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The NUBASE evaluation of nuclear and decay properties*

G. Audi^{a,§}, O. Bersillon^b, J. Blachot^b and A.H. Wapstra^c

^a *Centre de Spectrométrie Nucléaire et de Spectrométrie de Masse, CSNSM, IN2P3-CNRS&UPS, Bâtiment 108, F-91405 Orsay Campus, France*

^b *Service de Physique Nucléaire, CEA, B.P. 12, F-91680 Bruyères-le-Châtel, France*

^c *National Institute of Nuclear Physics and High-Energy Physics, NIKHEF, PO Box 41882, 1009DB Amsterdam, The Netherlands*

Abstract

This paper presents the NUBASE evaluation of nuclear and decay properties of nuclides in their ground- and isomeric-states. All nuclides for which some experimental information is known are considered. NUBASE uses extensively the information given by the “Evaluated Nuclear Structure Data Files” and includes the masses from the “Atomic Mass Evaluation” (AME, second part of this issue). But it also includes information from recent literature and is meant to cover all experimental data along with their references. In case no experimental data is available, trends in the systematics of neighboring nuclides have been used, whenever possible, to derive estimated values (labeled in the database as non-experimental). Adopted procedures and policies are presented.

AMDC: <http://csnwww.in2p3.fr/AMDC/>

1. Introduction

The present evaluation responds to the needs expressed by the nuclear physics community, from fundamental physics to applied nuclear sciences, for a database which contains values for the main basic nuclear properties such as masses, excitation energies of isomers, half-lives, spins and parities, decay modes and their intensities. A

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§ Corresponding author. *E-mail address:* audi@csnsm.in2p3.fr (G. Audi).

requirement is that all the information should be properly referenced in that database to allow checks on their validity.

One of the applications of such a database is the “Atomic Mass Evaluation” (AME) in which it is essential to have clear identification of the states involved in a decay, a reaction or a mass-spectrometric line. This is the main reason for which these two evaluations are coupled in the present issue. Furthermore, calculations requiring radioactive parameters for nuclear applications (e.g. reactors, waste management, nuclear astrophysics) need to access this basic information on any nuclide. In the preparation of a nuclear physics experiment, such a database could also be quite useful.

Most of the data mentioned above are in principle already present in two evaluated files: the “Evaluated Nuclear Structure Data Files” (ENSDF) [1] and the “Atomic Mass Evaluation” (AME2003, second part of this issue). The demand for a database as described above could be thus partially fulfilled by combining them in a ‘horizontal’ structure (which exists in the AME, but not in ENSDF). NUBASE is therefore, at a first level, a critical compilation of these two evaluations.

While building NUBASE, we found it necessary to examine the literature, firstly, to revise several of the collected results in ENSDF and ensure that the mentioned data are presented in a more consistent way; secondly, to have as far as possible all the available experimental data included, not only the recent ones (updating requirement), but also those missed in ENSDF (completeness requirement). This implied some evaluation work, which appears in the remarks added in the NUBASE table and in the discussions below. Full references are given for all of the added experimental information (cf. Section 2.7).

There is no strict cut-off date for the data from literature used in the present NUBASE2003 evaluation: all data available to us until the material was sent (November 19, 2003) to the publisher have been included. Those which could not be included for special reasons, like the need for a heavy revision of the evaluation at a too late stage, are added in remarks to the relevant data.

The contents of NUBASE are described below, along with some of the policies adopted in this work. Updating procedures of NUBASE are presented in Section 3. Finally, the electronic distribution of NUBASE and an interactive display of its contents with a World Wide Web Java program or with a PC-program are described in Section 4.

The present publication updates and includes all the information given in the previous and very first evaluation of NUBASE [2], published in 1997.

2. Contents of NUBASE

NUBASE contains experimentally known nuclear properties together with some values estimated by extrapolation of experimental data for 3177 nuclides. NUBASE also

contains data on isomeric states. We presently know 977 nuclides having one or more excited isomers according to our definition below. In the present evaluation we extended the definition of isomers compared to NUBASE'97 where only states with half-lives greater than 1 millisecond were considered. In present mass spectrometric experiments performed at accelerators, with immediate detection of the produced nuclei, isomers with half-lives as short as 100 ns may be present in the detected signals. We aimed at including as much as possible all those which play or might play in the near future a *rôle* in such experiments. We include also the description of those states that are involved in mass measurements and thus enter the AME2003.

For each nuclide (A, Z), and for each state (ground or excited isomer), the following quantities have been compiled, and when necessary evaluated: mass excess, excitation energy of the excited isomeric states, half-life, spin and parity, decay modes and intensities for each mode, isotopic abundances of the stable nuclei, and references for all experimental values of the above items.

In the description below, references to papers that are also quoted in the NUBASE table are given with the same Nuclear Structure Reference key number style [3]. They are listed at the end of this issue (AME2003, Part II, p. 579).

In NUBASE'97, the names and the chemical symbols used for elements 104 to 109 were those recommended then by the Commission on Nomenclature of Inorganic Chemistry of the International Union of Pure and Applied Chemistry (IUPAC). Since then, unfortunately for the resulting confusion, the names were changed and moreover two of them were displaced [4] (see also AME2003, Part I, Section 6.5). The user should therefore be careful when comparing results between NUBASE'97 and the present NUBASE2003 for nuclides with $Z \geq 104$. The finally adopted names and symbols are: 104 rutherfordium (Rf), 105 dubnium (Db), 106 seaborgium (Sg), 107 bohrium (Bh), 108 hassium (Hs), and 109 meitnerium (Mt), while the provisional symbols Ea, Eb, . . . , Ei are used for elements 110, 111, . . . , 118.

Besides considering all nuclides for which at least one piece of information is experimentally available, we also included unknown nuclides - for which we give estimated properties - in order to ensure continuity of the set of the considered nuclides at the same time in N , in Z , in A and in $N - Z$. The chart of the nuclides defined this way has a smooth contour.

As far as possible, one standard deviations (1σ) are given to represent the uncertainties connected with the experimental values. Unfortunately, authors do not always define the meaning of the uncertainties they quote; under such circumstances, the uncertainties are assumed to be one standard deviations. In many cases, the uncertainties are not given at all; we then estimated them on the basis of the limitations of the method of measurement.

Values and errors that are given in the NUBASE table have been rounded, even if unrounded values were found in ENSDF or in the literature. In cases where the two

furthest-left significant digit in the error were larger than a given limit (30 for the energies, to maintain strict identity with AME2003, and 25 for all other quantities), values and errors were rounded off (see examples in the ‘Explanation of table’). In very few cases, when essential for traceability, we added a remark with the original value.

When no experimental data exist for a nuclide, values can often be estimated from observed trends in the systematics of experimental data. In the AME2003, masses estimated from systematic trends were already flagged with the symbol ‘#’. The use of this symbol has been extended in NUBASE to all other quantities and has the same meaning of indicating non-experimental information.

2.1. Mass excess

The mass excess is defined as the difference between the atomic mass (in mass units) and the mass number, and is given in keV for each nuclear state, together with its one standard deviation uncertainty. The mass excess values given in NUBASE are exactly those of the AME2003 evaluation, given in the second part of this issue.

It sometimes happens that knowledge of masses can yield information on the decay modes, in particular regarding nucleon-stability. Such information has been used here, as can be seen in the table for ^{10}He , ^{19}Na , ^{39}Sc , ^{62}As or ^{63}As . In some cases we rejected claimed observation of decay modes, when not allowed by energetic consideration. As an example, ENSDF2000 compiles for ^{142}Ba five measurements of delayed neutron decay intensities, whereas $Q(\beta^-n) = -2955(7)$ keV.

Figure 1 complements the main table in displaying the precisions on the masses, in a color-coded chart, as a function of N and Z .

2.2. Isomers

In the first version of NUBASE in 1997 [2], a simple definition for the excited isomers was adopted: they were states that live longer than 1 millisecond. Already in NUBASE97, we noticed that such a simple definition had several drawbacks, particularly for alpha and proton decaying nuclides: whereas for β -decay a limit of 1 millisecond was acceptable (the shortest-lived known β -decaying nuclide (^{35}Na) has a half-life of 1.5 millisecond), for α or proton decay, several cases are known where an isomer with a half-life far below 1 millisecond lives still longer than the ground-state.

As mentioned earlier, the definition of isomers is now extended to include a large number of excited states, with half-lives as short as 100 ns, that are of interest for mass spectrometric works at accelerators. Isomers are given in order of increasing excitation energy and identified by appending ‘ m ’, ‘ n ’, ‘ p ’ or ‘ q ’ to the nuclide name, e.g. ^{90}Nb for the ground-state, $^{90}\text{Nb}^m$ for the first excited isomer, $^{90}\text{Nb}^n$ for the second

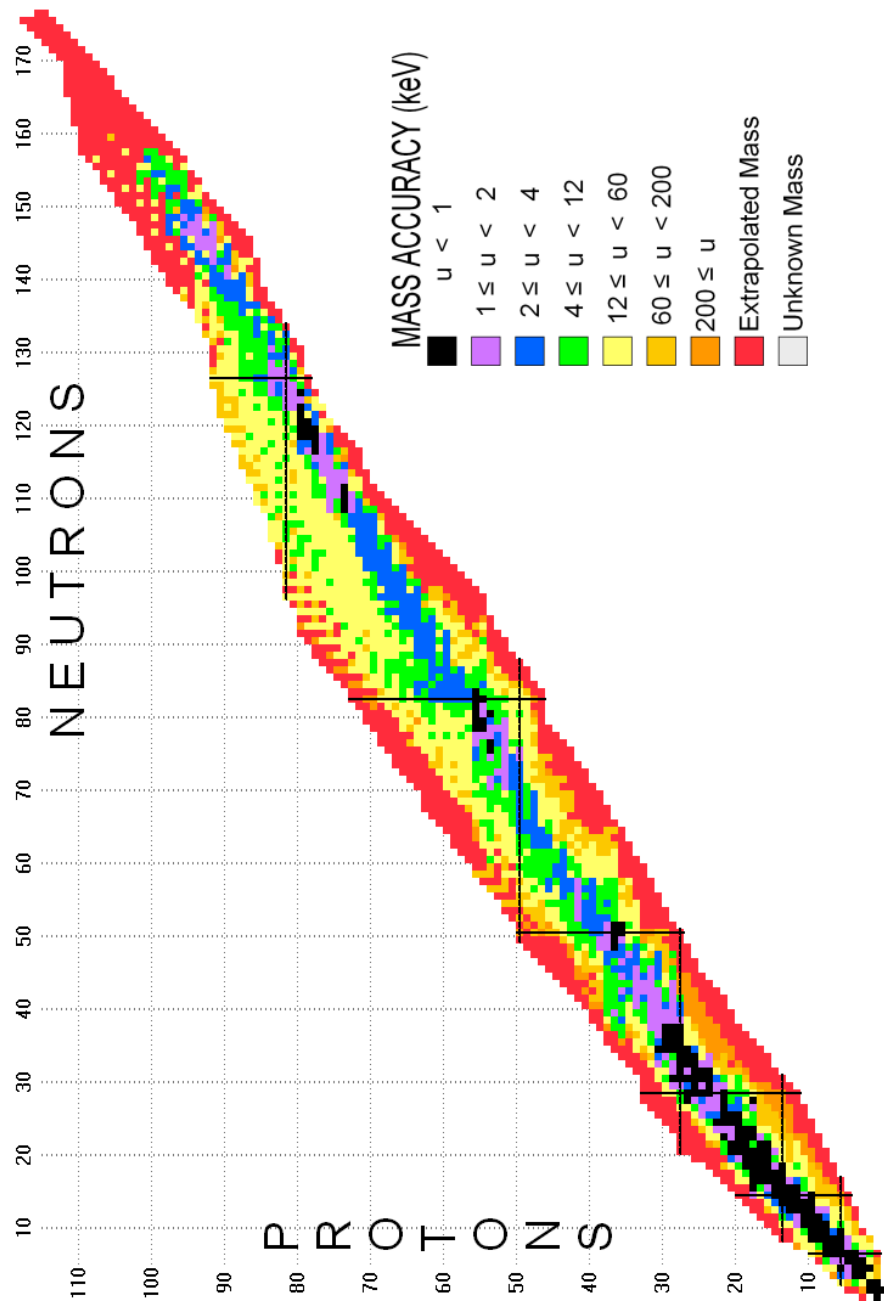


Figure 1: Chart of the nuclides for the precision 'u' on masses (created by NUCLEUS-AMDC).

one, $^{90}\text{Nb}^p$ and $^{90}\text{Nb}^q$ for respectively the third and fourth. In NUBASE97 we could not report in a normal way the third excited isomer of ^{178}Ta with half-life 59 ms, because of poorness of notation; the new notation adopted here removes also such a limitation.

The excitation energy can be derived from a number of different experimental methods. When this energy is derived from a method other than γ -ray spectrometry, the origin is indicated by a two-letter code and the numerical value is taken from AME. Otherwise, the code is left blank and the numerical value is taken from ENSDF or from literature update.

When the existence of an isomer is under discussion (e.g. $^{141}\text{Tb}^m$) it is flagged with ‘EU’ in the origin field to mean “existence uncertain”. A comment is generally added to indicate why its existence is questioned, or where this matter has been discussed. Depending on the degree of our confidence in this existence, we can still give a mass excess value and an excitation energy, or omit them altogether (e.g. $^{138}\text{Pm}^n$). In the latter case, the mention “non-existent” appears in place of that excitation energy.

When an isomer has been reported, and later proved not to exist (e.g. $^{184}\text{Lu}^m$), it is flagged with ‘RN’ in the origin field to mean “reported, non-existent”. In such case we give of course no mass excess value and no excitation energy, and, as in the case of the ‘EU’s above, they are replaced by the same mention “non-existent”.

Note: we have extended the use of the two flags ‘EU’ and ‘RN’ to cases where the discovery of a nuclide (e.g. ^{260}Fm) is questioned. In this case however we always give an estimate, derived from systematic trends, for the ground state masses.

In several cases, ENSDF gives a lower and a higher limit for an isomeric excitation energy. A uniform distribution of probabilities has been assumed which yields a value at the middle of the range and a 1σ uncertainty of 29% of that range (cf. Appendix B of the AME2003, Part I, for a complete description of this procedure). An example is ^{136}La for which it is known that the excited isomer lies above the level at 230.1 keV, but, as explained in ENSDF, there are good experimental indications that the difference between these two levels lies between 10 and 40 keV. We present this information as $E = 255(9)$ keV. However, if that difference would have been derived from theory or from systematics, the resulting E is considered as non-experimental and the value flagged with the ‘#’ symbol.

In case that the uncertainty σ on the excitation energy E is relatively large compared to the value, the assignment to ground state and isomeric state is uncertain. If $\sigma > E/2$ a flag is added in the NUBASE table.

As a result of this work, the orderings of several ground-states and isomeric-states have been reversed compared to those in ENSDF. They are flagged in the NUBASE table with the ‘&’ symbol. In several cases we found evidence for a state below the adopted ENSDF ground-state. Also, in many other cases, the systematics of nuclides with the same parities in N and Z strongly suggest that such a lower state should exist.

They have been added in the NUBASE table and can be located easily, since they are also flagged with the ‘&’ symbol. In a few cases, new information on masses can also lead to reversal of the level ordering. Thanks to the coupling of the NUBASE and the AME evaluations, all changes in level ordering are carefully synchronized.

News on isomeric excitation energies

Interestingly, the technique of investigating proton decay of very proton-rich nuclides gives information on isomeric excitation energies. Thus, such work on ^{167}Ir [1997Da07] shows that it has an isomeric excitation energy $E = 175.3(2.2)$ keV. This information is displayed by the ‘p’ symbol following the excitation energy. In addition, study of the α -decay series of these activities not only showed that a number of α lines earlier assigned to ground-states belong in reality to isomers, but also allowed to derive values for their excitation energies.

Another case of such a change is ^{181}Pb . The α decay half-life that was previously assigned to $^{181}\text{Pb}^m$ is now assigned to the ground-state, following the work of Toth *et al.* [1996To01] who showed, first, that contrary to a previous work, there is no α line at higher energy than the one just mentioned, and second, that the observed α is in correlation with the decay of the daughter ^{177}Hg , which is also most probably a $5/2^-$ state.

2.3. Half-life

For some light nuclei, the half-life ($T_{1/2}$) is deduced from the level total width (Γ_{cm}) by the equation $\Gamma_{\text{cm}} T_{1/2} \simeq \hbar \ln 2$:

$$T_{1/2} (\text{s}) \simeq 4.562 \cdot 10^{-22} / \Gamma_{\text{cm}} (\text{MeV}).$$

Quite often uncertainties for half-lives are given asymmetrically T_{-b}^{+a} . If these uncertainties are used in some applications, they need to be symmetrized. Earlier (cf. AME’95) a rough symmetrization was used: take the central value to be the mid-value between the upper and lower 1σ -equivalent limits $T + (a - b)/2$, and define the uncertainty to be the average of the two uncertainties $(a + b)/2$. A strict statistical derivation (see Appendix) shows that a better approximation for the central value is obtained by using $T + 0.64 \times (a - b)$. The exact expression for the uncertainty is given in the Appendix.

When two or more independent measurements have been reported, they are averaged, while being weighed by their reported precision. While doing this, we consider the NORMALIZED CHI, χ_n (or ‘consistency factor’ or ‘Birge ratio’), as defined in AME2003, Part I, Section 5.2. Only when χ_n is beyond 2.5, do we depart from the statistical result, and adopt the external error for the average, following the same

policy as discussed and adopted in AME2003, Part I, Section 5.4. Very rarely, when the Birge ratio χ_n is so large that we consider all errors given as non-relevant, do we adopt the arithmetic average (unweighed) for the result and the corresponding error (based on the dispersion of values). In all such cases, a remark is added to the data, giving the list of values that were averaged, and, when relevant, the value of the Birge ratio χ_n and the reason for our choice.

In the case of experiments in which extremely rare events are observed, and where the results are very asymmetric, we did not average directly the half-lives derived from different works, but instead, when the information given in the papers was sufficient (e.g. ^{264}Hs or ^{269}Hs), we combined the delay times of the individual events, as prescribed by Schmidt *et al* [1984Sc13].

Some measurements are reported as a range of values with most probable lower and upper limits. They are treated, as explained above (cf. Section 2.2), as a uniform distribution of probabilities with a value at the middle of the range and a 1σ uncertainty of 29% of that range (cf. Appendix B of the AME2003 for a complete description of this procedure).

For some nuclides identified by using a time-of-flight spectrometer, an upper or a lower limit on the half-life is given.

i) For *observed* species, we give this important but isolated piece of information (lower limit) in place of the uncertainty on the half-life, and within brackets (e.g. ^{36}Mg , p. 34). The user of our table should be careful in that this limit can be very far below the eventually measured half-life. To help to avoid confusion, we now give, in addition, an estimate (as always in the present two evaluations, flagged with #) for the half-life derived from trends in systematics.

ii) For nuclides sought for but *not observed*, we give the found upper limit in place of the half-life. Upper limits for undetected nuclides have been evaluated for NUBASE by F. Pougheon [1993Po.A], based on the time-of-flight of the experimental setup and the yields expected from the trends in neighboring nuclides (e.g. ^{19}Na).

When half-lives for nuclides with the same parities in Z and N are found to vary smoothly (see Fig. 2), interpolation or extrapolation is used to obtain reasonable estimates.

2.4. Spin and parity

As in ENSDF, values are presented without and with parentheses based upon strong and weak assignment arguments, respectively (see the introductory pages of Ref. [5]). Unfortunately, the latter include estimates from systematics or theory. Where we can distinguish them, we use parentheses if the so-called “weak” argument is an experimental one, but the symbol ‘#’ in the other cases. The survey might have not been complete, and the reader might still find non-flagged non-experimental cases (the

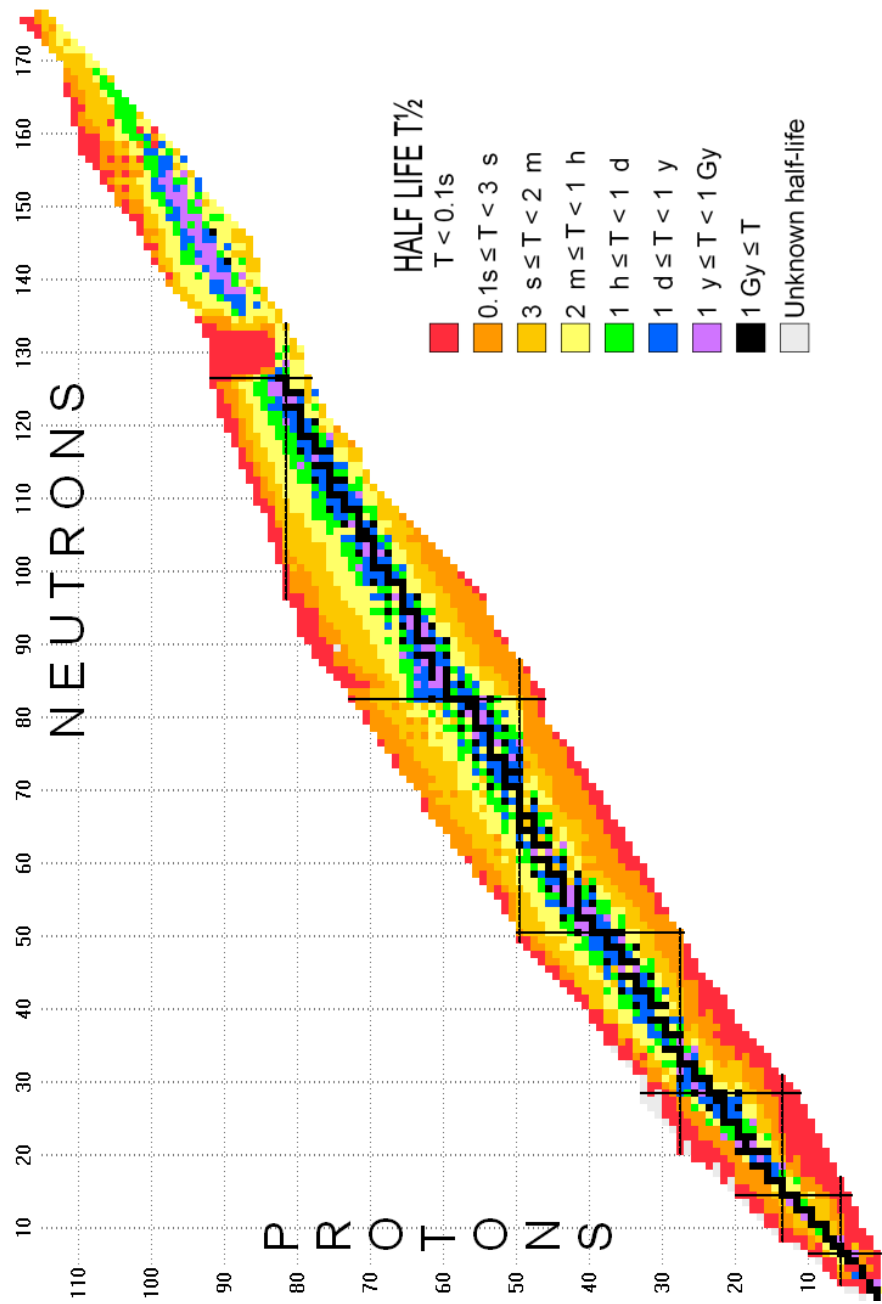


Figure 2: Chart of the nuclides for half-lives (created by NUCLEUS-AMDC).

authors will gratefully appreciate mention of such cases to improve future versions of NUBASE).

If spin and parity are not known from experiment, they can be estimated, in some cases, from systematic trends in neighboring nuclides with the same parities in N and Z . This is often true for odd- A nuclides (see Fig. 3 and Fig. 4), but also, not so rarely, for odd–odd ones, as can be seen in Fig. 5. These estimated values are also flagged with the ‘#’ symbol. In several cases we replaced the ENSDF systematics by our own.

The review of nuclear radii and moments of Otten [1989Ot.A], in which the spins were compiled, was used to check and complete the spin values in NUBASE.

2.5. Decay modes and intensities

The most important policy, from our point of view, in coding the information for the decay modes, is in establishing a very clear distinction between a decay mode that is energetically allowed but not yet experimentally observed (represented by a question mark alone, which thus refers to the decay mode itself), and a decay mode that is actually observed but for which the intensity could not be determined (represented by ‘=?’, the question mark referring here to the quantity after the equal sign).

As in ENSDF, no corrections have been made to normalize the primary intensities to 100%.

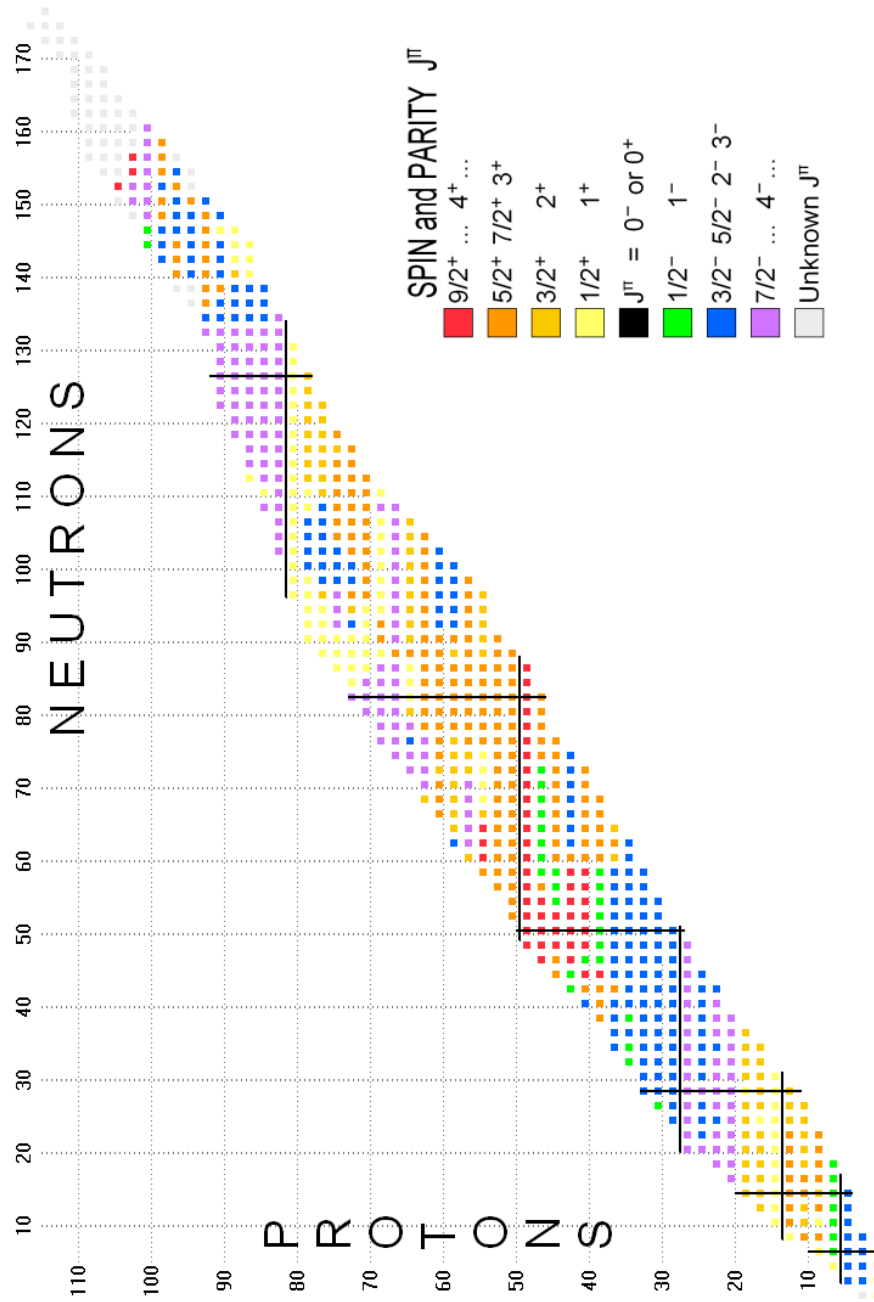
Besides direct updates from the literature, we also made use of partial evaluations by other authors (with proper quotation). They are mentioned below, when discussing some particular decay modes.

The β^+ decay

In the course of our work we refined some definitions and notations for the β^+ decay, in order to present more clearly the available information. We denote with β^+ the decay process that includes both electron capture, denoted ε , and the decay by positron emission, denoted e^+ . One can then symbolically write: $\beta^+ = \varepsilon + e^+$. As is well known, for an available energy below 1022 keV, only electron capture ε is allowed; above that value both processes compete.

Remark: this notation is **not** the same as the one implicitly used in ENSDF, where the combination of both modes is denoted “EC+B+”.

When both modes compete, the separated intensities are not always available from experiment. Most of the time, separated values in ENSDF are calculated ones. In continuation of one of our general policies, in which we retain whenever possible only experimental information, we decided not to retain ENSDF’s calculated separated values (which are scarce and not always updated). Most often, it is in some very particular cases that the distinction is of importance, like in the case of rare or extremely rare processes (e.g. ^{91}Nb , ^{54}Mn , $^{119}\text{Te}^m$). Then, the use of our notation is useful.

Figure 3: Chart of the nuclides for spins and parities. Shown are only the odd- Z even- N nuclides (created by NUCLEUS-AMDC).

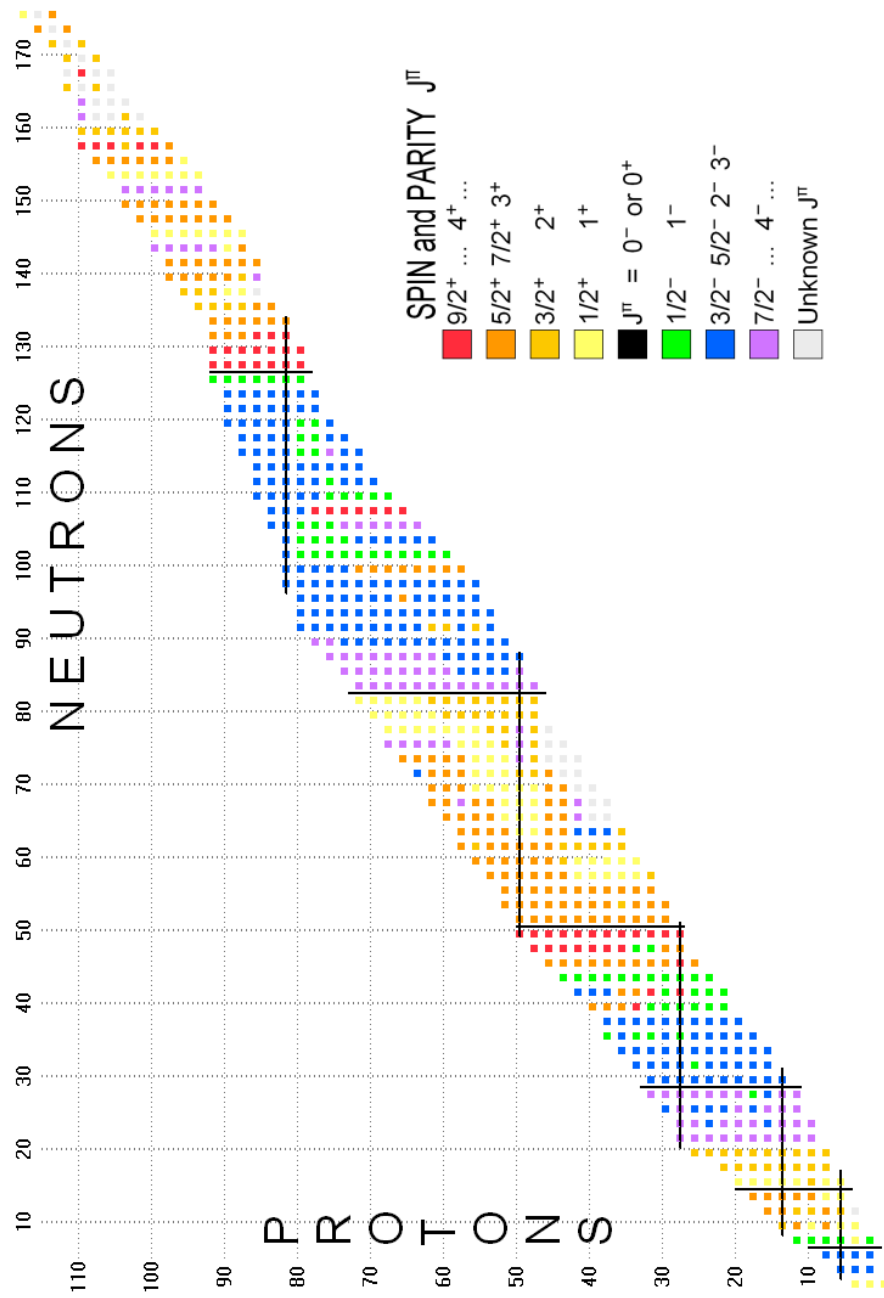
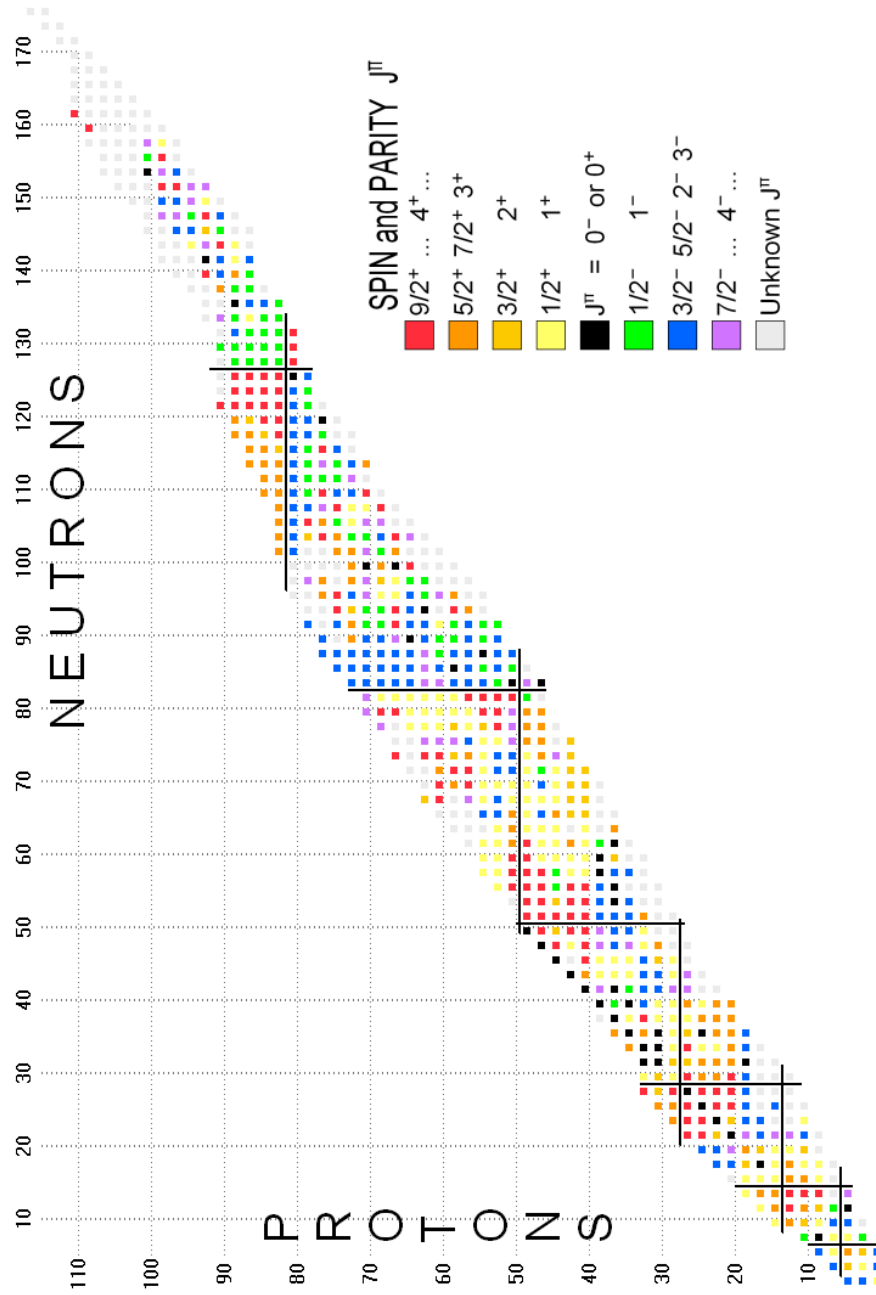


Figure 4: Chart of the nuclides for spins and parities. Shown are only the even- Z odd- N nuclides (created by NUCLEUS-AMDC).

Figure 5: Chart of the nuclides for spins and parities. Shown are only the odd- Z odd- N nuclides (created by NUCLEUS-AMDC).

In the same line, we give both electron capture ε -delayed fission and the positron e^+ -delayed fission with the same symbol $\beta^+ \text{SF}$.

The double- β decay

In the course of our work we found that half-lives for double- β decay were not always given in a consistent way in ENSDF. For NUBASE we decided to give only half-life values or upper-limits related to the dominant process, which is in general the two-neutrino gs-gs transition (one exception may be ^{98}Mo , for which the neutrinoless decay is predicted to be faster, see [2002Tr04]). No attempt was made to convert to the same statistical confidence level (CL) upper limit results given by different authors.

The excellent recent compilation of Tretyak and Zdesenko [2002Tr04] was of great help in this part of our work.

The β -delayed decays

For delayed decays, intensities have to be considered carefully. By definition, the intensity of a decay mode is the percentage of decaying nuclei in that mode. But traditionally, the intensities of the pure β decay and of those of the delayed ones are summed to give an intensity that is assigned to the pure β decay. For example, if the (A, Z) nuclide has a decay described, according to the tradition, by ' $\beta^- = 100$; $\beta^- n = 20$ ', this means that for 100 decays of the parent (A, Z) , 80 $(A, Z+1)$ and 20 $(A-1, Z+1)$ daughter nuclei are produced and that 100 electrons and 20 delayed-neutrons are emitted. A strict notation, following the definition above, would have been in this case ' $\beta^- = 80$; $\beta^- n = 20$ '. However we decided to follow the tradition and use in our work the notation: ' $\beta^- = 100$; $\beta^- n = 20$ '.

This also holds for more complex delayed emissions. A decay described by: ' $\beta^- = 100$; $\beta^- n = 30$; $\beta^- 2n = 20$; $\beta^- \alpha = 10$ ' corresponds to the emission of 100 electrons, $(30+2 \times 20=70)$ delayed-neutrons and 10 delayed- α particles; and in terms of residual nuclides, to 40 $(A, Z+1)$, 30 $(A-1, Z+1)$, 20 $(A-2, Z+1)$ and 10 $(A-4, Z-1)$. More generally, P_n , the number of emitted neutrons per 100 decays, can be written:

$$P_n = \sum_i i \times \beta_{in}^-;$$

and similar expressions for α or proton emission. The number of residual β daughter $(A, Z+1)$ is:

$$\beta^- - \sum_i \beta_{in}^- - \sum_j \beta_{j\alpha}^- - \dots$$

Another special remark concerns the intensity of a particular β -delayed mode. The primary β -decay populates several excited states in the β -daughter, that will further decay by particle emission. However, in the case where the daughter's ground state also decays by the same particle emission, some authors included its decay

in the value for the concerned β -delayed intensity. We decided not to do so for two reasons. Firstly, because the energies of the particles emitted from the excited states are generally much higher than that from the ground-state, implying different subsequent processes. Secondly, because the characteristic times for the decays from the excited states are related to the parent, whereas those for the decays from the daughter's ground state are due to the daughter. For example ${}^9\text{C}$ decays through β^+ mode with an intensity of 100% of which 12% and 11% to two excited p-emitting states in ${}^9\text{B}$, and 17% to an α -emitting state. We give thus $\beta^+p=23\%$ and $\beta^+\alpha=17\%$, from which the user of our table can derive a 60% direct feeding of the ground-state of ${}^9\text{B}$. In a slightly different example, ${}^8\text{B}$ decays only to two excited states in ${}^8\text{Be}$ which in turn decay by α and γ emission, but not to the ${}^8\text{Be}$ ground-state. We write thus $\beta^+=100\%$ and $\beta^+\alpha=100\%$, the difference of which leaves 0% for the feeding of the daughter's ground state.

Finally, we want to draw to the attention of the user of our table, that the percentages are, by definition, related to 100 decaying nuclei, not to the primary beta-decay fraction. An illustrative example is given by the decay of ${}^{228}\text{Np}$, for which the delayed-fission probability is given in the original paper as 0.020(9)% [1994Kr13], but this number is relative to the ϵ process, the intensity of which is 59(7)%. We thus renormalized the delayed-fission intensity to 0.012(6)% of the total decay.

In collecting the delayed proton and α activities, the remarkable work of Hardy and Hagberg [1989Ha.A], in which this physics was reviewed and discussed, was an appreciable help in our work. The review of Honkanen, Äystö and Eskola [6] on delayed-protons has also been verified.

Similarly, the review of delayed neutron emission by Hansen and Jonson [1989Ha.B] was carefully examined and used in our table, as well as the evaluation of Rudstam, Aleklett and Sihver [1993Ru01].

2.6. Isotopic abundances

Isotopic abundances are taken from the compilation of K.J.R. Rosman and P.D.P. Taylor [1998Ro45] and are listed in the decay field with the symbol IS. They are displayed as given in [1998Ro45], i.e. we did not even apply our rounding policy.

2.7. References

The year of the archival file is indicated for the nuclides evaluated in ENSDF; otherwise, this entry is left blank.

References for all of the experimental updates are given by the NSR key number [3], and listed at the end of this issue (p. 579). They are followed by one, two or three one-letter codes which specify the added or modified physical quantities (see the

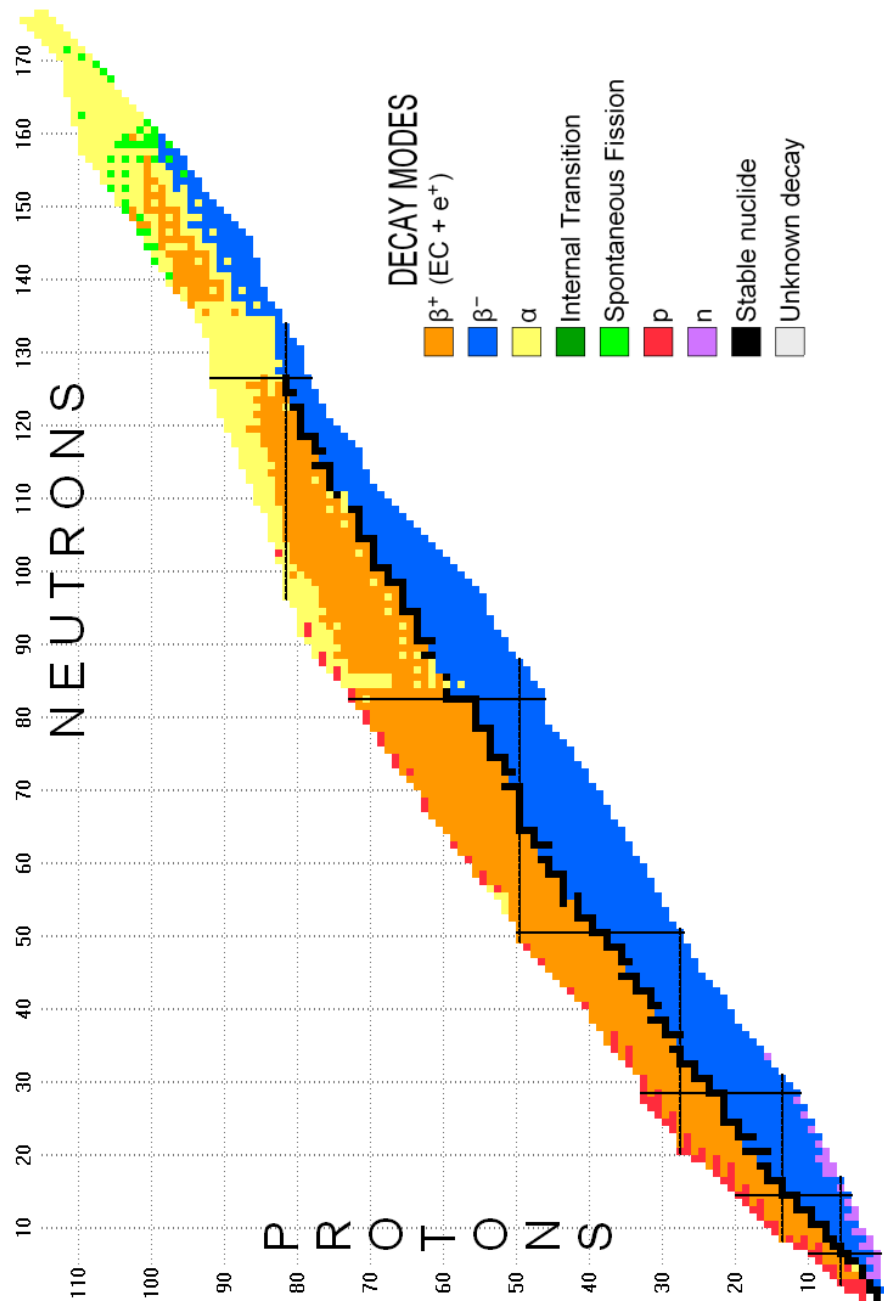


Figure 6: Chart of the nuclides for decay modes (created by NUCLEUS-AMDC).

Explanation of Table). In cases where more than one reference is needed to describe the updates, they are given in a remark. No reference is given for systematic values. The ABBW reference key is used in cases where it may not appear unambiguously that re-interpretations of the data were made by the present authors.

3. Updating procedure

NUBASE is updated via two routes: from ENSDF after each new A-chain evaluation (or from the bi-annual releases), and directly from the literature.

ENSDF files are retrieved from NNDC using the on-line service [1] and transferred through the Internet. Two of the present authors [7] developed programs to successfully:

- check that each Z in the A-chain has an ‘adopted levels’ data set; if not, a corresponding data set is generated from the ‘decay’ or ‘reaction’ data set,
- extract the ‘adopted levels’ data sets from ENSDF,
- extract from these data sets the required physical quantities, and convert them into a format similar to the NUBASE format.

The processed data are used to update manually the previous version of NUBASE. This step is done separately by the four authors and cross-checked until full agreement is reached.

The ENSDF is updated generally by A-chains, and, more recently, also by individual nuclides. Its contents however is very large, since it encompasses all the complex nuclear structure and decay properties. This is a huge effort, and it is no wonder that some older data (including annual reports, conference proceedings, and theses) are missing, and that some recent data have not yet been included. Where we notice such missing data, they are analyzed and evaluated, as above, independently by the four authors and the proposed updatings are compared. Most often these new data are included in the next ENSDF evaluation and the corresponding references can be removed from the NUBASE database.

4. Distribution and displays of NUBASE

Full content of the present evaluation is accessible on-line at the web site of the Atomic Mass Data Center (AMDC) [8] through the *World Wide Web*. An electronic ASCII file for the NUBASE table, for use with computer programs, is also distributed by the AMDC. This file will **not** be updated, to allow stable reference data for calculations. Any work using that file should make reference to the present paper and not to the electronic file.

The contents of NUBASE can be displayed by a Java program JVNUBASE [9] through the *World Wide Web* and also with a PC-program called “NUCLEUS” [10]. Both can

be accessed or downloaded from the AMDC. They will be updated regularly to allow the user to check for the latest available information in NUBASE.

5. Conclusions

A ‘horizontal’ evaluated database has been developed which contains most of the main properties of the nuclides in their ground and isomeric states. These data originate from a critical compilation of two evaluated datasets: the ENSDF, updated and completed from the literature, and the AME. The guidelines in setting up this database were to cover as completely as possible all the experimental data, and to provide proper reference for those used in NUBASE and not already included in ENSDF; this traceability allows any user to check the recommended data and, if necessary, undertake a re-evaluation.

As a result of this ‘horizontal’ work, a greater homogeneity in data handling and presentation has been obtained for all of the nuclides. Furthermore, isomeric assignments and excitation energies have been reconsidered on a firmer basis and their data improved.

It is expected to follow up this second version of NUBASE with improved treatments. Among them, we plan to complete the extension due to the new definition of isomer to states with half-lives between 100 ns and 1 millisecond that are available at the large-scale facilities. Another foreseeable implementation would be to provide the main α , γ , conversion and X-ray lines accompanying the decays. NUBASE could also be extended to other nuclear properties: energies of the first 2^+ states in even-even nuclides, radii, moments . . . An interesting feature that is already implemented, but not yet checked sufficiently to be included here, is to give for each nuclide, in ground or isomeric-state, the year of its discovery.

6. Acknowledgements

We wish to thank our many colleagues who answered our questions about their experiments and those who sent us preprints of their papers. Continuous interest, discussions, suggestions and help in the preparation of the present publication by C. Thibault were highly appreciated. We appreciate the help provided by J.K. Tuli in solving some of the puzzles we encountered. Special thanks are due to S. Audi for the preparation of the color figures from the NUCLEUS program, and to C. Gaulard and D. Lunney for careful reading of the manuscript. A.H.W. expresses his gratitude to the NIKHEF-K laboratory and especially to Mr. K. Huyser for his continual help, and J.B. to the ISN-Grenoble and DRFMC-Grenoble laboratories for permission to use their facilities.

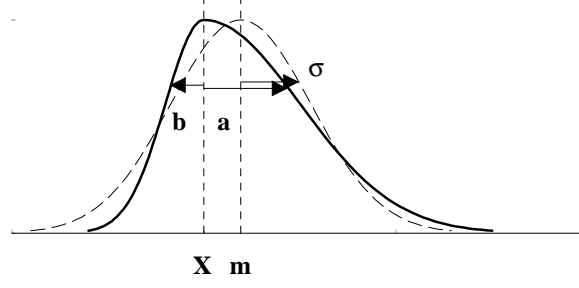


Figure 7: Simulated asymmetric probability density function (heavy solid line) and the equivalent symmetric one (dashed line).

Appendix A. Symmetrization of asymmetric uncertainties

Experimental data are sometimes given with asymmetric uncertainties, X_{-b}^{+a} . If these data are to be used with other ones in some applications, their uncertainties may need to be symmetrized. A simple method (Method 1), used earlier, consisted in taking the central value to be the mid-value between the upper and lower 1σ -equivalent limits $X + (a - b)/2$, and define the uncertainty to be the average of the two uncertainties $(a + b)/2$.

An alternative method (Method 2) is to consider the random variable x associated with the measured quantity. For this random variable, we assume the probability density function to be an asymmetric normal distribution having a modal (most probable) value of $x = X$, a standard deviation b for $x < X$, and a standard deviation a for $x > X$ (Fig. 7). Then the average value of this distribution is

$$\langle x \rangle = X + \sqrt{2/\pi} (a - b),$$

with variance

$$\sigma^2 = (1 - 2/\pi) (a - b)^2 + ab. \quad (1)$$

The median value m which divides the distribution into two equal areas is given, for $a > b$, by

$$\operatorname{erf}\left(\frac{m - X}{\sqrt{2}a}\right) = \frac{a - b}{2a}, \quad (2)$$

and by a similar expression for $b > a$.

We define the equivalent symmetric normal distribution we are looking for as a distribution having a mean value equal to the median value m of the previous distribution with same variance σ .

Table A. Examples of treatment of asymmetric uncertainties for half-lives. Method 1 is the classical method, used previously, as in the AME'95. Method 2 is the one developed in this Appendix and used for half-lives and intensities of the decay modes.

Nuclide	Original $T_{1/2}$	Method 1	Method 2
^{76}Ni	240+550–190 ms	420 ± 370	470 ± 390
^{222}U	1.0+1.0–0.4 μs	1.3 ± 0.7	1.4 ± 0.7
^{264}Hs	327+448–120 μs	490 ± 280	540 ± 300
^{266}Mt	1.01+0.47–0.24 ms	1.1 ± 0.4	1.2 ± 0.4

If the shift $m - X$ of the central value is small compared to a or b , expression (2) can be written [11]:

$$m - X \simeq \sqrt{\pi/8} (a - b) \simeq 0.6267 (a - b).$$

In order to allow for a small non-linearity that appears for higher values of $m - X$, we adopt for Method 2 the relation

$$m - X = 0.64 (a - b).$$

Table A illustrates the results from both methods. In NUBASE, Method 2 is used for the symmetrization of asymmetric half-lives and of asymmetric decay intensities.

References

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Table I. Table of nuclear and decay properties**EXPLANATION OF TABLE**

Data are presented in groups ordered according to increasing mass number A .

Nuclide	<p>Nuclidic name: mass number $A = N + Z$ and element symbol (for $Z > 109$ see Section 2). Element indications with suffix ‘m’, ‘n’, ‘p’ or ‘q’ indicate assignments to excited isomeric states (defined, see text, as upper states with half-lives larger than 100 ns). Suffixes ‘p’ and ‘q’ indicate also non-isomeric levels, of use in the AME2003. Suffix ‘r’ indicates a state from a proton resonance occurring in (p,γ) reactions (e.g. $^{28}\text{Si}^r$). Suffix ‘x’ applies to mixtures of levels (with relative ratio R, given in the ‘Half-life’ column), e.g. occurring in spallation reactions (indicated ‘spmix’ in the ‘J^π’ column) or fission (‘fsmix’).</p>
Mass excess	<p>Mass excess $[M(\text{in u}) - A]$, in keV, and its one standard deviation uncertainty as given in the ‘Atomic Mass Evaluation’ (AME2003, second part of this volume).</p> <p>Rounding policy: in cases where the furthest-left significant digit in the error is larger than 3, values and errors are rounded off, but not to more than tens of keV. (Examples: $2345.67 \pm 2.78 \rightarrow 2345.7 \pm 2.8$, $2345.67 \pm 4.68 \rightarrow 2346 \pm 5$, but $2346.7 \pm 468.2 \rightarrow 2350 \pm 470$).</p> <p># in place of decimal point: value and uncertainty derived not from purely experimental data, but at least partly from systematic trends (cf. AME2003).</p>
Excitation energy	<p>For excited isomers only: energy difference, in keV, between levels adopted as higher level isomer and ground state isomer, and its one standard deviation uncertainty, as given in AME2003 when derived from the AME, otherwise as given by ENSDF. The rounding policy is the same as for the mass excess (see above).</p> <p># in place of decimal point: value and uncertainty derived from systematic trends. The excitation energy is followed by its origin code when derived from a method other than γ-ray spectrometry:</p> <p>MD Mass doublet RQ Reaction energy difference AD α energy difference BD β energy difference p proton decay XL L X-rays Nm estimated value derived with help of Nilsson model</p> <p>When the existence of an isomer is questionable the following codes are used:</p> <p>EU existence of isomer is under discussion (e.g. $^{141}\text{Tb}^m$). If existence is strongly doubted, no excitation energy and no mass are given. They are replaced by the mention “non-existent” (e.g. $^{138}\text{Pm}^n$).</p> <p>RN isomer is proved not to exist (e.g. $^{184}\text{Lu}^m$). Excitation energy and mass are replaced by the mention “non-existent”.</p> <p>Remark: codes EU and RN are also used when the discovery of a nuclide (e.g. ^{260}Fm) is questioned. In this case however we always give an estimate, derived from systematic trends, for the ground state mass.</p> <p>Isomeric assignment:</p> <p>* In case the uncertainty σ on the excitation energy E is larger than half that energy ($\sigma > E/2$), these quantities are followed by an asterisk (e.g. ^{130}In and $^{130}\text{In}^*$).</p> <p>& In case the ordering of the ground- and isomeric-states are reversed compared to ENSDF, an ampersand sign is added (e.g. ^{90}Tc and $^{90}\text{Tc}^m$).</p>

Half-life	<p>s = seconds; m = minutes; h = hours; d = days; y = years; 1 y = 31 556 926 s or 365.2422 d adopted values for NUBASE (see text) STABLE = stable nuclide or nuclide for which no finite value for half-life has been found. # value estimated from systematic trends in neighboring nuclides with the same Z and N parities. subunits: ms: 10^{-3} s millisecond ky: 10^3 y kiloyear μs: 10^{-6} s microsecond My: 10^6 y megayear ns: 10^{-9} s nanosecond Gy: 10^9 y gigayear ps: 10^{-12} s picosecond Ty: 10^{12} y terayear fs: 10^{-15} s femtosecond Py: 10^{15} y petayear as: 10^{-18} s attosecond Ey: 10^{18} y exayear zs: 10^{-21} s zeptosecond Zy: 10^{21} y zettayear ys: 10^{-24} s yoctosecond Yy: 10^{24} y yottayear For isomeric mixtures: R is the production ratio of excited isomeric state to ground-state.</p>
J^π	<p>Spin and parity: () uncertain spin and/or parity. # values estimated from systematic trends in neighboring nuclides with the same Z and N parities. high high spin. low low spin. am same J^π as α-decay parent; For isomeric mixtures: mix (spmix and fsmix if coming from spallation and fission respec- tively).</p>
Ens	<p>Year of the archival file of the ENSDF (in order to reduce the width of the Table, the two digits for the centuries are omitted).</p>
Reference	<p>Reference keys: (in order to reduce the width of the Table, the two digits for the centuries are omitted; at the end of this volume however, the full reference key-number is given: 1992Pa05 and not 92Pa05) 92Pa05 Updates to ENSDF derived from regular journal. These keys are taken from Nuclear Data Sheets. Where not yet available, the style 03Ya.1 is provisionally adopted. 95Am.A Updates to ENSDF derived from abstract, preprint, private communication, con- ference, thesis or annual report. ABW Re-interpretation by the present authors. The reference key-numbers are followed by one, two or three letter codes which specifies the added or modified physical quantities: T for half-life J for spin and/or parity E for the isomer excitation energy D for decay mode and/or intensity I for identification</p>

Decay modes and intensities Decay modes followed by their intensities (in %), and their one standard deviation uncertainties. The special notation 1.8e-12 stands for 1.8×10^{-12} .
 The uncertainties are given - only in this field - in the ENSDF-style: $\alpha=25.9 \pm 2.3$ %

The ordering is according to decreasing intensities.

α	α emission
p 2p	proton emission 2-proton emission
n 2n	neutron emission 2-neutron emission
ε	electron capture
e^+	positron emission
β^+	β^+ decay ($\beta^+ = \varepsilon + e^+$)
β^-	β^- decay
$2\beta^-$	double β^- decay
$2\beta^+$	double β^+ decay
β^-n	β^- delayed neutron emission
β^-2n	β^- delayed 2-neutron emission
β^+p	β^+ delayed proton emission
β^+2p	β^+ delayed 2-proton emission
$\beta^-\alpha$	β^- delayed α emission
$\beta^+\alpha$	β^+ delayed α emission
β^-d	β^- delayed deuteron emission
IT	internal transition
SF	spontaneous fission
β^+SF	β^+ delayed fission
β^-SF	β^- delayed fission
^{24}Ne	heavy cluster emission
...	list is continued in a remark, at the end of the A-group

For long-lived nuclides:

IS Isotopic abundance

* A remark on the corresponding nuclide is given below the block of data corresponding to the same A.

Remarks. For nuclides indicated with an asterix at the end of the line, remarks have been added. They are collected in groups at the end of each block of data corresponding to the same A. They start with a code letter, like the ones following the reference key-number, as given above, indicating to which quantity the remark applies. They give:

- i) Continuation for the list of decays. In this case, the remark starts with three dots.
- ii) Information explaining how a value has been derived.
- iii) Reasons for changing a value or its uncertainty as given by the authors or for rejecting it.
- iv) Complementary references for updated data.
- v) Separate values entering an adopted average.

Nuclide	Mass excess (keV)		Excitation energy(keV)	Half-life	J^π	Ens	Reference	Decay modes and intensities (%)			
^1_0n	8071.3171	0.0005		613.9 s	0.6	1/2 ⁺	00	02PaDG	T	β^- =100	
^1_1H	7288.9705	0.0001		STABLE		1/2 ⁺	00	98Ro45	D	IS=99.9885 70	*
^1_1H	D : all isotopic abundances in NUBASE are from 98Ro45										**
^2_1H	13135.7216	0.0003		STABLE		1 ⁺	99			IS=0.0115 70	
^3_1H	14949.8060	0.0023		12.32 y	0.02	1/2 ⁺	00			β^- =100	
^3_2He	14931.2148	0.0024		STABLE		1/2 ⁺	98			IS=0.000137 3	
^3_3Li	28670#	2000#	RN	p-unstable			98			p ?	
^4_2He	25900	100		139 ys	10	2 ⁻	98	03Me11	T	n=100	*
^4_3Li	2424.9156	0.0001		STABLE		0 ⁺	98			IS=99.999863 3	
^4_4Be	25320	210		91 ys	9	2 ⁻	98	65Ce02	T	p=100	
^4_4Be	T : width=3.28(0.23) MeV; also 91Go19=4.7(1.0) outweighed, not used										**
^5_1H	32890	100		> 910 ys		(1/2 ⁺)	02	03Go11	T	2n=100	*
^5_2He	11390	50		700 ys	30	3/2 ⁻	02			n=100	
^5_3Li	11680	50		370 ys	30	3/2 ⁻	02			p=100	
^5_4Be	38000#	4000#				1/2 ⁺ #	02			p ?	
^5_1H	T : from width < 0.5 MeV; at variance with 01Ko52=280(50) ys, width=1.9(0.4)										**
^5_1H	T : (same authors) but with instrumental resolution=1.3 MeV										**
^5_1H	T : others 91Go19=66(25) ys 95Al31=110 ys probably for higher state										**
^5_1H	J : from angular distribution consistent with $l = 0$										**
^6_2He	41860	260		290 ys	70	2 ⁻ #	02			n ?; 3n ?	
^6_2He	17595.1	0.8		806.7 ms	1.5	0 ⁺	02	90Ri01	D	β^- =100; β^- -d=0.00028 5	
^6_3Li	14086.793	0.015		STABLE		1 ⁺	02			IS=7.59 4	
^6_4Be	18375	5		5.0 zs	0.3	0 ⁺	02			2p=100	
^6_5B	43600#	700#		p-unstable#		2 ⁻ #				2p ?	
^7_1H	49140#	1010#		23 ys	6	1/2 ⁺ #		03Ko11	T	2n ?	*
^7_2He	26101	17		2.9 zs	0.5	(3/2 ⁻)	03	02Me07	T	n=100	*
^7_3Li	14908.14	0.08		STABLE		3/2 ⁻	03			IS=92.41 4	
^7_4Be	15770.03	0.11		53.22 d	0.06	3/2 ⁻	03			ϵ =100	
^7_5B	27870	70		350 ys	50	(3/2 ⁻)	03			p=100	
^7_1H	T : from estimated width 20(5) MeV in Fig. 5										**
^7_2He	T : from 159(28) keV, average 02Me07=150(80) 69St02=160(30)										**
^8_2He	31598	7		119.0 ms	1.5	0 ⁺	99	88Aj01	D	β^- =100; β^- -n=16 1; β^- -t=0.9 1	*
^8_3Li	20946.84	0.09		840.3 ms	0.9	2 ⁺	99	90Sa16	T	β^- =100; β^- - α =100	*
^8_4Be	4941.67	0.04		67 as	17	0 ⁺	99			α =100	
^8_5B	22921.5	1.0		770 ms	3	2 ⁺	99	88Aj01	D	β^+ =100; β^+ - α =100	*
^8_6C	35094	23		2.0 zs	0.4	0 ⁺	99			2p=100	
^8_2He	D : β^- -n intensity is from 88Aj01; β^- -t intensity from 86Bo41										**
^8_3Li	D : β^- decay to first 2 ⁺ state in ^8Be , which decays 100% in 2 α										**
^8_4Be	D : β^+ to 2 excited states in ^8Be , then α and γ , but not to ^8Be ground-state										**
^9_2He	40939	29		7 zs	4	1/2 ^(-#)	99	99Bo26	T	n=100	*
^9_3Li	24954.3	1.9		178.3 ms	0.4	3/2 ⁻	99	95Re.A	D	β^- =100; β^- -n=50.8 2	*
^9_4Be	11347.6	0.4		STABLE		3/2 ⁻	99			IS=100.	
^9_5B	12415.7	1.0		800 zs	300	3/2 ⁻	99			p=100	
^9_6C	28910.5	2.1		126.5 ms	0.9	(3/2 ⁻)	99	88Aj01	D	β^+ =100; β^+ -p=23; β^+ - α =17	*
^9_2He	T : derived from width 100(60) keV J : from 01Ch31										**
^9_3Li	D : also 92Te03 β^- -n=51(1)% 81La11=49(5) outweighed, not used										**
^9_4Be	D : β^+ =12% and 11% to 2 excited p-emitting states in ^9B , and 17% to α emitter										**

Nuclide	Mass excess (keV)		Excitation energy(keV)		Half-life		J^π	Ens	Reference	Decay modes and intensities (%)			
^{10}He	48810	70			2.7	zs	1.8	0^+	99	94Os04	T	2n=100	*
^{10}Li	33051	15			2.0	zs	0.5	$(1^-, 2^-)$	99	94Yo01	TJ	n=100	
$^{10}\text{Li}^m$	33250	40	200	40	RQ	3.7	zs	1.5	1^+	97Zi04	T	IT=100	*
$^{10}\text{Li}^n$	33530	40	480	40	RQ	1.35	zs	0.24	2^+	94Yo01	T	IT=100	*
^{10}Be	12606.7	0.4			1.51	My	0.06	0^+	99			β^- =100	
^{10}B	12050.7	0.4			STABLE			3^+	99			IS=19.9 7	
^{10}C	15698.7	0.4			19.290	s	0.012	0^+	99	90Ba02	T	β^+ =100	
^{10}N	38800	400			200	ys	140	(2^-)	99	02Le16	TJ	p ?	
^{10}He	D : most probably 2 neutron emitter from S_{2n} =1070(70) keV												**
$^{10}\text{Li}^m$	T : average 97Zi04=120(+100-50) 94Yo01=100(70) keV												**
$^{10}\text{Li}^n$	T : average 94Yo01=358(23) 93Bo03=150(70) keV, Birge ratio B =2.8												**
^{11}Li	40797	19			8.75	ms	0.14	$3/2^-$	00	97Mo35	T	β^- =100; β^- n=84.9 8; ...	*
^{11}Be	20174	6			13.81	s	0.08	$1/2^+$	00	81Ai03	D	β^- =100; β^- α =2.9 4	
^{11}B	8667.9	0.4			STABLE			$3/2^-$	00			IS=80.1 7	
^{11}C	10650.3	1.0			20.39	m	0.02	$3/2^-$	00			β^+ =100	
^{11}N	24300	50			590	ys	210	$1/2^+$	00	03Gu06	T	p=100	*
$^{11}\text{N}^m$	25040	80	740	60	690	ys	80	$1/2^-$		96Ax01	ETJ	p=100	
^{11}Li	D : ... ; β^- 2n=4.1 4; β^- 3n=1.9 2; β^- n α =1.00 6; β^- t=0.014 3; β^- d=0.013 5												**
^{11}Li	D : β^- n, β^- 2n and β^- 3n intensities are from 89Ha.B's evaluation;												**
^{11}Li	D : β^- n α intensity is from 84La27; β^- d intensity from 96Mu19;												**
^{11}Li	D : β^- t: average 84La27=0.010(4)% 96Mu19=0.020(5)%												**
^{11}Li	T : average 97Mo35=8.99(0.10) 96Mu19=8.2(0.2) 95Re.A=8.4(0.2)												**
^{11}Li	T : 81Bj01=8.83(0.12) and 74Ro31=8.5(0.2)												**
^{11}N	T : unweighed average 03Gu06=0.24(0.24) 00Ma62=1.44(0.2) MeV 00O101=0.4(0.1)												**
^{11}N	T : and 96Ax01=0.99(0.20) MeV (Birge ratio B =3.03)												**
^{12}Li	50100#	1000#			< 10	ns			00	74Bo05	I	n ?	
^{12}Be	25077	15			21.50	ms	0.04	0^+	00	01Be53	T	β^- =100; β^- n=0.50 3	*
^{12}B	13368.9	1.4			20.20	ms	0.02	1^+	00	66Sc23	D	β^- =100; β^- α =1.6 3	
^{12}C	0.0	0.0			STABLE			0^+	00			IS=98.93 8	
^{12}N	17338.1	1.0			11.000	ms	0.016	1^+	00	66Sc23	D	β^+ =100; $\beta^+\alpha$ =3.5 5	
^{12}O	32048	18			580	ys	30	0^+	00	95Kr03	T	2p=60 30; β^+ ?	
^{12}Be	D : from 99Be53; also 95Re.A=0.52 9% outweighted, not used												**
^{13}Be	33250	70			0.5	ns	0.1	$(1/2^+)$		01Th01	TJ	n ?	
$^{13}\text{Be}^p$	33950	90	700	120	RQ	2.7	zs	1.8	$(1/2^-)$	00			
$^{13}\text{Be}^q$	35160	50	1910	90	RQ			$(5/2^+)$					
^{13}B	16562.2	1.1			17.33	ms	0.17	$3/2^-$	00			β^- =100; β^- n=0.28 4	
^{13}C	3125.0113	0.0009			STABLE			$1/2^-$	01			IS=1.07 8	
^{13}N	5345.48	0.27			9.965	m	0.004	$1/2^-$	00			β^+ =100	
^{13}O	23112	10			8.58	ms	0.05	$(3/2^-)$	00	70Es03	D	β^+ =100; β^+ p=10.9 20	
^{14}Be	39950	130			4.35	ms	0.17	0^+	01	02Je11	D	β^- =100; β^- n=98 2; ...	*
$^{14}\text{Be}^p$	41470	60	1520	150				(2^+)		95Bo10			
^{14}B	23664	21			12.5	ms	0.5	2^-	01	95Re.A	D	β^- =100; β^- n=6.04 23	
^{14}C	3019.893	0.004			5.70	ky	0.03	0^+	01			β^- =100	
^{14}N	2863.4170	0.0006			STABLE			1^+	01			IS=99.632 7	
^{14}O	8007.36	0.11			70.598	s	0.018	0^+	01	01Ga59	T	β^+ =100	*
^{14}F	32660#	400#						2^- #				p ?	
^{14}Be	D : ... ; β^- 2n=0.8 08; β^- 3n=0.2 2; β^- t=0.02 1; β^- α <0.004												**
$^{14}\text{Be}^p$	D : supersedes 99Be53, same group												**
^{14}O	T : average 01Ga59=70.560(0.049) 78Wi04=70.613(0.025) 73Cl12=70.590(0.030)												**

Nuclide	Mass excess (keV)	Excitation energy(keV)	Half-life	J^π	Ens	Reference	Decay modes and intensities (%)
^{15}Be	49800#	500#	< 200 ns			03Ba47 I	n ?
^{15}B	28972	22	9.87 ms	0.07 $3/2^-$	93	95Re.A TD	β^- =100; β^- n=93.6 12; β^- 2n=0.4 2
^{15}C	9873.1	0.8	2.449 s	0.005 $1/2^+$	94		β^- =100
^{15}N	101.4380	0.0007	STABLE	$1/2^-$	94		IS=0.368 7
^{15}O	2855.6	0.5	122.24 s	0.16 $1/2^-$	94		β^+ =100
^{15}F	16780	130	410 ys	60 $(1/2^+)$	93	01Ze.A T	p=100
^{15}B	D: β^- 2n intensity is from 89Re.A		J: given in 91Aj01				*
^{15}B	T: four other outweighed results, see ENSDF*93, ranging 10.1 - 10.8 ms						**
^{15}F	T: average 01Ze.A=1.23(0.22)MeV 78Be16=1.2(0.3) 78Ke06=0.8(0.3)						**
^{16}Be	57680#	500#	< 200 ns	0^+		03Ba47 I	2n ?
^{16}B	37080	60	< 190 ps	0^-	99		n ?
^{16}C	13694	4	747 ms	8 0^+	99	89Re.A D	β^- =100; β^- n=97.9 23
^{16}N	5683.7	2.6	7.13 s	0.02 2^-	99	74Ne10 D	β^- =100; β^- α =0.00100 7
^{16}O	-4737.0014	0.0001	STABLE	0^+	99		IS=99.757 16
^{16}F	10680	8	11 zs	6 0^-	99		p=100
^{16}Ne	23996	20	9 zs	0^+	99		2p=100
^{16}Be	I: 100 events expected, none observed						**
^{17}B	43770	170	5.08 ms	0.05 $(3/2^-)$	99	88Du09 D	β^- =100; β^- n=63 1; ...
^{17}C	21039	17	193 ms	5 $(3/2^+)$	99	01Ma08 J	β^- =100; β^- n=28.4 13
^{17}N	7871	15	4.173 s	0.004 $1/2^-$	99	94Do08 D	β^- =100; β^- n=95 1; ...
^{17}O	-808.81	0.11	STABLE	$5/2^+$	99		IS=0.038 1
^{17}F	1951.70	0.25	64.49 s	0.16 $5/2^+$	99		β^+ =100
^{17}Ne	16461	27	109.2 ms	0.6 $1/2^-$	99	88Bo39 D	β^+ =100; β^+ p=96.0 9; β^+ α =2.7 9
^{17}B	D: ...; β^- 2n=11 7; β^- 3n=3.5 7; β^- 4n=0.4 3						**
^{17}C	T: average 95Sc03=193(6) 95Re.A=188(10) 86Cu01=202(17)						**
^{17}C	D: β^- n intensity is from 95Re.A						**
^{17}N	D: ...; $\beta^+\alpha$ =0.0025 4						**
^{18}B	52320#	800#	< 26 ns	4^-	#	93Po.A I	n ?
^{18}C	24930	30	92 ms	2 0^+	96		β^- =100; β^- n=31.5 15
^{18}N	13114	19	622 ms	9 1^-	96	95Re.A D	β^- =100; β^- n=10.9 9; ...
^{18}O	-781.5	0.6	STABLE	0^+	96		IS=0.205 14
^{18}F	873.7	0.5	109.771 m	0.020 1^+	96	02Un02 T	β^+ =100
$^{18}\text{F}^m$	1995.1	0.5	234 ns	5^+			
^{18}Ne	5317.17	0.28	1.672 s	0.008 0^+	96		β^+ =100
^{18}Na	24190	50	1.3 zs	0.4 1^-	#	01Ze.A TD	p=?; β^+ ?
^{18}N	D: ...; $\beta^+\alpha$ =12.2 6						**
^{18}N	D: β^- n intensity is from 95Re.A; β^- α intensity from 89Zh04						**
^{18}N	T: average 99Og03=620(14) 82Ol01=624(12)						**
^{19}B	59360#	400#	2.92 ms	0.13 $3/2^-$	#	03Yo02 T	β^- =100; β^- n \approx 75; ...

Nuclide	Mass excess (keV)		Excitation energy(keV)		Half-life		J ^π	Ens	Reference	Decay modes and intensities (%)	
²⁰ C	37560	240			16	ms	3	0 ⁺	98 90Mu06 T	β ⁻ =100; β ⁻ n=72.14	*
²⁰ N	21770	60			130	ms	7		98 95Re.A TD	β ⁻ =100; β ⁻ n=57.0-25	**
²⁰ O	3797.5	1.1			13.51	s	0.05	0 ⁺	98	β ⁻ =100	
²⁰ F	-17.40	0.08			11.163	s	0.008	2 ⁺	98 98Ti06 T	β ⁻ =100	
²⁰ Ne	-7041.9313	0.0018			STABLE			0 ⁺	98	IS=90.48-3	
²⁰ Na	6848	7			447.9	ms	2.3	2 ⁺	98 89Cl02 D	β ⁺ =100; β ⁺ α=25.0-4	
²⁰ Mg	17570	27			90	ms	6	0 ⁺	98 95Pi03 TD	β ⁺ =100; β ⁺ p=30.4-16	
²⁰ C	T : average 90Mu06=14(+6-5) 95Re.A 16.7(3.5)										**
²⁰ Mg	T : average 95Pi03=95(3) 92Go10=82(4), with Birge ratio B=2.6										**
²¹ C	45960#	500#			< 30	ns		1/2 ⁺ #	00 93Po.A I	n ?	
²¹ N	25250	100			87	ms	6	1/2 ⁻ #	00	β ⁻ =100; β ⁻ n=80-6	
²¹ O	8063	12			3.42	s	0.10	(1,3,5)/2 ⁺	00	β ⁻ =100	
²¹ F	-47.6	1.8			4.158	s	0.020	5/2 ⁺	00	β ⁻ =100	
²¹ Ne	-5731.78	0.04			STABLE			3/2 ⁺	00	IS=0.27-1	
²¹ Na	-2184.2	0.7			22.49	s	0.04	3/2 ⁺	00	β ⁺ =100	
²¹ Mg	10911	16			122	ms	2	(5/2,3/2) ⁺	00	β ⁺ =100; β ⁺ p=32.6-10; ...	*
²¹ Al	26120#	300#			< 35	ns		1/2 ⁺ #	00 93Po.A I	p ?	
²¹ Mg	D : ... ; β ⁺ α<0.5										**
²¹ Mg	J : from mirror ²¹ F, there is a preference for 5/2 ⁺										**
²² C	53280#	900#			6.2	ms	1.3	0 ⁺	00 03Yo02 TD	β ⁻ =100; β ⁻ n=99.39; ...	*
²² N	32040	190			13.9	ms	1.4		00 03Yo02 T	β ⁻ =100; β ⁻ n=35-5	*
²² O	9280	60			2.25	s	0.15	0 ⁺	00	β ⁻ =100; β ⁻ n<22	
²² F	2793	12			4.23	s	0.04	4 ⁺ , (3 ⁺)	00	β ⁻ =100; β ⁻ n<11	
²² Ne	-8024.715	0.018			STABLE			0 ⁺	00	IS=9.25-3	
²² Na	-5182.4	0.4			2.6019	y	0.0004	3 ⁺	00	β ⁺ =100	
²² Na ^m	-4599.4	0.4	583.03	0.09	244	ns	6	1 ⁺	00	IT=100	
²² Mg	-397.0	1.3			3.857	s	0.009	0 ⁺	00	β ⁺ =100	
²² Al	18180#	90#			59	ms	3	(3) ⁺	00 97B103 D	β ⁺ =100; β ⁺ p=44-3; ...	*
²² Si	32160#	200#			29	ms	2	0 ⁺	00 96B111 D	β ⁺ =100; β ⁺ p=32-4	
²² C	D : ... ; β ⁻ 2n ? D : from 98Yo06										**
²² N	D : from 90Mu06										**
²² Al	D : ... ; β ⁺ 2p=0.9-5; β ⁺ α=0.31-9										**
²³ N	38400#	300#			14.5	ms	2.4	1/2 ⁻ #	00 98Yo06 T	β ⁻ =100; β ⁻ n=80-21; β ⁻ 2n ?	*
²³ O	14610	120			90	ms	40	1/2 ⁺ #	00 90Mu06 T	β ⁻ =100; β ⁻ n=31-7	
²³ F	3330	80			2.23	s	0.14	(3/2,5/2) ⁺	00	β ⁻ =100; β ⁻ n<14	
²³ Ne	-5154.05	0.10			37.24	s	0.12	5/2 ⁺	00	β ⁻ =100	
²³ Na	-9529.8536	0.0027			STABLE			3/2 ⁺	00	IS=100.	
²³ Mg	-5473.8	1.3			11.317	s	0.011	3/2 ⁺	00	β ⁺ =100	
²³ Al	6770	19			470	ms	30	5/2 ⁺ #	00 95Ti08 D	β ⁺ =100; β ⁺ p=8-4	*
²³ Si	23770#	200#			42.3	ms	0.4	3/2 ⁺ #	00 97B104 TD	β ⁺ =100; β ⁺ p≈88; ...	*
²³ N	T : statistical error 1.4, systematics 2.0 estimated by NUBASE										**
²³ Al	D : β ⁺ p=3.5(1.9)% from the IAS. Total=3.5×4.8/2.2=7.6%										**
²³ Si	D : ... ; β ⁺ 2p=3.6-3										**
²⁴ N	47540#	400#			< 52	ns			00 93Po.A I	n ?	
²⁴ O	19070	240			65	ms	5	0 ⁺	00	β ⁻ =100; β ⁻ n=18-6	
²⁴ F	7560	70			400	ms	50	(1,2,3) ⁺	00	β ⁻ =100; β ⁻ n<5.9	
²⁴ Ne	-5951.5	0.4			3.38	m	0.02	0 ⁺	00	β ⁻ =100	
²⁴ Na	-8418.11	0.08			14.9590	h	0.0012	4 ⁺	00	β ⁻ =100	
²⁴ Na ^m	-7945.90	0.08	472.207	0.009	20.20	ms	0.07	1 ⁺	00	IT≈100; β ⁻ =0.05	
²⁴ Mg	-13933.567	0.013			STABLE			0 ⁺	00	IS=78.99-4	
²⁴ Al	-56.9	2.8			2.053	s	0.004	4 ⁺	00	β ⁺ =100; β ⁺ α=0.035-6; ...	*
²⁴ Al ^m	368.9	2.8	425.8	0.1	131.3	ms	2.5	1 ⁺	00	IT=82-3; β ⁺ =18-3; ...	*
²⁴ Si	10755	19			140	ms	8	0 ⁺	00 98Cz01 D	β ⁺ =100; β ⁺ p=37.6-25	
²⁴ P	32000#	500#						1 ⁺ #		p ?; β ⁺ ?	
²⁴ Al	D : ... ; β ⁺ p=0.0016-3										**
²⁴ Al ^m	D : ... ; β ⁺ α=0.028-6										**

Nuclide	Mass excess (keV)	Excitation energy(keV)	Half-life	J ^π	Ens	Reference	Decay modes and intensities (%)	
²⁵ N	56500#	500#	< 260 ns	1/2 ⁻ #		99Sa06 ID	n ?; 2n ?; β ⁻ =0	*
²⁵ O	27440#	260#	< 50 ns	3/2 ⁺ #	00	93Po.A I	n ?	
²⁵ F	11270	100	50 ms	6	5/2 ⁺ #	00	β ⁻ =100; β ⁻ n=14 5	
²⁵ Ne	-2108	26	602 ms	8	(3/2 ⁺) ⁺	00	β ⁻ =100	
²⁵ Na	-9357.8	1.2	59.1 s	0.6	5/2 ⁺	00	β ⁻ =100	
²⁵ Mg	-13192.83	0.03	STABLE		5/2 ⁺	00	IS=10.00 1	
²⁵ Al	-8916.2	0.5	7.183 s	0.012	5/2 ⁺	00	β ⁺ =100	
²⁵ Si	3824	10	220 ms	3	5/2 ⁺	00	β ⁺ =100; β ⁺ p=36.81 5	
²⁵ P	18870#	200#	< 30 ns		1/2 ⁺ #	00	p ?	
* ²⁵ N	D : in 99Sa06 experiment, 240 ²⁵ N events expected, none observed							**
²⁶ O	35710#	260#	< 40 ns	0 ⁺	00	93Po.A I	2n ?; n=30#; β ⁻ =0	*
²⁶ F	18270	170	10.2 ms	1.4	1 ⁺	00	β ⁻ =100; β ⁻ n=11 4	*
²⁶ Ne	430	27	197 ms	1	0 ⁺	00	β ⁻ =100; β ⁻ n=0.13 3	
²⁶ Na	-6862	6	1.077 s	0.005	3 ⁺	00	β ⁻ =100	
²⁶ Mg	-16214.582	0.027	STABLE		0 ⁺	00	IS=11.01 3	
²⁶ Al	-12210.31	0.06	717 ky	24	5 ⁺	00	β ⁺ =100	
²⁶ Al ^m	-11982.01	0.06	228.305	0.013	6.3452 s	0.0019	0 ⁺	00
²⁶ Si	-7145	3	2.234 s	0.013	0 ⁺	00	β ⁺ =100	
²⁶ P	10970#	200#	30 ms	25	(3 ⁺)	00	β ⁺ =100; β ⁺ 2p≈1; ...	*
²⁶ S	25970#	300#	10# ms		0 ⁺		2p ?	
* ²⁶ O	D : in 96Fa01 and 99Sa06, several 100s of ²⁶ O events expected, none observed							**
* ²⁶ F	T : other not used 99Di01=9.6(0.8): same data							**
* ²⁶ P	D : ...; β ⁺ p≈0.9							**
²⁷ O	44950#	500#	< 260 ns	3/2 ⁺ #		99Sa06 I	n ?; 2n ?	
²⁷ F	24930	380	4.9 ms	0.2	5/2 ⁺ #	01	β ⁻ =100; β ⁻ n=77 21	*
²⁷ Ne	7070	110	32 ms	2	3/2 ⁺ #	01	β ⁻ =100; β ⁻ n=2.0 5	
²⁷ Na	-5517	4	301 ms	6	5/2 ⁺	01	β ⁻ =100; β ⁻ n=0.13 4	
²⁷ Mg	-14586.65	0.05	9.458 m	0.012	1/2 ⁺	01	β ⁻ =100	
²⁷ Al	-17196.66	0.12	STABLE		5/2 ⁺	01	IS=100.	
²⁷ Si	-12384.30	0.15	4.16 s	0.02	5/2 ⁺	01	β ⁺ =100	
²⁷ P	-717	26	260 ms	80	1/2 ⁺	01	β ⁺ =100; β ⁺ p=0.07	
²⁷ S	17540#	200#	21 ms	4	(5/2 ⁺)	01	β ⁺ =100; β ⁺ 2p=2.0 10;...	*
* ²⁷ F	T : others not used: 99Re16=6.5(1.1) and 97Ta22=5.3(0.9) outweighed; and							**
* ²⁷ F	T : 99Di01=5.2(0.3) same data as in 99Re16							**
* ²⁷ S	D : ...; β ⁺ p=?							**
²⁸ O	53850#	600#	< 100 ns	0 ⁺		98Po.A I	n ?; 2n ?; β ⁻ =0	*
²⁸ F	33230#	510#	< 40 ns			01	n ?	
²⁸ Ne	11240	150	18.3 ms	2.2	0 ⁺	01	β ⁻ =100; β ⁻ n=16 6	*
²⁸ Na	-989	13	30.5 ms	0.4	1 ⁺	01	β ⁻ =100; β ⁻ n=0.58 12	
²⁸ Mg	-15018.6	2.0	20.915 h	0.009	0 ⁺	01	β ⁻ =100	
²⁸ Al	-16850.44	0.13	2.2414 m	0.0012	3 ⁺	01	β ⁻ =100	
²⁸ Si	-21492.7968	0.0018	STABLE		0 ⁺	01	IS=92.2297 7	
²⁸ Si ^r	-8951.55	0.12	12541.25	0.12	RQ	3 ⁺	01	
²⁸ P	-7159	3	270.3 ms	0.5	3 ⁺	01	β ⁺ =100; β ⁺ p=0.0013 4;...	*
²⁸ S	4070	160	125 ms	10	0 ⁺	01	β ⁺ =100; β ⁺ p=20.7 19	
²⁸ Cl	26560#	500#			1 ⁺ #		p ?	
* ²⁸ O	D : in 97Ta22 and 99Sa06, 11 and 37 ²⁸ O events expected, none observed							**
* ²⁸ Ne	T : average 99Re16=18(3) 97Ta22=21(5) 92Te03=17(4). Others not used:							**
* ²⁸ Ne	T : 95Re.A=8.2(2.5) at variance, 99Di01=20(3) same data as in 99Re16							**
* ²⁸ P	D : ...; β ⁺ α=0.00086 25							**

Nuclide	Mass excess (keV)	Excitation energy(keV)	Half-life	J^π	Ens	Reference	Decay modes and intensities (%)
²⁹ F	40300#	580#	2.6 ms	0.3	5/2 ⁺ #	01 99Re16 T	β^- =100; β^- n=60 40; ... *
²⁹ Ne	18060	270	15.6 ms	0.5	3/2 ⁺ #	01 01Be53 D	β^- =100; β^- n=19 4; ... *
²⁹ Na	2665	13	44.9 ms	1.2	3/2 ⁽⁺⁾ #	01 95Re.A D	β^- =100; β^- n=25.9 23 *
²⁹ Mg	-10619	14	1.30 s	0.12	3/2 ⁺	01	β^- =100
²⁹ Al	-18215.3	1.2	6.56 m	0.06	5/2 ⁺	01	β^- =100
²⁹ Si	-21895.046	0.021	STABLE		1/2 ⁺	01	IS=4.6832 5
²⁹ P	-16952.6	0.6	4.142 s	0.015	1/2 ⁺	01	β^+ =100
²⁹ S	-3160	50	187 ms	4	5/2 ⁺	01 79Vi01 D	β^+ =100; β^+ p=46.4 10
²⁹ Cl	13140#	200#	< 20 ns		3/2 ⁺ #	01 93Po.A I	p ?
* ²⁹ F	D : ... ; β^- 2n ?						**
* ²⁹ F	T : average 99Re16=2.9(0.8) 98No.A=2.6(0.4) 97Ta22=2.4(0.8). Others not						**
* ²⁹ F	T : used: 99Di01=2.4(0.4) same data as in 99Re16						**
* ²⁹ F	D : β^- n from 99Di01=100(80)%						**
* ²⁹ Ne	D : ... ; β^- 2n<2.2						**
* ²⁹ Ne	D : average 01Be53=17 5 99Re16=27 9; other not used: 99Di01=27(9)%, same						**
* ²⁹ Ne	D : data as in 99Re16. β^- 2n limit is from 01Be53						**
* ²⁹ Na	D : β^- n: average 95Re.A=27.1(1.6)% 84La03=21.5(3.0)%						**
³⁰ F	48900#	600#	< 260 ns			99Sa06 I	n ?
³⁰ Ne	23100	570	5.8 ms	0.2	0 ⁺	01 99Di01 D	β^- =100; β^- n=13 8 *
³⁰ Na	8361	25	48.4 ms	1.7	2 ⁺	01 99Di01 T	β^- =100; β^- n=30 4; ... *
³⁰ Mg	-8911	8	335 ms	17	0 ⁺	01 84La03 D	β^- =100; β^- n<0.06
³⁰ Al	-15872	14	3.60 s	0.06	3 ⁺	01	β^- =100
³⁰ Si	-24432.928	0.030	STABLE		0 ⁺	01	IS=3.0872 5
³⁰ P	-20200.6	0.3	2.498 m	0.004	1 ⁺	01	β^+ =100
³⁰ S	-14063	3	1.178 s	0.005	0 ⁺	01	β^+ =100
³⁰ Cl	4440#	200#	< 30 ns		3 ⁺ #	01 93Po.A I	p ?
³⁰ Ar	20080#	300#	< 20 ns		0 ⁺	93Po.A I	2p ?
* ³⁰ Ne	D : from 9(17)%						**
* ³⁰ Na	D : ... ; β^- 2n=1.17 16; β^- α =5.5e-5 20						**
* ³⁰ Na	T : average 99Di01=50(4) 97Ta22=48(5) 84La02=48(2)						**
* ³⁰ P	D : first observed radionuclide, in 1934						**
³¹ F	56290#	600#	1# ms (>260 ns)		5/2 ⁺ #	99Sa06 I	β^- ?; β^- n ?
³¹ Ne	30840#	900#	3.4 ms	0.8	7/2 ⁻ #	01	β^- =100; β^- n ?
³¹ Na	12650	210	17.0 ms	0.4	(3/2 ⁺)	01 93Kl02 J	β^- =100; β^- n=37 5; ... *
³¹ Mg	-3217	12	230 ms	20	3/2 ⁺	01 95Re.A D	β^- =100; β^- n=6.2 20 *
³¹ Al	-14954	20	644 ms	25	(5/2, 3/2) ⁺	01	β^- =100; β^- n<1.6 *
³¹ Si	-22949.01	0.04	157.3 m	0.3	3/2 ⁺	01	β^- =100
³¹ P	-24440.88	0.18	STABLE		1/2 ⁺	01	IS=100.
³¹ S	-19044.6	1.5	2.572 s	0.013	1/2 ⁺	01	β^+ =100
³¹ Cl	-7070	50	150 ms	25	3/2 ⁺	01 85Ay02 D	β^+ =100; β^+ p=0.7 *
³¹ Ar	11290#	210#	14.4 ms	0.6	5/2 ⁽⁺⁾ #	01 00Fy01 T	β^+ =100; β^+ p=63 7; ... *
* ³¹ Na	D : ... ; β^- 2n=0.9 2; β^- 3n<0.05						**
* ³¹ Na	D : all from 84Gu19						**
* ³¹ Mg	D : strongly conflicting with earlier 84La03=1.7(0.3)%						**
* ³¹ Al	J : from systematics there is a preference for 5/2 ⁺						**
* ³¹ Cl	D : β^+ p=0.44% for 986 keV protons. Total: 165/100×0.44=0.726%						**
* ³¹ Ar	D : ... ; β^+ 2p=7.2 11; β^+ 3p<1.4; β^+ p α <0.38; β^+ α <0.03						**
* ³¹ Ar	D : from 98Ax02						**
* ³¹ Ar	T : average 00Fy01=14.1(0.7) 92Ba01=15.1(+1.3-1.1) J : from 99Th09						**
³² Ne	37280#	800#	3.5 ms	0.9	0 ⁺	01	β^- =100; β^- n ?
³² Na	19060	360	12.9 ms	0.7	(3 ⁻ , 4 ⁻)	01 93Kl02 J	β^- =100; β^- n=24 7; ... *
³² Mg	-955	18	95 ms	16	0 ⁺	01	β^- =100; β^- n=2.4 5
³² Al	-11060	90	31.7 ms	0.8	1 ⁺	01 95Re.A TD	β^- =100; β^- n=0.7 5
³² Al ^m	-10100	90	955.7 0.4	200 ns	20	(4 ⁺)	01 96Ro02 ETJ
³² Si	-24080.91	0.05	132 y	13	0 ⁺	01	β^- =100
³² Si ^m	-18497.9	1.0	5583.0 1.0	27 ns	2	(5 ⁻)	97Fo01 ETJ

... A-group is continued on next page ...

Nuclide	Mass excess (keV)		Excitation energy(keV)		Half-life		J ^π	Ens	Reference	Decay modes and intensities (%)	
... A-group continued ...											
³² P	-24305.22	0.19			14.263	d	0.003	1 ⁺	01	02Un02	T β ⁻ =100
³² S	-26015.70	0.14			STABLE			0 ⁺	01		IS=94.93 31
³² Cl	-13330	7			298	ms	1	1 ⁺	01	79Ho27	D β ⁺ =100; β ⁺ α=0.054 8; ...
³² Ar	-2200.2	1.8			98	ms	2	0 ⁺	01		β ⁺ =100; β ⁺ p=43 3
³² Ar ^m	3400#	100#	5600#	100#				5 ⁻ #			IT ?
³² K	20420#	500#						1 ⁺ #			p ?
³² K ^m	21370#	510#	950#	100#				4 ⁺ #			p ?
³² Na	D : ... ; β ⁻ 2n=8 2										
³² Na	T : average 98No.A=11.5(0.8) 84La03=13.2(0.4)										
³² Cl	D : ... ; β ⁺ p=0.026 5										
³³ Ne	46000#	800#			< 260	ns		7/2 ⁻ #		02No11	I n ?
³³ Na	24890	870			8.2	ms	0.2	3/2 ⁺ #	01	02Ra16	TD β ⁻ =100; β ⁻ n=47 6; ...
³³ Mg	4894	20			90.5	ms	1.6	7/2 ⁻ #	01	02Mo29	T β ⁻ =100; β ⁻ n=17 5
³³ Al	-8530	70			41.7	ms	0.2	5/2 ⁺ #	01	02Mo29	T β ⁻ =100; β ⁻ n=8.5 7
³³ Si	-20493	16			6.18	s	0.18	(3/2 ⁺)	01		β ⁻ =100
³³ P	-26337.5	1.1			25.34	d	0.12	1/2 ⁺	01		β ⁻ =100
³³ S	-26585.99	0.14			STABLE			3/2 ⁺	01		IS=0.76 2
³³ Cl	-21003.4	0.5			2.511	s	0.003	3/2 ⁺	01		β ⁺ =100
³³ Ar	-9384.1	0.4			173.0	ms	2.0	1/2 ⁺	01		β ⁺ =100; β ⁺ p=38.7 10
³³ K	6760#	200#			< 25	ns		3/2 ⁺ #	01	93Po.A	I p ?
³³ Ne	T : estimated half-life 1# ms for β ⁻ decay I : also 02Le.A < 1.5 μs										
³³ Na	D : ... ; β ⁻ 2n=13 3										
³⁴ Ne	53120#	810#			1#	ms (>1.5 μs)		0 ⁺		02Le.A	I β ⁻ ?; β ⁻ n ?
³⁴ Na	32760#	900#			5.5	ms	1.0	1 ⁺	01	ABBW	D β ⁻ =100; β ⁻ 2n≈50; β ⁻ n≈15
³⁴ Mg	8810	230			20	ms	10	0 ⁺	01		β ⁻ =100; β ⁻ n ?
³⁴ Al	-2930	110			56.3	ms	0.5	4 ⁺ #	01	01Nu01	T β ⁻ =100; β ⁻ n=12.5 25
³⁴ Si	-19957	14			2.77	s	0.20	0 ⁺	01		β ⁻ =100
³⁴ P	-24558	5			12.43	s	0.08	1 ⁺	01		β ⁻ =100
³⁴ S	-29931.79	0.11			STABLE			0 ⁺	01		IS=4.29 28
³⁴ Cl	-24439.78	0.18			1.5264	s	0.0014	0 ⁺	01		β ⁺ =100
³⁴ Cl ^m	-24293.42	0.18	146.36	0.03	32.00	m	0.04	3 ⁺	01		β ⁺ =55.4 6; IT=44.6 6
³⁴ Ar	-18377.2	0.4			845	ms	3	0 ⁺	01		β ⁺ =100
³⁴ K	-1480#	300#			< 40	ns		1 ⁺ #	01	93Po.A	I p ?
³⁴ Ca	13150#	300#			< 35	ns		0 ⁺	01	93Po.A	I 2p ?
³⁴ Ne	I : also 02No11 > 260 ns										
³⁴ Na	D : β ⁻ n≈15%, β ⁻ 2n≈50% estimated from P _n = β ⁻ n + 2×β ⁻ 2n=115(20)% in 84La03										
³⁴ Na	D : assuming β ⁻ n/β ⁻ 2n=0.3 from trends in the ³⁰ Na- ³³ Na series: 26 41 3 4										
³⁴ Al	D : from 95Re.A; strongly conflicting with 89Ba50=27(5)% and 88Mu08=54(12)%										
³⁴ Al	T : also 95Re.A=42(6) ms										
³⁵ Na	39580#	950#			1.5	ms	0.5	3/2 ⁺ #	01		β ⁻ =100; β ⁻ n=?
³⁵ Mg	16150#	400#			70	ms	40	7/2 ⁻ #	01	95Re.A	D β ⁻ =100; β ⁻ n=52 46
³⁵ Al	-130	180			38.6	ms	0.4	5/2 ⁺ #	01	01Nu01	TD β ⁻ =100; β ⁻ n=41 13
³⁵ Si	-14360	40			780	ms	120	7/2 ⁻ #	01	95Re.A	D β ⁻ =100; β ⁻ n<5
³⁵ P	-24857.7	1.9			47.3	s	0.7	1/2 ⁺	01		β ⁻ =100
³⁵ S	-28846.36	0.10			87.51	d	0.12	3/2 ⁺	01		β ⁻ =100
³⁵ Cl	-29013.54	0.04			STABLE			3/2 ⁺	01		IS=75.78 4
³⁵ Ar	-23047.4	0.7			1.775	s	0.004	3/2 ⁺	01		β ⁺ =100
³⁵ K	-11169	20			178	ms	8	3/2 ⁺	01		β ⁺ =100; β ⁺ p=0.37 15
³⁵ Ca	4600#	200#			25.7	ms	0.2	1/2 ⁺ #	01		β ⁺ =100; β ⁺ p=95.7 14; ...
³⁵ Al	T : also 95Re.A=30(4); both strongly conflicting with 89Le16=170(70) and										
³⁵ Al	T : 88Mu08=130(+100-50)										
³⁵ Al	D : also 95Re.A=26(4)% 89Le16=40(10)% and 88Mu08=87(+37-25)%										
³⁵ Ca	D : ... ; β ⁺ 2p=4.2 3										

Nuclide	Mass excess (keV)		Excitation energy(keV)		Half-life	J ^π	Ens Reference	Decay modes and intensities (%)	
³⁶ Na	47950#	950#			< 260 ns		02No11 I	n ?	*
³⁶ Mg	21420#	500#			5# ms(>200 ns)	0 ⁺	01 89Gu03 I	β ⁻ ?	
³⁶ Al	5780	210			90 ms 40		01	β ⁻ =100; β ⁻ n<30	
³⁶ Si	-12480	120			450 ms 60	0 ⁺	01 95Re.A D	β ⁻ =100; β ⁻ n=12 5	
³⁶ P	-20251	13			5.6 s 0.3	4 ⁻ #	01	β ⁻ =100	
³⁶ S	-30664.07	0.19			STABLE	0 ⁺	01	IS=0.02 1	
³⁶ Cl	-29521.86	0.07			301 ky 2	2 ⁺	01	β ⁻ =98.1 1; β ⁺ =1.9 1	
³⁶ Ar	-30231.540	0.027			STABLE	0 ⁺	01	IS=0.3365 30; 2β ⁺ ?	
³⁶ K	-17426	8			342 ms 2	2 ⁺	01	β ⁺ =100; β ⁺ p=0.048 14; ...	*
³⁶ Ca	-6440	40			102 ms 2	0 ⁺	01 95Tr02 D	β ⁺ =100; β ⁺ p=56.8 13	
³⁶ Sc	13900#	500#						p ?	
* ³⁶ Na	I : also 02Le.A < 1.5 μs								**
* ³⁶ K	D : ... ; β ⁺ α=0.0034 13								**
³⁷ Na	55280#	960#			1# ms(>1.5 μs)	3/2 ⁺ #	02Le.A I	β ⁻ ?; β ⁻ n ?	*
³⁷ Mg	29250#	900#			40# ms(>260 ns)	7/2 ⁻ #	01 96Sa34 I	β ⁻ ?; β ⁻ n ?	
³⁷ Al	9950	330			20# ms (>1 μs)	3/2 ⁺ #	01 91Or01 I	β ⁻ ?	
³⁷ Si	-6580	170			90 ms 60	7/2 ⁻ #	01 95Re.A D	β ⁻ =100; β ⁻ n=17 13	
³⁷ P	-18990	40			2.31 s 0.13	1/2 ⁺ #	01	β ⁻ =100	
³⁷ S	-26896.36	0.20			5.05 m 0.02	7/2 ⁻	01	β ⁻ =100	
³⁷ Cl	-31761.53	0.05			STABLE	3/2 ⁺	01	IS=24.22 4	
³⁷ Ar	-30947.66	0.21			35.04 d 0.04	3/2 ⁺	01	ε=100	
³⁷ K	-24800.20	0.09			1.226 s 0.007	3/2 ⁺	01	β ⁺ =100	
³⁷ Ca	-13162	22			181.1 ms 1.0	(3/2 ⁺)	01 95Tr03 D	β ⁺ =100; β ⁺ p=82.1 7	
³⁷ Sc	2840#	300#				7/2 ⁻ #		p ?	
* ³⁷ Na	I : also 02No11 > 260 ns								**
³⁸ Mg	35000#	500#			1# ms(>260 ns)	0 ⁺	01 97Sa14 I	β ⁻ ?	*
³⁸ Al	16050	730			40# ms(>200 ns)		01 89Gu03 I	β ⁻ ?	
³⁸ Si	-4070	140			90# ms (>1 μs)	0 ⁺	01 91Zh24 I	β ⁻ ?; β ⁻ n ?	
³⁸ P	-14760	100			640 ms 140		01 95Re.A D	β ⁻ =100; β ⁻ n=12 5	
³⁸ S	-26861	7			170.3 m 0.7	0 ⁺	01	β ⁻ =100	
³⁸ Cl	-29798.10	0.10			37.24 m 0.05	2 ⁻	01	β ⁻ =100	
³⁸ Cl ^m	-29126.74	0.10	671.361	0.008	715 ms 3	5 ⁻	01	IT=100	
³⁸ Ar	-34714.6	0.3			STABLE	0 ⁺	01	IS=0.0632 5	
³⁸ K	-28800.7	0.4			7.636 m 0.018	3 ⁺	01	β ⁺ =100	
³⁸ K ^m	-28670.2	0.4	130.50	0.28	RQ 923.9 ms 0.6	0 ⁺	01	β ⁺ =100	
³⁸ K ⁿ	-25342.7	0.4	3458.0	0.2	21.98 μs 0.11	(7 ⁺), (5 ⁺)	01	IT=100	
³⁸ Ca	-22059	5			440 ms 8	0 ⁺	01	β ⁺ =100	
³⁸ Sc	-4940#	300#			< 300 ns	2 ⁻ #	01 94Bi10 I	p ?	
³⁸ Sc ^m	-4270#	320#	670#	100#		5 ⁻ #	01	IT ?; p ?	
³⁸ Ti	9100#	250#			< 120 ns	0 ⁺	01 96Bi21 I	2p ?	
* ³⁸ Mg	I : 18 events reported								**
³⁹ Mg	43570#	510#			< 260 ns	7/2 ⁻ #	02No11 I	n ?	*
³⁹ Al	21400	1470			10# ms(>200 ns)	3/2 ⁺ #	01 89Gu03 I	β ⁻ ?	
³⁹ Si	1930	340			90# ms (>1 μs)	7/2 ⁻ #	01 90Au.A I	β ⁻ ?	
³⁹ P	-12870	100			190 ms 50	1/2 ⁺ #	01 95Re.A TD	β ⁻ =100; β ⁻ n=26 8	
³⁹ S	-23160	50			11.5 s 0.5	(3, 5, 7)/2 ⁻	01	β ⁻ =100	
³⁹ Cl	-29800.2	1.7			55.6 m 0.2	3/2 ⁺	01	β ⁻ =100	
³⁹ Ar	-33242	5			269 y 3	7/2 ⁻	01	β ⁻ =100	
³⁹ K	-33807.01	0.19			STABLE	3/2 ⁺	01	IS=93.2581 44	
³⁹ Ca	-27274.4	1.9			859.6 ms 1.4	3/2 ⁺	01	β ⁺ =100	
³⁹ Sc	-14168	24			< 300 ns	7/2 ⁻ #	01 94Bi10 I	p=100	*
³⁹ Ti	1500#	210#			31 ms 4	3/2 ⁺ #	01 90De43 TD	β ⁺ =100; ...	*
* ³⁹ Mg	T : estimated half-life 1# ms for β ⁻ decay								**
* ³⁹ Sc	D : most probably proton emitter from S _p =-602(24) keV								**
* ³⁹ Ti	D : ... ; β ⁺ p=85 15; β ⁺ 2p=15# D : β ⁺ 2p decay observed by 92Mo15								**
* ³⁹ Ti	T : average 90De43=26(+8-7) 01Gi01=31(+6-4)								**

Nuclide	Mass excess (keV)	Excitation energy(keV)	Half-life	J^π	Ens	Reference	Decay modes and intensities (%)	
^{40}Mg	50240#	900#	1# ms	0^+		02No11 I	$\beta^- ?; \beta^- n ?$	*
^{40}Al	29300#	700#	10# ms (>260 ns)		02	97Sa14 I	$\beta^- ?; \beta^- n ?$	*
^{40}Si	5470	560	20# ms (>200 ns)	0^+	02	89Gu03 I	$\beta^- ?; \beta^- n ?$	
^{40}P	-8110	140	153 ms 8	$(2^-, 3^-)$	02		$\beta^- = 100; \dots$	*
^{40}S	-22870	140	8.8 s 2.2	0^+	02		$\beta^- = 100$	
^{40}Cl	-27560	30	1.35 m 0.02	2^-	02		$\beta^- = 100$	
^{40}Ar	-35039.8960	0.0027	STABLE	0^+	02		IS=99.6003 30	
^{40}K	-33535.20	0.19	1.251 Gy 0.011	4^-	02		IS=0.0117 1; ...	*
$^{40}\text{K}^m$	-31891.56	0.19	1643.639 0.011	336 ns 12	0^+	02	IT=100	
^{40}Ca	-34846.27	0.21	STABLE (>5.9 Zy)	0^+	01	99Be64 T	IS=96.941 156; $2\beta^+ ?$	
^{40}Sc	-20523.2	2.8	182.3 ms 0.7	4^-	02		$\beta^+ = 100; \dots$	*
^{40}Ti	-8850	160	53.3 ms 1.5	0^+	02		$\beta^+ = 100; \beta^+ p = 100$	
^{40}V	10330#	500#		2^-	#		p ?	
^{40}Mg I : one event expected, none observed; similar search in 02Le.A								
^{40}Al I : 34 events reported in 97Sa14; also one event in 96Sa34								
^{40}P D : ...; $\beta^- n = 15.8$ 21								
^{40}K D : ...; $\beta^- = 89.28$ 13; $\beta^+ = 10.72$ 13								
^{40}Sc D : ...; $\beta^+ p = 0.44$ 7; $\beta^+ \alpha = 0.017$ 5								
^{41}Al	35700#	800#	2# ms (>260 ns)	$3/2^+ \#$	02	97Sa14 I	$\beta^- ?$	*
^{41}Si	13560	1840	30# ms (>200 ns)	$7/2^- \#$	02	89Gu03 I	$\beta^- ?$	
^{41}P	-5280	220	150 ms 15	$1/2^+ \#$	02		$\beta^- = 100; \beta^- n = 30$ 10	
^{41}S	-19020	120	1.99 s 0.05	$7/2^- \#$	02		$\beta^- = 100; \beta^- n ?$	
^{41}Cl	-27310	70	38.4 s 0.8	$(1/2, 3/2^+)$	02		$\beta^- = 100$	
^{41}Ar	-33067.5	0.3	109.61 m 0.04	$7/2^-$	02		$\beta^- = 100$	
^{41}K	-35559.07	0.19	STABLE	$3/2^+$	02		IS=6.7302 44	
^{41}Ca	-35137.76	0.24	102 ky 7	$7/2^-$	02		$\epsilon = 100$	
^{41}Sc	-28642.39	0.23	596.3 ms 1.7	$7/2^-$	02		$\beta^+ = 100$	
$^{41}\text{Sc}^r$	-25760.10	0.23	2882.30 0.05 RQ	$7/2^+$	02		P=59 2; IT=41 2	
^{41}Ti	-15700#	100#	80.9 ms 1.2	$3/2^+$	02	98Bh12 T	$\beta^+ = 100; \beta^+ p \approx 100$	*
^{41}V	-210#	210#		$7/2^- \#$			p ?	
^{41}Al I : reported 4 events								
^{41}Ti T : average 98Bh12=81.3(2.0) 98Li46=82(3) 96Fa09=81(4) 74Se11=80(2)								
^{42}Al	43680#	900#	1# ms				$\beta^- ?; \beta^- n ?$	
^{42}Si	18430#	500#	5# ms (>200 ns)	0^+	01	90Le03 I	$\beta^- ?; \beta^- n ?$	*
^{42}P	940	450	120 ms 30		01	89Le16 T	$\beta^- = 100; \beta^- n = 50$ 20	
^{42}S	-17680	120	1.013 s 0.015	0^+	01		$\beta^- = 100; \beta^- n < 4$	
^{42}Cl	-24910	140	6.8 s 0.3		01		$\beta^- = 100$	
^{42}Ar	-34423	6	32.9 y 1.1	0^+	01		$\beta^- = 100$	
^{42}K	-35021.56	0.22	12.360 h 0.012	2^-	01		$\beta^- = 100$	
^{42}Ca	-38547.07	0.25	STABLE	0^+	01		IS=0.647 23	
^{42}Sc	-32121.24	0.27	681.3 ms 0.7	0^+	01		$\beta^+ = 100$	
$^{42}\text{Sc}^m$	-31504.96	0.28	616.28 0.06	61.7 s 0.4	$(7, 5, 6)^+$	01	$\beta^+ = 100$	
$^{42}\text{Sc}^r$	-26044.91	0.26	6076.33 0.08 RQ	$(1^+ \text{ to } 4^+)$	01		IT=100	
^{42}Ti	-25122	5	199 ms 6	0^+	01		$\beta^+ = 100$	
^{42}V	-8170#	200#	< 55 ns	2^-	#	01	92Bo37 I	p ?
^{42}Cr	5990#	300#	14 ms 3	0^+	01	01Gi01 TD	$\beta^+ \approx 100; \beta^+ p = ?; 2p ?$	
^{42}Si TD : ENSDF reports preliminary values from 98Yo.A: half-life=20 ms 10 and								
^{42}Si TD : $\beta^- n = 103$ 48, subject to further analysis according to the authors								
^{43}Si	26700#	700#	15# ms (>260 ns)	$3/2^- \#$		02No11 I	$\beta^- ?; \beta^- n ?$	
^{43}P	5770	970	33 ms 3	$1/2^+ \#$	01		$\beta^- = 100; \beta^- n = 100$	
^{43}S	-11970	200	260 ms 15	$3/2^- \#$	01	98Wi.A T	$\beta^- = 100; \beta^- n = 40$ 10	
$^{43}\text{S}^m$	-11650	200	319 5	480 ns 50	$(7/2^-)$	01	00Sa21 EJ	IT=100
^{43}Cl	-24170	160	3.07 s 0.07	$3/2^+ \#$	01		$\beta^- = 100; \beta^- n ?$	*
^{43}Ar	-32010	5	5.37 m 0.06	$(5/2^-)$	01		$\beta^- = 100$	
^{43}K	-36593	9	22.3 h 0.1	$3/2^+$	01		$\beta^- = 100$	
^{43}Ca	-38408.6	0.3	STABLE	$7/2^-$	01		IS=0.135 10	

... A-group is continued on next page ...

Nuclide	Mass excess (keV)		Excitation energy(keV)		Half-life	J^π	Ens	Reference	Decay modes and intensities (%)
... A-group continued ...									
⁴³ Sc	-36187.9	1.9			3.891 h	0.012	7/2 ⁻	01	$\beta^+=100$
⁴³ Sc ^m	-36036.5	1.9	151.4	0.2	438 μ s	7	3/2 ⁺	01	IT=100
⁴³ Ti	-29321	7			509 ms	5	7/2 ⁻	01	$\beta^+=100$
⁴³ Ti ^m	-29008	7	313.0	1.0	12.6 μ s	0.6	(3/2 ⁺)	01	IT=100
⁴³ Ti ⁿ	-26255	7	3066.4	1.0	560 ns	6	(19/2 ⁻)	01	IT=100
⁴³ V	-18020#	230#			80# ms		7/2 ⁻ #	01	$\beta^+?$
⁴³ Cr	-2130#	220#			21.6 ms	0.7	(3/2 ⁺)	01	$\beta^+=100$; $\beta^+p=23$ 6; ... *
⁴³ Sc ^m	J : from comparison of B(E2) and half-life with theoretical ones **								
⁴³ V	T : >800 ms reported by 92Bo37 and adopted in ENSDF'01. To be confirmed. **								
⁴³ Cr	D : ... ; $\beta^+2p=6$ 5; $\beta^+\alpha?$ **								
⁴⁴ Si	32840#	800#			10# ms		0 ⁺		$\beta^-?$; $\beta^-n?$
⁴⁴ P	12100#	700#			30# ms	(>200 ns)		99	89Gu03 I $\beta^-?$
⁴⁴ S	-9120	390			123 ms	10	0 ⁺	99	$\beta^-=100$; $\beta^-n=18$ 3
⁴⁴ Cl	-20230	110			560 ms	110		99	$\beta^-=100$; $\beta^-n<8$
⁴⁴ Ar	-32673.1	1.6			11.87 m	0.05	0 ⁺	99	$\beta^-=100$
⁴⁴ K	-35810	40			22.13 m	0.19	2 ⁻	99	$\beta^-=100$
⁴⁴ Ca	-41468.5	0.4			STABLE		0 ⁺	99	IS=2.086 110
⁴⁴ Sc	-37816.1	1.8			3.97 h	0.04	2 ⁺	99	$\beta^-=100$
⁴⁴ Sc ^m	-37545.2	1.8	270.95	0.20	58.61 h	0.10	6 ⁺	99	IT=98.80 7; $\beta^+=1.20$ 7
⁴⁴ Sc ⁿ	-37669.9	1.8	146.224	0.022	50.4 μ s	0.7	0 ⁻	99	
⁴⁴ Ti	-37548.5	0.7			60.0 y	1.1	0 ⁺	99	$\varepsilon=100$ *
⁴⁴ V	-24120	120			* 111 ms	7	(2 ⁺)	99	$\beta^+=100$; $\beta^+\alpha=?$
⁴⁴ V ^m	-23850#	160#	270#	100#	* 150 ms	3	(6 ⁺)	99	$\beta^+=100$
⁴⁴ V ⁿ	-23970#	160#	150#	100#			0 ⁻		
⁴⁴ Cr	-13460#	50#			54 ms	4	0 ⁺	99	96Fa09 D $\beta^+=100$; $\beta^+p=7$ 3
⁴⁴ Mn	6400#	500#			< 105 ns		2 ⁻ #	99	p ?
⁴⁴ Ti	T : also 01Ha21=59(2) **								
⁴⁵ P	17900#	800#			8# ms	(>200 ns)	1/2 ⁺ #	93	90Le03 I $\beta^-?$
⁴⁵ S	-3250	1740			82 ms	13	3/2 ⁻ #	97	$\beta^-=100$; $\beta^-n=54$
⁴⁵ Cl	-18360	120			400 ms	40	3/2 ⁺ #	95	$\beta^-=100$; $\beta^-n=24$ 4
⁴⁵ Ar	-29770.6	0.5			21.48 s	0.15	(1,3,5)/2 ⁻	95	$\beta^-=100$ *
⁴⁵ K	-36608	10			17.3 m	0.6	3/2 ⁺	95	$\beta^-=100$
⁴⁵ Ca	-40812.0	0.4			162.67 d	0.25	7/2 ⁻	95	94Lo04 T $\beta^-=100$
⁴⁵ Sc	-41067.8	0.8			STABLE		7/2 ⁻	95	IS=100.
⁴⁵ Sc ^m	-41055.4	0.8	12.40	0.05	318 ms	7	3/2 ⁺	95	IT=100
⁴⁵ Ti	-39005.7	1.0			184.8 m	0.5	7/2 ⁻	95	$\beta^+=100$
⁴⁵ V	-31880	17			547 ms	6	7/2 ⁻	95	$\beta^+=100$
⁴⁵ Cr	-18970	500			* 50 ms	6	7/2 ⁻ #	95	$\beta^+=100$; $\beta^+p>27$
⁴⁵ Cr ^m	-18920#	510#	50#	100#	* 1# ms		3/2 ⁺ #		IT ?; $\beta^+?$
⁴⁵ Mn	-5110#	300#			< 70 ns		7/2 ⁻ #	97	92Bo37 I p ?
⁴⁵ Fe	13580#	220#			4.9 ms	1.5	3/2 ⁺ #	97	02Gi09 TD 2p=75 5; $\beta^+=25$ 5; ... *</

Nuclide	Mass excess (keV)	Excitation energy(keV)	Half-life	J^π	Ens	Reference	Decay modes and intensities (%)
... A-group continued ...							
⁴⁶ Cr	−29474 20		260 ms	60	0 ⁺	00	$\beta^+=100$
⁴⁶ Mn	−12370# 110#	*	37 ms	3	(4 ⁺)	00 92Bo37	TD $\beta^+=100; \beta^+p=22\ 2; \dots$ *
⁴⁶ Mn ^m	−12220# 150# 150# 100#	*	1# ms		1 [−] #		$\beta^+?$
⁴⁶ Fe	760# 350#		9 ms	4	0 ⁺	00 01Gi01	TD $\beta^+=100; \beta^+p=36\ 20$
* ⁴⁶ Ca	T : limit is for neutrinoless $\beta\beta$ decay						**
* ⁴⁶ Mn	D : ... ; $\beta^+2p\approx 18; \beta^+\alpha?$						**
* ⁴⁶ Mn	T : average 92Bo37=41(+7−6) 01Gi01=34.0(+4.5−3.5)						**
* ⁴⁶ Mn	D : $\beta^+2p\approx 18\%$ estimated from $P_p = \beta^+p + 2\times\beta^+2p=58(9)\%$ in 01Gi01						**
⁴⁷ S	8000# 800#		20# ms	(>200 ns)	3/2 [−] #	95 89Gu03	I $\beta^−?$
⁴⁷ Cl	−10520# 600#		200# ms	(>200 ns)	3/2 ⁺ #	95 89Gu03	I $\beta^−=100; \beta^−n<3$
⁴⁷ Ar	−25910 100		580 ms	120	3/2 [−] #	95 89Ba.B	T $\beta^−=100; \beta^−n<1$ *
⁴⁷ K	−35696 8		17.50 s	0.24	1/2 ⁺	95	$\beta^−=100$
⁴⁷ Ca	−42340.1 2.3		4.536 d	0.003	7/2 [−]	95	$\beta^−=100$
⁴⁷ Sc	−44332.1 2.0		3.3492 d	0.0006	7/2 [−]	95	$\beta^−=100$
⁴⁷ Sc ^m	−43565.3 2.0	766.83 0.09	272 ns	8	(3/2) ⁺	95	IT=100
⁴⁷ Ti	−44932.4 0.8		STABLE		5/2 [−]	95	IS=7.44 2
⁴⁷ V	−42002.1 0.8		32.6 m	0.3	3/2 [−]	95	$\beta^+=100$
⁴⁷ Cr	−34558 14		500 ms	15	3/2 [−]	95	$\beta^+=100$
⁴⁷ Mn	−22260# 160#		100 ms	50	5/2 [−] #	95 96Fa09	TD $\beta^+=100; \beta^+p=3.4\ 9$
⁴⁷ Fe	−6620# 260#		21.8 ms	0.7	7/2 [−] #	97 01Gi01	TD $\beta^+=100; \beta^+p=87\ 7$
⁴⁷ Fe ^m	−5850# 280#	770# 100#			3/2 ⁺ #		IT?
⁴⁷ Co	10700# 500#				7/2 [−] #		p?
* ⁴⁷ Ar	D : from 95So03						**
⁴⁸ S	13200# 900#		10# ms	(>200 ns)	0 ⁺		90Le03 I $\beta^−?$
⁴⁸ Cl	−4700# 700#		100# ms	(>200 ns)			89Gu03 I $\beta^−?$
⁴⁸ Ar	−23720# 300#		500# ms		0 ⁺		$\beta^−?$
⁴⁸ K	−32124 24		6.8 s	0.2	(2 [−])	95	$\beta^−=100; \beta^−n=1.14\ 15$
⁴⁸ Ca	−44214 4		53 Ey	17	0 ⁺	95 00Br63	T IS=0.187 21; ... *
⁴⁸ Sc	−44496 5		43.67 h	0.09	6 ⁺	95	$\beta^−=100$
⁴⁸ Ti	−48487.7 0.8		STABLE		0 ⁺	95	IS=73.72 3
⁴⁸ V	−44475.4 2.6		15.9735 d	0.0025	4 ⁺	95	$\beta^+=100$
⁴⁸ Cr	−42819 7		21.56 h	0.03	0 ⁺	95	$\beta^+=100$
⁴⁸ Mn	−29320 110		158.1 ms	2.2	4 ⁺	97 87Se07	D $\beta^+=100; \beta^+p=0.28\ 4; \dots$ *
⁴⁸ Fe	−18160# 70#		44 ms	7	0 ⁺	95 96Fa09	TD $\beta^+=100; \beta^+p=3.6\ 11$
⁴⁸ Co	1640# 400#				6 ⁺ #		p?
⁴⁸ Ni	18400# 500#		10# ms	(>500 ns)	0 ⁺	01 00B101	I 2p?
* ⁴⁸ Ca	D : ... ; $2\beta^−=?; \beta^−?$						**
* ⁴⁸ Ca	T : average 00Br63=42(33−13) 96Ba80=43(+24−11 statistics + 14 systematics)						**
* ⁴⁸ Ca	T : also $T>36$ Ey from 70Ba61. Single $\beta^−$ decay: $T>6$ Ey (95% CL), from 85Al17						**
* ⁴⁸ Mn	D : ... ; $\beta^+\alpha=6e-4$						**
* ⁴⁸ Mn	D : one $\beta^+\alpha$ event was observed, versus 437 β^+p , in fig.4 of 87Se07						**
⁴⁹ S	22000# 950#		< 200 ns		3/2 [−] #	97 90Le03	I n?
⁴⁹ Cl	300# 800#		50# ms	(>200 ns)	3/2 ⁺ #	95 89Gu03	I $\beta^−?$
⁴⁹ Ar	−18150# 500#		170 ms	50	3/2 [−] #	95 03We09	TD $\beta^−=100; \beta^−n=65\ 20$
⁴⁹ K	−30320 70		1.26 s	0.05	(3/2 ⁺)	95	$\beta^−=100; \beta^−n=86\ 9$
⁴⁹ Ca	−41289 4		8.718 m	0.006	3/2 [−]	95	$\beta^−=100$
⁴⁹ Sc	−46552 4		57.2 m	0.2	7/2 [−]	95	$\beta^−=100$
⁴⁹ Ti	−48558.8 0.8		STABLE		7/2 [−]	95	IS=5.41 2
⁴⁹ V	−47956.9 1.2		330 d	15	7/2 [−]	95	$\epsilon=100$
⁴⁹ Cr	−45330.5 2.4		42.3 m	0.1	5/2 [−]	95	$\beta^+=100$
⁴⁹ Mn	−37616 24		382 ms	7	5/2 [−]	01	$\beta^+=100$
⁴⁹ Fe	−24580# 150#		70 ms	3	(7/2 [−])	95 96Fa09	J $\beta^+=100; \beta^+p=52\ 10$
⁴⁹ Co	−9580# 260#		< 35 ns		7/2 [−] #	97 94B110	I p?
⁴⁹ Ni	9000# 400#		13 ms	4	7/2 [−] #	97 01Gi01	TD $\beta^+=100; \beta^+p=?$
* ⁴⁹ S	I : statistics precludes any conclusion, say authors						**

Nuclide	Mass excess (keV)		Excitation energy(keV)		Half-life		J^π	Ens	Reference	Decay modes and intensities (%)	
⁵⁰ Cl	7300#	900#			20#	ms					β^- ?
⁵⁰ Ar	-14500#	700#			85	ms	30	0 ⁺	95	03We09 TD	β^- =100; β^- n=35 10
⁵⁰ K	-25350	280			472	ms	4	(0 ⁻ , 1, 2 ⁻)	95		β^- =100; β^- n=29 3
⁵⁰ Ca	-39571	9			13.9	s	0.6	0 ⁺	95		β^- =100
⁵⁰ Sc	-44537	16			102.5	s	0.5	5 ⁺	95		β^- =100
⁵⁰ Sc ^m	-44280	16	256.895	0.010	350	ms	40	2 ⁺ , 3 ⁺	95		IT>97.5; β^- <2.5
⁵⁰ Ti	-51426.7	0.8			STABLE			0 ⁺	95		IS=5.18 2
⁵⁰ V	-49221.6	1.0			150	Py	40	6 ⁺	95		IS=0.250 4; β^+ =83 11;... *
⁵⁰ Cr	-50259.5	1.0			STABLE		(>1.3 Ey)	0 ⁺	95	03Bi05 T	IS=4.345 13; 2 β^+ ?
⁵⁰ Mn	-42626.8	1.0			283.9	ms	0.5	0 ⁺	95		β^+ =100
⁵⁰ Mn ^m	-42398	7	229	7	1.75	m	0.03	5 ⁺	95		β^+ =100
⁵⁰ Fe	-34480	60			155	ms	11	0 ⁺	01		β^+ =100; β^+ p≈0
⁵⁰ Co	-17200#	170#			44	ms	4	(6 ⁺)	01	96Fa09 JD	β^+ =100; β^+ p=54 12
⁵⁰ Ni	-3790#	260#			9.1	ms	1.8	0 ⁺	97	01Ma.A T	β^+ ?
* ⁵⁰ V	D : ... ; β^- =17 11										**
⁵¹ Cl	13500#	1000#			2#	ms	(>200 ns)	3/2 ⁺ #	97	90Le03 I	β^- ?
⁵¹ Ar	-7800#	700#			60#	ms	(>200 ns)	3/2 ⁻ #	97	89Gu03 I	β^- ?
⁵¹ K	-22000#	500#			365	ms	5	3/2 ⁺ #	97		β^- =100; β^- n=47 5
⁵¹ Ca	-35860	90			10.0	s	0.8	3/2 ⁻ #	97		β^- =100; β^- n ?
⁵¹ Sc	-43218	20			12.4	s	0.1	(7/2) ⁻	97		β^- =100
⁵¹ Ti	-49727.8	1.0			5.76	m	0.01	3/2 ⁻	97		β^- =100
⁵¹ V	-52201.4	1.0			STABLE			7/2 ⁻	97		IS=99.750 4
⁵¹ Cr	-51448.8	1.0			27.7025	d	0.0024	7/2 ⁻	97		ϵ =100
⁵¹ Mn	-48241.3	1.0			46.2	m	0.1	5/2 ⁻	97		β^+ =100
⁵¹ Fe	-40222	15			305	ms	5	5/2 ⁻	97		β^+ =100
⁵¹ Co	-27270#	150#			60#	ms	(>200 ns)	7/2 ⁻ #	97	87Po04 I	β^+ ?
⁵¹ Ni	-11440#	260#			30#	ms	(>200 ns)	7/2 ⁻ #	97	87Po04 I	β^+ ?
⁵² Ar	-3000#	900#			10#	ms		0 ⁺	00		β^- ?
⁵² K	-16200#	700#			105	ms	5	2 ⁻ #	00	ABBW D	β^- =100; β^- n≈64; ... *
⁵² Ca	-32510	700			4.6	s	0.3	0 ⁺	00		β^- =100; β^- n<2
⁵² Sc	-40360	190			8.2	s	0.2	3 ⁽⁺⁾	00		β^- =100
⁵² Ti	-49465	7			1.7	m	0.1	0 ⁺	00		β^- =100
⁵² V	-51441.3	1.0			3.743	m	0.005	3 ⁺	00		β^- =100
⁵² Cr	-55416.9	0.8			STABLE			0 ⁺	00		IS=83.789 18
⁵² Mn	-50705.4	2.0			5.591	d	0.003	6 ⁺	00		β^+ =100
⁵² Mn ^m	-50327.7	2.0	377.749	0.005	21.1	m	0.2	2 ⁺	00		β^+ =98.25 5; IT=1.75 5
⁵² Fe	-48332	7			8.275	h	0.008	0 ⁺	00		β^+ =100
⁵² Fe ^m	-41520	130	6810	130	45.9	s	0.6	12 ⁺ #	00		β^+ ≈100; IT<0.004
⁵² Co	-33920#	70#			115	ms	23	(6 ⁺)	00		β^+ =100
⁵² Co ^m	-33540#	120#	380#	100#	104	ms	11	2 ⁺ #		97Ha04 TD	β^+ =?; IT ? *
⁵² Ni	-22650#	80#			38	ms	5	0 ⁺	00		β^+ =100; β^+ p=17.0 14
⁵² Cu	-2630#	260#						3 ⁺ #	00		p ?
* ⁵² K	D : ... ; β^- 2n≈21										**
* ⁵² K	D : β^- n≈64%, β^- 2n≈21% estimated from $P_n = \beta^-n + 2 \times \beta^-2n=107(20)\%$ in ⁸³ La23										**
* ⁵² K	D : and assuming $\beta^-n/\beta^-2n=3$ as in ³² Na										**
* ⁵² Co ^m	I : tentative: no specific evidence for ⁵² Co ^m , say authors in 97Ha04										**

Nuclide	Mass excess (keV)	Excitation energy(keV)	Half-life	J^π	Ens	Reference	Decay modes and intensities (%)
⁵³ Ar	4600#	1000#	3# ms	5/2 ⁻ #	99		β^- ?; β^-n ?
⁵³ K	-12000#	700#	30 ms	5	3/2 ⁺ #	99 ABBW D	β^- =100; β^-n ≈67; ... *
⁵³ Ca	-27900#	500#	90 ms	15	3/2 ⁻ #	99 83La23 D	β^- =100; β^-n >30 *
⁵³ Sc	-37620#	300#	> 3 s		7/2 ⁻ #	99 98So03 TD	β^- =100; β^-n ?
⁵³ Ti	-46830	100	32.7 s	0.9	(3/2) ⁻	99	β^- =100
⁵³ V	-51849	3	1.60 m	0.04	7/2 ⁻	99	β^- =100
⁵³ Cr	-55284.7	0.8	STABLE		3/2 ⁻	99	IS=9.501 17
⁵³ Mn	-54687.9	0.8	3.7 My	0.4	7/2 ⁻	99	ϵ =100
⁵³ Fe	-50945.3	1.8	8.51 m	0.02	7/2 ⁻	99	β^+ =100
⁵³ Fe ^m	-47904.9	1.8 3040.4 0.3	2.526 m	0.024	19/2 ⁻	99 97Ge11 T	IT=100 *
⁵³ Co	-42645	18	242 ms	8	7/2 ⁻ #	99 02Lo13 T	β^+ =100 *
⁵³ Co ^m	-39447	22 3197 29 p	247 ms	12	(19/2 ⁻)	99	β^+ ≈98.5; p≈1.5
⁵³ Ni	-29370#	160#	45 ms	15	7/2 ⁻ #	99 76Vi02 D	β^+ =100; β^+p ≈45
⁵³ Cu	-13460#	260#	< 300 ns		3/2 ⁻ #	99 93Bl.A I	p ?; β^+ ?
* ⁵³ K	D : ... ; β^-2n ≈17						**
* ⁵³ K	D : β^-n ≈67%, β^-2n ≈17% estimated from $P_n = \beta^-n + 2 \times \beta^-2n = 100(30)\%$ in 83La23						**
* ⁵³ K	D : and assuming $\beta^-n/\beta^-2n=4$ as in ³³ Na						**
* ⁵³ Ca	D : $\beta^-n=40(10)\%$ is a lower limit (see ENSDF)						**
* ⁵³ Ca	T : expected $T=2\#$ s from systematics of Ca isotopes						**
* ⁵³ Fe ^m	T : average 97Ge11=2.48(0.05) 68De27=2.51(0.02) 67Es06=2.58(0.03)						**
* ⁵³ Co	T : average 02Lo13=240(9) 89Ho13=240(20) 73Ko10=262(25)						**
⁵⁴ K	-5400#	900#	10 ms	5	2 ⁻ #	01	β^- =100; β^-n =?
⁵⁴ Ca	-23890#	700#	50# ms	(>300 ns)	0 ⁺	01 97Be70 I	β^- ?; β^-n ?
⁵⁴ Sc	-34220	370	260 ms	30	3 ⁺ #	01 02Ja16 T	β^- =100; β^-n ? *
⁵⁴ Sc ^m	-34110	370 110 3	7 μ s	5	(5 ⁺)	01 98Gr14 EJ	IT=100
⁵⁴ Ti	-45590	120	1.5 s	0.4	0 ⁺	01	β^- =100
⁵⁴ V	-49891	15	49.8 s	0.5	3 ⁺	01	β^- =100
⁵⁴ V ^m	-49783	15 108 3	900 ns	500	(5 ⁺)	98Gr14 EJ	IT=100
⁵⁴ Cr	-56932.5	0.8	STABLE		0 ⁺	01	IS=2.365 7
⁵⁴ Mn	-55555.4	1.3	312.03 d	0.03	3 ⁺	01 02Un02 T	ϵ =100; β^- <2.9e-4; ... *
⁵⁴ Fe	-56252.5	0.7	STABLE		0 ⁺	01	IS=5.845 35; 2 β^+ ?
⁵⁴ Fe ^m	-49725.6	0.9 6526.9 0.6	364 ns	7	10 ⁺	01	IT=100
⁵⁴ Co	-48009.5	0.7	193.23 ms	0.14	0 ⁺	01	β^+ =100
⁵⁴ Co ^m	-47812.1	0.9 197.4 0.5	1.48 m	0.02	(7) ⁺	01	β^+ =100
⁵⁴ Ni	-39210	50	104 ms	7	0 ⁺	01 02Lo13 T	β^+ =100 *
⁵⁴ Cu	-21690#	210#	< 75 ns		3 ⁺ #	01 94Bl10 I	p ?
⁵⁴ Zn	-6570#	400#			0 ⁺		2p ?
* ⁵⁴ Sc	T : average 02Ja16=360(60) 98So03=225(40)						**
* ⁵⁴ Mn	D : ... ; e^+ =1.28e-7 25						**
* ⁵⁴ Mn	D : e^+ average 98Wu01=1.20(0.26) 97Za07=2.2(0.9)						**
* ⁵⁴ Ni	T : average 02Lo13=103(9) 99Re06=106(12)						**
⁵⁵ K	-270#	1000#	3# ms		3/2 ⁺ #		β^- ?; β^-n ?
⁵⁵ Ca	-18120#	700#	30# ms	(>300 ns)	5/2 ⁻ #	97Be70 I	β^- ?
⁵⁵ Sc	-29580	740	120 ms	40	7/2 ⁻ #	01	β^- =100; β^-n ?
⁵⁵ Ti	-41670	150	490 ms	90	3/2 ⁻ #	01 98Am04 T	β^- =100 *
⁵⁵ V	-49150	100	6.54 s	0.15	7/2 ⁻ #	01	β^- =100
⁵⁵ Cr	-55107.5	0.8	3.497 m	0.003	3/2 ⁻	01	β^- =100
⁵⁵ Mn	-57710.6	0.7	STABLE		5/2 ⁻	01	IS=100.
⁵⁵ Fe	-57479.4	0.7	2.737 y	0.011	3/2 ⁻	01	ϵ =100
⁵⁵ Co	-54027.6	0.7	17.53 h	0.03	7/2 ⁻	01	β^+ =100
⁵⁵ Ni	-45336	11	204.7 ms	1.7	7/2 ⁻	01 02Lo13 T	β^+ =100 *
⁵⁵ Cu	-31620#	300#	40# ms	(>200 ns)	3/2 ⁻ #	01 87Po04 I	β^+ ?; p ?
⁵⁵ Zn	-14920#	250#	20# ms	(>1.6 μ s)	5/2 ⁻ #	01 01Gi10 I	β^+ ?
* ⁵⁵ Ti	T : unweighed average 98Am04=320(60) 96Do23=600(40) and 95So.A=545(95)						**
* ⁵⁵ Ti	T : (Birge ratio $B=2.75$)						**
* ⁵⁵ Ni	T : average 02Lo13=196(5) 99Re06=204(3) 87Ha.A=212.1(3.8) 84Ay01=208(5)						**
* ⁵⁵ Ni	T : and 77Ho25=189(5) 76Ed.A=219(6); 97Wo06=204(3) superseded by 99Re06						**

Nuclide	Mass excess (keV)	Excitation energy(keV)	Half-life	J^π	Ens	Reference	Decay modes and intensities (%)
^{56}Ca	−13440#	900#	10# ms (>300 ns)	0 ⁺	99	97Be70 I	β^- ?
^{56}Sc	−25270#	700#	80# ms (>300 ns)	3 ⁺ #	99	97Be70 I	β^- ?
^{56}Ti	−38940	200	164 ms	24	0 ⁺	99 98Am04 TD	β^- =100; β^- n ? *
^{56}V	−46080	200	216 ms	4	(1 ⁺)	99 03Ma02 TJ	β^- =100; β^- n ?
^{56}Cr	−55281.2	1.9	5.94 m	0.10	0 ⁺	99	β^- =100
^{56}Mn	−56909.7	0.7	2.5789 h	0.0001	3 ⁺	99	β^- =100
^{56}Fe	−60605.4	0.7	STABLE		0 ⁺	99	IS=91.754 36
^{56}Co	−56039.4	2.1	77.23 d	0.03	4 ⁺	99	β^+ =100
^{56}Ni	−53904	11	6.075 d	0.010	0 ⁺	99	β^+ =100
^{56}Cu	−38600#	140#	93 ms	3	(4 ⁺)	99 01Bo54 TJD	β^+ =100; β^+ p=0.40 12
^{56}Zn	−25730#	260#	36 ms	10	0 ⁺	01 95Wa.A T	β^+ ?; β^+ p ? *
^{56}Ga	−4740#	260#		3 ⁺ #			p ?
* ^{56}Ti	T : average 98Am04=190(40) 96Do23=150(30)						**
* ^{56}Zn	T : half-life is derived from experimental (p,n) cross sections						**
* ^{56}Zn	I : identified by time-of-flight 01Gi10 with $T > 1.6 \mu\text{s}$						**
^{57}Ca	−7120#	1000#	5# ms		5/2 ⁻ #		β^- ?; β^- n ?
^{57}Sc	−20690#	700#	13 ms	4	7/2 ⁻ #	98 02So.A TD	β^- =100; β^- n=33#
^{57}Ti	−33540	460	60 ms	16	5/2 ⁻ #	98 99So20 T	β^- =100; β^- n=0.3# *
^{57}V	−44190	230	350 ms	10	(3/2 ⁻)	98 03Ma02 TJ	β^- =100; β^- n=0.4#
^{57}Cr	−52524.1	1.9	21.1 s	1.0	(3/2 ⁻)	98	β^- =100
^{57}Mn	−57486.8	1.8	85.4 s	1.8	5/2 ⁻	98	β^- =100
^{57}Fe	−60180.1	0.7	STABLE		1/2 ⁻	98	IS=2.119 10
^{57}Co	−59344.2	0.7	271.74 d	0.06	7/2 ⁻	98	ϵ =100
^{57}Ni	−56082.0	1.8	35.60 h	0.06	3/2 ⁻	98	β^+ =100
^{57}Cu	−47310	16	196.3 ms	0.7	3/2 ⁻	98	β^+ =100
^{57}Zn	−32800#	100#	38 ms	4	7/2 ⁻ #	98 02Lo13 T	β^+ =100; β^+ p≈65 *
^{57}Ga	−15900#	260#			1/2 ⁻ #		p ?
* ^{57}Ti	T : average 99So20=67(25) 96Do23=56(20); 98Am04=180(30) at variance not used						**
* ^{57}Zn	T : average 02Lo13=37(5) 76Vi02=40(10)						**
^{58}Sc	−15170#	800#	12 ms	5	3 ⁺ #	02So.A TD	β^- =100
^{58}Ti	−30770#	700#	54 ms	7	0 ⁺	97 99So20 TD	β^- =100 *
^{58}V	−40210	250	191 ms	8	3 ⁺ #	97 03Ma02 TD	β^- =100; β^- n ? *
^{58}Cr	−51830	200	7.0 s	0.3	0 ⁺	97	β^- =100
^{58}Mn	−55910	30	3.0 s	0.1	1 ⁺	97	β^- =100
$^{58}\text{Mn}^m$	−55840	30	71.78	0.05	65.2 s	0.5	(4 ⁺) 97 β^- =?; IT=20#
^{58}Fe	−62153.4	0.7	STABLE		0 ⁺	97	IS=0.282 4
^{58}Co	−59845.9	1.2	70.86 d	0.06	2 ⁺	00	β^+ =100
$^{58}\text{Co}^m$	−59821.0	1.2	24.95	0.06	9.04 h	0.11	5 ⁺ 00 IT=100
$^{58}\text{Co}^n$	−59792.8	1.2	53.15	0.07	10.4 μs	0.3	4 ⁺ 00 IT=100
^{58}Ni	−60227.7	0.6	STABLE	(>700 Ey)	0 ⁺	01	IS=68.0769 89; $2\beta^+$? *
^{58}Cu	−51662.1	1.6	3.204 s	0.007	1 ⁺	01	β^+ =100
^{58}Zn	−42300	50	84 ms	9	0 ⁺	99 02Lo13 T	β^+ =100; β^+ p<3 *
^{58}Ga	−23990#	210#			2 ⁺ #		p ?
$^{58}\text{Ga}^m$	−23960#	230#	30#	100#	5 ⁺ #		p ?
^{58}Ge	−8370#	320#			0 ⁺		2p ?
* ^{58}Ti	T : average 02So.A=59(9) 99So20=47(10)						**
* ^{58}V	T : average 03Ma02=185(10) 98Am04=200(20) 98So03=205(20)						**
* ^{58}Ni	T : >400 Ey to 2 ⁺ level of ^{58}Fe , >700 Ey to ground-state						**
* ^{58}Zn	T : average 02Lo13=83(10) 98Jo18=86(18)						**

Nuclide	Mass excess (keV)	Excitation energy(keV)	Half-life	J^π	Ens	Reference	Decay modes and intensities (%)
⁵⁹ Sc	−10040# 900#		10# ms	7/2 [−] #			β^- ?; β^-n ?
⁵⁹ Ti	−25220# 700#		30 ms	3	5/2 [−] #	02 02So.A T	β^- =100 *
⁵⁹ V	−37070 310		75 ms	7	7/2 [−] #	02	β^- =100; β^-n ?
⁵⁹ Cr	−47890 240		460 ms	50	5/2 [−] #	02	β^- =100
⁵⁹ Cr ^m	−47390 240	503.0 1.7	96 μ s	20	(9/2 ⁺)	02	IT=100
⁵⁹ Mn	−55480 30		4.59 s	0.05	(5/2 [−])	02	β^- =100
⁵⁹ Fe	−60663.1 0.7		44.495 d	0.009	3/2 [−]	02	β^- =100
⁵⁹ Co	−62228.4 0.6		STABLE		7/2 [−]	02	IS=100.
⁵⁹ Ni	−61155.7 0.6		101 ky	13	3/2 [−]	02 94Ru19 T	β^+ =100 *
⁵⁹ Cu	−56357.2 0.8		81.5 s	0.5	3/2 [−]	02	β^+ =100
⁵⁹ Zn	−47260 40		182.0 ms	1.8	3/2 [−]	02	β^+ =100; β^+p =0.10 3
⁵⁹ Ga	−34120# 170#				3/2 [−] #		p?
⁵⁹ Ge	−17000# 280#				7/2 [−] #		2p?
* ⁵⁹ Ti	T: supersedes 99So20=58(17) same group						**
* ⁵⁹ Ni	T: unweighed average 94Ru19=108(13) 94Ru19(meteorite)=120(22) 81Ni08=76(5)						**
* ⁵⁹ Ni	T: (Birge ratio B=2.05)						**
⁶⁰ Sc	−4000# 900#		3# ms	3 ⁺ #			β^- ?
⁶⁰ Ti	−21650# 800#		22 ms	2	0 ⁺	02So.A TD	β^- =100
⁶⁰ V	−32580 470		122 ms	18	3 ⁺ #	97 99So20 TD	β^- =100; β^-n ?
⁶⁰ V ^m	−32580# 490#	0# 150#	40 ms	15	1 ⁺ #	03So02 TD	β^- =?; IT?
⁶⁰ V ⁿ	−32480 470	101 1	>400 ns)			99So20 EI	IT=100
⁶⁰ Cr	−46500 210		560 ms	60	0 ⁺	93 96Do23 T	β^- =100 *
⁶⁰ Mn	−53180 90		51 s	6	0 ⁺	94	β^- =100
⁶⁰ Mn ^m	−52910 90	271.90 0.10	1.77 s	0.02	3 ⁺	94 92Sc.A E	β^- =88.5 8; IT=11.5 8
⁶⁰ Fe	−61412 3		1.5 My	0.3	0 ⁺	93	β^- =100
⁶⁰ Co	−61649.0 0.6		5.2713 y	0.0008	5 ⁺	00	β^- =100
⁶⁰ Co ^m	−61590.4 0.6	58.59 0.01	10.467 m	0.006	2 ⁺	00	IT≈100; β^- =0.24 3
⁶⁰ Ni	−64472.1 0.6		STABLE		0 ⁺	96	IS=26.2231 77
⁶⁰ Cu	−58344.1 1.7		23.7 m	0.4	2 ⁺	93	β^+ =100
⁶⁰ Zn	−54188 11		2.38 m	0.05	0 ⁺	02	β^+ =100
⁶⁰ Ga	−40000# 110#		70 ms	10	(2 ⁺)	02 01Ma96 TJ	β^+ =100; β^+p =1.6 7; ... *
⁶⁰ Ge	−27770# 230#		30# ms		0 ⁺		β^+ ?
⁶⁰ As	−6400# 600#				5 ⁺ #		p?
⁶⁰ As ^m	−6340# 600#	60# 20#			2 ⁺ #		p?
* ⁶⁰ V	T: also 98Am04=200(40), not used						**
* ⁶⁰ Cr	T: weighed average 96Do23=510(150) 88Bo06=570(60); other 95Am.A=380(30)						**
* ⁶⁰ Ga	D: ...; $\beta^+ \alpha < 0.023$ 20						**
* ⁶⁰ Ga	T: average 02Lo13=70(13) 01Ma96=70(15)						**
⁶¹ Ti	−15650# 900#		10# ms	>300 ns)	1/2 [−] #	99 97Be70 I	β^- ?; β^-n ?
⁶¹ V	−29360# 400#		47.0 ms	1.2	7/2 [−] #	99 03So02 TD	β^- =100; $\beta^-n < 6$
⁶¹ Cr	−42180 250		261 ms	15	5/2 [−] #	99 99So20 TD	β^- =100; β^-n ?
⁶¹ Mn	−51560 230		670 ms	40	(5/2 [−])	99 99Ha05 D	β^- =100; β^-n ?
⁶¹ Fe	−58921 20		5.98 m	0.06	3/2 [−] , 5/2 [−]	99	β^- =100
⁶¹ Fe ^m	−58060 20	861 3	250 ns	10	9/2 ⁺ #	99 98Gr14 E	IT=100
⁶¹ Co	−62898.4 0.9		1.650 h	0.005	7/2 [−]	99	β^- =100
⁶¹ Ni	−64220.9 0.6		STABLE		3/2 [−]	99	IS=1.1399 6
⁶¹ Cu	−61983.6 1.0		3.333 h	0.005	3/2 [−]	99	β^+ =100
⁶¹ Zn	−56345 16		89.1 s	0.2	3/2 [−]	99	β^+ =100
⁶¹ Zn ^m	−56257 16	88.4 0.1	< 430 ms		1/2 [−]	99	IT=100
⁶¹ Zn ⁿ	−55927 16	418.10 0.15	140 ms	70	3/2 [−]	99	IT=100
⁶¹ Zn ^p	−55589 16	756.02 0.18	< 130 ms		5/2 [−]	99	IT=100
⁶¹ Ga	−47090 50		168 ms	3	3/2 [−]	99 02We07 TD	β^+ =100; $\beta^+p \approx 0$
⁶¹ Ga ^m	−47000# 110#	90# 100#			1/2 [−] #		
⁶¹ Ge	−33730# 300#		39 ms	12	3/2 [−] #	99 02Lo13 T	β^+ =100; $\beta^+p \approx 80$ *
⁶¹ As	−18050# 600#				3/2 [−] #		p?
* ⁶¹ Cr	T: average 99So20=251(22) 98Am04=270(20)						**
* ⁶¹ Ge	T: average 02Lo13=36(21) 87Ho01=40(15)						**

Nuclide	Mass excess (keV)		Excitation energy(keV)			Half-life		J ^π	Ens	Reference	Decay modes and intensities (%)			
⁶² Ti	-11650#	900#				10#	ms					β ⁻ ?		
⁶² V	-24420#	500#				33.5	ms	2.0	3 ⁺ #	01	03So02	TD	β ⁻ =100	
⁶² Cr	-40410	340				199	ms	9	0 ⁺	01	02So.A	TD	β ⁻ =100; β ⁻ n ?	*
⁶² Mn	-48040	220			*	671	ms	5	(3 ⁺)	01	99Ha05	TD	β ⁻ =100; β ⁻ n=?	*
⁶² Mn ^m	-48040#	270#	0#	150#	*	92	ms	13	(1 ⁺)		99So20	TJD	β ⁻ =100; β ⁻ n≈0	*
⁶² Fe	-58901	14				68	s	2	0 ⁺	01			β ⁻ =100	
⁶² Co	-61432	20				1.50	m	0.04	2 ⁺	01			β ⁻ =100	
⁶² Co ^m	-61410	21	22	5		13.91	m	0.05	5 ⁺	01			β ⁻ >99; IT<1	
⁶² Ni	-66746.1	0.6				STABLE			0 ⁺	01			IS=3.6345 17	
⁶² Cu	-62798	4				9.673	m	0.008	1 ⁺	01	02Un02	T	β ⁺ =100	*
⁶² Zn	-61171	10				9.186	h	0.013	0 ⁺	01			β ⁺ =100	
⁶² Ga	-52000	28				115.99	ms	0.17	0 ⁺	01	03Hy02	T	β ⁺ =100	*
⁶² Ga ^m	-51183	28	817.5	0.5		4.6	ns	0.5	(3 ⁺)	01	98Vi06	ETJ	IT=100	*
⁶² Ge	-42240#	140#				130	ms	40	0 ⁺	01	02Lo13	TD	β ⁺ =100	*
⁶² As	-24960#	300#							1 ⁺ #	01			p ?	*
⁶² Cr	T : average 02So.A=209(12) 99So20=187(15) 98Am04=190(30)												**	
⁶² Cu	T : others 97Zi06(LS method)=9.68(0.04) 97Zi06(IC method)=9.673(0.026)												**	
⁶² Cu	T : 69Jo07=9.73(0.02) 69Bo11=9.7(0.1) 65Li11=9.79(0.06) 65Eb01=9.76(0.02)												**	
⁶² Ga	T : average 03Hy02=115.84(0.25) 79Da04=116.34(0.35) 78Ai23=115.95(0.30)												**	
⁶² Ge	I : T=113(+6-5) ms in 93Wi03 (table 1) is a misprint for ⁶² Ga												**	
⁶² As	D : p-unstable from estimated S _p =-1476#(422#) keV												**	
⁶³ Ti	-5200#	1000#				3#	ms		1/2 ⁻ #				β ⁻ ?; β ⁻ n ?	
⁶³ V	-20910#	600#				17	ms	3	7/2 ⁻ #	01	03So02	TD	β ⁻ =100; β ⁻ n<35	
⁶³ Cr	-35530#	300#				129	ms	2	1/2 ⁻ #	01	02So.A	TD	β ⁻ =100; β ⁻ n ?	*
⁶³ Mn	-46350	260				275	ms	4	5/2 ⁻ #	01	99Ha05	TD	β ⁻ =100; β ⁻ n=?	*
⁶³ Fe	-55550	170				6.1	s	0.6	(5/2) ⁻	01			β ⁻ =100	
⁶³ Co	-61840	20				26.9	s	0.4	7/2 ⁻	01	94It.A	T	β ⁻ =100	*
⁶³ Ni	-65512.6	0.6				100.1	y	2.0	1/2 ⁻	01			β ⁻ =100	
⁶³ Ni ^m	-65425.5	0.6	87.15	0.11		1.67	μs	0.03	5/2 ⁻	01			IT=100	
⁶³ Cu	-65579.5	0.6				STABLE			3/2 ⁻	01			IS=69.17 3	
⁶³ Zn	-62213.0	1.6				38.47	m	0.05	3/2 ⁻	01			β ⁺ =100	
⁶³ Ga	-56547.1	1.3				32.4	s	0.5	(3/2 ⁻)	01			β ⁺ =100	
⁶³ Ge	-46910#	200#				142	ms	8	3/2 ⁻ #	01	02Lo13	TD	β ⁺ =100	*
⁶³ As	-33820#	500#							3/2 ⁻ #	01			p ?	*
⁶³ Cr	T : also 99So20=113(16) and 98Am04=110(70) outweighed, not used												**	
⁶³ Mn	T : also 99So20=322(23) 95Am.A=290(20) 85Bo49=250(40) outweighed, not used												**	
⁶³ Co	T : average 94It.A=26.41(0.27) 72Jo08=27.5(0.3) 69Wa15=26(1)												**	
⁶³ Ge	T : average 02Lo13=150(9) 93Wi03=95(+23-20)												**	
⁶³ As	D : p-unstable from estimated S _p =-1132#(522#) keV												**	
⁶⁴ V	-15400#	700#				10#	ms	(>300 ns)		97	97Be70	I	β ⁻ ?	
⁶⁴ Cr	-33150#	400#				43	ms	1	0 ⁺		02So.A	TD	β ⁻ =100	*
⁶⁴ Mn	-42620	270				88.8	ms	2.5	(1 ⁺)	96	99So20	TJD	β ⁻ =100; β ⁻ n=?	*
⁶⁴ Mn ^m	-42490	270	135	3		> 100	μs				98Gr14	ET	IT=100	
⁶⁴ Fe	-54770	280				2.0	s	0.2	0 ⁺	96			β ⁻ =100	
⁶⁴ Co	-59793	20				300	ms	30	1 ⁺	96			β ⁻ =100	
⁶⁴ Ni	-67099.3	0.6				STABLE			0 ⁺	96			IS=0.9256 9	
⁶⁴ Cu	-65424.2	0.6				12.700	h	0.002	1 ⁺	96			β ⁺ =61.0 3; β ⁻ =39.0 3	
⁶⁴ Zn	-66003.6	0.7				STABLE		(>2.3 Ey)	0 ⁺	96	85No03	T	IS=48.63 60; 2β ⁺ ?	
⁶⁴ Ga	-58834.3	2.0				2.627	m	0.012	0 ⁺ (#)	96			β ⁺ =100	
⁶⁴ Ga ^m	-58791.5	2.0	42.85	0.08		21.9	μs	0.7	2 ⁺	96	99Ta29	TJ	IT=100	
⁶⁴ Ge	-54350	30				63.7	s	2.5	0 ⁺	96			β ⁺ =100	
⁶⁴ As	-39520#	360#				40	ms	30	0 ⁺ #		02Lo13	TD	β ⁺ =100	
⁶⁴ Cr	T : also 99So20=44(12) outweighed, not used												**	
⁶⁴ Mn	T : average 02So.A=91(4) 99So20=85(5) 99Ha05=89(4); 98Am04=140(30) not used												**	

Nuclide	Mass excess (keV)	Excitation energy(keV)	Half-life	J^π	Ens	Reference	Decay modes and intensities (%)
^{65}V	-11250# 800#		10# ms	$5/2^-$			β^- ?; $\beta^- n$?
^{65}Cr	-27800# 500#		27 ms	3	$1/2^-$	97 02So.A	TD $\beta^- = 100$; $\beta^- n$?
^{65}Mn	-40670 540		92 ms	1	$5/2^-$	93 02So.A	TD $\beta^- = 100$; $\beta^- n = ?$ *
^{65}Fe	-50880 240		1.3 s	0.3	$1/2^-$	93 99So20	T $\beta^- = 100$ *
$^{65}\text{Fe}^m$	-50520 240	364 3	430 ns	130	$(5/2^-)$	98Gr14	ETJ IT=100
^{65}Co	-59170 13		1.20 s	0.06	$(7/2^-)$	93	$\beta^- = 100$
^{65}Ni	-65126.1 0.6		2.5172 h	0.0003	$5/2^-$	97	$\beta^- = 100$
$^{65}\text{Ni}^m$	-64113.1 1.2	1013 1	26.7 ns	1.0	$9/2^+$	95Bl01	ETJ
^{65}Cu	-67263.7 0.7		STABLE		$3/2^-$	93	IS=30.83 3
^{65}Zn	-65911.6 0.7		244.06 d	0.10	$5/2^-$	00	$\beta^+ = 100$
$^{65}\text{Zn}^m$	-65857.7 0.7	53.928 0.010	1.6 μs	0.6	$(1/2^-)$	00	IT=100
^{65}Ga	-62657.2 0.8		15.2 m	0.2	$3/2^-$	93	$\beta^+ = 100$
^{65}Ge	-56410 100		30.9 s	0.5	$(3/2^-)$	93 87Vi01	D $\beta^+ = 100$; $\beta^+ p = 0.011$ 3
^{65}As	-46980# 300#		170 ms	30	$3/2^-$	93 02Lo13	T $\beta^+ = 100$ *
^{65}Se	-32920# 600#		< 50 ms		$3/2^-$	93 94Mo.A	T $\beta^+ = 100$; $\beta^+ p = ?$ *
* ^{65}Mn	T : others 99Ha05=88(4) 99So20=100(8) 98Am04=110(20) outweighed, not used						**
* ^{65}Fe	T : 95Am.A=760(50) ms supersedes 94Cz02=450(150) from same group, none used						**
* ^{65}As	T : average 02Lo13=126(16) 95Mo26=190(11) with Birge ratio $B=3.3$						**
* ^{65}Se	D : from 93Ba12						**
^{66}Cr	-24800# 600#		10 ms	6	0^+	98 02So.A	TD $\beta^- = 100$
^{66}Mn	-36250# 400#		64.4 ms	1.8		98 02So.A	TD $\beta^- = 100$; $\beta^- n = ?$ *
^{66}Fe	-49570 300		440 ms	40	0^+	98 99So20	TD $\beta^- = 100$; $\beta^- n ?$ *
^{66}Co	-56110 250		194 ms	17	(3^+)	98 00Mu10	TJ $\beta^- = 100$ *
$^{66}\text{Co}^m$	-55940 250	175 3	1.21 μs	0.01	(5^+)	98Gr14	ETJ IT=100
$^{66}\text{Co}^n$	-55470 250	642 5	> 100 μs		(8^-)	98Gr14	ETJ IT=100
^{66}Ni	-66006.3 1.4		54.6 h	0.4	0^+	98	$\beta^- = 100$
^{66}Cu	-66258.3 0.7		5.120 m	0.014	1^+	98	$\beta^- = 100$
^{66}Zn	-68899.4 0.9		STABLE		0^+	98	IS=27.90 27
^{66}Ga	-63724 3		9.49 h	0.07	0^+	98	$\beta^+ = 100$
^{66}Ge	-61620 30		2.26 h	0.05	0^+	98	$\beta^+ = 100$
^{66}As	-51500 680		95.77 ms	0.23	(0^+)	98 98Gr12	J $\beta^+ = 100$
$^{66}\text{As}^m$	-50140 680	1356.70 0.17	1.1 μs	0.1	(5^+)	01Gr07	TJ IT=100 *
$^{66}\text{As}^n$	-48480 680	3023.9 0.3	8.2 μs	0.5	(9^+)	01Gr07	TJ IT=100 *
^{66}Se	-41720# 300#		33 ms	12	0^+	98 02Lo13	TD $\beta^+ = 100$
* ^{66}Mn	T : average 02So.A=64(2) 99Ha05=66(4)						**
* ^{66}Mn	T : also 99So20=62(14) 98Am04=90(20) outweighed, not used						**
* ^{66}Fe	T : average 99So20=440(60) 98Am04=440(60)						**
* ^{66}Co	T : average 00Mu10=180(10) 94Cz02=240(30) 85Bo49=230(20)						**
* $^{66}\text{As}^m$	J : $3^+ \#$ from systematics						**
* $^{66}\text{As}^n$	T : supersedes 98Gr12=17.5(1.5) E : from 98Gr12						**
^{67}Cr	-19050# 700#		10# ms	(>300 ns)	$1/2^-$	97 97Be70	I $\beta^- ?$
^{67}Mn	-33400# 500#		45 ms	3	$5/2^-$	97 02So.A	TD $\beta^- = 100$; $\beta^- n = ?$ *
^{67}Fe	-45690 420		394 ms	9	$1/2^-$	91 02So.A	TD $\beta^- = 100$; $\beta^- n ?$ *
$^{67}\text{Fe}^m$	-45320 420	367 3	64 μs	17	$(5/2^-)$	03Sa02	ET IT=100 *
^{67}Co	-55060 320		425 ms	20	$7/2^-$	91 99We07	T $\beta^- = 100$ *
^{67}Ni	-63742.7 2.9		21 s	1	$1/2^-$	01 00Ri14	J $\beta^- = 100$
$^{67}\text{Ni}^m$	-62736 4	1007 3	13.3 μs	0.2	$9/2^+$	01 98Gr14	E IT=100
^{67}Cu	-67318.8 1.2		61.83 h	0.12	$3/2^-$	91	$\beta^- = 100$
^{67}Zn	-67880.4 0.9		STABLE		$5/2^-$	91	IS=4.10 13
^{67}Ga	-66879.7 1.3		3.2612 d	0.0006	$3/2^-$	96	$\varepsilon = 100$
^{67}Ge	-62658 5		18.9 m	0.3	$1/2^-$	91	$\beta^+ = 100$
$^{67}\text{Ge}^m$	-62640 5	18.2 0.05	13.7 μs	0.9	$5/2^-$	91	IT=100
$^{67}\text{Ge}^n$	-61906 5	751.70 0.06	110.9 ns	1.4		91	IT=100
^{67}As	-56650 100		42.5 s	1.2	$(5/2^-)$	91	$\beta^+ = 100$

... A-group is continued on next page ...

Nuclide	Mass excess (keV)	Excitation energy(keV)	Half-life	J ^π	Ens	Reference	Decay modes and intensities (%)		
... A-group continued ...									
⁶⁷ Se	-46490# 200#		133 ms	11	5/2 ⁻ #	97 95BI23	TD β ⁻ =100; β ⁺ p=0.5 1	*	
⁶⁷ Br	-32800# 500#				1/2 ⁻ #		p ?	*	
* ⁶⁷ Mn	T : average 02So.A=47(4) 99Ha05=42(4)								**
* ⁶⁷ Fe	T : others 99So20=500(100) 98Am04=470(50) outweighed, not used								**
* ⁶⁷ Fe ^m	T : average 03Sa02=75(21) 98Gr14=43(30), same authors, different experiment								**
⁶⁷ Co	T : others 99Pr10=440(70) 99So20=440(80) 85Bo49=420(70) outweighed, not used								**
⁶⁷ Co	T : and 95Am.A=310(20) at variance, not used								**
⁶⁷ Se	T : average 02Lo13=136(12) 94Ba50=107(35)								**
* ⁶⁷ Se	T : values from 95BI23 for ⁶⁷ Se=60(+17-11) and ⁷¹ Kr questioned by 97Oio1								**
⁶⁸ Mn	-28600# 600#		28 ms	4		02	02So.A T β ⁻ =100; β ⁻ n=?	*	
⁶⁸ Fe	-43130 700		187 ms	6	0 ⁺	02	02So.A T β ⁻ =100; β ⁻ n ?	*	
⁶⁸ Co	-51350 320	*	200 ms	21	(7 ⁻)	02	00Mu10 T β ⁻ =100	*	
⁶⁸ Co ^m	-51200# 350# 150# 150#	*	1.6 s	0.3	(3 ⁺)	02	00Mu10 JD β ⁻ =?; IT ?		
⁶⁸ Ni	-63463.8 3.0		29 s	2	0 ⁺	02	β ⁻ =100		
⁶⁸ Ni ^m	-61694 3 1770.0 1.0		276 ns	65	0 ⁺	02	IT=100		
⁶⁸ Ni ⁿ	-60615 3 2849.1 0.3		860 μs	50	5 ⁻	02	IT=100		
⁶⁸ Cu	-65567.0 1.6		31.1 s	1.5	1 ⁺	02	β ⁻ =100		
⁶⁸ Cu ^m	-64845.4 1.7 721.6 0.7		3.75 m	0.05	(6 ⁻)	02	IT=84 1; β ⁻ =16 1		
⁶⁸ Zn	-70007.2 1.0		STABLE		0 ⁺	02	IS=18.75 51		
⁶⁸ Ga	-67086.1 1.5		67.71 m	0.09	1 ⁺	02	β ⁺ =100		
⁶⁸ Ga ^m	-65856.2 1.5 1229.87 0.04		62.0 ns	1.4	7 ⁻	02	IT=100		
⁶⁸ Ge	-66980 6		270.95 d	0.16	0 ⁺	02	ε=100		
⁶⁸ As	-58900 40		151.6 s	0.8	3 ⁺	02	β ⁺ =100		
⁶⁸ As ^m	-58470 40 425.21 0.16		111 s	20	1 ⁺	02	IT=100		
⁶⁸ Se	-54210 30		35.5 s	0.7	0 ⁺	02	β ⁺ =100		
⁶⁸ Br	-38640# 360#		< 1.5 μs		3 ⁺ #	02	95BI06 I p ?		
* ⁶⁸ Mn	T : average 02So.A=28(8) 99Ha05=28(4)								**
* ⁶⁸ Fe	T : others 99So20=155(50) 91Be33=100(60) outweighed, not used								**
* ⁶⁸ Co	T : average 00Mu10=230(30) 99So20=170(30); not used 95Am.A=310(30)								**
* ⁶⁸ Co	T : 95Am.A supersedes 91Be33=180(100) from same group								**
⁶⁹ Mn	-25300# 800#		14 ms	4	5/2 ⁻ #	00	β ⁻ =100; β ⁻ n=24#	*	
⁶⁹ Fe	-38400# 500#		109 ms	9	1/2 ⁻ #	00	02So.A T β ⁻ =100; β ⁻ n=7#		
⁶⁹ Co	-50000 340		227 ms	13	7/2 ⁻ #	00	02So.A T β ⁻ =100; β ⁻ n=1#		
⁶⁹ Ni	-59979 4		11.5 s	0.3	9/2 ⁺	00	99Pr10 T β ⁻ =100	*	
⁶⁹ Ni ^m	-59658 4 321 2		3.5 s	0.4	(1/2 ⁻)	00	98Gr14 E β ⁻ ≈100; IT ?	*	
⁶⁹ Ni ⁿ	-57278 11 2701 10		439 ns	3	(17/2 ⁻)	00	IT=100		
⁶⁹ Cu	-65736.2 1.4		2.85 m	0.15	3/2 ⁻	00	β ⁻ =100		
⁶⁹ Cu ^m	-62994.4 1.7 2741.8 1.0		360 ns	30	(13/2 ⁺)	00	IT=100		
⁶⁹ Zn	-68418.0 1.0		56.4 m	0.9	1/2 ⁻	00	β ⁻ =100		
⁶⁹ Zn ^m	-67979.4 1.0 438.636 0.018		13.76 h	0.02	9/2 ⁺	00	IT≈100; β ⁻ =0.033 3		
⁶⁹ Ga	-69327.8 1.2		STABLE		3/2 ⁻	00	IS=60.108 9		
⁶⁹ Ge	-67100.6 1.3		39.05 h	0.10	5/2 ⁻	00	β ⁺ =100		
⁶⁹ Ge ^m	-67013.8 1.3 86.765 0.014		5.1 μs	0.2	1/2 ⁻	00	IT=100		
⁶⁹ Ge ⁿ	-66702.7 1.3 397.944 0.018		2.81 μs	0.05	9/2 ⁺	00	IT=100		
⁶⁹ As	-63090 30		15.2 m	0.2	5/2 ⁻	00	β ⁺ =100		
⁶⁹ Se	-56300 30		27.4 s	0.2	(1/2 ⁻)	00	95Po01 J β ⁺ =100; β ⁺ p=0.045 10		
⁶⁹ Se ^m	-56260 30 39.4 0.1		2.0 μs	0.2	5/2 ⁻	00	IT=100		
⁶⁹ Se ⁿ	-55730 30 573.9 1.0		955 ns	16	9/2 ⁺	00	00Ch07 T IT=100	*	
⁶⁹ Br	-46480# 110#	*	< 24 ns		1/2 ⁻ #	00	96Pf01 I p ?	*	
⁶⁹ Br ^m	-46440# 150# 40# 100#	*			5/2 ⁻ #				
⁶⁹ Br ⁿ	-45910# 150# 570# 100#				9/2 ⁺ #				
... A-group is continued on next page ...									

Nuclide	Mass excess (keV)	Excitation energy(keV)	Half-life	J^π	Ens	Reference	Decay modes and intensities (%)	
... A-group continued ...								
^{69}Kr	-32440# 400#		32 ms	10	5/2 ⁻ #	00	$\beta^+=100; \beta^+p=?$	
^{69}Mn	D: β^-n observed by 99Ha05							**
^{69}Co	T: average 02So.A=232(17) 99Mu17=220(20); other 99So20=190(40), not used							**
^{69}Ni	T: average 99Pr10=11.7(0.6) 85Bo49=11.4(0.3); not used 98Fr15=11.2(0.9)							**
$^{69}\text{Ni}^m$	T: average 99Mu17=3.5(0.5) 99Pr10=3.4(0.7)							**
$^{69}\text{Ni}^m$	E: 9/2 ⁺ level in isotones: ^{73}Ge =-66 ^{71}Zn =157(1) ^{69}Ni =-321(2) exhibits							**
$^{69}\text{Ni}^m$	E: unusual strong variations							**
$^{69}\text{Se}^u$	T: average 00Ch07=950(21) 95Po01=960(23)							**
^{69}Br	T: in contradiction with 450 keV protons, 50<T<100 μs reported in 88Ho.A							**
^{70}Fe	-35900# 600#		94 ms	17	0 ⁺	97 02So.A	TD $\beta^-=100$	
^{70}Co	-45640 840		125 ms	7	(6 ⁻ , 7 ⁻)	93 00Mu10	TJD $\beta^-=100; \beta^-n?$	
$^{70}\text{Co}^m$	-45440# 860# 200# 200#	*	500 ms	180	(3 ⁺)	00Mu10	TJD $\beta^-\approx 100; \text{IT}^?; \beta^-n?$	
^{70}Ni	-59150 350		6.0 s	0.3	0 ⁺	03 98Fr15	TD $\beta^-=100$	
$^{70}\text{Ni}^m$	-56290 350 2860 2		232 ns	1	8 ⁺	03	IT=100	
^{70}Cu	-62976.1 1.6		44.5 s	0.2	(6 ⁻)	93 02We03	TJ $\beta^-=100$	
$^{70}\text{Cu}^m$	-62875.4 2.0 100.7 2.6 MD		33 s	2	(3 ⁻)	02We03	TJ $\beta^-\approx 50; \text{IT}\approx 50$	
$^{70}\text{Cu}^n$	-62734.1 2.1 242.0 2.7 MD	&	6.6 s	0.2	1 ⁺	93 02We03	TD $\beta^-\approx 95; \text{IT}\approx 5$	
^{70}Zn	-69564.6 2.0		STABLE		0 ⁺	93	IS=0.62 3; 2 $\beta^-?$	
^{70}Ga	-68910.1 1.2		21.14 m	0.03	1 ⁺	93	$\beta^-\approx 100; \epsilon=0.41$ 6	
^{70}Ge	-70563.1 1.0		STABLE		0 ⁺	93	IS=20.84 87	
^{70}As	-64340 50		52.6 m	0.3	4 ⁽⁺⁾ #	93	$\beta^+=100$	
$^{70}\text{As}^m$	-64310 50 32.06 0.03		96 μs	3	2 ⁽⁺⁾	93	IT=100	
^{70}Se	-62050 60		41.1 m	0.3	0 ⁺	93	$\beta^+=100$	
^{70}Br	-51430# 310#		79.1 ms	0.8	0 ⁺ #	93	$\beta^+=100$	
$^{70}\text{Br}^u$	-49140# 310# 2292.2 0.8		2.2 s	0.2	(9 ⁺)	93 00Pi15	J $\beta^+=?; \text{IT}^?$	
^{70}Kr	-41680# 390#		57 ms	21	0 ⁺	97 00Oi02	TD $\beta^+?$	
^{70}Co	T: average 02So.A=121(8) 98Am04=150(20); others 00Mu10=120(30) 99So20=92(25)							**
$^{70}\text{Cu}^u$	D: IT=few percent E: post deadline 03Va.2 101.1(0.3) and 242.4(0.3)							**
^{70}Zn	T: >500 Ty in ENSDF is for 0v-2 β^- decay alone							**
$^{70}\text{Br}^m$	E: from 2002Je07							**
^{71}Fe	-31000# 800#		30# ms (>300 ns)		7/2 ⁺ #	97 97Be70	I $\beta^-?$	
^{71}Co	-43870 840		97 ms	2	7/2 ⁻ #	93 02So.A	T $\beta^-=100; \beta^-n?$	
^{71}Ni	-55200 370		2.56 s	0.03	1/2 ⁻ #	93 98Fr15	T $\beta^-=100$	
^{71}Cu	-62711.1 1.5		19.4 s	1.4	(3/2 ⁻)	93 99Pr10	T $\beta^-=100$	
$^{71}\text{Cu}^m$	-59955 10 2756 10		271 ns	13	(19/2 ⁻)	93 98Gr14	ETJ IT=100	
^{71}Zn	-67327 10		2.45 m	0.10	1/2 ⁻	93	$\beta^-=100$	
$^{71}\text{Zn}^m$	-67169 10 157.7 1.3		3.96 h	0.05	9/2 ⁺	93	$\beta^-\approx 100; \text{IT}\leq 0.05$	
^{71}Ga	-70140.2 1.0		STABLE		3/2 ⁻	93	IS=39.892 9	
^{71}Ge	-69907.7 1.0		11.43 d	0.03	1/2 ⁻	93	$\epsilon=100$	
$^{71}\text{Ge}^m$	-69709.3 1.0 198.367 0.010		20.40 ms	0.17	9/2 ⁺	93	IT=100	
^{71}As	-67894 4		65.28 h	0.15	5/2 ⁻	93	$\beta^+=100$	
^{71}Se	-63120 30		4.74 m	0.05	5/2 ⁻	93	$\beta^+=100$	
$^{71}\text{Se}^m$	-63070 30 48.79 0.05		5.6 μs	0.7	1/2 ⁻ to 9/2 ⁻	93	IT=100	
$^{71}\text{Se}^n$	-62860 30 260.48 0.10		19.0 μs	0.5	(9/2 ⁺)	93 00Ch07	T IT=100	
^{71}Br	-57060 570		21.4 s	0.6	(5/2 ⁻)	93	$\beta^+=100$	
^{71}Kr	-46920 650		100 ms	3	(5/2 ⁻)	97 97Oi01	TJD $\beta^+=100; \beta^+p=2.1$ 7	
^{71}Rb	-32300# 500#	*			5/2 ⁻ #		p?	
$^{71}\text{Rb}^m$	-32250# 510# 50# 100#	*			1/2 ⁻ #			
$^{71}\text{Rb}^n$	-32040# 510# 260# 100#				9/2 ⁺ #			
^{71}Co	T: other not used: 98Am04=210(40)							**
^{71}Cu	T: average 99Pr10=19(3) 83Ru06=19.5(1.6)							**
$^{71}\text{Cu}^m$	T: average 98Is11=250(30) 98Gr14=275(14)							**
^{71}Kr	T: average 97Oi01=100(3) 81Ew01=97(9); 95Bl23=64(+8-5) at variance not used							**
^{71}Kr	T: values from 95Bl23 for ^{67}Se and ^{71}Kr questioned by 97Oi01							**
^{71}Kr	D: 95Bl23=5.2(0.6) at variance not used							**

Nuclide	Mass excess (keV)	Excitation energy(keV)	Half-life	J^π	Ens	Reference	Decay modes and intensities (%)
^{72}Fe	−28300# 800#		10# ms (>300 ns)	0^+	97	97Be70 I	$\beta^- ?$
^{72}Co	−39300# 600#		90 ms	20		98Am04 TD	$\beta^-=100; \beta^-_n ?$
^{72}Ni	−53940 440		1.57 s	0.05	0^+	98Fr15 TD	$\beta^-=100; \beta^-_n ?$ *
^{72}Cu	−59783.0 1.4		6.6 s	0.1	(1^+)	95	$\beta^-=100$
$^{72}\text{Cu}^m$	−59513 3 270	3	1.76 μs	0.03	(4^-)	98Gr14 ETJ	IT=100
^{72}Zn	−68131 6		46.5 h	0.1	0^+	95	$\beta^-=100$
^{72}Ga	−68589.4 1.0		14.10 h	0.02	3^-	95	$\beta^-=100$
$^{72}\text{Ga}^m$	−68469.7 1.0 119.66	0.05	39.68 ms	0.13	(0^+)	95	IT=100
^{72}Ge	−72585.9 1.6		STABLE	0^+	95		IS=27.54 34
$^{72}\text{Ge}^m$	−71894.5 1.6 691.43	0.04	444.2 ns	0.8	0^+		
^{72}As	−68230 4		26.0 h	0.1	2^-	95	$\beta^+=100$
^{72}Se	−67894 12		8.40 d	0.08	0^+	97	$\epsilon=100$
^{72}Br	−59020 60		78.6 s	2.4	1^+	95 03Pi03 J	$\beta^+=100$
$^{72}\text{Br}^m$	−58920 60 100.92	0.03	10.6 s	0.3	1^-	95	IT≈100; $\beta^+=?$
^{72}Kr	−53941 8		17.16 s	0.18	0^+	95 03Pi03 T	$\beta^+=100$ *
^{72}Rb	−38120# 500#		* < 1.5 μs	$3^+\#$	97 95Bi06 I		p ?
$^{72}\text{Rb}^m$	−38020# 510# 100# 100#		* 1# μs	1^-			p ?
* ^{72}Ni	T : not used 95Am.A=1.30(0.10) and 92Be.A=2.06(0.30) (the two of same group)						**
* ^{72}Kr	T : average 03Pi03=17.1(0.2) 73Da22=17.4(0.4)						**
^{73}Co	−37040# 700#		80# ms (>300 ns)	$7/2^- \#$	02	97Be70 I	$\beta^- ?$
^{73}Ni	−49860# 300#		840 ms	30	$(9/2^+)$	02	$\beta^-=100; \beta^-_n ?$
^{73}Cu	−58987 4		4.2 s	0.3	$(3/2^-)$	02	$\beta^-=100; \beta^-_n ?$
^{73}Zn	−65410 40		23.5 s	1.0	$(1/2^-)$	02	$\beta^-=100$
$^{73}\text{Zn}^m$	−65210 40 195.5	0.2	13.0 ms	0.2	$(5/2^+)$	02	IT=100
$^{73}\text{Zn}^n$	−65170 40 237.6	2.0 EU	5.8 s	0.8	$(7/2^+)$	02	IT=?: $\beta^-_n =?$ *
^{73}Ga	−69699.3 1.7		4.86 h	0.03	$3/2^-$	02	$\beta^-=100$
^{73}Ge	−71297.5 1.6		STABLE		$9/2^+$	02	IS=7.73 5
$^{73}\text{Ge}^m$	−71284.2 1.6 13.2845	0.0015	2.92 μs	0.03	$5/2^+$	02	IT=100
$^{73}\text{Ge}^n$	−71230.8 1.6 66.726	0.009	499 ms	11	$1/2^-$	02	IT=100
^{73}As	−70957 4		80.30 d	0.06	$3/2^-$	93	$\epsilon=100$
^{73}Se	−68218 11		7.15 h	0.08	$9/2^+$	03	$\beta^+=100$
$^{73}\text{Se}^m$	−68192 11 25.71	0.04	39.8 m	1.3	$3/2^-$	03	IT=72.6 3; $\beta^+=27.4$ 3
^{73}Br	−63630 50		3.4 m	0.2	$1/2^-$	02	$\beta^+=100$
^{73}Kr	−56552 7		28.6 s	0.6	$3/2^-$	02	$\beta^+=100; \beta^+p=0.25$ 3 *
$^{73}\text{Kr}^m$	−56118 7 433.66	0.12	107 ns	10	$(9/2^+)$	03	IT=100
^{73}Rb	−46050# 150#		< 30 ns		$3/2^- \#$	03	p ?
$^{73}\text{Rb}^m$	−45620# 180# 430# 100#				$9/2^+\#$		
^{73}Sr	−31700# 600#		> 25 ms		$1/2^- \#$	03	$\beta^+=100; \beta^+p=?$
* $^{73}\text{Zn}^n$	E : if 42.1 keV γ feeds $^{73}\text{Zn}^m$, EU: see discussion in ENSDF'02						**
* ^{73}Kr	T : average 99Mi17=29.0(1.0) 81Ha44=28.4(0.7); 73Da22=25.9(0.6) at variance,						**
* ^{73}Kr	T : not used						**
^{74}Co	−32250# 800#		50# ms (>300 ns)		03	97Be70 I	$\beta^- ?$
^{74}Ni	−48370# 400#		680 ms	120	0^+	03 98Fr15 T	$\beta^-=100; \beta^-_n ?$ *
^{74}Cu	−56006 6		1.594 s	0.010	$1^+\#$	95	$\beta^-=100$
^{74}Zn	−65710 50		95.6 s	1.2	0^+	95	$\beta^-=100$
^{74}Ga	−68050 4		8.12 m	0.12	(3^-)	95	$\beta^-=100$
$^{74}\text{Ga}^m$	−67990 4 59.571	0.014	9.5 s	1.0	(0^-)	95	IT=?: $\beta^-_n =25\#$
^{74}Ge	−73422.4 1.6		STABLE		0^+	95	IS=36.28 73
^{74}As	−70860.0 2.3		17.77 d	0.02	2^-	95	$\beta^+=66$ 2; $\beta^-_n =34$ 2
^{74}Se	−72212.7 1.7		STABLE		0^+	95	IS=0.89 4; $2\beta^+ ?$
^{74}Br	−65306 15		25.4 m	0.3	(0^-)	95	$\beta^+=100$
$^{74}\text{Br}^m$	−65292 15 13.58	0.21	46 m	2	$4^+(\#)$	95	$\beta^+=100$
^{74}Kr	−62331.5 2.0		11.50 m	0.11	0^+	95	$\beta^+=100$
$^{74}\text{Kr}^m$	−61824 10 508	10	29 ns	6	0^+		IT=100
^{74}Rb	−51917 4		64.76 ms	0.03	(0^+)	95	$\beta^+=100$
^{74}Sr	−40700# 500#		50# ms (>1.5 μs)	0^+	97	95Bi06 I	$\beta^+ ?$
* ^{74}Ni	T : average 98Fr15=900(200) 98Am04=540(160)						**

Nuclide	Mass excess (keV)	Excitation energy(keV)	Half-life	J^π	Ens	Reference	Decay modes and intensities (%)
⁷⁵ Co	−29500# 800#		40# ms (>300 ns)	7/2 [−] #	99	97Be70 I	β^- ?
⁷⁵ Ni	−43900# 400#		600 ms	200	7/2 ⁺ #	99 85Re01 D	β^- =100; β^- -n=1.6# *
⁷⁵ Cu	−54120 980		1.224 s	0.003	3/2 [−] #	99	β^- =100; β^- -n=3.5 6
⁷⁵ Zn	−62470 70		10.2 s	0.2	7/2 ⁺ #	99	β^- =100
⁷⁵ Ga	−68464.6 2.4		126 s	2	(3/2) [−]	99	β^- =100
⁷⁵ Ge	−71856.4 1.6		82.78 m	0.04	1/2 [−]	99	β^- =100
⁷⁵ Ge ^m	−71716.7 1.6	139.69 0.03	47.7 s	0.5	7/2 ⁺	99	IT≈100; β^- =0.030 6
⁷⁵ As	−73032.4 1.8		STABLE		3/2 [−]	99	IS=100.
⁷⁵ As ^m	−72728.5 1.8	303.9241 0.0007	17.62 ms	0.23	9/2 ⁺	99	IT=100
⁷⁵ Se	−72169.0 1.7		119.779 d	0.004	5/2 ⁺	99	ϵ =100
⁷⁵ Br	−69139 14		96.7 m	1.3	3/2 [−]	99	β^+ =100
⁷⁵ Kr	−64324 8		4.29 m	0.17	5/2 ⁺	99	β^+ =100
⁷⁵ Rb	−57222 7		19.0 s	1.2	(3/2) [−]	99	β^+ =100
⁷⁵ Sr	−46620 220		88 ms	3	(3/2) [−]	99 03Hu01 TJD	β^+ =100; β^+ -p=5.2 9
* ⁷⁵ Ni	D : β^- -n=1.6%#	estimated by 85Re01					**
⁷⁶ Ni	−41610# 900#		470 ms	390	0 ⁺	97 98Am04 T	β^- =100; β^- -n ?
⁷⁶ Cu	−50976 7		* 641 ms	6	(3,5)	95 90Wi12 J	β^- =100; β^- -n=3 2
⁷⁶ Cu ^m	−50980# 200#	0# 200#	* 1.27 s	0.30	(1,3)	95 90Wi12 J	β^- =100
⁷⁶ Zn	−62140 80		5.7 s	0.3	0 ⁺	95	β^- =100
⁷⁶ Ga	−66296.6 2.0		32.6 s	0.6	(2 ⁺ , 3 ⁺)	95	β^- =100
⁷⁶ Ge	−73213.0 1.7		1.58 Zy	0.17	0 ⁺	95 01K111 T	IS=7.61 38; 2 β^- =100 *
⁷⁶ As	−72289.5 1.8		1.0778 d	0.0020	2 [−]	95	β^- ≈100; ϵ <0.02
⁷⁶ As ^m	−72245.1 1.8	44.425 0.001	1.84 μ s	0.06	(1) ⁺		
⁷⁶ Se	−75252.1 1.7		STABLE		0 ⁺	95	IS=9.37 29
⁷⁶ Br	−70289 9		16.2 h	0.2	1 [−]	95	β^+ =100
⁷⁶ Br ^m	−70186 9	102.58 0.03	1.31 s	0.02	(4) ⁺	95	IT>99.4; β^+ <0.6
⁷⁶ Kr	−69014 4		14.8 h	0.1	0 ⁺	95	β^+ =100
⁷⁶ Rb	−60479.8 1.9		36.5 s	0.6	1 ^(−)	95 78Ha08 D	β^+ =100; β^+ α =3.8e−7 10
⁷⁶ Rb ^m	−60162.9 1.9	316.93 0.08	3.050 μ s	0.007	(4 ⁺)	95 00Ch07 T	IT=100
⁷⁶ Sr	−54240 40		8.9 s	0.3	0 ⁺	95	β^+ =100
⁷⁶ Y	−38700# 500#		500# ns (>170 ns)			00We.A I	β^+ ?; p ? *
* ⁷⁶ Ge	T : from 01K111=1.55(+0.19−0.15); other results from same group:						**
* ⁷⁶ Ge	T : 97Gu13=1.77(+0.13−0.11) 94Ba15=1.42(0.13)						**
* ⁷⁶ Ge	T : other groups 93Br22=0.84(+0.10−0.08)(2 σ) 90Va18=0.90(0.10)						**
* ⁷⁶ Ge	T : and 90Mi23=1.1(+0.6−0.3)(2 σ)						**
* ⁷⁶ Ge	TD : claim for 0 ν - $\beta\beta$ 01K113=15 Yy not trusted. See also 02Aa.1 and 02Zd02						**
* ⁷⁶ Y	I : also 01Ki13>200 ns, same group						**
⁷⁷ Ni	−36750# 500#		300# ms (>300 ns)	9/2 ⁺ #	97	97Be70 I	β^- ?
⁷⁷ Cu	−48580# 400#		469 ms	8	3/2 [−] #	97	β^- =100
⁷⁷ Zn	−58720 120		2.08 s	0.05	7/2 ⁺ #	97	β^- =100
⁷⁷ Zn ^m	−57950 120	772.39 0.12	1.05 s	0.10	1/2 [−] #	97	IT>50; β^- <50
⁷⁷ Ga	−65992.3 2.4		13.2 s	0.2	(3/2) [−]	97	β^- =100
⁷⁷ Ge	−71214.0 1.7		11.30 h	0.01	7/2 ⁺	97	β^- =100
⁷⁷ Ge ^m	−71054.3 1.7	159.70 0.10	52.9 s	0.6	1/2 [−]	97	β^- =81 2; IT=19 2
⁷⁷ As	−73916.6 2.3		38.83 h	0.05	3/2 [−]	97	β^- =100
⁷⁷ As ^m	−73441.2 2.3	475.443 0.016	114.0 μ s	2.5	9/2 ⁺	97	IT=100
⁷⁷ Se	−74599.6 1.7		STABLE		1/2 [−]	97	IS=7.63 16
⁷⁷ Se ^m	−74437.7 1.7	161.9223 0.0007	17.36 s	0.05	7/2 ⁺	97	IT=100
⁷⁷ Br	−73235 3		57.036 h	0.006	3/2 [−]	97	β^+ =100
⁷⁷ Br ^m	−73129 3	105.86 0.08	4.28 m	0.10	9/2 ⁺	97	IT=100
⁷⁷ Kr	−70169.4 2.0		74.4 m	0.6	5/2 ⁺	97	β^+ =100
⁷⁷ Rb	−64825 7		3.77 m	0.04	3/2 [−]	97	β^+ =100
⁷⁷ Sr	−57804 9		9.0 s	0.2	5/2 ⁺	97	β^+ =100; β^+ -p<0.25
⁷⁷ Y	−46910# 60#		63 ms	17	5/2 ⁺ #	97 01Ki13 T	β^+ =?; β^+ -p ?; p<10 *
* ⁷⁷ Y	D : limit for p is from 00We.A						**

Nuclide	Mass excess (keV)	Excitation energy(keV)	Half-life	J^π	Ens	Reference	Decay modes and intensities (%)
^{78}Ni	−34300# 1100#		200# ms (>300 ns)	0 ⁺	97	97Be70 I	β^- ?
^{78}Cu	−44750# 400#		342 ms 11		97	91Kr15 T	β^- =100
^{78}Zn	−57340 90		1.47 s 0.15	0 ⁺	91		β^- =100
$^{78}\text{Zn}^m$	−54670 90	2673 1	319 ns 9	(8 ⁺)		00Da07 ET	IT=100
^{78}Ga	−63706.6 2.4		5.09 s 0.05	(3 ⁺)	91		β^- =100
^{78}Ge	−71862 4		88 m 1	0 ⁺	91		β^- =100
^{78}As	−72817 10		90.7 m 0.2	2 [−]	91		β^- =100
^{78}Se	−77026.1 1.7		STABLE		91		IS=23.77 28
^{78}Br	−73452 4		6.46 m 0.04	1 ⁺	91		β^+ ≈100; β^- <0.01
$^{78}\text{Br}^m$	−73271 4	180.82 0.13	119.2 μ s	4 ⁺			*
^{78}Kr	−74179.7 1.1		STABLE (>110 Ey)	0 ⁺	91	94Sa31 T	IS=0.35 1; $2\beta^+$?
^{78}Rb	−66936 7		17.66 m 0.08	0 ⁽⁺⁾	91		β^+ =100
$^{78}\text{Rb}^m$	−66825 7	111.20 0.10	5.74 m 0.05	4 ^(−)	91	91Mc.A E	β^+ =90 2; IT=10 2
$^{78}\text{Rb}^x$	−66862 14	74 12	$R = 2.0 \pm 0.5$	spmix			
^{78}Sr	−63174 7		159 s 8	0 ⁺	91	92Gr09 T	β^+ =100
^{78}Y	−52530# 400#	*	54 ms 5	(0 ⁺)	97	01Ga24 TJD	β^+ ≈100; β^+ p ?
$^{78}\text{Y}^m$	−52530# 640#	0# 500#	5.8 s 0.5	5 ⁺ #		01Ki13 TD	β^+ ≈100; β^+ p ?
^{78}Zr	−41700# 500#		50# ms (>170 ns)	0 ⁺		00We.A I	β^+ ?; β^+ p ?
* ^{78}Br	D : β^- branch is uncertain. See ENSDF						**
* ^{78}Kr	T : limit given here is for the K-e ⁺ decay (theoretically faster)						**
* ^{78}Y	T : average 01Ga24=50(8) 01Ki13=55(+9−6)						**
* $^{78}\text{Y}^m$	T : average 01Ki13=5.7(0.7) 98Uu01=5.8(0.6)						**
* ^{78}Zr	I : also 01Ki13>200 ns same group						**
^{79}Cu	−42330# 500#		188 ms 25	3/2 [−] # 02			β^- =100; β^- n=55 17
^{79}Zn	−53420# 260#		995 ms 19	(9/2 ⁺) 02			β^- =100; β^- n=1.3 4
^{79}Ga	−62510 100		2.847 s 0.003	3/2 [−] # 02			β^- =100; β^- n=0.089 19
^{79}Ge	−69490 90		18.98 s 0.03	(1/2 [−]) 02			β^- =100
$^{79}\text{Ge}^m$	−69300 90	185.95 0.04	39.0 s 1.0	7/2 ⁺ # 02			β^- =96 1; IT=4 1
^{79}As	−73637 6		9.01 m 0.15	3/2 [−] 02			β^- =100
$^{79}\text{As}^m$	−72864 6	772.81 0.06	1.21 μ s 0.01	(9/2 ⁺) 02		98Gr14 T	IT=100
^{79}Se	−75917.6 1.7		295 ky 38	7/2 ⁺ 02			β^- =100
$^{79}\text{Se}^m$	−75821.8 1.7	95.77 0.03	3.92 m 0.01	1/2 [−] 02			IT≈100; β^- =0.056 11
^{79}Br	−76068.5 2.0		STABLE	3/2 [−] 02			IS=50.69 7
$^{79}\text{Br}^m$	−75860.9 2.0	207.61 0.09	4.86 s 0.04	(9/2 ⁺) 02			IT=100
^{79}Kr	−74443 4		35.04 h 0.10	1/2 [−] 02			β^+ =100
$^{79}\text{Kr}^m$	−74313 4	129.77 0.05	50 s 3	7/2 ⁺ 02			IT=100
$^{79}\text{Kr}^n$	−74296 4	147.06 0.06	78.7 ns 1.0	(5/2 [−]) 02			IT=100
^{79}Rb	−70803 6		22.9 m 0.5	5/2 ⁺ 02			β^+ =100
^{79}Sr	−65477 8		2.25 m 0.10	3/2 ^(−) 02			β^+ =100
^{79}Y	−58360 450		14.8 s 0.6	5/2 ⁺ # 02			β^+ ≈100; β^+ p ?
^{79}Zr	−47360# 400#		56 ms 30	5/2 ⁺ # 02			β^+ ≈100; β^+ p ?
* $^{79}\text{As}^m$	T : 98Ho15=0.87(0.06) outweighed, not used						**
^{80}Cu	−36450# 600#		100# ms (>300 ns)		97	97Be70 I	β^- ?
^{80}Zn	−51840 170		545 ms 16	0 ⁺	92		β^- =100; β^- n=1.0 5
^{80}Ga	−59140 120		1.697 s 0.011	(3)	92	93Ru01 D	β^- =100; β^- n=0.89 6
^{80}Ge	−69515 28		29.5 s 0.4	0 ⁺	92		β^- =100
^{80}As	−72159 23		15.2 s 0.2	1 ⁺	92		β^- =100
^{80}Se	−77759.9 2.0		STABLE	0 ⁺	92		IS=49.61 41; $2\beta^-$?
^{80}Br	−75889.5 2.0		17.68 m 0.02	1 ⁺	92		β^- =91.7 2; β^+ =8.3 2
$^{80}\text{Br}^m$	−75803.7 2.0	85.843 0.004	4.4205 h 0.0008	5 [−]	92		IT=100
^{80}Kr	−77892.5 1.5		STABLE	0 ⁺	92		IS=2.28 6
^{80}Rb	−72173 7		33.4 s 0.7	1 ⁺	92	93Al03 T	β^+ =100
$^{80}\text{Rb}^m$	−71679 7	494.4 0.5	1.6 μ s 0.02	6 ⁺		92Do10 E	β^+ =100
^{80}Sr	−70308 7		106.3 m 1.5	0 ⁺	99		β^+ =100
^{80}Y	−61220 180		30.1 s 0.5	4 [−]	92	98Do04 TJ	β^+ =100
$^{80}\text{Y}^m$	−60990 180	228.5 0.1	4.8 s 0.3	(1 [−])		98Do04 ETJ	IT=81 2; β^+ =19 2
$^{80}\text{Y}^n$	−60910 180	312.5 1.0	4.7 μ s 0.3	(2 ⁺)		00Ch07 ETJ	IT=100

... A-group is continued on next page ...

Nuclide	Mass excess (keV)		Excitation energy(keV)		Half-life	J^π	Ens	Reference	Decay modes and intensities (%)		
... A-group continued ...											
^{80}Zr	-55520	1490			4.6 s	0.6	0 ⁺	92 01Ki13 T	$\beta^+=100; \beta^+p?$	*	
^{80}Y	T : differences with 82De36=38(1) 81Li12=33.8(0.6) explained in 98Do04										**
$^{80}\text{Y}^m$	T : average 01No07=5.0(0.5) 98Do04=4.7(0.3) D : from 98Do04										**
$^{80}\text{Y}^m$	E : 00Ch07=84(1) above 228.5 level										**
^{80}Zr	T : average 01Ki13=5.3(+1.1-0.9) 00Re03=4.1(+0.8-0.6)										**
^{81}Zn	-46130#	300#			290 ms	50	5/2 ⁺ #	97	$\beta^-=100; \beta^-n=7.5$	30	
^{81}Ga	-57980	190			1.217 s	0.005	(5/2 ⁻)	97	$\beta^-=100; \beta^-n=11.9$	7	
^{81}Ge	-66300	120			8 s	2	9/2 ⁺ #	97	$\beta^-=100$	*	
$^{81}\text{Ge}^m$	-65620	120	679.13	0.04	8 s	2	(1/2 ⁺)	97	$\beta^-\approx 100; IT<1$		
^{81}As	-72533	6			33.3 s	0.8	3/2 ⁻	97	$\beta^-=100$		
^{81}Se	-76389.5	2.0			18.45 m	0.12	1/2 ⁻	97	$\beta^-=100$		
$^{81}\text{Se}^m$	-76286.5	2.0	102.99	0.06	57.28 m	0.02	7/2 ⁺	97	$IT\approx 100; \beta^-=0.052$	14	
^{81}Br	-77974.8	2.0			STABLE		3/2 ⁻	97	$IS=49.31$	7	
$^{81}\text{Br}^m$	-77438.6	2.0	536.20	0.09	34.6 μ s		9/2 ⁺				
^{81}Kr	-77694.0	2.0			229 ky	11	7/2 ⁺	97	$\varepsilon=100$		
$^{81}\text{Kr}^m$	-77503.4	2.0	190.62	0.04	13.10 s	0.03	1/2 ⁻	97	$IT\approx 100; \varepsilon=0.0025$	4	
^{81}Rb	-75455	6			4.576 h	0.005	3/2 ⁻	97	$\beta^+=100$		
$^{81}\text{Rb}^m$	-75369	6	86.31	0.07	30.5 m	0.3	9/2 ⁺	97	$IT=97.6$ 6; $\beta^+=2.4$	6	
^{81}Sr	-71528	6			22.3 m	0.4	1/2 ⁻	99	$\beta^+=100$		
^{81}Y	-66020	60			70.4 s	1.0	(5/2 ⁺)	98	$\beta^+=100$		
^{81}Zr	-58490	170			5.5 s	0.4	3/2 ⁻ #	00	$\beta^+=100; \beta^+p=0.12$	2	
^{81}Nb	-47480#	1500#			< 44 ns		3/2 ⁻ #	97 00We.A I	$p?; \beta^+?; \beta^+p?$	*	
^{81}Ge	T : derived from 7.6(0.6), for mixture of ground-state and isomer with almost same half-life										**
^{81}Nb	I : also 99Ja02<80 01Ki13<200 ns T : estimated half-life for β^+ : 100# ms										**
^{82}Zn	-42460#	500#			100# ms	(>300 ns)	0 ⁺	03 97Be70 I	$\beta^-?$		
^{82}Ga	-53100#	300#			599 ms	2	(1,2,3)	03 93Ru01 D	$\beta^-=100; \beta^-n=21.3$	13	
^{82}Ge	-65620	240			4.55 s	0.05	0 ⁺	03	$\beta^-=100$	*	
^{82}As	-70320	200			19.1 s	0.5	(1 ⁺)	03	$\beta^-=100$		
$^{82}\text{As}^m$	-70075	25	250	200	BD *	13.6 s	0.4	(5 ⁺)	03	$\beta^-=100$	
^{82}Se	-77594.0	2.0			97 Ey	5	0 ⁺	03 99Pi08 T	$IS=8.73$ 22; $2\beta^-=100$	*	
^{82}Br	-77496.5	1.9			35.282 h	0.007	5 ⁻	03	$\beta^-=100$		
$^{82}\text{Br}^m$	-77450.6	1.9	45.9492	0.0010	6.13 m	0.05	2 ⁻	03	$IT=97.6$ 3; $\beta^-=2.4$	3	
^{82}Kr	-80589.5	1.8			STABLE		0 ⁺	03	$IS=11.58$	14	
^{82}Rb	-76188.2	2.8			1.273 m	0.002	1 ⁺	03	$\beta^+=100$		
$^{82}\text{Rb}^m$	-76119.1	2.4	69.1	1.5	MD	6.472 h	0.006	5 ⁻	03	$\beta^+\approx 100; IT<0.33$	
^{82}Sr	-76008	6			25.36 d	0.03	0 ⁺	03 87Ho06 T	$\varepsilon=100$	*	
^{82}Y	-68190	100			8.30 s	0.20	1 ⁺	03	$\beta^+=100$		
$^{82}\text{Y}^m$	-67790	100			268 ns	25	4 ⁻	03	$IT=100$		
^{82}Zr	-64190#	230#	402.63	0.14	32 s	5	0 ⁺	03	$\beta^+=100$		
^{82}Nb	-52970#	300#			51 ms	5	0 ⁺	03 01Ga24 T	$\beta^+=100; \beta^+p?$	*	
^{82}Ga	D : average 93Ru01=31.1(4.4) 86Wa17=19.8(1.7) 80Lu04=21.4(2.2)										**
^{82}Sr	T : average 99Pi08=83(+9-7) 98Ar10=83(12) 92El07=108(+26-6) 88Li11=120(10)										**
^{82}Se	T : average 87Ho06=25.36(0.03) 87Ju02=25.342(0.053)										**
^{82}Nb	T : average 01Ga24=52(6) 01Ki13=48(+8-6)										**
^{83}Zn	-36300#	500#			80# ms	(>300 ns)	5/2 ⁺ #	01 97Be70 I	$\beta^-?$		
^{83}Ga	-49390#	300#			308 ms	1	3/2 ⁻ #	01	$\beta^-=100; \beta^-n=37$	17	
^{83}Ge	-60900#	200#			1.85 s	0.06	5/2 ⁺ #	01	$\beta^-=100$		
^{83}As	-69880	220			13.4 s	0.3	3/2 ⁻ #	01	$\beta^-=100$		
^{83}Se	-75341	4			22.3 m	0.3	9/2 ⁺	01	$\beta^-=100$		
$^{83}\text{Se}^m$	-75113	4	228.50	0.20	70.1 s	0.4	1/2 ⁻	01	$\beta^-=100$		
^{83}Br	-79009	4			2.40 h	0.02	3/2 ⁻	01	$\beta^-=100$		
$^{83}\text{Br}^m$	-75940	4	3068.8	0.6	700 ns	100	(19/2 ⁻)	01	$IT=100$		
^{83}Kr	-79981.7	2.8			STABLE		9/2 ⁺	01	$IS=11.49$	6	
$^{83}\text{Kr}^m$	-79972.3	2.8	9.4053	0.0008	154.4 ns	1.1	7/2 ⁺	01	$IT=100$		
$^{83}\text{Kr}^m$	-79940.1	2.8	41.5569	0.0010	1.83 h	0.02	1/2 ⁻	01	$IT=100$		
... A-group is continued on next page ...											

Nuclide	Mass excess (keV)		Excitation energy(keV)		Half-life		J ^π	Ens	Reference	Decay modes and intensities (%)	
... A-group continued ...											
⁸³ Rb	-79075	6			86.2	d	0.1	5/2 ⁻	01		ε=100
⁸³ Rb ^m	-79033	6	42.11	0.04	7.8	ms	0.7	9/2 ⁺	01	68Et01 T	IT=100
⁸³ Sr	-76795	10			32.41	h	0.03	7/2 ⁺	01		β ⁺ =100
⁸³ Sr ^m	-76536	10	259.15	0.09	4.95	s	0.12	1/2 ⁻	01		IT=100
⁸³ Y	-72330	40			7.08	m	0.06	9/2 ⁺	01	92Bu10 J	β ⁺ =100
⁸³ Y ^m	-72270	40	61.98	0.11	2.85	m	0.02	(3/2 ⁻)	01		β ⁺ =60.5; IT=40.5
⁸³ Zr	-66460	100			41.6	s	2.4	1/2 ⁻ #	01		β ⁺ =100; β ⁺ p=?
⁸³ Zr ^m	-66410	100	52.72	0.05	530	ns	0.12	(5/2 ⁻)	01		IT=100
⁸³ Zr ⁿ			non existent	RN	8	s	1	high	01	87Ra06 I	β ⁺ =100; β ⁺ p=?
⁸³ Nb	-58960	310			4.1	s	0.3	(5/2 ⁺)	01		β ⁺ =100
⁸³ Mo	-47750#	500#			23	ms	19	3/2 ⁻ #	01	01Ki13 TD	β ⁺ =100; β ⁺ p?
⁸³ Zr ⁿ	D : 6(4)% of total β ⁺ p go to first excited state in ⁸² Sr										
⁸³ Zr ⁿ	I : misassigned: absence of radiations suggests no isomer with E>18 keV										
⁸⁴ Ga	-44110#	400#			85	ms	10		97		β ⁻ =100; β ⁻ n=70.15
⁸⁴ Ge	-58250#	300#			954	ms	14	0 ⁺	97	93Ru01 T	β ⁻ =100; β ⁻ n=10.8.6
⁸⁴ As	-66080#	300#			4.02	s	0.03	(3) ⁽⁺⁾ #	97	93Ru01 T	β ⁻ =100; β ⁻ n=0.28.4
⁸⁴ As ^m	-66080#	320#	0#	100#	650	ms	150		97		β ⁻ =100
⁸⁴ Se	-75952	15			3.1	m	0.1	0 ⁺	97		β ⁻ =100
⁸⁴ Br	-77799	15			31.80	m	0.08	2 ⁻	97		β ⁻ =100
⁸⁴ Br ^m	-77460	100	340	100	6.0	m	0.2	(6 ⁻)	97		β ⁻ =100
⁸⁴ Br ⁿ	-77391	15	408.2	0.4	< 140	ns		1 ⁺	97		IT=100
⁸⁴ Kr	-82431.0	2.8			STABLE			0 ⁺	97		IS=57.00.4
⁸⁴ Kr ^m	-79195.0	2.8	3236.02	0.18	1.89	μs	0.04	8 ⁺	97		IT=100
⁸⁴ Rb	-79750.0	2.8			32.77	d	0.14	2 ⁻	97		β ⁺ =96.2.5; β ⁻ =3.8.5
⁸⁴ Rb ^m	-79286.4	2.8	463.62	0.09	20.26	m	0.04	6 ⁻	97		IT≈100; β ⁺ =0.0012
⁸⁴ Sr	-80644	3			STABLE			0 ⁺	97		IS=0.56.1; 2β ⁺ ?
⁸⁴ Y	-74160	90			4.6	s	0.2	1 ⁺	97		β ⁺ =100
⁸⁴ Y ^m	-74230	170	-80	190	39.5	m	0.8	(5 ⁻)	97		β ⁺ =100
⁸⁴ Zr	-71490#	200#			25.9	m	0.7	0 ⁺	97		β ⁺ =100
⁸⁴ Nb	-61880#	300#			9.8	s	0.9	3 ⁺	97	03Do01 T	β ⁺ =100; β ⁺ p?
⁸⁴ Nb ^m	-61540#	300#	338	10	103	ns	19	(5 ⁻)	97	00Ch07 ETJ	IT=100
⁸⁴ Mo	-55810#	400#			3.8	ms	0.9	0 ⁺	97	01Ki13 T	β ⁺ =100; β ⁺ p?
⁸⁴ Ge	T : average 93Ru01=947(11) 91Kr15=984(23)										
⁸⁴ Nb	T : average 03Do01=9.5(1.0) 77Ko05=12(3)										
⁸⁵ Ga	-40050#	500#			50#	ms (>300 ns)		3/2 ⁻ #	97	97Be70 I	β ⁻ ?
⁸⁵ Ge	-53070#	400#			540	ms	50	5/2 ⁺ #	97		β ⁻ =100; β ⁻ n=14.3
⁸⁵ As	-63320#	200#			2.021	s	0.010	3/2 ⁻ #	97		β ⁻ =100; β ⁻ n=59.4.24
⁸⁵ Se	-72428	30			31.7	s	0.9	5/2 ⁺ #	97		β ⁻ =100
⁸⁵ Br	-78610	19			2.90	m	0.06	3/2 ⁻	91		β ⁻ =100
⁸⁵ Kr	-81480.3	1.9			10.776	y	0.003	9/2 ⁺	91	02Un02 T	β ⁻ =100
⁸⁵ Kr ^m	-81175.4	1.9	304.871	0.020	4.480	h	0.008	1/2 ⁻	91		β ⁻ =78.6.4; IT=21.4.4
⁸⁵ Kr ⁿ	-79488.5	2.3	1991.8	1.3	1.6	μs	0.7	(17/2 ⁺)	91		IT=100
⁸⁵ Rb	-82167.331	0.011			STABLE			5/2 ⁻	91		IS=72.17.2
⁸⁵ Sr	-81102.6	2.8			64.853	d	0.008	9/2 ⁺	91	02Un02 T	ε=100
⁸⁵ Sr ^m	-80863.9	2.8	238.66	0.06	67.63	m	0.04	1/2 ⁻	91		IT=86.6.4; β ⁺ =13.4.4
⁸⁵ Y	-77842	19			2.68	h	0.05	(1/2 ⁻)	94		β ⁺ =100
⁸⁵ Y ^m	-77822	19	19.8	0.5	4.86	h	0.13	9/2 ⁺	94		β ⁺ ≈100; IT<0.002
⁸⁵ Zr	-73150	100			7.86	m	0.04	7/2 ⁺	94		β ⁺ =100
⁸⁵ Zr ^m	-72860	100	292.2	0.3	10.9	s	0.3	(1/2 ⁻)	94		IT≤92; β ⁺ >8
⁸⁵ Nb	-67150	220			20.9	s	0.7	(9/2 ⁺)	91		β ⁺ =100
⁸⁵ Nb ^m	-66390	220	759.0	1.0	12	s	5	(1/2 ⁻)	91	98Oi.A ETJ	β ⁺ =100
⁸⁵ Mo	-59100#	280#			3.2	s	0.2	1/2 ⁻ #	97	97Hu15 TD	β ⁺ =100; β ⁺ p=?
⁸⁵ Tc	-47670#	400#			< 110	ns		1/2 ⁻ #	97	00We.A I	p?; β ⁺ ?; β ⁺ p?
⁸⁵ Tc	I : also 99Ja02<100 ns T : estimated half-life for β ⁺ decay; 100# ms										

Nuclide	Mass excess (keV)		Excitation energy(keV)		Half-life		J^π	Ens	Reference	Decay modes and intensities (%)	
⁸⁶ Ga	-34350#	800#			30#	ms (>300 ns)		01	97Be70 I	β^- ?	
⁸⁶ Ge	-49840#	500#			300#	ms (>300 ns)	0 ⁺	01	94Be24 I	β^- ?; β^-n ?	
⁸⁶ As	-59150#	300#			945	ms	8	01		β^- =100; β^-n =33 4	
⁸⁶ Se	-70541	16			15.3	s	0.9	0 ⁺	01	β^- =100	
⁸⁶ Br	-75640	11			55.1	s	0.4	(2 ⁻)	01	β^- =100	
⁸⁶ Kr	-83265.57	0.10			STABLE			0 ⁺	01	IS=17.30 22; 2 β^- ?	
⁸⁶ Rb	-82747.02	0.20			18.642	d	0.018	2 ⁻	01	β^- =100; ϵ =0.0052 5	
⁸⁶ Rb ^m	-82190.97	0.27	556.05	0.18	1.017	m	0.003	6 ⁻	01	IT \approx 100; β^- <0.3	
⁸⁶ Sr	-84523.6	1.1			STABLE			0 ⁺	01	IS=9.86 1	
⁸⁶ Sr ^m	-81567.9	1.1	2955.68	0.21	455	ns	7	8 ⁺	01	IT=100	
⁸⁶ Y	-79284	14			14.74	h	0.02	4 ⁻	97	β^+ =100	
⁸⁶ Y ^m	-79066	14	218.30	0.20	48	m	1	(8 ⁺)	01	IT=99.31 4; β^+ =0.69 4	
⁸⁶ Y ⁿ	-78982	14	302.2	0.5	125	ns	6	(7 ⁻)	01	IT=100	
⁸⁶ Zr	-77800	30			16.5	h	0.1	0 ⁺	01	β^+ =100	
⁸⁶ Nb	-69830	90			88	s	1	(6 ⁺)	01	β^+ =100	
⁸⁶ Nb ^m	-69580#	180#	250#	160#	56	s	8	high	01	94Sh07 JD	β^+ =100
⁸⁶ Mo	-64560	440			19.6	s	1.1	0 ⁺	01	β^+ =100	
⁸⁶ Tc	-53210#	300#			55	ms	6	(0 ⁺)	01	01Ga24 TJ	β^+ =100; β^+p ?
⁸⁶ Tc ^m	-51710#	340#	1500	150	1.11	μ s	0.21	(5 ⁺ , 5 ⁻)	01	00Ch07 EJ	IT=100
⁸⁶ Nb ^m	I : existence considered as uncertain in ENSDF ⁰¹ ; needs confirmation										**
⁸⁶ Tc	T : average 01Ga24=44(12) 01Ki13=59(+8-7)										**
⁸⁶ Tc ^m	E : above the 4 ⁺ state at 1328 or 1445 keV										**
⁸⁷ Ge	-44240#	500#			150#	ms (>300 ns)	5/2 ⁺ #	02	97Be70 I	β^- ?; β^-n ?	
⁸⁷ As	-55980#	300#			610	ms	120	3/2 ⁻ #	02	93Ru01 T	β^- =100; β^-n =15.4 22
⁸⁷ Se	-66580	40			5.50	s	0.12	5/2 ⁺ #	02		β^- =100; β^-n =0.20 4
⁸⁷ Br	-73857	18			55.65	s	0.13	3/2 ⁻	02		β^- =100; β^-n =2.60 4
⁸⁷ Kr	-80709.43	0.27			76.3	m	0.5	5/2 ⁺	02		β^- =100
⁸⁷ Rb	-84597.795	0.012			49.23	Gy	0.22	3/2 ⁻	02	82Mi14 T	IS=27.83 2; β^- =100
⁸⁷ Sr	-84880.4	1.1			STABLE			9/2 ⁺	02		IS=7.00 1
⁸⁷ Sr ^m	-84491.9	1.1	388.533	0.003	2.815	h	0.012	1/2 ⁻	02		IT \approx 100; ϵ =0.30 8
⁸⁷ Y	-83018.7	1.6			79.8	h	0.3	1/2 ⁻	02		β^+ =100
⁸⁷ Y ^m	-82637.9	1.6	380.82	0.07	13.37	h	0.03	9/2 ⁺	02		IT=98.43 10; β^+ =1.57 10
⁸⁷ Zr	-79348	8			1.68	h	0.01	(9/2 ⁺) ⁺	02		β^+ =100
⁸⁷ Zr ^m	-79012	8	335.84	0.19	14.0	s	0.2	(1/2 ⁻) ⁻	02		IT=100
⁸⁷ Nb	-74180	60			3.75	m	0.09	(1/2 ⁻)	02		β^+ =100
⁸⁷ Nb ^m	-74180	60	3.84	0.14	2.6	m	0.1	9/2 ⁺ #	02		β^+ =100
⁸⁷ Mo	-67690	220			14.05	s	0.23	7/2 ⁺ #	02	97Hu07 TD	β^+ =100; β^+p =15 5
⁸⁷ Tc	-59120#	300#			2.18	s	0.16	1/2 ⁻ #	02	00We.A TD	β^+ =100; β^+p ?
⁸⁷ Tc ^m	-59100#	310#	20#	60#	2#	s		9/2 ⁺ #			β^+ ?; IT ?
⁸⁷ Ru	-47340#	600#			50#	ms (>1.5 μ s)	1/2 ⁻ #	02	95Ry03 I	β^+ ?	
⁸⁷ As	T : unweighed average 93Ru01=485(40) 78Cr03=730(60) (Birge ratio B=3.4)										**
⁸⁷ Rb	T : average 82Mi14=49.44(0.28) 74Ne14=48.8(0.8) 77Da22=48.9(0.4) obtained by										**
⁸⁷ Rb	T : three methods, respectively: geochronology, decay counting, chemical										**
⁸⁷ Rb	T : 77Da22 supersedes 66Mc12=47.2(0.4) using the same material										**
⁸⁷ Mo	T : average 97Hu07=13.6(1.1) 91Mi15=14.5(0.3) 83Ha06=13.3(0.4)										**
⁸⁷ Mo	D : average 97Hu07=15(6)% (through 3 levels) 83Ha06=15(8)% first 2 ⁺ state										**

Nuclide	Mass excess (keV)		Excitation energy(keV)		Half-life		J^π	Ens	Reference	Decay modes and intensities (%)	
⁸⁸ Ge	−40140#	700#			80#	ms (>300 ns)	0 ⁺	97	97Be70 I	β^- ?	
⁸⁸ As	−51290#	500#			300#	ms (>300 ns)		97	94Be24 I	β^- ?; β^-_n ?	
⁸⁸ Se	−63880	50			1.53	s	0.06	0 ⁺	97		$\beta^-_n=100$; $\beta^-_n=0.99$ 10
⁸⁸ Br	−70730	40			16.36	s	0.07	(2 [−] , 1 ⁺)	98	93Ru01 T	$\beta^-_n=100$; $\beta^-_n=6.58$ 18 *
⁸⁸ Br ^m	−70460	40	272.7	0.3	5.4	μ s	0.7		98		IT=100
⁸⁸ Kr	−79692	13			2.84	h	0.03	0 ⁺	88		$\beta^-_n=100$
⁸⁸ Rb	−82609.00	0.16			17.78	m	0.11	2 [−]	88		$\beta^-_n=100$
⁸⁸ Sr	−87921.7	1.1			STABLE			0 ⁺	88		IS=82.58 1
⁸⁸ Y	−84299.1	1.9			106.65	d	0.04	4 [−]	88		$\beta^+_n=100$
⁸⁸ Y ^m	−83624.6	1.9	674.55	0.04	13.9	ms	0.2	(8) ⁺	88		IT=100
⁸⁸ Y ⁿ	−83906.2	1.9	392.86	0.09	300	μ s	3	1 ⁺	88		
⁸⁸ Zr	−83623	10			83.4	d	0.3	0 ⁺	88		$\epsilon=100$
⁸⁸ Nb	−76070	100			14.5	m	0.1	(8 ⁺)	88		$\beta^+_n=100$
⁸⁸ Nb ^m	−76030	100	40	140	BD *	7.8	m	0.1	(4 [−])	88	$\beta^+_n=100$
⁸⁸ Mo	−72700	20			8.0	m	0.2	0 ⁺	97		$\beta^+_n=100$
⁸⁸ Tc	−62710#	200#			5.8	s	0.2	(2, 3)	97		$\beta^+_n=100$
⁸⁸ Tc ^m	−62710#	360#	0#	300#	*	6.4	s	0.8	(6, 7, 8)	97	$\beta^+_n=100$
⁸⁸ Ru	−55650#	400#			1.3	s	0.3	0 ⁺	97	01Ki13 TD	$\beta^+_n=100$; β^+_p ?
* ⁸⁸ Br	T : average 93Ru01=16.34(0.08) 74Gr29=16.5(0.2)				J : systematics prefers (2 [−])						**
⁸⁹ Ge	−33690#	900#			50#	ms (>300 ns)	3/2 ⁺ #	98	97Be70 I	β^- ?	
⁸⁹ As	−47140#	500#			200#	ms (>300 ns)	3/2 [−] #	98	94Be24 I	β^- ?	
⁸⁹ Se	−59200#	300#			410	ms	40	5/2 ⁺ #	98		$\beta^-_n=100$; $\beta^-_n=7.8$ 25
⁸⁹ Br	−68570	60			4.40	s	0.03	(3/2 [−] , 5/2 [−])	98		$\beta^-_n=100$; $\beta^-_n=13.8$ 4 *
⁸⁹ Kr	−76730	50			3.15	m	0.04	3/2 ⁽⁺⁾ #	98	95Ke04 J	$\beta^-_n=100$
⁸⁹ Rb	−81713	5			15.15	m	0.12	3/2 [−]	98		$\beta^-_n=100$
⁸⁹ Sr	−86209.1	1.1			50.53	d	0.07	5/2 ⁺	98		$\beta^-_n=100$
⁸⁹ Y	−87701.7	2.6			STABLE			1/2 [−]	98		IS=100.
⁸⁹ Y ^m	−86792.7	2.6	908.97	0.03	15.663	s	0.005	9/2 ⁺	98	94It.A T	IT=100
⁸⁹ Zr	−84869	4			78.41	h	0.12	9/2 ⁺	98		$\beta^+_n=100$
⁸⁹ Zr ^m	−84281	4	587.82	0.10	4.161	m	0.017	1/2 [−]	98		IT=93.77 12; ... *
⁸⁹ Nb	−80650	27			2.03	h	0.07	(9/2 ⁺)	98		$\beta^+_n=100$
⁸⁹ Nb ^m	−80650#	40#	0#	30#	*	1.10	h	0.03	(1/2) [−]	98	$\beta^+_n=100$
⁸⁹ Mo	−75004	15			2.11	m	0.10	(9/2 ⁺)	98		$\beta^+_n=100$
⁸⁹ Mo ^m	−74617	15	387.5	0.2	190	ms	15	(1/2 [−])	98		IT=100
⁸⁹ Tc	−67840#	200#			12.8	s	0.9	(9/2 ⁺)	98		$\beta^+_n=100$
⁸⁹ Tc ^m	−67780#	200#	62.6	0.5	12.9	s	0.8	(1/2 [−])	98		$\beta^+_n \approx 100$; IT<0.01
⁸⁹ Ru	−59510#	500#			1.38	s	0.11	(7/2) ⁽⁺⁾ #	98	00We.A T	$\beta^+_n=100$; $\beta^+_p=?$ *
⁸⁹ Rh	−47660#	450#			10#	ms (>1.5 μ s)	7/2 ⁺ #	98	95Ry03 I	β^+_n ?	*
* ⁸⁹ Br	T : ENSDF averages 8 values. Also 93Ru01=4.348(0.022)										**
* ⁸⁹ Zr ^m	D : ... ; $\beta^+_n=6.23$ 12										**
* ⁸⁹ Ru	T : average 00We.A=1.45(0.13) 99Li33=1.2(0.2); same group 01Ki13=1.5(0.2)										**
* ⁸⁹ Rh	I : unobserved in 00We.A, at detection limit										**

Nuclide	Mass excess (keV)	Excitation energy(keV)	Half-life	J^π	Ens	Reference	Decay modes and intensities (%)
⁹⁰ As	−41450# 800#		80# ms (>300 ns)			97Be70 I	β^- ?
⁹⁰ Se	−55930# 400#		300# ms (>300 ns)	0 ⁺		94Be24 I	β^- ?; β^-n ?
⁹⁰ Br	−64620 80		1.910 s 0.010		98	93Ru01 T	β^- =100; β^-n =25.2 9 *
⁹⁰ Kr	−74970 19		32.32 s 0.09	0 ⁺	98		β^- =100
⁹⁰ Rb	−79362 7		158 s 5	0 [−]	98		β^- =100
⁹⁰ Rb ^m	−79255 7	106.90 0.03	258 s 4	3 [−]	98		β^- =97.4 4; IT=2.6 4
⁹⁰ Rb ^x	−79291 14	71 12	R = 2 1	fsmix			
⁹⁰ Sr	−85941.6 2.9		28.79 y 0.06	0 ⁺	98		β^- =100
⁹⁰ Y	−86487.5 2.6		64.00 h 0.21	2 [−]	98		β^- =100
⁹⁰ Y ^m	−85805.8 2.6	681.67 0.10	3.19 h 0.06	7 ⁺	98		IT≈100; β^- =0.0018 2
⁹⁰ Zr	−88767.3 2.4		STABLE	0 ⁺	98		IS=51.45 40
⁹⁰ Zr ^m	−86448.3 2.4	2319.000 0.010	809.2 ms 2.0	5 [−]	98		IT=100
⁹⁰ Zr ⁿ	−85177.9 2.4	3589.419 0.016	131 ns 4	8 ⁺	98		IT=100
⁹⁰ Nb	−82656 5		14.60 h 0.05	8 ⁺	98		β^+ =100
⁹⁰ Nb ^m	−82534 5	122.370 0.022	63 μ s 2	6 ⁺	98		IT=100
⁹⁰ Nb ⁿ	−82531 5	124.67 0.25	18.81 s 0.06	4 [−]	98		IT=100
⁹⁰ Nb ^p	−82485 5	171.10 0.10	< 1 μ s	7 ⁺	98		IT=100
⁹⁰ Nb ^q	−82274 5	382.01 0.25	6.19 ms 0.08	1 ⁺	98		IT=100
⁹⁰ Nb ^r	−80776 5	1880.21 0.20	472 ns 13	(11 [−])	98		IT=100
⁹⁰ Mo	−80167 6		5.56 h 0.09	0 ⁺	98		β^+ =100
⁹⁰ Mo ^m	−77292 6	2874.73 0.15	1.12 μ s 0.05	8 ⁺ #	98		IT=100
⁹⁰ Tc	−71210 240		* & 8.7 s 0.2	1 ⁺	98		β^+ =100
⁹⁰ Tc ^m	−70900 300	310 390	BD * & 49.2 s 0.4	(8 ⁺)	98	93Ru03 J	β^+ =100 *
⁹⁰ Ru	−65310# 300#		11 s 3	0 ⁺	98		β^+ =100
⁹⁰ Rh	−53220# 500#		* 15 ms 7	0 ⁺ #	98	01Ki13 TD	β^+ =100; β^+p ?
⁹⁰ Rh ^m	−53220# 710#	0# 500#	* 1.1 s 0.3	9 ⁺ #	98	01Ki13 TD	β^+ =100; β^+p ?
* ⁹⁰ Br	T : supersedes 80A115=1.92(0.02) from same group						**
* ⁹⁰ Tc ^m	E : arguments are given in 93Ru03 for the (8 ⁺) level to be the ground-state						**
⁹¹ As	−36860# 900#		50# ms (>300 ns)	3/2 [−] #	99	97Be70 I	β^- ?
⁹¹ Se	−50340# 500#		270 ms 50	1/2 ⁺ #	99		β^- =100; β^-n =21 10
⁹¹ Br	−61510 70		541 ms 5	3/2 [−] #	99		β^- =100; β^-n =20 3
⁹¹ Kr	−71310 60		8.57 s 0.04	5/2 ⁽⁺⁾	01		β^- =100
⁹¹ Rb	−77745 8		58.4 s 0.4	3/2 ^(−)	99		β^- =100
⁹¹ Sr	−83645 5		9.63 h 0.05	5/2 ⁺	01		β^- =100
⁹¹ Sr ^x	−83599 11	47 11	R = 6	mix			
⁹¹ Y	−86345.0 2.9		58.51 d 0.06	1/2 [−]	99		β^- =100
⁹¹ Y ^m	−85789.4 2.9	555.58 0.05	49.71 m 0.04	9/2 ⁺	99		IT>98.5; β^- <1.5
⁹¹ Zr	−87890.4 2.3		STABLE	5/2 ⁺	01		IS=11.22 5
⁹¹ Zr ^m	−84723.1 2.3	3167.3 0.4	4.35 μ s 0.14	(21/2 ⁺)	01		IT=100
⁹¹ Nb	−86632 4		680 y 130	9/2 ⁺	99	91Hi.A D	ϵ ≈100; e^+ =0.0138 25
⁹¹ Nb ^m	−86527 4	104.60 0.05	60.86 d 0.22	1/2 [−]	99	91Hi.A D	IT=96.6 5; ϵ =3.4 5; ... *
⁹¹ Nb ⁿ	−84598 4	2034.35 0.19	3.76 μ s 0.12	(17/2 [−])	99		IT=100
⁹¹ Mo	−82204 11		15.49 m 0.01	9/2 ⁺	99		β^+ =100
⁹¹ Mo ^m	−81551 11	653.01 0.09	64.6 s 0.6	1/2 [−]	99		IT=50.0 16; β^+ =50.0 16
⁹¹ Tc	−75980 200		3.14 m 0.02	(9/2 ⁺)	99		β^+ =100
⁹¹ Tc ^m	−75840 200	139.3 0.3	3.3 m 0.1	(1/2 [−])	99		β^+ >99; IT<1
⁹¹ Ru	−68660# 580#		* 9 s 1	(9/2 ⁺)	99		β^+ =100
⁹¹ Ru ^m	−68580 500	80# 300#	* 7.6 s 0.8	(1/2 [−])	99		β^+ ≈100; β^+p =?; IT ?
⁹¹ Rh	−59100# 400#		1.74 s 0.14	7/2 ⁺ #	99	00We.A TD	β^+ =100; β^+p ?
⁹¹ Pd	−47400# 570#		10# ms (>1.5 μ s)	7/2 ⁺ #	99	95Ry03 I	β^+ ?
* ⁹¹ Nb ^m	D : ...; e^+ =0.0028 2						**

Nuclide	Mass excess (keV)	Excitation energy(keV)	Half-life	J^π	Ens	Reference	Decay modes and intensities (%)
⁹² As	−30930# 900#		30# ms (>300 ns)		01	97Be70 I	β^- ?
⁹² Se	−46650# 600#		100# ms (>300 ns)	0 ⁺	01	97Be70 I	β^- ?
⁹² Br	−56580 50		343 ms 15	(2 [−])	01		β^- =100; β^- n=33.1 25
⁹² Kr	−68785 12		1.840 s 0.008	0 ⁺	01		β^- =100; β^- n=0.0332 25
⁹² Rb	−74772 6		4.492 s 0.020	0 [−]	01		β^- =100; β^- n=0.0107 5
⁹² Sr	−82868 3		2.66 h 0.04	0 ⁺	03		β^- =100
⁹² Y	−84813 9		3.54 h 0.01	2 [−]	01		β^- =100
⁹² Zr	−88453.9 2.3		STABLE	0 ⁺	01		IS=17.15 8
⁹² Nb	−86448.3 2.8		34.7 My 2.4	(7 ⁺)	01		β^+ ≈100; β^- <0.05
⁹² Nb ^m	−86312.8 2.8 135.5 0.4		10.15 d 0.02	(2 ⁺)	01		β^+ =100
⁹² Nb ⁿ	−86222.6 2.8 225.7 0.4		5.9 μ s 0.2	(2 [−])	01		IT=100
⁹² Nb ^p	−84245.0 2.8 2203.3 0.4		167 ns 4	(11 [−])	01		IT=100
⁹² Mo	−86805 4		STABLE (>190 Ey)	0 ⁺	01	97Ba35 T	IS=14.84 35; 2 β^+ ?
⁹² Mo ^m	−84045 4 2760.46 0.16		190 ns 3	8 ⁺	01		IT=100
⁹² Tc	−78935 26		4.25 m 0.15	(8 ⁺)	01		β^+ =100
⁹² Tc ^m	−78665 26 270.15 0.11		1.03 μ s 0.07	(4 ⁺)	01		IT=100
⁹² Ru	−74410# 300#		3.65 m 0.05	0 ⁺	01		β^+ =100
⁹² Rh	−63360# 400#		4.3 s 1.3	(6 ⁺)	01	01Xu05 TJD	β^+ =100; β^+ p=?
⁹² Pd	−55500# 500#		1.1 s 0.3	0 ⁺	01	01Ki13 TD	β^+ =100; β^+ p ?
* ⁹² Mo	T : T>190 Ey (2 σ)						**
* ⁹² Rh	T : unweighed average 01Xu05=3.0(0.8) 01Ki13=5.6(0.5) (Birge ratio B=2.76)						**
* ⁹² Rh	J : from 97Ka07; 01Xu05>4						**
⁹³ Se	−40720# 800#		50# ms (>300 ns)	1/2 ⁺ #	97	97Be70 I	β^- ?
⁹³ Br	−53050# 300#		102 ms 10	3/2 [−] #	01		β^- =100; β^- n=68 7
⁹³ Kr	−64020 100		1.286 s 0.010	1/2 ⁺	01		β^- =100; β^- n=1.95 11
⁹³ Rb	−72618 8		5.84 s 0.02	5/2 [−]	97		β^- =100; β^- n=1.39 7
⁹³ Rb ^m	−72365 8 253.38 0.03		57 μ s 15	(3/2 [−] , 5/2 [−])	97		IT=100
⁹³ Sr	−80085 8		7.423 m 0.024	5/2 ⁺	97		β^- =100
⁹³ Y	−84223 11		10.18 h 0.08	1/2 [−]	97		β^- =100
⁹³ Y ^m	−83464 11 758.719 0.021		820 ms 40	7/2 ⁺	97		IT=100
⁹³ Zr	−87117.0 2.3		1.53 My 0.10	5/2 ⁺	97		β^- =100
⁹³ Nb	−87208.3 2.4		STABLE	9/2 ⁺	97		IS=100.
⁹³ Nb ^m	−87177.5 2.4 30.77 0.02		16.13 y 0.14	1/2 [−]	97		IT=100
⁹³ Mo	−86803 4		4.0 ky 0.8	5/2 ⁺	97		ϵ =100
⁹³ Mo ^m	−84378 4 2424.89 0.03		6.85 h 0.07	21/2 ⁺	97		IT≈100; β^+ =0.12 1
⁹³ Tc	−83603 4		2.75 h 0.05	9/2 ⁺	01		β^+ =100
⁹³ Tc ^m	−83211 4 391.84 0.08		43.5 m 1.0	1/2 [−]	01		IT=76.6 11; β^+ =23.4 11
⁹³ Tc ⁿ	−81418 4 2185.16 0.15		10.2 μ s 0.3	(17/2) [−]	01		
⁹³ Ru	−77270 90		59.7 s 0.6	(9/2) ⁺	97		β^+ =100
⁹³ Ru ^m	−76540 90 734.40 0.10		10.8 s 0.3	(1/2) [−]	97	83Ay01 D	β^+ =78.0 23; ...
⁹³ Ru ⁿ	−75190 90 2082.6 0.9		2.20 μ s 0.17	(21/2) ⁺	97		IT=100
⁹³ Rh	−69170# 400#		13.9 s 1.6	9/2 ⁺ #	01	01Ki13 TD	β^+ =100; β^+ p ?
⁹³ Pd	−59700# 400#		1.07 s 0.12	(9/2 ⁺)	01	01Ki13 TJD	β^+ =100; β^+ p=?
⁹³ Ag	−46780# 600#		5# ms (>1.5 μ s)	9/2 ⁺ #	97	95Ry03 I	p ?; β^+ ?
* ⁹³ Ru ^m	D : ... ; IT=22.0 23; β^+ p=0.027 5						**
* ⁹³ Pd	T : average 01Ki13=1000(200) 01Xu05=1300(200) 00Sc31=900(200)						**
* ⁹³ Ag	I : the few events reported in 94He28 are not trusted by NUBASE						**
* ⁹³ Ag	T : estimated half-life is for β^+ decay; p-decay would be much shorter						**

Nuclide	Mass excess (keV)	Excitation energy(keV)	Half-life	J^π	Ens	Reference	Decay modes and intensities (%)
⁹⁴ Se	−36800# 800#		20# ms (>300 ns)	0 ⁺	97	97Be70 I	β^- ?
⁹⁴ Br	−47800# 400#		70 ms	20	92		β^- =100; β^- -n=70 15
⁹⁴ Kr	−61140# 300#		210 ms	4	0 ⁺	01 03Be05 TD	β^- =100; β^- -n=1.11 7 *
⁹⁴ Rb	−68553 8		2.702 s	0.005	3 ⁽⁻⁾	92 93Ru01 D	β^- =100; β^- -n=10.01 23
⁹⁴ Sr	−78840 7		75.3 s	0.2	0 ⁺	92	β^- =100
⁹⁴ Y	−82348 7		18.7 m	0.1	2 ⁻	92	β^- =100
⁹⁴ Zr	−87266.8 2.4		STABLE	(>110 Py)	0 ⁺	92 99Ar25 T	IS=17.38 28; 2 β^- ?
⁹⁴ Nb	−86364.5 2.4		20.3 ky	1.6	(6) ⁺	92	β^- =100
⁹⁴ Nb ^m	−86323.6 2.4	40.902	0.012	6.263 m	0.004	92	IT=99.50 6; β^- =0.50 6
⁹⁴ Mo	−88409.7 1.9		STABLE		0 ⁺	97	IS=9.25 12
⁹⁴ Tc	−84154 4		293 m	1	7 ⁺	92	β^+ =100
⁹⁴ Tc ^m	−84079 4	75.5	1.9	52.0 m	1.0	(2) ⁺	92 β^+ ≈100; IT<0.1
⁹⁴ Ru	−82568 13		51.8 m	0.6	0 ⁺	92	β^+ =100
⁹⁴ Ru ^m	−79923 13	2644.55	0.25	71 μ s	4	(8) ⁺	92 IT=100
⁹⁴ Rh	−72940# 450#		* 70.6 s	0.6	(2 ⁺ , 4 ⁺)	92 96Jo06 J	β^+ =100; β^+ -p=1.8 5
⁹⁴ Rh ^m	−72640 400	300#	200#	* 25.8 s	0.2	(8) ⁺	92 β^+ =100
⁹⁴ Pd	−66350# 400#			9.0 s	0.5	0 ⁺	02 β^+ =100
⁹⁴ Pd ^m	−61470# 400#	4884.4	0.5	530 ns	10	(14) ⁺	02 IT=100
⁹⁴ Ag	−53300# 500#		37 ms	18	0 ⁺ #	02	β^+ =100; β^+ -p ?
⁹⁴ Ag ^m	−51950# 640#	1350#	400#	422 ms	16	(7 ⁺)	02 β^+ =100; β^+ -p=? *
⁹⁴ Ag ⁿ	−46800# 500#	6500#	2000#	300 ms	200	(21 ⁺)	02 β^+ =100; β^+ -p=? *
* ⁹⁴ Kr	T : average 03Be05=212(5) 72Am01=200(10); others outweighed not used:						**
* ⁹⁴ Kr	T : 03Be05=210(20) 75As04=220(20) and 96Me09=330(100)						**
* ⁹⁴ Ag ^m	T : average 02La18=360(30) 01Ki13=450(20) 94Sc35=420(50)						**
⁹⁵ Br	−43900# 500#		50# ms (>300 ns)	3/2 ⁻ #	97	97Be70 I	β^- ?
⁹⁵ Kr	−56040# 400#		114 ms	3	1/2 ⁽⁺⁾	95 03Be05 TD	β^- =100; β^- -n=2.87 18 *
⁹⁵ Rb	−65854 21		377.5 ms	0.8	5/2 ⁻	95	β^- =100; β^- -n=8.73 20
⁹⁵ Sr	−75117 7		23.90 s	0.14	1/2 ⁺	94	β^- =100
⁹⁵ Y	−81207 7		10.3 m	0.1	1/2 ⁻	94	β^- =100
⁹⁵ Zr	−85657.8 2.4		64.032 d	0.006	5/2 ⁺	00	β^- =100
⁹⁵ Nb	−86781.9 2.0		34.991 d	0.006	9/2 ⁺	00	β^- =100
⁹⁵ Nb ^m	−86546.2 2.0	235.690	0.020	3.61 d	0.03	1/2 ⁻	00 IT=94.4 6; β^- =5.6 6
⁹⁵ Mo	−87707.5 1.9		STABLE		5/2 ⁺	00	IS=15.92 13
⁹⁵ Tc	−86017 5		20.0 h	0.1	9/2 ⁺	95	β^+ =100
⁹⁵ Tc ^m	−85978 5	38.89	0.05	61 d	2	1/2 ⁻	95 β^+ =96.12 32; IT=3.88 32
⁹⁵ Ru	−83450 12		1.643 h	0.014	5/2 ⁺	94	β^+ =100
⁹⁵ Rh	−78340 150		5.02 m	0.10	(9/2) ⁺	94	β^+ =100
⁹⁵ Rh ^m	−77800 150	543.3	0.3	1.96 m	0.04	(1/2) ⁻	94 IT=88 5; β^+ =12 5
⁹⁵ Pd	−70150# 400#			10# s	9/2 ⁺ #	95 97Sc30 TD	β^+ =100 *
⁹⁵ Pd ^m	−68290 300	1860#	500#	13.3 s	0.3	(21/2 ⁺)	95 β^+ =?; IT=5#; ... *
⁹⁵ Ag	−60100# 400#			1.74 s	0.13	(9/2 ⁺)	95 β^+ =100; β^+ -p=? *
⁹⁵ Ag ^m	−59760# 400#	344.2	0.3	< 0.5 s	(1/2 ⁻)	03Do.1 ETJ	IT=100
⁹⁵ Ag ⁿ	−57570# 400#	2531	1	< 16 ms	(23/2 ⁺)	03Do.1 ETJ	IT=100
⁹⁵ Ag ^p	−55240# 400#	4859	1	< 40 ms	(37/2 ⁺)	03Do.1 ETJ	IT=100
⁹⁵ Cd	−46700# 600#		5# ms		9/2 ⁺ #		β^+ ?; β^+ -p ?
* ⁹⁵ Kr	J : from 95Ke04						**
* ⁹⁵ Pd	T : 1.35(0.26) s in 97Sc30, if the 1219.3 keV γ originates from ground-state;						**
* ⁹⁵ Pd	T : 1.7 s < T < 7.5 s in Schmidt's thesis 1995 cited in 97Sc30t						**
* ⁹⁵ Pd ^m	D : ... ; β^+ -p=0.90 16						**
* ⁹⁵ Ag	T : from 97Sc30 for β^+ γ activity; supersedes 94Sc35=2.0(0.1) by same authors						**
* ⁹⁵ Ag	T : also 03Do.1=1.85(0.34), same group						**

Nuclide	Mass excess (keV)		Excitation energy(keV)		Half-life		J^π	Ens	Reference	Decay modes and intensities (%)		
⁹⁶ Br	-38630#	700#			20#	ms	(>300 ns)	97	97Be70	I	β^- ?	
⁹⁶ Kr	-53030#	500#			80	ms	7	0 ⁺	97	03Be05	TD	β^- =100; β^- -n=3.7 4
⁹⁶ Rb	-61225	29			203	ms	3	2 ⁺	95	93Ru01	D	β^- =100; β^- -n=13.4 4
⁹⁶ Rb ^m	-61230#	200#	0#	200#	200#	ms	(>1 ms)	1(-#)		81Bo30	JI	β^- ?; IT ?; β^- -n ?
⁹⁶ Sr	-72939	27			1.07	s	0.01	0 ⁺	93			β^- =100
⁹⁶ Y	-78347	23			5.34	s	0.05	0 ⁻	93			β^- =100
⁹⁶ Y ^m	-77206	21	1140	30	BD	9.6	s	0.2	(8 ⁺)	93		β^- =100
⁹⁶ Zr	-85442.8	2.8			24	Ey	6	0 ⁺	98	99Ar25	T	IS=2.80 9; $2\beta^-$ =100
⁹⁶ Nb	-85604	4			23.35	h	0.05	6 ⁺	93			β^- =100
⁹⁶ Mo	-88790.5	1.9			STABLE			0 ⁺	93			IS=16.68 2
⁹⁶ Tc	-85817	5			4.28	d	0.07	7 ⁺	93			β^+ =100
⁹⁶ Tc ^m	-85783	5	34.28	0.07	51.5	m	1.0	4 ⁺	93			IT=98.0 5; β^+ =2.0 5
⁹⁶ Ru	-86072	8			STABLE		(>67 Py)	0 ⁺	01	85No03	T	IS=5.54 14; $2\beta^+$?
⁹⁶ Rh	-79679	13			9.90	m	0.10	(6 ⁺)	93			β^+ =100
⁹⁶ Rh ^m	-79627	13	52.0	0.1	1.51	m	0.02	(3 ⁺)	93			IT=60 5; β^+ =40 5
⁹⁶ Pd	-76230	150			122	s	2	0 ⁺	93			β^+ =100
⁹⁶ Pd ^m	-73700	150	2530.8	0.1	1.81	μ s	0.01	8 ⁺	93	98GrB	TD	IT=100
⁹⁶ Ag	-64570#	400#			4.45	s	0.04	(8 ⁺)	93	03Ba39	TJ	β^+ =100; β^+ -p=9.7 17
⁹⁶ Ag ^m	-64570#	400#	0#	50#	6.9	s	0.6	(2 ⁺)		03Ba39	TJD	β^+ =100; β^+ -p=18 5
⁹⁶ Ag ⁿ	-64570#	400#			700	ns	200			97Gr02	T	IT ?
⁹⁶ Cd	-56100#	500#			1#	s		0 ⁺				β^+ ?
⁹⁶ Rb	T : ENSDF average of 8 values. There is also 93Ru01=201(1)										**	
⁹⁶ Rb ^m	I : non-observation by 81Th04 is not in contradiction with 81Bo30 experiment										**	
⁹⁶ Rb ^m	I : existence of this isomer is discussed in ENSDF										**	
⁹⁶ Zr	T : from 21(+8-4 statistics + 2 systematics); other 93Ka12=39(9) in geochemical										**	
⁹⁶ Zr	T : experiment, not used: observation of $2\beta^-$ decay questioned by 96Ba37										**	
⁹⁶ Pd ^m	T : supersedes 97Gr02=1.7(0.1); other 83Gr01=2.2(0.3) outweighed										**	
⁹⁶ Ag	T : average 03Ba39=4.40(0.06) 97Sc30=4.50(0.06)										**	
⁹⁶ Ag	D : average β^+ -p 97Sc30=11.9(2.6) 82Ku15=8.0(2.3); 96He25=3.7(0.9) not used										**	
⁹⁷ Br	-34650#	800#			10#	ms	(>300 ns)	3/2 ⁻ -#	97	97Be70	I	β^- ?
⁹⁷ Kr	-47920#	500#			63	ms	4	3/2 ⁺ -#		03Be05	TD	β^- =100; β^- -n=6.7 6
⁹⁷ Rb	-58360	30			169.9	ms	0.7	3/2 ⁺	93	93Ru01	D	β^- =100; β^- -n=25.7 8
⁹⁷ Sr	-68788	19			429	ms	5	1/2 ⁺	93			β^- =100; β^- -n<0.05
⁹⁷ Sr ^m	-68480	19	308.13	0.11	170	ns	10	(7/2 ⁺)	93			IT=100
⁹⁷ Sr ⁿ	-67957	19	830.8	0.2	255	ns	10	11/2 ⁻ -#	93			IT=100
⁹⁷ Y	-76258	12			3.75	s	0.03	(1/2 ⁻)	93	93Ru01	D	β^- =100; β^- -n=0.058 7
⁹⁷ Y ^m	-75590	12	667.51	0.23	1.17	s	0.03	(9/2 ⁺)	93			β^- >99.3; IT<0.7; ...
⁹⁷ Y ⁿ	-72735	12	3523.3	0.4	142	ms	8	(27/2 ⁻)	93			IT>80; β^- \leq 20
⁹⁷ Zr	-82946.6	2.8			16.90	h	0.05	1/2 ⁺	93			β^- =100
⁹⁷ Nb	-85605.6	2.6			72.1	m	0.7	9/2 ⁺	93			β^- =100
⁹⁷ Nb ^m	-84862.3	2.6	743.35	0.03	52.7	s	1.8	1/2 ⁻	93			IT=100
⁹⁷ Mo	-87540.4	1.9			STABLE			5/2 ⁺	93			IS=9.55 8
⁹⁷ Tc	-87220	5			2.6	My	0.4	9/2 ⁺	93			ε =100
⁹⁷ Tc ^m	-87123	5	96.56	0.06	90.1	d	1.0	1/2 ⁻	93			IT \approx 100; ε <0.34
⁹⁷ Ru	-86112	8			2.9	d	0.1	5/2 ⁺	93			β^+ =100
⁹⁷ Rh	-82590	40			30.7	m	0.6	9/2 ⁺	93			β^+ =100
⁹⁷ Rh ^m	-82330	40	258.85	0.17	46.2	m	1.6	1/2 ⁻	93			β^+ =94.4 6; IT=5.6 6
⁹⁷ Pd	-77800	300			3.10	m	0.09	5/2 ⁺ -#	01			β^+ =100
⁹⁷ Ag	-70820	320			25.3	s	0.3	(9/2 ⁺)	93	97Sc30	T	β^+ =100
⁹⁷ Ag ^m	-68480	320	2343	49	5	ns		(21/2 ⁺)				
⁹⁷ Cd	-60600#	400#			2.8	s	0.6	9/2 ⁺ -#	93	97Sc30	T	β^+ =100; β^+ -p=?
⁹⁷ In	-47000#	600#			5#	ms		9/2 ⁺ -#				p ?; β^+ ?
⁹⁷ Y ^m	D : ... ; β^- -n<0.08										*	
⁹⁷ In	T : estimated half-life is for β^+ decay; p-decay would be much shorter										**	

Nuclide	Mass excess (keV)			Excitation energy(keV)		Half-life	J^π	Ens	Reference	Decay modes and intensities (%)	
^{98}Kr	−44800#	600#				46 ms	8	0 ⁺	03	β^- =100; β^- -n=7.0 10	
^{98}Rb	−54220	50				114 ms	5	(0, 1) ^(−#)	03	β^- =100; β^- -n=13.8 6; ...	*
$^{98}\text{Rb}^m$	−53940	120	290	130	BD	96 ms	3	(3, 4) ^(+#)	03	β^- =100	
^{98}Sr	−66646	26				653 ms	2	0 ⁺	03	β^- =100; β^- -n=0.25 5	
^{98}Y	−72467	25				548 ms	2	(0) [−]	03	β^- =100; β^- -n=0.331 24	
$^{98}\text{Y}^m$	−72050	30	410	30	BD	2.0 s	0.2	(5 ⁺ , 4 [−])	03	β^- =?; IT=10#; ...	*
$^{98}\text{Y}^n$	−71971	25	496.19	0.15		7.6 μs	0.4	(2) [−]	03	IT=100	
$^{98}\text{Y}^p$	−72296	25	170.74	0.6		620 ns	80	(2) [−]	03	IT=100	
^{98}Zr	−81287	20				30.7 s	0.4	0 ⁺	03	β^- =100	
^{98}Nb	−83529	6				2.86 s	0.06	1 ⁺	03	β^- =100	
$^{98}\text{Nb}^m$	−83445	7	84	4		51.3 m	0.4	(5 ⁺)	03	β^- ≈100; IT=0.1#	
^{98}Mo	−88111.7	1.9				STABLE	(>100 Ty)	0 ⁺	03	IS=24.13 31; 2 β^- ?	*
^{98}Tc	−86428	4				4.2 My	0.3	(6) ⁺	03	β^- =100; β^+ =0	
$^{98}\text{Tc}^m$	−86337	4	90.76	0.16		14.7 μs	3	(2) [−]	03	IT=100	
^{98}Ru	−88224	6				STABLE		0 ⁺	03	IS=1.87 3	
^{98}Rh	−83175	12			*	8.72 m	0.12	(2) ⁺	03	β^+ =100	
$^{98}\text{Rh}^m$	−83120#	50#	60#	50#	*	3.6 m	0.2	(5 ⁺)	03	IT=89 5; β^+ =11 5	
^{98}Pd	−81300	21				17.7 m	0.3	0 ⁺	03	β^+ =100	
^{98}Ag	−73060	70				47.5 s	0.3	(5 ⁺)	03	β^+ =100; β^+ -p=0.0012 5	*
$^{98}\text{Ag}^m$	−72890	70	167.83	0.15		220 ns	20	(3 ⁺)	03	98Gr.B ETD IT=100	
^{98}Cd	−67630	80				9.2 s	0.3	0 ⁺	03	β^+ =100; β^+ -p<0.025	
$^{98}\text{Cd}^m$	−65200	80	2427.5	0.6		190 ns	20	8 ⁺ #	98 98Gr.B TD	IT=100	*
^{98}In	−53900#	200#			*	45 ms	23	0 ⁺ #	03	01Ki13 TD β^+ =100; β^+ -p ?	
$^{98}\text{In}^m$	−53900#	540#	0#	500#	*	1.7 s	0.8		03	01Ki13 TD β^+ =100; β^+ -p ?	
^{98}Rb	D : ... ; β^- -2n=0.051 7										**
$^{98}\text{Y}^m$	D : ... ; β^- -n=3.4 10										**
$^{98}\text{Y}^m$	J : 94St31=(5 ⁺) 95Ha.B=(4 [−])										**
^{98}Mo	T : limit given here is for 0v-2 β^- decay (theoretically faster, see text)										**
^{98}Ag	J : (5 ⁺) with experimental basis preferred to (6 ⁺), see discussion in ENSDF										**
$^{98}\text{Cd}^m$	T : supersedes 97Gr02=200(+300−170); other 97Go18=480(160) outweighed										**
^{99}Kr	−39500#	600#				40 ms	11	3/2 ⁺ #	97 03Be05 TD	β^- =100; β^- -n=11 7	
^{99}Rb	−50880	130				50.3 ms	0.7	(5/2 ⁺)	98	β^- =100; β^- -n=15.9 20	
^{99}Sr	−62190	80				269 ms	1	3/2 ⁺	95	β^- =100; β^- -n=0.100 19	
^{99}Y	−70201	24				1.470 s	0.007	(5/2 ⁺)	95	β^- =100; β^- -n=1.9 4	
$^{99}\text{Y}^m$	−68059	24	2141.65	0.19		8.6 μs	0.8	(17/2 ⁺)	95	IT=100	
^{99}Zr	−77768	20				2.1 s	0.1	1/2 ⁺	95	02Ca37 J β^- =100	
^{99}Nb	−82327	13				15.0 s	0.2	9/2 ⁺	95	β^- =100	
$^{99}\text{Nb}^m$	−81962	13	365.29	0.14		2.6 m	0.2	1/2 [−]	95	β^- =?; IT<3.8	
^{99}Mo	−85965.8	1.9				65.94 h	0.01	1/2 [−]	95	β^- =100	
$^{99}\text{Mo}^m$	−85868.0	1.9	97.785	0.003		15.5 μs	0.2	5/2 ⁺	95	IT=100	
^{99}Tc	−87323.1	2.0				211.1 ky	1.2	9/2 ⁺	01	β^- =100	
$^{99}\text{Tc}^m$	−87180.4	2.0	142.6832	0.0011		6.015 h	0.009	1/2 [−]	01	IT≈100; β^- =0.0037 6	
^{99}Ru	−87617.0	2.0				STABLE		5/2 ⁺	95	IS=12.76 14	
^{99}Rh	−85574	7				16.1 d	0.2	(1/2 [−])	95	β^+ =100	
$^{99}\text{Rh}^m$	−85510	7	64.3	0.4		4.7 h	0.1	9/2 ⁺	95	β^+ ≈100; IT<0.16	
^{99}Pd	−82188	15				21.4 m	0.2	(5/2 ⁺)	95	β^+ =100	
^{99}Ag	−76760	150				124 s	3	(9/2 ⁺)	95	β^+ =100	
$^{99}\text{Ag}^m$	−76250	150	506.1	0.4		10.5 s	0.5	(1/2 [−])	95	IT=100	
^{99}Cd	−69850#	210#				16 s	3	(5/2 ⁺)	95	β^+ =100; β^+ -p=0.21 8;...	*
^{99}In	−61270#	400#				3.1 s	0.8	9/2 ⁺ #	97 01Ki13 TD	β^+ =100; β^+ -p ?	
$^{99}\text{In}^m$	−60870#	430#	400#	150#		1# s		1/2 [−] #		β^+ =?; IT ?	
^{99}Sn	−47200#	600#				5# ms		9/2 ⁺ #		β^+ ?; β^+ -p ?	*
$^{99}\text{Sn}^m$	−46800#	610#	400#	100#				1/2 [−] #			
^{99}Cd	D : ... ; $\beta^+\alpha$ <1e−4										**
^{99}Sn	I : the 3 events reported in 95Ry03 are not trusted by NUBASE										**

Nuclide	Mass excess (keV)	Excitation energy(keV)		Half-life		J ^π	Ens	Reference	Decay modes and intensities (%)			
¹⁰⁰ Kr	−36200#	500#		10#	ms	(>300 ns)	0 ⁺	97	97Be70	I	β [−] ?	
¹⁰⁰ Rb	−46700#	300#		51	ms	8	(3 ⁺)	97	93Ru01	D	β [−] =100; β [−] n=5.6 12;...	*
¹⁰⁰ Sr	−60220	130		202	ms	3	0 ⁺	97			β [−] =100; β [−] n=0.78 13	
¹⁰⁰ Y	−67290	80		* 735	ms	7	1 [−] , 2 [−]	97			β [−] =100; β [−] n=0.92 8	
¹⁰⁰ Y ^m	−67090#	220#	200#	* 940	ms	30	(3, 4, 5) ⁺ #	97			β [−] =100	
¹⁰⁰ Zr	−76600	40		7.1	s	0.4	0 ⁺	97			β [−] =100	
¹⁰⁰ Nb	−79939	26		1.5	s	0.2	1 ⁺	97			β [−] =100	
¹⁰⁰ Nb ^m	−79471	28	470	40	BD	2.99	s	0.11	(4 ⁺ , 5 ⁺)	97	β [−] =100	
¹⁰⁰ Mo	−86184	6		8.5	Ey	0.5	0 ⁺	97	97Al02	T	IS=9.63 23; 2β [−] =100	*
¹⁰⁰ Tc	−86016.2	2.2		15.8	s	0.1	1 ⁺	97			β [−] ≈100; ε=0.0018 9	
¹⁰⁰ Tc ^m	−85815.5	2.2	200.67	0.04		8.32	μs	0.14	(4) ⁺	97		
¹⁰⁰ Tc ⁿ	−85772.2	2.2	243.96	0.04		3.2	μs	0.2	(6) ⁺	97		
¹⁰⁰ Ru	−89219.0	2.0			STABLE		0 ⁺	97			IS=12.60 7	
¹⁰⁰ Rh	−85584	18		20.8	h	0.1	1 [−]	97			β ⁺ =100	
¹⁰⁰ Rh ^m	−85476	18	107.6	0.2		4.6	m	0.2	(5 ⁺)	97	IT≈98.3; β ⁺ ≈1.7	
¹⁰⁰ Pd	−85226	11		3.63	d	0.09	0 ⁺	97			ε=100	
¹⁰⁰ Ag	−78150	80		2.01	m	0.09	(5) ⁺	97			β ⁺ =100	
¹⁰⁰ Ag ^m	−78130	80	15.52	0.16		2.24	m	0.13	(2) ⁺	97	β ⁺ =?; IT ?	
¹⁰⁰ Cd	−74250	100		49.1	s	0.5	0 ⁺	97			β ⁺ =100	
¹⁰⁰ Cd ^m	−71700	100	2548.6	0.5		60	ns	3	(8) ⁺	97	IT=100	
¹⁰⁰ In	−64170	250		5.9	s	0.2	(6, 7) ⁺	97	02Pl03	TJ	β ⁺ =100; β ⁺ p>3.9	*
¹⁰⁰ Sn	−56780	710		1.1	s	0.4	0 ⁺	97			β ⁺ =100; β ⁺ p<17	*
* ¹⁰⁰ Rb	D : . . . ; β [−] 2n=0.15 5										**	
* ¹⁰⁰ Rb	T : ENSDF average of 3 values. See also 53(2) of 85Pf.A J : from 95Pf04										**	
* ¹⁰⁰ Rb	D : β [−] 2n intensity is derived from β [−] 2n/β [−] n=0.027(7), in 81Jo.A										**	
* ¹⁰⁰ Mo	T : average 97Al02=7.6(+2.2−1.4) 97De40=6.82(+0.38−0.53 statistics + 0.68 systematics)										**	
* ¹⁰⁰ Mo	T : 95Da37=9.5(0.9) 91Ej02=11.5(+3−2) and 91Ei04=11.6(+3.4−0.8)										**	
* ¹⁰⁰ In	T : others: 95Sz01=6.1(0.9) 95Fa.A=6.3(+1.0−.9); 95Fa.A supersedes 95Sc33=7.8(.8)										**	
* ¹⁰⁰ Sn	D : from 97Su06 β ⁺ p/β ⁺ <20%										**	
¹⁰¹ Rb	−43600	170		32	ms	4	3/2 ⁺ #	98			β [−] =100; β [−] n=28 4	
¹⁰¹ Sr	−55410	120		118	ms	3	(5/2 [−])	98			β [−] =100; β [−] n=2.37 14	
¹⁰¹ Y	−64910	100		426	ms	20	(5/2 ⁺)	98	96Me09	T	β [−] =100; β [−] n=1.94 18	*
¹⁰¹ Zr	−73460	30		2.3	s	0.1	3/2 [−]	98	02Ca37	J	β [−] =100	
¹⁰¹ Nb	−78942	19		7.1	s	0.3	(5/2#) ⁺	98			β [−] =100	
¹⁰¹ Mo	−83511	6		14.61	m	0.03	1/2 ⁺	98			β [−] =100	
¹⁰¹ Tc	−86336	24		14.22	m	0.01	9/2 ⁺	98			β [−] =100	
¹⁰¹ Tc ^m	−86128	24	207.53	0.04		636	μs	8			IT=100	
¹⁰¹ Ru	−87949.7	2.0			STABLE		5/2 ⁺	98			IS=17.06 2	
¹⁰¹ Ru ^m	−87422.2	2.0	527.5	0.4		17.5	μs	0.4	11/2 [−]	98	IT=100	
¹⁰¹ Rh	−87408	17		3.3	y	0.3	1/2 [−]	98			ε=100	
¹⁰¹ Rh ^m	−87251	17	157.32	0.04		4.34	d	0.01	9/2 ⁺	98	ε=93.6 2; IT=6.4 2	
¹⁰¹ Pd	−85428	18		8.47	h	0.06	5/2 ⁺	98			β ⁺ =100	
¹⁰¹ Ag	−81220	100		11.1	m	0.3	9/2 ⁺	98			β ⁺ =100	
¹⁰¹ Ag ^m	−80950	100	274.1	0.3		3.10	s	0.10	1/2 [−]	98	IT=100	
¹⁰¹ Cd	−75750	150		1.36	m	0.05	(5/2 ⁺)	98			β ⁺ =100	
¹⁰¹ In	−68610#	300#		15.1	s	1.1	9/2 ⁺ #	98			β ⁺ =100; β ⁺ p=?	
¹⁰¹ In ^m	−68060#	320#	550#	100#		10#	s	1/2 [−]	#		β ⁺ =95#; IT=5#	
¹⁰¹ Sn	−59560#	300#		3	s	1	5/2 ⁺ #	98			β ⁺ =100; β ⁺ p=?	
* ¹⁰¹ Y	T : average 96Me09=400(20) 86Wa17=440(20) and 83Wo10=500(50)										**	
* ¹⁰¹ Y	T : 93Ru01=279(9) at variance, not used										**	

Nuclide	Mass excess (keV)	Excitation energy(keV)		Half-life		J ^π	Ens	Reference	Decay modes and intensities (%)
¹⁰² Rb	−38310#	500#			37 ms	5		98	β [−] =100; β [−] n=18 8
¹⁰² Sr	−53080	110			69 ms	6	0 ⁺	98	93Ru01 D β [−] =100; β [−] n=5.5 15
¹⁰² Y	−61890	90			* & 300 ms	10	low	98	β [−] =100; β [−] n=4.9 12
¹⁰² Y ^m	−61690#	220#	200#	200#	* & 360 ms	40	high	98	β [−] =100; β [−] n=4.9 12
¹⁰² Zr	−71740	50			2.9 s	0.2	0 ⁺	98	β [−] =100
¹⁰² Nb	−76350	40			1.3 s	0.2	1 ⁺	98	β [−] =100
¹⁰² Nb ^m	−76220	50	130	50	BD 4.3 s	0.4	high	98	β [−] =100
¹⁰² Mo	−83557	21			11.3 m	0.2	0 ⁺	01	β [−] =100
¹⁰² Tc	−84566	9			* 5.28 s	0.15	1 ⁺	98	β [−] =100
¹⁰² Tc ^m	−84546	13	20	10	* 4.35 m	0.07	(4,5)	98	β [−] =98 2; IT=2 2
¹⁰² Ru	−89098.0	2.0			STABLE		0 ⁺	98	IS=31.55 14
¹⁰² Rh	−86775	5			207.0 d	1.5	(1 [−] , 2 [−])	98	98Sh21 T β ⁺ =78 5; β [−] =22 5
¹⁰² Rh ^m	−86634	5	140.75	0.08	3.742 y	0.010	6 ⁺	98	98Sh21 T β ⁺ ≈100; IT=0.233 24
¹⁰² Pd	−87925.1	3.0			STABLE		0 ⁺	98	IS=1.02 1; 2β ⁺ ?
¹⁰² Ag	−82265	28			12.9 m	0.3	5 ⁺	98	β ⁺ =100
¹⁰² Ag ^m	−82256	28	9.3	0.4	7.7 m	0.5	2 ⁺	98	β ⁺ =51 5; IT=49 5
¹⁰² Cd	−79678	29			5.5 m	0.5	0 ⁺	98	β ⁺ =100
¹⁰² In	−70710	110			23.3 s	0.1	(6 ⁺)	98	03Gi06 T β ⁺ =100; β ⁺ p=0.0093 13
¹⁰² Sn	−64930	130			4.6 s	1.4	0 ⁺	98	95Fa.A T β ⁺ =100; β ⁺ p ?
¹⁰² Sn ^m	−62910	130	2017	2	720 ns	220	(6 ⁺)	98	98Li50 EJT IT=100
* ¹⁰² Rh	T : average 98Sh21=207.3(1.7) 61Hi06=206(3)								
* ¹⁰² Rh ^m	J : from 99Gi14								
* ¹⁰² In	J : from 95Sz01								
* ¹⁰² Sn	T : 95Fa.A, supersedes 95Sc28=4.5(0.7), preliminary from same group								
* ¹⁰² Sn ^m	T : average 98Li50=620(+430−190) 97Gr02=300(+500−200) 96Li50=1000(500)								
¹⁰³ Sr	−47550#	500#			50# ms (>300 ns)		01	97Be70 I β [−] ?	
¹⁰³ Y	−58940#	300#			224 ms	19	5/2 ⁺ #	01	96Me09 T β [−] =100; β [−] n=8 3
¹⁰³ Zr	−68370	110			1.3 s	0.1	(5/2 [−])	01	β [−] =100
¹⁰³ Nb	−75320	70			1.5 s	0.2	(5/2 ⁺)	01	β [−] =100
¹⁰³ Mo	−80850	60			67.5 s	1.5	(3/2 ⁺)	01	β [−] =100
¹⁰³ Tc	−84597	10			54.2 s	0.8	5/2 ⁺	01	β [−] =100
¹⁰³ Ru	−87258.8	2.0			39.26 d	0.02	3/2 ⁺	01	β [−] =100
¹⁰³ Ru ^m	−87020.6	2.1	238.2	0.7	1.69 ms	0.07	11/2 [−]	01	IT=100
¹⁰³ Rh	−88022.2	2.8			STABLE		1/2 [−]	01	IS=100.
¹⁰³ Rh ^m	−87982.4	2.8	39.756	0.006	56.114 m	0.009	7/2 ⁺	01	IT=100
¹⁰³ Pd	−87479.1	2.9			16.991 d	0.019	5/2 ⁺	01	ε=100
¹⁰³ Pd ^m	−86694.3	2.9	784.79	0.10	25 ns	2	11/2 [−]	01	IT=100
¹⁰³ Ag	−84791	17			65.7 m	0.7	7/2 ⁺	01	β ⁺ =100
¹⁰³ Ag ^m	−84657	17	134.45	0.04	5.7 s	0.3	1/2 [−]	01	IT=100
¹⁰³ Cd	−80649	15			7.3 m	0.1	5/2 ⁺	01	β ⁺ =100
¹⁰³ In	−74599	25			60 s	1	9/2 ⁺ #	01	97Sz04 T β ⁺ =100
¹⁰³ In ^m	−73967	25	631.7	0.1	34 s	2	1/2 [−] #	01	97Sz04 ETD β ⁺ =67; IT=33
¹⁰³ Sn	−66970#	300#			7 s	3	5/2 ⁺ #	01	β ⁺ =100; β ⁺ p=?
¹⁰³ Sb	−56180#	300#			100# ms (>1.5 μs)		5/2 ⁺ #	01	95Ry03 I β ⁺ ?
* ¹⁰³ Y	T : average 96Me09=230(20) 96Lh04=190(50)								

Nuclide	Mass excess (keV)	Excitation energy(keV)	Half-life	J^π	Ens	Reference	Decay modes and intensities (%)
¹⁰⁴ Sr	−44400# 700#		30# ms (>300 ns)	0 ⁺	00	97Be70 I	β^- ?
¹⁰⁴ Y	−54910# 400#		180 ms	60	00	99Wa09 D	β^- =100; β^- n=?
¹⁰⁴ Zr	−66340# 400#		1.2 s	0.3	0 ⁺	00	β^- =100
¹⁰⁴ Nb	−72220 100		4.9 s	0.3	(1 ⁺)	00	β^- =100; β^- n=0.06 3
¹⁰⁴ Nb ^m	−72010 100	220 120	940 ms	40	high	00	β^- =100; β^- n=0.05 3
¹⁰⁴ Mo	−80330 50		60 s	2	0 ⁺	00	β^- =100
¹⁰⁴ Tc	−82490 50		18.3 m	0.3	3 ⁺ #	00	β^- =100
¹⁰⁴ Tc ^m	−82420 50	69.7 0.2	3.5 μ s	0.3	2(+)	00	IT=100
¹⁰⁴ Ru	−88089 3		STABLE		0 ⁺	00	IS=18.62 27; 2 β^- ?
¹⁰⁴ Rh	−86949.8 2.8		42.3 s	0.4	1 ⁺	00	β^- ≈100; β^+ =0.45 10
¹⁰⁴ Rh ^m	−86820.8 2.8	128.967 0.004	4.34 m	0.03	5 ⁺	00	IT≈100; β^- =0.13 1
¹⁰⁴ Pd	−89390 4		STABLE		0 ⁺	00	IS=11.14 8
¹⁰⁴ Ag	−85111 6		69.2 m	1.0	5 ⁺	00	β^+ =100
¹⁰⁴ Ag ^m	−85104 6	6.9 0.4	33.5 m	2.0	2 ⁺	00	β^+ ≈100; IT<0.07
¹⁰⁴ Cd	−83975 9		57.7 m	1.0	0 ⁺	00	β^+ =100
¹⁰⁴ In	−76110 80		1.80 m	0.03	5, 6(+)	00	β^+ =100
¹⁰⁴ In ^m	−76020 80	93.48 0.10	15.7 s	0.5	(3 ⁺)	00	IT=80; β^+ =20
¹⁰⁴ Sn	−71590 100		20.8 s	0.5	0 ⁺	00	β^+ =100
¹⁰⁴ Sb	−59180# 360#		470 ms	130		00 95Fa.A D	β^+ =?; β^+ p<7; p<7; α ? *
* ¹⁰⁴ Nb	D : β^- n=0.71% of 83En03, at variance, not used						**
* ¹⁰⁴ Sb	D : 95Fa.A supersedes 95Sc28 p<1						**
¹⁰⁵ Sr	−38580# 700#		20# ms (>300 ns)		97	97Be70 I	β^- ?
¹⁰⁵ Y	−51350# 500#		60# ms (>300 ns)	5/2 ⁺ #	97	94Be24 I	β^- ?
¹⁰⁵ Zr	−62360# 400#		600 ms	100	97		β^- =100; β^- n ?
¹⁰⁵ Nb	−70850 100		2.95 s	0.06	5/2 ⁺ #	94 96Me09 D	β^- =100; β^- n=1.7 9
¹⁰⁵ Mo	−77340 70		35.6 s	1.6	(5/2 [−])	93	β^- =100
¹⁰⁵ Tc	−82290 60		7.6 m	0.1	(3/2 [−])	93	β^- =100
¹⁰⁵ Ru	−85928 3		4.44 h	0.02	3/2 ⁺	93	β^- =100
¹⁰⁵ Rh	−87846 4		35.36 h	0.06	7/2 ⁺	93	β^- =100
¹⁰⁵ Rh ^m	−87716 4	129.781 0.004	45 s		1/2 [−]	93	IT=100
¹⁰⁵ Pd	−88413 4		STABLE		5/2 ⁺	93	IS=22.33 8
¹⁰⁵ Ag	−87068 11		41.29 d	0.07	1/2 [−]	93	β^+ =100
¹⁰⁵ Ag ^m	−87043 11	25.465 0.012	7.23 m	0.16	7/2 ⁺	93	IT≈100; β^+ =0.34 7
¹⁰⁵ Cd	−84330 12		55.5 m	0.4	5/2 ⁺	93	β^+ =100
¹⁰⁵ In	−79481 17		5.07 m	0.07	9/2 ⁺	93 87Eb02 J	β^+ =100
¹⁰⁵ In ^m	−78807 17	674.1 0.3	48 s	6	(1/2) [−]	93	IT=?; β^+ =25#
¹⁰⁵ Sn	−73260 80		34 s	1	(5/2 ⁺)	93 95Pf01 T	β^+ =100; β^+ p=?
¹⁰⁵ Sb	−63820 100		1.12 s	0.16	(5/2 ⁺)	02	β^+ ?; p≈1; β^+ p ?
¹⁰⁵ Te	−52500# 500#		1# μ s		5/2 ⁺ #		α ?; β^+ ?
* ¹⁰⁵ Rh ^m	T : no error given; other value: 30 s (see ENSDF: remeasurement recommended)						**
* ¹⁰⁵ Sn	J : from 85De08						**
* ¹⁰⁵ Te	I : the 3 events reported in 95Ry03 are not trusted by NUBASE						**
¹⁰⁶ Y	−46770# 700#		50# ms (>300 ns)		97	97Be70 I	β^- ?
¹⁰⁶ Zr	−59700# 500#		200# ms (>300 ns)	0 ⁺	97	94Be24 I	β^- ?
¹⁰⁶ Nb	−67100# 200#		920 ms	40	2 ⁺ #	94 96Me09 TD	β^- =100; β^- n=4.5 3
¹⁰⁶ Mo	−76255 18		8.73 s	0.12	0 ⁺	94 95Jo02 T	β^- =100
¹⁰⁶ Tc	−79775 13		35.6 s	0.6	(1, 2)	94	β^- =100
¹⁰⁶ Ru	−86322 8		373.59 d	0.15	0 ⁺	94	β^- =100
¹⁰⁶ Rh	−86361 8		29.80 s	0.08	1 ⁺	94	β^- =100
¹⁰⁶ Rh ^m	−86225 11	136 12	131 m	2	(6) ⁺	94	β^- =100
¹⁰⁶ Pd	−89902 4		STABLE		0 ⁺	94	IS=27.33 3
¹⁰⁶ Ag	−86937 5		23.96 m	0.04	1 ⁺	94	β^+ =?; β^- ≈0.5
¹⁰⁶ Ag ^m	−86847 5	89.66 0.07	8.28 d	0.02	6 ⁺	94	β^+ =100; IT≤4.2e−6

... A-group is continued on next page ...

Nuclide	Mass excess (keV)	Excitation energy(keV)	Half-life	J ^π	Ens	Reference	Decay modes and intensities (%)	
... A-group continued ...								
¹⁰⁶ Cd	-87132 6		STABLE	(>410 Ey)	0 ⁺	94 02Tr04 T	IS=1.25 6; 2β ⁺ ?	
¹⁰⁶ In	-80606 12		6.2 m	0.1	7 ⁺	94	β ⁺ =100	
¹⁰⁶ In ^m	-80577 12	28.6 0.3	5.2 m	0.1	(3 ⁺)	94	β ⁺ =100	
¹⁰⁶ Sn	-77430 50		1.92 m	0.08	0 ⁺	94	β ⁺ =100	
¹⁰⁶ Sb	-66330# 310#		600 ms	200	(4 ⁺)	97 94Se01 J	β ⁺ =100	
¹⁰⁶ Sb ^m	-65330# 590# 1000#	500#	220 ns	20		98Li50 T	IT=100	
¹⁰⁶ Te	-58210 130		70 μs	20	0 ⁺	94Pa11 T	α=100	
* ¹⁰⁶ Zr	I: and T>240 ns in 97So07							*
* ¹⁰⁶ Nb	T: average 96Me09=900(20) 83Sh06=1020(50)							**
* ¹⁰⁶ Sb	T: from 95Le.C, Fig. 4, preliminary							**
* ¹⁰⁶ Te	T: average 94Pa11=60(+40-20) 81Sc17=60(+30-10)							**
¹⁰⁷ Y	-42720# 500#		30# ms	(>300 ns)	5/2 ⁺ #	00 97Be70 I	β ⁻ ?	
¹⁰⁷ Zr	-55190# 300#		150# ms	(>300 ns)		00 94Be24 I	β ⁻ ?	
¹⁰⁷ Nb	-64920# 400#		300 ms	5	5/2 ⁺ #	00 96Me09 TD	β ⁻ =100; β ⁻ -n=6.0 15	
¹⁰⁷ Mo	-72940 160		3.5 s	0.5	(7/2 ⁻)	00	β ⁻ =100	
¹⁰⁷ Mo ^m	-72870 160	66.3 0.2	470 ns	30	(5/2 ⁻)	00	IT=100	
¹⁰⁷ Tc	-79100 150		21.2 s	0.2	(3/2 ⁻)	00	β ⁻ =100	
¹⁰⁷ Tc ^m	-79030 150	65.7 1.0	184 ns	3	(5/2 ⁻)	00	IT=100	
¹⁰⁷ Ru	-83920 120		3.75 m	0.05	(5/2 ⁺)	00	β ⁻ =100	
¹⁰⁷ Rh	-86863 12		21.7 m	0.4	7/2 ⁺	00	β ⁻ =100	
¹⁰⁷ Rh ^m	-86595 12	268.36 0.04	> 10 μs		1/2 ⁻	00	IT=100	
¹⁰⁷ Pd	-88368 4		6.5 My	0.3	5/2 ⁺	00	β ⁻ =100	
¹⁰⁷ Pd ^m	-88153 4	214.6 0.3	21.3 s	0.5	11/2 ⁻	00	IT=100	
¹⁰⁷ Ag	-88402 4		STABLE		1/2 ⁻	00	IS=51.839 8	
¹⁰⁷ Ag ^m	-88309 4	93.125 0.019	44.3 s	0.2	7/2 ⁺	00	IT=100	
¹⁰⁷ Cd	-86985 6		6.50 h	0.02	5/2 ⁺	00	β ⁺ =100	
¹⁰⁷ In	-83560 11		32.4 m	0.3	9/2 ⁺	00	β ⁺ =100	
¹⁰⁷ In ^m	-82882 11	678.5 0.3	50.4 s	0.6	1/2 ⁻	00	IT=100	
¹⁰⁷ Sn	-78580 80		2.90 m	0.05	(5/2 ⁺)	00	β ⁺ =100	
¹⁰⁷ Sb	-70650# 300#		4.6 s	0.8	5/2 ⁺ #	00	β ⁺ =100	
¹⁰⁷ Te	-60540# 300#		3.1 ms	0.1	5/2 ⁺ #	00	α=70 30; β ⁺ =30 30	
* ¹⁰⁷ Zr	I: and T>240 ns in 97So07							**
* ¹⁰⁷ Nb	T: average 96Me09=300(30) 91Hi02=300(10)							**
¹⁰⁸ Y	-37740# 800#		20# ms	(>300 ns)		00 95Cz.A I	β ⁻ ?; β ⁻ -n ?	
¹⁰⁸ Zr	-52200# 600#		80# ms	(>300 ns)	0 ⁺	00 97Be70 I	β ⁻ ?; β ⁻ -n ?	
¹⁰⁸ Nb	-60700# 300#		193 ms	17	(2 ⁺)	00	β ⁻ =100; β ⁻ -n=6.2 5	
¹⁰⁸ Mo	-71300# 200#		1.09 s	0.02	0 ⁺	00	β ⁻ =100	
¹⁰⁸ Tc	-75950 130		5.17 s	0.07	(2 ⁺)	00	β ⁻ =100	
¹⁰⁸ Ru	-83670 120		4.55 m	0.05	0 ⁺	00	β ⁻ =100	
¹⁰⁸ Rh	-85020 110		16.8 s	0.5	1 ⁺	00	β ⁻ =100	
¹⁰⁸ Rh ^m	-85080 40	-60 110	BD *	6.0 m	0.3	(5 ⁺)(#)	00 β ⁻ =100	
¹⁰⁸ Pd	-89524 3		STABLE		0 ⁺	00	IS=26.46 9	
¹⁰⁸ Ag	-87602 4		2.37 m	0.01	1 ⁺	00	β ⁻ =97.15 20; β ⁺ =2.85 20	
¹⁰⁸ Ag ^m	-87493 4	109.440 0.007	418 y	21	6 ⁺	00	β ⁺ =91.3 9; IT=8.7 9	
¹⁰⁸ Cd	-89252 6		STABLE	(>410 Py)	0 ⁺	02 95Ge14 T	IS=0.89 3; 2β ⁺ ?	
¹⁰⁸ In	-84116 10		58.0 m	1.2	7 ⁺	00	β ⁺ =100	
¹⁰⁸ In ^m	-84086 10	29.75 0.05	39.6 m	0.7	2 ⁺	00	β ⁺ =100	
¹⁰⁸ Sn	-82041 20		10.30 m	0.08	0 ⁺	00	β ⁺ =100	
¹⁰⁸ Sb	-72510# 210#		7.4 s	0.3	(4 ⁺)	00	β ⁺ =100; β ⁺ p ?	
¹⁰⁸ Te	-65720 100		2.1 s	0.1	0 ⁺	00 85Ti02 D	β ⁺ =51 4; α=49 4; ...	
¹⁰⁸ I	-52650# 360#		36 ms	6	1 ⁺ #	00 94Pa12 D	α=?: β ⁺ =9#; p<1	
* ¹⁰⁸ Ag ^m	T: discrepant results: 418(7) 310(130) 127(21), see ENSDF							**
* ¹⁰⁸ Te	D: ...; β ⁺ p=2.4 10; β ⁺ α<0.065							**
* ¹⁰⁸ I	D: β ⁺ =9%# estimated by 94Pa12 using theoretical β ⁺ half-life ≈400 ms							**

Nuclide	Mass excess (keV)	Excitation energy(keV)	Half-life	J^π	Ens	Reference	Decay modes and intensities (%)
^{109}Zr	-47280# 500#		60# ms (>300 ns)		99	97Be70 I	β^- ?
^{109}Nb	-58100# 500#		190 ms 30	$5/2^+$	99		β^- =100; β^- n=31 5
^{109}Mo	-67250# 300#		530 ms 60	$7/2^-$	99		β^- =100
^{109}Tc	-74540 100		860 ms 40	$3/2^-$	99		β^- =100; β^- n=0.08 2
^{109}Ru	-80850 70		34.5 s 1.0	$5/2^+$	99		β^- =100
^{109}Rh	-85011 12		80 s 2	$7/2^+$	99		β^- =100
^{109}Pd	-87607 3		13.7012 h 0.0024	$5/2^+$	99		β^- =100
$^{109}\text{Pd}^m$	-87418 3	188.990 0.010	4.696 m 0.003	$11/2^-$	99		IT=100
^{109}Ag	-88722.7 2.9		STABLE	$1/2^-$	99		IS=48.161 8
$^{109}\text{Ag}^m$	-88634.7 2.9	88.0341 0.0011	39.6 s 0.2	$7/2^+$	99		IT=100
^{109}Cd	-88508 4		461.4 d 1.2	$5/2^+$	99		ϵ =100
$^{109}\text{Cd}^m$	-88448 4	59.6 0.4	12 μs 2	$1/2^+$	99		IT=100
$^{109}\text{Cd}^n$	-88045 4	463.0 0.5	10.9 μs 0.5	$11/2^-$	99		IT=100
^{109}In	-86489 6		4.2 h 0.1	$9/2^+$	99		β^+ =100
$^{109}\text{In}^m$	-85839 6	650.1 0.3	1.34 m 0.07	$1/2^-$	99		IT=100
$^{109}\text{In}^n$	-84387 6	2101.8 0.2	209 ms 6	$(19/2^+)$	99		IT=100
^{109}Sn	-82639 10		18.0 m 0.2	$5/2^{(+)}$	99		β^+ =100
^{109}Sb	-76259 19		17.0 s 0.7	$5/2^+$	99		β^+ =100
^{109}Te	-67610 60		4.6 s 0.3	$(5/2^+)$	99		β^+ =?; α =3.9 13; ... *
^{109}I	-57610 100		103 μs 5	$(5/2^+)$	02	87Gi02 J	p=100
* ^{109}Te	D : ... ; β^+ p=9.4 31; β^+ α <0.005						**
^{110}Zr	-43900# 800#		30# ms (>300 ns)	0^+	00	97Be70 I	β^- ?
^{110}Nb	-53620# 500#		170 ms 20	2^+	00		β^- =100; β^- n=40 8
^{110}Mo	-65460# 400#		300 ms 40	0^+	00		β^- =100; β^- n ?
^{110}Tc	-70960 80		920 ms 30	(2^+)	00	96Me09 D	β^- =100; β^- n=0.04 2
^{110}Ru	-79980 50		11.6 s 0.6	0^+	00		β^- =100
^{110}Rh	-82780 50		28.5 s 1.5	$(> 3)^{(+\#)}$	00		β^- =100
$^{110}\text{Rh}^m$	-82839 22	-60 50	3.2 s 0.2	1^+	00		β^- =100
^{110}Pd	-88349 11		STABLE (>600 Py)	0^+	00	52Wi26 T	IS=11.72 9; $2\beta^-$?
^{110}Ag	-87460.6 2.9		24.6 s 0.2	1^+	00		β^- \approx 100; ϵ =0.30 6
$^{110}\text{Ag}^m$	-87343.0 2.9	117.59 0.05	249.950 d 0.024	6^+	00	02Un02 T	β^- =98.64 6; IT=1.36 6
^{110}Cd	-90353.0 2.7		STABLE	0^+	00		IS=12.49 18
^{110}In	-86475 12		4.9 h 0.1	7^+	00		β^+ =100
$^{110}\text{In}^m$	-86413 12	62.1 0.5	69.1 m 0.5	2^+	00		β^+ =100
^{110}Sn	-85844 14		4.11 h 0.10	0^+	00		ϵ =100
^{110}Sb	-77540# 200#		23.0 s 0.4	(4^+)	00	97La13 J	β^+ =100
^{110}Te	-72280 50		18.6 s 0.8	0^+	00		β^+ \approx 100; α =0.003#
^{110}I	-60320# 310#		650 ms 20	1^+	00		β^+ =83 4; α =17 4; ... *
^{110}Xe	-51900 130		310 ms 190	0^+	00	02Ma19 TD	α =64 35; β^+ ?
* ^{110}I	D : ... ; β^+ p=11 3; β^+ α =1.1 3						**

Nuclide	Mass excess (keV)	Excitation energy(keV)	Half-life	J^π	Ens	Reference	Decay modes and intensities (%)
¹¹¹ Nb	−50630# 500#		80# ms (>300 ns)	5/2 ⁺ #	97	97Be70 I	β^- ?
¹¹¹ Mo	−61100# 400#		200# ms (>300 ns)		97	94Be24 I	β^- ? *
¹¹¹ Tc	−69220 110		290 ms 20	3/2 [−] #	96	96Me09 TD	β^- =100; β^- n=0.85 20 *
¹¹¹ Ru	−76670 70		2.12 s 0.07	(5/2 ⁺)	96	98Lh02 J	β^- =100
¹¹¹ Rh	−82357 30		11 s 1	(7/2 ⁺)	96		β^- =100
¹¹¹ Pd	−86004 11		23.4 m 0.2	5/2 ⁺	96		β^- =100
¹¹¹ Pd ^m	−85832 11	172.18 0.08	5.5 h 0.1	11/2 [−]	96		IT=73.3; β^- =27.3
¹¹¹ Ag	−88221 3		7.45 d 0.01	1/2 [−]	96		β^- =100
¹¹¹ Ag ^m	−88161 3	59.82 0.04	64.8 s 0.8	7/2 ⁺	96		IT=99.3 2; β^- =0.7 2
¹¹¹ Cd	−89257.5 2.7		STABLE	1/2 ⁺	00		IS=12.80 12
¹¹¹ Cd ^m	−88861.3 2.7	396.214 0.021	48.50 m 0.09	11/2 [−]	00		IT=100
¹¹¹ In	−88396 5		2.8047 d 0.0004	9/2 ⁺	00		ϵ =100
¹¹¹ In ^m	−87859 5	536.95 0.06	7.7 m 0.2	1/2 [−]	00		IT=100
¹¹¹ Sn	−85945 7		35.3 m 0.6	7/2 ⁺	96		β^+ =100
¹¹¹ Sn ^m	−85690 7	254.72 0.08	12.5 μ s 1.0	1/2 ⁺			
¹¹¹ Sb	−80888 28		75 s 1	(5/2 ⁺)	96		β^+ =100
¹¹¹ Te	−73480 70		19.3 s 0.4	5/2 ⁺ #	97		β^+ =100; β^+ p=?
¹¹¹ I	−64950# 300#		2.5 s 0.2	5/2 ⁺ #	96		β^+ ≈100; α =0.088
¹¹¹ I ^m	−63550# 300#	1398 1	21 ns 2	(11/2 [−])			
¹¹¹ Xe	−54400# 300#		740 ms 200	5/2 ⁺ #	96	94Pa11 D	β^+ ?; α =10.7
¹¹¹ Xe ^m		non existent RN	900 ms 200			90Tu.A T	
* ¹¹¹ Mo	I : and T>240 ns in 97So07						**
* ¹¹¹ Tc	T : supersedes 88Pe13=300(30) from same group						**
* ¹¹¹ Xe ^m	I : from assigning α decay to isomer in older version of ENSDF						**
¹¹² Nb	−45800# 700#		60# ms (>300 ns)	2 ⁺ #	97	97Be70 I	β^- ?
¹¹² Mo	−58830# 600#		150# ms (>300 ns)	0 ⁺	97	94Be24 I	β^- ?
¹¹² Tc	−66000 120		290 ms 20	2 ⁺ #	97	99Wa09 TD	β^- =100; β^- n=1.5 2
¹¹² Ru	−75480 70		1.75 s 0.07	0 ⁺	97		β^- =100
¹¹² Rh	−79740 50		3.4 s 0.4	1 ⁺	97	99Lh01 T	β^- =100 *
¹¹² Rh ^m	−79410 60	330 70 BD	6.73 s 0.15	> 3	97	99Lh01 T	β^- =100 *
¹¹² Pd	−86336 18		21.03 h 0.05	0 ⁺	97		β^- =100
¹¹² Ag	−86624 17		3.130 h 0.009	2 ^(−)	97		β^- =100
¹¹² Cd	−90580.5 2.7		STABLE	0 ⁺	97		IS=24.13 21
¹¹² In	−87996 5		14.97 m 0.10	1 ⁺	97		β^+ =56.3; β^- =44.3
¹¹² In ^m	−87839 5	156.59 0.05	20.56 m 0.06	4 ⁺	97		IT=100
¹¹² In ⁿ	−87645 5	350.76 0.09	690 ns 50	7 ⁺	97		IT=100
¹¹² In ^p	−87382 5	613.69 0.14	2.81 μ s 0.03	8 [−]	97	87Eb02 J	IT=100
¹¹² Sn	−88661 4		STABLE	0 ⁺	97		IS=0.97 1; 2 β^+ ?
¹¹² Sb	−81601 18		51.4 s 1.0	3 ⁺	97		β^+ =100
¹¹² Te	−77300 170		2.0 m 0.2	0 ⁺	97		β^+ =100
¹¹² I	−67100# 210#		3.42 s 0.11	1 ⁺ #	97	78Ro19 D	β^+ ≈100; α =0.0012; ... *
¹¹² Xe	−59970 100		2.7 s 0.8	0 ⁺	97	94Pa11 D	β^+ ≈100; α =0.9 8 *
¹¹² Cs	−46290# 300#		500 μ s 100	1 ⁺ #	02		p=100
* ¹¹² Rh	T : supersedes 91Jo11=2.1(0.3) and 88Ay02=3.8(0.6) of same group						**
* ¹¹² Rh ^m	T : supersedes 88Ay02=6.8(0.2)						**
* ¹¹² I	D : ... ; β^+ p=0.88 10; β^+ α =0.104 12						**
* ¹¹² I	D : β^+ p and β^+ α are derived from β^+ p/ α =735(80) β^+ p/ β^+ α =8.5(2), in 85Ti02						**
* ¹¹² Xe	D : α intensity is estimated from 94Pa11=0.8(+1.1−0.5)% and 78Ro19=0.84%						**

Nuclide	Mass excess (keV)	Excitation energy(keV)		Half-life		J ^π	Ens	Reference	Decay modes and intensities (%)
¹¹³ Nb	-42200# 800#			30#	ms (>300 ns)	5/2 ⁺ #	98	97Be70	I β ⁻ ?
¹¹³ Mo	-54140# 600#			100#	ms (>300 ns)		98	94Be24	I β ⁻ ?
¹¹³ Tc	-63720# 300#			170	ms 20	3/2 ⁻ #	98	99Wa09	TD β ⁻ =100; β ⁻ n=2.1 3
¹¹³ Ru	-72200 70			800	ms 50	(5/2 ⁺)	98	98Ku17	J β ⁻ =100
¹¹³ Ru ^m	-72070 70	130	18	510	ms 30	(11/2 ⁻)		98Ku17	ETJ IT=2; β ⁻ =?
¹¹³ Rh	-78680 50			2.80	s 0.12	(7/2 ⁺)	98	93Pe11	J β ⁻ =100
¹¹³ Pd	-83690 40			93	s 5	(5/2 ⁺)	98		β ⁻ =100
¹¹³ Pd ^m	-83610 40			300	ms 100	(9/2 ⁻)	98		IT=100
¹¹³ Pd ⁿ		81.1 0.3		> 100	s		98	81Me17	I β ⁻ =100
¹¹³ Ag	-87033 17	non existent	RN	5.37	h 0.05	1/2 ⁻	98		β ⁻ =100
¹¹³ Ag ^m	-86990 17	43.50 0.10		68.7	s 1.6	7/2 ⁺	98		IT=64 7; β ⁻ =36 7
¹¹³ Cd	-89049.3 2.7			7.7	Py 0.3	1/2 ⁺	98		IS=12.22 12; β ⁻ =100
¹¹³ Cd ^m	-88785.8 2.7	263.54 0.03		14.1	y 0.5	11/2 ⁻	98		β ⁻ ≈100; IT=0.14
¹¹³ In	-89370 3			STABLE		9/2 ⁺	99		IS=4.29 5
¹¹³ In ^m	-88978 3	391.699 0.003		1.6579	h 0.0004	1/2 ⁻	99		IT=100
¹¹³ Sn	-88333 4			115.09	d 0.03	1/2 ⁺	00		β ⁺ =100
¹¹³ Sn ^m	-88256 4	77.386 0.019		21.4	m 0.4	7/2 ⁺	00		IT=91.1 23; β ⁺ =8.9 23
¹¹³ Sb	-84420 18			6.67	m 0.07	5/2 ⁺	98		β ⁺ =100
¹¹³ Te	-78347 28			1.7	m 0.2	(7/2 ⁺)	98		β ⁺ =100
¹¹³ I	-71130 50			6.6	s 0.2	5/2 ⁺ #	98		β ⁺ =100; α=3.31e-7; ...
¹¹³ Xe	-62090 80			2.74	s 0.08	5/2 ⁺ #	98	85Ti02	D β ⁺ ≈100; α=0.011 5; ...
¹¹³ Cs	-51700 100			16.7	μs 0.7	5/2 ⁺ #	02		p=100; α=0
^{*113} Tc T : 98Ku17=110(30) and 92Ay02=130(50) are from same authors									
^{*113} Ru ^m E : above the 99 keV level and below 160 keV									
^{*113} Pd ⁿ I : existence is not possible since discovery of ¹¹³ Pd ^m by 93Pe11									
^{*113} I D : ... ; β ⁺ α ?									
^{*113} Xe D : ... ; β ⁺ p=7 4; β ⁺ α≈0.007 4									
^{*113} Xe D : α=0.0024-0.0204% from estimated limit for the reduced width, see 85Ti02									
^{*113} Xe D : β ⁺ p and β ⁺ α derived from β ⁺ p/α=605(35) and β ⁺ p/β ⁺ α=500-1500 in 85Ti02									
¹¹⁴ Mo	-51310# 700#			80#	ms (>300 ns)	0 ⁺	03	97Be70	I β ⁻ ?
¹¹⁴ Tc	-59730# 600#			150	ms 30	2 ⁺ #	03		β ⁻ =100; β ⁻ n=?
¹¹⁴ Ru	-70530# 230#			530	ms 60	0 ⁺	03		β ⁻ =100; β ⁻ n ?
¹¹⁴ Rh	-75630 110			* 1.85	s 0.05	1 ⁺	03		β ⁻ =100; β ⁻ n ?
¹¹⁴ Rh ^m	-75430# 190#	200# 150#	*	1.85	s 0.05	(4,5)	03		β ⁻ =100
¹¹⁴ Pd	-83497 24			2.42	m 0.06	0 ⁺	03		β ⁻ =100
¹¹⁴ Ag	-84949 25			4.6	s 0.1	1 ⁺	03		β ⁻ =100
¹¹⁴ Ag ^m	-84750 25	199 5		1.50	ms 0.05	(< 7 ⁺)	03		IT=100
¹¹⁴ Cd	-90020.9 2.7			STABLE	(>92 Py)	0 ⁺	03	95Ge14	T IS=28.73 42; 2β ⁻ ?
¹¹⁴ In	-88572 3			71.9	s 0.1	1 ⁺	03		β ⁻ =99.50 15; β ⁺ =0.50 15
¹¹⁴ In ^m	-88382 3	190.29 0.03		49.51	d 0.01	5 ⁺	03		IT=96.75 24; β ⁺ =3.25 24
¹¹⁴ In ⁿ	-88070 3	501.94 0.03		43.1	ms 0.6	(8 ⁻)	03		IT=100
¹¹⁴ In ^p	-87930 3	641.72 0.03		4.3	μs 0.4	(7 ⁺)	03		IT=100
¹¹⁴ Sn	-90561 3			STABLE		0 ⁺	03		IS=0.66 1
¹¹⁴ Sn ^m	-87474 3	3087.37 0.07		733	ns 14	7 ⁻	03		IT=100
¹¹⁴ Sb	-84515 28			3.49	m 0.03	(3 ⁺)	03		β ⁺ =100
¹¹⁴ Sb ^m	-84020 28	495.5 0.07		219	μs 12	(8 ⁻)	03		IT=100
¹¹⁴ Te	-81889 28			15.2	m 0.7	0 ⁺	03		β ⁺ =100
¹¹⁴ I	-72800# 300#			2.1	s 0.2	1 ⁺	03		β ⁺ =100; β ⁺ p ?
¹¹⁴ I ^m	-72530# 300#	265.9 0.5		6.2	s 0.5	(7)	03	ABBW96	D β ⁺ =91 2; IT=9 2
¹¹⁴ Xe	-67086 11			10.0	s 0.4	0 ⁺	03		β ⁺ =100
¹¹⁴ Cs	-54540# 310#			570	ms 20	(1 ⁺)	03		β ⁺ ≈100; α=0.018 6; ...
¹¹⁴ Ba	-45950 140			530	ms 230	0 ⁺	03	02Ma19	D β ⁺ ≈100; β ⁺ p=20 10; ...
^{*114} I ^m D : evaluated for NUBASE by J. Blachot, based on ¹¹⁴ I IT decay									
^{*114} Cs D : ... ; β ⁺ p=8.7 13; β ⁺ α=0.19 3									
^{*114} Ba D : ... ; α=0.9 3; ¹² C<0.038									
^{*114} Ba D : ¹² C intensity is from 95Gu10									

Nuclide	Mass excess (keV)	Excitation energy(keV)		Half-life		J ^π	Ens	Reference	Decay modes and intensities (%)	
¹¹⁵ Mo	−46310#	800#		60#	ms	(>300 ns)		99	β [−] ?; β [−] n ?	
¹¹⁵ Tc	−57110#	700#		100#	ms	(>300 ns)	3/2 [−] #	99	β [−] ?; β [−] n ?	
¹¹⁵ Ru	−66430	130		740	ms	80		99	β [−] =100; β [−] n ?	
¹¹⁵ Rh	−74210	80		990	ms	50	7/2 ⁺ #	99	β [−] =100	
¹¹⁵ Pd	−80400	60		25	s	2	5/2 ⁺ #	99	β [−] =100	
¹¹⁵ Pd ^m	−80310	60	89.18	0.25	50	s	3	11/2 [−] #	99	β [−] =92.0 20; IT=8.0 20
¹¹⁵ Ag	−84990	30		20.0	m	0.5	1/2 [−]	99	β [−] =100	
¹¹⁵ Ag ^m	−84950	30	41.16	0.10	18.0	s	0.7	7/2 ⁺	99	β [−] =79.0 3; IT=21.0 3
¹¹⁵ Cd	−88090.5	2.7		53.46	h	0.10	1/2 ⁺	99	β [−] =100	
¹¹⁵ Cd ^m	−87909.5	2.7	181.0	0.5	44.56	d	0.24	(11/2) [−]	99	β [−] ≈100; IT<0.003
¹¹⁵ In	−89537	4		441	Ty	25	9/2 ⁺	99	IS=95.71 5; β [−] =100	
¹¹⁵ In ^m	−89201	4	336.244	0.017	4.486	h	0.004	1/2 [−]	99	IT=95.0 7; β [−] =5.0 7
¹¹⁵ Sn	−90036.0	2.9		STABLE				1/2 ⁺	99	IS=0.34 1
¹¹⁵ Sn ^m	−89423.2	2.9	612.81	0.04	3.26	μs	0.08	7/2 ⁺	99	IT=100
¹¹⁵ Sn ⁿ	−89322.4	2.9	713.64	0.12	159	μs	1	11/2 [−]	99	IT=100
¹¹⁵ Sb	−87003	16		32.1	m	0.3	5/2 ⁺	99	β ⁺ =100	
¹¹⁵ Te	−82063	28		5.8	m	0.2	7/2 ⁺	99	β ⁺ =100	
¹¹⁵ Te ^m	−82053	29	10	7	6.7	m	0.4	(1/2) ⁺	99	β ⁺ ≈100; IT<0.06
¹¹⁵ Te ⁿ	−81783	28	280.05	0.20	7.5	μs	0.2	11/2 [−]	99	IT=100
¹¹⁵ I	−76338	29		1.3	m	0.2	5/2 ⁺ #	99	β ⁺ =100	
¹¹⁵ Xe	−68657	12		18	s	4	(5/2 ⁺)	99	β ⁺ =100; β ⁺ p=0.34 6; ...	*
¹¹⁵ Cs	−59700#	300#		1.4	s	0.8	9/2 ⁺ #	99	β ⁺ =100; β ⁺ p≈0.07	
¹¹⁵ Ba	−49030#	600#		450	ms	50	5/2 ⁺ #	99	β ⁺ =100; β ⁺ p>15	
* ¹¹⁵ Pd ^m	J : E3 transition to ground-state									**
* ¹¹⁵ Te ^m	E : less than 20 keV, from ENSDF									**
* ¹¹⁵ Xe	D : ... ; β ⁺ α=0.0003 1									**
¹¹⁶ Tc	−52750#	700#		90#	ms	(>300 ns)	2 ⁺ #	01	97Be70 I	β [−] ?
¹¹⁶ Ru	−64450#	700#		400#	ms	(>300 ns)	0 ⁺	01	94Be24 I	β [−] ?
¹¹⁶ Rh	−70740	140		680	ms	60	1 ⁺	01		β [−] =100; β [−] n ?
¹¹⁶ Rh ^m	−70540#	210#	200#	150#	570	ms	50	(6 [−])	01	β [−] =100
¹¹⁶ Pd	−79960	60		11.8	s	0.4	0 ⁺	01		β [−] =100
¹¹⁶ Ag	−82570	50		2.68	m	0.10	(2) [−]	01		β [−] =100
¹¹⁶ Ag ^m	−82490	50	81.90	0.20	8.6	s	0.3	(5 ⁺)	01	β [−] =94.0 15; IT=6.0 15
¹¹⁶ Cd	−88719	3		30	Ey	4	0 ⁺	01	03Da09 T	IS=7.49 18; 2β [−] =100
¹¹⁶ In	−88250	4		14.10	s	0.03	1 ⁺	01	98Bh04 D	β [−] ≈100; ε=0.23 6
¹¹⁶ In ^m	−88123	4	127.267	0.006	54.29	m	0.17	5 ⁺	01	β [−] =100
¹¹⁶ In ⁿ	−87960	4	289.660	0.006	2.18	s	0.04	8 [−]	01	IT=100
¹¹⁶ Sn	−91528.1	2.9		STABLE			0 ⁺	01		IS=14.54 9
¹¹⁶ Sb	−86821	6		15.8	m	0.8	3 ⁺	01		β ⁺ =100
¹¹⁶ Sb ^m	−86440	40	380	40	60.3	m	0.6	8 [−]	01	β ⁺ =100
¹¹⁶ Te	−85269	28		2.49	h	0.04	0 ⁺	01		β ⁺ =100
¹¹⁶ I	−77490	100		2.91	s	0.15	1 ⁺	01		β ⁺ =100
¹¹⁶ I ^m	−77090#	110#	400#	50#	3.27	μs	0.16	(7 [−])	01	IT=100
¹¹⁶ Xe	−73047	13		59	s	2	0 ⁺	01		β ⁺ =100
¹¹⁶ Cs	−62070#	100#		700	ms	40	(1 ⁺)	01		β ⁺ =100; β ⁺ p=0.28 7;...
¹¹⁶ Cs ^m	−61970#	120#	100#	60#	3.85	s	0.13	4 ⁺ ,5,6	01	β ⁺ =100; β ⁺ p=0.51 15;...
¹¹⁶ Ba	−54600#	400#		1.3	s	0.2	0 ⁺	01		β ⁺ =100; β ⁺ p=3 1
* ¹¹⁶ Ru	I : and T>240 ns in 97So07									**
* ¹¹⁶ Cd	T : from 29(1 statistics +4−3 systematics); supersedes 00Da27=26(1 statistics +7−4 systematics)									**
* ¹¹⁶ Cs	D : ... ; β ⁺ α=0.049 25									**
* ¹¹⁶ Cs ^m	D : ... ; β ⁺ α=0.008 2									**

Nuclide	Mass excess (keV)	Excitation energy(keV)	Half-life	J^π	Ens	Reference	Decay modes and intensities (%)
^{117}Tc	−49850#	700#	40# ms (>300 ns)	$3/2^-$	02	97Be70 I	β^- ?
^{117}Ru	−60010#	700#	300# ms (>300 ns)		02	94Be24 I	β^- ? *
^{117}Rh	−68950#	500#	440 ms	40	02		β^- =100
^{117}Pd	−76530	60	4.3 s	0.3	02		β^- =100
$^{117}\text{Pd}^m$	−76330	60	19.1 ms	0.7	02		IT=100
^{117}Ag	−82270	50	73.6 s	1.4	02		β^- =100
$^{117}\text{Ag}^m$	−82240	50	5.34 s	0.05	02		β^- =94.0 15; IT=6.0 15
^{117}Cd	−86425	3	2.49 h	0.04	02		β^- =100
$^{117}\text{Cd}^m$	−86289	3	3.36 h	0.05	02		β^- ≈100; IT≈0
^{117}In	−88945	6	43.2 m	0.3	02		β^- =100
$^{117}\text{In}^m$	−88630	6	116.2 m	0.3	02		β^- =52.9 15; IT=47.1 15
^{117}Sn	−90400.0	2.9	STABLE	$1/2^+$	02		IS=7.68 7
$^{117}\text{Sn}^m$	−90085.4	2.9	13.76 d	0.04	02		IT=100
^{117}Sb	−88645	9	2.80 h	0.01	02		β^+ =100
^{117}Te	−85097	13	62 m	2	02		β^+ =100; e^+ =25 1
$^{117}\text{Te}^m$	−84801	13	103 ms	3	02	99Mo30 J	IT ?
$^{117}\text{Te}^n$	−84823	13	19.9 ns	0.4	02		IT=100
^{117}I	−80435	28	2.22 m	0.04	02		β^+ =100; e^+ ≈77
^{117}Xe	−74185	10	61 s	2	02		β^+ =100; β^+ p=0.0029 6
^{117}Cs	−66440	60	* 8.4 s	0.6	02		β^+ =100
$^{117}\text{Cs}^m$	−66290#	100#	* 6.5 s	0.4	02		β^+ =100
$^{117}\text{Cs}^x$	−66390	80	$R=?$	spmix			
^{117}Ba	−57290#	300#	1.75 s	0.07	02	97Ja12 D	β^+ =100; β^+ p=13 3; ... *
^{117}La	−46510#	400#	23.5 ms	2.6	02		p=?; β^+ =6#
$^{117}\text{La}^m$	−46370#	400#	10 ms	5	02		p=?; β^+ =3#
* ^{117}Ru	I : and $T>240$ ns in 97So07						**
* ^{117}Ba	D : ... ; $\beta^+\alpha=0.024$ 8						**
* ^{117}Ba	D : β^+ p from 97Ja12. β^+ p/ $\beta^+\alpha=350$ -1200 from 85Ti02 yields $\beta^+\alpha=0.011$ -0.037						**
^{118}Tc	−45200#	900#	30# ms (>300 ns)	2^+	97	95Cz.A I	β^- ?
^{118}Ru	−57920#	800#	200# ms (>300 ns)	0^+		94Be24 I	β^- ?
^{118}Rh	−65140#	500#	310 ms	30	97	00Jo18 TJD	β^- =100
^{118}Pd	−75470	210	1.9 s	0.1	95		β^- =100
^{118}Ag	−79570	60	3.76 s	0.15	95	93Ja03 J	β^- =100
$^{118}\text{Ag}^m$	−79440	60	2.0 s	0.2	95	95Ap.A E	β^- =59; IT=41
^{118}Cd	−86709	20	50.3 m	0.2	95		β^- =100
^{118}In	−87230	8	* 5.0 s	0.5	95		β^- =100
$^{118}\text{In}^m$	−87130#	50#	* 4.364 m	0.007	95	94It.A T	β^- =100
$^{118}\text{In}^n$	−86990#	50#	8.5 s	0.3	95		IT=98.6 3; β^- =1.4 3 *
^{118}Sn	−91656.1	2.9	STABLE	0^+	95		IS=24.22 9
^{118}Sb	−87999	4	3.6 m	0.1	95		β^+ =100
$^{118}\text{Sb}^m$	−87749	6	5.00 h	0.02	95		β^+ =100
$^{118}\text{Sb}^n$	−87948	4	20.6 μ s	0.6			
^{118}Te	−87721	15	6.00 d	0.02	95		ε =100
^{118}I	−80971	20	13.7 m	0.5	95		β^+ =100
$^{118}\text{I}^m$	−80781	20	8.5 m	0.5	95	94Ka39 E	β^+ ≈100; IT=?
^{118}Xe	−78079	10	3.8 m	0.9	95		β^+ =100
^{118}Cs	−68409	13	* 14 s	2	95		β^+ =100; β^+ p=0.021 14;... *
$^{118}\text{Cs}^m$	−68310#	60#	* 17 s	3	95	93Be46 J	β^+ =100; β^+ p=0.021 14;... *
$^{118}\text{Cs}^x$	−68404	12	$R<0.1$	spmix			
^{118}Ba	−62370#	200#	5.2 s	0.2	97	97Ja12 TD	β^+ =100; β^+ p ?
^{118}La	−49620#	300#	200# ms				β^+ ?
* $^{118}\text{In}^n$	E : 138.2(0.5) keV above $^{118}\text{In}^m$, from ENSDF						**
* ^{118}Cs	D : ... ; $\beta^+\alpha=0.0012$ 5						**
* ^{118}Cs	D : derived from β^+ p=0.042(6)%, $\beta^+\alpha=0.0024(4)$ % for mixture of ground-state and isomer.						**
* ^{118}Cs	D : Replaced by uniform distributions from zero to values for each isomer						**
* $^{118}\text{Cs}^m$	D : ... ; $\beta^+\alpha=0.0012$ 5						**

Nuclide	Mass excess (keV)	Excitation energy(keV)				Half-life	J^π	Ens	Reference	Decay modes and intensities (%)
^{119}Ru	-53240#	700#				170#	ms (>300 ns)		97Be70 I	β^- ?
^{119}Rh	-63240#	600#				300#	ms (>300 ns)	7/2 ⁺ #	94Be24 I	β^- ?
^{119}Pd	-71620#	300#				920	ms	130	00	β^- =100
^{119}Ag	-78560	90			* &	6.0	s	0.5	1/2 ⁻ #	β^- =100
$^{119}\text{Ag}^m$	-78540#	90#	20#	20#	* &	2.1	s	0.1	7/2 ⁺ #	β^- =100
^{119}Cd	-83910	80				2.69	m	0.02	(3/2 ⁺)	β^- =100
$^{119}\text{Cd}^m$	-83760	80	146.54	0.11		2.20	m	0.02	11/2 ⁻ #	β^- =100
^{119}In	-87704	8				2.4	m	0.1	9/2 ⁺	β^- =100
$^{119}\text{In}^m$	-87393	8	311.37	0.03		18.0	m	0.3	1/2 ⁻	β^- =94.4 15; IT=5.6 15
^{119}Sn	-90068.4	2.9				STABLE			1/2 ⁺	IS=8.59 4
$^{119}\text{Sn}^m$	-89978.9	2.9	89.531	0.013		293.71	d	0.7	11/2 ⁻	IT=100
^{119}Sb	-89477	8				38.19	h	0.22	5/2 ⁺	ε =100
$^{119}\text{Sb}^m$	-86625	11	2852	7		850	ms	90	27/2 ⁺ #	IT=100
^{119}Te	-87184	8				16.05	h	0.05	1/2 ⁺	β^- =100
$^{119}\text{Te}^m$	-86923	8	260.96	0.05		4.70	d	0.04	11/2 ⁻	ε =99.59 4; e^+ =0.41 4; ...
^{119}I	-83766	28				19.1	m	0.4	5/2 ⁺	β^+ =100
^{119}Xe	-78794	10				5.8	m	0.3	5/2 ⁺ (+)	e^+ =79 5; ε =21 5
^{119}Cs	-72305	14			*	43.0	s	0.2	9/2 ⁺	β^+ =100; $\beta^+\alpha$ <2e-6
$^{119}\text{Cs}^m$	-72260#	30#	50#	30#	*	30.4	s	0.1	3/2 ⁺ (+)	β^+ =100
$^{119}\text{Cs}^s$	-72289	9	16	11		R = .5		.25	spmix	
^{119}Ba	-64590	200				5.4	s	0.3	(5/2 ⁺)	β^+ =100; β^+ p<25
^{119}La	-54970#	400#				1#	s		11/2 ⁻ #	β^+ ?
^{119}Ce	-44000#	600#				200#	ms		5/2 ⁺ #	β^+ ?
$^{119}\text{Ag}^m$ E : estimated from 7/2 ⁺ level in isotopes ^{113}Ag =43 ^{115}Ag =41 ^{117}Ag =28										
$^{119}\text{Sb}^m$	E : estimated less than 20 keV above 2841.7 level									
$^{119}\text{Te}^m$	D : ... ; IT<0.008									
^{120}Ru	-50940#	800#				80#	ms (>300 ns)	0 ⁺	02 95Cz.A I	β^- ?
^{120}Rh	-59230#	600#				200#	ms (>300 ns)		94Be24 I	β^- ?
^{120}Pd	-70150	120				500	ms	100	0 ⁺	β^- =100
^{120}Ag	-75650	70				1.23	s	0.04	3(+)#	β^- =100; β^-n <0.003
$^{120}\text{Ag}^m$	-75450	70	203.0	1.0		371	ms	24	6(-)	β^- ≈63; IT≈37
^{120}Cd	-83974	19				50.80	s	0.21	0 ⁺	β^- =100
^{120}In	-85740	40			*	3.08	s	0.08	1 ⁺	β^- =100
$^{120}\text{In}^m$	-85690#	50#	50#	60#	* &	46.2	s	0.8	5 ⁺	β^- =100
$^{120}\text{In}^n$	-85440#	200#	300#	200#	* &	47.3	s	0.5	8(-)	β^- =100
^{120}Sn	-91105.1	2.5				STABLE			0 ⁺	IS=32.58 9
$^{120}\text{Sn}^m$	-88623.5	2.5	2481.63	0.06		11.8	μ s	0.5	(7 ⁻)	IT=100
$^{120}\text{Sn}^n$	-88202.9	2.5	2902.22	0.22		6.26	μ s	0.11	10 ⁺ #	IT=100
^{120}Sb	-88424	8			*	15.89	m	0.04	1 ⁺	β^+ =100
$^{120}\text{Sb}^m$	-88420#	100#	0#	100#	*	5.76	d	0.02	8 ⁻	β^+ =100
$^{120}\text{Sb}^n$	-88346	8	78.16	0.05		246	ns	2	(3 ⁺)	IT=100
$^{120}\text{Sb}^p$	-86096	8	2328.3	0.6		400	ns	8	(6)	IT=100
^{120}Te	-89405	10				STABLE			0 ⁺	IS=0.09 1; 2 β^+ ?
^{120}I	-83790	18				81.6	m	0.2	2 ⁻	β^+ =100
$^{120}\text{I}^m$	-83717	18	72.61	0.09		228	ns	15	(1 ⁺ , 2 ⁺ , 3 ⁺)	IT=100
$^{120}\text{I}^n$	-83470	23	320	15		53	m	4	(7 ⁻)	β^+ =100
^{120}Xe	-82172	12				40	m	1	0 ⁺	β^+ =100
^{120}Cs	-73889	10			*	61.2	s	1.8	2(-)#	β^+ =100; $\beta^+\alpha$ <2.0e-5 4; ...
$^{120}\text{Cs}^m$	-73790#	60#	100#	60#	*	57	s	6	(7 ⁻)	β^+ =100; $\beta^+\alpha$ <2.0e-5 4; ...
$^{120}\text{Cs}^s$	-73884	9	5	4		R < 0.1			spmix	
^{120}Ba	-68890	300				24	s	2	0 ⁺	β^+ =100
^{120}La	-57690#	500#				2.8	s	0.2	02	β^+ =100; β^+ p=?
^{120}Ce	-49710#	700#				250#	ms		0 ⁺	β^+ ?
$^{120}\text{Ag}^m$ T : average 03Wa13=400(30) 71Fo22=320(40)										
^{120}Cs	D : ... ; β^+ p<7e-6 3									
^{120}Cs	D : isomers not distinguished by 75Ho09 in $\beta^+\alpha$ and β^+ p. Values replaced									
^{120}Cs	D : by upper limits for both (cf. ENSDF evaluation of ^{118}Cs)									
$^{120}\text{Cs}^m$	D : ... ; β^+ p<7e-6 3									

Nuclide	Mass excess (keV)	Excitation energy(keV)	Half-life	J^π	Ens	Reference	Decay modes and intensities (%)
¹²¹ Rh	−57080#	900#	100# ms (>300 ns)	7/2 ⁺ #		94Be24 I	β^- ?
¹²¹ Pd	−66260#	500#	400# ms (>300 ns)		00	94Be24 I	β^- ? *
¹²¹ Ag	−74660	150	790 ms	20	7/2 ⁺ #	00	β^- =100; β^- n=0.080 13
¹²¹ Cd	−81060	80	13.5 s	0.3	(3/2 ⁺)	00	β^- =100
¹²¹ Cd ^m	−80850	80	8.3 s	0.8	(11/2 [−])	00	β^- =100
¹²¹ In	−85841	27	23.1 s	0.6	9/2 ⁺	00	β^- =100
¹²¹ In ^m	−85528	27	3.88 m	0.10	1/2 [−]	00	β^- =98.8 2; IT=1.2 2
¹²¹ Sn	−89204.1	2.5	27.03 h	0.04	3/2 ⁺	00	β^- =100
¹²¹ Sn ^m	−89197.8	2.5	43.9 y	0.5	11/2 [−]	00	IT=77.6 20; β^- =22.4 20
¹²¹ Sn ⁿ	−87205.3	2.7	5.3 μ s	0.5	19/2 ⁺ #	00	IT=100
¹²¹ Sb	−89595.1	2.2	STABLE		5/2 ⁺	00	IS=57.21 5
¹²¹ Te	−88551	26	19.16 d	0.05	1/2 ⁺	00	β^+ =100
¹²¹ Te ^m	−88257	26	154 d	7	11/2 [−]	00	IT=88.6 11; β^+ =11.4 11
¹²¹ I	−86287	10	2.12 h	0.01	5/2 ⁺	00	β^+ =100
¹²¹ I ^m	−83910	10	9.0 μ s	1.5		00	IT=100
¹²¹ Xe	−82473	11	40.1 m	2.0	(5/2 ⁺)	00	β^+ =100
¹²¹ Cs	−77100	14	155 s	4	3/2 ⁺ (⁺)	00	β^+ =100
¹²¹ Cs ^m	−77032	14	122 s	3	9/2 ⁺ (⁺)	00	β^+ =83; IT=17
¹²¹ Ba	−70740	140	29.7 s	1.5	5/2 ⁺ (⁺)	00	β^+ =100; β^+ p=0.02 1
¹²¹ La	−62400#	500#	5.3 s	0.2	11/2 [−] #	00	β^+ =100; β^+ p ?
¹²¹ Ce	−52700#	500#	1.1 s	0.1	(5/2) ⁽⁺⁾ #	00	99Li46 J β^+ =100; β^+ p≈1
¹²¹ Pr	−41580#	700#	600 ms	300	(3/2 [−])	00	90Bo39 TJD p=?; β^+ ?; β^+ p ? *
* ¹²¹ Pd	I : and T>240 ns in 97So07						**
* ¹²¹ Pr	T : T=1.4(0.8) s in ENSDF: not trusted to belong to this nuclide						**
¹²² Rh	−52900#	700#	50# ms (>300 ns)			97Be70 I	β^- ?
¹²² Pd	−64690#	400#	300# ms (>300 ns)		0 ⁺	98 94Be24 I	β^- ? *
¹²² Ag	−71230#	210#	* 520 ms	14	(3 ⁺)	94 95Fe12 T	β^- =100; β^- n=0.186 10 *
¹²² Ag ^m	−71150#	220#	* 1.5 s	0.5	8 [−] #	94	β^- =100; β^- n ?
¹²² Cd	−80730	40	* 5.24 s	0.03	0 ⁺	94	β^- =100
¹²² In	−83580	50	* 1.5 s	0.3	1 ⁺	94	β^- =100
¹²² In ^m	−83540#	80#	* 10.3 s	0.6	5 ⁺	94	β^- =100
¹²² In ⁿ	−83290	130	10.8 s	0.4	8 [−]	94	β^- =100
¹²² Sn	−89945.9	2.7	STABLE		0 ⁺	94	IS=4.63 3; 2 β^- ?
¹²² Sb	−88330.2	2.2	2.7238 d	0.0002	2 [−]	94	β^- =97.59 12; ... *
¹²² Sb ^m	−88166.6	2.2	4.191 m	0.003	(8) [−]	94	IT=100
¹²² Sb ⁿ	−88192.7	2.2	530 μ s		5 ⁺		
¹²² Te	−90314.0	1.5	STABLE		0 ⁺	94	IS=2.55 12
¹²² I	−86080	5	3.63 m	0.06	1 ⁺	94	β^+ =100
¹²² Xe	−85355	11	20.1 h	0.1	0 ⁺	94	ϵ =100
¹²² Cs	−78140	30	21.18 s	0.19	1 ⁺	96 93Al03 T	β^+ =100; β^+ α <2e−7 *
¹²² Cs ^m	−78005	9	3.70 m	0.11	8 [−]	96	β^+ =100
¹²² Cs ⁿ	−78010	30	360 ms	20	(5) [−]	96	IT=100
¹²² Ba	−74609	28	1.95 m	0.15	0 ⁺	94	β^+ =100
¹²² La	−64540#	300#	8.7 s	0.7		94	β^+ =100; β^+ p=?
¹²² Ce	−57840#	400#	2# s		0 ⁺	94	β^+ ?; β^+ p ? *
¹²² Pr	−44890#	500#	500# ms				β^+ ?
* ¹²² Pd	I : and T>240 ns in 97So07						**
* ¹²² Ag	D : β^- n intensity is from 93Ru01						**
* ¹²² Sb	D : ... ; β^+ =2.41 12						**
* ¹²² Cs	T : average 93Al03=21.2(0.2) 69Ch18=21.0(0.7)						**
* ¹²² Cs	D : β^+ α intensity upper limit is from 75Ho09						**
* ¹²² Ce	I : T=8.7(0.7) s in NDS 71 (1994) was misprint for ¹²² La; corrected in ENSDF						**

Nuclide	Mass excess (keV)	Excitation energy(keV)	Half-life	J^π	Ens	Reference	Decay modes and intensities (%)
^{123}Pd	−60610# 600#		200# ms (>300 ns)			94Be24 I	β^- ?
^{123}Ag	−69960# 210#		296 ms	6	(7/2 ⁺)	94 95Fe12 T	β^- =100; β^- -n=0.55 5 *
^{123}Cd	−77310 40		2.10 s	0.02	(3/2 ⁺)	94	β^- =100
$^{123}\text{Cd}^m$	−76990 40	316.52 0.23	1.82 s	0.03	(11/2 [−])	94	β^- =?; IT=?
^{123}In	−83426 24		5.98 s	0.06	9/2 ⁺	94	β^- =100
$^{123}\text{In}^m$	−83099 24	327.21 0.04	47.8 s	0.5	1/2 [−]	94	β^- =100
^{123}Sn	−87820.5 2.7		129.2 d	0.4	11/2 [−]	94	β^- =100
$^{123}\text{Sn}^m$	−87795.9 2.7	24.6 0.4	40.06 m	0.01	3/2 ⁺	94	β^- =100
^{123}Sb	−89224.1 2.1		STABLE		7/2 ⁺	94	IS=42.79 5
^{123}Te	−89171.9 1.5		> 600 Ty		1/2 ⁺	94 96Al30 T	IS=0.89 3; ϵ =100 *
$^{123}\text{Te}^m$	−88924.3 1.5	247.55 0.04	119.25 d	0.15	11/2 [−]	94	IT=100
^{123}I	−87943 4		13.2235 h	0.0019	5/2 ⁺	94 02Un02 T	β^+ =100
^{123}Xe	−85249 10		2.08 h	0.02	1/2 ⁺	94 90Ne.A J	β^+ =100
$^{123}\text{Xe}^m$	−85064 10	185.18 0.22	5.49 μ s	0.26	7/2 ^(−)		
^{123}Cs	−81044 12		5.87 m	0.04	1/2 ⁺	94 93Al03 T	β^+ =100 *
$^{123}\text{Cs}^m$	−80887 12	156.74 0.21	1.64 s	0.12	(11/2 [−])	94	IT=100
$^{123}\text{Cs}^x$	−81037 13	7 4	$R < 0.1$		spmix		
^{123}Ba	−75655 12		2.7 m	0.4	5/2 ⁺	94	β^+ =100
^{123}La	−68710# 200#		17 s	3	11/2 [−] #	94	β^+ =100
^{123}Ce	−60180# 300#		3.8 s	0.2	(5/2 ⁽⁺⁾)	94	β^+ =100; β^+ p=?
^{123}Pr	−50340# 600#		800# ms		3/2 ⁺ #		β^+ ?
* ^{123}Ag	T : average 95Fe12=293(7) 86Ma42=300(20) 83Re05=300(10)				D : from 93Ru01		**
* ^{123}Te	T : and T=24(9) Ey for ϵ (K), same authors						**
* ^{123}Te	I : this nuclide is not considered 'stable' since K ϵ has been observed						**
* ^{123}Cs	T : average 93Al03=5.87(0.05) 68Ch18=5.87(0.05)						**
^{124}Pd	−58800# 500#		100# ms (>300 ns)	0 ⁺		97Be70 I	β^- ?
^{124}Ag	−66470# 200#		* 172 ms	5	3 ⁺ #	97	β^- =100; β^- -n>0.1
$^{124}\text{Ag}^m$	−66470# 220#	0# 100#	* 200# ms		8 [−] #	95Kr.A I	β^- ?; IT ? *
^{124}Cd	−76710 60		1.25 s	0.02	0 ⁺	97	β^- =100
^{124}In	−80880 50		* 3.11 s	0.10	3 ⁺	97	β^- =100
$^{124}\text{In}^m$	−80900 50	−20 70	BD * 3.7 s	0.2	(8 ^(−#))	97	β^- ≈100; IT ?
^{124}Sn	−88236.8 1.4		STABLE	(>100 Py)	0 ⁺	97 52Ka41 T	IS=5.79 5; 2 β^- ?
$^{124}\text{Sn}^m$	−85911.8 1.4	2325.01 0.04	3.1 μ s	0.5	7 [−]	97	IT=100
$^{124}\text{Sn}^n$	−85580.2 1.5	2656.6 0.5	45 μ s	5	10 ⁺ #	97	IT=100
^{124}Sb	−87620.3 2.1		60.20 d	0.03	3 [−]	98	β^- =100
$^{124}\text{Sb}^m$	−87609.4 2.1	10.8627 0.0008	93 s	5	5 ⁺	97	IT=75 5; β^- =25 5
$^{124}\text{Sb}^n$	−87583.5 2.1	36.8440 0.0014	20.2 m	0.2	(8 [−])	97	IT=100
$^{124}\text{Sb}^p$	−87579.5 2.1	40.8038 0.0007	3.2 μ s	0.3	(3 ⁺ , 4 ⁺)	97	IT=100
^{124}Te	−90524.5 1.5		STABLE		0 ⁺	97	IS=4.74 14
^{124}I	−87365.0 2.4		4.1760 d	0.0003	2 [−]	97	β^+ =100
^{124}Xe	−87660.1 1.8		STABLE	(>48 Py)	0 ⁺	97 89Ba22 T	IS=0.09 1; 2 β^+ ?
^{124}Cs	−81731 8		30.9 s	0.4	1 ⁺	97 93Al03 T	β^+ =100 *
$^{124}\text{Cs}^m$	−81268 8	462.55 0.17	6.3 s	0.2	(7 ⁺)	97	IT=100
$^{124}\text{Cs}^x$	−81701 22	30 20	$R=?$		spmix		
^{124}Ba	−79090 12		11.0 m	0.5	0 ⁺	97	β^+ =100
^{124}La	−70260 60		* 29.21 s	0.17	(7 [−] , 8 [−])	97 97As05 T	β^+ =100 *
$^{124}\text{La}^m$	−70160# 120#	100# 100#	* 21 s	4	low ⁽⁺⁾ #	97 97As05 T	β^+ =100
^{124}Ce	−64820# 300#		9.1 s	1.2	0 ⁺	98 97As05 T	β^+ =100 *
^{124}Pr	−53130# 600#		1.2 s	0.2		97	β^+ =100; β^+ p=?
^{124}Nd	−44500# 600#		500# ms		0 ⁺		β^+ ?
* $^{124}\text{Ag}^m$	I : "There is some evidence for a low-spin and a high-spin isomer in ^{124}Ag "						**
* ^{124}Cs	T : average 93Al03=30.9(0.5) 78Ek05=30.8(0.5)						**
* ^{124}La	J : for ^{124}La and $^{124}\text{La}^m$ are from 92Id01						**
* ^{124}Ce	T : average 97As05=10.8(1.5) 78Bo32=6(2)						**

Nuclide	Mass excess (keV)	Excitation energy(keV)				Half-life		J^π	Ens	Reference	Decay modes and intensities (%)
^{125}Ag	-64800# 300#					166	ms	7	$7/2^+\#$	99	$\beta^-=100; \beta^-n=?$
^{125}Cd	-73360 70				*	650	ms	20	$3/2^+\#$	99	$\beta^-=100$
$^{125}\text{Cd}^m$	-73310 50	50	70	BD	*	570	ms	90	$11/2^-\#$	89Hu03 T	$\beta^-=100$
^{125}In	-80480 30					2.36	s	0.04	$9/2^+$	99	$\beta^-=100$
$^{125}\text{In}^m$	-80120 30	360.12	0.09			12.2	s	0.2	$1/2^{(-)}$	99	$\beta^-=100$
^{125}Sn	-85898.5 1.5					9.64	d	0.03	$11/2^-$	99	$\beta^-=100$
$^{125}\text{Sn}^m$	-85871.0 1.5	27.50	0.14			9.52	m	0.05	$3/2^+$	99	$\beta^-=100$
^{125}Sb	-88255.5 2.6					2.75856	y	0.00025	$7/2^+$	99	$\beta^-=100$
^{125}Te	-89022.2 1.5					STABLE			$1/2^+$	99	IS=7.07 15
$^{125}\text{Te}^m$	-88877.4 1.5	144.772	0.009			57.40	d	0.15	$11/2^-$	99	IT=100
^{125}I	-88836.4 1.5					59.400	d	0.010	$5/2^+$	99	$\varepsilon=100$
^{125}Xe	-87192.1 1.9					16.9	h	0.2	$1/2^{(+)}$	99	$\beta^+=100$
$^{125}\text{Xe}^m$	-86939.5 1.9	252.60	0.14			56.9	s	0.9	$9/2^{(-)}$	99	IT=100
^{125}Cs	-84088 8					45	m	1	$1/2^{(+)}$	99	$\beta^+=100$
$^{125}\text{Cs}^m$	-83821 8	266.6	1.1			900	ms	30	$(11/2^-)$	99 98Su16 TJ	IT=100
^{125}Ba	-79668 11					3.5	m	0.4	$1/2^{(+\#)}$	99	$\beta^+=100$
^{125}La	-73759 26					64.8	s	1.2	$(11/2^-)$	99	$\beta^+=100$
$^{125}\text{La}^m$	-73652 26	107.0	0.1			390	ms	40	$(3/2^+)$	99 99Ca21 ETJ	IT=100
^{125}Ce	-66660# 200#					9.3	s	0.3	$(7/2^-)$	99 02Pe15 J	$\beta^+=100; \beta^+p=?$
^{125}Pr	-57910# 400#					3.3	s	0.7	$3/2^+\#$	02	$\beta^+=100; \beta^+p?$
^{125}Nd	-47620# 400#					600	ms	150	$5/2^{(+\#)}$	02	$\beta^+=100$
$^{125}\text{Cd}^m$ T : unweighed average 89Hu03=480(30) 86Ma42=660(30) (Birge ratio $B=4.24$)											
^{125}La J : ENSDF'99 says ground-state spin unknown; a $(11/2^-)$ level lies at 8-9 keV above ground-state											
$^{125}\text{La}^m$ J : $3/2^+\#$ from systematics; low spin and even-parity from 99Ca21											
^{125}Ce T : average 99Ca21=9.6(0.4) 86Wi15=9.2(1.0) 83Ni05=8.9(0.5)											
^{126}Ag	-61010# 300#					107	ms	12	$3^+\#$	03	$\beta^-=100; \beta^-n=?$
^{126}Cd	-72330 50					515	ms	17	0^+	03	$\beta^-=100$
^{126}In	-77810 40				*	1.53	s	0.01	$3^{(+\#)}$	03	$\beta^-=100$
$^{126}\text{In}^m$	-77710 50	100	60	BD	*	1.64	s	0.05	$8^{(-\#)}$	03 79Fo10 J	$\beta^-=100$
^{126}Sn	-86020 11					230	ky	14	0^+	03	$\beta^-=100$
$^{126}\text{Sn}^m$	-83801 11	2218.99	0.08			6.6	μs	1.4	7^-	03	IT=100
$^{126}\text{Sn}^n$	-83456 11	2564.5	0.5			7.7	μs	0.5	$10^+\#$	03	IT=100
^{126}Sb	-86400 30					12.35	d	0.06	(8^-)	03	$\beta^-=100$
$^{126}\text{Sb}^m$	-86380 30	17.7	0.3			19.15	m	0.08	(5^-)	03	$\beta^-=86.4; \text{IT}=14.4$
$^{126}\text{Sb}^n$	-86360 30	40.4	0.3			11	s		(3^-)	03	IT=100
$^{126}\text{Sb}^p$	-86300 30	104.6	0.3			553	ns	5	(3^+)	03	IT=100
^{126}Te	-90064.6 1.5					STABLE			0^+	03	IS=18.84 25
^{126}I	-87911 4					12.93	d	0.05	2^-	03	$\beta^+=52.7.5; \beta^-=47.3.5$
^{126}Xe	-89169 6					STABLE			0^+	03	IS=0.09 1; $2\beta^+?$
^{126}Cs	-84345 12					1.64	m	0.02	1^+	03	$\beta^+=100$
$^{126}\text{Cs}^m$	-84072 12	273.0	0.7			>1	μs			03	IT=100
$^{126}\text{Cs}^n$	-83749 12	596.1	1.1			171	μs	14		03	IT=100
^{126}Ba	-82670 12					100	m	2	0^+	03	$\beta^+=100$
^{126}La	-74970 90				*	54	s	2	$(5^{(+\#)})$	03	$\beta^+=100$
$^{126}\text{La}^m$	-74760 400	210	410	BD	*	20	s	20	$(0^-, 1^-, 2^-)$	03	$\beta^+=100$
^{126}Ce	-70821 28					51.0	s	0.3	0^+	03	$\beta^+=100$
^{126}Pr	-60260# 200#					3.12	s	0.18	$(4.5, 6)$	03 88Ba42 T	$\beta^+=100; \beta^+p=?$
^{126}Nd	-52890# 400#					1#	s	$(>200\text{ns})$	0^+	03 00So11 I	$\beta^+?$
^{126}Pm	-39570# 500#					500#	ms				$\beta^+?$
$^{126}\text{La}^m$ T : 97As05: "by far shorter than 50 s"											
^{126}Pr T : average 95Os03=3.14(0.22) 88Ba42=3.0(0.4) and 83Ni05=3.2(0.6)											

Nuclide	Mass excess (keV)		Excitation energy(keV)		Half-life		J ^π	Ens	Reference	Decay modes and intensities (%)				
¹²⁷ Ag	-58900#	300#			79	ms	3	7/2 ⁺ #	98	96Wo.A	TD	β ⁻ =100; β ⁻ n=?	*	
¹²⁷ Cd	-68520	70			370	ms	70	(3/2 ⁺)	96			β ⁻ =100		
¹²⁷ In	-76990	40			1.09	s	0.01	9/2 ⁽⁺⁾	96	87Eb02	J	β ⁻ =100; β ⁻ n≤0.03		
¹²⁷ In ^m	-76520	70	460	70	BD			(1/2 ⁻)	96			β ⁻ =100; β ⁻ n=0.69 4		
¹²⁷ Sn	-83499	25			2.10	h	0.04	(11/2 ⁻)	96			β ⁻ =100		
¹²⁷ Sn ^m	-83494	25	4.7	0.3				(3/2 ⁺)	96			β ⁻ =100		
¹²⁷ Sb	-86700	5			3.85	d	0.05	7/2 ⁺	96			β ⁻ =100		
¹²⁷ Te	-88281.1	1.5			9.35	h	0.07	3/2 ⁺	96			β ⁻ =100		
¹²⁷ Te ^m	-88192.8	1.5	88.26	0.08				11/2 ⁻	96			IT=97.6 2; β ⁻ =2.4 2		
¹²⁷ I	-88983	4			STABLE			5/2 ⁺	96			IS=100.		
¹²⁷ Xe	-88321	4			36.345	d	0.003	1/2 ⁺	96	02Un02	T	ε=100		
¹²⁷ Xe ^m	-88024	4	297.10	0.08				9/2 ⁻	96			IT=100		
¹²⁷ Cs	-86240	6			6.25	h	0.10	1/2 ⁺	96			β ⁺ =100		
¹²⁷ Cs ^m	-85788	6	452.23	0.21				(11/2 ⁻)	96			IT=100		
¹²⁷ Ba	-82816	11			12.7	m	0.4	1/2 ⁺	96			β ⁺ =100		
¹²⁷ Ba ^m	-82736	11	80.33	0.12				7/2 ⁻	96			IT=100		
¹²⁷ La	-77896	26			5.1	m	0.1	(11/2 ⁻)	96			β ⁺ =100		
¹²⁷ La ^m	-77881	26	14.8	1.2				(3/2 ⁺)	96			β ⁺ ≈100; IT ?		
¹²⁷ Ce	-71980	60			*	29	s	2	5/2 ⁺ #	98	96Ge07	T	β ⁺ =100	
¹²⁷ Ce ^m	-71980#	120#	0#	100#	*	34	s	2	(1/2 ⁺)		96Ge07	TJD	β ⁺ =100	
¹²⁷ Pr	-64430#	200#			4.2	s	0.3	3/2 ⁺ #	98			β ⁺ =100		
¹²⁷ Pr ^m	-63830#	280#	600#	200#		50#	ms	11/2 ⁻		98Mo30	J	β ⁺ ?; IT ?		
¹²⁷ Nd	-55420#	400#			1.8	s	0.4	5/2 ⁺ #	96			β ⁺ =100; β ⁺ p=?		
¹²⁷ Pm	-45060#	600#			1#	s		5/2 ⁺ #				β ⁺ ?; p ?		
* ¹²⁷ Ag	T : supersedes 95Fe12=109(25) from same group											**		
¹²⁸ Ag	-54800#	300#			58	ms	5		01			β ⁻ =100; β ⁻ n=?		
¹²⁸ Cd	-67290	290			280	ms	40	0 ⁺	01			β ⁻ =100		
¹²⁸ In	-74360	50			840	ms	60	(3 ⁺)	01	93Ru01	D	β ⁻ =100; β ⁻ n=0.038 3		
¹²⁸ In ^m	-74110	50	247.87	0.10				(1 ⁻)	01			IT=100	*	
¹²⁸ In ^m	-74040	50	320	60	BD			(8 ⁻)	01			β ⁻ =100		
¹²⁸ Sn	-83335	27			59.07	m	0.14	0 ⁺	01			β ⁻ =100		
¹²⁸ Sn ^m	-81244	27	2091.50	0.11				(7 ⁻)	01			IT=100		
¹²⁸ Sb	-84609	25			*	9.01	h	0.04	8 ⁻	01		β ⁻ =100		
¹²⁸ Sb ^m	-84599	24	10	7	*	10.4	m	0.2	5 ⁺	01		β ⁻ =96.4 10; IT=3.6 10	*	
¹²⁸ Te	-88992.1	1.7			2.2	Yy	0.3	0 ⁺	01	96Ta04	T	IS=31.74 8; 2β ⁻ =100	*	
¹²⁸ Te ^m	-86201.4	1.7	2790.7	0.4				10 ⁺	01			IT=100		
¹²⁸ I	-87738	4			24.99	m	0.02	1 ⁺	01			β ⁻ =93.1 8; β ⁺ =6.9 8		
¹²⁸ I ^m	-87600	4	137.850	0.004				4 ⁻	01			IT=100		
¹²⁸ I ^m	-87571	4	167.367	0.005				(6 ⁻)	01			IT=100		
¹²⁸ Xe	-89860.0	1.4			STABLE			0 ⁺	01			IS=1.92 3		
¹²⁸ Xe ^m	-87072.7	1.5	2787.3	0.4				8 ⁻	01			IT=100		
¹²⁸ Cs	-85931	5			3.640	m	0.014	1 ⁺	01	93A103	T	β ⁺ =100	*	
¹²⁸ Ba	-85402	10			2.43	d	0.05	0 ⁺	01			ε=100		
¹²⁸ La	-78630	50			*	5.18	m	0.14	(5 ⁺)	01		β ⁺ =100		
¹²⁸ La ^m	-78530#	110#	100#	100#	*	< 1.4	m	(1 ⁺ , 2 ⁻)	01			β ⁺ =100		
¹²⁸ Ce	-75534	28			3.93	m	0.02	0 ⁺	01			β ⁺ =100		
¹²⁸ Pr	-66331	30			2.84	s	0.09	(3 ⁺)	01	99Xi03	J	β ⁺ =100; β ⁺ p=?	*	
¹²⁸ Nd	-60180#	200#			5#	s		0 ⁺	01			β ⁺ ?; β ⁺ p ?	*	
¹²⁸ Pm	-48050#	400#			1.0	s	0.3	6 ⁺ #	01	93Li40	D	β ⁺ ≈100; β ⁺ p ?; p=0	*	
¹²⁸ Sm	-39050#	500#			500#	ms		0 ⁺				β ⁺ ?; p ?		
* ¹²⁸ In ^m	T : 10 μs < half-life < 20 ms, cf. ENSDF											**		
* ¹²⁸ Sb ^m	E : less than 20 keV above ground state, cf. ENSDF											**		
* ¹²⁸ Te	T : see also 92Be30=7.7(0.4) not used for consistency with ¹³⁰ Te (see below)											**		
* ¹²⁸ Cs	T : average 93A103=3.66(0.02) 76He04=3.62(0.02)											**		
* ¹²⁸ Pr	D : from 85Wi07											**		
* ¹²⁸ Nd	T : 83Ni05 gave 4(2) s. Proved, by 85Wi07, to be due to ¹²⁸ Pr, not to ¹²⁸ Nd											**		
* ¹²⁸ Pm	D : p=0 from 93Li40 J : as calculated by 02Xu11											**		

Nuclide	Mass excess (keV)	Excitation energy(keV)	Half-life	J^π	Ens	Reference	Decay modes and intensities (%)
¹²⁹ Ag	-52450# 400#		44 ms	7	7/2 ⁺ # 03		$\beta^- = 100; \beta^- n = ?$
¹²⁹ Ag ^m	-52450# 450#	0# 200#	160 ms	1/2 ⁻ # 03			$\beta^- ?; \beta^- n ?$ *
¹²⁹ Cd	-63200# 300#		242 ms	8	3/2 ⁺ # 96	03Pf.A TD	$\beta^- = 100; \beta^- n = ?$
¹²⁹ Cd ^m	-63200# 360#	0# 200#	104 ms	6	11/2 ⁻ #	03Pf.A TD	$\beta^- = 100; \beta^- n = ?$
¹²⁹ In	-72940 40		611 ms	4	9/2 ⁺ # 96	93Ru01 T	$\beta^- = 100; \beta^- n = 0.25 \ 5$ *
¹²⁹ In ^m	-72560 70	380 70	1.23 s	0.03	1/2 ⁻ # 96		$\beta^- \approx 100; IT < 0.3; \dots$ *
¹²⁹ In ⁿ	-71250 40	1688.0 0.5	8.5 μ s	0.5	17/2 ⁻	03Ge04 ETJ	IT=100
¹²⁹ Sn	-80594 29		2.23 m	0.04	3/2 ⁺ # 96		$\beta^- = 100$
¹²⁹ Sn ^m	-80559 29	35.2 0.3	6.9 m	0.1	11/2 ⁻ # 96		$\beta^- \approx 100; IT \approx 0.002$
¹²⁹ Sb	-84628 21		4.40 h	0.01	7/2 ⁺ 96		$\beta^- = 100$
¹²⁹ Sb ^m	-82777 21	1851.05 0.10	17.7 m	0.1	(19/2 ⁻) 96		$\beta^- = 85; IT = 15$
¹²⁹ Sb ⁿ	-82767 21	1860.90 0.10	> 2 μ s		(15/2 ⁻) 96		IT=100
¹²⁹ Sb ^p	-82489 21	2138.9 0.5	1.1 μ s	0.1	(23/2 ⁺)	03Ge04 ETJ	IT=100
¹²⁹ Te	-87003.2 1.8		69.6 m	0.3	3/2 ⁺ 96		$\beta^- = 100$
¹²⁹ Te ^m	-86897.7 1.8	105.50 0.05	33.6 d	0.1	11/2 ⁻ 96		IT=63 17; $\beta^- = 37 \ 17$
¹²⁹ I	-88503 3		15.7 My	0.4	7/2 ⁺ 96		$\beta^- = 100$
¹²⁹ Xe	-88697.4 0.7		STABLE		1/2 ⁺ 96		IS=26.44 24
¹²⁹ Xe ^m	-88461.3 0.7	236.14 0.05	8.88 d	0.02	11/2 ⁻ 96		IT=100
¹²⁹ Cs	-87500 5		32.06 h	0.06	1/2 ⁺ 96		$\beta^+ = 100$
¹²⁹ Ba	-85065 11		2.23 h	0.11	1/2 ⁺ 96		$\beta^+ = 100$
¹²⁹ Ba ^m	-85057 11	8.42 0.06	2.16 h	0.02	7/2 ⁺ # 96		$\beta^+ \approx 100; IT = ?$
¹²⁹ La	-81326 21		11.6 m	0.2	3/2 ⁺ 96		$\beta^+ = 100$
¹²⁹ La ^m	-81154 21	172.1 0.4	560 ms	50	11/2 ⁻ 96		IT=100
¹²⁹ Ce	-76287 28		3.5 m	0.3	(5/2 ⁺) 97	93Al03 T	$\beta^+ = 100$ *
¹²⁹ Ce ^m	-76179 28	107.6 0.1	62 ns	5	(7/2 ⁻) 96		IT=100
¹²⁹ Pr	-69774 30		30 s	4	(3/2 ⁺) 96	96Gi08 J	$\beta^+ = 100$
¹²⁹ Pr ^m	-69390 30	382.7 0.5	1# ms		(11/2 ⁻)	97Gi07 EJD	IT=100
¹²⁹ Nd	-62240# 200#		4.9 s	0.2	5/2 ⁺ # 96		$\beta^+ = 100; \beta^+ p = ?$
¹²⁹ Pm	-52950# 400#		3# s (>200 ns)		5/2 ⁺ #	00So11 I	$\beta^+ ?$
¹²⁹ Sm	-42250# 500#		550 ms	100	5/2 ⁺ #	99Xu05 TD	$\beta^+ = 100$
* ¹²⁹ Ag	I : the evaluators are not convinced by the identification arguments						**
* ¹²⁹ In	T : average 93Ru01=611(5) 86Wa17=610(10)						**
* ¹²⁹ In ^m	D : ... ; $\beta^- n = 2.5 \ 5$						**
* ¹²⁹ Ce	J : from 96Gi08 (5/2 ⁺ in ENSDF was from theory)						**
¹³⁰ Ag	-46160# 330#		50 ms	0 ⁺	01		$\beta^- = 100; \beta^- n ?$
¹³⁰ Cd	-61570 280		162 ms	7	0 ⁺ 01	01Ha39 TD	$\beta^- = 100; \beta^- n = 3.5 \ 10$
¹³⁰ In	-69890 40		290 ms	20	(1 ⁻) 01		$\beta^- = 100; \beta^- n = 0.93 \ 13$
¹³⁰ In ^m	-69840 40	50 50	538 ms	5	10 ⁻ # 01	93Ru01 T	$\beta^- = 100; \beta^- n = 1.65 \ 15$ *
¹³⁰ In ⁿ	-69490 50	400 60	540 ms	10	(5 ⁺) 01		$\beta^- = 100; \beta^- n = 1.65 \ 15$
¹³⁰ Sn	-80139 11		3.72 m	0.07	0 ⁺ 01		$\beta^- = 100$
¹³⁰ Sn ^m	-78192 11	1946.88 0.10	1.7 m	0.1	7 ⁻ # 01		$\beta^- = 100$
¹³⁰ Sb	-82292 17		39.5 m	0.8	8 ⁻ # 01		$\beta^- = 100$
¹³⁰ Sb ^m	-82287 17	4.80 0.20	6.3 m	0.2	(4,5) ⁺ 01		$\beta^- = 100$
¹³⁰ Te	-87351.4 1.9		790 Ey	100	0 ⁺ 01	96Ta04 TD	IS=34.08 62; $2\beta^- = 100$ *
¹³⁰ Te ^m	-85205.0 1.9	2146.41 0.04	115 ns	8	(7 ⁻) 01		IT=100
¹³⁰ Te ⁿ	-84690 7	2661 7	1.90 μ s	0.08	(10 ⁺) 01		IT=100 *
¹³⁰ Te ^p	-82976.0 2.6	4375.4 1.8	261 ns	33	01		IT=100
¹³⁰ I	-86932 3		12.36 h	0.01	5 ⁺ 01		$\beta^- = 100$
¹³⁰ I ^m	-86892 3	39.9525 0.0013	8.84 m	0.06	2 ⁺ 01		IT=84 2; $\beta^- = 16 \ 2$
¹³⁰ Xe	-89881.7 0.7		STABLE		0 ⁺ 01		IS=4.08 2
¹³⁰ Cs	-86900 8		29.21 m	0.04	1 ⁺ 01		$\beta^+ = 98.4; \beta^- = 1.6$
¹³⁰ Cs ^m	-86737 8	163.25 0.11	3.46 m	0.06	5 ⁻ 01		IT \approx 100; $\beta^+ = 0.16 \ 2$
¹³⁰ Cs ^x	-86873 17	27 15	R = .2 .1	fsmix			
¹³⁰ Ba	-87261.6 2.8		STABLE	(>4.0 Zy)	0 ⁺ 01	96Ba24 T	IS=0.106 1; $2\beta^+ ?$
¹³⁰ Ba ^m	-84786.5 2.8	2475.12 0.18	9.54 ms	0.14	8 ⁻ 01	02Mo31 T	IT=100 *

... A-group is continued on next page ...

Nuclide	Mass excess (keV)		Excitation energy(keV)		Half-life	J^π	Ens	Reference	Decay modes and intensities (%)	
... A-group continued ...										
¹³⁰ La	-81628	26			8.7 m	0.1	3(+)	01	$\beta^+=100$	
¹³⁰ Ce	-79423	28			22.9 m	0.5	0+	01	$\beta^+=100$	
¹³⁰ Ce ^m	-76969	28	2453.6	0.3	100 ns	8	(7-)	01	IT=100	
¹³⁰ Pr	-71180	60			40.0 s	0.4	(6,7)(+ [#])	01	$\beta^+=100$	
¹³⁰ Pr ^m	-71080#	120#	100#	100#	10# s		2 ⁺ #	01	$\beta^+?$	
¹³⁰ Nd	-66596	28			21 s	3	0+	01	$\beta^+=100$	
¹³⁰ Pm	-55470#	300#			2.6 s	0.2	(5 ⁺ , 6 ⁺ , 4 ⁺)	01	$\beta^+=100; \beta^+p=?$	
¹³⁰ Sm	-47580#	400#			1# s		0+	01	$\beta^+?$	
¹³⁰ Eu	-33940#	500#			1.1 ms	0.5	2 ⁺ #	02Ma61	TD p=?; $\beta^+=1\#$	
¹³⁰ In ^m	T : average 93Ru01=542(9) 85Re.A=532(6) and 86Wa17=550(10)									
¹³⁰ In ^m	T : 76Lu02=580(10) at variance, not used									
¹³⁰ Te	T : see also numerous (not used) results in 95Tr07									
¹³⁰ Te	T : treated by ENSDF'01 as a lower limit (not accepted by NUBASE)									
¹³⁰ Te ⁿ	E : less than 25 keV above 2648.57(0.22) (8 ⁺) level, see ENSDF'01									
¹³⁰ Ba ^m	T : others 66Br14=8.8(0.2) 69Wa.A=13.5(1.0) not used									
¹³⁰ Pr ^m	J : 88Ba42: there is also a low-spin component in ¹³⁰ Pr activity									
¹³⁰ Pr ^m	J : see also the discussion in 01Gi17 on three isomeric states in ¹³⁰ Pr									
¹³⁰ Nd	T : other conflicting data, not used: 00Xu08=13(3) 77Bo02=28(3)									
¹³¹ Cd	-55270#	300#			68 ms	3	7/2 ⁻ #	00Ha55	TD $\beta^-=100; \beta^-n=3.5$ 10	
¹³¹ In	-68137	28			280 ms	30	(9/2 ⁺)	94	93Ru01 D $\beta^-=100; \beta^-n=2.2$ 3	
¹³¹ In ^m	-67790	40	350	40	BD	350 ms	50	(1/2 ⁻)	94	$\beta^-\approx 100; \dots$
¹³¹ In ⁿ	-64040	70	4100	70	BD	320 ms	60	(19..23/2 ⁺)	94	$\beta^->99; \dots$
¹³¹ Sn	-77314	21			56.0 s	0.5	(3/2 ⁺)	94		$\beta^-=100$
¹³¹ Sn ^m	-77230#	40#	80#	30#	58.4 s	0.5	(11/2 ⁻)	94	01Si.A	E $\beta^-=100; IT<0.0004\#$
¹³¹ Sb	-81988	21			23.03 m	0.04	(7/2 ⁺)	94		$\beta^-=100$
¹³¹ Te	-85209.5	1.9			25.0 m	0.1	3/2 ⁺	94		$\beta^-=100$
¹³¹ Te ^m	-85027.3	1.9	182.250	0.020	30 h	2	11/2 ⁻	94		$\beta^-=77.8$ 16; IT=22.2 16
¹³¹ I	-87444.4	1.1			8.02070 d	0.00011	7/2 ⁺	94		$\beta^-=100$
¹³¹ Xe	-88415.2	1.0			STABLE		3/2 ⁺	94		IS=21.18 3
¹³¹ Xe ^m	-88251.3	1.0	163.930	0.008	11.84 d	0.07	11/2 ⁻	94		IT=100
¹³¹ Cs	-88060	5			9.689 d	0.016	5/2 ⁺	94		$\varepsilon=100$
¹³¹ Ba	-86683.8	2.8			11.50 d	0.06	1/2 ⁺	94		$\beta^+=100$
¹³¹ Ba ^m	-86496.7	2.8	187.14	0.12	14.6 m	0.2	9/2 ⁻	94		IT=100
¹³¹ La	-83769	28			59 m	2	3/2 ⁺	94		$\beta^+=100$
¹³¹ La ^m	-83464	28	304.52	0.24	170 μ s	10	11/2 ⁻	94		IT=100
¹³¹ Ce	-79720	30			10.2 m	0.3	(7/2 ⁺)	99		$\beta^+=100$
¹³¹ Ce ^m	-79660	30	61.8	0.1	5.0 m	1.0	(1/2 ⁺)	99	96Gi08	E $\beta^+=100$
¹³¹ Ce ⁿ	-79560	30	162.00	0.09	70 ns	5	(9/2 ⁻)			
¹³¹ Pr	-74280	50			1.50 m	0.03	(3/2 ⁺)	94	96Gi08	T $\beta^+=100$
¹³¹ Pr ^m	-74130	50	152.4	0.2	5.7 s	0.2	(11/2 ⁻)	94	96Ge12	ED IT=96.4 12; $\beta^+=3.6$ 12
¹³¹ Nd	-67769	28			33 s	3	(5/2)(+ [#])	94	96Ge12	T $\beta^+=100; \beta^+p=?$
¹³¹ Nd ^m	-67412	28	357	3	50 ns		(7/2 ⁻)	94	96Ge12	J IT=100
¹³¹ Pm	-59740#	200#			6.3 s	0.8	5/2 ⁺ #	94	99Ga41	T $\beta^+=100; \beta^+p?$
¹³¹ Sm	-50200#	300#			1.2 s	0.2	5/2 ⁺ #	94		$\beta^+=100; \beta^+p=?$
¹³¹ Eu	-39350#	400#			17.8 ms	1.9	3/2 ⁺	02		p=?; $\beta^+=12\#$
¹³¹ In ^m	D : ... ; $\beta^-n\leq 2.0$ 4; IT \leq 0.018									
¹³¹ In ^m	D : ... ; $\beta^-n=0.028$ 5; IT \leq 1									
¹³¹ Sn ^m	E : ENSDF'94=241.8(0.8) questioned from theoretical and exp. considerations									
¹³¹ Pr	T : average 96Gi08=1.57(0.07) 93Al03=1.48(0.02) and 83Ga.A=1.58(0.05)									

Nuclide	Mass excess (keV)		Excitation energy(keV)		Half-life		J^π	Ens	Reference	Decay modes and intensities (%)		
^{132}Cd	-50720#	500#			97 ms	10	0^+		00Ha55	TD	β^- =100; β^- n=60 15	
^{132}In	-62420	60			206 ms	4	(7^-)	02			β^- =100; β^- n=6.2 11	
^{132}Sn	-76554	14			39.7 s	0.5	0^+	92			β^- =100	
^{132}Sb	-79674	14			2.79 m	0.05	(4^+)	92			β^- =100	
$^{132}\text{Sb}^m$	-79470	30	200	30	4.15 m	0.05	(8^-)	92	89St06	E	β^- =100	
^{132}Te	-85182	7			3.204 d	0.013	0^+	92			β^- =100	
^{132}I	-85700	6			2.295 h	0.013	4^+	92			β^- =100	
$^{132}\text{I}^m$	-85595	10	104	12	BD	1.387 h	0.015	(8^-)	92		IT=86 2; β^- =14 2	
^{132}Xe	-89280.5	1.0			STABLE		0^+	92			IS=26.89 6	
$^{132}\text{Xe}^m$	-86528.2	1.0	2752.27	0.17		8.39 ms	0.11	(10^+)	92		IT=100	
^{132}Cs	-87155.9	1.9				6.479 d	0.007	2^+	92		β^+ =98.13 9; β^- =1.87 9	
^{132}Ba	-88434.8	1.1			STABLE	(>300 Ey)	0^+	94	96Ba24	T	IS=0.101 1; $2\beta^+$?	
^{132}La	-83740	40				4.8 h	0.2	2^-	94		β^+ =100	
$^{132}\text{La}^m$	-83550	40	188.18	0.11		24.3 m	0.5	6^-	94		IT=76; β^+ =24	
^{132}Ce	-82474	21				3.51 h	0.11	0^+	99		β^+ =100	
$^{132}\text{Ce}^m$	-80133	21	2340.8	0.5		9.4 ms	0.3	(8^-)	99	01Mo05	TJ	IT=100
^{132}Pr	-75210	60			*	1.49 m	0.11	(2^+)	01	94Bu18	TJ	β^+ =100
$^{132}\text{Pr}^m$	-75210#	120#	0#	100#	*	20# s		(5^+)		90Ko25	J	β^+ ?
^{132}Nd	-71426	24				1.56 m	0.10	0^+	97	95Bu11	T	β^+ =100
^{132}Pm	-61710#	200#				6.3 s	0.7	(3^-)	92		β^+ =100; β^+ p \approx 5e-5	
^{132}Sm	-55250#	300#				4.0 s	0.3	0^+	92		β^+ =100; β^+ p ?	
^{132}Eu	-42500#	400#				100# ms				93Li40	D	β^+ ?; p=0
* ^{132}Pr	T : average 94Bu18=1.47(0.12) 74Ar27=1.6(0.3)										**	
* ^{132}Nd	T : average 95Bu11=1.47(0.12) 77Bo02=1.75(0.17)										**	
^{133}In	-57930#	300#			165 ms	3	$(9/2^+)$	02	96Ho16	J	β^- =100; β^- n=85 10	
$^{133}\text{In}^m$	-57600#	300#	330#	40#	180# ms		$(1/2^-)$		96Ho16	J	IT ?	
^{133}Sn	-70950	40			1.45 s	0.03	$7/2^-$ #	98	93Ru01	D	β^- =100; β^- n=0.0294 24	
^{133}Sb	-78943	25			2.5 m	0.1	$(7/2^+)$	95			β^- =100	
^{133}Te	-82945	24			12.5 m	0.3	$(3/2^+)$	95			β^- =100	
$^{133}\text{Te}^m$	-82611	24	334.26	0.04		55.4 m	0.4	$(11/2^-)$	95		β^- =82.5 30; IT=17.5 30	
^{133}I	-85887	5			20.8 h	0.1	$7/2^+$	95			β^- =100	
$^{133}\text{I}^m$	-84253	5	1634.174	0.017		9 s	2	$(19/2^-)$	95		IT=100	
^{133}Xe	-87643.6	2.4			5.2475 d	0.0005	$3/2^+$	95	02Un02	T	β^- =100	
$^{133}\text{Xe}^m$	-87410.4	2.4	233.221	0.018		2.19 d	0.01	$11/2^-$	95		IT=100	
^{133}Cs	-88070.958	0.022			STABLE		$7/2^+$	95			IS=100.	
^{133}Ba	-87553.5	1.0			10.51 y	0.05	$1/2^+$	95			ε =100	
$^{133}\text{Ba}^m$	-87265.3	1.0	288.247	0.009		38.9 h	0.1	$11/2^-$	95		IT \approx 100; ε =0.0096 11	
^{133}La	-85494	28			3.912 h	0.008	$5/2^+$	95			β^+ =100	
$^{133}\text{La}^m$	-84958	28	535.60	0.02		62 ns	3	$11/2^-$				
^{133}Ce	-82423	16			97 m	4	$1/2^+$	97			β^+ =100	
$^{133}\text{Ce}^m$	-82386	16	37.1	0.8		4.9 h	0.4	$9/2^-$	97		β^+ =100	
^{133}Pr	-77938	12			6.5 m	0.3	$(3/2^+)$	97			β^+ =100	
$^{133}\text{Pr}^m$	-77746	12	192.05	0.14		1.1 μ s	0.2	$(11/2^-)$	97	01Xu04	T	IT=100
^{133}Nd	-72330	50			70 s	10	$(7/2^+)$	97			β^+ =100	
$^{133}\text{Nd}^m$	-72200	50	127.97	0.11		70 s		$(1/2^+)$	97	95Br24	D	β^+ \approx 100; IT=?
$^{133}\text{Nd}^n$	-72150	50	176.10	0.10		300 ns		$(9/2^-)$	97		IT=100	
^{133}Pm	-65410	50			&	15 s	3	$(3/2^+)$	95	96Ga17	J	β^+ =100
$^{133}\text{Pm}^m$	-65280	50	130.4	1.0	&	10# s		$(11/2^-)$	97	96Ga17	EJ	β^+ ?; IT ?
^{133}Sm	-57130#	200#				2.90 s	0.17	$(5/2^+)$	01	01Xu04	T	β^+ =100; β^+ p=?
^{133}Eu	-47280#	300#				200# ms		$11/2^-$ #			β^+ ?	
* ^{133}In	D : β^- n intensity is from 93Ru01										**	
* $^{133}\text{Pm}^m$	E : combining γ s from Table 1: 214.7 + 357.7 + 453.8 - 252.8 - 643(1)										**	
* ^{133}Sm	T : average 01Xu04=3.1(0.5) 85Wi07=2.8(0.2) 77Bo02=3.2(0.4)										**	

Nuclide	Mass excess (keV)	Excitation energy(keV)		Half-life		J^π	Ens	Reference	Decay modes and intensities (%)
^{136}Sn	−56500#	500#			250 ms	30	0 ⁺	02	β^- =100; β^- -n=30 5
^{136}Sb	−64880#	300#			923 ms	14	1 [−] #	02	β^- =100; β^- -n=16.3 32;...
$^{136}\text{Sb}^m$	−64710#	300#	173	3	570 ns	50	6 [−] #	02	01Mi22 E
^{136}Te	−74430	50			17.63 s	0.08	0 ⁺	02	β^- =100; β^- -n=1.31 5
^{136}I	−79500	50			83.4 s	1.0	(1 [−])	02	β^- =100
$^{136}\text{I}^m$	−78850	110	650	120	46.9 s	1.0	(6 [−])	02	β^- =100; IT=0
^{136}Xe	−86425	7			STABLE	(>10 Zy)	0 ⁺	02	02Be74 T
$^{136}\text{Xe}^m$	−84533	7	1891.703	0.014	2.95 μs	0.09	6 ⁺	02	IT=100
^{136}Cs	−86338.7	1.9			13.16 d	0.03	5 ⁺	02	β^- =100
$^{136}\text{Cs}^m$	−85821	5	518	5	19 s	2	8 [−]	02	83We07 E
^{136}Ba	−88886.9	0.4			STABLE		0 ⁺	02	IS=8.87 16; 2 β^- ?
$^{136}\text{Ba}^m$	−86856.4	0.4	2030.466	0.018	308.4 ms	1.9	7 [−]	02	IT=100
^{136}La	−86040	50			9.87 m	0.03	1 ⁺	02	β^+ =100
$^{136}\text{La}^m$	−85790	50	255	9	114 ms	3	(8) ^(−#)	02	01Da22 T
^{136}Ce	−86468	13			STABLE	(>38 Py)	0 ⁺	02	IS=0.185 2; 2 β^+ ?
$^{136}\text{Ce}^m$	−83373	13	3095.5	0.4	2.2 μs	0.2	10 ⁺	02	IT=100
^{136}Pr	−81327	12			13.1 m	0.1	2 ⁺	02	β^+ =100
$^{136}\text{Pr}^m$	−80732	12	594.62	0.22	91.7 ns	0.9	(6) ⁺	02	IT=100
^{136}Nd	−79199	12			50.7 m	0.3	0 ⁺	02	β^+ =100
^{136}Pm	−71200	80			107 s	6	(5 [−])	02	β^+ =100
$^{136}\text{Pm}^m$	−71070	90	130	120	47 s	2	(2 ⁺)	02	β^+ =100
^{136}Sm	−66811	12			47 s	2	0 ⁺	02	β^+ =100
$^{136}\text{Sm}^m$	−64546	12	2264.7	1.1	15 μs	1	(8 [−])	02	IT=100
^{136}Eu	−56260#	200#			3.3 s	0.3	(7 ⁺)	02	89Vi04 D
$^{136}\text{Eu}^m$	−56260#	540#	0#	500#	3.8 s	0.3	(3 ⁺)	02	89Vi04 D
^{136}Gd	−49050#	400#			1# s	(>200 ns)	0 ⁺	02	00So11 I
^{136}Tb	−35970#	600#			200# ms			02	β^+ ?
* ^{136}Sb	D : . . . ; β^- -2n=0.28#								**
* $^{136}\text{La}^m$	E : approx. 10–40 keV above 230.1 level, from ENSDF'02, thus 230.1 + 25(9)								**
^{137}Sn	−50310#	600#			190 ms	60	5/2 [−] #	02	β^- =100; β^- -n=58 15
^{137}Sb	−60260#	400#			450 ms	50	7/2 ⁺ #	94	02Sh08 TD
^{137}Te	−69560	120			2.49 s	0.05	3/2 [−] #	94	93Ru01 D
^{137}I	−76503	28			24.13 s	0.12	(7/2 ⁺)	94	93Ru01 TD
^{137}Xe	−82379	7			3.818 m	0.013	7/2 [−]	94	β^- =100; β^- -n=7.14 23
^{137}Cs	−86545.6	0.5			30.1671 y	0.0013	7/2 ⁺	01	β^- =100
^{137}Ba	−87721.2	0.4			STABLE		3/2 ⁺	97	IS=11.232 24
$^{137}\text{Ba}^m$	−87059.5	0.4	661.659	0.003	2.552 m	0.001	11/2 [−]	97	IT=100
^{137}La	−87101	13			60 ky	20	7/2 ⁺	94	ε =100
^{137}Ce	−85879	13			9.0 h	0.3	3/2 ⁺	94	β^+ =100
$^{137}\text{Ce}^m$	−85625	13	254.29	0.05	34.4 h	0.3	11/2 [−]	94	IT=99.22 3; β^+ =0.78 3
^{137}Pr	−83177	12			1.28 h	0.03	5/2 ⁺	94	β^+ =100
$^{137}\text{Pr}^m$	−82616	12	561.22	0.23	2.66 μs		11/2 [−]		
^{137}Nd	−79580	11			38.5 m	1.5	1/2 ⁺	01	β^+ =100
$^{137}\text{Nd}^m$	−79061	11	519.43	0.17	1.60 s	0.15	(11/2 [−])	01	IT=100
^{137}Pm	−74073	13			2# m		5/2 ⁺ #		β^+ ?
$^{137}\text{Pm}^m$	−73920	50	150	50	2.4 m	0.1	11/2 [−]	94	β^+ =100
^{137}Sm	−68030	40			45 s	1	(9/2 [−])	94	β^+ =100
$^{137}\text{Sm}^m$	−67850#	60#	180#	50#	20# s		1/2 ⁺ #		β^+ ?
^{137}Eu	−60020#	200#			8.4 s	0.5	11/2 [−] #	94	88Be.A T
^{137}Gd	−51210#	400#			2.2 s	0.2	7/2 ⁺ #	94	99Xu05 T
^{137}Tb	−41000#	600#			600# ms		11/2 [−] #	96	p^- ; β^+ ?
* ^{137}I	T : supersedes 74Ru08=24.5(0.2) from same group								*

Nuclide	Mass excess (keV)	Excitation energy(keV)	Half-life	J^π	Ens	Reference	Decay modes and intensities (%)
^{138}Sb	−55150# 300#		500# ms (>300 ns)	2^-	03	94Be24 I	β^- ?; $\beta^- n$?
^{138}Te	−65930# 210#		1.4 s	0^+	03		β^- =100; $\beta^- n$ =6.3 21
^{138}I	−72330 80		6.23 s	0.03 (2^-)	03	93Ru01 D	β^- =100; $\beta^- n$ =5.46 18
^{138}Xe	−80150 40		14.08 m	0.08 0^+	03		β^- =100
^{138}Cs	−82887 9		33.41 m	0.18 3^-	03		β^- =100
$^{138}\text{Cs}^m$	−82807 9	79.9 0.3	2.91 m	0.08 6^-	03		IT=81 2; β^- =19 2
$^{138}\text{Cs}^k$	−82847 25	40 23	$R=?$	fsmix			
^{138}Ba	−88261.6 0.4		STABLE	0^+	03		IS=71.698 42
$^{138}\text{Ba}^m$	−86171.1 0.4	2090.54 0.06	800 ns	100 6^+	03		IT=100
^{138}La	−86525 4		102 Gy	1 5^+	03		IS=0.090 1; ... *
$^{138}\text{La}^m$	−86452 4	72.57 0.03	116 ns	5 (3^+)	03		IT=100
^{138}Ce	−87569 10		STABLE (>150 Ty)	0^+	03	01Da22 T	IS=0.251 2; $2\beta^+$?
$^{138}\text{Ce}^m$	−85440 10	2129.17 0.12	8.65 ms	0.20 7^-	03		IT=100
^{138}Pr	−83132 14		1.45 m	0.05 1^+	03		β^+ =100
$^{138}\text{Pr}^m$	−82783 17	348 23 BD	2.12 h	0.04 7^-	03		β^+ =100
^{138}Nd	−82018 12		5.04 h	0.09 0^+	03		β^+ =100
$^{138}\text{Nd}^m$	−78843 12	3174.9 0.4	410 ns	50 (10^+)	03		IT=100
^{138}Pm	−74940 27		10 s	2 1^+	03		β^+ =100
$^{138}\text{Pm}^m$	−74911 13	30 30 BD *	3.24 m	0.05 5^-	03		β^+ =100
$^{138}\text{Pm}^n$		non existent EU	3.24 m	0.05 (3^+)	03	81De38 I	β^+ =100 *
^{138}Sm	−71498 12		3.1 m	0.2 0^+	03		β^+ =100
^{138}Eu	−61750 28		12.1 s	0.6 (6^-)	03		β^+ =100
^{138}Gd	−55780# 200#		4.7 s	0.9 0^+	03		β^+ =100
$^{138}\text{Gd}^m$	−53550# 200#	2232.7 1.1	6 μs	1 (8^-)	03		
^{138}Tb	−43630# 400#		800# ms (>200 ns)		03	00So11 I	β^+ ?; p=0 *
^{138}Dy	−34940# 600#		200# ms	0^+			β^+ ?
* ^{138}La	D : ... ; β^+ =65.6 5; β^- =34.4 5						**
* $^{138}\text{Pm}^n$	D : arguments for a second isomer, of intermediate spin, are not convincing						**
* ^{138}Tb	D : from 93Li40						**
^{139}Sb	−50320# 500#		300# ms (>300 ns)	$7/2^+$	01	94Be24 I	β^- ?
^{139}Te	−60800# 400#		500# ms (>300 ns)	$5/2^-$	01	94Be24 I	β^- ?; $\beta^- n$?
^{139}I	−68840 30		2.282 s	0.010 $7/2^+$	01	93Ru01 T	β^- =100; $\beta^- n$ =10.0 3 *
^{139}Xe	−75644 21		39.68 s	0.14 $3/2^-$	01		β^- =100
^{139}Cs	−80701 3		9.27 m	0.05 $7/2^+$	01		β^- =100
^{139}Ba	−84913.7 0.4		83.1 m	0.3 ($7/2^-$)	01		β^- =100
^{139}La	−87231.4 2.4		STABLE	$7/2^+$	01		IS=99.910 1
^{139}Ce	−86952 7		137.641 d	0.020 $3/2^+$	01		ϵ =100
$^{139}\text{Ce}^m$	−86198 7	754.24 0.08	56.54 s	0.13 $11/2^-$	01	94It.A T	IT=100
^{139}Pr	−84823 8		4.41 h	0.04 $5/2^+$	01		β^+ =100
^{139}Nd	−81992 26		29.7 m	0.5 $3/2^+$	01		β^+ =100
$^{139}\text{Nd}^m$	−81761 26	231.15 0.05	5.50 h	0.20 $11/2^-$	01		β^+ =88.2 4; IT=11.8 4
^{139}Pm	−77496 13		4.15 m	0.05 ($5/2^+$)	01		β^+ =100
$^{139}\text{Pm}^m$	−77307 13	188.7 0.3	180 ms	20 ($11/2^-$)	01		IT \approx 100; β^+ =0.16#
^{139}Sm	−72380 11		2.57 m	0.10 $1/2^+$	01		β^+ =100
$^{139}\text{Sm}^m$	−71923 11	457.40 0.22	10.7 s	0.6 $11/2^-$	01		IT=93.7 5; β^+ =6.3 5
^{139}Eu	−65398 13		17.9 s	0.6 ($11/2^-$)	01		β^+ =100
^{139}Gd	−57530# 200#		5.7 s	0.3 $9/2^-$	01	99Xi04 T	β^+ =100; $\beta^+ p$ =? *
$^{139}\text{Gd}^m$	−57280# 250#	250# 150# *	4.8 s	0.9 $1/2^+$	01		β^+ =100; $\beta^+ p$ =? *
^{139}Tb	−48170# 300#		1.6 s	0.2 $11/2^-$	01		β^+ =100; $\beta^+ p$?
^{139}Dy	−37690# 500#		600 ms	200 $7/2^+$	01		β^+ =100; $\beta^+ p$?
* ^{139}I	T : average 93Ru01=2.280(0.011) 80Al15=2.29(0.02)						**
* ^{139}Gd	T : average 99Xi04=5.8(0.9) 88Be.A=5.8(0.4); other 83Ni05=4.9(1.0) not used						**
* ^{139}Gd	T : since it corresponds to a mixture of ground-state and isomer						**
* $^{139}\text{Gd}^m$	D : assuming that the delayed protons reported by 83Ni05 are from both states						**

Nuclide	Mass excess (keV)	Excitation energy(keV)	Half-life	J^π	Ens	Reference	Decay modes and intensities (%)
¹⁴⁰ Te	-56960#	300#	300# ms (>300 ns)	0 ⁺	98	94Be24 I	β^- ?; $\beta^- n$?
¹⁴⁰ I	-64270#	200#	860 ms	40 (3) ^(-#)	95		β^- =100; $\beta^- n$ =9.3 10
¹⁴⁰ Xe	-72990	60	13.60 s	0.10 0 ⁺	02		β^- =100
¹⁴⁰ Cs	-77051	8	63.7 s	0.3 1 ⁻	95		β^- =100
¹⁴⁰ Ba	-83271	8	12.752 d	0.003 0 ⁺	98		β^- =100
¹⁴⁰ La	-84321.0	2.4	1.6781 d	0.0003 3 ⁻	95		β^- =100
¹⁴⁰ Ce	-88083.3	2.5	STABLE	0 ⁺	95		IS=88.450 51
¹⁴⁰ Ce ^m	-85975.5	2.5	2107.85 0.03	7.3 μ s	1.5 6 ⁺		
¹⁴⁰ Pr	-84695	6	3.39 m	0.01 1 ⁺	95		β^+ =100
¹⁴⁰ Pr ^m	-83932	6	763.3 0.7	3.05 μ s	0.20 (8) ⁻		
¹⁴⁰ Nd	-84252	28	3.37 d	0.02 0 ⁺	95		ϵ =100
¹⁴⁰ Nd ^m	-82031	28	2221.4 0.1	600 μ s	50 7 ⁻	95	IT=100
¹⁴⁰ Pm	-78210	40	9.2 s	0.2 1 ⁺	95		β^+ =100
¹⁴⁰ Pm ^m	-77783	13	420 40 BD	5.95 m	0.05 8 ⁻	95	β^+ =100
¹⁴⁰ Sm	-75456	12	14.82 m	0.12 0 ⁺	95		β^+ =100
¹⁴⁰ Eu	-66990	50	1.51 s	0.02 1 ⁺	95		β^+ =100
¹⁴⁰ Eu ^m	-66780	50	210 15	125 ms	2 5 ⁻ #	95	IT \approx 100; β^+ <1 *
¹⁴⁰ Gd	-61782	28	15.8 s	0.4 0 ⁺	95	ABBW E	β^+ =100
¹⁴⁰ Tb	-50480	800	2.4 s	0.2 5	97	91Fi03 T	β^+ =100; $\beta^+ p$ =0.26 13
¹⁴⁰ Dy	-42840#	500#	700# ms	0 ⁺	02		β^+ ?
¹⁴⁰ Dy ^m	-40670#	500#	2166.1 0.5	7.0 μ s	0.5 (8) ⁻	02	β^+ ?
¹⁴⁰ Ho	-29310#	500#	6 ms	3 8 ⁺ #	02		$p=?$; $\beta^+=1$ #
* ¹⁴⁰ Eu ^m	E : less than 50 keV above 185.3 level, from ENSDF, thus 185.3 + 25(15)						**
¹⁴¹ Te	-51560#	400#	100# ms (>300 ns)	5/2 ⁻ #	01	94Be24 I	β^- ?; $\beta^- n$?
¹⁴¹ I	-60520#	200#	430 ms	20 7/2 ⁺ #	01		β^- =100; $\beta^- n$ =21 3
¹⁴¹ Xe	-68330	90	1.73 s	0.01 5/2 ^(-#)	01		β^- =100; $\beta^- n$ =0.044 5
¹⁴¹ Cs	-74477	11	24.84 s	0.16 7/2 ⁺	01		β^- =100; $\beta^- n$ =0.035 3
¹⁴¹ Ba	-79726	8	18.27 m	0.07 3/2 ⁻	01		β^- =100
¹⁴¹ La	-82938	5	3.92 h	0.03 (7/2 ⁺)	01		β^- =100
¹⁴¹ Ce	-85440.1	2.5	32.508 d	0.013 7/2 ⁻	01		β^- =100
¹⁴¹ Pr	-86020.9	2.5	STABLE	5/2 ⁺	01		IS=100.
¹⁴¹ Nd	-84198	4	2.49 h	0.03 3/2 ⁺	01		β^+ =100
¹⁴¹ Nd ^m	-83441	4	756.51 0.05	62.0 s	0.8 11/2 ⁻	01	IT \approx 100; $\beta^+=0.032$ 8
¹⁴¹ Pm	-80523	14	20.90 m	0.05 5/2 ⁺	01	70Ab05 D	β^+ =100
¹⁴¹ Pm ^m	-79895	14	628.40 0.10	630 ns	20 11/2 ⁻	01	IT=100
¹⁴¹ Sm	-75939	9	10.2 m	0.2 1/2 ⁺	01		β^+ =100
¹⁴¹ Sm ^m	-75763	9	176.0 0.3	22.6 m	0.2 11/2 ⁻	01	$\beta^+\approx$ 100; IT=0.31 3
¹⁴¹ Eu	-69927	13	40.7 s	0.7 5/2 ⁺	01		β^+ =100
¹⁴¹ Eu ^m	-69831	13	96.45 0.07	2.7 s	0.3 11/2 ⁻	01	IT=86 3; $\beta^+=14$ 3
¹⁴¹ Gd	-63224	20	14 s	4 (1/2 ⁺)	01		β^+ =100; $\beta^+ p$ =0.03 1
¹⁴¹ Gd ^m	-62846	20	377.8 0.2	24.5 s	0.5 (11/2 ⁻)	01	$\beta^+=89$ 2; IT=11 2
¹⁴¹ Tb	-54540	110	* 3.5 s	0.2 (5/2 ⁻)	01		β^+ =100
¹⁴¹ Tb ^m	-54540#	230#	0# 200# EU *	7.9 s	0.6 11/2 ⁻ #	01	β^+ =100 *
¹⁴¹ Dy	-45320#	300#	900 ms	200 (9/2 ⁻)	01	88Be.A I	β^+ =100; $\beta^+ p$ =?
¹⁴¹ Ho	-34370#	500#	4.1 ms	0.3 (7/2 ⁻)	02		$p=?$; $\beta^+=1$ #
¹⁴¹ Ho ^m	-34300#	500#	66 2	6.4 μ s	0.8 (1/2 ⁺)	02	p=100 *
* ¹⁴¹ Tb ^m	I : existence discussed in 88Be.A. Provisionally accepted						**
* ¹⁴¹ Ho ^m	T : from 01Se03=6.5(+0.7-0.9)						**

Nuclide	Mass excess (keV)	Excitation energy(keV)	Half-life	J^π	Ens	Reference	Decay modes and intensities (%)
¹⁴² Te	-47430# 600#		50# ms (>300 ns)	0 ⁺	00	94Be24 I	β^- ?
¹⁴² I	-55720# 400#		200 ms	2 ⁻ #	00		β^- =100; β^- -n=25#
¹⁴² Xe	-65480 100		1.22 s 0.02	0 ⁺	00	03Be05 TD	β^- =100; β^- -n=0.36 3
¹⁴² Cs	-70515 11		1.689 s 0.011	0 ⁻	00	93Ru01 T	β^- =100; β^- -n=0.090 4 *
¹⁴² Ba	-77823 6		10.6 m 0.2	0 ⁺	00		β^- =100 *
¹⁴² La	-80035 6		91.1 m 0.5	2 ⁻	00		β^- =100
¹⁴² Ce	-84538.5 3.0		STABLE (>50 Py)	0 ⁺	00		IS=11.114 51; α ?; 2 β^- ? *
¹⁴² Pr	-83792.7 2.5		19.12 h 0.04	2 ⁻	00		β^- \approx 100; ϵ =0.0164 8
¹⁴² Pr ^m	-83789.0 2.5	3.694 0.003	14.6 m 0.5	5 ⁻	00		IT=100
¹⁴² Nd	-85955.2 2.3		STABLE	0 ⁺	00		IS=27.2 5
¹⁴² Pm	-81157 25		40.5 s 0.5	1 ⁺	00		β^+ =100
¹⁴² Pm ^m	-80274 25	883.17 0.16	2.0 ms 0.2	(8) ⁻	00		IT=100
¹⁴² Sm	-78993 6		72.49 m 0.05	0 ⁺	00		β^+ =100
¹⁴² Eu	-71320 30		2.36 s 0.10	1 ⁺	00	91Fi03 T	β^+ =100 *
¹⁴² Eu ^m	-70856 12	460 30 BD	1.223 m 0.008	8 ⁻	00		β^+ =100
¹⁴² Gd	-66960 28		70.2 s 0.6	0 ⁺	00		β^+ =100
¹⁴² Tb	-57060# 300#		597 ms 17	1 ⁺	00		β^+ =100; β^+ p=0.0022 11
¹⁴² Tb ^m	-56780# 300#	280.2 1.0	303 ms 17	(5 ⁻)	00		IT \approx 100; β^+ <0.5
¹⁴² Dy	-49960# 360#		2.3 s 0.3	0 ⁺	00		β^+ =100; β^+ p=0.06 3
¹⁴² Ho	-37470# 500#		400 ms 100	(6 τ 09)	02		β^+ \approx 100; β^+ p=?; p \approx 0
* ¹⁴² Cs	T : average 93Ru01=1.684(0.014) 77Re05=1.70(0.02)						**
* ¹⁴² Ba	D : β^- -n=0.091(0.003)% in ENSDF'00 contradicts Q(β^- -n)=-2955(7) keV						**
* ¹⁴² Ce	T : lower limit is for α decay; for $\beta\beta$ decay 01Da22>260 Py						**
* ¹⁴² Eu	T : average 91Fi03=2.34(0.12) 75Ke08=2.4(0.2)						**
¹⁴³ I	-51640# 400#		100# ms (>300 ns)	7/2 ⁺ #	02	94Be24 I	β^- ?; β^- -n=40#
¹⁴³ Xe	-60450# 200#		511 ms 6	5/2 ⁻	02	03Be05 TD	β^- =100; β^- -n=1.00 15
¹⁴³ Cs	-67671 24		1.791 s 0.007	3/2 ⁺	02		β^- =100; β^- -n=1.64 7
¹⁴³ Ba	-73936 13		14.5 s 0.3	5/2 ⁻	02		β^- =100
¹⁴³ La	-78187 15		14.2 m 0.1	(7/2) ⁺	02		β^- =100
¹⁴³ Ce	-81612.0 3.0		33.039 h 0.006	3/2 ⁻	02		β^- =100
¹⁴³ Pr	-83073.5 2.6		13.57 d 0.02	7/2 ⁺	02		β^- =100
¹⁴³ Nd	-84007.4 2.3		STABLE	7/2 ⁻	02		IS=12.2 2
¹⁴³ Pm	-82966 3		265 d 7	5/2 ⁺	02		ϵ =100; e^+ <5.7e-6
¹⁴³ Pm ^m	-82006 3	959.73 0.13	24.0 ns 0.7	11/2 ⁻	02		IT=100
¹⁴³ Sm	-79523 4		8.75 m 0.08	3/2 ⁺	02		β^+ =100
¹⁴³ Sm ^m	-78769 4	753.99 0.16	66 s 2	11/2 ⁻	02		IT \approx 100; β^+ =0.24 6
¹⁴³ Sm ⁿ	-76729 4	2793.8 0.13	30 ms 3	23/2 ⁽⁻⁾	02		IT=100
¹⁴³ Eu	-74242 11		2.59 m 0.02	5/2 ⁺	02		β^+ =100
¹⁴³ Eu ^m	-73852 11	389.51 0.04	50.0 μ s 0.5	11/2 ⁻	02		IT=100
¹⁴³ Gd	-68230 200		39 s 2	(1/2) ⁺	02	78Fi02 D	β^+ =100; β^+ p=?; β^+ α =? *
¹⁴³ Gd ^m	-68080 200	152.6 0.5	110.0 s 1.4	(11/2 ⁻)	02	78Fi02 D	β^+ =100; β^+ p=?; β^+ α =?
¹⁴³ Tb	-60430 60		12 s 1	(11/2 ⁻)	01		β^+ =100
¹⁴³ Tb ^m	-60430# 120#	0# 100#	* < 21 s	5/2 ⁺ #	01		β^+ ?
¹⁴³ Dy	-52320# 200#		5.6 s 1.0	(1/2 ⁺)	01	03Xu04 TJ	β^+ =100; β^+ p=? *
¹⁴³ Dy ^m	-52010# 200#	310.7 0.6	3.0 s 0.3	(11/2 ⁻)	01	03Xu04 JTD	β^+ =100; β^+ p=?
¹⁴³ Ho	-42280# 400#		300# ms (>200 ns)	11/2 ⁻ #	01	00So11 I	β^+ ?
¹⁴³ Er	-31350# 600#		200# ms	9/2 ⁻ #			β^+ ?
* ¹⁴³ Gd	D : 78Fi02: β^+ p and/or $\beta^+\alpha$ for ¹⁴³ Gd+ ¹⁴³ Gd ^m =0.001%, 39 particles detected						**
* ¹⁴³ Dy	T : others: 84Ni03=3.2(0.6) 83Ni05=4.1(0.3) in two different experiments						**

Nuclide	Mass excess (keV)	Excitation energy(keV)	Half-life	J^π	Ens	Reference	Decay modes and intensities (%)
¹⁴⁴ I	-46580# 500#		50# ms (>300 ns)	1 ⁻ #	01	94Be24 I	β^- ?; β^- n=40#
¹⁴⁴ Xe	-57280# 300#		388 ms	7	01	03Be05 TD	β^- =100; β^- n=3.0 3
¹⁴⁴ Cs	-63270 26		* 994 ms	4	1 ^(-#)	01	β^- =100; β^- n=3.20 21
¹⁴⁴ Cs ^m	-62970# 200#	300# 200#	* < 1 s	(> 3)	01		β^- =?; IT ?
¹⁴⁴ Ba	-71769 13		11.5 s	0.2	01		β^- =100 *
¹⁴⁴ La	-74890 50		40.8 s	0.4	(3 ⁻)	01	β^- =100
¹⁴⁴ Ce	-80437 3		284.91 d	0.05	0 ⁺	01	β^- =100
¹⁴⁴ Pr	-80756 3		17.28 m	0.05	0 ⁻	01	β^- =100
¹⁴⁴ Pr ^m	-80697 3	59.03 0.03	7.2 m	0.3	3 ⁻	01	IT≈100; β^- =0.07
¹⁴⁴ Nd	-83753.2 2.3		2.29 Py	0.16	0 ⁺	01	IS=23.8 3; α =100
¹⁴⁴ Pm	-81421 3		363 d	14	5 ⁻	01	ϵ =100; e ⁺ <8e-5
¹⁴⁴ Pm ^m	-80580 3	840.90 0.05	780 ns	200	(9 ⁺)	01	IT=100
¹⁴⁴ Pm ⁿ	-72825 4	8595.8 2.2	2.7 μ s	(27 ⁺)	01		IT=100
¹⁴⁴ Sm	-81972.0 2.8		STABLE		0 ⁺	01	IS=3.07 7; 2 β^+ ?; α ?
¹⁴⁴ Sm ^m	-79648.4 2.8	2323.60 0.08	880 ns	25	6 ⁺	01	IT=100
¹⁴⁴ Eu	-75622 11		10.2 s	0.1	1 ⁺	01	β^+ =100
¹⁴⁴ Eu ^m	-74494 11	1127.6 0.6	1.0 μ s	0.1	(8 ⁻)	01	IT=100
¹⁴⁴ Gd	-71760 28		4.47 m	0.06	0 ⁺	01	β^+ =100
¹⁴⁴ Tb	-62368 28		1 s		1 ⁺	01	β^+ =100; β^+ p ?
¹⁴⁴ Tb ^m	-61971 28	396.9 0.5	4.25 s	0.15	(6 ⁻)	01	IT=66; β^+ =34; β^+ p ?
¹⁴⁴ Tb ⁿ	-61892 28	476.2 0.5	2.8 μ s	0.3	(8 ⁻)	01	IT=100
¹⁴⁴ Tb ^p	-61851 28	517.1 0.5	670 ns	60	(9 ⁺)	01	IT=100
¹⁴⁴ Dy	-56580 30		9.1 s	0.4	0 ⁺	01	β^+ =100; β^+ p=?
¹⁴⁴ Ho	-45200# 300#		700 ms	100		01	β^+ =100; β^+ p=?
¹⁴⁴ Er	-36910# 400#		400# ms (>200 ns)	0 ⁺	01	00So11 I	β^+ ?
* ¹⁴⁴ Ba	D : β^- n=3.6 7 in ENSDF'01 belongs in fact to ¹⁴⁴ Cs						**
¹⁴⁵ Xe	-52100# 300#		188 ms	4	3/2 ⁻ #	97	03Be05 TD β^- =100; β^- n=5.0 6
¹⁴⁵ Cs	-60057 11		582 ms	6	3/2 ⁺	93	93Ru01 TD β^- =100; β^- n=14.3 8 *
¹⁴⁵ Ba	-67410 70		4.31 s	0.16	5/2 ⁻	98	β^- =100
¹⁴⁵ La	-72990 90		24.8 s	2.0	(5/2 ⁺)	98	96Ur02 J β^- =100
¹⁴⁵ Ce	-77100 40		3.01 m	0.06	(3/2 ⁻)	93	β^- =100
¹⁴⁵ Pr	-79632 7		5.984 h	0.010	7/2 ⁺	93	β^- =100
¹⁴⁵ Nd	-81437.1 2.3		STABLE		7/2 ⁻	93	IS=8.3 1
¹⁴⁵ Pm	-81274 3		17.7 y	0.4	5/2 ⁺	93	ϵ =100; α =2.8e-7
¹⁴⁵ Sm	-80657.7 2.8		340 d	3	7/2 ⁻	02	ϵ =100
¹⁴⁵ Sm ^m	-71871.5 2.9	8786.2 0.7	990 ns	170	(49/2 ⁺)	02	IT=100
¹⁴⁵ Eu	-77998 4		5.93 d	0.04	5/2 ⁺	93	β^+ =100
¹⁴⁵ Eu ^m	-77282 4	716.0 0.3	490 ns		11/2 ⁻	93	IT=100
¹⁴⁵ Gd	-72927 19		23.0 m	0.4	1/2 ⁺	01	β^+ =100
¹⁴⁵ Gd ^m	-72178 19	749.1 0.2	85 s	3	11/2 ⁻	01	IT=94.3 5; β^+ =5.7 5
¹⁴⁵ Tb	-65880 60		* 20# m		(3/2 ⁺)	96	93To04 J β^+ ?
¹⁴⁵ Tb ^m	-65880# 120#	0# 100#	* 30.9 s	0.7	(11/2 ⁻)	96	93Al03 T β^+ =100 *
¹⁴⁵ Dy	-58290 50		9.5 s	1.0	(1/2 ⁺)	93	93Al03 T β^+ =100; β^+ p=?
¹⁴⁵ Dy ^m	-58170 50	118.2 0.2	14.1 s	0.7	(11/2 ⁻)	93	93To04 T β^+ =100 *
¹⁴⁵ Ho	-49180# 300#		* 2.4 s	0.1	(11/2 ⁻)	93	β^+ =100
¹⁴⁵ Ho ^m	-49080# 320#	100# 100#	* 100# ms		5/2 ⁺ #		β^+ ?; IT ?
¹⁴⁵ Er	-39690# 400#		900 ms	300	1/2 ⁺ #	98	β^+ =100; β^+ p=?
¹⁴⁵ Tm	-27880# 400#		3.1 μ s	0.3	(11/2 ⁻)	02	98Ba13 TJ p=100 *
* ¹⁴⁵ Cs	T : average 93Ru01=579(6) 82Ra13=594(13)						**
* ¹⁴⁵ Tb ^m	T : average 93Al03=31.6(0.6) 82No08=29.5(1.0) and 82Al07=29.5(1.5)						**
* ¹⁴⁵ Dy	T : average 93Al03=10.5(1.5) 93To04=6(2) and 84Sc.C=10(1)						**
* ¹⁴⁵ Dy ^m	T : average 93To04=14.5(1.0) 82No08=13.6(1.0)						**
* ¹⁴⁵ Tm	T : average 03Ka04=3.1(0.3) 98Ba13=3.5(1.0) J : not adopted by ENSDF'02						**

Nuclide	Mass excess (keV)	Excitation energy(keV)	Half-life	J^π	Ens	Reference	Decay modes and intensities (%)
¹⁴⁶ Xe	-48670# 400#		146 ms	6	0 ⁺	97 03Be05 TD	β^- =100; β^- n=6.9 15
¹⁴⁶ Cs	-55620 70		323 ms	6	1 ⁻	97 93Ru01 T	β^- =100; β^- n=14.2 5 *
¹⁴⁶ Ba	-65000 70		2.22 s	0.07	0 ⁺	97 93Ru01 D	β^- =100 *
¹⁴⁶ La	-69120 70		6.27 s	0.10	2 ⁻	97 93Ru01 D	β^- =100 *
¹⁴⁶ La ^m	-68990 150	130 130	10.0 s	0.1	(6 ⁻)	97 79Ke02 E	β^- =100 *
¹⁴⁶ Ce	-75680 70		13.52 m	0.13	0 ⁺	97	β^- =100
¹⁴⁶ Pr	-76710 60		24.15 m	0.18	(2) ⁻	97	β^- =100
¹⁴⁶ Nd	-80931.1 2.3		STABLE		0 ⁺	97	IS=17.2 3; 2 β^- ?; α ?
¹⁴⁶ Pm	-79460 5		5.53 y	0.05	3 ⁻	99	ϵ =66.0 13; β^- =34.0 13
¹⁴⁶ Sm	-81002 4		103 My	5	0 ⁺	97	α =100
¹⁴⁶ Eu	-77122 6		4.61 d	0.03	4 ⁻	97	β^+ =100
¹⁴⁶ Eu ^m	-76456 6	666.37 0.16	235 μ s	3	9 ⁺	97	IT=100
¹⁴⁶ Gd	-76093 5		48.27 d	0.10	0 ⁺	01	ϵ =100
¹⁴⁶ Tb	-67770 50		8 s	4	1 ⁺	97	β^+ =100
¹⁴⁶ Tb ^m	-67620# 110#	150# 100#	24.1 s	0.5	5 ⁻	93Al03 T	β^+ =100
¹⁴⁶ Tb ⁿ	-66840# 110#	930# 100#	1.18 ms	0.02	(10 ⁺)	97	IT=100 *
¹⁴⁶ Dy	-62554 27		33.2 s	0.7	0 ⁺	97 93Al03 T	β^+ =100
¹⁴⁶ Dy ^m	-59618 27	2935.7 0.6	150 ms	20	10 ⁺ #	97	IT=100
¹⁴⁶ Ho	-51570# 200#		3.6 s	0.3	(10 ⁺)	97	β^+ =100; β^+ p=?
¹⁴⁶ Er	-44710# 300#		1.7 s	0.6	0 ⁺	97 93To05 D	β^+ =100; β^+ p=?
¹⁴⁶ Tm	-31280# 400#		240 ms	30	(6 ⁻)	02	p \approx 100; β^+ ?
¹⁴⁶ Tm ^m	-31200# 400#	71 6 p	72 ms	23	(10 ⁺)	02	p=?; β^+ =16#
* ¹⁴⁶ Cs	T : average 93Ru01=321(2) 76Lu02=343(7)						**
* ¹⁴⁶ Ba	D : 93Ru01 β^- n<0.02% is not relevant since $Q(\beta^-$ n) is negative: =-190(100)						**
* ¹⁴⁶ La	D : 93Ru01 β^- n<0.007% is not relevant since $Q(\beta^-$ n) is negative: =-180(80)						**
* ¹⁴⁶ La ^m	E : derived from $Q(^{146}\text{La}^m)$ =6660(120) in 79Ke02						**
* ¹⁴⁶ Tb ⁿ	E : 779.6 keV above ¹⁴⁶ Tb ^m , from ENSDF						**
¹⁴⁷ Xe	-43260# 400#		130 ms	80	3/2 ⁻ #	98 03Be05 TD	β^- =100; β^- n=4.0 23 *
¹⁴⁷ Cs	-52020 50		225 ms	5	(3/2 ⁺)	92 93Ru01 D	β^- =100; β^- n=28.5 17
¹⁴⁷ Ba	-60600# 210#		893 ms	1	(3/2 ⁺)	98 93Ru01 D	β^- =100 *
¹⁴⁷ La	-66850 50		4.015 s	0.008	(5/2 ⁺)	98 93Ru01 D	β^- =100; β^- n=0.040 3 *
¹⁴⁷ Ce	-72030 30		56.4 s	1.0	(5/2 ⁻)	92	β^- =100
¹⁴⁷ Pr	-75455 23		13.4 m	0.4	(3/2 ⁺)	92	β^- =100
¹⁴⁷ Nd	-78151.9 2.3		10.98 d	0.01	5/2 ⁻	92	β^- =100
¹⁴⁷ Pm	-79047.9 2.4		2.6234 y	0.0002	7/2 ⁺	96	β^- =100
¹⁴⁷ Sm	-79272.1 2.4		106.0 Gy	1.1	7/2 ⁻	92 70Gu14 T	IS=14.99 18; α =100 *
¹⁴⁷ Eu	-77550 3		24.1 d	0.6	5/2 ⁺	99	β^+ \approx 100; α =0.0022 6
¹⁴⁷ Gd	-75363 3		38.06 h	0.12	7/2 ⁻	99	β^+ =100
¹⁴⁷ Gd ^m	-66775 3	8587.8 0.4	510 ns	20	(49/2 ⁺)	99	IT=100
¹⁴⁷ Tb	-70752 12		1.64 h	0.03	1/2 ⁺ #	99 97Wa04 T	β^+ =100
¹⁴⁷ Tb ^m	-70701 12	50.6 0.9	1.87 m	0.05	(11/2) ⁻	99 93Al03 T	β^+ =100 *
¹⁴⁷ Dy	-64188 20		40 s	10	1/2 ⁺	92 84To07 D	β^+ =100; β^+ p \approx 0.05
¹⁴⁷ Dy ^m	-63438 20	750.5 0.4	55 s	1	11/2 ⁻	92	β^+ =65 4; IT=35 4
¹⁴⁷ Ho	-55837 28		5.8 s	0.4	(11/2 ⁻)	92	β^+ =100; β^+ p ?
¹⁴⁷ Er	-47050# 300#		2.5 s		(1/2 ⁺)	92	β^+ =100; β^+ p=?
¹⁴⁷ Er ^m	-46950# 300#	100# 50#	2.5 s	0.2	(11/2 ⁻)	92	β^+ =100 *
¹⁴⁷ Tm	-36370# 300#		580 ms	30	11/2 ⁻	02	β^+ =85 5; p=15 5
¹⁴⁷ Tm ^m	-36300# 300#	60 5 p	360 μ s	40	3/2 ⁺	02	p=100
* ¹⁴⁷ Xe	D : from β^- n<8%						**
* ¹⁴⁷ Ba	D : 93Ru01 β^- n=0.06(3)% contradicts $Q(\beta^-$ n)=-340(120)						**
* ¹⁴⁷ La	J : from 96Ur02						**
* ¹⁴⁷ Sm	T : average 70Gu14=106(2) 65Va16=108(2) 64Do01=104(3) 61Wr02=105(2)						**
* ¹⁴⁷ Tb ^m	T : average 93Al03=1.92(0.07) 73Bo13=1.83(0.06) E : from 87Li09						**
* ¹⁴⁷ Er ^m	E : estimated from 11/2 ⁻ level in isotones ¹⁴¹ Sm=175 ¹⁴³ Gd=152 ¹⁴⁵ Dy=118						**

Nuclide	Mass excess (keV)	Excitation energy(keV)	Half-life	J^π	Ens	Reference	Decay modes and intensities (%)
^{148}Cs	-47300	580	146 ms	6	00		β^- =100; β^- -n=25.1 25
^{148}Ba	-58010	80	612 ms	17	0+	00	β^- =100; β^- -n=0.4 3
^{148}La	-63130	60	1.26 s	0.08	(2 ⁻)	00	β^- =100; β^- -n=0.15 3
^{148}Ce	-70391	29	56 s	1	0+	00	β^- =100
^{148}Pr	-72531	26	2.29 m	0.02	1 ⁻	00	β^- =100
$^{148}\text{Pr}^m$	-72480#	40#	50#	30#	*	2.01 m	0.07 (4) 00 ABBW E β^- =100 *
^{148}Nd	-77413.4	2.8	STABLE	(>3.0 Ey)	0+	00	82Be20 T IS=5.7 1; 2 β^- ?; α ?
^{148}Pm	-76872	6	5.368 d	0.002	1 ⁻	00	β^- =100
$^{148}\text{Pm}^m$	-76734	6	137.9	0.3	41.29 d	0.11 5 ⁻ , 6 ⁻	00 β^- =95.8 6; IT=4.2 6
^{148}Sm	-79342.2	2.4	7 Py	3	0+	00	IS=11.24 10; α =100
^{148}Eu	-76302	10	54.5 d	0.5	5 ⁻	00	β^+ =100; α =9.4e-7 28
^{148}Gd	-76275.8	2.8	74.6 y	3.0	0+	00	α =100; 2 β^+ ?
^{148}Tb	-70540	14	60 m	1	2 ⁻	00	β^+ =100
$^{148}\text{Tb}^m$	-70450	14	90.1	0.3	2.20 m	0.05 (9) ⁺	00 β^+ =100
$^{148}\text{Tb}^n$	-61921	14	8618.6	1.0	1.310 μ s	0.007 (27 ⁺)	00 IT=100
^{148}Dy	-67859	11	3.3 m	0.2	0+	00	β^+ =100
^{148}Ho	-58020	130	2.2 s	1.1	(1 ⁺)	00	β^+ =100
$^{148}\text{Ho}^m$	-57620#	160#	400#	100#	9.49 s	0.12 (6) ⁻	00 93Al03 T β^+ =100; β^+ p=0.08 1 *
$^{148}\text{Ho}^n$	-57330#	160#	690#	100#	2.35 ms	0.04 (10 ⁺)	00 IT=100 *
^{148}Er	-51650#	200#	4.6 s	0.2	0+	00	β^+ =100; β^+ p \approx 0.15
^{148}Tm	-39270#	400#	700 ms	200	(10 ⁺)	00	β^+ =100
^{148}Yb	-30350#	600#	250# ms		0+	00	β^+ ?
* $^{148}\text{Pr}^m$	E : derived from ENSDF estimate $E < 90$ keV						**
* $^{148}\text{Ho}^m$	T : average 93Al03=9.30(0.20) 89Ta11=9.59(0.15)						**
* $^{148}\text{Ho}^n$	E : 694.4 keV above $^{148}\text{Ho}^m$, from ENSDF						**
^{149}Cs	-43850#	200#	150# ms	(>50 ms)	3/2 ⁺ #	95	87Ra12 I β^- ?; β^- -n ?
^{149}Ba	-53490#	200#	344 ms	7	3/2 ⁻ #	95	β^- =100; β^- -n=0.43 12
^{149}La	-60800#	320#	1.05 s	0.03	5/2 ⁺ #	95	93Ru01 D β^- =100; β^- -n=1.4 3
^{149}Ce	-66700	100	5.3 s	0.2	3/2 ⁻ #	98	β^- =100
^{149}Pr	-71060	80	2.26 m	0.07	(5/2 ⁺)	95	β^- =100
^{149}Nd	-74380.9	2.8	1.728 h	0.001	5/2 ⁻	95	β^- =100
^{149}Pm	-76071	4	53.08 h	0.05	7/2 ⁺	95	β^- =100
$^{149}\text{Pm}^m$	-75831	4	240.214	0.007	35 μ s	3	11/2 ⁻
^{149}Sm	-77141.9	2.4	STABLE	(>2 Py)	7/2 ⁻	95	IS=13.82 7; α ?
^{149}Eu	-76447	4	93.1 d	0.4	5/2 ⁺	95	ε =100
^{149}Gd	-75133	4	9.28 d	0.10	7/2 ⁻	01	β^+ =100; α =4.3e-4 10
^{149}Tb	-71496	4	4.118 h	0.025	1/2 ⁺	99	β^+ =83.3 17; α =16.7 17
$^{149}\text{Tb}^m$	-71460	4	35.78	0.13	4.16 m	0.04	11/2 ⁻ 99 β^+ \approx 100; α =0.022 3
^{149}Dy	-67715	9	4.20 m	0.14	7/2 ⁽⁻⁾	95	88Ah02 J β^+ =100
$^{149}\text{Dy}^m$	-65054	9	2661.1	0.4	490 ms	15	(27/2 ⁻) 95 IT=99.3 3; β^+ =0.7 3
$^{149}\text{Dy}^n$	-60230	30	7490	30	28 ns	2	(47/2 ⁺) 95 IT=100 *
^{149}Ho	-61688	18	21.1 s	0.2	(11/2 ⁻)	95	β^+ =100
$^{149}\text{Ho}^m$	-61639	18	48.80	0.20	56 s	3	(1/2 ⁺) 95 β^+ =100
^{149}Er	-53742	28	4 s	2	(1/2 ⁺)	95	β^+ =100; β^+ p=7 2
$^{149}\text{Er}^m$	-53000	28	741.8	0.2	8.9 s	0.2	(11/2 ⁻) 95 β^+ =96.5 7; IT=3.5 7;... *
^{149}Tm	-44040#	300#	900 ms	200	(11/2 ⁻)	95	β^+ =100; β^+ p=0.26 15
^{149}Yb	-33500#	500#	700 ms	200	(1/2 ⁺ , 3/2 ⁺)	95	01Xu06 TD β^+ =100; β^+ p=?
* $^{149}\text{Dy}^n$	E : 7409.9 above level at ≈ 80 keV						**
* $^{149}\text{Er}^m$	D : ...; β^+ p=0.18 7						**
^{150}Cs	-38960#	300#	100# ms	(>50 ms)		97	87Ra12 I β^- ?; β^- -n ?
^{150}Ba	-50600#	400#	300 ms		0+	95	β^- =100; β^- -n ?
^{150}La	-57040#	400#	510 ms	30	(3 ⁺)	97	95Ok02 TJ β^- =100; β^- -n=2.7 3
^{150}Ce	-64820	50	4.0 s	0.6	0+	95	β^- =100
^{150}Pr	-68304	26	6.19 s	0.16	(1) ⁻	96	β^- =100
^{150}Nd	-73690	3	6.7 Ey	0.7	0+	96	97De40 TD IS=5.6 2; 2 β^- =100 *
^{150}Pm	-73603	20	2.68 h	0.02	(1 ⁻)	95	β^- =100

... A-group is continued on next page ...

Nuclide	Mass excess (keV)	Excitation energy(keV)			Half-life		J^π	Ens	Reference	Decay modes and intensities (%)
... A-group continued ...										
^{150}Sm	-77057.3	2.4			STABLE		0^+	96		IS=7.38 1
^{150}Eu	-74797	6			36.9 y	0.9	$5^{(-)}$	95		$\beta^+=100$
$^{150}\text{Eu}^m$	-74755	6	42.1	0.5	12.8 h	0.1	0^-	95		$\beta^+=89$ 2; $\beta^+=11$ 2; ...
^{150}Gd	-75769	6			1.79 My	0.08	0^+	96		$\alpha=100$; $2\beta^+$?
^{150}Tb	-71111	8			3.48 h	0.16	(2^-)	96		$\beta^+\approx 100$; $\alpha<0.05$
$^{150}\text{Tb}^m$	-70654	28	457	29	MD	5.8 m	0.2	9^+	96	$\beta^+\approx 100$; IT ?
^{150}Dy	-69317	5			7.17 m	0.05	0^+	96		$\beta^+=64$ 5; $\alpha=36$ 5
^{150}Ho	-61948	14			*	76.8 s	1.8	2^-	95	93Al03 T
$^{150}\text{Ho}^m$	-61960	50	-10	50	BD *	23.3 s	0.3	$(9)^+$	95	$\beta^+=100$
$^{150}\text{Ho}^n$	-61960	50	8000			751 ns				
^{150}Er	-57833	17				18.5 s	0.7	0^+	95	$\beta^+=100$
^{150}Tm	-46610#	200#			* &	3# s		(1^+)	88Ni02 J	$\beta^+=100$
$^{150}\text{Tm}^m$	-46470#	240#	140#	140#	* &	2.20 s	0.06	(6^-)	95	96Ga24 T
$^{150}\text{Tm}^n$	-45800#	240#	810#	140#		5.2 ms	0.3	(10^+)	95	$\beta^+=100$; $\beta^+p=1.2$ 3
^{150}Yb	-38730#	400#				700# ms (>200 ns)		0^+	97	00So11 I
^{150}Lu	-24940#	500#				46 ms	6	$(5^-, 6^-)$	02	00Gi01 J
$^{150}\text{Lu}^m$	-24900#	500#	34	15	p	80 μs	60	$(1^+, 2^+)$	02	00Gi01 J
^{150}Nd T : from 6.75(+0.37-0.68 statistics + 0.68 systematics)										
$^{150}\text{Eu}^m$ D : ... ; IT \leq 5e-8										
^{150}Ho T : average 93Al03=78(2) 82No08=72(4)										
$^{150}\text{Tm}^m$ T : average 96Ga24=2.22(0.07) 88Ni02=2.15(0.10) and 87To05=2.2(0.2)										
$^{150}\text{Tm}^m$ T : 82No08=3.5(0.6) at variance, not used D : from 88Ni02										
$^{150}\text{Tm}^n$ E : 671.6 keV above $^{150}\text{Tm}^m$, from ENSDF										
^{151}Cs	-35220#	500#			60# ms (>50 ms)	$3/2^+$	97	87Ra12 I		β^- ?; β^-n ?
^{151}Ba	-45820#	400#			200# ms (>300 ns)	$3/2^-$	97	94Be24 I		β^- ?
^{151}La	-54290#	400#			300# ms (>300 ns)	$5/2^+$	97	94Be24 I		β^- ?
^{151}Ce	-61500	100			1.02 s	0.06	$3/2^-$	97		$\beta^-=100$
^{151}Pr	-66771	23			18.90 s	0.07	$(3/2)^{(-\#)}$	97		$\beta^-=100$
^{151}Nd	-70953	3			12.44 m	0.07	$3/2^+$	97		$\beta^-=100$
^{151}Pm	-73395	5			28.40 h	0.04	$5/2^+$	97		$\beta^-=100$
^{151}Sm	-74582.5	2.4			90 y	8	$5/2^-$	97		$\beta^-=100$
$^{151}\text{Sm}^m$	-74321.4	2.4	261.13	0.04	1.4 μs	0.1	$(11/2)^-$	97		IT=100
^{151}Eu	-74659.1	2.5			STABLE		$5/2^+$	97		IS=47.81 3
$^{151}\text{Eu}^m$	-74462.9	2.5	196.245	0.010	58.9 μs	0.5	$11/2^-$	97		
^{151}Gd	-74195	4			124 d	1	$7/2^-$	97		$\varepsilon=100$; $\alpha=1.0\text{e}-6$ 6
^{151}Tb	-71630	5			17.609 h	0.001	$1/2^{(+)}$	99		$\beta^+\approx 100$; $\alpha=0.0095$ 15
$^{151}\text{Tb}^m$	-71530	5	99.54	0.06	25 s	3	$(11/2^-)$	99		IT=93.8 4; $\beta^+=6.2$ 4
^{151}Dy	-68759	4			17.9 m	0.3	$7/2^{(-)}$	99		$\beta^+=?$; $\alpha=5.6$ 4
^{151}Ho	-63632	12			35.2 s	0.1	$11/2^{(-)}$	97	87Ne.A J	$\beta^+=?$; $\alpha=22$ 3
$^{151}\text{Ho}^m$	-63591	12	41.0	0.2	47.2 s	1.0	$1/2^{(+)}$	97	87Ne.A J	$\alpha=77$ 18; β^+ ?
^{151}Er	-58266	16			23.5 s	1.3	$(7/2^-)$	97		$\beta^+=100$
$^{151}\text{Er}^m$	-55681	16	2585.5	0.6	580 ms	20	$(27/2^-)$	97		IT=95.3 3; $\beta^+=4.7$ 3
^{151}Tm	-50782	20			&	4.17 s	0.10	$(11/2^-)$	97	$\beta^+=100$
$^{151}\text{Tm}^m$	-50690	21	92	7	AD &	6.6 s	1.4	$(1/2^+)$	97	$\beta^+=100$
$^{151}\text{Tm}^n$	-48126	20	2655.67	0.22	451 ns	24	$(27/2^-)$	97		IT=100
^{151}Yb	-41540	300			1.6 s	0.5	$(1/2^+)$	97	86To12 T	$\beta^+=100$; $\beta^+p=?$
$^{151}\text{Yb}^m$	-40790#	320#	750#	100#	1.6 s	0.5	$(11/2^-)$	97	86To12 TD	$\beta^+\approx 100$; $\beta^+p=?$; IT=0.4#
$^{151}\text{Yb}^n$	-39750#	580#	1790#	500#	2.6 μs	0.7	$19/2^-$	97		IT=100
$^{151}\text{Yb}^p$	-39090#	580#	2450#	500#	20 μs	1	$27/2^-$	97		IT=100
^{151}Lu	-30200#	400#			80.6 ms	1.9	$(11/2^-)$	02	93Se04 D	$p=?$; $\beta^+=37$ #
$^{151}\text{Lu}^m$	-30130#	400#	77	5	p	16 μs	1	$(3/2^+)$	02	$p=?$; β^+ ?
^{151}Yb T : derived from 1.6(0.1), for mixture of ground-state and isomer with almost same half-life										
$^{151}\text{Yb}^m$ E : 740# estimated by 90Ak01 (see ENSDF'97)										
$^{151}\text{Yb}^n$ E : 1791.2 keV above $^{151}\text{Yb}^m$ (see ENSDF'97)										
$^{151}\text{Yb}^p$ E : 2448 keV above $^{151}\text{Yb}^m$ (see ENSDF'97)										
^{151}Lu D : $p=63.4(0.9)\%$ in ENSDF'02, based on predicted beta-decay half-life \approx 220 ms										

Nuclide	Mass excess (keV)	Excitation energy(keV)	Half-life	J^π	Ens	Reference	Decay modes and intensities (%)
¹⁵² Ba	−42600#	500#	100# ms	0 ⁺	97		β^- ?
¹⁵² La	−50070#	400#	200# ms (>300 ns)		97	94Be24 I	β^- ?
¹⁵² Ce	−59110#	200#	1.1 s	0.3	0 ⁺	97 90Ta07 T	β^- =100
¹⁵² Pr	−63810	120	3.63 s	0.12	4 ⁺	97 99To04 J	β^- =100
¹⁵² Nd	−70158	25	11.4 m	0.2	0 ⁺	97	β^- =100
¹⁵² Pm	−71262	26	4.12 m	0.08	1 ⁺	97	β^- =100
¹⁵² Pm ^m	−71120	80	7.52 m	0.08	4 [−]	97	β^- =100
¹⁵² Pm ⁿ	−71010#	150#	13.8 m	0.2	(8)	97	β^- ≈100; IT=?
¹⁵² Sm	−74768.8	2.5	STABLE		0 ⁺	97	IS=26.75 16
¹⁵² Eu	−72894.5	2.5	13.537 y	0.006	3 [−]	97	β^+ =72.1 3; β^- =27.9 3
¹⁵² Eu ^m	−72848.9	2.5	9.3116 h	0.0013	0 [−]	97	β^- =72 4; β^+ =28 4
¹⁵² Eu ⁿ	−72746.6	2.5	96 m	1	8 [−]	97	IT=100
¹⁵² Gd	−74714.2	2.5	108 Ty	8	0 ⁺	97	IS=0.20 1; α =100; 2 β^+ ?
¹⁵² Tb	−70720	40	17.5 h	0.1	2 [−]	98	β^+ =100; α <7e−7
¹⁵² Tb ^m	−70220	40	4.2 m	0.1	8 ⁺	98	IT=78.8 8; β^+ =21.2 8
¹⁵² Dy	−70124	5	2.38 h	0.02	0 ⁺	99	ϵ ≈100; α =0.100 7
¹⁵² Ho	−63608	14	161.8 s	0.3	2 [−]	97	β^+ =88 3; α =12 3
¹⁵² Ho ^m	−63448	14	50.0 s	0.4	9 ⁺	97	β^+ =89.2 17; α =10.8 17
¹⁵² Ho ⁿ	−60588	14	8.4 μ s	0.3	19 [−]	97	IT=100
¹⁵² Er	−60500	11	10.3 s	0.1	0 ⁺	97	α =90 4; β^+ =10 4
¹⁵² Tm	−51770	70	8.0 s	1.0	(2#) [−]	97	β^+ =100
¹⁵² Tm ^m	−51670#	110#	5.2 s	0.6	(9) ⁺	97	β^+ =100
¹⁵² Yb	−46310	210	3.04 s	0.06	0 ⁺	97	β^+ =100; β^+ p ?
¹⁵² Lu	−33420#	200#	650 ms	70	(5 [−] , 6 [−])	97 88Ni02 T	β^+ =100; β^+ p=15 7
* ¹⁵² Ce	T : average 90Ta07=1.4(0.2) 91Ay.A=0.8(0.3)						**
* ¹⁵² Pm ⁿ	E : ENSDF: “Probably feeds 7.52 m level” at 140 keV						**
* ¹⁵² Lu	T : average 88Ni02=600(100) 87To02=700(100)						**
¹⁵³ Ba	−37620#	800#	80# ms	5/2 [−] #			β^- ?
¹⁵³ La	−46930#	600#	150# ms (>300 ns)	5/2 ⁺ #	98	94Be24 I	β^- ?
¹⁵³ Ce	−55350#	400#	500# ms (>300 ns)	3/2 [−] #	98	94Be24 I	β^- ?
¹⁵³ Pr	−61630	100	4.28 s	0.11	5/2 [−] #	98	β^- =100
¹⁵³ Nd	−67349	27	31.6 s	1.0	(3/2) [−]	98	β^- =100
¹⁵³ Pm	−70685	11	5.25 m	0.02	5/2 [−]	98	β^- =100
¹⁵³ Sm	−72565.8	2.5	46.284 h	0.004	3/2 ⁺	98	β^- =100
¹⁵³ Sm ^m	−72467.4	2.5	10.6 ms	0.3	11/2 [−]	98	IT=100
¹⁵³ Eu	−73373.5	2.5	STABLE		5/2 ⁺	98	IS=52.19 3
¹⁵³ Gd	−72889.8	2.5	240.4 d	1.0	3/2 [−]	98	ϵ =100
¹⁵³ Gd ^m	−72794.6	2.5	3.5 μ s	0.4	(9/2 ⁺)	98	IT=100
¹⁵³ Gd ⁿ	−72718.6	2.5	76.0 μ s	1.4	(11/2 [−])	98	IT=100
¹⁵³ Tb	−71320	4	2.34 d	0.01	5/2 ⁺	98	β^+ =100
¹⁵³ Tb ^m	−71157	4	186 μ s	4	11/2 [−]	98	IT=100
¹⁵³ Dy	−69150	5	6.4 h	0.1	7/2 ^(−)	99	β^+ ≈100; α =0.0094 14
¹⁵³ Ho	−65019	6	2.01 m	0.03	11/2 [−]	98	β^+ ≈100; α =0.051 25
¹⁵³ Ho ^m	−64950	6	9.3 m	0.5	1/2 ⁺	98	β^+ ≈100; α =0.18 8
¹⁵³ Er	−60488	9	37.1 s	0.2	7/2 ^(−)	98	α =53 3; β^+ =47 3
¹⁵³ Tm	−54015	18	1.48 s	0.01	(11/2 [−])	98	α =91 3; β^+ =9 3
¹⁵³ Tm ^m	−53972	18	2.5 s	0.2	(1/2 ⁺)	98	α =92 3; β^+ =?
¹⁵³ Yb	−47060#	200#	4.2 s	0.2	7/2 [−] #	98	β^+ =?; α =50#; ...
¹⁵³ Yb ^m	−44360#	220#	15 μ s	1	(27/2 [−])	98	*
¹⁵³ Lu	−38410	210	900 ms	200	11/2 [−]	98	α =70#; β^+ =?; p=0
¹⁵³ Lu ^m	−38330	210	1# s		1/2 ⁺	98	β^+ ?; α ?; p=0
¹⁵³ Lu ⁿ	−35780	210	15 μ s	3	27/2 [−]	98	
¹⁵³ Hf	−27300#	500#	400# ms (>200 ns)	1/2 ⁺ #		00So11 I	β^+ ?
¹⁵³ Hf ^m	−26550#	510#	500# ms		11/2 [−] #		β^+ ?; IT ?
* ¹⁵³ Sm	T : see also 99Sc12=46.274(7)						**
* ¹⁵³ Er	J : and 89Ot.A						**
* ¹⁵³ Yb	D : ... ; β^+ p=0.008 2						**
* ¹⁵³ Yb ^m	E : in ENSDF 2578.2 + x						**
* ¹⁵³ Lu	D : p decay is from 97Ir01						**

Nuclide	Mass excess (keV)	Excitation energy(keV)		Half-life		J ^π	Ens	Reference	Decay modes and intensities (%)
¹⁵⁴ La	-42380# 600#				100# ms				β ⁻ ?
¹⁵⁴ Ce	-52700# 500#				300# ms (>300 ns)	0 ⁺	98	94Be24 I	β ⁻ ?
¹⁵⁴ Pr	-58200 150				2.3 s	0.1 (3 ⁺ , 2 ⁺)	98		β ⁻ =100
¹⁵⁴ Nd	-65690 110				25.9 s	0.2 0 ⁺	98		β ⁻ =100
¹⁵⁴ Nd ^m	-65210# 190#	480#	150#		1.3 μs				
¹⁵⁴ Nd ⁿ	-64340 110	1349	10		> 1 μs	(5 ⁻)	98		
¹⁵⁴ Pm	-68500 40			* &	1.73 m	0.10 (0, 1)	98		β ⁻ =100
¹⁵⁴ Pm ^m	-68380 110	120	120	BD * &	2.68 m	0.07 (3, 4)	98		β ⁻ =100
¹⁵⁴ Sm	-72461.6 2.5				STABLE	(>2.3 Ey)	0 ⁺		IS=22.75 29; 2β ⁻ ?
¹⁵⁴ Eu	-71744.4 2.5				8.593 y	0.004 3 ⁻	98		β ⁻ ≈100; ε=0.02 1
¹⁵⁴ Eu ^m	-71599.1 2.5	145.3	0.3		46.3 m	0.4 (8 ⁻)	98		IT=100
¹⁵⁴ Gd	-73713.2 2.5				STABLE		0 ⁺		IS=2.18 3
¹⁵⁴ Tb	-70160 50			*	21.5 h	0.4 0 ⁽⁺⁾	98		β ⁺ ≈100; β ⁻ <0.1
¹⁵⁴ Tb ^m	-70150 50	12	7	*	9.4 h	0.4 3 ⁻	98	ABBW E	β ⁺ ≈78.2 7; IT=21.8 7;...
¹⁵⁴ Tb ⁿ	-69960# 160#	200#	150#	*	22.7 h	0.5 7 ⁻	98		β ⁺ ≈98.2 6; IT=1.8 6
¹⁵⁴ Dy	-70398 8				3.0 My	1.5 0 ⁺	99		α=100; 2β ⁺ ?
¹⁵⁴ Ho	-64644 8				11.76 m	0.19 2 ⁻	98		β ⁺ ≈100; α=0.019 5
¹⁵⁴ Ho ^m	-64406 28	238	30	AD	3.10 m	0.14 8 ⁺	98		β ⁺ =100; α<0.001; IT≈0
¹⁵⁴ Er	-62612 5				3.73 m	0.09 0 ⁺	01		β ⁺ ≈100; α=0.47 13
¹⁵⁴ Tm	-54429 14			*	8.1 s	0.3 (2 ⁻)	98		α=54 5; β ⁺ =46 5
¹⁵⁴ Tm ^m	-54360 50	70	50	BD *	3.30 s	0.07 (9 ⁺)	98		α=58 5; β ⁺ =42 5
¹⁵⁴ Yb	-49934 17				409 ms	2 0 ⁺	98		α=92.6 12; β ⁺ =7.4 12
¹⁵⁴ Lu	-39570# 200#				1# s	(2 ⁻)	98		β ⁺ ?
¹⁵⁴ Lu ^m	-39510# 200#	58	13	AD	1.12 s	0.08 (9 ⁺)	98	88Vi02 D	β ⁺ ≈100; β ⁺ p=?; ...
¹⁵⁴ Lu ⁿ	-37300# 600#	> 2562			35 μs	3 (17 ⁺)	98		IT=100
¹⁵⁴ Hf	-32730# 500#				2 s	1 0 ⁺	98		β ⁺ ≈100; α≈0
* ¹⁵⁴ Tb ^m	D : ... ; β ⁻ <0.1								
* ¹⁵⁴ Tb ^m	E : less than 25 keV, from ENSDF								
* ¹⁵⁴ Tm ^m	D : IT decay has not been observed								
* ¹⁵⁴ Lu ^m	D : ... ; β ⁺ α=?; α=0.002#								
* ¹⁵⁴ Lu ^m	D : β ⁺ p and β ⁺ α modes observed by 88Vi02; β ⁺ p confirmed by 90Sh.A								
¹⁵⁵ La	-38800# 800#				60# ms	5/2 ⁺ #			β ⁻ ?
¹⁵⁵ Ce	-48400# 600#				200# ms (>300 ns)	5/2 ⁻ #	97	94Be24 I	β ⁻ ?
¹⁵⁵ Pr	-55780# 300#				1# s (>300 ns)	5/2 ⁻ #	97	95Cz.A I	β ⁻ ?
¹⁵⁵ Nd	-62470# 150#				8.9 s	0.2 3/2 ⁻ #	94		β ⁻ =100
¹⁵⁵ Pm	-66970 30				41.5 s	0.2 (5/2 ⁻)	94		β ⁻ =100
¹⁵⁵ Sm	-70197.2 2.6				22.3 m	0.2 3/2 ⁻	94		β ⁻ =100
¹⁵⁵ Eu	-71824.5 2.5				4.7611 y	0.0013 5/2 ⁺	94		β ⁻ =100
¹⁵⁵ Gd	-72077.1 2.5				STABLE		3/2 ⁻	97	IS=14.80 12
¹⁵⁵ Gd ^m	-71956.1 2.5	121.05	0.19		32.0 ms	0.3 11/2 ⁻	97		IT=100
¹⁵⁵ Tb	-71254 12				5.32 d	0.06 3/2 ⁺	94		ε=100
¹⁵⁵ Dy	-69160 12				9.9 h	0.2 3/2 ⁻	99		β ⁺ =100
¹⁵⁵ Dy ^m	-68926 12	234.33	0.03		6 μs	11/2 ⁻	99		IT=100
¹⁵⁵ Ho	-66040 18				48 m	1 5/2 ⁺	94		β ⁺ =100
¹⁵⁵ Ho ^m	-65898 18	141.97	0.11		880 μs	80 11/2 ⁻	94		IT=100
¹⁵⁵ Er	-62215 7				5.3 m	0.3 7/2 ⁻	94		β ⁺ ≈100; α=0.022 7
¹⁵⁵ Tm	-56635 13				21.6 s	0.2 (11/2 ⁻)	95		β ⁺ ≈98.1 3; α=1.9 3
¹⁵⁵ Tm ^m	-56594 14	41	6		45 s	3 (1/2 ⁺)	95		β ⁺ >92; α<8
¹⁵⁵ Yb	-50503 17				1.793 s	0.019 (7/2 ⁻)	94	96Pa01 T	α=89 4; β ⁺ =11 4
¹⁵⁵ Lu	-42554 20			&	68.6 ms	1.6 (11/2 ⁻)	94	97Da07 TD	α=88 4; β ⁺ ?
¹⁵⁵ Lu ^m	-42534 21	20	6	AD &	138 ms	8 (1/2 ⁺)	94	97Da07 TJD	α=76 16; β ⁺ ?
¹⁵⁵ Lu ⁿ	-40773 20	1781.0	2.0	AD	2.70 ms	0.03 (25/2 ⁻)	94	96Pa01 T	α≈100; IT ?
¹⁵⁵ Hf	-34100# 400#				890 ms	120 7/2 ⁻ #	94		β ⁺ ≈100; α ?
¹⁵⁵ Ta	-23670# 500#				13 μs	4 (11/2 ⁻)	02		p=100
* ¹⁵⁵ Yb	T : average 96Pa01=1.80(0.02) 91To08=1.75(0.05)								
* ¹⁵⁵ Lu	T : average 96Pa01=70(1) 97Da07=63(2) 91To09=66(7) 79Ho10=70(6)								
* ¹⁵⁵ Lu	D : α : average 97Da07=90(2)% 79Ho10=79(4)% with Birge ratio B=4.4								
* ¹⁵⁵ Lu ^m	T : average 97Da07=150(24) 96Pa01=136(9) 91To09=140(20)								
* ¹⁵⁵ Lu ⁿ	T : average 96Pa01=2.71(0.03) 81Ho.A=2.62(0.07)								

Nuclide	Mass excess (keV)		Excitation energy(keV)		Half-life		J^π	Ens	Reference	Decay modes and intensities (%)
^{156}Ce	-45400#	600#			150#	ms	0^+			β^- ?
^{156}Pr	-51910#	400#			500#	ms (>300 ns)			95Cz.A I	β^- ?
^{156}Nd	-60530	200	1432	5	5.49	s	0^+	03		β^- =100
$^{156}\text{Nd}^m$	-59100	200			135	ns	5^-	03		IT=100
^{156}Pm	-64220	30			26.70	s	4^-	03		β^- =100
^{156}Sm	-69370	10			9.4	h	0^+	03		β^- =100
$^{156}\text{Sm}^m$	-67972	10	1397.55	0.09	185	ns	5^-	03		IT=100
^{156}Eu	-70093	6			15.19	d	0^+	03		β^- =100
^{156}Gd	-72542.2	2.5			STABLE		0^+	03		IS=20.47 9
$^{156}\text{Gd}^m$	-70404.6	2.5	2137.60	0.05	1.3	μs	7^-	03		IT=100
^{156}Tb	-70098	4			5.35	d	3^-	03		$\beta^+\approx 100$; β^- ?
$^{156}\text{Tb}^m$	-70044	5	54	3	24.4	h	(7^-)	03		IT=100
$^{156}\text{Tb}^n$	-70010	4	88.4	0.2	5.3	h	0^+	03		IT=?; $\beta^+=?$
^{156}Dy	-70530	7			STABLE	(>1 Ey)	0^+	03	58Ri23 T	IS=0.06 1; α ?; $2\beta^+$?
^{156}Ho	-65350	40			56	m	4^-	03		$\beta^+=100$
$^{156}\text{Ho}^m$	-65300	40	52.4	0.5	9.5	s	1^-	03		IT=?; β^+ ?
$^{156}\text{Ho}^n$	-65250#	60#	100#	50#	7.8	m	(9^+)	03		$\beta^+=75$; IT ?
^{156}Er	-64213	24			19.5	m	0^+	03		$\beta^+=100$; $\alpha=17\text{e-}6$ 4
^{156}Tm	-56840	16			83.8	s	2^-	03		$\beta^+\approx 100$; $\alpha=0.064$ 10
$^{156}\text{Tm}^m$	-56636	16	203.6	0.5	400	ns	(11^-)	03		IT=100
$^{156}\text{Tm}^n$			non existent	RN	19	s	3^-	03	91To08 I	
^{156}Yb	-53264	11			26.1	s	0^+	03		$\beta^+=90$ 2; $\alpha=10$ 2
^{156}Lu	-43750	70			494	ms	(2^-)	03		$\alpha=?$; $\beta^+=5\#$
$^{156}\text{Lu}^m$	-43530#	110#	220#	80#	198	ms	$(9)^+$	03	96Pa01 D	$\alpha=94$ 6; β^+ ?
^{156}Hf	-37850	210			23	ms	0^+	03	96Pa01 D	$\alpha=97$ 3; β^+ ?
$^{156}\text{Hf}^m$	-35890	210	1959.0	1.0	480	μs	8^+	03	96Pa01 T	$\alpha=100$
^{156}Ta	-25800#	400#			144	ms	(2^-)	03		p ≈ 100 ; β^+ ?
$^{156}\text{Ta}^m$	-25700#	400#	100	8	360	ms	(9^+)	03		$\beta^+=95.8$ 9; p=4.2 9
$^{156}\text{Tb}^m$	E : derived from E3 24h to 4^+ 49.630 level and $E(\text{IT})< B(\text{L})=9 \text{ keV}$									
^{156}Dy	T : lower limit is for α decay									
$^{156}\text{Tm}^m$	I : see also the discussion in ENSDF'03									
$^{156}\text{Lu}^m$	D : derived from original $\alpha=98(9)\%$									
^{156}Hf	D : derived from original $\alpha=100(6)\%$									
$^{156}\text{Hf}^m$	T : average 96Pa01=520(10) 81Ho.A=444(17)									
$^{156}\text{Ta}^m$	T : 96Pa01=375(54) 93Li34=320(80)									
^{157}Ce	-40670#	700#			50#	ms	$7/2^+\#$			β^- ?
^{157}Pr	-48970#	400#			300#	ms	$5/2^- \#$			β^- ?
^{157}Nd	-56790#	200#			2#	s (>300 ns)	$5/2^- \#$		95Cz.A I	β^- ?
^{157}Pm	-62370	110			10.56	s	$(5/2^-)$	96		β^- =100
^{157}Sm	-66730	50			8.03	m	$(3/2^-)$	96		β^- =100
^{157}Eu	-69467	5			15.18	h	$5/2^+$	96		β^- =100
^{157}Gd	-70830.7	2.5			STABLE		$3/2^-$	96		IS=15.65 2
^{157}Tb	-70770.6	2.5			71	y	$3/2^+$	96		$\varepsilon=100$
^{157}Dy	-69428	7			8.14	h	$3/2^-$	97		$\beta^+=100$
$^{157}\text{Dy}^m$	-69229	7	199.38	0.07	21.6	ms	$11/2^-$	97		IT=100
^{157}Ho	-66829	24			12.6	m	$7/2^-$	96		$\beta^+=100$
^{157}Er	-63420	28			18.65	m	$3/2^-$	96		$\beta^+=100$
$^{157}\text{Er}^m$	-63265	28	155.4	0.3	76	ms	$(9/2^+)$	96		IT=100
^{157}Tm	-58709	28			3.63	m	$1/2^+$	97		$\beta^+=100$
^{157}Yb	-53442	10			38.6	s	$7/2^-$	96		$\beta^+=99.5$; $\alpha=0.5$
^{157}Lu	-46483	19			6.8	s	$(1/2^+, 3/2^+)$	96		$\beta^+?$; $\alpha=?$
$^{157}\text{Lu}^m$	-46462	19	21.0	2.0	4.79	s	$(11/2^-)$	96		$\beta^+=?$; $\alpha=6$ 2
^{157}Hf	-38750#	200#			115	ms	$7/2^-$	96	96Pa01 T	$\alpha=86$ 9; $\beta^+=14$ 9
^{157}Ta	-29630	210			10.1	ms	$1/2^+$	02		$\alpha=?$; p=3.4 12; ...
$^{157}\text{Ta}^m$	-29610	210	22	5	4.3	ms	$11/2^-$	02		$\alpha=?$; $\beta^+=1\#$; p=0
$^{157}\text{Ta}^n$	-28040	210	1593	9	1.7	ms	$(25/2^-)$	02		$\alpha=100$
$^{157}\text{Dy}^m$	T : as adopted by ENSDF evaluator from 3 inconsistent results									
^{157}Lu	T : ENSDF'96 average of very discrepant 91To09=5.7(0.5) 91Le15,92Po14=9.6(8)									
^{157}Ta	D : ...; $\beta^+=1\#$									

Nuclide	Mass excess (keV)	Excitation energy(keV)	Half-life	J^π	Ens	Reference	Decay modes and intensities (%)
¹⁵⁸ Pr	−44730# 600#		200# ms				β^- ?
¹⁵⁸ Nd	−54400# 400#		700# ms (>300 ns)	0 ⁺	97	95Cz.A I	β^- ?
¹⁵⁸ Pm	−59090 130		4.8 s 0.5		96		β^- =100
¹⁵⁸ Sm	−65210 80		5.30 m 0.03	0 ⁺	96		β^- =100
¹⁵⁸ Eu	−67210 80		45.9 m 0.2	(1 [−])	96		β^- =100
¹⁵⁸ Gd	−70696.8 2.5		STABLE	0 ⁺	96		IS=24.84 7
¹⁵⁸ Tb	−69477.2 2.6		180 y 11	3 [−]	96		β^+ =83.4 7; β^- =16.6 7
¹⁵⁸ Tb ^m	−69366.9 2.9	110.3 1.2	10.70 s 0.17	0 [−]	96		IT≈100; β^- <0.6; ... *
¹⁵⁸ Tb ⁿ	−69088.8 2.6	388.37 0.15	395 μ s	7 [−]			
¹⁵⁸ Dy	−70412 3		STABLE	0 ⁺	96		IS=0.10 1; α ?; 2 β^+ ?
¹⁵⁸ Ho	−66191 27		11.3 m 0.4	5 ⁺	97		β^+ ≈100; α ?
¹⁵⁸ Ho ^m	−66124 27	67.200 0.010	28 m 2	2 [−]	97		IT>81; β^+ <19
¹⁵⁸ Ho ⁿ	−66010# 80#	180# 70#	21.3 m 2.3	(9 ⁺)	97		β^+ >93; IT<7#
¹⁵⁸ Er	−65304 25		2.29 h 0.06	0 ⁺	96		ε =100
¹⁵⁸ Tm	−58703 25		3.98 m 0.06	2 [−]	96		β^+ =100
¹⁵⁸ Tm ^m	−58650# 100#	50# 100#	20 ns	(5 ⁺)	96	81Dr07 T	IT ? *
¹⁵⁸ Yb	−56015 8		1.49 m 0.13	0 ⁺	96		β^+ ≈100; α ≈0.0021 12
¹⁵⁸ Lu	−47214 15		10.6 s 0.3	2 [−]	96	95Ga.A J	β^+ =99.09 20; ... *
¹⁵⁸ Hf	−42104 18		2.84 s 0.07	0 ⁺	96	96Pa01 TD	β^+ =55 3; α =45 3 *
¹⁵⁸ Ta	−31020# 200#		49 ms 8	(2 [−])	96	97Da07 TJD	α =96 4; β^+ ? *
¹⁵⁸ Ta ^m	−30880# 200#	140 12	36.0 ms 0.8	(9 ⁺)	96	97Da07 TJE	α =93 6; β^+ ?; IT ? *
¹⁵⁸ W	−23700# 500#		1.37 ms 0.17	0 ⁺	96	00Ma95 T	α =100 *
¹⁵⁸ W ^m	−21810# 500#	1889 8	143 μ s 19	8 ⁺		00Ma95 T	α =100 *
* ¹⁵⁸ Tb ^m	D : ... ; β^+ <0.01						**
* ¹⁵⁸ Tm ^m	I : T≈20 s in 81Dr07 was a typo. Value in Fig. 2 was correct. See 96Dr.A						**
* ¹⁵⁸ Lu	D : ... ; α =0.91 20						**
* ¹⁵⁸ Hf	T : average 96Pa01=2.85(0.07) 73To02=2.8(0.2)						**
* ¹⁵⁸ Ta	T : average 97Da07=72(12) 96Pa01=46(4) with Birge ratio B=2						**
* ¹⁵⁸ Ta	D : derived from original α ≈100(8)%						**
* ¹⁵⁸ Ta ^m	T : average 97Da07=37.7(1.5) 96Pa01=35(1) 79Ho10=36.8(1.6)						**
* ¹⁵⁸ W	T : average 00Ma95=1.5(0.2) 96Pa01=0.9(+0.4−0.3)						**
* ¹⁵⁸ W ^m	T : average 00Ma95=140(20) 96Pa01=160(50)						**
¹⁵⁹ Pr	−41450# 700#		100# ms	5/2 [−] #			β^- ?
¹⁵⁹ Nd	−50220# 500#		500# ms	7/2 ⁺ #			β^- ?
¹⁵⁹ Pm	−56850# 200#		1.47 s 0.15	5/2 [−] # 03			β^- =100
¹⁵⁹ Sm	−62210 100		11.37 s 0.15	5/2 [−] 03			β^- =100
¹⁵⁹ Eu	−66053 7		18.1 m 0.1	5/2 ⁺ 03			β^- =100
¹⁵⁹ Gd	−68568.5 2.5		18.479 h 0.004	3/2 [−] 03			β^- =100
¹⁵⁹ Tb	−69539.0 2.6		STABLE	3/2 ⁺ 03			IS=100.
¹⁵⁹ Dy	−69173.5 2.7		144.4 d 0.2	3/2 [−] 03			ε =100
¹⁵⁹ Dy ^m	−68820.7 2.7	352.77 0.14	122 μ s 3	11/2 [−] 03			IT=100
¹⁵⁹ Ho	−67336 4		33.05 m 0.11	7/2 [−] 03			β^+ =100
¹⁵⁹ Ho ^m	−67130 4	205.91 0.05	8.30 s 0.08	1/2 ⁺ 03			IT=100
¹⁵⁹ Er	−64567 4		36 m 1	3/2 [−] 03			β^+ =100
¹⁵⁹ Er ^m	−64384 4	182.602 0.024	337 ns 14	9/2 ⁺ 03			IT=100
¹⁵⁹ Er ⁿ	−64138 4	429.05 0.03	590 ns 60	11/2 [−] 03			IT=100
¹⁵⁹ Tm	−60570 28		9.13 m 0.16	5/2 ⁺ 03			β^+ =100
¹⁵⁹ Yb	−55843 18		1.72 m 0.10	5/2 [−] ([−]) 03	93Al03 T		β^+ =100 *
¹⁵⁹ Lu	−49710 40		12.1 s 1.0	1/2 ⁺ # 03			β^+ ≈100; α =0.1#
¹⁵⁹ Lu ^m	−49610# 90#	100# 80#	10# s	11/2 [−] #			β^+ ?; IT ?; α ?
¹⁵⁹ Hf	−42854 17		5.20 s 0.10	7/2 [−] # 03	96Pa01 T		β^+ =65 7; α =35 7 *
¹⁵⁹ Ta	−34448 21		1.04 s 0.09	(1/2 ⁺)	97Da07 TJ		β^+ ?; α =34 5 *
¹⁵⁹ Ta ^m	−34385 20	64 5	514 ms 9	(11/2 [−]) 03	96Pa01 T		α =55 1; β^+ ? *
¹⁵⁹ W	−25230# 400#		8.2 ms 0.7	7/2 [−] # 03	96Pa01 TD		α =82 16; β^+ ? *
* ¹⁵⁹ Yb	T : supersedes 80Al14=1.40(0.20) from same group						**
* ¹⁵⁹ Hf	J : 7/2 [−] is not measured in 00Di18, p.7: “a 7/2 [−] assignment is assumed”						**
* ¹⁵⁹ Ta	T : average 97Da07=0.83(0.18) 96Pa01=1.10(0.10)						**
* ¹⁵⁹ Ta ^m	T : average 97Da07=500(11) 96Pa01=544(16); other 02Ro17=620(50)						**
* ¹⁵⁹ W	D : derived from original α =92(23)%						**

Nuclide	Mass excess (keV)		Excitation energy(keV)		Half-life		J^π	Ens	Reference	Decay modes and intensities (%)			
^{160}Nd	-47420#	600#			300#	ms	0^+		85Si25	I	β^- ?	*	
^{160}Pm	-53100#	300#			2#	s					β^- ?		
^{160}Sm	-60420#	200#			9.6	s	0.3	0^+	97		β^- =100		
^{160}Eu	-63370#	200#			38	s	4	$1^{(-)}$	97		β^- =100		
^{160}Gd	-67948.6	2.6			STABLE		(>31 Ey)	0^+	97	01Da22	T	IS=21.86 19; $2\beta^-$?	
^{160}Tb	-67842.9	2.6			72.3	d	0.2	3^-	97		β^- =100		
^{160}Dy	-69678.1	2.5			STABLE			0^+	97		IS=2.34 8		
^{160}Ho	-66388	15			25.6	m	0.3	5^+	97		β^+ =100		
$^{160}\text{Ho}^m$	-66328	15	59.98	0.03	5.02	h	0.05	2^-	97		IT=65 3; β^+ =35 3		
$^{160}\text{Ho}^n$	-66191	22	197	16	3	s		(9^+)	97	ABBW	E	IT=100	*
^{160}Er	-66058	24			28.58	h	0.09	0^+	97		ε =100		
^{160}Tm	-60300	30			9.4	m	0.3	1^-	97		β^+ =100		
$^{160}\text{Tm}^m$	-60230	40	70	20	74.5	s	1.5	$5^{(+\#)}$	97		IT=85 5; β^+ =15 5		
^{160}Yb	-58170	17			4.8	m	0.2	0^+	97		β^+ =100		
^{160}Lu	-50270	60			36.1	s	0.3	$2^-\#$	97		β^+ =100; $\alpha < 1\text{e-}4$		
$^{160}\text{Lu}^m$	-50270#	120#	0#	100#	40	s	1		97		$\beta^+ \approx 100$; α ?		
^{160}Hf	-45937	12			13.6	s	0.2	0^+	97		$\beta^+ \approx 99.3$ 2; $\alpha = 0.7$ 2		
^{160}Ta	-35880	90			1.70	s	0.20	$(2\#)^-$		96Pa01	TJD	β^+ ?; $\alpha = ?$	*
$^{160}\text{Ta}^m$	-35560#	110#	310#	90#	1.55	s	0.04	$(9)^+$	97	96Pa01	TJ	$\beta^+ = 66\#$; $\alpha = ?$	*
^{160}W	-29360	210			90	ms	5	0^+	97	96Pa01	TD	$\alpha = 87$ 8; β^+ ?	*
^{160}Re	-16660#	400#			860	μs	120	(2^-)	02	92Pa05	J	p=91 5; $\alpha = 9$ 5	*
$^{*160}\text{Nd}$	I : seen in the thermal fission of ^{252}Cf											**	
$^{*160}\text{Ho}^n$	E : less than 55 keV above 169.55 level, from ENSDF											**	
$^{*160}\text{Ta}$	J : from α correlation with ^{156}Lu line											**	
$^{*160}\text{Ta}^m$	J : from α correlation with $^{156}\text{Lu}^m$ line											**	
$^{*160}\text{W}$	T : average 96Pa01=91(5) 81Ho10=81(15)											**	
$^{*160}\text{Re}$	J : protons from $d_{3/2}$ orbital											**	
^{161}Nd	-42960#	700#			200#	ms		$1/2^-\#$			β^- ?		
^{161}Pm	-50430#	500#			700#	ms		$5/2^-\#$			β^- ?		
^{161}Sm	-56980#	300#			4.8	s	0.8	$7/2^+\#$	00		β^- =100		
^{161}Eu	-61780#	300#			26	s	3	$5/2^+\#$	00		β^- =100		
^{161}Gd	-65512.7	2.7			3.646	m	0.003	$5/2^-$	00	94It.A	T	β^- =100	
^{161}Tb	-67468.2	2.6			6.906	d	0.019	$3/2^+$	00		β^- =100		
^{161}Dy	-68061.1	2.5			STABLE			$5/2^+$	00		IS=18.91 24		
^{161}Ho	-67203	3			2.48	h	0.05	$7/2^-$	00		ε =100		
$^{161}\text{Ho}^m$	-66992	3	211.16	0.03	6.76	s	0.07	$1/2^+$	00		IT=100		
^{161}Er	-65209	9			3.21	h	0.03	$3/2^-$	00		β^+ =100		
$^{161}\text{Er}^m$	-64813	9	396.44	0.04	7.5	μs	0.7	$11/2^-$	00		IT=100		
^{161}Tm	-61899	28			30.2	m	0.8	$7/2^+$	00		β^+ =100		
$^{161}\text{Tm}^m$	-61892	28	7.4	0.2	5#	m		$1/2^+$	00		β^+ ?; IT ?		
^{161}Yb	-57844	16			4.2	m	0.2	$3/2^-$	00		β^+ =100		
^{161}Lu	-52562	28			7.7	s	2	$1/2^+$	00		β^+ =100		
$^{161}\text{Lu}^m$	-52400	30	166	18	7.3	ms	0.4	$(9/2^-)$	00	ABBW	E	IT=100	*
^{161}Hf	-46319	23			18.2	s	0.5	$3/2^-\#$	00		$\beta^+ \approx 100$; $\alpha < 0.13$		
^{161}Ta	-38730#	60#			3#	s		$1/2^+\#$			β^+ ?; α ?		
$^{161}\text{Ta}^m$	-38684	23	50#	50#	2.89	s	0.12	$11/2^-$	00		$\beta^+ = 95\#$; $\alpha = ?$		
^{161}W	-30410#	200#			409	ms	16	$7/2^-\#$	00	96Pa01	T	$\alpha = 73$ 3; β^+ =27 3	*
^{161}Re	-20880	210			370	μs	40	$1/2^+$	02	97Ir01	D	p=97 2; α ?	*
$^{161}\text{Re}^m$	-20750	210	123.8	1.3	15.6	ms	0.9	$11/2^-$	02		$\alpha = ?$; p=4.8 6		
$^{*161}\text{Lu}^m$	E : less than K binding energy (61 keV) above 135.6 level, from ENSDF											**	
$^{*161}\text{W}$	T : average 96Pa01=409(18) 79Ho10=410(40)											**	
$^{*161}\text{Re}$	D : derived from original p=100(7)%											**	
$^{*161}\text{Re}$												**	

Nuclide	Mass excess (keV)	Excitation energy(keV)	Half-life	J^π	Ens	Reference	Decay modes and intensities (%)
^{162}Pm	−46310#	700#	500# ms				β^- ?
^{162}Sm	−54750#	500#	2.4 s	0.5	0 ⁺	00As.A	β^- =100
^{162}Eu	−58650#	300#	10.6 s	1.0	99		β^- =100
^{162}Gd	−64287	5	8.4 m	0.2	0 ⁺	99	β^- =100
^{162}Tb	−65680	40	7.60 m	0.15	1 [−]	99	β^- =100
^{162}Dy	−68186.8	2.5	STABLE		0 ⁺	99	IS=25.51 26
^{162}Ho	−66047	4	15.0 m	1.0	1 ⁺	99	β^+ =100
$^{162}\text{Ho}^m$	−65941	8	67.0 m	0.7	6 [−]	99	IT=62; β^+ =38
^{162}Er	−66343	3	STABLE	(>140 Ty)	0 ⁺	56Po16	IS=0.14 1; α ?; $2\beta^+$?
^{162}Tm	−61484	26	21.70 m	0.19	1 [−]	99	β^+ =100
$^{162}\text{Tm}^m$	−61350	50	24.3 s	1.7	5 ⁺	99	IT ?; β^+ =18 4
^{162}Yb	−59832	16	18.87 m	0.19	0 ⁺	99	β^+ =100
^{162}Lu	−52840	80	1.37 m	0.02	1 ^(−)	99	β^+ =100
$^{162}\text{Lu}^m$	−52720#	220#	1.5 m		4 [−] #	99	$\beta^+\approx 100$; IT ?
$^{162}\text{Lu}^n$	−52540#	220#	1.9 m			99	$\beta^+\approx 100$; IT ?
^{162}Hf	−49173	10	39.4 s	0.9	0 ⁺	99	$\beta^+\approx 100$; $\alpha=0.008$ 1
^{162}Ta	−39780	50	3.57 s	0.12	3 ⁺ #	99	$\beta^+\approx 100$; $\alpha=0.074$ 10
^{162}W	−34002	18	1.36 s	0.07	0 ⁺	99	β^+ ?; $\alpha=45.2$ 16
^{162}Re	−22350#	200#	107 ms	13	(2 [−])	99	$\alpha=94$ 6; β^+ ?
$^{162}\text{Re}^m$	−22180#	200#	77 ms	9	(9 ⁺)	99	$\alpha=91$ 5; β^+ ?
^{162}Os	−14500#	500#	1.87 ms	0.18	0 ⁺	99	$\alpha=100$
* $^{162}\text{Ho}^m$ E : about 10 keV above level at 96.1(0.1), from ENSDF; error from NUBASE							**
* ^{162}Er T : lower limit is for α decay							**
* $^{162}\text{Tm}^m$ E : above 66.90 level and less than 192 keV, from ENSDF							**
* ^{162}Os T : average 00Ma95=1.9(0.2) 96Bi07=1.5(+0.7−0.5) 89Ho12=1.9(0.7)							**
^{163}Pm	−43150#	800#	200# ms		5/2 [−] #		β^- ?
^{163}Sm	−50900#	700#	1# s		1/2 [−] #		β^- ?
^{163}Eu	−56630#	500#	6# s		5/2 ⁺ #		β^- ?
^{163}Gd	−61490#	300#	68 s	3	7/2 ⁺ #	00	β^- =100
^{163}Tb	−64601	5	19.5 m	0.3	3/2 ⁺	00	β^- =100
^{163}Dy	−66386.5	2.5	STABLE		5/2 [−]	00	IS=24.90 16
^{163}Ho	−66383.9	2.5	4.570 ky	0.025	7/2 [−]	00	ϵ =100
$^{163}\text{Ho}^m$	−66086.0	2.5	1.09 s	0.03	1/2 ⁺	00	IT=100
^{163}Er	−65174	5	75.0 m	0.4	5/2 [−]	00	β^+ =100
$^{163}\text{Er}^m$	−64729	5	580 ns	100	(11/2 [−])	00	IT=100
^{163}Tm	−62735	6	1.810 h	0.005	1/2 ⁺	00	β^+ =100
^{163}Yb	−59304	16	11.05 m	0.25	3/2 [−]	00	β^+ =100
^{163}Lu	−54791	28	3.97 m	0.13	1/2 ⁽⁺⁾	01	β^+ =100
^{163}Hf	−49286	28	40.0 s	0.6	3/2 [−] #	00	$\beta^+=100$; $\alpha<0.0001$
^{163}Ta	−42540	40	10.6 s	1.8	1/2 ⁺ #	00	$\beta^+\approx 100$; $\alpha\approx 0.2$
^{163}W	−34910	50	2.8 s	0.2	3/2 [−] #	00	β^+ ?; $\alpha=13$ 2
^{163}Re	−26007	20	390 ms	70	(1/2 ⁺)	00	β^+ ?; $\alpha=32$ 3
$^{163}\text{Re}^m$	−25892	20	214 ms	5	(11/2 [−])	00	$\alpha=66$ 4; β^+ ?
^{163}Os	−16120#	400#	5.5 ms	0.6	7/2 [−] #	00	$\alpha\approx 100$; β^+ ?; β^+p ?

Nuclide	Mass excess (keV)		Excitation energy(keV)		Half-life		J^π	Ens	Reference	Decay modes and intensities (%)	
^{164}Sm	-48180#	800#			500#	ms	0^+			β^- ?	
^{164}Eu	-53100#	600#			2#	s				β^- ?	
^{164}Gd	-59750#	400#			45	s	3	0^+	01	β^- =100	
^{164}Tb	-62080	100			3.0	m	0.1	(5^+)	01	β^- =100	
^{164}Dy	-65973.3	2.5			STABLE			0^+	01	IS=28.18 37	
^{164}Ho	-64987.1	2.8			29	m	1	1^+	01	ε =60 5; β^- =40 5	
$^{164}\text{Ho}^m$	-64847.3	2.8	139.77	0.08	38.0	m	1.0	6^-	01	IT=100	
^{164}Er	-65950	3			STABLE			0^+	01	IS=1.61 3; α ?; $2\beta^+$?	
^{164}Tm	-61888	28			2.0	m	0.1	1^+	01	ε =61 1; e^+ =39 1	
$^{164}\text{Tm}^m$	-61878	29	10	6	5.1	m	0.1	6^-	01	IT \approx 80; β^+ \approx 20	*
^{164}Yb	-61023	16			75.8	m	1.7	0^+	01	ε =100	
^{164}Lu	-54642	28			3.14	m	0.03	$1^{(-)}$	01	β^+ =100	*
^{164}Hf	-51822	20			111	s	8	0^+	01	β^+ =100	
^{164}Ta	-43283	28			14.2	s	0.3	(3^+)	01	β^+ =100	*
^{164}W	-38234	12			6.3	s	0.2	0^+	01	β^+ =96.2 12; α =3.8 12	
^{164}Re	-27640#	160#			*	&		high	95Pa.A J	α ?	
$^{164}\text{Re}^m$	-27520	100	120#	120#	530	ms	230	$(2\#)^-$	01	α =?; β^+ =42#	*
^{164}Os	-20460	210			21	ms	1	0^+	01	α =?; β^+ =2#	
^{164}Ir	-7270#	410#			&	1#	ms	2^-		p ?; α ?; β^+ ?	
$^{164}\text{Ir}^m$	-7000#	400#	270#	110#	&	94	μs	9^+	02	p=?; α ?; β^+ ?	*
* $^{164}\text{Tm}^m$ E : less than 20 keV, from ENSDF											**
* ^{164}Lu J : negative parity proposed by 98Ge13; odd-odd ^{160}Tm ^{162}Tm ^{162}Lu have 1^- ground-state											**
* ^{164}Ta D : was erroneously considered as alpha emitter, instead of ^{163}Ta by 83Sc18											**
* $^{164}\text{Re}^m$ J : from α correlation with ^{160}Ta line											**
* $^{164}\text{Ir}^m$ T : average 02Ma61=58(+46-18) 01Ke05=110(+60-30)											**
^{165}Sm	-43800#	900#			200#	ms		$5/2^-$		β^- ?	
^{165}Eu	-50560#	700#			1#	s		$5/2^+$		β^- ?	
^{165}Gd	-56470#	500#			10.3	s	1.6	$1/2^-$	99	β^- =100	
^{165}Tb	-60660#	200#			2.11	m	0.10	$3/2^+$	92	β^- =100	
^{165}Dy	-63617.9	2.5			2.334	h	0.001	$7/2^+$	92	β^- =100	
$^{165}\text{Dy}^m$	-63509.7	2.5	108.160	0.003	1.257	m	0.006	$1/2^-$	92	IT=97.76 11; β^- =2.24 11	
^{165}Ho	-64904.6	2.5			STABLE			$7/2^-$	92	IS=100.	
^{165}Er	-64528	3			10.36	h	0.04	$5/2^-$	92	ε =100	
^{165}Tm	-62936	3			30.06	h	0.03	$1/2^+$	92	β^+ =100	
^{165}Yb	-60287	28			9.9	m	0.3	$5/2^-$	92	β^+ =100	
^{165}Lu	-56442	27			10.74	m	0.10	$1/2^+$	99	β^+ =100	
^{165}Hf	-51636	28			76	s	4	$(5/2^-)$	92	β^+ =100	
^{165}Ta	-45855	17			31.0	s	1.5	$5/2^-$	92	β^+ =100	
$^{165}\text{Ta}^p$	-45800	30	60	30	AD			$9/2^-$			
^{165}W	-38862	25			5.1	s	0.5	$3/2^-$	99	β^+ \approx 100; α <0.2	
^{165}Re	-30657	28			1#	s		$1/2^+$	99	β^+ ?; α ?	
$^{165}\text{Re}^m$	-30610	23	47	26	AD	*	2.1	$11/2^-$	99	β^+ =87 3; α =13 3	
^{165}Os	-21650#	200#			71	ms	3	$(7/2^-)$	99	α >60; β^+ <40	
^{165}Ir	-11630#	220#			< 1#	μs		$1/2^+$	02	p ?; α ?	
$^{165}\text{Ir}^m$	-11440	210	180#	50#	300	μs	60	$11/2^-$	02	p=87 4; α =13 4	

Nuclide	Mass excess (keV)	Excitation energy(keV)	Half-life	J^π	Ens	Reference	Decay modes and intensities (%)
¹⁶⁶ Eu	−46600# 800#		400# ms				β^- ?
¹⁶⁶ Gd	−54400# 600#		4.8 s 1.0	0 ⁺		00As.A TD	β^- =100
¹⁶⁶ Tb	−57760 100		25.6 s 2.2		97	00As.A T	β^- =100 *
¹⁶⁶ Dy	−62590.1 2.6		81.6 h 0.1	0 ⁺	92		β^- =100
¹⁶⁶ Ho	−63076.9 2.5		26.83 h 0.02	0 [−]	92		β^- =100
¹⁶⁶ Ho ^m	−63070.9 2.5	5.985 0.018	1.20 ky 0.18	(7) [−]	92		β^- =100
¹⁶⁶ Er	−64931.6 2.5		STABLE	0 ⁺	92		IS=33.61 35
¹⁶⁶ Tm	−61894 12		7.70 h 0.03	2 ⁺	92		β^+ =100
¹⁶⁶ Tm ^m	−61772 14	122 8	340 ms 25	6 [−]		96Dr07 TJE	IT=100 *
¹⁶⁶ Yb	−61588 8		56.7 h 0.1	0 ⁺	92		ϵ =100
¹⁶⁶ Lu	−56021 30		2.65 m 0.10	6 ^(−)	92	98Ge13 J	β^+ =100
¹⁶⁶ Lu ^m	−55990 30	34.37 0.05	1.41 m 0.10	3 ^(−)	92	98Ge13 J	β^+ =58 5; IT=42 5
¹⁶⁶ Lu ⁿ	−55980 30	42.9 0.5	2.12 m 0.10	0 ^(−)	92	98Ge13 J	β^+ >80; IT<20
¹⁶⁶ Hf	−53859 28		6.77 m 0.30	0 ⁺	92		β^+ =100
¹⁶⁶ Ta	−46098 28		34.4 s 0.5	(2) ⁺	92		β^+ =100
¹⁶⁶ W	−41892 10		19.2 s 0.6	0 ⁺	00		β^+ ≈100; α =0.035 12
¹⁶⁶ Re	−31850# 90#		& 2# s	2 [−] #			β^+ ?; α ?
¹⁶⁶ Re ^m	−31700 70	150# 50#	& 2.5 s	9 ⁺ #	92	92Me10 T	β^+ ?; α =5 2 *
¹⁶⁶ Re ^p	−31700# 100#	150# 50#		low			
¹⁶⁶ Os	−25438 18		216 ms 9	0 ⁺	92	96Pa01 T	α =72 13; β^+ =28 13 *
¹⁶⁶ Ir	−13210# 200#		10.5 ms 2.2	(2) [−]	02		α =93 3; p=7 3
¹⁶⁶ Ir ^m	−13030# 200#	172 6 p	15.1 ms 0.9	(9) ⁺	02		α =98.2 6; p=1.8 6
¹⁶⁶ Pt	−4790# 500#		300 μ s 100	0 ⁺	97	96Bi07 TD	α =100
* ¹⁶⁶ Tb	T : supersedes 94Ts.A=21(6) same group						**
* ¹⁶⁶ Tm ^m	E : less than 25 keV above 109.34 level						**
* ¹⁶⁶ Re ^m	T : average 92Me10=2.3(0.2) 84Sc06=2.8(0.3)						**
* ¹⁶⁶ Re ^m	D : α intensity is derived from 2% < α < 8% as discussed in ENSDF						**
* ¹⁶⁶ Os	T : average 96Pa01=220(7) 91Se01=194(17)						**
¹⁶⁷ Eu	−43590# 800#		200# ms	5/2 ⁺ #			β^- ?
¹⁶⁷ Gd	−50700# 600#		3# s	5/2 [−] #			β^- ?
¹⁶⁷ Tb	−55840# 400#		19 s 3	3/2 ⁺ #	00	99As03 T	β^- =100
¹⁶⁷ Dy	−59940 60		6.20 m 0.08	(1/2) [−]	00		β^- =100
¹⁶⁷ Ho	−62287 6		3.1 h 0.1	7/2 [−]	00		β^- =100
¹⁶⁷ Ho ^m	−62028 6	259.34 0.11	6.0 μ s 1.0	3/2 ⁺	00		IT=100
¹⁶⁷ Er	−63296.7 2.5		STABLE	7/2 ⁺	00		IS=22.93 17
¹⁶⁷ Er ^m	−63088.9 2.5	207.801 0.005	2.269 s 0.006	1/2 [−]	00		IT=100
¹⁶⁷ Tm	−62548.3 2.7		9.25 d 0.02	1/2 ⁺	00		ϵ =100
¹⁶⁷ Tm ^m	−62368.8 2.7	179.480 0.019	1.16 μ s 0.06	(7/2) ⁺	00		IT=100
¹⁶⁷ Tm ⁿ	−62255.5 2.7	292.820 0.020	0.9 μ s 0.1	7/2 [−]	00		IT=100
¹⁶⁷ Yb	−60594 5		17.5 m 0.2	5/2 [−]	00		β^+ =100
¹⁶⁷ Lu	−57500 30		51.5 m 1.0	7/2 ⁺	00		β^+ =100
¹⁶⁷ Lu ^m	−57500# 40#	0# 30#	> 1 m	1/2 ^(−#)	00		IT ?; β^+ ?
¹⁶⁷ Hf	−53468 28		2.05 m 0.05	(5/2) [−]	00		β^+ =100
¹⁶⁷ Ta	−48351 28		1.33 m 0.07	(3/2 ⁺)	00		β^+ =100
¹⁶⁷ W	−42089 19		19.9 s 0.5	3/2 [−] #	00		β^+ =99.96 1; α =0.04 1 *
¹⁶⁷ Re	−34840# 50#		& 3.4 s 0.4	9/2 [−] #	00		α ≈100; β^+ ?
¹⁶⁷ Re ^m	−34710 40	130# 40#	& 5.9 s 0.3	1/2 ⁺ #	00		β^+ ≈99; α ≈1
¹⁶⁷ Os	−26500 70		810 ms 60	3/2 [−] #	00		α =57 8; β^+ =43 8
¹⁶⁷ Ir	−17079 19		35.2 ms 2.0	1/2 ⁺	02		α =48 6; p=32 4; β^+ ?
¹⁶⁷ Ir ^m	−16903 19	175.3 2.2 p	30.0 ms 0.6	11/2 [−]	02		α =80 10; β^+ ?; ... *
¹⁶⁷ Pt	−6540# 410#		700 μ s 200	7/2 [−] #	00		α =100
* ¹⁶⁷ W	J : lowest observed state by 92Th06 is 13/2 ⁺						**
* ¹⁶⁷ Ir ^m	D : ... ; p=0.4 1						**

Nuclide	Mass excess (keV)	Excitation energy(keV)			Half-life		J^π	Ens	Reference	Decay modes and intensities (%)			
^{168}Gd	−48100#	700#			300#	ms	0^+		85Si25	I	β^- ?		
^{168}Tb	−52500#	500#			8.2	s	4^- #	99			β^- =100		
^{168}Dy	−58560	140			8.7	m	0^+	99			β^- =100		
^{168}Ho	−60070	30			2.99	m	0.07	94			β^- =100		
$^{168}\text{Ho}^m$	−60010	30	59	1	132	s	4	(6^+)	94	90Ch37	E	$\text{IT}\approx 100$; $\beta^- < 0.5$	
^{168}Er	−62996.7	2.5			STABLE			0^+	94			$\text{IS}=26.78$ 26	
^{168}Tm	−61317.7	2.9			93.1	d	0.2	3^+	94			$\beta^+ \approx 100$; $\beta^- = 0.010$ 7	
^{168}Yb	−61575	4			STABLE		(>130 Ty)	0^+	94	56Po16	T	$\text{IS}=0.13$ 1; α ?; $2\beta^+$?	
^{168}Lu	−57060	50			5.5	m	0.1	$6^{(-)}$	94	98Ge13	J	$\beta^+ = 100$	
$^{168}\text{Lu}^m$	−56880	100	180	110	BD *	6.7	m	0.4	3^+	94		$\beta^+ > 95$; $\text{IT} < 5$	
^{168}Hf	−55361	28			25.95	m	0.20	0^+	01			$\varepsilon \approx 98$; $e^+ \approx 2$	
^{168}Ta	−48394	28			2.0	m	0.1	(2^- , 3^+)	94			$\beta^+ = 100$	
^{168}W	−44890	16			51	s	2	0^+	94			$\beta^+ \approx 100$; $\alpha = 0.0032$ 10	
^{168}Re	−35790	30			4.4	s	0.1	(5^+ , 6^+ , 7^+)	94			$\beta^+ \approx 100$; $\alpha \approx 0.005$	
$^{168}\text{Re}^m$			non existent	RN	6.6	s	1.5			92Me10	I		
^{168}Os	−29991	12			2.06	s	0.06	0^+	94	96Pa01	T	$\beta^+ = 51$ 3; $\alpha = 49$ 3	
^{168}Ir	−18740#	150#			161	ms	21	high	94	96Pa01	TJD	$\alpha = 82$ 14	
$^{168}\text{Ir}^m$	−18690	110	50#	100#	*	125	ms	40	low	94	96Pa01	TJ	$\alpha = ?$; β^+ ?
^{168}Pt	−11040	210			2.00	ms	0.18	0^+	94	98Ki20	T	$\alpha \approx 100$; $\beta^+ = 0.7\%$	
* ^{168}Gd	I : seen in the thermal fission of ^{252}Cf											**	
* ^{168}Yb	T : lower limit is for α decay											**	
* ^{168}Os	T : average 96Pa01=2.1(0.1) 84Sc06=2.0(0.2) 82En03=2.2(0.1) 78Ca11=1.9(0.1)											**	
* ^{168}Os	T : 84Sc06 supersedes 78Sc26=2.4(0.2) from same group											**	
* ^{168}Pt	T : average 98Ki20=2.0(0.2) 96Bi07=2.0(0.4)											**	
^{169}Gd	−43900#	800#			1#	s		$7/2^-$ #				β^- ?	
^{169}Tb	−50100#	600#			2#	s		$3/2^+$ #				β^- ?	
^{169}Dy	−55600	300			39	s	8	($5/2^-$)	91			$\beta^- = 100$	
^{169}Ho	−58803	20			4.7	m	0.1	$7/2^-$	91			$\beta^- = 100$	
^{169}Er	−60928.7	2.5			9.40	d	0.02	$1/2^-$	91			$\beta^- = 100$	
^{169}Tm	−61280.0	2.5			STABLE			$1/2^+$	91			$\text{IS}=100$.	
^{169}Yb	−60370	4			32.026	d	0.005	$7/2^+$	91			$\varepsilon = 100$	
$^{169}\text{Yb}^m$	−60346	4	24.199	0.003	46	s	2	$1/2^-$	91			$\text{IT}=100$	
^{169}Lu	−58077	5			34.06	h	0.05	$7/2^-$	91			$\beta^+ = 100$	
$^{169}\text{Lu}^m$	−58048	5	29.0	0.5	160	s	10	$1/2^-$	91			$\text{IT}=100$	
^{169}Hf	−54717	28			3.24	m	0.04	($5/2^-$)	91			$\beta^+ = 100$	
^{169}Ta	−50290	18			4.9	m	0.4	($5/2^+$)	91	98Zh03	J	$\beta^+ = 100$	
^{169}W	−44918	15			76	s	6	($5/2^-$)	91			$\beta^+ = 100$	
^{169}Re	−38386	28			8.1	s	0.5	$9/2^-$ #	91	92Me10	TD	$\beta^+ = ?$; $\alpha = 0.005$ 3	
$^{169}\text{Re}^m$	−38241	17	145	29	15.1	s	1.6	$1/2^+$ #	91	92Me10	TD	β^+ ?; $\alpha \approx 0.2$	
^{169}Os	−30721	25			3.46	s	0.11	$3/2^-$ #	91	96Pa01	T	$\beta^+ = 89$ 1; $\alpha = 11$ 1	
^{169}Ir	−22081	26			& 780	ms	360	$1/2^+$ #		99Po09	TD	$\alpha = 50$ 18; β^+ ?	
$^{169}\text{Ir}^m$	−21927	22	154	24	& 308	ms	22	$11/2^-$ #	91	96Pa01	TD	$\alpha = 81$ 7; $\beta^+ = 19$ 7	
^{169}Pt	−12380#	200#			3.7	ms	1.5	$3/2^-$ #	91	96Pa01	T	$\alpha = ?$; $\beta^+ = 1\%$	
^{169}Au	−1790#	300#			150#	μs		$1/2^+$ #				α ?; β^+ ?	
* ^{169}Re	D : $\alpha = 0.005(3)\%$ derived from original $\alpha = 0.001\%$ - 0.01%											**	
* $^{169}\text{Re}^m$	T : average 92Me10=16.3(0.8) 84Sc06=12.9(1.1)											**	
* ^{169}Os	T : average 96Pa01=3.6(0.2) 95Hi02=3.2(0.3) 84Sc06=3.5(0.2) 82En03=3.4(0.2)											**	
* $^{169}\text{Ir}^m$	T : also 99Po09=323(+90−66) D : average 99Po09=84(8)% 96Pa01=72(13)%											**	
* ^{169}Pt	T : average 96Pa01=5(3) 81Ho10=2.5(+2.5−1.0)											**	

Nuclide	Mass excess (keV)				Excitation energy(keV)		Half-life		J^π	Ens	Reference	Decay modes and intensities (%)	
^{170}Tb	-46340#	700#					3#	s				β^- ?	
^{170}Dy	-53660#	200#					30#	s		0 ⁺	02	β^- ?	
^{170}Ho	-56240	50				*	2.76	m	0.05	6 ⁺ #	02	β^- =100	
$^{170}\text{Ho}^m$	-56140	60	100	80		BD *	43	s	2	(1 ⁺)	02	β^- =100	
^{170}Er	-60114.6	2.8					STABLE	($>320\text{Py}$)		0 ⁺	02	IS=14.93 27; ...	*
^{170}Tm	-59800.6	2.5					128.6	d	0.3	1 ⁻	02	β^- \approx 100; ϵ =0.131 10	
$^{170}\text{Tm}^m$	-59617.4	2.5	183.197	0.004			4.12	μs	0.13	(3 ⁺)	02	IT=100	
^{170}Yb	-60769.0	2.4					STABLE			0 ⁺	02	IS=3.04 15	
$^{170}\text{Yb}^m$	-59510.5	2.4	1258.46	0.14			370	ns	15	4 ⁻	02	IT=100	
^{170}Lu	-57310	17					2.012	d	0.020	0 ⁺	02	β^+ =100	
$^{170}\text{Lu}^m$	-57217	17	92.91	0.09			670	ms	100	(4 ⁻)	02	IT=100	
^{170}Hf	-56254	28					16.01	h	0.13	0 ⁺	02	ϵ =100	
^{170}Ta	-50138	28					6.76	m	0.06	(3 ⁺)#	02	β^+ =100	
^{170}W	-47293	15					2.42	m	0.04	0 ⁺	02	$\beta^+\approx$ 100; $\alpha<1\%$	
^{170}Re	-38918	26					9.2	s	0.2	(5 ⁺)	02	$\beta^+\approx$ 100; $\alpha<0.01\%$	
^{170}Os	-33928	11					7.46	s	0.23	0 ⁺	02	β^+ =?; α =8.6 18	
^{170}Ir	-23320#	100#					910	ms	150	low#	02	β^+ ?; α =5.2 17	
$^{170}\text{Ir}^m$	-23050	70	270#	70#			440	ms	60	high#	02	α =36 10; β^+ ?; IT ?	
^{170}Pt	-16306	19					13.8	ms	0.5	0 ⁺	02	α =?; β^+ =2#	
^{170}Au	-3610#	200#					310	μs	50	(2 ⁻)	02	p=85 10; α =15 10	
$^{170}\text{Au}^m$	-3340#	200#	274	16		p	630	μs	60	(9 ⁺)	02	02Ma61 TD p=75 15; α =?; β^+ ?	*
* ^{170}Er	D : ... ; 2 β^- ?; α ?												**
* $^{170}\text{Au}^m$	T : from 02Ke.C=620(+60-50); other 02Ma61=570(+310-150)												**
^{171}Tb	-43500#	800#					500#	ms		3/2 ⁺ #		β^- ?	
^{171}Dy	-50110#	300#					6#	s		7/2 ⁻ #		β^- ?	
^{171}Ho	-54520	600					53	s	2	7/2 ⁻ #	02	β^- =100	
^{171}Er	-57724.9	2.8					7.516	h	0.002	5/2 ⁻	02	β^- =100	
$^{171}\text{Er}^m$	-57526.3	2.8	198.6	0.1			210	ns	10	1/2 ⁻	02	IT=100	
^{171}Tm	-59215.6	2.6					1.92	y	0.01	1/2 ⁺	02	β^- =100	
$^{171}\text{Tm}^m$	-58790.6	2.6	424.9560	0.0015			2.60	μs	0.02	7/2 ⁻	02	IT=100	
^{171}Yb	-59312.1	2.4					STABLE			1/2 ⁻	02	IS=14.28 57	
$^{171}\text{Yb}^m$	-59216.8	2.4	95.282	0.002			5.25	ms	0.24	7/2 ⁺	02	IT=100	
$^{171}\text{Yb}^i$	-59189.7	2.4	122.416	0.002			265	ns	20	5/2 ⁻	02	IT=100	
^{171}Lu	-57833.5	2.8					8.24	d	0.03	7/2 ⁺	02	β^+ =100	
$^{171}\text{Lu}^m$	-57762.4	2.8	71.13	0.08			79	s	2	1/2 ⁻	02	IT=100	
^{171}Hf	-55431	29					12.1	h	0.4	7/2 ⁽⁺⁾	02	β^+ =100	
$^{171}\text{Hf}^m$	-55409	29	21.93	0.09			29.5	s	0.9	1/2 ⁽⁻⁾	02	IT \approx 100; β^+ ?	
^{171}Ta	-51720	28					23.3	m	0.3	(5/2 ⁻)	02	β^+ =100	
^{171}W	-47086	28					2.38	m	0.04	(5/2 ⁻)	02	β^+ =100	
^{171}Re	-41250	28					15.2	s	0.4	(9/2 ⁻)	02	β^+ =100	
^{171}Os	-34293	19					8.3	s	0.2	(5/2 ⁻)	02	β^+ ?; α =1.80 21	
^{171}Ir	-26430	40					3.6	s	1.0	1/2 ⁺ #	02	$\alpha\approx$ 100; β^+ ?	
$^{171}\text{Ir}^m$	-26250#	50#	180#	30#			1.40	s	0.10	(11/2 ⁻)	02	99Ba84 J α =58 11; β^+ ?; p ?	
^{171}Pt	-17470	90					44	ms	7	3/2 ⁻ #	02	α =?; β^+ =2#	
^{171}Au	-7565	26					30	ms	5	(1/2 ⁺)	02	03Ba20 T p \approx 100; α ?	*
$^{171}\text{Au}^m$	-7315	20	250	16		p	1.014	ms	0.019	11/2 ⁻	02	03Ba20 TJ α =54 4; p=46 4	
^{171}Hg	3500#	300#					80	μs	30	3/2 ⁻ #	02	$\alpha\approx$ 100; β^+ =0.01#	
* ^{171}Au	T : average 03Ba20=37(+7-5) 99Po09=17(+9-5); Birge ratio B=2.0												*

Nuclide	Mass excess (keV)	Excitation energy(keV)	Half-life	J^π	Ens	Reference	Decay modes and intensities (%)
^{172}Dy	−47730# 400#		3# s	0^+			$\beta^- ?$
^{172}Ho	−51400# 400#		25 s 3		95		$\beta^- = 100$
^{172}Er	−56489 5		49.3 h 0.3	0^+	95		$\beta^- = 100$
^{172}Tm	−57380 6		63.6 h 0.2	2^-	95		$\beta^- = 100$
^{172}Yb	−59260.3 2.4		STABLE	0^+	95		IS=21.83 67
^{172}Lu	−56741.3 3.0		6.70 d 0.03	4^-	95		$\beta^+ = 100$
$^{172}\text{Lu}^m$	−56699 3	41.86 0.04	3.7 m 0.5	1^-	95		IT=100
$^{172}\text{Lu}^n$	−56632 3	109.41 0.10	440 μs 12	$(1)^+$			
^{172}Hf	−56404 24		1.87 y 0.03	0^+	95		$\epsilon = 100$
$^{172}\text{Hf}^m$	−54398 24	2005.58 0.11	163 ns 3	(8^-)			
^{172}Ta	−51330 28		36.8 m 0.3	(3^+)	95		$\beta^+ = 100$
^{172}W	−49097 28		6.6 m 0.9	0^+	95		$\beta^+ = 100$
^{172}Re	−41520 50		15 s 3	(5)	95		$\beta^+ = 100$
$^{172}\text{Re}^m$	−41520# 110#	0# 100#	55 s 5	(2)	95		$\beta^+ = 100$
^{172}Os	−37238 15		19.2 s 0.9	0^+	95	95Hi02 D	$\beta^+ = ?; \alpha = 1.1\ 2$
^{172}Ir	−27520# 110#		4.4 s 0.3	(3^+)	95		$\beta^+ = 98; \alpha = 2$
$^{172}\text{Ir}^m$	−27240 30	280# 100#	2.0 s 0.1	(7^+)	95		$\beta^+ = 77\ 3; \alpha = 23\ 3$
^{172}Pt	−21101 13		98.4 ms 2.4	0^+	95	02Ro17 T	$\alpha = 77\ 21; \beta^+ ?$ *
^{172}Au	−9280# 160#		4.7 ms 1.1	high	95	96Pa01 TJ	$\alpha = ?; p < 2$ *
^{172}Hg	−1090 210		420 μs 240	0^+		99Se14 TD	$\alpha = 100$
* ^{172}Pt	T : average 02Ro17=104(7) 96Pa01=96(3) 82En03=90(10) 81De22=120(10) and						**
* ^{172}Pt	T : 75Ga25=100(10) D : derived from original $\alpha = 94(32)\%$						**
* ^{172}Au	T : average 96Pa01=6.3(1.5) 93Se09=4(1)						**
* ^{172}Au	J : from α correlation with ^{168}Ir line						**
^{173}Dy	−43780# 500#		2# s	$9/2^+ \#$			$\beta^- ?$
^{173}Ho	−49100# 400#		10# s	$7/2^- \#$			$\beta^- ?$
^{173}Er	−53650# 200#		1.434 m 0.017	$(7/2^-)$	95	94It.A T	$\beta^- = 100$
^{173}Tm	−56259 5		8.24 h 0.08	$(1/2^+)$	95		$\beta^- = 100$
$^{173}\text{Tm}^m$	−55941 5	317.73 0.20	10 μs	$(7/2^-)$			
^{173}Yb	−57556.3 2.4		STABLE	$5/2^-$	95		IS=16.13 27
$^{173}\text{Yb}^m$	−57157.4 2.5	398.9 0.5	2.9 μs 0.1	$1/2^-$			
^{173}Lu	−56885.8 2.4		1.37 y 0.01	$7/2^+$	95		$\epsilon = 100$
$^{173}\text{Lu}^m$	−56762.1 2.4	123.672 0.013	74.2 μs	$5/2^-$			
^{173}Hf	−55412 28		23.6 h 0.1	$1/2^-$	95		$\beta^+ = 100$
^{173}Ta	−52397 28		3.14 h 0.13	$5/2^-$	95		$\beta^+ = 100$
^{173}W	−48727 28		7.6 m 0.2	$5/2^-$	95		$\beta^+ = 100$
^{173}Re	−43554 28		2.0 m 0.3	$(5/2^-)$	95		$\beta^+ = 100$
^{173}Os	−37438 15		22.4 s 0.9	$(5/2^-)$	95	95Hi02 TD	$\beta^+ \approx 100; \alpha = 0.4\ 2$
^{173}Ir	−30272 14		9.0 s 0.8	$(3/2^+, 5/2^+)$	95		$\beta^+ > 93; \alpha < 7$
$^{173}\text{Ir}^m$	−30019 28	253 27	2.20 s 0.05	$(11/2^-)$	95		$\beta^+ = 88\ 1; \alpha = 12\ 1$
^{173}Pt	−21940 60		365 ms 7	$5/2^- \#$	95	02Ro17 T	$\alpha = 84\ 6; \beta^+ = 16\ 6$ *
^{173}Au	−12820 26		25 ms 1	$(1/2^+)$	03		$\alpha = 86\ 13; \beta^+ = 6\ #$ *
$^{173}\text{Au}^m$	−12606 22	214 23	14.0 ms 0.9	$(11/2^-)$	03		$\alpha = 89\ 11; \beta^+ = 4\ #$
^{173}Hg	−2570# 210#		1.1 ms 0.4	$3/2^- \#$	03		$\alpha = 100$
* ^{173}Pt	T : average 02Ro17=370(13) 96Pa01=376(11) 82En03=360(20) and 81De22=325(20)						**
* ^{173}Au	D : from 94(+6–19)%; and for isomer $^{173}\text{Au}^m$ 92(+8–13)%						**

Nuclide	Mass excess (keV)	Excitation energy(keV)			Half-life		J ^π	Ens	Reference	Decay modes and intensities (%)	
¹⁷⁴ Ho	−45500#	500#			8#	s				β [−] ?	
¹⁷⁴ Er	−51950#	300#			3.2	m	0.2	0 ⁺	99	β [−] =100	
¹⁷⁴ Tm	−53870	40			5.4	m	0.1	(4) [−]	99	β [−] =100	
¹⁷⁴ Yb	−56949.6	2.4			STABLE			0 ⁺	99	IS=31.83 92	
¹⁷⁴ Lu	−55575.3	2.4			3.31	y	0.05	1 [−]	99	98Ge13 J	β ⁺ =100
¹⁷⁴ Lu ^m	−55404.5	2.4	170.83	0.05	142	d	2	6 [−]	99	98Ge13 J	IT=99.38 2; ε=0.62 2
¹⁷⁴ Hf	−55846.6	2.8			2.0	Py	0.4	0 ⁺	99		IS=0.16 1; α=100; 2β ⁺ ?
¹⁷⁴ Hf ^m	−54049	3	1797.5	2.0	2.39	μs	0.04	(8 [−])	99		IT=100
¹⁷⁴ Ta	−51741	28			1.14	h	0.08	3 ⁺	99		β ⁺ =100
¹⁷⁴ W	−50227	28			33.2	m	2.1	0 ⁺	99		β ⁺ =100
¹⁷⁴ Re	−43673	28			2.40	m	0.04		99		β ⁺ =100
¹⁷⁴ Os	−39996	11			44	s	4	0 ⁺	99		β ⁺ ≈100; α=0.024 7
¹⁷⁴ Ir	−30869	28			7.9	s	0.6	(3 ⁺)	99		β ⁺ ≈99.5 3; α=0.5 3
¹⁷⁴ Ir ^m	−30676	26	193	11	AD	4.9	s	0.3	(7 ⁺)	99	β ⁺ ≈97.5 3; α=2.5 3
¹⁷⁴ Pt	−25319	12			889	ms	17	0 ⁺	99		α=76 8; β ⁺ ?
¹⁷⁴ Au	−14200#	100#			139	ms	3	low	99	02Ro17 TD	α=90 6; β ⁺ ?
¹⁷⁴ Au ^m	−13840	70	360#	70#	171	ms	29	high	99	96Pa01 TJ	α=7; β ⁺ ?
¹⁷⁴ Hg	−6647	20			2.0	ms	0.4	0 ⁺	99	99Se14 T	α≈100; β ⁺ =0.4#
* ¹⁷⁴ Au	T : others 96Pa01=171(29) 83Sc24=120(20)										**
¹⁷⁵ Ho	−42800#	600#			5#	s		7/2 [−] #		β [−] ?	
¹⁷⁵ Er	−48650#	400#			1.2	m	0.3	(9/2 ⁺)	98	96Zh03 TD	β [−] =100
¹⁷⁵ Tm	−52320	50			15.2	m	0.5	1/2 ⁺	98		β [−] =100
¹⁷⁵ Yb	−54700.6	2.4			4.185	d	0.001	7/2 [−]	93		β [−] =100
¹⁷⁵ Yb ^m	−54185.7	2.4	514.869	0.007	68.2	ms	0.3	1/2 [−]	93		IT=100
¹⁷⁵ Lu	−55170.7	2.2			STABLE			7/2 ⁺	93		IS=97.41 2
¹⁷⁵ Lu ^m	−53780	4	1391	3	930	μs	80	19/2 ⁺	98	98Wh02 ETJ	IT=100
¹⁷⁵ Hf	−54483.8	2.8			70	d	2	5/2 [−]	93		ε=100
¹⁷⁵ Ta	−52409	28			10.5	h	0.2	7/2 ⁺	93		β ⁺ =100
¹⁷⁵ W	−49633	28			35.2	m	0.6	(1/2 [−])	93		β ⁺ =100
¹⁷⁵ Re	−45288	28			5.89	m	0.05	(5/2 [−])	93		β ⁺ =100
¹⁷⁵ Os	−40105	14			1.4	m	0.1	(5/2 [−])	93		β ⁺ =100
¹⁷⁵ Ir	−33429	20			9	s	2	(5/2 [−])	93		β ⁺ ≈99.15 28; α=0.85 28
¹⁷⁵ Ir ^p	−33357	17	72	17	AD			<i>am</i>			
¹⁷⁵ Pt	−25690	19			2.52	s	0.08	5/2 [−] #	93		α=64 5; β ⁺ ?
¹⁷⁵ Au	−17440	40			&	100#	ms	1/2 ⁺ #	99	02Ro17 D	α=?: β ⁺ ?
¹⁷⁵ Au ^m	−17240#	50#	200#	30#	&	156	ms	3	99	02Ro17 T	α=82 17; β ⁺ ?
¹⁷⁵ Hg	−7990	100			10.8	ms	0.4	5/2 [−] #	93	02Ro17 T	α=?: β ⁺ =1#
* ¹⁷⁵ Au	D : from analysis of data in 02Ro17, we assign the 6412 line to ¹⁷⁵ Au										**
* ¹⁷⁵ Au ^m	T : average 02Ro17=158(3) 01Ko44=143(8); others 96Pa01=185(30) 83Sc24=200(22)										**
* ¹⁷⁵ Hg	T : others 97Uu01=13(+6−4) 96Pa01=8(8) outweighed, not used										**
¹⁷⁶ Er	−46500#	400#			20#	s		0 ⁺		β [−] ?	
¹⁷⁶ Tm	−49370	100			1.85	m	0.03	(4 ⁺)	98	94It.A T	β [−] =100
¹⁷⁶ Yb	−53494.1	2.6			STABLE		(>160 Py)	0 ⁺	98	96De60 T	IS=12.76 41; ...
¹⁷⁶ Yb ^m	−52444.1	2.6	1050.0	0.3	11.4	s	0.3	(8) [−]	98		IT=?: β [−] <10#
¹⁷⁶ Lu	−53387.4	2.2			38.5	Gy	0.7	7 [−]	98	03Gr02 T	IS=2.59 2; β [−] =100
¹⁷⁶ Lu ^m	−53264.5	2.2	122.855	0.006	3.664	h	0.019	1 [−]	98		β [−] ≈100; ε=0.095 16
¹⁷⁶ Hf	−54577.5	2.2			STABLE			0 ⁺	98		IS=5.26 7
¹⁷⁶ Ta	−51370	30			8.09	h	0.05	(1) [−]	98		β ⁺ =100
¹⁷⁶ Ta ^m	−51270	30	103.0	1.0	1.1	ms	0.1	(+)	98		IT=100
¹⁷⁶ Ta ⁿ	−48550	60	2820	50	0.97	ms	0.07	(20 [−])	98		IT=100
... A-group is continued on next page ...											

Nuclide	Mass excess (keV)	Excitation energy(keV)	Half-life	J^π	Ens	Reference	Decay modes and intensities (%)
... A-group continued ...							
¹⁷⁶ W	-50642	28	2.5 h	0.1	0 ⁺	98	$\varepsilon=100$
¹⁷⁶ Re	-45063	28	5.3 m	0.3	3 ⁺	98	$\beta^+=100$
¹⁷⁶ Os	-42098	28	3.6 m	0.5	0 ⁺	98	$\beta^+=100$
¹⁷⁶ Ir	-33861	20	8.3 s	0.6		98	$\beta^+=96.9$ 6; $\alpha=3.1$ 6
¹⁷⁶ Pt	-28928	14	6.33 s	0.15	0 ⁺	98	$\beta^+ ?$; $\alpha=38$ 3
¹⁷⁶ Au	-18540#	110#	1.08 s	0.17	(5 ⁻)	98 ABBW J	$\alpha=?$; $\beta^+=40$ #
¹⁷⁶ Au ^m	-18380	30	860 ms	160	(7 ⁺)	02Ro17 T	$\alpha=?$; $\beta^+=40$ #
¹⁷⁶ Hg	-11779	14	20.4 ms	1.5	0 ⁺	98 02Ro17 T	$\alpha=90$ 9; $\beta^+ ?$
¹⁷⁶ Tl	550#	200#	10# ms				$\alpha ?$
* ¹⁷⁶ Yb	D : ... ; 2 $\beta^- ?$; $\alpha ?$						**
* ¹⁷⁶ Lu	T : arithmetic average 03Gr02=40.8(0.3) 98Ni07=36.9(0.2) 92Da03=37.3(0.5)						**
* ¹⁷⁶ Lu	T : 90Ge05=40.5(0.9) 83Sa44=37.8(0.2) 82Sg01=35.9(0.5) 80No01=40.8(2.4)						**
* ¹⁷⁶ Lu	T : 72Ko50=37.9(0.3) (a weighed average would yield Birge ratio $B=4.6$)						**
* ¹⁷⁶ Ta ⁿ	E : 2774.8(1.5) + x, and x estimated 50(50) by NUBASE						**
* ¹⁷⁶ Au	J : from α decay to ¹⁷² Ir 168.4 level						**
* ¹⁷⁶ Au ^m	J : from α decay to ¹⁷² Ir ^m						**
* ¹⁷⁶ Hg	T : average 02Ro17=20(2) 99He25=21(3) 99Po09=21(4); others not used						**
* ¹⁷⁶ Hg	T : 96Pa01=18(10) and 83Sc24=34(+18-9)						**
¹⁷⁷ Er	-42800#	500#	3#	s	1/2 ⁻ #		$\beta^- ?$
¹⁷⁷ Tm	-47470#	300#	90	s	6	03	$\beta^-=100$
¹⁷⁷ Yb	-50989.2	2.6	1.911 h	0.003	(9/2 ⁺)	03	$\beta^-=100$
¹⁷⁷ Yb ^m	-50657.7	2.6	6.41 s	0.02	(1/2 ⁻)	03	IT=100
¹⁷⁷ Lu	-52389.0	2.2	6.647 d	0.004	7/2 ⁺	03	$\beta^-=100$
¹⁷⁷ Lu ^m	-51418.8	2.2	160.44 d	0.06	23/2 ⁻	03	$\beta^-=78.6$ 8; IT=21.4 8
¹⁷⁷ Lu ⁿ	-48489	10	7 m	2	39/2 ⁻	03	$\beta^-=?$; IT ?
¹⁷⁷ Lu ^p	-52238.6	2.2	130 ns	3	9/2 ⁻	03	IT=100
¹⁷⁷ Lu ^q	-51819.3	2.2	155 μ s	7	1/2 ⁺	03	IT=100
¹⁷⁷ Hf	-52889.6	2.1	STABLE		7/2 ⁻	03	IS=18.60 9
¹⁷⁷ Hf ^m	-51574.1	2.1	1.09 s	0.05	23/2 ⁺	03	IT=100
¹⁷⁷ Hf ⁿ	-50149.6	2.1	51.4 m	0.5	37/2 ⁻	03	IT=100
¹⁷⁷ Hf ^p	-51547.2	2.1	55.9 μ s	1.2	(19/2 ⁻)	03	IT=100
¹⁷⁷ Ta	-51724	4	56.56 h	0.06	7/2 ⁺	03	$\beta^+=100$
¹⁷⁷ Ta ^m	-51538	4	3.62 μ s	0.10	5/2 ⁻	03	IT=100
¹⁷⁷ Ta ⁿ	-50369	4	5.31 μ s	0.25	21/2 ⁻	03	IT=100
¹⁷⁷ Ta ^p	-51651	4	410 ns	7	9/2 ⁻	03	IT=100
¹⁷⁷ Ta ^q	-47068	4	133 μ s	4	49/2 ⁻	03	IT=100
¹⁷⁷ W	-49702	28	132 m	2	1/2 ⁻	03	$\beta^+=100$
¹⁷⁷ Re	-46269	28	14 m	1	5/2 ⁻	03	$\beta^+=100$
¹⁷⁷ Re ^m	-46184	28	50 μ s	10	5/2 ⁺	03	IT=100
¹⁷⁷ Os	-41950	16	3.0 m	0.2	1/2 ⁻	03	$\beta^+=100$
¹⁷⁷ Ir	-36047	20	30 s	2	5/2 ⁻	03	$\beta^+\approx 100$; $\alpha=0.06$ 1
¹⁷⁷ Pt	-29370	15	10.6 s	0.4	5/2 ⁻	03	$\beta^+=94.3$ 5; $\alpha=5.7$ 5
¹⁷⁷ Pt ^m	-29223	15	2.2 μ s	0.3	1/2 ⁻	03	IT=100
¹⁷⁷ Au	-21550	13	1.46 s	0.03	(1/2 ⁺ , 3/2 ⁺)	03	01Ko44 TJD $\alpha\approx 100$; $\beta^+ ?$
¹⁷⁷ Au ^m	-21334	28	1.180 s	0.012	11/2 ⁻	03	01Ko44 ETJ $\alpha\approx 100$; $\beta^+ ?$
¹⁷⁷ Au ⁿ	-21093	28	7 ns	4	(9/2 ⁻)	03	02Ro17 ETJ IT=100
¹⁷⁷ Hg	-12780	80	127.3 ms	1.8	5/2 ⁻ #	03	$\alpha=85$; $\beta^+=15$
¹⁷⁷ Tl	-3328	25	18 ms	5	(1/2 ⁺)	03	$\alpha=73$ 13; p=27 13
¹⁷⁷ Tl ^m	-2521	17	230 μ s	40	(11/2 ⁻)	03	p=51 8; $\alpha=49$ 8
* ¹⁷⁷ Au ^m	E : 157.9 keV above 5/2 ⁺ level at estimated 44(28) keV by NUBASE						**
* ¹⁷⁷ Au ⁿ	E : 240.8 keV above 11/2 ⁻ level T : < 15 ns						**

Nuclide	Mass excess (keV)		Excitation energy(keV)				Half-life		J ^π	Ens	Reference	Decay modes and intensities (%)	
¹⁷⁸ Tm	-44120#	400#					30#	s					β ⁻ ?
¹⁷⁸ Yb	-49698	10					74	m	3	0 ⁺	94		β ⁻ =100
¹⁷⁸ Lu	-50343.0	2.9					28.4	m	0.2	1 ⁽⁺⁾	94		β ⁻ =100
¹⁷⁸ Lu ^m	-50219	4	123.8	2.6	RQ		23.1	m	0.3	9 ⁽⁻⁾	94	98Ge13 J	β ⁻ =100
¹⁷⁸ Hf	-52444.3	2.1					STABLE			0 ⁺	94		IS=27.28 7
¹⁷⁸ Hf ^m	-51296.9	2.1	1147.423	0.005			4.0	s	0.2	8 ⁻	94		IT=100
¹⁷⁸ Hf ^m	-49998.6	2.1	2445.69	0.11			31	y	1	16 ⁺	94	94Ki.A E	IT=100
¹⁷⁸ Hf ^p	-49870.8	2.2	2573.5	0.5			68	μs	2	(14 ⁻)	94		IT=100
¹⁷⁸ Ta	-50507	15				*	9.31	m	0.03	1 ⁺	94		β ⁺ =100
¹⁷⁸ Ta ^m	-50410#	50#	100#	50#		*	2.36	h	0.08	(7) ⁻	94		β ⁺ =100
¹⁷⁸ Ta ⁿ	-48940#	50#	1570#	50#			59	ms	3	(15 ⁻)	94	96Ko13 T	IT=100
¹⁷⁸ Ta ^p	-47510#	50#	3000#	50#			290	ms	12	(21 ⁻)		96Ko13 TJE	
¹⁷⁸ W	-50416	15					21.6	d	0.3	0 ⁺	94		ε=100
¹⁷⁸ Re	-45653	28					13.2	m	0.2	(3 ⁺)	94		β ⁺ =100
¹⁷⁸ Os	-43546	16					5.0	m	0.4	0 ⁺	94		β ⁺ =100
¹⁷⁸ Ir	-36252	20					12	s	2		95		β ⁺ =100
¹⁷⁸ Pt	-31998	11					21.1	s	0.6	0 ⁺	94		β ⁺ =92.3 3; α=7.7 3
¹⁷⁸ Au	-22330	60					2.6	s	0.5		94		β ⁺ ≤60; α>40
¹⁷⁸ Hg	-16317	13					269	ms	3	0 ⁺	94	02Ro17 T	α=?; β ⁺ =30#
¹⁷⁸ Tl	-4750#	110#					255	ms	10			02Ro17 TD	α=?; β ⁺ =47#
¹⁷⁸ Pb	3568	24					230	μs	150	0 ⁺		01Ro.B T	α≈100; β ⁺ ?
* ¹⁷⁸ Ta ⁿ	E : 1470.6 keV above ¹⁷⁸ Ta ^m , from ENSDF												**
* ¹⁷⁸ Ta ⁿ	T : average 96Ko13=58(4) 79Du02=60(5)												**
* ¹⁷⁸ Ta ^p	E : 2902 keV above the (7) ⁻ ¹⁷⁸ Ta ^m isomer												**
* ¹⁷⁸ Hg	T : others 96Pa01=287(23) 91Se01=250(25) and 79Ha10=260(30)												**
* ¹⁷⁸ Pb	T : two events at 202 and 147 μs												**
¹⁷⁹ Tm	-41600#	500#					20#	s		1/2 ⁺ #			β ⁻ ?
¹⁷⁹ Yb	-46420#	300#					8.0	m	0.4	(1/2 ⁻)	94		β ⁻ =100
¹⁷⁹ Lu	-49064	5					4.59	h	0.06	7/2 ⁽⁺⁾	94		β ⁻ =100
¹⁷⁹ Lu ^m	-48472	5	592.4	0.4			3.1	ms	0.9	1/2 ⁽⁺⁾	94		IT=100
¹⁷⁹ Hf	-50471.9	2.1					STABLE			9/2 ⁺	94		IS=13.62 2
¹⁷⁹ Hf ^m	-50096.9	2.1	375.0367	0.0025			18.67	s	0.04	1/2 ⁻	94		IT=100
¹⁷⁹ Hf ^m	-49366.1	2.1	1105.84	0.19			25.05	d	0.25	25/2 ⁻	94		IT=100
¹⁷⁹ Ta	-50366.3	2.2					1.82	y	0.03	7/2 ⁺	00		ε=100
¹⁷⁹ Ta ^m	-49049.0	2.2	1317.3	0.4			9.0	ms	0.2	(25/2 ⁺)	00		IT=100
¹⁷⁹ Ta ⁿ	-47727.0	2.3	2639.3	0.5			54.1	ms	1.7	(37/2 ⁺)	00		IT=100
¹⁷⁹ W	-49304	16					37.05	m	0.16	(7/2 ⁻)	94		β ⁺ =100
¹⁷⁹ W ^m	-49082	16	221.926	0.008			6.40	m	0.07	(1/2 ⁻)	94		IT≈100; β ⁺ =0.28 3
¹⁷⁹ Re	-46586	24					19.5	m	0.1	(5/2 ⁺)	95		β ⁺ =100
¹⁷⁹ Re ^m	-46521	24	65.39	0.09			95	μs	25	(5/2 ⁻)			
¹⁷⁹ Os	-43020	18					6.5	m	0.3	(1/2 ⁻)	94		β ⁺ =100
¹⁷⁹ Ir	-38077	11					79	s	1	(5/2 ⁻)	98		β ⁺ =100
¹⁷⁹ Pt	-32264	9					21.2	s	0.4	1/2 ⁻	94		β ⁺ ≈100; α=0.24 3
¹⁷⁹ Au	-24952	17					7.1	s	0.3	5/2 ⁻ #	94		β ⁺ =78.0 9; α=22.0 9
¹⁷⁹ Au ^p	-24853	18	99	16	AD					(11/2 ⁻)			
¹⁷⁹ Hg	-16922	27					1.09	s	0.04	5/2 ⁻ #	94	02Ro17 T	α≈53; β ⁺ =?; β ⁺ p≈0.15
¹⁷⁹ Tl	-8300	40					270	ms	30	(1/2 ⁺)	01	ABBW J	α=?; β ⁺ =30#
¹⁷⁹ Tl ^m	-7440#	50#	860#	30#			1.60	ms	0.16	(9/2 ⁻)	01	02Ro17 T	α≈100; IT ?; β ⁺ ?
¹⁷⁹ Pb	2000#	200#					3#	ms		5/2 ⁻ #			α ?
* ¹⁷⁹ Hg	T : average 02Ro17=1.08(0.09) 71Ha03=1.09(0.04)												**
* ¹⁷⁹ Tl	T : average 02Ro17=415(55) 98To14=230(40) 83Sc24=160(+90-40)												**
* ¹⁷⁹ Tl	J : from α decay to ¹⁷⁵ Au ^m												**
* ¹⁷⁹ Tl ^m	T : average 02Ro17=1.7(0.2) 98To14=1.8(0.4) 96Pa01=0.7(+6-4) 83Sc24=1.4(0.5)												**

Nuclide	Mass excess (keV)	Excitation energy(keV)	Half-life	J^π	Ens	Reference	Decay modes and intensities (%)				
^{180}Yb	-44400#	400#	2.4 m	0.5	0 ⁺	94	β^- =100				
^{180}Lu	-46690	70	5.7 m	0.1	5 ⁺	94	β^- =100				
$^{180}\text{Lu}^m$	-46680	70	1 s		3 ⁻	95Me03 J	β^- ?; IT?				
^{180}Hf	-49788.4	2.1	STABLE	2	0 ⁺	94	IS=35.08 16				
$^{180}\text{Hf}^m$	-48646.9	2.1	1141.48	0.04	5.5 h	0.1	8 ⁻	IT \approx 100; β^- =0.3 1			
^{180}Ta	-48936.2	2.2	8.152 h	0.006	1 ⁺	94	ϵ =86 3; β^- =14 3				
$^{180}\text{Ta}^m$	-48860.9	1.8	75.3	1.3	RQ	STABLE	(>1.2 Py)	IS=0.012 2; β^- ?			
$^{180}\text{Ta}^n$	-47485.2	2.4	1451.0	1.0	45 μ s	2	15 ⁻	96Dr02 TE			
^{180}W	-49644	4	STABLE	(>700 Py)	0 ⁺	94	03Da05 T	IS=0.12 1; α ?; $2\beta^+$? *			
$^{180}\text{W}^m$	-48115	4	1529.04	0.03	5.47 ms	0.09	8 ⁻	94	IT=100		
^{180}Re	-45840	21	2.44 m	0.06	(1) ⁻	94	β^+ =100				
^{180}Os	-44359	20	21.5 m	0.4	0 ⁺	94	β^+ =100				
^{180}Ir	-37978	22	1.5 m	0.1	(4,5) ^(+ #)	94	β^+ =100				
^{180}Pt	-34436	11	52 s	3	0 ⁺	94	$\beta^+\approx$ 100; $\alpha\approx$ 0.3				
^{180}Au	-25596	21	8.1 s	0.3	94	$\beta^+\leq$ 98.2; $\alpha\geq$ 1.8					
^{180}Hg	-20245	14	2.56 s	0.02	0 ⁺	94	93Wa03 T	β^+ =52 4; α =48 4			
^{180}Tl	-9400#	120#	1.5 s	0.2	94	98To14 TD	β^+ ?; $\alpha=7$ 3; ... *				
^{180}Pb	-1939	21	5 ms	3	0 ⁺	00	96To08 TD	α =100			
$^{*180}\text{W}$	T : lower limit is for α decay, also 03Ce01>270 Py 97Ge15>74 Py						**				
$^{*180}\text{W}$	T : indication in 03Da05 for 1.1(+0.8-0.4) Ey, but important background						**				
$^{*180}\text{W}$	T : 03Da09>80 Py for $2\beta^-$ decay						**				
$^{*180}\text{Tl}$	D : ... ; $\beta^+\text{SF}\approx$ 1.0e-4						**				
$^{*180}\text{Tl}$	D : α =(2-12)% from 02An.A						**				
^{181}Yb	-40850#	400#	1# m		3/2 ⁻ #		β^- ?				
^{181}Lu	-44740#	300#	3.5 m	0.3	(7/2 ⁺)	91	β^- =100				
^{181}Hf	-47411.9	2.1	42.39 d	0.06	1/2 ⁻	91	β^- =100				
$^{181}\text{Hf}^m$	-46817	4	595	3	80 μ s	5	(9/2 ⁺)	01Sh36 ETJ IT=100			
$^{181}\text{Hf}^n$	-46372	10	1040	10	100 μ s		(17/2 ⁺)	01Sh36 ETJ IT=100			
$^{181}\text{Hf}^p$	-45674	10	1738	10	1.5 ms	0.5	(27/2 ⁻)	01Sh36 ETJ IT=100			
^{181}Ta	-48441.6	1.8	STABLE		7/2 ⁺	92	IS=99.988 2				
$^{181}\text{Ta}^m$	-48435.4	1.8	6.238	0.020	6.05 μ s	0.12	9/2 ⁻	92	IT=100		
$^{181}\text{Ta}^n$	-46957	3	1485	3	25 μ s	2	21/2 ⁻	98Wh02 ETJ IT=100			
$^{181}\text{Ta}^p$	-46212	3	2230	3	210 μ s	20	29/2 ⁻	98Wh02 ETJ IT=100			
^{181}W	-48254	5	121.2 d	0.2	9/2 ⁺	91	ϵ =100				
^{181}Re	-46511	13	19.9 h	0.7	5/2 ⁺	91	β^+ =100				
^{181}Os	-43550	30	105 m	3	1/2 ⁻	92	β^+ =100				
$^{181}\text{Os}^m$	-43500	30	48.9	0.2	2.7 m	0.1	(7/2 ⁻)	92	95Ro09 E	β^+ =100	
^{181}Ir	-39472	26	4.90 m	0.15	(5/2 ⁻)	93	β^+ =100				
^{181}Pt	-34375	15	52.0 s	2.2	1/2 ⁻	99	95Bi01 D	$\beta^+\approx$ 100; α =0.074 10			
^{181}Au	-27871	20	13.7 s	1.4	(3/2 ⁻)	99	$\beta^+=?$; $\alpha=2.7$ 5				
^{181}Hg	-20661	15	3.6 s	0.1	1/2 ⁽⁻⁾	99	$\beta^+=69$ 5; $\alpha=31$ 5; ... *				
$^{181}\text{Hg}^p$	-20460#	40#	210#	40#	13/2 ⁺						
^{181}Tl	-12801	9	3.2 s	0.3	1/2 ⁺ #	91	98To14 TD	$\alpha=?$; β^+ ?	*		
$^{181}\text{Tl}^m$	-11944	29	857	29	AD	1.7 ms	0.4	9/2 ⁻ #	98To14 TD	β^+ ?; $\alpha=?$; IT?	*
^{181}Pb	-3140	90	45 ms	20	5/2 ⁻ #	96To01 T	$\alpha=?$; $\beta^+=2$ #	*			
$^{181}\text{Pb}^m$	non existent RN &						13/2 ⁺ #	91	96To01 I	*	
$^{*181}\text{Hg}$	D : ... ; $\beta^+\text{p}=0.016$ 4; $\beta^+\alpha=11\text{e}-6$ 4						**				
$^{*181}\text{Tl}$	T : average 98To14=3.2(0.3) 92Bo.D=3.4(0.6)						**				
$^{*181}\text{Tl}^m$	T : average 98To14=1.4(0.5) 84Sc.A=2.7(1.0)						**				
$^{*181}\text{Pb}$	T : supersedes 89To01=50(+40-30) from same group						**				
$^{*181}\text{Pb}^m$	I : proved by 96To01 not to exist						**				

Nuclide	Mass excess (keV)	Excitation energy(keV)		Half-life		J^π	Ens	Reference	Decay modes and intensities (%)	
¹⁸² Lu	−41880#	200#		2.0	m	0.2	(0, 1, 2)	95		β^- =100
¹⁸² Hf	−46059	6		9	My	2	0 ⁺	95		β^- =100
¹⁸² Hf ^m	−44886	6	1172.88	0.18	61.5	m	1.5	8 [−]	95	β^- =58.3; IT=42.3
¹⁸² Ta	−46433.3	1.8		114.43	d	0.03	3 [−]	95		β^- =100
¹⁸² Ta ^m	−46417.0	1.8	16.263	0.003	283	ms	3	5 ⁺	95	IT=100
¹⁸² Ta ⁿ	−45913.7	1.8	519.572	0.018	15.84	m	0.10	10 [−]	95	IT=100
¹⁸² W	−48247.5	0.8		STABLE		(>170 Ey)	0 ⁺	95	03Da05	T IS=26.50 16; α ?
¹⁸² Re	−45450	100		*	64.0	h	0.5	7 ⁺	95	β^+ =100
¹⁸² Re ^m	−45388	20	60	100	BD	*	12.7	h	0.2	2 ⁺ 95 β^+ =100
¹⁸² Os	−44609	22			22.10	h	0.25	0 ⁺	95	ϵ =100
¹⁸² Ir	−39052	21			15	m	1	(3 ⁺)	95	95Sa42 J β^+ =100
¹⁸² Pt	−36169	16			2.2	m	0.1	0 ⁺	95	β^+ ≈100; α =0.038 2
¹⁸² Au	−28301	20			15.5	s	0.4	(2 ⁺)	95	01Ib02 J β^+ ≈100; α =0.13 5
¹⁸² Hg	−23576	10			10.83	s	0.06	0 ⁺	95	97Ba21 D β^+ ≈86.2 9; α =13.8 9; ...
¹⁸² Tl	−13350	80		*	2.0	s	0.3	2 [−] #	95	92Bo.D T β^+ >96; α <4
¹⁸² Tl ^m	−13250#	130#	100#	100#	*	2.9	s	0.5	(7 ⁺)	91Bo22 TJ α ≈100; β^+ ?
¹⁸² Tl ^p	−12750#	160#	600#	140#				10 [−]		
¹⁸² Pb	−6826	14			60	ms	40	0 ⁺	95	α =?; β^+ =2#
* ¹⁸² W	T : also 03Ce01>25 Ey 97Ge15>8.3 Ey									
* ¹⁸² Au	T : average 95Bi01=14.5(1.3)(for α), 15.3(1.0)(for α) and 92Ro21=15.6(0.4)									
* ¹⁸² Hg	D : ...; β^+ p<1e−5									
* ¹⁸² Hg	D : α average 97Ba21=13.3(0.5) 80Sc09=15.2(0.8); β^+ p is from 71Ho07									
* ¹⁸² Tl ^m	T : average 91Bo22=3.1(1.0) 92Bo.D=2.8(0.6)									
¹⁸³ Lu	−39520#	300#		58	s	4	(7/2 ⁺)	91		β^- =100
¹⁸³ Hf	−43290	30		1.067	h	0.017	(3/2 [−])	91		β^- =100
¹⁸³ Ta	−45296.1	1.8		5.1	d	0.1	7/2 ⁺	91		β^- =100
¹⁸³ Ta ^m	−45222.9	1.8	73.174	0.012	107	ns	11	9/2 [−]	91	IT=100
¹⁸³ W	−46367.0	0.8		STABLE		(>80 Ey)	1/2 [−]	01	03Da05	T IS=14.31 4; α ?
¹⁸³ W ^m	−46057.5	0.8	309.493	0.003	5.2	s	0.3	11/2 ⁺	01	IT=100
¹⁸³ Re	−45811	8		70.0	d	1.4	5/2 ⁺	99		ϵ =100
¹⁸³ Re ^m	−43903	8	1907.6	0.3	1.04	ms	0.04	(25/2 ⁺)	99	IT=100
¹⁸³ Os	−43660	50		13.0	h	0.5	9/2 ⁺	91		β^+ =100
¹⁸³ Os ^m	−43490	50	170.71	0.05	9.9	h	0.3	1/2 [−]	91	β^+ ≈85 2; IT=15 2
¹⁸³ Ir	−40197	25		58	m	5	5/2 [−]	91	61Di04	T β^+ ≈100; α =0.05#
¹⁸³ Pt	−35772	16		6.5	m	1.0	1/2 [−]	93	95Bi01	D β^+ ≈100; α =0.0096 5
¹⁸³ Pt ^m	−35738	16	34.50	0.08	43	s	5	(7/2 [−])	93	β^+ ≈100; α <4e−4; IT ?
¹⁸³ Au	−30187	10		42.8	s	1.0	5/2 [−]	99	94Pa37	J β^+ ≈100; α =0.55 25
¹⁸³ Au ^m	−30114	10	73.3	0.4	> 1	μ s		(1/2 ⁺)	99	IT=100
¹⁸³ Au ^p	−29956	10	230.6	0.6	< 1	μ s		(11/2 [−])	99	IT=100
¹⁸³ Hg	−23800	8		9.4	s	0.7	1/2 [−]	01		β^+ ≈88.3 20; α =11.7 20; ...
¹⁸³ Hg ^m	−23560#	40#	240#	40#	EU	5#	s	13/2 ⁺ #	01Sc41	I β^+ ?
¹⁸³ Hg ^p	−23602	13	198	14	AD			13/2 ⁺ #		
¹⁸³ Tl	−16587	10		6.9	s	0.7	1/2 ⁺ #	02		β^+ =?; α =2#
¹⁸³ Tl ^m	−15944	16	643	14	AD	60	ms	15	9/2 [−] #	02 α ≈1.5; β^+ ?; IT ?
¹⁸³ Tl ⁿ	−15611	20	976.8	17	1.48	μ s	0.10	(13/2 ⁺)	02	01Mu26 EJ IT=100
¹⁸³ Pb	−7569	28		535	ms	30	(3/2 [−])	03		α =?; β^+ =10#
¹⁸³ Pb ^m	−7475	28	94	8	AD	415	ms	20	(13/2 ⁺)	03 α ≈100; β^+ ?
* ¹⁸³ W	T : also 03Ce01>13 Ey 97Ge15>1.9 Ey									
* ¹⁸³ Ir	T : average 61Di04=55(7) 61La05=60(6)									
* ¹⁸³ Hg	D : ...; β^+ p=2.6e−4 8									
* ¹⁸³ Hg ^m	I : 2001Sc41= no isomer seen with same characteristics as ¹⁸⁵ Hg or ¹⁸⁷ Hg									
* ¹⁸³ Hg ^m	I : no isomer in same odd- <i>N</i> ¹⁸¹ Pt and ¹⁷⁹ Os									
* ¹⁸³ Tl ⁿ	E : 346.8(0.3) keV above ¹⁸³ Tl ^m									

Nuclide	Mass excess (keV)	Excitation energy(keV)	Half-life	J^π	Ens	Reference	Decay modes and intensities (%)
¹⁸⁴ Lu	−36410#	400#	20 s	3	(3 ⁺)	90 95Kr04 TJ	β^- =100
¹⁸⁴ Lu ^m		non existent	20 s		high	95Kr04 I	
¹⁸⁴ Hf	−41500	40	4.12 h	0.05	0 ⁺	90	β^- =100
¹⁸⁴ Hf ^m	−40230	40	48 s	10	8 [−]	95Kr04 TE	β^- =100
¹⁸⁴ Ta	−42841	26	8.7 h	0.1	(5 [−])	90	β^- =100
¹⁸⁴ W	−45707.3	0.9	STABLE	(>180 Ey)	0 ⁺	90 03Da05 T	IS=30.64 2; α ?
¹⁸⁴ Re	−44227	4	38.0 d	0.5	3 ^(−)	90	β^- =100
¹⁸⁴ Re ^m	−44039	4	169 d	8	8 ⁽⁺⁾	90	IT=75.4 11; ϵ =24.6 11
¹⁸⁴ Os	−44256.1	1.3	STABLE	(>56 Ty)	0 ⁺	90	IS=0.02 1; α ?; 2 β^+ ?
¹⁸⁴ Ir	−39611	28	3.09 h	0.03	5 [−]	90	β^- =100
¹⁸⁴ Ir ^m	−39385	28	470 μ s		3 ⁺		
¹⁸⁴ Pt	−37332	18	17.3 ms	0.2	0 ⁺	90 95Bi01 D	β^+ ≈100; α =0.0017 7
¹⁸⁴ Pt ^m	−35493	18	1.01 ms	0.05	8 [−]	90	IT=100
¹⁸⁴ Au	−30319	22	20.6 s	0.9	5 ⁺	03	β^+ ≈100; α <0.016
¹⁸⁴ Au ^m	−30251	22	47.6 s	1.4	2 ⁺	03 94Ib01 EJ	β^+ =?; IT=30 10; α <0.016
¹⁸⁴ Au ⁿ	−30091	22	69 ns	6	3 [−]	03	IT=100
¹⁸⁴ Hg	−26349	10	30.6 s	0.3	0 ⁺	90	β^+ =98.89 6; α =1.11 6
¹⁸⁴ Tl	−16890	50	9.7 s	0.6	2 [−] #	90 92Bo.D T	β^+ =97.9 7; α =2.1 7
¹⁸⁴ Tl ^m	−16790#	110#	10# s		7 ⁺ #		β^+ ?; IT ?
¹⁸⁴ Tl ⁿ	−16390#	150#	> 20 ns		(10 [−])	84Sc.A T	IT ?
¹⁸⁴ Pb	−11045	14	490 ms	25	0 ⁺	03 02An.A D	α =80 15; β^+ ?
¹⁸⁴ Bi	1050#	130#	6.6 ms	1.5	3 ⁺ #	02An.A T	α = ?
¹⁸⁴ Bi ^m	1200#	160#	13 ms	2	10 [−] #	02An.A T	α = ?
* ¹⁸⁴ W	T : also 03Ce01>29 Ey 97Ge15>4.0 Ey						**
* ¹⁸⁴ Os	T : lower limit is for α decay						**
* ¹⁸⁴ Tl ⁿ	T : alpha decay from ¹⁸⁸ Bi ^m not coincident with X(K) and γ						**
* ¹⁸⁴ Tl ⁿ	I : identified by 02Sc.A						**
¹⁸⁵ Hf	−38360#	200#	3.5 m	0.6	3/2 [−] #	95	β^- =100
¹⁸⁵ Ta	−41396	14	49.4 m	1.5	7/2 ⁺ #	95	β^- =100
¹⁸⁵ Ta ^m	−40090	30	> 1 ms		(21/2 [−])	99Wh03 TJD	IT=100
¹⁸⁵ W	−43389.7	0.9	75.1 d	0.3	3/2 [−]	95	β^- =100
¹⁸⁵ W ^m	−43192.3	0.9	1.597 m	0.004	11/2 ⁺	95 94It.A T	IT=100
¹⁸⁵ Re	−43822.2	1.2	STABLE		5/2 ⁺	95	IS=37.40 2
¹⁸⁵ Re ^m	−41698.2	2.3	123 ns	23	(21/2)	97Sh37 T	IT=100
¹⁸⁵ Os	−42809.4	1.3	93.6 d	0.5	1/2 [−]	95	ϵ =100
¹⁸⁵ Os ^m	−42707.1	1.5	3.0 μ s	0.4	7/2 [−] #	95	IT ?
¹⁸⁵ Ir	−40336	28	14.4 h	0.1	5/2 [−]	95	β^- =100
¹⁸⁵ Pt	−36680	40	70.9 m	2.4	(9/2 ⁺)	95	β^+ ≈100; α =0.0050 20
¹⁸⁵ Pt ^m	−36580	40	33.0 m	0.8	(1/2 [−])	95	β^+ =?; IT<2
¹⁸⁵ Au	−31867	26	4.25 m	0.06	5/2 [−]	95	β^+ ≈100; α =0.26 6
¹⁸⁵ Au ^m	−31770#	100#	6.8 m	0.3	1/2 ⁺ #	95	β^+ <100; IT ?
¹⁸⁵ Hg	−26176	16	49.1 s	1.0	1/2 [−]	95	β^+ =94 1; α =6 1
¹⁸⁵ Hg ^m	−26072	16	21.6 s	1.5	13/2 ⁺	95 87Ki.A E	IT=54 10; β^+ =46 10; α ≈0.03
¹⁸⁵ Tl	−19760	50	19.5 s	0.5	1/2 ⁺ #	95	β^+ =?; α ?
¹⁸⁵ Tl ^m	−19300	50	1.83 s	0.12	9/2 [−] #	95 77Sc03 E	IT≈100; α =0.10 3; β^+ ?
¹⁸⁵ Tl ⁿ	−18760	50	8.3 ns	1.4	(13/2 ⁺)	95La08 T	
¹⁸⁵ Pb	−11541	16	6.3 s	0.4	3/2 [−]	95 02An15 TJD	α =50 25; β^+ ?
¹⁸⁵ Pb ^m	−11480#	40#	4.07 s	0.15	13/2 ⁺	02An15 TJD	α =50 25; β^+ ?
¹⁸⁵ Bi	−2210#	50#	* & 2# ms		9/2 [−] #	96Da06 J	p ?; α ?
¹⁸⁵ Bi ^m	−2143	18	* & 49 μ s	7	1/2 ⁺	02 01Po05 T	p=85 6; α =15 6
* ¹⁸⁵ Ta ^m	E : from 99Wh03 : less than 100 keV above 1258 level J : assuming ground-state=7/2 ⁺						**
* ¹⁸⁵ Pt	D : if the 4444(10) keV α line is from ground-state; otherwise α =0.0010(4)% from isomer						**
* ¹⁸⁵ Hg ^m	E : ENSDF gives 99.3(0.5) plus “8-keV uncertainty”, but missed 87Ki.A work						**
* ¹⁸⁵ Pb	T : average 02An15=6.3(0.4) 80Sc09=6.1(1.1)						**
* ¹⁸⁵ Pb ^m	T : average 02An15=4.3(0.2) 80Sc09=3.73(0.24) (excluding the 6.1 s activity)						**
* ¹⁸⁵ Bi	T : estimated from 9/2 [−] isomers in odd Bi and Tl isotopes						**
* ¹⁸⁵ Bi ^m	T : average 01Po05=50(8) 96Da06=44(16)						**

Nuclide	Mass excess (keV)		Excitation energy(keV)		Half-life	J^π	Ens	Reference	Decay modes and intensities (%)		
^{186}Hf	-36430#	300#			2.6 m	1.2	0 ⁺	03	β^- =100		
^{186}Ta	-38610	60			10.5 m	0.3	(2 ⁻ , 3 ⁻)	03	β^- =100		
^{186}W	-42509.5	1.7			STABLE	(>4.1 Ey)	0 ⁺	03	03Da09	T	
$^{186}\text{W}^m$	-40992.3	1.8	1517.2	0.6	18 μs	1	(7 ⁻)	03	IS=100		
$^{186}\text{W}^n$	-38966.7	2.7	3542.8	2.1	> 3 ms		(16 ⁺)	03	IT=100		
^{186}Re	-41930.2	1.2			3.7183 d	0.0011	1 ⁻	03	β^- =92.53 10; ε =7.47 10		
$^{186}\text{Re}^m$	-41781	7	149	7	200 ky	50	(8 ⁺)	03	IT=?; β^- <10		
^{186}Os	-42999.5	1.4			2.0 Py	1.1	0 ⁺	03	IS=1.59 3; α =100		
^{186}Ir	-39173	17			16.64 h	0.03	5 ⁺	03	β^+ =100		
$^{186}\text{Ir}^m$	-39172	17	0.8	0.4	1.92 h	0.05	2 ⁻	03	91Be25	ET	
^{186}Pt	-37864	22			2.08 h	0.05	0 ⁺	03	β^+ \approx 75; IT \approx 25		
^{186}Au	-31715	21			10.7 m	0.5	3 ⁻	03	β^+ =100; $\alpha\approx$ 1.4e-4		
$^{186}\text{Au}^m$	-31487	21	227.77	0.07	110 ns	10	2 ⁺	03	β^+ =100; α =0.0008 2		
$^{186}\text{Au}^p$			non existent	RN	< 2 m				IT=100		
^{186}Hg	-28539	11			1.38 m	0.06	0 ⁺	03	83Po10	I	
$^{186}\text{Hg}^m$	-26322	11	2217.3	0.4	82 μs	5	(8 ⁻)	03	$\beta^+\approx$ 100; α =0.016 5		
^{186}Tl	-20190	180			* & 40# s		(2 ⁻)	03	IT=100		
$^{186}\text{Tl}^m$	-19874	9	320	180	AD * & 27.5 s	1.0	(7 ⁺)	03	91Va04	I	
$^{186}\text{Tl}^n$	-19501	9	690	180	AD 2.9 s	0.2	(10 ⁻)	03	β^+ ?		
^{186}Pb	-14681	11			4.82 s	0.03	0 ⁺	03	$\beta^+\approx$ 100; $\alpha\approx$ 0.006		
^{186}Bi	-3170	80			* 14.8 ms	0.7	(3 ⁺)	03	IT=100		
$^{186}\text{Bi}^m$	-2900#	160#	270#	140#	* 9.8 ms	0.4	(10 ⁻)	03	02An.A	T	
^{186}W	T : limit is 2 β^- decay; 03Da05>170 Ey 03Ce01>27 Ey 97Ge15>6.5 Ey for α decay										
$^{186}\text{W}^n$	T : lower limit is 3 ms; upper limit 30 s										
$^{186}\text{Re}^m$	T : uncertainty estimated by ENSDF'89 evaluator										
$^{186}\text{Ir}^m$	T : average 91Be25=1.90(0.05) 70Fi.A=2.0(0.1)										
$^{186}\text{Ir}^m$	E : E is positive and below 1.5 keV										
^{186}Tl	I : identified as decay level from ^{190}Bi in 91Va04										
$^{186}\text{Tl}^n$	E : 374.0(0.2) keV above $^{186}\text{Tl}^m$										
^{186}Bi	T : average 02An.A=14.8(0.8) 97Ba21=15.0(1.7)										
^{187}Hf	-32980#	400#			30# s	(>300 ns)	3/2 ⁻ #		99Be63	I	
^{187}Ta	-36770#	200#			2# m	(>300 ns)	7/2 ⁺ #		99Be63	I	
^{187}W	-39904.8	1.7			23.72 h	0.06	3/2 ⁻	92	β^- ?		
^{187}Re	-41215.7	1.4			41.2 Gy	0.2	5/2 ⁺	91	β^- ?		
^{187}Os	-41218.2	1.4			STABLE		1/2 ⁻	92	IS=62.60 2; β^- =100; ...	*	
^{187}Ir	-39716	6			10.5 h	0.3	3/2 ⁺	91	IS=1.96 2		
$^{187}\text{Ir}^m$	-39530	6	186.15	0.04	30.3 ms	0.6	9/2 ⁻	91	β^+ =100		
^{187}Pt	-36713	28			2.35 h	0.03	3/2 ⁻	91	IT=100		
^{187}Au	-33005	25			8.4 m	0.3	1/2 ⁺	91	β^+ =100		
$^{187}\text{Au}^m$	-32884	25	120.51	0.16	2.3 s	0.1	9/2 ⁻	91	$\beta^+\approx$ 100; α =0.003#		
^{187}Hg	-28118	14			& 1.9 m	0.3	3/2 ⁻	91	IT=100		
$^{187}\text{Hg}^m$	-28059	20	59	16	MD & 2.4 m	0.3	13/2 ⁺	91	β^+ =100; $\alpha>$ 1.2e-4		
^{187}Tl	-22444	8			51 s		(1/2 ⁺)	99	β^+ =100; $\alpha>$ 2.5e-4		
$^{187}\text{Tl}^m$	-22109	8	335	3	AD 15.60 s	0.12	(9/2 ⁻)	99	β^+ <100; α ?		
^{187}Pb	-14980	8			* 15.2 s	0.3	(3/2 ⁻)	00	IT=?; β^+ ?; α =0.15 5		
$^{187}\text{Pb}^n$	-14969	11	11	11	AD * 18.3 s	0.3	(13/2 ⁺)	00	$\beta^+=93$ 2; $\alpha=7$ 2		
^{187}Bi	-6373	15			32 ms	3	9/2 ⁻ #	01	$\beta^+=88$ 2; $\alpha=12$ 2		
$^{187}\text{Bi}^m$	-6272	18	101	20	AD 320 μs	70	1/2 ⁺ #	01	$\alpha>$ 50; β^+ ?		
$^{187}\text{Bi}^n$	-6121	15	252	1	7 μs	5	(13/2 ⁺)		$\alpha>$ 50; β^+ ?		
^{187}Re	D : ... ; $\alpha<$ 0.0001										
^{187}Re	T : others: 89Li30=42.3(0.7) outweighed and, same group, 86Li11=43.5(1.3)										

Nuclide	Mass excess (keV)		Excitation energy(keV)		Half-life	J^π	Ens	Reference	Decay modes and intensities (%)		
¹⁸⁸ Hf	-30880#	500#			20# s (>300 ns)	0 ⁺	02	99Be63 I	β^- ?		
¹⁸⁸ Ta	-33810#	200#			20# s (>300 ns)		02	99Be63 I	β^- ?		
¹⁸⁸ W	-38667	3			69.78 d	0.05	0 ⁺	02	β^- =100		
¹⁸⁸ Re	-39016.1	1.4			17.0040 h	0.0022	1 ⁻	02	β^- =100		
¹⁸⁸ Re ^m	-38844.0	1.4	172.069	0.009	18.59 m	0.04	(6) ⁻	02	IT=100		
¹⁸⁸ Os	-41136.4	1.4			STABLE		0 ⁺	02	IS=13.24 8		
¹⁸⁸ Ir	-38328	7			41.5 h	0.5	1 ⁻	02	β^+ =100		
¹⁸⁸ Ir ^m	-37360	30	970	30	4.2 ms	0.2	7 ⁺ #	02	IT≈100; β^+ ?		
¹⁸⁸ Pt	-37823	5			10.2 d	0.3	0 ⁺	02	ε =100; α =2.6e-5 3		
¹⁸⁸ Au	-32301	20			8.84 m	0.06	1 ⁽⁻⁾	02	β^+ =100		
¹⁸⁸ Hg	-30202	12			3.25 m	0.15	0 ⁺	02	β^+ =100; α =3.7e-5 8		
¹⁸⁸ Hg ^m	-27478	12	2724.3	0.4	134 ns	15	(12 ⁺)	02	IT=100		
¹⁸⁸ Tl	-22350	30		*	71 s	2	(2 ⁻)	02	β^+ =100		
¹⁸⁸ Tl ^m	-22307	10	40	30	MD	*	71 s	1	(7 ⁺)	02	β^+ =100
¹⁸⁸ Tl ⁿ	-22038	10	310	30	MD		41 ms	4	(9 ⁻)	02	IT≈100; β^+ ?
¹⁸⁸ Pb	-17815	11			25.5 s	0.1	0 ⁺	02	β^+ =?; α =9.3 8		
¹⁸⁸ Pb ^m	-15237	11	2578.2	0.7	830 ns	210	(8 ⁻)	02	IT=100		
¹⁸⁸ Pb ⁿ	-15102	11	2713.0	0.6	94 ns		(11 ⁻)	02	IT=100		
¹⁸⁸ Pb ^p	-15020	50	2800	50	797 ns	21		02	IT=100		
¹⁸⁸ Bi	-7200	50		* &	44 ms	3	3 ⁺ #	02	97Wa05 T	α =?; β^+ ?	
¹⁸⁸ Bi ^m	-7000#	150#	210#	140#	* &	220 ms	40	(10 ⁻)	02	97Wa05 T	α =?; β^+ ?
¹⁸⁸ Po	-538	19			430 μ s	180	0 ⁺	02			α =?; β^+ ?
¹⁸⁸ Ir ^m	E : less than 100 keV above 923.5 level, from ENSDF										
¹⁸⁸ Tl ⁿ	E : 268.8(0.5) keV above ¹⁸⁸ Tl ^m , from 91Va04										
¹⁸⁸ Pb ^p	E : 2700.5 above unknown level, see ENSDF 02										
¹⁸⁸ Bi	T : average 97Wa05=46(7) 84Sc.A=44(3)										
¹⁸⁸ Bi ^m	T : average 97Wa05=218(50) 84Sc.A=210(90)										
¹⁸⁹ Ta	-31830#	300#			3# s (>300 ns)	7/2 ⁺ #		99Be63 I	β^- ?		
¹⁸⁹ W	-35480	200			11.6 m	0.3	(3/2 ⁻)	91	97Ya03 T	β^- =100	
¹⁸⁹ Re	-37978	8			24.3 h	0.4	5/2 ⁺	91		β^- =100	
¹⁸⁹ Os	-38985.4	1.5			STABLE		3/2 ⁻	91		IS=16.15 5	
¹⁸⁹ Os ^m	-38954.6	1.5	30.814	0.018	5.8 h	0.1	9/2 ⁻	91		IT=100	
¹⁸⁹ Ir	-38453	13			13.2 d	0.1	3/2 ⁺	91		ε =100	
¹⁸⁹ Ir ^m	-38081	13	372.18	0.04	13.3 ms	0.3	11/2 ⁻	91		IT=100	
¹⁸⁹ Ir ⁿ	-36120	13	2333.3	0.4	3.7 ms	0.2	(25/2) ⁺	91		IT=100	
¹⁸⁹ Pt	-36483	11			10.87 h	0.12	3/2 ⁻	92		β^+ =100	
¹⁸⁹ Pt ^m	-36291	11	191.6	0.4	143 μ s		(13/2 ⁺)				
¹⁸⁹ Au	-33582	20			28.7 m	0.3	1/2 ⁺	92		β^+ =100; α <3e-5	
¹⁸⁹ Au ^m	-33335	20	247.23	0.17	4.59 m	0.11	11/2 ⁻	92		β^+ ≈100; IT=?	
¹⁸⁹ Hg	-29630	30			7.6 m	0.1	3/2 ⁻	96		β^+ =100; α <3e-5	
¹⁸⁹ Hg ^m	-29549	18	80	30	MD		13/2 ⁺	96	01Sc41 E	β^+ =100; α <3e-5	
¹⁸⁹ Tl	-24602	11			2.3 m	0.2	(1/2 ⁺)	99		β^+ =100	
¹⁸⁹ Tl ^m	-24319	10	283	6	AD		9/2 ⁽⁻⁾	99	85Bo46 J	β^+ ≈100; IT<4	
¹⁸⁹ Pb	-17880	30		*	51 s	3	(3/2 ⁻)	91	ABBW J	β^+ >99; α ≈0.4	
¹⁸⁹ Pb ^m	-17840#	50#	40#	30#	1# m		(13/2 ⁺)		ABBW J	β^+ ?; IT ?	
¹⁸⁹ Bi	-10060	50			674 ms	11	(9/2 ⁻)	98	95Ba75 J	α >50; β^+ <50	
¹⁸⁹ Bi ^m	-9880	50	181	6	AD		(1/2 ⁺)	98	95Ba75 TJ	α >50; β^+ <50	
¹⁸⁹ Bi ⁿ	-9700	50	357	1	880 ns	50	(13/2 ⁺)		01An11 ETJ	IT=100	
¹⁸⁹ Po	-1415	22			5 ms	1	3/2 ⁻ #		99An52 TD	α =?; β^+ ?	
¹⁸⁹ W	T : average 97Ya03=11.7(0.5) 65Ka07=11.5(0.3)										
¹⁸⁹ Pb	J : from α decay to ¹⁸⁵ Hg										
¹⁸⁹ Pb ^m	J : from α decay from ¹⁹³ Po ^m										
¹⁸⁹ Bi	T : average 02Hu14=667(13) 97Wa05=728(40) 85Co06=680(30)										
¹⁸⁹ Bi ^m	T : average 97An09=4.8(0.5) 97Wa05=5.2(0.6) 95Ba75=7.0(0.2)										
¹⁸⁹ Bi ⁿ	T : from 02Hu14; also 01An11>360(120)										

Nuclide	Mass excess (keV)	Excitation energy(keV)	Half-life	J^π	Ens	Reference	Decay modes and intensities (%)	
^{190}Ta	−28660#	400#	300# ms				β^- ?	
^{190}W	−34300	160	30.0 m	1.5	0 ⁺	03	β^- =100	
$^{190}\text{W}^m$	−31920	160	2381	5	< 3.1 ms	(10 [−]) 03	IT=100	
^{190}Re	−35570	150			3.1 m	0.3	(2 [−]) 03	β^- =100
$^{190}\text{Re}^m$	−35360	160	210	60	3.2 h	0.2	(6 [−]) 03	ABBW E β^- =54.4 20; IT ?
^{190}Os	−38706.3	1.5			STABLE		0 ⁺ 03	IS=26.26 2
$^{190}\text{Os}^m$	−37000.9	1.5	1705.4	0.2	9.9 m	0.1	(10 [−]) 03	IT=100
^{190}Ir	−36751.2	1.7			11.78 d	0.10	4 [−] 03	β^+ =100; α^+ <0.002
$^{190}\text{Ir}^m$	−36725.1	1.7	26.1	0.1	1.120 h	0.003	(1 [−]) 03	IT=100
$^{190}\text{Ir}^n$	−36374.8	1.7	376.4	0.1	3.087 h	0.012	(11 [−]) 03	β^+ =91.4 2; IT=8.6 2
$^{190}\text{Ir}^p$	−36715.0	1.7	36.154	0.025	> 2 μs		(4 ⁺) 03	IT=100
$^{190}\text{Ir}^q$	−36433.6	1.7	317.56	0.04	90 ns		(5 [−]) 03	IT=100
^{190}Pt	−37323	6			650 Gy	30	0 ⁺ 03	IS=0.014 1; α =100;...
^{190}Au	−32881	16			* 42.8 m	1.0	1 [−] 03	β^+ =100; α <1e−6
$^{190}\text{Au}^m$	−32680#	150#	200#	150#	* 125 ms	20	11 [−] # 03	IT≈100; β^+ ?
^{190}Hg	−31370	16			20.0 m	0.5	0 ⁺ 03	ε ≈100; α^+ <1; ...
^{190}Tl	−24330	50			* 2.6 m	0.3	2 ^(−) 03	β^+ =100
$^{190}\text{Tl}^m$	−24200#	70#	130#	90#	* 3.7 m	0.3	7 ⁽⁺⁾ 03	β^+ =100
$^{190}\text{Tl}^n$	−24040#	90#	290#	70#	750 μs	40	(8 [−]) 03	IT=100
$^{190}\text{Tl}^p$	−23920#	90#	410#	70#	> 1 μs		9 [−] 03	91Va04 ET IT ?
^{190}Pb	−20417	12			71 s	1	0 ⁺ 03	β^+ ?; α =0.40 4
$^{190}\text{Pb}^m$	−17802	12	2614.8	0.8	150 ns		(10 ⁺) 03	IT=100
$^{190}\text{Pb}^n$	−17799	23	2618	20	25 μs		(12 ⁺) 03	IT ?
$^{190}\text{Pb}^p$	−17759	12	2658.2	0.8	7.2 μs	0.6	(11 [−]) 03	IT=100
^{190}Bi	−10900	180			6.3 s	0.1	(3 ⁺) 03	91Va04 J α =77 21; β^+ =?
$^{190}\text{Bi}^m$	−10483	10	420	180	MD 6.2 s	0.1	(10 [−]) 03	91Va04 J α =70 9; β^+ ?
$^{190}\text{Bi}^n$	−10210	10	690	180	MD > 500 ns	100	7 ⁺ # 03	01An11 ET IT=100
^{190}Po	−4563	13			2.46 ms	0.05	0 ⁺ 03	α ≈100; β^+ =0.1#
* $^{190}\text{Re}^m$	E : from lower limit 119.12 and calculated 173 and 220 (see ENSDF'90)							
* $^{190}\text{Re}^m$	E : 210(290) from difference in beta-decay							
* ^{190}Pt	D : ... ; 2 β^+ ?							
* ^{190}Hg	D : ... ; α <3.4e−7							
* $^{190}\text{Tl}^n$	E : 161.9 keV above $^{190}\text{Tl}^m$							
* $^{190}\text{Tl}^p$	E : 236.2 keV above $^{190}\text{Tl}^m$							
* $^{190}\text{Pb}^n$	E : above $^{190}\text{Pb}^m$, see ENSDF'03							
* $^{190}\text{Bi}^n$	E : 273(1) keV above the (10 [−]) isomer							
^{191}W	−31110#	200#			20# s	(>300 ns)	3/2 [−] #	99Be63 I β^- ?
^{191}Re	−34349	10			9.8 m	0.5	(3/2 ⁺ , 1/2 ⁺) 95	β^- =100
^{191}Os	−36393.7	1.5			15.4 d	0.1	9/2 [−] 95	β^- =100
$^{191}\text{Os}^m$	−36319.3	1.5	74.382	0.003	13.10 h	0.05	3/2 [−] 95	IT=100
^{191}Ir	−36706.4	1.7			STABLE		3/2 ⁺ 95	IS=37.3 2
$^{191}\text{Ir}^m$	−36535.2	1.7	171.24	0.05	4.94 s	0.03	11/2 [−] 95	IT=100
$^{191}\text{Ir}^n$	−34590	40	2120	40	5.5 s	0.7	95	ABBW E IT=100
^{191}Pt	−35698	4			2.802 d	0.025	3/2 [−] 96	ε =100
$^{191}\text{Pt}^m$	−35549	4	149.04	0.02	95 μs		13/2 ⁺	
^{191}Au	−33810	40			3.18 h	0.08	3/2 ⁺ 99	β^+ =100
$^{191}\text{Au}^m$	−33540	40	266.2	0.5	920 ms	110	(11/2 [−]) 99	IT=100
^{191}Hg	−30593	23			49 m	10	3/2 ^(−) 00	86UI02 J β^+ ≈100; α <5e−6
$^{191}\text{Hg}^m$	−30470	30	128	22	50.8 m	1.5	13/2 ⁺ 00	01Sc41 E β^+ =100; α <5e−6
^{191}Tl	−26281	8			20# m		(1/2 ⁺) 95	β^+ ?
$^{191}\text{Tl}^m$	−25984	7	297	7	BD 5.22 m	0.16	9/2 ^(−) 95	β^+ =100
^{191}Pb	−20250	40			* 1.33 m	0.08	(3/2 [−]) 95	β^+ ≈100; α =0.013 5
$^{191}\text{Pb}^m$	−20231	28	20	50	MD * 2.18 m	0.08	13/2 ⁽⁺⁾ 95	88Me.A J β^+ ≈100; α ≈0.02
^{191}Bi	−13240	7			12.3 s	0.3	(9/2 [−]) 00	03Ke04 T α =60 20; β^+ =40 20
$^{191}\text{Bi}^m$	−13000	9	240	4	AD 124 ms	5	(1/2 ⁺) 00	03Ke04 T α =75 25; β^+ ≈25
^{191}Po	−5054	11			22 ms	1	3/2 [−] # 00	α ≈100; β^+ ?
$^{191}\text{Po}^m$	−5020	10	34	12	AD 98 ms	8	(13/2 ⁺) 00	α ≈100; β^+ ?
* $^{191}\text{Ir}^n$	E : estimated less than 150 keV above 2047.1 level, from ENSDF							
* $^{191}\text{Hg}^m$	E : original error (8 keV) increased by 20 for isomer+ground-state lines in trap							
* ^{191}Bi	T : average 03Ke04=12.4(0.4) 85Co06=12(1) 74Le02=13(1) 72Ga27=12.0(0.7)							
* $^{191}\text{Bi}^m$	T : average 03Ke04=121(+8−5) 99An36=115(10) 81Le23=150(15)							

Nuclide	Mass excess (keV)	Excitation energy(keV)		Half-life	J ^π	Ens	Reference	Decay modes and intensities (%)
¹⁹² W	−29650#	600#		10# s (>300ns)	0 ⁺		99Be63 I	β [−] ?
¹⁹² Re	−31710#	200#		16 s	1	98		β [−] =100
¹⁹² Os	−35880.5	2.6		STABLE	(>9.8 Ty)	0 ⁺	98	IS=40.78 19; 2β [−] ?; α ? *
¹⁹² Os ^m	−33865.1	2.6	2015.40	0.11	5.9 s	0.1	(10 [−])	98 IT>87; β [−] <13
¹⁹² Ir	−34833.2	1.7		73.827 d	0.013	4 ⁺	98	β [−] =95.13 14; ε=4.87 14
¹⁹² Ir ^m	−34776.5	1.7	56.720	0.005	1.45 m	0.05	1 [−]	98 IT≈100; β [−] =0.0175
¹⁹² Ir ⁿ	−34665.1	1.7	168.14	0.12	241 y	9	(11 [−])	98 IT=100
¹⁹² Pt	−36292.9	2.5		STABLE		0 ⁺	98	IS=0.782 7
¹⁹² Au	−32777	16		4.94 h	0.09	1 [−]	98	β ⁺ =100
¹⁹² Au ^m	−32642	16	135.41	0.25	29 ms	5# ⁺	98	IT=100
¹⁹² Au ⁿ	−32345	16	431.6	0.5	160 ms	20	(11 [−])	98 IT=100
¹⁹² Hg	−32011	16		4.85 h	0.20	0 ⁺	00	ε=100; α<4e−6
¹⁹² Tl	−25870	30		9.6 m	0.4	(2 [−])	99	β ⁺ =100
¹⁹² Tl ^m	−25710	60	160	50	10.8 m	0.2	(7 ⁺)	99 91Va04 E β ⁺ =100
¹⁹² Tl ^p	−25694	25	180	40	AD		(3 ⁺)	91Va04 E
¹⁹² Pb	−22556	13		3.5 m	0.1	0 ⁺	98	β ⁺ ≈100; α=0.0059 7
¹⁹² Pb ^m	−19975	13	2581.1	0.1	164 ns	7	(10 ⁺)	98 IT=100
¹⁹² Pb ⁿ	−19931	13	2625.1	1.1	1.1 μs	0.5	(12 ⁺)	98 IT=100
¹⁹² Pb ^p	−19813	13	2743.5	0.4	756 ns	21	(11 [−])	98 IT=100
¹⁹² Bi	−13550	30		34.6 s	0.9	(3 ⁺)	98	β ⁺ =88 5; α=12 5
¹⁹² Bi ^m	−13399	9	150	30	MD	39.6 s	0.4	(10 [−]) 98 β ⁺ =90 3; α=10 3
¹⁹² Po	−8071	12		32.2 ms	0.3	0 ⁺	98	99He32 T α=?; β ⁺ =0.5# *
¹⁹² Po ^m	−5470#	500#	2600#	500#	1 μs	12 ⁺ #	99He32 T	IT=100
* ¹⁹² Os	T : lower limit is for 0ν-2β [−] decay **							
* ¹⁹² Po	T : others 98A127=31(4) 96Bi17=33.2(1.4) 81Le23=34(3) outweighed, not used **							
¹⁹³ Re	−30300#	200#		30# s (>300 ns)	5/2 ⁺ #		99Be63 I	β [−] ?
¹⁹³ Os	−33392.6	2.6		30.11 h	0.01	3/2 [−]	98	β [−] =100
¹⁹³ Ir	−34533.8	1.7		STABLE		3/2 ⁺	98	IS=62.7 2
¹⁹³ Ir ^m	−34453.6	1.7	80.240	0.006	10.53 d	0.04	11/2 [−]	98 IT=100
¹⁹³ Pt	−34477.0	1.7		50 y	6	1/2 [−]	98	ε=100
¹⁹³ Pt ^m	−34327.2	1.7	149.78	0.04	4.33 d	0.03	13/2 ⁺	98 IT=100
¹⁹³ Au	−33394	11		17.65 h	0.15	3/2 ⁺	98	β ⁺ =100; α<1e−5
¹⁹³ Au ^m	−33104	11	290.19	0.03	3.9 s	0.3	11/2 [−]	98 IT≈100; β ⁺ ≈0.03
¹⁹³ Hg	−31051	15		3.80 h	0.15	3/2 [−]	99	β ⁺ =100
¹⁹³ Hg ^m	−30910	15	140.76	0.05	11.8 h	0.2	13/2 ⁺	99 β ⁺ =92.8 5; IT=7.2 5
¹⁹³ Tl	−27320	110		21.6 m	0.8	1/2 ⁽⁺⁾ #	99	β ⁺ =100
¹⁹³ Tl ^m	−26950	110	369	4	2.11 m	0.15	9/2 [−]	99 IT=75; β ⁺ =25 *
¹⁹³ Pb	−22190	50		* 5# m		(3/2 [−])	99	ABBW J β ⁺ ?
¹⁹³ Pb ^m	−22060#	90#	130#	80#	* 5.8 m	0.2	13/2 ⁽⁺⁾	99 88Me.A J β ⁺ =100
¹⁹³ Bi	−15873	10		67 s	3	(9/2 [−])	98	β ⁺ ?; α=3.5 15
¹⁹³ Bi ^m	−15564	12	308	7	AD	3.2 s	0.6	(1/2 ⁺) 98 α=90 20; β ⁺ ?
¹⁹³ Po	−8360	30		420 ms	40	3/2 [−] #	98	α=?; β ⁺ =5#
¹⁹³ Po ^m	−8260#	50#	100#	30#	240 ms	10	(13/2 ⁺)	98 ABBW J α=?; β ⁺ =3#
¹⁹³ At	−150	50		40 ms		9/2 [−] #	98	α=100
* ¹⁹³ Tl ^m	E : less than 13 keV above 362.5 level, from ENSDF **							
* ¹⁹³ Pb	J : from α decay from ¹⁹⁷ Po **							
* ¹⁹³ Pb	T : T=4.0 m reported in Karlsruhe charts 1981 and 1995. Not traceable **							
¹⁹⁴ Re	−27550#	300#		2# s (>300ns)			99Be63 I	β [−] ?
¹⁹⁴ Os	−32432.7	2.6		6.0 y	0.2	0 ⁺	96	β [−] =100
¹⁹⁴ Ir	−32529.3	1.7		19.28 h	0.13	1 [−]	96	β [−] =100
¹⁹⁴ Ir ^m	−32382.2	1.7	147.078	0.005	31.85 ms	0.24	(4 ⁺)	96 IT=100
¹⁹⁴ Ir ⁿ	−32160	70	370	70	BD	171 d	11	(10, 11) ^(−#) 96 β [−] =100
¹⁹⁴ Pt	−34763.1	0.9		STABLE		0 ⁺	96	IS=32.967 99
¹⁹⁴ Au	−32262	10		38.02 h	0.10	1 [−]	96	β ⁺ =100
¹⁹⁴ Au ^m	−32155	10	107.4	0.5	600 ms	8	(5 ⁺)	96 IT=100
¹⁹⁴ Au ⁿ	−31786	10	475.8	0.6	420 ms	10	(11 [−])	96 IT=100
¹⁹⁴ Hg	−32193	13		440 y	80	0 ⁺	01	ε=100

... A-group is continued on next page ...

Nuclide	Mass excess (keV)				Excitation energy(keV)		Half-life	J^π	Ens	Reference	Decay modes and intensities (%)	
... A-group continued ...												
^{194}Tl	-26830	140				*	33.0 m	0.5	2 ⁻	99	$\beta^+=100; \alpha<1\text{e-}7$	
$^{194}\text{Tl}^m$	-26530#	240#	300#	200#		*	32.8 m	0.2	(7 ⁺)	99	$\beta^+=100$	
^{194}Pb	-24208	17					12.0 m	0.5	0 ⁺	99	$\beta^+=100; \alpha=7.3\text{e-}6\text{ }29$	
^{194}Bi	-15990	50				*	95 s	3	(3 ⁺)	96	$\beta^+\approx 100; \alpha=0.46\text{ }25$	
$^{194}\text{Bi}^m$	-15880	50	110	70	MD	*	125 s	2	(6 ⁺ , 7 ⁺)	96	$\beta^+\approx 100; \alpha?$	
$^{194}\text{Bi}^n$	-15760#	70#	230#	90#			115 s	4	(10 ⁻)	96	$\beta^+\approx 100; \alpha=0.20\text{ }7$	
^{194}Po	-11005	13					392 ms	4	0 ⁺	96	$\alpha\approx 100; \beta^+?$	
$^{194}\text{Po}^m$	-8480	13	2525	2			15 μs	2	(11 ⁻)	99He32	TJD	IT=100
^{194}At	-1190	190					40 ms		3 ⁺ #	96	$\alpha\approx 100; \beta^+?$	
$^{194}\text{At}^m$	-711	17	480	190	AD		250 ms		10 ⁻ #	96	$\alpha\approx 100; \text{IT}?$	
^{195}Os	-29690	500					6.5 m		3/2 ⁻ #	99	$\beta^-=100$	*
^{195}Ir	-31689.8	1.7					2.5 h	0.2	3/2 ⁺	99	$\beta^-=100$	
$^{195}\text{Ir}^m$	-31590	5	100	5			3.8 h	0.2	11/2 ⁻	99	$\beta^-=95\text{ }5; \text{IT}=5\text{ }5$	
^{195}Pt	-32796.8	0.9					STABLE		1/2 ⁻	99	IS=33.832 10	
$^{195}\text{Pt}^m$	-32537.5	0.9	259.30	0.08			4.02 d	0.01	13/2 ⁺	99	IT=100	
^{195}Au	-32570.0	1.3					186.10 d	0.05	3/2 ⁺	99	$\varepsilon=100$	
$^{195}\text{Au}^m$	-32251.4	1.3	318.58	0.04			30.5 s	0.2	11/2 ⁻	99	IT=100	
^{195}Hg	-31000	23					10.53 h	0.03	1/2 ⁻	99	$\beta^+=100$	
$^{195}\text{Hg}^m$	-30824	23	176.07	0.04			41.6 h	0.8	13/2 ⁺	99	IT=54.2 20; $\beta^+=45.8\text{ }20$	
^{195}Tl	-28155	14					1.16 h	0.05	1/2 ⁺	99	$\beta^+=100$	
$^{195}\text{Tl}^m$	-27672	14	482.63	0.17			3.6 s	0.4	9/2 ⁻	99	IT=100	
^{195}Pb	-23714	23					15 m		3/2# ⁻	99	$\beta^+=100$	
$^{195}\text{Pb}^m$	-23511	23	202.9	0.7			15.0 m	1.2	13/2 ⁺	99	$\beta^+=100$	
^{195}Bi	-18024	6					183 s	4	(9/2 ⁻)	99	$\beta^+\approx 100; \alpha=0.03\text{ }2$	
$^{195}\text{Bi}^m$	-17624	8	399	6	AD		87 s	1	(1/2 ⁺)	99	$\beta^+=67\text{ }17; \alpha=33\text{ }17$	*
^{195}Po	-11070	40					4.64 s	0.09	3/2 ⁻ #	99	$\alpha=75\text{ }15; \beta^+=25\text{ }15$	
$^{195}\text{Po}^m$	-10964	28	110	50	AD		1.92 s	0.02	13/2 ⁺ #	00	$\alpha\approx 90; \beta^+\approx 10; \text{IT}<0.01$	
^{195}At	-3476	9				&	328 ms	20	(1/2 ⁺)	00	$\alpha\approx 100; \beta^+?$	
$^{195}\text{At}^m$	-3443	8	34	7	AD	&	147 ms	5	9/2 ⁻ #	00	$\alpha=?; \beta^+<25\#$	
^{195}Rn	5070	50				*	6 ms		3/2 ⁻ #	01Ke06	TD	$\alpha=?$
$^{195}\text{Rn}^m$	5118	15	50	50		*	6 ms		13/2 ⁺ #	01Ke06	TD	$\alpha=?$
* ^{195}Os I : identification of this nuclide has been questioned, see ENSDF'99												
* $^{195}\text{Bi}^m$ J : spins of ground-state and of isomer derived from alpha decay												
^{196}Os	-28280	40					34.9 m	0.2	0 ⁺	98	$\beta^-=100$	
^{196}Ir	-29440	40					52 s	1	(0 ⁻)	98	$\beta^-=100$	
$^{196}\text{Ir}^m$	-29229	20	210	40	BD		1.40 h	0.02	(10, 11 ⁻)	98	$\beta^-=100; \text{IT}<0.3$	
^{196}Pt	-32647.4	0.9					STABLE		0 ⁺	98	IS=25.242 41	
^{196}Au	-31140.0	3.0					6.1669 d	0.0006	2 ⁻	98	$\beta^+=92.8\text{ }8; \beta^-=7.2\text{ }8$	
$^{196}\text{Au}^m$	-31055	3	84.660	0.020			8.1 s	0.2	5 ⁺	98	IT=100	
$^{196}\text{Au}^n$	-30544	3	595.66	0.04			9.6 h	0.1	12 ⁻	98	IT=100	
^{196}Hg	-31826.7	2.9					STABLE	(>2.5 Ey)	0 ⁺	98	90Bu28 T	IS=0.15 1; 2 $\beta^+?$
^{196}Tl	-27497	12					1.84 h	0.03	2 ⁻	98	$\beta^+=100$	
$^{196}\text{Tl}^m$	-27103	12	394.2	0.5			1.41 h	0.02	(7 ⁺)	98	$\beta^+=95.5; \text{IT}=4.5$	
^{196}Pb	-25361	14					37 m	3	0 ⁺	01	$\beta^+=100; \alpha\leq 3\text{e-}5$	
$^{196}\text{Pb}^m$	-23623	14	1738.27	0.12			< 1 μs		4 ⁺	01	IT=100	
^{196}Bi	-18009	24					5.1 m	0.2	(3 ⁺)	99	$\beta^+\approx 100; \alpha=0.00115\text{ }34$	
$^{196}\text{Bi}^m$	-17842	25	166.6	3.0	AD		0.6 s	0.5	(7 ⁺)	99	IT=?; $\beta^+?$	
$^{196}\text{Bi}^n$	-17739	25	270	3	AD		4.00 m	0.05	(10 ⁻)	99	$\beta^-=74.2\text{ }25; \text{IT}=25.8\text{ }25; \dots$	*
^{196}Po	-13474	13					5.56 s	0.12	0 ⁺	98	93Wa04 TD	$\alpha=94\text{ }5; \beta^+=6\text{ }5$
$^{196}\text{Po}^m$	-10984	13	2490.5	1.7			850 ns	90	(11 ⁻)	98	IT=100	
^{196}At	-3920	60				*	253 ms	9	3 ⁺ #	98	97Pu01 T	$\alpha=?; \beta^+=4\#$
$^{196}\text{At}^m$	-3950	50	-30	80	AD	*	20# ms		10 ⁻ #	96En01	D	IT?
$^{196}\text{At}^n$	-3760	60	157.9	0.1			11 μs		5 ⁺ #	00Sm06	ET	IT?
^{196}Rn	1970	15					4.7 ms	1.1	0 ⁺	98	01Ke06 T	$\alpha\approx 100; \beta^+=0.2\#$
* $^{196}\text{Bi}^n$ D : ...; $\alpha=0.00038\text{ }10$												
* ^{196}Po T : average 97Pu01=5.5(0.1) 93Wa04=5.8(0.2)												

Nuclide	Mass excess (keV)		Excitation energy(keV)		Half-life		J^π	Ens	Reference	Decay modes and intensities (%)	
¹⁹⁷ Ir	−28268	20			5.8	m	0.5	3/2 ⁺	96		β^- =100
¹⁹⁷ Ir ^m	−28153	21	115	5	8.9	m	0.3	11/2 [−]	96		β^- ≈100; IT=0.25 10
¹⁹⁷ Pt	−30422.4	0.8			19.8915	h	0.0019	1/2 [−]	96		β^- =100
¹⁹⁷ Pt ^m	−30022.8	0.8	399.59	0.20	95.41	m	0.18	13/2 ⁺	96		IT=96.7 4; β^- =3.3 4
¹⁹⁷ Au	−31141.1	0.6			STABLE			3/2 ⁺	96		IS=100.
¹⁹⁷ Au ^m	−30732.0	0.6	409.15	0.08	7.73	s	0.06	11/2 [−]	96		IT=100
¹⁹⁷ Hg	−30541	3			64.94	h	0.07	1/2 [−]	96	01Li17 T	ϵ =100
¹⁹⁷ Hg ^m	−30242	3	298.93	0.08	23.8	h	0.1	13/2 ⁺	96		IT=91.4 7; ϵ =8.6 7
¹⁹⁷ Tl	−28341	16			2.84	h	0.04	1/2 ⁺	96		β^+ =100
¹⁹⁷ Tl ^m	−27733	16	608.22	0.08	540	ms	10	9/2 [−]	96		IT=100
¹⁹⁷ Pb	−24749	6			8	m	2	3/2 [−]	01		β^+ =100
¹⁹⁷ Pb ^m	−24429	6	319.31	0.11	43	m	1	13/2 ⁺	01		β^+ =81 2; IT=19 2; ...
¹⁹⁷ Pb ⁿ	−22835	6	1914.10	0.25	1.15	μ s	0.20	21/2 [−]	01		IT=100
¹⁹⁷ Bi	−19688	8			9.3	m	0.5	(9/2 [−])	99		β^+ =100; α =1e−4#
¹⁹⁷ Bi ^m	−19000	110	690	110	AD	5.04	m	0.16	(1/2 ⁺)	99	α =55 40; β^+ =45 40; ...
¹⁹⁷ Po	−13360	50			53.6	s	1.0	(3/2 [−])	96		β^+ ?; α =44 7
¹⁹⁷ Po ^m	−13120#	90#	230#	80#		25.8	s	0.1	(13/2 ⁺)	96	α =84 9; β^+ ?; IT=0.01#
¹⁹⁷ At	−6340	50			*	350	ms	40	(9/2 [−])	96	α =96 4; β^+ =4 4
¹⁹⁷ At ^m	−6293	13	50	50	AD *	3.7	s	2.5	(1/2 ⁺)	96	α ≈100; β^+ ?; IT<0.004
¹⁹⁷ Rn	1480	60			66	ms	16	3/2 [−]	# 98	96En02 T	α ≈100; β^+ ?
¹⁹⁷ Rn ^m	1670#	50#	200#	60#		21	ms	5	(13/2 ⁺)	98	96En02 T α ≈100; β^+ ?
* ¹⁹⁷ Hg T : other 66El09=64.14(0.05) at strong variance: Birge ratio would be B=9.3											
* ¹⁹⁷ Pb ^m D : ... ; α <3e−4											
* ¹⁹⁷ Bi ^m D : ... ; IT<0.3											
* ¹⁹⁷ Rn T : average 96En02=65(+25−14) 95Mo14=51(+35−15)											
* ¹⁹⁷ Rn ^m T : average 96En02=19(+8−4) 95Mo14=18(+9−5) J : from α decay to ¹⁹³ Po ^m											
...											
¹⁹⁸ Ir	−25820#	200#			8	s	1		02		β^- =100
¹⁹⁸ Pt	−29908	3			STABLE		(>320 Ty)	0 ⁺	02	52Fr23 T	IS=7.163 55; 2 β^- ?; α ?
¹⁹⁸ Au	−29582.1	0.6			2.69517	d	0.00021	2 [−]	02		β^- =100
¹⁹⁸ Au ^m	−29269.9	0.6	312.2200	0.0020	124	ns	4	5 ⁺	02		IT=100
¹⁹⁸ Au ⁿ	−28770.4	1.6	811.7	1.5	2.27	d	0.02	(12 [−])	02		IT=100
¹⁹⁸ Hg	−30954.4	0.3			STABLE			0 ⁺	02		IS=9.97 20
¹⁹⁸ Tl	−27490	80			5.3	h	0.5	2 [−]	02		β^+ =100
¹⁹⁸ Tl ^m	−26950	80	543.5	0.4	1.87	h	0.03	7 ⁺	02		β^+ =54 2; IT=46 2
¹⁹⁸ Tl ⁿ	−26750	80	742.3	0.4	32.1	ms	1.0	10 [−]	# 02		IT=100
¹⁹⁸ Pb	−26050	15			2.4	h	0.1	0 ⁺	02		β^+ =100
¹⁹⁸ Pb ^m	−23909	15	2141.4	0.4	4.19	μ s	0.10	(7) [−]	02		IT=100
¹⁹⁸ Bi	−19369	28			10.3	m	0.3	(2 ⁺ , 3 ⁺)	02		β^+ =100
¹⁹⁸ Bi ^m	−19085	28	280	40	MD	11.6	m	0.3	(7 ⁺)	02	β^+ =100
¹⁹⁸ Bi ⁿ	−18837	28	530	40	MD	7.7	s	0.5	10 [−]	02	IT=100
¹⁹⁸ Po	−15473	17			1.77	m	0.03	0 ⁺	02		α =57 2; β^+ =43 2
¹⁹⁸ Po ^m	−13619	17	1853.63	0.18	29	ns	2	8 ⁺	02		IT=100
¹⁹⁸ Po ⁿ	−12907	17	2565.92	0.20	200	ns	20	11 [−]	02		IT=100
¹⁹⁸ Po ^p	−12781	17	2691.86	0.20	750	ns	50	12 ⁺	02		IT ?
¹⁹⁸ At	−6670	50			4.2	s	0.3	(3 ⁺)	02	95Bi.A D	α >94; β^+ ?
¹⁹⁸ At ^m	−6340#	70#	330#	90#	1.0	s	0.2	(10 [−])	02	95Bi.A D	α >86; β^+ ?
¹⁹⁸ Rn	−1231	13			65	ms	3	0 ⁺	02		α =?; β^+ =1#
¹⁹⁸ Rn ^m			non existent	EU	50	ms	9				α =?; β^+ =?; IT=?
* ¹⁹⁸ Pt T : lower limit is for 0v-2 β^- decay											
* ¹⁹⁸ Bi ⁿ E : 248.5(0.5) keV above ¹⁹⁸ Bi ^m , from 92Hu04											
* ¹⁹⁸ Rn ^m I : α decay assigned to isomer by ENSDF'95, not accepted by NUBASE											
...											
¹⁹⁹ Ir	−24400	40			20#	s		3/2 ⁺	# 01		β^- ?
¹⁹⁹ Pt	−27392	3			30.80	m	0.21	5/2 [−]	94		β^- =100
¹⁹⁹ Pt ^m	−26968	4	424	2	13.6	s	0.4	(13/2) ⁺	94		IT=100
¹⁹⁹ Au	−29095.0	0.6			3.139	d	0.007	3/2 ⁺	94		β^- =100
¹⁹⁹ Au ^m	−28546.1	0.6	548.9368	0.0021	440	μ s	30	(11/2) [−]	94		IT=100
¹⁹⁹ Hg	−29547.1	0.4			STABLE			1/2 [−]	94		IS=16.87 22
¹⁹⁹ Hg ^m	−29014.6	0.4	532.48	0.10	42.66	m	0.08	13/2 ⁺	94	01Li17 T	IT=100
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... A-group is continued on next page ...

Nuclide	Mass excess (keV)	Excitation energy(keV)			Half-life	J ^π	Ens	Reference	Decay modes and intensities (%)
... A-group continued ...									
¹⁹⁹ Tl	-28059 28				7.42 h	0.08 1/2 ⁺	94		β ⁺ =100
¹⁹⁹ Tl ^m	-27309 28	749.7	0.3		28.4 ms	0.2 9/2 ⁻	94		IT=100
¹⁹⁹ Pb	-25228 26				90 m	10 3/2 ⁻	01		β ⁺ =100
¹⁹⁹ Pb ^m	-24799 26	429.5	2.7		12.2 m	0.3 (13/2 ⁺)	01	ABBW E	IT=93; β ⁺ =7
¹⁹⁹ Pb ⁿ	-22664 26	2563.8	2.7		10.1 μs	0.2 (29/2 ⁻)	01	ABBW E	IT=100
¹⁹⁹ Bi	-20798 12				27 m	1 9/2 ⁻	94		β ⁺ =100
¹⁹⁹ Bi ^m	-20131 12	667	4		24.70 m	0.15 (1/2 ⁺)	94		β ⁺ =?; IT<2; α≈0.01
¹⁹⁹ Po	-15215 23				5.48 m	0.16 (3/2 ⁻)	94		β ⁺ =92.5 3; α=7.5 3
¹⁹⁹ Po ^m	-14903 23	312.0	2.8	AD	4.17 m	0.04 13/2 ⁺	94		β ⁺ =73.5 10; α=24 1; IT=2.5
¹⁹⁹ At	-8820 50				7.2 s	0.5 (9/2 ⁻)	94		α=89 6; β ⁺ ?
¹⁹⁹ Rn	-1520 60				620 ms	30 3/2 ⁻ #	98		α=?; β ⁺ =6#
¹⁹⁹ Rn ^m	-1334 29	180	70	AD	320 ms	20 13/2 ⁺ #	98		α=?; β ⁺ =3#
¹⁹⁹ Fr	6760 40				16 ms	7 1/2 ⁺ #	01	99Ta20 T	α≈100; β ⁺ ?
^{*199} Hg ^m	T : average 01Li17=42.67(0.09) 69Kl06=42.6(0.2)								
^{*199} Pb ^m	E : 424.8 γ to level lower than 9.3 keV, from ENSDF					D : from 78Le.A			
^{*199} Pb ⁿ	E : 2559.1 to level lower than 9.3 keV, from ENSDF								
²⁰⁰ Pt	-26603 20				12.5 h	0.3 0 ⁺	95		β ⁻ =100
²⁰⁰ Au	-27270 50				48.4 m	0.3 1 ⁽⁻⁾	95		β ⁻ =100
²⁰⁰ Au ^m	-26300 50	970	70	BD	18.7 h	0.5 12 ⁻	95		β ⁻ =82 2; IT=18 2
²⁰⁰ Hg	-29504.1 0.4				STABLE		0 ⁺	95	IS=23.10 19
²⁰⁰ Tl	-27048 6				26.1 h	0.1 2 ⁻	95		β ⁺ =100
²⁰⁰ Tl ^m	-26294 6	753.6	0.2		34.3 ms	1.0 7 ⁺	95		IT=100
²⁰⁰ Pb	-26243 11				21.5 h	0.4 0 ⁺	95		ε=100
²⁰⁰ Bi	-20370 24				36.4 m	0.5 7 ⁺	95		β ⁺ =100
²⁰⁰ Bi ^m	-20270# 70#	100#	70#		31 m	2 (2 ⁺)	95		β ⁺ >90; IT<10
²⁰⁰ Bi ⁿ	-19942 24	428.20	0.10		400 ms	50 (10 ⁻)	95		IT=100
²⁰⁰ Po	-16954 14				11.5 m	0.1 0 ⁺	95		β ⁺ =88.9 3; α=11.1 3
²⁰⁰ At	-8988 24				43.2 s	0.9 (3 ⁺)	95	96Ta18 T	α=57 6; β ⁺ =43 6
²⁰⁰ At ^m	-8875 25	112.7	3.0	AD	47 s	1 (7 ⁺)	95		α=43 7; β ⁺ =?; IT ?
²⁰⁰ At ⁿ	-8644 24	344	3	AD	3.5 s	0.2 (10 ⁻)	95		IT≈84; α≈10.5; β ⁺ ≈4.5
²⁰⁰ Rn	-4006 13				1.03 s	0.05 0 ⁺	98	96Ta18 T	α=?; β ⁺ =2#
²⁰⁰ Fr	6120 80				24 ms	10 3 ⁺ #	97	96En01 TD	α=100
²⁰⁰ Fr ^m	6180 70	60	110	AD *	650 ms	210 10 ⁻ #	97	95Mo14 TD	α≈100; IT ?
^{*200} At	T : average 96Ta18=44(2) 92Hu04=43(1)								
^{*200} At ⁿ	E : 230.9(0.2) keV above ²⁰⁰ At ^m , from ENSDF								
^{*200} Rn	T : average 96Ta18=0.96(0.03) 84Ca32=1.06(0.02)								
²⁰¹ Pt	-23740 50				2.5 m	0.1 (5/2 ⁻)	94		β ⁻ =100
²⁰¹ Au	-26401 3				26 m	1 3/2 ⁺	94		β ⁻ =100
²⁰¹ Hg	-27663.3 0.6				STABLE		3/2 ⁻	94	IS=13.18 9
²⁰¹ Hg ^m	-26897.1 0.6	766.23	0.15		94 μs		13/2 ⁺		
²⁰¹ Tl	-27182 15				72.912 h	0.017 1/2 ⁺	94		ε=100
²⁰¹ Tl ^m	-26263 15	919.50	0.09		2.035 ms	0.007 (9/2 ⁻)	94		IT=100
²⁰¹ Pb	-25258 22				9.33 h	0.03 5/2 ⁻	94		β ⁺ =100
²⁰¹ Pb ^m	-24629 22	629.14	0.17		61 s	2 13/2 ⁺	94		IT>99; β ⁺ <1
²⁰¹ Bi	-21416 15				108 m	3 9/2 ⁻	94		β ⁺ =100; α<1e-4
²⁰¹ Bi ^m	-20570 15	846.34	0.21		59.1 m	0.6 1/2 ⁺	94		β ⁺ =92.9#; IT<6.8; α=?
²⁰¹ Po	-16525 6				15.3 m	0.2 3/2 ⁻	94		β ⁺ =98.4 3; α=1.6 3
²⁰¹ Po ^m	-16101 6	424.1	2.4	AD	8.9 m	0.2 13/2 ⁺	94		IT=56 14; β ⁺ =41 10; α≈2.9
²⁰¹ At	-10789 8				85 s	3 (9/2 ⁻)	94	96Ta18 T	α=71 7; β ⁺ =29 7
²⁰¹ Rn	-4070 70				7.0 s	0.4 (3/2 ⁻)	94	96Ta18 T	α=?; β ⁺ =20#
²⁰¹ Rn ^m	-3790# 90#	280#	90#		3.8 s	0.1 (13/2 ⁺)	94	96Ta18 T	α=?; β ⁺ =10#; IT=0.01#
²⁰¹ Fr	3600 70				61 ms	12 (9/2 ⁻)	94	96En01 T	α≈100; β ⁺ <1
^{*201} Bi ^m	D : α decay is observed. Its branching ratio is estimated 0.3%# in ENSDF								
^{*201} At	T : average 96Ta18=83(2) and two results in ENSDF=89(3)								
^{*201} Rn	T : average 96Ta18=7.1(0.8) 71Ho01=7.0(0.4)								
^{*201} Fr	T : average 96En01=69(+16-11) 80Eu03=48(15)								

Nuclide	Mass excess (keV)	Excitation energy(keV)	Half-life	J^π	Ens	Reference	Decay modes and intensities (%)
²⁰² Pt	−22600#	300#	44 h	15	0 ⁺	97	$\beta^- = 100$
²⁰² Au	−24400	170	28.8 s	1.9	(1 [−])	97	$\beta^- = 100$
²⁰² Hg	−27345.9	0.6	STABLE		0 ⁺	97	IS=29.86 26
²⁰² Tl	−25983	15	12.23 d	0.02	2 [−]	97	$\beta^+ = 100$
²⁰² Tl ^m	−25033	15	950.19	0.10	572 μ s	7	97
²⁰² Pb	−25934	8	52.5 ky	2.8	0 ⁺	97	$\varepsilon \approx 100$; $\alpha < 1\%$
²⁰² Pb ^m	−23764	8	2169.83	0.07	3.53 h	0.01	9 [−] 97
²⁰² Bi	−20733	20	1.72 h	0.05	5(+ [−])	97	IT=90.5 5; $\beta^+ = 9.5$ 5
²⁰² Bi ^m	−20118	21	615	7	3.04 μ s	0.06	(10#) [−] 97
²⁰² Po	−17924	15	44.7 m	0.5	0 ⁺	97	$\beta^+ = ?$; $\alpha = 1.92$ 7
²⁰² Po ^m	−15297	15	2626.7	0.7	> 200 ns	11 [−]	97
²⁰² At	−10591	28	184 s	1	(2,3) ⁺	97	$\beta^+ = ?$; $\alpha = 18$ 3
²⁰² At ^m	−10401	28	190	40	MD	182 s	2 (7 ⁺) 97
²⁰² At ⁿ	−10010	28	580	40	MD	460 ms	50 (10 [−]) 97
²⁰² Rn	−6275	18	9.94 s	0.18	0 ⁺	97	92Hu04 E
²⁰² Fr	3140	50	290 ms	30	(3 ⁺)	97	96Ta18 T
²⁰² Fr ^m	3470#	70#	330#	90#	340 ms	40	(10 [−]) 97
²⁰² Ra	9210	60	2.6 ms	2.1	0 ⁺	98	96Le09 TD
* ²⁰² Hg	D : lower half-life limit for ²⁴ Ne decay $T > 3.7$ Zy, from ⁹⁰ Bu28						**
* ²⁰² Bi	J : re-evaluation to a possible 6 ⁺ is discussed in ⁹⁶ Ca02						**
* ²⁰² At ⁿ	D : . . . ; $\alpha = 0.096$ 11						**
* ²⁰² At ⁿ	E : 391.7(0.5) keV above ²⁰² At ^m						**
* ²⁰² Rn	T : average ⁹⁶ Ta18=10.3(0.4) ⁷¹ Ho01=9.85(0.20)						**
* ²⁰² Fr	T : average ⁹⁶ En01=230(+80−40) ⁹⁵ Bi.A=300(40)						**
²⁰³ Au	−23143	3	53 s	2	3/2 ⁺	93	$\beta^- = 100$
²⁰³ Hg	−25269.1	1.7	46.612 d	0.018	5/2 [−]	93	$\beta^- = 100$
²⁰³ Hg ^m	−24336.0	2.0	933.1	1.0	24 μ s	(13/2 ⁺)	93
²⁰³ Tl	−25761.2	1.3	STABLE		1/2 ⁺	93	IS=29.524 14
²⁰³ Tl ^m	−22360	300	3400	300	7.7 μ s	0.5	(25/2 ⁺) 98Pf02 TJ
²⁰³ Pb	−24787	7	51.873 h	0.009	5/2 [−]	93	IT=100
²⁰³ Pb ^m	−23962	7	825.20	0.09	6.3 s	0.2	13/2 ⁺ 93
²⁰³ Pb ⁿ	−21838	7	2949.47	0.22	480 ms	20	29/2 [−] 93
²⁰³ Bi	−21540	22	11.76 h	0.05	9/2 [−]	93	$\beta^+ = 100$; $\alpha \approx 1e-5$
²⁰³ Bi ^m	−20442	22	1098.14	0.07	303 ms	5	1/2 ⁺ 93
²⁰³ Po	−17307	26	36.7 m	0.5	5/2 [−]	93	$\beta^+ \approx 100$; $\alpha = 0.11$ 2
²⁰³ Po ^m	−16666	26	641.49	0.17	45 s	2	13/2 ⁺ 93
²⁰³ At	−12163	12	7.4 m	0.2	9/2 [−]	93	$\beta^+ = 69$ 3; $\alpha = 31$ 3
²⁰³ Rn	−6160	24	43.5 s	2.1	(3/2,5/2) [−]	93	96Ta18 T
²⁰³ Rn ^m	−5798	24	363	4	AD	26.7 s	0.5 13/2 ⁽⁺⁾ 93
²⁰³ Fr	861	16	550 ms	20	9/2 [−] #	98	87Bo29 J
²⁰³ Ra	8640	80	4 ms	3	(3/2 [−])	98	96Le09 TJD
²⁰³ Ra ^m	8860	40	220	90	AD	41 ms	17 (13/2 ⁺) 98
* ²⁰³ Rn	T : average ⁹⁶ Ta18=42(3) ⁷¹ Ho01=45(3)						**
* ²⁰³ Rn ^m	T : from ⁹⁶ Ta18						**
²⁰⁴ Au	−20750#	200#	39.8 s	0.9	(2 [−])	94	$\beta^- = 100$
²⁰⁴ Hg	−24690.2	0.3	STABLE		0 ⁺	94	IS=6.87 15; 2 β^- ?
²⁰⁴ Tl	−24346.0	1.3	3.78 y	0.02	2 [−]	94	$\beta^- = 97.10$ 12; $\varepsilon = 2.90$ 12
²⁰⁴ Tl ^m	−23242.0	1.4	1104.0	0.4	63 μ s	2	(7) ⁺ 94
²⁰⁴ Tl ⁿ	−21850	500	2500	500	2.6 μ s	0.2	(12 [−]) 98Pf02 TJ
²⁰⁴ Tl ^p	−20850	500	3500	500	1.6 μ s	0.2	(20 ⁺) 98Pf02 TJ
²⁰⁴ Pb	−25109.7	1.2	STABLE	(>140 Py)	0 ⁺	94	IS=1.4 1; α ?
²⁰⁴ Pb ^m	−22923.9	1.2	2185.79	0.05	67.2 m	0.3	9 [−] 94
²⁰⁴ Bi	−20667	26	11.22 h	0.10	6 ⁺	94	$\beta^+ = 100$
²⁰⁴ Bi ^m	−19862	26	805.5	0.3	13.0 ms	0.1	10 [−] 94
²⁰⁴ Bi ⁿ	−17834	26	2833.4	1.1	1.07 ms	0.03	(17 ⁺) 94
²⁰⁴ Po	−18334	11	3.53 h	0.02	0 ⁺	94	$\beta^+ = 99.34$ 1; $\alpha = 0.66$ 1

... A-group is continued on next page ...

Nuclide	Mass excess (keV)	Excitation energy(keV)	Half-life	J^π	Ens	Reference	Decay modes and intensities (%)
... A-group continued ...							
²⁰⁴ At	-11875	24	9.2 m	0.2	7 ⁺	94	$\beta^+=96.2$ 2; $\alpha=3.8$ 2
²⁰⁴ At ^m	-11288	24	587.30	0.20	108 ms	10	(10 ⁻) 94 IT=100
²⁰⁴ Rn	-7984	15	1.24 m	0.03	0 ⁺	95	$\alpha=73$ 1; β^+ ?
²⁰⁴ Fr	608	25	1.7 s	0.3	(3 ⁺)	94	95Bi.A D $\alpha=96$ 2; β^+ ?
²⁰⁴ Fr ^m	658	25	50	4	AD	2.6 s	0.3 (7 ⁺) 94 95Bi.A D $\alpha=90$ 2; β^+ ?
²⁰⁴ Fr ⁿ	934	25	326	4	AD	1.7 s	0.6 (10 ⁻) 94 94Le05 T $\alpha=74$ 8; IT=26 8
²⁰⁴ Ra	6054	15	60 ms	11	0 ⁺	98	95Le04 T $\alpha\approx 100$; $\beta^+=0.3$ #
* ²⁰⁴ Fr ⁿ	E : 276.1 keV above ²⁰⁴ Fr ^m , from 95Bi.A						D : α intensity is from 95Bi.A
* ²⁰⁴ Ra	T : average 95Le04=45(+55-21) 96Le09=59(+12-9)						
²⁰⁵ Au	-18750#	300#	31 s	2	3/2 ⁺	97	94We02 T $\beta^-=100$
²⁰⁵ Hg	-22287	4	5.2 m	0.1	1/2 ⁻	98	$\beta^-=100$
²⁰⁵ Hg ^m	-20730	4	1556.53	0.24	1.10 ms	0.04	(13/2 ⁺) 98 IT=100
²⁰⁵ Tl	-23820.6	1.3	STABLE		1/2 ⁺	93	IS=70.476 14
²⁰⁵ Tl ^m	-20530.0	1.3	3290.63	0.17	2.6 μ s	0.2	25/2 ⁺ 93 IT=100
²⁰⁵ Pb	-23770.1	1.2	15.3 My	0.7	5/2 ⁻	93	$\epsilon=100$
²⁰⁵ Pb ^m	-22756.3	1.2	1013.839	0.013	5.54 ms	0.10	13/2 ⁺ 93 IT=100
²⁰⁵ Pb ⁿ	-20574.5	1.4	3195.6	0.8	217 ns	5	25/2 ⁻ 93 IT=100
²⁰⁵ Bi	-21062	7	15.31 d	0.04	9/2 ⁻	93	$\beta^+=100$
²⁰⁵ Po	-17509	20	1.66 h	0.02	5/2 ⁻	93	$\beta^+\approx 100$; $\alpha=0.04$ 1
²⁰⁵ Po ^m	-16048	20	1461.20	0.21	58 ms	1	19/2 ⁻ 93 IT=100
²⁰⁵ Po ⁿ	-16629	20	880.30	0.04	645 μ s		13/2 ⁺
²⁰⁵ At	-12972	15	26.2 m	0.5	9/2 ⁻	93	$\beta^+=90$ 2; $\alpha=10$ 2
²⁰⁵ At ^m	-10909	15	2062.57	0.25	67.9 ns		25/2 ⁺
²⁰⁵ At ⁿ	-10632	15	2339.60	0.25	7.8 μ s		29/2 ⁺
²⁰⁵ Rn	-7710	50	2.8 m	0.1	5/2 ⁻	93	$\beta^+=77$ 4; $\alpha=23$ 4
²⁰⁵ Fr	-1310	8	3.85 s	0.10	(9/2 ⁻)	93	$\alpha\approx 100$; $\beta^+<1$
²⁰⁵ Ra	5840	90	220 ms	40	(3/2 ⁻)	93	96Le09 TJ $\alpha=?$; β^+ ?
²⁰⁵ Ra ^m	6150#	100#	310#	110#	180 ms	50	(13/2 ⁺) 96Le09 TJD $\alpha=?$; IT ?
* ²⁰⁵ Ra	T : average 96Le09=210(+60-40) 87He10=220(60)						
²⁰⁶ Hg	-20946	20	8.15 m	0.10	0 ⁺	99	$\beta^-=100$
²⁰⁶ Tl	-22253.1	1.4	4.200 m	0.017	0 ⁻	99	$\beta^-=100$
²⁰⁶ Tl ^m	-19610.0	1.4	2643.11	0.19	3.74 m	0.03	(12 ⁻) 99 IT=100
²⁰⁶ Pb	-23785.4	1.2	STABLE		0 ⁺	99	IS=24.1 1
²⁰⁶ Pb ^m	-21585.3	1.2	2200.14	0.04	125 μ s	2	7 ⁻ 99 IT=100
²⁰⁶ Pb ⁿ	-19758.1	1.4	4027.3	0.7	202 ns	3	12 ⁺ 99 IT=100
²⁰⁶ Bi	-20028	8	6.243 d	0.003	6 ⁽⁺⁾	99	$\beta^+=100$
²⁰⁶ Bi ^m	-19968	8	59.897	0.017	7.7 μ s	0.2	(4 ⁺) 99 IT=100
²⁰⁶ Bi ⁿ	-18983	8	1044.8	0.5	890 μ s	10	(10 ⁻) 99 IT=100
²⁰⁶ Po	-18182	8	8.8 d	0.1	0 ⁺	99	$\beta^+=94.55$ 5; $\alpha=5.45$ 5
²⁰⁶ Po ^m	-16596	8	1585.85	0.11	222 ns	10	8 ⁺ # 99 IT=100
²⁰⁶ Po ⁿ	-15920	8	2262.22	0.14	1.05 μ s	0.06	9 ⁻ # 99 IT=100
²⁰⁶ At	-12420	20	30.6 m	1.3	(5 ⁺)	99	$\beta^+=99.11$ 8; $\alpha=0.89$ 8
²⁰⁶ At ^m	-11613	20	807	3	410 ns	80	(10 ⁻) 99 99Fe10 ETJ IT=100
²⁰⁶ Rn	-9116	15	5.67 m	0.17	0 ⁺	99	$\alpha=62$ 3; $\beta^+=38$ 3
²⁰⁶ Fr	-1243	28	16 s		(2 ⁺ , 3 ⁺)	99	92Hu04 D $\beta^+=?$; $\alpha=42$ 24
²⁰⁶ Fr ^m	-1048	28	190	40	MD	15.9 s	0.1 (7 ⁺) 99 92Hu04 D $\alpha=42$ 24; β^+ ?; IT ?
²⁰⁶ Fr ⁿ	-517	28	730	40	MD	700 ms	100 (10 ⁻) 99 IT=?; $\alpha\approx 12$ #
²⁰⁶ Ra	3565	18	240 ms	20	0 ⁺	99	$\alpha=100$
²⁰⁶ Ac	13510	70	* & 25 ms	7	(3 ⁺)	99	$\alpha\approx 100$; $\beta^+=0.2$ #
²⁰⁶ Ac ^m	13590	90	80	50	* & 15 ms	6	99 $\alpha\approx 100$
²⁰⁶ Ac ⁿ	13800#	80#	290#	110#	& 41 ms	16	(10 ⁻) 99 $\alpha\approx 100$
* ²⁰⁶ Po ^m	E : less than 40 keV above 1573.4 level, from ENSDF						
* ²⁰⁶ Fr	D : $\alpha=84(2)\%$ for mixture of ²⁰⁶ Fr and ²⁰⁶ Fr ^m , in 92Hu04. Value replaced by						
* ²⁰⁶ Fr	D : uniform distribution 0%-84% for each isomer						
* ²⁰⁶ Fr ⁿ	E : 531 keV above ²⁰⁶ Fr ^m , from ENSDF						

Nuclide	Mass excess (keV)		Excitation energy(keV)		Half-life		J^π	Ens	Reference	Decay modes and intensities (%)		
²⁰⁷ Hg	-16220	150			2.9	m	0.2	(9/2 ⁺)	94		β^- =100	
²⁰⁷ Tl	-21034	5			4.77	m	0.02	1/2 ⁺	94		β^- =100	
²⁰⁷ Tl ^m	-19686	5	1348.1	0.3	1.33	s	0.11	11/2 ⁻	94		IT≈100; β^- <0.1#	
²⁰⁷ Pb	-22451.9	1.2			STABLE			1/2 ⁻	94		IS=22.1 1	
²⁰⁷ Pb ^m	-20818.5	1.2	1633.368	0.005	806	ms	6	13/2 ⁺	94		IT=100	
²⁰⁷ Bi	-20054.4	2.4			32.9	y	1.4	9/2 ⁻	94		β^+ =100	
²⁰⁷ Bi ^m	-17952.9	2.4	2101.49	0.16	182	μs	6	21/2 ⁺	94		IT=100	
²⁰⁷ Po	-17146	7			5.80	h	0.02	5/2 ⁻	94		β^+ ≈100; α=0.021 2	
²⁰⁷ Po ^m	-15763	7	1383.15	0.06	2.79	s	0.08	19/2 ⁻	94		IT=100	
²⁰⁷ Po ⁿ	-16031	7	1115.073	0.016	49	μs		13/2 ⁻				
²⁰⁷ At	-13243	21			1.80	h	0.04	9/2 ⁻	94		β^+ =91.4 10; α=8.6 10	
²⁰⁷ Rn	-8631	26			9.25	m	0.17	5/2 ⁻	94		β^+ =79 3; α=21 3	
²⁰⁷ Rn ^m	-7732	26	899.0	1.0	181	μs	18	(13/2 ⁺)	94		IT=100	
²⁰⁷ Fr	-2840	50			14.8	s	0.1	9/2 ⁻	94		α=95 2; β^+ =5 2	
²⁰⁷ Ra	3540	60			1.3	s	0.2	(5/2 ⁻ , 3/2 ⁻)	94		α≈90; β^+ ≈10	
²⁰⁷ Ra ^m	4095	25	560	50	AD	57	ms	8	(13/2 ⁺)	94	96Le09 T	IT=85#; α=?; ...
²⁰⁷ Ac	11130	50			31	ms	8	9/2 ⁻ #	98	94Le05	TD	α=100
²⁰⁷ Ra ^m	D : ... ; β^+ =0.55#										**	
²⁰⁷ Ra ^m	T : average 96Le09=63(16) 87He10=55(10)										**	
²⁰⁷ Ac	T : average 98Es02=27(+11-6) 94Le05=22(+40-9)										**	
²⁰⁸ Hg	-13100#	300#			42	m	5	0 ⁺	98	98Zh22	T	β^- =100
²⁰⁸ Tl	-16749.5	2.0			3.053	m	0.004	5 ⁽⁺⁾	98			β^- =100
²⁰⁸ Pb	-21748.5	1.2			STABLE			0 ⁺	96			IS=52.4 1
²⁰⁸ Pb ^m	-16853.5	2.3	4895	2	500	ns	10	10 ⁺	86	98Pf02	T	IT=100
²⁰⁸ Bi	-18870.0	2.4			368	ky	4	(5) ⁺	86			β^+ =100
²⁰⁸ Bi ^m	-17298.9	2.4	1571.1	0.4	2.58	ms	0.04	(10) ⁻	86			IT=100
²⁰⁸ Po	-17469.5	1.8			2.898	y	0.002	0 ⁺	86			α≈100; β^+ =0.00223 23
²⁰⁸ At	-12491	26			1.63	h	0.03	6 ⁺	86			β^+ =99.45 6; α=0.55 6
²⁰⁸ Rn	-9648	11			24.35	m	0.14	0 ⁺	86			α=62 7; β^+ =38 7
²⁰⁸ Fr	-2670	50			59.1	s	0.3	7 ⁺	86			α=90 4; β^+ =10 4
²⁰⁸ Ra	1714	15			1.3	s	0.2	0 ⁺	86			α=?; β^+ =5#
²⁰⁸ Ra ^m	3510	200	1800	200	270	ns		(8 ⁺)		98Le.A	ETJ	
²⁰⁸ Ac	10760	60			97	ms	16	(3 ⁺)	96	96Ik01	T	α=?; β^+ =1#
²⁰⁸ Ac ^m	11258	28	500	50	AD	28	ms	7	96	96Ik01	T	α=?; IT<10#; β^+ =1#
²⁰⁸ Hg	T : 98Zh22=41(+5-4) supersedes 94Zh02=42(+23-12) of same group										**	
²⁰⁸ Ac	T : average 96Ik01=83(+34-19) 94Le05=95(+24-16)										**	
²⁰⁸ Ac ^m	E : if α decay goes to (7 ⁺) ²⁰⁴ Fr ^m , instead of (10 ⁻) as assumed in AME, then										**	
²⁰⁸ Ac ^m	E : E will become 234(22) keV										**	
²⁰⁸ Ac ^m	T : average 96Ik01=21(+28-8) 94Le05=25(+9-5)										**	
²⁰⁹ Hg	-8350#	200#			37	s	8	9/2 ⁺ #		98Zh22	T	β^- =100
²⁰⁹ Tl	-13638	8			2.161	m	0.007	(1/2 ⁺)	91	94Ar23	T	β^- =100
²⁰⁹ Pb	-17614.4	1.8			3.253	h	0.014	9/2 ⁺	91			β^- =100
²⁰⁹ Bi	-18258.5	1.4			19	Ey	2	9/2 ⁻	91	03De11	TD	IS=100.; α=100
²⁰⁹ Po	-16365.9	1.8			102	y	5	1/2 ⁻	91			α≈100; β^+ =0.48 4
²⁰⁹ At	-12880	7			5.41	h	0.05	9/2 ⁻	91			β^+ =95.9 5; α=4.1 5
²⁰⁹ Rn	-8929	20			28.5	m	1.0	5/2 ⁻	91			β^+ =83 2; α=17 2
²⁰⁹ Rn ^m	-7755	20	1173.98	0.13	13.4	μs		13/2 ⁺				
²⁰⁹ Fr	-3769	15			50.0	s	0.3	9/2 ⁻	91			α=89 3; β^+ =11 3
²⁰⁹ Ra	1850	50			4.6	s	0.2	5/2 ⁻	91			α≈90; β^+ ≈10
²⁰⁹ Ac	8840	50			92	ms	11	(9/2 ⁻)	91	00He17	T	α=?; β^+ =1#
²⁰⁹ Th	16500	100			7	ms	5	5/2 ⁻ #	97	96Ik01	TD	α=?; β^+ ?
²⁰⁹ Ac	T : average 00He17=98(+59-27) 96Ik01=82(+18-13) 94Le05=91(+21-14)										**	
²⁰⁹ Ac	T : and 68Va04=100(50)										**	

Nuclide	Mass excess (keV)	Excitation energy(keV)	Half-life	J^π	Ens	Reference	Decay modes and intensities (%)
²¹⁰ Hg	−5110#	300#	10#	m (>300 ns)	0 ⁺	03	98Pf02 I β^- ?
²¹⁰ Tl	−9246	12	1.30	m	0.03	5 ⁺ #	03 β^- =100; β^- n=0.009 6
²¹⁰ Pb	−14728.3	1.5	22.20	y	0.22	0 ⁺	03 β^- =100; α =1.9e−6 4
²¹⁰ Pb ^m	−13450	5	1278	5	201	ns	17 8 ⁺ 03 IT=100
²¹⁰ Bi	−14791.8	1.4	5.012	d	0.005	1 [−]	03 β^- =100; α =13.2e−5 10
²¹⁰ Bi ^m	−14520.5	1.4	271.31	0.11	3.04	My	0.06 9 [−] 03 α =100
²¹⁰ Bi ⁿ	−14358.3	1.4	433.49	0.10	57.5	ns	10 7 [−] 03 IT=100
²¹⁰ Po	−15953.1	1.2	138.376	d	0.002	0 ⁺	03 α =100
²¹⁰ Po ^m	−14396.1	1.2	1556.96	0.03	98.9	ns	2.5 8 ⁺ 03 IT=100
²¹⁰ At	−11972	8	8.1	h	0.4	(5) ⁺	03 β^+ ≈100; α =0.175 20
²¹⁰ At ^m	−9422	8	2549.6	0.2	482	μs	6 (15) [−] 03 IT=100
²¹⁰ At ⁿ	−7944	8	4027.7	0.2	5.66	μs	0.07 (19) ⁺ 03 IT=100
²¹⁰ At ^p	−5013	8	6959.3	0.6	98	ns	2 (26) [−] 03 IT=100
²¹⁰ Rn	−9598	9	2.4	h	0.1	0 ⁺	03 α =96 1; β^+ ?
²¹⁰ Rn ^m	−7908	17	1690	15	644	ns	40 8 ⁺ # 03 IT ?
²¹⁰ Rn ⁿ	−5761	17	3837	15	1.06	μs	0.05 (17) [−] 03 IT=100
²¹⁰ Rn ^p	−3105	17	6493	15	1.04	μs	0.07 (22) ⁺ 03 IT=100
²¹⁰ Fr	−3346	22	3.18	m	0.06	6 ⁺	03 α =60 30; β^+ =40 30
²¹⁰ Ra	461	15	3.7	s	0.2	0 ⁺	03 α =?; β^+ =4#
²¹⁰ Ra ^m	2260	200	1800	200	2.24	μs	(8 ⁺) 03 98Le.A EJ α =?; β^+ =9#
²¹⁰ Ac	8790	60	350	ms	40	7 ⁺ #	03 00He17 T α =?; β^+ =1#
²¹⁰ Th	14043	25	17	ms	11	0 ⁺	03 α =?; β^+ =1#
* ²¹⁰ Rn ^m	E : ENSDF2003: less than 50 keV above 1664.6 level						**
* ²¹⁰ Ac	T : average 00He17=335(+64−46) 68Va04=350(50)						**
²¹¹ Tl	−6080#	200#	1#	m (>300 ns)	1/2 ⁺ #	98Pf02 I	β^- ?
²¹¹ Pb	−10491.4	2.7	36.1	m	0.2	9/2 ⁺	91 β^- =100
²¹¹ Bi	−11858	6	2.14	m	0.02	9/2 [−]	91 α ≈100; β^- =0.276 4
²¹¹ Bi ^m	−10631	6	1227.2	0.3	70	ns	5 (21/2 [−]) 91 IT=100
²¹¹ Bi ⁿ	−10601	12	1257	10	1.4	μs	0.3 (25/2 [−]) 91 98Pf02 T IT=100
²¹¹ Po	−12432.5	1.3	516	ms	3	9/2 ⁺	91 α =100
²¹¹ Po ^m	−10970	5	1462	5	AD	25.2	s (25/2 ⁺) 91 α ≈100; IT=0.016 4
²¹¹ Po ⁿ	−10298	5	2135	5	0.25	μs	0.07 (31/2 [−]) 98Fo04 ETJ IT≈100; α ?
²¹¹ Po ^p	−7559	5	4874	5	2	μs	1 (43/2 ⁺) 98Fo04 ETJ IT≈100; α ?
²¹¹ At	−11647.1	2.8	7.214	h	0.007	9/2 [−]	96 ϵ =58.20 8; α =41.80 8
²¹¹ Rn	−8756	7	14.6	h	0.2	1/2 [−]	96 β^+ =72.6 17; α =27.4 17
²¹¹ Fr	−4158	21	3.10	m	0.02	9/2 [−]	91 α >80; β^+ <20
²¹¹ Ra	836	26	13	s	2	5/2 ^(−)	91 α >93; β^+ <7
²¹¹ Ac	7200	70	213	ms	25	9/2 [−] #	91 00He17 T α ≈100; β^+ <0.2
²¹¹ Th	13910	70	48	ms	20	5/2 [−] #	96 95Uu01 T α =?; β^+ =0.5#
* ²¹¹ Ac	T : average 00He17=200(29) 68Va04=250(50)						**
²¹² Tl	−1650#	300#	30#	s (>300 ns)	5 ⁺ #	98Pf02 I	β^- ?
²¹² Pb	−7547.4	2.2	10.64	h	0.01	0 ⁺	92 β^- =100
²¹² Pb ^m	−6212	10	1335	10	5	μs	1 (8 ⁺) 92 98Pf02 T IT=100
²¹² Bi	−8117.3	2.0	60.55	m	0.06	1 ^(−)	92 89Ha.A D β^- =64.06 6; α =35.94 6; ... *
²¹² Bi ^m	−7870	30	250	30	AD	25.0	m (9 [−]) 92 α =67 1; β^- =33 1; β^- α =30 1
²¹² Bi ⁿ	−5920#	200#	2200#	200#	7.0	m	0.3 > 15 92 β^- ≈100; IT ?
²¹² Po	−10369.4	1.2	299	ns	2	0 ⁺	92 α =100
²¹² Po ^m	−7459	12	2911	12	AD	45.1	s (18 ⁺) 92 α ≈100; IT=0.07 2
²¹² At	−8621	7	314	ms	2	(1 [−])	92 α ≈100; β^+ <0.03; β^- <2e−6
²¹² At ^m	−8395	6	226	9	AD	119	ms (9 [−]) 92 α >99; IT<1
²¹² At ⁿ	−3849	8	4772	3	152	μs	5 (25 [−]) 98By01 ETJ IT=100
²¹² Rn	−8660	3	23.9	m	1.2	0 ⁺	92 α =100; 2 β^+ ?
²¹² Fr	−3538	26	20.0	m	0.6	5 ⁺	92 β^+ =57 2; α =43 2
²¹² Ra	−191	11	13.0	s	0.2	0 ⁺	92 α =?; β^+ =15#
²¹² Ra ^m	1767	11	1958.4	0.5	10.9	μs	0.4 (8) ⁺ 92 IT=100

... A-group is continued on next page ...

Nuclide	Mass excess (keV)	Excitation energy(keV)	Half-life	J^π	Ens	Reference	Decay modes and intensities (%)			
... A-group continued ...										
²¹² Ac	7280	70	920 ms	50	6 ⁺ #	92 00He17 T	$\alpha=?; \beta^+=3\#$	*		
²¹² Th	12091	18	36 ms	15	0 ⁺	92	$\alpha\approx 100; \beta^+=0.3\#$			
²¹² Pa	21610	70	8 ms	5	7 ⁺ #	97Mi03 TD	$\alpha=100$			
²¹² Bi	D : ... ; $\beta^-\alpha=0.014$							**		
²¹² Bi ^m	E : 1910 keV, if 100% β^- decay goes to 2922 level in ²¹² Po, and if $\log ft$ for							**		
²¹² Bi ⁿ	E : this transition is 5.1 (see ENSDF), or higher							**		
²¹² Ac	T : average 00He17=880(110) 68Va04=930(50)							**		
²¹² Ac	J : ENSDF proposes to assign 7 ⁺ , if the observed α feeds the ²⁰⁸ Fr 7 ⁺ ground-state							**		
²¹³ Pb	-3184	8	10.2 m	0.3	(9/2 ⁺)	92	$\beta^-=100$			
²¹³ Bi	-5231	5	45.59 m	0.06	9/2 ⁻	92	$\beta^-=97.91\ 3; \alpha=2.09\ 3$			
²¹³ Po	-6653	3	4.2 μ s	0.8	9/2 ⁺	92	$\alpha=100$			
²¹³ At	-6579	5	125 ns	6	9/2 ⁻	92	$\alpha=100$			
²¹³ Rn	-5698	6	19.5 ms	0.1	(9/2 ⁺)	92 00He17 T	$\alpha=100$	*		
²¹³ Fr	-3550	8	34.6 s	0.3	9/2 ⁻	92	$\alpha=99.45\ 3; \beta^+=0.55\ 3$			
²¹³ Ra	358	20	2.74 m	0.06	1/2 ⁻	92	$\alpha=80\ 5; \beta^+?$			
²¹³ Ra ^m	2127	21	1769	6	AD	2.1 ms	0.1 17/2 ⁻ #	92 76Ra37 J	IT \approx 99; $\alpha\approx 1$	*
²¹³ Ac	6150	50	731 ms	17	9/2 ⁻ #	92 00He17 T	$\alpha=?; \beta^+?$			
²¹³ Th	12120	70	140 ms	25	5/2 ⁻ #	92	$\alpha=?; \beta^+?$			
²¹³ Pa	19660	70	7 ms	3	9/2 ⁻ #	97 95Ni05 TD	$\alpha=100$			
²¹³ Rn	T : in same paper 18.0(0.4) 19.0(0.5), not used. Other 70Va13=25.0(0.2) at							**		
²¹³ Rn	T : variance, not used							**		
²¹³ Ra ^m	E : derived from difference in α decay energy in the AME evaluation.							**		
²¹³ Ra ^m	E : ENSDF evaluation: less than 10 keV above 1769.7 level, thus 1775(3) keV							**		
²¹³ Ra ^m	J : 17/2 ⁻ or 13/2 ⁺ as proposed by 76Ra37							**		
²¹⁴ Pb	-181.3	2.4	26.8 m	0.9	0 ⁺	95	$\beta^-=100$			
²¹⁴ Bi	-1200	11	19.9 m	0.4	1 ⁻	95 89Ha.A D	$\beta^-\approx 100; \alpha=0.021\ 1; \beta^-\alpha=0.003$			
²¹⁴ Po	-4469.9	1.5	164.3 μ s	2.0	0 ⁺	95	$\alpha=100$			
²¹⁴ At	-3380	4	558 ns	10	1 ⁻	95	$\alpha=100$			
²¹⁴ At ^m	-3320	8	59	9	AD	268 ns				
²¹⁴ At ⁿ	-3146	5	234	6	AD	760 ns				
²¹⁴ Rn	-4320	9	270 ns	20	0 ⁺	95	$\alpha=100; 2\beta^+?$			
²¹⁴ Rn ^m	-2695	9	1625.1	0.5	6.5 ns	3.0	8 ⁺			
²¹⁴ Fr	-958	9	5.0 ms	0.2	(1 ⁻)	95	$\alpha=100$			
²¹⁴ Fr ^m	-835	9	123	6	AD	3.35 ms	0.05 (8 ⁻)	95 $\alpha=100$		
²¹⁴ Ra	101	9	2.46 s	0.03	0 ⁺	95	$\alpha\approx 100; \beta^+=0.059\ 4$			
²¹⁴ Ac	6429	22	8.2 s	0.2	5 ⁺ #	95	$\alpha\geq 89\ 3; \beta^+\leq 11\ 3$			
²¹⁴ Th	10712	17	100 ms	25	0 ⁺	95	$\alpha\approx 100; \beta^+=0.1\#$			
²¹⁴ Pa	19490	80	17 ms	3		95 95Ni05 D	$\alpha=100$			
²¹⁵ Pb	4480#	410#	36 s	1	5/2 ⁺ #	96Ry.B T	$\beta^-=100$	*		
²¹⁵ Bi	1649	15	7.6 m	0.2	(9/2 ⁻)	01	$\beta^-=100$			
²¹⁵ Bi ^m	2997	15	1347.5	2.5	36.4 m	2.5 (25/2 ⁻)	01 02Fr.B D	IT=?: $\beta^-=?$	*	
²¹⁵ Po	-540.3	2.5	1.781 ms	0.004	9/2 ⁺	01	$\alpha=100; \beta^-=2.3e-4\ 2$			
²¹⁵ At	-1255	7	100 μ s	20	9/2 ⁻	01	$\alpha=100$			
²¹⁵ Rn	-1169	8	2.30 μ s	0.10	9/2 ⁺	01	$\alpha=100$			
²¹⁵ Fr	318	7	86 ns	5	9/2 ⁻	01	$\alpha=100$			
²¹⁵ Ra	2534	8	1.55 ms	0.07	9/2 ⁺ #	01	$\alpha=100$			
²¹⁵ Ra ^m	4412	8	1877.8	0.5	7.1 μ s	0.2 (25/2 ⁺)	01 IT=100			
²¹⁵ Ra ⁿ	4781	8	2246.9	0.5	1.39 μ s	0.07 (29/2 ⁻)	01 IT=100			
²¹⁵ Ac	6012	21	170 ms	10	9/2 ⁻	01	$\alpha\approx 100; \beta^+=0.09\ 2$			
²¹⁵ Th	10927	27	1.2 s	0.2	(1/2 ⁻)	01	$\alpha=100$			
²¹⁵ Pa	17870	90	14 ms	2	9/2 ⁻ #	01	$\alpha=100$			
²¹⁵ Pb	T : other preliminary result 02Fr.B=147(12) s							**		
²¹⁵ Bi ^m	T : other preliminary result 02Fr.B=36.9(0.6) s							**		

Nuclide	Mass excess (keV)		Excitation energy(keV)		Half-life		J^π	Ens	Reference	Decay modes and intensities (%)					
^{216}Bi	5874	11			2.17	m	0.05	1^-	97	96Ry.B	T	β^- =100	*		
^{216}Po	1783.8	2.2			145	ms	2	0^+	97			α =100; $2\beta^-$?			
^{216}At	2257	4			300	μs	30	$1^{(-)}$	97			α \approx 100; β^- <0.006; ε <3e-7			
$^{216}\text{At}^m$	2670	6	413	5	100#	μs		(9^-)	97			α =100			
^{216}Rn	256	7			45	μs	5	0^+	97			α =100			
^{216}Fr	2979	14			700	ns	20	(1^-)	97			α =100; β^+ <2e-7#			
^{216}Ra	3291	9			182	ns	10	0^+	97			α =100; ε <1e-8			
^{216}Ac	8123	27			440	μs	16	(1^-)	97	00He17	T	α =100; β^+ =7e-5#			
$^{216}\text{Ac}^m$	8166	26	44	7	AD	443	7	(9^-)	97	00He17	T	α =100; β^+ =7e-5#			
^{216}Th	10304	13			26.8	ms	0.3	0^+	97	01Ha46	T	α \approx 100; β^+ =0.006#	*		
$^{216}\text{Th}^m$	12346	16	2042	13	AD	137	μs	4	(8^+)	97	01Ha46	TJD	IT=94 4; α =?	*	
$^{216}\text{Th}^n$	12941	24	2637	20		615	ns	55	(11^-)	97	01Ha46	TJ	IT=100	*	
^{216}Pa	17800	70			105	ms	12		97	96An21	T	α =?; β^+ =2#	*		
* ^{216}Bi	T : also 90Ru02=3.6(0.4) outweighed, not used												**		
* ^{216}Th	T : average 01Ha46=25.4(0.8) 00He17=27.0(0.3); other 68Va18=28(2) outweighed												**		
* $^{216}\text{Th}^m$	T : average 01Ha46=128(8) 00He17=140(5)												**		
* ^{216}Pa	T : not updated in 00He17: “could not be determined satisfactorily”												**		
^{217}Bi	8820#	200#			97	s	3	$9/2^-$	#	96Ry.B	T	β^- =100			
^{217}Po	5901	7			1.47	s	0.05	$5/2^+$	#	91	96Ry.B	T	α >95; β^- <5		
^{217}At	4396	5			32.3	ms	0.4	$9/2^-$	#	91	97Ch53	D	α \approx 100; β^- =0.008 2	*	
^{217}Rn	3659	4			540	μs	50	$9/2^+$	#	91			α =100		
^{217}Fr	4315	7			16.8	μs	1.9	$9/2^-$	#	94	90An19	T	α =100	*	
^{217}Ra	5887	9			1.63	μs	0.17	$(9/2^+)$	#	91	90An19	T	α =100	*	
^{217}Ac	8707	13			69	ns	4	$9/2^-$	#	91			α =?; β^+ \leq 2		
$^{217}\text{Ac}^m$	10719	19	2012	20	AD	740	ns	40	$(29/2^+)$	#	91		IT=95.7 10; α =4.3 10		
^{217}Th	12216	21			240	μs	5	$(9/2^+)$	#	91	02He29	T	α =100	*	
^{217}Pa	17070	50			3.48	ms	0.09	$9/2^-$	#	91	02He29	T	α =100	*	
$^{217}\text{Pa}^m$	18930	50	1860	7	AD	1.08	ms	0.03	$29/2^+$	#	91	02He29	TD	α =73 4; IT ?	
^{217}U	22700	90			26	ms	14	$1/2^-$	#		00Ma65	TD	α =?		
* ^{217}At	D : average β^- 97Ch53=0.0067(24) 69Le.A=0.012(4)												**		
* ^{217}Fr	T : average 90An19=16(2) 70Bo13=22(5)												**		
* ^{217}Ra	T : average 90An19=1.7(0.3) 70Bo13=1.6(0.2)												**		
* ^{217}Th	T : average 02He29=237(2) 00He17=247(3) with Birge ratio B =2.8												**		
* ^{217}Pa	T : average 02He29=3.8(0.2) 00He17=3.4(0.1)												**		
^{218}Bi	13340#	360#			33	s	1	1^-	#	02Fr.B	TD	β^- =100			
^{218}Po	8358.3	2.4			3.10	m	0.01	0^+	96			α \approx 100; β^- =0.020 2			
^{218}At	8099	12			1.5	s	0.3	1^-	96			α \approx 100; β^- =0.1			
^{218}Rn	5217.5	2.4			35	ms	5	0^+	96			α =100			
^{218}Fr	7059	5			1.0	ms	0.6	1^-	96			α =100			
$^{218}\text{Fr}^m$	7146	6	86	4	AD	22.0	ms	0.5	96			α \approx 100; IT ?			
$^{218}\text{Fr}^p$	7260#	150#	200#	150#				high							
^{218}Ra	6651	11			25.6	μs	1.1	0^+	96			α =100; $2\beta^+$?			
^{218}Ac	10840	50			1.08	μs	0.09	1^-	96			α =100			
$^{218}\text{Ac}^m$	10990#	70#	150#	50#	32	ns	9	(9^-)	96	94De04	ET		*		
$^{218}\text{Ac}^i$	11420#	70#	584#	50#	103	ns	11	(11^+)	96				*		
^{218}Th	12374	13			109	ns	13	0^+	96			α =100			
^{218}Pa	18669	25			113	μs	10	96	00He17	T		α =100	*		
^{218}U	21920	30			6	ms	5	0^+	96			α =100			
* $^{218}\text{Ac}^m$	E : at least 122.5 in 94De04												**		
* $^{218}\text{Ac}^i$	E : 384.5(0.2) keV above $^{218}\text{Ac}^m$, from ENSDF												**		
* ^{218}Pa	T : supersedes 96An21=110(20)												**		

Nuclide	Mass excess (keV)	Excitation energy(keV)	Half-life		J^π	Ens	Reference	Decay modes and intensities (%)
²¹⁹ Po	12800#	360#	2#	m	(>300 ns)	7/2 ⁺ #	98Pf02 I	β^- ?; α ?
²¹⁹ At	10397	4	56	s	3	5/2 ⁻ #	01	$\alpha \approx 97$; $\beta^- \approx 3$
²¹⁹ Rn	8830.8	2.5	3.96	s	0.01	5/2 ⁺	01	$\alpha = 100$
²¹⁹ Fr	8618	7	20	ms	2	9/2 ⁻	01	$\alpha = 100$
²¹⁹ Ra	9394	8	10	ms	3	(7/2) ⁺	01	$\alpha = 100$
²¹⁹ Ac	11570	50	11.8	μ s	1.5	9/2 ⁻	01	$\alpha = 100$; $\beta^+ = 1\text{e-}6\#$
²¹⁹ Th	14470	50	1.05	μ s	0.03	9/2 ⁺ #	01	$\alpha = 100$; $\beta^+ = 1\text{e-}7\#$
²¹⁹ Pa	18520	50	53	ns	10	9/2 ⁻	01	$\alpha = 100$; $\beta^+ = 5\text{e-}9\#$
²¹⁹ U	23210	60	55	μ s	25	9/2 ⁺ #	01	$\alpha = 100$; $\beta^+ = 1.4\text{e-}5\#$
²²⁰ Po	15470#	360#	40#	s	(>300 ns)	0 ⁺	98Pf02 I	β^- ?
²²⁰ At	14350	50	3.71	m	0.04	3(-#)	97	$\beta^- = 92$ 2; $\alpha = 8$ 2
²²⁰ Rn	10613.4	2.2	55.6	s	0.1	0 ⁺	97	$\alpha = 100$; $2\beta^-$?
²²⁰ Fr	11483	4	27.4	s	0.3	1 ⁺	97	$\alpha \approx 100$; $\beta^- = 0.35$ 5
²²⁰ Ra	10273	9	17.9	ms	1.4	0 ⁺	97	$\alpha = 100$
²²⁰ Ac	13752	15	26.36	ms	0.19	(3 ⁻)	97	$\alpha = 100$; $\beta^+ = 5\text{e-}4\#$
²²⁰ Th	14669	22	9.7	μ s	0.6	0 ⁺	97	$\alpha = 100$; $\epsilon = 2\text{e-}7\#$
²²⁰ Pa	20380	60	780	ns	160	1 ⁻ #	97	$\alpha = 100$; $\beta^+ = 3\text{e-}7\#$
²²⁰ U	23030#	200#	60#	ns		0 ⁺		α ?; β^+ ?
* ²²⁰ Ra	T : average 00He17=18(2) 90An19=17(2) 61Ru06=23(5)							**
* ²²⁰ Ac	T : average 90An19=26.4(0.2) 70Bo13=26.1(0.5)							**
²²¹ At	16810#	200#	2.3	m	0.2	3/2 ⁻ #	90	$\beta^- = 100$
²²¹ Rn	14472	6	25	m	2	7/2 ⁽⁺⁾	90	$\beta^- = 78$ 1; $\alpha = 22$ 1
²²¹ Fr	13278	5	4.9	m	0.2	5/2 ⁻	90	$\alpha \approx 100$; $\beta^- = 0.0048$ 15; ...
²²¹ Ra	12964	5	28	s	2	5/2 ⁺	90	$\alpha = 100$; $^{14}\text{C} = 1.2\text{e-}10$ 9
²²¹ Ac	14520	50	52	ms	2	9/2 ⁻	90	$\alpha = 100$
²²¹ Th	16938	9	1.68	ms	0.06	(7/2 ⁺)	90	$\alpha = 100$
²²¹ Pa	20380	50	5.9	μ s	1.7	9/2 ⁻	90	$\alpha = 100$
²²¹ U	24590#	100#	700#	ns		9/2 ⁺ #		α ?; β^+ ?
* ²²¹ Fr	D : ...; $^{14}\text{C} = 8.8\text{e-}11$ 11							**
* ²²¹ Fr	D : β^- intensity is from 97Ch53; ^{14}C intensity is from 94Bo28							**
* ²²¹ Th	T : also 00He17=2.0(+0.3-0.2)							**
²²² At	20800#	300#	54	s	10		96	$\beta^- = 100$
²²² Rn	16373.6	2.4	3.8235	d	0.0003	0 ⁺	96	$\alpha = 100$
²²² Fr	16349	21	14.2	m	0.3	2 ⁻	96	$\beta^- = 100$
²²² Ra	14321	5	38.0	s	0.5	0 ⁺	96	$\alpha = 100$; $^{14}\text{C} = 3.0\text{e-}8$ 10
²²² Ac	16621	5	5.0	s	0.5	1 ⁻	96	$\alpha = 99$ 1; $\beta^+ = 1$ 1
²²² Ac ^m	16820#	150#	1.05	m	0.07	high	96	$\alpha = ?$; IT ≤ 10 ; $\beta^+ = 1.4$ 4
²²² Th	17203	12	2.05	ms	0.07	0 ⁺	96	$\alpha = 100$; $\epsilon < 1.$

Nuclide	Mass excess (keV)	Excitation energy(keV)	Half-life		J^π	Ens	Reference	Decay modes and intensities (%)		
²²⁴ Rn	22440#	300#	107 m	3	0 ⁺	97		β^- =100		
²²⁴ Fr	21660	50	3.33 m	0.10	1 ⁻	97		β^- =100		
²²⁴ Ra	18827.2	2.2	3.66 d	0.04	0 ⁺	97		α =100; ¹⁴ C=4.0e-9 12		
²²⁴ Ac	20235	4	2.78 h	0.17	0 ⁻	97		β^+ =90.6 17; α =9.4 17; β^- <1.6#		
²²⁴ Th	19996	11	1.05 s	0.02	0 ⁺	97		α =100; 2 β^+ ?		
²²⁴ Pa	23870	16	844 ms	19	5 ⁻ #	97	96Li05 T	α ≈100; β^+ =0.1#		
²²⁴ U	25714	25	940 μ s	270	0 ⁺	97	92To02 T	α =100; β^+ <1.2e-4#	*	
* ²²⁴ Pa	T : average 96Li05=790(60) 96Wi.A=850(20)									**
* ²²⁴ U	T : average 92To02=1000(400) 91An10=700(+500-200)									**
²²⁵ Rn	26490#	300#	4.66 m	0.04	7/2 ⁻	90	97Bu03 T	β^- =100		
²²⁵ Fr	23810	30	4.0 m	0.2	3/2 ⁻	90		β^- =100		
²²⁵ Ra	21994.0	3.0	14.9 d	0.2	1/2 ⁺	90		β^- =100		
²²⁵ Ac	21638	5	10.0 d	0.1	(3/2 ⁻)	90	93Bo26 D	α =100; ¹⁴ C=6.0e-10 13		
²²⁵ Th	22310	5	8.72 m	0.04	(3/2 ⁻)	90		α ≈90; ϵ ≈10		
²²⁵ Pa	24340	70	1.7 s	0.2	5/2 ⁻ #	90		α =100		
²²⁵ U	27377	12	61 ms	4	5/2 ⁺ #	90	00He17 T	α =100	*	
²²⁵ Np	31590	70	3# ms	(>2 μ s)	9/2 ⁻ #	97	94Ye08 ID	α =100		
* ²²⁵ U	T : 00He17=59(+5-2); others 94An02=68(+45-20) 92To02=95(15) and									**
* ²²⁵ U	T : 89He13=80(+40-10) outweighed, not used									**
²²⁶ Rn	28770#	400#	7.4 m	0.1	0 ⁺	96		β^- =100		
²²⁶ Fr	27370	100	49 s	1	1 ⁻	96		β^- =100		
²²⁶ Ra	23669.1	2.3	1.600 ky	0.007	0 ⁺	96	90We01 D	α =100; ¹⁴ C=2.6e-9 6; 2 β^- ?	*	
²²⁶ Ac	24310	3	29.37 h	0.12	(1) ^(-#)	96		β^- =83 3; ϵ =17 3; α =0.006 2		
²²⁶ Th	23197	5	30.57 m	0.10	0 ⁺	96	01Bo11 D	α =100; ¹⁸ O<3.2e-12		
²²⁶ Pa	26033	11	1.8 m	0.2		96		α =74 5; β^+ =26 5		
²²⁶ U	27329	13	269 ms	6	0 ⁺	96	01Ca.B T	α =100	*	
²²⁶ Np	32740#	90#	35 ms	10		96		α =100; β^+ =0.003#		
* ²²⁶ Ra	D : ¹⁴ C: average 90We01=2.3(0.8) 86Ba26=2.9(1.0) 85Ho21=3.2(1.6)									**
* ²²⁶ U	T : average 01Ca.B=258(13) 00He17=281(9) 99Gr28=260(10)									**
²²⁷ Rn	32980#	420#	20.8 s	0.7	5/2 ^(+#)	01	97Ku20 J	β^- =100		
²²⁷ Fr	29650	100	2.47 m	0.03	1/2 ⁺	01		β^- =100		
²²⁷ Ra	27179.0	2.4	42.2 m	0.5	3/2 ⁺	01		β^- =100		
²²⁷ Ac	25850.9	2.4	21.772 y	0.003	3/2 ⁻	01		β^- =98.62 36; α =1.38 36		
²²⁷ Th	25806.2	2.5	18.68 d	0.09	1/2 ⁺	01		α =100		
²²⁷ Pa	26832	7	38.3 m	0.3	(5/2 ⁻)	01		α =85 2; ϵ =15 2		
²²⁷ U	29022	17	1.1 m	0.1	(3/2 ⁺)	01		α =100; β^+ <0.001#		
²²⁷ Np	32560	70	510 ms	60	5/2 ⁻ #	01		α ≈100; β^+ =0.05#		
²²⁸ Rn	35380#	410#	65 s	2	0 ⁺	97		β^- =100		
²²⁸ Fr	33280#	200#	38 s	1	2 ⁻	97		β^- =100		
²²⁸ Ra	28941.8	2.4	5.75 y	0.03	0 ⁺	97		β^- =100		
²²⁸ Ac	28896.0	2.5	6.15 h	0.02	3 ⁺	97		β^- =100		
²²⁸ Th	26772.2	2.2	1.9116 y	0.0016	0 ⁺	97		α =100; ²⁰ O=1.13e-11 22		
²²⁸ Pa	28924	4	22 h	1	3 ⁺	97		β^+ =98.0 2; α =2.0 2		
²²⁸ U	29225	15	9.1 m	0.2	0 ⁺	97		α >95; ϵ <5		
²²⁸ Np	33700#	200#	61.4 s	1.4		97	94Kr13 D	ϵ =60 7; α =40 7; β^+ SF=0.012 6	*	
²²⁸ Pu	36090	30	10# ms	(>2 μ s)	0 ⁺	97	94An02 ID	α ≈100; β^+ =0.1#		
* ²²⁸ Np	D : β^+ SF=0.020(9)% defined by 94Kr13 relative to ϵ , thus 0.012(6)% of total									**

Nuclide	Mass excess (keV)	Excitation energy(keV)	Half-life	J^π	Ens	Reference	Decay modes and intensities (%)
²²⁹ Fr	35820	40	50.2 s	0.4	1/2 ⁺ #	90 92Bo05 T	β^- =100
²²⁹ Ra	32563	19	4.0 m	0.2	5/2 ⁽⁺⁾	90	β^- =100
²²⁹ Ac	30750	30	62.7 m	0.5	(3/2 ⁺)	90	β^- =100
²²⁹ Th	29586.5	2.8	7.34 ky	0.16	5/2 ⁺	90	α =100
²²⁹ Th ^m	29586.5	2.8	70 h	50	3/2 ⁺	94He08 TEJ	IT ?
²²⁹ Pa	29898.0	2.7	1.50 d	0.05	(5/2 ⁺)	90	ε ≈100; α =0.48 5
²²⁹ Pa ^m	29909.6	2.7	420 ns	30	3/2 ⁻	98Le15 EJD	IT=100
²²⁹ U	31211	6	58 m	3	(3/2 ⁺)	90	β^+ ≈80; α ≈20
²²⁹ Np	33780	90	4.0 m	0.2	5/2 ⁺ #	90	α >50; β^+ <50
²²⁹ Np ^p	33850#	100#			5/2 ⁻ #		
²²⁹ Pu	37400	50	120 s	50	3/2 ⁺ #	97 01Ca.B TD	α =100
* ²²⁹ Th ^m	D : ultraviolet γ -ray emission assigned by 97Ir02 and 98Ri03 to IT decay is						**
* ²²⁹ Th ^m	D : proved by 99Sh12 to be due to N ₂ discharge emission. 99Ut01 sees						**
* ²²⁹ Th ^m	D : no UV in vacuo.						**
²³⁰ Fr	39600#	450#	19.1 s	0.5		93	β^- =100
²³⁰ Ra	34518	12	93 m	2	0 ⁺	93	β^- =100
²³⁰ Ac	33810	300	122 s	3	(1 ⁺)	94 01Yu03 D	β^- =100; β^- SF=1.19e-6 40
²³⁰ Th	30864.0	1.8	75.38 ky	0.30	0 ⁺	93	α =100; SF<5e-11; ...
²³⁰ Pa	32175	3	17.4 d	0.5	(2 ⁻)	93	β^+ ≈91.6 13; β^- ≈8.4 13; ...
²³⁰ U	31615	5	20.8 d		0 ⁺	93 01Bo11 D	α =100; 22Ne=4.8e-12 20; ...
²³⁰ Np	35240	50	4.6 m	0.3		93	β^+ ≤97; α ≥3
²³⁰ Np ^p	35540#	210#			am		
²³⁰ Pu	36934	15	1.70 m	0.17	0 ⁺	93 01Ca.B T	α =?; β^+ ?
* ²³⁰ Th	D : ...; ²⁴ Ne=5.6e-11 10						**
* ²³⁰ Pa	D : ...; α =0.0032 1						**
* ²³⁰ U	D : ...; SF<1.4e-10#; 2 β^+ ?						**
* ²³⁰ Pu	T : also 90An22=154(66)s outweighed, not used						**
²³¹ Fr	42330#	470#	17.6 s	0.6	1/2 ⁺ #	01	β^- =100
²³¹ Ra	38400#	300#	103 s	3	(5/2 ⁺)	01	β^- =100
²³¹ Ra ^m	38470#	300#	53 μ s		(1/2 ⁺)	01	IT=100
²³¹ Ac	35920	100	7.5 m	0.1	(1/2 ⁺)	01	β^- =100
²³¹ Th	33817.3	1.8	25.52 h	0.01	5/2 ⁺	01	β^- =100; α =4e-11#
²³¹ Pa	33425.7	2.3	32.76 ky	0.11	3/2 ⁻	01	α =100; SF≤3e-10; ...
²³¹ U	33807	3	4.2 d	0.1	(5/2) ⁽⁺⁾ #	01	ε ≈100; α =0.004 1
²³¹ Np	35630	50	48.8 m	0.2	(5/2) ⁽⁺⁾ #	01	β^+ ≈98 1; α =2 1
²³¹ Np ^p	35690#	60#			5/2 ⁻ #		
²³¹ Pu	38285	26	8.6 m	0.5	3/2 ⁺ #	01 99La14 D	β^+ ≈87 5; α =13 5
²³¹ Am	42440#	300#	30#	s			β^+ ?; α ?
* ²³¹ Pa	D : ...; ²⁴ Ne=13.4e-10 17; ²³ F=9.9e-13						**
²³² Fr	46360#	640#	5 s	1		97 90Me13 T	β^- =100
²³² Ra	40650#	280#	250 s	50	0 ⁺	91	β^- =100
²³² Ac	39150	100	119 s	5	(1 ⁺)	91	β^- =100
²³² Th	35448.3	2.0	14.05 Gy	0.06	0 ⁺	91 95Bo18 D	IS=100.; α =100; SF=11e-10 3; ...
²³² Pa	35948	8	1.31 d	0.02	(2 ⁻)	91	β^- ≈100; ε =0.003 1
²³² U	34610.7	2.2	68.9 y	0.4	0 ⁺	91 90Bo16 D	α =100; ²⁴ Ne=8.9e-10 7; ...
²³² Np	37360#	100#	14.7 m	0.3	(4 ⁺)	91	β^+ ≈100; α ≈0.003
²³² Pu	38366	18	33.7 m	0.5	0 ⁺	91 ABBW D	ε =?; α =11#
²³² Am	43400#	300#	1.31 m	0.04		91	β^+ =?; α =2#; β^+ SF=0.069 10
* ²³² Th	D : ...; ²⁴ Ne+ ²⁶ Ne<2.78e-10; 2 β^- ?						**
* ²³² U	D : ...; ²⁸ Mg<5e-12; SF<1e-12						**
* ²³² U	D : ²⁴ Ne: average, as adopted by 91Bo20, of 2 results from their group						**
* ²³² Pu	T : average 00La25=33.1(0.8) 73Ja06=34.1(0.7)						**
* ²³² Pu	D : derived from 1.6%# < α < 20%#, in ENSDF						**

Nuclide	Mass excess (keV)	Excitation energy(keV)	Half-life	J^π	Ens	Reference	Decay modes and intensities (%)
²³³ Ra	44770# 470#		30 s	5	1/2 ⁺ #	97	β^- =100
²³³ Ac	41500# 300#		145 s	10	(1/2 ⁺)	90	β^- =100
²³³ Th	38733.2 2.0		22.3 m	0.1	1/2 ⁺	90	β^- =100
²³³ Pa	37490.1 2.2		26.967 d	0.002	3/2 ⁻	90	β^- =100
²³³ U	36920.0 2.7		159.2 ky	0.2	5/2 ⁺	96	α =100; SF<6e-9; ...
²³³ Np	37950 50		36.2 m	0.1	(5/2 ⁺)	90	β^+ ≈100; α ≤0.001
²³³ Np ^p	38000# 60#	50# 30#			(5/2 ⁻)	90	
²³³ Pu	40050 50		20.9 m	0.4	5/2 ⁺ #	90	β^+ ≈100; α =0.12 5
²³³ Am	43170# 100#		3.2 m	0.8		00Sa52	TD β^+ ?; α >3
²³³ Cm	47290 70		1# m		3/2 ⁺ #	01Ca.B	D α =?; β^+ ?
* ²³³ U	D : ...; ²⁴ Ne=7.2e-11 9; ²⁸ Mg<1.3e-13						**
²³⁴ Ra	47230# 490#		30 s	10	0 ⁺	94	β^- =100
²³⁴ Ac	45100# 400#		44 s	7		94	β^- =100
²³⁴ Th	40614 3		24.10 d	0.03	0 ⁺	94	β^- =100
²³⁴ Pa	40341 5		6.70 h	0.05	4 ⁺	94	β^- =100; SF<3e-10
²³⁴ Pa ^m	40419 4	78 3	1.17 m	0.03	(0 ⁻)	94	β^- ≈100; IT=0.16 4; SF<1e-10
²³⁴ U	38146.6 1.8		245.5 ky	0.6	0 ⁺	94	IS=0.0055 2; α =100; ...
²³⁴ U ^m	39567.9 1.8	1421.32 0.10	33.5 μ s	2.0	6 ⁻		*
²³⁴ Np	39956 9		4.4 d	0.1	(0 ⁺)	94	β^+ =100
²³⁴ Pu	40350 7		8.8 h	0.1	0 ⁺	94	ϵ ≈94; α ≈6
²³⁴ Am	44530# 210#		2.32 m	0.08		94	β^+ ≈100; α =0.039 12; ...
²³⁴ Cm	46724 18		51 s	12	0 ⁺	01Ca.B	TD α =?; β^+ =47#; SF=3
* ²³⁴ U	D : ...; SF=1.73e-9 10; ²⁸ Mg=1.4e-11 3; ²⁴ Ne+ ²⁶ Ne=9e-12 7						**
* ²³⁴ Am	D : ...; β^+ SF=0.0066 18						**
²³⁵ Ac	47720# 360#		40# s		1/2 ⁺ #		β^- ?
²³⁵ Th	44260 50		7.2 m	0.1	1/2 ⁺ #	03	β^- =100
²³⁵ Pa	42330 50		24.44 m	0.11	(3/2 ⁻)	03	β^- =100
²³⁵ U	40920.5 1.8		704 My	1	7/2 ⁻	03	IS=0.7200 51; α =100; ...
²³⁵ U ^m	40920.6 1.8	0.0765 0.0004	26 m		1/2 ⁺	03	IT=100
²³⁵ Np	41044.7 2.0		396.1 d	1.2	5/2 ⁺	03	ϵ ≈100; α =0.00260 13
²³⁵ Pu	42184 21		25.3 m	0.5	(5/2 ⁺)	03	β^+ ≈100; α =0.0028 7
²³⁵ Am	44660# 120#		9.9 m	0.5	5/2 ⁻ #	03	β^+ ≈100; α =0.40 5
²³⁵ Cm	47910# 200#		5# m		5/2 ⁺ #	03	β^+ ?; α ?
²³⁵ Cm ^p	47960# 210#	50# 50#			am		
²³⁵ Bk	52700# 400#		20# s				β^+ ?; α ?
* ²³⁵ U	D : ...; SF=7e-9 2; ²⁰ Ne=8e-10 4; ²⁵ Ne≈8e-10; ²⁸ Mg=8e-10						**
²³⁶ Ac	51510# 500#		2# m				β^- ?
²³⁶ Th	46450# 200#		37.5 m	0.2	0 ⁺	91	β^- =100
²³⁶ Pa	45350 200		9.1 m	0.1	1 ⁽⁻⁾	91	β^- =100; β^- SF=6e-8 4
²³⁶ U	42446.3 1.8		23.42 My	0.03	0 ⁺	91	α =100; SF=9.6e-8 6
²³⁶ U ^m	45196 10	2750 10	115 ns		0 ⁺		
²³⁶ Np	43380 50		154 ky	6	(6 ⁻)	91	ϵ =87.3 5; β^- =12.5 5; α =0.16 4
²³⁶ Np ^m	43439 7	60 50	22.5 h	0.4	1	91	ϵ =52 1; β^- =48 1
²³⁶ Np ^p	43618 14	240 50			3 ⁻		
²³⁶ Pu	42902.7 2.2		2.858 y	0.008	0 ⁺	91	α =100; SF=1.36e-7 4; ...
²³⁶ Am	46180# 100#		30# m			91	β^+ ?; α ?
²³⁶ Cm	47890# 200#		10# m		0 ⁺	91	β^+ ?; α ?
²³⁶ Bk	53400# 400#		1# m				β^+ ?; α ?
* ²³⁶ Pa	D : β^- SF decay questioned by 90Ha02						**
* ²³⁶ U	D : and Ne+Mg < 4e-10%, from 89Mi.A						**
* ²³⁶ Pu	D : ...; ²⁸ Mg=2e-12; 2 β^+ ?						**

Nuclide	Mass excess (keV)	Excitation energy(keV)	Half-life	J^π	Ens	Reference	Decay modes and intensities (%)	
²³⁷ Th	50200# 360#		4.8 m	0.5	5/2 ⁺ #	97 00Xu02 T	$\beta^- = 100$	*
²³⁷ Pa	47640 100		8.7 m	0.2	(1/2 ⁺)	95	$\beta^- = 100$	
²³⁷ U	45391.9 1.9		6.75 d	0.01	1/2 ⁺	95	$\beta^- = 100$	
²³⁷ Np	44873.3 1.8		2.144 My	0.007	5/2 ⁺	95 89Pr.A D	$\alpha = 100$; SF $\leq 2e-10$; ³⁰ Mg $< 4e-12$	*
²³⁷ Pu	45093.3 2.2		45.2 d	0.1	7/2 ⁻	95	$\epsilon \approx 100$; $\alpha = 0.0042$ 4	
²³⁷ Pu ^m	45238.8 2.2	145.544 0.010	180 ms	20	1/2 ⁺	95	IT=100	
²³⁷ Am	46570# 60#		73.0 m	1.0	5/2 ⁽⁻⁾	95	$\beta^+ \approx 100$; $\alpha = 0.025$ 3	
²³⁷ Cm	49280# 210#		20# m		5/2 ⁺ #	95	$\beta^+ ?$; $\alpha ?$	
²³⁷ Cm ^p	49480# 260#	200# 150#			7/2 ⁻			
²³⁷ Bk	53100# 220#		1# m		7/2 ⁺ #		$\beta^+ ?$; $\alpha ?$	
²³⁷ Bk ^p	53170# 230#	70# 30# Nm			(3/2 ⁻)			
²³⁷ Cf	57820# 500#		2.1 s	0.3	5/2 ⁺ #	98 95La09 TD	$\alpha ?$; SF ≈ 10 ; $\beta^+ ?$	
* ²³⁷ Th	T : average 00Xu02=4.69(0.60) 93Yu03=5.0(0.9)							**
* ²³⁷ Np	D : and cluster (Z=10-14) < 1.8e-12%, from 92Mo03							**
²³⁸ Th	52630# 280#		9.4 m	2.0	0 ⁺	02	$\beta^- = 100$	
²³⁸ Pa	50770 60		2.27 m	0.09	3 ⁻ #	02 85Ba57 D	$\beta^- = 100$; β^- SF $< 2.6e-6$	
²³⁸ U	47308.9 1.9		4.468 Gy	0.003	0 ⁺	02 91Tu02 D	IS=99.2745 106; $\alpha = 100$; ...	*
²³⁸ U ^m	49866.8 2.0	2557.9 0.5	280 ns	6	0 ⁺	02	IT=?; SF=2.6 4; $\alpha < 0.5$	
²³⁸ Np	47456.3 1.8		2.117 d	0.002	2 ⁺	02	$\beta^- = 100$	
²³⁸ Np ^m	49760# 200# 2300#	200#	112 ns	39		02	SF ≈ 100 ; IT ?	
²³⁸ Pu	46164.7 1.8		87.7 y	0.1	0 ⁺	02 89Wa10 D	$\alpha = 100$; SF=1.9e-7 1; ...	*
²³⁸ Am	48420 50		98 m	2	1 ⁺	02	$\beta^+ = 100$; $\alpha = 1.0e-4$ 4	
²³⁸ Am ^m	50920# 210# 2500#	200#	35 μ s	10		02	SF ≈ 100 ; IT ?	
²³⁸ Cm	49400 40		2.4 h	0.1	0 ⁺	02	$\epsilon ?$; $\alpha \leq 10$	
²³⁸ Bk	54290# 290#		2.40 m	0.08		02 94Kr03 D	$\beta^+ \approx 100$; $\alpha ?$; β^+ SF=0.048 2	
²³⁸ Bk ^p	54490# 330#	200# 150#			am			
²³⁸ Cf	57200# 400#		21.1 ms	1.3	0 ⁺	02 01Og08 TD	SF ≈ 100 ; $\alpha \approx 0.2$; $\beta^+ ?$	*
* ²³⁸ U	D : ...; SF=5.45e-5 7; $2\beta^- = 2.2e-10$ 7							**
* ²³⁸ U	D : $2\beta^- = 2.2(7)e-10\%$ derived from $2\beta^-$ half-life $T = 2.0(0.6)$ Zy, in 91Tu02							**
* ²³⁸ Pu	D : ...; ³² Si $\approx 1.4e-14$; ²⁸ Mg+ ³⁰ Mg $\approx 6e-15$							**
* ²³⁸ Cf	T : average 01Og08=21.1(+1.9-1.7) 95La09=21(2)							**
²³⁹ Pa	53340# 200#		1.8 h	0.5	(3/2 ⁻) ^(-#)	03	$\beta^- = 100$	
²³⁹ U	50573.9 1.9		23.45 m	0.02	5/2 ⁺	03	$\beta^- = 100$	
²³⁹ U ^m	50594# 20# 20# 20#		> 250 ns		(5/2 ⁺)	03	$\beta^- = 100$	
²³⁹ U ⁿ	50707.7 1.9	133.7990 0.0010	780 ns	40	1/2 ⁺	03	IT=100	
²³⁹ Np	49312.4 2.1		2.356 d	0.003	5/2 ⁺	03	$\beta^- = 100$; $\alpha = 5e-10$ #	
²³⁹ Pu	48589.9 1.8		24.11 ky	0.03	1/2 ⁺	03	$\alpha = 100$; SF=3.1e-10 6	
²³⁹ Pu ^m	48981.5 1.8	391.584 0.003	193 ns	4	7/2 ⁻	03	IT=100	
²³⁹ Am	49392.0 2.4		11.9 h	0.1	(5/2 ⁻)	03	$\epsilon \approx 100$; $\alpha = 0.010$ 1	
²³⁹ Am ^m	51890 200 2500	200	163 ns	12	(7/2 ⁺)	03	SF ≈ 100 ; IT ?	
²³⁹ Cm	51190# 100#		2.9 h		(7/2 ⁻)	03	$\beta^+ \approx 100$; $\alpha < 0.1$	
²³⁹ Cm ^p	51340# 140#	150# 100#			1/2 ⁺			
²³⁹ Bk	54290# 230#		3# m		7/2 ⁺ #	03	$\beta^+ ?$; $\alpha ?$	
²³⁹ Bk ^p	54330# 230#	41 11 AD			(3/2 ⁻)			
²³⁹ Cf	58150# 210#		60 s	30	5/2 ⁺ #	03	$\alpha = ?$; $\beta^+ ?$	
²⁴⁰ Pa	56800# 300#		2# m				$\beta^- ?$	
²⁴⁰ U	52715 5		14.1 h	0.1	0 ⁺	96	$\beta^- = 100$; $\alpha < 1e-10$	
²⁴⁰ Np	52315 15		* 61.9 m	0.2	(5 ⁺)	96	$\beta^- = 100$	
²⁴⁰ Np ^m	52335 21	20 15	* 7.22 m	0.02	1 ⁽⁺⁾	96 81Hs02 E	$\beta^- \approx 100$; IT=0.11 3	
²⁴⁰ Pu	50127.0 1.8		6.564 ky	0.011	0 ⁺	01 89Pr.A D	$\alpha = 100$; SF=5.7e-6 2; ³⁴ Si $< 1.3e-13$	
²⁴⁰ Am	51512 14		50.8 h	0.3	(3 ⁻)	96	$\beta^+ = 100$; $\alpha \approx 1.9e-4$	
²⁴⁰ Cm	51725.4 2.3		27 d	1	0 ⁺	96	$\alpha \approx 100$; $\epsilon < 0.5$; SF=3.9e-6 8	
²⁴⁰ Bk	55670# 150#		4.8 m	0.8		96	$\beta^+ ?$; $\alpha = 10$ #; β^+ SF=0.0020 13	
²⁴⁰ Bk ^p	55910# 180#	240# 100#			am			
²⁴⁰ Cf	58030# 200#		1.06 m	0.15	0 ⁺	96 95La09 D	$\alpha \approx 98$; SF ≈ 2 ; $\beta^+ ?$	
²⁴⁰ Es	64200# 400#		1# s				$\alpha ?$; $\beta^+ ?$	

Nuclide	Mass excess (keV)	Excitation energy(keV)	Half-life	J^π	Ens	Reference	Decay modes and intensities (%)
²⁴¹ U	56200# 300#		5# m	7/2 ⁺ #			β^- ?
²⁴¹ Np	54260 70		13.9 m	0.2 (5/2 ⁺)	94		β^- =100
²⁴¹ Pu	52956.8 1.8		14.35 y	0.10 5/2 ⁺	96		$\beta^- \approx 100$; $\alpha=0.00245$ 2; ... *
²⁴¹ Pu ^m	53118.4 1.8	161.60 0.10	880 ns	1/2 ⁺			
²⁴¹ Pu ⁿ	55160 200	2200 200	21 μ s	3			
²⁴¹ Am	52936.0 1.8		432.2 y	0.7 5/2 ⁻	94		$\alpha=100$; SF=4.3e-10 18; ... *
²⁴¹ Am ^m	55140 100	2200 100	1.5 μ s				
²⁴¹ Cm	53703.4 2.2		32.8 d	0.2 1/2 ⁺	94		$\epsilon=99.0$ 1; $\alpha=1.0$ 1
²⁴¹ Bk	56100# 200#		4.6 m	0.4 (7/2 ⁺)	94	03As01 T	α ?; β^+ ?
²⁴¹ Bk ^p	56150# 200#	51 3 AD		3/2 ⁻			
²⁴¹ Cf	59360# 260#		3.8 m	0.7 7/2 ⁻ #	94		$\beta^+ \approx 75$; $\alpha \approx 25$
²⁴¹ Cf ^p	59510# 270#	150# 100# Nm		(1/2 ⁺)			
²⁴¹ Es	63840# 230#		10 s	5 (3/2 ⁻)	97	96Ni09 TJD	α =?; β^+ ?
²⁴¹ Es ^p	64240# 300#	400# 200#		(7/2 ⁺)			
* ²⁴¹ Pu	D : ... ; SF<2.4e-14						**
* ²⁴¹ Am	D : ... ; ³⁴ Si<7.4e-14						**
²⁴² U	58620# 200#		16.8 m	0.5 0 ⁺	02		β^- =100
²⁴² Np	57420 200		2.2 m	0.2 (1 ⁺)	02		β^- =100
²⁴² Np ^m	57420# 210#	0# 50# *	5.5 m	0.1 6 ⁺ #	02		β^- =100
²⁴² Pu	54718.4 1.9		375 ky	2 0 ⁺	02		$\alpha=100$; SF=5.50e-4 6
²⁴² Am	55469.7 1.8		16.02 h	0.02 1 ⁻	02		β^- =82.7 3; $\epsilon=17.3$ 3
²⁴² Am ^m	55518.3 1.8	48.60 0.05	141 y	2 5 ⁻	02		IT \approx 100; $\alpha=0.45$ 2; SF<4.7e-9
²⁴² Am ⁿ	57670 80	2200 80	14.0 ms	1.0 (2 ⁺ , 3 ⁻)	02		SF \approx 100; IT=?; α ?
²⁴² Cm	54805.2 1.8		162.8 d	0.2 0 ⁺	02		$\alpha=100$; SF=6.2e-6 3; ... *
²⁴² Bk	57740# 200#		7.0 m	1.3 2 ⁻ #	02	80Ga07 D	$\beta^+ \approx 100$; β^+ SF<3e-5; α ?
²⁴² Bk ^m	57940# 280#	200# 200#	600 ns	100	02		SF \approx 100; IT ?
²⁴² Bk ^p	57990# 220#	250# 100#		4 ⁻			
²⁴² Cf	59340 40		3.49 m	0.15 0 ⁺	02	70Si19 T	$\alpha=80$ 20; β^+ ?; SF<0.014 *
²⁴² Es	64970# 330#		13.5 s	2.5 02	94Ke.B D		α =?; β^+ =?; β^+ SF=0.6 *
²⁴² Fm	68400# 400#		800 μ s	200 0 ⁺	02		SF=?; α ?
* ²⁴² Cm	D : ... ; ³⁴ Si=1.1e-14 4; 2 β^+ ?						**
* ²⁴² Cf	T : average 70Si19=3.68(0.44) 67Si07=3.4(0.2) 67Fi04=3.2(0.5) 67H01=3.7(0.3)						**
* ²⁴² Es	D : β^+ SF=0.6% assuming α and β^+ are equal						**
²⁴³ Np	59880# 30#		1.85 m	0.15 (5/2 ⁻)	93		β^- =100
²⁴³ Np ^p	59925 11	50# 30# Nm		(5/2 ⁻)			
²⁴³ Pu	57756 3		4.956 h	0.003 7/2 ⁺	93		β^- =100
²⁴³ Pu ^m	58140 3	383.6 0.4	330 ns	30 (1/2 ⁺)	93		IT=100
²⁴³ Am	57176.1 2.3		7.37 ky	0.04 5/2 ⁻	93		$\alpha=100$; SF=3.7e-9 2
²⁴³ Cm	57183.6 2.1		29.1 y	0.1 5/2 ⁺	93		$\alpha \approx 100$; $\epsilon=0.29$ 3; SF=5.3e-9 9
²⁴³ Cm ^p	57312 10	129 9 AD		7/2 ⁺			
²⁴³ Bk	58691 5		4.5 h	0.2 (3/2 ⁻)	93		$\beta^+ \approx 100$; $\alpha \approx 0.15$
²⁴³ Bk ^p	58740# 30#	50# 30#		(7/2 ⁻)			
²⁴³ Cf	60950# 140#		10.7 m	0.5 (1/2 ⁺)	93		$\beta^+ \approx 86$; $\alpha \approx 14$
²⁴³ Es	64780# 230#		21 s	2 3/2 ⁻ #	93		$\beta^+ \leq 70$; $\alpha \geq 30$
²⁴³ Es ^p	65180# 310#	400# 200#		am			
²⁴³ Fm	69260# 220#		210 ms	60 7/2 ⁻ #	93	ABBW D	$\alpha=60$ 40; β^+ ?; SF=0.57# *
* ²⁴³ Fm	D : $\alpha=40(20)$ % if α branching of ²³⁹ Cf is 100%, see ENSDF						**
²⁴⁴ Np	63200# 300#		2.29 m	0.16 (7 ⁻)	03		β^- =100
²⁴⁴ Pu	59806 5		80.0 My	0.9 0 ⁺	03	92Mo25 D	$\alpha \approx 100$; SF=0.121 4; ... *
²⁴⁴ Am	59881.0 2.1		10.1 h	0.1 6 ⁻ #	03		β^- =100
²⁴⁴ Am ^m	59969.5 2.3	88.6 1.7 RQ	26 m	1 1 ⁺	03		$\beta^- \approx 100$; $\epsilon=0.0361$ 13
²⁴⁴ Cm	58453.7 1.8		18.10 y	0.02 0 ⁺	03		$\alpha=100$; SF=1.37e-4 3
²⁴⁴ Cm ^m	59493.9 1.8	1040.188 0.012	34 ms	2 6 ⁺	03		IT=100

... A-group is continued on next page ...

Nuclide	Mass excess (keV)				Excitation energy(keV)	Half-life	J^π	Ens	Reference	Decay modes and intensities (%)	
... A-group continued ...											
²⁴⁴ Bk	60716	14				4.35 h	0.15	4 ⁻ #	03	$\beta^+ ?$; $\alpha=0.006\ 3$	
²⁴⁴ Bk ^p	60860#	50#	140#	50#				<i>am</i>			
²⁴⁴ Cf	61479.2	2.9				19.4 m	0.6	0 ⁺	03	$\alpha\approx 100$; $\varepsilon ?$	
²⁴⁴ Es	66030#	180#				37 s	4		03	$\beta^+=?$; $\alpha=5\ 3$; $\beta^+SF=0.01$	
²⁴⁴ Es ^p	66230#	240#	200#	150#				<i>am</i>			
²⁴⁴ Fm	69010#	280#				3.3 ms	0.5	0 ⁺	03	SF ≈ 100 ; $\alpha=0.4\#$	
* ²⁴⁴ Pu	D : ... ; $2\beta^- < 7.3\text{e-}9$										**
* ²⁴⁴ Pu	T : and $T(2\beta^-) > 1.1\text{ Ey}$, from ⁹² Mo25; thus $2\beta^- < 7.3\text{ e-}9\text{e}$										**
²⁴⁵ Pu	63106	14				10.5 h	0.1	(9/2 ⁻)	93	$\beta^-=100$	
²⁴⁵ Am	61900	3				2.05 h	0.01	(5/2 ⁺)	93	$\beta^-=100$	
²⁴⁵ Cm	61004.7	2.1				8.5 ky	0.1	7/2 ⁺	93	$\alpha=100$; SF=6.1e-7 9	
²⁴⁵ Cm ^m	61360.6	2.1	355.90	0.10		290 ns	20	1/2 ⁺	93	IT=100	
²⁴⁵ Bk	61815.4	2.3				4.94 d	0.03	3/2 ⁻	93	$\varepsilon\approx 100$; $\alpha=0.12\ 1$	
²⁴⁵ Bk ^p	61870#	30#	50#	30#				(7/2 ⁻)			
²⁴⁵ Cf	63386.9	2.9				45.0 m	1.5	(5/2 ⁺)	93	$\beta^+=64\ 3$; $\alpha=36\ 3$	
²⁴⁵ Cf ^p	63540#	100#	150#	100#				7/2 ⁺			
²⁴⁵ Es	66440#	200#				1.1 m	0.1	(3/2 ⁻)	93	$\beta^+=60\ 10$; $\alpha=40\ 10$	
²⁴⁵ Es ^p	66740#	220#	300#	100#				<i>am</i>			
²⁴⁵ Es ^q	66790#	250#	350#	140#				<i>am</i>			
²⁴⁵ Fm	70220#	280#				4.2 s	1.3	1/2 ⁺ #	93	$\alpha=?$; $\beta^+=4.2\#$; SF=0.13#	
²⁴⁵ Md	75290#	320#			*	900 μs	250	1/2 ⁻ #	97	96Ni09 TJD SF=?; $\alpha ?$	
²⁴⁵ Md ^m	75490#	310#	200#	100#	*	400 ms	200	(7/2 ⁺)	97	96Ni09 TJD $\alpha=?$; $\beta^+ ?$	
²⁴⁶ Pu	65395	15				10.84 d	0.02	0 ⁺	98	$\beta^-=100$	
²⁴⁶ Am	64995	18				39 m	3	(7 ⁻)	98	$\beta^-=100$	
²⁴⁶ Am ^m	65025	15	30	10		25.0 m	0.2	2 ⁽⁻⁾	98	$\beta^-\approx 100$; IT<0.02	
²⁴⁶ Cm	62618.4	2.1				4.76 ky	0.04	0 ⁺	98	$\alpha\approx 100$; SF=0.02615 7	
²⁴⁶ Bk	63970	60				1.80 d	0.02	2 ⁽⁻⁾	98	$\beta^+\approx 100$; $\alpha=0.1\#$	
²⁴⁶ Cf	64091.7	2.1				35.7 h	0.5	0 ⁺	98	$\alpha=100$; SF=2.5e-4 2; $\varepsilon < 4\text{e-}3$	
²⁴⁶ Es	67900#	220#				7.7 m	0.5	4 ⁻ #	98	$\beta^+=90.1\ 18$; $\alpha=9.9\ 18$; ...	*
²⁴⁶ Es ^p	68250#	300#	350#	200#				<i>am</i>			
²⁴⁶ Fm	70140	40				1.1 s	0.2	0 ⁺	98	96Ni09 D $\alpha=?$; $\beta^+>10$; SF=4.5 13; ...	*
²⁴⁶ Md	76280#	330#				1.0 s	0.4		98	$\alpha=?$; $\beta^+ ?$; SF ?	*
²⁴⁶ Md ^m	76490#	340#	210	70	EU	1.0 s	0.4			96Ni09 TD $\alpha=?$; $\beta^+ ?$	*
* ²⁴⁶ Es	D : ... ; $\beta^+SF\approx 0.003$										**
* ²⁴⁶ Fm	D : ... ; $\beta^+SF=10\ 5$										**
* ²⁴⁶ Md ^m	I : no longer considered to exist, see ENSDF'98										**
²⁴⁷ Pu	69000#	300#				2.27 d	0.23	1/2 ⁺ #	93	$\beta^-=100$	
²⁴⁷ Am	67150#	100#				23.0 m	1.3	5/2#	93	$\beta^-=100$	
²⁴⁷ Cm	65534	4				15.6 My	0.5	9/2 ⁻	93	$\alpha=100$	
²⁴⁷ Bk	65491	6				1.38 ky	0.25	(3/2 ⁻)	93	$\alpha\approx 100$; SF ?	
²⁴⁷ Cf	66137	8				3.11 h	0.03	7/2 ⁺ #	93	$\varepsilon\approx 100$; $\alpha=0.035\ 5$	
²⁴⁷ Es	68610#	30#				4.6 m	0.3	7/2 ⁺ #	93	$\beta^+\approx 93$; $\alpha\approx 7$; SF $\approx 9\text{e-}5\#$	
²⁴⁷ Es ^p	68930#	200#	320#	200#				<i>am</i>			
²⁴⁷ Fm	71580#	140#				35 s	4	5/2 ⁺ #	93	$\alpha\geq 50$; $\beta^+\leq 50$	
²⁴⁷ Fm ^m			non existent	EU		9.2 s	2.3		93	67Fl15 I $\alpha\approx 100$; IT ?	*
²⁴⁷ Fm ^p	71730#	170#	150#	100#	Nm			(7/2 ⁺)			
²⁴⁷ Fm ^q	71980#	210#	400#	150#							
²⁴⁷ Md	76040#	320#			*	270 ms	160	1/2 ⁻ #	93	93Ho.A TD SF=?; $\alpha ?$	
²⁴⁷ Md ^m	76170#	310#	130#	100#	Nm *	1.12 s	0.22	(7/2 ⁺)		93Ho.A TD $\alpha=100$; SF=0.0001#	
* ²⁴⁷ Fm ^m	I : existence of this isomer is discussed in ENSDF										*

Nuclide	Mass excess (keV)	Excitation energy(keV)	Half-life	J^π	Ens	Reference	Decay modes and intensities (%)	
²⁴⁸ Am	70560#	200#	3# m		99		β^- ?	
²⁴⁸ Cm	67392	5	348 ky	6	0 ⁺	99	$\alpha=91.61$ 16; SF=8.39 16; ...	*
²⁴⁸ Bk	68080#	70#	* > 9 y		6 ⁺ #	99	α ?	
²⁴⁸ Bk ^m	68110	21	30# 70#	* 23.7 h	0.2	1 ⁽⁻⁾	β^- =70 5; ϵ =30 5; α =0.001#	
²⁴⁸ Bk ^p	68130	50	50#			(5 ⁻)		
²⁴⁸ Cf	67240	5		334 d	3	0 ⁺	$\alpha\approx 100$; SF=0.0029 3	
²⁴⁸ Es	70300#	50#		27 m	5	2 ⁻ , 0 ⁺ #	β^+ ≈ 100 ; $\alpha\approx 0.25$; β^+ SF=3e-5	
²⁴⁸ Es ^m			non existent	41 m				
²⁴⁸ Fm	71906	12		36 s	3	0 ⁺	$\alpha=93$ 7; $\beta^+=7$ 7; SF=0.10 5	
²⁴⁸ Md	77150#	240#		7 s	3		$\beta^+=80$ 10; $\alpha=20$ 10; ...	*
²⁴⁸ Md ^p	77250#	250#	100# 70#					
²⁴⁸ No	80660#	300#		< 2 μ s		0 ⁺	SF ?	
* ²⁴⁸ Cm	D : ... ; 2 β^- ?							**
* ²⁴⁸ Md	D : ... ; β^+ SF<0.05							**
²⁴⁹ Am	73100#	300#		1# m			β^- ?	
²⁴⁹ Cm	70750	5		64.15 m	0.03	1/2 ⁽⁺⁾	β^- =100	
²⁴⁹ Cm ^m	70799	5	48.758 0.017	23 μ s		(7/2 ⁺)	$\alpha=100$	
²⁴⁹ Bk	69849.6	2.6		330 d	4	7/2 ⁺	β^- ≈ 100 ; $\alpha=0.00145$ 8; ...	*
²⁴⁹ Bk ^m	69858.4	2.6	8.80 0.10	300 μ s		(3/2 ⁻)	IT=100	
²⁴⁹ Cf	69725.6	2.2		351 y	2	9/2 ⁻	$\alpha=100$; SF=5.0e-7 4	
²⁴⁹ Cf ^m	69870.6	2.2	144.98 0.05	45 μ s	5	5/2 ⁺	IT=100	
²⁴⁹ Es	71180#	30#		102.2 m	0.6	7/2 ⁺	β^+ ≈ 100 ; $\alpha=0.57$ 8	
²⁴⁹ Fm	73620#	100#		2.6 m	0.7	7/2 ⁺ #	β^+ ?; $\alpha=33$ 9	
²⁴⁹ Md	77330#	220#		24 s	4	(7/2 ⁻)	$\alpha>60$; β^+ ?	
²⁴⁹ Md ^m	77430#	250#	100# 100#	1.9 s	0.9	(1/2 ⁻)	$\alpha=100$	
²⁴⁹ No	81820#	340#		57 μ s	12	5/2 ⁺ #	β^+ ?; α ?	
* ²⁴⁹ Bk	D : ... ; SF=47e-9 2							**
²⁵⁰ Cm	72989	11		8300# y		0 ⁺	SF ≈ 74 ; $\alpha\approx 18$; β^- ≈ 8	
²⁵⁰ Bk	72951	4		3.212 h	0.005	2 ⁻	β^- =100	
²⁵⁰ Bk ^m	72987	4	35.59 0.05	29 μ s	1	(4 ⁺)	IT=100	
²⁵⁰ Bk ⁿ	73036	5	84.1 2.1	213 μ s	8	(7 ⁺)	IT ?	
²⁵⁰ Cf	71171.8	2.1		13.08 y	0.09	0 ⁺	$\alpha\approx 100$; SF=0.077 3	
²⁵⁰ Es	73230#	100#		* 8.6 h	0.1	(6 ⁺)	β^+ >97; α ?	
²⁵⁰ Es ^m	73430#	180#	200# 150#	* 2.22 h	0.05	1 ⁽⁻⁾	β^+ ≈ 100 ; α ?	
²⁵⁰ Fm	74074	12		30 m	3	0 ⁺	$\alpha>90$; $\epsilon<10$; SF=0.0069 10	
²⁵⁰ Fm ^m	75570#	300#	1500# 300#	1.8 s	0.1	7, 8#	IT>80; $\alpha<20$; β^+ ?; ...	*
²⁵⁰ Md	78640#	300#		52 s	6		$\beta^+=93$ 3; $\alpha=7$ 3; β^+ SF=0.02	
²⁵⁰ Md ^p	78830#	340#	190# 150#			am		
²⁵⁰ No	81520#	200#		5.7 μ s	0.8	0 ⁺	SF ≈ 100 ; $\alpha=0.1$ #; ...	*
* ²⁵⁰ Fm ^m	D : ... ; SF<8.2E-5							**
* ²⁵⁰ No	D : ... ; $\beta^+=0.00025$ #							**
* ²⁵⁰ No	T : also 01Og08=36(+11-6)							**
²⁵¹ Cm	76648	23		16.8 m	0.2	(1/2 ⁺)	β^- =100	
²⁵¹ Bk	75228	11		55.6 m	1.1	3/2 ⁻ #	β^- =100	
²⁵¹ Bk ^m	75264	11	35.5 1.3	58 μ s	4	7/2 ⁺ #	IT=100	
²⁵¹ Cf	74135	4		900 y	40	1/2 ⁺	$\alpha\approx 100$; SF ?	
²⁵¹ Es	74512	6		33 h	1	(3/2 ⁻)	ϵ ?; $\alpha=0.5$ 2	
²⁵¹ Fm	75987	8		5.30 h	0.08	(9/2 ⁻)	$\beta^+=98.20$ 13; $\alpha=1.80$ 13	
²⁵¹ Fm ^m	76178	8	191 2	15.2 μ s	2.3	(5/2 ⁺)	IT=100	
²⁵¹ Md	79030#	200#		4.0 m	0.5	7/2 ⁻ #	$\beta^+=95$ #; α =?	
²⁵¹ Md ^p	79080#	210#	50# 30#			am		
²⁵¹ No	82910#	180#		* 760 ms	30	7/2 ⁺ #	$\alpha=83$ 16; β^+ ?; SF<0.3	
²⁵¹ No ^m	83030#	210#	110# 180#	* 1.7 s	1.0	9/2 ⁻ #	$\alpha=100$	*
²⁵¹ Lr	87900#	300#		150# μ s			β^+ ?; α ?	
* ²⁵¹ No ^m	I : tentative assignment in 97He29, could not be confirmed in 01He35							**

Nuclide	Mass excess (keV)	Excitation energy(keV)			Half-life	J^π	Ens	Reference	Decay modes and intensities (%)	
²⁵² Cm	79060# 300#				< 1 d	0 ⁺	99		β^- ?	
²⁵² Bk	78530# 200#				1.8 m 0.5		99	92Kr.A TD	β^- =?; α ?	
²⁵² Cf	76034 5				2.645 y 0.008	0 ⁺	99		α =96.908 8; SF=3.092 8	
²⁵² Es	77290 50				471.7 d 1.9	(5 ⁻)	99		α =78 2; ϵ =22 2	
²⁵² Fm	76817 6				25.39 h 0.04	0 ⁺	99		α ≈100; SF=0.0023 2; $2\beta^+$?	
²⁵² Md	80630# 200#				2.3 m 0.8		99		β^+ >50; α <50	
²⁵² Md ^p	80670# 220#	40#	100#			<i>am</i>				
²⁵² No	82881 13				2.44 s 0.04	0 ⁺	99	01Og08 TD	α ≈67; SF=32.2 5; β^+ ?	*
²⁵² Lr	88840# 250#				390 ms 90		99	01He35 TD	β^+ =71#; α =?; SF<1	
²⁵² Lr ^p	89140# 290#	300#	150#							
* ²⁵² No	T : other 03Be18=2.38(+0.26-0.22)				D : SF from 01Og08; α estimated by NUBASE					**
²⁵³ Bk	80930# 360#				10# m			91Kr.A I	β^- ?	*
²⁵³ Cf	79301 6				17.81 d 0.08	(7/2 ⁺)	99		β^- ≈100; α =0.31 4	
²⁵³ Es	79013.7 2.6				20.47 d 0.03	7/2 ⁺	99		α =100; SF=8.7e-6 3	
²⁵³ Fm	79350 4				3.00 d 0.12	(1/2) ⁺	99		ϵ =88 1; α =12 1	
²⁵³ Md	81300# 210#				12 m 8	7/2 ⁻ #	99		β^+ ≈100; α =0.6#	
²⁵³ Md ^p	81300# 210#	0#	30#			<i>am</i>				
²⁵³ No	84470# 100#				1.62 m 0.15	9/2 ⁻ #	99		α =?; β^+ =20#; SF=0.001#	
²⁵³ No ^m	84590# 100#	129	19	AD	31 μ s	5/2 ⁺ #			α =?	
²⁵³ Lr	88690# 220#				* & 580 ms 70	(7/2 ⁻)	99	01He35 TJD	α =90 10; SF=2.6 21; β^+ =1#	
²⁵³ Lr ^m	88710# 250#	30#	100#		* & 1.5 s 0.3	(1/2 ⁻)	99	01He35 TJD	α =90 10; SF=8 5; β^+ =1#	
²⁵³ Rf	93790# 450#				* 13 ms 5	(7/2) ^(+##)		95Ho.B TJ	SF≈50 2; α ≈50	*
²⁵³ Rf ^m	93990# 470#	200#	150#		* 52 μ s 14	(1/2) ^(-##)	99	97He29 J	SF=?; α =5#	
* ²⁵³ Bk	I : possible identification, in 91Kr.A. Needs confirmation									**
* ²⁵³ Rf	I : the state with ≈1.8 s reported in ENSDF is not confirmed									**
²⁵⁴ Bk	84390# 300#				1# m				β^- ?	
²⁵⁴ Cf	81341 12				60.5 d 0.2	0 ⁺	01		SF≈100; α =0.31 2; $2\beta^-$?	
²⁵⁴ Es	81992 4				275.7 d 0.5	(7 ⁺)	01		α ≈100; ϵ =0.03#; ...	*
²⁵⁴ Es ^m	82076 3	84.2	2.5	AD	39.3 h 0.2	2 ⁺	01		α ≈98 2; IT<3; α =0.32 1; ...	*
²⁵⁴ Fm	80904.2 2.8				3.240 h 0.002	0 ⁺	01		α ≈100; SF=0.0592 3	
²⁵⁴ Md	83510# 100#				* 10 m 3	(0 ⁻)	01		β^+ ≈100; α ?	
²⁵⁴ Md ^m	83560# 140#	50#	100#		* 28 m 8	(3 ⁻)	01		β^+ ≈100; α ?	
²⁵⁴ No	84724 18				51 s 10	0 ⁺	01		α =90 4; β^+ =10 4; SF=0.17 5	
²⁵⁴ No ^m	85220# 100#	500#	100#		280 ms 40		01		IT>80; α ?	
²⁵⁴ Lr	89850# 340#				13 s 3		01		α =76 11; β^+ =24 11; SF ?	*
²⁵⁴ Lr ^p	89880# 340#	30#	70#							
²⁵⁴ Rf	93320# 290#				23 μ s 3	0 ⁺	01	97He29 TD	SF=?; α <1.5	
* ²⁵⁴ Es	D : ...; β^- =1.74e-4 8; SF<3e-6									**
* ²⁵⁴ Es ^m	D : ...; ϵ =0.076 7; SF<0.045									**
* ²⁵⁴ Lr	T : also 01Ga20=13.4(4.2)									**
²⁵⁵ Cf	84810# 200#				85 m 18	(7/2 ⁺)	99		β^- =100; SF<0.001#; α =2e-7#	
²⁵⁵ Es	84089 11				39.8 d 1.2	(7/2 ⁺)	99		β^- =92.0 4; α =8.0 4; SF=0.0041 2	
²⁵⁵ Fm	83799 5				20.07 h 0.07	7/2 ⁺	99		α =100; SF=2.4e-5 10	
²⁵⁵ Fm ^p	84050# 100#	250#	100#	Nm		(9/2 ⁺)				
²⁵⁵ Md	84843 7				27 m 2	(7/2 ⁻)	99		β^+ =92 2; α =8 2; SF<0.15	
²⁵⁵ Md ^p	84850# 70#	10#	70#			<i>am</i>				
²⁵⁵ No	86854 10				3.1 m 0.2	(1/2 ⁺)	99		α =61 3; β^+ =39 3	
²⁵⁵ No ^p	86950# 70#	100#	70#	Nm		(7/2 ⁺)				
²⁵⁵ Lr	90060# 210#				22 s 4	7/2 ⁻ #	99		α =?; β^+ <30#; SF<1#	*
²⁵⁵ Rf	94400# 180#				* 1.64 s 0.11	9/2 ⁻ #	99	01He35 TD	α =?; SF=52 6	
²⁵⁵ Rf ^m	94320# 210#	-80#	180#		* 1.0 s 0.4	5/2 ⁺ #	99	97He29 D	α =100	
²⁵⁵ Db	100040# 420#				1.7 s 0.5		99		α ?; SF≈20	
* ²⁵⁵ Lr	T : also 01Ga20=21(8)									**

Nuclide	Mass excess (keV)		Excitation energy(keV)		Half-life		J^π	Ens	Reference	Decay modes and intensities (%)	
²⁵⁶ Cf	87040#	300#			12.3	m	1.2	0 ⁺	99		SF=100; $\alpha=6.2e-7\#$; $2\beta^-$?
²⁵⁶ Es	87190#	100#		*	25.4	m	2.4	(1 ⁺ , 0 ⁻)	99		β^- =100
²⁵⁶ Es ^m	87190#	140#	0#	100#	7.6	h		(8 ⁺)	99		β^- =100; β^- -SF=0.002
²⁵⁶ Fm	85486	7			157.6	m	1.3	0 ⁺	99		SF=91.9 3; $\alpha=8.1$ 3
²⁵⁶ Md	87620	50			77	m	2	(1 ⁻)	99		$\beta^+=?$; $\alpha=9.2$ 7; SF<3
²⁵⁶ Md ^p	87700#	110#	80#	100#				<i>am</i>			
²⁵⁶ No	87824	8			2.91	s	0.05	0 ⁺	99		$\alpha\approx 100$; SF=0.53 6; $\epsilon<0.01\#$
²⁵⁶ Lr	91870#	220#			27	s	3		99		$\alpha=85$ 10; $\beta^+=15$ 10; SF<0.03
²⁵⁶ Lr ^p	91970#	230#	100	70	XL						
²⁵⁶ Rf	94236	24			6.45	ms	0.14	0 ⁺	99	97He29	TD SF=?; $\alpha=0.32$ 17
²⁵⁶ Db	100720#	290#			1.9	s	0.4		99	01He35	TD $\alpha=?$; $\beta^+=36$ 12; SF=?
* ²⁵⁶ Rf	T : average 97He29=6.2(0.2) 84Og02=6.7(0.2)										**
* ²⁵⁶ Db	T : average 01He35=1.6(+0.5-0.3) 83Og.A=2.6(+1.4-0.8)										**
²⁵⁷ Es	89400#	410#			7.7	d	0.2	7/2 ⁺ #	99		β^- =100; $\alpha=4e-4\#$
²⁵⁷ Fm	88589	6			100.5	d	0.2	(9/2 ⁻)	99		$\alpha\approx 100$; SF=0.210 4
²⁵⁷ Md	88996.2	2.8			5.52	h	0.05	(7/2 ⁻)	99		$\epsilon=85$ 3; $\alpha=15$ 3; SF<4
²⁵⁷ No	90241	22			25	s	2	(7/2 ⁺)	99	02Ho11	D $\alpha=?$; $\beta^+=15$ 8
²⁵⁷ No ^p	90550#	110#	310#	100#				<i>am</i>			
²⁵⁷ Lr	92740#	210#			646	ms	25	9/2 ⁺ #	99		$\alpha\approx 100$; $\beta^+=0.01\#$; SF=0.001#
²⁵⁷ Lr ^p	92890#	230#	150#	100#				<i>am</i>			
²⁵⁷ Rf	95930#	100#			4.7	s	0.3	(1/2 ⁺)	99	97He29	JD $\alpha=?$; $\beta^+=11$ 1; SF<1.4
²⁵⁷ Rf ^m	96050#	100#	114	17	AD			(11/2 ⁻)	99	97He29	EJ $\alpha\approx 100$; SF=0.7#; $\beta^+=?$
²⁵⁷ Rf ^p	96030#	120#	100#	70#				(7/2 ⁺)			*
²⁵⁷ Db	100340#	230#			* & 1.53	s	0.17	(9/2 ⁺)	99	01He35	TJD $\alpha>94$; SF<6; $\beta^+=1\#$
²⁵⁷ Db ^m	100450#	250#	100#	100#	* & 790	ms	130	(1/2 ⁻)	99	01He35	TJD $\alpha>87$; SF<13; $\beta^+=1\#$
* ²⁵⁷ Rf ^m	E : 97He29=118(4) keV form direct comparison of two alpha lines										**
²⁵⁸ Es	92700#	300#			3#	m					β^- ?; α ?
²⁵⁸ Fm	90430#	200#			370	μ s	14	0 ⁺	01	86Hu05	T SF ≈ 100 ; α ?
²⁵⁸ Md	91688	5			51.5	d	0.3	8 ⁻ #	01	93Mo18	D $\alpha\approx 100$; $\beta^+<0.0015$; $\beta^-<0.0015$
²⁵⁸ Md ^m	91690#	200#	0#	200#	* 57.0	m	0.9	1 ⁻ #	01	93Mo18	D $\epsilon=?$; SF<20; $\beta^-<10\#$; $\alpha<1.2$
²⁵⁸ No	91480#	200#			1.2	ms	0.2	0 ⁺	01		SF ≈ 100 ; $\alpha=0.001\#$; $2\beta^+$?
²⁵⁸ Lr	94840#	100#			4.1	s	0.3		01		$\alpha>95$; $\beta^+<5$
²⁵⁸ Lr ^p	95040#	180#	200#	150#				<i>am</i>			
²⁵⁸ Rf	96400#	200#			12	ms	2	0 ⁺	01		SF=87 2; $\alpha=13$ 2
²⁵⁸ Db	101750#	340#			* 4.5	s	0.6		01		$\alpha=64$ 7; $\beta^+=36$ 7; SF<1#
²⁵⁸ Db ^m	101810#	350#	60#	100#	* 20	s	10	01			$\beta^+\approx 100$; IT ?
²⁵⁸ Sg	105420#	410#			3.3	ms	1.0	0 ⁺	01		SF=?; $\alpha<20$
* ²⁵⁸ Fm	T : average 86Hu05=360(20) 71Hu03=380(20) (all 1 σ) ENSDF gives 3 σ										**
* ²⁵⁸ Md	D : derived from "the sum of SF, ϵ and β^- decay branches < 0.003%" in										**
* ²⁵⁸ Md	D : 93Mo18 and T(SF)>150000 y, from 86Lo16, thus SF<1e-4#										**
* ²⁵⁸ Md ^m	D : SF<20% derived from 93Mo18 "the sum of SF and β^- decay branches < 30%"										**
²⁵⁹ Fm	93700#	280#			1.5	s	0.3	3/2 ⁺ #	99		SF=100
²⁵⁹ Md	93620#	200#			1.60	h	0.06	7/2 ⁻ #	99	93Mo18	T SF=?; $\alpha<1.3$
²⁵⁹ No	94110#	100#			58	m	5	9/2 ⁺ #	99		$\alpha=75$ 4; $\epsilon=25$ 4; SF<10
²⁵⁹ No ^p	94390#	180#	280#	150#							
²⁵⁹ Lr	95850#	70#			6.2	s	0.3	9/2 ⁺ #	99		$\alpha=78$ 2; SF=22 2; $\beta^+=0.6\#$
²⁵⁹ Lr ^p	96200#	170#	350#	150#							
²⁵⁹ Rf	98400#	70#			2.8	s	0.4	7/2 ⁺ #	99	94Gr08	T $\alpha=92$ 2; SF=8 2; $\beta^+=0.3\#$
²⁵⁹ Rf ^p	98500#	100#	100#	70#	Nm			(3/2 ⁺)			*
²⁵⁹ Rf ^f	98610#	130#	210#	110#	Nm			(9/2 ⁺)			
²⁵⁹ Db	102100#	210#			510	ms	160		99	01Ga20	TD $\alpha=100$
²⁵⁹ Sg	106660#	180#			580	ms	210	1/2 ⁺ #	99		$\alpha=90$ 10; SF<20
* ²⁵⁹ Rf	T : average 94Gr08=1.7(+0.8-0.5) 85So03=3.4(1.7) 81Be03=3.0(1.3)										**
* ²⁵⁹ Rf	T : 73Dr10=3.2(0.8) and 69Gh01=3.2(0.8)										**

Nuclide	Mass excess (keV)	Excitation energy(keV)	Half-life	J^π	Ens	Reference	Decay modes and intensities (%)	
²⁶⁰ Fm	95640# 500#	EU	1# m	0 ⁺			SF ?	*
²⁶⁰ Md	96550# 320#		27.8 d 0.8		99	92Lo.B TD	SF=?; $\alpha < 5$; $\epsilon < 5$; $\beta^- < 3.5$	*
²⁶⁰ No	95610# 200#		106 ms 8	0 ⁺	99		SF=100	
²⁶⁰ Lr	98280# 120#		3.0 m 0.5		99		$\alpha = 80$ 20; $\beta^+ = 20$ 20	
²⁶⁰ Rf	99150# 200#		21 ms 1	0 ⁺	99		SF=?; $\alpha = 2\#$; $\epsilon = 0.01\#$	
²⁶⁰ Db	103680# 230#		1.52 s 0.13		99		$\alpha \geq 90.4$ 6; $SF \leq 9.6$ 6; $\beta^+ < 2.5$	
²⁶⁰ Db ^p	103880# 280# 200# 150#							
²⁶⁰ Sg	106580 40		3.8 ms 0.8	0 ⁺	99		SF=60 30; $\alpha = 40$ 30	
²⁶⁰ Bh	113610# 580#		300# μ s		99		$\alpha = 100$	
* ²⁶⁰ Fm	I : half-life ≈ 4 ms and SF=100 mode were reported in the 92Lo.B internal							**
* ²⁶⁰ Fm	I : report. Not confirmed in subsequent experiment by same group (97Lo.A)							**
* ²⁶⁰ Fm	I : Discovery of this nuclide is considered unproven							**
* ²⁶⁰ Md	T : supersedes 86Hu01=31.8(0.5) of same group							**
²⁶¹ Md	98480# 650#		40# m	7/2 ⁻ #			α ?	
²⁶¹ No	98500# 300#		3# h	3/2 ⁺ #			α ?	
²⁶¹ Lr	99560# 200#		39 m 12		99		SF=?; α ?	
²⁶¹ Rf	101315 29		* & 5.5 s 2.5	3/2 ⁺ #	99	02Ho11 T	$\alpha = ?$; SF=40	
²⁶¹ Rf ^m	101390# 100# 70# 100#		* & 81 s 9	9/2 ⁺ #		02Ho11 TD	$\alpha = ?$; $\beta^+ < 15$; SF<10	
²⁶¹ Rf ^p	101420 70 100 60 AD			3/2 ⁺ #				
²⁶¹ Db	104380# 230#		1.8 s 0.4		99		$\alpha > 82$; SF<18	
²⁶¹ Sg	108160# 130#		230 ms 60	7/2 ⁺ #	99		$\alpha \approx 100$; SF<1	
²⁶¹ Sg ^p	108290# 140# 130 50 AD			(9/2 ⁺)				
²⁶¹ Sg ^q	108320# 140# 160 50 AD			(3/2 ⁺)				
²⁶¹ Bh	113330# 230#		13 ms 4		99		$\alpha = 95$ 5; SF<10	
²⁶² Md	101410# 580#		3# m				SF ?; α ?	
²⁶² No	99950# 450#		5 ms	0 ⁺	01		SF \approx 100; α ?	
²⁶² Lr	102120# 200#		4 h		01		$\beta^+ = ?$; SF<10; α ?	
²⁶² Rf	102390# 280#		* 2.3 s 0.4	0 ⁺	01		SF \approx 100; $\alpha < 0.8$	
²⁶² Rf ^m	102990# 490# 600# 400#		* 47 ms 5	high		96La11 I	SF=100	*
²⁶² Db	106270# 180#		35 s 5		01		$\alpha \approx 67$; SF \approx 30; $\beta^+ = 3\#$	
²⁶² Db ^p	106390# 200# 120# 70#						α ?	
²⁶² Sg	108420# 280#		8 ms 3	0 ⁺	01	01Ho06 TD	SF=?; $\alpha < 22$	
²⁶² Bh	114470# 350#		290 ms 160		01	97Ho14 T	$\alpha = ?$; SF<20	*
²⁶² Bh ^m	114780# 350# 300 60 AD		14 ms 4		01	97Ho14 T	$\alpha = ?$; SF<10	*
* ²⁶² Rf ^m	I : assigned by 96La11 to K-isomeric state							**
* ²⁶² Bh	T : 3 events at 225, 255 and 278 ms yielding 175(+240–64), see 84Sc13							**
* ²⁶² Bh ^m	T : 11 events yielding 12.2(+5.5–2.8)							**
²⁶³ No	102980# 490#		20# m				α ?; SF ?	
²⁶³ Lr	103670# 360#		5# h				α ?	
²⁶³ Rf	104840# 180#		11 m 3	3/2 ⁺ #	99	93Gr.C TD	SF=?; $\alpha = 30$	*
²⁶³ Db	107110# 170#		29 s 9		99	92Kr01 D	SF=56 14; $\alpha = ?$; $\beta^+ = 6.9$ 16	*
²⁶³ Db ^p	107510# 260# 400# 200#							
²⁶³ Sg	110220# 120#		1.0 s 0.2	9/2 ⁺ #	99		$\alpha > 70$; SF ?	
²⁶³ Sg ^m	110320# 100# 100# 70# Nm *		120 ms	3/2 ⁺ #	99		$\alpha = ?$; IT ?	
²⁶³ Bh	114610# 370#		200# ms		99		α ?	
²⁶³ Hs	119750# 350#		1# ms	7/2 ⁺ #	99		$\alpha = 100$	
²⁶³ Hs ^p	120250# 360# 500# 100#			<i>am</i>			α ?; SF ?	
* ²⁶³ Rf	T : average 03Kr.1=24(+19–7) m 93Gr.C=500(+300–200) s 92Cz.A=600(+300–200) s							**
* ²⁶³ Db	D : SF from 92Kr01=57(+13–15); β^+ average 03Kr.1=3(+4–1) 93Gr.C=8(2)							**
* ²⁶³ Db	T : Possibly a candidate for the 54(+98–21) s SF decay observed by 98Ik02							**

Nuclide	Mass excess (keV)		Excitation energy(keV)		Half-life		J^π	Ens	Reference		Decay modes and intensities (%)		
^{264}No	104650#	640#			1#	m	0^+				α ?; SF ?		
^{264}Lr	106230#	440#			10#	h					α ?; SF ?		
^{264}Rf	106180#	450#			1#	h	0^+				α ?		
^{264}Db	109360#	230#			3#	m					α ?		
^{264}Sg	110780#	280#			400#	ms	0^+	99			α ?		
^{264}Bh	116070#	280#			1.3	s	0.5	99	02Ho11	T	$\alpha=?; \beta^+$?	*	
$^{264}\text{Bh}^p$	116370#	310#	300#	150#			am						
^{264}Hs	119600	40			540	μs	0^+	99	95Ho.B	T	$\alpha\approx 50$; SF ≈ 50	*	
T : mean lifetime of 6 events 1.5 s													
T : 95Ho.B (2 events 76 μs and 825 μs) 87Mu15 (1 event 80 μs). Average of													
T : the 3 events: 327(+448–120) μs , see 84Sc13													
^{265}Lr	107900#	710#			10#	h					α ?; SF ?		
^{265}Rf	108710#	420#			13	h	$3/2^+\#$	00	99Og.A	TD	α ?	*	
^{265}Db	110480#	280#			15#	m					α ?		
^{265}Sg	112820	60			8	s	$3/2^+\#$	99			$\alpha>50$; SF ?		
$^{265}\text{Sg}^p$	113120#	120#	300#	100#			$11/2^-\#$						
^{265}Bh	116570#	380#			500#	ms					α ?		
^{265}Hs	121170#	140#			2.1	ms	$9/2^+\#$	99			$\alpha\approx 100$; SF<1		
$^{265}\text{Hs}^m$	121480#	140#	300	70	AD	780	μs	150	$3/2^+\#$	99	$\alpha\approx 100$; IT ?		
^{265}Mt	126820#	460#			2#	ms					α ?		
T : one case only after a 1.3 h measurement													
^{266}Lr	111130#	660#			1#	h					α ?; SF ?		
^{266}Rf	109880#	540#			10#	h	0^+				α ?; SF ?		
^{266}Db	112740#	360#			20#	m					α ?; SF ?		
^{266}Sg	113700#	290#			21	s	6	0^+	01	98Tu01	T	$\alpha=34$ 9; SF=66 9	*
^{266}Bh	118250#	200#			5	s	3		01		$\alpha\approx 100$; β^+ ?; SF ?	*	
^{266}Hs	121190#	280#			2.7	ms	1.0	0^+	01	01Ho06	TD	$\alpha=?$; SF $\approx 1.4\#$	
^{266}Mt	127890#	350#			1.2	ms	0.4		01	84Og03	D	$\alpha=?$; SF<5.5	*
$^{266}\text{Mt}^m$	129120#	350#	1230	80	AD	6	ms	3	01	97Ho14	TD	$\alpha=100$	*
T : average 98Tu01=21(+20–12) 94La22=10–30 D : from 18%< α <50% 50%<SF<82%													
T : from T=1–10; estimated 1# s from systematics													
T : 10 events yielding 1.01(+0.47–0.24)													
T : 3 events at 7.8, 2.0 and 5.0 yield 3.4(+4.7–1.3)													
^{267}Rf	113200#	580#			5#	h					α ?; SF ?		
^{267}Db	113990#	470#			2#	h					α ?; SF ?		
^{267}Sg	115900#	270#			19	ms			99Og.B	T	$\alpha=100$		
^{267}Bh	118910#	260#			22	s	10		00Wi15	TD	$\alpha=100$		
^{267}Hs	122760#	100#			32	ms	15	$3/2^+\#$	00		$\alpha=100$		
$^{267}\text{Hs}^m$			non existent	EU	200	ms			95Ho.A	TDI	$\alpha=?$; IT ?	*	
^{267}Mt	127900#	540#			10#	ms					α ?		
^{267}Ea	134450#	370#			10	μs	8	$9/2^+\#$	00	95Gh04	T	$\alpha=100$	*
I : tentative only													
T : one single event, lifetime 4 μs , thus $T=2.8(+13.0-1.3)$, see 84Sc13													
^{268}Rf	115170#	710#			1#	h	0^+				α ?; SF ?		
^{268}Db	116850#	530#			6#	h					α ?; SF ?		
^{268}Sg	117000#	540#			30#	s	0^+				α ?; SF ?		
^{268}Bh	120870#	380#			25#	s					α ?; SF ?		
^{268}Hs	123110#	410#			2#	s	0^+				α ?		
^{268}Mt	129220#	320#			53	ms	21	$5^+\#, 6^+\#$	00	02Ho11	T	$\alpha=100$	*
$^{268}\text{Mt}^p$	129470#	330#	250#	100#							α ?; SF ?		
^{268}Ea	133940#	500#			100#	μs	0^+				α ?		
T : mean lifetime of 6 events 60 ms													

Nuclide	Mass excess (keV)	Excitation energy(keV)	Half-life	J^π	Ens	Reference	Decay modes and intensities (%)
²⁶⁹ Db	118730# 770#		3# h				α ?; SF ?
²⁶⁹ Sg	119930# 660#		35 s 23		00		$\alpha < 100$; SF ?
²⁶⁹ Bh	121740# 410#		25# s				α ?
²⁶⁹ Hs	124870# 120#		27 s 17		00	02Ho11 T	$\alpha = 100$ *
²⁶⁹ Mt	129530# 550#		200# ms				α ?
²⁶⁹ Ea	135180# 140#		230 μ s 110	3/2 ⁺ #	00	95Ho03 T	$\alpha = 100$
* ²⁶⁹ Hs	T : 2 events at 19.7 and 22.0 s yield 14(+26–6)						**
²⁷⁰ Db	121760# 720#		1# h				α ?; SF ?
²⁷⁰ Sg	121400# 620#		10# m	0 ⁺			α ?; SF ?
²⁷⁰ Bh	124460# 470#		30# s				α ?; SF ?
²⁷⁰ Hs	125430# 290#		30# s	0 ⁺		01Tu.B D	$\alpha = 100$
²⁷⁰ Mt	131020# 540#		2# s				α ?
²⁷⁰ Ea	134810# 290#		160 μ s 100	0 ⁺		01Ho06 TD	$\alpha \approx 100$; SF ≈ 0.2
²⁷⁰ Ea ^m	135940# 290#	1140 70	10 ms 6	(10) ^(-#)		01Ho06 ETJ	$\alpha = ?$; IT ?
²⁷¹ Sg	124330# 650#		2# h				α ?; SF ?
²⁷¹ Bh	125920# 560#		40# s				α ?; SF ?
²⁷¹ Hs	128230# 340#		40# s				α ?; SF ?
²⁷¹ Mt	131470# 570#		5# s				α ?
²⁷¹ Ea	136060# 110#		210 ms 170	11/2 ⁻ #	00		$\alpha = 100$
²⁷¹ Ea ^m	136090# 110#	29 29 AD *	1.3 ms 0.5	9/2 ⁺ #	00		$\alpha = 100$
²⁷² Sg	125900# 770#		1# h	0 ⁺			α ?; SF ?
²⁷² Bh	128580# 610#		2# m				α ?; SF ?
²⁷² Hs	129530# 580#		40# s	0 ⁺			α ?; SF ?
²⁷² Mt	133890# 480#		10# s				α ?; SF ?
²⁷² Ea	136290# 650#		1# s	0 ⁺			SF ?
²⁷² Eb	143090# 330#		2.0 ms 0.8	5 ⁺ #, 6 ⁺ #	00	02Ho11 T	$\alpha = 100$ *
* ²⁷² Eb	T : mean lifetime of 6 events 2.3 ms						**
²⁷³ Sg	128750# 660#		1# m				SF ?
²⁷³ Bh	130050# 830#		90# m				α ?; SF ?
²⁷³ Hs	132260# 830#	RN	50# s	3/2 ⁺ #	00	02Ni10 I	α ? *
²⁷³ Mt	134990# 510#		20# s				α ?; SF ?
²⁷³ Ea	138670# 130#		360 μ s 280	13/2 ⁻ #	00		$\alpha = 100$
²⁷³ Ea ^m	138870# 130#	198 20 EU	120 ms	3/2 ⁺ #	00		$\alpha = 100$
²⁷³ Ea ^p	138950# 130#	290 40 AD					α ?; SF ?
²⁷³ Eb	143150# 610#		5# ms				α ?
* ²⁷³ Hs	T : 99Ni03=1.2(+1.7–0.6) alpha decay retracted by authors in 02Ni10						**
²⁷⁴ Bh	132680# 780#		90# m				α ?; SF ?
²⁷⁴ Hs	133330# 650#		1# m	0 ⁺			α ?; SF ?
²⁷⁴ Mt	137390# 560#		20# s				α ?; SF ?
²⁷⁴ Ea	139250# 490#		2# s	0 ⁺			α ?; SF ?
²⁷⁴ Eb	145050# 620#		5# ms				α ?
²⁷⁵ Bh	134370# 650#		40# m				SF ?
²⁷⁵ Hs	135950# 710#		30# m				α ?; SF ?
²⁷⁵ Mt	138460# 590#		30# s				α ?; SF ?
²⁷⁵ Ea	141750# 450#		2# s				α ?; SF ?
²⁷⁵ Eb	145450# 690#		10# ms				α ?

Nuclide	Mass excess (keV)		Excitation energy(keV)		Half-life		J^π	Ens	Reference	Decay modes and intensities (%)		
²⁷⁶ Hs	137120#	820#			1#	h	0 ⁺				α ?; SF ?	
²⁷⁶ Mt	140800#	680#			40#	s					α ?; SF ?	
²⁷⁶ Ea	142550#	610#			5#	s	0 ⁺				α ?; SF ?	
²⁷⁶ Eb	147640#	630#			100#	ms					α ?; SF ?	
²⁷⁷ Hs	139580#	730#			40	m	30	3/2 ⁺ #	00	99Og10	TD	SF=100
²⁷⁷ Mt	141980#	880#			1#	m						α ?; SF ?
²⁷⁷ Ea	144980#	960#	RN		5#	s		11/2 ⁺ #	00	02Ni10	I	α ?
²⁷⁷ Eb	148590#	620#			1#	s						α ?; SF ?
²⁷⁷ Ec	152710#	130#			1.1	ms	0.7	3/2 ⁺ #	00	02Ho11	T	α =100
²⁷⁷ Hs	T : one single event 16.5 m yields 11(+55–5)											
²⁷⁷ Ea	T : 99Ni03=3.0(+4.7–1.5) alpha decay retracted by authors in 02Ni10											
²⁷⁷ Ec	T : two events at 0.280 ms and 1.406 ms											
²⁷⁸ Mt	144210#	840#			30#	m						α ?; SF ?
²⁷⁸ Ea	145750#	680#			10#	s		0 ⁺				α ?; SF ?
²⁷⁸ Eb	150530#	630#			1#	s						α ?; SF ?
²⁷⁸ Ec	153060#	530#			10#	ms		0 ⁺				α ?; SF ?
²⁷⁹ Mt	145490#	720#			6#	m						α ?; SF ?
²⁷⁹ Ea	147980#	740#			10#	s						α ?; SF ?
²⁷⁹ Eb	151340#	660#			3#	s						α ?; SF ?
²⁷⁹ Ec	155140#	490#			100#	ms						α ?; SF ?
²⁸⁰ Ea	148850#	850#			11	s	6	0 ⁺		01Og01	TD	SF=100
²⁸⁰ Eb	153210#	740#			10#	s						α ?; SF ?
²⁸⁰ Ec	155600#	640#			1#	s		0 ⁺				α ?; SF ?
²⁸⁰ Ea	T : 3 events at 6.93, 14.3 and 7.4 yield 6.6(+9–2.4)											
²⁸¹ Ea	150960#	730#			4	m	3	3/2 ⁺ #	00	99Og10	TD	α =100
²⁸¹ Eb	154040#	930#			1#	m						α ?; SF ?
²⁸¹ Ec	157690#	990#	RN		10#	s		3/2 ⁺ #	00	02Ni10	I	α ?
²⁸¹ Ea	T : one single event 1.6 m yields 1.1(+5.3–0.5), see 84Sc13											
²⁸¹ Ec	T : 99Ni03=0.89(+1.30–0.45) alpha decay retracted by authors in 02Ni10											
²⁸² Eb	156010#	890#			4#	m						α ?; SF ?
²⁸² Ec	158140#	710#			30#	s		0 ⁺				α ?; SF ?
²⁸³ Eb	156880#	780#			10#	m						α ?; SF ?
²⁸³ Ec	160020#	770#			4.2	m	2.1			99Og05	TD	SF=100
²⁸³ Ed	164360#	730#			10#	s						α ?; SF ?
²⁸³ Ec	T : 4 events at 99Og07=9.3 m, 3.8 m, 99Og05=3.0 m and 0.9 m yield 3(+3–1) m											
²⁸⁴ Ec	160570#	850#			31	s	18	0 ⁺		01Og01	TD	α =100
²⁸⁴ Ed	165880#	800#			1#	m						α ?; SF ?
²⁸⁵ Ec	162180#	730#			40	m	30	5/2 ⁺ #	00	99Og10	TD	α =100
²⁸⁵ Ed	166490#	980#			2#	m						α ?; SF ?
²⁸⁵ Ee	171110#	1030#	RN		5#	s		3/2 ⁺ #	00	02Ni10	I	α ?
²⁸⁵ Ec	T : one single event 15.4 s yields 11(+51–5), see 84Sc13											
²⁸⁵ Ee	T : 99Ni03=580(+870–290) alpha decay retracted by authors in 02Ni10											

[illegible]