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### **CALCULATION OF THE STOPPING POWER RATIO WATER-TO-AIR FOR REFERENCE DOSIMETRY IN HADRON THERAPY**

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#### *Dosimetry – Reference quality*

Accuracy in the Stopping power of liquid water and air is of fundamental interest in reference dosimetry for Hadrontherapy. In particle therapy, ionization chamber dosimetry requires the knowledge of the water-to-air stopping power ratio (SPRT). According to the International Atomic Energy Agency Technical Report TRS-398, the SPRT for swift proton beams can be calculated using a semi-empirical law as a particle range function. However, due to the complexity of the particle-energy spectrum for heavier ions, the protocol recommends taking a constant value of 1.13 with an estimated uncertainty of 2%. In more recent publications, a parametrization of the water-to-air stopping power ratio is proposed, but it depends strongly on the ionization potentials of water and air used. Other authors propose an approach based on indirect experimental measurements. In the present work, Stopping power of proton, helium, carbon and oxygen ions in liquid water and air are calculated using a distorted-wave model to approximate the ionization cross sections required. Taking into account only the primary particle spectrum (at the entrance channel), the SPRT can be approximated as the ratio of the stopping powers of water and air. The ratios of theoretical Stopping powers as a function of the incident energy and charge are compared with the obtained using the values recommended by ICRU Reports 49 (for proton and helium) and 73 (for carbon and oxygen ions). The dependence of the SPRT with the charge and energy of the incident ions is analyzed. Results are compared with the proposed by TRS-398 and the calculated by the semi-empirical approaches.