AbstractID: 9355 Title: Detour factors for low-energy electrons in water

Purpose: The aim of this study is to calculate the average penetration depth, $z_{av,}$ and detour factors of 10-10 000 eV electrons in water using an in-house Monte Carlo track structure code. These low electrons are known to be the most toxic in sense of radiation damage and the calculation of their true depth of penetration and energy depositions is required in areas such as radiation therapy, to be able to calculate the correlation between ion tracks and the potential cell damage. **Material and methods:** The CSDA-range largely overestimates the range of electrons of energies between 10-10000 eV because of the high amount of elastic scattering. Up to 50% of the interactions can be elastic for energies below 100 eV. This phenomena will shorten the longitudinal distribution, average penetration depth z_{av}, but elongate the transverse distribution $<x^2+y^2>_{av}$. Several definition of the detour factor can be found in the literature. In this work is the detour factor defined as in ICRU (1993): $d = z_{av}/r_o$, were r_o is the CSDA-range. The z_{av} is computed according to: $z_{av} = \frac{1}{N}\sum z_{abs}$, were N is the number of histories and z_{abs} is the depth of absorption of every primary electron. r_o is calculated by integrating the stopping power, which is extracted from the MC track structure code. **Results:** The calculated z_{av} is shorter for low energies compared to Wilson *et al*(2004) and slightly higher for energies around 10 keV. z_{av} is substantially shorter than the calculated CSDA-range for energies below 1 keV, which results in a small Detour factor. The sigmoid shape of the Detour curve decompose at very low energies around 10 eV due to a drastically reduction of the ionization cross section and a still increasing elastic cross section. **Conclusions:** The results show that the CSDA-range should be used with caution at these low energies.