MONTE CARLO SIMULATIONS FOR CT DATA ANALYSIS AND ITS APPLICATION IN PET IMAGING AND RADIOTHERAPY PLANNING

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Abstract – In this work we study the relationship between Hounsfield Units obtained from a CT image and tissue electronic densities, PET attenuation coefficients and Line Energy Transfers (LET) for electrons with energies up to 1 MeV. For this purpose, simulations with PENELOPE of the attenuation of x-rays emitted from a CT scanner have been performed, as well as for the calculation of the attenuation of 511 KeV photons and LET for electrons. To measure the relationship between these magnitudes we compare the results obtained with our simulations with the ones obtained following the Hybrid method proposed by Kinahan. The assessment of tissue properties according to their Hounsfield Units obtained within this Hybrid method is good (discrepancies with the actual values given by the PENELOPE simulations are below 10 %) for the majority of tissues studied, with the noticeable exception of adipose tissue and compact bone.