AbstractID: 1348 Title: Total Skin Electron Therapy treatment optimization: Selection of an optimal scatterer using Monte Carlo simulation of single large scattered electron fields at extended distances

Development of a Total Skin Electron Therapy (TSET) procedure and acquiring all of the necessary parameters by measurement is difficult, tedious and time consuming. To produce large fields for TSET, an external scatterer is usually attached to treatment head. Selection of scatterer's properties would be influenced by the requirements of angular spread, minimum energy loss and bremsstrahlung contamination. The goal of this research was to select properties of an optimal scatterer (z and thickness) in order to achieve an optimum single large electron field at extended SSD, as a first step in development of a TSET optimization process. A 6 MeV electron beam from a Philips SL-20 unit, scattered by a control copper scatterer, was simulated using EGS4 code (12 hours CPU time for transport of particles from scatterer into a cylindrical phantom, r=50 cm, at 300 SSD for 10^5 initial electrons). For optimization process, a group of 10 materials were selected as candidate materials, using the radiation length concept. Comparison of field characteristics calculated for candidate materials and control scatterer resulted in selection of a 0.059 mm lead foil as the optimal scatterer: a uniformity index of 93%, a $d_{80\%}$ of 1.8-2.1 cm and a 30% increase in output compared to control scatterer . The simulations showed that in large scattered electron fields, energy loss and dose rate are controlled by scatterer's atomic number and thickness respectively. For the same energy loss, however, field uniformity and bremsstrahlung contamination are not influenced noticeably by the properties of the scatterer.