

AbstractID: 7103 Title: Verification of Bremsstrahlung Splitting in Geant4 for Radiotherapy Quality Beams

Purpose:

To evaluate the impact of applying the uniform bremsstrahlung splitting with charged secondary Russian Roulette variance reduction technique, on a Geant4 based thick target bremsstrahlung benchmark Monte Carlo simulation.

Method and Materials:

Thick target bremsstrahlung benchmark simulation runs were carried out using the Geant4 Simulation Toolkit (version 8.2). The primary electrons were generated at energies between 10-30MeV, with target materials of lead, aluminium and beryllium. To speed up the simulation, uniform bremsstrahlung with charged secondary Russian Roulette was applied. Various studies were carried out in order to get an idea of the Monte Carlo efficiency improvement with various bremsstrahlung splitting and Russian Roulette configurations. Verification studies were also carried out to check for unexpected bias introduced in various spectra.

Results:

Initial results indicate the photon fluence and energy distribution from thick targets of various materials are properly calculated when using a bremsstrahlung splitting factor of 100. The simulation is sped up by a factor of around 10.

Conclusion:

Reasonable speedup can be achieved through the use of uniform bremsstrahlung splitting with charged secondary Russian Roulette in Geant4. Further work is underway to evaluate the speedup compared with other codes, as well as continued verification studies. The results of this work will be reported at the meeting.