VALIDATION OF GEANT4 FRAGMENTATION FOR HEAVY ION THERAPY

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^{12}C ion therapy has had growing interest in recent years for its excellent dose conformity. However at therapeutic energies which go as high as 400MeV/u results in the production of secondary fragments which for 400MeV/u contributes to 70% of the deposited energy at the Bragg Peak. The impact of these fragments cannot be overlooked, which result in secondary dose being delivered outside of the planned target and increasing the risk of secondary cancer for the patient as well as altering the relative biological effectiveness. It is therefore vital to accurately know the extent of secondary fragment production. This works investigates the accuracy of three different nuclear fragmentation models available in the Monte Carlo Toolkit Geant4, the Binary Intranuclear Cascade (BIC), the Quantum Molecular Dynamics (QMD) and the Liege Intranuclear Cascade (INCL). The models were benchmarked against experimental data for a pristine 400MeV/u ^{12}C beam incident upon a water phantom, which provides data for fragment yields per depth, angular distribution of fragments and the energy distributions of fragments. Regression test was performed with the Geant4 versions 10.0, 10.1 and the most recent release 10.2.