AbstractID: 4461 Title: Monte Carlo dose calculations in homogeneous and heterogeneous media: A comparison between the PMCEPT code and the MCNP5, EGS4, DPM codes and measurements

Monte Carlo dose calculations in homogeneous and heterogeneous media: A comparison between the PMCEPT code and the MCNP5, EGS4, DPM codes and measurements

Oyeon Kum
Combinatorial and Computational Mathematics Center
Pohang University of Science and Technology

The Monte Carlo method for high-energy photon and charged particle transport is the most accurate means for predicting dose distributions in radiation treatment of patients. Owing to rapid development of computer hardware and network technologies the use of this method is not restricted only to big research centers any more. A new parallel Monte Carlo electron and photon transport (PMCEPT) code [Kum and Lee, J. Kor. Phys. Soc. **47** (2005) 716] for calculating electron and photon beam doses has been developed based on a three dimensional geometry defined by computerized tomography (CT) images and implemented on the Beowulf PC cluster. The PMCEPT code was validated on the homogeneous and multi-layered targets for megavoltage electron beams by comparing with the results of experiments and calculations from conventional Monte Carlo codes of the MCNP5, EGS4, and DPM. The computing time of the PMCEPT code was approximately twenty times faster than that of MCNP5 on the IBM ThinkPad X40 (laptop) with 1.2-GHz CPU and 512-MB ram memory operated by RedHat Linux 9. The PMCEPT results in general agreed well with others in homogeneous and heterogeneous media within a maximum of 2--3 % error. At the conference, we will show various benchmark results for the PMCEPT. This work was supported, in part, by the SRC/ERC program of MOST/KOSEF (grant number: R11-1999-054).