DEVELOPMENT OF THE USER CODE, UCBEAM AND COMPARISON OF THE MEASURED DOSES USING A TORSO PHANTOM WITH THE CALCULATED DOSES USING OTOKO PHANTOM

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The opportunity of partial irradiation is increasing with diversification of radiation application, for example, utilization of high intensity synchrotron radiation, radio isotope diagnosis and radiotherapy. Although Monte Carlo method can include complex geometries and source conditions, it requires amount of effort and time to prepare input data. A user code of EGS4, UCBEAM is developed to facilitate input data preparation.

The calculation system is constructed with user code, calculation code, numerical phantom, and postprocessor. EGS4 and Otoko phantom are employed as calculation code and numerical phantom respectively in this work. The user code, UCBEAM has been developed to connect EGS4 and Otoko phantom and run the calculation. The postprocessor receives the result from user code and outputs the absorption dose profiles in arbitrary cross-sections, absorption dose of each organs and effective dose. This system is possible to simulate photon and electron rectangle or circular section beam, uniform AP(Anterior to Posterior), PA, LL(Left Lateral), RL(Right Lateral), HF(Head to Foot), FH, or ISO(ISOtropic) irradiations. In the cases of whole body uniform irradiations, the conversion coefficients calculated by this system has shown good agreement with the other works.

To compare the measured doses using a torso phantom with the calculated doses using otoko phantom under the local irradiation condition, the experiment was done. The torso phantom employed in the experiment consists of polyurethane resin and has slits for dosimeters. The phantom was irradiated on its breastbone with a monoenergic horizontal anterior photon beam and the doses were measured with TLDs in the cases where the beam energies are 40 keV and 80 keV.

The measured and calculated organ doses agreed within factor of two for most organs except organs which have few measuring points in experiment, for example, oesophagus and bone marrow. The absorbed dose of each TLDs and that of the corresponding spot in otoko phantom also agreed with factor two. It is considered that this factor derives from the difference of individual that the phantoms are modeled after. The construction of a numerical phantom based on the CT images of the torso phantom used in this experiment is planned. The differences caused by the individuality will be analyzed quantitatively in the future work.