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The Numerical Simulation of Cultural Heritage Radiation Treatment by Monte Carlo Method

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Radiation processing techniques are in wide use in for disinfection and consolidation of archived materials and cultural heritage artefacts. The maximum dose (Dmax), which can be absorbed by product without changing its properties, is known from research phase. So, minimal absorbed dose (Dmin) should be transferred to product to achieve disinfection and this dose shouldn't be more than maximum dose. The location and magnitude of the dose minimum and maximum is critical to process control, optimized irradiation configurations and it affects both disinfection and product properties. Reliable product dose-maps are necessary for identification of these critical process parameters and may involve time consuming and laborious dosimetry. In some cases determination of the dose-maps is difficult to produce by experiment. Such cases are very often occur during cultural heritage artefacts radiation treatment. In such situations the numerical simulation can be used.

After consideration of all possible software toolkits for passage of ionization radiation through the matter GEANT4 was chosen.

The CADMesh library was implemented in developed code to input complicated geometry.

The radiation sources (plaque and cylindrical) were inputed into the code. Their activities, loading date into operation can be loaded from .csv file.

The comparison between measuraments and simulated results were made.

The simulated results have shown a good agreement with measured ones.

Country/Organization invited to participate

Ukraine

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