A New Simplified and Ultra-Fast Dose Simulation Software Tool

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Staff at Pacific Northwest National Laboratory (PNNL), at the request of the Office of Radiological Security (ORS) within the U.S. National Nuclear Security Administration (NNSA), identified impediments for those companies desiring to transition from cobalt-60 to an accelerator technology for processing product. One of those impediments identified was a dose simulation software tool that was much more simplified and faster than existing commercial software and could be run on a regular laptop. PNNL's answer to this tool gap was to develop PUFFIn, which stands for Penelope User Friendly Fast Interface. PUFFIn utilizes the PENELOPE code, which is more amenable to photons and electrons. PUFFIn was developed primarily as an educational tool, and healthcare product manufacturers and the associated sterilizer facilities are expected to be examples of the main benefactors. PUFFIn allows nonexperts to quickly and easily learn the basics in dose distribution in static materials or products, obtain 2D and 3D dose visualizations that include the minimum and maximum dose locations (i.e., dose uniformity ratio, DUR), and the differences in these parameters between gamma-rays, electron beam and X-ray.

The PUFFIN software package was initially released to the sterilization community in April of 2023. Training workshops and validation measurements were performed at Texas A&M University in the USA and at the Aerial CRT facility in France. This presentation will review the progress made in 2023 and the upgrades that were made to the PUFFIn code for the 2024 release of the software, including the ability to import complex 3D data sets from both CAD and X-Ray Tomography, the expansion of the number of materials supported, and the ability to run on multiple processors.