

AbstractID: 2991 Title: Air Bubble-free Motorized PET-CT QA phantom with Shielding Well

Purpose: Performance phantom for PET-CT scanner (Philips Gemini scanner, UK) with special features such as air bubble-free, motorized shaking mechanism, and >95% shielding well is designed to evaluate imaging performance of the scanner.

Method and Materials: The phantom consists of three parts: (1) a phantom, (2) a motor, (3) a carrier device with 4cm thick Lipowitz shielding well. The phantom is implemented in a 16cm-diameter * 25cm-length water phantom with acrylic housing. Various internal structures include (a) many discs for linearity, resolution, (b) cones for axial coordinates, and (c) a long disc holder for fixing each disc and for shaking. Each disk has two small wings in the disc edges, thus effectively perturbing water while it is rotating. Proper discs can be chosen and inserted in the disc holder. The holder is inserted onto the housing and extended out of the phantom, and connected to a motor via a plastic belt, thus making possible rotating the internal structures. Also, the phantom has a conical top in the internal cylinder housing, so air bubbles produced during rotation are pushed toward an air pocket and trapped there. The radioactive material is injected through the air pocket, and plugged. The phantom is placed in the radiation shielding well while it is prepared.

Results: The shaking mechanism of the PET-CT scanner is evaluated with different shaking speeds and different amounts of radioisotopes (0.1 to 10mCi ¹⁸F). The air bubbles are eliminated 100% during shaking mechanism, and does not introduce any artifacts in even CT images. Total preparation time with this phantom is about 10 minute. The shielding well attenuates radiation exposure by 95%. Detailed measured data will be presented.

Conclusion: The phantom was very handy and effective to measure simple imaging QA in 10 minute preparation time with minimum radiation exposure.