

CT-scanning and virtual simulation, using a dedicated CT simulator is becoming more common for treatment planning of complex anatomical sites. The radiographic simulator film is then replaced by Digitally Reconstructed Radiographs (DRR) providing the reference image needed for implementation of the patient set-up on the treatment machine. This image must be geometrically accurate and have sufficient image content for unambiguous comparison to the portal image. We have designed a DRR phantom to study the accuracy and linearity of the image reconstruction and to measure the low and high contrast and resolution of the image. One objective is to use the phantom to determine the optimal reconstruction and CT acquisition parameters needed to achieve a high quality reference DRR image. The phantom consists of a Plexiglas tank and replaceable accessories needed to determine the projection accuracy and linearity, image resolution and contrast. The phantom contains three different tissue densities (lung, muscle and bone) for the purpose of optimizing the density enhancement features of the reconstruction algorithm. The lateral walls and the base plate of the tank are marked with lines that are used for alignment of the phantom in the laser coordinate system, defining the image reference plane. With proper alignment of the phantom in the image reference plane, all the accessories are aligned to determine the geometric accuracy of the DRR reconstruction. CT acquisition parameters are optimized for different anatomical sites, with respect to resolution and high and low density contrast.

This work was partially supported by the ARC association.