

An MRI Compatible Externally and Internally Deformable Lung Motion Phantom for Multi-Modality IGRT

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MRI has become an attractive tool for tumor motion management. However, current MR-compatible phantoms are only capable of reproducing translational motion. This study describes the construction, and validation of a more realistic, MRI-compatible multi-modality lung phantom that is deformable internally as well as externally. We present a radiotherapy application of our phantom by quantifying the geometric errors associated from the use of single cycle 4DCT for target position estimation. Subsequently, we proceed to investigate the potential gain that can be achieved from the use of MRI based motion monitoring for a better characterization of respiration induced tumor motion. To overcome the noted limitations, we present a strategy to build a lung motion model that uses additional surrogate data to generate a 4DCT over multiple cycles, thereby accounting for breathing irregularities.

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