

AbstractID: 1702 Title: RADIATION THERAPY TREATMENT PLANNING WITH MR IMAGES: Critical Caveats on Distortion the Physicist Must Know

Magnetic resonance (MR) imaging is used extensively for diagnostic applications because of its superior soft tissue contrast and ability to derive functional information including perfusion, diffusion, and spectroscopy. Consequently, there is much interest in incorporating MR imaging into radiation treatment planning (RTP) to improve tumor delineation when compared to more conventional imaging modalities such as x-ray computed tomography (CT) or ultrasound. However, MR images are prone to geometric distortions, making their spatial fidelity potentially unreliable. Scanner-dependent, environment-related, and patient-induced distortions can introduce spatial inaccuracies of millimeters up to centimeters. It is essential for the therapy physicist to understand these distortions, in order to be an informed resource for the proper use of MR imaging in RTP, especially with the growing interest in MR simulators. Details on how the distortions arise, examples of how they manifest themselves in the images, methods for minimizing each type of distortion, and values quantifying distortions associated with typical clinical pulse sequences and scanning parameters will be reviewed. The trade-offs between image resolution, signal-to-noise ratio, magnitude of distortions and scan time will be explored. Implications for RTP will be discussed in detail and a MR QA program for stereotactic radiosurgery using MR-only treatment planning will be described.