

**Purpose:** To develop a comprehensive protocol for the acceptance testing and clinical commissioning a wide bore (70cm) MRI-Simulator for radiotherapy localization and planning.

**Methods:** A GE 1.5T Optima 450W MR scanner was installed in our department in 2010. Standards derived from the ACR MRI Accreditation Program were used as reference for acceptance testing and commissioning. Commercially available phantoms were used to characterize magnetic field homogeneity, image intensity uniformity, high contrast spatial resolution, slice thickness, position accuracy and geometric accuracy. For 2D SE, GRE and 3D CUBE imaging sequences, in plane and through plane distortion and distortion correction accuracy with and without the GradWarp distortion algorithm provided the software was assessed. The test was performed using multi ROI at different locations off center with multiple slices using the Magphan® phantom. Couch position, couch load and laser system accuracy were also assessed.

Daily QA procedures were developed for SNR, RF, isocenter position and the gradient linearity. Parameters derived from commissioning were utilized as baseline reference values for a comprehensive QA program.

**Results:** For clinical commissioning, the MR scanner met the criteria established by the ACR MRI Accreditation Program. The results from ACR phantom showed that image quality specifications were met. The highest spatial frequencies were 9 lp/cm; visualized. The results from the monthly QA demonstrate that variations are within 1% of the commissioning data illustrating good self consistency as regards MRI simulator performance. In-plane distortion measurements show that the distortion correction algorithm reduced the error to within acceptable (< 1mm at 30mm sup/inf to isocentre and within 2 mm at 120 mm off center).

**Conclusions:** Analysis of the test results indicates consistent and reproducible operation of the wide bore MRI-SIM unit. A comprehensive commissioning and QA protocol has been developed for use in the radiation oncology setting.