AbstractID: 5485 Title: X-Ray Tube Induction Motor Performance in a 1.5 T MRI Fringe Field

Purpose: To assess the performance of the induction motor of a rotating-anode x-ray tube in the magnetic fringe field of a clinical MRI scanner. The x-ray tube must be placed in the fringe field near the entrance of an MRI scanner so that a hybrid x-ray/MRI system for use in percutaneous aortic valve replacement in aortic stenosis patients can be constructed.

Method and Materials: A standard rotating-anode x-ray tube insert was placed into the fringe field of a 1.5 T unshielded research MRI scanner. The induction motor in the x-ray tube was aligned so that the magnetic field lines were in the plane of its stator core. The induction motor of the x-ray tube was placed in magnetic fields ranging from 0 to 500 G. The magnetic fields were measured with a Model 4048 Gauss meter. The rotation speed of the anode was measured using a strobe light. The power consumed by the motor during operation in the fringe field was measured separately using a PLM-1 power meter. The fringe fields of an actively shielded clinical 1.5 T scanner were measured with the Gauss meter and compared to the fields applied to the motor.

Results: The anode rotation speed dropped from 3437 +/- 6.8 rpm to 2744 +/- 5.3 rpm when the magnetic fringe field was increased from 0 to 400 G. The average power consumed by the motor increased from 70.5 +/- 0.4 W to 78.2 +/- 0.1 W when the fringe field was increased from 0 to 500 G.

Conclusion: This work indicates the feasibility of safely operating an x-ray tube induction motor in the fringe field of an MRI scanner. Power consumption did not significantly increase and anode rotation speed did not fall below 3000 rpm until a fringe field exceeding 300 G was applied.