AbstractID: 10725 Title: Radiation induced effects in an 8.5 MHz magnetic resonance imaging coil

Purpose: Few research groups are involved in integrating magnetic resonance imaging (MRI) with a linear accelerator in order to obtain real-time MRI images during the treatment beam-on. Therefore, the radio frequency (RF) coils used in MRI will be irradiated during this real-time image guided radiotherapy. The radiation effects on RF coils include instantaneous induced currents and long term radiation damage to components. These effects are potential obstacles facing linac-MRI integration. This work measures and characterizes the instantaneous effect of pulsed radiation on MRI coils. **Method and Materials:** A CAT Solenoid coil was placed inside an RF cage, to remove RF noise, and connected to a current amplifier. The amplifier output was sent through RF filters to the RF cage exterior and then to an oscilloscope. The cage was placed in the pulsed beam of a linac and the current induced by pulsed radiation was measured by the oscilloscope; the waveforms were then transferred to a PC and power spectral density was calculated. **Results:** The RF cage was very effective in eliminating the extraneous RF noise from the radiation induced signal. The induced signal is only present when the radiation beam is on and incident upon the coil. The power spectrum of the induced current indicates that most of the power is contained below 1 MHz, but there is signal is present at the coil resonance frequency (8.5 MHz)**.** The induced current a) occurs mainly in the copper winding, b) is reduced if buildup material is placed on the coil and c) increases linearly with the dose rate. **Conclusion:** Radiation induced current is present in MRI coils, but its impact on imaging is yet to be determined. This, along with magnetic field impact on induced current will be examined using the functioning 0.2 Tesla linac-MR prototype.