AbstractID: 10775 Title: Radio frequency noise from clinical linear accelerators

Purpose: Several groups are actively pursuing the integration of an MRI with a megavoltage teletherapy treatment unit. Our system will use a 0.2 Tesla magnet for imaging and a 6MV linear accelerator (linac) for treatment. An important scientific aspect of this project is the possible radio frequency (RF) noise interference between the MRI and linac. The purpose of this work is to report on the measurement of the RF emissions in the treatment room of a clinical linac.

Method and Materials: The electric (*E*) and magnetic (*H*) field components of the RF noise from a clinical linac were measured using commercially available field probes. Measurements were taken on a Varian 600C linac. The time response of the signal induced in the probes was captured by an appropriate oscilloscope. The discrete Fourier transforms of these time domain measurements were calculated to obtain the measured power as a function of frequency. A second set of measurements were taken to study the dependence of field strength on the location within the vault.

Results: Our measurements indicate that the *E* field strength is on the order of V/m, around 8.5 MHz, and that most of the signal in the *H* field in concentrated at frequencies below 5 MHz. Besides a few peaks, in general toward higher frequencies both the *E* and *H* field strengths drop. We measured a power density of 14.6 $\mu W/m^2$ at 8.5 MHz for a Varian 600C linac. Our measurements show that the measured field strength has little dependency on the measurement position within a treatment vault.

Conclusion: Since an MRI coil receives power on the order of μWs during imaging, it will be important to properly shield or otherwise reduce this extraneous RF power in the linac-MR unit.