

AbstractID: 12891 Title: Dosimetric verification of HDR treatment planning system dose calculations by Farmer chamber measurements in water

**Purpose:** To evaluate the applicability of Farmer ion chambers for absolute dosimetry of high dose rate (HDR) brachytherapy sources in water and the potential to use this methodology for brachytherapy treatment planning system (TPS) dose calculation validation. **Method and Materials:** Water tank absolute dosimetric measurements of  $^{192}\text{Ir}$  doses were performed with a Farmer ionization chamber. Autoradiography was used for determination of absolute source position and subsequent alignment of the source with the chamber. A small solid water phantom was used for brachy catheter support. The phantom was immersed in a water tank equipped with a chamber holding mechanism capable of 1D motion. The chamber and the electrometer used for absolute dose measurements had ADCL traceable calibration factors for external beam reference dosimetry (calibrated in water with  $^{60}\text{Co}$  beam). Doses were measured from 2 cm to 11 cm away from a single dwell position. Measurements were compared to doses calculated by Oncentra HDR TPS as well as simple hand calculations, utilizing point source geometry, inverse square dose falloff and published data for radial dose falloff due to attenuation. **Results:** The measured and the TPS doses agreed within 3% up to 8 cm from the source, within 4% from 8 cm to 10 cm, and within 6% at 11 cm. The hand calculations, performed as a simple consistency check, agreed with the TPS within 1% across the entire tested range. **Conclusions:** The presented results indicate that Farmer chambers are suitable for absolute dosimetry of  $^{192}\text{Ir}$  sources over the useful HDR therapeutic range (2 cm to 10 cm). Absolute measurements in water performed with Farmer chambers can be easily employed for commercial TPS dosimetric commissioning as well as for routine dosimetric checks of the HDR delivery systems.