Purpose: Absolute dosimetry with the associated uncertainties for 192Ir High Dose Rate (HDR) Brachytherapy Tandem applicator are presented using A16 microchamber and Monte Carlo simulation. The results are compared to the TG-43 protocol.

Methods: An A16 Exradin MicroChamber, MCNPX 2.6 Monte Carlo simulation code and PTW farmer chamber with an ADCL calibration coefficient were used in this work. The A16 microchamber was calibrated using MCNPX simulation and PTW farmer chamber. Statistical and systematic uncertainty analyses associated with each experimental technique were analyzed quantitatively using MCNPX 2.6 to evaluate source positional error, Tandem positional error, phantom size effect, volume averaging, stem and wall effects, and Tandem effect.

Results: A16 microchamber was calibrated according to the AAPM TG-21 protocol and resulted in a value of 3.21E+09 Gy/C for Ngas. Absolute dose and uncertainty analyses along the transverse axis of a Tandem applicator were calculated using MCNPX and A16 microchamber. The results were compared to the TPS. The generated overall uncertainties associated with the A16 microchamber are 22%, 17%, 15%, 15%, 16%, 17%, and 19% at 1cm, 2cm, 3cm, 4cm, and 5cm, respectively.

Conclusions: In this work, the author investigated the absolute dosimetry for 192Ir HDR brachytherapy for a Tandem applicator using A16 microchamber and compared the results to the TPS. Furthermore, the author also investigated and analyzed the systematic and statistical uncertainties associated with experimental dosimetry as recommended by AAPM TG-138 and GEC-ESTRO. Based on this work, dosimetry of HDR brachytherapy using A16 ionization microchamber can be used, within uncertainties, as an alternative or redundant for the LiF TLDs.