

Design Of An Attenuating Source Holder For HDR ^{192}Ir Brachytherapy Calibrations.

A new re-entrant chamber (SS)¹ with excellent spatial characteristic (4.2cm long plateau of 0.1% dose variation) and sensitivity has recently become available for HDR and LDR brachytherapy source calibrations. The improved sensitivity of the chamber presents a problem for several commonly used electrometers whose narrow dynamic range (<199nA) prevents their use in the calibration of 10Ci ^{192}Ir source. These electrometers require that the SS chamber response (255nA/10Ci) be reduced by at least 25%. We resolved this dilemma by designing an attenuating source holder using appropriate HVL and mass attenuation coefficient computations. Brass was chosen as the attenuator material due to its high density and ease of machining. We calculated 5mm thick brass to be sufficient to attenuate the ion-current signal. The length of the attenuator was calculated to be 3.5cm based on the HDR source size, length of the active chamber volume, the distances of chamber wall and the attenuator surface from the center of the source. These calculations were verified with in-air transmission measurements using a farmer ion chamber in “good geometry”. In the final design, brass cylinder is soldered to the hollow brass tube. Axial response of the chamber is measured by the precise movement of the source attenuator in steps of 0.25cm, with the source programmed in the center of the attenuator each time. Measurements were repeated and the results were found to be within 0.1%.

(1)Sweet-Spot” (SS) chamber, Model#34-070-5, Nuclear Associates, Carle Place, NY