

AbstractID: 8627 Title: The air-kerma strength standard for ¹⁹²Ir HDR sources at the University of Wisconsin ADCL

Purpose: To present a compilation of a seven-year study of measurements using several HDR afterloaders and to provide a comprehensive analysis of the various published methodologies for interpolating between NIST standards to determine the air-kerma calibration coefficient for ¹⁹²Ir. Ultimately an update of the current interim standard will be considered. **Materials and Methods:** An acrylic apparatus for performing the seven-distance measurement technique equipped with laser alignment was used to acquire all datasets. Measurements were performed with an Exradin A3 spherical ion chamber that had been calibrated at NIST for beam qualities of M250 as well as ¹³⁷Cs. A total of four different afterloaders were measured during multiple trials and a comparison of the results was made to assess any trends in measurements due to source geometry. Recently published interpolation methods were compared to the method used in the original establishment of the interim standard in 1991 with proper accounting of the revisions in the NIST air-kerma standards in 2003. Three different methods for solving the non-linear system of equations were compared to assess stability and minimize uncertainty. **Results:** Depending on the interpolation method, deviations of -1.12% to -0.37% from the long-standing air-kerma calibration factor were observed. In comparing the measurements from the last seven years, (2000-2007), to the well chamber transfer standards, (1991), certain trends between various source models were identified, but the overall effect was found to be in the range of -0.95% to 0.18%. **Conclusion:** Based on the data recorded it is reasonable to assume, given the uncertainty in the method, that a single calibration factor would indeed be appropriate for all source models. The possibility of a formal update to the standard will be considered.