

Medical Physics Seminar

Monday, September 28, 2015

1345 HSLC ~ 4:00 P.M.

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EGSnrc investigation of the NE2575 ionization chamber anomaly, and ideal chamber shapes

In 1993, upon acquiring a Cs-137 irradiator, physicists at the National Research Council of Canada (NRC) noticed that measurements with the large volume 600cc ionization chamber model NE2575 showed an unexpected deviation from the inverse square law, with a discrepancy of up to 4% at 8 meters from the source. Although this anomaly was confirmed experimentally and was well documented, a definitive explanation remained elusive. Twenty years later, we revisit this problem using EGSnrc Monte Carlo simulations to discern the contribution of each chamber component to the anomaly. We show that the observed deviation arises mostly from long photon attenuation paths inside the chamber cylindrical side wall. We propose an empirical correction to address the issue in practice, but also uncover an optimal chamber angle where the inverse square law behavior is recovered. This leads us to broaden our perspective and ask: what is the ideal detector shape which minimizes deviations from the inverse square law?



1345 HEALTH SCIENCES LEARNING CENTER

4:00—5:00 P.M.

