

AbstractID: 8846 Title: Estimation of Errors in IMRT Dosimetry

The dose delivered by IMRT can be computed/measured by a variety of methods (IMRT Treatment Planning System – IMRT TPS, independent MU verification calculator – MUVC, ion chamber, TLD, etc.). All these quantities are estimates of the dose actually delivered (“truth”). Although the “truth” is not directly accessible, we want to quantify the errors associated with computation/measurement of delivered dose. In the statistical theory of imaging, a technique for estimating errors associated with a given method in the absence of a “golden standard”, has been developed¹. We used this technique, in conjunction with a statistical model of errors in IMRT dosimetry, to estimate the uncertainty in isocenter dose determined by a commercial IMRT-TPS, an independent MUVC and ion chamber measurements. We used the dose estimation triplets (produced with IMRT-TPS, independent MUVC, and ion chamber measurements) for a set of 38 distinct IMRT treatment plans. Using this technique, the standard error of the isocenter dose was 0.9% for the IMRT-TPS, 2.2% for the independent MUVC, and 2.2% for ion chamber measurements. These results can be used to estimate the “true” dose delivered when multiple estimates are available. Implications for clinical decision making will be discussed.

¹Hopin et al, IEEE Transact. Med. Imag., vol. 21(5), 441-449.