An iterative EPID calibration procedure for dosimetric verification that considers the EPID scattering factor

There has been an increasing interest in the application of EPIDs to dosimetric verification, particularly for intensity modulated radio therapy. Although not water-equivalent, the phantom scatter factor of an EPID, S_{pe}, is generally assumed to be that of a full phantom, S_p, or a slab phantom, S_{ps}, in EPID calibration. This assumption may introduce errors in absolute dosimetry using EPIDs. A calibration procedure that iteratively updates S_{pe} and calibration curve (pixel value to dose rate) is presented. The EPID (Varian PortalVision) is irradiated using a 20x20 cm field with different beam intensities. Reference dose rates are from chamber measurements in air, multiplied by S_p or S_{ps}. The calibration curve is obtained by fitting pixel values and reference dose rates to a quadratic equation. The S_{pe} is obtained from EPID measurement in 10x10 cm and 20x20 cm fields and using the calibration curve, and is in turn used to adjust dose rate measurements and hence the calibration curve. The above procedure is repeated until it converges. The final calibration curve is used to calculate portal doses for four rectangular fields. The results indicate that dose calculated using S_{pe} is more consistent with chamber measurements (mean=0.998, STD=0.007), than that obtained using S_p (mean=0.995, STD=0.007) or S_{ps}, (mean=0.993, STD=0.012). Furthermore, differences between S_{pe} and S_{ps} are as large as 2% for some field sizes. It is concluded that the EPID calibration for absolute dosimetry should consider EPID scattering properties.