AbstractID: 9569 Title: EPID's Exit Dosimetry: Defining its Dose-Pixel (Doxel) Dispersion and Validating IMRT portal doses in Lung and Prostate.

Methods for on-line dose conversions of EPID portal images are clinically desirable to replace latent film validations of IMRT. But an EPID IMRT portal is difficult to scale simply linearly to dose, because it is non-equilibrium beam outputs with high dose gradients and pixel statistical uncertainties including exit scattered photon dose components. We develop the DOXEL technique to convert EPID a:mSi 500 images to dose by establishing optimal dose-pixel or DOXEL in the pixel histograms' signal-to-noise ratios (SNR). The technique is extensively tested in open/IMRT fields, at different Monitor Units (5/1000) and fields (2/20 cm) for 6MV/18MV beams with/without phantom or patients. Examined include DOXEL histograms, dose linearity and accuracy against chambers/EDR films at varying source distances. Predicted versus delivered doses are then evaluated for 7-fields-IMRT typical for our Institution's Prostate and Lung radiotherapy. DOXEL dispersions of high confidence level were found between 15-25 pixels at 2% SNR (**FIGURE 1**). EPID field size factors (OF) and their SSD variations were then established for both 6MV/18MV with/without 1.5cm/3.5cm buildups. Thereby, on-line EPID exit doses in cumulative units (CU) for phantom and patient IMRT were made at >96% confidence dose levels (**FIGURE 2).** In conclusion, because of high-Z (a:mSi) and absence of d_{max}, EPID's IMRT images are difficult to convert with high confidence to absolute/relative doses using straight linear scaling. Unlike converting film densities acquired within phantom, converting EPID's densities acquired beyond the phantom necessitates that non-equilibrium dose conversions account for the DOXEL dispersions in pixel-dose correlation.