AbstractID: 8806 Title: Reduced energy dependence artifact in CR plate dosimetry using pencil beam response correction and Thoraeus filters

Purpose: To improve the accuracy of the Kodak 2000RT Computer Radiography (CR) Beam Dosimetry System by reducing the effect of the energy dependent response of the CR plates. **Method and Materials:** The energy dependent response of the CR plates is due to the presence of elements with atomic numbers higher than water. This results in larger photoelectric cross section, which leads to dose over-response for photon energies lower than few hundred keV. The use of lead foils on both sides of the CR plate in the Kodak CR solid water dosimetry cassette strongly suppresses this dependence by reducing the number of low energy photons reaching the plate. To determine the accuracy of these plates when used in a most time efficient way, we scanned them 2 min after exposure. For a very large IMRT field (mean dose 23 cGy) we observe gamma <1 compliance (3 mm distance-to-agreement and 3 cGy dose difference) for 73% of the points. To correct for the observed under- and over-determination of the dose in the high and low dose regions, we used Monte Carlo to simulate the response kernel of the CR plates to a pencil beam and then used this kernel in convolution dose calculations. To further reduce the flux of characteristic x-rays reaching the plates we added more foils forming Thoraeus filters on both sides of the plates. **Results:** The use of CR response kernel increased the gamma index compliance to 83% for this large IMRT field. The addition of the Thoraeus filters further increased the compliance to 90%, with largest errors seen close to the plate edges. For smaller 15x15 cm IMRT fields, compliance of 96% was observed. **Conclusion:** With appropriate response correction and low energy photon filtering Kodak's CR plates can be used as an efficient and potentially accurate 2D dosimeter.