

AbstractID: 7617 Title: In vivo EPID dosimetry for large scale clinical IMRT verification

**Purpose:** To introduce 2D *in vivo* EPID dosimetry as a tool for IMRT verification in the clinic for all curative patients (about 2000/year) before the end of 2007; meanwhile replacing pre-treatment dosimetry, reducing workload and improving efficiency.

**Method and Materials:** EPID images are acquired per segment, and by means of a back-projection algorithm converted to dose distributions in a plane intersecting the isocenter, perpendicular to the beam axis. In this plane, a 2D field-by-field comparison is performed between the back-projected EPID and planned dose distributions, using the  $\gamma$ -evaluation method with 3%/3mm of maximum dose as criteria. For each field the mean  $\gamma$ , maximum 1%  $\gamma$ , percentage of points in agreement, and the isocenter dose difference are reported. These numbers are fed into a decision rule setting limits on the approval of a treatment plan.

**Results:** Currently, treatment plans of prostate, rectum, skull and liver cancer patients are already validated based on *in vivo* EPID measurements; for the other patient groups *in vivo* dosimetry is being introduced. Statistics for a group of 152 prostate patients, each having 3-5 EPID measurements thus filtering out random uncertainties, show an average mean  $\gamma$ -value per patient of 0.41, and an average isocenter dose difference of -1.5% between EPID and plan. Clinically relevant errors were detected in four prostate plans, and these plans were replaced. Preliminary results for head&neck, breast and lung IMRT treatments show the feasibility of the method for these sites but inhomogeneity corrections need to be refined to improve accuracy.

**Conclusions:** For a variety of treatment sites, 2D *in vivo* EPID dosimetry is now clinically used, or will be introduced soon, for IMRT verification of all curative patients. In this way, an efficient and accurate routine procedure has been developed for routine purposes providing the radiotherapy chain with an extra safety net.