

AbstractID: 2693 Title: A technique for respiratory-gated radiotherapy treatment verification with an EPID in cine mode

**Purpose:** Many clinics are performing respiratory-gated treatment based on external surrogates. Verification of these treatments is very important for ensuring the delivery of the planned dose distribution.

**Method and Materials:** We have developed a new technique for treatment verification using an Electronic Portal Imaging Device (EPID) in *cine* mode for gated 3D conformal therapy. Implanted radiopaque fiducial markers inside or near the target are required for this technique. The markers are contoured on the planning CT set, enabling us to create Digitally Reconstructed Radiographs (DRR's) for each treatment beam. During the treatment, a sequence of EPID images are acquired without disrupting the treatment. Implanted markers are visualized in the images and their positions in the beam's-eye-view are calculated off-line and compared to the reference position by matching the field apertures in corresponding EPID and DRR images. The precision of the patient setup, the placement of the beam-gating window, as well as the residual tumor motion can be assessed. This technique has been demonstrated in a case study, with three implanted markers.

**Results:** For this patient, the intra-fractional variation of all marker positions in the gating window has a 95% range of 4.8 mm in the SI direction (the primary axis of motion). This is about the same (5 mm) as the residual motion considered in the planning process. The inter-fractional variation of the daily mean positions of the markers, which indicates the uncertainty in the setup procedure, is within +8.3/-4.5 mm (95% range) in the SI direction.

**Conclusion:** The proposed technique will be used for gated treatment verification. The results of many cases will help us determine appropriate treatment margins for gating.

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