# AbstractID: 6746 Title: CTV-to-PTV margins for prostate irradiations, a quantitative assessment using novel voxel tracking techniques

**Purpose:** To quantify adequate anisotropic CTV-to-PTV margins for three different setup strategies used during prostate irradiations: (1) no setup corrections, (2) on-line corrections based on bony anatomy and (3) on-line corrections based on gold markers.

**Method and Materials:** Three radiation oncologists independently delineated the CTV, the bladder and the rectum in CT images of 30 prostate patients with implanted gold markers using a 3D model-based segmentation technique. IMRT plans with zero CTV-to-PTV margins were generated for each of the 3 times 30 contoured image datasets. Eight repeat scans were acquired to allow simulation of the delivered dose distributions in changing geometry. Different registration approaches were taken to mimic the different setup strategies. A surface-model based deformable image registration system was used to warp the delivered dose distributions back to the dose in the planning CT. Based on the geometric extent of underdosed areas in this patient population, a set of anisotropic margins was derived. A second simulation was carried out to assess the target coverage of the derived margins.

**Results:** Without setup correction, margins of 10 mm for the corpus of the prostate and 15 mm for the seminal vesicles were required. These margins could be reduced to 7 mm and 12 mm respectively with on-line correction using bony anatomy registration methods and to 3 mm and 7 mm using on-line repositioning based on gold markers. A larger margin at the apex was required to account for the significant observer variability and steep dose gradients at this location (11 mm – skin marker registration, 9 mm - bony anatomy registration, 7 mm – gold marker registration).

**Conclusion:**
Novel voxel tracking techniques enable us to calculate accumulated dose distributions and design accurate 3-D CTV-to-PTV margins for prostate irradiations.