# AbstractID: 2822 Title: Dosimetric Evaluation of Inverse Monte Carlo-based Modulated Electron Beam Treatment Planning and Delivery Using a Few Leaf Electron Collimator

**Purpose:** To investigate the potential of improving the treatment planning and delivery of treatment to superficially located tumors using energy modulated electron therapy (EMET) based on inverse techniques and Monte Carlo dose calculation algorithms. This study investigates the application of EMET using a few-leaf electron collimator (FLEC) in head & neck, sarcoma, and breast sites in comparison with three dimensional conventional radiation therapy (3D-CRT) and intensity modulated radiation therapy (IMRT) techniques.

**Method and Materials:** Treatment planning was performed for a parotid case, a sarcoma case, and a breast case. Three Monte Carlo calculated plans were compared for each case: 3D-CRT, IMRT, and 3D-CRT in conjunction with EMET (EMET-CRT). For all patients, dose volume histograms (DVHs) were obtained for organs of interest. For each plan, homogeneity and conformity indices of dose distributions, sparing index (SPIN50/10) that quantifies the conformity of the low isodose lines, and the whole-body dose equivalent (WBDE) were analyzed.

**Results:** Adding EMET delivered with the FLEC to 3D-CRT preserves target conformity and dose homogeneity and improves sparing of normal tissues. For the head & neck case the mean dose to the contralateral parotid and brain decreased relative to IMRT by 43% to 84%, and by 57% to 71%, respectively. Improved normal tissue sparing is also quantified as an increase in sparing index of 47% and 30% for the head & neck and the breast cases, respectively. The WBDE for EMET-CRT was reduced by up to 72% when compared with IMRT.

**Conclusion:** EMET delivered with the FLEC could be a valuable addition to currently existing treatment techniques especially when applied to superficially located tumors that are inherently difficult to plan using IMRT. The addition of EMET systematically leads to a reduction in WBDE especially when compared with IMRT.