

## AbstractID: 7160 Title: Electron density mapping for MRI-based treatment planning

**Purpose:** To develop an accurate MRI-based treatment planning method by assigning MR images the desired electron density information through the use of diagnostic CT and a deformable registration model.

**Method:** MR and CT images are registered using deformable or rigid registration method depending on the disease site or the patient positioning when acquiring the CT data. Based on the voxel-to-voxel correspondence established by the registration, the electron density distribution of the CT images (this can be a diagnostic CT with patient positioned arbitrarily) is mapped onto the MRI and plan is computed based on the modified MR images, which take advantage of the useful features of CT and simulation MRI. To evaluate the accuracy of the MRI-based dose calculation, six clinical cases, including three brain and three head-and-neck cases are studied. For each case, three IMRT plans are computed with the same beam configuration but different image basis: CT, MRI with mapped electron density, and MRI with voxel values replaced by that of water. The dose distributions from the three types of calculations are compared.

**Results:** In all cases, the MRI with mapped electron density yielded very close dose values as compared with the CT-based calculation. The maximum discrepancy between the two is found to be less than 2.0% in the high dose region. Compared to the MRI with mapped CT electron density, MRI with uniform water voxel value yielded quite different dose distributions in all regions, and the dose discrepancy can be as large as 3-5% for both brain and H&N cases.

**Conclusion:** The MR images with mapped CT electron density yield very similar treatment plan compared with the CT-based calculations. The approach has potential to eliminate simulation CT by planning a patient treatment with only simulation MRI and diagnostic CT data.