AbstractID: 6798 Title: The effect of tissue inhomogeneity on IMRT

In the new era of IMRT the importance of accurate dose calculation is further elevated. The goal of IMRT is to produce a plan that will deliver optimum conformance to the tumor. If the effects of tissue inhomogeneities are ignored or miss-interpreted during the calculation, then the deliverable distribution is not the optimal one.
In this work we investigated the effect of tissue inhomogeneity on IMRT planning for some clinically relevant cases. Plans were optimized using 6x only and 18x only photon beams (coplanar), in order to study not only the effect of different types of inhomogeneity algorithms on the IMRT plan, but also to investigate the magnitude and significance of the effect as the energy of the beam changes.
In the study, we compared homogeneous dose calculation to pencil beam, generalized Batho, EqTAR, convolution, superposition and Monte Carlo (both for optimization and final dose calculation where applicable). Our results showed several differences between the homogeneous calculation and the more advanced algorithms for both energies. The absolute dose was found to be several percent units (up to 20%) different proximal to tissue interfaces, especially tissue-bone and air-tissue. The location and value of the hot spots were also quite different. Plans were compared based on isodose distribution coverage and on DVHs. Based on our findings we concluded that for IMRT, tissue inhomogeneities should be included in the optimization, or at least be computed both with and without for a more realistic clinical assessment.