AbstractID: 7489 Title: DMLC IMRT to moving tissues - towards 4D therapy

Purpose. The goal of traditional approaches to IMRT delivery to moving tisues (gating, target outline tracking, IMRT tumor tracking) is to irradiate patient body so that effects of tisuue motion are eliminated and IMRT therapies in the presence of tissue motion are delivered so that the IMRT dose distributions for moving bodies are equivalent to the dose distribution delivered to the static body geometry. In contrast the proposed solution for IMRT delivery to moving tissues and organs aims at delivering treatments that are dosimetrically superior relative to any IMRT therapy possible for stationary body geometry.

Method. Treatment plans (3D) are derived for each phase of the (static) body geometry. This is done with existing planning software in comercial TPS and for body geometries defined by data scorred in 4D CT. Using the freedom of multiple solutions of DMLC IMRT delivery of given intensity map to moving target the exploitation of leaf trajectories and dose rate intensities are investigated (for each phase plan) to find the optimized treatment deliveries that are more advantageous than 3D IMRT plans derived for each phase of the static body geometry. The best deliverable plan among all derived for each of the motion phase is chosen as the one to be realized. The resulting intensity delivered by these strategies, and resulting dose distributions, are calculated and compared to best plans derived for each phase plans.

Results. The example of treatment derived for particular phase of body motion geometry has been investigated. The DMLC IMRT delivery of given dose to target that simultaneously minimizes the dose delivered to organ at risk due to interaction between motion of leaves and motion of the target is calculated that shows the dosimetric advantage over 3D IMRT therapy.