

AbstractID: 7730 Title: Sensitivity of proton and photon plans to the intra- and inter-fractional changes in patient's anatomy

**Purpose:** To evaluate the sensitivity of proton and photon plans to anatomical variations.

**Method and Materials:** One intensity-modulated photon (IMRT) and four proton treatment plans were constructed using the end-inspiration phase (T0) and the end-expiration phase (T50) of the four dimensional computed tomography (4DCT) scan of the lung patient. One of the proton plans was a composite plan consisting of three beams and the other three were single beam proton plans. The IMRT photon plan consisted of 9 beams. For each plan a dose volume histogram (DVH), a dose difference between T0 and T50 phases, and a distance-to-agreement (DTA) between the T0 and T50 dose were computed to quantify the impact of changes in the anatomy due to respiratory motion.

**Results:** The average DTA for the photon plan significantly smaller than the corresponding distance for the proton plan. The three beam proton plan had smaller average DTA than single beams proton plans.

**Conclusion:** The respiratory motion has a much stronger impact on the proton therapy dose variations as compared to the IMRT dose. Respiratory motion compensation has greater importance in proton treatment planning than in photon treatment planning. Using multiple beams in proton plans can potentially reduce the dose variations in proton treatment.