Purpose: To verify a Tomotherapy plan for a typical head and neck treatment against experimental measurements.

Methods: The treatment plan for a head and neck case was generated by the Tomotherapy treatment planning system (TPS) to deliver ~70 Gy in 33 sessions to the contoured PTV. The plan was calculated on a CIRS ATOM anthropomorphic phantom that provides a grid spacing of 3x3cm holes to accommodate thermoluminescent detectors (TLD). The plan was verified against experimental measurements carried out by LiF:Mg,Ti (TLD-700) TLD. Up to 20 locations were selected within the irradiated region and three detectors were used simultaneously at each point to decrease the statistical uncertainty. TLD locations were labeled in the planning system and dose comparisons between TPS prediction and experimental measurements were performed in terms of absolute dose to water for a single fraction. We examined the dose from (i) the corresponding 3.5MV Tomo-scan alone and (ii) the complete treatment. TLD-700 were found to fulfill the requirements of reproducibility, linearity and flat energy response in a previous study. In particular, TLD energy response was previously checked for 6 MV flattening filter free and conventional radiation beams under reference conditions.

Results: Doses derived from the TPS were in most cases in good agreement (4% on average) with TLD dose measurements within TLD statistical uncertainties (about 3%). Larger discrepancies up to 7% were found for points close to complex tissue inhomogeneities, such as bony structures. Dose from the scanning procedure alone is about 1% of the dose per fraction.

Conclusions: This work indicates that dose delivery plans created with Tomotherapy TPS are accurate for head and neck tumor localizations.