Purpose/Objective: To evaluate the overall performance of treatment planning and MLC delivery systems for clinical implementation of IMRT modality.

Materials/Methods: A 6-MV beam of photons from Elekta Synergy linac, modeled into Pinnacle treatment planning system (TPS), (Version 9.0) was used to develop plans from a suite of benchmark test cases provided in the TG-119 protocol. Each test case had a planning tumor volume (PTV) and an organ-at-risk (OAR) embedded into the rectangular phantom. These tests were planned, delivered, measured and analyzed using state-of-the-art dosimetry systems. Per-field planar isodose distributions were measured with the MapCHECK-2 diode-array device (Sun Nuclear Corporation, Melbourne, FL). A radiographic EDR-2 film, placed at one coronal plane in the phantom, was exposed to all fields with planned gantry and collimator angles. RIT113 scanning software (V5.3) was used to perform film dosimetry. Measured and planned dose distributions were analyzed using gamma criteria of 3%/3-mm. For absolute dosimetry, each test plan was delivered on a 30-cmx30-cmx20-cm homogenous solid-water phantom to assess agreement between planned and measured dose in high and low dose regions using a calibrated 0.125cc cylindrical ion chamber. Upon achieving quantitative confidence limits on baseline values established in the TG-119 protocol, the H&N phantom of the Radiation Physics Center (RPC) was irradiated with its planned IMRT fields and returned to RPC for dosimetric analysis.

Results: The MapCHECK-2 and EDR-2 film measurements reproduced the planned isodose distributions with 99-100% gamma-test passing rates for all IMRT test plans. Ion-chamber dosimetry showed <2% difference between the planned and measured doses in the high and low dose regions. Our institution passed the RPC IMRT credentialing test using the RPC’s H&N dosimetry phantom.

Conclusions: AAPM TG-119 protocol provides a useful resource for the clinical evaluation of the IMRT modality consisting of Pinnacle TPS and Elekta synergy MLC delivery system.