AbstractID: 10127 Title: Volumetric Patient-Specific Quality Assurance for VMAT Treatment Delivery Using the Dynalog Files

Purpose: The Volumetric Modulated Arc Therapy (VMAT) technology is a novel delivery method that is capable of producing highly conformal dose distributions though concomitant optimization of MLC shapes, dose rate and gantry speed. The aim of this work is to present a practical approach for patient–specific volumetric reconstruction of the dose delivered of a VMAT treatment using the DMLC and treatment controller log (Dynalog) files.

Method: The accuracy of VMAT delivery was analyzed for prostate patients. For each patient, a clinical treatment was reconstructed and values recorded in the log files for the gantry angle, dose rate and leaf positions were converted to a new DICOM-compliant plan using a custom-developed software system. The plan was imported in a treatment planning system and the reconstructed dose was recreated on the original CT by simply recomputing the dose. Reconstructed and planned doses together with original CT scan and delineated structures are in the same coordinate systems and can be combined directly or verified through dose-volume histograms to asses treatment objective degradation due to machine imprecision.

Results: In all cases, analysis of the leaf positions showed a maximum error of -0.26 mm (mean 0.15 mm). Gantry speed deviation was less than 1º and the delivered MU was within 0.001 % from the planned value. Measurements using the Matrixx system in a phantom were used to validate the dosimetric accuracy of the proposed method, with an agreement of at least 96% using the gamma index.

Conclusions: The methodology provides an volumetric evaluation of the dose delivered by VMAT plans, easily achieved by automated analysis of Dynalog files without additional measurements or phantom setups. It provides a valuable platform for adaptive therapy in future.