

Purpose: Rapid arc delivery is an advanced beam delivery technique where the intensity modulated dose is delivered by controlling the gantry angular velocity, multileaf collimator (MLC) leaf velocity and the beam dose rate. We explore the use of dynalog files to perform QA of this complex delivery by comparing various parameters of the delivery to the planned delivery.

Method: A rapid arc delivery on the Varian linear accelerator generates two log files, the MLC dynalog and the gantry dynalog. Information of the MLC position as a function of time can be determined from MLC dynalogs which are samples every 50 milliseconds. The gantry dynalogs provide the information about the delivered monitor Units (MUs) as a function gantry position. The information about the delivery obtained from the dynalog files are compared against the planned delivery (DICOM-RT plan file) to assure the quality of the delivery. Factors affecting dosimetric quality and machine mechanical ability are compared. An in-house developed software tool called DAQA(Dynalog Arc QA Tool) was used to import the dynalog and plan files, analyze data and export results.

Rapid arc plans performed on phantom and real patients CT data sets were used for testing. Parameters such as MLC segment area as a function of gantry angle, MLC positional error, gantry angular velocity between, dose rate variation, jaw position difference and gantry position difference were compared between the planned and the delivered.

Results: We have found the delivery was overall very stable and reproducible. The dynalogs provided more information about the delivery than the measurements. Measurement performed using ionchamber array agreed well with the plan (Eclipse TPS). Delivery errors related to the machine which may be insensitive to the dose can also be detected using dynalogs.

Conclusion: Another advantage of dynalogs is their use in moving towards comprehensive automated Quality Assurance.