AbstractID: 3746 Title: A New Linac QA Procedure for the Characterization of Gantry Radiation Isocenter

Purpose

A new linac QA method is developed to characterize the size and shape of gantry radiation isocenter. The method accurately measures gantry sag as a function of gantry angles and the size of gantry radiation isocenter in the gantry rotation plane.

Method and Materials

In order to determine both sag and radiation isocenter size in the gantry rotation plane we wrap a film (or a phosphor imaging plate) on a cylinder of circumference equal to the film length. We designed a static MLC "dashed line" pattern consisting of regions of radiation along a line. The pattern is designed such that the center of the irradiation line can be easily determined.

The cylinder is positioned such that its axis is the same as the gantry rotation axis. The film is exposed to the MLC line pattern for multiple gantry angles. Both entry and exit patterns are seen on the film. A special MLC pattern was designed to accurately characterize the gap between the two ends of the film.

An automated analysis program determines the MLC line angles and centers on the film, characterizes the cylinder position and generates the desired gantry radiation isocenter information.

Results

The gantry sag is observed to have a smooth dependence on gantry angle with extreme values for 0^0 and 180^0. The smallest circle crossing or tangent to all rays in the gantry rotation plane determines the gantry radiation isocenter size in this plane. The inherent accuracy of the method is estimated at +/- 0.1 mm. The total irradiation time is about 15 min. The data analysis is less than 5 min.

Conclusions

The designed method characterizes both gantry sag and wobble in one simple and accurate test.