AbstractID: 9401 Title: A New Method of Measuring the Accuracy of Stereotactic Cones and MLC with Gantry and Collimator Rotation

Precision and accuracy are vital for stereotactic radiosurgery and radiotherapy. We set up the patients with lasers and we treat with radiation fields defined by cones or MLC, therefore the lasers must be accurately aligned with the radiation fields. In addition, the manner in which the beam shapers move with gantry and collimator angles must be reproducible and reliable. The standard method of measuring laser alignment and rotational shifts at the Tom Baker Cancer Centre, the Winston-Lutz test, is only semi-quantitative, and the results are subject to inter-observer variation. We have developed a method of digitally detecting therapy X-Rays and lasers using a 512 by 1024 photodiode array with a 48μm pixel pitch, the Radeye1 from the Rad-icon Imaging Corporation to which we added optical density filters and an intensifying screen. We took images of the lasers and the radiation fields at various gantry and collimator angles and analyzed them with in-house developed Matlab tools.

For the 4mm diameter cone we measured an apparent head tilt of 0.14 (±0.02) mm and a gantry sag of 0.39 (±0.02) mm. The lasers were within 0.25 (±0.05) mm of the compromise radiation isocentre. For a 6mm by 6mm MLC we found the center of the radiation field varied by 0.58 (±0.02) mm with collimator rotation. The ceiling laser was 0.52 (±0.02) mm from the centre of the MLC rotation.

This system can be used to both monitor and improve machine performance, which may lead to improved outcomes for patient treatment.