**Title:** CyberKnife M6 InCise-2 multileaf collimator setup, modelization and quality insurance program.

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**Introduction:**

InCise-2 MLC approximately reduces treatment time by 30% by decreasing the total amount of beams and MUs.

Beams library measurements, modelization validation and MLC quality insurance program are presented.

**Methods:**

Commissioning:

TMR, profiles and OF are measured for 11 beam sizes from 7.6 x 7.7 mm² to 115 x 100.1 mm² using a PTW diode in an IBA BluePhantom2 water phantom. OF are also measured with IBA CC13 and PTW PinPoint ionization chambers and Gafchromics EBT3 films placed in a solid water equivalent phantom.

Absence of light field, the robot’s degrees of freedom and the leaves’ inclinaison (inducing asymmetrical penumbra) makes Water Phantom and MLC axes alignment, thereby profiles measurement, tricky.

Measurements are compared to the composite data given by the manufacturer.

Validation of the model:

Treatment planning with the MLC can be achieved two different methods: Isocentric conformal or conformal avoidance, which is based on three different fluence modulation processes in the inverse planning system.

Treatment plans based on each planning methods are calculated on the Standard Imaging SRS Dose Verification Phantom and delivered on the phantom where several EBT3 films have been inserted.

2D gamma index analysis (1 mm/5% and 3mm/3%) is carried out using software made on site.

Quality Control :

TG-50 and Garden-Fence tests are carried out using Gafchromic EBT3 films to control leaves positioning accuracy. Transmission through MLC is also measured using films.

**Results:**

Commissioning:

Regarding OF, the different detectors match well for 23x23.1 mm² field size and above (maximum mismatch : 0.5%). Below this field size, mismatch between ionization chambers, diode and films is significant: e.g. diode versus film over-estimates OF by 5.3% for the field size 7.6 x 7.7 mm².

Moreover, TMR, profiles and OF measured match well with the composite data.

Model validation :

Gamma-index analysis results are better than 95% for each planning method.

Quality Control :

TG-50 test is carried out every morning with visual validation. Garden-Fence test results are monthly quantitatively analyzed. Manufacturer’s criteria about leaves positioning accuracy are:

* No drift above 0.95mm
* No leaf takes more than one position with a drift over 0.5mm
* No more than 13 leaves belonging to the same side have drift over 0.5mm

In step with manufacturer’s criteria, leakage below 0.5% has been measured.

**Conclusions:**

MLC has been clinically used since March 2016. As expected, treatment time is significantly reduced while dosimetry quality is maintained compared with Iris collimation. Though, the Monte-Carlo algorithm unavailability restrains the use of MLC.

Les recommandations de CQ proposées par le constructeur sont notre référentiel de base ; des tests complémentaires sont à l’étude.

Manufacturer’s quality control recommendations are our guideline. Additional tests are being studied.