Patient Breathing Effect Assessment for a Soft-Docking IOERT Device(Mobetron, Intraop)

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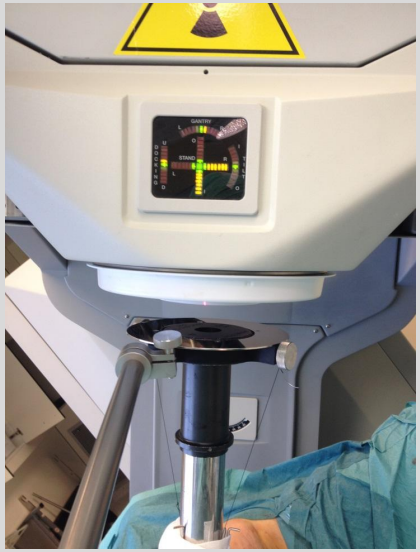


ISIORT MEETING, Köln, Germany, 25-27 September 2014

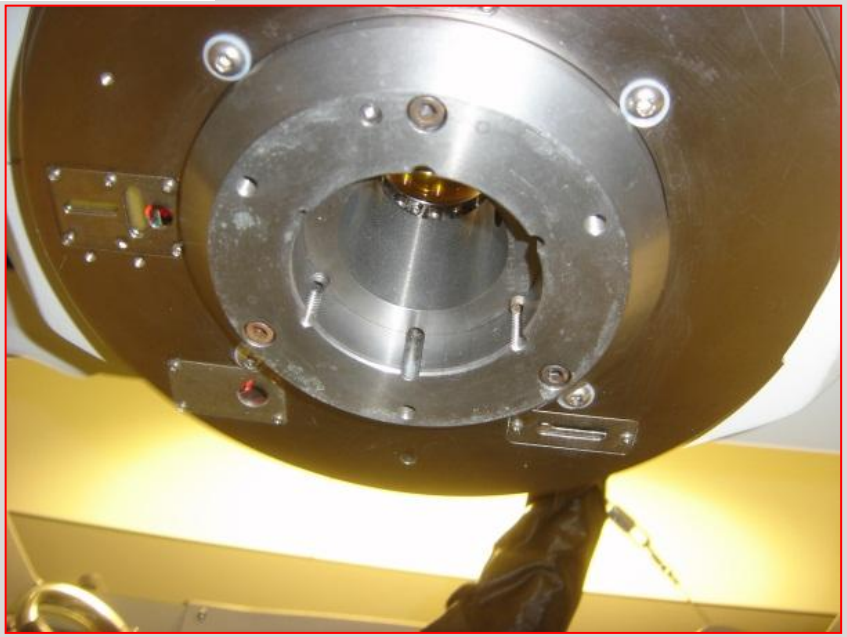
Introduction

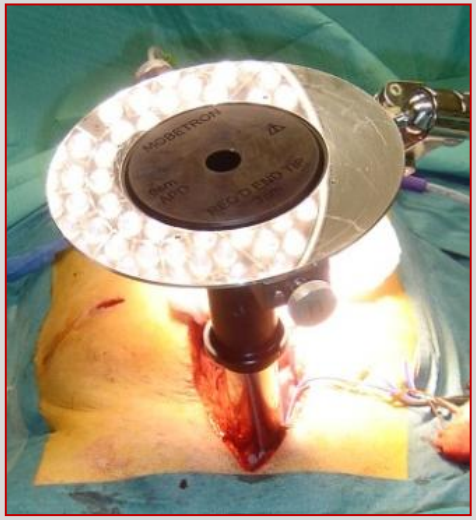
Two existing docking systems: soft and hard

Small periodic applicator movements are unavoidable due to patient breathing

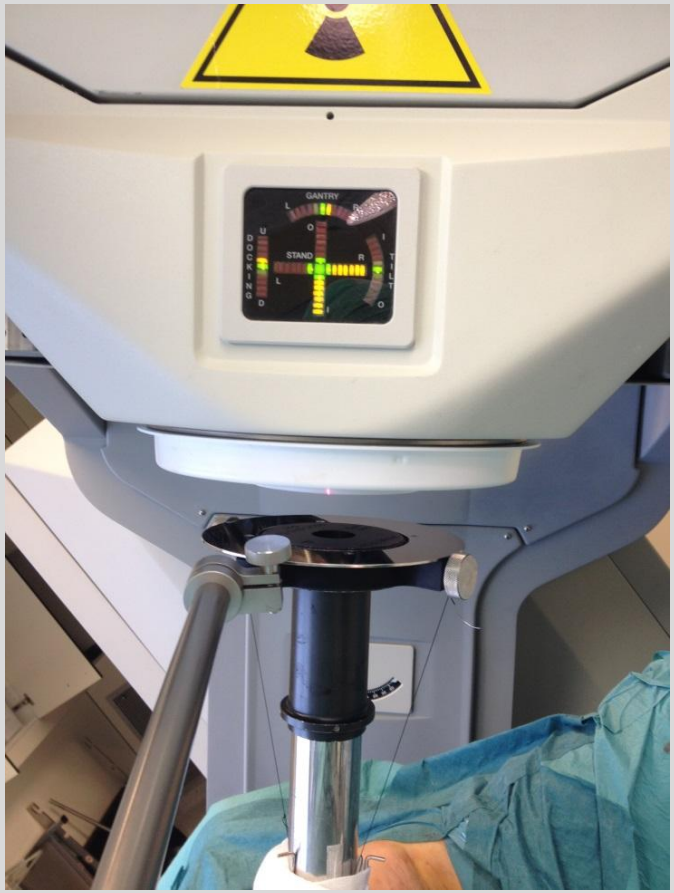
Purpose of the study : to assess small periodic beam misalignments on dose distribution

Soft docking system

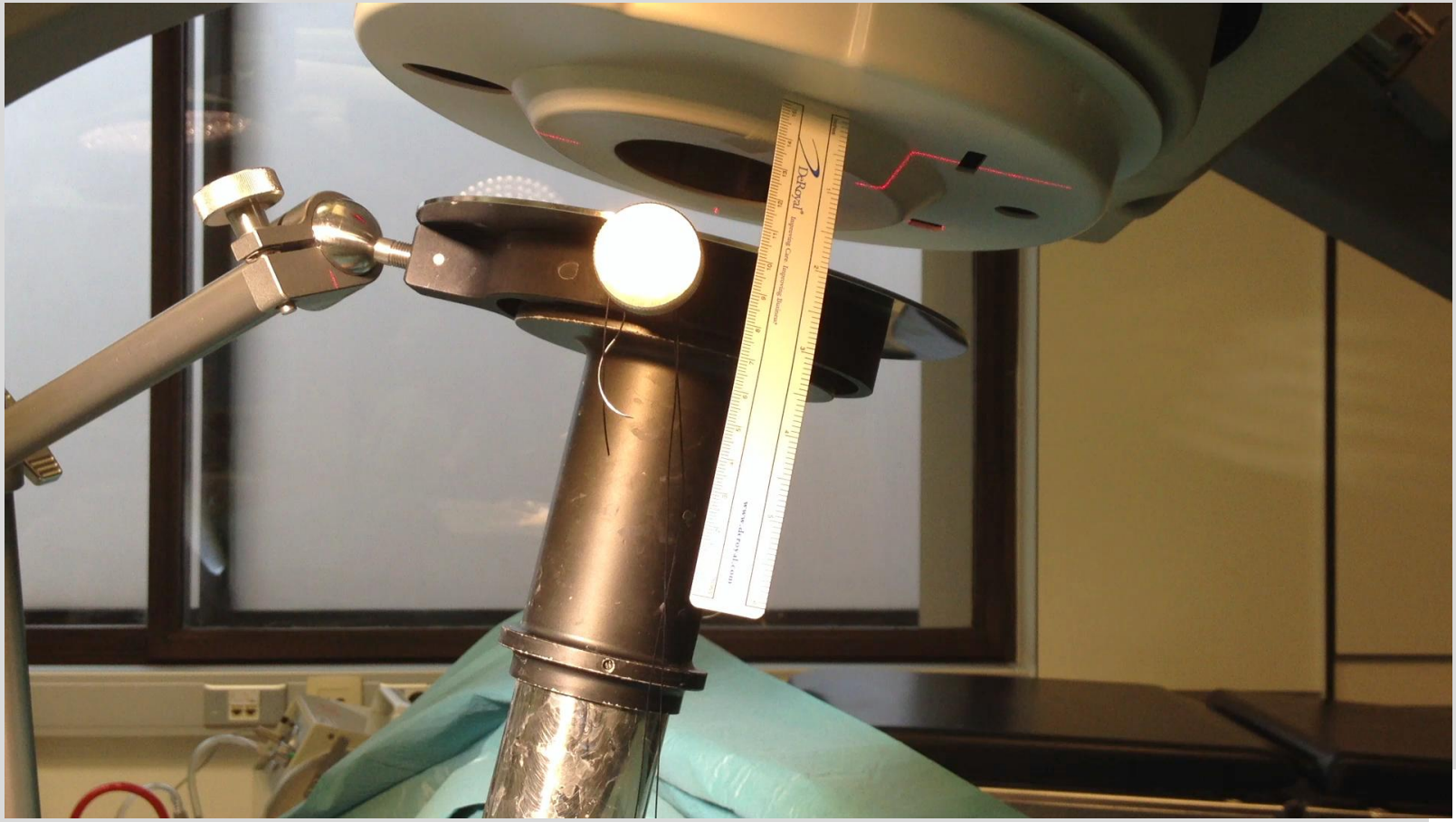




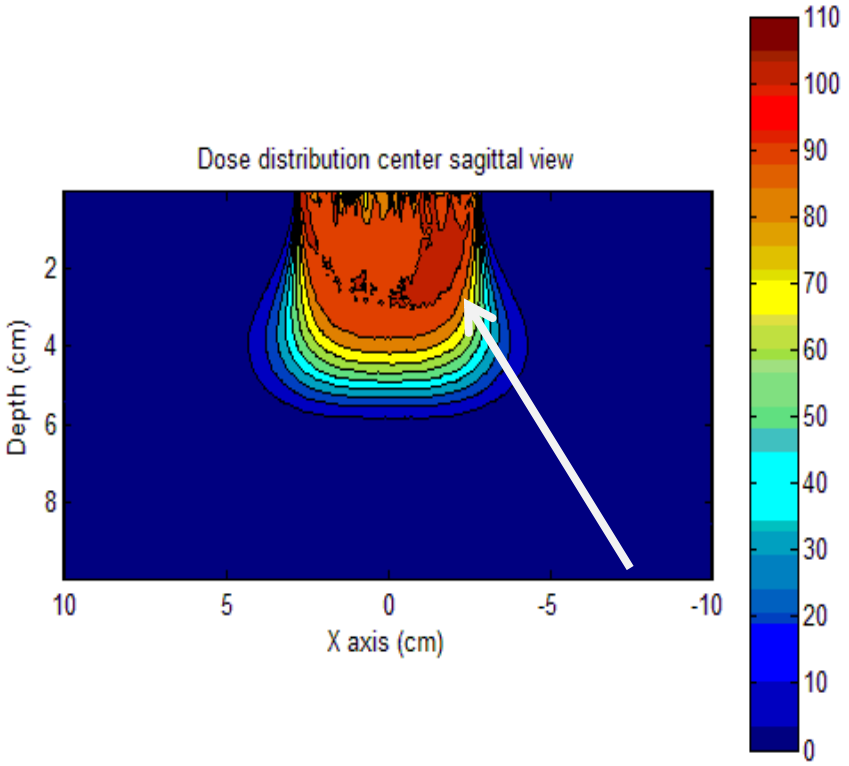
Soft docking system with patient

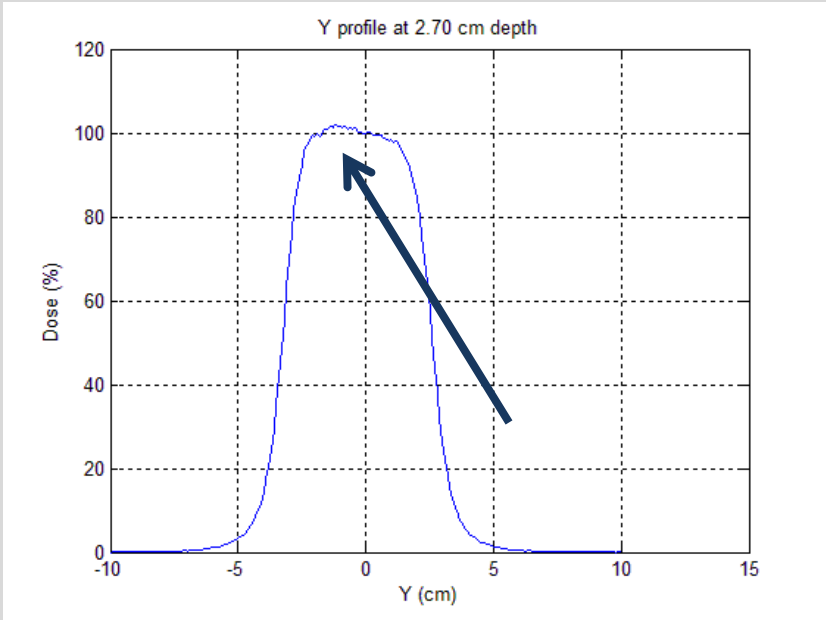


Soft docking system with patient



Monte Carlo Simulation





5.5 cm Applicator, 12 MeV,
3mm lateral static misalignment

Material

Beam energies: 6, 9 & 12 MeV

Applicators: 10 & 5.5 cm dia, flat tip

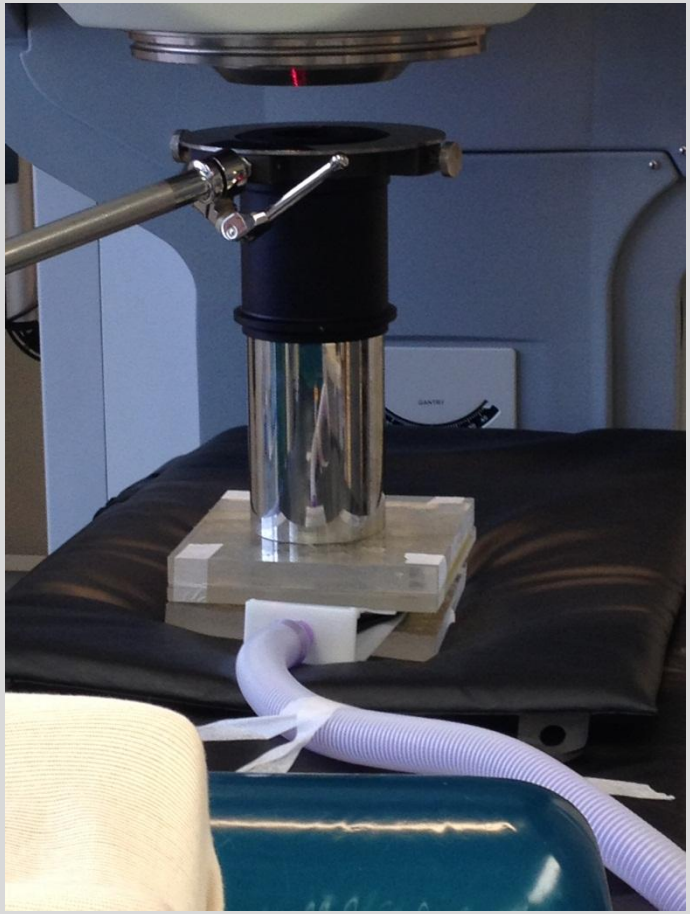
EBT3 Gafchromic Films @ Dmax

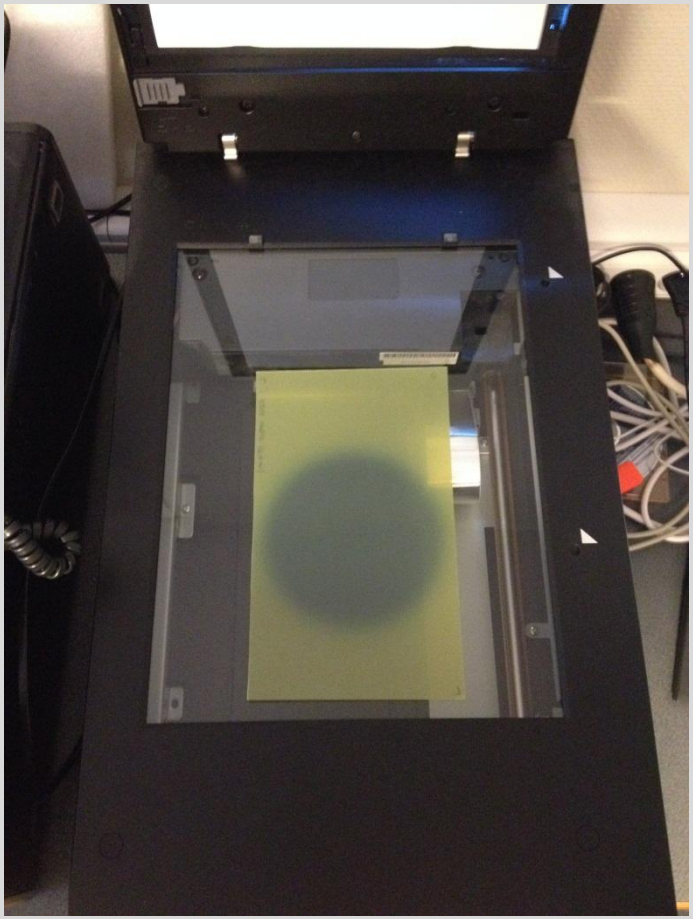
PMMA slab phantom

Epson V750 flat scanner

Anesthesiology Respirator

Material





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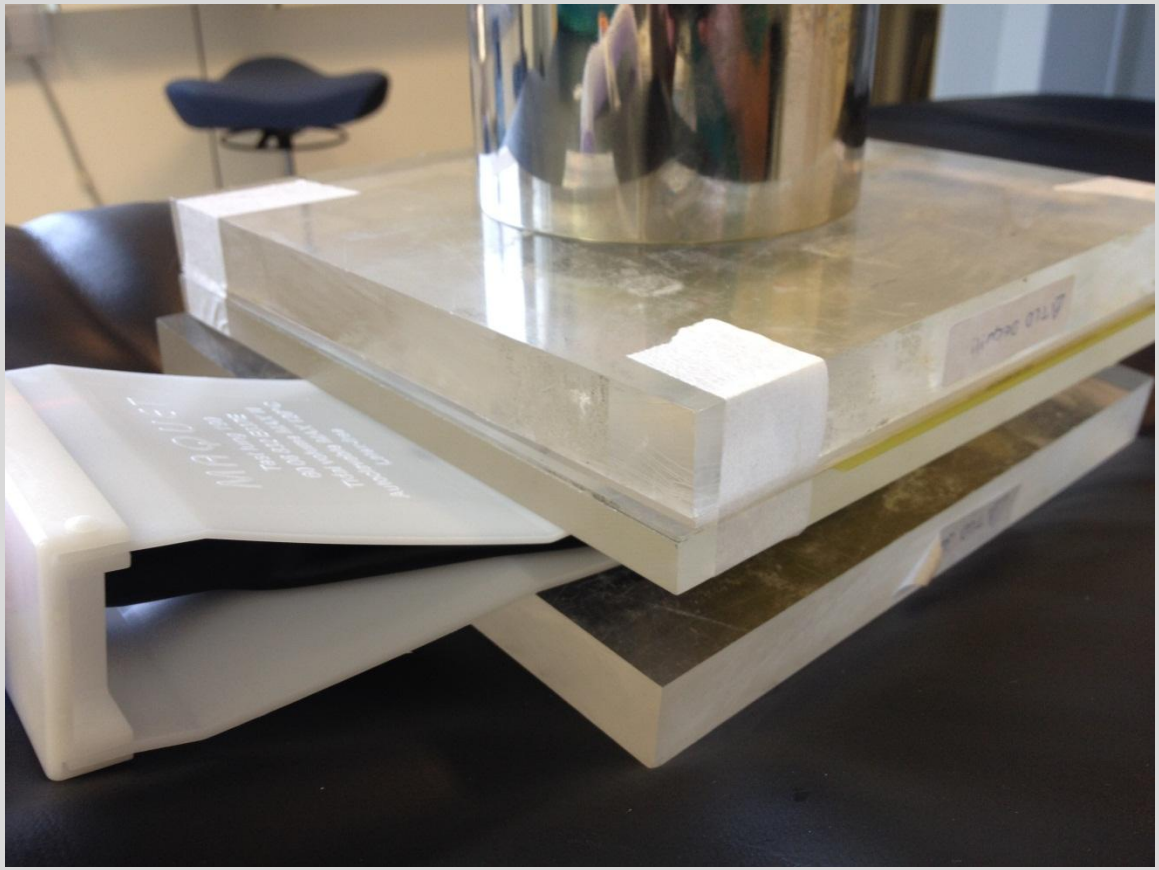


Material

Material

Breathing cycle frequency

In clinical condition : 12-15 /min, Beam-on time ≈ 1,8 min ⟹ 22-27 cycles

With phantom : 30/min, Beam-on time: 0,8 min

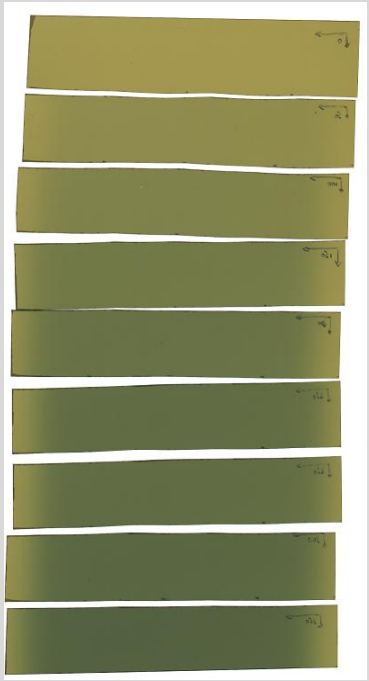
⟹ 24 cycles

Material

Films calibration

9 film strips were exposed from 0 to 4 Gy in 0.5 Gy intervals (9 MeV beam from a Varian accelerator)

The calibration curve was obtained with the FilmQA Pro software



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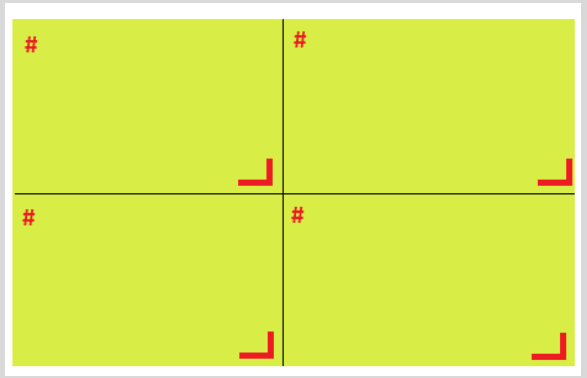
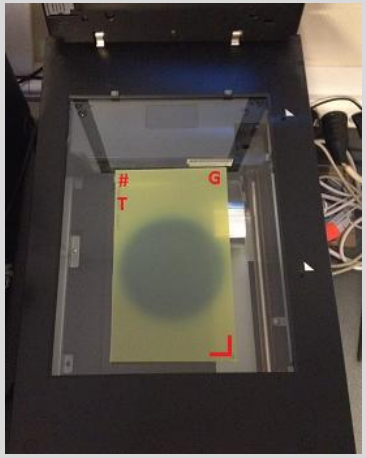




Measurement protocol:

Waiting time: at least 6 hours

Always the same film orientation

5 consecutive scans

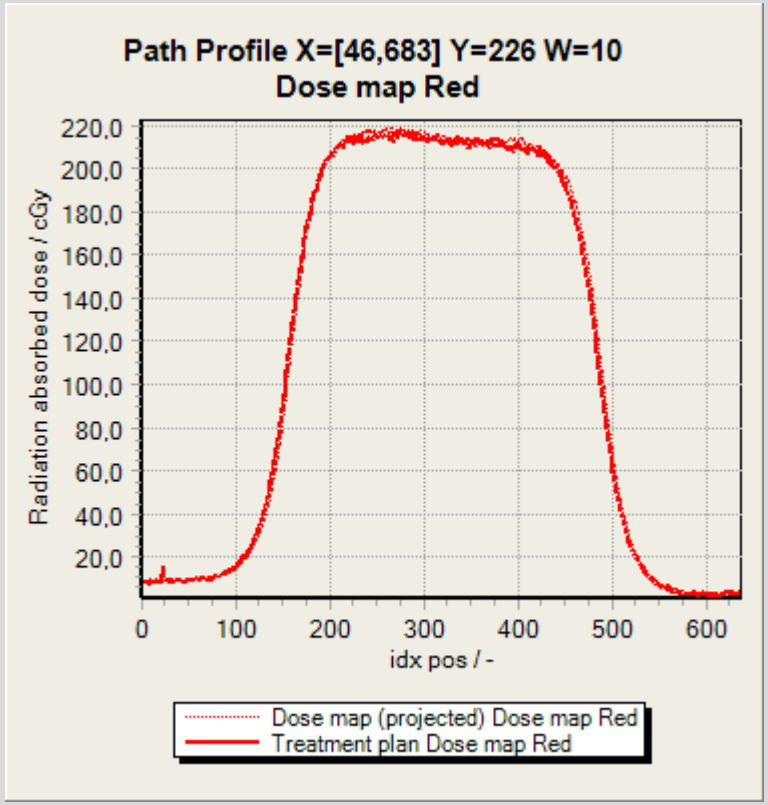
Mode professionnal

48 bit colors

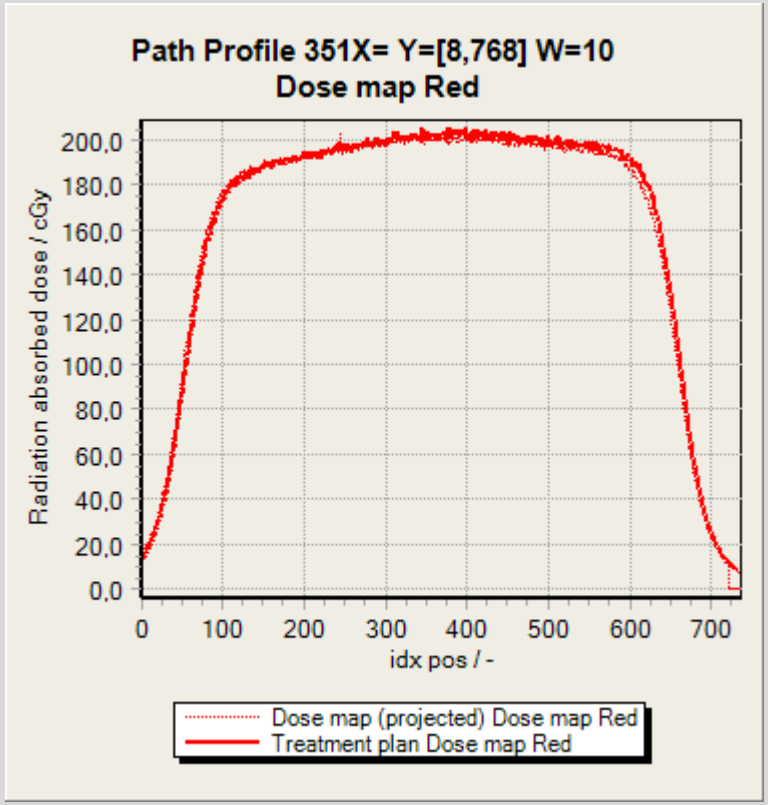
150 ppi

Results

Profiles comparison



6 MeV dia 5.5 cm



12 MeV dia 10 cm

Results

Penumbras 80%-20% :

Differences [mm] between static and mobile

	6 MeV	9 MeV	12 MeV
DIA 55 mm (X)	0.08	0.11	-0.025
DIA 55 mm (Y)	0.22	-0.32	-0.155
DIA 100 mm (X)	-0.1	-0.36	0.43
DIA 100 mm (Y)	0.02	0.09	-0.13

Results

2D Dose comparison (γ index)

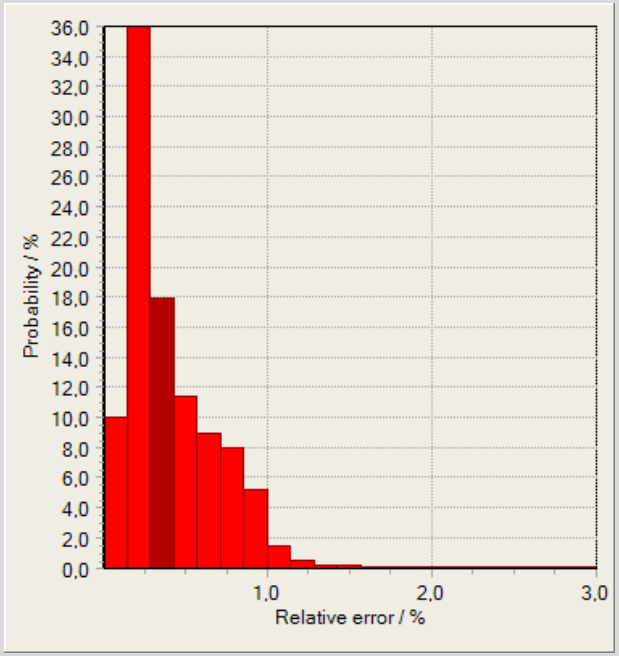
Criteria : 1mm, 1%, min Threshold 20 cGy

Percentage of points that fulfill the comparison criteria

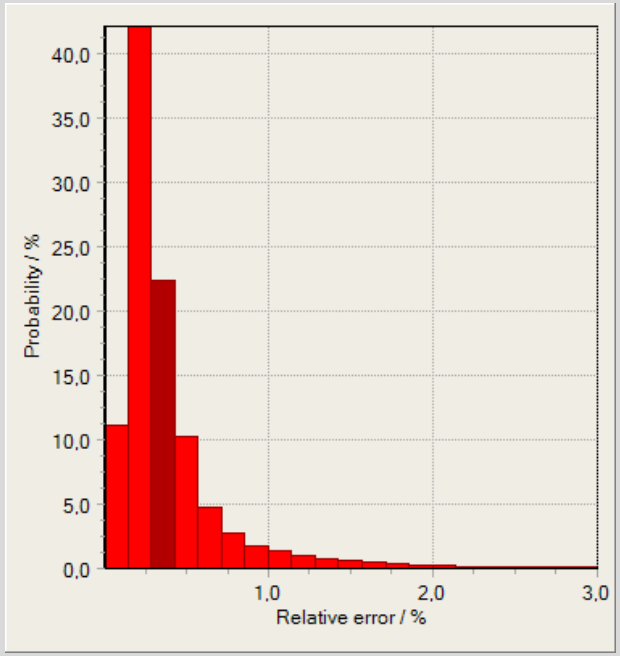
	6 MeV	9 MeV	12 MeV
5.5 cm dia	99,98	99,9	99,96
10 cm dia		99,91	99,97

Results

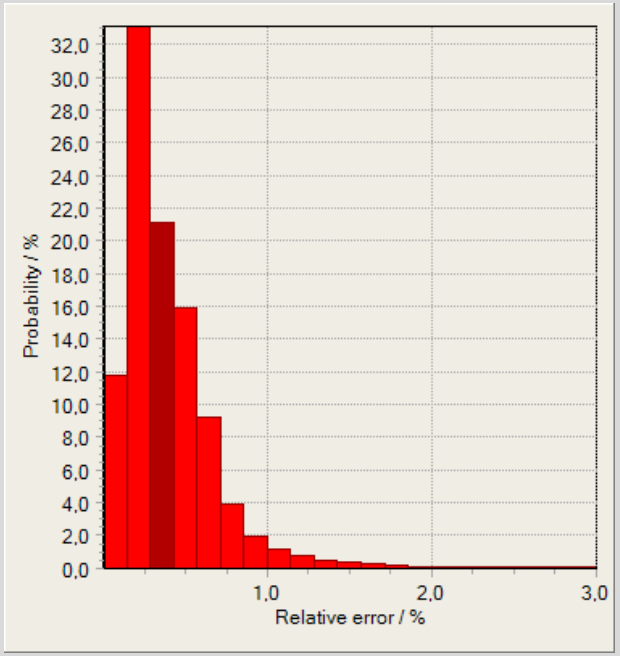
Relative dose difference distributions (5.5 cm dia)



12 MeV



9 MeV



6 MeV

Conclusion

No penumbra broadening

Similar 2D dose distribution

→ Small periodic applicator movements due to 20-25 breathing cycles in soft-docking IOERT devices do not impact significantly the 2D dose distribution @ d max.

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THANK YOU FOR YOUR ATTENTION