Ausfallkonzept bei IMRT

Problem

During a tretment series with an IMRT Plan the Treatment unit has a major malfunction and will be down for more than two days.

The patient must be treated on an other treatment unit.

- Can the plan be treated on an other treatment unit without recalculation?

out of order

shifting IMRT plans to an other treatment unit

without recalculation

Equipement

VARIAN:
- CLINAC 2100C und CLINAC 600C
  - Millennium MLC 80 Leafs
- ARIA
- ECLIPSE

IBA-Dosimetry:
- MatriXX
  - OmniPro-ImRT SW
- Blue Phantom
  - OmniPro-Accept SW

Upgrade for Dynamic MLC (DMLC)

Upgrade:

- Hardware: small change on a elektronic board
- Software: new license

Acceptance procedure from Varian:

- Arc Dynamic test
- Segmental IMRT test (step and shot)
- Moving Window test
- Using a log file for storing the leaf positions. Using the “dynalog file viewer” SW for analysing the positioning accuracy of the leafs

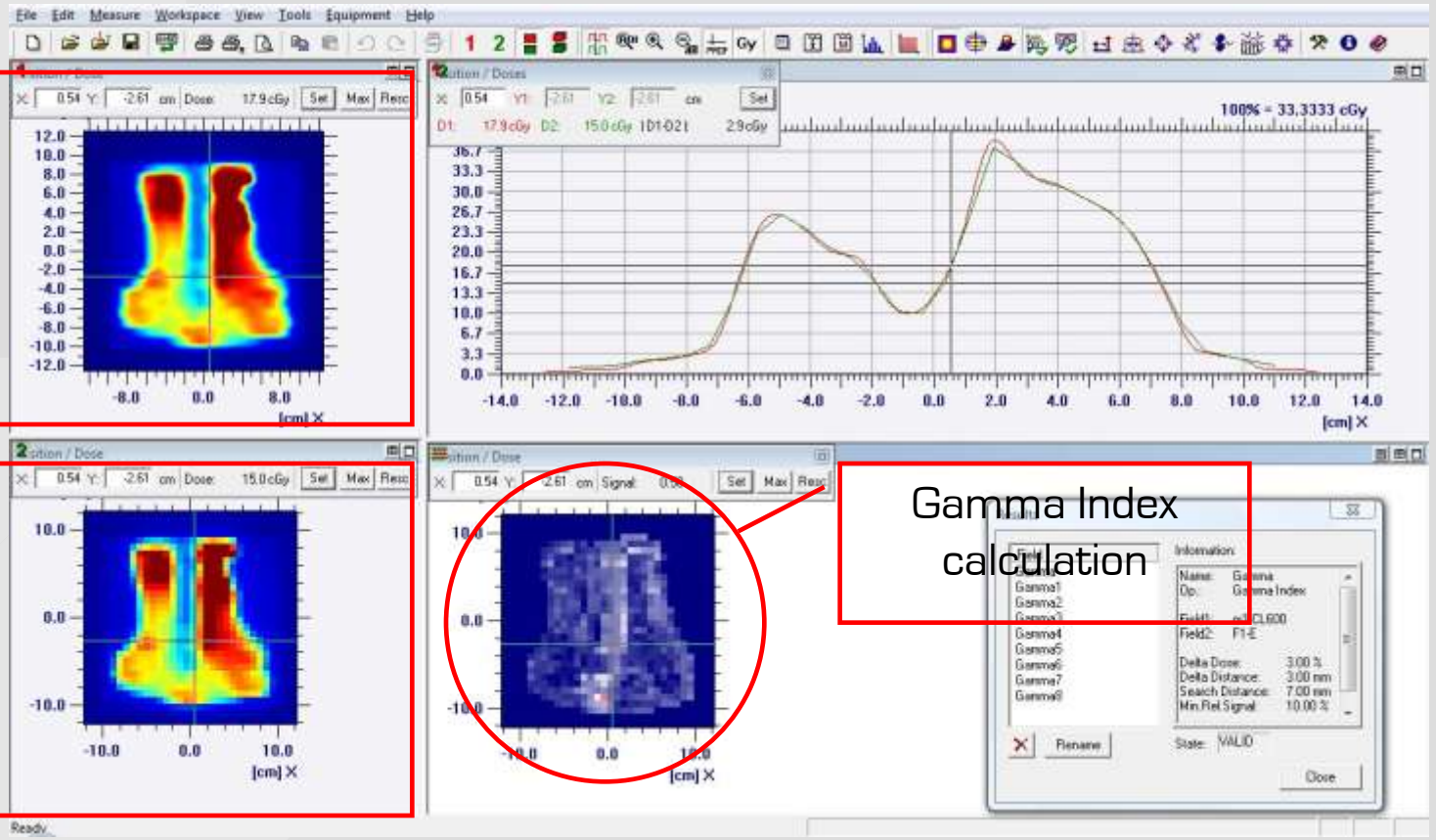
First quick check after upgrade the DMLC

head and neck plan of a real patient:

Optimisation
CL2100

Dose calculation
CL2100

Treated
CL600

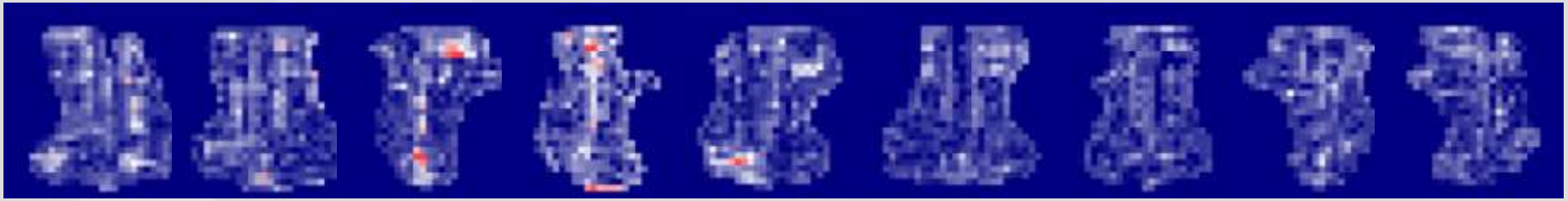


Gamma Index calculation

IMRT verification directly after implementation of the DMLC

head and neck plan of a real patient: Optimisation CL2100 Dose calculation CL2100

treated at CL2100



treated CL600

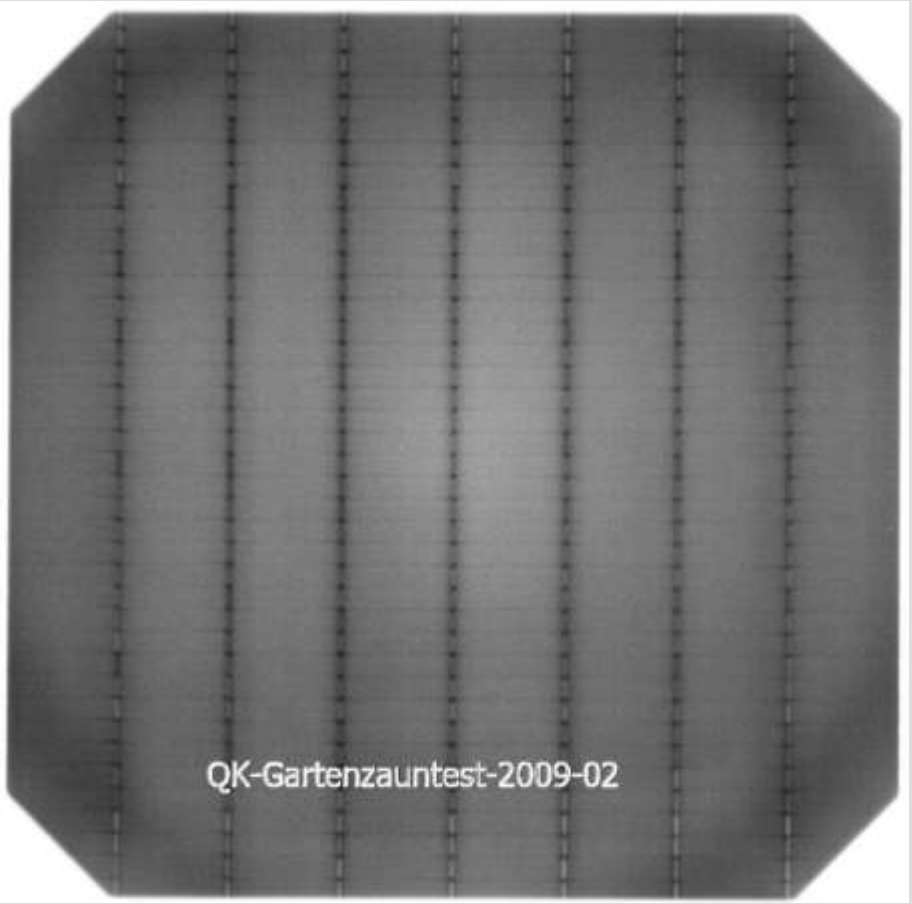
adjusting the CLINAC hardware for IMRT

Verifying - adjusting:

- Dosimetric leaf gap
- Dose Rate dependance

Insert new data:

- Water Phantom Measruements using a small detector (Diode)
- Outputfactors for small fields
- Transmissionfactor



Picket fence test before calibration of the MLC

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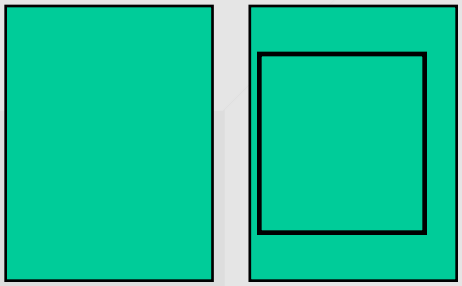
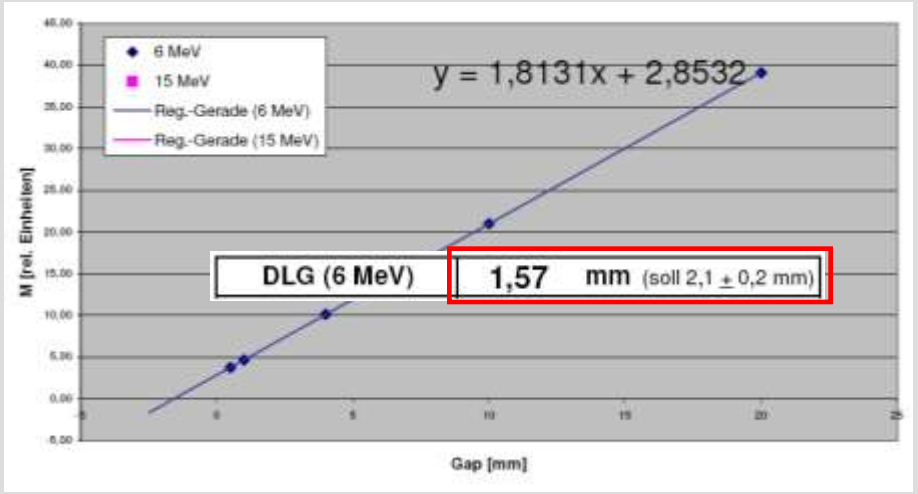


Gap [mm]	MU-calc	MU-Clinac	f	6 MeV Messwert M-gap	6 MeV Messwert M-trans	6 MeV M = f*Mg-Mtr
closed		40	1,000		2,00	
0,5	40,20	40	1,005	5,70	2,00	3,73
1	40,40	40	1,010	6,60	2,00	4,67
4	41,60	42	0,991	12,25	2,00	10,13
10	44,00	44	1,000	23,00	2,00	21,00
20	48,00	48	1,000	41,10	2,00	39,10



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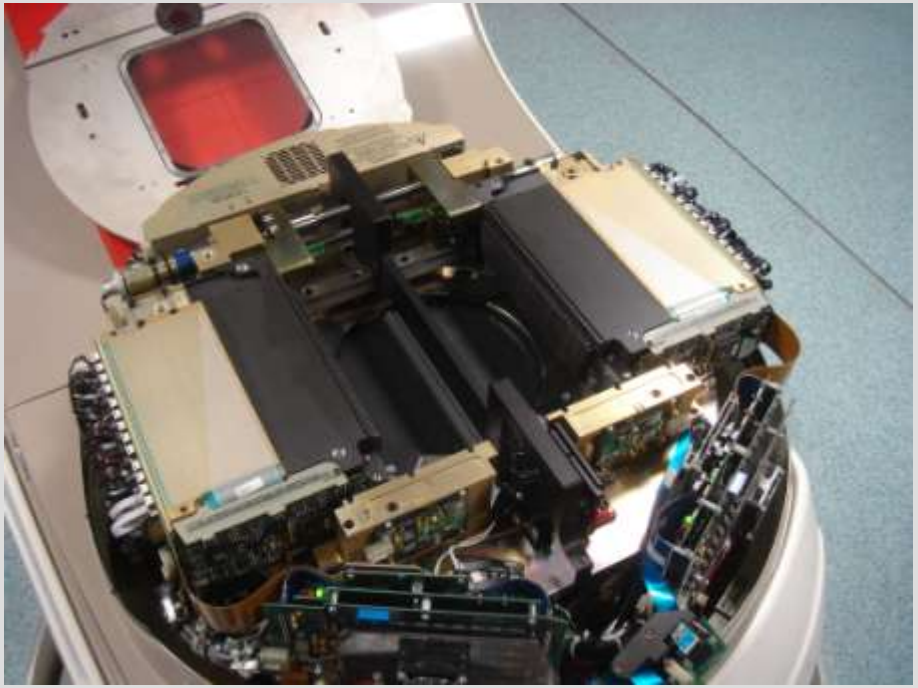

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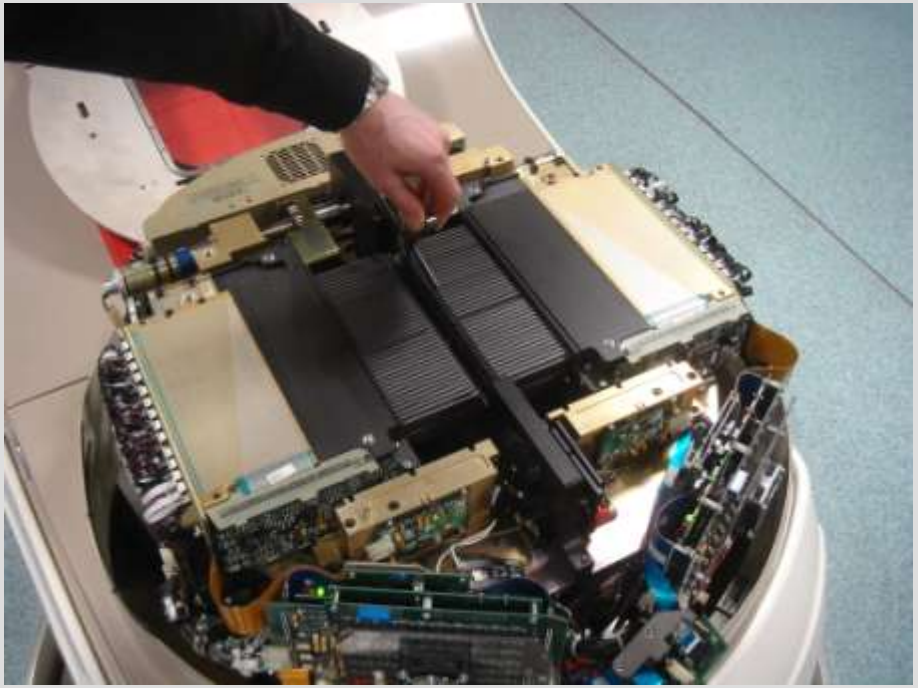

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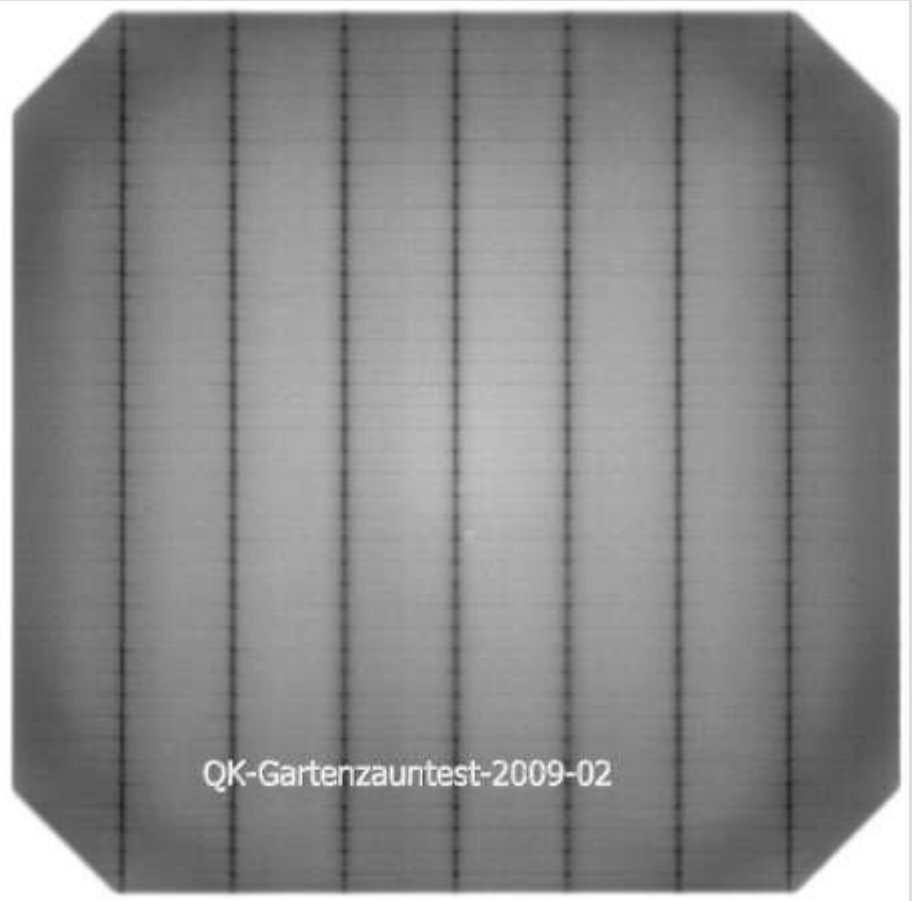

Picket fence test before calibration of the MLC

adjusting the CLINAC hardware for IMRT

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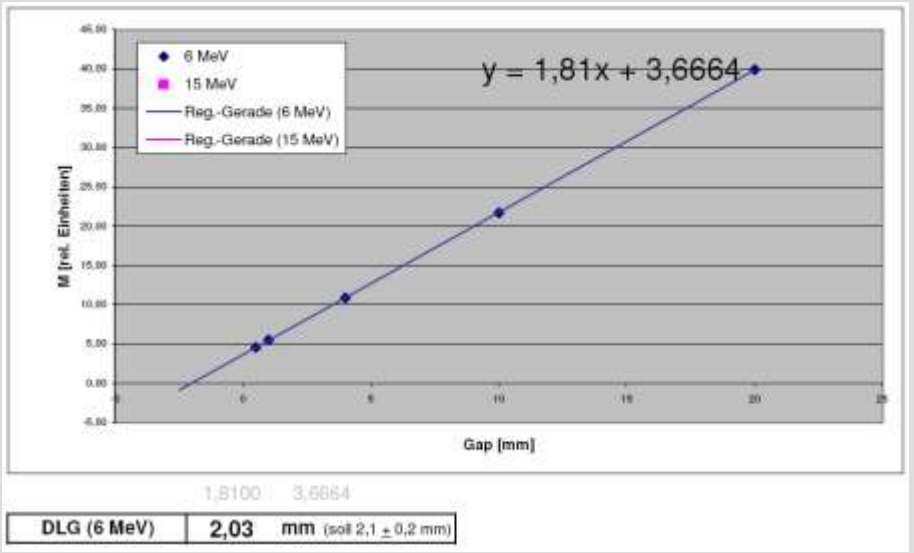
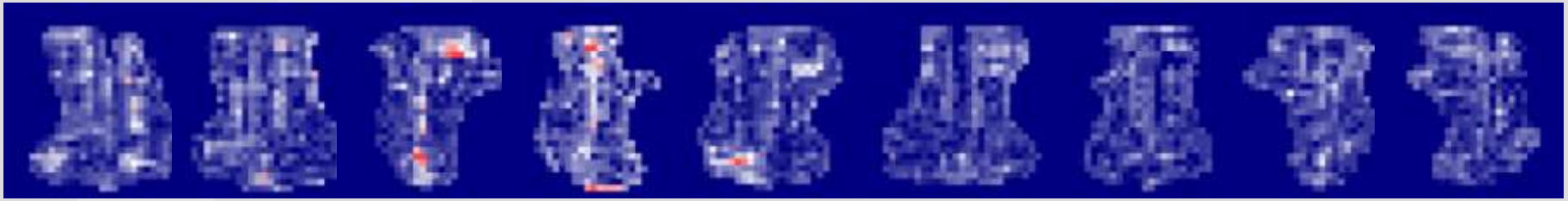


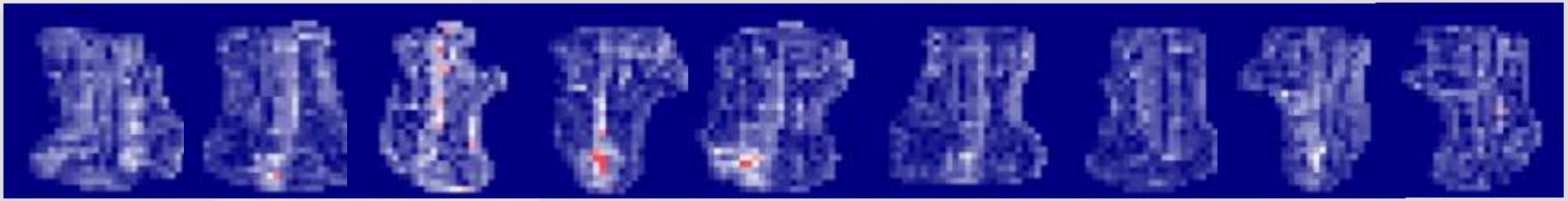
IMRT verification directly after implementation of the DMLC

head and neck plan of a real patient: Optimisation CL2100 Dose calculation CL2100 treated at CL2100



treated at CL600

treated at CL600 after leave gap calibration



adjusting the CLINAC hardware for IMRT

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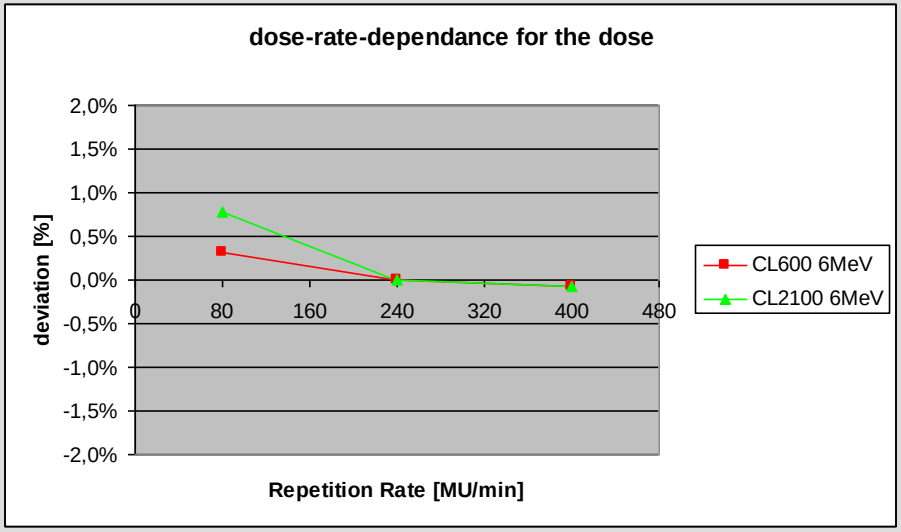


RepRate [MU/min]	deviation CL600 6MeV [%]	deviation CL2100 6MeV [%]
80	0,3%	0,8%
240	0,0%	0,0%
400	-0,1%	-0,1%

Dose-rate-dependences of the dose

Varian:

specification for the CL2100 C:

D_{80} / D_{240} 2%

D_{400} / D_{240} 2%

Method: measuring 100 MU using different dose rates 80, 240 und 400. The dose measured Dose (D_{80} ; D_{400}) should deviate not more than 2% from D_{240}.

Before calibration:

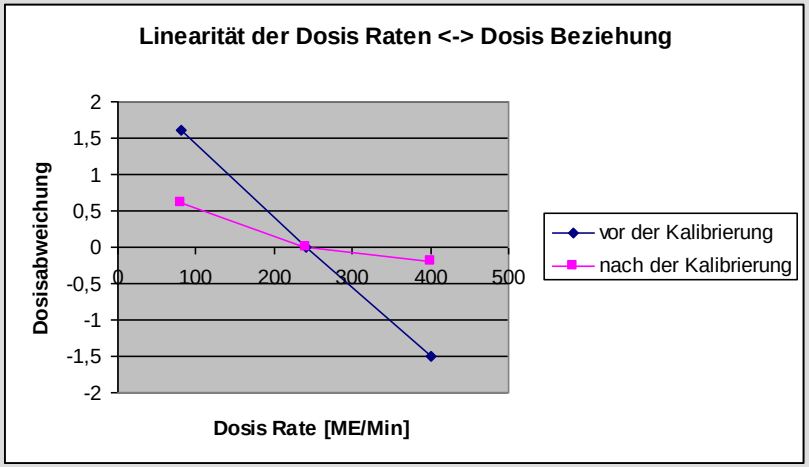
D_{80} / D_{240} = + 1.6%

D_{400} / D_{240} = - 1.5%

After calibration:

D_{80} / D_{240} = + 0.6%

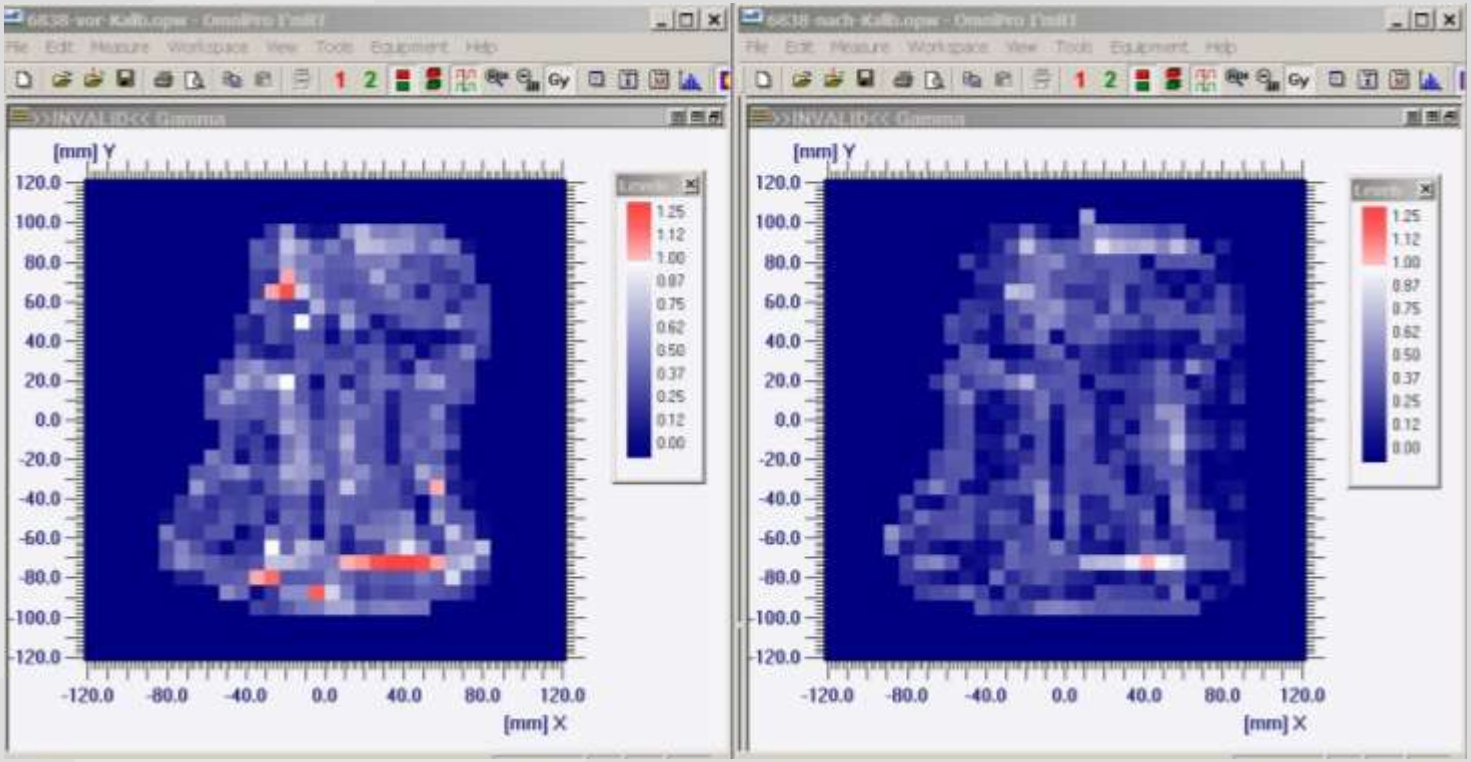
D_{400} / D_{240} = - 0.2%



Dose-rate-dependences of the dose

Prior calibration

After calibration



commissioning the RTPS for IMRT

Verifying - adjusting:

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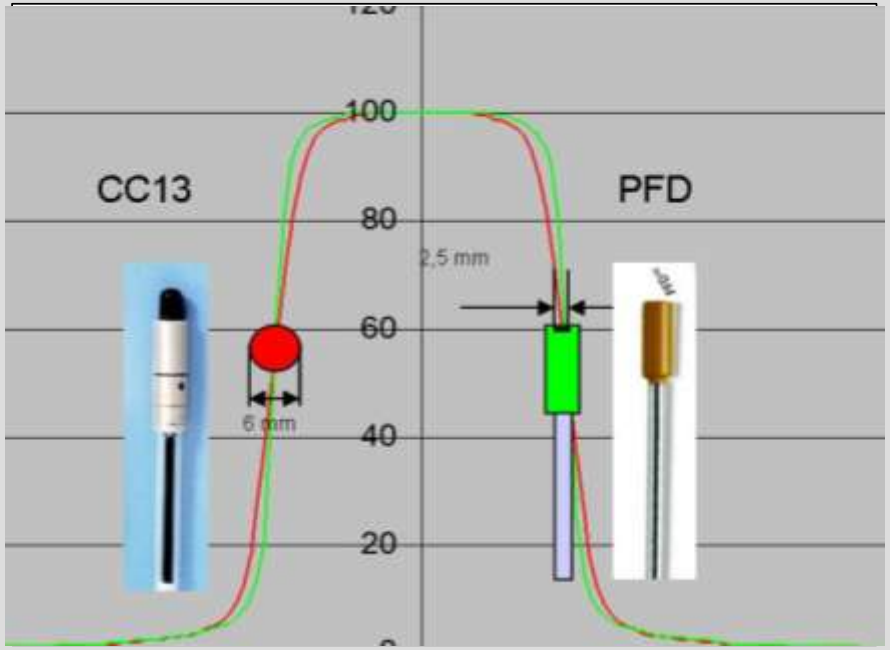

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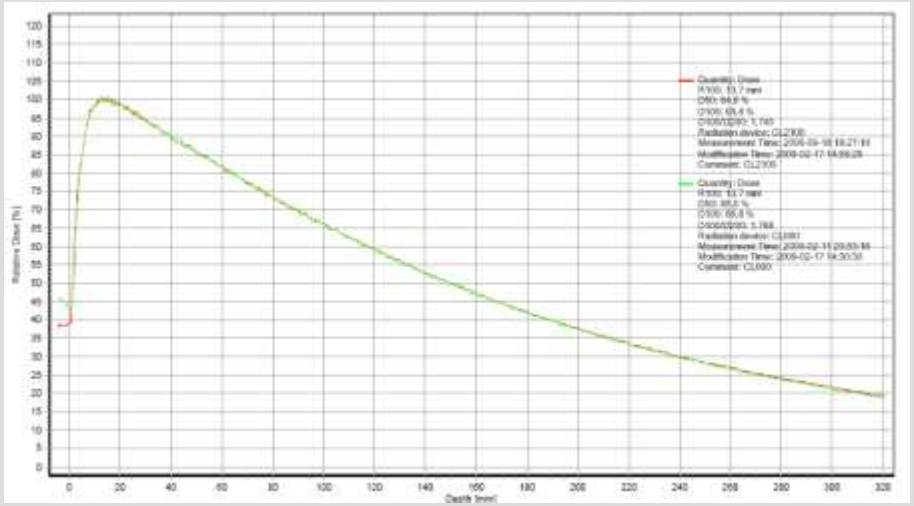

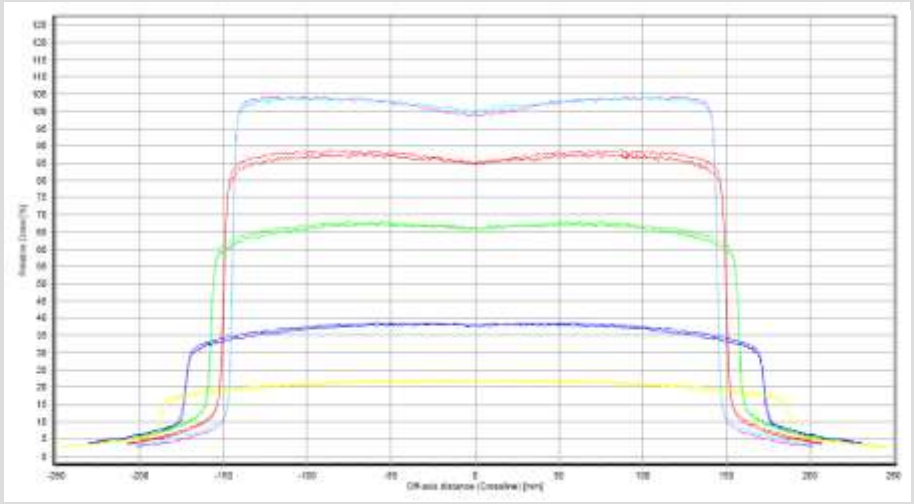

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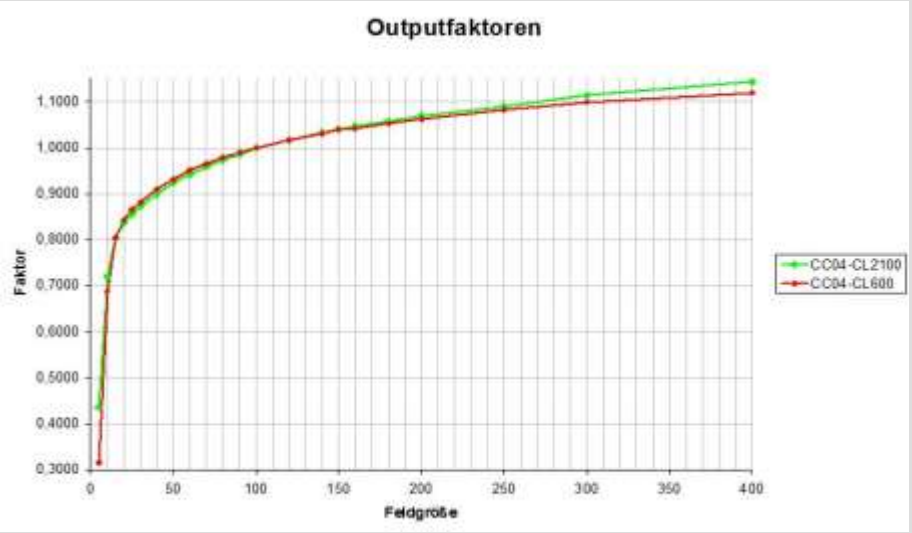

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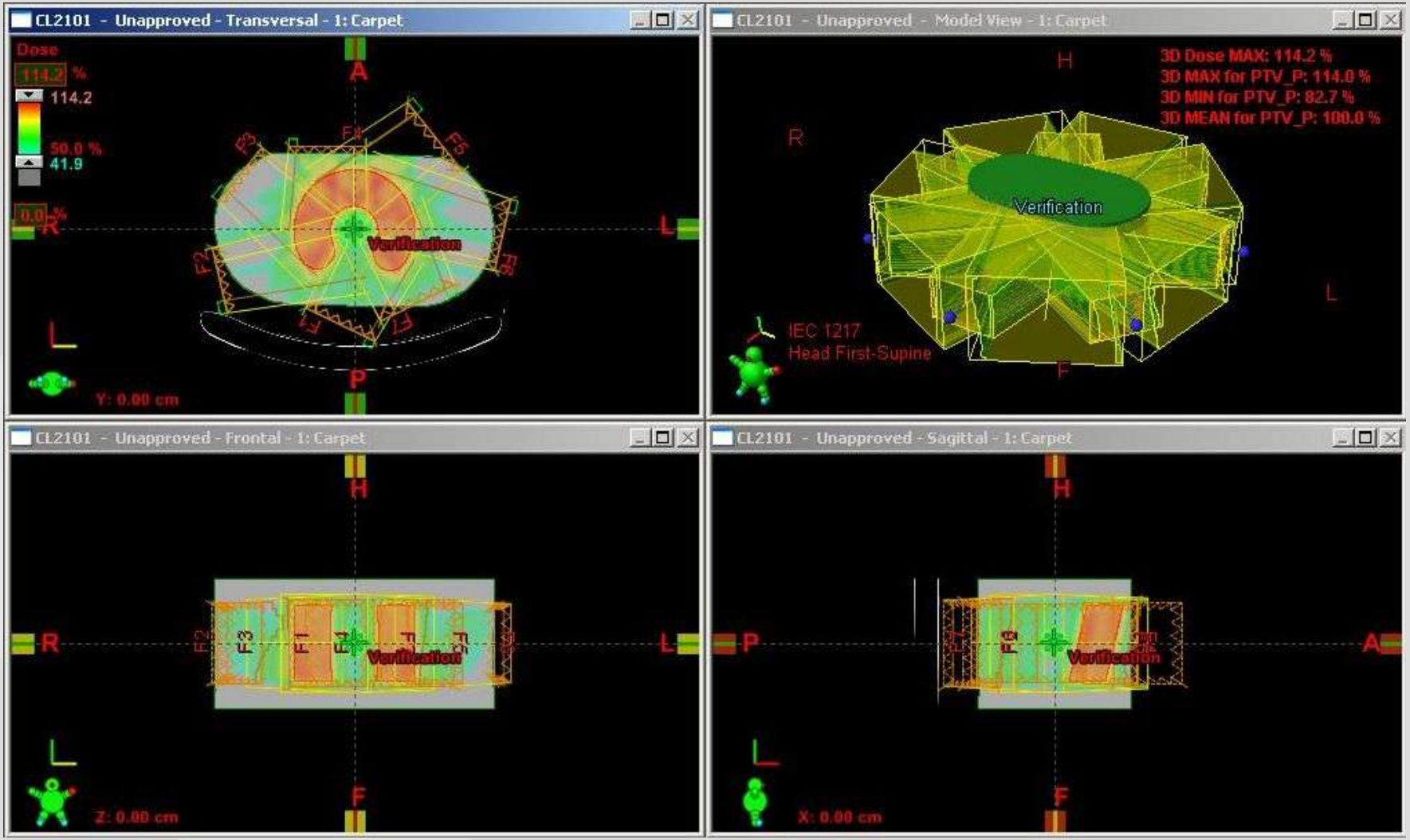
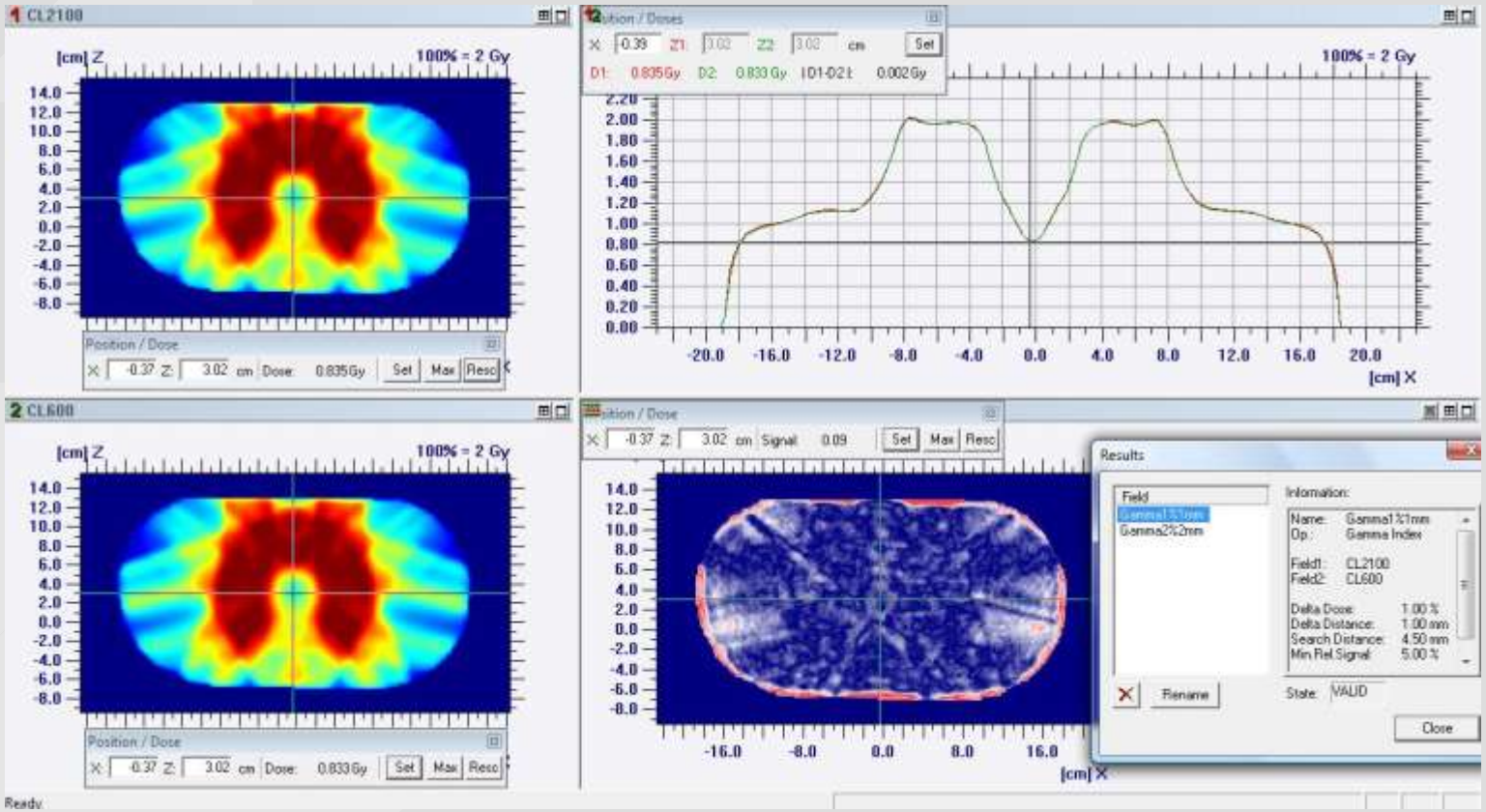
Comparison between the IMRT at the CL2100 and CL600



Comparison of the optimization and dose calculation

CL2100

CL600

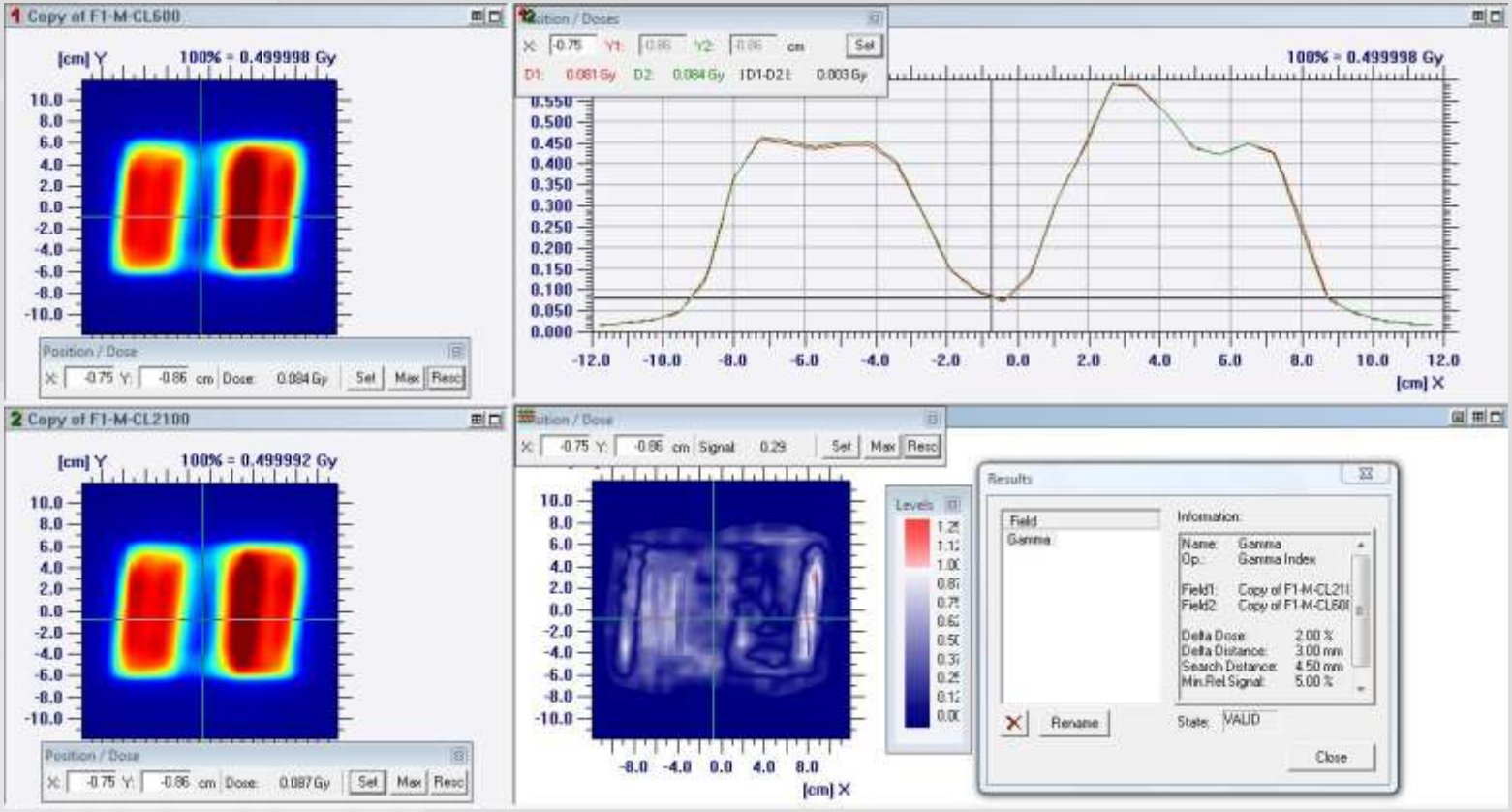


Gamma Index 1% 1mm

Comparison of the dose delivery

CL600

CL2100



Gamma Index 2% 3mm

field related verification of the dose delivery

Plan calculated for the Clinac CL2100 but delivered with the Clinac CL600

Analyzed with gamma index calculation; measured versus calculated data.

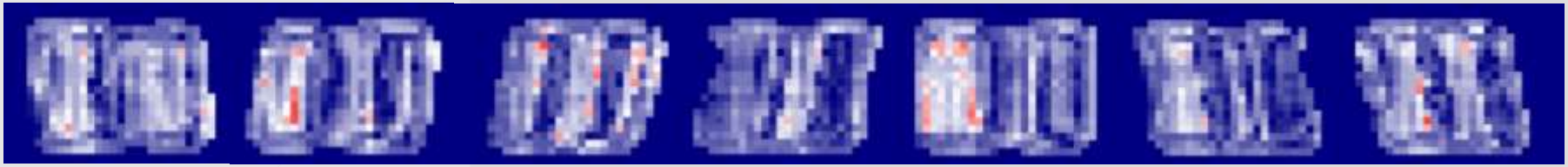
Plan calculated for the Clinac CL600 but delivered with the Clinac CL2100

Analyzed with gamma index calculation; measured versus calculated data.

field related verification of the dose delivery

CL2100 → CL2100

CL2100 → CL600



CL600 → CL600

CL600 → CL2100