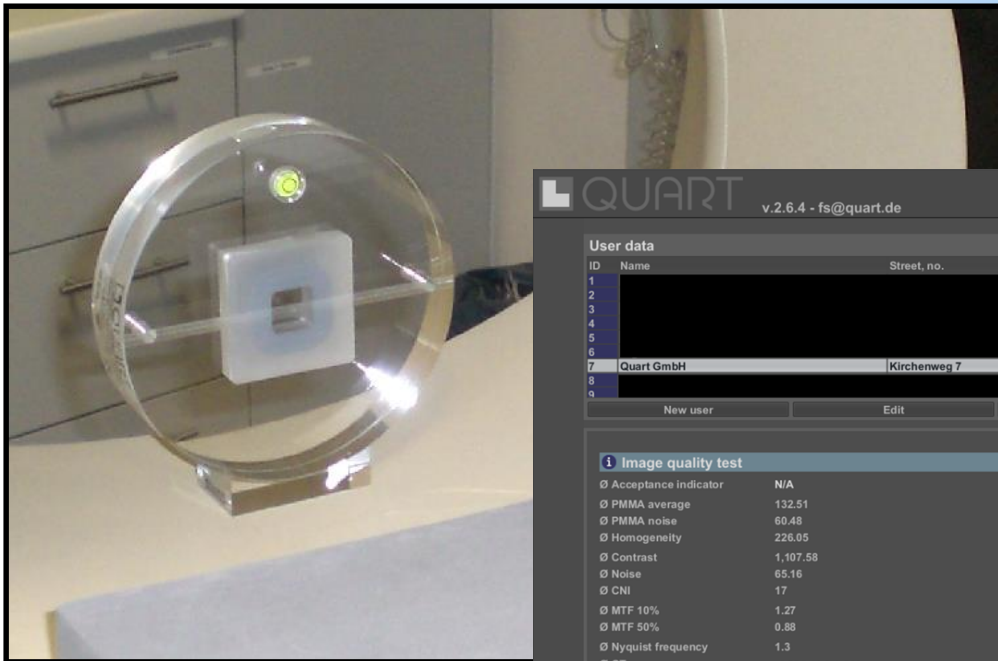


QA solutions for cone beam and computed tomography

Dr. Felix H. Schöfer
QUART, Zorneding, Germany
fs@quart.de



CTtec - Imaging Performance Test



QUART v.2.6.4 - fs@quart.de **CTTEC**

User data

ID	Name	Street, no.	City
1			
2			
3			
4			
5			
6			
7	Quart GmbH	Kirchenweg 7	85604 Zorneding
8			
9			

New user Edit Delete

Image quality test

Ø Acceptance indicator	N/A
Ø PMMA average	132.51
Ø PMMA noise	60.48
Ø Homogeneity	226.05
Ø Contrast	1,107.58
Ø Noise	65.16
Ø CNR	17
Ø MTF 10%	1.27
Ø MTF 50%	0.88
Ø Nyquist frequency	1.3
Ø CT _{air}	-1,021.46 [13.32]
Ø CT _{PMMA}	162.09 [72.89]
Ø CT _{PVC}	1,291.85 [107.94]
Ø CT _{water}	8.6 [265.05]
Ø Contrast _z	1,831.73
Ø Noise _z	100.41
Ø CNR _z	18.24

X-ray device

ID	Manufacturer	Model	Location	Created at
8	Manufacturer	Model	Location	Nov 16, 2018 11:56 AM

New device Edit Delete

Test results

ID	Test from	Type of test	Image tests
13	Nov 16, 2018 11:56 AM	NONE	3

New MSCT test New CBCT test No dose test Delete

ID	Image test from	Latest edit	Ø AI	Runs
10	Nov 16, 2018 11:56 AM	--	N/A	0
11	Nov 16, 2018 11:59 AM	Nov 16, 2018 11:57 AM	N/A	1
15	Jun 24, 2020 11:43 AM	Jun 24, 2020 11:47 AM	N/A	1

Perform image test Edit Delete

Information

Test series saved

24% 537MB

Standard Phantom

DIN6868-161&15 IEC 61223-3-7



Standard Software

QUART

v.2.6.4 - fs@quart.de

CTTEC

User data

ID	Name	Street, no.	City
1			
2			
3			
4			
5			
6			
7	Quart GmbH	Kirchenweg 7	85604 Zorneding
8			
9			

New userEditDelete

i Image quality test

Ø Acceptance indicatorN/A

Ø PMMA average132.51

Ø PMMA noise60.48

Ø Homogeneity226.05

Ø Contrast1,107.58

Ø Noise65.16

Ø CN17

Ø MTF 10%1.27

Ø MTF 50%0.88

Ø Nyquist frequency1.3

Ø CT_{air}-1,021.46 [13.32]

Ø CT_{PMMA}162.09 [72.89]

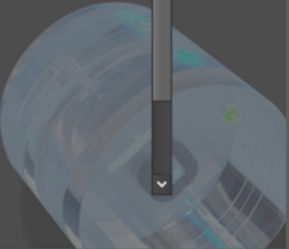
Ø CT_{PVC}1,291.85 [107.94]

Ø CT_{water}8.6 [265.05]

Ø Contrast_z1,831.73

Ø Noise_z100.41

Ø CN1_z18.24



X-ray device

ID	Manufacturer	Model	Location	Created at
8	Manufacturer	Model	Location	Nov 16, 2018 11:56 AM

New deviceEditDelete

ID Test fromType of testImage tests

13 Nov 16, 2018 11:56 AMNONE3

New MSCT testNew CBCT testNo dose testDelete

ID	Image test from	Latest edit	Ø AI	Runs
10	Nov 16, 2018 11:56 AM	--	N/A	0
11	Nov 16, 2018 11:59 AM	Nov 16, 2018 11:57 AM	N/A	1
15	Jun 24, 2020 11:43 AM	Jun 24, 2020 11:47 AM	N/A	1

Perform image testEditDelete

Information

Test series saved

24%

537MB

Dose

Geometric data

Distance of the focal spot from the centre of rotation (mm)	50
Distance of the focal spot from the detector (mm)	80
Horizontal diameter of scanned volume (mm)	20
Horizontal diameter of radiation field at detector (mm)	30

Dosimeter

Manufacturer	Quart, Zorneding, Germany
Model	didoNeo
Serial number	0001

Dose measurements

Dose 1 (mGy)	7
Dose 2 (mGy)	6
Dose 3 (mGy)	8
Dose mean (mGy)	6.5
Dose maximum deviation (%)	7.692
Dose at the isocentre (mGy)	15.6
Dose at the isocentre is within tolerance (<50mGy)	

Imaging: Preparation

Test images used

Axial slice

1_resolution_image_i0016_0000b.dcm

Edit path to test image

DICOM image readable

Homogeneity slice

2_homogeneity_image_i0040_0000b.dcm

Edit path to test image

Water slice

3_Water_i0009_0000b.dcm

Sagittal slice

4_Sagittal_DCT0205_original.dcm

Serial no. of the test-phantom used

Test-phantom serial no.

0001



Conventional tests

Image display (monitor)

☒ OK

☐ Not OK

Radiation output: tube potential, leakage, filtration, repeatability, reproducibility

☒ OK

☐ Not OK

Beam collimation and alignment

☒ OK

☐ Not OK

Artefacts

☒ OK

☐ Not OK

Operator protection (report from radiation protection expert is provided)

☒ OK

☐ Not OK

Imaging: Evaluation

QUART

v.2.6.4 - fs@quart.de

CTTEC

NYQ

CNR

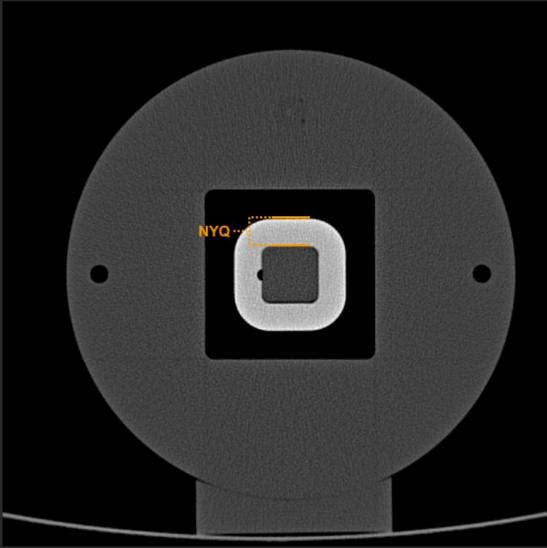
HOM

MTF

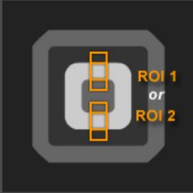
std

save

gear



Nyquist Frequency



Define the ROI by dragging a selection area and position it as in the example image.

Nyquist frequency: 1.30

Contrast-to-Noise Indicator

Contrast: ???

Noise: ???

CNI: ???

Homogeneity

PMMA average: ???

PMMA noise: ???

Homogeneity: ???

Modulation Transfer Behavior

MTF 10%: ???

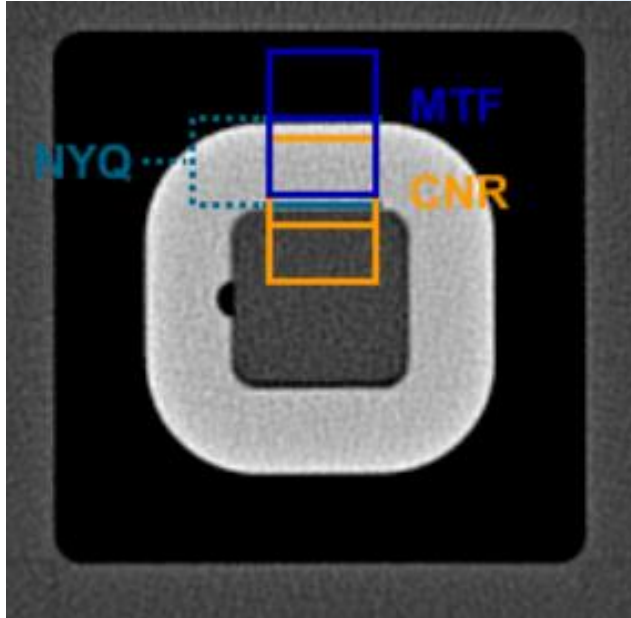
RATE 500/... ???

Test series updated

538MB

Imaging: Evaluation

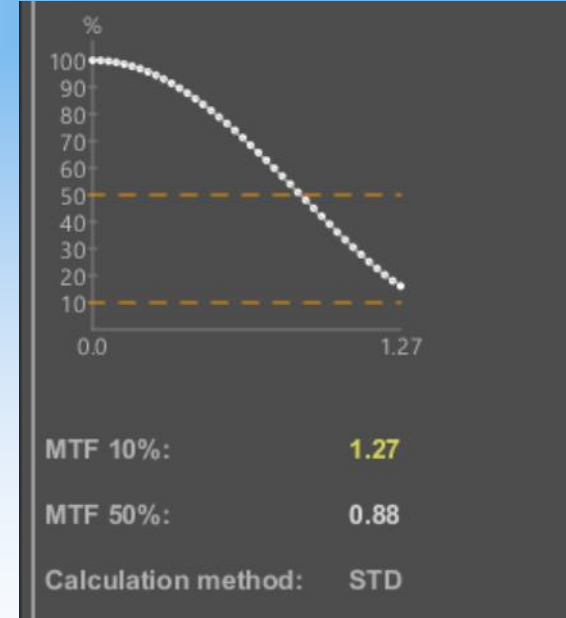
dataset



guidance



result



Reporting



Parameter	Run 1
Monitor	Ok
Functional testing	Ok
Alignment	Ok
Artefacts	Ok
Radiation protection	Ok
Acceptance indicator	311.63
PMMA average	132.51
PMMA noise	60.48
Homogeneity	226.05
Contrast	1,107.58
Noise	65.16
CNI	17.00
MTF 10%	1.27 ³
MTF 50%	0.88
Nyquist frequency	1.30
CT _{air}	-1,021.46
CT _{PMMA}	162.09
CT _{PVC}	1,291.85
CT _{water}	8.60
Contrast _z	1,831.73
Noise _z	100.41
CNI _z	18.24
MTF _z 10%	2.00 ²
MTF _z 50%	0.72
Nyquist frequency _z	2.40

CT-Quality control test

created on Jul 16, 2020

Controller:

Dr. Felix H. Schöfer ceo

User data:

Quart GmbH
Kirchenweg 7
85604 Zorneding
Tel.: +498106249118
Fax: +498106249119
Email: info@quart.biz

X-ray device:

Manufacturer: Manufacturer
Model: Model
Serial no. x-ray device: Serial no.
Active size of detector: 20 x 20 cm²
Imaged volume: r10cm h5cm
Entrance dose rate: 1mGy/s
Maximum scan time: 12 sec
kV/mA settings: 100kV, 100mA
Selected mode: pulsed
Test-phantom serial no.: 0001

Test program:

Software: CTlec 2.6.4
Manufacturer: Quart GmbH (www.quart.de)

Dosemeter: Quart, Zorneding, Germany didoNeo
Serial number: 0001

Compliant with the EFOMP-ESTRO-IAEA guideline

Test results

Parameter	TOL	Run 1	Run 2	Run 3	Average
Acceptance indicator	--	311.63	--	--	311.63
Homogeneity	--	226.05	--	--	226.05
CNI	--	17.00	--	--	17.00
MTF 10%	--	1.27 ¹	--	--	1.27
MTF 50%	--	0.88	--	--	0.88
Nyquist frequency	--	1.30	--	--	1.30
CT _{air}	--	-1,021.46	--	--	-1,021.46
CT _{PMMA}	--	162.09	--	--	162.09
CT _{PVC}	--	1,291.85	--	--	1,291.85
CT _{water}	--	8.60	--	--	8.60
CNI _z	--	18.24	--	--	18.24
MTF _z 10%	--	2.00 ²	--	--	2.00
MTF _z 50%	--	0.72	--	--	0.72
Nyquist frequency _z	--	2.40	--	--	2.40

MTF-Calculation method: ¹ 161 ² PRE ³ STD / All results are within tolerance.

Image display (monitor)

Radiation output: tube potential, leakage, filtration, repeatability, reproducibility

Beam collimation and alignment

Artefacts

Operator protection (report from radiation protection expert is provided)

Exposure: Dose 1: 7mGy Dose 2: 6mGy Dose 3: 8mGy

The maximum deviation of the dose measurements from the dose mean (7mGy) is: 14.29%

Dose at the isocentre: 16.8mGy is within tolerance (<50mGy and less than 40% deviation from the reference value)

Ok ☒ / Not ok ☐

Ok ☒ / Not ok ☐

Ok ☒ / Not ok ☐

Ok ☒ / Not ok ☐

Ok ☒ / Not ok ☐

Test result: Acceptable

Registered to: fs@quart.de

Date, signature

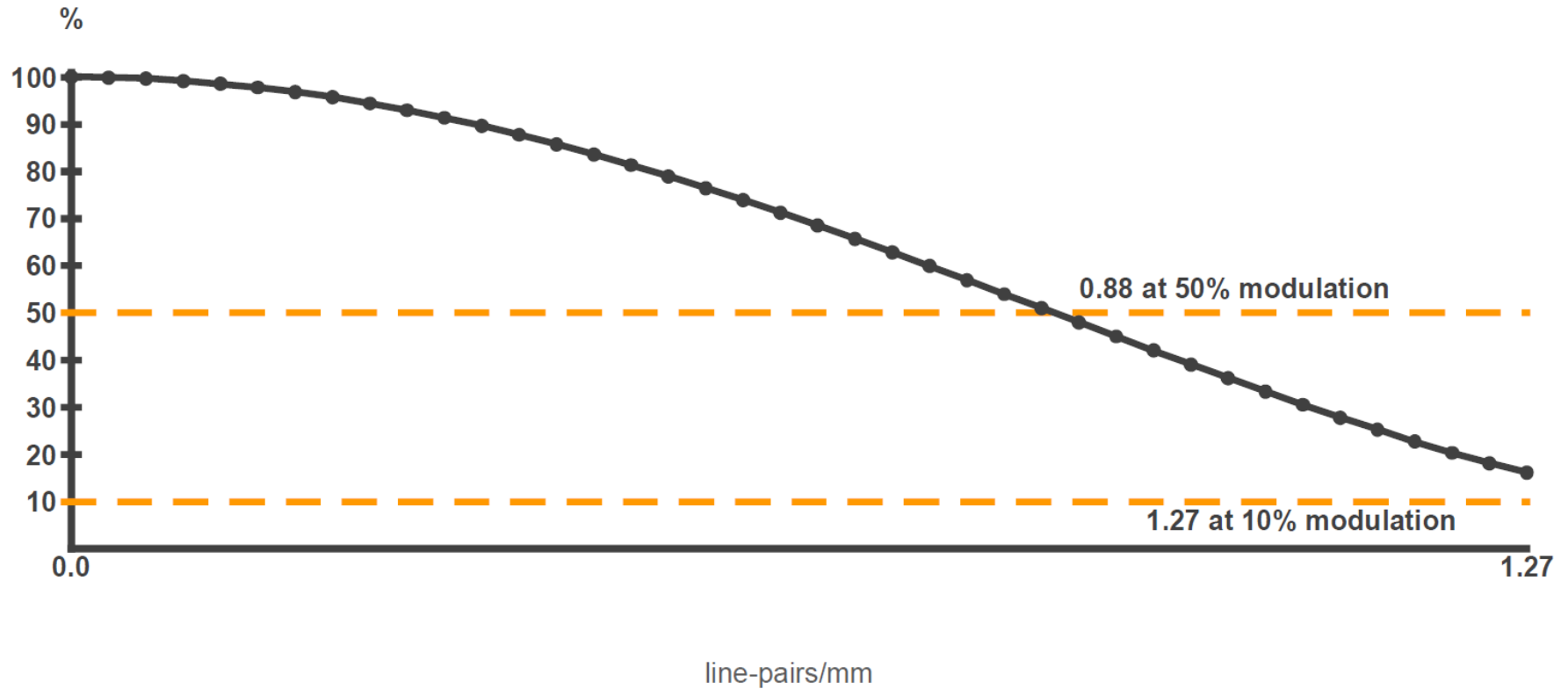
Reporting

Parameter	TOL	Run 1	Run 2	
Acceptance indicator	--	311.63	--	
Homogeneity	--	226.05	--	
CNI	--	17.00	--	
MTF 10%	--	1.27 ³	--	
MTF 50%	--	0.88	--	
Nyquist frequency	--	1.30	--	
CT _{air}	--	-1,021.46	--	
CT _{PMMA}	--	162.09	--	
CT _{PVC}	--	1,291.85	--	
CT _{water}	--	8.60	--	
CNI _z	--	18.24	--	
MTF _z 10%	--	2.00 ²	--	
MTF _z 50%	--	0.72	--	
Nyquist frequency _z	--	2.40	--	

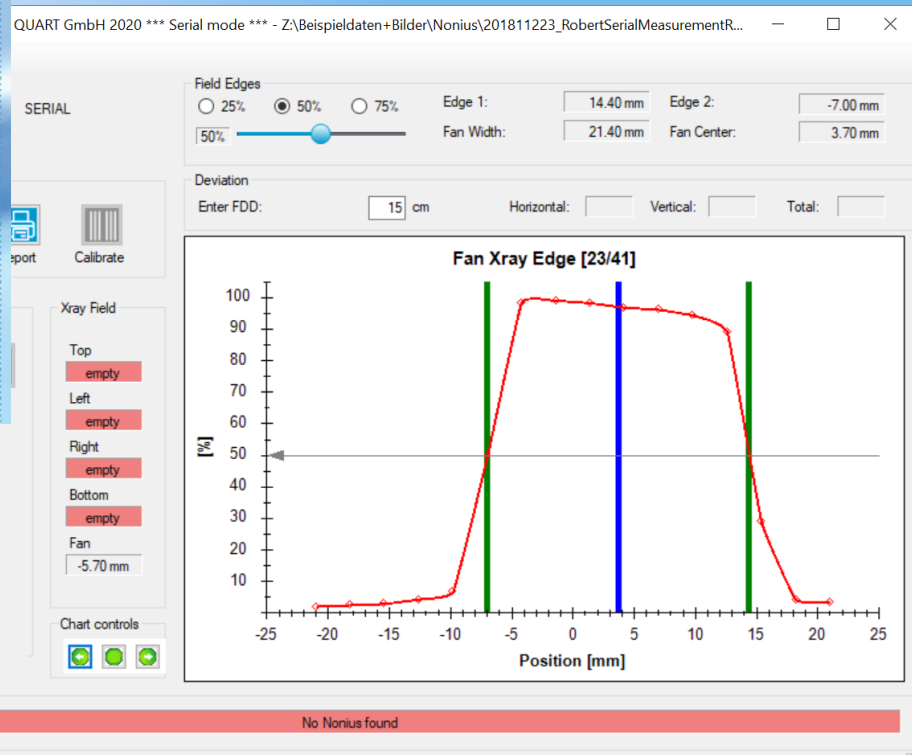
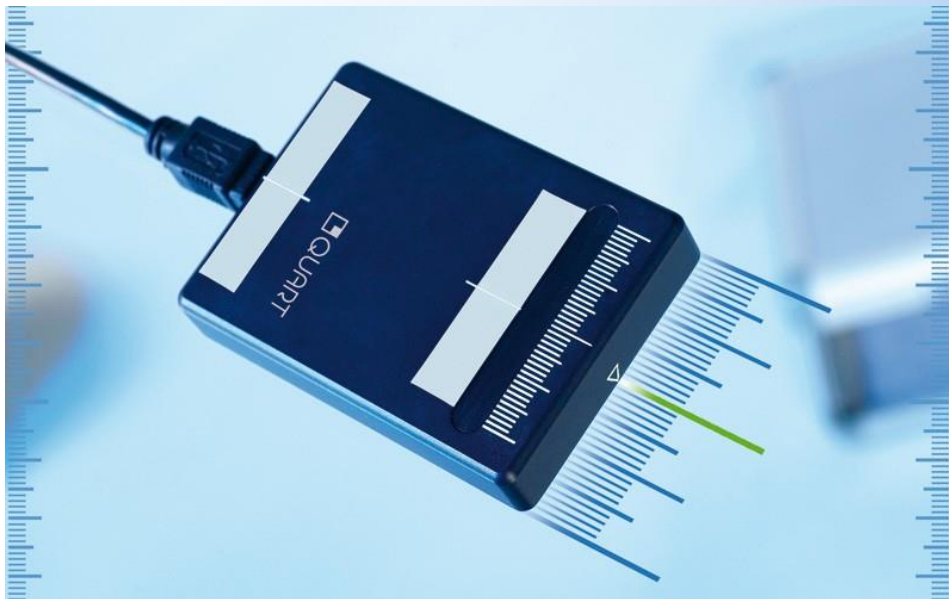
MTF-Calculation method: ¹ 161 ² PRE ³ STD / All results are within tolerance.

Reporting

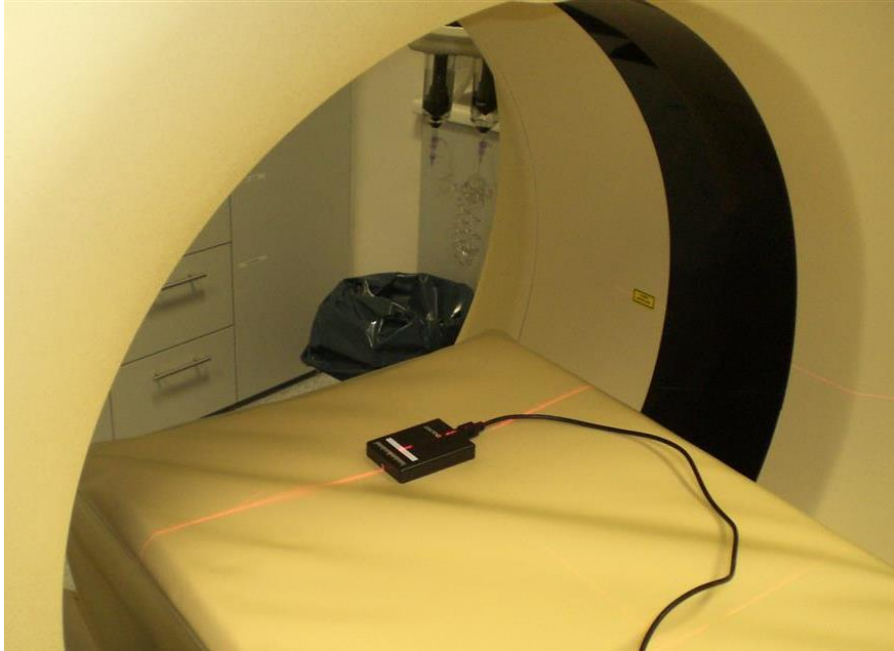
MTF (Run 1)



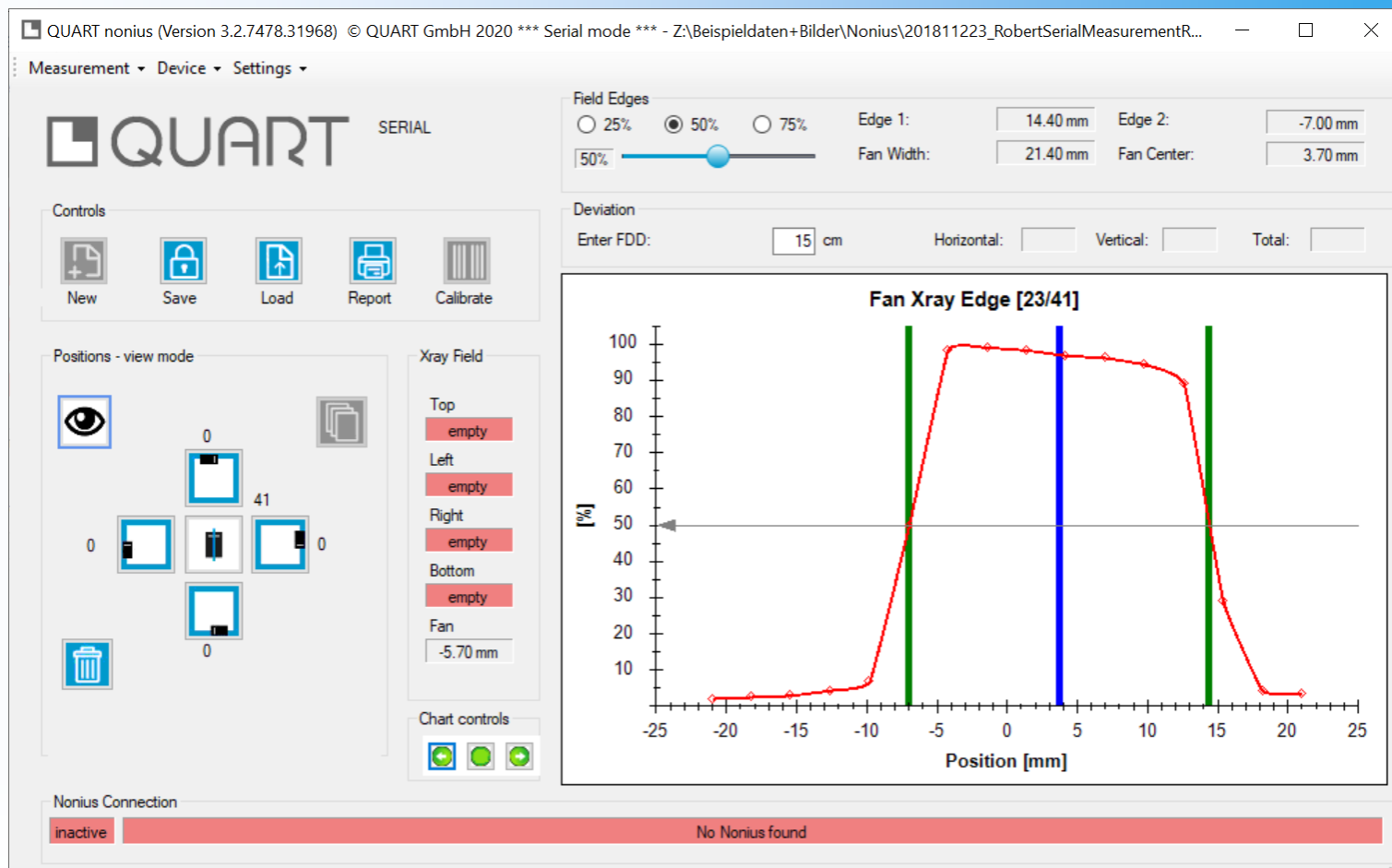
Nonius - Collimation Test



Position accuracy test: Nonius is positioned in the isocenter and aligned with the positioning lights



Nonius - collimation test



Nonius - collimation test

