

# Eine komplette Qualitätssicherung für die moderne Strahlentherapie

Mobius 3D

Mobius FX

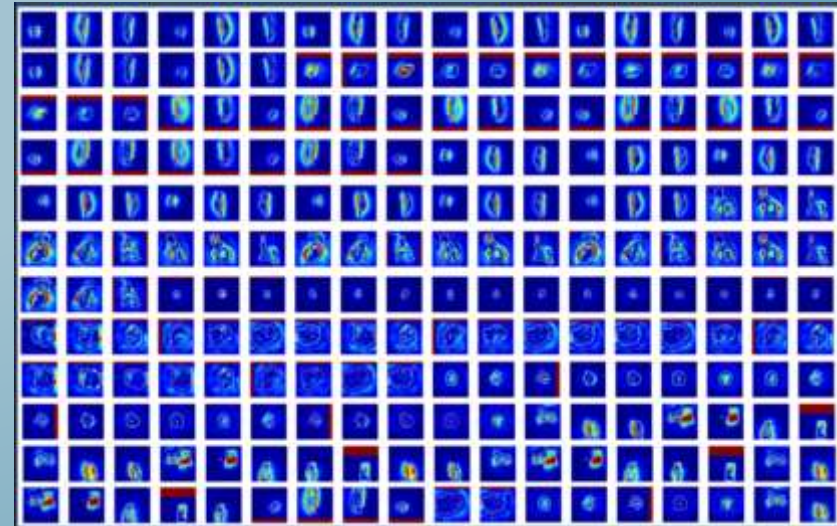
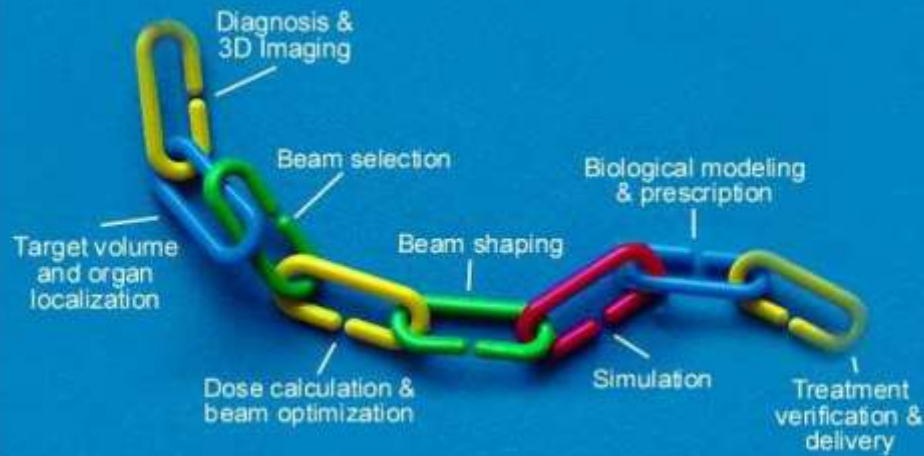
Mobius MVP

*Johann Kindlein*



[www.medinex.com.de](http://www.medinex.com.de)

# WIE MÖCHTEN SIE DIE DATENFLUT IN DER STRAHLENTHERAPIE ZEITEFFIZIENT IM AUGE BEHALTEN ?





# WIE MÖCHTEN SIE VERSTECKTE FEHLER FINDEN UND UNFÄLLE VERHINDERN ?



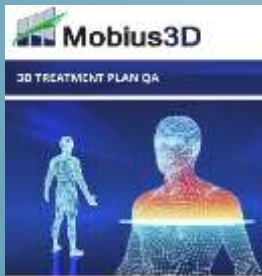
# WIE MÖCHTEN SIE DIE FEIN ABGESTIMMTE FEHLERLOSE ZUSAMMENARBEIT IHRER SYSTEME SICHERN UM UNFÄLLE ZU VERHINDERN?



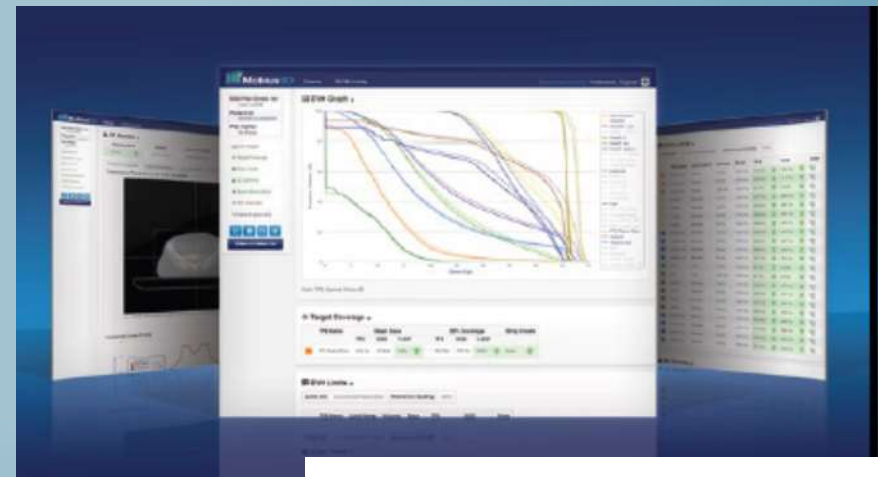
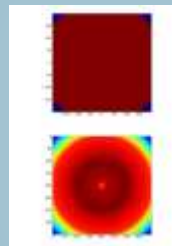
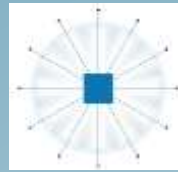
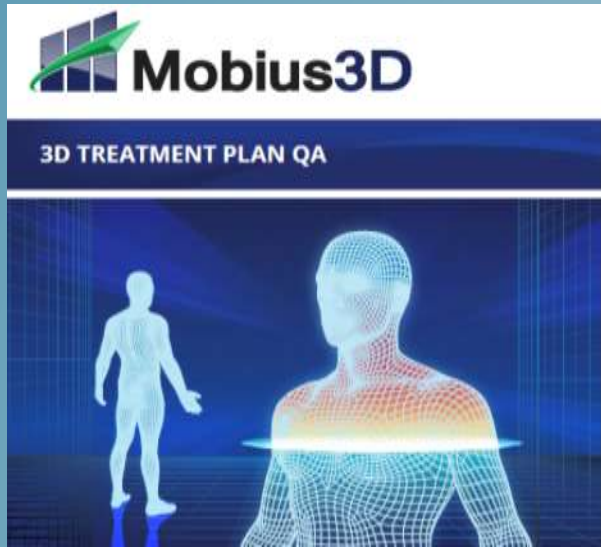


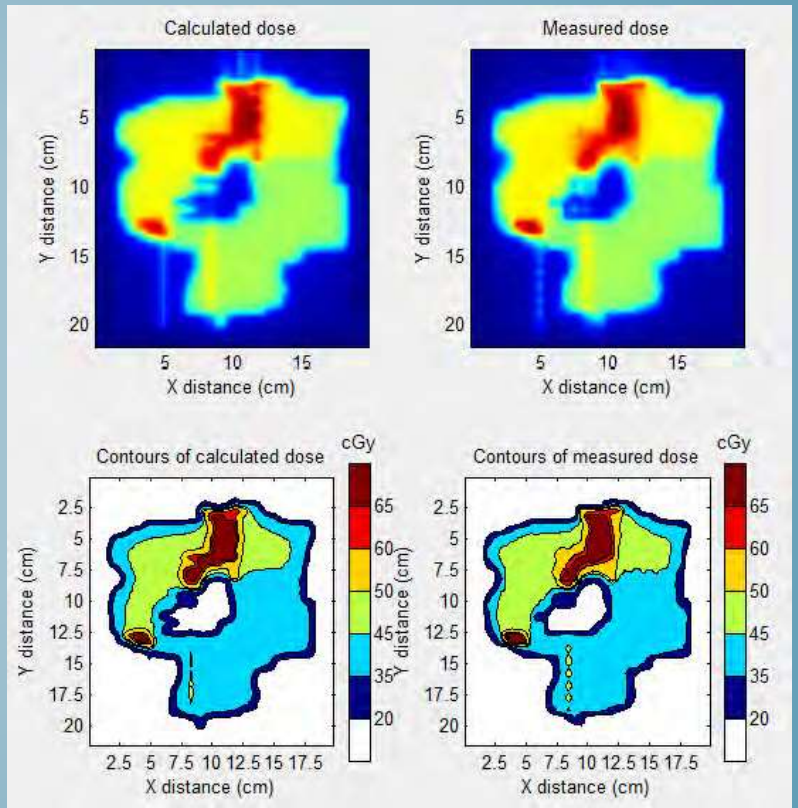
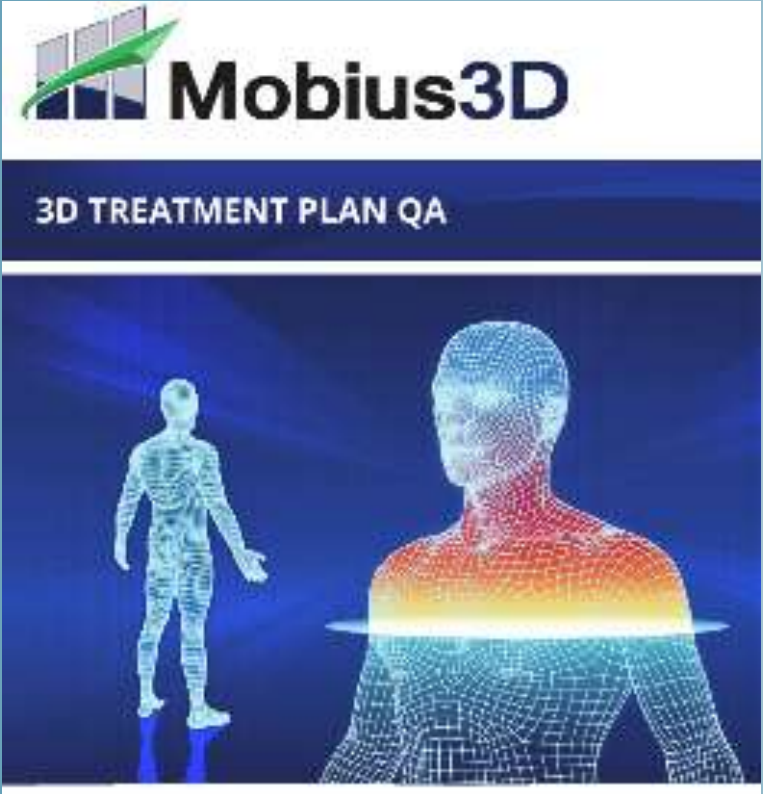
# Die **Mobius** Produktlinie ist eine effiziente, zeitsparende und effektive Lösung für die :

- *Planungsüberprüfung*
- *Fraktionsüberprüfung*
- *Datenintegrität*
- *Messüberprüfung*
- *Versteckte Fehler zu entdecken*



# MOBIUS 3D AUF EINEN BLICK







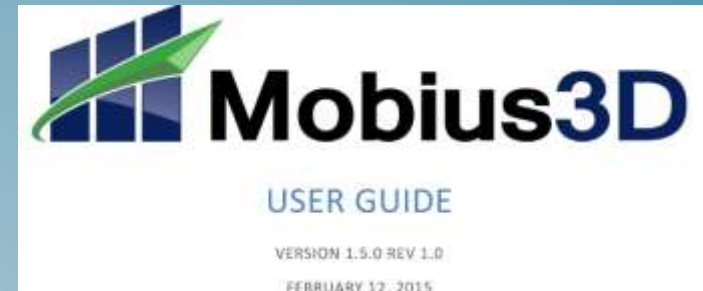
# MOBIUS 3D – KEY FEATURES

## Mobius 3D

Das automatische System für 3D- Bestrahlungsplanung QA

### Key Features

- ✓ 3 % Genauigkeit für IMRT & VMAT Anwendungen mit komplexer Anatomie
- ✓ PlugIn -Einsatzbereitschaft
- ✓ Kein Zeitaufwand
- ✓ Automatischer Start mit minutenschnellen GPU Berechnungen
- ✓ Voreinstellungen der Server-Funktionen
- ✓ Voreinstellungen der Schnittstellen Ihrem Planungssystem und Linearbeschleuniger
- ✓ Unabhängiger schneller „Collapsed-Cone Faltungsüberlagerungs (CCCS )-Algorithmus“
- ✓ Gold Standard „Commissioning-Beam – Modell“ zur Überprüfung die Ihrer Messdaten
- ✓ Automatisches Importieren der DICOM RT Planungsdaten.
- ✓ Verwendung der Planungs-CT Daten für die Berechnungen
- ✓ Automatische Kontrolle der DVH Zielvolumen
- ✓ Überprüfung der Dosis im gesamten Patientenbehandlungsvolumen
- ✓ MU Prüfung in mehr als einem einzigen Punkt (3D)
- ✓ Patienten Heterogenitäten werden automatisch mit den CT- Daten berücksichtigt
- ✓ Überprüft ob die DVH-Ziele Ihrer Pläne erfüllt werden
- ✓ Berechnung der 3D-Passing Rate





# MOBIUS 3D – KEY FEATURES

- ✓ 3D Gamma-Analyse in einzelnen CT-Schnitten (Transversal, Koronar, Sagital)
- ✓ Individuelle ROI-Einstellungen mit Identifizierung der anatomischen Strukturen.
- ✓ Einstellung individueller Toleranzen für Warnungen
- ✓ Streu-Voxel Erkennung in den Zielstrukturen Verhinderung falscher Dosisberechnungen
- ✓ Vorinstallierte DVH Zielvorgaben von RTOG und TG -101 DVH
- ✓ PDF- Reports für die Planungsdaten jedes Patienten
- ✓ Intuitive Browser-Schnittstellen und Bedienung
- ✓ Browser Zugang von Laptops, Tablets und Handys
- ✓ Kompatibel mit jedem modernen Bestrahlungsplanungssystem
- ✓ Kompatibel für konventionelle Beschleuniger und Tomo-Geräten
- ✓ Benutzer Verwaltung, Zugangsberechtigungen und Passwörter  
Für Physiker und Ärzte.
- ✓ Überprüfung der MLC Funktionalität (Bewegungsfähigkeit) ( wie das gemacht wird ? )



# MOBIUS 3D – KEY FEATURES

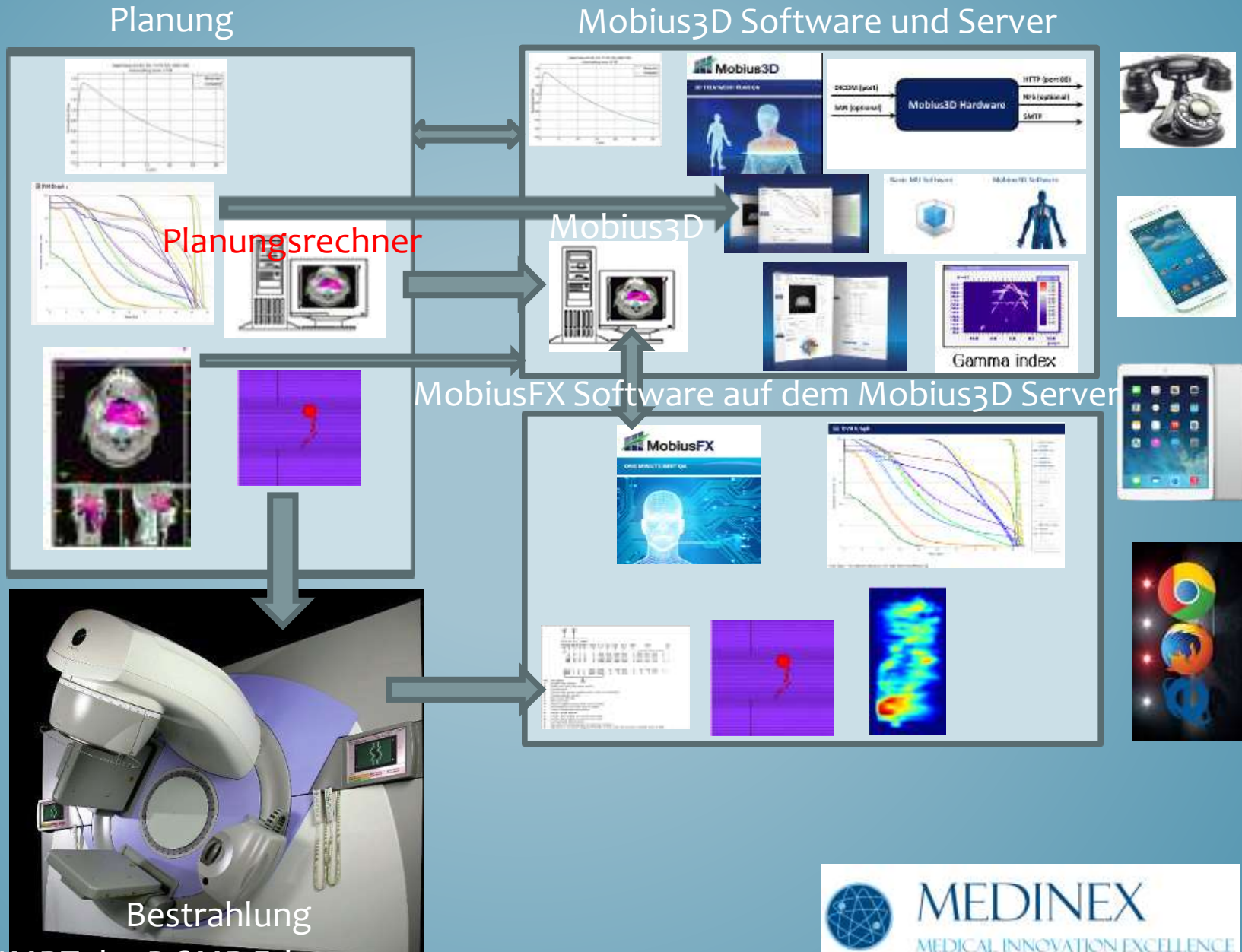
- ✓ Überprüfung der Kollisionsgefahr zwischen Gantry und Patient
- ✓ Bestimmung der benötigten MLC Zeiten und der Bestrahlungszeit
- ✓ Behandlungsarten
  - Photonen
  - Elektronen - Pencil Beam Neuredefinition Algorithmus ( PBRA )
  - Alle Energien
  - SRS / SBRT (MLC)
  - ARCS & VMAT IMRT
  - Free Flat Filter ( FFF)
  - Keil-Einschübe (Physical , Dynamic, Universal)
- ✓ Bestrahlungsplanungssysteme (TPS)
  - Pinnacle
  - Eclipse
  - XIO
  - iPlan
  - RayStation
  - Masterplan
- ✓ Multileafkollimatoren
  - Millenium Series
  - BrainLab m3
  - Strahl Modulator
  - Siemens 160 ML
  - HD 120
  - MLC i2
  - Optifocus



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# DAS FUNKTIONSPRINZIP





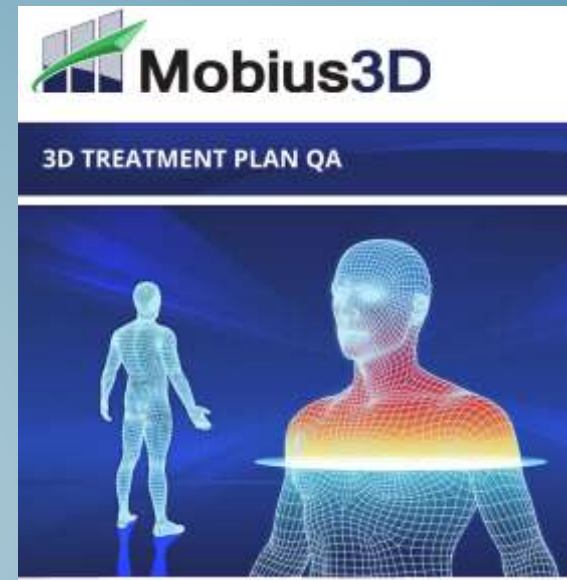
# MOBIUS 3D LIZENZEN PRO LINAC



Username

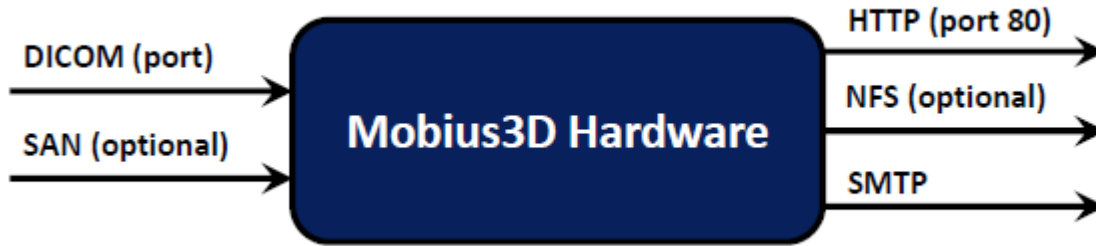
Password

[Log In](#)



Institution Name	Machine Name	Matched Machines	Vendor	Model	MLC	100 MU Dose at 10 cm for 10x10 field (cGy)				
						6	7	10	15	18
Unknown Institution	21EX		Varian	21 EX	Millennium 120	66.3				79.6
Unknown Institution	2300IX		Varian	2300IX	Millennium 120	66.6				79.4
Unknown Institution	600C		Varian	600C	Millennium 120	67.2				
Unknown Institution	ARTISTED		Siemens	Artiste	Siemens 160	67.6				78.3
Unknown Institution	Agility		Elekta	Agility	Agility 160	67.16				75.95

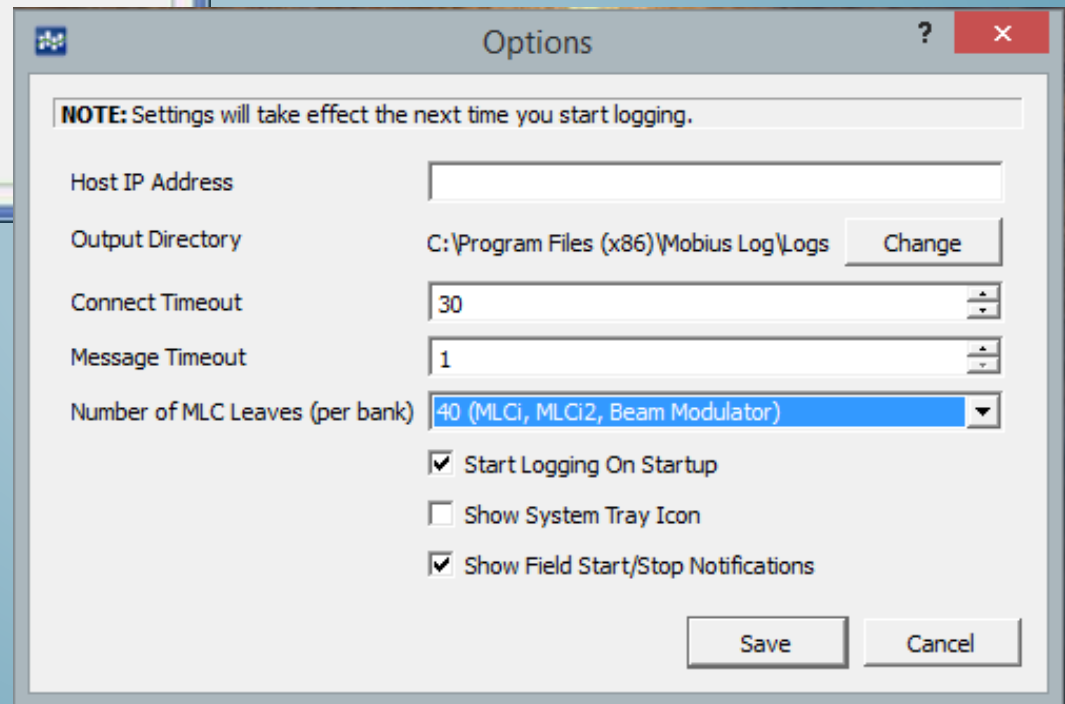
# MOBIUS 3D MIT HARDWARE SERVER UND SOFTWARE



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# MOBIUS 3D NETZWERKEINBINDUNG





# MOBIUS 3D ANWENDER EINSTELLUNGSMÖGLICHKEITEN



## Diagnostics



DICOM Files



Delivery Files



System Logs



Resource Usage



## Configuration



Manage Machines



ROI Settings



Plan Check Settings



CT to Density Settings



Manage Users



Network Setup



DICOM Device Setup



Manage Network Shares



Mail Setup



Clock Settings



## Maintenance



Update System Software



Reboot Mobius3D



Wipe Data



Shutdown Mobius3D



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# MOBIUS3D LINAC KOMPATIBILITÄT

Vendor	Supported Machine Models	Photon Energy (MV)	Supported Physical Wedge Angles	Virtual Wedge/Dynamic Wedge	Electron Energy [MeV] <i>(as applicable)</i>	SRS Cone Energy (MV) <sup>1</sup>
Accuray	TomoTherapy	6	N/A	N/A	N/A	N/A
Elekta	Synergy S	6, 10, 15	Universal wedge	Universal wedge	6, 7, 9, 10, 11, 12, 13, 15, 16, 18, 20	6
	Synergy, SL, SLi, Infinity, Precise, VersaHD	6, 10, 15, 18	Universal wedge	Universal wedge		N/A
		6FFF, 10FFF	N/A	N/A		
Siemens	Artiste	6, 18	15, 30, 45, 60	Yes	6, 8, 10, 12, 15, 18	N/A
	Oncor, Primus	6, 15, 18, 23	15, 30, 45, 60	Yes		
		10	N/A	Yes		
		6FFF	N/A	N/A		
Varian	2100C/D, 21EX/23EX, 21iX/23iX, Trilogy, TrueBeam/TrueBeam STx, Novalis Tx	4, 6, 10, 15, 16, 18, 23	15, 30, 45, 60	Yes	6, 9, 12, 15, 16, 18, 20	6, 6FFF, 6SRS
		8, 20, 25	N/A	Yes		
		6FFF, 10FFF, 6SRS	N/A	N/A		
	6EX, 600C, Novalis	6	15, 30, 45, 60	Yes		6



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# LINAC PARAMETER EINSTELLUNGEN

## Output Factor Table

Sample 6MV

Insert sizes (cm)	Air Gap Factor SSD (cm)					Output Factor Applicator Sizes (cm)				
	98	100	105	110	115	6x6	10x10	15x15	20x20	25x25
2x2	1.00	1.00	0.76	0.56	0.42	0.78	0.78	0.78	0.77	0.76
3x3	1.04	1.00	0.89	0.75	0.62	0.90	0.93	0.93	0.93	0.93
4x4	1.02	1.00	0.94	0.88	0.77	0.95	0.99	0.99	0.99	0.99
6x6	1.01	1.00	0.87	0.95	0.93	0.96	1.00	1.01	1.03	1.02
8x8	1.01	1.00	0.98	0.96	0.95	1.00	1.00	1.02	1.03	
10x10	1.01	1.00	0.98	0.97	0.95	1.00	1.00	1.02	1.03	
12x12	1.01	1.00	0.98	0.97	0.95		1.00	1.03	1.02	
15x15	1.01	1.00	0.98	0.97	0.95		1.00	1.01	1.01	
20x20	1.00	1.00	0.99	0.98	0.97			1.01	1.02	
25x25	1.00	1.00	0.99	0.98	0.98					1.01

Download CSV

## Customize Output Factors

Select A CSV File

Choose File No file chosen

NOTE:

M3D currently only accepts uploaded output factors values (in green above)

Upload CSV

## Customize Machine Configuration

Machine 23IX

Energy 6 MV

### Multileaf Collimator

DLG Correction From M3D's Default

0 mm

### Dose

Dose Rate

400 MU/min

Max MU Per Field

999

### Collimator Clearance

Distance Between Isocenter And Collimator Surface

40 cm

Collimator Radius

37.5 cm

Change Machine Configuration



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# MLC-KOMPATIBILITÄT

Vendor	MLC Model
Accuray	TomoTherapy
Elekta	Agility 160 MLCi/MLCi2 80 <sup>2</sup> BeamModulator 80 microMLC 112 (Apex)
Novalis	NovalisM3 52
Siemens	Siemens 82 Siemens 160 3DMLC 58
Varian	Millennium 120 Millennium 80 Millennium 52 High Definition 120

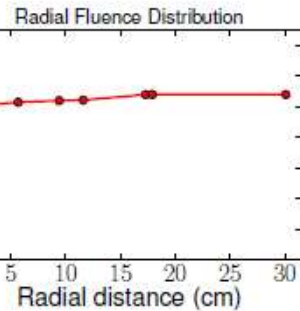
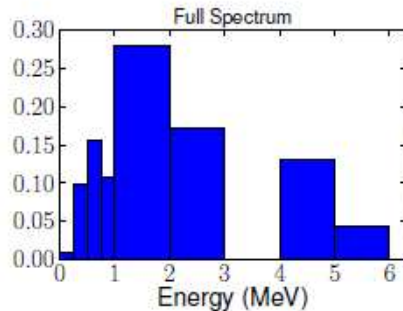


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# MOBIUS3D BEAM MODELL ANPASSUNG

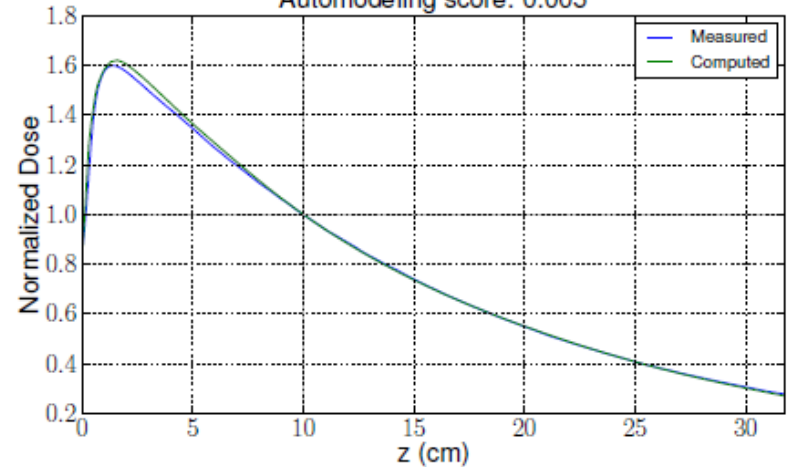
21iX 6MV: No Wedge



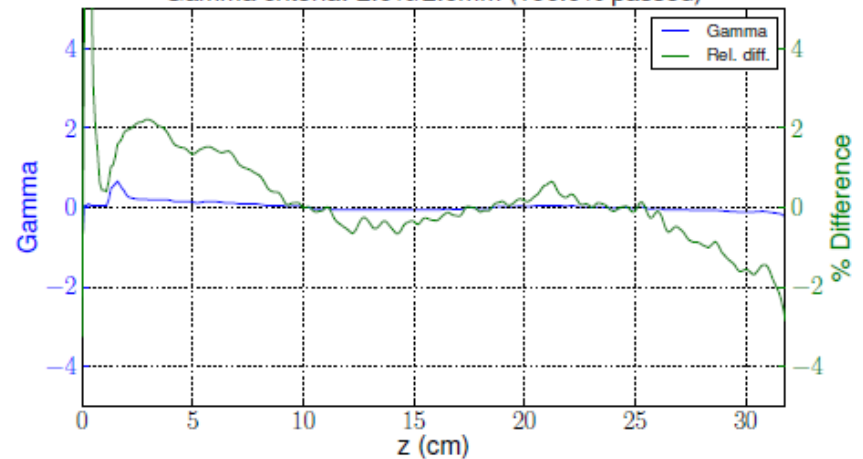
Jaw Transmission	
Fraction	0.006
Filter Scatter	
Gaussian width (cm)	3.58
Gaussian height	0.039
Offaxis Softening	
Factor	0.0687
MLC Leaves	
MLC Transmission	0.017
Curvature (cm)	10.8
Thickness (cm)	8.57
Source Size	
FWHM (cm)	0.177
Electron Contamination	
Surface contamination	0.439
Linear contamination	0.125
Linear distance (cm)	0.1
Coefficient	1.75
$C_1$	0.196
$C_2$	5.87
$C_3$	0.106
Offaxis coefficient	10.

Output Factors			
Field Size (cm)	OF	OF <sub>c</sub>	OF <sub>p</sub>
2	0.786	0.974	0.807
5	0.891	0.985	0.905
10	1.	1.	1.
20	1.11	1.01	1.09
30	1.17	1.03	1.13
40	1.21	1.07	1.13
Calibration			
10x10 field at 10 cm depth			
100MU dose: 66.1 cGy			

Depth Dose (X1/X2: 2.5/2.5, Y1/Y2: 2.5/2.5) (SSD 100)  
Automodeling score: 0.005



Gamma criteria: 2.0%/2.0mm (100.0% passed)



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# BEAM MODELL ANPASSUNGEN

### Customize Beam Model

Machine: 2100EX Energy: 8 MV Wedge: No Wedge

Field Size	5 cm depth	15 cm depth	25 cm depth
PDD Values, 5x5 Field, 100 cm SSD	84.20 Reference: 84.20% Current: 84.20%	46.28 Reference: 46.28% Current: 46.28%	25.55 Reference: 25.55% Current: 25.55%
PDD Values, 10x10 Field, 100 cm SSD	85.77 Reference: 85.77% Current: 85.77%	50.07 Reference: 50.07% Current: 50.07%	28.68 Reference: 28.68% Current: 28.68%
PDD Values, 20x20 Field, 100 cm SSD			

#### Off-Axis Ratios at 5cm Depth, 20x20 Field, 100 cm SSD

1 cm	2.5 cm	5 cm	7.5 cm
100.40 Reference: 100.40% Current: 100.40%	101.10 Reference: 101.10% Current: 101.10%	102.54 Reference: 102.54% Current: 102.54%	103.26 Reference: 103.26% Current: 103.26%

#### Output Factors (including Wedge Factors) at 10cm Depth, 100 cm SSD

2x2	5x5	10x10	30x30
0.79 Reference: 0.79 Current: 0.79	0.89 Reference: 0.89 Current: 0.89	1.00 Reference: 1.00 Current: 1.00	1.17 Reference: 1.17 Current: 1.17

Note: Beam model customization may take a while to complete. During this time, plan checks may proceed more slowly than normal. Once beam model customization is finished an e-mail will be sent out to the configured e-mail recipients.

[Queue Beam Model Customization](#) [Reset Beam Model](#)



# ANWENDERZUGANGS-EINSTELLUNGEN

## Manage Users

**Administrators (2)**  
Mr. Physie Physics  
Mrs. Dosie Dosimer

**Dosimetrists (1)**  
Mrs. Dosie Dosimer

**Physicians (1)**  
Dr. Doc Doctor

**Physicists (1)**  
Mr. Physie Physics

**Therapists (0)**

[Add User...](#)

### Edit User — Mrs. Dosie Dosimer (user)

Salutation: Mrs.

First Name: Dosie

Last Name: Dosimer

Group: Dosimetrists

Administrator:

[Save Changes](#) [Change Password...](#) [Remove User](#)

## Network Settings

Use DHCP (MAC address: 14:da:e9:f4:b0:43)  
 Configure network manually

IP address:

Netmask: 255.255.255.0

Gateway:

Broadcast: 255.255.255.255

Nameserver:

### Current Network Configuration

IP address	172.22.22.136
Netmask	255.255.255.0
Gateway	172.22.22.1
Broadcast	172.22.22.255
Nameservers	172.22.22.1

[Save Settings](#) [Cancel](#)

## Mail Settings

Sender E-Mail Address: Mobius3D <do-not-reply@mobius3d>

Default Recipient E-Mail Addresses (one per line):

SMTP Server:

SMTP Port: 25

SMTP User (if required):

SMTP Password (if required):

Connection Security: SSL/TLS

[Save Settings](#) [Cancel](#) [Send Test E-Mail](#)

### Send E-Mail When Check Result Is...

	Pass	Warning	Alert	Exception
Plan Check	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
QA Check	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Daily Check	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Treatment Summary	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>

# BEISPIEL PINNACLE DATEN EXPORT

**DICOM Export**

Trial to export:

Local AE Title:

Series Number:

Series Description:

Destination AE Title:

DICOM Timeout:

**RT Plans**

Send SSDs in all arc control points

Prescription	Tolerance Table
<input checked="" type="checkbox"/> Prescription_1	<input type="text" value="STANDARD"/>

**RT Structures**

**RT Images**

Annotate RT Images

**RT Dose**

Dose per control point

Dose per beam

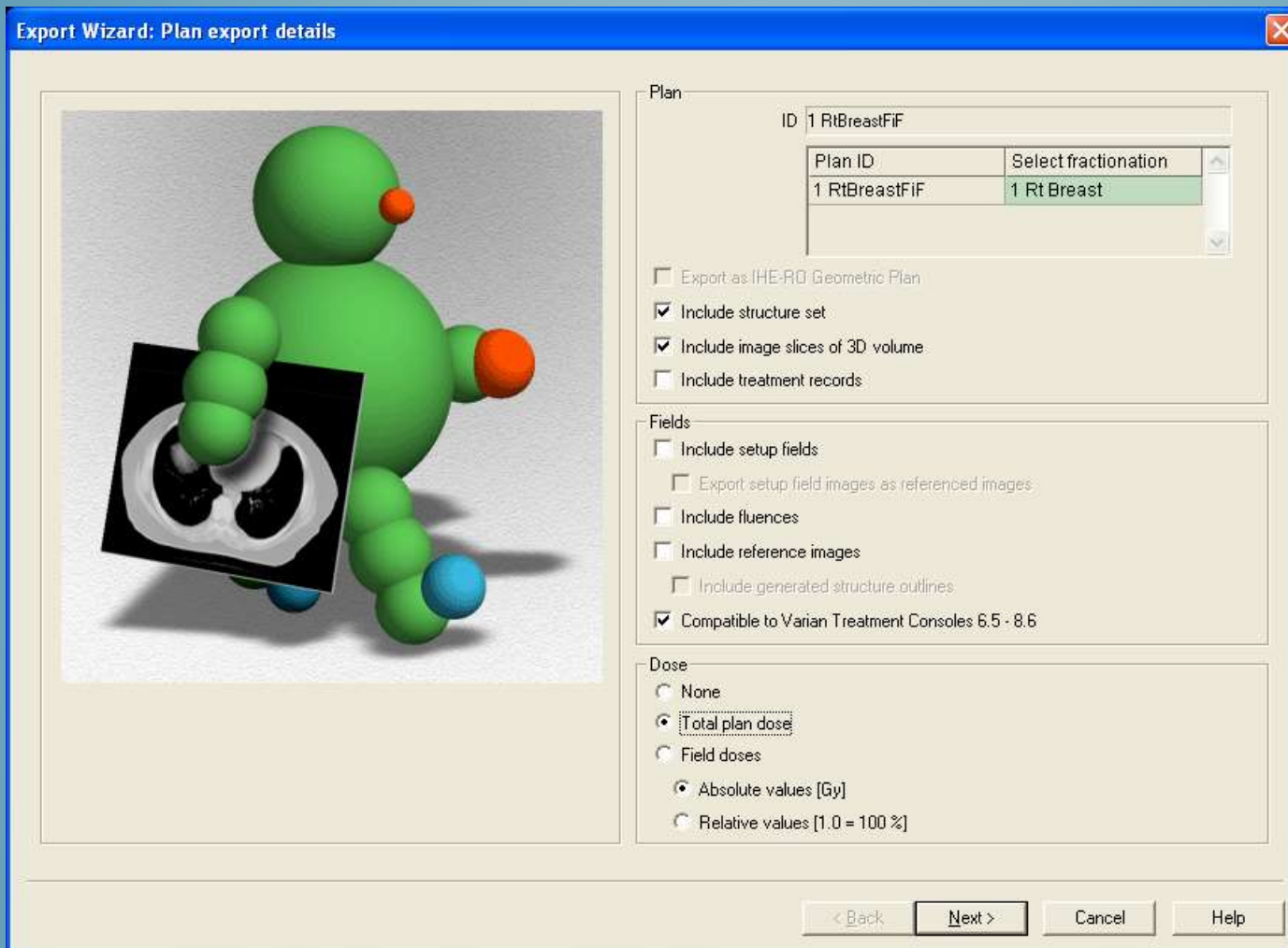
Dose per prescription

Sum of selected prescriptions

**Spatial Registration**

**DICOM Image**

# BEISPIEL ECLIPSE





# TOMO DATEN EXPORT EINRICHTUNG



# PLAN ÜBERPRÜFUNGS-EINSTELLUNGEN

## Plan Check Settings for Minnesota Romeo ZZ, Brain

Dose Calculation	Recalculate Dose	<input type="checkbox"/>	Default: Unchecked	
CT Couch Removal	Table Height Override	<input type="text" value=""/>	cm Default:	
	Use Body Contour (if present)	<input type="text" value="Yes"/>	Default: Yes	
	Use CT Table Height (if present)	<input type="text" value="No"/>	Default: No	
	Use Dose Edge	<input type="text" value="Yes"/>	Default: Yes	
Dose Calculation	Voxel Size	<input type="text" value="Automatic Detection"/>	Default: 0.0	
3D Gamma	Dose Difference Criteria	<input type="text" value="5"/>	% Default: 5%	
	Distance Criteria	<input type="text" value="3"/>	mm Default: 3 mm	
	Dose Threshold	<input type="text" value="10"/>	% Default: 10%	
	Warning Percent <	<input type="text" value="90"/>	% Default: 90%	
	Alert Percent <	<input type="text" value="85"/>	% Default: 85%	
	Reference Dose	<input type="text" value=""/>	Gy Default:	
Target Coverage	Mean Dose Difference <	<input type="text" value="5"/>	% Default: 5%	
	Percent Coverage	<input type="text" value="90"/>	% Default: 90%	
	Stray Voxel Threshold <	<input type="text" value="0.1"/>	cc Default: 0.1 cc	
DVH Limits	Limit Set	<input type="text" value="Automatic Detection"/>	Default: Automatic	
	Tolerance Scaling	<input type="text" value="100"/>	% Default: 100%	
Single Point MU Calculation	Search Radius	<input type="text" value="3"/>	mm Default: 3 mm	
Mobius Phantom	Calculate Mobius Phantom Dose	<input type="text" value="No"/>	Default: No	
Treatment Summary	Include First Fraction	<input type="text" value="No"/>	Default: No	
ROI Identification	ROI Name	Classification	Density Override (g/cc)	Direction
	Lt Eye	<input type="text" value="Eyes X"/>	None	Automatic
	ROI_1	<input type="text" value="Select DVH Limits / Targets..."/>	None	Automatic
	Rt Eye	<input type="text" value="Eyes X"/>	None	Automatic

# DICOM BROWSER

## Browse DICOM Objects

Patient

Hotel Lima ZZ (SN00006-403018eb)

[Download anonymized DICOM](#)

DICOM can be uploaded to [files.mobiusmed.com](http://files.mobiusmed.com).

Modality

RTPLAN (2 objects)

Series UID

2.25.318580257560667858429255553977867844064 (2 instances)

SOP Instance UID

2.25.206201031443114931034518638949057648708

(300a, 0070) Fraction Group Sequence



(0008, 1030) Study Description

RT^CHEST\_TP (Adult)

(0008, 0080) Institution Name

(0020, 000e) Series Instance UID

2.25.318580257560667858429255553977867844064

(0008, 0005) Specific Character Set

ISO\_IR 100

(0008, 0050) Accession Number

(300a, 00b0) Beam Sequence



(0020, 000d) Study Instance UID

2.25.314940684395471722738608045087161778609

(0008, 103e) Series Description

ARIA RadOnc Plans



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# WEITERE EINSTELLUNGSMÖGLICHKEITEN

**Cone Output Factors at 1.5 cm Depth, 98.5 cm SSD**

Cone Diameter (mm)	Output Factor	<input type="button" value="x"/>
<input type="text" value="4.0"/>	<input type="text" value="0.6602"/>	
Cone Diameter (mm)	Output Factor	<input type="button" value="x"/>
<input type="text" value="6.0"/>	<input type="text" value="0.746"/>	
Cone Diameter (mm)	Output Factor	<input type="button" value="x"/>
<input type="text" value="7.5"/>	<input type="text" value="0.8135"/>	
Cone Diameter (mm)	Output Factor	<input type="button" value="x"/>
<input type="text" value="10.0"/>	<input type="text" value="0.8706"/>	
Cone Diameter (mm)	Output Factor	<input type="button" value="x"/>
<input type="text" value="12.5"/>	<input type="text" value="0.9041"/>	
Cone Diameter (mm)	Output Factor	<input type="button" value="x"/>
<input type="text" value="15.0"/>	<input type="text" value="0.9219"/>	

« Previous ROI      Next ROI »

**Special**

- Body
- Targets
- ROIs
- Bladder
- Bladder wall
- Brachial plexus
- Brain
- Brainstem
- Bronchus
- Cauda equina
- Cochlea
- Colon
- Constrictor
- Duodenum
- Ears (inner/middle)
- Esophagus
- Eyes
- Femoral heads
- Glottic larynx
- Great vessels
- Heart
- Jejunum/ileum
- Kidney
- Lens

« Back           

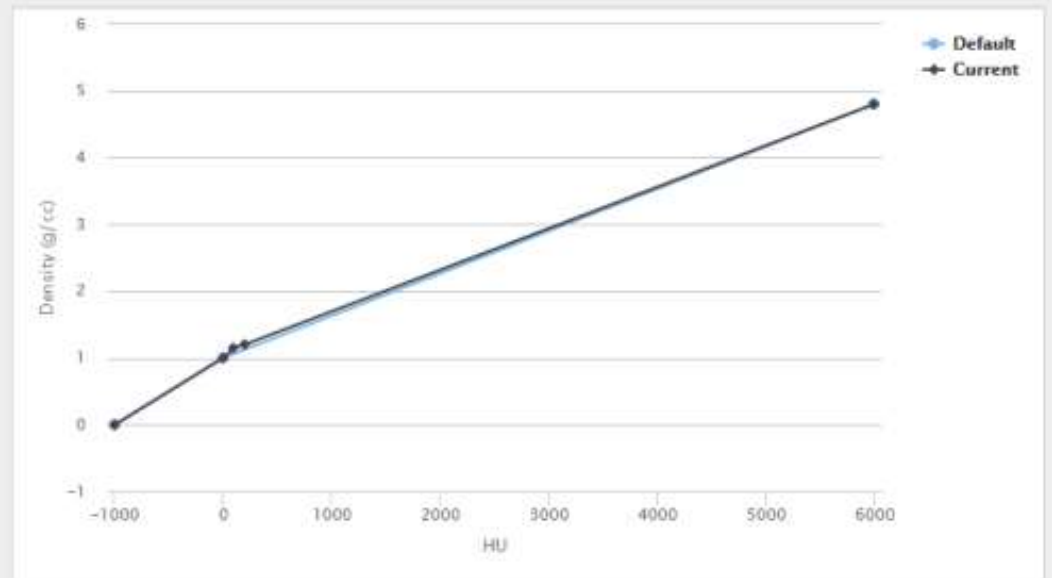


# CT DATEN ANPASSUNG

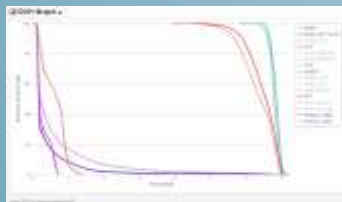
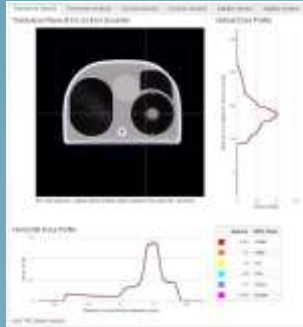
CT to Density Table

HU	Density (g/cc)	
-1000.0	0.0	+ Add Row
0.0	1.0	- Delete
100	1.15	- Delete
200	1.2	- Delete
6000.0	4.8	

Save Table    Use Defaults



# ERGEBNISBERICHTE



**DVH Limits**

LINK 041 Commercial Transcatheter    Tubercula Biting    100%

TPA Name	Link Name	Volume	Date	TPA	WCC	RCR
...	...	...	...	...	...	...
...	...	...	...	...	...	...
...	...	...	...	...	...	...
...	...	...	...	...	...	...
...	...	...	...	...	...	...
...	...	...	...	...	...	...
...	...	...	...	...	...	...
...	...	...	...	...	...	...



# MOBIUS 3D ANALYSE-ERGEBNISSE

**Mobius3D** Patients DICOM Activity Quick Calc Administrator (admin) Preferences Log out

Search by patient name, ID, or institution

Patient	Received ↓	Result	
New Vermont ZZ SN25011-e6892679	1/24/2015 12:17 PM	✓ Pass	2 Plans
York Massachusetts ZZ SN00000-bbc85260	1/24/2015 8:39 AM	✗ Alert	1 Plan
Tennessee Juliet ZZ SN05341-8e8c8f44	1/23/2015 1:51 PM	✓ Pass	7 Plans
Zebra Carolina ZZ SN25011-03212154	1/23/2015 1:14 PM	✓ Pass	11 Plans
Virginia Massachusetts ZZ SN00000-65f13698	1/23/2015 9:21 AM	✓ Pass	3 Plans
Florida Delta ZZ	1/21/2015	✗ Alert	

**Plan: IMRT PELVIS; 6 MV VMAT 48.9 Gy (Max Dose)**  
Anonymized; 21X - MWHH, 25 Fractions (Methodist Houston)

✓ All DICOM files received (Plan: Sat, January 24, 2015, 06:34 AM) ▼

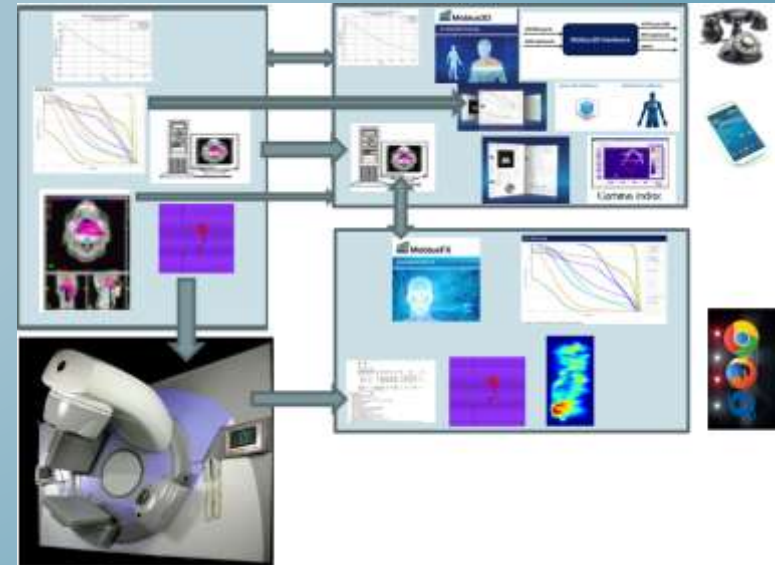
✓ Plan Check finished (Sat, January 24, 2015, 06:38 AM) ▲

Target Coverage	DVH Limits	3D Gamma	Deliverable	Approvals
✓	✓	✓	✓	(No Approvals)

Checked with Mobius3D v1.5

Search by patient name, ID, or insti...

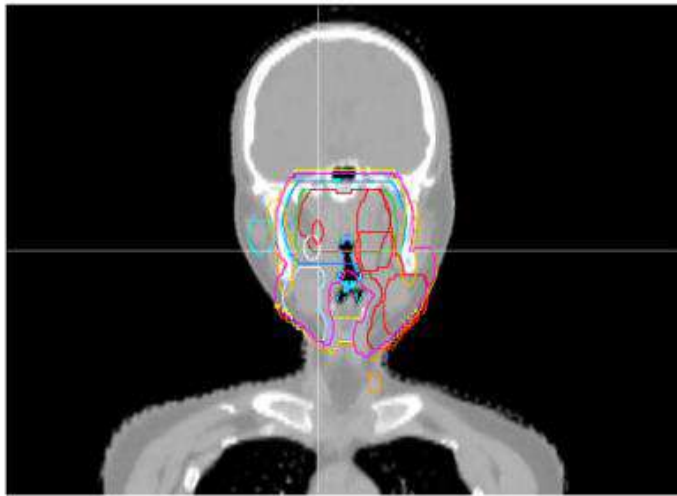
Patient	Received ↓	Result	
Delta Oscar ZZ SN02586-08389f77	2/18/2013 11:51 AM	✓ Pass	3 Plans »
Uniform Victor ZZ SN07517-08b10418	2/17/2013 6:53 PM	✓ Pass	1 Plan »
Lima Uniform ZZ SN00006-8d47f041	2/17/2013 2:25 PM	✗ Alert	2 Plans »
Hotel Zulu ZZ SN02943-cd7c2779	2/17/2013 2:21 PM	✓ Pass	1 Plan »
Hotel Sierra ZZ SN00005-e7f9f6b9	2/17/2013 2:20 PM	✓ Pass	3 Plans »
Hotel Lima ZZ SN00006-403018eb	2/17/2013 2:20 PM	✓ Pass	2 Plans »



# TARGET COVERAGE DIFFERENCES

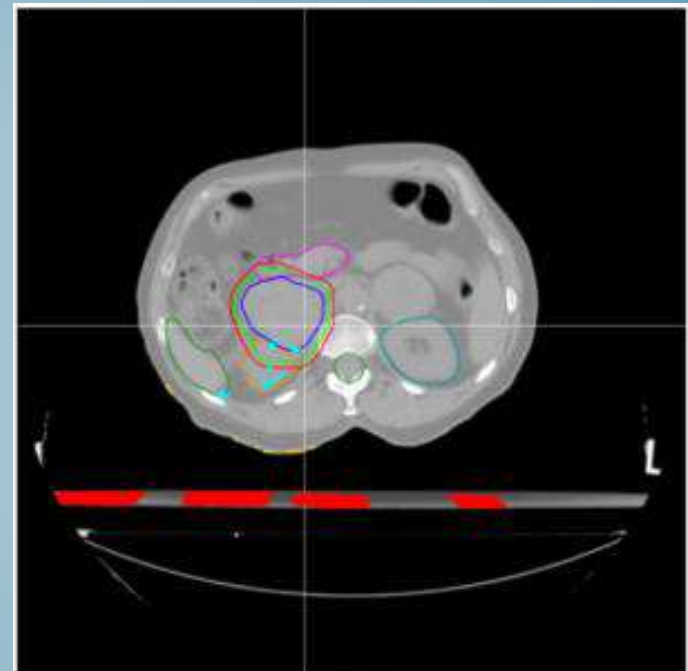
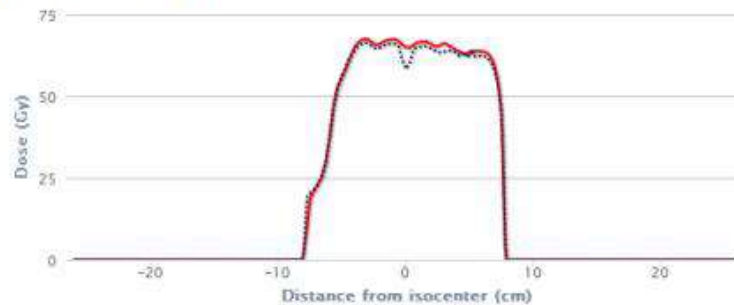
DIFFERENCES IN AIR AND BONE

GAMMA FAILURES IN THE TREATMENT COUCH



CT Table Height -16.52 cm from isocenter, CT couch removed.

Horizontal Dose Profile



CT Table Height not provided. CT couch not removed.

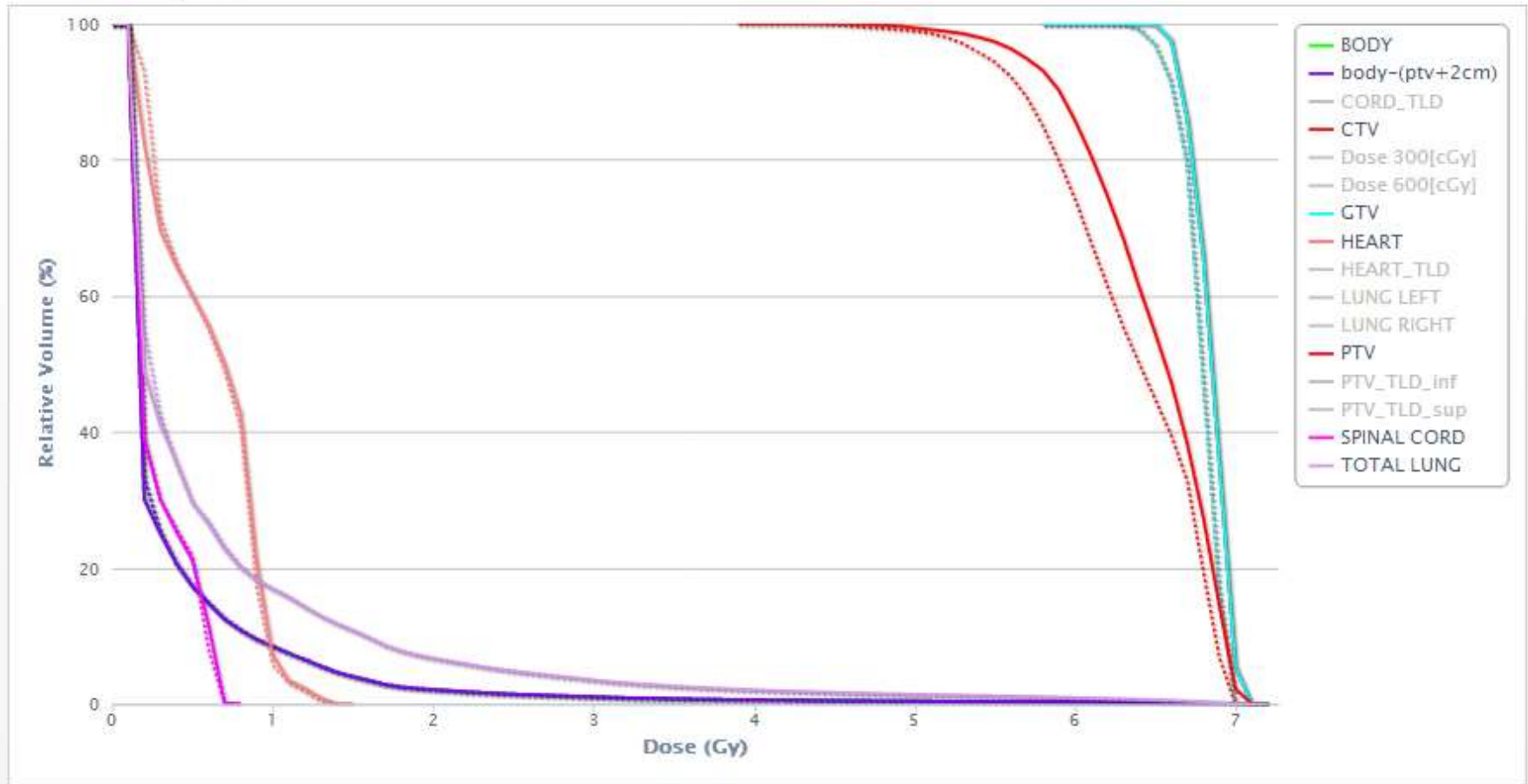


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# DVH- ERGEBNIS

DVH Graph ▲



Solid: TPS; Dashed: Mobius3D



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# ZIELVOLUMEN ANALYSE

## Target Coverage ▲

	TPS Name	Mean Dose			90% Coverage			Stray Voxels			
		TPS	M3D	% Diff	TPS	M3D	% Diff				
■	PTV	6.37 Gy	6.23 Gy	-2.0%	✓	5.81 Gy	5.58 Gy	-3.3%	✓	None	✓
■	CTV	6.74 Gy	6.68 Gy	-0.8%	✓	6.58 Gy	6.52 Gy	-0.8%	✓	None	✓
■	GTV	6.74 Gy	6.68 Gy	-0.8%	✓	6.58 Gy	6.52 Gy	-0.8%	✓	None	✓

## DVH Limits ▲

Limit Set Conventional Fractionation **Tolerance Scaling** 100%


	TPS Name	Limit Name	Volume	Dose	TPS	M3D	Note
■	esophagus	Esophagus ⓘ	Mean	<35 Gy	19.9 Gy	✓ 19.9 Gy	✓
■	esophagus	Esophagus ⓘ	33%	<45 Gy	39.2 Gy	✓ 39.2 Gy	✓
■	esophagus	Esophagus ⓘ	15%	<54 Gy	45.4 Gy	✓ 46.3 Gy	✓
■	heart	Heart ⓘ	33%	<60 Gy	7.92 Gy	✓ 7.6 Gy	✓
■	heart	Heart ⓘ	67%	<45 Gy	2.87 Gy	✓ 2.99 Gy	✓
■	heart	Heart ⓘ	100%	<40 Gy	0.44 Gy	✓ 0.37 Gy	✓
■	total lung	Lung (right and left) ⓘ	37%	<20 Gy	7.71 Gy	✓ 7.62 Gy	✓
■	total lung	Lung (right and left) ⓘ	Mean	<20 Gy	12.6 Gy	✓ 12.5 Gy	✓



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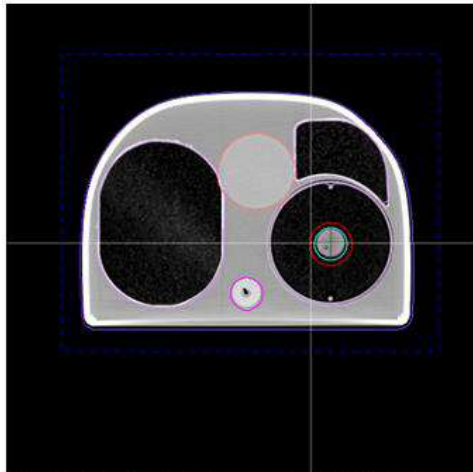


# 3D GAMMA ANALYSE

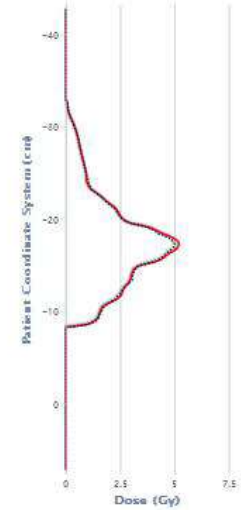
Passing Rate	Criteria	Reference Dose	Threshold Dose	TPS Voxels	M3D Voxels
100.0% 	5.0% / 3.0 mm	7.04 Gy (Max Dose)	0.7 Gy	3.0 mm, 2.5 mm, 2.5 mm	3.0 mm

Transverse Gamma    Transverse Isodose    Coronal Gamma    Coronal Isodose    Sagittal Gamma    Sagittal Isodose

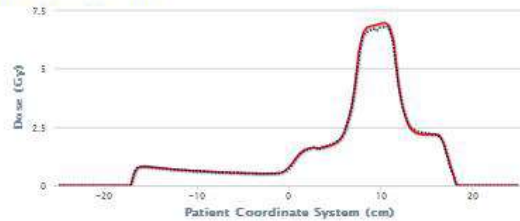
Transverse Plane at 0.0 cm from Isocenter      Vertical Dose Profile



ROI 'body-(ptv+2cm)' used as external surface, density outside of 'body-(ptv+2cm)' set to zero.



Horizontal Dose Profile:



Gamma	M3D Dose
<span style="color:red">■</span> $\geq 2.0$	Hottest
<span style="color:orange">■</span> $\geq 1.5$	Hotter
<span style="color:yellow">■</span> $\geq 1.0$	Hot
<span style="color:cyan">■</span> $\geq 1.0$	Cool
<span style="color:blue">■</span> $\geq 1.5$	Cooler
<span style="color:magenta">■</span> $\geq 2.0$	Coolest

Solid: TPS, Dashed: M3D



## ROI Overview

TPS Name	Volume	3D Gamma (5.0% / 3.0 mm)	Mean Dose		Density Override	
			TPS	M3D		
<span style="color:red">■</span> PTV	72.8 cc	99.9%	6.37 Gy	6.23 Gy	-2.0%	None
<span style="color:green">■</span> LUNG RIGHT	3488 cc	100.0%	0.13 Gy	0.12 Gy	-0.1%	None
<span style="color:purple">■</span> PTV_TLD_sup	0.07 cc	100.0%	6.82 Gy	6.68 Gy	-2.0%	None
<span style="color:cyan">■</span> PTV_TLD_inf	0.05 cc	100.0%	6.8 Gy	6.66 Gy	-2.0%	None
<span style="color:blue">■</span> TOTAL LUNG	7021 cc	100.0%	0.5 Gy	0.51 Gy	0.1%	None
<span style="color:magenta">■</span> SPINAL CORD	132 cc	100.0%	0.17 Gy	0.17 Gy	0.0%	None
<span style="color:blue">■</span> body-(ptv+2cm)	23990 cc	100.0%	0.24 Gy	0.25 Gy	0.0%	None



# SCHNELLE AUSWERTUNGSMÖGLICHKEIT

## Photon Quick Calc

**Patient Information (Optional)**

Copy from Plan

Patient Name

Patient ID

**Beam Information (Required)**

Copy from beam

Machine Name

Beam Energy

X Opening  cm  cm

Y Opening  cm  cm

SSD  cm  cm

Depth  cm  cm

Beam Dose  cGy  cGy

**(Optional)**

Beam Name

TPS MU

Blocked Field Size (X)  cm  cm

Blocked Field Size (Y)  cm  cm

## Electron Quick Calc

**Patient Information (Optional)**

Patient Name

Patient ID

**Beam Information (Required)**

Machine Name

Beam Energy

Applicator

Cutout Width  cm

Cutout Length  cm

SSD  cm

Depth %  %

Beam Dose  cGy

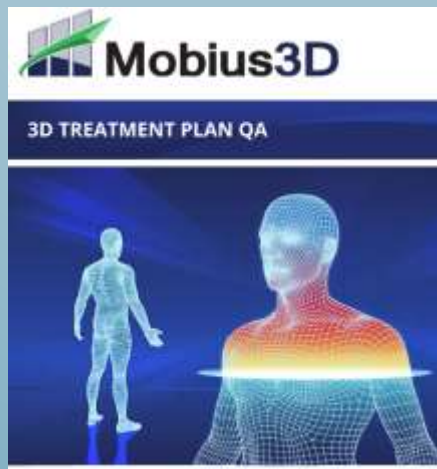
**(Optional)**

Beam Name

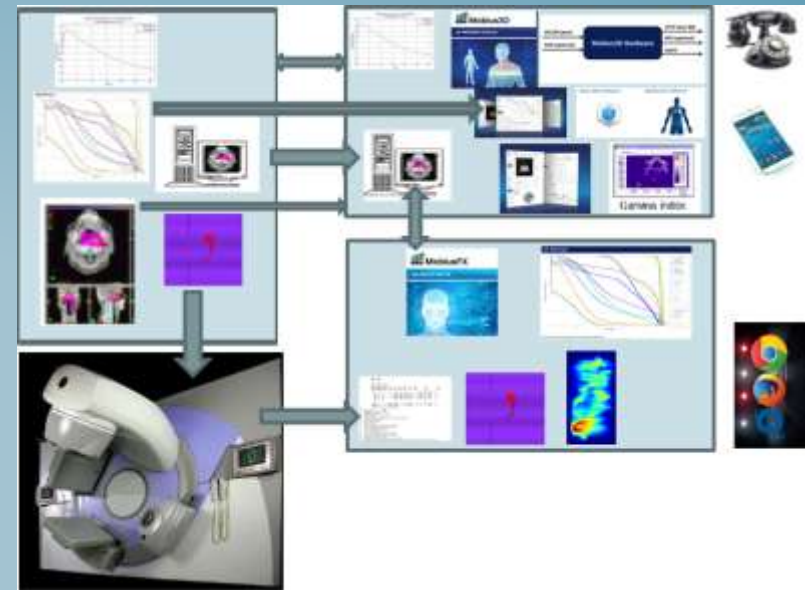
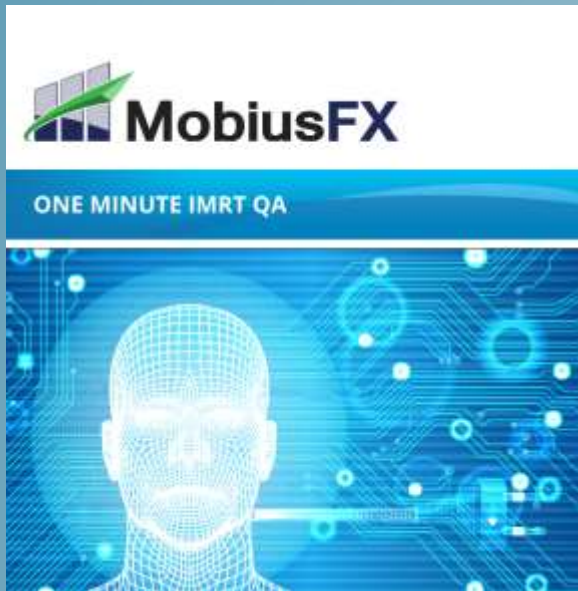
TPS MU



# MOBIUS FX



# MOBIUS FX LIZENZEN PRO LINAC

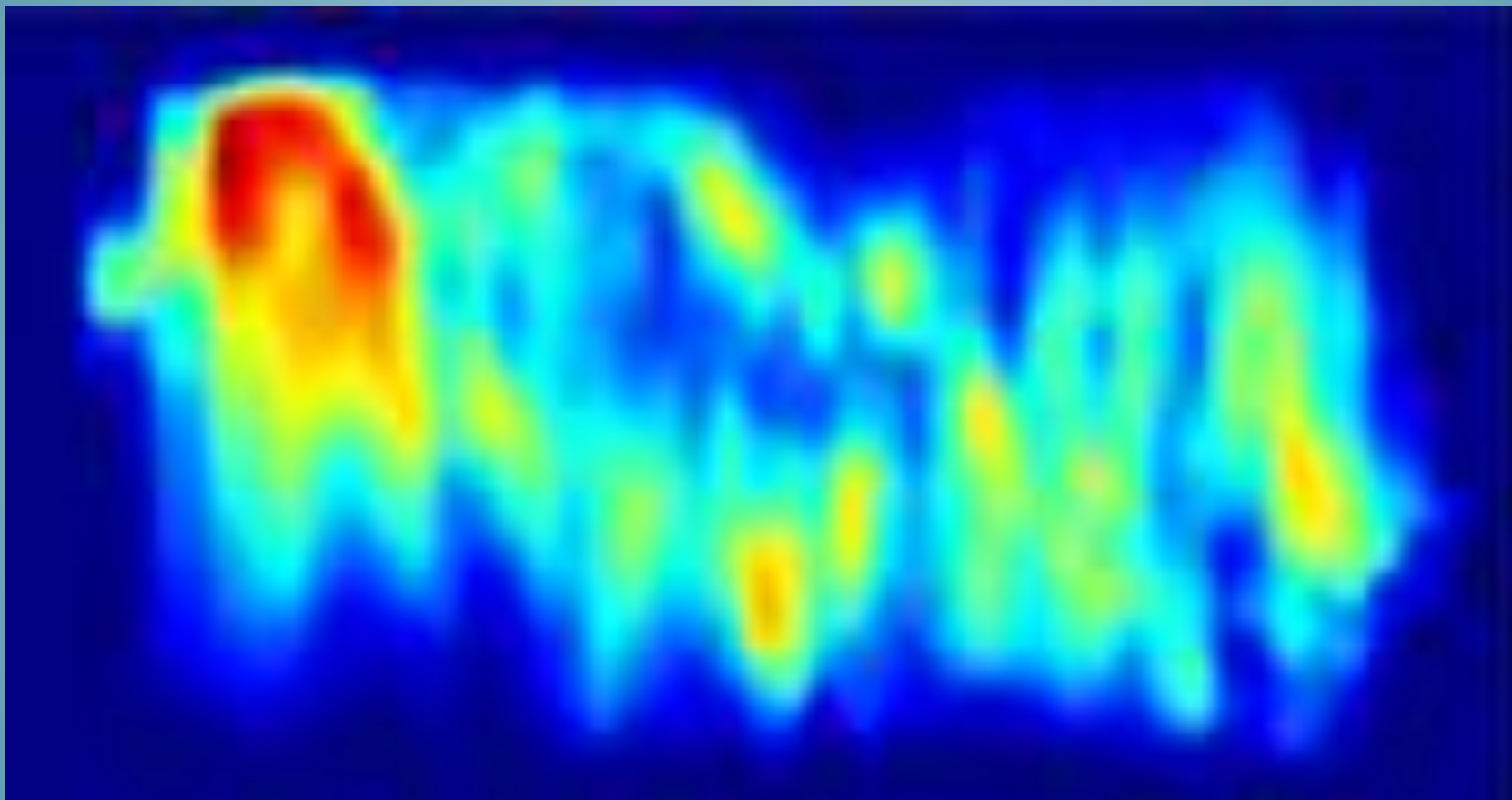


Institution Name	Machine Name	Matched Machines	Vendor	Model	MLC	100 MU Dose at 10 cm for 10x10 field (cGy)				
						6	7	10	15	18
Unknown Insitution	21EX		Varian	21 EX	Millennium 120	66.3				79.6
Unknown Insitution	23000X		Varian	23000X	Millennium 120	66.6				79.4
Unknown Insitution	600C		Varian	600C	Millennium 120	67.2				
Unknown Insitution	ARTISTED		Siemens	Artiste	Siemens 160	67.6				78.3
Unknown Insitution	Agility		Elekta	Agility	Agility 160	67.16				75.95



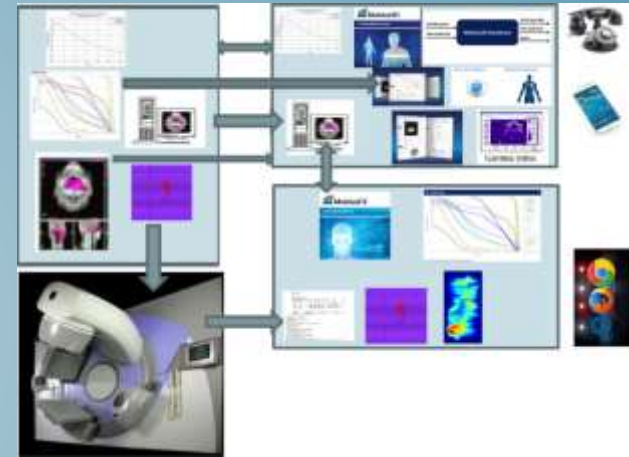


# MIT MOBIUS FX AUS DEN MLC-LOGFILES DATEN FLUENZWERTE



# MOBIUS FX - KEY FEATURES

- ✓ Keine Hardware erforderlich
- ✓ Kein selbständiges System. Verwendet die Mobius3D Software Module und Hardware
- ✓ Analysiert und überprüft die Funktion jedes einzelne Leaf des MLC-Kolimators
- ✓ Patienten Heterogenitäten werden automatisch mit den CT- Daten berücksichtigt
- ✓ Erkennung von Übertragungsfehler oder „Beam Commissioning“ Fehler
- ✓ 3D Kontrolle der dem Patienten verabreichte Dosis
- ✓ Überprüft ob die DVH-Ziele Ihrer Pläne erfüllt werden
- ✓ 30-90 Minuten Zeitersparnis pro Patient für Überprüfung der Bestrahlung
- ✓ Berechnung der 3D-Passing Rate
- ✓ 3D Gamma-Analyse in einzelnen CT-Schnitten (Transversal, Koronar, Sagital)
- ✓ Individuelle ROI-Einstellungen mit Identifizierung der anatomischen Strukturen.
- ✓ Einstellung individueller Toleranzen für Warnungen
- ✓ Streu-Voxel Erkennung in den Zielstrukturen Verhinderung falscher Dosisberechnungen
- ✓ Vorinstallierte DVH Zielvorgaben von RTOG und TG -101 DVH
- ✓ PDF- Reports für die Planungsdaten jedes Patienten
- ✓ Intuitive Browser-Schnittstellen und Bedienung
- ✓ Browser Zugang von Laptops, Tablets und Handys



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# MOBIUS FX DATEN TRANSFER GENAUIGKEITS EINSTELLUNGEN

## MobiusFX Data Transfer Limits

Collimator Fail Level >	<input type="text" value="2"/>	deg	Default: 2 deg
Couch Alert Level >	<input type="text" value="10"/>	deg	Default: 10 deg
Couch Warn Level >	<input type="text" value="2"/>	deg	Default: 2 deg
Gantry Fail Level >	<input type="text" value="2"/>	deg	Default: 2 deg
Jaw Fail Level >	<input type="text" value="5"/>	mm	Default: 5 mm
MLC Fail Level >	<input type="text" value="5"/>	mm	Default: 5 mm
MU Difference Fail Level >	<input type="text" value="2"/>	mu	Default: 2 mu



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# MOBIUS FX PARAMETER LIMITS FÜR WARNUNGSMELDUNGEN

## MobiusFX RMS Limits

Collimator RMS Failure Level >	<input type="text" value="3"/>	deg	Default: 3 deg
Collimator RMS Warning Level >	<input type="text" value="2"/>	deg	Default: 2 deg
Couch RMS Failure Level >	<input type="text" value="3"/>	deg	Default: 3 deg
Couch RMS Warning Level >	<input type="text" value="2"/>	deg	Default: 2 deg
Gantry RMS Failure Level >	<input type="text" value="3"/>	deg	Default: 3 deg
Gantry RMS Warning Level >	<input type="text" value="2"/>	deg	Default: 2 deg
Jaw RMS Failure Level >	<input type="text" value="3.5"/>	mm	Default: 3.5 mm
Jaw RMS Warning Level >	<input type="text" value="2.5"/>	mm	Default: 2.5 mm
MLC RMS Failure Level >	<input type="text" value="3.5"/>	mm	Default: 3.5 mm
MLC RMS Warning Level >	<input type="text" value="2.5"/>	mm	Default: 2.5 mm



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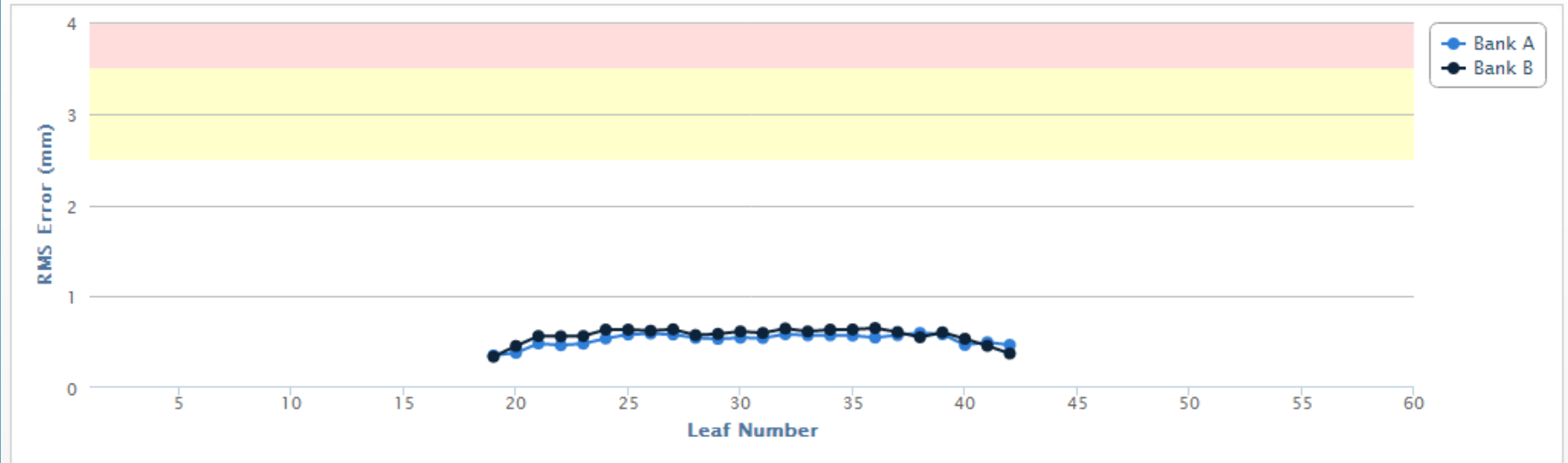
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# DARSTELLUNG DER RMS-WERTE

## RMS Values ▲

Beam: All Beams ▼



	X1	X2	Y1	Y2	Collimator	Gantry
RMS Error	0.61 mm	0.54 mm	0.0 mm	0.0 mm	0.0°	0.0°



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# BEAM DATEN ANALYSIEREN UND ERBNISSE BERICHTEN

**\* Beam Information ▲**

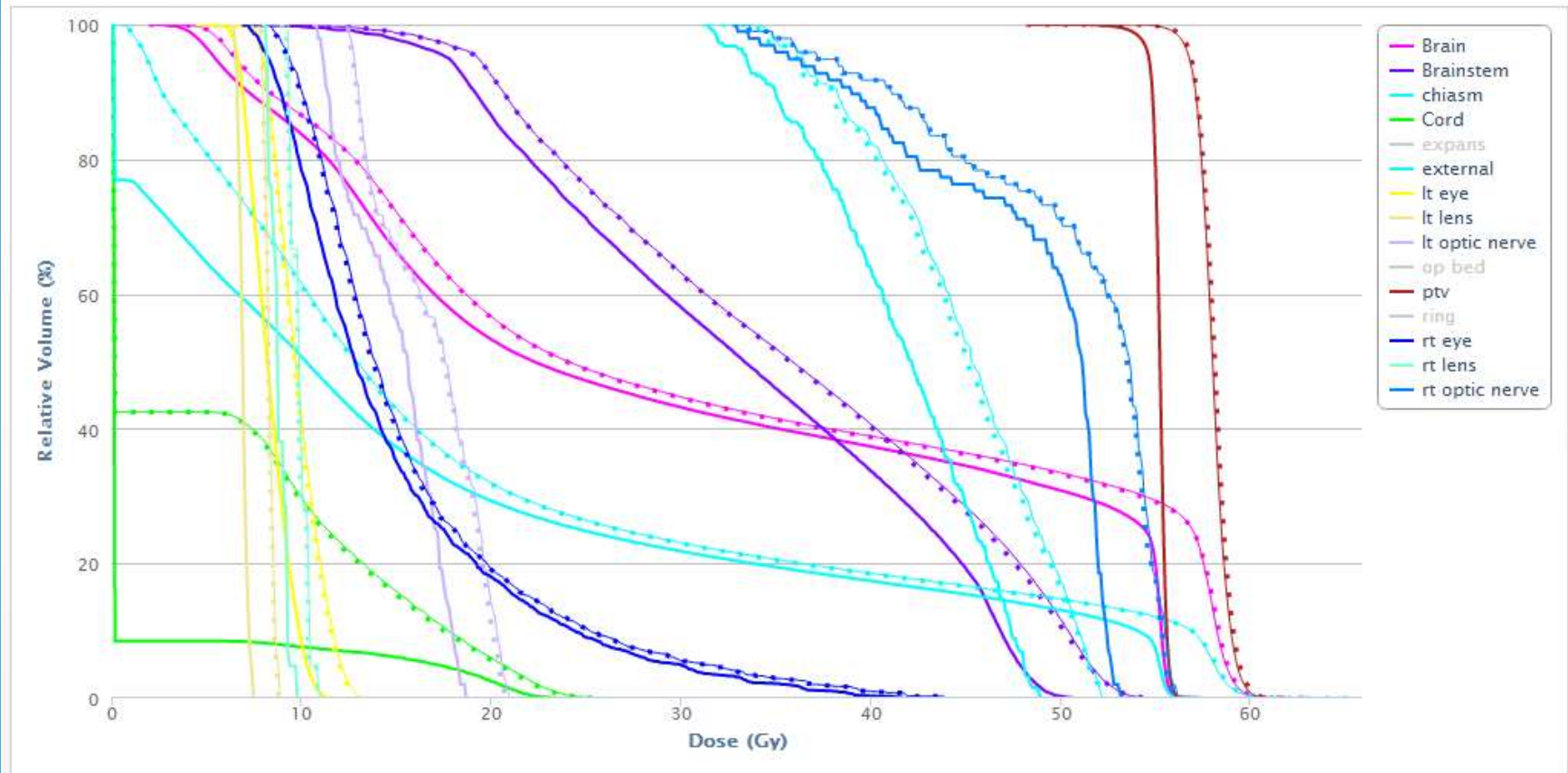
Number of Fractions Planned	1				
Planning Machine Name	TrueBeam1				
Delivery Start Time	Fri, November 15, 2013, 02:39 PM				

Beam	L	M	N	O	P
	✓	✓	✓	✓	✓
Data Transfer	Pass	Pass	Pass	Pass	Pass
Energy (MV)	6	6	6	6	6
MU	99	125	74	104	47
Segments	498	629	373	523	239
X1 / X2 Jaws (cm)	4.5 2.5	3.5 4	3.5 3.5	4.5 3	3.5 3.5
Y1 / Y2 Jaws (cm)	4 3.5	2.5 4.5	3 4.5	3 4.5	3.5 4.5
Wedge	None	None	None	None	None
MLC	SnS	SnS	SnS	SnS	SnS
Rotation	Static	Static	Static	Static	Static
Gantry	315°	60°	45°	300°	230°
Collimator	0°	0°	0°	0°	0°
Couch	0°	0°	0°	0°	0°
Delivery Time	24 sec	27 sec	16 sec	23 sec	14 sec
Beam On	40.9%	47.3%	46.4%	44.7%	35.3%

# DVH- AUSGABE UND VERGLEICH

DVH Graph ▲

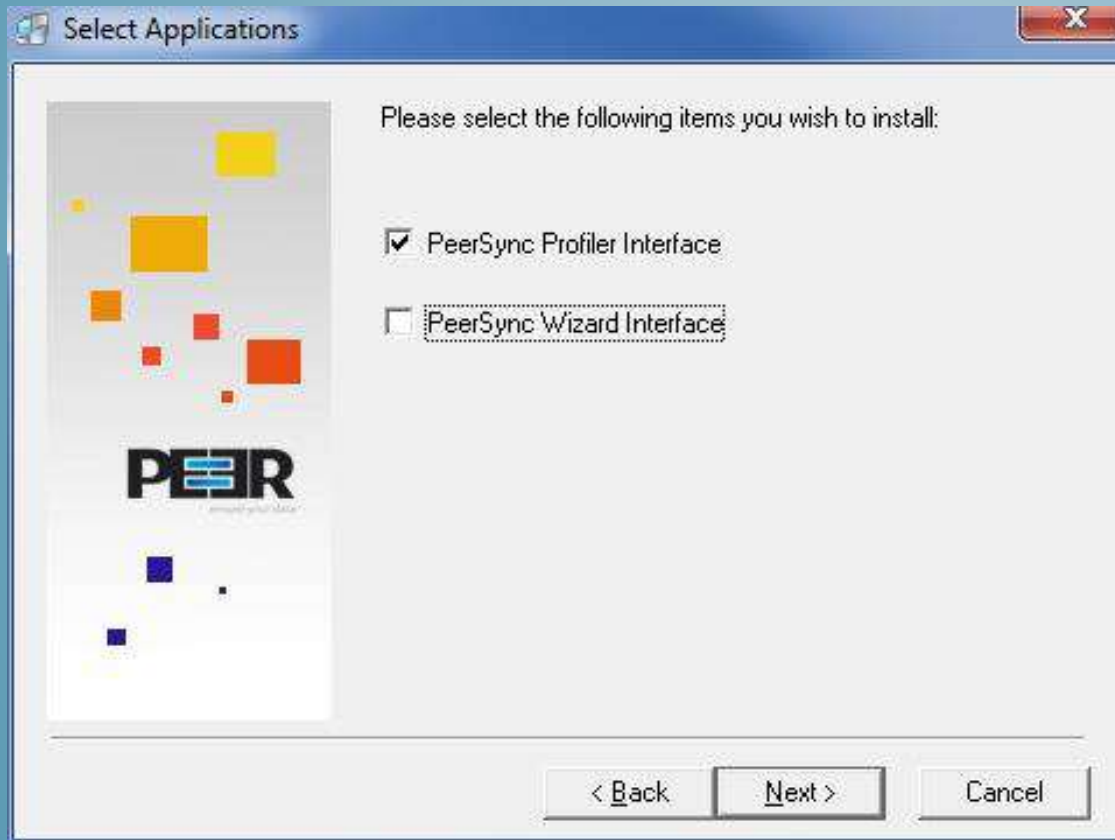


Thick Solid: TPS; Dashed: Mobius3D; Thin Solid: Delivered (MobiusFX)



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# PEERSYNC VARIAN-LOGFILE DATENÜBERTRAGUNG IN EINEN ORDNER IM NETZWERK





# PEERSYNC VARIAN-LOGFILE DATENÜBERTRAGUNG IN EINEN ORDNER IM NETZWERK

## VARIAN DYNALOG FILES

**Alle 50 ms werden folgende Daten registriert :**

- ☒ Beam on/off state**
- ☒ Beam hold on/off state**
- ☒ Fractional dose (not absolute MU)**
- ☒ Planned leaf positions**
- ☒ Delivered leaf positions**
- ☒ Jaw positions**
- ☒ Collimator rotation**
- ☒ Gantry rotation**
- ☒ Carriage positions**

# MOBIUS LOG FÜR ELEKTA

## ELEKTA LOG FILES

MobiusFX und Mobius Log 1.31 .

Mobius Log – Aufnahme der Elekta iCom Vx stream files.

Mobius Log kann auf jedem im Strahlentherapie-Netzwerk PC installiert werden.

iCom-Vx - Elekta Netzwerk Kommunikationsprotokoll.

It is supported by Elekta Desktop and Integrity treatment control systems.

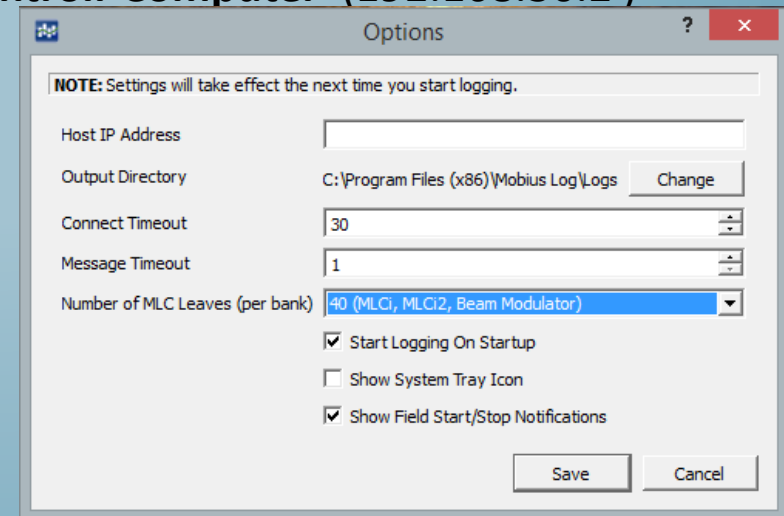
## MOBIUS LOG –Funktionsweise und Konfiguration

### Mobius Log

**Netzwerk Installation mit Zugang zum Elekta Kontroll-Computer (192.168.30.2 )**

Oder NSS (wenn außerhalb der Elekta Firewall)..

### Ein PC für jeden Elekta – Linac





# MOBIUS MVP









**Phantom Verification**

Position	MFX Dose (cGy)	Ion Chamber Dose (cGy)	% Diff
A	110.1 +/- 5.0	<input type="text" value=""/>	-
B	215.1 +/- 5.1	<input type="text" value=""/>	-
C	230.4 +/- 1.7	<input type="text" value="232.1"/>	0.9%
D	213.1 +/- 9.0	<input type="text" value=""/>	-
E	110.4 +/- 4.7	<input type="text" value=""/>	-
F	231.4 +/- 2.2	<input type="text" value=""/>	-
G	228.3 +/- 3.8	<input type="text" value=""/>	-

**VIELEN DANK FÜR IHRE  
AUFMERKSAMKEIT !**



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