

# **Vereinfachte Verfahren der IMRT-Qualitätssicherung in Würzburg**

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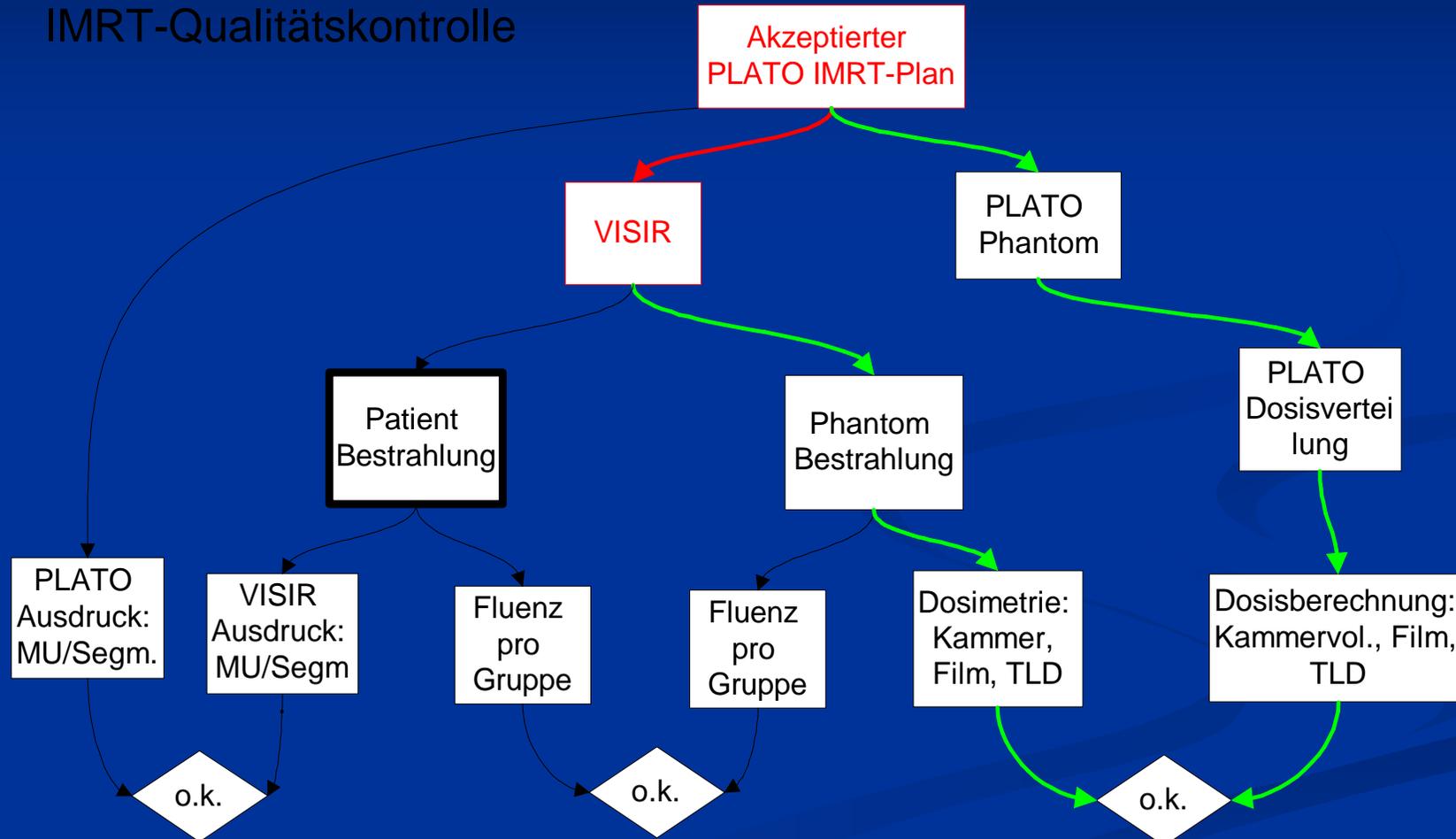
# IMRT in Würzburg: Kurzübersicht

- ✍ Seit Dez. 2002: 21 Patienten
- ✍ Schädelbasis, Nasopharynx-Rez.(18), HNO (2)
- ✍ RO: 2-8 (manchmal 1 Hilfsvolumen)
- ✍ ZV: 1-3 nebeneinander / geschachtelt
- ✍ PLATO RTS 2.6.2 - ITP 1.1.8 (Konrad)
- ✍ 3-5 Levels
- ✍ Meist 7 Felder coplanar  
gelegentlich 5 Felder coplanar + 1 Feld mit TD
- ✍ ca. 30 – 60 Segmente
- ✍ Planungszeit 1-4 h
- ✍ Siemens PRIMUS Step & Shoot
- ✍ Messung mit Auswertung, Planvorbereitung 4-6 h
- ✍ Patienten-Liegezeiten (erstes bis letztes Feld) 10 - 25 min

# Konzept IMRT-Qualitätssicherung

## 1. Kreis „Dosimetrie“

IMRT-Qualitätskontrolle

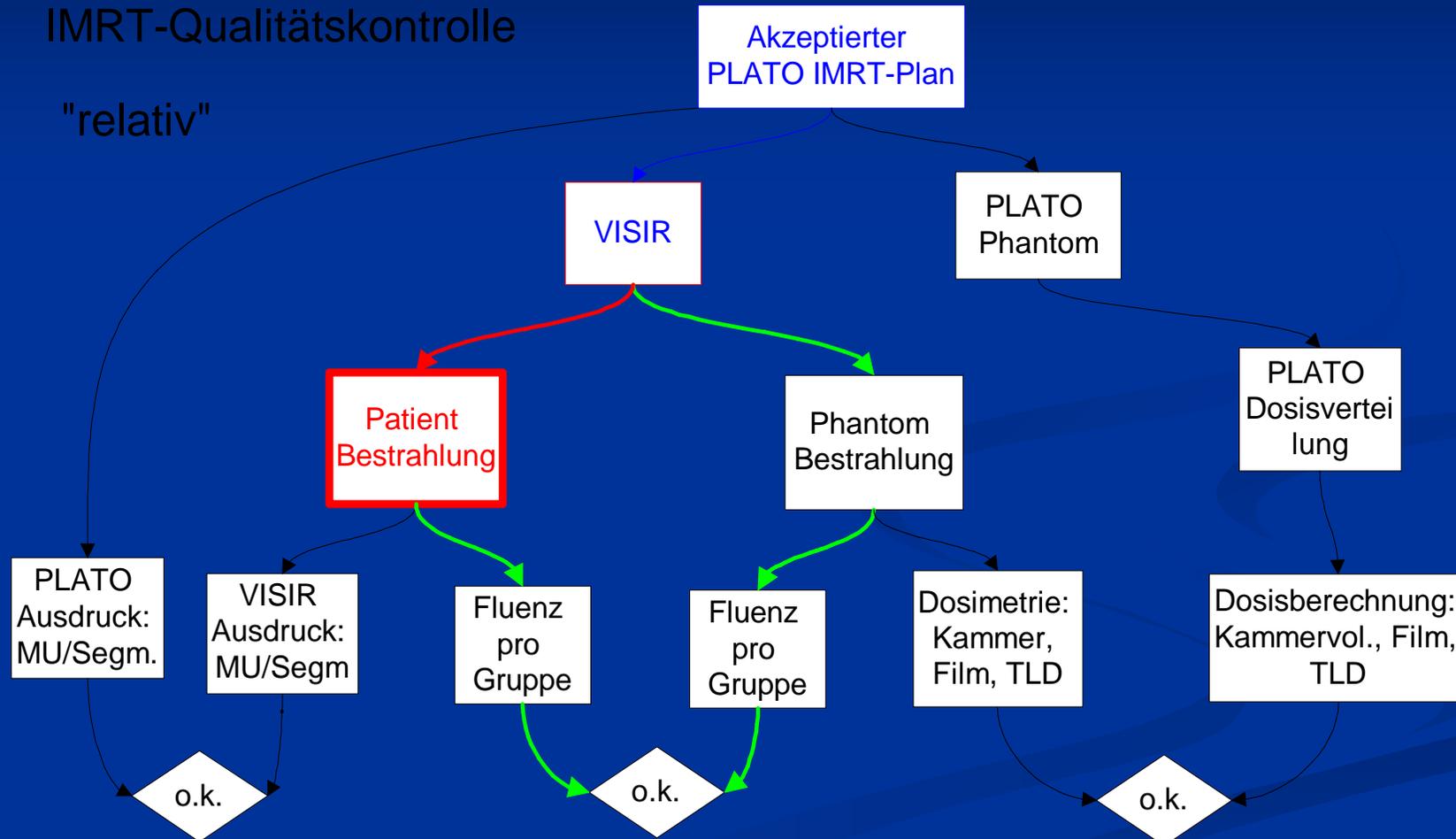


# Konzept IMRT-Qualitätssicherung

## 2. Kreis „Fluenz“

IMRT-Qualitätskontrolle

"relativ"

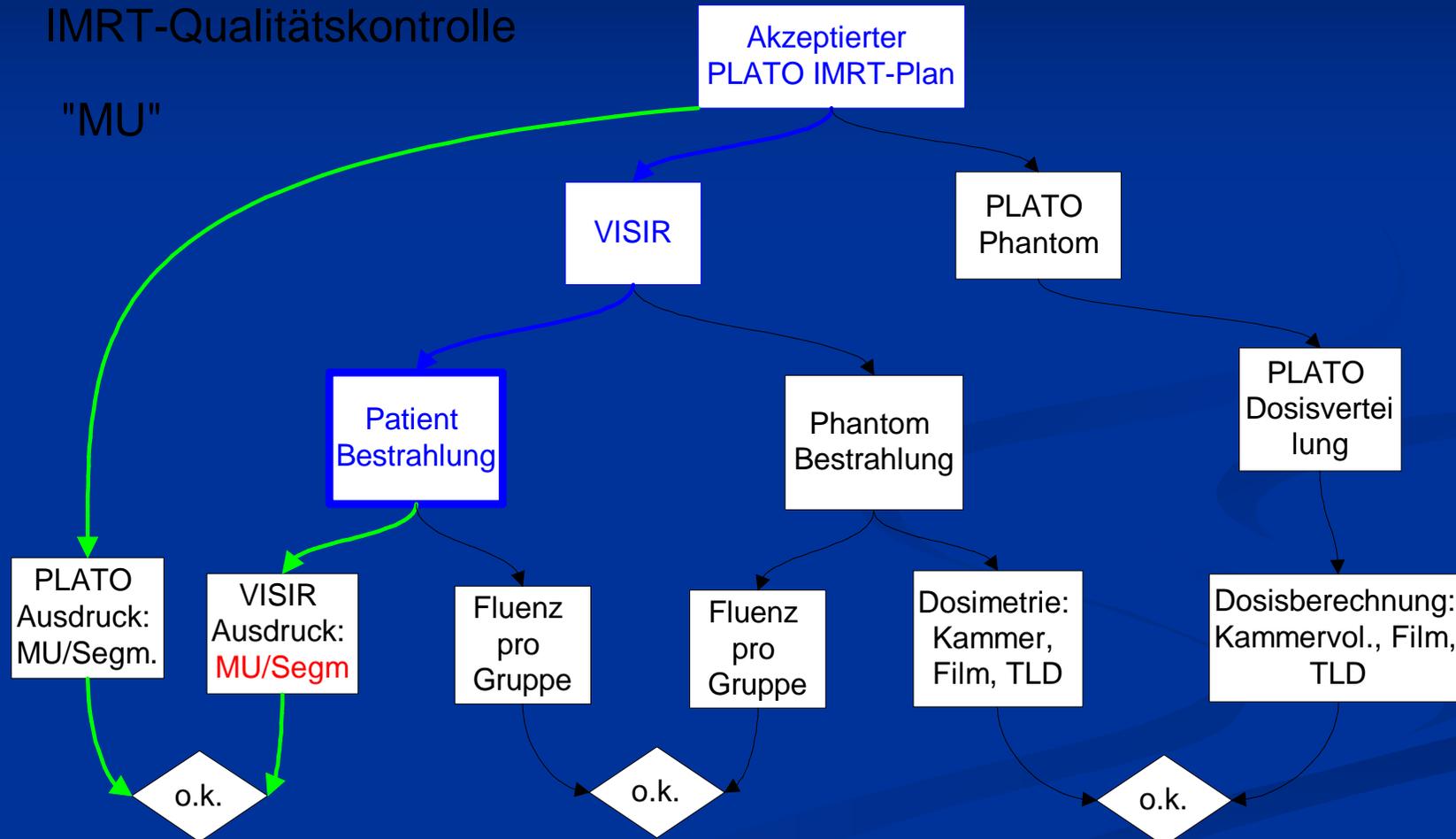


# Konzept IMRT-Qualitätssicherung

## 3. Kreis „MU“

IMRT-Qualitätskontrolle

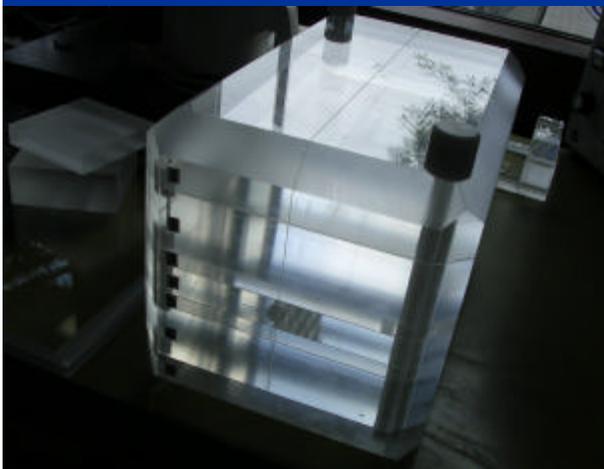
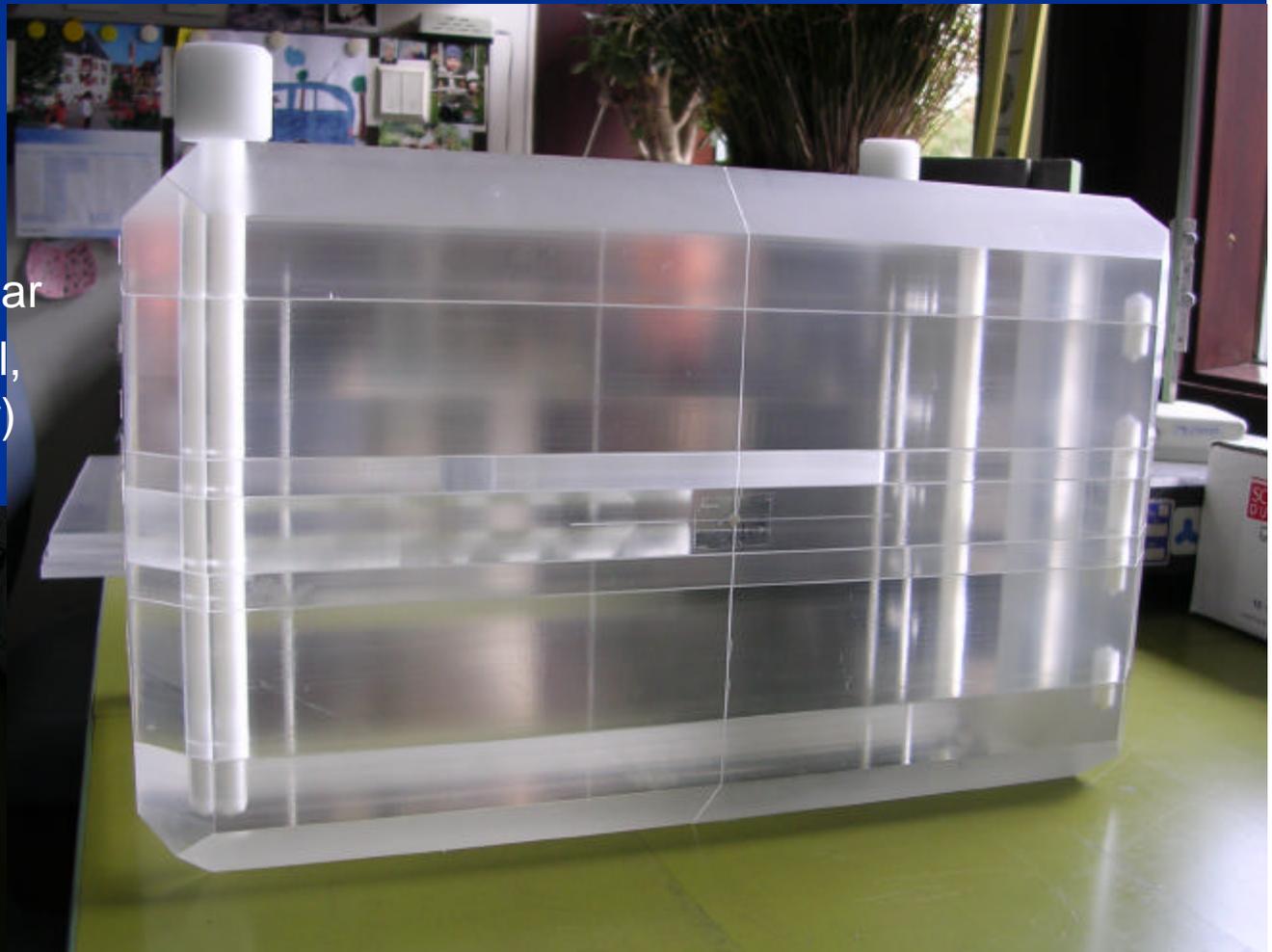
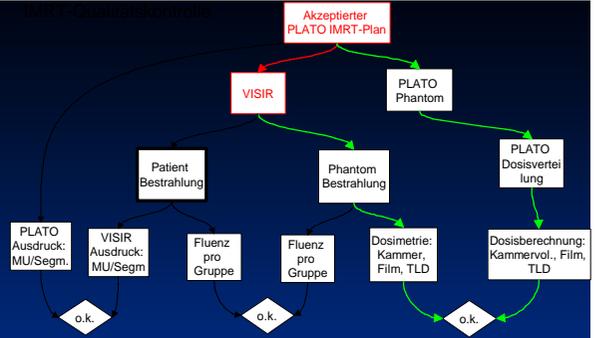
"MU"



# IMRT in Würzburg Dosimetrie

## IMRT-Phantom

- ✂ Plexiglas
- ✂ 20 x 20 x 35 cm<sup>3</sup>  
geschrägte Kanten
- ✂ Film, TLD, Kammer
- ✂ quer, längs verwendbar
- ✂ Filme coronal, sagittal,  
transversal (alternativ)

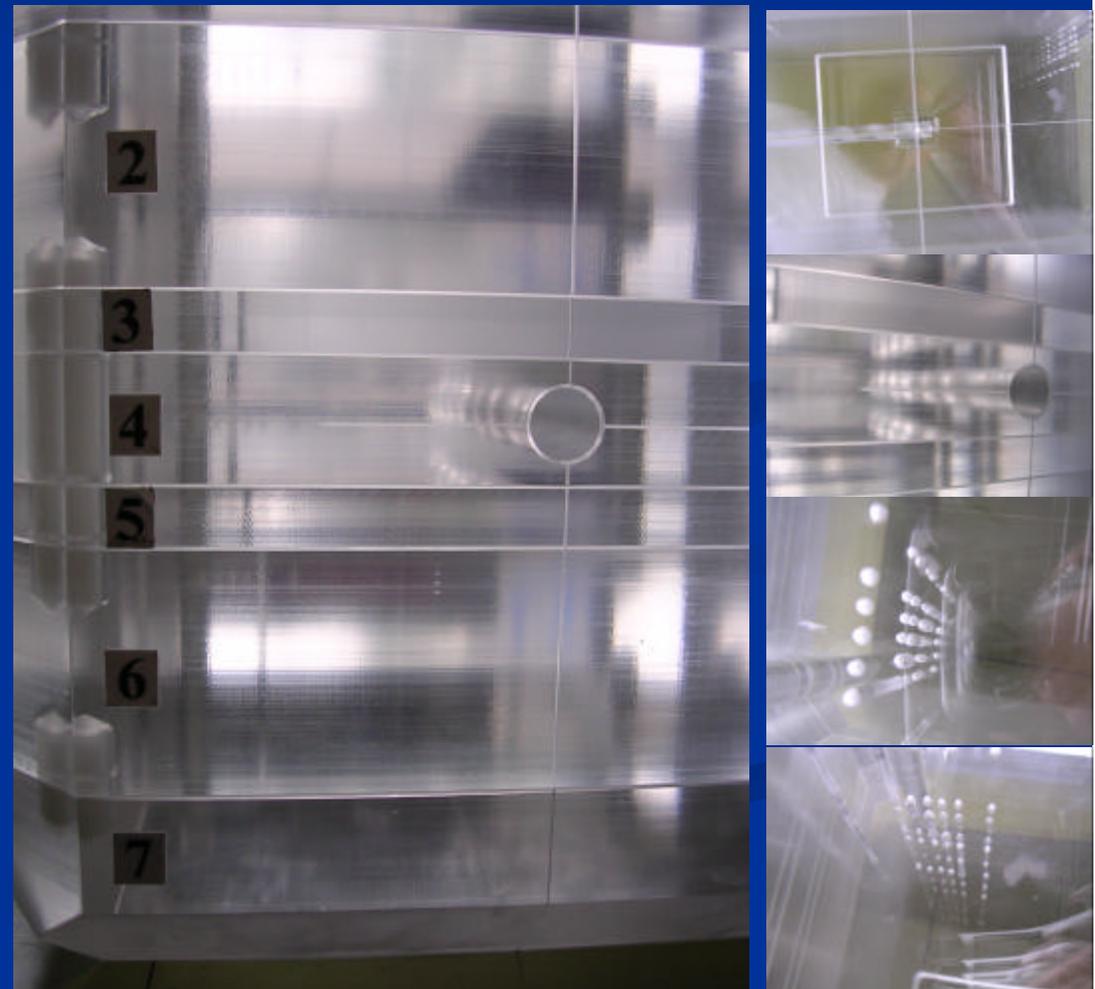
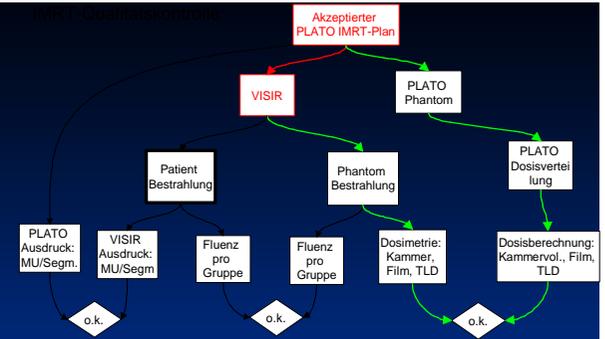


# IMRT in Würzburg

## Dosimetrie

### IMRT-Phantom

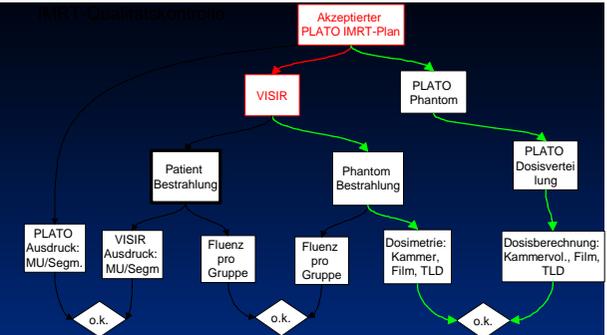
- 4 Isozentrumsnahe  
2 Isozentrumsferne  
Film-Schichten
- Ebenen- und  
Positionscodierung der  
Filme (Readypack)
- Zentrale  
Kameraaufnahme
- Aufnahme für TLD-Platte  
Isozentrumsnah



# IMRT in Würzburg

## Dosimetrie

### IMRT-Phantomplan: Ionisationskammer-Dosimetrie

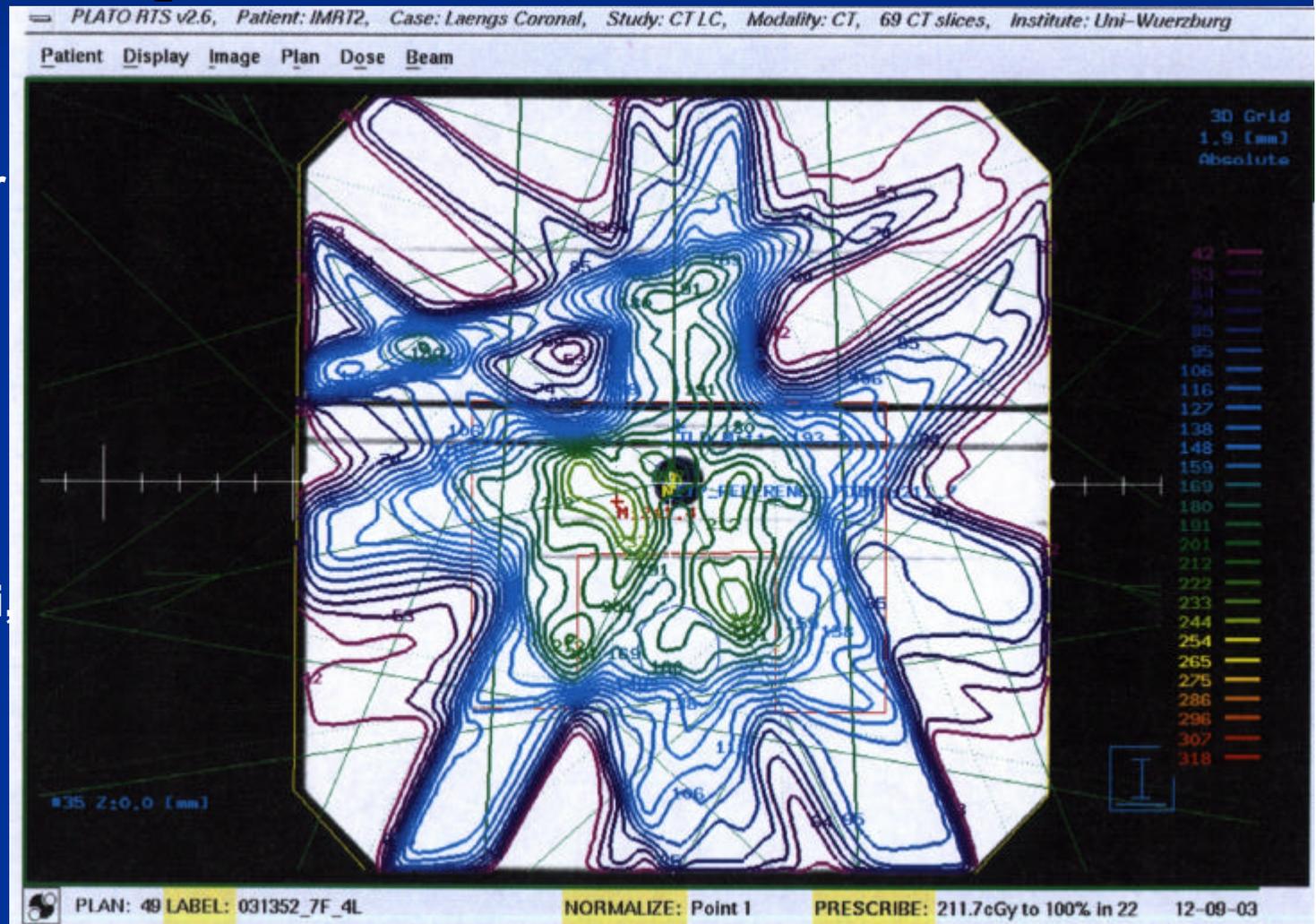


1 cm<sup>3</sup> – Kammer  
PTW 23331

Isozentrum bzw.  
homogenes  
Gebiet

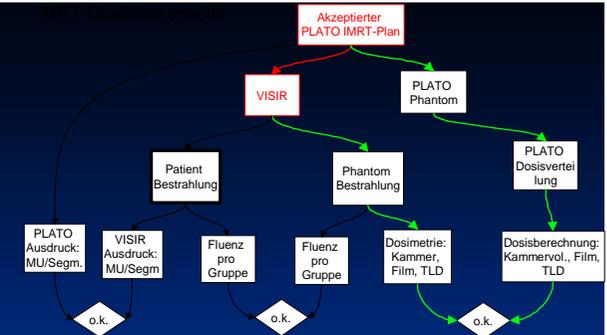
Leybovich, Sethi,  
Dogan  
Med. Phys. 2003  
Low, Parikh  
Med. Phys. 2003

Bratengeier Würzburg

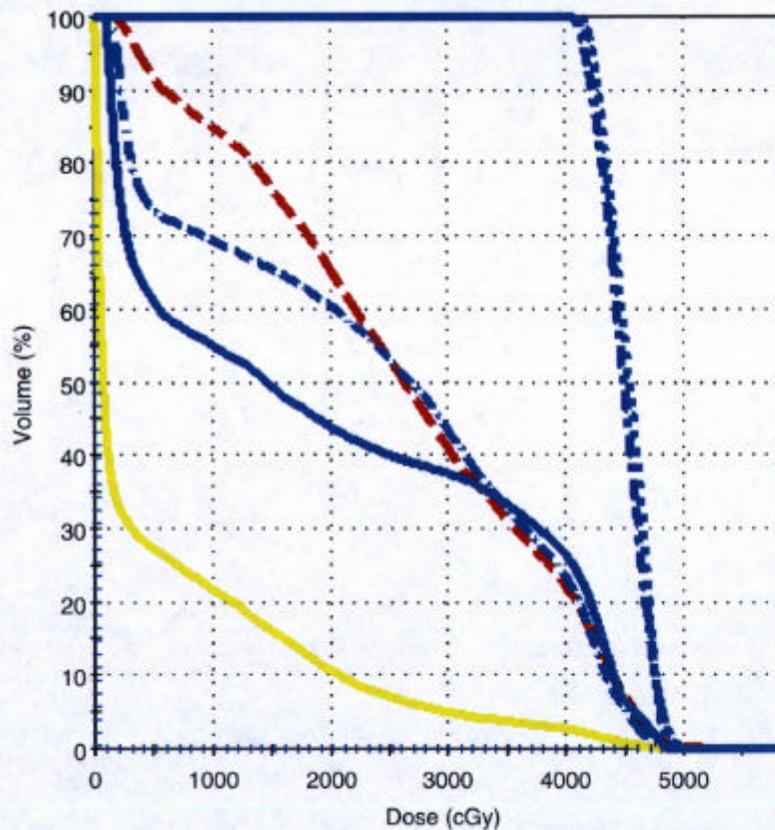


# IMRT in Würzburg Dosimetrie

## IMRT-Phantomplan: Ionisationskammer-Dosimetrie



Cumulative Dose Volume Histogram



22 F

	V(CC)	Min	Max	Mean	SD
*=incomplete					
body*	13370.2	0.0	4647.0	601.5	1038.6
target	707.2	181.0	4978.0	2625.1	1340.0
test*	113.2	0.0	24.0	9.8	9.9
Messkammervolumen	1.0	4136.0	4912.0	4527.7	18
Messkammer	2.5	4064.0	5017.0	4495.5	197.0
TLD-Einsatz	138.6	139.0	4866.0	2387.1	1595.5
OAR	58.8	95.0	4856.0	2002.8	1784.8

7,058 Gy

Mittelung über Kammervolumen

Nr. random points=10000

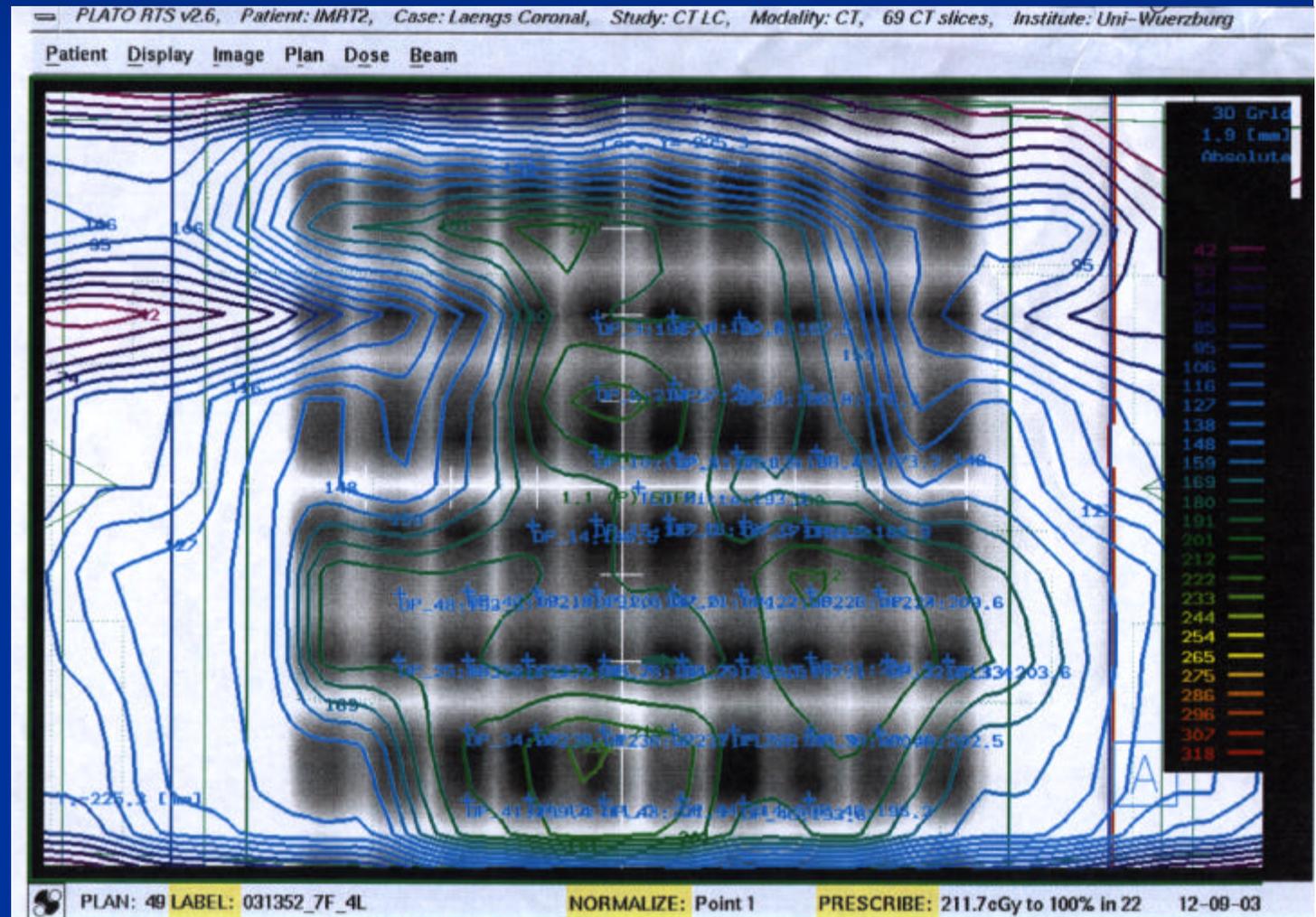
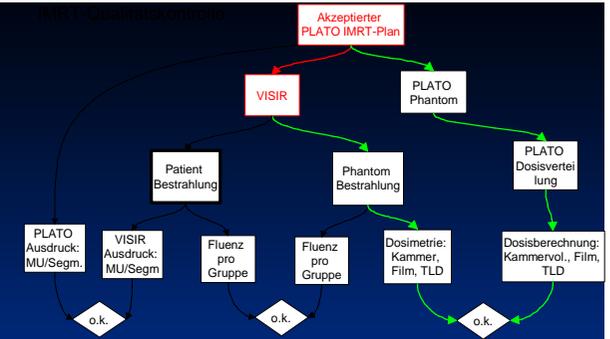
Bratengeier

\*\* Patient name: BRA IMRT II Patient Id: IMRT2 Birth: 26-Jul-2002 Study date: 2002 07 22 (15:44:43) Plan label: Unnamed \*\*\*\* (NOT saved plan)

# IMRT in Würzburg

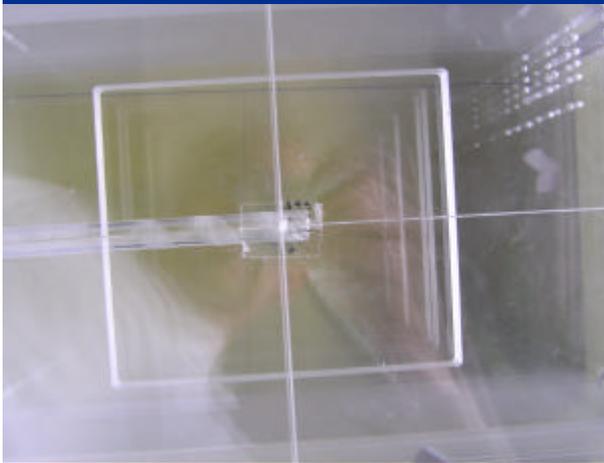
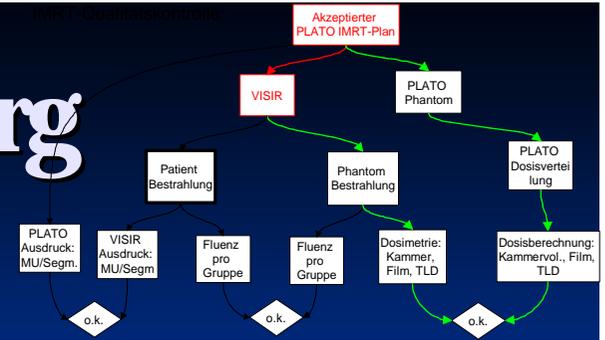
## Dosimetrie

### IMRT-Phantomplan: TL-Dosimetrie



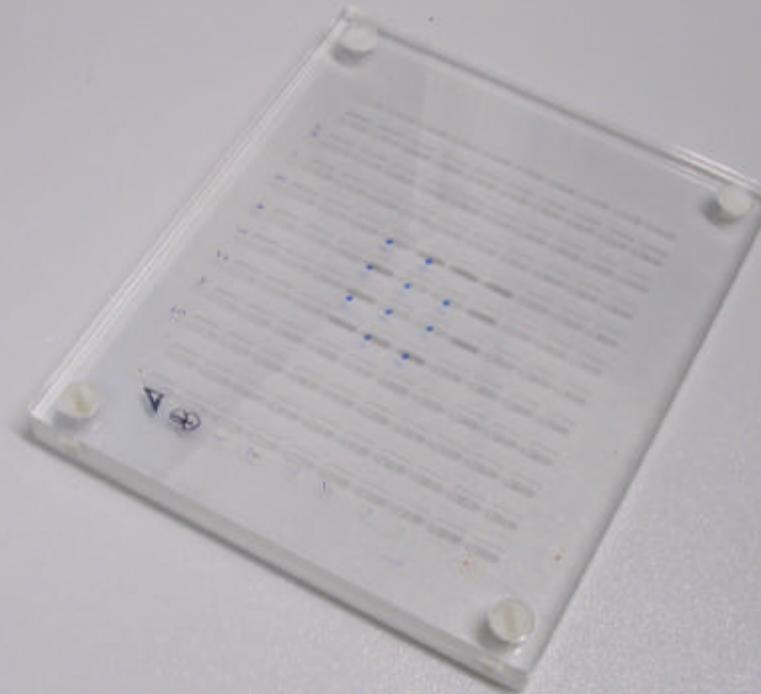
# IMRT in Würzburg Dosimetrie

## IMRT-Phantomplan: TL-Dosimetrie



✍ Harshaw 5500

✍ TLD 100

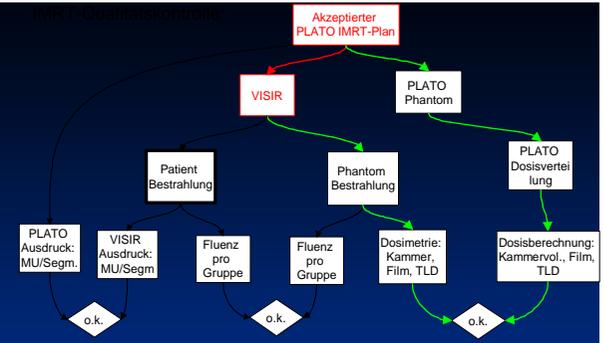




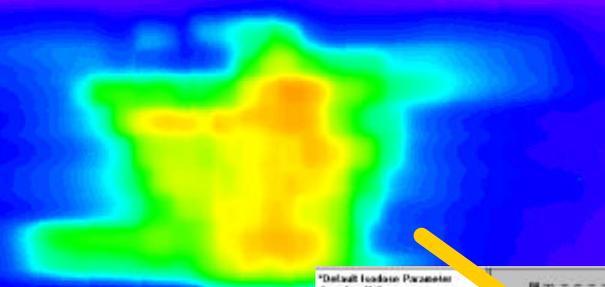
# IMRT in Würzburg

## Dosimetrie

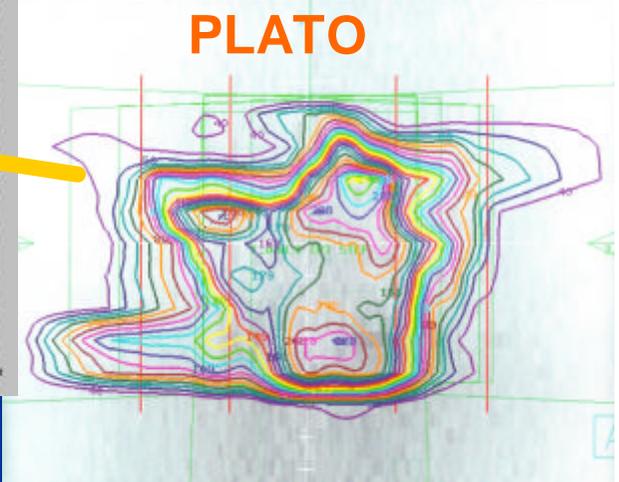
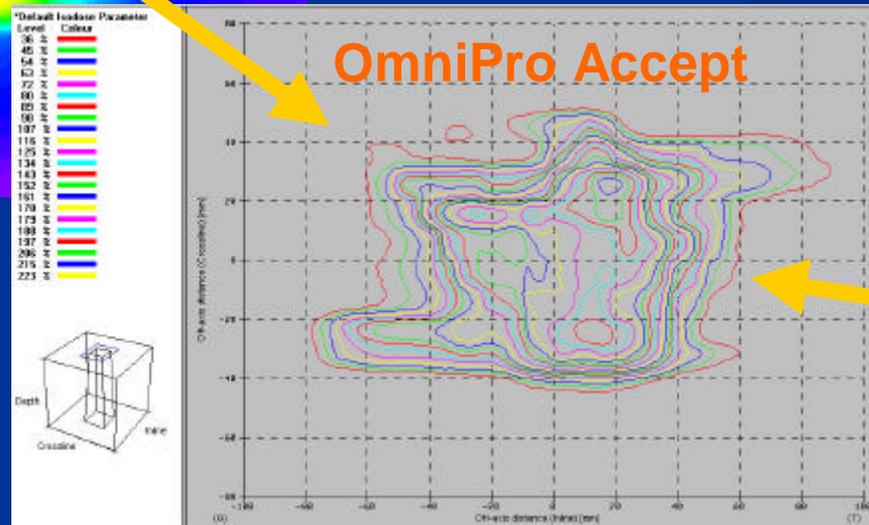
### IMRT-Phantomplan: Film-Dosimetrie



Film



1. IBA Omni-Pro Accept 6.1 / VIDAR VXR 16  
Qualitativer Vergleich der Strukturen  
Quantitativer Vergleich der Dosis auf Plateaus
2. IBA Omni-Pro IMRT / VIDAR  
Auslesen des PLATO-Dosiswürfels  
(in Arbeit)





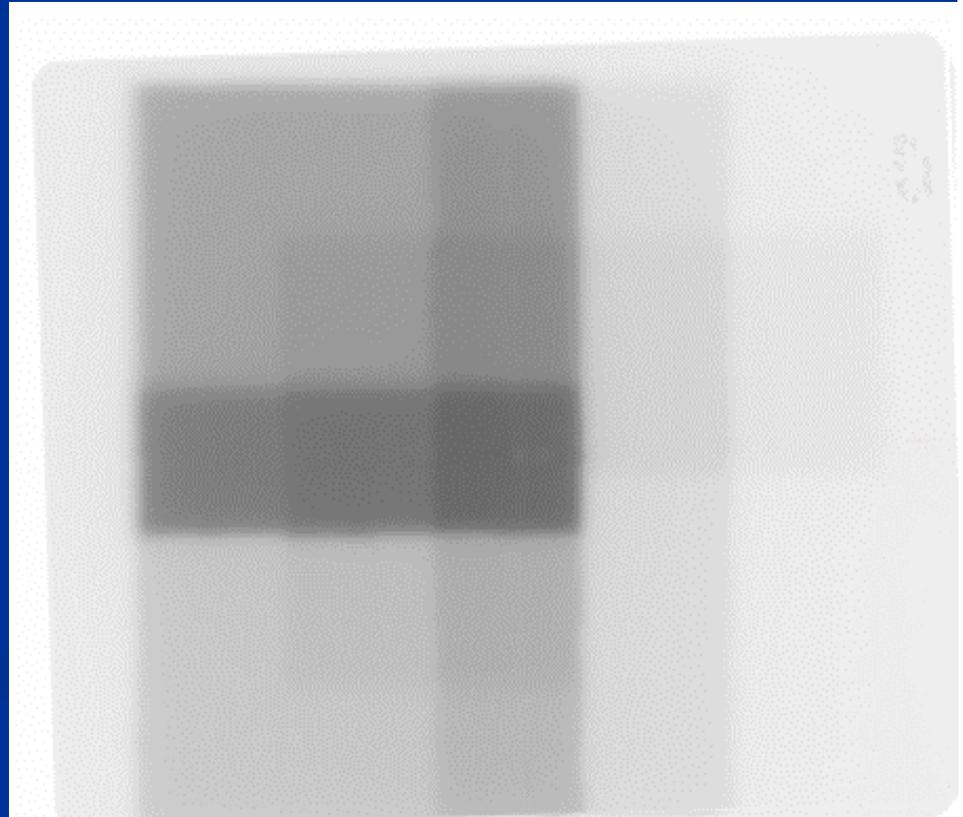
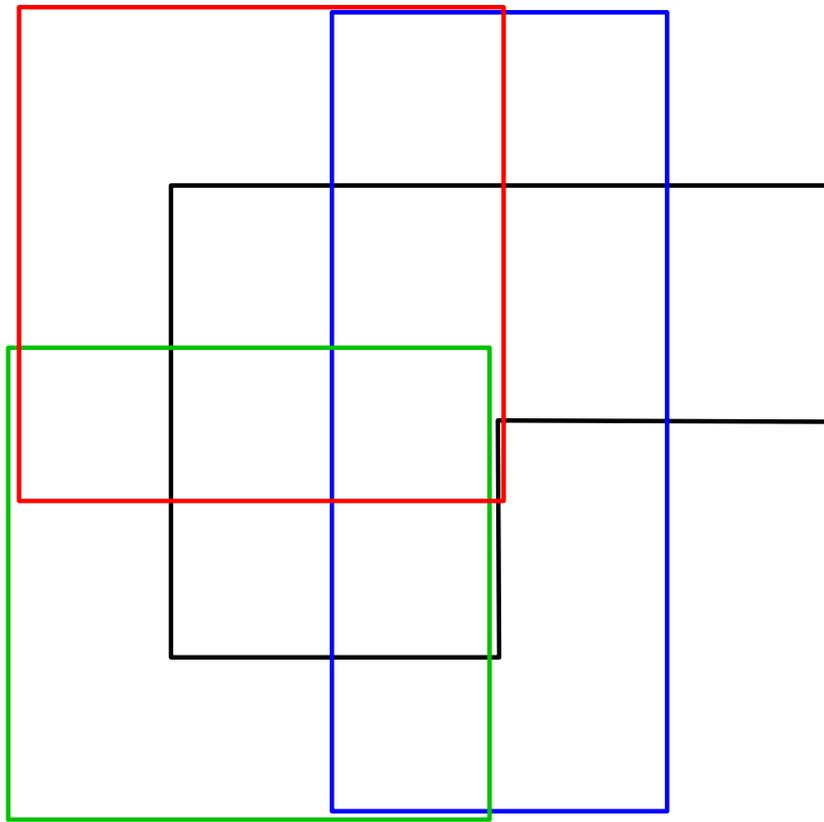
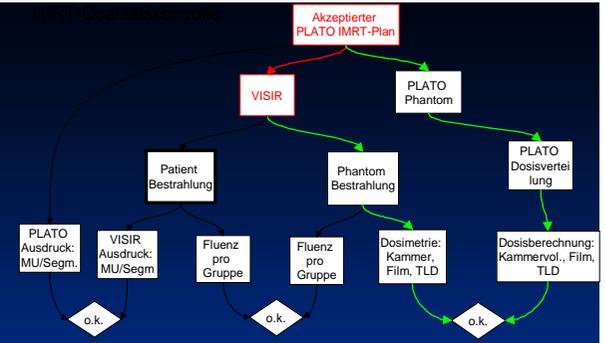
# IMRT in Würzburg

## Dosimetrie

„SENSI“: 4 Feldsegmente

### Belichtungstreppe

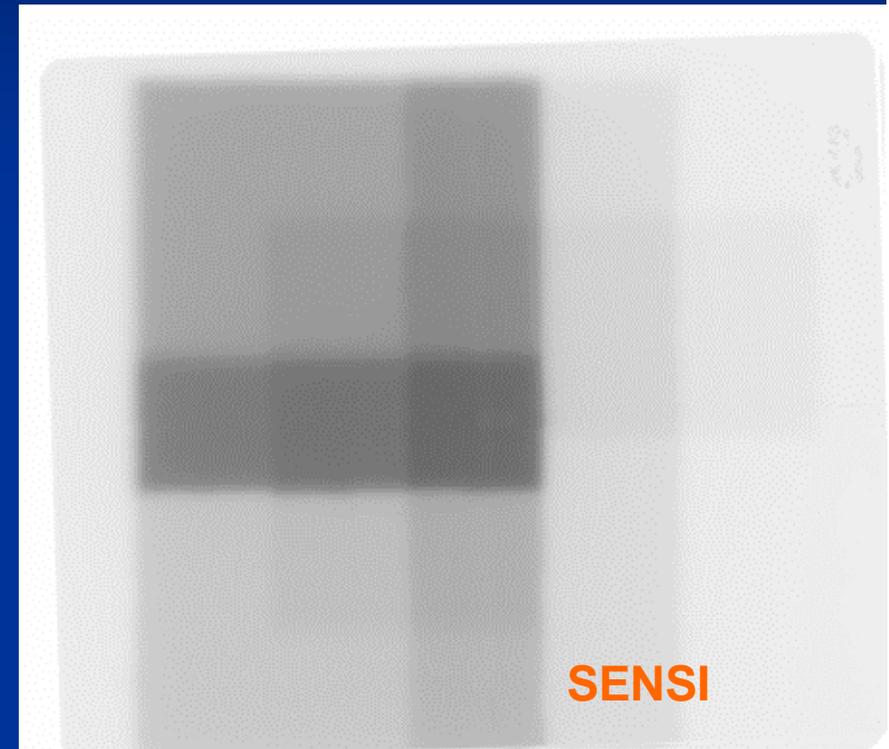
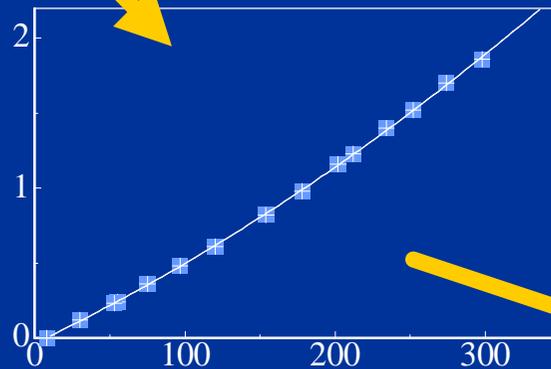
zur Kalibrierung von EDR2-Film



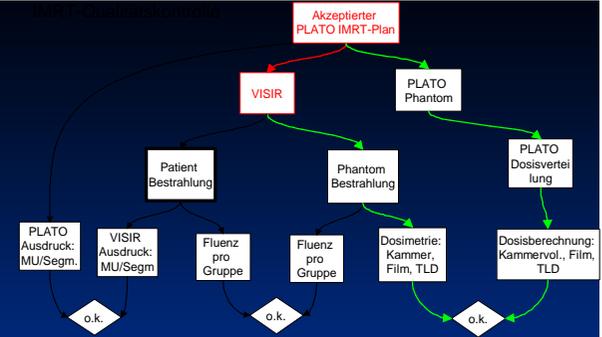
# IMRT in Würzburg

## Dosimetrie

- Nach Absolutdosimetrie:
- Messfilme 10 x 10 T 5
- MU – Dosis Beziehung bekannt
- MU – Schwärzung Beziehung bekannt



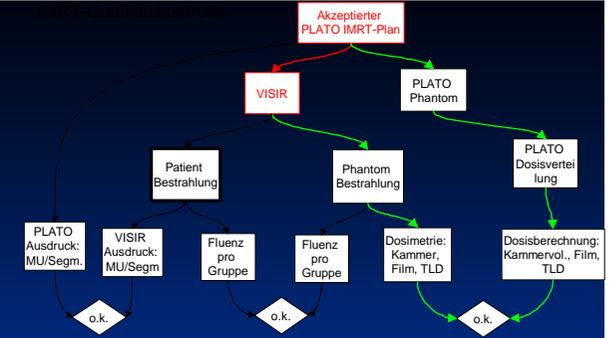
- Den Schwärzungstreppen-Stufen des SENSIFilms kann eine Dosis zugeordnet werden



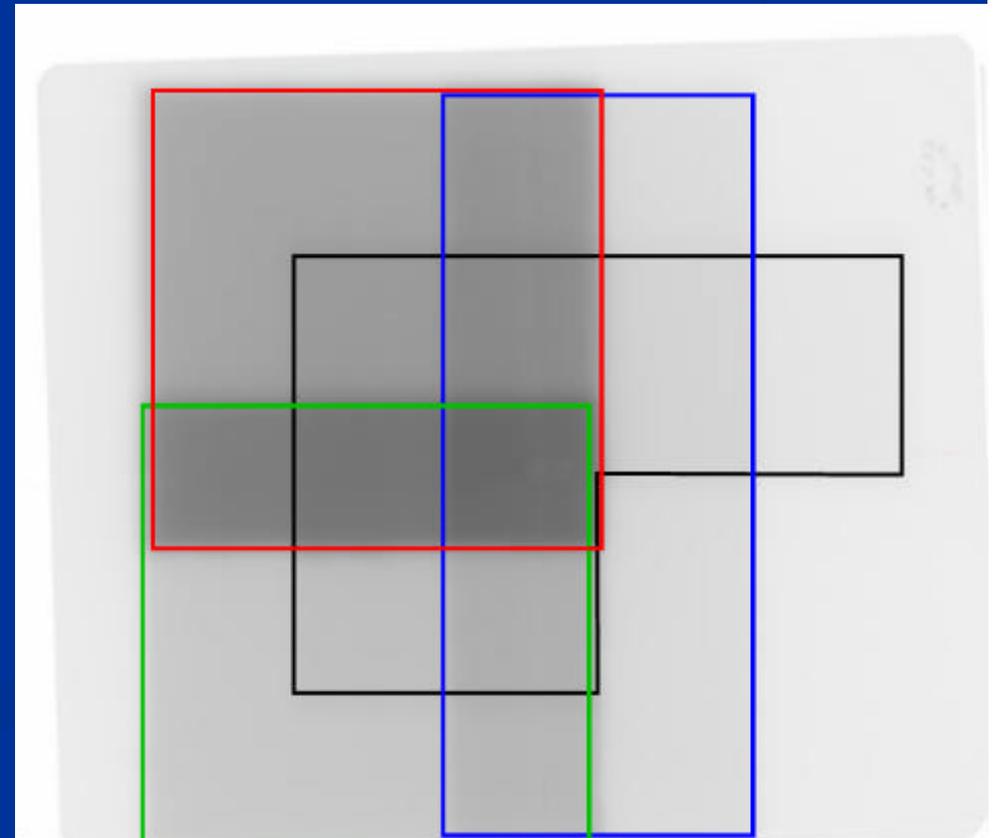
# IMRT in Würzburg

## Dosimetrie

„SENSI“: 4 Feldsegmente - 20, 40, 80, 160 MU  
für 15 Dosis-Stufen

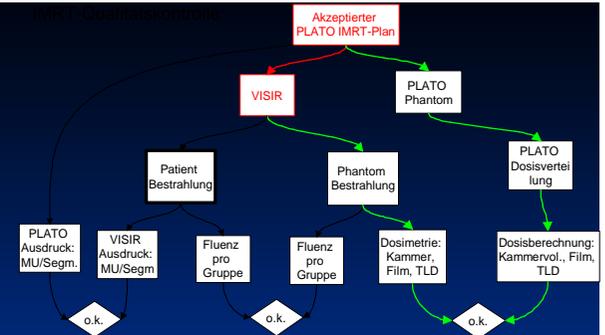


160	200	40	0
180	220	60	20
240	260	300	
100	140		
80	120	40	

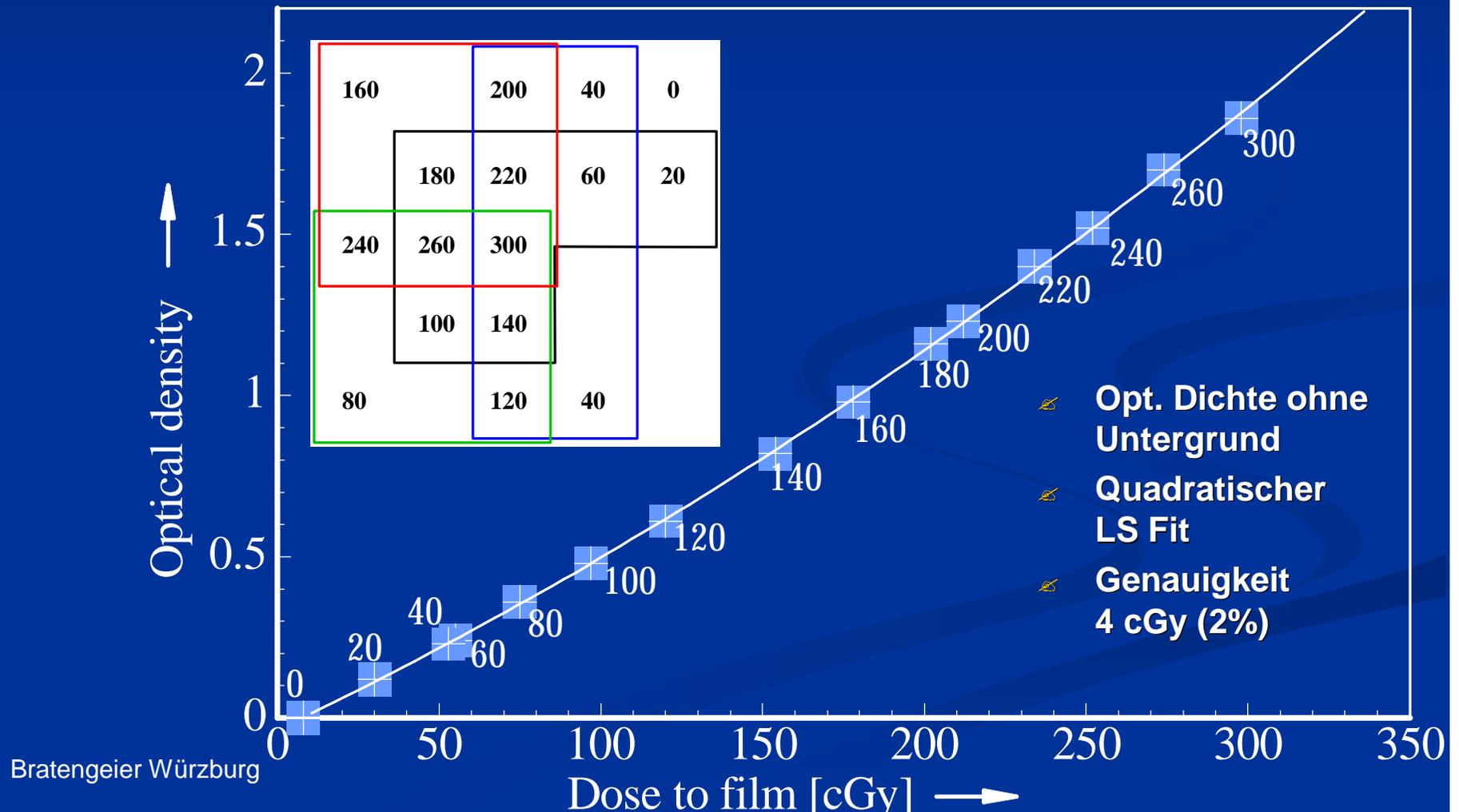


# IMRT in Würzburg

## Dosimetrie



„SENSI“: Anwendung auf EDR2-Film – OD(Dosis)



# IMRT in Würzburg

## Vergleich Planungssystem / Dosimetrie

### Dosisverhältnis

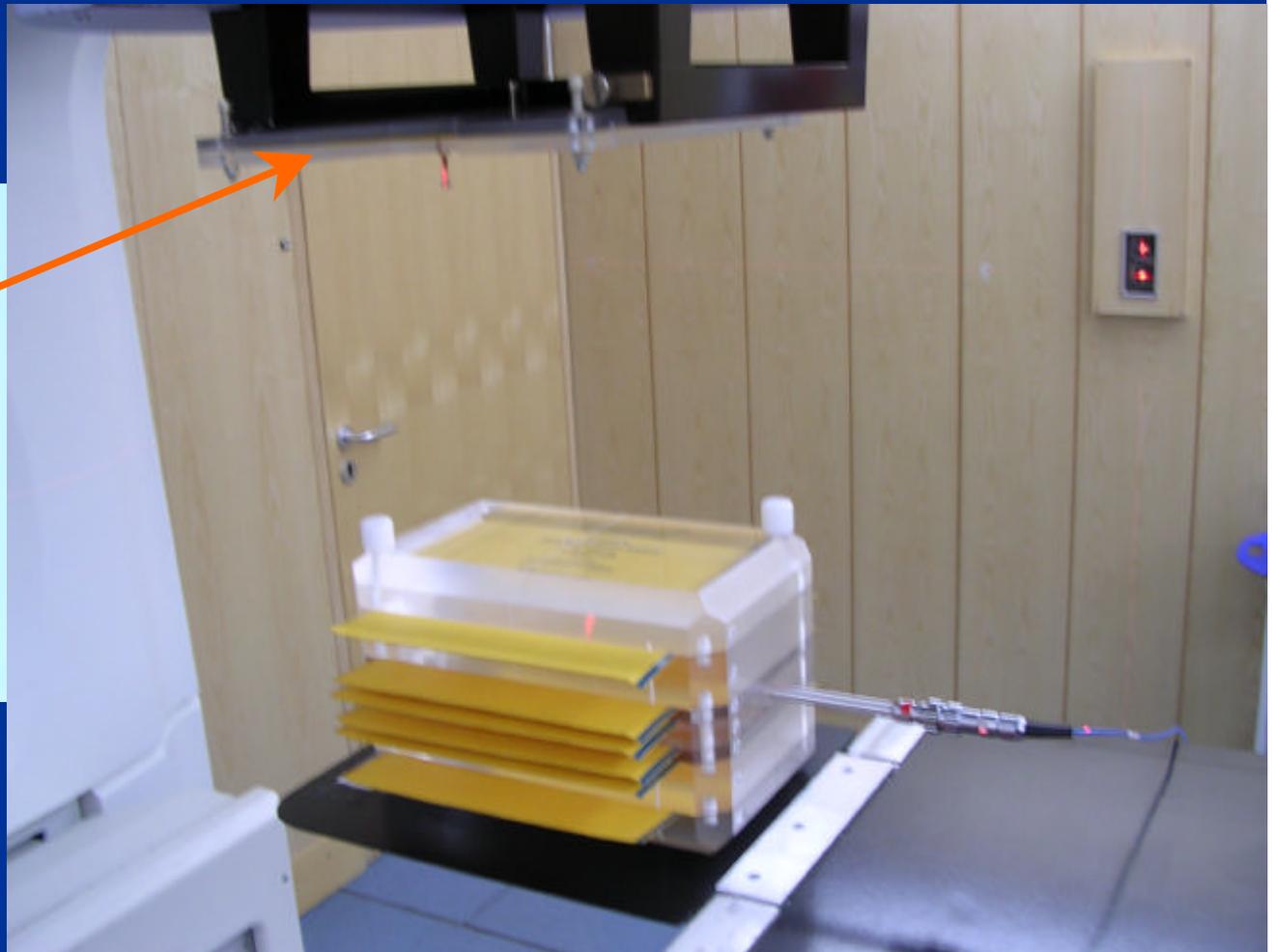
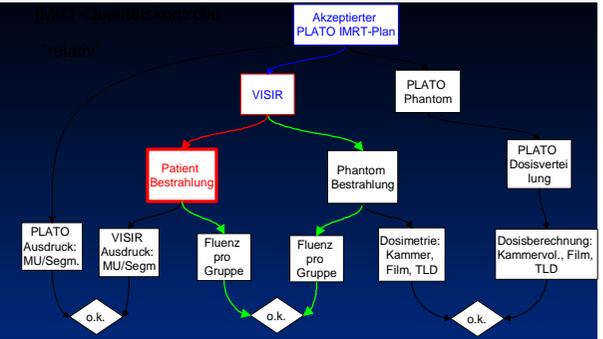
	MW	s	Min	Max
IMRT (12 Pat.)				
✂ PLATO/Kammer	<b>1.016</b>	<b>± 0.017</b>	0.982	1.046
✂ PLATO/Film	<b>1.065</b>	<b>± 0.029</b>	1.042	1.100

### Standardfelder 10x10

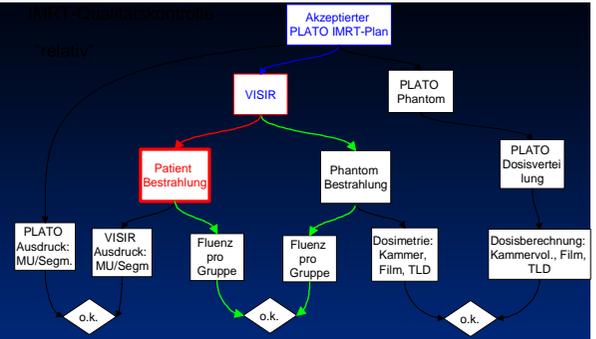
✂ PLATO/Kammer	<b>1.017</b>
✂ PLATO/Film	<b>1.042</b>

# IMRT in Würzburg Fluenz

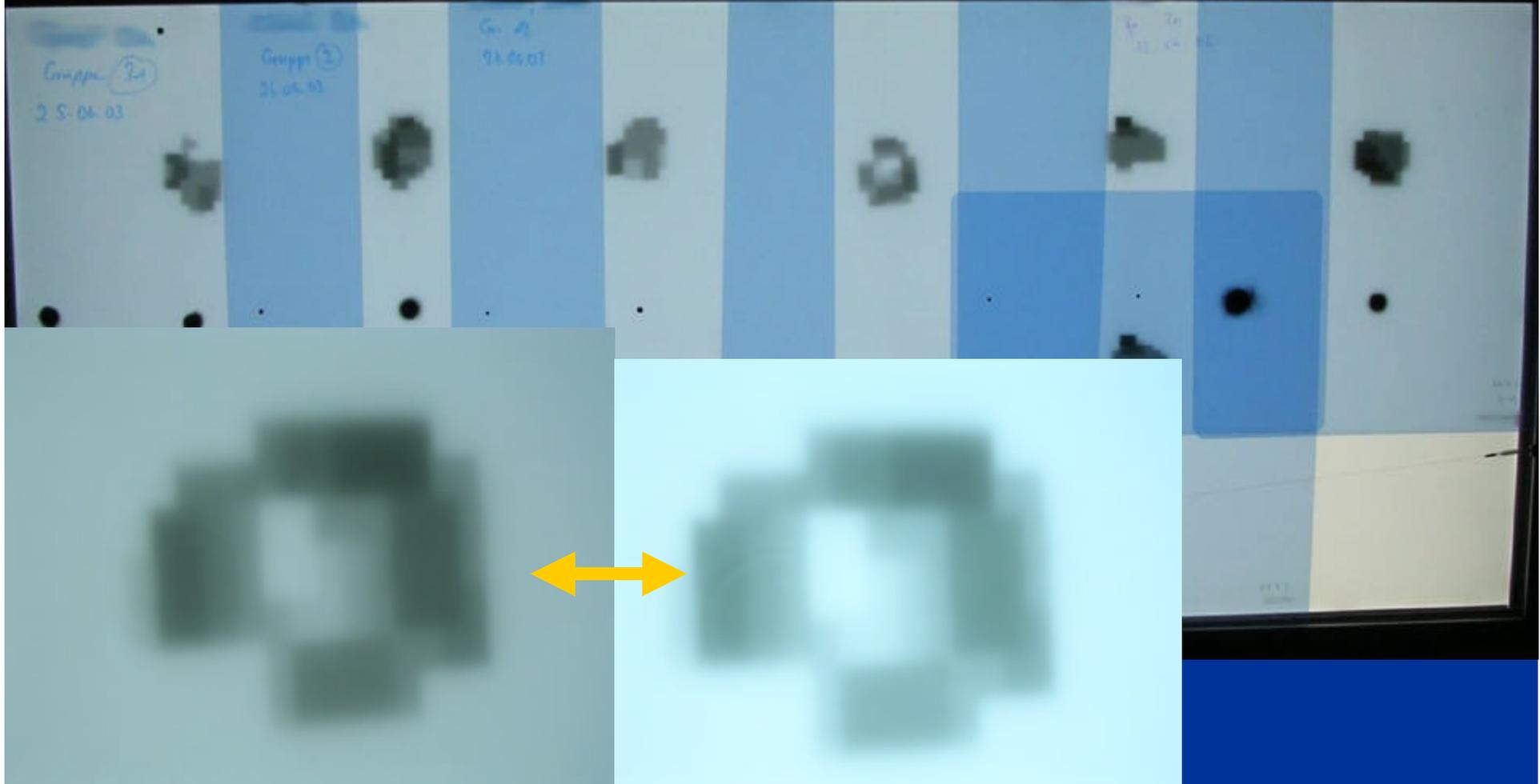
## Fluenz bei Phantombestrahlung



# IMRT in Würzburg Fluenz



📄 Vergleich Phantombestrahlung / Ersteinstellung



Patient Selection System: Patient info, Case info, Study info, patient data  
 Institute : Uni-Wuerzburg  
 Patient# : PLATO RTS v2.6  
 Patient :  
 Case Name : Untitled  
 Study Name : Untitled  
 Images : 50  
 Study Date : <Unknown> <Unknown>

Plan Data  
 PLAN : 3  
 LABEL : 031352 7P 4L ORIGIN MARKER POSITION  
 NORMALIZE : Point # 1 --X-- --Y-- --Z--  
 PRESCRIBE : 244.0cGy to 100% in 22 fraction(s)  
 PLAN DATE : 12-09-2003 10:18

Beam Data: conform user convention [ P1i 117 / 14-MAY-2003 ]

Beam	1	2	3	4	5
Fieldn	1	2	3	4	5

SSD/Depth is in 1.0\*cm; Gantr in 1.0\*deg.

Unit	P1i 117				
X/E	6X	6X	6X	6X	6X
	SAD	SAD	SAD	SAD	SAD
SSD	94.4	93.8	92.2	89.1	90.8
Depth	5.6	6.2	7.8	10.9	9.2
Gantr	0.0	51.0	103.0	154.0	206.0
Start	-	-	-	-	-
Stop	-	-	-	-	-

Primary Collimator: X and Y are in 1.0\*cm; Colli in 1.0\*deg.

PCT	Asym X				
	Asym Y				
X	9.0	12.0	13.8	11.4	10.2
X1	4.5	6.9	7.5	6.3	5.1
X2	4.5	5.1	6.3	5.1	5.1
Y	9.0	9.0	9.0	9.0	9.0
Y1	4.5	4.5	4.5	4.5	4.5
Y2	4.5	4.5	4.5	4.5	4.5
SCT	ITP	ITP	ITP	ITP	ITP
Colli	0.0	0.0	0.0	0.0	0.0

Table Top: Lat, Long, Vert are in 1.0\*cm; Rot in 1.0\*deg.

Lat	0.4	0.4	0.4	0.4	0.4
Long	2.8	2.8	2.8	2.8	2.8
Vert	-6.0	-6.0	-6.0	-6.0	-6.0
Rot	0.0	0.0	0.0	0.0	0.0

Beam Modifier data:

Wedge	None	None	None	None	None
Angle	-	-	-	-	-
Name	-	-	-	-	-
Block	None	None	None	None	None
Tray	None	None	None	None	None

Correc tions

Inhomog.	*ON*								
Bolus	*OFF*								

Monitor Units or decimal Minutes

Weight	0.414	0.067	0.380	0.338	0.473
MU/Min	115.0	175.0	106.0	165.0	146.0
wedge	0.0	0.0	0.0	0.0	0.0
open	115.0	175.0	106.0	165.0	146.0

MU PLATO

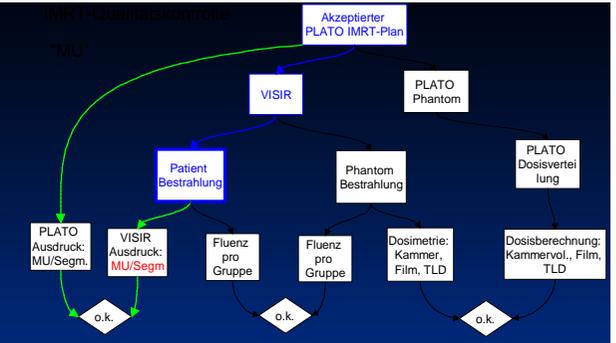
MU VISIR



# IMRT in Würzburg MU

Vergleich der MU des Planungssystem-Ausdrucks mit den Angaben des Verifikationssystems

> Freigabe für weitere Einstellungen



# IMRT in Würzburg

## weitere Kontrollen in der laufenden Serie

- ✍ Pro Bestrahlungstag bei einem Feld Fluenzkontrolle
- ✍ Mindestens wöchentliche Isozentrumskontrolle
- ✍ Wöchentlicher Leafcheck:  
dichte Folge von 1 cm-Segmenten