



*Coordinatori:  
Francesca Valvo, Cynthia Aristei,  
Marco Lupattelli, Vincenzo Fusco*

**- RIONERO IN VULTURE : 31 OTTOBRE 2014**

**Tecniche di irradiazione (3D-CRT - IMRT - IGRT)**

**Aspetti tecnico-dosimetrici**

*Stefania Maggi  
SOD Fisica Sanitaria  
AOU Ospedali Riuniti – Ancona*

File QuickLinks Edit View Insert Workspace Planning Tools Window Help

2.0 cm 2.0 cm 2.0 cm

Series 5088  
CT\_1

- ANO
- ANO #
- prova 3d
- ANO 45
- ANO 50
- ANO 54
- Plan Sum

Fields

- AP
- PA
- LAT DX
- LAT SN
- MLC
- LAT SN
- ANO 50
- Fields
- PA 2
- LAT DX 2
- LAT SN 2
- ANO 54
- Fields
- AP 3
- PA 3
- LAT DX 3
- LAT SN 3

Plan Sum - Transversal - CT\_1

Isodoses (cGy)

- 5940.0
- 5670.0
- 5400.0
- 5130.0
- 4860.0
- 4768.0
- 4575.0
- 4050.0

Z: 1.55 cm

Plan Sum - Dose Volume Histogram

Ratio of Total Structure Volume

Dose [cGy]

Some structures are unapproved or rejected

Plan Sum - Sagittal - CT\_1

X: 0.28 cm

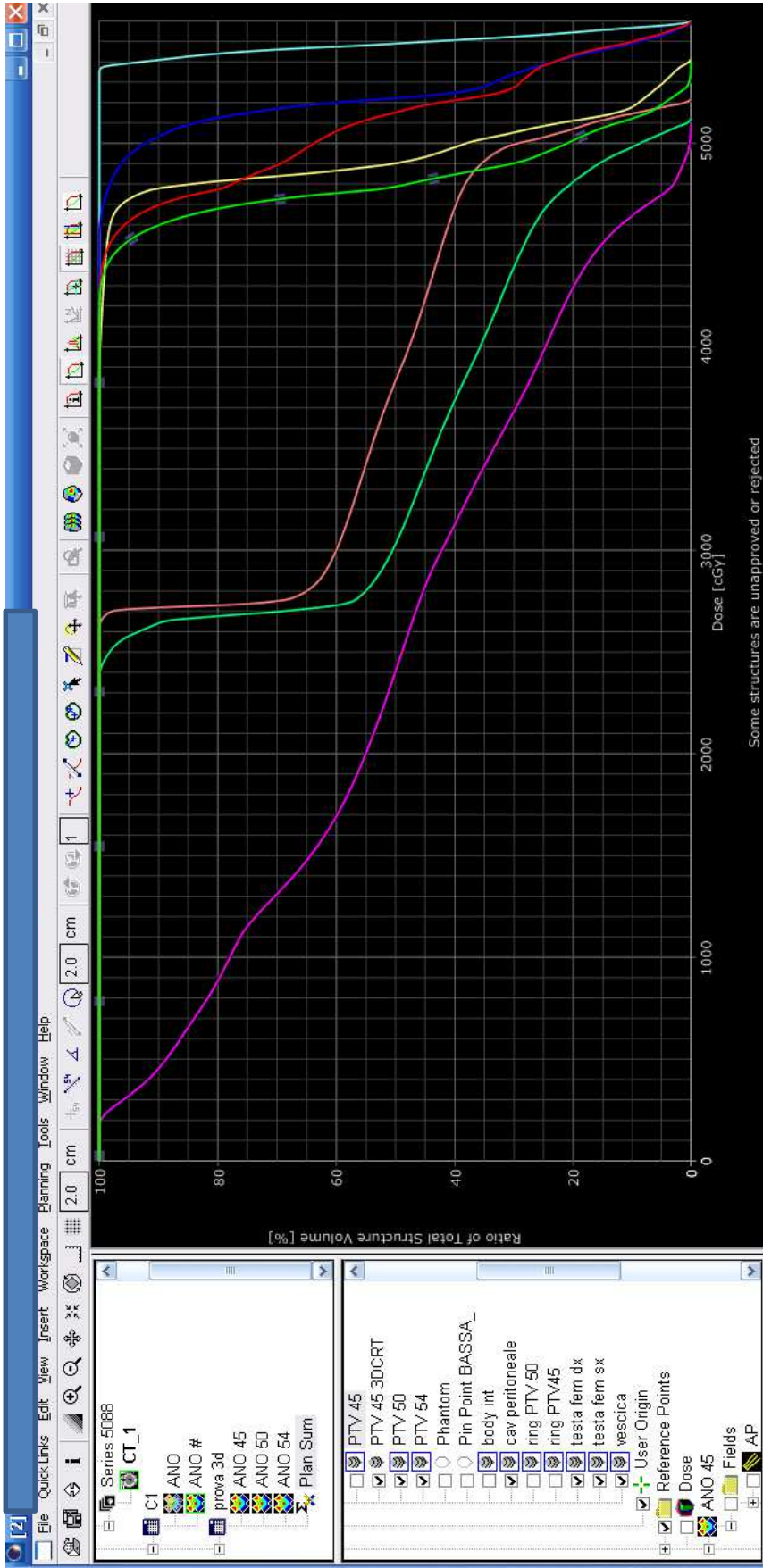
Plan Sum - Frontal - CT\_1

Y: 10.92 cm

Fields | Dose Prescription | Field Alignments | Plan Objectives | Optimization Objectives | Dose Statistics | Calculation Models | Plan Sum

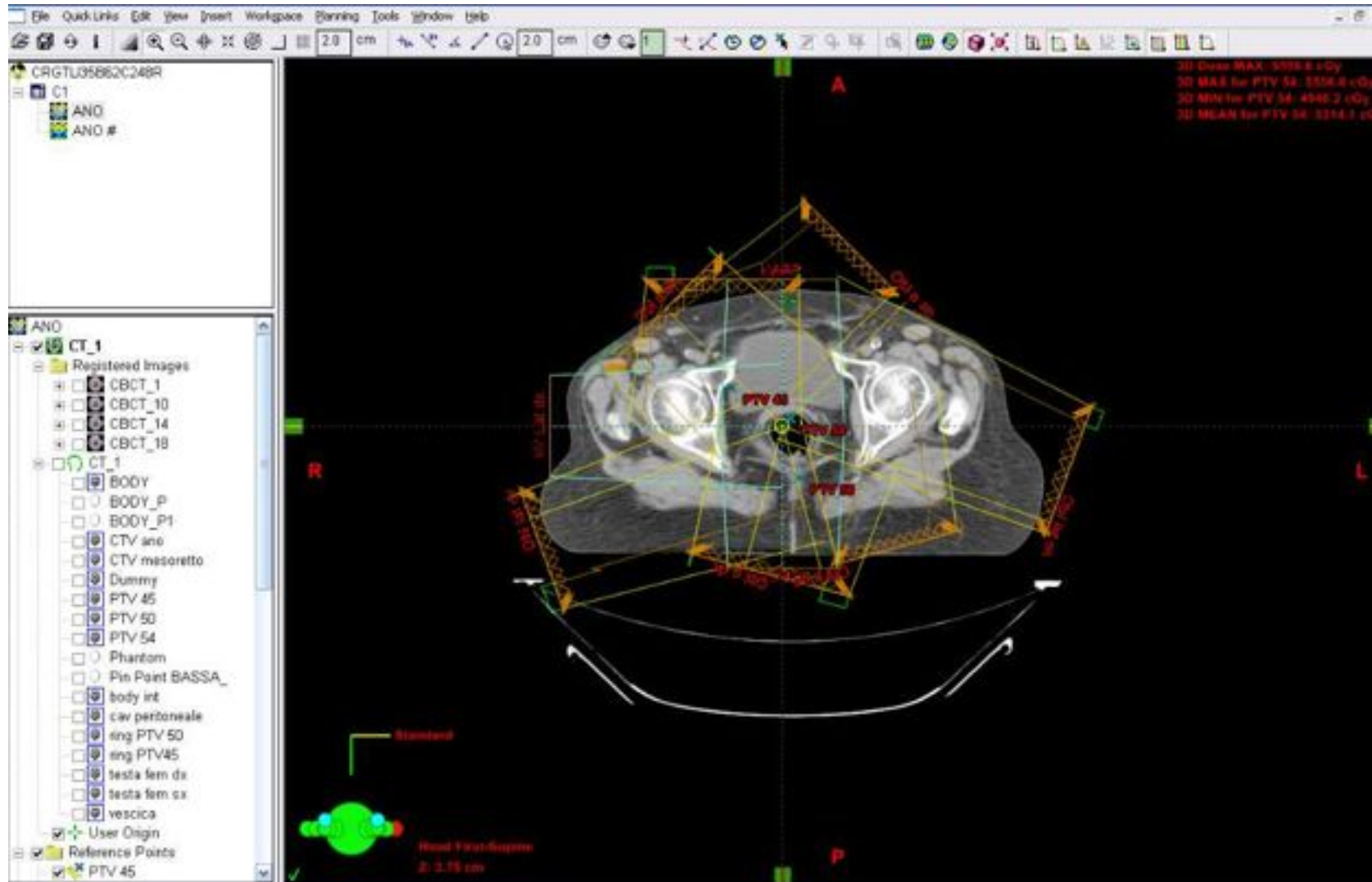
View	DVH Line	Structure	Approval Status	Plan	Plan Sum	Course	Volume [cm <sup>3</sup> ]	Dose Statistics	Dose Cover [%]	Sampling Cover...	Min Dose [cGy]	Max Dose [cGy]	Mean Dose [cGy]
✓		PTV 50	Approved	Plan Sum	prova 3d	786.4	100.0	100.0	100.0	100.0	4494.3	5802.2	5243.2
✓		PTV 45	Approved	Plan Sum	prova 3d	732.6	100.0	100.0	100.0	100.0	4057.4	5404.3	4826.4
✓		cav peritoneale	Approved	Plan Sum	prova 3d	511.4	100.0	100.0	100.0	100.0	164.5	5099.1	2507.8
✓		vescica	Approved	Plan Sum	prova 3d	314.7	100.0	100.0	100.0	100.0	3816.4	5419.2	4948.0
✓		testa fem dx	Approved	Plan Sum	prova 3d	158.2	100.0	100.0	100.0	100.0	2573.3	5225.0	3886.2
✓		testa fem sx	Approved	Plan Sum	prova 3d	105.9	100.0	100.0	100.0	100.0	2358.9	5126.2	3549.0
✓		PTV 54	Approved	Plan Sum	prova 3d	244.6	100.0	100.0	100.0	100.0	5352.4	5803.7	5489.6
✓		PTV 45 3DCRT	Unapproved	Plan Sum	prova 3d	1766.0	100.0	100.0	100.0	100.0	4057.4	5803.7	5104.3
✓		ring PTV45	Approved	Plan Sum	prova 3d	417.4	100.0	100.0	100.0	100.0	1891.9	5435.1	4666.4
✓		ring PTV 50	Approved	Plan Sum	prova 3d								
✓		Dummy	Approved	Plan Sum	prova 3d								
✓		BODY	Approved	Plan Sum	prova 3d								
✓		CTV ano	Approved	Plan Sum	prova 3d								
✓		CTV mesoretto	Approved	Plan Sum	prova 3d								
✓		body int	Approved	Plan Sum	prova 3d								

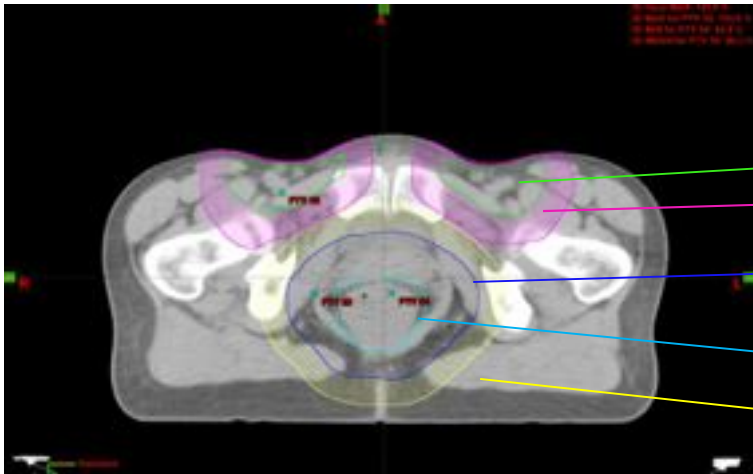
User: emanuelam | Group: FISTICI | Site: Main | NUM | 13:00



View	DVH Line	Structure	Approval Status	Plan	Course	Volume [cm <sup>3</sup> ]	Dose Statistics	Dose Cover [%]	Sampling Cover [%]	Min Dose [cGy]	Max Dose [cGy]	Mean Dose [cGy]
<input checked="" type="checkbox"/>		PTV 50	Approved	Plan Sum	prova 3d	786.4	100.0	100.0	100.0	4494.3	5602.2	5243.2
<input checked="" type="checkbox"/>		PTV 45	Approved	Plan Sum	prova 3d	732.6	100.0	100.0	100.0	4057.4	5404.3	4826.4
<input checked="" type="checkbox"/>		cav peritoneale	Approved	Plan Sum	prova 3d	511.4	100.0	100.0	100.0	164.5	5098.1	2507.8
<input checked="" type="checkbox"/>		vescica	Approved	Plan Sum	prova 3d	314.7	100.0	100.0	100.0	3816.4	5419.2	4948.0
<input checked="" type="checkbox"/>		testa fem dx	Approved	Plan Sum	prova 3d	156.2	100.0	100.0	100.0	2573.3	5225.0	3886.2
<input checked="" type="checkbox"/>		testa fem sx	Approved	Plan Sum	prova 3d	105.9	100.0	100.0	100.0	2358.9	5126.2	3549.0
<input checked="" type="checkbox"/>		PTV 54	Approved	Plan Sum	prova 3d	244.6	100.0	100.0	100.0	5352.4	5603.7	5489.6
<input checked="" type="checkbox"/>		PTV 45 3DCRT	Unapproved	Plan Sum	prova 3d	1766.0	100.0	100.0	100.0	4057.4	5603.7	5104.3
<input checked="" type="checkbox"/>		ring PTV45	Approved	Plan Sum	prova 3d	417.4	100.0	100.0	100.0	1891.9	5435.1	4666.4
<input checked="" type="checkbox"/>		ring PTV 50	Approved	Plan Sum	prova 3d							
<input checked="" type="checkbox"/>		Dummy	Approved	Plan Sum	prova 3d							
<input checked="" type="checkbox"/>		BODY	Approved	Plan Sum	prova 3d							
<input checked="" type="checkbox"/>		CTV ano	Approved	Plan Sum	prova 3d							
<input checked="" type="checkbox"/>		CTV mesoretto	Approved	Plan Sum	prova 3d							
<input checked="" type="checkbox"/>		body int	Approved	Plan Sum	prova 3d							

# IMRT Sliding windows: class solution





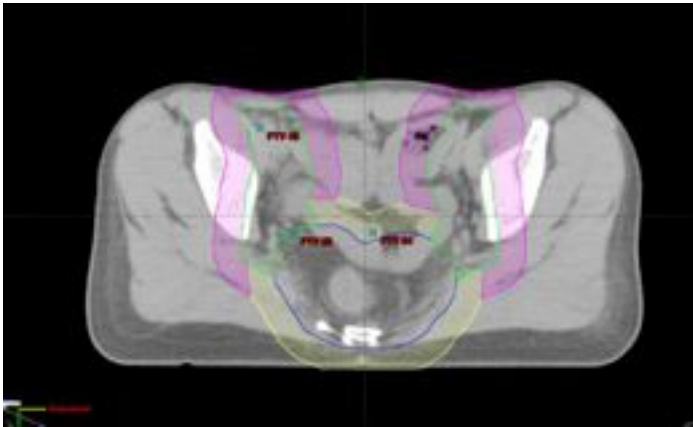
PTV N45

RING 45

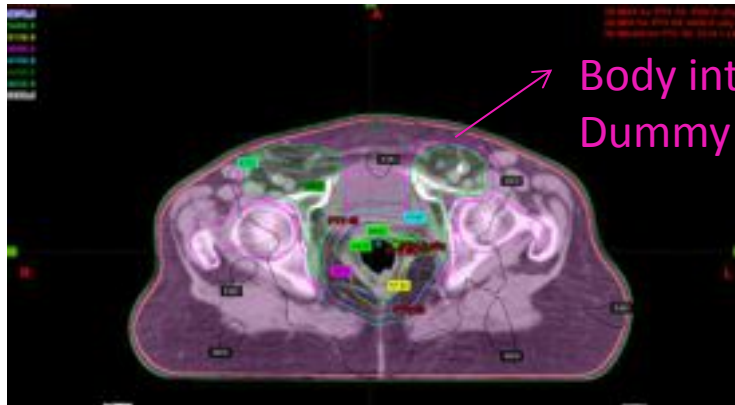
PTV T 50

PTV T 54

RING 50

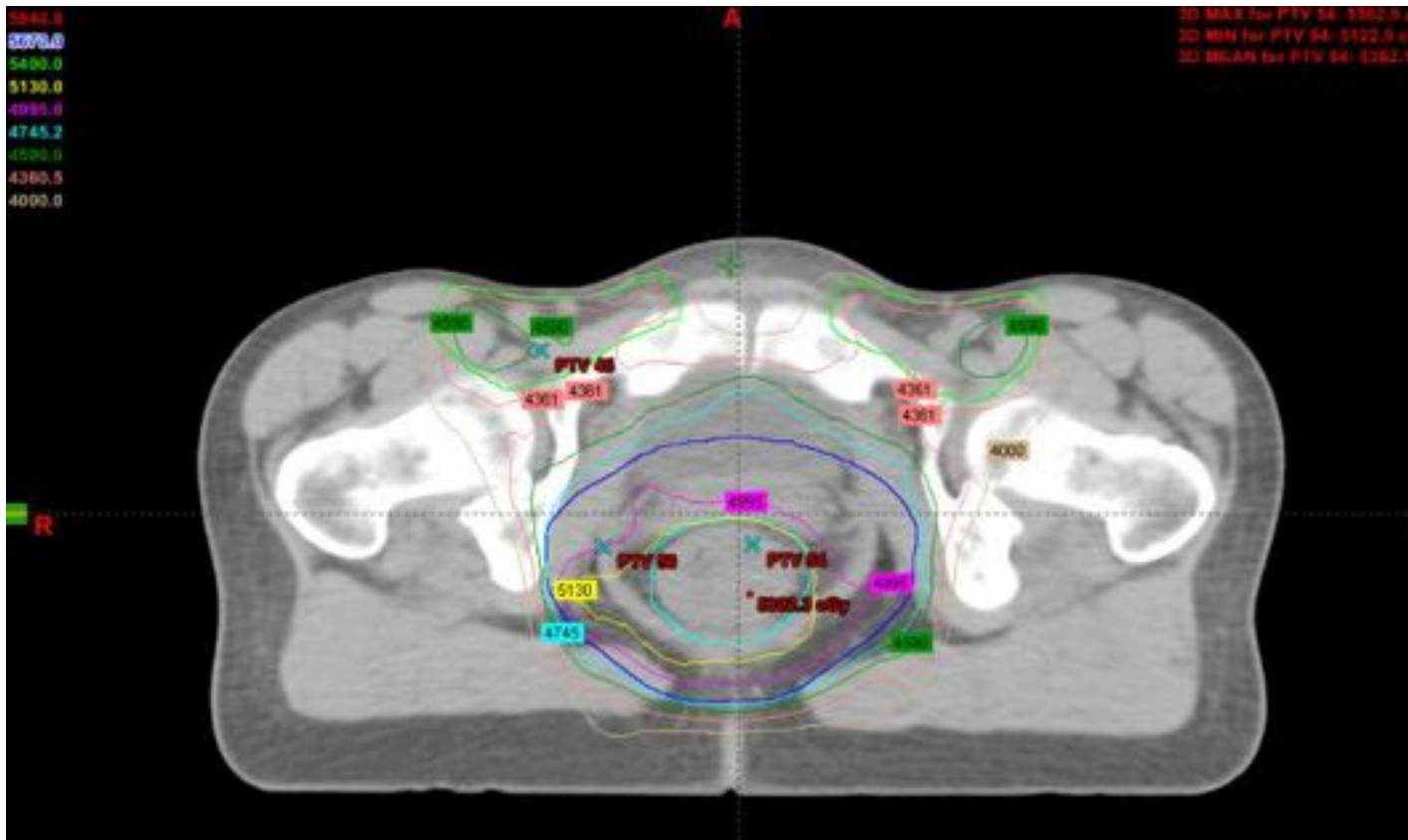


Color	Structure	Limit	Vol [%]	[cc]	Priority
Light Green	Carper - PTV	upper	0.00	4750.0	300
Light Green	carpeltarsale	upper	0.00	5900.0	300
Pink	dummy ant	upper	0.00	4900.0	250
Light Red	femora lx	upper	10.00	4900.0	50
Light Red	femora rx	upper	0.00	5900.0	300
Light Green	PTV 45	upper	0.00	4800.0	300
Light Green	PTV 45	lower	100.00	4390.5	300
Blue	PTV 50	upper	0.00	5900.0	300
Blue	PTV 50	lower	100.00	4800.0	300
Light Blue	PTV 54	upper	0.00	5600.0	300
Light Blue	PTV 54	lower	100.00	5200.0	300
Light Blue	PTV50 - PTV54	upper	0.00	5150.0	300
Light Blue	PTV50 - PTV54	lower	100.00	4800.0	300
Pink	ring 45	upper	0.00	4450.0	300
Pink	ring 45	upper	5.00	4300.0	200
Pink	ring 50	upper	0.00	4900.0	300
Pink	ring 50	upper	5.00	4750.0	200
Light Green	vesica	upper	10.00	4500.0	50
Light Green	vesica	upper	0.00	5900.0	300
Light Red	femora dx	upper	10.00	4900.0	50
Light Red	femora dx	upper	0.00	5900.0	300

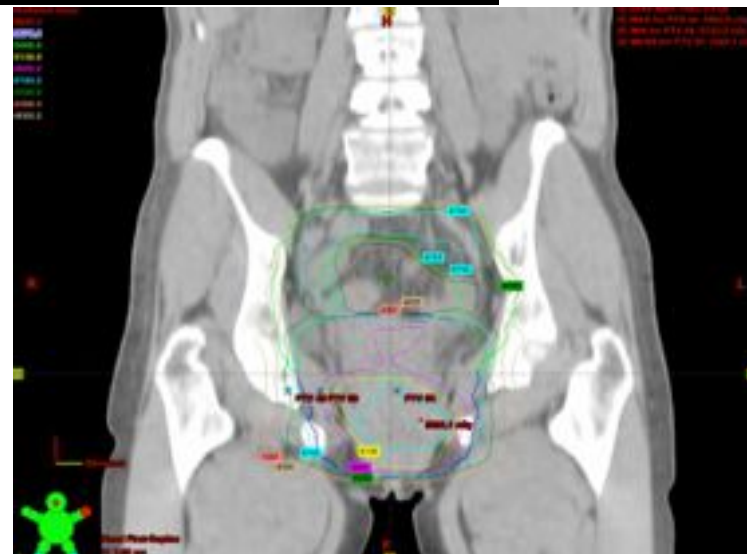


Body int  
Dummy

Inverse Planning : OPTIMIZATION



## DOSE DISTRIBUTION IMRT SLIDING WINDOWS



Plan Label: ANO  
 Plan Status: Approved  
 Plan Date: Mar 27, 2014 10:55:28 AM  
 Position: HFS

User Name: Marco Valenti

What's Next  
 Plan Approved  
 Click Generate Plan Report to create a plan report  
 You may now perform Delivery Quality Assurance to verify the planned dose.

Save

Contouring | ROIs | Plan Settings | Beam Angles | Optimization | Fractionation

Presets  
 Lines  
 Gy %

57.80 Gy
54.00 Gy
51.30 Gy
48.60 Gy
47.50 Gy
45.00 Gy
43.60 Gy
40.10 Gy

Target

Name	
PTV 54 T	<input checked="" type="checkbox"/>
PTV 54 N	<input checked="" type="checkbox"/>
PTV 50	<input checked="" type="checkbox"/>

Regions at Risk

Name	
BODY	<input type="checkbox"/>
Ring PTV 54T	<input type="checkbox"/>
Dummy	<input type="checkbox"/>
Ring PTV 54N	<input type="checkbox"/>
BTV T	<input type="checkbox"/>
BTV N	<input type="checkbox"/>
CTV meso+canal	<input type="checkbox"/>
CTV N	<input type="checkbox"/>
bodyint	<input type="checkbox"/>
vesicla	<input type="checkbox"/>
fem dx	<input type="checkbox"/>
Cute	<input type="checkbox"/>
cav perf.	<input type="checkbox"/>
fem lx	<input type="checkbox"/>
Cute int	<input type="checkbox"/>
Ring PTV 45	<input type="checkbox"/>
Ring PTV 50	<input type="checkbox"/>

Transverse

Coronal

Sagittal

45Gy

54Gy

50Gy

95%

95%

110

129

137

Tuesday, October 28, 2014 11:32:48

Start | Tomotherapy DQA Station | Planning Station | Calculator | ANO ANOAL.bsp - Paint | 11:32 AM

Paziente 2  
T2 N+ M+

Plan Label: ANO  
Plan Status: Approved  
Plan Date: Apr 29, 2014 10:24:14 AM  
Position: HFS

What's Next

Plan Approved

- Click Generate Plan Report to create a plan report
- You may now perform Delivery Quality Assurance to verify the planned dose.

User Name: Marco Valentini

Contouring ROIs Plan Settings Beam Angles Optimization Fractionation

Presets

Lines

0y 0%

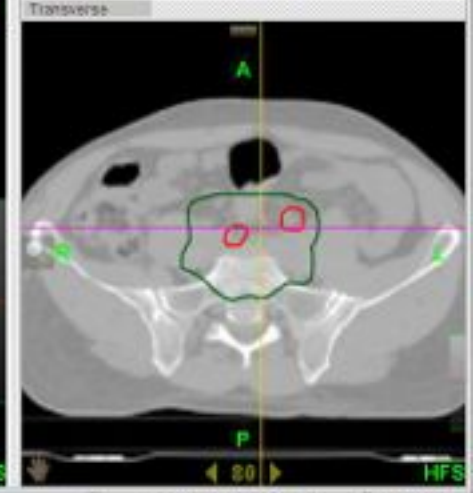
Edit

Target

Name	Color
PTV3D	Green
PTV54T	Blue
PTV50L5R	Red

Regions at Risk

Name	Color
the per - PTV	Blue
BODY	Light Blue
CTV T	Green
MESORETTO	Orange
fossa ischio rel	Yellow
CTV N	Red
STV T	Light Green
1 cm	Light Blue
CTV LR	Green
vesica	Light Blue
Femore dx	Yellow
Can per	Light Blue
Femore sr	Yellow
bulbo	Light Blue
ginad	Light Blue
STV N	Light Green





Paziente 2  
T2 N+ M+

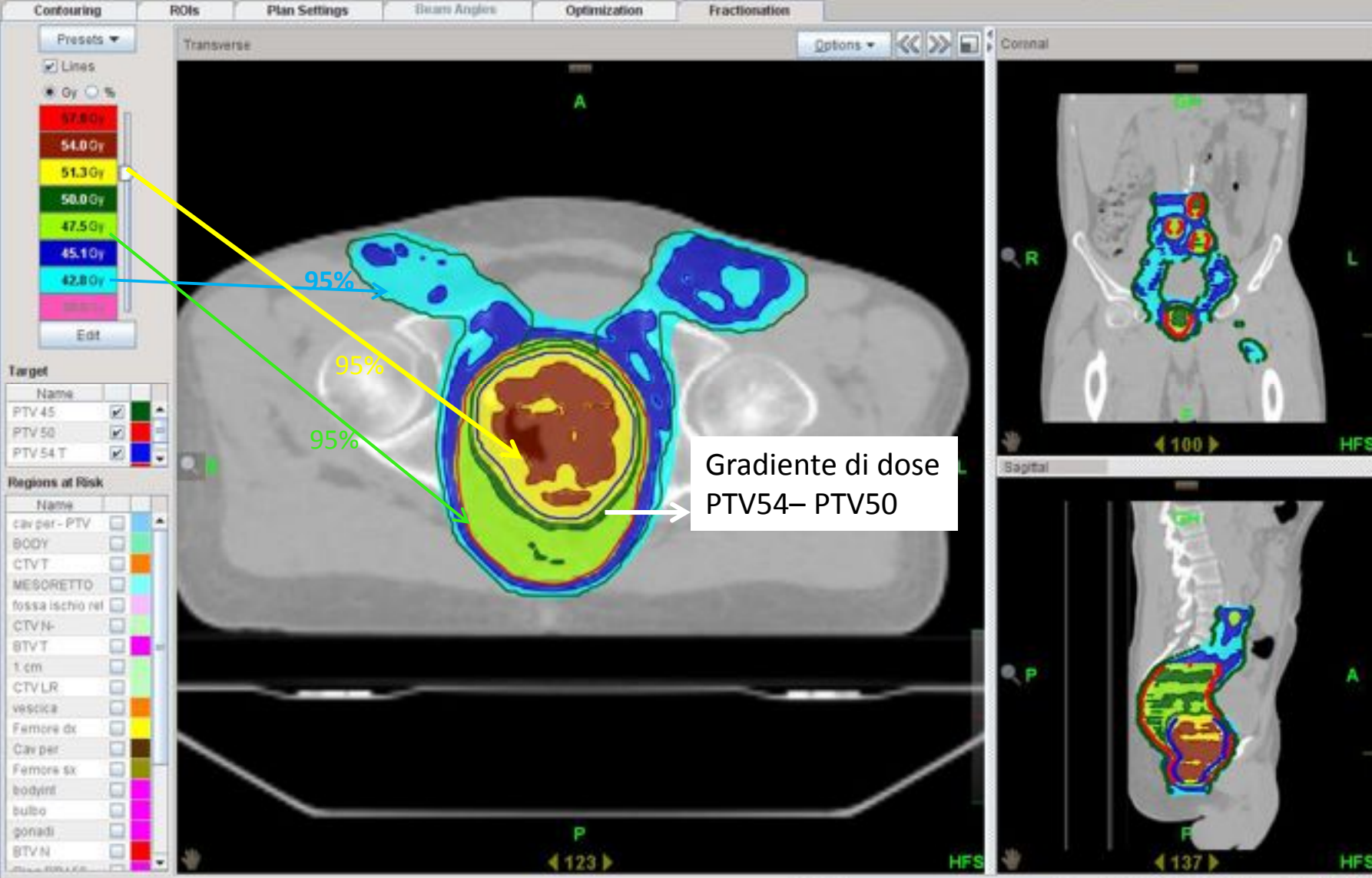
Plan Label: ANO  
Plan Status: Approved  
Plan Date: Apr 29, 2014 10:24:14 AM  
Position: HFS

What's Next

Plan Approved

- Click **Generate Plan Report** to create a plan report.
- You may now perform **Delivery Quality Assurance** to verify the planned dose.

User Name: Emanuela Morabito



Tuesday, October 28, 2014 17:11:18

Parametri inverse planning : Optimization

Prescription  
 Median For: PTV 54 T will receive **54.00 Gy** in 27 Fractions ROI contours have been resampled

Target Constraints

Name	Display	Color	Blocked	Use	Importance	Max Dose [Gy]	Max Dose Pen.	DVH Vol	DVH Dose [Gy]	Min Dose [Gy]	Min Dose Pen.
PTV 54 T	<input checked="" type="checkbox"/>	Blue	1 Unblocked	<input checked="" type="checkbox"/>	20	54.00	20	50.00	54.00	54.00	20
PTV 50 N SUP	<input checked="" type="checkbox"/>	Red	2 Unblocked	<input checked="" type="checkbox"/>	20	49.95	20	50.00	49.95	49.95	20
PTV 50	<input checked="" type="checkbox"/>	Red	3 Unblocked	<input checked="" type="checkbox"/>	20	49.95	20	50.00	49.95	49.95	20
PTV 45	<input checked="" type="checkbox"/>	Green	4 Unblocked	<input checked="" type="checkbox"/>	25	45.00	20	50.00	45.00	45.00	40

Regions at Risk Constraints

Name	Display	Color	Blocked	Use	Importance	Max Dose [Gy]	Max Dose Pen.	DVH Vol	DVH Dose [Gy]	DVH Pt. Pen.
cav per - PTV	<input type="checkbox"/>	Light Blue	1 Unblocked	<input checked="" type="checkbox"/>	3	42.75	5	5.00	10.00	10
Dummy	<input type="checkbox"/>	Magenta	2 Unblocked	<input checked="" type="checkbox"/>	3	47.50	5	2.00	30.00	10
vescica	<input type="checkbox"/>	Orange	3 Unblocked	<input type="checkbox"/>						
Femore dx	<input type="checkbox"/>	Yellow	4 Unblocked	<input type="checkbox"/>						
Femore sx	<input type="checkbox"/>	Olive	5 Unblocked	<input type="checkbox"/>						
gonadi	<input type="checkbox"/>	Magenta	6 Unblocked	<input type="checkbox"/>						
bulbo	<input type="checkbox"/>	Magenta	7 Unblocked	<input type="checkbox"/>						
Ring PTV 45	<input type="checkbox"/>	Magenta	8 Unblocked	<input type="checkbox"/>						
Ring PTV 50	<input type="checkbox"/>	Magenta	9 Unblocked	<input type="checkbox"/>						

Optimize

Dose Calc Grid: Fine

Field Width: 2.5 cm - Jaws...

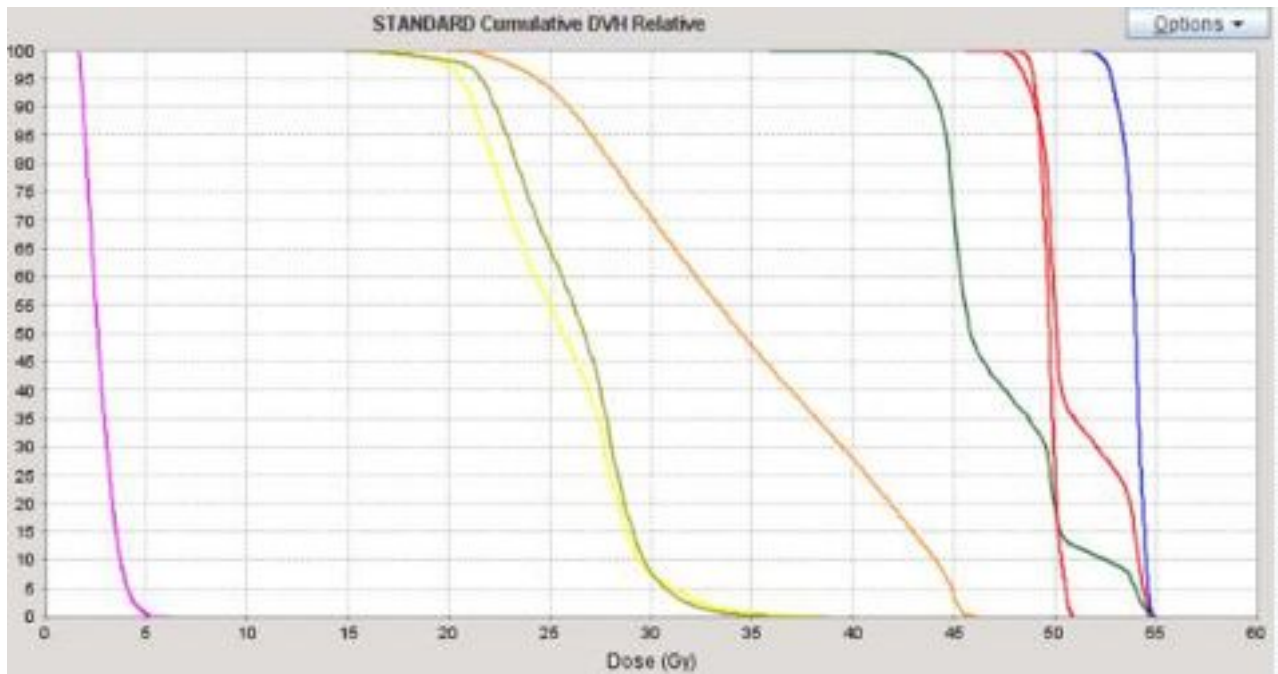
Jaw Mode: Fixed

Modulation Factor: 2.500

Pitch: 0.267

Batch Beamlets

Mode: Beamlet



Targets

Name	Display	Color
PTV 45	<input checked="" type="checkbox"/>	Green
PTV 50	<input checked="" type="checkbox"/>	Red
PTV 54 T	<input checked="" type="checkbox"/>	Blue

Regions at Risk

Name	Displ.	Color
CTV	<input type="checkbox"/>	Orange
Cav per	<input type="checkbox"/>	Light Blue
Femore sx	<input type="checkbox"/>	Olive
gonadi	<input checked="" type="checkbox"/>	Magenta
vescica	<input checked="" type="checkbox"/>	Orange
Femore dx	<input checked="" type="checkbox"/>	Yellow

Infiltrazione cute

Label: ANO  
Status: Approved  
Date: Jul 1, 2014 12:06:41 PM  
Session: HFS

What's Next

Plan Approved

- Click Generate Plan Report to create a plan report.
- You may now perform Delivery Quality Assurance to verify the planned dose.

User Name: Marco Valenti

Contouring ROIs Plan Settings Beam Angles Optimization Fractionation

Presets

Lines

Gy %

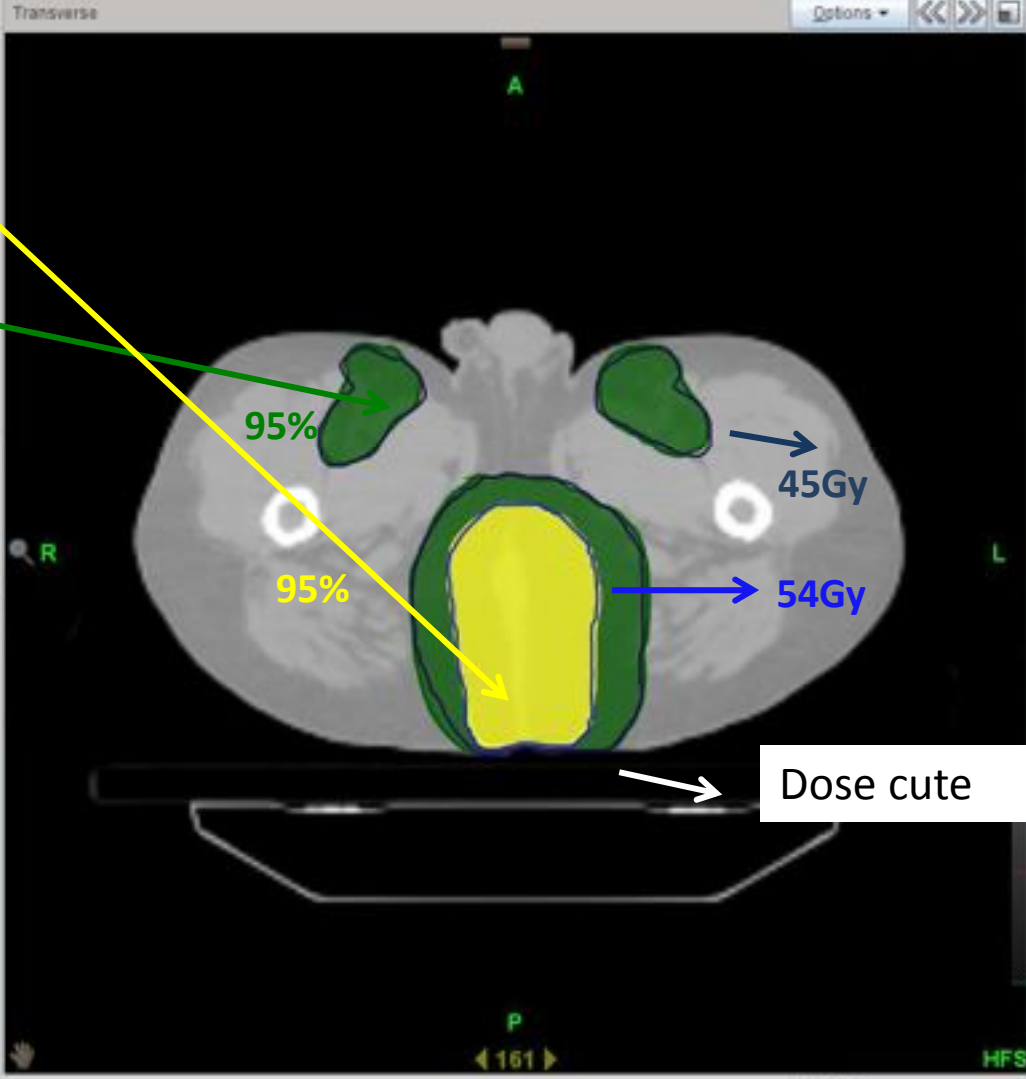
- 57.8 Gy
- 54.0 Gy
- 51.3 Gy
- 50.0 Gy
- 47.5 Gy
- 45.1 Gy
- 42.8 Gy
- 38.0 Gy

Target

Name	
PTV 50	<input type="checkbox"/>
PTV 54	<input checked="" type="checkbox"/>
PTV 45	<input checked="" type="checkbox"/>

Regions at Risk

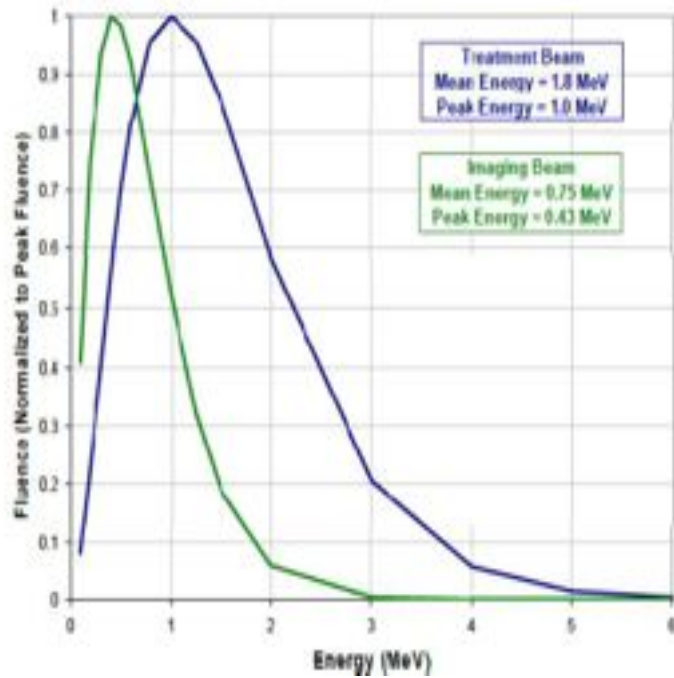
Name	
CTV IR	<input type="checkbox"/>
FEMORE SX	<input type="checkbox"/>
TESTICOLO D-	<input type="checkbox"/>
BULBO PENIEI	<input type="checkbox"/>
FEMORE DX	<input type="checkbox"/>
VESICIA	<input type="checkbox"/>
TESTICOLO SX	<input type="checkbox"/>
Dummy	<input type="checkbox"/>
Dummy rid	<input type="checkbox"/>
fossa ischio nel	<input type="checkbox"/>
CTV N-	<input type="checkbox"/>
cavita' periton	<input type="checkbox"/>
BODY	<input type="checkbox"/>
BTV N INO SX	<input type="checkbox"/>
BTVT	<input type="checkbox"/>
CTVT	<input type="checkbox"/>
CTV N+	<input type="checkbox"/>



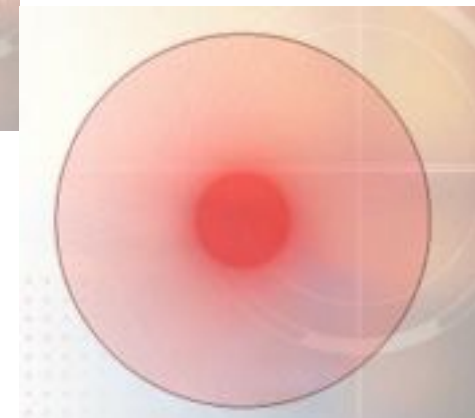
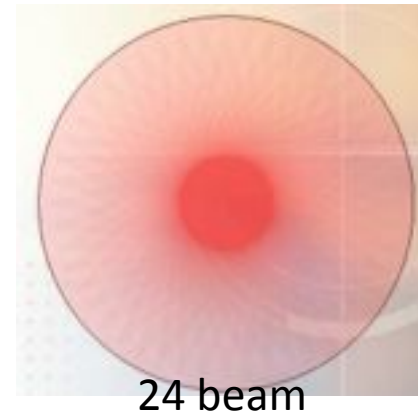
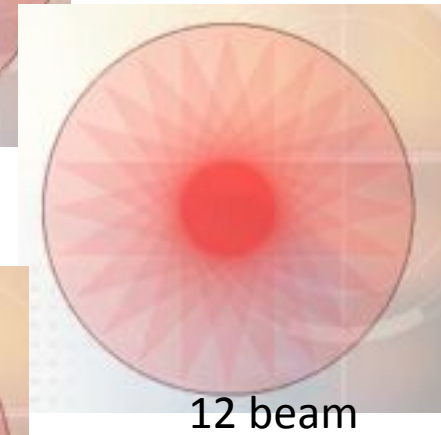
Tuesday, October 28, 2014 11:38:46

# Tomotherapy

## ■ Spectral Energy Distribution

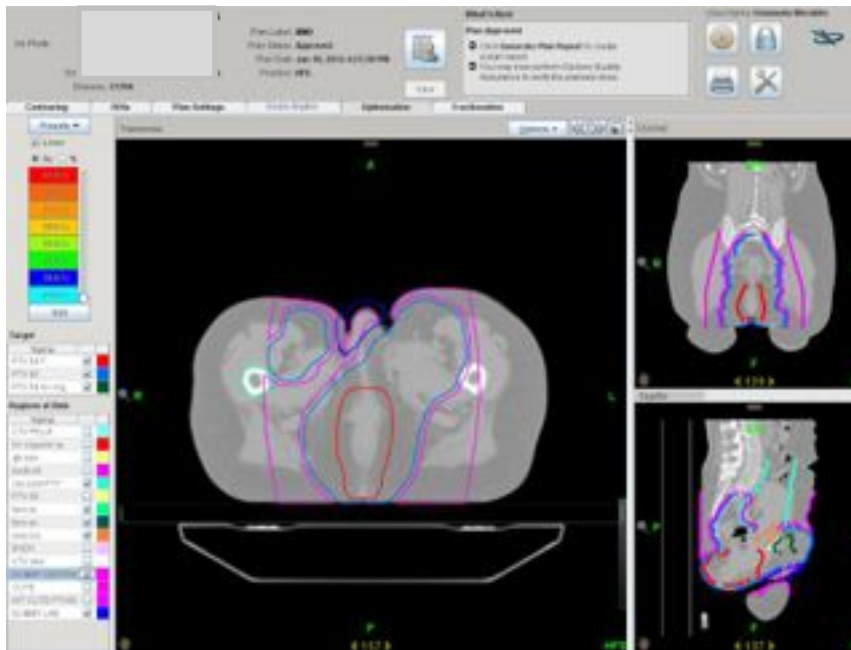


**HELICAL  
Delivery**

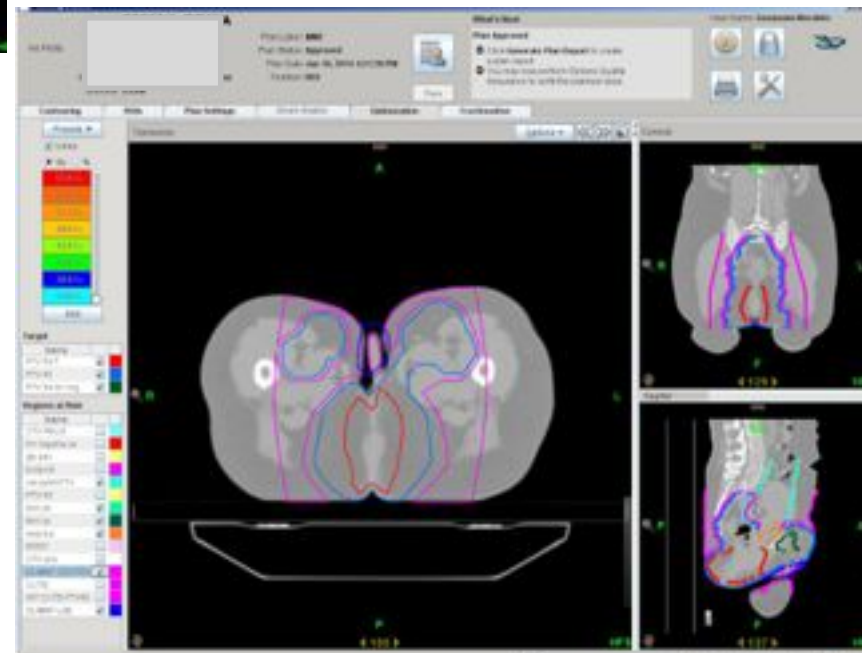


51 beam  
Proiezioni TOMO

## Come risolvere le complessità



Strutture dummy





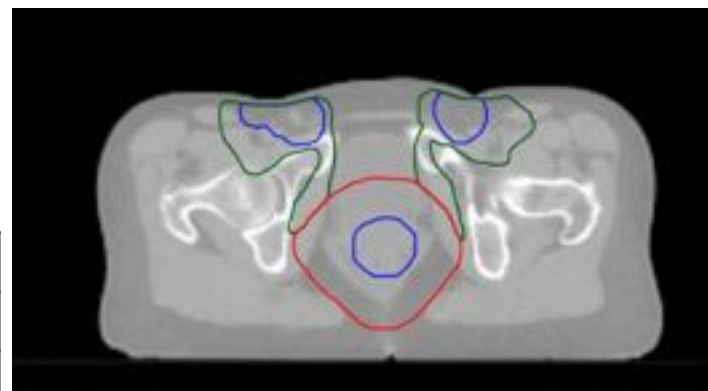
**RTOG 0529: A Phase 2 Evaluation of Dose-Painted Intensity Modulated Radiation Therapy in Combination With 5-Fluorouracil and Mitomycin-C for the Reduction of Acute Morbidity in Carcinoma of the Anal Canal**

Lisa A. Kachnic, MD,<sup>\*</sup> Kathryn Winter, MS,<sup>†</sup> Robert J. Myerson, MD,<sup>‡</sup> Michael D. Goodyear, MD,<sup>§</sup> John Willins, PhD,<sup>\*</sup> Jacqueline Esthappan, PhD,<sup>‡</sup> Michael G. Haddock, MD,<sup>||</sup> Marvin Rotman, MD,<sup>¶</sup> Parag J. Parikh, MD,<sup>‡</sup> Howard Safran, MD,<sup>#</sup> and Christopher G. Willett, MD<sup>\*\*</sup>

**IMRT Target Goals : PTV tumor and Nodal**

- Prescription dose to more than 95% PTV
- $\leq 10\%$  PTV receive more than 110% of the prescription dose
- $\leq 1\%$  PTV receive less than 93% of the prescription dose

<b>TOMOTHERAPY</b>	<b>D<sub>93</sub></b>	<b>D<sub>95</sub></b>	<b>Dmax</b>	<b>D<sub>107</sub></b>	<b>D<sub>110</sub></b>	<b>Vol cc</b>
<b>Paziente 1</b>						
PTV 54T	100	100	102,5	NA	NA	104,3
PTV 54N	100	99,7	103,5	NA	NA	85,16
PTV 50	100	99,9	108	0,05	NA	779,53
PTV 45	100	100	121	15,8	5	981,7
<b>Paziente 2</b>						
PTV 54T	100	100	101,8	NA	NA	243,5
PTV 50N	100	100	101,8	NA	NA	23,24
PTV 50	100	99,6	107,74	0,1	NA	642,7
PTV 45	100	98,3	113	1,8	0,5	1586,7
<b>Paziente 3</b>						
PTV 54T	100	99,8	101,3	NA	NA	343
PTV 54N+ing	100	99,9	102	NA	NA	287
PTV 45	100	99,6	121	13	8	2769,5
<b>Paziente 4</b>						
PTV 54	99,9	99	103	NA	NA	1174,7
PTV 50	100	100	102	NA	NA	100,29
PTV 45	98	96	119	10	5	3036,1



1070 totale

$$\text{PTV50} = \text{PTV 50 Totale} - \text{PTV 54T}$$

$$\text{PTV45} = \text{PTV 45 N} - \text{PTV 54N}$$



- Ottimizzazione nella pianificazione – determinazione della priorità
- Corretta interpretazione del DVH



<b>IMRT sliding windows</b>	<b>D93</b>	<b>D95</b>	<b>Dmax</b>	<b>D107</b>	<b>D110</b>	<b>Vol cc</b>
<b>Paziente 1</b>						
PTV 54	100	99,9	103	NA	NA	142,5
PTV 50	100	99	108	0,03	NA	935
PTV 45	98,6	96	112	10	0,06	684
<b>Paziente 2</b>						
PTV 54	100	99,8	105	NA	NA	159,8
PTV 45	99	97	116	7	0,6	1445,4
<b>Paziente 3</b>						
PTV 50	100	99,8	108	0,1	NA	630
PTV 45	97,8	95	106,8	NA	NA	2016,8
<b>Paziente 4</b>						
PTV 54N	99,99	97,6	101,7	NA	NA	290
PTV 50	99,9	97	108	0,01	NA	1039,7
PTV 45	96,6	88,5	108	0,003	NA	1062,9
<b>Paziente 5</b>						
PTV 54N	100	99,5	104	NA	NA	154
PTV 50	98	92	110	0,2	NA	1413,2
PTV 45	99	95,3	111	0,3	0,0003	443,3
<b>Paziente 6</b>						
PTV 54N	100	100	104	NA	NA	94,4
PTV 50	99,4	97,1	108,5	1,4	NA	917,8
PTV 45	99	94,9	112,8	0,3	0,0001	903,8
<b>Paziente 7</b>						
PTV 54T	99,6	94,7	106	NA	NA	349,8
PTV 54N	98,3	82,7	104	NA	NA	60,5
PTV 50	100	98,9	107,7	0,2	NA	309,4
PTV 45	98,6	92	117	9,1	3,6	2283,4

# IMRT



# IGRT

**Tecniche di Imaging nel Bunker sono indispensabili nei trattamenti IMRT**



**Correzione set up error !!!**



**Correzione organ motion error ??**

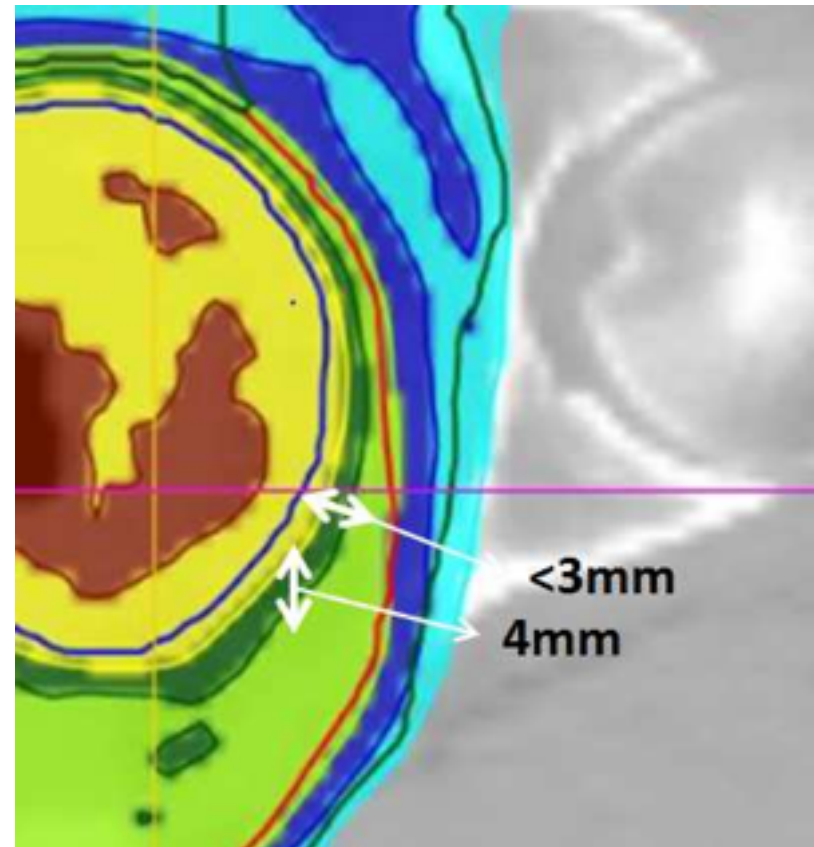
# MVCT : set up error

SHIFT Mean	X	Y	Z
	3.4±3.0	3.9±3.2	4.6±2.3

La dimensione del  
gradiente di dose è

≤

dell'errore di set up!!!

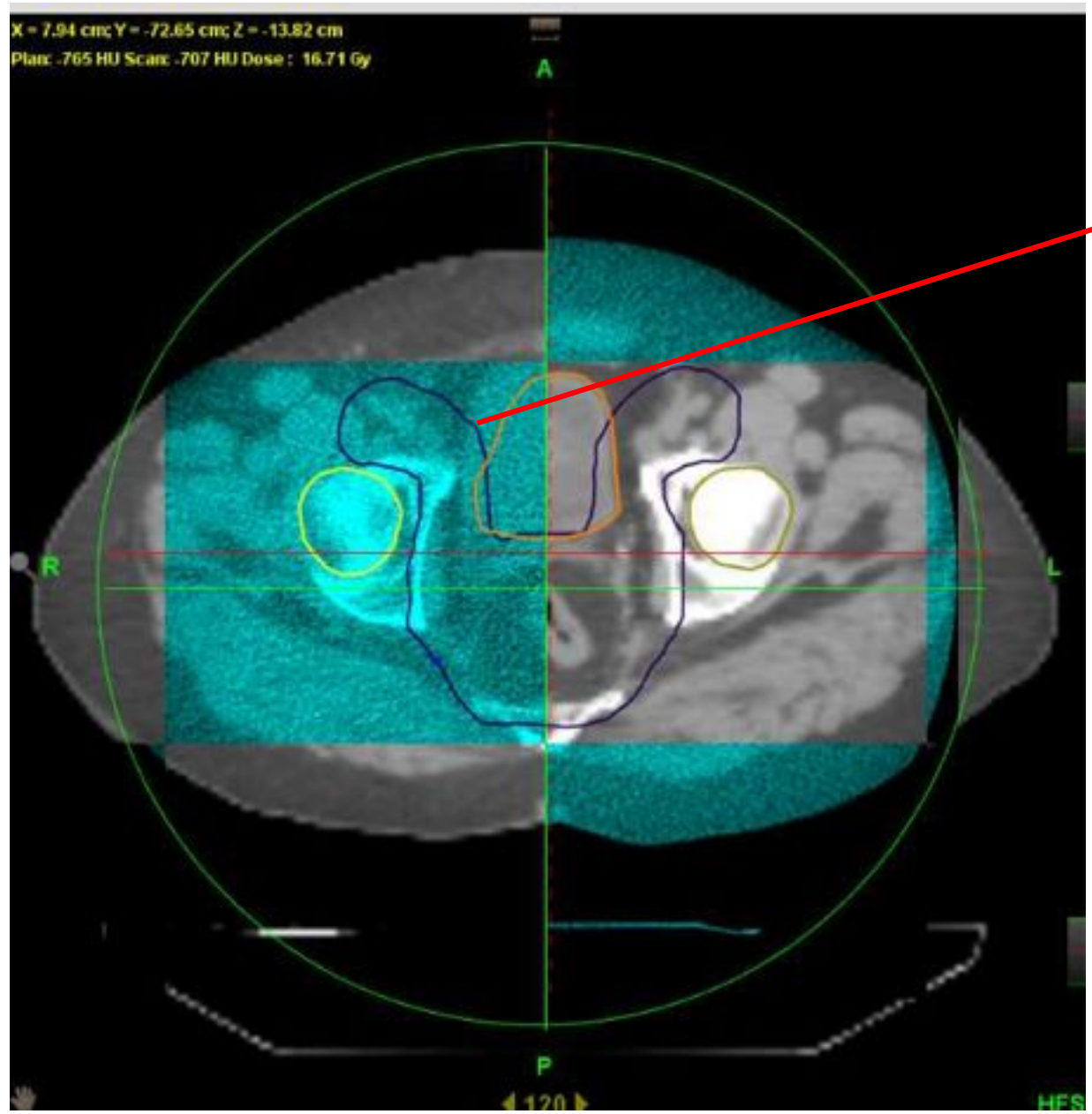


# MVCT : accuratezza



- Spessore strato = TC di planning o suo multiplo
- 3D match :
  - Strutture ossee
  - **Strutture ossee e tessuti molli**
  - Tessuti molli

→ Rotazione !!

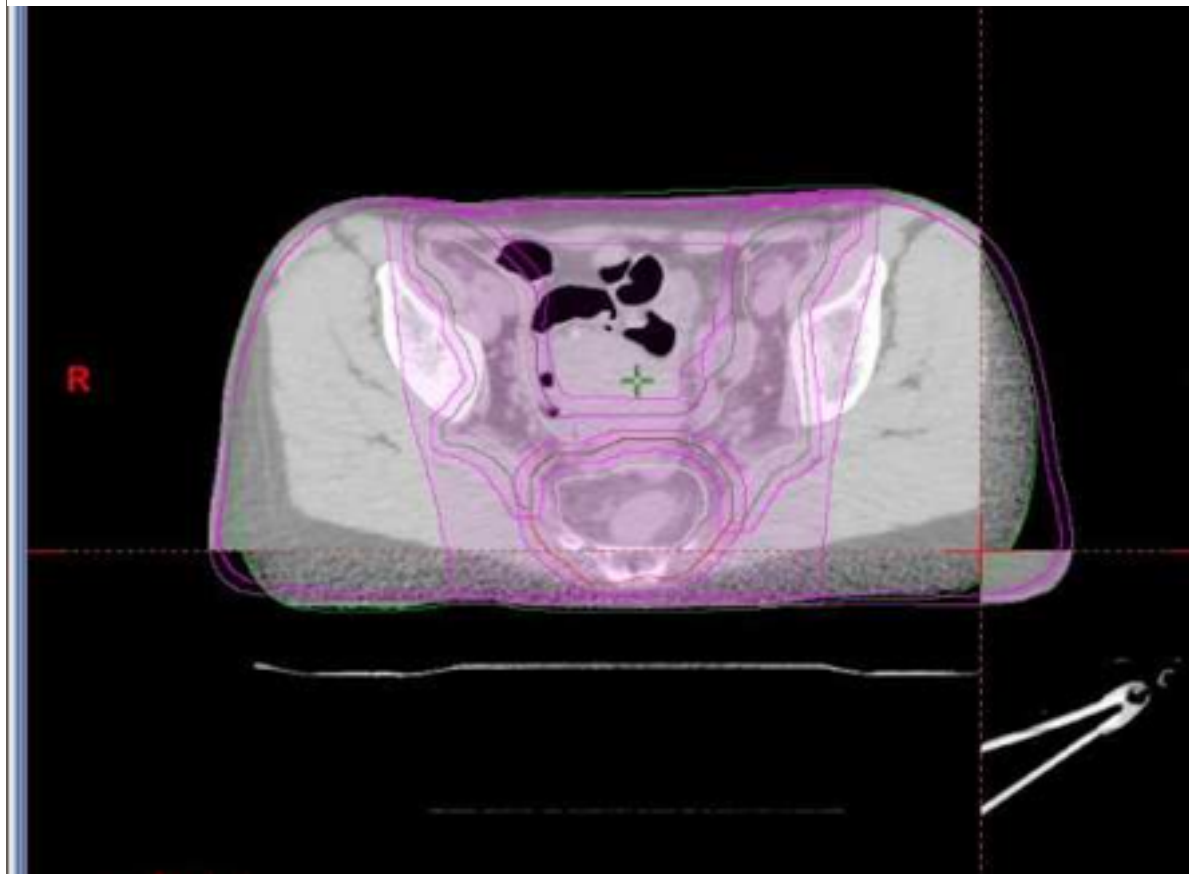


Effetto della rotazione

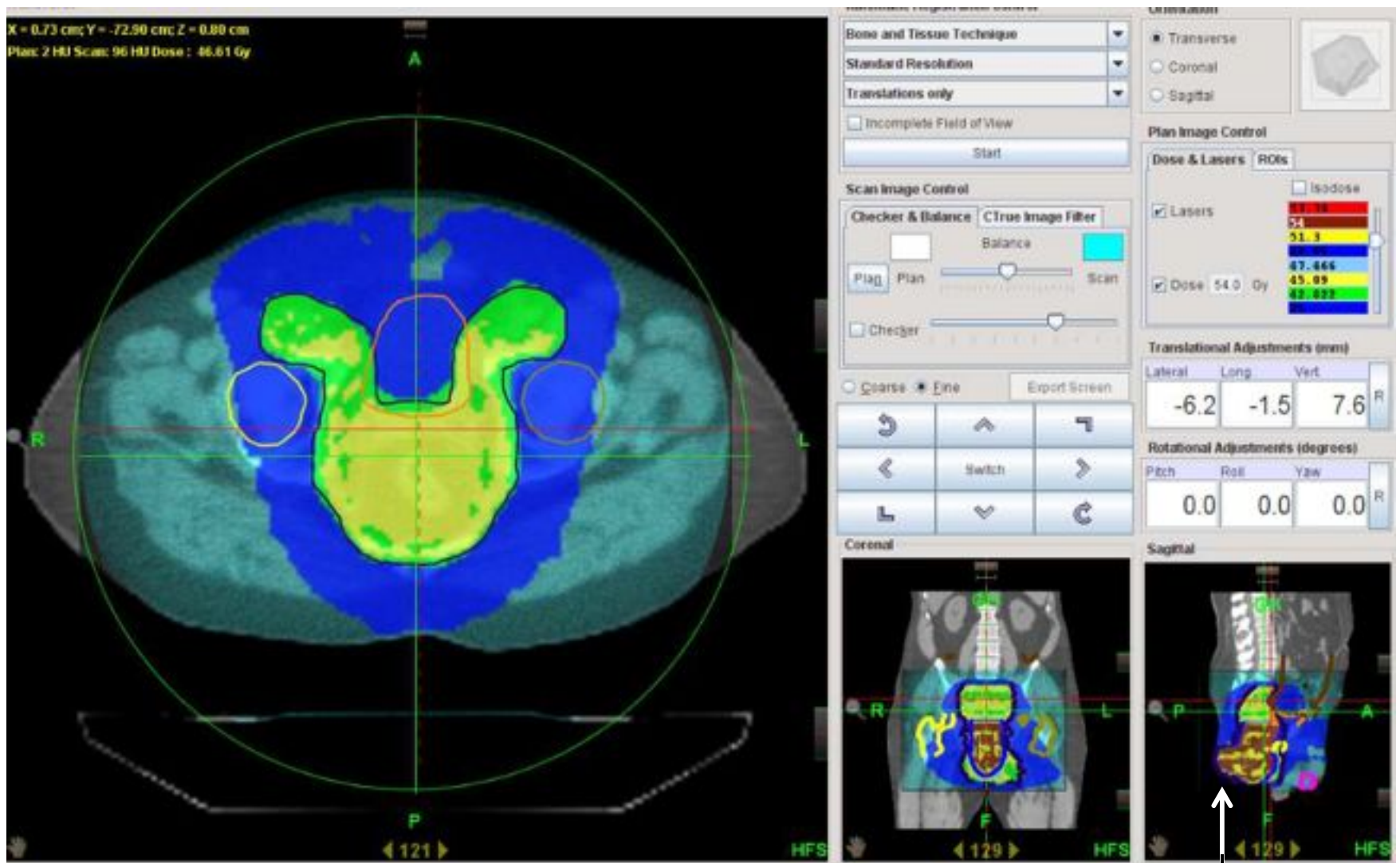
MVCT : correzione set up ma....  
Variazione profilo paziente



Inaccuratezza dosimetrica

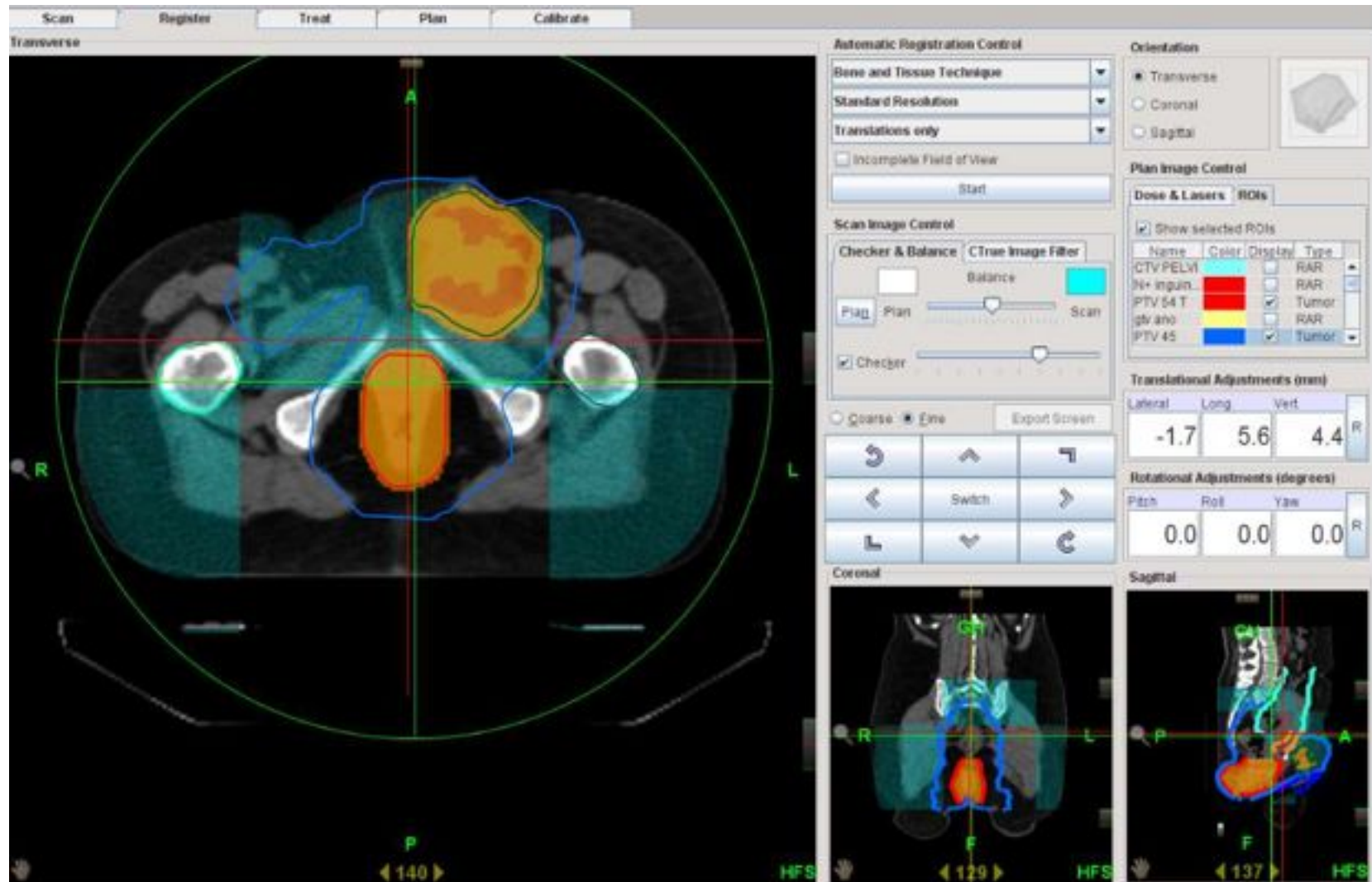


Ripianificazione ?



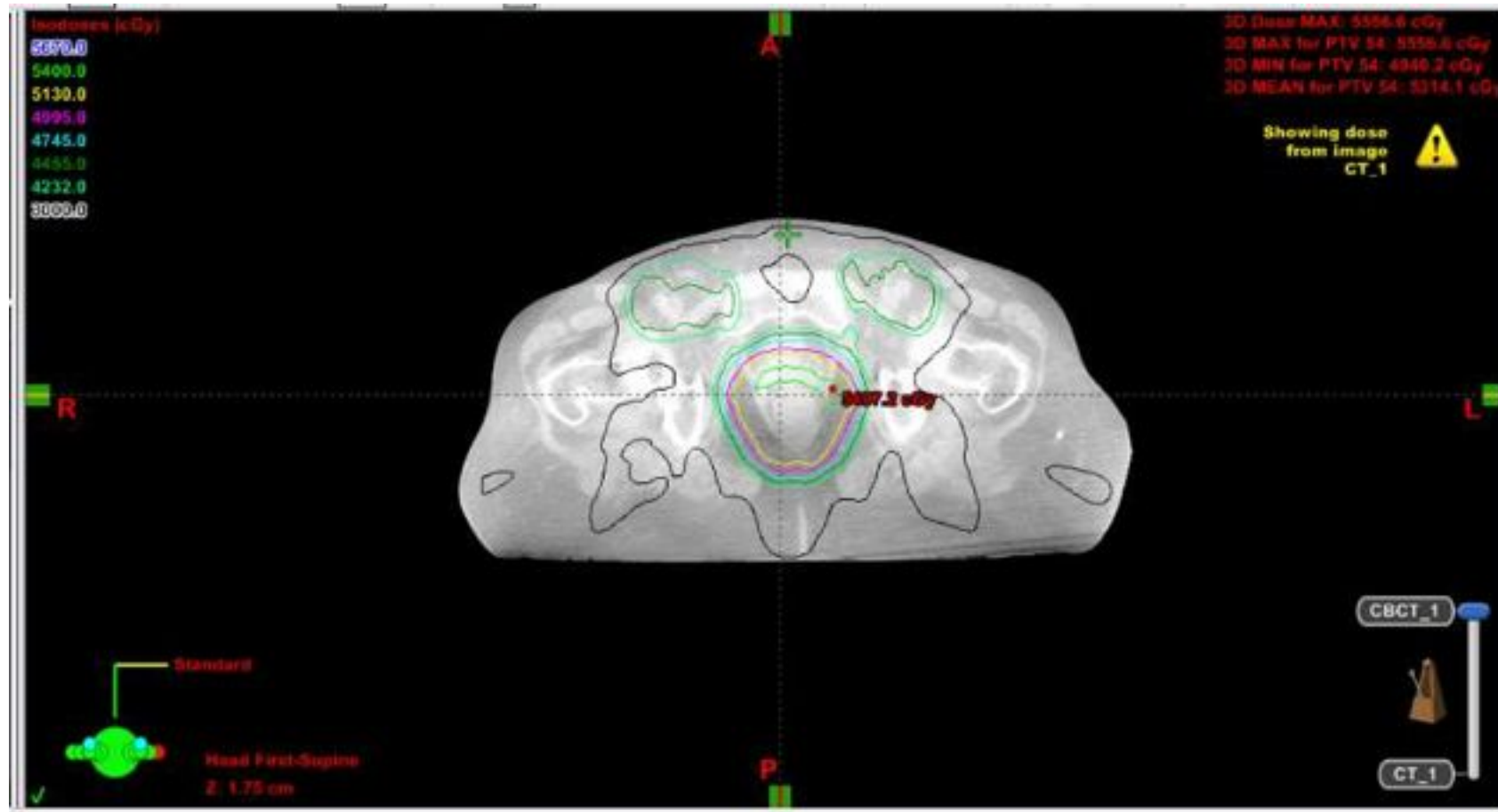
Dose cute 95%- 100%

# MVCT : verifica dose – anatomia - PTV

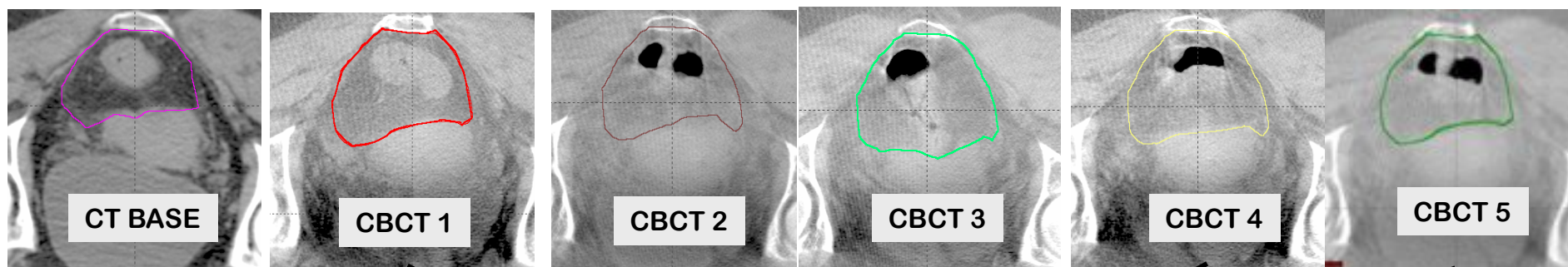




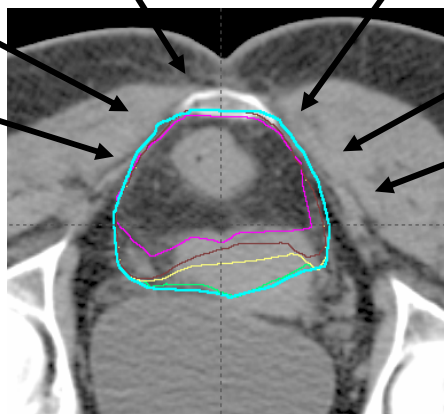
# CBCT : Qualità Immagine



## ORGAN MOTION ERROR : STUDIO su CBCT OR MESORETTO



co-registrazione off-line sulle strutture ossee tra CTsim e CBCT sul TPS Eclipse;



definizione di un "ITV" personalizzato, che racchiude movimento e deformazione dei limiti del mesoretto studiati sulle prime 5 CBCT di ogni paziente in esame.

# IMRT : Organ Motion

- Correzione on line (CBCT .. MVCT .....qualità immagine, risoluzione a basso contrasto per tessuti molli)
- Applicazione di un margine 3D funzione di :
  - Pz prono/ supino
  - Sistema di immobilizzazione
  - Riproducibilità condizioni paziente

$$\Sigma tot = \sqrt{(\Sigma est)^2 + (\Sigma int)^2}$$

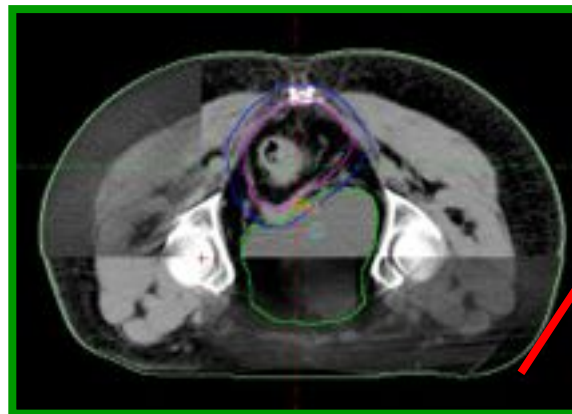
$$\sigma tot = \sqrt{(\sigma est)^2 + (\sigma int)^2}$$

$$\text{MARGIN} = 2 \cdot \Sigma tot + 0,7 \cdot \sigma tot$$

# Organ Motion mesoretto

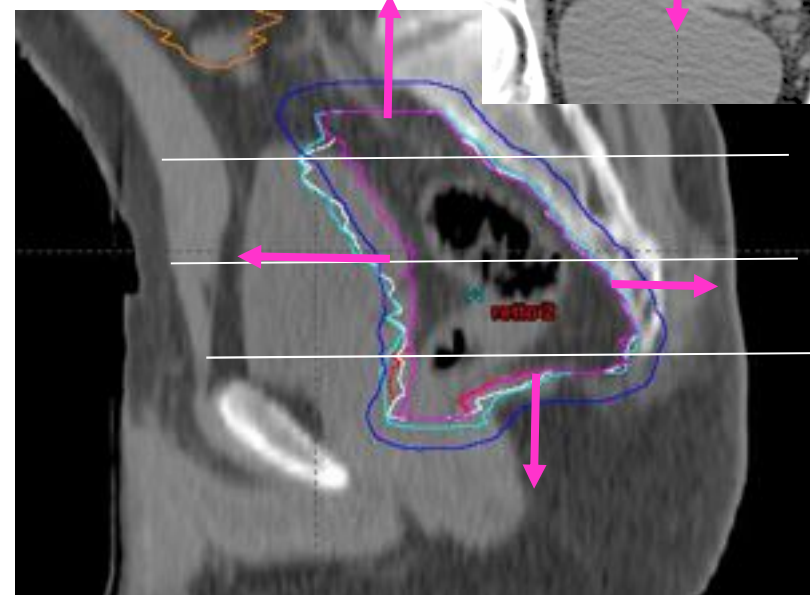
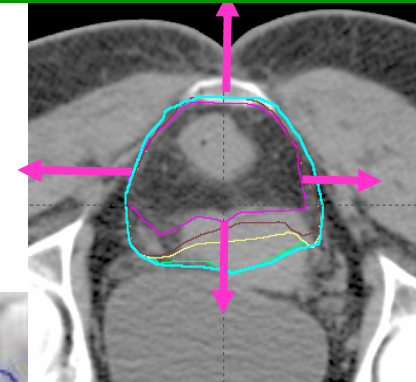
## Calcolo del margine

RT SU PTV STANDARD



Correzione set up

STUDIO  
OM MESORETTO



POPOLAZIONE 12 PAZIENTI

Laterale SN  $4.3 \pm 3.0$  mm SD  
Laterale DX  $4.7 \pm 3.3$  mm SD  
Anteriore  $6.5 \pm 5.9$  mm SD  
Posteriore  $3.8 \pm 3.6$  mm SD  
Craniale  $1.0 \pm 0.1$  mm SD  
Caudale  $8.2 \pm 2.2$  mm SD

# BELLY BOARD



18 pazienti  
 Protocollo IGRT: daily CBCT

	Y(vrt) mm	Z(Ing) mm	X(lat) mm
$\Sigma$ pop	7.1	4.9	2.3
Margine = ap: 16.7 cc: 12.9 lat: 7.0			
	Y(vrt) mm	Z(Ing) mm	X(lat) mm
$\sigma$ pop	3.6	4.5	3.4

# SCHIUMA GAMBE



12 pazienti  
 Protocollo IGRT: daily CBCT

	Y(vrt) mm	Z(Ing) mm	X(lat) mm
$\Sigma$ pop	1.1	2.7	2.9
Margine = ap: 5.6 cc: 8.3 lat: 8.5			
	Y(vrt) mm	Z(Ing) mm	X(lat) mm
$\sigma$ pop	4.8	3.9	3.9

# COMBIFIX



72 pazienti

Protocollo IGRT: daily CBCT

	Y(vrt)	Z(Ing)	X(lat)
$\Sigma$ pop	1.9	3.6	2.5
Margine = ap: 7.6 cc: 9.9 lat: 7.2			
$\sigma$ pop	5.5	3.8	3.2

# SCHIUMA PELVI



+ GAMBE

25 pazienti

Protocollo IGRT: daily CBCT

	Y(vrt)	Z(Ing)	X(lat)
$\Sigma$ pop	1.6	1.8	2.4
Margine = ap: 5.7 cc: 5.6 lat: 6.8			
$\sigma$ pop	3.1	2.8	2.8

# Conclusioni

- Il raggiungimento degli obiettivi dosimetrici in inverse planning dipendono dalla corretta modalità di individuazione dei volumi
- Le tecniche IMRT permettono di rispettare e ottenere anche risultati migliori delle indicazioni RTOG 0529
- Un trattamento IMRT **deve** avvalersi di tecniche IGRT
- La Tomotherapy permette una migliore conformazione della dose rispetto alla IMRT sliding windows, con migliore omogeneità e gradienti più rapidi
- La tomoterapia permette di trattare adeguatamente le infiltrazioni cutanee e i casi più complessi
- Tra le tecniche IGRT la CBCT, grazie a una migliore qualità dell'immagine e una migliore risoluzione a basso contrasto, permette la visualizzazione dei tessuti molli e una valutazione dell'organ motion