Radiotherapy Plan Evaluation

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Goals of Planning

- PTV receives adequate uniform dose
  - Ideal: 100% of the dose to 100% of PTV
  - ICRU
    - 100% of PTV is covered by 95% of the Prescribed Dose
    - maximum dose to PTV does not exceed 107% of the prescribed dose
- Safe OARs (do not exceed tolerance)

CB-CHOP

- Contours
- Beams
- Coverage
- Heterogeneity
- OAR
- Prescription

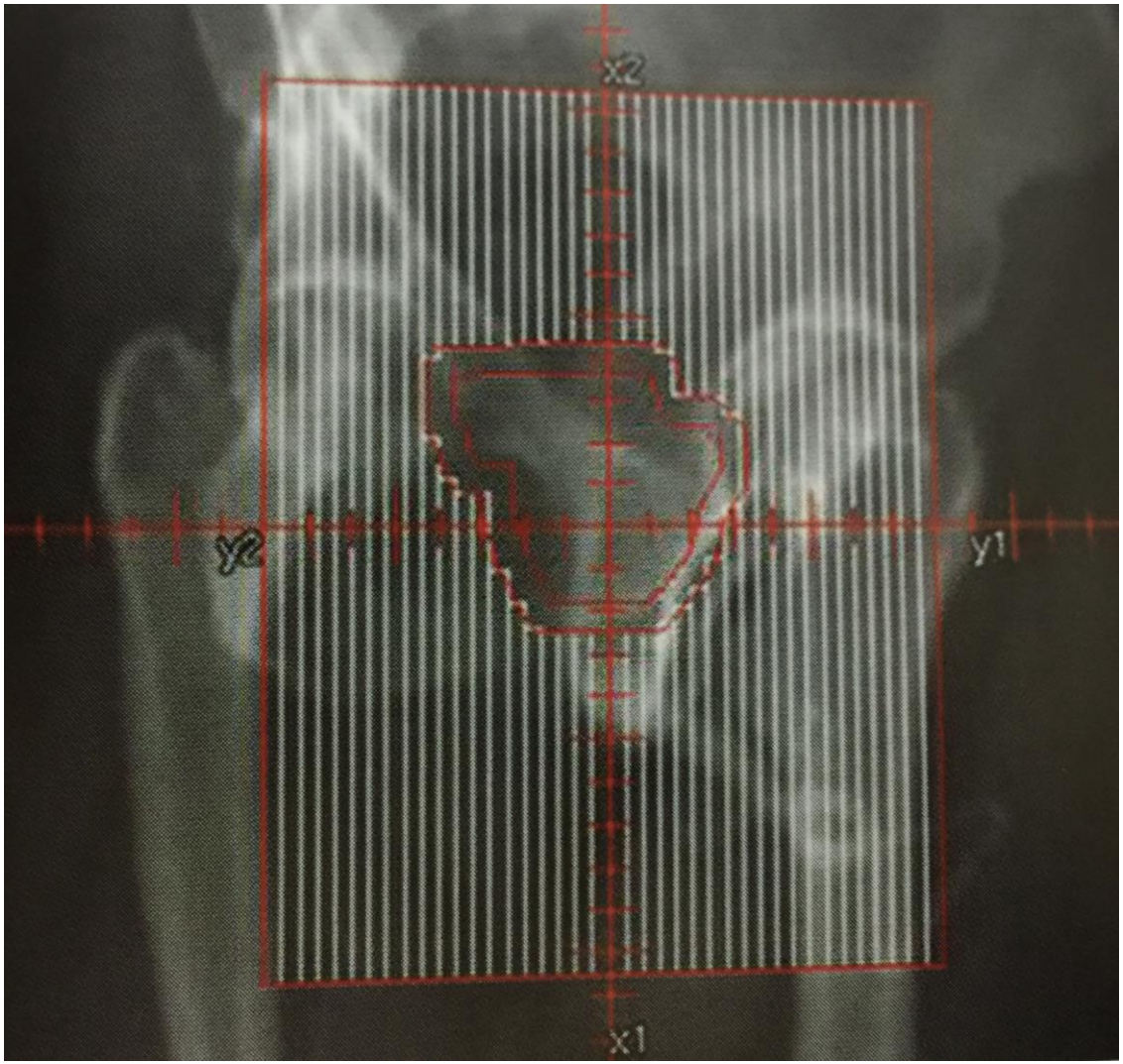
CB-CHOP

- Contours
- Beams
- Coverage
- Heterogeneity
- OAR
- Prescription

Visual Assessment: Beam Eye View

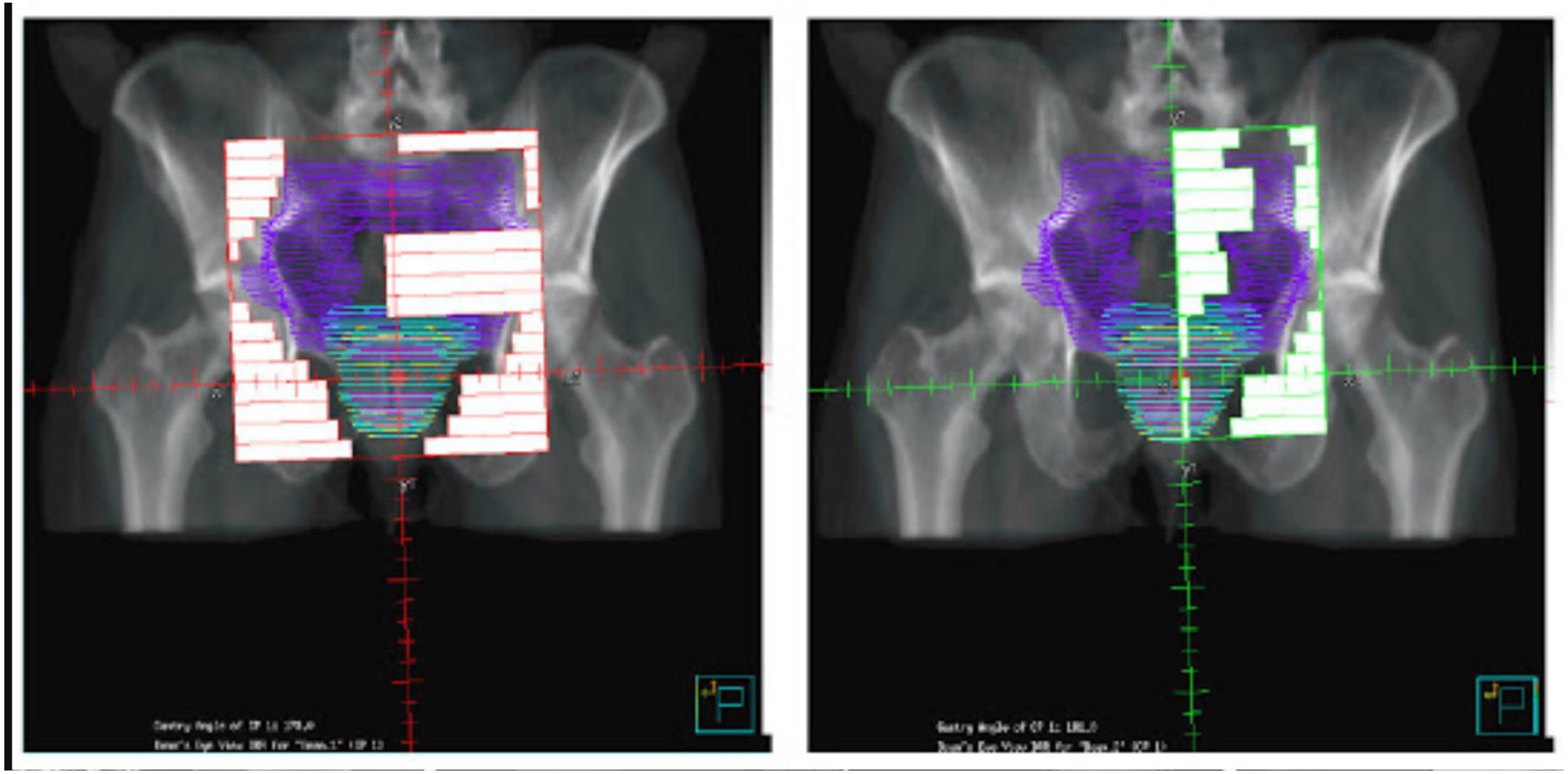
1. Beam Orientation
2. Bone
3. MLC

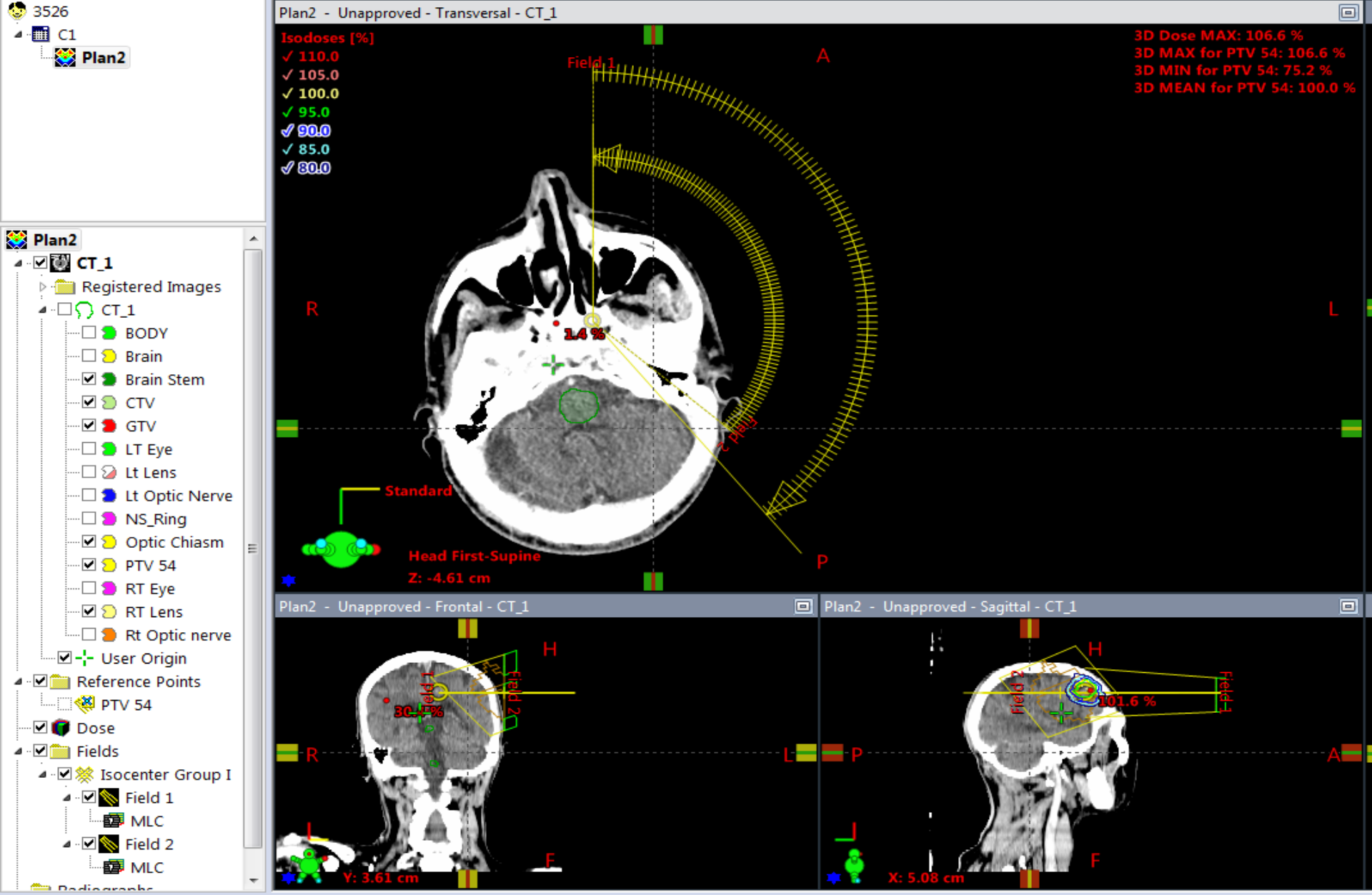
Action
- modify MLC Penumbra
- Rotate Gantry for 90^0 movement



Visual Assessment: DRR Digitally Reconstructed Radiograph

PTV and OAR

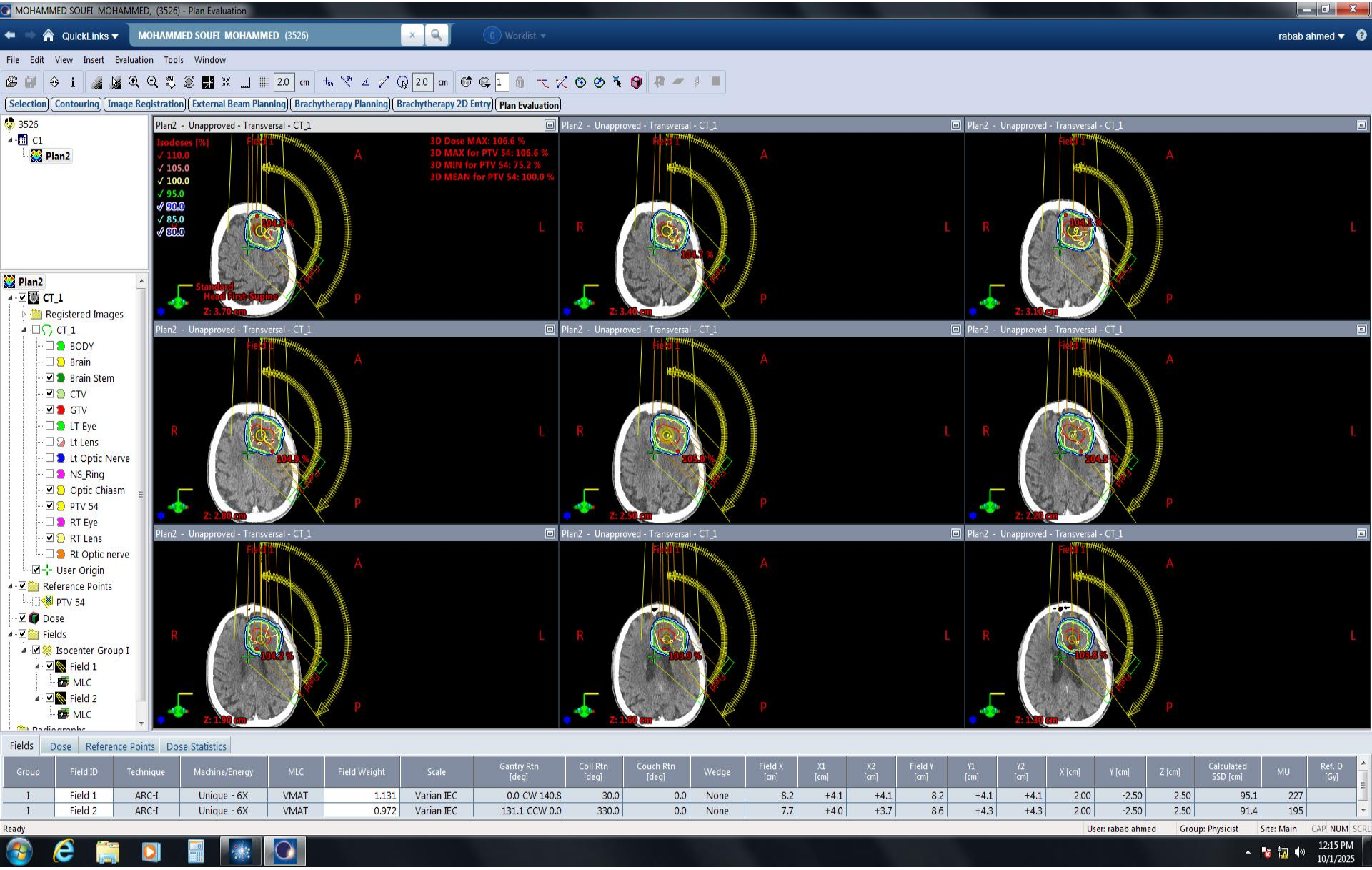




Fields | Dose | Reference Points | Dose Statistics

Group	Field ID	Technique	Machine/Energy	MLC	Field Weight	Scale	Gantry Rtn [deg]	Coll Rtn [deg]	Couch Rtn [deg]	Wedge	Fi
I	Field 1	ARC-I	Unique - 6X	VMAT	1.131	Varian IEC	0.0 CW 140.8	30.0	0.0	None	
I	Field 2	ARC-I	Unique - 6X	VMAT	0.972	Varian IEC	131.1 CCW 0.0	330.0	0.0	None	


MOHAMMED SOUFI MOHAMMED, (3526) - Plan Evaluation
QuickLinks
MOHAMMED SOUFI MOHAMMED (3526)
Worklist
rabab ahmed
File Edit View Insert Evaluation Tools Window
Selection Contouring Image Registration External Beam Planning Brachytherapy Planning Brachytherapy 2D Entry Plan Evaluation
3526
C1
Plan2
Plan2 - Unapproved - Transversal - CT_1
Isodoses [%]
110.0
105.0
100.0
95.0
90.0
85.0
80.0
Z: -4.20 cm
Plan2 - Unapproved - Model View - CT_1
3D Dose MAX: 106.6 %
3D MAX for PTV 54: 106.6 %
3D MIN for PTV 54: 75.2 %
3D MEAN for PTV 54: 100.0 %
Standard
Head First-Supine
Plan2 - Unapproved - Frontal - CT_1
Y: -0.66 cm
Plan2 - Unapproved - Sagittal - CT_1
X: -0.22 cm
Plan2
CT_1
Registered Images
CT_1
BODY
Brain
Brain Stem
CTV
GTV
LT Eye
Lt Lens
Lt Optic Nerve
NS_Ring
Optic Chiasm
PTV 54
RT Eye
RT Lens
Rt Optic nerve
User Origin
Reference Points
PTV 54
Dose
Fields
Isocenter Group I
Field 1
MLC
Field 2
MLC
Fields
Dose
Reference Points
Dose Statistics
Group | Field ID | Technique | Machine/Energy | MLC | Field Weight | Scale | Gantry Rtn [deg] | Coll Rtn [deg] | Couch Rtn [deg] | Wedge | Field X [cm] | X1 [cm] | X2 [cm] | Field Y [cm] | Y1 [cm] | Y2 [cm] | X [cm] | Y [cm] | Z [cm] | Calculated SSD [cm] | MU | Ref. D [Gy]
I | Field 1 | ARC-I | Unique - 6X | VMAT | 1.131 | Varian IEC | 0.0 CW 140.8 | 30.0 | 0.0 | None | 8.2 | +4.1 | +4.1 | 8.2 | +4.1 | +4.1 | 2.00 | -2.50 | 2.50 | 95.1 | 227
I | Field 2 | ARC-I | Unique - 6X | VMAT | 0.972 | Varian IEC | 131.1 CCW 0.0 | 330.0 | 0.0 | None | 7.7 | +4.0 | +3.7 | 8.6 | +4.3 | +4.3 | 2.00 | -2.50 | 2.50 | 91.4 | 195
Ready
User: rabab ahmed
Group: Physicist
Site: Main
CAP NUM SCRL
12:16 PM
10/1/2025



Group	Field ID	Technique	Machine/Energy	MLC	Field Weight	Scale	Gantry Rtn [deg]	Coll Rtn [deg]	Couch Rtn [deg]	Wedge	Field X [cm]	X1 [cm]	X2 [cm]	Field Y [cm]	Y1 [cm]	Y2 [cm]	X [cm]	Y [cm]	Z [cm]	Calculated SSD [cm]	MU	Ref. D [Gy]
I	Field 1	ARC-I	Unique - 6X	VMAT	1.131	Varian IEC	0.0 CW 140.8	30.0	0.0	None	8.2	+4.1	+4.1	8.2	+4.1	+4.1	2.00	-2.50	2.50	95.1	227	
I	Field 2	ARC-I	Unique - 6X	VMAT	0.972	Varian IEC	131.1 CCW 0.0	330.0	0.0	None	7.7	+4.0	+3.7	8.6	+4.3	+4.3	2.00	-2.50	2.50	91.4	195	

CB-CHOP

- Contours
- Beams
- Coverage
- Heterogeneity
- OAR
- Prescription

Methods

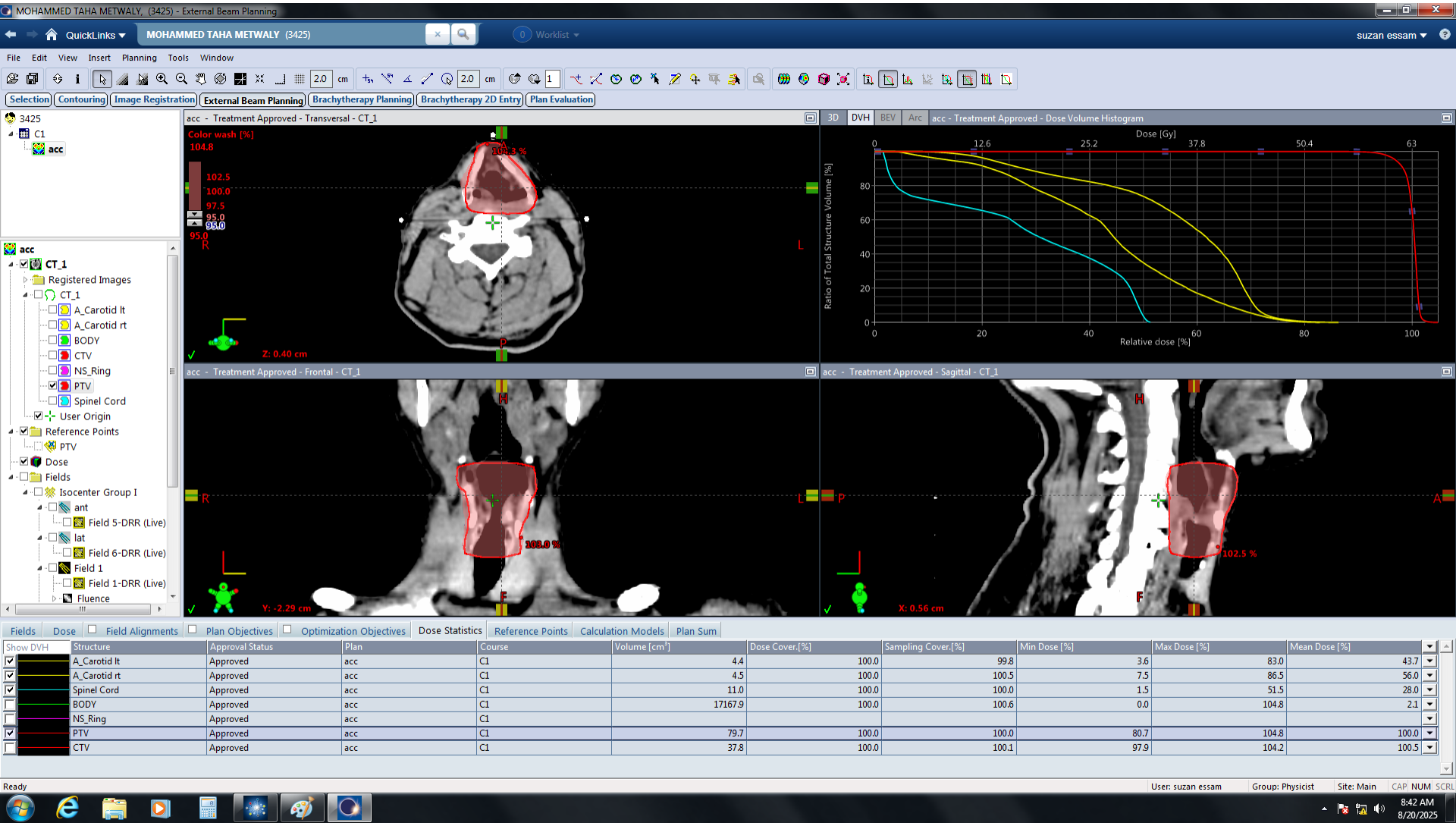
1. Visual Display of dose distribution
   A. Isodose Shapes
      - Isodose lines
      - Colour wash
      - Iso-dose surfaces
   B. Dose Volume Histograms (DVH)

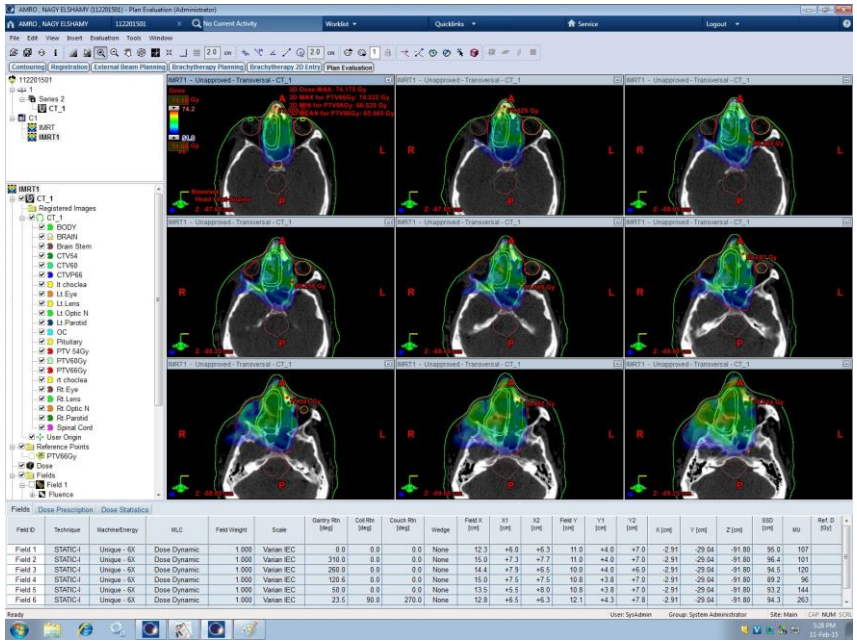
2. Statistics

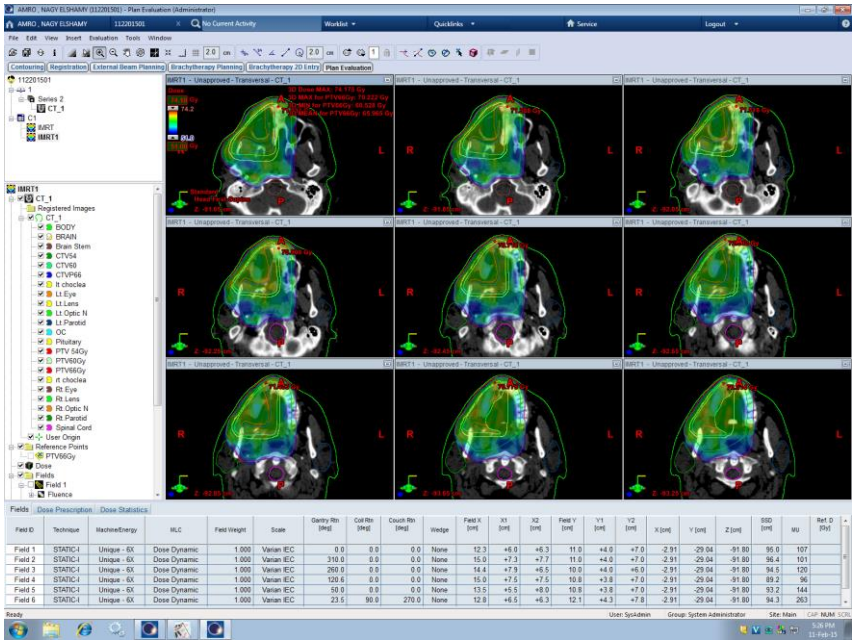
Axial, Coronal, Sagittal Isodose Lines

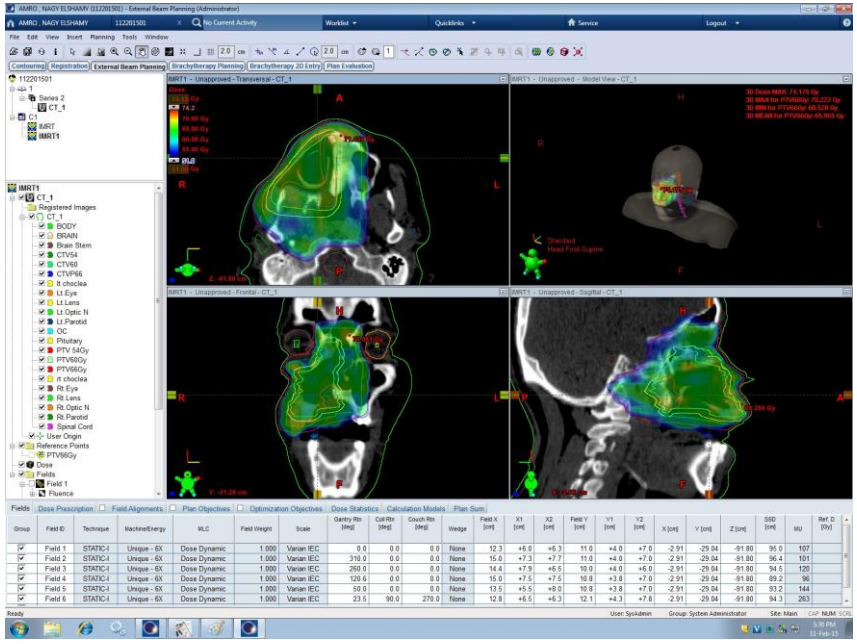
DVH

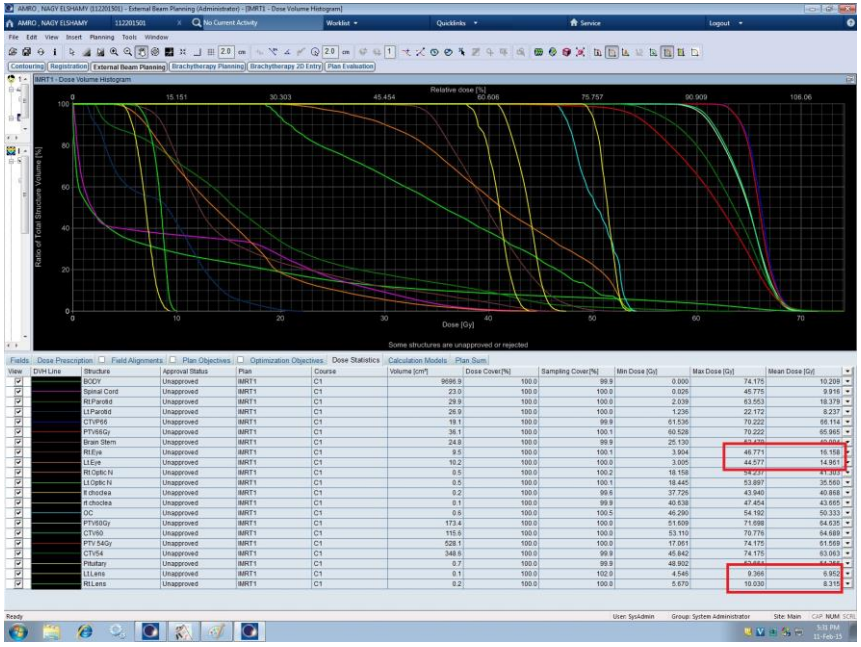
Statistics





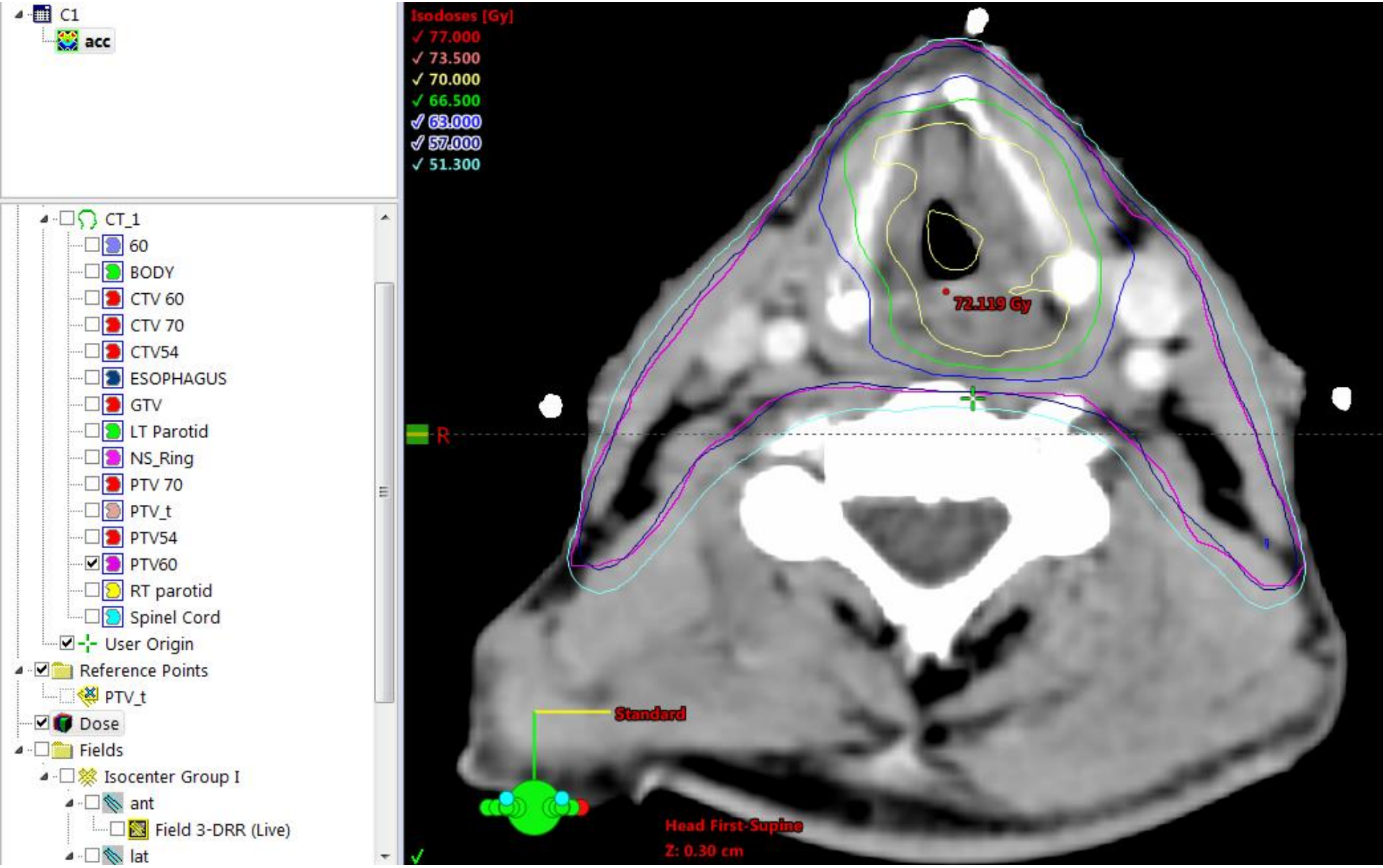


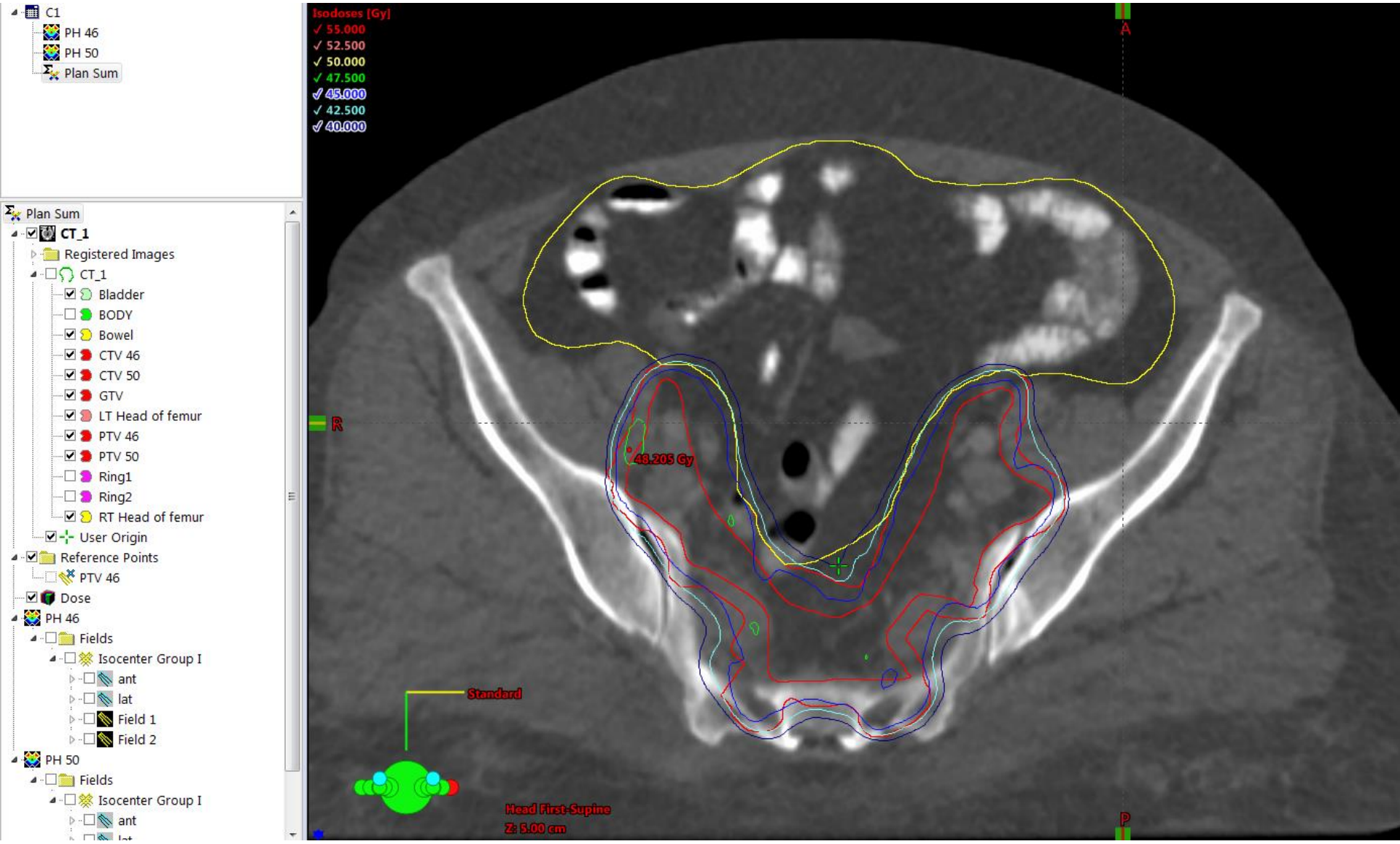


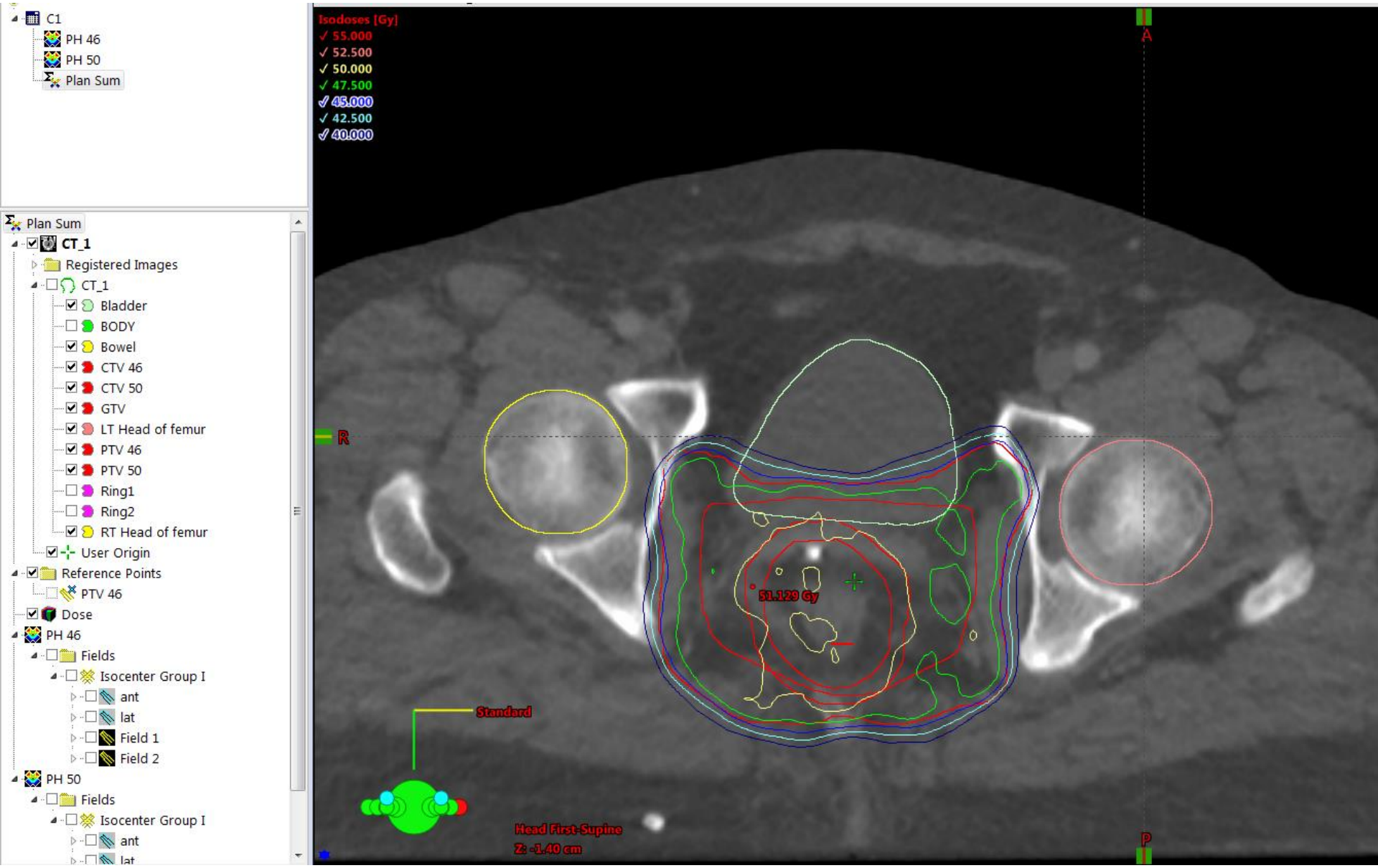


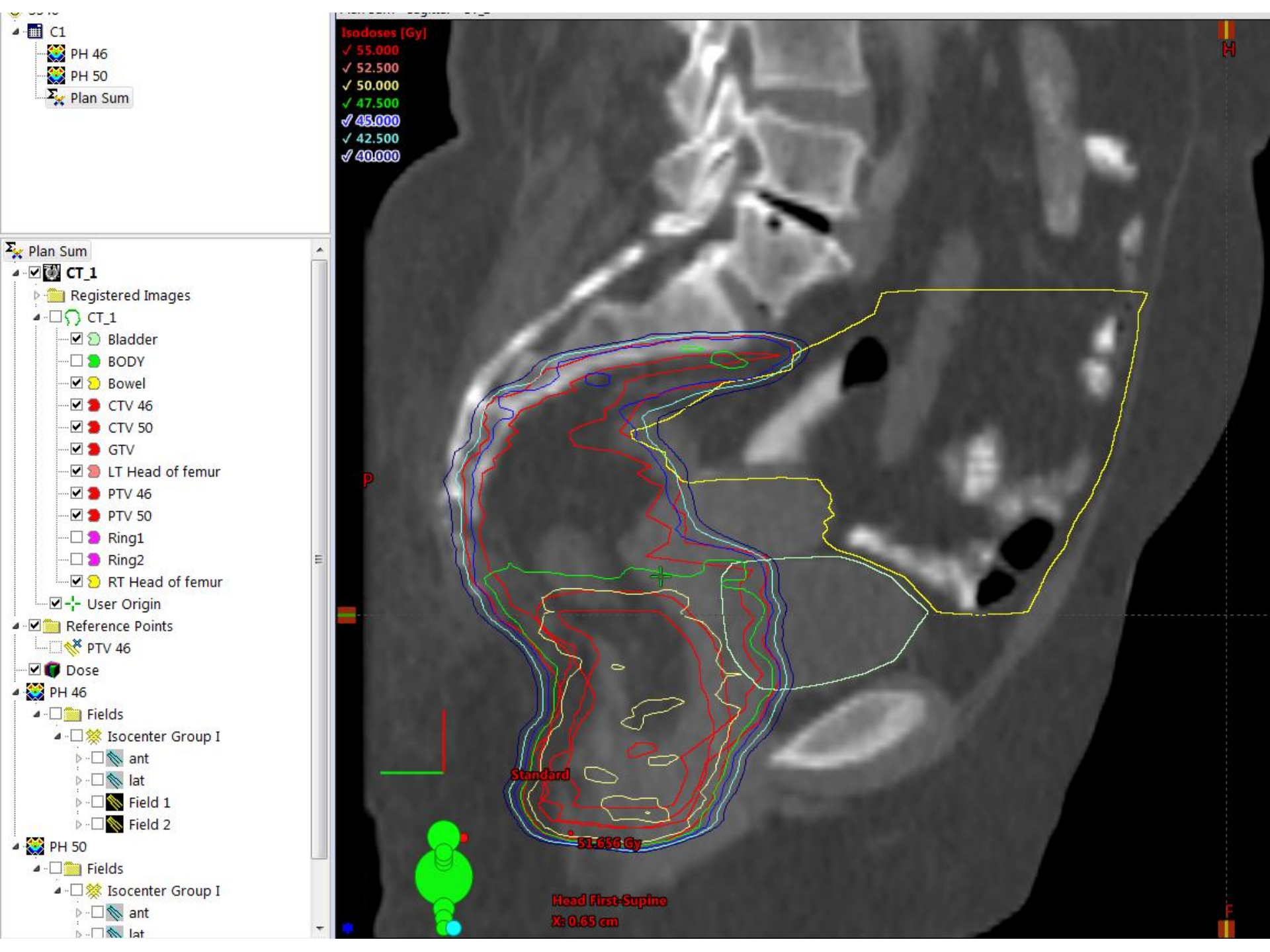
Isodose Lines


C1
acc
CT_1
60
BODY
CTV 60
CTV 70
CTV54
ESOPHAGUS
GTV
LT Parotid
NS_Ring
PTV 70
PTV_t
PTV54
PTV60
RT parotid
Spinel Cord
User Origin
Reference Points
PTV_t
Dose
Fields
Isocenter Group I
ant
Field 3-DRR (Live)
lat
Isodoses [%]
110.0
105.0
100.0
95.0
90.0
81.4
73.3
103.0 %
R
Standard
Head First-Supine
Z: 0.30 cm

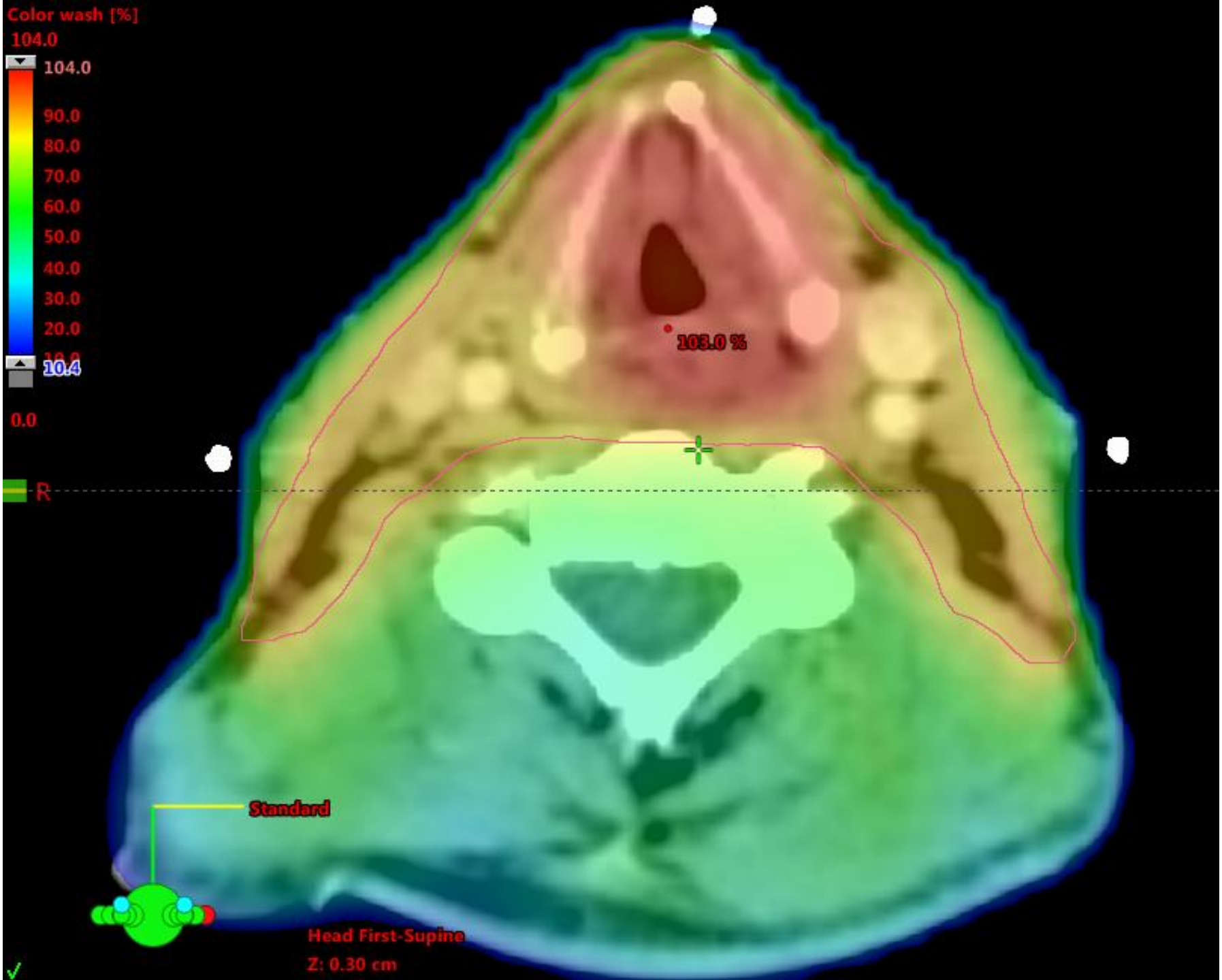

C1
acc
CT_1
60
BODY
CTV 60
CTV 70
CTV54
ESOPHAGUS
GTV
LT Parotid
NS_Ring
PTV 70
PTV_t
PTV54
PTV60
RT parotid
Spinel Cord
User Origin
Reference Points
PTV_t
Dose
Fields
Isocenter Group I
ant
Field 3-DRR (Live)
lat
Isodoses [Gy]
77.000
73.500
70.000
66.500
63.000
57.000
51.300
72.119 Gy
R
Standard
Head First-Supine
Z: 0.30 cm

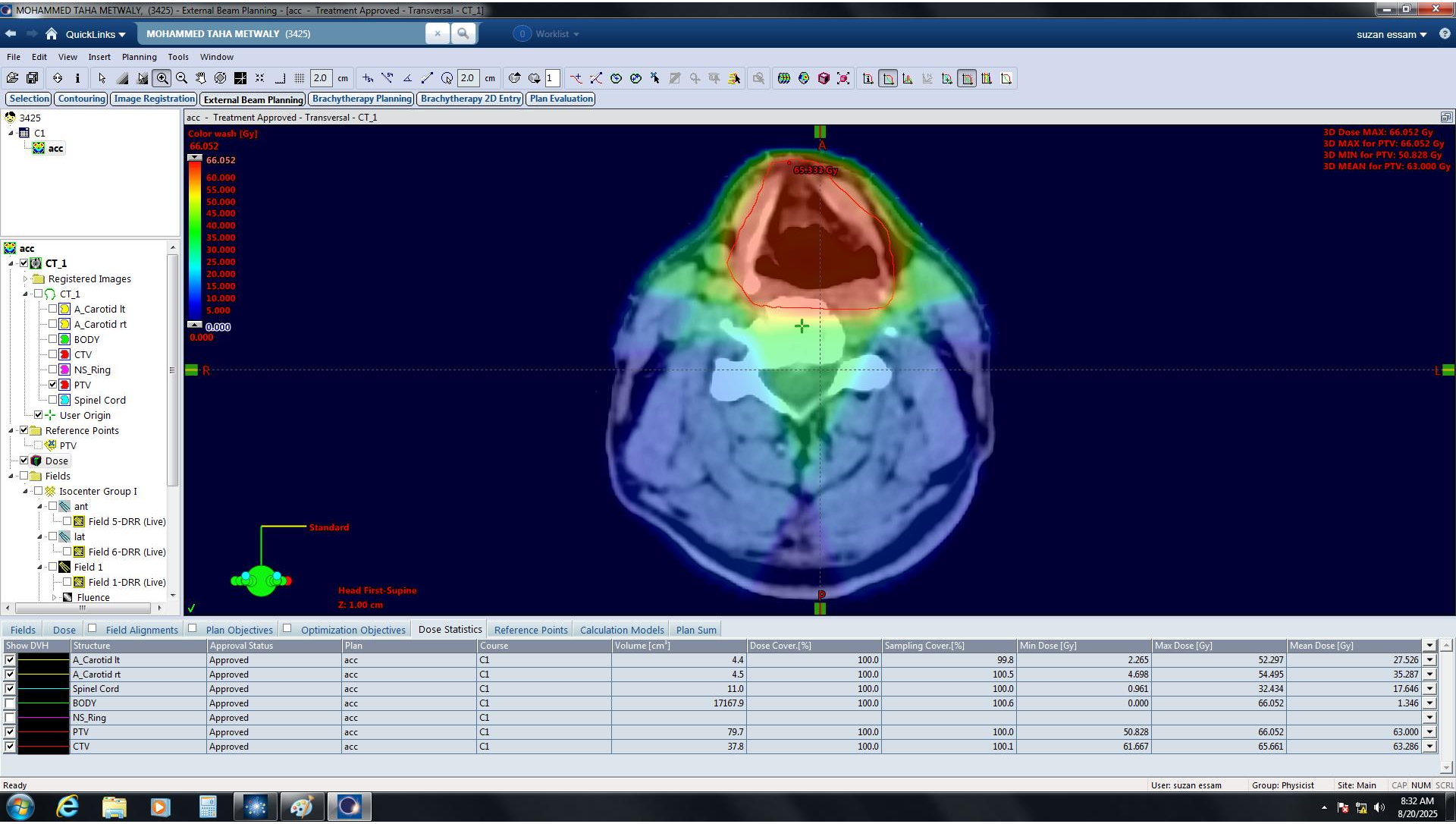

C1
PH 46
PH 50
Plan Sum
Plan Sum
CT_1
Registered Images
CT_1
Bladder
BODY
Bowel
CTV 46
CTV 50
GTV
LT Head of femur
PTV 46
PTV 50
Ring1
Ring2
RT Head of femur
User Origin
Reference Points
PTV 46
Dose
PH 46
Fields
Isocenter Group I
ant
lat
Field 1
Field 2
PH 50
Fields
Isocenter Group I
ant
Isodoses [Gy]
55.000
52.500
50.000
47.500
45.000
42.500
40.000
A
R
48.205 Gy
Standard
Head First-Supine
Z: 5.00 cm
P


C1
PH 46
PH 50
Plan Sum
Plan Sum
CT_1
Registered Images
CT_1
Bladder
BODY
Bowel
CTV 46
CTV 50
GTV
LT Head of femur
PTV 46
PTV 50
Ring1
Ring2
RT Head of femur
User Origin
Reference Points
PTV 46
Dose
PH 46
Fields
Isocenter Group I
ant
lat
Field 1
Field 2
PH 50
Fields
Isocenter Group I
ant
lat
Isodoses [Gy]
55.000
52.500
50.000
47.500
45.000
42.500
40.000
A
R
P
51.129 Gy
Standard
Head First-Supine
Z: -1.40 cm

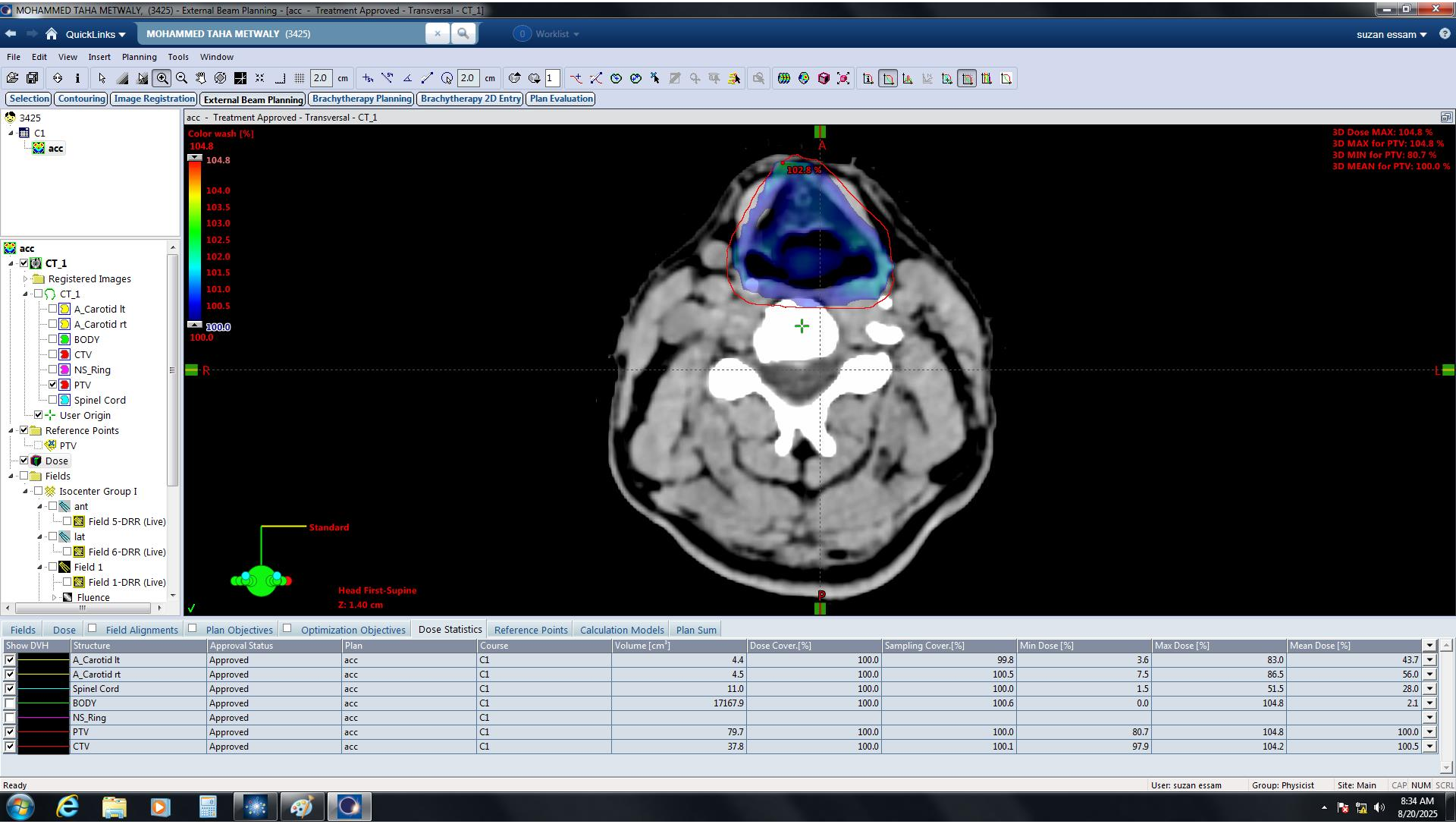

C1
PH 46
PH 50
Plan Sum
Plan Sum
CT_1
Registered Images
CT_1
Bladder
BODY
Bowel
CTV 46
CTV 50
GTV
LT Head of femur
PTV 46
PTV 50
Ring1
Ring2
RT Head of femur
User Origin
Reference Points
PTV 46
Dose
PH 46
Fields
Isocenter Group I
ant
lat
Field 1
Field 2
PH 50
Fields
Isocenter Group I
ant
lat
Isodoses [Gy]
55.000
52.500
50.000
47.500
45.000
42.500
40.000
H
P
F
Standard
51.656 Gy
Head First-Supine
X: 0.65 cm

Colour Wash


Color wash [%]
104.0
104.0
90.0
80.0
70.0
60.0
50.0
40.0
30.0
20.0
10.4
0.0
R
103.0 %
Standard
Head First-Supine
Z: 0.30 cm

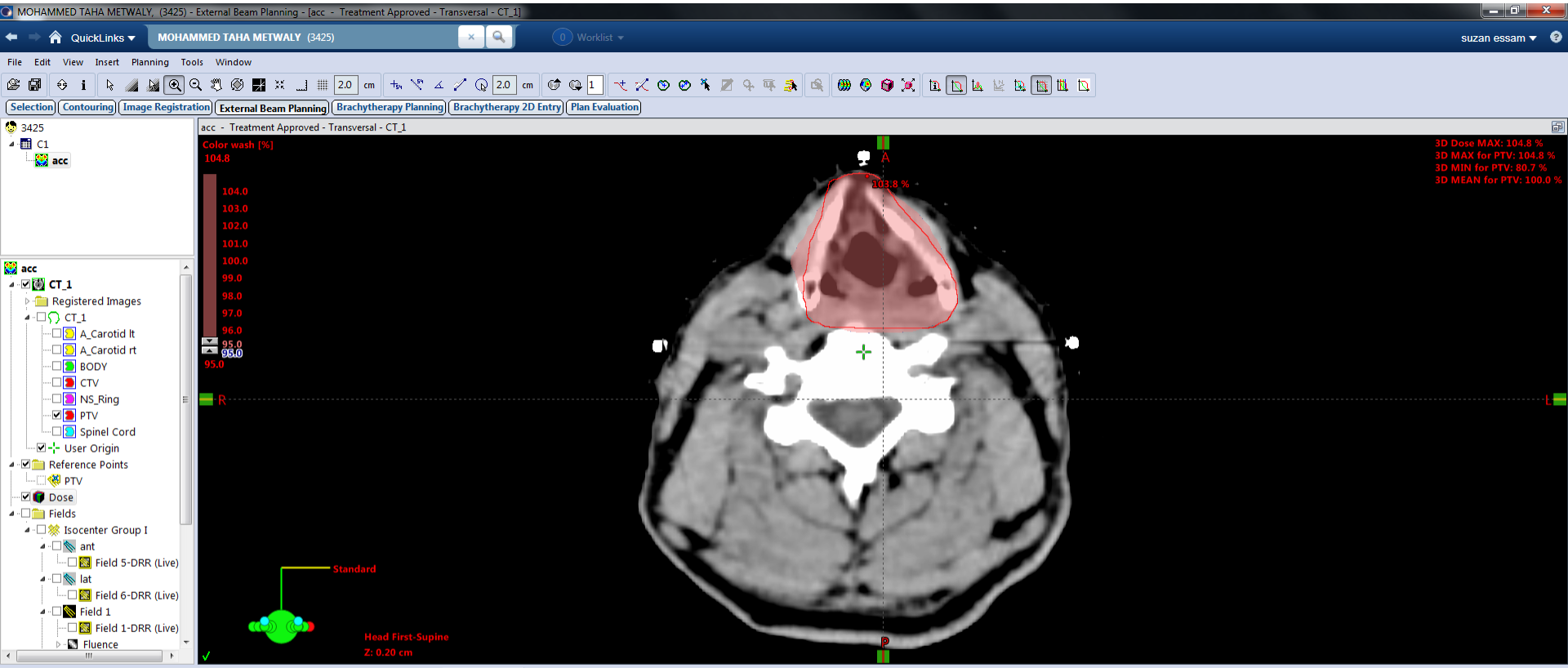


Show DVH	Structure	Approval Status	Plan	Course	Volume [cm³]	Dose Cover.[%]	Sampling Cover.[%]	Min Dose [Gy]	Max Dose [Gy]	Mean Dose [Gy]
☑	A_Carotid lt	Approved	acc	C1	4.4	100.0	99.8	2.265	52.297	27.526
☑	A_Carotid rt	Approved	acc	C1	4.5	100.0	100.5	4.698	54.495	35.287
☑	Spinel Cord	Approved	acc	C1	11.0	100.0	100.0	0.961	32.434	17.646
☐	BODY	Approved	acc	C1	17167.9	100.0	100.6	0.000	66.052	1.346
☐	NS_Ring	Approved	acc	C1						
☑	PTV	Approved	acc	C1	79.7	100.0	100.0	50.828	66.052	63.000
☑	CTV	Approved	acc	C1	37.8	100.0	100.1	61.667	65.661	63.286

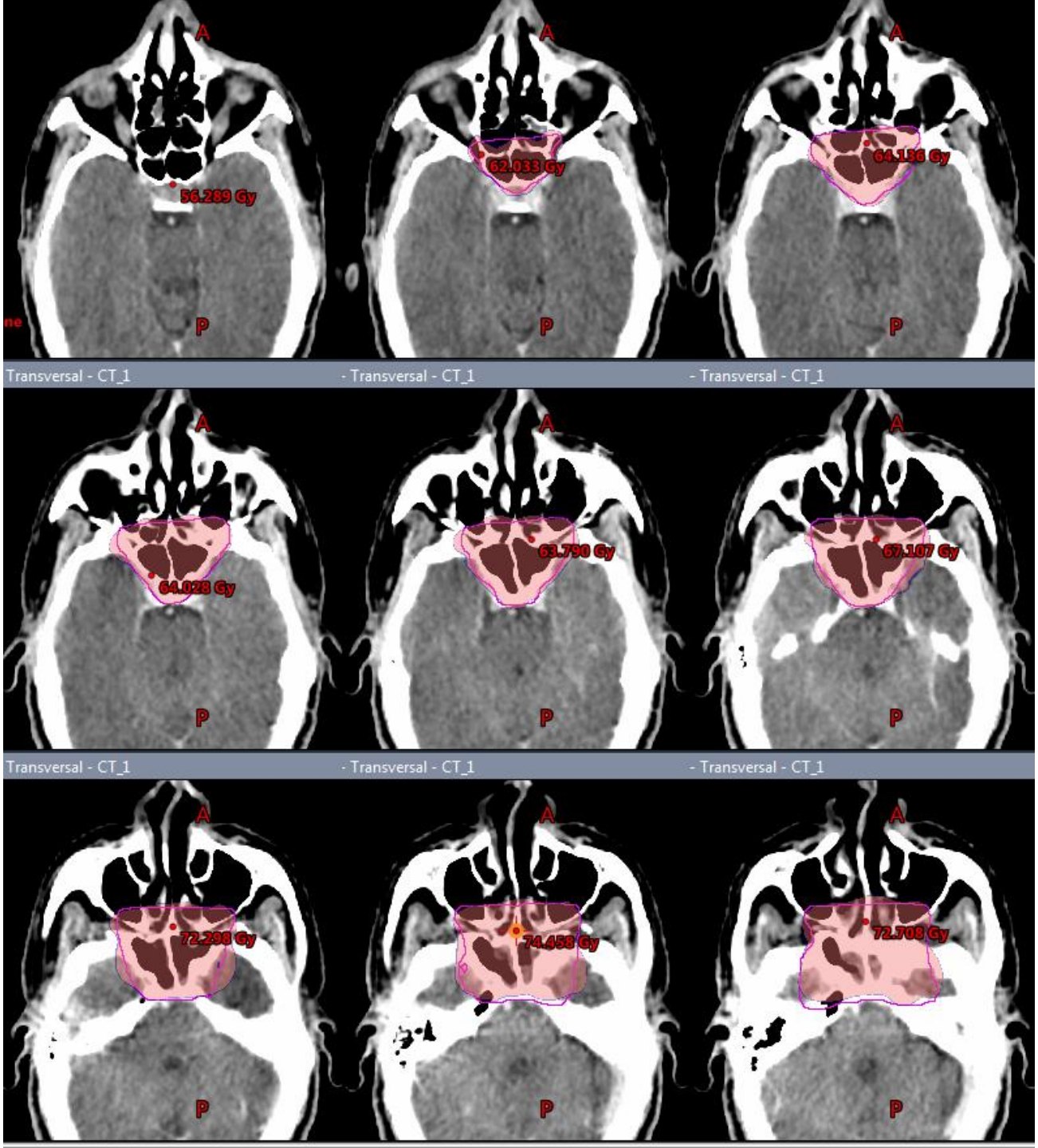


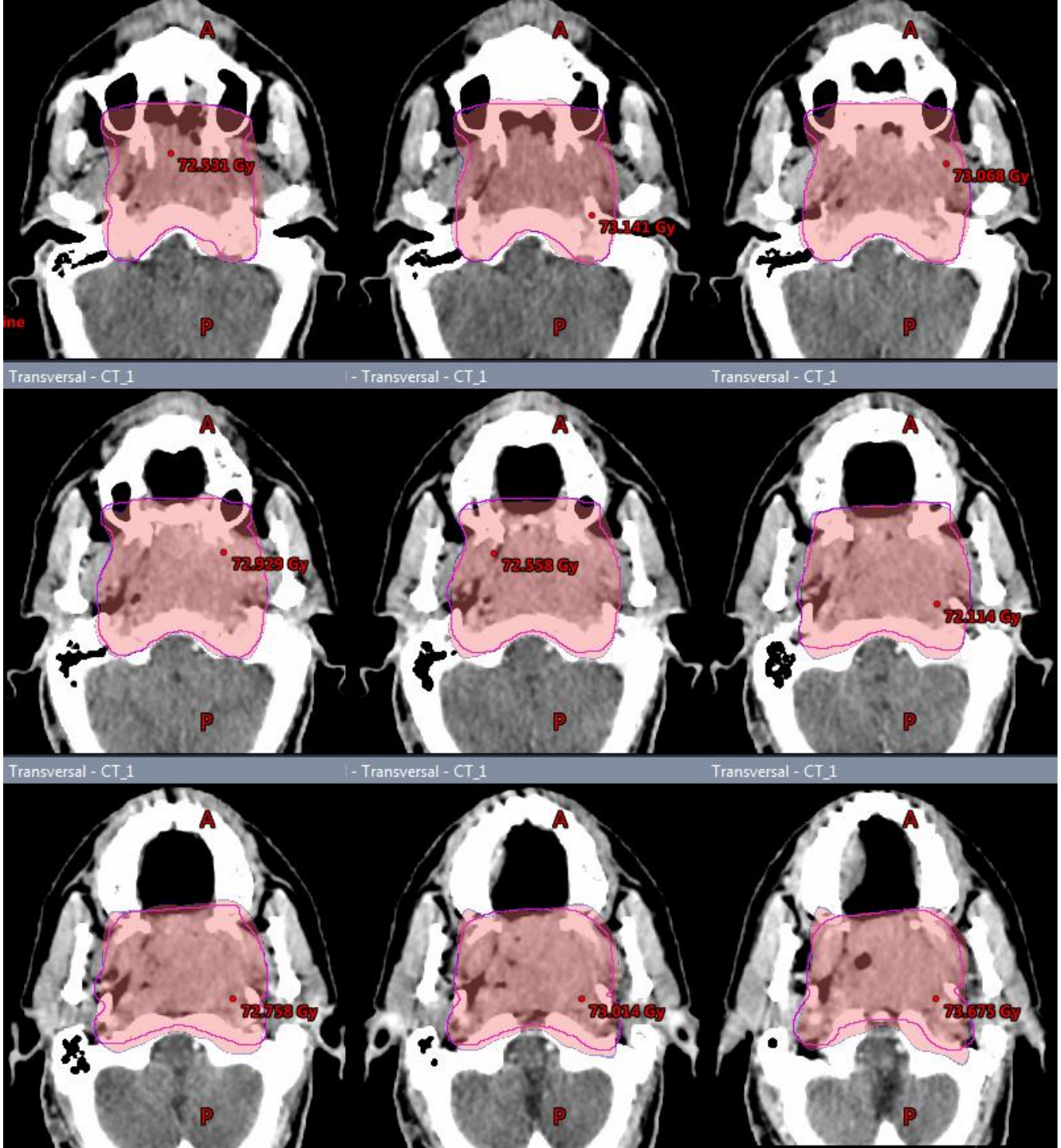
Show DVH	Structure	Approval Status	Plan	Course	Volume [cm³]	Dose Cover.[%]	Sampling Cover.[%]	Min Dose [%]	Max Dose [%]	Mean Dose [%]
☑	A_Carotid lt	Approved	acc	C1	4.4	100.0	99.8	3.6	83.0	43.7
☑	A_Carotid rt	Approved	acc	C1	4.5	100.0	100.5	7.5	86.5	56.0
☑	Spinel Cord	Approved	acc	C1	11.0	100.0	100.0	1.5	51.5	28.0
☐	BODY	Approved	acc	C1	17167.9	100.0	100.6	0.0	104.8	2.1
☐	NS_Ring	Approved	acc	C1						
☑	PTV	Approved	acc	C1	79.7	100.0	100.0	80.7	104.8	100.0
☑	CTV	Approved	acc	C1	37.8	100.0	100.1	97.9	104.2	100.5

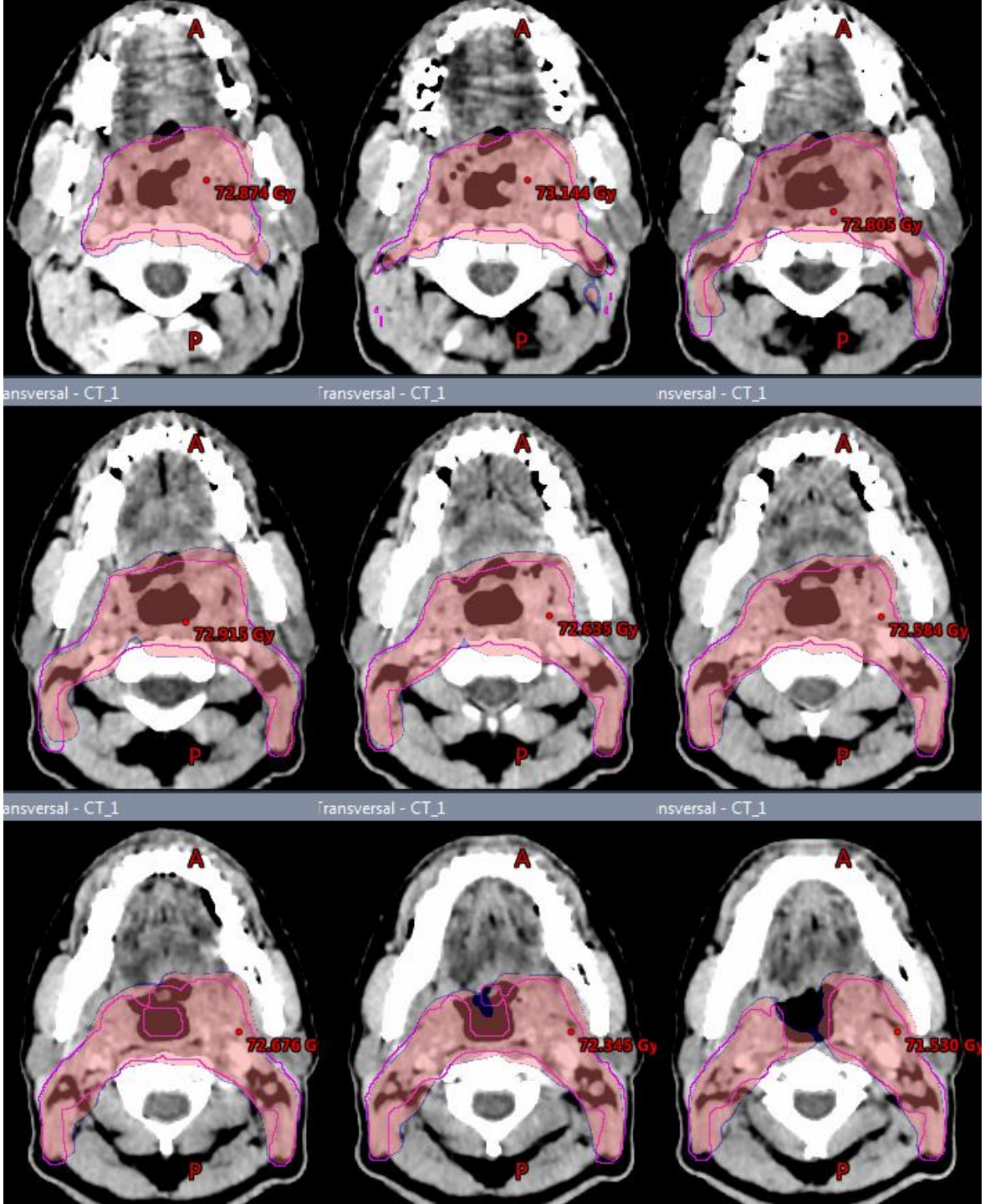
Isodose Surface

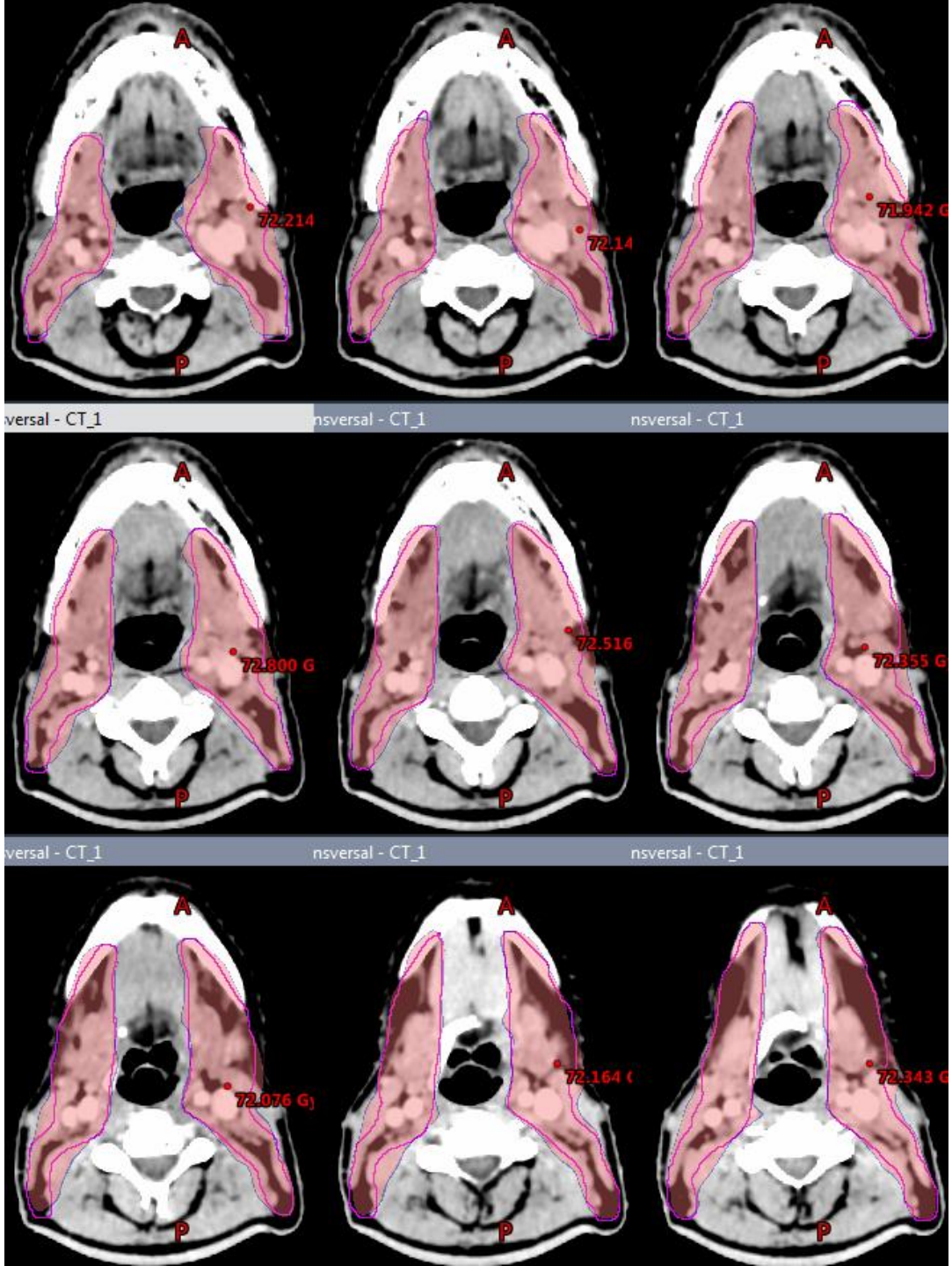

MOHAMMED TAHA METWALY, (3425) - External Beam Planning - [acc - Treatment Approved - Transversal - CT_1]
QuickLinks
MOHAMMED TAHA METWALY (3425)
Worklist
suzan essam
File Edit View Insert Planning Tools Window
Selection Contouring Image Registration External Beam Planning Brachytherapy Planning Brachytherapy 2D Entry Plan Evaluation
3425
C1
acc
acc - Treatment Approved - Transversal - CT_1
Color wash [%]
104.8
104.0
103.0
102.0
101.0
100.0
99.0
98.0
97.0
96.0
95.0
95.0
3D Dose MAX: 104.8 %
3D MAX for PTV: 104.8 %
3D MIN for PTV: 80.7 %
3D MEAN for PTV: 100.0 %
103.8 %
A
R
L
P
acc
CT_1
Registered Images
CT_1
A_Carotid lt
A_Carotid rt
BODY
CTV
NS_Ring
PTV
Spinel Cord
User Origin
Reference Points
PTV
Dose
Fields
Isocenter Group I
ant
Field 5-DRR (Live)
lat
Field 6-DRR (Live)
Field 1
Field 1-DRR (Live)
Fluence
Standard
Head First-Supine
Z: 0.20 cm
Fields Dose Field Alignments Plan Objectives Optimization Objectives Dose Statistics Reference Points Calculation Models Plan Sum
Show DVH Structure Approval Status Plan Course Volume [cm³] Dose Cover.[%] Sampling Cover.[%] Min Dose [%] Max Dose [%] Mean Dose [%]
A_Carotid lt Approved acc C1 4.4 100.0 99.8 3.6 83.0 43.7
A_Carotid rt Approved acc C1 4.5 100.0 100.5 7.5 86.5 56.0
Spinel Cord Approved acc C1 11.0 100.0 100.0 1.5 51.5 28.0
BODY Approved acc C1 17167.9 100.0 100.6 0.0 104.8 2.1
NS_Ring Approved acc C1
PTV Approved acc C1 79.7 100.0 100.0 80.7 104.8 100.0
CTV Approved acc C1 37.8 100.0 100.1 97.9 104.2 100.5
Ready
User: suzan essam
Group: Physicist
Site: Main
CAP NUM SCRL
8:35 AM
8/20/2025

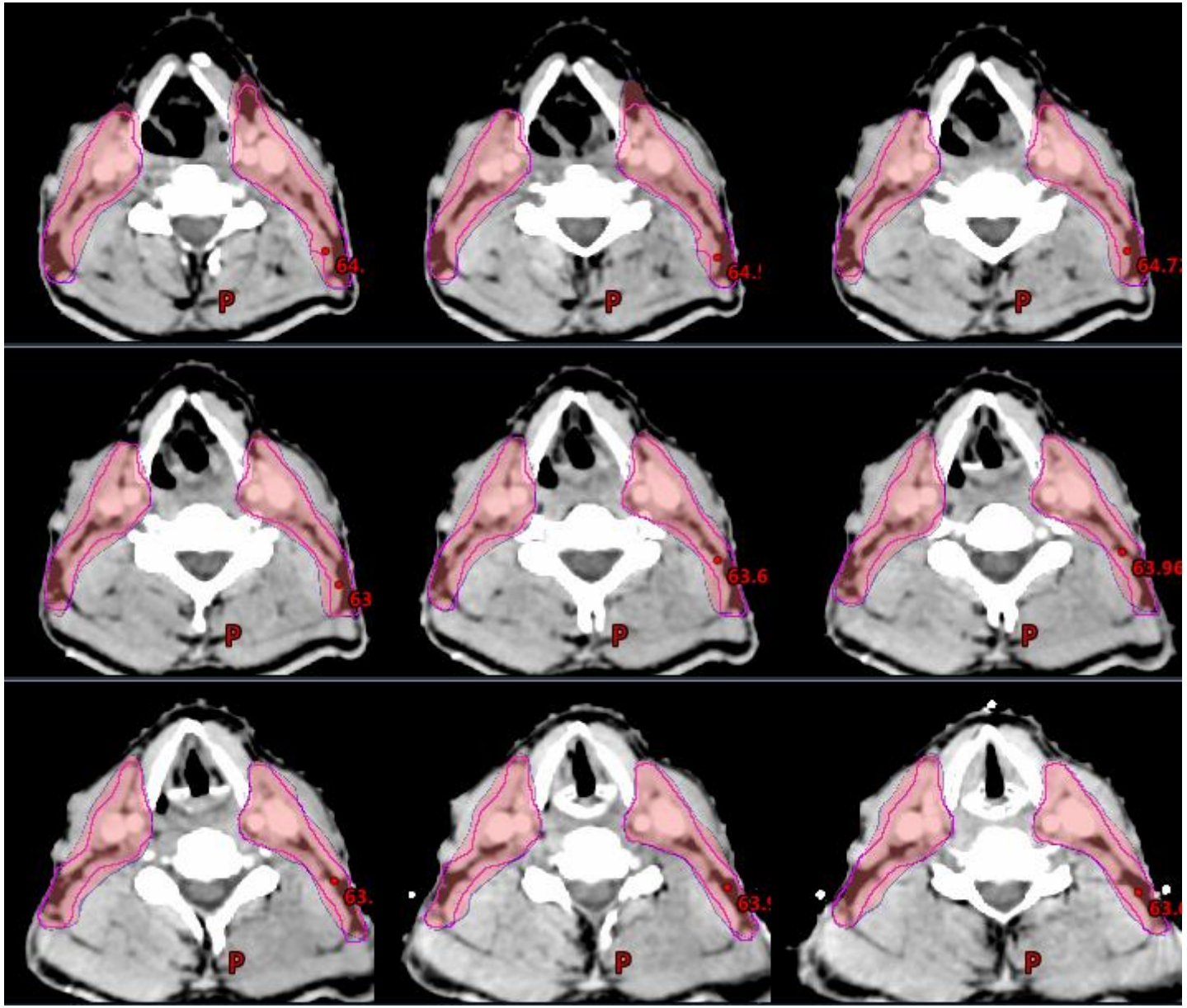

C1
acc
CT_1
60
BODY
CTV 60
CTV 70
CTV54
ESOPHAGUS
GTV
LT Parotid
NS_Ring
PTV 70
PTV_t
PTV54
PTV60
RT parotid
Spinel Cord
User Origin
Reference Points
PTV_t
Dose
Fields
Isocenter Group I
ant
Field 3-DRR (Liv
Color wash [%]
104.0
103.0
102.0
101.0
100.0
99.0
98.0
97.0
96.0
95.0
95.0
95.0
103.0 %
R
Standard
Head First-Supine
Z: 0.30 cm

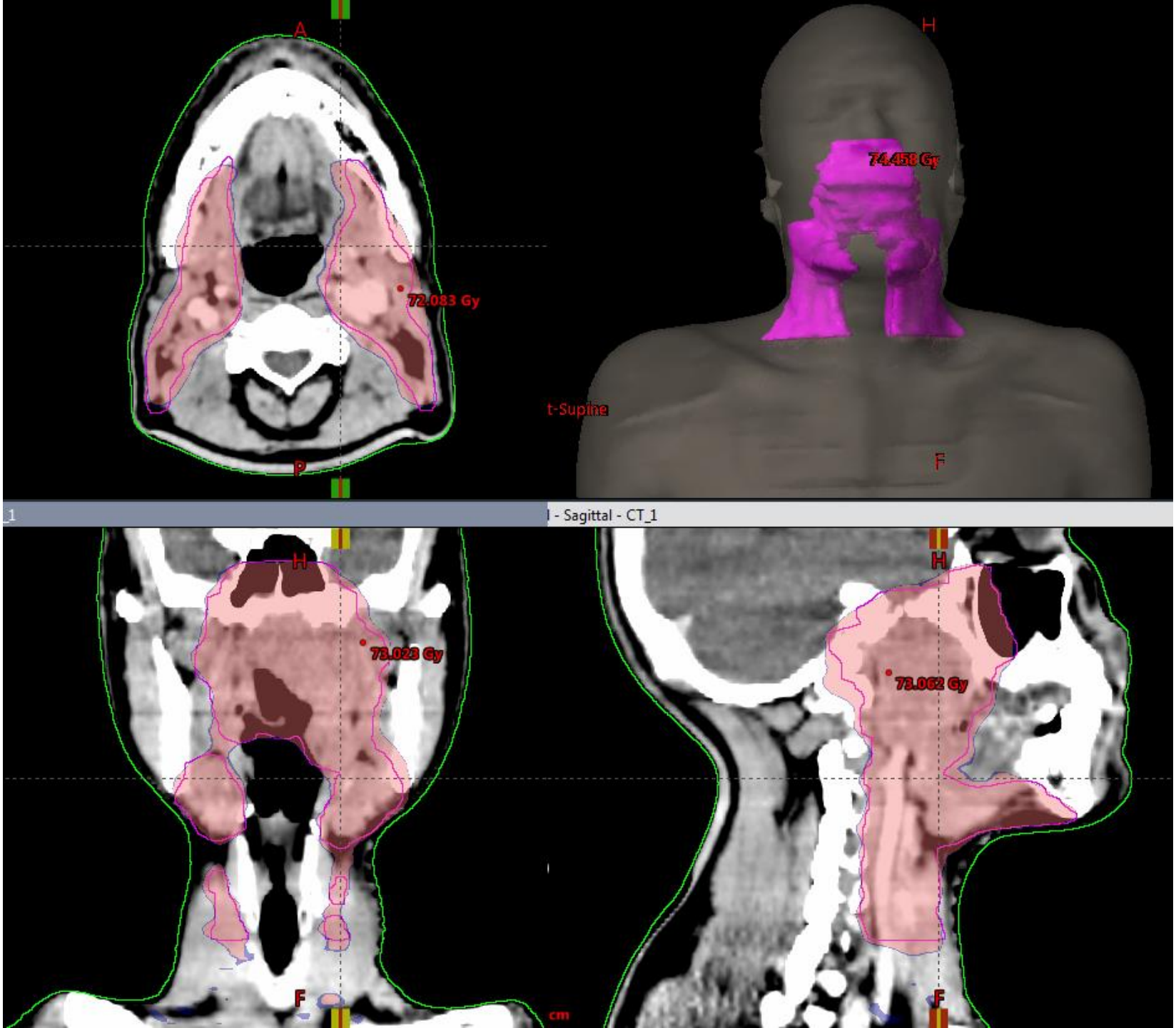

A
P
56.289 Gy
62.033 Gy
64.136 Gy
Transversal - CT_1
- Transversal - CT_1
- Transversal - CT_1
64.028 Gy
63.790 Gy
67.107 Gy
Transversal - CT_1
- Transversal - CT_1
- Transversal - CT_1
72.298 Gy
74.458 Gy
72.708 Gy

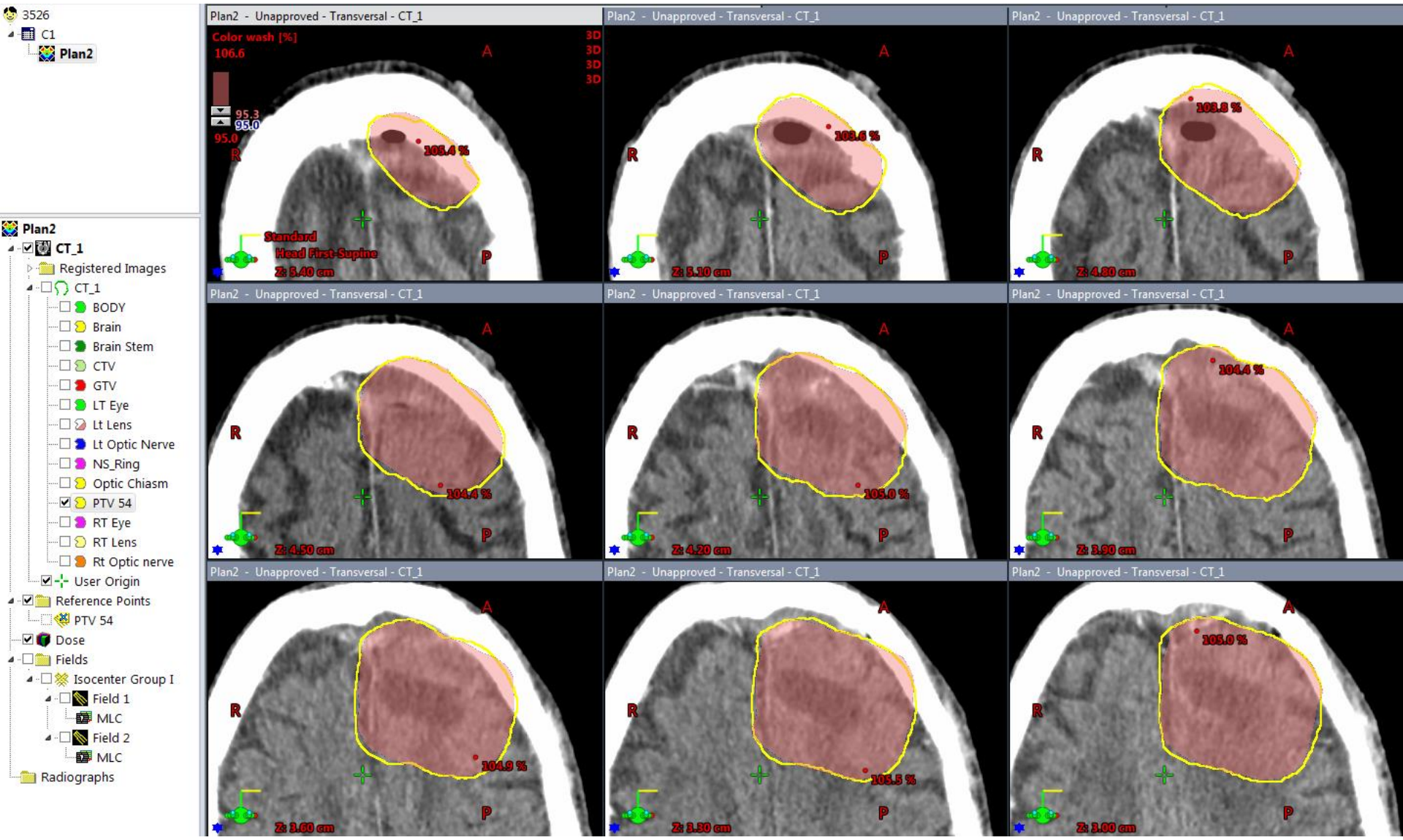

A
P
72.531 Gy
73.141 Gy
73.068 Gy
Transversal - CT_1
- Transversal - CT_1
Transversal - CT_1
72.929 Gy
72.558 Gy
72.114 Gy
Transversal - CT_1
- Transversal - CT_1
Transversal - CT_1
72.758 Gy
73.014 Gy
73.675 Gy

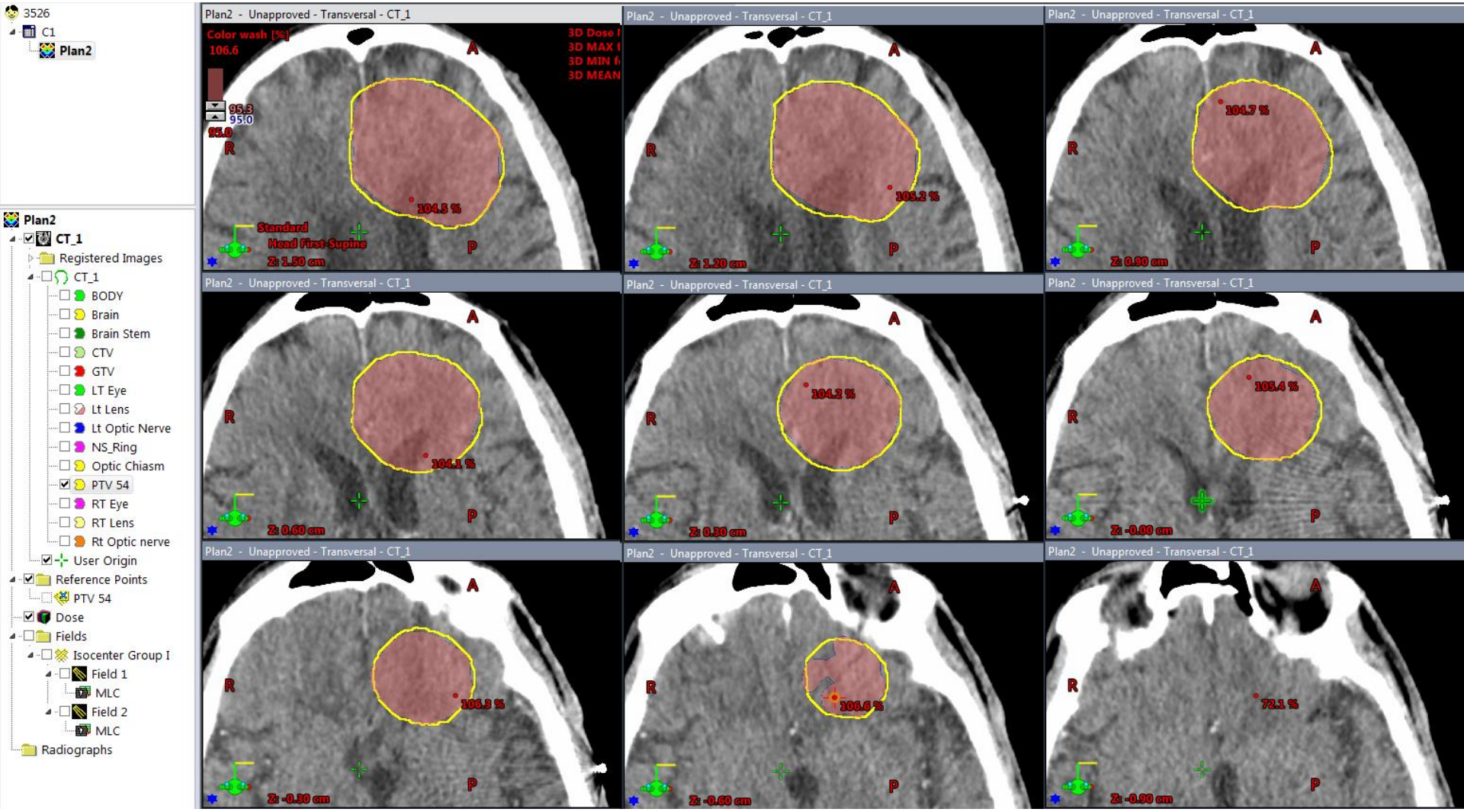

A
P
72.874 Gy
73.144 Gy
72.805 Gy
ansversal - CT_1
Transversal - CT_1
nsversal - CT_1
72.915 Gy
72.635 Gy
72.584 Gy
72.676 G
72.345 Gy
71.530 Gy

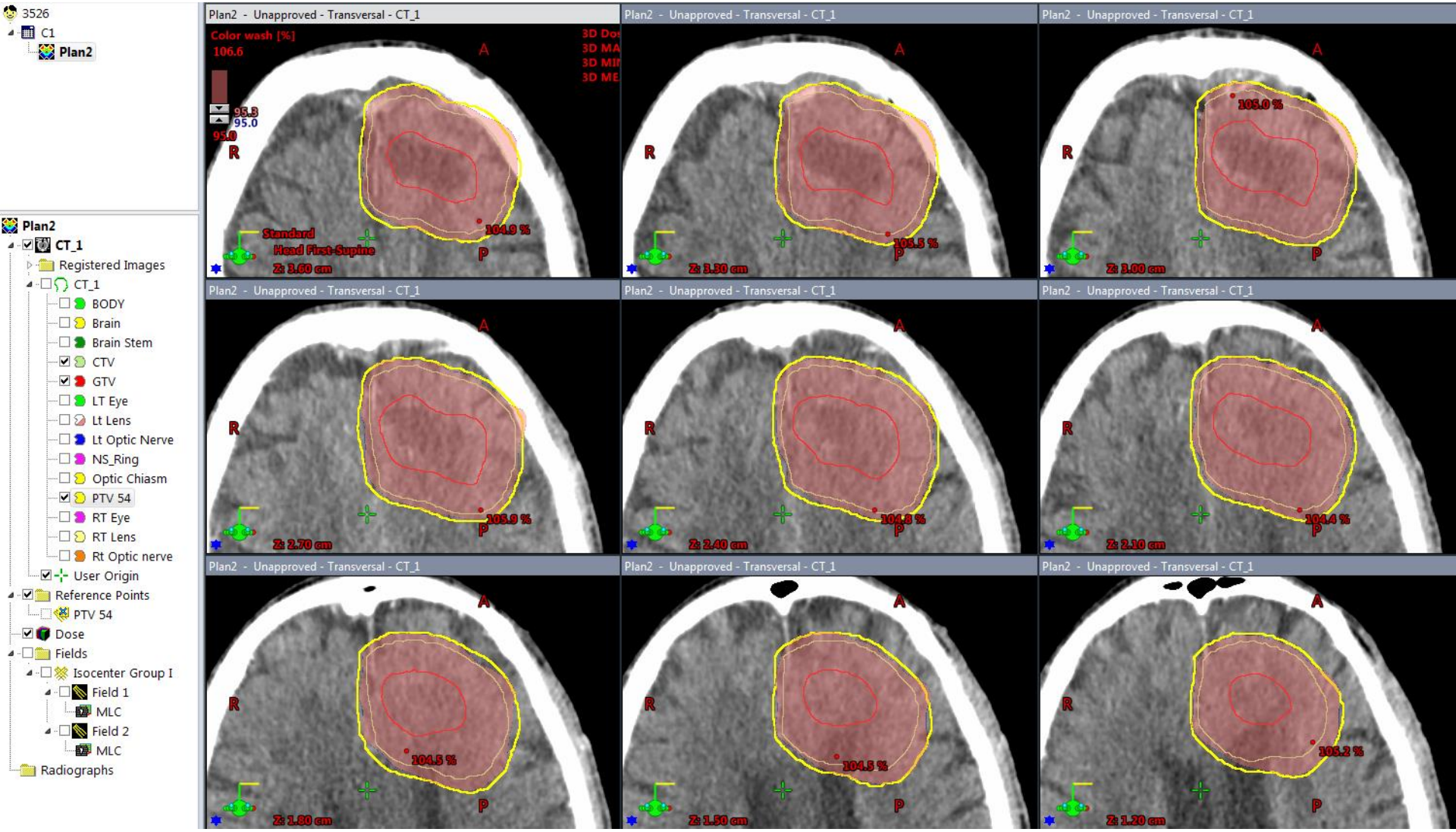

A
P
72.214
72.14
71.942 G
versal - CT_1
nsversal - CT_1
nsversal - CT_1
72.800 G
72.516
72.355 G
versal - CT_1
nsversal - CT_1
nsversal - CT_1
72.076 G
72.164
72.343 G


64.
P
64.
P
64.7
P
63
P
63.6
P
63.96
P
63.
P
63.
P
63.
P


A
P
72.083 Gy
H
74.458 Gy
t-Supine
F
_1
l - Sagittal - CT_1
H
73.023 Gy
F
cm
H
73.062 Gy
F


3526
C1
Plan2
Plan2
CT_1
Registered Images
CT_1
BODY
Brain
Brain Stem
CTV
GTV
LT Eye
Lt Lens
Lt Optic Nerve
NS_Ring
Optic Chiasm
PTV 54
RT Eye
RT Lens
Rt Optic nerve
User Origin
Reference Points
PTV 54
Dose
Fields
Isocenter Group I
Field 1
MLC
Field 2
MLC
Radiographs
Plan2 - Unapproved - Transversal - CT_1
Color wash [%]
106.6
95.3
95.0
95.0
3D
A
R
P
108.4 %
Standard
Head First-Supine
Z: 5.40 cm
Plan2 - Unapproved - Transversal - CT_1
108.6 %
Z: 5.10 cm
Plan2 - Unapproved - Transversal - CT_1
108.8 %
Z: 4.80 cm
Plan2 - Unapproved - Transversal - CT_1
104.4 %
Z: 4.50 cm
Plan2 - Unapproved - Transversal - CT_1
105.0 %
Z: 4.20 cm
Plan2 - Unapproved - Transversal - CT_1
104.4 %
Z: 3.90 cm
Plan2 - Unapproved - Transversal - CT_1
104.9 %
Z: 3.60 cm
Plan2 - Unapproved - Transversal - CT_1
105.5 %
Z: 3.30 cm
Plan2 - Unapproved - Transversal - CT_1
105.0 %
Z: 3.00 cm

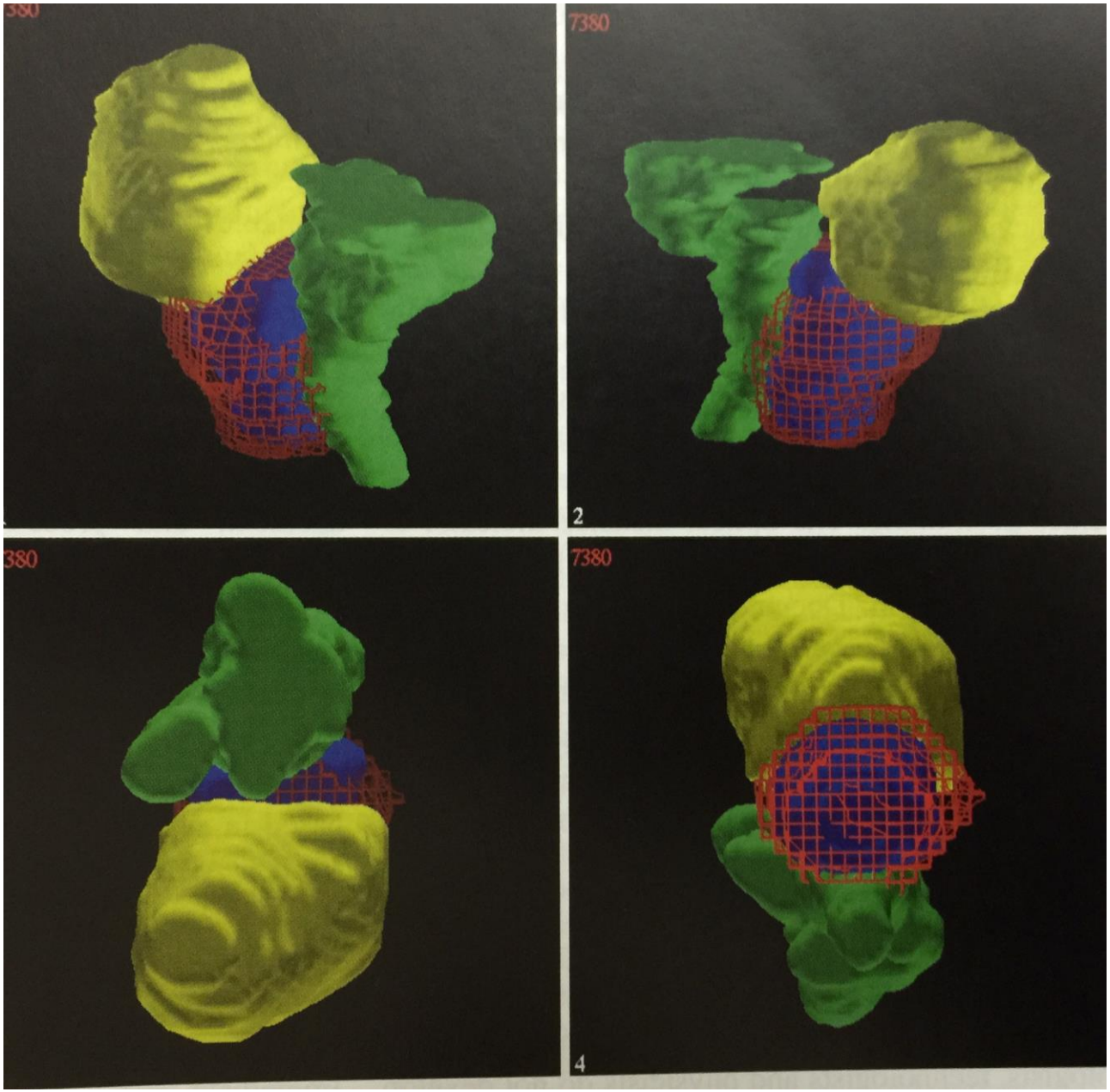

3526
C1
Plan2
Plan2
CT_1
Registered Images
CT_1
BODY
Brain
Brain Stem
CTV
GTV
LT Eye
Lt Lens
Lt Optic Nerve
NS_Ring
Optic Chiasm
PTV 54
RT Eye
RT Lens
Rt Optic nerve
User Origin
Reference Points
PTV 54
Dose
Fields
Isocenter Group I
Field 1
MLC
Field 2
MLC
Radiographs
Plan2 - Unapproved - Transversal - CT_1
Color wash [%]
106.6
95.3
95.0
95.0
3D Dose
3D MAX
3D MIN
3D MEAN
Standard
Head First-Supine
Z: 1.50 cm
104.5 %
Z: 1.20 cm
105.2 %
104.7 %
Z: 0.90 cm
104.1 %
Z: 0.60 cm
104.2 %
Z: 0.30 cm
105.4 %
Z: -0.00 cm
106.3 %
Z: -0.30 cm
106.6 %
Z: -0.60 cm
72.1 %
Z: -0.90 cm
A
P
R

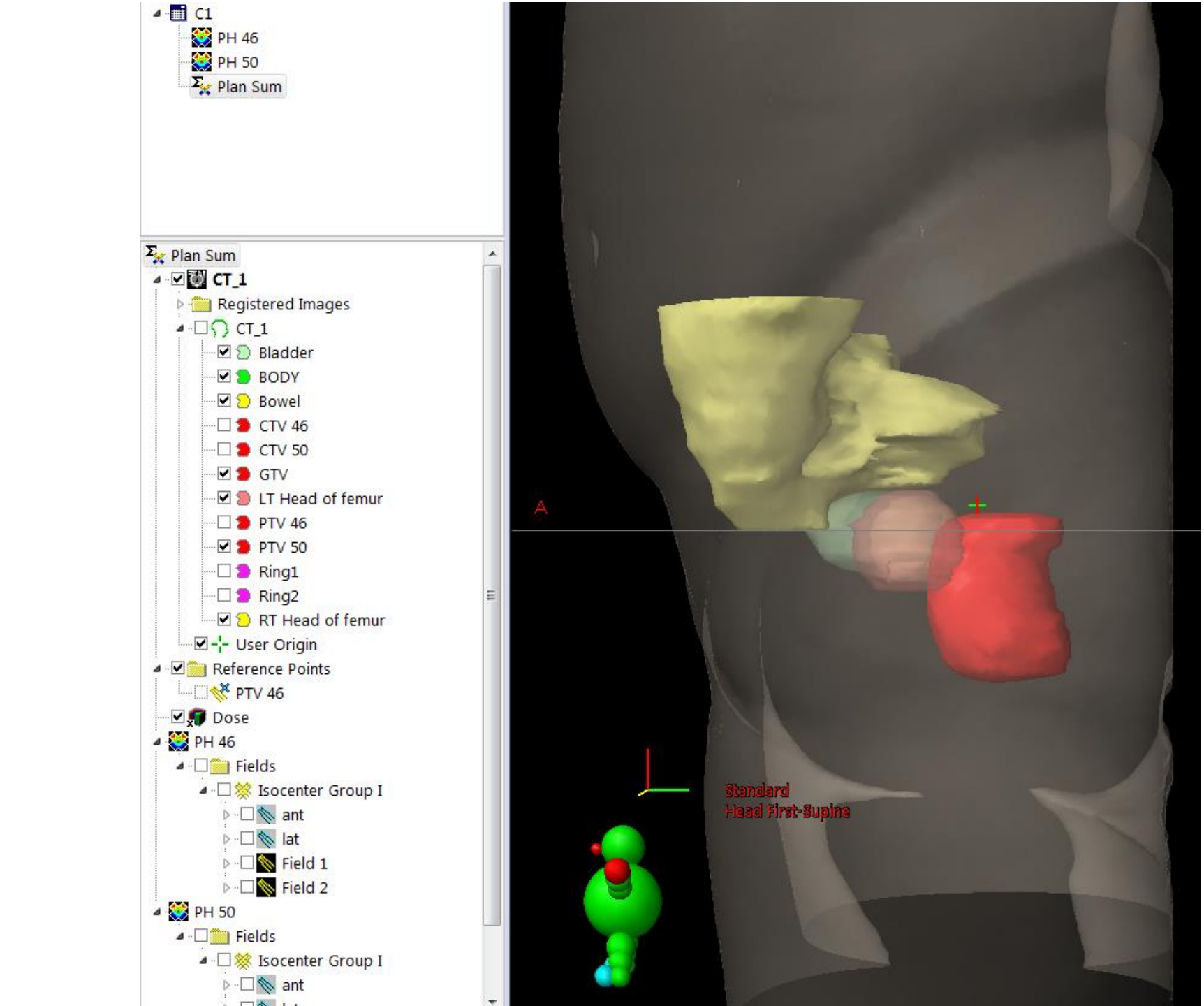

3526
C1
Plan2
Plan2
CT_1
Registered Images
CT_1
BODY
Brain
Brain Stem
CTV
GTV
LT Eye
Lt Lens
Lt Optic Nerve
NS_Ring
Optic Chiasm
PTV 54
RT Eye
RT Lens
Rt Optic nerve
User Origin
Reference Points
PTV 54
Dose
Fields
Isocenter Group I
Field 1
MLC
Field 2
MLC
Radiographs
Plan2 - Unapproved - Transversal - CT_1
Color wash [%]
106.6
95.8
95.0
95.0
A
R
P
Standard
Head First-Supine
Z: 3.60 cm
104.9 %
Plan2 - Unapproved - Transversal - CT_1
Z: 3.30 cm
105.5 %
Plan2 - Unapproved - Transversal - CT_1
105.0 %
Z: 3.00 cm
Plan2 - Unapproved - Transversal - CT_1
Z: 2.70 cm
105.9 %
Plan2 - Unapproved - Transversal - CT_1
Z: 2.40 cm
104.8 %
Plan2 - Unapproved - Transversal - CT_1
Z: 2.10 cm
104.4 %
Plan2 - Unapproved - Transversal - CT_1
Z: 1.80 cm
104.5 %
Plan2 - Unapproved - Transversal - CT_1
Z: 1.50 cm
104.5 %
Plan2 - Unapproved - Transversal - CT_1
Z: 1.20 cm
103.2 %

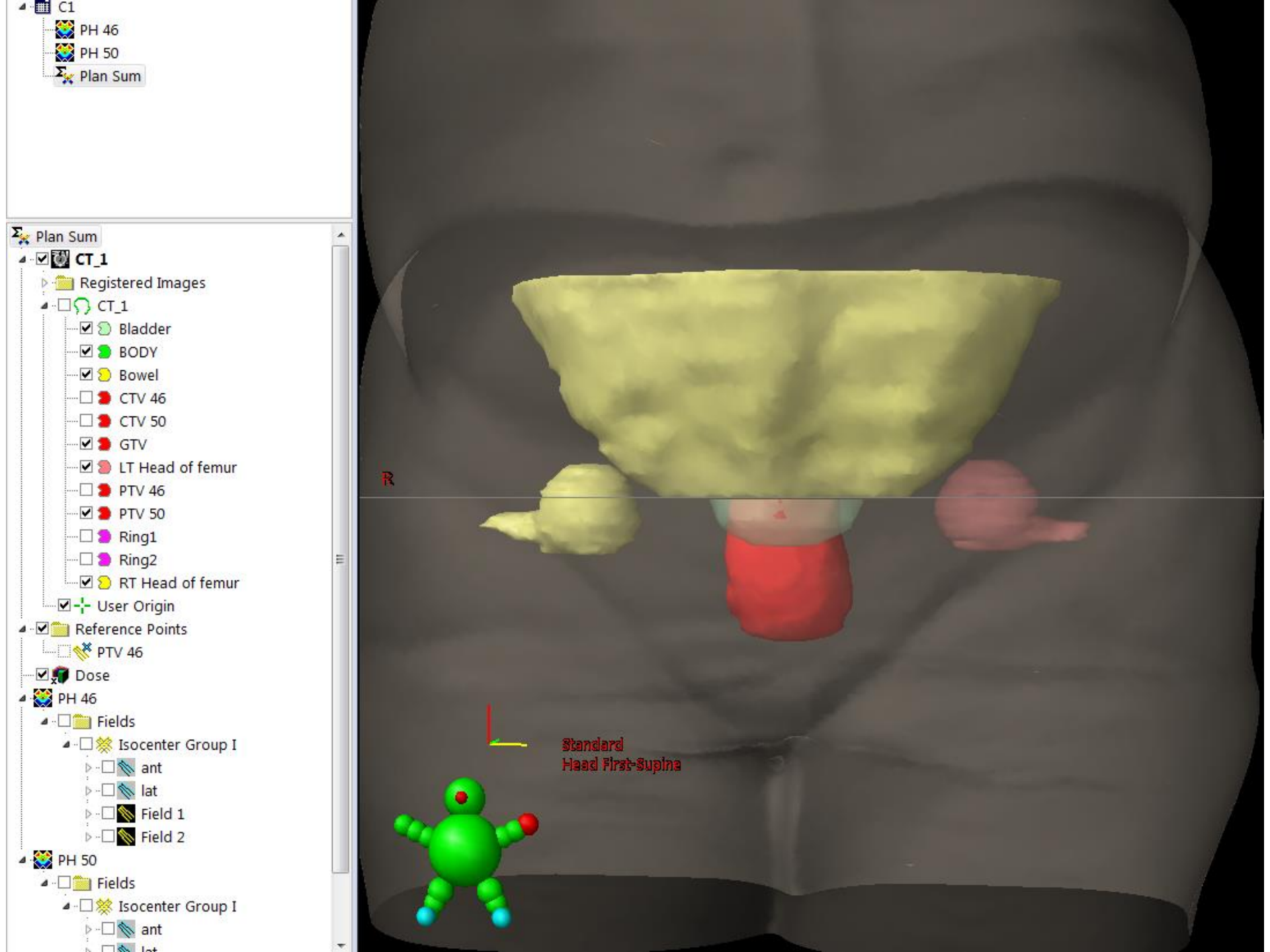
Visual Assessment

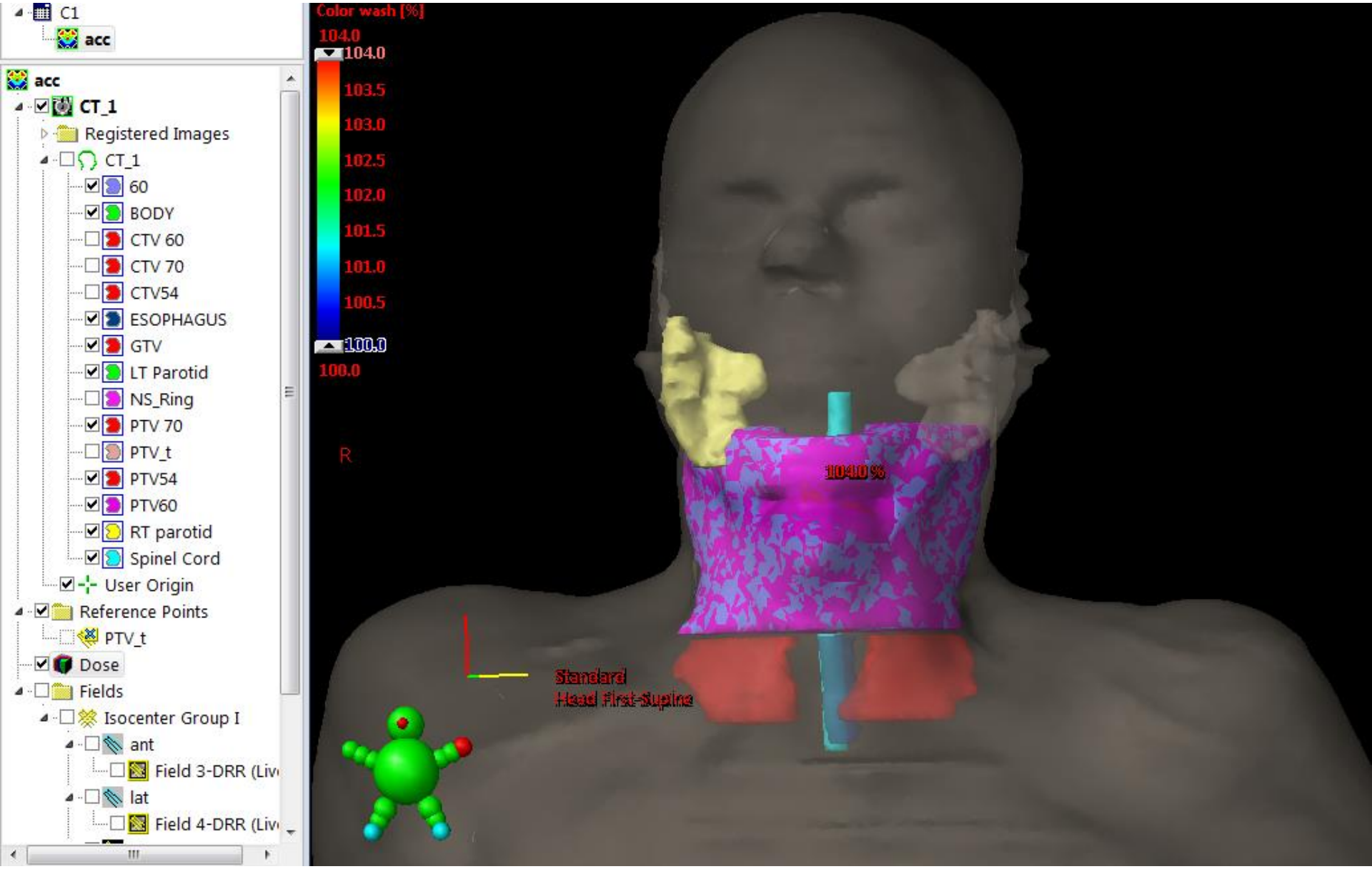
Room View

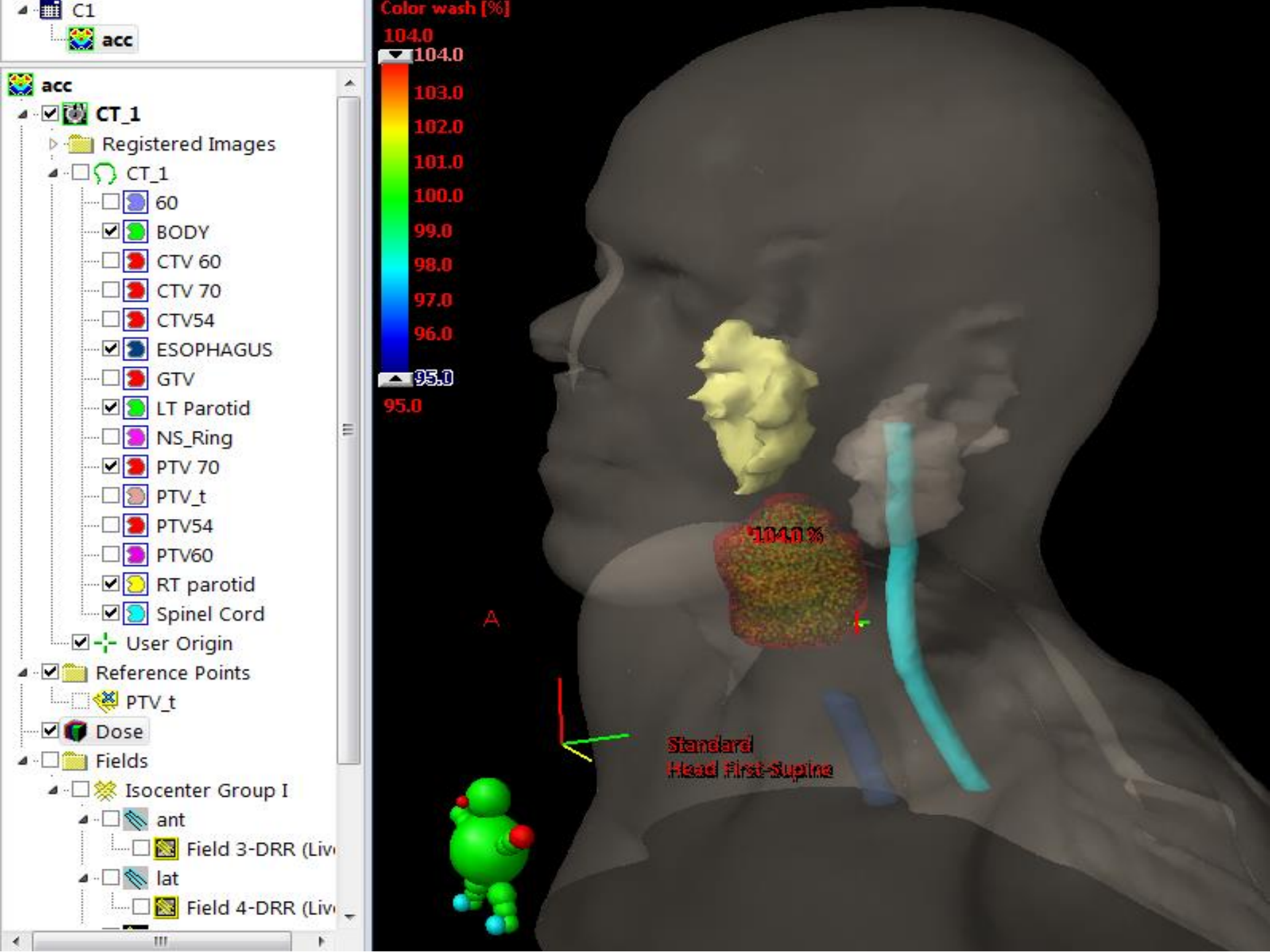
PTV & OAR identify areas of invagination & hot areas

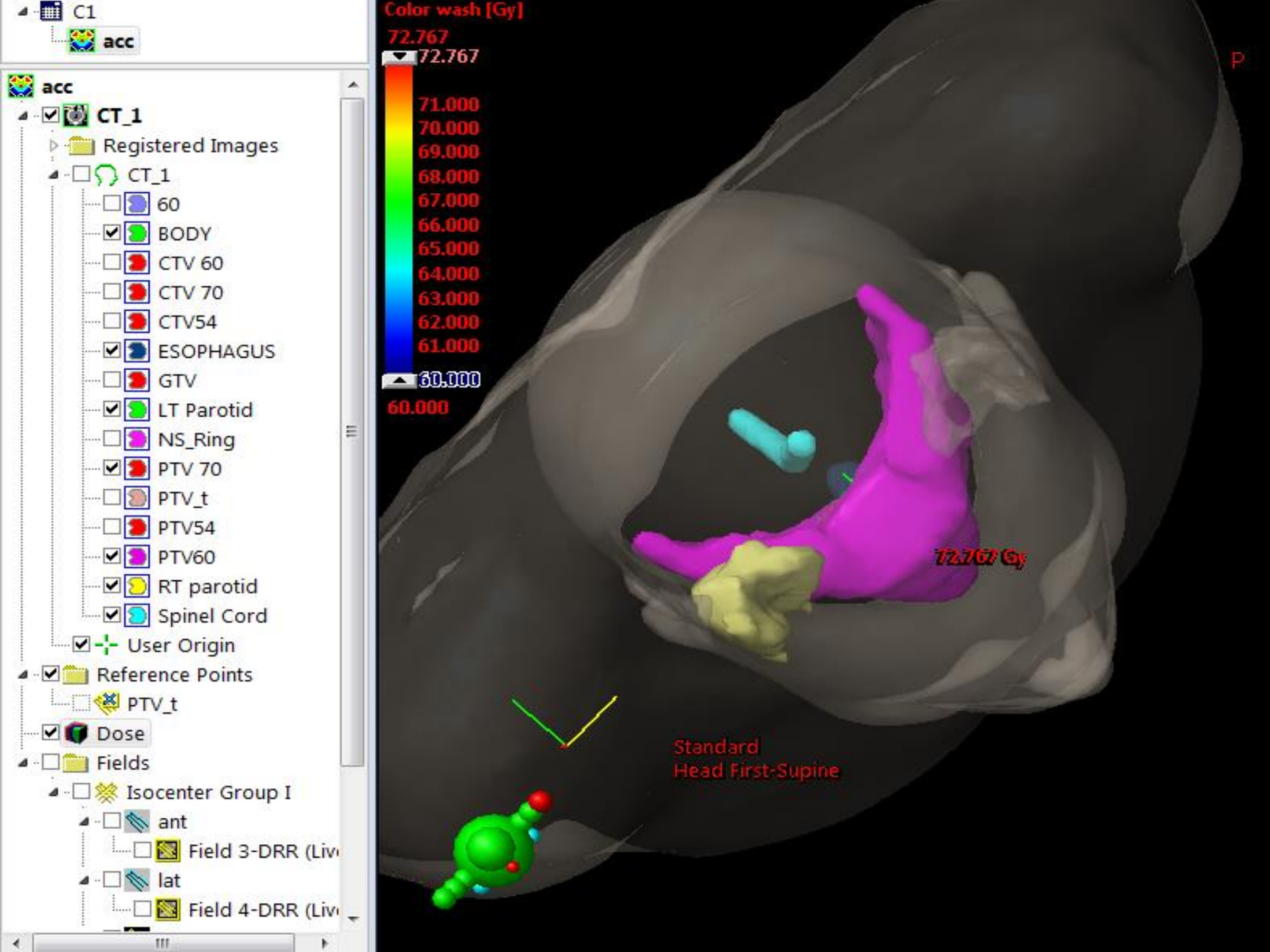



C1
PH 46
PH 50
Plan Sum
Plan Sum
CT_1
Registered Images
CT_1
Bladder
BODY
Bowel
CTV 46
CTV 50
GTV
LT Head of femur
PTV 46
PTV 50
Ring1
Ring2
RT Head of femur
User Origin
Reference Points
PTV 46
Dose
PH 46
Fields
Isocenter Group I
ant
lat
Field 1
Field 2
PH 50
Fields
Isocenter Group I
ant
A
Standard
Head First-Supine


C1
PH 46
PH 50
Plan Sum
Plan Sum
CT_1
Registered Images
CT_1
Bladder
BODY
Bowel
CTV 46
CTV 50
GTV
LT Head of femur
PTV 46
PTV 50
Ring1
Ring2
RT Head of femur
User Origin
Reference Points
PTV 46
Dose
PH 46
Fields
Isocenter Group I
ant
lat
Field 1
Field 2
PH 50
Fields
Isocenter Group I
ant
R
Standard
Head First-Supine

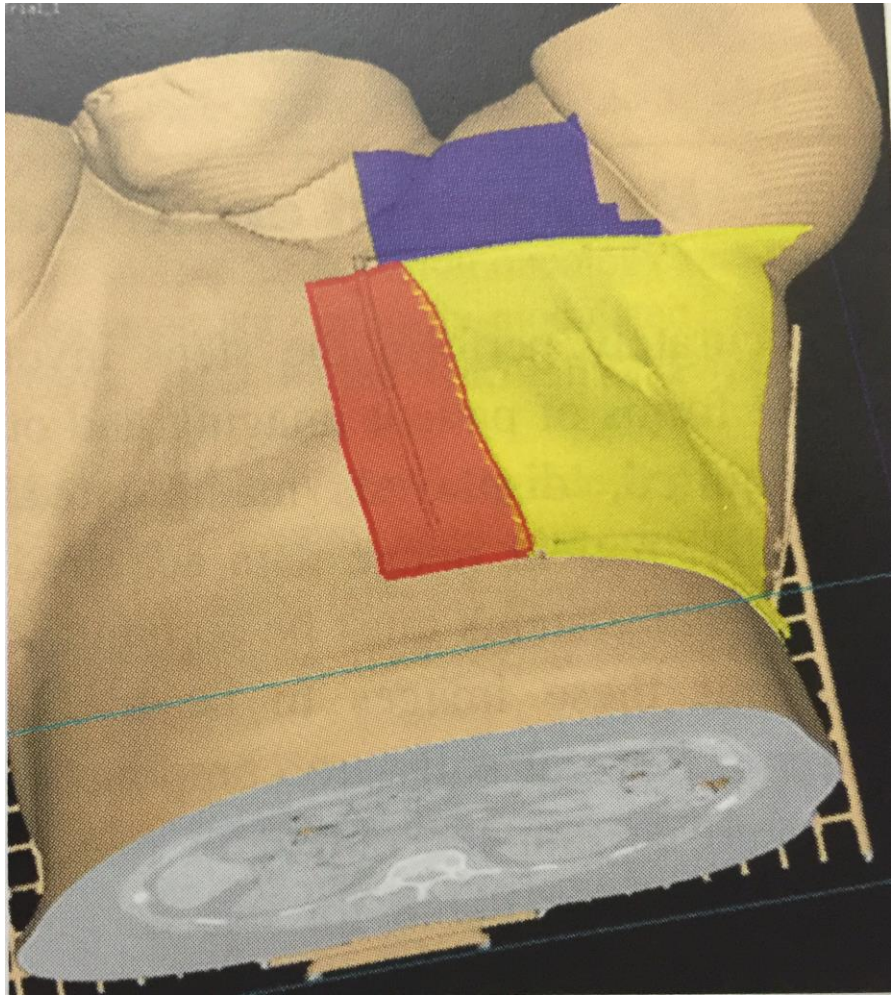

C1
acc
acc
CT_1
Registered Images
CT_1
60
BODY
CTV 60
CTV 70
CTV54
ESOPHAGUS
GTV
LT Parotid
NS_Ring
PTV 70
PTV_t
PTV54
PTV60
RT parotid
Spinel Cord
User Origin
Reference Points
PTV_t
Dose
Fields
Isocenter Group I
ant
Field 3-DRR (Liv
lat
Field 4-DRR (Liv
Color wash [%]
104.0
104.0
103.5
103.0
102.5
102.0
101.5
101.0
100.5
100.0
100.0
R
104.0 %
Standard
Head First-Supine

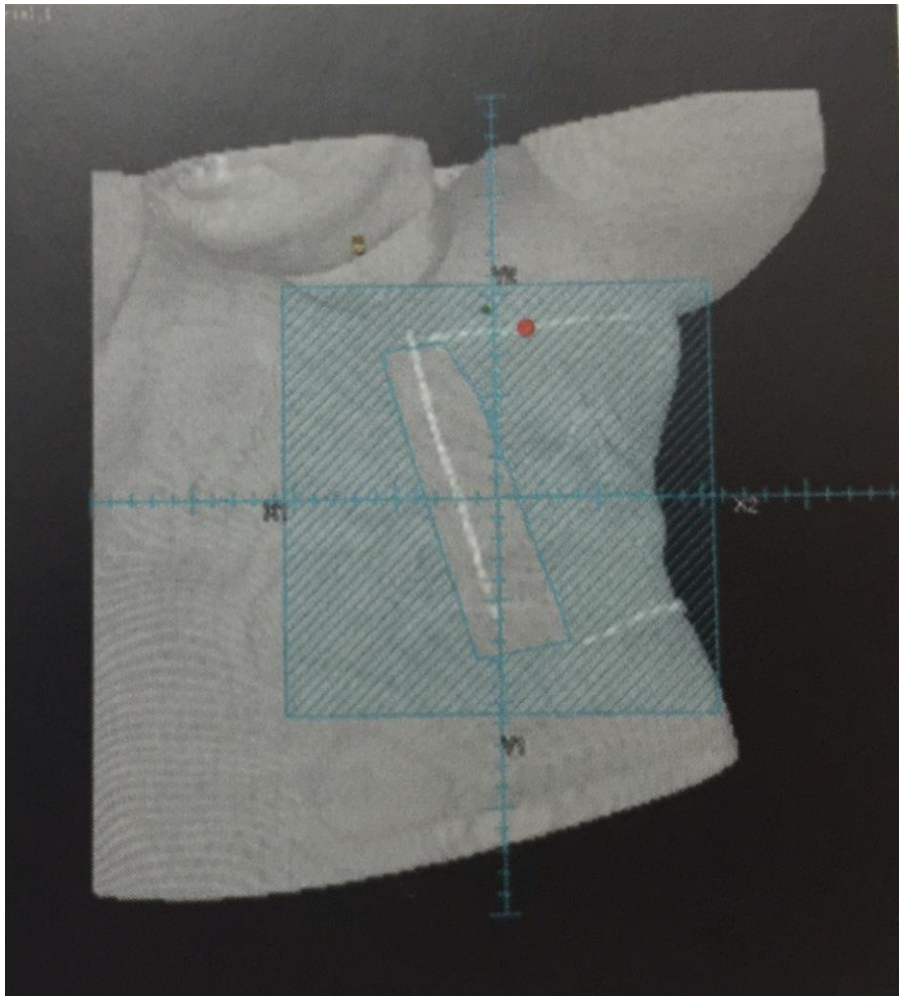

C1
acc
acc
CT_1
Registered Images
CT_1
60
BODY
CTV 60
CTV 70
CTV54
ESOPHAGUS
GTV
LT Parotid
NS_Ring
PTV 70
PTV_t
PTV54
PTV60
RT parotid
Spinel Cord
User Origin
Reference Points
PTV_t
Dose
Fields
Isocenter Group I
ant
Field 3-DRR (Liv
lat
Field 4-DRR (Liv
Color wash [%]
104.0
104.0
103.0
102.0
101.0
100.0
99.0
98.0
97.0
96.0
95.0
95.0
104.0 %
A
Standard
Head First-Supine

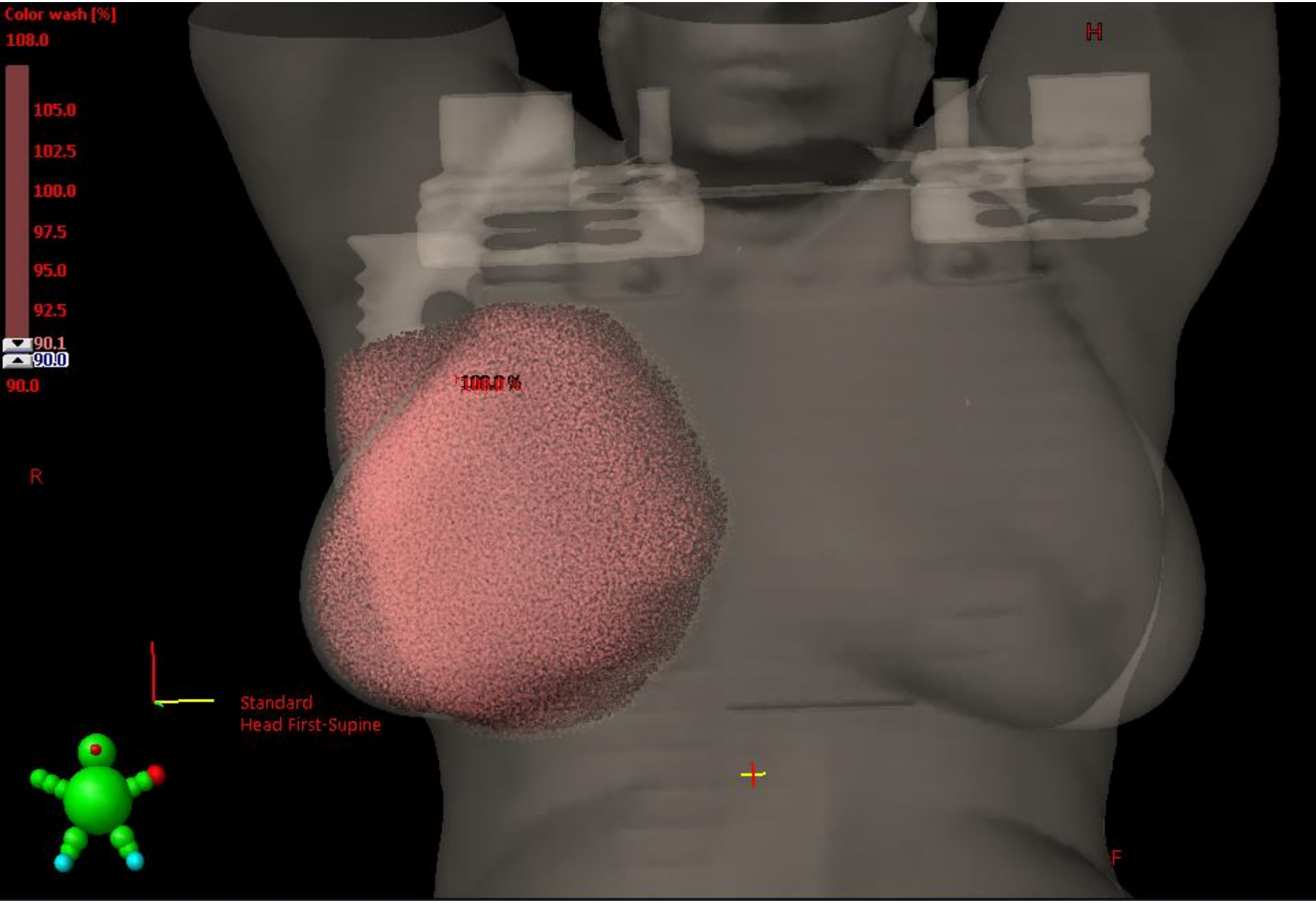

C1
acc
acc
CT_1
Registered Images
CT_1
60
BODY
CTV 60
CTV 70
CTV54
ESOPHAGUS
GTV
LT Parotid
NS_Ring
PTV 70
PTV_t
PTV54
PTV60
RT parotid
Spinel Cord
User Origin
Reference Points
PTV_t
Dose
Fields
Isocenter Group I
ant
Field 3-DRR (Liv
lat
Field 4-DRR (Liv
Color wash [Gy]
72.767
72.767
71.000
70.000
69.000
68.000
67.000
66.000
65.000
64.000
63.000
62.000
61.000
60.000
60.000
P
72.767 Gy
Standard
Head First-Supine

Visual Assessment: Skin View

Beam & skin orientation





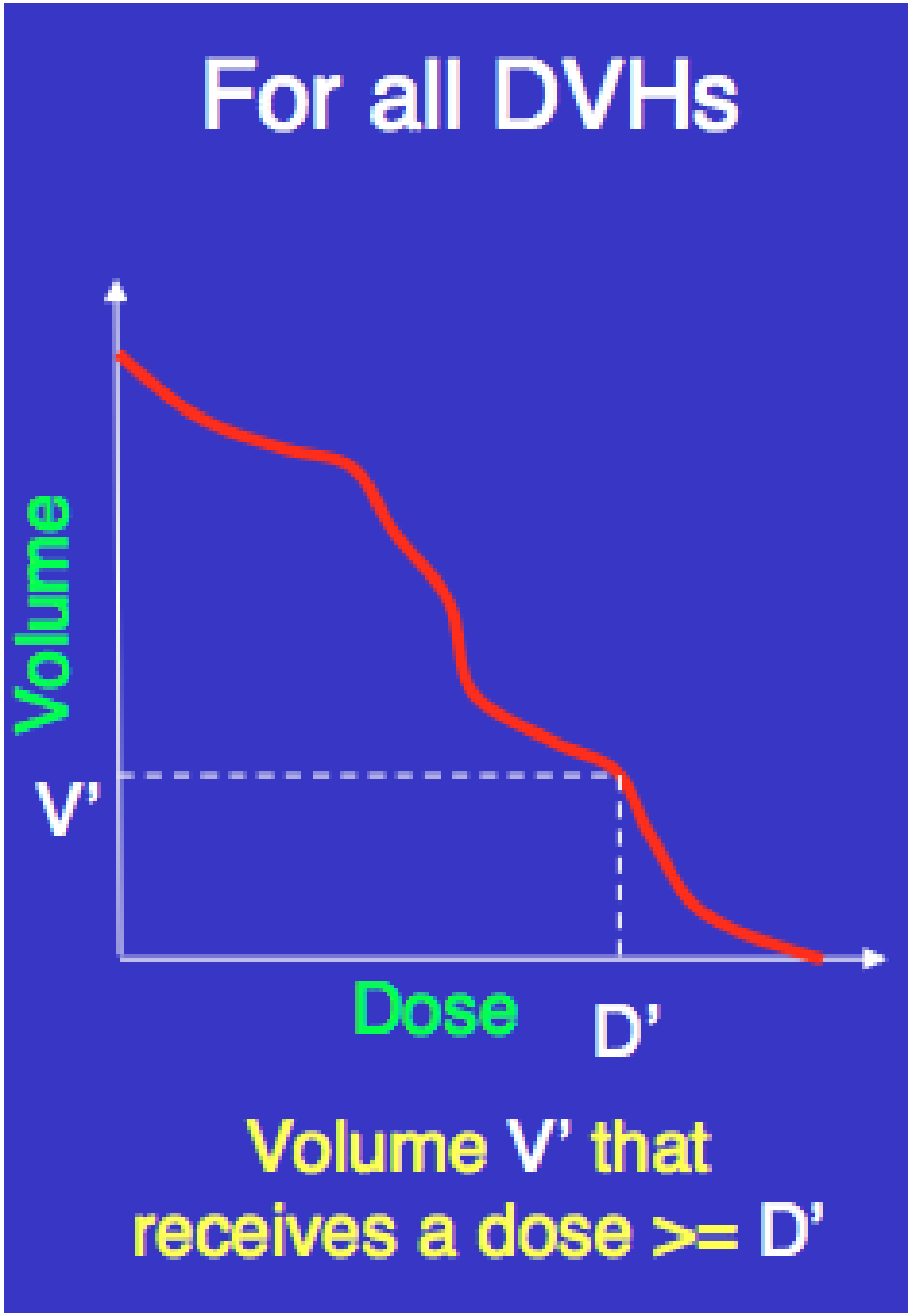

Color wash [%]
108.0
105.0
102.5
100.0
97.5
95.0
92.5
90.1
90.0
90.0
H
R
F
Standard
Head First-Supine


C1
Rt.Breast
Rt.Breast
CT_1
Registered Images
CT_1
BODY
CTV
Lung Right
PTV
PTV_c
User Origin
Reference Points
PTV
Dose
Fields
Isocenter Group I
ant
Field 3-DRR (Live)
lat
Field 4-DRR (Live)
Field 1
MLC
Field 2
MLC
Field 1.0
MLC
Color wash [%]
108.0
105.0
102.5
100.0
97.5
95.0
92.5
90.1
90.0
90.0
108.0 %
P
Standard
Head First-Supine

Dose Volume Histogram

- Powerful quantitative Tool for evaluation of plan
- Two types:
  - Differential (Direct)
  - Cumulative (integral)
- Drawback of DVH
  - Loss of spatial information
  - Insensitive to small hot or cold spot
  - Can only be calculated for VOIs

For all DVHs



Volume V' that
receives a dose >= D'

MOHAMMED TAHA METWALY, (3425) - External Beam Planning - [acc - Treatment Approved - Dose Volume Histogram]

QuickLinks | MOHAMMED TAHA METWALY (3425) | Worklist | suzan essam

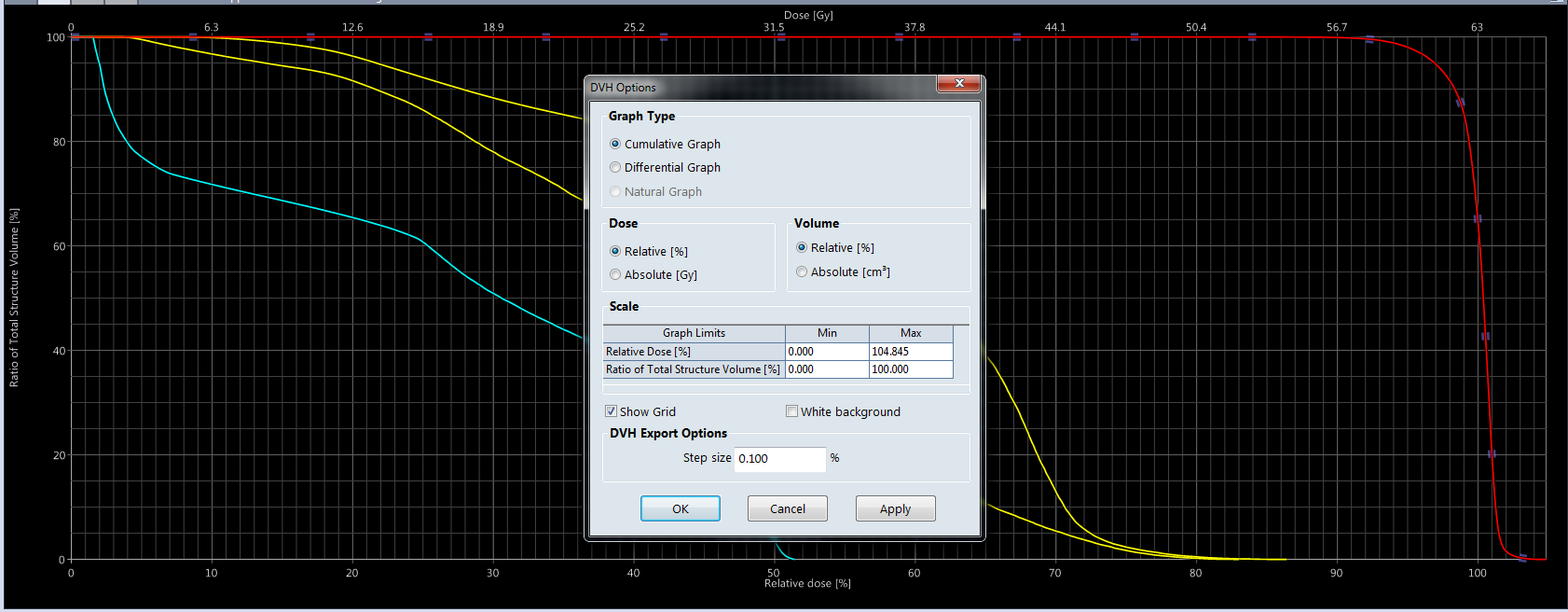
File Edit View Insert Planning Tools Window

Selection | Contouring | Image Registration | External Beam Planning | Brachytherapy Planning | Brachytherapy 2D Entry | Plan Evaluation

3425
C1
acc

acc
CT_1
Registered Images
CT_1
A_Carotid lt
A_Carotid rt
BODY
CTV
NS_Ring
PTV
Spinel Cord
User Origin
Reference Points
PTV
Dose
Fields
Isocenter Group I
ant
Field 5-DRR (Live)
lat
Field 6-DRR (Live)
Field 1
Field 1-DRR (Live)
Fluence

3D | DVH | BEV | Arc | acc - Treatment Approved - Dose Volume Histogram



DVH Options

Graph Type
- (•) Cumulative Graph
- ( ) Differential Graph
- ( ) Natural Graph

Dose
- (•) Relative [%]
- ( ) Absolute [Gy]

Volume
- (•) Relative [%]
- ( ) Absolute [cm³]

Scale

Graph Limits	Min	Max
Relative Dose [%]	0.000	104.845
Ratio of Total Structure Volume [%]	0.000	100.000

[x] Show Grid [ ] White background

DVH Export Options

Step size 0.100 %

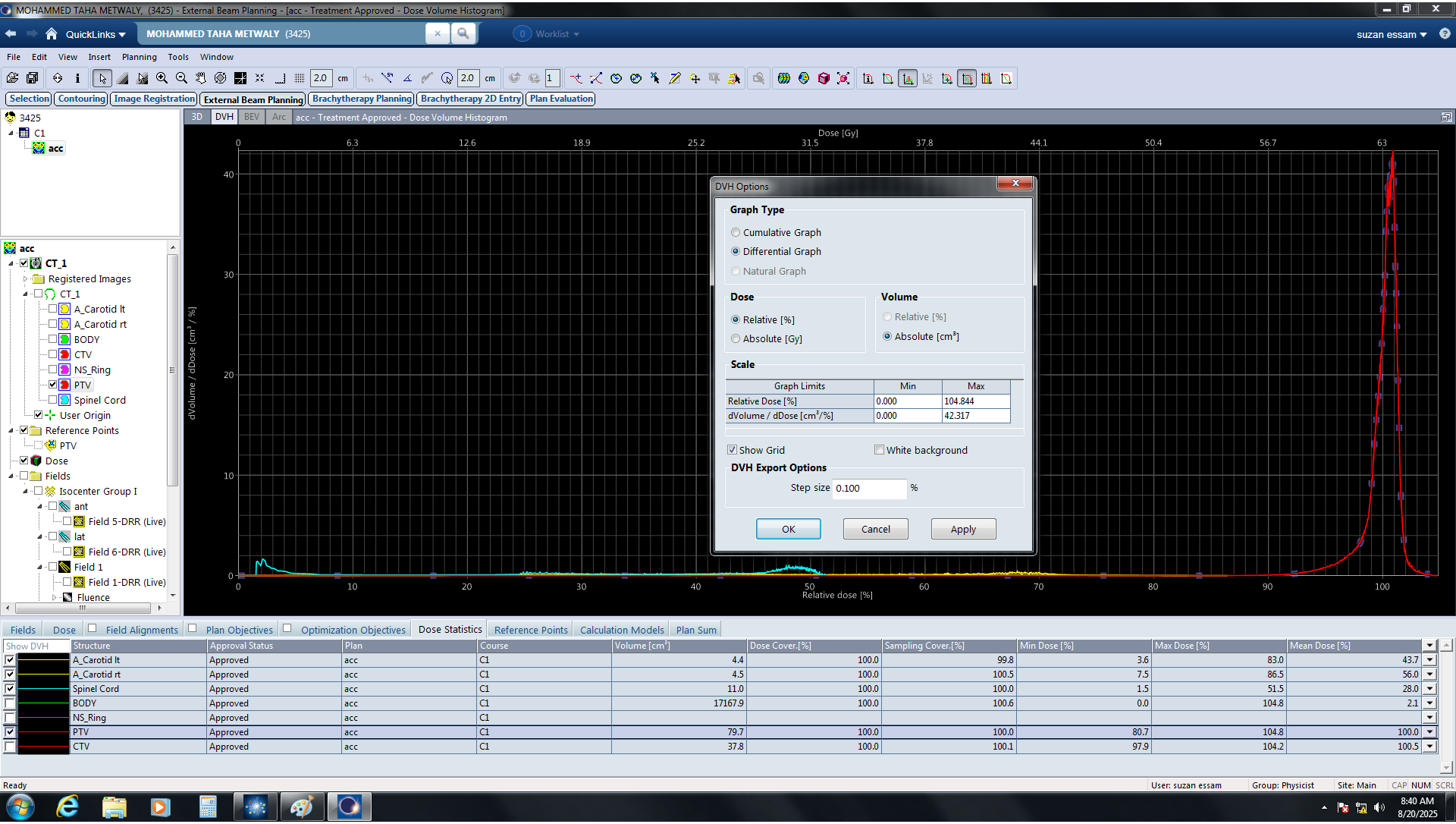
OK | Cancel | Apply

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

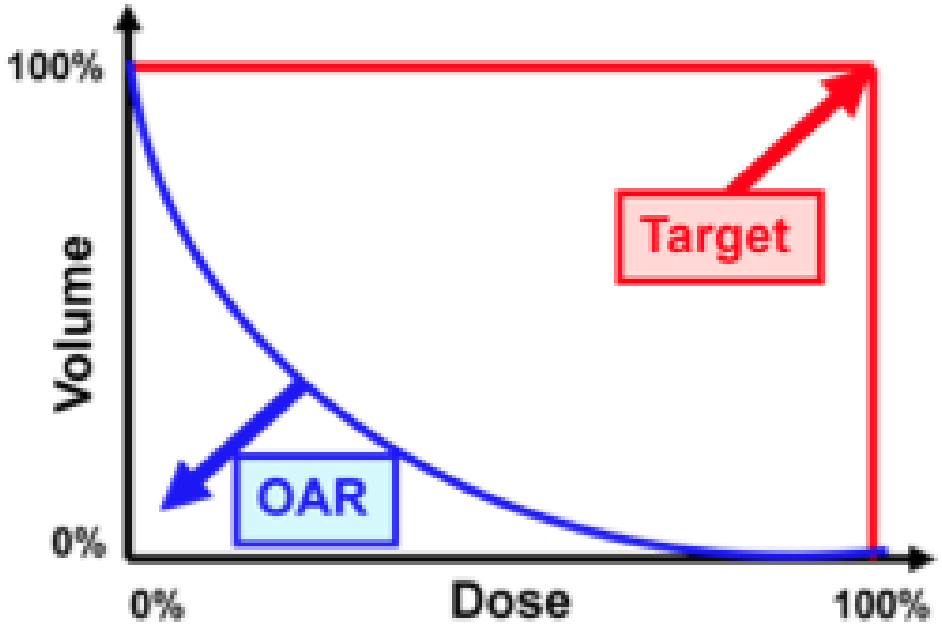
Show DVH	Structure	Approval Status	Plan	Course	Volume [cm³]	Dose Cover.[%]	Sampling Cover.[%]	Min Dose [%]	Max Dose [%]	Mean Dose [%]
☑	A_Carotid lt	Approved	acc	C1	4.4	100.0	99.8	3.6	83.0	43.7
☑	A_Carotid rt	Approved	acc	C1	4.5	100.0	100.5	7.5	86.5	56.0
☑	Spinel Cord	Approved	acc	C1	11.0	100.0	100.0	1.5	51.5	28.0
☐	BODY	Approved	acc	C1	17167.9	100.0	100.6	0.0	104.8	2.1
☐	NS_Ring	Approved	acc	C1						
☑	PTV	Approved	acc	C1	79.7	100.0	100.0	80.7	104.8	100.0
☐	CTV	Approved	acc	C1	37.8	100.0	100.1	97.9	104.2	100.5

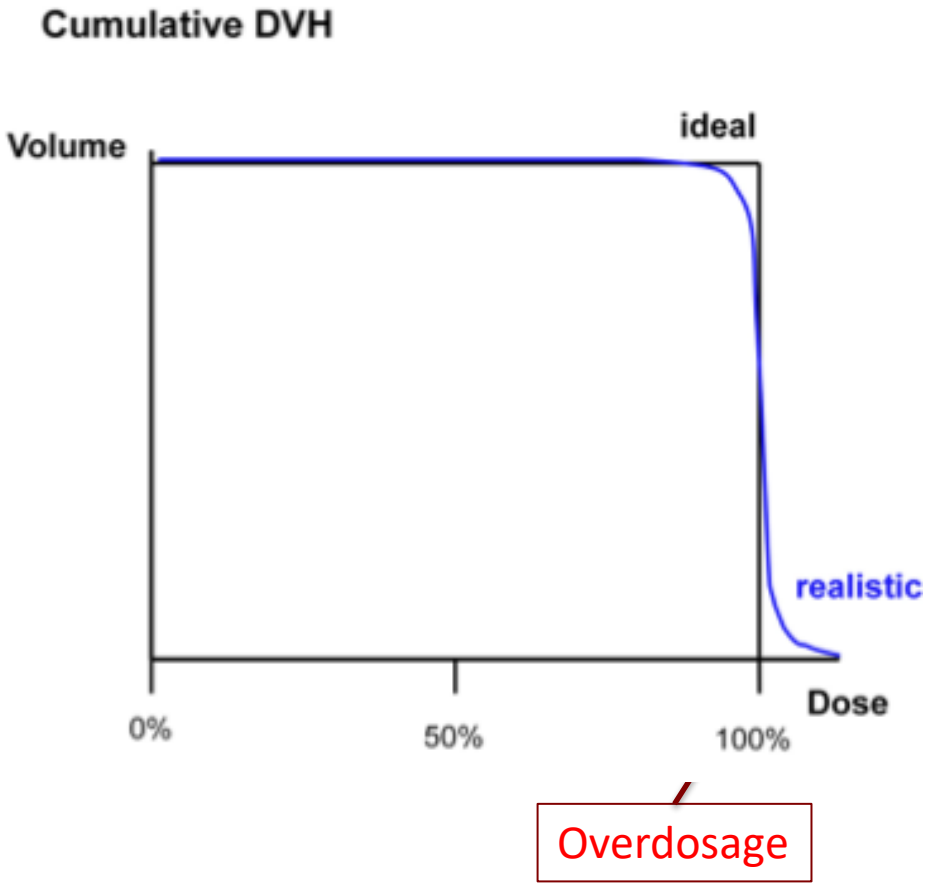
Ready | User: suzan essam | Group: Physicist | Site: Main | CAP NUM SCRL

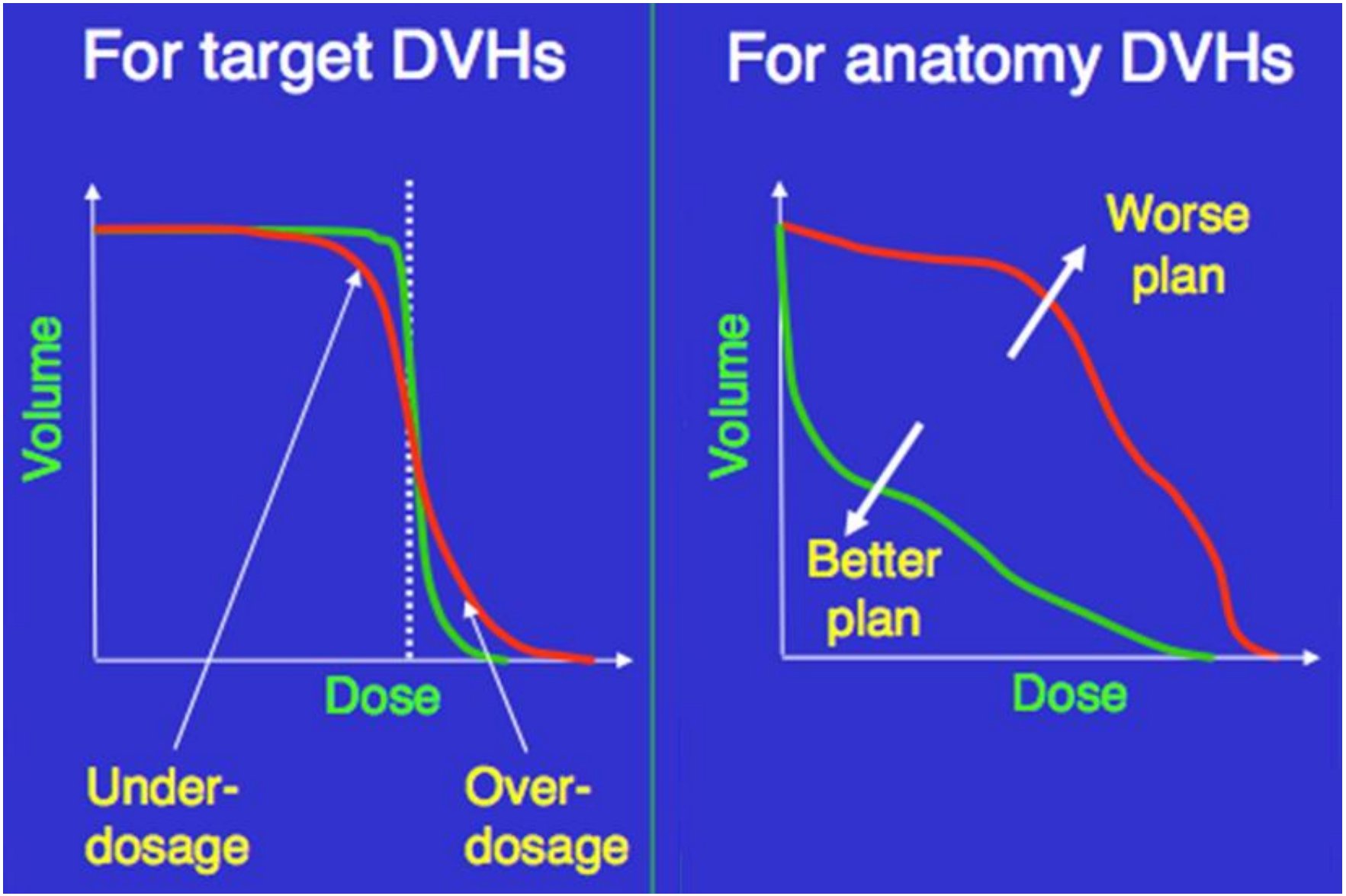
8:39 AM
8/20/2025

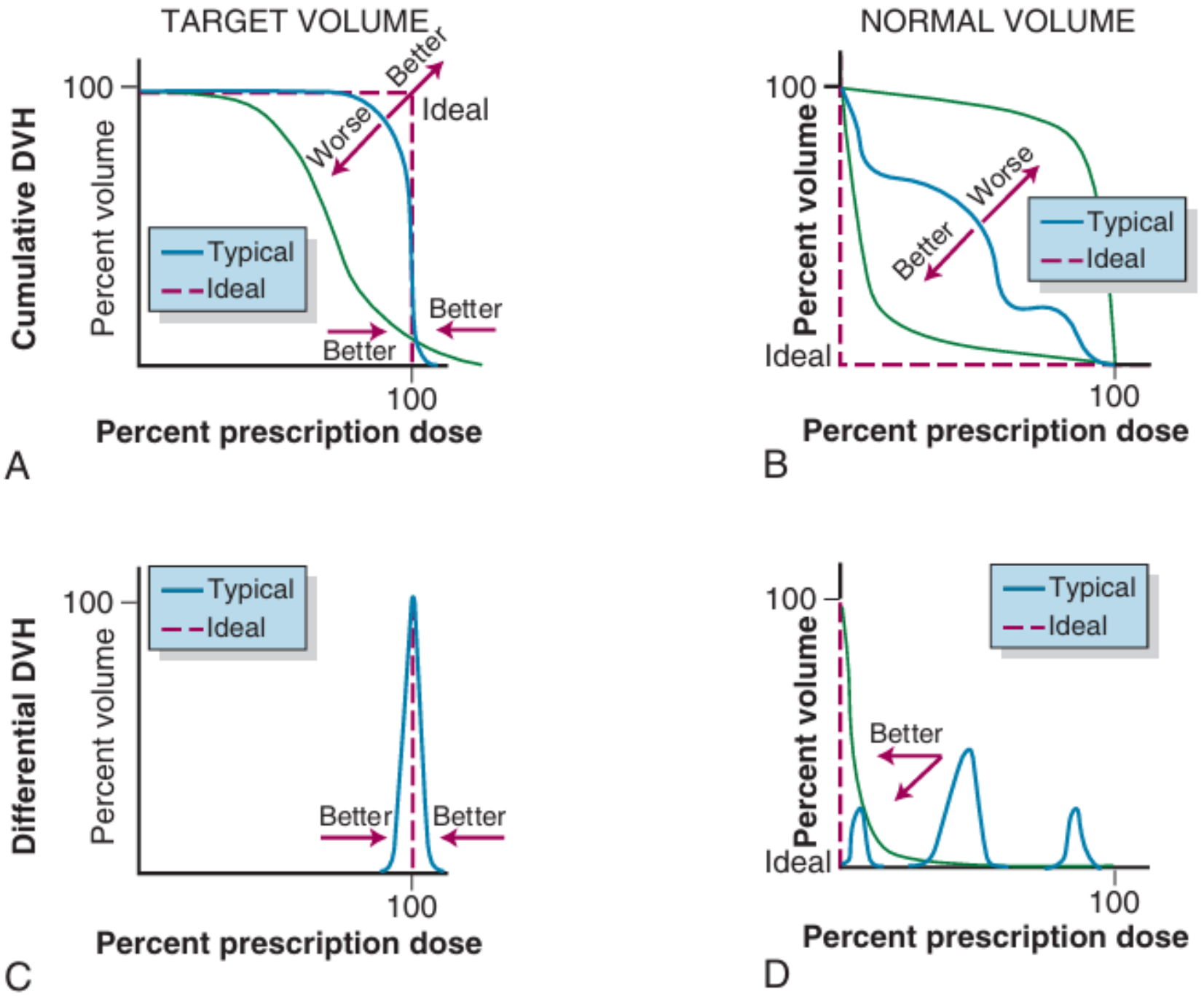

MOHAMMED TAHA METWALY, (3425) - External Beam Planning - [acc - Treatment Approved - Dose Volume Histogram]
QuickLinks
MOHAMMED TAHA METWALY (3425)
Worklist
suzan essam
File Edit View Insert Planning Tools Window
Selection Contouring Image Registration External Beam Planning Brachytherapy Planning Brachytherapy 2D Entry Plan Evaluation
3425
C1
acc
3D DVH BEV Arc
acc - Treatment Approved - Dose Volume Histogram
Dose [Gy]
dVolume / dDose [cm³ / %]
Relative dose [%]
DVH Options
Graph Type
Cumulative Graph
Differential Graph
Natural Graph
Dose
Relative [%]
Absolute [Gy]
Volume
Relative [%]
Absolute [cm³]
Scale
Graph Limits | Min | Max
Relative Dose [%] | 0.000 | 104.844
dVolume / dDose [cm³/%] | 0.000 | 42.317
Show Grid
White background
DVH Export Options
Step size 0.100 %
OK
Cancel
Apply
acc
CT_1
Registered Images
CT_1
A_Carotid lt
A_Carotid rt
BODY
CTV
NS_Ring
PTV
Spinel Cord
User Origin
Reference Points
PTV
Dose
Fields
Isocenter Group I
ant
Field 5-DRR (Live)
lat
Field 6-DRR (Live)
Field 1
Field 1-DRR (Live)
Fluence
Fields Dose Field Alignments Plan Objectives Optimization Objectives Dose Statistics Reference Points Calculation Models Plan Sum
Show DVH | Structure | Approval Status | Plan | Course | Volume [cm³] | Dose Cover.[%] | Sampling Cover.[%] | Min Dose [%] | Max Dose [%] | Mean Dose [%]
A_Carotid lt | Approved | acc | C1 | 4.4 | 100.0 | 99.8 | 3.6 | 83.0 | 43.7
A_Carotid rt | Approved | acc | C1 | 4.5 | 100.0 | 100.5 | 7.5 | 86.5 | 56.0
Spinel Cord | Approved | acc | C1 | 11.0 | 100.0 | 100.0 | 1.5 | 51.5 | 28.0
BODY | Approved | acc | C1 | 17167.9 | 100.0 | 100.6 | 0.0 | 104.8 | 2.1
NS_Ring | Approved | acc | C1
PTV | Approved | acc | C1 | 79.7 | 100.0 | 100.0 | 80.7 | 104.8 | 100.0
CTV | Approved | acc | C1 | 37.8 | 100.0 | 100.1 | 97.9 | 104.2 | 100.5
Ready
User: suzan essam
Group: Physicist
Site: Main
CAP NUM SCRL
8:40 AM
8/20/2025

Ideal & Realistic DVH






For target DVHs
Volume
Dose
Under-
dosage
Over-
dosage
For anatomy DVHs
Volume
Worse
plan
Better
plan
Dose


TARGET VOLUME
Cumulative DVH
Percent volume
100
Better
Ideal
Worse
Typical
Ideal
Better
Better
100
Percent prescription dose
A
NORMAL VOLUME
100
Percent volume
Worse
Better
Typical
Ideal
Ideal
100
Percent prescription dose
B
Differential DVH
Percent volume
100
Typical
Ideal
Better
Better
100
Percent prescription dose
C
100
Percent volume
Typical
Ideal
Better
Ideal
100
Percent prescription dose
D

MOHAMMED TAHA METWALY, (3425) - External Beam Planning - [acc - Treatment Approved - Dose Volume Histogram]

QuickLinks | MOHAMMED TAHA METWALY (3425) | Worklist | suzan essam

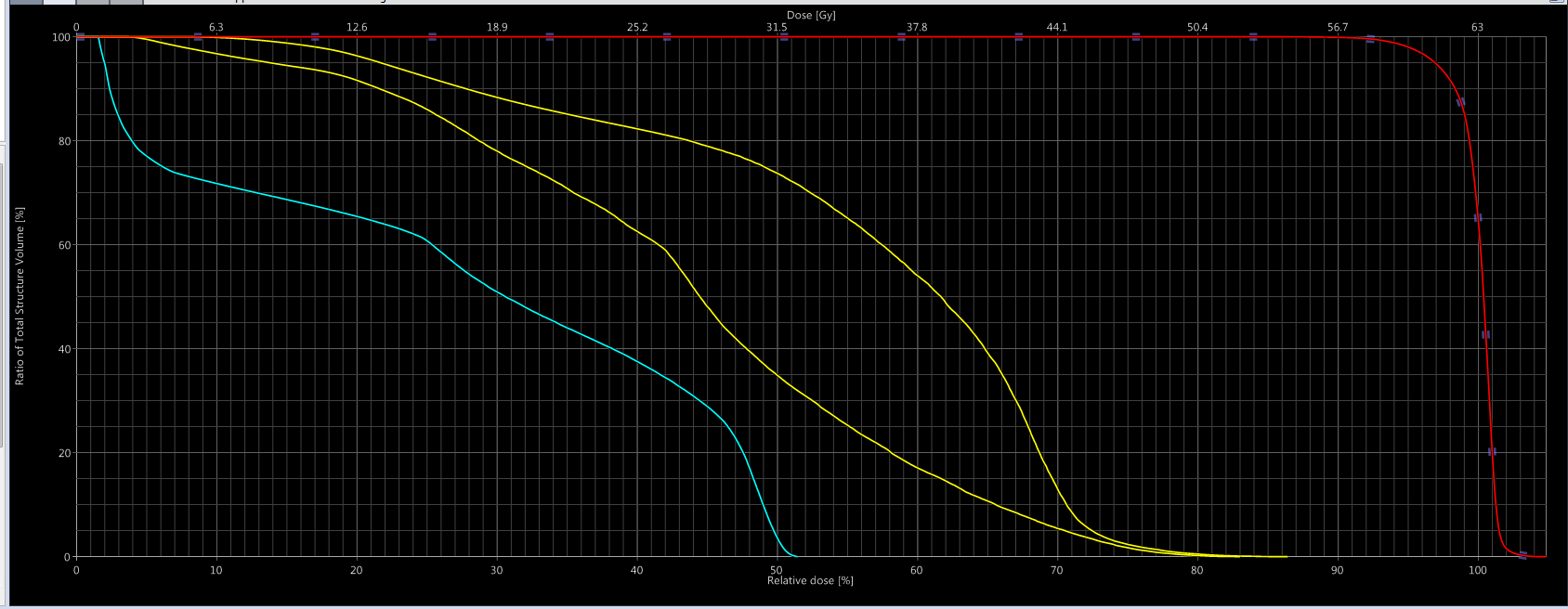
File Edit View Insert Planning Tools Window

Selection | Contouring | Image Registration | External Beam Planning | Brachytherapy Planning | Brachytherapy 2D Entry | Plan Evaluation

3425
- C1
  - acc

acc
- CT_1
  - Registered Images
  - CT_1
    - A_Carotid lt
    - A_Carotid rt
    - BODY
    - CTV
    - NS_Ring
    - PTV
    - Spinel Cord
  - User Origin
- Reference Points
  - PTV
- Dose
- Fields
  - Isocenter Group I
    - ant
      - Field 5-DRR (Live)
    - lat
      - Field 6-DRR (Live)
    - Field 1
      - Field 1-DRR (Live)
    - Fluence

3D | DVH | BEV | Arc | acc - Treatment Approved - Dose Volume Histogram



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

Show DVH	Structure	Approval Status	Plan	Course	Volume [cm³]	Dose Cover.[%]	Sampling Cover.[%]	Min Dose [%]	Max Dose [%]	Mean Dose [%]
☑	A_Carotid lt	Approved	acc	C1	4.4	100.0	99.8	3.6	83.0	43.7
☑	A_Carotid rt	Approved	acc	C1	4.5	100.0	100.5	7.5	86.5	56.0
☑	Spinel Cord	Approved	acc	C1	11.0	100.0	100.0	1.5	51.5	28.0
☐	BODY	Approved	acc	C1	17167.9	100.0	100.6	0.0	104.8	2.1
☐	NS_Ring	Approved	acc	C1						
☑	PTV	Approved	acc	C1	79.7	100.0	100.0	80.7	104.8	100.0
☐	CTV	Approved	acc	C1	37.8	100.0	100.1	97.9	104.2	100.5

Ready | User: suzan essam | Group: Physicist | Site: Main | CAP NUM SCRL

8:38 AM
8/20/2025

MOHAMMED TAHA METWALY, (3425) - External Beam Planning - [acc - Treatment Approved - Dose Volume Histogram]

QuickLinks | MOHAMMED TAHA METWALY (3425) | Worklist | suzan essam

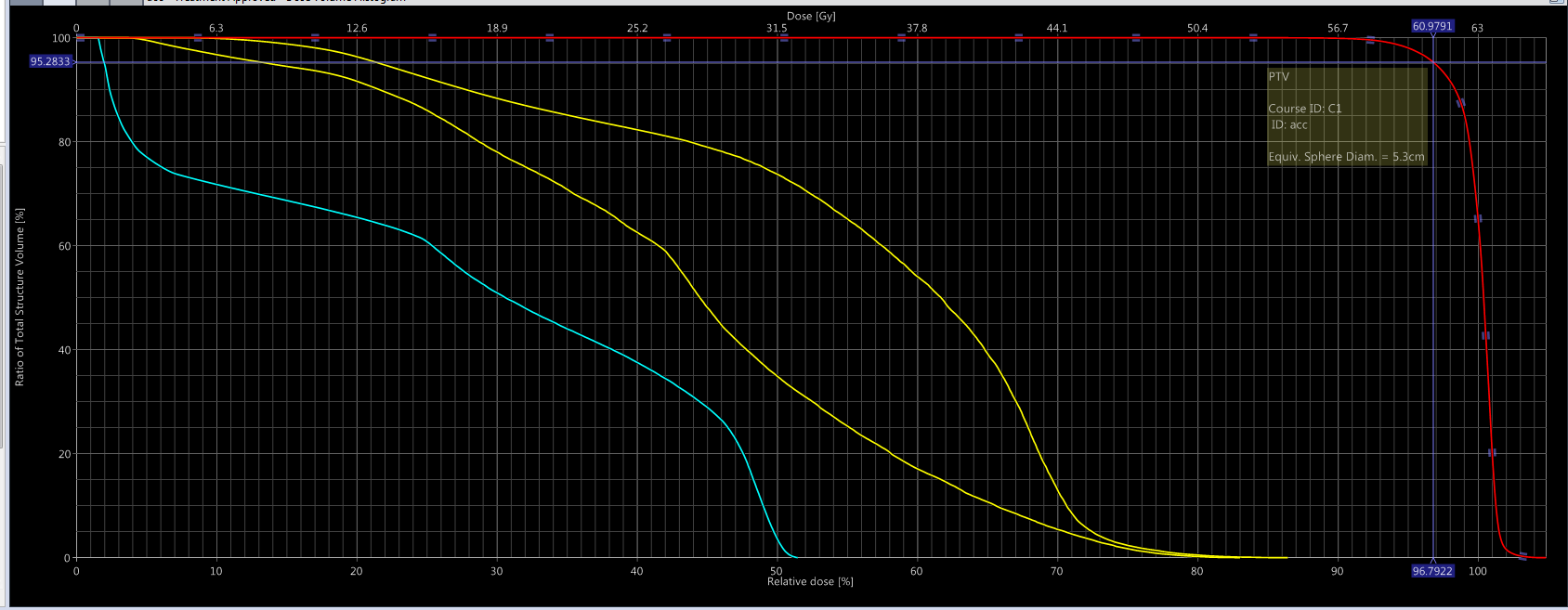
File Edit View Insert Planning Tools Window

Selection | Contouring | Image Registration | External Beam Planning | Brachytherapy Planning | Brachytherapy 2D Entry | Plan Evaluation

3425
- C1
  - acc

acc
- CT_1
  - Registered Images
  - CT_1
    - A_Carotid lt
    - A_Carotid rt
    - BODY
    - CTV
    - NS_Ring
    - PTV
    - Spinel Cord
  - User Origin
- Reference Points
  - PTV
- Dose
- Fields
  - Isocenter Group I
    - ant
      - Field 5-DRR (Live)
    - lat
      - Field 6-DRR (Live)
    - Field 1
      - Field 1-DRR (Live)
    - Fluence

3D | DVH | BEV | Arc | acc - Treatment Approved - Dose Volume Histogram

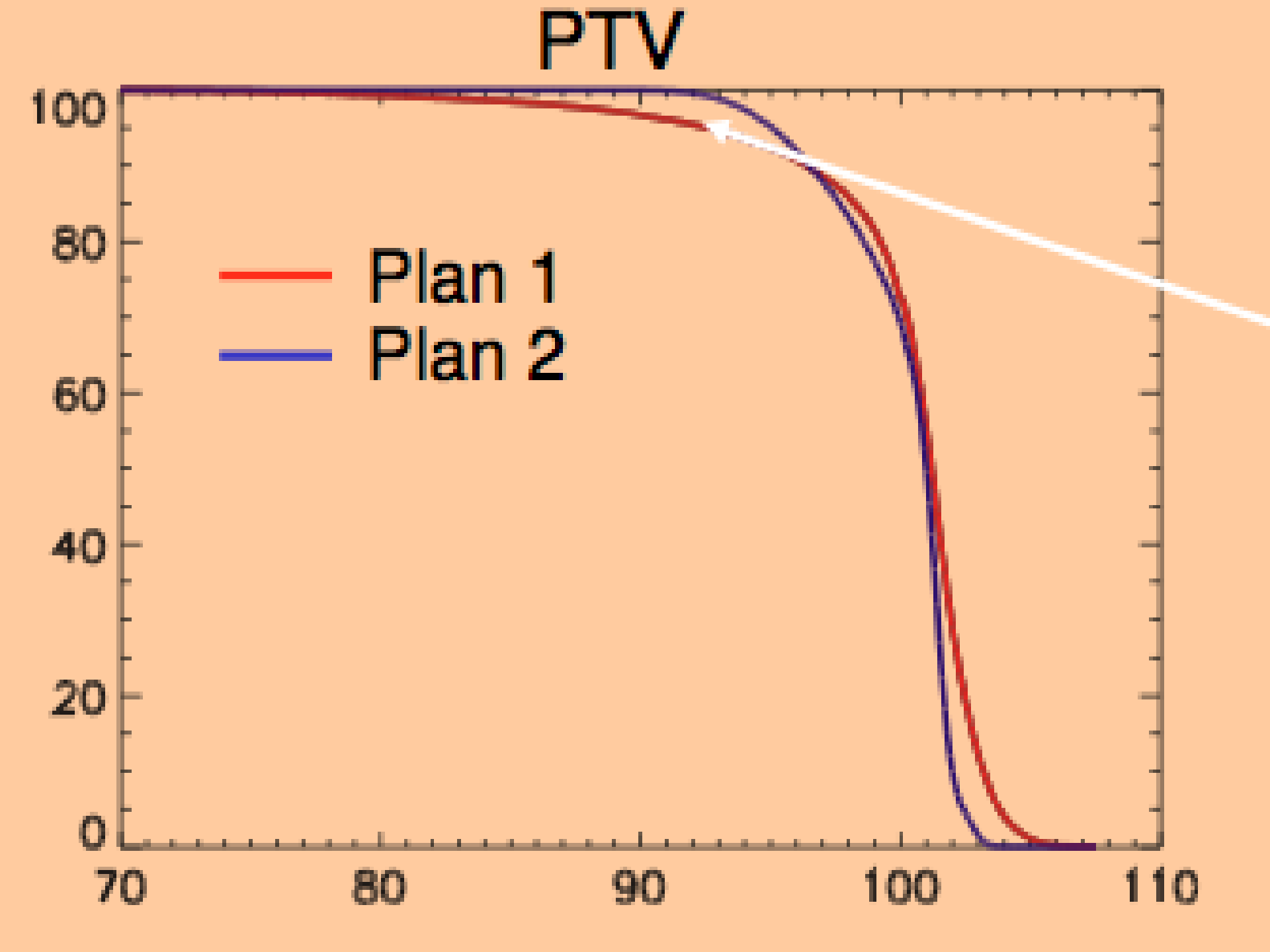


Fields | Dose | Field Alignments | Plan Objectives | Optimization Objectives | Dose Statistics | Reference Points | Calculation Models | Plan Sum

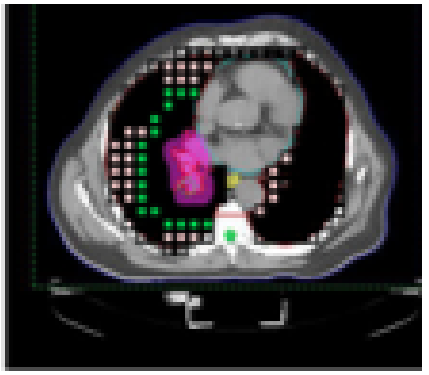
Show DVH	Structure	Approval Status	Plan	Course	Volume [cm³]	Dose Cover.[%]	Sampling Cover.[%]	Min Dose [%]	Max Dose [%]	Mean Dose [%]
☑	A_Carotid lt	Approved	acc	C1	4.4	100.0	99.8	3.6	83.0	43.7
☑	A_Carotid rt	Approved	acc	C1	4.5	100.0	100.5	7.5	86.5	56.0
☑	Spinel Cord	Approved	acc	C1	11.0	100.0	100.0	1.5	51.5	28.0
☐	BODY	Approved	acc	C1	17167.9	100.0	100.6	0.0	104.8	2.1
☐	NS_Ring	Approved	acc	C1						
☑	PTV	Approved	acc	C1	79.7	100.0	100.0	80.7	104.8	100.0
☐	CTV	Approved	acc	C1	37.8	100.0	100.1	97.9	104.2	100.5

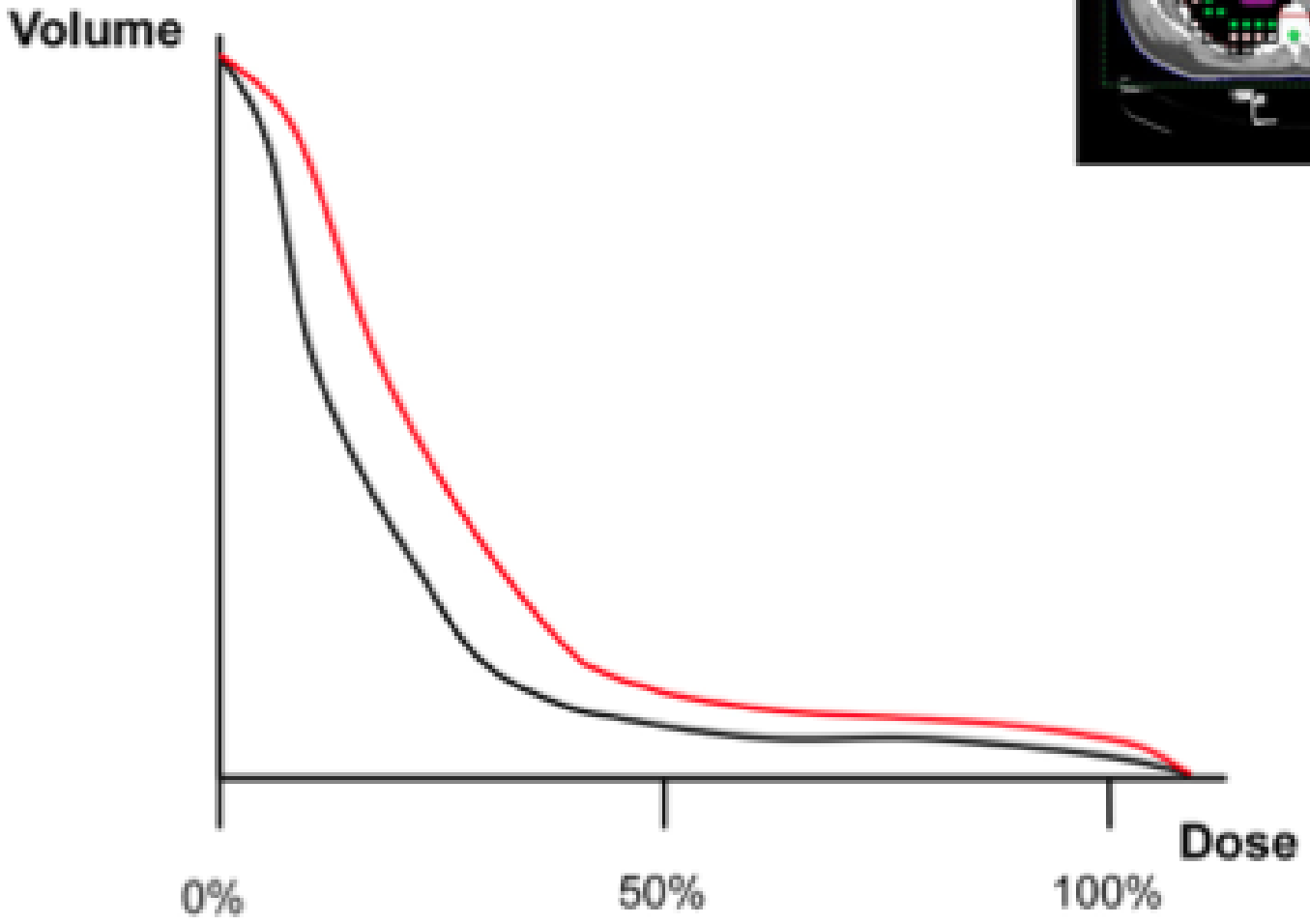
Ready | User: suzan essam | Group: Physicist | Site: Main | CAP NUM SCRL

8:37 AM
8/20/2025

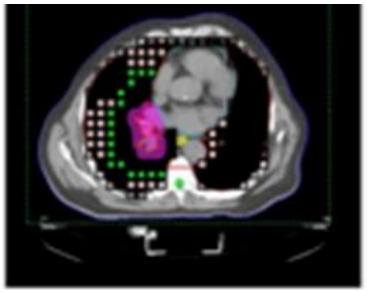

PTV
100
80
60
40
20
0
70
80
90
100
110
Plan 1
Plan 2

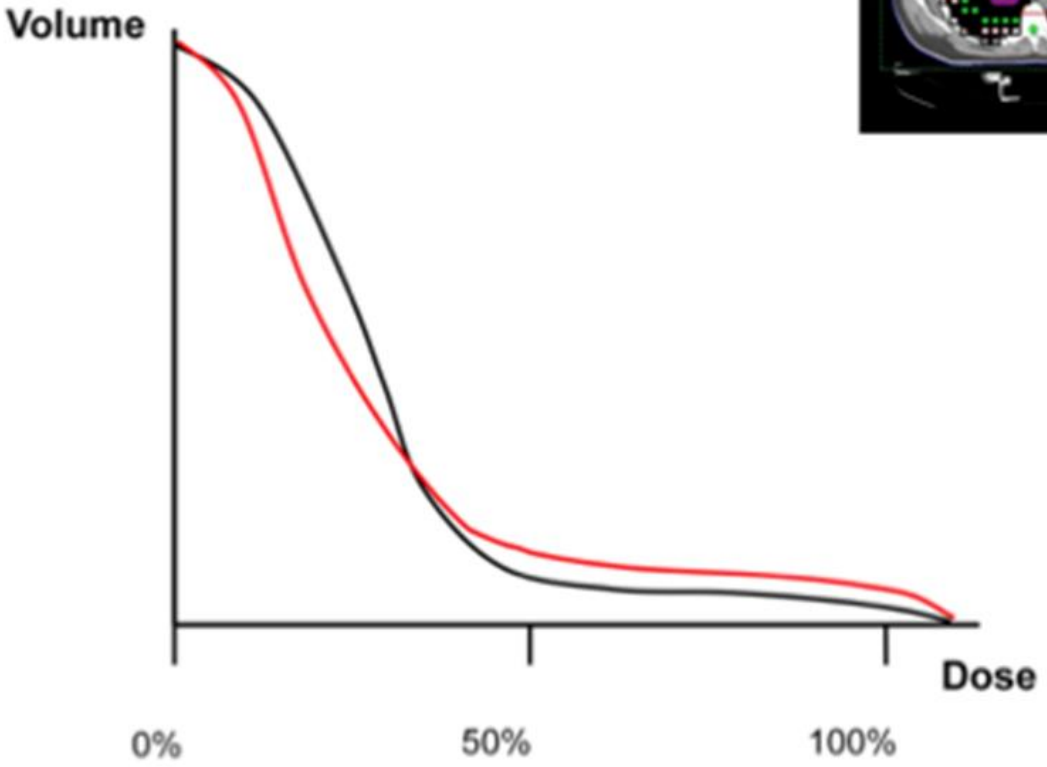
Comparison of techniques using DVHs (dose-volume histograms)





Comparison of techniques using DVHs (dose-volume histograms)





- The situation in this case, when the two DVHs are crossing each other, is less clear
- The red curve indicates a DVH having a higher dose in the high dose region compared to the black curve, but has less dose in the lower dose region

Statistics

Show DVH	Structure	Max Dose [Gy]	Mean Dose [Gy]
☐	total		
☑	rt optic nerve	9.307	5.810
☑	rt eye	18.630	4.699
☑	lt optic nerve	8.869	5.286
☑	lt eye	19.184	4.366
☑	cricopharynx	59.715	48.647
☑	brain stem	52.366	26.841
☑	TemporalLobe_R	63.275	22.391
☑	TemporalLobe_L	64.045	19.561
☑	Spinel Cord	43.444	32.619
☑	RT parotid	62.171	23.236
☑	RT LENS	4.662	3.433
☑	PharynxConst_M	60.341	52.652
☑	PharynxConst_I	60.467	50.390
☑	PTV_60	74.458	63.806
☑	PTV 70	74.458	70.150
☑	PTV 54	62.990	56.249
☐	NS_Ring		
☑	Mandible	72.296	41.746
☑	Lens Lt	4.784	3.623
☑	LT Parotid	72.067	23.769
☐	GTVp		
☐	GTV In		
☑	Esophagus inlet	56.174	51.635
☑	ESOPHAGUS	57.169	42.741
☑	Cochlea Rt	51.163	39.341
☑	Cochlea Lt	52.442	40.391
☑	Chiasm	25.485	14.045

QUANTEC

Organ	Volume segment	Irradiation type (partial organ unless otherwise stated)	End point	Dose (Gy), or dose/ volume parameters	Rate (%)	Notes on dose/ volume parameters
Brain	Whole organ	3D-CRT	Symptomatic necrosis	D_{max} <60	<3	Data at 72 and 90 Gy, extrapolated from BED models
	Whole organ	3D-CRT	Symptomatic necrosis	D_{max} = 72	5	
	Whole organ	3D-CRT	Symptomatic necrosis	D_{max} = 90	10	
	Whole organ	SRS (single fraction)	Symptomatic necrosis	V_{12} <5–10 cc	<20	Rapid rise when V_{12} > 5–10 cc
Brain stem	Whole organ	Whole organ	Permanent cranial neuropathy or necrosis	D_{max} <54	<5	
	Whole organ	3D-CRT	Permanent cranial neuropathy or necrosis	D1–10 ≤59	<5	
	Whole organ	SRS (single fraction)	Permanent cranial neuropathy or necrosis	D_{max} <12.5	<5	For patients with acoustic tumors
Optic nerve/ chiasm	Whole organ	3D-CRT	Optic neuropathy	D_{max} <55	<3	Given the small size, 3D-CRT is often whole organ
	Whole organ	3D-CRT	Optic neuropathy	D_{max} 55–60	3–7	
	Whole organ	3D-CRT	Optic neuropathy	D_{max} >60	>7–20	
	Whole organ	SRS (single fraction)	Optic neuropathy	D_{max} <12	<10	
Spinal cord	Partial organ Thoracic	3D-CRT	Myelopathy	D_{max} = 50	00.02	Including full cord cross-section
	Partial organ	3D-CRT	Myelopathy	D_{max} = 60	6	
	Cervical					
	Partial organ	SRS (single fraction)	Myelopathy	D_{max} = 13	1	Partial cord cross-section irradiated
	Partial organ	SRS (hypofractionation)	Myelopathy	D_{max} = 20	1	3 fractions, partial cord cross-section irradiated
Cochlea (auditory)	Whole organ	3D-CRT	Sensory neural hearing loss	Mean dose ≤45	<30	Mean dose to cochlea, hearing at 4 kHz
	Whole organ	SRS (single fraction)	Sensory neural hearing loss	Prescription dose ≤14	<25	Serviceable hearing

QUANTEC

Organ	Volume segment	Irradiation type (partial organ unless otherwise stated)	End point	Dose (Gy), or dose/ volume parameters	Rate (%)	Notes on dose/ volume parameters
Parotid	Bilateral whole Parotid glands	3D-CRT	Long-term parotid salivary function reduced to <25% of pre-RT level	Mean dose <25	<20	For combined parotid glands
	Unilateral whole parotid gland	3D-CRT	Long-term parotid salivary function reduced to <25% of pre-RT level	Mean dose <25	<20	For single parotid gland. At least one parotid gland spared to <20 Gy
	Bilateral whole parotid glands	3D-CRT	Long-term parotid salivary function reduced to <25% of pre-RT level	Mean dose <39	<50	For combined parotid glands
Pharynx	Pharynx constrictor muscles	Whole organ	Symptomatic dysphagia and aspiration	Mean dose <50	<20	Based on Section B4 in paper
Larynx	Whole organ	3D-CRT	Vocal dysfunction	Dmax <66	<20	With chemotherapy, based on single study
	Whole organ	3D-CRT	Aspiration	Mean dose <50	<30	With chemotherapy, based on single study
	Whole organ	3D-CRT	Edema	Mean dose <44	<20	Without chemotherapy, based on single study in patients without larynx cancer
	Whole organ	3D-CRT	Edema	V_{50} <27%	<20	
Lung	Whole organ	3D-CRT	Symptomatic pneumonitis	$V_{20} \leq 30\%$	<20	For combined lung. Gradual dose response
	Whole organ	3D-CRT	Symptomatic pneumonitis	Mean dose = 7	5	Excludes purposeful whole-lung irradiation
	Whole organ	3D-CRT	Symptomatic pneumonitis	Mean dose = 13	10	
	Whole organ	3D-CRT	Symptomatic pneumonitis	Mean dose = 20	20	
	Whole organ	3D-CRT	Symptomatic pneumonitis	Mean dose = 24	30	
	Whole organ	3D-CRT	Symptomatic pneumonitis	Mean dose = 27	40	

QUANTEC

Organ	Volume segment	Irradiation type (partial organ unless otherwise stated)	End point	Dose (Gy), or dose/ volume parameters	Rate (%)	Notes on dose/ volume parameters
Esophagus	Whole organ	3D-CRT	Grade ≥3 acute esophagitis	Mean dose <34	5–20	Based on RTOG and several studies
	Whole organ	3D-CRT	Grade ≥2 acute esophagitis	V_{35} <50%	<30	A variety of alternate threshold doses have been implicated. Appears to be a dose/ volume response
	Whole organ	3D-CRT	Grade ≥2 acute esophagitis	V_{50} <40%	<30	
	Whole organ	3D-CRT	Grade ≥2 acute esophagitis	V_{70} <20%	<30	
Heart	Pericardium	3D-CRT	Pericarditis	Mean dose <26	<15	Based on single study
	Pericardium	3D-CRT	Pericarditis	V_{30} <46%	<15	
	Whole organ	3D-CRT	Long-term cardiac mortality	V_{25} <10%	<1	Overly safe risk estimate based on model predictions
Liver	Whole liver – GTV	3D-CRT or Whole organ	Classic RILD	Mean dose <30–32	<5	Excluding patients with pre-existing liver disease or hepatocellular carcinoma
	Whole liver – GTV	3D-CRT	Classic RILD	Mean dose <42	<50	
	Whole liver – GTV	3D-CRT or Whole organ	Classic RILD	Mean dose <28	<5	In patients with Child-Pugh A pre-existing liver disease or hepatocellular carcinoma, excluding hepatitis B reactivation as an endpoint
	Whole liver – GTV	3D-CRT	Classic RILD	Mean dose <36	<50	
	Whole liver –GTV	SBRT (hypofractionation)	Classic RILD	Mean dose <13–18	<5; <5	3 fractions, for primary liver cancer, 6 fractions, for primary liver cancer
	Whole liver – GTV	SBRT (hypofractionation)	Classic RILD	Mean dose <15–20	<5; <5	3 fractions, for liver metastases, 6 fractions, for liver metastases
	>700 cc of normal liver	SBRT (hypofractionation)	Classic RILD	D_{max} <15	<5	Based on critical volume, in 3–5 fractions

QUANTEC

Organ	Volume segment	Irradiation type (partial organ unless otherwise stated)	Endpoint	Dose (Gy), or dose/ volume parameters	Rate (%)	Notes on dose/ volume parameters
Kidney	Bilateral whole kidney	Bilateral whole organ or 3D-CRT	Clinically relevant renal dysfunction	Mean dose <15–18	<5	
	Bilateral whole kidney	Bilateral whole organ	Clinically relevant renal dysfunction	Mean dose <28	<50	
	Bilateral whole kidney	3D-CRT	Clinically relevant renal dysfunction	V_{12} <55%	<5	For combined kidney
				V_{20} <32%		
				V_{23} <30%		
				V_{28} <20%		
Stomach	Whole organ	Whole organ	Ulceration	D_{100} <45	<7	
Small bowel	Individual small-bowel loops	3D-CRT	Grade ≥ 3 acute toxicity§	V_{15} <120 cc	<10	Volume based on segmentation of the individual bowel loops, not the entire potential peritoneal space
	Entire potential space within peritoneal cavity	3D-CRT	Grade ≥ 3 acute toxicity[4]	V_{45} <195 cc	<10	Volume based on the entire potential space within the peritoneal cavity
Rectum	Whole organ	3D-CRT	Grade ≥ 2 late rectal toxicity, grade ≥ 3 late rectal toxicity	V_{50} <50%	<15; <10	Prostate cancer treatment
	Whole organ	3D-CRT	Grade ≥ 2 late rectal toxicity, grade ≥ 3 late rectal toxicity	V_{60} <35%	<15; <10	
	Whole organ	3D-CRT	Grade ≥ 2 late rectal toxicity, grade ≥ 3 late rectal toxicity	V_{65} <25%	<15; <10	
	Whole organ	3D-CRT	Grade ≥ 2 late rectal toxicity, grade ≥ 3 late rectal toxicity	V_{70} <20%	<15; <10	
	Whole organ	3D-CRT	Grade ≥ 2 late rectal toxicity, grade ≥ 3 late rectal toxicity	V_{75} <15%	<15; <10	

QUANTEC

Organ	Volume segment	Irradiation type (partial organ unless otherwise stated)	Endpoint	Dose (Gy), or dose/volume parameters	Rate (%)	Notes on dose/ volume parameters
Bladder	Whole organ	3D-CRT	Grade ≥ 3 late RTOG	D_{max} <65	<6	Bladder cancer treatment. Variations in bladder size/shape/location during RT hamper ability to generate accurate data
	Whole organ	3D-CRT	Grade ≥3 late RTOG	V_{65} ≤50%		Prostate cancer treatment. Based on RTOG 0415 recommendation
				V_{70} ≤35%		
				V_{75} ≤25%		
				V_{80} ≤15%		
Penile bulb	Whole organ	3D-CRT	Severe erectile dysfunction	Mean dose to 95% of gland <50	<35	
	Whole organ	3D-CRT	Severe erectile dysfunction	D_{90} <50	<35	
	Whole organ	3D-CRT	Severe erectile dysfunction	D_{60-70} <70	<55	FLT4
Upper femora	Whole bone	Any	Fracture	45–50	5	

Organ	Constraint	Optimal	Mandatory
Nervous system			
Brain	D_{max}	<60 Gy	
Brainstem	D_{max} whole organ		54 Gy (60 Gy if PRV used)
	D(1–10 cc)		<59 Gy
Peripheral nerves	D_{max}	<60 Gy	
Spinal cord	D_{max} to PRV (cord +5 mm or spinal canal)		<50 Gy (48 Gy if concomitant chemotherapy)
Head and neck			
Cochlea	Mean dose	<45 Gy	
Lacrimal gland	D_{max}		<40 Gy
Larynx	Mean dose	<45 Gy, <35 Gy where feasible	
Lens	D_{max}	<10 Gy	
Optic nerve and chiasm	D_{max}		<55 Gy <60 Gy if PTV very close to one optic nerve
Parotid gland	Mean dose	<24 Gy	
Pharyngeal constrictors	Mean dose	<50 Gy	
Retina	D_{max}	<50 Gy	
Submandibular gland	Mean dose	<39 Gy	
Thorax			
Heart	Mean dose	<25 Gy	<30 Gy
	V30 Gy	<45%	
	V40 Gy	<30%	

Lung (whole lung volume minus GTV)	V20 Gy	<35% (<25% if risk factors – see text)	
	Mean lung dose	<18 Gy	
Oesophagus (e.g. in lung cancer treatment)	Length within treated volume	<8 cm	<12 cm
Abdomen and pelvis			
Bladder	V50 Gy	<50%	
	V60 Gy	<25%	<50%
Femoral heads	V50 Gy	<5%	<50%
Kidney (each)	V20 Gy	<25%	<30%
Kidney (both)	V20 Gy	<30%	<35%
Liver	V30 Gy		<30%
	Mean	<28 Gy	<30 Gy
Ovary	D_{max}	<1.5 Gy	<15 Gy
Penile bulb	V50 Gy	<50%	
	V60 Gy	<10%	
Rectum	V30 Gy	<70%	<80%
	V40 Gy	<51%	<65%
	V50 Gy	<38%	<50%
	V60 Gy	<27%	<35%
	V70 Gy	<15%	<20%
Small bowel	D_{max} (0.1 cc)	<58 Gy	<60 Gy
	V50 Gy	<10 cc	
	V15 Gy	<120 cc	
Spleen	Mean dose	<10 Gy	
Testis	D_{max}	<2 Gy	<6 Gy

Organ	Max critical volume	One fraction (Gy)	Three fractions (Gy)	Five fractions (Gy)	End point grade 3
Brain	100 %			20	Necrosis
Brain stem	<0.5 cc	10	18 (6 Gy/fx	23 (4.6 Gy/fx	Neuropathy
Spinal cord	< 1.2 cc	7	12.3(4.1 Gy/fx)	14.5 (2.9 Gy/fx	Myelopathy
Optic nerve	0.2 cc	08-ott	15	20	Neuropathy
Cochlea		10	17	23	Hearing loss
Larynx	4 cc	10		20	
Brachial plexus	3 cc	14	22.05	30	Neuropathy
Bronchus	< 4 cc	10	15 (5 Gy/fx)	16.5 (3.3 Gy)	
Lung	1,000 cc	07.04	10.5 (4 Gy/fx)	13.5 (2.7 Gy/fx)	Pneumonitis
Heart	< 15 cc	16	24 (8 Gy/fx)	32 (6 Gy/fx)	Pericarditis
Esophagus	< 5 cc	11.09	17	20	Stenosis
Rib	< 1 cc	22	28	35	Fracture
Stomach	< 10 cc	11	16.5 (5 Gy/fx)	18 (3.6 Gy/fx)	Ulceration
Duodenum	< 10 cc	9	11.04	12.05	Stenosis
Small bowel	< 5 cc	11.09	17.7 (5.9Gy/fx)	19.05	Stenosis
Colon/rectum	< 20 cc	14.03	16.8 (5.6 Gy/fx)	18.3 (3.6 Gy/fx)	Colitis Proctitis
Liver	< 700 cc	9	19 (6.4 Gy/fx)	21 (4.2 Gy/fx)	Liver function
Kidney	< 200 cc	08.04	16 (4 Gy/fx)	17.5 (3.5 Gy)	Renal function
Bladder	< 15 cc	11.04	16.8 (5.6 Gy)	18 (3.6 Gy/fx)	Cystitis
Penile bulb	< 3 cc	14	21.9 (7.3 Gy)	30 (6 Gy/fx)	Erectile dysfunction
Skin	< 10 cc	23	30 (10 Gy/fx)	36.5(7.3 Gy)	Ulceration
Femoral head	< 10 cc	14	21.9 (7.3 Gy)	30(6 Gy/fx)	Necrosis

Priority

- Critical OAR
  - CNS
  - brain stem
  - visual Pathway (optic tract, chiasm, Nerve)
  - retina
- PTV
- Non-critical OAR
  - Lens
  - Parotid
  - Oral Cavity
  - etc

Sinonasal case

Priorities and penalties

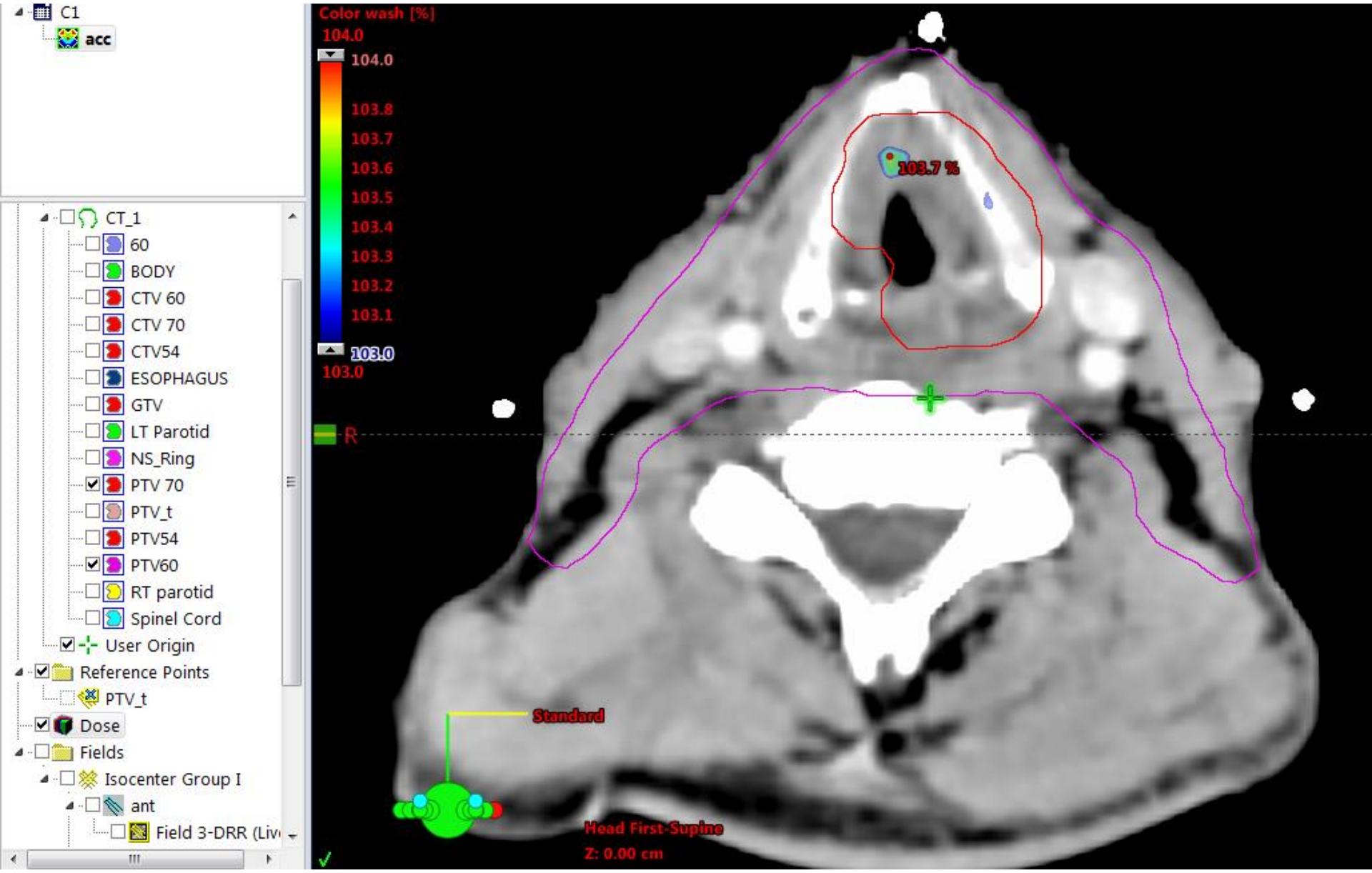
1. Highest priority:
- Spinal cord
- Brain stem
- Optic chiasm
- Optic nerve
- Posterior eye on the ”best” side

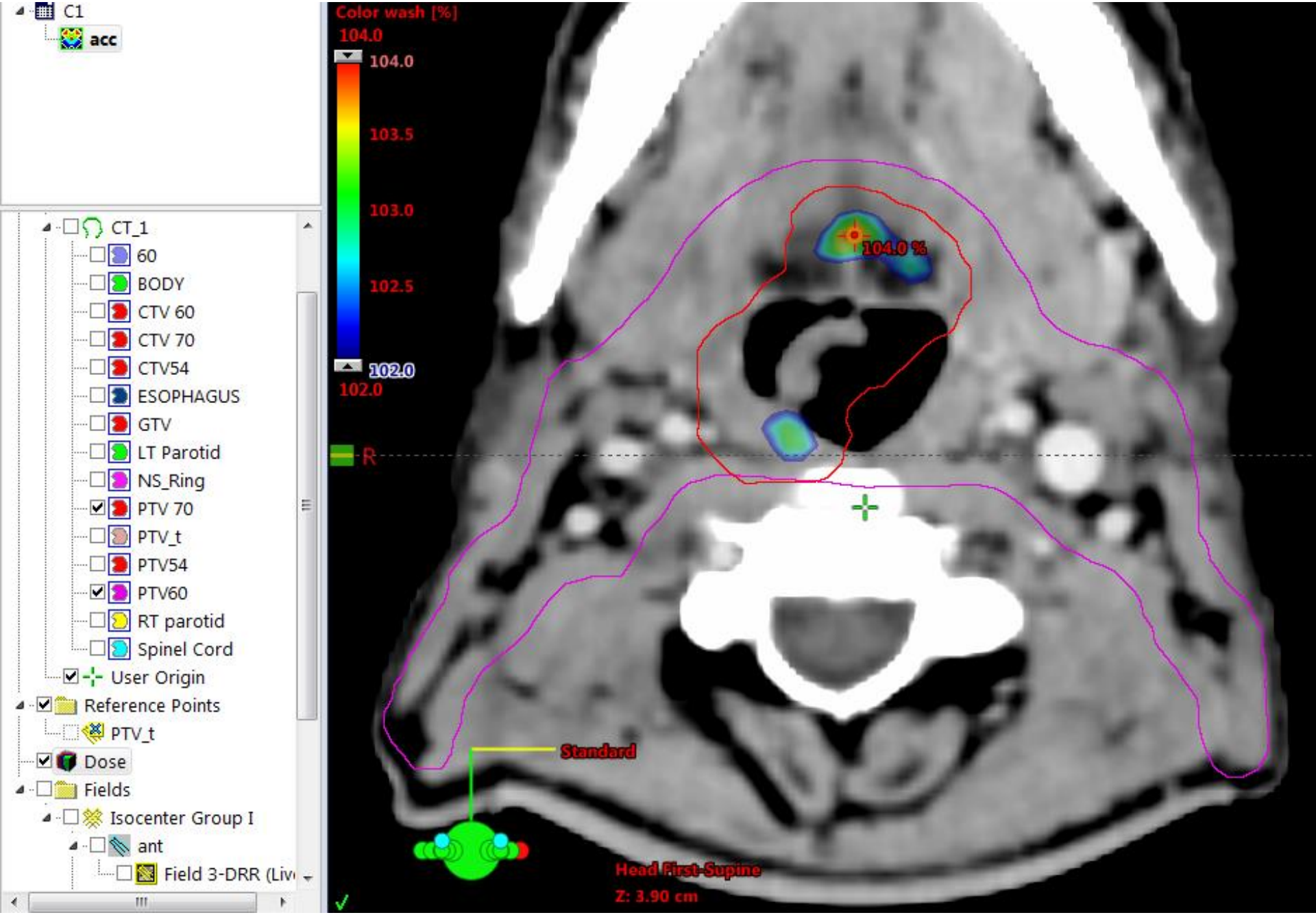
2. Second priority: Coverage of PTV-T, PTV-E-highrisk and PTV-E-lowrisk

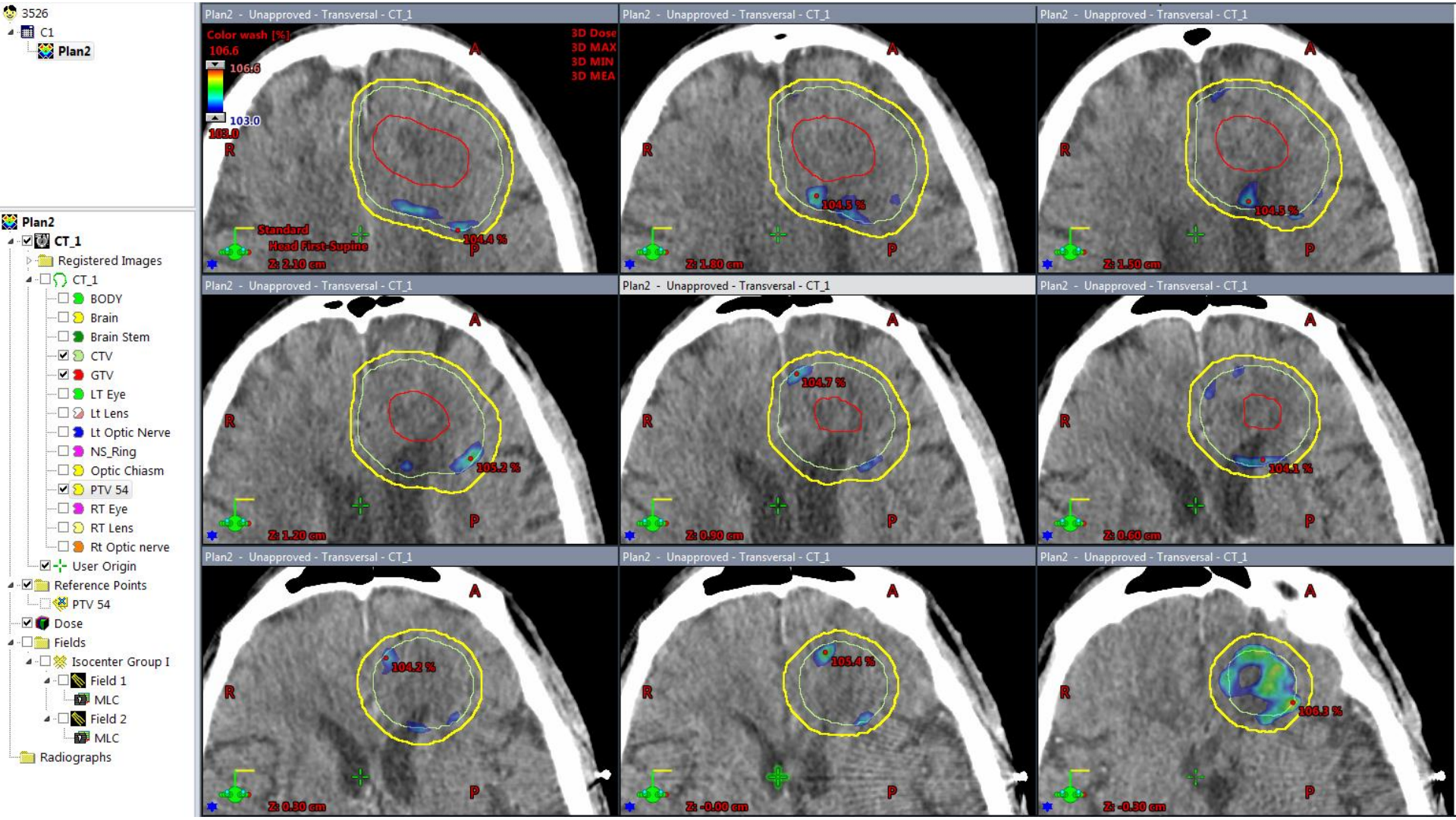
3. Third priority: Less critical normal tissues:
- Inner ear
- Parotid glands
- Larynx
- Anterior eye

HOT and COLD spots

- Volume
- Magnitude
- Location


C1
acc
CT_1
60
BODY
CTV 60
CTV 70
CTV54
ESOPHAGUS
GTV
LT Parotid
NS_Ring
PTV 70
PTV_t
PTV54
PTV60
RT parotid
Spinel Cord
User Origin
Reference Points
PTV_t
Dose
Fields
Isocenter Group I
ant
Field 3-DRR (Liv
Color wash [%]
104.0
104.0
103.8
103.7
103.6
103.5
103.4
103.3
103.2
103.1
103.0
103.0
108.7 %
R
Standard
Head First-Supine
Z: 0.00 cm


C1
acc
CT_1
60
BODY
CTV 60
CTV 70
CTV54
ESOPHAGUS
GTV
LT Parotid
NS_Ring
PTV 70
PTV_t
PTV54
PTV60
RT parotid
Spinel Cord
User Origin
Reference Points
PTV_t
Dose
Fields
Isocenter Group I
ant
Field 3-DRR (Liv
Color wash [%]
104.0
104.0
103.5
103.0
102.5
102.0
102.0
R
104.0 %
Standard
Head First-Supine
Z: 3.90 cm

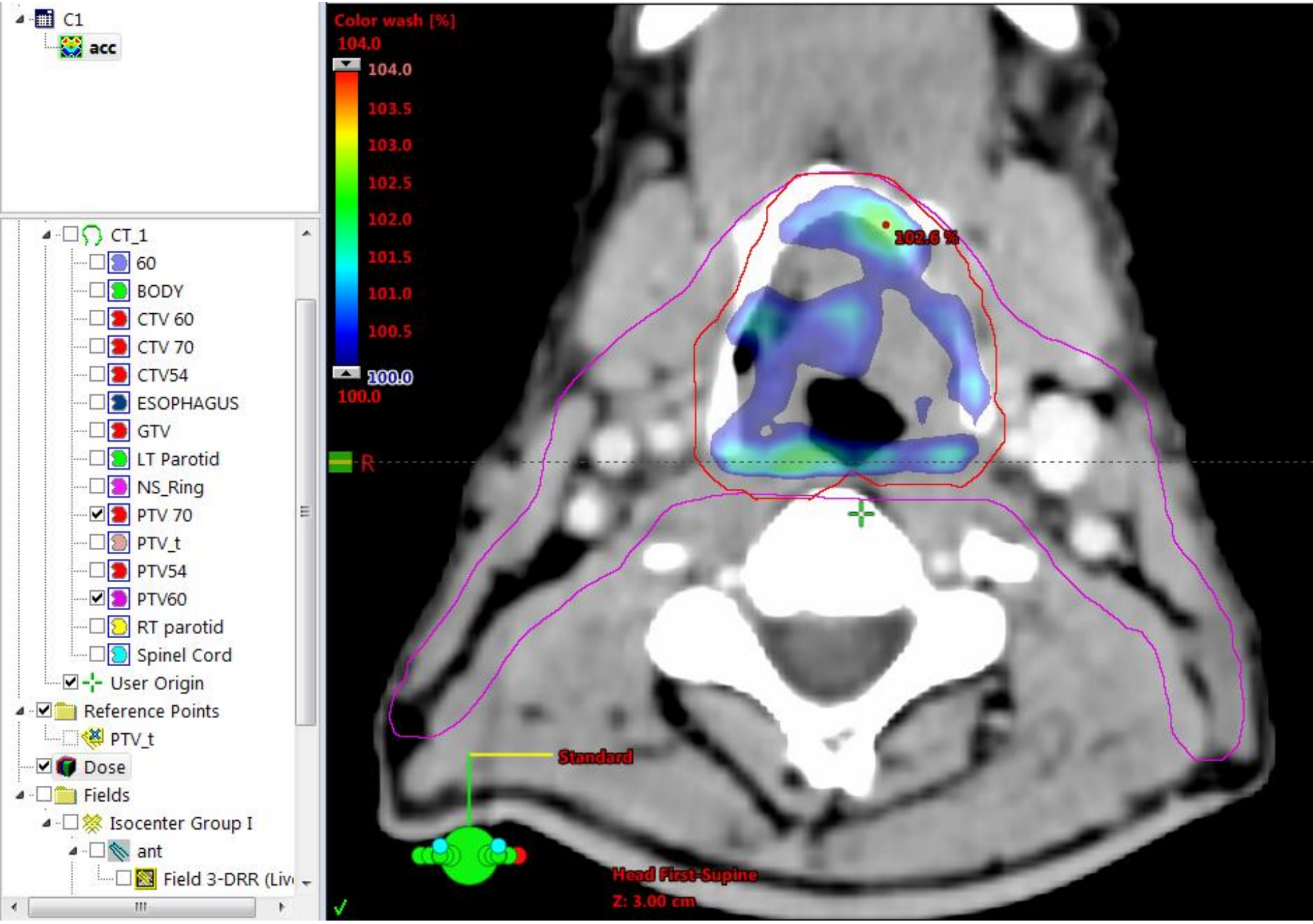

3526
C1
Plan2
Plan2
CT_1
Registered Images
CT_1
BODY
Brain
Brain Stem
CTV
GTV
LT Eye
Lt Lens
Lt Optic Nerve
NS_Ring
Optic Chiasm
PTV 54
RT Eye
RT Lens
Rt Optic nerve
User Origin
Reference Points
PTV 54
Dose
Fields
Isocenter Group I
Field 1
MLC
Field 2
MLC
Radiographs
Plan2 - Unapproved - Transversal - CT_1
Color wash [%]
106.6
106.6
103.0
103.0
3D Dose
3D MAX
3D MIN
3D MEA
A
R
P
Standard
Head First-Supine
Z: 2.10 cm
104.4 %
Z: 1.80 cm
104.5 %
Z: 1.50 cm
104.5 %
Z: 1.20 cm
105.2 %
Z: 0.90 cm
104.7 %
Z: 0.60 cm
104.1 %
Z: 0.30 cm
104.2 %
Z: -0.00 cm
105.4 %
Z: -0.30 cm
106.3 %

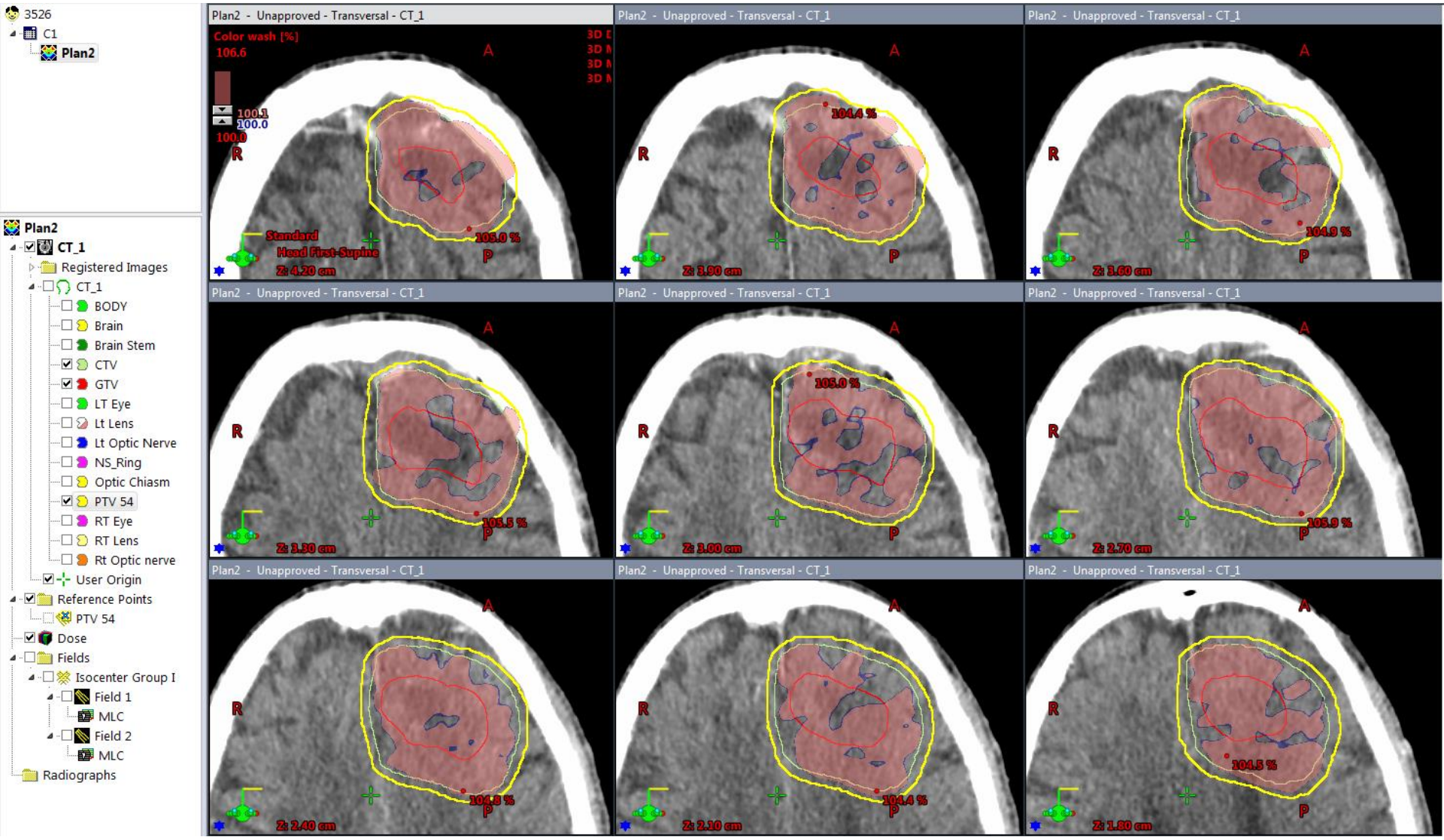
Dose Homogeneity

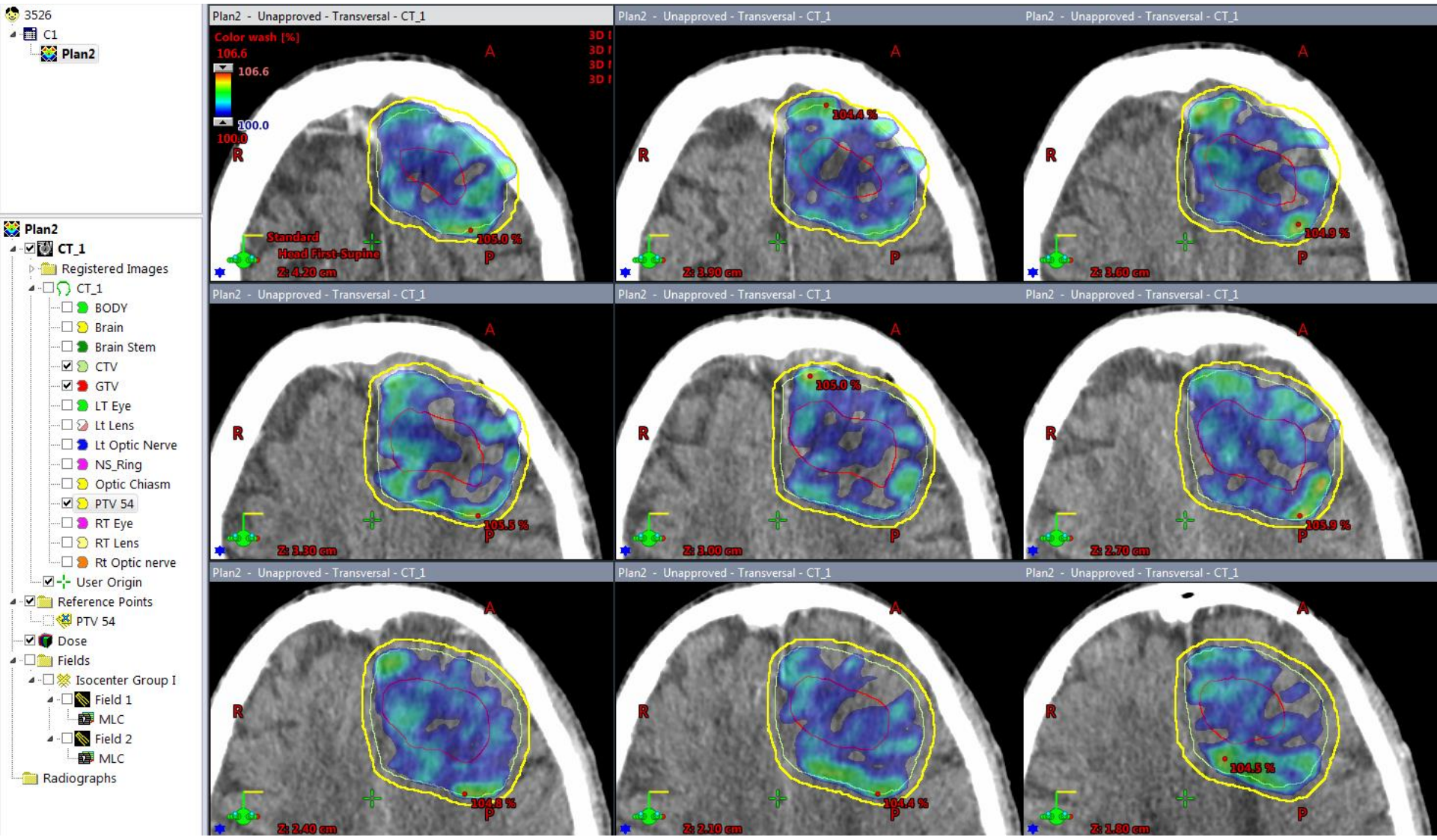
- Dose homogeneity characterizes the uniformity of the absorbed-dose distribution within the target volume.
- Homogeneity index = $HI = \frac{D_{2\%} - D_{98\%}}{D_{50\%}}$
- An HI of zero indicates that the absorbed-dose distribution is almost homogeneous.
- The ICRU previously recommended that the absorbed dose in the PTV be confined within from 95 % to 107 % of the prescribed absorbed dose (ICRU, 1999).

Dose Conformity

Characterizes the degree to which the high-dose region conforms to the target volume, usually the PTV.


C1
acc
CT_1
60
BODY
CTV 60
CTV 70
CTV54
ESOPHAGUS
GTV
LT Parotid
NS_Ring
PTV 70
PTV_t
PTV54
PTV60
RT parotid
Spinel Cord
User Origin
Reference Points
PTV_t
Dose
Fields
Isocenter Group I
ant
Field 3-DRR (Liv
Color wash [%]
104.0
104.0
103.5
103.0
102.5
102.0
101.5
101.0
100.5
100.0
100.0
102.6 %
R
Standard
Head First-Supine
Z: 3.00 cm


3526
C1
Plan2
Plan2
CT_1
Registered Images
CT_1
BODY
Brain
Brain Stem
CTV
GTV
LT Eye
Lt Lens
Lt Optic Nerve
NS_Ring
Optic Chiasm
PTV 54
RT Eye
RT Lens
Rt Optic nerve
User Origin
Reference Points
PTV 54
Dose
Fields
Isocenter Group I
Field 1
MLC
Field 2
MLC
Radiographs
Plan2 - Unapproved - Transversal - CT_1
Color wash [%]
106.6
100.1
100.0
100.0
Standard
Head First-Supine
Z: 4.20 cm
105.0 %
Z: 3.90 cm
104.4 %
Z: 3.60 cm
104.9 %
Z: 3.30 cm
105.5 %
Z: 3.00 cm
105.0 %
Z: 2.70 cm
105.9 %
Z: 2.40 cm
104.8 %
Z: 2.10 cm
104.4 %
Z: 1.80 cm
104.5 %


3526
C1
Plan2
Plan2
CT_1
Registered Images
CT_1
BODY
Brain
Brain Stem
CTV
GTV
LT Eye
Lt Lens
Lt Optic Nerve
NS_Ring
Optic Chiasm
PTV 54
RT Eye
RT Lens
Rt Optic nerve
User Origin
Reference Points
PTV 54
Dose
Fields
Isocenter Group I
Field 1
MLC
Field 2
MLC
Radiographs
Plan2 - Unapproved - Transversal - CT_1
Color wash [%]
106.6
106.6
100.0
100.0
Standard
Head First-Supine
Z: 4.20 cm
105.0 %
Z: 3.90 cm
104.4 %
Z: 3.60 cm
104.9 %
Z: 3.30 cm
105.5 %
Z: 3.00 cm
105.0 %
Z: 2.70 cm
105.9 %
Z: 2.40 cm
104.8 %
Z: 2.10 cm
104.4 %
Z: 1.80 cm
104.5 %

Dose Indices

ICRU #62: Conformity Index (CI)

- Defined as the: $\frac{\text{Treated Volume}}{\text{PTV Volume}}$
- Implies the Treated Volume totally encompasses the PTV
- CI = 1 Ideal conformation
- CI > 1 Irradiated volume includes healthy tissue
- CI < 1 Target volume is only partially irradiated

ICRU #62: Conformity Index Prostate Example

- Volume of Prostate PTV: 157 cc
- Volume of 95% Volume: 198 cc
- CI = 198cc/157cc = 1.26

- Treated volume includes healthy tissue

ICRU #62: Conformity Index
PBI Example

- Volume of PTV_eval: 144 cc
- Volume of 95% Volume: 138 cc
- CI = 138cc/144cc = 0.958

- PTV only partially covered

Conformity index$_{RTOG}$ = V_{RI}/TV (equ1) Where V_{RI} = Reference isodose volume and TV = Target volume.

Dose homogeneity index (DHI) is defined as a ratio between the dose reached in 95% of the PTV volume ($D_{\geq 95\%}$) and the dose reached in 5% ($D_{\geq 5\%}$) of the PTV volume.

i.e. DHI = $D_{\geq 95\%\ (\text{within PTV})}$ / $D_{\geq 5\%\ (\text{within PTV})}$ (equ 2)

HI (Homogeneity index) is a ratio between the maximum dose in the target volume and the reference isodose.

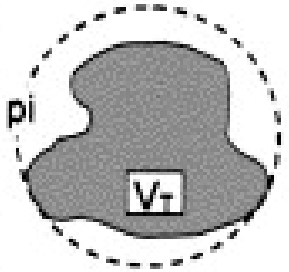
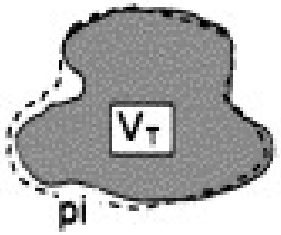
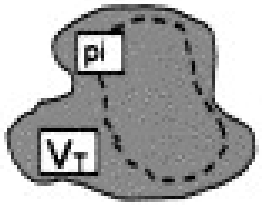
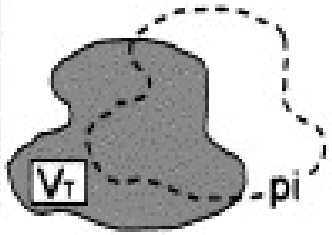
Homogeneity index$_{RTOG}$ = I_{max}/RI (equ 3) Where I_{max} = maximum isodose in the target, and RI = reference isodose.

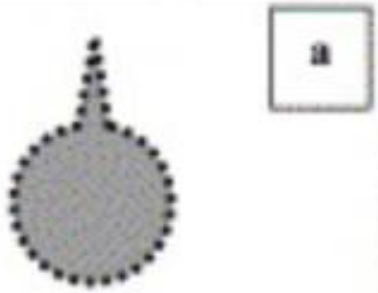
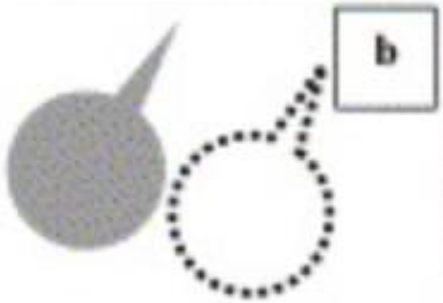
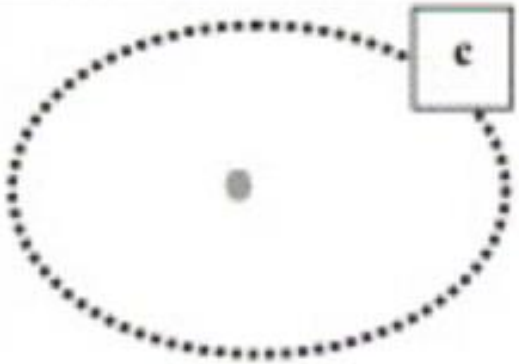
- **Paddick Conformity Index** (more precise, accounts for dose spill):

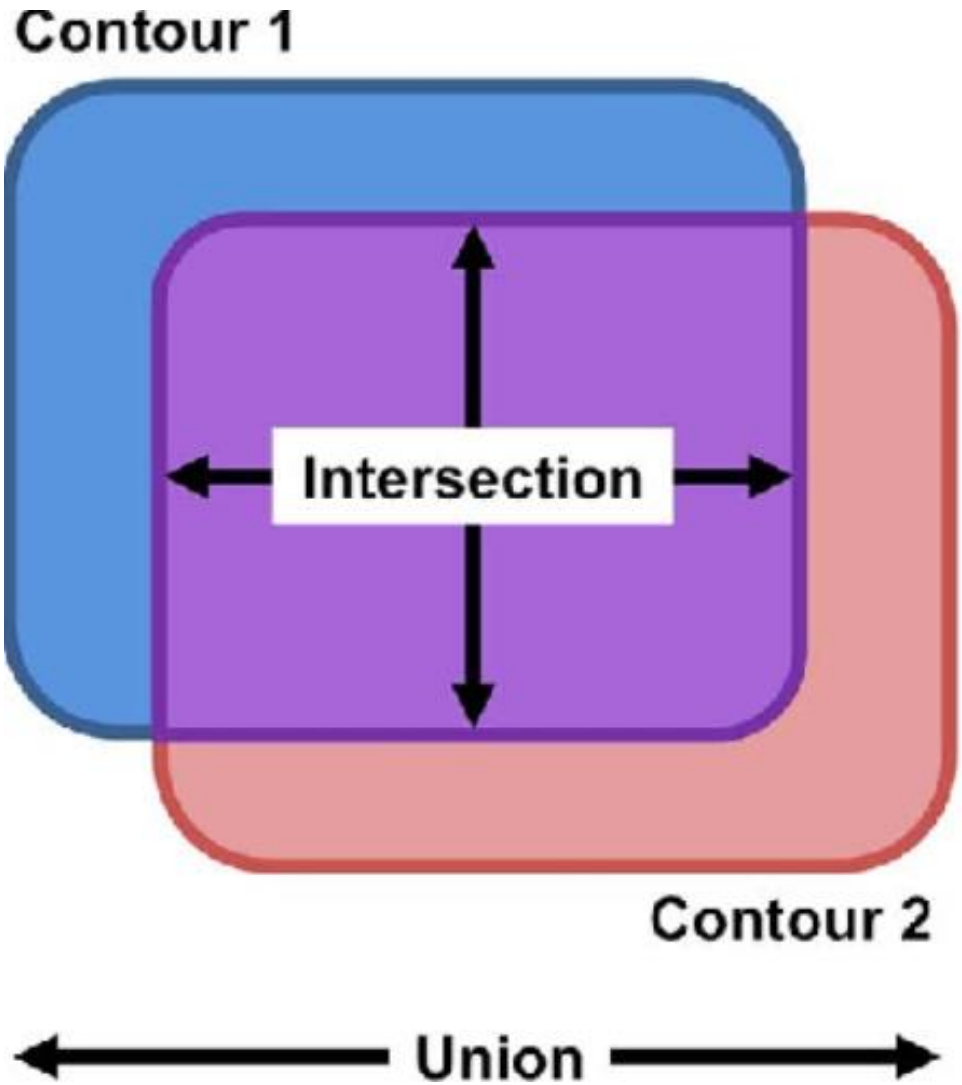
$$CI_{Paddick} = \frac{(V_{PTV,RI})^2}{V_{PTV} \times V_{RI}}$$

where $V_{PTV,RI}$ is the portion of the PTV covered by the reference isodose

- CI defined by the RTOG: ratio between the volume covered by the reference isodose, which according to ICRU is isodose of 95%, and the target volume designated as PTV.
- $CI_{RTOG} = Vri/TV$
  - CI = 1 : ideal dose coverage or high conformity.
  - CI > 1 : irradiated volume exceeds the TV and covers part of the healthy tissue.
  - CI < 1 : the target volume is partially radiated.
- RTOG criteria define a range of CI values to determine the quality of conformity since the value up to 1 can rarely be reached
  - CI between 1 and 2: in accordance with the protocol
  - CI between 2-2.5 and 0.9-1: minor deviation of the protocol
  - CI > 2.5 and < 0.9: severe deviation from the protocol

Case	1	2	3	4
Single slice showing target volume and prescription isodose				
Volume data	V_T = 1.0 V_{pi} = 2.0 $V_{T,pi}$ = 1.0	V_T = 1.0 V_{pi} = 1.2 $V_{T,pi}$ 0.95	V_T = 1.0 V_{pi} = 0.5 $V_{T,pi}$ = 1.0	V_T = 1.0 V_{pi} = 1.0 $V_{T,pi}$ = 0.5
$Coverage_{RTOG}$	1.0	0.72	0.20	0.16
% Coverage	100%	95%	50%	50%
CI_{RTOG}	2.0	1.2	0.5	1.0
CI	0.5	0.79	1.0	0.5
CN	0.5	0.75	0.5	0.25

CN = 1	CN = 0	CN ≈ 0
		
TV: Target Volume: V_R: Volume of the Reference Isodose TV= 5 cm^3 V_{RI}= 5 cm^3 TV_{RI} = 5 cm^3	TV: Target Volume: V_R: Volume of the Reference Isodose TV= 5 cm^3 V_R= 5 cm^3 TV_{RI} = 0 cm^3	TV: Target Volume: V_R: Volume of the Reference Isodose TV= 5 cm^3 V_R= 1600 cm^3 TV_{RI} = 5 cm^3 TV<<<< PI
$\frac{TV_{RI} \times TV_{RI}}{TV \times V_R} = 1$	$\frac{TV_{RI} \times TV_{RI}}{TV \times V_R} = 0$	$\frac{TV_{RI} \times TV_{RI}}{TV \times V_R} \approx 0$



Conformity Index of Contours 1 and 2

$$CI = \frac{\text{Intersection}}{\text{Union}}$$

Suggested in a trial

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http://scholar.cu.edu.eg/?q=ashrafhassouna

Publications

Bio

Classes

Images

Ashraf Hamed Mohamed Hassouna

Professor of Radiation Oncology

(email)

CAIRO UNIVERSITY

Bio

Biography | *Curriculum Vitae*

M.D.
in Radiation Oncology

NCI, Cairo University,

You Can Get This Presentation …. and… More

Agenda

- Lecture (CB-CHOP).
- Workstation (acceptance of 2-4 cases every day).