



~~Cancer~~
UT MD Anderson

From Clicks to Consistency

Automating Optimization Contours in RayStation

Brittney Rochford, BS, CMD

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What are “Optimization Contours”

Dosimetrist-created structures built on top of physician-drawn targets and OARs

- Smaller focus area for optimizer
- Avoid conflicting objectives in optimization
- Conform higher dose around target (rings)
- Conform lower dose in normal tissue (NT)

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Advantages



SPEED

- Fast Initial Plan
- Adapt Plans Quickly
- Fast Replans
- Contour Names Match Objective Templates

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Disclaimer



- One template accommodates multiple planners' styles
- Consistency is the goal – avoid cluttering templates

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Example: Contour Template for Prostate Planning



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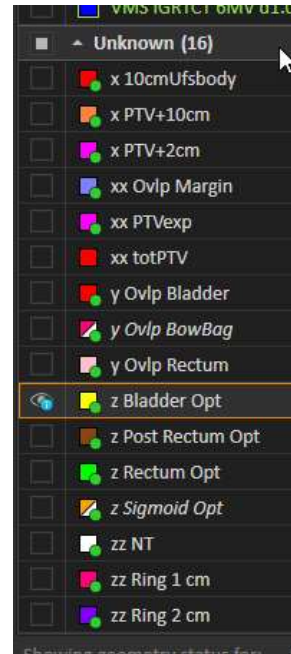
Contour Definitions using Prostate Example

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Definitions of contours - Prefixes

- Keeps ROIs in order
- Easier to identify



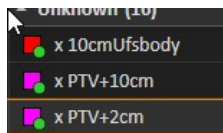
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Definitions of contours – Prefixes x & xx

Prefix:

x & xx: these contours are intermediary structures used to create the actual opt structures.



It is wise to keep these intermediary structures because if the physician changes target contours or you are doing an adapt plan, you want to have these available and unchanged

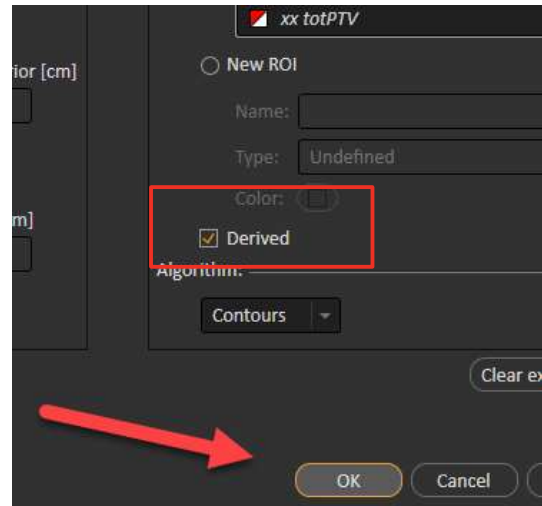
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Definitions of Contours

VERY IMPORTANT:

Keep the contours you create derived. All the power is in the derivation



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Definitions of contours – Prefixes x & xx

xx totPTV:

All PTVs combined



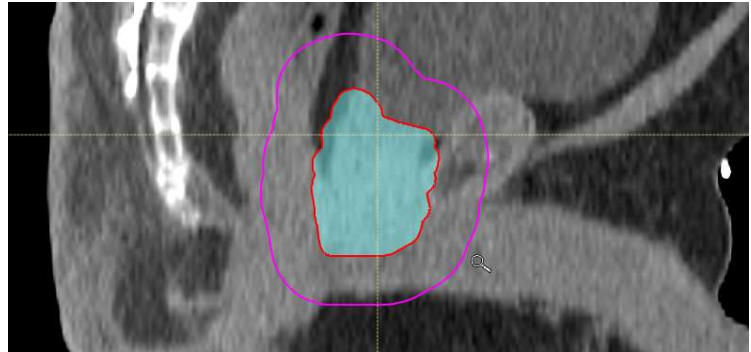
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Definitions of contours – Prefixes x & xx

x PTV+2cm:

xx totptv + 2 cm all around



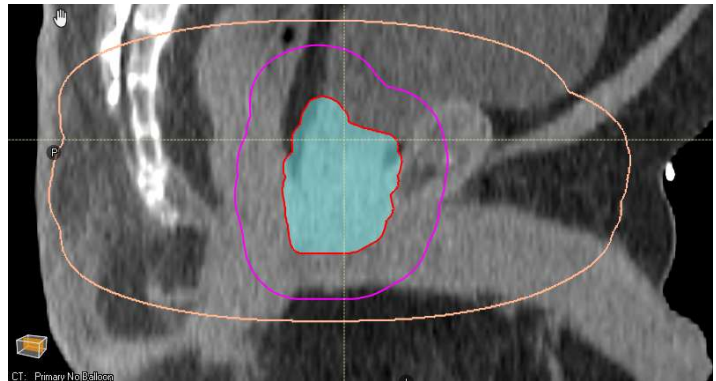
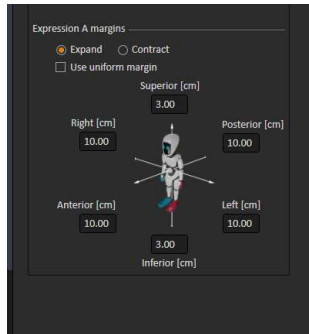
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Definitions of contours – Prefixes x & xx

x PTV+10cm:

(x PTV+2cm)
expanded

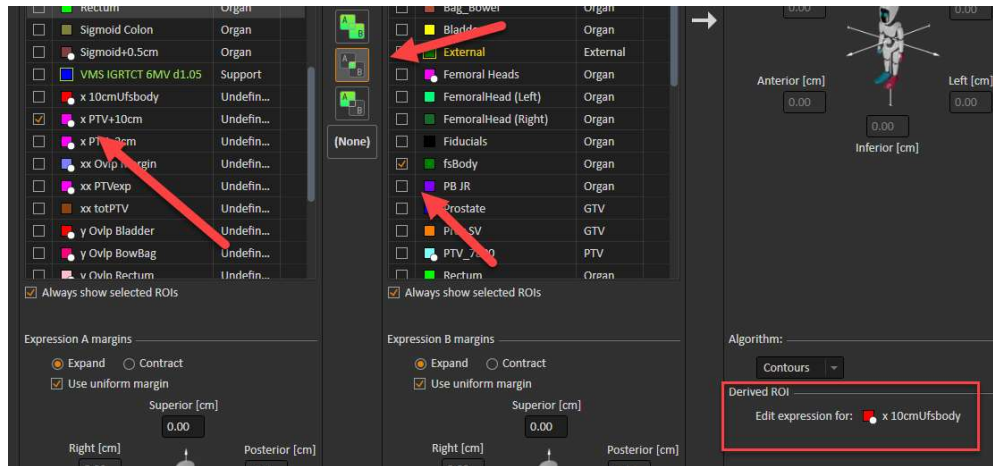


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Definitions of contours – Prefixes x & xx

x 10cmUfsbody: Clips area that is outside of the patient external



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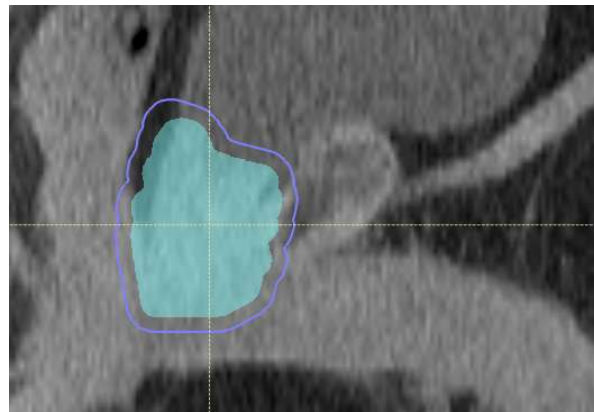
Definitions of contours – Prefixes x & xx

x Ovlp Margin:

$xx\ totPTV + 0.5\ cm$

Creates an expansion on the PTV to be used when creating overlap regions.

0.5 – 1 cm is typically a good margin



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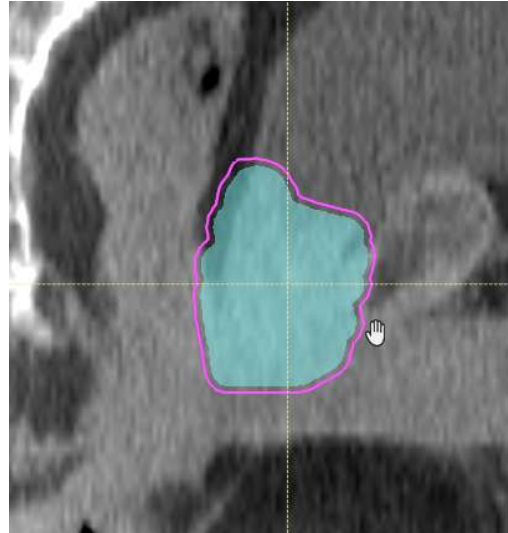
Definitions of contours – Prefixes x & xx

xx PTVexp:

xx totPTV + 0.2 cm

Creates an expansion on the PTV to be used as a gap when creating OAR optimization structures (gap between OAR and PTV)

0.2 – 0.5 cm is typically a good margin



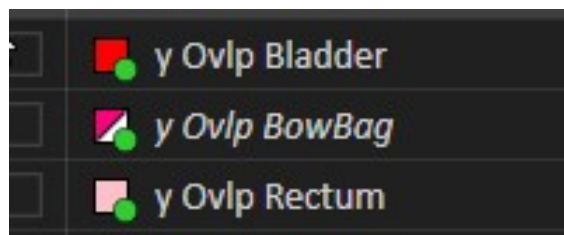
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Definitions of contours – Prefix y

Prefix y:

these contours are overlaps of oar with ptv + margin. This creates a smaller ROI for the optimizer to focus on.

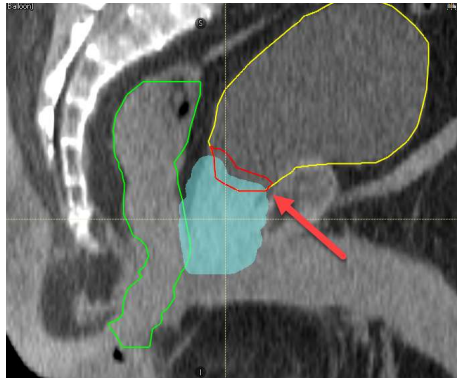


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Definitions of contours – Prefix y

y Ovlp Bladder



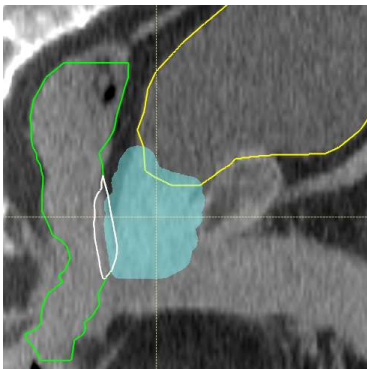
The screenshot shows the RayStation software interface. On the left, 'Expression A' lists various ROIs including 'Bladder' and 'External'. On the right, 'Expression B' lists 'y Ovlp Bladder'. The 'Output' panel on the far right shows 'Derived ROI' as 'y Ovlp Bladder'. Red arrows point from the 'Bladder' ROI in Expression A to the 'y Ovlp Bladder' ROI in Expression B, and from the 'y Ovlp Bladder' ROI in Expression B to the 'Derived ROI' field in the Output panel.

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Definitions of contours – Prefix y

y Ovlp Rectum



The screenshot shows the RayStation software interface. On the left, 'Expression A' lists various ROIs including 'Rectum'. On the right, 'Expression B' lists 'y Ovlp Rectum'. The 'Output' panel on the far right shows 'Derived ROI' as 'y Ovlp Rectum'. Red arrows point from the 'Rectum' ROI in Expression A to the 'y Ovlp Rectum' ROI in Expression B, and from the 'y Ovlp Rectum' ROI in Expression B to the 'Derived ROI' field in the Output panel.

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Definitions of contours – Prefixes z & zz

z: these contours are OAR opt structures.



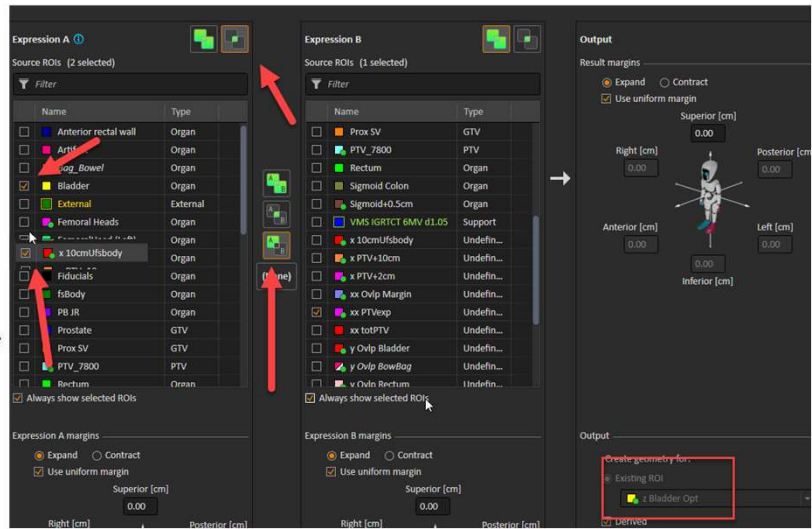
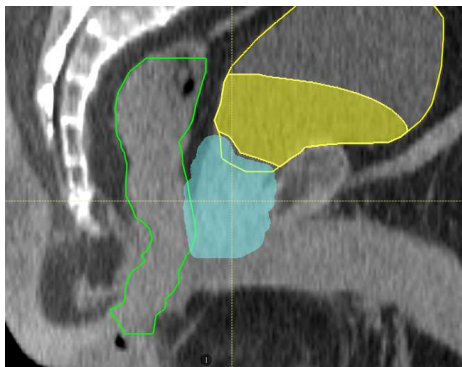
zz: these contours conform dose. NTs and rings



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Definitions of Contours – Prefixes z & zz

z Bladder Opt



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Definitions of Contours – Prefixes z & zz

z Rectum Opt



Expression A (2 selected)

Name	Type
FemoralHead (Right)	Organ
Fiducials	Organ
fsBody	Organ
PB_IR	Organ
Prostate	GTV
Prox SV	GTV
PTV_7800	PTV
Rectum	Organ
Sigmoid Colon	Organ
Sigmoid4.0.5cm	Organ
VMS IGRCT GMV d1.05	Support
x 10cmfBody	Undefin...
x PTV+10cm	Undefin...
x PTV+2cm	Undefin...
xx Ovlr Margin	Undefin...
Always show selected ROIs	

Expression B (3 selected)

Name	Type
Sigmoid Colon	Organ
Sigmoid4.0.5cm	Organ
VMS IGRCT GMV d1.05	Support
x 10cmfBody	Undefin...
x PTV+10cm	Undefin...
x PTV+2cm	Undefin...
xx Ovlr Margin	Undefin...
xx PTVexp	Undefin...
xx totPTV	Undefin...
y Ovlr Bladder	Undefin...
y Ovlr BowBag	Undefin...
y Ovlr Rectum	Undefin...
z Bladdr Opt	Undefin...
z Post Rectum Opt	Undefin...
z Rectum Opt	Undefin...
Always show selected ROIs	

Output

Result margins

- Expand Contract
- Use uniform margin

Superior [cm]: 0.00

Right [cm]: 0.00

Anterior [cm]: 0.00

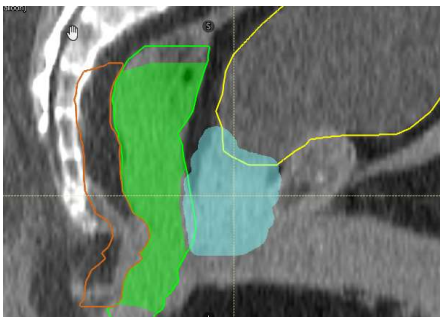
Inferior [cm]: 0.00

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Definitions of Contours – Prefixes z & zz

z Post Rectum Opt



Expression A (2 selected)

Name	Type
FemoralHead (Left)	Organ
FemoralHead (Right)	Organ
Fiducials	Organ
fsBody	Organ
PB_IR	Organ
Prostate	GTV
Prox SV	GTV
PTV_7800	PTV
Rectum	Organ
Sigmoid Colon	Organ
Sigmoid4.0.5cm	Organ
VMS IGRCT GMV d1.05	Support
x 10cmfBody	Undefin...
x PTV+10cm	Undefin...
x PTV+2cm	Undefin...
xx Ovlr Margin	Undefin...
Always show selected ROIs	

Expression B (1 selected)

Name	Type
External	External
Femoral Heads	Organ
FemoralHead (Left)	Organ
FemoralHead (Right)	Organ
fsBody	Organ
PB_IR	Organ
Prostate	GTV
Prox SV	GTV
PTV_7800	PTV
Rectum	Organ
Sigmoid Colon	Organ
Sigmoid4.0.5cm	Organ
VMS IGRCT GMV d1.05	Support
x 10cmfBody	Undefin...
Always show selected ROIs	

Output

Result margins

- Expand Contract
- Use uniform margin

Superior [cm]: 0.00

Right [cm]: 0.00

Anterior [cm]: 0.00

Inferior [cm]: 0.00

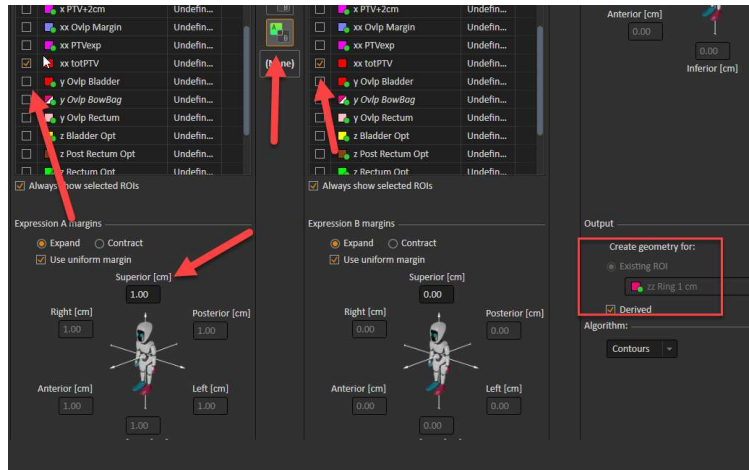
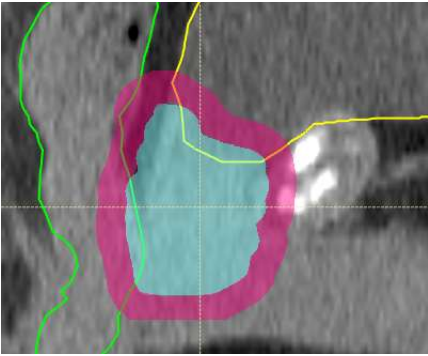
Create geometry for: z Post Rectum Opt

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Definitions of Contours – Prefixes z & zz

zz Ring 1 cm

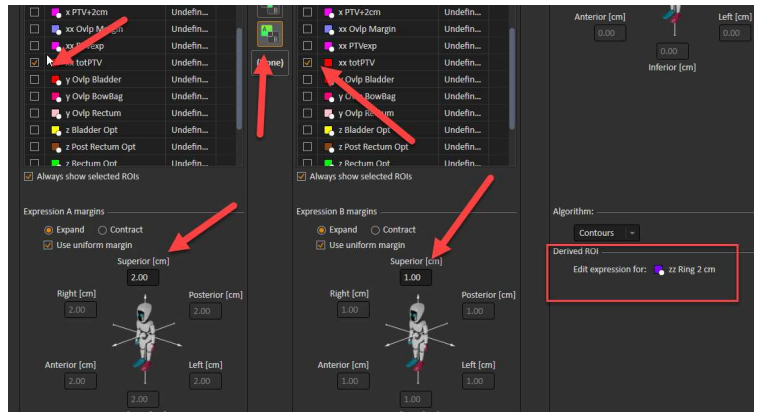
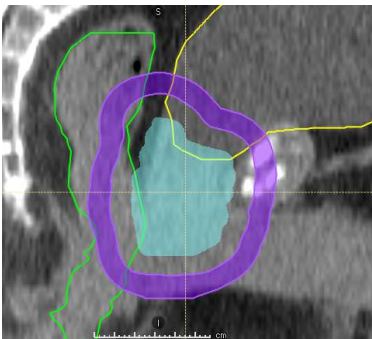


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Definitions of Contours – Prefixes z & zz

zz Ring 2 cm

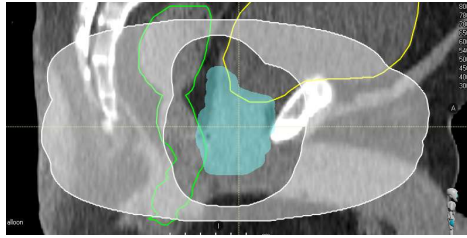


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Definitions of Contours – Prefixes z & zz

zz NT



The screenshot displays the RayStation software interface for defining contours. On the left, a list of contours includes 'VMS IGRTCT 6MV d1.05', 'x 10cmUfsbody', 'x PTV+10cm', 'x PTV+2cm', 'xx Ovip Margin', 'xx PTVexp', 'xx totPTV', 'y Ovip Bladder', and 'y Ovip BowBag'. The 'xx Ovip Margin' contour is selected. Below this list are 'Expression A margins' and 'Expression B margins' sections, each with 'Expand' and 'Contract' radio buttons and a 'Use uniform margin' checkbox. The margins are defined by 'Superior [cm]', 'Right [cm]', 'Posterior [cm]', 'Anterior [cm]', and 'Left [cm]' with numerical input fields. On the right, the 'Output' section shows 'Create geometry for:' with 'Existing ROI' and 'zz NT' options, and the 'Algorithm' set to 'Contours'. Red arrows point to the 'None' button in the contour list and the 'zz NT' option in the output section.

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Create your own Template 1. Create a Base Template

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Create a Base Template

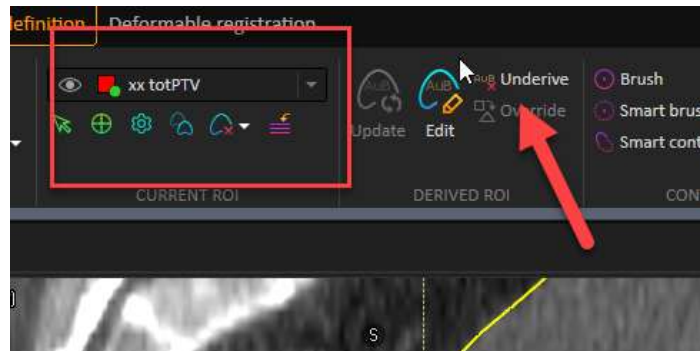


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Make a basic template

1. Very important: underive xx totPTV

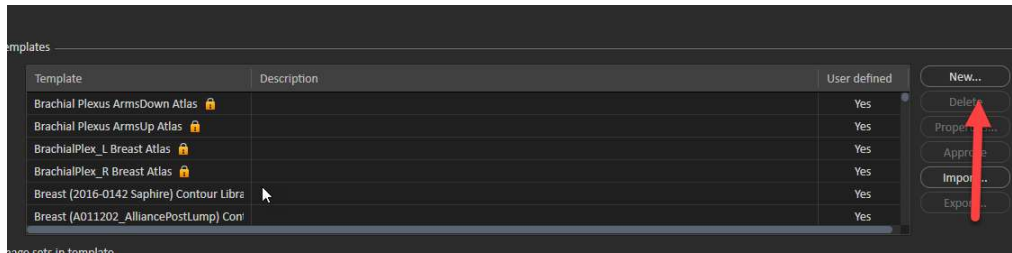


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Make a base template

2. New roi geometry > structure template management > new...



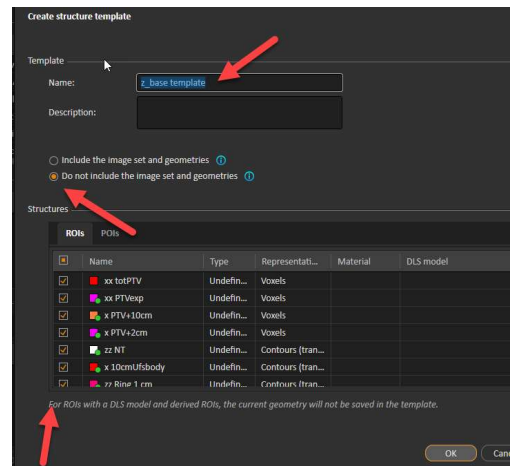
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Make a base template

3. Rois to check:

- External x PTV+2cm
- fsBody zz NT
- xx totPTV zz Ring 1 cm
- xx PTVexp zz Ring 2 cm
- x PTV+10cm xx Ovlp Margin



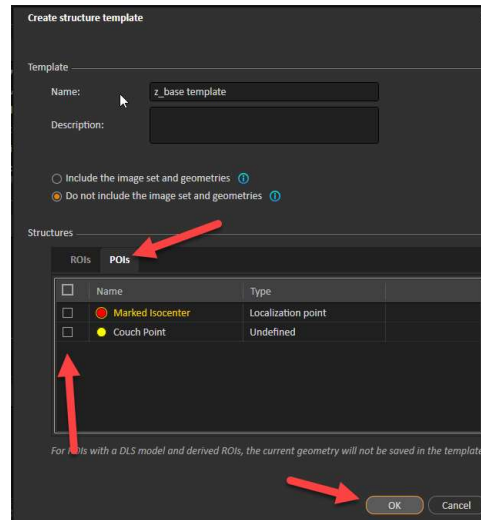
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Make a base template

4. Uncheck POIs

5. OK



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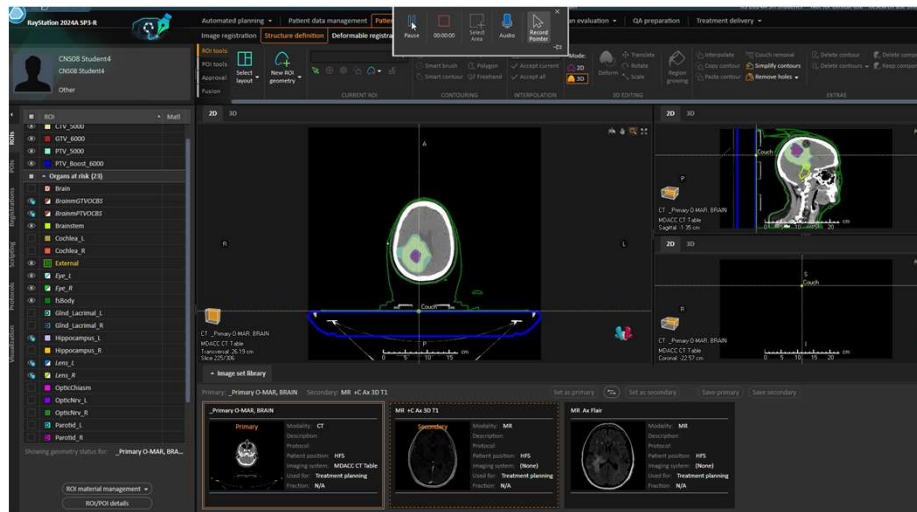
Create your Own Template

2. Load Base Template

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Create a brain template. Load Base Template

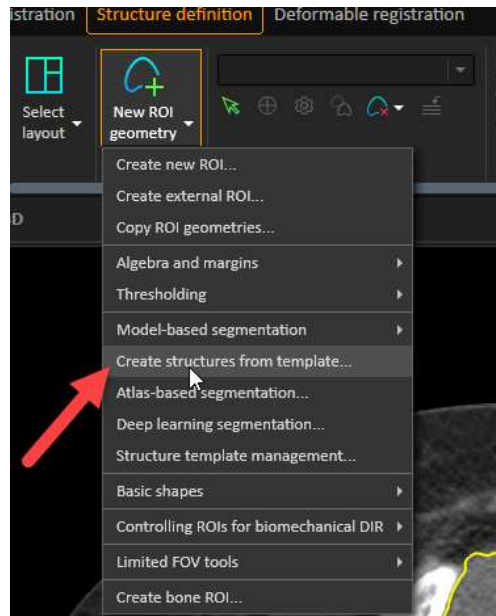


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Load Base Template

1. New ROI Geometry
2. Create structures from template...

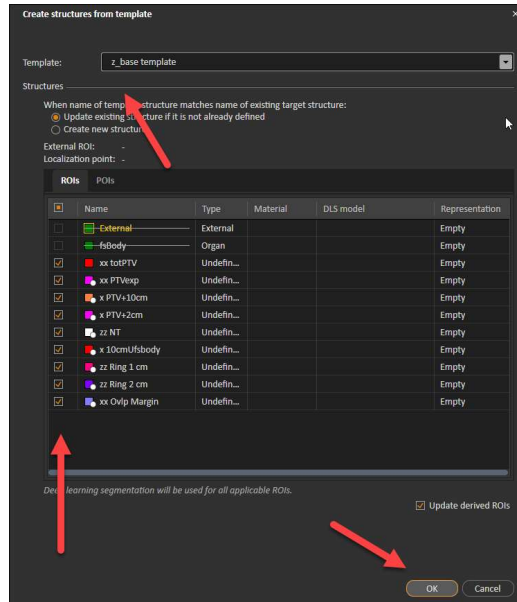


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Load Base Template

3. Choose the base template
4. OK

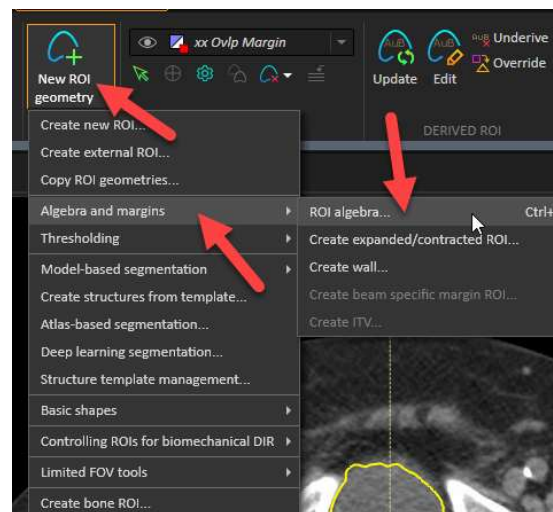


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Load Base Template – Create xx totPTV ROI

5. New ROI geometry
6. Algebra and margins
7. ROI algebra

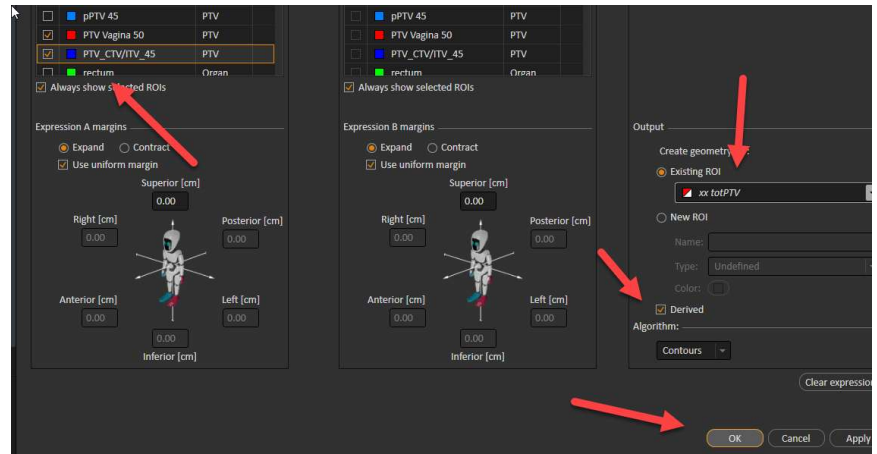


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Load Base Template – Create xx totPTV ROI

8. Choose all PTVs as the source

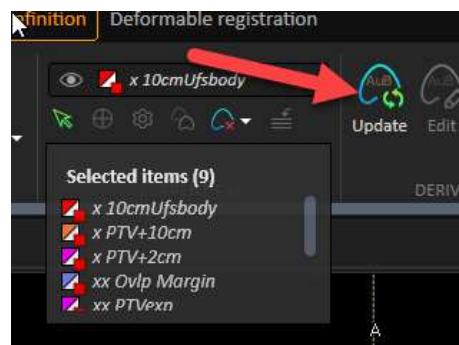


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Load Base Template – Update your Base

9. Update your base contours



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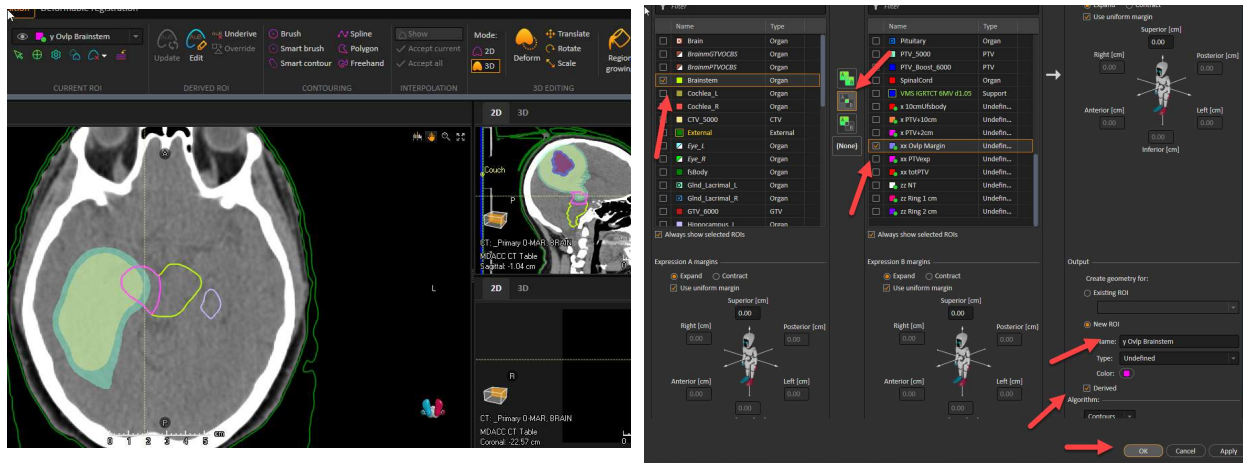
Create your Own Template

3. Create Site Specific Contours

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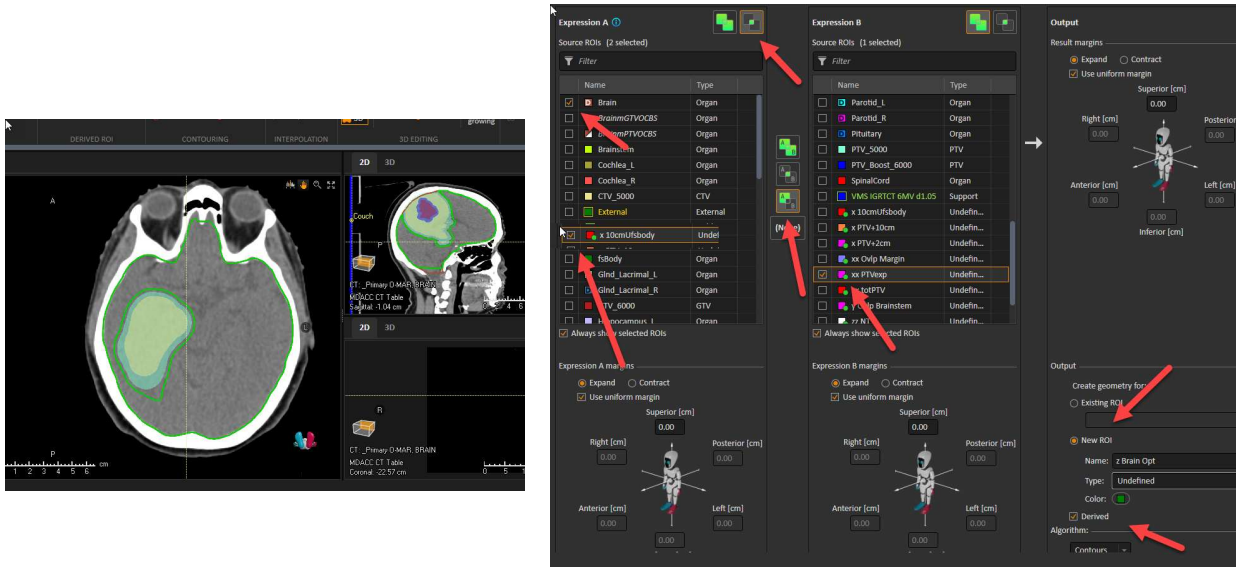
Create Overlap OARs



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Create Optimization OARs



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Create Site Specific Templates



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Create Site Specific Templates

1. Underrive fs totPTV
2. New ROI
3. Structure Template Management...
4. New...

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Create Site Specific Templates

*** Do not include the image set and geometries***

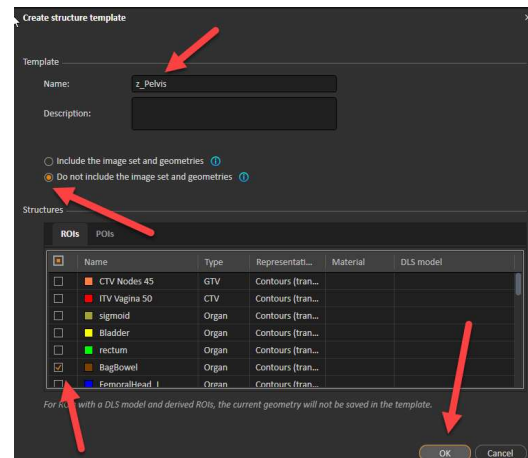
ROIs to leave checked:

OARs that are sources for overlap or opt structures

External

fsbody

x, xx, y, z prefix structures

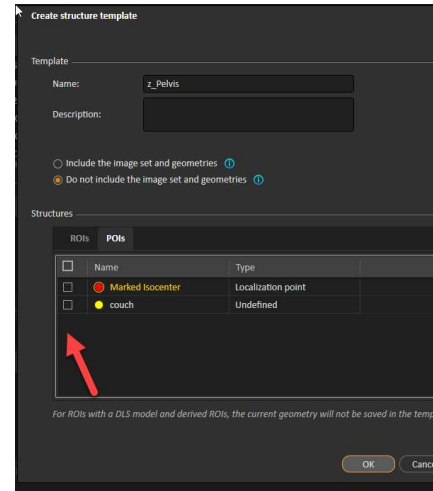


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Create Site Specific Templates

Uncheck POIs



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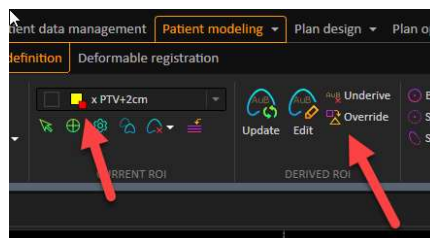
IMPORTANT:

IMPORTANT

DO: Underderive x totPTV before creating the template

DON'T: underderive contours when processing

When processing, if there is a red box:



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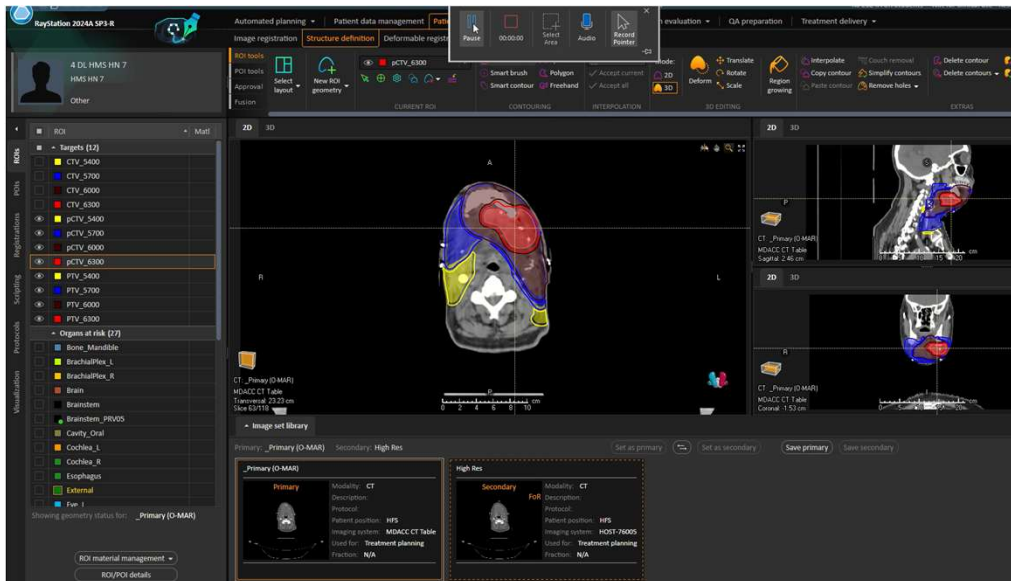
Examples

HN
Contour Changes
Adapt Plans

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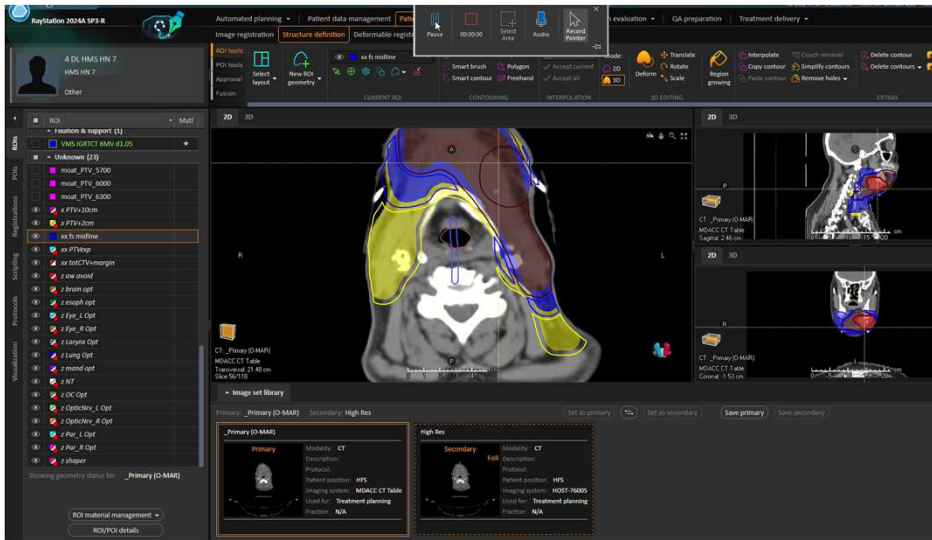
Example – HN Plan



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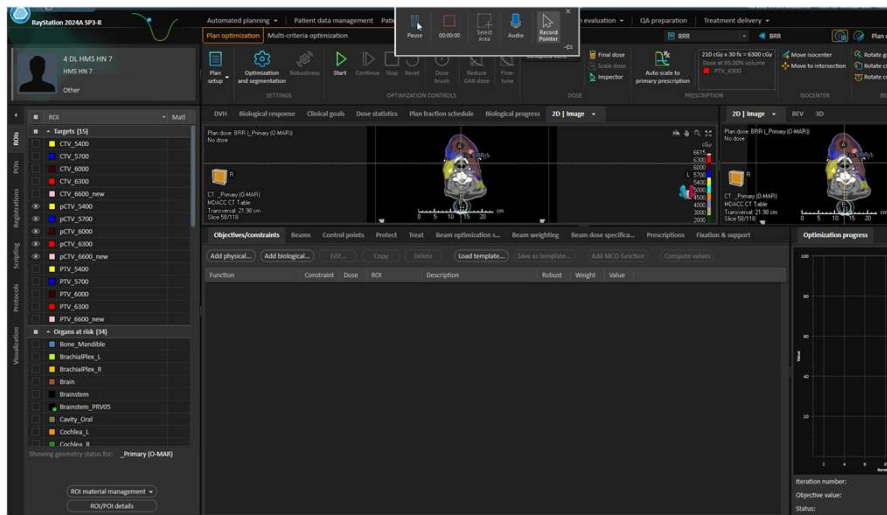
Example - HN Cont.



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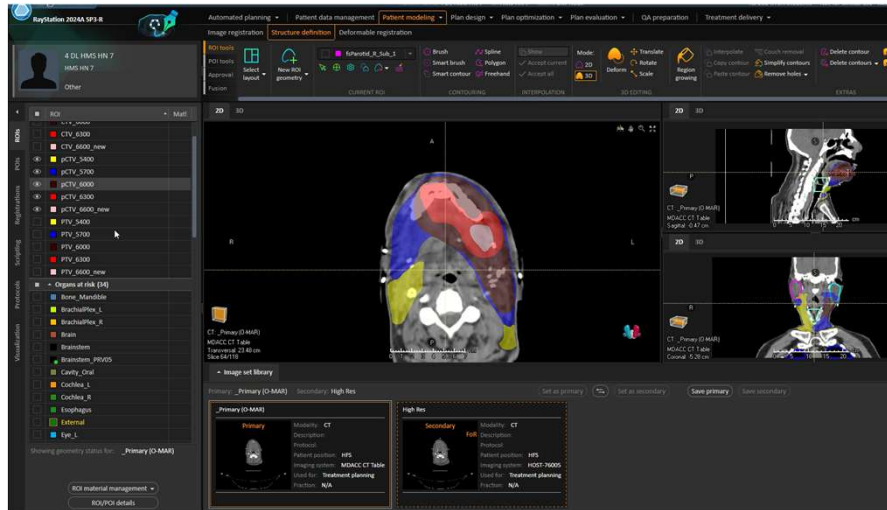
Example – HN Optimization Template



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Example – Contour Change/Replan/Adapt

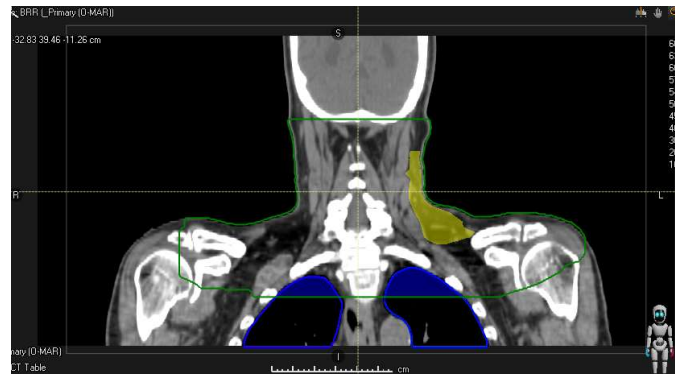


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Intermediary Contour Advantages

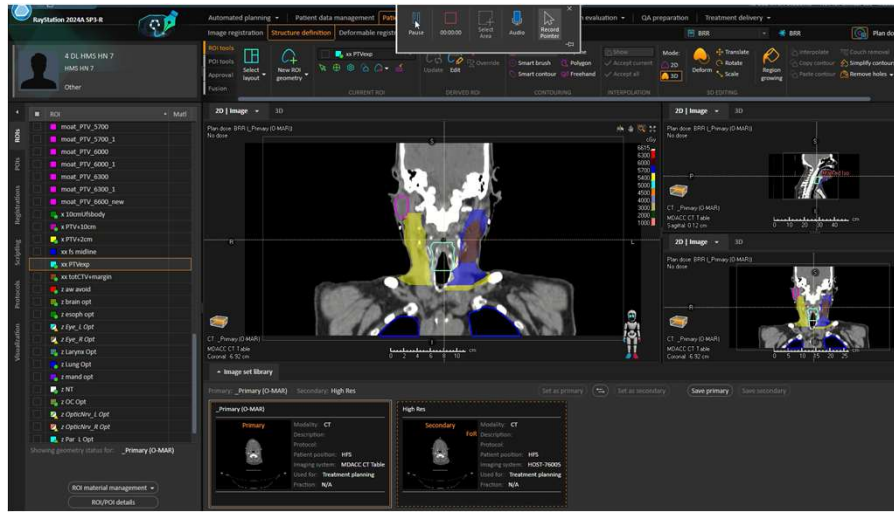
- Volumetric and mean dose objectives looking at relatively same volume
- Future info for class solutions



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Update Template for Different Styles



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Questions?

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