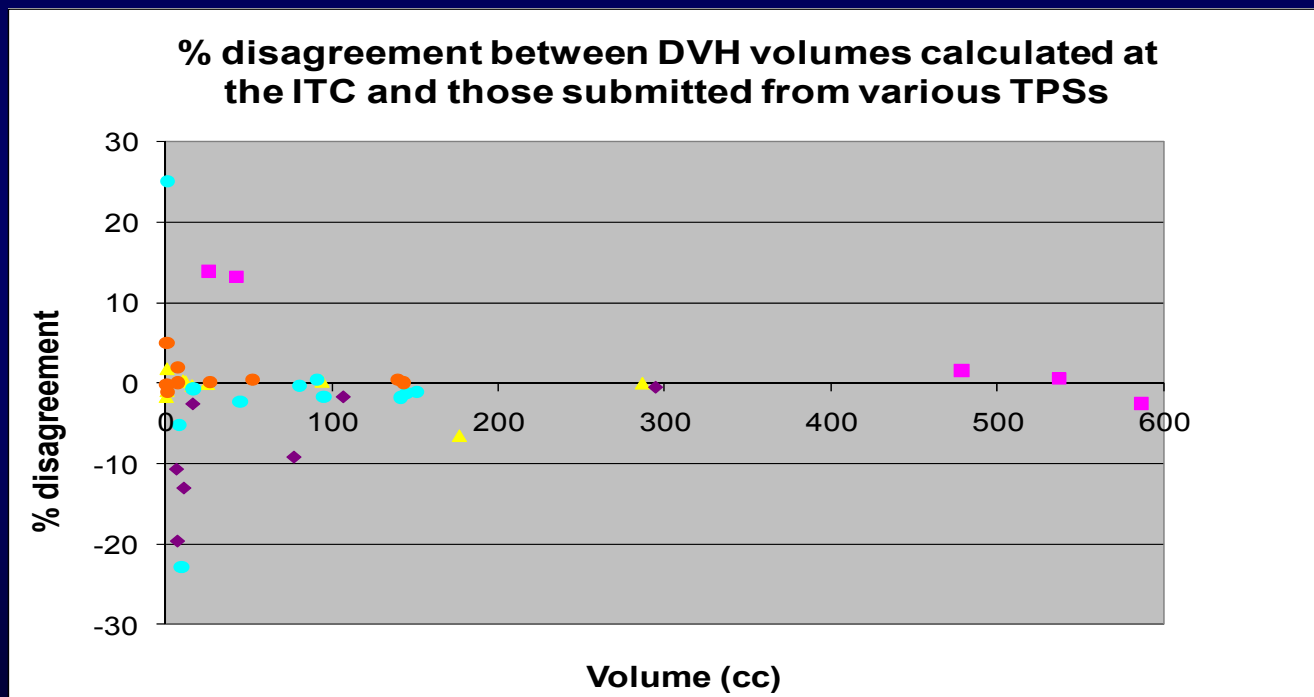


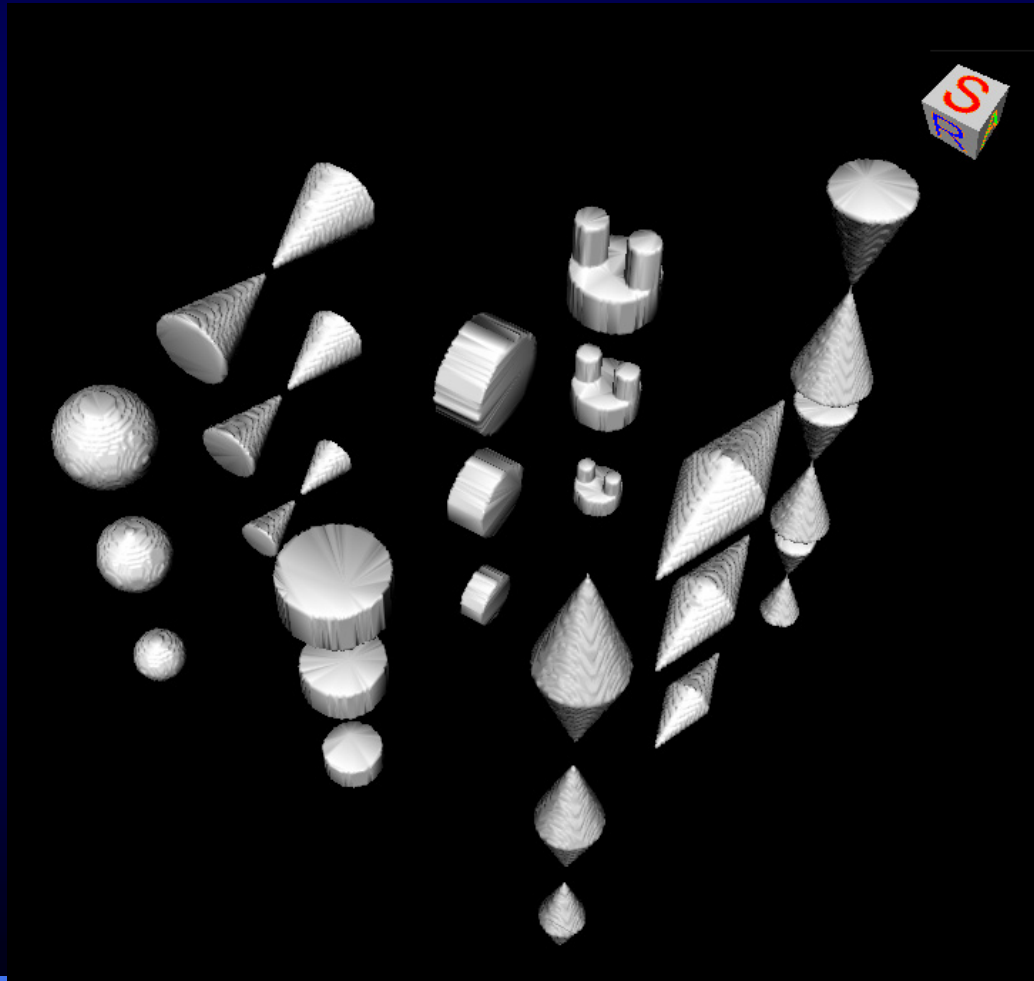
Early study showing volume calculation discrepancies



Investigation with Electronic Phantom

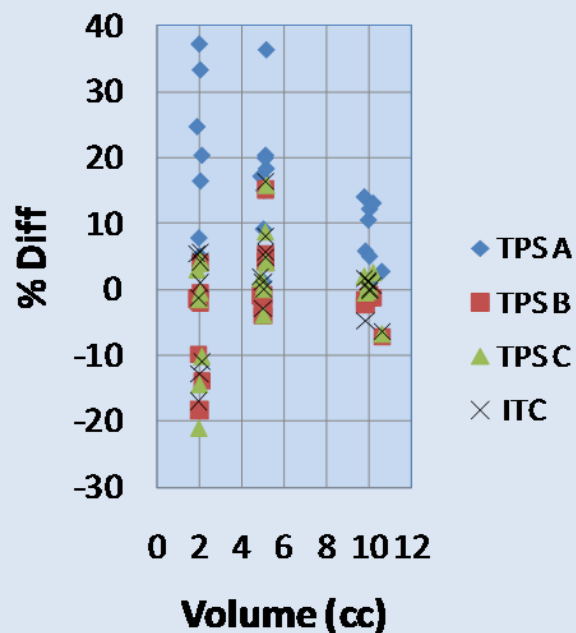
- We have hypothesized that the discrepancies between submitted DVHs from treatment planning systems and the ITC recalculated DVHs is due largely to inter-slice volumes at the axial ends of structures.
- When the volume in the axial end-slices is a significant portion of a structure's total volume or when the CT slice spacing under-samples a volume, the discrepancies should be worse.
- In order to investigate the effect of structure geometry and CT slice spacing, the ITC has used open-source POSDA software (www.posda.com) to construct an electronic phantom.
- The phantom is designed to identify and emphasize the suspected sources of discrepancies seen between DVH calculations.
- The phantom was constructed with multiple slice thicknesses, and includes structures with multiple volumes, orientations, and geometries.
- **The intent of this study is not to decide which is the best method of calculating DVHs, but rather to point out discrepancies that exist and investigate how these discrepancies impact data collection for multi-institutional clinical trials.**

Surface rendering of objects in the electronic phantom. The POSDA software was used to create the volumes shown, as well as a DICOM RT Structure Set containing contours at the surface of each structure in CT image slice planes.

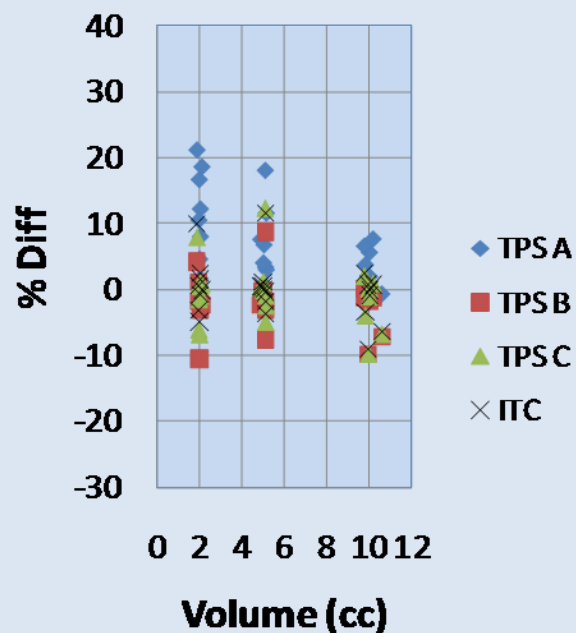


% Difference between calculated volumes and reference volume vs. reference volume

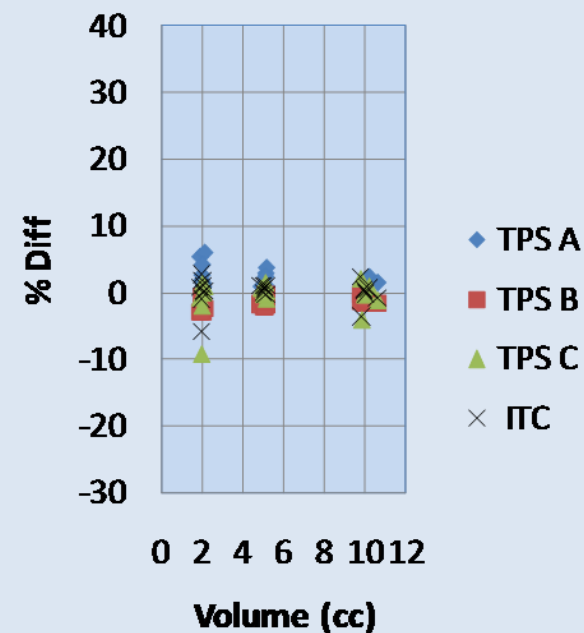
5 mm slice spacing



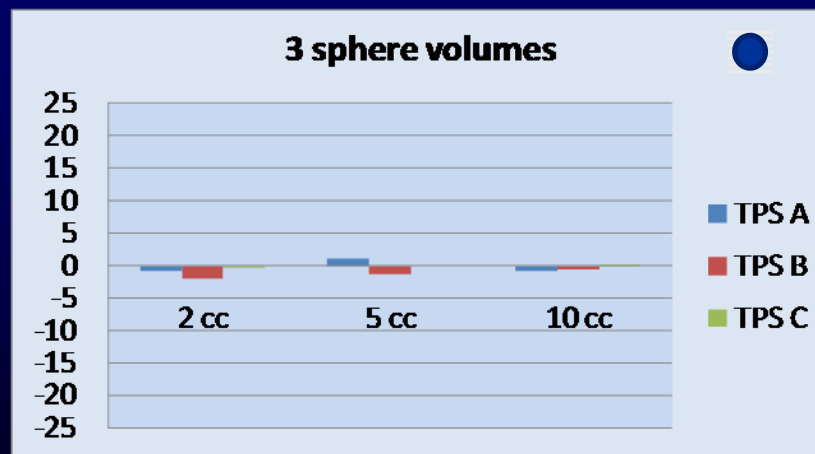
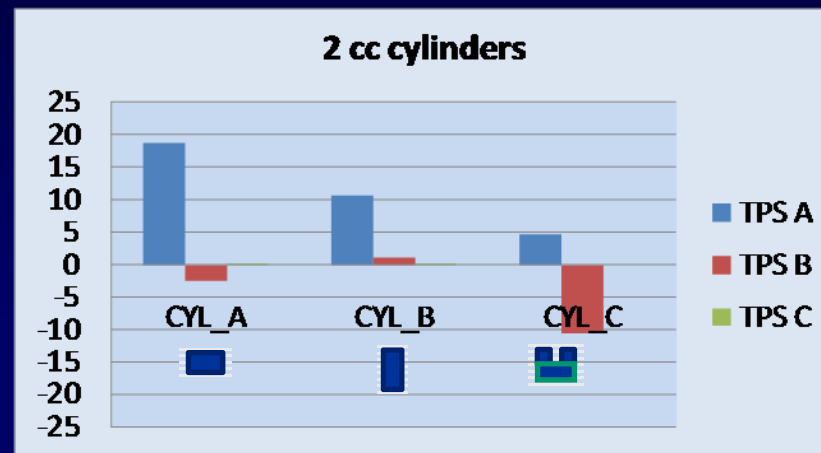
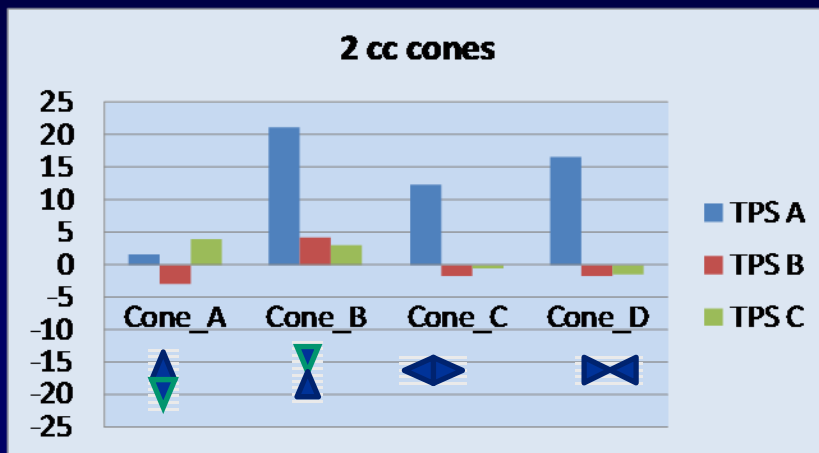
3 mm slice spacing



1 mm slice spacing

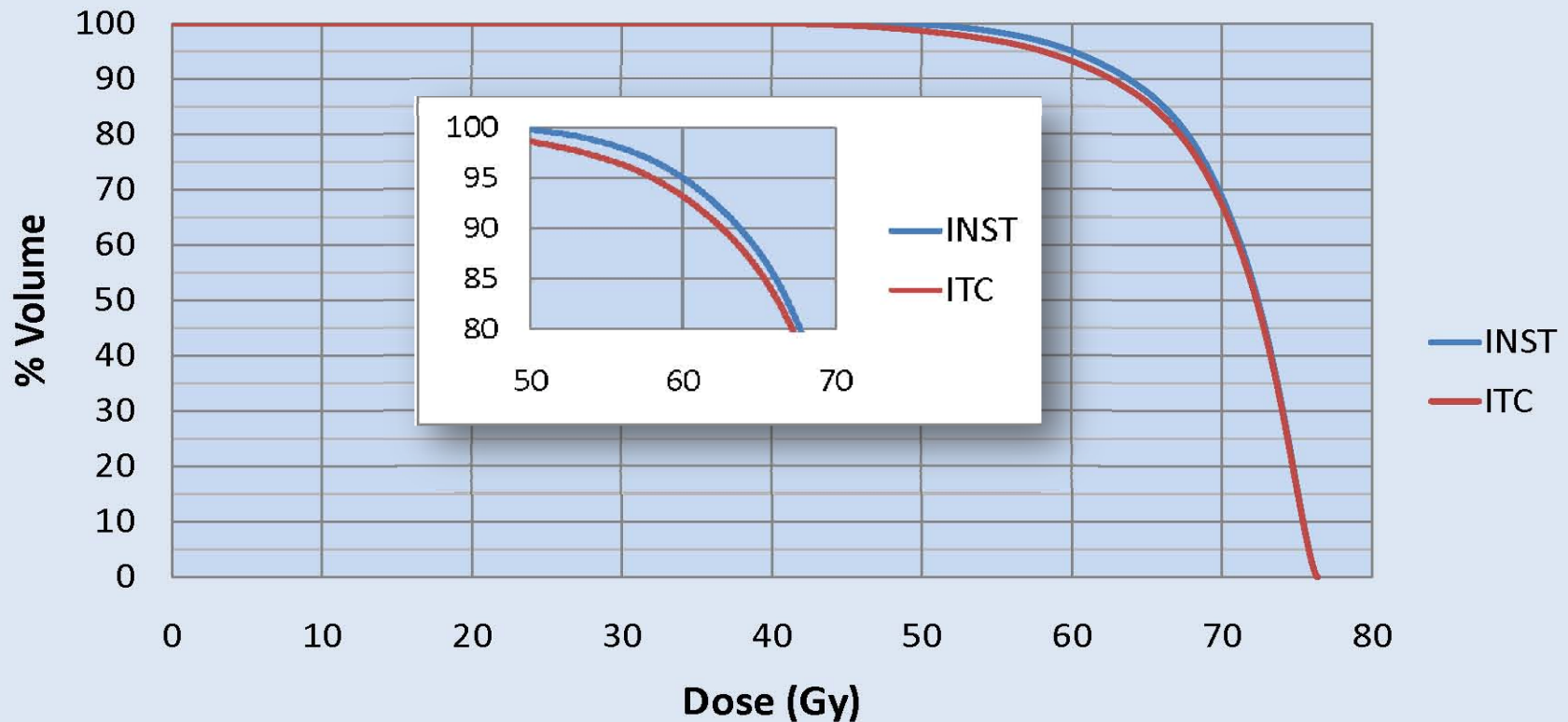


Effect of structure shape and orientation

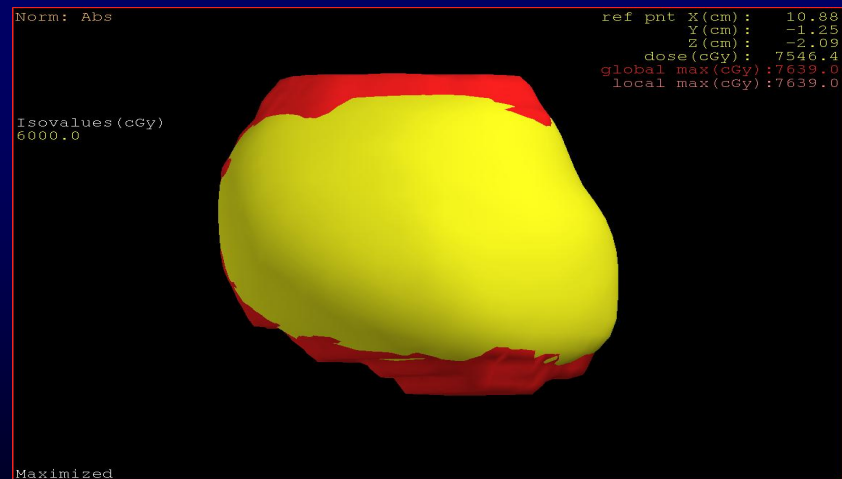
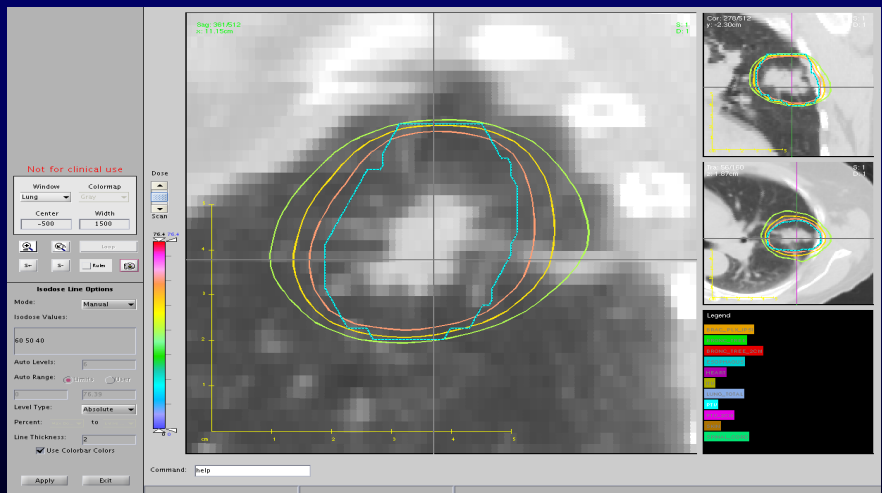
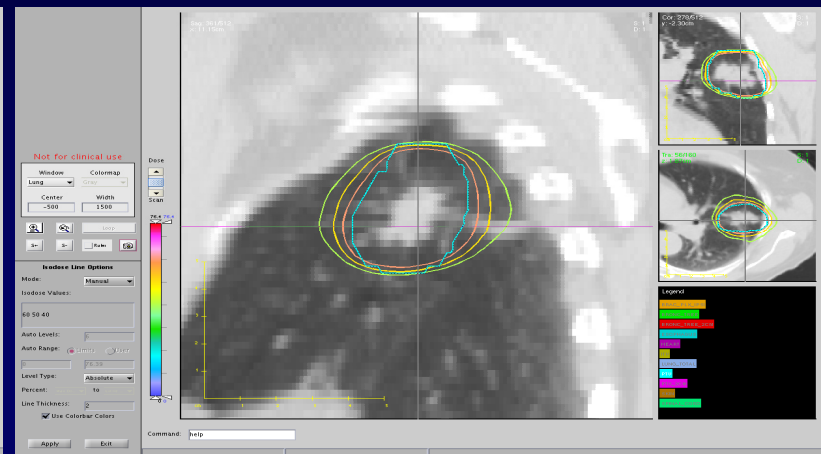
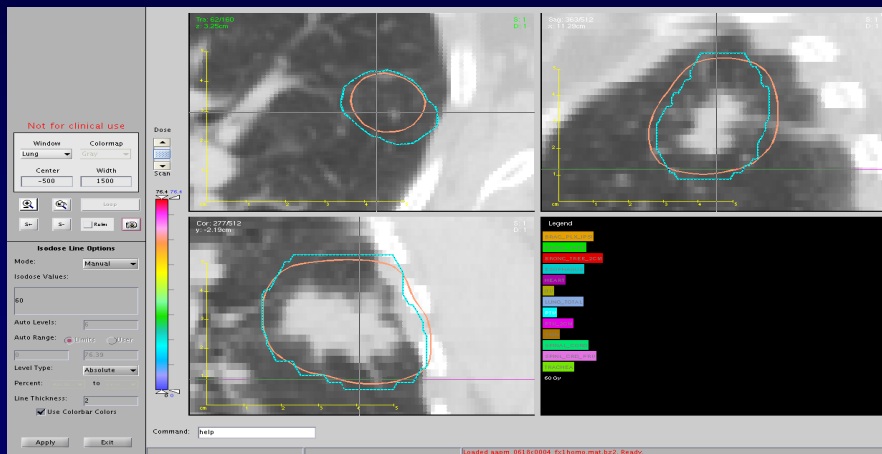


Demonstrated in protocol case: impact on review

Comparison of ITC calculated DVHs and submitted DVHs from a commercial treatment planning system for a protocol case



Demonstrated in protocol case: impact on review



Example of dose resolution

ITC RRT - Case: 0813c0007 - User: wlsrtog - v.07022001 - Microsoft Internet Explo...

Isodose Contours Plan: fx1hetero

31.50 Gy 0.00 Gy 0.00 Gy
 0.00 Gy 0.00 Gy 0.00 Gy

Structures (dashed when isodoses are displayed)

All Off All On

ON	ON
<input type="checkbox"/> BRAC_PLX_CNTR	<input type="checkbox"/> PTV
<input checked="" type="checkbox"/> BRAC_PLX_IPSI	<input type="checkbox"/> PTV_2CM
<input type="checkbox"/> BRONC_TREE	<input type="checkbox"/> SKIN
<input type="checkbox"/> BRONC_TREE_2CM	<input type="checkbox"/> SKINOAR
<input type="checkbox"/> ESOPHAGUS	<input type="checkbox"/> SPINAL_CORD
<input type="checkbox"/> GTV-T_ex-5000	<input type="checkbox"/> TRACHEA
<input type="checkbox"/> GTV-T_in-5000	<input type="checkbox"/> VESSELS
<input type="checkbox"/> HEART	<input type="checkbox"/> brachi-subclav-axill vein
<input type="checkbox"/> ITV-T-5000	<input type="checkbox"/> matchISODOSE-XXXXX

DVH: ITC Re-calc DVH

Struct: PTV Eval DVH

PTV

Plan ID	Vol ≥ Ref	Max	Min	Mean
fx1hetero	95.90 %	61.40 Gy	39.10 Gy	56.50 Gy
fxhires	96.70 %	61.50 Gy	37.30 Gy	56.60 Gy

Vol = 34.10 cc Conf_index = 0.824 [DVH Data File](#)

SLICE: -8.65 CM ZOOM: 2

W/L Preset: Default (soft tissue)

Win: 470 Lvl: 20 Update

ITC Remote Review Tool

Effect of increasing resolution of dose matrix from 2.5 mm grid size to 1.5 mm grid size

ITC RRT - Case: 0813c0007 - User: wlsr

SLICE: -8.65 CM

ITC RRT - Case: 0813c0007 - User: wlsrtog - v.07022001 - Microsoft Internet Explo...

SLICE: -8.65 CM ZOOM: 32

Update Image Edit Contours Contour Colors

Isodose Contours Plan: fxhires

31.50 Gy 0.00 Gy 0.00 Gy

0.00 Gy 0.00 Gy 0.00 Gy

Structures (dashed when isodoses are displayed)

All Off All On

<input type="checkbox"/> BRAC_PLX_CNTR	<input type="checkbox"/> PTV
<input checked="" type="checkbox"/> BRAC_PLX_IPSI	<input type="checkbox"/> PTV_2CM
<input type="checkbox"/> BRONC_TREE	<input type="checkbox"/> SKIN
<input type="checkbox"/> BRONC_TREE_2CM	<input type="checkbox"/> SKINOAR
<input type="checkbox"/> ESOPHAGUS	<input type="checkbox"/> SPINAL_CORD
<input type="checkbox"/> GTV-T_ex-5000	<input type="checkbox"/> TRACHEA
<input type="checkbox"/> GTV-T_in-5000	<input type="checkbox"/> VESSELS
<input type="checkbox"/> HEART	<input type="checkbox"/> brachi-subclav-axill vein
<input type="checkbox"/> ITV-T-5000	<input type="checkbox"/> matchISODOSE-XXXX

DVH: ITC Re-calc DVH

Struct: PTV Eval DVH

PTV

Plan ID	Vol ≥ Ref	Max	Min	Mean
fxlhetero	95.90 %	61.40 Gy	39.10 Gy	56.50 Gy
fxhires	96.70 %	61.50 Gy	37.30 Gy	56.60 Gy

Vol = 34.10 cc Conf_index = 0.824 [DVH Data File](#)

Sup ↑ Inf ↓ Image Click Mode

Print EXIT Zoom In

W/L Win:

Sup ↑ Inf ↓ Image Click Mode

Print EXIT Zoom In

W/L Preset: Default (soft tissue)

Win: 470 Lvl: 20 Update

ITC Remote Review Tool