

# Experience gained from the RPC's credentialing programs for advanced technology clinical trials



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*Making Cancer History®*

# Credentialing Techniques

## Phantoms



## Benchmarks



# Purpose of Credentialing

- Education
- Evaluate ability to deliver dose
- Improve understanding of protocol
  - **Reduce deviation rate**

# General Credentialing Process

- Previous patients treated with technique
- Facility Questionnaire
- Knowledge Assessment Questionnaire
- Benchmark case or phantom irradiation
- Electronic data submission
- RPC QA & dosimetry review
- Clinical review by radiation oncologist

**Feedback to Institution**



QuickTime™ and a  
TIFF (Uncompressed) decompressor  
are needed to see this picture.

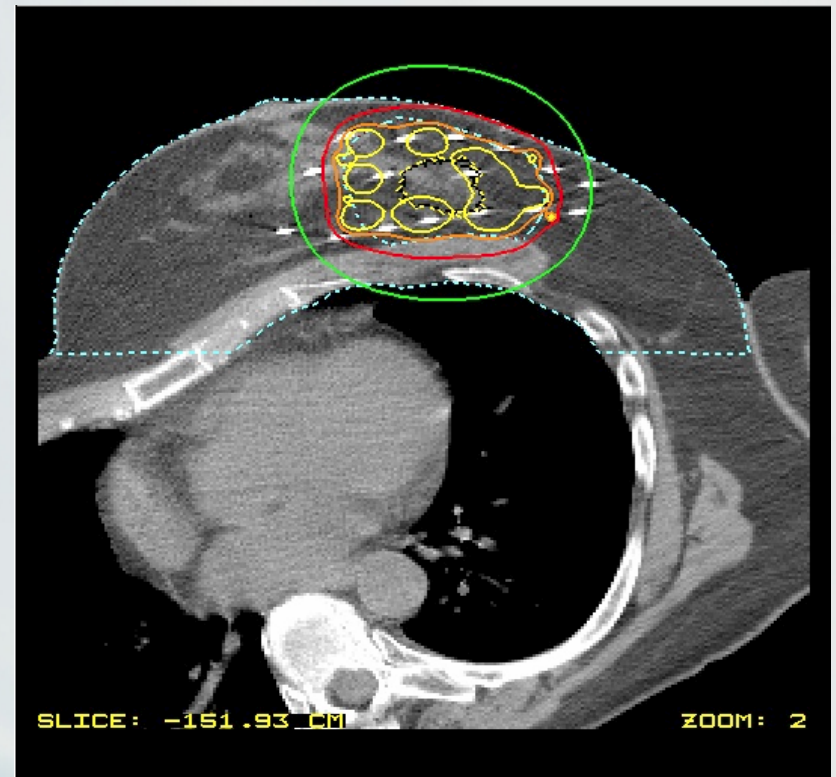
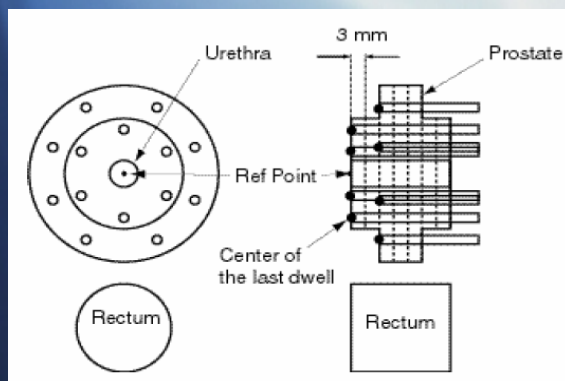
# Credentialing 3D Conformal Radiation Therapy (3D CRT)

- Evaluate 3D treatment planning process and ability to provide documentation
- 449 credentials issued to 414 distinct institutions to date
  - Most through NSABP/RTOG partial breast irradiation (PBI) trial

# Credentialing

## LDR and HDR Brachytherapy

- Evaluate
  - Implant technique
  - Dosimetry
  - Documentation
  - Protocol compliance



# Credentials Awarded (based on benchmarks)

	<u>Credentials</u>	<u>Institutions</u>
Prostate LDR (0232)	70	63
Prostate HDR (0321)	11	7
Breast 3D CRT (0413)	792	364
Breast Mammosite®	497	245
Breast Multicatheter	115	41
Other 3D CRT (NCCTG)	52	52
Cervix (GOG)	55	46
<b>TOTAL</b>	<b>1,592</b>	<b>611</b>

# Results of Credentialing

## (closed studies)

Study	Major Deviations	Minor Deviations	Number of Patients
GOG 165 HDR Cervix Credentialed inst	0	15	70
RTOG 95-17 HDR & LDR Breast (all)	0	4	100
RTOG 0019 LDR Prostate (values for dose only)	0	6	117 reviewed (total 129 eligible)



# Results of Credentialing

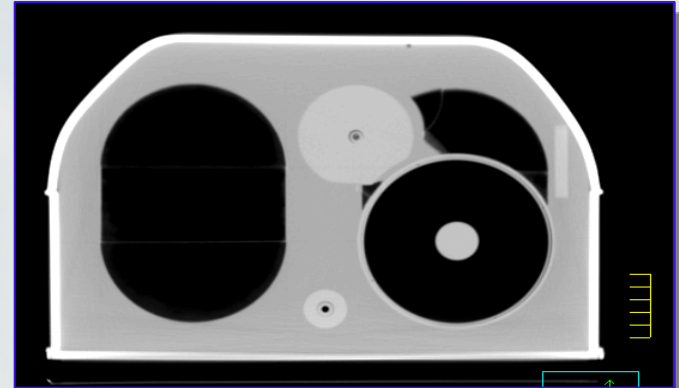
## (closed studies)

Study	Major Deviations	Minor Deviations	Number of Patients
GOG 165 HDR Cervix Credentialed inst	0	15	70
Non-credentialed	57	87	275
RTOG 95-17 HDR & LDR Breast (all)	0	4	100
RTOG 0019 LDR Prostate (values for dose only)	0	6	117 reviewed (total 129 eligible)

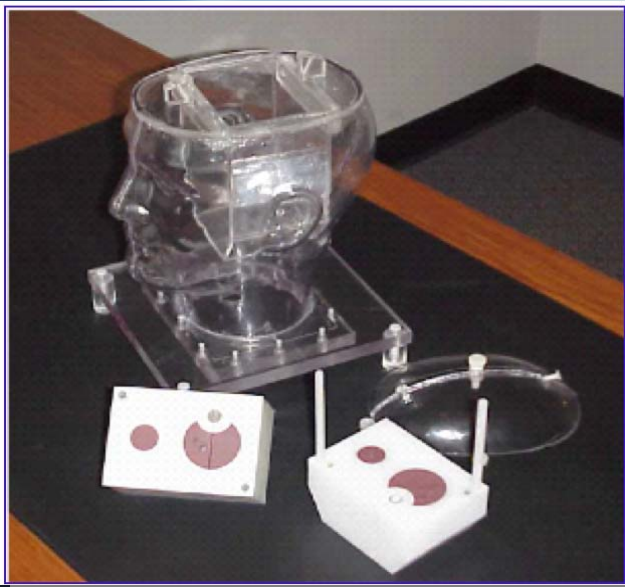
# RPC Phantoms



prostate IMRT: 4, incl. prosthesis



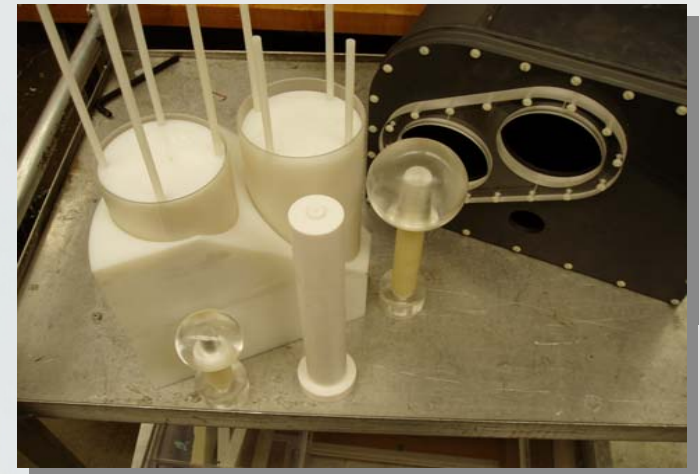
thorax SBRT: 3 phantoms,  
6 under construction



H&N IMRT: 20 in  
service, 5 under  
constr.

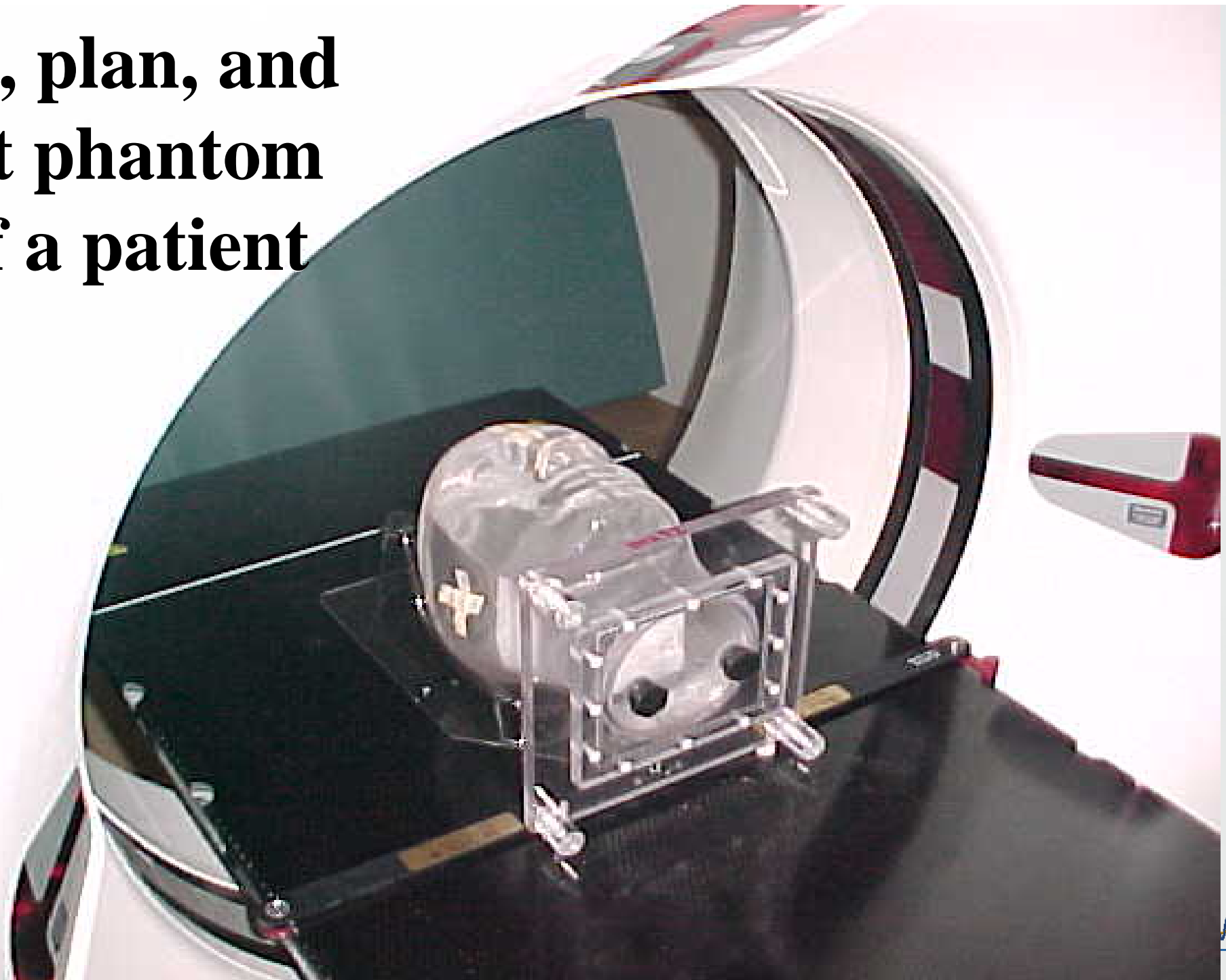


SRS: 2 in service, others  
sent by RDS



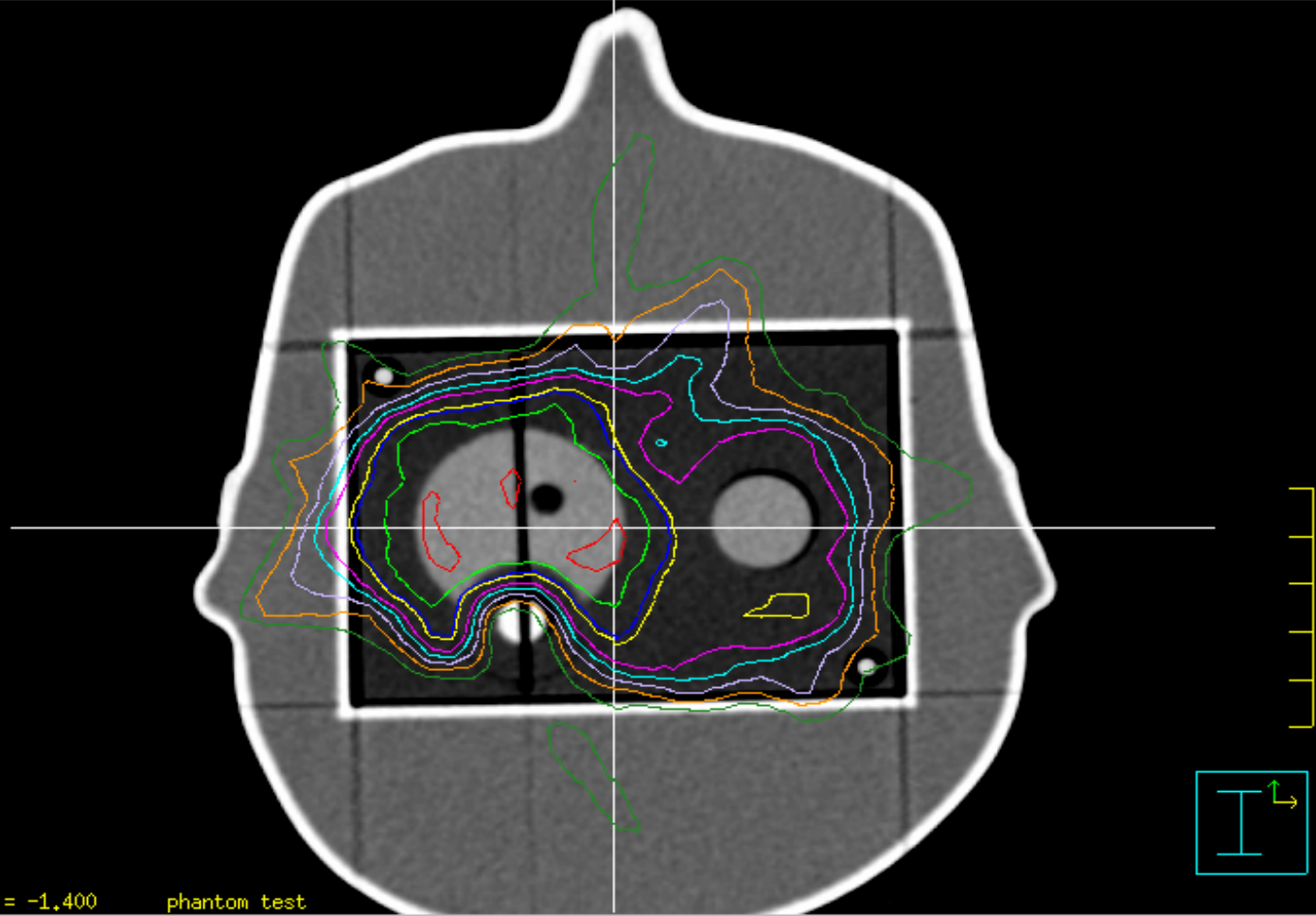
liver SBRT: 3,  
incl. motion

**Scan, plan, and  
treat phantom  
as if a patient**



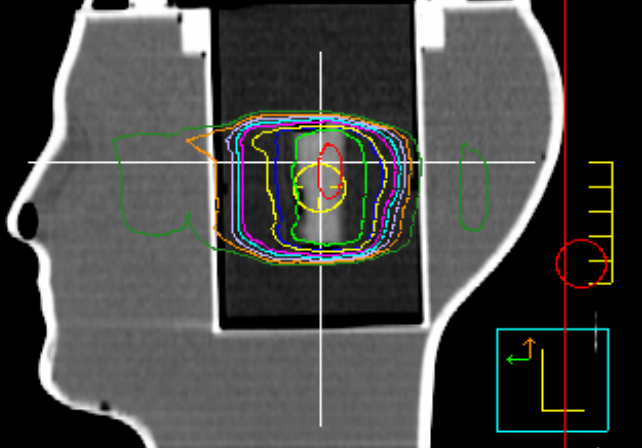


Absolute  
700.0 cGy  
660.0 cGy  
614.0 cGy  
600.0 cGy  
540.0 cGy  
502.0 cGy  
450.0 cGy  
400.0 cGy  
350.0 cGy

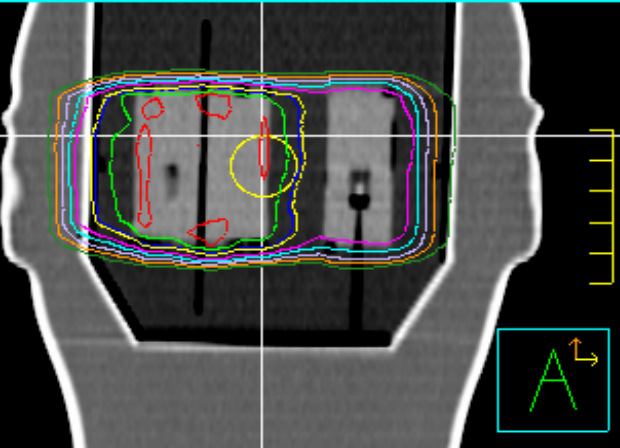


Slice 83: Z = -1.400 phantom test

Absolute  
700.0 cGy  
660.0 cGy  
614.0 cGy  
600.0 cGy  
540.0 cGy  
502.0 cGy  
450.0 cGy  
400.0 cGy  
350.0 cGy

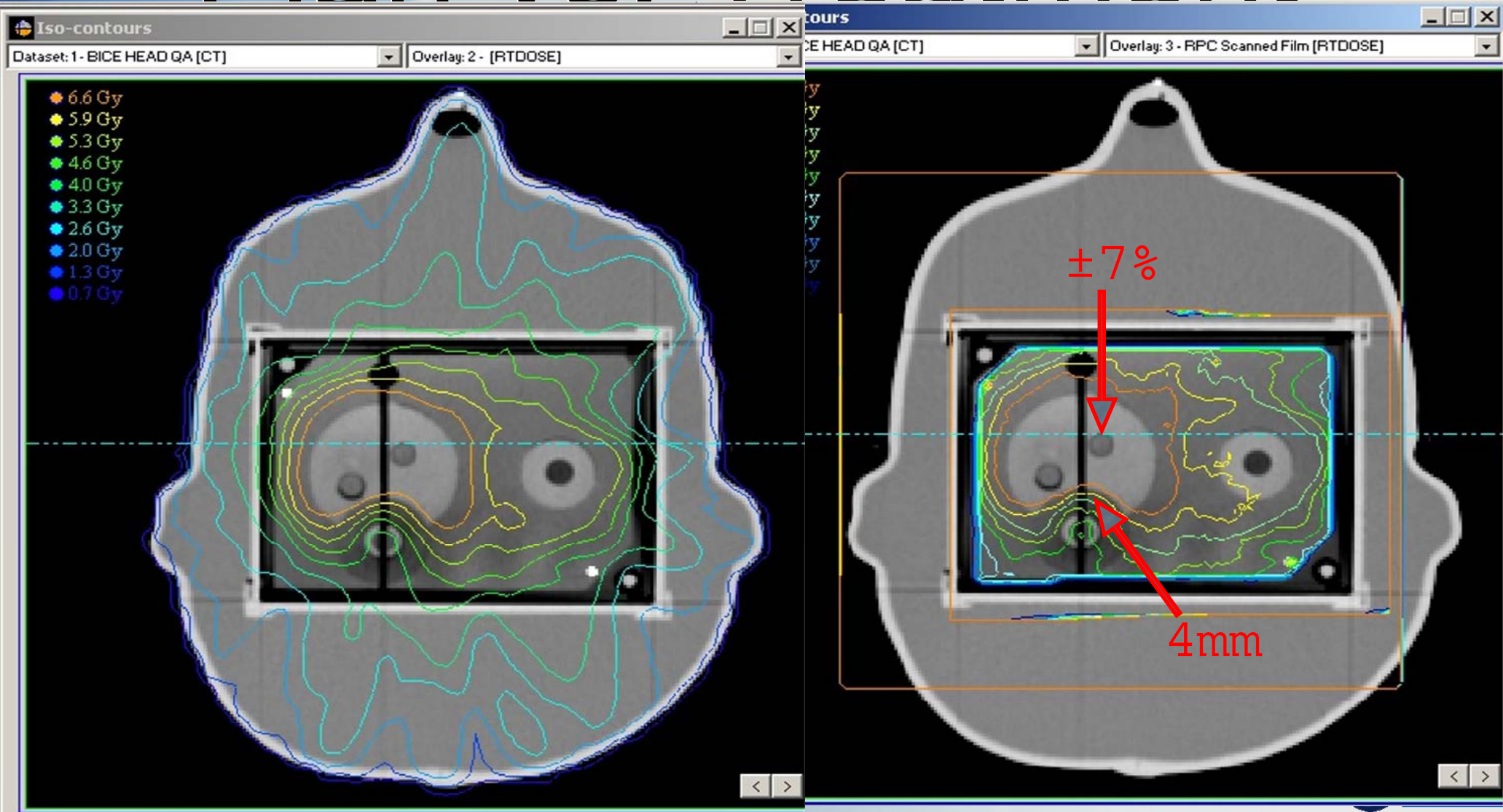


Absolute  
700.0 cGy  
660.0 cGy  
614.0 cGy  
600.0 cGy  
540.0 cGy  
502.0 cGy  
450.0 cGy  
400.0 cGy  
350.0 cGy

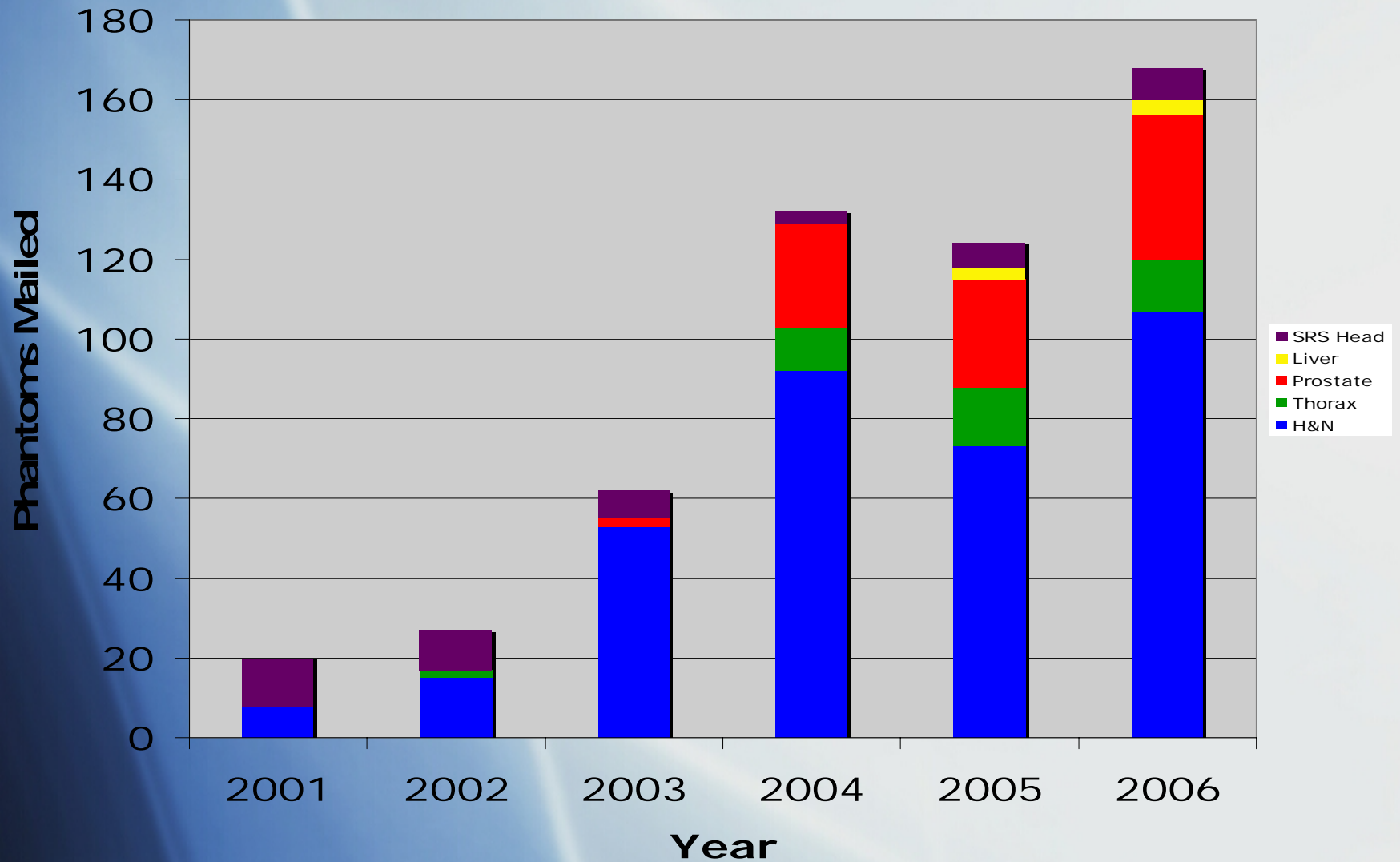




# Plan vs. Treatment



# Number of Phantom Mailings



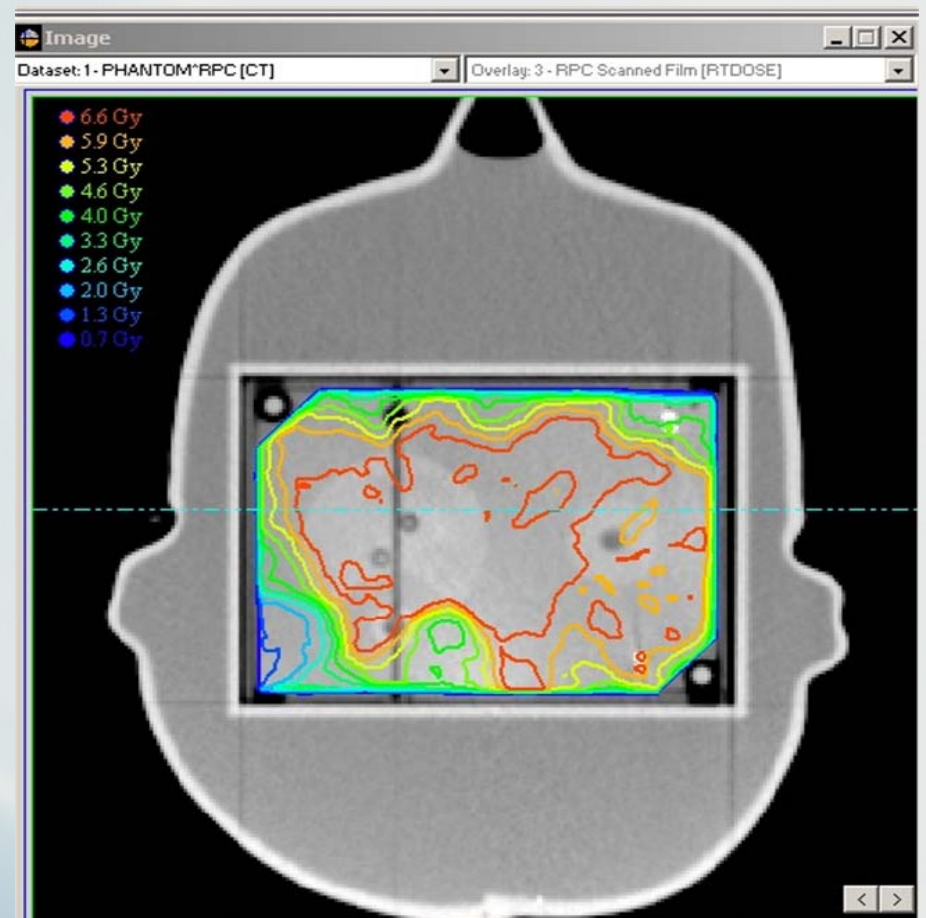
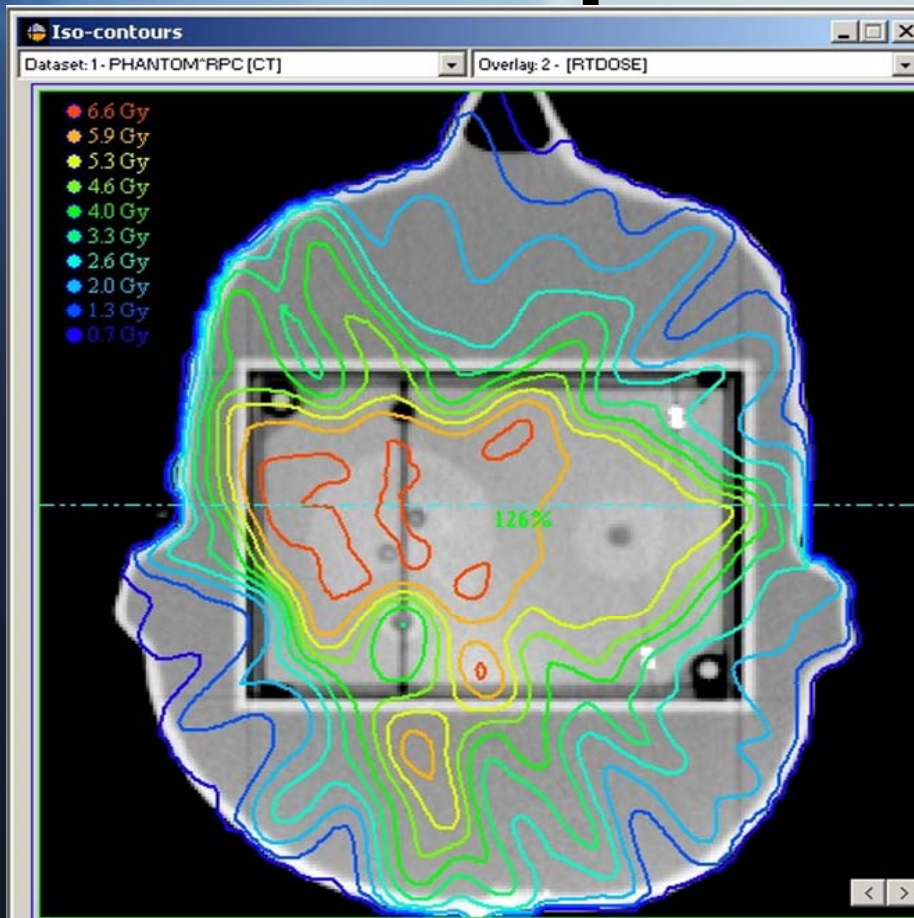
# Phantom Results

Phantom	H&N	Prostate	Thorax	Liver
Irradiations	<b>254</b>	73	30	6
Pass	<b>179*</b>	55	17	3
Fail	<b>71</b>	9	7	1
Under analysis or at institution	30	6	6	1
Year introduced	2001	Spring 2004	Spring 2004	Spring 2005

**\* 30% of institutions failed H&N phantom on the first attempt**



# Examples of Failures



13-15 Nov 2006

IAEA/QANTRM

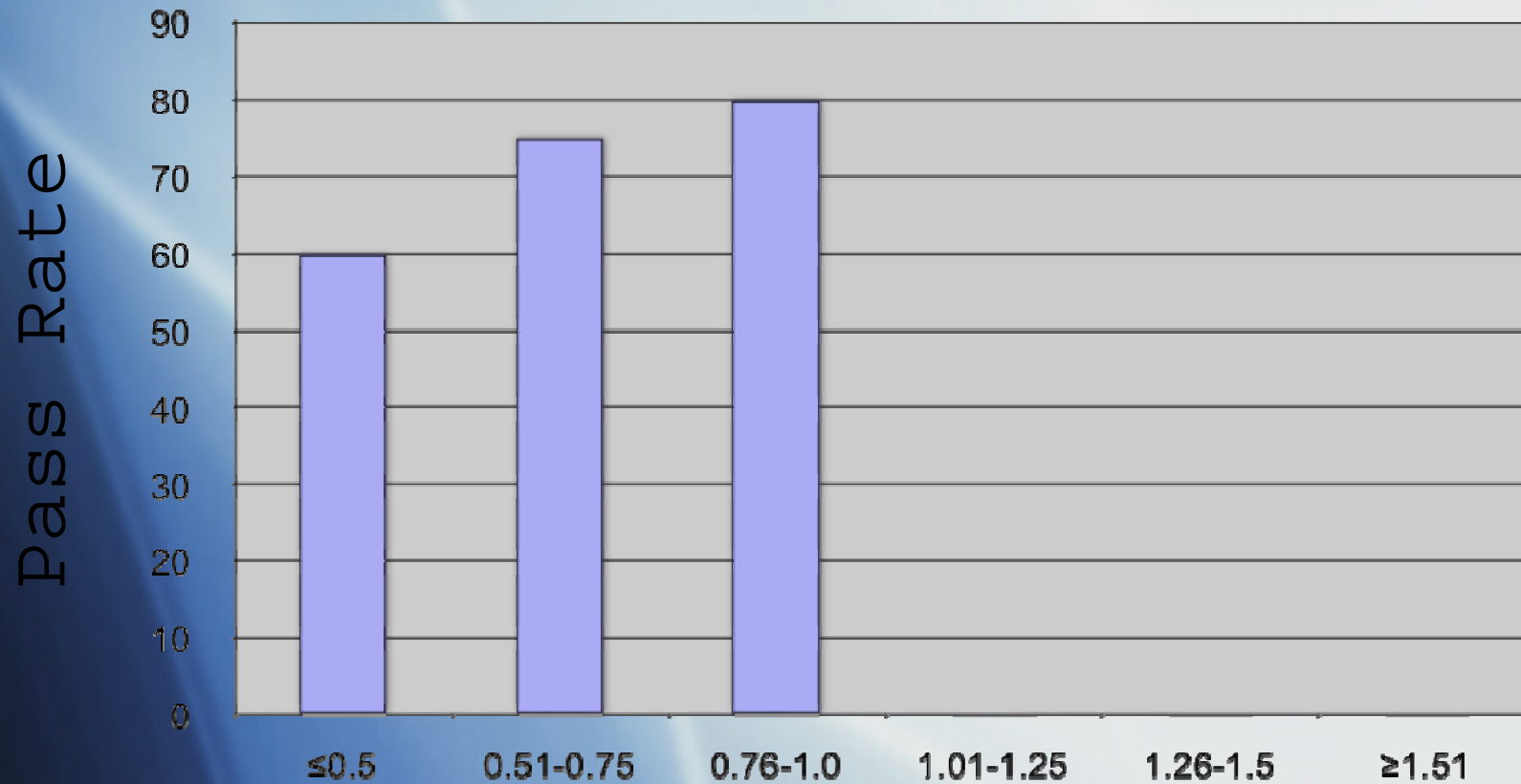




# Explanations for Failures

<b>Explanation</b>	<b>Minimum # of occurrences</b>
<b>incorrect output factors in TPS</b>	<b>1</b>
<b>incorrect PDD in TPS</b>	<b>1</b>
<b>inadequacies in beam modeling at leaf ends (Cadman, et al; PMB 2002)</b>	<b>14</b>
<b>not adjusting MU to account for dose differences measured with ion chamber</b>	<b>3</b>
<b>errors in couch indexing with Peacock system</b>	<b>2</b>
<b>2 mm tolerance on MLC leaf position</b>	<b>1</b>
<b>setup errors</b>	<b>7</b>
<b>target malfunction</b>	<b>1</b>

# Physicists per machine



# Lung Phantom Irradiations

TPS	Dose Calc. Algor correction on	Number of irradiations	$D_{\text{hetero}}/D_{\text{homo}}$
Precise v 2.01	Scatter Integ. Clarkson Type	2	$1.19 \pm 2.6\%$
BrainLab	Clarkson & Pencil Beam	4	$1.21 \pm 0\%$
Eclipse	Pencil Beam	2	$1.19 \pm 4.6\%$
Ergo	3D Convolution Pencil Beam	1	$1.19 \pm 0.1\%$
Pinnacle v 6.2, 6.4, 7.0g, 7.4f	Adaptative Convolve	8	$1.13 \pm 2.1\%$
Render plan	Change in primary attenuation	1	1.20
XiO	Superposition/ Convolution	3	$1.12 \pm 2.4\%$
<b>Total</b>		<b>21</b>	<b>1.18</b>

# TLD Dose vs. Hetero Corrected Plan

TPS	Dose Calc. Algor correction on	Number of irradiations	$D_{TLD}/D_{hetero}$
Precise v 2.01	Scatter Integ. Clarkson Type	2	$0.99 \pm 3.1\%$
BrainLab	Clarkson & Pencil Beam	4	$0.96 \pm 2.7\%$
Eclipse	Pencil Beam	2	$0.97 \pm 1.6\%$
Ergo	3D Convolution Pencil Beam	1	$0.98 \pm 3.2\%$
Pinnacle v 6.2, 6.4, 7.0g, 7.4f	Adaptative Convolve	8	$0.99 \pm 2.3\%$
Render plan	Change in primary attenuation	1	0.92
XiO	Superposition/ Convolution	3	0.96*
<b>Total</b>		<b>21</b>	<b>0.97</b>



# The End

