



RPC's Credentialing Programs for Clinical Trials

July 19, 2010
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and RPC Staff

Mission

The mission of the Radiological Physics Center is to assure NCI and the Cooperative Groups that institutions participating in clinical trials deliver prescribed radiation doses that are clinically comparable and consistent.

Now 42 years of experience of building an infrastructure, establishing communications with institutions, developing relationships with study groups and QA offices, and adding value to the clinical trials program

RPC Programs

- Assurance of constancy of basic machine calibration
- Assurance of validity of treatment planning data
- Assurance of consistency of treatment records
- Credentialing of advanced technology procedures

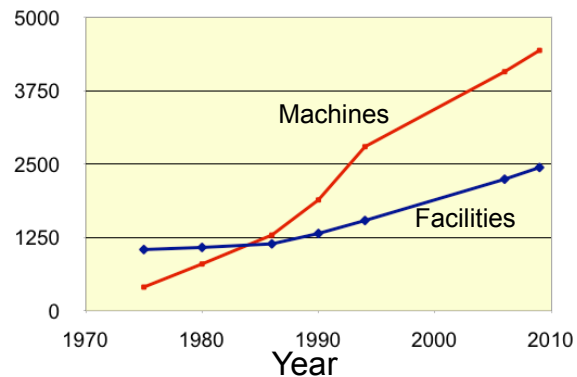


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Assurance of Constancy of Basic Machine Calibration

- RPC monitors 1,768 institutions, of which ~1,600 are in the US
- Increase from 1,338 in 2005 (32%)
- Number of radiation beams has increased more rapidly

US Machines & Facilities



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Improvements to Annual TLD Audits

- Monitor ~ 14,000 beams/yr
- Review of instructions
- Conversion from TLD to OSL



Verification of Standard Output

- **Photon and electron beams from conventional linear accelerators**
- **CyberKnife**
- **TomoTherapy**
- **Gamma Knife**
- **Protons**

TLD vs OSL

- LiF:Mg,Ti (TLD-100) capsules
- Disposable
- One reading
- Temperature and weight control .
- 3 dosimeters per point
- 6 min reading time
- Dosimeter cost per check \$2.40
- (Al₂O₃:C) nano dots
- Reusable (dose limit ~ 10Gy)
- Re-readable
- No temp/weight ctrl, light tightness
- 2 dosimeters per point,
- ~ 2 min reading time
- Dosimeter cost per check \$1.00



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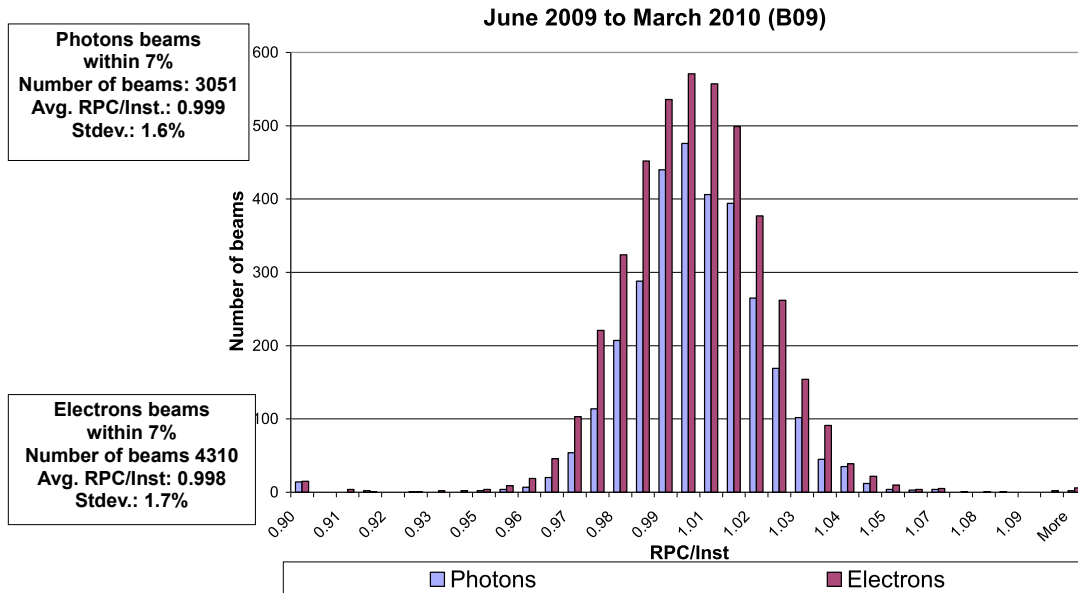
Equipment

OSL

TLD

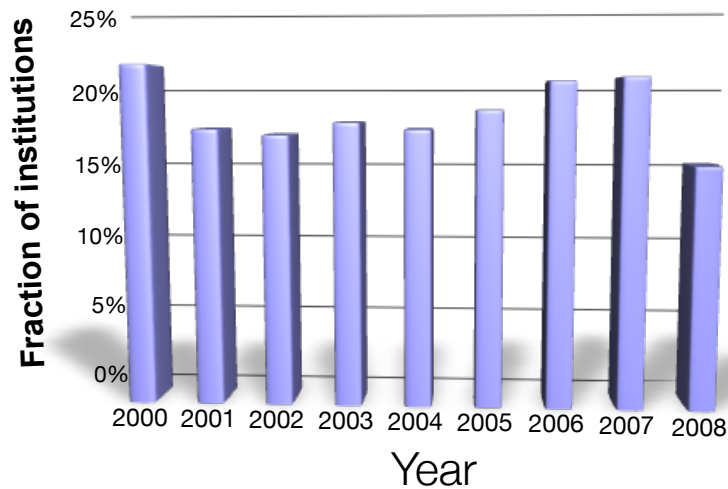
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Distribution of TLD results



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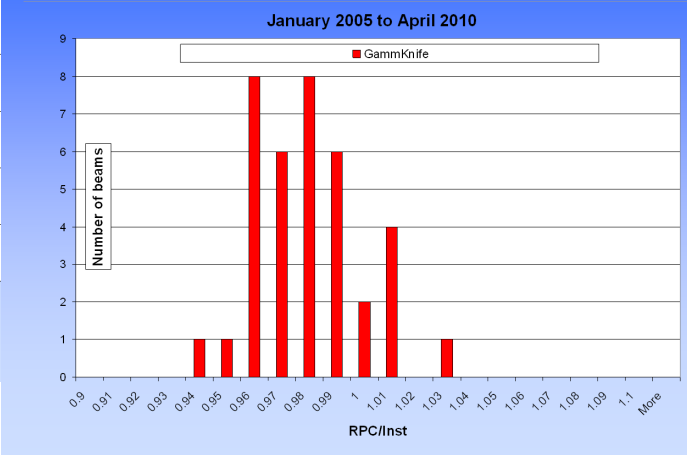
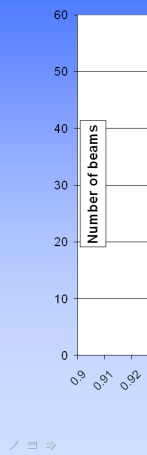
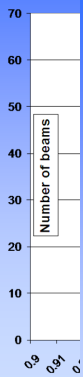
Institutions with One or More Unacceptable TLD Measurements



Distribution of TLD results

Distribution of TLD results

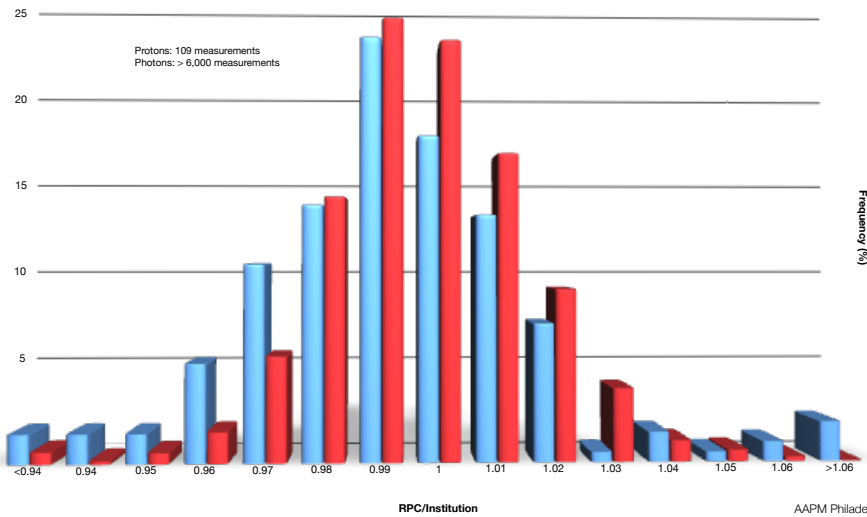
Distribution of TLD results



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TLD measurements in proton beams

Proton TLD Frequency Distribution



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Web-Based Facility Questionnaire

Facility Questionnaire
PART I (Demographics and Technical Survey) 2595

All textboxes can be edited. Please verify correctness of data. Click **Submit** on the bottom of the page to save and submit your changes/additions. Use the appropriate **Button** for the accommodating commands. **Please make sure** to click the **Acknowledge** button at the end of the form to verify that the information are correct to the best of your knowledge.

Institution Info

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Telephone:	<input type="text" value="3193567591"/>	Extension:	<input type="text"/>
Person submitting this form	<input type="text"/>	Zipcode	<input type="text" value="52242"/>
Email	<input type="text"/>	Phone:	<input type="text"/>
		Fax:	<input type="text" value="3193849749"/>

Person submitting this form:

Email: Phone: [TLD/OSL and Billing Address](#)

List the **main** individuals responsible for general question regarding clinical Trials and dosimetry compliance (TLD monitoring) for this cooperative group

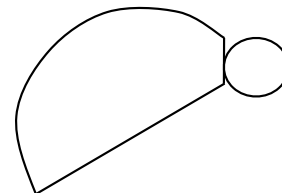
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Telephone	<input type="text"/>	Fax	<input type="text"/>
Research Associate:	<input type="text" value="Kelli Bodecker"/>	Email	<input type="text"/>
Telephone	<input type="text"/>	Fax	<input type="text"/>
Dosimetrist:	<input type="text"/>	Email	<input type="text"/>
Telephone	<input type="text"/>	Fax	<input type="text"/>
Radiation	<input type="text" value="John Buatti"/>	Email	<input type="text"/>

RPC Phantoms

Pelvis (10)

Thorax (13)

Spine (3)



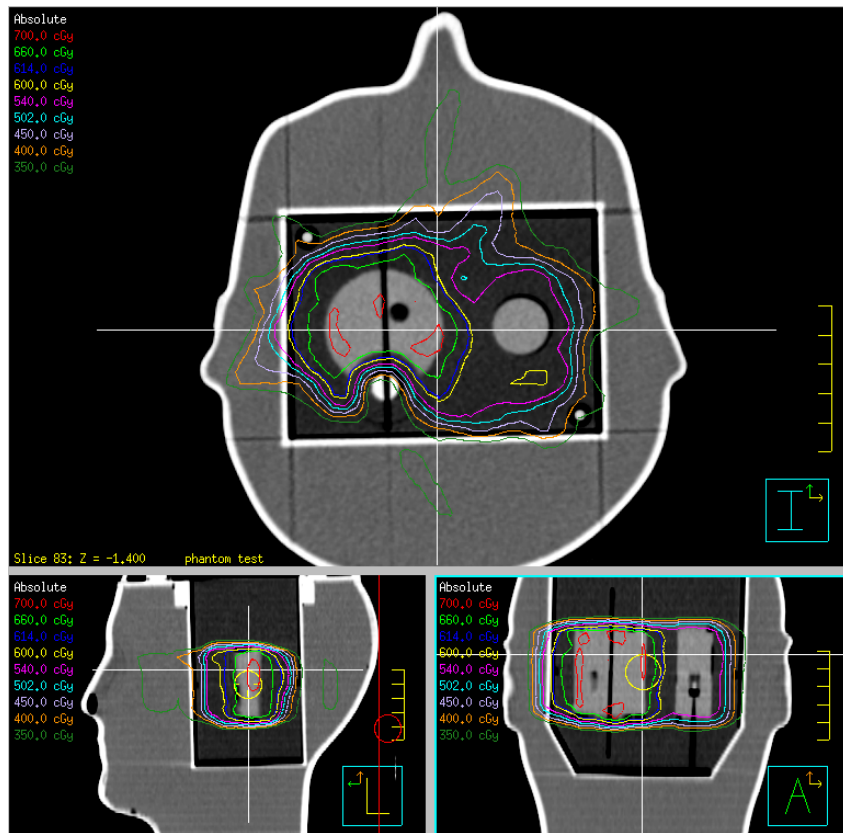
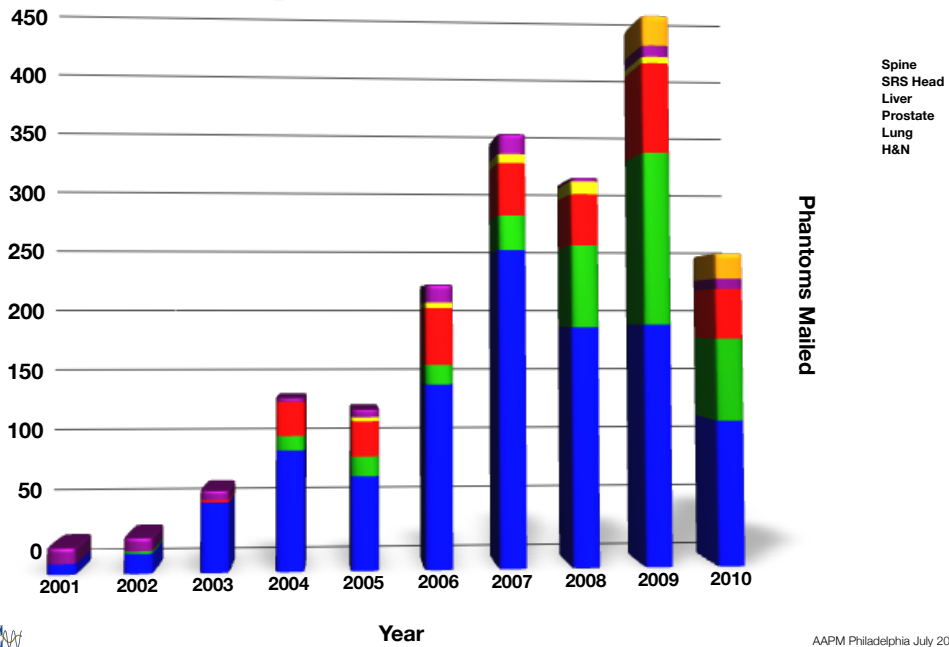
H&N (31)

Liver (2)

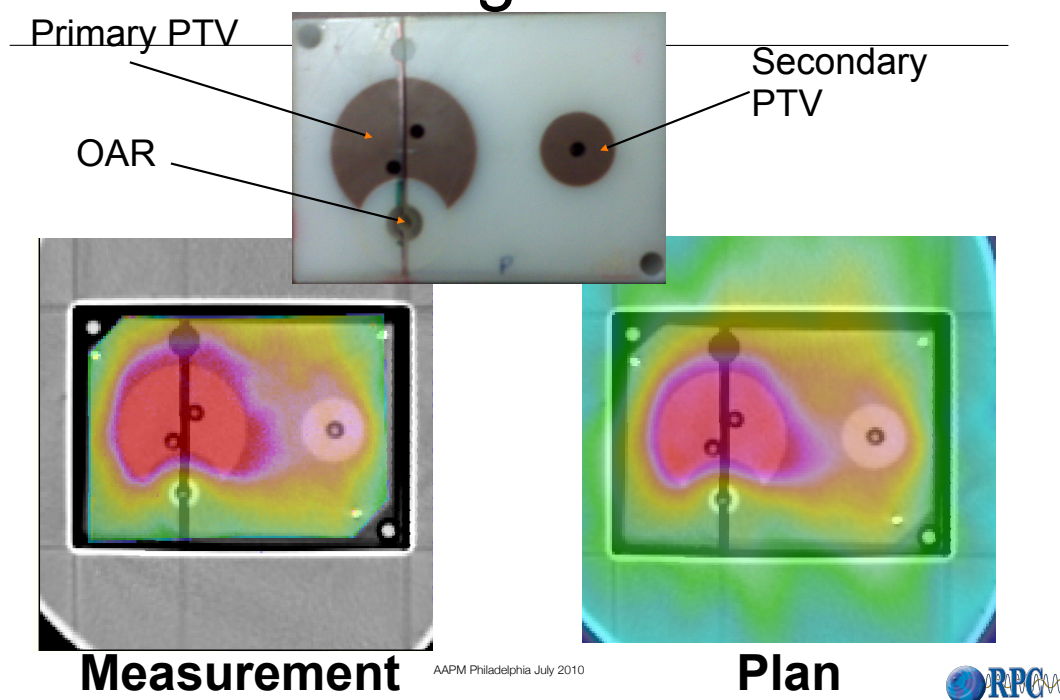
SRS Head (4)



Number of Phantoms Mailed per Year



Good Agreement



Phantom Results

Comparison between institution's plan
and delivered dose.

Phantom	H&N	Prostate	Spine	Lung	Liver
Irradiations	752	174	19	174	23
Pass	585	143	13	124	12
Pass %	78%	82%	68%	71%	52%
Criteria	7%/4mm	7%/4mm	5%/3mm	5%/5mm	7%/4mm
Year introduced	2001	2004	2009	2004	2005

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Phantom notes

- 🌐 Lung phantoms: Passing rate same for static vs. moving irradiations
- 🌐 Spine phantoms: Lengthy waiting list. 4 new phantoms under construction

Proton therapy facilities

- ✘ Presently 7 clinically-active US proton therapy centers
- ✘ ≥ 2 new centers expected to open this year, perhaps 5 more in next 2 years
- ✘ Several trials in development to allow protons
- ✘ NCI has provided funds for a consultant to refine visit procedures and lead visits to 5 centers during 2010

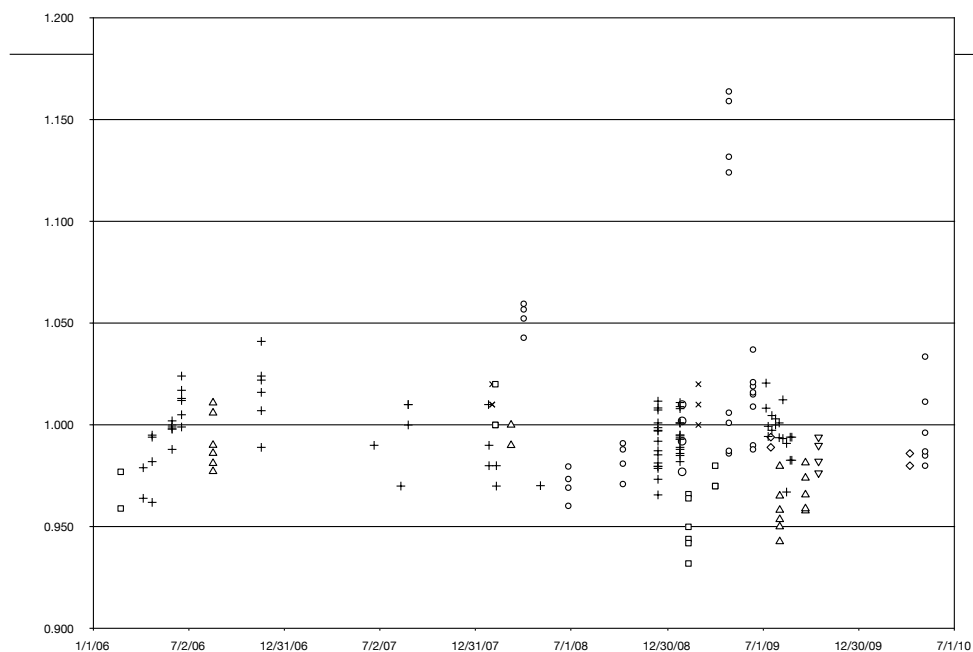
Proton Facility Approval

- * NCI Guidelines mandate –
 - * Questionnaire - sent to facilities by QARC
 - * Completed by 4 centers
- * TLD monitoring
 - * Mailed to 7 US centers + 1 Japanese center
- * On-site dosimetry review visits
 - * 2 visits completed (initial level of approval)
 - * 3 visits under way, to be completed this year
- * Anthropomorphic phantoms
 - * Modifications to existing phantoms



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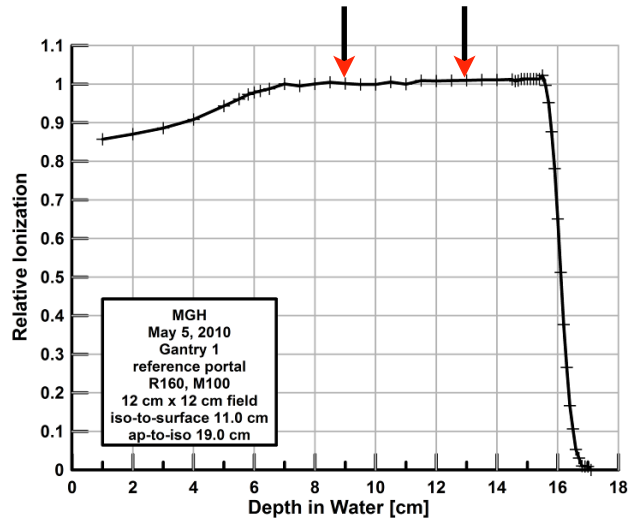
Proton Beam Monitoring



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TLD: Output and Depth Dose Measurements

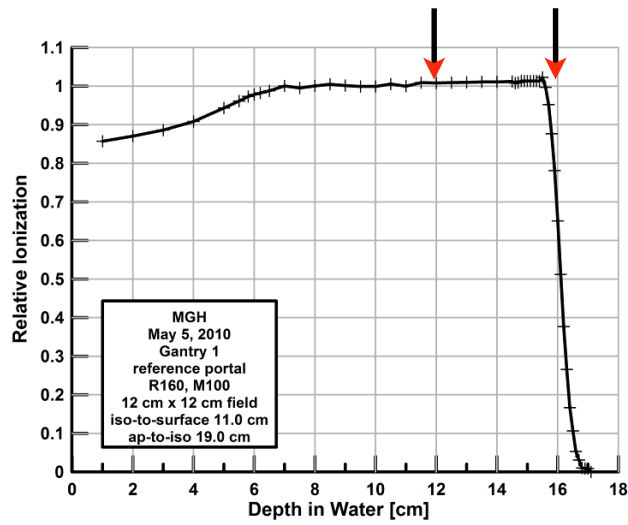
Most measurements at mid-SOBP ± 2 cm



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TLD: Output and Depth Dose Measurements

Recent measurements at mid-SOBP and \sim distal 90%



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Visits - Review of Institution Procedures and Records

- Beam measurements & QA:
 - Profiles - lateral and depth
 - Dose/MU reproducibility
 - Annual QA
- Review of treatment planning
 - Planning procedures
 - Optimization
 - Prescription
- CT procedures
 - Scanning protocols
 - CT # scaling
 - CT # to RLSP conversion



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Visits: Measurements on Site

- CT # and conversion to RLSP
- Imaging system quality, dose and alignment
- Anatomical phantom
 - Contouring
 - Planning
 - Dosimetry
- Beam measurements - representative fields for pituitary, spine, lung, prostate
 - Depth dose
 - Dose/MU
 - Lateral profiles (deferred)
- Recommendations

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Phantoms

- Existing pelvis phantom was modified
 - Irradiated at 2 facilities

- Lung phantom modifications underway
 - Materials tested
 - Dosimetry insert constructed
 - Evaluation of phantom underway

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Brain Phantom

- Selected Phantom Lab “Alderson” phantom
 - Materials fall on CT#-RLSP curve
 - Contains realistic bony anatomy
 - Inserts with target and dosimetry will be constructed

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Next Steps

- Continue to focus on approving proton centers
- Continue development work on phantoms
- Funding received from NCI through the MGH grant
 - Supports a consultant 0.25 FTE
 - Scheduling visits to 3 additional centers
- Goal is to have at least 5 proton centers approved by end of 2010



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International Participation

- RPC has audited international institutions that are members of US study groups, as part of routine audits
- In 2007, RPC was approached by EORTC to consider offering TLD audits to EORTC members, at cost
- Following agreement among RPC, EORTC and NCI, EORTC began recommending RPC's TLD service to their members
- Subsequent meetings between RPC, EORTC, and other groups have been held to discuss expanding auditing procedures
- RPC now auditing 134 non North-American institutions
 - Including 95 EORTC members



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International Clinical Trials

- RTOG (and several other study groups) are expanding trials to international participation
- Through agreements with EORTC, RPC will make phantoms available to international participants in NCI-sponsored clinical trials
 - EORTC staff trained to load/unload dosimeters
- Proposal for international workshops in development
- Meeting scheduled at IAEA in November to coordinate QA oversight

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Irradiation of RPC Phantoms

- Through various arrangements, 25 international institutions have already irradiated RPC phantoms
- Arrangements are being discussed for providing phantoms to additional institutions in Europe, the Middle East, Australasia and Latin America
- Through agreement with the RTOG and NCI, international non-member institutions participating in RTOG trials will meet the same QA requirements as member institutions

<http://rpc.mdanderson.org>

Supported by NCI
grants CA10953 and
CA81647



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