

The Radiological Physics Center (RPC): 45 Years of Improving Radiotherapy Dosimetry



Radiological Physics Center

- Funded continuously by the NCI for nearly 45 years (one of the 12 longest running NCI grants) even as structure of cooperative group programs have changed over the years.

Only Four Directors

1. R Shalek (1968-1985)
2. W. Hanson (1985-2001)
3. G Ibbott (2001-2010)
4. D Followill (2010-present)

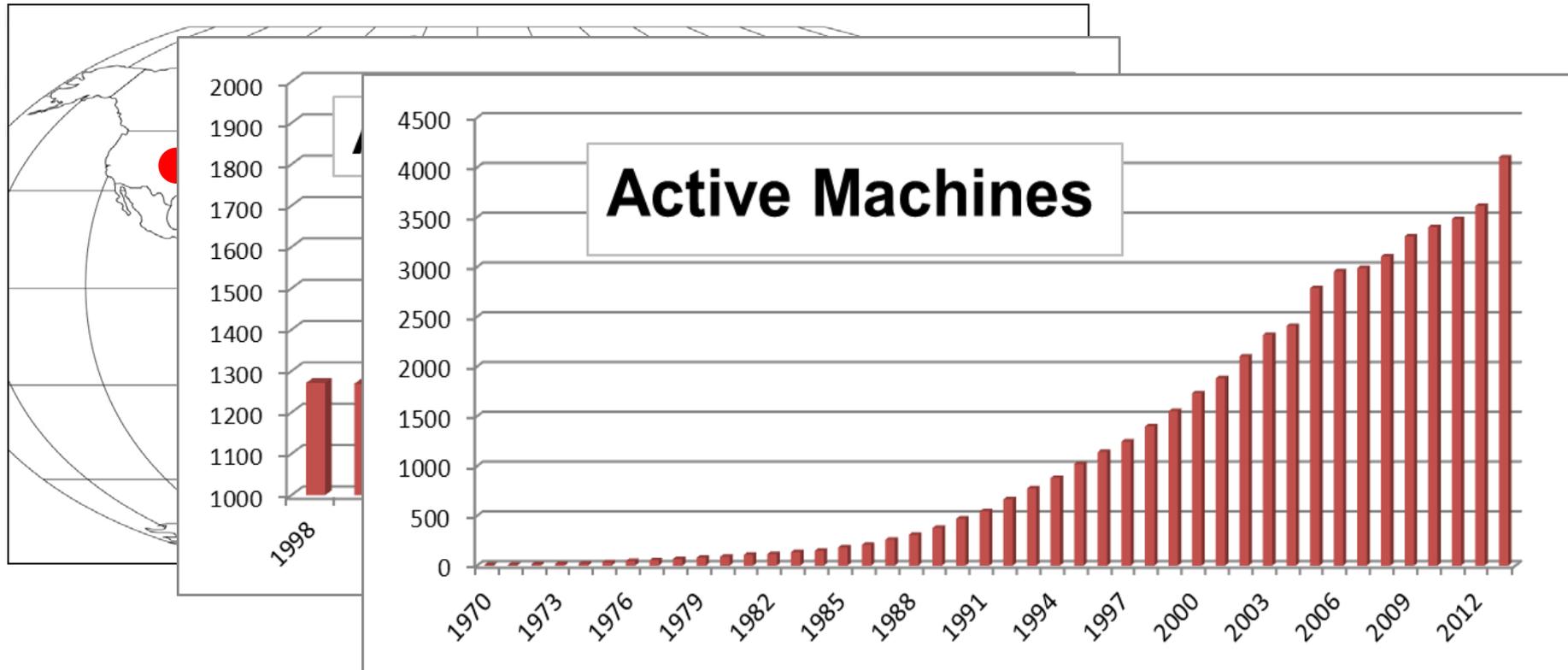


RPC Mission

1. Assure NCI and cooperative groups that institutions participating in clinical trials deliver prescribed doses that are comparable and consistent. (Minimize dose uncertainty)
2. Help institutions to make any corrections that might be needed.
3. Report findings to the community.

Clinical Trial Participants

- # of Active Institutions – 1,906 (320 inst. in 53 other countries)
- ~4,100 megavoltage machines
- ~28,000 active megavoltage beams



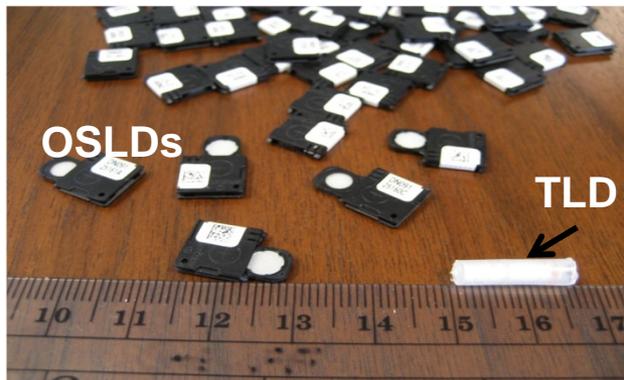
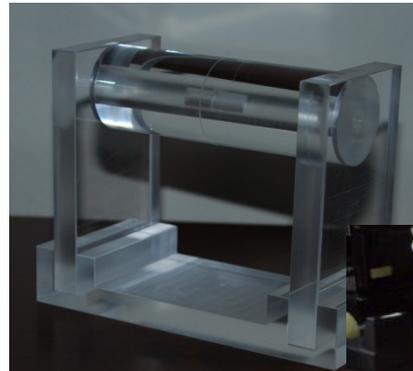
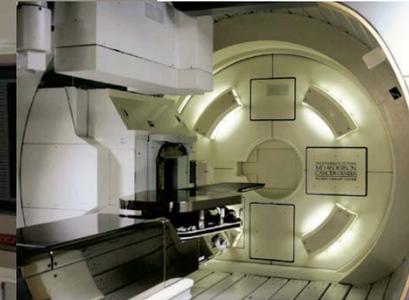
RPC Activities

1. Remote audit of beam output

- 2,123,067 beams checked w/ TLD/OSLDs

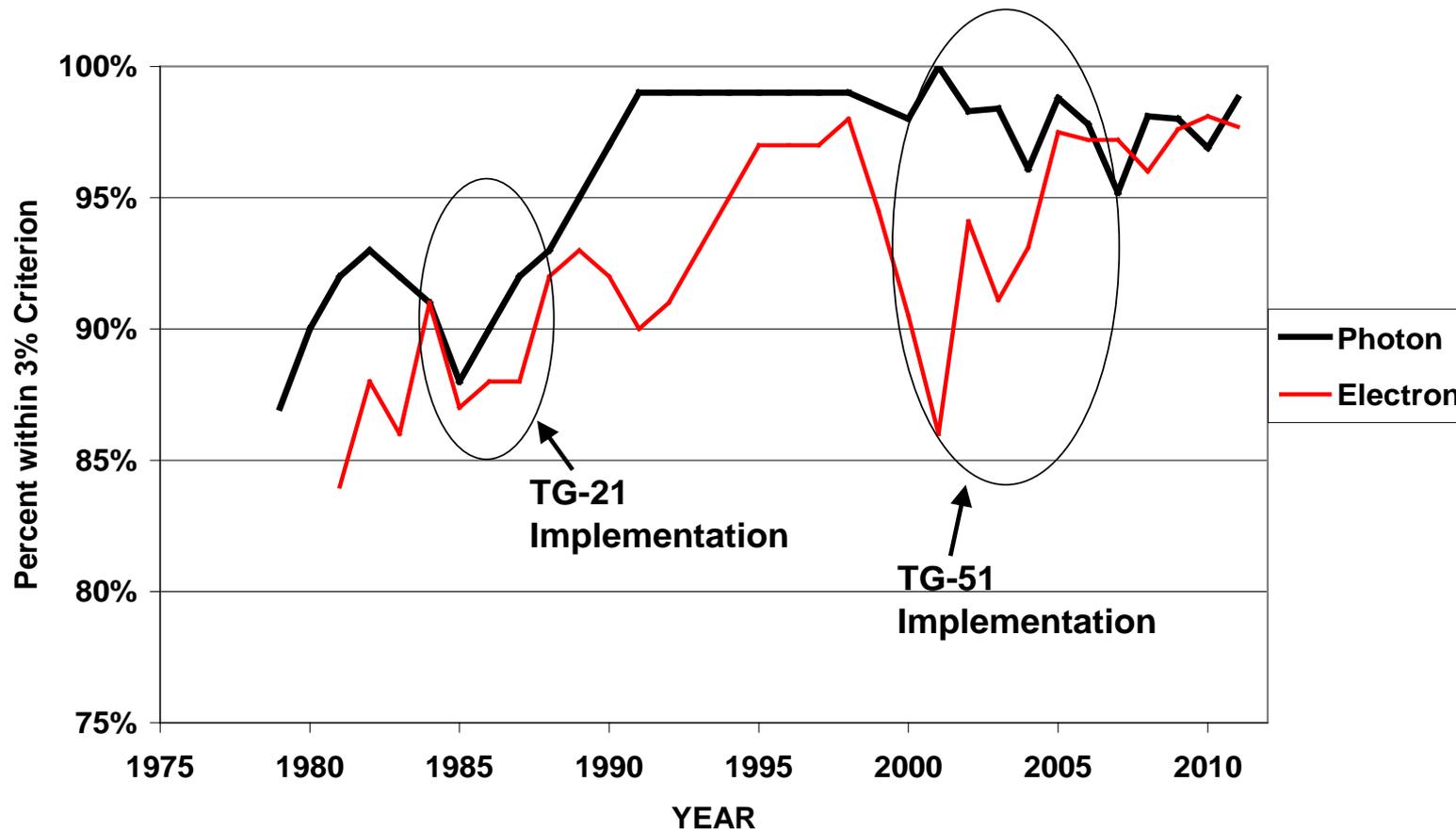
Remote Audits of Machine Output

- Verification of Reference Calibration for photon, proton and electron beams
- Units of special design (Gamma Knife, CyberKnife, Tomotherapy)



RPC Activities

BEAM CALIBRATION RPC Onsite Visits



RPC Activities

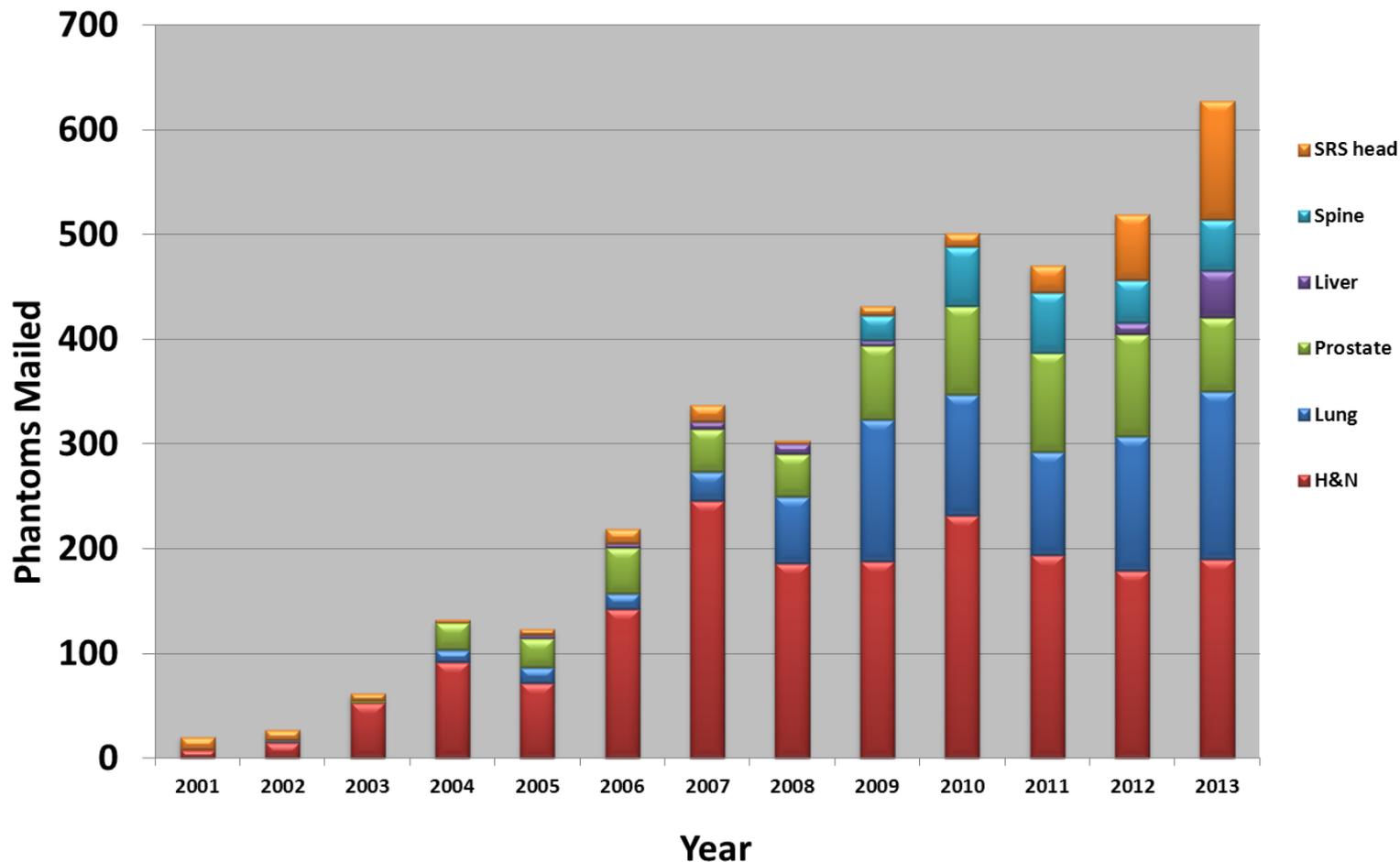
1. Remote audit of beam output
 - 2,123,067 beams checked w/ TLD/OSLDs
2. Onsite Dosimetry review visits
 - 1,773 site visits to 829 RT facilities
3. Patient Treatment Reviews
 - 27,517 patient records reviewed

Results of Chart Review

- **1% Systematic errors**
Potential to impact every patient treated by institution
- **11% Individual errors**
 - Impacts study groups and institution
- **27% Reporting errors**
 - Impacts study group and institution

Without RPC review **39%** of the doses used by the study group would be incorrect

RPC Activities



Phantom Results

Phantom

IMRT H&N Phantom

	2005	2013	Historical
Irradiations	152	181	1458
Pass	102 (67%)	164 (91%)	1210 (83%)
Fail	41	17	248

Criteria

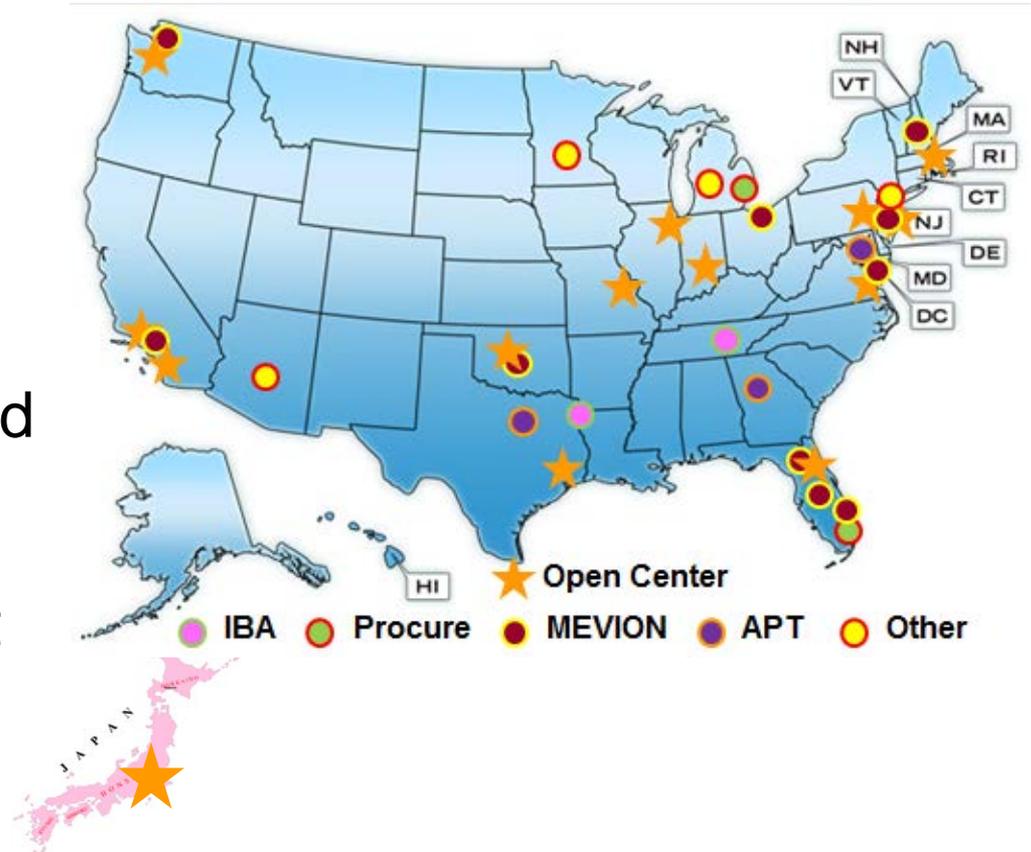
7%/4mm

RPC Activities

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 - 2,123,067 beams checked w/ TLD/OSLDs
2. Onsite Dosimetry review visits
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3. Patient Treatment Reviews
 - 27,517 patient records reviewed
4. Credentialing
 - 3069 phantoms shipped
5. Proton Approvals
 - 12/16 clinical active proton centers approved

Proton Audits

- IROC Houston (RPC) has been monitoring proton centers since 2007
- Currently monitor 16 clinically active centers (1 abroad) – all are interested in clinical trials
- 20-25 new centers in next few years



Publications

- Co-authored **19** AAPM TG reports
- **222** peer reviewed publications (list provided)
55 pubs 2011-present
- 21 abstracts accepted 2014 AAPM mtg. (8 oral and 13 posters)

Summary

- 45 years of improving clinical trial dosimetry
- The RPC continues to find discrepancies – human error
- QA programs are needed so as to not obscure trial outcomes

RPC → IROC Houston QA Center

Scientific Accuracy

Service

Seek Opportunities



Thank You
Questions?