

The 50th Anniversary of the Radiological Physics Center (RPC)/IROC Houston QA Center Activities and Findings



50 Years Ago

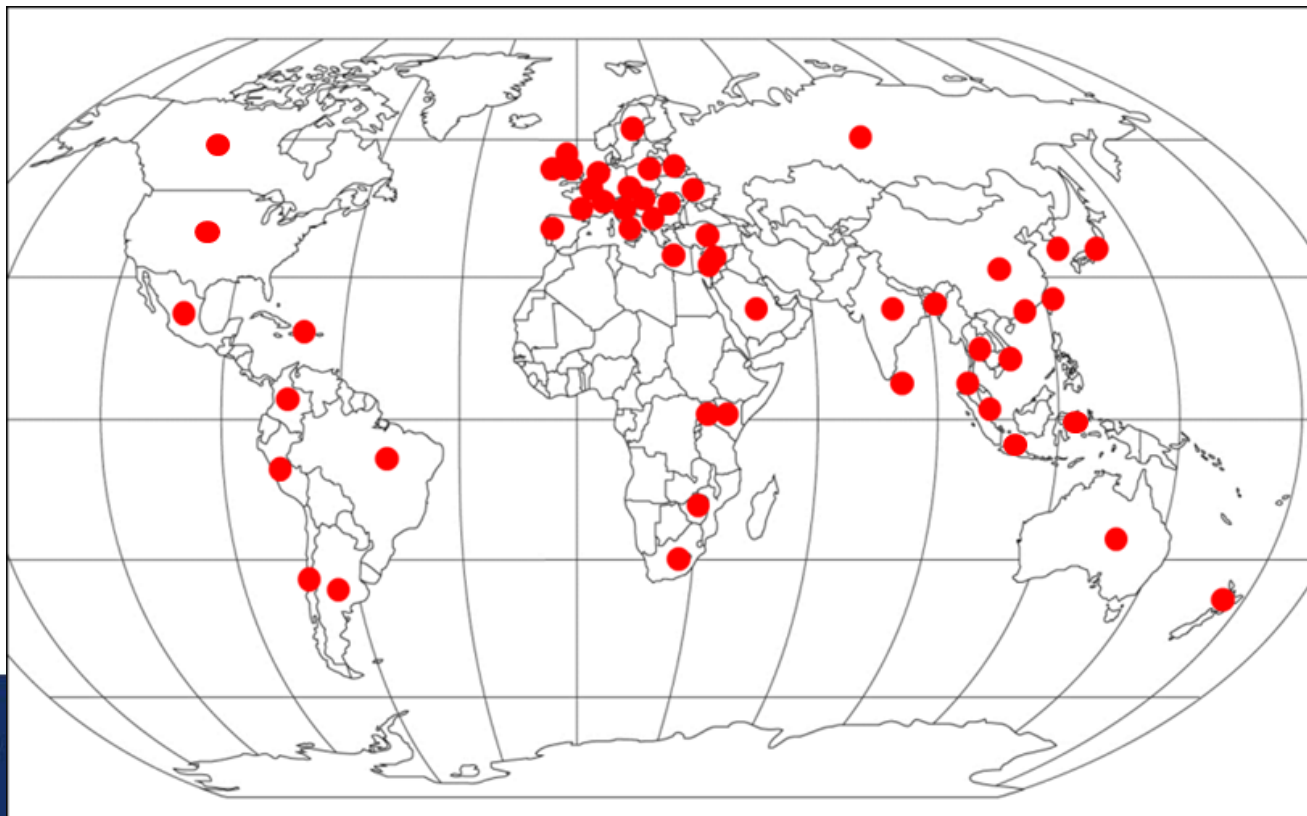
**2001 Space Odyssey debut
1st Offshore Technology Conf.
Intel Corp founded
1st 747 jumbo jet flew
RTOG created**

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.

Monitored RT Sites

- Just 22 sites in 1968 in the USA
 - 2,202 institutions are currently monitored across 60 countries
- 4,670 megavoltage machines
28,737 active megavoltage beams



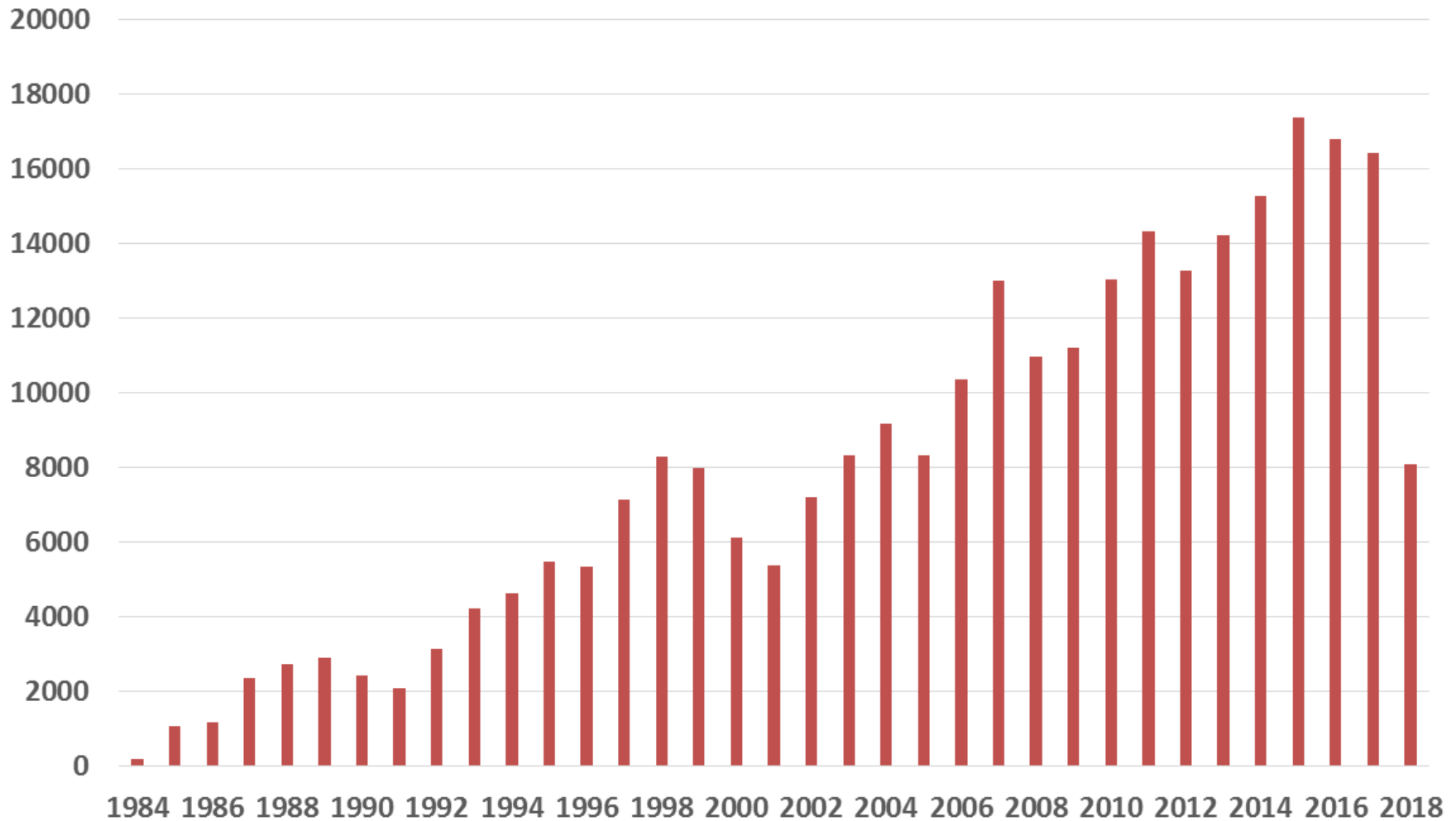
Key Milestones

- 1968 – first onsite dosimetry visit conducted
- 1977 - TLD program for photon beams
- 1982 – TLD program for electron beams
- 1986 – conversion to TG21
- 1998 – RADs relational database went live
- 2000 – conversion from TG21 to TG51
- 2001 – initiated E2E phantom program
- 2007 – TLD program for proton beams
- 2010 – switched from TLD to OSLD
- 2010 – first proton site visit
- 2015 – virtual site visit program begins
- 2018 – first work on carbon ions begins

RPC Activities

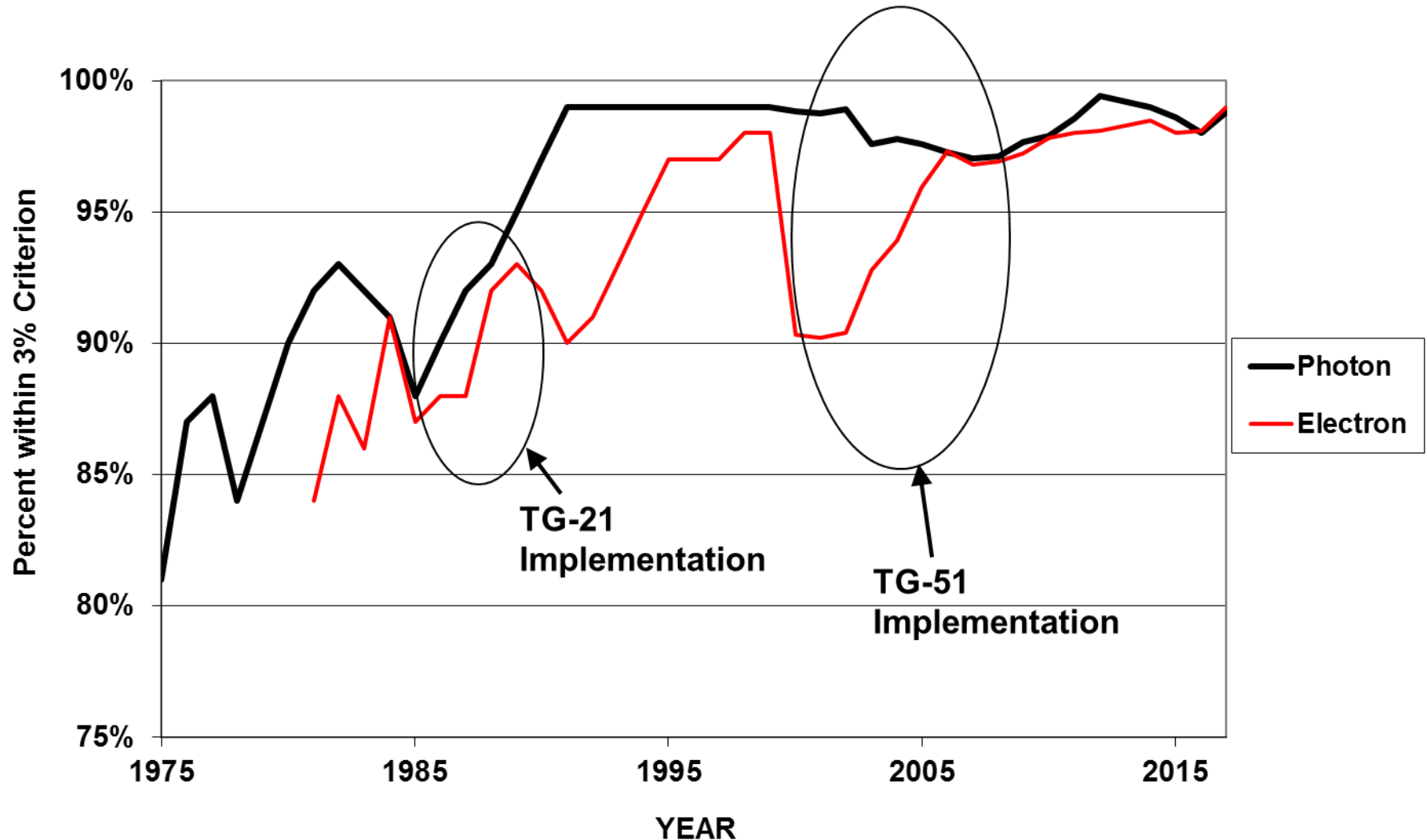
1. Remote audit of beam output

Normal TLD/OSLD Sent



RPC Activities

BEAM CALIBRATION IROC Houston Onsite Visits



RPC Activities

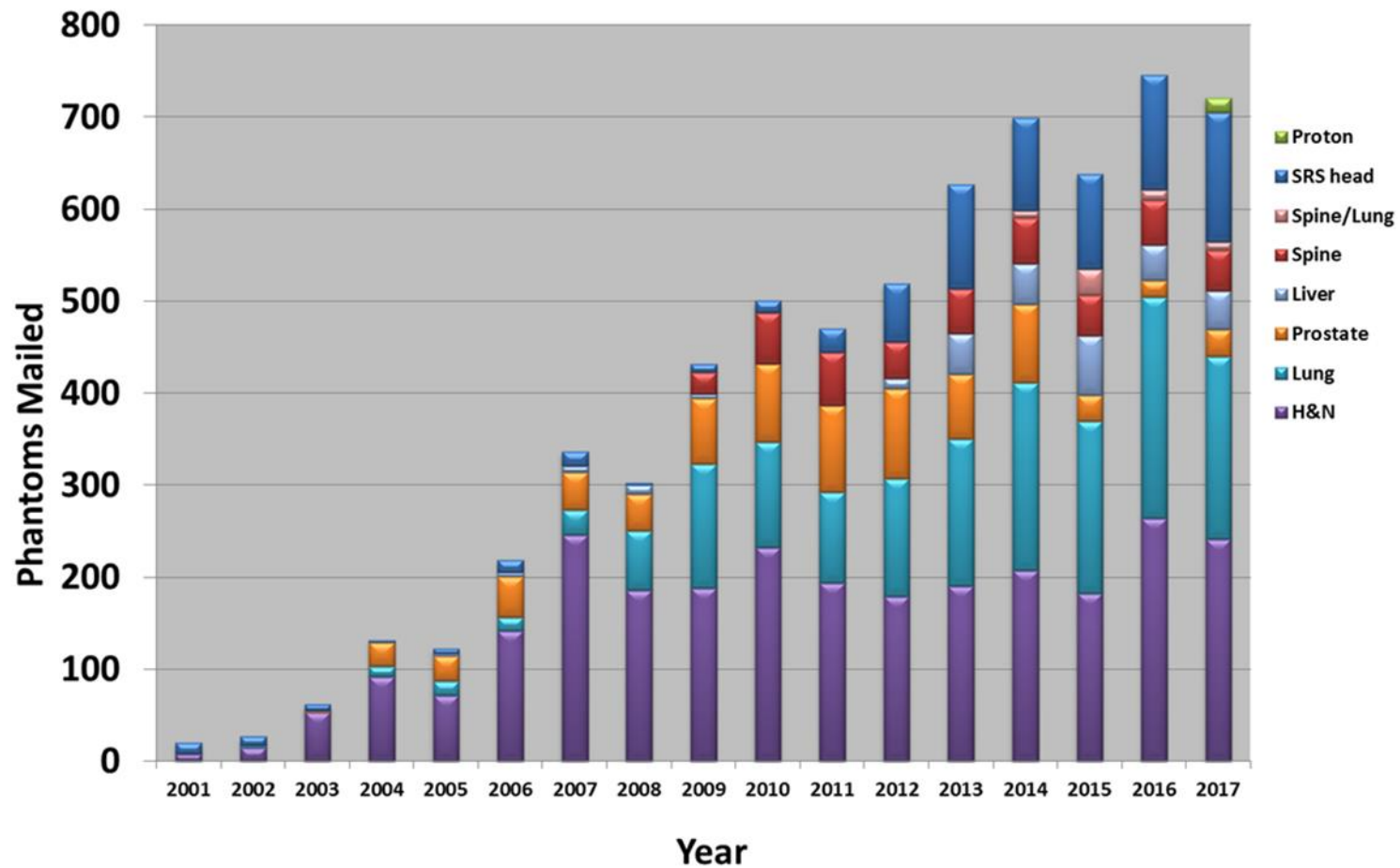
1. Remote audit of beam output
 - 301,179 beams checked w/ TLD/OSLDs
2. Onsite Dosimetry review visits
 - 2,543 site visits to 849 RT facilities
3. **Patient Treatment Reviews**
 - **17,936 patient records reviewed**

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	2017	Historical
Irradiations	152	208	2345
Pass	102 (67%)	198 (95%)	2031 (87%)
Fail	41	10	314

Criteria

$\pm 7\%/4\text{mm}$

RPC Activities

1. Remote audit of beam output

- 301,179 beams checked w/ TLD/OSLDs

2. Onsite Dosimetry review visits

- 2,543 site visits to 849 RT facilities

3. Patient Treatment Reviews

- 17,936 patient records reviewed

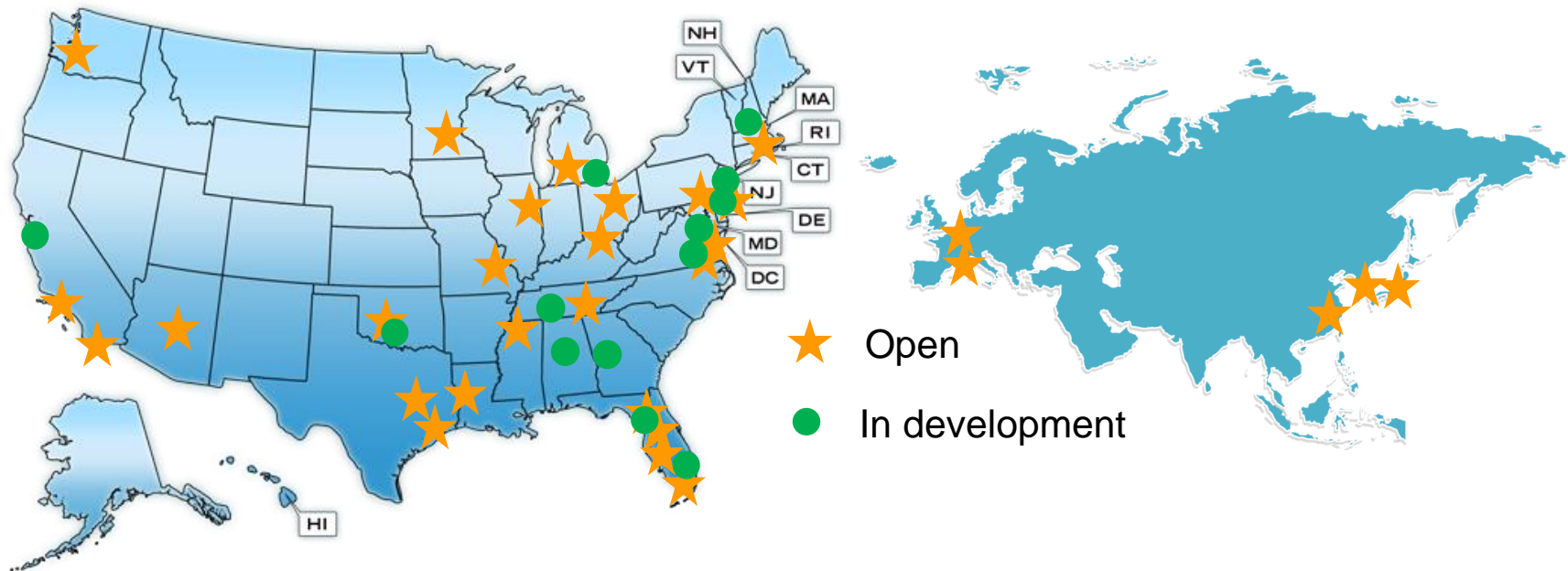
4. Credentialing

- 6,835 phantoms shipped

5. Proton Approvals

- **24/28 clinical active proton centers approved**

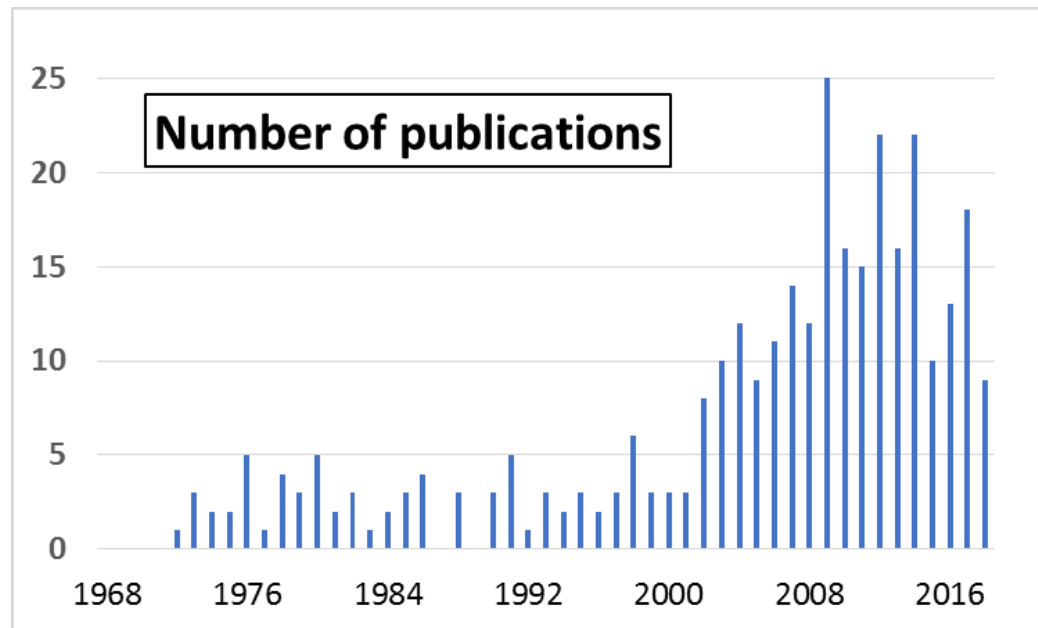
IROC's Proton Program



- 32 proton centers currently audited
- 34 proton site visits performed since 2010
- 141 proton phantoms irradiated

Publications

- Co-authored **22** AAPM TG reports
- **326** peer reviewed publications
141 pubs 2010-present
- **20** abstracts accepted
2018 AAPM



Some Key Accomplishments

- Improving accuracy of beam calibration
- Setting the QA baseline for IMRT
- Developing a comprehensive proton QA program
- Helping to resolve FS/depth dependence of WFs
- Implementing TG21 and TG51
- Detailing heterogeneity dose calc errors (xray & p⁺)
- Setting QA standards globally
- Developing comprehensive E2E audit program

Summary

- 50 years of serving the radiation oncology community and improving clinical trial dosimetry
- We continue to help resolve discrepancies
 - human error
- Independent QA programs are still needed.

Questions?

