



Remote Audits to GammaKnife IROC





No conflict of interest to declare

Work supported by NCI grants CA180803 and CA214526

IROC Houston QA office

UT MD Anderson Cancer Center



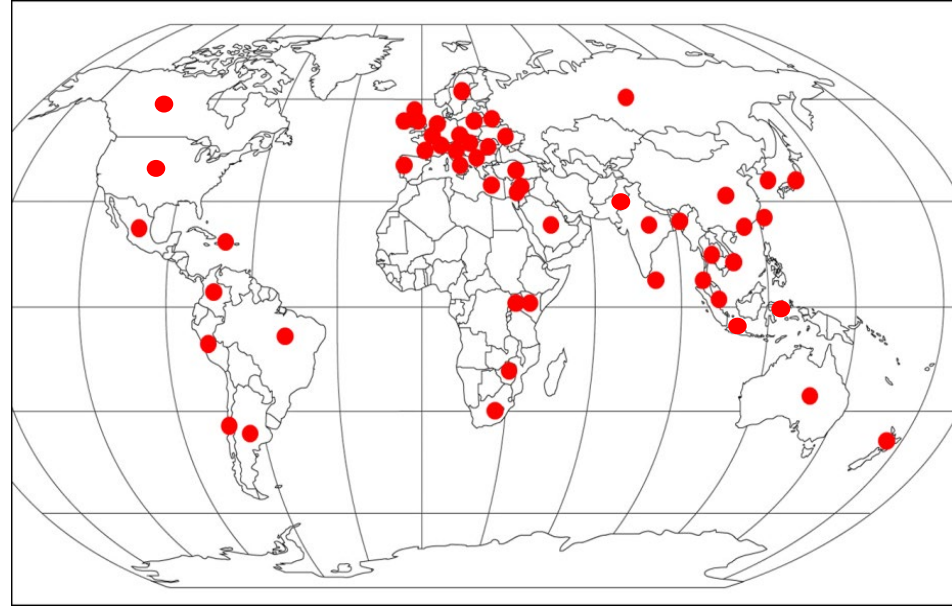
Texas Medical Center



Houston - Texas

Extent of Activities

- **1,877** RT sites participate in NCTN
- **439** other RT sites (primarily international)
- **53** countries



Core services

- **Site Qualification:** Output checks
- **Trial Design Support:** Review protocols
- **Credentialing:** Phantoms, IGRT, benchmark cases....
- **Data Management (pre-review):** Prepare patient cases for review
- **Case Review:** Review patient cases to ensure they follow the protocol
- **Data Management (post-review):** Store/manage reviewed data

GammaKnife data since 1996

Records from our database

159 institution with at least one GK unit

140/159 are in USA

Models: number of units as May 2021

Elekta GK 4,4C,C: 77 / 17 active

Elekta Perfexion: 74 / 57 active

Elekta ICON: 60 / 58 active

MASEP Infini: 2

American Radiosurgery Vertex 360: 1

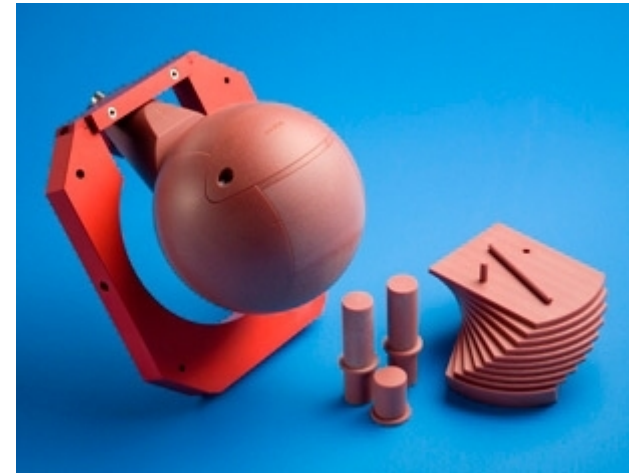
Output check - phantoms

GammaKnife Cassette



ABS plastic sphere

Solid water sphere



GammaKnife Insert



Output check

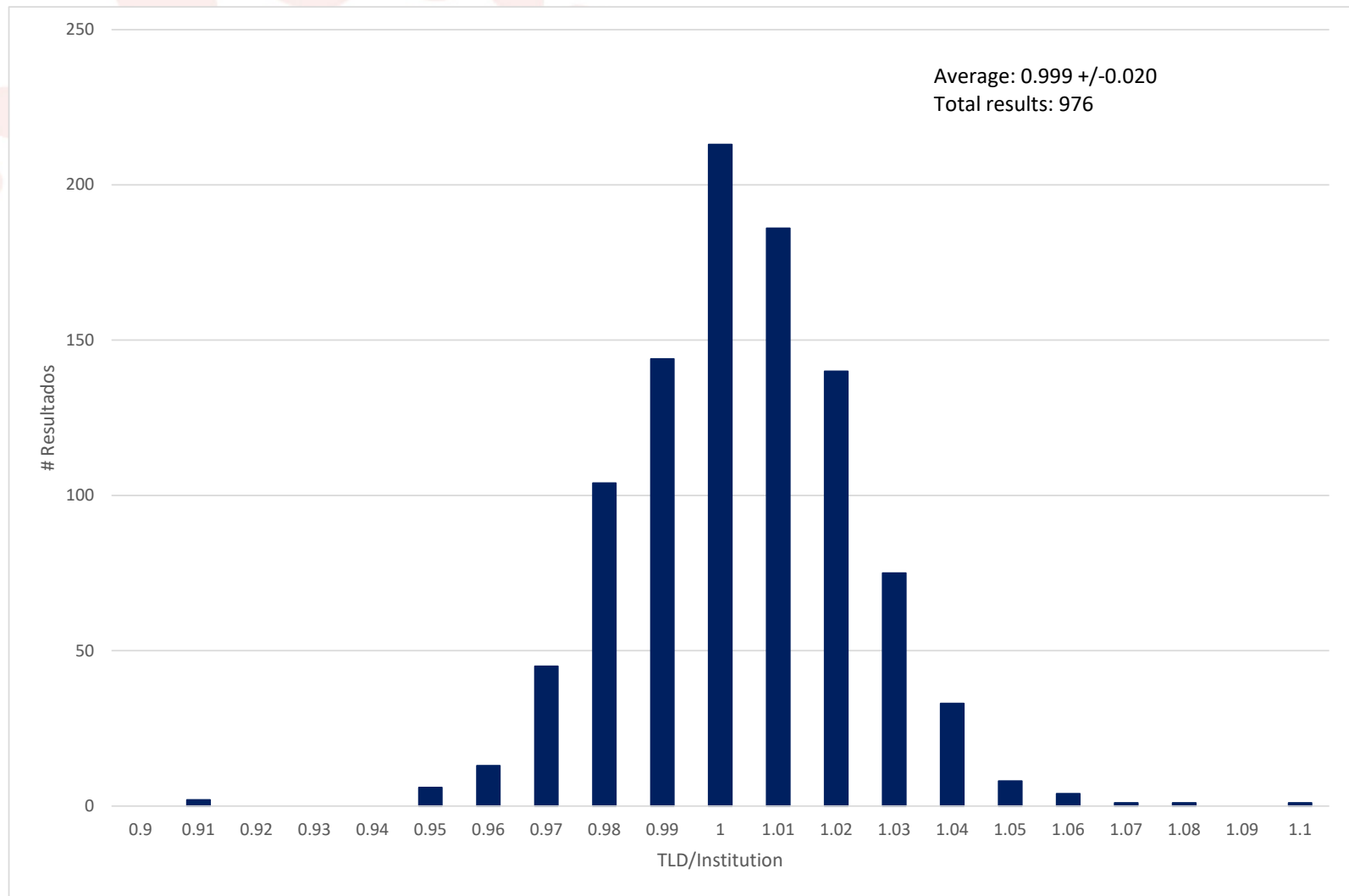
Detector: TLD LiF-100 powder in capsules

Dose: 6 Gy to the center of the phantom

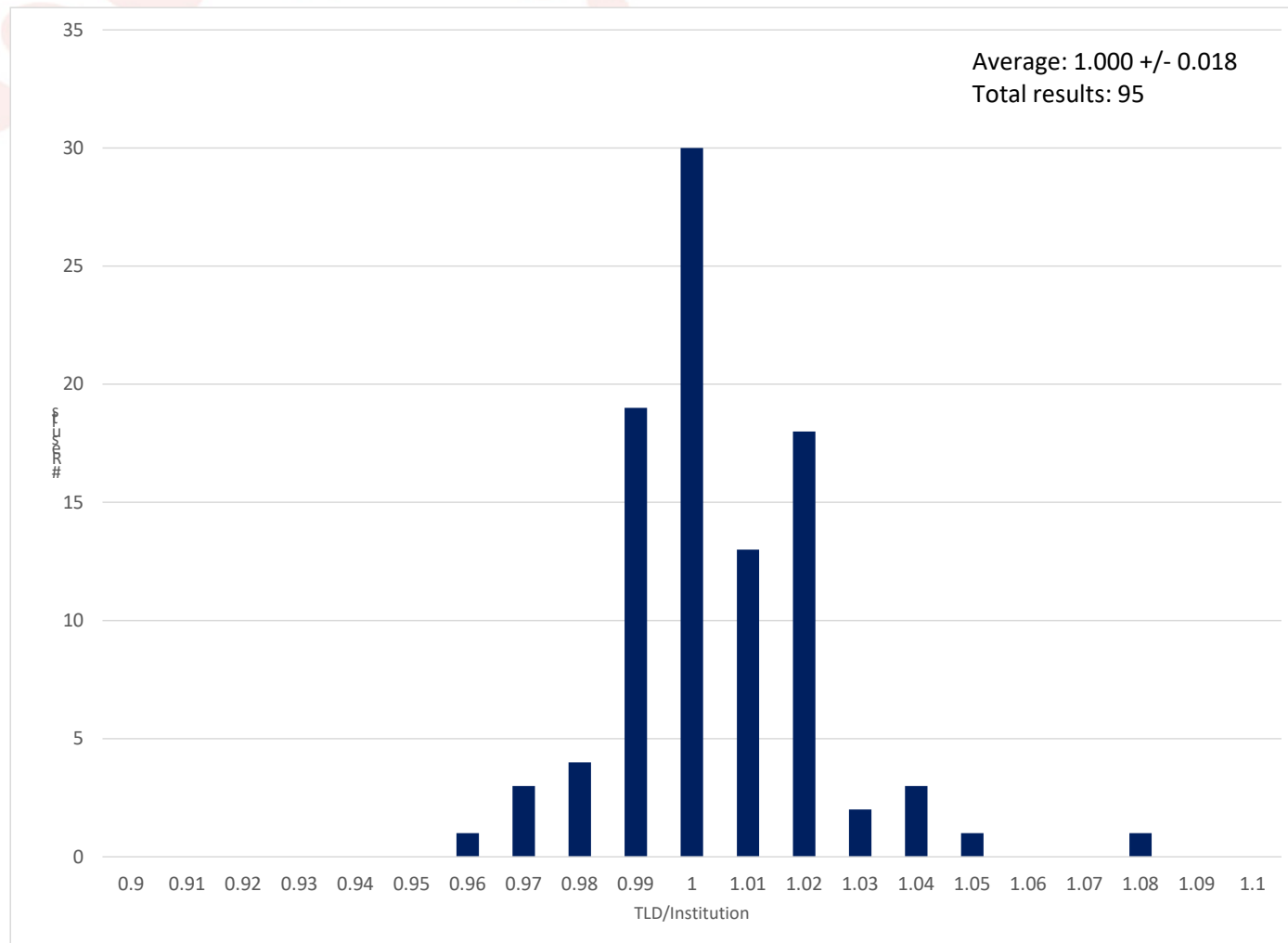
Criteria: TLD dose/Delivered dose within 5%

1st report issued: February 2008

Output check – since 2008



Output check - results 2020





Output check

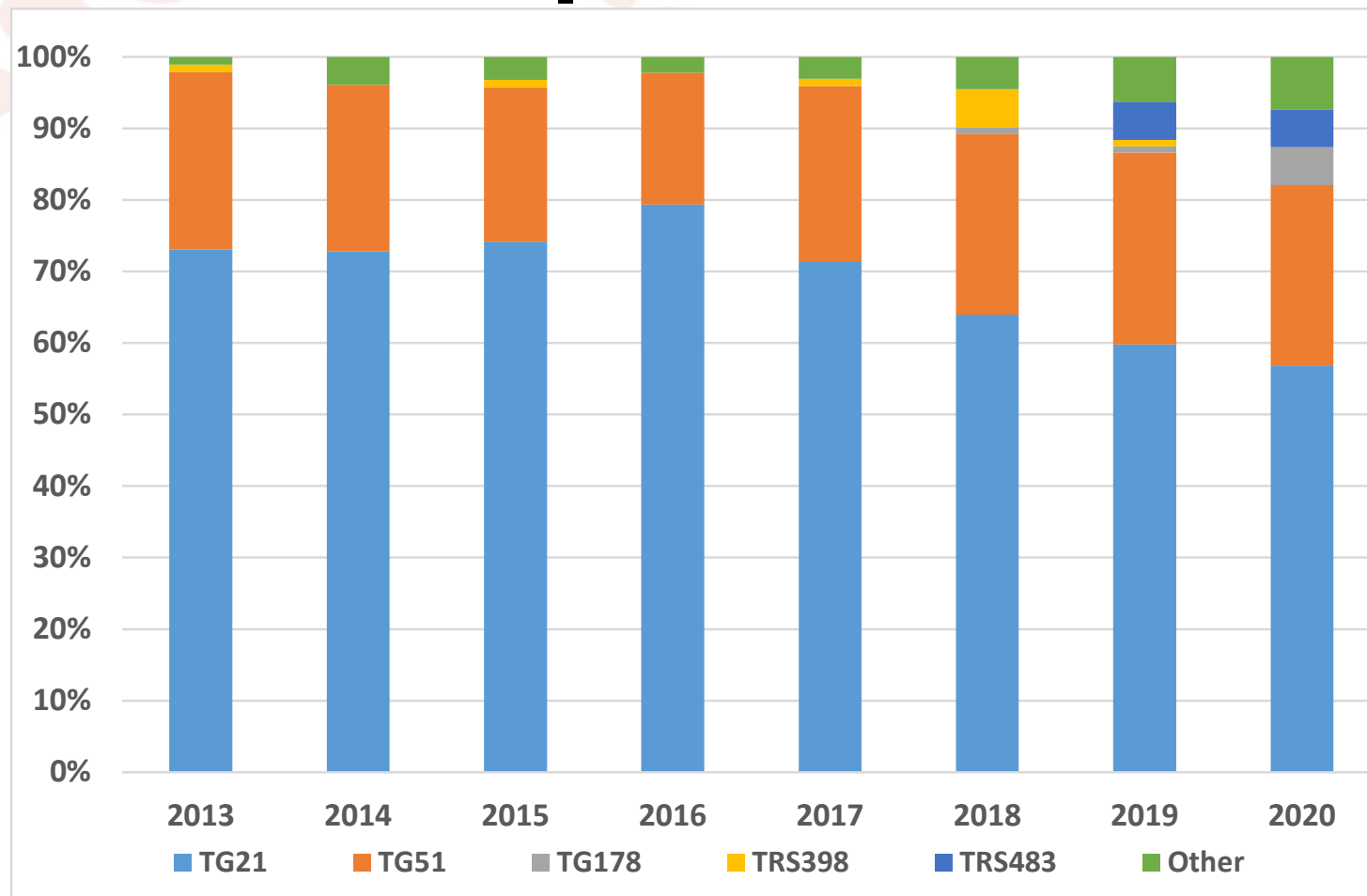
Some numbers

Values over history (on 2020)

Report dose to muscle: 13% (11%)

Calibration protocol TG 21: 68% (57%)

Output check



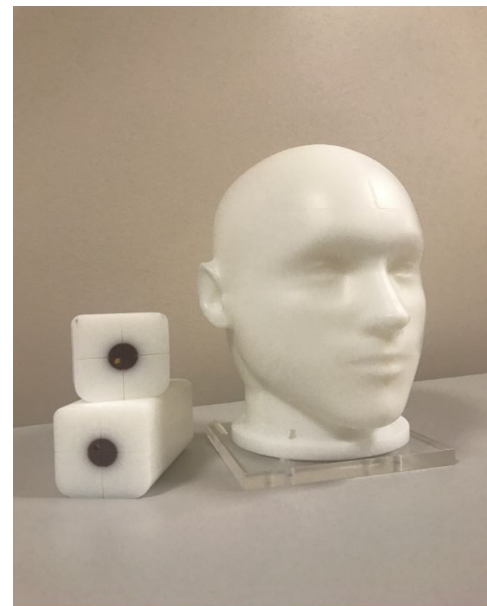
Percentage of results reported per year

Anthropomorphic Phantom

Head / SRS treatment / centrally located target 1.9cm diameter

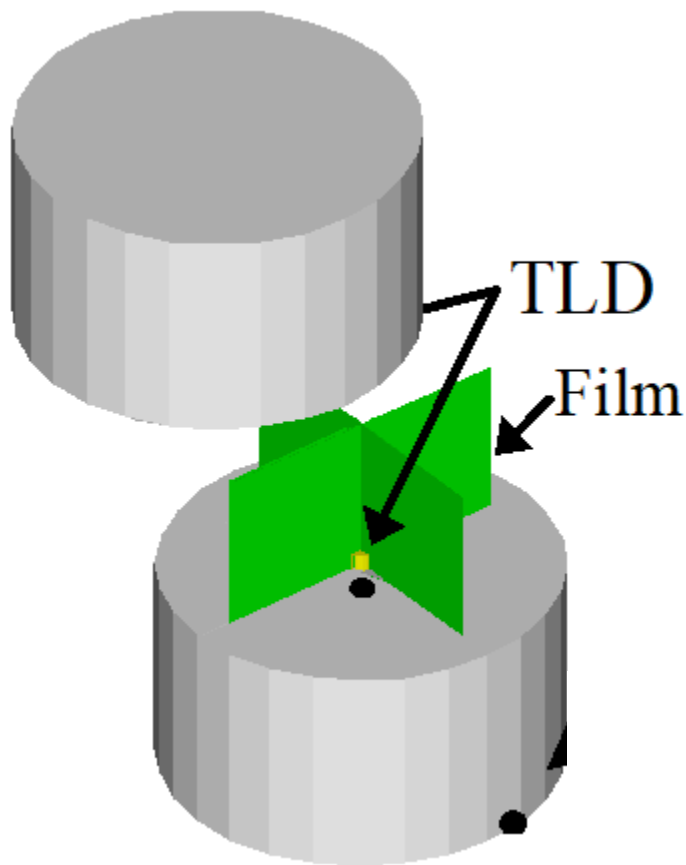


Original design
Fill up with water / two inserts
TLD, sagittal and coronal films



New design
Solid head / one inserts
TLD, sagittal and coronal films

Anthropomorphic Phantom



MRI and CT planning image

Dose center of target: 30 Gy

**Coverage of target with 15 Gy
isodose line**

Use IGRT

Anthropomorphic Phantom

Detectors: TLD LiF-100 powder in capsules

Gafchromic Film (MD55/MDV3)

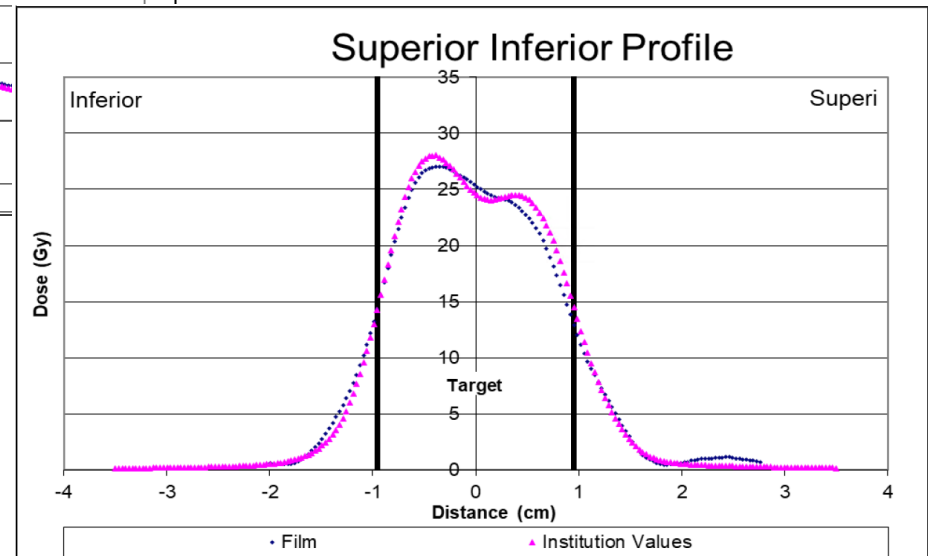
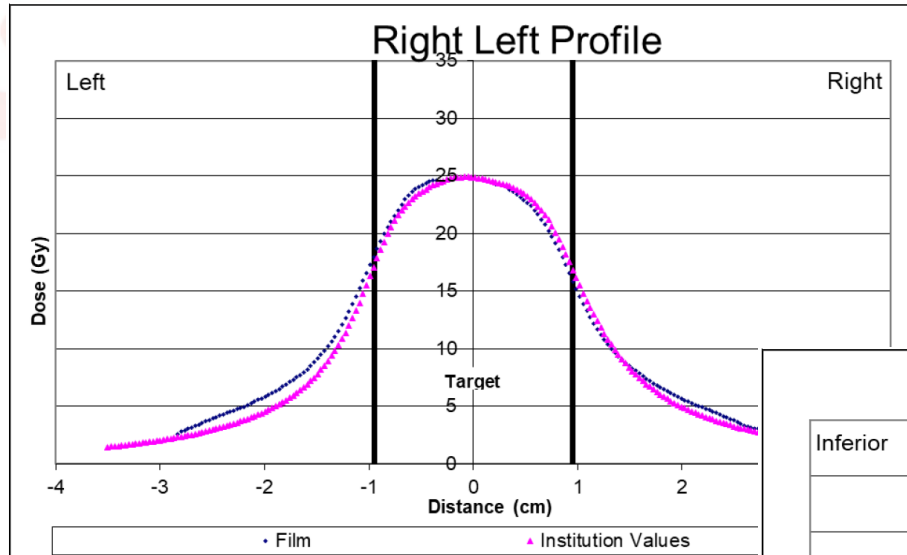
Dose: 30 Gy to the center of the target

Criteria: TLD dose/Delivered dose within 5%

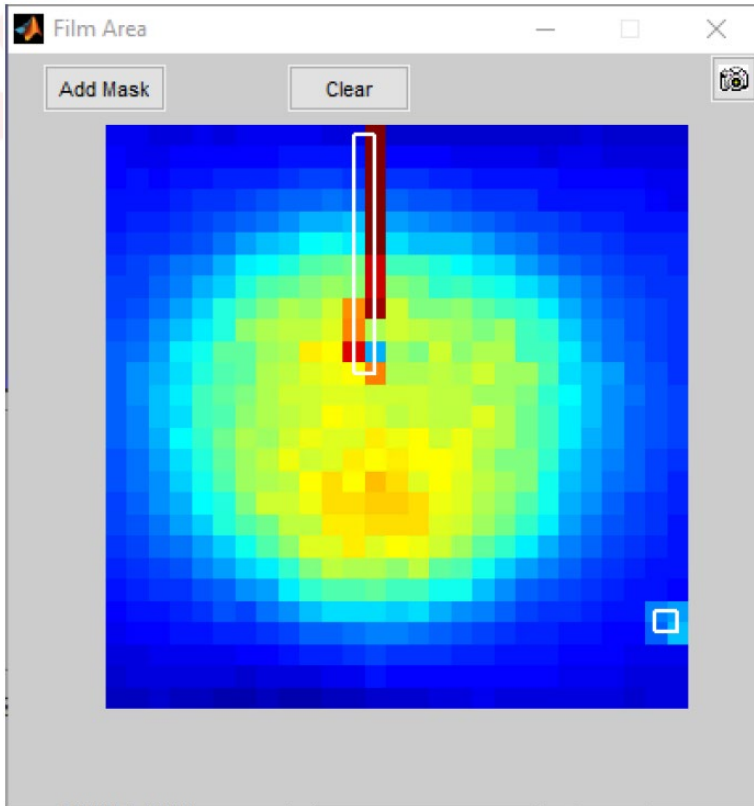
At least 85% of pixel within 5%/3mm per plane

1st report issued: June 1996

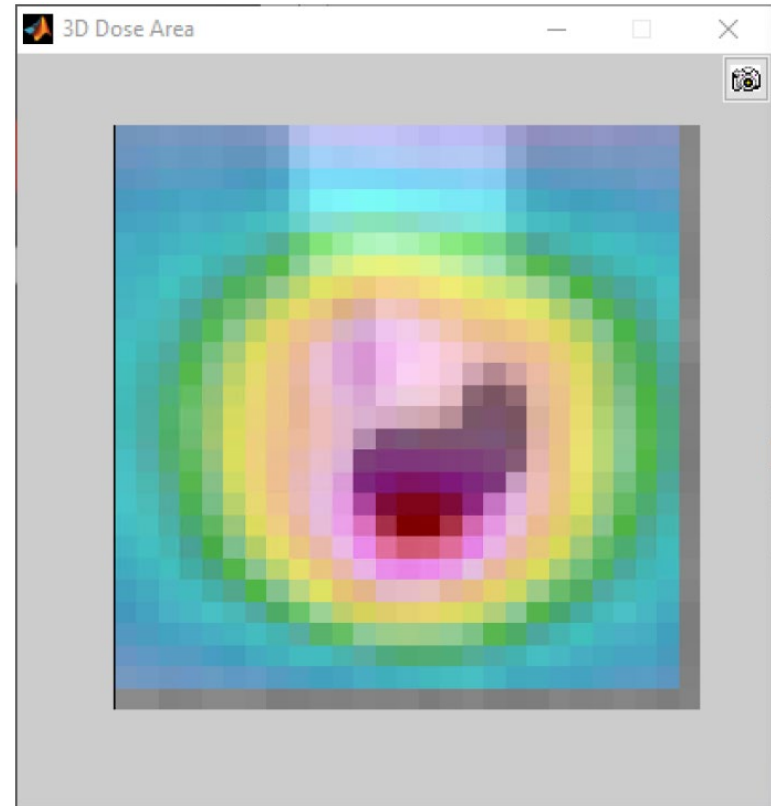
Anthropomorphic Phantom



Anthropomorphic Phantom

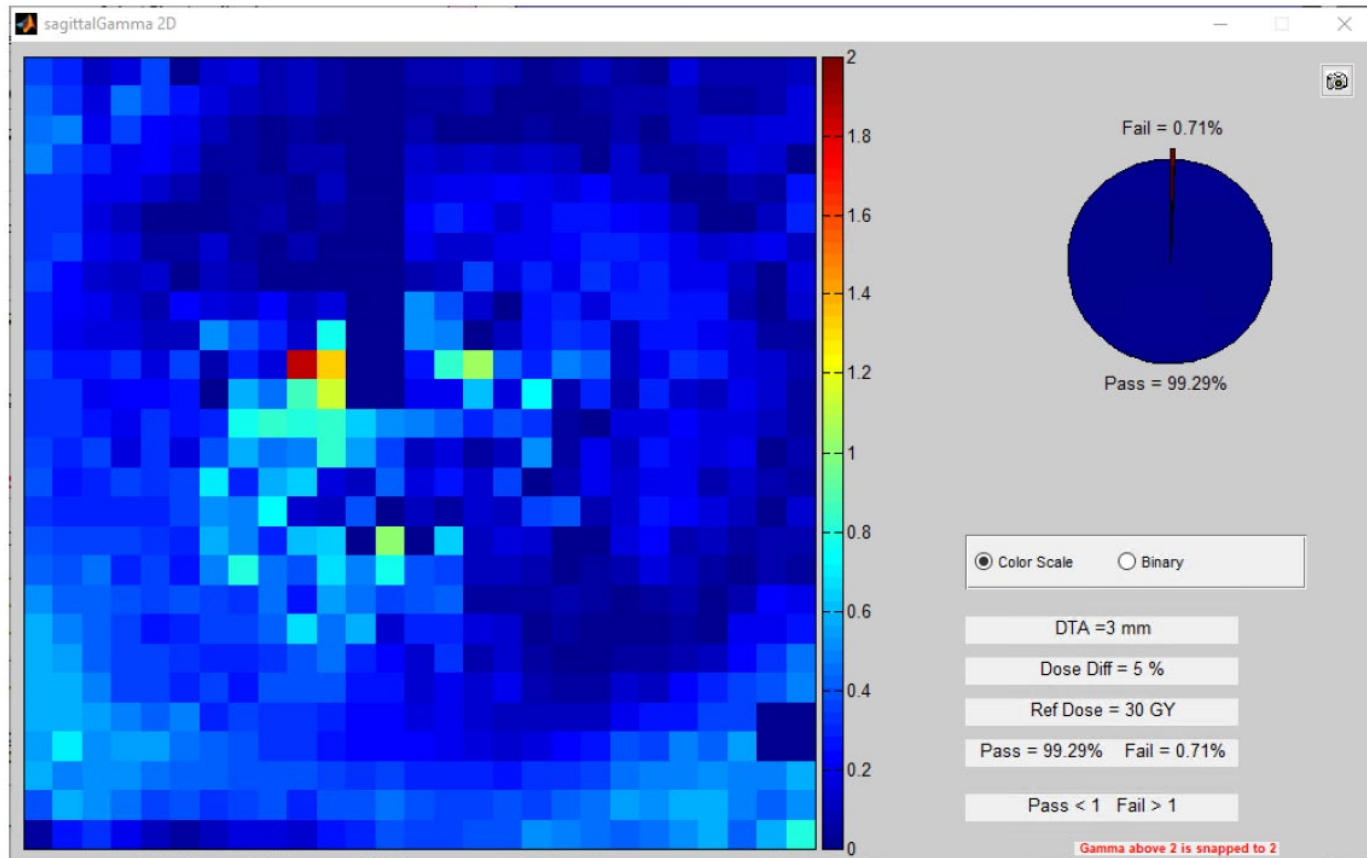


Film dose



TPS dose

Anthropomorphic Phantom



Gamma Analysis

Anthropomorphic Phantom

Some numbers

GK(other deliveries) period 2012-2020

Number report: 130 (942)

Pass rate: 89.2% (84.6%)

Anthropomorphic Phantom

Some numbers

GK(other deliveries) period 2012-2020

Failure due to TLD dose: 93% cases (68% cases)

Avg. TLD/Inst dose: 0.985 ± 0.026 (0.982 ± 0.036)

Available under MD Anderson Phantom Lab (Fee)



Summary

More that 25 years offering QA audits to GK

Results are consistent over time

Dose from plans is report to water (see TG 329)

Reference calibration is combination of standards

Thank you



irochouston.mdanderson.org