

About systematic difference between IROC TLD measurements and Tomotherapy dose calculation for small body phantoms

Authors: A. Kapulsky, A. M. Ndlovu

Hackensack University Medical Center and Cancer Center at HUMC
Hackensack, NJ



Hackensack
Meridian Health



PURPOSE

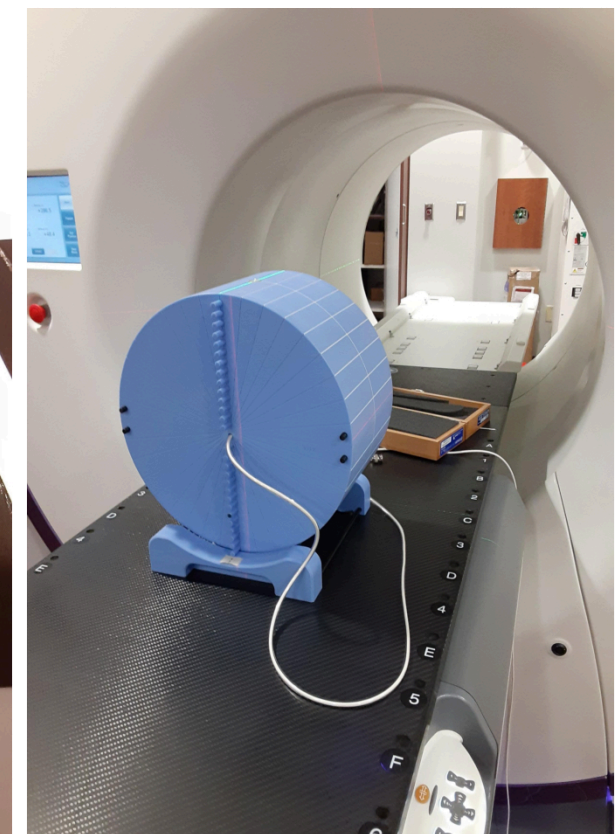
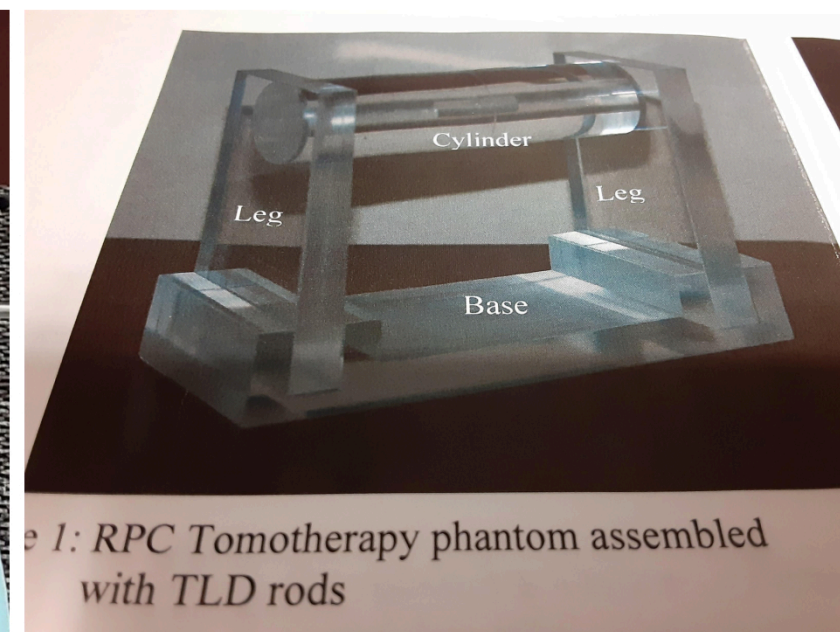
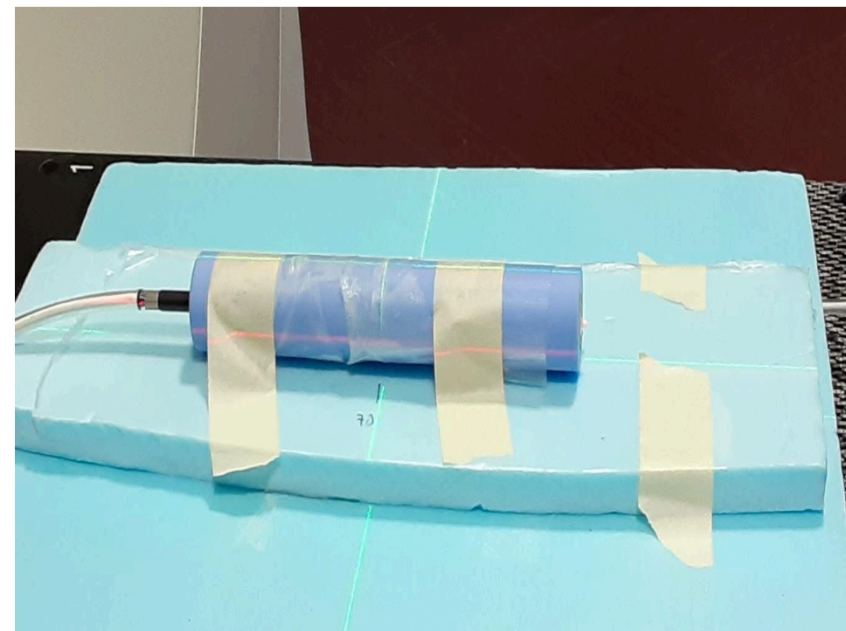
Based on our own experiences as well as those of some other Tomotherapy users, we noticed a systematic difference between planned and measured by IROC doses to TLDs during annual machine calibration.

In the past 7 years the average difference between IROC TLD measurements and Tomotherapy Planning System (TPS) calculation in our institution was -2.6%.

We propose the following explanation for this systematic difference.

RESULTS

Average measured dose difference from TPS between two sets of plans in a small and large body phantoms were -3.2%



METHOD

“Patient” treatment plan for small cylindrical phantom ($d=2.8\text{cm}$) comprised of two inserts from Tomotherapy CheesePhantom similar to IROC phantom ($d=3.3\text{cm}$) was calculated on TPS.

DQA plan was calculated using the same “patient” treatment plan for the small phantom but a Tomotherapy CheesePhantom was used as a phantom, so the same plan was projected to a larger phantom body ($d=30\text{cm}$).

Both “patient” and DQA plans were delivered 3 times sequentially to maintain similar measurement and delivery conditions.

Dose was measured using Ionization chamber and compared to the average TPS dose to a small ROI equal to a chamber’s measuring volume.

CONCLUSIONS

Tomotherapy system is normally calibrated based on ionization chamber dose measurements in a full body Tomotherapy CheesePhantom.

We have demonstrated that not only IROC TLDs but also chamber measurements for small volume phantoms showed doses lower than calculated by TPS.

Chamber measurements in small body phantoms should be a part of Tomotherapy calibration in order to optimize TPS for current IROC TLD protocol. Alternatively, IROC TLDs could be inserted into a full body Tomotherapy CheesePhantom.

CONTACT INFORMATION

Alexander Kapulsky Ph.D.

Alexander.Kapulsky@hackensackmeridian.org