

AbstractID: 8304 Title: Quality Audits of the Calibration for TG-51 Non-Compliant Beams by the Radiological Physics Center

**Purpose:** The Radiological Physics Center, since 1969, has been conducting quality audits of radiotherapy facilities to assure the National Cancer Institute that patients entered onto clinical trials receive comparable and accurate doses. Recently, the use of new treatment machines to treat clinical trial patients that have TG-51 non-compliant beams, such as the Hi-Art TomoTherapy, Elekta Gamma Knife, Accuray CyberKnife and various proton machines, has required the RPC to monitor the reference calibration of these treatment machines.

**Material and Methods:** The RPC used its TLD program and ion chamber measurements during on-site dosimetry review visits to verify the output of each machine with a TG-51 non-compliant beam. Standard RPC TLD blocks and special TLD miniphantoms, made to accommodate the physical restrictions of the machines, were sent to institutions to be irradiated and returned to the RPC for analysis. Proton beams were assessed at two points in a spread out bragg peak.

**Results:** The TLD results from the TomoTherapy stationary beam, CyberKnife, Gamma Knife and proton beams yielded average TLD/institution ratios of 1.007, 1.007, 0.982 and 0.999, respectively. The rotational TomoTherapy beam had an average RPC/institution ratio of 0.973. The standard deviations of the TomoTherapy and CyberKnife results were large (5.1 – 8.6%), indicating a wide range of results. Seven percent of the beams audited fell outside the RPC's 5% criterion. The ion chamber measurements on a limited number of TomoTherapy, CyberKnife and proton beams all indicated good agreement between the RPC and the institution (within  $\pm 2\%$ ).

**Conclusion:** Audits of the calibrations of TG-51 non-compliant beams have shown that the majority of the institutions are within the RPC's  $\pm 5\%$  criterion, however since 7% of the beams tested were outside of the criterion, vigilance is warranted.

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