Purpose: Ionization chambers and electrometers are mandatorily calibrated with primary standard periodically at least once in every 2 years. However, there is no protocol or national requirements for calibration and testing of cables connecting the detector to electrometer even though it is not uncommon to see badly twisted, lacerated, kinked or knotted cables used in the measurement. Radiation treatment with small fields, (SRS, gamma knife, Tomotherapy, etc.) requires dose measurements with high degree of precision with small detectors. In this study, we investigated the quality of cable which could be critical to signal-to-noise ratio (SNR) in such measurements.

Materials & Methods: Nine different commercially available cables were acquired from various vendors with different diameters and flexibility. These cables were characterized with signals from 5 different ionization chambers (volume 0.6-0.0167cm^3). The response of the cable-connector-ionization chamber combinations were analyzed in a 6 MV photons beam under identical irradiation condition. Signals from cables were evaluated without and with connecting to an ion chamber for net signal for quality of cable and connectors.

Results: Signal from cable connectors alone is significant. The net signal is linearly related to the chamber volume with a slope of 35.38nC/cm^3. Based on the magnitude of the net signal, cables may be characterized as high, medium and low performance. However, there is no correlation with the physical characteristics or manufacturer of the cables. The signal is within ±2.0% for large volume (0.6 cm^3) ion chamber and cable combination. For small volume (0.016 cm^3) chambers the response is dominated by the quality of cable with variations up to ±12 %.

Conclusions: The quality of cables must be checked periodically before dose measurements. Consideration should be given for a national protocol for the evaluation or calibration of cables especially for small volume chambers used in small field dosimetry.