AbstractID: 9802 Title: Everything you wanted to know about the practical implementation of TG-51 protocol in the clinic

In 1999 Task Group 51 (TG-51) of the Radiation Therapy Committee of the AAPM published a protocol for the calibration of high-energy photon and electron beams used in radiation therapy. The formalism and the dosimetry procedures recommended in this protocol are based on the use of an ionization chamber calibrated in terms of absorbed dose-to-water in a standards laboratory's reference quality ^{60}Co gamma ray beam. This is different from the recommendations given in the AAPM TG-21 protocol which are based on an exposure calibration factor of an ionization chamber in a ^{60}Co beam and a N_{gas} formalism for the determination of absorbed dose-to-water in reference conditions. Although the TG-51 protocol has been published nearly three years ago, the adoption of this protocol by the medical physics community is rather slow. According to the Radiological Physics Center, approximately 35% of the US radiation therapy facilities have made the transition from TG-21 to TG-51. The goal of this refresher course is to discuss the rationale and advantages of making a transition to the TG-51 protocol and discuss the practical steps that are necessary to successfully implement the recommendations of the TG-51 protocol in the clinic. Information will be provided on the following topics: 1) Measuring percent depth-ionization and depth dose curves for photon and electron beams using cylindrical and plane-parallel ionization chambers. 2) Determining the beam quality conversion factor k_Q for photon beams and the electron beam quality conversion factor k'_{R50} for electron beams. 3) Measuring gradient correction factor P_{gr}^{Q} for cylindrical chambers in electron beams. 4) Measuring various correction factors to the charge reading. 5) Using cylindrical and plane-parallel ionization chambers for absolute calibration measurements. 6) Determining dose at the depth of dose maximum from measurements made at the reference depth for both photon and electron beams. 7) Taking measurements needed to compare the recommendations of the TG-51 protocol with those of the TG-21 protocol. 8) Identifying expected differences in absorbed doses between TG-51 and TG-21 for both photon and electron beams. 9) Identify the sources that contribute to the observed differences between the two protocols. 10) Clarify potential sources of confusion in the clinical implementation of TG-51. 11) Why implementation of the TG-51 protocol will bring uniformity in therapy beam calibration with the rest of the world.

At the conclusion of this refresher course, the attendee should be able to

1. Apply TG-51 protocol to calibrate photon and electron beams.
2. Use cylindrical and plane-parallel ionization chambers for the determination of percent depth ionization curves, percent depth dose curves and absorbed dose calibration for photon and electron beams in a water phantom.
3. Describe experimental techniques that will enable comparison of absorbed doses-to-water between TG-51 and TG-21 protocols.
4. Determine sources that contribute to the observed differences in absorbed dose between the TG-51 and TG-21 protocols, and identify the magnitude of the difference for each source.
5. Clarify various points of confusion that may arise when implementing the TG-51 protocol.