AbstractID: 14582 Title: CE - Therapy SAMs: Commissioning and calibrating a linear accelerator – state-of-the-art in 2010

Commissioning and calibrating a linear accelerator – state-of-the-art in 2010

This presentation will cover the procedures required to commission and calibrate a linear accelerator with reference to the relevant AAPM publications – TG-106 and TG-51.

Commissioning: AAPM Task Group-106[1] provided detailed information on the beam data collection for commissioning of a linear accelerator that provided procedures for acquiring specific photon and electron beam parameters and methods to reduce measurement errors. It elaborated: need for commissioning data, issues with beam commissioning measurements, selection of phantom size and material, selection of cable, adopter, detectors, scanning system setup problems, (possible solution and examples), scanning speed, hysteresis, saturation, time delay, sampling, orientation fields such as total body irradiation (TBI) and total skin electron irradiation (TSEI) and small fields used in stereotactic radiosurgery (SRS), and intensity modulated radiation therapy (IMRT), smoothing, filtering and processing and presentation of commissioning data.
An overview and limitation of the task group will be discussed in the context of the rational for beam data commissioning, time needed for data collection and the legality of the data for future use.

Calibration: It is ten years since the TG-51[2] protocol was published. Recent developments have called into question the relevance of the protocol as it stands. Three areas are immediately obvious: i) The majority of chambers available today do not have k_Q factors listed in TG-51; ii) Users can obtain linac-based absorbed dose calibration coefficients for ion chambers on a routine basis; iii) Monte-Carlo radiation transport algorithms now allow accurate modelling of ion chamber geometries (and thus more accurate calculated k_Q factors).
In light of these issues the AAPM set up a working group to review TG-51 and provide clarification. The output would be an addendum that updates the TG-51 protocol to the situation in 2010. This presentation will deal primarily with *megavoltage photon beams* and will discuss the content of the draft report:

i) Calculated k_Q factors for new chambers developed after the publication of TG-51
ii) A comparison of these calculations with measured k_Q factors obtained at primary standards laboratories
iii) An in-depth discussion of uncertainties with guidance on how the clinical physicist can affect the overall uncertainty in absorbed dose to water
iv) Best practice recommendations to minimize errors and ensure consistent dosimetric reporting

There will also be some discussion of the issues to be faced in the update for electron beam dosimetry.

Learning objective:

1. Rationale for beam data commissioning for a linear accelerator
2. Typical problems, choice of detectors, data collection accuracy
3. Data processing and accuracy needed
4. Rationale for an update to TG-51
5. Content of photon beam addendum
6. Timeline for electron beam update.

AbstractID: 14582 Title: CE - Therapy SAMs: Commissioning and calibrating a linear accelerator – state-of-the-art in 2010

[1]I. J. Das, C. W. Cheng, R. J. Watts, A. Ahnesjo, J. Gibbons, X. A. Li, J. Lowenstein , R. K. Mitra, W. E. Simon and T. C. Zhu, "Accelerator beam data commissioning equipment and procedures: Report of the TG-106 of the therapy physics committee of the AAPM," Med Phys **35**, 4186-4215 (2008).

[2]P.Almond, P.J. Biggs, B. M. Coursey, W. F. Hanson, M .S. Huq, R. Nath, and D.W.O. Rogers, "AAPM's TG-51 protocol for clinical reference dosimetry of high-energy photon and electron beams Report of AAPM Radiation Therapy Committee Task Group No. 51," *Med Phy*. **26**:1847-1870 (1999).