

Implementation of a procedure for calibrating parallel plate ionization chambers in energy X-ray beams

F.S. Dias¹, O. Rodrigues Jr¹, M.P.A. Potiens¹

¹Instituto de Pesquisas Energéticas e Nucleares – IPEN/USP
e-mail: fabio.sabara.dias@gmail.com

Radiotherapy can be a low-cost method of treating cancer if appropriate diagnostic and therapeutic equipment, associated with well-trained staff, is available. Among the various modalities available for treatment, intraoperative radiotherapy (IORT) is a good option as it is a method based on a high dose of radiation administered to the tumor bed immediately after surgical excision, thus reducing treatment time.[1,2]

IORT can be obtained using miniature accelerators capable of producing low-energy X-rays with voltages ranging from 30 to 50 kilovolts, for example, in the ZEISS INTRABEAM system (Carl Zeiss Meditec AG, Jena, Germany) present in hospitals such as Oswaldo Cruz and AC.Camargo in São Paulo, Brazil. [3]

One of the difficulties related to this system is carrying out adequate dosimetry and calibration of the system. According to the recently updated TRS 398 recommendations, for the use of low energy beams, the ideal is to use a parallel plate ionization chamber calibrated in terms of absorbed dose in water. [4]

Thus, this work aimed to establish a calibration procedure for parallel plate ionization chambers in terms of absorbed dose in water at the Ionizing Radiation Metrology Center (CEMRI) at the Institute for Energy and Nuclear Research (IPEN). To confirm the procedure, the calibration of 4 parallel plate ionization chambers was carried out, including one belonging to a private hospital.

Acknowledgement: *This work was supported by CNPQ through a grant in project 140965/2021-1 and by FAPESP through a partnership in project 2018/05982-0*

References

- [1] TEHRANI, Y. A; SETAYESHI, S. Intra-Operative Radiotherapy in Breast Cancer Treatment: A Literature Review. **Iranian Red Crescent Medical Journal**, v. 21, n. 9, 2019
- [2] HENSLEY, F.W. Present state and issues in IORT Physics. **Radiation Oncology**, v. 12, n. 1, p. 1-30, 2017.
- [3] SHAIKH, M. Y; BURMEISTER, J; SCOTT, R; KUMARASWAMY, L. K; NALICHOWSKI, A; JOINER, M. C. Dosimetric evaluation of incorporating the revised V4. 0 calibration protocol for breast intraoperative radiotherapy with the INTRABEAM system. **Journal of Applied Clinical Medical Physics**, v. 21, n. 2, p. 50-59, 2020.
- [4] IAEA, INTERNATIONAL ATOMIC ENERGY AGENCY. **Absorbed Dose Determination in External Beam Radiotherapy, An International Code of Practice for Dosimetry Based on Standards of Absorbed Dose to Water**. IAEA TRS-398, rev 1, Vienna, Austria, 2024.