COMPLIANCE OF INDIGENOUS TELECOBALT UNIT (BHABHATRON-II) WITH IEC RADIATION SAFETY STANDARDS

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Abstract:
Telecobalt units in comparison to medical linear accelerators (linacs) are widely used in developing countries for cancer treatment and are preferred over linacs because of: i) low cost, ii) low maintenance cost, iii) lesser power requirements, and iv) less down time. Due to these reasons, the telecobalt unit is still popular over linac at least for the developing countries, though linac is advantageous over telecobalt machine in various aspects such as variable dose rates, multiple photon and electron - beams and energies and lesser beam penumbra. At present in India, there are only 385 teletherapy units which includes 281 telecobalt units and 104 linacs. On the basis of cancer incidence in India, it is estimated that we need more than 1000 teletherapy units, which is likely to increase in near future. It is worth mentioning that out of 281 telecobalt units, almost all the units are imported except a few indigenous. Further, the imported telecobalt units are quite expensive which is a major hindrance for establishing radiotherapy centres in rural India. In view of the above, Bhabha Atomic Research Centre, Mumbai, India designed and developed a prototype telecobalt unit, which was named as Bhabhatron-I. With further operational feedback, a modified model was developed and renamed as Bhabatron-II, which has maximum source capacity of 555 TBq \(^{60}\)Co. It is mandatory that before the unit is used for clinical applications, it shall comply with various safety standards like electrical, mechanical, dosimetric and radiation safety etc., In India, Atomic Energy Regulatory Board, ensures that the unit complies with National/International standards before granting Type Approval Certificate to the manufacturer. In this paper, the results pertaining to radiation safety of the Bhabhatron-II unit are reported. The radiation leakage tests with beam ON/OFF and during source transition were performed as per the requirements of International Electrotechnical Commission (IEC-60601-2-11, 1997) and National requirements as stated in RPhD/telegamma/QA/95. For measurements, four different dosimetric devices i.e., thermoluminescent dosimeters, FC65-G/783 Farmer Type ionization chamber, radiographic films and survey meter were used. The results obtained were found to be within the tolerance limits as specified in National/International standards except for, i) the transmission through X collimators, and ii) the average radiation leakage levels along the source drawer (in front of the head) during beam OFF position at 1m from the source, which exceeded the maximum permissible limits of radiation leakage levels in OFF position. In this paper, we have tried to report the measured radiation levels of the indigenous telecobalt unit and compared with the prescribed National/International safety standards. The results of measurements were useful for the manufacturer in modifying the telecobalt unit so as to comply with the prevailing standards.

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