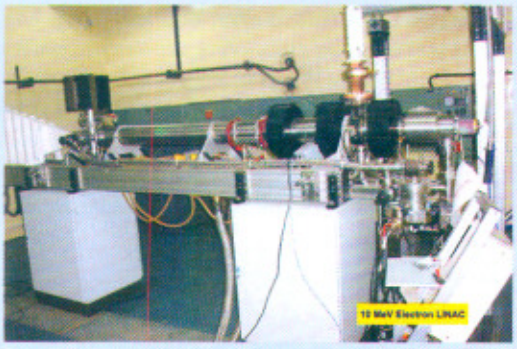

Fig.A20.1 10MeV electron LINAC

(Contributed by: PR Hannurkar; hannurka@cat.ernet.in)

A.21 Radiotherapy machine operational

A microtron based radiotherapy machine for treatment of cancer patients has been designed and developed. The machine (fig.A.21.1) can be operated in both electron and photon modes. The electron mode will be used for treatment of superficial tumors, while the photon mode will be used for treatment of deep-seated and bulky tumors. The specifications of the machine are given below:

Photon energy	6, 9MV
Electron energy	6, 9, 12MeV
Dose rate	0.5 – 5Gy/min
Dose uniformity	±3%
Field size	0 x 0–40 x 40cm^2
Gantry rotation	±180°
Collimator rotation	±95°

An electron beam of 6 & 9MeV, beam current on internal target is 22- 25 mA and the extracted current measured with FCT is 19-20mA. The machine has been operated up to 50 Hz pulse repetition rate. The extracted beam is further transported through the beam transport line with 90% efficiency and passes through the treatment head meant for generation of the clinically acceptable radiation field. The treatment head contains combination of scattering foils or x-ray targets with flattening filters to be used with electron and photon modes respectively. Radiation field generated from the treatment head has been measured with a radiation field analyzer (RFA) having 3-dimensional movement mechanism for 3D mapping of radiation field. Profile measurements of 6MV photon beam (without flattening filter) have been carried out in water with miniature solid-state detectors (sensitive volume 0.0003cm^3). The desired dose profiles are generated by plotting the ratio of field to reference signal vs. position of field detector. The percentage depth dose profile in water and transverse profile along principal axis at D_{max} level are shown in figures A.21.2 & A.21.3 respectively. As per the requirements of International Electro technical Commission (IEC)/ British Journal of Radiology (BJR) the desired value of depth of D_{max} and quality index (D_{20}/D_{10}) for 6MV beam is 1.6cm and 0.67 respectively. The measured values of these parameters (without flattening filter) for our beam are 1.7cm and 0.62 respectively. The variations in the values are due to the presence of soft x-ray components transmitted from the x-ray target. By introducing a suitable flattening filter the soft components will be filtered out to meet the desired requirement. Flatness of the transverse dose profile will be achieved within ± 3% by optimizing the shape of the flattening filter. In electron modes the maximum dose rate measured at SAD (100cm) is 10-12Gy/min.

Fig.A.21.1 Microtron based radiotherapy machine

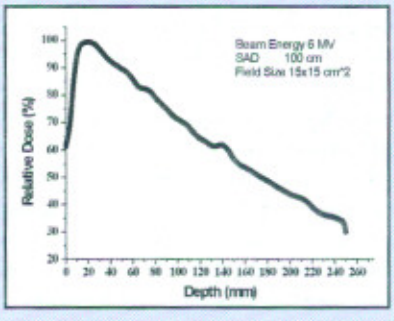

Fig.A.21.2 Depth dose curve in water for 6MV photon beam

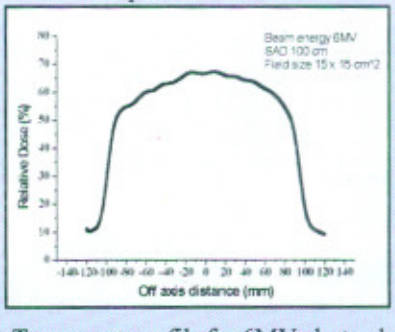

Fig.A.21.3 Transverse profile for 6MV photon beam

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