

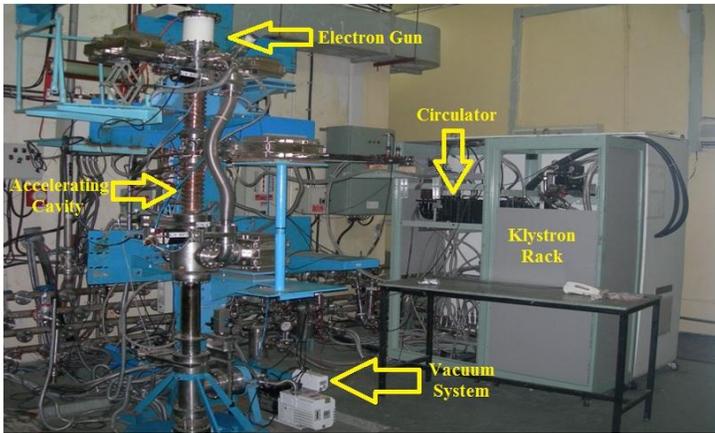
10 MeV Industrial RF Accelerator

The 10 MeV RF electron Linac facility at EBC, Kharghar is used for radiation processing either in electron beam mode or in X-ray mode. The conveyor system is used for product handling during the irradiation processing. Along with its various subsystems, Linac is housed in a two storied building with 2.6 meters thick concrete shielding walls. The Linac structure with electron gun, RF cavity, gate valves, SIPs, and beam transport line is at first floor, whereas scan magnet, scan horn, titanium foil, SIP for scan horn and conveyor systems for material handling is at ground floor.

The electron beam at 50 keV is generated in electron gun with LaB6 cathode and is injected into the on-axis coupled cavity linac which accelerates the electrons to energy of maximum 10 MeV. A 2856 MHz, 6 MW Klystron based RF power source is used to establish the required electric field of 18 MV/m inside the linac. After acceleration, the magnetic sweep scanner deflects the beam in the scan horn and taken out in the atmosphere through a 1000 mm × 70 mm, 50 ? m thick titanium foil window for radiation processing applications. The complete linac up to titanium foil is maintained in the vacuum of 10^{-7} torr with the help of rotary backed turbo molecular pumps and sputter-ion pumps. A low conductivity water cooled tantalum target is used to convert the electron beam into X-ray mode irradiation. The other sub-systems of RF Linac are ozone removal system to remove the ozone from scan horn area which is generated by the interaction of electron beam with air molecules before hitting the product to be irradiated. The low conductivity water (LCW) cooling system is used to remove the heat generated in various sub-systems of RF Linac during operation. The air cooling system is used to remove the heat by imparting the air flow via fans. These are used to cool electron gun load, titanium foil, electron gun etc.

System Specifications

Operating Energy	10MeV
Operating Frequency	2856±2MHz
Peak Beam Current	250mA
Beam Pulse Width	10µsec
Pusle Repition Frequency	400Hz
Average Output Beam Power	10kW
Microwave Input Power to LINAC	6MW peak, 25kW average
Electron Source	50keV, 1A peak, LaB ₆ Based
Length of Accelerator section	978 mm (33 cells)



10MeV RF Accelerator Overview



Scan Horn

Applications

- Radiation Food processing
- Cross linking of polymers
- X-ray source for Cargo-scanning
- X-ray & Neutron source for radiography
- Semiconductor irradiation
- Radiation curing of adhesives
 - Graft polymerization
 - Teflon degradation
 - Diamond coloring
 - Medical sterilization
 - Food disinfestations

Utilisation

- Power diode Trr reduction from 15 μ s to 8 μ s, 4 kGy. (BHEL)
- Chittosan irradiation for increasing yield of sugar cane production and waste management, 50 kGy. (VSI, Pune)
- Zirconium alloy coolant radiation damage studies, 400 MGy @ rate of 1 MGy/hr. (RED+ChD, BARC)
- Performance testing of solar cells in high radiation field, 350 kGy, (ISRO).
- Polyethylene gaskets O-ring cross linking. (Softening temperature enhanced from 60⁰C to 280⁰C). (Technocraft Industries)
- Polyvinyl acetate cross linking, 50 kGy. (Pidilite Industries)
- Recovery of pure copper from scrapped PCB, 400 kGy. (Electronic Waste Management) (ICT and RTDD, BARC)