

A.5: Endurance testing of food irradiation Linac

Linac-3 (9.5 MeV, 10 kW beam power) is designed for electron beam food irradiation. This Linac has a maximum electron energy limiting system to less than 10 MeV to meet the regulatory requirements for food irradiation. Linac assembly under high power test is shown in Figure A.5.1. All operating parameters are set and monitored using in-house developed control system. Extensive machine safety and personnel safety interlocks are in place for safe operation of the Linac at high power.

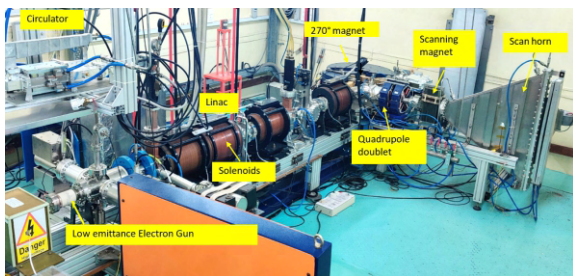


Fig. A.5.1: Linac-3 assembly under high power test.

Pulse beam current signal of ACCTs before and after 270° magnet and energy measurement plates are shown in Figure A.5.2. In order to test the endurance of the machine, a non-stop operation of the Linac for 32 hours was carried out at the rated beam parameters of energy 9.5 MeV, 10 kW beam power. The operation of the Linac was stable over the full duration of the test. Traces of beam energy, current and power (after bending magnet) over one hour are shown in Figure A.5.3. Beam current plot over 8 hrs. during 32 hours of non-stop operation is shown in Figure A.5.4.

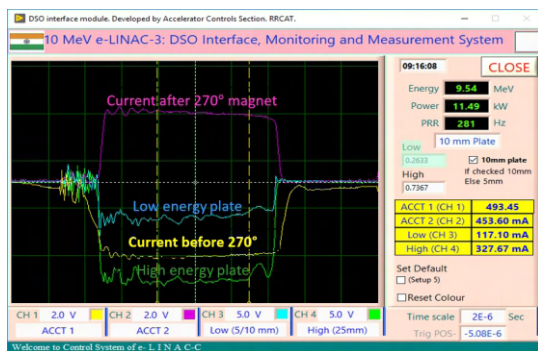


Fig. A.5.2: Digital storage oscilloscope (DSO) screen showing traces of beam current and energy.

The non-stop endurance testing was witnessed by industry representatives. This test is a major milestone towards deployment of “high power” Indian Linacs both for industrial as well as food irradiation applications. Linac has also been qualified for food irradiation by doing volumetric dosimetry on coriander powder and Poha. Dosimetry was done as per ISO14470 and ASTM 51431 standards. Energy measurement using wedge method is shown in Figure A.5.5. Dose uniformity of 1.5 was achieved as shown in Figure A.5.6.

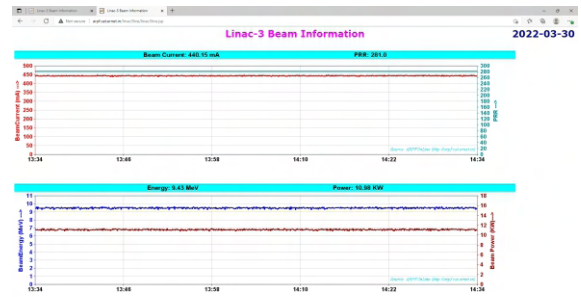


Fig. A.5.3: One-hour plot of beam energy, current and power (after 270° magnet).

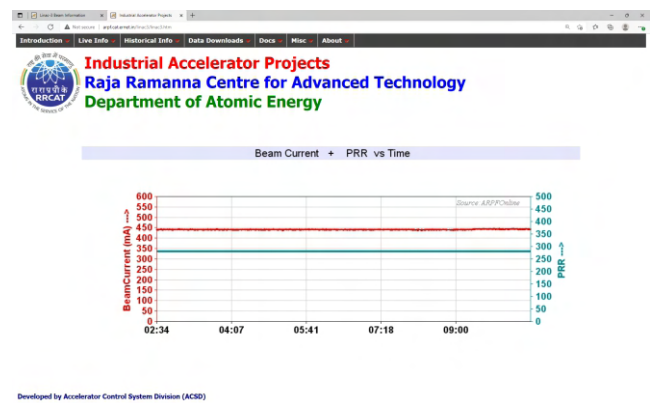


Fig. A.5.4: Beam current plot over 8 hrs. during 32 hours of non-stop operation.

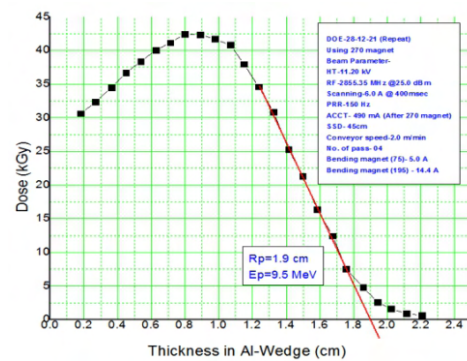


Fig. A.5.5: Energy determination using depth dose curve derived from wedge method.

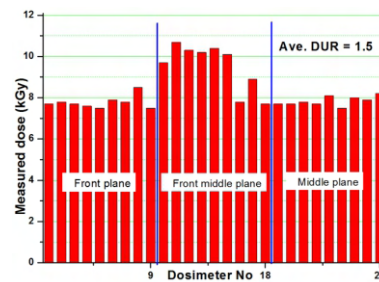


Fig. A.5.6: Dose uniformity in coriander powder.

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