levels were briefly observed accompanying the multipacting.

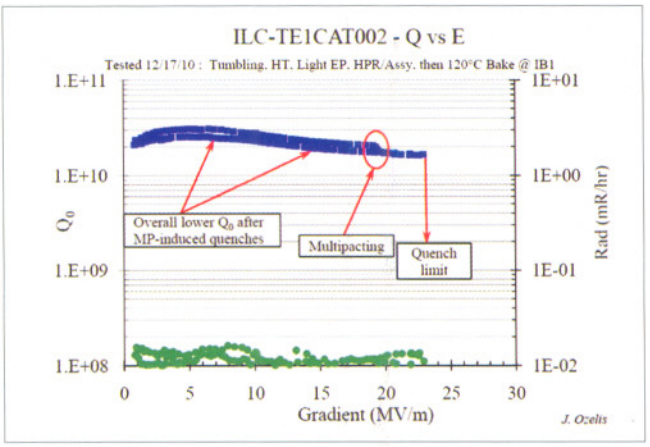

Fig.A.8.2: Q vs E_{acc} plot of Indian SCRF Cavity TE1CAT002 second test run

Both low field and high field Q_0's were reasonably good - $2.5x10^{10}$ and $1.7x10^{10}$, respectively. The cavity's performance improved somewhat as a result of the processing undertaken since its first test - especially noted is an overall improvement in quality factor Q0 as shown in Fig. A.8.2.

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A.9: Development of Centrifugal Barrel Polishing Machine

Superconducting RF cavities are designed to operate for accelerating gradients of ~ 25-40 MV/m. The fabrication processes introduce defects in the surface layer. Therefore surface layer of up to 120-150 microns is to be removed by mass finishing operations. Surface finish of the cavities needs to be of a high quality for operation at high RF voltages. A surface finish of around 100 nm is obtained using barrel polishing. Fig. A.9.1 shows a centrifugal barrel polishing designed and developed at RRCAT, Indore with the help of a local fabricator. The machine has been designed to accommodate two numbers of single cell 1.3 GHz SCRF cavities. The rotational speed can be varied from 0 to 200 rpm.

Fig. A.9.1: Barrel polishing machine for Single cell 1.3 GHz SCRF cavity.

The mass finishing media is filled inside the cavity. The cavity is mounted on fixtures and placed in barrels that are fixed on a rotating turret. The barrels rotate on their own axis as well as revolve about the turret axis.

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A.10: Electron beam irradiation for quarantine disinfestation of seeds

A 750 keV DC accelerator and product irradiation system is operational at RRCAT in the energy range of 500-750 keV with a typical beam current of 10 mA. The electron beam is scanned using a scanning magnet to the desired width based on the product requirement (maximum scan width is 1 meter). The beam is extracted out in air through a thin titanium foil for irradiation of products.

Under a collaboration between RRCAT and National Bureau of Plant Genetic Resources, New Delhi (NBPGR), work is being done to study the effective dose of electron beam as quarantine disinfestation treatment in some important crops. The study also includes irradiation of the seeds infested with the target pests at different development stages to find the lethal dose and effect of exposure on the insect survival, fecundity and survival of the pests in the next generation.

As part of this collaborative work, various uninfested seeds, infested seeds with different development stages of target pests and various harmful male and female insects were irradiated using the accelerator irradiation system. This included seeds of soybean, chickpea, mungbean, rice, cotton, wheat and brassica, and various insects viz. callosobruchus chinensis, callosobruchus maculatus, trogoderma granarium, sitophilus oryzae.

The dose delivered to the product is a function of electron current and speed of the conveyor belt on which it is moving across the electron beam. Based on the dosimetry experiments using B3 film at 500 keV, we determined the required beam current and conveyor speed to deliver dose of 250 Gy in one pass as shown in Fig. A.10.1.

Fig.A.10.1:The irradiation system during dosimetry qualification using B3 film. Also seen in the picture is the beam scanner and conveyor system.

Fig.A.10.2: Sample of various seeds on process trays.

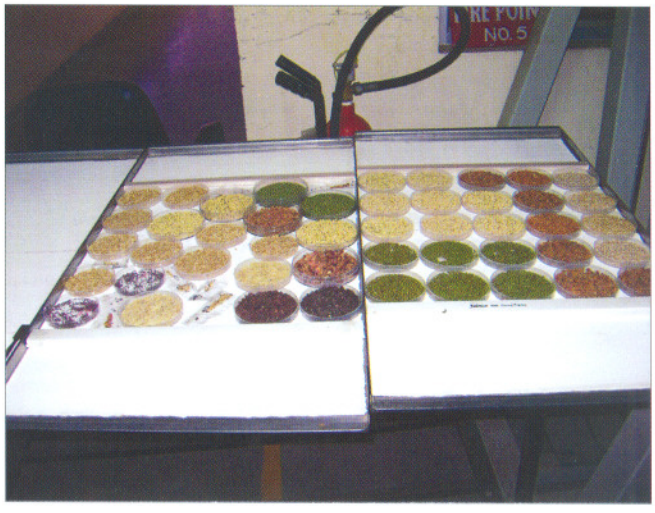

Fig.A.10.3:Seeds on process tray passing through the beam scanner on conveyor belt.

Higher doses were given to the samples in steps of 250 Gy by increasing the number of passes. The dose uniformity at 500 keV was within ±5% for scanning width of 500 mm. The samples to be irradiated were placed in the process trays at one end of the conveyor belt and were made to pass through the electron beam as shown in Fig. A.10.2 and Fig. A.10.3. Irradiation process was monitored through a CCT monitor in the control room. The samples were exposed to doses of 250 Gy to 1500 Gy at the beam energy 500 keV. Subsequently the germination and seedling vigour of the irradiated seeds were studied by NBPGR to determine the doses for the enhancement of these qualities.

Contribution from colleagues in Industrial and Medical Accelerator Section and high voltage team of Power Supply and Industrial Accelerator Division is acknowledged.

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