

DEVELOPMENT OF CROWBAR SYSTEM FOR THE PROTECTION OF HIGH POWER VACUUM TUBES USED FOR 240 KW, 3-PHI RF SYSTEM FOR SUPERCONDUCTING CYCLOTRON AT VECC

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Abstract

RF system of K-500 superconducting cyclotron at VECC is a complex three phase system operating in the frequency range of 9-27 MHz with potential of around 90kV feeding to each of three RF-cavities placed in median plane of cyclotron at 120° apart. At final stage in each phase, a water cooled vacuum Tetrode Tube EIMAC 4CW150000E is used as high power amplifier, capable of delivering 80 kW RF power to RF-cavity. A high voltage DC power supply rated at 450 kW at 20kV feeding to their Anodes, is developed in-house with ultra-fast(5μ -sec)Crowbar protection system to protect the tubes against Internal Arc using energy diverter topology. High power vacuum tubes are prone to internal Arc and can get severely damaged if excessive energy is dissipated during fault. A highly specialized scheme that incorporates a complex electronics control and fault processing circuitry which does latching for fault diagnostic and replicates the hardwired logic circuit to generate a trigger pulse to fire Ignitron as crowbar switch ignoring the noise as well as providing redundancy to trip Mains ACB. Circuit simulations and test results with specialized measurement procedure are described in this paper.

**CONTRIBUTION NOT
RECEIVED**