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Technology developments for ECRH system

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The Gyrotron based electron Cyclotron resonance Heating (ECRH) system is used on tokamaks Aditya-U and SST-1. The ECRH system consists of High power Gyrotron, corrugated waveguide based transmission line and a quasi-optical launcher.
The 42GHz Gyrotron delivers 500kW power for 500ms duration. This Gyrotron operates at ˜ - 48kV beam voltage and +18kV anode voltage. This system draws around 20A beam current. This is a critical systems associated with high voltage power supply systems. A dedicated protection system is used to protect the Gyrotron in an event of fault. An ignitron based crowbar system removes the voltage within 10⊠s and ensures the safe operation of Gyrotron.
In order to operate the system with more reliability, power supplies and protection system are being upgraded indigenously. An advance thyristor based solid state crowbar is under development which will replace the ignitron crowbar system. A 20kV solid state crowbar has been developed and tested successfully. This system has been integrated with the existing anode power supply. The prototype crowbar at 30kV has also been tested successfully. A 50kV solid state crowbar has been designed and under development. An IGBT based solid state switch has been developed successfully which has been tested up to 18kV. This can replace the existing anode power supply which has slow rise time. This IGBT based switch facilitates the system for modulation.
An advance launcher has been designed and under procurement. This launcher consists of two mirrors (one focusing and other plane) mounted on SS flange. The focusing mirror is fixed however the plane mirror can be steered in ultra-high vacuum (UHV) environment. The plane mirror is connected with two mechanisms for necessary movement in two directions. The system is designed such that to minimize the backless and give the precession movement with position indicator. This prototype launcher can be used as real-time feedback launcher with some additional modifications.
The paper discusses about the technologies developed indigenously for the safe, reliable and accurate operation of ECRH system on tokamaks.

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