# Seminar

# Institute for Plasma Research

**Title :** Development of PWM Rectifier

**Speaker:** Mr. Amitkumar M. Patel
Institute for Plasma Research, Gandhinagar

**Date :** 9th May 2019 (Thursday)

**Time :** 04.30 PM

**Venue :** Committee Room 4, (New Building), IPR

**Abstract :**

Harnessing Nuclear Fusion reaction as a source of energy is important for mankind as it can potentially provide an environmentally benign way to produce energy from an almost inexhaustible resource, viz., Deuterium from water. Research in ITER grade magnetic confinement fusion uses high power Radio Frequency sources and accelerated Neutral Particles to heat plasma to fusion temperature. These devices use High Voltage Power Supplies (HVPS) that need to supply power in the range of 1-10 MW with output voltage of several tens of kilo volt. Pulse Step Modulation technique is one of the potential technique that is used to generate High Voltage from a series connection of a large number of low voltage switched power modules, all fed by a Multisecondary transformer. This makes the HVPS capable of generating low ripple output with µs order transient response time and low let through energy in case of load fault. However, power quality and reliability of these systems still need improvement for compatibility with industrial environment. In a conventional diode rectifier based switched power supply module, current drawn from multisecondary transformer is highly distorted which ultimately affects the transformer performance. Because of same, higher capacity may be explored or better thermal management. In addition to this, there is also a mandate to control the supply side harmonics in the power supply system as per the IEEE guidelines. Apart from power quality, certain applications demand a stable and programmable dc link in the switched power supply module. As a mitigating action, a novel concept of replacing diode rectifiers by Front End Converter is attempted for first time in any PSM based module. Thesis mainly discusses about HVPS with conventional diode rectifiers and possibility of replacing a diode rectifiers by Front End converter (FEC) to mainly improve upon the harmonic performance. It also discusses about the implementation of the same in a laboratory scale 6 kW module and the performance results so achieved, supported by simulation on MATLAB.