

# Seminar

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## Institute for Plasma Research

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**Title :** Tokamak as a Transformer  
**Speaker:** Mr. Devilal Kumawat  
Institute for Plasma Research, Gandhinagar  
**Date :** 11th July 2019 (Thursday)  
**Time :** 3:00 PM  
**Venue :** Board Room, New Building, IPR

### **Abstract :**

ADITYA-U is a medium sized tokamak with major radius of 0.75m and minor radius of 0.25m. The plasma in ADITYA-U tokamak is initiated, stabilized and confined using different time varying magnetic field coils. Loop voltage is required to be controlled during plasma discharge to optimize and predict the breakdown of plasma, proper impurity burn-through time, plasma current flat-top. Plasma current magnitude and duration of the plasma is governed by temporal profile of loop voltage. In ADITYA-U tokamak, plasma discharges are performed with different shape and magnitude of plasma loop voltage in order to perform various experiments.

An Electrical-Model is developed for ADITYA-U tokamak to study the generation of different shapes and duration of loop voltages out of the total available flux, which is 0.6 Vs (positive convertor power supply only). Loop voltage waveform is governed by selecting different magnitude of resistance values, ignitron switching time and duration of external resistance in the wave shaping primary circuit. Loop voltage control system has been modelled using Numerical Code (Electrical-Model). Same results have been validated with the simulated results of Ohmic wave shaping circuit in MATLAB- SIMULINK. Temporal profile of current in ohmic transformer (OT) coil is modelled and benchmarked for all plasma and vacuum discharges. Temporal profile of Loop voltage has been generated for plasma discharges and vacuum discharges using Electrical-Model for ADITYA-U tokamak. Validation of loop voltage profiles are also performed with various experimental plasma and vacuum discharges.

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