Seminar

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Institute for Plasma Research

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Title: Runaway Electron Behaviour during ECRH Termination as Observed by ECE in the ADITYA-U Tokamak

Speaker: Dr. Varsha Siju
Institute for Plasma Research, Gandhinagar

Date: 24th March 2026 (Tuesday)

Time: 10:30 AM

Venue: Seminar Hall, IPR

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Abstract

The dynamics of runaway electron (RE) generation under the influence of electron cyclotron resonance heating (ECRH) have been systematically examined in the ADITYA-U tokamak. Electron cyclotron waves accelerate a fraction of bulk electrons to suprathermal energies, forming a seed population capable of undergoing runaway acceleration. Following the termination of ECRH, this fast-electron tail can exceed the relativistic critical momentum, thereby intensifying runaway production and triggering kinetic instabilities. These processes manifest experimentally as a pronounced rise in electron cyclotron emission (ECE) intensity. Two classes of discharges were analyzed: (i) cases in which the increased loop voltage immediately after ECRH termination drives the fast electrons into the runaway regime, and (ii) cases where an initially elevated fast-electron population present during plasma start-up is further accelerated into the runaway domain by an applied ECRH pulse. In both scenarios, the modified electron distribution function and its subsequent redistribution lead to enhanced micro instabilities, reflected in the observed ECE amplitude growth.

References:

1. Jaspers R, “Runaway electrons in tokamak plasma” PhD Thesis, Eindhoven University of Technology, 1995.
2. H. Knopfel and D.A.Spong, “Runaway electrons in toroidal discharges” Nuclear Fusion Vol. 19, No.6., pp 785-829, Jun 1979
3. Varsha Siju, “Study of electron dynamics in tokamak plasma through Electron Cyclotron (EC) emission using Radiometer” PhD Thesis, Homi Bhabha National Institute (2024)