Contribution ID: **549** Type: **Poster**

Ferritic Wall and Scrape-Off-Layer Current Effects on Kink Mode Dynamics

Wednesday 19 October 2016 08:30 (4 hours)

The HBT-EP research program aims to: (i) quantify wall-stabilized kink mode dynamics and multimode response to applied magnetic perturbations, (ii) understand the relationship between control coil configuration, conducting and ferromagnetic wall effects, and active feedback control, and (iii) explore advanced feedback algorithms. We present an overview of planned research activities for the next 3 years, along with ongoing experiments in support of upcoming research. Multiple simultaneous kink modes are measured by over 200 local magnetic sensors. We observe that modulation of n=1 halo current depends on phase and amplitude of rotating kink modes and applied RMPs. A low latency (14us) control system uses 96 inputs and 64 outputs for adaptive control of kinks, via a 512-core graphics processing unit. An in-vessel adjustable ferromagnetic wall is used to study ferritic resistive wall modes, and produces increased mode growth rates, RMP response, and disruptivity. Magnetic feedback suppression of modes requires higher actuator gain with the nearby ferritic wall. A biased electrode in the plasma is coupled to the feedback system, and is used to control the rotation of kinks and evaluate error fields. At strong positive bias, the electrode induces a fast plasma rotation state with enhanced poloidal flow shear. A quasi-linear sharp-boundary model of the plasma's multimode response to error fields, including resistive and ferromagnetic effects, is developed to determine harmful error-field structures. Machine upgrades will allow improved measurements and control of scrape-off-layer (SOL) currents. Movable tiles positioned around limiting surfaces will measure SOL and vessel currents during mode activity and disruptions. Biasable plates at divertor strike points will allow control of field-aligned SOL currents for feedback studies. An extreme ultraviolet diagnostic including (i) four sets of 16 poloidal views and (ii) a two-color 16-chord tangential system will allow tomographic reconstruction of the plasma's optical emission and internal structure of kink modes, along with temperature profiles versus time. These measurements will enable feedback on kink modes using only optical sensors and both magnetic and edge-current actuators.

Paper Number

EX/P3-40

Country or International Organization

United States of America

Author: Dr LEVESQUE, Jeffrey (Columbia University)

Co-authors: Dr HANSEN, Christopher (University of Washington); Dr STOAFER, Christopher (Columbia University); Mr RHODES, Dov (Columbia University); Prof. NAVRATIL, Gerald (Columbia University); Dr BIALEK, James (Columbia University); Mr BROOKS, John (Columbia University); Ms ABLER, Melissa (Columbia University); Prof. MAUEL, Michael (Columbia University); Mr BYRNE, Patrick (Columbia University); Mr HUGHES, Paul (Columbia University); Mr PENG, Qian (Columbia University)

Presenter: Dr LEVESQUE, Jeffrey (Columbia University)

Session Classification: Poster 3

Track Classification: EXS - Magnetic Confinement Experiments: Stability