ITPA Topical Group on MHD, Control, and Disruptions

Summary of 5th meeting, Nov. 8-10, 2004

Presented by Ted Strait

Workshop on MHD Mode Control

Princeton, Nov. 23, 2004

More information at http://itpa.ipp.mpg.de/

ITPA Topical Group on MHD, Control, and Disruptions

- Fifth meeting: Lisbon, Nov. 8-10
- New chairman: Tim Hender
- Scope now includes energetic ion modes
  - Formerly in Steady State group
- U.S. attendees:

  Ted Strait, Michio Okabayashi, Jon Menard, Eric Hollmann, Ed Lazarus
- *U.S. members:*

  Ted Strait, Steve Jardin, Bob Granetz, Jerry Navratil, John Wesley, Ed Lazarus

Physics topics

- **Joint sessions with other ITPA groups**
  - **Stability limits and transport with strong RS and transport barriers: *(with Transport Physics group)***
  - **"Physics versus drsep" *(with Pedestal, Divertor, Transport, Confinement, and Steady-State groups)***

- **Additional technical talks**
  - **Beta-limiting instabilities and their control (NTM, RWM)**
  - **Disruption physics, prediction, avoidance and mitigation**
  - **Magnetic control of plasma equilibrium (including error fields)**

Tokamak Physics Basis Document

- **Tokamak Physics Basis for Burning Plasma**
  - **Update of ITER Physics Basis (Nucl. Fusion 39 No. 12, Dec. 1999)**
    - **Chapter 3. MHD Stability, Operational Limits and Disruptions**
    - **Chapter 8. Plasma Operation and Control**
  - **Now editing sub-sections for balance and length**
    - **Editors for Chapters 3&8: V. Pustovitov and J. Wesley**
  - **Deadline for final draft: Dec. 31**
    - **To be submitted to journal by March 31**

New projects

- **Initiation of new Disruption Database**
  - To include conditions preceding disruption, disruption dynamics, disruption effects, scalar and vector data
  - Coordinator: J. Wesley
  - Goal: first draft of variables for the database by Dec. 31

- **Proposal to develop a common form for the modified Rutherford equation (for benchmarking models and experiments)**
  - Initial goal is to agree on the general form and definitions of parameters, not the specific numerical values
  - Coordinated by Y. Gribov and H. Zohm

Discussion of joint experiments

- MDC1 Pressure and size scaling of gas jet penetration for disruption mitigation.
  - No direct comparisons yet
  - Expts ongoing or planned in C-Mod, DIII-D, JET, JT-60U, Tore Supra
- MDC2 Joint experiments on resistive wall mode physics.
  - Resonant field amplification experiment started (DIII-D, JET)
  - RFA and critical rotation frequency experiments planned (DIII-D, JET, JT-60U, NSTX, Textor)
- MDC3 Joint experiments on neoclassical tearing modes (including error field effects)
  - 3/2 beta rampdown experiments done (AUG, DIII-D, JET, JT-60U)
  - 2/1 beta rampdown and error field experiments planned (AUG, DIII-D, JET, others?)
- MDC4 Neoclassical tearing mode physics - aspect ratio.
  - No direct comparisons yet
  - AUG / MAST experiment planned (DIII-D / NSTX in 2006?)

Discussion of joint experiments

- MDC5 Comparison of sawtooth control methods for neoclassical tearing mode suppression.
  - Some experiments in 2003 but none in 2004.
  - Experiments planned in AUG, DIII-D, HL2A, JET, NSTX, TCV
- MDC6 Error field sideband effects for ITER (low beta)
  - Non-dimensional scaling done (C-Mod, DIII-D, JET)
  - Need to resolve DIII-D comparison, and Bt scaling in C-Mod
  - Possible future expts in C-Mod, DIII-D, JET, MAST, NSTX, Textor
- MDC7 Improving NTM modelling/ extrapolation to ITER
  - Modified Rutherford equation benchmarked without ECCD stabilization (AUG, DIII-D, JET) and with ECCD (AUG, DIII-D)
  - Possible joint experiments on pre-emptive ECCD (DIII-D, JT-60U, possibly AUG)
  - Possible expts on current drive width (AUG, DIII-D, possibly JT-60U)
- MDC8 Joint experiment on fast ion physics *(new topic)*
  - Under discussion by fast ion experts

Plans for next meeting

- **Next meeting (tentatively): Tarragona, Spain**
  - **Immediately before or after EPS meeting June 28-July 2**

- **Focus topics for next meeting**
  - **Disruption database - working group meeting**
  - **NTM physics: (ρ^* scaling, seeding)**
    - **Common form for modified Rutherford eqn.**
    - **Benchmark numerical values vs. experiment**
  - **Benchmarking of RWM feedback codes (without rotation)**
    - **Feedback requirements for ITER**
    - **Effect of noise, noise amplitude in present experiments**