Transport Sessions Summary

D. S. Darrow

(with S. Kaye)

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4 areas considered

- Experiments
- Diagnostics
- Facility upgrades
- Modeling & analysis

Experiments (1)

- Use perturbative techniques to measure:
  - Ion & electron thermal transport
  - Impurity & bulk ion particle transport (with gas puff or pellets)
- A scaling of confinement
- Scaling of confinement with dimensionless parameters

Experiments: ETG & ITG

- ~~Suppress ETG mode temporarily by pellet~~ injection (large grad-n) and measure transient changes in transport
- Measure momentum transport & correlation with low & high k turbulence (w/ DIII-D)
- Look for ETG & ITG:
  - Microwave scattering
  - Reflectometry
  - Flat spots in Ti profile (ion-ion collision timescale)
- Vary pressure gradient & T_i/T_e to turn ITG on & off, look for effects on transport

Experiments (3)

- Look for transport induced by magnetic fluctuations (fast particle transport?)
- Compare co- & counter-injection (momentum transport, zonal flows, E_r generation, beam friction transport)
- Study high-confinement L-mode plasmas (+ noninductive current drive)
- Measure edge fluctuation-driven transport

Experiments (4)

- Measure viscosity & resistivity at high beta for astrophysics applications
- Measure beam ion loss during MHD or external B perturbation
- Measure ELM structure

Diagnostics: fluctuations

- 300 GHz scattering system: resolves k_r & k_θ as function of R (look for ETG)
- Imaging reflectometry: k_θ as function of R & θ (look for ITG)
- 100 GHz backscattering, using existing horns (look for ETG)
- FIReTIPS Faraday rotation will give mean δB (to 0.1% level) along sightlines

Diagnostics (2)

- MSE: CIF + LIF systems will allow measurement of E_r (flow shear); good edge spatial resolution possible (ELM studies)
- Enhanced resolution MPTS (40–45 channels)
- High resolution CHERS
- Edge rotation diagnostic (no NBI required)
- BES

Diagnostics (3)

- TAE & MHD tomography (USXR arrays?)
- Beam ion density profile measurement (neutron collimator, CFP loss, or multisightline NPA)
- Additional scanning probe to measure divertor plasma and correlations with midplane
- δB measurement on fine scale (how??)
- High resolution edge j(r) & p(r) (for ELM studies)

Facility Upgrades: Higher B_T center stack

- New center stack: higher B_T offers many advantages:
  - Wider range of variation of ρ^*
  - Smaller ρ^* would allow separation of scaling with ρ^* vs scaling with A
  - Allows ICRF minority heating for heat pulse studies (low harmonic minority heating)
- BUT, new center stack would obstruct MPTS laser sightline & require system redesign

Facility Upgrades (2)

- Pellet injector: for fueling, perturbative transport studies, η_e control
- Supersonic gas puffer: pertubative particle transport, divertor diagnosis
- Laser blow-off injector: particle transport
- Cryopump to control n_e: reduces recycling to allow D puffing to look at main ion species particle transport
- Counter-injecting beam to compare co vs counter vs balanced injection

Modeling & Analysis (1)

- Benchmark gyrokinetic codes against each other (already partially completed)
- Compare profile data & fluctuation spectra between experiment and GK codes
- Develop calculation of NB friction effects on thermal transport (NCLASS)
- Develop TRANSP predictive capability, esp. with critical gradient models

Modeling & Analysis (2)

- Bridge gap between GK & MHD codes
- Implement parallel fitting of MPTS & CHERS raw data
- Develop model of CAE saturated amplitude
- Clarify measured T_i/T_e ratios & seek explanation for any anomalies

Main points

- Add fluctuation diagnostics and look for ETG & ITG
- Enhance edge diagnostics for ELM & H-mode pedestal studies
- Develop quantitative model of beam friction effects on transport & test
- Do perturbative studies of particle & heat transport
- Quantify momentum transport
- Understand nature of high confinement L-mode