Burning Plasma Wave-Particle Issues for ITER

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Standard H-mode scenarios (Q=10)
Main role: Heating and MHD control

- NBI : no specific issues

- ICRH
  - He^3 Scenario is a very good ion heating system: essential in the power ramp-up phase.
  - Some disagreements with presented simulations:
    - o To be understood: alpha distribution? Better Fokker-Plank model?
  - For non active phase: heavy minority absorption, He^3 He^4
  - Coupling studies done for ITER antenna (ELM resilient): development of code needed.

- ECRH: no specific issues (horizontal launcher).
  - o quantify beam width

MHD control (ECCD on NTMs)

- General agreement with ITER proposal

Steady-state scenarios (AT scenarios): Main role: Current and Pressure Profile control

NBCD (issues not covered)

- Good agreement with total CD
- CD location appears to be an issue (EPM modes, other effects ?)

ICRH

- ICCD
  - Agreement with ITER proposal
- Electron CD
  - Higher estimate than in the ITER proposal (divergences under study: higher damping on electrons ?)
  - In effect, not a problem:
    - At center only a need for a seed current
    - Off-axis, low efficiency (proportional to Te)

ECCD

- Agreement with ITER proposal
- Still an issue to assess CD efficiency at r/a=0.6

LHCD

- Higher far off-axis CD efficiency
- Interesting simulations: Efficiency lower than foreseen in ITER but:
  - o Electron trapping effects not observed in present LHCD exp. with off-axis CD + high central Te
  - o Significant counter CD: optimisation to be made
- Coupling issues: Active density control needed in front of launcher.

Missing items/issues for AT scenarios:

- Rotation issues
- Momentum injection issues (in connection with transport)
- Alpha distributions more “realistic” for AT scenarios, in particular for strong reversed shear scenarios.
- Heating and CD systems taken as actuators for Current and Pressure profile control :
  - o “dynamic code simulations”

More generally

- Studies of Hybrid scenarios (important for long pulse studies in absence of developed steady state scenarios)
- Development and Benchmarking of simulation integrated codes on multi-machine data base