

# ***IOS meeting summary, work plan and actions***

***October 2011***

## **ITER: Reports from STAC-10 and STAC-11 (provisional)**

- Scenario modelling well on-track. More work on divertor compatibility, hybrids, SS and non-active scenarios. Need validation by experiments (particle transport, MHD,.....)
- CS conductor is a concern → scenarios. Risk of losing any margin for operation or back-ups (17MA).
- TF shielding: Proposals, 3cm thicker inner wall.
- Divertor: Decision on W deferred.

## Experiments:

- JET: Restarted operation with Be/W wall, operation in stages until July 2012.
- DIII-D: Run-time this October, with new off-axis NB. Maybe no further operation until Oct. 2012.
- AUG: More RMP coils, ECRH, boron coated ICRH protection tiles. Ops: Jan-Nov 2012.
- C-Mod: Restarting now, new tilted ICRH antenna + long pulse LHCD
- FTU: Operation Nov 2011-June 2012, RT ECRH launcher. Li, LHCD.

## Experiments (continued):

- Tore Supra: Restart in Sept 2012 (400kV supply for ITER), 6-7MW LHCD and 3MW ICRH, long pulse. Long term: WEST.
- LHD: Next: DD operation, closed divertor and increase in ICRH and ECRH power.
- KSTAR: Lots of new data. Operation: Oct-Nov 2012 with 3.5 MW NBI, diagnostic upgrades.

## Joint Experiments (JE's):

- IOS-1.1 and IOS-1.2, will continue
- IOS-2.3: FTU, TS and KSTAR to contribute.
- IOS-3.1 and IOS-3.2: AUG can do experiments in 2012 (to be confirmed) + data analyses.  
Report on IOS-3.1
- IOS-4.1, IOS-4.2 and IOS-4.3 will continue (good progress so far)
- IOS 5.2 and IOS 5.3: Lots of new data, need to analyse jointly.
- IOS-6.1: Refocus → New JE, IOS-6.x
- IOS-6.3: Not a strong commitment, but continue

## Discussion on JE:

- Boundaries to q95 scenario (fast  $I_p$  ramp-up, etc..),  $I_i$ - $q$  diagram. Look at old current ramp data.

Modify IOS-1.1 Collect 0-D database and see where we are (G. Sips).

- Real time control of seeding? What is the best actuator and control strategy. → 2013. Write into IOS-1.2 that this is a longer term aim.
- Impact of ELM mitigation on plasma scenarios (we should be prepared to pick this up). Discuss with PEP.

## Scenario development (modelling):

- CORSICA, baseline simulations (incl. reduced CS perf.), ITER-IO and F4E (incl. ramp-down options)
- Non-active phase AND DD operation. Good to see some DD scenario assessment
- Pros and Cons of H, He and DD operation
- Hybrids: Several revised simulations, 53-73MW input power options, q-evolution
- Long pulse: Hybrid like 10MA, or baseline like 10-15MA, sensitive to impurity concentration (Ar, W)
- SS scenarios with ITB and different heating studied with TCS/TRANSP + MHD stab. analyses.
- TASK and TOTAL for 3-D systems applications

## Joint Modelling Activities: 10 JA's in the TG

- **JA1**, Joint modelling of ramp-up experiments, need to combine data from experiments (C-Mod+....). → advise to ITER on L-mode ramp-up modelling.
- **JA-2**, H-L transition modelling. Only report on EU activity. Detailed modelling of H → L. Local and global models + include impurities.
- **JA-3**, Hybrid benchmark is finished. Need to store data + profiles. New simulations always welcome.
- **JA-4**, SS scenario code-code benchmark, NF paper. Still need to improve: He, rotation, new EC launch and FW → Close + store data + profiles?
- **JA-5**, Hybrid and SS ramp-up access – no progress.



## Joint Modelling Activities (continued)

- **JA-6**, Benchmark of full-wave ICRH solvers. NF publ. nearing completion. 1 DT + 3 low activation cases.
- **JA-7**, SS scenario modelling, split into two tasks  
A: SS exploration (+control), B: Actuators (new JA?).
- **JA-8**, burn control simulations for ITER – to start!
- **JA-9**, Optimisation of operation space for long-pulse scenarios. 15MA baseline at lower  $n_e \rightarrow 1000s$
- **JA-10**,

**We need to get more focus JA's (priority for a few)  
e.g. JA-2, JA-8, JA-9, JA-10**

## Actuator Studies

- H&CD issues for ITER: EL launcher optimised and new geometry information will be available soon. ELM coil induced losses of fast NBI ions are not negligible. New OFMC solver.
- Simulations of baseline performance with beta-pedestal and N-NB energy.
- UL+EL launcher modifications would in best case allow CD for  $\rho=0-0.9$  to be used in scenarios and increases CD by 50%  $\rightarrow$  9MW SS scenario at  $Q\sim 5.3$  with 33MW NBI (on+off axis) + 40MW ECCD.

## Integrated scenario control

- Good progress on combined control of flux profile and plasma beta (reported under IOS-6.1).
- ITER plasma control working group: Document with realistic physics requirements for PCS CDR in November 2012. Spreadsheets for control area's
- Robust profile control is demonstrated, using a simplified model for  $T_e$  and  $q$  variations.
- Simulate NTM and ELM effects in ITER hybrids. NTM feedback control scheme tested in simulations for KSTAR.

## **Actions before the next meeting**

- By 7<sup>th</sup> November 2011
  - ITPA-CC summary report
  - JE summary reports
  - JE proposals for 2012
- Synopsis for the IAEA
- Publication and documentation.
  - NF papers from previous IAEA
  - Report on some JE (next meeting, IOS-1.1, IOS-3.1, database studies fro IOS-4.1, IOS-3.2 )

**Next Meeting:**

- CIEMAT, Madrid, Spain
- 16-19 April 2012 or 17-20 April 2012
- Progress on usual topics + IAEA contributions
  
- Meeting format may evolve....(reporting on JE, JA, high priority tasks)
  
- New chairs: G. Sips, T. Luce and J. Snipes

**See you then:**

**THANK you Shun !!!!**