EFDA Task Force Integrated Tokamak Modelling

EUROPEAN FUSION DEVELOPMENT AGREEMENT

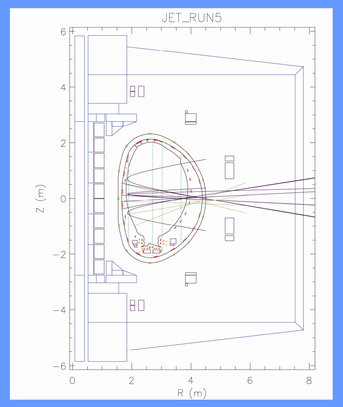
Interfacing tokamak design, experimental data and synthetic diagnostics in the ITM-TF

Experimentalist and Diagnosticians Resource Group (EDRG)

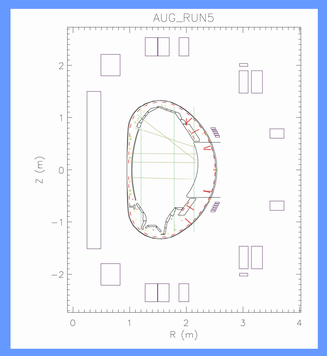
- Privileged contact point of the ITM-TF with Experimentalists and Diagnostics experts.
- Coordinate the interaction with experimental devices in activities related to Verification and Validation (V&V) of ITM modules & workflows and plasma control. (e.g. *testbed* of plasma discharges, timeline and requirements capture)
- Develop a comprehensive set of machine descriptions and data mappings for participating devices.
- Foster the integration of synthetic diagnostics to assist V&V activities but also for diagnostics design.

Major European Tokamaks system design fitted on CPOs

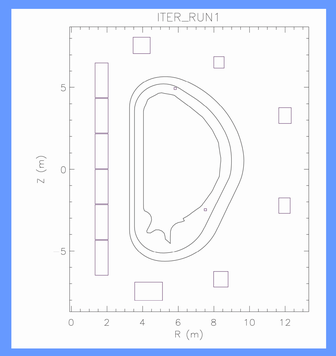
- Structural details : Vessel, Plasma Facing Components (PFC), Iron core, PF systems and H&CD (e.g. NBI, RF antennas).
- Diagnostics details : magnetics, optical, fusion product, probes, radiometer,…
- Machine descriptions & data mappings (from local database to ITM database)
  - ✓consolidated for JET / Tore Supra ⇒ equilibrium & linear MHD stability production runs, ETS runs to follow.
  - ✓Asdex Upgrade integration maturing, block 2D and 3D wall ready
  - ✓FTU and MAST also integrated with PF / vessel /PFC and magnetics/interferometry



JET device : PF, vessel + PFC, iron, NBI + Polar./Interf.+ magnetics



AUG device : PF, vessel + PFC, magnetics + Interf.

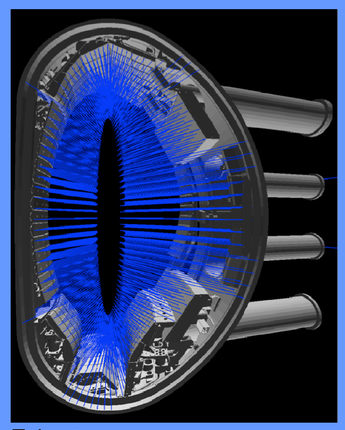


ITER device : PF, vessel + PFC

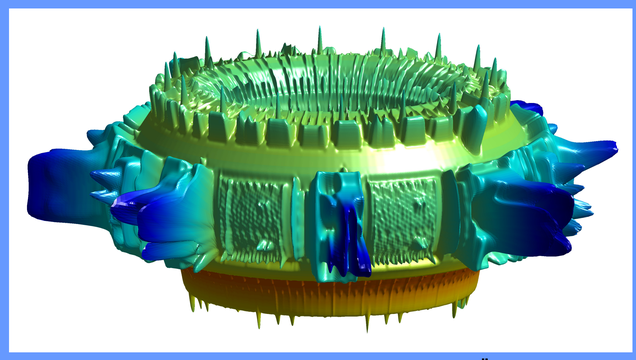
Integrating 3D structures – the first wall

Massive (~10Gbyte) wall that drawing offices produce is unmanageable and too detailed

➢Rasterization of the wall by shooting pre-defined rays + smoothing for gas tight wall



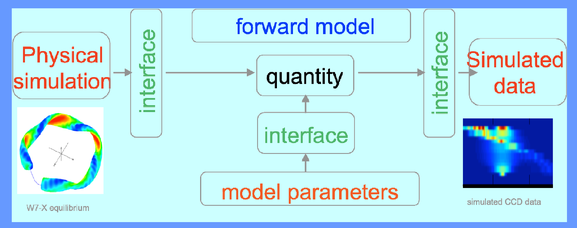
T. Lunt



S. Äkäslompolo

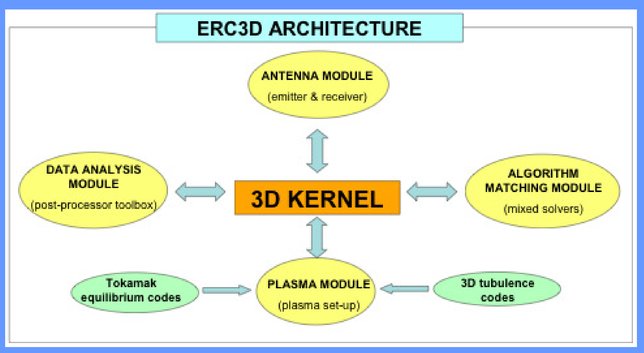
Asdex Upgrade Rasterization on (θ,φ) structured mesh with length of rays hit colortable

Fostering synthetic diagnostic integration



A. Dinklage et al FST 59, 410 (2011)

- MSE spectra forward model (IPP) developed and tested against experimental data. Synthetic diagnostic integration workflow and CPO requirements set grounds for integration.
- Neutron spectrometer/cameras, Neutral Particle Analyser and Fast Ion Loss Detector (VR, TEKES) efforts ongoing to assist code benchmarking & validation.



- Full 3D reflectometer simulator (ERCC Team) integrated on the Gateway (CPO readable, ongoing tests to integrate under Kepler)