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Some impressions from EPS 2011

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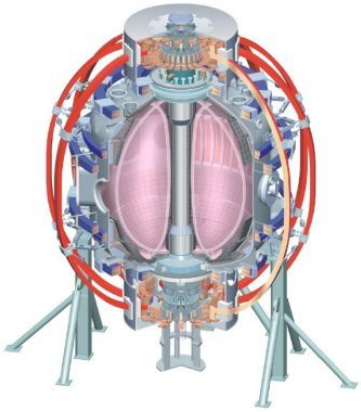
Lawrence Livermore National Laboratory

38th EPS Plasmas Strasbourg 2011

European Physical Society

38th Conference on Plasma Physics

27th June – 1st July 2011



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Edge and Boundary physics well represented in talks and posters at EPS

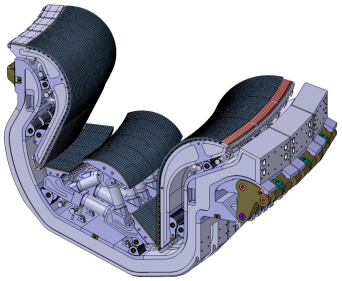
Talks:

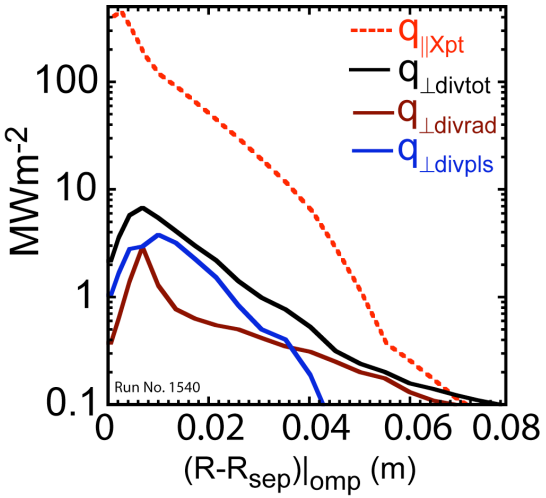
- I1.002 Rudolph Neu Preparing the scientific basis for an all metal wall in ITER
- I1.301 R. Pitts The ITER plasma-wall interaction challenge
- I1.303 M. Groth Poloidal distribution of recycling sources and score plasma fuelling in DIII-D, ASDEX Upgrade and JET L-mode plasmas
- O1.301 P.W. Gingell Hybrid code investigation of the physics of multi-species plasma blobs in magnetic Fields
- O1.302 S. Takamura W nano structure
- I1.401 I. Furno Understanding and taming plasma blobs in toroidal magnetized plasmas
- I1.402 T. Windisch Nonlinear mode coupling and structure formation in drift-wave turbulence
- I1.403 O. F. Petrov Dusty plasmas in the presence of external forces
- 02.303 S. Potzel Detached inner divertor plasmas with and without Nitrogen seeding and RMP
- I2.109 Suttrop W. First observations of ELM mitigation with new active in-vessel saddle coils in ASDEX Upgrade
- 02.102 Huber, A. Radiation heat loads on plasma-facing components of JET during the massive gas injection experiment
- I3.110 Wiesen, S. Integrated modelling of JET type-I ELMy H-mode pulses and predictions for ITER-Like Wall scenarios
- I3.111 Feng, Y. Comparison between stellarator and tokamak divertor transport
- 03.107 Kurki-suonio, T. 3D ASCOT simulations of 13C transport in ASDEX Upgrade
- 03.108 Devaux, S. Surface layer effects on the heat loads on JET divertor plates
- 03.109 Soukhanovskii, V.A. The snowflake divertor: a game-changer for magnetic fusion devices?
- 03.110 Loarer, T. Isotopic plasma wall changeover experiments during long discharges in Tore Supra

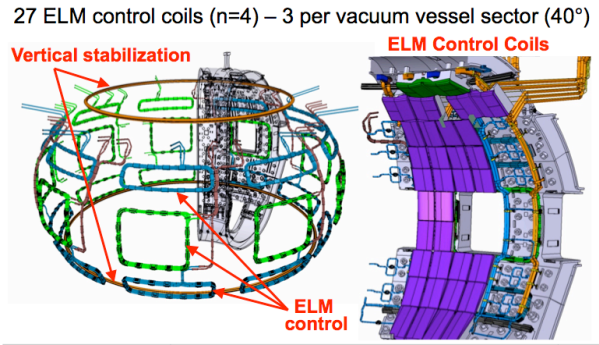
And many more posters

The ITER plasma-wall interaction challenge – still much R&D needed

- R. Pitts "The ITER plasma-wall interaction challenge"
  - Complementary to R. Neu "Preparing the scientific basis for an all metal wall in ITER"
  - Why is PWI is challenging on ITER: Four main reasons (cf. with today's devices):
    - High stored energy; High plasma current; Long pulse, High fluence; Nuclear operation
  - PFC design
  - Four important areas where R&D is critical
    - heat fluxes (steady state and transient)
      - $q_{||}$~1 GW/m^2, λ_q~5mm; partial detachment mandatory
      - Transients: disruptions and ELMs- mitigation mandatory
    - tritium retention
      - recovery of inventory would be required every ~700 ITER full performance discharges
    - material erosion and migration
    - Dust
    - → **all to large extent strongly interlinked**







Edge and pedestal – focus on ELM suppression and pedestal structure studies

- Suttrop W. First observations of ELM mitigation with new active in-vessel saddle coils in ASDEX Upgrade
  - New coils - n=2, both resonant and non-resonant MPs
  - Type I ELMs replaced by ELM-like small transport events
    - Event energy reduced, divertor heat flux reduced x 6-8
  - Plasma stored energy, ped. density unchanged
  - Core tungsten purged at nearly the same rate (cf. Type I ELMs)
  - Wide q_{95} operating window
  - Recent PRL, Invited talk at APS DPP 2011

- Several tokamaks reporting pedestal structure studies over ELM cycle
  - TCV: Type I and Type III ELMs, + range of collisionalities
  - MAST
    - T_e, n_e, P_e – gradients move inward during ELM cycle
    - P_e width increases, P_e height increases (mostly due to n_e)
    - Consistent with ELITE modeling

Divertor and plasma-surface interaction physics

- M. Groth Poloidal distribution of recycling sources and core plasma fuelling in DIII-D, ASDEX Upgrade and JET L-mode plasmas
  - Comparison of codes UEDGE, SOLPS, EDGE2D for well-diagnosed L-mode
  - Codes do not produce consistent poloidal fueling distribution
  - Predictions of the recycling locations and strength, and the SOL conditions are significantly uncertain
- Feng, Y. Comparison between stellarator and tokamak divertor transport
- Snowflake divertor
  - TCV: Effect of snowflake on ELM heat fluxes in inner divertor
  - FAST: possibility of snowflake configurations with existing 2-3 coil
    - The Fusion Advanced Studies Torus (FAST) conceptual study has been proposed as possible European ITER Satellite
- J. Strachan Tungsten Contamination by Neutral Beam Shine-through in the JET ILW
  - EDGE2D modeling of the effect of 120 keV NBI shine-through on tungsten sputtering: no significant core contamination
- M. Shimada Glow discharge cleaning on ITER
  - Design of ITER GDC system and modeling