



MAX-PLANCK-INSTITUT
FÜR PLASMAPHYSIK



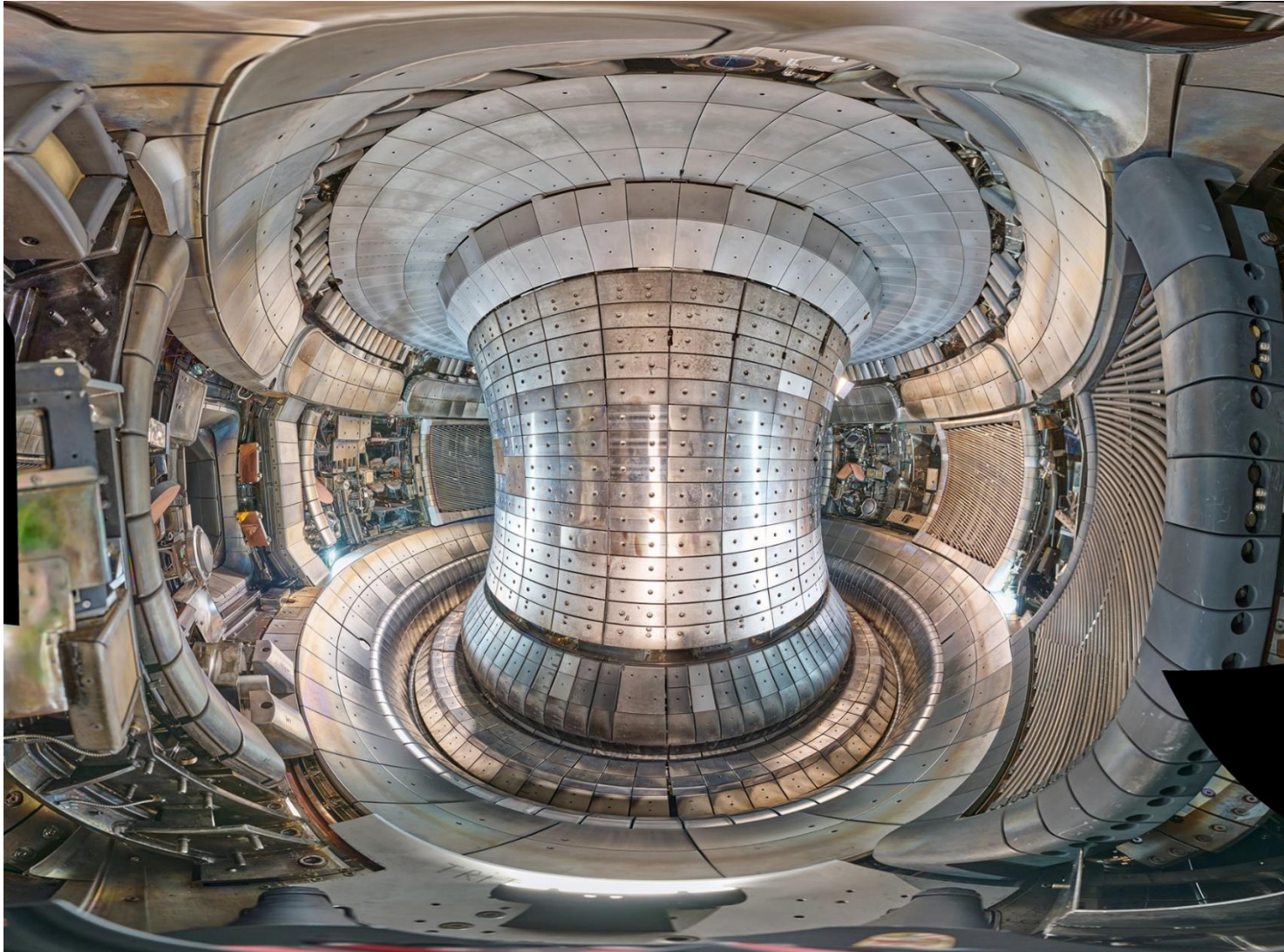
EUROfusion General Programme Meeting Nov 18, 2024

ASDEX Upgrade: machine news and program for 2025



Arne Kallenbach on behalf of the ASDEX Upgrade team

AUG vessel closed after 2-year vent on Aug 30th



Final in-vessel panorama view
August 2024

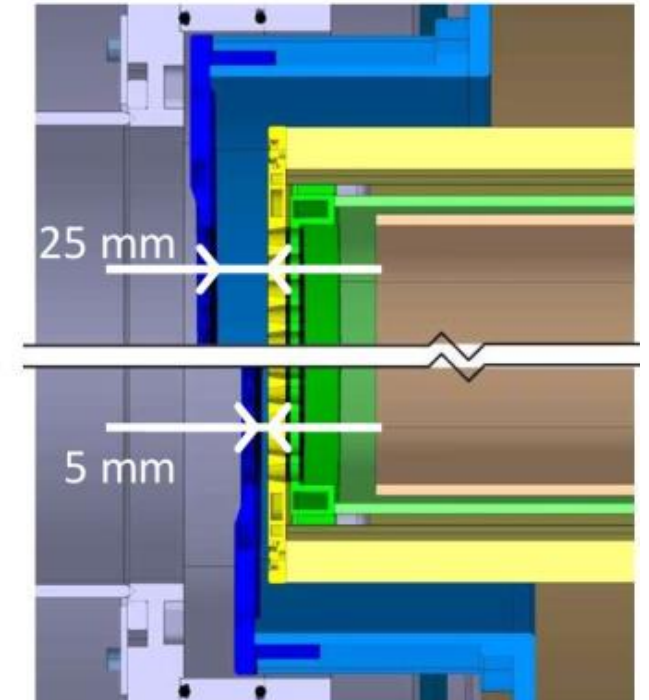
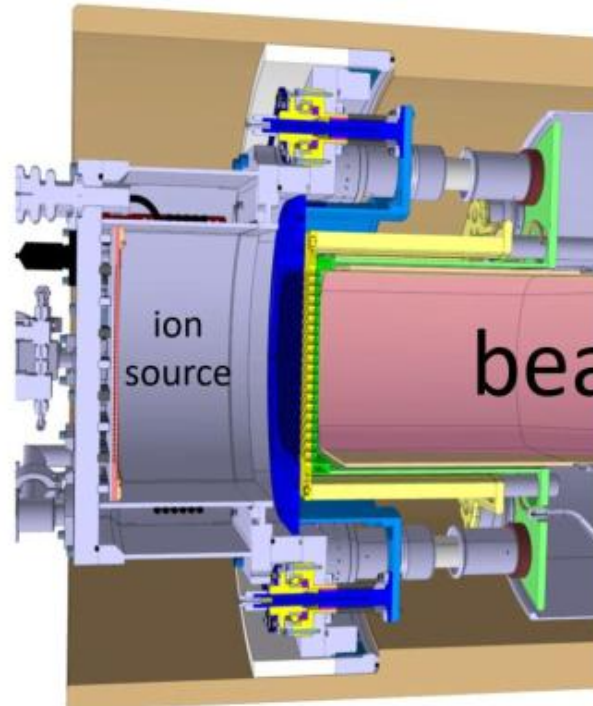
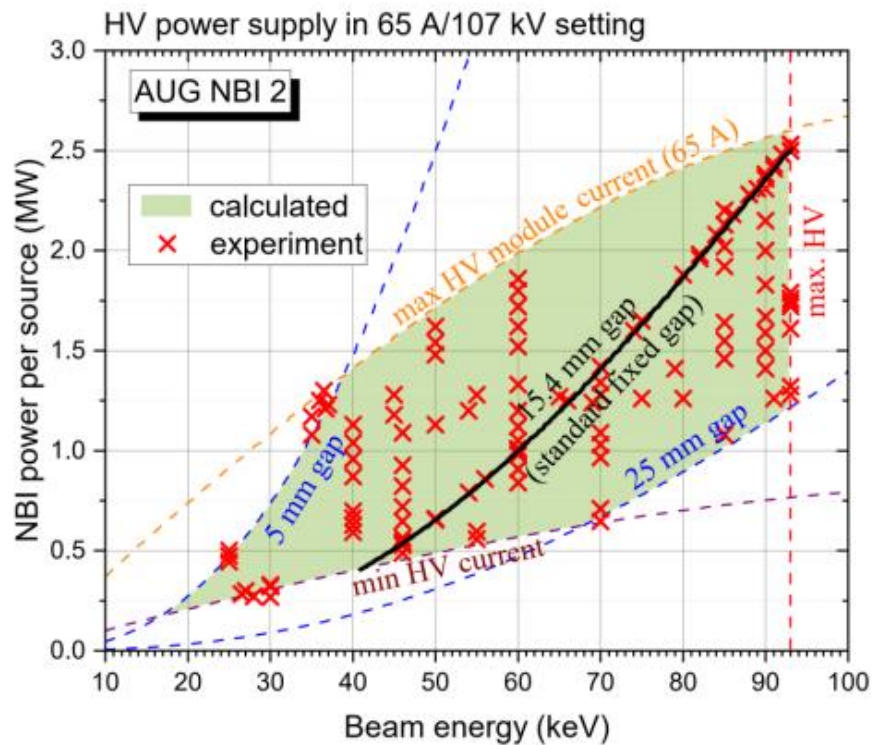
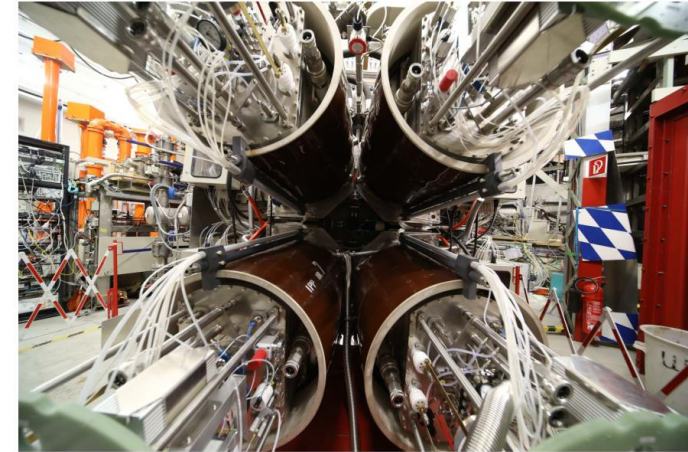
Foto: V. Rohde

Finalization of the AUG extension work and restart

- The AUG vessel was closed on **Aug 30.**, followed by leak repairs and baking from **Sep 17-27**
- Restart began on **Oct 8**, with a no-op week 42 for re-installation of a repaired transformer
- Progress in restart was quite slow:
 - Very difficult I_p rampup after restart with clean metal surface (+ original control and other issues)
 - 1.5 days lost due to cooling water problem
 - Finally $I_p=0.4$ MA flattop achieved with ECRH assist on **Oct 25**, albeit high runaway content
 - Toroidally halved boronization on **Oct 28** (joint venture exp EUROfusion-IPP following ITER request): immediate I_p buildup, some shaky breakdowns, good plasma startup after some conditioning pulses
 - 2.5 days lost Nov 5,7,8 after arc in EZ2 generator motor supply
 - NBI comissioning slow due to HF problems in box I and delayed installation in box II + HV problem NBI II expected back ~ during Fri Nov 22

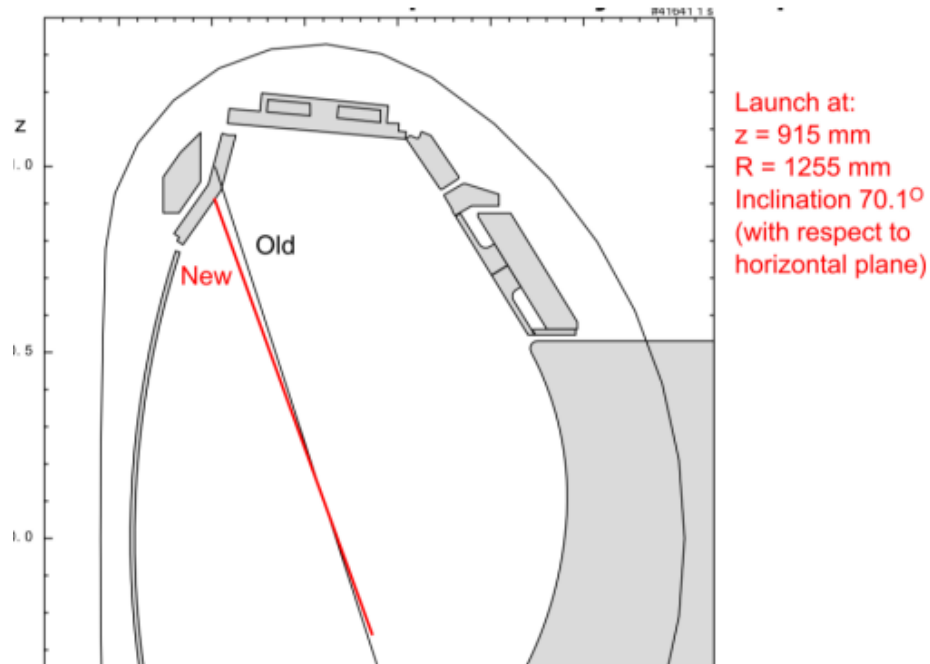
NBI upgrades

- NBI box I switched from arc to RF sources
- NBI box II all sources with variable gap (as source 5 in 2022)
- Slow commissioning due to some technical issues



Pellets

- A number of changes to the system
- Slightly changed geometry, refer to diaggeom



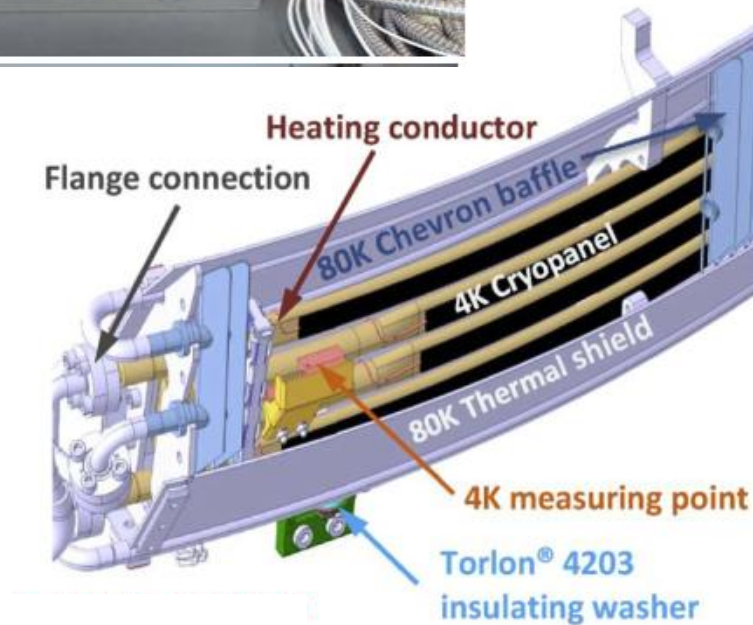
- System running so far, but successful delivery ratio too low (80 % in best shot)

Probable reason cutter timing, can be varied

Characterisation of the new cryopump



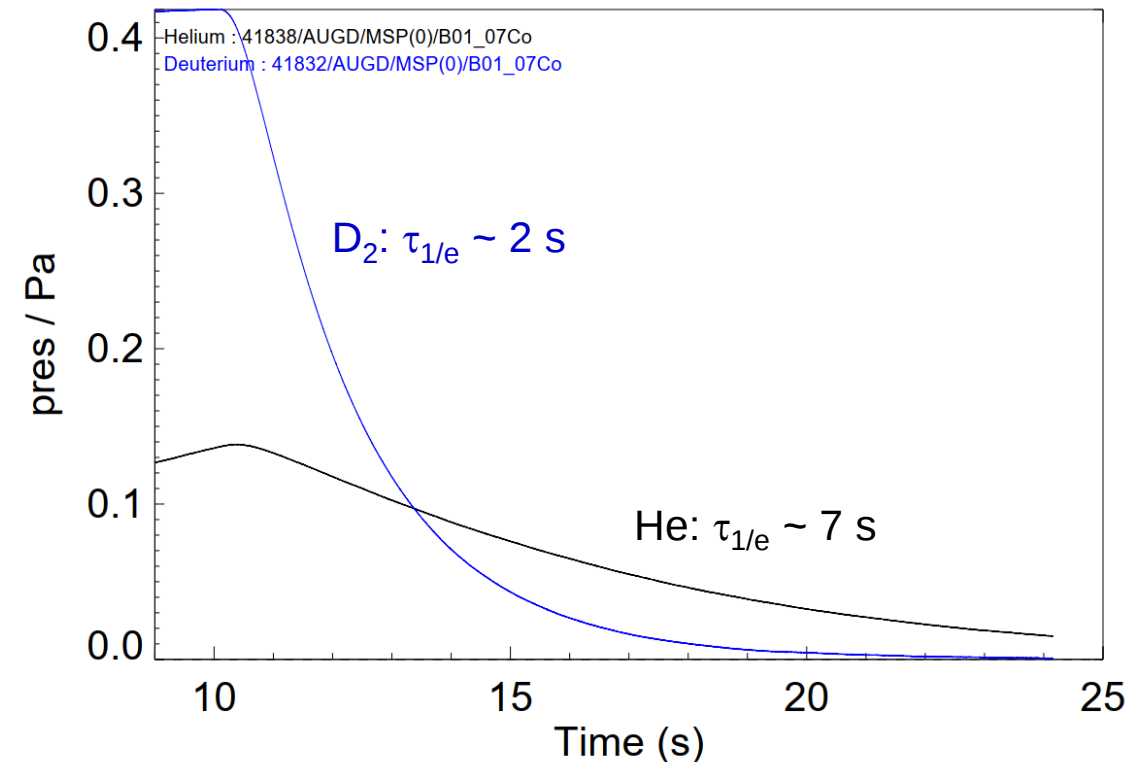
- 7 modules
- Charcoal coating enables helium pumping



Characterisation of the new cryopump

Measurement of pumping speed and saturation behaviour for D and He Nov 5+6

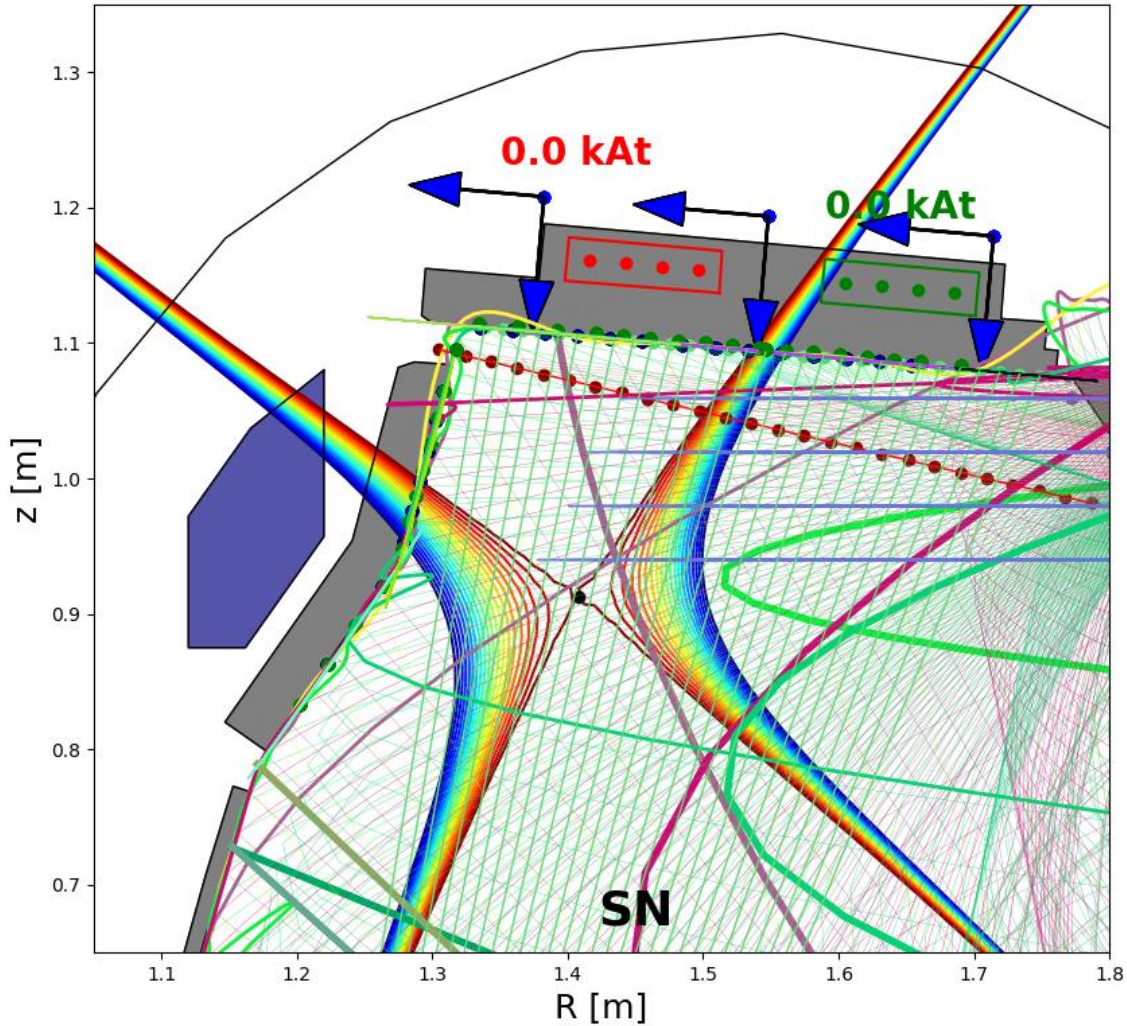
- Preliminary results from control room perspective (deep analysis still ongoing, report Monday morning ~ Dec 2)
- Effective pumping speed for D₂ about as expected
- Helium pumping due to charcoal coating, but pure He pumping speed less than for D₂
- Effect of He entrainment in D₂ flow to be evaluated (Gerd Schall)
- Uptake capability for helium is limited !



Diagnostics

- most of the diagnostics up and running
- ECE currently old data acquisition, 32 kHz, 7 s – new DAQ system to come online soon
- Core Thomson scattering with new 100 Hz laser, preliminary calibration, data written to exp= YAGG till N₂ calib. Lower divertor TS expected this week, upper divertor TS next week, afterwards Raman calibration
- New bolometry and spectroscopy systems up and running
- Upper Helium-beam diagnostic under commissioning
- Upper divertor TS coming soon
- Tungsten diagnostics from grazing incidence spectr. Online, data written to exp= PUETTI until Thomson data rewritten to AUG

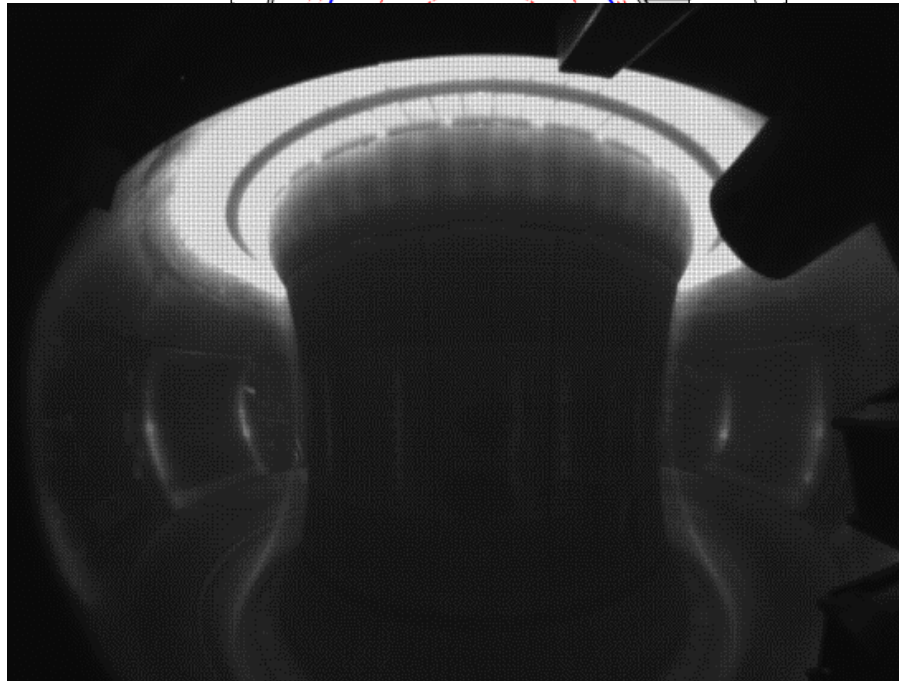
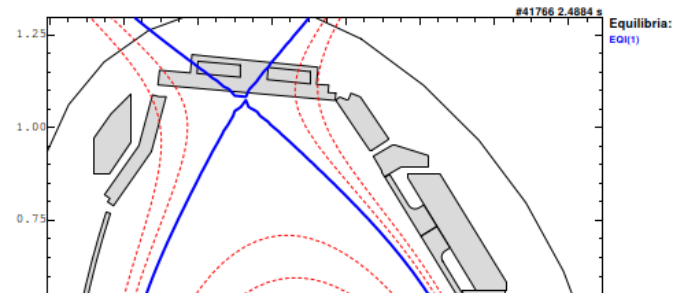
New diagnostics



New diagnostics:

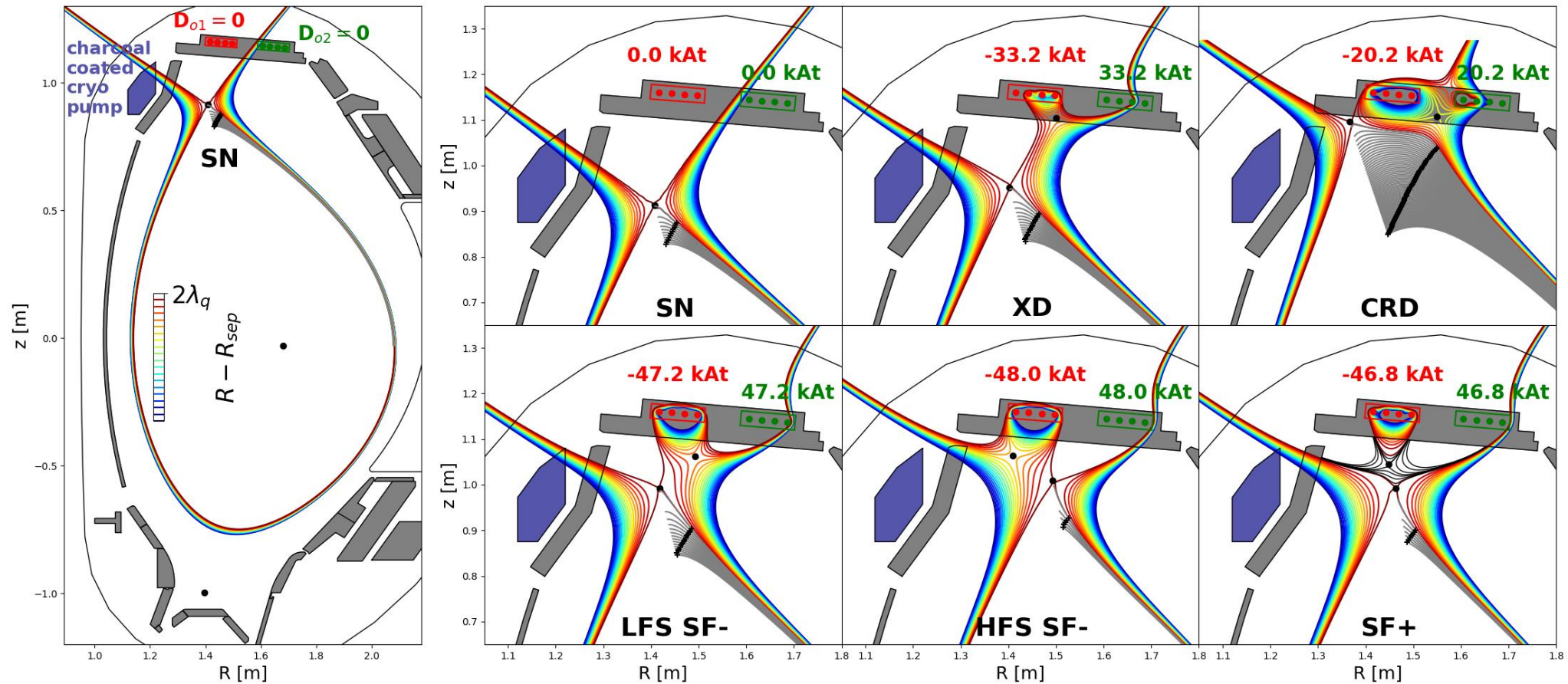
- Langmuir probes
- IR Thermography
- Thermocouples
- NIR & VIS Video Real Time
- Divertor Thomson Scattering (+EUROfusion)
- Manometers & gas flow meters
- Reflectometry
- Shunt measurements
- Bolometry
- Spectroscopy
- Magnetic probes
- Dispersion interferometer (disruption studies, 2025)
- MANTIS in prep.

First plasmas in new upper divertor



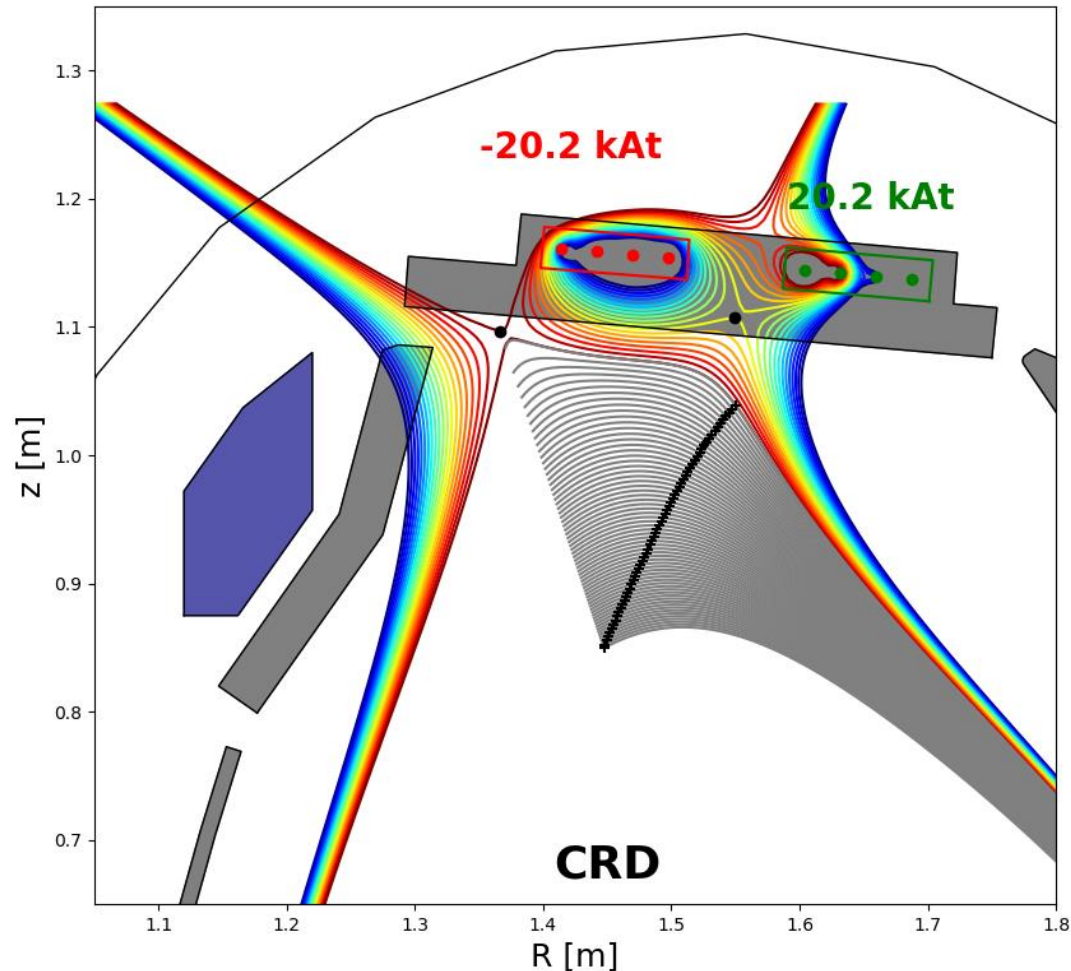
Preparation of the new Div-Ilo

Many configurations are prepared and partly investigated for performance with predictive modelling (EMC3, SOLPS)



test equilibria for diagnostic development etc. stored as AUG shotfiles (Tilman Lunts Science Meeting Talk Mar 2023)

Prospects for extreme CRD with Div-IIo



Concept / physics:

- + dissipate power before it reaches the SOL
- + stabilize radiating region at the X-point (XPR)
- + Provide neutral plugging
- + Maximize volume of confined plasma
- + reduce PF coil currents

Challenges:

- + stabilize position of XPR
- + shallow field line incidence angles ?

ASDEX Upgrade Schedule



Restart finished on 15.11., 2nd boronization on 18.11. (or 20.11.), - a few weeks delayed, finally.
SPI expected back 12.12.

Nov 19 – Dec 18: 2024 program 12 experimental days for proposals, ~ 100 shots
- physics experiments, but – no current in new upper divertor coils available

End Jan 2025 - development of AD configurations with antisymmetric coil currents

~ March 2025 - integration of AD configurations with AT and no-ELM scenarios (QCE, EDA, RMP, ..)

Spring – summer 2025 - development of coils current feedback (sensors to be defined)

Low density program: AT, RMP ELM suppression etc: 7 boronizations in 4 week intervals in 2025

Aug 2025 – Sept or Nov 2025

summer break, vessel opening likely

~ end 2025 differential divertor coil currents