EUROfusion General Programme Meeting Nov 4th, 2025

ASDEX Upgrade: machine news and programm for 2026(/27)

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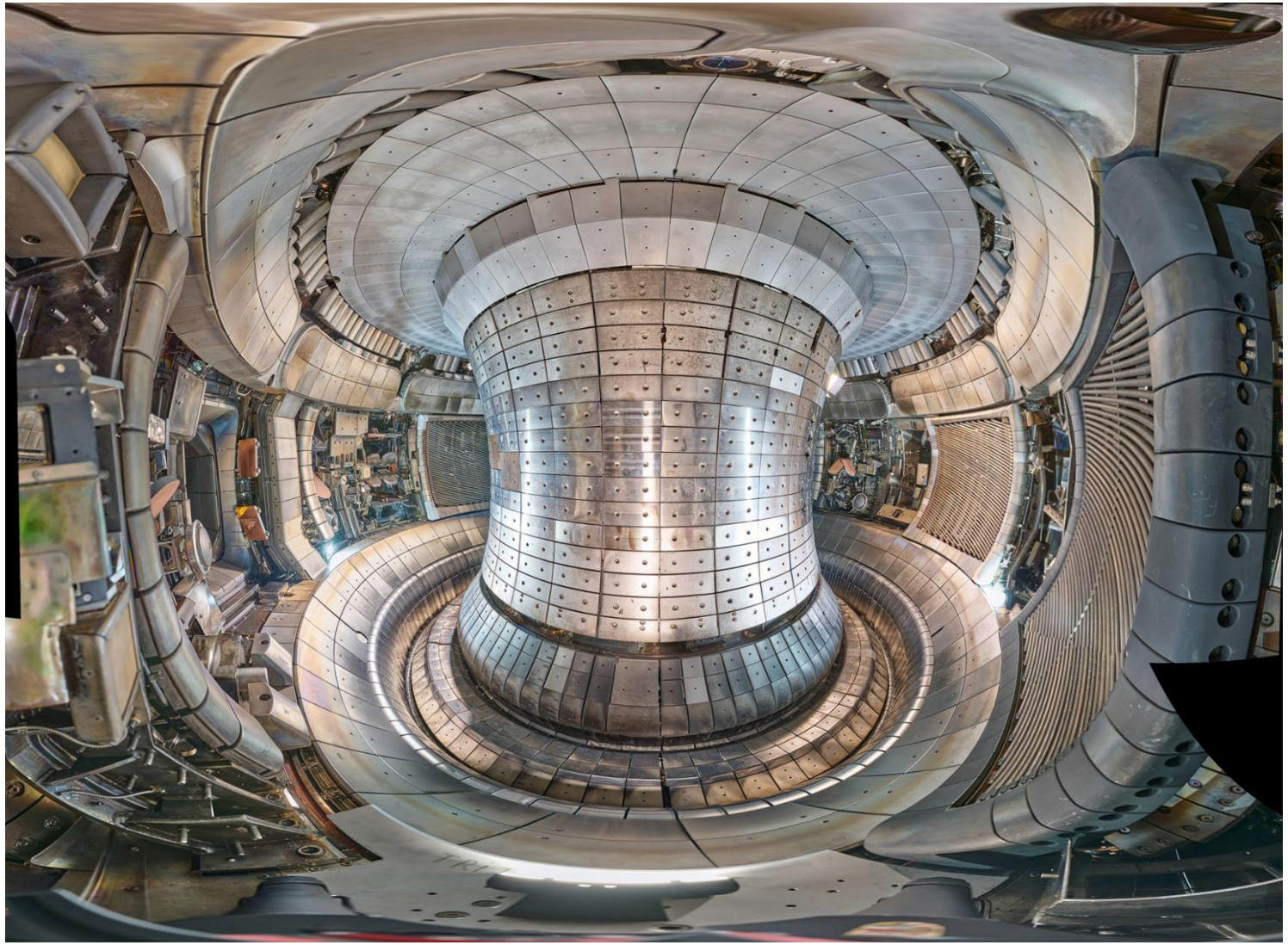
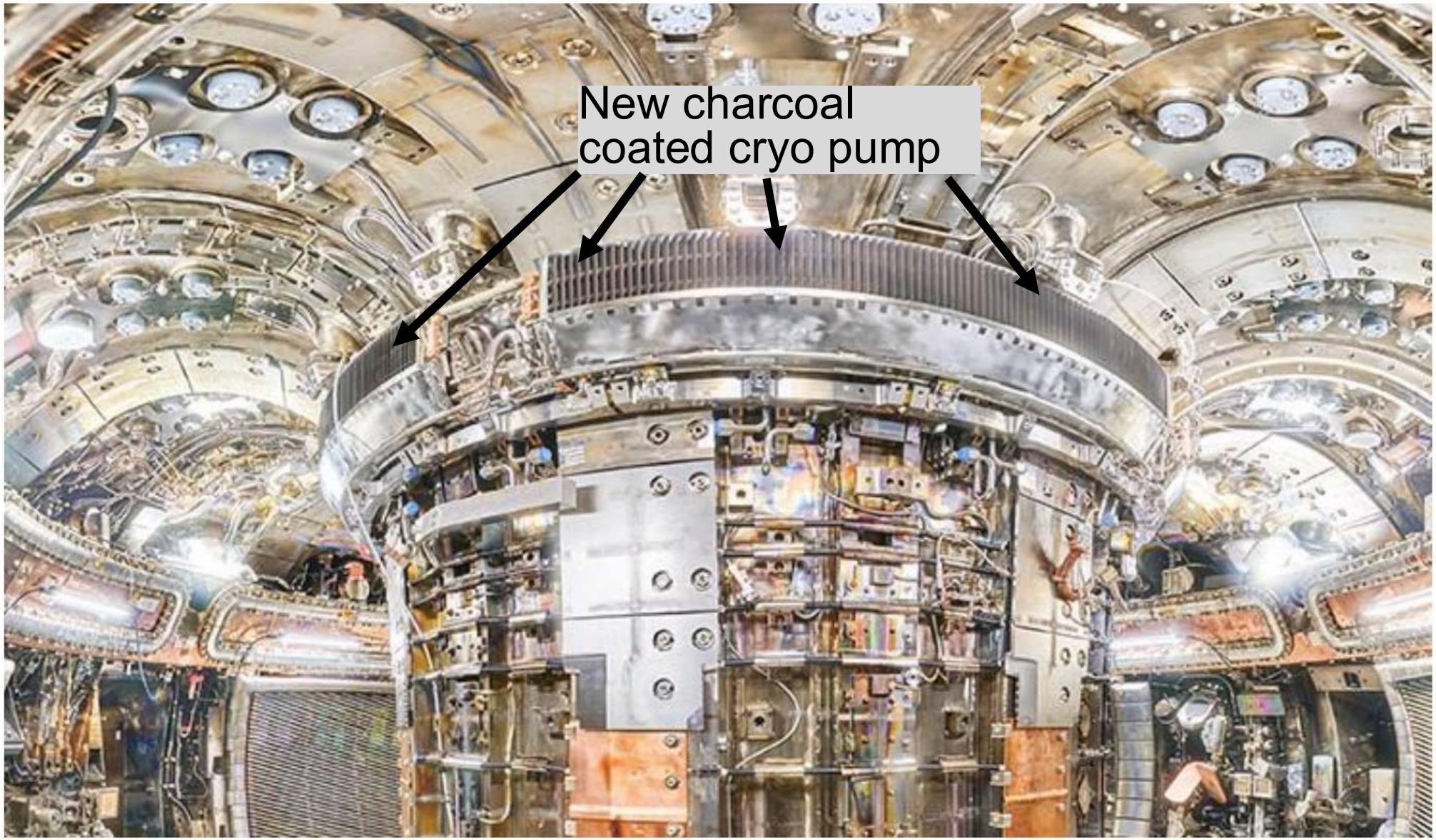
AUG finished 1st Campaign with new upper divertor (ADCs!)

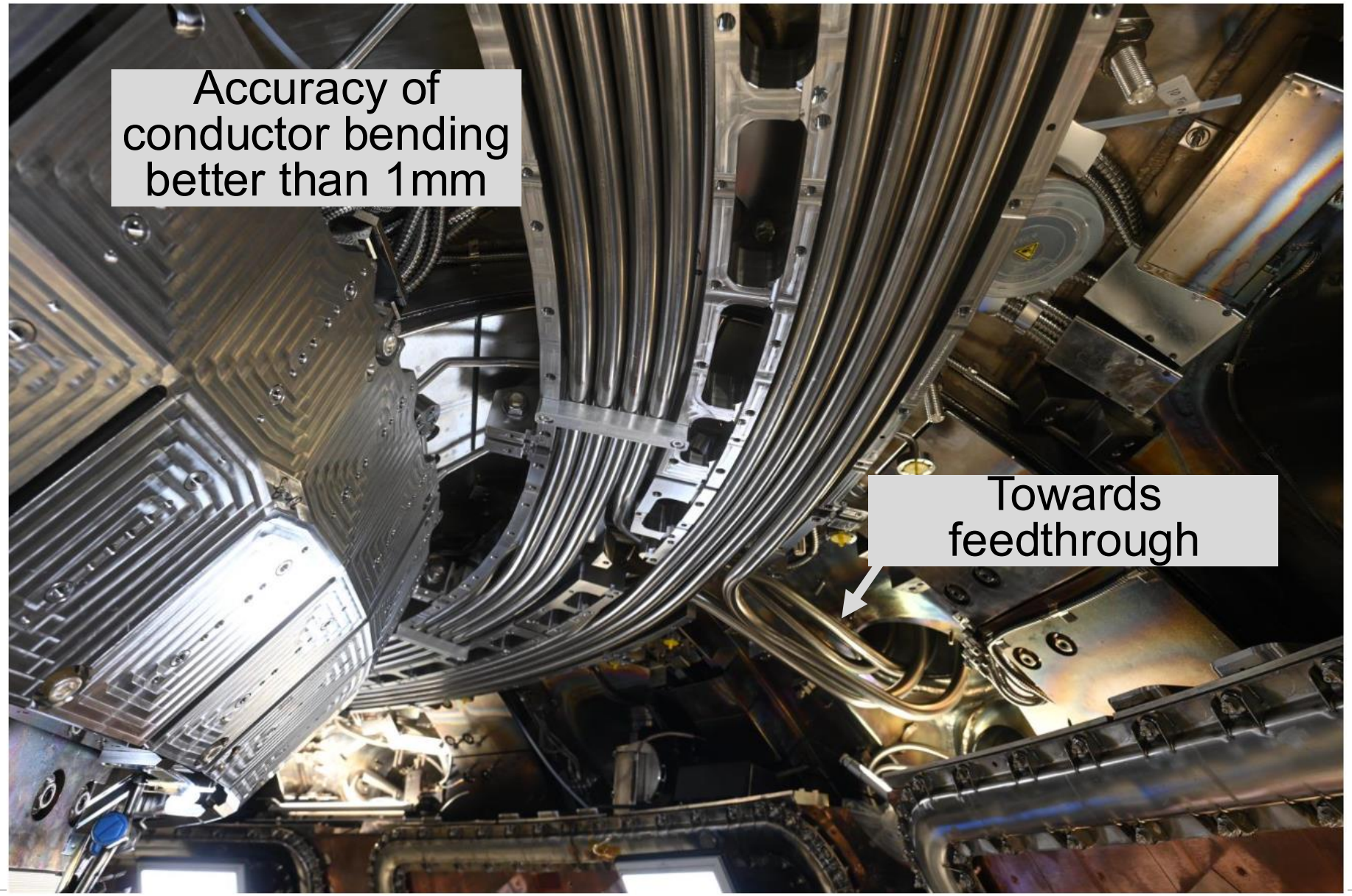


Final in-vessel panorama view
August 2024

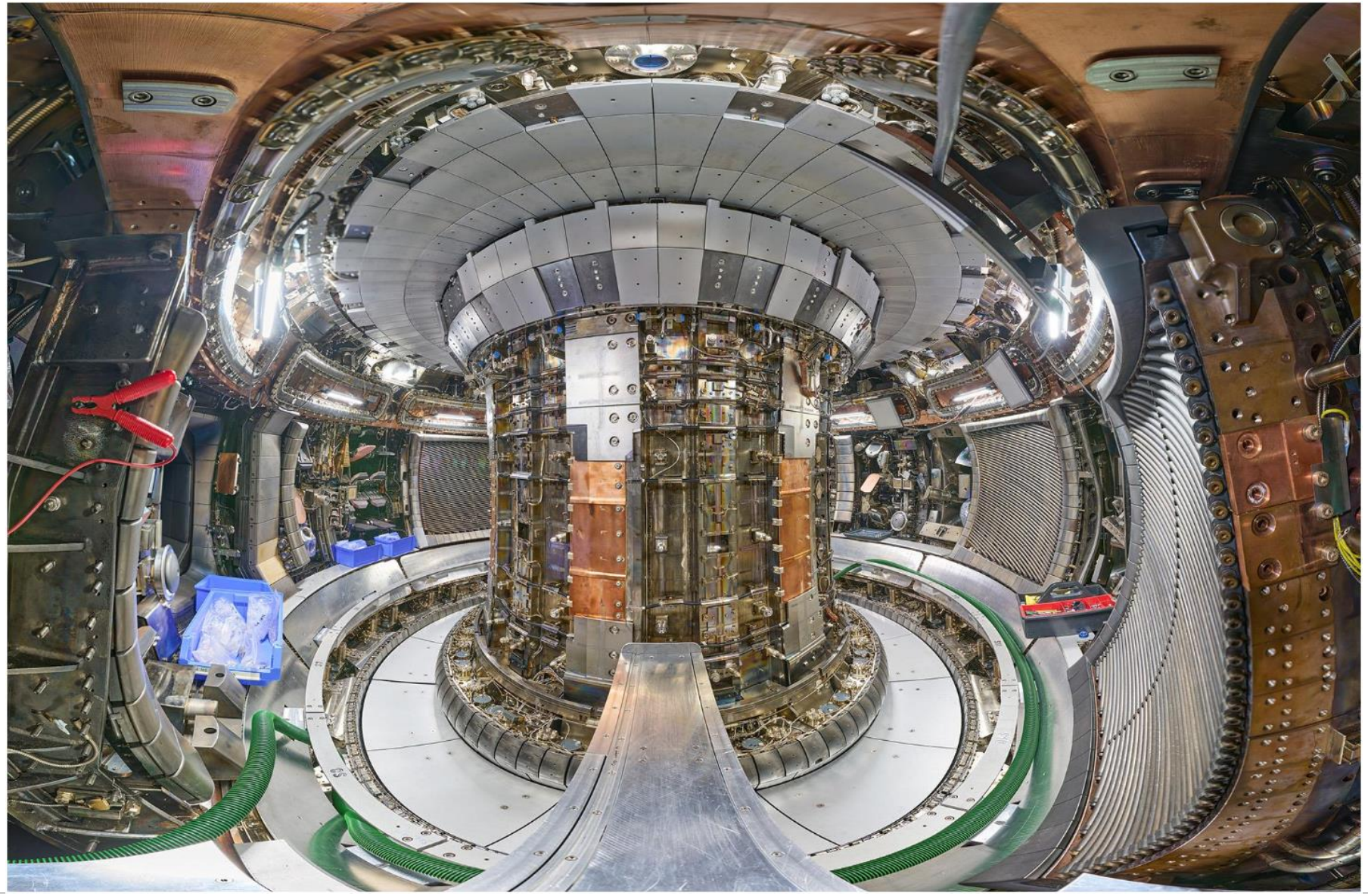
Upper divertor upgrade



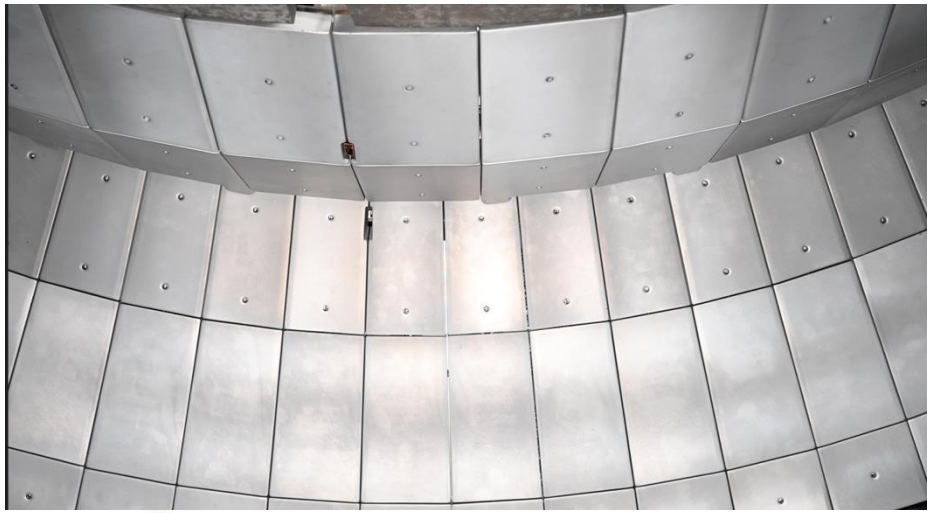
Upper divertor upgrade

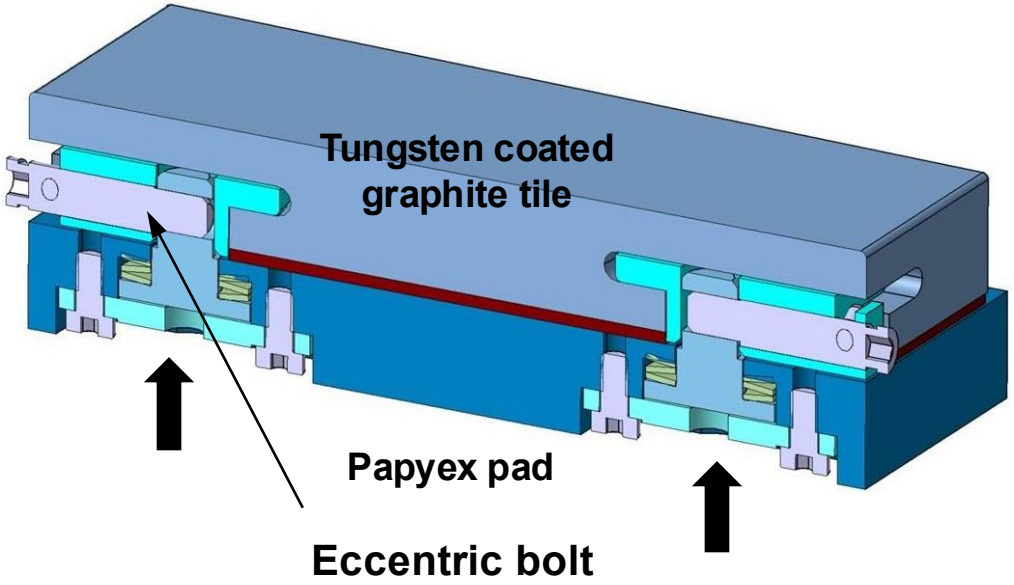


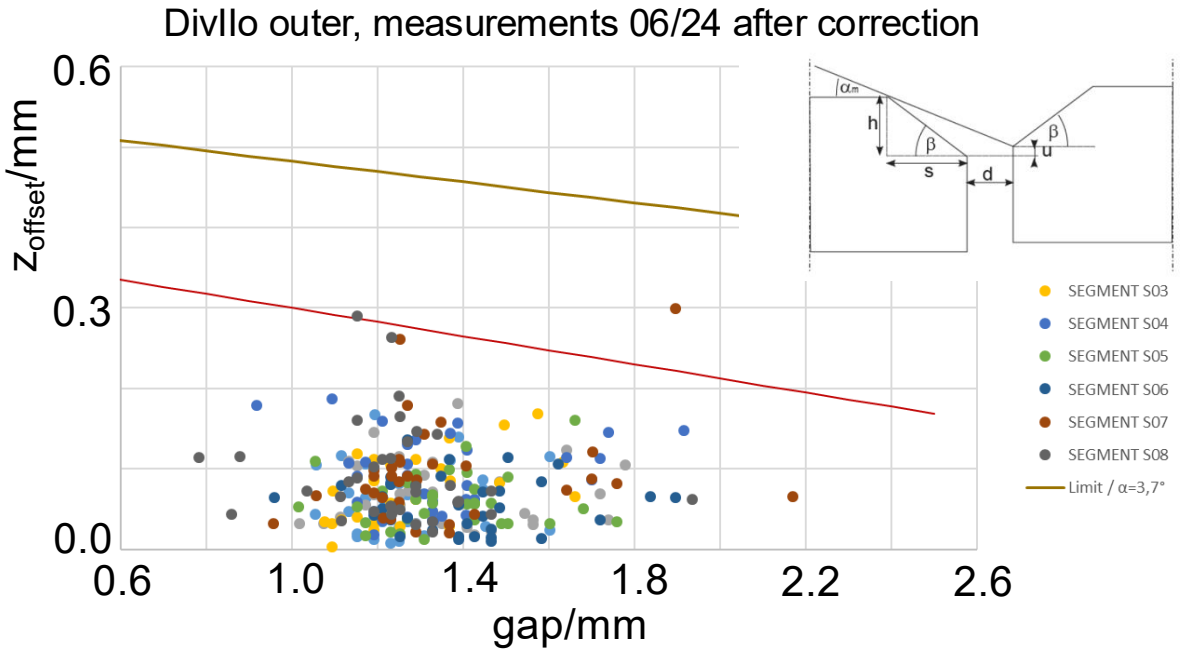
Upper divertor upgrade



Flat tile target in the upper divertor fulfills tolerances





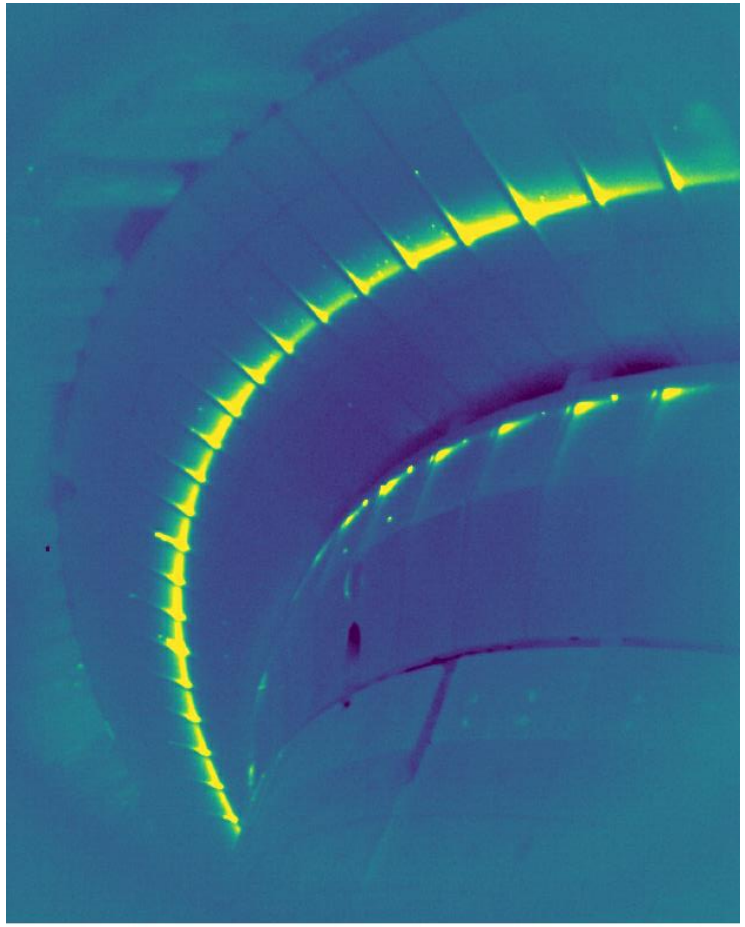


Strict tolerance requirements to avoid leading edges

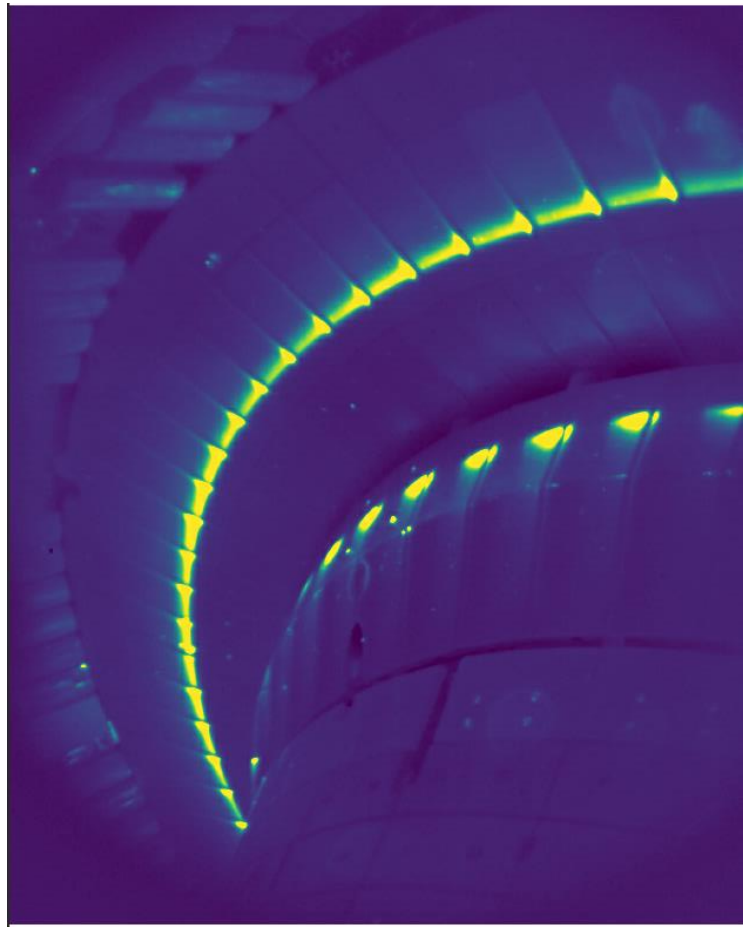
- alignment of most exposed tiles by excentric bolts on the lower side
- height offsets below 300 μm were met

No leading edges detected for both field helicities

#41980, B_{tor} = +2.5



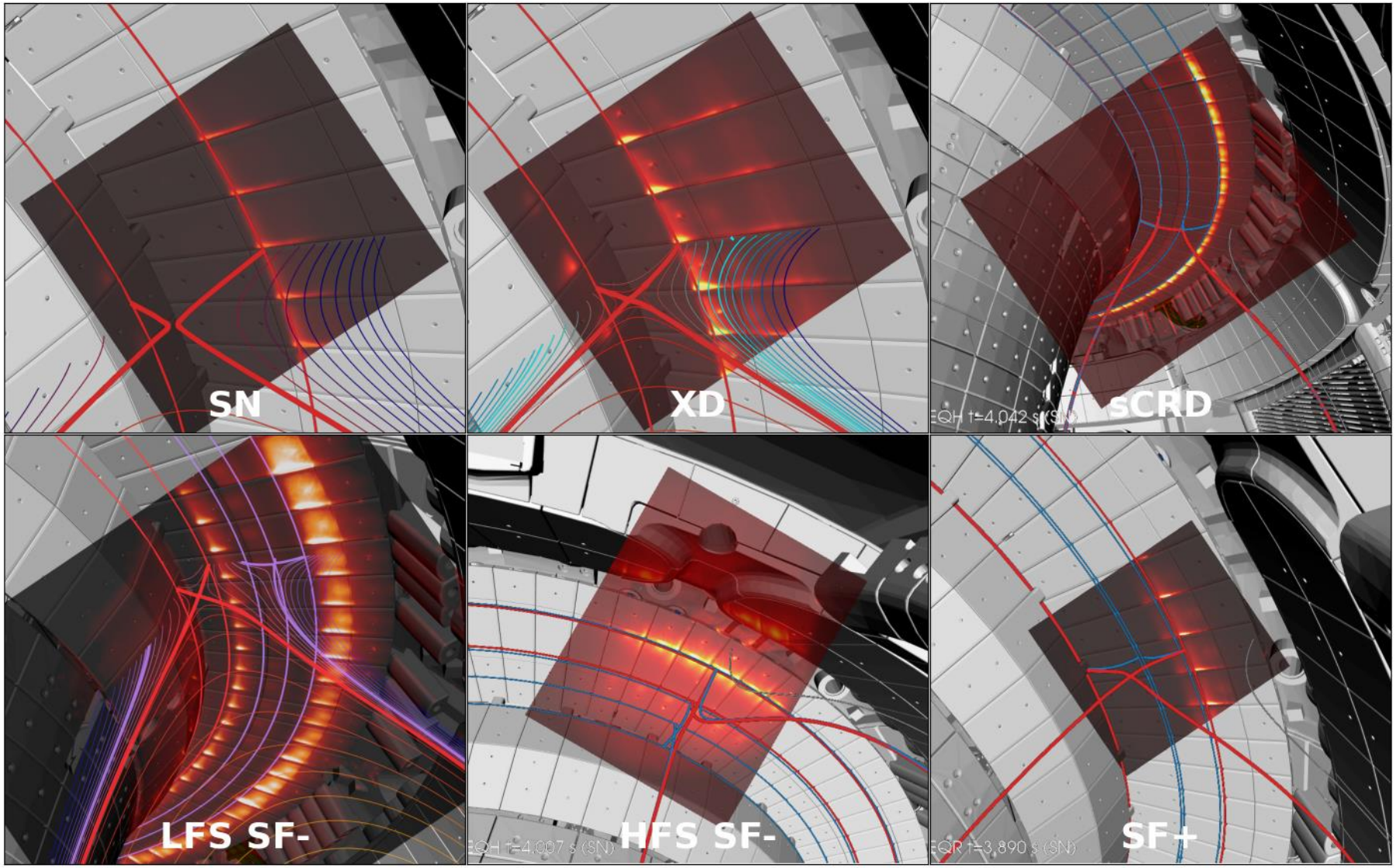
#41982, B_{tor} = -2.5



Both helicities with 4.5 MW ECRH heating, symmetric flat divertor tiles with no tilting

All Alternative Divertor Configurations (ADC) achieved!

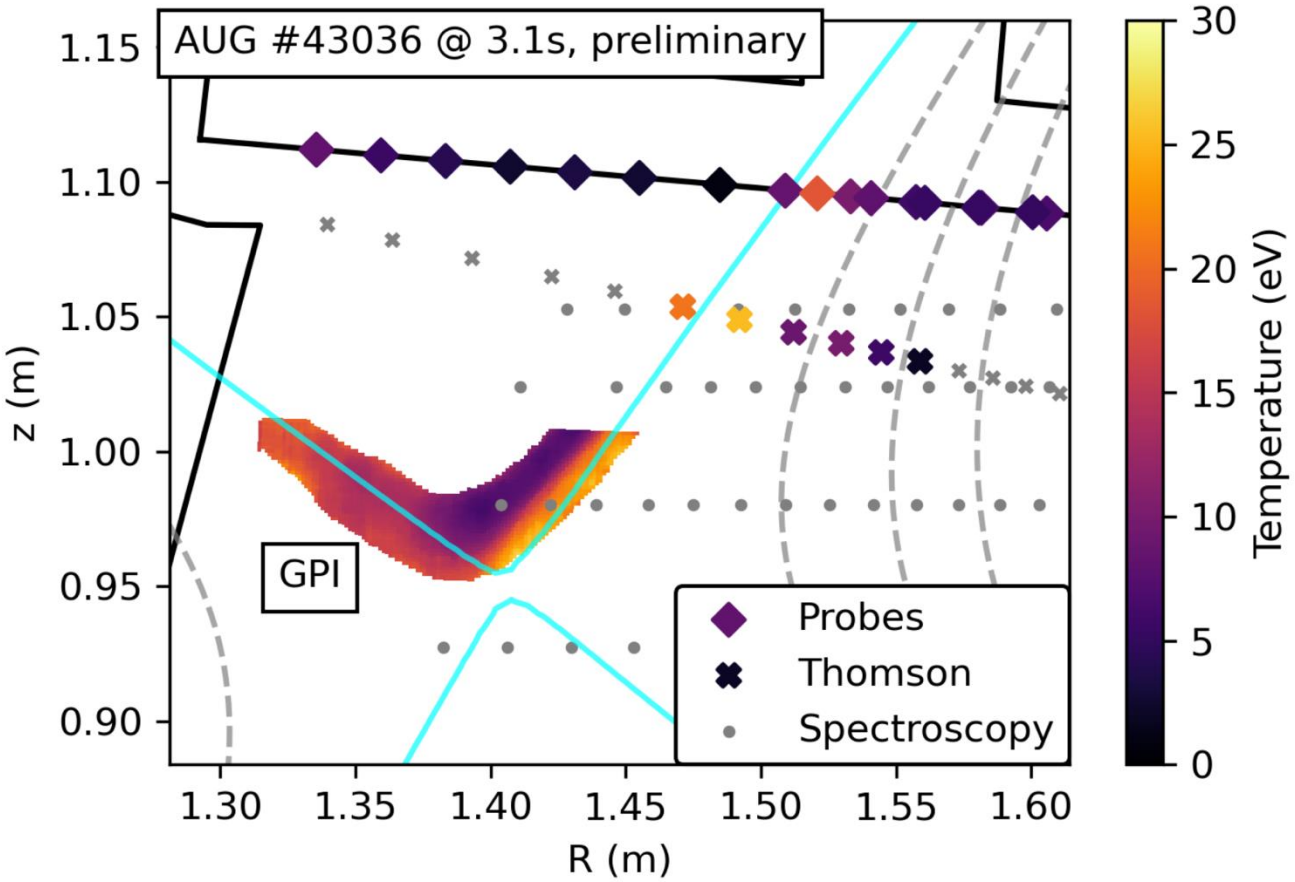
- **All envisaged configurations**
- **Up to ~20 MW of heating** (world record in ADC, P/R~12)
- **Ip = 0.6-1.0MA**
- **Seeding of N, Ar, Kr**
- **Detachment**



Very good Diagnostic Coverage in new Upper Divertor

Example: electron temperature

- Quantitative agreement in low density L-mode plasma between:
  - **Langmuir probes**
  - **Thomson scattering**
  - **Gas puff imaging (GPI)**
- **Spectroscopy** can replace GPI at higher densities
- Detailed comparison is **ongoing work**



Issues identified during/after the campaign

- **The cryo pump did release pumped gases during plasma operation (Clear evidence for Ne and D), He pumping seems less efficient – why?**

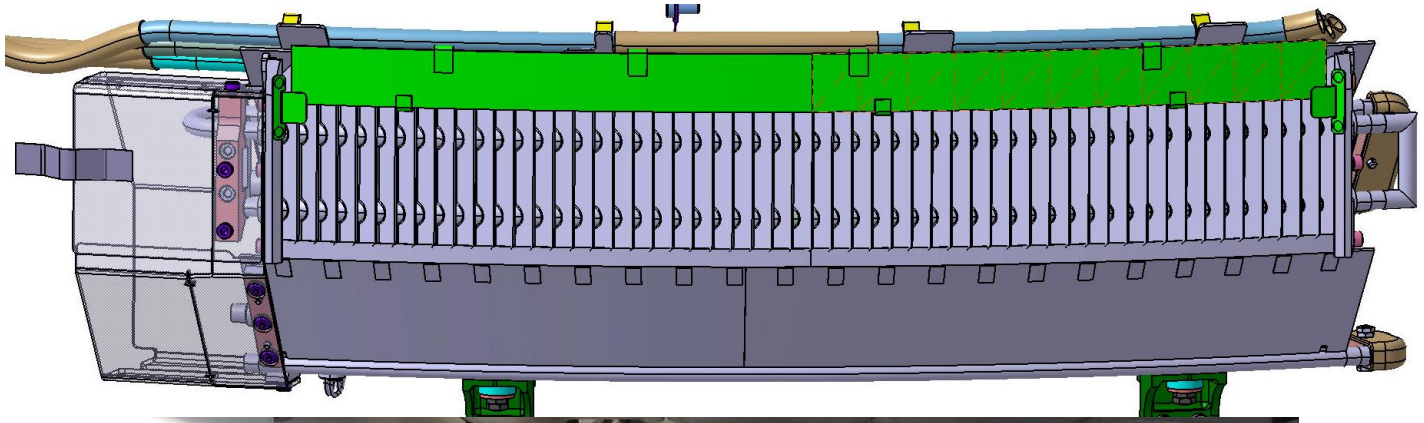
  $\Rightarrow$ plasma radiation, ECRH stray field, role of arcs (?)

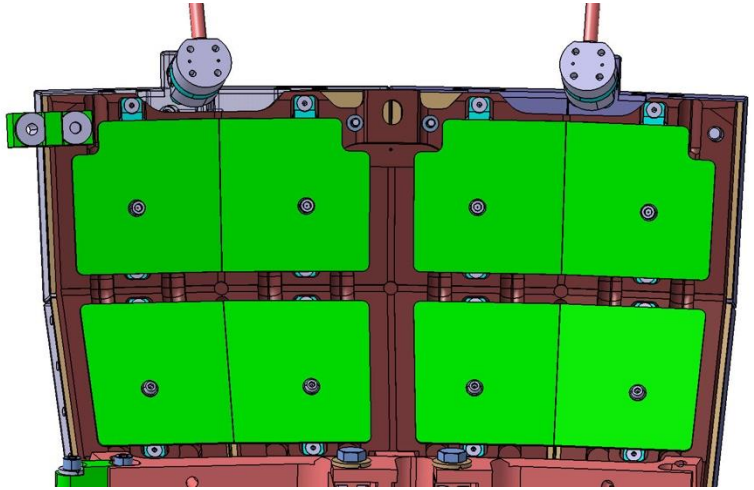
- **Strong disruptions led to a damage of the lower divertor tile**
- **Vacuum flanges below divertor structure loosened during operation**
- **Arcing at the cryo-pump pipes observed**

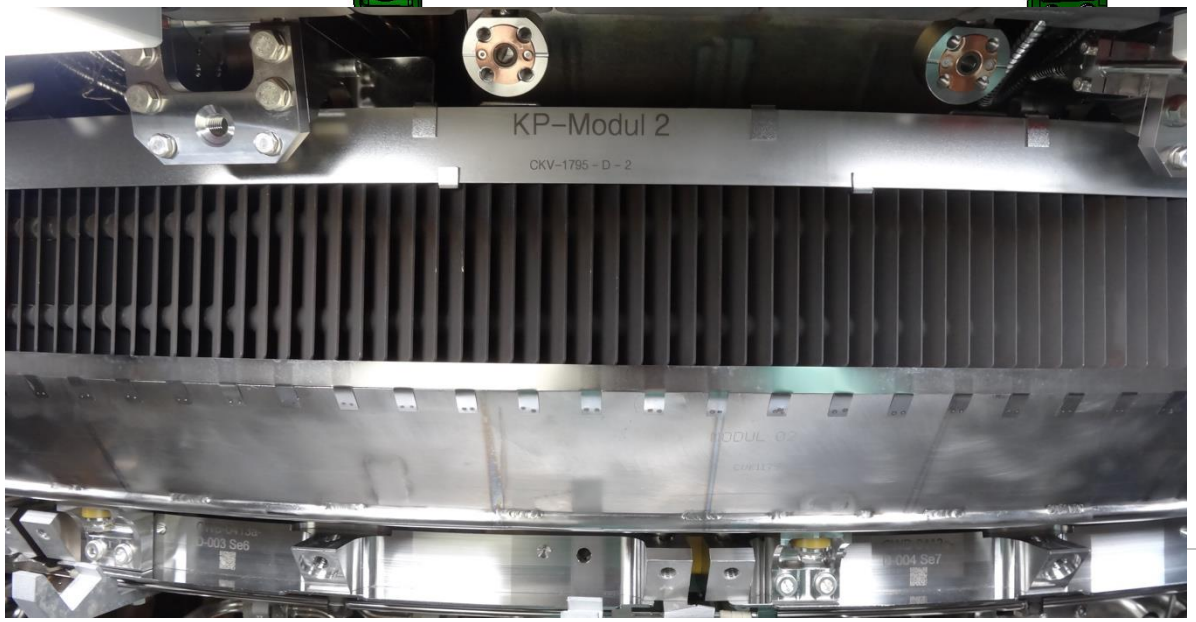
Hardening of the Cryopump against radiation

Installation of plates closing the gap between CP housing and chevron to reduce the both plasma radiation and ECRH radiation (plates coated with TiO-AlO)

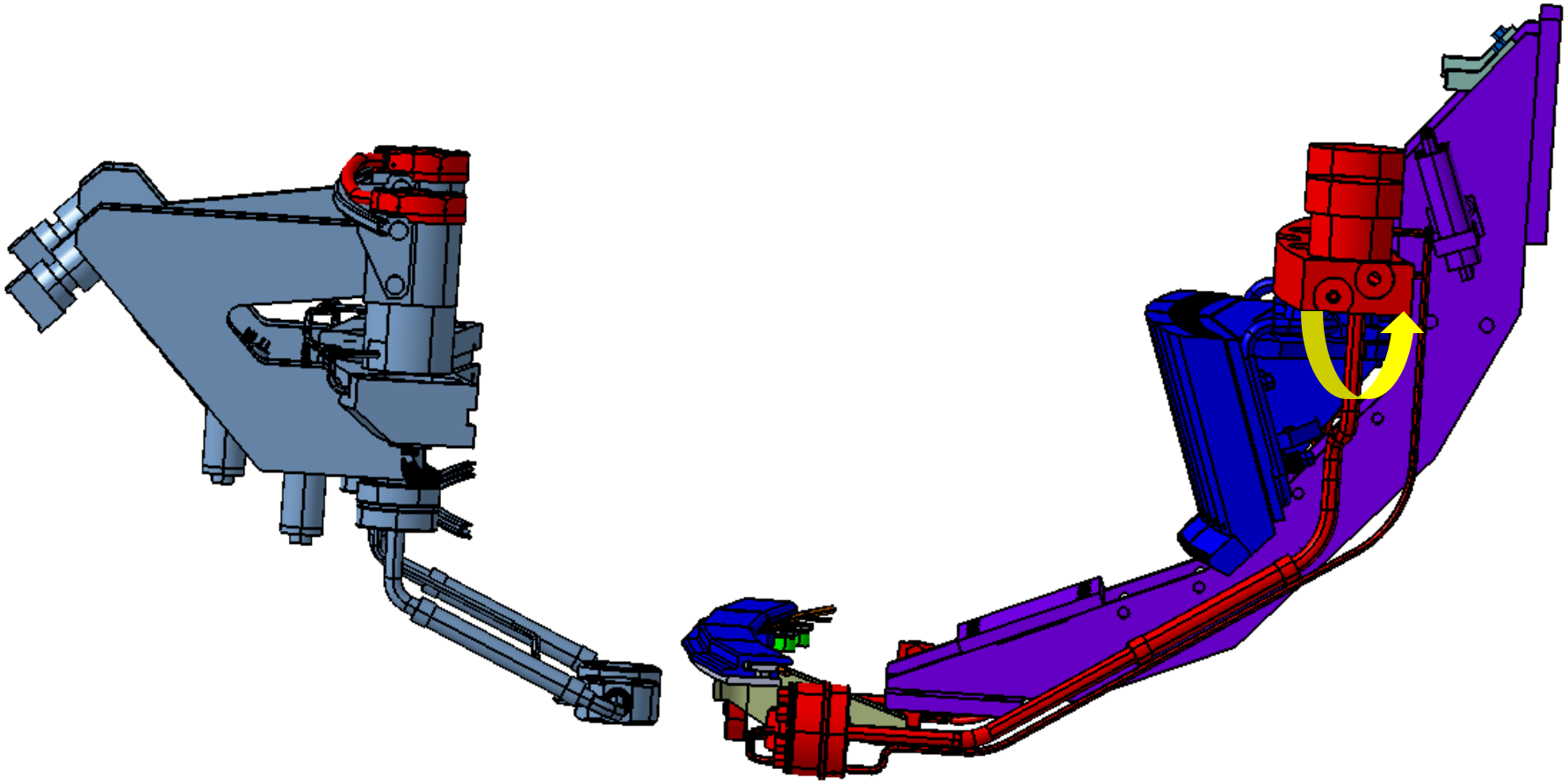
Installation of the coated absorption plates in the inner divertor







Leak on the lower divertor: repair the leak!



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  ⇒ plasma radiation, ECRH stray field, role of arcs (?)

- Strong disruptions led to a damage of the lower divertor tile
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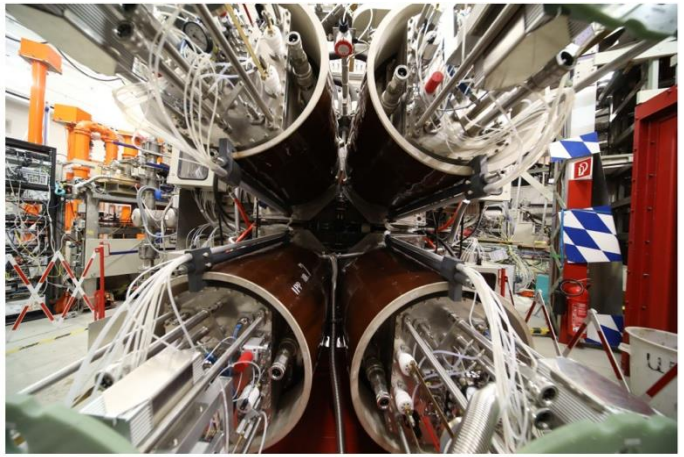
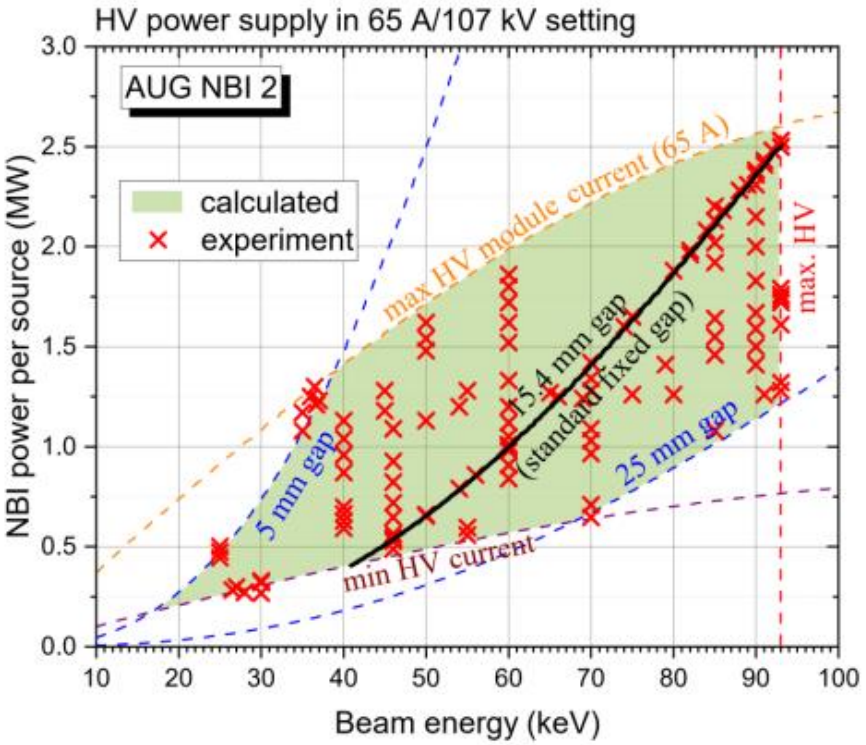
⇒ Repair and Improvement Actions made the vent longer

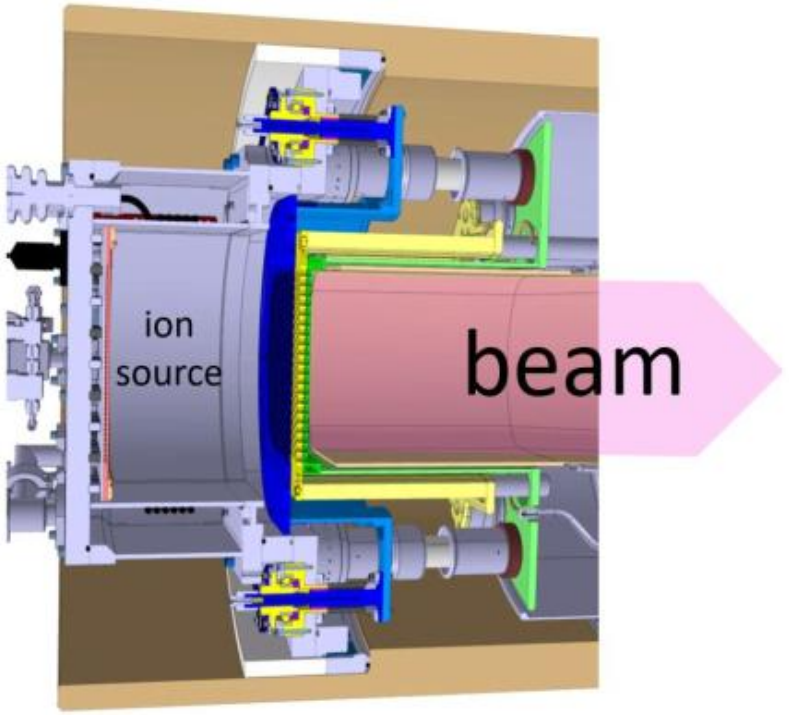
- Cryo hardening and tightening againts plasma and ECRH radiation
- Cryo hardening against arcing
- Repairs of tiles and additional isolation of current paths through tiles
- Removing of lower divertor structures neccessary to repair flanges (makes vent much longer)

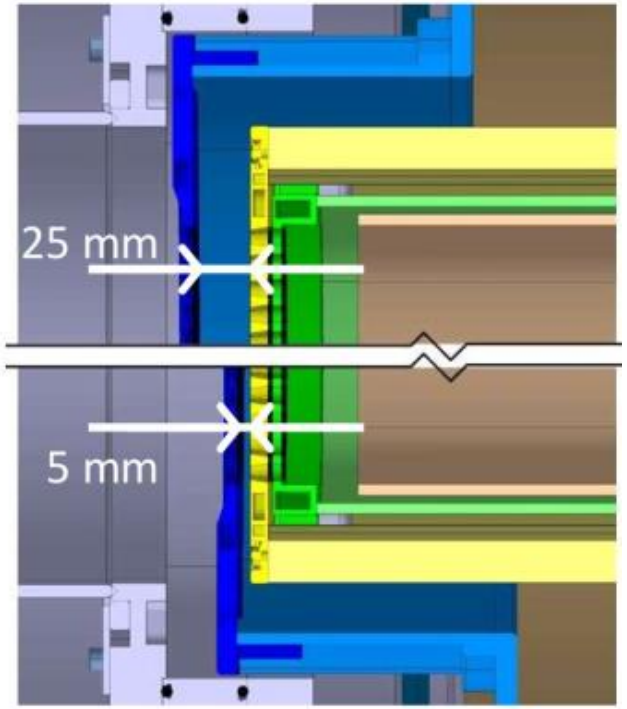
NBI upgrades (new in 2024)

- NBI box I switched from arc to RF sources
- NBI box II all sources with variable gap (as source 5 in 2022)
- Fully commissioned







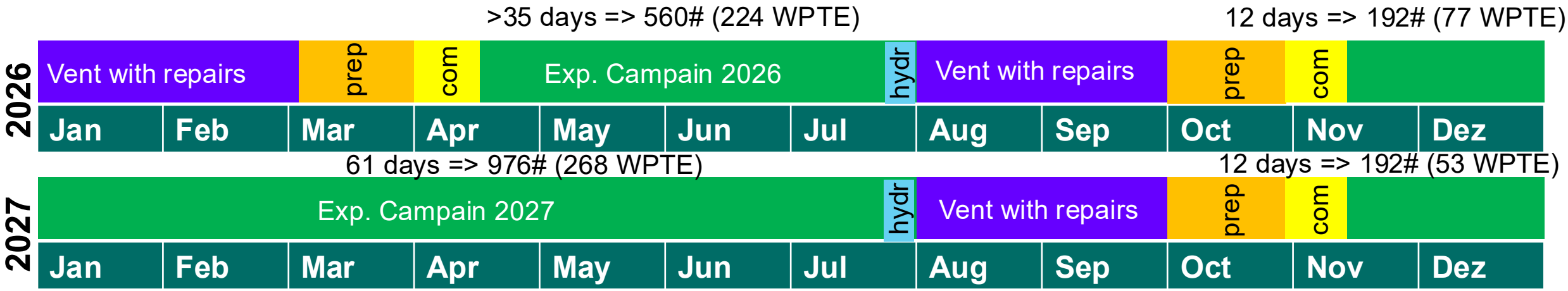


Diagnostics/Machine aspects

- New upper divertor diagnostics fully operational including divertor Thomson scattering
- Upper GPI diagnostic at low densities (PhD thesis ongoing)
- Dispersion interferometer and MANTIS available (PhD theses going on)
- Will the cryo-pump performance improve?
- Outer midplane diags show issues for USN due to high neutral/plasma interference (under inv.)
- ECRH: 7 gyrotrons (one gyrotron retired, still 4.5-5MW), end of 2027 again 8 gyrotrons => 5.5-6MW
- ICRH: 2026 no change, 2027: new generator enables 6MW total power + additionally 24MHz @ <2MW
- Bt=3.5T possible with short flattop time (max flattop in Bt ~3s), commisioning in plasma pulse neccessary

- **Possible machine safety measures discussed**
  - **Fast ion loads on outer limiters**
  - **Disruption forces**

ASDEX Upgrade Schedule 2026/27



1st boronization on 13th of april, restart from 14.4. (maybe earlier ?)

2nd boronization on 27.04. Proposal execution from 28.04. (maybe earlier?)

WPTE Campaign 2026/27:

28th of Apr 2026 to Jul 2026 + Nov/Dez 2027 + Jan 2027 to Jul 2027 + Nov/Dec 2027

At current planning: 622 discharges