



WPSA Enhancement Projects: Overview

WPSA General Meeting (06-09-2022)

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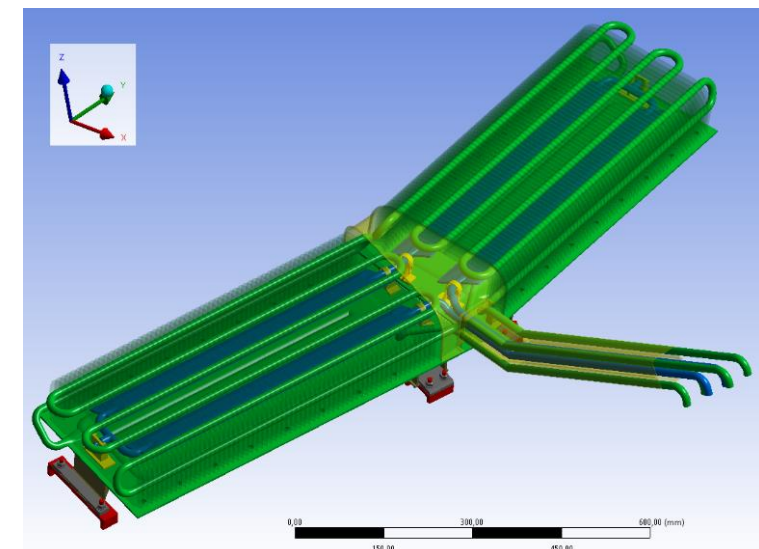
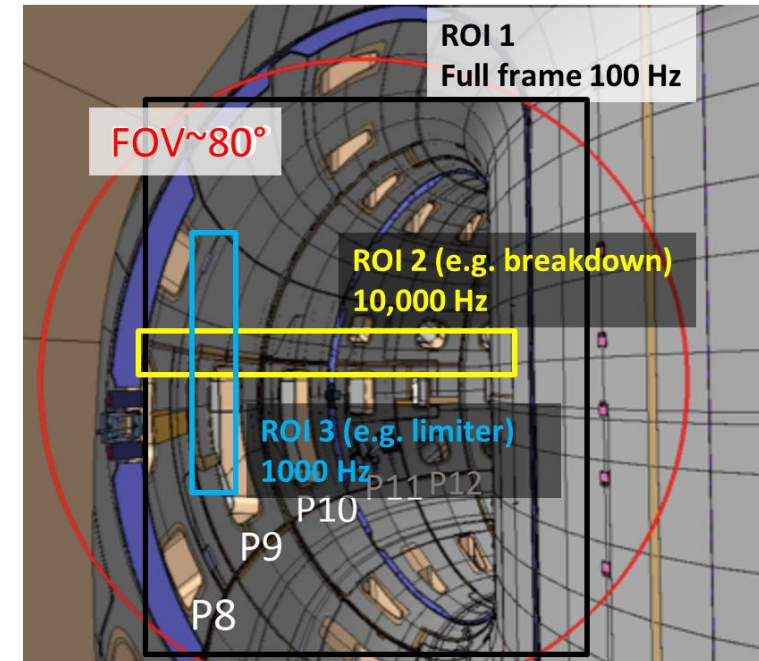


EDICAM (EK-CER)

- First EU diagnostic on JT-60SA
- Commissioning of the EDICAM camera completed, without plasma, remotely from Hungary
- Participation in Integrated Commissioning during 2022-2023 (SA.D.02 Grant Deliverable 2022):
 - Camera operation with plasma (exploitation and functionality testing)
 - Support machine commissioning

Divertor Cryopumps (KIT)

- Procurement Arrangement (PA) signed (2021)
- Manufacturing phase ongoing:
 - Some components (vacuum vessel supports) already delivered to Naka (Sept 2021)
 - Process monitoring during 2022
- Final delivery expected by end of 2022 for installation starting in 2023 (ME1): Installation period planned by QST for Sep-Nov 2023



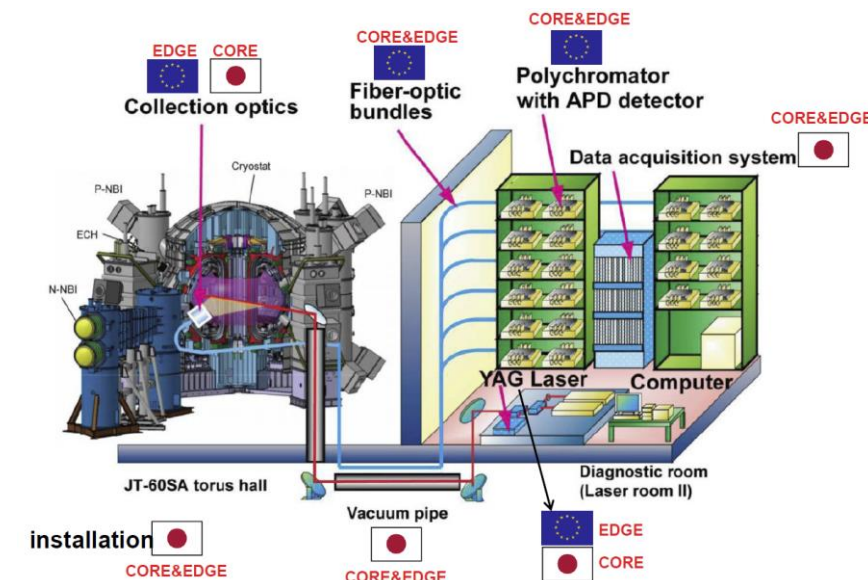
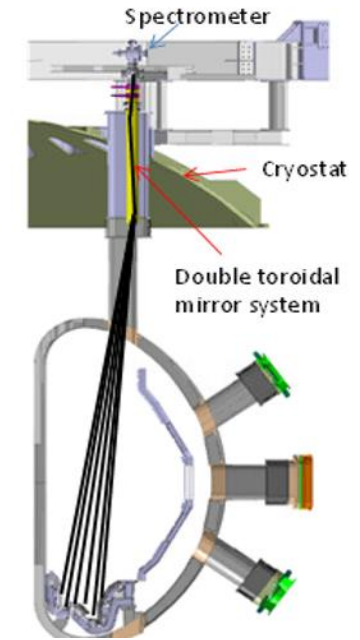


VUV Spectrometer (ENEA-RFX)

- PA to be finalized and signed during 2022
- Main components under manufacturing/procurement
- Test bed preparation ongoing (Frascati): Spectrometer already in Frascati
- System installation expected during 2023 (ME1)

Thomson Scattering System (ENEA-RFX)

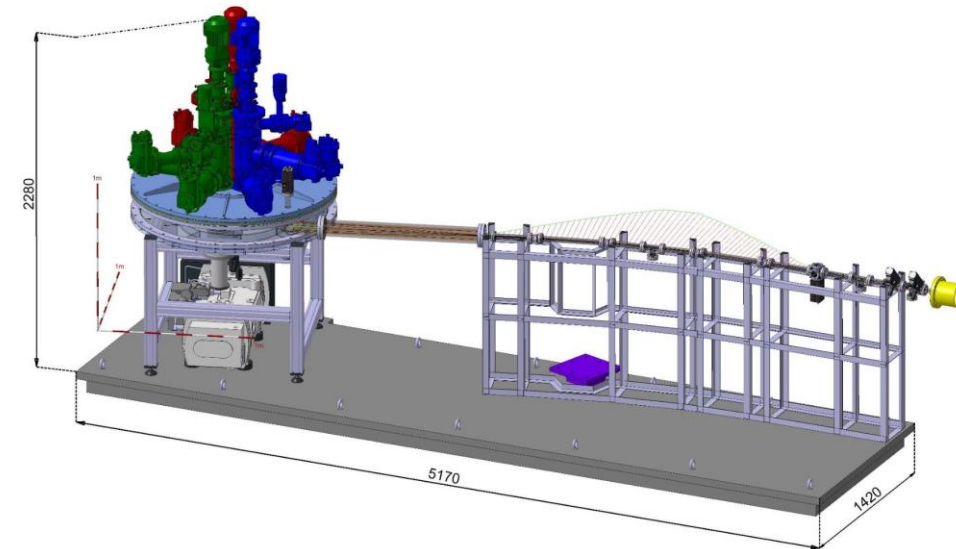
- PA signed and ongoing
- Manufacturing/procurement of all components launched (monitoring during 2022)
- Components delivery expected by end of 2022 (possible delays due to international sanctions)
- Expected system components installation:
 - Outside torus hall first quarter 2023
 - Inside torus hall during 2024 (ME1)





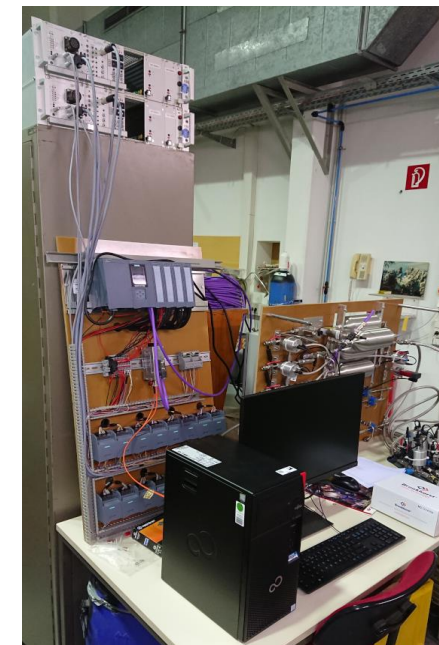
Pellet Launching System (MPG)

- Manufacturing of pellet sources (fuelling and pacing) ongoing (monitoring during 2022)
- Centrifuge manufacturing contract awarded:
 - KoM by mid 2022
 - Delivery expected by mid 2024
- Test bed ready at IPP (PLS to be tested by end of 2023)
- Shipment to Naka expected by late 2024



Massive Gas Injection System (MPG)

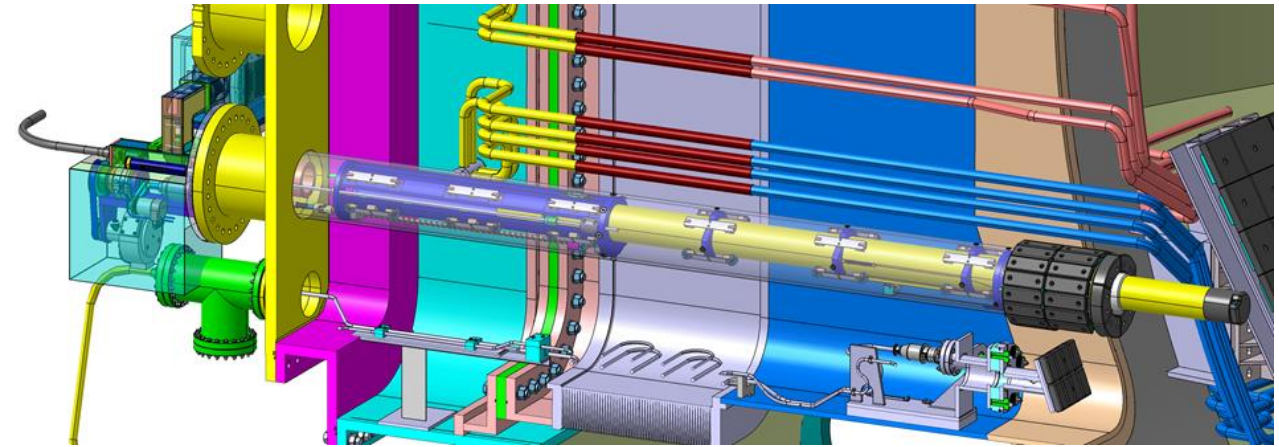
- PA to be finalized and signed during 2022
- Design approval from Ibaraki prefecture obtained (second application needed due to small changes in design)
- All components already manufactured and delivered:
 - Properly working
 - Acceptance tests being prepared (at IPP Garching)
- System installation planned for 2024





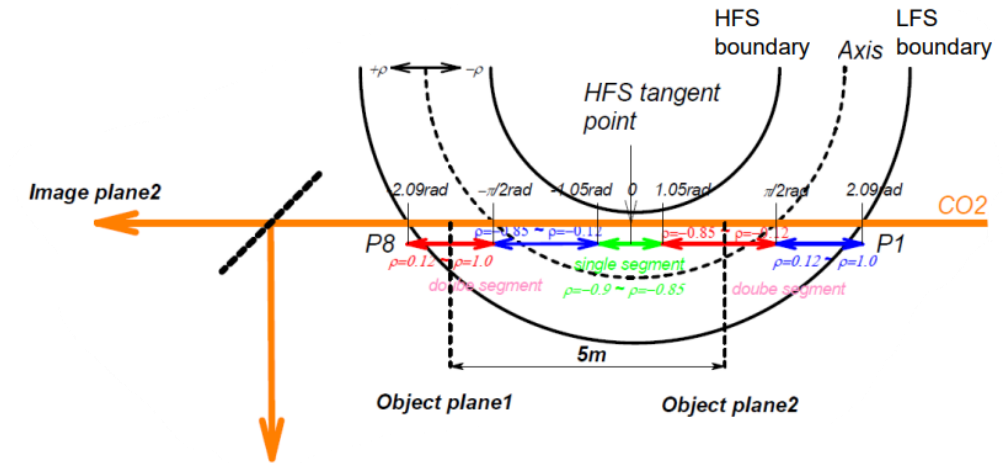
Fast-ion Loss Detector (University of Seville)

- PA to be finalized and signed during 2022
- Completion of final design during 2022:
 - Finalizing mechanical design (iteration with QST/F4E)
 - Complete camera shielding box design (MCNP assessment about to start)
- Start procurements by end of 2022: new funding scheme being defined between EUROfusion and F4E
 - Contract between F4E and UoS to be signed in Sep 2022 for hardware procurements
- Installation expected during 2025 (ME2)



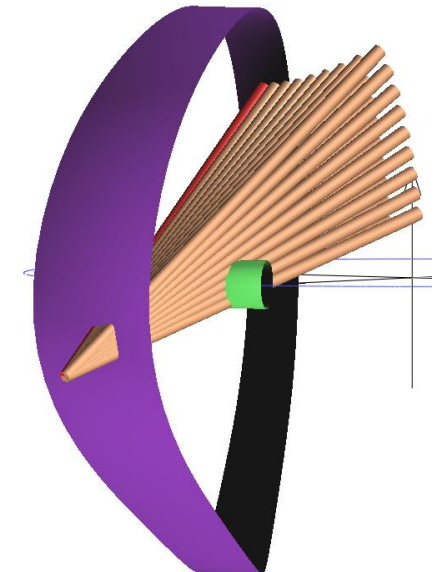
Tangential Phase Contrast Imaging System (EPFL)

- Mechanical design update according to new QST requirements
- Definition of approximate budget
- Tentative schedule elaboration for project completion (installation included)



Doppler Reflectometry System (CIEMAT)

- Progress on mechanical design description
- Requirements estimation for baseline system with steering mirror
- Tentative schedule for project completion (installation included)



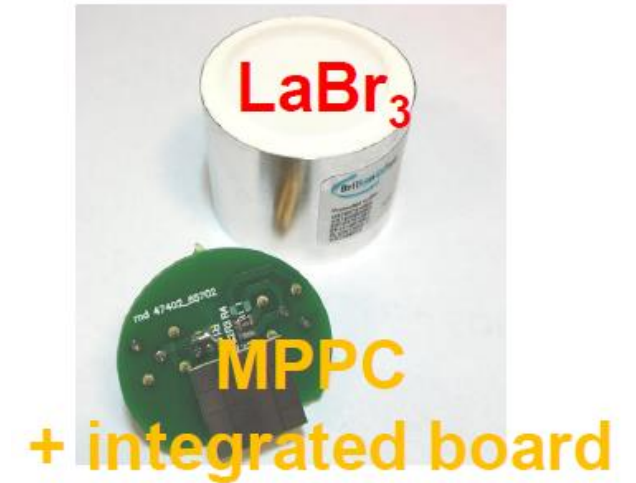


Gamma-ray Diagnostics (ENEA, UKAEA)

- Preliminary specification of gamma-ray detectors based on first assessment of expected signal-to-background ratio
- Definition of a scientific case: benefits of gamma-ray diagnostics in energetic particle studies for all research phases

Neutron Diagnostics (VR, ENEA, IPPLM)

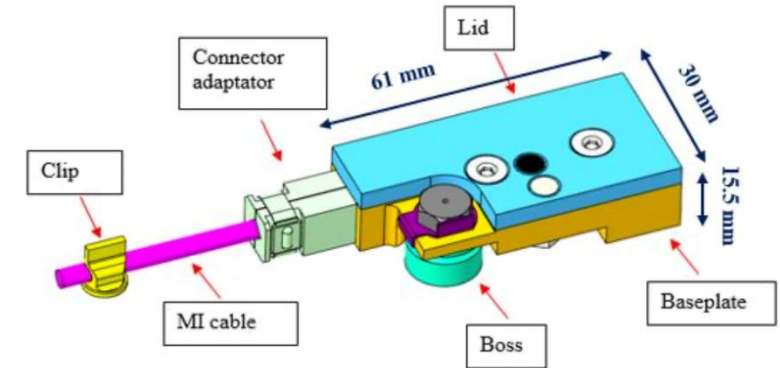
- Continue with scenario replication for studies on performance and integration of compact spectrometer
- Neutronics simulations (MCNP):
 - N&G fluxes and spectra in relevant areas (detectors locations, components shielding,...)
 - Pre-analysis of measurements with Ionization Chambers and Diamond detectors
 - Studies on dosimetry systems





EC Stray Detection System (ENEA)

- Complete EC beam tracing analysis considering final antenna configuration
- In-vessel ECH sensor study (performed in collaboration with IO and QST)
- Engineering integration study, prototyping, basic sensor testing and calibration
- Elaborate tentative commissioning plans

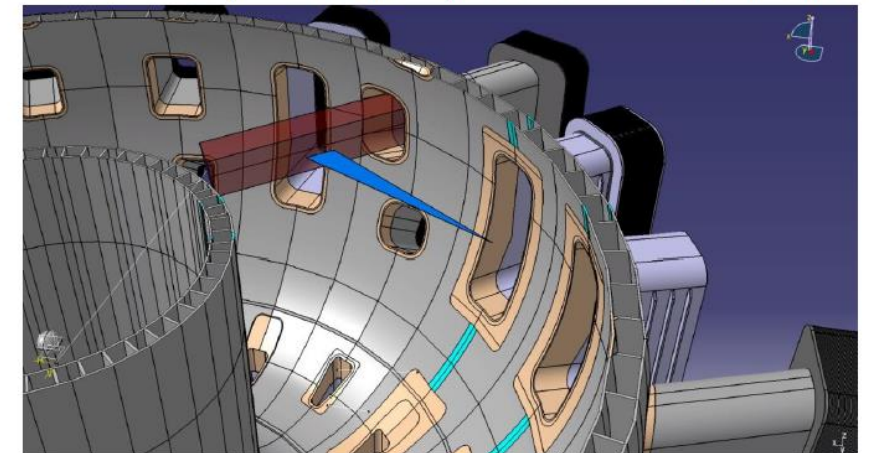


ITER EC stray radiation sensor CAD model

Beam Emission Spectroscopy System (EK-CER)

- Lithium and heating BES diagnostics:
 - Performance analysis update with updated plasma configuration
 - Elaborate project plan and cost estimate based on the feasibility study

D-BES – Set-up 8B beam on port 16. Observation on P-17



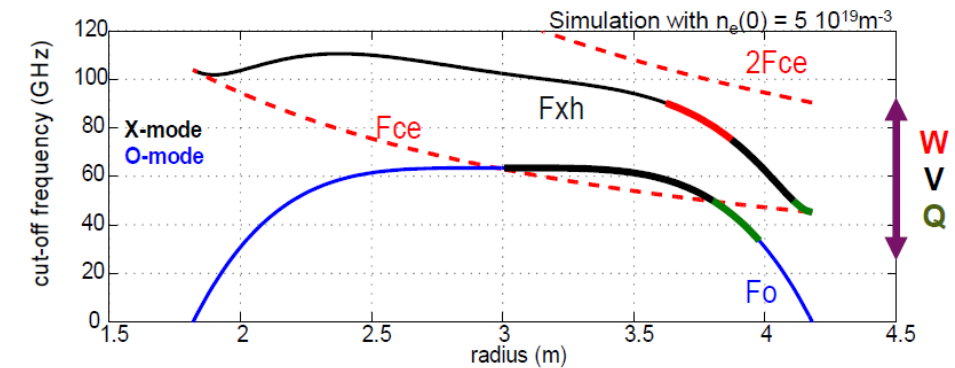


Ultra-fast Reflectometry Upgrade (CEA)

- Continuation of practical implementation studies:
 - Identification of suitable installation locations
 - Study of waveguide routes (type of waveguides and antennas, distance to plasma edge...)
 - Analysis of a possible space sharing with the DR system (CIEMAT)
 - Provide estimated budget and timeline for project execution

Infrared Imaging System (CEA)

- Identification/study of possible improvements for QST IR diagnostics in terms of mechanics, optics and IR data use for physics studies and machine protection
- Identify/define requirements for applications in future divertors (carbon, carbon cooled and tungsten) and PFC



JT-60SA
 $R = 3 \text{ m}$
 $a = 1.18 \text{ m}$
 $B = 2.3 \text{ T}$

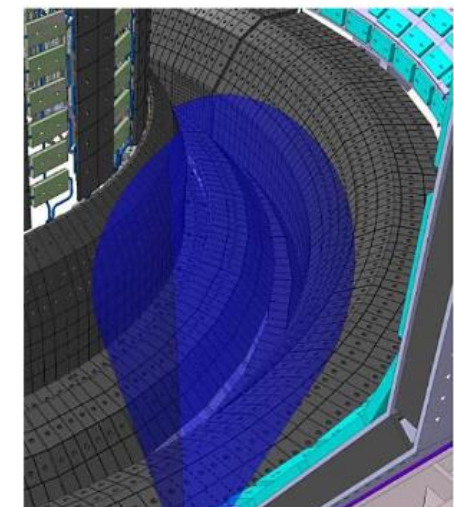
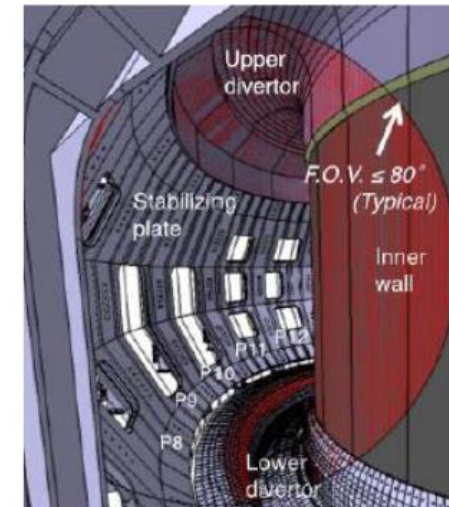
Similarities with JET

3 frequency bandwidths are required

Q-band (33-50 GHz)

V-band (50-75 GHz)

W-band (75-110 GHz)

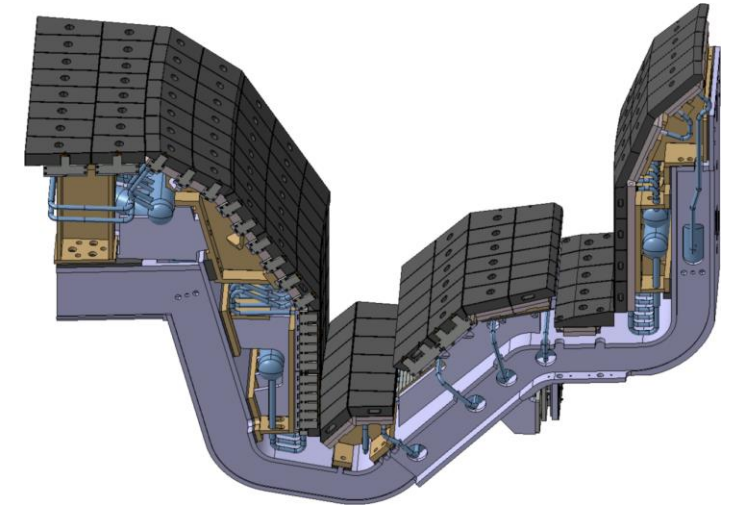




FP9 Enhancement Projects: Overview (5/5)

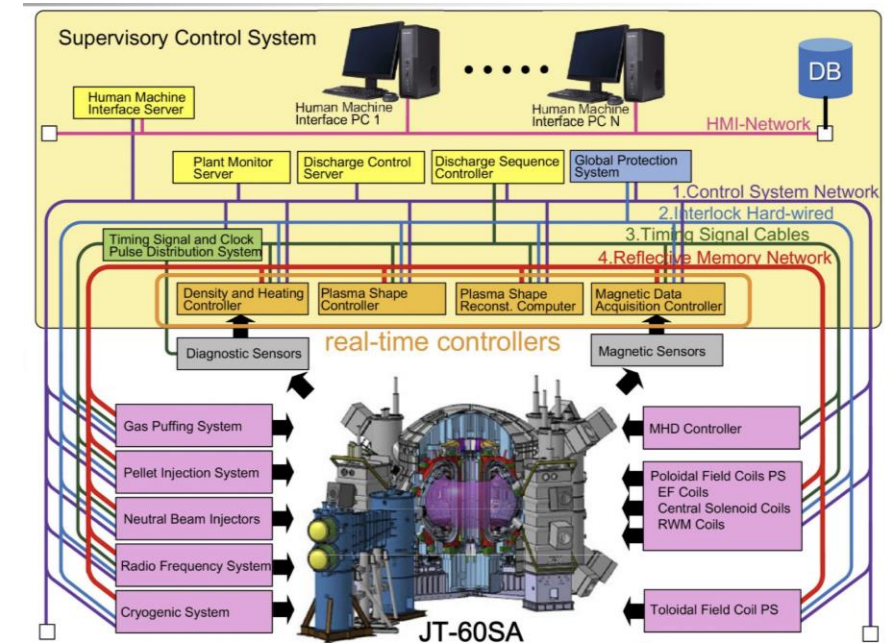
Langmuir Probes Specifications (CEA)

- New activity in 2022 (collaboration with WPDIV and F4E)
- Support on definition Langmuir probes specifications compatible with actively cooled divertor



Remote Access Architecture (ENEA, CEA, IPP)

- Support to the development and test of the JT-60SA remote participation tools
- Analysis & planning of actions needed to setup effective remote participation to JT-60SA
- In line with SA.M.02 (Grant Milestone in 2022)





Enhancement Projects: Objectives for 2022 and beyond

FP8 Enhancement Projects

- Complete procurement of most projects and prepare installation in 2023-2025
- EDICAM: Contribute to Integrated Commissioning II (SA.D.02 Grant Deliverable 2022)

FP9 Enhancement Projects

- Progress in Remote Access (SA.M.02 Grant Milestone in 2022)
- Projects mature enough (TPCI, DR, EC-Stray): propose to move to implementation phase depending on priorities being defined by Experiment Teams (EUROfusion-QST)
- Rest of projects: Complete/improve feasibility studies to support prioritization being defined by Experiment Teams

