



Exploitation of JT-60SA (WPSA)

FP9 Enhancement Projects Activities Summary

PPM 2021

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Several enhancement projects selected for period 2021-2025 in WPSA

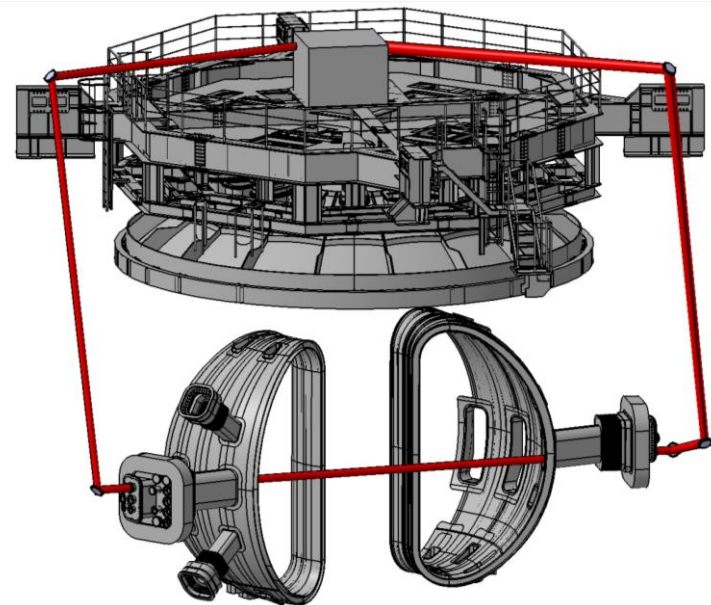
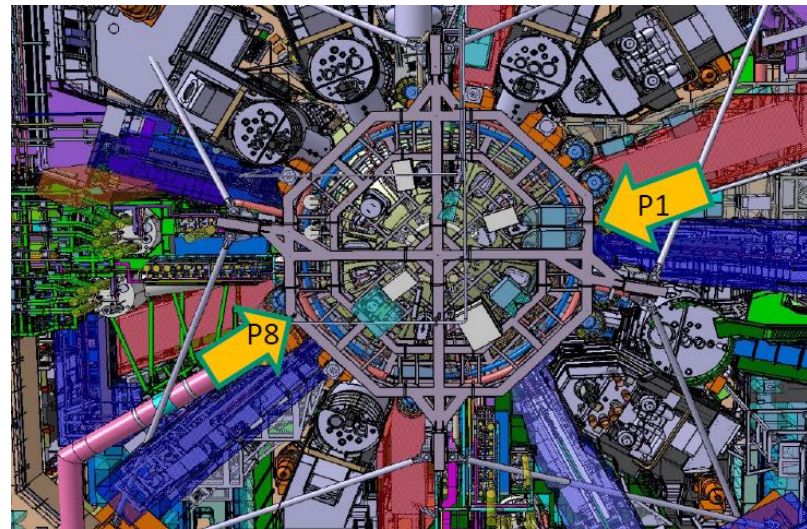


- Different diagnostics considered for design and procurement
 - Tangential Phase Contrast Imaging (TPCI) system
 - Doppler Reflectometry (DR) system
 - EC Stray Detection system
 - Neutron and Gamma diagnostics
 - Beam Emission Spectroscopy (BES) system
 - IR imaging system
 - Ultra-Fast Reflectometry system
- Remote Access Architecture design and implementation

Tangential Phase Contrast Imaging (TPCI) system



- Proposal by EPFL (S. Coda)
- Optical and mechanical layout finalized
 - Neutron + gamma shielding, fire-safety beam shielding planned
 - Lasers, detector (with automated LN2 cooling), electronics and acquisition included in design
- Plans for 2021/2022 period
 - Proposal to be prepared for consideration by experimental/scientific teams and QST/F4E (during 2021)
 - Complete mechanical design (2021)
 - Compilation of engineering specifications and purchasing indications
 - Detailed CAD design
 - Ready to start manufacturing when/if agreed (2022)

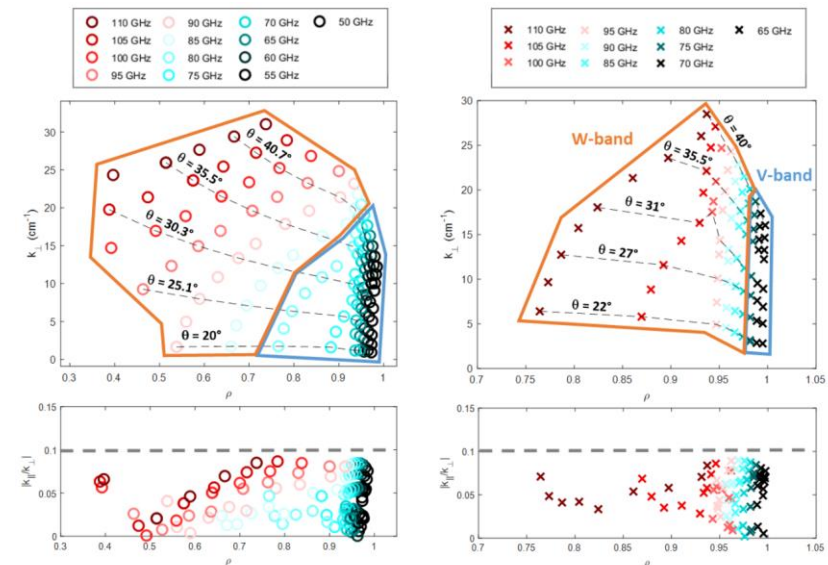
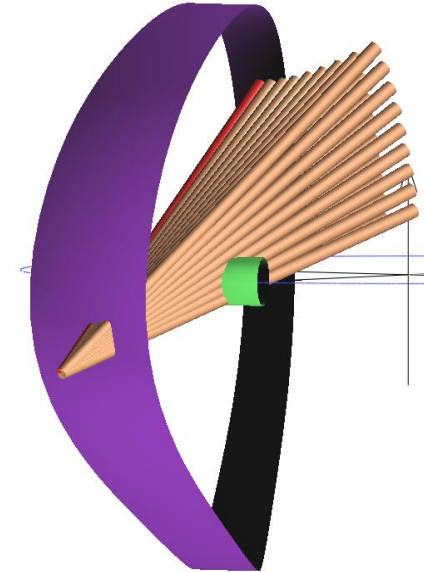




Doppler Reflectometry (DR) system

- Proposal by CIEMAT (D. Carralero)
- Scientific proposal and feasibility study completed
- Conceptual design (minimum viable + baseline design) with budget estimation proposed
- Plans for 2021/2022
 - Proposal to be prepared for consideration by experimental/scientific teams and QST/F4E (during 2021)
 - Ready to start manufacturing when/if agreed (2022)

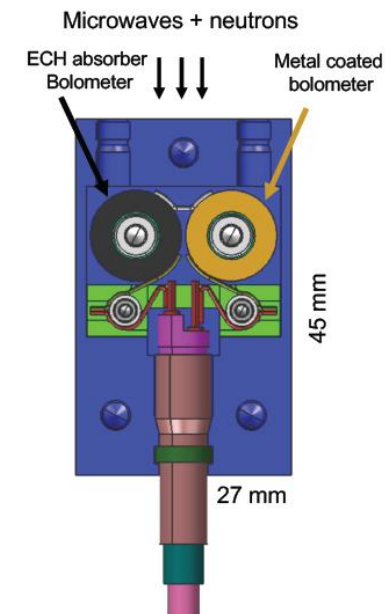
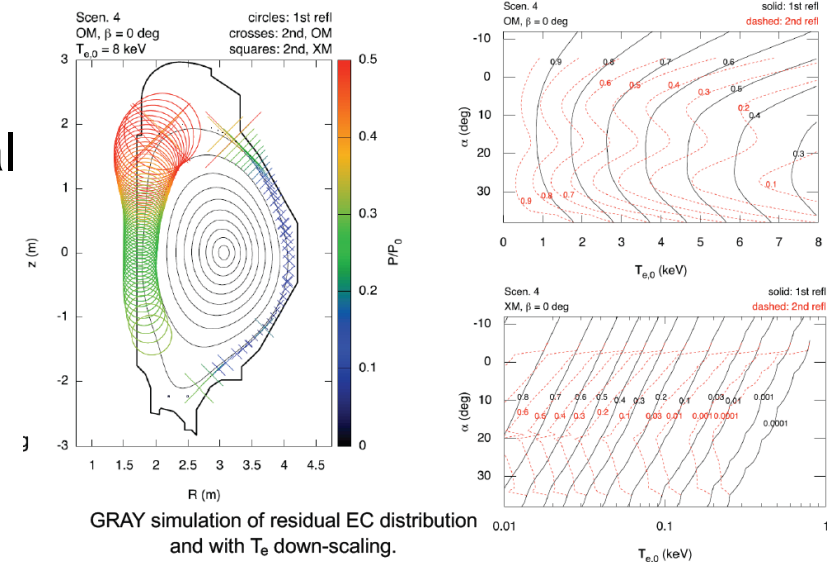
Explore mechanical compatibility (space sharing) with ultra-fast reflectometry proposal (CEA) – to be discussed





EC Stray Detection system

- Proposal by ENEA (A. Moro)
- Previous work analysis, scientific proposal and feasibility study started
- Sensor type selected (ITER-like type)
- EC load estimated in vessel (first plasma scenario)
- Proposed activities for 2021/2022 period
 - EC Beam tracing analysis (GRAY)
 - In vessel ECH sensor study (ANSYS): ITER bolometer and alternatives, adaptation to JT-60SA
 - Engineering integration study (CATIA): location, installation, instrumentation and control requirements
 - Prototyping, basic sensor testing, calibration and commissioning plan

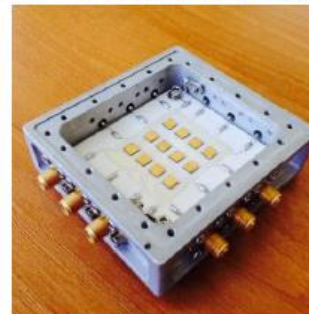


Neutron and Gamma diagnostics



- Joint proposal by ENEA, CCFE, VR, and IPPLM (M. Nocente, V. Kiptily, M. Cecconello, M. Angelone, E. Laszynska, K. Mikszuta-Michalik)
- Exploratory work and preliminary scoping studies already launched and presented
- Plans for 2021/2022
 - Build strong scientific case based on scientific goals (JT-60SA, ITER and Demo) - N&G is not currently priority for QST
 - Focus proposal to complement existing/planned diagnostics and studies (runaway physics, disruption dynamics,...)
 - Appoint technical coordinator and define tasks/deliverables for every group (fast-ions + neutronics)

VNS matrix at JET

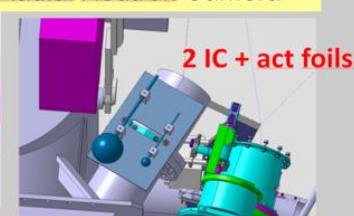
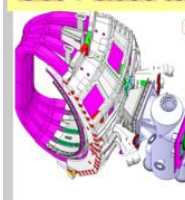


Standalone oblique diamond detector at JET

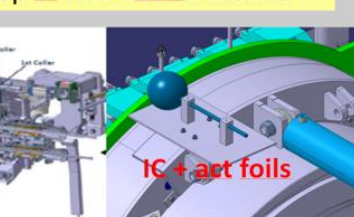
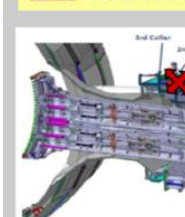
5 cm



Oct 1 close to Radial Neutron Camera



Oct 2 on the top of ITER Like Antenna

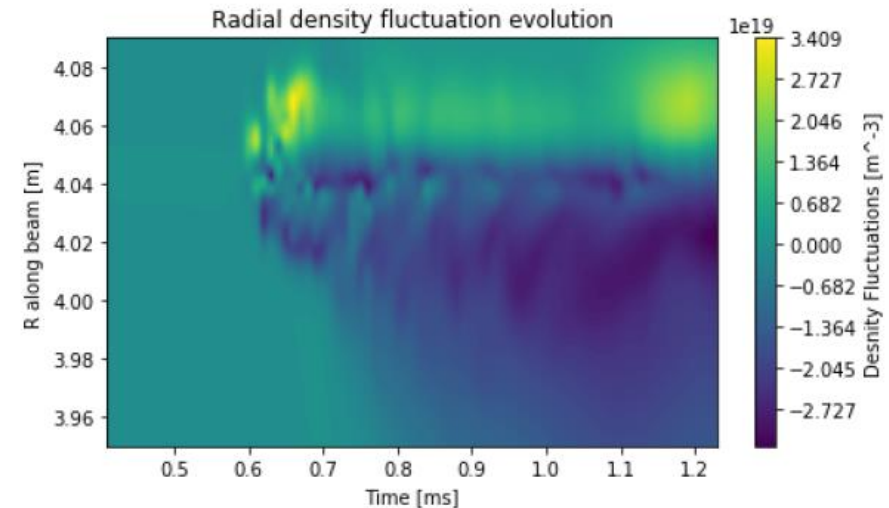


Beam Emission Spectroscopy system (BES)

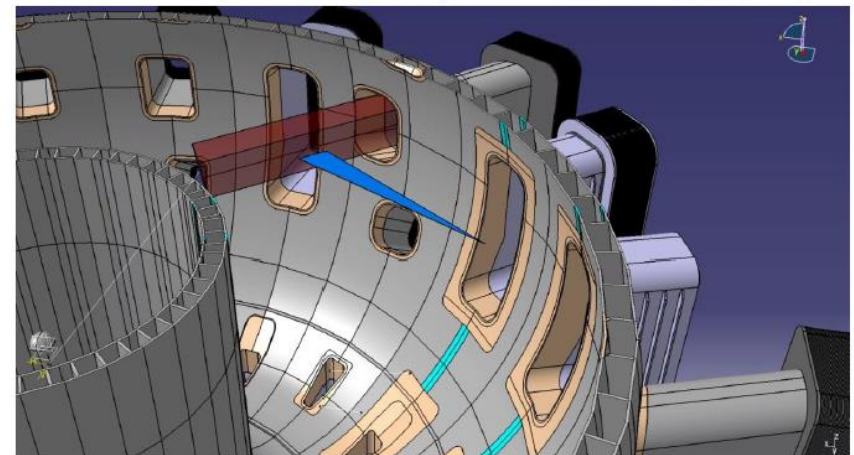


- Proposal by EK (D. Dunai, G. Anda)
- Previous proposal being updated
- Plans for 2021/2022 period
 - Update the feasibility study with the latest scenario calculations
 - Update the feasibility study with synthetic diagnostics results from JOREK (may be from HESEL)
 - Project plan and cost estimate for alkali and turbulence imaging BES diagnostics
 - Update the research plan based on the results of the feasibility study

Links/requests towards modelling team to be defined



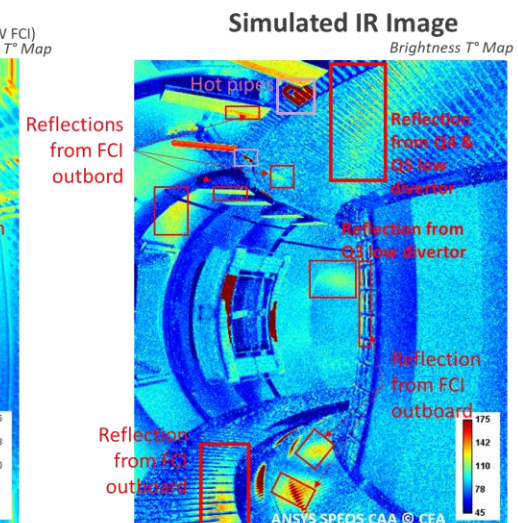
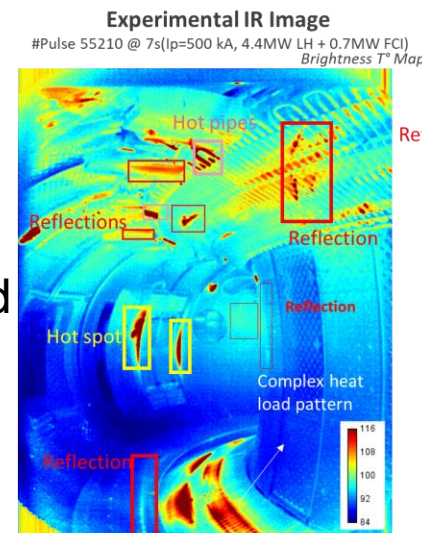
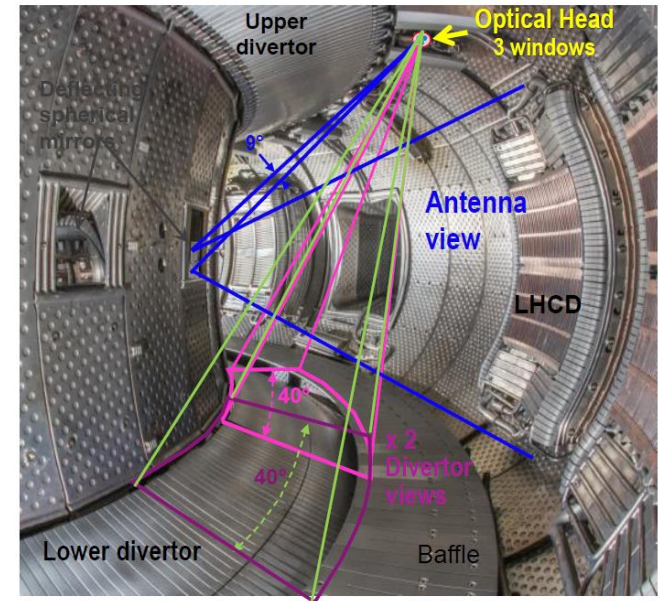
D-BES – Set-up 8B beam on port 16. Observation on P-17





Infrared (IR) Imaging system

- Proposal by CEA (X. Curtois, M-H. Aumeunier)
- New proposal to enhance quality of temperature measurements in perturbative environment
- Plans for 2021/2022
 - Scope study: assessment of the need, define preliminary specifications
 - Practical implementation study: analysis of current situation in JT-60SA, enhance what is planned,...
 - Synthetic diagnostic and correction methods development (to be discussed with CM area)

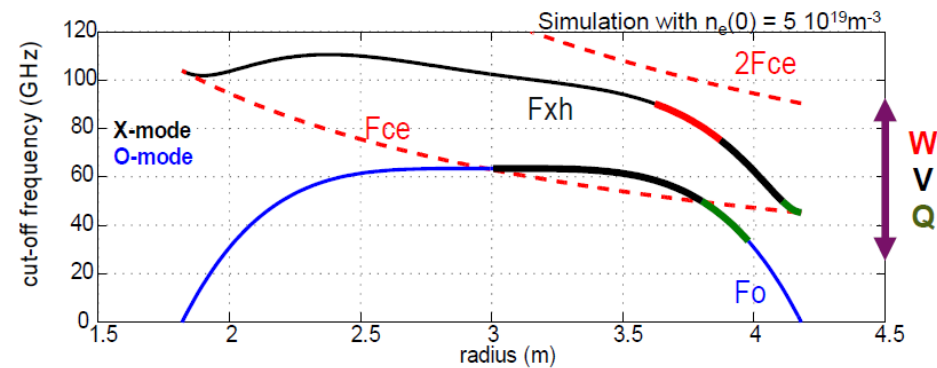




Ultra-Fast Reflectometry system

- Proposal by CEA (F. Clairet, Ch. Bottereau)
- New proposal to upgrade JT-60SA reflectometer capabilities
- Currently, JT-60SA reflectometer (standard) has no assigned port
- Plans for 2021/2022
 - Scope study: assessment of the need, define preliminary specifications
 - Practical implementation study: analysis of current situation in JT-60SA, enhance what is planned, reuse JT-60U instrumentation...
 - Consider borrowing reflectometers from other machines (JET, WEST)

Explore mechanical compatibility (space sharing) with DR proposal (CIEMAT) – to be discussed



JT-60SA
R = 3 m
a = 1.18 m
B = 2.3 T

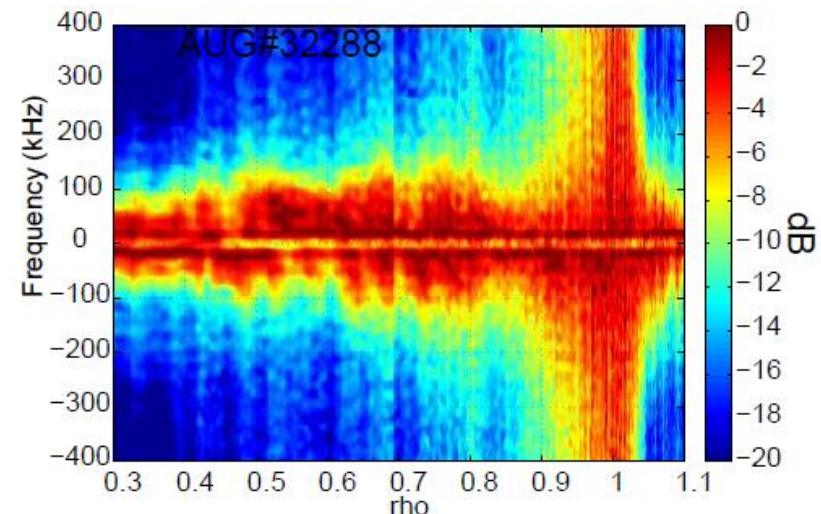
Similarities with JET

3 frequency bandwidths are required

Q-band (33-50 GHz)

V-band (50-75 GHz)

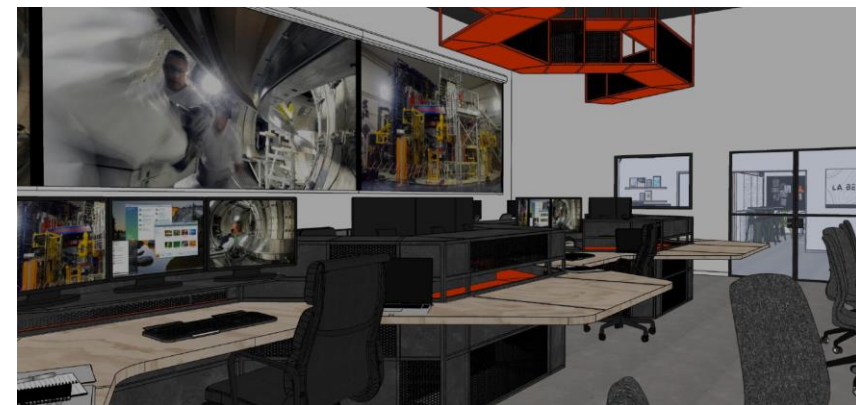
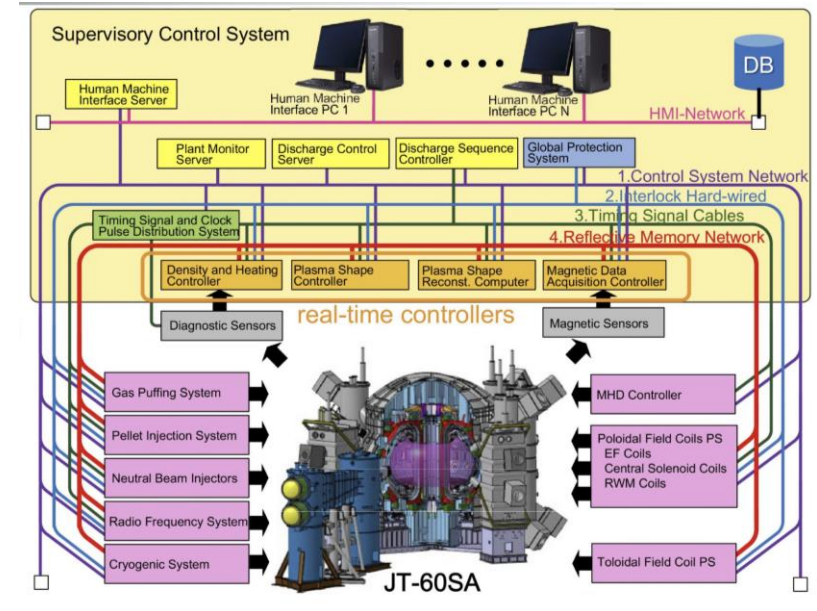
W-band (75-110 GHz)





Remote Access Architecture

- Joint proposal by ENEA, CEA and IPP Garching (G. de Tommasi, F. Imbeaux, C. Fuchs)
- Previous work and current situation reviewed and presented by ENEA
- Several approaches/ideas presented by proponents
- Plans for 2021/2022 period
 - Agree on common approach
 - Finalize functional requirements for EU toward implementation in 2023
 - Coordination with EU-REC activities
 - Develop conceptual design





- Significant number of proposals for JT-60SA enhancements received during present WPSA call
- Selected proposals for 2021/(2022) discussed with proponents
 - TPCI, DR and BES will be prepared to be considered by experimental team for implementation
 - Scoping studies N&G, EC Stray detection, IR imaging and Ultra-fast reflectometry will be launched
 - Remote Access Architecture design will start
- Main tasks/deliverables/acceptance criteria will be defined and agreed with proponents during upcoming weeks (to be submitted for WPSA AWP 2021/2022)