CWP extension for 2026/2027

WPSA objectives for 2026/2027

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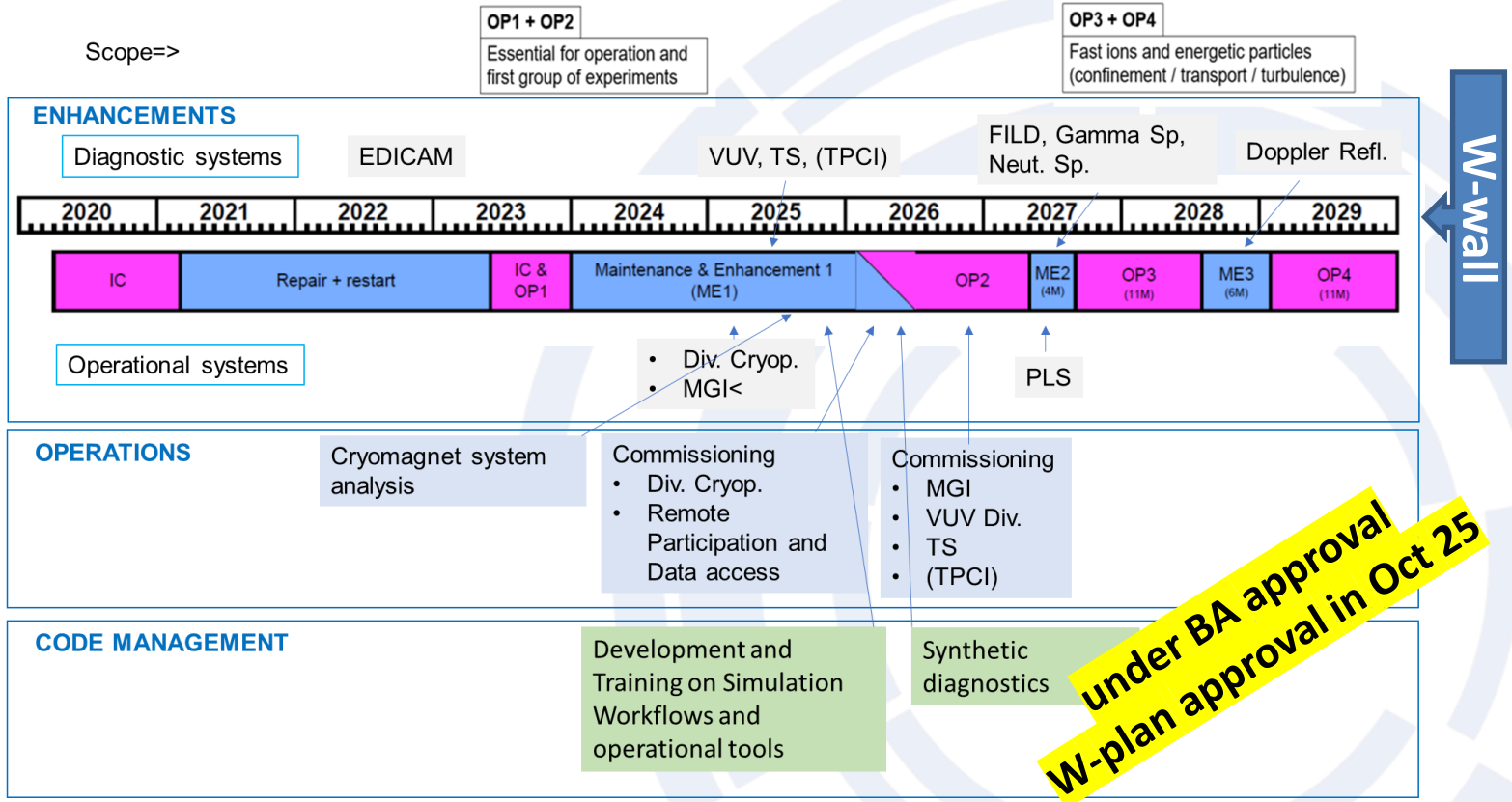
Background: JT-60SA status and mid-term plan

Main objectives of 2024-25 ME1 shutdown

- completion of the insulation reinforcements (mainly poloidal coils and CS modules)
- installation of extensive set of new key components and subsystems in preparation of the next operational campaign OP2 (P-N NBI, ECRF launchers, in-vessel coils, stabilizing plate, C-IC divertor, diagnostics, analysis cluster…)



OP2 objectives

- Commissioning with H plasmas for D plasma operation
  - Break down and plasma formation studies
  - Commissioning NB injectors into plasma, including monitoring of shine-through vs energy (esp. N-NBI)
  - Step-by-step increase of plasma current up to 5.5 MA
  - Test of plasma control schemes: current, position, density, heating
- ITER risk mitigation
  - Studies of L-H transition (H and D and possibly addition of He)
  - Disruption/ Runaway Generation and mitigation studies (including MGI)

- Scenario development
  - Initial integrated scenarios development towards ITER standard H-mode
  - OP2 Baseline, OP2 Hybrid, OP2 ITB

- BA-STP technical objective: demonstration of Poloidal Field Coils operation at the rated design value (20kA) during OP2 after the insulation reinforcement performed in 2022-2024.

WPSA Objectives 2026/2027

EUROPE Strategic Priorities
scenarios compatible with W-PFCs.
Management of disruptions and runaways
Fast ion physics
real-time control strategies

- Gain experience in operation of high current, high plasma volume SC device

- 2026: OP2 restart, systems commissioning and first operation (edge TS, div. VUV, MGI)
  - Support systems operation
  - Support data production
  - Finalize procurements for ME2
  - Finalize preparation of installation and commissioning of ME2 systems
  - Support design and procurements for ME3 -2028 (DR, Neutron monitor and Neutron Spectrometer 2)
  - Support data validation and analysis including IMAS
  - Develop upgrades and new enhancements in preparation of W operation (diagnostics, heating, control, protection etc)

- 2027: ME2 installation of FILD, TPCI, Gamma spectrometer, PLS1, (neutron spectrometer 1)
  - Support installation and integration of ME2 systems
  - Develop enhancements for ME3 (DR, edge diagnostics?)
  - Develop upgrades in preparation of W operation (diagnostics, heating, control, protection etc)

Grant deliverables

#	Scientific gap	Activity (deliverable)	Comment (priority)
1 - 2026	Disruption management (connected to scenario development at high current, plasma volume and stored energy)	Support provision of set of measurement systems and actuators, control strategies (MGI, EDICAM)	1- operational need
2 - 2027	HEP physics in reactor relevant condition	Support provision of set of measurement systems (Gamma, FILD)	2- HEP already in ME2. new physics
3 - 2027	Turbulence study in reactor relevant condition	Support provision of set of measurement systems (TPCI)	3 –important when scenarios developed

Additional information: WPSA structure and 2025 high level objectives

WPSA Project structure

WPSA

Enhancements and Commissioning of JT-60SA

WP organization

PSO
Alessandra Di Bastiano (ENEA)

Project Management
PL: Carlo Sozzi (ENEA)

W JT-60SA
EUROfusion activities in preparation of the transition to W wall and divertor
Coordination across WPs

JIFS
JT-60SA International Fusion School
Advice & Support

Tasks

Enhancements area aims to promote scoping and feasibility studies up to the level of conceptual design for new enhancement projects, and assist the procurement when approved.
Coordinator: Juan Ayllon-Guerola (CIEMAT)

Code Management aims to provide verified simulation and analysis tools for application to JT-60SA in support to the preparation of the experimental campaigns, data analysis, interpretation of diagnostics and experiments.
Coordinator: Gloria Falchetto (CEA)

Operations supports the commissioning activities and execution of the experimental campaigns providing expertise in plant and plasma operations, vacuum conditioning, real-time control, diagnostics, heating and fuelling systems.
Coordinator: Matteo Iafrati (ENEA)

Overall long-term objective of WPSA:

Prepare and support the scientific exploitation of JT-60SA cooperating with Fusion For Energy within the Broader Approach – Satellite Tokamak Project (BA-STP) framework

coherently with the needs and the priorities of the European Fusion Roadmap.

WPSA High level objectives 2025

- Prepare and assist machine integration of the EU-led diagnostic systems (OP, ENH) in 2025/26
- Prepare commissioning and first operation of the EU-led systems for “delivering” to the scientific community (Experiment Team) (OP) in 2026/2027
- Prepare and verify a suite of tools and codes for the Scientific Exploitation, including operation-oriented and control room tools, synthetic diagnostics, simulation workflows (CM) for the subsequent validation on data or benchmarking with/in WPTE
- Support new users in data access and first level analysis, leveraging experience gained during commissioning (training)
- Develop feasibility, design, assist procurement of new subsystems according with the JT-60SA scientific plan (ENH), in particular starting in 2025: diagnostics for plasma edge and plasma-wall interaction
- Contribute to the preparation and execution of the 3rd edition of the JIFS school
- Establish a plan for the EU contribution to the transition to W divertor and wall. This might include several lines of work and collection of information of activities performed in other EuroFusion WPs

1. Definition of the scientific priorities for the C phase and for the W phase and W-related preparation experiments in the C phase of JT-60SA (ET)
2. Definition of plasma scenarios and corresponding magnetic configuration (ET), supported by WPTE and Theory and Simulation developments
3. Modeling of heat load (WPTE)
4. Core and impurity transport (WPTE)
5. Modeling of heat load and bevel shaping on divertor PFCs – Short term study on PFCs (WPDIV)
6. Modeling for divertor PFCs shape optimization (WPPWIE)
7. Development and test/qualification of divertor PFCs (WPDIV)
8. Test of materials with linear plasma devices (WPPWIE)
9. Upgrade of diagnostics for W monitoring, wall and divertor protection (WPSA)
10. Upgrade of the heating systems (WPSA)
11. Upgrade of the protection system (WPSA)
12. Review of the wall cleaning systems and procedures (WPSA)
13. Review of the gas injection system (WPSA)