PSD Project Board 2 April 2025

Exploitation (Enhancement and Commissioning) of JT-60SA (WPSA) Scope and budget optimization within Work Packages for 2026-27¶

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ISTP-CNR (ENEA)

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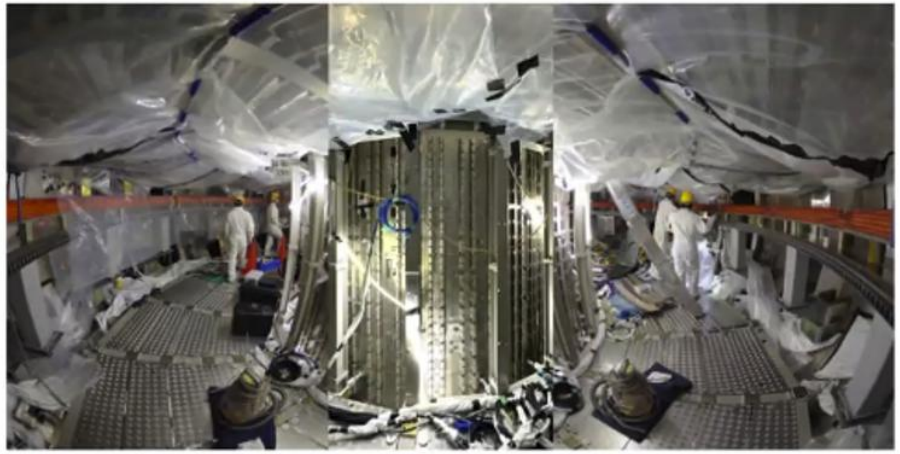
Background: JT-60SA status and near-term plans & objectives

Main objectives of 2024-25 ME1 shutdown

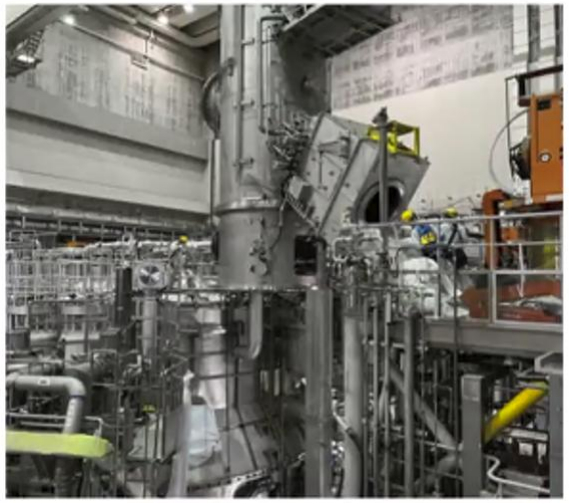
- completion of the insulation reinforcements (mainly poloidal coils and CS modules)
- installation of extensive set of new key components and subsystems in preparation of the next operational campaign OP2 (P-N NBI, ECRF launchers, in-vessel coils, stabilizing plate, C-IC divertor, many diagnostics,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



Upper Fast Plasma Position Control Coil

OP2 objectives, 2026

- Commissioning with H plasmas for D plasma operation
  - 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)
  - 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
  - **OP3 (2027): consolidate and further extensions of the results (ELMs, Fast Ions, High Beta, Radiative scenario...)**
  - BA-STP technical objective: demonstration of Poloidal Field Coils operation at the rated design value (20kA) during OP2 after insulation reinforcement



Tanks of perpendicular NBI reinstalled in the torus hall

Gear box for exploitation (escape from the sand playground)

- Diagnostics being developed for the next Machine Enhancement periods are high priority for the next steps of the scientific programme of JT-60SA: short pulses, high current for studies in transport and confinement, high energy particles, scenario development

  - Tangential Phase Contrast Imaging (TPCI)
  - Fast Ion Losses Detector (FILD)
  - Gamma Rays Spectrometer (GRS)

  installation ME2 2027

  - Doppler Reflectometry
  - Compact Neutron Spectrometer (for High Neutron Rate)

  installation ME3 2028

  - Pellet Launching System (PLS)
    - Fueling source
    - Pacing Source

  tentative: installation ME3 2028

  - Supporting analysis and simulation tools
    - MHD and HEP workflows
    - Pulse Design Simulator
    - Magnetic Control
    - Cryomagnet system analysis
    - Synthetic diagnostics
    - …

Proposed Diagnostic and Priority

7

JT-60SA Advanced Superconducting Tokamak BA-Satellite Tokamak Program

Concept

- As OP3 is still short pulse at high power in C-wall. Studies and diagnostics for MHD, T&C and EP experiments will be priority: PCI, DR for T&C and EP, Neutron spectrum and gamma-ray for EP and MHD
- Divertor diagnostics are being important for long pulse preparation.

Experiment Team Coordination Meeting, February 2025

The list submitted to PL in April 2023 Note: FILD is not listed because it's on the PA level.

Diagnostics	(i) Purpose and (ii) Measuremet	Main Topical Goups	Impact on high priority research items in SARP v4.0	Priority ELs
Neutron diagnostics	(i) Fast particle physics, disruption dynamics and runaway electrons studies (ii) Neutron emissivity, neutron spectrum, total flux	Energetic Particle, MHD	Energetic particle driven mode studies Runaway electron studies Fast ion effects on turbulence and transport	I
Gamma-ray diagnostics	(i) Runaway electrons and fast ions bahaviors (ii) Hard x-ray and/or gamma-ray emission from the plasma, energy distribution of protons and/or deuterons from the beam	Energetic Particle, MHD	Runaway electron studies	I
PCI (Phase Contrast Imaging)	(i) Turbulence transport physics at low k to mid k fluctuations (ITG, TEM) (i) Local plasma density fluctuations across the entire minor radius,	Transport	Transport in dominant electron heating in H-mode plasmas Intrinsic torque and intrinsic rotation studies ITB and intrinsic rotation studies	I
DR (Doppler Reflectometry System)	(i) Turbulence transport physics at high k fluctuations (TEM, ETG) (ii) Fluctuation amplitude, kperp spectra, radial correlation length, etc.	Transport	Transport in dominant electron heating in H-mode plasmas Intrinsic torque and intrinsic rotation studies ITB and intrinsic rotation studies	I
Vertical ECE	(i) Transport processes of high-energy electrons (ii) Electron velocity distribution (fluctuations in the phase space of confined electrons) and local electron temperature fluctuations.	Transport, MHD	Runaway electron studies	I

WPSA high level objectives 2026-2027 coherent with the machine timeline

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
- ***Key competence for ITER=>2031***
- ***=> on site team operating on subsystems is a good entry door***
- ***=> scientific leverage of the development effort***
- *****Transitional policy urgently needed*****

- 2026: OP2 restart, systems commissioning and first operation (edge TS, div. VUV, MGI)
  - Support systems operation
  - Support data production
  - Finalize procurements for the following ME2
  - Finalize preparation of installation and commissioning of ME2 systems
  - Support design and procurements for ME3 -2028: (Doppler Reflectometry, Vertical Neutron Camera and Compact Neutron Spectrometer)
  - Support data validation and analysis
  - Develop upgrades and new enhancements in preparation of W operation (diagnostics, heating, control, protection etc)
  - Provide software tools to support subsystem operation, control room analysis
  - Provide subsystems data analysis for safe operation
- 2027: ME2 installation of FILD, TPCI, Gamma Spectrometer, possibly PLS1, final development of compact neutron spectrometer (CNS), DR
  - 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 Milestone Dec. 2026	**Commissioning of the Edge Thomson Scattering Diagnostics**	
Grant Deliverable Dec. 2027	**First measurement of the pedestal density and temperature at sub-cm spatial resolution in JT-60SA**	**Scientific Gap: Pedestal physics at high plasma current in a large tokamak device**

JT-60SA Timeline

Scope=>

OP1 + OP2
Essential for operation and first group of experiments

2025-2027 Development
2027-2028 Inst.& Comm.

OP3 + OP4
Fast ions and energetic particles (confinement / transport / turbulence)

ENHANCEMENTS

Diagnostic systems

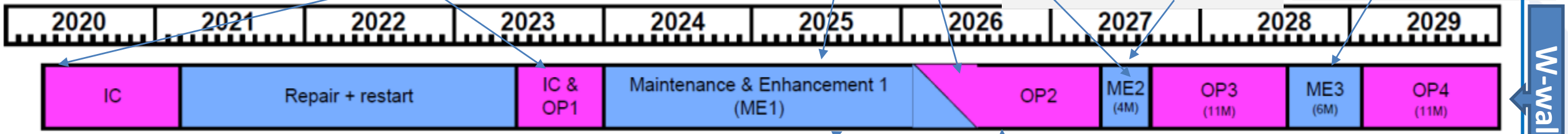
Installation, commissioning, first operation:

2020 EDICAM

2025-26 VUV, TS

2027 TPCI, FILD, LaBr3(Ce) Gamma Sp, (CLYC Neut. Sp.)

2028 Doppler Refl., LaCl3(Ce) Neut. Sp, Vertical Neut. Cam



Operational systems

2025-26-27 Neutronics
- Support in shielding calculation
- Support for Activation Foils and spectrometry from dose

- 2025 Div. Cryop.
- 2026 MGI

PLS ?

EC Stray ?

OPERATIONS

2025-2026 Cryomagnet system:
- Component test and characterization
- System modeling
- Plant data analysis

Commissioning 2026
- Div. Cryop (F4E).
- Remote Participation and Data access

Commissioning 2026
- Edge TS
- VUV Div
- MGI

Timeline BASC approved
W-plan approval in Oct 25

2025-2026 Development on operational tools:
- Synthetic diagnostics

CODE MANAGEMENT

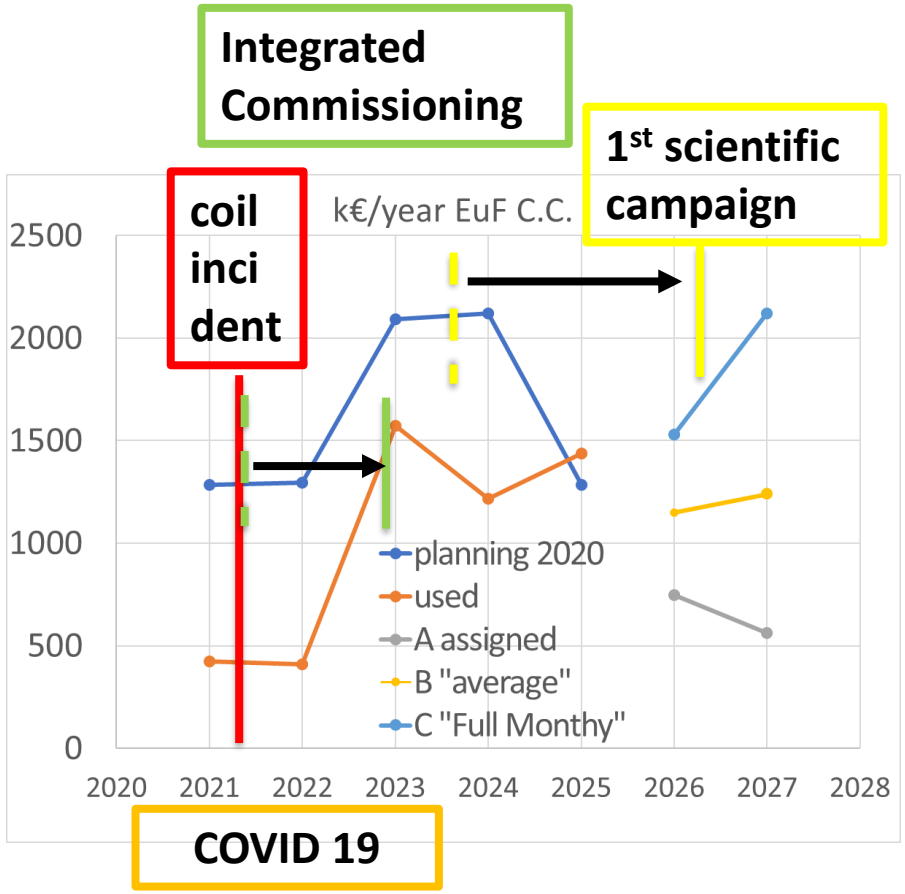
2025 Training on Simulation Workflows:
- MHD stability
- High Energy Particles

2025 Development on operational tools:
- Pulse simulator
- Magnetic control
- Tools for data access
- Breakdown
- El. Cycl. propagation tools

2026 Training:
- Pulse simulator

2026-27 Training and expl:
- Magnetic control
- EC propagation tools

Budget scenarios for 2026-2027



- Funding scenario A (1.2 M€ 26-27)
  - Reduced support to systems under first operation, then minimal (or zero)=>reduced operativity of diagnostics, impact on scientific leverage
  - Development reduced and Installation of ME2 enhancements (all but one – FILD?) to be postsponed => delay and reduced scientific impact
  - Support for development of other enhancement (towards ME3) to be strongly reduced or stopped => delay and reduced scientific impact
  - Support for operational tools to be stopped => reduced productivity
  - Support for cryomagnet system to be stopped => impact in safe operation margins and achievable pulse rate
- Funding scenario B (2.2 M€ 26-27)
  - Acceptable support on site for operational systems (not optimal)
  - Reduced support for development of systems, delays likely but keep going =>reduce the risk of loosing the team
  - PLS likely to be postponed
  - Reduced support for tools and systems analysis (cryo, neutronics, magnetic control, EC
- Funding scenario C (3.4 M€ 26-27)
  - Plan as expected to support JT-60SA enhancements and their commissioning and first operation
  - No delay for funding reasons

Timeline plan A

Scope=>

OP1 + OP2
Essential for operation and first group of experiments

2025-2027 Development
2027-2028 Inst.& Comm.

OP3 + OP4
Fast ions and energetic particles (confinement / transport / turbulence)

JT-60SA Advanced Superconducting Tokamak BA-Satellite Tokamak Program

ENHANCEMENTS

Diagnostic systems

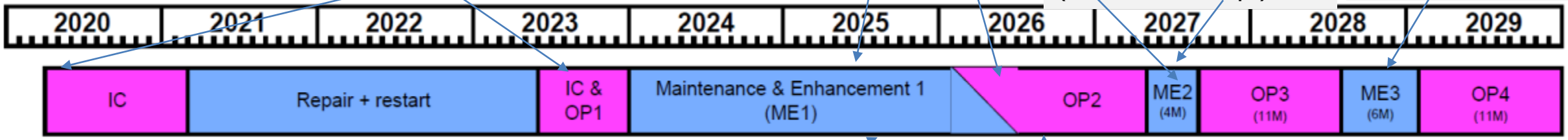
Installation, commissioning, first operation:

2020 EDICAM

2025-26 VUV, TS

2027 TPCI, FILD, LaBr3(Ce) Gamma Sp, (CLYC Neut. Sp.)

2028 Doppler Refl., LaCl3(Ce) Neut. Sp, Vertical Neut. Cam



Operational systems

2025-26-27 Neutronics
- Support in shielding calculation
- Support for Activation Foils and spectrometry from dose

- 2025 Div. Cryop.
- 2026 MGI

Delayed ➔ PLS?

EC Stray?

OPERATIONS

2025-2026 Cryomagnet system:
- Component test and characterization
- System modeling
- Plant data analysis

Commissioning 2026
- Div. Cryop (F4E).
- Remote Participation and Data access

Commissioning 2026
- Edge TS (reduced)
- VUV Div (reduced)
- MGI (minimal)

Timeline BASC approved
W-plan approval in Oct 25

2025-2026 Development on operational tools:
- Synthetic diagnostics

CODE MANAGEMENT

2025 Training on Simulation Workflows:
- MHD stability
- High Energy Particles

2025 Development on operational tools:
- Pulse simulator
- Magnetic control
- Tools for data access
- Breakdown
- EC propagation tools

2026 Training:
- Pulse simulator

2026-27 Training and expl:
- Magnetic control
- EC propagation tools

2026 plan A

Name	Acronym	2026 objective	2026 WPSA Area	Priority 2026	2026 resources (PMs)	On site work (months X PMs)
Edge Thomson Scattering	ETS	Calibration, Commissioning, Operation	OP	1	18.5	11.6
Divertor VUV	DivVUV	Installation, Commissioning, Operation	OP	1	9.5	5.13
EDICAM	ED	Operation	OP	1	6	3.7
Pellet Launching System	PLS	Assembly and lab test	ENH	1	6	0.8
PLS source	SPLS	Design assistance	ENH	1	4	0.5
Massive Gas Injection	MGI	Commissioning and Operation	OP	1	4	2
Tangential Phase Contrast Imaging	TPCI	Ex-vessel installation	OP	1	4	2
Fast Ion Loss Detector	FILD	Assembly and lab test	ENH	1	6	1
Gamma Ray Spectrometry	GRS	Procurement, manufacturing, lab test	ENH	1	7	0.5
Compact Neutron Spectrometry	CNS	Procurement, manufacturing, lab test	ENH	1	5.5	0.5
Vertical Neutron Camera (profile monitor)	VNC	Procurement, manufacturing, lab test	ENH	2	0	0
Runaway Electron Monitor	REM	Installation and commissioning/operation	OP	**1**	3	1.33
Edge and SOL diagnostics +	ESD	Conceptual design of selected diagnostics	ENH	2	0	0
Neutronics	Neut	Support to shielding design	ENH	1	1	0.5
Activation foils	AF	Installation	ENH	1	3	0.5
Doppler Reflectometry	DR	Mechanical design and validation	ENH	2	0	0
EC stray detection	ECS	Procurement and manufacturing	ENH	2	0	0
EDICAM	ED	Detailed design, depending on selected application	ENH	2	0	0
Electron Cyclotron Waves simulation	ECW	development of tools for ECH and ECE for control application	CM	2	0	0
Tools for conditioning and magnetic control	MAGC	development and training	CM	2	0	0
Remote access for diagnostics mantainence	REC	support for new subsystems	CM	2	0	0
Criomagnet system simulation and data analysis	CryoS	Application to cool down phase	OP	2	0	0
pulse discharge simulator	PDS	Training for users	CM	1	1	0
Test of criomagnet components	CryoT		OP	2	0	0
Preparation of pellet commissioning	PLSC		OP	3	0	0
Area coordination	AC			1	8	0.7
Divertor Cryopumps	DivCryo	Operation	OP	4	0	0
WPSA GPM				**3**		0
Project management and PSO	MAN			1	10.8	1
TOTAL 2026					**97.3**	**31.76**

2026 ECc (k€) incl. missions	**679**
2026 EC contr w/o missions	**400**

2027 plan A

Name	Acronym	2027 objective	2027 WPSA Area	Priority 2027	2027 resources (PMs)	2027 on site work (months X PMs)
Edge Thomson Scattering	ETS	Operation	OP	1	12	8
Divertor VUV	DivVUV	Operation	OP	2	0	0
EDICAM	ED	Operation	OP	1	6	2
Pellet Launching System	PLS	Installation and commissioning/operation	OP	1	5	1
PLS source	SPLS	Manufacturing assistance	OP	1	4	1
Massive Gas Injection	MGI	Operation	OP	2	0	0
Tangential Phase Contrast Imaging	TPCI	Finalize Installation and commissioning/operation	OP	1	3	1
Fast Ion Loss Detector	FILD	Installation and commissioning/operation	OP	1	16	6
Gamma Ray Spectrometry	GRS	Installation and commissioning/operation	OP	1	4	1
Compact Neutron Spectrometry	CNS	Procurement and manufacturing	ENH	1	8.5	1
Vertical Neutron Camera (profile monitor)	VNC	Procurement and manufacturing	ENH	2	0	0
Runaway Electron Monitor	REM	Operation	OP	**1**	1	0
Edge and SOL diagnostics +	ESD	Procurement and manufacturing	ENH	2	0	0
Neutronics	Neut	Support to shielding design	ENH	2	0	0
Activation foils	AF	Analysis of first operation	ENH	2	0	0
Doppler Reflectometry	DR	Procurement and manufacturing	ENH	2	0	0
EC stray detection	ECS	Installation and commissioning	OP	2	0	0
EDICAM	ED	Procurement and manufacturing	ENH	2	0	0
Electron Cyclotron Waves simulation	ECW	development of tools for ECH and ECE for conctrol application	CM	2	0	0
Tools for conditioning and magnetic control	MAGC	development and training	CM	2	0	0
Remote access for diagnostics manteinance	REC	support for new subsystems	CM	2	0	0
Cryomagnet system simulation and data analysis	CryoS	Data analysis	OP	2	0	0
pulse discharge simulator	PDS		CM	3	0	0
Test of criomagnet components	CryoT		OP	2	0	0
Preparation of pellet commissioning	PLSC		OP	1	1	0
Area coordination	AC			1	8	1
Divertor Cryopumps	DivCryo	Operation	OP	5	0	0
WPSA GPM				**2**	0	0
Project management and PSO	MAN			1	10.8	1
TOTAL 2027					**79.3**	**23**

2027 ECc (k€) incl. missions	**520**
2027 EC contr w/o missions	**334**

Draft AWP 2026-27: realistic objectives

- the objectives of WPSA in 2026-27 are:
- 2026: systems commissioning and first operation in OP2 of edge TS, div. VUV, MGI
  - Support first phase of new systems operation (commissioning with plasma)
  - Support first data production and interpretation
  - Finalize design and assist procurements for systems foreseen for the following machine enhancement periods (ME2, ME3 and later)
  - Finalize preparation of installation and commissioning procedures of systems under installation in ME2 (2027)
- 2027: installation and commissioning of Fast Ion Loss Detector.
  - Advance and finalize the preparation for the installation of Tangential Phase Contrast Imaging (TPCI), Gamma Ray Spectrometer (GRS) in the following Machine enhancement period (>2027)
  - Support development and procurement of the Pellet Launching System (PLS)
  - Guarantee minimal support for operation of Edge TS and EDICAM

Draft AWP 2026-27: impact on the JT-60SA programme

- With the present level of resources, the following activities have to be paused and delayed.
- Installation of the following systems
- TPCI
- GRS
- Foreseen in the JT-60SA time plan for ME2 (2027) has to be postponed, with impact on the scientific scope of OP3 campaign.
- The development of the following systems has to be paused
- Doppler Reflectometry
- Vertical Neutron Camera
- With impact on the OP4 scientific scope (>2028)

Draft AWP 2026-27: impact on the JT-60SA programme

- The support for the characterization of components and the simulation and analysis of the cryo-magnet system has to be paused, with impact in safe operation margins and achievable pulse rate related to the Poloidal Field coils
- The support to development of magnetic real time control and modelling tools has to be paused, likely with a negative impact on the capability of European researchers for the preparation of the plasma operations and development of the scenarios
- Monitoring of remote access to plant systems and diagnostics and development of remote access procedures has to be paused, delaying the opportunity of performing part of the monitoring and maintenance from EU
- The development of edge and SOL diagnostics has to be paused likely impacting the scientific scope of OP4 and the enhancement plan in preparation of the transition to the Tungsten wall
- Moreover, a significant reduction of resources for the development of the following systems becomes necessary, with increased risk of delay in the installation
- Pellet Launching System

TBD (personal considerations here, not discussed in PSD or elsewhere)

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
- ***Key competence for ITER=>2031***
- ***=> on site team operating on subsystems is a good entry door***
- ***=> scientific leverage of the development effort***

- *****Transitional policy urgently needed*****

- JT-60SA: OP2, OP3, perhaps OP4 before W shutdown (ending in 203X, 0<X<4?)
- ITER starting Operation in ~2033, operation core team on site in 2031: JT-60SA
- 2026-2027 Transitional period towards FP10
- Assumptions:
  - F4E running JT-60SA and ITER operations for EU
  - F4E needs to develop a structure for scientific scope. Fishing the Eurofusion pond (but not only). Could be ready in 2028?
  - Scientific driven enhancements ARE part of the scientific scope.
- Considerations
  - In JT-60SA Eurofusion has been for long time in a weak position, and gaining momentum (but still not full citizenship) providing high added value HW and scientific competence during the IC and later in the Experiment Team
  - Not providing high quality AND numerous enough participation in OP2-OP3 and OP4(?) would be serious missed objective for the fusion community in EU.
  - F4E may be interested to negotiate/available to financially take over earlier, if EUROfusion offers (and supports) a light leading structure (core competencies) to drive the transition (scientific exploitation, enhancements, operations).

Timeline plan B

Scope=>

OP1 + OP2
Essential for operation and first group of experiments

2025-2027 Development
2027-2028 Inst.& Comm.

OP3 + OP4
Fast ions and energetic particles (confinement / transport / turbulence)

ENHANCEMENTS

Installation, commissioning, first operation:

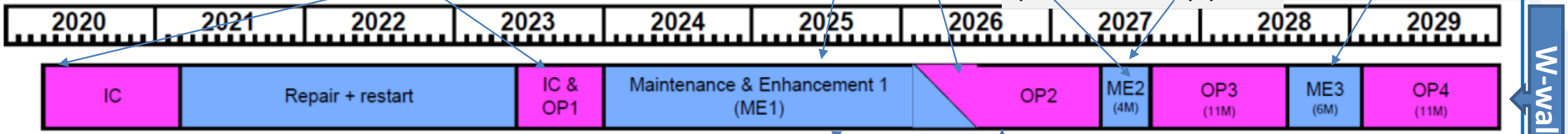
Diagnostic systems

2020 EDICAM

2025-26 VUV, TS

2027 TPCI, FILD, LaBr3(Ce) Gamma Sp, (CLYC Neut. Sp.)

2028 ?Doppler Refl., LaCl3(Ce) Neut. Sp, ?Vertical Neut. Cam



Operational systems

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- Support for Activation Foils and spectrometry from dose

- 2025 Div. Cryop.
- 2026 MGI

Delayed ➔

PLS?

EC Stray?

OPERATIONS

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- Component test and characterization
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- Plant data analysis

Commissioning 2026
- Div. Cryop (F4E).
- Remote Participation and Data access

Commissioning 2026
- Edge TS (reduced)
- VUV Div (reduced)
- MGI (minimal)

Timeline BASC approved
W-plan approval in Oct 25

CODE MANAGEMENT

2025 Training on Simulation Workflows:
- MHD stability
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2025 Development on operational tools:
- Pulse simulator
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- Tools for data access
- Breakdown
- EC propagation tools

2025-2026 Development on operational tools:
- Synthetic diagnostics

2026 Training:
- Pulse simulator

2026-27 Training and expl:
- Magnetic control
- EC propagation tools

2026 Plan B

Name	Acronym	2026 objective	2026 WPSA Area	Priority 2026	2026 resources (PMs)	On site work (months X PMs)
Edge Thomson Scattering	ETS	Calibration, Commissioning, Operation	OP	1	20	15
Divertor VUV	DivVUV	Installation, Commissioning, Operation	OP	1	10	5.6
EDICAM	ED	Operation	OP	1	6	4.3
Pellet Launching System	PLS	Assembly and lab test	ENH	1	6	1
PLS source	SPLS	Design assistance	ENH	1	4	0.5
Massive Gas Injection	MGI	Commissioning and Operation	OP	1	6	3
Tangential Phase Contrast Imaging	TPCI	Ex-vessel installation	OP	1	8	2
Fast Ion Loss Detector	FILD	Assembly and lab test	ENH	1	8	1
Gamma Ray Spectrometry	GRS	Procurement, manufacturing, lab test	ENH	1	6	0.5
Compact Neutron Spectrometry	CNS	Procurement, manufacturing, lab test	ENH	1	6	0.5
Vertical Neutron Camera (profile monitor)	VNC	Procurement, manufacturing, lab test	ENH	2	6	0.5
Runaway Electron Monitor	REM	Installation and commissioning/operation	OP	**1**	3	2
Edge and SOL diagnostics +	ESD	Conceptual design of selected diagnostics	ENH	2	8	2
Neutronics	Neut	Support to shielding design	ENH	2	4	0.5
Activation foils	AF	Installation	ENH	2	4	0.5
Doppler Reflectometry	DR	Mechanical design and validation	ENH	2	10	1
EC stray detection	ECS	Procurement and manufacturing	ENH	2	4	0.5
EDICAM (multiple lines)	ED	Detailed design, depending on selected application	ENH	2	0	0
Electron Cyclotron Waves simulation	ECW	development of tools for ECH and ECE for conctrol application	CM	1	2	1
Tools for conditioning and magnetic control	MAGC	development and training	CM	1	4	2
Remote access for diagnostics mantainence	REC	support for new subsystems	CM	2	2	0
Criomagnet system simulation and data analysis	CryoS	Application to cool down phase	OP	1	6	2
pulse discharge simulator	PDS	Training for users	CM	1	2	0
Test of criomagnet components	CryoT		OP	2	0	0
Preparation of pellet commissioning	PLSC		OP	3	0	0
Area coordination	AC			1	8	1
Divertor Cryopumps	DivCryo	Operation	OP	4	0	0
WPSA GPM				**3**	0	0
Project management and PSO	MAN			1	10.8	2
TOTAL 2026					**153.8**	

2026 ECc (k€) incl. missions	**1067**
2026 EC contr w/o missions	**649**

2027 Plan B

Name	Acronym	2027 objective	2027 WPSA Area	Priority 2027	2027 resources (PMs)	2027 on site work (months X PMs)
Edge Thomson Scattering	ETS	Operation	OP	1	15	8
Divertor VUV	DivVUV	Operation	OP	1	6	2
EDICAM	ED	Operation	OP	1	9	6
Pellet Launching System	PLS	Installation and commissioning/operation	OP	1	4	1
PLS source	SPLS	Manufacturing assistance	OP	1	4	0.5
Massive Gas Injection	MGI	Operation	OP	1	4	2
Tangential Phase Contrast Imaging	TPCI	Finalize Installation and commissioning/operation	OP	1	12	10
Fast Ion Loss Detector	FILD	Installation and commissioning/operation	OP	1	12	10
Gamma Ray Spectrometry	GRS	Installation and commissioning/operation	OP	1	12	10
Compact Neutron Spectrometry	CNS	Procurement and manufacturing	ENH	1	9	1
Vertical Neutron Camera (profile monitor)	VNC	Procurement and manufacturing	ENH	2	9	1
Runaway Electron Monitor	REM	Operation	OP	1	1	0
Edge and SOL diagnostics +	ESD	Procurement and manufacturing	ENH	2	8	2
Neutronics	Neut	Support to shielding design	ENH	2	3	0.5
Activation foils	AF	Analysis of first operation	ENH	2	3	0.5
Doppler Reflectometry	DR	Procurement and manufacturing	ENH	2	12	1
EC stray detection	ECS	Installation and commissioning	OP	2	6	2
EDICAM	ED	Procurement and manufacturing	ENH	2	0	0
Electron Cyclotron Waves simulation	ECW	development of tools for ECH and ECE for conctrol application	CM	2	2	1
Tools for conditioning and magnetic control	MAGC	development and training	CM	1	1	0
Remote access for diagnostics mantainence	REC	support for new subsystems	CM	2	2	0
Criomagnet system simulation and data analysis	CryoS	Data analysis	OP	2	6	0
pulse discharge simulator	PDS		CM	3	0	0
Test of criomagnet components	CryoT		OP	4	0	0
Preparation of pellet commissioning	PLSC		OP	1	1	0
Area coordination	AC			1	8	1
Divertor Cryopumps	DivCryo	Operation	OP	5	0	0
WPSA GPM				2		0
Project management and PSO	MAN			1	10.8	1
TOTAL 2027					**159.8**	**60.5**

2027 ECc (k€) incl. missions	**1134**
2027 EC contr w/o missions	**692**

2026 “Full Monthy”

Name	Acronym	2026 objective	2026 WPSA Area	Priority 2026	2026 resources (PMs)	On site work (months X PMs)
Edge Thomson Scattering	ETS	Calibration, Commissioning, Operation	OP	1	24	19
Divertor VUV	DivVUV	Installation, Commissioning, Operation	OP	1	12	5.6
EDICAM	ED	Operation	OP	1	6	4.3
Pellet Launching System	PLS	Assembly and lab test	ENH	1	18	1
PLS source	SPLS	Design assistance	ENH	1	6	0.5
Massive Gas Injection	MGI	Commissioning and Operation	OP	1	6	4
Tangential Phase Contrast Imaging	TPCI	Ex-vessel installation	OP	1	12	4
Fast Ion Loss Detector	FILD	Assembly and lab test	ENH	1	12	1
Gamma Ray Spectrometry	GRS	Procurement, manufacturing, lab test	ENH	1	12	0.5
Compact Neutron Spectrometry	CNS	Procurement, manufacturing, lab test	ENH	1	12	0.5
Vertical Neutron Camera (profile monitor)	VNC	Procurement, manufacturing, lab test	ENH	2	6	0.5
Runaway Electron Monitor	REM	Installation and commissioning/operation	OP	**1**	3	2
Edge and SOL diagnostics +	ESD	Conceptual design of selected diagnostics	ENH	2	24	1
Neutronics	Neut	Support to shielding design	ENH	2	4	0.5
Activation foils	AF	Installation	ENH	2	4	0.5
Doppler Reflectometry	DR	Mechanical design and validation	ENH	2	18	1
EC stray detection	ECS	Procurement and manufacturing	ENH	2	4	0.5
EDICAM	ED	Detailed design, depending on selected application	ENH	2	4	0
Electron Cyclotron Waves simulation	ECW	development of tools for ECH and ECE for conctrol application	CM	1	2	1
Tools for conditioning and magnetic control	MAGC	development and training	CM	1	6	2
Remote access for diagnostics mantainence	REC	support for new subsystems	CM	2	2	0
Criomagnet system simulation and data analysis	CryoS	Application to cool down phase	OP	1	6	2
pulse discharge simulator	PDS	Training for users	CM	1	2	0
Test of criomagnet components	CryoT		OP	4	4	0
Preparation of pellet commissioning	PLSC		OP	3	2	0
Area coordination	AC			1	9	1
Divertor Cryopumps	DivCryo	Operation	OP	4	0	0
WPSA GPM				**3**	0	0
Project management and PSO	MAN			1	10.8	2
TOTAL 2026					**230.8**	**54.4**

2026 ECc (k€) incl. missions	**1464**
2026 EC contr w/o missions	**1001**

2027 “Full Monthy”

Name	Acronym	2027 objective	2027 WPSA Area Priority 2027	2027 resources (PMs)	2027 on site work (months X PMs)
Edge Thomson Scattering	ETS	Operation	OP	1	18	18
Divertor VUV	DivVUV	Operation	OP	1	6	4.5
EDICAM	ED	Operation	OP	1	12	8.6
Pellet Launching System	PLS	Installation and commissioning/operation	OP	1	18	12
PLS source	SPLS	Manufacturing assistance	OP	1	6	4
Massive Gas Injection	MGI	Operation	OP	1	12	8
Tangential Phase Contrast Imaging	TPCI	Finalize Installation and commissioning/operation	OP	1	18	20
Fast Ion Loss Detector	FILD	Installation and commissioning/operation	OP	1	18	20
Gamma Ray Spectrometry	GRS	Installation and commissioning/operation	OP	1	12	14
Compact Neutron Spectrometry	CNS	Procurement and manufacturing	ENH	1	12	1
Vertical Neutron Camera (profile monitor)	VNC	Procurement and manufacturing	ENH	2	12	1
Runaway Electron Monitor	REM	Operation	OP	1	1	0
Edge and SOL diagnostics +	ESD	Procurement and manufacturing	ENH	2	24	2
Neutronics	Neut	Support to shielding design	ENH	2	4	0.5
Activation foils	AF	Analysis of first operation	ENH	2	4	0.5
Doppler Reflectometry	DR	Procurement and manufacturing	ENH	2	18	1
EC stray detection	ECS	Installation and commissioning	OP	2	6	2
EDICAM	ED	Procurement and manufacturing	ENH	2	4	0
Electron Cyclotron Waves simulation	ECW	development of tools for ECH and ECE for conctrol application	CM	2	2	1
Tools for conditioning and magnetic control	MAGC	development and training	CM	1	8	2
Remote access for diagnostics mantainence	REC	support for new subsystems	CM	2	2	0
Criomagnet system simulation and data analysis	CryoS	Data analysis	OP	2	6	2
pulse discharge simulator	PDS		CM	3	0	0
Test of criomagnet components	CryoT		OP	4	0	0
Preparation of pellet commissioning	PLSC		OP	1	2	0
Area coordination	AC			1	9	1
Divertor Cryopumps	DivCryo	Operation	OP	5	0	0
WPSA GPM				**2**	0	3.75
Project management and PSO	MAN			1	10.8	2
TOTAL 2027					**244.8**	**136.35**

2027 ECc (k€) incl. missions	**1928**
2027 EC contr w/o missions	**1079**