

PSD AWP25 Planning Meeting

WPSA AWP 2025

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Introduction

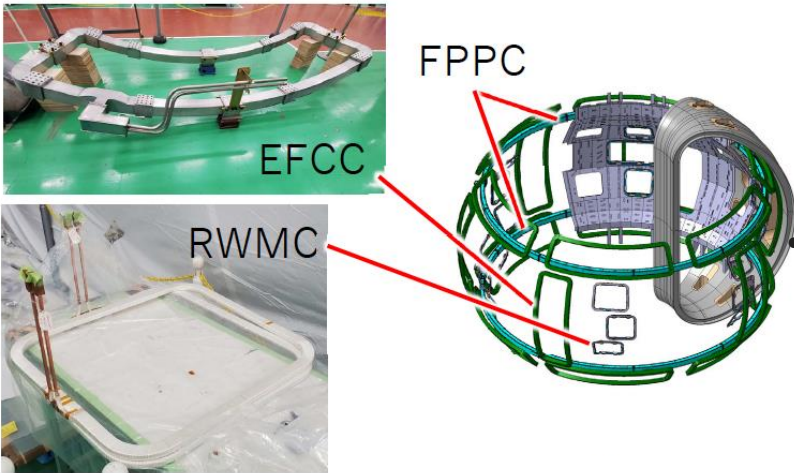
- Present status: JT-60SA
 - IC successfully executed and under analysis (JT-60SA ET/ WPTE), significant contribution from the former WPSA IC team, also involved in the present Experiment Team
 - Machine reinforcement and repair ongoing. No reduction in the machine target capabilities is expected in the next OP period. Possible (likely) impact on the timeline
 - Direct transition from C-IC divertor and C wall to W-ACD and W wall under discussion, possible final approval by end of 2024
- Present status: WPSA ongoing tasks
 - Enhancements
 - Code Management
 - Operation



JT-60SA expected timeline: ME1 status and plans

On schedule

- Tang-NB beam line connection started
- EFCC installation started
- EF repairing is on going after its mockup test.
- Mockup test for CS repairing is ongoing.



Delay / rescheduling

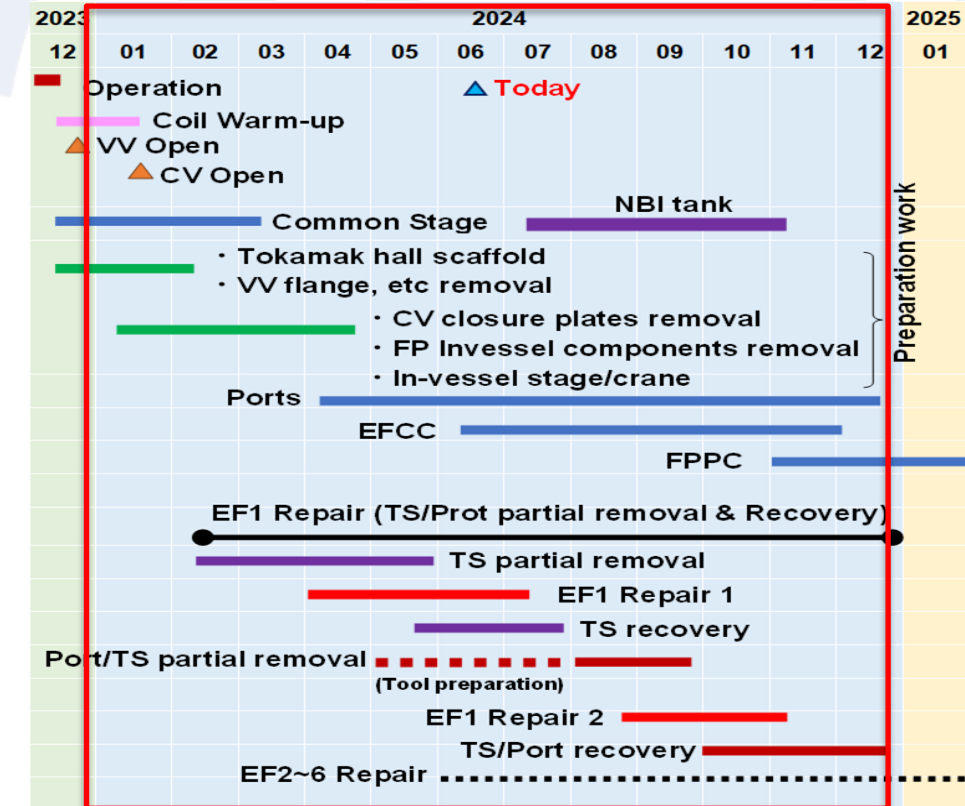
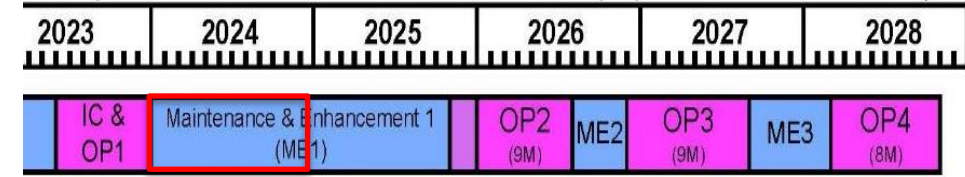
- Additional insulation reinforcement of EF/CS coils is required.

⇒ Schedule for the operation start (VV closure) is reconsidered.

The schedule will be discussed/ revised at Project Committee in October and will be approved/clear at BA Steering Committee in December.

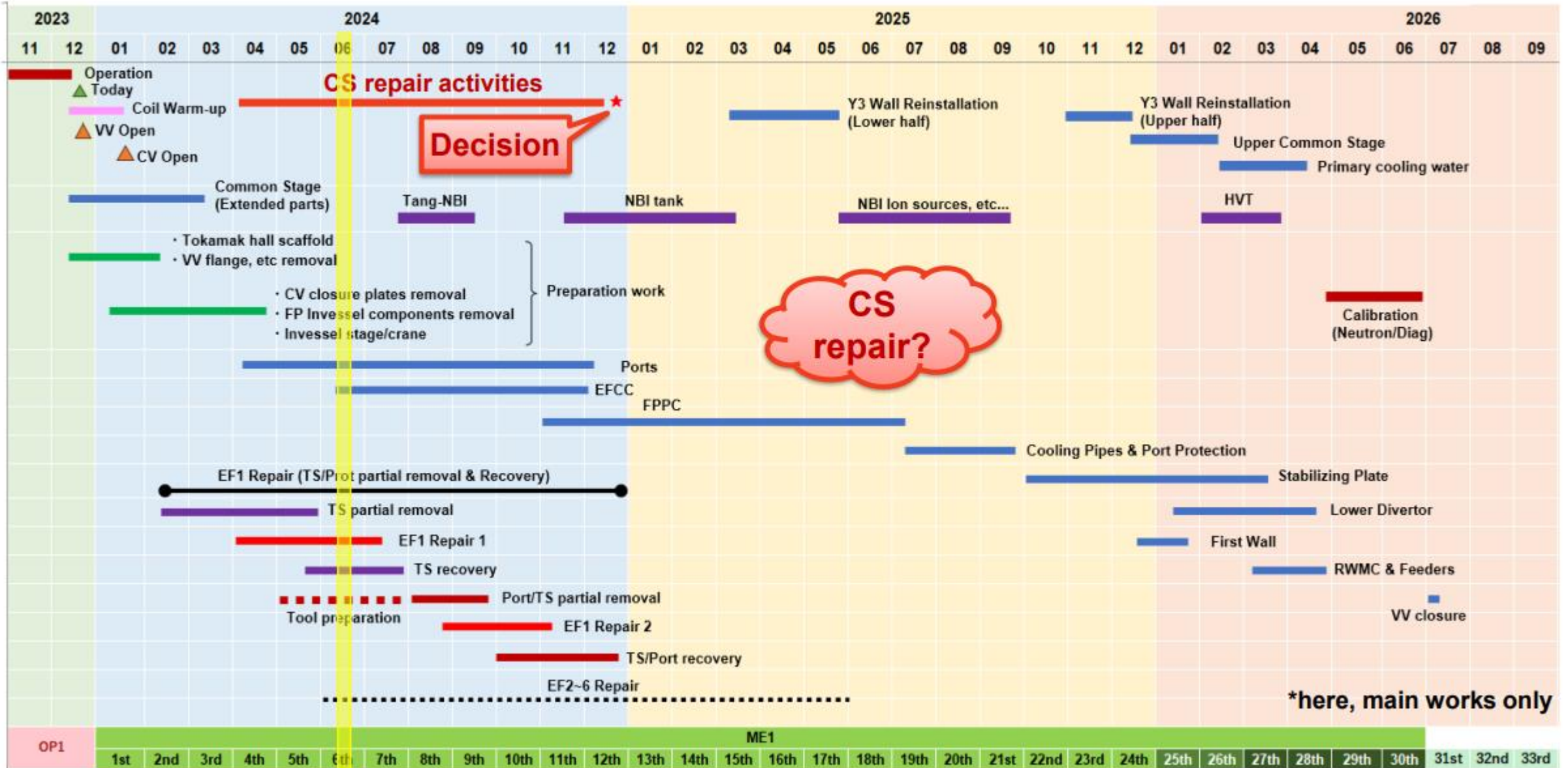
Pellet source procurement is in trouble, other options are proposed.

⇒ Pellet will not be ready in OP2 (no significant impact expected if delay limited to OP2)





JT-60SA expected timeline: ME1 status and plans





JT-60SA expected timeline: caveat

2024

red: Critical path work

- June : **Start of EFCC installation**
- July : **Start of Tang-NB beam line connection**
- November : **Start of upper FPPC on-site winding**
- November : **Start of Perpendicular-NB beam line connection**
- December : **Completion of Port assembly**

2025/2026

- July 2025 : Completion of FPPC
- October 2025 : Start of SP installation
- December, 2025 : Completion of Y3 wall
- January 2026 : Start of Lower divertor
- March 2026 : Completion of SP
- July 2026 : Start of Vacuum evacuation

Not yet reflected: RF trans. lines/ X1&X2 walls/ CS & other EFs

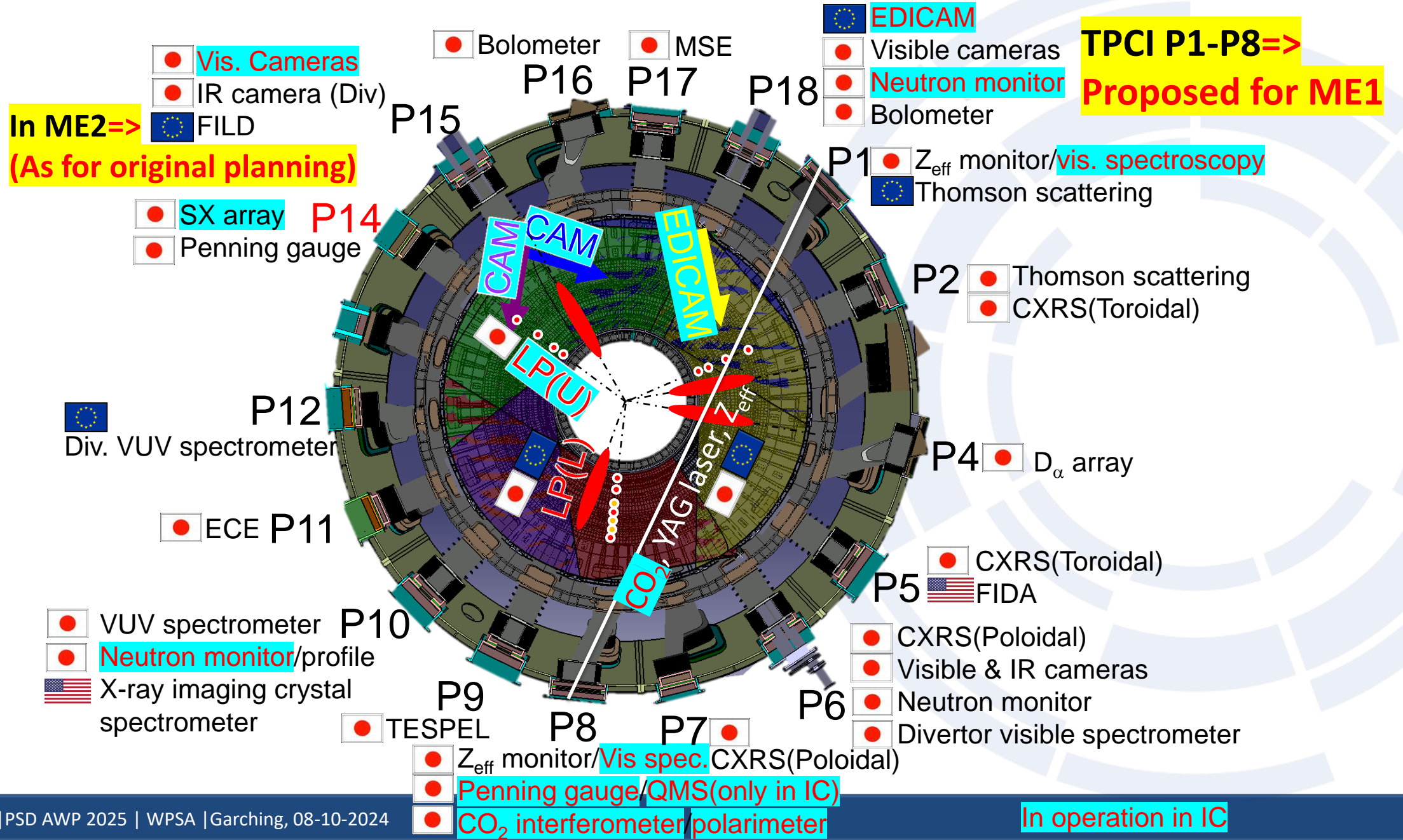
*Detailed schedule in 2nd year is being arranged involving contractors.

*CS repair strategy could affect milestones in 2nd year.

<https://users.jt60sa.org/?uid=2DE69N>



Diagnostics for OP2 (~2026)





Outline

- High level objectives 2025
 - Prepare and assist machine integration of the EU diagnostics (OP, ENH) in 2025/26
 - Prepare commissioning and first operation => “delivering” to the ET (OP) in 2026/2027
 - Prepare and verify a suite of tools and codes for the Scientific Exploitation, including operation-oriented tools, synthetic diagnostics, simulation workflows (CM) (validation with/in TE)
 - support new users in data analysis, leveraging experience gained during commissioning
 - support training for control room tools
 - Develop feasibility, design, assist procurement of new subsystems according with the JT-60SA scientific plan (ENH), in particular EDGE diagnostics
 - Establish a plan for the EU contribution to the transition to W divertor and wall
 - Contribute to JIFS
- Detailed objectives
 - Enhancements
 - Code Management
 - Operation
 - W transition (PCR?)
- Resources
- Missions
- Deliverables and Milestones



2025 Detailed Objectives: Enhancements Area

Enhancement	Objective	Team	Proposed Resources (PMs)	Missions (round trips X total days)
FILD	<ul style="list-style-type: none">Manufacturing and acceptance tests preparationPA signature	CIEMAT-UniSev J. Ayllon-Guerola	12	1 person 1 week to Naka for on-site technical discussions
TPCI	<ul style="list-style-type: none">Manufacturing completion and installation preparationPA signature	EPFL-SPC S. Coda	24	2 persons 1 week to Naka for on-site technical discussions
Doppler Reflectometer	<ul style="list-style-type: none">Completion of design for manufacturingPA preparation and signature	CIEMAT e. de la Luna	24	2 persons 1 week to Naka for on-site technical discussions
Neutron Diagnostics	<ul style="list-style-type: none">Completion of feasibility study and transition to implementation phaseCompletion of preliminary design	VR M. Ceconello	12	1 person 1 week to Naka for on-site technical discussions
Gamma-Ray Spectrometer	<ul style="list-style-type: none">Completion of feasibility study and transition to implementation phaseCompletion of preliminary design	ENEA-UniMilano M. Nocente	12	1 person 1 week to Naka for on-site technical discussions
Neutronics Assessments	<ul style="list-style-type: none">Support F4E on preparation of CAD models for systems to be included in Neutronics Simulations	IPP-LM B. Bieńkowska	4	
EC-Stray detection system	<ul style="list-style-type: none">Support the development of JT-60SA stray sensors	MPG, ENEA	2	



2025 Detailed Objectives: Enhancements Area

Enhancement	Objective	Team	Proposed Resources (PM)	Missions (round trips X total days)
VUV Spectrometer	<ul style="list-style-type: none"> Completion of assembly at lab, acceptance tests and calibration. 	ENEACRFX M. Valisa	3	
Pellet Launching System	<ul style="list-style-type: none"> Support pellet injection system integration and local commissioning 	IPP-MPG P. Lang	30	2x20
EDICAM	<ul style="list-style-type: none"> Additional EDICAMs feasibility study 	EK T. Szepesi	3	
Edge diagnostics and other proposals	<ul style="list-style-type: none"> Feasibility studies of edge diagnostics: <ul style="list-style-type: none"> Low Energy Neutral Particle Analyzer (LENPA) Quartz Micro Balance (QMB) Surface Thermo-Couples (STC) Fiber Bragg Grating IR/Vis cameras SOL current X array (low energy) LIDS/LIBS Divertor Thomson scattering ... 	call	24	



2025 Detailed Objectives: Operations Area

- Installation procedures
- Boundary documents
- Requirements for commissioning in plasma
- Technical assistance

Subsystem operation	Objective	Team	Proposed Resources	Missions (round trips X total days)
Thomson Scattering	<ul style="list-style-type: none">• Reception at Naka site and preparation for installation during 2026• Preparation of the commissioning	ENEA-CRFX R. Pasqualotto, F. D'Isa	3	2x10 (JA) 2x10 (UE)
VUV Spectrometer	<ul style="list-style-type: none">• Delivery to Naka site for installation during 2026• Preparation of the commissioning	ENEA-CRFX M. Valisa, A Belpane (EEG)	1	2x10
Pellet Launching System	<ul style="list-style-type: none">• Preparation of the pellet on-site commissioning	IPP-MPG P. Lang	2	
EDICAM	<ul style="list-style-type: none">• Electronics upgrade to enhance performance	EK-CER T. Szepesi	1	2x10
Divertor cryopumps	<ul style="list-style-type: none">• Assistance to installation	KIT T. Giegerich V. Hauer,	2	2x15
TPCI	<ul style="list-style-type: none">• Preparation of the installation (if in ME1 confirmed)	EPFL S. Coda	2	



2025 Detailed Objectives: Operations Area

Operation-related activity	Objective	Team	Proposed Resources	Missions (round trips X total days)
Cryo-magnets analysis and material/components tests	<ul style="list-style-type: none">Characterization of superconductive strands and conductorsSoftware tools for QVC analysisCold Cathode Gauges tests	CEA, ENEA	14 tbd	3 x 30 days (total)
Real time equilibrium and plasma control	<ul style="list-style-type: none">JT-60SA analysis and modelling tools	ENEA (CREATE)	6	2 x 10 days
Remote participation, data access, IMAS wrapper	<ul style="list-style-type: none">Improvement of remote access (e.g. EDICAM)IMAS interfaces for JT-60SA including training	CEA, ENEA (CREATE), EK-CER	6 tbc	2 x 10 days
H&CD systems: Operational requirements in W	<ul style="list-style-type: none">Evaluation of JT-60SA NBI Operation with Tungsten Wall	MPG	2+ECRH tbc	2 x 20 days
Test and training of operational tools, wall conditioning	<ul style="list-style-type: none">Training on operational tools and report on conditioning and RGA upgrade	CEA, ENEA	2	2 x 30 days



2025 Detailed Objectives: Code Management

General assumption:

- development and verification of tools supported by WPSA (e.g. made available on the EuF gateway)
- Validation (on data) and exploitation supported by WPTE
- **Agreements for installation and use outside EU to be managed (International Collaboration?)**

Operation oriented tools	codes	2025	Proposed resources
Discharge simulator	NICE-METIS + CREATE-NL controllers (implementing JT-60SA specifics) + EGENE Artaud Mattei	Test case and documentation on the closed loop simulator => training to users (ET)	4
Breakdown simulator	BKDO+GRAY for kinetics & EC power absorption + CREATE-BD for magnetics D Ricci M Mattei	=> Apply for analysis OP1, OP2 (ET), transfer to TSVV15 (PDT)	4 tbc=> development Analysis in ET!
Error field workflow	L Pigatto (RFX Padova)	Apply to OP1 (ET/WPTE) and OP-2 preparation	If development completed, => TE?
Energetic particle workflow	ATEP (in IMAS/validated on AUG) Lauber (IPP) + ASCOT (VTT)	=> ET/WPTE when IMAS installed on Naka server	1 (Training)
MHD stability workflow	MHD stability chain (in IMAS by ITM/CD R Coelho)	=> ET/WPTE when IMAS installed on Naka server	1 (Training)
Cryo & magnets modelling	TACTICS THEA STREAM SIMCRYOGENICS Le Coz Nicollet Bonne (CEA)	=> Moved under WPSA Operations Area	-



2025 Detailed Objectives: Code Management

Synthetic diagnostics	codes	2025	Proposed resources
FILD synthetic diagnostics	FILDSIM Manolo G-M+ EEG univ Sevilla	Full diagnostics simulation	2
VUV	ENEA (RFX)		2
TS	ENEA (RFX)		2
Enhancements preparation (W)			
Assessment of SOL and divertor plasma conditions with W wall in high performance scenarios (relevant new scenarios)	SOLEEDGE3D, SOLPS-ITER (ENEA, ?)	Heat load for PFC design	4
PFCs shape optimization	?		4 tbc



Summary of resources

- PMs: 228 tasks incl. 9 area coordination
 - + PL+PSO
 - This is essentially saturating the 2025 indicative resources
- +125 PMs NA 2024:
 - mostly due to
 - delay in new diagnostics development – decision on port allocation;
 - delay in the installation of the already completed systems
 - delay in the definition of operation related topics
- But: new tasks to be activated for the transition to W (see next slides, PCR?)



W transition /1

- Meeting in July, (finally) collection of comments to the document completed <https://indico.euro-fusion.org/event/3203/minutes>
- Collection of related activities in SA, TE, PWIE, DIV
- Perspective of the potential support from the WPs
- Work lines to be developed
 - Scientific priorities for the C phase and for the W phase (mainly input from ET/TE)
 - Modeling
 - Diagnostics development for W monitoring, wall and div protection
 - Upgrade of the heating systems
 - Upgrade of the protection system
 - W preparation experiments in the C phase
 - PFCs test plan

#	Proposed actions	Who	Target date	Status
1	Set parameters of the divertor (shape, etc) open for optimization without unaffordable impact on the procurement (issue brief document)	V.Tomarchio	15 Sept	completed
2	Quantify resources /time needed for divertor optimization	S. Brezinsek	30 Sept	?
3	Propose how to coordinate the activity of modeling (ET, WPSA, TE...)	C. Sozzi, G. Falchetto, J. Garcia, TE TFL	30 Sept	ongoing
4	Draft a workplan	C. Sozzi/D.Douai	30 Oct	ongoing



W transition /2

- Interaction with JT-60SA/TE to be clarified
 - ET organized a meeting with “W” experts from EuF, QST, ITER (transport, sources modelling)
 - Output document not public at this time
 - General approach:
 - develop core transport modeling (ASTRA – STRAHL, ETS, JINTRAC) in the Transport & Confinement” TG (led by Luca Garzotti, UKAEA)
 - Develop SOL, PWIE, Div modelling in the Divertor, Scrape Off Layer and Plasma-Material Interaction TG (led by Tomohide Nakano, QST).
 - Open participation to the technical discussions for the ET members is expected
- Next discussion in EuF
 - WPSA Planning Meeting 4th-6th December (Naples) – agenda being finalized also with interaction from the other “W” WPs
 - Sessions on physics, technology, diagnostics and protection [WPSA PPM 2024 draft agenda](#)



Summary of missions (2024)

Type	Role	Purpose	Quantity	Mission days EU	Total days UE	Travels UE N.	Mission days JA	Total days JA	Travels JA N.	Total costs mission	Second. mm	Total Second mm	Travels Secon. N.	Total costs secondment	Indirect costs	Total resources	Total CC	actual mission days at 6th Oct
Mission	Task holders, ETL, TGL, AC, PL, PSO	WPSA GPM	50	5	250	1		0		67500		0			16875	84375	59,062.50	
Mission	Coordination meeting	Milan	4	4	16	1				4600					1150	5750	4,025.00	
Mission	T-S Operation		3		0		15	45	1	18300		0			4575	22875	16,012.50	
Mission	T-S Operation	D'Isa	1		0		14	14	1	5850		0			1462.5	7312.5	5,118.75	
Mission	VUV (Valisa)		3		0		10	30	1	14550		0			3637.5	18187.5	12,731.25	5
Mission	Conditioning		2		0		15	30	1	12200		0			3050	15250	10,675.00	
Mission	JT-60 tools students (CREATE)	training	2		0		30	60	1	19700		0			4925	24625	17,237.50	
Mission	OP - Tools remote participation De	tommasi	2		0		15	30	1	12200		0			3050	15250	10,675.00	
Mission	TCPI design	EPFL	3		0		11	33	1	15300		0			3825	19125	13,387.50	
Mission	Magnets Operation		2		0		10	20	1	9700		0			2425	12125	8,487.50	
Mission	Cryo Operation		1		0		11	11	1	5100		0			1275	6375	4,462.50	
Mission	Ehnancement meeting		2		0		6	12	1	7700		0			1925	9625	6,737.50	
Mission	OP in Europe (CEA-ENEA)		2	7	14	1				3500		0			875	4375	3,062.50	
Mission	TCM Cadarache		11	7	77	1				19250		0			4812.5	24062.5	16,843.75	
Mission	MHD workflow (CM)	training	5	5	25	1				6750		0			1687.5	8437.5	5,906.25	
Mission	EUROFusion disruption tools (CM)		5	5	25	1				6750		0			1687.5	8437.5	5,906.25	
Mission	discharge simulator (CM)		5	5	25	1				6750		0			1687.5	8437.5	5,906.25	
Mission	Breakdown simulator		2	7	14	1				3500		0			875	4375	3,062.50	
Mission	Cryo (CM)		2	7	14	1				3500		0			875	4375	3,062.50	
Mission	JIFS		10				17	170	1	66000		0			16500	82500	57,750.00	90
Mission	T-S Europe - Enhancement		10	10	100	1				23500		0			5875	29375	20,562.50	41
Mission	PL - EU		1	25	25	5				6750		0			1687.5	8437.5	5,906.25	19
Mission	PL - JA		2				15	30	1	12200		0			3050	15250	10,675.00	
Mission	Expe team coordination		1				18	18	1	6850		0			1712.5	8562.5	5,993.75	
Mission	AC -OP		1				21	21	2	9950		0			2487.5	12437.5	8,706.25	16
Mission	Exp team working sessions		12				17	204	1	79200		0			19800	99000	69,300.00	143
Mission	AC-EN		5	7	35	1				8750		0			2187.5	10937.5	7,656.25	
Mission	AC-EN -Japan		1				15	15	1	3750		0			937.5	4687.5	3,281.25	
Secondment	ETL	secondment	1		0			0	1		12	12	1	78557.44	0	78557.44	78557.44	



Summary of missions (2025)

When (MM/YYYY)	Type	Role	Purpose	Quantity	Mission days		Travels UE N.	Mission days JA	Total days JA	Travels JA N.	Total costs mission	Second. mm	Total Second mm	Travels Sec. N.	Total costs secondment	Indirect costs	Total resources	Total CC	Comment
					EU	Total days UE													
	Mission	task holders, ETL, TGL, AC, PL, PSO	WPSA GPM	40	5	200	1		0		54000		0			13500	67500	47250	
	Mission	ETL, TGL, AC, PL	Research Meeting	10		0		7	70	1	41000		0			10250	51250	35875	partial
	Mission	ETL, TGL, AC, PL	Research Meeting	10		0		7	70	1	41000		0			10250	51250	35875	partial
	Mission	TG member	Exp campaign	10		0		90	900	1	225000		0		0	56250	281250	196875	
	Mission	TS	TS	1		0		90	90	1	22500		0		0	5625	28125	19687.5	
	Mission	VUV	VUV	1		0		90	90	1	22500		0		0	5625	28125	19687.5	
	Mission	JIFS	JIFS	20		0		15	300	1	75000		0			18750	93750	65625	
	Mission	Enhancement JA (detail in "EN table")	FILD, TS, VUV	1		0		215	215	11	53750		0			13437.5	67187.5	47031.25	
	Mission	IC and OP plasma	FILD, TS, VUV, DIV	1		0		578	578	19	146850		0			36712.5	183562.5	128493.75	
	Mission	Modelling		3		0		30	90	1	29550		0			7387.5	36937.5	25856.25	
	Mission	Preparation OP2*		11		0		14	154	1	90200		0			22550	112750	78925	
	Mission	TS (1 person x 2 weeks IPP-CR and UKAEA)		2		0		14	28	1	7000		0			1750	8750	6125	
	Mission	VUV (1 person x 2 weeks (IPPLM and UKAEA)		2		0		14	28	1	7000		0			1750	8750	6125	
	Secondment	TGL	Exp campaign secondment	3		0			0			6	18	1	121361.16	0	121361.16	121361.16	
	Secondment	ETL		1		0						12	12	1	78557.44	0	78557.44	78557.44	
	Mission	Enhancement JA	FILD	1		0		7	7	1	4100		0		0	1025	5125	3587.5	
	Mission	Enhancement JA	TCPI	2		0		7	14	1	8200		0		0	2050	10250	7175	
	Mission	Enhancement JA	Dopp. Refl	2		0		7	14	1	8200		0		0	2050	10250	7175	
	Mission	Enhancement JA	Neutron Diagn.	1		0		7	7	1	4100		0		0	1025	5125	3587.5	
	Mission	Enhancement JA	Gamma Ray	1		0		7	7	1	4100		0		0	1025	5125	3587.5	
	Mission	Enhancement JA	Pellet	2	20	40	1		0	1	8700		0		0	2175	10875	7612.5	
	Mission	Operation	TS	2	10	20	1		0	1	4700		0		0	1175	5875	4112.5	
	Mission	Operation	TS	2		0		10	20	1	9700		0		0	2425	12125	8487.5	
	Mission	Operation	VUV	2		0		10	20	1	9700		0		0	2425	12125	8487.5	
	Mission	Operation	EDICAM	2		0		10	20	1	9700		0		0	2425	12125	8487.5	
	Mission	Operation	Cryopumps	2		0		15	30	1	12200		0		0	3050	15250	10675	
	Mission	Operation	Cryo-magnets	3		0		30	90	1	29550		0		0	7387.5	36937.5	25856.25	
	Mission	Operation	RT	2		0		10	20	1	9700		0		0	2425	12125	8487.5	
	Mission	Operation	REC	2		0		10	20	1	9700		0		0	2425	12125	8487.5	
	Mission	Operation	NBI	2		0		20	40	1	14700		0		0	3675	18375	12862.5	
	Mission	Operation	Conditioning	2		0		30	60	1	19700		0			4925	24625	17237.5	
	Secondment	Enhancement JA	TPCI installation	1								6	6	1	40453.72	0	40453.72	40453.72	
			tot								982100					245525	1467997.32	1099709.82	
			tot transfer								356200					89050	645168.6	511593.6	

- Secondment EPFL is this a PCR?



Milestones and Deliverables (original 2020 planning)

Table 6-1: Grant Agreement Milestones

GA Milestone No.	GA Milestone Title	Due Date [mm/yyyy]
SA.M.01	Participation in the Integrated Commissioning before plasma operations	June 2021 ✓
SA.M.02	Start of the EU-REC project	Apr. 2022 ✓
SA.M.03	Decision on plan and resources of EU enhancements for BA Phase II – 2025-2029	June 2023 ✓
SA.M.04	Call to start EU enhancement programme for 2025-2029	Sept.2023 ✓
SA.M.05	Start of the new EU enhancement projects (TBD)	Nov. 2023 ✓
SA.M.06	Participation to the development of scenario at high plasma current in H-mode**	Dec. 2025* ✗

(*)Milestones dependent on external conditions to which the workpackage is constrained, see Risk Table (WPR-04)

(**) The title is proposed to be modified from the previous “Demonstration of stable operation at 5.5 MA plasma current in H-mode completed (participation)”

- ✓ achieved with some delay
- ✗ not achievable in FP9 -2025
- At risk in extension 2026-27



Milestones and Deliverables (original 2020 planning)

Table 6-2: Grant Agreement Deliverables

GA Deliverable No.	GA Deliverable Title	Due Date [mm/yyyy]
SA.D.01	Appointment of Experiment Leader from EU (after call issued end 2020)	Apr. 2021 ✓
SA.D.02	Report on the first phase of the Integrated Commissioning (before plasma operations). Results and return of experience, mainly for DTT	Dec. 2021 ✓
SA.D.03	Report on the initial organisation of the JT-60SA scientific exploitation	Dec. 2021 ✓
SA.D.04	Documented plan of EU enhancement programme for BA Phase II– 2025-2029	Dec. 2022 ✓
SA.D.05	Delivery and final tests of EU-REC completed	Jun. 2024 ~
SA.D.06	Installation of the EU systems before the OP2 campaign.	Dec. 2024 ~ X
SA.D.07	Report on participation to the OP.2 campaign. Results and return of experience	Dec 2025 X
SA.D.08	Final Report on the Integrated Commissioning (including plasma operations)	Dec. 2023 V
SA.D.10	Delivery of EU procurements (TBD) for the OP3 campaign completed.	Dec. 2025* ~

(*)Deliverables dependent on external conditions to which the workpackage is constrained, see Risk Table (WPR-04)

- ~ on going, with changed scope
- ~ in delay wrt original planning, but in time for the machine timeline, **except PLS**



2024 WPSA milestones

24C. WP MILESTONES

Table 24C-1: Work Package Milestones (annual targets to be achieved) (WP-M) for [2024]

Sequential WP-M ID	Related WBS ID	WP Milestone Title	Due Date [mm/yyyy]	Related GA D/M No.	Criticality of Relation to the GA D/M (high/low)
WPM06	SA.SE.CM	Provide test cases (including documentation) for training to the Experiment Team on simulation tools (at least two among Discharge Simulator, MHD stability workflow, Energetic Particle workflow or other available tools)	12/2024 ~		
WPM07	SA.SE.EN	Launch of the new enhancement projects with selection of the implementing teams, preparation of the projects plan and assignation of resources.	12/2024 V	SA.M.05	high
WPM08	SA.SE.EX	Implementation of the Experiment Team with involvement of the Experiment Team members - pending outcome of the Call for Interest or participation	12/2024 V		





Deliverables and Milestones 2025

- D: Test of the remote participation and analysis tools provided by the JT-60SA IPT with the EuF assistance
- D: Delivery on site of the diagnostics enhancements with their commissioning plan (TS, VUV) and synthetic diagnostics tool
- M: Finalize the design of the Gamma and FILD diagnostics
- M: Implementation of the EuF workplan for the W transition
- D: Perform (in collaboration with ET/TE) the training on: MHD workflow, HEP workflow, Discharge simulator tool.
- => issue: licensing of software outside EuF for BA participants and potentially other external partner (ITER, USA,...)



PCRs (tbc)

#	Description	Justification	resources	comment
PCR_SA_2 5_01	Reserve resources for secondment for diagnostics implementation (TPCI)	Not foreseen, project advanced faster than expected	From unused mission budget 2024, 49 k€	Likely EPFL staff
PCR_SA_2 5_02	Include W transition activity	New activity not foreseen in the previous PMP	Move NA resources 2024 to 2025 (about 125 PMs)	Call required