Exploitation of JT-60SA (WPSA)

Project Board Tokamak Exploitation

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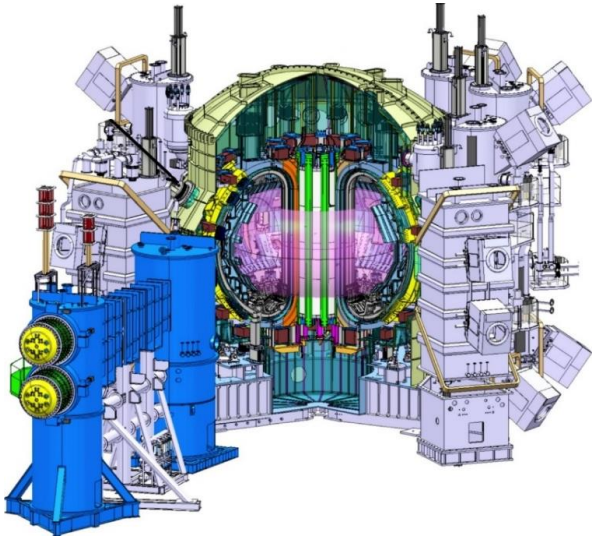
WPSA: Exploitation of JT-60SA – project objectives



High current, large size, high triangularity shape
=> High confinement

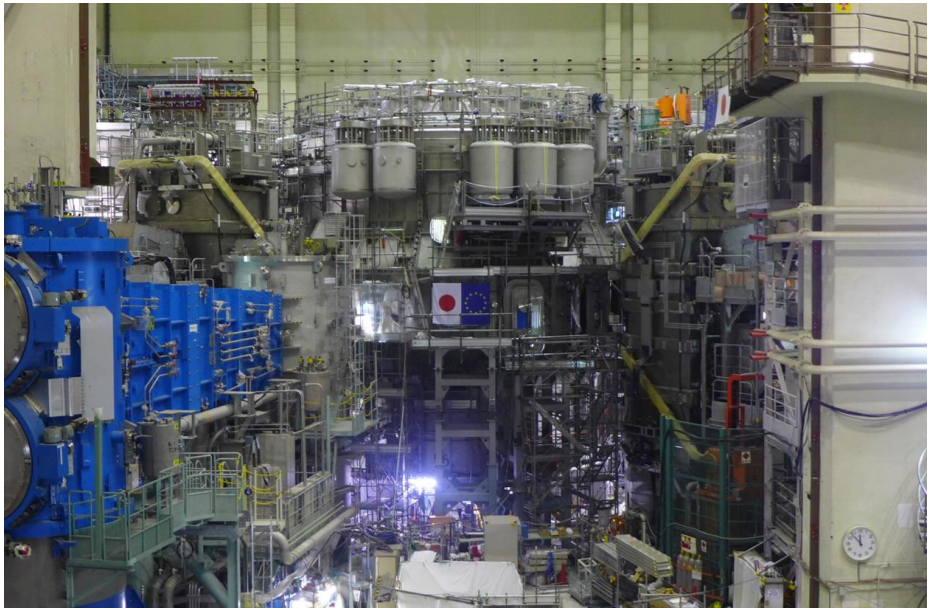
Long pulse=>steady state

High electron heating, High energy Negative NBI
=>energetic particles, ITER and DEMO relevant scenario, plasma controllability

- support of the European exploitation of JT-60SA within the Broader Approach.
- The main objective is to support a high level EU participation in the JT-60SA scientific exploitation, fully integrated in the EU fusion programme.
  - preparing to play an active role in scientific exploitation and campaigns management
  - participation to the machine integrated commissioning and to plasma operations
  - preparing a full and efficient access to data and analysis tools, on site and remotely;
  - contributing to the machine enhancements plan with specific procurements
- Maintaining/developing control room experience in a large superconducting machine in view of EU participation in ITER operation
- Contribution to specific items of the ITER Research Plan
  - Start-up, Wall conditioning (w and w/o EC)
  - Disruption loads, mitigation, detection, triggering, avoidance…
  - H-mode, L-H transition, ELM control, plasma magnetic control, NBI shine-through
  - Topics in diagnostics R&D (high neutron flux resilience, very high temperature, in-situ calibration…)

Outline

- Project status
  - JT-60SA
  - WPSA
- Programme and resources in 2021
  - 2021 objectives and activities
  - Resources allocation
- Recent publications and presentation



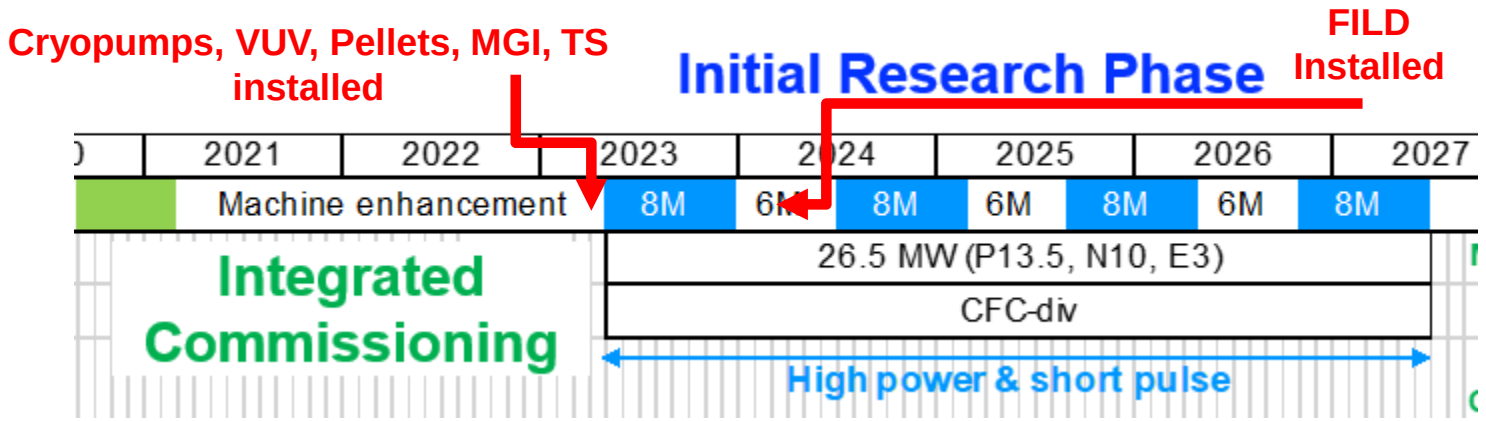
JT-60SA Assembly completed in March 2020

JT-60SA status

- 14 September 2020 Vacuum vessel pump-down started
- 10 October 2020 Magnets cooling down
- Superconducting status reached on 26.11.2020
- Vacuum vessel baking started on 02.12.2020
- Coils energization test started on 13rd January
- 02.03.2021 ECR plasma (toroidal field only) obtained
- 02.03.2021 Toroidal field coils energized with a current of 25.7kA - full design magnetic field of 2.25 T
- 09.03.2021 Operations suspended during the Equilibrium Field Coil n.1 (EF1) energization test, while high voltage (5-7 kV) was applied. The coil current increased rapidly and then interrupted by the PS interlock.
- The cryostat pressure increased from 10^{-3} Pa to 7kPa
- After warm-up of the coils and cryostat venting (30 days) the inspection was possible and melted spots with marks of discharge observed on the outer shell of the terminal joints of the EF1 coil
- From inspection and analysis, the discharge was motivated with insufficient voltage holding capability at the joint of the current feeders.
- The pressure rise of cryostat was caused by the He leakage through the melted spots on the current feeders. No damage in the conductor and in the EF1 coil itself.
- Root cause identified in insufficient voltage holding capability of the insulation of the terminal joints.

Repair and impact on planning

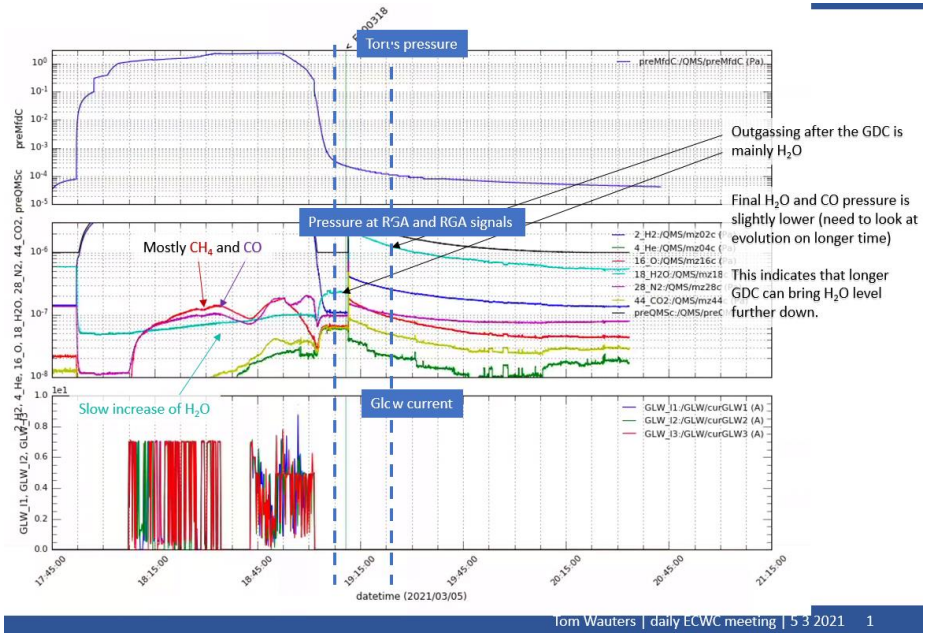
- Repair and improvement of feeders joints needed after the identification (via HV testing) of the problematic location
- Mock-up test of the solution and training of the personnel for correct execution
- Single and global coil test before the closure of the repair
- Cryogenics system operation procedure also revised for improved safety
- Over-current and over-voltage detection improved
- Vacuum pumping and IC restart in February 2022.
- Plasma operation expected in spring-summer 2022
- Planning of the following Machine Enhancement 1 phase not yet available
- At present the schedule of EU enhancements for ME1 is kept (tbc after the incoming TCM)



Participation in the IC

Participation in IC

- Participation in the IC organized (in FP8) in seven topics
  - Wall conditioning (ECWC) and gas analysis
  - Plasma control and equilibrium reconstruction
  - Magnetic diagnostics validation and MHD/Disruption analysis
  - Plasma breakdown (with ECRH)
  - Cryogenic and magnet operation analysis
  - Plasma discharge preparation and development
  - Camera (EDICAM) and image analysis
- Activity performed with good efficiency and good contact with local QST team despite COVID limitations (only 2 IC team members on site)
- After the coil incident, IC work reorganized with the purpose of
  - continuation of the activities which are of high relevance in preparation of the next IC phase
  - saving of the resources to allow both off site and on site significant participation when the IC will resume

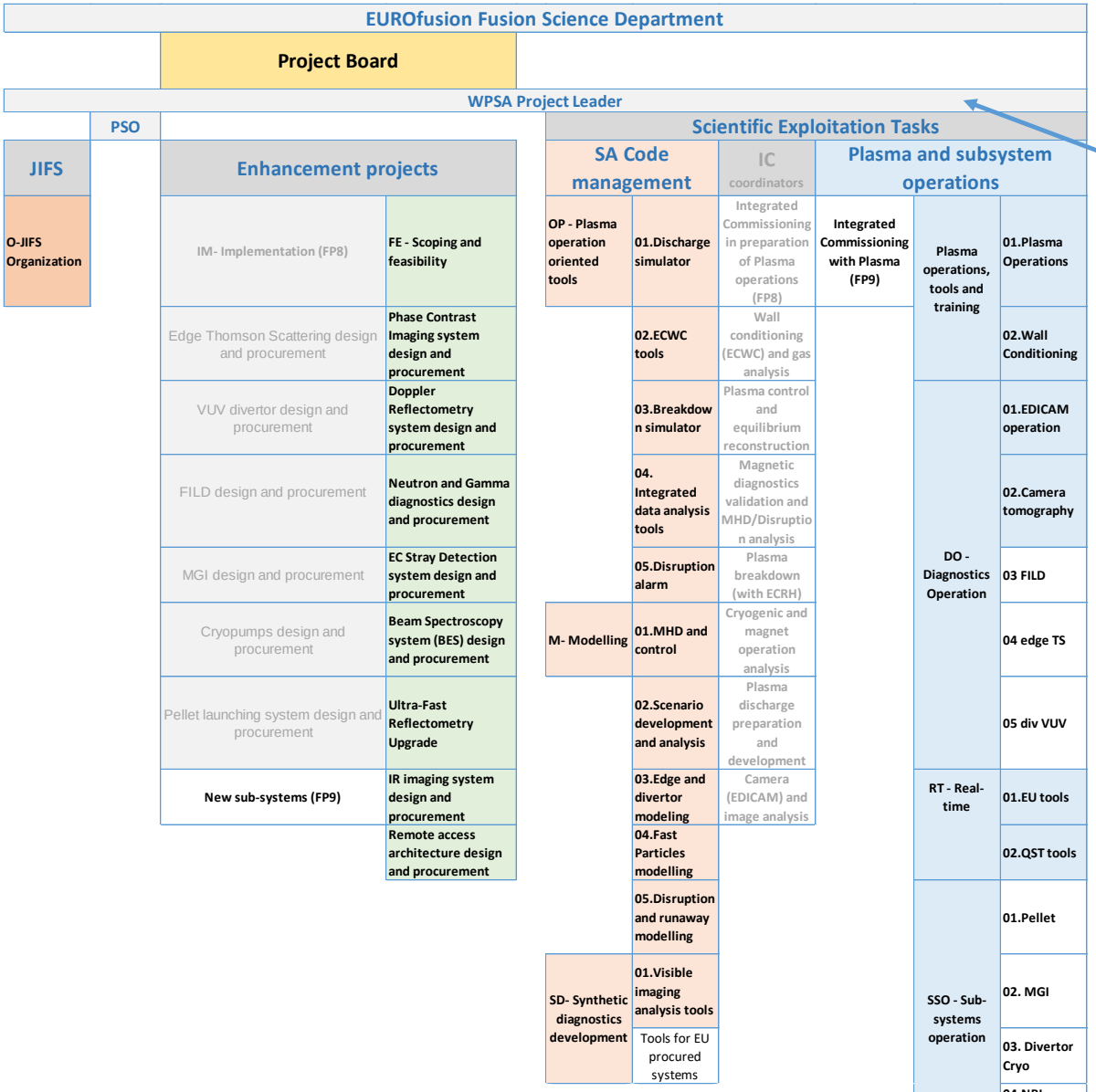


- Cryogenics & magnets
- Magnetics measurements
- Breakdown
- Wall conditioning
- Equilibrium control

WPSA recent news

- 8th WPSA Project Planning Meeting held on 15th-19th March, with wide participation (>100). Great interest in JT-60SA
  - Following the PPM, further interactions for the preparation of the tasks
- JIFS
  - A final version of the JIFS Charter has been elaborated and approved
  - Appointed: School Advisory Board (from EU: P.Barabaschi, P. Bettini, G. De Tommasi, A. Fasoli, M. Garcia-Muñoz, V. Naulin, R. Neu, Directors (G. Giruzzi and Y. Kamada), School Organization Committee
  - Increased visibility and increased interest in JIFS from MEXT and EU commission
  - JT-60SA and JIFS inauguration being linked => 2022
  - JIFS programme and focus in elaboration
  - Website in preparation
- The Phase contrast Imaging diagnostics proposal, initiated within the collaboration between SPC (S.Coda) and NIFS (K.Tanaka) in the framework of WPSA has been awarded by a highly competitive grant by the Japanese Society for the Promotion of Science (JSPS) received by Tanaka-san.
  - Opportunity for co-funding.
  - Scientific discussion being focused for the approval process

WPSA organization and Work Breakdown Structure

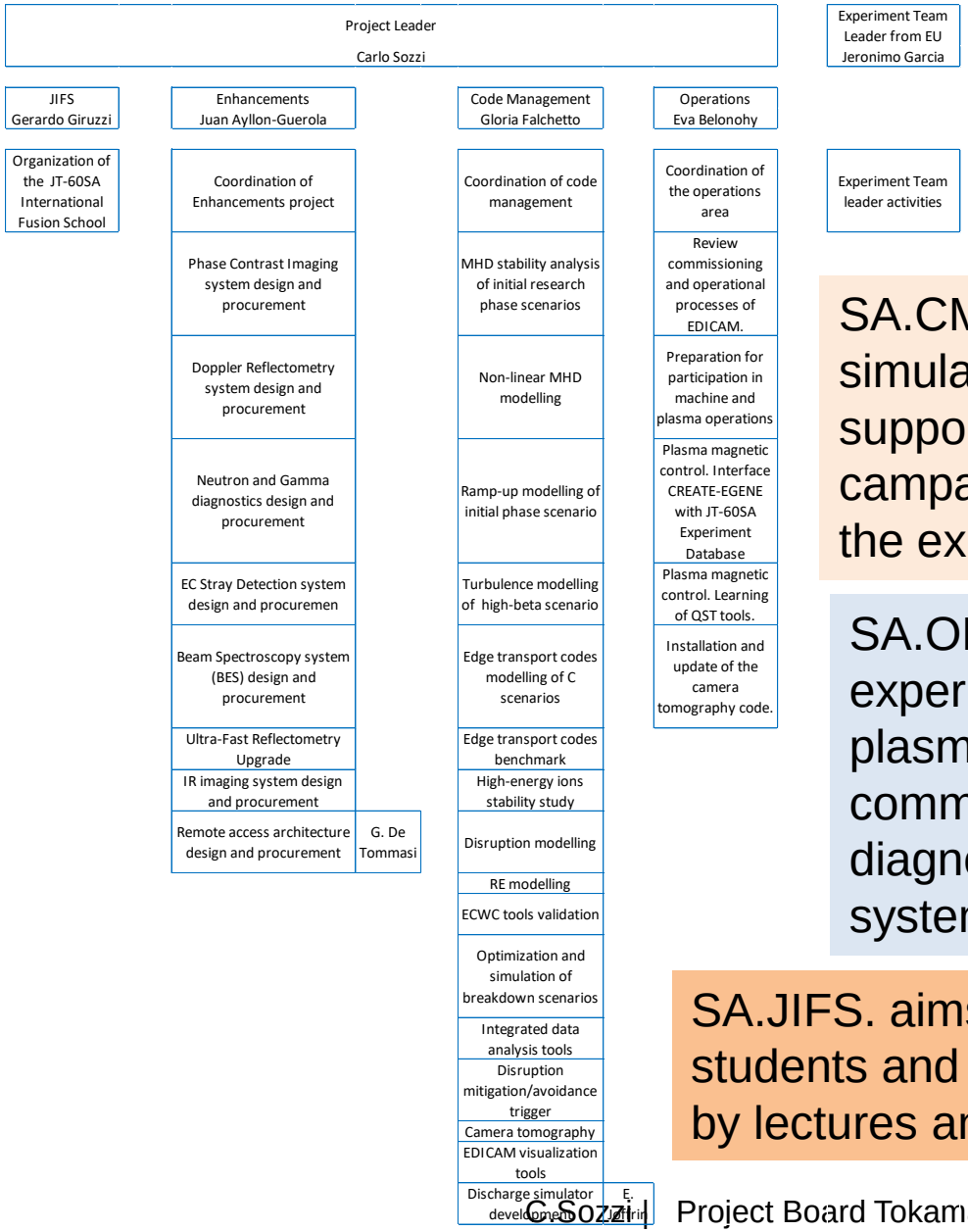


Topical Groups

1. Scenarios
2. Transport
3. Energetic particles
4. MHD
5. PWI and SOL
6. Pedestal

- Hybrid nature of WPSA
  - Runs partially as a project
  - Partially as a campaign
- Mixed Work programme FP8 & FP9 (until 2022)
- Substantial importance of interfaces
- WPDIV, WPPWIE
- WPPrIO, WPTE

Activity (FP9) organized in 4 areas ~ 40 tasks



SA.EN aims to promote scoping and feasibility studies up to the level of conceptual design for new enhancement projects.

SA.CM aims to provide validated selected simulation tools for application to JT-60SA in support to the preparation of the experimental campaigns, the data analysis and interpretation of the experiments.

SA.OP will support the execution of the experimental campaigns providing expertize in plasma operations, vacuum conditioning, plant commissioning and operation such as the diagnostics, of the heating and of the fuelling systems.

SA.JIFS. aims to develop links between Japanese and EU students and young researchers, completing their training by lectures and practical examples and applications.

Management and organization

Level 1	Level 2	Level 3	Task title	Task coordinator	Deliverable title	Deliverable Owner	Beneficiary	PM
IC	PL Commissioning with plasma	01. Integrated commissiong with plasma	Integrated commissioning	Sozzi	Integrated commissioning activities 2021	Sozzi (ENEA)	not allocated	85.89
JIFS	O-JIFS Organization	01. JT-60SA International Fusion School	Organization of the JT-60SA International Fusion School	Giruzzi	School organization	Giruzzi (CEA)	CEA,ENEA, UKAEA	6.50
PM	PM Project Management	01.PL and PSO activities	2021 Project management activies	Sozzi	2021 PL and PSO salaries	Sozzi (ENEA)	ENEA	10.80
PM	PM Project Management	02.Experiment Team Leader	Experiment Team leader activities	Garcia	Experiment team leader salaries 2021	Garcia (CEA)	CEA	3
SE.EX	**EXC-Experimental campaign**	**01.Participation to research topics**	Participation to topical groups	Garcia	Contribution to the preparation of the experimental campaign	Garcia (CEA)	not allocated	6.90

IC not allocated motivated by the shifting of the activity in 2022
SE.EX not allocated waiting for Topical Group Leaders nomination

Enhancements 1

Level 1	Level 2	Level 3	Task title	Task coordinator	Deliverable title	Deliverable Owner	Beneficiary	PM	Acceptance criteria
EN	AC- Area Coordination	01.Area Coordinator	Coordination of Enhancements project	Ayllon	Report on the coordination of SA.EN	J. Ayllon-Guerola (CIEMAT)	CIEMAT	3	Report on the coordination of SA.EN
EN	FE - Scoping and feasibility	01.Phase Contrast Imaging (PCI) system design and procurement	Phase Contrast Imaging system design and procurement	Ayllon	Report/publication on PCI system final design	S. Coda (EPFL)	EPFL	2.4	Design Basis Documentation in IDM Configuration Model in IDM
EN	FE - Scoping and feasibility	02.Doppler Reflectometry (DR) system design and procurement	Doppler Reflectometry system design and procurement	Ayllon	Report/publication on final feasibility study of DR	D. Carralero (CIEMAT)	CIEMAT	1	Report on final feasibility study of DR
EN	FE - Scoping and feasibility	03.Neutron and Gamma diagnostics design and procurement	Neutron and Gamma diagnostics design and procurement	Ayllon	Report/publication on final feasibility study for Gamma diagnostics	M. Nocente (ENEA-UNIBicocca)	ENEA (UNI BICOCCA, ISTP), CCFE	4	Report on final feasibility study for Gamma diagnostics
EN	FE - Scoping and feasibility	03.Neutron and Gamma diagnostics design and procurement	Neutron and Gamma diagnostics design and procurement	Ayllon	Report/publication on final feasibility study for Neutronics diagnostics	M. Angelone (ENEA)	ENEA	2	Report on final feasibility study for Neutronics diagnostics
EN	FE - Scoping and feasibility	03.Neutron and Gamma diagnostics design and procurement	Neutron and Gamma diagnostics design and procurement	Ayllon	Report/publication on final feasibility study for Neutron diagnostics_IPPL M	E. Laszynska (IPPLM)	IPPLM	2	Report on final feasibility study for Neutron diagnostics
EN	FE - Scoping and feasibility	03.Neutron and Gamma diagnostics design and procurement	Neutron and Gamma diagnostics design and procurement	Ayllon	Report/publication on final feasibility study for Neutron diagnostics_VR	M. Cecconello(VR)	VR	3	Report on final feasibility study for Neutron diagnostics

Enhancements 2

Level 1	Level 2	Level 3	Task title	Task coordinator	Deliverable title	Deliverable Owner	Beneficiary	PM	Acceptance criteria
EN	FE - Scoping and feasibility	04.EC Stray Detection system design and procurement	EC Stray Detection system design and procurement	Ayllon	Report/publication on final feasibility study for EC Stray Detection system	A. Moro (ENEA-CNR)	ENEA	3	Report on final feasibility study for EC Stray Detection system
EN	FE - Scoping and feasibility	05.Beam Spectroscopy system (BES) design and procurement	Beam Spectroscopy system (BES) design and procurement	Ayllon	Report/publication on BES upgraded proposal including conceptual design	D. Dunai (EK)	EK	4.5	Report on BES upgraded proposal including conceptual design
EN	FE - Scoping and feasibility	06.Ultra-Fast Reflectometry Upgrade	Ultra-Fast Reflectometry Upgrade	Ayllon	Report/publication on FR scoping and practical implementation studies	F. Clairet (CEA)	CEA	1	Report on FR scoping and practical implementation studies
EN	FE - Scoping and feasibility	07.IR imaging system design and procurement	IR imaging system design and procurement	Ayllon	Report/publication on IR imaging system scoping and practical implementation studies	X. Curtois (CEA)	CEA	1	Report on IR imaging system scoping and practical implementation studies
EN	REC - Remote experiment systems and tools	01.Remote access architecture	Remote access architecture design and procurement	De Tommasi	Report/publication on conceptual design for the JT-60SA remote access architecture	G. De Tommasi (ENEA-CREATE)	ENEA, CEA, MPG	6	Report on conceptual design for the JT-60SA remote access architecture

Operations

Level 1	Level 2	Level 3	Task title	Task coordinator	Deliverable title	Deliverable Owner	Beneficiary	PM	Acceptance criteria
SE.OP	AC - Area Coordination	01.Area Coordinator	Coordination of the operations area	E. Belonohy	Report on the activities related to Operations Area	E. Belonohy (UKAEA-CCFE)	UKAEA	3	Report delivered
SE.OP	PO - Plasma Operations	01.Plasma Operations	Preparation for participation in machine and plasma operations	E. Belonohy	Report on the activities related to plasma operations	E. Belonohy (UKAEA-CCFE)	UKAEA, ENEA, CEA	4	Workshop or meeting series on JT-60SA and report delivered
SE.OP	RT - Real-time	01.CREATE tools	Plasma magnetic control. Interface CREATE-EGENE with JT-60SA Experiment Database	G. de Tommasi	Report on the progress of the CREATE tools	G. De Tommasi (ENEA-CREATE)	ENEA	1	Interface completed and report delivered
SE.OP	RT - Real-time	02.QST tools	Plasma magnetic control. Learning of QST tools.	G. de Tommasi	Report on progress in the MECS training	G. De Tommasi (ENEA-CREATE)	ENEA	1	MECS training organised with QST and report delivered
SE.OP	DO - Diagnostics Operation	01.EDICAM operation	Review commissioning and operational processes of EDICAM.	T. Szepesi	Report on the status of the EDICAM operational process planned for the next operational phase	T. Szepesi (EK)	EK	1	Report delivered
SE.OP	DO - Diagnostics Operation	02.Camera tomography	Installation and update of the camera tomography code.	J. Cavalier	Report on the installation of the camera tomography code on the Naka-server	J. Cavalier (IPP-CR)	IPP-CR	1	Camera tomography tool installed and report delivered
SE.OP	TBD-OP Budget	01. Budget to be defined	Budget not allocated	Falchetto	OP residual budget 2021	Belonohy (UKAEA)	not allocated	18.07	____

Code Management 1 – Plasma op. tools

Level 1	Level 2	Level 3	Task title	Task coordinator	Deliverable title	Deliverable Owner	Beneficiary	PM	Acceptance criteria
SE.CM	AC - Area coordination	01. Area coordinator	Coordination of code management	Falchetto	Report on the coordination of SA.CM	Falchetto (CEA)	CEA	3.6	
SE.CM	OP - Plasma operation oriented tools	01.Discharge simulator	Discharge simulator development	Joffrin	Light coupling simulator delployed on the Gateway including documentation for users.	Joffrin (CEA)	CEA	5	Report /publication
SE.CM	OP - Plasma operation oriented tools	01.Discharge simulator	Discharge simulator development	Joffrin	Report on the convergence of CREATE-NL-METIS strong coupling alogrithm.	M Mattei(ENEA -CREATE)	ENEA	4	Report /publication
SE.CM	OP - Plasma operation oriented tools	02.ECWC tools	ECWC tools validation	Falchetto	Preliminary report on the validation of TOMATOR-1D code on the first data from JT-60SA Integrated Commissioning	Tom Wauters (LPP-ERM-KMS)	LPP-ERM-KMS	3	Report /publication
SE.CM	OP - Plasma operation oriented tools	03.Breakdown simulator	Optimization and simulation of breakdown scenarios	Falchetto	Documentation on runs on JT60-SA breakdown using strongly coupled breakdown simulations.	Daria Ricci (ENEA-CNR)	ENEA	3	Demo
SE.CM	OP - Plasma operation oriented tools	04. Integrated data analysis tools	Integrated data analysis tools	Falchetto	Documentation on IDAV requirements and specification for JT-60SA	Rainer Fischer (IPP-Garching)	MPG	2	Report
SE.CM	OP - Plasma operation oriented tools	05.Disruption alarm	Disruption mitigation/avoidance trigger	Falchetto	Proposal for building disruption mitigation/avoidance trigger starting from scratch.	Jesus Vega (CIEMAT)	CIEMAT, NCSRD, ENEA, IAP	5	Report

Code Management 2 - Modelling

Level 1	Level 2	Level 3	Task title	Task coordinator	Deliverable title	Deliverable Owner	Beneficiary	PM	Acceptance criteria
SE.CM	M- Modelling	01.MHD and control	MHD stability analysis of initial research pahse scenarios	Falchetto	Report/publication on beta scan stability of scenario 4 with respect to pressure gradient driven internal modes.	Coelho (IST)	IST	1	Demo
SE.CM	M- Modelling	01.MHD and control	MHD stability analysis of initial research pahse scenarios	Falchetto	Report/publication on the kinetic stability of scenario 5 including passive stabilization of RWM.	Pigatto (ENEA-RFX)	ENEA(RFX)	2	Report / publication
SE.CM	M- Modelling	01.MHD and control	Non-linear MHD modelling	Falchetto	Report/publication on pellet triggered ELMS modelling with JOREK	Futatani (CIEMAT)	CIEMAT	1	Report /publication
SE.CM	M- Modelling	02.Scenario development and analysis	Ramp-up modelling of initial phase scenario	Garzotti	Report/publication on the validation of the HCD schemes for ECRH in the transport codes	Garzotti (CCFE)	CCFE, CEA,VR	8	Report / publication
SE.CM	M- Modelling	02.Scenario development and analysis	Turbulence modelling of high-beta scenario	Falchetto	Non-linear simulation with the GENE code of a representative, high-beta JT-60SA plasma scenario, post-processed through a synthetic diagnostic for PCI	Iantchenko (EPFL)	EPFL	1	Report /publication
SE.CM	M- Modelling	03.Edge and divertor modeling	Edge transport codes modelling of C scenarios	Falchetto	Preliminary report on the modelling of initial phase scenarios with edge/SOL transport codes	G Falchetto(CEA)	CEA	2	Report /publication
SE.CM	M- Modelling	03.Edge and divertor modeling	Edge transport modelling of C scenarios	Falchetto	Preliminary report on the modelling of C wall Scenario 2 with SOLPS-ITER with Ar seeding.	Piotr Chmielewski (IPPLM)	IPPLM	6	Report / publication
SE.CM	M- Modelling	03.Edge and divertor modeling	Edge transport codes benchmark	Falchetto	Report/publication on the benchmark of SOLPS_ITER to SONIC.	G Rubino (ENEA, Tuscia)	ENEA,MPG	3	Report /publication
SE.CM	M- Modelling	04.Fast Particles modelling	High-energy ions stability study	Falchetto	Assessment of the stability of high-energy ions in the ramp-up of the initial phase scenarios via the energetic particle workflow(s).	Ph Lauber (IPP-Garching)	MPG	2	Report /publication
SE.CM	M- Modelling	04.Fast Particles modelling	High-energy ions stability study	Falchetto	Report on MHD stability of scenario 4 mediated by NBI energetic particles	R Coelho (IST)	IST	1	
SE.CM	M- Modelling	05.Disruption and runaway modelling	Disruption modelling	Falchetto	Preliminary report on the validation of disruption modelling tools (CarMa0NL-CARIDDI) on first JT-60SA mechanical data	Villone (CREATE)	ENEA(CREATE)	2	Report /publication
SE.CM	M- Modelling	05.Disruption and runaway modelling	RE modelling	Falchetto	Report on the simulations of the depth profiles of the energy deposited by Runaway electrons in JT-60SA Plasma Facing Components.	J Caloud (IPP.CR)	IPP.CR	0.6	Report /publication

Code Management 3 – synthetic diagnostics

Level 1	Level 2	Level 3	Task title	Task coordinator	Deliverable title	Deliverable Owner	Beneficiary	PM	Acceptance criteria
SE.CM	SD- Synthetic diagnostics development	01.Visible imaging analysis tools	Camera tomography	Falchetto	Release of the validated (on TCV /Compass) camera tomography tool for JT-60SA, calibrated to EDICAM.	Cavalier (IPP.CR)	IPP.CR	3	Tools available
SE.CM	SD- Synthetic diagnostics development	01.Visible imaging analysis tools	EDICAM visualization tools	Falchetto	Release of the EDICAM Data Visualization Software (EDVIS, FLAP) adapted to JT-60SA	Szepesi (EK)	EK	10	Tools available

Summary of resources allocated for 2021

Beneficiary Id	PM @ 0%	PM @ 50%	PM @ 70%	Total PM	Total PM Cost [k€]	Costs Eq./OGS @ 40% [k€]	Total Eq./OGS Costs [k€]	Total Missions Cost [k€]	Total Indirect Costs [k€]	Total Resources [k€]	Total Cons. Contr. [k€]	Total Commission Contr. [k€]
LPP-ERM-KMS	0	3	0	3	22.775	0	0	0	5.69375	28.46875	14.234375	15.657813
IPP.CR	0	4.6	0	4.6	13.72333333	0	0	0	3.43083333	17.154167	8.577084	9.434792
CEA	0	23.6	3	26.6	200.6083333	0	0	0	50.15208333	250.760417	131.036461	137.918233
MPG	0	7	0	7	49.7	0	0	0	12.425	62.125	31.0625	34.16875
NCSRD	0	2	0	2	7.533333333	0	0	0	1.88333333	9.416667	4.708334	5.179167
EK-CER	0	15.5	0	15.5	37.45833333	0	0	0	9.36458333	46.822916	23.411459	25.752604
ENEA	0	28	10.8	38.8	216.9566667	9	9	0	56.48916667	282.445834	155.195424	155.345213
IPPLM	5	8	0	13	38.45833333	0	0	0	9.61458333	48.072916	14.791667	26.440104
CIEMAT	0	6	0	6	28.2	0	0	0	7.05	35.25	17.625	19.3875
VR	0	6	0	6	39.3	0	0	0	9.825	49.125	24.5625	27.01875
EPFL	0	3.4	0	3.4	33.94333333	0	0	0	8.48583333	42.429167	21.214584	23.336042
UKAEA	0	8.5	0	8.5	51.85	0	0	0	12.9625	64.8125	32.40625	35.646875
IST	0	2	0	2	8.25	0	0	0	2.0625	10.3125	5.15625	5.671876
IAP	0	1	0	1	4.833333333	0	0	0	1.20833333	6.041667	3.020834	3.322917
Not Allocated	0	110.9	10.85	121.75	760.9375	0	0	393.6	288.634375	1443.171875	836.939064	793.744532
	5.00	229.50	24.65	259.15	1,514.527	9.000	9.000	393.600	479.282	2,396.409	1,323.942	1,318.025

Revision of Grant Deliverables and Milestones

ID	Deliverables Table	Date
SA.D.01	Appointment of EU Deputy Experiment Leader (after call issued end 2020)	Apr. 2021
SA.D.02	Final report on Integrated Commissioning. Results and return of experience, mainly for DTT	Dec. 2021
SA.D.03	Report on organisation of the JT-60SA scientific exploitation	Dec. 2021
SA.D.04	Documented plan of EU enhancement programme for BA Phase II– 2025-2029	May 2022
SA.D.05	Delivery and final tests of EU-REC completed	Jan. 2023
SA.D.06	Commissioning and calibration of the EU systems before the 2023 campaign completed.	Mar. 2023
SA.D.07	Final report on the 2023 campaign. Results and return of experience	Mar. 2024
SA.D.08	Commissioning and calibration of the FILD system before 2024 campaign completed.	Jun. 2024
SA.D.09	Final report on the 2024 campaign. Results and return of experience	Mar. 2025
SA.D.10	Delivery of EU procurements (TBD) for the campaign 2026 completed.	Dec. 2025

- Accounting for delay of 6-12 months in the experimental campaigns
- Titles adjusted to make them more independent from "external" events such machine availability, reliability and performance.

Presently in the CWP

ID	Deliverables Table	Date
SA.D.01	Appointment of Experiment Leader from EU (after call issued end 2020)	Apr. 2021 √
SA.D.02	Final report on Integrated Commissioning. Results and return of experience, mainly for DTT	Dec. 2022
SA.D.03	Report and plan on 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. 2023
SA.D.06	EU systems enhancements ready before the first JT60-SA campaign	Jun. 2023
SA.D.07	Report on the first JT60-SA campaign. Results and return of experience	Dec. 2024
SA.D.08	FILD system ready before second JT60-SA campaign	Jun. 2024
SA.D.09	Report on the second JT60-SA campaign. Results and return of experience	Dec. 2025
SA.D.10	Delivery of EU procurements (TBD) for the third JT-60SA campaign completed.	Dec. 2025

	Milestones Table	Date
SA.M.01	Participation in the Integrated Commissioning to first 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 2022
SA.M.04	Call to start EU enhancement programme for 2025-2029	Oct. 2022
SA.M.05	Start of the new EU enhancement projects (TBD)	Jan. 2023
SA.M.06	Demonstration of stable operation at 5.5 MA plasma current in H-mode completed (participation)	Dec. 2023
SA.M.07	Demonstration of non-inductive scenario at $\beta_N \geq 3$ completed (participation)	Dec. 2024

Proposal after machine delay

	Milestones Table	Date
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	Mar. 2023
SA.M.04	Call to start EU enhancement programme for 2025-2029	Jun. 2023
SA.M.05	Start of the new EU enhancement projects (TBD)	Oct. 2023
SA.M.06	Contribution to the demonstration of stable operation at high plasma current in H-mode	Dec. 2024
SA.M.07	Contribution to the demonstration of non-inductive scenario at high β	Dec. 2025

Presentations at recent (upcoming) conferences

- **M. Yoshida et al., Plasma physics and control studies in JT-60SA for ITER scenario development and risk mitigation, EPS 2021 (invited)**
- P. Lang et al., Pellet actuator development step-by-step: from AUG to JT-60SA and EU-DEMO, EPS 2021
- L. Carraro et al., Simulation of the VUV spectral emission from the JT-60SA divertor, EPS 2021
- Ph. Lauber et al., Energetic Particle dynamics induced by off-axis neutral beam injection on ASDEX Upgrade, JT-60SA and ITER, IAEA 2020
- S. Coda et al., A phase-contrast-imaging core fluctuation diagnostic and first-principles turbulence modeling for JT-60SA, IAEA 2020
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