WPSA Operations Area - 2022 plans

WPSA General Meeting, 4-6 May 2022

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WPSA Operations Area Goals

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.

Primary goals in 2022:

1 - Ensure successful execution of the first **integrated commissioning** activities in 2022-23.
Capture and share the commissioning and operations experience.

2 - Start the preparation of the **commissioning of EU enhancement projects** reviewing their needs, and connection to protection systems.

3 - Start building a team of EUROfusion experts to **support the operational activities of future campaigns**.

Relevant EUROfusion wiki pages:

- FP9 WPSA Operations Area
- FP9 Integrated commissioning information (2022-23)
- FP8 Integrated commissioning information (2019-21)

Integrated commissioning activities in 2020-21

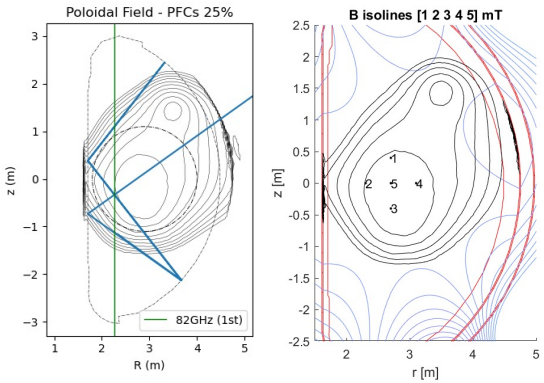
Integrated commissioning - IC (December 2020 – March 2021)

Close collaboration with QST and F4E on 7 IC topics

1. *Cryo and magnet system:* supported coil cool down, energization and repair plan.
2. *EDICAM:* commissioned the camera remotely. Ready for first plasma.
3. *Scenario development:* shared first IC experience of MAST-U and WEST. Discussed plasma operation plan.
4. *Equilibrium control:* prepared CREATE tools for JT-60SA. First steps to learn MECS.
5. *Plasma Breakdown:* simulated JT-60SA plasma breakdown incl. at various coil currents.
6. *Magnetics, MHD, disruptions:* Supported calibration of magnetics. Prepared tools for a disruption database.
7. *Wall conditioning:* direct input into GDC commissioning, ECWC simulation parameter scans.

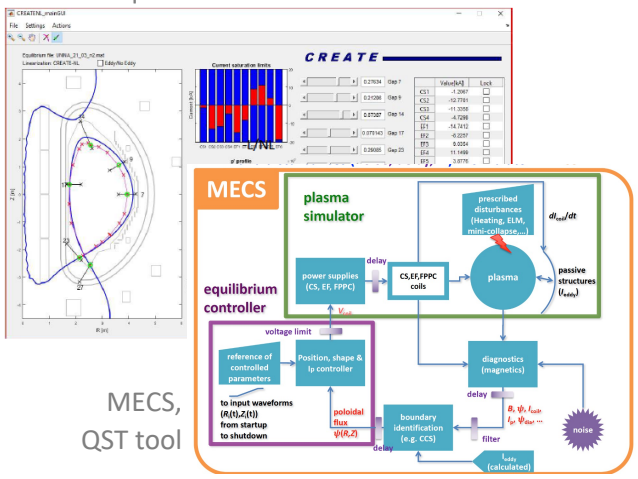
Magnets: A. Louizguiti with the QST team and S. Davis

Scenario development: M. Iafrati in the Naka control room

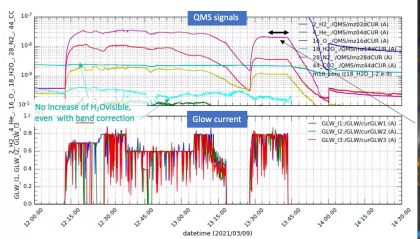


Plasma breakdown with 25% PF coils

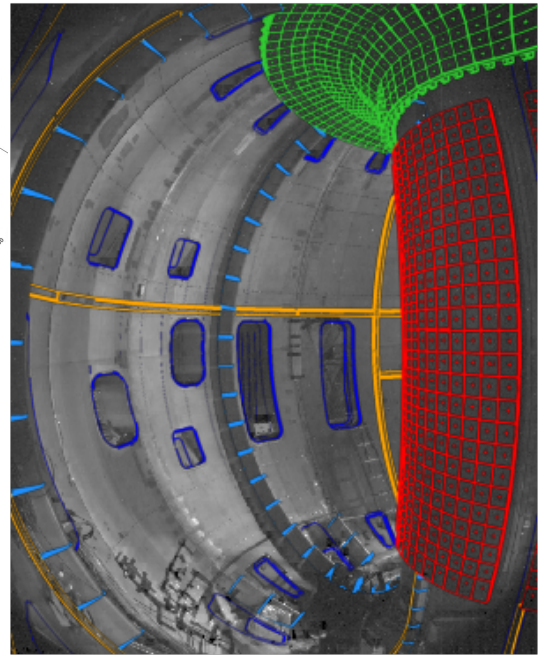
CREATE equilibrium control tools



MECS, QST tool



Glow Discharge Cleaning (GDC) commissioning and ECWC preparations with simulations



First EDICAM photo with the camera tomography calibration

Continue strong support of the integrated commissioning activities in 2022-23

2022 activities to support integrated commissioning:

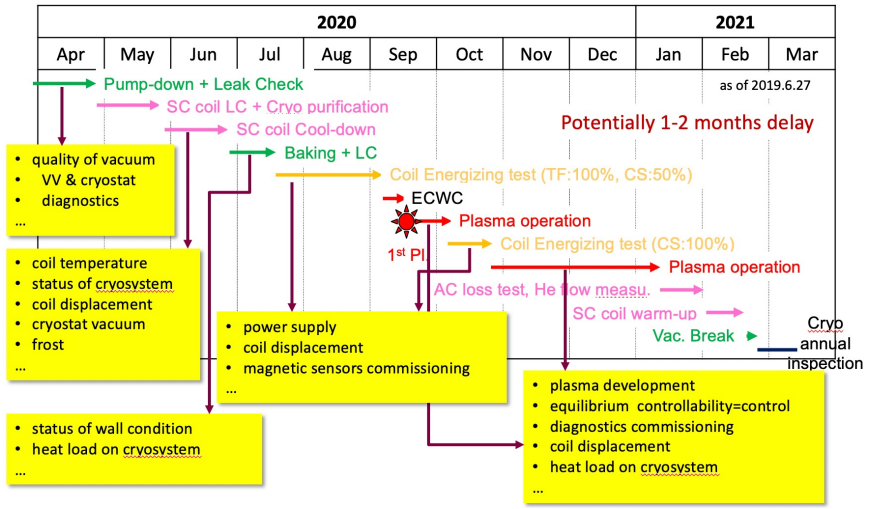
1. Continue strong support of QST in the integrated commissioning ensuring its success through visits to the Naka site and remotely from Europe
2. Ensure participation of the European team with suitable (remote) data and computer connection and tools.
3. Capture and share commissioning and operational experience.
4. Analyze IC and make recommendations in view of the future campaigns.
5. Involve the Experiment Team Leaders and Topical Group Leaders in IC.

Thursday, 5th May 2022 session 1 – 9.45 CET
Diagnostic available in IC 2022-23

Friday, 6th May 2022 session 1 – 9 CET
IC preparation, control room support and remote participation tools

Friday, 6th May 2022 session 2 – 10.40 CET
IC related physics studies

Waiting for updated IC plan for 2022

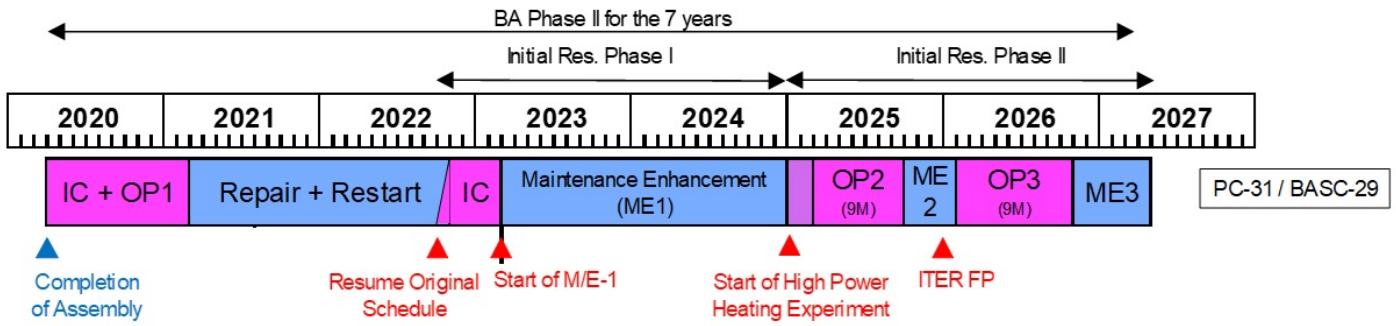


FP9 WPSA Operations (E. Belonohy)
Plasma Operations (incl. vacuum conditioning and breakdown)
Equilibrium control
Magnetics and the disruptions database
Cryo and Magnets
EDICAM operation
Camera tomography implementation

FP9 WPSA Code Management (G. Falchetto)
ECWC simulations
EDICAM software tools
Camera tomography software tool
Breakdown simulations
Disruption modelling

FP9 WPSA Enhancements (J. Ayllon)
Remote access architecture (incl. data and computer access in IC)

Support commissioning of the EU enhancements projects



- Kick-off meeting with EU enhancement projects in 2021, started discussion on commissioning requirements, connection to protection systems, future operation of the enhancements.
- Consider best practices for documentation to support commissioning (develop commissioning procedure, knowledge maps)

2022 activities to prepare commissioning of EU enhancements:

1. Preparation of the divertor cryopump commissioning
2. Inspection of the Massive Gas Injection system upon arrival to the Naka-site

EUROfusion Operations Network:

- Monthly NBI seminars including the QST NBI team starting in May 2022

FP9 WPSA Operations (E. Belonohy)
Fast Ion Loss Detector (FILD)
Thomson Scattering (TS)
VUV Spectrometer (VUV)
Pellet injection
Massive Gas Injection (MGI)
Divertor Cryopump System
Neutral Beam Injection (NBI) (QST enhancement)

FP8 and FP9 WPSA Enhancements (J. Ayllon)

F4E Enhancements (G. Phillips)

Thursday, 5th May 2022 session 2

Previous commissioning experiences, expected working conditions and policies, documentation

Operational support of future campaigns

2022 activities for control room roles and support

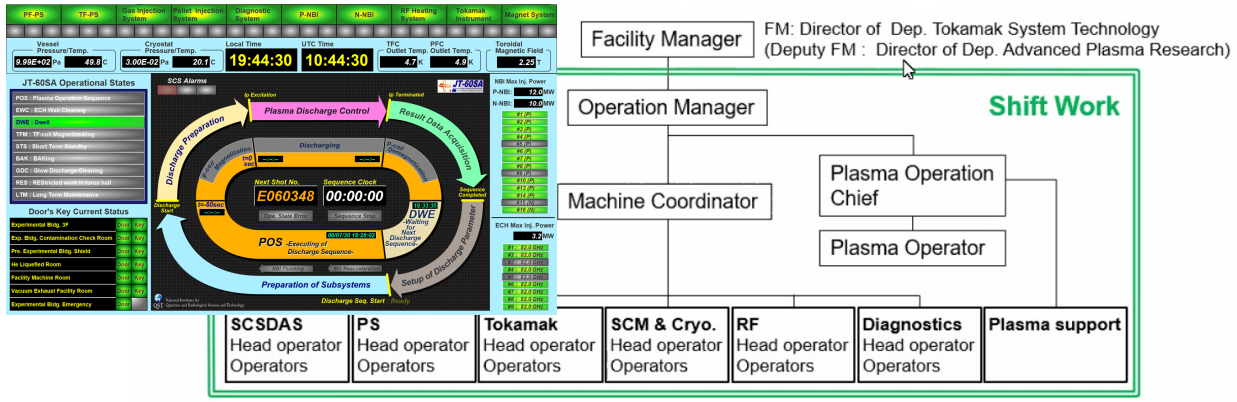
- Support QST and F4E during IC and test/improve European access to the control room work (tools, intranet, policies).
- Start building a real-time expert group by reviewing the scientific real-time networks available in European devices.
- Support the preparation of the Experiment Team.

Friday, 6th May 2022 morning IC session 1

IC preparation, control room support and remote participation tools

FP9 WPSA Operations (E. Belonohy)

Real-time networks



JT-60SA control room

Capture and share the operations experience

Publications

- Integrated commissioning is QST responsibility
- Encourage publications in collaboration with QST and F4E on the commissioning and operational experience, strategy and lessons learned during IC
- PPCF Special Issue on Operations (QST special editor: Y. Kamada) (dedicated operations papers, published once accepted)

EUROfusion Operations Network

Established in 2021, EON is a network of 18 experts across 9 associations to:

- facilitate stronger connection between the operational groups of EUROfusion facilities to share operational experience, improve operational reliability and performance,
- support development and training of operators, creation of a joint knowledge base
- contribute to the EUROfusion preparation for the (integrated) commissioning and operation of ITER.

Starting 2022 EON organizes events, training and seminars on dedicated operational topics open to all EUROfusion experts. Monthly NBI operations seminars from May 2022. Further 2022 events planned for vacuum conditioning, session leader training among others.

EUROfusion Operations Network members

WPSA Operations Area – 2022 deliverables

FP9 Management tasks	Deliverable owner	Beneficiaries
Coordination of the integrated commissioning activities in 2022 in relation to plasma operations (including wall conditioning and breakdown), EDICAM operation and camera tomography, equilibrium control and magnetics, cryogenic systems and superconducting coils).	E. Belonohy	UKAEA
FP9 2022 integrated commissioning activity tasks		
Ensure that the EDICAM camera is ready for wall conditioning and first plasma operation of JT-60SA. Operate and optimise the camera during the integrated commissioning phase.	T. Szepesi	EK-CER
Interface with the EDICAM system and provide timely camera tomography analysis to support ECWC modelling, breakdown studies during the integrated commissioning phase.	J. Cavalier	IPP.CR
Participate in the integrated commissioning of JT-60SA and support the QST team related to plasma operations	M. Iafrati	ENEA
Participate in the integrated commissioning of JT-60SA and support the QST team related to plasma operations	P. Moreau	CEA
Participate in the integrated commissioning of JT-60SA and support the QST team related to plasma operations	E. Belonohy	UKAEA
Support the achievement and optimisation of the plasma breakdown for the first plasma operation of JT-60SA.	D. Ricci	ENEA, MPG
Validate control-oriented plasma linear models against experiment data. This validation will include the implementation of the control algorithms adopted during the Integrated Commissioning within the CREATE tools.	G. de Tommasi	ENEA
Participation of ENEA experts to MECS training provided by QST and/or EU experts.	G. de Tommasi	ENEA
FP8 2022 integrated commissioning tasks		
CREATE personnel to support QST onsite in the commissioning of the plasma equilibrium control system.	G. de Tommasi	ENEA
Support the commissioning of the magnetic diagnostics and perform MHD analysis during the integrated commissioning.	L. Pigatto	ENEA
Support the commissioning activities related to the JT-60SA cryogenic and magnet systems.	F. Michel	CEA

WPSA Operations Area – 2022 deliverables

FP9 Management tasks	Deliverable Woner	Beneficiary
Coordination of the activities related to machine and plasma operations. Coordination and training of control room experts Coordination of Remote Access and Participation Coordination of the activities related to the commissioning of the EU-led Enhancements	E. Belonohy	UKAEA
FP9 Preparation of future campaigns tasks		
Review and summarise currently available scientific real-time networks used on EUROfusion facilities as input for consideration by the JT-60SA Experimental Team.	S. Hall	UKAEA
Review and summarise currently available scientific real-time networks used on EUROfusion facilities as input for consideration by the JT-60SA Experimental Team.	O. Ficker	IPP.CR
FP9 Preparation of commissioning of EU enhancement tasks		
Inspection of the Massive Gas Injection system with an onsite visit upon delivery of the system to the Naka site.	M. Dibon	MPG
Preparation activities related to the commissioning and operation of the JT-60SA divertor cryopump system including consideration of experience from European devices.	C. Day	KIT
FP8 Preparation of commissioning of EU enhancement tasks		
Preparation and commissioning of the VUV diagnostic in ENEA prior to delivery to Japan	S. Scully	UKAEA