



WPSA Operations – Real-time controllers

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Top European priorities:

1. Development and investigation of **high performance scenarios** compatible with future W-PFCs.
2. **Avoidance and mitigation of disruptions and runaways**
3. Fast ion physics
4. Development and validation of **high level real-time control strategies**

A top WPSA priority:

Maintaining/developing control room experience in a large superconducting machine in view of EU participation in ITER operation

WPSA-OP Primary goals in 2022-23:

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

From the operational side:

- Enable **high performance** and **long-pulse operation** on a large-scale superconducting device
- **Risk mitigation** in a high current device by providing triggers to terminate safely.
- **Save resources** by a) reduce number of pulses required to achieve required pulse and
b) dud detection (stop pulse if does not reach target values, e.g. save gas on cryo pump).

Strong synergy between scientific exploitation lead by Experiment Team (definition/requirements of the real-time controller) and Operations (implementation on the JT-60SA real-time server and control room operation).

2022

Step 1. Review and summarise currently available scientific real-time networks used on EUROfusion facilities as input for consideration by the JT-60SA Experimental Team.

+ Understand current and planned real-time platform on JT-60SA

Agreed with QST

Focus first on scientific (high-level) controllers. Collect and share European experience with JT-60SA. Collaboration with the EUROfusion Operations Networks (EON).
-> Developing EON Real-Time workshop proposal for 2023.

2023

Step 2A. Focus on few dedicated real-time controllers selected with the Experiment Team. Review feasibility, potential design/implementation considerations, requirements.

2024

Step 2B. Interest to understand current and planned JT-60SA protection system. Share and collect European experience.

OP2

Step 3. Contribute to the development of real-time controllers for JT-60SA

OP3

Step 4. Control room support to commissioning, optimise and run real-time controllers.

- What controllers to focus on in 2023? What additional information would be useful?

In general good staged approach. => **dedicated meeting with Experiment Team and QST.**
Collaboration with EON -> workshop, etc.

Information to add : (avoid jargon)

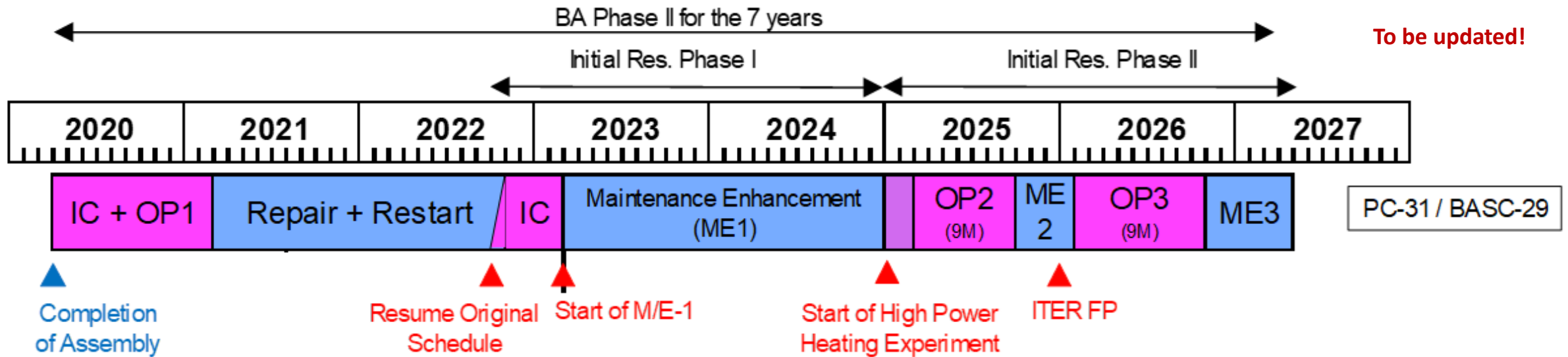
- Level of development
- Frequency of use
- Associated experiments
- Discussion on how much detail to include on requirements for the controllers

JT-60SA long pulse steady state – limited EU experience => **IAEA technical meeting on long pulse**
=> **Show experience with MIMO controllers (e.g. see JET experience)**

Potential controllers to focus on: => **Need to identify controllers to focus on in 2023 (pilot studies)**

- Experiment team is preparing list - need to add operations requirements
- Beta control, control for OP2 & 3 based on availability of diagnostics, NTM, RE control
- Current discussion with QST on RWM, ..

Timeline to be updated

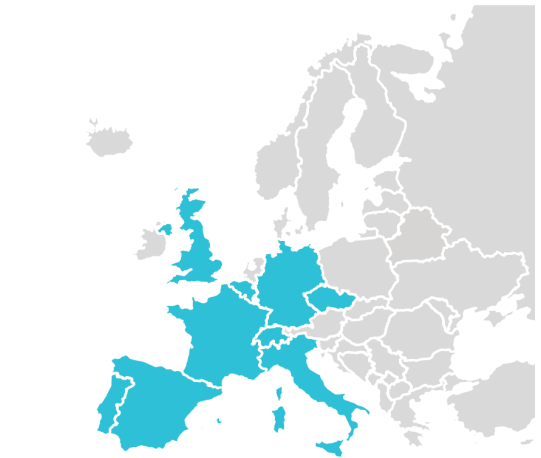


EUROfusion Operations Network

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.



EUROfusion Operations Network members

EON NBI members

2022 activities:

- Review of the operational roles and training on EUROfusion devices
- [Monthly EON seminars on NBI operations](#) started in May 2022
 - Next NBI seminar is on JT-60SA on 15th September 2022

Potential events in 2023 relevant to JT-60SA:

- Vacuum conditioning, first plasma operation including runaway generation
- Commissioning of superconducting coils
- Real-time controllers, hardware and software platforms
- Foundation course on session leading

Positive NBI Teams involved
JET, MAST-U, ASDEX Upgrade, Wendelstein 7-X, TCV, TJ-II, COMPASS-U, JT-60SA
Negative NBI Teams involved
ELISE, BATMAN-Upgrade, SPIDER, MITICA, JT-60SA
Guests
ITER, LHD, (DIII-D)

► Looking for important topics to dedicate EON events relevant for JT-60SA