

Human Machine Interface for PRIMA Cooling System of SPIDER and MITICA experiment.

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The realization of the first full scale neutral beam injector for ITER is taking place at the Padova Research on Injector Megavolt Accelerated (PRIMA) complex, managed by Consorzio RFX. The facility comprises two large experimental systems: the Source for Production of Ion of Deuterium Extracted from Rf plasma (SPIDER) currently in operation and the Megavolt ITER Injector & Concept Advancement (MITICA) in advanced installation phase. They aim at studying new systems for the production of neutral hydrogen/deuterium particles accelerated to high energy and used to heat the ITER plasma. SPIDER is aimed to produce a negative ion beam approximately 66A / 57A accelerated at 100 keV, while MITICA produce a negative ion beam of 40A /46 A at 1MeV of acceleration, which is then neutralized to produce a neutral beam about 17 MW.

A large plant, called PRIMA COOLING System [1] has been constructed to manage and dissipate the heat produced power produced from the experiments and related auxiliary facilities, totaling a peak power of 70 MW of power absorbed from the experiments and related auxiliary facilities.

For both SPIDER and MITICA experiments, the coordination of the system is managed independently by the central control system Control and Data Acquisition System (CODAS) [2], while the interlocking functions are managed by the two Central Interlock Systems (CIS) [3].

In this Poster we will briefly introduce the plant and describe the control system structure focusing on the *Human Machine Interface* and the *alarm handling* system of CODAS. These have been implemented by using the *BOY* and *BEAST* components of the Control System Studio (CSS) a graphical integrated environment based on Eclipse distributed by ITER Codac Core System [4]. Plant systems HMI have been developed as close as possible to the local HMI procured by the suppliers. The synchronization of the different plant systems during the experiment sequence is driven by the *Central Finite State Machine (FSM)* implemented through CODAC state notation language (SNL); experiment sequence is carried on by specialized users by using specific HMI implemented to shows sequence status of the plants and to allow coordinate state transitions.

References

- [1] Fellin, Francesco, et al. *Fusion Eng. Des* 123 (2017): 463-467.
- [2] Luchetta A. et al 2014 *Fusion Eng. Des.* **89** 663-8
- [3] Pomaro N. et al 2013 *Fusion Eng. Des.* **88** 980-4
- [4] Codac Core System <https://www.iter.org/mach/codac/coresystem>