

Integrated Commissioning of PRIMA Cooling System for 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.

Both experiments are meant to operate for up to 3600s continuously. Thus 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.

The COOLING control system comprises three Plant Units (PU): SPIDER PU, MITICA PU, and Shared PU, dealing with SPIDER equipment, MITICA equipment, and the one shared between the two experiments. Each PU is equipped with a slow controller (Siemens PLC Simatic S7-300F) with Profinet distributed I/O.

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, highlighting its strengths and weaknesses, from the point of view of the practical experience of the commissioning of the full plant, carried out in the recently months.

References

- [1] Fellin, Francesco, et al. "Manufacturing and assembly of the cooling plant for SPIDER experiment." *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](#)