

THE COOLING PLANT FOR SPIDER AND MITICA EXPERIMENTS

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This work presents a description of the Cooling Plant for two new experiments: MITICA (Megavolt ITER Injector Concept Advanced) and SPIDER (Source for Production of Ion of Deuterium Extracted from Rf Plasma) to be built in Padova. Each experiment consists of source and injector in-vessel components and auxiliary systems, like Power Supply, Vacuum, Gas Injection and Cooling Plants; further systems for MITICA are the Cryoplant, the Residual Field Magnetic Coils and the High Voltage Transmission Line.

The large amount of total rejected power (up to 70 MW), different experimental scenarios (pulse duration up to 3600 seconds), different requirements for temperature levels, coolant properties and voltage holding issues have been taken into account for the conceptual design. The design work has been carried out considering several different aspects like operability, reliability, standardization of components, maintenance and repair, installed power and costs. Suitable design solutions have been adopted to reduce radiological risks due to the presence of activated corrosion materials in the cooling water of some components.

Groups of components with similar cooling requirements are fed by dedicated primary circuits; fine temperature regulation, water quality monitoring, calorimetric measurements are characteristics of the primary circuits design. Each primary circuit is connected to a common secondary circuit which allows for thermal dissipation and, in some cases, also components preheating. Secondary circuits are connected to two water basins cooled down by an active cooling rejection system, composed of cooling towers and air coolers. In this way the impulsive heat loads to be rejected are attenuated by water basins aiming to reduce the size of active rejection system equipment.

A large amount of effort has been devoted to obtain good plant integration with the Experiments Main Hall (in which MITICA and SPIDER are installed) and other buildings and technical supplies.

The description of special requirements for stand-alone systems like Draining and Drying System, Pressure Test System are also part of this work.