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P2.021 Safety Systems in the ITER Neutral Beam Test Facility

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The construction of SPIDER, the experimental device of the ITER Neutral Beam Test Facility (NBTF) devoted to the study of the ion source, is completed and SPIDER will soon start operation. The construction of MITICA, the full-size prototype of the ITER HNBI, is in progress. SPIDER and MITICA operation presents many possible hazards including radiation (D.Lgs.230/95-Cat.A), electrical, explosive gas, laser and fire risks. As these safety risks are typically not limited to a single experimental device, the NBTF team decided to use for people and environment safety an integrated approach, referred to as the NBTF Safety System, capable to deal globally with all risks. Safety in the NBTF is implemented first by design in the plant systems where possible; when safety by design is not sufficient, the safety system uses specific devices for active safety. As many different systems collaborate to guarantee the NBTF safety, a coordinating system, called Central Safety System (CSS), has been implemented to supervise all safety systems and provide the safety responsible officer an overall graphics representation of the NBTF safety. The CSS provides the safety coordination and presentation layer, but it is also required to implement directly safety instrumented functions. The paper will present the requirements of the Safety Systems deriving from the safety risk analysis carried out. It will also describe the design and implementation of the safety components with particular focus on the CSS that uses the Siemens SIMATIC S7 400FH PLC technology along with safe input/output remote nodes connected through double ring-topology Profibus redundant network. Complying with the IEC 61508/61511 standards, the system architecture uses the PROFISafe profile and the human machine interface is based on WinCC OA; special provisions are used for communication of safety-related information with the PLC.

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