

Design and Development of Safety control system of Indian Test Facility (IN-TF) for ITER DNB

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Indian Test Facility (IN-TF) [1] is being built in IPR to characterize Diagnostic Neutral Beam [2] in cooperation with ITER Organization. INTF is a complex system which consists of several plant systems like beam source, gas feed, vacuum, cryogenics and mechanical systems. To ensure successful operation INTF, integrated operation involving all the constituent plant systems is required. The experimental phases involve application of HV power supplies and High power RF power (~800KW) which will produce considerable amount of power (~6 MW) within the facility for longer durations. Hence the entire facility will be exposed high heat fluxes and RF radiations.

For ensuring occupational safety for working personnel, it is of prime importance that a mature Safety control system [3] be developed and commissioned for INTF. The design of safety control system (SCS) is based on ITER PCDH guidelines and industrial standards for programmable safety systems (IEC 61511 and IEC 61508). The process of detailed design includes identification of safety instrumented functions (SIF), sensor selection and prototype development. The control hardware includes fault tolerant Siemens PLC with distributed interface on Profisafe protocol and safety software which is developed using Siemens safety programming environment. The SCS has to interface with the conventional INTF Control system (which is based on CODAC core system) for non critical data exchange. The SCS also dictate the overall mode of INTF operations.

This paper describes the design methodology involved in arriving at final design with details of application of safety standards for identifying the Safety integrity levels (SIL) of SIFs and details of software level interface. The overall integrated system configuration and test results are also discussed.

References:

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Author: Mr TYAGI, Himanshu (ITER-India,IPR)

Co-authors: CHAKRABORTY, Arun Kumar (ITER-India, Institute for Plasma Research); Mr JOSHI, Jaydeep-kumar (ITER-India (Institute for Plasma Research)); Dr MAINAK BANDYOPADHYAY, MAINAK (ITER-INDIA, INSTITUTE FOR PLASMA RESEARCH); Prof. SINGH, Mahendrajit (ITER - India Institute for Plasma Research Bhat Gandhinagar Gujarat 382428 India); Mr PATEL, kartik (IPR); Mr YADAV, ratnakar (ITER-India,IPR)

Presenter: Mr TYAGI, Himanshu (ITER-India,IPR)

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