

Integration of the ITER Diagnostics Plant Systems with CODAC

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ITER requires extensive diagnostic systems in order to meet the requirements for machine operation, protection, plasma control and physics studies. The realisation of these systems is a major challenge not only because of the harsh environment and the nuclear requirements but also with respect to Instrumentation and Control (I&C) of all the 59 diagnostics plants. The I&C system is the term encompassing all hardware and software required to operate ITER. It has two levels of hierarchy; the Central I&C Systems and the Plant Systems I&C.

The diagnostics plant systems I&C consists of signal conditioning electronics, data acquisition, signal processing resources and communication links demanding state-of-the-art commercial technology to provide the required resources for data acquisition and signal processing. The engineering (electrical, optical, vacuum, gas, water and port) systems will be monitored and controlled by industrial slow controllers. The connection to the central I&C systems is realized via various types of network links including high performance networks for plasma control, audio-video networks, and timing networks.

The Plant Systems I&C are mostly “in-kind”, i.e. procured by the seven ITER Domestic Agencies (DA), while the Central I&C Systems are “in-fund”, i.e. procured by ITER Organization (IO). Standardization of Plant Systems I&C is of primary importance and has been one of the highest priority tasks of CODAC. The standards are published in the Plant Control Design Handbook (PCDH) which will be followed to ensure a homogeneous design, guarantee high availability and simplify maintenance and possible upgrades.

In this paper, we will elaborate on the concepts of interfacing the diagnostics plant systems with CODAC and the standards that must be followed for the design.

- The interfacing section will describe the type of data exchanged between central and diagnostic plant I&C systems for each network type as well as the required data rates and signal processing demands for different operating scenarios.
- The standards section describes the hardware architecture and components proposed for data acquisition, data processing, and local communication links while the software standards describes the data protocols and software application development and implementation aspects.

The integration of the diagnostics plant systems with CODAC will be an important step to ensure that ITER can be operated as a fully integrated and automated system for controlled fusion experiments.