ITER PROTOTYPE FAST PLANT SYSTEM CONTROLLER

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ITER CODAC Design identified the need for slow and fast control plant systems, based respectively on industrial automation technology with maximum sampling rates below 100 Hz, and on embedded technology with higher sampling rates and more stringent real-time requirements. The fast system is applicable to diagnostics and Plant Systems in closed-control loops whose cycle times are below 1 ms. Fast Controllers will be dedicated industrial controllers with the ability to supervise other fast and/or slow controllers, interface to actuators and sensors and high performance networks (HPN).

This contribution will present the detailed hardware implementation and the preliminary tests of two prototypes of a Fast Plant System Controller (FPSC), specialized for data acquisition, constrained by ITER technological choices. This prototyping activity contributes to the Plant Control Design Handbook (PCDH) effort of standardization, specifically regarding fast controller characteristics. The prototypes were built using two different form factors, PXIe and ATCA, with the aim of comparing the implementations.

The system requirements elicitation analyzed carefully the planned ITER diagnostics and the most stringent requirements were selected. The presented solution took into consideration channel density, synchronization, resolution, sampling rates and the needs for signal conditioning such as filtering and galvanic isolation. The engineering design, which was made compliant with ITER standards, will be discussed in detail with particular emphasis to the key requirements driving the implementation decisions. The integration of the two controllers in the standard CODAC environment will also be presented and discussed. Both controllers contain an EPICS IOC providing the interface to the mini-CODAC which will be used for all testing activities. As one of the applications will be data acquisition for plasma control applications it is essential that the fast controller is able to transport the relevant data through SDN to the High Performance Computers. Therefore, particular attention was given to the requirements for streaming the data to the synchronous Databus Network (SDN). Preliminary results of the systems capability in this field as well as on the streaming of scientific data to CODAC for visualization and archiving will also be presented.