Contribution ID: **3** Type: **Poster**

Automated Testing of ITER Diagnostics Scientific Instrumentation

Tuesday 23 October 2018 08:30 (20 minutes)

ITER requires extensive diagnostics to meet the demands for machine operation, plasma control, protection, safety and physics studies. Most diagnostics require high performance scientific computing for the processing of complex algorithms for the measurements. The most stringent requirements are found in the more than 50 diagnostics measurement systems in terms of high performance data acquisition, data processing and real-time data streaming from distributed sources to the plasma control system as well as large amounts of raw data streaming to scientific archiving. While most of these requirements have been achieved individually the challenge for ITER will be the integration of these state-of-the-art technologies in a coherent design while maintaining all of the performance aspects simultaneously. The instrumentation and control (I&C) systems for each diagnostic must meet around 500–700 functional and non-functional requirements which include also the requirements from the ITER handbooks such as the Plant Control Design Handbook (PCDH), Electrical Engineering Design Handbook (EDH) and the Radiation Compatibility Handbook.

While the diagnostics I&C system engineering methodology (Figure 1) is well established for requirements management, detailed design, and implementation, the acceptance testing, demonstrating the compliance of the I&C system with the requirements needs further elaboration. This includes the definition of the test scenarios, detailed test procedures, and well-defined pass-fail criteria for each test. Since compliance validation against a large number of requirements can be very time consuming a high degree of automation during testing is desirable.

This paper presents the elaboration of the pass/fail criteria, the acceptance testing procedures for diagnostics plant system I&C, and describes the design and implementation for automated testing. First results will illustrate the reduction in testing time for obtaining a detailed compliance evaluation.

Country or International Organization

ITER

Paper Number

FIP/P1-2

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Session Classification: P1 Posters

Track Classification: FIP - Fusion Engineering, Integration and Power Plant Design