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ITER DIAGNOSTICS DEVELOPMENT

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ITER is the largest and most technically advanced magnetic fusion device ever and is under construction in France. It is also a nuclear installation. As a result, monitoring and controlling this device using diagnostics is crucial for successful operation. Design, construction and planning for operation of these diagnostics are now well underway with some buildings complete and several more under construction. A sufficient diagnostic set is needed to cover the reliable routine operation, advanced operation and physics exploitation. This involves many boundary penetrations and in general interfaces with many of the ITER major components. These diagnostics also have to be fully operational in many diverse scenarios with managed redundancy as needed in critical areas.

Demonstration of the success of ITER will come through the diagnostics. To facilitate this, a set of 50 diagnostics will be deployed, each one with its own set of specific requirements. These diagnostics are divided up into categories including magnetics, neutrons, bolometer, optical, microwave and operational systems. The latter including pressure gauges, infrared systems and a range of observation systems for tritium and dust.

Incorporation of all these systems provides a very large matrix of interfaces across virtually the whole of the device from inside to outside. These interfaces also include the control system. Managing these interfaces is a complex task. It is further complicated by the fact that many teams (more than 60 teams) are working on the systems and these are stationed around the world in the partner and supplier laboratories as well as at the construction site. From the control and operations perspective, the systems will need to be tightly managed to ensure that the whole system is built up in a coherent way. This will ensure that all the hard and soft interfaces are integrated. The environment has also to deal with neutrons, activation, maintenance and ultra-high vacuum. All these together provide a complex design path with components and hence the diagnostics being designed to be secure, cost effective and reliable.

This talk will focus on the approaches and the challenges of implementing a full suite of diagnostics on ITER.

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