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xTCA based Instrumentation and Control Systems for ITER

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The operation of the ITER (International Thermonuclear Experimental Reactor) tokamak imposes significant demands on the instrumentation and control (I&C) section of its 160 plant systems which are representative for many large scale physics applications. The plant I&C systems must support the operational needs for machine protection, plasma operation and physics exploitation. 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.

The mandatory communication protocols are PCI-Express and Gigabit Ethernet while the CODAC supported form-factor are xTCA and PXIe. Presented will be the I&C requirements, example designs for diagnostics use cases using commercial components, challenges during implementation, and the remaining issues which can be most efficiently resolved with contributions from industry and research institutes.

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