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Evaluation results of MicroTCA equipment at CERN

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MicroTCA is a candidate platform for modular electronics for the upgrade of the current generation of high energy physics experiments at CERN. Driven by the rising interest in this standard, the Electronic Systems for Experiments group has launched in 2011 an evaluation project with the aim of performing technical evaluations and eventually providing support for equipment procured on a large scale by LHC experiments. Different devices from different vendors have been acquired, evaluated and interoperability tests have been performed. This presentation shows the test procedures and facilities that have been developed for this purpose and focuses on the evaluation results including electrical, thermal and interoperability aspects.

Summary

The AdvancedTCA and MicroTCA industry standards are gaining momentum among the LHC experiments both as platforms for new projects and as replacements for certain VMEbus based systems. At CERN, the first MicroTCA systems are going to be installed during the current Long Shutdown (LS1) while deployment of larger quantities of systems are planned for the Long Shutdowns 2 (2018) and 3 (2022/23). Several independent groups at CERN and in collaborating institutes have already started to develop MicroTCA modules for Large Hadron Collider (LHC) experiments and the question arises as to what standard format these modules should eventually be based on. In this framework, the CERN Electronic Systems for Experiments group launched the xTCA Evaluation Project with the goal of providing technical evaluation of MicroTCA systems with a clear focus on the infrastructure equipment such as shelves, power supplies, power modules, cooling units and MCHs. The project includes electrical evaluations of power modules, thermal characterization of crates and IPMI functionality tests. The electrical evaluation of the power modules includes static and dynamic regulation tests, efficiency and power factor measurements, ripple and noise characterization as well as overcurrent protection test. The thermal tests aim at estimating the cooling unit performance and airflow homogeneity inside a shelf. The IPMI functionalities have been tested using a commercial automated test suite for checking the Hardware Platform Management Software and (E)MMC firmware implemented in MicroTCA based systems. A complete test setup consisting of AMC and RTM load modules for electrical and thermal tests has been designed and built. The control and monitoring of the equipment under test is based on a Labview interface developed to automate the test procedure. During the test phases, several interoperability problems and technical issues have been uncovered and addressed by working in collaboration with the manufacturers. This allowed us to acquire knowledge and experience with these new architectures. For each component a detailed evaluation report has been written. This presentation describes the test procedures and facilities and reports on the evaluation results with a clear focus on the electrical, thermal and interoperability aspects of the tested MicroTCA equipment.

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