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Blade-board for stability studies of the slow-control functionality of the CMS muon DT uTCA backend

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In recent years, some minor issues were observed during operation of CMS Muon specific TM7 blade-boards, which are data concentrators for the hit-data from Drift-Tube chambers. These blade-boards reside in the uTCA crates in the service cavern of CMS. Talk presents a recently developed test-board, which is used as an inexpensive substitution of TM7. The developed test-board implements a Module Management Controller (MMC) and some further functional aspects of TM7. It facilitates extensive tests for observing operational stability with many TM7-alike blades within one uTCA crate. Along with presenting the test-board and its firmware, talk also covers ongoing stability studies.

Summary (500 words)

The CMS muon Drift-Tube (DT) System uTCA crates carry a number of TM7 blade-boards, which concentrate the hit-data received from the DT chambers. The Module Management Controler (MMC) functionality of a TM7 is implemented by the firmware, running on a dedicated microcontroller within the TM7's circuit. In general, the implemented MMC circuit and functionality replicate the CERN MMC Mezzanine. During the run activity in the last years some minor issues in the behaviour of the TM7 boards were observed. These issues mainly concern the TM7 slow-control activity. In order to provide detailed observations of the behaviour of a fully occupied uTCA crate, without having to use a number of expensive TM7 boards, an imitator test-board was developed. The central component of the developed test-board is the ATmega128 microcontroller, the same as the one present at the CERN MMC Mezzanine. This test-board completely includes the MMC functionality and parts of TM7 circuitry. Along with the MMC, the board also includes an I2C-switch and a Phased-Locked-Loop (PLL) components. Connectors in the front part of the board enable safe access to the LHC clock signal, which is originally sourced from the backplane of the uTCA crate. A PLL-passed clock signal is available with the front panel connectors as well. The functional pins of the microcontroller are connected to a number of breakout pins. In order to emulate high-power load in the respective uTCA slot, the test-board carries a set of switchable power resistors. With the listed features the developed test-board potentially may be used as a cost effective debug instrument which emulates the slow-control activities between a uTCA blade-board and the crate. Use of the test-board may also be possible in order to test some changes in the MMC firmware, before flashing it in the MMC-microcontroller of the TM7 board. This talk describes the developed board and presents the ongoing stability studies.

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