

# **CMM++ specification and status**

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- The first version of the CMM++ project specification available:
  - <http://ermoline.web.cern.ch/ermoline/CMM++/>
- This document specify:
  - CMM++ functional requirements,
  - CMM/CMM++ differences,
  - technical aspects of the CMM++ implementation.
- The engineering solutions will be reflected in the detailed hardware and firmware specifications.
- Documents time schedule:
  - Now - Jun 2011: clarifications and additions (e.g. – data formats)
    - June 2011: Preliminary Design Review (L1Calo Upgrade meeting)
  - Jul 2011 - Jan 2012: engineering specification, design documentation
    - Sep 2012: Production Readiness Review

## ■ Backward compatibility :

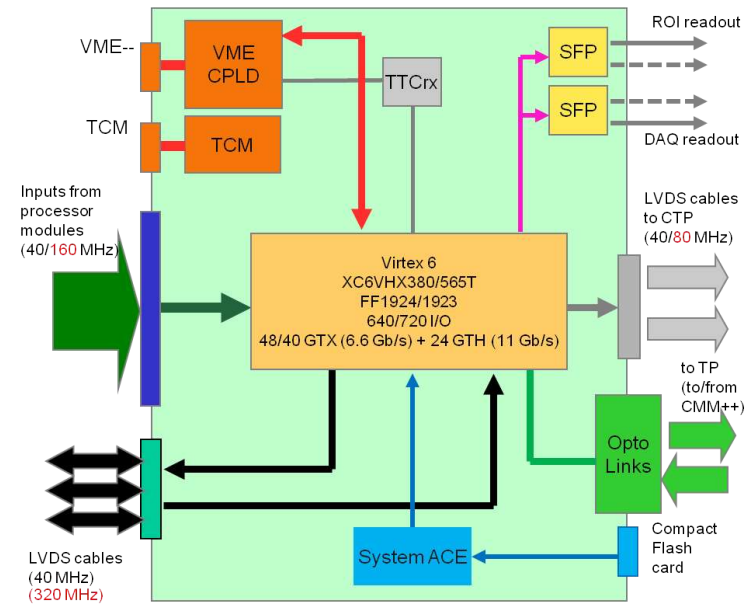
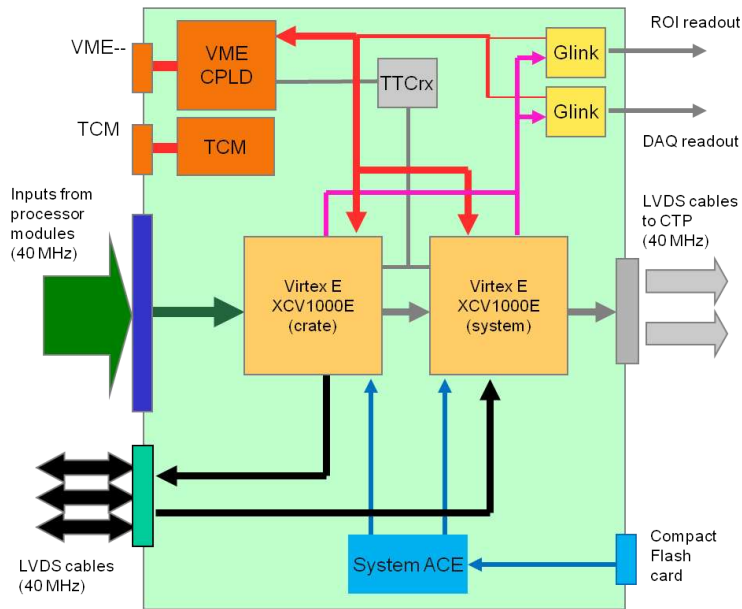
- *be designed to fit in the CMM positions in the processor crates ,*
- *inherit all main logical components, electrical interfaces, programming model and data formats of the current CMM,*
- *be able to implement all different version of CMM FPGA logic, adapted to new hardware.*

## ■ Data source for topological processor:

- *receive extra data from upgraded processor modules over the crate backplane at higher data transfer rate (160Mb/s),*
- *transmit data to the TP via multi-fiber optical ribbon link(s),*  
“Test” and “Upgrade” modes
- *transmit extra data from upgraded processor modules to the L1Calo Read-Out Drivers.*

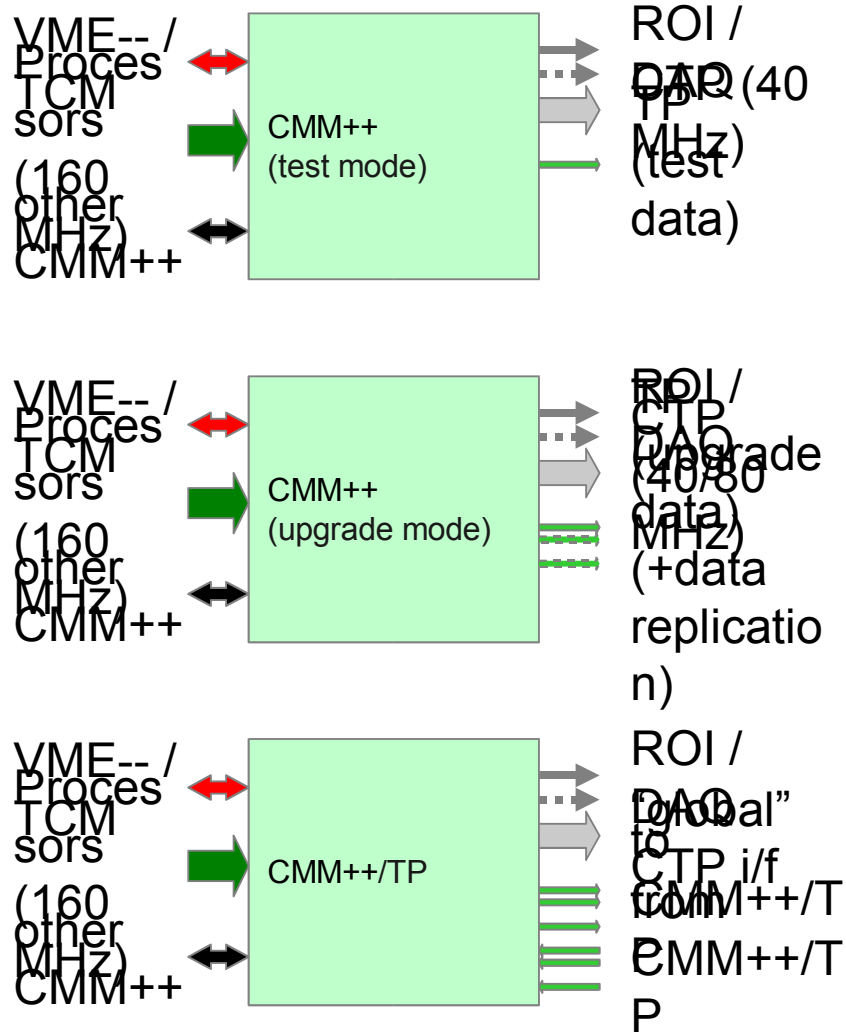
## ■ Standalone mode

- *receive data via additional multi-fiber optical ribbon links,*
- *provide interface to the new upgraded CTP.*



## ■ Main modifications to the CMM hardware:

- *replacement of the obsolete FPGA devices by new parts to receive data at 160Mb/s from the backplane, transmit and receive data via multi-fiber optical ribbon link using transceivers in FPGA,*
- *implementation of the G-link protocol in firmware,*
- *implementation of multi-fiber optical ribbon links,*
- *selection of FPGA(s) configuration according to the mode of operation.*



## ■ Test mode:

- backward compatible mode
- backward compatible data format
- data to the TP for test purposes.

## ■ Upgrade mode:

- new data format
- data processing/reduction to fit in a single TP module

- data replication to multiple TPs

## ■ Standalone (CMM++/TP) mode :

- no TP available
- data processing/replication
- data reception from other CMM++ passive fibers re-grouping
- multiple (CMM++/TP)s

- 2011: Project and engineering specifications
  - CMM++ project Preliminary Design Review
  - Preliminary design studies
  - Test rig installed, checked out at MSU
- 2012: Prototype design and fabrication
  - CMM++ schematics and PCB layout
  - Production Readiness Review
  - Prototype fabrication, CMM firmware ported on CMM++
  - Tests in basic test stand at MSU
- 2013: Prototype testing/installation/commissioning, final fabrication
  - Prototype tests in test rig at CERN
  - CMM++ firmware development and test
  - Test in the L1Calo system during shutdown
  - Fabricate and assemble full set of CMM++ modules
- 2014: Final commissioning in the L1Calo trigger system