



Status of BackEnd Electronics

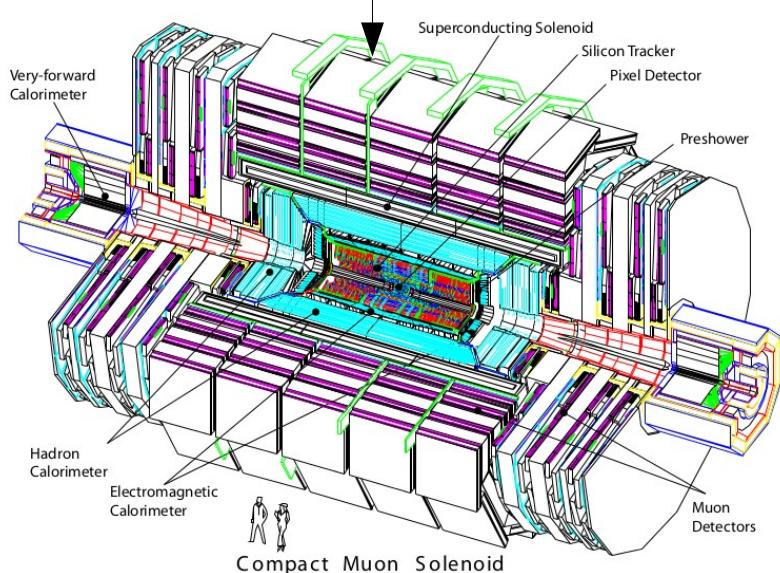
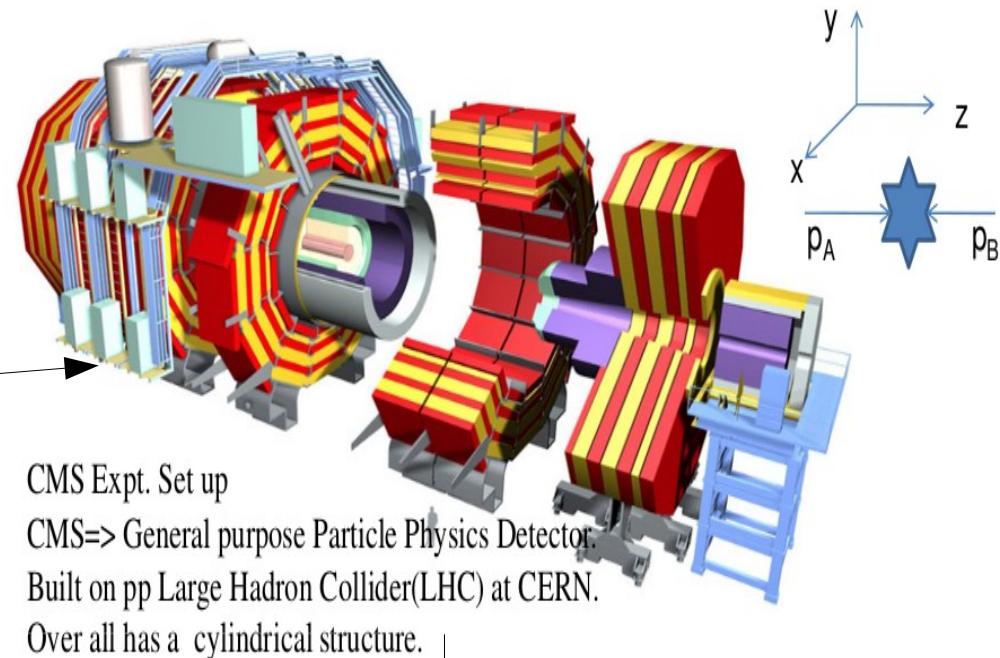
For
CMS Hadron Calorimeter In LHC

Presented by:
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on behalf of CMS Collaboration

Outline

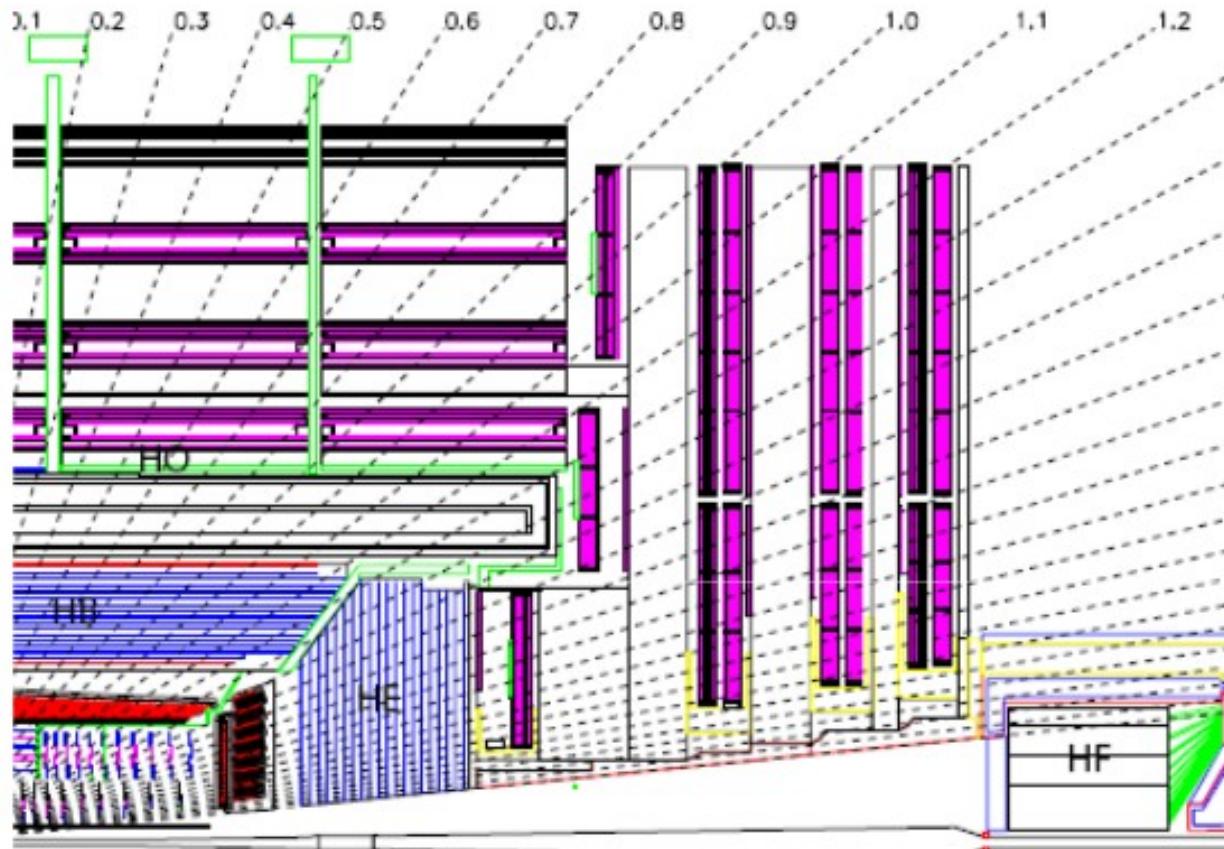
- CMS Detector
- CMS HCAL BackEnd Electronics Upgrade
 - => μ TCA and AMC Card
 - =>Fabrication
 - =>Testing
 - =>Database
- Summary and Outlook

Compact Muon Solenoid(CMS)



CMS Hadron Calorimeter

The design of the Hcal leads to good hermiticity , good transverse granularity , moderate energy resolution , sufficient depth for hadron shower containment.



CMS Hcal longitudinal view

- The dashed lines are at fixed η values.
- The hadron calorimeter barrel and endcaps sit behind the tracker and the electromagnetic calorimeter as seen from the interaction point.

CMS HCAL BackEnd Electronics

=> VME (Versa Module Europa) is currently in use as the data acquisition system for CMS HCAL BackEnd part.

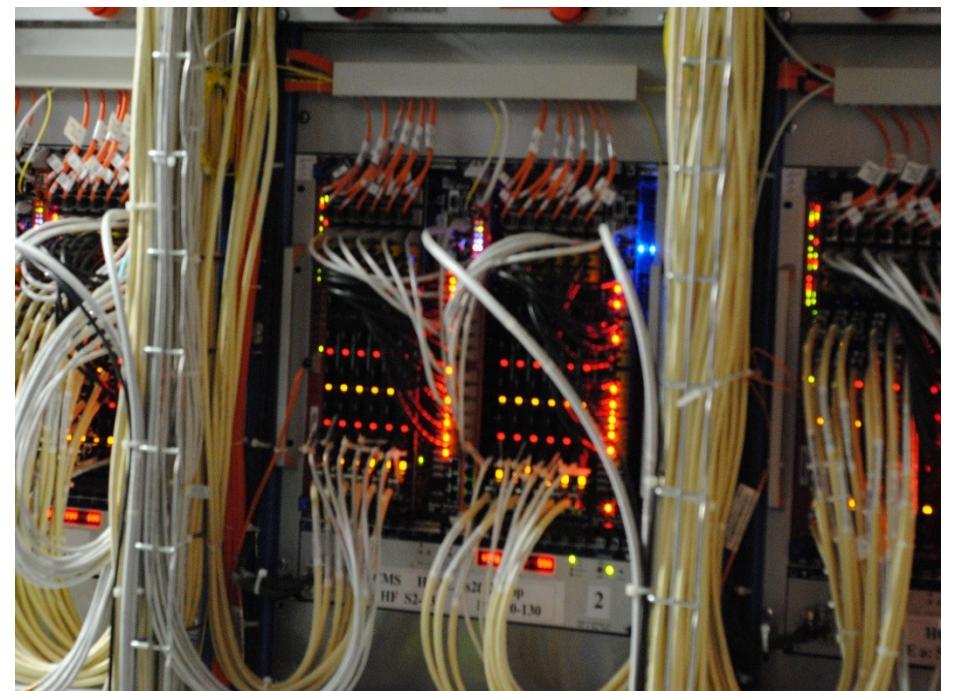
=>But in the upgrade of CMS related work it will be replaced by MicroTCA for high speed data acquisition.

Why this upgrade?

Increase of energy as well as luminosity in the LHC requires an increase in channel count of the readout part of the HCAL.

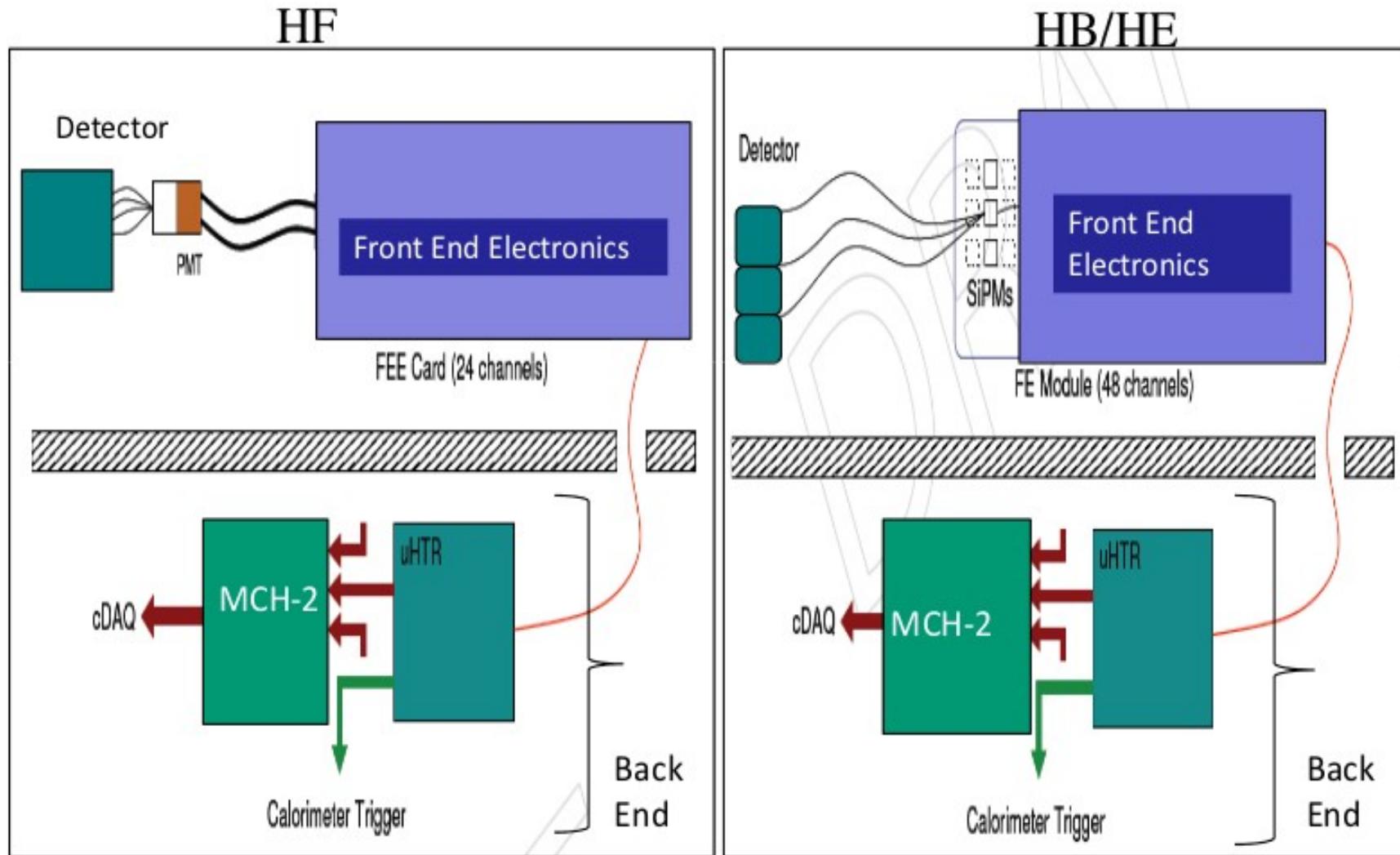
=> Will result an increase in data volume

=>Thus will require an upgrade of the back-end electronics.



Current VME system at P5

HCAL Readout Scheme

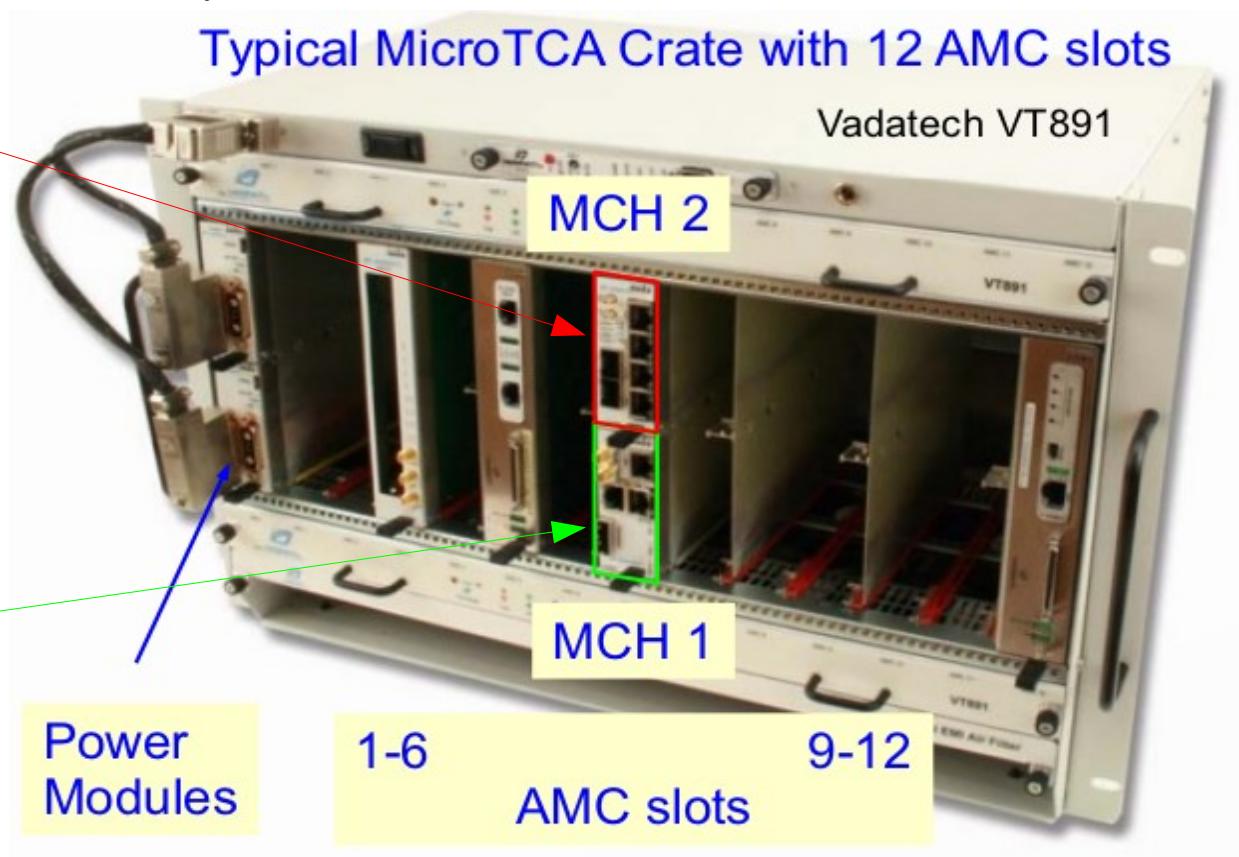


μ TCA

Typical MicroTCA Crate with 12 AMC slots

The Custom one:
Distributes the LHC clock
and collects data from
uHTRs and sends them to
CDAQ.

The Commercial one:
Controls the power to
all AMC modules

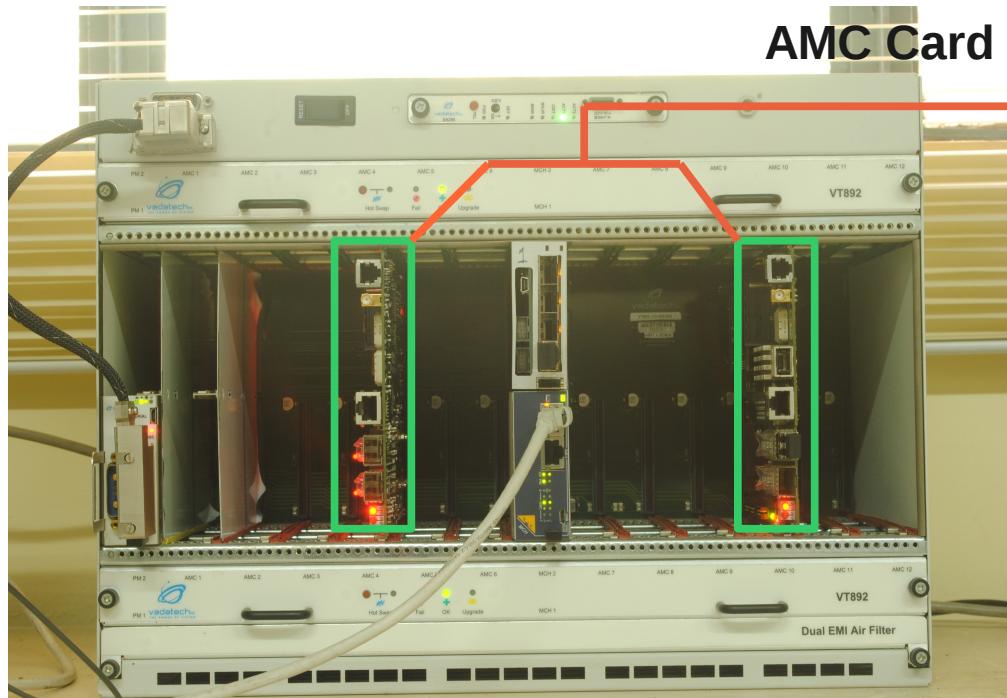


Developed firstly by telecommunication Industry.

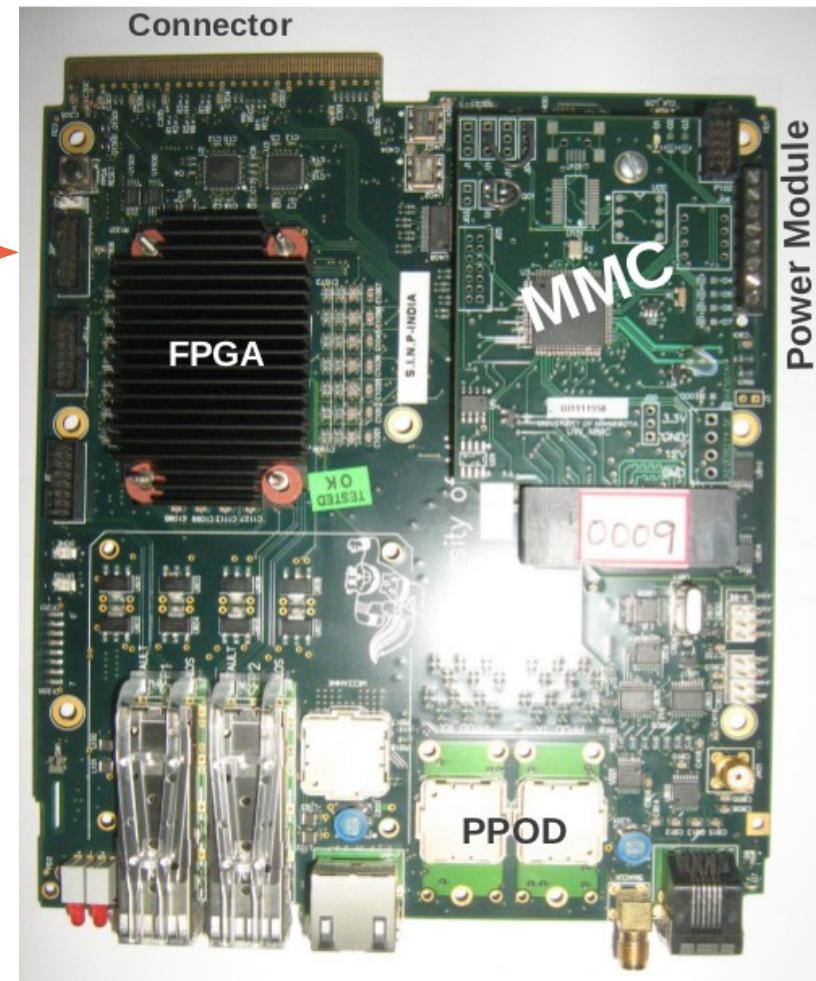
Consists of 12 uHTR cards => (Minnesota + India).

MCH2/AMC13/DTC card => Boston

AMC/μHTR Card



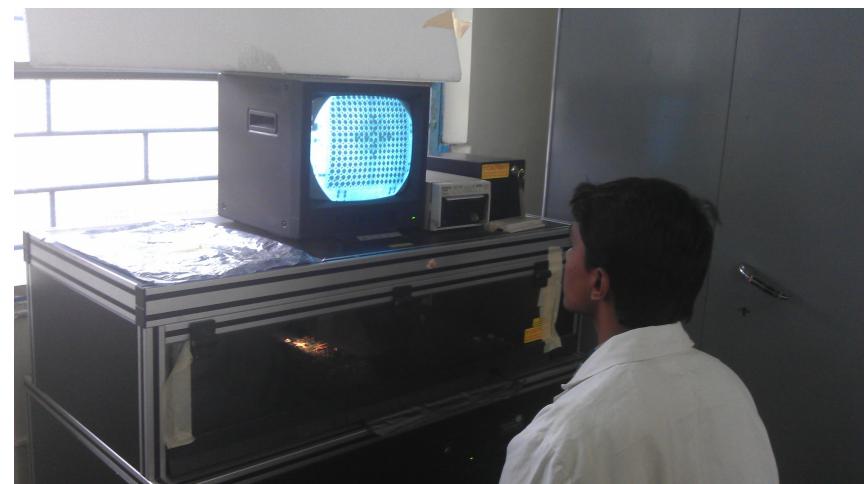
μTCA Crate at SINP



- AMC/μHTR Card receives the digital information from the front end, calculates & transmits Trigger Primitives.
- Hold the data pipeline while waiting for L1 Accept.
- Also capable of lumi Calculation.

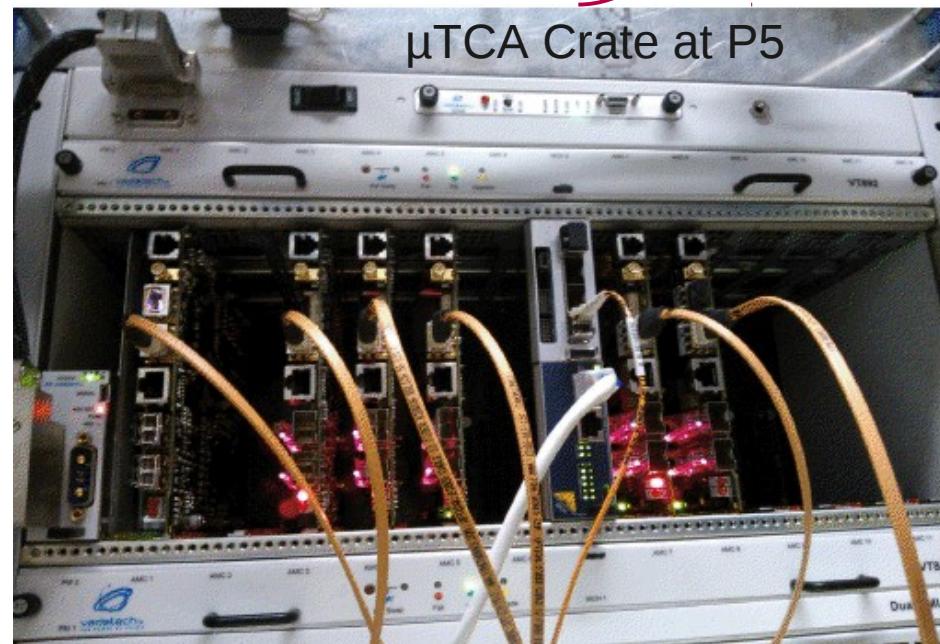
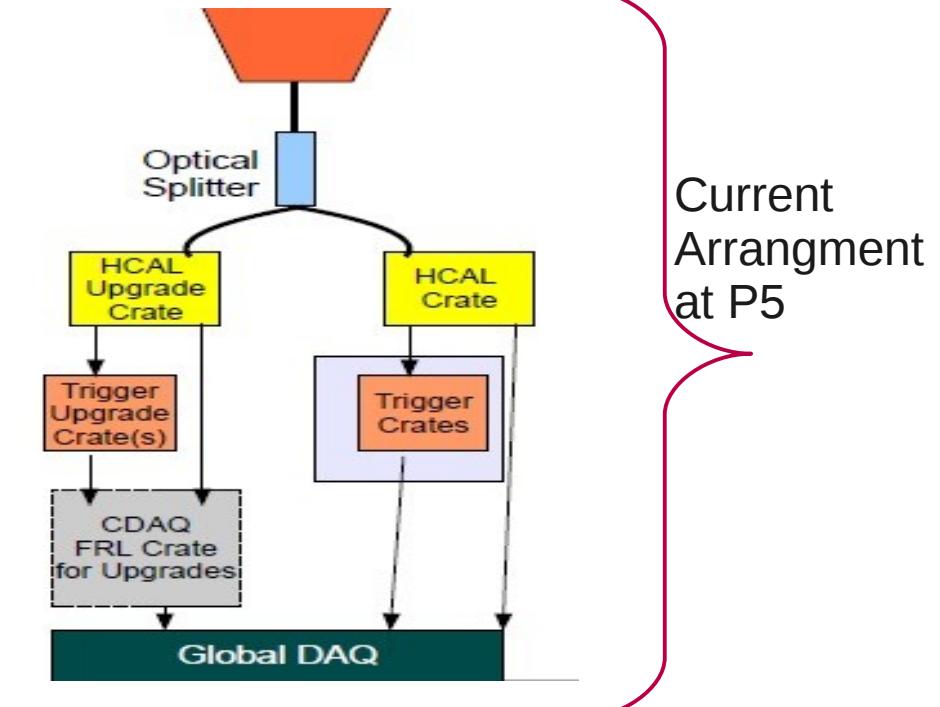
Fabrication

- 10 AMC cards (each has 12 PCBs)are made in an Indian Industry at Bangalore as a joint project of SINP and UMN .
- Different components of the card like FPGA,IC's were soldered by reflow soldering (Other components manually).
- For mass production automated pick & place machine will be used for all components.
- Inspection has been done with X-ray machine.



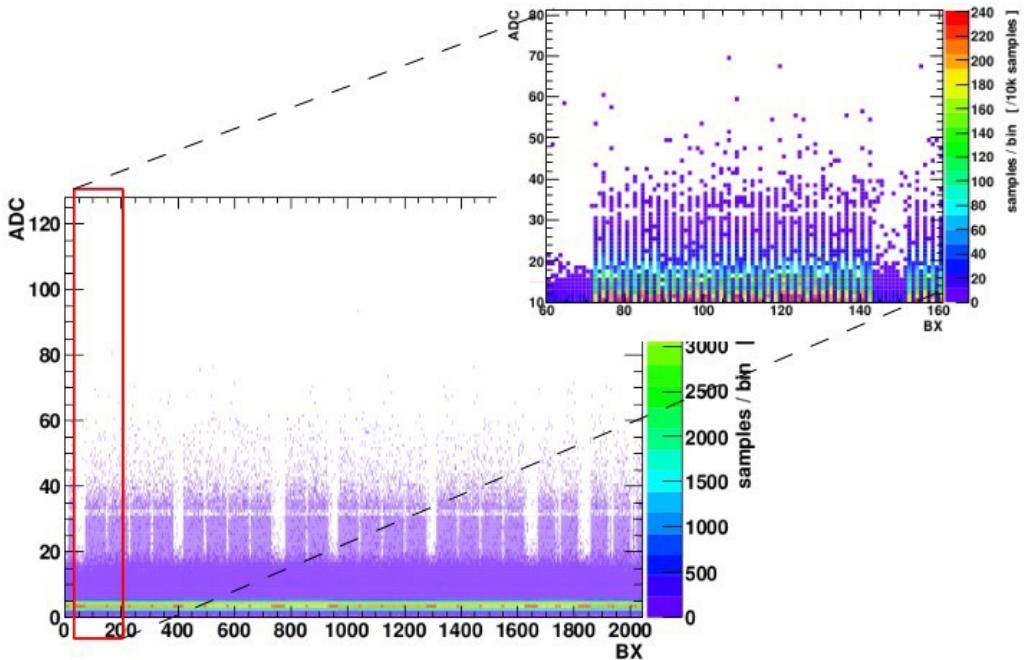
Testing and Installation at P5

- Initial tests were done at SINP:
(Blinking Test, Loading Firmware, Assigning IP and MAC Address etc.)
- A μ TCA crate (Vadatech) has been installed at P5 in parallel to the existing VME.
 - It is operating for the HB, HE and HF.
 - It is capable to read data from the front end following the LHC cloock.

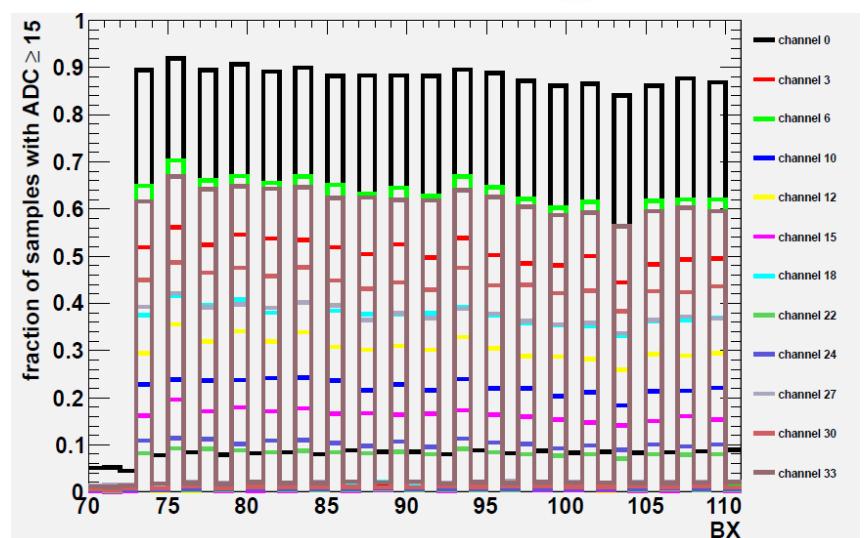


An Important MileStone

- Observed bunch structure - 50 nsec time spacing visible.



- All fibers are aligned in time for each card.



Twiki Page with all information

This table shows current status of the miniCTR cards (various series).

miniCTR2d series

MAC Addr: 00-80-55-CE-C0-0C ~ 14 for N77850

IP Addr: 192.168.x.x

Type	Serial #	FPGA-1	EPROM	SFP0/1 (Gbps)	MAC Addr.	IP	Slot No.	Fiber	PPOD_TX	PPOD_RX	MMC	Test Status	Location	Comments
mCTR2d	0001	XC5VFX70T-1FFG1136C	M25P128	8.5	0C	30.04	1	1			DI1111***		P5,CERN	Firmware 4.02
mCTR2d	0002	XC5VFX70T-1FFG1136C	M25P128	8.5							549		904,CERN	Default IP/MAC address MMC problem sorted out.
mCTR2d	0003	XC5VFX70T-1FFG1136C	M25P128	8.5	0E	30.12	3	2			543		P5, CERN	Firmware 4.02
mCTR2d	0004	XC5VFX70T-1FFG1136C	M25P128	8.5	0F	30.16	4	3			551		P5, CERN	Firmware 4.02

Outlook

- Several changes will be done for the AMC card:
 - => Each card will now have 2 power modules
(Tests will be carried out at SINP)
 - => Each card will have 2FPGA's
 - => Each card will have 2 PPOD Receivers so that 24 channel information can go to 1 card instead of 12.
- Mass production and Testing of the cards will be carried out in India at first for HF (36 HTR cards ,+18 spares) .
- Job has already begun.

Thanks..