

MCM Tests and Other Developments

Victor Andrei

**Kirchhoff-Institut für Physik
Ruprecht-Karls-Universität Heidelberg**

L1Calo Trigger Joint Meeting, Cambridge, 23/03/2011



Overview

- MCM Supply & Investigations
- Rem FPGA Firmware
- G-Link Timeout

MCM Spares

- Current number of valid spare MCMs:

Heidelberg:	28 (PPMs) × 16 (MCMs/PPM)	448
	not mounted on PPMs	53
	never operated on PPM	30
CERN:	16 (PPMs) × 16 (MCMs/PPM)	256

TOTAL: 787

- apart from these, returns from CERN
 - failed only DAC/Pedestal tests at CERN → passed again similar tests in Heidelberg
 - re-test & re-use in emergency cases ?

MCM Categorisation

■ Test all 'Heidelberg spares' and sort them in categories according to pre-defined criteria:

➔ GOOD MCMs

● flawless operation

➔ USABLE MCMs

● small deviations from expectation, but still functional

➔ BAD MCMs

● large deviation or severe errors → no usable spares



■ digital part

➔ either GOOD or BAD

■ "mixed signal" part (ADC, PHOS4)

➔ still debating upon the criteria

MCM Investigations (1/3)

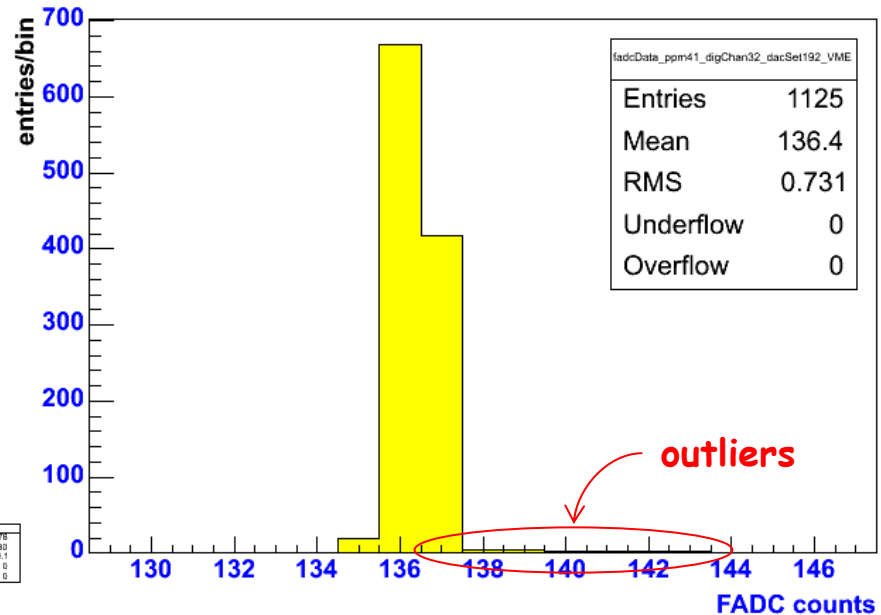
full scan of the FADC range

➔ AnIn-DAC offset + external DC offset

observed occasionally large deviations from mean (outliers)

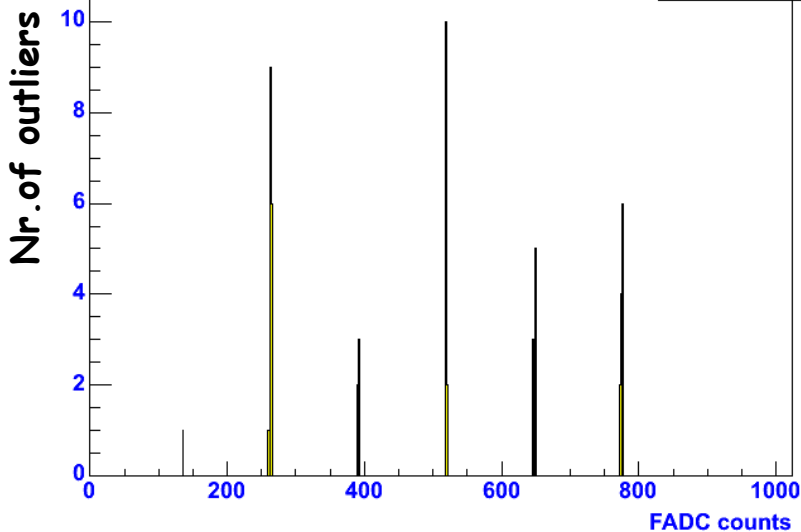
➔ from 5-6 up to 10-12 FADC counts

FADC Data, DAC=192, SpiDac_Test, PPM# 41, DigChan 32(VME Readout)



Outliers Warnings & Errors per FADC Counts (PPM 254)

fadc_outliers_bac_ppm254	
Entries	78
Mean	482
RMS	188.1
Underflow	0
Overflow	0



outliers seem mostly to occur only for certain FADC output

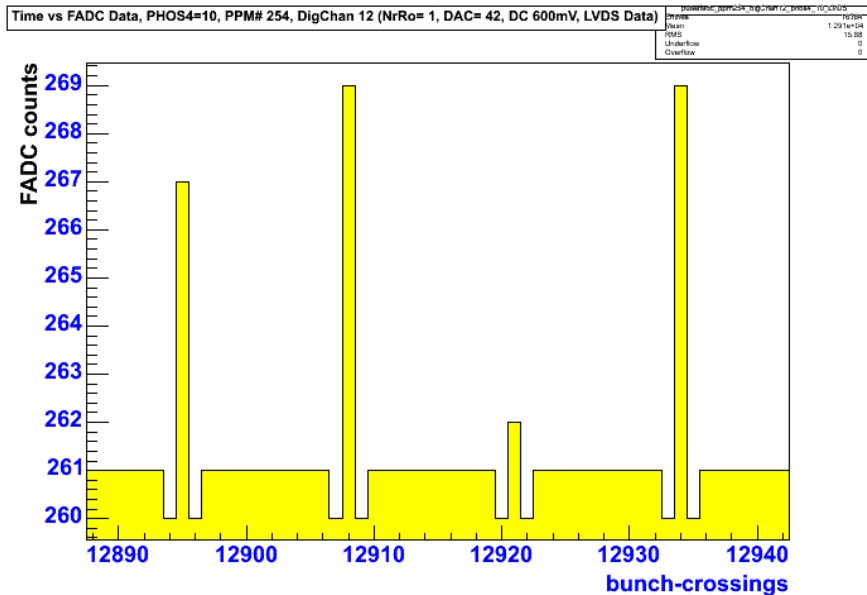
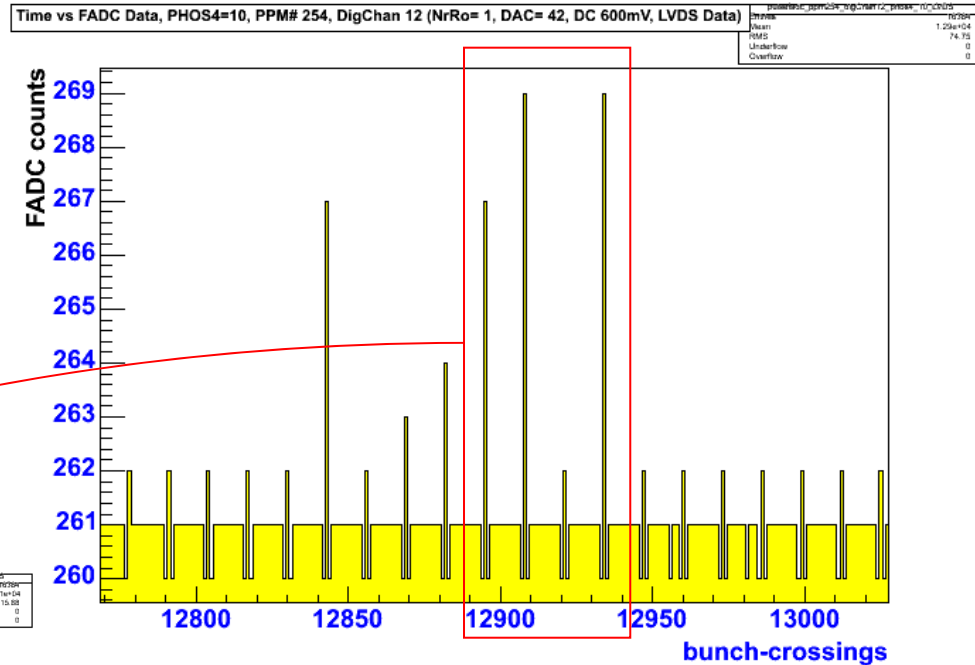
➔ 128, 256, 384, 512, 640, 768

➔ worst channel: 0.5 ‰ outliers

MCM Investigations (2/3)

■ further investigations:

- ➡ set ASICs in transparent mode
→ send the 10-bit FADC input over the LVDS links to CP
- ➡ record 16384 consecutive BCs per channel
- ➡ re-run the full FADC-DAC scan



■ spikes every 13 BCs → FrameBit effect

- ➡ observed first by ZDC
- ➡ most of the observed outliers related to the FrameBit effect
- ➡ analogue-digital ground coupling ? → **not changeable !**

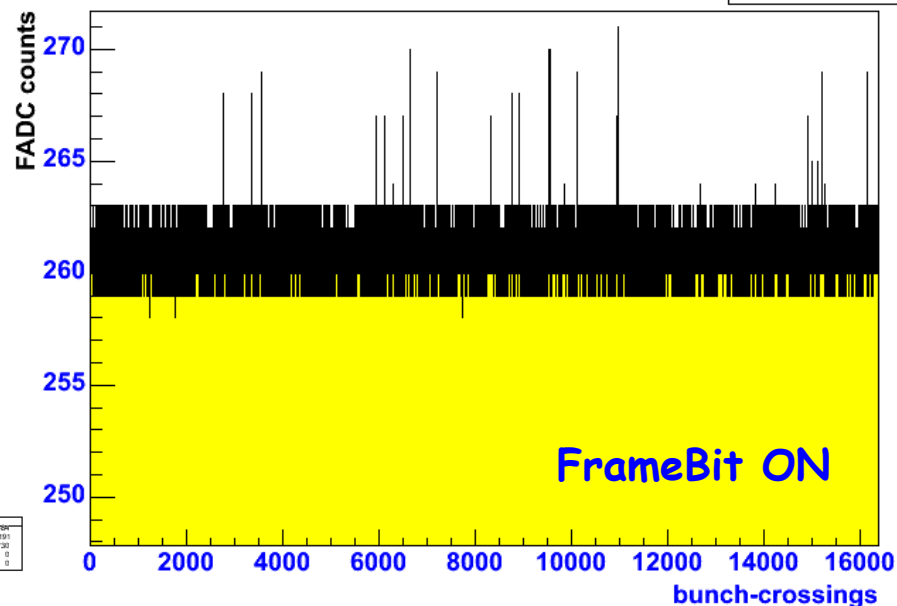
MCM Investigations (3/3)

■ verification of the FrameBit effect:

➔ disable the FrameBit transmission from ReM FPGA to ASICs

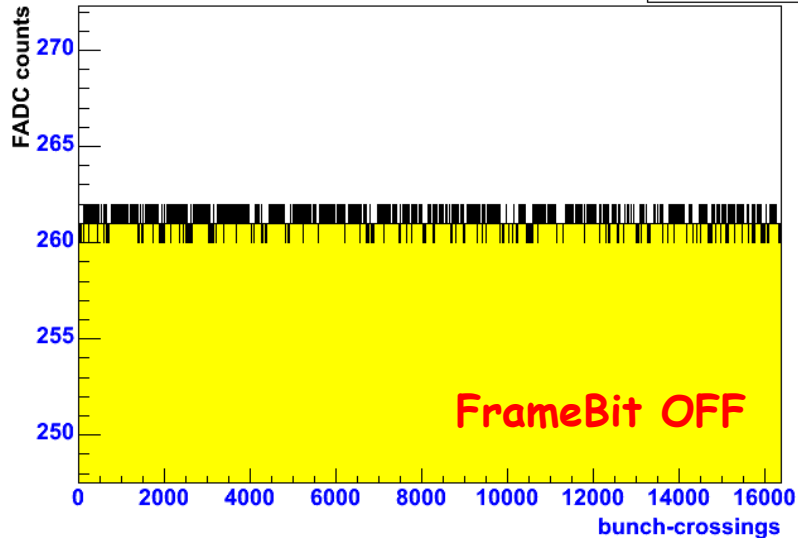
Time vs FADC Data, PHOS4=15, PPM# 254, DigChan 12 (NrRo= 1, DAC= 42, DC 600mV, LVDS Data)

FrameBit	8152
RMS	4730
Underflow	0
Overflow	0



Time vs FADC Data, PHOS4=15, PPM# 254, DigChan 12 (NrRo= 1, DAC= 42, DC 600mV, LVDS Data)

FrameBit	8152
RMS	4730
Underflow	0
Overflow	0



■ digital activity on the MCMs & PPMs is reduced

■ RMS lower than 1 FADC count when FrameBit is off

PHOS4 Errors

■ PHOS4 errors

- occasionally: the PHOS4s apparently lose their settings after significant periods of operation
 - the error moves in the system from PPM to PPM
-
- PHOS4 chip almost a black box → very difficult to trace the problem
 - we have some ideas for testing in the lab → to be implemented in the near future

ReM FPGA Firmware

- new version (5.0.0) since January 2011
 - ➔ monitoring of the RGTm-O status bits
 - LINKRDY, Tx_Fault → so far only mapped into ReM_Status register
 - 4-bit results provided via the second ReM_Error register
 - ➔ 32-bit EventCounter register
 - extension of the existing internal 4-bit EventCounter
 - accessible over VME
 - ➔ new bit field for the FirmwareVersion register
 - previously: 16-bit MainVersion + 16-bit Subversion (e.g. 4.13)
 - currently : 16-bit MainVersion + 8-bit Subversion + 8-bit Debug (e.g. 5.0.0)

- User & Developer Manual released also in January 2011
 - ➔ current version: 1.1
 - ➔ document available in EDMS and on KIP's webpage

G-Link Timeout

- one PPM (# 41) returned from CERN due to G-Link Timeout error
- PPM tested in Heidelberg for several weeks → no readout error detected!
- we don't have a ROD in the lab, but:
 - ➔ checked readout transfer to PPM boundaries → **OK!**
 - ➔ monitored RGTM-O's status bits → **OK!**
- PPM loaded with "bad" MCMs before being sent to Heidelberg!
 - ➔ PPMs generating G-Link Timeouts should be sent back in "original configuration"!
- if G-Link Timeout errors occur again:
 - ➔ check ReM status & error registers
 - ➔ check EventCounter register for several PPMs → is the "ill" PPM receiving same number of L1As?
 - ➔ let us know these evidences!

Summary & Conclusions

- categorisation of the spare MCMs to be started soon
- the other 2000 MCMs **work well**
- new ReM firmware version → **stable** operation at CERN and in Heidelberg