EMCAL Calibration Status

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EMCAL Construction Schedule

Rough estimate from US-DOE CD-1 Review in September:

- 2005/2006: First testbeam at FNAL with prototype EMCal, design iteration, CDR written
- 2007: First modules produced, new testbeam with final design (Summer)
- 2007/2008: First supermodules (SM) assembled and tested with cosmics(Fall '07), installed in ALICE (Mar/Sep '08)
- 2009: Commissioning of first SMs with data, installation of next SMs (Apr/Aug)
- 2010: Installation of next SMs (Feb/Jul/Dec), first data with large acceptance
- 2011: Last SMs installed (May)

Calibration Status

1. Online calibration strategies and status of the Shuttle Preprocessors

We have a volunteer identified to work on this (Gustavo Conesa) but he has been otherwise occupied with simulations for the EMCAL CDR and LHCC responses. He will be at CERN next week for the ALICE week and will work with the PHOS people to get the SHUTTLE working for EMCAL.

2. Calibration requirement tables - Size of calibration data to be handled by the Shuttle

Updates to the readiness table appended to presentation and sent to Yves.

3. Planning and implementation of the online calibration

David Silvermyr is the EMCAL online representative/DAQ contact person. He will be stationed at CERN from December 2006. Some online calibration code will be adapted from testbeam, some from PHOS.

LED calibration system is planned for relative APD gains; first implementation was done with testbeam run, will be integrated into AliRoot after next testbeam (Summer 2007).

Zeroth order calibration constants will come from Cosmic calibration tests to be done at Yale (Richard Witt) as SMs are assembled and tested. Software will be written within AliRoot, completed for first testing in ~ Fall 2007.

EMCAL Calibration Data

Par #	Parameter	Data format/size per channel	Data size (Total) Bytes		Update freq	Source
			in OCDB	reference		
1	pedestal for low gain	TH1I (872 bytes)		14MB	run	HLT or DAQ/LDC
2	pedestal for high gain	TH1I (872 bytes)		14MB	run	HLT or DAQ/LDC
3	pedestal sigma for low gain	1 float		1.11E+05	run	HLT or DAQ/LDC
4	pedestal sigma for high gain	1 float		1.11E+05	run	HLT or DAQ/LDC
5	energy/ADC channel for low gain from physics	1 float	1.11E+05	1.11E+05	run	HLT or DAQ/LDC
6	energy/ADC channel for high gain from physics	1 float	1.11E+05	1.11E+05	run	HLT or DAQ/LDC
7	energy/ADC channel for low gain from LED	1 float	1.11E+05	1.11E+05	run, maybe more often	HLT or DAQ/LDC
8	energy/ADC channel for high gain from LED	1 float	1.11E+05	1.11E+05	run, maybe more often	HLT or DAQ/LDC
9	time walk coefficient 1 for low gain	1 float	1.11E+05	1.11E+05	year	LDC?
10	time walk coefficient 2 for low gain	1 float	1.11E+05	1.11E+05	year	LDC?
11	time walk coefficient 3 for low gain	1 float	1.11E+05	1.11E+05	year	LDC?
12	time walk coefficient 1 for high gain	1 float	1.11E+05	1.11E+05	year	LDC?
13	time walk coefficient 2 for high gain	1 float	1.11E+05	1.11E+05	year	LDC?
14	time walk coefficient 3 for high gain	1 float	1.11E+05	1.11E+05	year	LDC?
15	dead/hot channel map	1 integer	5.60E+04	5.60E+04	run	HLT or DAQ/LDC
16	high voltages for APD	1 float	1.11E+07	1.11E+07	daily	DCS
17	Supermodule temperatures	-	1.00E+03	1.00E+03	a few minutes	DCS
	Total sizer per run		1.23E+07	1.25E+07		

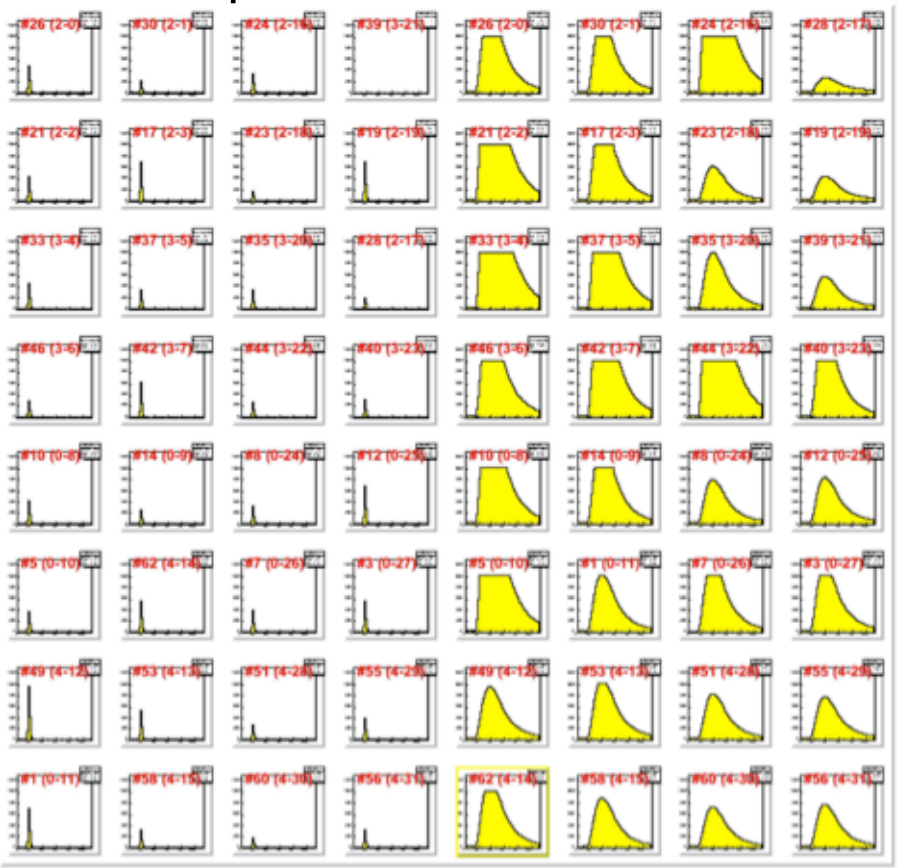
EMCAL Calibration Data

Par #	Run type / Trigger type	# of required events/sampling rate	Processing level: sub-event or event	Results: FEE/Archive	Accessible by offline	Calib. Procedure in AliRoot	use case #
1	special pedestal run or physics run	10000 events	sub-event	DAQ or HLT FES/OCDB	yes	no	1, 2, or 5
2	special pedestal run or physics run	10000 events	sub-event	DAQ or HLT FES/OCDB	yes	no	1, 2, or 5
3	special pedestal run or physics run	10000 events	sub-event	OCDB	yes	no	1 or 2
4	special pedestal run or physics run	10000 events	sub-event	OCDB	yes	no	1 or 2
5	physics run	1e+6 pp events	sub-event	DAQ or HLT FES/OCDB	yes	no	1 or 2
6	physics run	1e+6 pp events	sub-event	DAQ or HLT FES/OCDB	yes	no	1 or 2
7	special LED run	10000 events	sub-event	DAQ or HLT FES/OCDB	yes	no	1 or 2
8	special LED run	10000 events	sub-event	DAQ or HLT FES/OCDB	yes	no	1 or 2
9	calibration run during long beam off periods	10000 events	sub-event	DAQ or HLT FES/OCDB	yes	no	1 or 2
10	calibration run during long beam off periods	10000 events	sub-event	DAQ or HLT FES/OCDB	yes	no	1 or 2
11	calibration run during long beam off periods	10000 events	sub-event	DAQ or HLT FES/OCDB	yes	no	1 or 2
12	calibration run during long beam off periods	10000 events	sub-event	DAQ or HLT FES/OCDB	yes	no	1 or 2
13	calibration run during long beam off periods	10000 events	sub-event	DAQ or HLT FES/OCDB	yes	no	1 or 2
14	calibration run during long beam off periods	10000 events	sub-event	DAQ or HLT FES/OCDB	yes	no	1 or 2
15	physics run, LED run	10000 events	sub-event	HLT FES/OCDB	yes	no	1 or 2
16	always	-	-	DCS Archive DB/OCDB	yes	no	4
17	always	-	-	DCS Archive DB/OCDB	yes	no	4

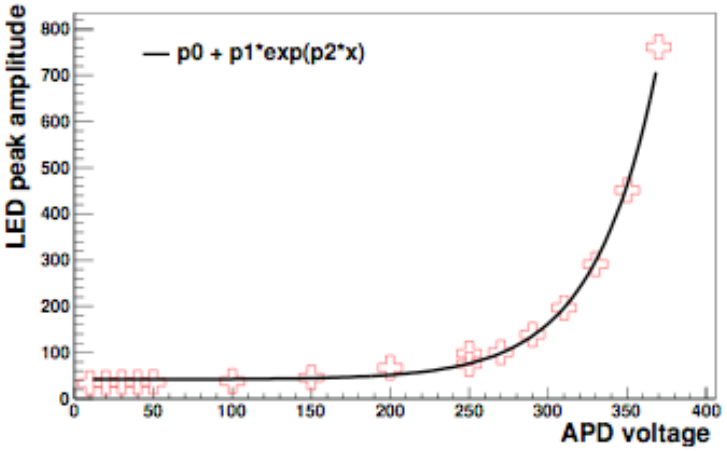
LED system

EMCAL prototype of 8x8 towers with two shaping times tested at Fermilab in November 2005

LED pulses to each channel:



100ns 1μs



$$ADC(t) = pedestal + Ax^{\gamma} \exp^{\gamma(1-x)}$$

$$x = (t_{\max} - t)/\tau$$

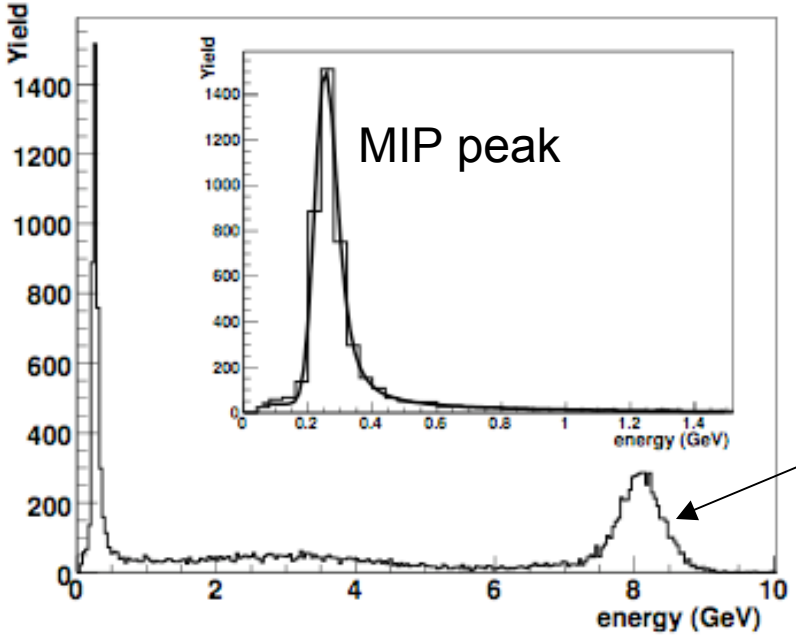
Channel-by-channel gain variations evaluated with LED signals at various operating voltages (Calibration parameters 7,8)

Time walk coefficients evaluated once/year and then fixed in peak fits (9-14)

MIP/Cosmic Calibrations

Testbeam results (after iterative calibration):

(Calibration parameters 5,6)



Calibrated Cluster energy

Minimum ionizing particle (MIP) peak fit for each tower → relative gains

8 GeV/c electron beam at Fermilab

MIP peak energy deposit dependence on momentum

(Need electrons for absolute energy calibration)