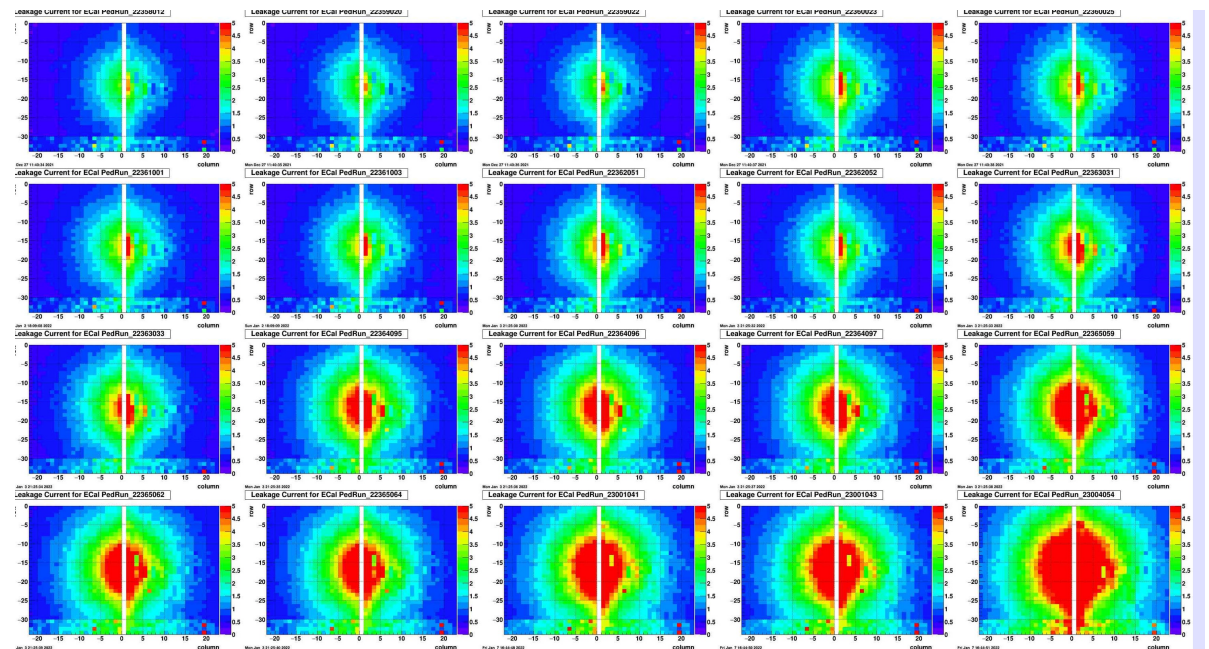


FCS Status

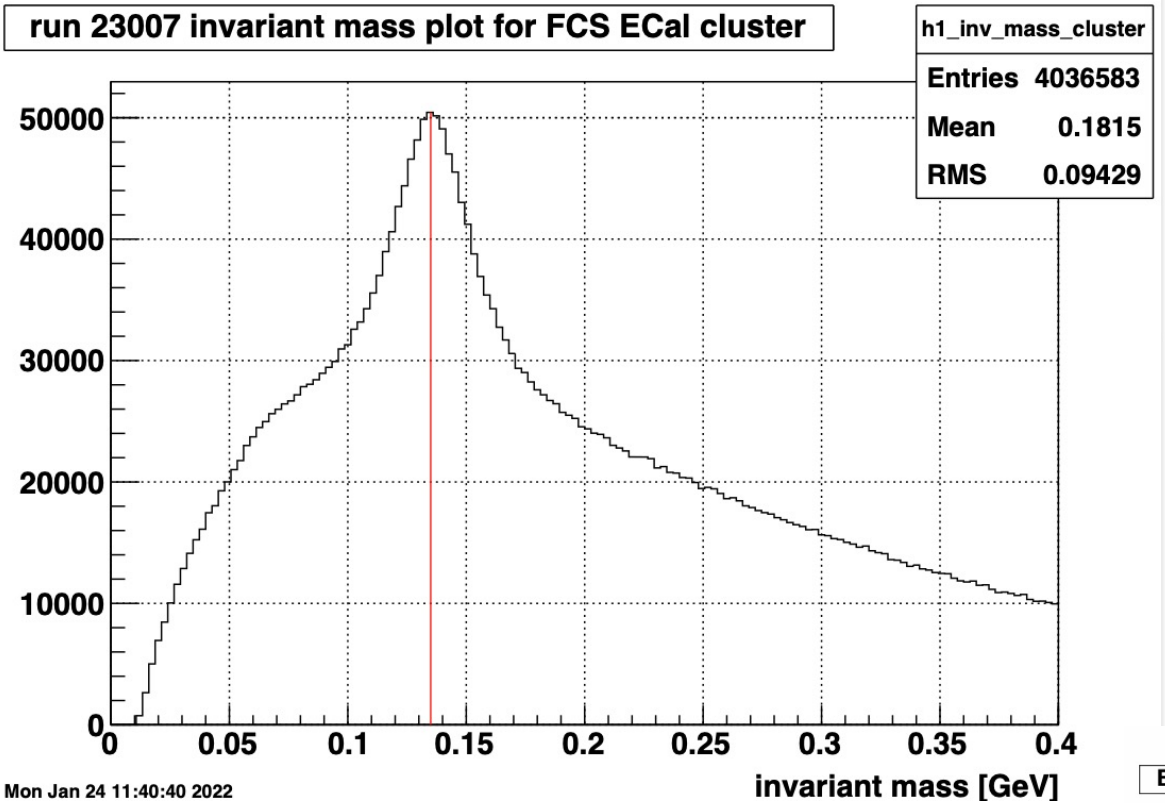
1. HV, Attenuator, Gain File for DEP (and offline gain)
2. Radiation Damage (Oleg will discuss this in detail)
3. Online Plots
4. Alignment Ecal and Hcal
5. Future calibration run needs
6. Summer Shut down (Oelg)

Akio Ogawa
STAR CM
2022/02/15

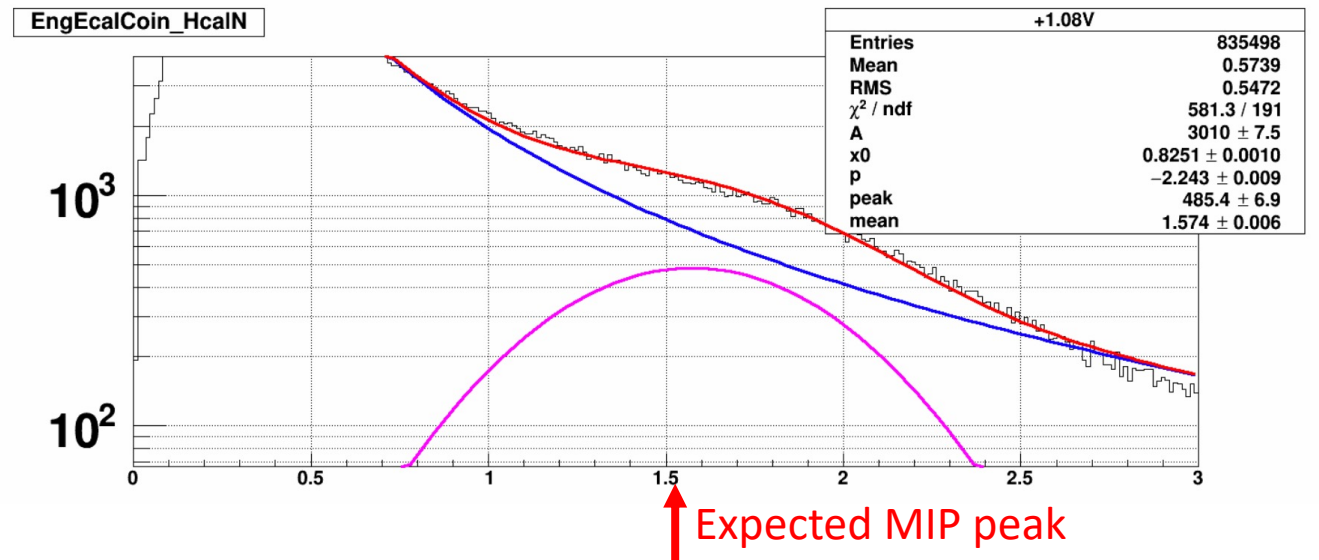


Ecal Dark Currents from Ananya's Radiation Monitor

Pi0 reconstructed from Ecal by Xilin



MIP peak from Hcal (Matched with Ecal MIP) by Navagyan



See their talks for more details

FCS Operation during Run22

- FCS Run22 Dataset : Details at <https://www.star.bnl.gov/protected/spin/akio/fcs/run22.html>
 - 2021/10/01 FCS Opened for cosmic
 - 2021/12/01 Initial Ecal Attenuator (1/2.7 or 8.5dB) & ET matched gain
 - 2021/12/20 FCS Closed
 - **2021/12/21 Ecal Attenuator (1/5.31 or 14.5dB) and Hcal DEP Gain (x1.3)**
 - 2021/12/25 Thresholds adjusted & **Production IDs**
 - 2022/01/07 1st Low Luminosity Calibration Run
 - **2022/01/27 2nd Low Luminosity Calibration Run with new Hcal Voltage (+5.36V) & ET matched gain. Thresholds & New Prod ID**
- FCS Gain : Details at <https://www.star.bnl.gov/protected/spin/akio/fcs/run22gain.html>

Det	Date	Run	Voltage	Attenuator	electronics_gain	Offline Gain	Avg GainCorr
Ecal	2021Oct01	22274001	Default	1/1	1	0.0053/5.31	~1.21
Ecal	2021Dec01	22335028	Default	1/2.7	1	0.0053/5.31*2.7	~1.21
Ecal	2021Dec21	22355068	Default	1/5.31	1	0.0053	~1.21
Det	Date	Run	Voltage	Attenuator	electronics_gain	Offline Gain	Avg GainCorr
Hcal	2021Oct01	22274001	Default	1/1	1	0.0053*1.3*1.21*1.65	~1.0
Hcal	2021Dec21	22355068	Default	1/1	1.3	0.0053*1.3*1.21*1.65	~1.0
Hcal	2022Jan27	23027047	+0.536	1/1	1.3	0.0053*1.3*1.21	~1.0

Offline Gains are from current best knowledge and back calculated for past & already in Offline DB

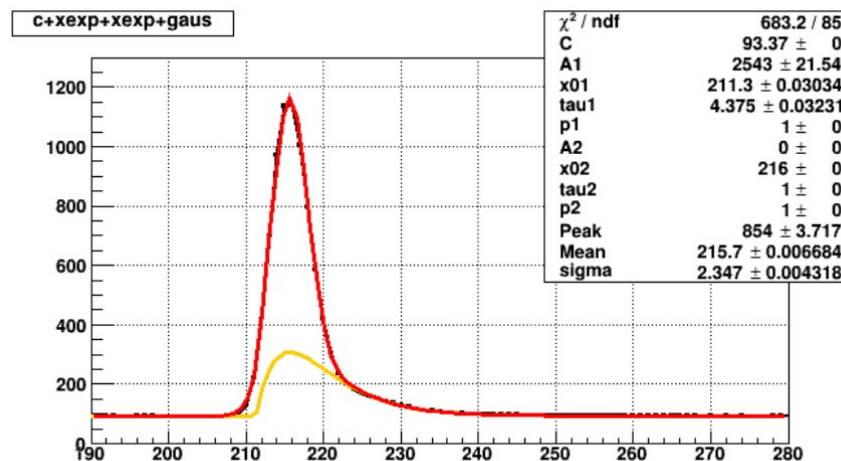
FCS Gain

<https://www.star.bnl.gov/protected/spin/akio/fcs/run22gain.html>

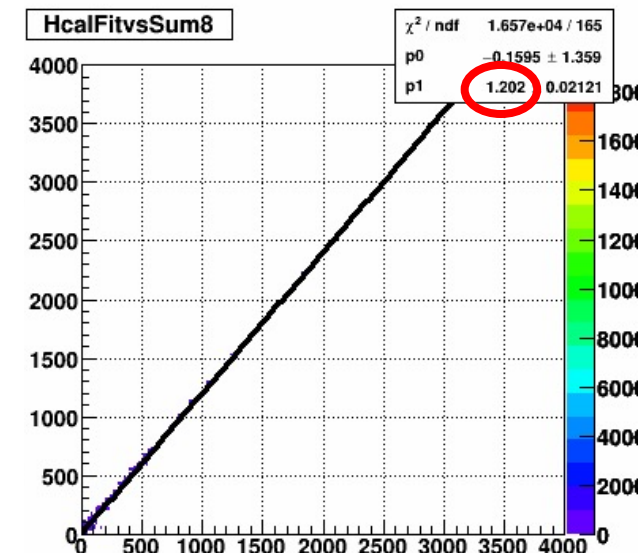
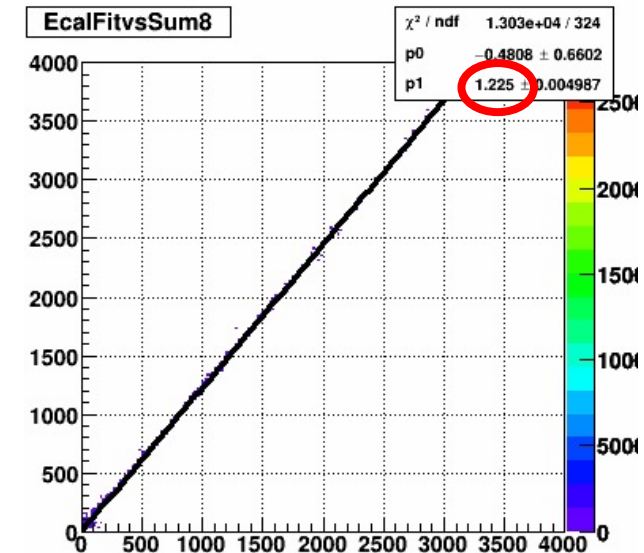
- My mistake : 53/12 is NOT 2.7 but 4.4
- ~2.5cm Ecal & Hcal x difference of tower center (in trigger) nearest beam matters
- What is “ADC”?
 1. 16 timebin Sum (~100%)
David used for Hcal Cosmic @ 510
 2. 8 timebin Sum (~90%)
DEP Trigger Algorithm
 3. Gaus+BG fit ==> Gaus integral (~74%)
Offline / Xilin used for Pi0

Target Gain is
 E 0.0054 GeV/ch
 ET 0.24711 MeV/ch → 255 @ 8GeV threshold
 At DEP (Sum8)

Gaussian + xexp Fit

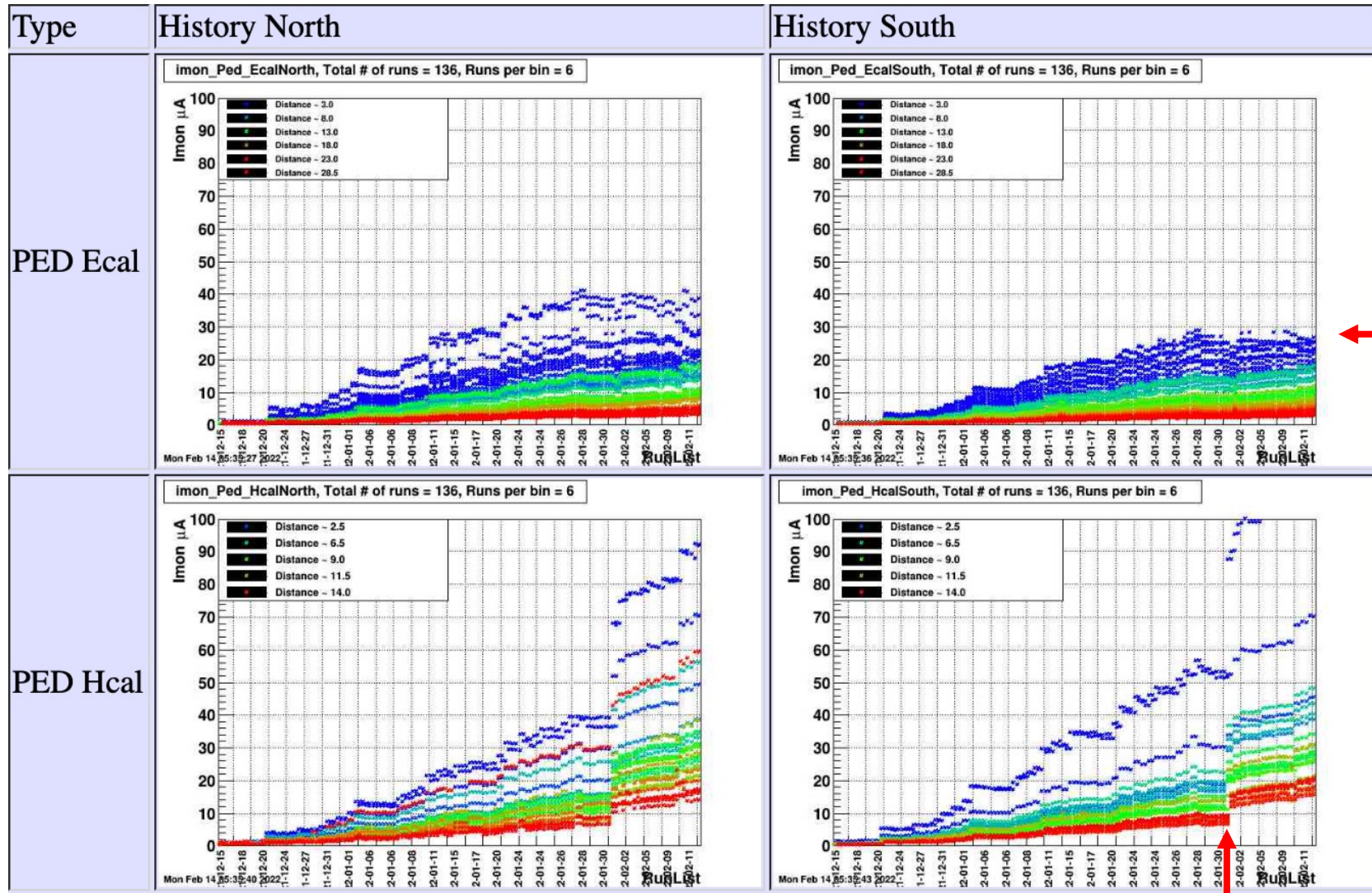


Gaus Integral vs Sum8



Online Plots : Radiation Monitor (Ananya)

<https://online.star.bnl.gov/fcs2022/radmon/>



Ecal current flattened?
(see Oleg's talk)

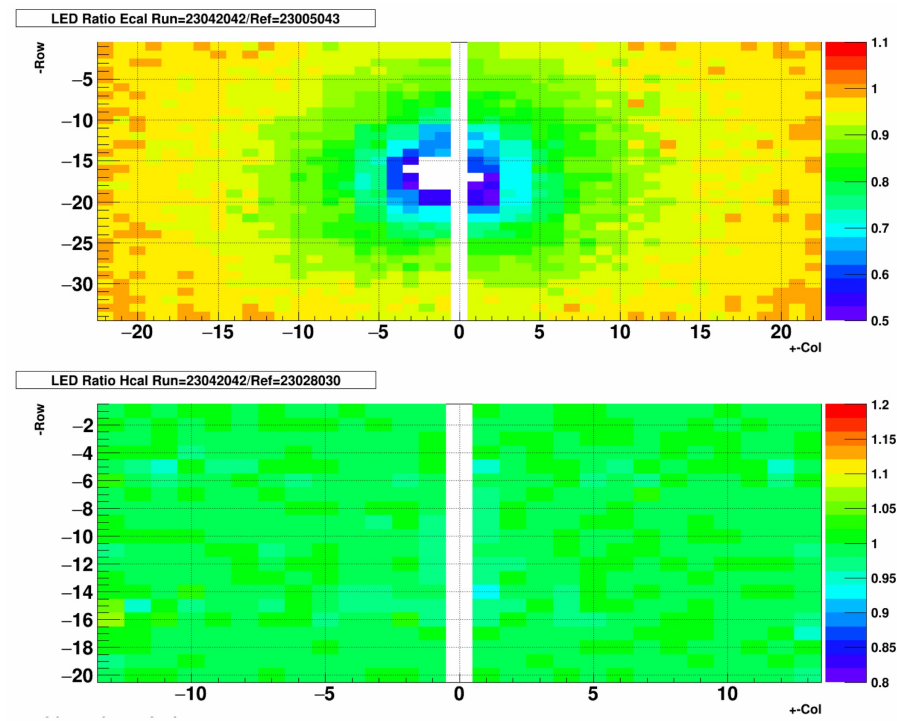
Hcal Voltage Change 2022/01/27

Limits are 400uA (Ecal) and 600uA(Hcal)
At this rate, they will reach 120 (Ecal) and 300 (Hcal) at near beam by end of run22

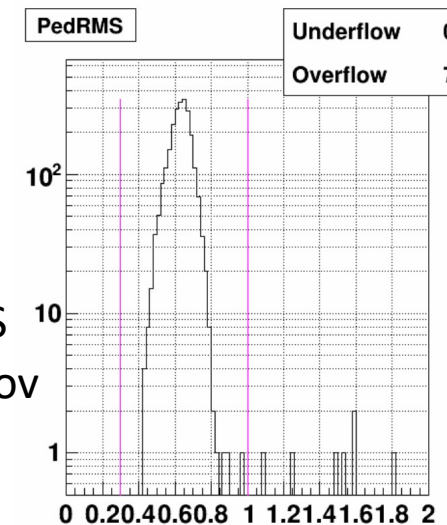
Online Plots : LED & Pedestal Monitor

<https://online.star.bnl.gov/fcs2022/led/>
<https://online.star.bnl.gov/fcs2022/led/search.php>

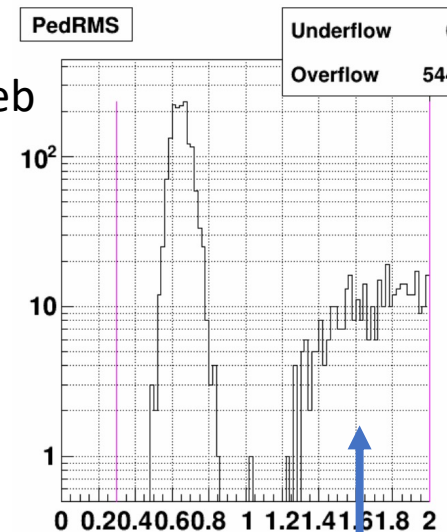
LED Ratio plot 2/11 over 1/05



Pedestal RMS
2021 Nov

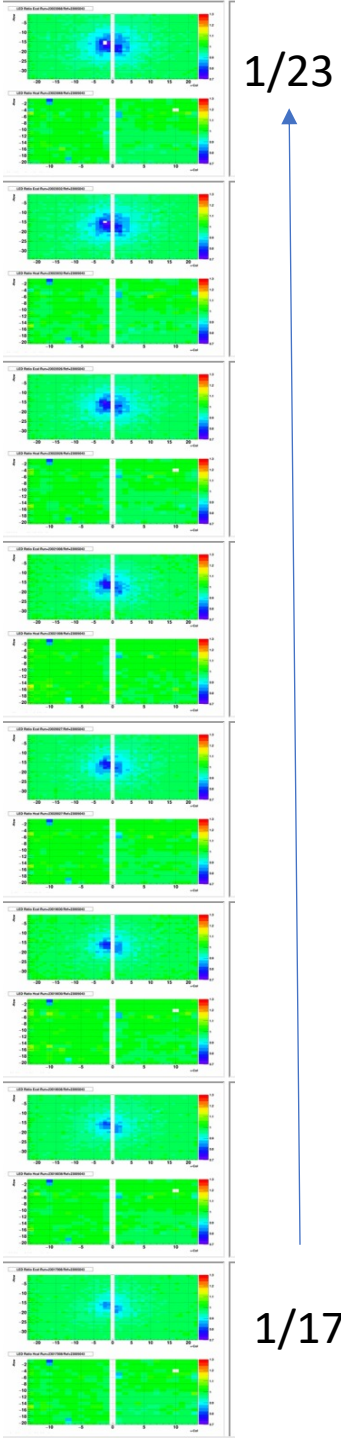


2002 Feb



EPD

- Ecal loosing lights as much as ~50% near beam over a month
- Hcal is stable
- Pedestal RMS is still < 1ch, even near beam

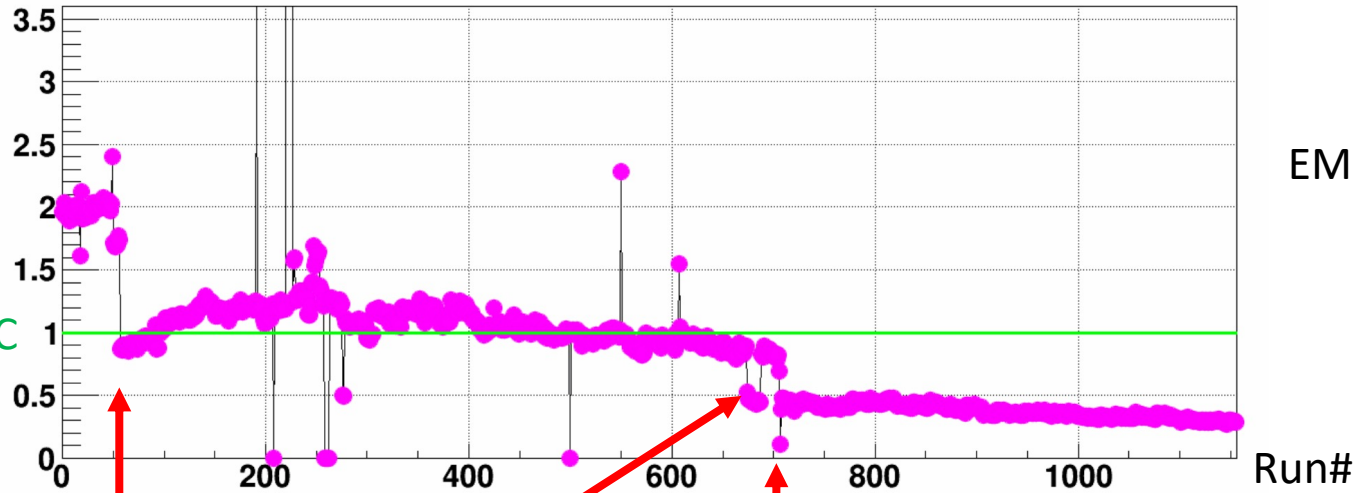


Online Plots : Rate Monitor

<https://online.star.bnl.gov/fcs2022/trg/rate/>

fcsDY/BBCTAC / MCratio

DY Trigger Scaler Rate / BBC rate (normalized to MC ratio)



EM & DY trigger rate slowly decreasing

Expected from MC

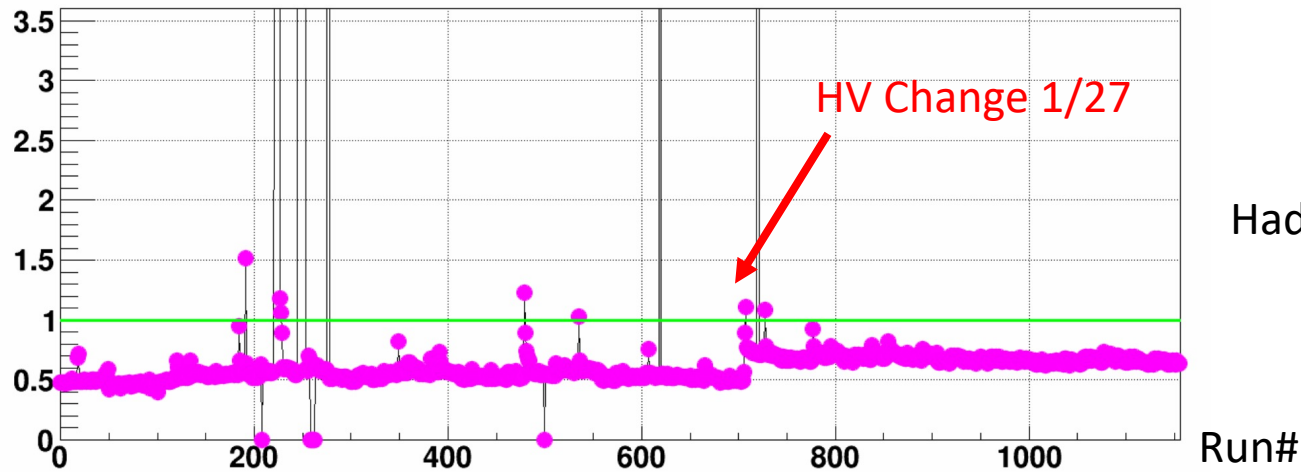
Initial Gain Change 12/21

¼ Pre-shower dead

ET Gain File Change 1/27

fcsHad2/BBCTAC / MCratio

HAD2 Trigger Scaler Rate / BBC rate (normalized to MC ratio)



Had (& JP) trigger rate are stable

Ecal & Hcal Alignments

<https://www.star.bnl.gov/protected/spin/akio/fcs/mip/>

Ecal & Hcal Y Positions were not surveyed

Ecal & Hcal Y position have been measured by Oleg and Akio on 2022/1/5

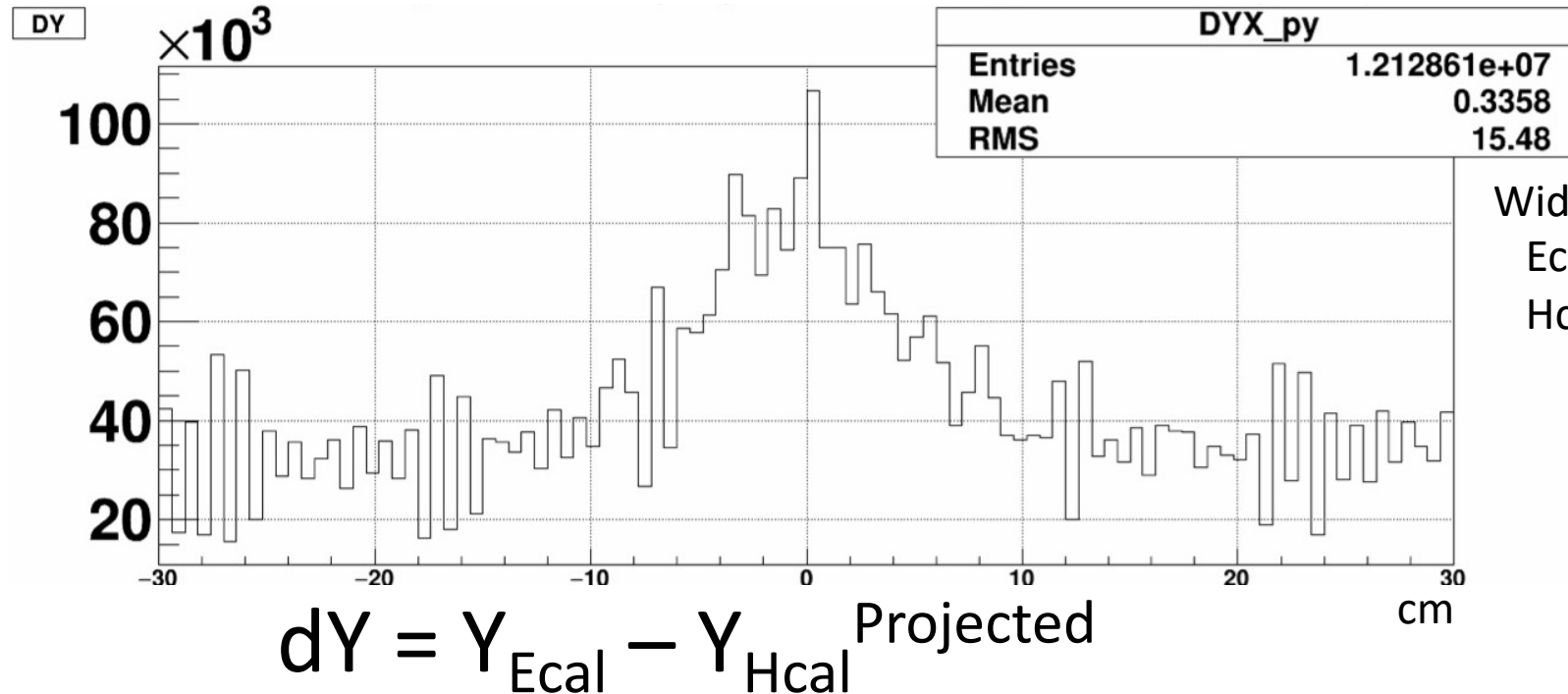
Ecal Y center is 5.26cm BELOW beam

Hcal Y center is 1.8cm ABOVE beam

Geometry & Offline DB now has correct Y offsets

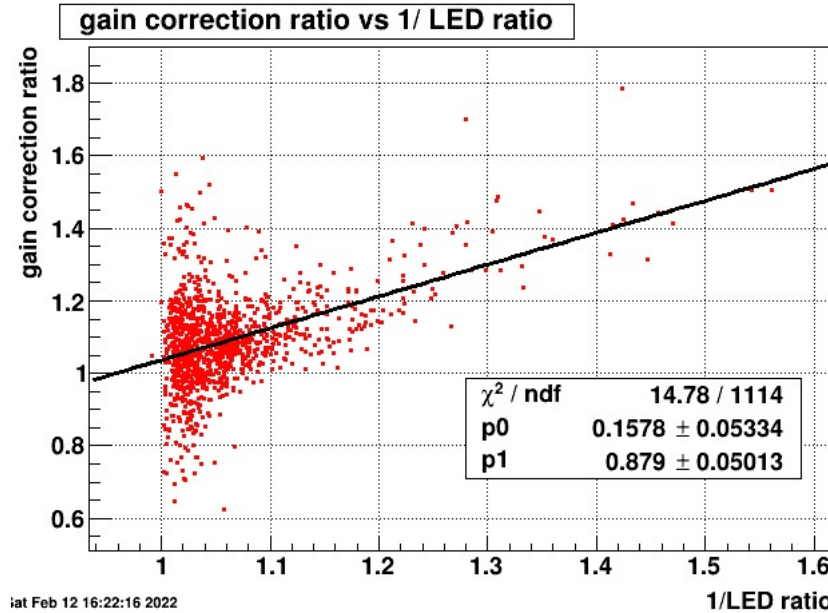
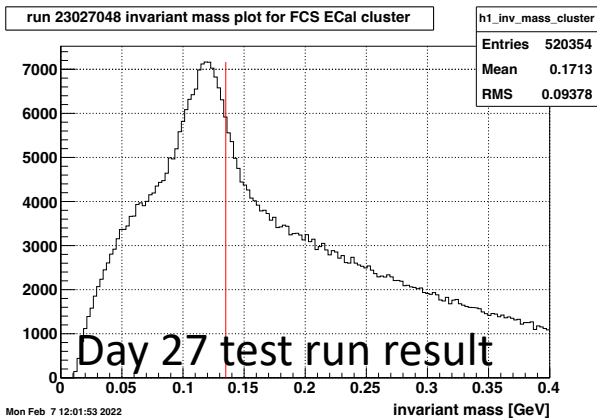
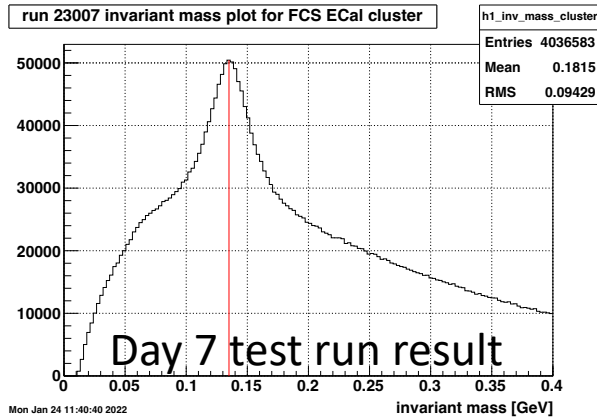
Ecal MIP candidate matching Hcal Mip Candidate shows peak around dY=0 (was off by ~7cm)

ECacl MIP matched to HCal MIP candidate



Width consistent with
Ecal width 5.5cm
Hcal width 10cm

Future Calibration run needs



Between day7 and day27:

1/LED ratio

vs

GainCorrectoon factor ratio
(Xilin)

- Light loss seen in LED is also confirmed by Pi0 analysis
- LED and EM shower (pi0) see similar amount of light loss (not trivial)
- But variation is large (cannot use LED ratio for tower by tower gain)
- ASAP, we need to install tower by tower gain (electronics gain file) for DEP (trigger)

- More low-luminosity MB trigger calibration runs?
- Or physics data taking is enough?

Summary & Conclusion

- Ecal Pi0 and Hcal MIP (Xilin & Navagyan)
- Gains for both Ecal and Hcal understood, in place, and in DB
- FCS Y position measured and now in MC Geometry & Offline DB
Confirmed by Ecal MIP & Hcal MIP correlation in DATA
- SiPM radiation damage is roughly as expected (Ananya)
Dark currents are still in ok range
Pedestal RMS shows no increase yet
- Ecal is losing lights (See Oleg's talk)
Ecal based trigger rates are dropping
Seen in both LED and pi0 analysis
- Hcal is NOT losing light
- ASAP, tower by tower gain (electronics gain file) for Ecal trigger to be installed
Or we may reduce attenuator for near beam towers
- Another low luminosity FCS gain calibration run?
- Waiting for tracking code to be in StEvent for Track-FCS matching

<https://www.star.bnl.gov/protected/spin/akio/fcs/jpsi/>

All events

Isolation & Ecal Cluster Size Cut

