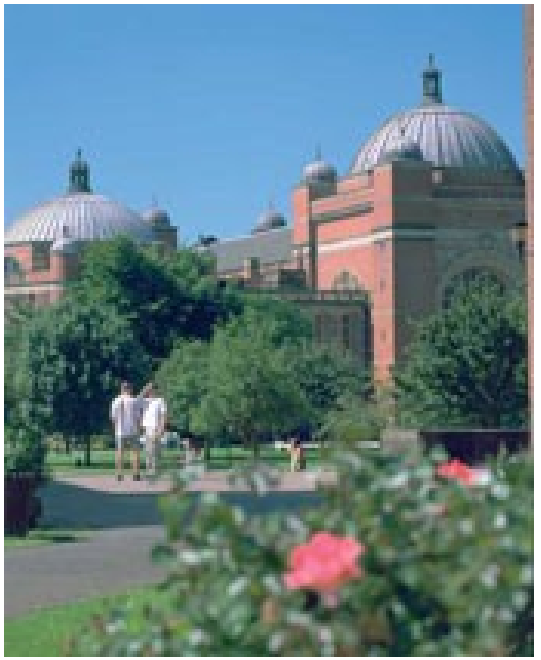
Calibration at the CAF

Juraj Bracinik, Peter Faulkner

L1Calo Joint Meeting, Cambridge
23rd March 2011

- Introduction
- Current Scheme
- Recent Developments
- Examples from recent runs
- Plans for the Future



Introduction

The calibration runs as taken by the shifter at Point 1 are written to castor. They are then analysed offline using the CERN Analysis Facility (CAF). This talk will describe the CAF analysis step.

Current Scheme at the CAF

Control Daemons

Processing of the calibration run data is controlled by three daemons running on an lxplus machine:

- RunsProvider
  - Looks for new calibration runs in COOL database
- JobOrganizer
  - Runs the Athena calibration jobs on CAF batch
- WOMonitor
  - Monitors and cleans up job output disk space

The daemons are all written in python – thanks to Damien Prieur and Veit Scharf.

Current Scheme at the CAF

RunsProvider

This monitors the COOL database looking for new calibration runs.
It has configurable 'listeners' looking for different types of run:

- LarEnergyScan, TileEnergyScan - Energy scans
- L1CaloPhos4Scan - Phos4 scans
- L1CaloStandalone - DAC scans, Pedestal runs
- LarCalibL1Calo,TileCalibL1Calo - Catchalls for anything else, eg. PMT scans

The run selection can be made on such things as RunType, Partition, Tier0Tag and number of events.
When a suitable run is found the details are written to an sqlite database.

Current Scheme at the CAF

JobOrganizer

This monitors the sqlite database for new runs found by RunsProvider. The Athena jobs selected to be run depend on which listeners they were found by:

- LarEnergyScan — RampMaker, D3PD
- TileEnergyScan — RampMaker, D3PD
- L1CaloPhos4Scan — Phos4ShapeMaker, D3PD
- L1CaloStandalone — CBNT (obsolete)
- LarCalibL1Calo — D3PD
- TileCalibL1Calo — D3PD

Jobs can be configured to be run automatically or held until released manually. Currently D3PD and CBNT jobs are held, as are RampMaker jobs with less than 1700 events.

Current Scheme at the CAF

JobOrganiser continued

If selected to be run the job is set up automatically from script and jobOption templates, the input files found and staged from castor, and the job submitted to lxbatch.
The sqlite database is updated with job details and status.

When the batch job is finished copies of the output files left by the job in the output disk area are put into castor.

A script written by Murrough monitors the sqlite database and output disk area and generates the web page of results:

http://atlas-l1calo.web.cern.ch/atlas-l1calo/calib/CalibRunsCAF.php

L1Calo Calibration Runs

Partition: Any **Tier0Tag:** Any **Analyses:** Any **Status:** Any

Columns: (•) All ( ) Fewer ( ) Custom [x] Events [x] RunType [x] Job Details

Date	Run	Events	Partition	RunType	Tier0Tag	Analyses	Status	Plots & Files	Job Details
2011-03-16 18:38	177757	1799	LArgL1CaloCombined	LarCalibL1Calo	L1CaloEnergyScan	LArL1CaloRampMaker	DONE/OK	Gains, Ramps, Bad	ic, io, L, O, A
2011-03-16 18:30	177756	1799	LArgL1CaloCombined	LarCalibL1Calo	L1CaloEnergyScan	L1CaloCalibD3PD	DONE/OK		ic, io, L, O, A
						LArL1CaloRampMaker	DONE/OK	Gains, Ramps, Bad	ic, io, L, O, A
2011-03-16 18:23	177754	1799	LArgL1CaloCombined	LarCalibL1Calo	L1CaloEnergyScan	L1CaloCalibD3PD	DONE/OK		ic, io, L, O, A
						LArL1CaloRampMaker	DONE/OK	Gains, Ramps, Bad	ic, io, L, O, A
2011-03-16 18:05	177752	1800	LArgL1CaloCombined	LarCalibL1Calo	L1CaloEnergyScan	LArL1CaloRampMaker	DONE/OK	Gains, Ramps, Bad	ic, io, L, O, A
2011-03-16 17:56	177749	1800	LArgL1CaloCombined	LarCalibL1Calo	L1CaloEnergyScan	LArL1CaloRampMaker	DONE/OK	Gains, Ramps, Bad	ic, io, L, O, A
2011-03-16 17:30	177746	1800	LArgL1CaloCombined	LarCalibL1Calo	L1CaloEnergyScan	LArL1CaloRampMaker	DONE/OK	Gains, Ramps, Bad	ic, io, L, O, A
2011-03-16 17:21	177745	1800	LArgL1CaloCombined	LarCalibL1Calo	L1CaloEnergyScan	LArL1CaloRampMaker	DONE/OK	Gains, Ramps, Bad	ic, io, L, O, A
2011-03-16 17:12	177743	1760	LArgL1CaloCombined	LarCalibL1Calo	L1CaloEnergyScan	LArL1CaloRampMaker	DONE/OK	Gains, Ramps,	ic, io, L, O, A

Current Scheme at the CAF

Athena job RampMaker

This is the job that processes the pulser runs to produce calibration gains. There are five steps to the job, 2 C++, 3 python:

- L1CaloRampMaker – Collects TT Et from ADC counts and corresponding CaloCells Et sum for each tower and energy step. Takes into account if gain one or default gains in calculating TT Et, and if Overlap EMB/EMEC or FCAL Low/High Eta in selecting CaloCells where there are two receivers.
- L1CaloLinearCalibration – Using the collection of Et's from step one, for each tower it extracts the mean and rms for each energy step. Plotting the TT Et means against Calo Et means a straight line is fitted and the resulting slope, offset, Chisquare and NDF written to a locally stored sqlite database (energyscanresults.sqlite).

Current Scheme at the CAF

RampMaker continued

- L1CaloDumpRampDataAlgorithm – Creates a ROOT file of graphs of the straight line fits (graphs.root) and an xml file of the fit results (rampdata.xml).
- PlotCalibrationGains – Produces eta/phi plots of resulting gains and reference comparisons (current values in COOL) and failed fits (Gains.ps/pdf).
- PlotRamps – Plots the graphs from step three in a more user-friendly way (rampPlots.ps/pdf).

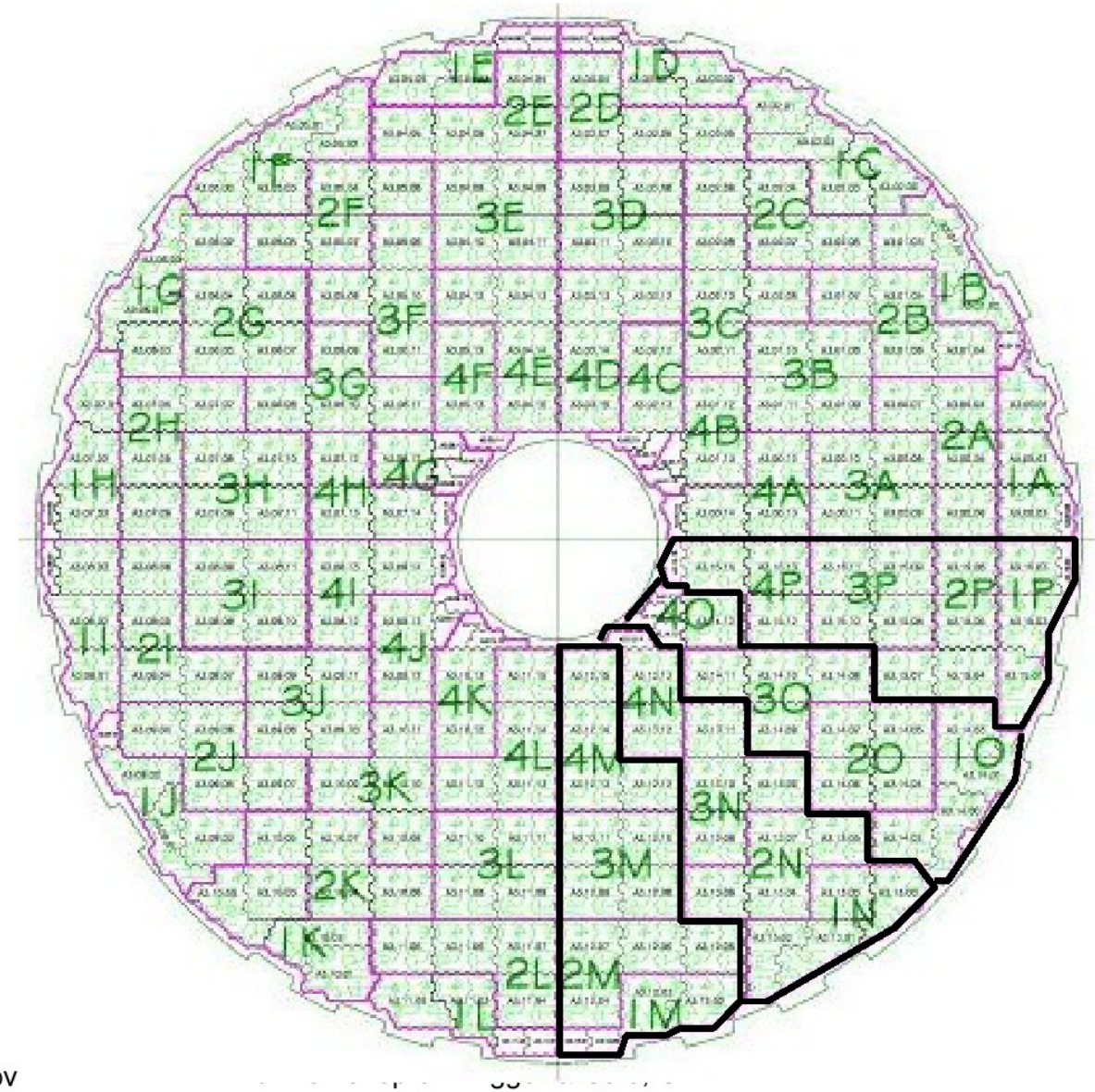
In addition a merging script takes the output from several runs (Tile, Calo Low eta, Calo High eta) and remaps from PPM channels to receiver channels to produce the list of gains to be updated in the COOL database.

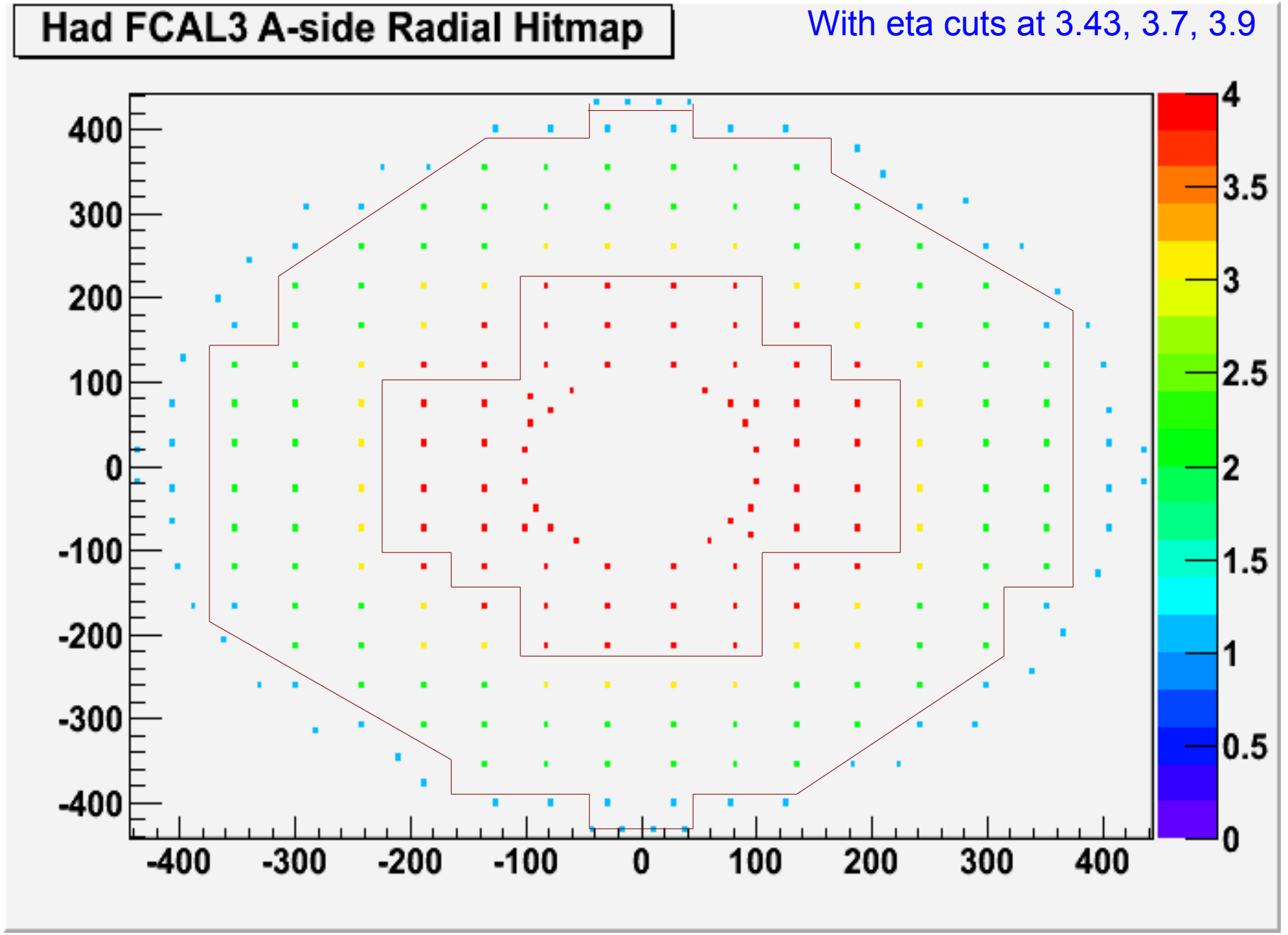
Recent Developments

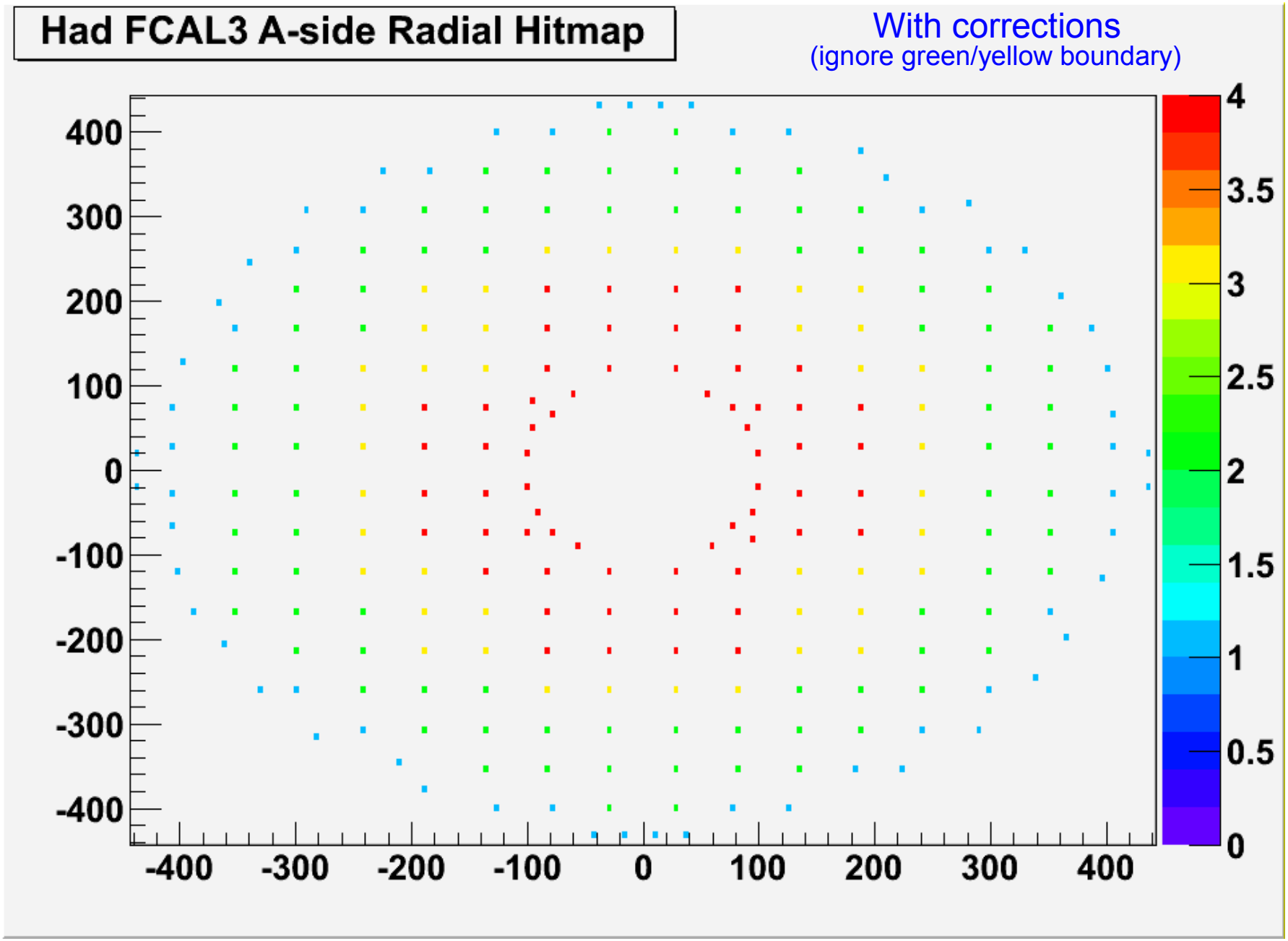
EMB/EMEC Overlap and FCAL 2/3

The towers in these regions have two receivers which need separate gains. Recently the RampMaker job and supporting tools have been updated to correctly match CaloCells to receivers for the type of pulser run taken (JM/JB/PF).
The next three slides show how the mappings were derived for FCAL3 (FCAL2 is similar). The first shows a radial map of FCAL3 with the sixteen phi bins given letters (A-P) and eta bins numbers (1-4), where two eta bins comprise one trigger tower. The second shows an x-y plot with simple eta cuts. Blue/yellow are LowEta, green/red HighEta. There are still some cells wrongly assigned. The third slide shows the plot with the same cuts but also with exceptions accounted for. The green/yellow boundary is taken care of by the TT to CaloCell mappings so should be ignored here.

FCAL 3


1E
1D
2E
2D
1F
1C
2F
3E
3D
2C
1G
1B
2G
3F
3C
2B
3G
4F
4E
4D
4C
3B
2H
4B
2A
1H
3H
4H
4G
4A
3A
1A
3I
4I
4P
3P
2P
1P
1I
2I
4J
4O
3J
4K
4N
3O
2J
4L
4M
2O
1O
1J
3K
3N
3L
3M
2N
2K
1N
1K
2L
2M
1L
1M


Had FCAL3 A-side Radial Hitmap
With eta cuts at 3.43, 3.7, 3.9
400
300
200
100
0
-100
-200
-300
-400
-400
-300
-200
-100
0
100
200
300
400
4
3.5
3
2.5
2
1.5
1
0.5
0



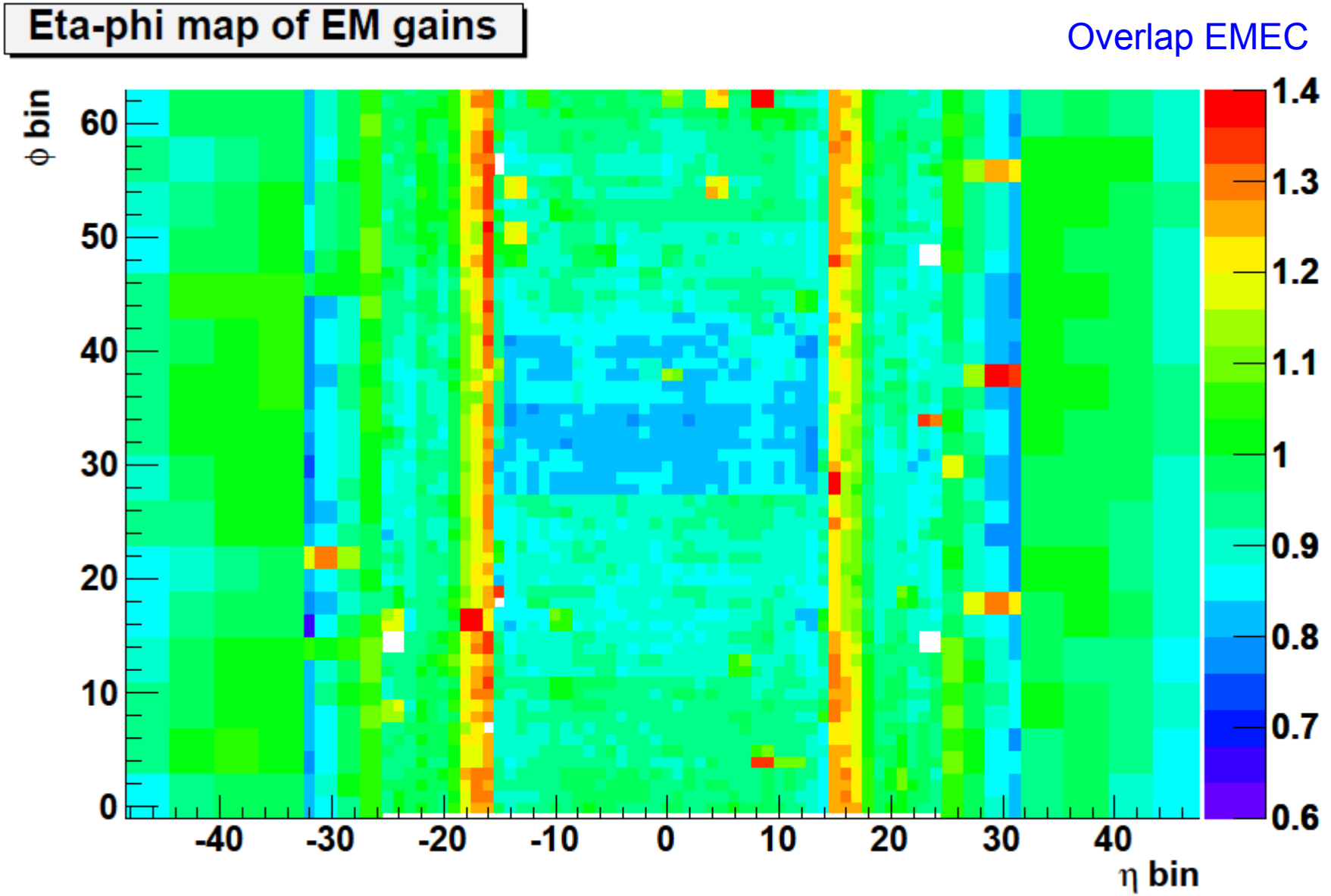
These mappings are implemented but will be checked more thoroughly at the next technical break.

Examples from Recent Runs

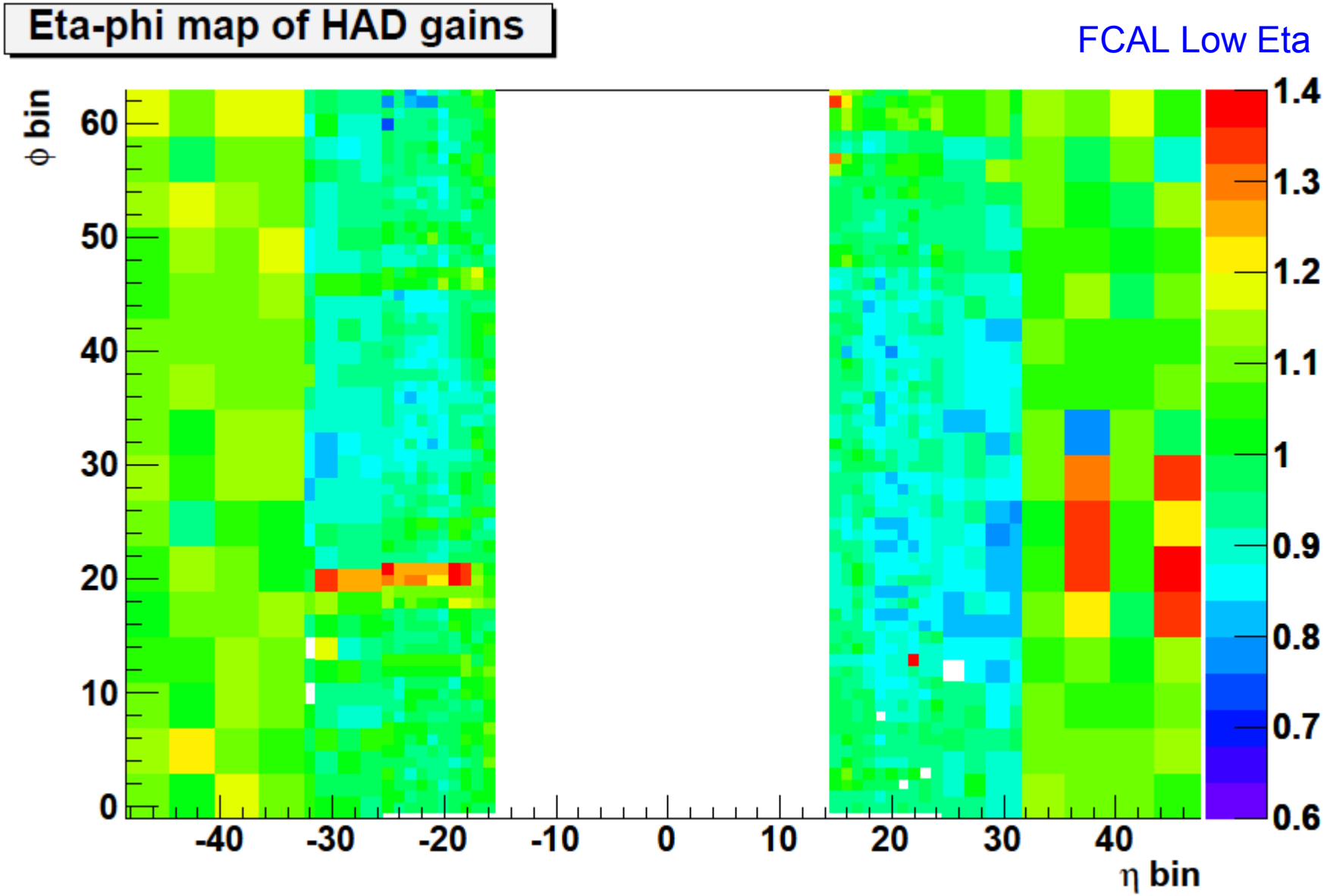
This mechanism has been recently used to update receiver gains for 2011 running. On the following slides you can see the gains currently used.

These are followed by plots showing high voltage corrections. In these there is a good correlation between areas with reduced HV and areas where high gains are needed.

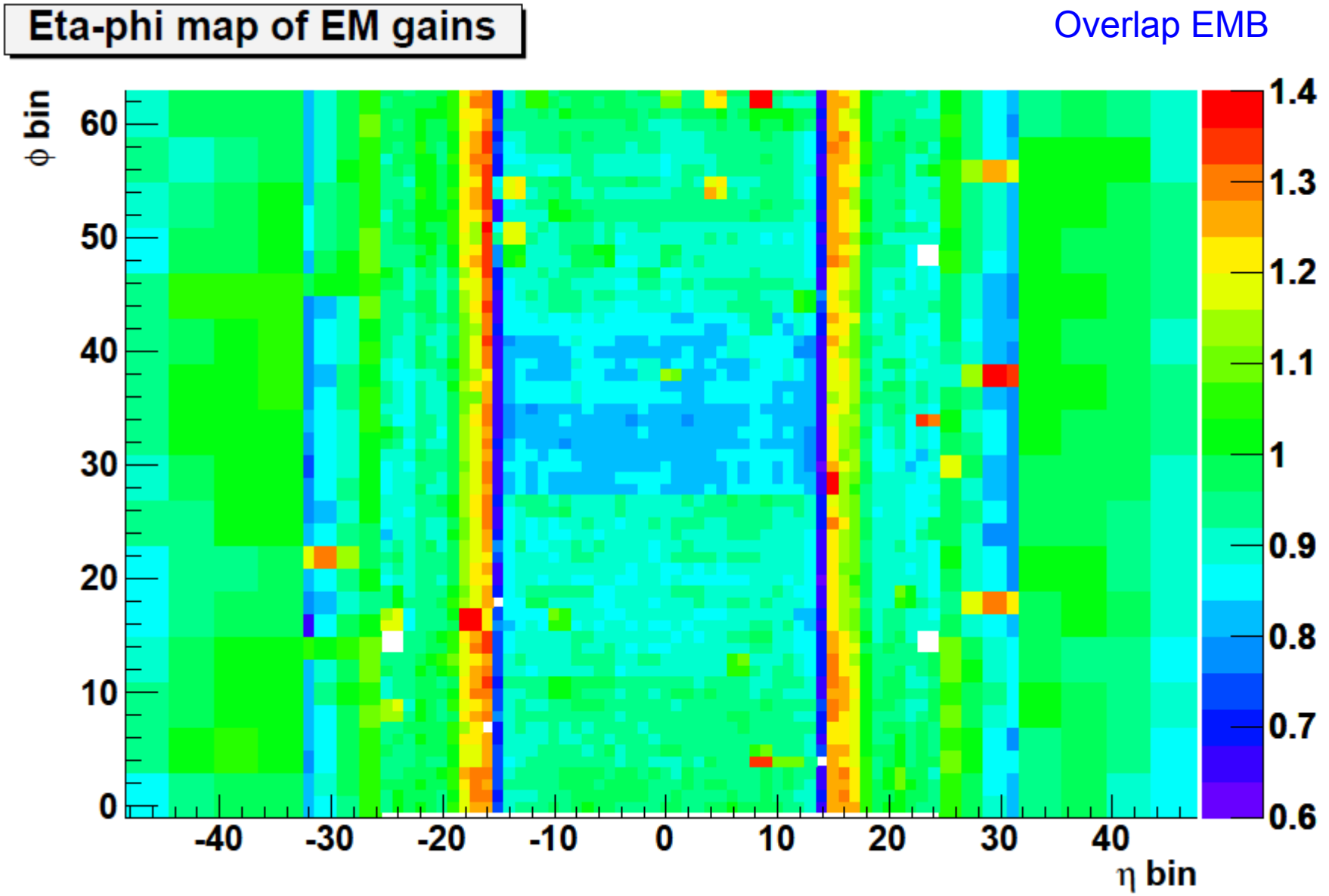
Gains from run 177754



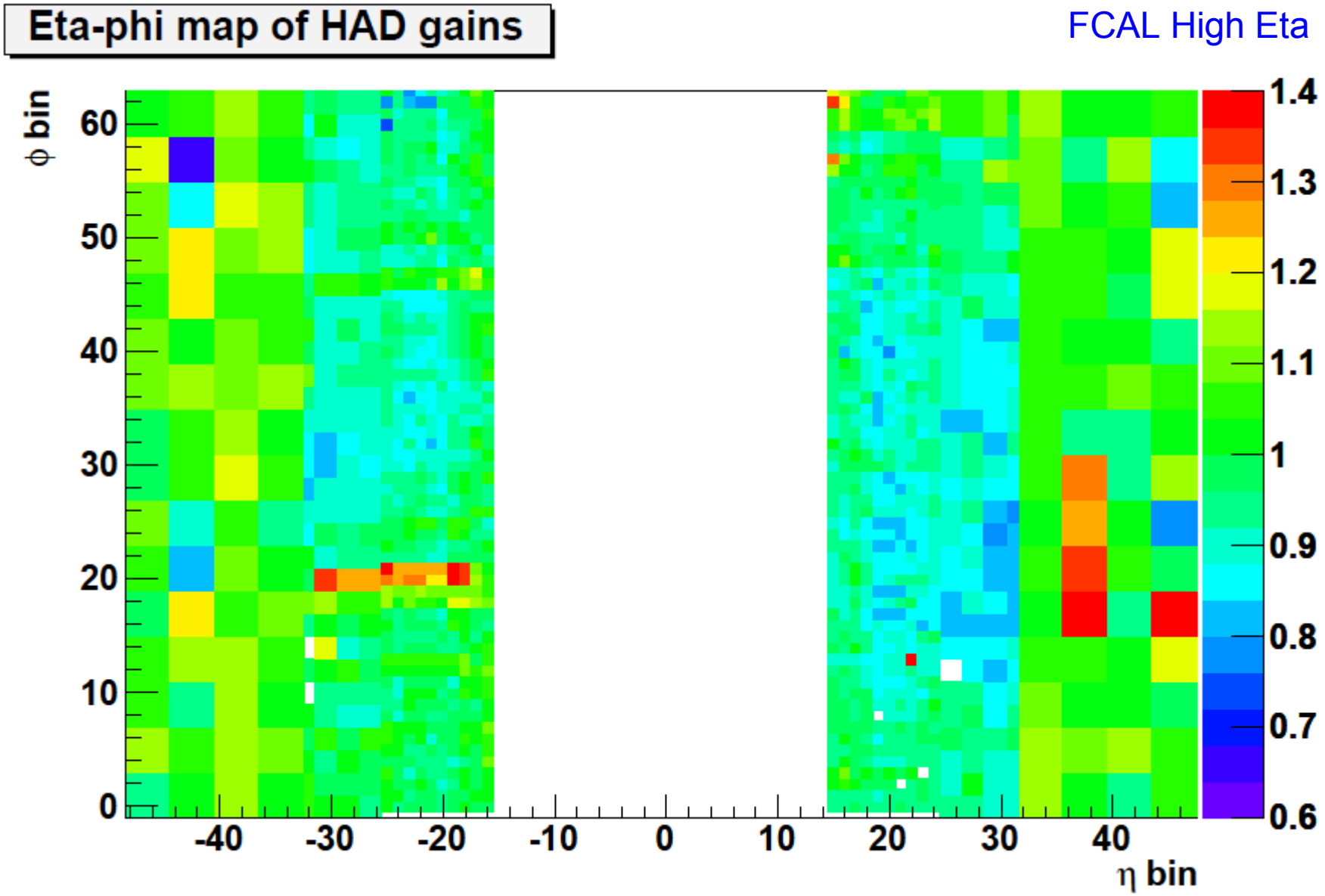
Gains from run 177754



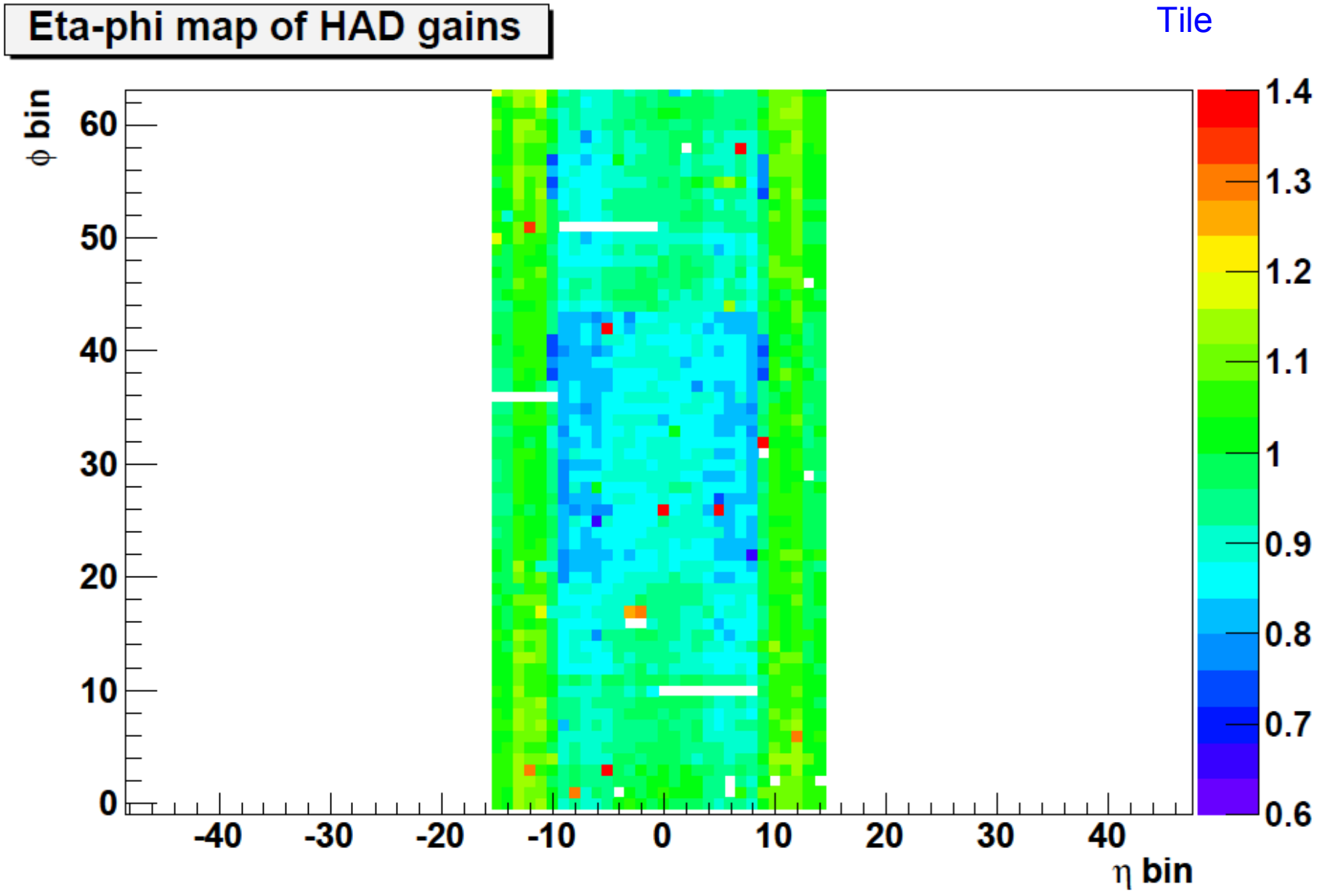
Gains from run 177756

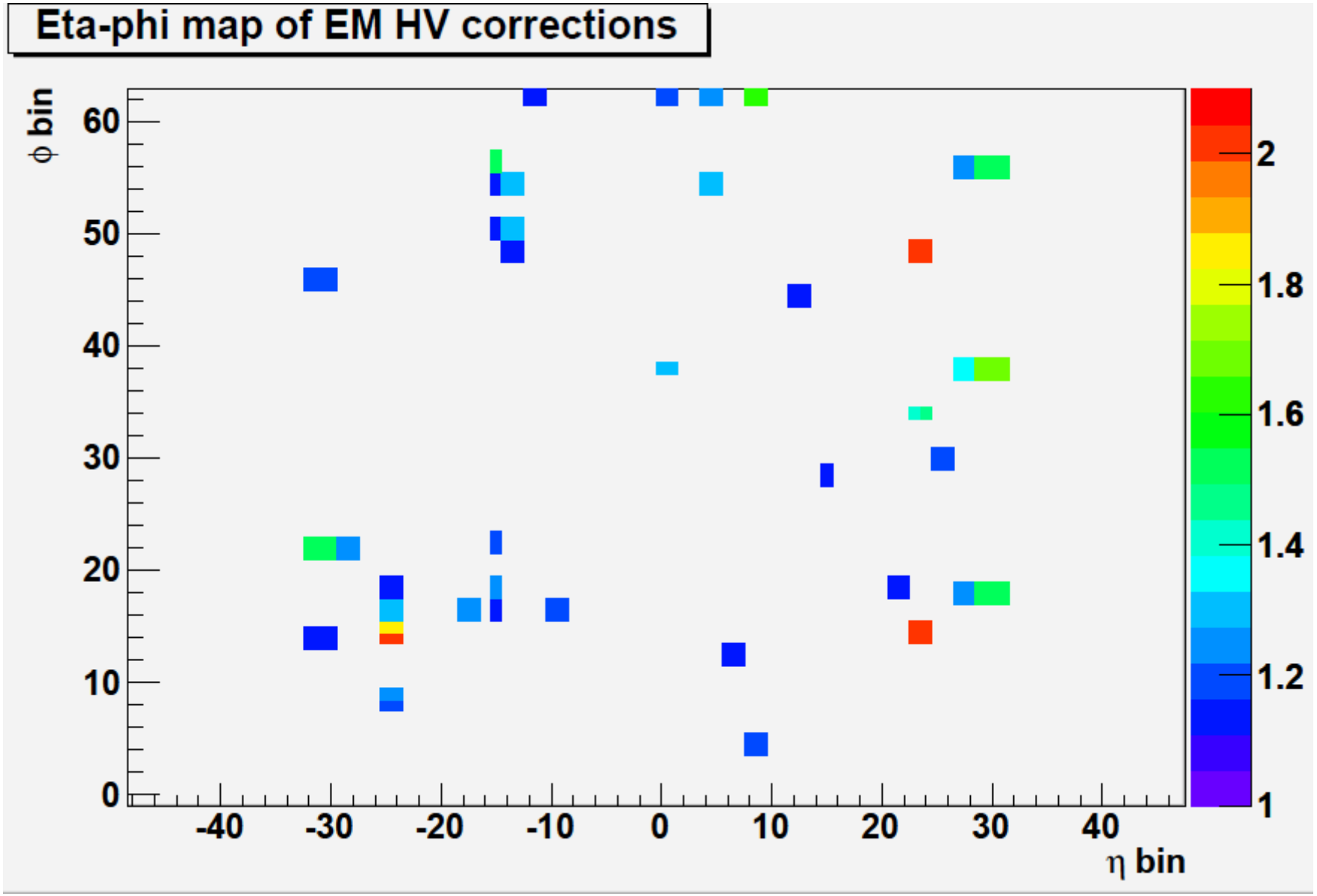


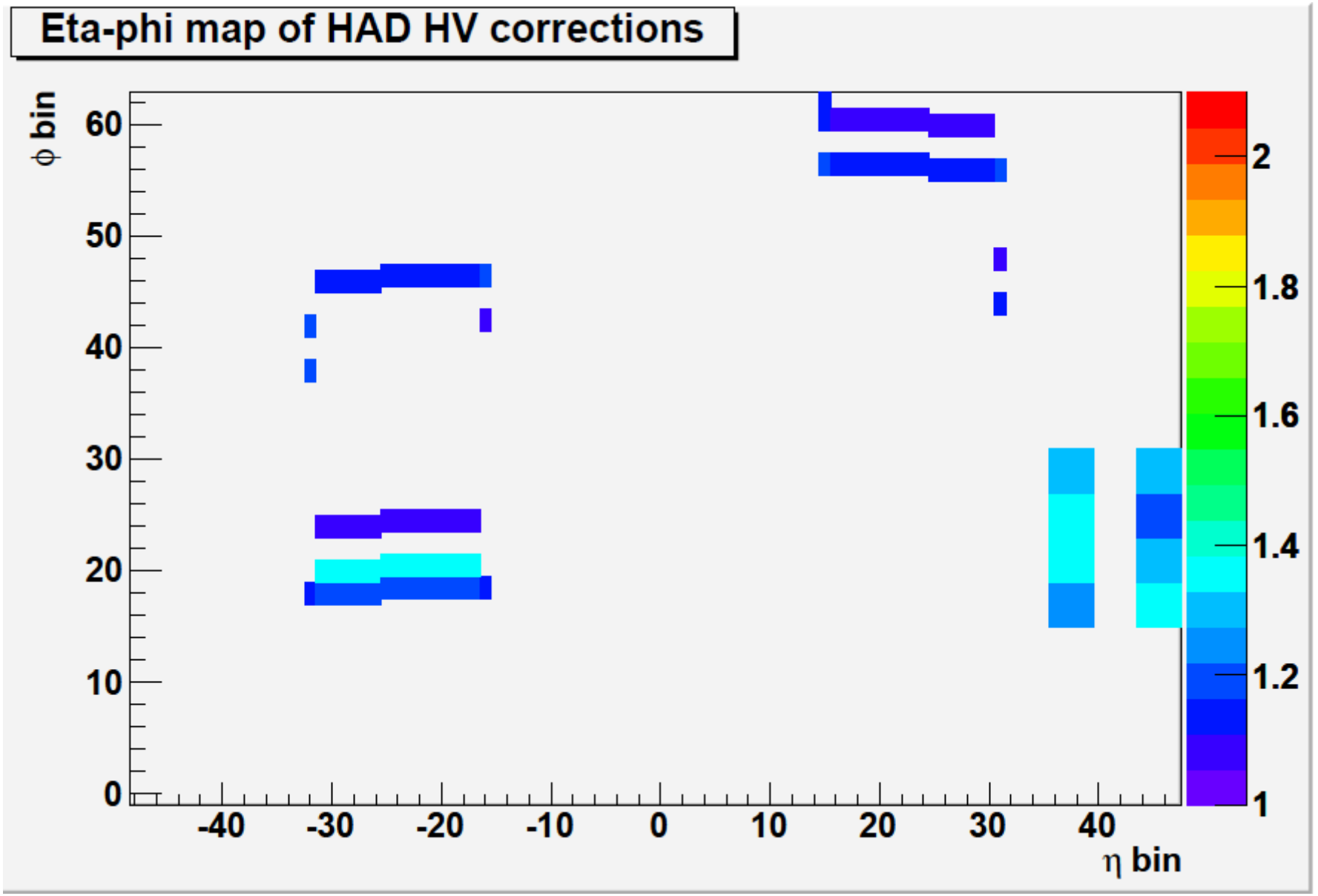
Gains from run 177756



Gains from run 176390




Eta-phi map of EM HV corrections
ϕ bin
60
50
40
30
20
10
0
-40
-30
-20
-10
0
10
20
30
40
η bin
2
1.8
1.6
1.4
1.2
1


Eta-phi map of HAD HV corrections
φ bin
60
50
40
30
20
10
0
-40
-30
-20
-10
0
10
20
30
40
η bin
2
1.8
1.6
1.4
1.2
1

Plans for the Future

Some improvements currently planned for the gains analysis:

- Put HV corrections into sqlite file – at the moment have to get separately from D3PD file.
- Get error codes from CaloCells – not used at present.
- Upload gains sqlite file to oracle so can monitor changes over time.
- Flag bad runs which should be ignored.
- Add monitoring/validation plots to Athena step for extra information/diagnostics.
- Add Gain Strategy flag to sqlite file and web page.

Conclusion

The CAF analysis machinery is working well and producing results in good time.
Further changes are planned to improve it still more.