



**Calorimeter      Software**  
**Status      &      News**

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- New features in CaloSoftware
  - Python configurable in CaloReco/CaloPIDs/CaloAssociators/CaloMoniDst
    - See Vanya's talk
  - Fast clusterisation tool (Dmitry, Victor)
    - Fast production of CaloCluster from LOCaloCandidate (LOCalo2Calo tool)
    - Partial decoding of Calo data
    - implemented in HLT1 calo-Alleys (Mariusz)

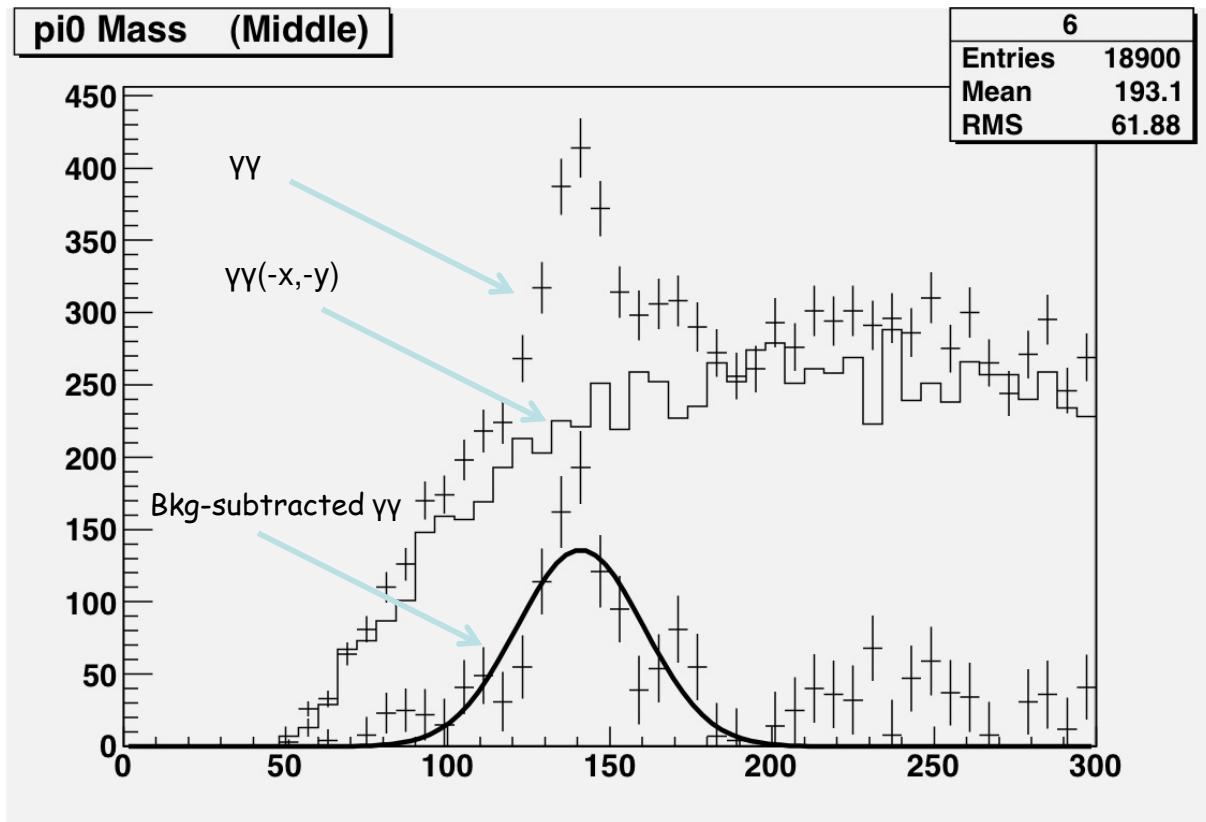


- New features in Calo Software (cont')

- **CaloMoniDst** :

- New histos for DataQuality stream :

- combinatorial background and bkg-subtraction for resolved  $\pi^0$  mass distribution
- combinatorial evaluated by combining  $\gamma\gamma(x \rightarrow -x, y \rightarrow -y)$  (Albert et al.)





- Coming soon :

- new Calo2MC Tool in preparation

- help to digest Calo object ->MCParticle association

- provides useful methods to identify/access MCParticles contributing to digit/cluster/calohypo/ProtoP/Particle
- provides matching quality estimator, MC contribution weight to cluster, ...
- provides cluster category according to MC origin (Photon, Pi0, Hadronic fragments, ...)
- provides detailed (text) description of the MC content of Calo objects, e.g.

```
----- Calo MC contribution to 1 cluster(s) -----  
---- Total calo energy deposit : 1719.93 MeV  
-- 0.2 % from : eta -> pi0 -> gamma -> e- -> gamma ( 0.0 % of the MC particle energy contributing )  
-- 0.3 % from : eta -> pi- ( 0.1 % of the MC particle energy contributing )  
-- 0.6 % from : K0 -> K_S0 -> pi- ( 0.1 % of the MC particle energy contributing )  
-- 3.6 % from : K- ( 0.5 % of the MC particle energy contributing )  
-- 8.7 % from : omega(782) -> pi- ( 1.2 % of the MC particle energy contributing )  
-- 81.6 % from : omega(782) -> pi0 -> gamma ( 80.5 % of the MC particle energy contributing )
```

- To be used in DaVinci TupleTool's (rewrite TupleToolPi0Info, ...)  
and also to simplify CaloAssociators algorithms (Digit2MC, Cluster2MC, NeutralPP2MC)



- Pending problem
  - related to CaloHypo (on DST) -> CaloCluster (NOT on DST) smartReference
    - DC06 backward compatibility broken for SplitPhotons -> SplitClusters
      - Code producing SplitClusters has changed since DC06 production -> SmartRef broken
    - Not really a problem - SplitPhoton->SplitCluster SmartRef. not used in the software
      - backward compatibility could be restored anyway (to be checked)
    - Would be problematic if this occur for Photon/Electron/MergedPi0 CaloHypo
      - CaloHypo->CaloCluster->CaloDigit SmartRef chain used to built MC association on-Demand from the (MCParticle,CaloDigit) relation table
  - Proposal (to avoid problem in the future) :
    - store (MCParticle, CaloHypo) relation table on (MC)DST
      - Hypo->Cluster SmartRef would not longer be used except for expert usage.
      - ProtoP->MC association would need to be adapted to use this table
    - CaloHypo2MCAlg producing such table does not exist yet
      - can be easily built using the new Calo2MCTool (see previous slide)
    - (MC)DST size increase to be evaluated
      - to be done soon



## • Online software (Calibration Farm)

### • New Orwell version v1r8

- include pre-calibration tools based on the 'Energy-Flow' method (Aurelien)
- include Automatic Analysis of Calibration Farm (LED data) histograms
- procedure basically commissioned during summer
- Produce regular Calorimeter status (Pedestal follow, dead/noisy channel, gain variation, ...)
- + summary histograms
- Interface to condition DataBase under discussion
- final implementation in Calibration Farm soon

```

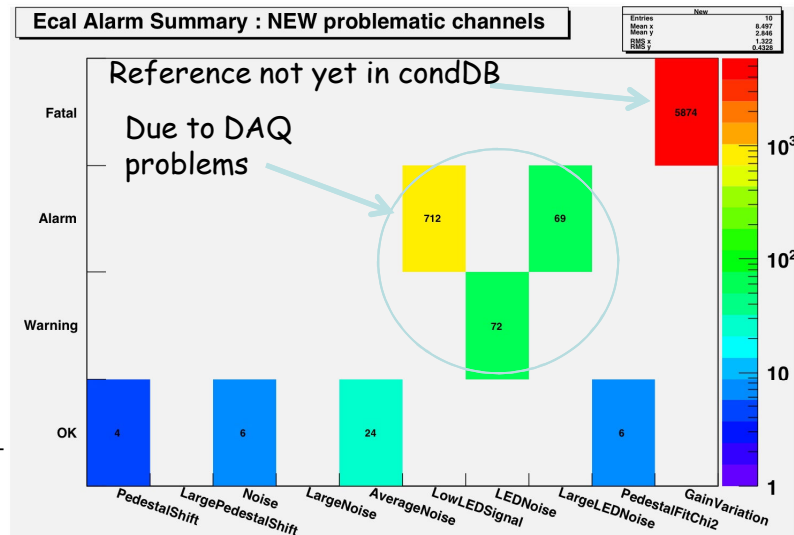
-----+-----
|                               |
|      monitor : EcalAnalysis.PedestalShift |
| 'Pedestal Mean for PMTs channels outside the [-0.3 , 1] range' |
| NO Associated condDB Quality mask - report only NEW problems |
| analyzing the Profile histo '/EcalCalib/Profile/Pedestal/1' |
|-----+-----|
| OK | 4 / 6016   NEW Ecal   PMT channels outside the expected |
| |         average over 6016 PMT : 0.409 |
| |         spread over 6016 PMT : 0.074 |
| |         spread/average over 6016 PMT : 18.010 % |
|-----+-----|

```

```

-----+-----
|                               |
|      monitor : EcalAnalysis.Noise |
| 'Pedestal RMS for PMT channels outside the [0.8 , 2] range' ( [0 , 30] for PINs ) |
| Associated condDB Quality mask : 0x0004 |
| analyzing the Profile histo '/EcalCalib/Profile/Pedestal/1' |
|-----+-----|
| OK | 6 / 6140   NEW Ecal PMT or PIN channels outside the expected |
| OK | 0 / 6140   KNOWN Ecal PMT or PIN channels outside the expected |
| OK | 0 / 6140 RESURRECTED Ecal PMT or PIN channels within the expected |
| |         average over 6016 PMT : 1.223 ( 124 PIN : 2.590 ) |
| |         spread over 6016 PMT : 0.064 ( 124 PIN : 0.697 ) |
| |         spread/average over 6016 PMT : 5.263 % ( 124 PIN : 26.931 % ) |
|-----+-----|

```





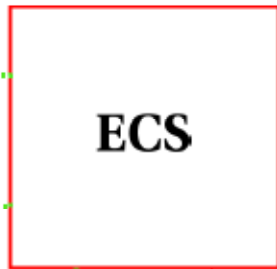
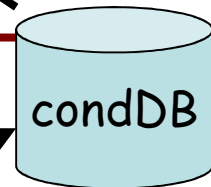
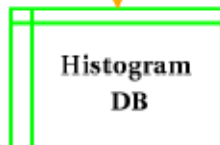
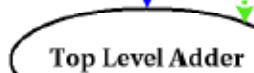
# Calibration/Monitoring architecture

Similar for CF and MF Histos

## Orwell/CaloCalib

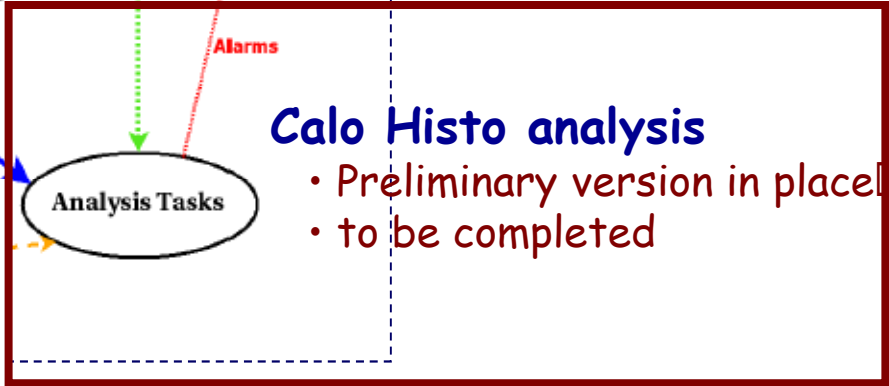
- basically commissioned
- need to be tuned
- initial values in condDB

under preparation *Online Histogram Flow*



## PVSS interface

- Under discussion
- Jean-Luc Panazol will take care



## Calo Histo analysis

- Preliminary version in place
- to be completed

From Giacomo Graziani



# Miscalibration exercise

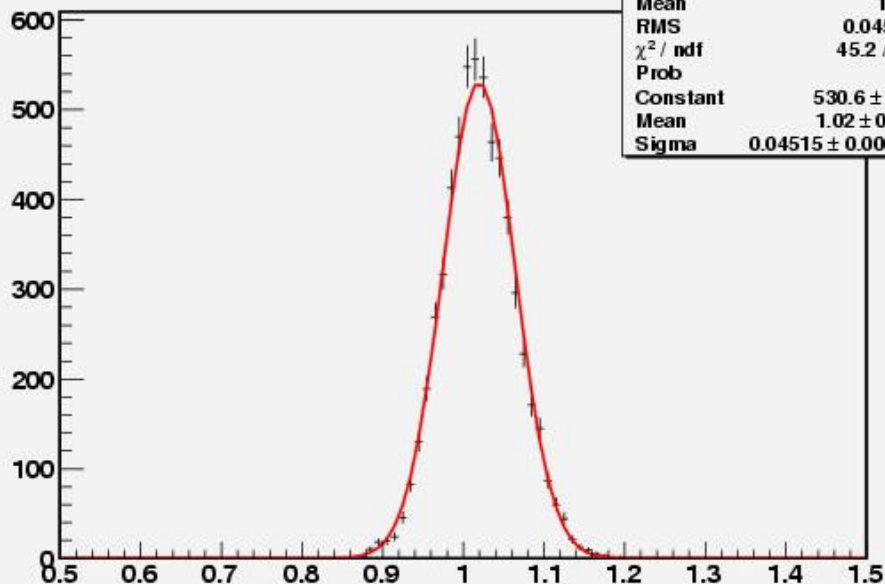
- Miscalibrated data production
  - 'Approximate' miscalibration reprocessing existing data
    - Fast procedure but reprocessing already digitized data gives approximate miscalibration
    - no miscalibration for the 1bit Spd
    - 0-suppression/saturation effect for Prs/Xcal
  - Sample reprocessed before summer:
    - 10M Fest09 minibias events (run 4834 - 654k L0-filtered)
    - Miscalibration : 10% RMS miscalibration in Ecal, Hcal and Prs + 11 dead channels in each.
  - Aurélien ran the Eflow method on the 10M 'miscalibrated' minibias
    - Eflow method : assume Energy deposit continuity with neighbors cells
      - compare energy deposit with neighbors average
      - expect ~5% (pre)calibration with this method (need few Millions of data)
      - Accurate method (e/p, pi0) should then reach the <~1% level calibration
    - Blind test : compare re-calibration coefficients (Aurélien) to initial miscalibration (OD)
    - Results on next slides
- Production of 'correctly' miscalibrated data
  - 200M miscalibrated data recently produced
  - to be used to develop/validate the offline fine energy calibration procedure (e/p, pi0 mass)





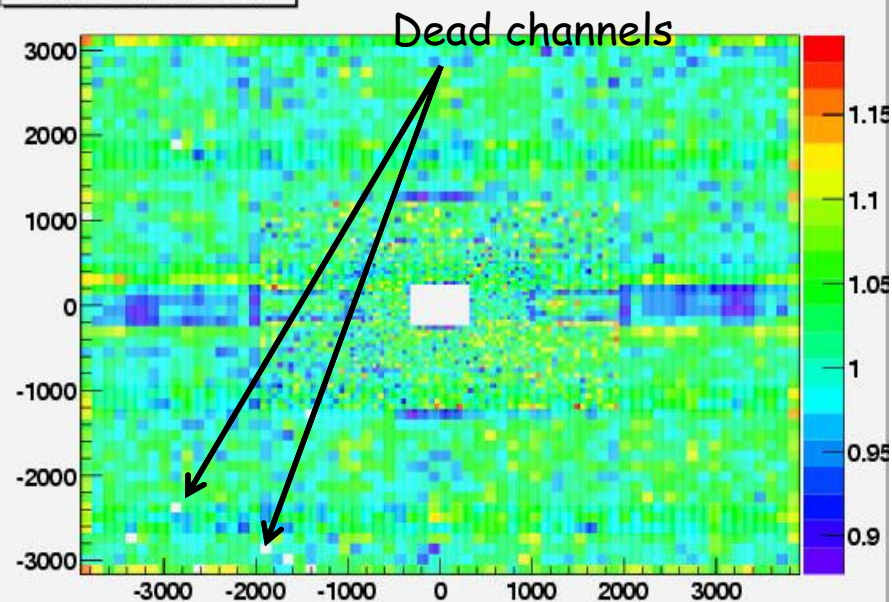
# Calibration blind test : Ecal

Ecal Coeff / DBCoeff



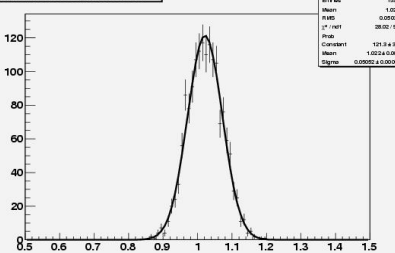
EcalRatio	
Entries	6016
Mean	1.02
RMS	0.04502
$\chi^2 / \text{ndf}$	45.2 / 97
Prob	1
Constant	$530.6 \pm 8.4$
Mean	$1.02 \pm 0.00$
Sigma	$0.04515 \pm 0.00041$

Ecal Coeff / DBCoeff



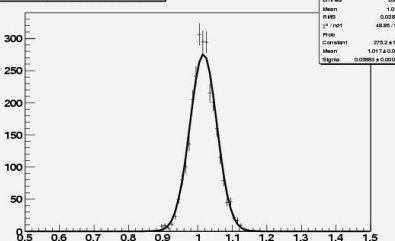
Region	Bias	Sigma	$\chi^2/\text{N dof}$
Inner	+2.2%	5.0%	28/97
Middle	+2.3%	4.8%	31/97
Outer	+1.7%	3.9%	49/97
All	+2.0%	4.5%	45/97

InnerEcal Coeff / DBCoeff



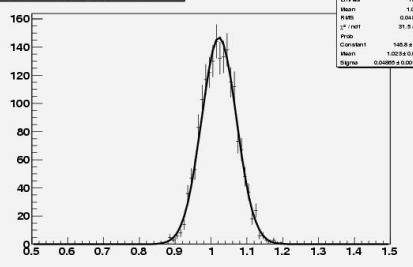
EcalRatio	
Entries	1562
Mean	1.023
RMS	0.04692
$\chi^2 / \text{ndf}$	28.62 / 97
Prob	1
Constant	$121.3 \pm 3.8$
Mean	$1.023 \pm 0.001$
Sigma	$0.04692 \pm 0.00041$

OuterEcal Coeff / DBCoeff



EcalRatio	
Entries	2069
Mean	1.017
RMS	0.03973
$\chi^2 / \text{ndf}$	48.89 / 97
Prob	1
Constant	$375.0 \pm 6.8$
Mean	$1.017 \pm 0.001$
Sigma	$0.03973 \pm 0.00041$

MiddleEcal Coeff / DBCoeff

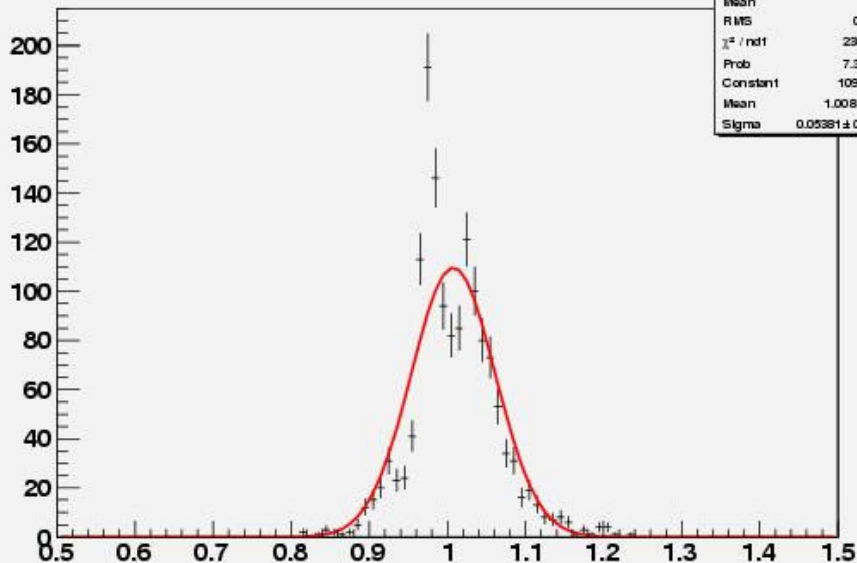


EcalRatio	
Entries	1762
Mean	1.023
RMS	0.04692
$\chi^2 / \text{ndf}$	31.9 / 97
Prob	1
Constant	$148.8 \pm 4.1$
Mean	$1.023 \pm 0.001$
Sigma	$0.04692 \pm 0.00041$



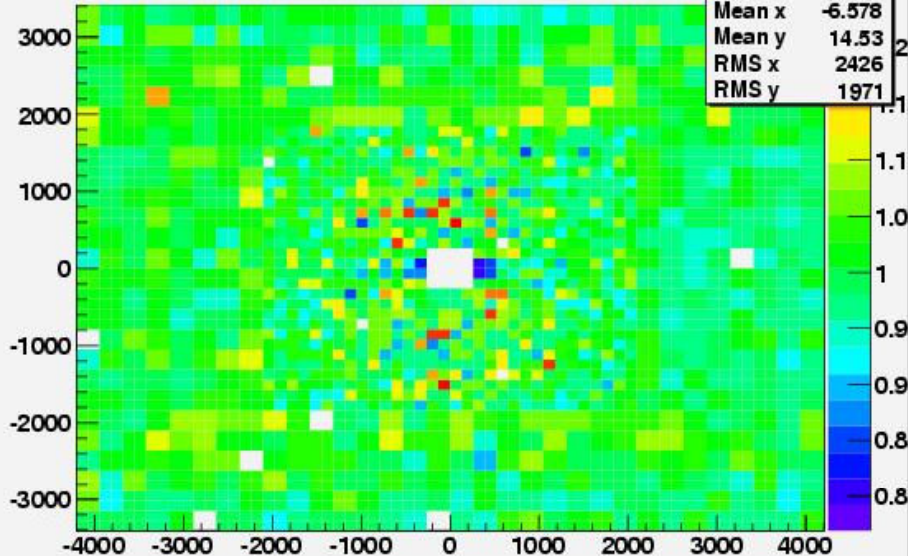
# Calibration blind test : Hcal

Hcal Coeff / DBCoeff



HcalRatio	
Entries	1488
Mean	1.008
RMS	0.05376
$\chi^2 / \text{ndf}$	230.4 / 97
Prob	7.344e-13
Constant	109.5 ± 3.5
Mean	1.008 ± 0.001
Sigma	0.05381 ± 0.00099

Hcal Coeff / DBCoeff



HcalRatio2D	
Entries	3312
Mean x	-6.578
Mean y	14.53
RMS x	2426
RMS y	1971

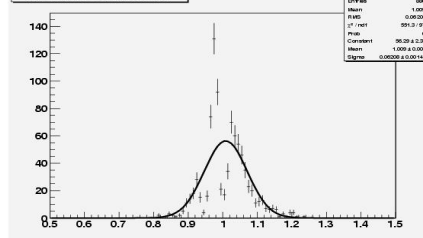
Region	Bias	Sigma	$\chi^2/\text{N dof}$
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Inner	+0.9%	6.2%	555/97
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Outer	+0.5%	3.9%	32/97
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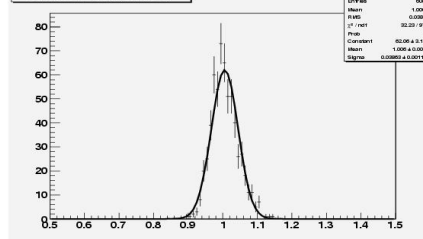
All	+0.8%	5.4%	230/97
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InnerHcal Coeff / DBCoeff



HcalRatio	
Entries	800
Mean	1.008
RMS	0.06203
$\chi^2 / \text{ndf}$	391.3 / 97
Prob	5.1
Constant	90.20 ± 2.33
Mean	1.008 ± 0.002
Sigma	0.06203 ± 0.00142

OuterHcal Coeff / DBCoeff



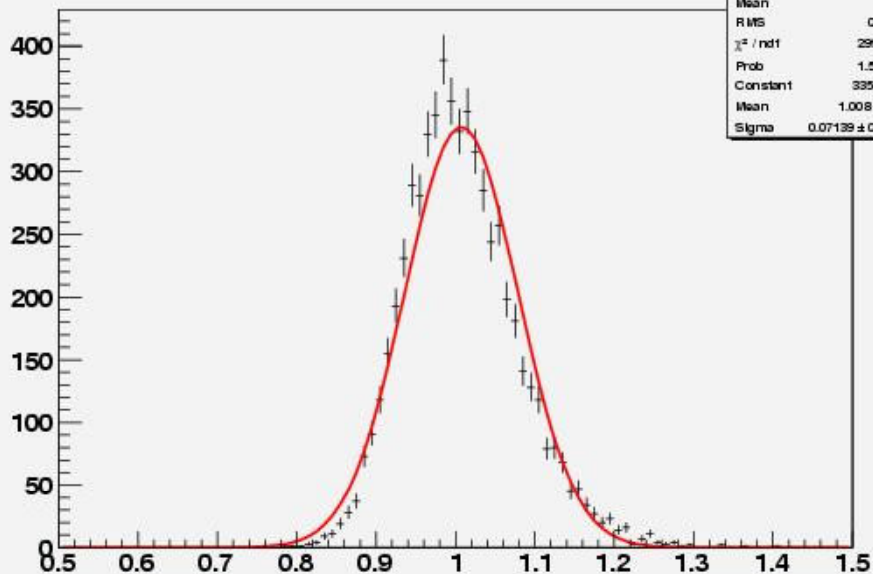
HcalRatio	
Entries	600
Mean	1.008
RMS	0.03980
$\chi^2 / \text{ndf}$	32.20 / 97
Prob	1
Constant	82.20 ± 2.10
Mean	1.008 ± 0.002
Sigma	0.03980 ± 0.00111



# Calibration blind test : Prs

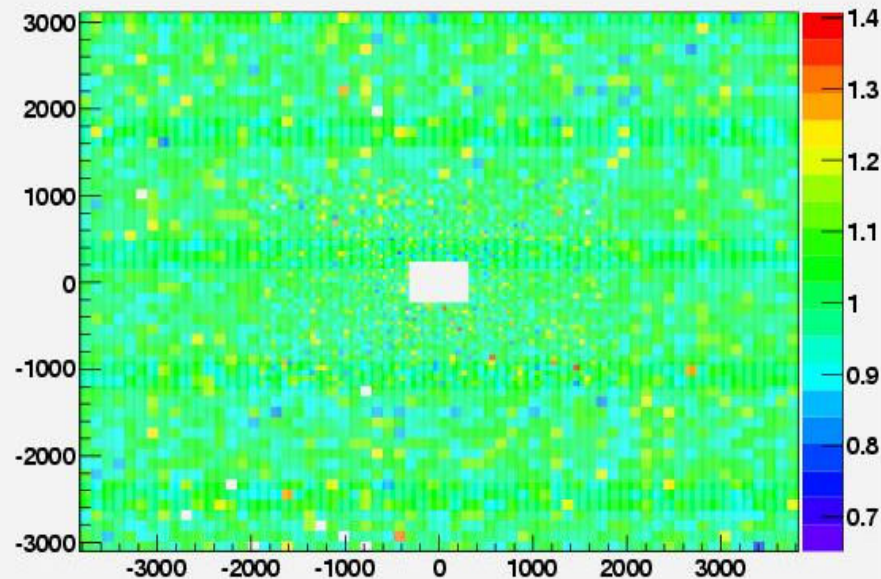


Prs Coeff / DBCoeff



PrsRatio	
Entries	6016
Mean	1.008
RMS	0.07132
$\chi^2 / \text{ndf}$	299.5 / 97
Prob	1.533e-22
Constant	335.5 ± 5.3
Mean	1.008 ± 0.001
Sigma	0.07139 ± 0.00065

Prs Coeff / DBCoeff



Region	Bias	Sigma	$\chi^2/\text{Ndf}$
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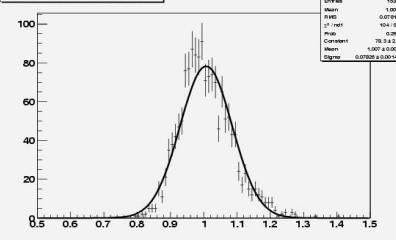
Inner	+0.7%	7.8%	104/97
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Middle	+0.9%	7.2%	138/97
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Outer	+0.7%	6.7%	166/97
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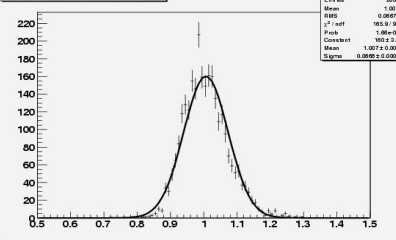
All	+0.8%	7.1%	300/97
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InnerPrs Coeff / DBCoeff



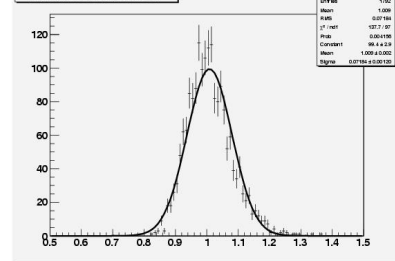
PrsRatio	
Entries	100
Mean	1.007
RMS	0.07052
$\chi^2 / \text{ndf}$	104 / 97
Prob	0.098
Constant	78 ± 2.4
Mean	1.007 ± 0.002
Sigma	0.0705 ± 0.0011

OuterPrs Coeff / DBCoeff



PrsRatio	
Entries	268
Mean	1.007
RMS	0.06971
$\chi^2 / \text{ndf}$	166 / 97
Prob	1.58e-25
Constant	160 ± 2.8
Mean	1.007 ± 0.001
Sigma	0.0697 ± 0.0007

MiddlePrs Coeff / DBCoeff



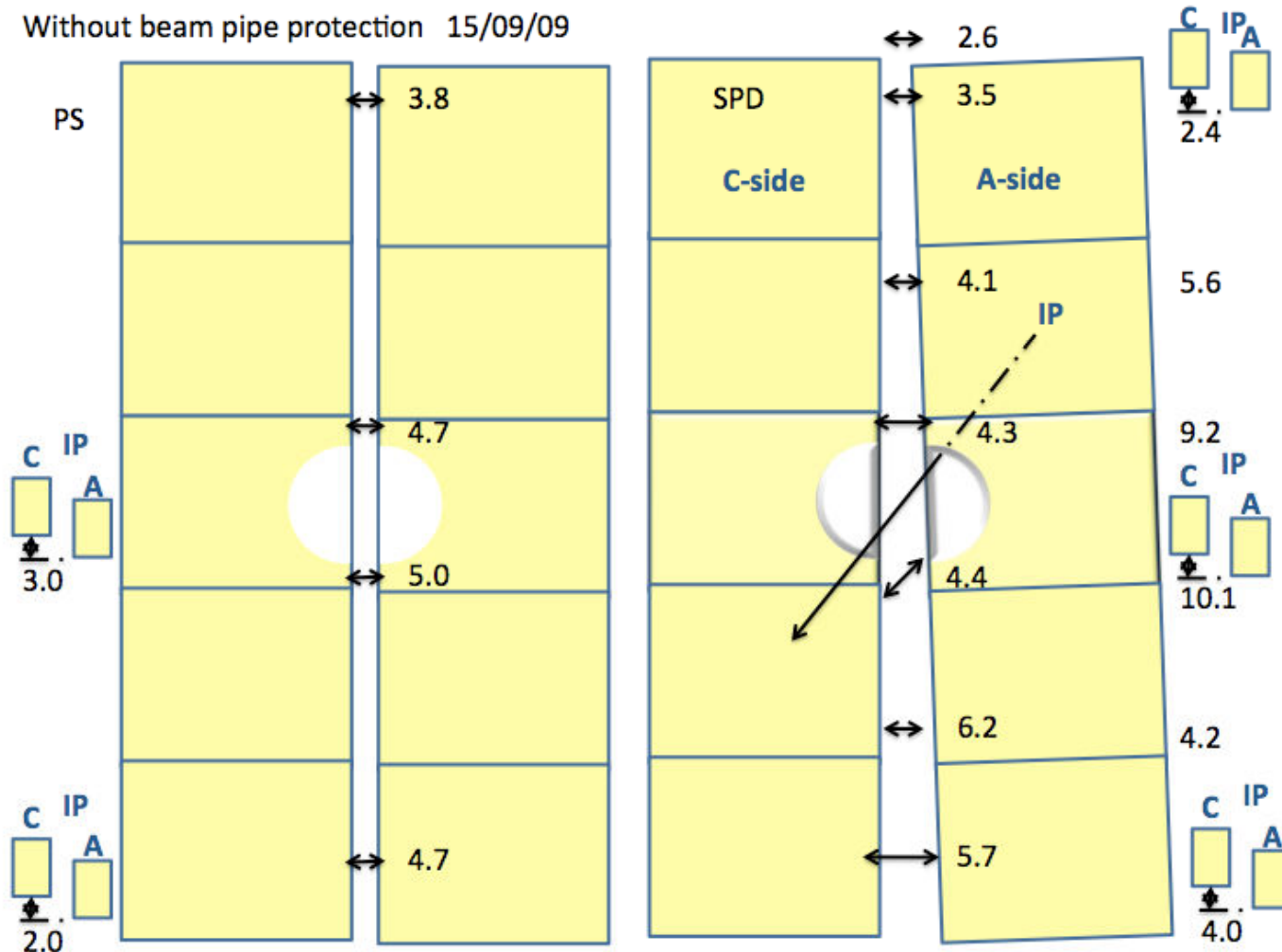
PrsRatio	
Entries	132
Mean	1.009
RMS	0.0716
$\chi^2 / \text{ndf}$	138 / 97
Prob	0.00008
Constant	98 ± 4.3
Mean	1.009 ± 0.002
Sigma	0.0716 ± 0.0012



# Other issues

- Alignment data survey
  - Prs/Spd position measured after final 2009 closure

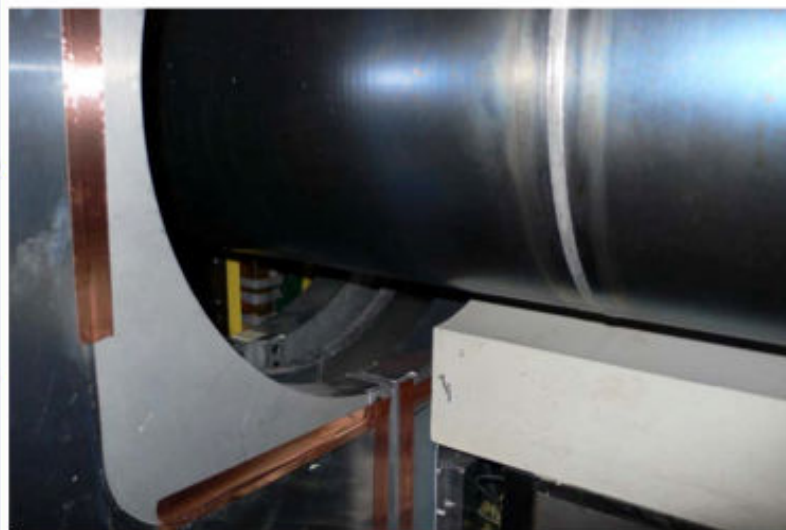
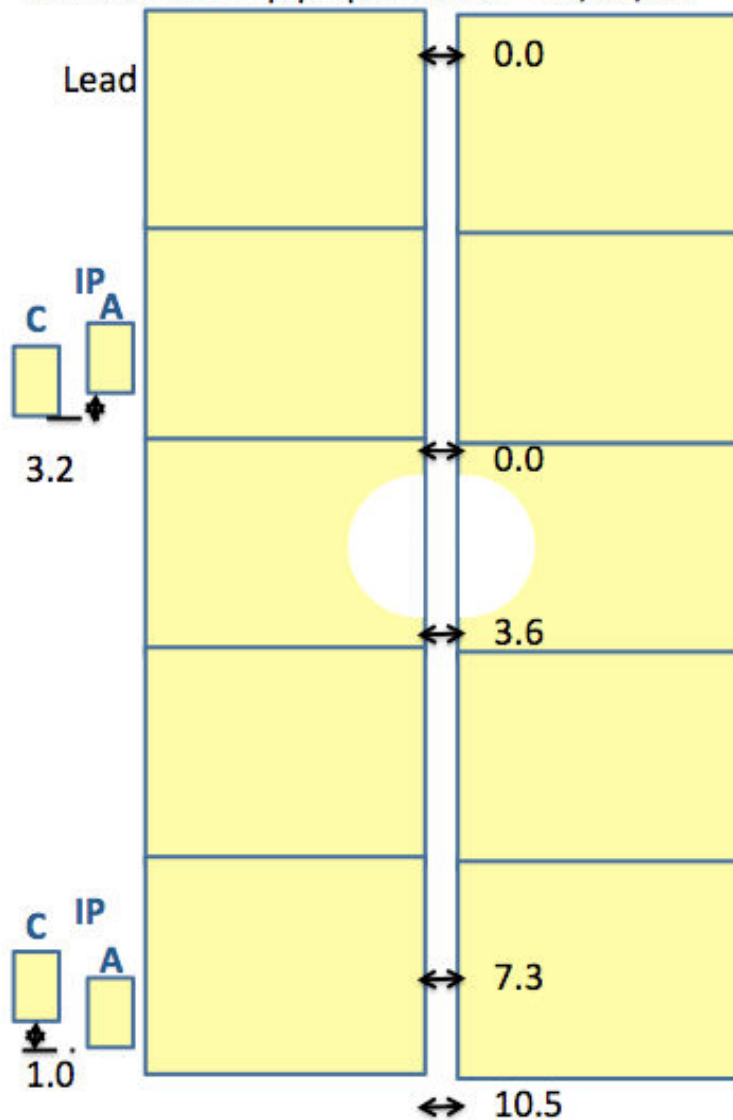
Without beam pipe protection 15/09/09





# Other issues

Without beam pipe protection 15/09/09



To be implemented in alignment condition



# Conclusion

- Calorimeter software essentially ready to play with first data
  - basic monitoring essentially in place
  - calibration with LED being completed
  - reconstruction, PID framework in place
  - absolute calibration, corrections tuning under development/validation