

# SUMMARY OF THE CALIBRATION SESSION AND PLANS FOR THE FUTURE

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K. Schweda, C. Zampolli

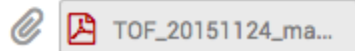
Offline Week, 25-27 Nov 2015

# SUMMARY OF THE CALIBRATION SESSION

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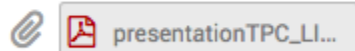
### CPass automatic merging 45'

Speakers: Chiara Zampolli (Universita e INFN, Bologna Bologna (IT)), Benjamin Donigus (Johann-Wolfgang-Goethe Univ. (DE))



### TPC Space Charge Distortions 30'

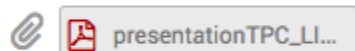
Speakers: Marian Ivanov (GSI - Helmholtzzentrum für Schwerionenforschung (DE)), Sadikin (Indonesian Institute of Sciences (IDN))



### Coffee Break 15'

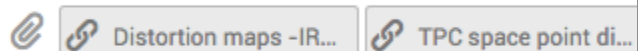
### TPC Loopers identification 30'

Speakers: Rifki Sadikin (Indonesian Institute of Science and Technology (IDN)), Helmholtzzentrum für Schwerionenforschung (DE))



### TPC Space Charge Distortions in CPass 1h0'

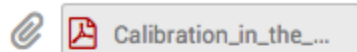
Speakers: Marian Ivanov (GSI - Helmholtzzentrum für Schwerionenforschung (DE)), Chiara Zampolli (Universita e INFN, Bologna (IT)), Benjamin Donigus (Johann-Wolfgang-Goethe Univ. (DE))



### Lunch break 2h0'

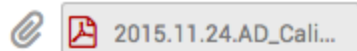
### Calibration in the HLT 30'

Speaker: Alex Henri Jean Chauvin (Technische Universität München (DE))



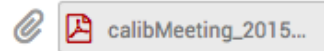
### AD 10'

Speaker: Christoph Mayer (Polish Academy of Sciences (PL))



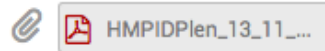
### EMCAL+DCAL 10'

Speakers: Gustavo Conesa Balbastre (Centre National de la Recherche Scientifique (FR)), Faivre (Centre National de la Recherche Scientifique (FR))



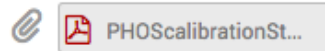
### HMPID 10'

Speaker: Giacomo Volpe (Hungarian Academy of Sciences (HU))



### PHOS+CPV 10'

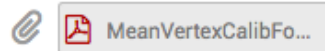
Speaker: Dmitri Peresunko (National Research Nuclear University (RU))



### Coffee Break 15'

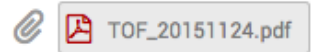
### MeanVertex - the luminous region 10'

Speaker: Davide Caffarri (CERN)



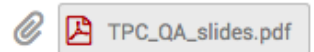
### TOF 10'

Speakers: Francesca Bellini (Universita e INFN, Bologna (IT)), Chiara Zampolli (Universita e INFN, Bologna (IT))



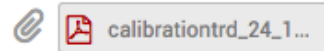
### TPC 10'

Speakers: Marian Ivanov (GSI - Helmholtzzentrum für Schwerionenforschung (DE)), Wiechula (Eberhard-Karls-Universität Würzburg (DE)), Wolfgang-Goethe Univ. (DE))



### TRD 10'

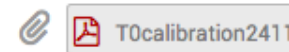
Speakers: Raphaelle Bailhache (Johann-Wolfgang-Goethe Univ. (DE)), Wolfgang-Goethe Univ. (DE))



### TO 10'

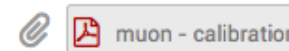
calibrationtrd\_24\_11...

Speaker: Alla Maevskaya (Rutherford Appleton Laboratory (UK))



### MUON 10'

Speaker: Laurent Aphenetch (CERN)



### FMD 10'

Speaker: Christian Holm Christensen (CERN)

### PMD 10'

Speaker: Tapan Nayak (Department of Physics (IN))

### VO 10'

Speaker: Cvetan Valeriev Chiriac (CERN)

### ZDC 10'

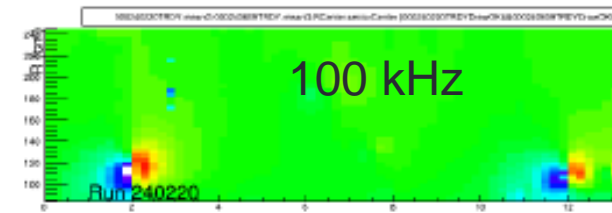
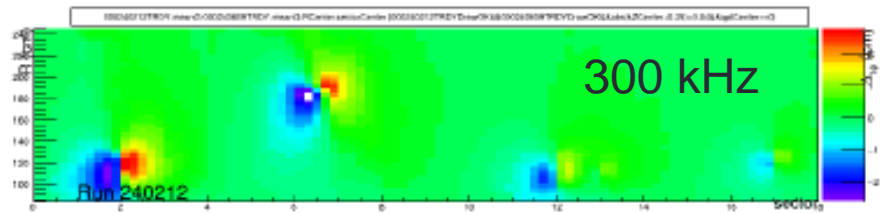
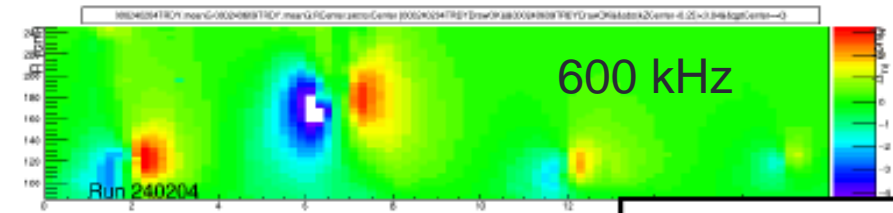
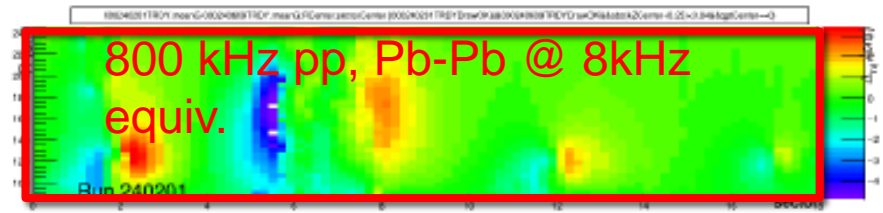
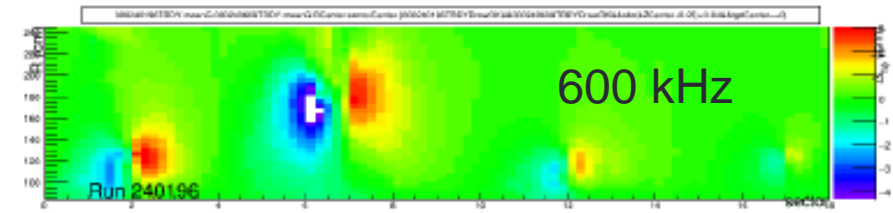
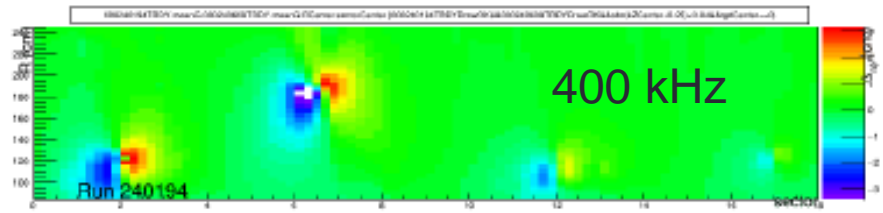
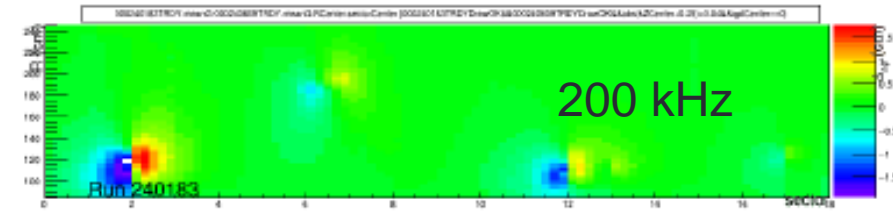
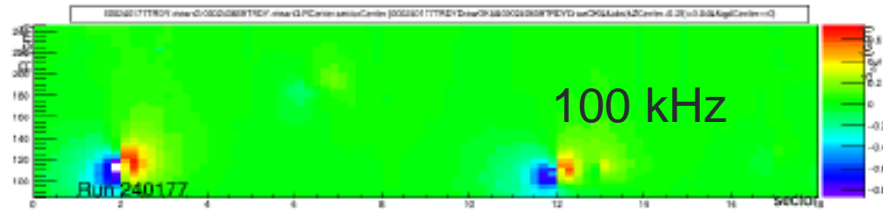
Speaker: Chiara Oddedisano (CERN)

**Busy agenda despite the ongoing data taking!**

# Manual Calibrations – Discussion outcome

- Goal: Automation of manual calibration after cpass1, before ppass
  - Presently, 3 days calibration window
  - Sometimes not met due to human factor
  - Automate for central barrel:
    - ITS(SDD): manual calibration, few hours, <1 day
    - TPC: fully automated
    - TOF: merging of output files at run level, and per period (should be a chain)
    - TRD: short runs, calibration fails due to low statistics, find successful run close in time and use same calibration object
- Straightforward to automate, by beginning of 2016
- Calibration window after cpass1 < 1 day
- Francesca Bellini  
Raphaelle Bailhache  
Chiara Zampolli  
Benjamin Doenigus  
Marian Ivanov  
Ruben Shahoyan

# IR scan - October 2015



IR scan runs:

Run	target IR
240609	10kHz
240165	20kHz
240177	100kHz
240183	200kHz
240194	400kHz
240196	600kHz
240201	800kHz
240204	600kHz
240212	300kHz
240220	100kHz

Effect above 2 cm at 400 kHz  
 Floating wires effect reduced after GG  
 polarity switch in OROC except of  
 OROC C06  
 IROC - the same effect

Marian Ivanov,  
 Ruben Shahoyan

# Run2/Run3 consideration for space charge fluctuation

IR scan from October.

Digital currents stable within  $\pm 5\%$  for current once the IR is equalized

Ongoing studies on correlations current/distortion (not for today)

- data to be corrected with  $O(\min)$  interval
- Otherwise  $\pm 5\% \times (2-5)$  cm  $\rightarrow$  (1-2.5 mm)

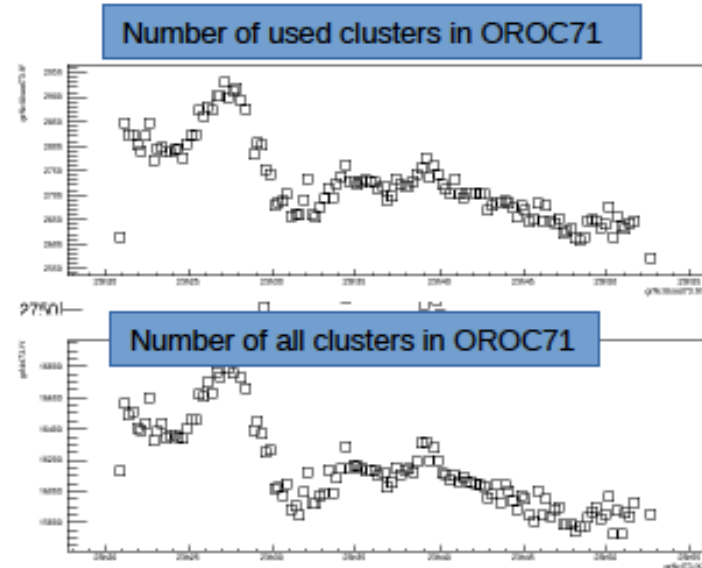
Ongoing studies to identify robust relative current estimators

Exported cluster counters for all TPC sectors, SPD, SSD and SDD

Current candidate - TPC OROC median A-side, C-side

to some extent estimator is trigger bias

I would like to activate back hardware currents in the OCDB for absolute renormalization (slope and offset)



Marian Ivanov,  
Ruben Shahoyan

## Data flow sequence:

- AliTPCcalibAlignInterpolation::ProcessESD(AliESDEvent)
  - esd event → residual tree delta(trak-cluster)
- AliTPCcalibAlignInterpolation::FillHistograms()
  - residual tree → 6 5D histograms (localX,phi(sector),r/z,q/pt,delta, time - O (minutes)
  - current graphs O(seconds)
  - mean information per time interval - events,<current>
- TStatToolkit::MakeDistortionMap (generic method)
  - residual histogram → distortion map
  - + mean time, mean currents as meta-data from the procedure above to be used for later current based second order correction
- AliNDLocalRegression::MakeFit
  - or other smoothing/outlier filtering method in space and time
  - distortion map → 4D functional representation
- Chebyshev polynomial interpolation (Ruben)

→ *Identical to Run3 strategy for space charge calibration*

Marian Ivanov,  
Ruben Shahoyan  
Chiara Zampolli

## New correction maps created (feedback)

- outliers in case of missing chamber generated
  - protection to be added
- kink close to the CE
  - clusters from other side used - z/sector match to be checked
  - fixed (to QA)
- optimal regularization parameters to be chosen
  - 4 version of maps (check the edge behaviour)
- adding metadata information - mean time and mean currents
  - mean time to be used for interpolation
  - $\text{current}/\langle \text{meanCurrent} \rangle$  to be used for current correction (+-5 %)
  - done
- speed up the code or jobs in parallel
  - some improvements done during last 3 days. New improvement will come today

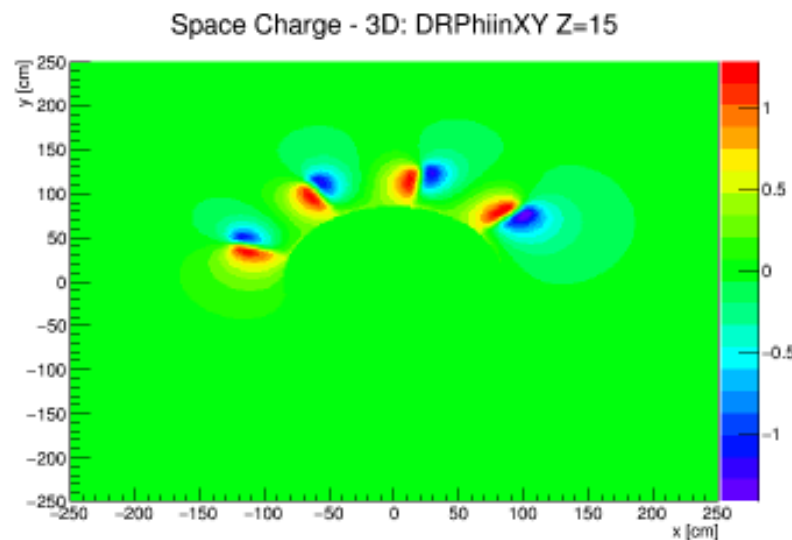
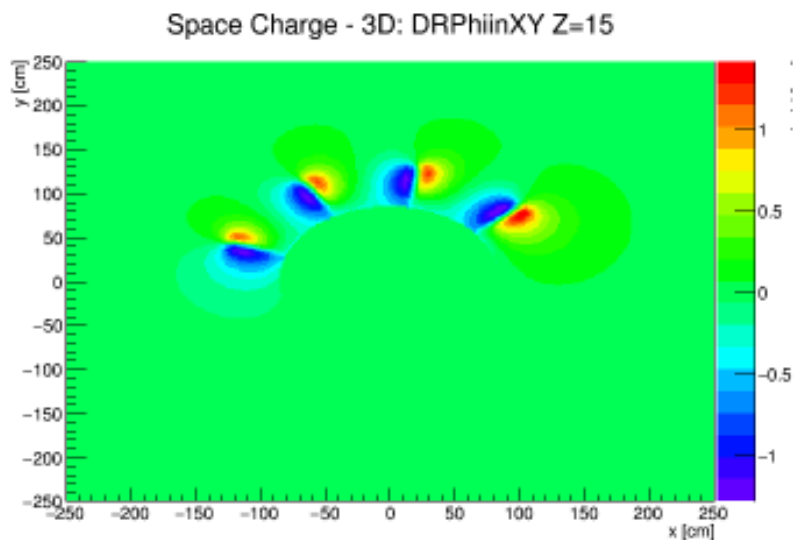
Further test on AliEn

Marian Ivanov,  
Ruben Shahoyan  
Chiara Zampolli



# Distortion and Correction Map (2)

Marian Ivanov,  
Rifki Sadikin,  
Jens Wiechula



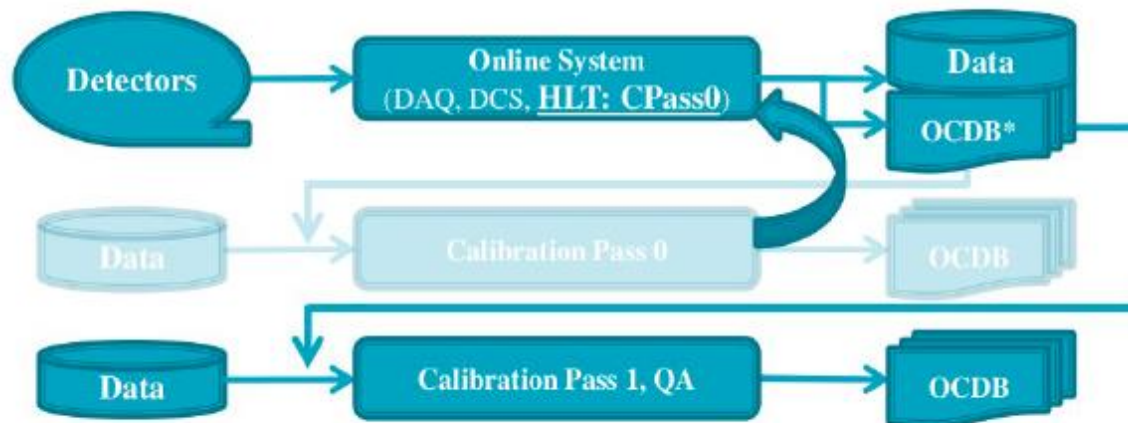
- Calculated from given space charge distribution
- Integration along drift lines
- Important tool for Run2 (e.g. get distortions from digital currents)
- Essential for Run3



# Plan

Calibration in the HLT,  
Alex Chauvin

- Online Calibration Plan during run II:
  - Implementation of (at least) CPass0 selection in the HLT (alignment, vdrift, dE/dx)
  - Limit: ESD data format is too heavy and complex for HLT
- Need to use a new data format: FlatESD
  - Objects will now be stored in memory



- Main JIRA task: ATO-40 “Preparation for TPC online”
- TWiki page:  
[https://twiki.cern.ch/twiki/bin/view/ALICE/TPC\\_Online](https://twiki.cern.ch/twiki/bin/view/ALICE/TPC_Online)

# Summary

Calibration in the HLT,  
Alex Chauvin

*i.e. what updates the OCDB in CPass*

- New data format: FlatESD
- Virtual classes to deal with both data format
- Calibration Components ported to use virtual interfaces and preprocessor updates: same reconstruction on/offline
- TPC calibration Components in HLT
  - Vdrift, alignment, and feedback loop ready
- To do list:
  - Fix serialization issue
  - Check for dE/dx result consistency and benchmark
  - Real-live test

Thank you for your attention

New detector in Run2!

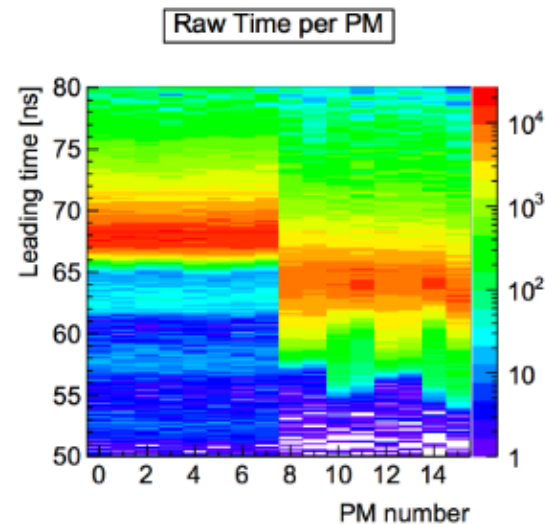
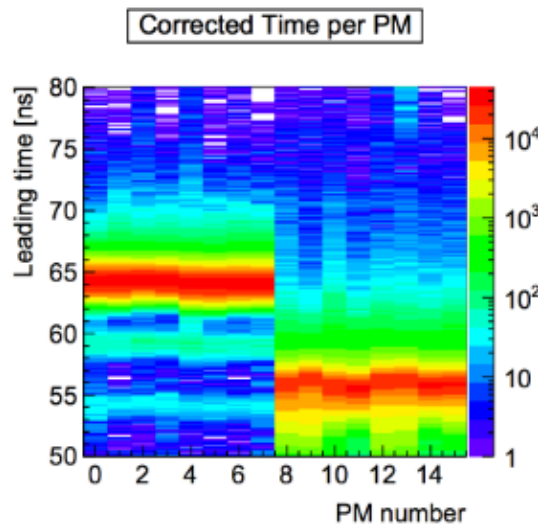
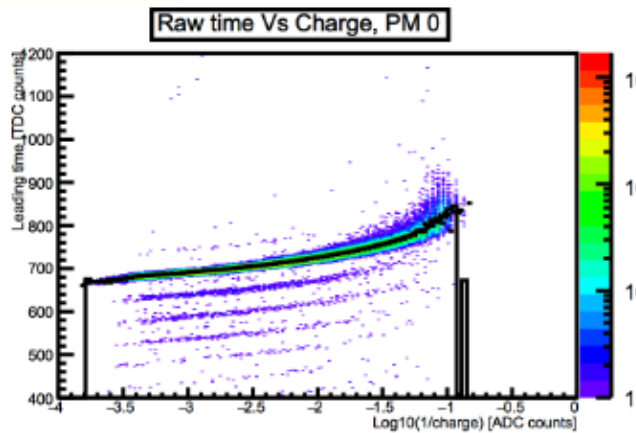
AD, Christoph Mayer

# Calibration

- All calibration is done in DAs running on the AD LDC
  - Usually no manual calibration is necessary
- Pedestals: for each pedestal run and each physics run
- Time-slewing correction: splines fitted to leading time vs.  $\log_{10}(1/\text{charge})$

Run 226445

M. Broz



New SMs for EMCAL,  
DCAL new!

## Procedure :

EMCAL+DCAL,  
Julien Faivre

- Tower gain =  $f(\text{High voltage})$ ,  
⇒ HV change induces modification of reconstructed cluster energy.
- Before installation at point-2 : pre-calibration with cosmic muons  
( $\simeq 260 \text{ MeV}$ -equivalent,  $\simeq 2 \%$  relative accuracy).
- Combine pairs of clusters to reconstruct  $\pi^0 \rightarrow \gamma\gamma$  decays :  
if a cluster doesn't have the right energy (i.e. a tower doesn't have the right gain),  
 $\pi^0$  inv mass peak not at the right mass.
- Tower-by-tower calibration,  
Iterative procedure.
- After calibration, coeff is known : put it in OCDB for reconstruction.
- End of the run : calculate new tower HV such that tower gain is correct  
next OCDB factors should vanish to "1".
- **Where we are :**  
→ partial  $\pi^0$  calibration with p-p, new HV starting from p-pRef.

New SMs for EMCAL,  
DCAL new!

## Conclusions :

EMCAL+DCAL,  
Julien Faivre

- Raw p-pRef :  $\pi^0$  in DCAL mean : 156  $\rightarrow$  135 MeV, (Marie G.,  
width : 15  $\rightarrow$  10 MeV Lucille R., Alexandre S.).
- pp 2015 data :
  - $\rightarrow$  EMCAL : some studies needed ;
  - if (Physics) : calibration to be continued ; (months)**
  - $\rightarrow$  DCAL + third-SMs : finish calibration.
- p-pRef, Pb-Pb and p-p 2016 :
  - $\rightarrow$  check and calibrate (months).
- Will begin heavier studies (year).
- More details : next Friday EMCAL-weekly meeting.

To get what EMCAL/DCAL has now, took 2 weeks of 2 FTE

## Conclusions

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- Online and offline calibration for HMPID is rather robust, no problems so far.
- No changes are foreseen for the Pb-Pb data taking period and for the next year.

**HMPID,  
Giacomo Volpe**

## PHOS and CPV calibrations

*D. Peresunko  
NIC Kurchatov Institute*

- PHOS
  - Amplitude calibrations
  - Time calibrations
  - Bad Map
- CPV
  - Pedestal
  - Gain calibrations
  - Bad Map

**PHOS and CPV,  
Dmitri Peresunko**

**CPV new! PHOS  
re-assembled!**

## Mean Vertex offline calibration → luminous region measurement.

- The Mean Vertex calibration is performed offline in the CPass0 framework.
  - (GRP/Calib/MeanVertex)
- The position of the Mean Vertex is extract from a fit of the  $(x, y, z)$  distributions of the vertices of the run.
- The luminous region determination  $(x, y)$  is based on the deconvolution of the vertexer algorithm resolution (for the  $z$  coordinate this deconvolution is not needed)
- This deconvolution is based on a measurement performed as a function of multiplicity.
- The code deals with all possible colliding systems (pp-pPb-PbPb) because now it takes the beam type from the GRP, no an average multiplicity of the event! This is an important improvement to reduce manual calibration. **Now the manual calibration is needed only for those run for which the fit fails.**
- **For PbPb, the luminous region is estimated with very central events where the vertexer algorithm resolution is negligible (a fit is done but no deconvolution is needed)**

*Investigation on whether CPass could automatically recover these cases will be done*

11/24/15

MeanVertex Calibration

MeanVertex,  
Davide Caffarri



**Mikolaj  
Krzewicki**

# HLT status

- What is currently running:
  - TPC compression, TPC reconstruction , ITS reco,
  - VZERO and ZDC will be tested soon
  - EMCAL reco is being debugged
  - QA for TPC,ITS,VZERO,ZDC,EMCAL (when processing is available)
  - Lumi region: Working and publishing to the LHC, output under investigation

# Periods with cpass1\_pass1 calibration

Legend: runs **with TOF** / **with pass1** / **with cpass1**,  
TS = prod. in technical stop, R = running

LHC15g (6/31/54)

LHC15h (63/68/68)

LHC15i (108/108/123)

LHC15j (143/TS/146)

LHC15k (26/TS/26)

LHC15l (100/TS/108)

LHC15m (runs without TPC → TOF cannot be calibrated)

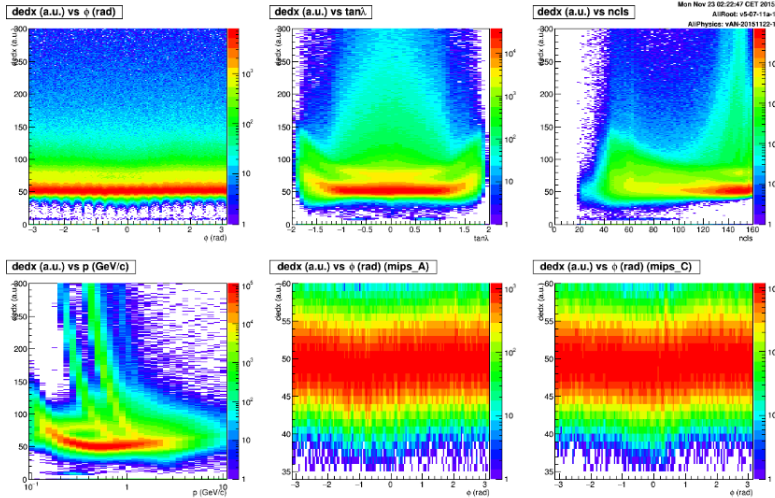
LHC15n (14R/1R/30R)

TOF, Francesca  
Bellini

- Double bands due to **problematic channels** spotted by the QA in all periods
  - To be identified with manual calibration
- (manual) calibration to be **rechecked after space charge calibration of the TPC**
- 34 **runs with no matched hits at TOF** (list of run/periods in backup)
  - due to channels flagged as inefficient and masked in reconstruction
  - **HW/readout related** → Under investigation
  - Runs **BAD for PHYSICS**, but **can be used for TPC calibration**

# Position of the mean MIP

Run 244416 – IR 100 kHz



- Mean MIP position at 50 → Good
- Small phi modulation → Not very good

24.11.2015

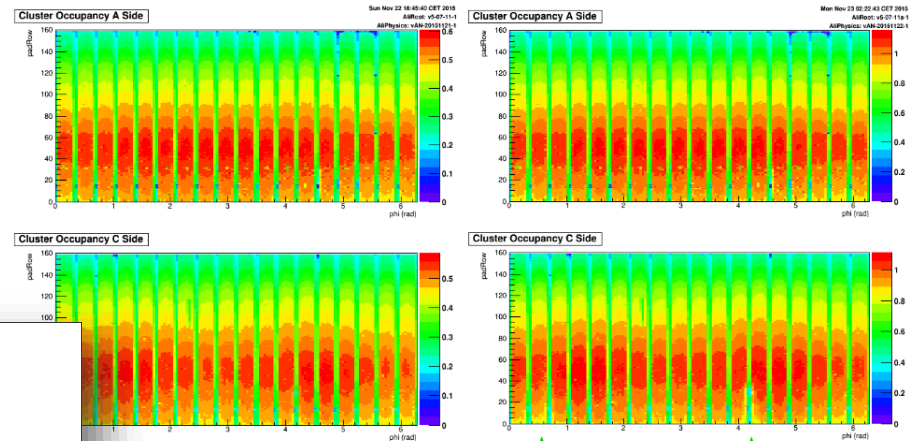
Offline Week - Carsten Klein

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# Cluster Occupancy – Space Charge Distortions

Run 24442 - IR 50 kHz

Run 244416 - IR 100 kHz



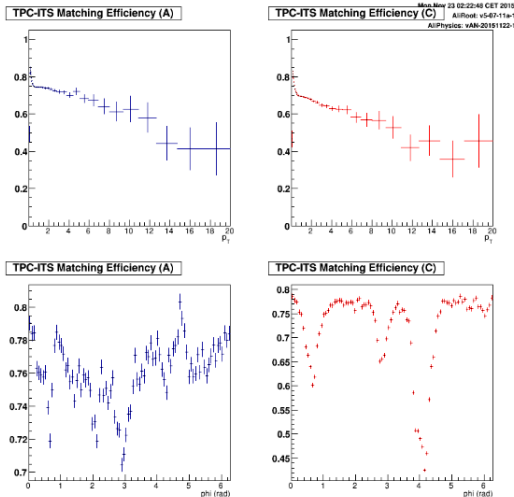
Distortions

Offline Week - Carsten Klein

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# TPC-ITS Matching Efficiency

Run 244416 – IR 100 kHz



- Huge phi modulation, especially at the C-Side
- Distorted tracks in TPC do not match to ITS tracks
- Bigger drop in efficiency for higher interaction rate
- Dips at phi=4 and phi=0.5 come from TPC
- Dip at phi=3 probably comes from ITS, one halfstave was off from SDD; needs to be rechecked

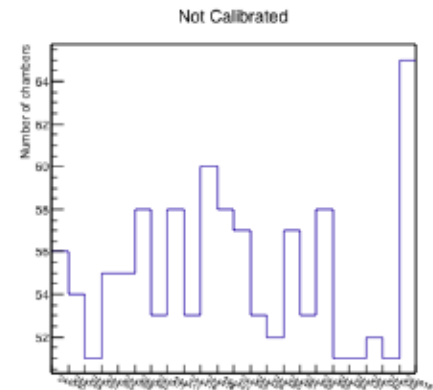
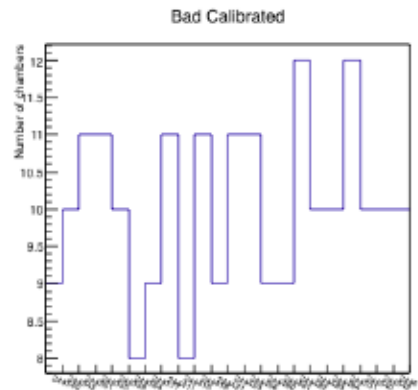
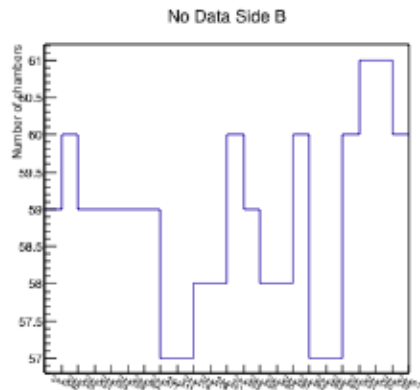
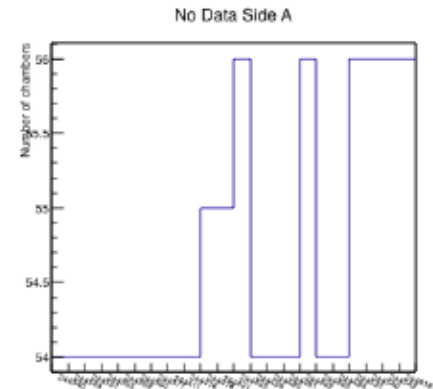
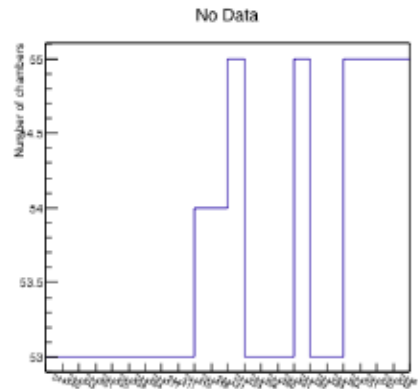
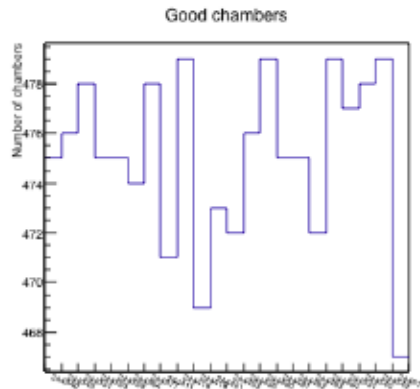
24.11.2015

Offline Week - Carsten Klein

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**TPC, Carsten Klein**

# Some OCDB variables



Chamber status: good chamber for analysis, chamber of half-chamber off/on with low HV, chamber with very low/high gain/drift, chamber not calibrated due to on/off or small stats

- **First cpass0/cpass1 calibration looks reasonable**
- **Iterations with more „demanding“ TRD analysis later**

**TRD, Raphaelle Bailhache**

# T0 calibration

## Slewing correction

*During Manual calibration after PbPb period ends*

- for pp – not needed;
- for PbPb based on 1st fill of physics data

**Mean position of CFD time** (with slewing correction if PbPb);  
**Global offset for interaction time signals – T0A, T0C,**  
**(T0A+T0C)/2**

In high interaction rate environment important to choose only signals from the triggered BC. Mean position of CFD, start amplitude signals, pedestals, OrA, OrC and 0TVX signals are written in OCDB after online calibration.

During reconstruction only time in range  $\pm 1.5\text{ns}$  around mean with start amplitude in range  $\pm 20\text{ns}$  will be chosen for competitions.

CPass0 writes **Mean position of CFD time** collected with kCalibBarrel trigger;

CPass1 writes **Global offset for interaction time signals**

# DATA SAMPLES

**MUON, Laurent  
Aphécetche**

- pp 13 TeV : 2.8 pb<sup>-1</sup> from muon\_calor\_pass 1
- pp 5.02 TeV : 110 nb<sup>-1</sup> from muon\_calor\_pass 1
- PbPb : ready to start

pp 13 TeV will need 2nd reco pass for statusmap bug  
pp 5 + PbPb : possibly refined alignment (reco or refit)

# PLANS FOR THE FUTURE

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# Future plans

- Automation of the manual calibration
  - Jan 2016
- Calibration and QA in the HLT
  - CPass0
    - First try: before end of PbPb period in a “parasitic” HLT chain
  - CPass0 + CPass1
  - requisites: TRD and TOF in the HLT reconstruction due to space charge effects
    - End of 2016
- Data compression by removing clusters from low momentum tracks (looping in the TPC → “loopers”)
  - End of 2016
- Improvements in the Calibration preparation for Monte Carlo