

Reporte de Actividades

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22 de Junio de 2012

Contenido

- UPC
- Cósmicos

PWG -UD

E. Scapparone & J.P. Revol

- Second version of the UPC paper (almost) ready. Last check this afternoon.
- All the requests from IRC implemented. New cross section ($-3.6 < y < -2.5$), compatible with the Zhalov model (based on EPS09 fit).
- A couple of days for english refinements by Orlando.
Corrections requiring a discussion minor corrections



→ Meeting on Monday afternoon,
send to the IRC by Monday.



will be sent during the week end to the IRC

<https://indico.cern.ch/conferenceDisplay.py?confId=177654>

CÓSMICOS

**60 cosmic runs has been analyzed with AliCosmics (version which includes MCN)
The analysis was done with AliRoot v5-04-25-AN on GRID.**

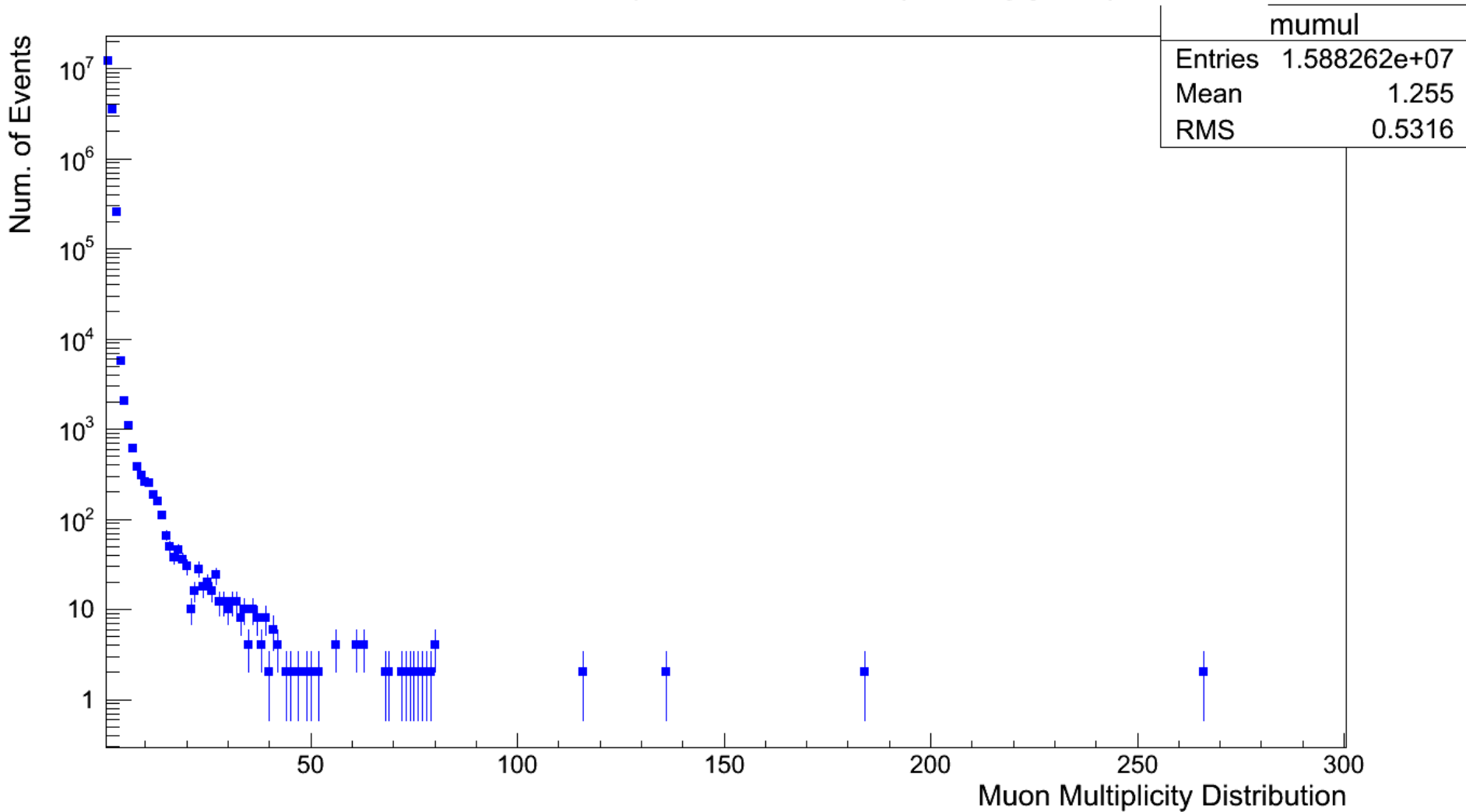
Period	Duration (days)	# Runs
LHC12a	5.96	33
LHC12b	0.68	8
LHC12c	2.50	19
TOTAL	9.14	60

The list of runs reconstructed can be found in:

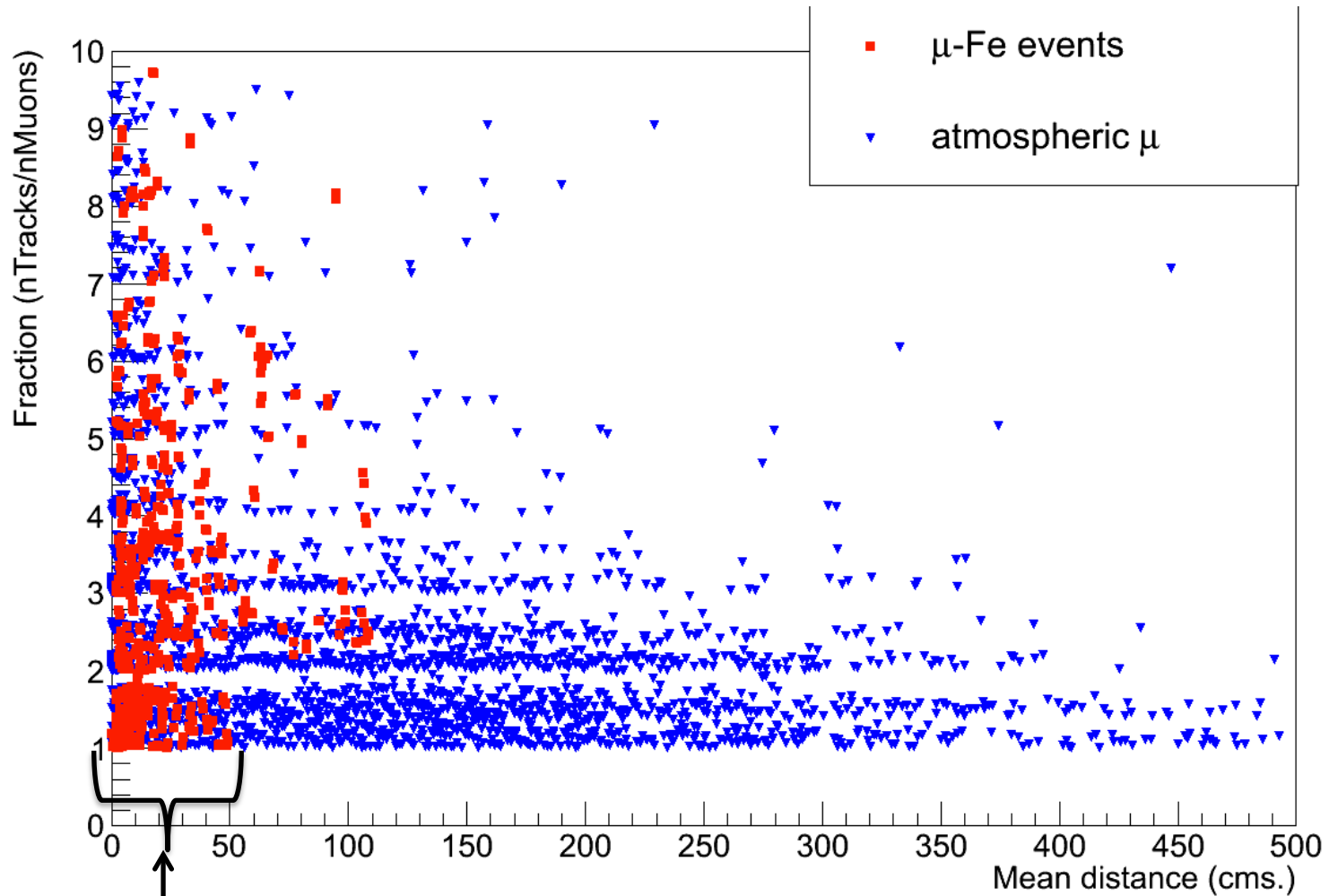
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LHC12a,b&c

Muon Multiplicity Distribution (all triggers)



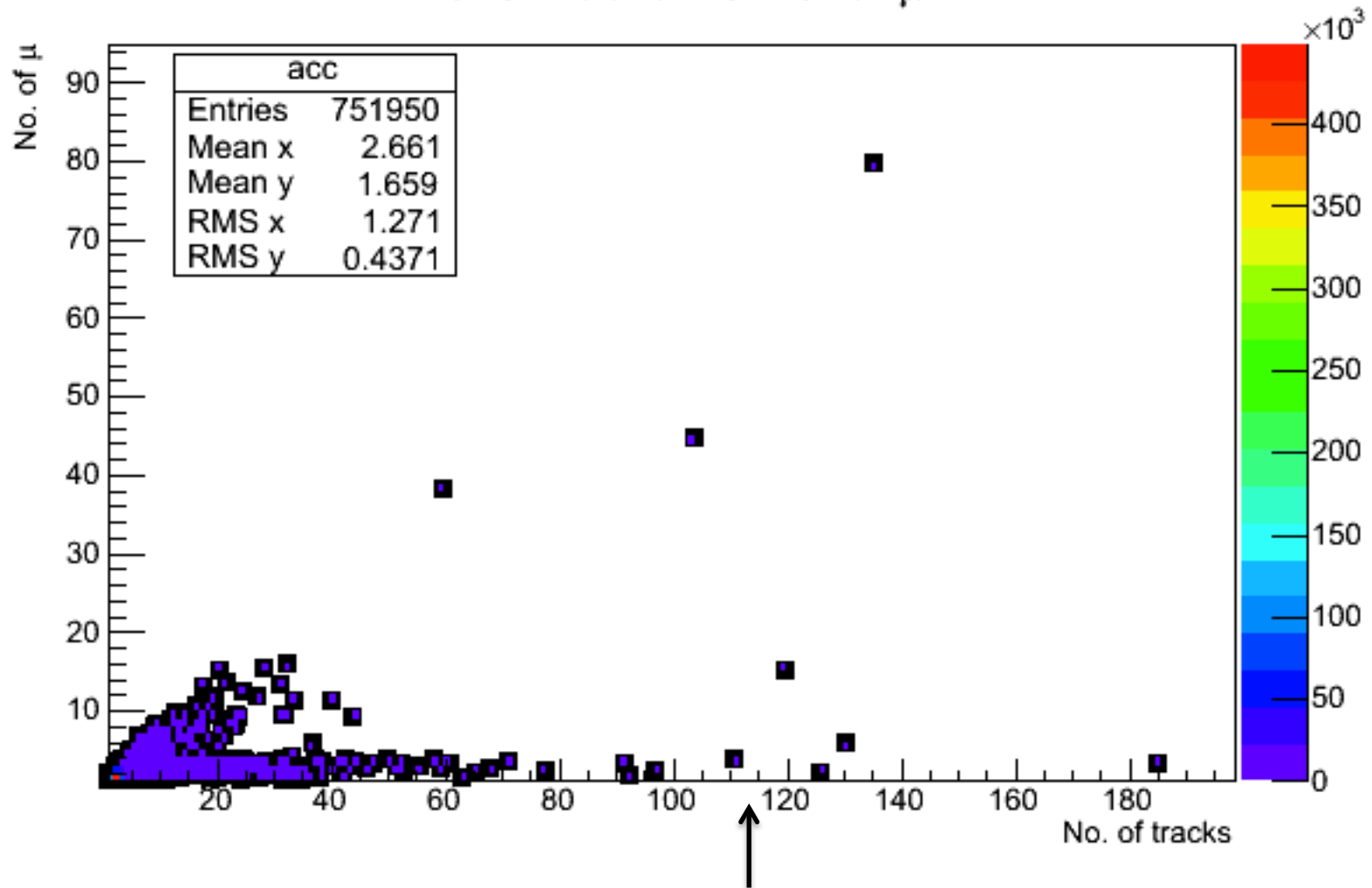
LHC12a,b&c



IT SEEMS THAT SOME COSMIC EVENTS ARE INTERACTION EVENTS.

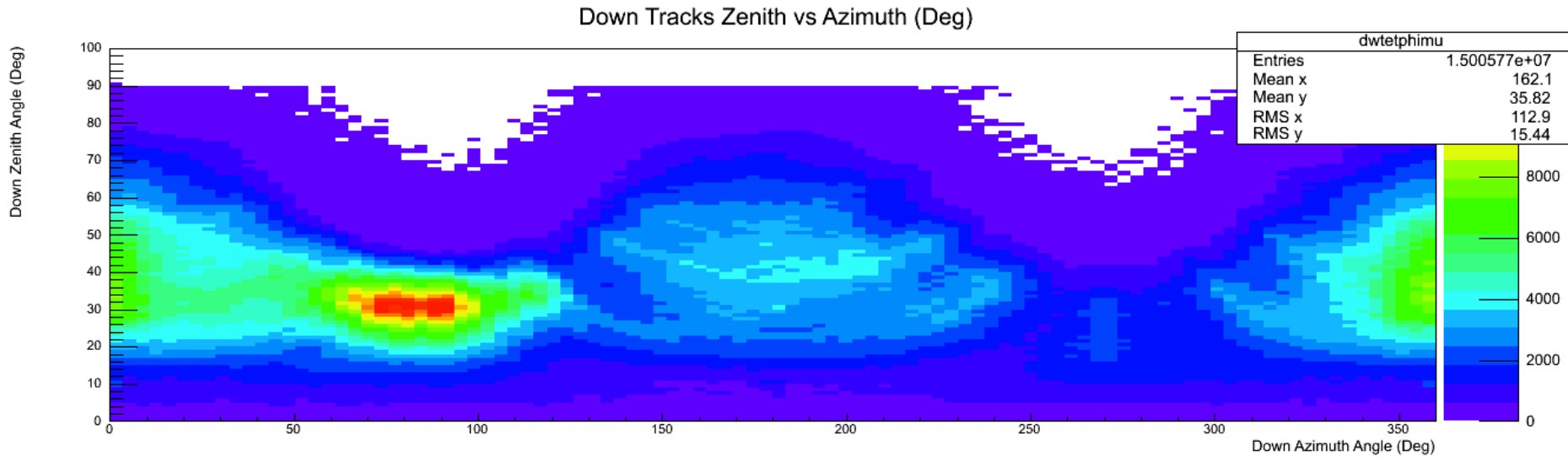
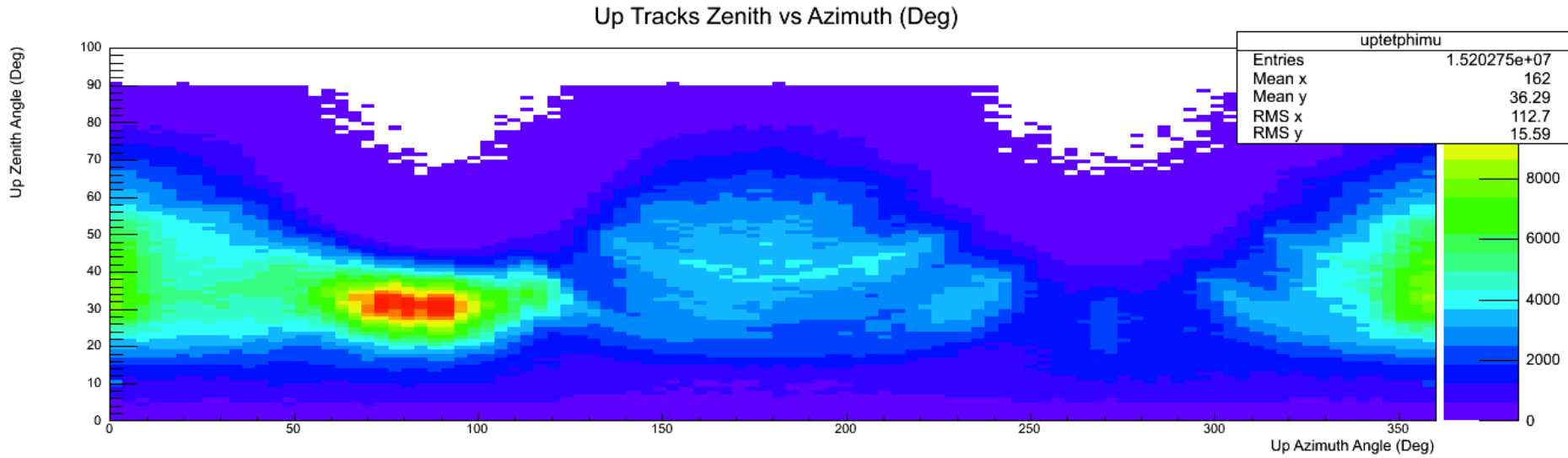
LHC12a,b&c

No. of tracks VS No. of μ

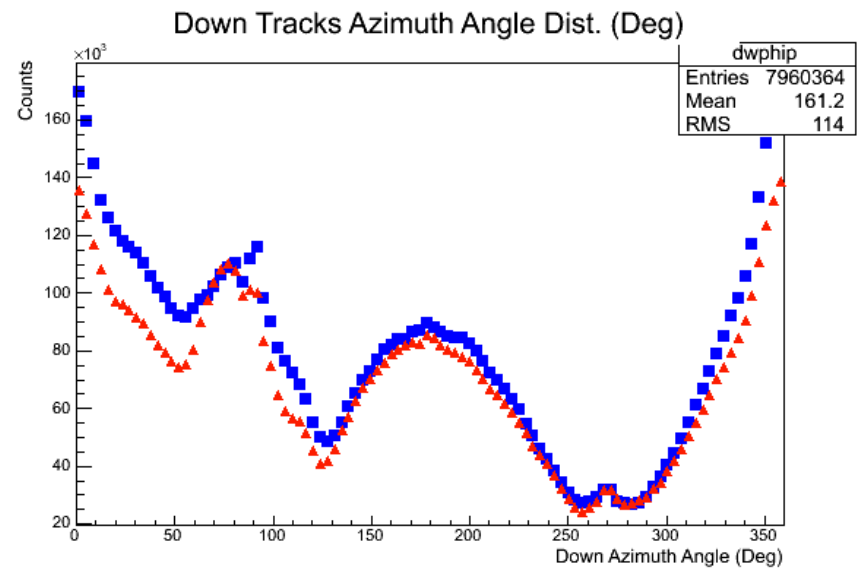
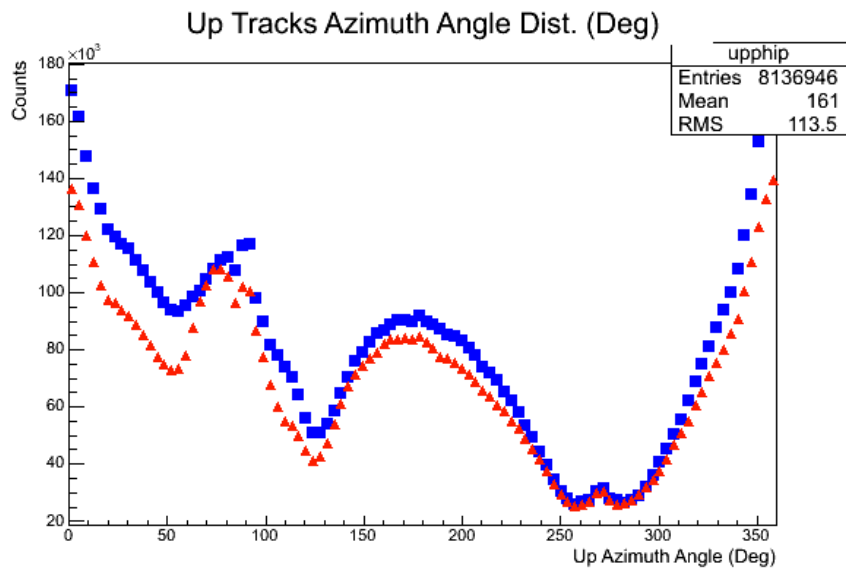
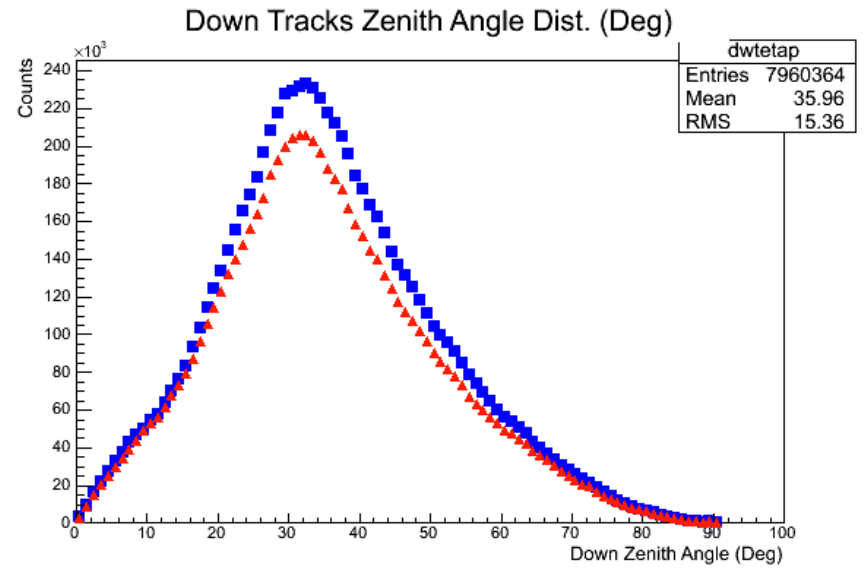
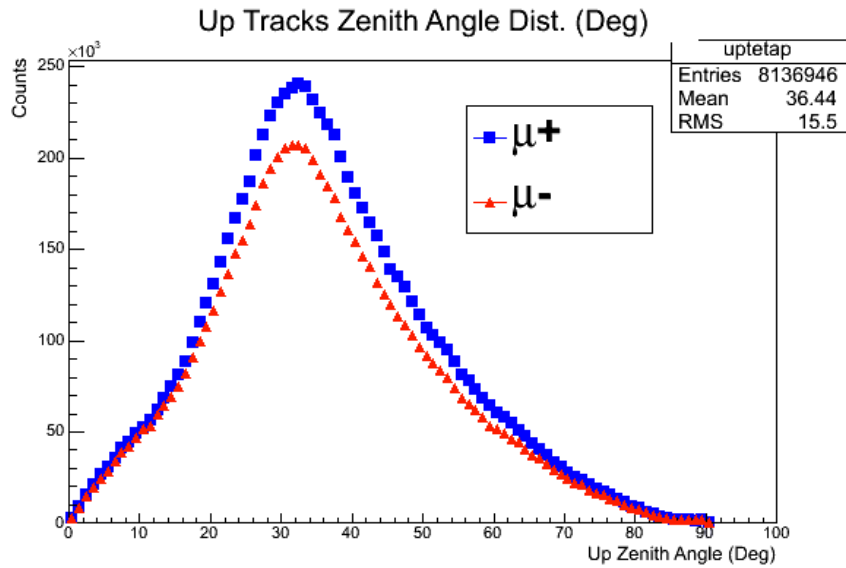


It seems that some interaction events are labeled as cosmic events.

LHC12a,b&c

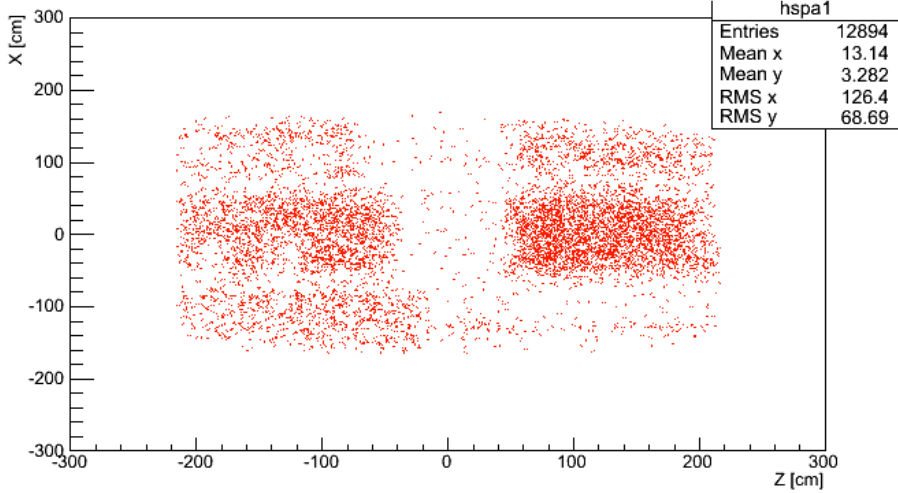


LHC12a,b&c

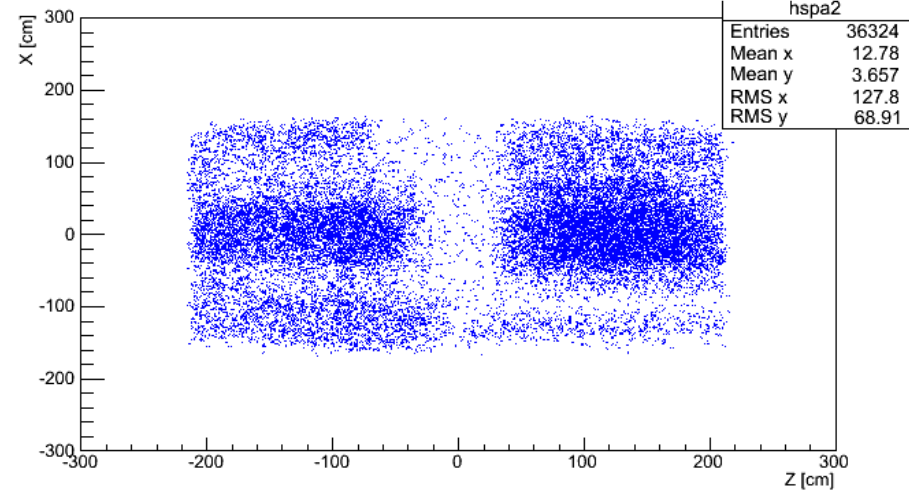


LHC12a,b&c

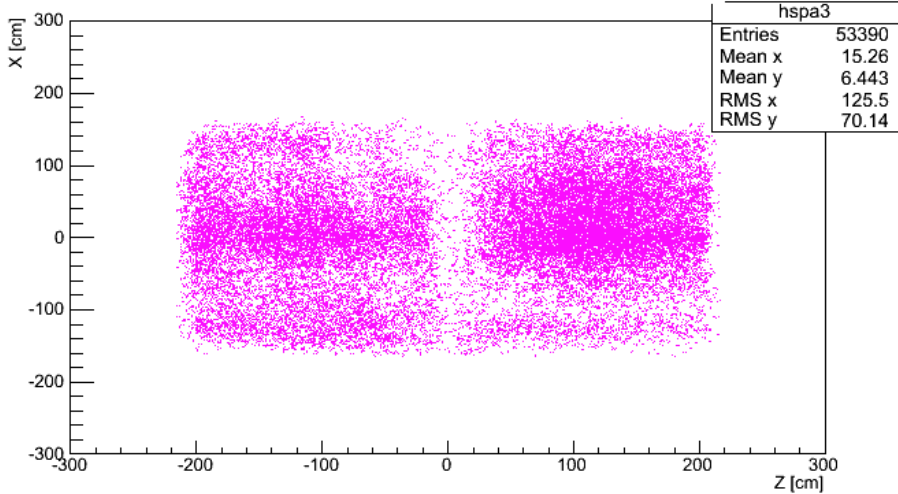
Spatial Dist. mu at $y=0$ $0 < \theta < 2.5$



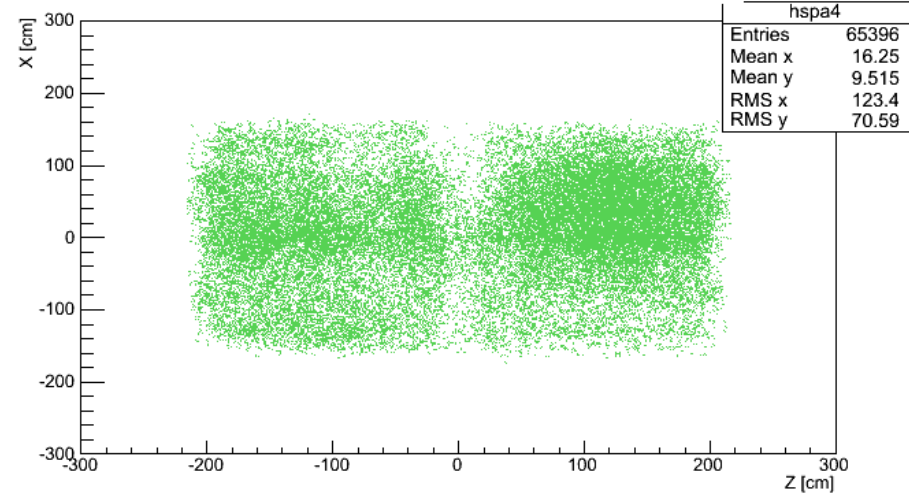
Spatial Dist. mu at $y=0$ $2.5 < \theta < 5$



Spatial Dist. mu at $y=0$ $5 < \theta < 7.5$

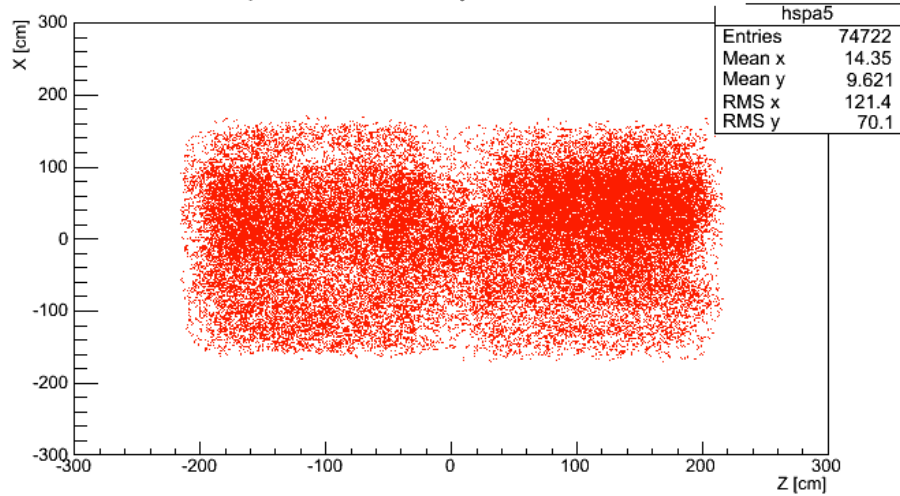


Spatial Dist. mu at $y=0$ $7.5 < \theta < 10$

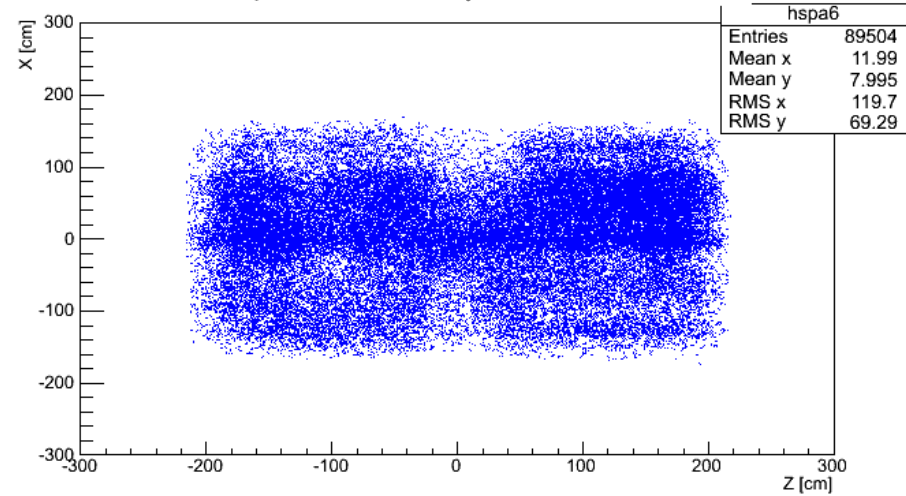


LHC12a,b&c

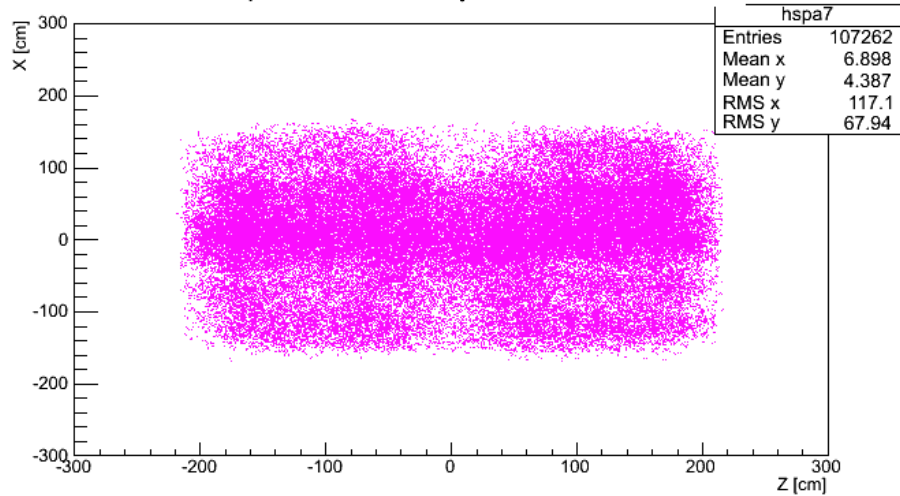
Spatial Dist. mu at $y=0$ $10 < \text{teta} < 12.5$



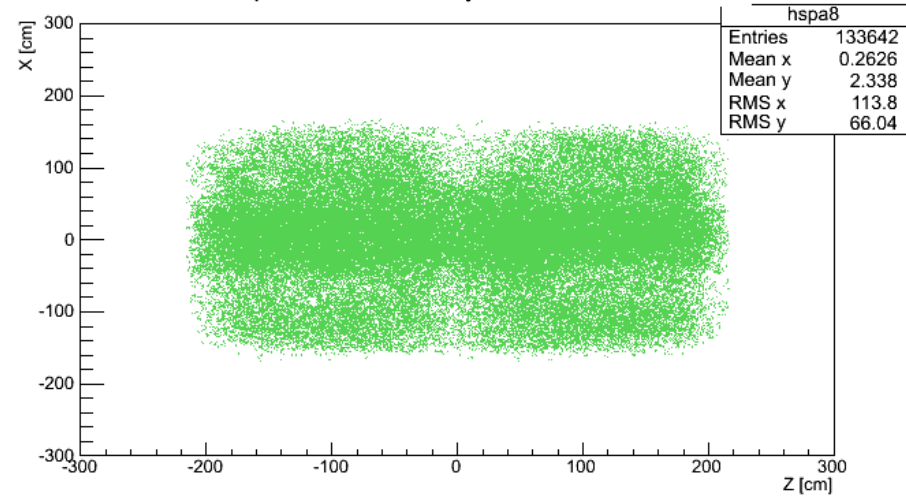
Spatial Dist. mu at $y=0$ $12.5 < \text{teta} < 15$



Spatial Dist. mu at $y=0$ $15 < \text{teta} < 17.5$

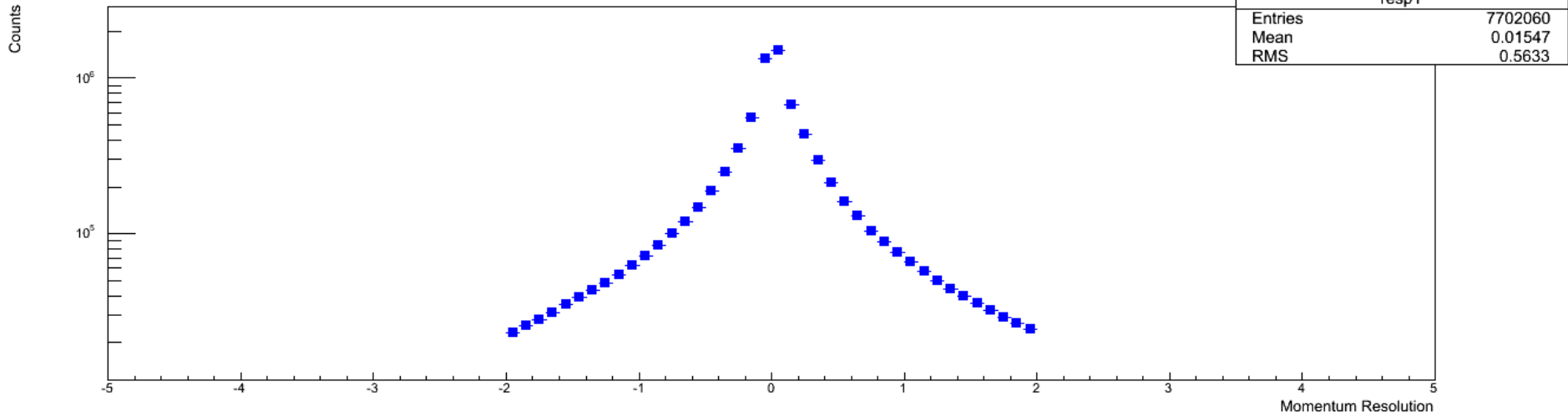


Spatial Dist. mu at $y=0$ $17.5 < \text{teta} < 20$

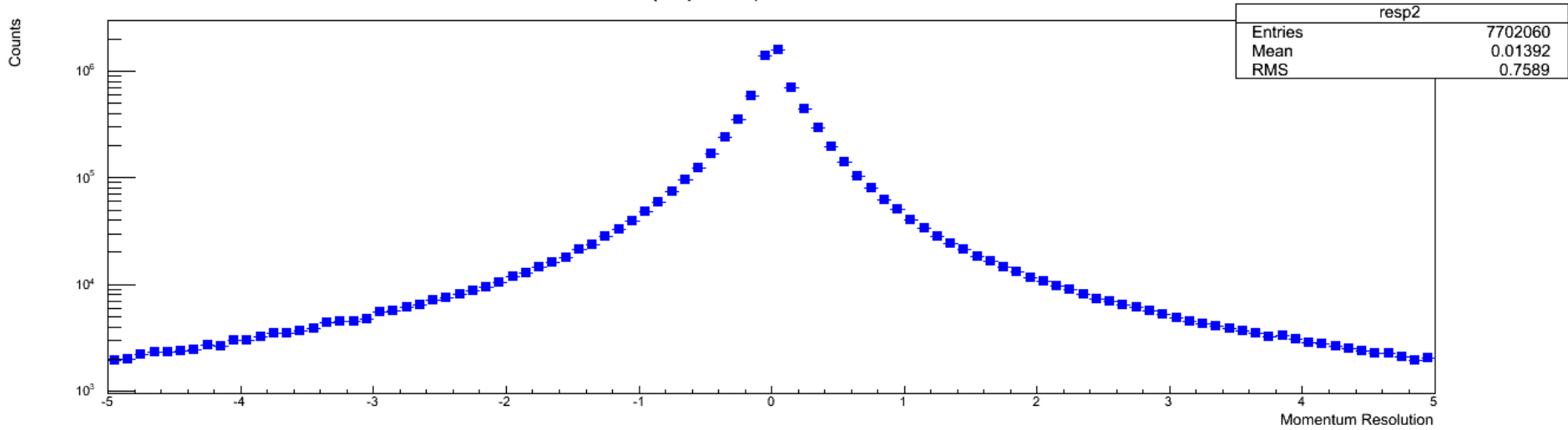


LHC12a,b&c

Mom.Res. (Pup-Pdw)/Pmed Pcov<100 GeV/c

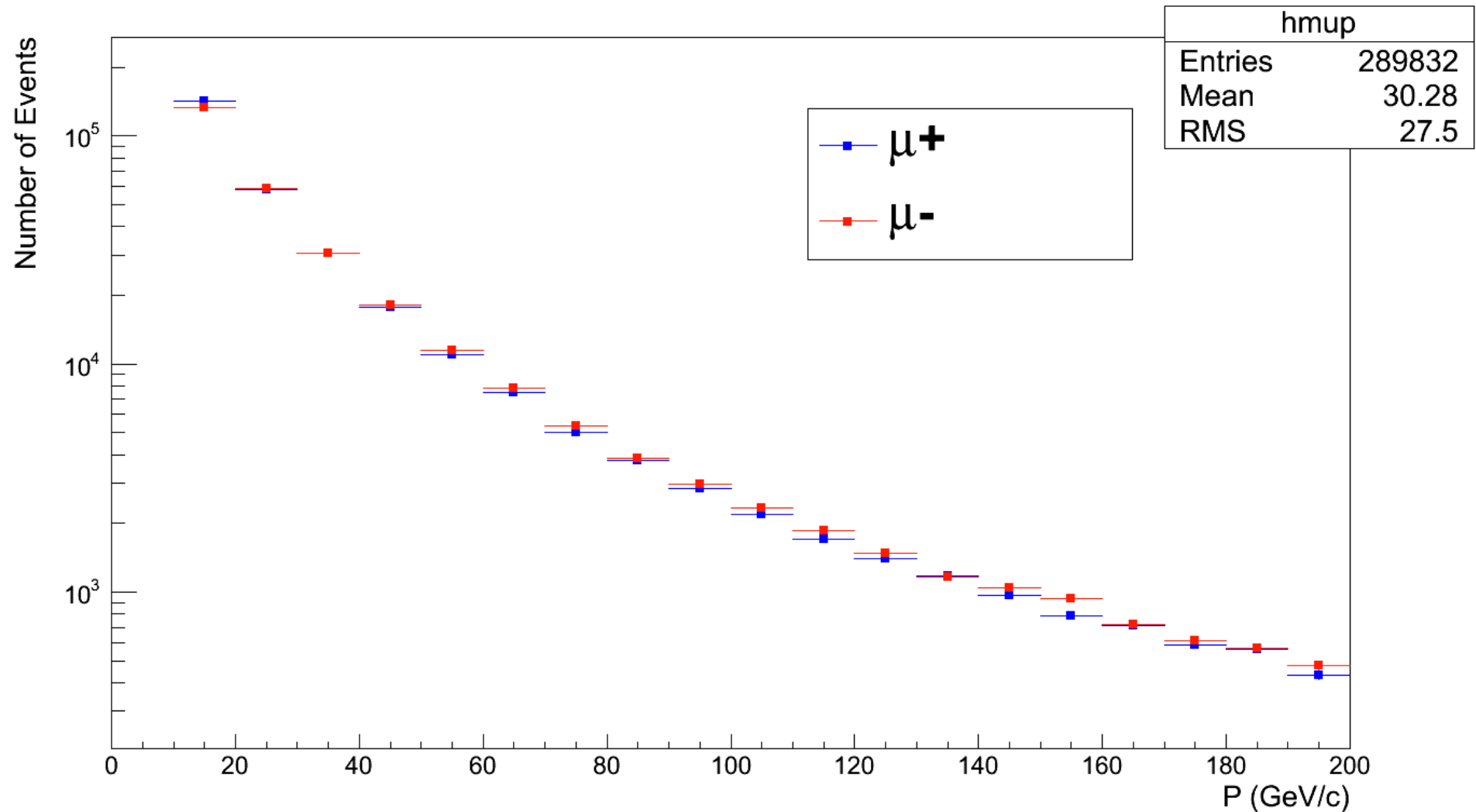


Mom.Res. (Pup-Pdw)/Pcov Pcov<100 GeV/c

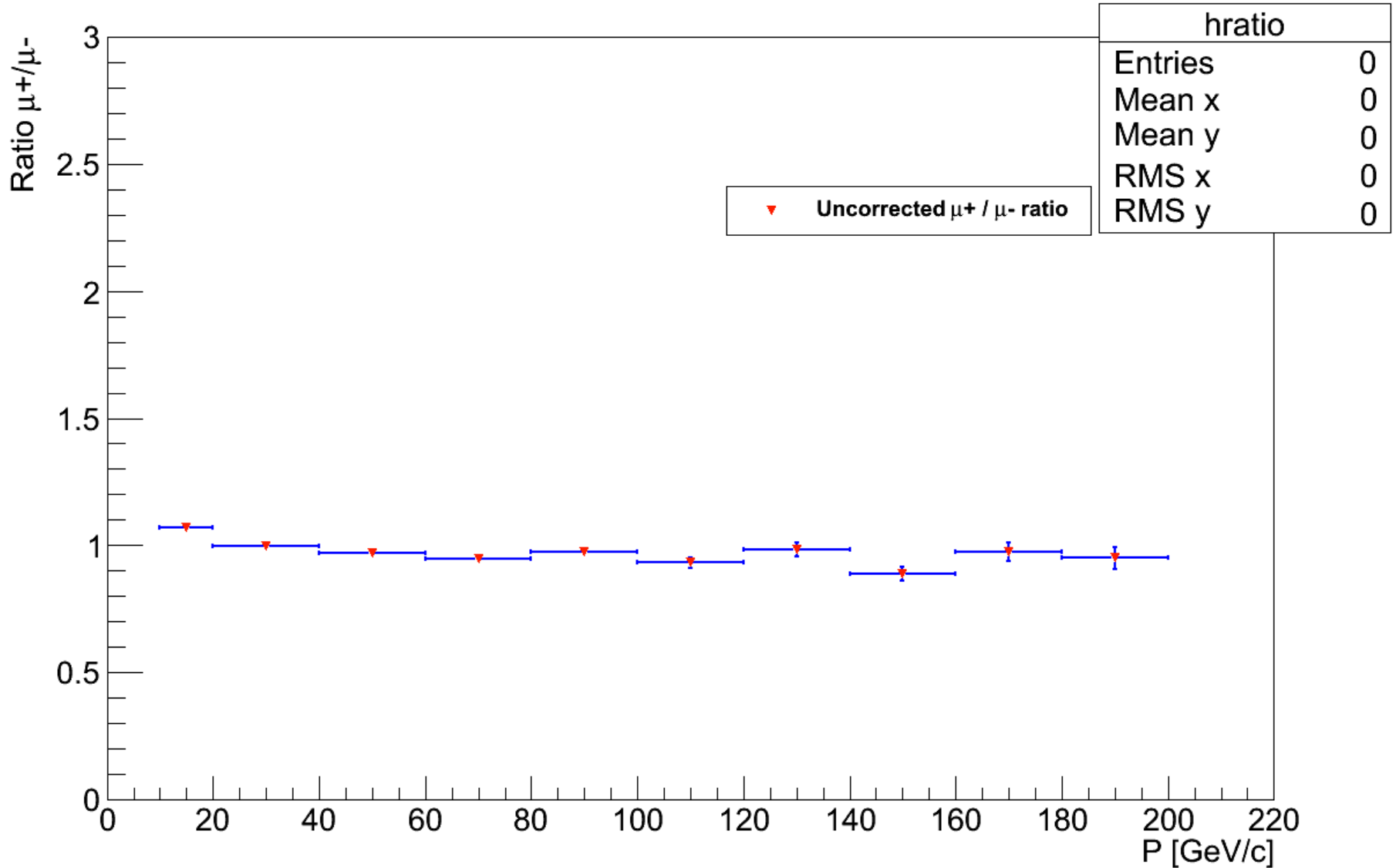


LHC12a,b&c

Uncorrected Momentum Distribution

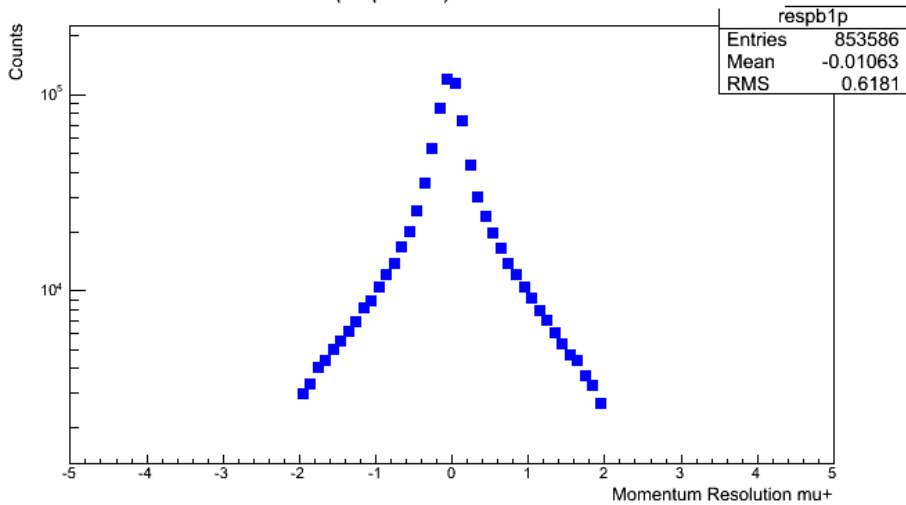


Uncorrected μ^+/μ^- Ratio

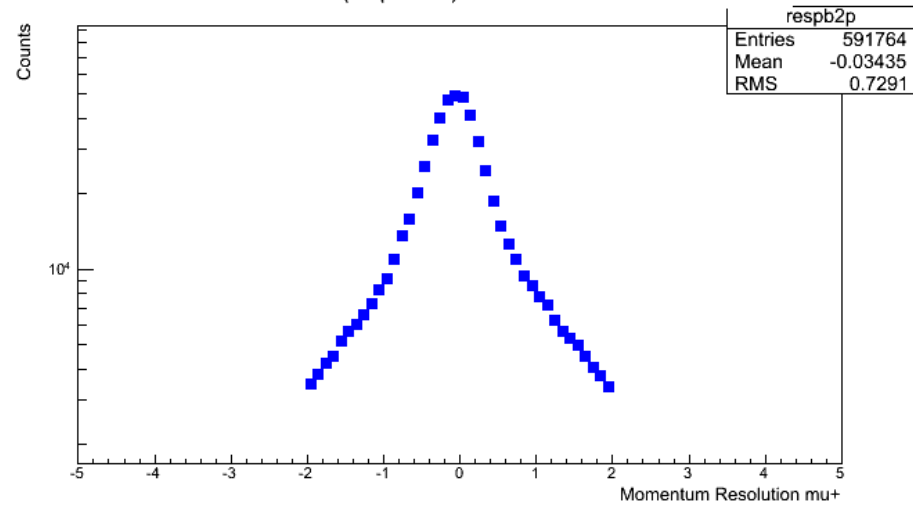


LHC12a,b&c

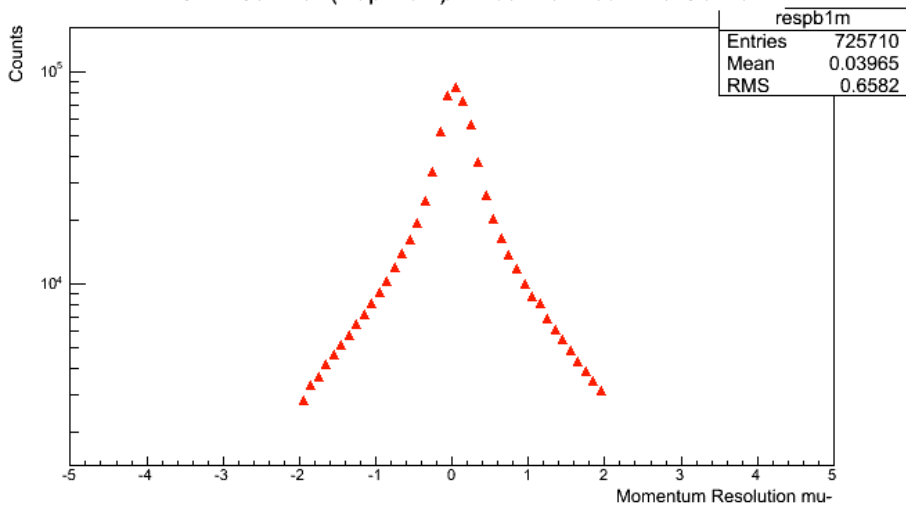
Mom.Res. mu+ (Pup-Pdw)/Pmed 10<Pcov<20 GeV/c



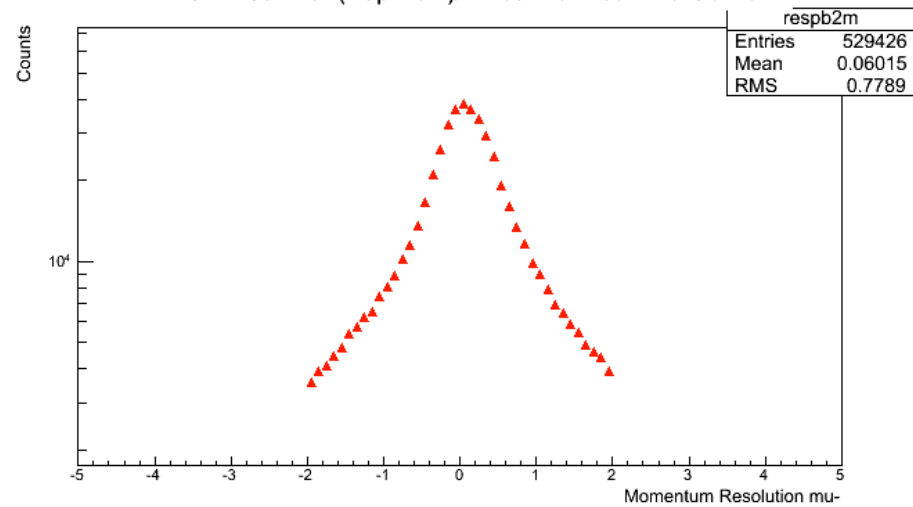
Mom.Res. mu+ (Pup-Pdw)/Pmed 20<Pcov<40 GeV/c



Mom.Res. mu- (Pup-Pdw)/Pmed 10<Pcov<20 GeV/c

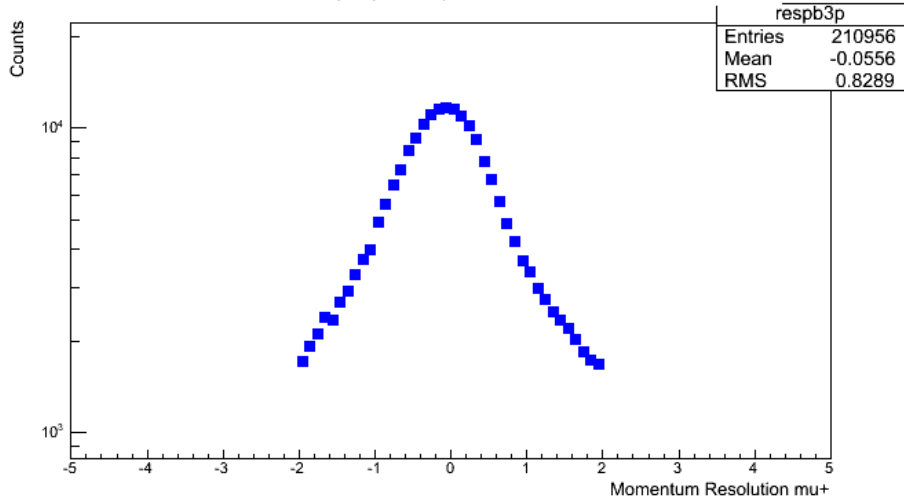


Mom.Res. mu- (Pup-Pdw)/Pmed 20<Pcov<40 GeV/c

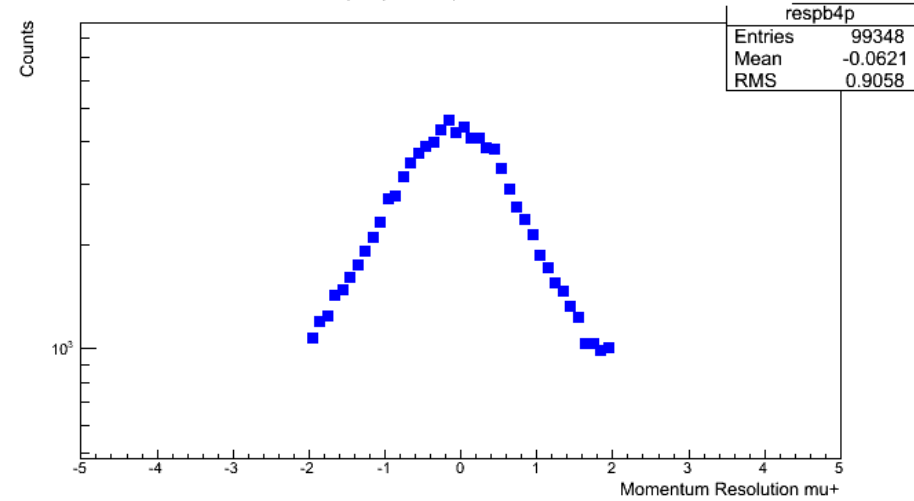


LHC12a,b&c

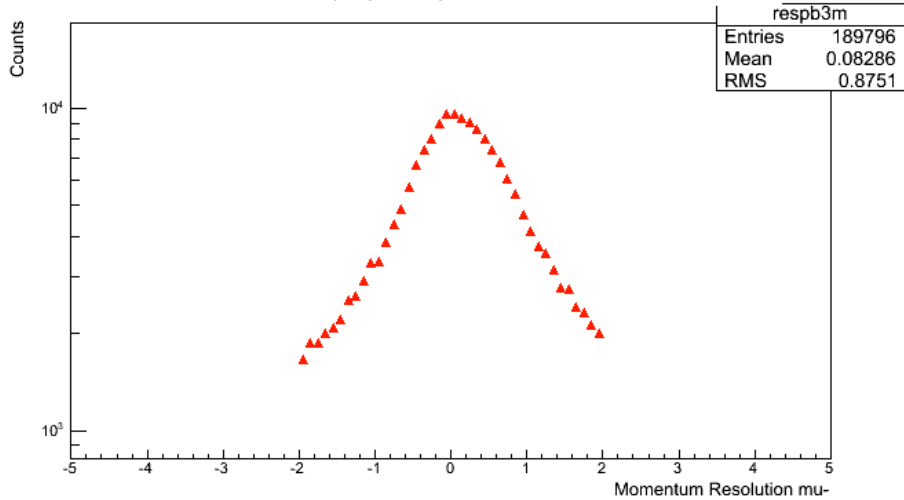
Mom.Res. mu+ (Pup-Pdw)/Pmed 40<Pcov<60 GeV/c



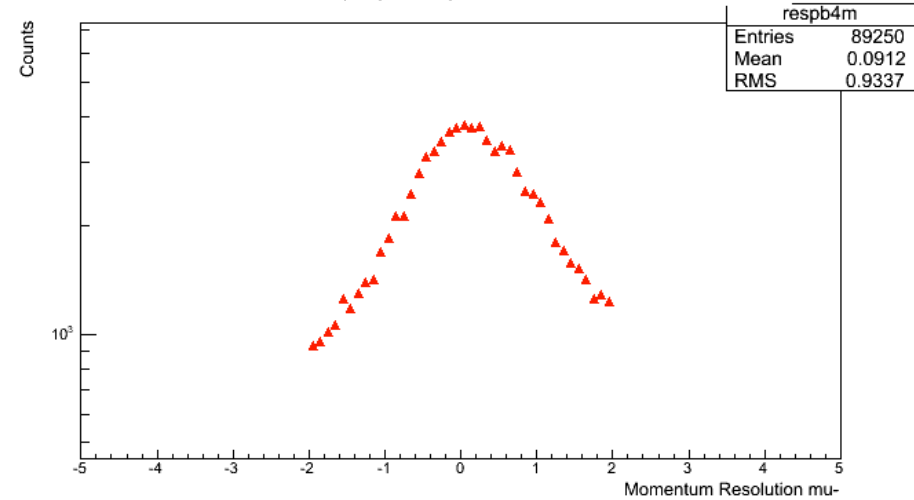
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Mom.Res. mu- (Pup-Pdw)/Pmed 40<Pcov<60 GeV/c

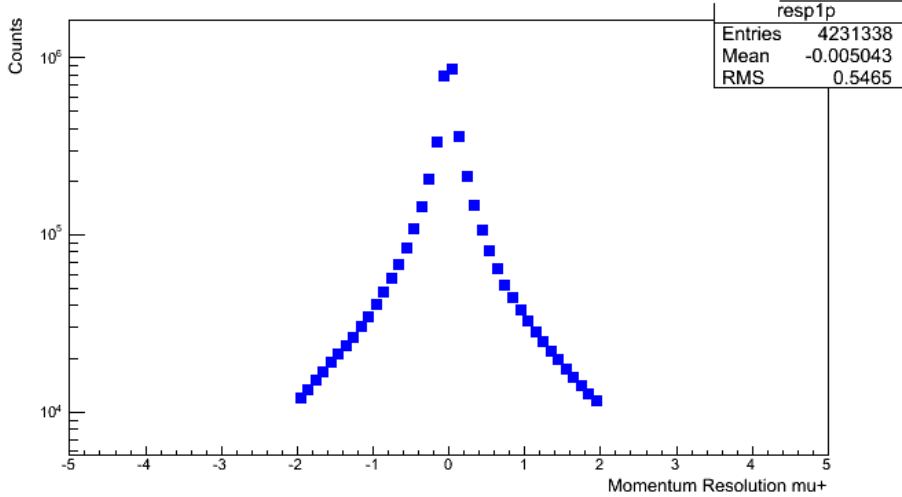


Mom.Res. mu- (Pup-Pdw)/Pmed 60<Pcov<80 GeV/c

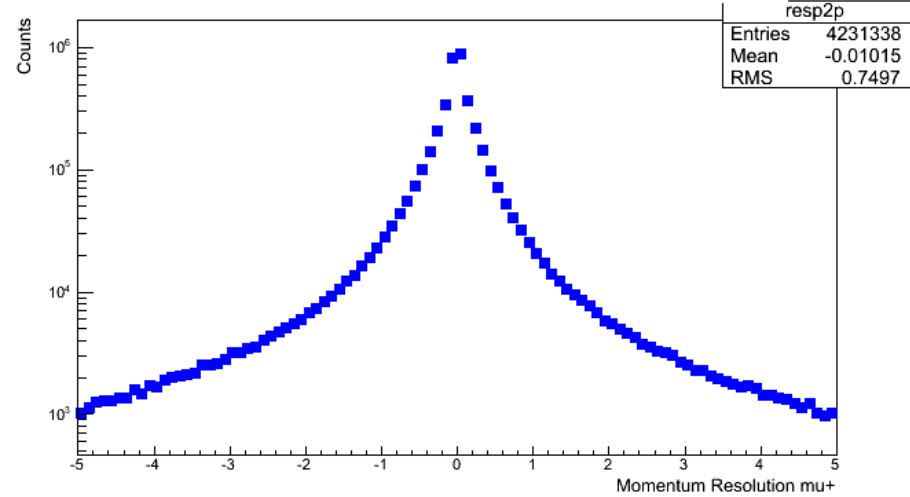


LHC12a,b&c

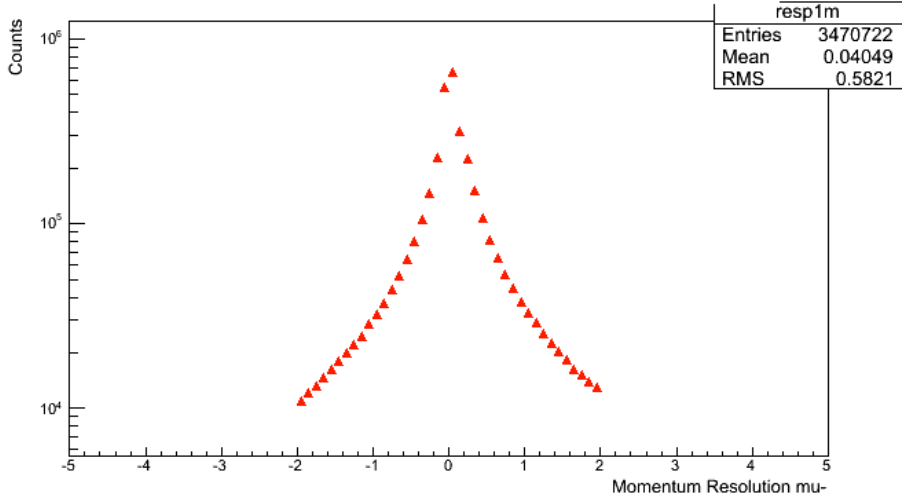
Mom.Res.mu+ (Pup-Pdw)/Pmed Pcov<100 GeV/c



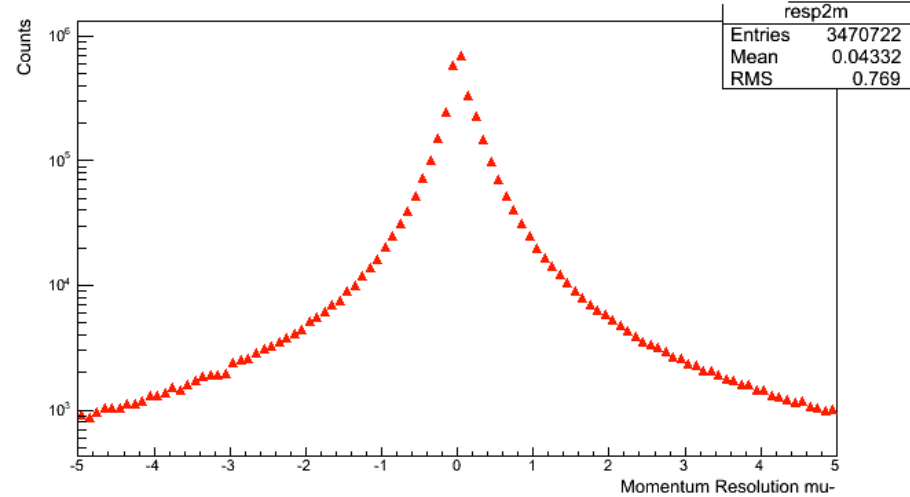
Mom.Res.mu+ (Pup-Pdw)/Pcov Pcov<100 GeV/c



Mom.Res.mu- (Pup-Pdw)/Pmed Pcov<100 GeV/c

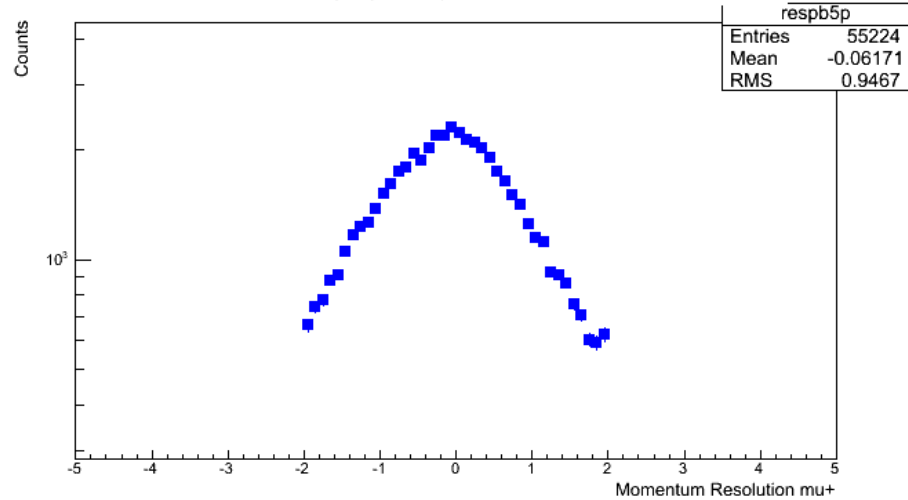


Mom.Res.mu- (Pup-Pdw)/Pcov Pcov<100 GeV/c

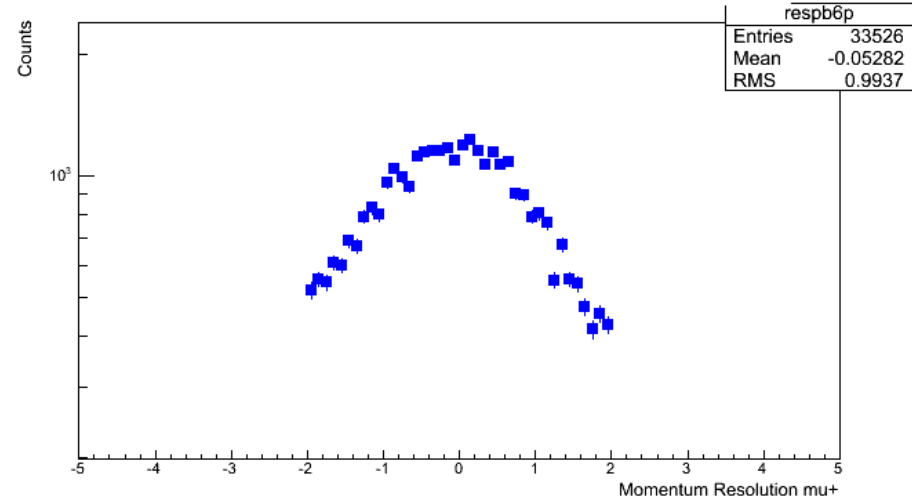


LHC12a,b&c

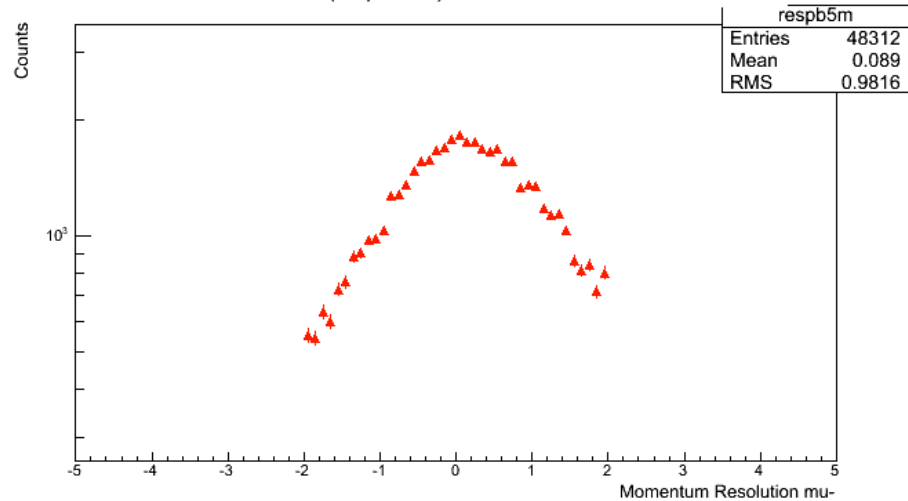
Mom.Res. mu+ (Pup-Pdw)/Pmed 80<Pcov<100 GeV/c



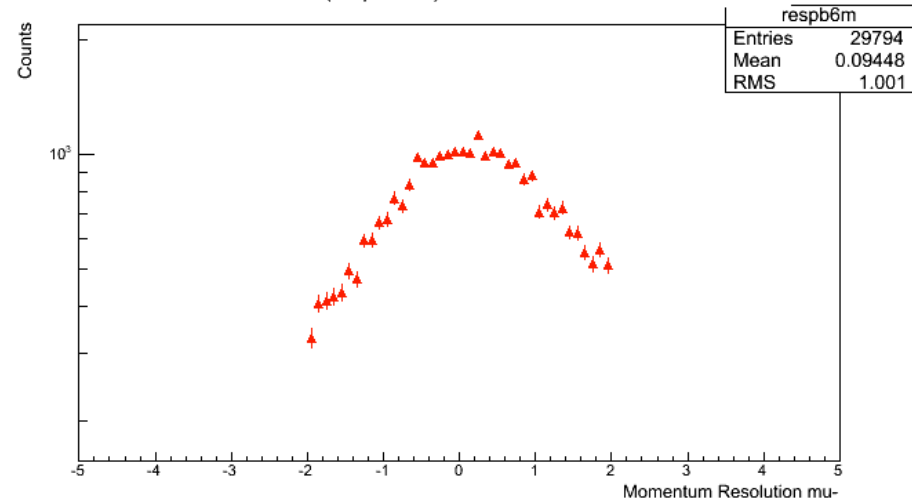
Mom.Res. mu+ (Pup-Pdw)/Pmed 100<Pcov<120 GeV/c



Mom.Res. mu- (Pup-Pdw)/Pmed 80<Pcov<100 GeV/c

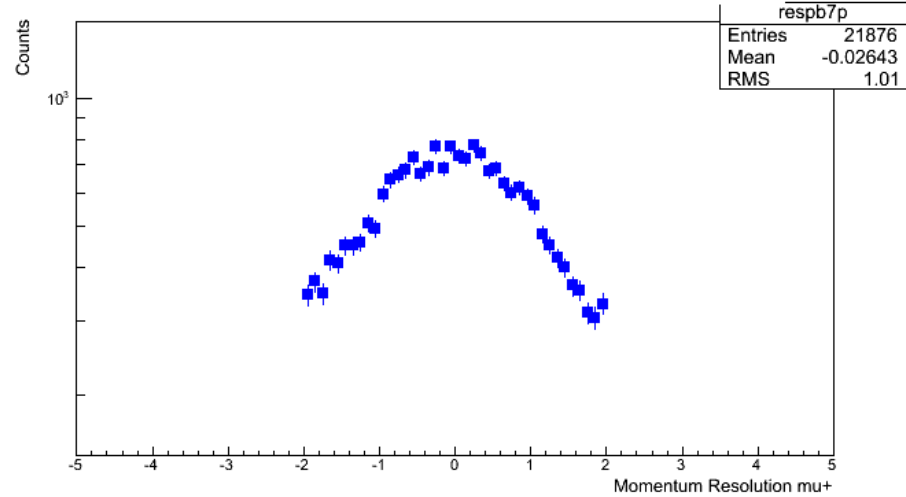


Mom.Res. mu- (Pup-Pdw)/Pmed 100<Pcov<120 GeV/c

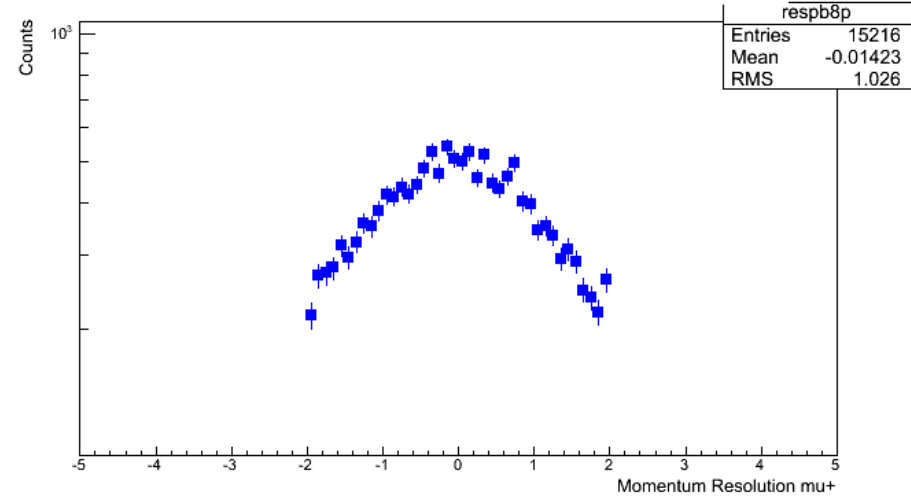


LHC12a,b&c

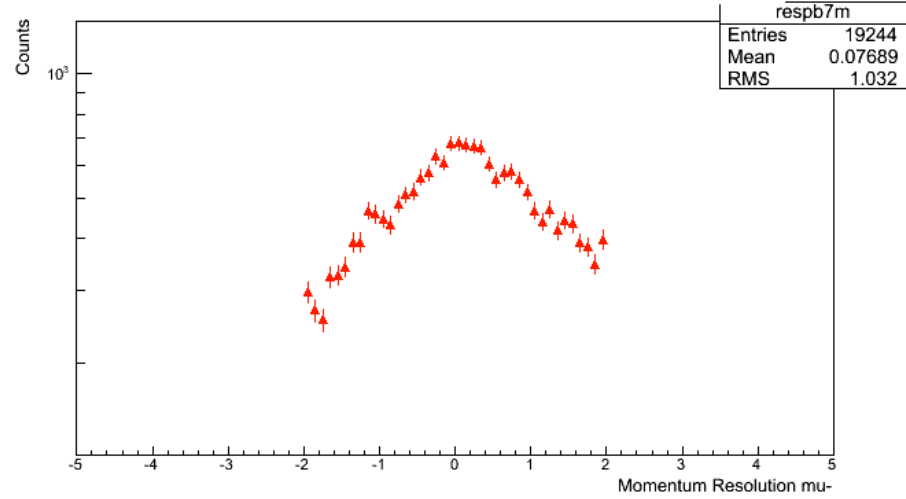
Mom.Res. mu+ (Pup-Pdw)/Pmed 120<Pcov<140 GeV/c



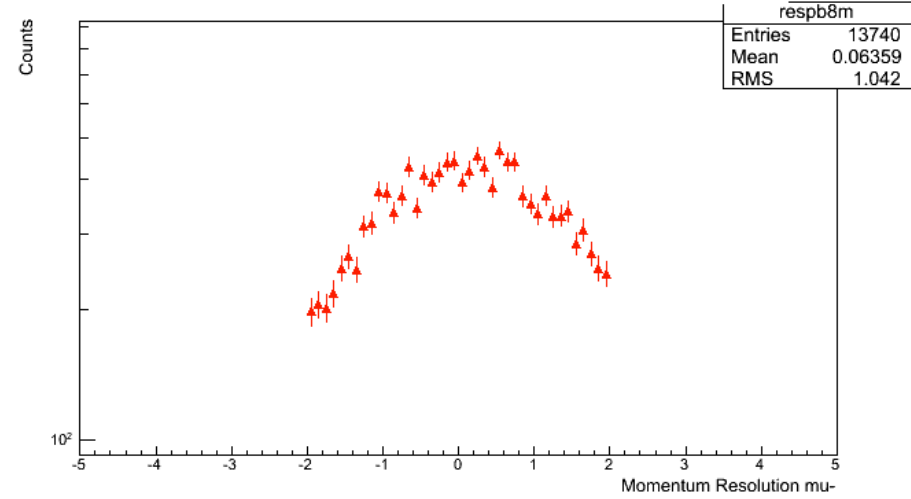
Mom.Res. mu+ (Pup-Pdw)/Pmed 140<Pcov<160 GeV/c



Mom.Res. mu- (Pup-Pdw)/Pmed 120<Pcov<140 GeV/c

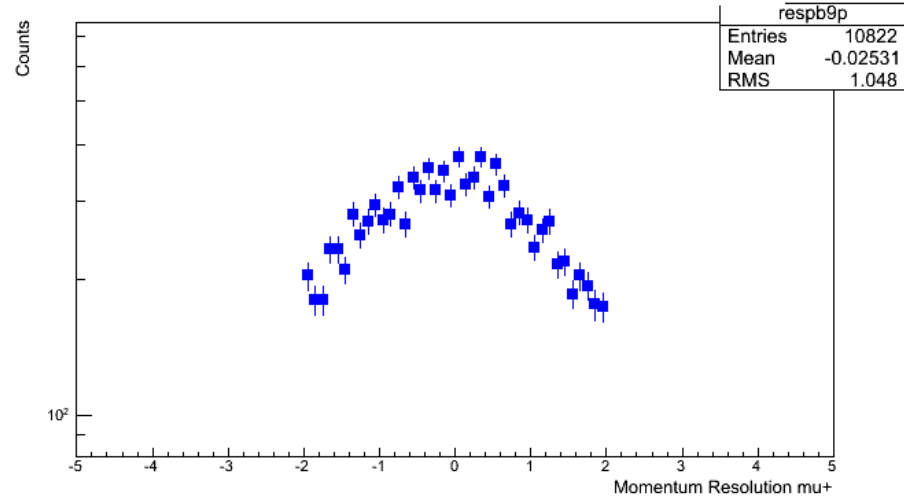


Mom.Res. mu- (Pup-Pdw)/Pmed 140<Pcov<160 GeV/c

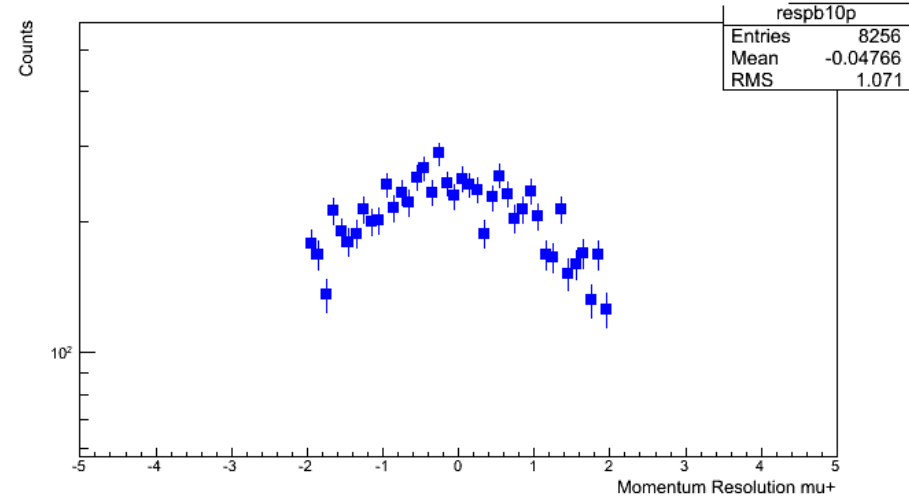


LHC12a,b&c

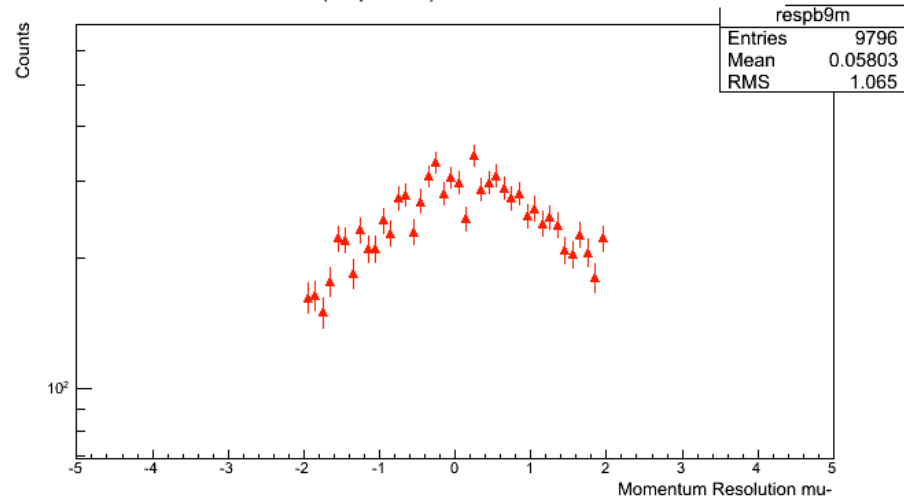
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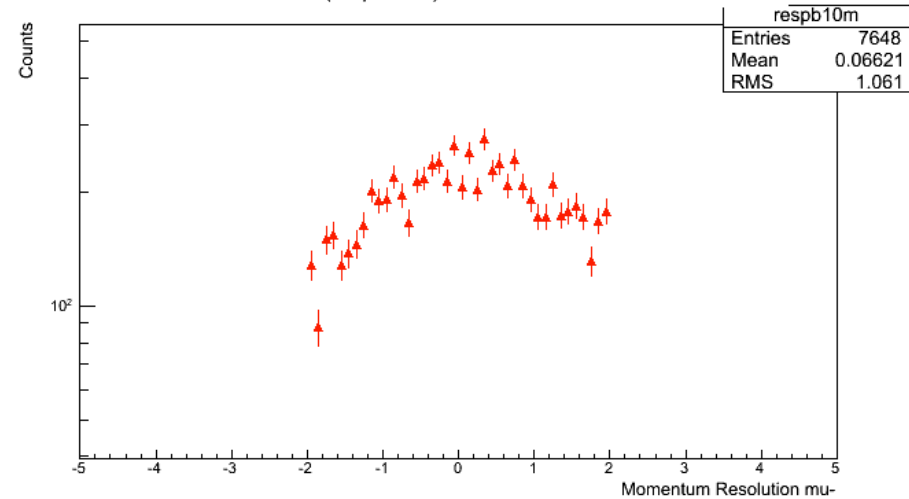
Mom.Res. mu+ (Pup-Pdw)/Pmed 180<Pcov<200 GeV/c



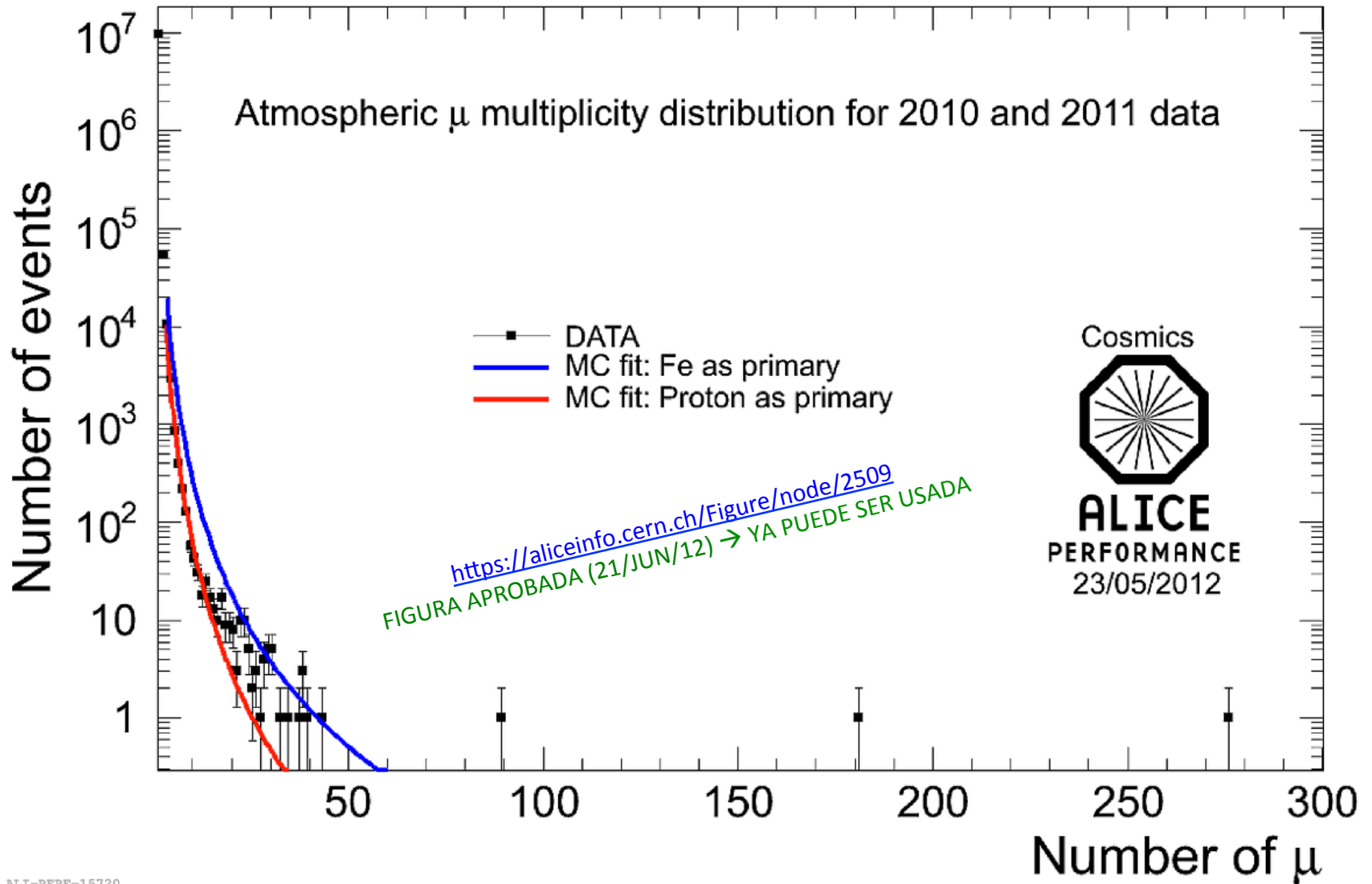
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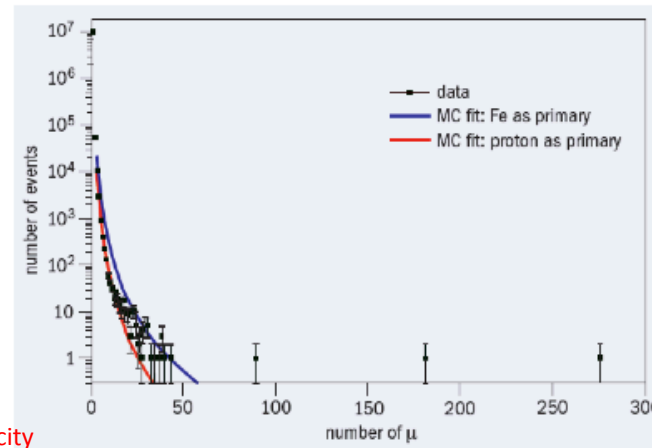
CERN COURIER ARTICLE



CERN COURIER ARTICLE

E. Scapparone & J.P. Revol

Cern courier article by Cosmic PAG. They propose to use this figure:

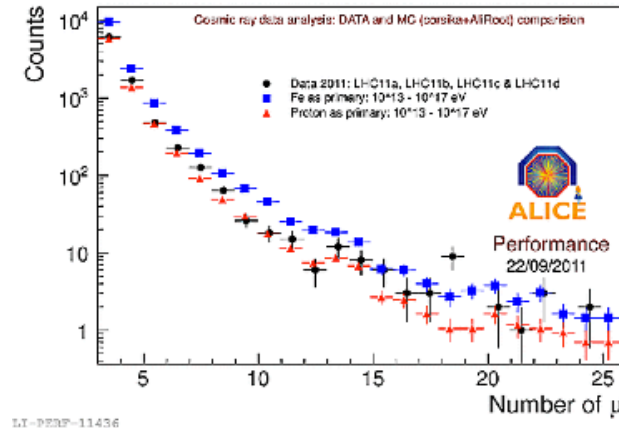


Hi Bruno,
there was a long discussion at the PB on the article. PBM pointed out these events are triggering a lot of interest/discussions (and this is very nice !) in the German CR groups: he was asked several times to comment on that. In this view it is considered dangerous to show the high multiplicity event part since any theoretician could write a paper on that and...he has to quote "Cern Courier" as an Alice reference. Also these are no more considered as "performance" results since the evidence for these events contains an important physics content.

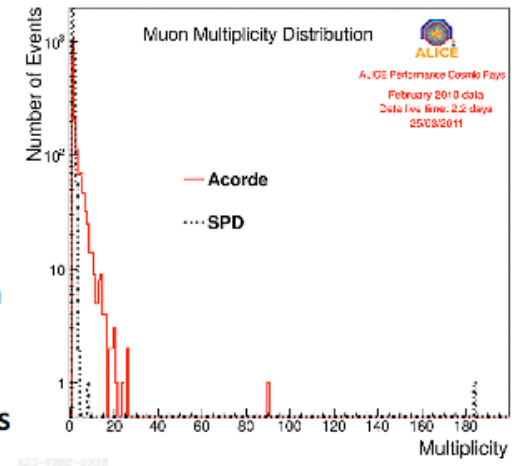
Actions:

- The PB decision is to show the old multiplicity figure (already presented in the past proceedings), then say we have few of these interesting high multiplicity events and show an event display.
- WE have to try to speed up the analysis of these events and try to write a note asap.

Eugenio



Already approved by PWG2 and used in several conference proceedings



<https://indico.cern.ch/conferenceDisplay.py?confId=177654>

ALICE looks to the skies

The ALICE experiment uses a special trigger to keep an eye on high-multiplicity atmospheric muon events – and has made some intriguing observations.

ALICE is one of the four big experiments at CERN's LHC. It is devoted mainly to the study of a new phase of matter, the quark-gluon plasma, which is created in heavy-ion collisions at very high energies. However, located in a cavern 52 m underground with 28 m overburden of rock, it can also detect muons produced by the interactions of cosmic rays reaching the atmosphere.

The use of high-energy collider detectors for cosmic-ray physics was pioneered during the era of the Large Electron-Positron (LEP) collider at CERN by the L3, ALEPH and DELPHI collaborations. An evolution of these programmes is now possible at the LHC, where the experiments are expected to operate for many years, with the possibility of recording a large amount of cosmic data. In this context, ALICE began a programme of cosmic data-taking, collecting data for 10 days over 2010 and 2011 during pauses in

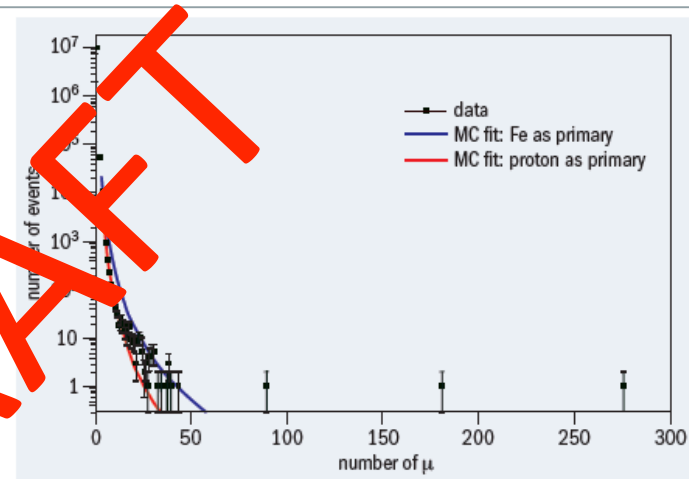


Fig. 1. Atmospheric muon-multiplicity distribution for the data taken in 2010 and 2011. The curves are the predicted distributions, assuming a pure-proton and pure-iron primary composition. The three high-multiplicity events are unexplained even by a pure-iron composition.

absorbed by the rock overburden and only muons with an energy greater than 15 GeV reach the detectors. The special features that

100 years of cosmic rays

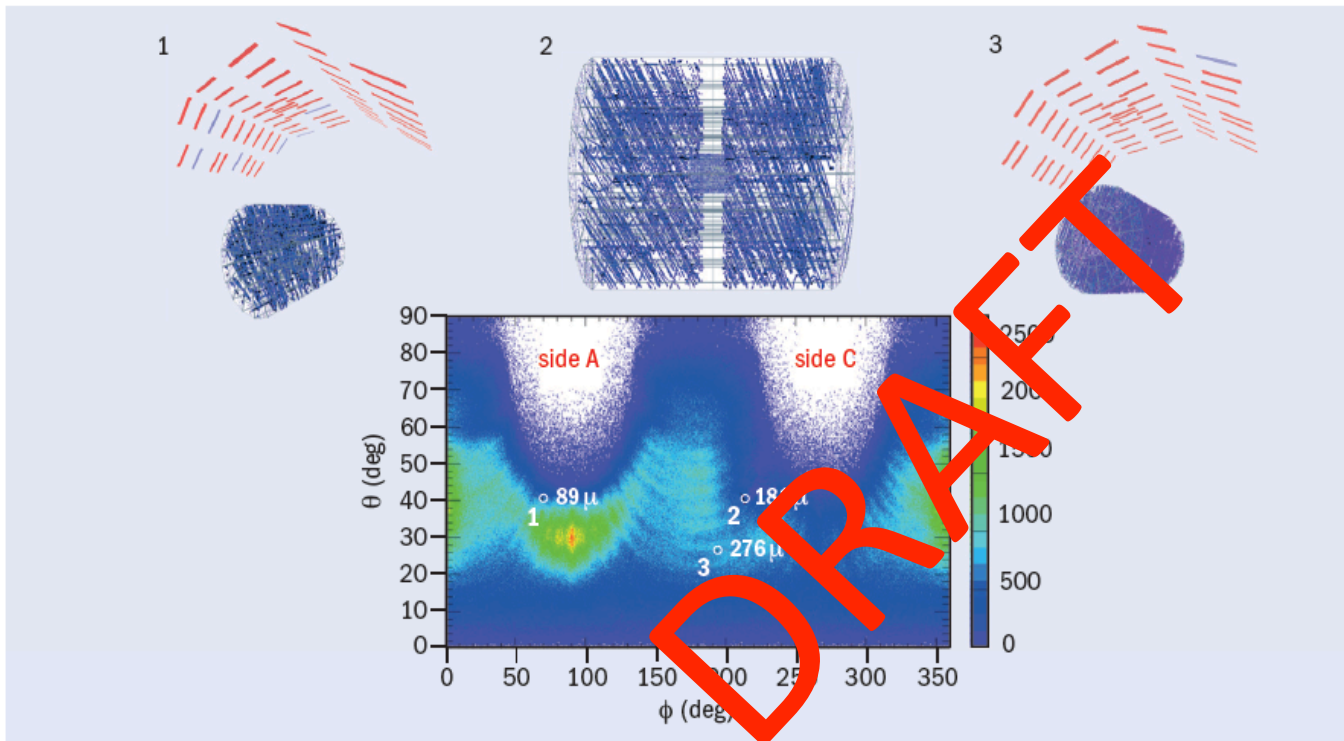
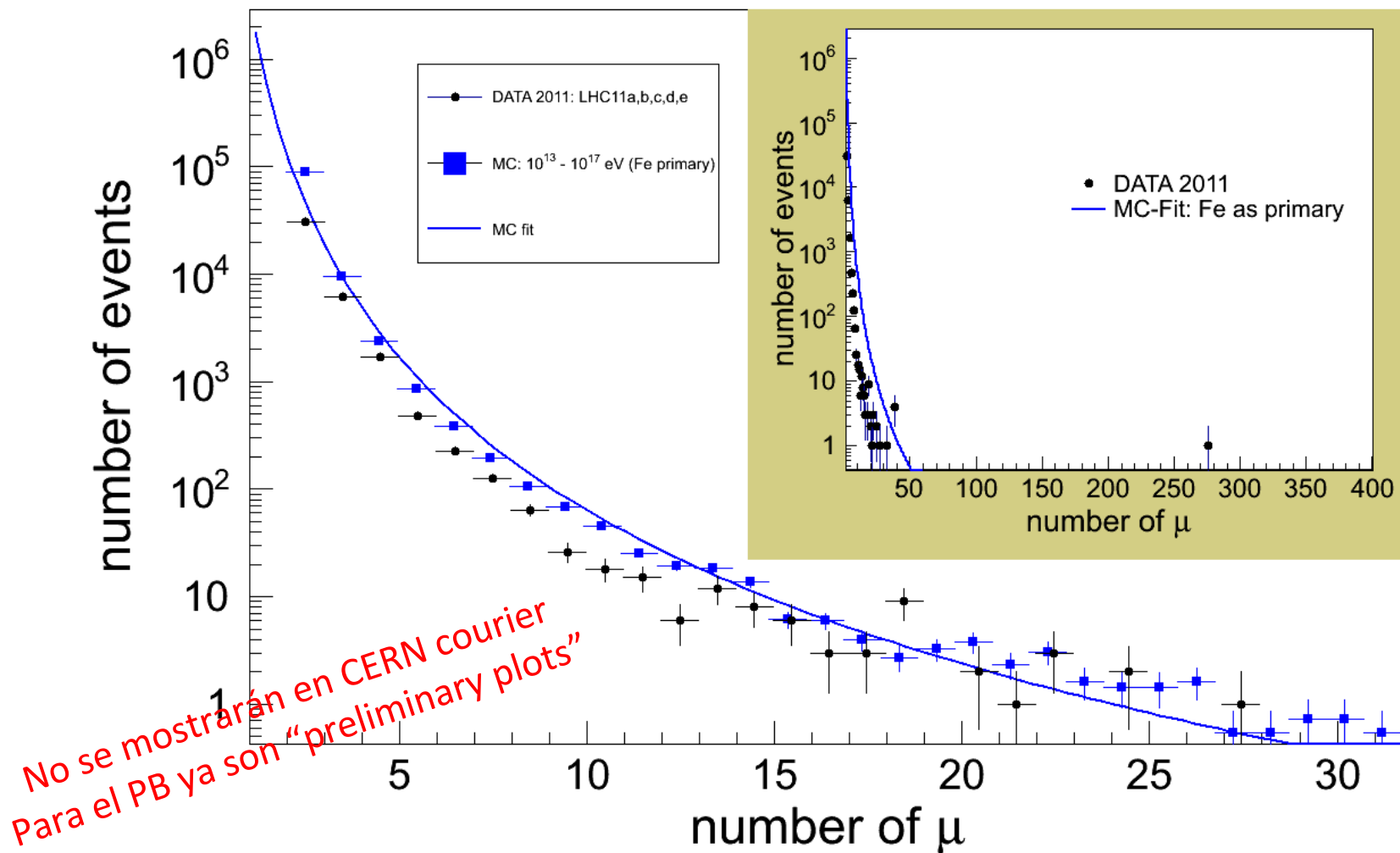


Fig. 2. Display of the three events with high muon-multiplicity and their location in the zenith–azimuth plane (θ – ϕ). These events are not affected by the effects of the ALICE access shafts (green regions). The highest multiplicity event has a signal in 58 ACORDE modules (red rectangles above the cylinder of the TPC).

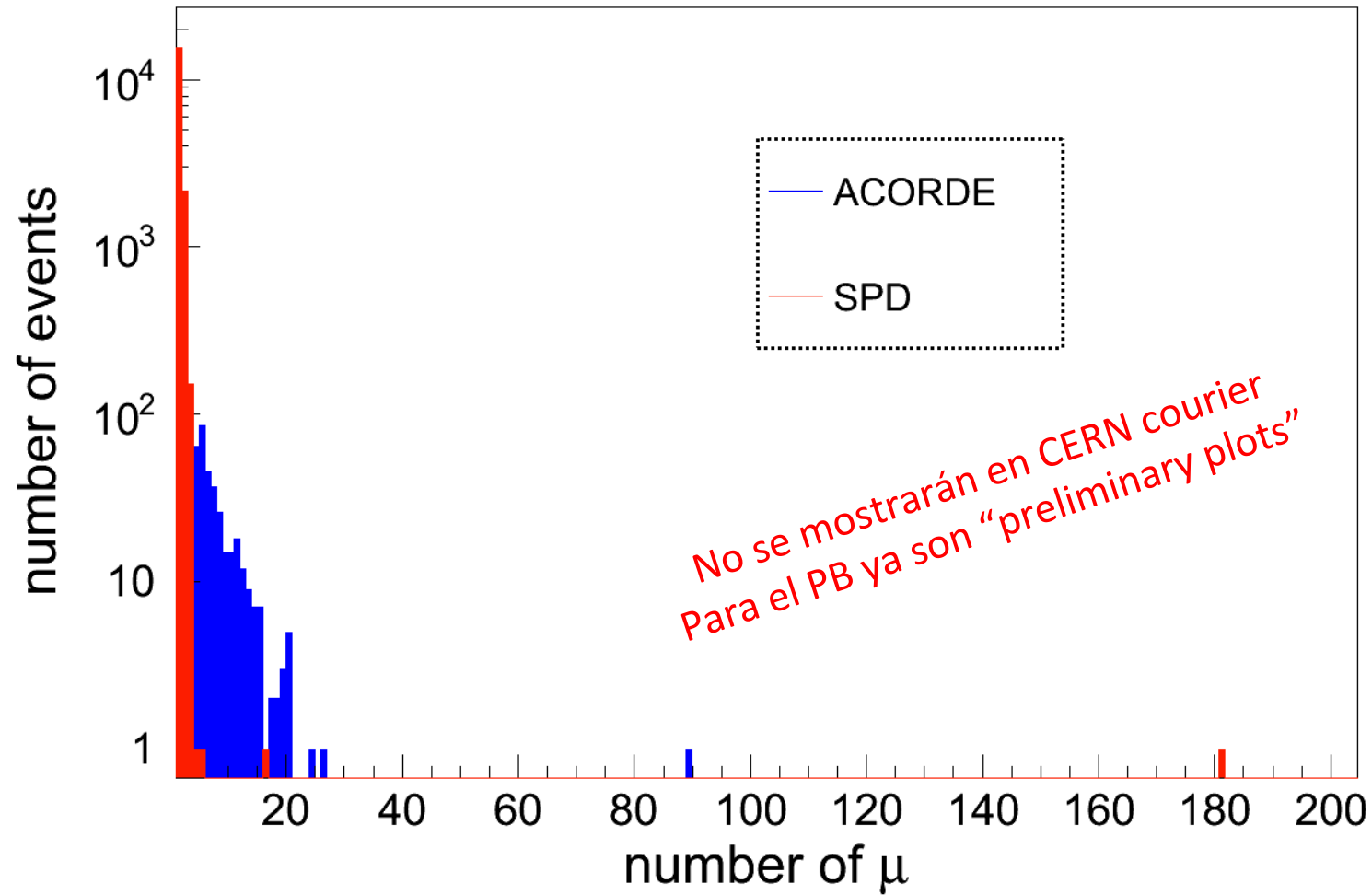
The track of an atmospheric muon crossing the apparatus can be reconstructed by the TPC. This detector's excellent tracking performance can be exploited to measure the main characteristics

276 muons is expected in ALICE in 4–5 years of data, while in one year 4–5 events with a muon multiplicity around 90, and 1–2 events with 180 muons, are expected. Because these events were detected

CERN COURIER ARTICLE



CERN COURIER ARTICLE

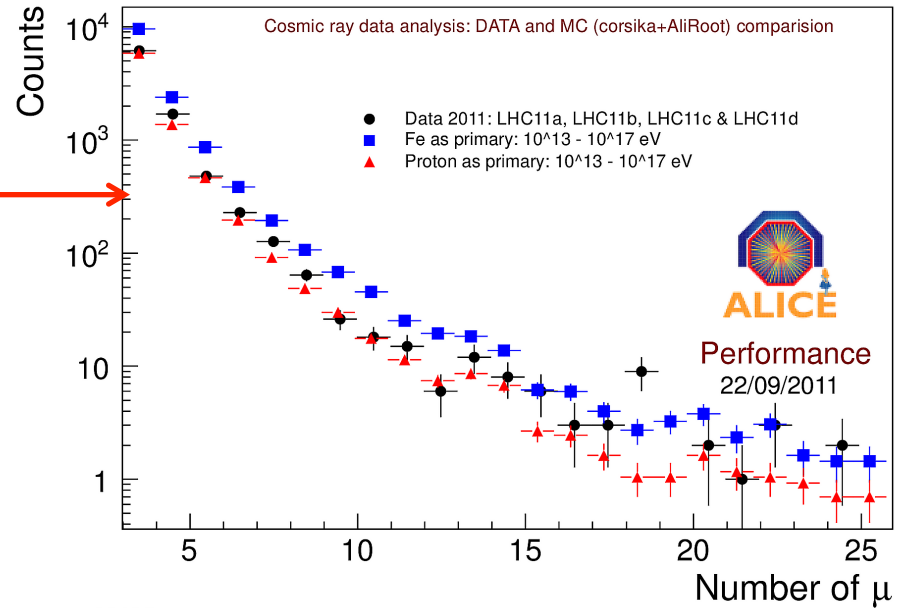
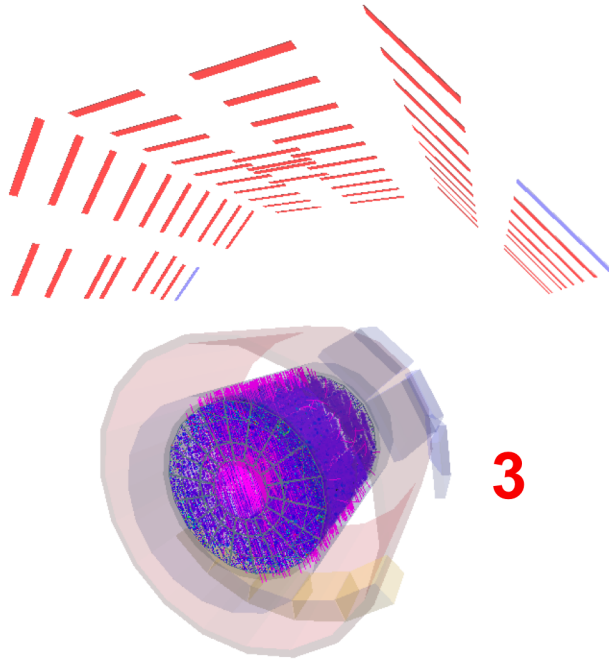


CERN COURIER ARTICLE

<https://aliceinfo.cern.ch/Figure/node/1832>

Dear Bruno,
you can give a look at the today PB on the plot i showed.
The agreement was to show the plot on the bottom left (slide 2) and to comment it saying to reproduce the multiplicity distribution you need a mixed composition (proton/iron only doesn't fit the data).
Then you may comment saying the besides these events we have detected few very high multiplicity events and you can show the event display of one of them.
Just a point: the resolution of the TOF should be ~ 100 ps.

Eugenio



FIGURAS QUE APARECERAN
EN EL ARTÍCULO DEL CERN
COURIER en el número de
Julio de 2012

Comentarios finales

- No se pueden mezclar los 3 periodos para el análisis de datos de 2012.
- La estrategia es usar solamente los datos del periodo LHC12c (0.5 Teslas)
- ¿Alguna sugerencia para combinar los datos de LHC12a y LHC12b?
 - Usar “findable ratio” para hacer una refinamiento en el matching de trazas
- Para el MC → hacer la generación para 2.5 días más y hacer la propagación como se hizo con los datos de 2011
- Hace falta un nuevo estudio para quitar eventos de interacción mu-Fe.
- Tenemos 3 eventos de alta multiplicidad de muones: 116 (LHC12a), 184 (LHC12b) y 136 (LHC12c) → todos disparados por TOF.
- La última versión del artículo para CERN courier está lista esperando el Vo.Bo. De Revol, Scapparone & Yves.
- Primera versión de la Tesis → próximo lunes (a más tardar)

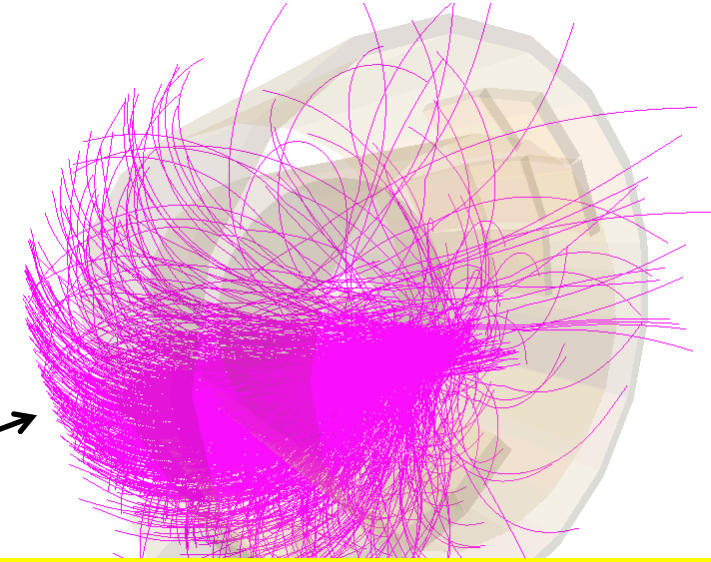
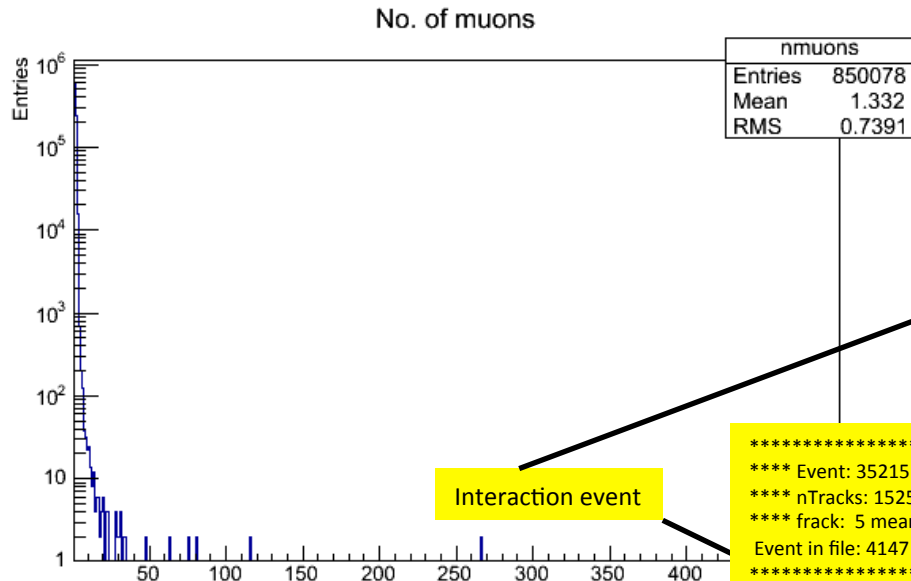
BACKUP

LHC12a

There are 33 runs analyzed for LHC12a period:

- 13 runs with magnetic field off
- 12 runs with (-,-) 0.1 Teslas non standard field
- 2 runs with Kr. Calibration, 0.1 Teslas non standard field
- 3 runs with (-,-)
- 1 run with Kr. Calibration, field off → Not reconstructed
- 3 runs with Cosmic/Beam in Adjust (+,+)

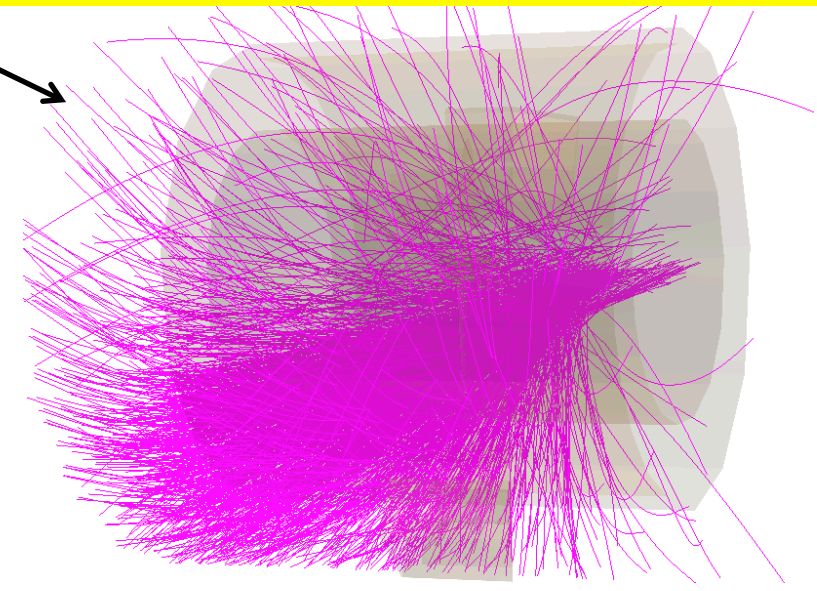
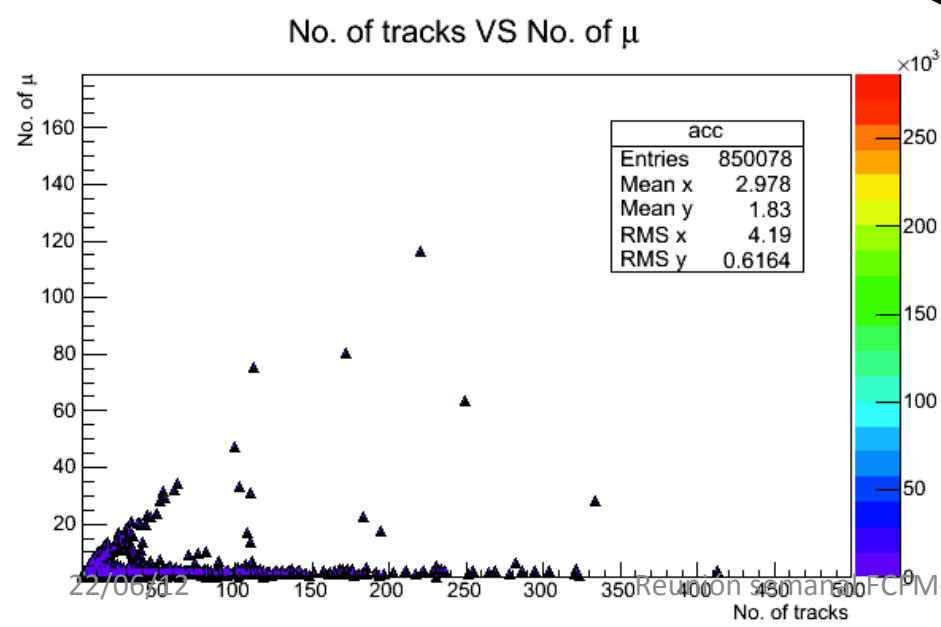
LHC12a



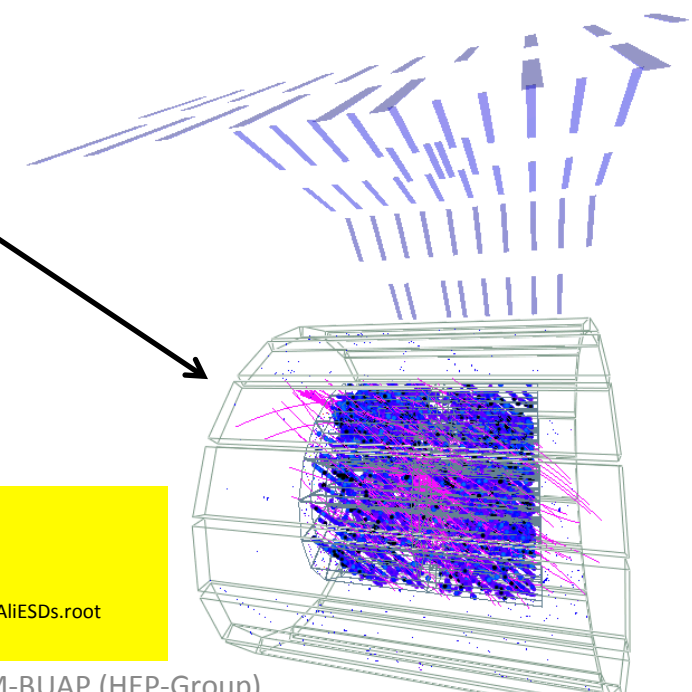
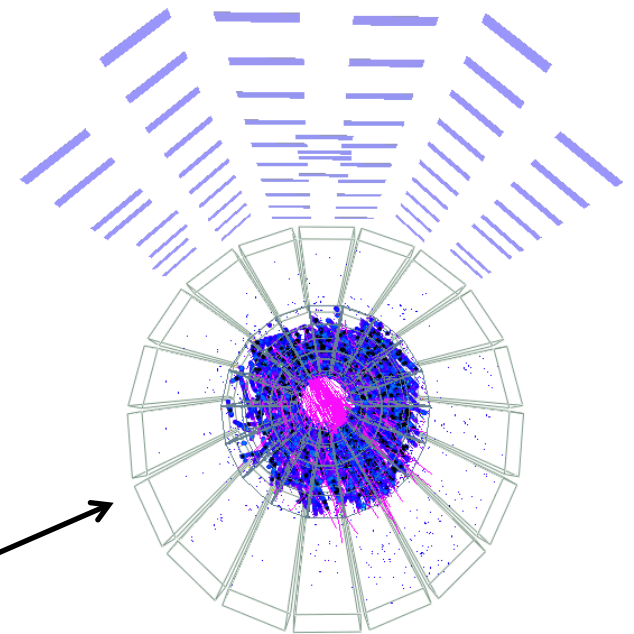
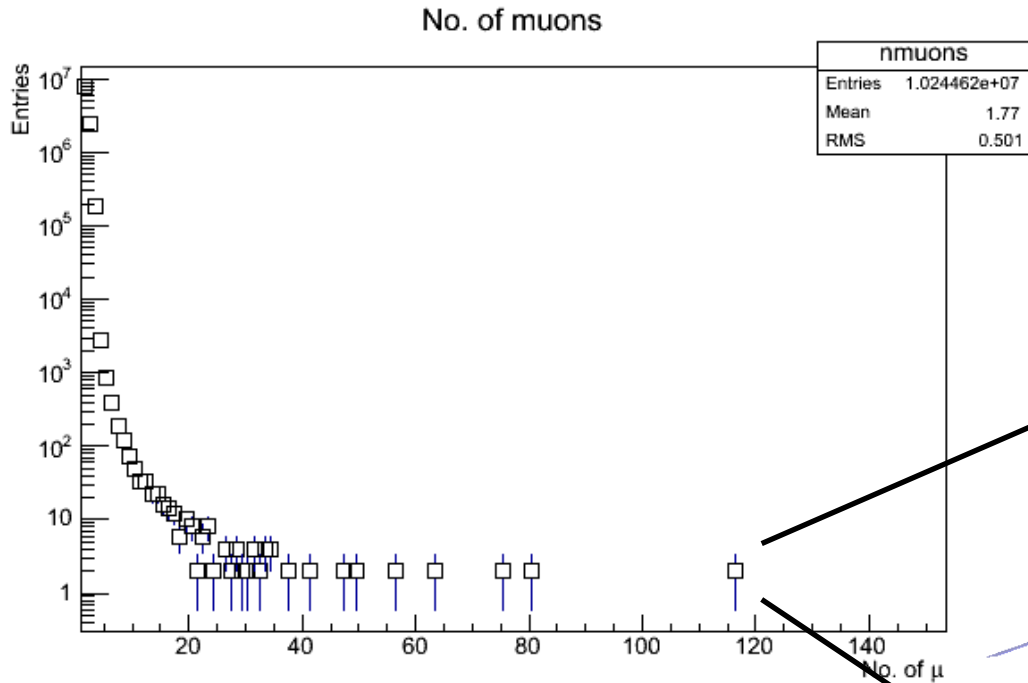
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***** Summary of event *****
**** Event: 3521512 trigFlag: 512 IsInteraction?: 0 MCN: 0 ****
**** nTracks: 1525 nMuons: 266 ****
**** frack: 5 meanDistance: 273.997 ****
Event in file: 4147 fileName: alien:///alice/data/2012/LHC12a/000172495/ESDs/cosmics/12000172495004.34/AliESDs.root
*****
    
```

Interaction event



LHC12a



```
***** Summary of event *****  
**** Event: 2155093 trigFlag: 512 IsInteraction?: 0 MCN: 0 ****  
**** nTracks: 220 nMuons: 116 ****  
**** frack: 1 meanDistance: 138.61 ****  
Event in file: 203 fileName: alien:///alice/data/2012/LHC12a/000172473/ESDs/cosmics/12000172473007.80/AliesDs.root  
*****
```

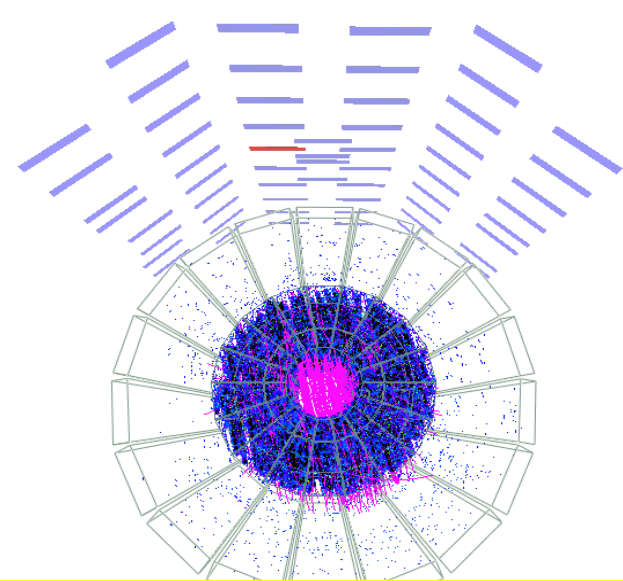
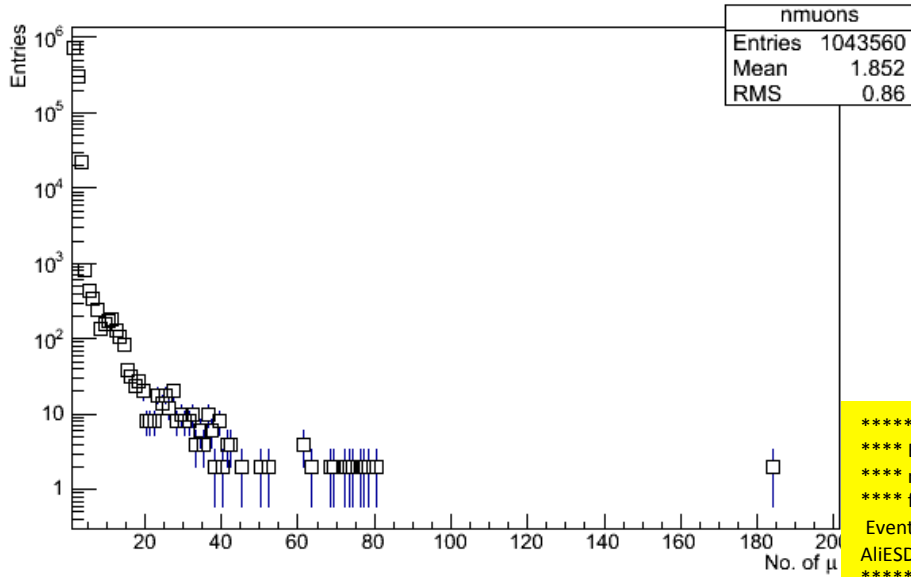
LHC12b

There are 8 runs analyzed for LHC12b period:

- 7 runs with magnetic field off
- 1 runs with (dipole off,+)

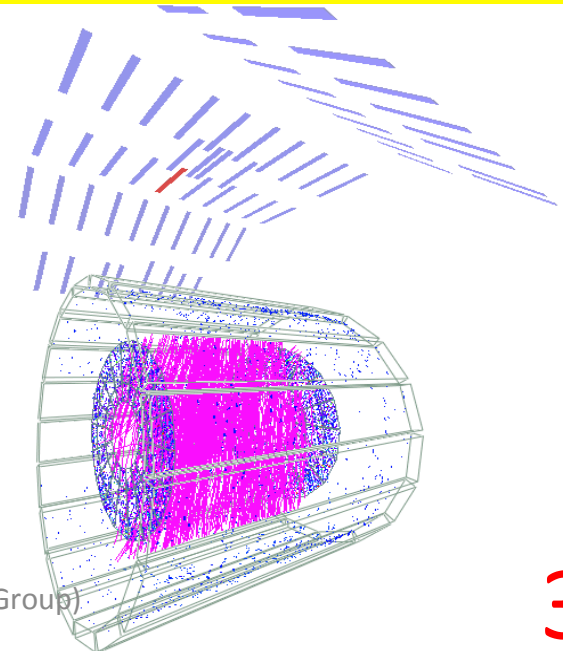
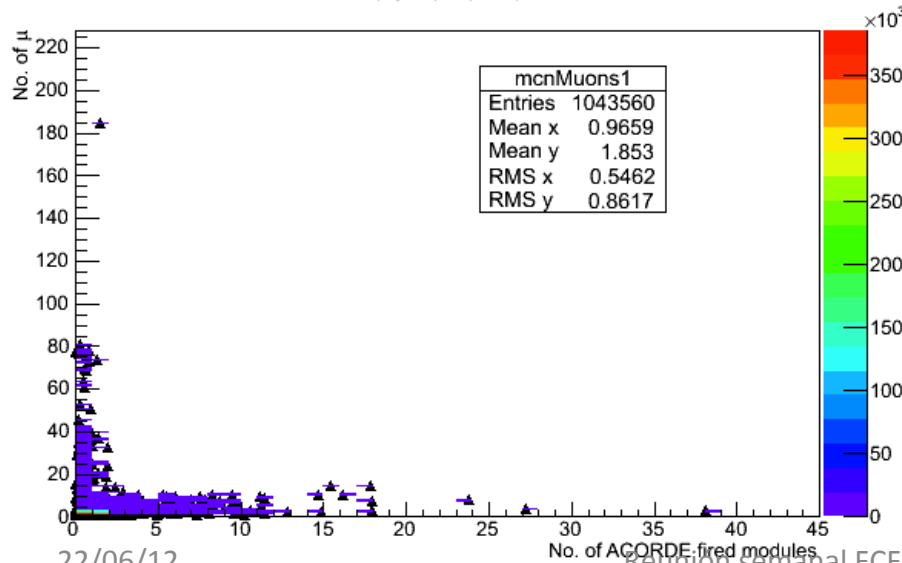
LHC12b

No. of muons



***** Summary of event *****
 **** Event: 1883554 trigFlag: 33 IsInteraction?: 0 MCN: 1 ****
 **** nTracks: 570 nMuons: 184 ****
 **** frack: 3 meanDistance: 128.962 ****
 Event in file: 2056 fileName: alien:///alice/data/2012/LHC12b/000179090/ESDs/cosmics/12000179090061.17/
 AliESDs.root

MUONS vs MCN



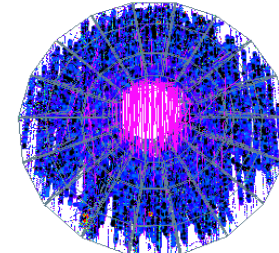
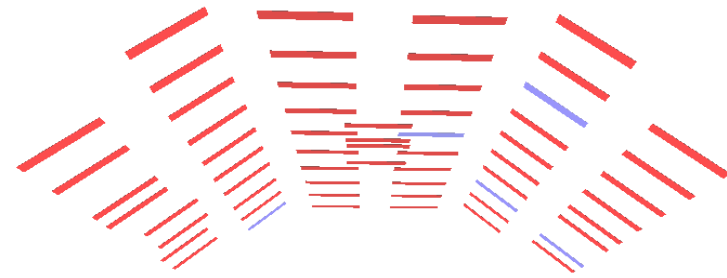
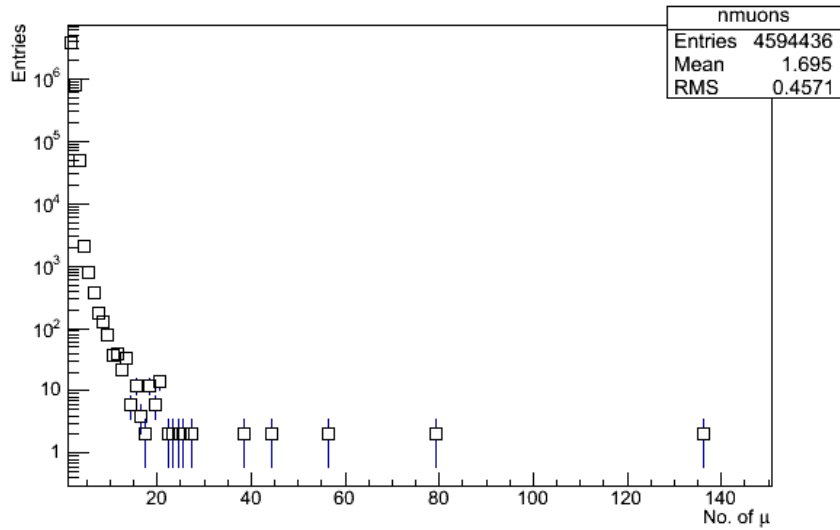
LHC12c

There are 19 runs analyzed for LHC12c period:

- (+,+) Field ON

LHC12c

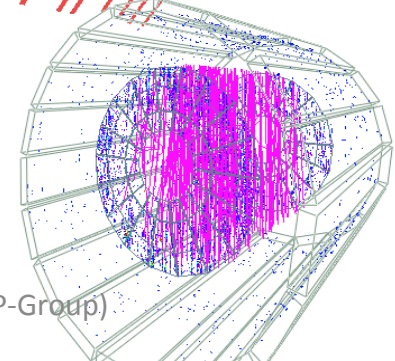
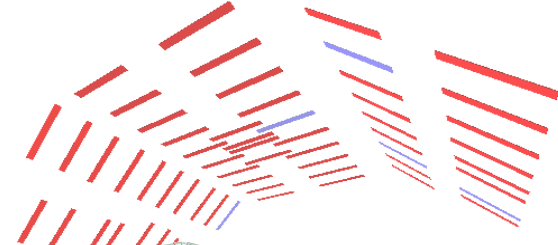
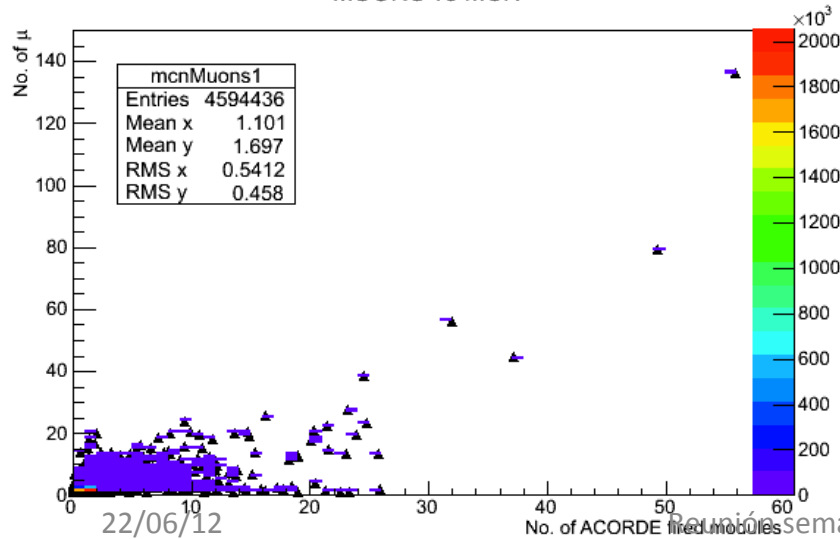
No. of muons



```

**** Summary of event ****
**** Event: 1194848 trigFlag: 33 IsInteraction?: 0 MCN: 55 ****
**** nTracks: 317 nMuons: 136 ****
**** frack: 2 meanDistance: 181.689 ****
Event in file: 67 fileName: alien:///alice/data/2012/LHC12c/
000179742/ESDs/cosmics/12000179742036.12/AlESDs.root
****
    
```

MUONS vs MCN

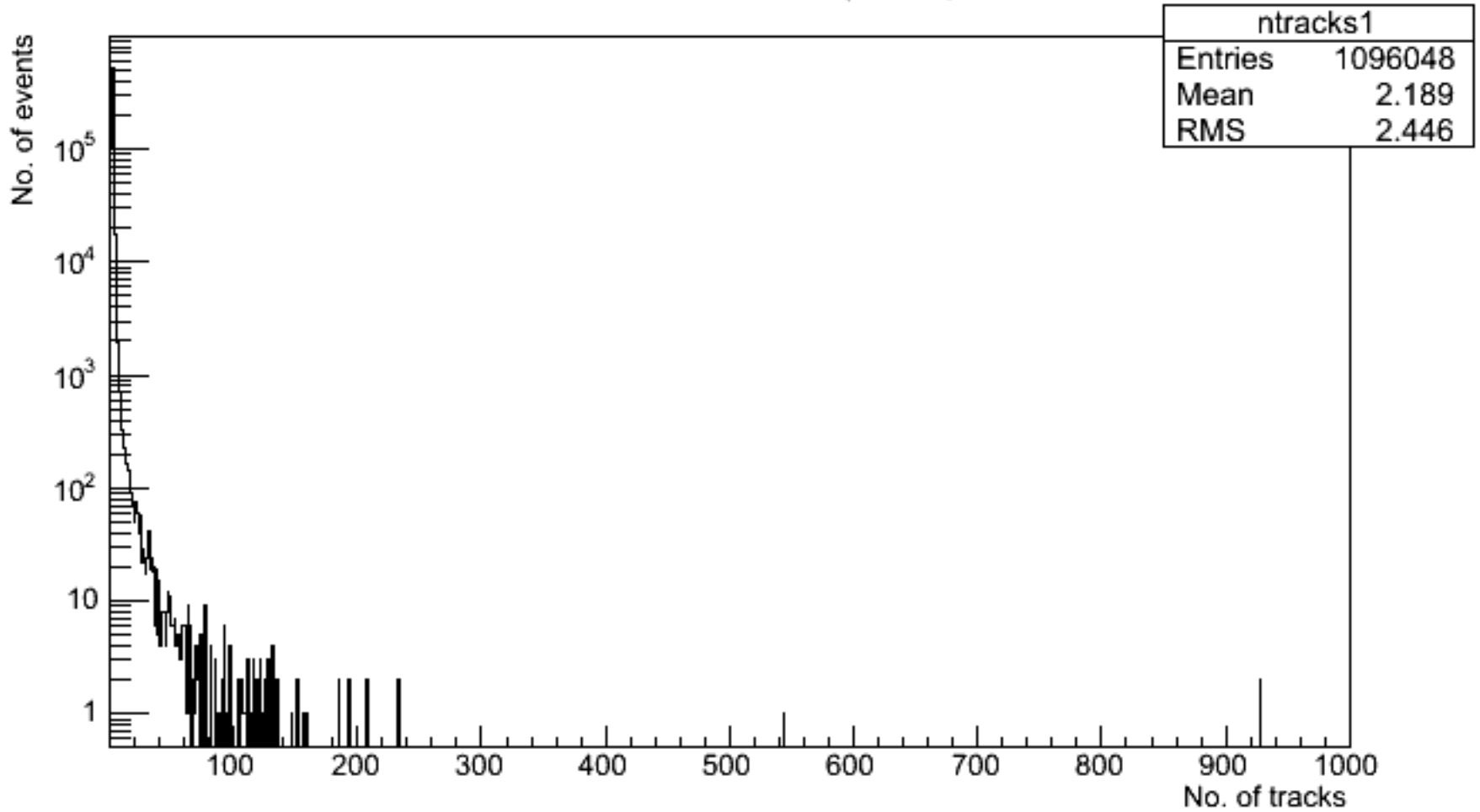


22/06/12

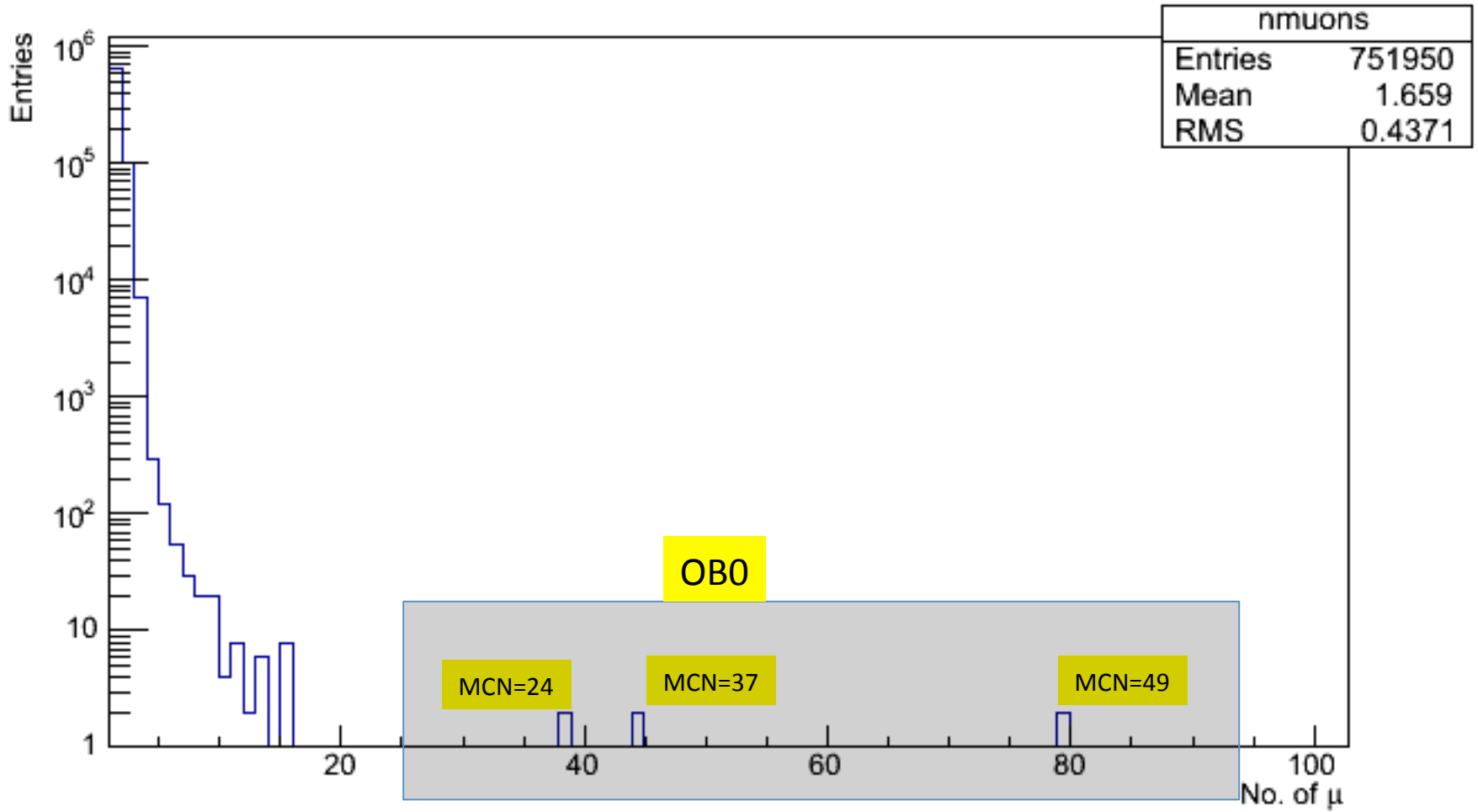
FOR EXAMPLE:

RUN 179758

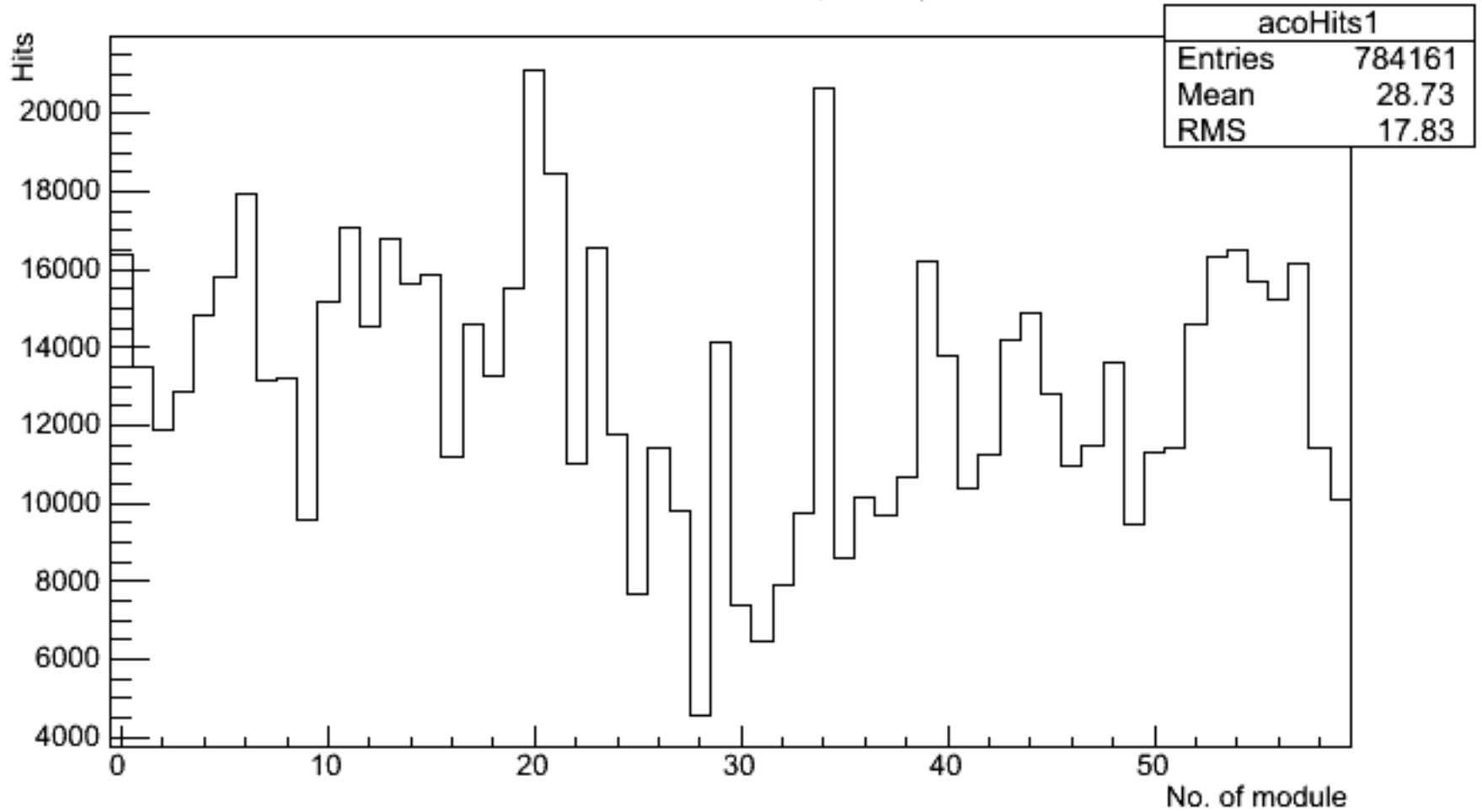
track distribution (ESD)



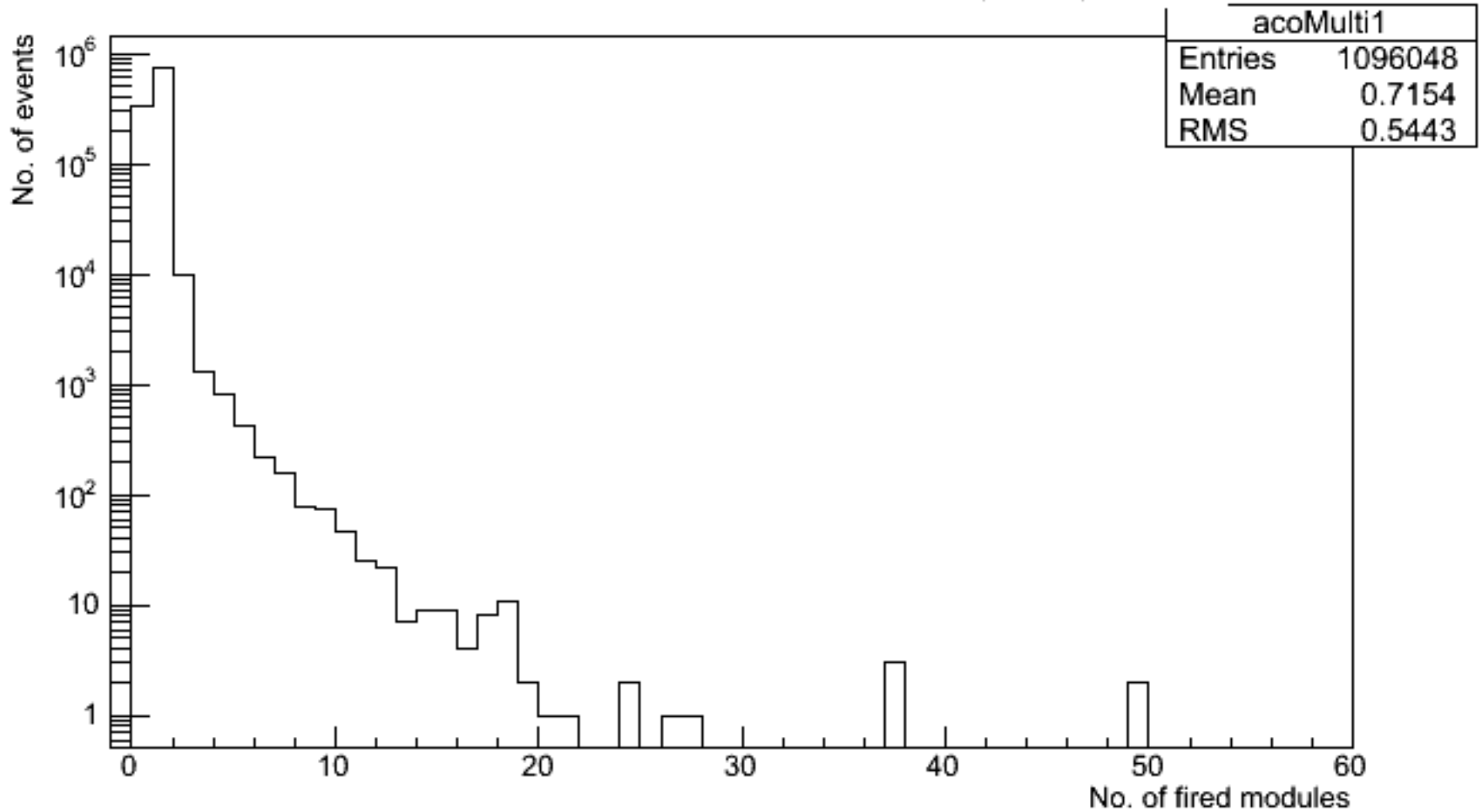
No. of muons



ACORDE hits (ESD)

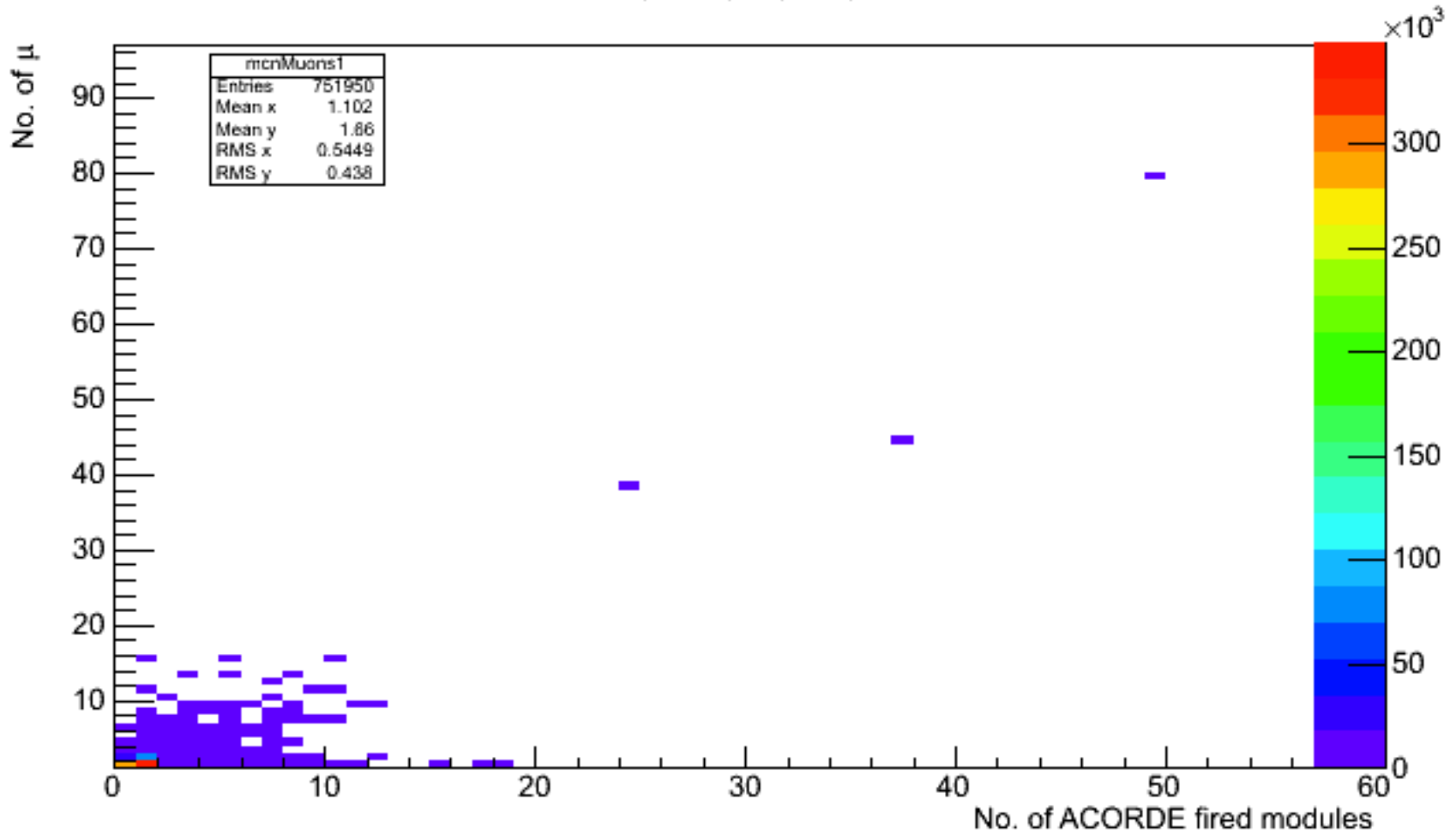


ACORDE modules multiplicity (ESD)



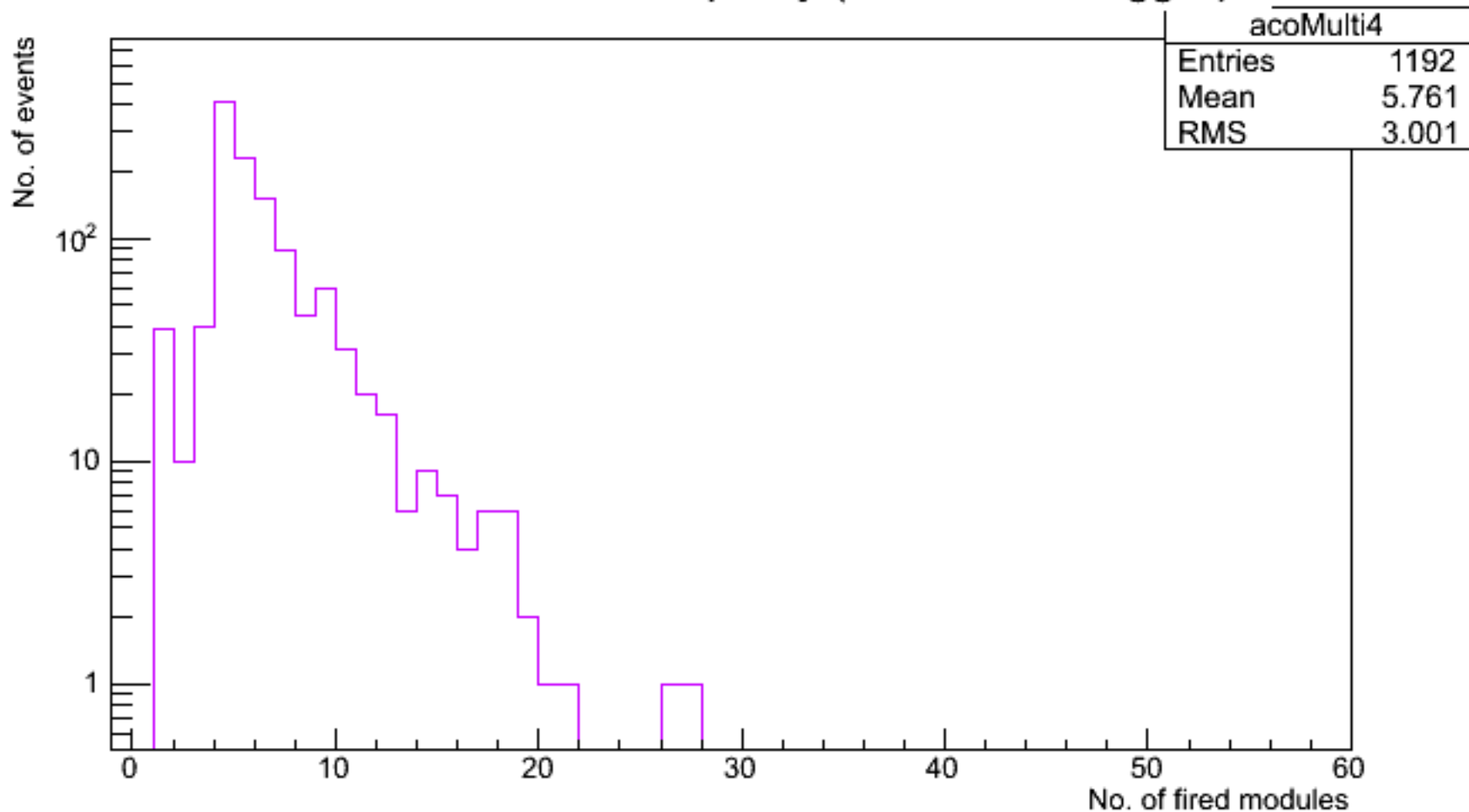
ALL TRIGGERS

MUONS vs MCN



ALL TRIGGERS

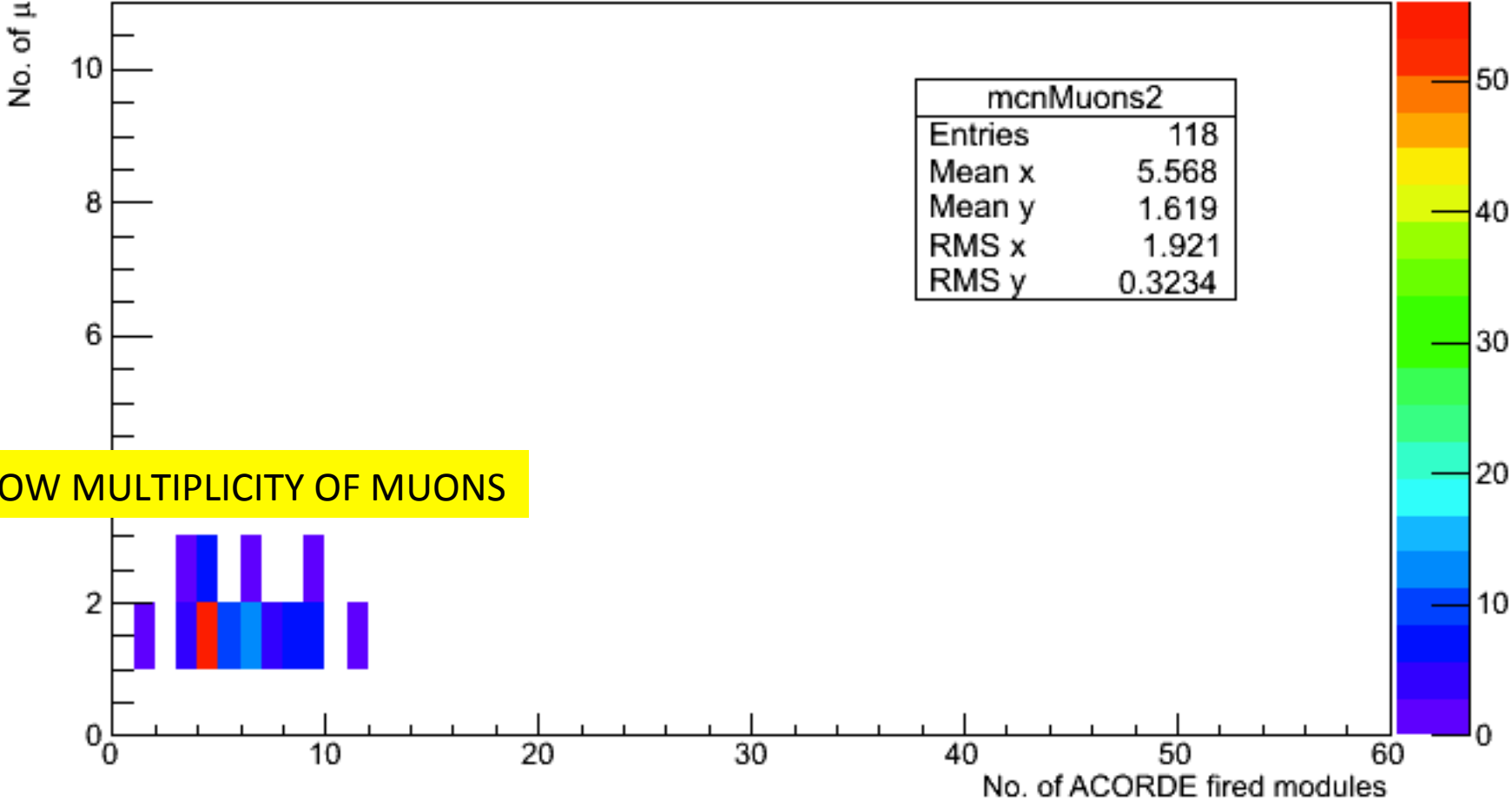
ACORDE modules multiplicity (ESD - AMU trigger)



AMU TRIGGER

There are atmospheric muons reconstructed by the TPC only in the 9.89% of the events triggered by ACORDE

MUONS vs MCN



LOW MULTIPLICITY OF MUONS

AMU TRIGGER

MCN > 20

```
***** Summary of event triggered by ACORDE *****
**** Event: 243706 trigFlag: 36 MCN: 26 ****
**** nTracks: 0 nMuons: 0 ****
Event in file: 1949 fileName: alien:///alice/data/2012/LHC12c/000179758/ESDs/cosmics/12000179758041.15/AliESDs.root
*****
***** Summary of event triggered by ACORDE *****
**** Event: 368827 trigFlag: 36 MCN: 27 ****
**** nTracks: 0 nMuons: 0 ****
Event in file: 1070 fileName: alien:///alice/data/2012/LHC12c/000179758/ESDs/cosmics/12000179758034.14/AliESDs.root
*****
***** Summary of event triggered by ACORDE *****
**** Event: 622938 trigFlag: 36 MCN: 21 ****
**** nTracks: 0 nMuons: 0 ****
Event in file: 320 fileName: alien:///alice/data/2012/LHC12c/000179758/ESDs/cosmics/12000179758009.10/AliESDs.root
*****
```

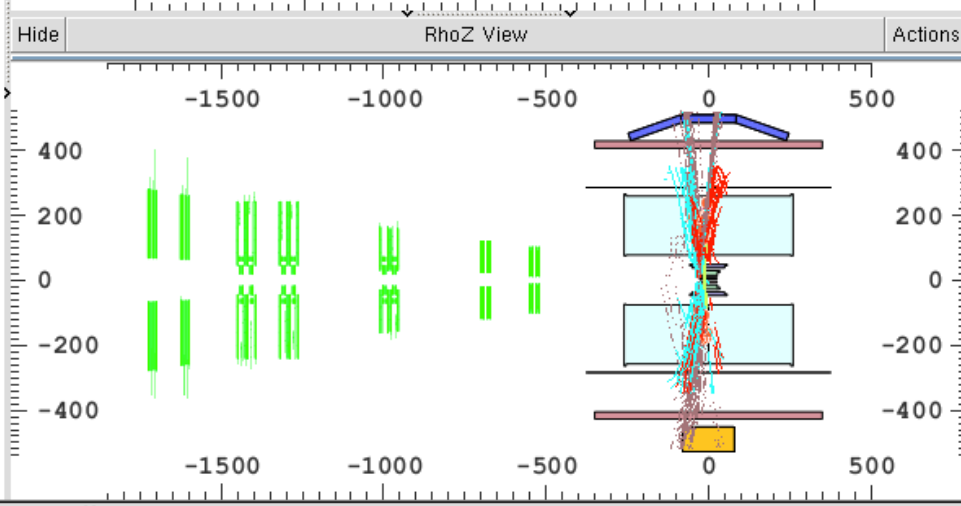
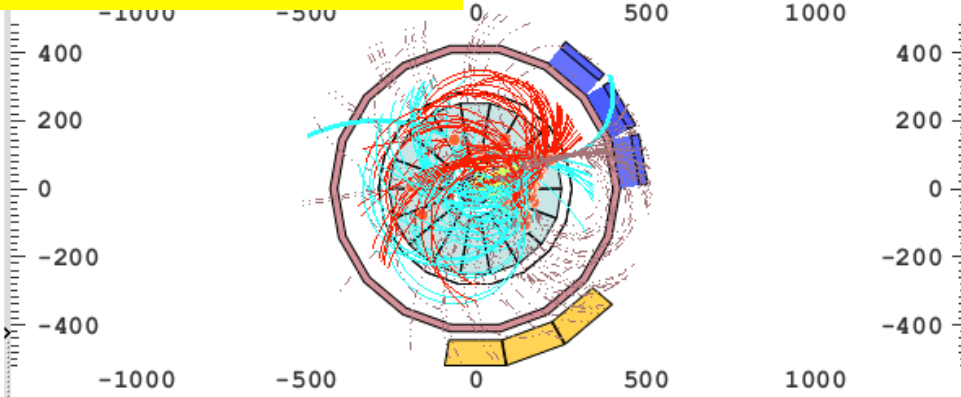
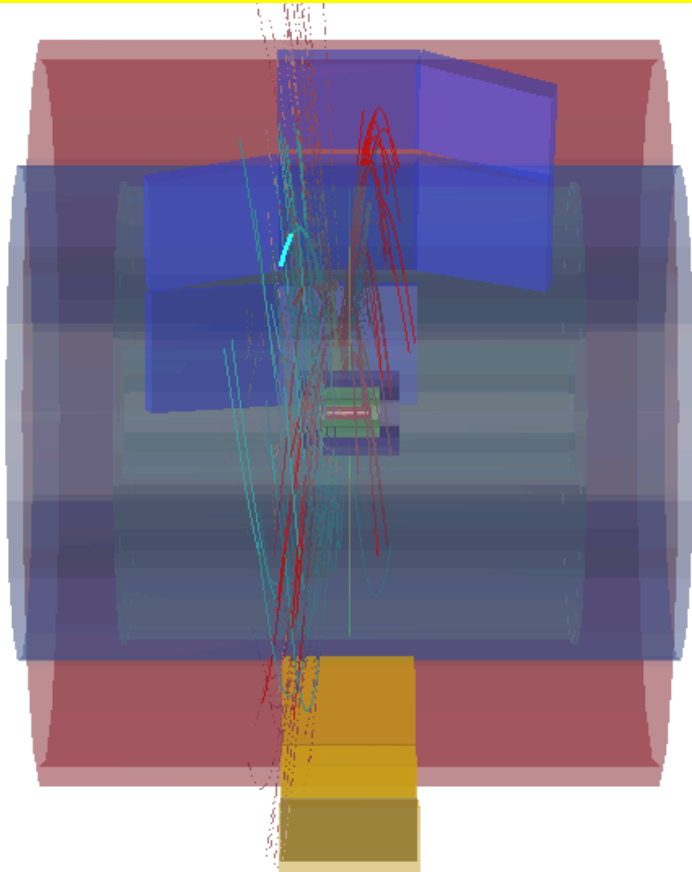
EMPTY EVENTS IN THE TPC WITH ACORDE TRIGGER + MCN > 20

MCN > 20

```
***** Summary of event triggered by TOF *****
*** Event: 68582 trigFlag: 33 MCN: 37 ***
*** nTracks: 103 nMuons: 44 ***
Event in file: 1817 fileName: alien:///alice/data/2012/LHC12c/000179758/ESDs/cosmics/12000179758042.12/AliESDs.root
*****
***** Summary of event triggered by TOF *****
*** Event: 110638 trigFlag: 33 MCN: 24 ***
*** nTracks: 59 nMuons: 38 ***
Event in file: 1706 fileName: alien:///alice/data/2012/LHC12c/000179758/ESDs/cosmics/12000179758041.12/AliESDs.root
*****
***** Summary of event triggered by TOF *****
*** Event: 298493 trigFlag: 33 MCN: 49 ***
*** nTracks: 135 nMuons: 79 ***
Event in file: 777 fileName: alien:///alice/data/2012/LHC12c/000179758/ESDs/cosmics/12000179758033.17/AliESDs.root
*****
***** Summary of event triggered by TOF *****
*** Event: 916310 trigFlag: 33 MCN: 37 ***
*** nTracks: 0 nMuons: 0 ***
Event in file: 1843 fileName: alien:///alice/data/2012/LHC12c/000179758/ESDs/cosmics/12000179758029.12/AliESDs.root
*****
```

ONE EMPTY EVENT IN THE TPC WITH OBO + TRD trigger

***** Summary of event *****
 *** Event: 8858 trigFlag: 33 IsInteraction?: 0 MCN: 1 ***
 *** nTracks: 119 nMuons: 15 ***
 Event in file: 1491 fileName: alien:///alice/data/2012/LHC12c/000179758/ESDs/cosmics/12000179758038.11/AliESDs.root



Command EventCtrl

First Prev 1491 / 2832 Next Last Refresh Autoload Time: 5

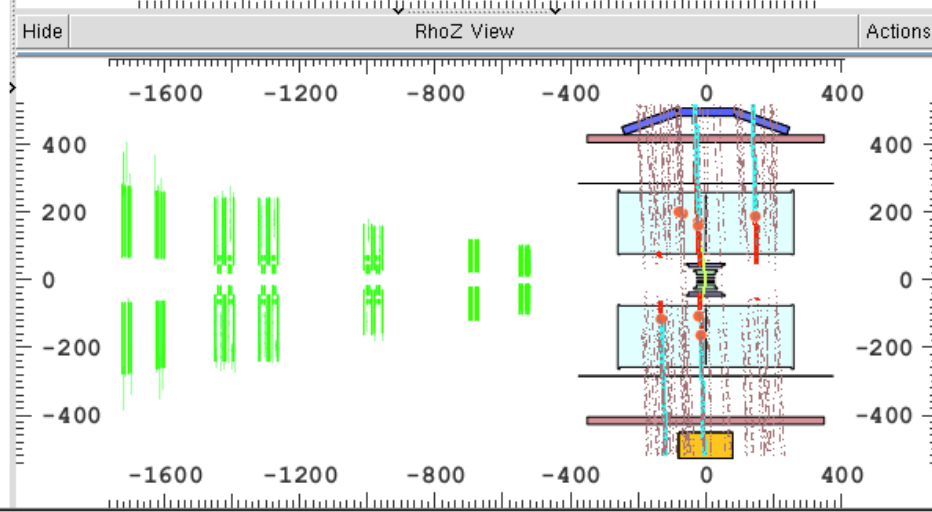
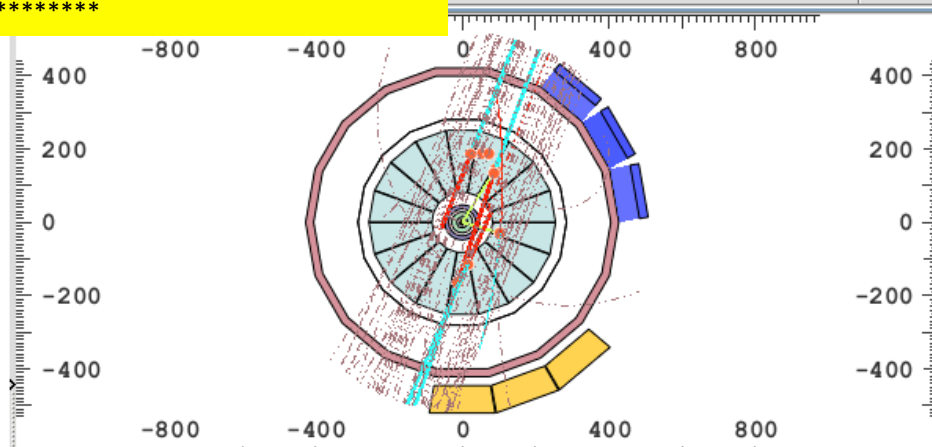
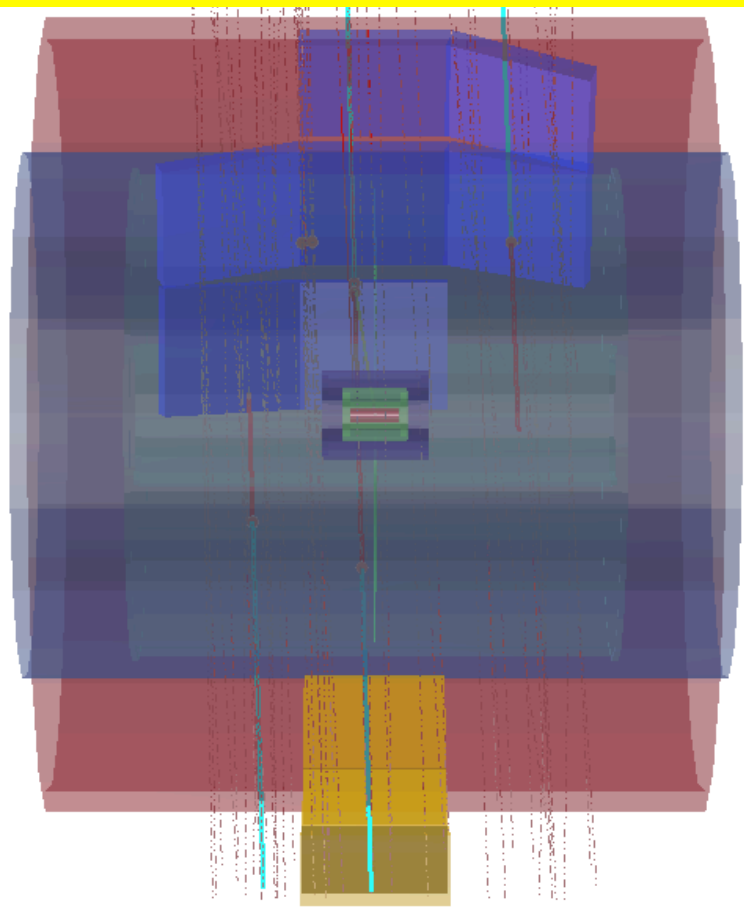
No raw-data event info is available!
 ESD event info: Run#: 179758 Event type: 7 (PHYSICS_EVENT) Period: d Orbit: 4acf31 BC: 3b6
 Active trigger classes: COOB0-ABCE-NOPF-ALLNOTRD COMSL-ABCE-NOPF-ALLNOTRD COAMU-ABCE-NOPF-ALLNOTRD COLSR-ABCE-NOPF-TPC CTRDCO2-ABCE-NOPF-TRD
 Trigger: 1 (COOB0-ABCE-NOPF-ALLNOTRD)
 Event# in file: 1491 Timestamp: 2012-05-05 22:46:54, MagField: 5.01e+00

***** Summary of event *****

**** Event: 68581 trigFlag: 33 IsInteraction?: 0 MCN: 37 ****

**** nTracks: 103 nMuons: 44 ****

Event in file: 1817 fileName: alien:///alice/data/2012/LHC12c/000179758/ESDs/cosmics/12000179758042.12/AliESDs.root



Command EventCtrl

First Prev 1817 / 2851 Next Last Refresh Autoload Time: 5

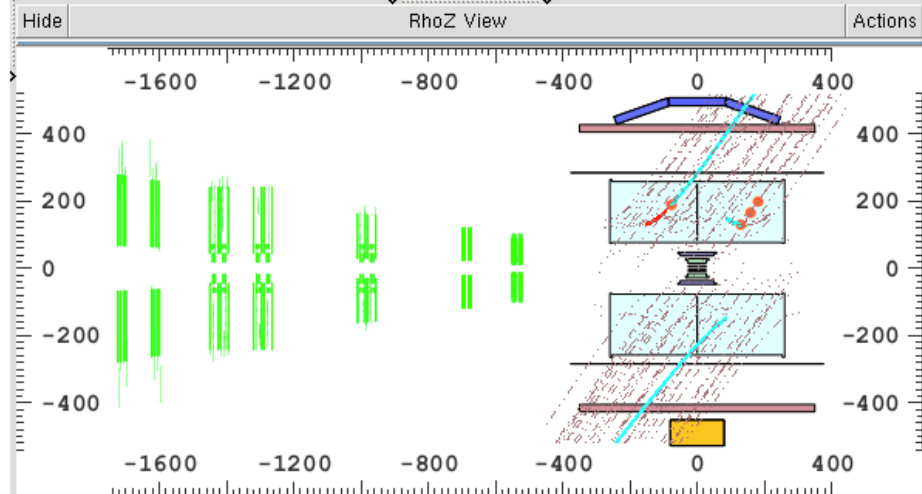
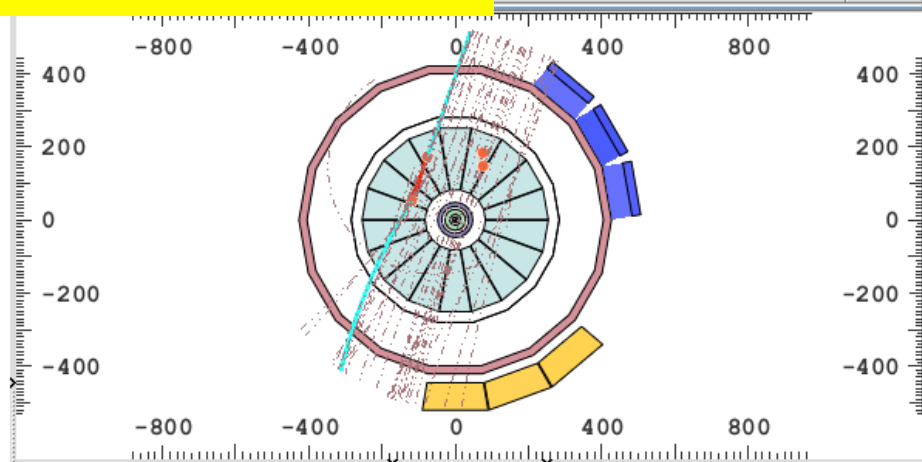
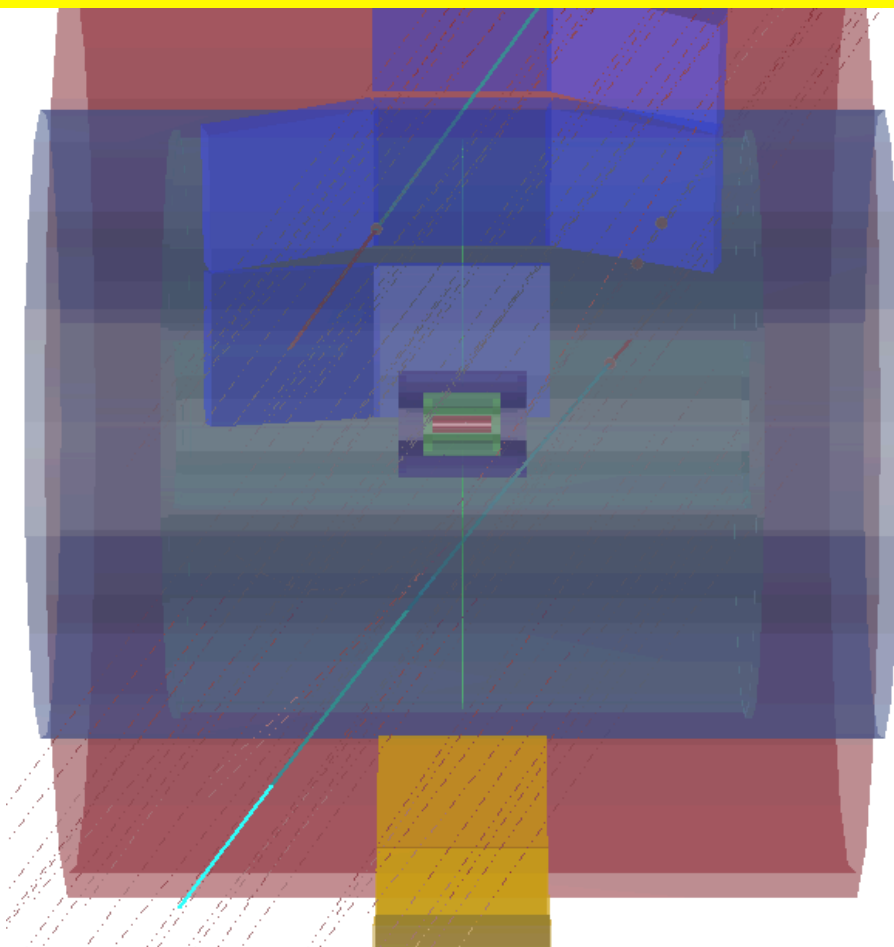
No raw-data event info is available!
ESD event info: Run#: 179758 Event type: 7 (PHYSICS_EVENT) Period: 10 Orbit: 1e906 BC: 96
Active trigger classes: COOB0-ABCE-NOPF-ALLNOTRD COMEL-ABCE-NOPF-ALLNOTRD COAMU-ABCE-NOPF-ALLNOTRD COLSR-ABCE-NOPF-TPC CTRDCO2-ABCE-NOPF-TRD
Trigger: 1 (COOB0-ABCE-NOPF-ALLNOTRD)
Event# in file: 1817 Timestamp: 2012-05-05 23:54:25, MagField: 5.01e+00

***** Summary of event *****

**** Event: 110638 trigFlag: 33 IsInteraction?: 0 MCN: 24 ****

**** nTracks: 59 nMuons: 38 ****

Event in file: 1706 fileName: alien:///alice/data/2012/LHC12c/000179758/ESDs/cosmics/12000179758041.12/AliESDs.root



Command EventCtrl

First Prev 1706 / 2842 Next Last Refresh Autoload Time: 5

No raw-data event info is available!
ESD event info: Run#: 179758 Event type: 7 (PHYSICS_EVENT) Period: f Orbit: 6f5c9 BC: 104
Active trigger classes: COOBO-ABCE-NOPF-ALLNOTRD COMEL-ABCE-NOPF-ALLNOTRD COAMU-ABCE-NOPF-ALLNOTRD COLSR-ABCE-NOPF-TPC CTRDCO2-ABCE-NOPF-TRD
Trigger: 1 (COOBO-ABCE-NOPF-ALLNOTRD)
Event# in file: 1706 Timestamp: 2012-05-05 23:30:03, MagField: 5.01e+00

Summary of event

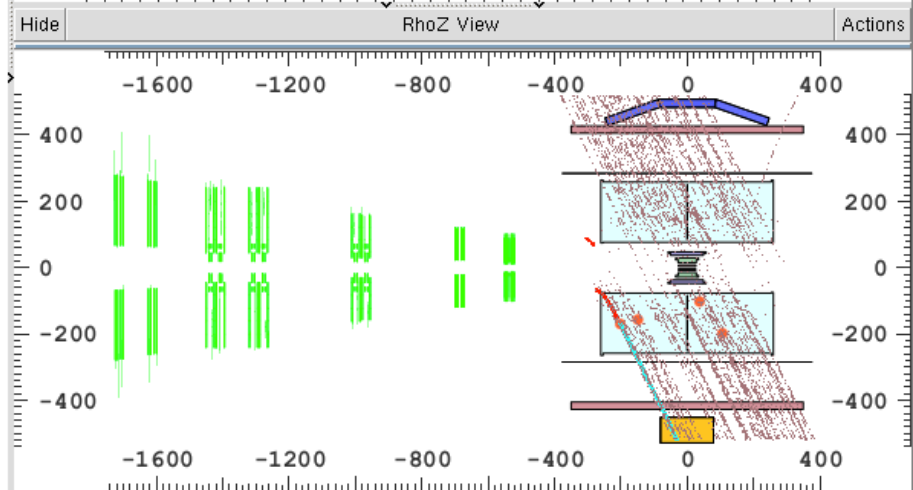
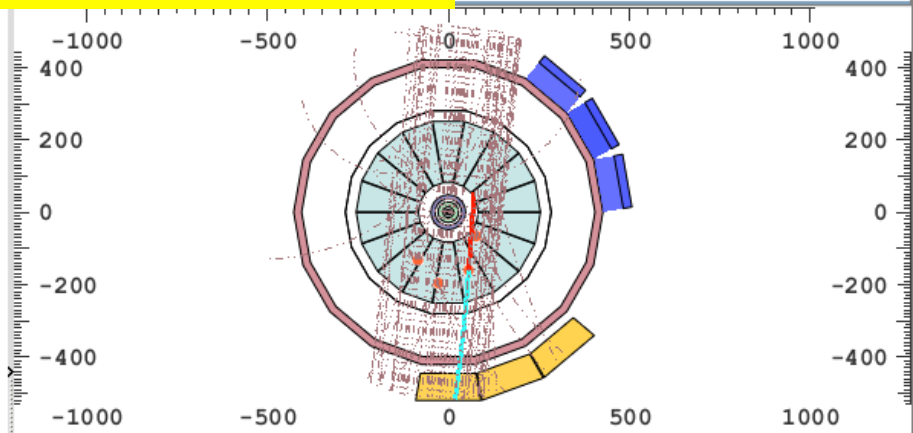
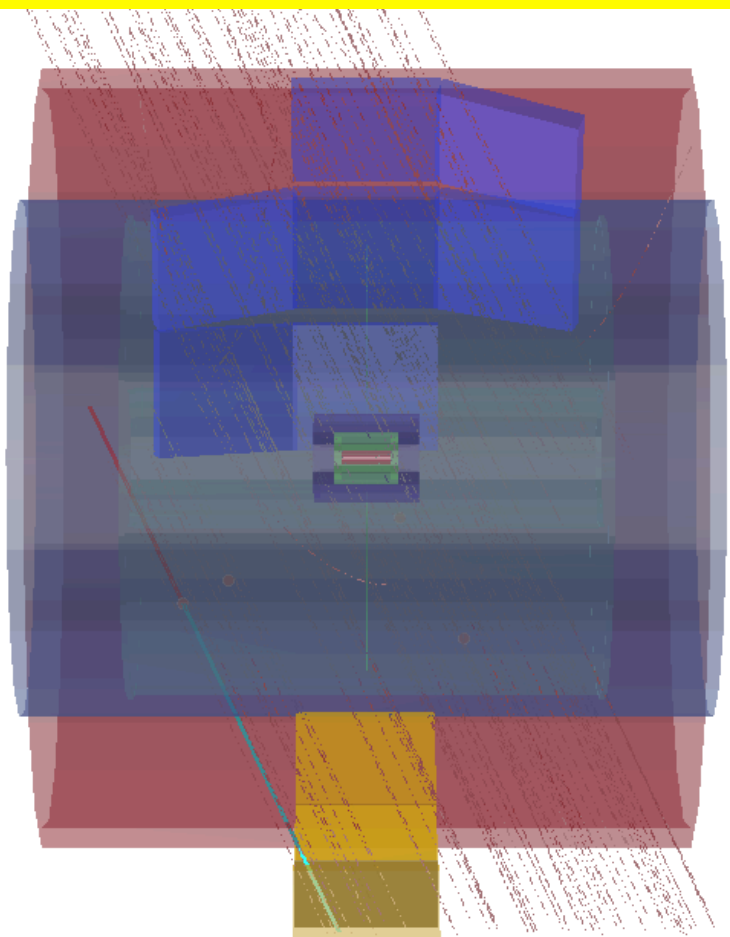
**** Event: 298493 trigFlag: 33 IsInteraction?: 0 MCN: 49 ****

**** nTracks: 135 nMuons: 79 ****

Event in file: 777 fileName: alien:///alice/data/2012/LHC12c/000179758/ESDs/cosmics/12000179758033.17/AliESDs.root

view

Actions



Command EventCtrl

First Prev 777 / 2837 Next Last Refresh Autoload Time: 5

No raw-data event info is available!

ESD event info: Run#: 179758 Event type: 7 (PHYSICS_EVENT) Period: 7 Orbit: 42907b BC: 6b1

Active trigger classes: COOBO-ABCE-NOPF-ALLNOTRD COMEL-ABCE-NOPF-ALLNOTRD COAMU-ABCE-NOPF-ALLNOTRD COLSR-ABCE-NOPF-TPC CTRDCO2-ABCE-NOPF-TRD

Trigger: 1 (COOBO-ABCE-NOPF-ALLNOTRD)

Event# in file: 777 Timestamp: 2012-05-05 20:16:55, MagField: 5.01e+00

***** Summary of event *****
**** Event: 88898 trigFlag: 33 IsInteraction?: 1 MCN: 1 ****
**** nTracks: 928 nMuons: 36 ****
Event in file: 1194 fileName: alien:///alice/data/2012/LHC12c/000179758/ESDs/cosmics/12000179758035.17/AlieSDs.root

TPC LASER EVENT

