

Global analysis of Single Beam and Cosmic Rays data

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Goals

- To learn how to identify the different kind of events:
 - beam gas,
 - beam halo,
 - collimator splash events,
 - cosmics.

Data analyzed

Run	87863	88128	90272
Data Type	Single beam 2 Collimator splashes	Single beam, run stable with BTPX and MBTS in coincidence	Long cosmic run
Magnet configuration	Toroid On Solenoid Off	Toroid On Solenoid Off	Toroid On Solenoid On
Detector configuration	SCT only endcap at low V No RPC	SCT only endcap at low V No TRT No RPC	All sub-detectors SCT at nominal V
Streams	Physics_BPTX	Physics_MBTS_BCM_LUCID	Physics_IDCosmic

Beam gas
+ Beam halo
+ Collimator splash
+ Cosmics events

Beam gas
+ Beam halo events
+ Cosmics events

Cosmics

- Very different detector conditions
- Different magnetic configuration
- Different streams & L1 triggers

Reconstruction Software

→ Single beam data, re-processed from ESDs using:

- Release: 14.2.21.8
- COMCOND-ES1C-000-00 (ID alignment)
- ATLAS-GEO-04-00-00 (correct magnet configuration –only Toroid-)
- Combined reconstruction ON

Note:

- Tier-0 processing was done with release 14.2.21.4
- COMCOND-006-00
- ATLAS-COMM-09-00-00 (wrong magnet configuration)
- Combined reconstruction OFF

→ Cosmic data, Tier-0 processing

- Release: 14.2.21.8
- COMCOND-ES1C-000-00
- ATLAS-GEO-03-00-00 (correct magnet configuration –full magnet-)
- Combined reconstruction ON

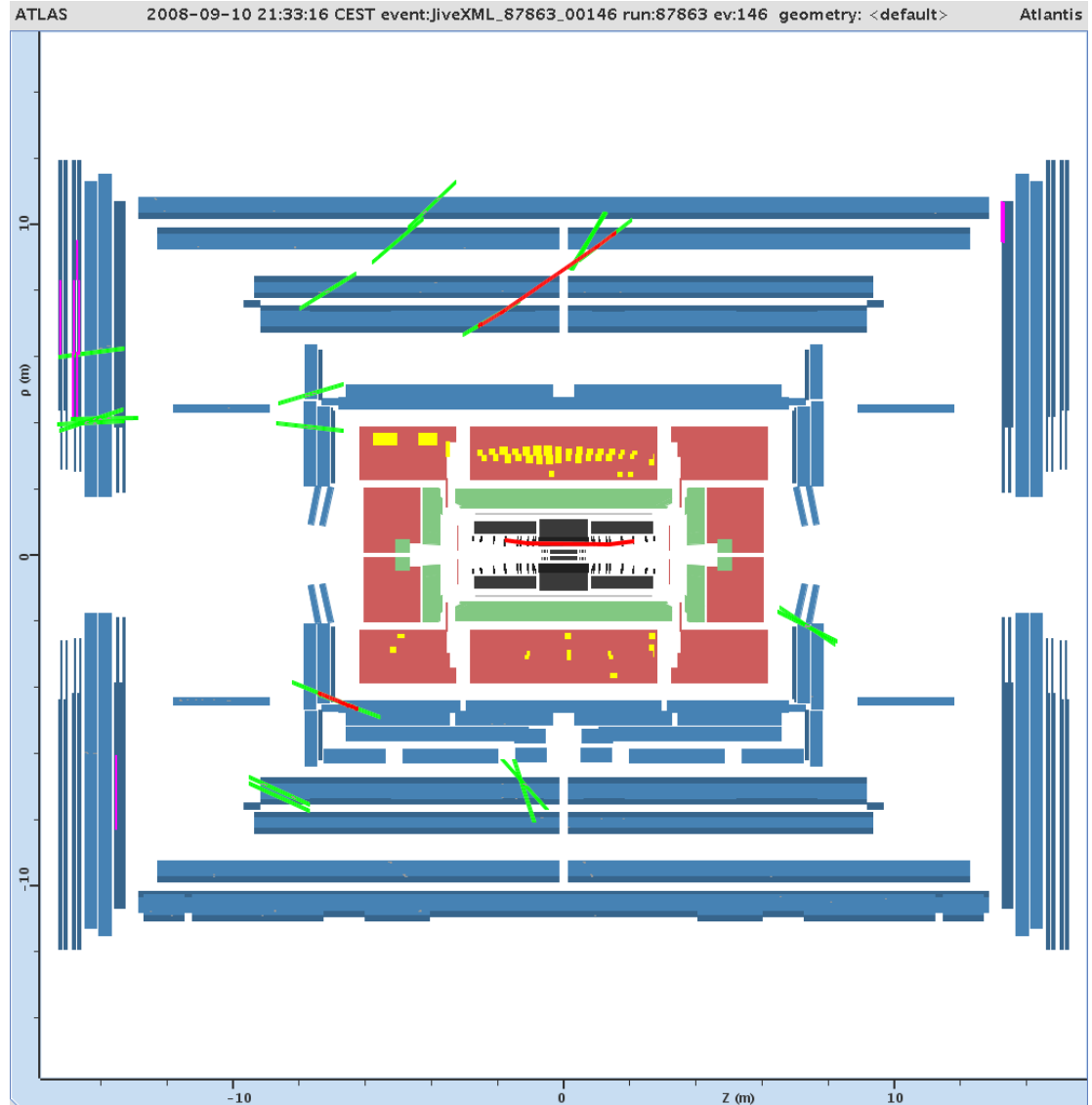
• Same software release and conditions!

SINGLE BEAM DATA

Some event displays

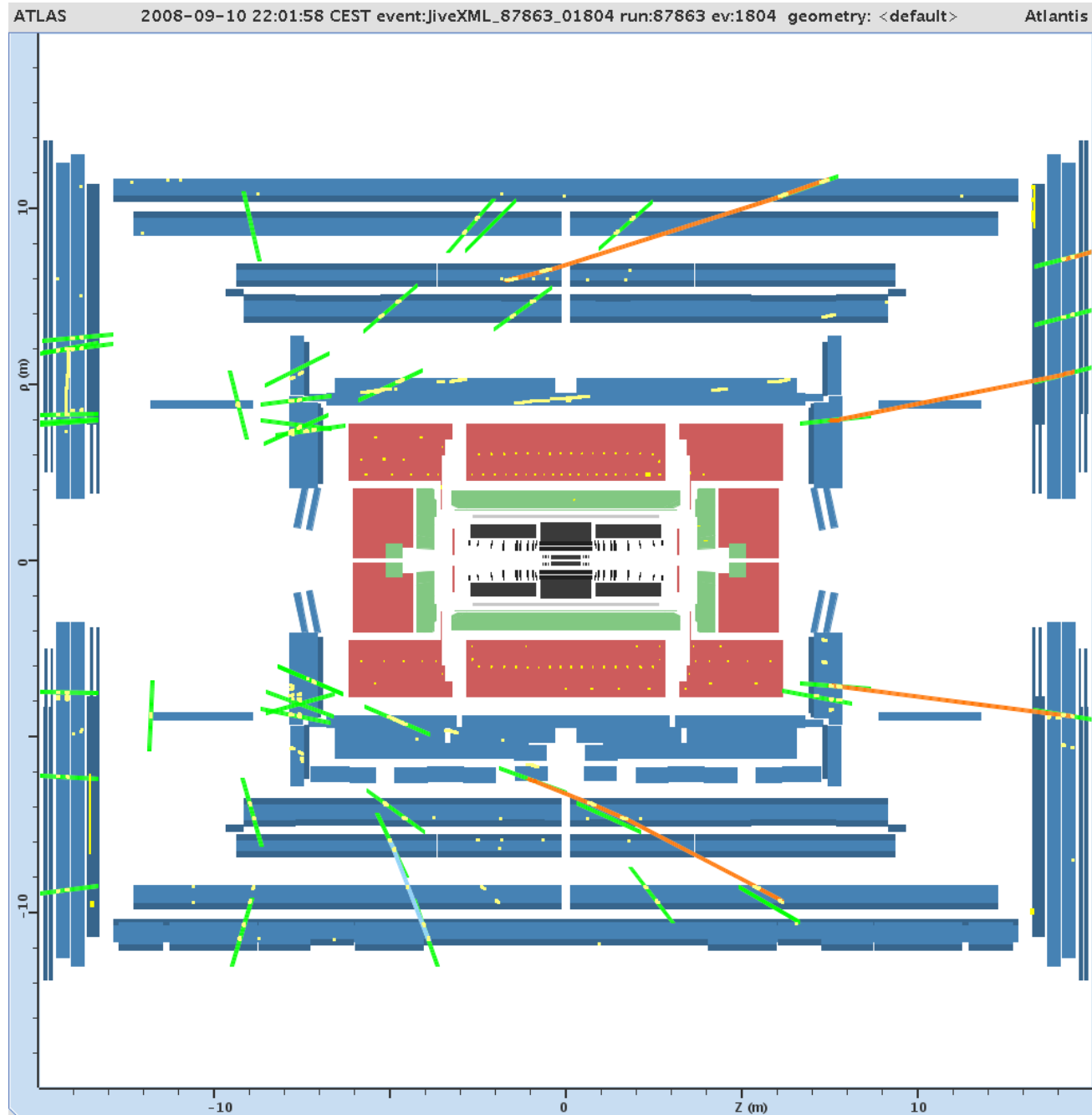
with tracks reconstructed in ID, Muon Spectrometer and Tile Cal.

Run 87863



03/10/2008

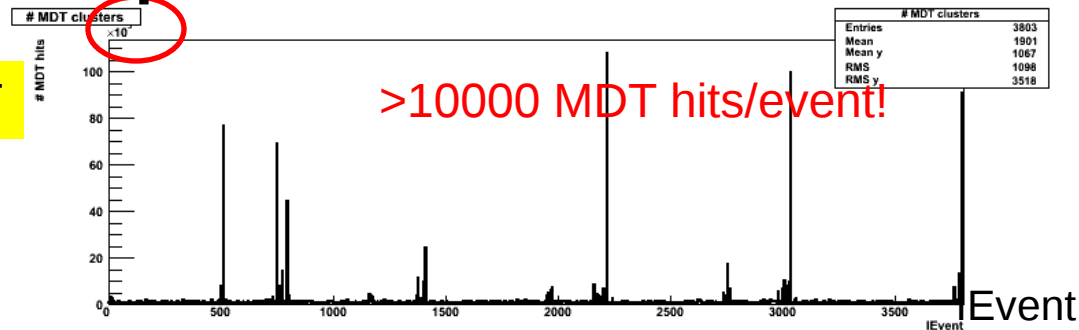
Run 87863



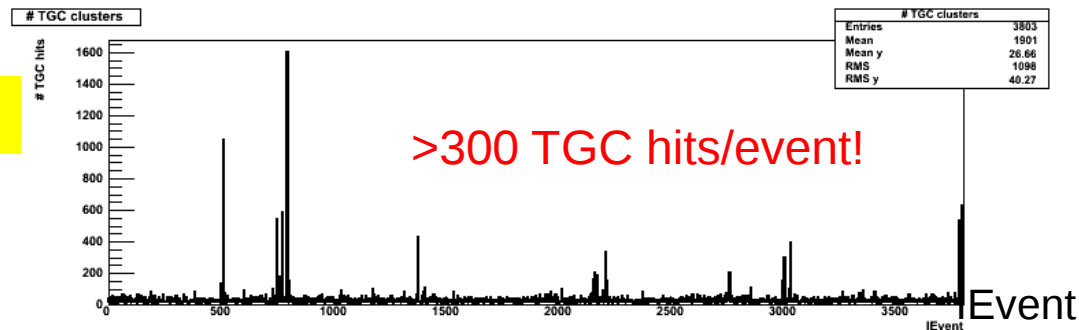
03/10/2008

Occupancies: # clusters Vs. IEvent

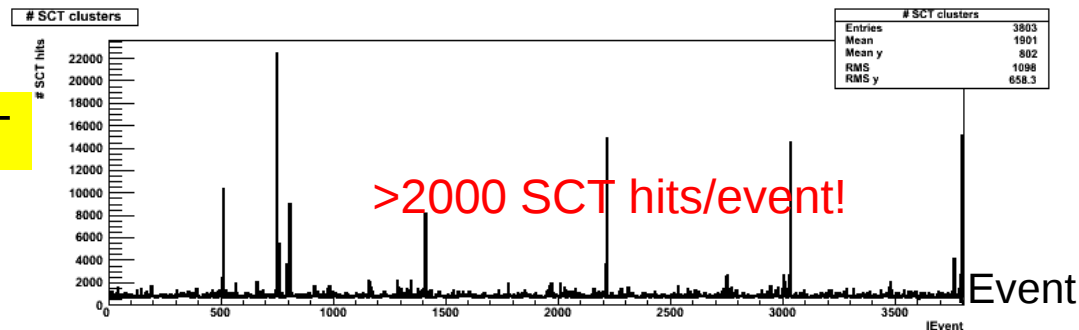
MDT



TGC



SCT



Possible splash events:

→ Events with lots of hits:
 >10000 MDT hits/event
 >300 TGC hits/event
 >2000 SCT hits/event

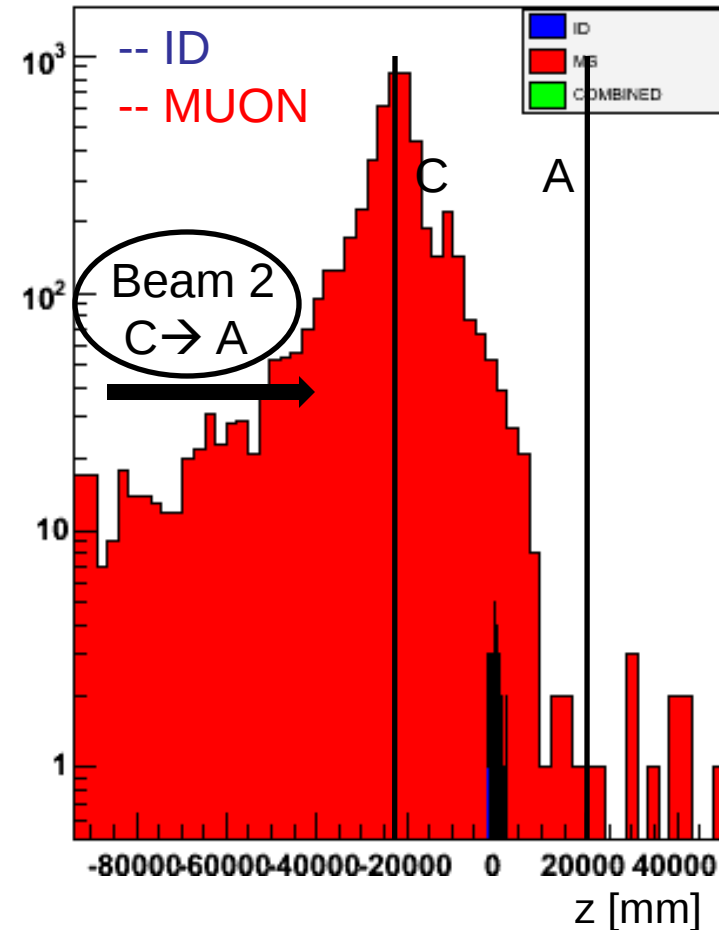
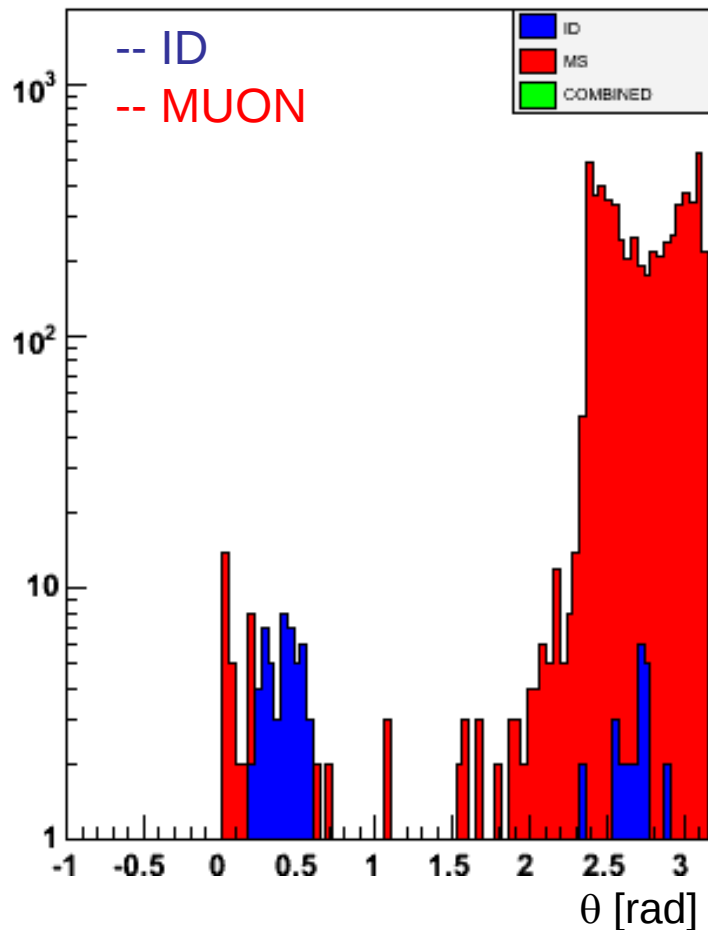
→ Some candidates:

EventNumber IEvent	
2627	516
3855	798
3940	3035
3939	3802

- The collimators splash events are seen by all sub-detectors
 → Synchronization among the sub-detectors ok!

03/10/2008

Tracking in the ID and Muon System

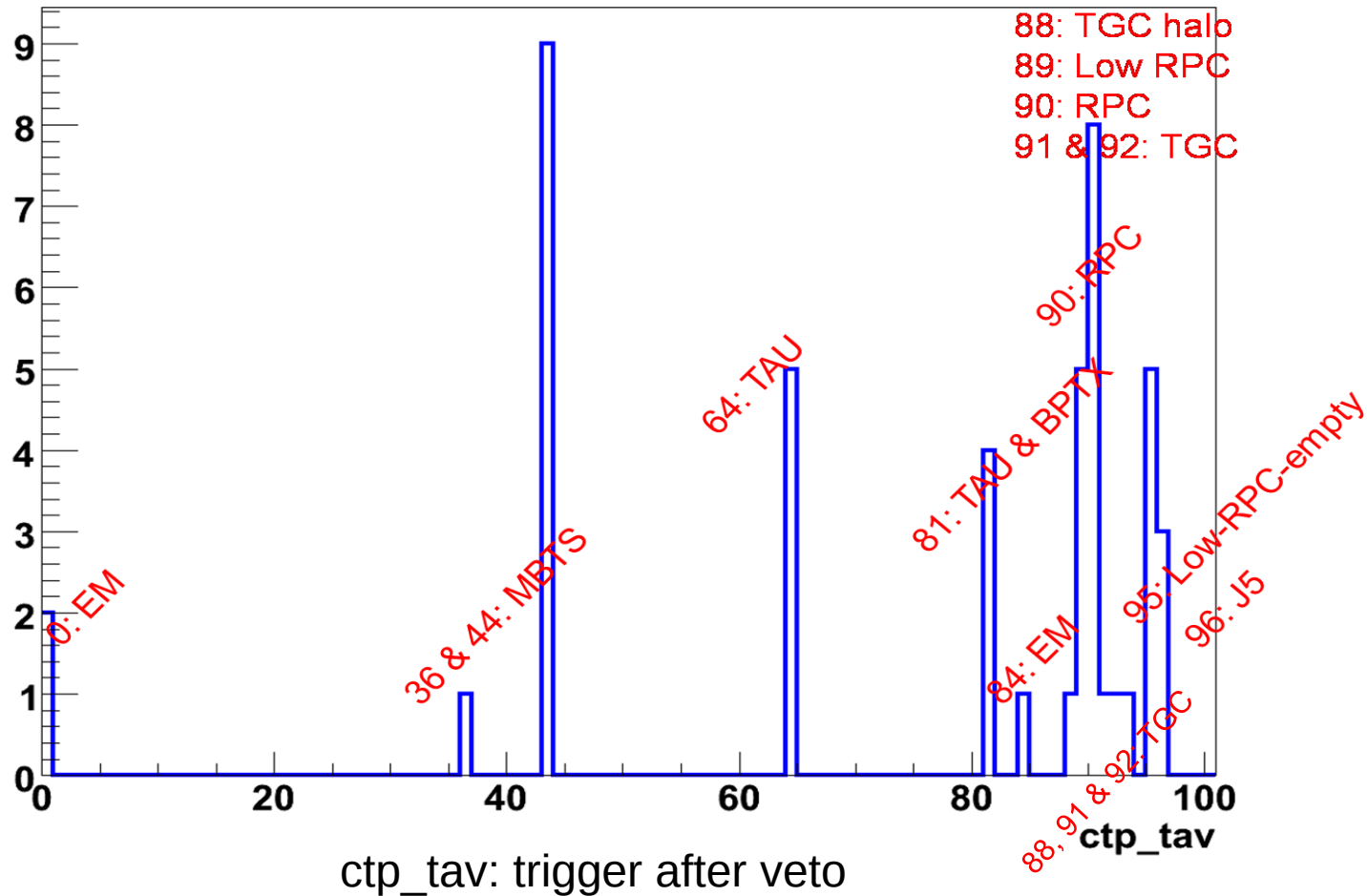


- The tracks seen by the ID and MS are different.
→ Indeed, no combined tracks are reconstructed!

COSMIC DATA

Run 90272

Which LVL1 triggers?



- No events triggered by Tile Cal in this cosmic run when one look at LVL1 info after veto.

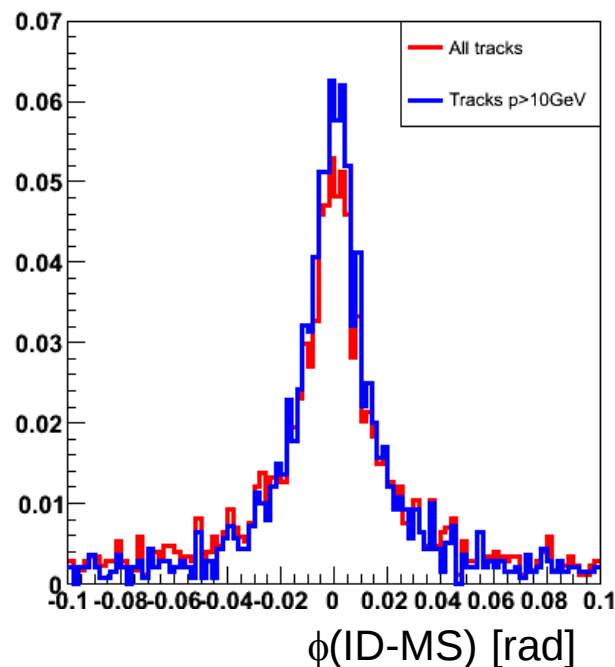
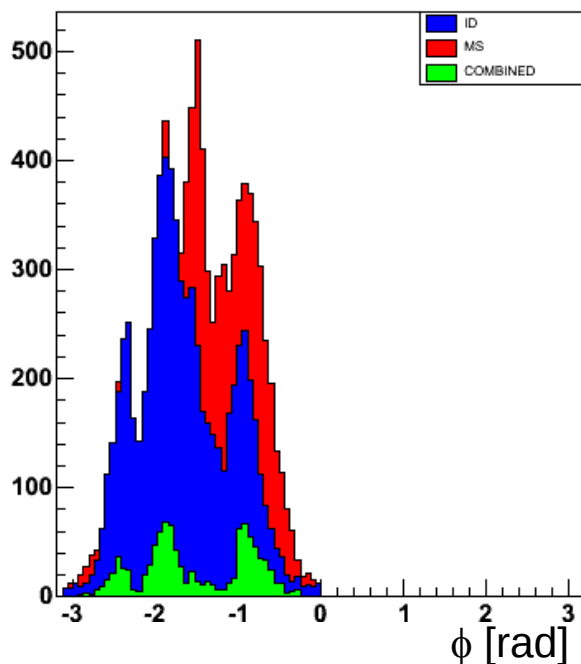
Tracking in ID and MS

-ID

(cut: SCThits >5 & TRThits >20)

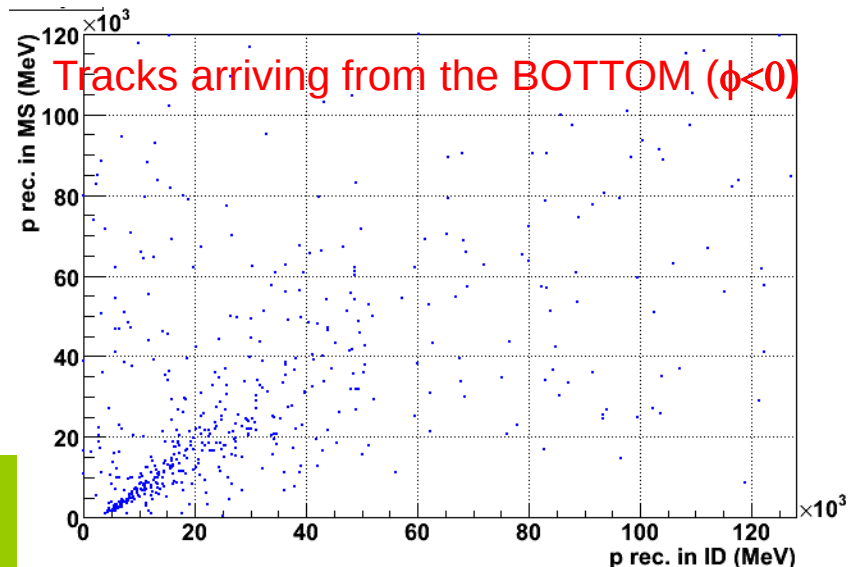
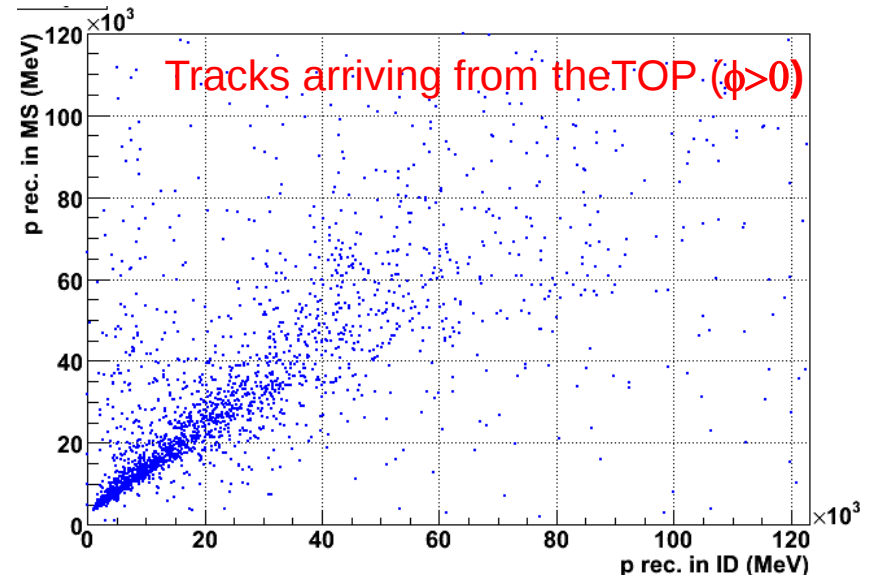
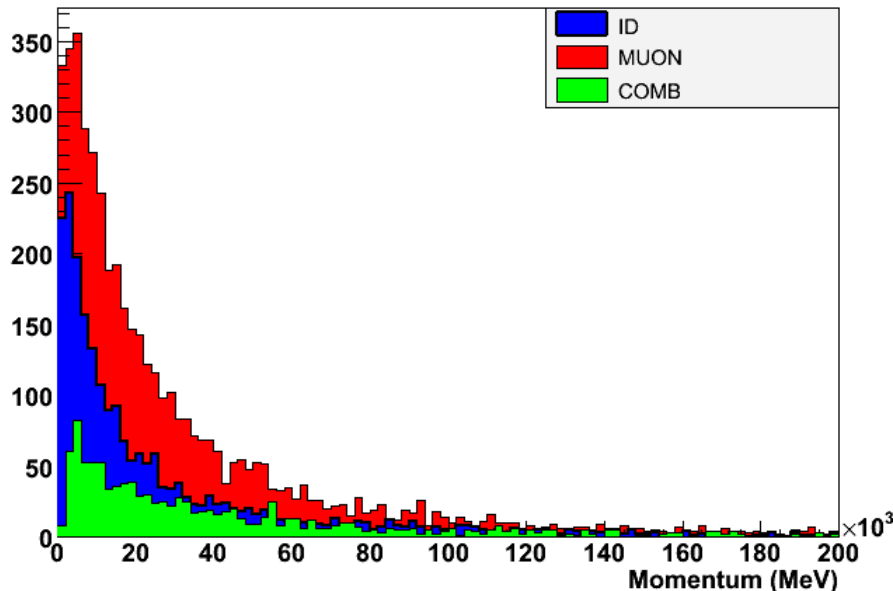
-Muon

-Combined (ID+Muon)



ID-MUON track parameters	ϕ_0 (mrad)	d_0 (mm)	θ_0 (mrad)	Z_0 (mm)
All tracks	$\mu = -0.5 \pm 0.4$ $\sigma = 11.4 \pm 0.5$	$\mu = 5.7 \pm 2.3$ $\sigma = 59.6 \pm 2.6$	$\mu = -0.4 \pm 0.4$ $\sigma = 8.5 \pm 0.4$	$\mu = -4.1 \pm 1.2$ $\sigma = 33.9 \pm 1.3$
Tracks $p > 10\text{GeV}$	$\mu = -0.2 \pm 0.4$ $\sigma = 10.8 \pm 0.5$	$\mu = 4.5 \pm 2.2$ $\sigma = 54.7 \pm 2.4$	$\mu = -0.6 \pm 0.4$ $\sigma = 7.3 \pm 0.4$	$\mu = -5.4 \pm 1.1$ $\sigma = 29.4 \pm 1.2$

Reconstructed momentum

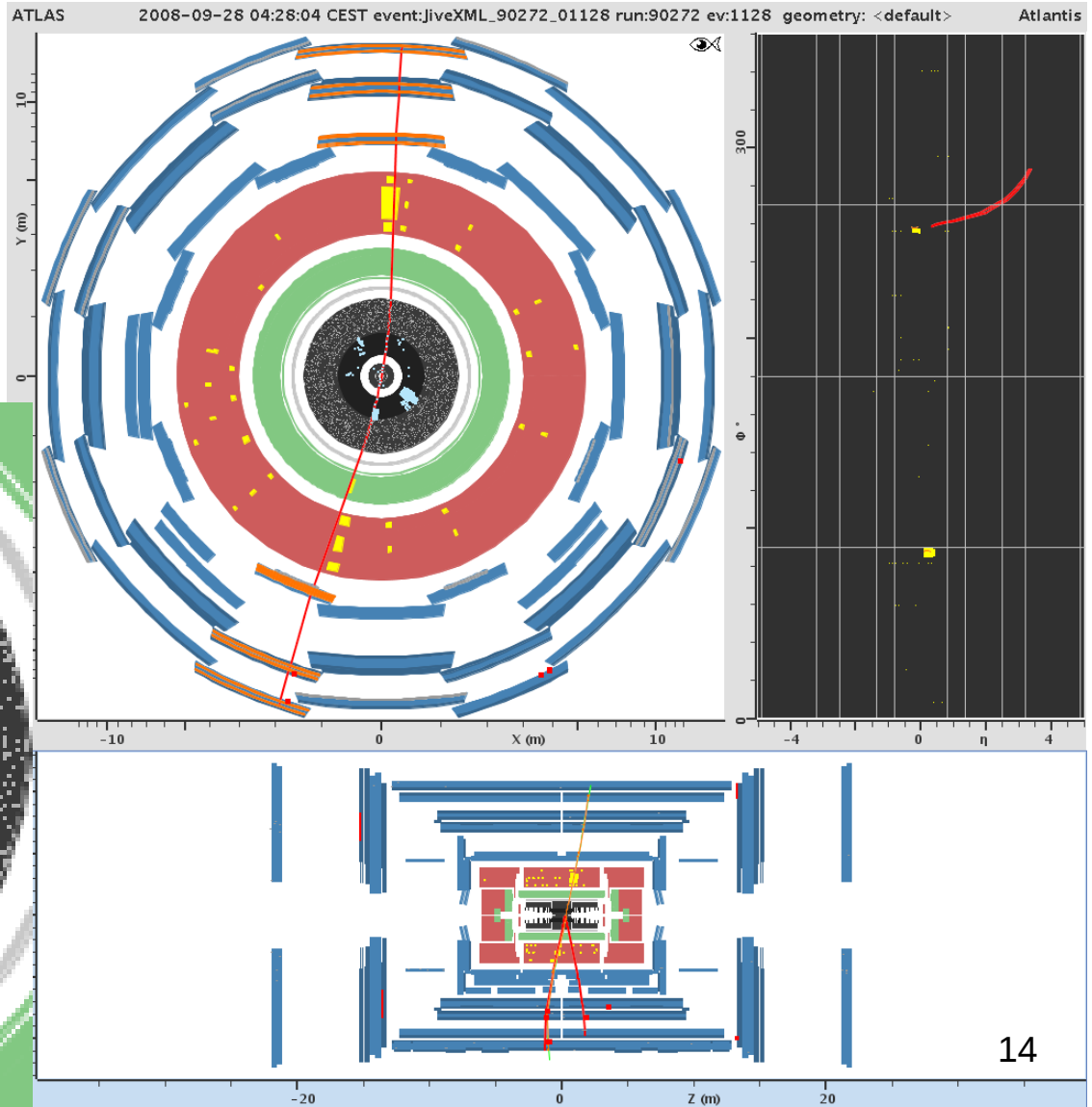
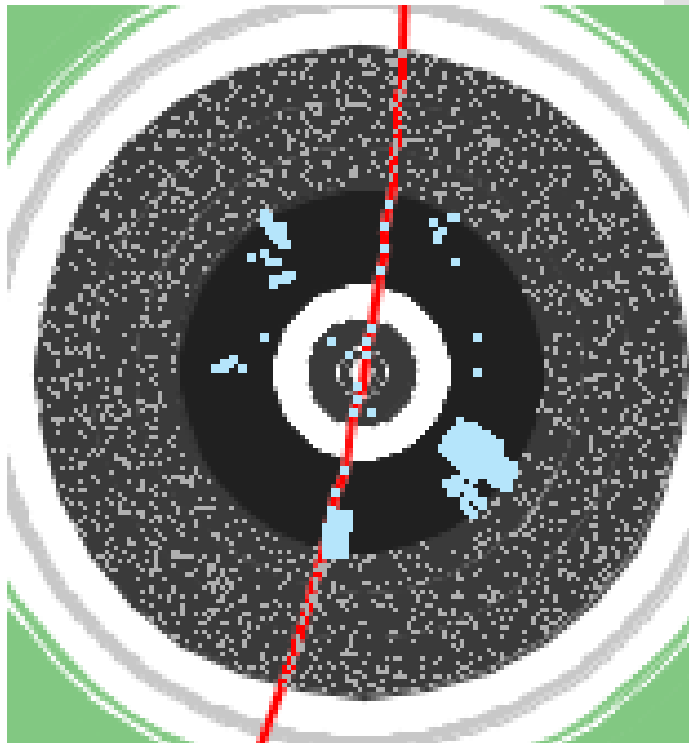


• Good correlation between ID and MS
→ Combined tracks are reconstructed!

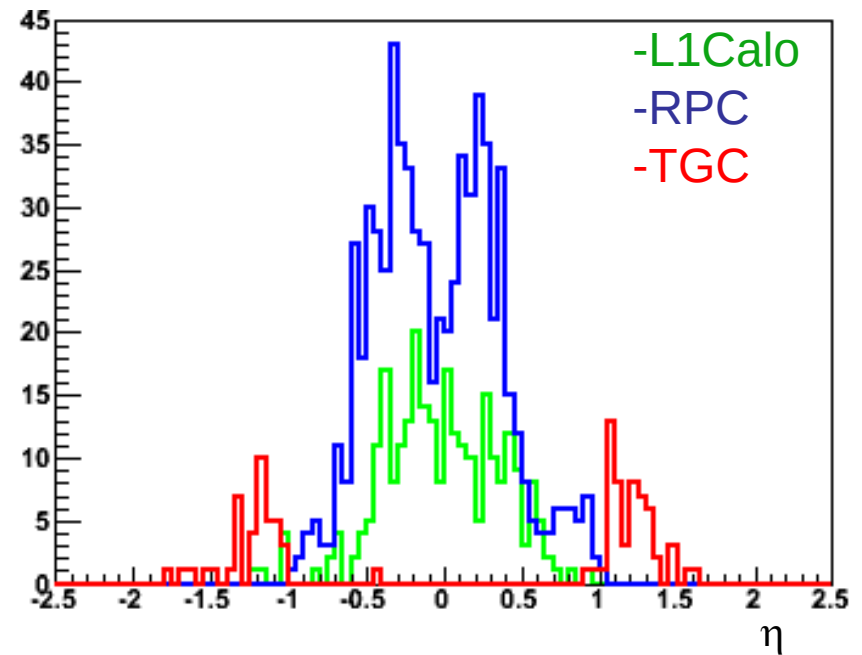
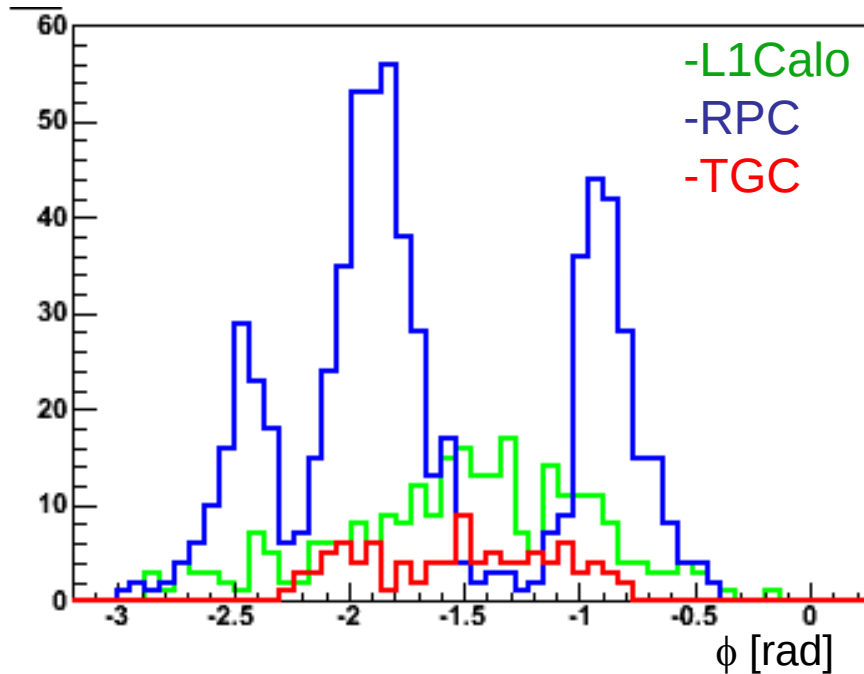
Some event displays

Run 90272
Stream IDCosmic

Run /Stream	Run 90272 IDCosmic
# events	15078
ID	5745 (38%) → 7135
-Pixels	9%
-SCT	35%
-TRT	96%
Muon	10918 (72%) → 17000
Combined (ID+Muon)	3371 (22%) → 3371



Track parameters for Combined tracks for different LVL1 triggers



COMPARISONS SINGLE BEAM & COSMIC DATA

Occupancy

-Cosmic run (90272)

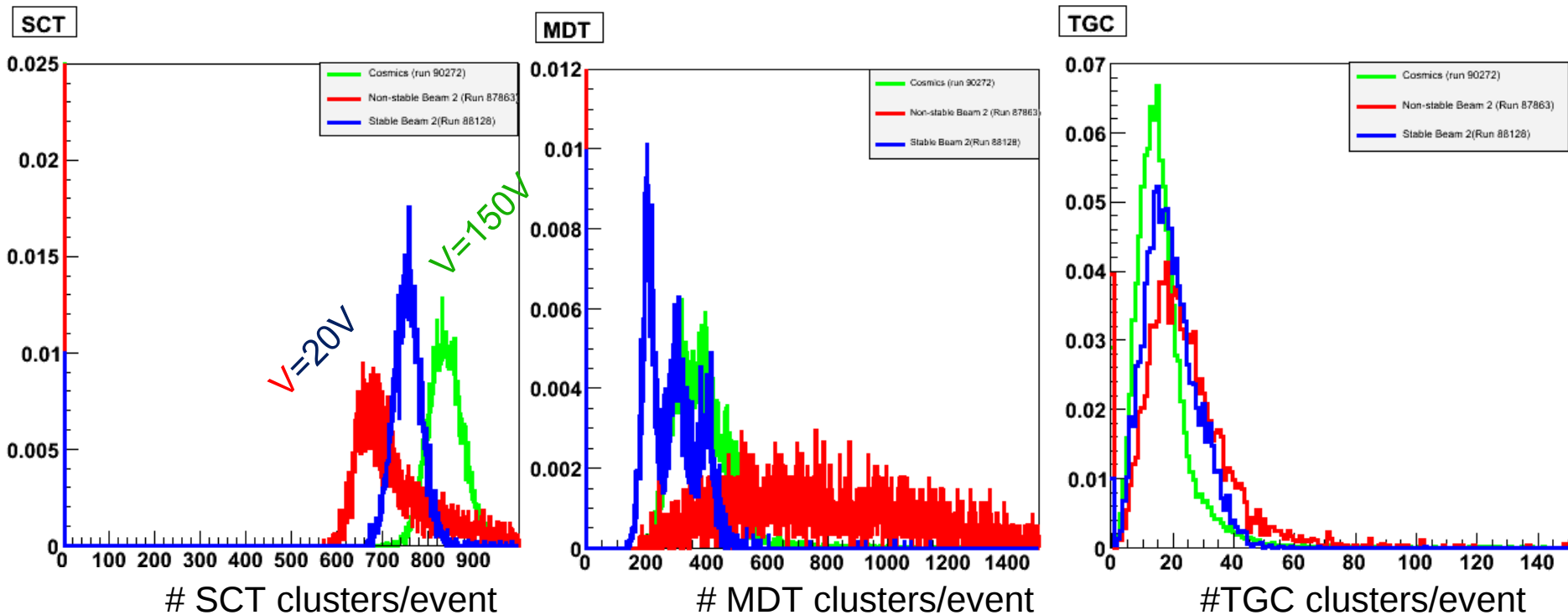
IDCosmic

-Non-stable beam (87863)

Stream BPTX

-Stable Run (88128)

Stream MBTS_BCM_LUCID



•The number of clusters is similar for cosmics and stable single beam (higher for non-stable run).

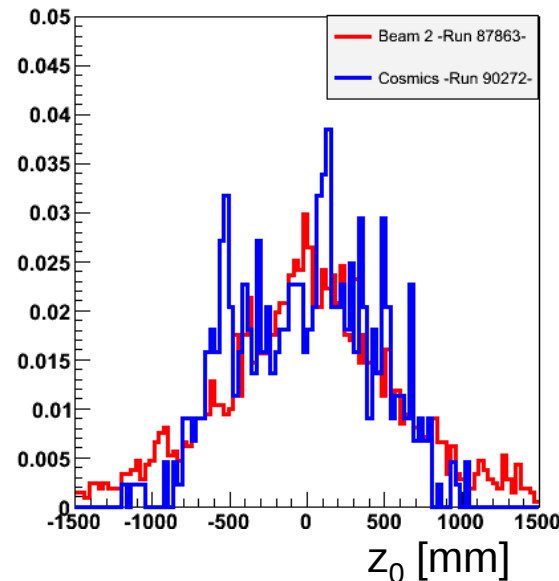
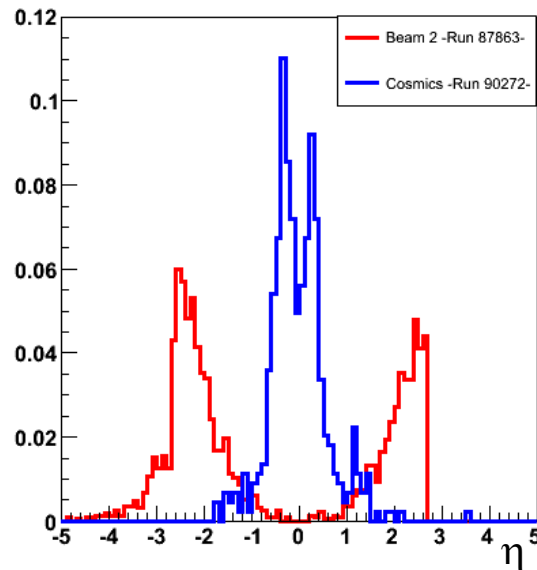
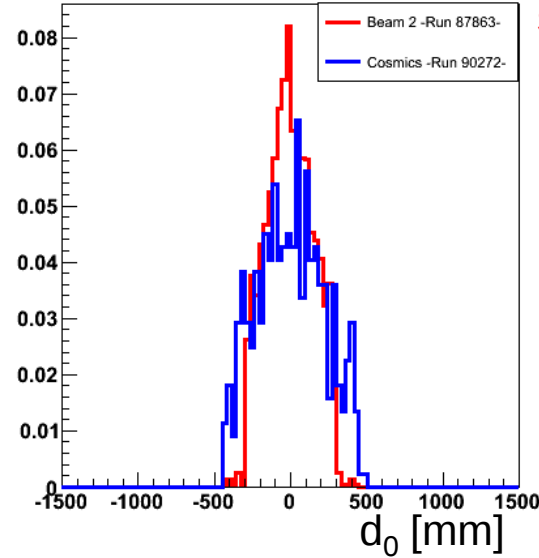
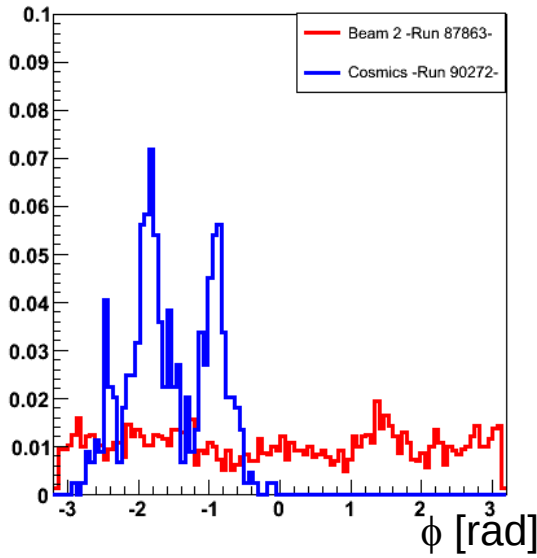
ID track parameters

-Cosmic run (90272)

IDCosmic

-Non-stable beam (87863)

Stream BPTX



•Cosmics tracks are mainly vertical while single beam tracks are more horizontal.

Muon track parameters

-Cosmic run (90272)

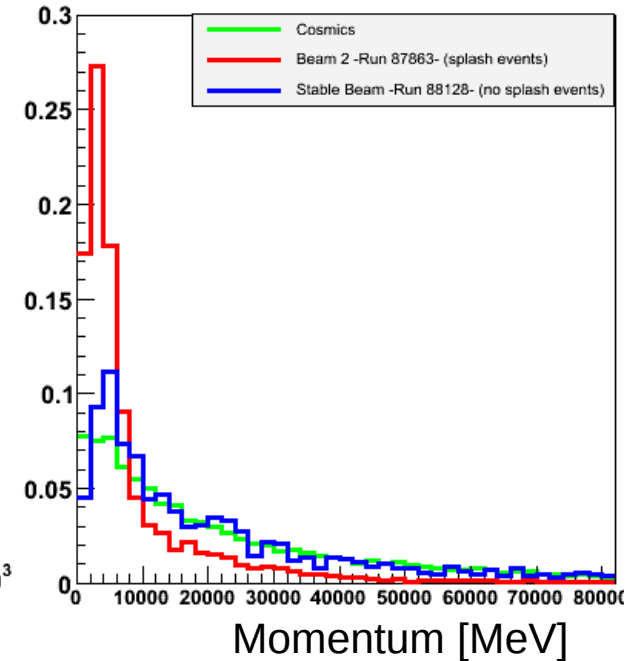
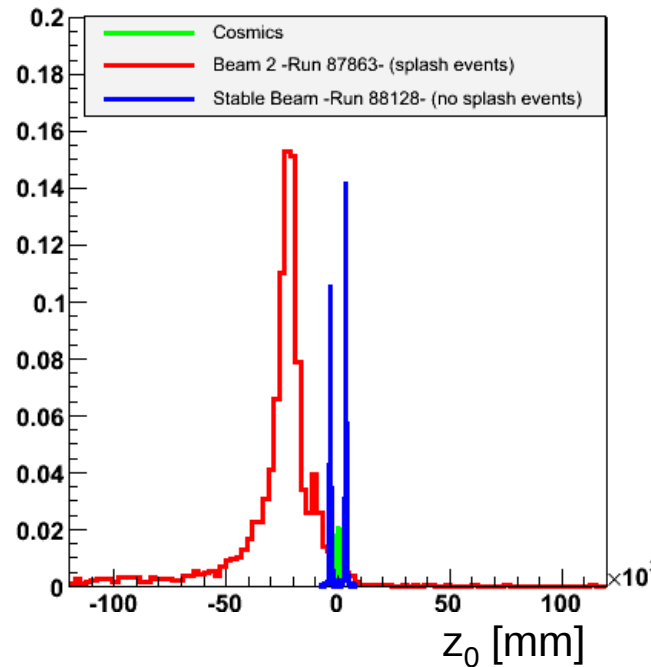
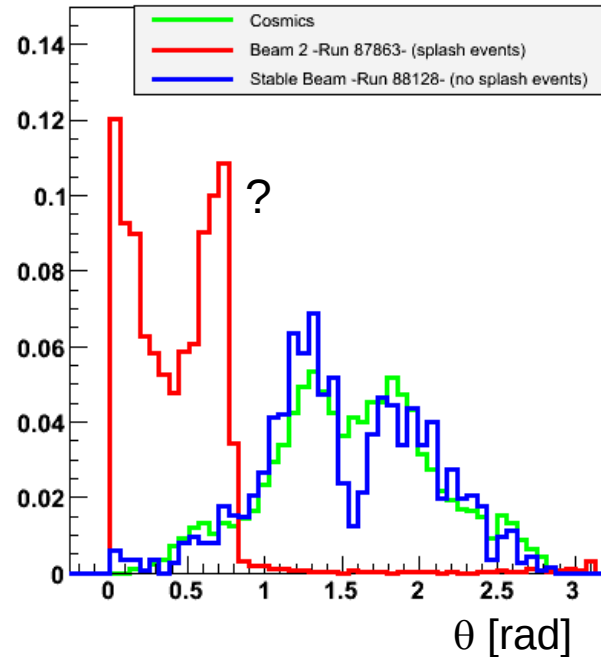
IDCosmic

-Non-stable beam (87863)

Stream BPTX

-Stable Run (88128)

Stream MBTS_BCM_LUCID



- Run stable (88128) and Cosmics run have similar distributions
→Run 88128 (stream MBTS_BCM_LUCID mostly contains cosmics).
- Non-stable single beam (higher for non-stable run).

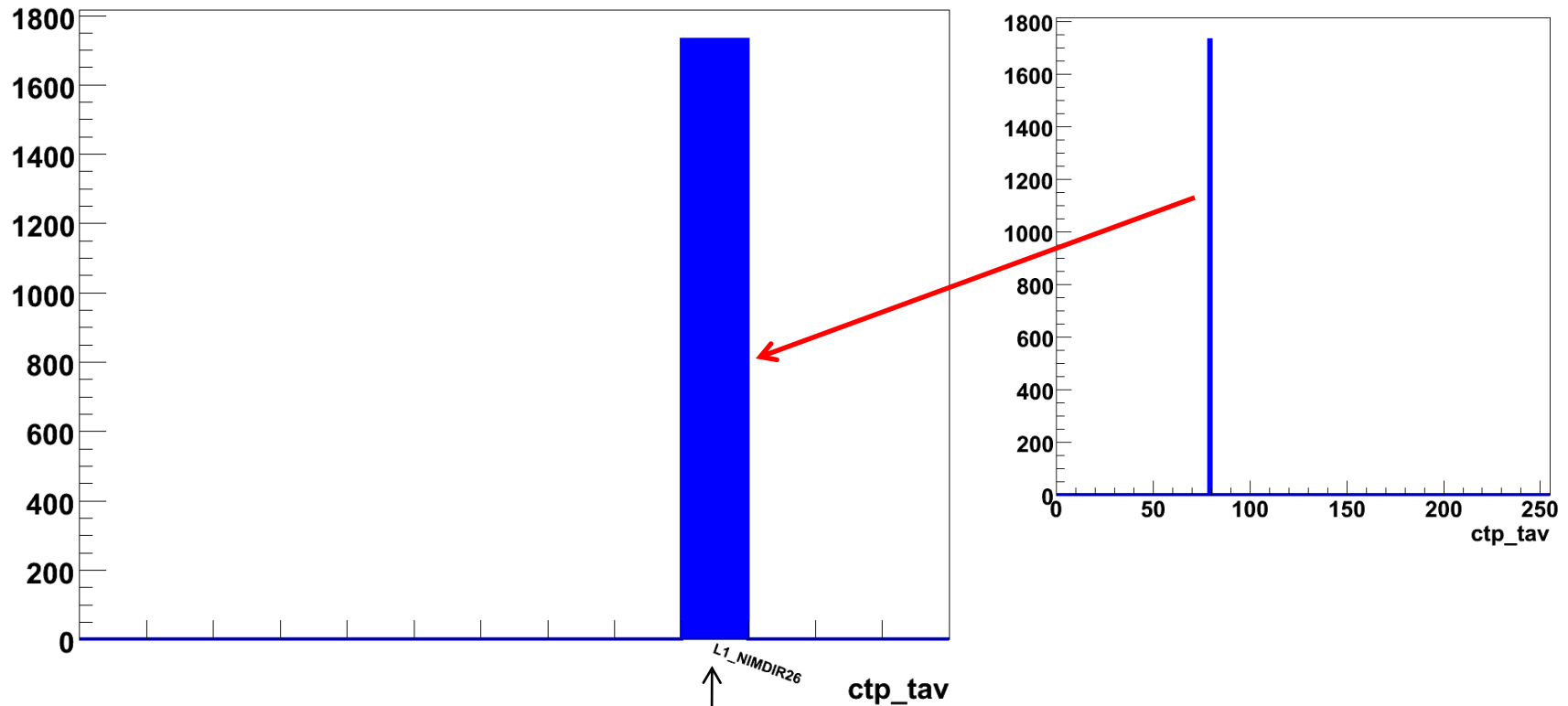
Conclusions

- Two single beam and one cosmic runs have been analysed:
 - Run 87863 (stream BPTX): non-stable, beam 2, toroid On.
 - Run 88128 (stream MBTS_BCM_LUCID): stable run, beam 2, toroid On.
 - Run 90272 (stream IDCosmic): Cosmic run, full magnet.
- Non-stable beam run (87863) seems to mainly contain beam halo events. While stable beam run (88128) seems to contain mostly cosmics.
- No beam-gas interactions identified.
- Global combined track studies have been performed with long cosmic runs.

BACK-UP

Which LVL1 triggers?

Run 87863 (non-stable)
Stream physics_BPTX



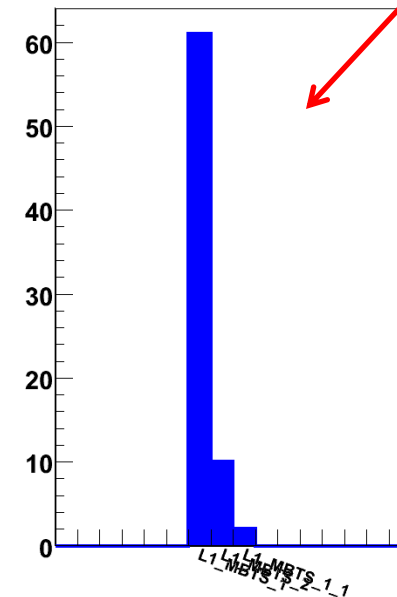
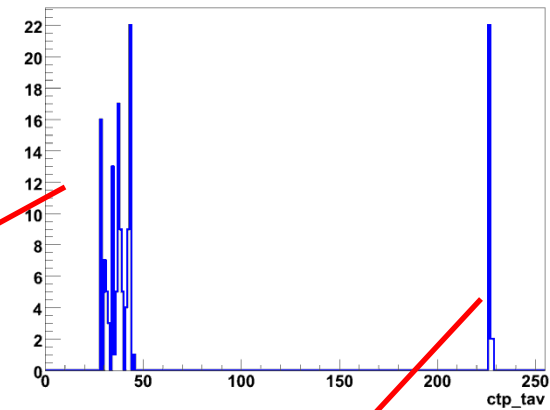
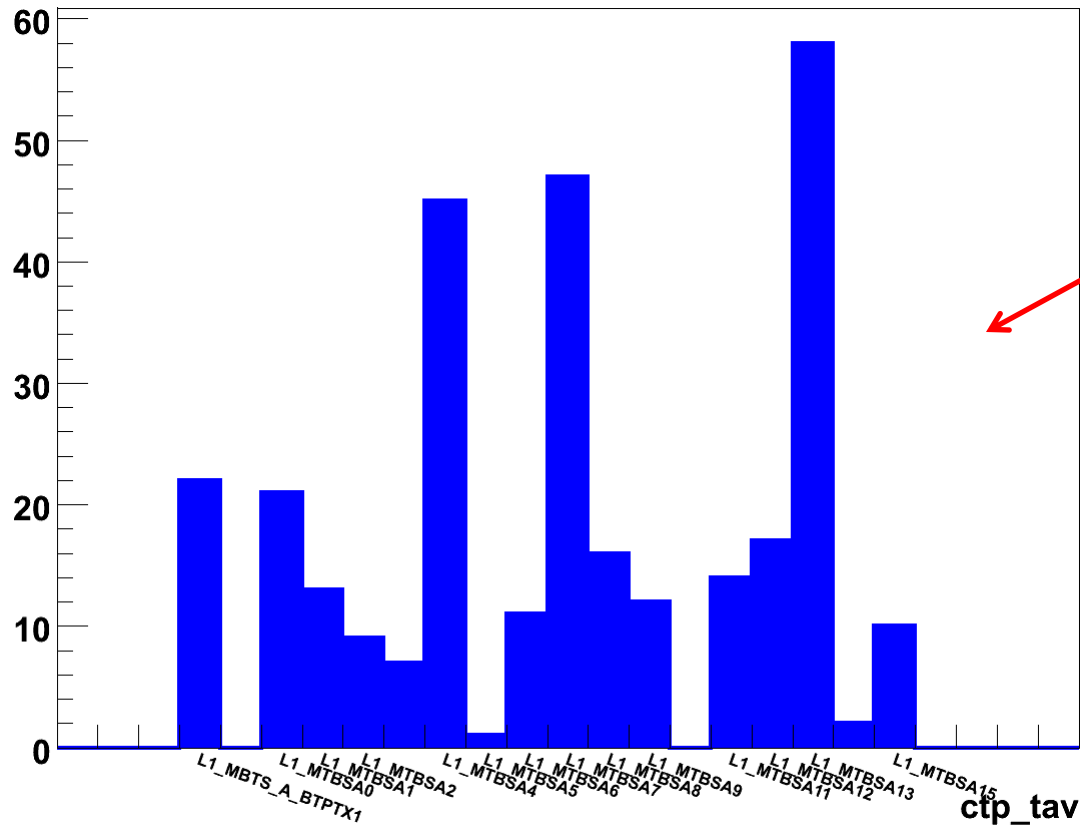
According to the run summary web page: (?)

<http://atlas-service-db-runlist.web.cern.ch/atlas-service-db-runlist/cgi-bin/runDetails.py?run=87863>

- All events have been triggered by the same LVL1 menu type.
- No overlap with other triggers.
- Should look at ctp information before veto.

LVL1TriggerInfo (ctp_tav)

Run Stable (Run 88128)
No collimator “splashes”



- All events have been triggered by LVL1 menus of the type L1_MBTS_*.
- Again, should look at LVL1 info before veto.