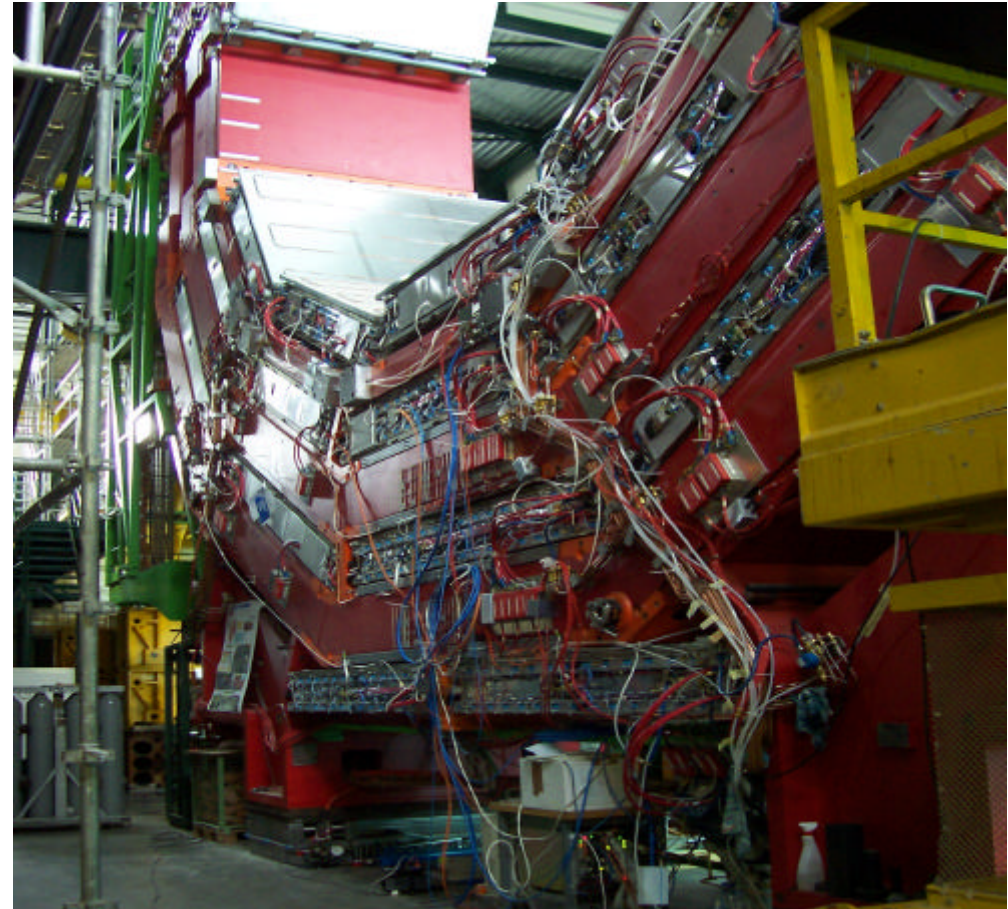


# DT Commissioning Data Analysis

- Some organisational aspects
- MB4 analysis  
(Giorgia, Francesca)
- TP analysis  
(Mary-Cruz, Anna)
- Logbook



# Cosmics Analysis Effort

- **Idea:** framework to discuss and coordinate analysis of commissioning data and preparation of cosmics challenge → "DT cosmics analysis"
- **Bi-weekly meetings** (VRVS) and one during CMS weeks  
Past meetings: summer 05, 19.Oct, 17.Nov, 23.Nov 05  
Next: 09.Dec 10:00-13:00 Bat.40-R-A10 (VRVS Sky)
- Group got joined by members of Aachen, Madrid, Padova, Torino  
~20 names on mailing list  
New students got involved and study commissioning data
- Mailing list = **cms-project-dt-cosmics** everybody interested can subscribe using SIMBA service  
<http://cern.ch/simba> → Subscription to lists → list name "cms-project-dt-cosmics"  
<your Email@host>

# Organisation of Information



- Agenda's of the meetings are  
<http://agenda.cern.ch/> → CMS → Muon detector
- Information and access at present:
  - Commissioning webpage <http://cms.pd.infn.it/commissioning/>
  - ISR webpage <http://cmsdoc.cern.ch/cms/MUON/dt/isr/>
  - Cosmic Challenge <http://cmsdoc.cern.ch/cms/MUON/dt/CC/cc.html>
- Information and access new:  
All pages can be accessed via the CMS Muon Barrel Webpage (several people have writing access)  
CMS → Muon → Muon DT = <http://cmsdoc.cern.ch/cms/MUON/dt/>
  - ISR (as above)
  - CC (as above)
  - commissioning <http://cmsdoc.cern.ch/cms/MUON/dt/SX5/>

# Information Logging & E-logbook

- Move from "paper-based" logbook information to electronics version
- E-version for commissioning based on the ISR web-based logging. Example:

<http://isr-muon.web.cern.ch/isr-muon/cgi-bin/teststatus.pl>

Jesus Puerta

Will display chamber status in wheel  
 **Chambers currently under test** 

Wheel 0 lower sectors (MB1s & MB4s ready to go)

CHAMBER	WH	SE	STAT	HV STAT	OPENED	DRESSING	COSMIC	SCALERS	MC	TIMECONST	DATE TIMECON
MB2											
MB00002_042	0	8	OK(FINISHED)		--//	--	--	--	--	--	--//
MB00002_044	0	9	THETA	OK	23/Nov/2005		OK	--	--	--	--//
MB00002_037	0	10	OK(FINISHED)		--//	--	--	--	--	--	--//
MB00002_045	0	11	OK(FINISHED)		--//	--	--	--	--	--	--//
MB00002_043	0	12	OK(FINISHED)		--//	--	--	--	--	--	--//
MB3											
MB00003_025	0	8	OK	OK	14/Nov/2005	--	OK	DONE	TESTED_OK		/Nov/2005
MB00003_037	0	9	MC	OK	--//	--	OK	DONE	--	--	--//
MB00003_044	0	10	OK(FINISHED)		--//	--	--	--	--	--	--//
MB00003_048	0	11	OK(FINISHED)		--//	--	--	--	--	--	--//
MB00003_035	0	12	OK(FINISHED)		--//	--	--	--	--	--	--//

To show: HV on/off, MC test, TP run, cosmics run, analysis, run summary, trigger config → Jesus talk on Friday cosmics ana meeting

→ Also electronics logbook based on ISR one

## mb4 , wheel 2 , sector ..

**We have analyzed:**

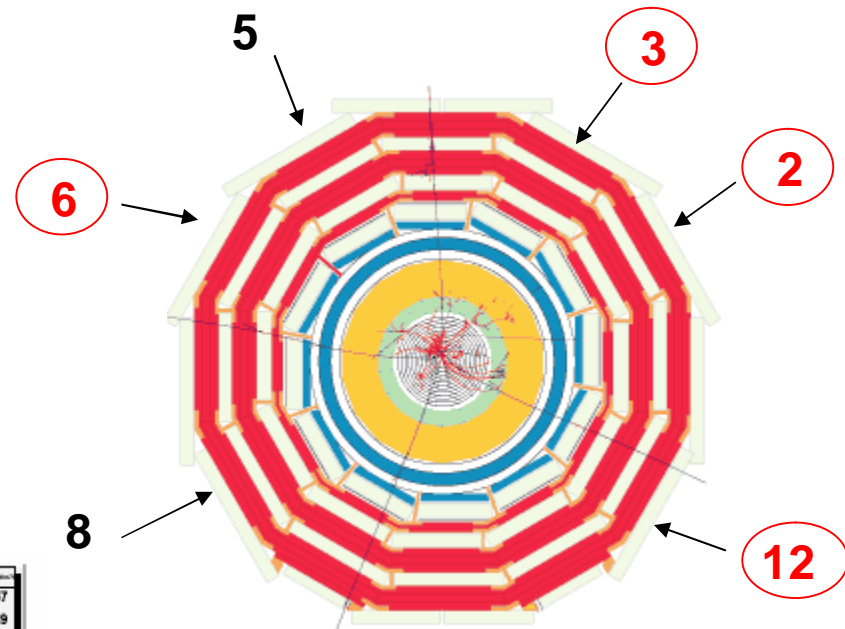
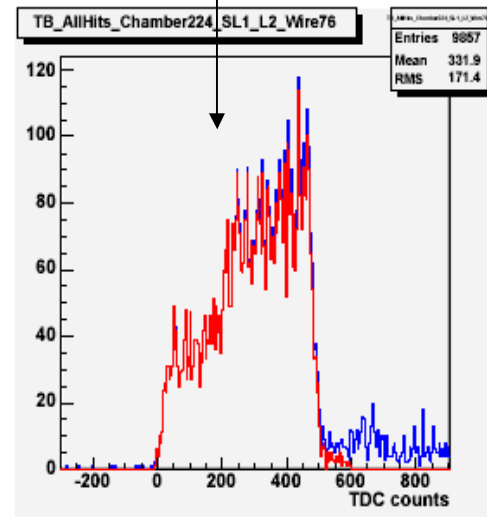
### -Test pulses

( Occupancy, Mean, RMS ) seem OK !!!

### -Cosmic runs

( Noise, occupancy, Time Boxes )

We have found the problem of the “distorted”  
time boxes in the red chambers

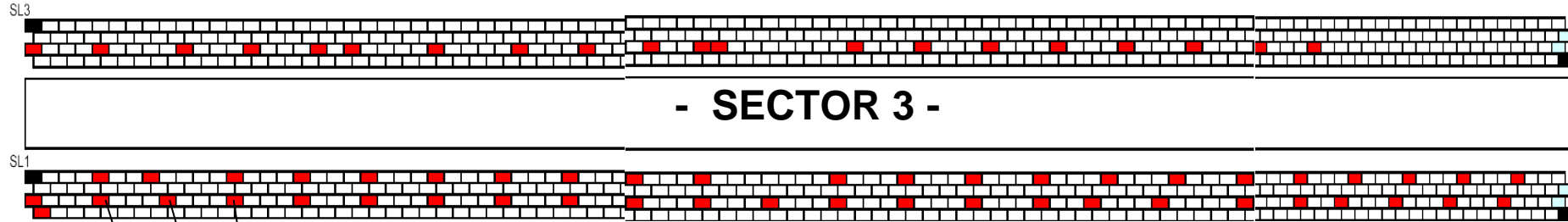


# MAPS OF CELLS WITH DISTORTED TIME BOXES

Cells with inverted time boxes are distributed according to a **regular pattern**

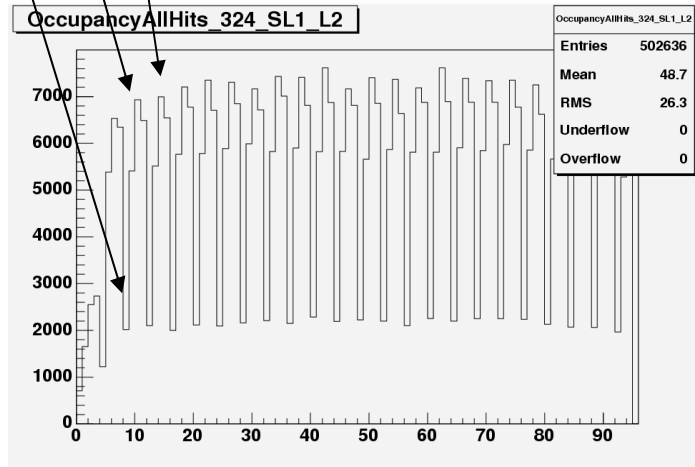
**occupancy drops in the cells with distorted time boxes**

MB4  
WHEEL2  
SECTOR3

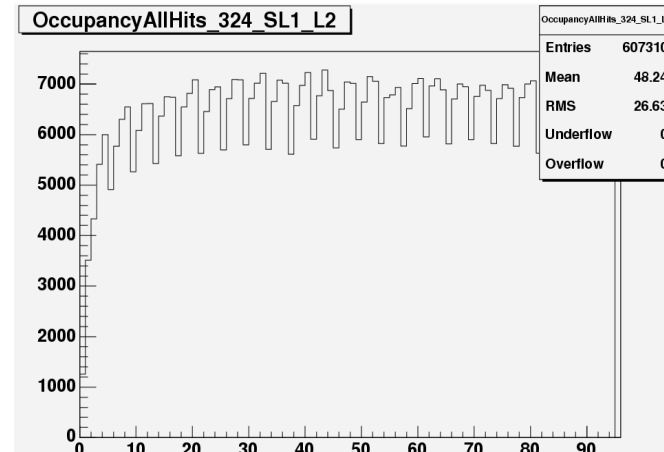


- non esiste per la geometria
- tempo invertito
- tutto v

HHandHL



Default TRG

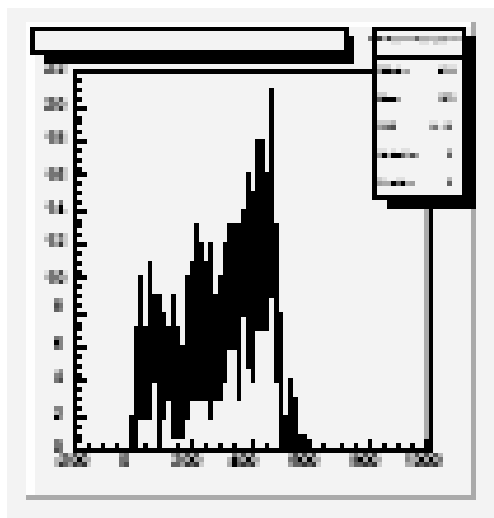


This problem appears when we analyze data taken with a HHandHL trigger while we don't observe “distorted time boxes” in data taken with the default trigger

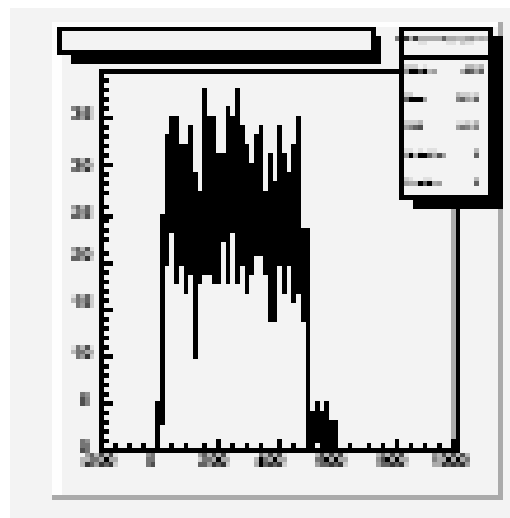
## TRACO PROBLEM ?

For example these are the time boxes of the same wire (41) in SL1, L2 of the chamber placed in the sector 3

HHandHL

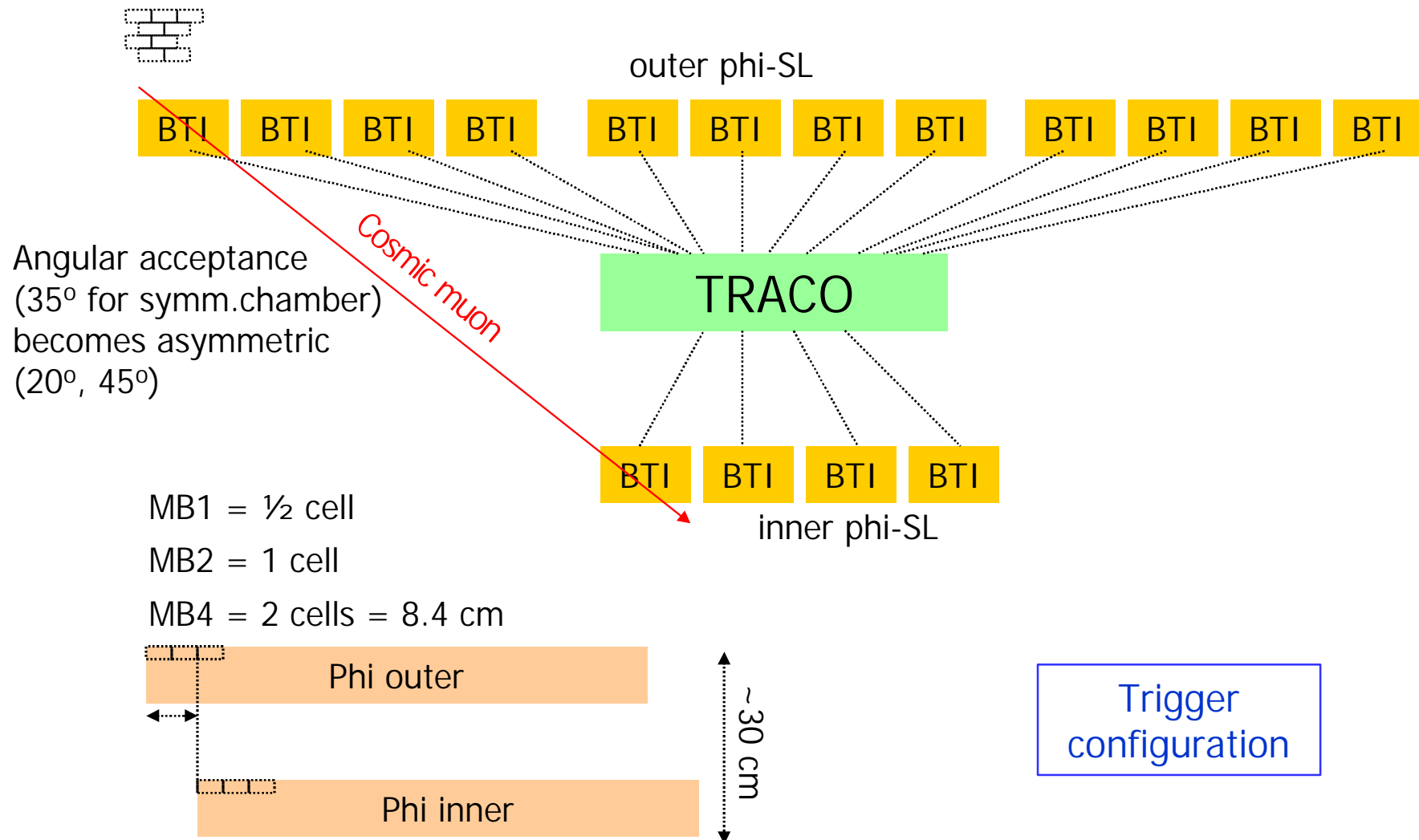


Default TRG



# Potential Interpretation

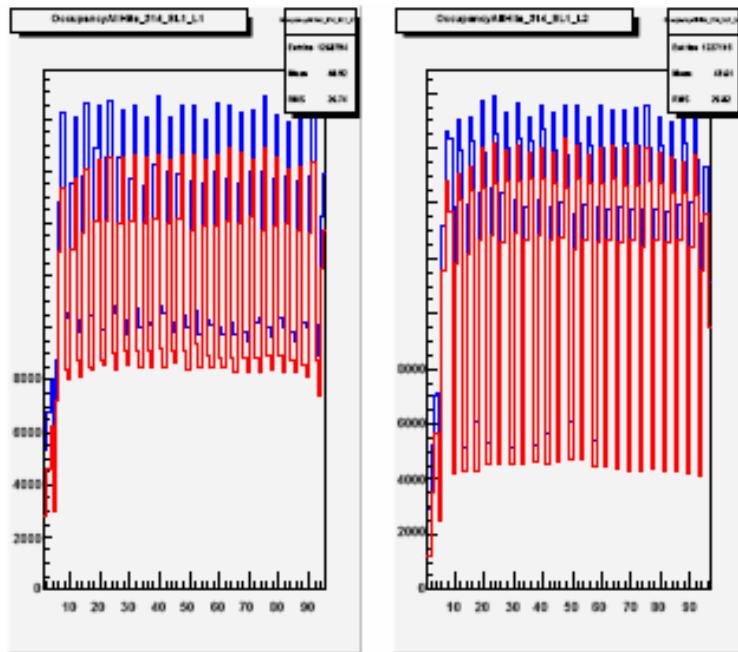
Angular acceptance of TRACO and shift between both phi SLs



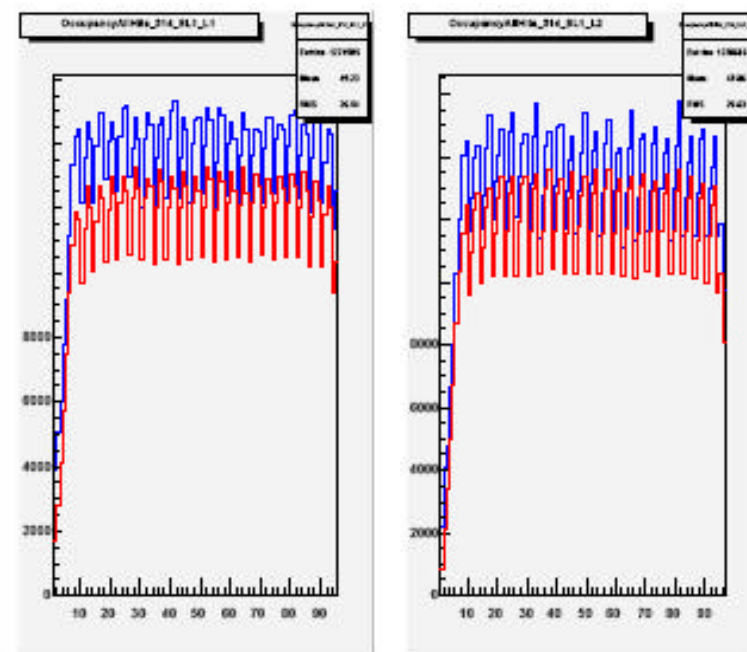


# New Configuration

MB4 sector 3 YB+1



HHandHL Old configuration Run 4059



HHandHL New configuration Run 4060

To be checked with SX5 data:

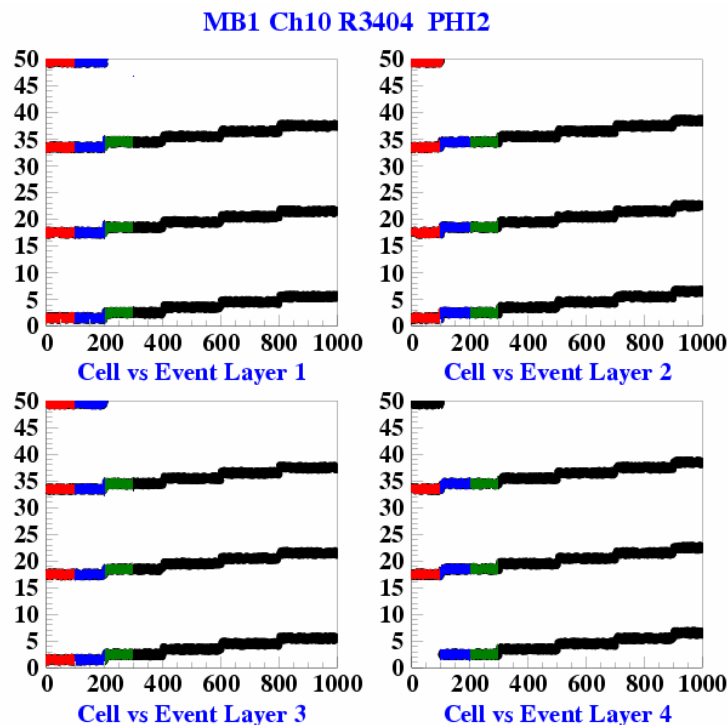
- Select ~vertical tracks
- Comparison of angular distribution for cells with normal/reduced occupancy
- Dependence on sector number

Compare to ISR data in horizontal MB4 orientation

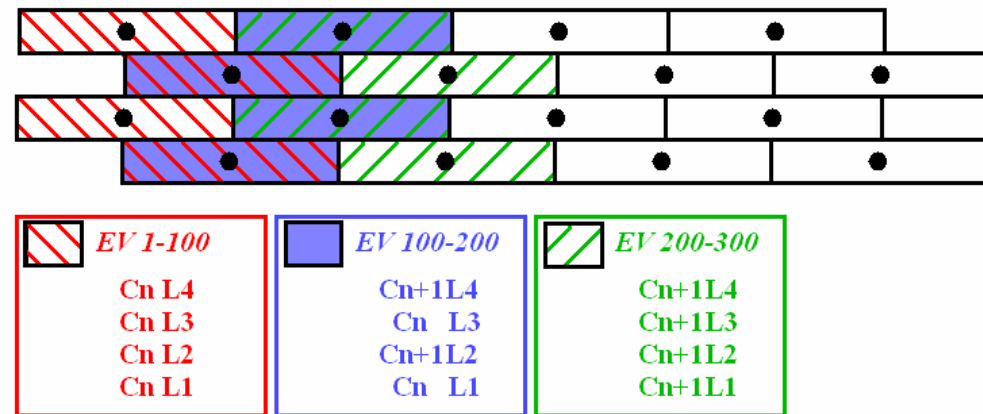
## Analysis of testpulse runs at SX5

When TP are taken all FE channels are disabled but "1 column" every 16 on each superlayer (= 1 on each tp connector).

→ No signals are expected from a cell when it is disabled



The configuration is changed every 100 events  
→ Each group of 100 events corresponds to a different cell pattern



- >> All the cells from the same FE connector would have similar TP values
- >> For all the FE connectors going to the same ROB we also expect similar values  
(Each ROB has its own delay)

## Observations from TP runs for MB1, 2, 3

- Most of TP runs for MB1,MB2,MB3 chambers at Wheel+2 have been analyzed
  
  - Comparing the TP values for the different cells we found:
    - L1&L3 have similar values
    - L2&L4 have similar values
    - Sometimes the results for **even layers** have a **systematic shift** with respect to **odd layers**. This shift **seems to depend on the run**.
      - The difference are related to the TP run → configuration ?
- This will introduce an **error on T0 determination**
- It is possible **fix the problem when taken TP data?**
  - A solution will be to **compute 2 global T0's** for each individual SL one for the **ODD layers** and other for the **EVEN layers**

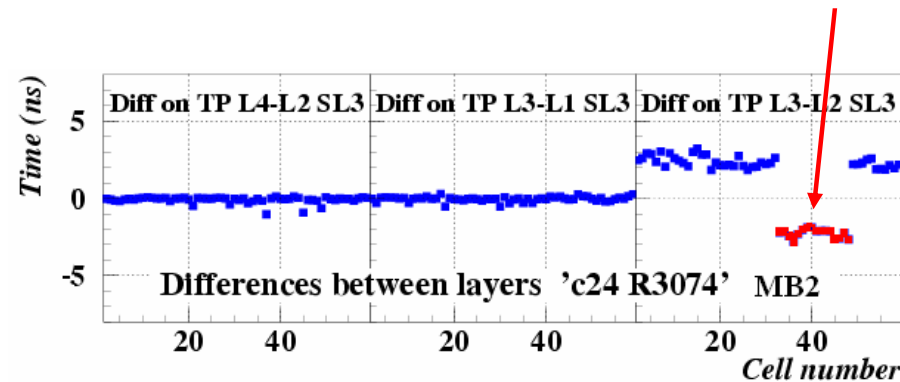
## Differences between odd & even layers

The average value of Dif Cell n (Layer 3- Layer 2) for each SL was computed and the results can be found on the tables on next slides.

Differences were computed cell by cell as:

$$\text{Dif Cell n (Layer i - Layer j)} = \text{TP Cell n Layer i} - \text{TP Cell n Layer j}$$

For the runs with "extra" differences on some connector, these "non expected" values were not used for the mean value computation.



## Wheel 2 Chambers MB2. TP Layer3 – TP Layer 2

Sector	#Cha	Run	SL PHI1		SL The		SL PHI2	
			Mean	RMS	Mean	RMS	Mean	RMS
2/2/2	46	3567	1.85	0.55	1.57	0.41	1.70	0.50
2/3/2	47	3546	0.96	0.50	0.67	0.47	1.02	0.56
2/4/2	48	3470	1.75	0.49	1.72	0.50	1.70	0.50
2/5/2	19	3502	0.15	0.28	0.16	0.26	0.05	0.25
		3504	0.18	0.21	0.07	0.24	0.06	0.24
2/6/2	49	3426	2.46	0.40	2.51	0.50	2.5	0.50
2/8/2	22	3395	1.52	0.47	1.99	0.50	1.41	0.39
2/9/2	23	3343	0.33	0.35	0.42	0.28	0.38	0.28
2/10/2	24	3074	2.42	0.47	2.30	0.48	2.36	0.40
2/11/2	17	3000						
2/12/2	26	3315	1.37	0.39	1.20	0.60	1.26	0.40

Cells not used to  
calculate mean  
values

Run 3567 Cells 49-52 SL PHI 2

Run 3546 Cells 53-60 SL PHI 2

Run 3074 Cells 33-48 SL PHI 2

## Summary and Conclusions

- Comparing the TP values for the different ROBs we found that in most of the cases the values are compatibles with the expectations with differences lower than 0.5ns.

**BUT:**

- >> ROB4 at MB1 have a **systematic difference** of the order of **1ns**
- >> Chamber MB2 Ch23 Run3343:  
Either ROB0 & ROB 6, either ROB1-ROB5 have differences of **~1ns**
- >> Chamber MB3 Ch12 Run3081:  
ROB0 have the **same delay** than ROB1 (Difference must be **~2.86ns**)
- >> Chamber MB3 Ch16 Run3256:  
Either ROB0 & ROB 6, either ROB1-ROB5 have differences of **~1ns**

# Report on Track reconstruction of cosmic rays

Anna Meneguzzo

Goal : Track reconstruction with the best resolution

That is required for

- *final commissioning checks*
- *cross checks with alignment measurements at ISR*
- *cosmic challenge and magnet test chamber behavior in magnet field and alignment parameter accuracy checks.*

Needed steps:

- a) Correct geometry
- b) T0i correction i.e. channel by channel equalization with TP data
- c) tTrig (i.e. common T0 for all data) after T0i corrections (with Gianluca method)
- d) T0\_event correction (after all previous checks) for removing the 25 ns spread wrt L1A

Results of the checks I performed on the *Toi\*.txt* file output by the monitor

Anna Meneguzzo

Legenda:

-\*33-48 means cell in the SL with some TP problems :usually the 2 TP lines seem exchanged ( except MB1)

Gray means not checked by A.M

AMB=Anna.M from TOI.txt files of conventional monitor output

MC=C.Mary\_Cruz from flat TP files analysis

Wh	MB	sect	SL1 PHI1 TP 11-12 &13-14	SL2 TP 11-12 &13-14	SL3 PHI2 TP 11-12 &13-14	TP Line CORR(am) tdc count	TP Line CORR(m_c) NS
2	1	1	0.00	0.00	0.00		
2	1	2	0.53	0.85	0.43	0.5	0.35
2	1	3	0.44	0.62	0.35	0.45	0.30
2	1	4	2.48	2.65	2.1	2.4	2.
2	1	5	1.39	1.49*33-48	1.73	1.4	1.
2	1	6	2.94	2.98	2.83	2.9	2.3
2	1	7	0.00	0.00	0.00		
2	1	8	0.55	0.62	0.52	0.6	0.3
2	1	9	2.00	1.95	1.80	2.	1.5
2	1	10	2.65	2.72	2.61	2.7	2.1
2	1	11	0.24	0.25	0.14	0.2	0.2
2	1	12	2.22	2.33	2.11	2.2	1.6
2	1	13	0.00	0.00	0.00		
2	1	14	0.00	0.00	0.00		

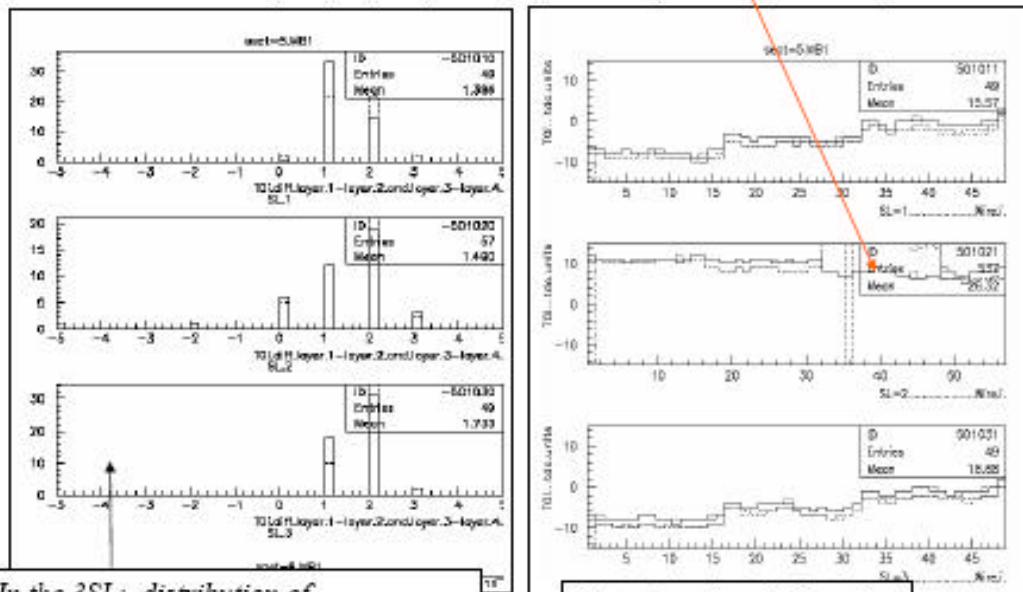
Example of an results table. Exists for all 4 chamber types.

Mary-Cruz recomputed TP *T0i* from flat files.

I checked *T0i\*.txt* files output by the monitor program during shifts at SX5.

*T0i* Results:

The two computations (MC\_Fouz presentation and my studies) on W2 give compatible results.



In the 3SL: distribution of  
 ——— TP(i,layer 1)- TP (i,layer 2)  
 ..... TP (i,layer 3)- TP (i,layer 4)  
 i=wire number (1:...)

TP value of each channel  
 ——— layer 1  
 ..... layer 2  
 - - - - layer 3  
 - - - - layer 4

I report in the next 4 tables the mean values of the differences between the *T0i* values of corresponding wires in layer 1 and of layer 2 and of layer 3 and layer 4 ( each SL separately) . In the last column I report the mean value of all the 3 SL.

The values in the last column are used to correct the shift of TP of odd layers in each chamber.

g data



## “Dead” Cells found at TP runs & Cosmic check

In all 42 chambers in YB+2 – 7 new cells dead in TP and cosmics

Chamber	TPRun	DeadCell	Comments
MB1 Ch14 Sector 2/4/1	3463	Phi1 C40L1  Phi1 C35L4	NOT DEAD at Cosmic Run 3462 It seems that the TP peak is missing (See next slides)
MB2 Ch47 Sector 2/3/2	3546	The C21L1 The C4L3 The C15L3 The C12L4	Also DEAD at Cosmic Runs 3545 and 3547
MB3 Ch8 Sector 2/8/3	3387	Phi2 C5L1 Phi2 C5L3	Also DEAD at Cosmic Runs 3385 and 3386
MB3 Ch30 Sector 2/3/3	3682	Phi1 C27L4	Also DEAD at Cosmic Run 3677
MB3 Ch24 Sector 2/11/3	3286	The C48L3	It is not dead, it is shifted by ~80TDC counts (64 ns). (See next slides) It also happen at Cosmic Run 3285

# New Dead Cells in MB1 YB+2

Use ISR chamber traveller and commissioning results

Sector	Chamber ID	Dead cells in AC Traveller	Commissioning result
02	028	Phi1: L2C01, L2C30	SL1: L2C01, L2C30
03	009	Theta: L4C28 Phi2: L1C20	SL2: <b>L4C27 (?)</b> SL3: L1C20
04	034 <small>Confusion in No.</small>	Phi1: L3C18 Theta: L4C45, L4C46	SL1: L3C18, <b>L4C05 (TP yes)</b> SL2: L4C45, L4C46
05	016	Theta: L1C50	SL2: L1C50
06	013	Phi1: L3C03, L1C45	SL1: L1C45, L3C03
08	010	Phi2: L2C07, L2C47	SL3: <b>L2C06 (?)</b> , L2C47
09	014	-	-
10	015	-	-
11	017	-	SL1: <b>L2C22 ineff.</b>
12	020	-	-

In YB+1 Sector 10, 11, 12 no new dead cells found in MB1

# Subjects

- **Subjects under study:**

Already presented:

- Track reconstruction and event-by-event correction of T0 time jitter for cosmics in autotrigger mode (Anna, Francesca)
- Study of testpulses MB1-MB4 (Mary-Cruz)
- MB4 chamber performance (Giorgia, Francesca)

This Friday: in addition to further studies of above studies

- Electronics logbook (Jesus)
- Comparative study of MB1 in sectors 10, 11, 12 (Emanuel)
- Study of simulated cosmics (Philipp)

Envisaged:

- Trigger studies (Stefano)
- Influence of threshold and HV settings (Torino)

- **Uncovered subjects:**

- Comparison of occupancy and time boxes to ISR data
- Wire by wire studies (efficiency, resolution)
- Commissioning in B-field – goals of cosmic challenge
- Someone may look at DCS data

Software tools:

- ORCA + commissioning package (MZ&GC)
- ORCA + own package
- Stand-alone software

# What else....

To come:

- Complete analysis of dead cells
- Study of trigger configurations
- More detailed studies of MB1, MB2, MB4
- .....

Email contact: <http://cern.ch/simba> → Subscription to lists → list name "cms-project-dt-cosmics" <your Email@host>

Agenda system with complete talks