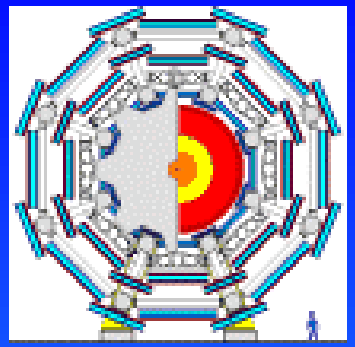

# A new algorithm for the LVL1muon Trigger simulation

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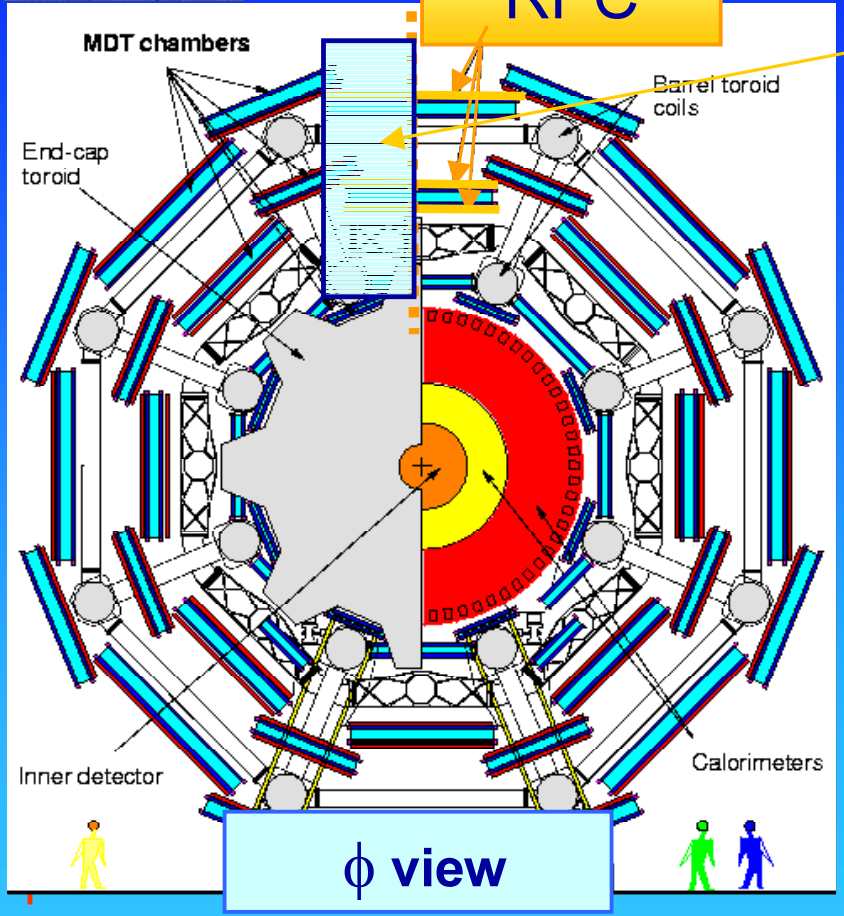
# Outlook:

- The LvL1 μ Trigger Logic
- Simulation:
  - Large Sector
  - Small Sector
- The gap regions
- The regularization procedure
- Conclusions

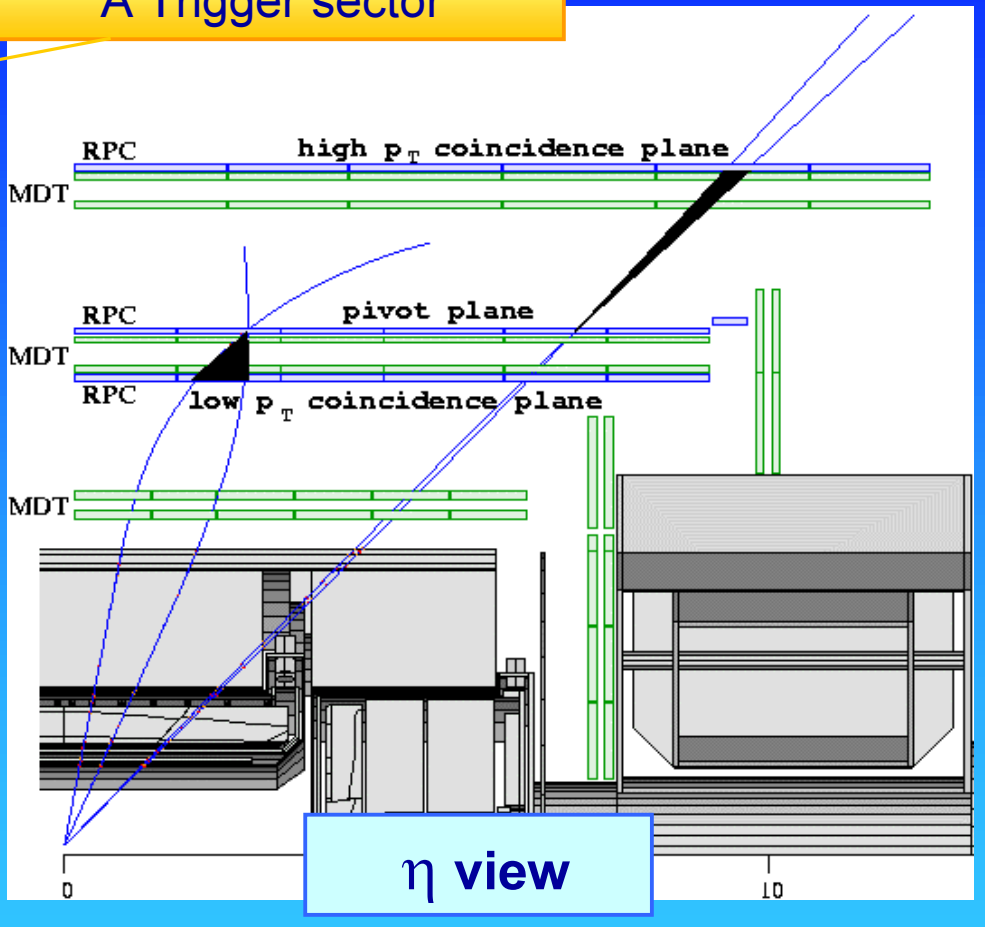
# Trigger sectors

## RPC




$\phi$ view

## A Trigger sector

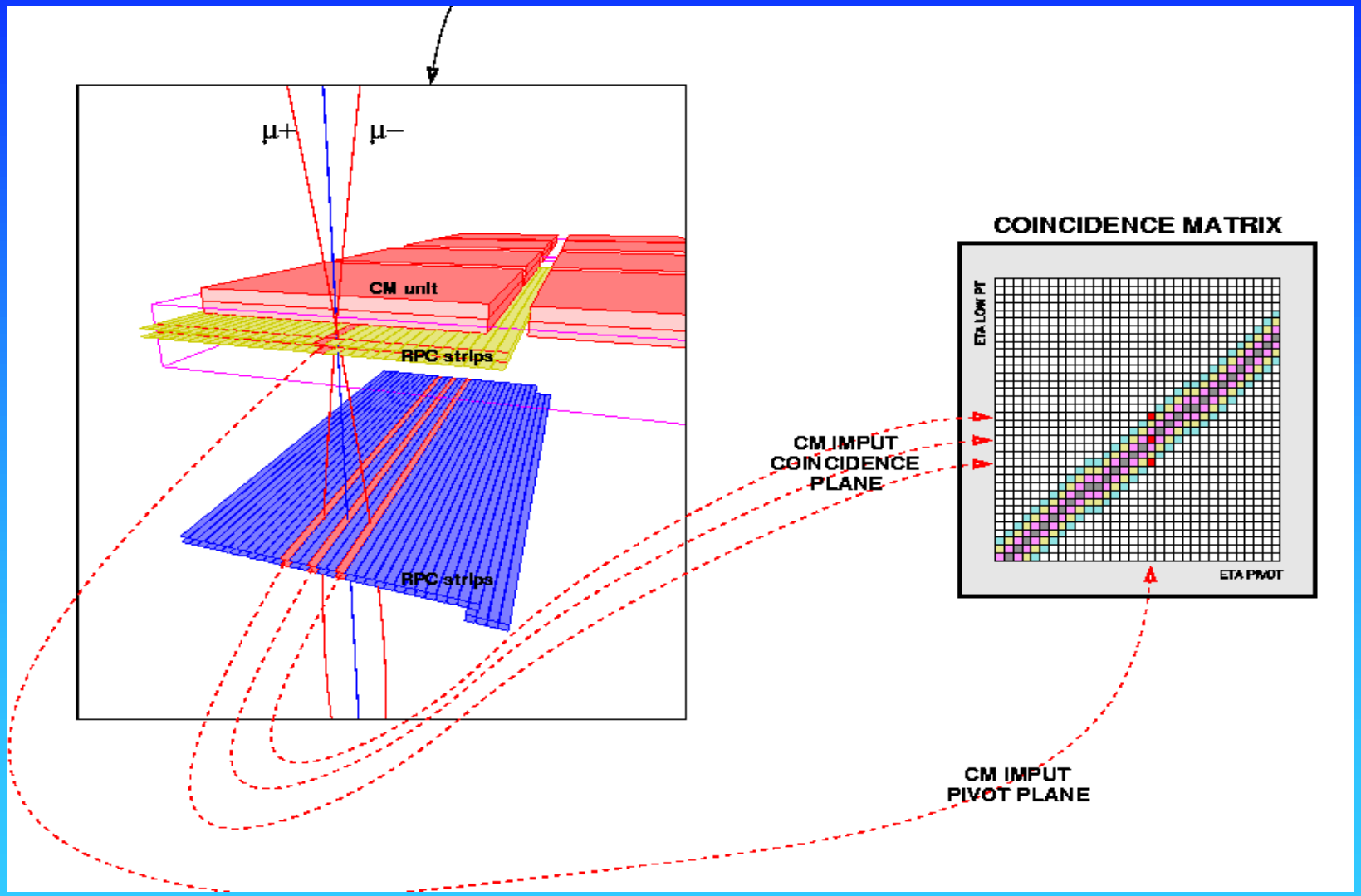



$\eta$ view

- **RPCs are placed in the Middle and Outer stations**

**64 trigger sectors**

# The LVL1 trigger logic



Old studies for the LVL1 already existed and are summarized in the LVL1-TDR

These refer to one old and incomplete version of the layout

Only studies with reduced granularity

**Requirements and features for the new algorithm:**

- **Automatic procedure**
- **Layout Independent**
- **Maximum granularity (strip by strip)**

# Analysis Chain

- **•Production of single μ events (ATLSIM)**
- **•Processing events with ATRIG**
- **•Analysis and application of the trigger algorithm**

**600**Kevents(400Mb/100 Kevents) for each pt value.

**9G** events in order to make an efficiency curve

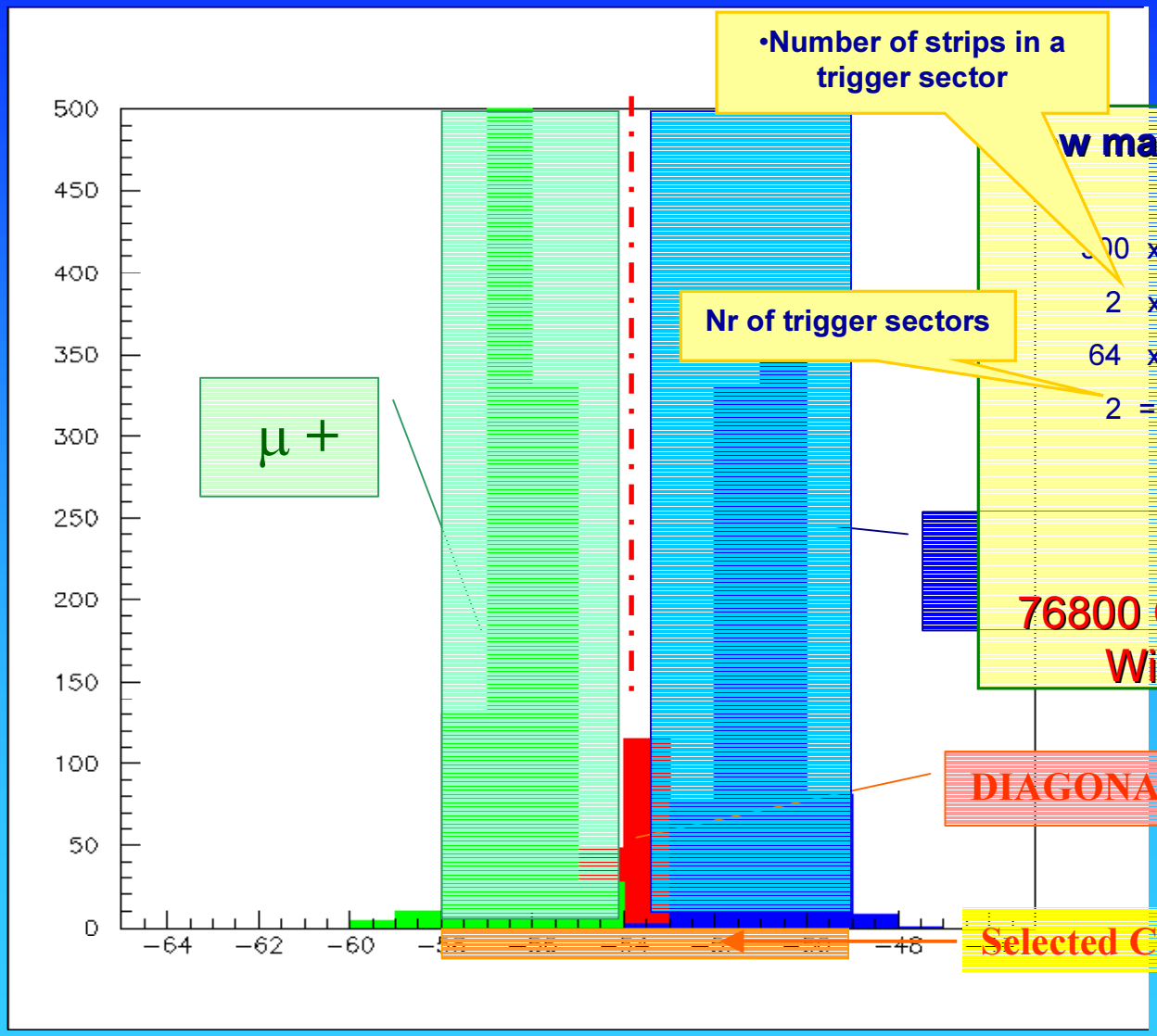
Make the LVL1 Ntuple needed for the analysis

Requirements:

**1) Automatic procedure**

**2)Layout indipendent**

**For every fired strip on the pivot plane we look at the distributions on the low pt plane (RPC1) and on the high pt plane (RPC3)**




•Number of strips in a trigger sector

Nr of trigger sectors

w many coincidence windows?

00 x
2 x
64 x
2 =

•Low/High Pt

η/ϕ view

76800 Coincidence Windows!!

DIAGONAL

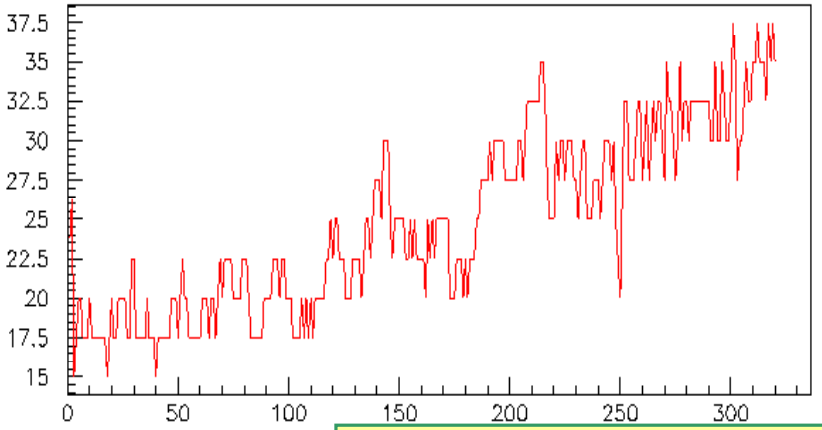
Selected Coincidence Window

SECTOR 0 (LARGE) **LOW PT** (th = 6 GeV)

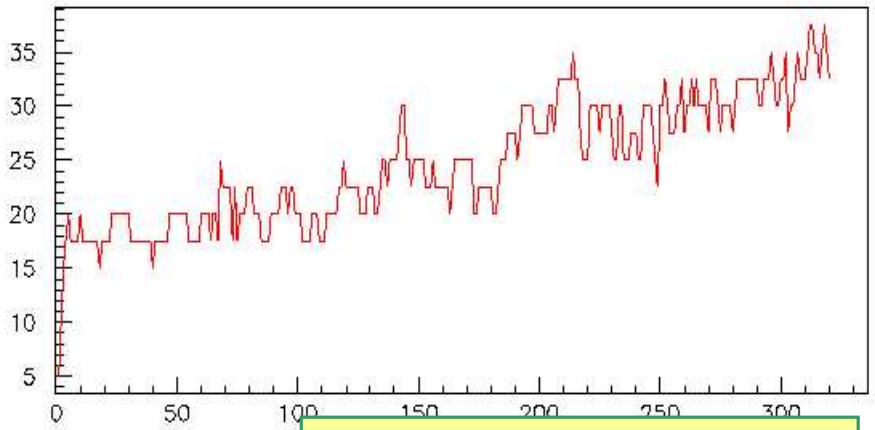
SECTOR 0 (LARGE) **HIGH PT** (th = 20 GeV)

## Coincidence Windows width

Width (cm)

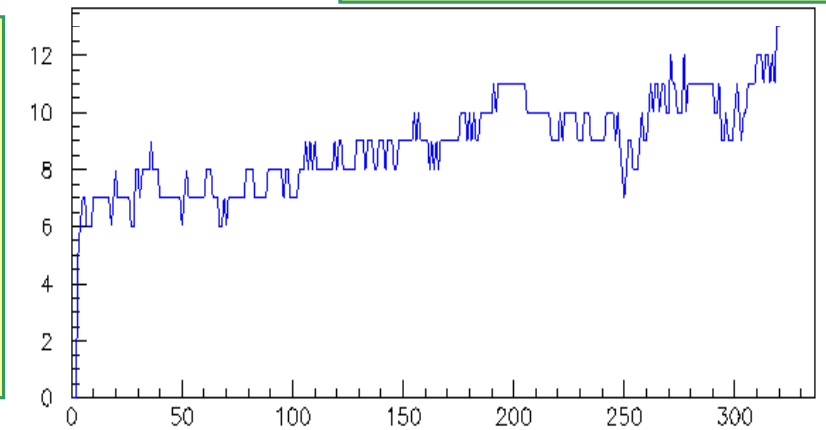



strips (∝ η)

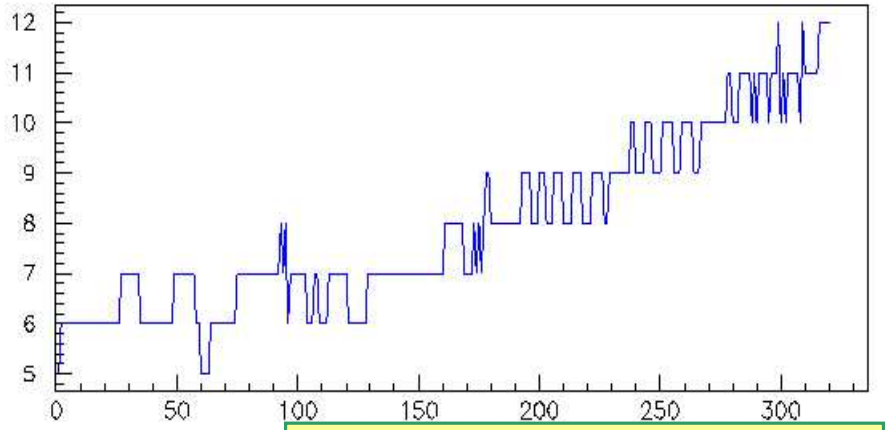



strips (∝ η)

Width (strips)



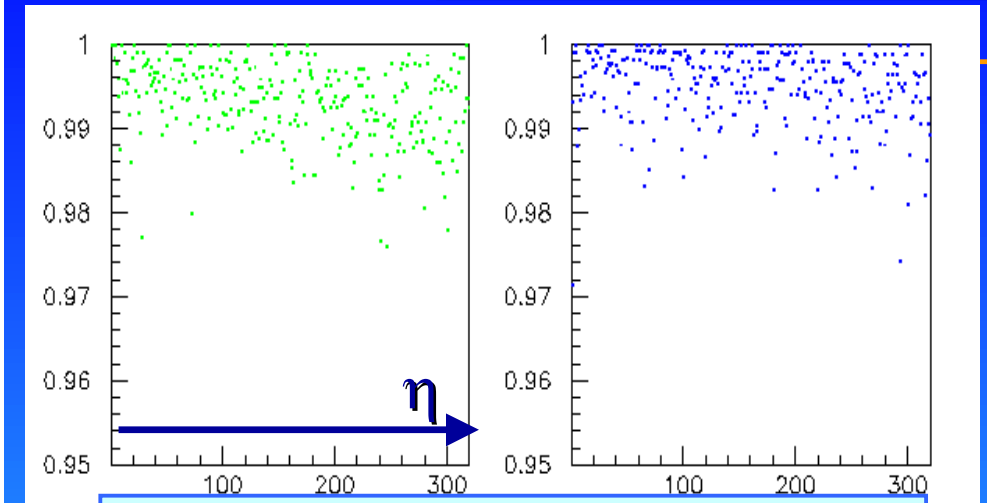

strips (∝ η)



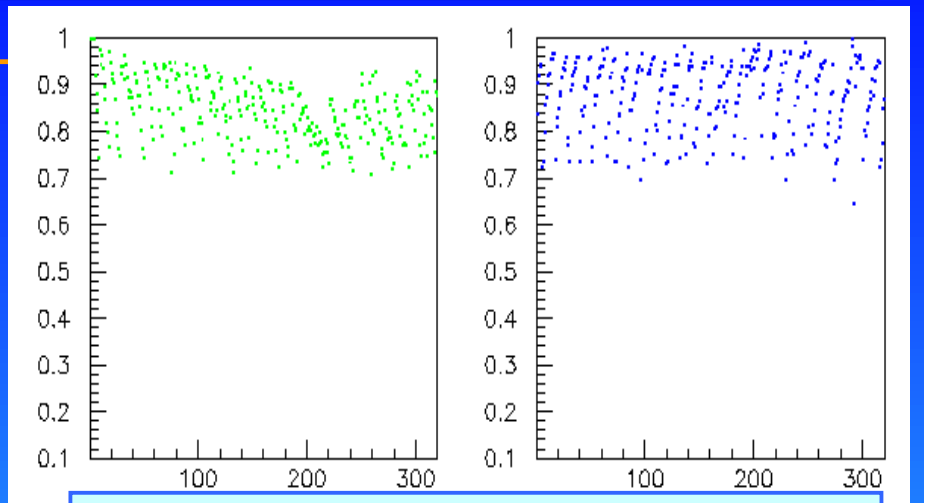

strips (∝ η)

•Layout O.08

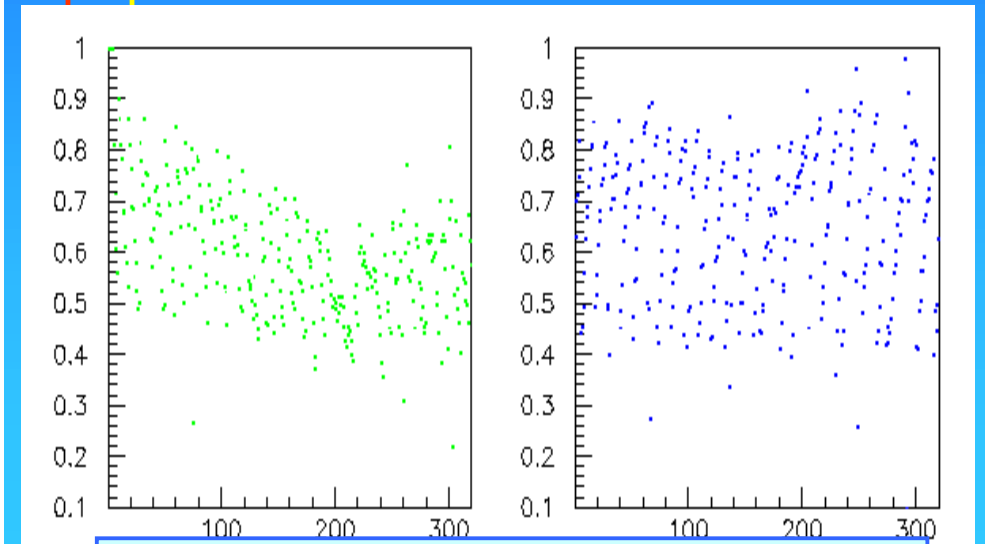
# LVL1 selection efficiency vs Pt (sector 0/Low Pt th=6 GeV)



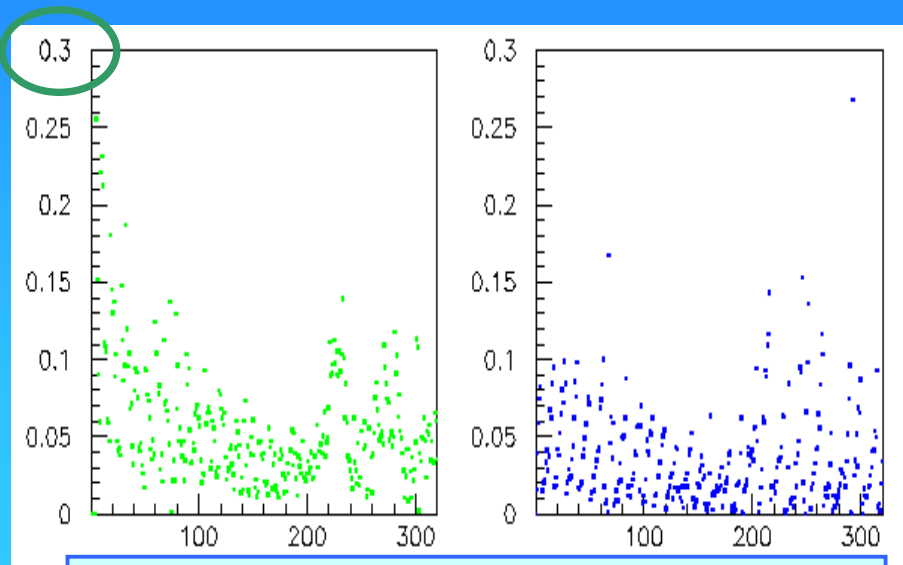

**Pt = 7 GeV**



**Pt = 5.5 GeV**



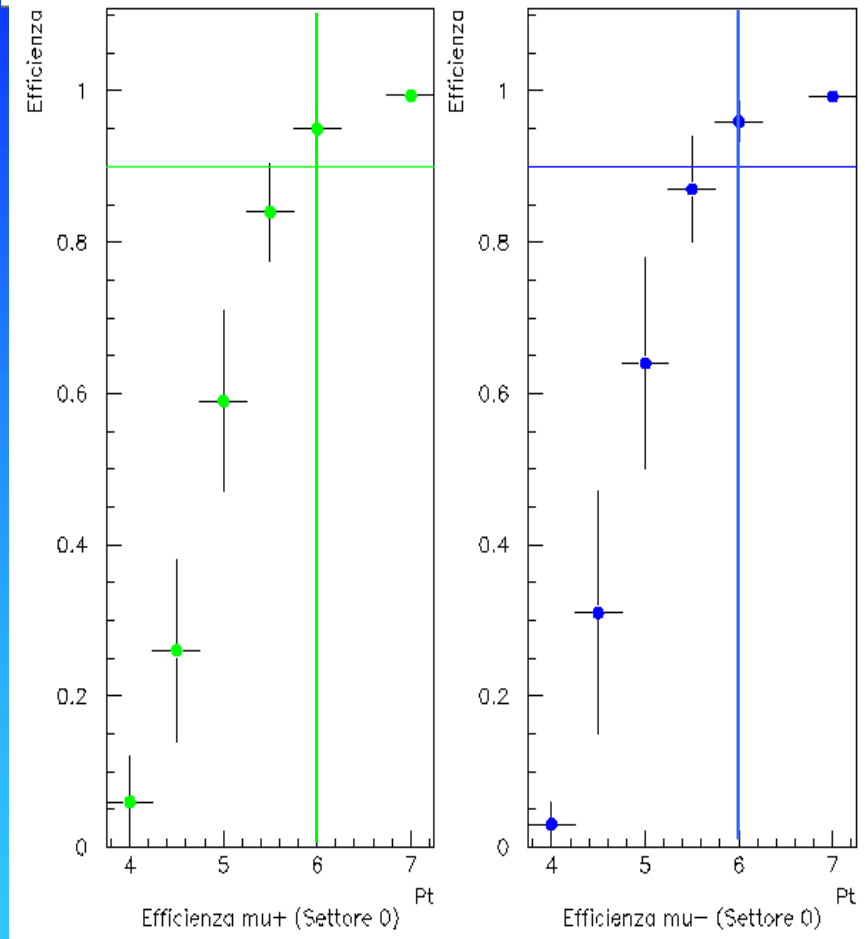
**Pt = 5 GeV**



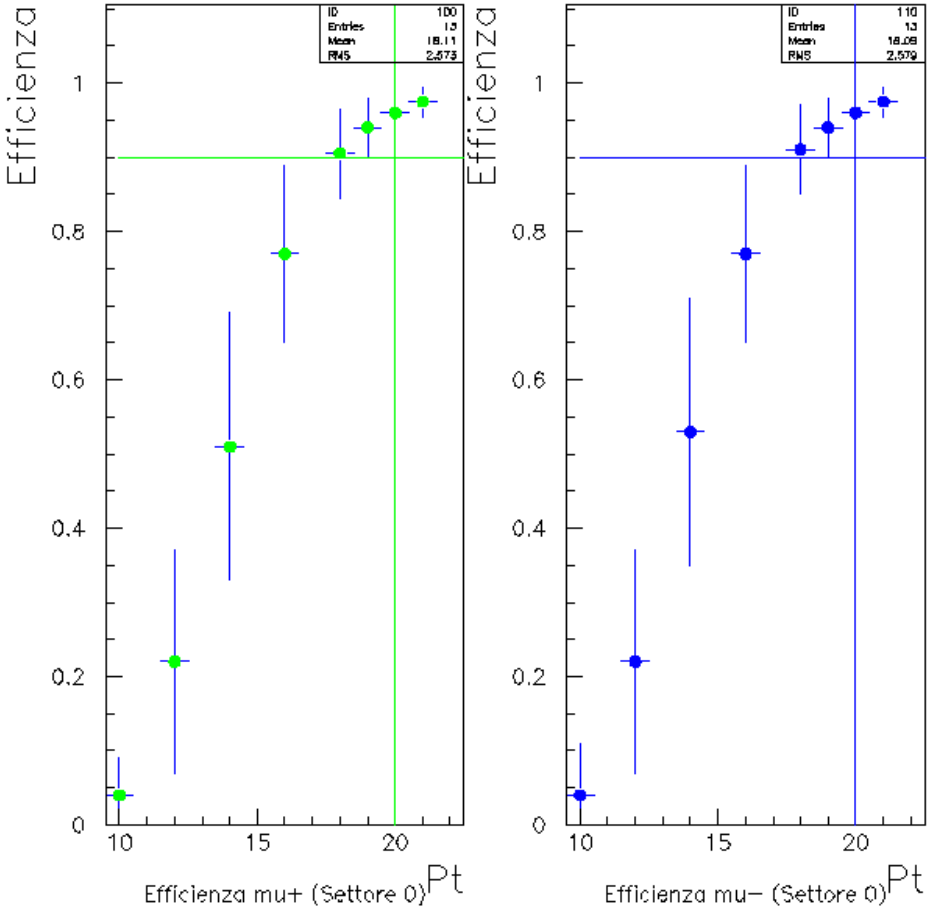
**Pt = 4 GeV**

th

# Efficiency Curve (sector 0 –Large-)

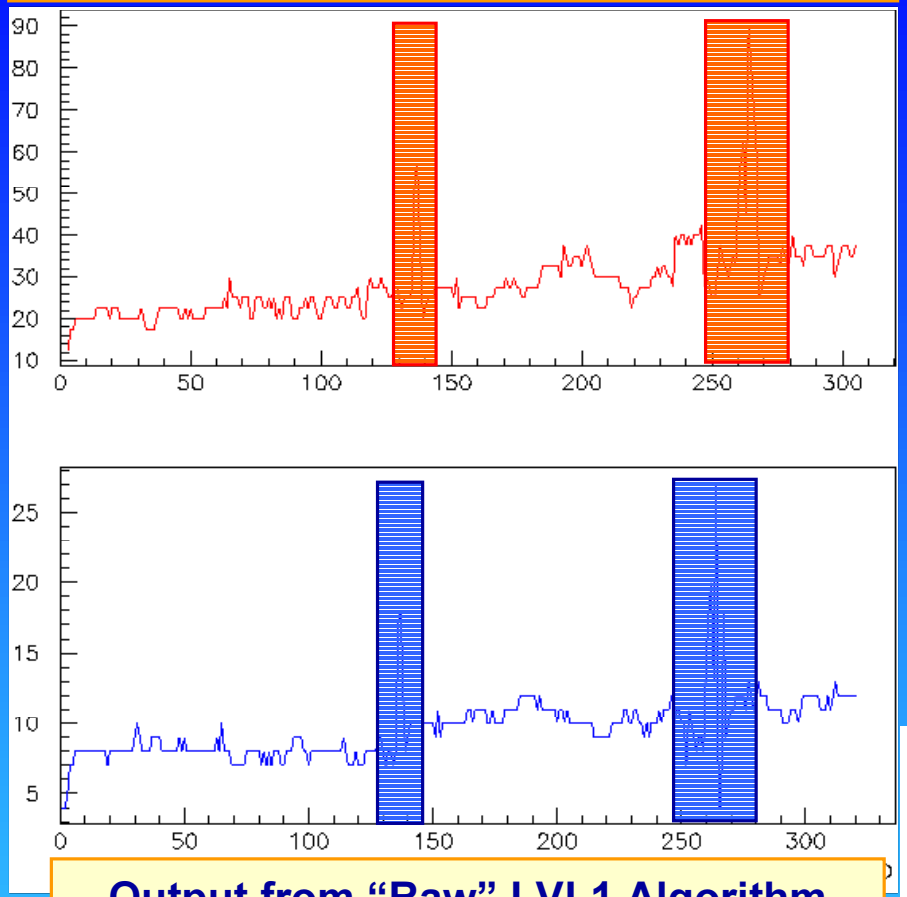



Low Pt

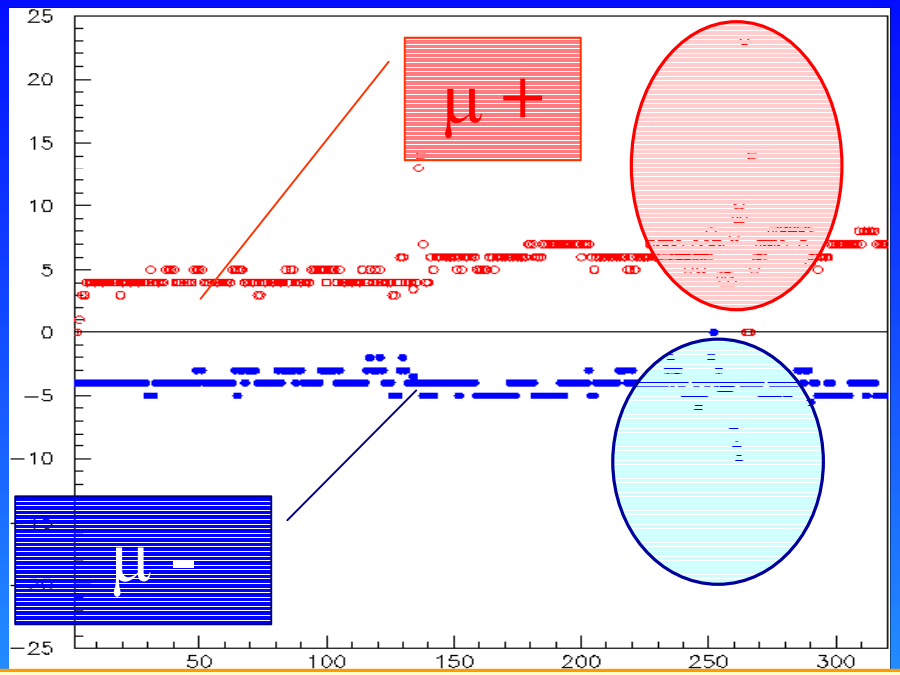



High Pt

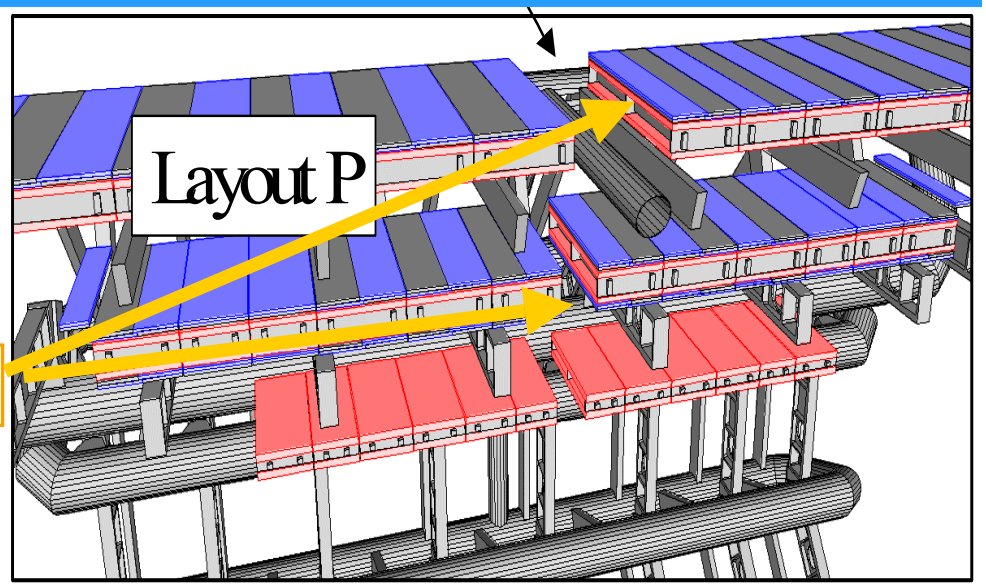
## SECTOR 1 (SMALL) LOW PT



## Output from “Raw” LVL1 Algorithm

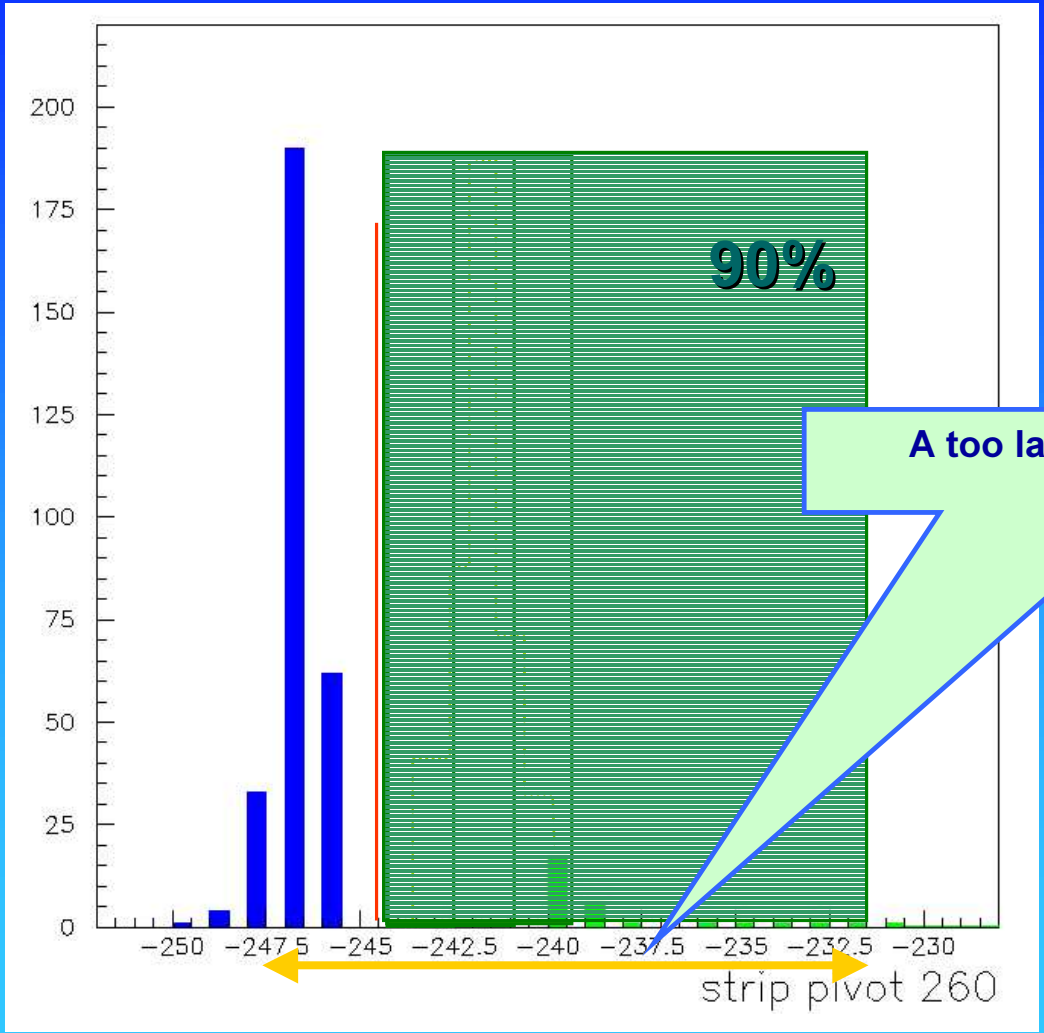



## Coincidence Windows width (LOW PT)




## Gaps along the small sectors

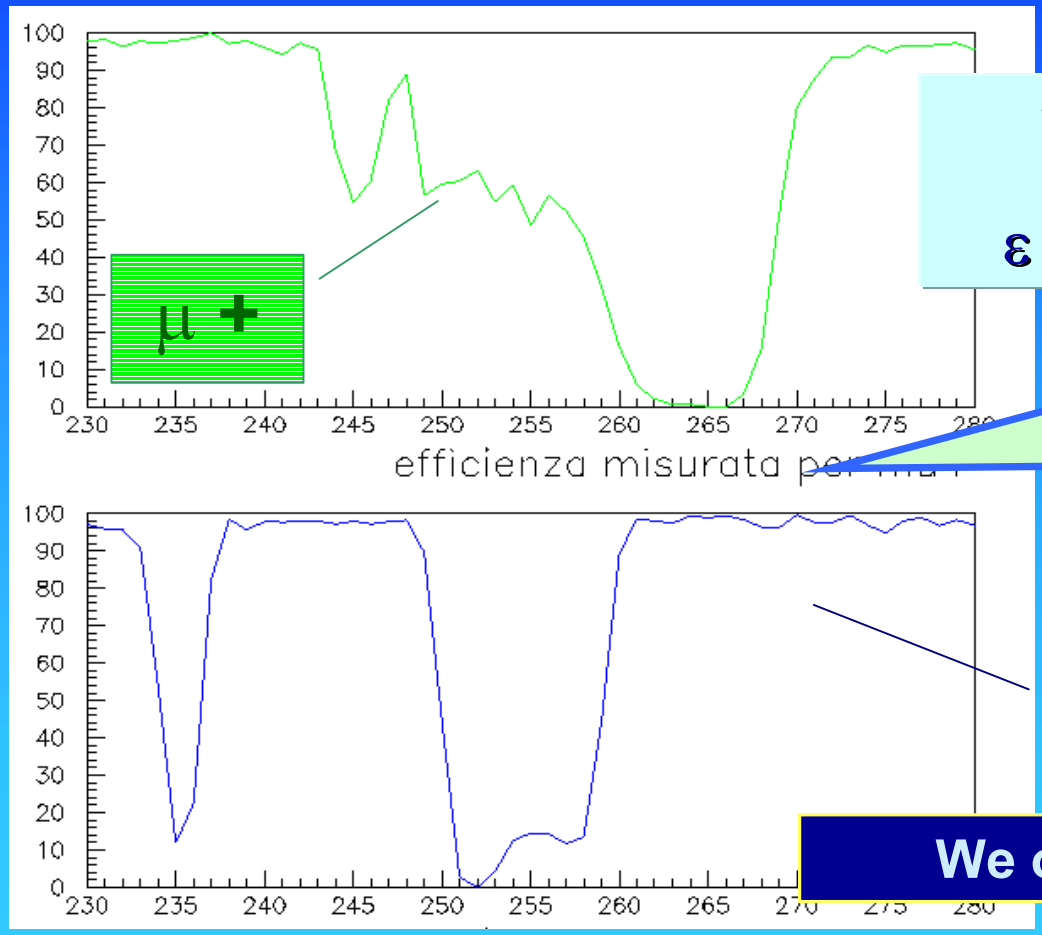
# Where is the problem?




A too large Coincidence Window!!

**A serious problem:**

**How recognize the gap regions without information on geometry?**




**We define the ε estimator as:**

**ε ≈ (# digi on RPC1)/(# digi on pivot)**

**Behaviour of ε in the neighbourhood of a gap region**

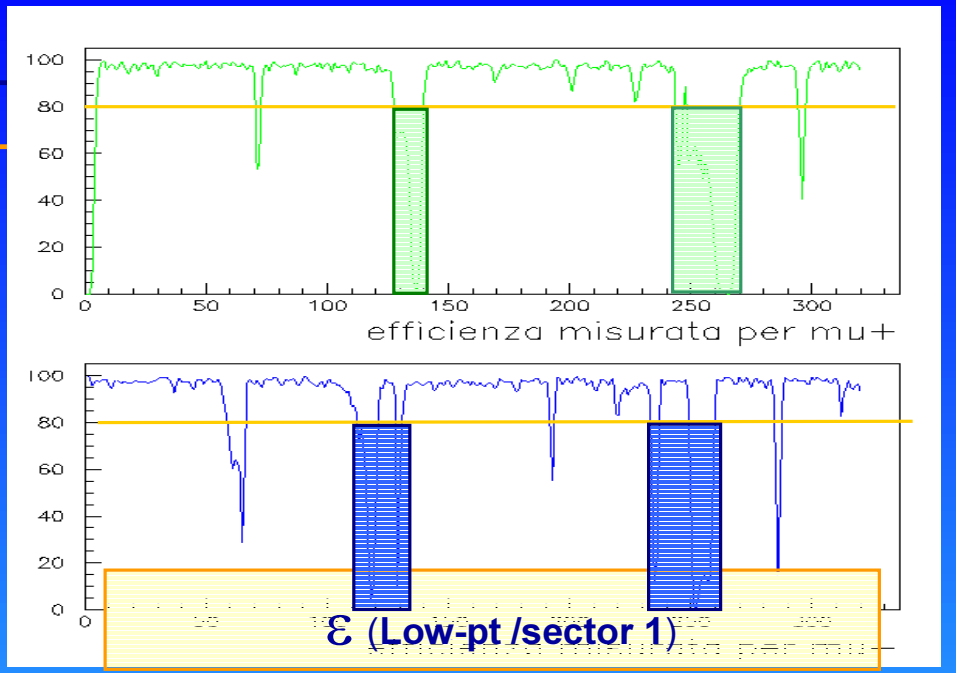
**We obtain the gap spectrum!!**

$\varepsilon \approx$ (n. digi on RPC1)/(n. digi on pivot)

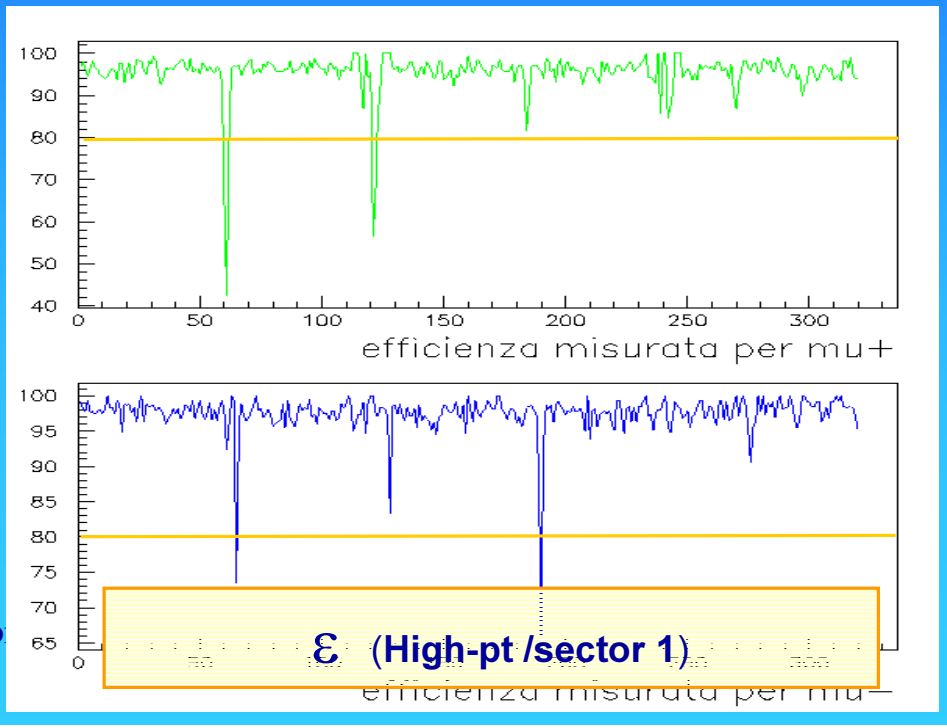
With the $\varepsilon$ estimator we tag all the pivot strips to which correspond low-pt and high–pt plane strips in the gap-region.

For these strips a regularization procedure was applied.

As an example, in the simplest case, the mean width of the previous 10 strips was assumed for the new coincidence window

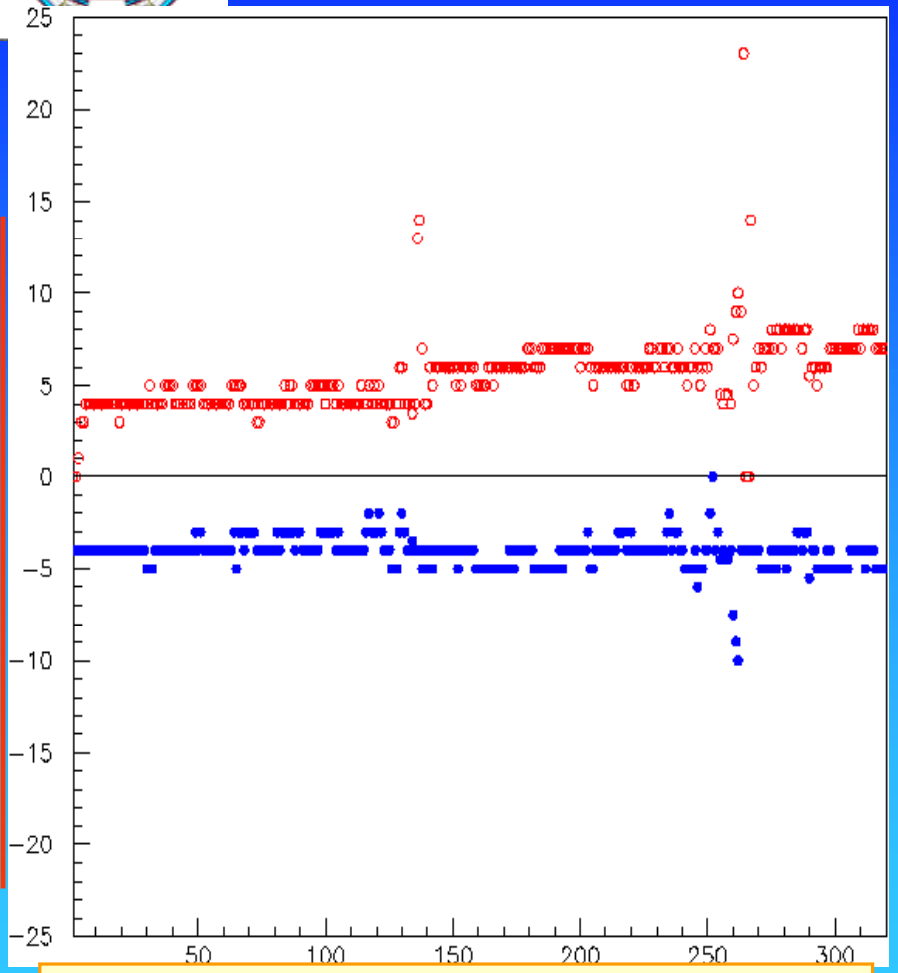



$\varepsilon$ (Low-pt /sector 1)

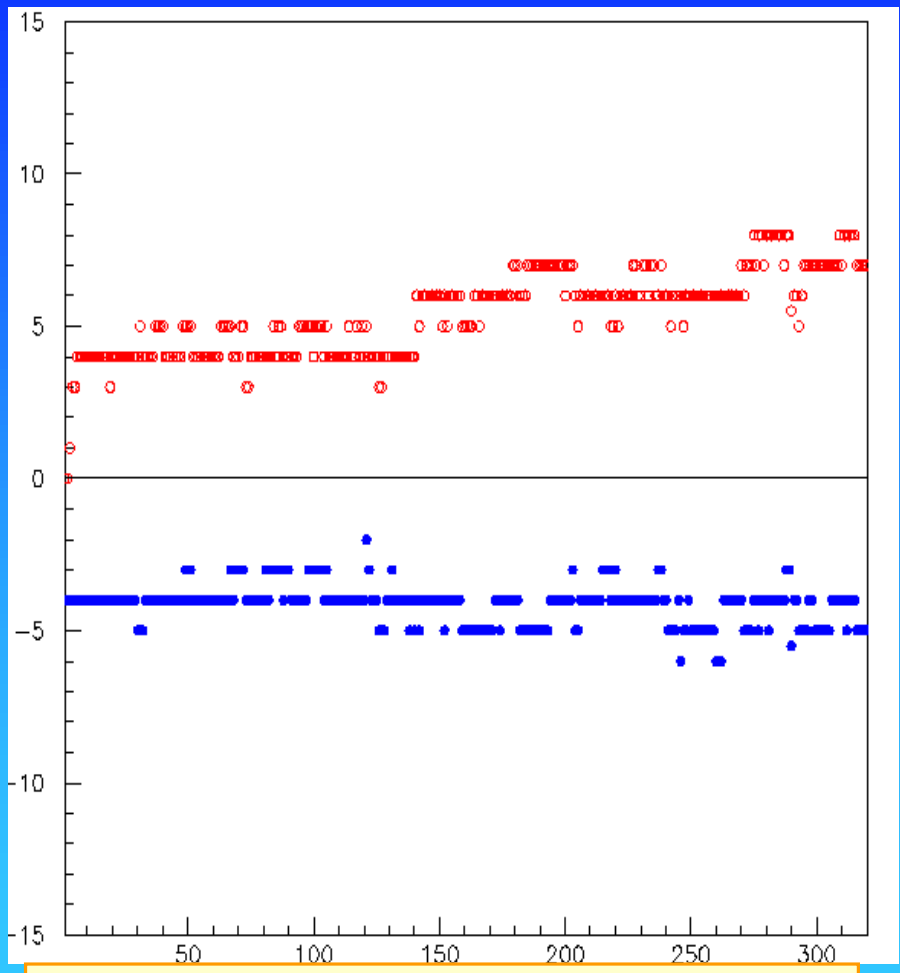



$\varepsilon$ (High-pt /sector 1)

# Regularization procedure




**Windows width (without reguralization) LOW PT (th = 6 GeV)**




**Windows width (after reguralization) LOW PT (th = 6 GeV)**

# Preliminary results and next developments

- A new automatic procedure for the LVL1 μ Trigger has been accomplished.
- The preliminary studies on layout O.08 confirm that the procedure is general, and doesn't need any information about the layout version.

- Analysis of the events simulated with layout P.03 (11 different sector type) will supply a new test of the automatic procedure.
- The analyses results on layout P.03 (windows of coincidence, cabling and performance) are necessary as input for the studies dedicated to the HLT-TDR.