

MB2 Test beam analysis

Preliminary results

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SUMMARY

1.- Test beam description

2.- Data status

2.1.- Beam chambers

2.2.- Wire position quality checks

3.- Space-time linearity

4.- Signal propagation along wire

5.- Amplification voltage effects

6.- Threshold effects

7.- Noise studies

7.1. Noise rates in radiation environment

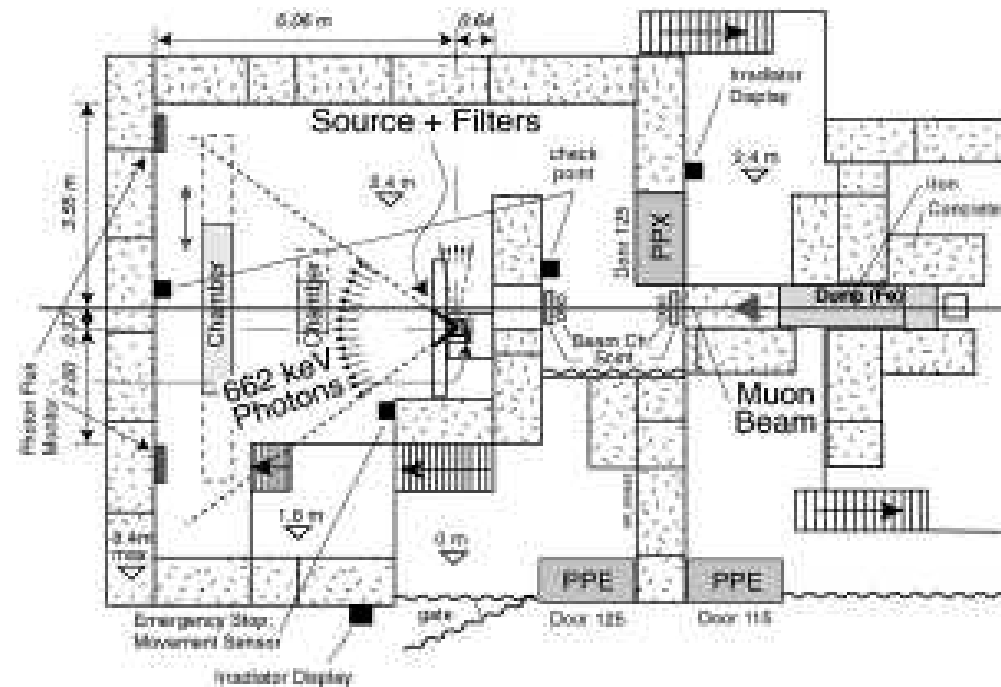
7.2. RPC influence

8.- Conclusions

Test beam description

MB2 + RPC

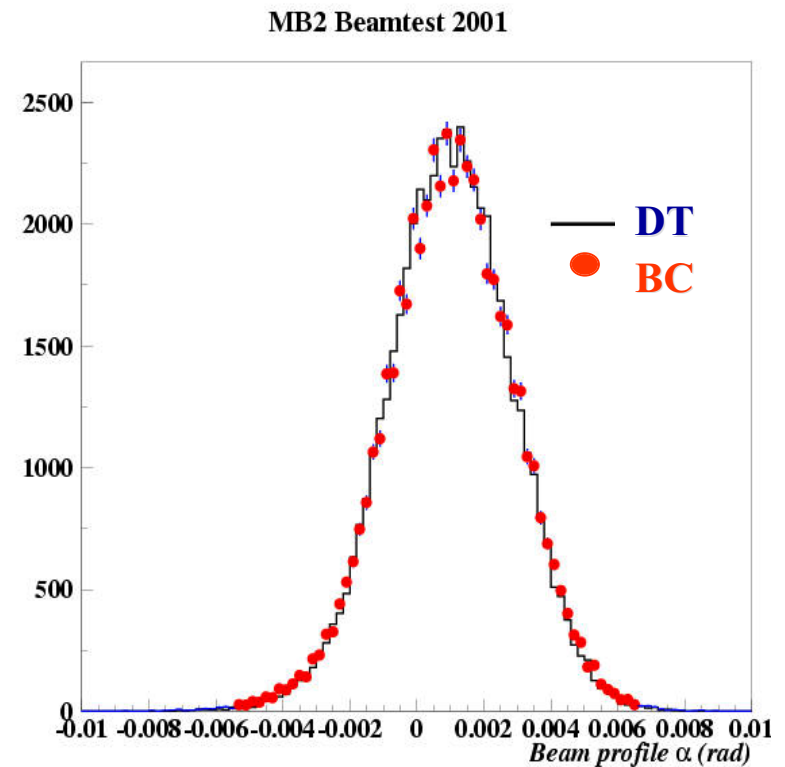
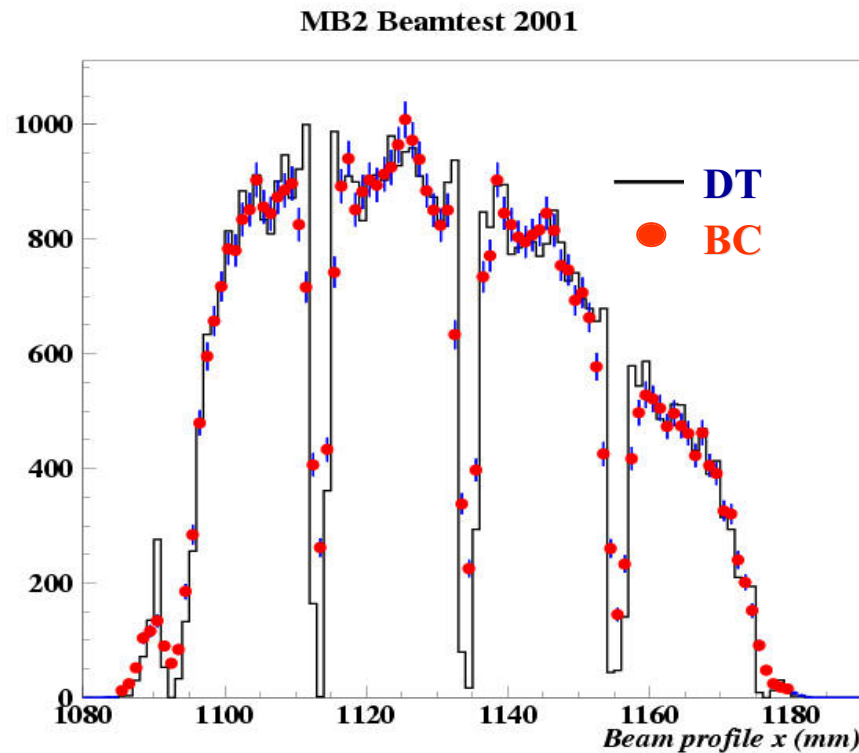
- Three positions
 - Two perpendicular
 - One tilted
- Radiation environment
 - Source ON (Several absorption filters) and OFF
- Several wire & cathode voltages
- Several discriminating thresholds
- RPC (ON with several voltages) and OFF



External reference : Beam chambers

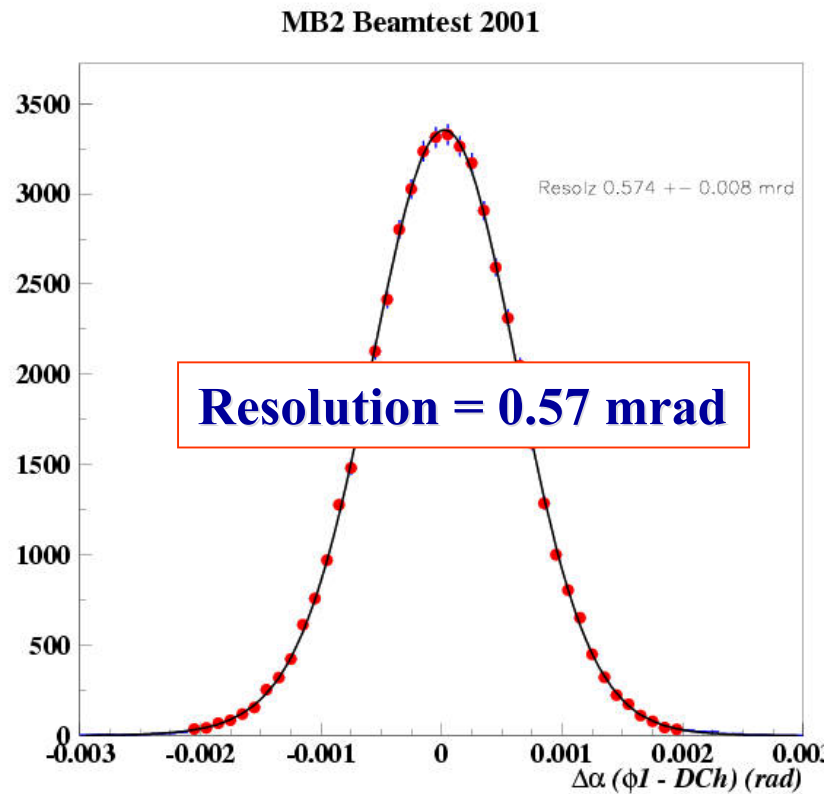
Beam chambers

- Tracks measured by MB2 are seen in BC with XX% efficiency

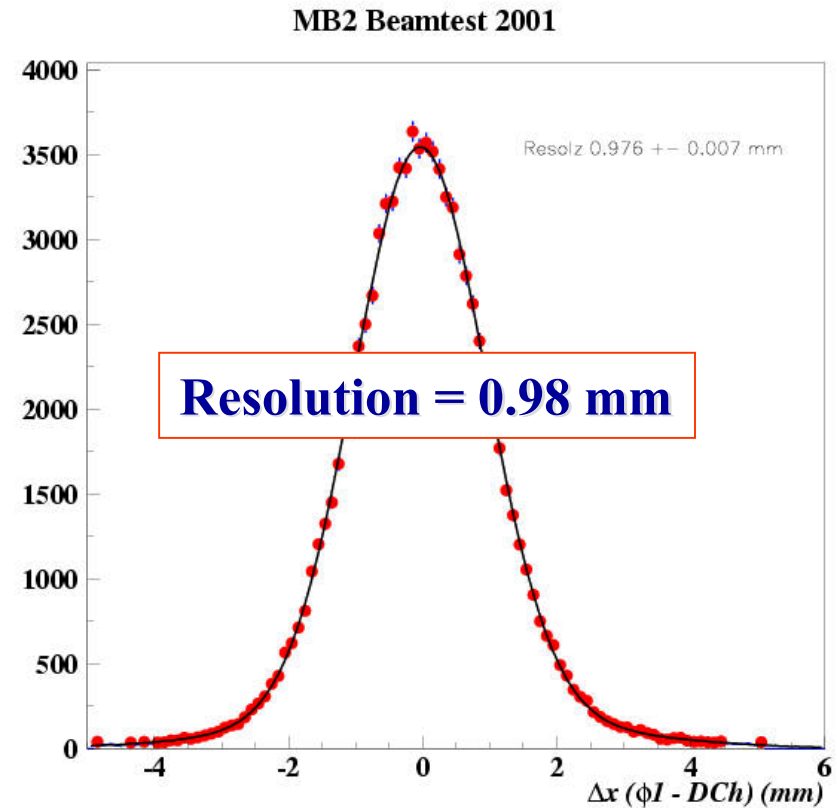


Good agreement BC - MB2

However...



- Better angular resolution in BC than in DT

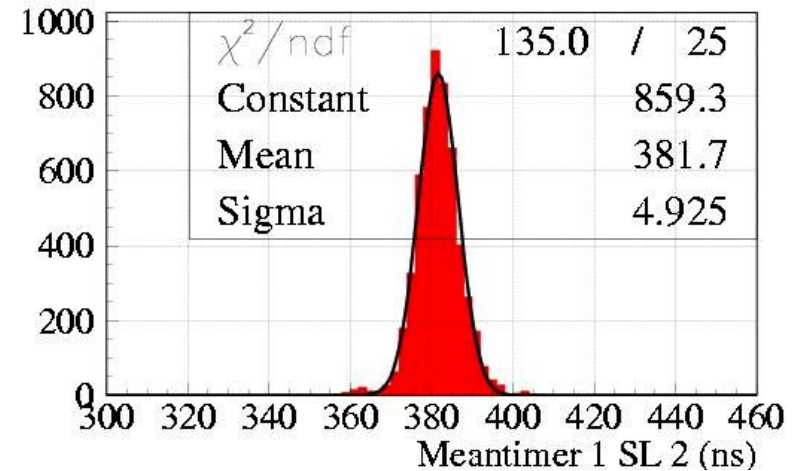
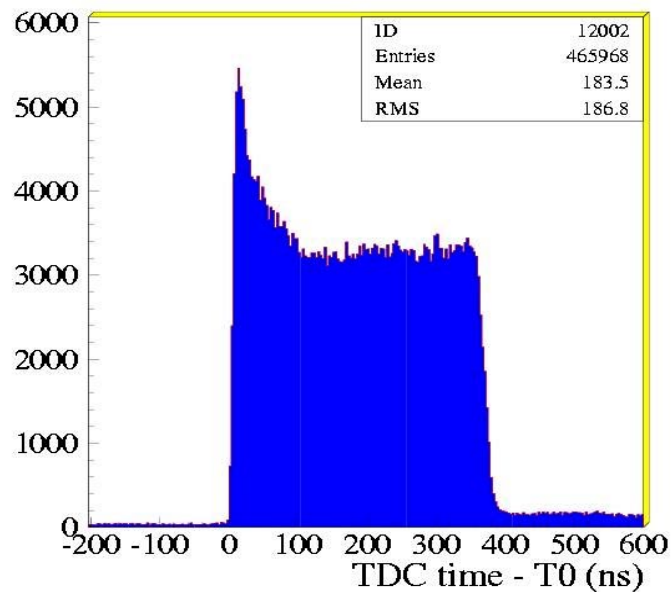
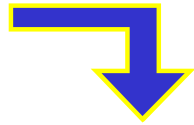


- Spatial resolution in BC of about 1 mm !!

Not suitable as external reference for position measurements

DT performance

After global and relative T0
calibration



In normal conditions:

Vw/Vstr/Vcat (kV) 3.6/1.8/-1.2

Thr = 15 mV , Source OFF

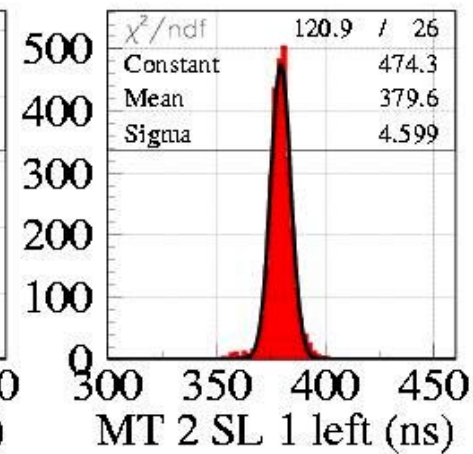
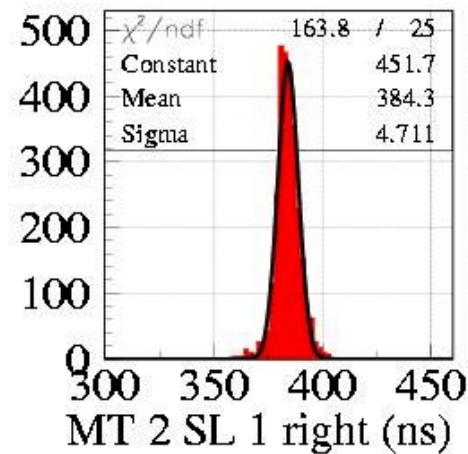
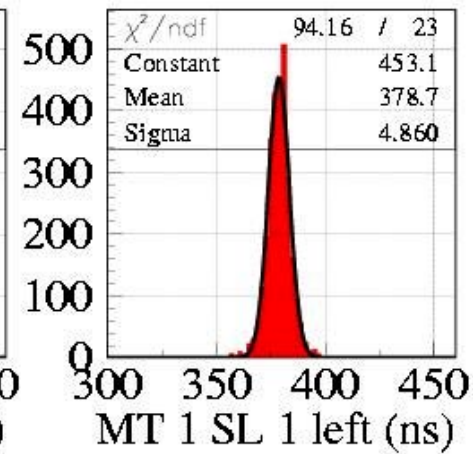
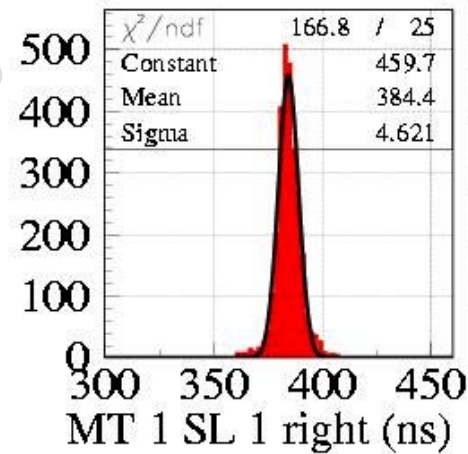
Drift velocity = 55 μ m / ns

Resolution = 180 μ m

Wire positions

- All wires SL phi1 and phi2 inside 100 μ m tolerance

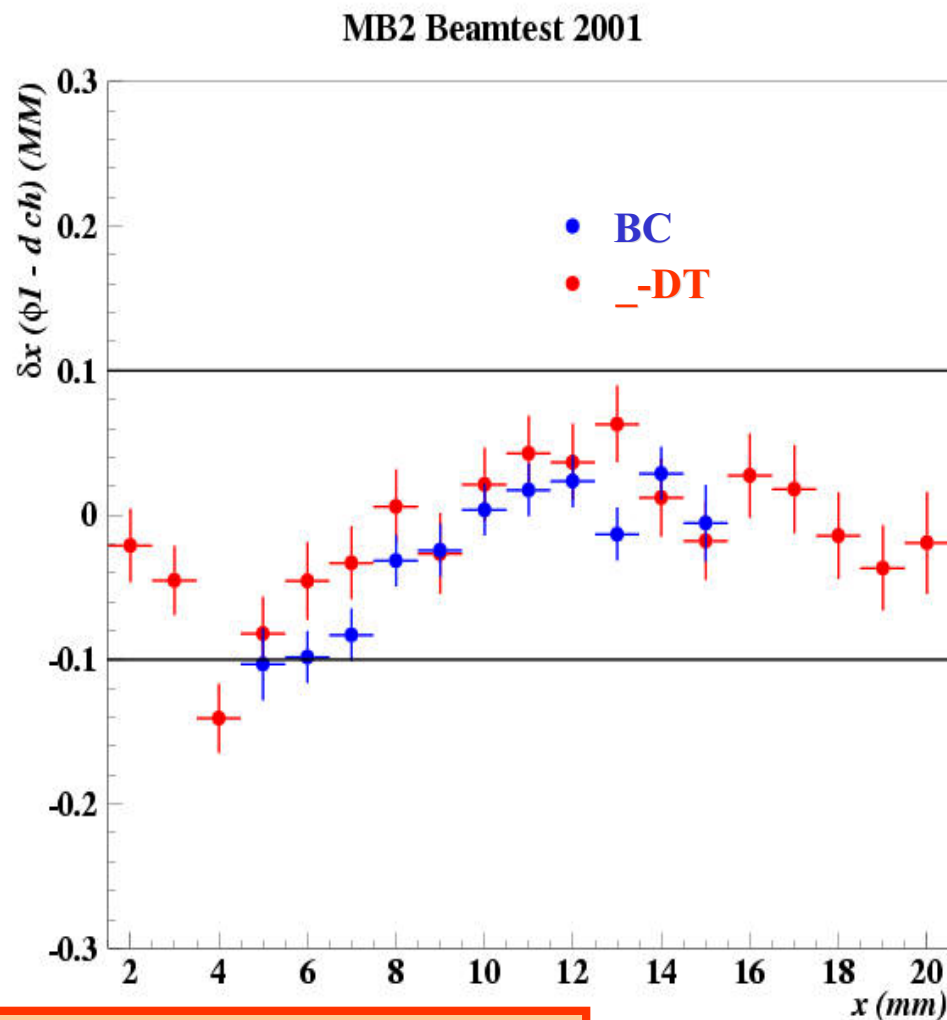
- $\sim 140 \mu$ m shift between two layers in SL theta corrected by software (as observed previously)



Checked in different beam positions

Space-time relation

- Deviations from linear behaviour of the drift velocity
- Measured in $_SL$'s using as external reference:
 - Beam chambers
 - The other $_SL$

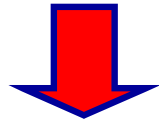


Compatible with previous measurements

Signal propagation along the wire

- Three different beam positions

- Along same cell in SL_

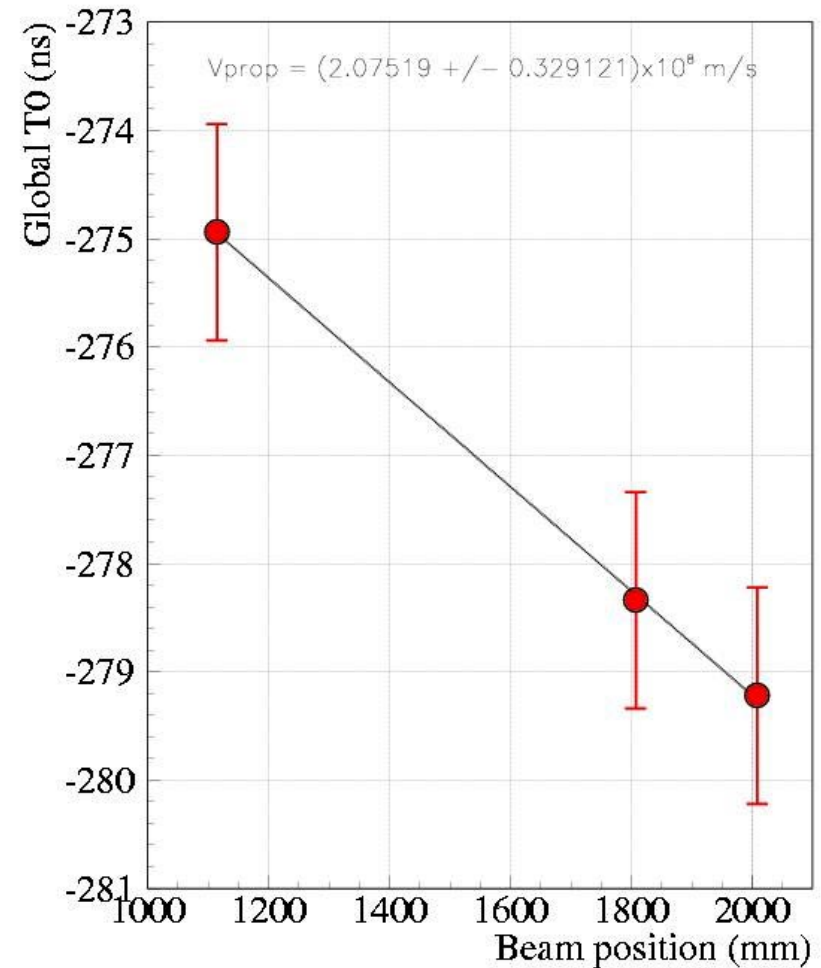


- Propagation time = global T0 variations in SL_

- Distance measured with the _SL's

Measured propagation velocity

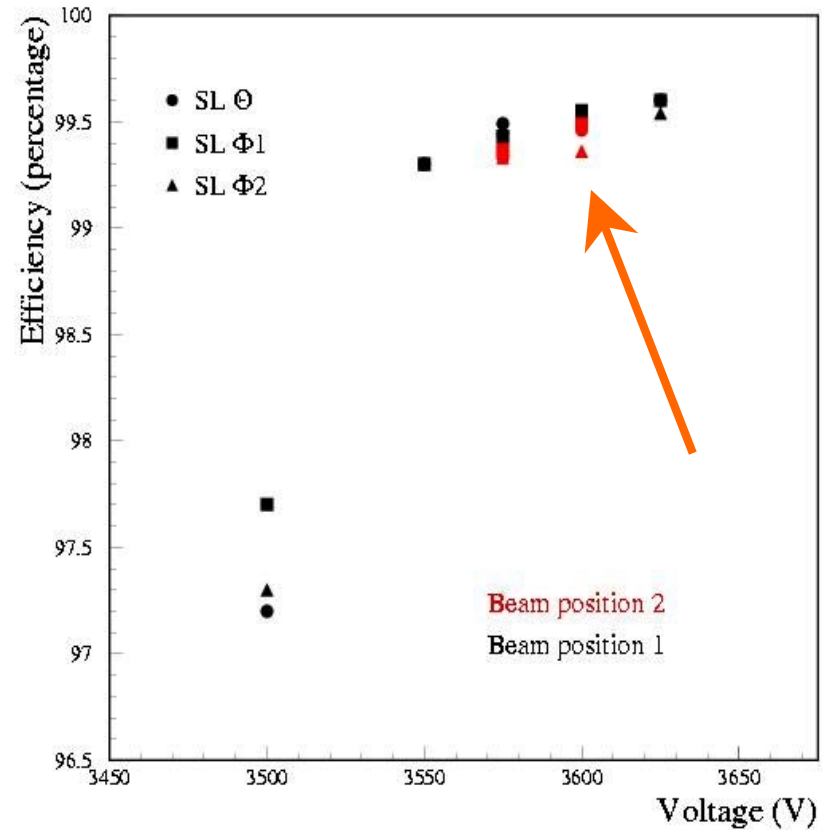
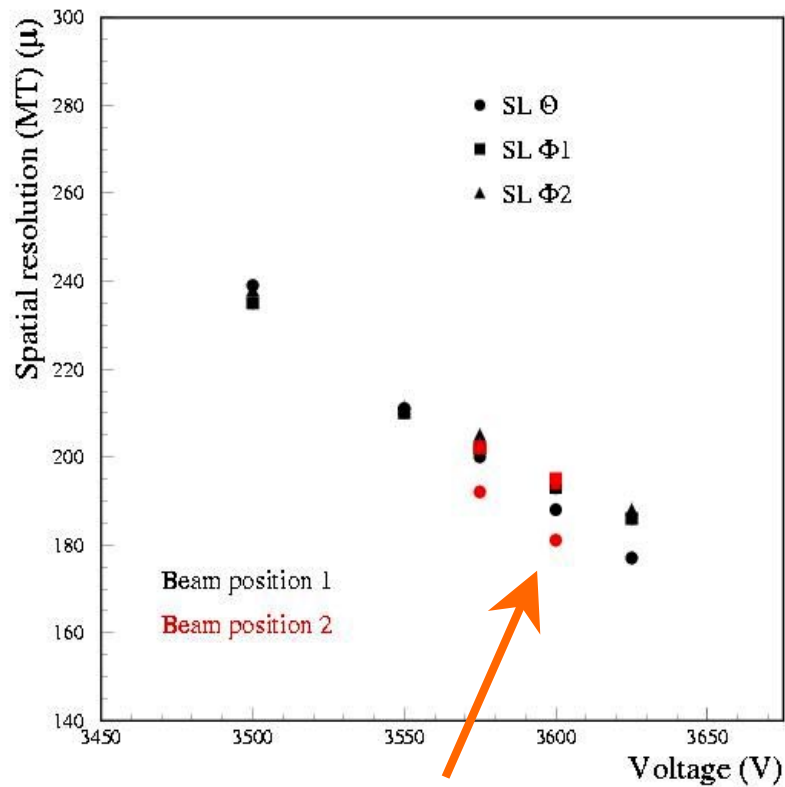
$$v = (2.08 \pm 0.33) \cdot 10^8 \text{ m/s}$$



Amplification voltage influence

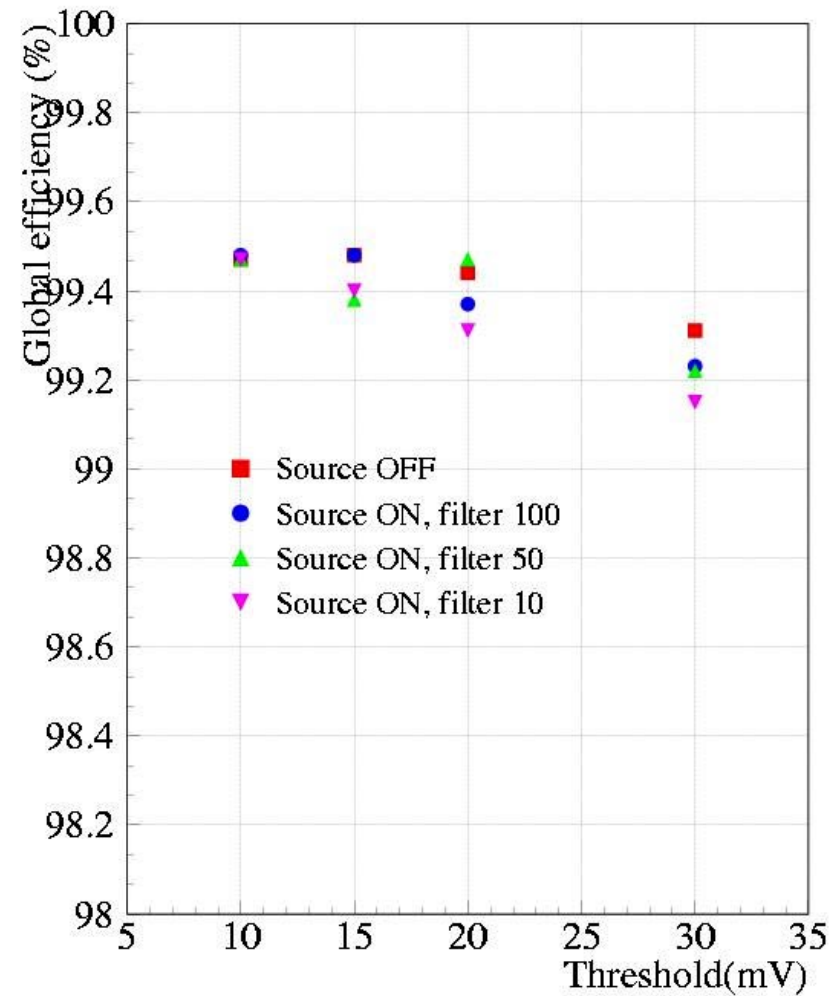
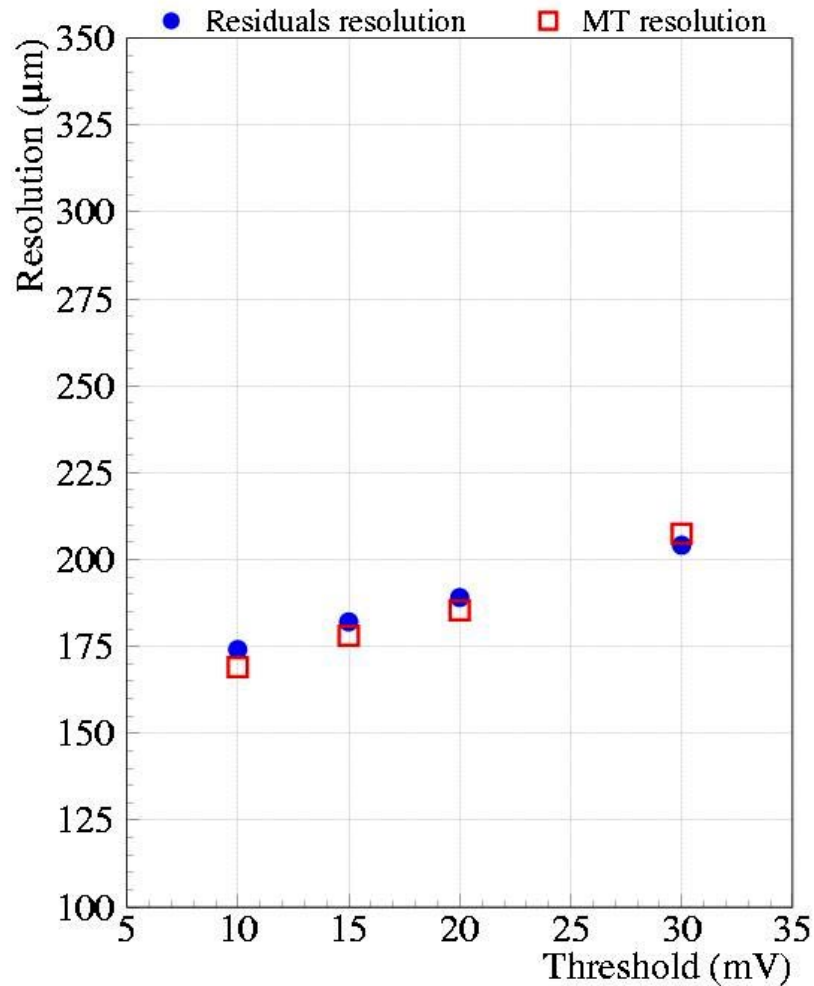
$$V_{\text{strip}} = 1800 \text{ V}$$

$$V_{\text{cath}} = -1200 \text{ V}$$



3600 V is a reasonable nominal value for wires

Threshold influence



Small variations with threshold up to 30 mV

Noise measurements

- In normal conditions:

- $V_w/V_s/V_{cat} = 3.6/1.8/-1.2$ kV

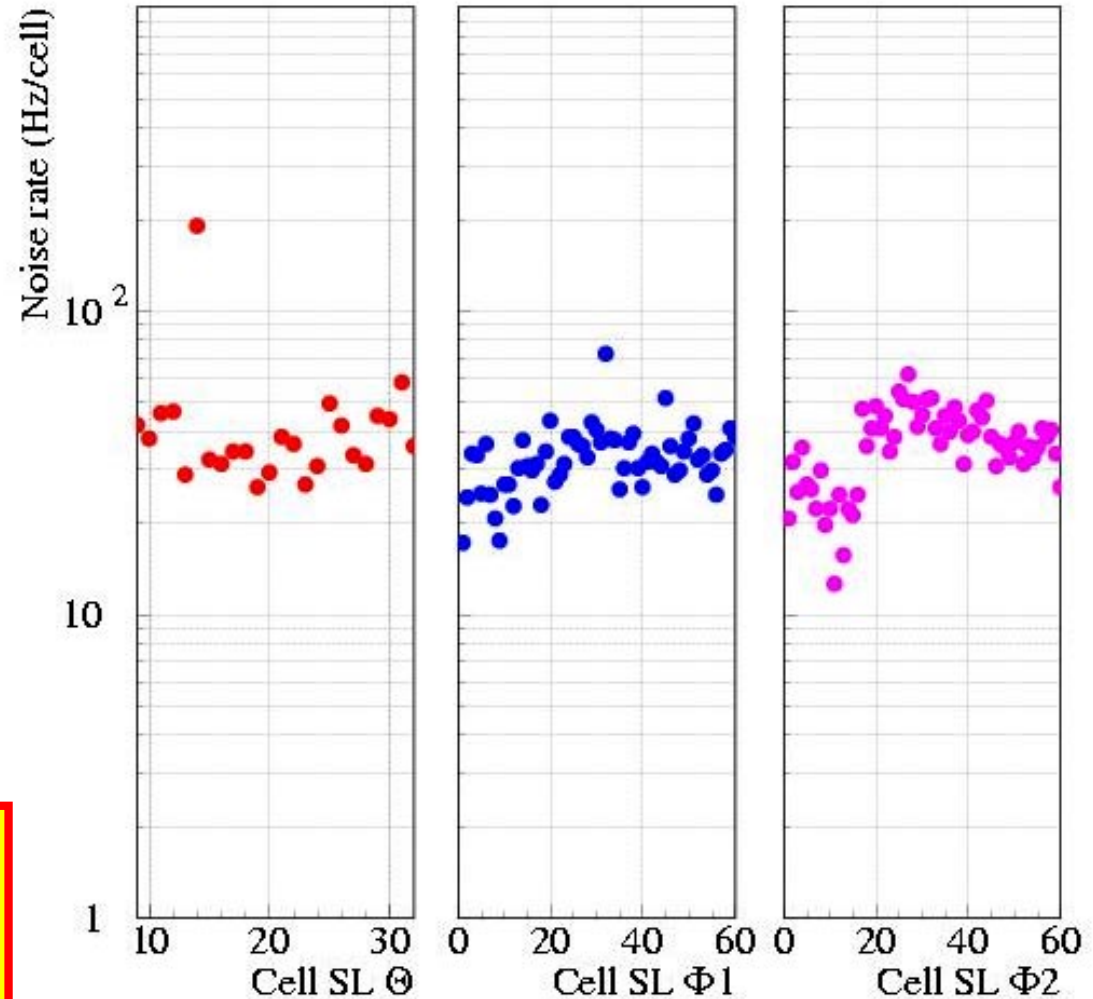
- Thr = 15 mV

- Source OFF

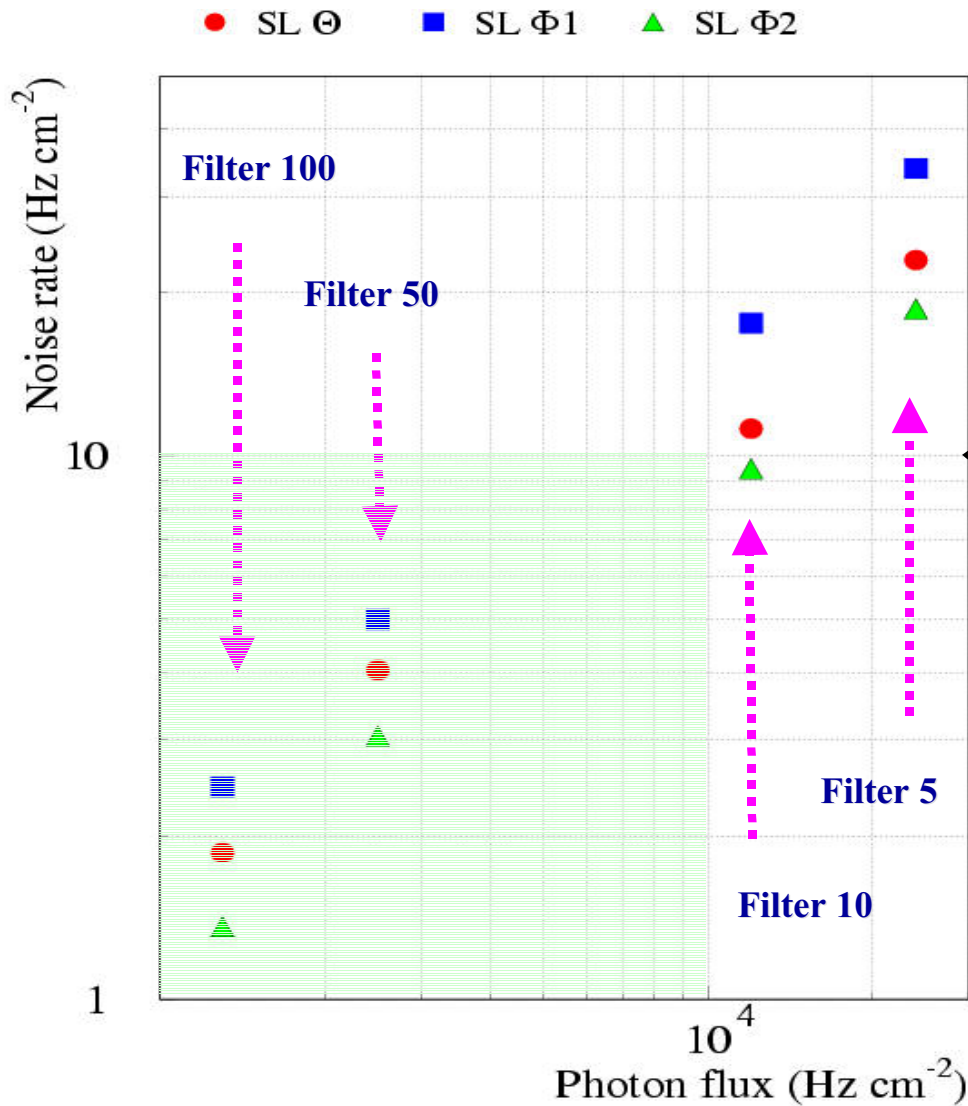
Average noise rate =

40 Hz/cell

0.04 Hz/cm²



Noise measurements in radiation environment

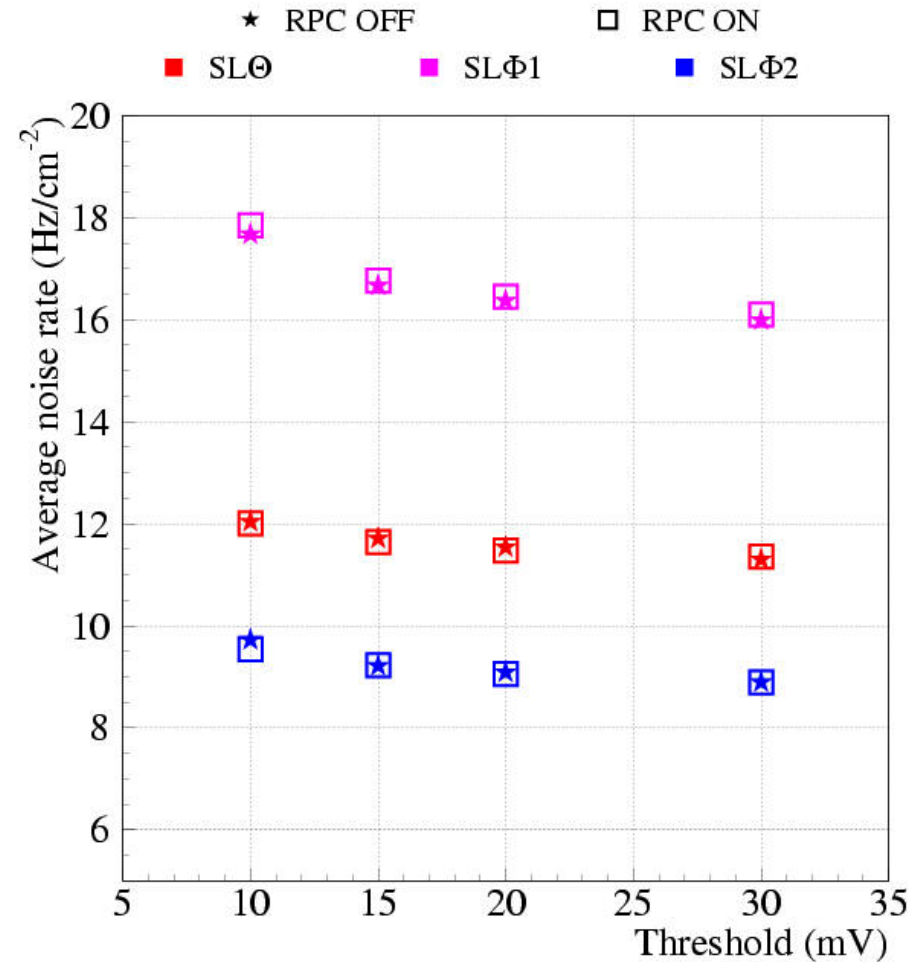
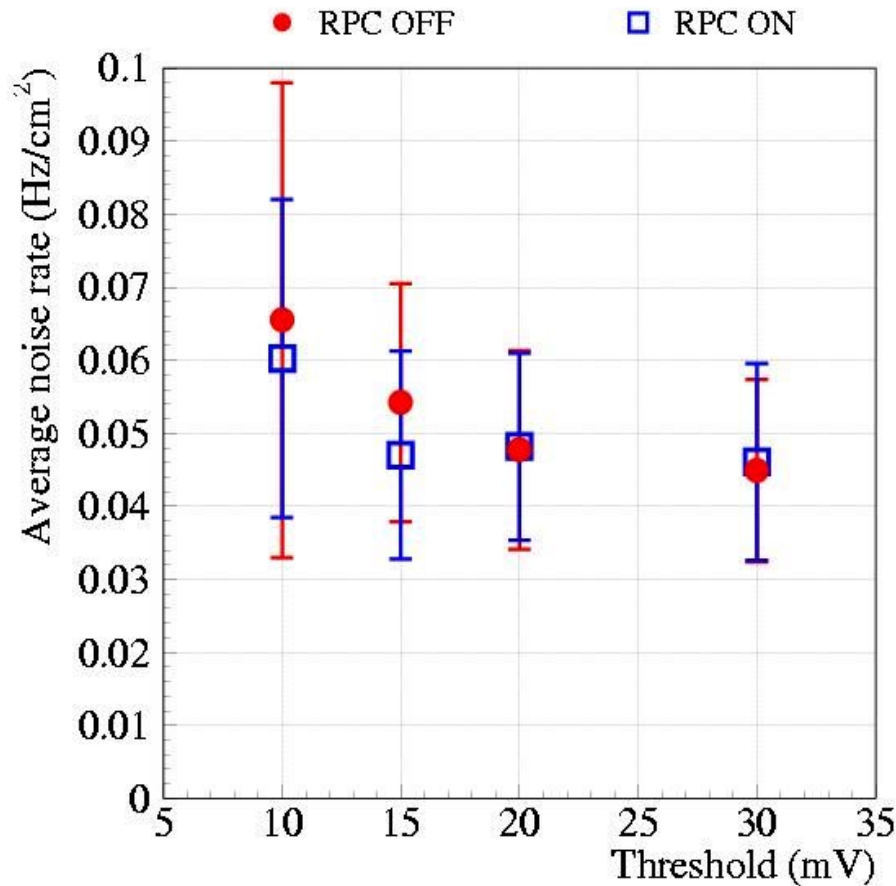


• Noise rate for several absorption filters of the radiation source

Maximum noise rate for DT in CMS

MB2 put under more than a factor 2 above the maximum expected noise

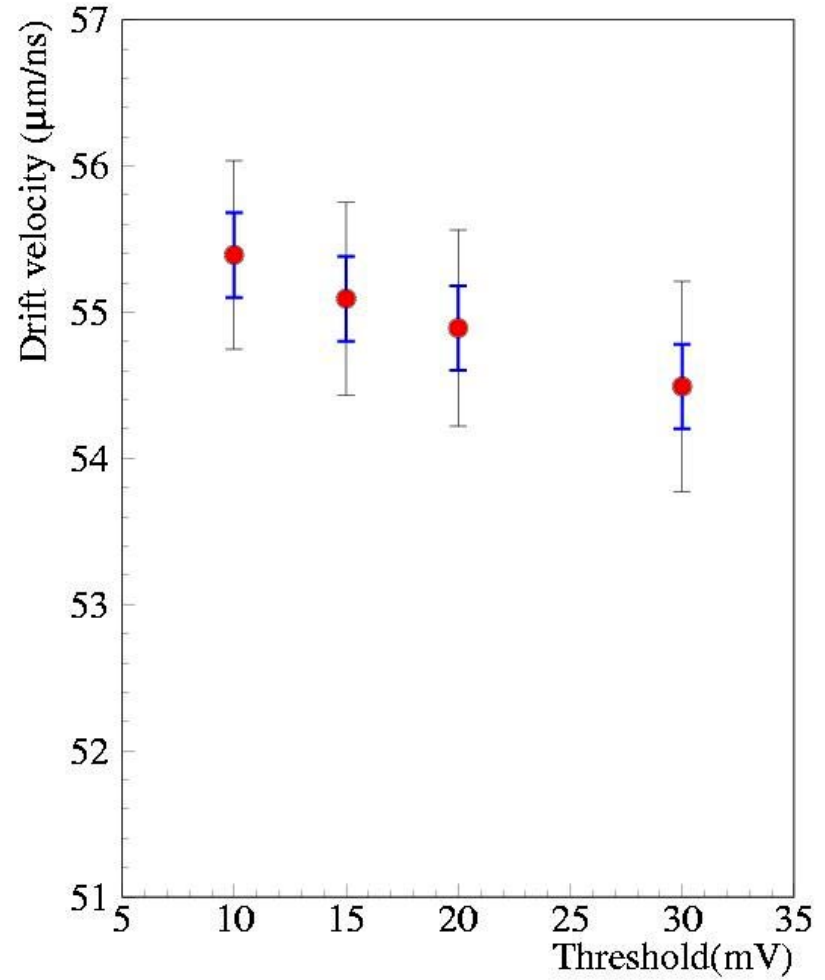
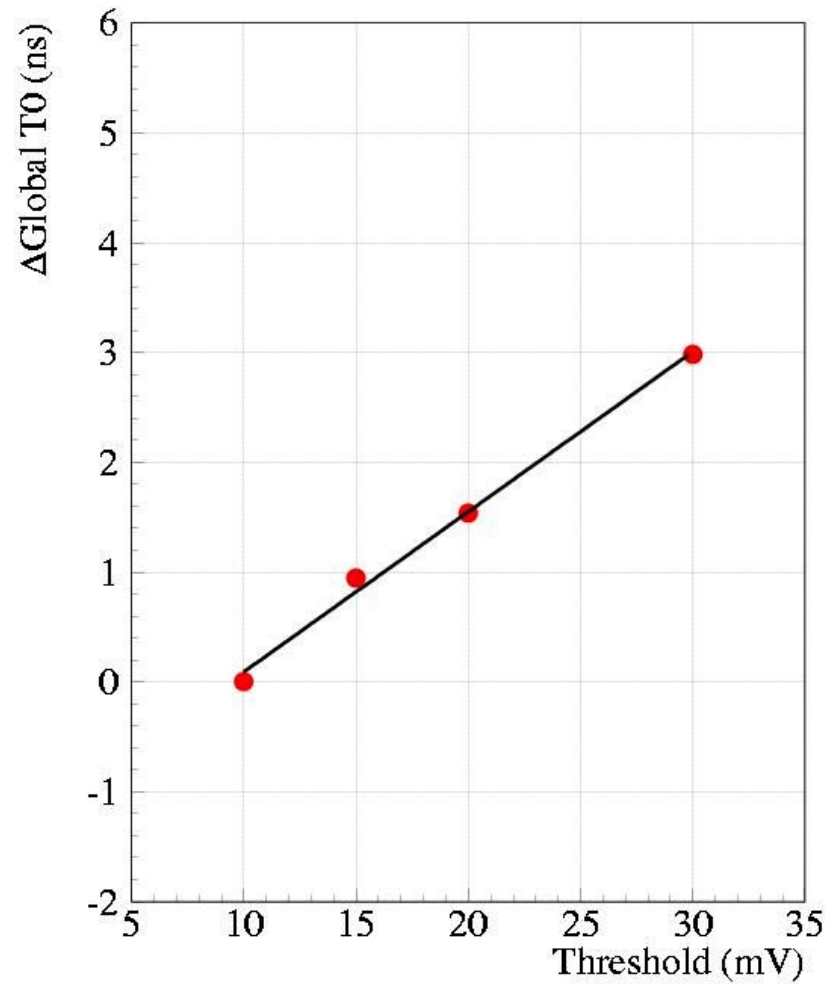
RPC and threshold influence in noise rate



RPC causes no interference with DT

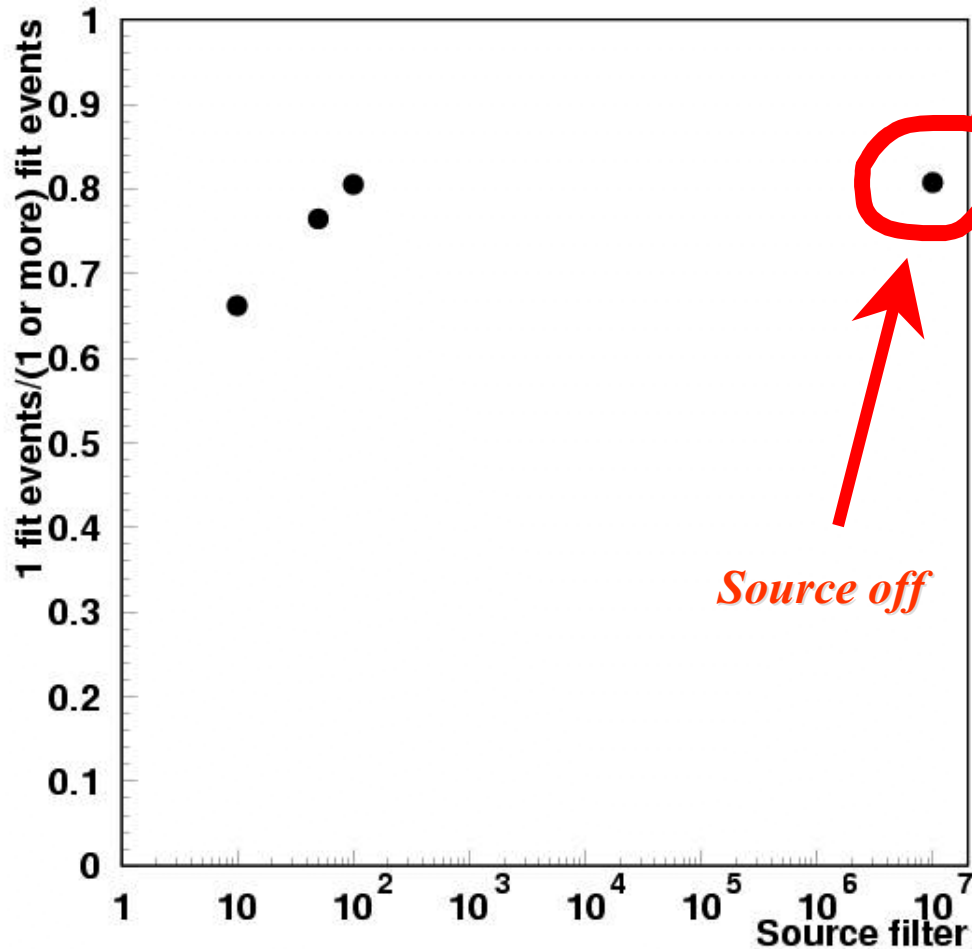
Conclusions

- **First completed MB2 chamber shows a very good performance, in agreement with previous results**
- **In normal conditions, a noise rate of 40 Hz/cell is expected**
 - **RPC coupling has no effect on DT behaviour**
- **Noise does not affect essentially to resolution or efficiency**



T0 variation of 0.15 mV/ns

Noise influence in tracking

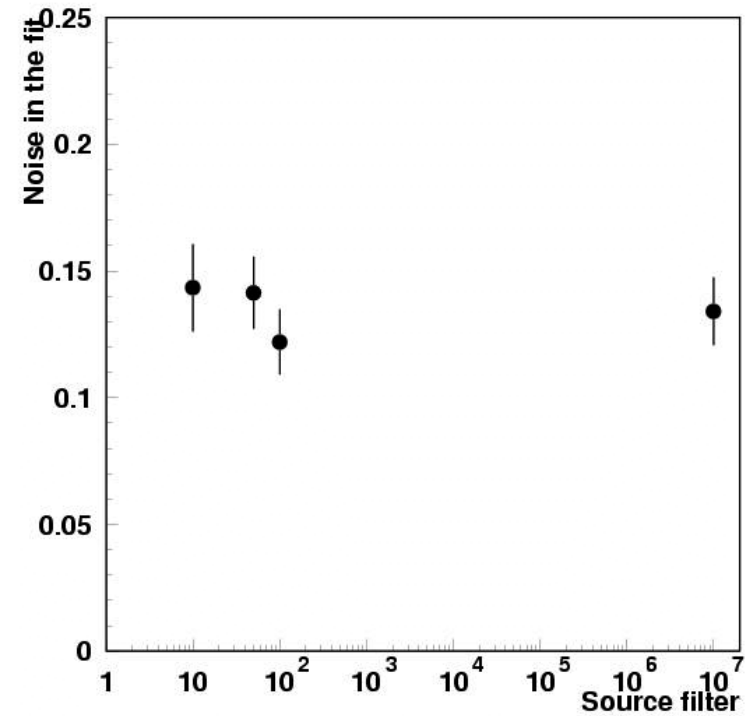
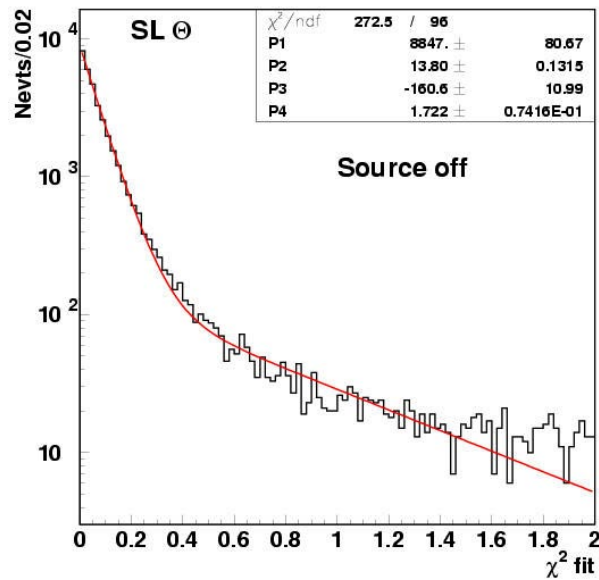


- What is the influence of a high amount of background in tracking performance

Fraction of events with just one fit vs. Source filter

Estimation of fits with noise hits:

Fitting the χ^2 distribution of fits to an exponential function and considering the rest as noise



Noise in fits is essentially flat