Test Beam (Cern, Oct 2003)
Wire chambers calibration

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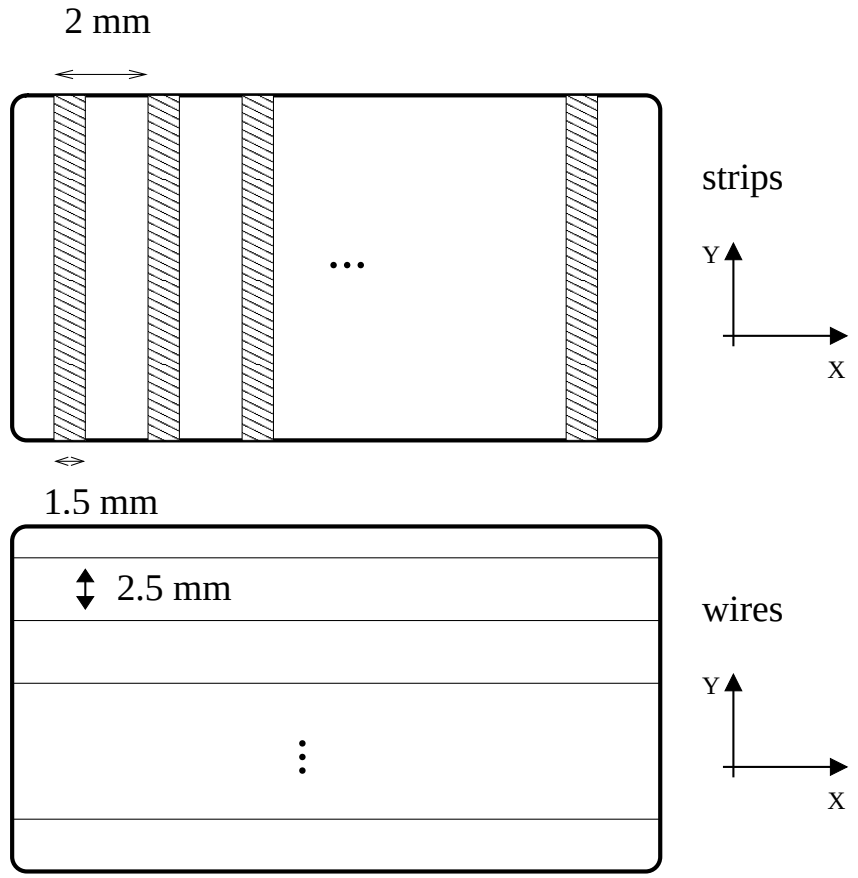
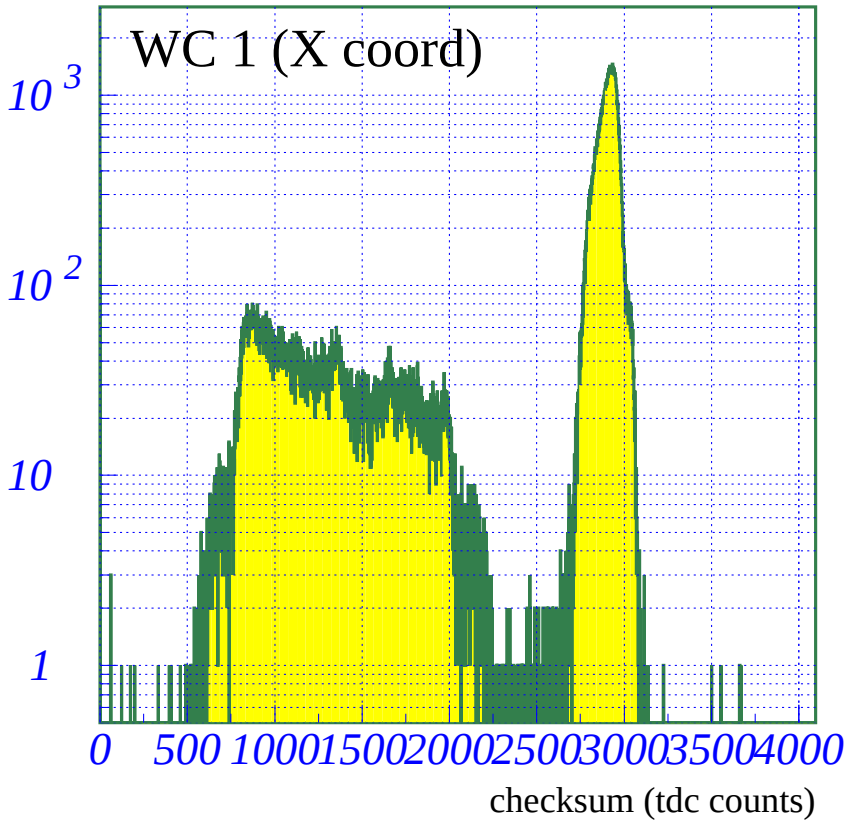
Wire chambers configuration

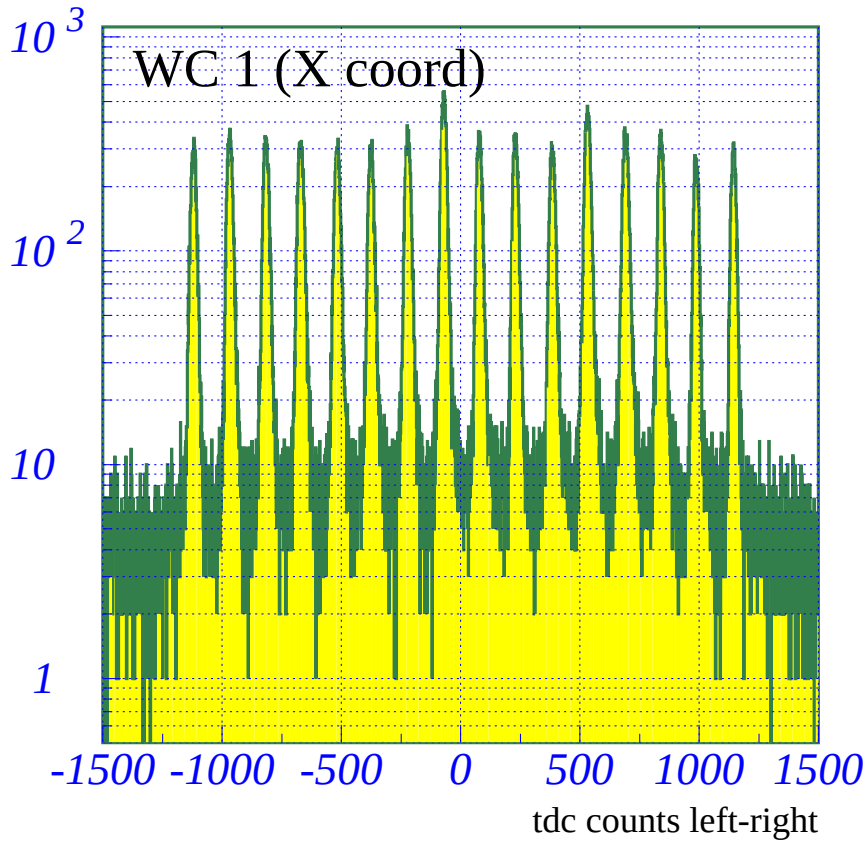
- X coordinate measured by strips
  - strip pitch : $2\ mm$
  - strip width : $1.5\ mm$
- Y coordinate measured by wires
  - 24 wires
  - distance among wires : $2.54\ mm$



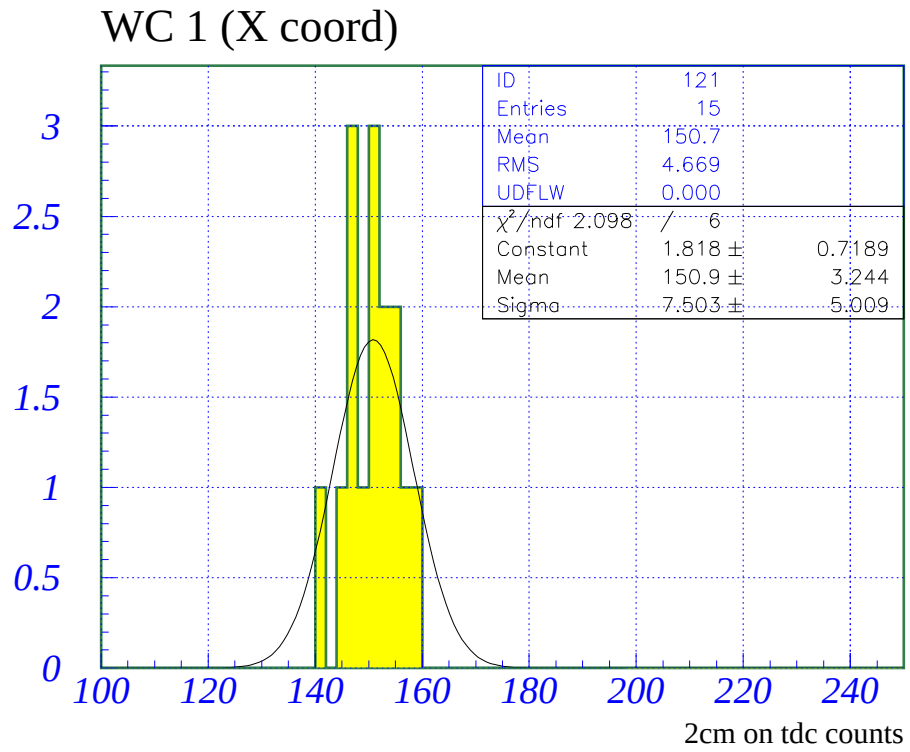
Wire Chamber N.1 - X measurements

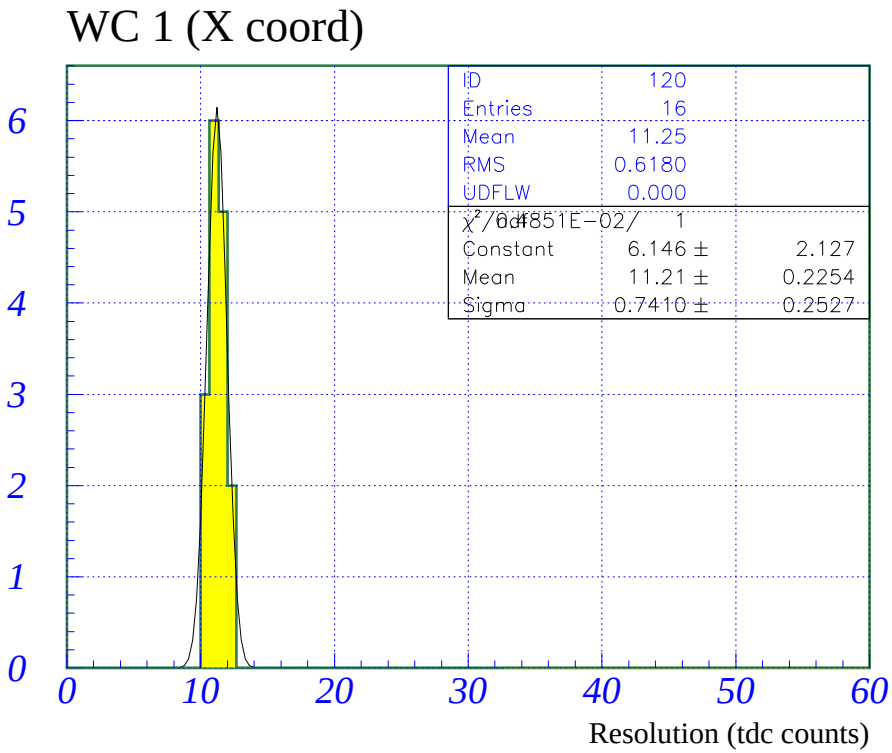
- X-ray source
- Scanning of 30 cm distance with a $2\ mm$ slit with a step of 2 cm
- Total of 16 points scanned





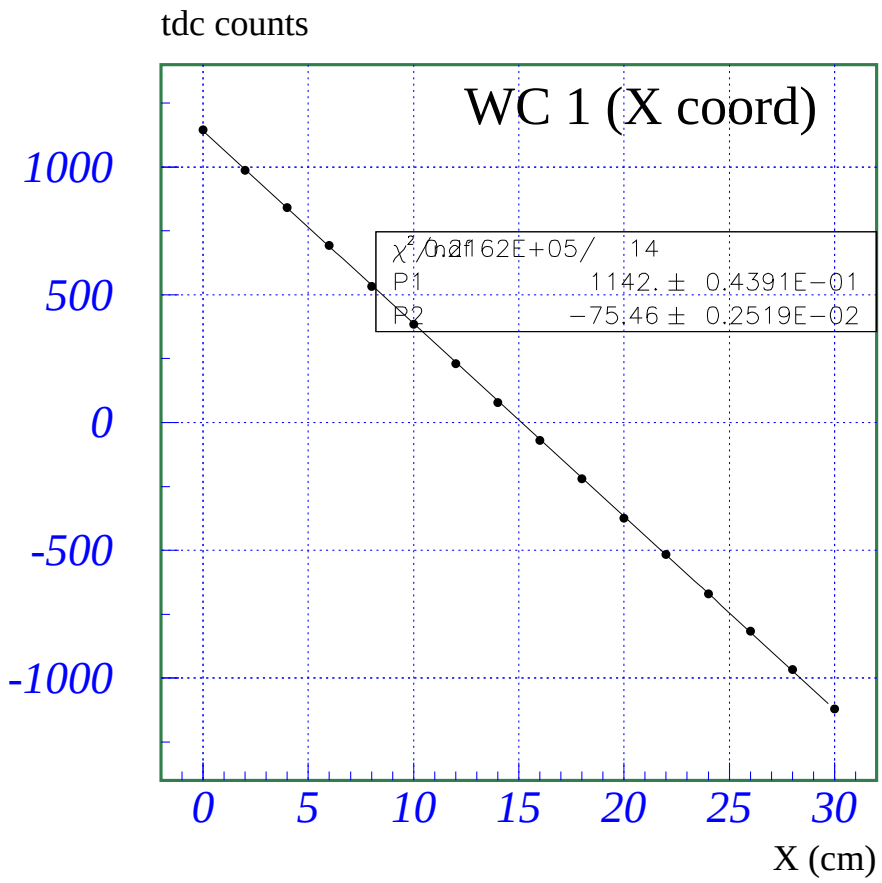
Wire Chamber N.1 - X resolution

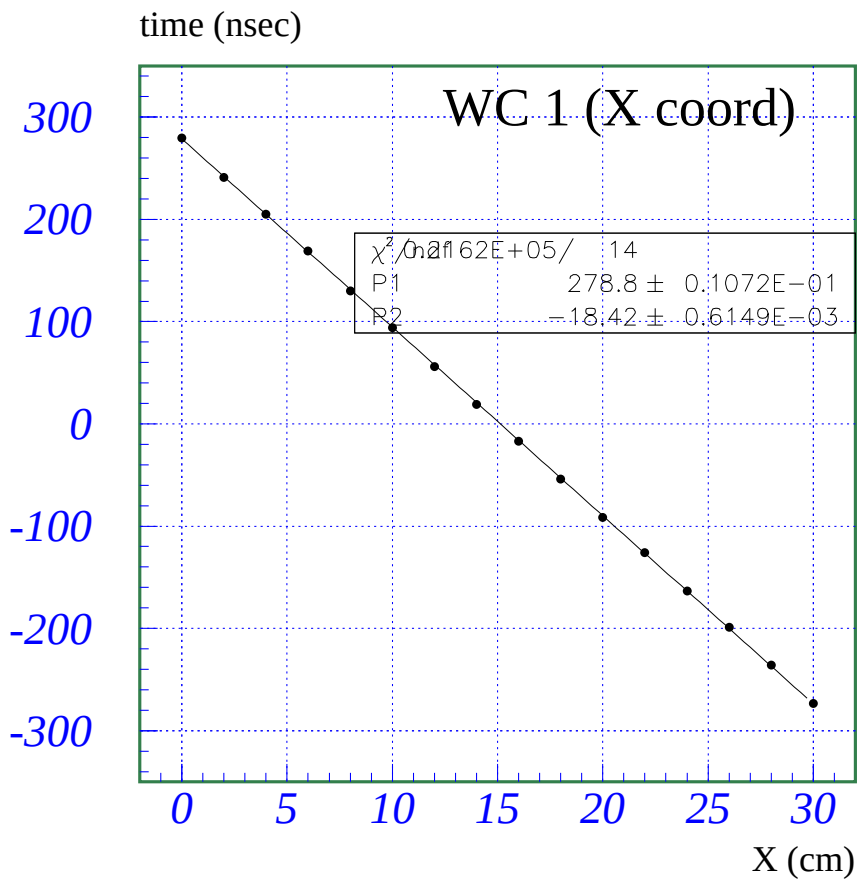




+ 2 cm steps is equivalent to 150.7 tdc counts $\Rightarrow 7.5$ tdc counts/mm
+ X width : 11.25 tdc counts $\Rightarrow \frac{11.25}{7.5} = 1.5\ mm$
+ Taking into account the slit width (2 mm), the resolution in X can be estimated as : $\sigma_X \sim X_{width} - 1mm \sim 0.5mm$

Wire Chamber N.1 - X calibration





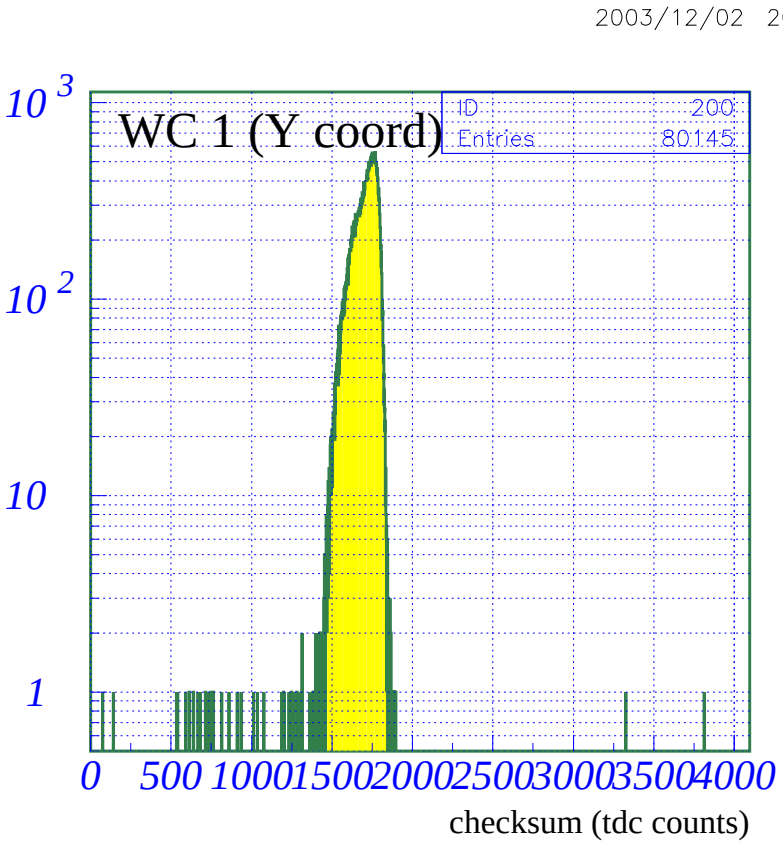
$$X(cm) = 15.14 - \frac{\#tdc_{(L-R)}}{75.46}$$

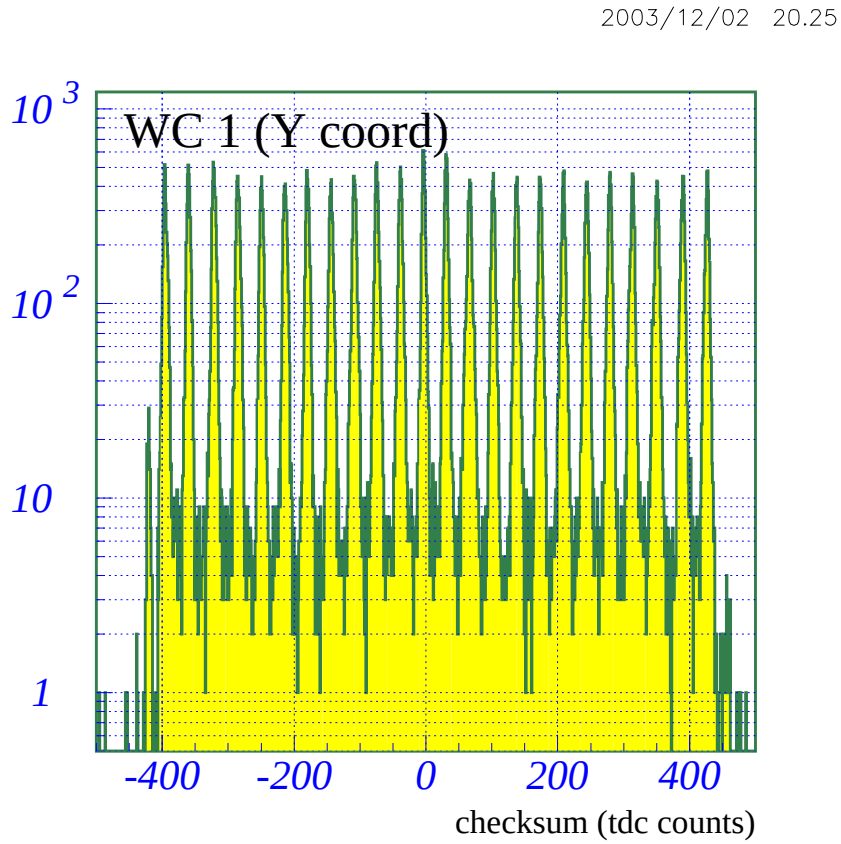
$$X(cm) = 15.14 - \frac{\Delta t(nsec)}{18.42}$$

Wire Chamber N.1 - Y measurements

- X-ray source
- All the chamber irradiated
- Total of 24 wires
- Resolution on Y coordinate :

$$\frac{2.54\ mm}{\sqrt{12}} \sim 0.734\ mm$$





Wire Chambe N.1 - Y calibration

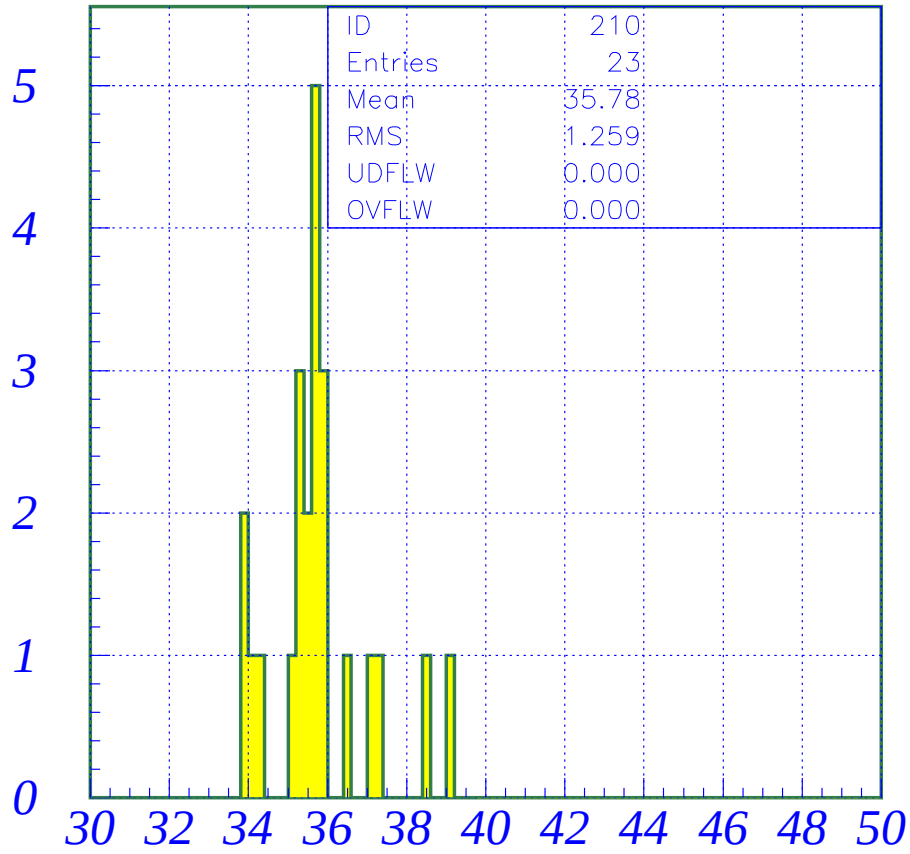
+ The difference between wires in terms of tdc counts :

$$< \Delta tdc >= 35.78 \pm 1.26$$

+ Calibration factor :

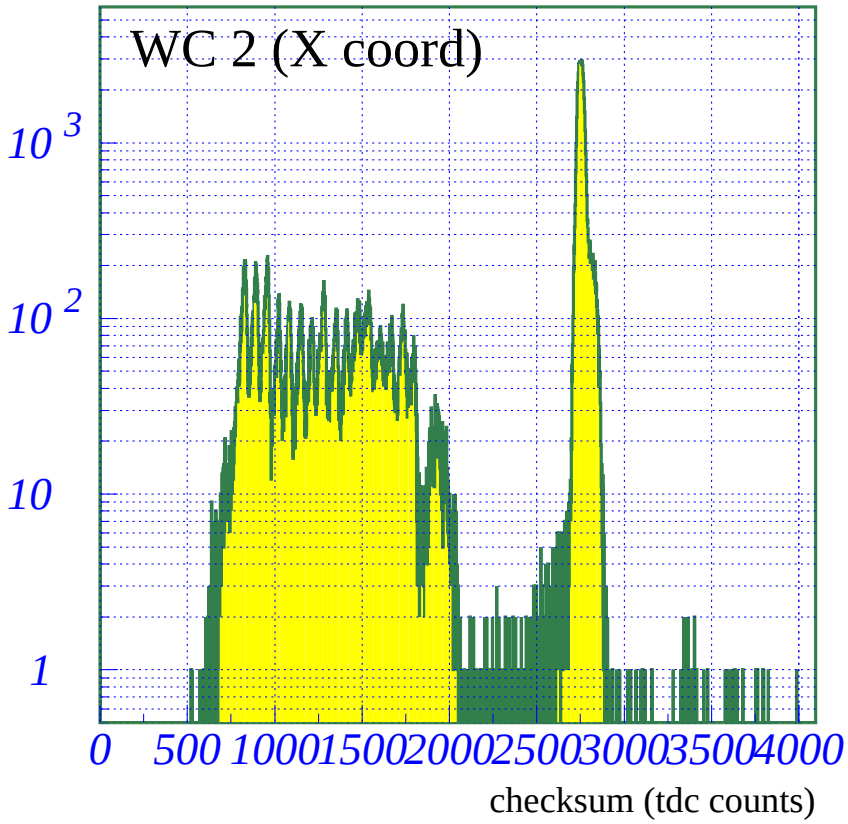
$$C_Y^{wc1} = \frac{35.78}{2.54} = 14.087 \;\; (\#tdc/mm)$$

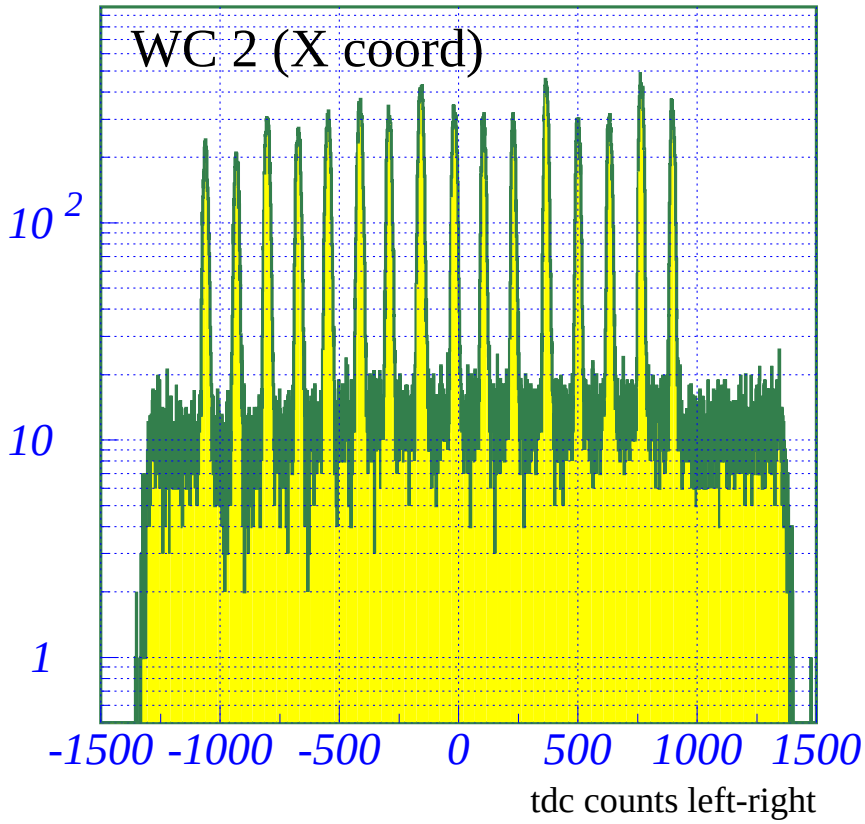
$$Y(cm) = \frac{\#tdc_{(L-R)}}{140.87}$$



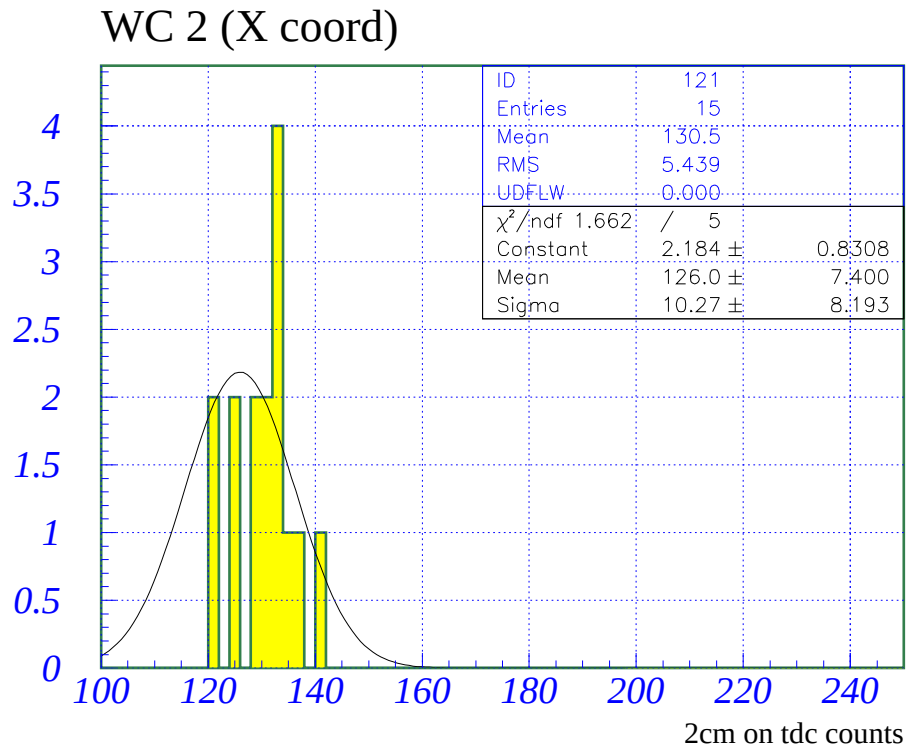
Wire Chamber N.2 - X measurements

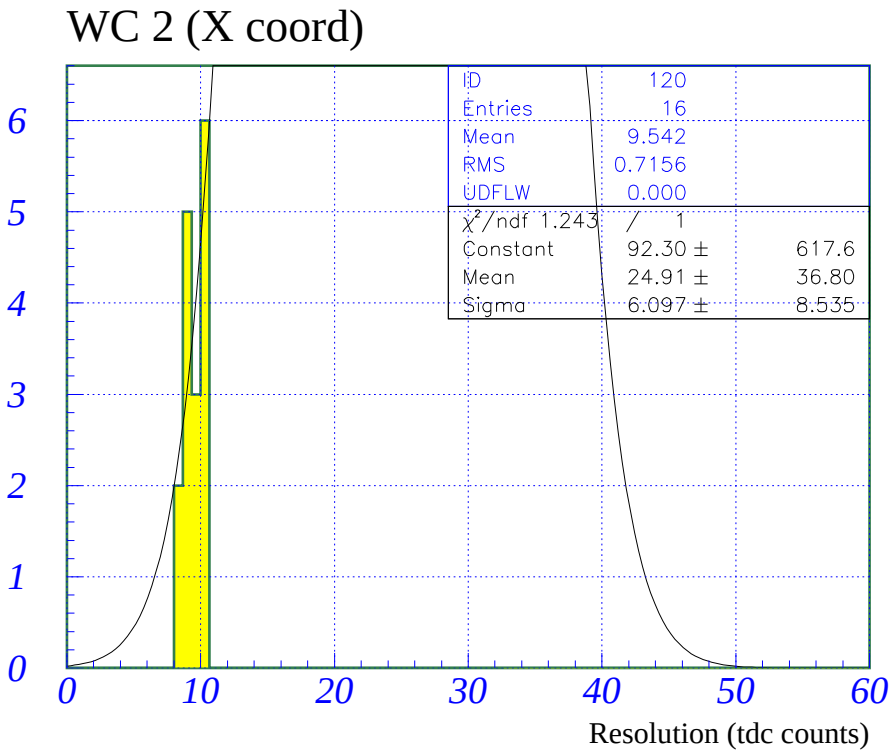
- X-ray source
- Scanning of 30 cm distance with a $2\ mm$ slit with a step of 2 cm
- Total of 16 points scanned





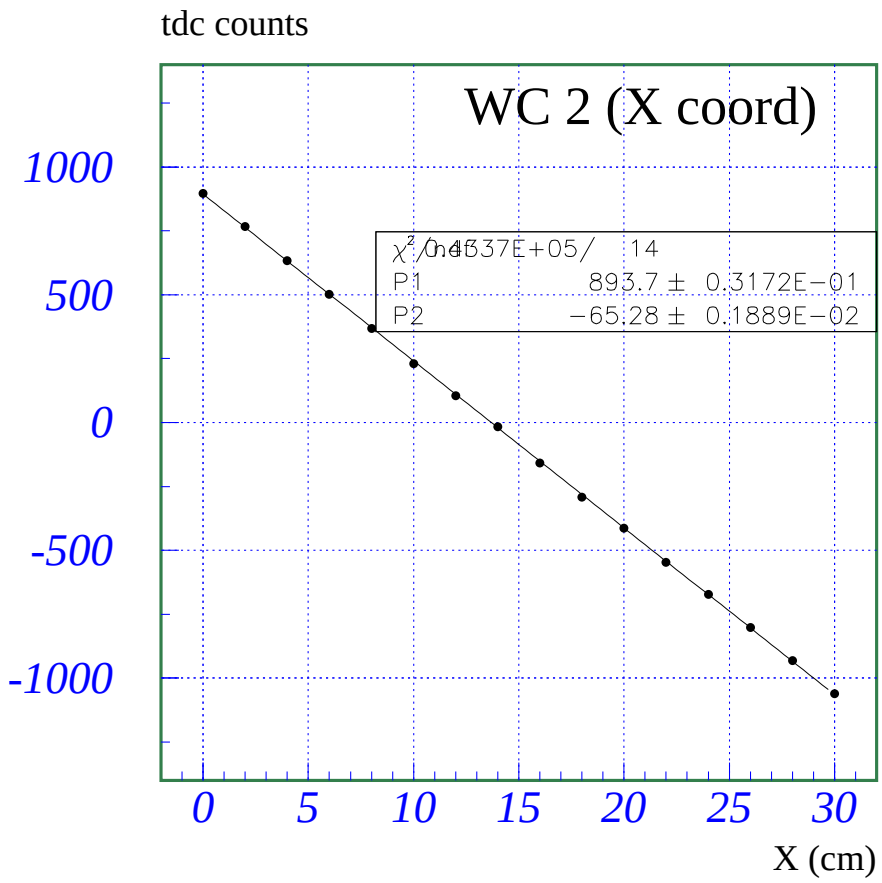
Wire Chamber N.2 - X resolution

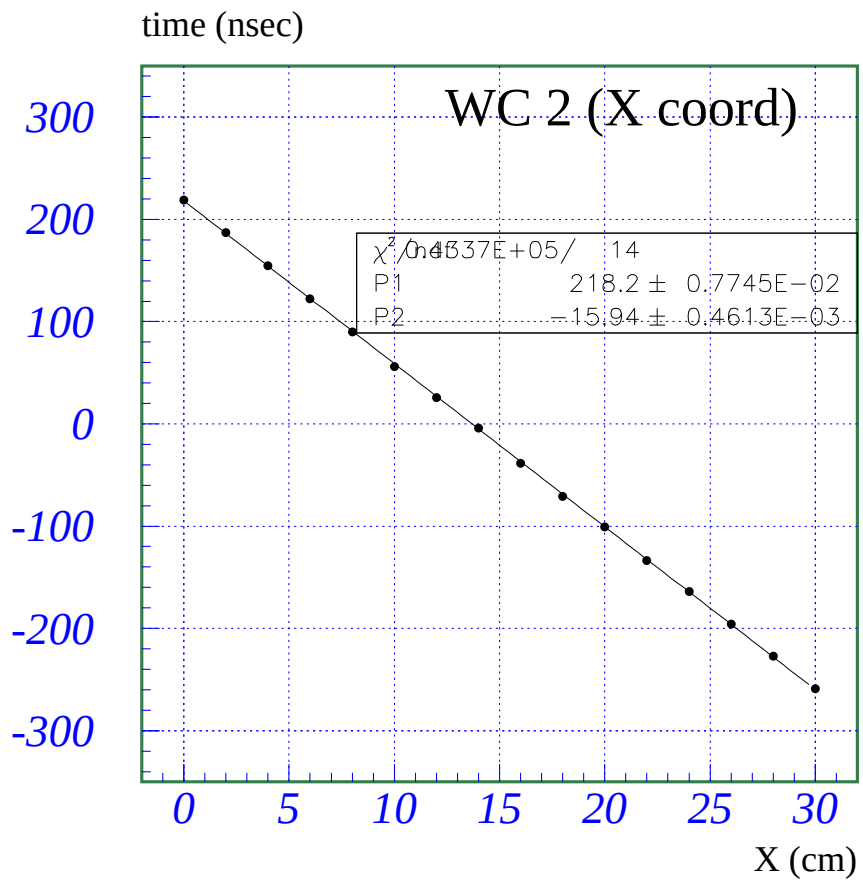




+ 2 cm steps is equivalent to 130.5 tdc counts $\Rightarrow 6.53$ tdc counts/mm
+ X width : 9.54 tdc counts $\Rightarrow \frac{9.54}{6.53} \sim 1.5\ mm$
+ Taking into account the slit width (2 mm), the resolution in X can be estimated as : $\sigma_X \sim X_{width} - 1mm \sim 0.5mm$

Wire Chamber N.2 - X calibration





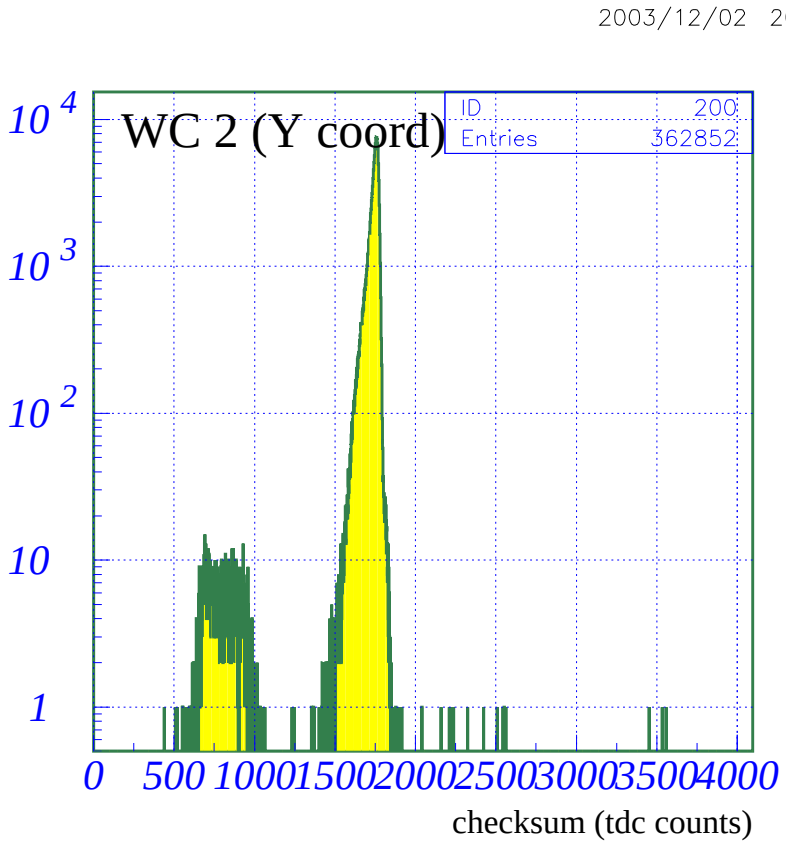
$$X(cm) = 13.69 - \frac{\#tdc_{(L-R)}}{65.28}$$

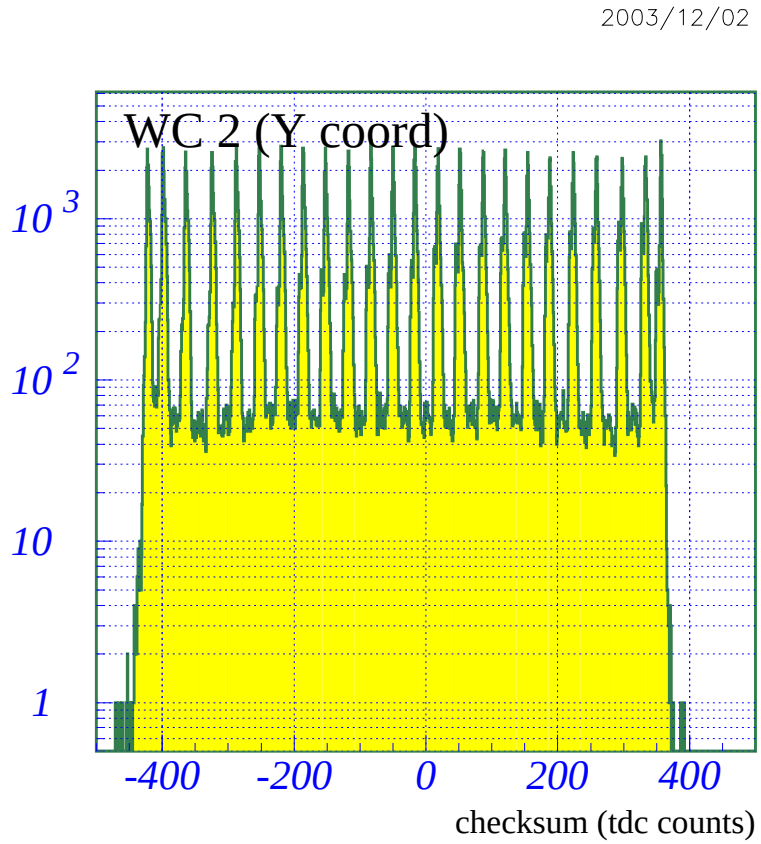
$$X(cm) = 13.69 - \frac{\Delta t(nsec)}{15.94}$$

Wire Chamber N.2 - Y measurements

- X-ray source
- All the chamber irradiated
- Total of 24 wires
- Resolution on Y coordinate :

$$\frac{2.54\ mm}{\sqrt{12}} \sim 0.734\ mm$$





Wire Chamber N.2 - Y calibration

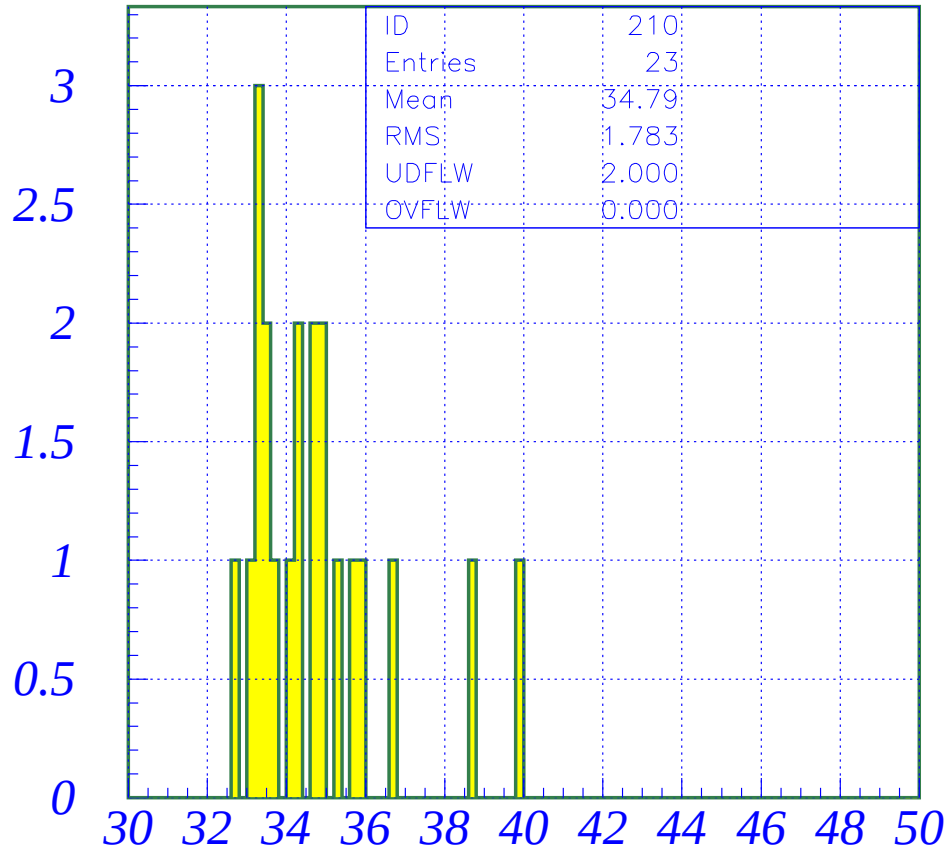
- Difference between wires on tdc counts :

$$< \Delta tdc >= 34.79 \pm 1.78$$

- Calibration factor :

$$C_Y^{wc2} = \frac{34.79}{2.54} = 13.697 \;\; (\#tdc/mm)$$

$$Y(cm) = \frac{\#tdc_{(L-R)}}{136.97}$$



Conclusions

Wire chamber 1

$$X(cm) = 15.14 - \frac{\#tdc_{(L-R)}}{75.46}$$

$$Y(cm) = \frac{\#tdc_{(L-R)}}{140.87}$$

Wire chamber 2

$$X(cm) = 13.69 - \frac{\#tdc_{(L-R)}}{65.28}$$

$$Y(cm) = \frac{\#tdc_{(L-R)}}{136.97}$$

WC-RICH interalignment

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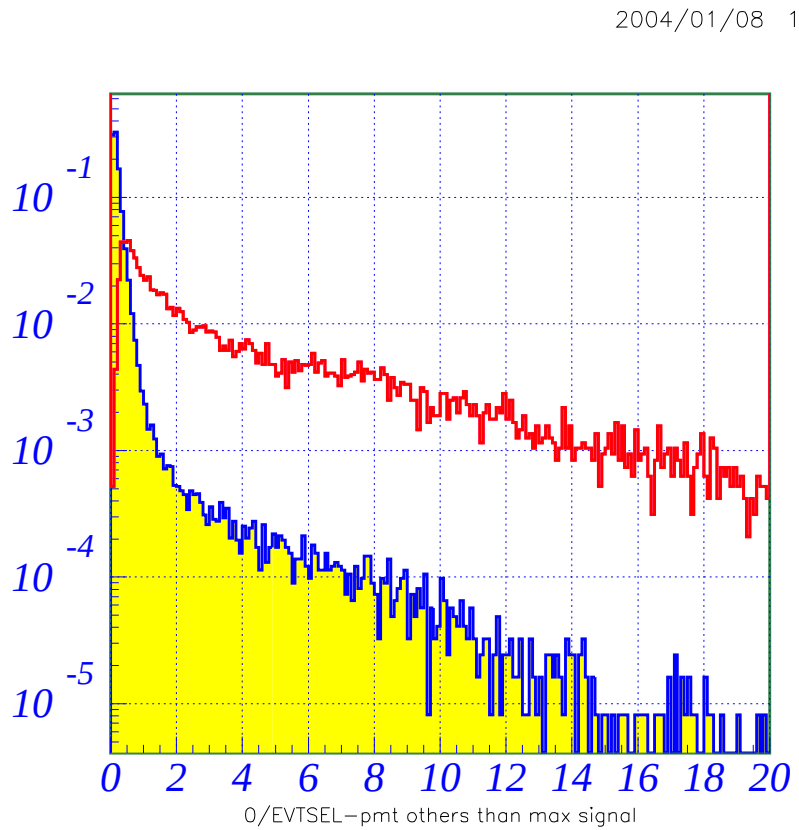
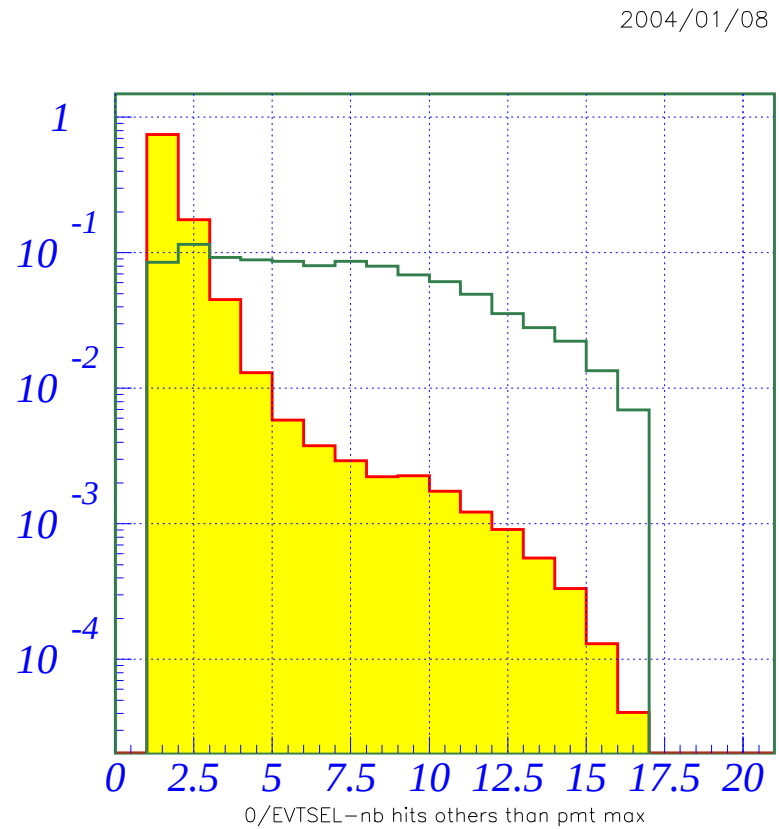
- proton runs used (618,...)
- get particle impact point coordinates on the rich prototype
  - through the light guide signal
  - through the cerenkov photon ring center
- correlate chambers and rich coordinates

Protons : particle impact point selection on LG

PM max signal : npe.vs.others



PM max signal : nhits.vs.others

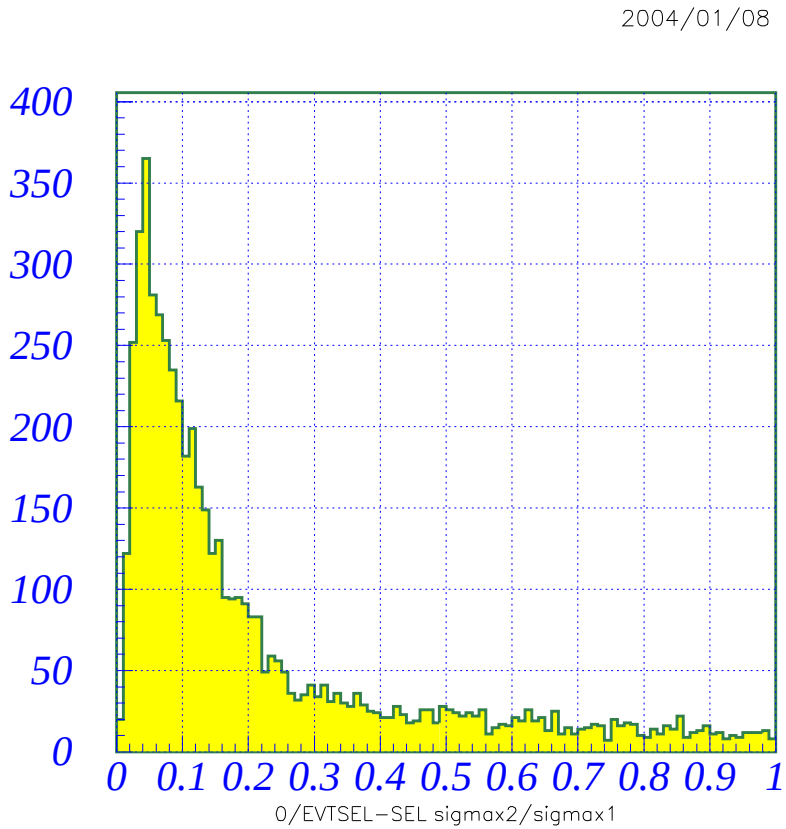


selection criteria :

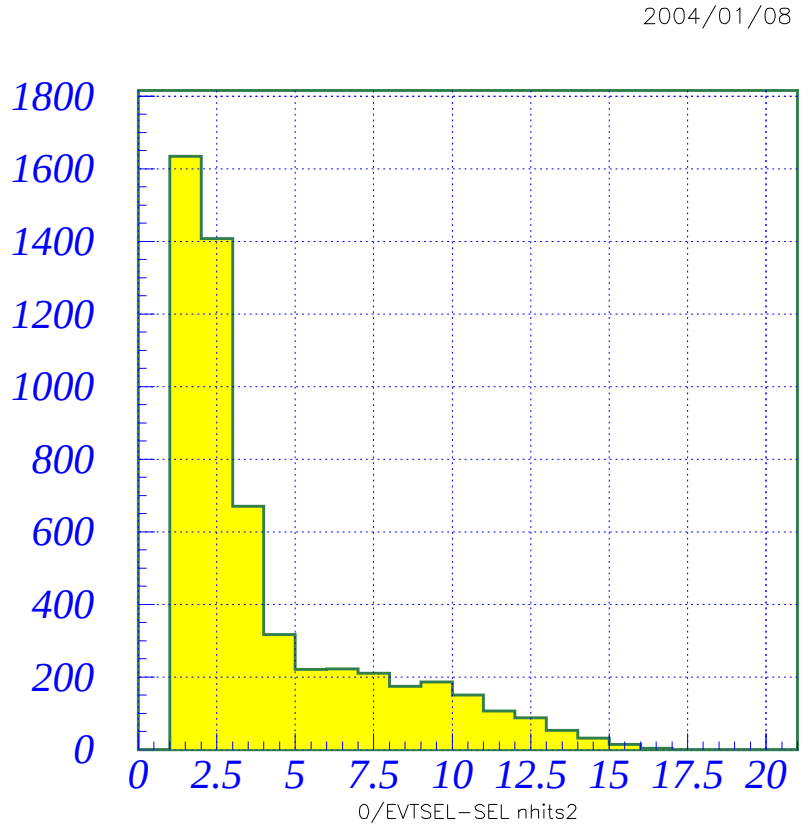
- pmt signal $> 2\ p.e$
- nb hits on max pmt ≥ 4

Protons : background rejection

Fraction of signal $2nd_{pmt}/1st_{pmt}$



Nb hits on 2nd pmt

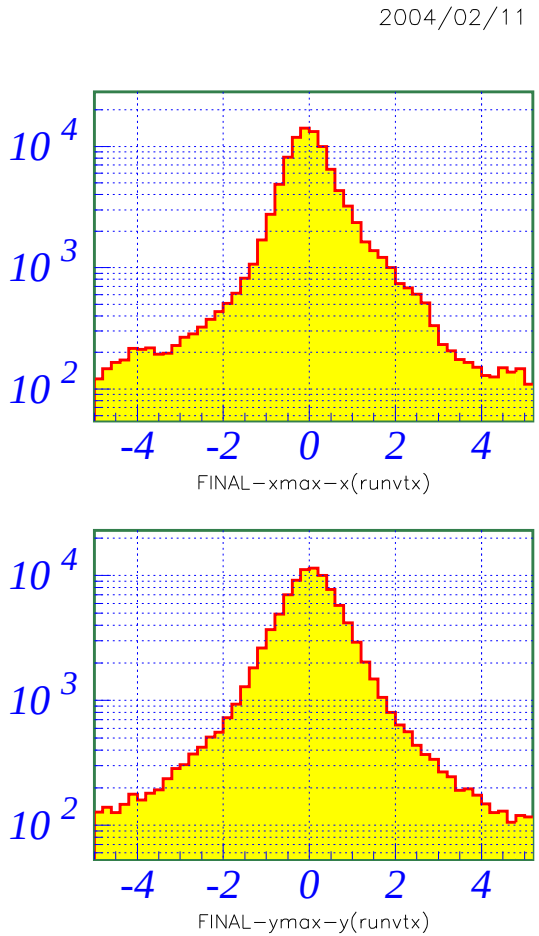


Reject events with a second crossing particle :

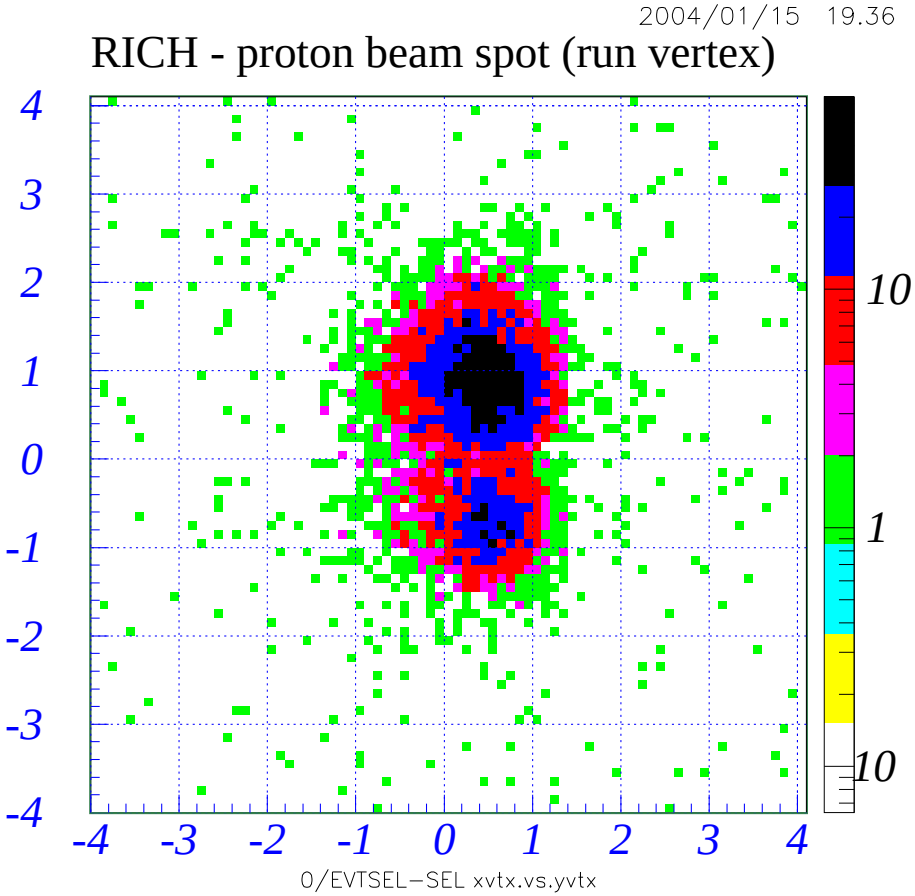
- $pmt2/pmt1$ fraction < 0.6
- nb hits on 2nd pmt < 5

event selection - Running vertex

running vertex .vs. max hit



beamspot from running vertex

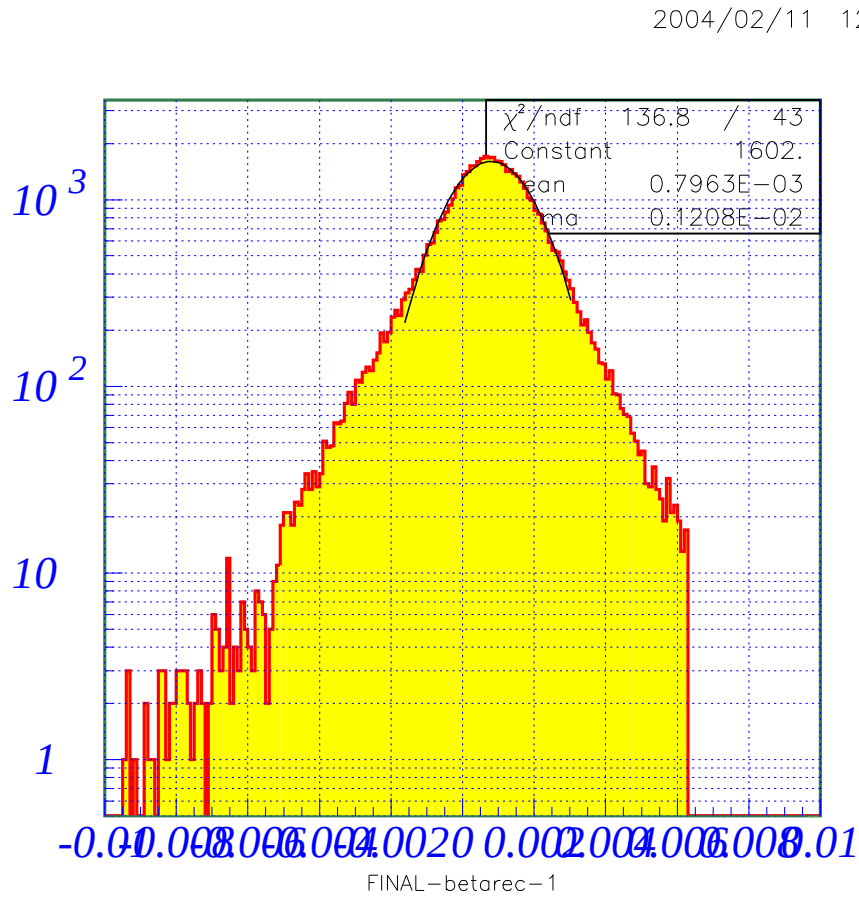


Run vertex compatible with hit max within $1\ cm$

Small proton beam excursion along X and Y

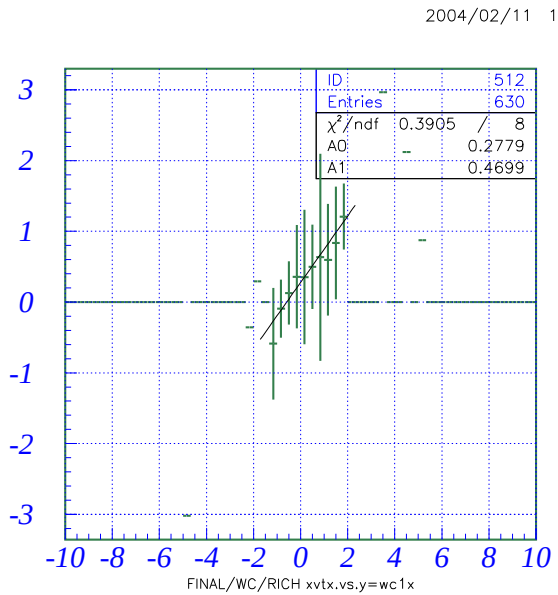
event selection- β reconstruction

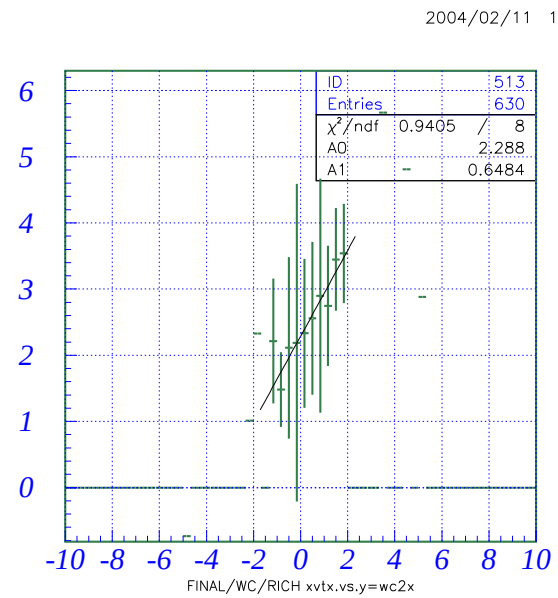
- Reconstructed velocity for 15 GeV/c protons is essentially $\beta = 1$
- cut : $(\beta_{rec} - 1) < 3E - 3$



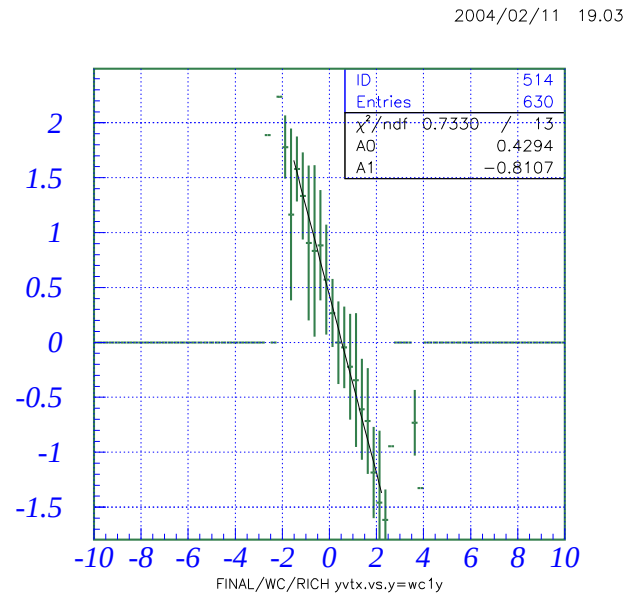
WC-RICH alignment

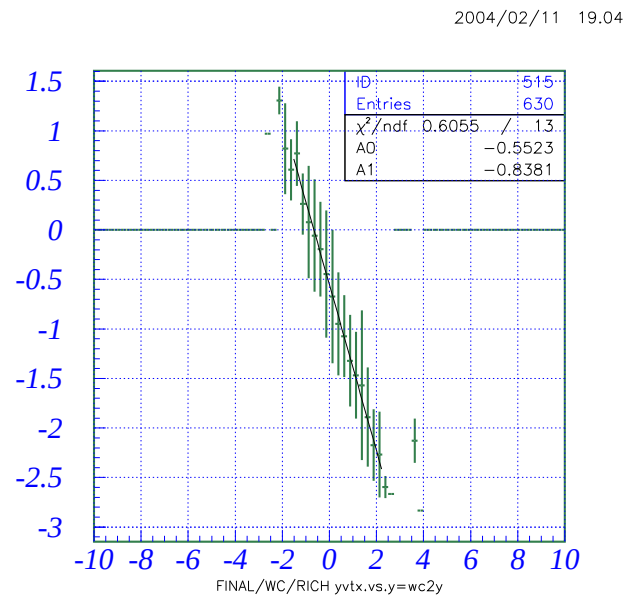
X coordinate





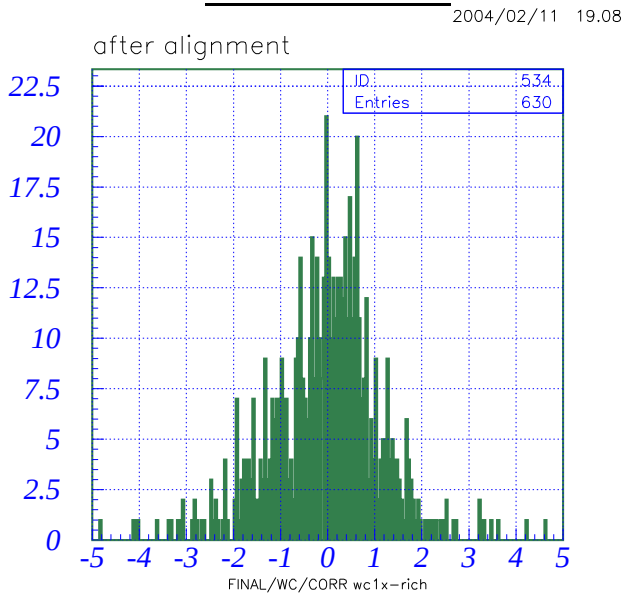
Y coordinate





WC1,2/RICH residuals after alignment

X residuals



Y residuals