

Run-6 pC scan measurements

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Spin Meeting (C-AD)
Aug 1, 2007

Outline

1. Intensity profile

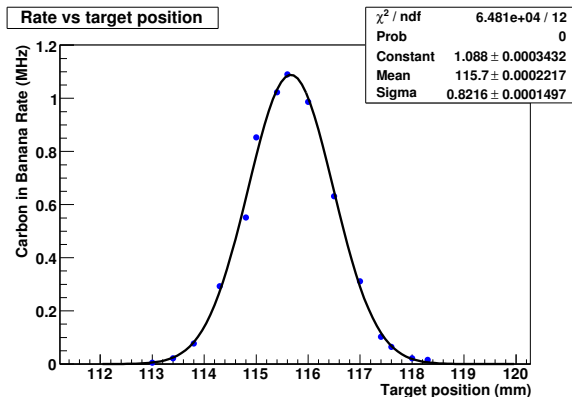
- ▶ Horizontal scans
- ▶ Vertical scans

2. Polarization profile

- ▶ Horizontal scans
- ▶ Vertical scans

An example: run 7654.005

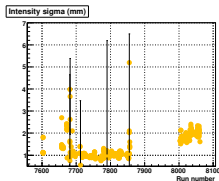
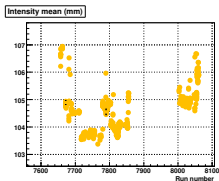
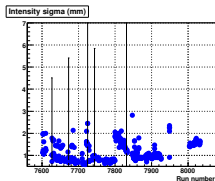
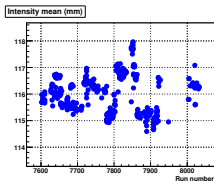
Horizontal scan (vertical target)



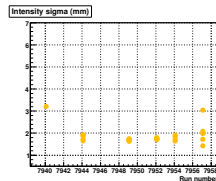
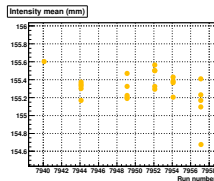
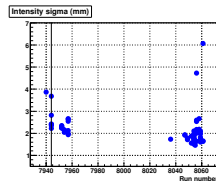
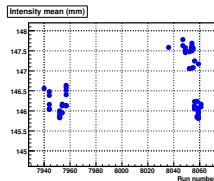
Horizontal width ~ 0.8 mm

Intensity profile: Run-6 history

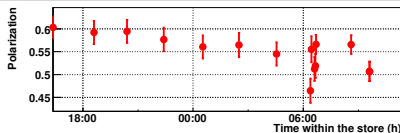
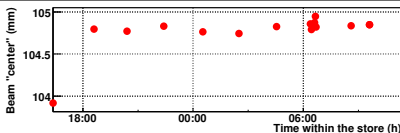
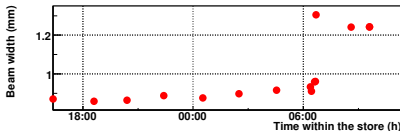
Horizontal scans



Vertical scans

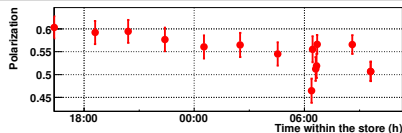


Changes in beam position/width within a fill: 7780-Yellow

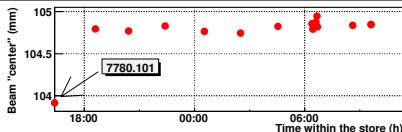
Fill 7780 Yellow: Polarization vs time**Fill 7780 Yellow: Beam position vs time****Fill 7780 Yellow: Beam width vs time**

Changes in beam position/width within a fill: 7780-Yellow

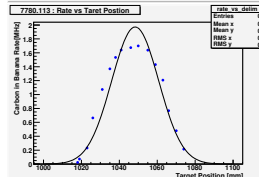
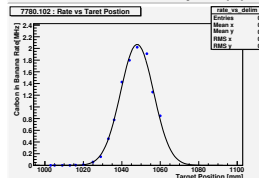
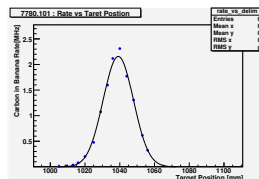
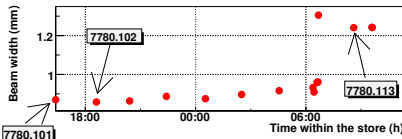
Fill 7780 Yellow: Polarization vs time



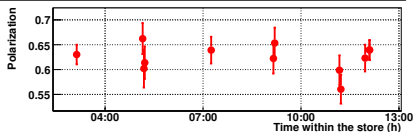
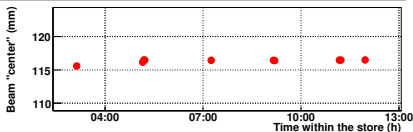
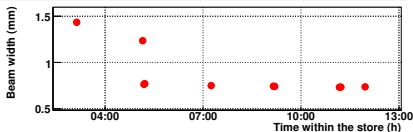
Fill 7780 Yellow: Beam position vs time



Fill 7780 Yellow: Beam width vs time

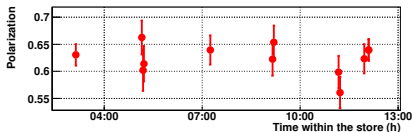


Changes in beam position/width within a fill: 7729-Blue

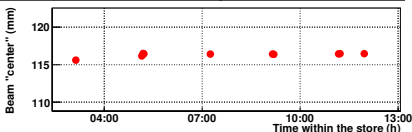
Fill 7729 Blue: Polarization vs time**Fill 7729 Blue: Beam position vs time****Fill 7729 Blue: Beam width vs time**

Changes in beam position/width within a fill: 7729-Blue

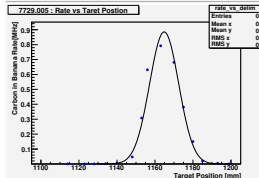
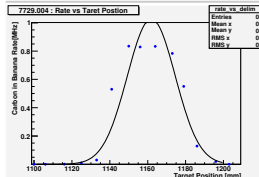
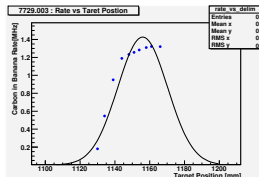
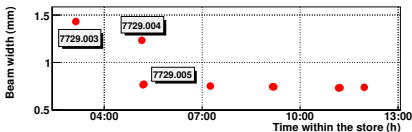
Fill 7729 Blue: Polarization vs time



Fill 7729 Blue: Beam position vs time



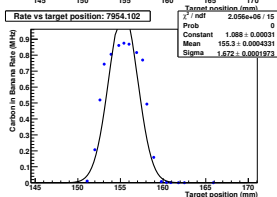
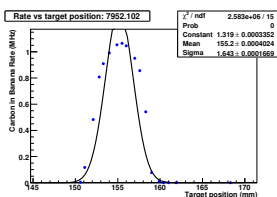
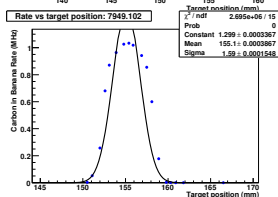
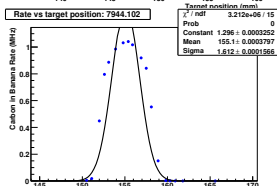
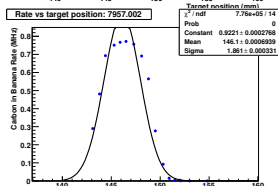
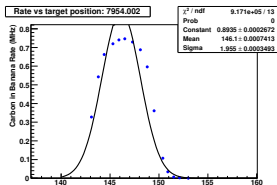
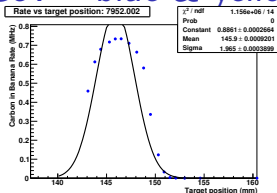
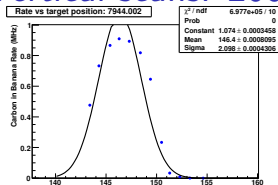
Fill 7729 Blue: Beam width vs time



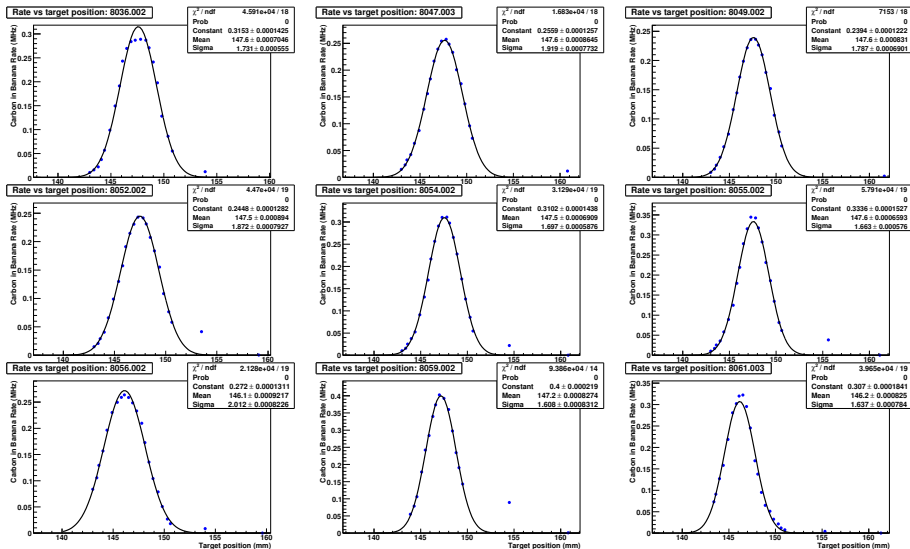
Vertical profile: fill summary

Horizontal scan		Vertical scan		← TOTAL
Blue	Yellow	Blue	Yellow	
133	144	15	6	
		7940	7940	200 GeV (long)
		7944	7944	
			7949	
		7952	7952	
		7954	7954	
		7957	7957	
		8036		62 GeV (trans)
		8047		
		8049		
		8052		
		8054		
		8055		
		8056		
		8058		
		8059		
		8061		

Vertical scans: 200 GeV – blue & yellow



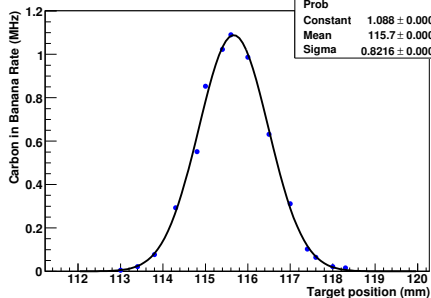
Vertical scans: 62 GeV – blue



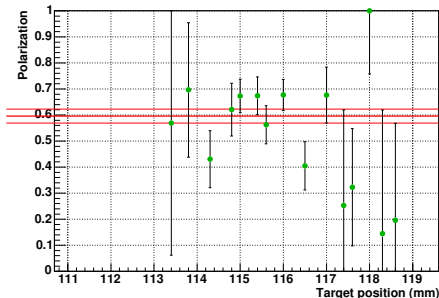
An example: run 7654.005

Horizontal scan (vertical target)

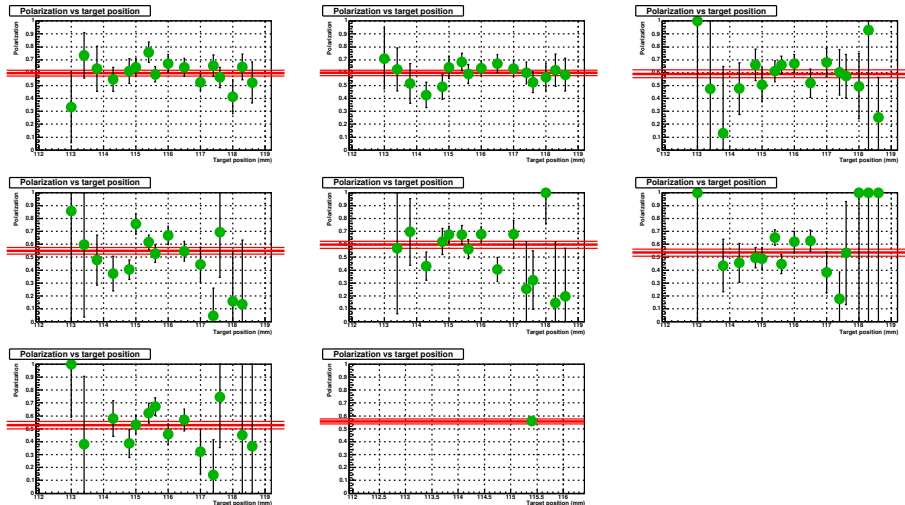
Rate vs target position



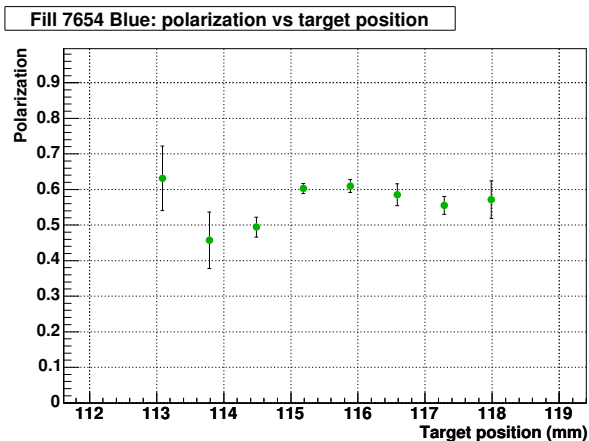
Polarization vs target position



A whole fill: polarization vs. target position



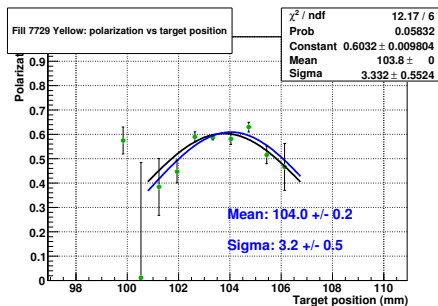
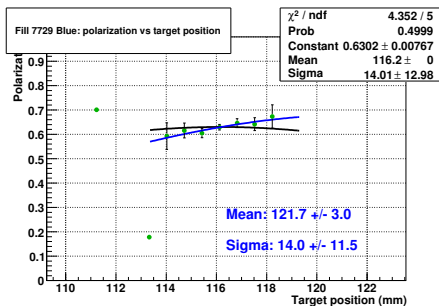
Polarization vs. target position: one combined fill



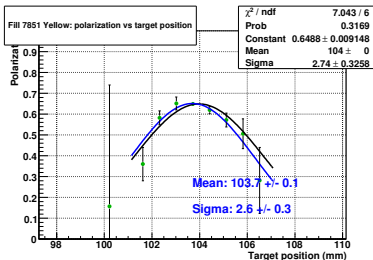
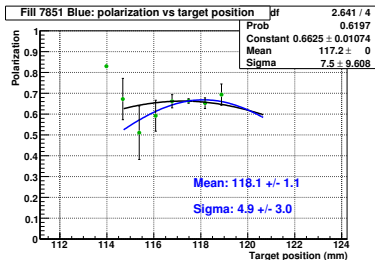
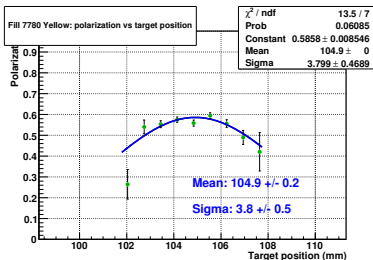
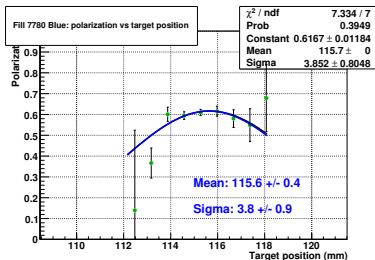
Gaussian fit to profile

Fit to “integrated measurements” within a fill:

- ▶ Fit within average “beam center” ± 3 mm ($\approx 3\sigma$)
- ▶ Two different fits:
 - ▶ Fixed gaussian mean to average “beam center”
 - ▶ All parameters free

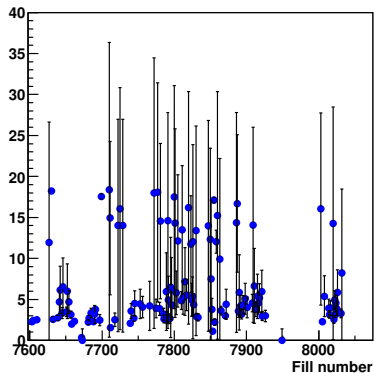


Some more examples:

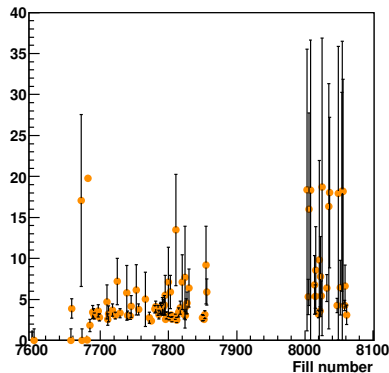


Polarization width history (horizontal scans)

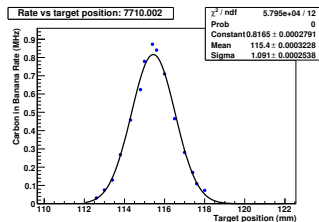
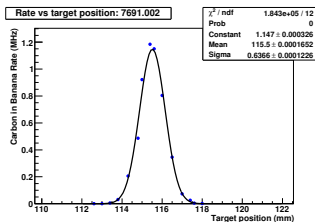
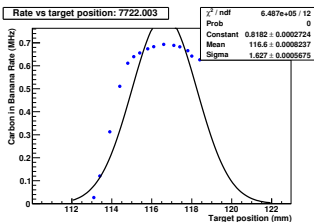
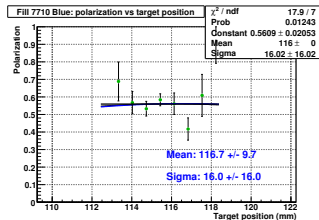
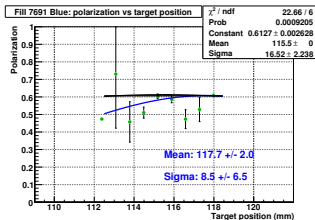
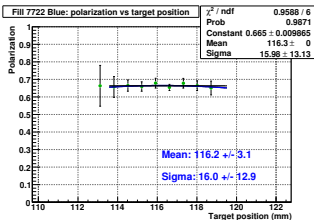
Polarization "width" (mm)



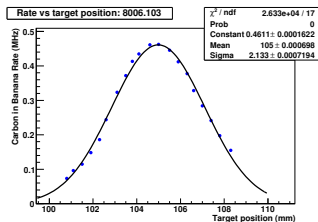
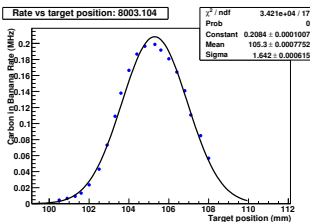
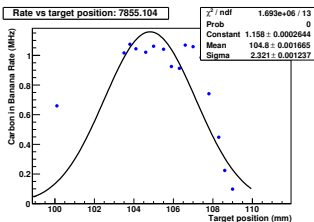
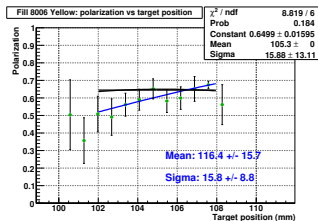
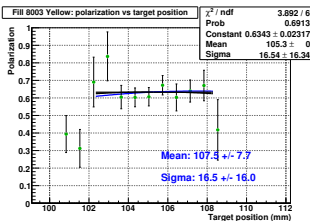
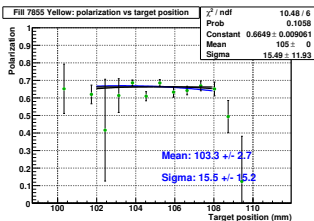
Polarization "width" (mm)



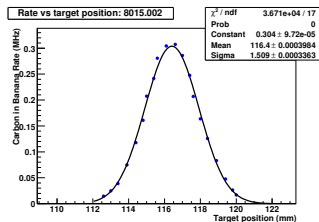
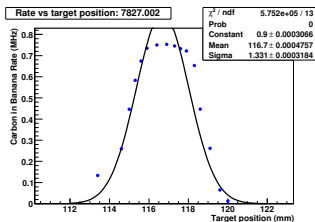
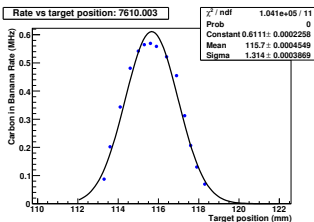
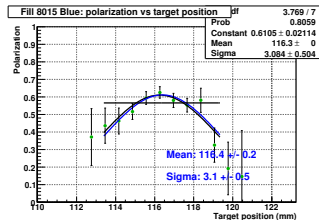
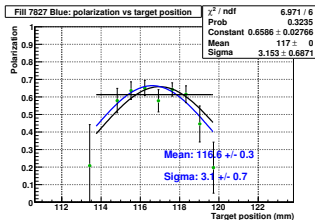
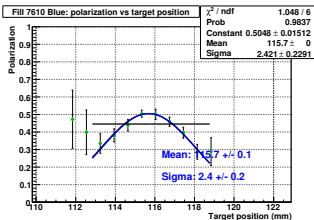
Large vs. small profile σ 's: some flat blue profiles



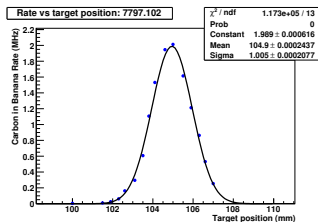
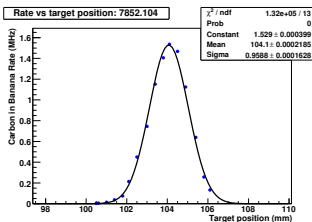
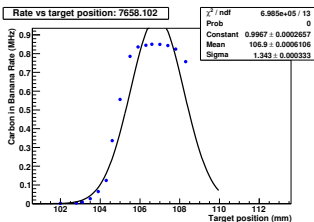
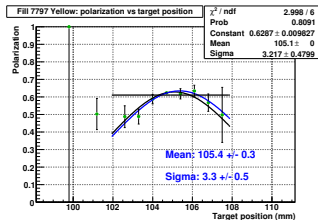
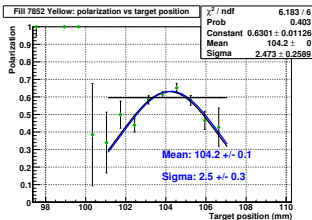
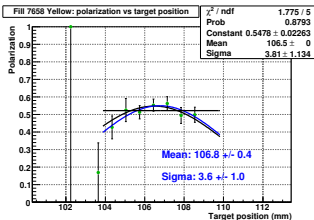
Large vs. small profile widths: some flat yellow profiles



Large vs. small profile σ 's: some "narrow" blue profiles

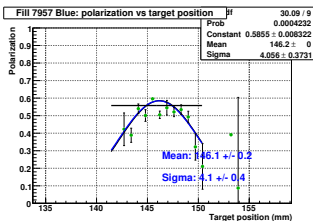
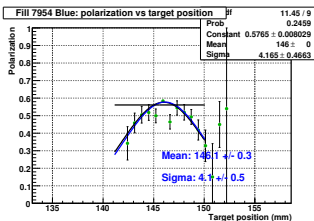
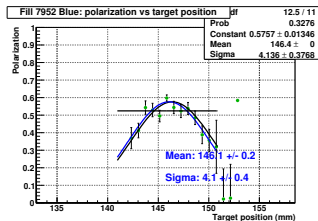
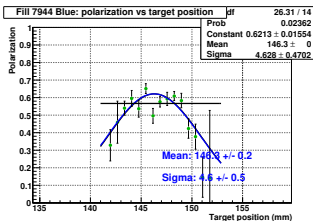
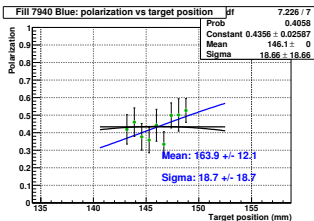


Large vs small profile widths: some “narrow” yellow profiles



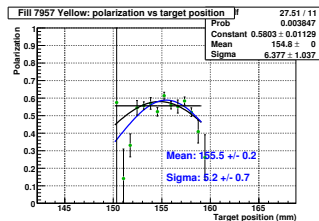
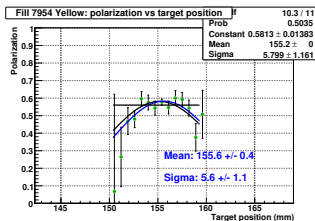
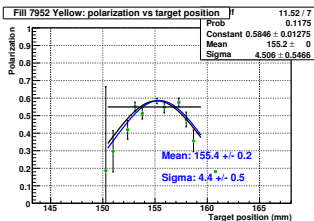
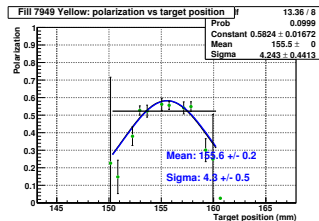
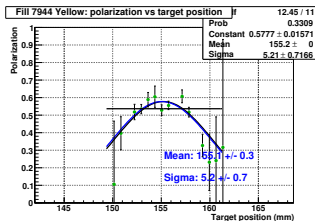
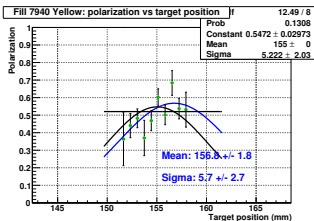
Vertical profile: Blue – 200 GeV

Reminder: “Non-gaussian” intensity profile (cf. slide 8)



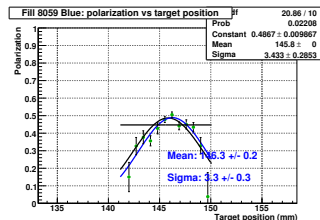
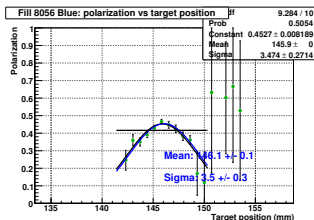
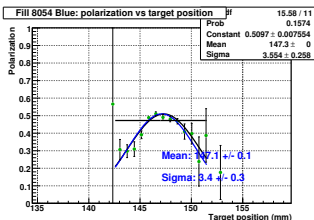
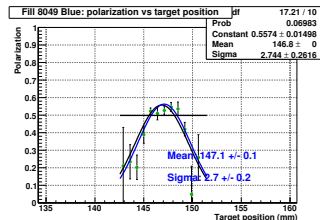
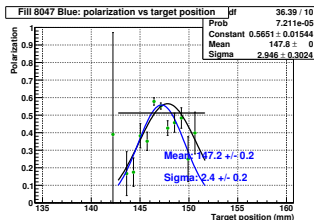
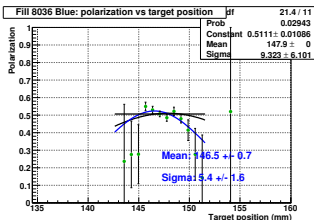
Vertical profile: Yellow – 200 GeV

Reminder: “Non-gaussian” intensity profile (cf. slide 8)



Vertical profile: Blue – 62 GeV

Reminder: Gaussian intensity profile (cf. slide 9)



Summary

1. Intensity profile

- ▶ Horizontal profile *sometimes* non-gaussian shape (or target position problem, target vibration. . .).
- ▶ Vertical profile *always* non-gaussian at 100 GeV (but OK at 31 GeV).

2. Polarization profile

- ▶ Sometimes very flat profile, sometimes narrow profile.
- ▶ Vertical profile seems stronger (but only a few measurements).

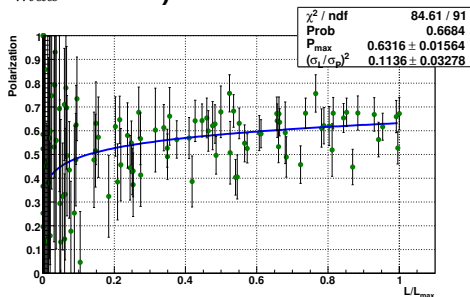
Polarization profile still dominant source of systematic uncertainty
in polarization measurement

Efforts should be made to better measure it and understand it

Supplementary slides

Polarization vs rate fit

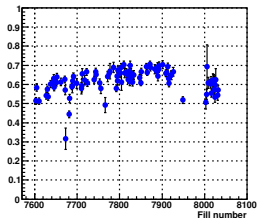
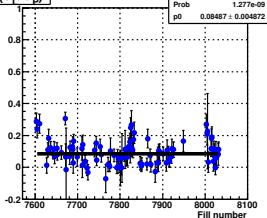
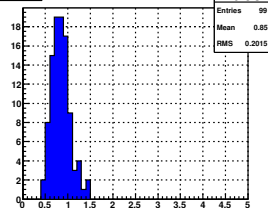
$$\left. \begin{aligned} L &= L_{max} \cdot e^{\frac{-x^2}{2\sigma_L^2}} \\ P &= P_{max} \cdot e^{\frac{-x^2}{2\sigma_P^2}} \end{aligned} \right\} \Rightarrow P = P_{max} \cdot (L/L_{max})^{(\frac{\sigma_L}{\sigma_P})^2}$$



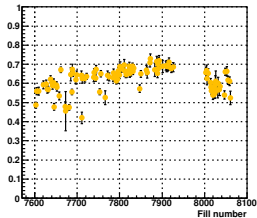
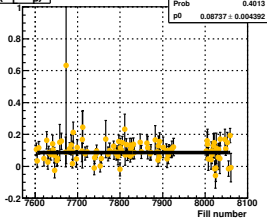
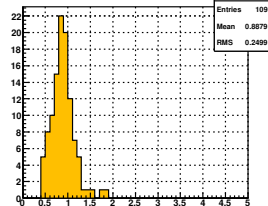
- ▶ Target positions cancels
(useful if funny beam shapes and/or unfinished scans)
- ▶ Still sensitive to target vibrations...

Horizontal scans

Polarization at peak

 $(\sigma_l / \sigma_p)^2$  χ^2 / ndf 

Polarization at peak

 $(\sigma_l / \sigma_p)^2$  χ^2 / ndf 

Vertical scans

