

Analysis of the dynamics
of the decay $\phi \rightarrow \pi^+ \pi^- \pi^0$:
Referees report

Mario Antonelli

- Detailed description in the KLOE MEMO 274

Comments

General:

- competitive results + 2000 data
⇒ KLOE note soon

Analysis is in a good shape:

- relevant detector effects taken into account
- several checks DATA-MC
- systematic uncertainties evaluation
- robustness of the fit

Main questions:

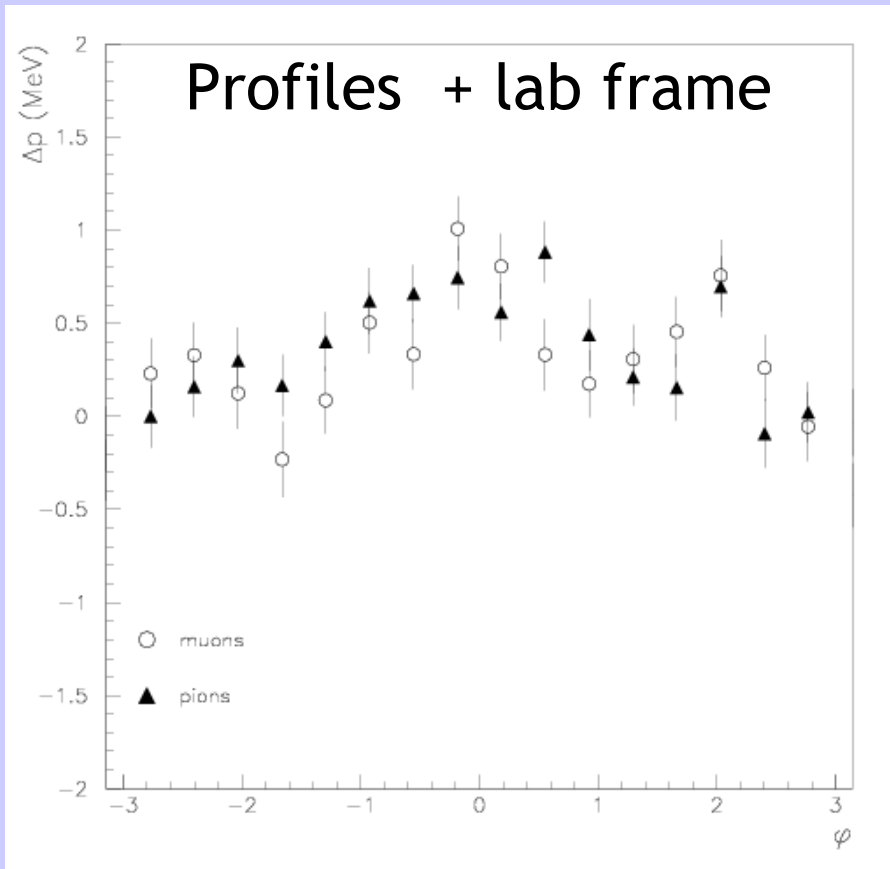
- bias on momentum measurement
- ISR not taken into account

Momentum bias

- difference in measured momenta between negative and positive charged particles

observed in the control samples: $\mu^+\mu^-$ and $\pi^+\pi^-$ events

$P(+)-P(-)$ (MeV)



NOW:

main systematic for ΔM_s measurements
0.5 MeV

ONLY the AVERAGE
enter in $\delta(\Delta M_s)$

ϕ

Momentum bias

Referees comment: find source(s) of the effect

⇒ correct measured momenta (use control sample)

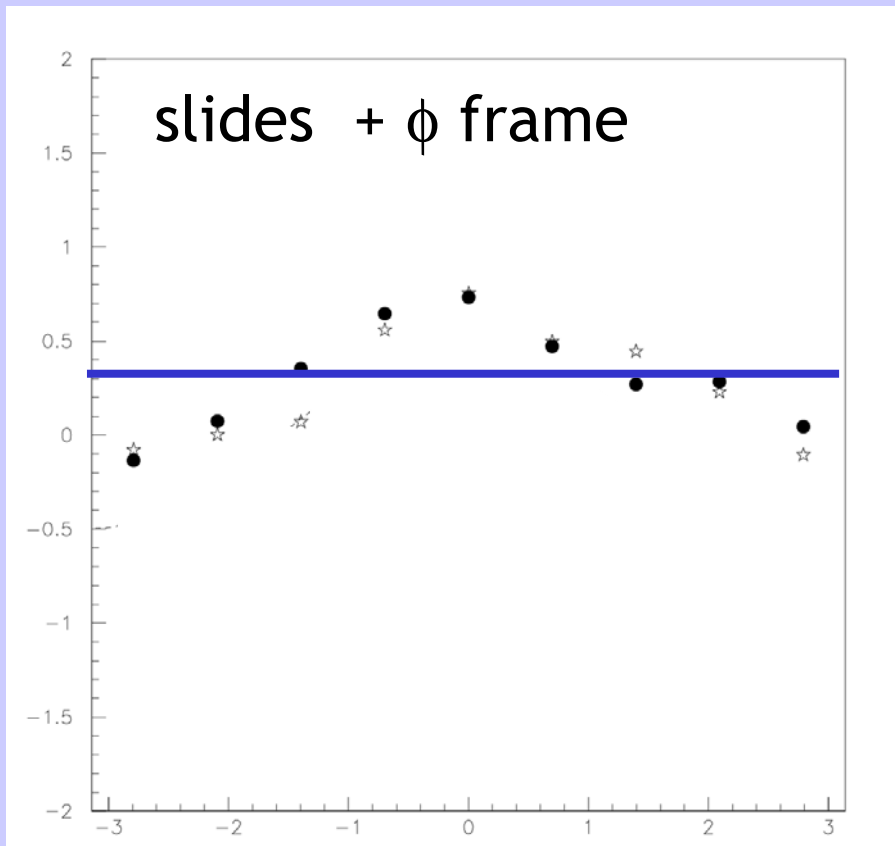
verify consistency with π^0 mass

systematics from uncertainties on correction

Closer look to the effect:

- ϕ rest of frame + use gaussian fits to slides

$P(+)-P(-)$ (MeV)



~ 280 KeV average

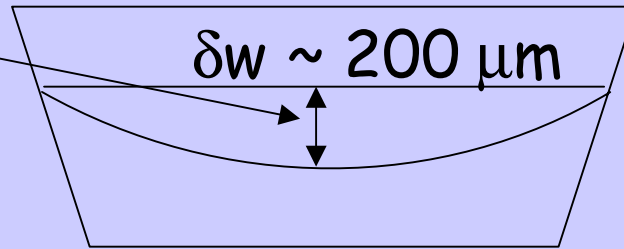
$50^\circ < \theta < 130^\circ$

ϕ

Momentum bias

R-Z view

- the wire droop

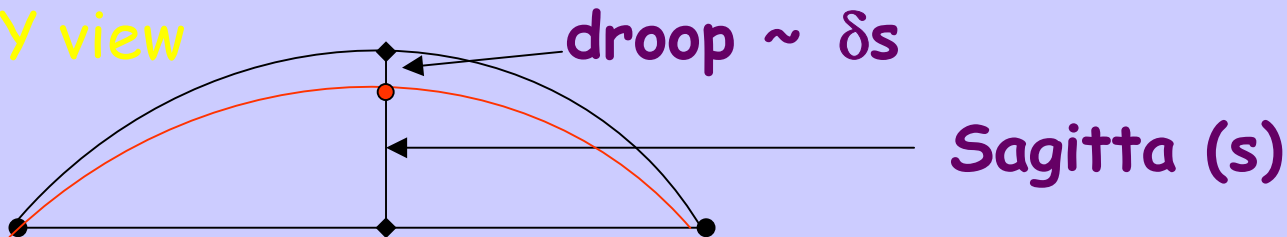


Not in scale

is not taken into account in the present track reconstruction algorithm

→ bias on the momentum ?

X-Y view



error on the wire position → δs → δp_{\perp}

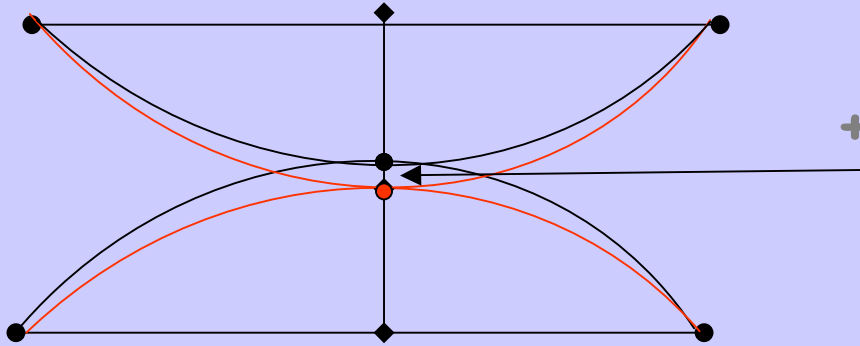
$$\delta p_{\perp} = p_{\perp}^2 / (0.3 B L_{\perp}^2) \delta s$$

100 μm → 300 keV @ $p = 500 MeV$

Momentum bias

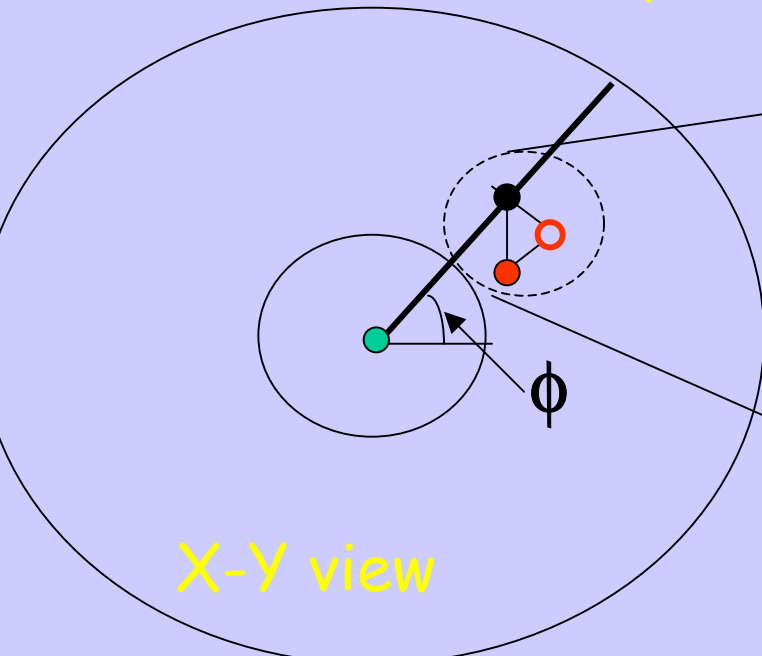
Charge dependent effect:

X-Y view

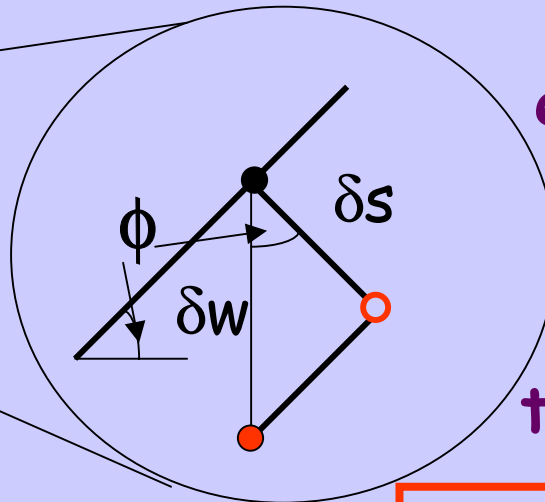


+ / - δs for + / - charge

ϕ dependent effect



X-Y view



effective bias



Parallel component to the sagitta

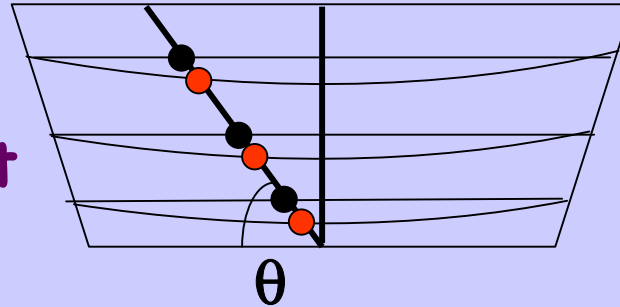
$$\delta s = \delta w \cos \phi$$

Momentum bias

θ dependent effect

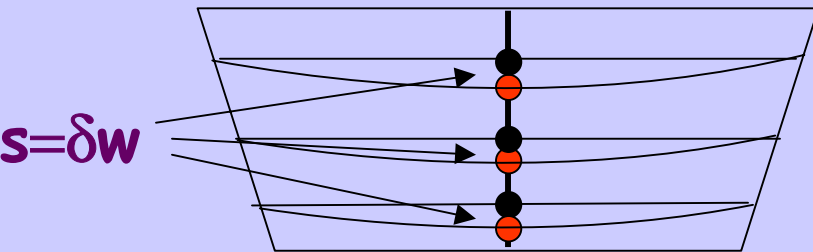
R-Z view

Only relative positions are important

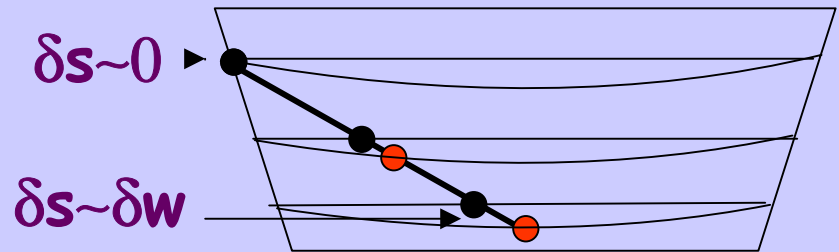


If wires have same droops δw

→ no effect at $\theta = 90^\circ$



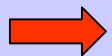
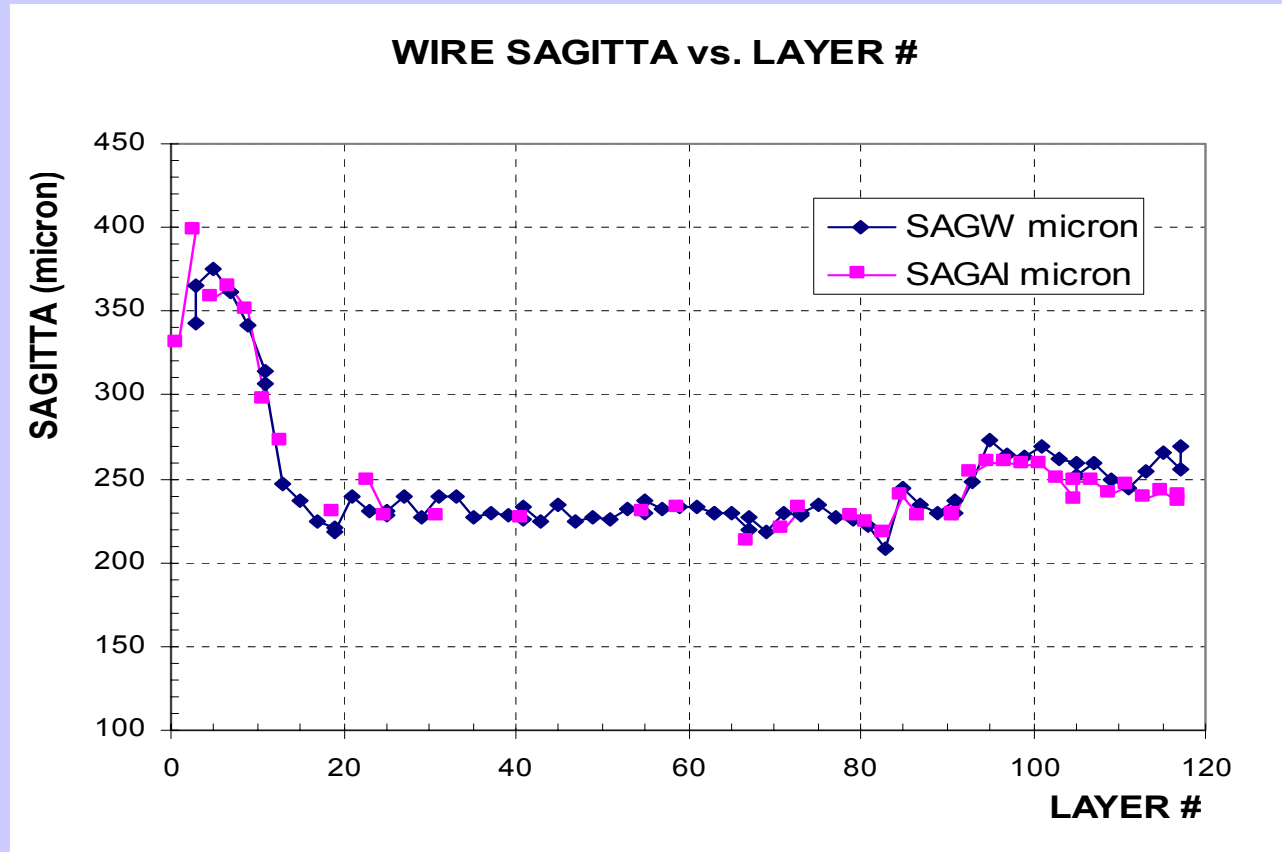
At small angle



X-Z view $\phi = 0$

Momentum bias

δw is not a constant

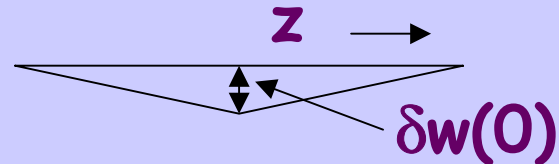


effect at $\theta = 90^\circ$ expected (and observed)

Momentum bias

use a toy model to verify consistency with data

- linear drop vs z



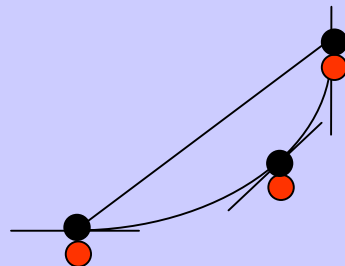
- evaluate average of effective δs :

θ, ϕ dependencies

and differences in $\delta w(0)$ vs R

taken into account

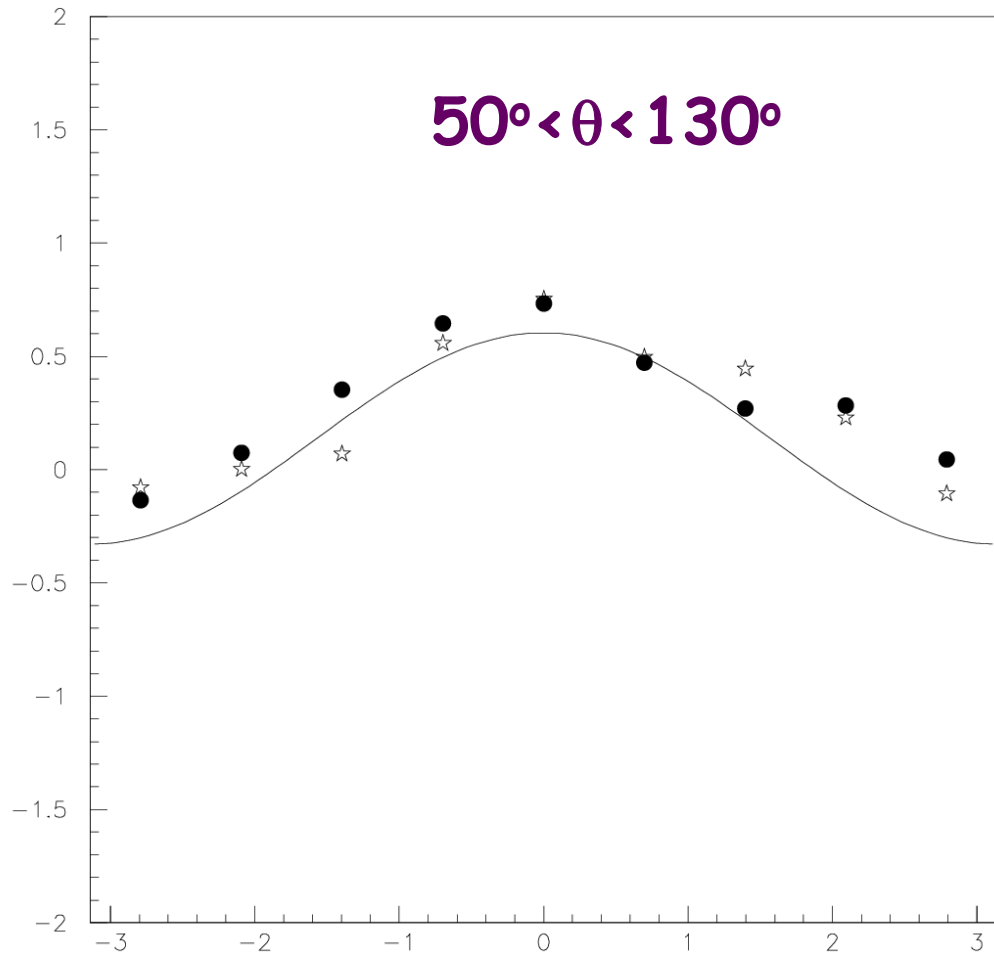
curvature effect on effective δs also considered



Not negligible $R \sim 1$ m

ϕ dependence (δs) on the wire

Results



check the model at low angles (large effects are expected)

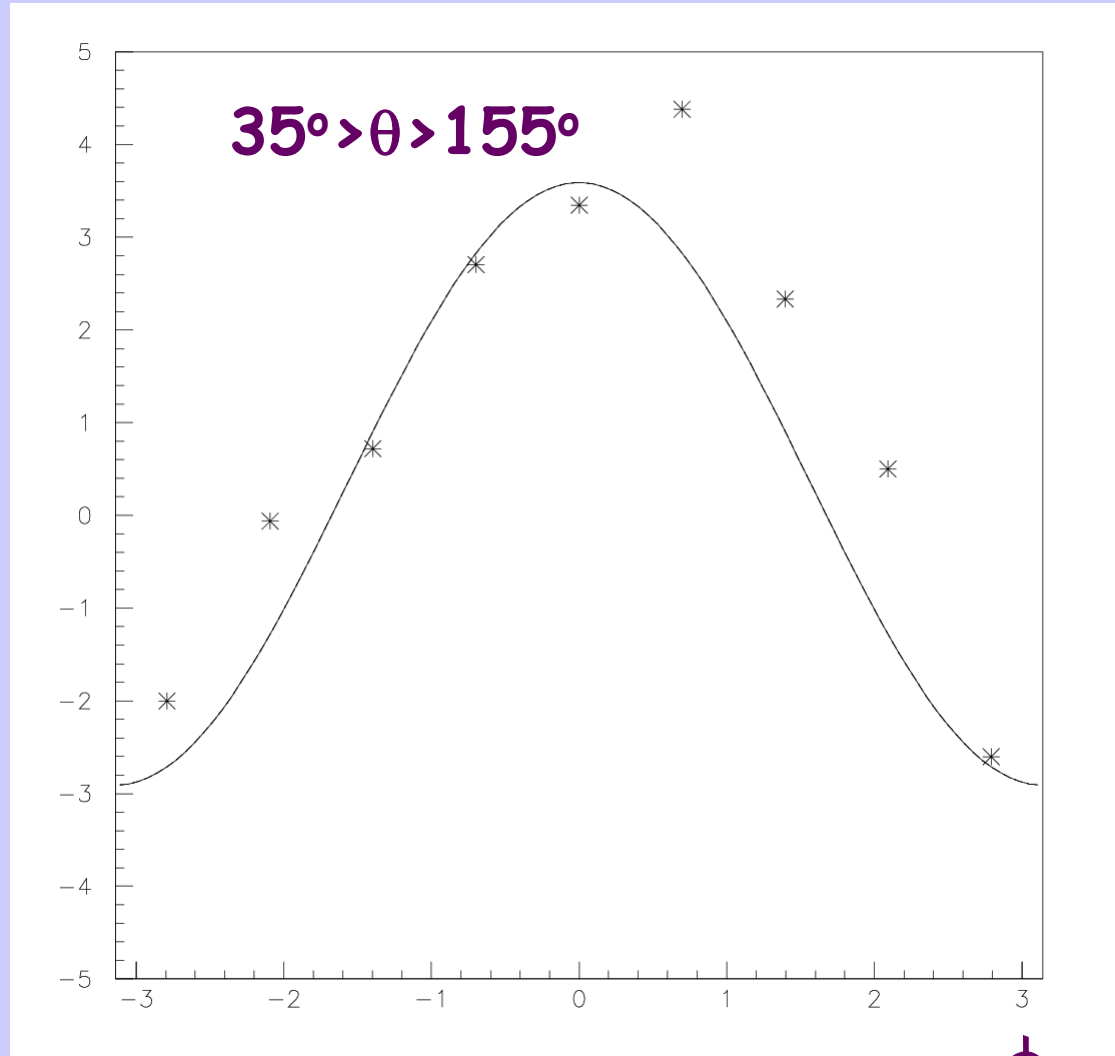


ϕ

results

Use bhabha

$P(+)-P(-)$ (MeV)



A bit asymmetric...
under study
Tilted plates?

ϕ

ISR effects?

Initial state radiation not taken into account in the fit

π^0 E,P evaluated from missing E,P using knowledge of W

Fit stability checked
varying cuts on
variables sensitive
to ISR

Some event with
 π^0 kinetic energy out
of boundaries?

