

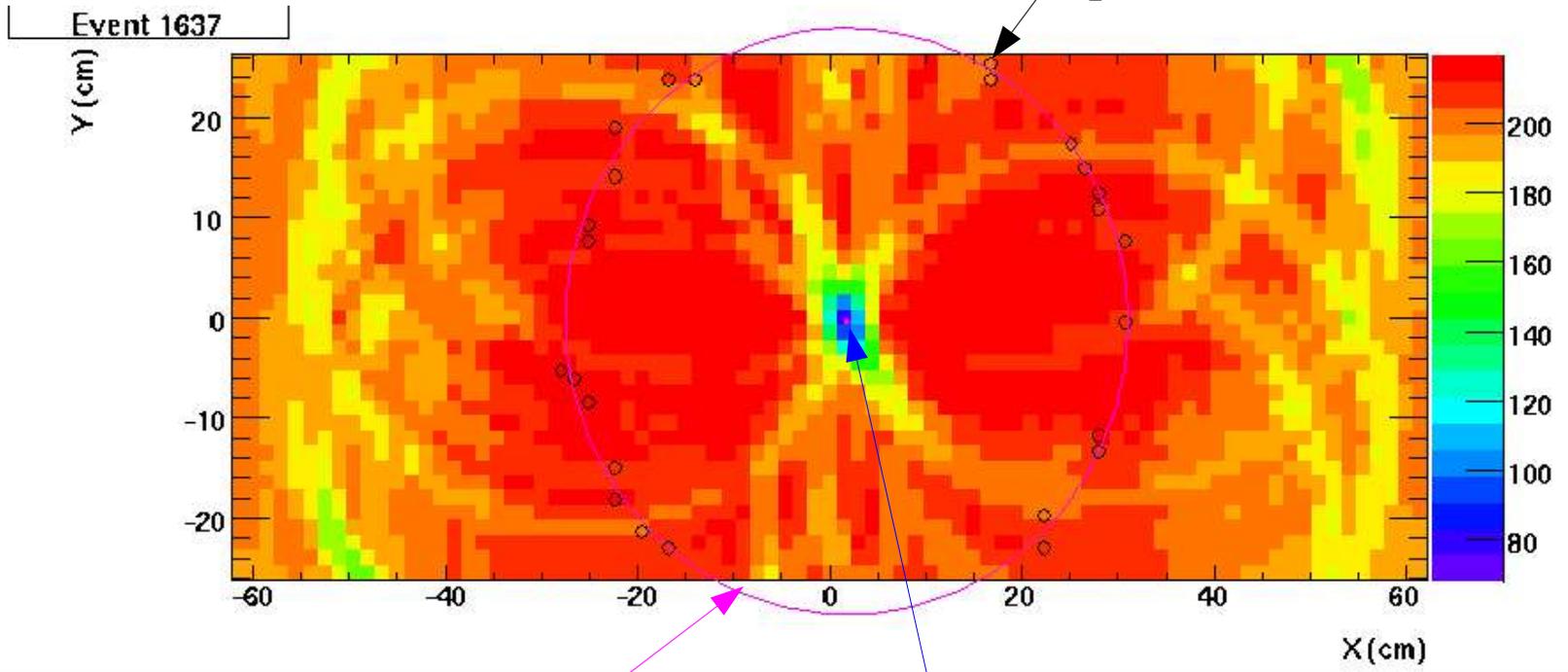
Charged Kaon Mass Measurement Update

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August 23, 2006

Likelihood - X-Y Map

Example of a pion event

Black circles represent hit phototubes



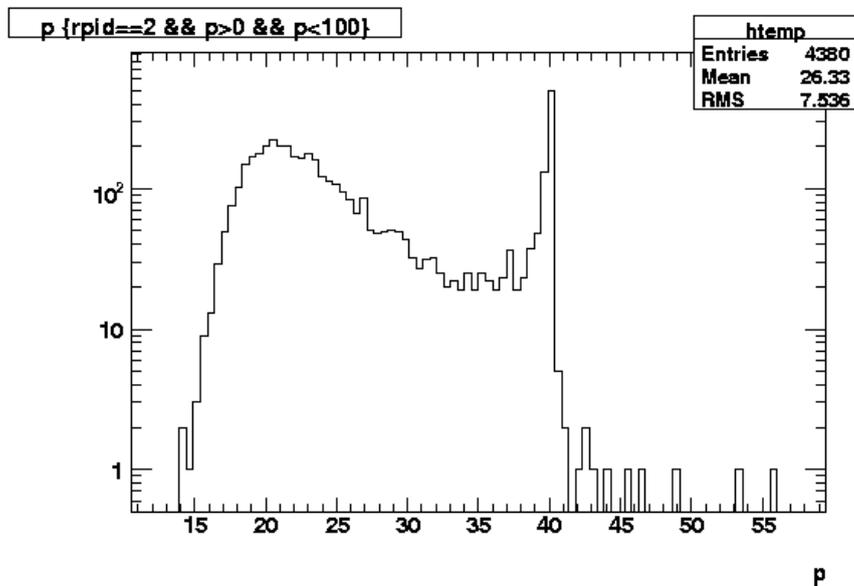
Z axis is
negative log
likelihood

Circle fit to pmt hits

Center found from negative
log likelihood minimization

Momentum From Likelihood

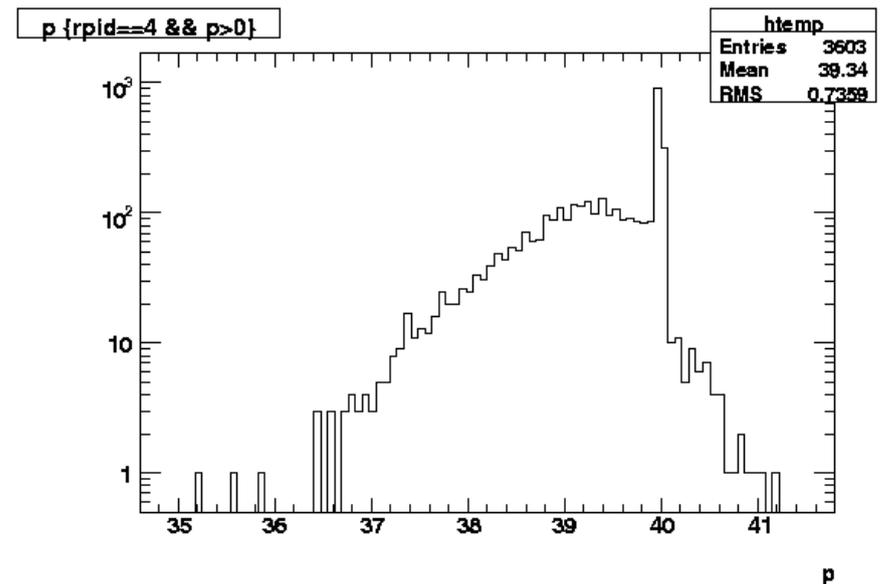
First minimize x-y with masses fixed at PDG values, momentum at 40 GeV. Next minimize with respect to momentum.



Peaks near initial guess where Minuit is getting stuck.

Left: Pion events. Momentum is way off.

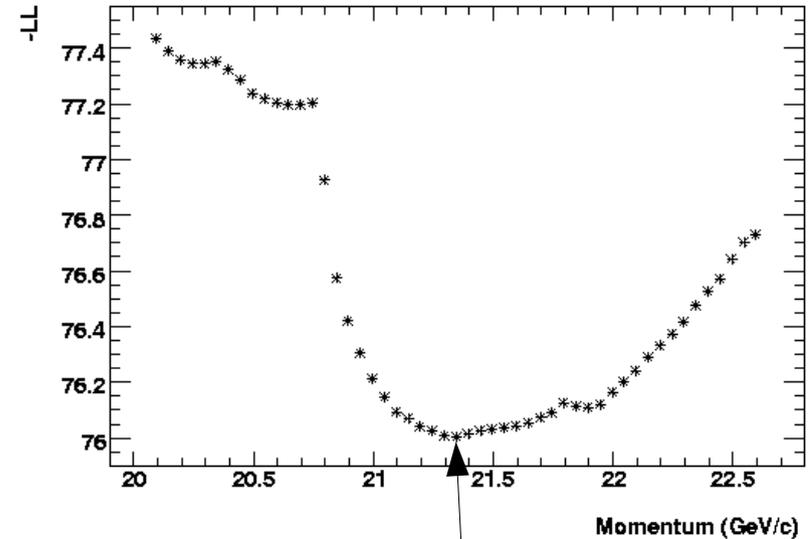
Bottom: Proton events. Momentum is resonable.



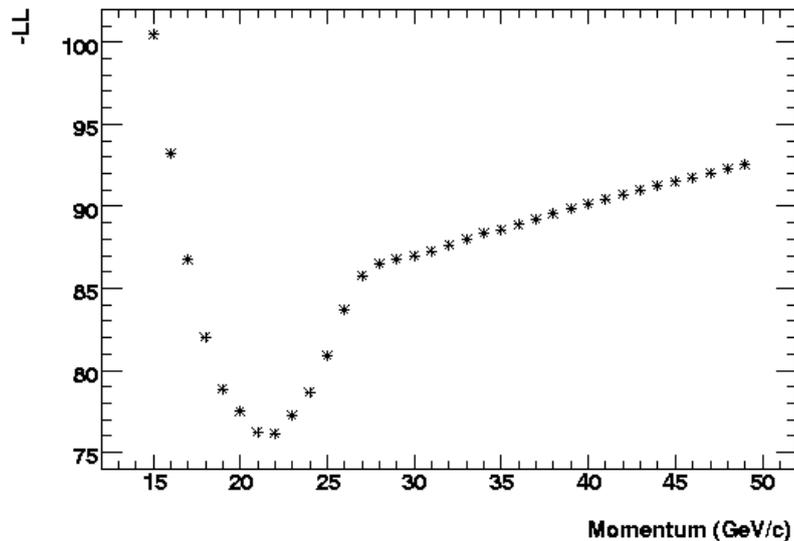
Momentum Maps

Likelihood function for this event is very smooth for the low resolution scan

Not as smooth on a finer scale, but a good minimum was found



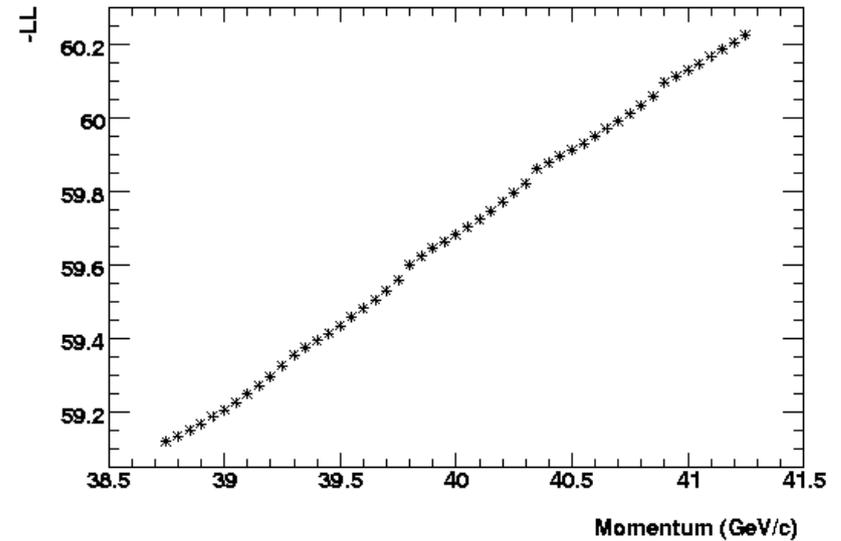
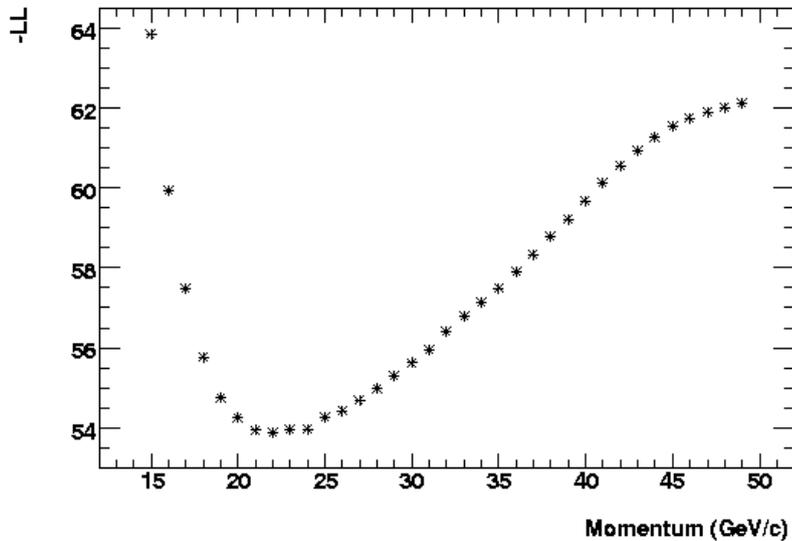
Best momentum from likelihood: 21.35 GeV/c



More Momentum Maps

Likelihood function for this event is very smooth for the low resolution scan

Still fairly smooth on finer scale
Why stuck on initial seed?



Minimization stuck on initial guess of 39.5 GeV/c

Refractive Index

Index of refraction during this running period: ~ 1.0004585

Momentum using both pion/proton radius distributions (eliminate n):

$$p^2 = \frac{(m_1^2 \cos(t_2)^2 - m_2^2 \cos(t_1)^2)}{(\cos(t_1)^2 - \cos(t_2)^2)} \quad p = 39.86 \text{ GeV}$$

Using one ring (need n value): $\langle R \rangle = 18.24$ $p = 39.05 \text{ GeV}$ (protons)
 $\langle R \rangle = 29.38$ $p = 22.6 \text{ GeV}$ (pions)

Do the opposite, assume 40 GeV: $n = 1.000445$ (protons)
 $n = 1.000447$ (pions)

Calculate p from each using the other n value: $p = 39.86$ (protons)
 $p = 47.9231$ (pions)

We seem to be off in overall scale for index of refraction