CKOV-1 PROGRESS

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SEP 21, 2005

• Uniformity Studies
• TOF CKV Concept
• LN2 Vacuum Window
RADIATOR OPTIONS - FOCUSING ON LN2

240-300 MeV/c
• About 40 pe separation × 2/3 light collection efficiency ~ 25 pes.
• Light Collection Uniformity issues.
• About 4 - 7 degrees of angular separation. Not Used.
Track Position Dependency of Light Collection

Collection Drop at -
\[ x \sim d \sin \theta = 5\text{cm} \sin 26^\circ = \pm 2\text{cm} \]
4---> 8--> 12 PMT Model helps Collection Uniformity
8- PMT/Mirror Model @ 240 MeV/c

MUON

LN2: $\Theta_c = 24.9\text{deg}$
$p=240\text{MeV/c}$

- Particle scan across radiator face.
- Light collection enhanced in the central region and wing.

PION

LN2: $\Theta_c = 16.5\text{deg}$
$p=240\text{MeV/c}$
**MUON**

LN2: $\Theta_c = 24.9\text{deg}$

$p=240\text{MeV/c}$

**PION**

LN2: $\Theta_c = 16.5\text{deg}$

$p=240\text{MeV/c}$

- Uniformity problem partially solved by increasing # Mirror/PMTs.
- X-Y position from TOF0/TOF1 Central Trigger Scintillator may be useful.
**PID Algorithm**

\[ N = \text{Lmeas}(x,y) \quad \mu = \text{Lpred}(x,y) \]

\[ P(N, \mu) = \mu^{N/N!} e^{-\mu} \]
**TOF CKOV CONCEPT**

- **μ** 26° -> 0.450rd --> 4.5 cm/bounce --> 4-5 bounces  \( \varepsilon = 0.9^{4.5} = 62\% 

- **π** 18° -> 0.310rd --> 3.1 cm/bounce --> 7-8 bounces  \( \varepsilon = 0.9^{7.5} = 45\% 

75cm --> (3.0+-0.2)ns  
+-0.2ns slewing

50cm --> (2.0 +- 0.2) ns  
+- 0.2ns slewing
TOF CKOV CONCEPT

10 cm LN2 Radiator

pmt

11.5cm
~4-5"

23cm

Beam view
PMT Response vs Time - 50ps/bin

240MeV/c

260MeV/c

280MeV/c

300MeV/c
PMT Response vs Time - 50ps/bin

240MeV/c

260MeV/c

280MeV/c

300MeV/c
Crude Analysis

\[ \text{To} = \text{first arrival} \]
\[ \text{Tx} = \text{cross over time} \]
\[ \text{Tmean} = \text{mean time} \]
\[ \text{Trms} = \text{r.m.s} \]
\[ Q = \int V dt \]

\[ Q = \text{integrated charge} \]
Timing Plots w mu/pi @ x,y = (0.,0.)

- Timing separation varies from 1 ns to ~0.5 ns.
**PLOTs at x0=0. y0=0.**

- **Cross Over Timing**
- **Charge Collected vs Momentum**

- Crossover timing may be more robust. Some fluctuations??
- Ratio of Charge collected rather flat due to extra bounces for pions.
SUMMARY

• 8 and 12 Mirror/PMT CKOV1 counter studied.
• Collection efficiency ~ 2/3 to 1/2.
• Better uniformity.

• LN2 Radiator/ Mirror Box needs x-y measurement to make proper pe light prediction.

• TOF CKOV concept works well in Simulation.

• LN2 Vacuum Windows in fabrication for tests.