• Unofficial decision taken to defer building of CKOV2.
• Ghislain has reviewed TOF0/1 mass resolution with tracker $\Delta p/p$. Reasonable motive to build CKOV1.
• Ghislain has performed important studies of a RICH-type CKOV1. [http://www.fynu.ucl.ac.be/themes/he/mice/talks.html](http://www.fynu.ucl.ac.be/themes/he/mice/talks.html)
• 6 pieces of Matsushita Aerogel obtained by Don for tests, $n=1.03$, $n=1.08$, $n = 1.12$
• Photon yields are being measured for possible use as a tandem threshold CKOV1 device (1.07, 1.12).
• Cost estimates indicate that CKOV1 may be doable for ~$50K USD in either RICH or Aerogel mode.
• Possible participation in Frascati test beam if travel funds available.

Beam configuration

T.J. Roberts Osaka Aug 04

June04A beam configuration

$P_{\pi} = 425$ MeV/c

Moved, Thinner, TOF0

Moved, Thinner, TOF1

New Iron Shield

7.8 m

Mass reconstructed from TOF

\[ m^2 = \left[ \left( \frac{c \Delta t}{l} \right)^2 - 1 \right] \left( p_T^2 + p_z^2 \right) \]

\[ \sigma_{p_z} = 3 \text{ MeV} / c \]

\[ \sigma_{p_z} = \frac{75}{3 + p_T} \]

Semilog plot!

16 k muons

400 pions

RICH-type CKOV1
Optical system

- 20 mm thick water radiator
  Diameter 440 mm
- 3 mm thick quartz window
- Instrumented imaging plane

Spherical mirror R=1016 mm
at 517 mm from quartz window
(optimized for min. spherical aberration)

Good muons

No momentum selection!

Through-going pions

Useful size of imaging plane

Radial distribution of hit PMTs for good muons

Only 10 PMTs per cell (instead of 16)

Results for 1” PMTs

- About 10 muons are outside the « red banana » due to large radius impact points
- Remember that the pion/muon ratio is exaggerated by a factor 40.
- Fair separation despite the finite granularity of the imaging plane
- Instrumented area of the imaging plane is too large

How does PID behave with a smaller number of larger diameter PMTs?

Only 7 PMTs per cell (instead of 10)

PID results with 1.5" PMTs

- Detection of a higher fraction of photoelectrons compared with 1-inch PMTs
- Good candidate if > 4 photoelectrons
- Separation is slightly worse than with 1-inch PMTs but still acceptable at the $10^{-4}$ level
- No cut on the $X^2$ yet

Monte Carlo truth

Reconstructed area

## Total cost estimates

<table>
<thead>
<tr>
<th>CKOV1 type</th>
<th>Threshold type</th>
<th>RICH type</th>
</tr>
</thead>
<tbody>
<tr>
<td>Radiator</td>
<td>Aerogel (n=1.08) 400 × 400 mm Total thickness 20 mm ~32 plates 10-mm thick</td>
<td>7241 € ($ 8605)</td>
</tr>
<tr>
<td></td>
<td>Aerogel (n=1.12) 400 × 400 mm Total thickness 20 mm ~32 plates 10-mm thick</td>
<td>10000 € ($ 11882)</td>
</tr>
<tr>
<td>PMT</td>
<td>200 mm diameter</td>
<td>Free</td>
</tr>
<tr>
<td>Mechanics and optics</td>
<td>10000 € ($ 11882)</td>
<td>10000 € ($ 11882)</td>
</tr>
<tr>
<td>Total cost (assuming a double radiator setup)</td>
<td>27241 € ($ 32357)</td>
<td></td>
</tr>
</tbody>
</table>

**Comments:** Exchange rate = 1.18812 $ for 1 €  
VAT not included

Aerogel Concept

Matsushita Samples

n=1.03

n=1.08

n=1.12

10x10x1cm³

10x10x1cm³

10x10x1cm³

Forward Transmission

\[ T_F = A \exp\{-t \frac{C}{\lambda^4}\} \text{ Rayleigh-like} \]

Forward Transmission

\[ n \quad A \quad C \]
\[ 1.03 \quad 98.99 \quad 0.041 \]
\[ 1.08 \quad 98.84 \quad 0.252 \]
\[ 1.12 \quad 96.96 \quad 0.638 \]

t(nm) sample thickness
\( \lambda \) (nm) wavelength

1 = T + A + S
T = transmitted light high in red.
A = Absorption low- we hope.
S = Scattering in the blue.

Aerogel Measurements

Conclusions

- CKOV1 can help with MICE beam pid.
- DISC design well advanced.
- Aerogel under study.
- Costs seem manageable.