

CKOV

Segmented Threshold Cherenkov Counter

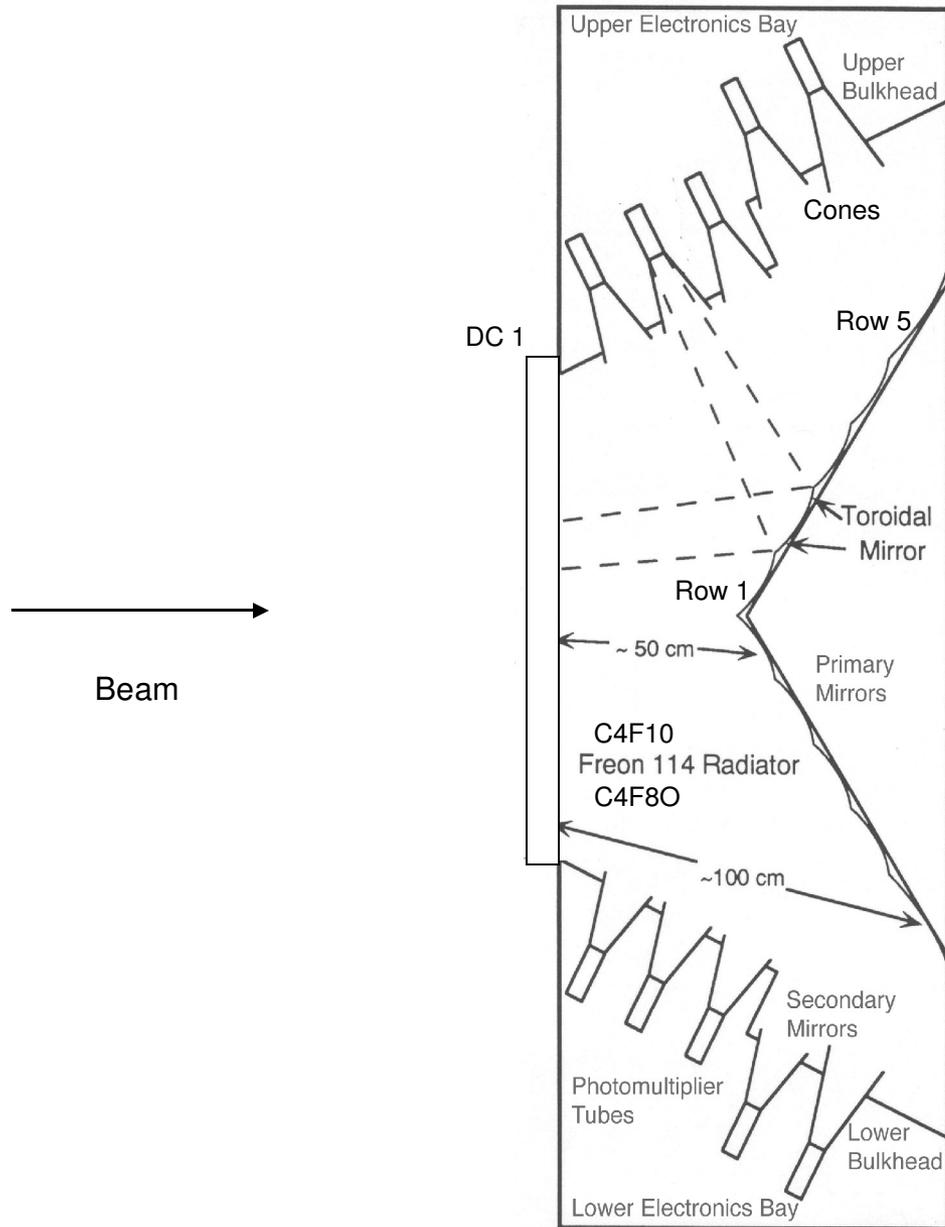
28 April 2007

W. Baker

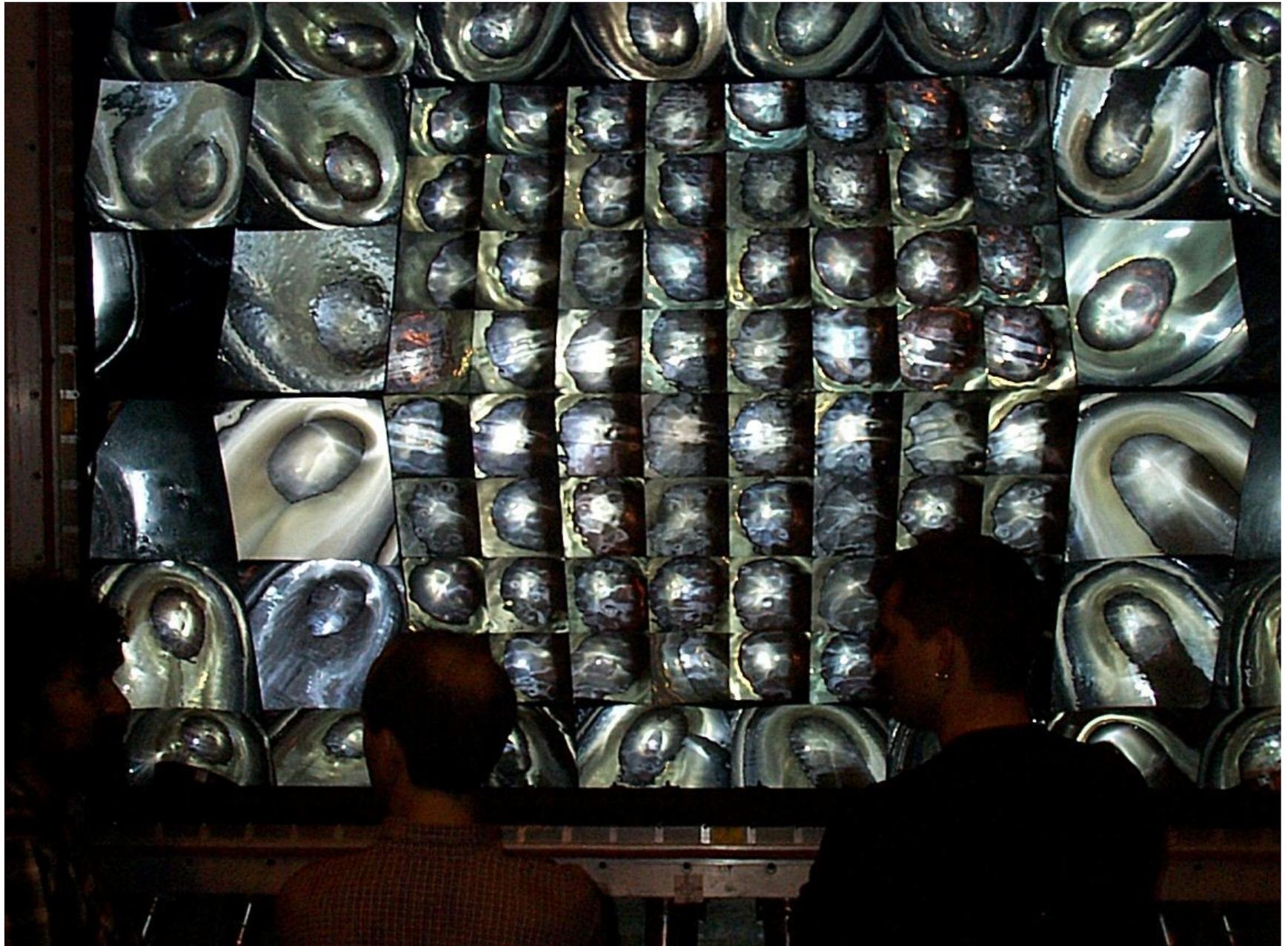
History and Performance

- 1. Built 20 plus years ago
- 2. Used in five experiments at Brookhaven and Fermilab (E766/E690/E910/E895/E907)
- 3. Originally yielded 10 to 20 photoelectrons at $\beta = 1$ depending on mirror row. (D. Christian memo of 2/15/87)
- 4. In E907 obtained 4 to 6 photoelectrons (P. Vahle presentation of 8/03/06). However, this was in mirror row 1 where E690 had 11 and where there is minimal radiator.
- 5. Do we need to do something? If so what?

CKOV Optics (vertical profile)



Beam's Eye View of Mirrors



Light Cones



Present Status

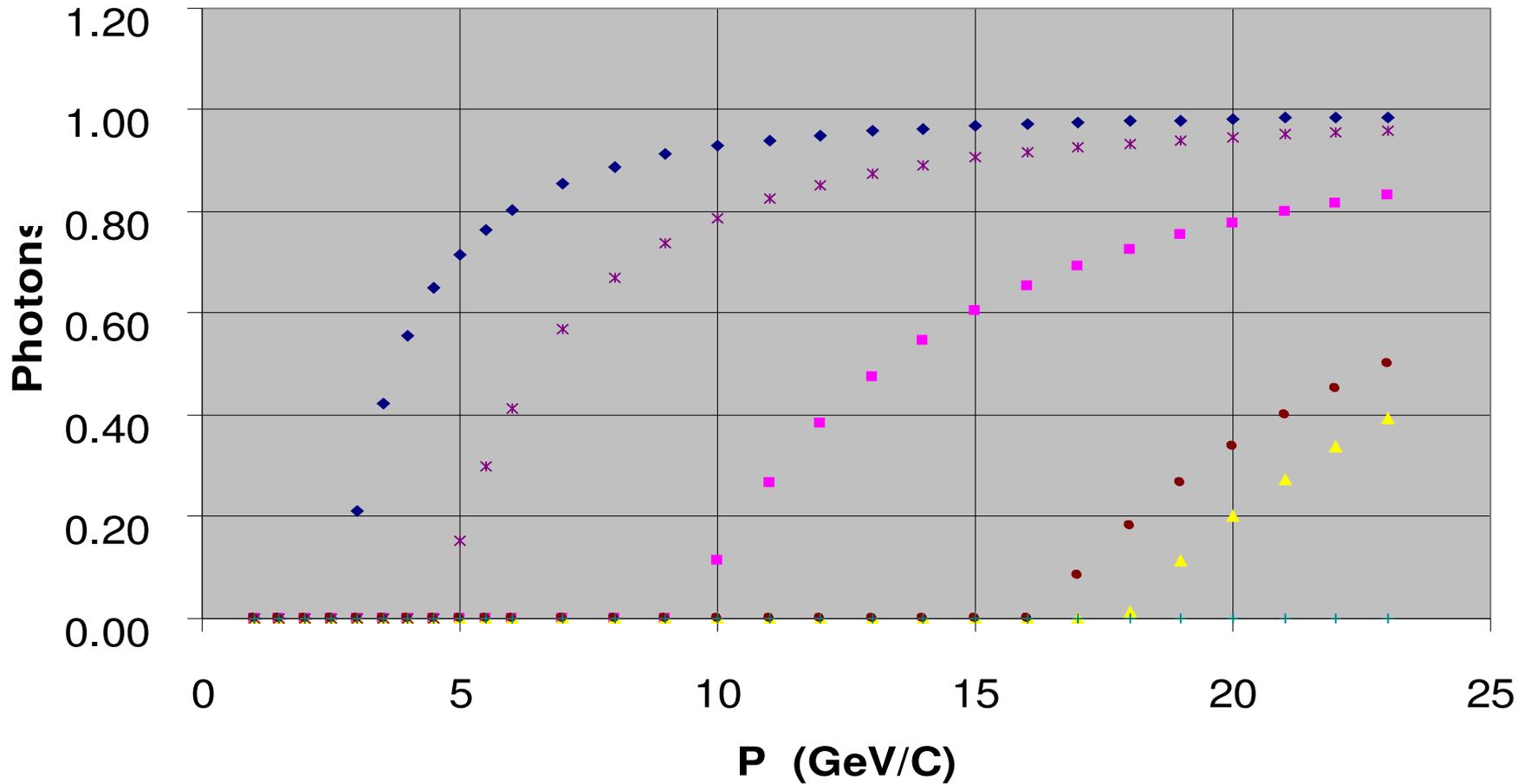
1. In position in MC7 and cabled up
2. Filled with C4F10. (?) (In future will use C4F8O)
3. Waiting for removal of DC2 and DC3

Present Plan for Moving

- 1. Roll tub containing CKOV back from JGG
- 2. Remove DC1
- 3. Purge CKOV of C4F10
- 4. Remove front window and examine/test mirrors
- 5. Separate mirrors at apex and uncable by removing high voltage cables from bases and supply cables from bulkheads
- 6. If mirrors are acceptable possibly move CKOV to downstream end of tub, otherwise move it to north end of MC7.

Thresholds in C4F8O and CO2

CKOV and RICH



◆ Pi CKOV ■ K CKOV ▲ P CKOV × - × Pi RICH ● K RICH + P RICH

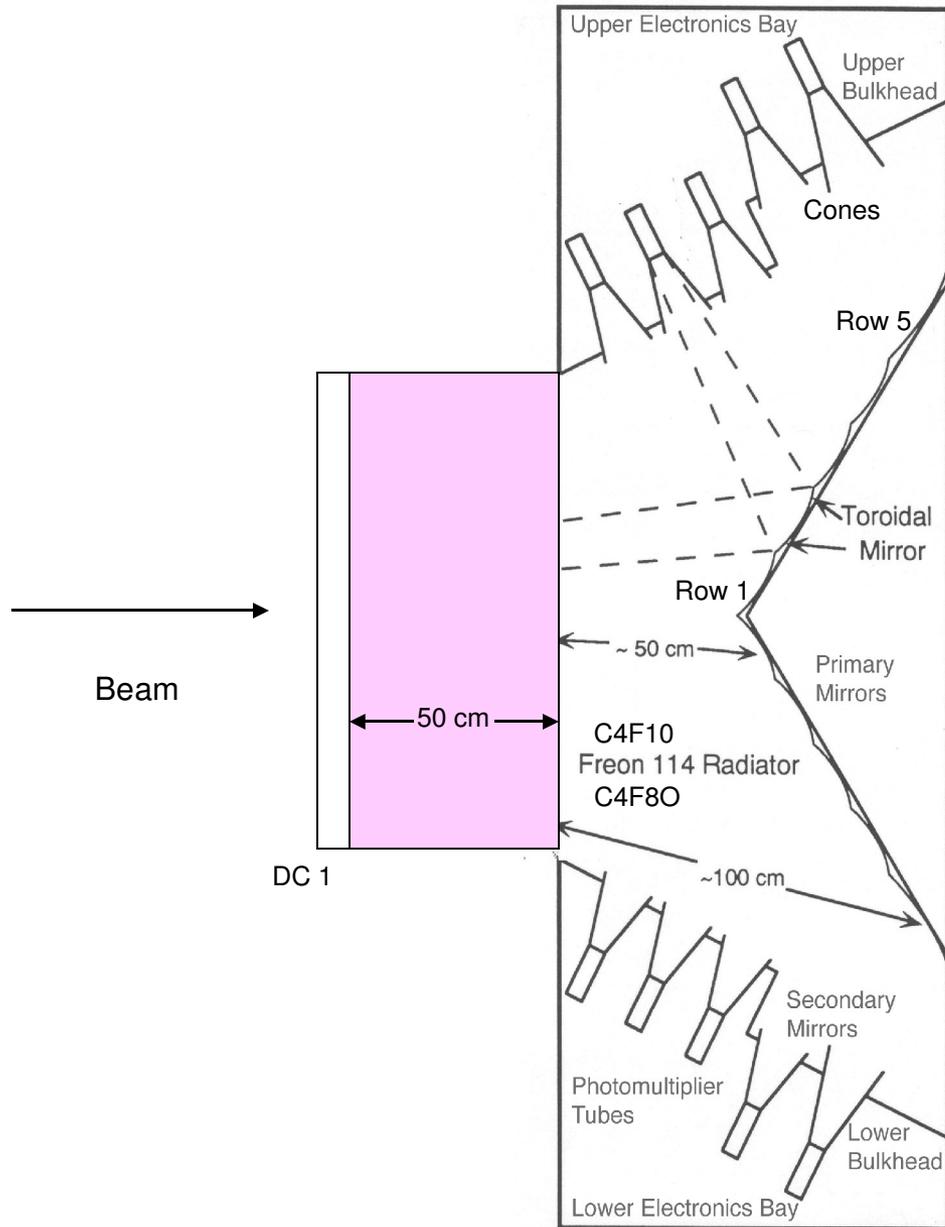
Observations

1. We need to detect light above pedestal, obviously.
2. For particles that get to RICH we do not necessarily need to do photon counting.

Possible Actions to Increase number of Photoelectrons

1. If mirrors look bad, replace the 96 toroidal mirrors with newly aluminized ones. Only 2 damaged, but it's all or none.
2. Replace all 96 2 inch glass phototubes with quartz ones. (4 or 5 faulty)
3. But, $96 \times \$X,000 = \$X00,000$
4. Or....

Lengthen the Radiator



Scattering of 5 GeV/C Pions in CKOV

- By mirrors 0.22 mr
- By mounting boards: 0.13 mr
- By 50 cm C4F8O: 0.24 mr
- Total with 50 cm C4F8O: 0.35 mr
- Total with 100 cm C4F8O: 0.43 mr
- Total with 150 cm C4F8O: 0.50 mr

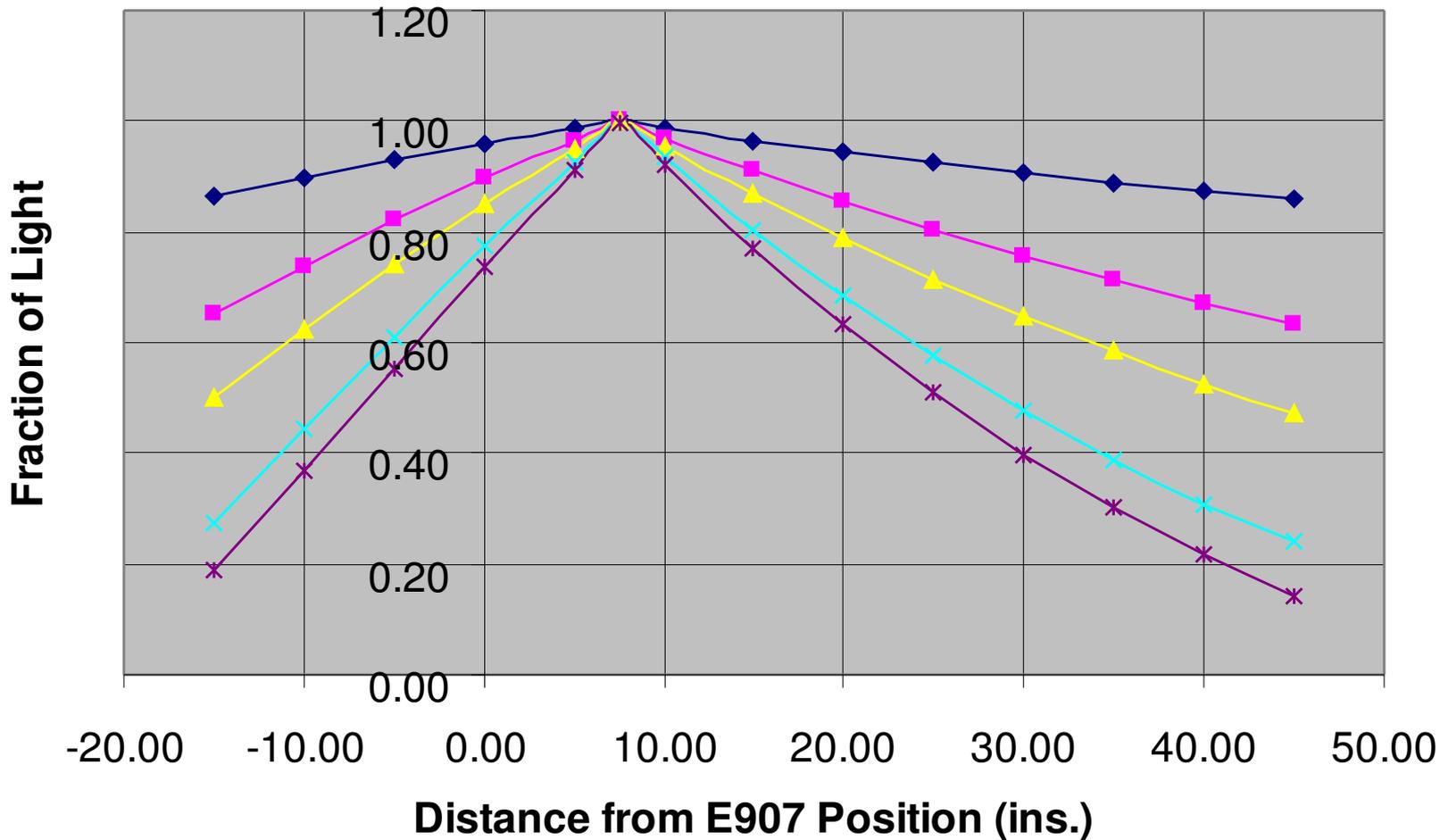
- 24% increase from 50 to 100 cm C4F8O
- 17% increase from 100 to 150 cm C4F8O

- There is a 50 cm gap available between DC2 and DC3.

- Now a different problem.....

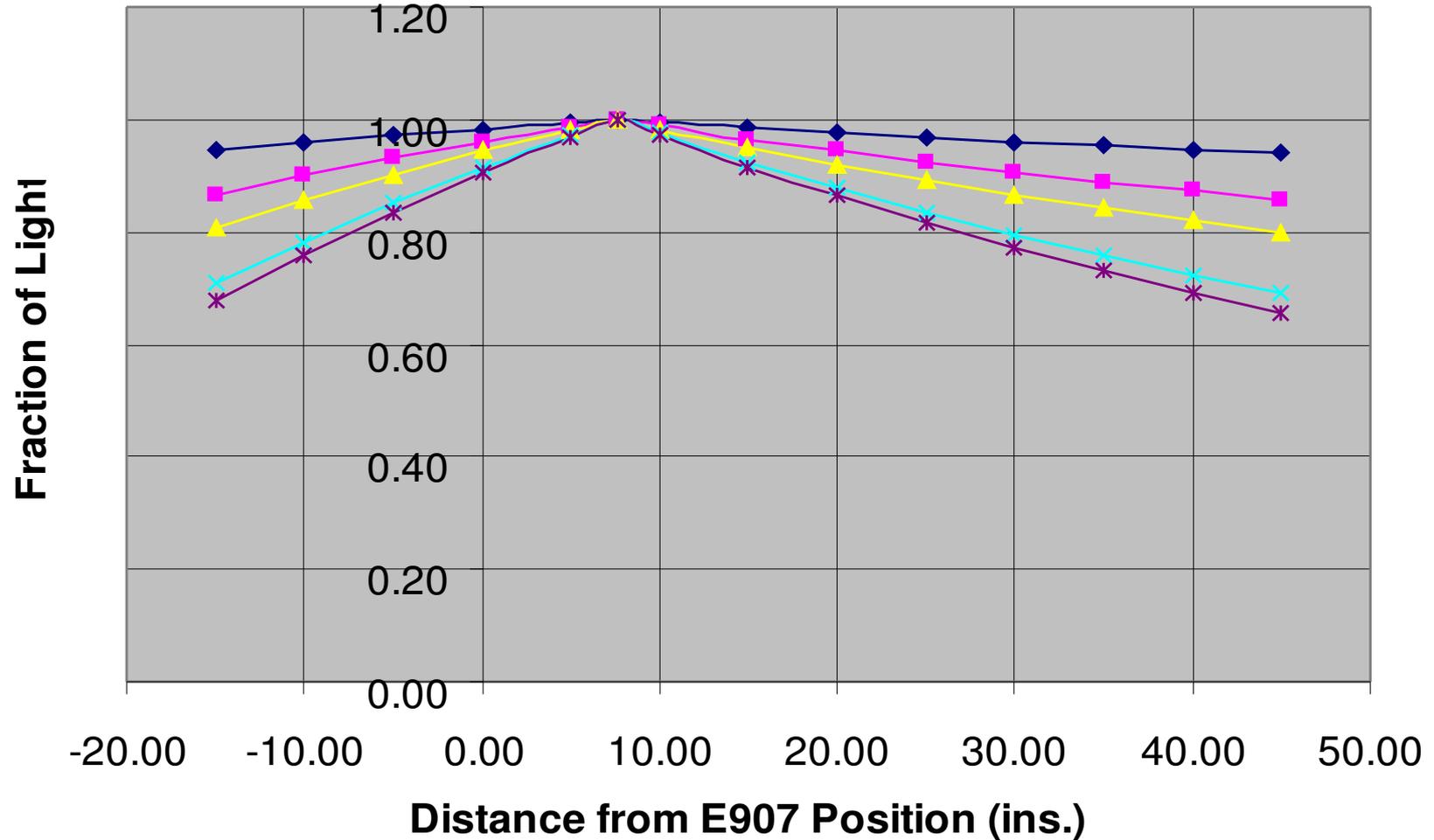
Position Dependence

Approximate Light at PMT



Position Dependence

Approximate Light at Cone



CKOV Requests

- 1. Add 50 cm extension to radiator length. This should double the number of photoelectrons from 6 in row 1 at apex to 12.
- 2. Replace 4 or 5 faulty phototubes.
- 3. Repair any gas leaks.
- 4. Do not increase distance to target.

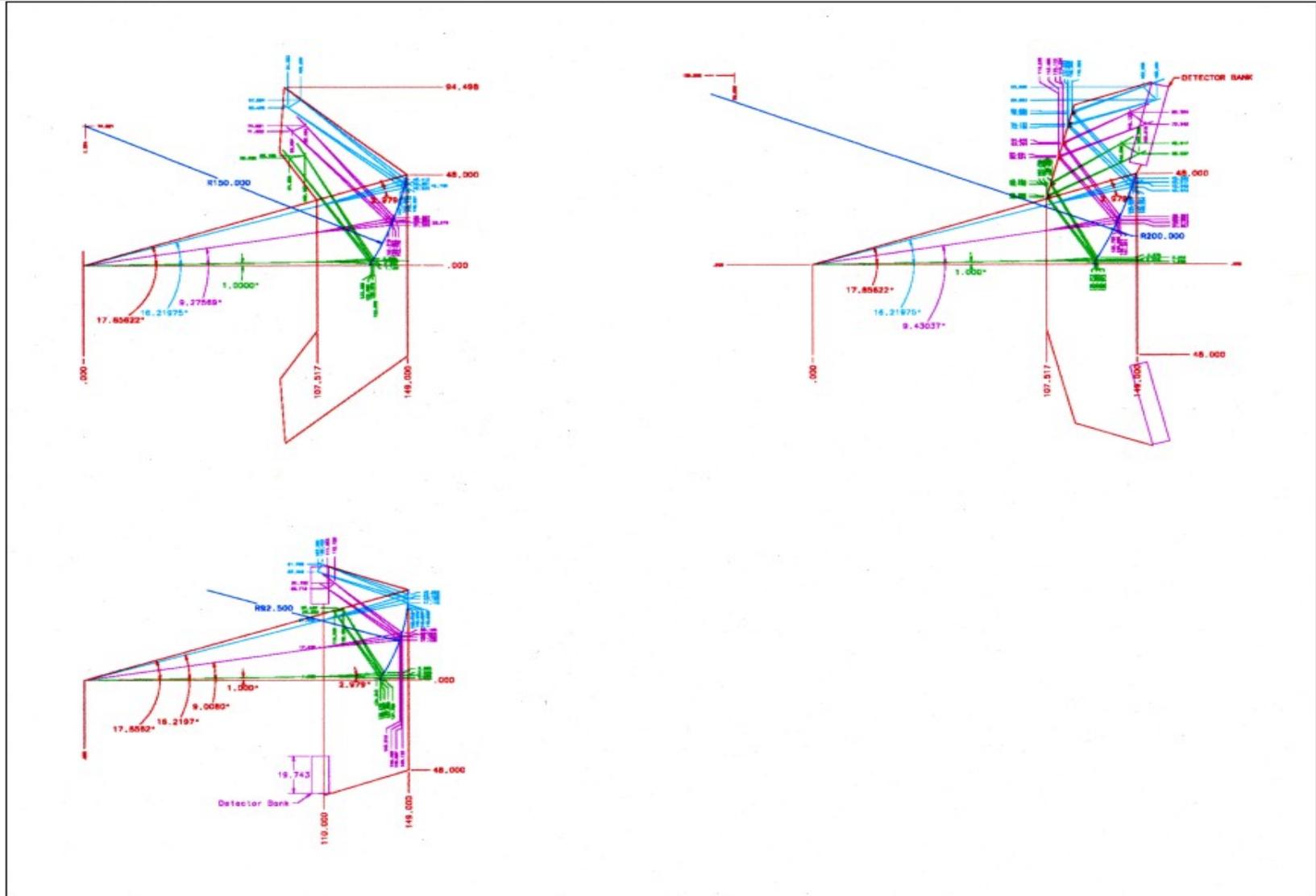
RICH Ideas

- Hamamatsu H9500: 256 channel multi anode photomultiplier tube
 - 1. Possibly good economics
 - 2. 89% active area
 - 3. “Peak to valley ratio for a single photoelectron is not very good on all channels.” Not suitable for a RICH says Hamamatsu.
- 64 channel tubes have less % active area and are not as cost effective. Burle says they will introduce a microchannel plate PMT this summer with good active area. Suitable for RICH counters says Burle.
- Pixelated GEM. Not an off-the-shelf item. Will need large area depending on focal length chosen. Need GEM experts to pursue.
- Lengthening radiator a much less expensive proposition than RICH.
- But a few preliminary optical designs for a RICH have been considered. Choice would depend on photon detector and further study.

Preliminary Optical Studies

(Drawn by Herman Cease)

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Start

C:\Documents and ...

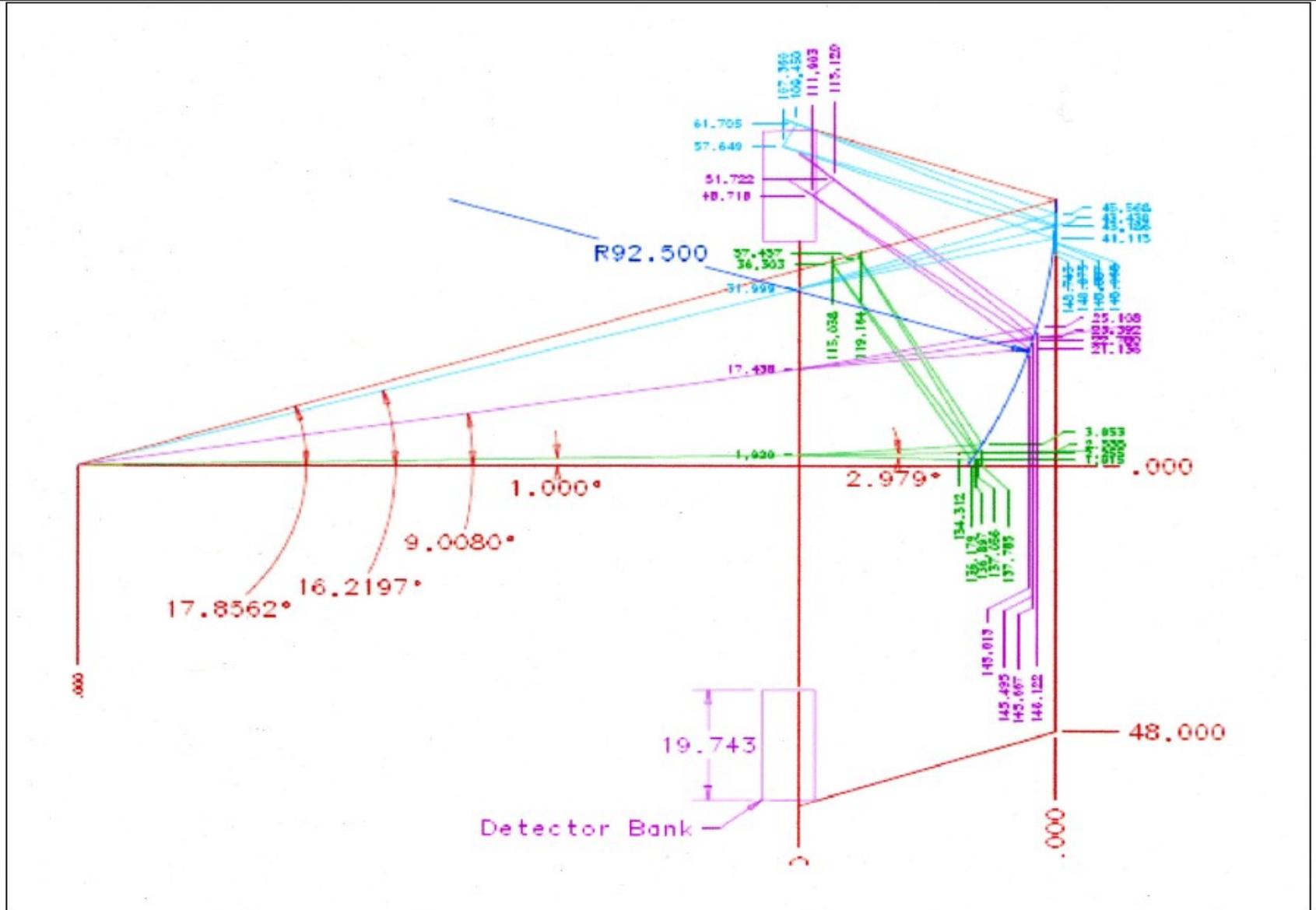
My Computer

File0098.bmp - ...

5:01 PM

In the Box, $f = 46''$

File0095.bmp - Windows Picture and Fax Viewer



With Horns, $f = 75''$

