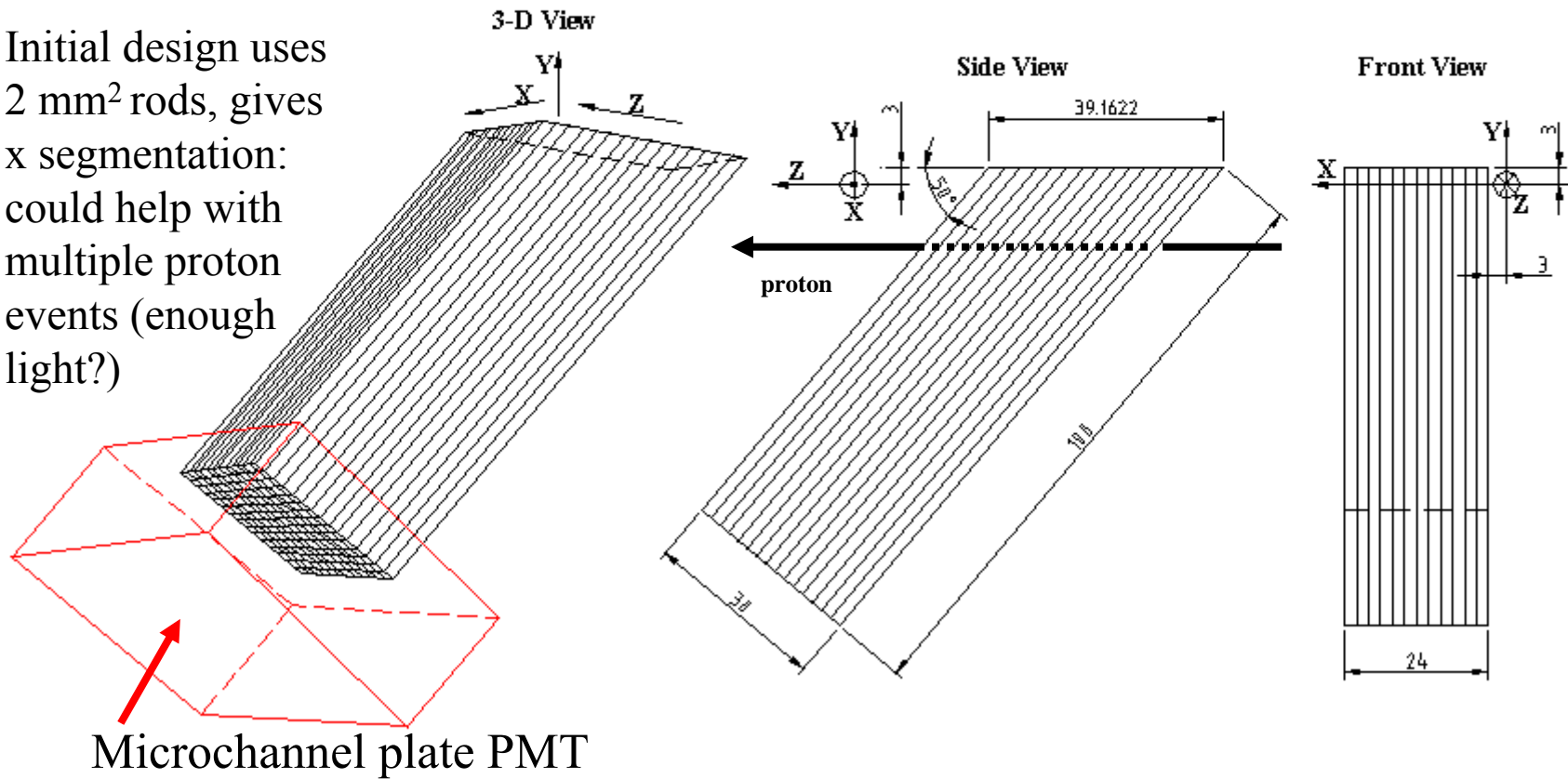


QUARTIC

**Preliminary UTA drawing
of Mike's concept for
a fast time resolution
Cerenkov counter:**

Initial design uses
2 mm² rods, gives
x segmentation:
could help with
multiple proton
events (enough
light?)



Cerenkov light in quartz:

$$\cos \theta_{ch} = \frac{1}{\beta n}; \text{ we have } \beta=1 \Rightarrow \cos \theta_{ch} = \frac{1}{n}$$

$n(\lambda) = 1.54$ for quartz ... for sim. use $n(\lambda)$

$\theta_{ch} = 49.5^\circ$... put bars at this angle or optimum(λ)

$$\text{PDG: } N_{pe} = L \frac{\alpha^2 Z^2}{r_e m_e c^2} \int \epsilon_{coll}(E) \epsilon_{det}(E) \sin^2 \theta_{ch}(E) dE$$

$$\Rightarrow N_{pe} \approx 90 \text{ cm}^{-1} L \langle \sin^2 \theta_{ch} \rangle = 52 \text{ cm}^{-1} L$$

Photon energy

Proposed design $L \sim 4$ cm so ~ 200 pe

but each 2x2 mm bar effectively 2.6 mm $\rightarrow \sim 13$ pe

(but this assumes 27% QE and whole cone of light!)

What happens if go to 4x4 (6x6) mm bars?

Note: 6x6 is standard pixel on Burle 85011 MCP

Simulation in progress at UTA, Alberta: Light at photocathode fn(time), with folded Cerenkov light, transmission, quantum efficiency all fn (wavelength). Getting vendor quotes: \$3-4k for fused silica; \$4.3K for Burle MCP

Jobs and choices:

1. Design

Concept: bars, plates, block, fibers, other? (**GASTOF Louvain**)

Simulations: full Geant (Yushu Yao, Alberta), ray tracing (Noyola, Harenza UTA)

Optimization

2. Radiator

Fused silica, quartz other?

Surface treatment: aluminization (can be done at Fermi, but not polishing)

3. Photodetector

Microchannel plate (MCP): Hamamatsu, Burle, other?

Avalanche photodiode (APD) ? other ? contacted Swain

4. Assembly and mounting (Alberta+20% UTA?)

Engineering and manufacture (including motion control)

5. Electronics (Alberta?)

Front end

Read-out

} Needs investigation

HV and slow controls

Jobs and choices (continued):

6. Software

Controls (?)

Readout (Alberta)

Data analysis (UTA+Alberta)

7. Test Beam

Integration with BTeV/CMS test setup

Effort

MOU

GOAL: test \geq two identical counters in Fermilab test beam in June 2006.

Funding: some available from Alberta, UTA+FNAL requests in progress