

Plans for Solid Čerenkov Detector

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- *Reference Detector Design*
- *Test Plans and Schedule*
- *Personnel and Funding Options*
- *PMT Options for Quartz Detector*

Solid Čerenkov Detector

- *Purpose:*

- provide *additional* and efficient *electron detection*
- sufficient *position resolution* to support limited *tracking* back to the target cell

- *Reference design:*

- *X-Y Lucite ($n = 1.49$) Čerenkov Hodoscope* operating in *total internal reflection* mode
- *X - ($1.25 \times 80.0 \times 12.5 \text{ cm}^3$) 16 bars*
- *Y - ($2.50 \times 12.5 \times 160. \text{ cm}^3$) 8 bars*

- *Position Resolution:*

- for a ($12.5 \times 12.5 \text{ cm}^2$) square area $\sim 3.6 \text{ cm}$

- *Number of Photoelectrons:*

- *Temple/Hampton Lucite detector $\sim 18 \text{ PE's}$ as $\beta \rightarrow 1$*

Plans Status and Schedule

- *Prototype Detector Tests:* *Nov'04 - Jan'05*
 - *get PE yields with Lucite from cosmics or in-beam tests*
 - *procure a single quartz bar and do PE tests*
- *Material decision:* *Feb'05*
 - *Lucite, Quartz, or high-index Glass*
- *Final design and procurement:* *Mar'05 - Aug'05*
- *Detector construction:* *Sep'05 - Jan'06*

Personnel and Funding

- *Personnel:*
 - *Addition of a **postdoc** (part time) from UVA*
- *Cost estimate and funding:*
 - ***Lucite** with borrowed electronics and Hall C engineering support **~ \$50k***
 - ***Quartz** **~ \$150k***
 - ***need to seek external funding***
 - *will have **\$50k** from Hampton PFC for half postdoc*

PMT Options for Quartz Detector

- *Silicon PMT:*
 - *novel type of APD*
 - *insensitive to magnetic fields*
 - *high gain $\sim 10^6$*
 - *good quantum efficiency $\sim 66\%$ at $\lambda = 550 \text{ nm}$*
 - *excellent timing resolution $\sim 120 \text{ ps}$ for single photoelectron detection*
 - *fast risetime $\sim 1 \text{ ns}$*
 - *achieves good dynamic range $\sim 10^3/\text{mm}^2$*
 - *does not exhibit any serious radiation damage effects*
 - *low bias voltage $\sim 50 - 60 \text{ V}$*
- *SiPM's performance comparable to a traditional PMT*