

*Forward Tracking Hodoscope
Status Report*

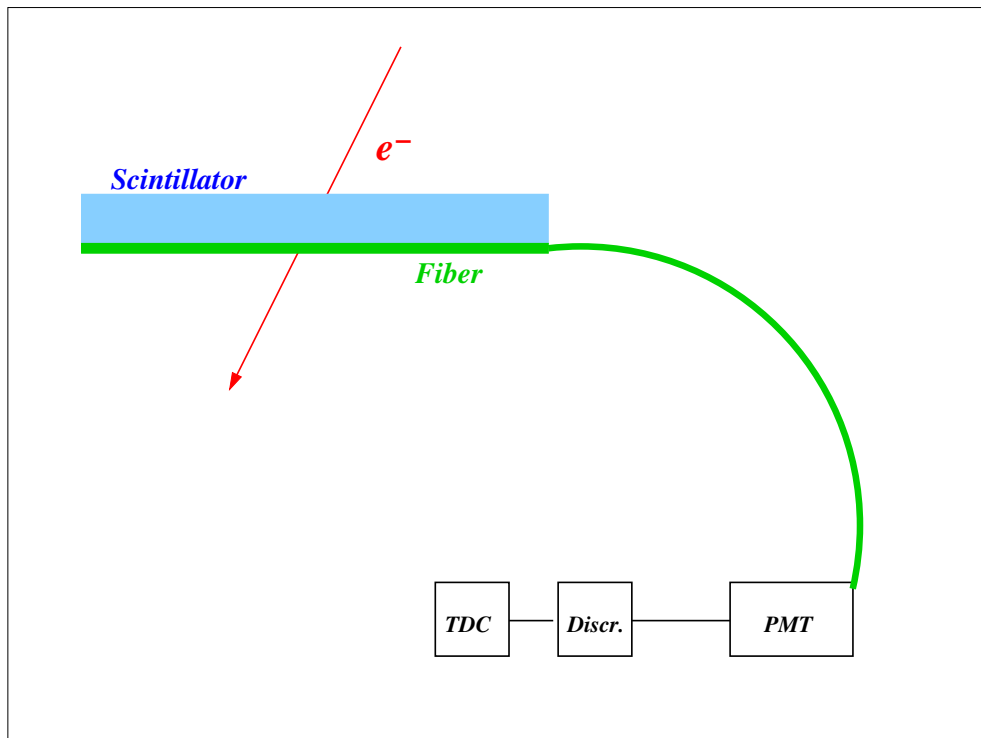
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SANE Collaboration Meeting XII
December 1, 2006*

Tracking Hodoscope Design

- *Bicron BC-408 Plastic Scintillator ($\lambda_{emit} \sim 425$ nm) 3 mm \times 3 mm square bars.*
- *Bicron BCF-92MC blue-green WLS Fiber ($\lambda_{abs} \sim 415$ nm, $\lambda_{emit} \sim 492$ nm) 1.2 mm \varnothing , 2.5 m long.*
- *Located 50 cm downstream of target directly in front of gas Čerenkov.*
- *Size: 40 cm (vertical) \times 22 cm (horizontal)*
- *Position resolution: $\sigma_y \sim 0.9$ mm*
- *133 bars along vertical and 73 along horizontal.*
- *Two Y planes offset by 1.5 mm for redundancy (266 bars).*
- *One X plane (73 bars).*
- *Total of 339 bars.*
- *WLS fiber glued on the surface along length of each bar.*
- *Bar/Fiber unit wrapped with Al-mylar and Tyvek/Tedlar.*

Readout System

- *Single-ended readout system with multianode PMT.*
- *Discriminator plus a TDC per channel.*
- *Expected total rate from (events + bgnd.) $\sim 3\text{-}4$ MHz, ~ 10 kHz per counter.*



- *Hodoscope will not be included in the trigger.*
- *Software coincidence of offset Y-planes for reliability.*

Readout System - Multianode PMT

- *Hamamatsu H7546B 64-channel multianode PMT*

HAMAMATSU

MULTIANODE
PHOTOMULTIPLIER TUBE ASSEMBLY
H7546B

**8 × 8 Multianode, High Speed Response, Low Cross-talk
30 mm Square, Bialkali Photocathode, 12-stage, Head-on Type**

GENERAL

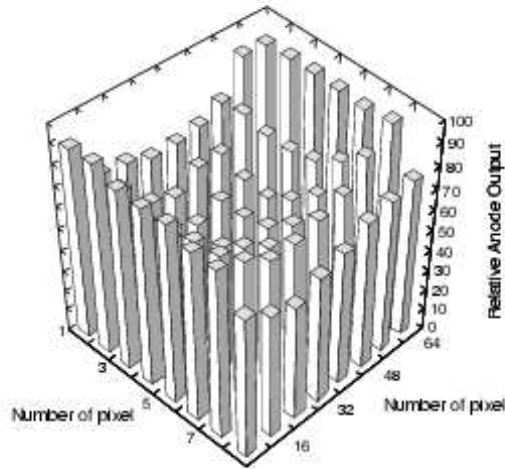
Parameter		Description / Value	Unit
Spectral Response		300 to 650	nm
Wavelength of Maximum Response		420	nm
Photocathode	Material	Bialkali	—
	Minimum Effective Area	18.1 × 18.1	mm
Window Material		Borosilicate glass	—
Dynode	Structure	Metal channel dynode	—
	Number of Stages	12	—
Anode Size		2 × 2	mm
Weight		Approx. 60	g
Suitable Socket (Supplied)		SD-108-T-22, SS-101-T-22, ASP-24307-02	—
Operating Ambient Temperature		-30 to +50	°C
Storage Temperature		-30 to +50	°C

MAXIMUM RATINGS (Absolute Maximum Values)

Parameter		Description / Value	Unit
Supply Voltage	Between Anode and Cathode	-1 000	V
Average Anode Output Current in Total		0.023	mA

Hamamatsu H7546B Characteristics

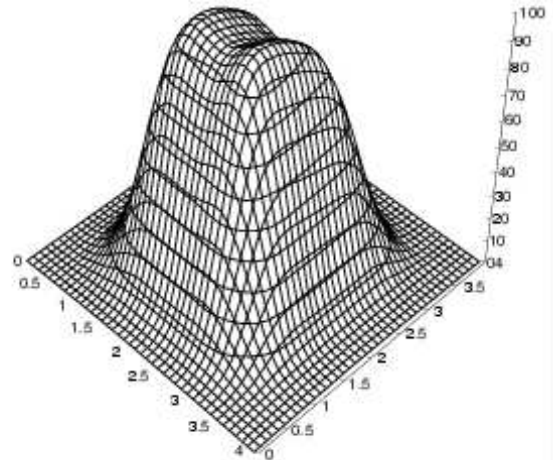
Figure 5: Typical Anode Uniformity



Each pole corresponds to each pixel of 64 anodes.
 APPLIED VOLTAGE = -800 V
 LIGHT SOURCE = W LAMP (DC LIGHT)
 (Full illumination on Photocathode)

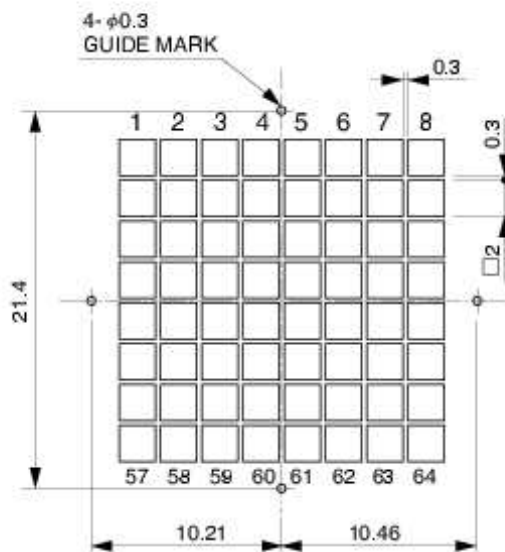
TPH-0072-B

Figure 6: Anode Uniformity of One Pixel



TPH-0072-A

Figure 7: Anode Matrix and Guide Mark



Anode Pattern

TPH-0072-C

GUIDEMARK

The guide marks are holes of 0.3 mm in diameter on the electrode plate. They can be seen from top of the H7546B through its photocathode. They can be used for positioning when scintillating or optical fibers are coupled to the H7546B.

Cost of Hardware

- *Hamamatsu H7546B PMT*
(\$1800 per unit × 5) ~ \$9.0 k
- *BC-408 scintillator - Y plane*
(\$33 per bar × 133 bars × 2) ~ \$8.8 k
- *BC-408 scintillator - X plane*
(\$42 per bar × 73 bars × 1) ~ \$3.1 k
- *BCF-92MC WLS fiber*
(\$5.60 per fiber × 339 fibers) ~ \$1.9 k
- *Total ~ \$23 k*

Current Status

- *Purchase orders for all scintillators, fibers, and PMT have been placed.*
- *5 Hamamatsu H7546B PMT at JLab.*
- *Delivery of 70 BC-408 scintillators and BCF-92MC WLS fibers for a Y-plane expected by next week.*
- *Delivery of 300 scintillators and WLS fibers expected in January, 2007.*
- *Discriminators and TDC's to instrument all channels available from Hall C.*
- *Need to acquire signal cables for all channels.*
- *Build a prototype 64-channel Y-plane by January, 2007.*
- *Proposal for prototype test with pions in SOS during E04-01/E06-09 in April, 2007.*
- *Build the complete hodoscope during summer, 2007.*