

Updates to the Proposal to Install Four Lightguide Detectors in μ BooNE

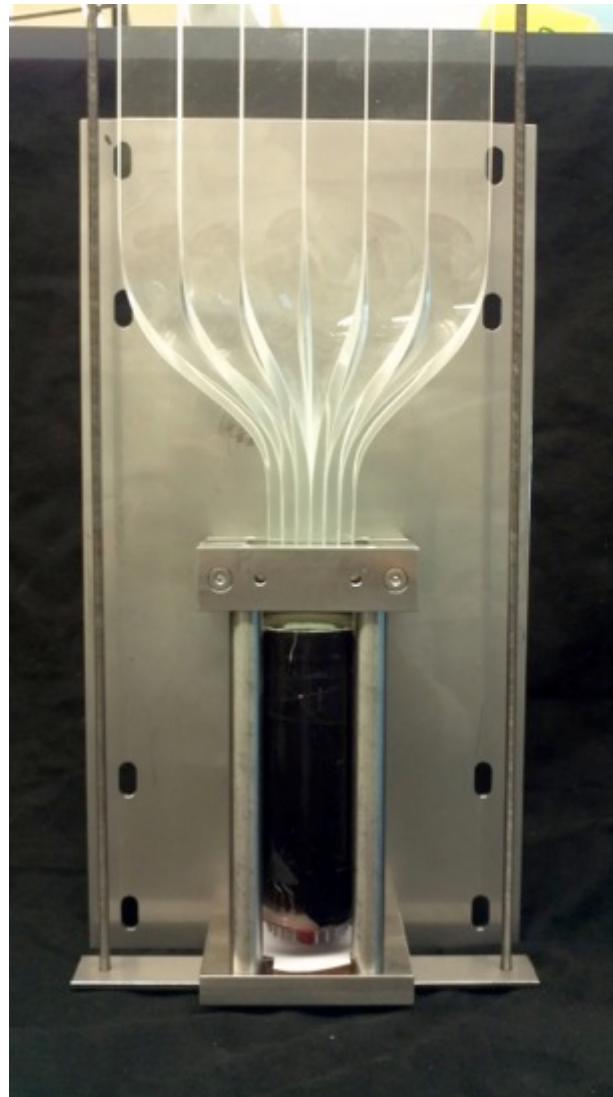
M. Toups, on behalf of the PMT Group

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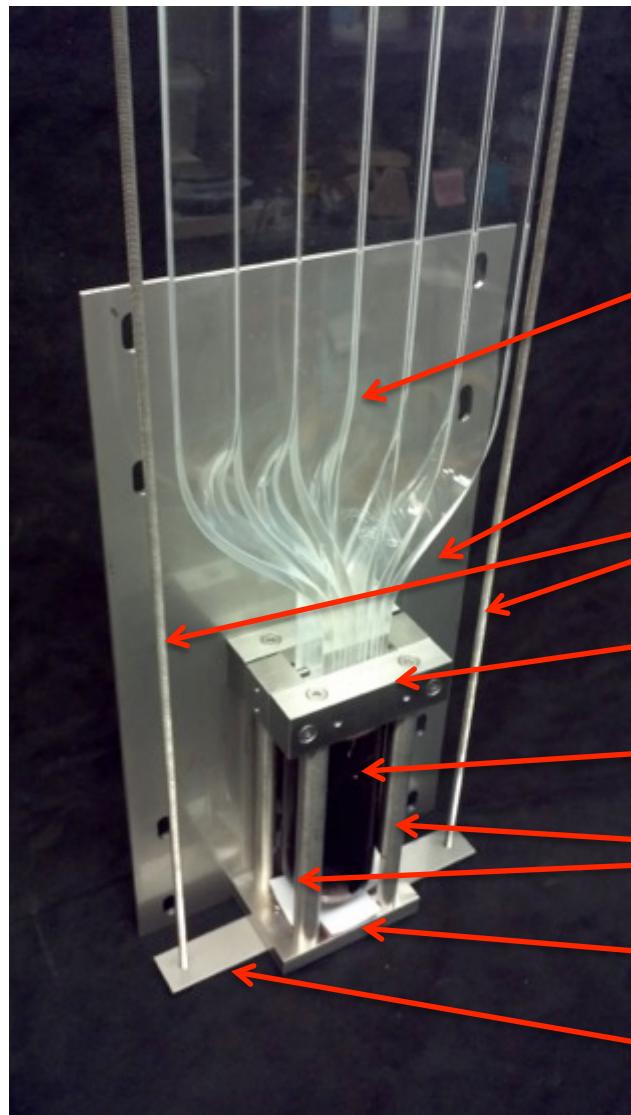
Introduction

- At last collaboration meeting, we proposed introducing four lightguide detectors (“paddles”) into μ BooNE detector (DocDB-2426)
 - μ BooNE PMT feed-through and electronics are designed to accommodate 40 channels of which only 32 are being used
 - Lightguides, PMTs, PMT bases, and mounts for 4 lightguide detectors have already been procured/produced
- In response, several items were raised by the collaboration:
 - Use stainless steel parts for the PMT paddle mounts
 - Test the acrylic bars in the Materials Test Stand
 - Review the 2” PMT base design
 - Determine how the paddles will be installed in μ BooNE

Stainless Steel Paddle Mount



PMT Paddle Mount Overview



Note: All mount materials are stainless steel unless otherwise indicated

Acrylic adiabatic light guide (paddle)

Back plate to mount to PMT rack

Threaded rods attach to top of paddle

Collar pinches paddle in two directions

2" PMT (mock PMT shown)

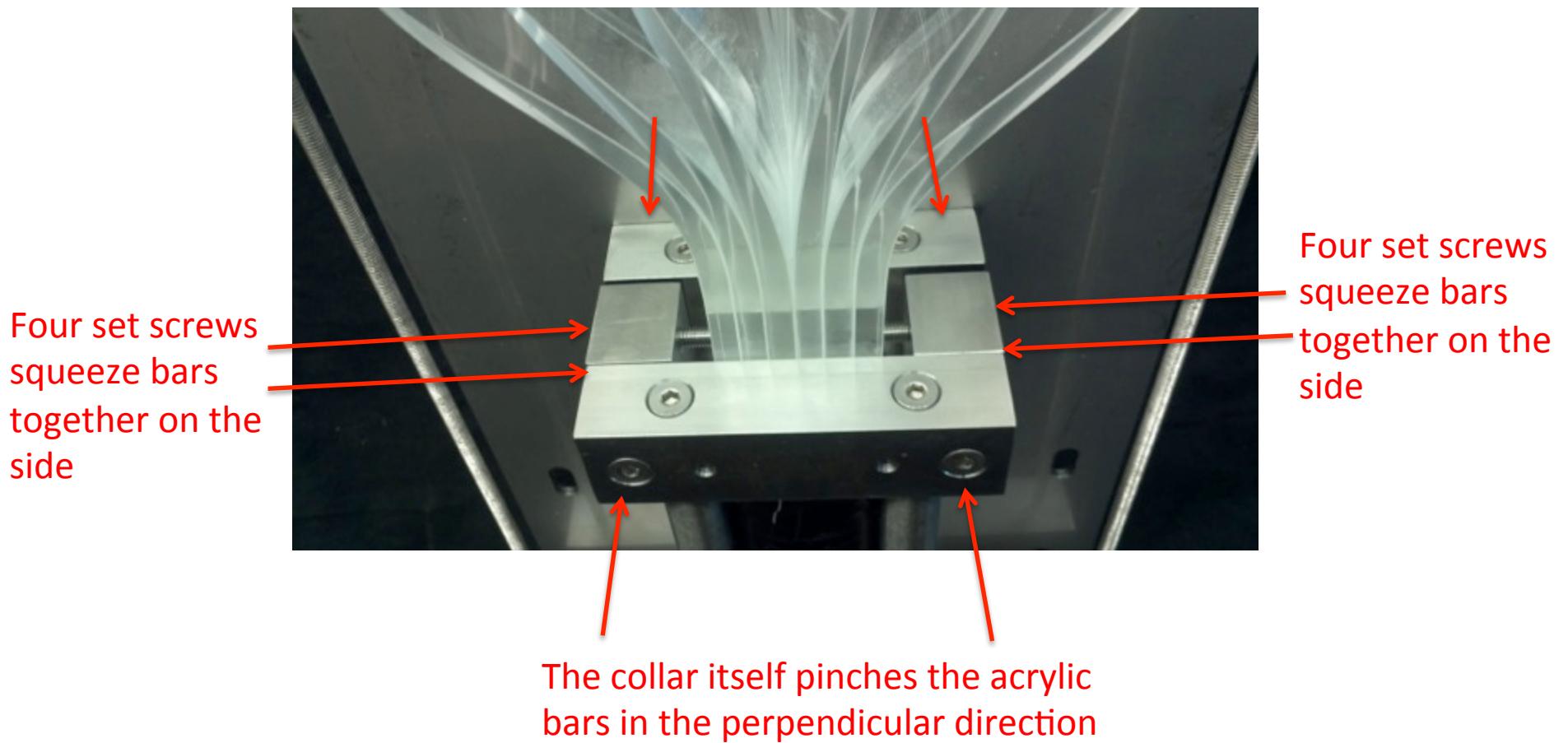
PMT loosely constrained by 4 bars

Bottom plate prevents PMT from falling out

Bottom plate extension for rod attachment

Detailed Collar View

Collar consists of four separate pieces held together by four counter-sunk screws

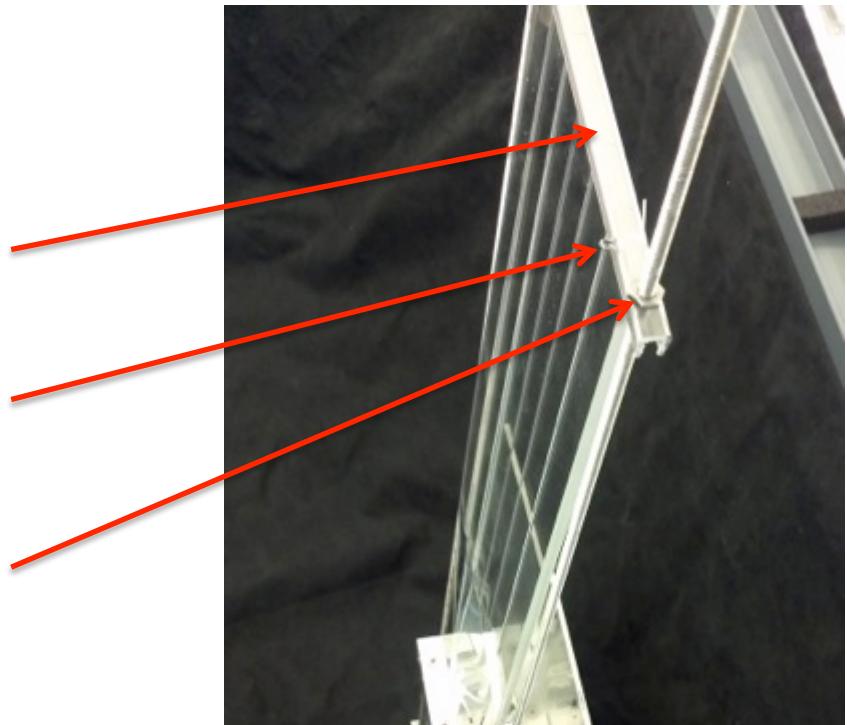


Top View

A polycarbonate channel slips over top of acrylic bars and keeps them aligned

A cotter pin through a hole in the outermost bar fastens the channel to the paddle

The threaded rod fits in a clearance hole in the polycarbonate channel and is fastened with a nut



Bottom View

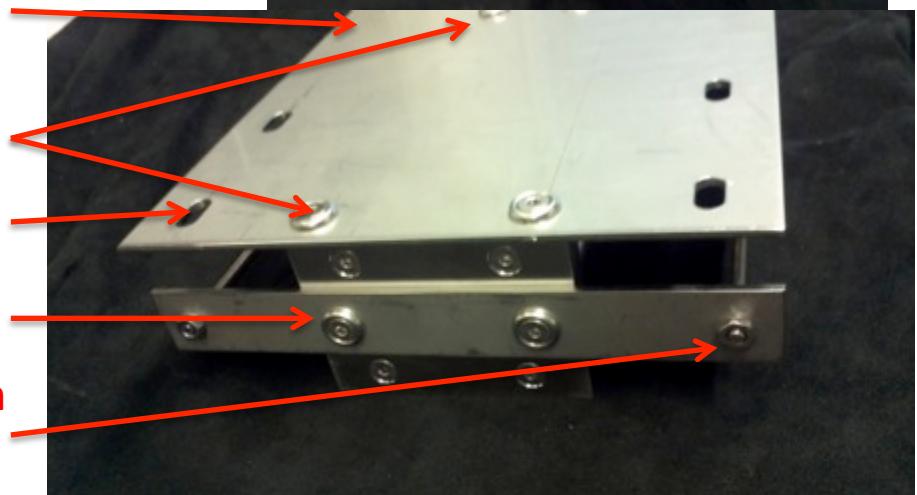
Back plate is same design as for PMT mount

Back plate attaches to collar and bottom plate with four screws

Slotted holes for U-clamps to attach to PMT rack

Bottom plate extension screws into bottom plate

Threaded rods screw into bottom plate extension and are secured with a lock washer and nut



Test Acrylic Bars in Materials Test Stand

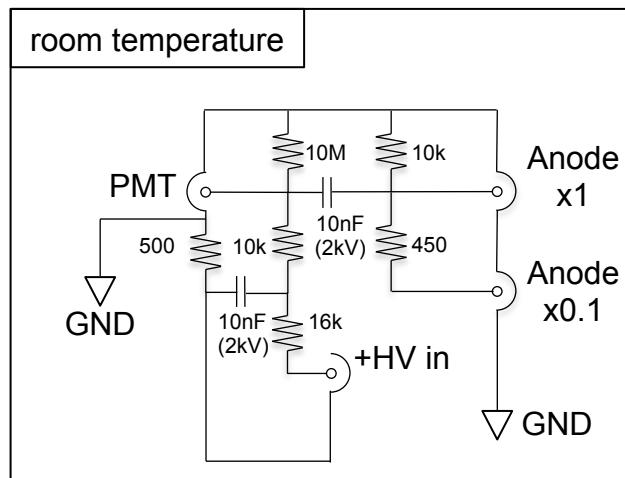
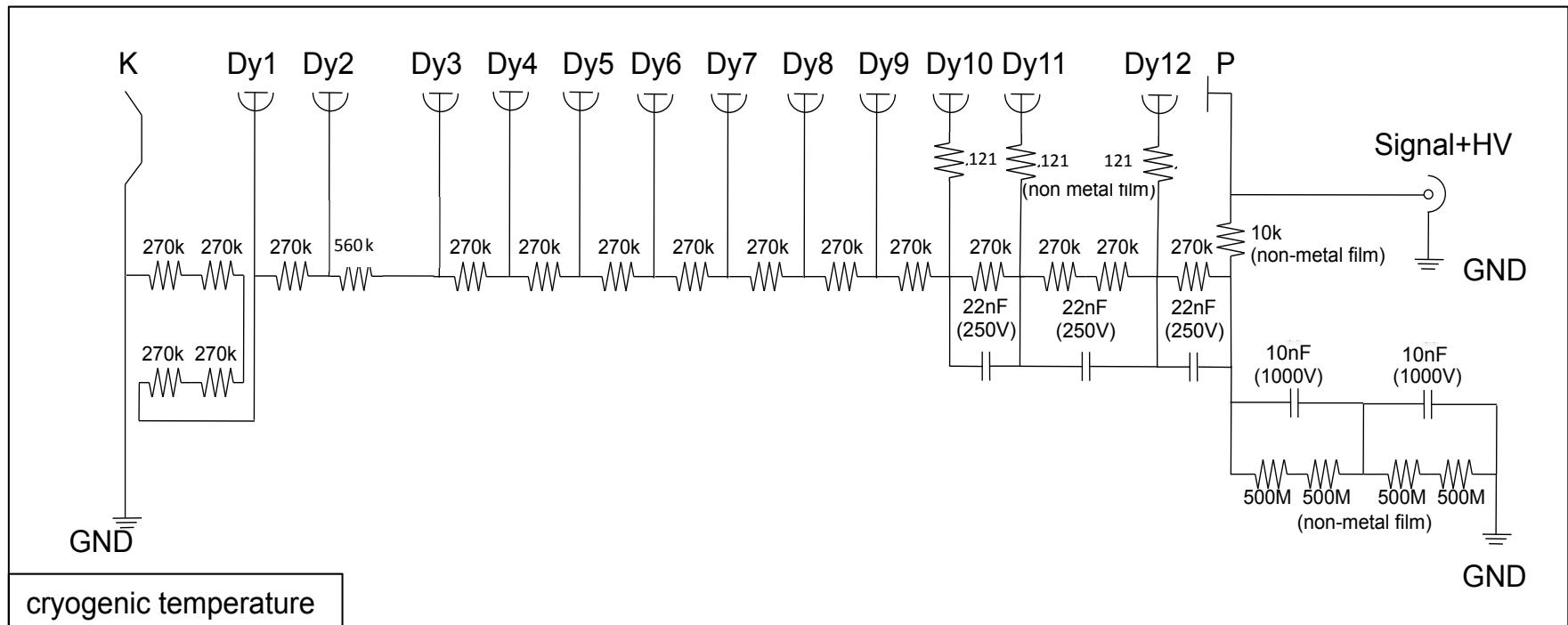
PAB Materials Test System	
Date of Receipt	9/15/2010, logbook entry # 1342
Sample Name/Description	TPB thin TPB layer on acrylic plate cut into 8 pieces
Sample	
Composition:	50% of tetraphenyl butadiene (organic scintilator)+50% polystyrene on acrylic
Picture Location:	Data Base
Weight:	38.6 g (acrylic plates with TPB layer)
Dimensions/Area:	200 cm ²
Source:	Teppel Katori
Preparation:	cleaned with air
Submerging in LAr or LH2	no
Time in the airlock(hrs)	25 h
Purge:	8/3/10 24 h purged from the bottle and 1 h from Luke
Vacuum:	
Room Temperature	
Start Time/Date, End Time/Date :	8/3/10 3:30 pm , 8/4/10 3:20 pm
PrM run # :	9516
Condenser state:	on
Filter state:	off
O2 reading:	x
H2O reading:	from 10 to 1000 ppb in 1 h, then fluctuating 600-1600 ppb
Lifetime:	from 10 ms to 0.7 in 17 hours
Liquid Test	
Start Time/Date, End Time/Date :	9/4/10 9:15 pm, 9/8/10 1:25 pm
PrM run # :	9687
Condenser state:	on
Filter state:	off
O2 reading:	x
H2O reading:	13-16 ppb
Temperature:	98 K
Lifetime:	dropped from 11 to 2 ms then recover to 6 ms in 12 h
Liquid level :	25 inches
Vapor Test	
Start Time/Date, End Time/Date :	9/8/10 1:25 pm, 9/9/10 10:40 am
PrM run # :	9776
Condenser state:	off
Filter state/settings:	off
O2 reading:	x
H2O reading:	280-320 ppb
Temperature:	240 K
Lifetime:	10 ms
Results/comments	

TPB-covered acrylic already tested for μ BooNE PMT system

Nonetheless, additional pieces of TPB-covered acrylic for paddles are in materials test stand queue

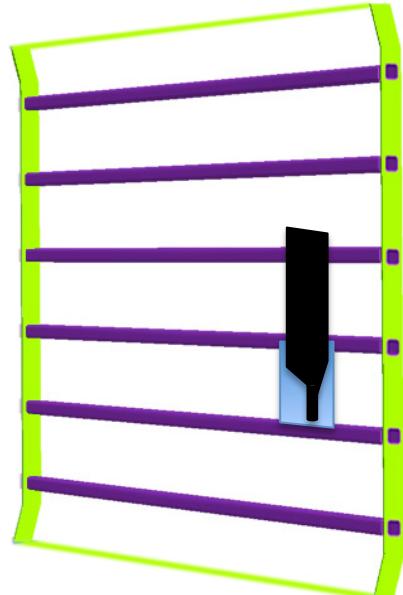
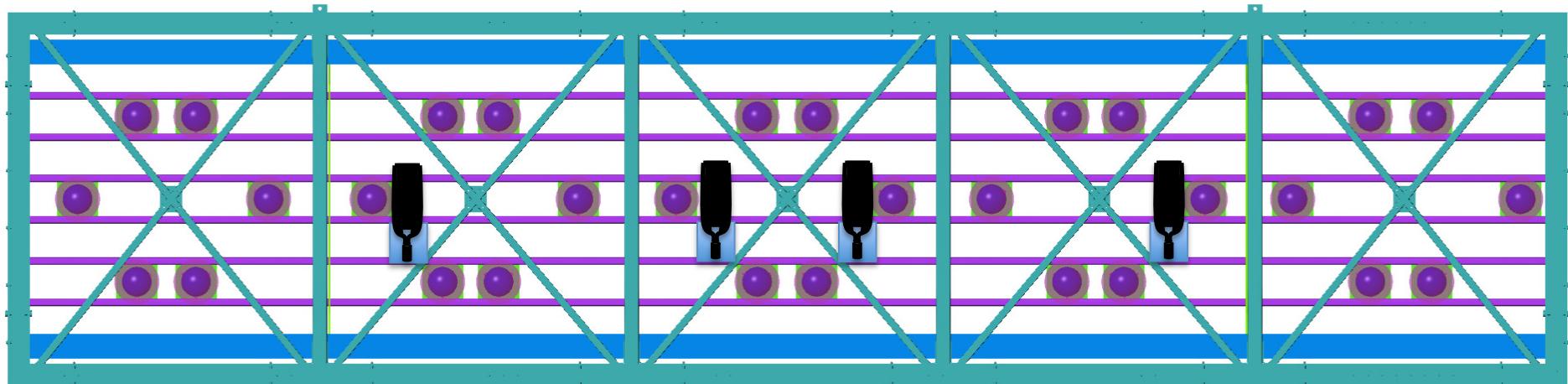
PMT paddles are a small contribution to the amount of acrylic already going in μ BooNE

2" PMT Base Design Sent to Linda Bagby (DocDB-2495)

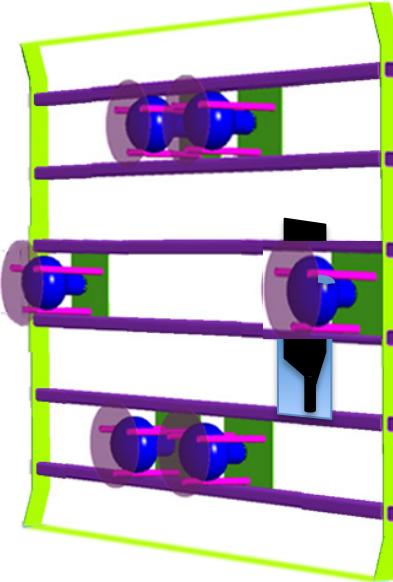


title: Hamamatsu R7725mod voltage divider
 drawing: Teppei Katori (katori@fnal.gov)
 date: 04/08/10
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How would PMT Paddles Be Installed In μ BooNE?



→
Paddles lie flat
against PMT rack
in front of bars

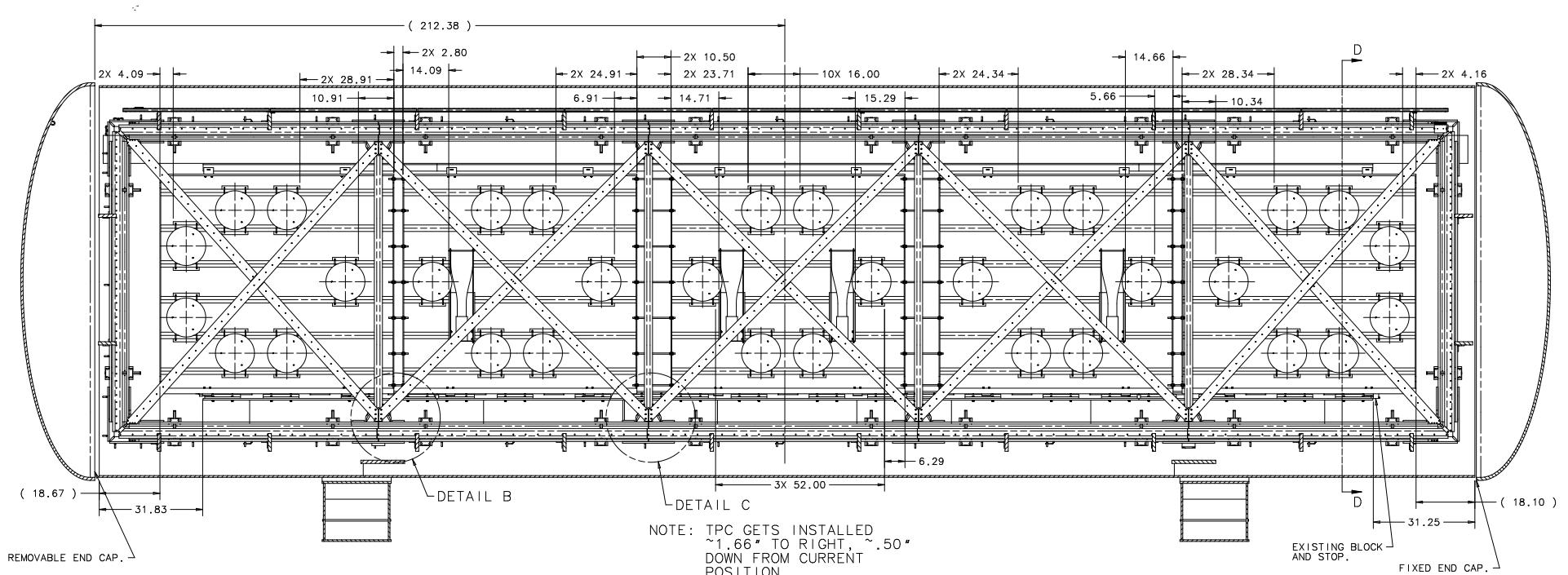


PMT Paddles Were A Part of PMT “Mock Installation”

- PMT installation time is dominated by time to mount and install PMT racks and spacers
 - Installing 4 lightguide detectors is a negligible contribution to PMT installation time



PMT Paddles Have Been Integrated Into PMT Rack Drawings



R. Reinert

Conclusions

- We propose to install 4 lightguide detectors in μ BooNE pending successful test results from the Materials Test Stand and a PMT base design sign-off from Linda Bagby
 - PMT paddle integration seems to be easily accommodated by current μ BooNE design
 - Questions raised by the collaboration have been addressed (or are being addressed)