

PHYS475 Design Review

J. Bynes, B. Edralin

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Outline

- Overview
- Block Diagram
- Specifications Table
- HV Divider Board
 - Schematics
 - Overview of key components parts
- Signal Gain Board
 - Schematics
 - Overview of key components parts
 - Simulation
- Gantt Chart
- Current Status and Issues

Overview

- PMT
- 10 Dynode Stages
- Provide HV to Stages
- PMT Readout is using the Waveform Sampling/Digitizing TARGETX ASIC at 1GSa/s

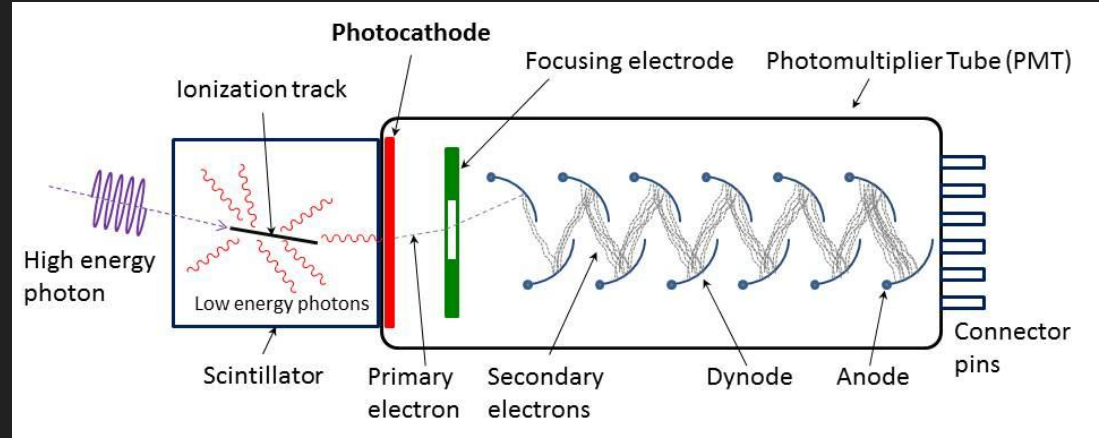


Figure 1: Photomultiplier Tube (PMT) diagram

Block Diagram

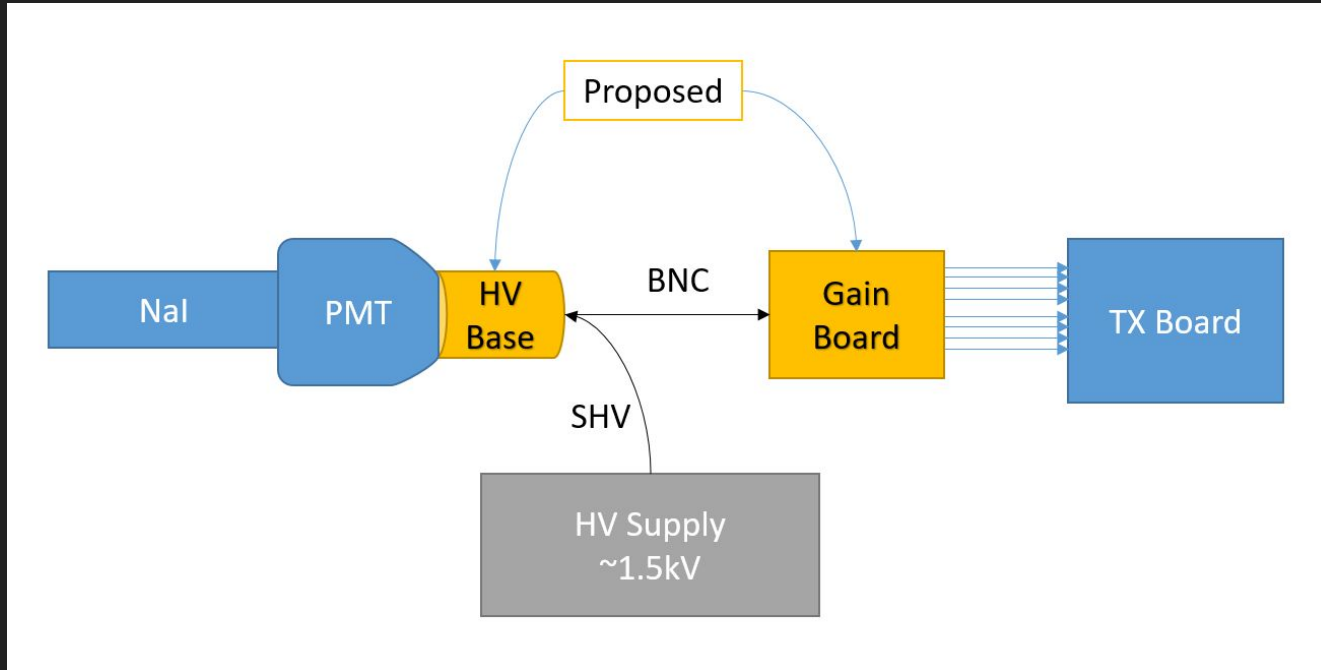


Figure 2: Block diagram including proposed components

Specifications Table

Specifications	HV Divider Board	Signal Gain Board
Function	Provide HV to PMT Dynode Stages	Provide various GAIN stages from 10^{-2} to 10^5
Board Dimension	Circular 2.2" Diameter	N/A
PCB Board	OSHPark. ETA Monday DEC 5th	In-House with Etchant. ETA Saturday DEC 3
Input Connector(s)	SHV	1 BNC
Output Connector(s)	BNC, PMT Base	8 MMCX

Schematics - HV Divider Board

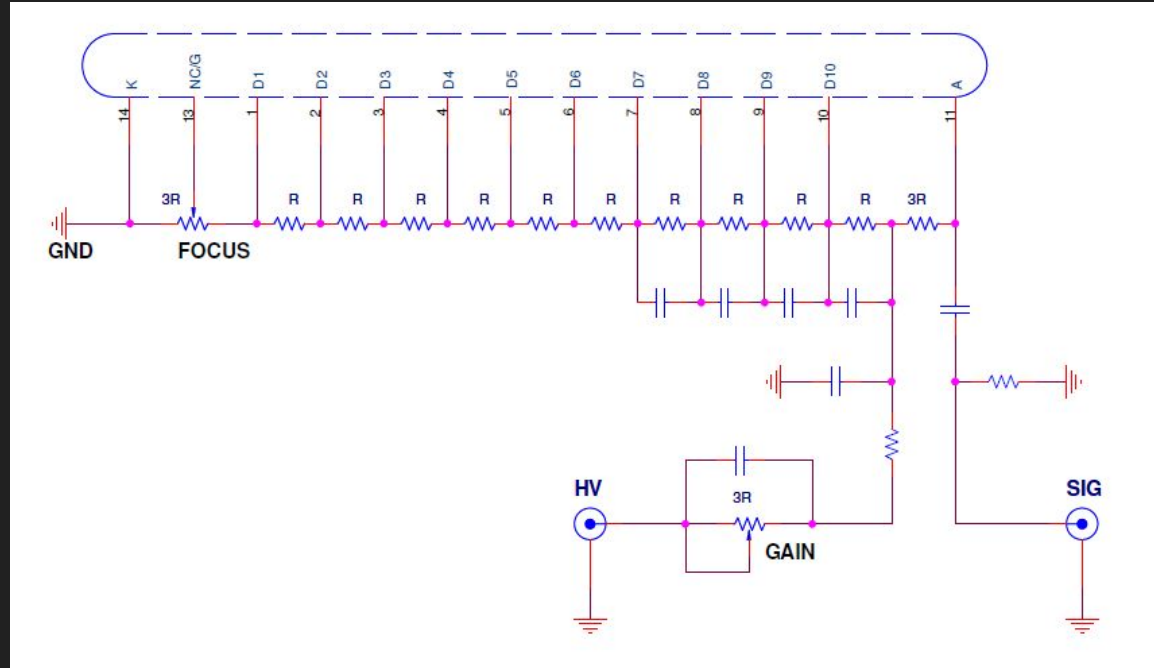


Figure 3: General schematic of HV Divider

Schematics - HV Divider Board

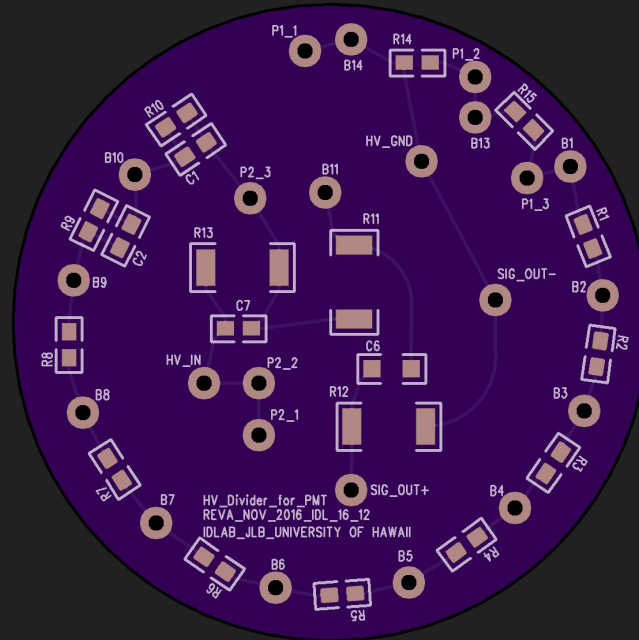


Figure 4: View of concept of fabricated HV Divider Board

Overview of Key Components - HV Divider Board

- Resistors! - For use in resistor divider chain
- Potentiometer for gain
- Potentiometer for focusing electrode
- Aluminum casing
- SHV input for HV
- BNC output for signal

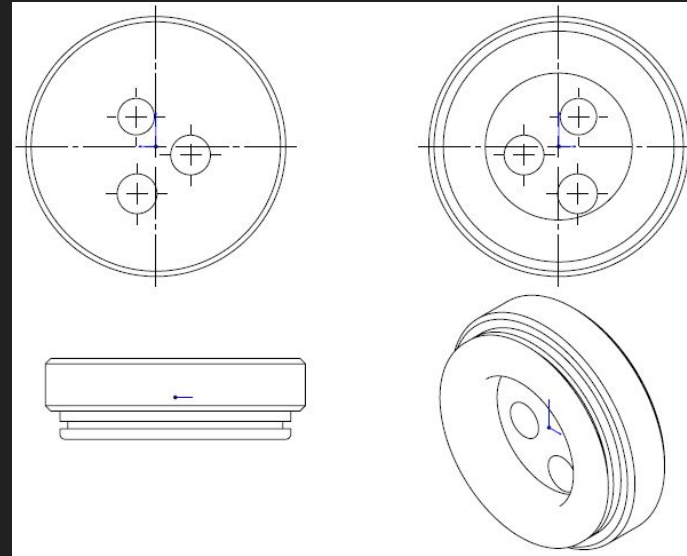
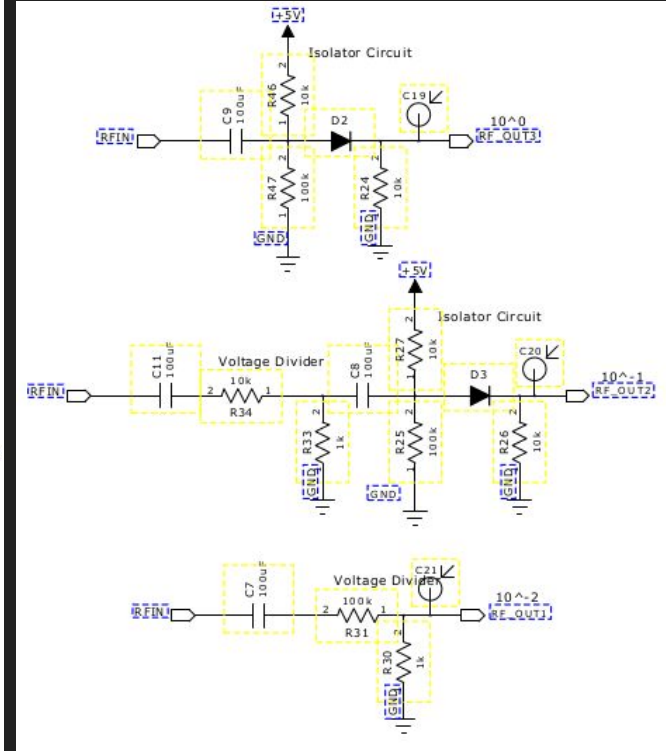
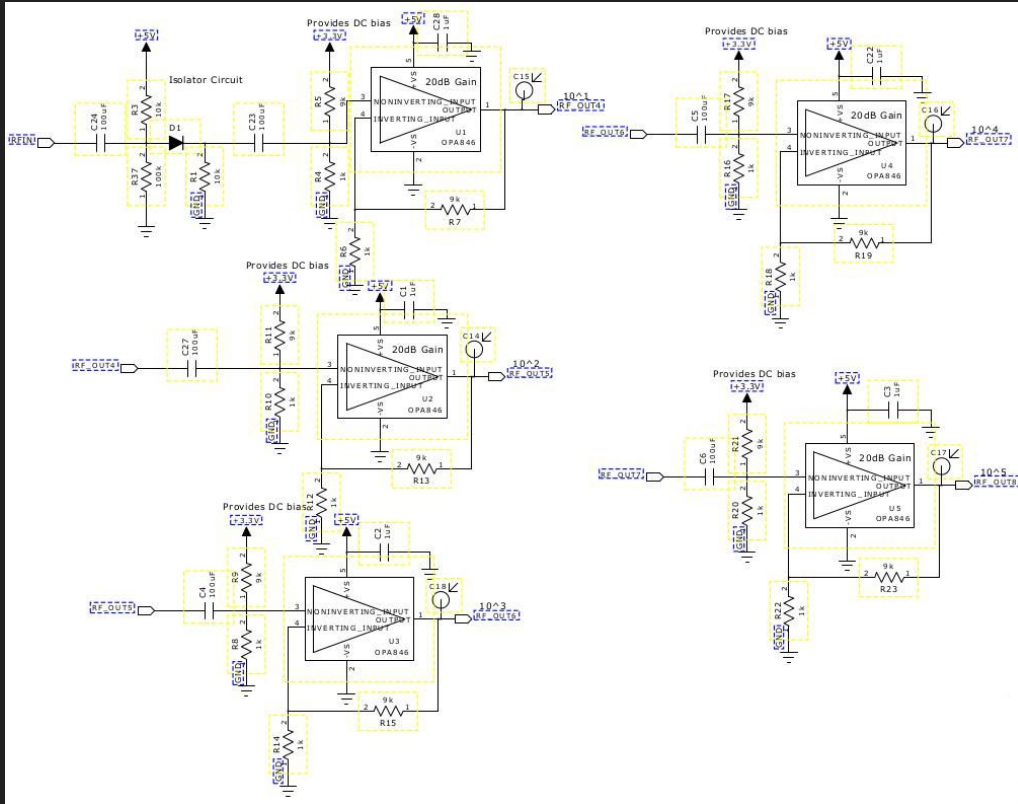
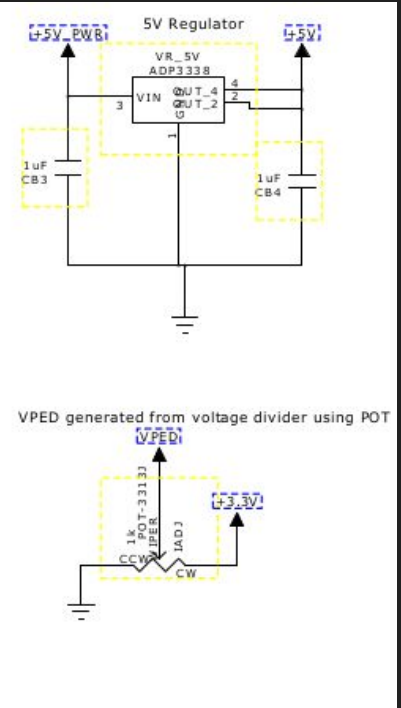
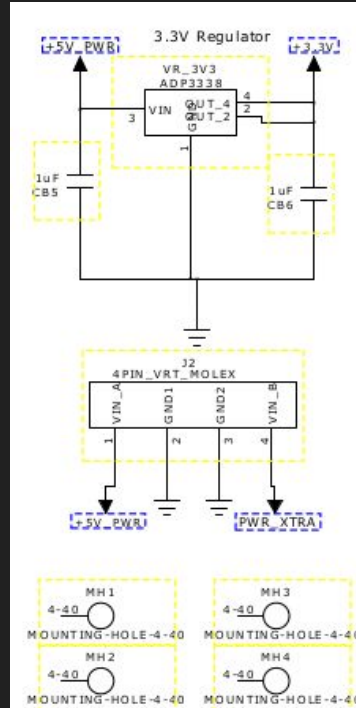
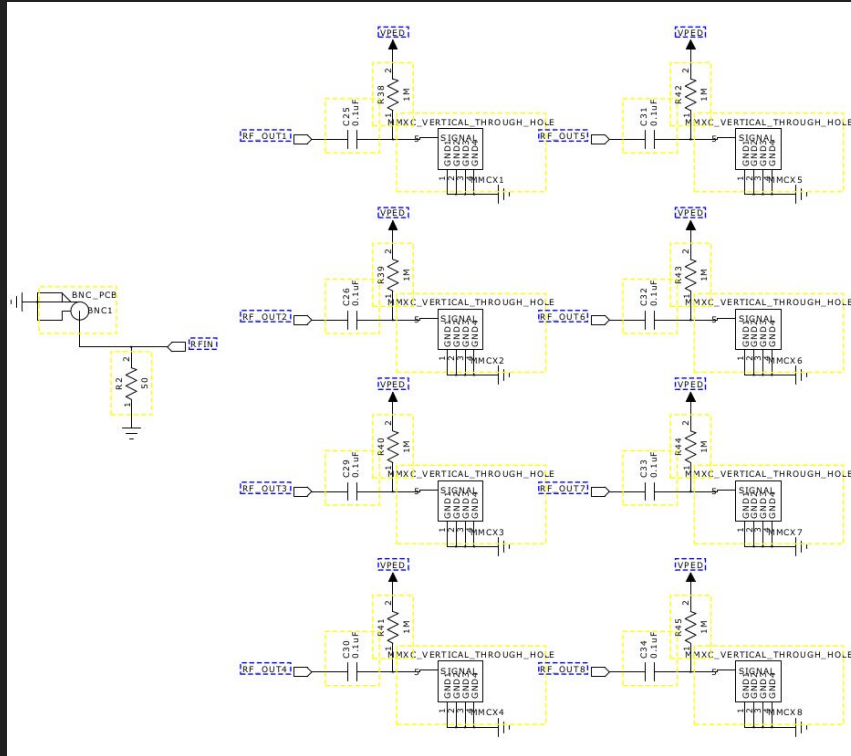


Figure 5: Cover for aluminum casing

Schematics - Signal Gain Board [1/2]



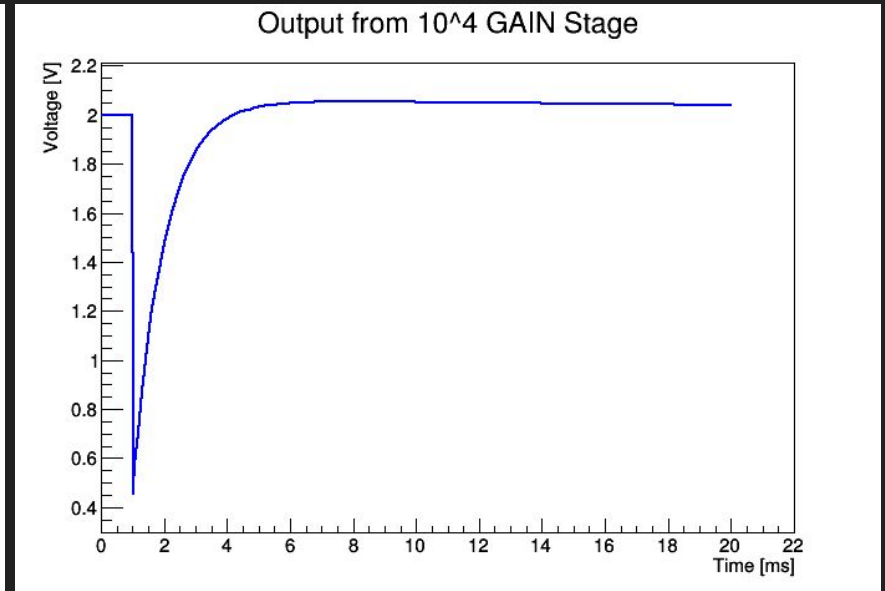
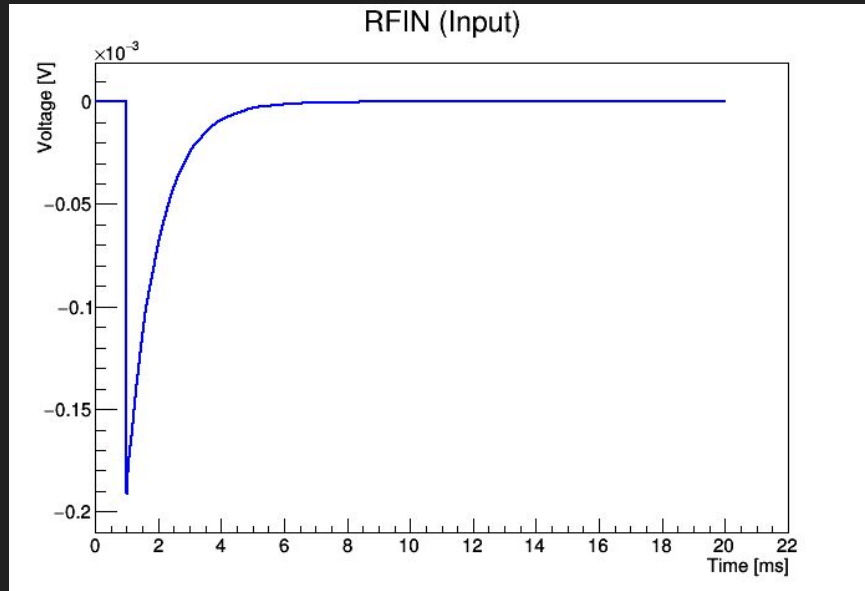
Schematics - Signal Gain Board [2/2]



Overview of Key Components - Signal Gain Board

- 1N4148 Diode
 - Transit Time = 25.9ns
 - Max Repetitive Reverse Voltage = 100V
 - DC Forward Current = 300mA
 - Forward Voltage = 0.62V
 - Total Capacitance = 4pF
- OPA846 Wideband, Low-Noise, Voltage-Feedback Op-Amp
 - High Bandwidth = 400MHz
 - Low Input Voltage Noise = 1.2nV/sqrt(Hz)
 - Low Supply Current = 12.6mA
 - Stable for GAINS ≥ 7
 - $V_s = \pm 5V$
- 3.3V and 5V Regulators

Simulation - Signal Gain Board



Gantt Chart

Item No.		Completed	12/3/2016	12/5/2016	12/6/2016	12/7/2016	12/8/2016	12/9/2016
1	Stage 1 (Understanding)							
2	Stage 2 (Prototype)							
3	HV Divider Board							
4	<i>Schematics/Layout</i>							
5	<i>Fabrication/Assembly</i>							
6	<i>Implementation/Testing</i>							
7	Cylindrical Case							
8	<i>Solidworks</i>							
9	<i>Machine Shop</i>							
10	<i>Implementation/Testing</i>							
11	Gain Board							
12	<i>PSPICE</i>							
13	<i>Fabrication/Assembly</i>							
14	<i>Firmware/Testing</i>							
15	Stage 3 (Robustness)							
16	<i>HV Divider Fab</i>							
17	<i>Gain FMC Fab</i>							
18	<i>TBA</i>							
19	Proposal							
20	Design Review							
21	Final Presentation							
	Points of contact: James Bynes (JLB), Bronson Edralin (BE)							
	Gary Varner (GSV)							

Current Status and Issues

- Cylindrical Case
 - Solidworks Design
 - Fabrication in Machine Shop
- HV Divider Board
 - Fabrication of PCB from OSH Park (ETA DEC 5)
 - Need to assemble after fab
 - Need to test
- Signal Gain Board
 - Schematic finalized with available parts in lab (Done NOV 30)
 - Layout of PCB (ETA DEC2)
 - In-House Fabrication of PCB using Etchant (ETA DEC3)
 - Need to assemble after fab
 - Need to test

