

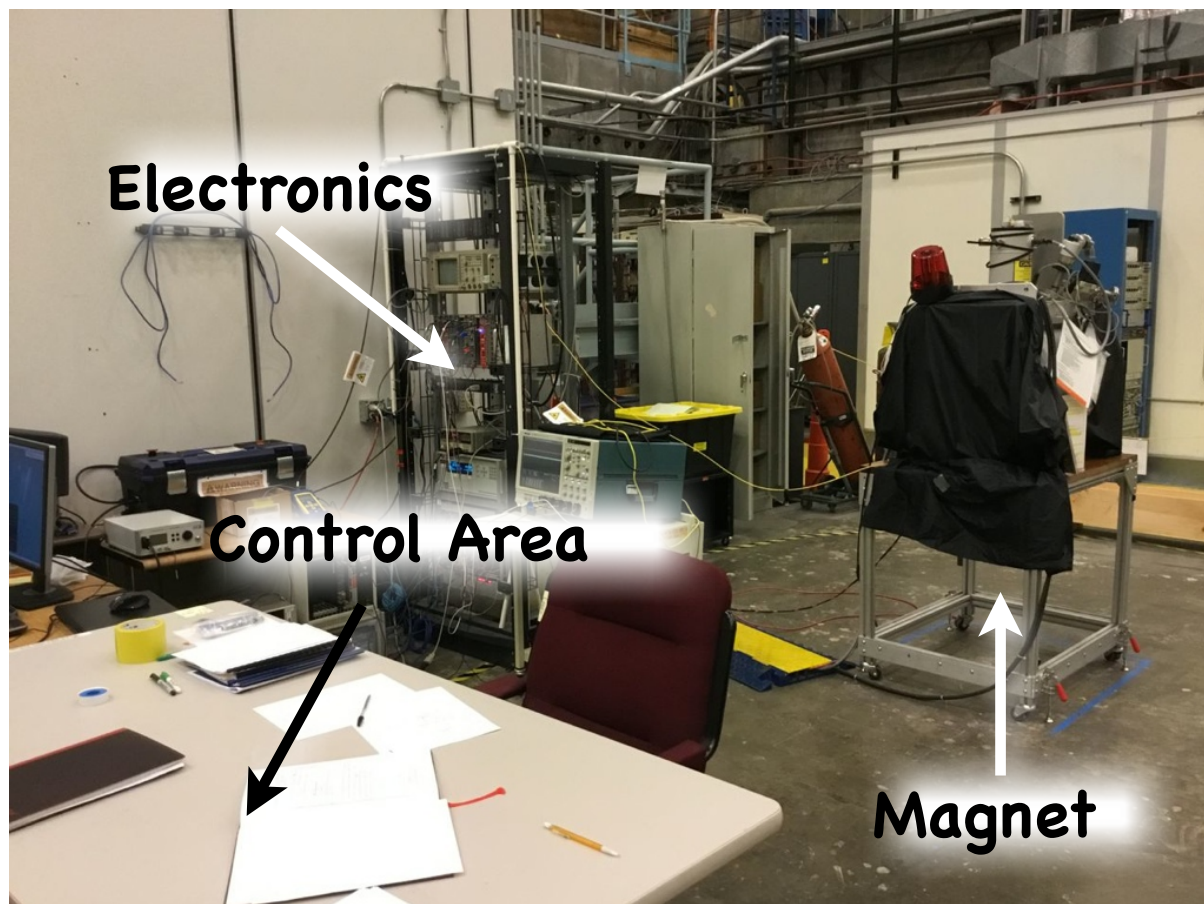
Photek/Photonis Characterization: Status Update

Yordanka Ilieva

Measurements in June - August 2021

People:

- Stony Brook University: P. Nadel-Turonski
- Jefferson Lab: C. Zorn, J. McKisson
- Catholic University of America: G. Kalicy,
- USC: Y. Ilieva, B. Tumeo, B. Moses

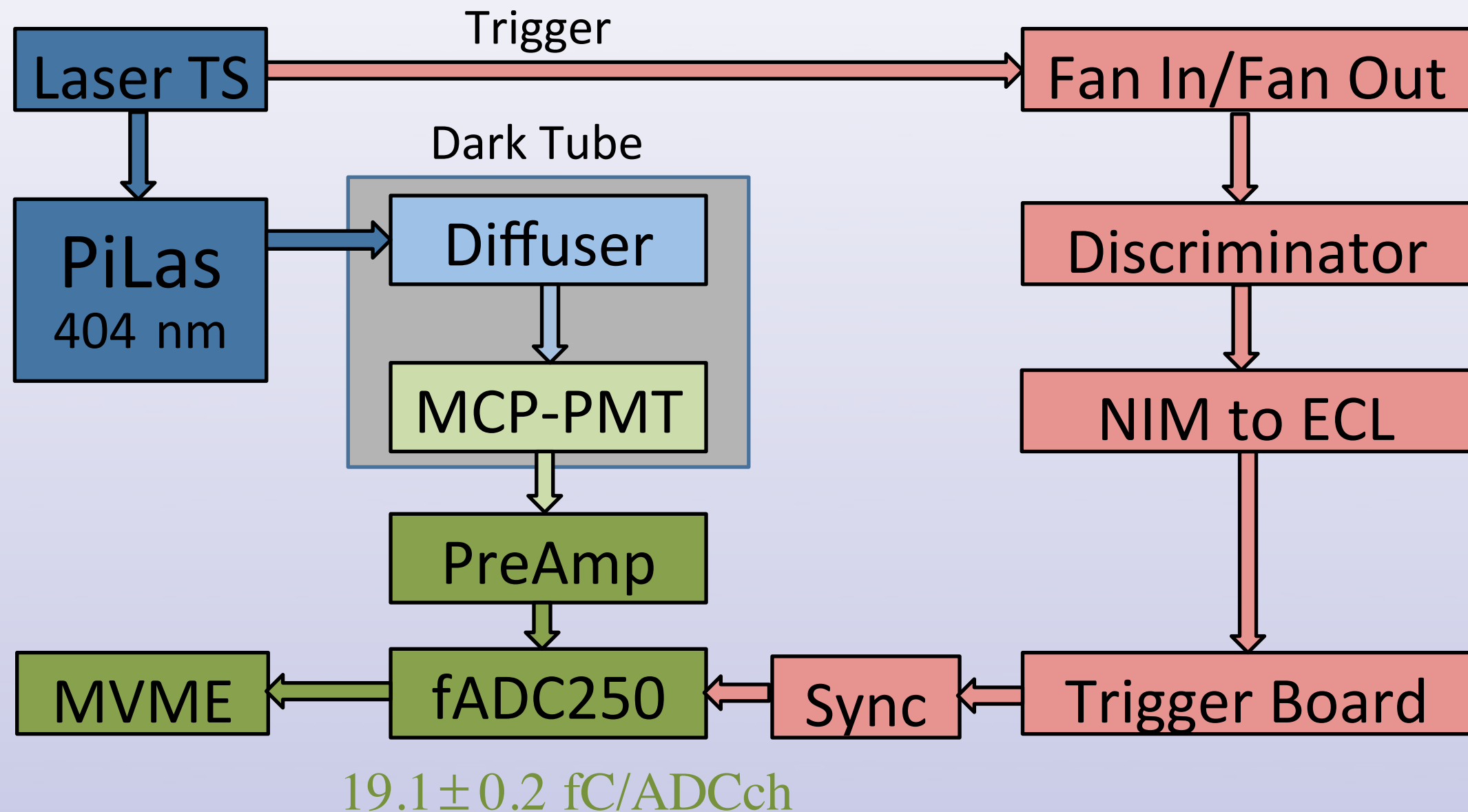


High-B Activities: FY21

- Gain Scan of Photech MAPMT253 (standard HV distribution) - analysis results ok
- Ion feedback data taken, no analysis results
- Gain Scan of Photonis XP85122-s-hice (standard HV distribution) - analysis results ok
- Ion feedback data taken, no analysis results
- Systematic studies of ORTEC VT120 preamplifier non-linearities at small input amplitudes (data ok, corrections to MCP-PMT data probably not possible)

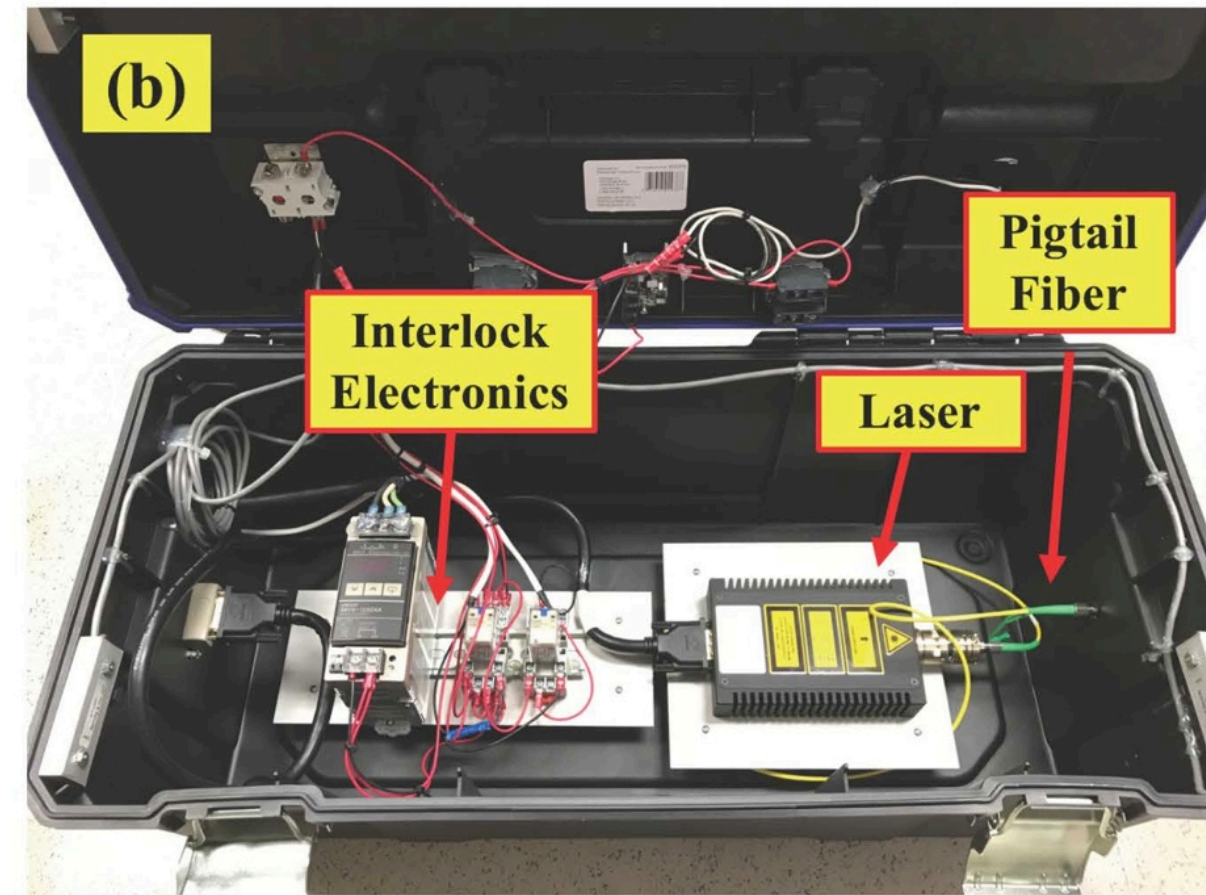
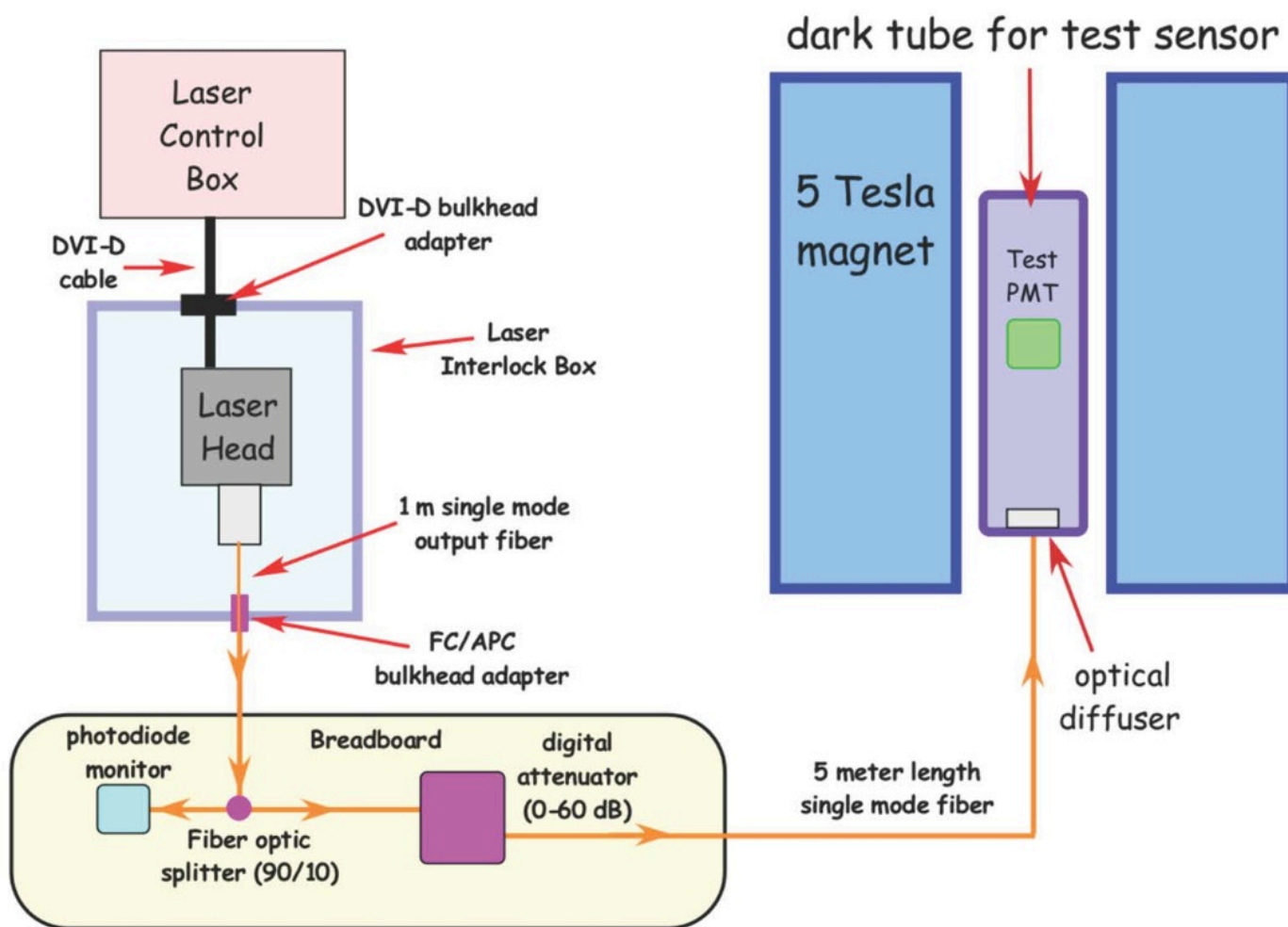
Facility Capabilities

Major components



Facility Capabilities

Major components



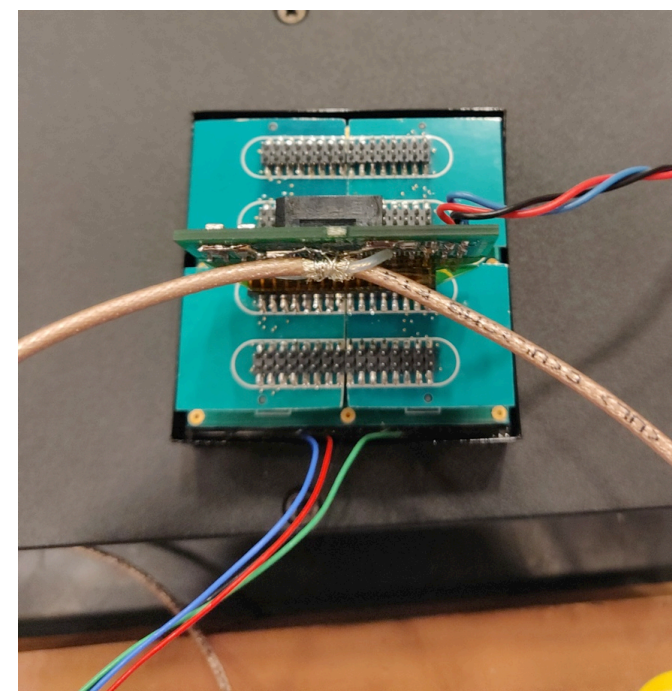
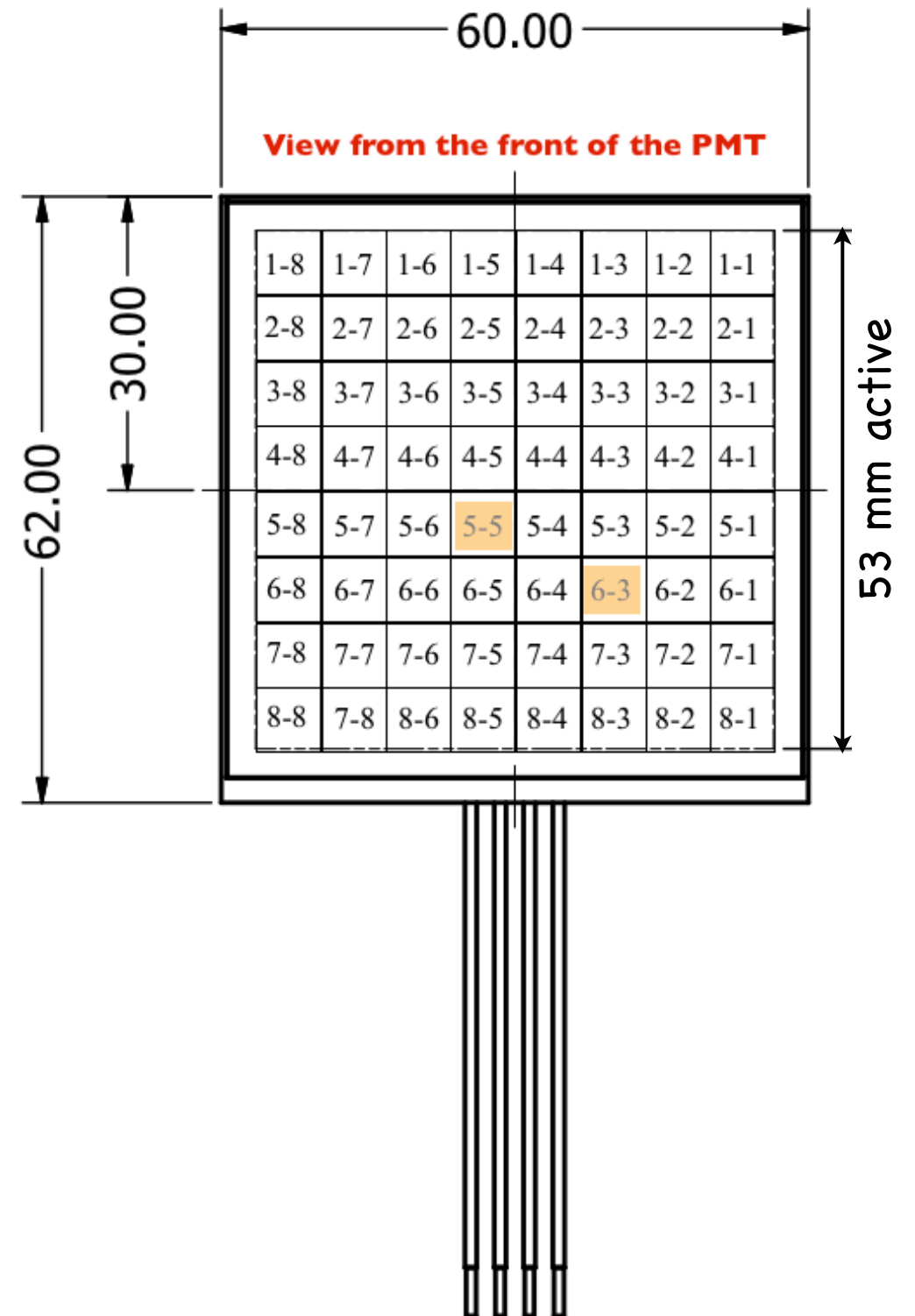
A **picosecond laser** added in **Summer 2018** (procured by ODU)

Laser setup (JLab Detector Group)

Laser safety system (JLab electronics Group)

Photek MAPMT253 General Information

Unit: A3200606, Free Loan from Photek incl. voltage divider



6 μ m pore size

8x8 geometry readout

6.524mm x 6.524 mm

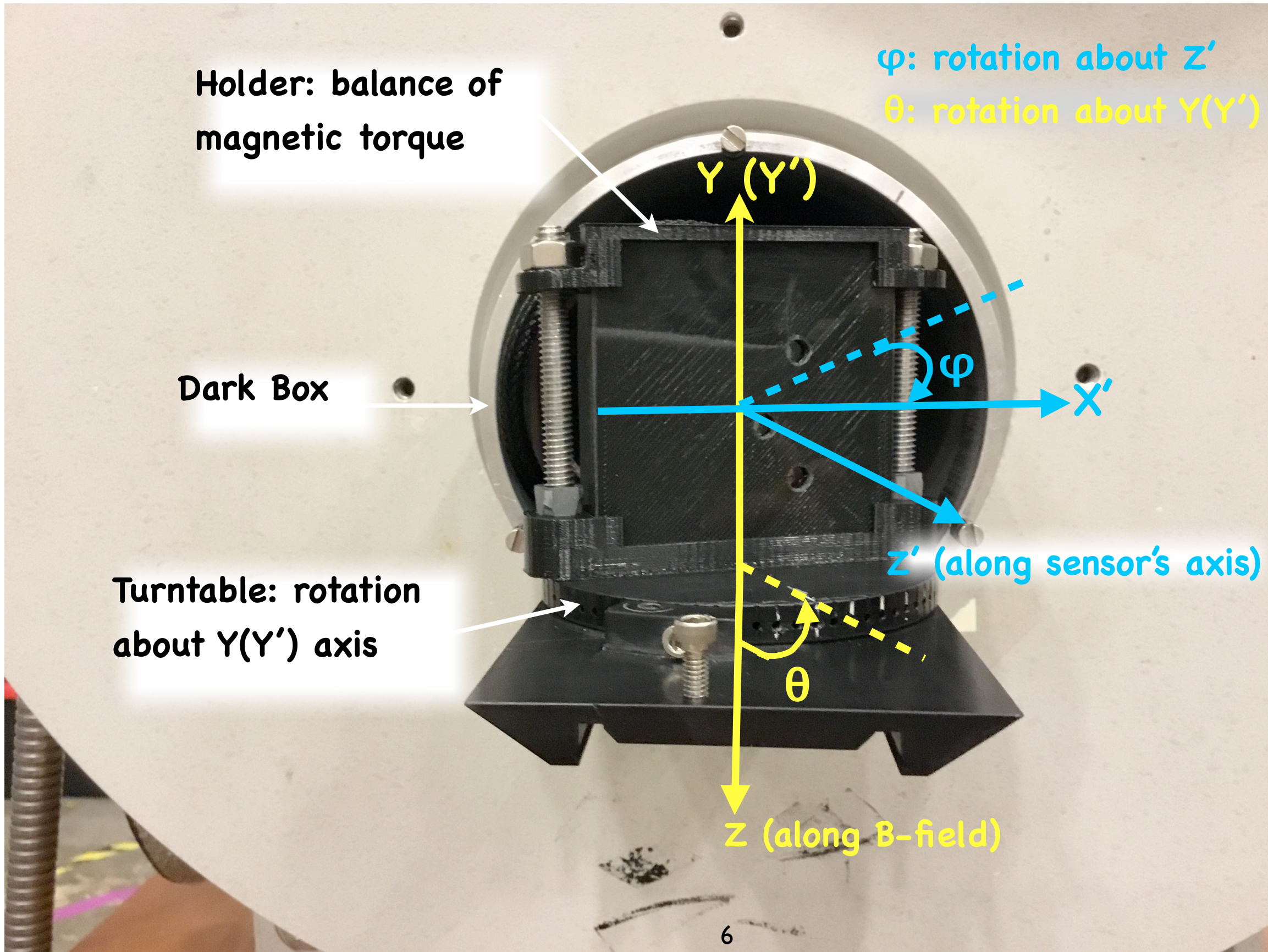
preamp on readout board: x10

tests of pixel 6-3

max HV: -3.1 kV

Photek MAPMT253 Gain Scan 2021

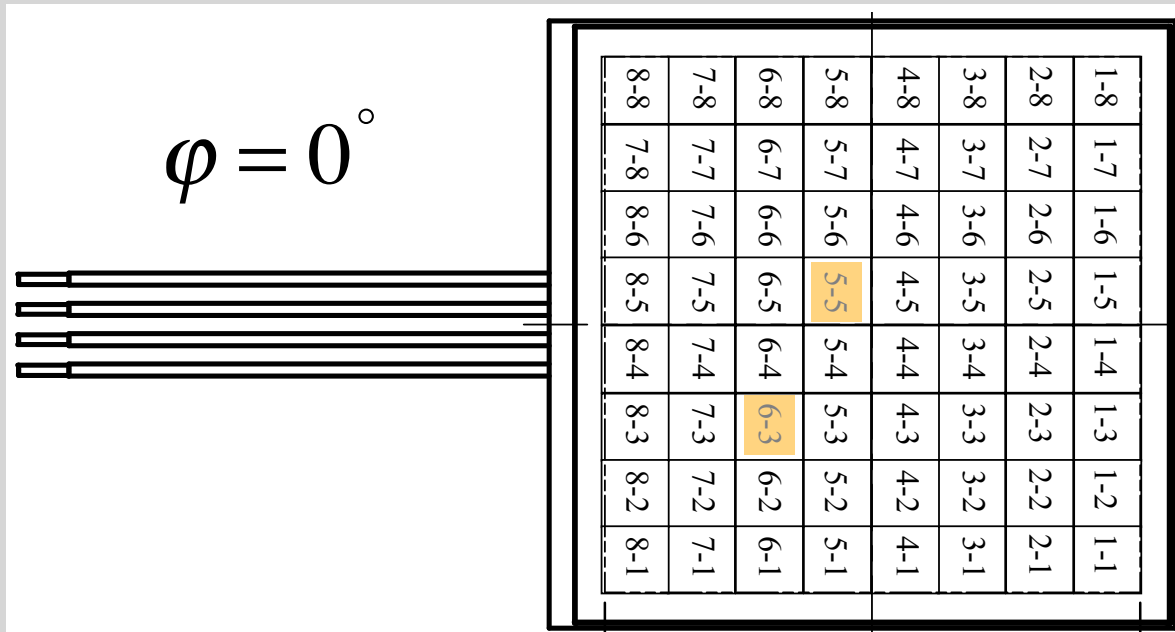
Rotation angles: definitions



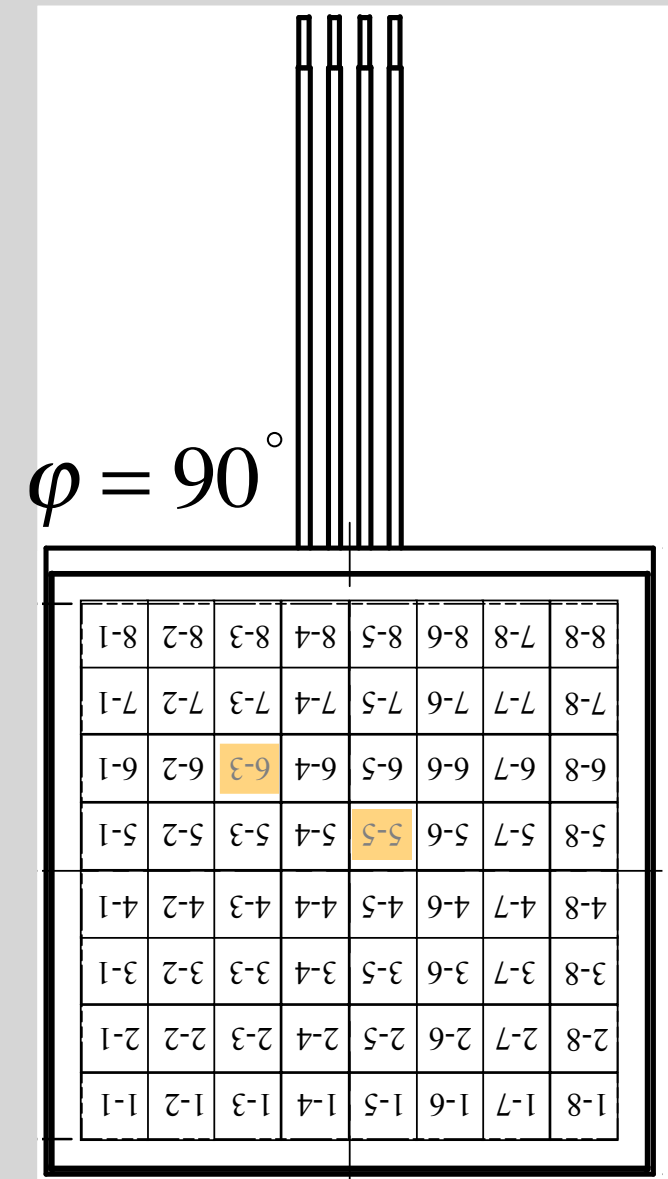
Photek MAPMT253 Gain Scan 2021

Rotation angle φ : Light comes into the page

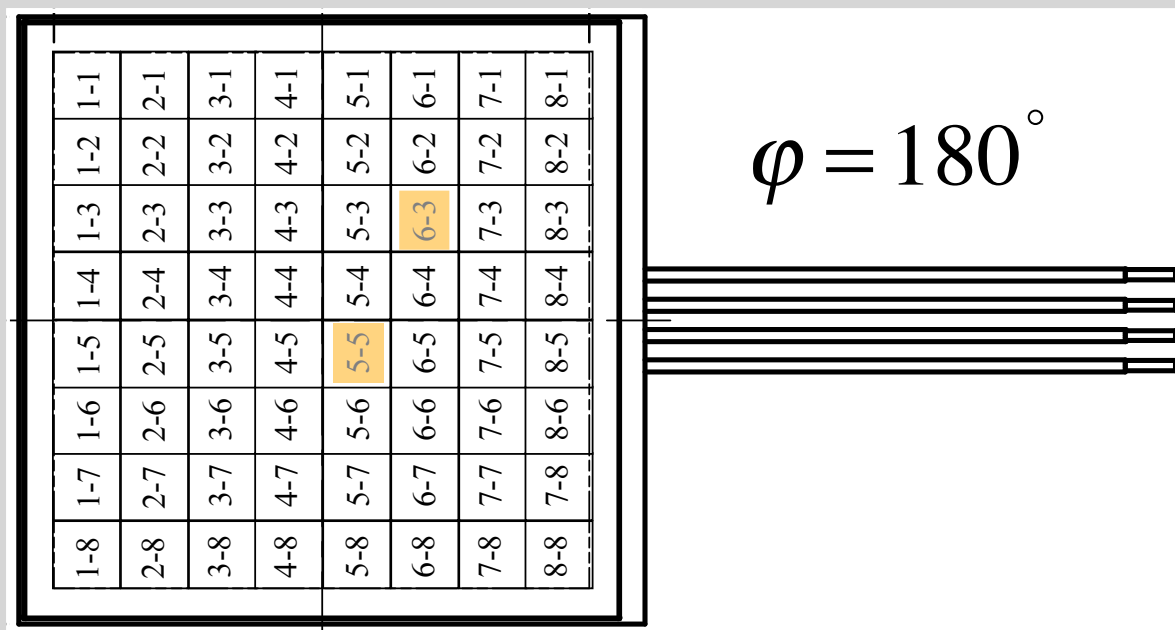
View from the front of the PMT



View from the front of the PMT



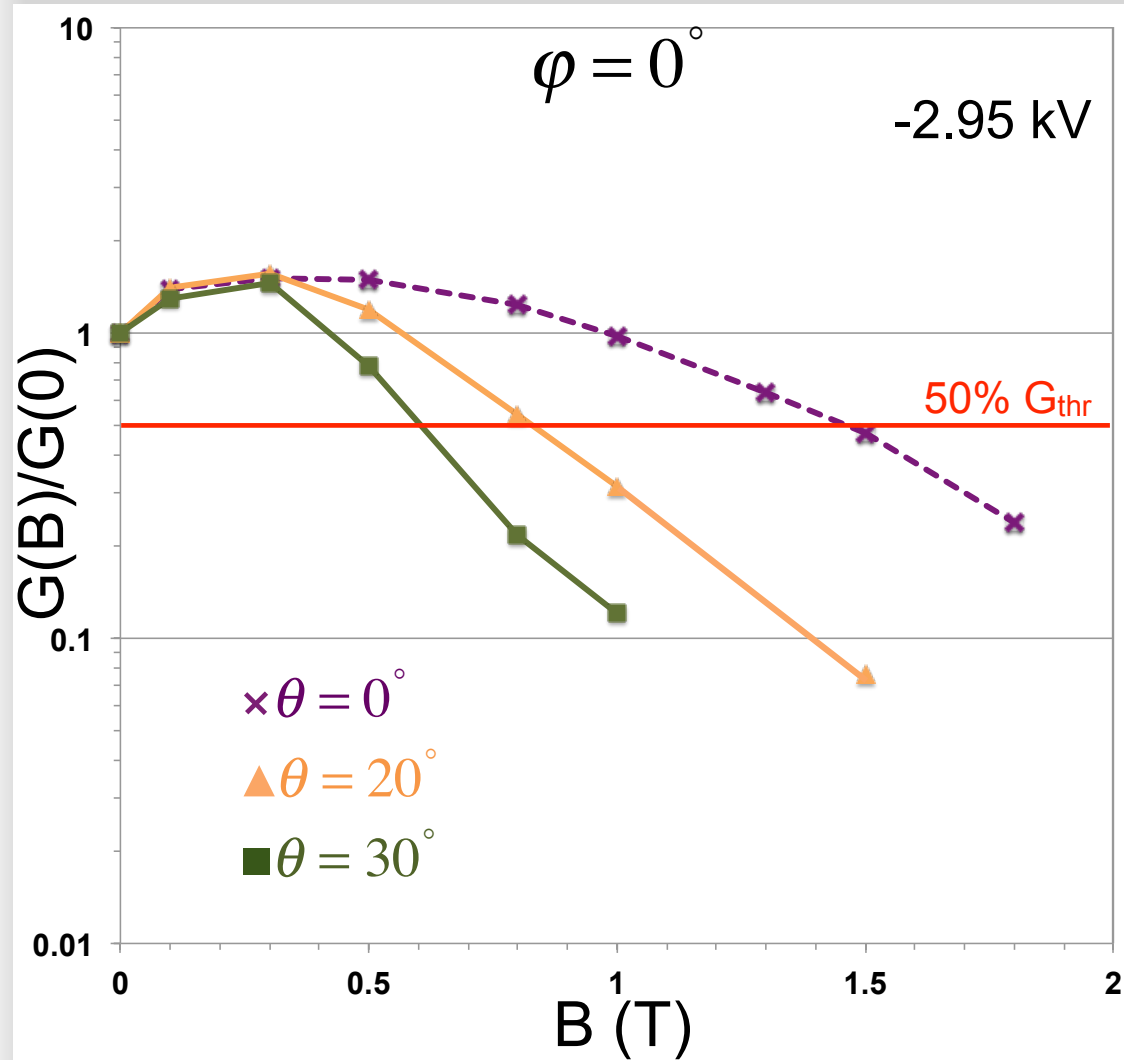
View from the front of the PMT



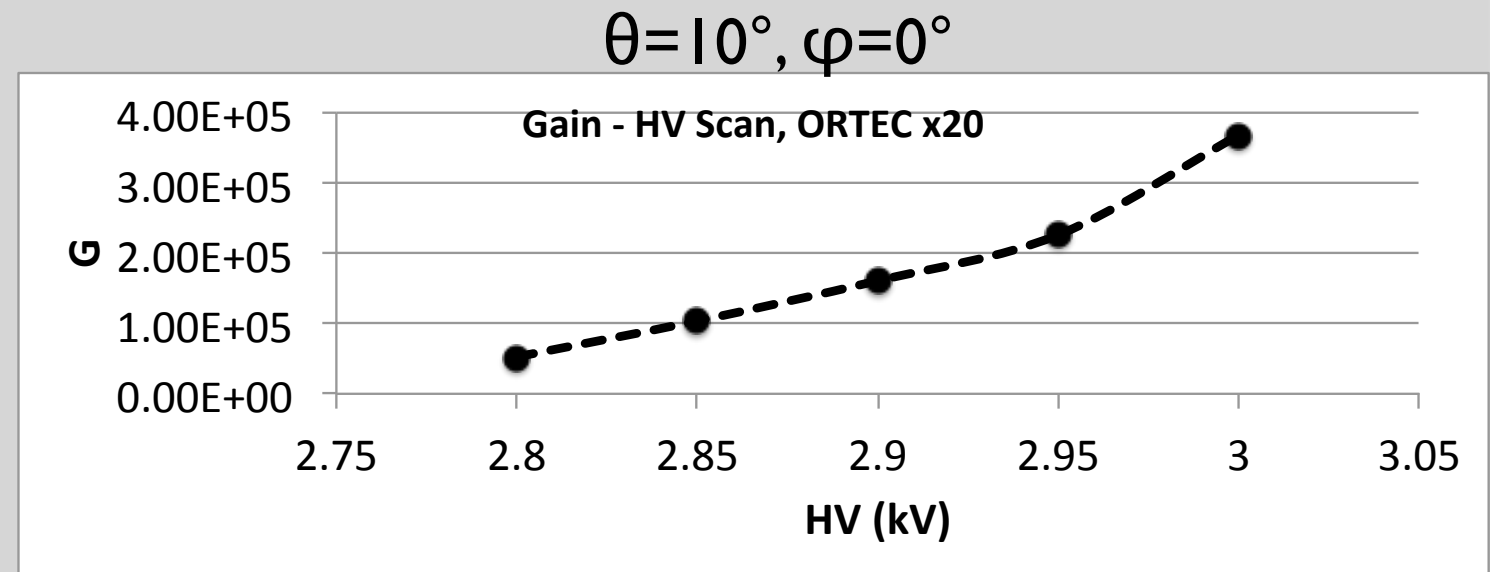
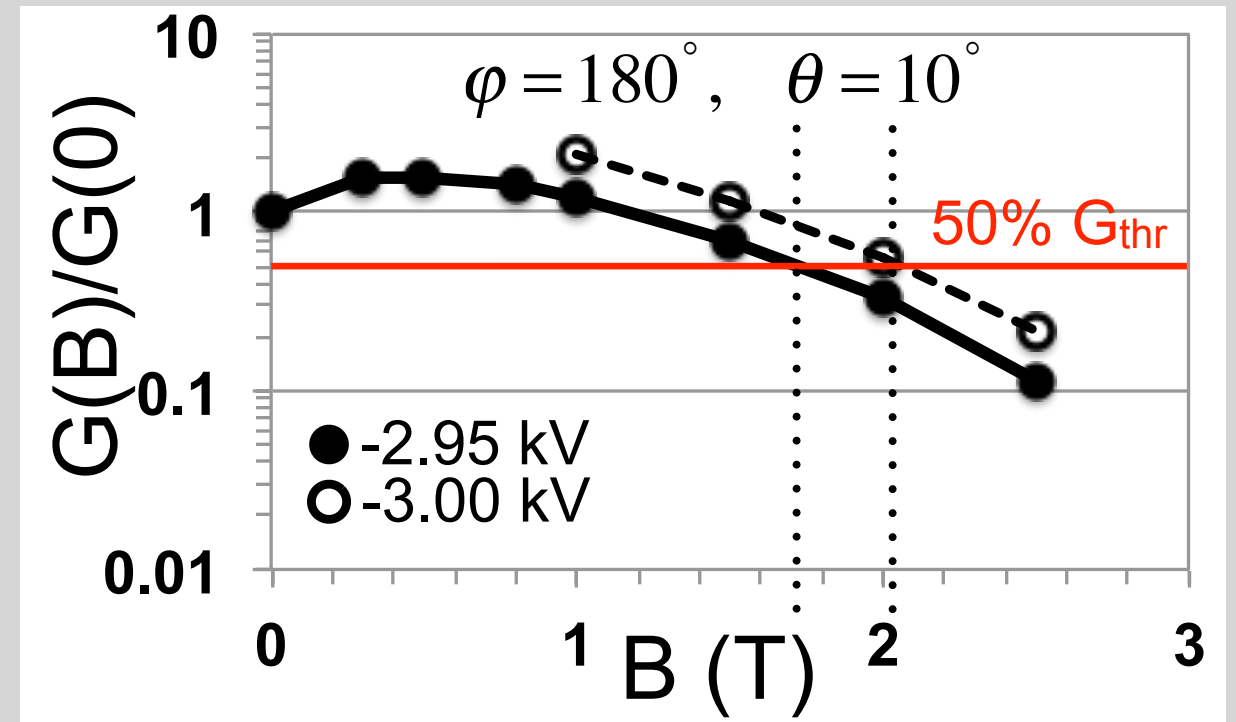
Photek MAPMT253 Gain Scan 2021

θ Dependence, HV gain recovery

B-field Scan: Jefferson Lab High-B Facility, June - August 2021, PMT Channel 6-3



15% gain variation at -3 kV between θ of 10° and 0° at 0 T (non-uniformity of diffuser, sampling different area of PMT when angle changes)

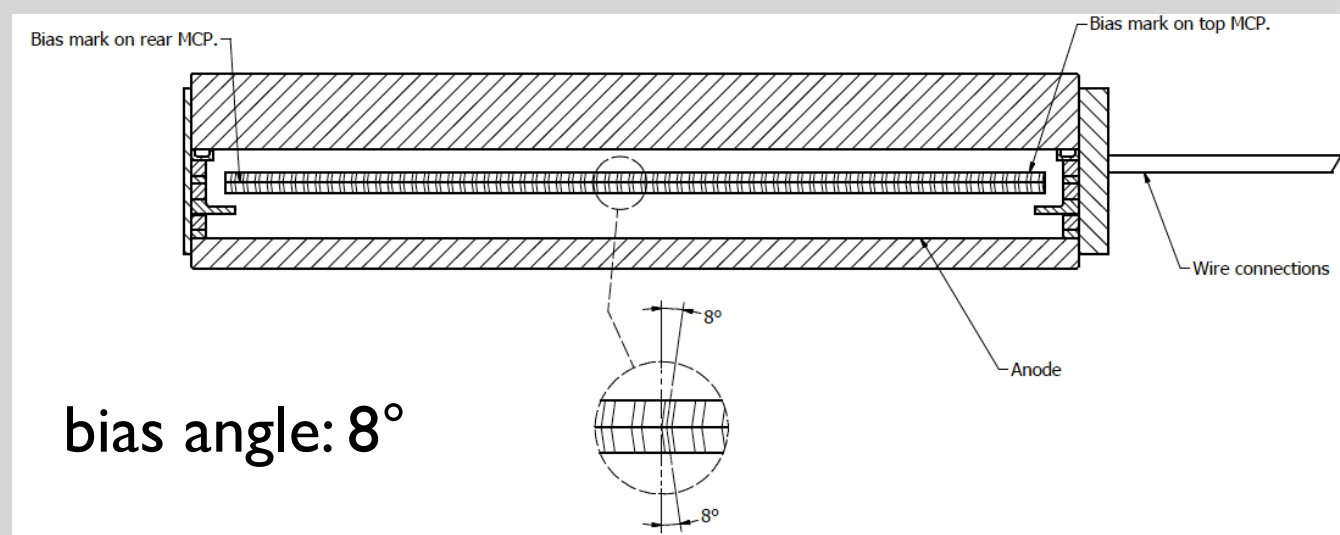
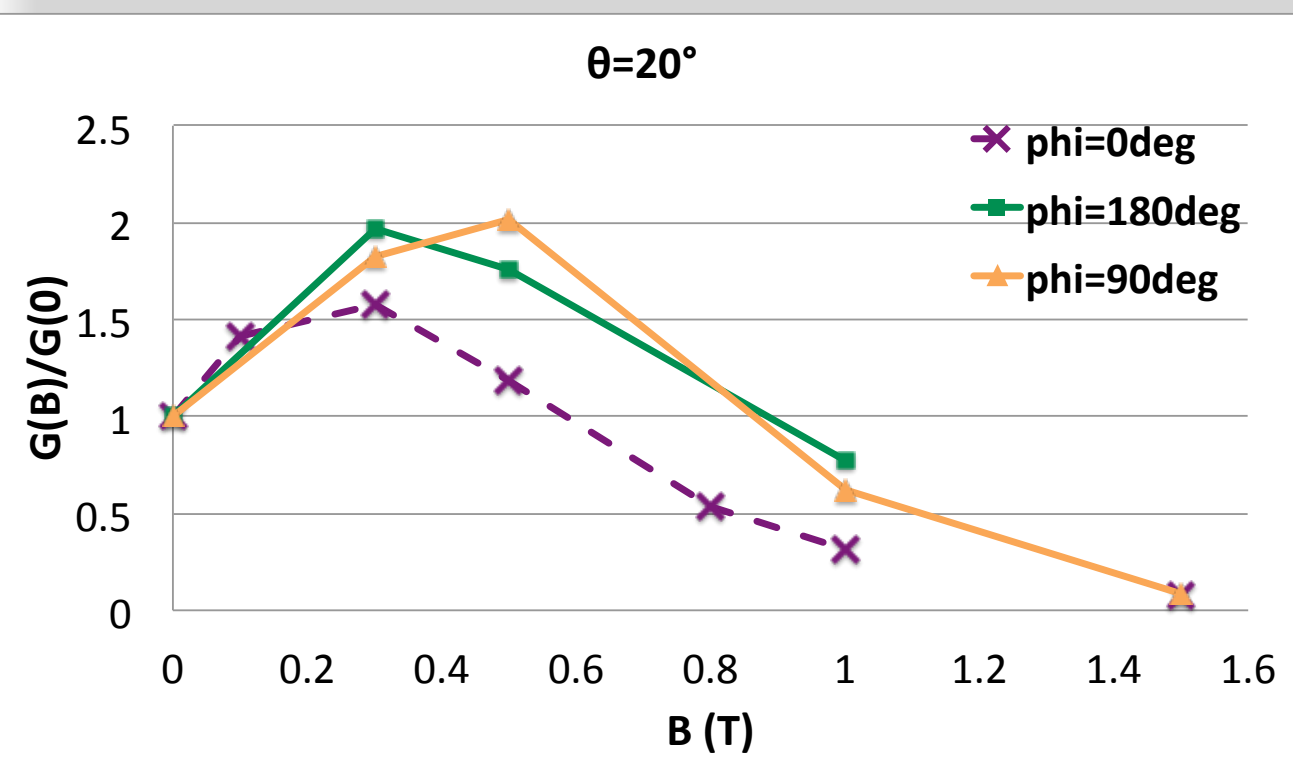
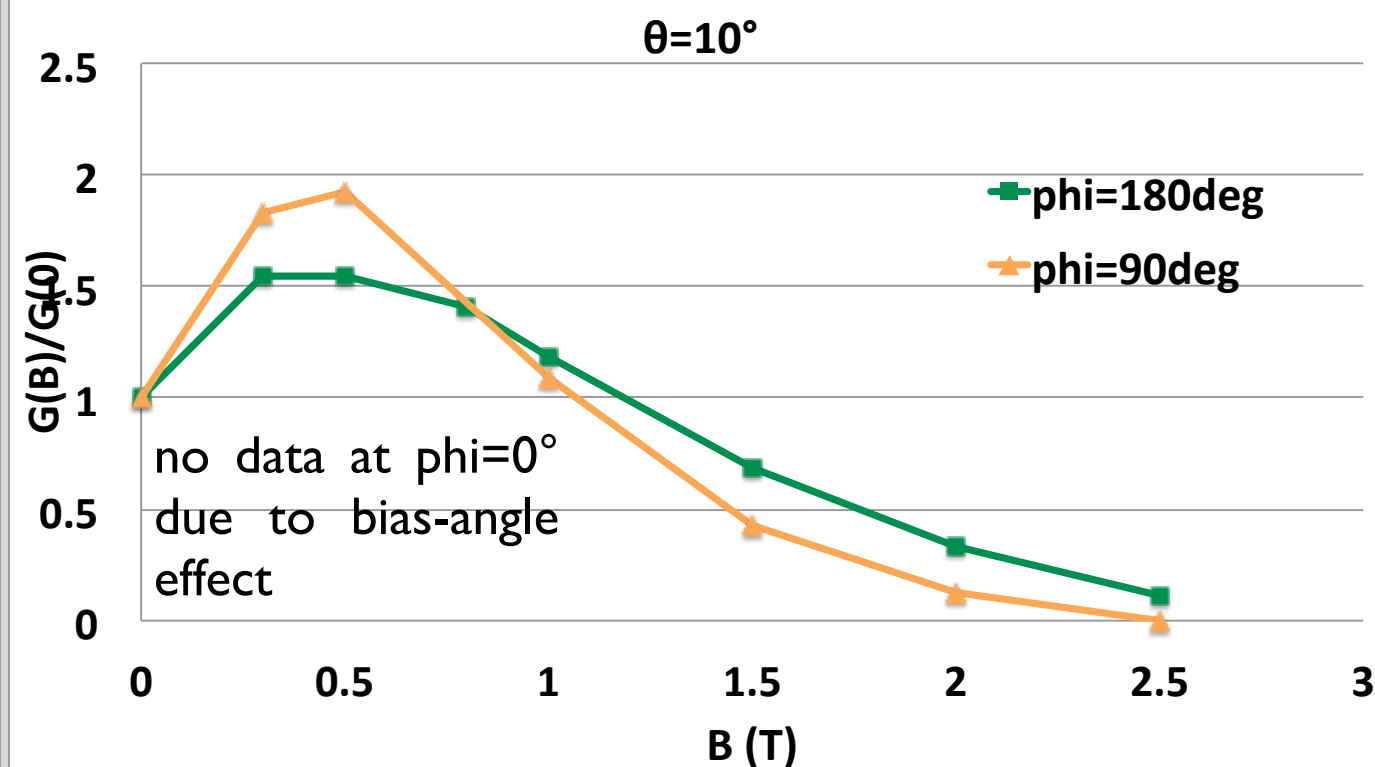
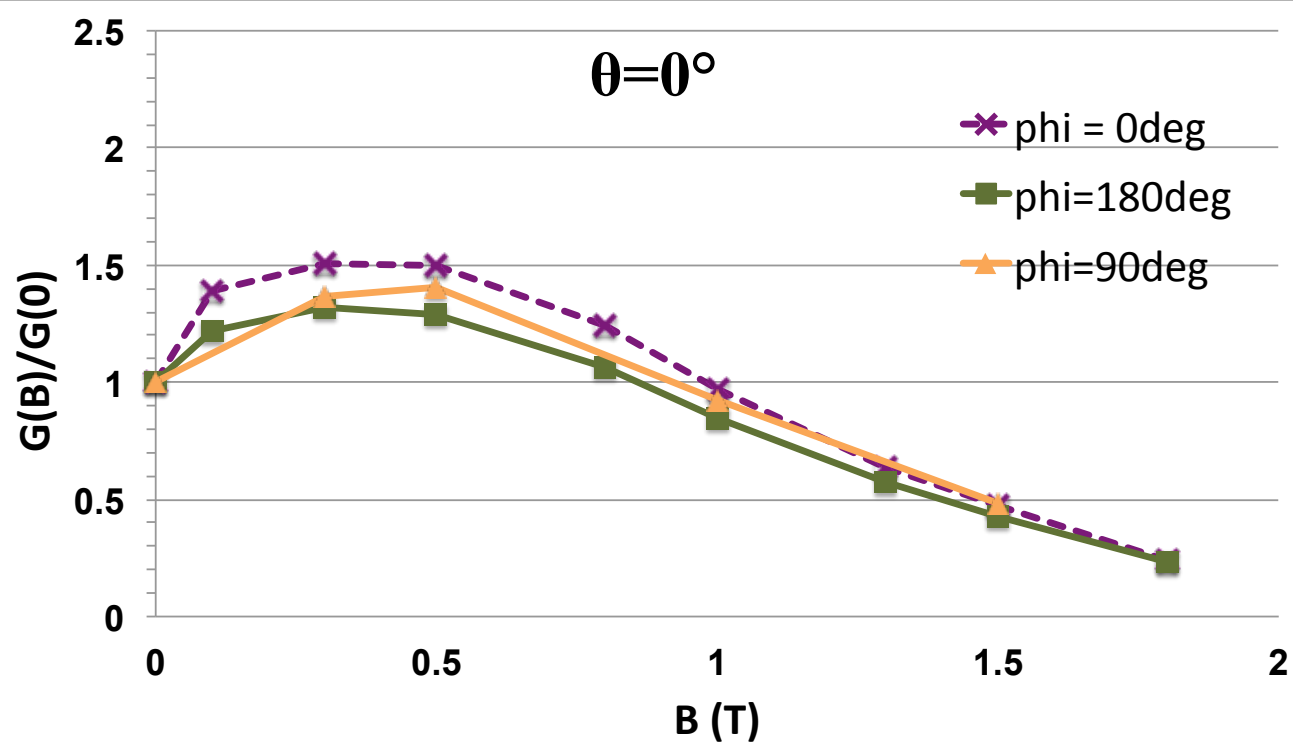


Specs: -2.8 kV for $1e6$ gain

Photek MAPMT253 Gain Scan 2021

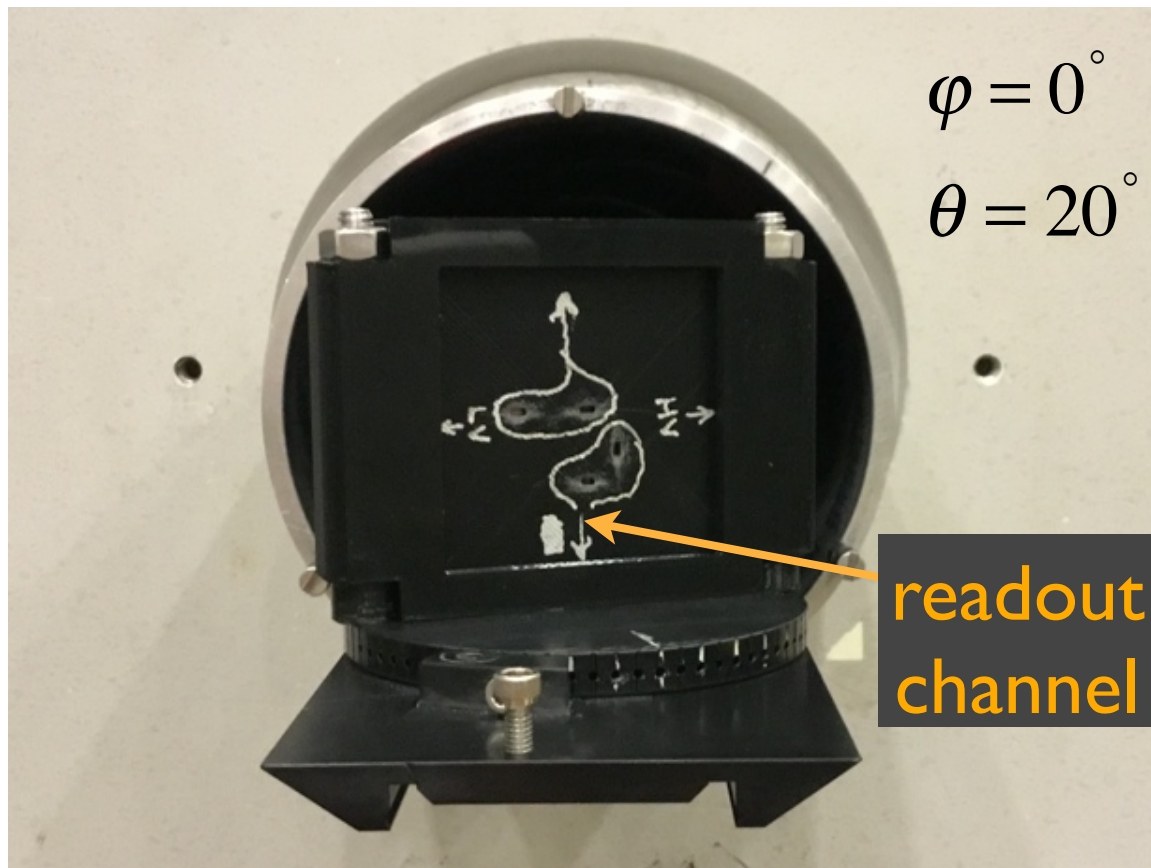
φ Dependence

B-field Scan: Jefferson Lab High-B Facility, June - August 2021, PMT Channel 6-3

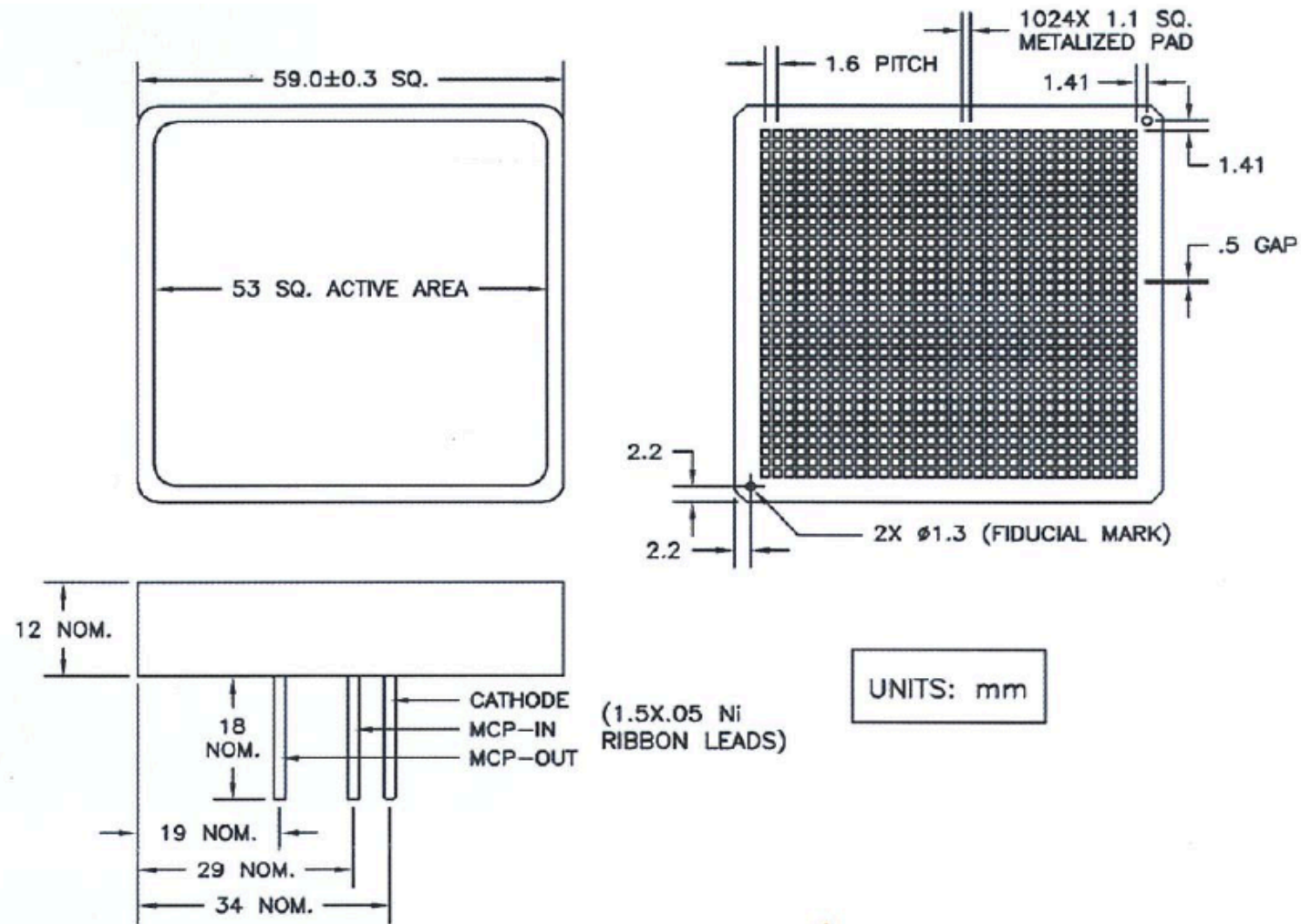


Photonis Planacon XP85122-S-HiCE Gain Scan 2021

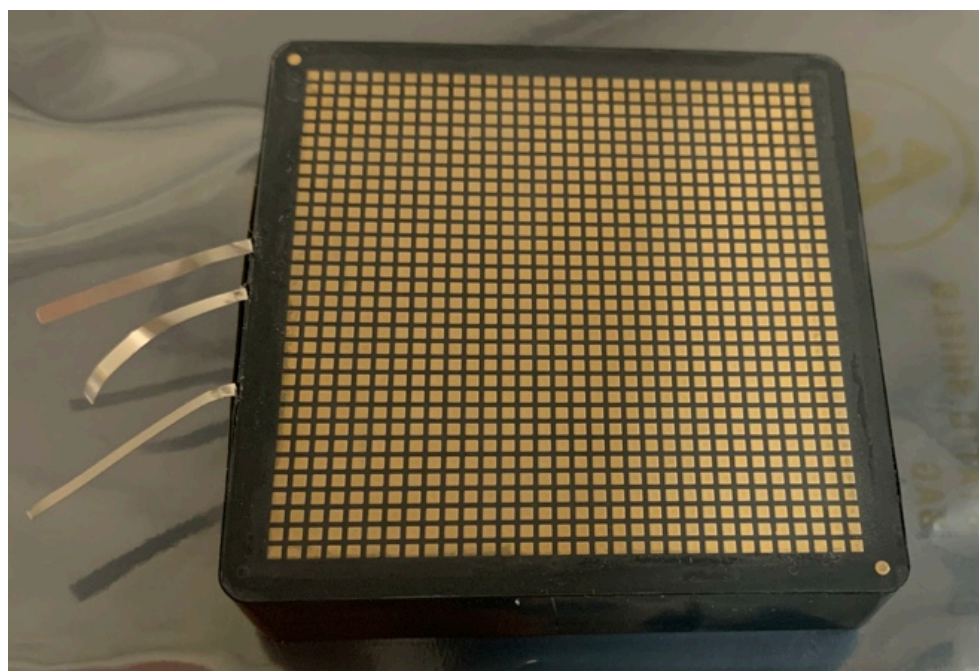
Readout channel and angles



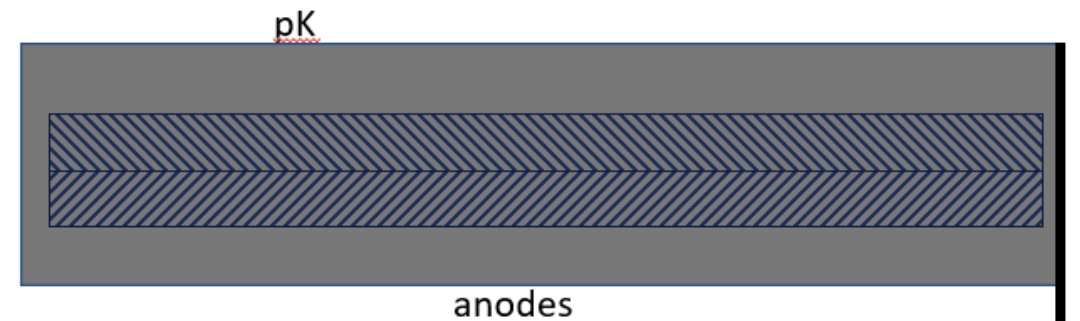
Two non-neighboring pairs of neighboring pixels coupled into a channel: mimic 16 x 16 application



Specs: -1.86 kV for 1e6 gain
max HV: -2 kV



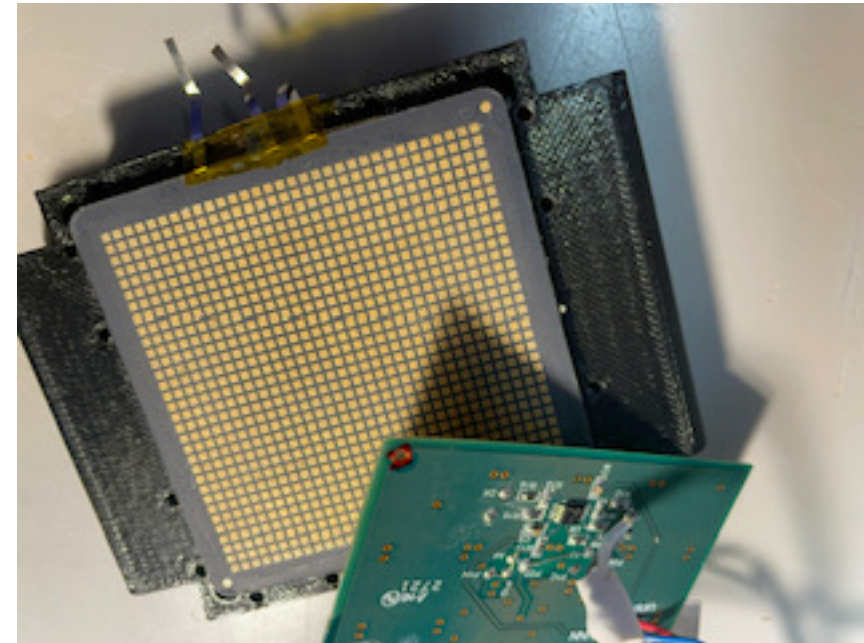
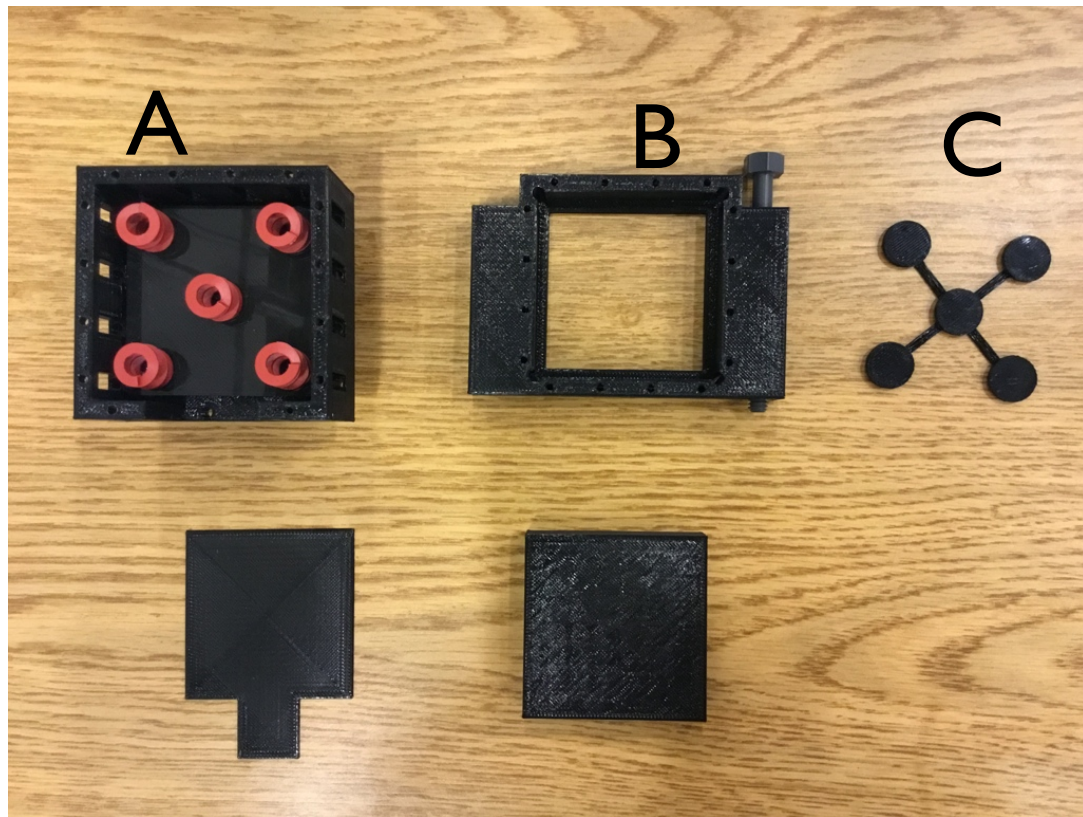
unit: 9002202



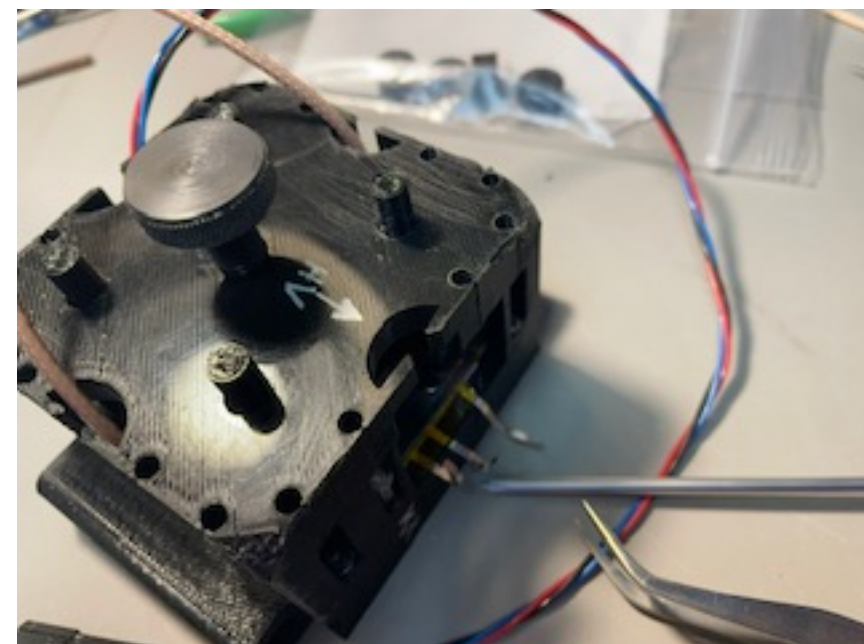
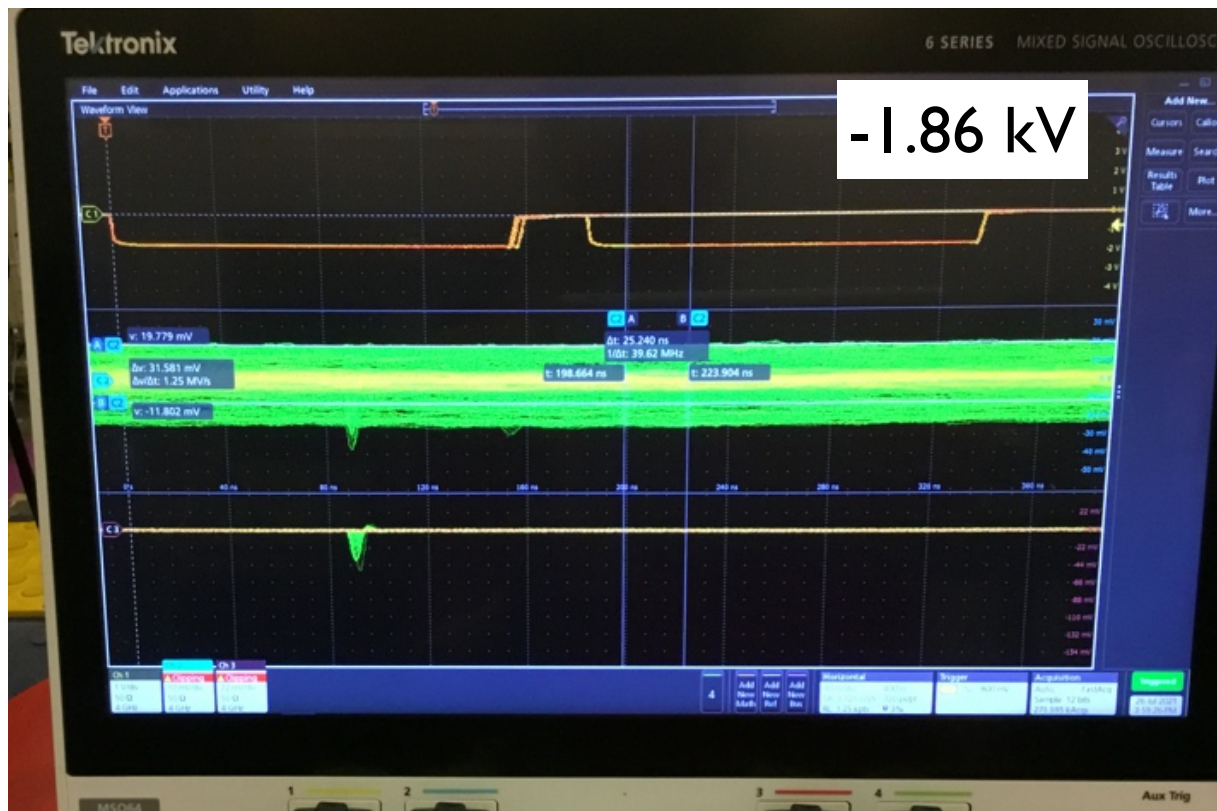
HV Leads

Photonis Planacon XP85122-S-HiCE Gain Scan 2021

Readout channel and angles



Condalign conductive adhesive: overnight at 20 kPa, afterward small residual pressure to maintain adequate conductivity.

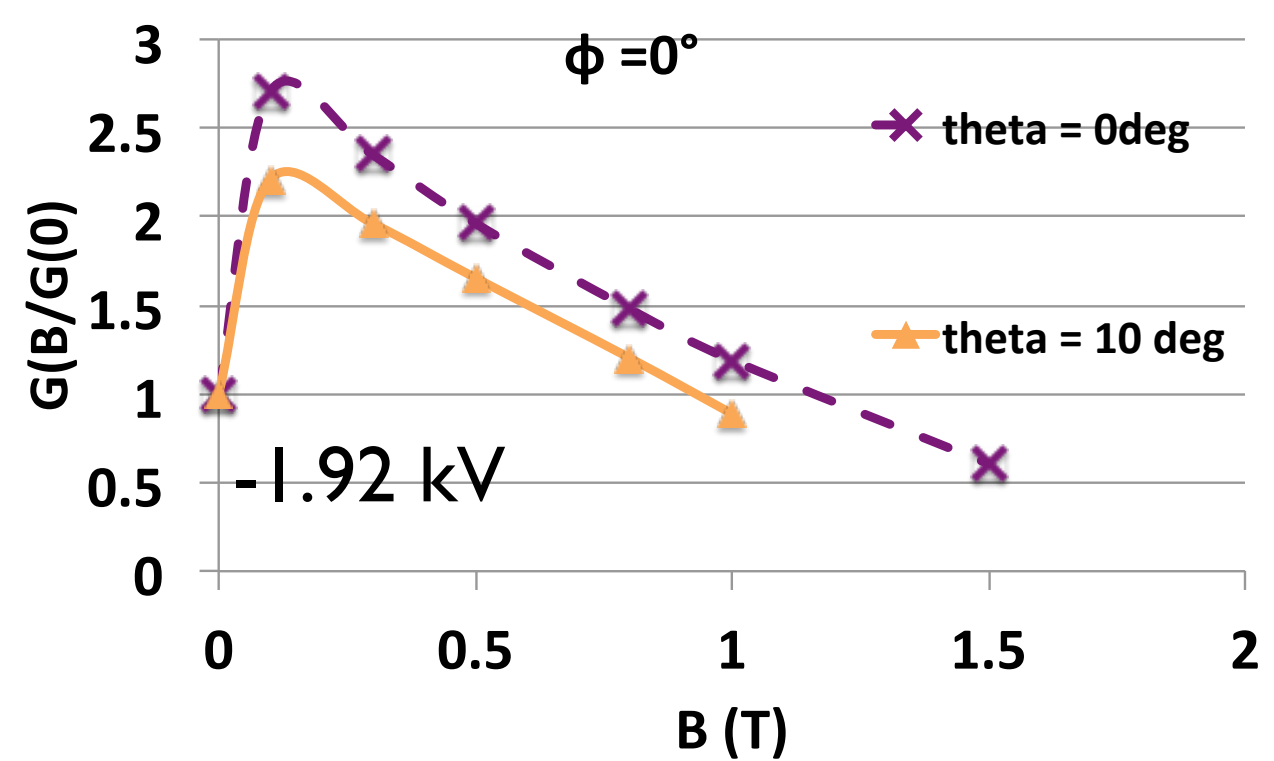
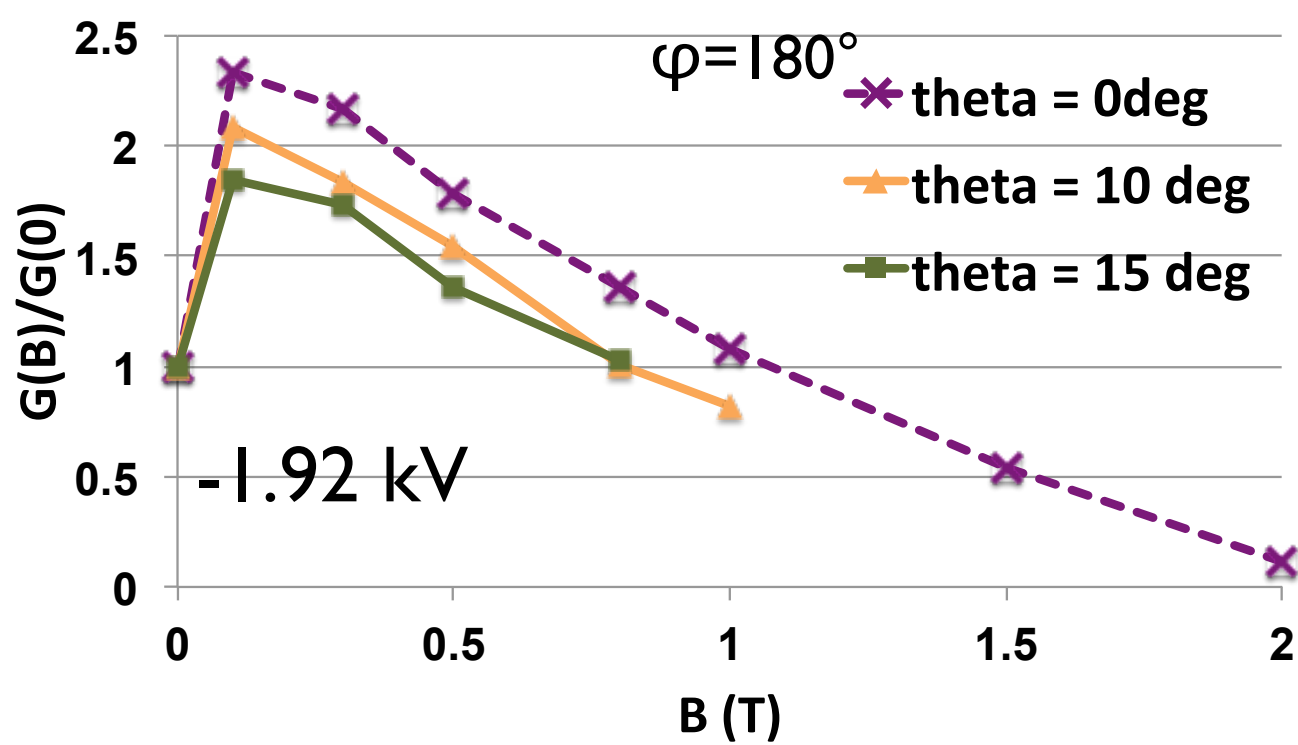


Photonis Gain Scan 2021

θ Dependence

B-field Scan: Jefferson Lab High-B Facility, June - August 2021

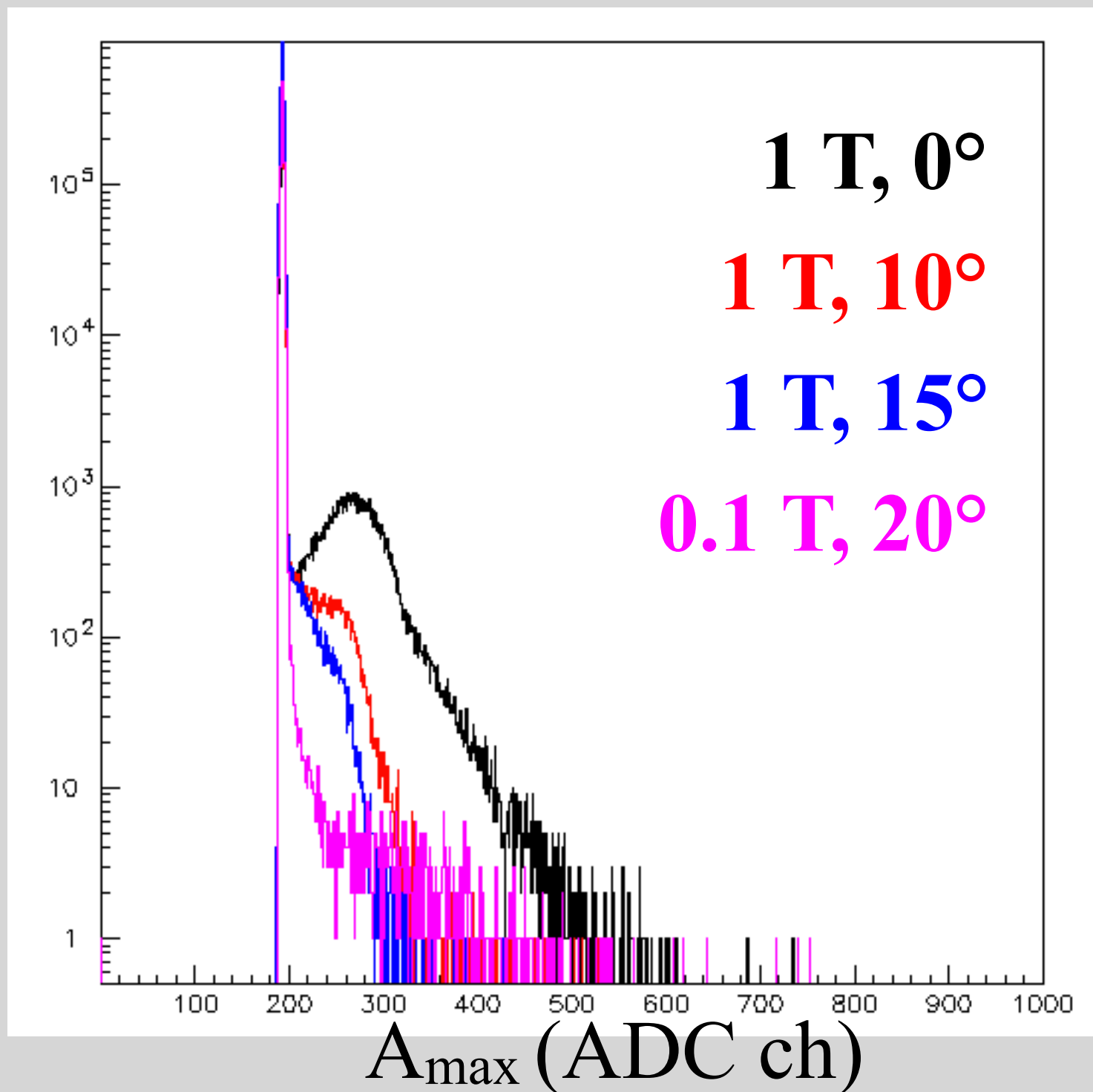
Internal amplification: x7.5



Photonis Gain Scan 2021

No signal at $\theta=20, 30$ deg

bias angle: 10°

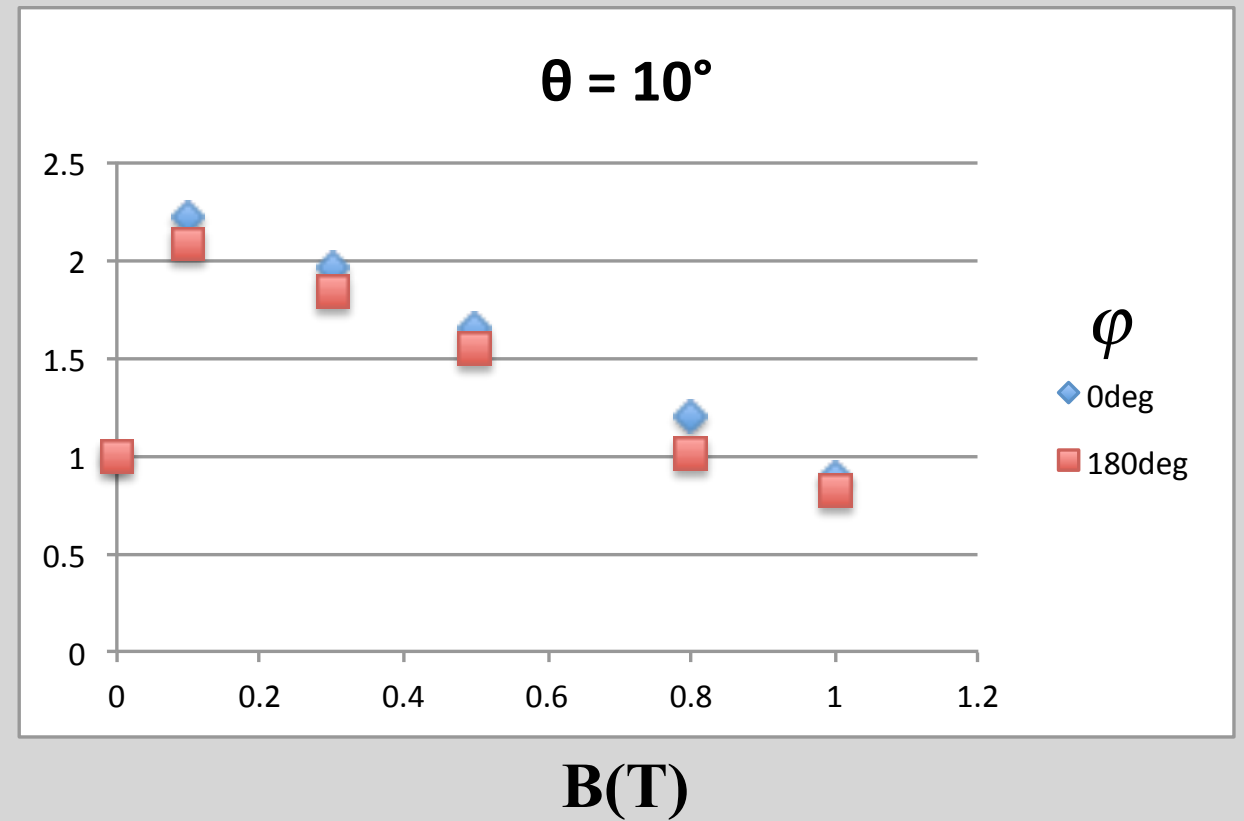
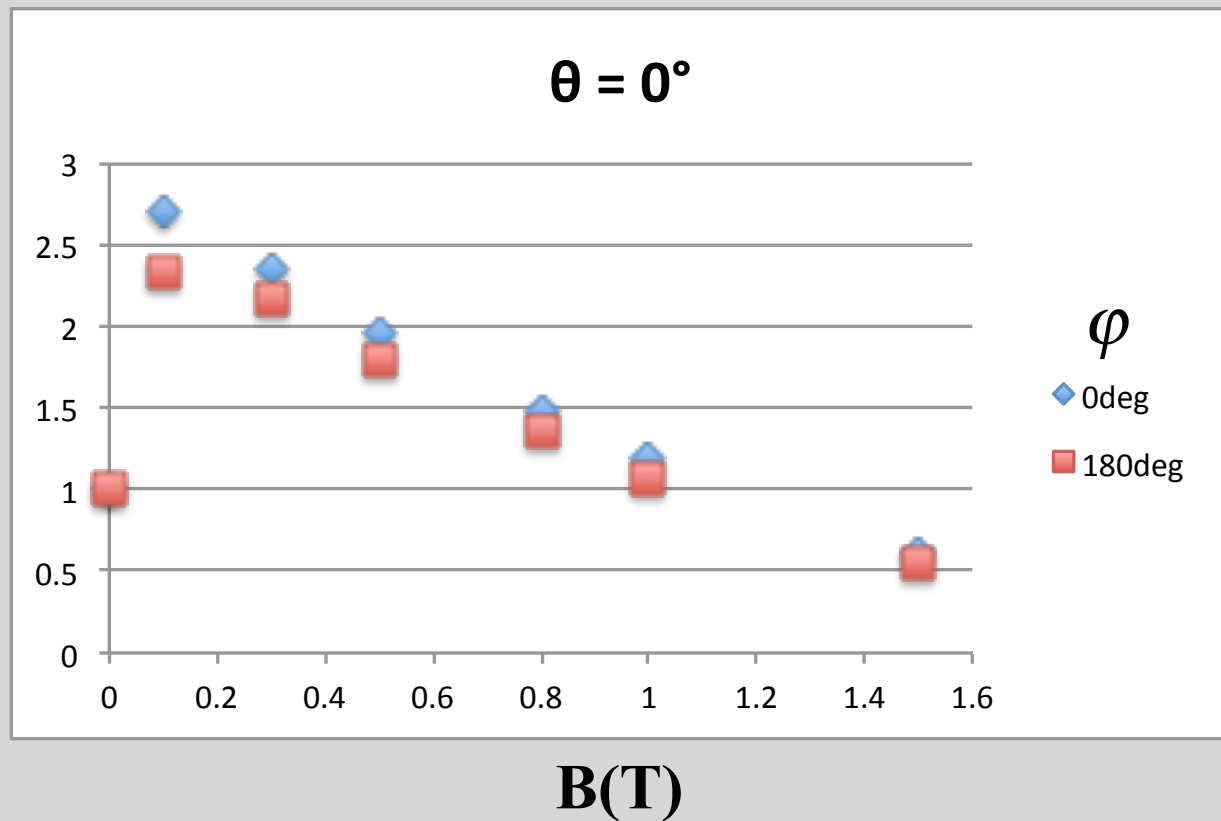


Photonis Gain Scan 2021

φ Dependence

B-field Scan: Jefferson Lab High-B Facility, June - August 2021

Internal amplification: x7.5

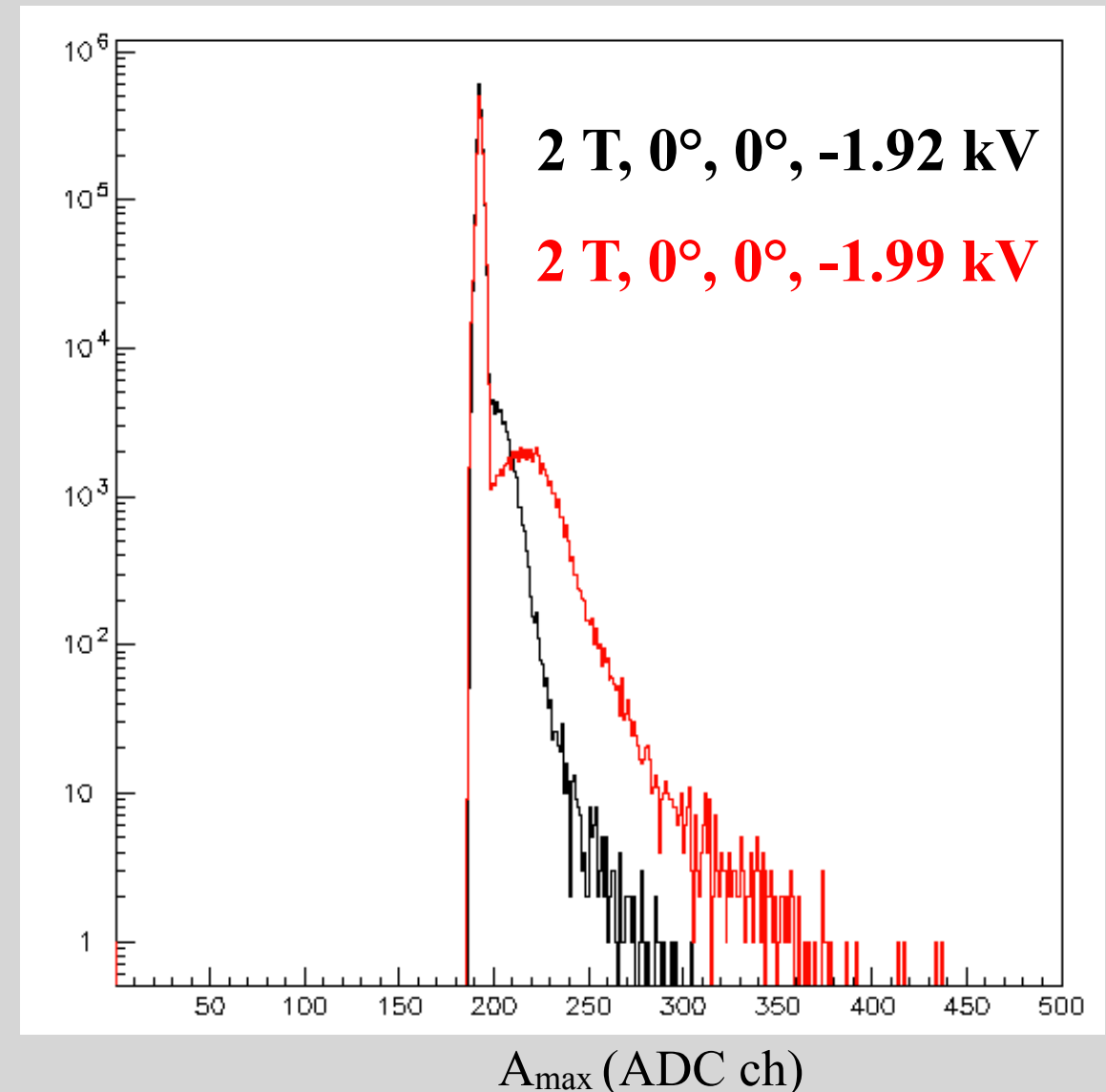
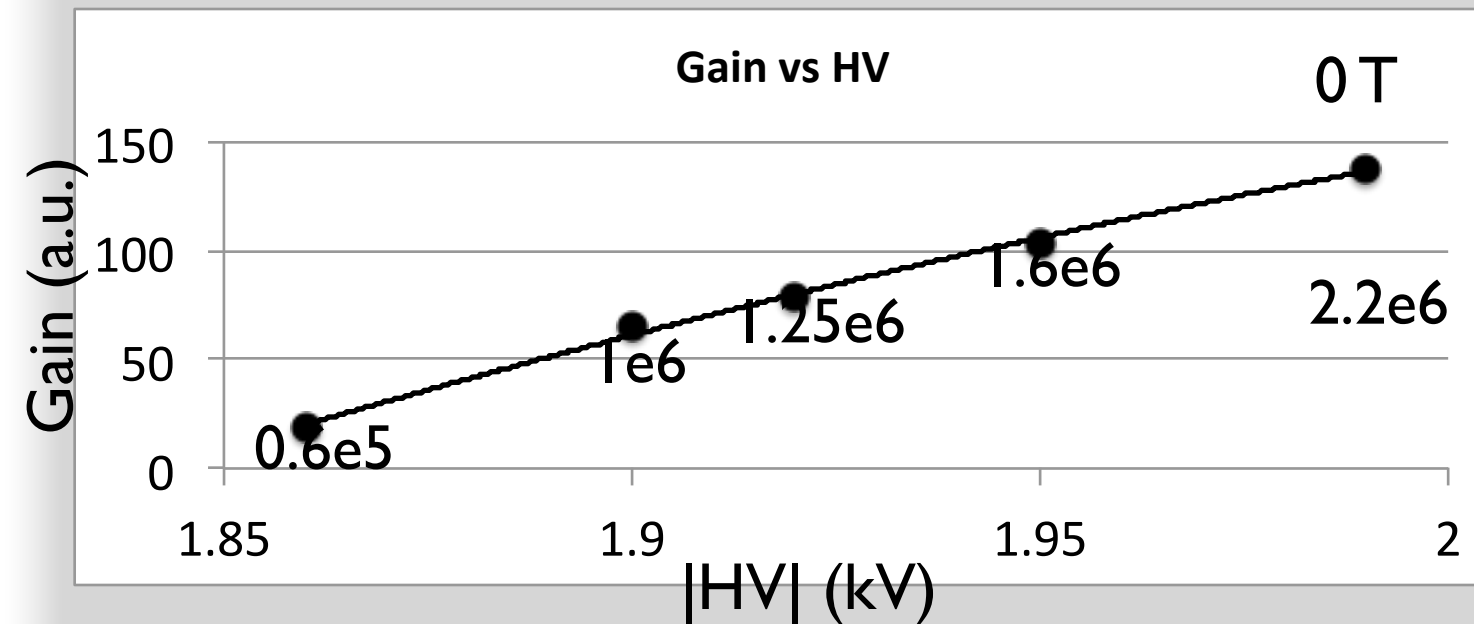


Photonis Gain Scan 2021

HV Gain recovery

B-field Scan: Jefferson Lab High-B Facility, June - August 2021

Internal amplification: x7.5



Tube Type: XP85122-S, Hi CE
Serial #: 8002202
Date: 20-Oct-20

DC TEST DATA

Cathode (white)	67	$\mu\text{A}/\text{lm}$
Cathode (blue)	8.8	$\mu\text{A}/\text{Blm}$
Voltage for 10^5 gain	1725	V
Voltage for 10^6 gain	1860	V
I_{dark} (@ 10^5 gain)	0.2	nA
I_{dark} (@ 10^6 gain)	1.2	nA
R_{MCP} (@1400V)	30.0	M Ω

Summary and Outlook

Photek: reasonable gain performance up to 1.5 T for angles up to 10 deg. Some azimuthal angle orientations are better than other - "sweet spot" can be identified. Needs to be tested in 16x16 geometry and for gain uniformity across the tube. Ion feedback analysis to be completed for max HV operation with lifetime in view.

Photonis: reasonable gain performance up to 1.5 T for angles up to 10 deg. Needs to be tested with a full readout. Ion feedback analysis to be completed for max HV operation with lifetime in view.

ORTEC VT120 Studies

x20 Non-linearity at small amplitudes: June - August 2021

