

Updates on hardware installation and preliminary studies

HRPPD #25

Ageing studies - Global Meet #3
12 March 2025

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Mauro Gregori², Saverio Minutoli¹, Mikhail Osipenko¹, Fulvio Tassarotto²

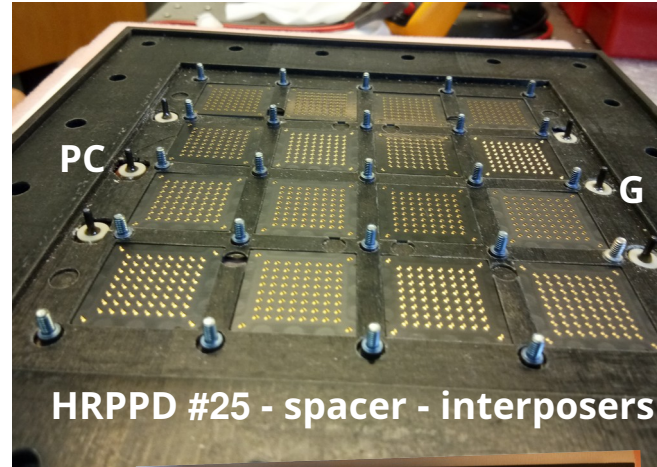
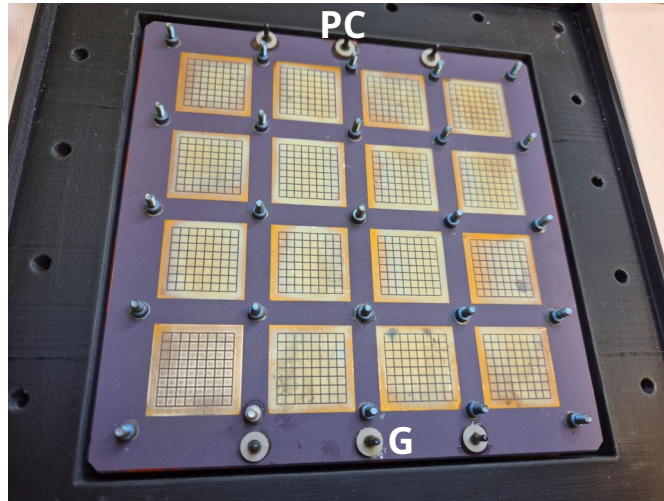
¹INFN Genova

²INFN Trieste

Outline

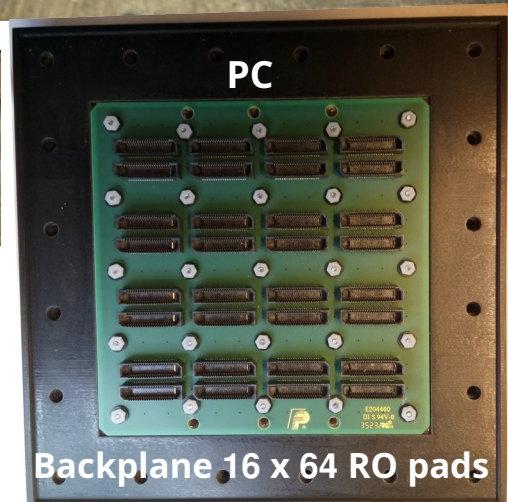
- Detector assembling and integration
- Electrical tests (leaks and isolation)
- Experimental set-up (light and signal)
- Electrical circuit
- Signals from Anode

Detector – assembling and integration

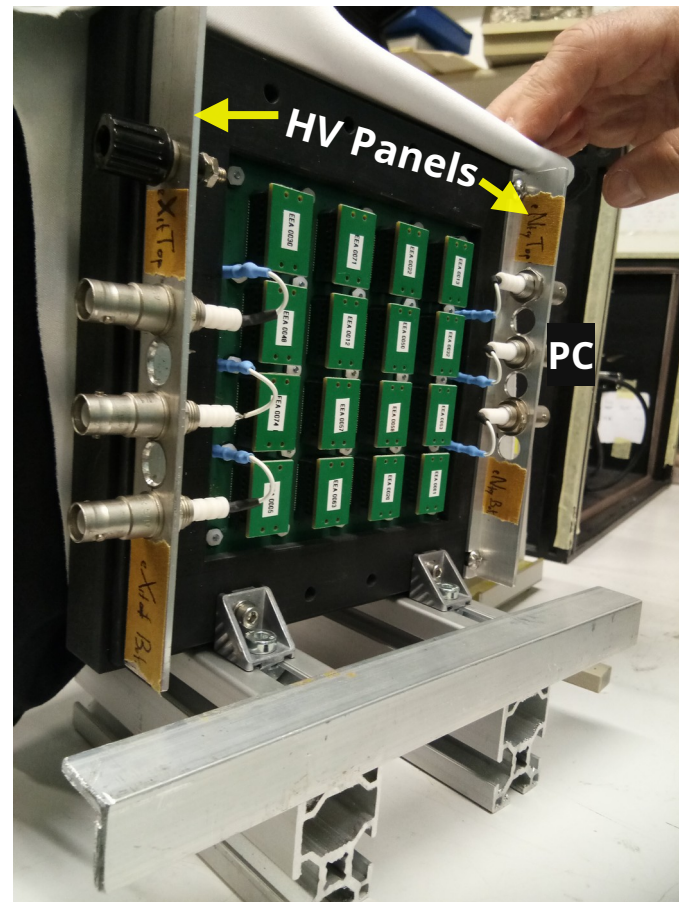
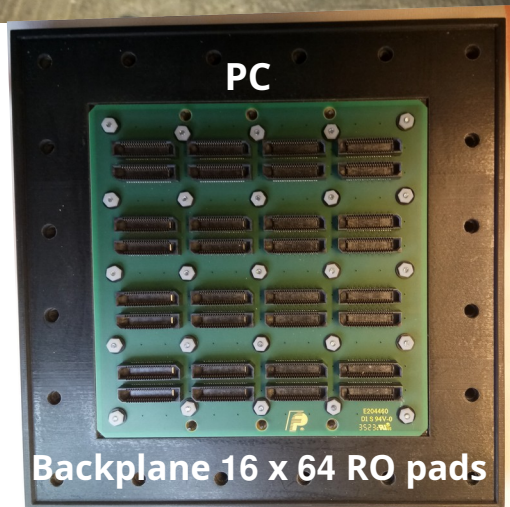
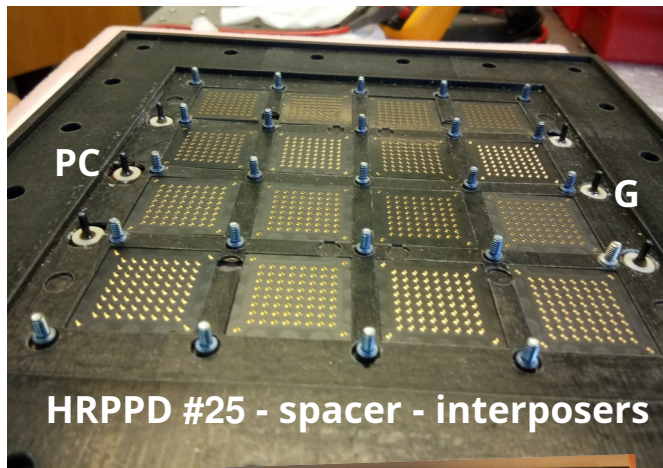
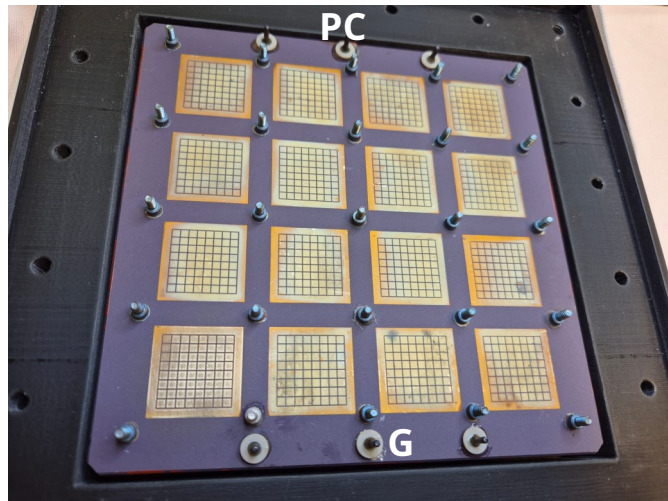


All components assembled:

- HRPPD #25
- Interposers
- Backplane with Samtec connectors
 - Planarity O (100 μ m)



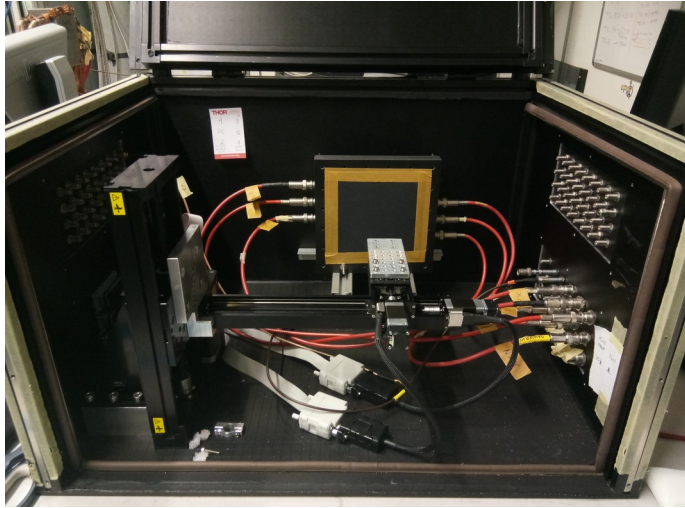
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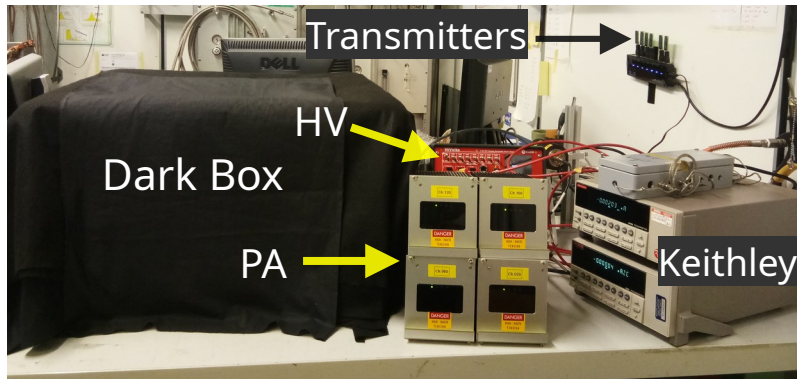
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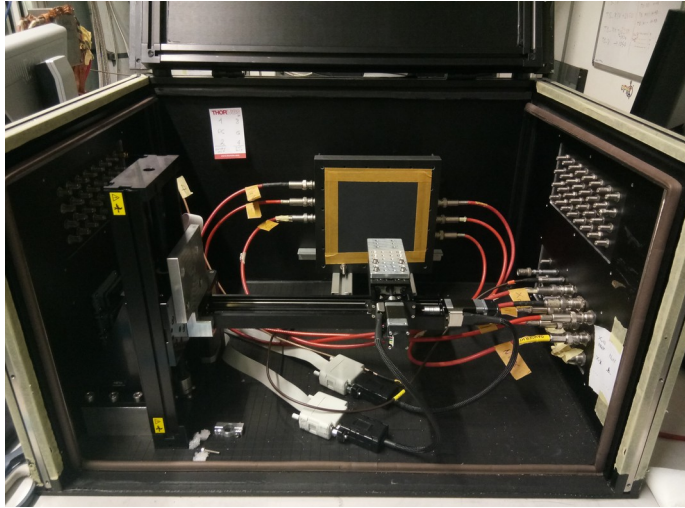
Electrical tests (Leaks)



- Keithley 6485 (10 fA)
- Custom-designed Pico-Ammeters (1 pA)
 - ✓ Limit ~50 nA
 - ✓ Circuit modified to push limit to ~500 nA
 - ✓ vplot (visualisation + recording)

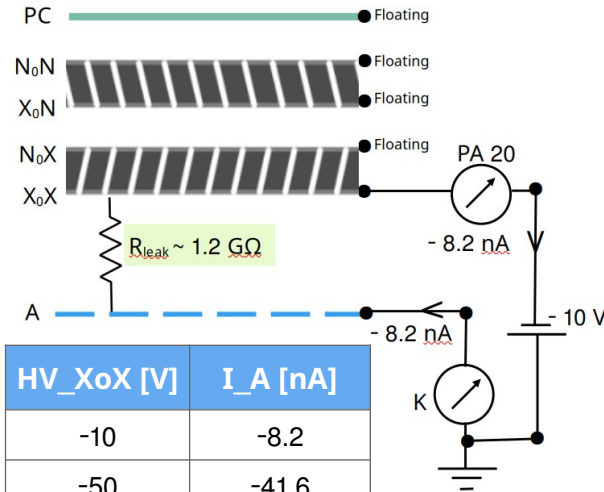


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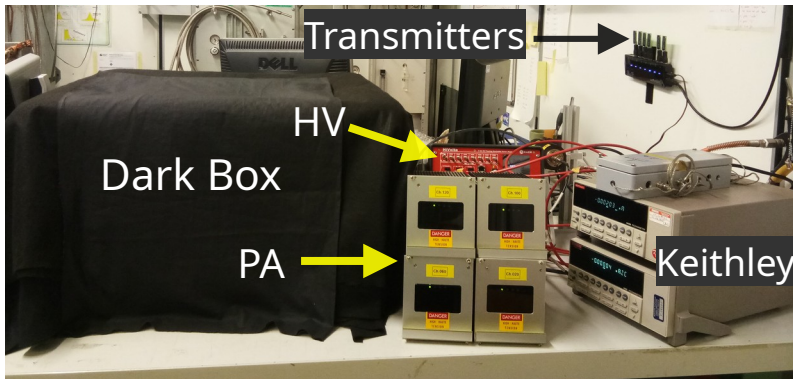


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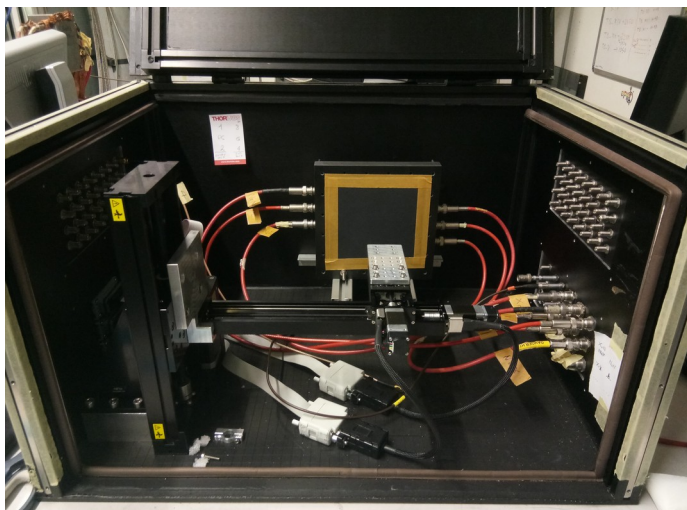
Bias provided to two electrodes



Ohmic

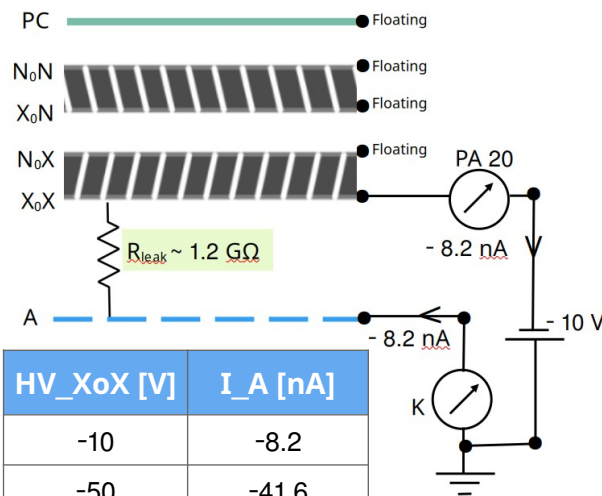


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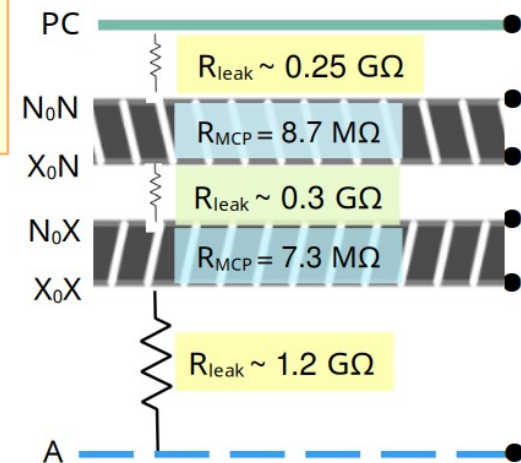
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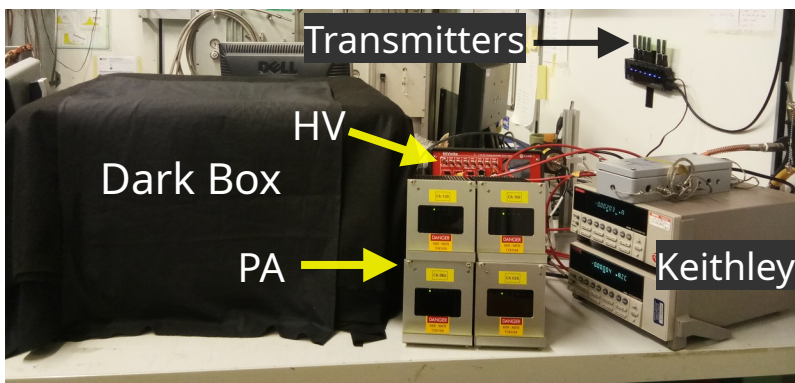


HV_XoX [V]	I_A [nA]
-10	-8.2
-50	-41.6
-100	-84.1
-200	-170.5

Ohmic

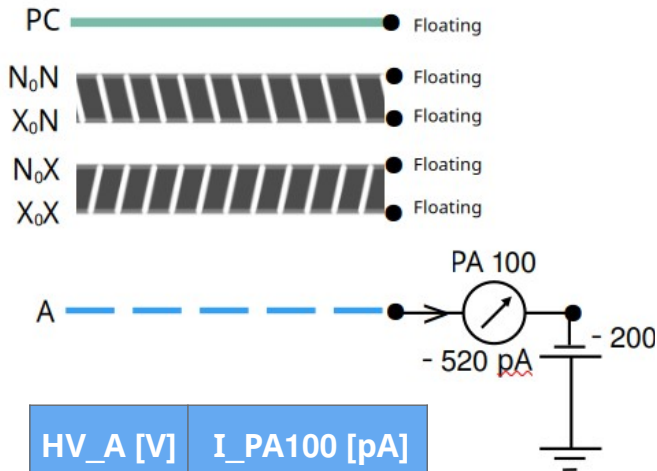


Anode and PC leaks were ~ 20 GΩ and ~ 13 GΩ for the LAPPD #153



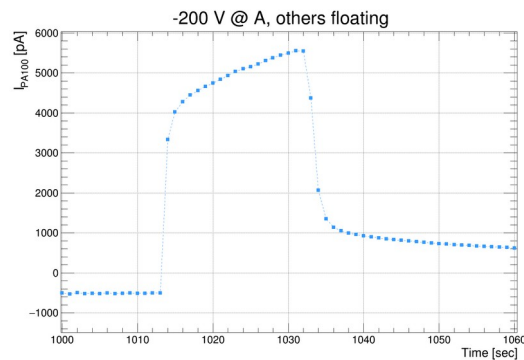
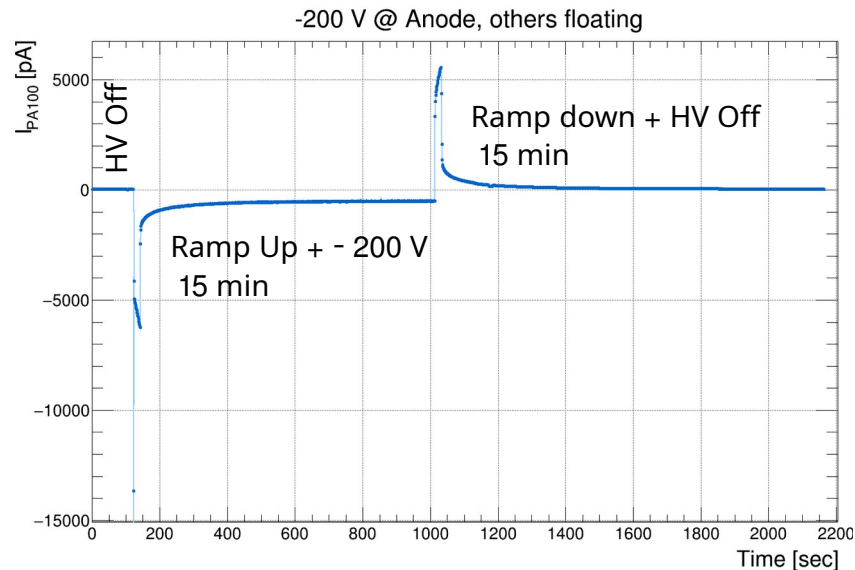
Electrical tests (Isolation)

Bias provided to single electrode



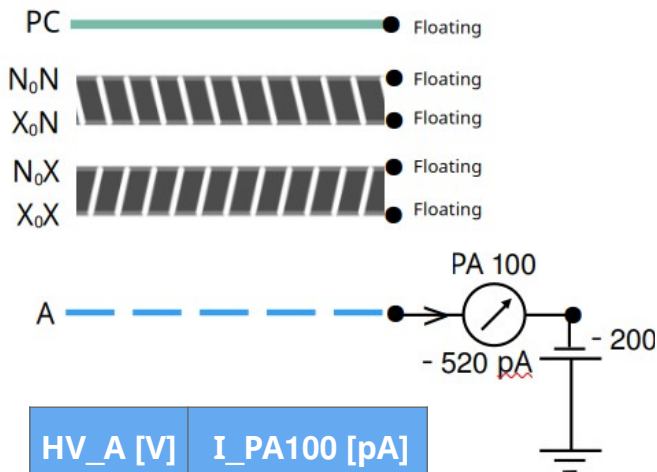
HV_A [V]	I_PA100 [pA]
-10	-20
-20	-40
-100	-250
-200	-520

$$R_{A, Iso} \sim 350-400 \text{ G}\Omega$$



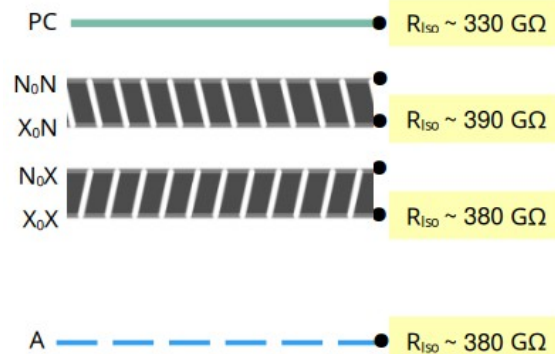
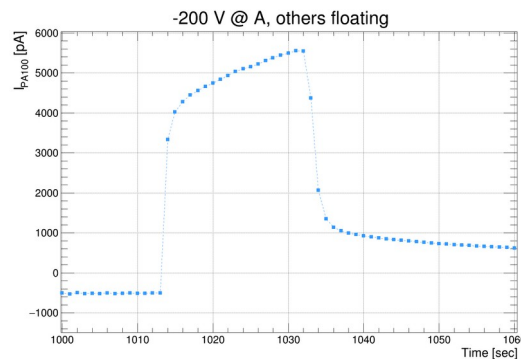
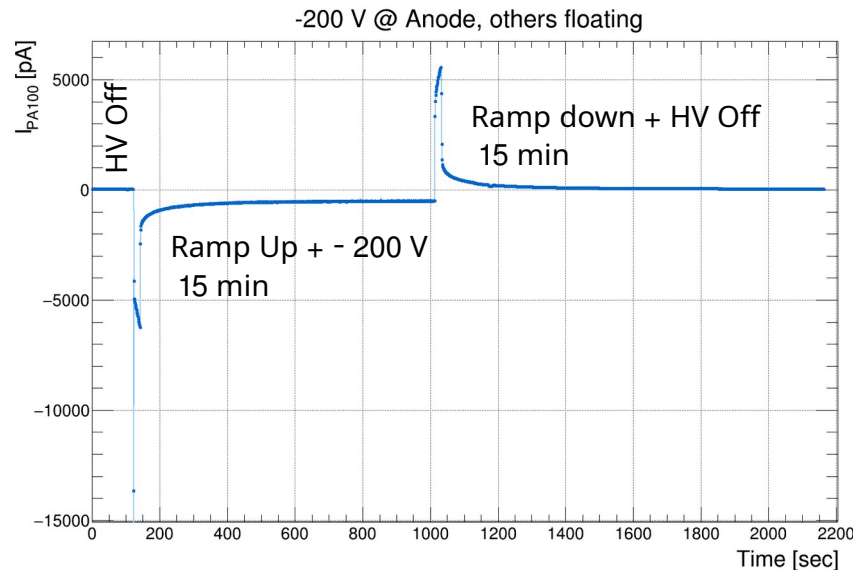
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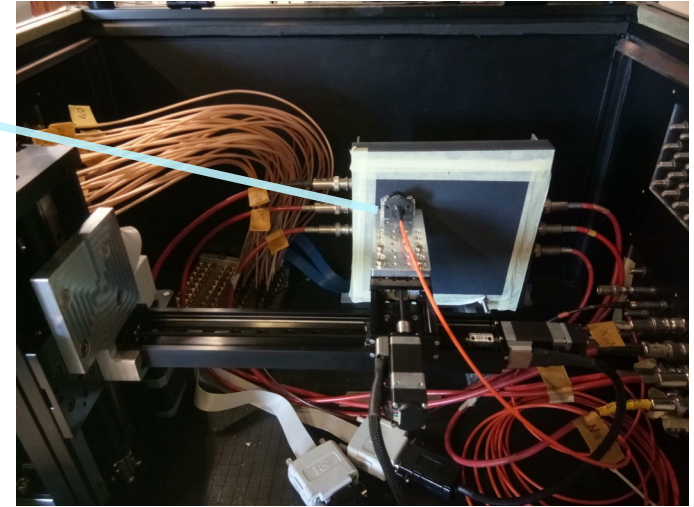
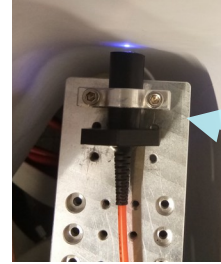
Good isolation

Experimental set-up (light and signal)

Signal from single pad: **Waiting for backplane** (modified design) and an adapter card. **Meanwhile, preparation goes on.**

- ♦ HRPPD inside light-tight dark box
- ♦ Double protection card
- ♦ 8 mm hole diameter
- ♦ Fibre on moving arm system
- ♦ Fibre tip ~ 1 cm away from window

- PicoQuant Laser (pulsed - 405 nm) with driver (PDL 800-D)
- Waveform generator to trigger the laser head

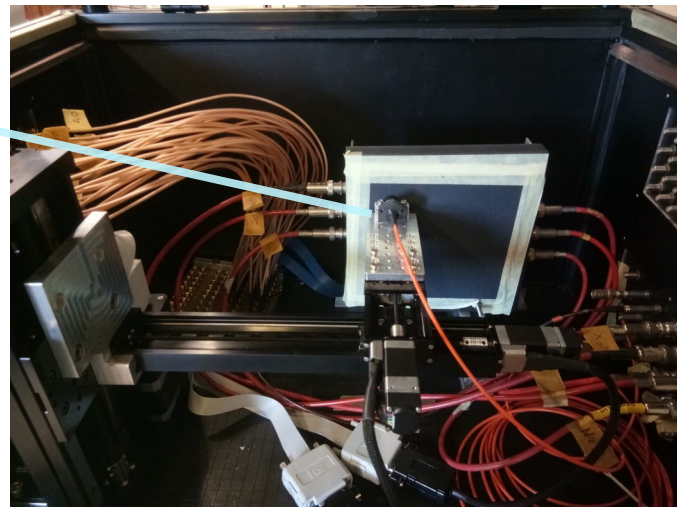
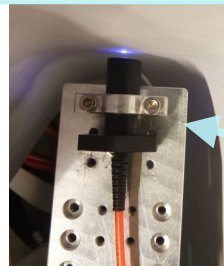


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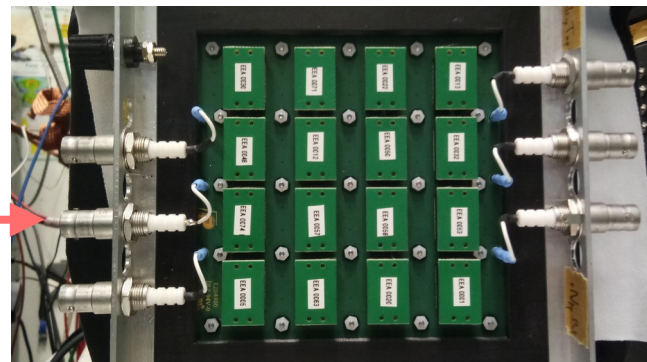
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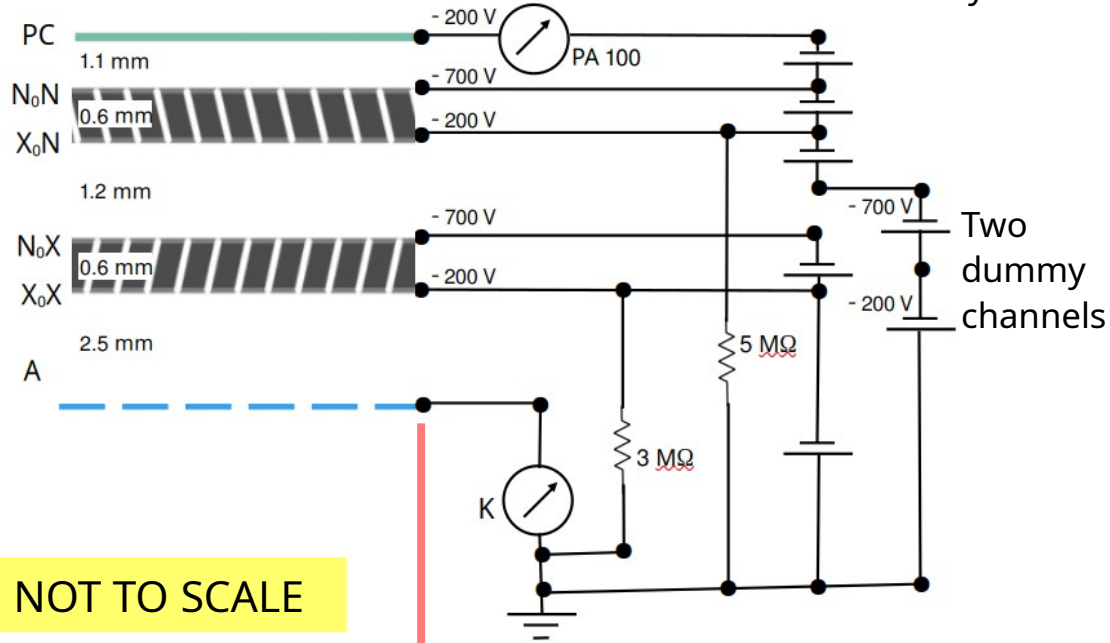
Signal from Anode (sum of 1024 pads)

- Via 16 Grounding caps the 1024 pads, Guard rings, Samtec pins are put together to **HRPPD Internal Ground** on backplane.
- HRPPD Internal Ground is connected to the Anode HV pin (central electrode of the SHV)
- This anode signal is read by Oscilloscope



Electrical circuit

HV power supply
7 Channels in Daisy chain



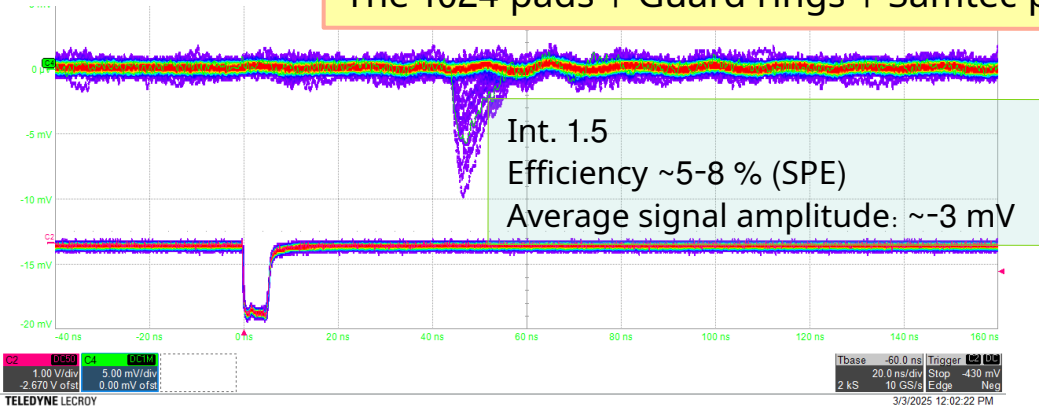
HV Ground Pin
either to Keithley or Oscilloscope

- CAEN DT1415ET HV power supply
✓ GECO 2020 software
- 2.5 GHz Oscilloscope (waverunner 9254)

Light signal from Anode

HV configuration: -200_-675_-200_-675_-30 V @ XoX_NoX_XoN_NoN_PC

The 1024 pads + Guard rings + Samtec pins (16 Grounding caps)

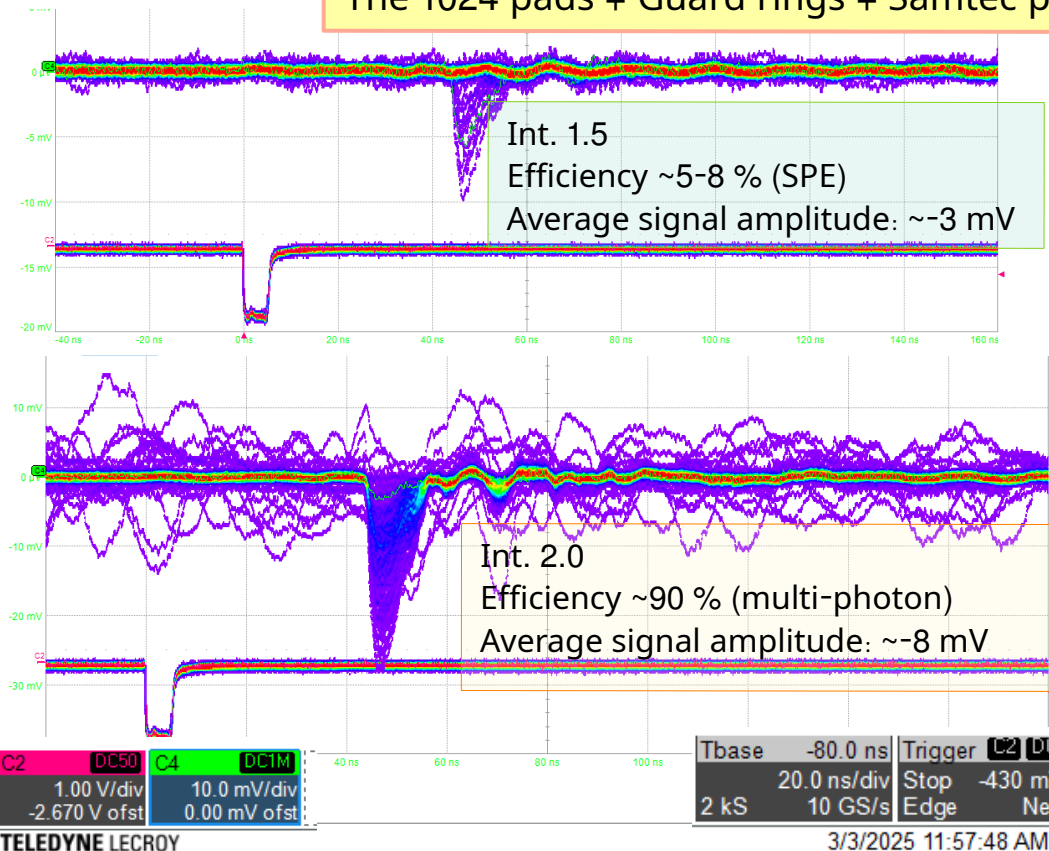


- Laser external trigger (600 Hz) mode
- Triggering on the laser sync pulse
- Light signal appears at ~ 45 ns

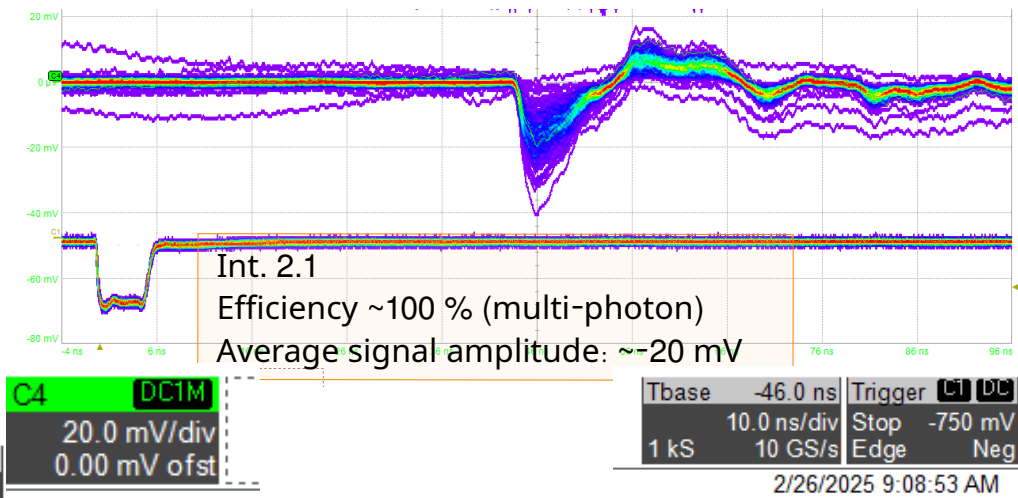
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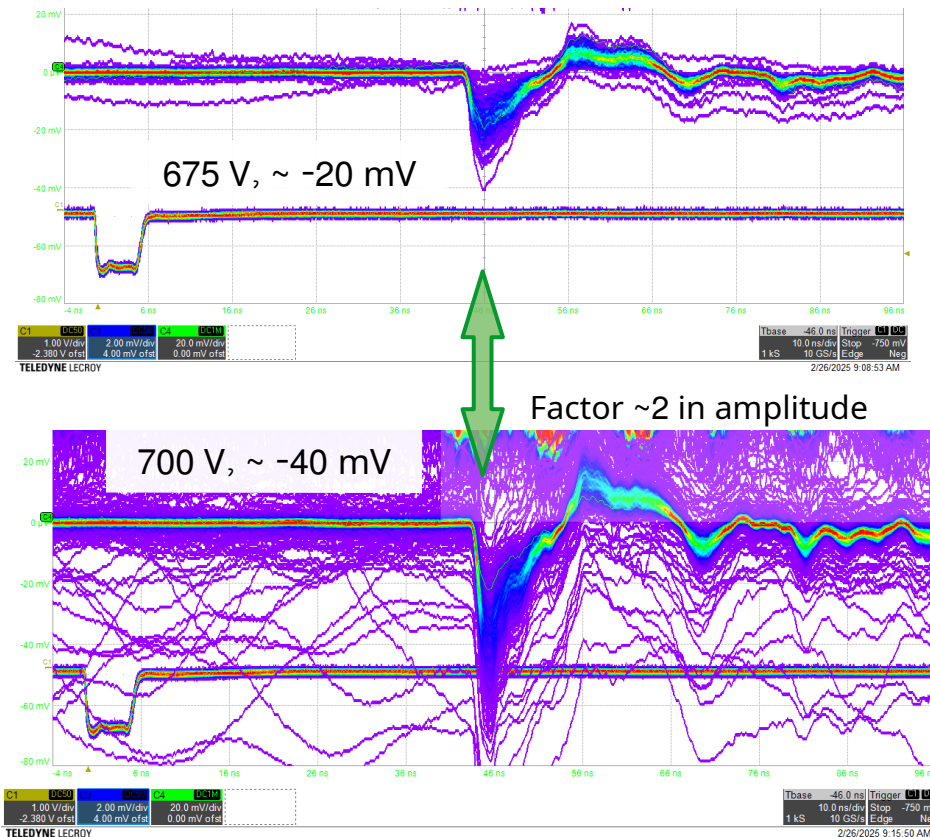


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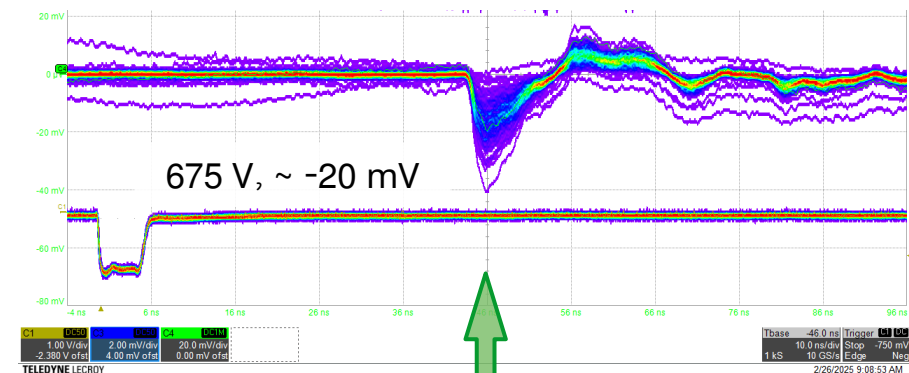
Signal amplitude varies with ΔV_{MCPs}

- Triggering at the Sync pulse from the Laser; Laser intensity 2.1
- -200 $-\Delta V$ -200 $-\Delta V$ -30 V

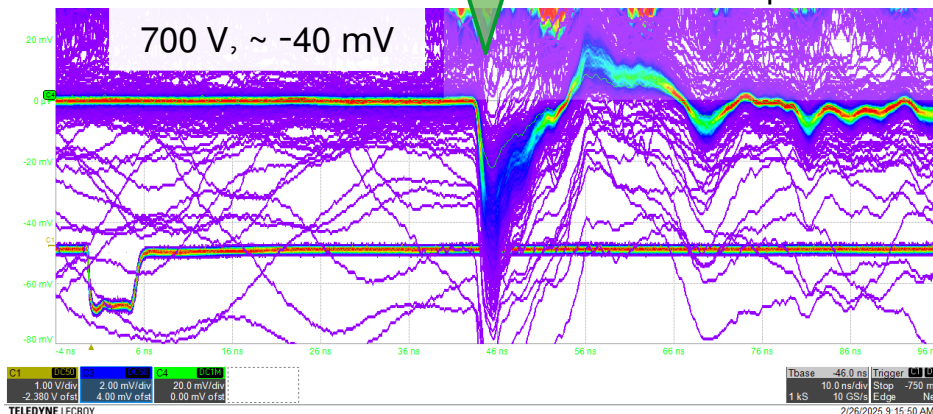


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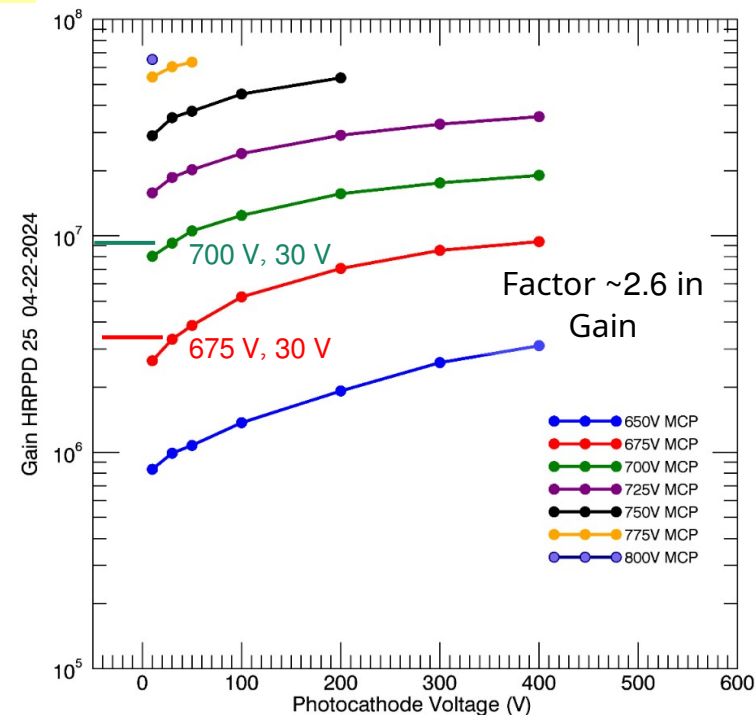
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- 200_- ΔV _-200_- ΔV _-30 V



Factor ~2 in amplitude



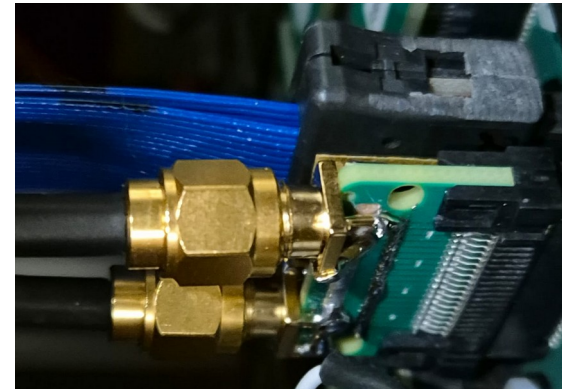
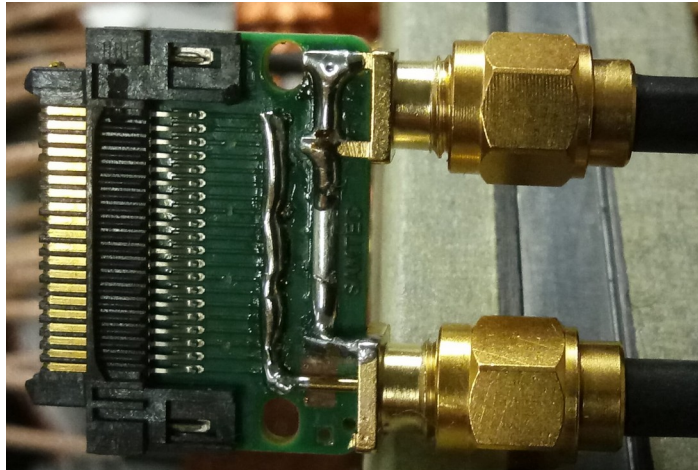
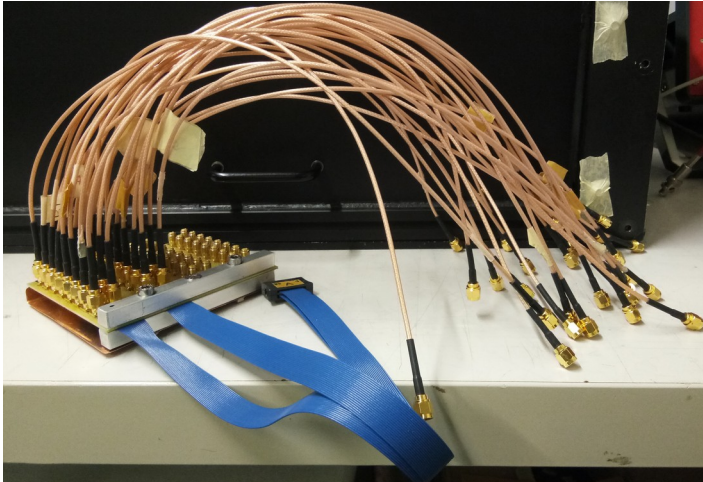
INCOM Datasheet



Clear evidence of light signals after multiplication in HRPD MCPs

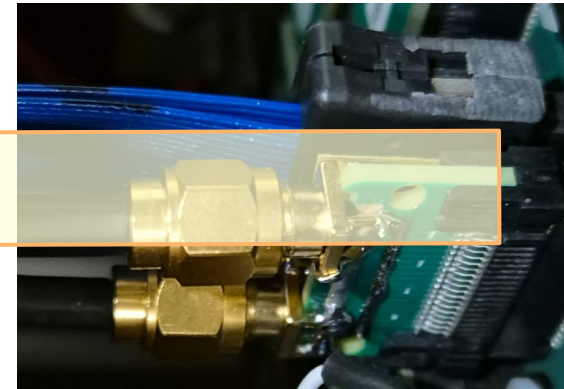
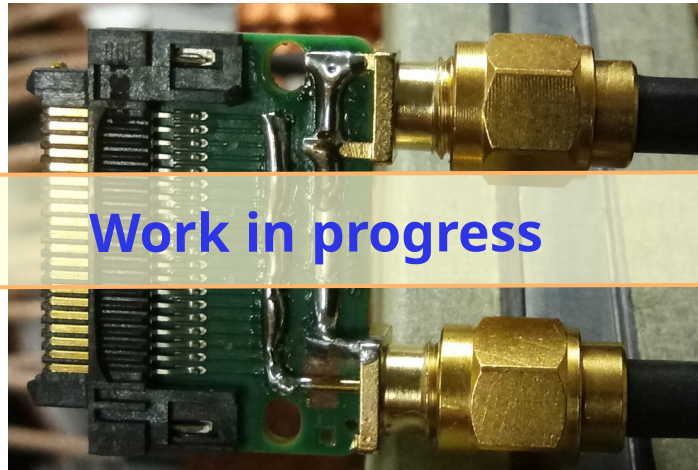
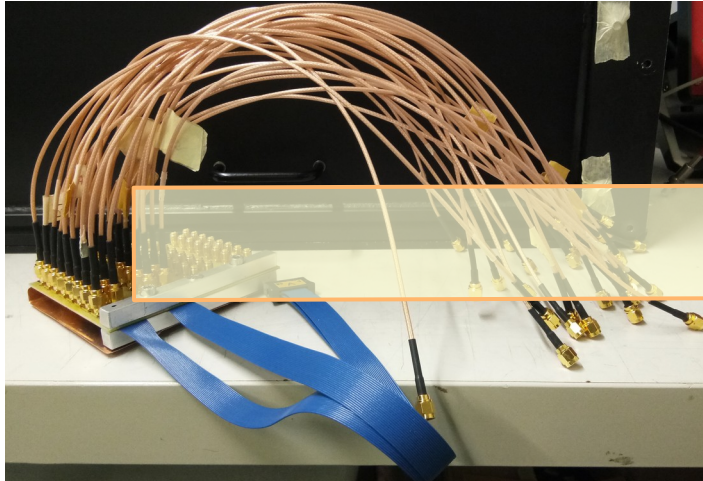
Preparation for reading single pad/ group of pads

- 32 pads read individually by ERCD connector via micro-coaxial cables (Samtec) - Bread board with SMA connectors
- Samtec connector PCB – two SMA mounted on a PCB – each SMA reads 16 pads together



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Summary

- All components of the HRPPD #25 are assembled together.
- Preliminary electrical checks performed - Ohmic leaks and good isolation ($> 300 \text{ G}\Omega$) measured.
- First light signals are seen from the anode. Reasonable signals in terms of shape, fast rising edge.
- Signals from single pads are next priorities in order to perform characterisation (Gain, PDE, QE) of the HRPPD #25.

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Thank you!