Crytur prototype 1.0

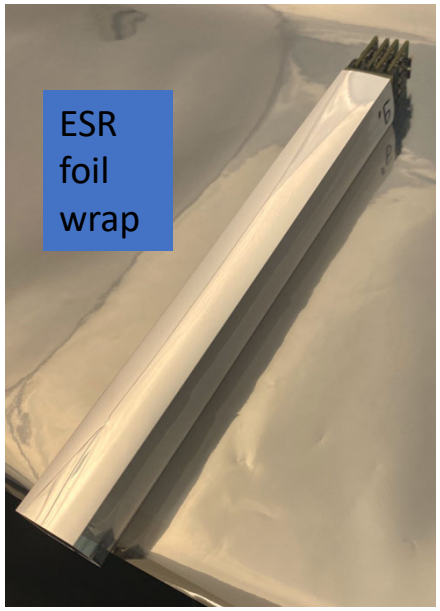
JLAB prototype PWO/SiPM

Assembly and testing instructions

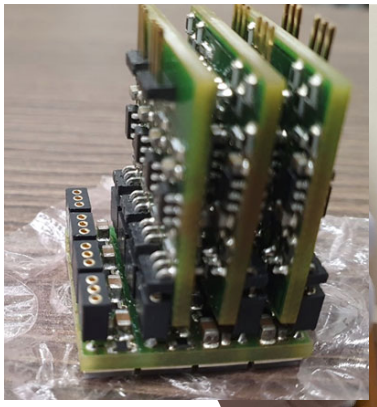

PWO crystals wrapped and coupled to their SiPM modules
Electronics cover
L-shape brackets for crystal frame closure
Detector closing plate
Detector front plate
Detector housing
L-shape brackets for crystal's frame, mounted on the top of the housing
EEEMCAL
PROTOTYPE
ELECTRON-ENDCAP EM CALORIMETER FOR EIC

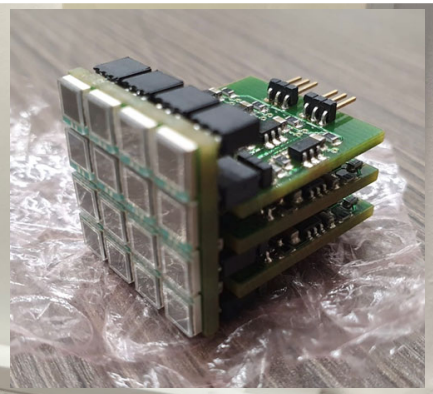
General assembly precautions

- Use grounded ESD protection mat and wrist band when disassembling the detector and when handling the detector electronics.
- The bond between the SiPM boards and the crystals is meant to be removable. Handle with care to prevent inadvertent decoupling.
- The PWO crystals are sensitive to shocks and abrasion, handle with care.
- The detector needs to be covered with a dark cloth to prevent light leaks through the ventilation openings.



Single PWO crystal wrapped in ESR foil and Tedlar and coupled to a 16-SiPM assembly





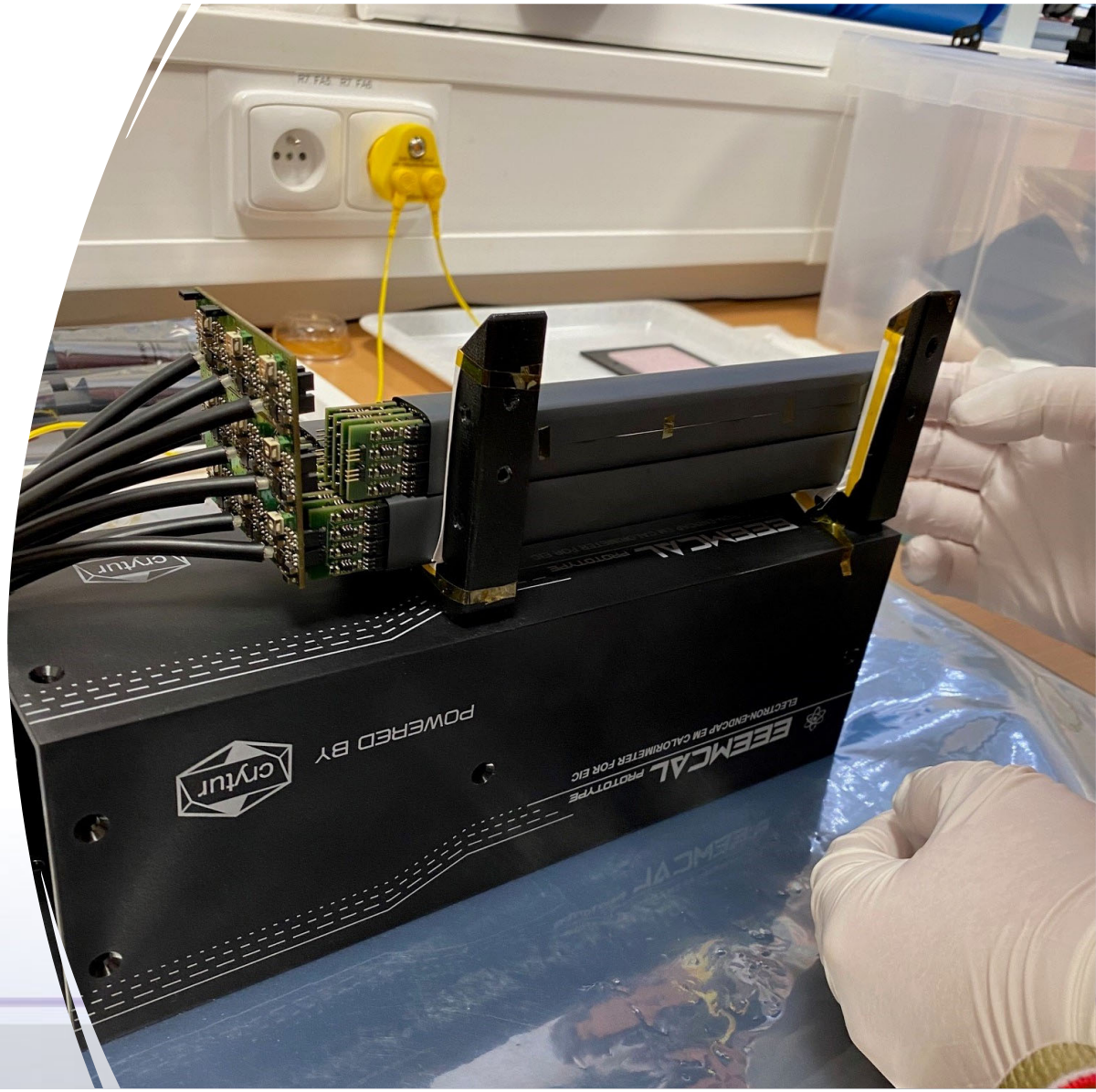
16-SIPM module

Crystal assembly: left to right, bottom to top in the L-shape brackets mounted outside of detector housing

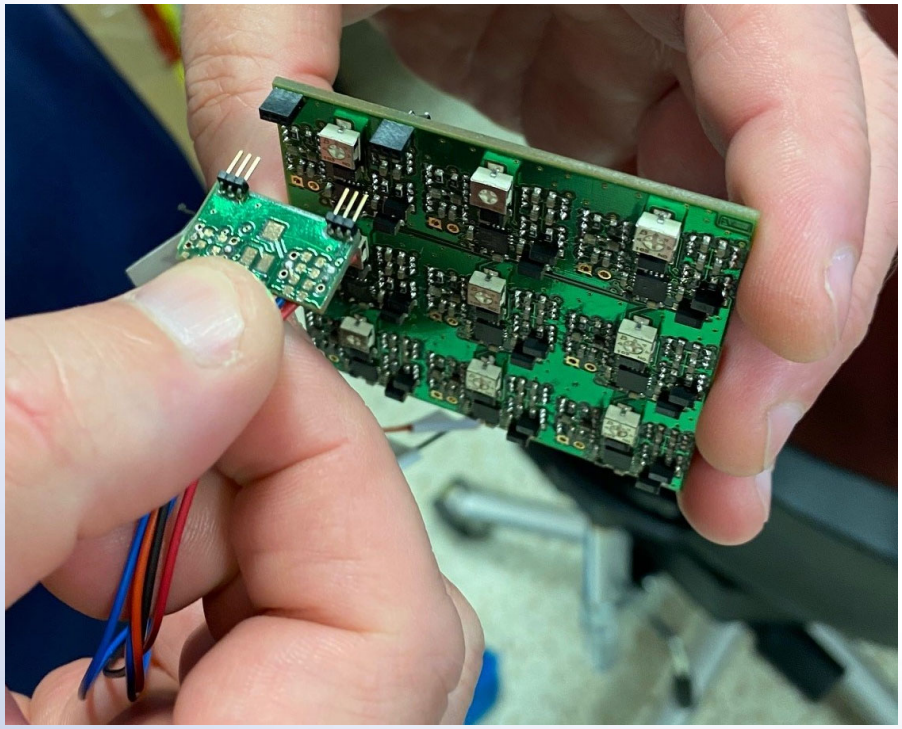
Another view of the first 3 crystals assembled on the L-shaped bracket fixtures mounted on the top of the detector housing

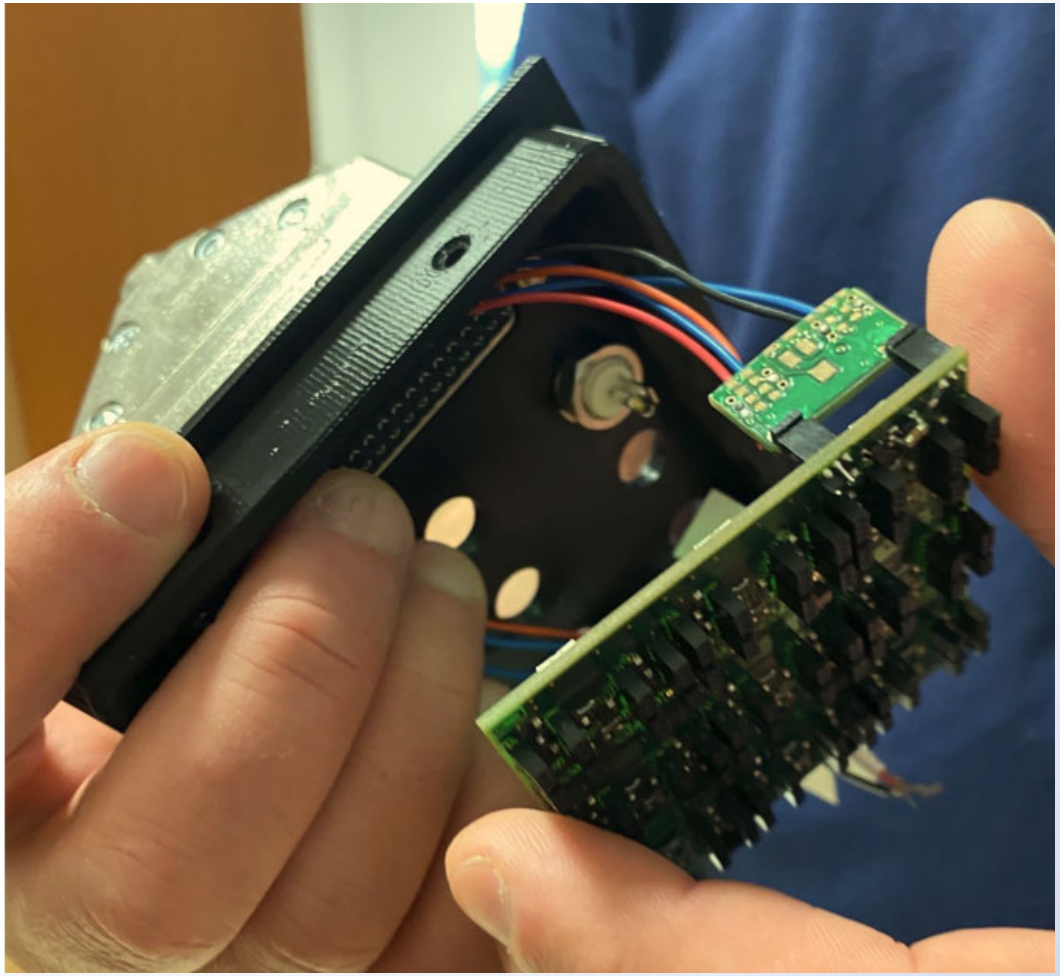
Electronics assembly:

Each individual crystal's module is plugged into motherboard one-by-one, as crystals are positioned in the brackets. The 2nd L-shape bracket is supporting the electronics' end of the crystal



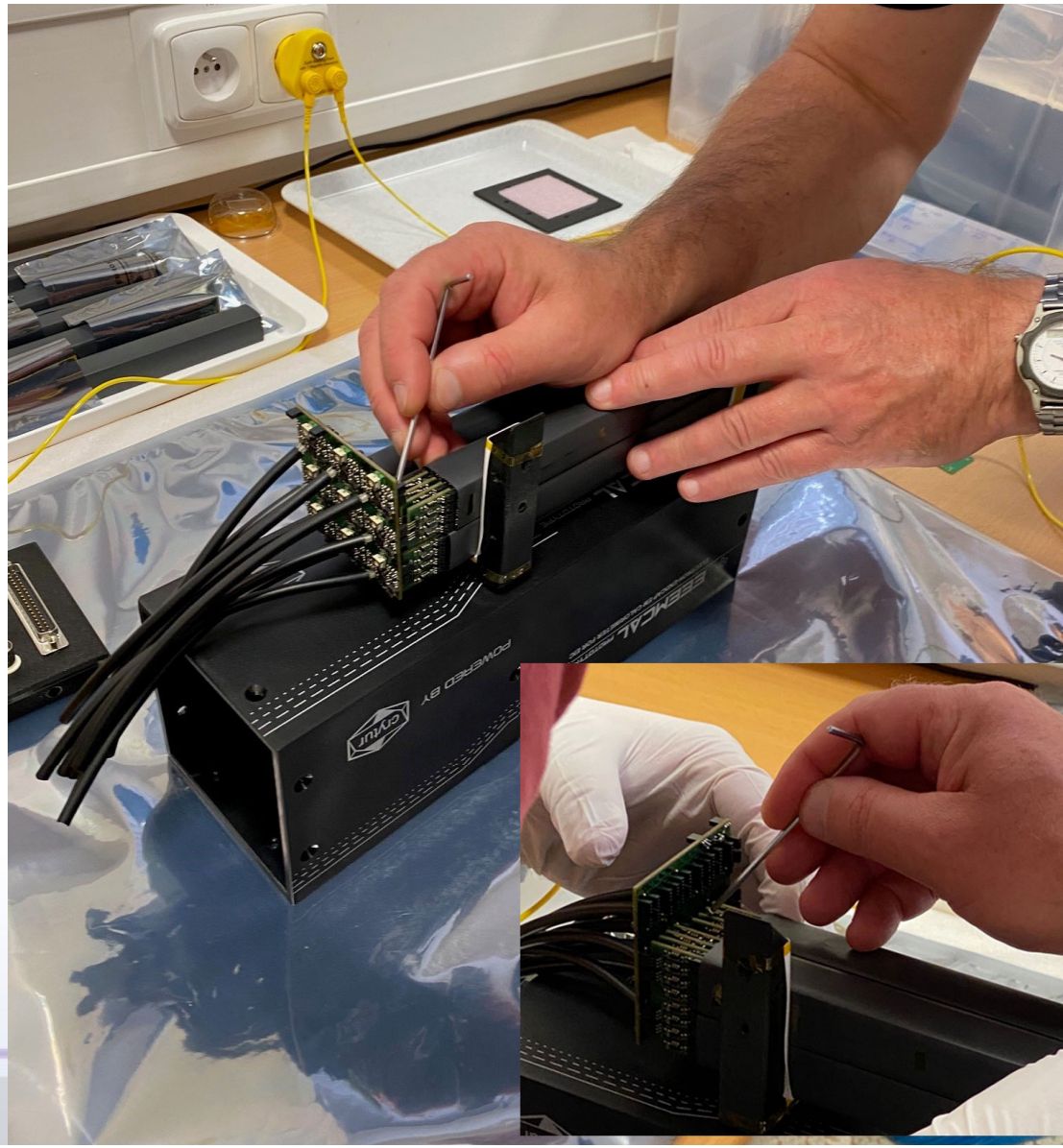
The mother board orientation:
The connector is on the top left

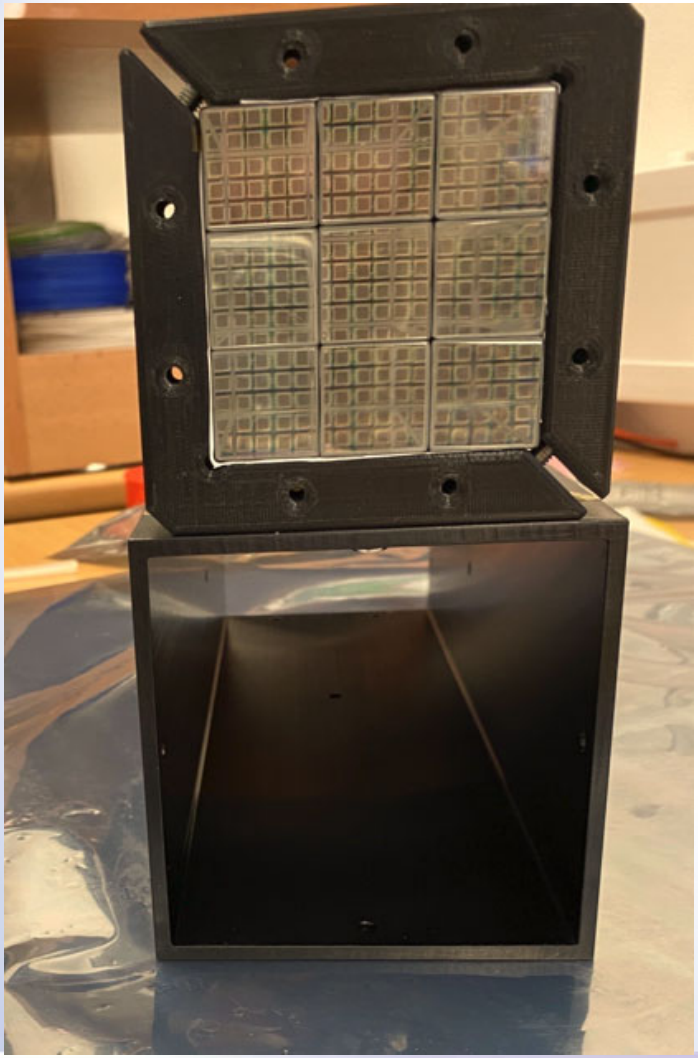


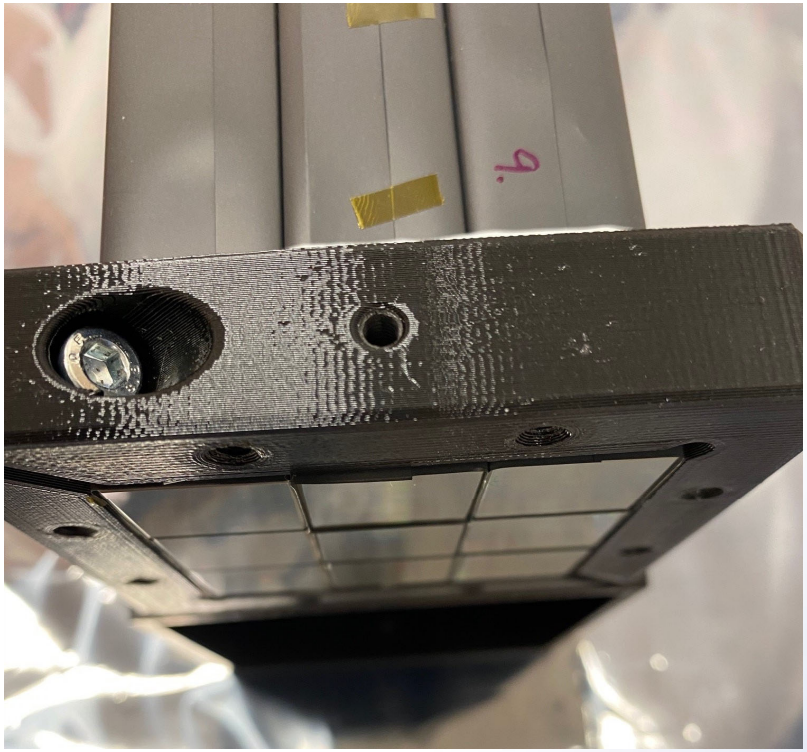


The mother board connection to back plate

Pins on each individual module can be aligned with the motherboard by gently straightening the small parallel boards to be plugged in. An ESD wristband must be worn to protect the electronics components.







After 9 crystals are mounted and aligned with the motherboard, an L-shape bracket is closed with another L-shape bracket and the brackets are screwed together with a hex screw (wrench supplied)

View of the assembled 9 crystals. The front faces of the crystals can be aligned by gently pushing them in or out. The crystals are easily chipped, so care must be taken not to touch them with sharp objects.

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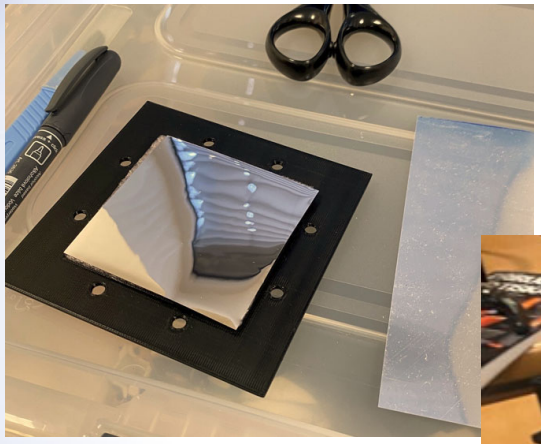
USA



Front plate with pre-installed ESR reflector and padding foam is used to protect crystals' faces

Inner detector, with the electronics module cover attached in the back and padded for mechanical protection with ESD carbon foam

Connector back plate with one D-sub 37 connector for power and nine BNC connectors for signal output from each individual crystal module. Black signal cables (~5 cm each) must be soldered to the back of the plate

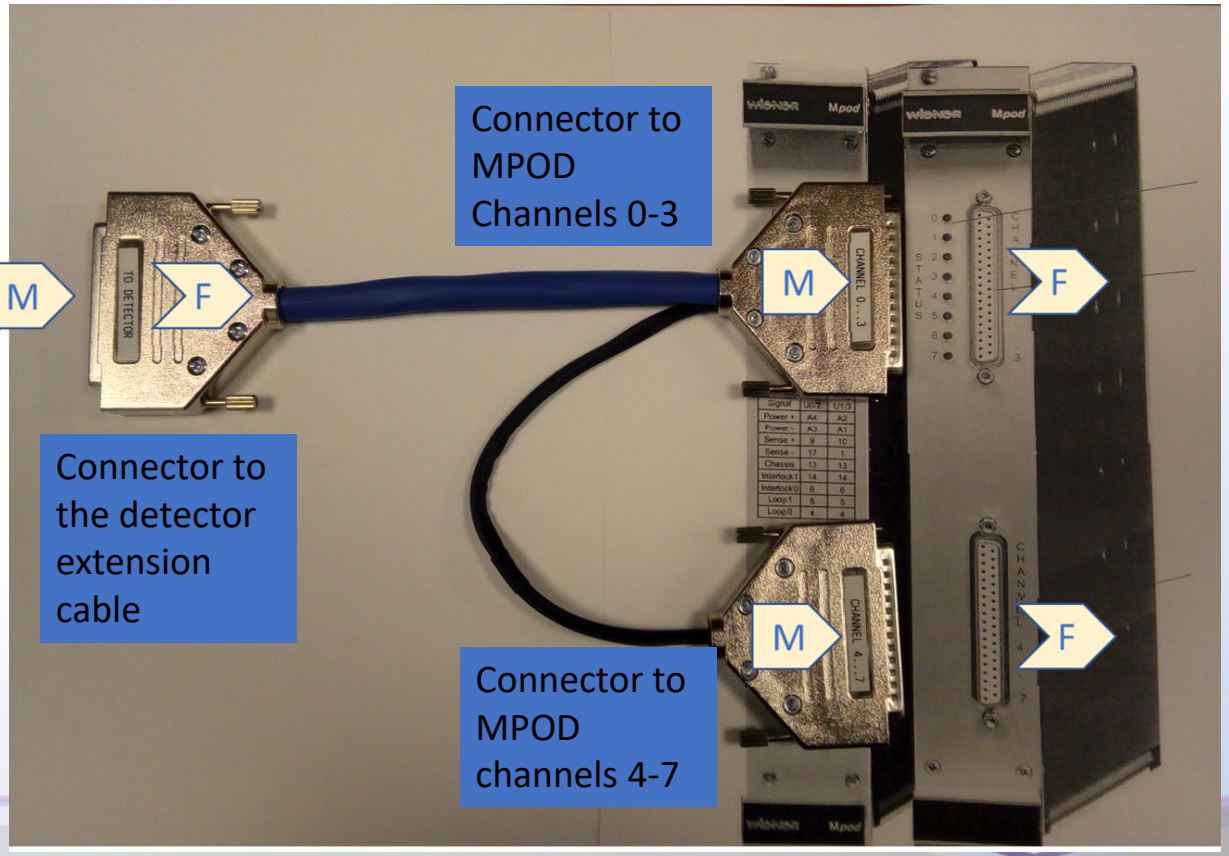
Testing with MPOD MPV8008I in the beam

Detector prototype — M — F — MPOD extension cable — M

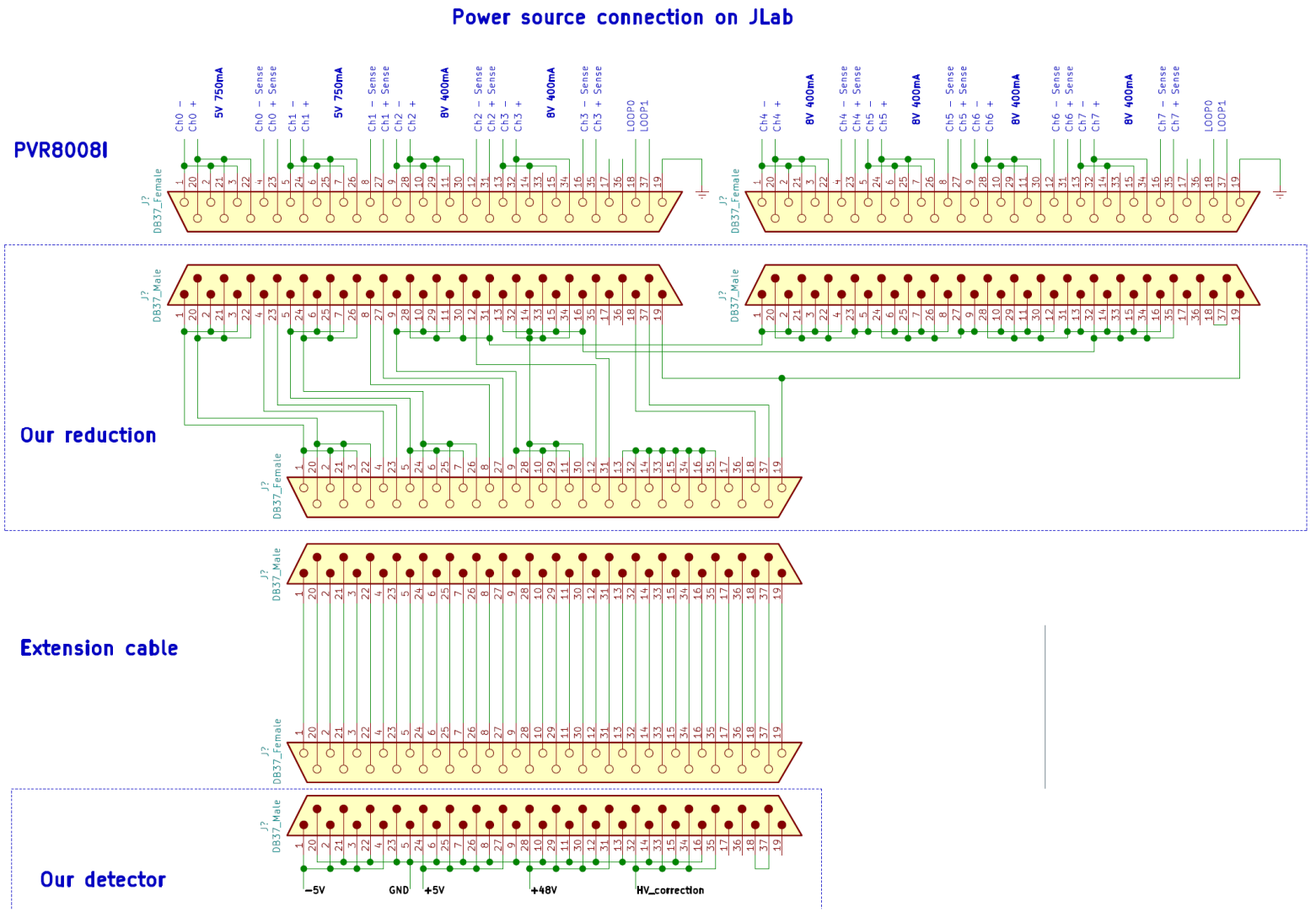
MPV8008I setup:

Ch0:	5V	750 mA
Ch1:	5V	750 mA
Ch2-Ch7:	8V	400 mA

(all six channels are used in serial connection to get 48V)



Power source connection on JLab



Connector for testing with 3 lab power supplies if MPOD is not available

D-sub-37 connector with flying leads for 3 power supplies:

+48 V must be powered on first

power ON:

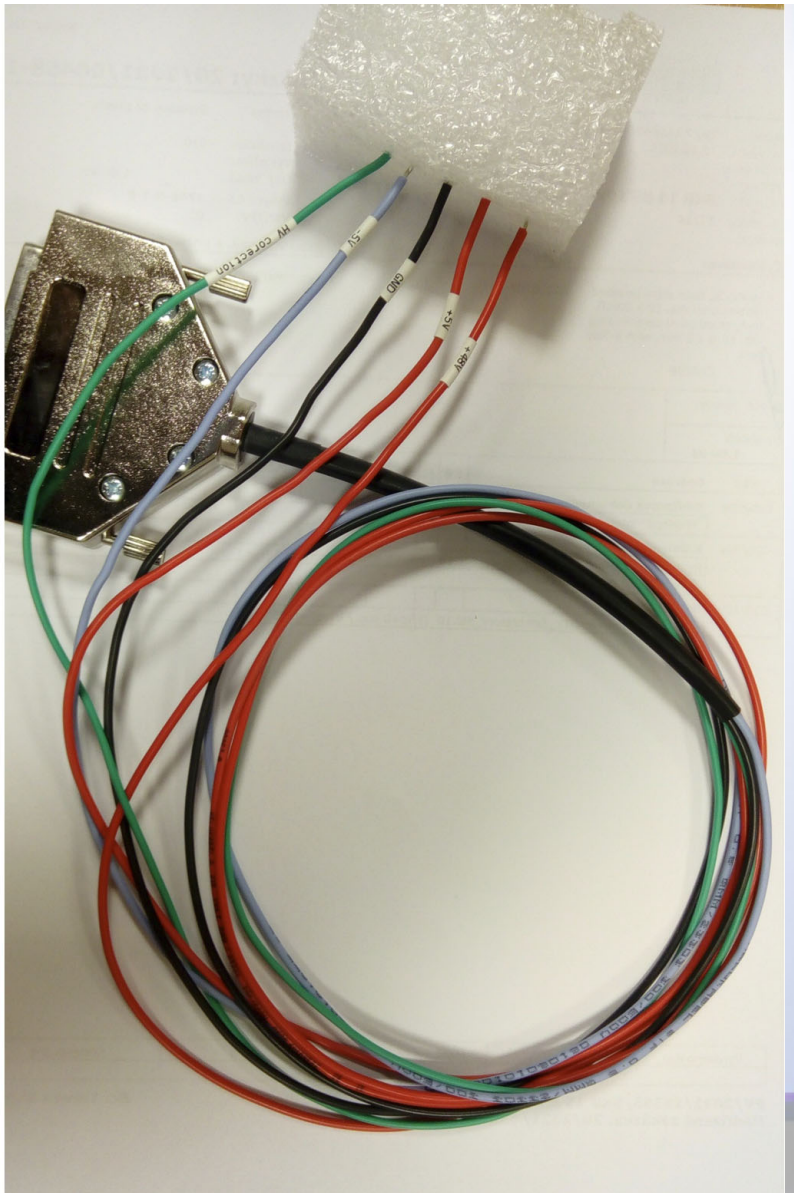
1/ switch on +48V source

2/ switch on +5V and -5V source

power OFF:

1/ switch off +5V and -5V source

2/ switch off +48V source

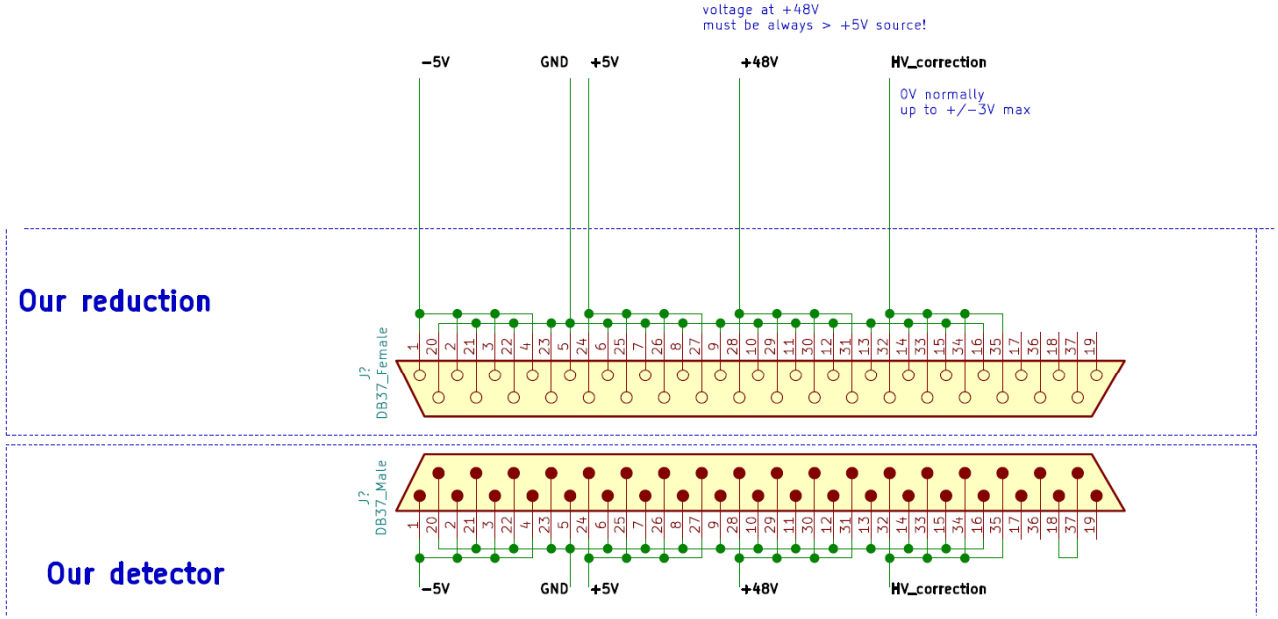


Pinouts for the connector's connection to power sources

Power source connection on pretesting laboratory

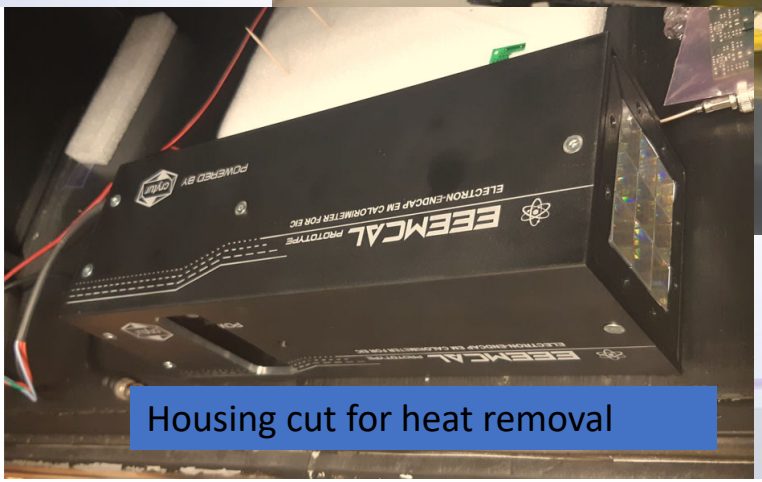
power ON:
1/ switch on +48V source
2/ switch on +5V and −5V source

power OFF:
1/ switch off +5V and −5V source
2/ switch off +48V source



Final assembly

External fans for heat management
Powered by separate USB power supply



Housing cut for heat removal

Power source in JLab

From Datasheet WIENER_MPOD_Manual_3.2.pdf:

MPOD Low Voltage Series - 8 channels with floating ground

Type	Channels	Voltage	I Max	Peak Power	V-Res	I-Res	Ripple
MPV 4008I	4	0 to 8V	20A	100W/ ch.	0.5mV	0.5mA	<3mVpp
MPV 8008I	8	0 to 8V	10A	50W / ch.	0.5mV	0.5mA	<3mVpp
MPV 8008LI	8	0 to 8V	5A	40W / ch.	0.5mV	0.25mA	<3mVpp
MPV 4016I	4	0 to 16V	10A	100W/ ch.	1mV	0.25mA	<2mVpp
MPV 8016I	8	0 to 15V	5A	50W / ch.	1mV	0.25mA	<2mVpp
MPV 4030I	4	0 to 30V	5A	100W/ ch.	2mV	0.12mA	<2mVpp
MPV 8030I	8	0 to 30V	2.5A	50W / ch.	2mV	0.12mA	<2mVpp
MPV 4060I	4	0 to 60V	2A	100W/ ch.	4mV	0.06mA	<2mVpp
MPV 8060I	8	0 to 60V	1A	50W / ch.	4mV	0.06mA	<2mVpp
MPV 8120I	8	0 to 120V	100mA	50W / ch.	4mV	4 µA	<10mVpp

I = Interlock, with sub **D** 37 pin female connector

MPOD Low Voltage mating connectors

Sub-D 37 extension cable 5m	37	Combined power/sense for 4 channels
Sub-D 37 extension cable 25m	37	Combined power/sense for 4 channels

Can use MPV 8008I

Datasheet error confirmed with the manufacturer, peak power is not 50W, but 12 W per channel with the current limit of 100mA