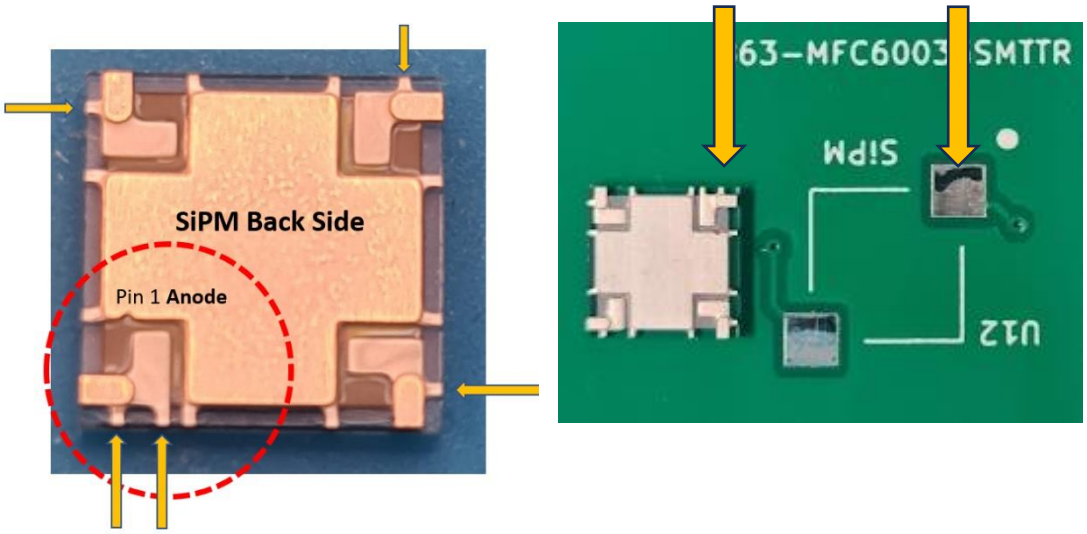
UKRAA Scintillator Assembly instructions from V28 onwards.

1. Solder SiPM chip to SiPM PCB

The SiPM chip is mounted on the top side of the scintillator PCB. The corner of the SiPM chip that has an extra tab aligns with the spot on the PCB, as shown below.



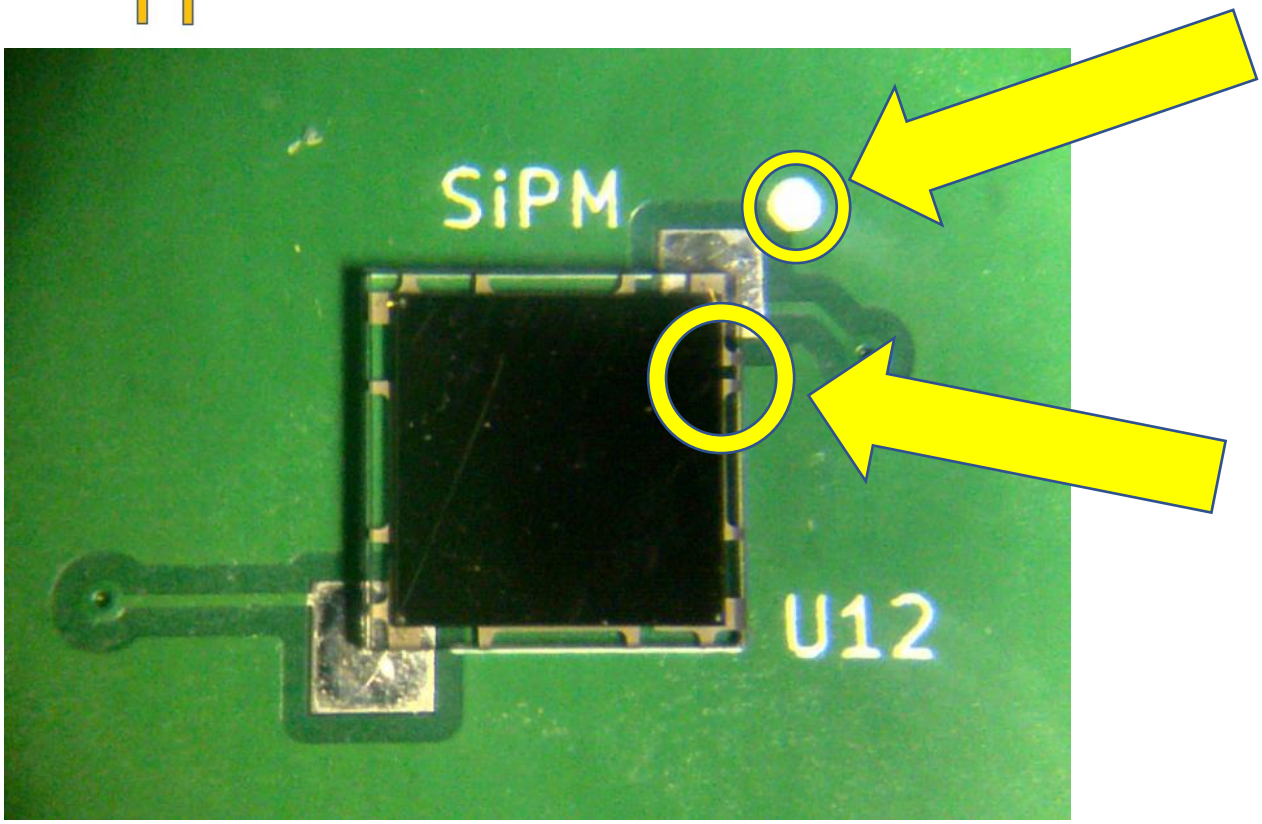
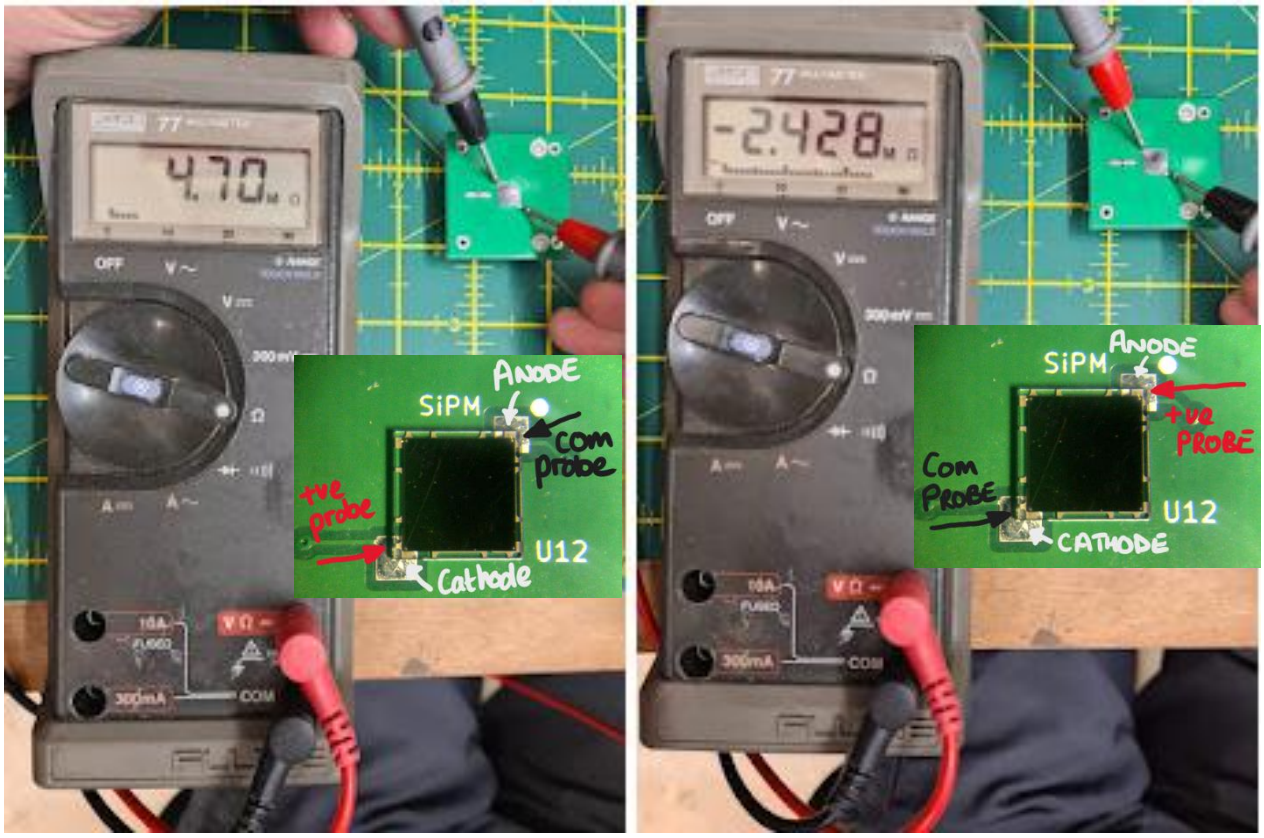


Image of SiPM chip on PCB board showing:

- SiPM chip located within the PCB white silkscreen lines and
- SiPM chip orientated so that the anode extra tab highlighted above is to the PCB white silkscreen dot.

2. Electrical Test #1

Prior to mounting the SiPM PCB to the scintillator and wrapping with PVC tape, undertake the following test.



The actual measured value will depend on the ambient light level.

The above example measured 260 LUX using Samsung/Android light meter.

If open circuit, then re-flow the SiPM chip.

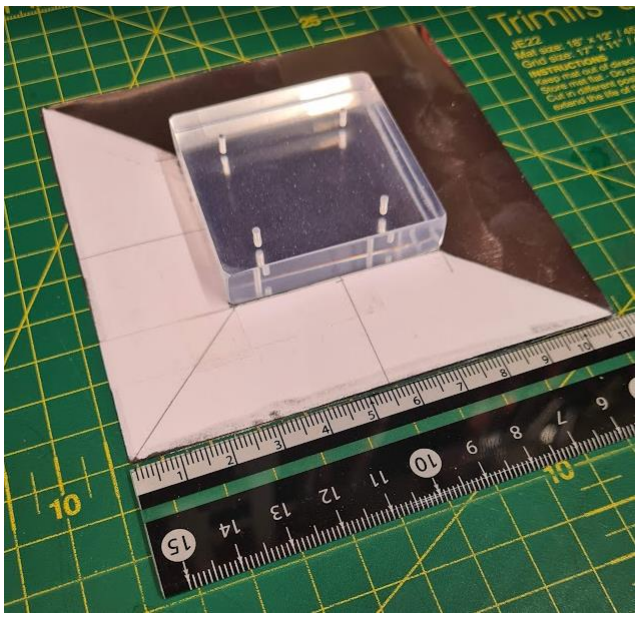
If short circuit or a few ohms; then de-solder the SiPM chip and inspect back-side conducting substrate. There will probably be a solder whisker, this can sometimes happen after a re-flow.

To remove flux residue use Isopropanol Alcohol for all cleaning of the SiPM PCB.

Note: meter probes should be at about 30 - 40 degrees to SiPM PCB pad (as shown). If applied with vertical pressure, an open contact can close giving a false positive reading for a dry joint.

3. Wrap the Scintillator with Aluminium foil.

- The foil should be 110 x 110 mm, shiny side up.
- Place scintillator in the centre of the foil, screw holes up.



A paper template can be made to set the scintillator in the centre of the aluminium foil.

- Fold foil such that there is a square aperture in the top centre.
- Punch the aluminium foil with a toothpick to expose the screw holes.

QUESTION FOR PAUL, did you cut the corners of the aluminium foil shown above??

4. Apply optical coupling gel

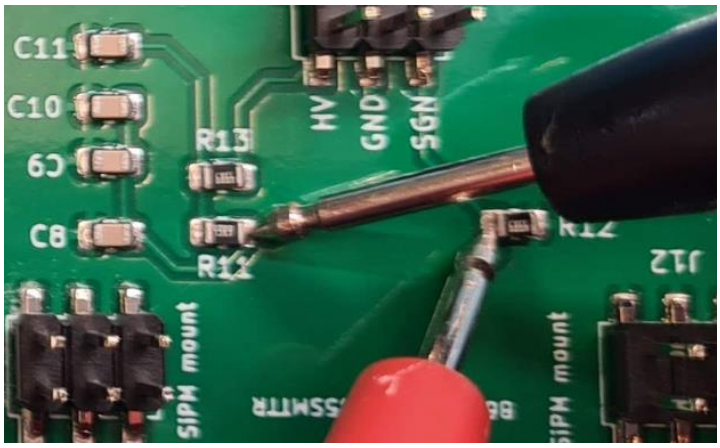
- Apply optical coupling gel to face of the SiPM chip, only about 1mm from the syringe tip is needed.

5. Mount the SiPM PCB

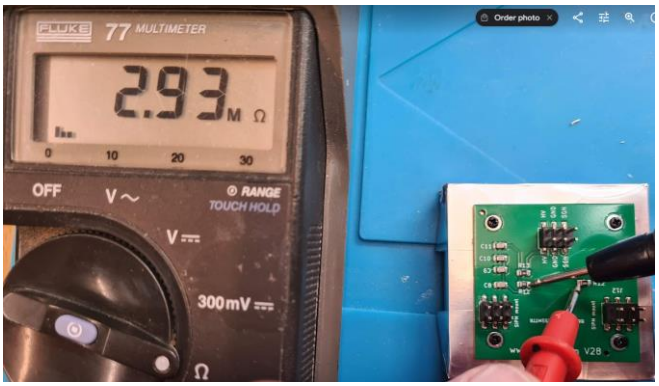
- Place SiPM PCB onto the scintillator block, applying light pressure.
- Screw down the four M1.6 x 6mm self-tap screws, using a Philips 0 screwdriver, enough to centre the PCB onto the scintillator - not tight at this stage.
- The screws will require some toque to cut the thread in the scintillator. Screw down in a diagonal sequence to apply even pressure to the SiPM; turn screwdriver 1/8th rotation each time until the screws are tight with even toque.

6. Electrical test #2

- This is to check the SiPM connection integer after the screw-down.



Probe placement on back-side of SiPM PCB.

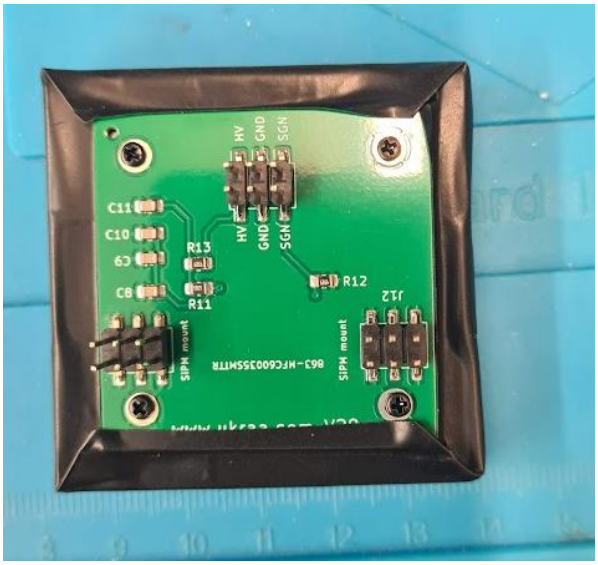


- If fail, remove the SiPM PCB and inspect the contacts and integrity of the SiPM using a magnifying loupe; i.e. the SiPM chip is neither cracked nor chipped. If looks correct, then reflow the solder.
- Re-Check Electrical Test #1 as described above.

7. Wrap the assembly with PVC tape

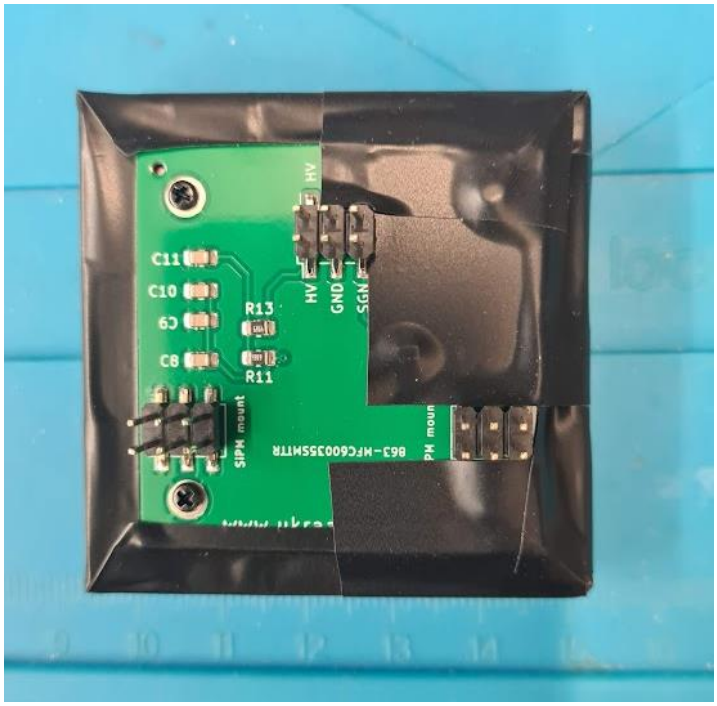
- Using 25mm black PVC, wrap the scintillator/SiPM assembly around the edge as shown below.

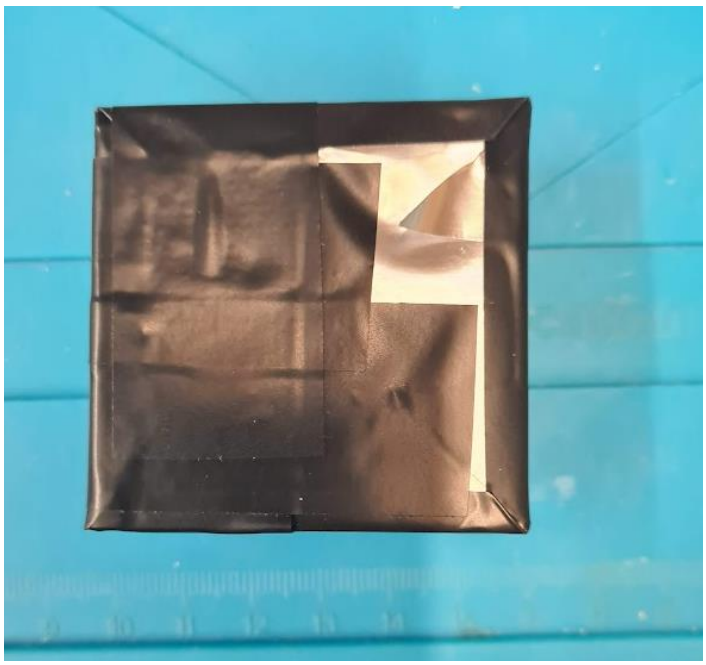
- Fold down the tape edges.



UKRAA Scintillator Assembly instructions from V28 onwards.

- Wrap from top to bottom until completely covered.





Repeat process; so that there is a **double layer** of PVC tape wrapping the scintillator assembly.

8. Electrical Test #3

SIG
GND
HV (29.5V)

SIG
GND
HV (29.5V)

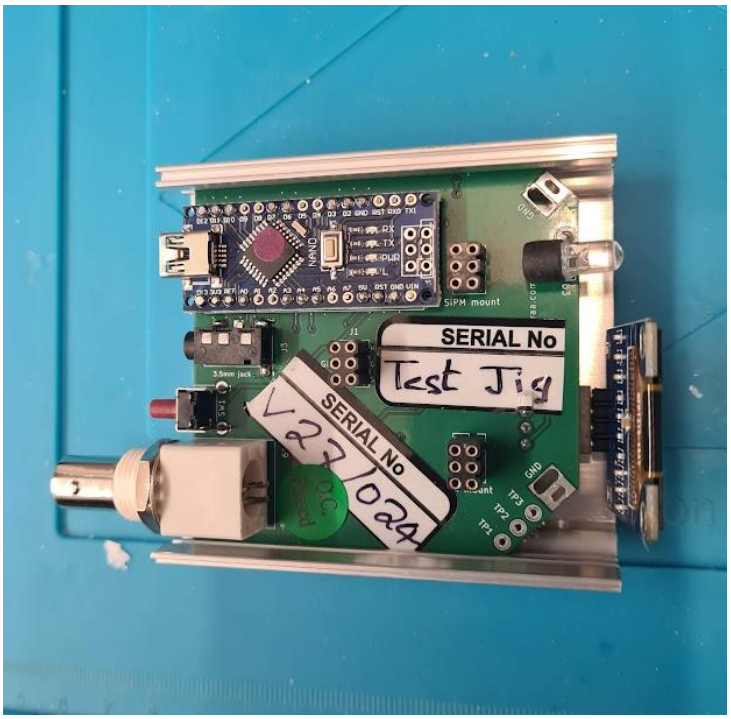
Expected values, using Fluke 77 multimeter, are shown above.

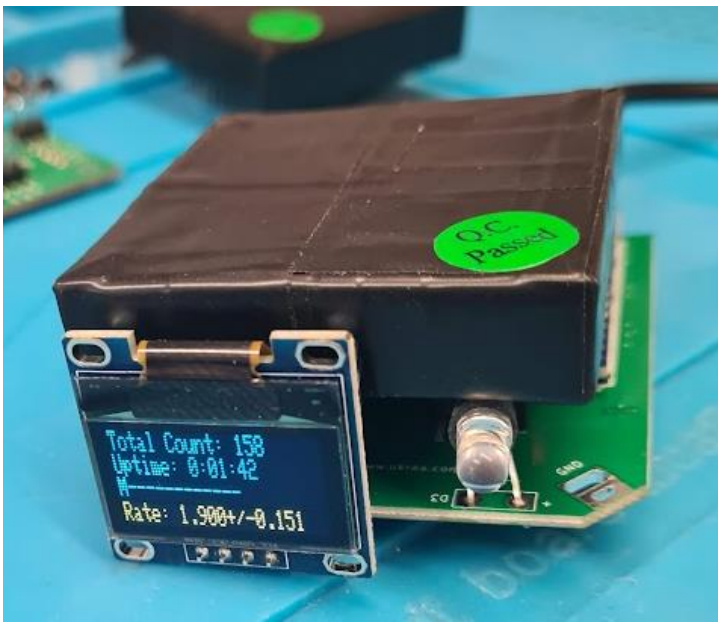
The 2.668MΩ value will vary depending on make/model of multimeter used.

The 50.0Ω value should be 49.9Ω.

9. Function check

- Plug the scintillator assay into a Test Jig.
- Turn on test jig.
- Wait for 60 seconds of count time
- Observe the displayed Rate; it should be between 0.8 and 2.2 cps.





10. Light leakage test.

The PVC wrap opacity should be checked for light leakage.

- While the scintillator assembly is still located in the test jig, expose wrapped assembly to high light level for 2mins. The count rate should not change. A desk magnifier illuminator is used in the example below.

- If the count rate does not change from that previously measured in section 9, then the scintillator assembly is considered to have PASSED all tests and a 'QC' sticker can be attached in left hand corner of scintillator assembly.

- If the count rate does change from that previously measured in section 9, then the scintillator assembly is considered to have FAILED the light leakage test. An additional layer of PVC tape should be applied to the scintillator assembly, as described in section 7. Then repeat sections 8, 9 and 10 to retest the scintillator assembly.