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U.S. DEPARTMENT OF ENERGY

RD53 Module Test Set-Up

A. Dimitrievska, M. Garcia-Sciveres, T. Heim,
L. Osojnak, S. Pagan Griso, E. Pianori, E.Resseguie
Lawrence Berkeley National Laboratory

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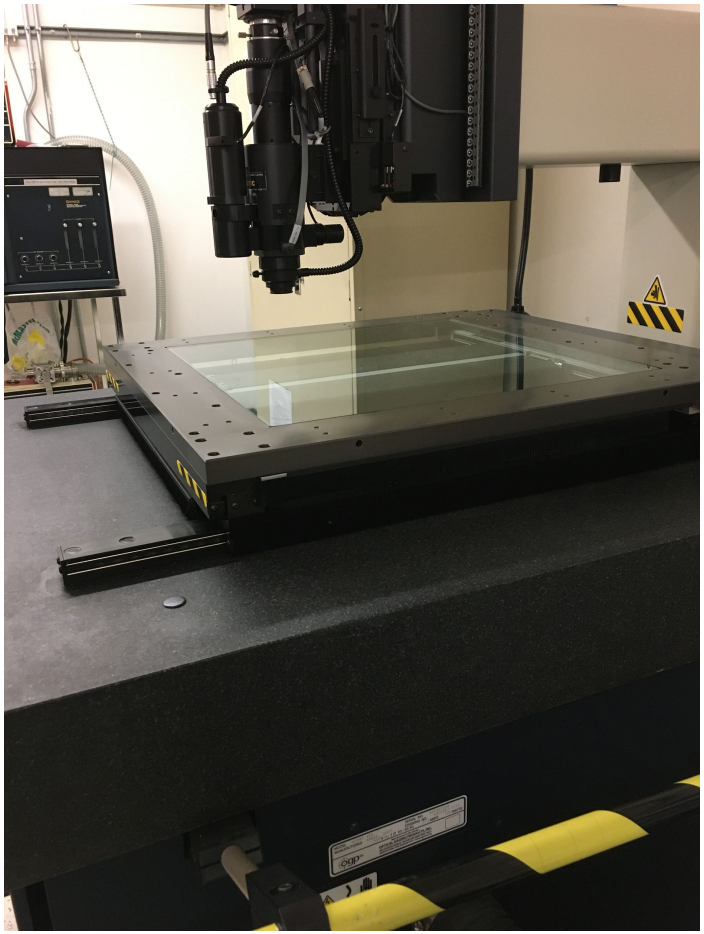
Student Instrumentation Meeting

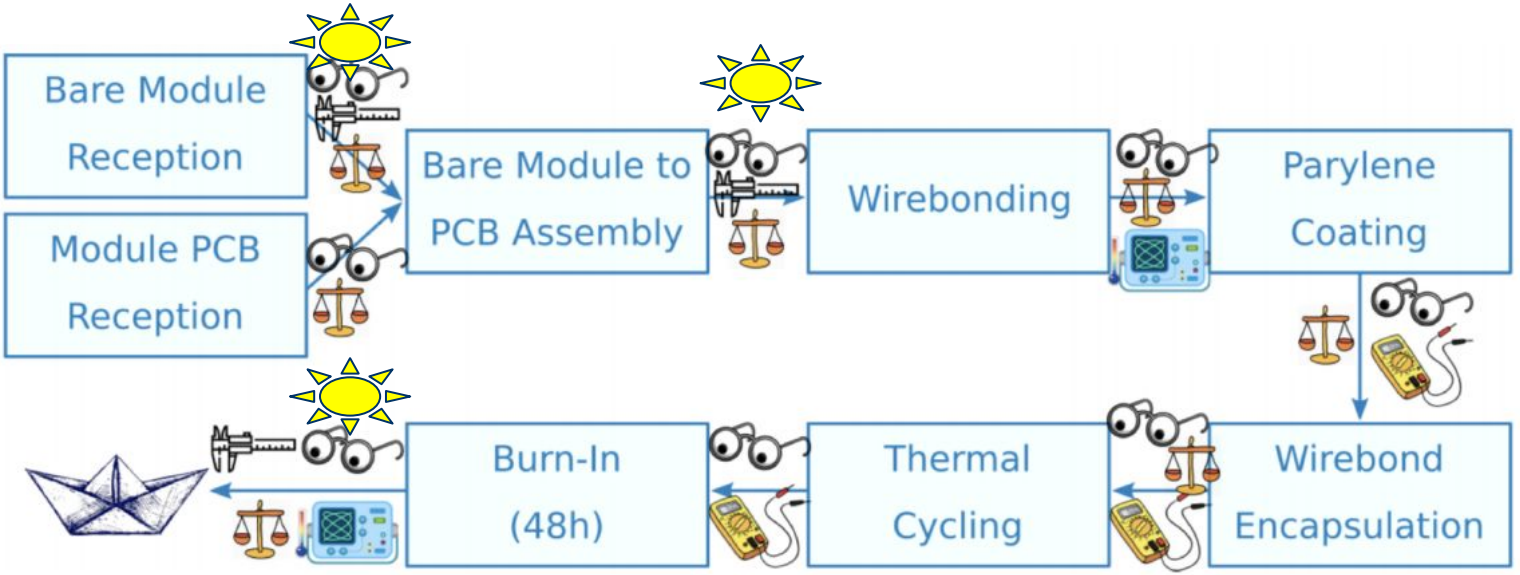
Introduction

- QC for pixel modules in development
- SmartScope for metrology
- Cooling Unit design and assembly

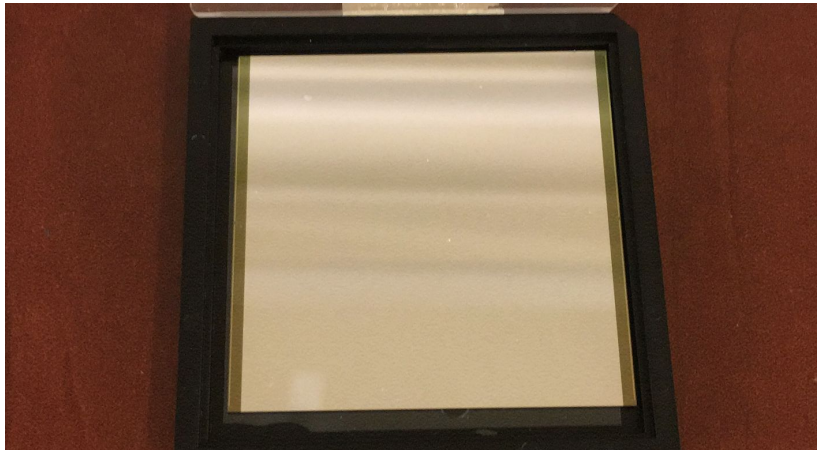
SmartScope in clean room

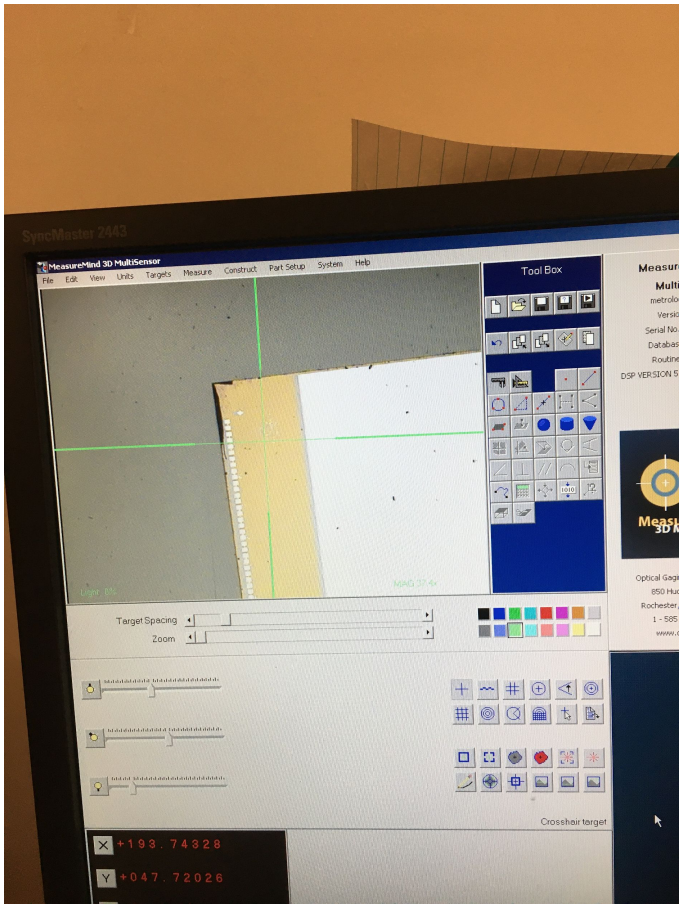


How this will be used in QC:



Dummy Quad Module on SmartScope

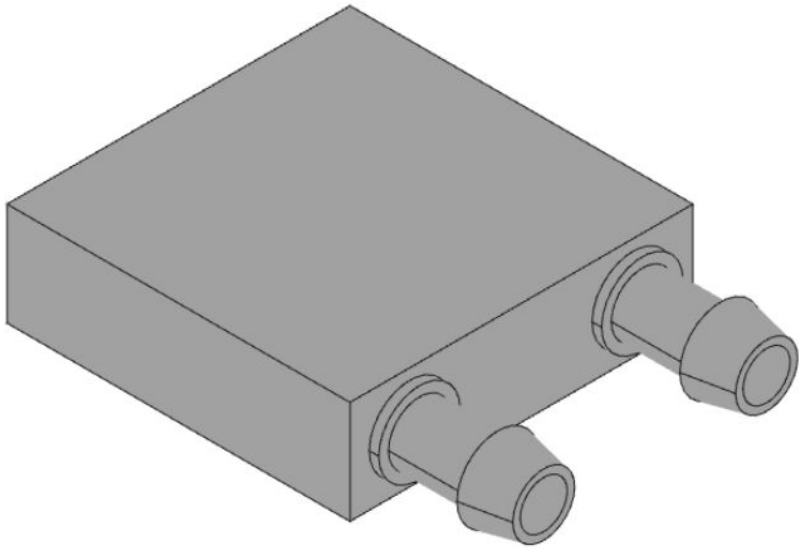




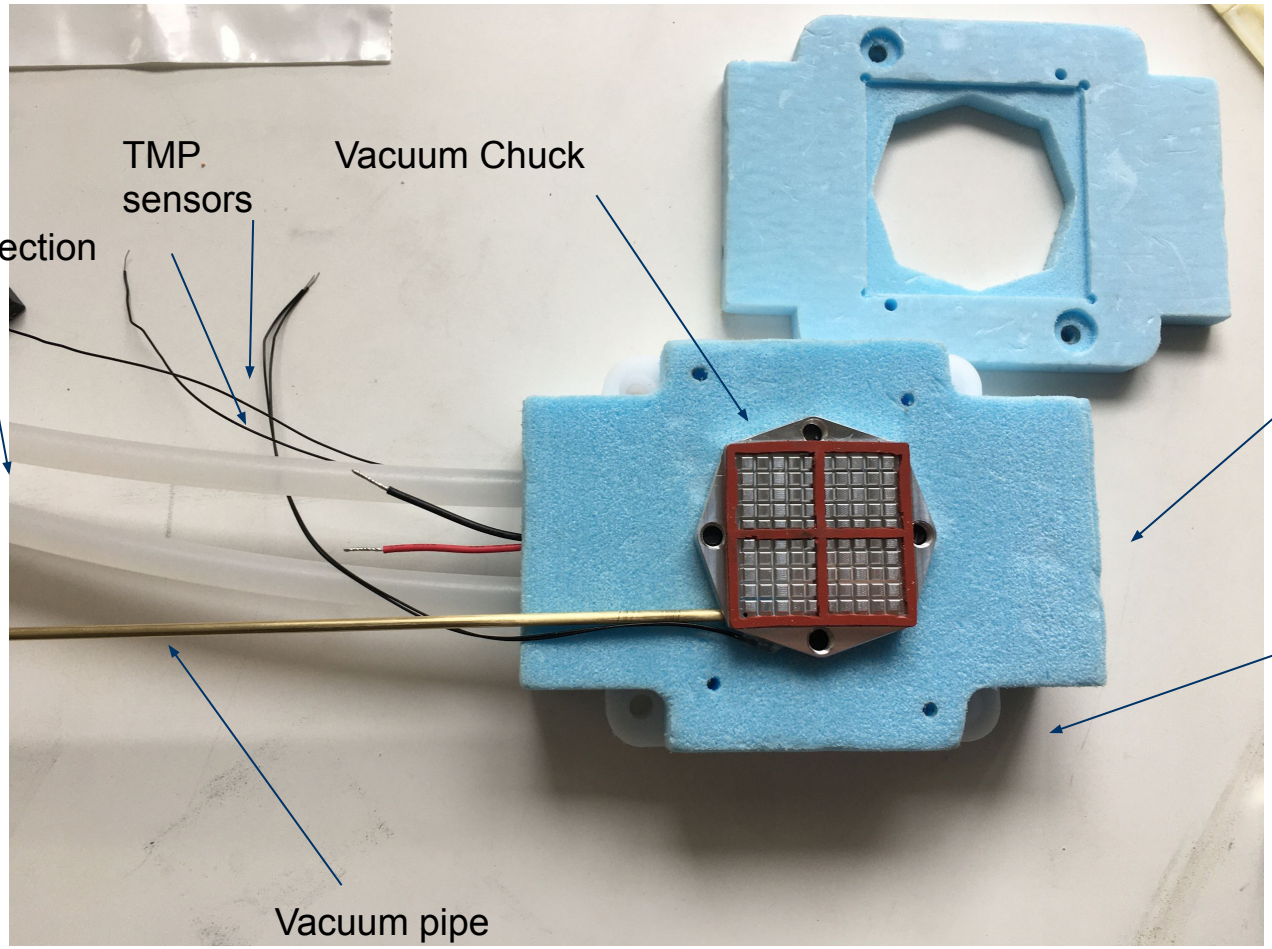
Chiller

- Cooling Unit will be powered by PolyScience Chiller.
- LabRemote code to read out chiller values of temperature and pressure of cooling fluid.
- Cooling fluid is mixture of water and glycol. This coolant dyed pink to spot leaks.
- LabRemote code to change value of temperature.
- Chiller attached directly to cooling plate with tubing.
- Pressure controlled with pipe loop.

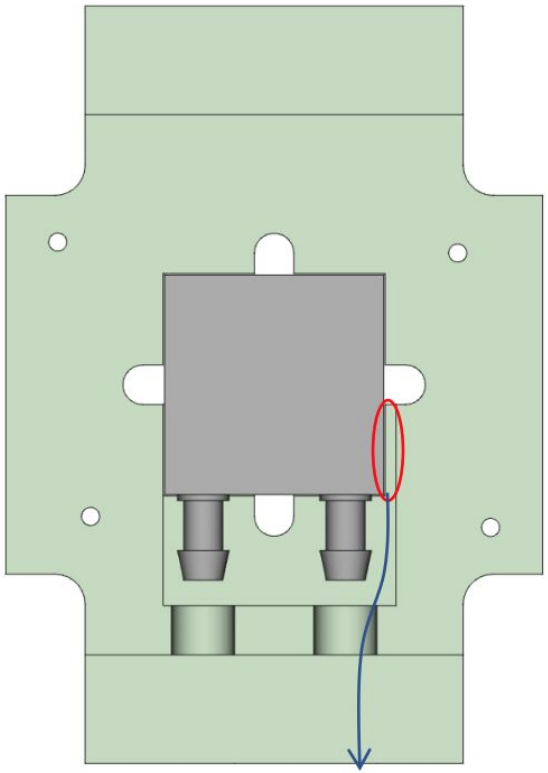
Cooling Plate/ Chiller



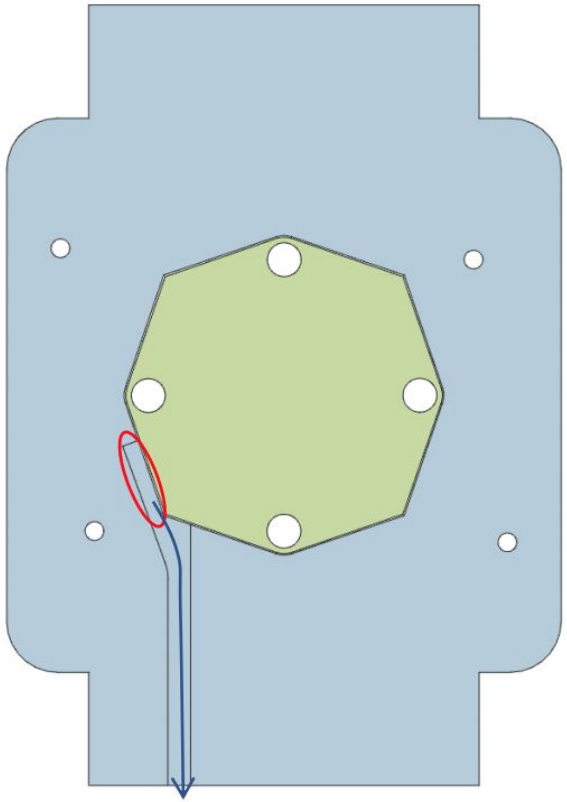
Cooling Unit Assembly (WIP)



Temperature Sensors Cooling Unit



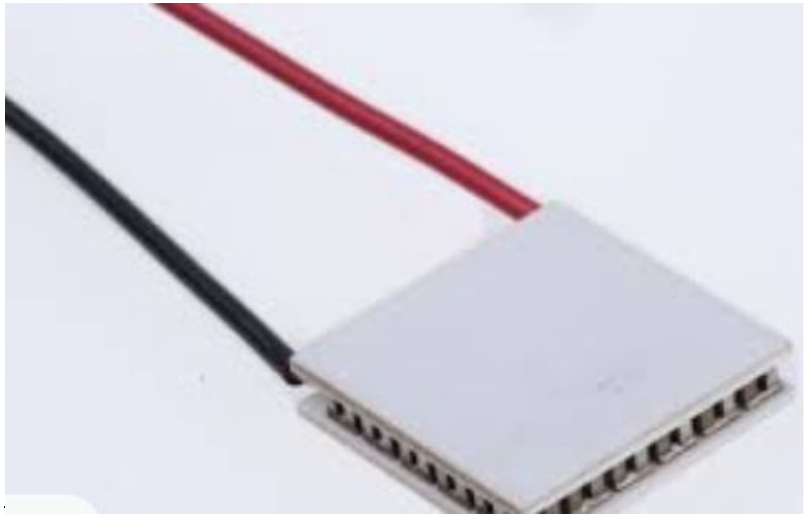
Coldplate temperature sensor location



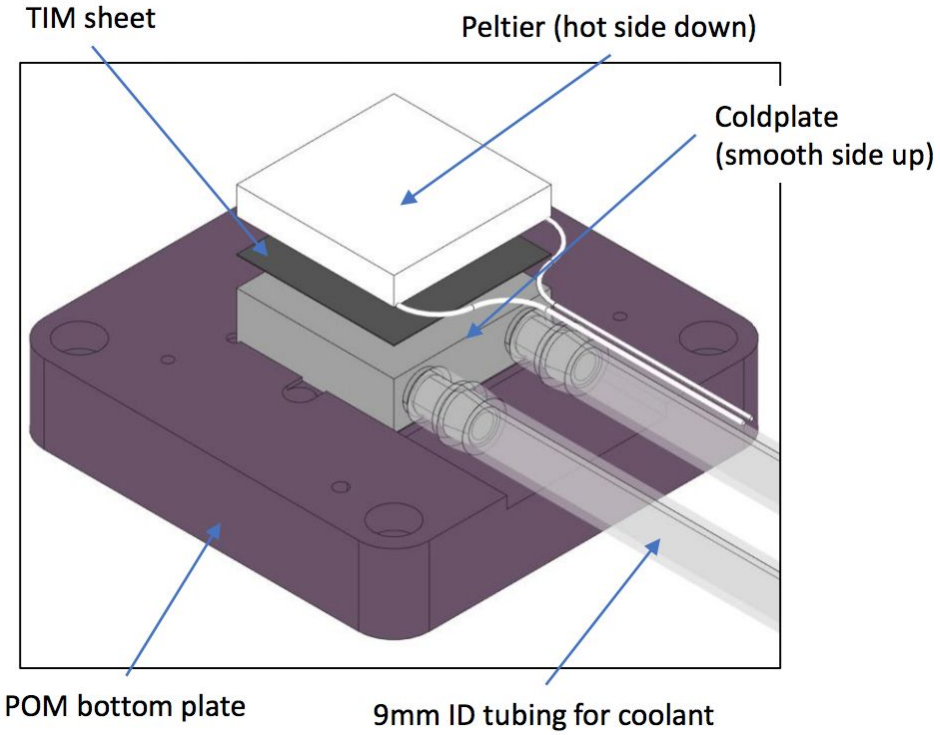
Vacuum chuck temperature sensor location

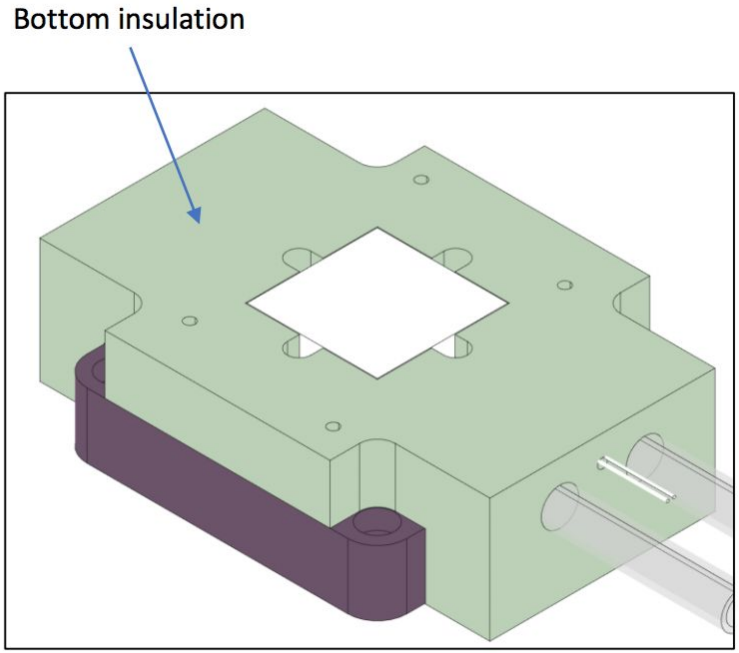
How Peltier achieves cooling

- Peltier = thermoelectric cooling module
- made of n and p type semiconductors
- “peltier effect” = heat either absorbed or emitted between the junctions of two different conductors when a current is applied
- causes one part of plate to heat and one to cool, can switch which are hot and cold based on direction of current
- hot side (heat sink) of peltier needs to be cooled using Chiller



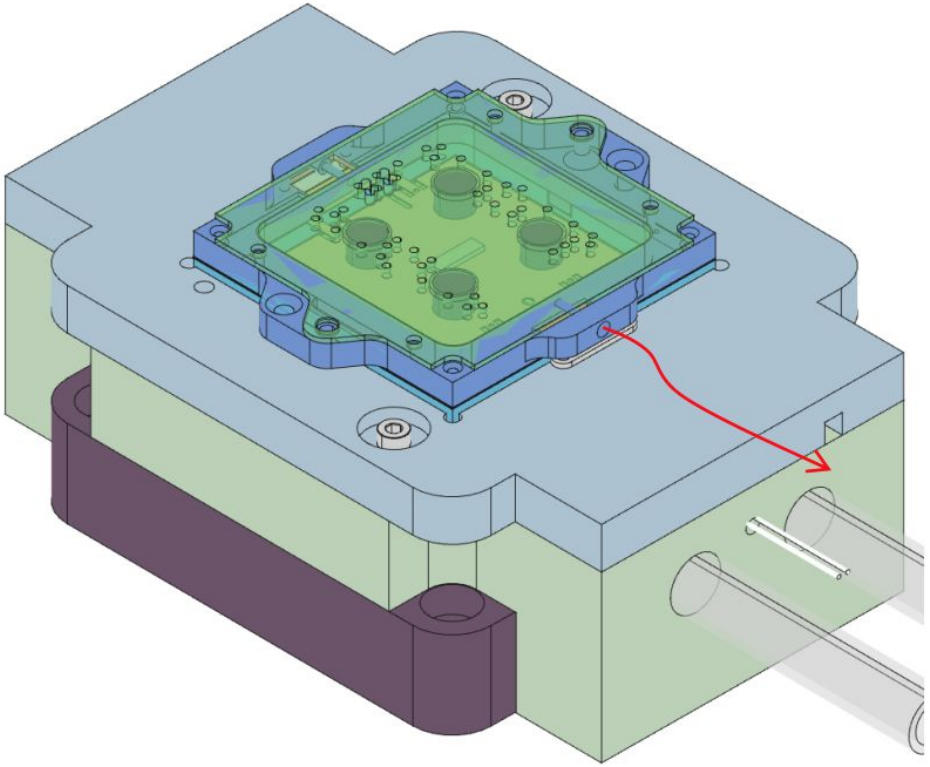
Peltier Cooling Unit Assembly





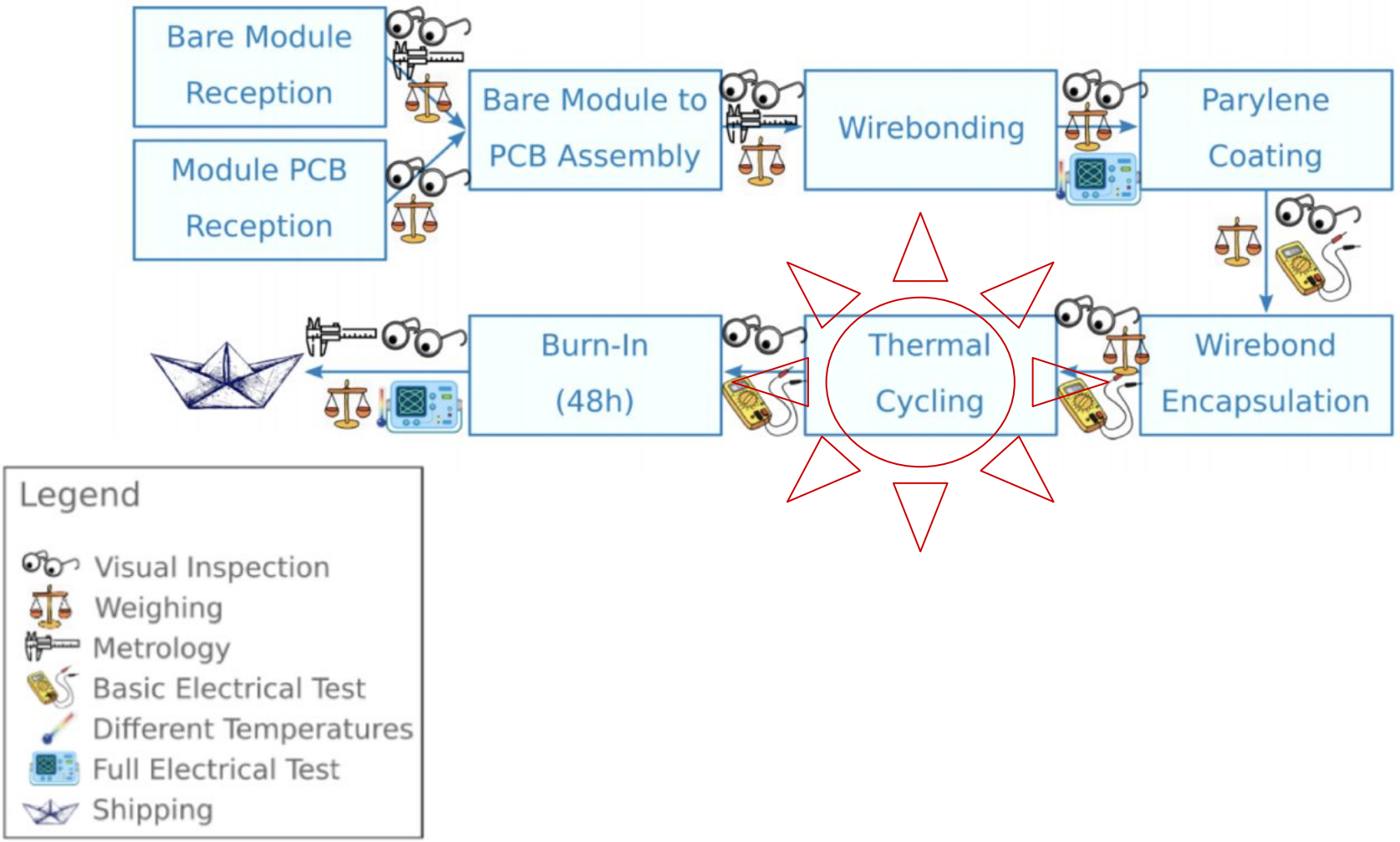
TIM sheets = graphite polymer film to increase thermal conductivity

Cooling Unit with Module

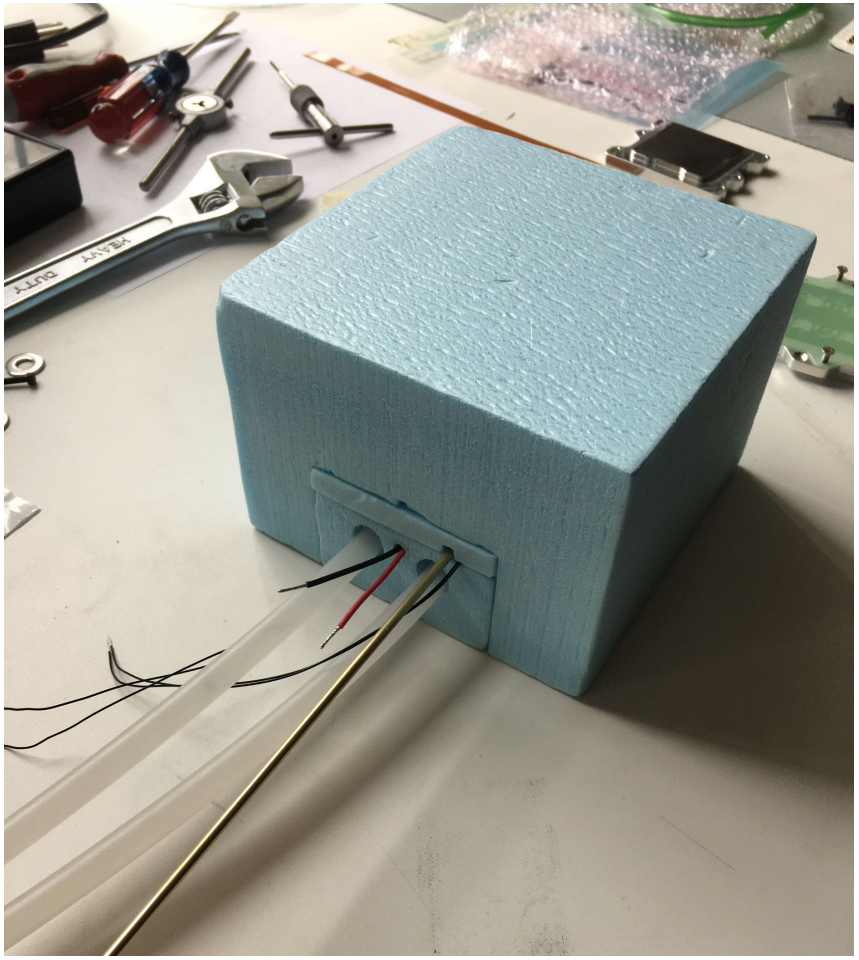


- Vacuum pulls module down
- Thermal contact with the “stack” cools module
- Thermal cycling (down to -55C) can be achieved

How this will be used in QC:



“Assembled” Cooling Unit



Conclusion

- Cooling Unit assembly in progress to achieve low temperatures with modules for QC
- SmartScope procedure for precise module measurements for QC
- Combine previous labRemote code for Chiller, NTC, temperature sensor, humidity sensor to control the cooling unit and push all data to influxDB using Arduino
- Begin testing quad modules (when they arrive/ are assembled) and push data to production database