



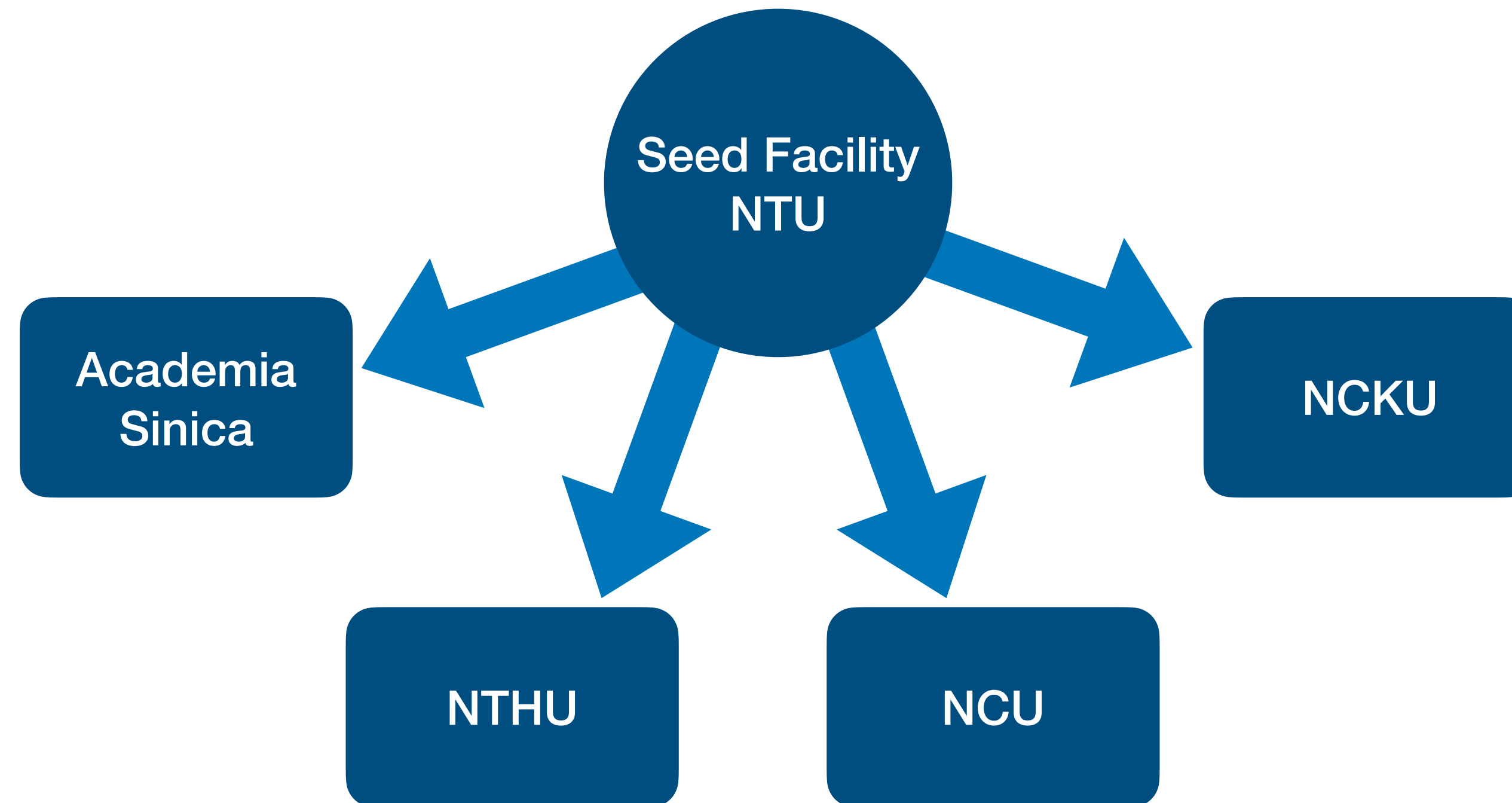
Establishment of an Instrumentation Detector Consortium in Taiwan

Hsin-Yeh Wu

17 Mar, 2021

2021 Asian Forum for Accelerators and Detectors





- TIDC started Nov 2020
- Share laboratories, resources and personnel among TIDC participating groups.
- Collaborate with local high-tech companies to provide high-quality custom-design parts for state-of-the-art detectors

Facilities



- Facility Located at NTU
- Started commissioning in 2019
- Ongoing R&D in tooling, bonding, encapsulating, biasing, etc

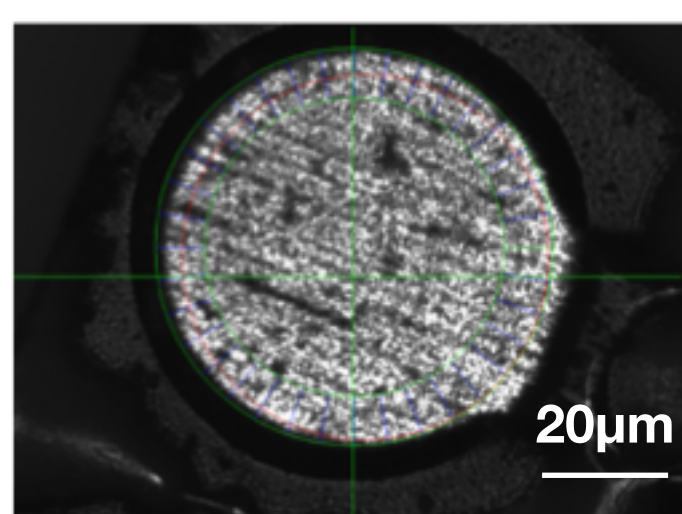
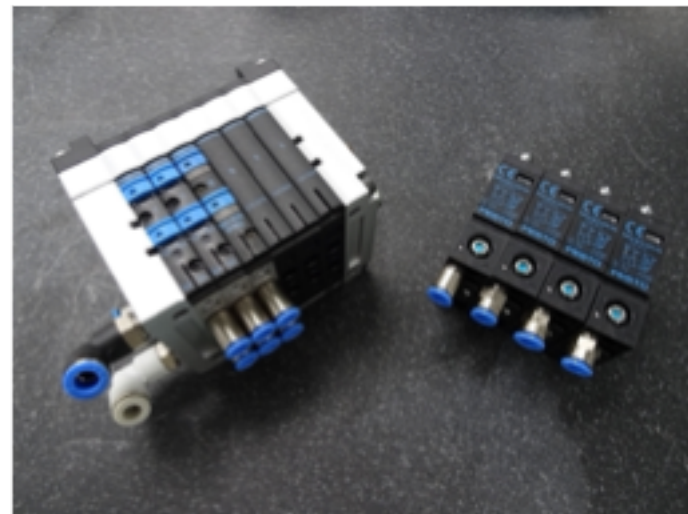
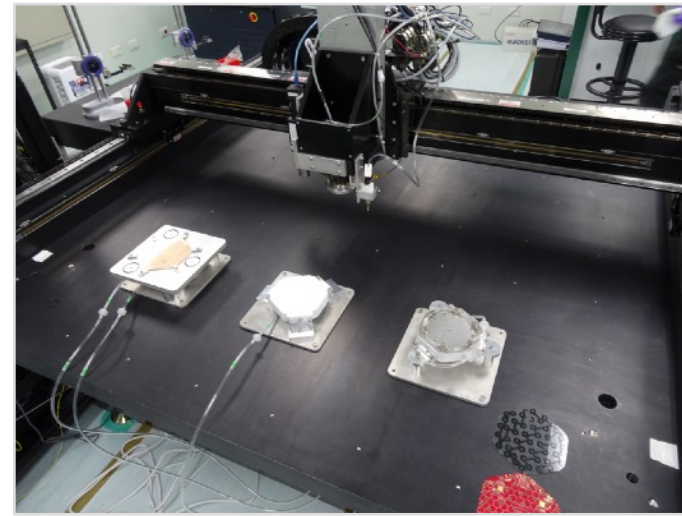
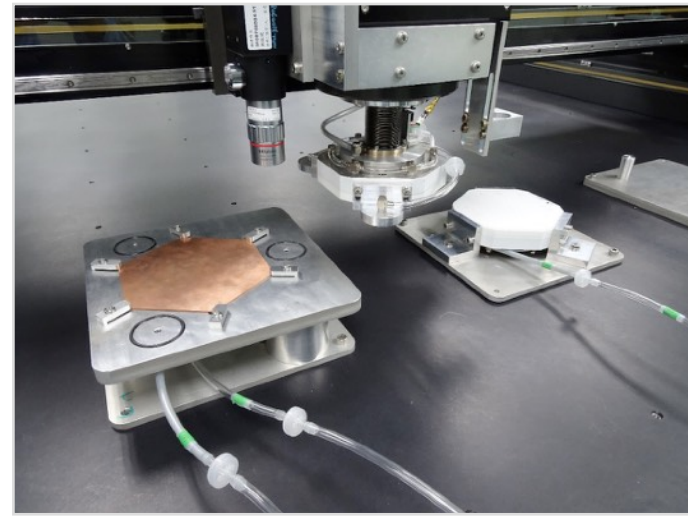
Clean room



Electronic testing lab



Assembly



Aerotech gantry system

- 1.25 x 1.25 m², 4 axis (x, y, z, θ) gantry
- Sub-micrometer precision
- Automated assembly program with LabView
- Vacuum system with Festo valves & sensor
- Pattern recognition with NI VDM

Wirebond



Hesse wire bonder

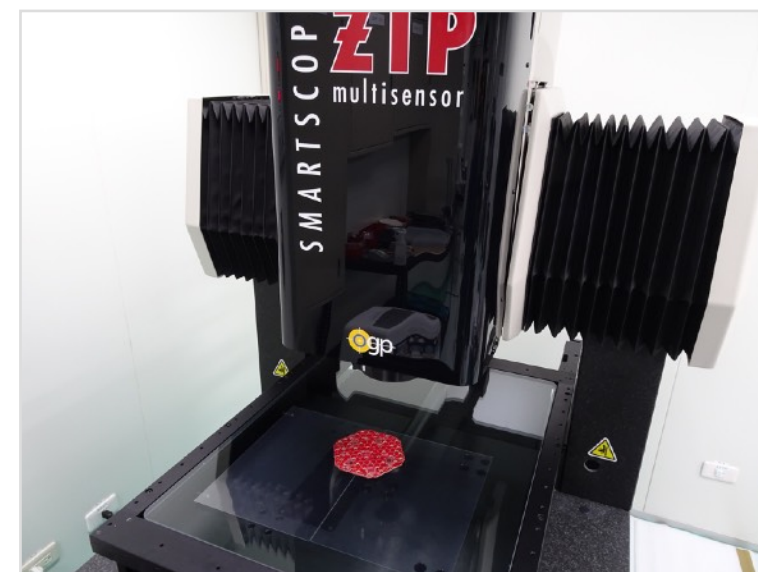
- Ultrasonic wedge bonding



Dage puller

- Wirebond stress test

Quality assurance / Quality control



Optical gaging product (OGP)

- Quick & precise compliance test



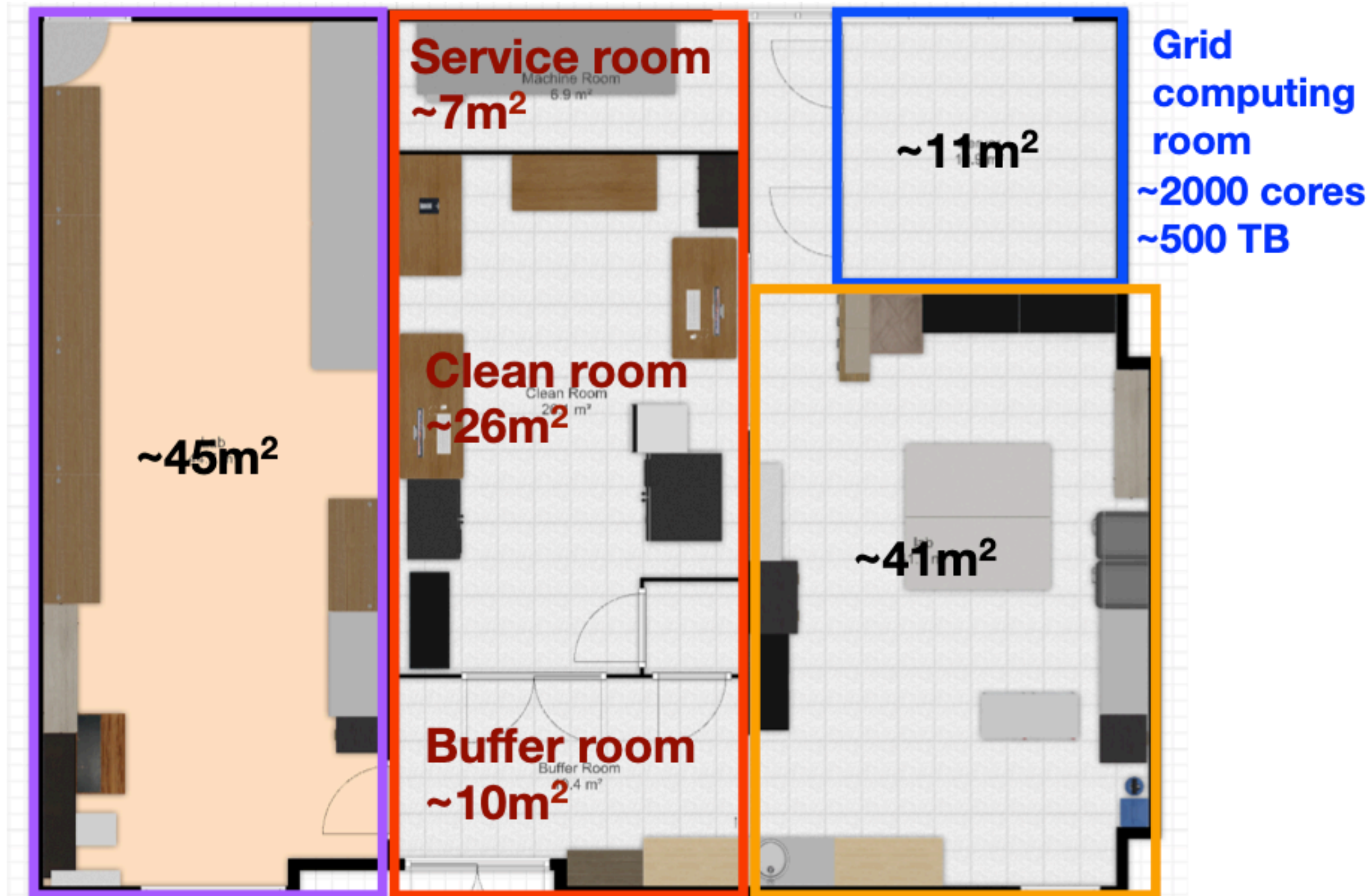
Probe station in a black box

- Surface defects check
- IV curve



Environmental chamber

- Temperature: -70 ~ +100°C
- Volume 306L

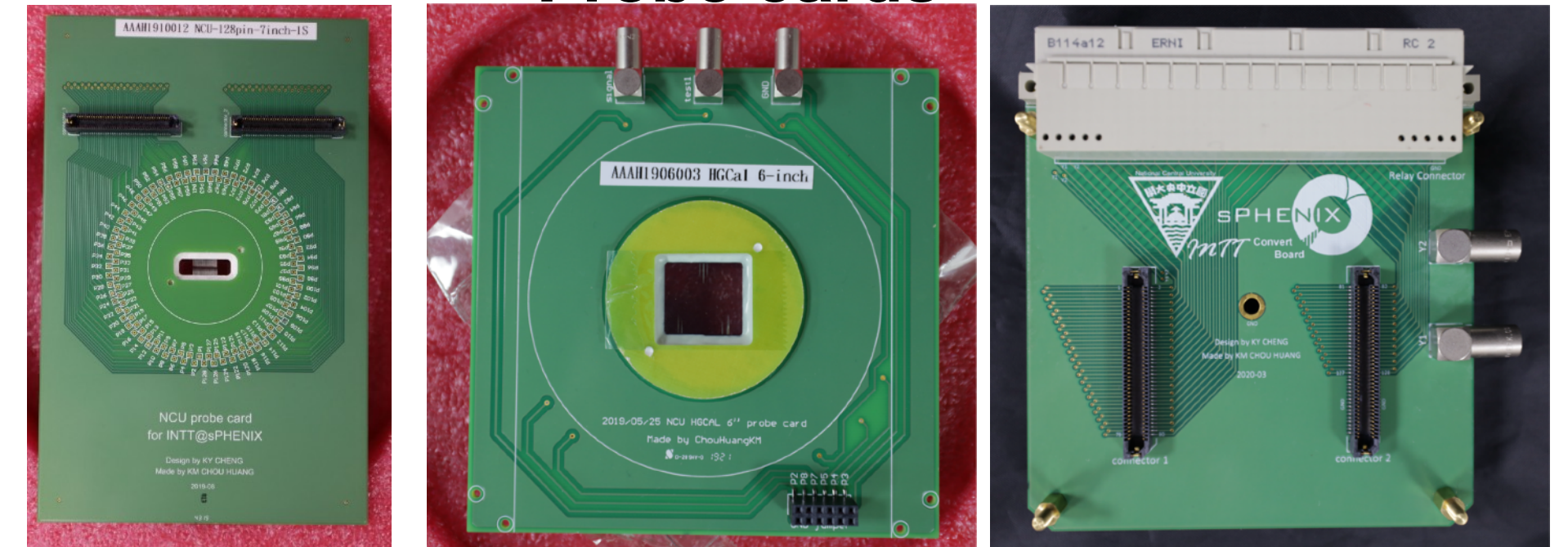


Space for testing, inspection, repair and students

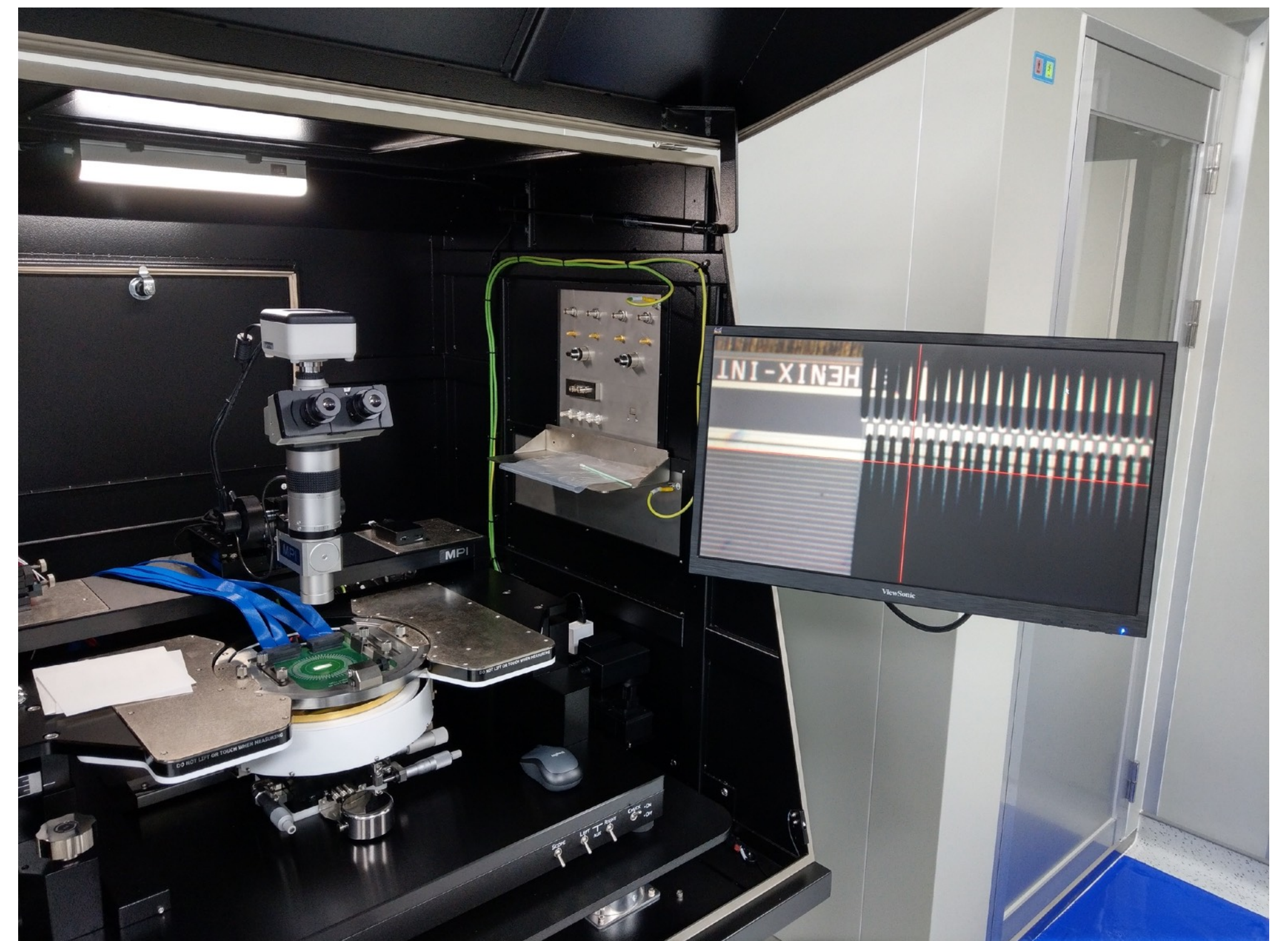
Clean room (class 10000) for Silicon detector for CMS/sPHENIX

Space for Scintillator+SiPM detector

Probe cards



8-inch semi-automatic MPI probe station





CNC Milling machine



CNC Wire EDM

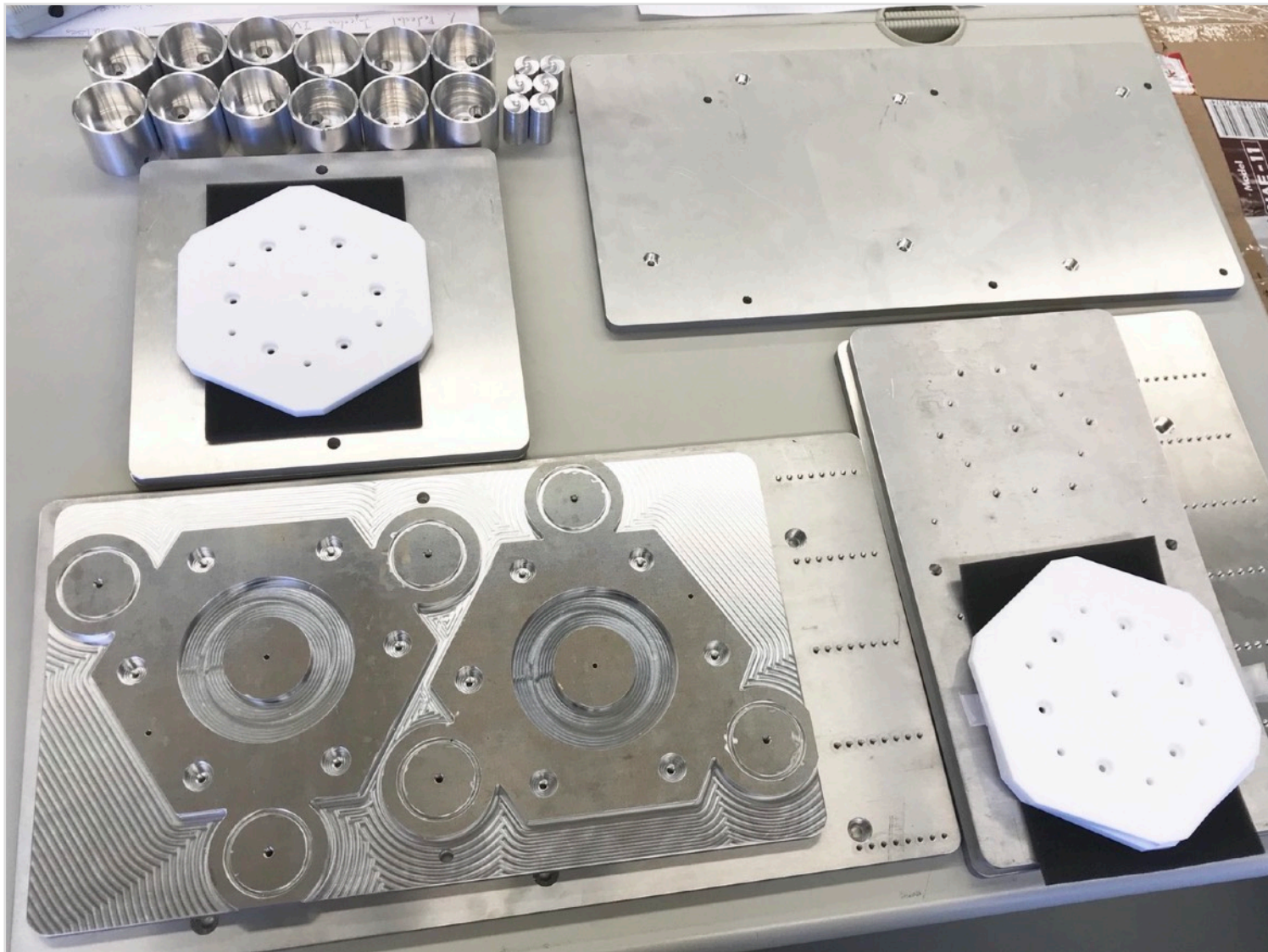
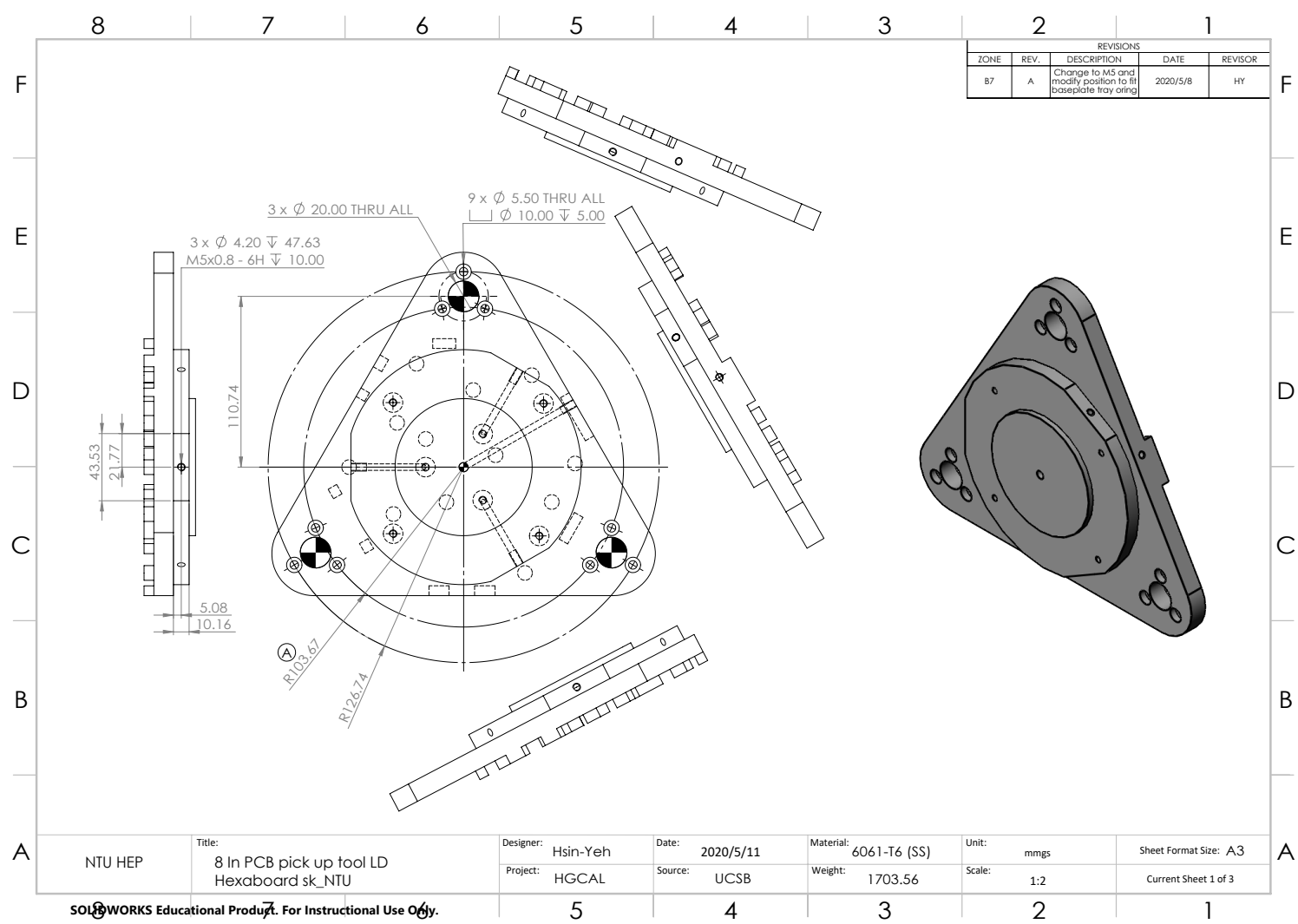
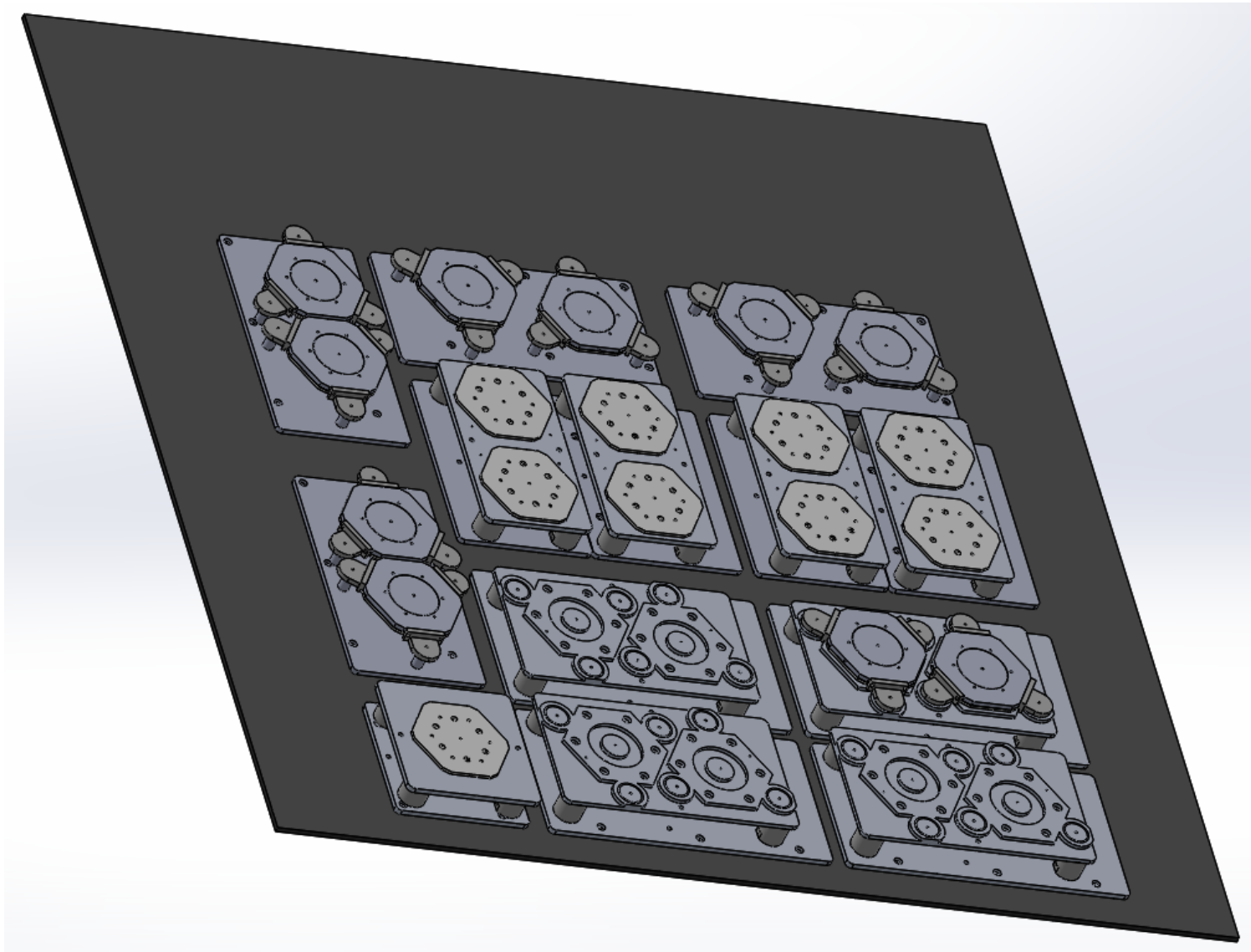
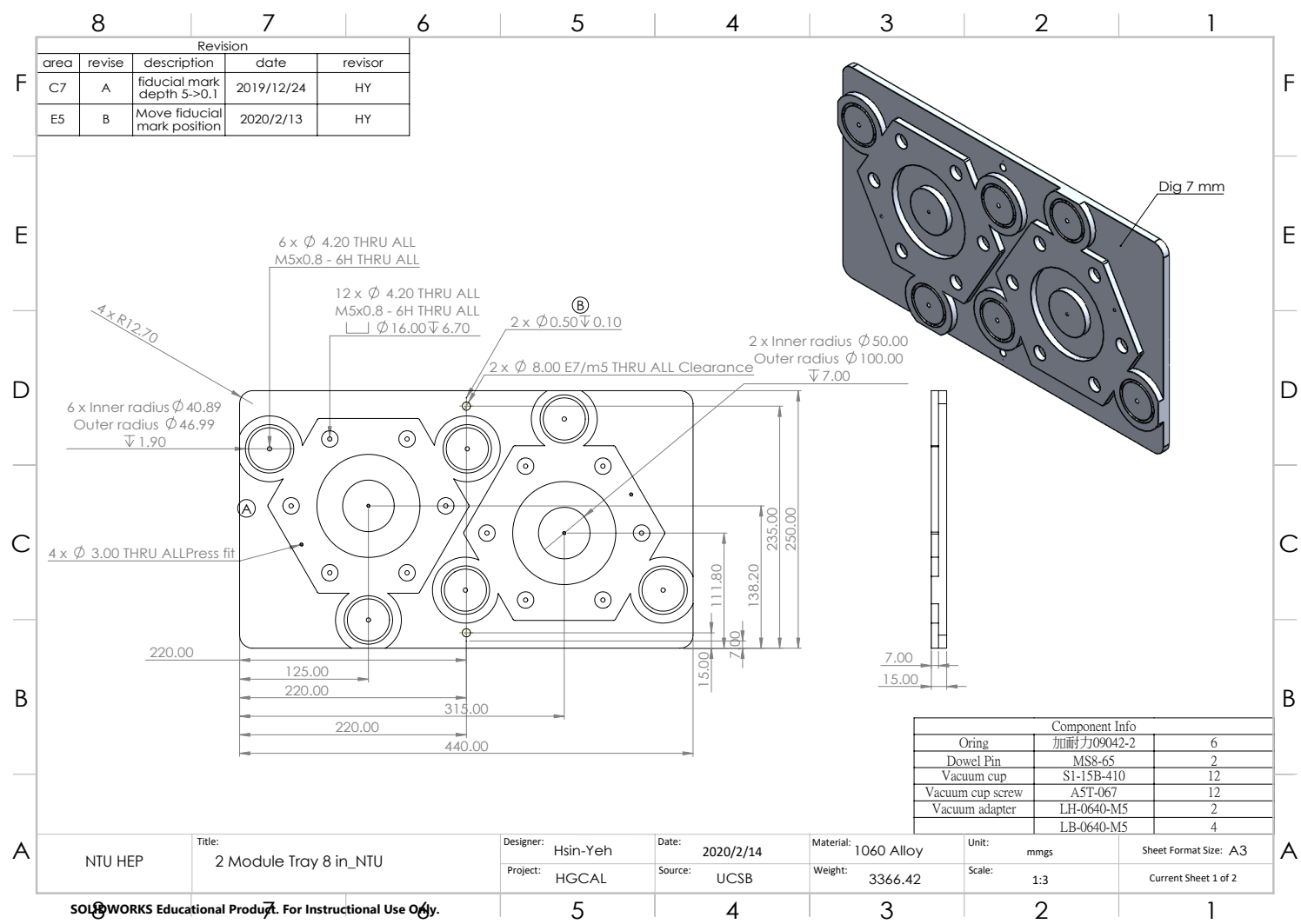


5-axis CNC



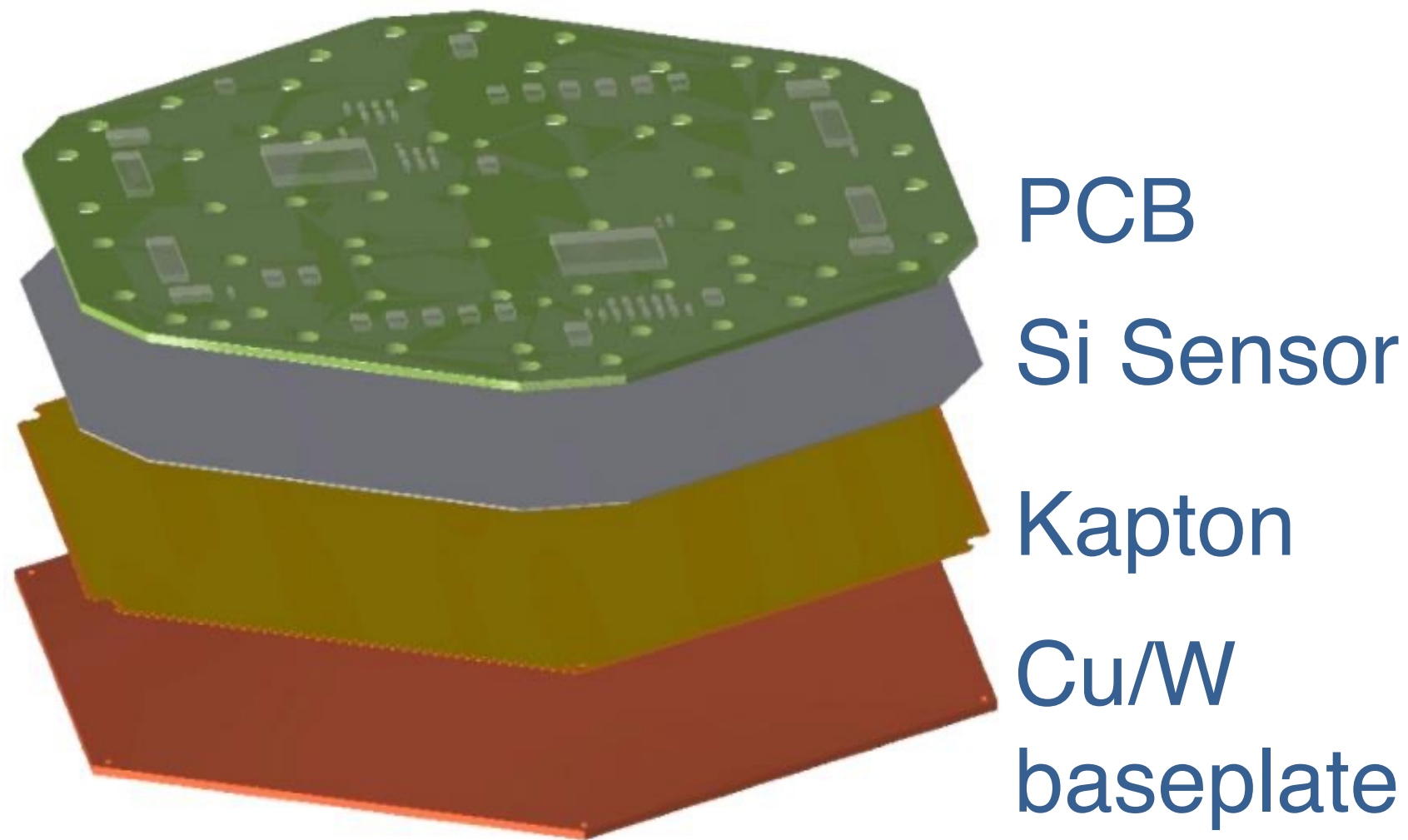
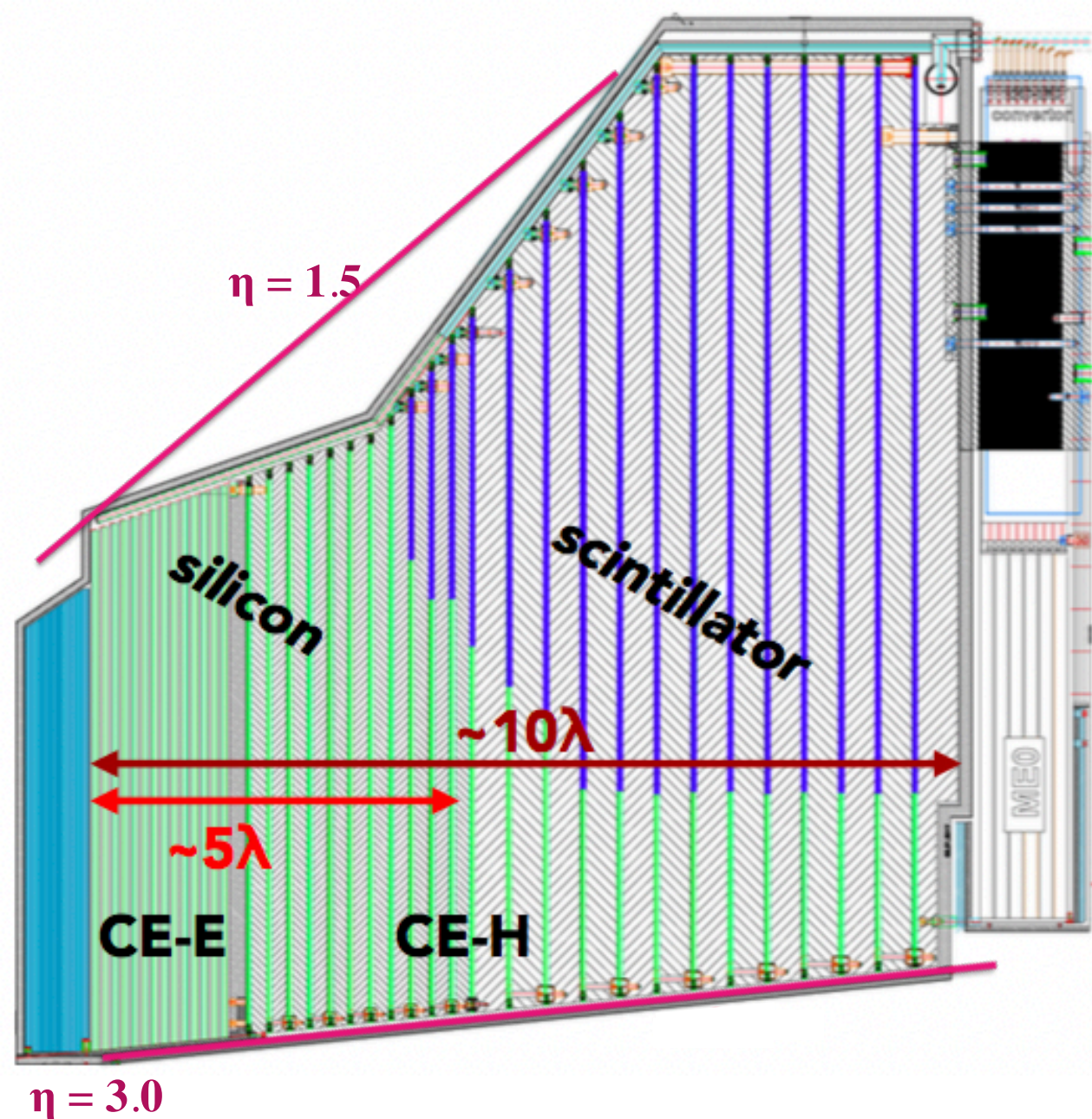
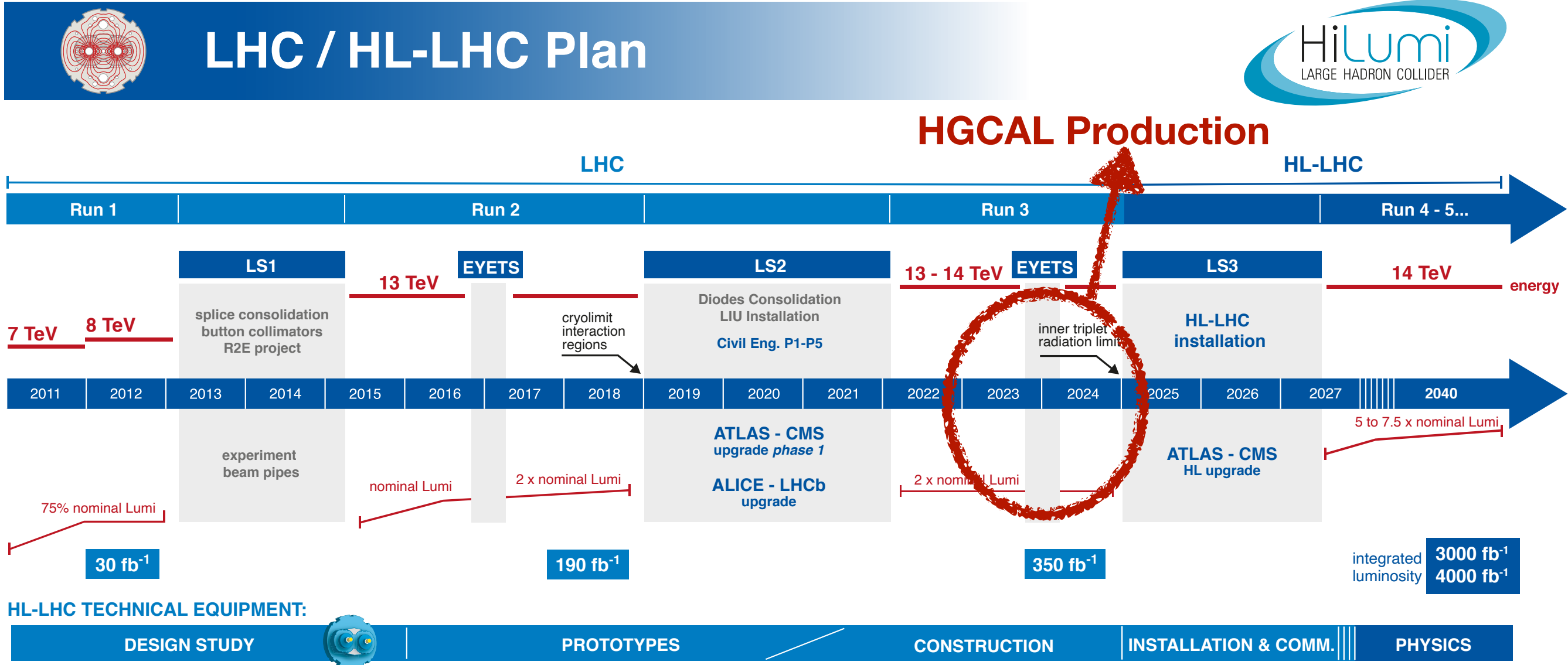
CNC High Speed Lathe

High Precision Jigs Design & Production



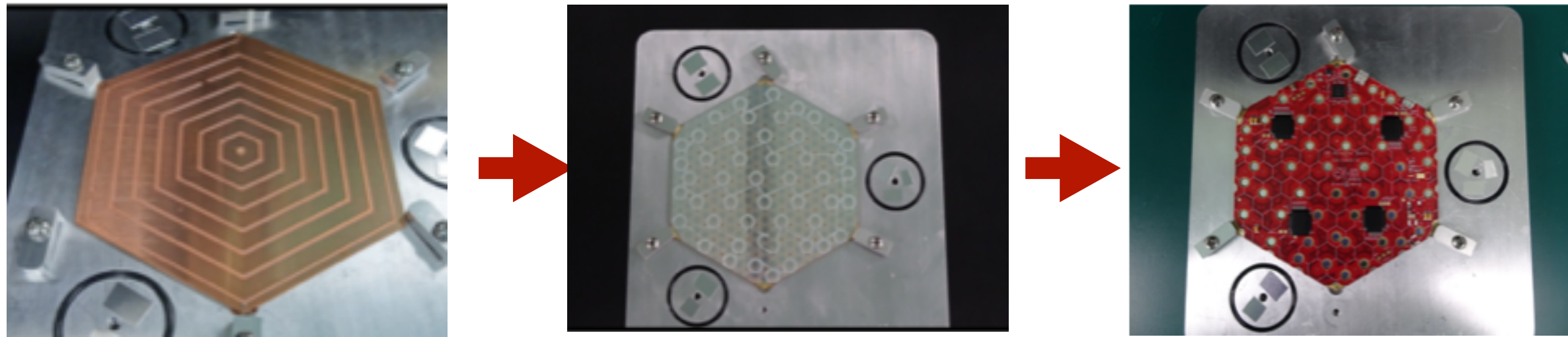
Projects

CMS High Granularity Calorimeter (HGCAL)



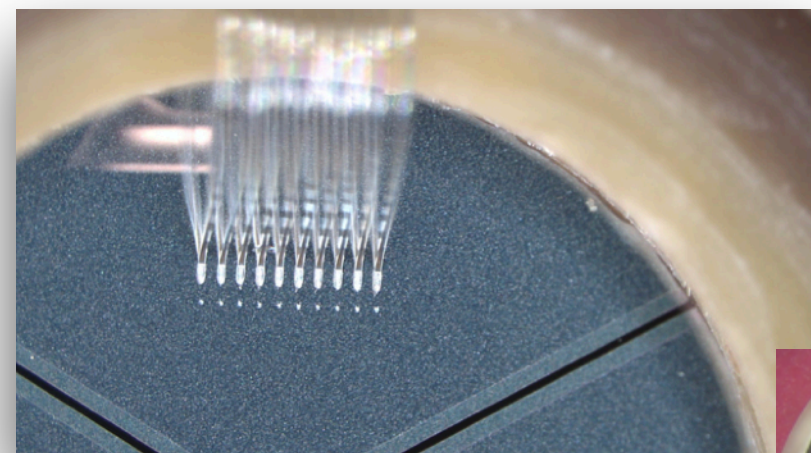
NTU Mission : 5000 Silicon modules in 2 years

- Assembly

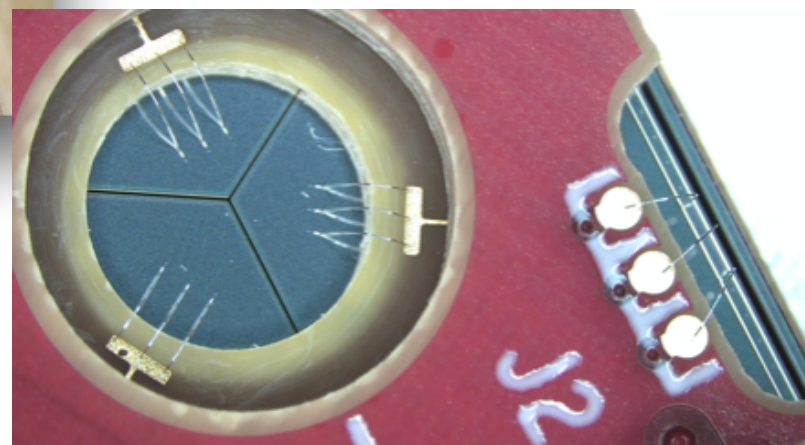


Videos: <https://www.taiwan-tidc.org/dummy-module.html>

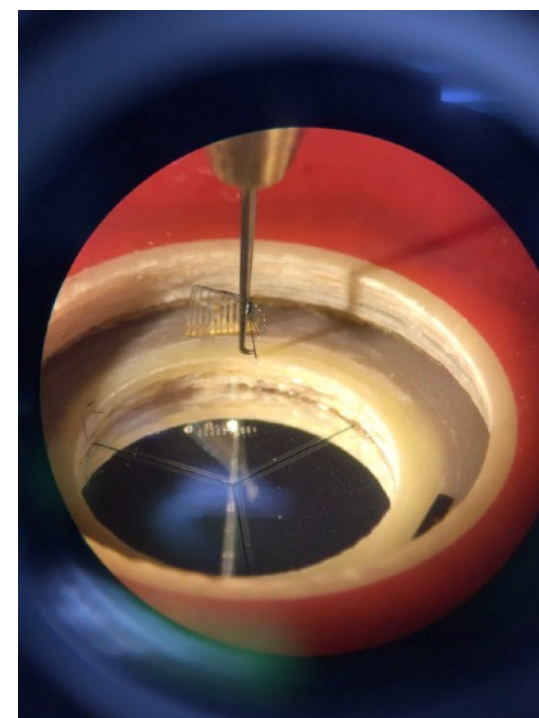
- Wirebond



Pull Test Bonds

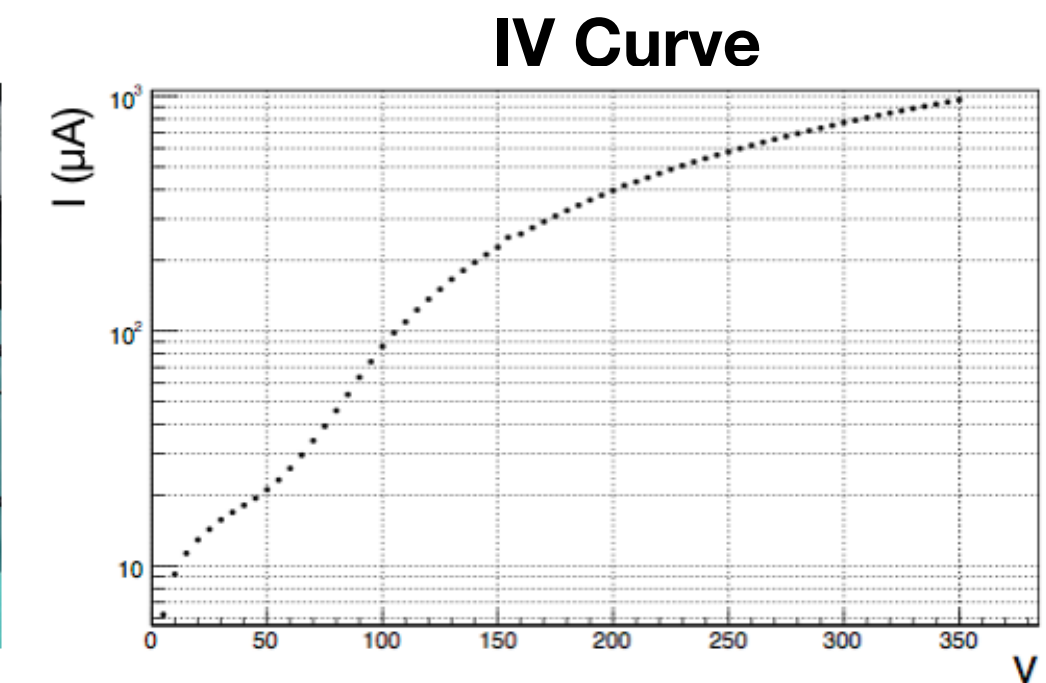
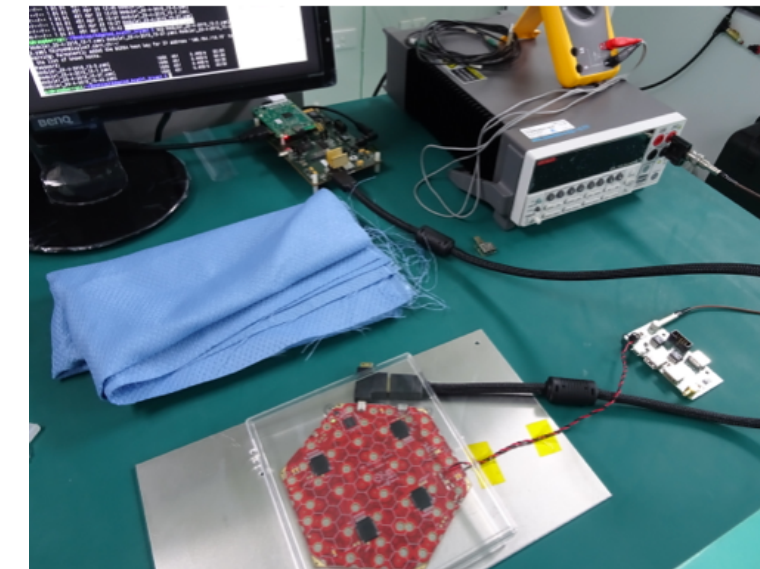


Step hole & Guard ring bonds

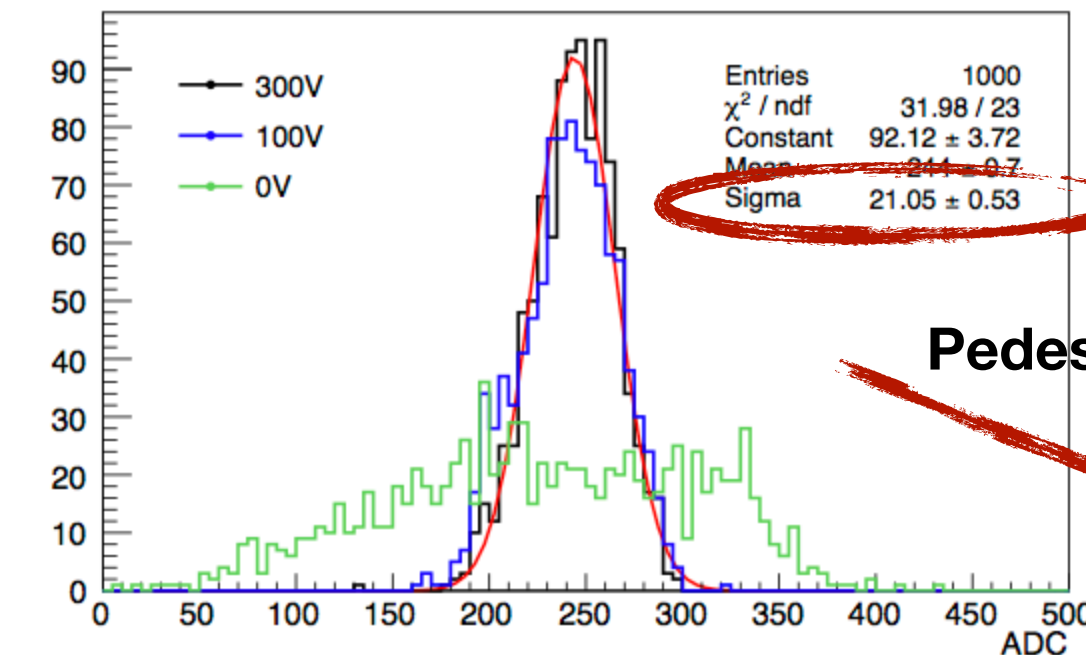


Pull Test

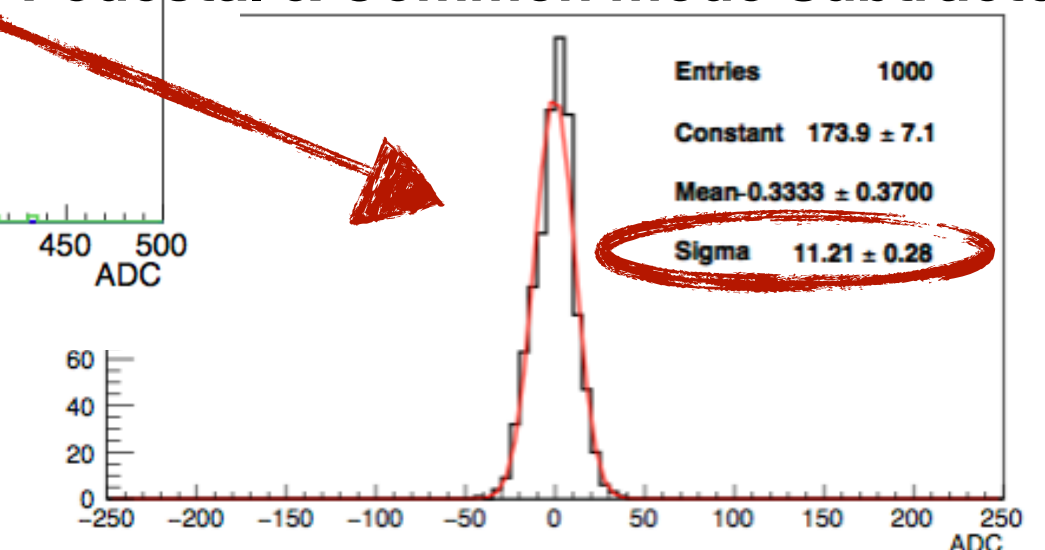
- Test Results



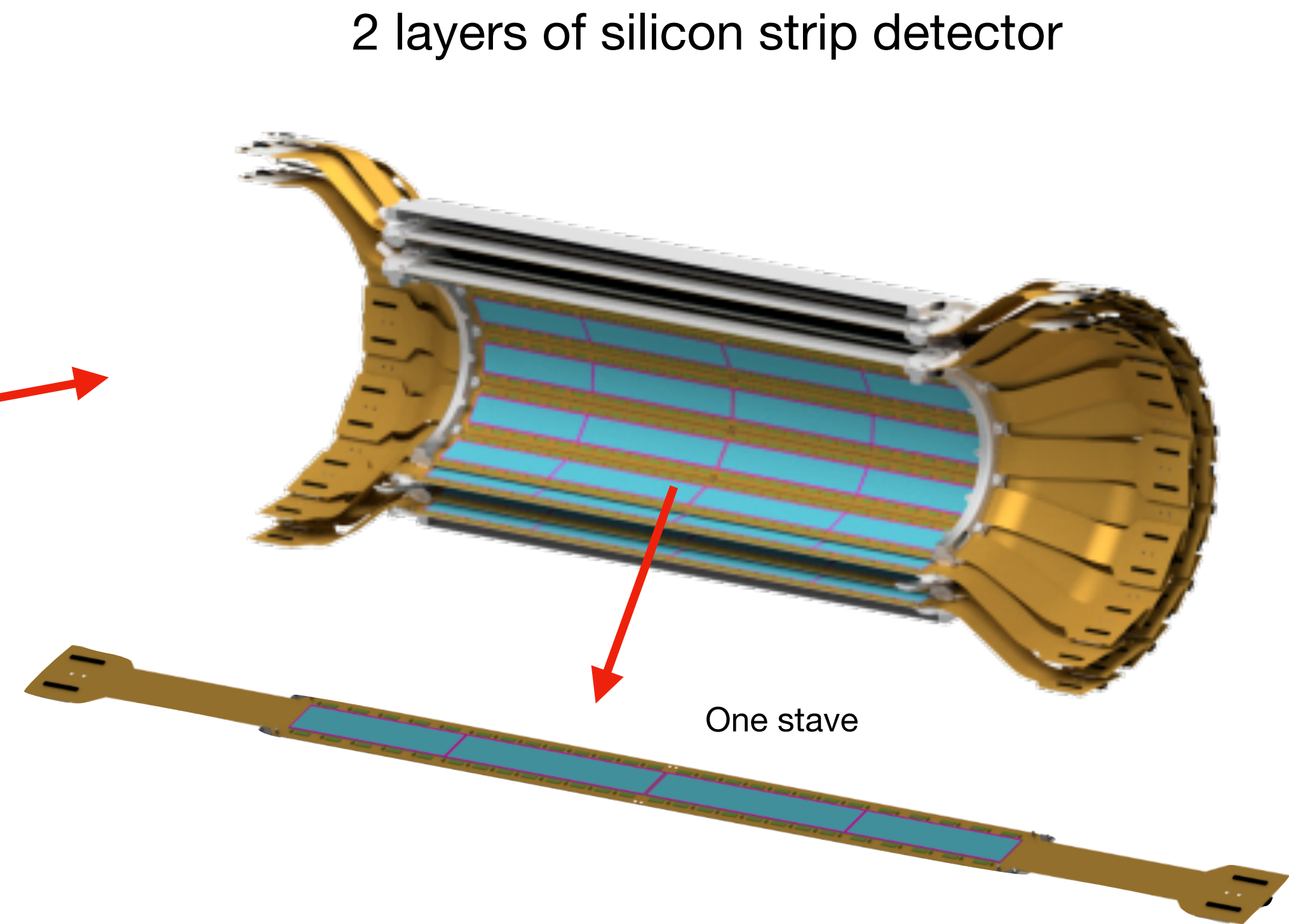
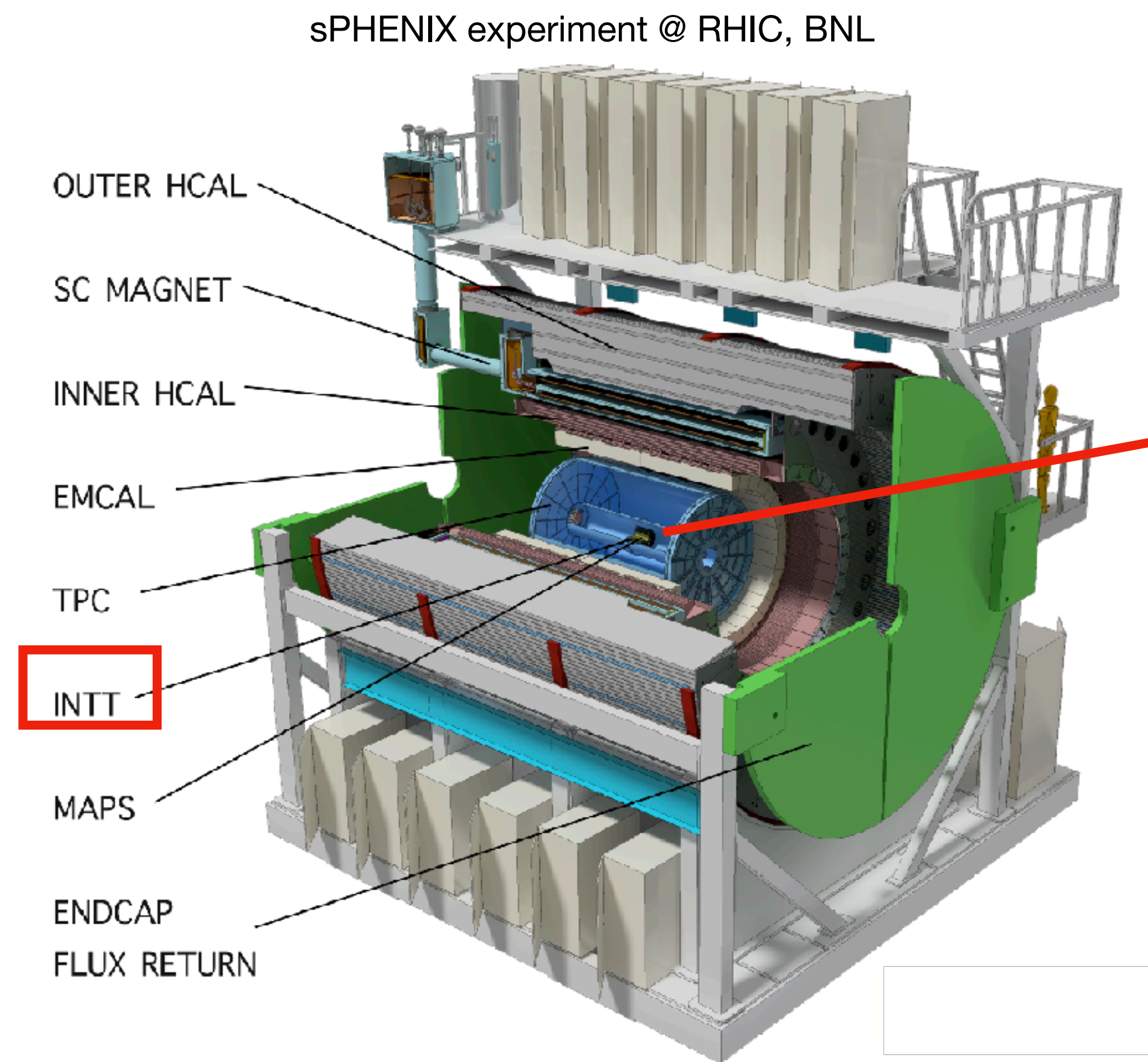
HG Pedestal with different bias voltage



Pedestal & Common mode Subtracted

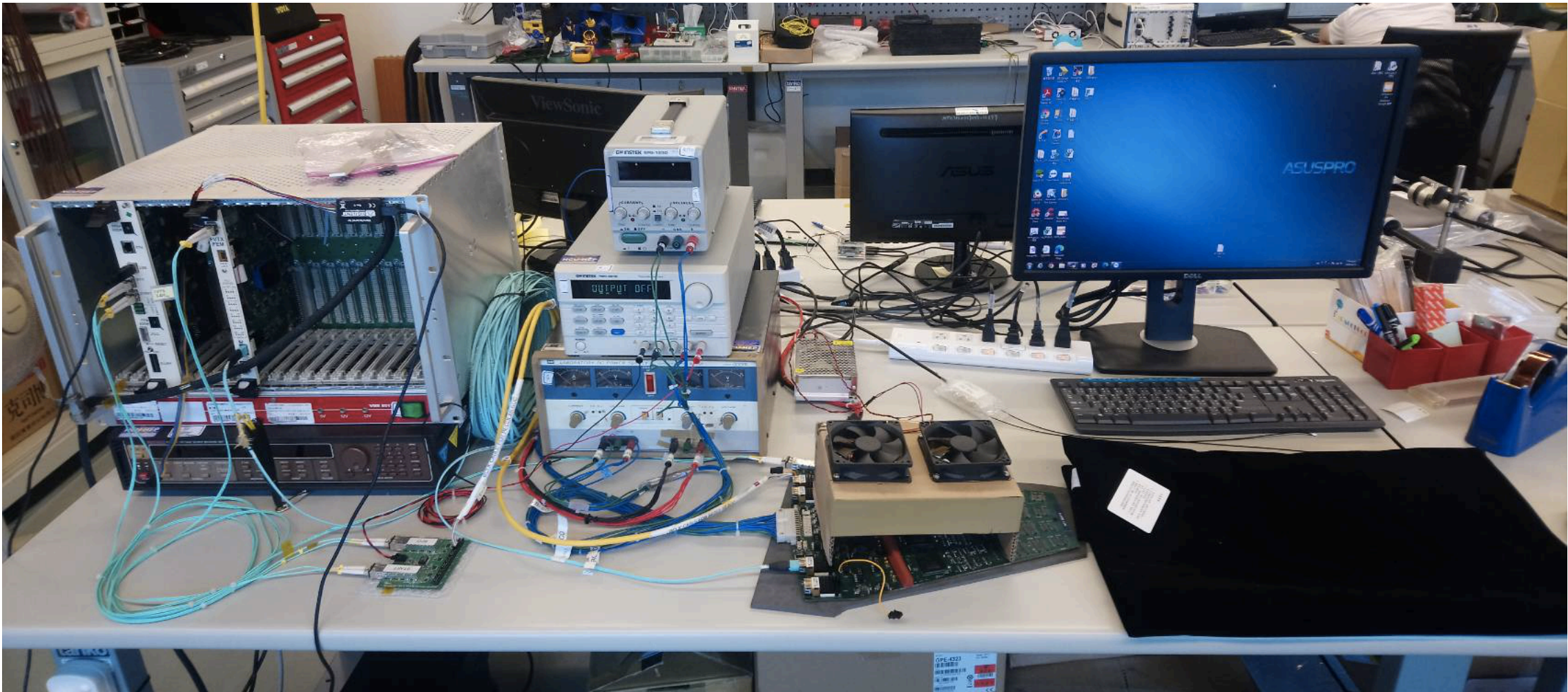


First Module successfully built, wirebonded and tested

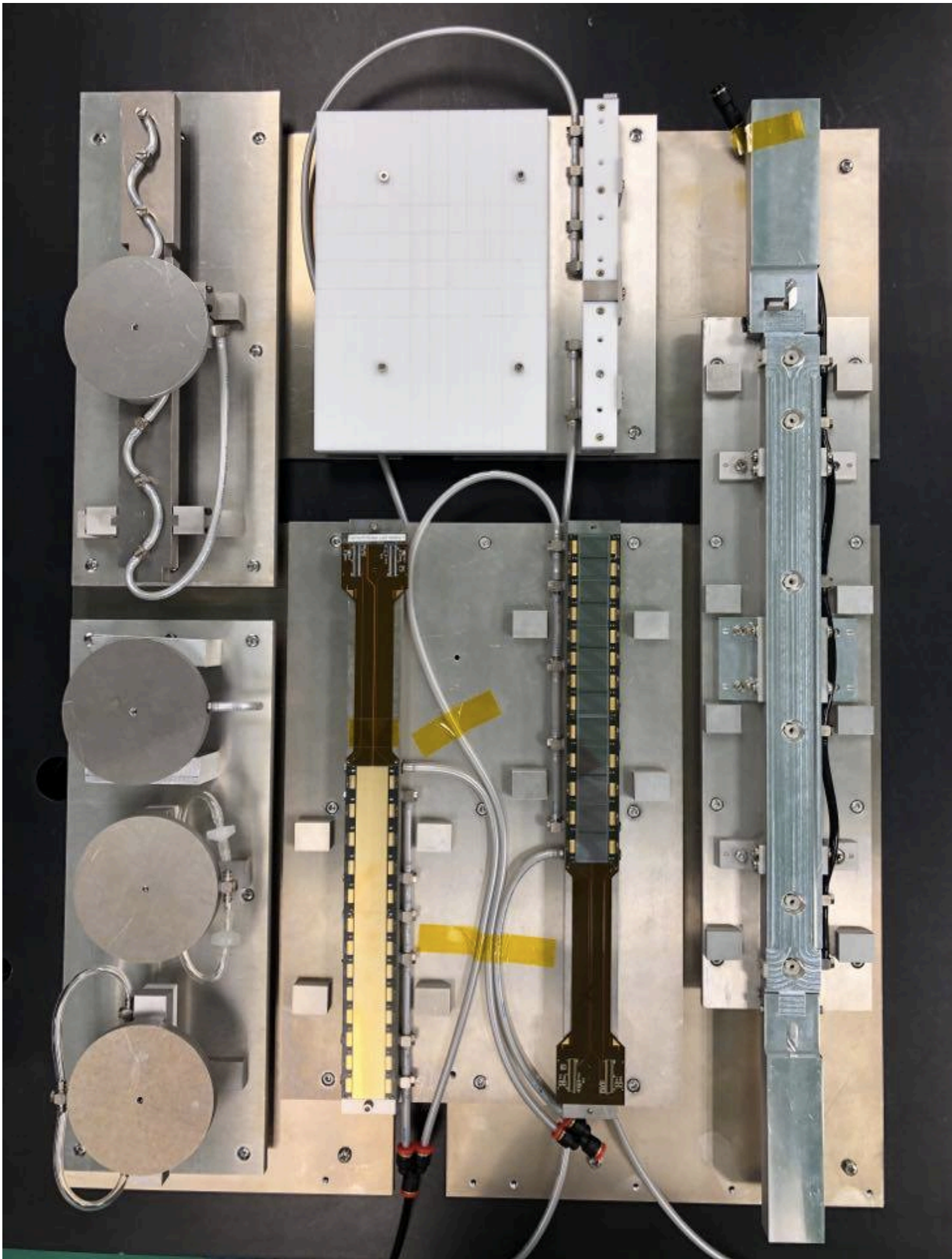
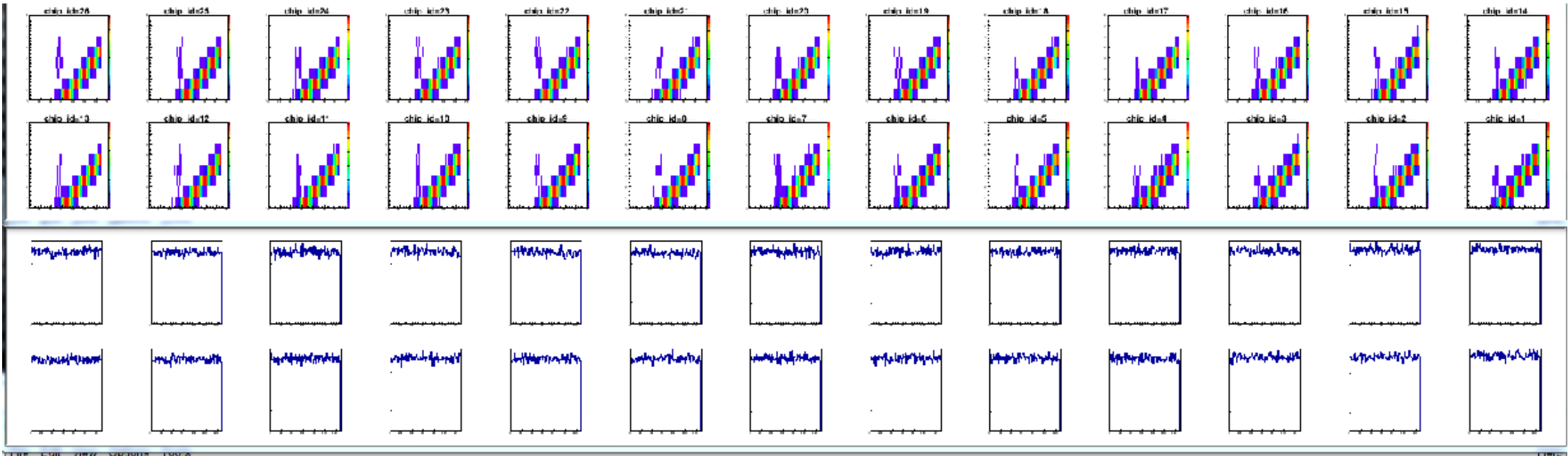


INTT : 56 Ladders + spares = 112 Ladders -> 40 Ladders in Taiwan

TestBench

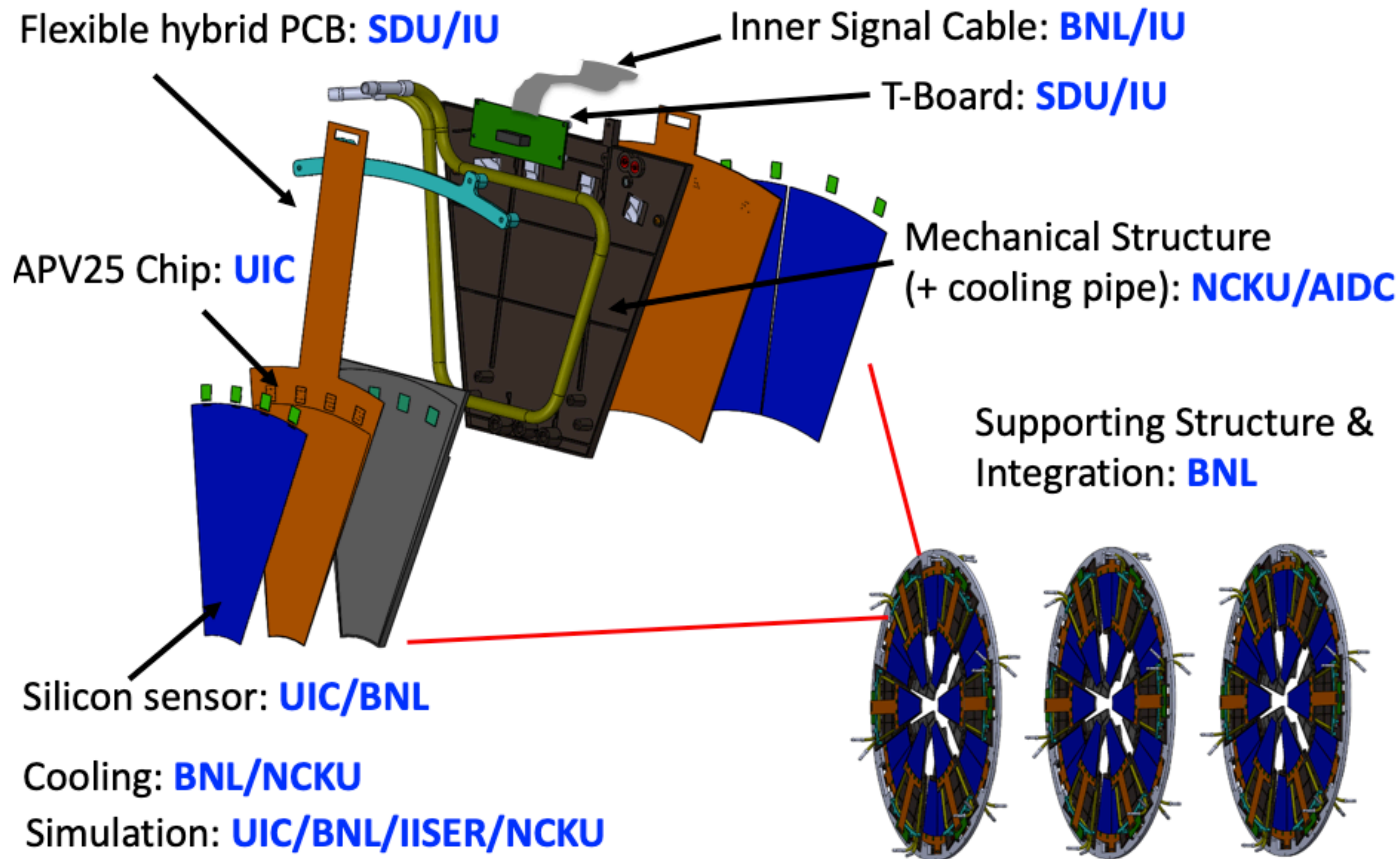


INTT module calibration results

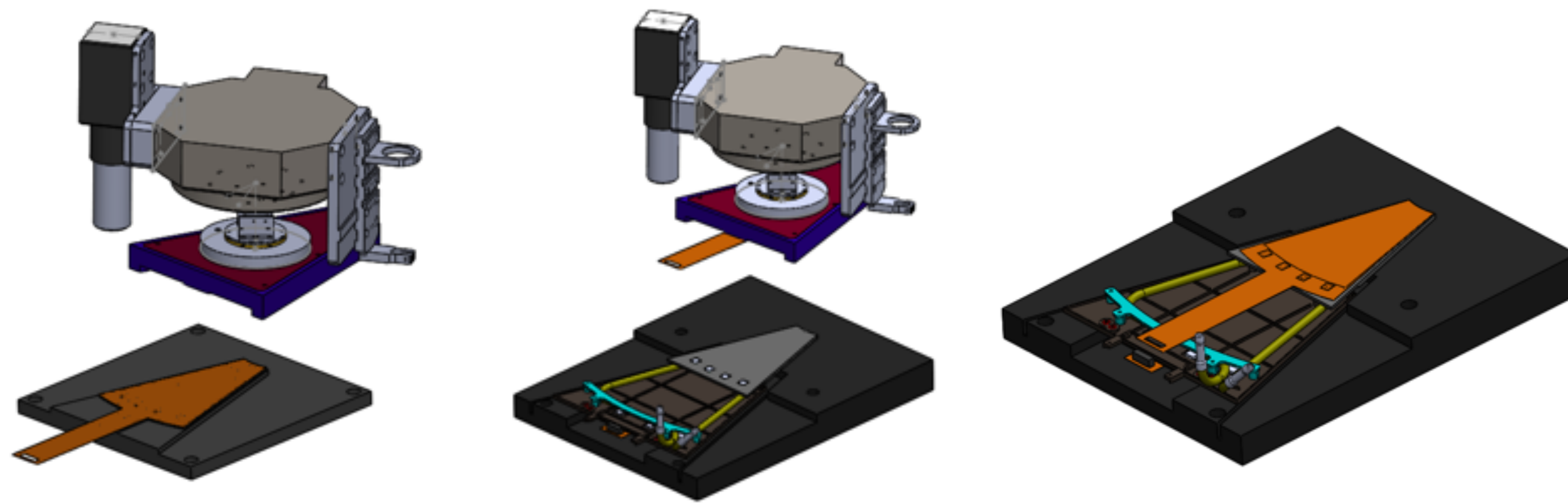


INTT assembly family on Gantry

STAR Forward Silicon tracker



Assembly schematic diagram

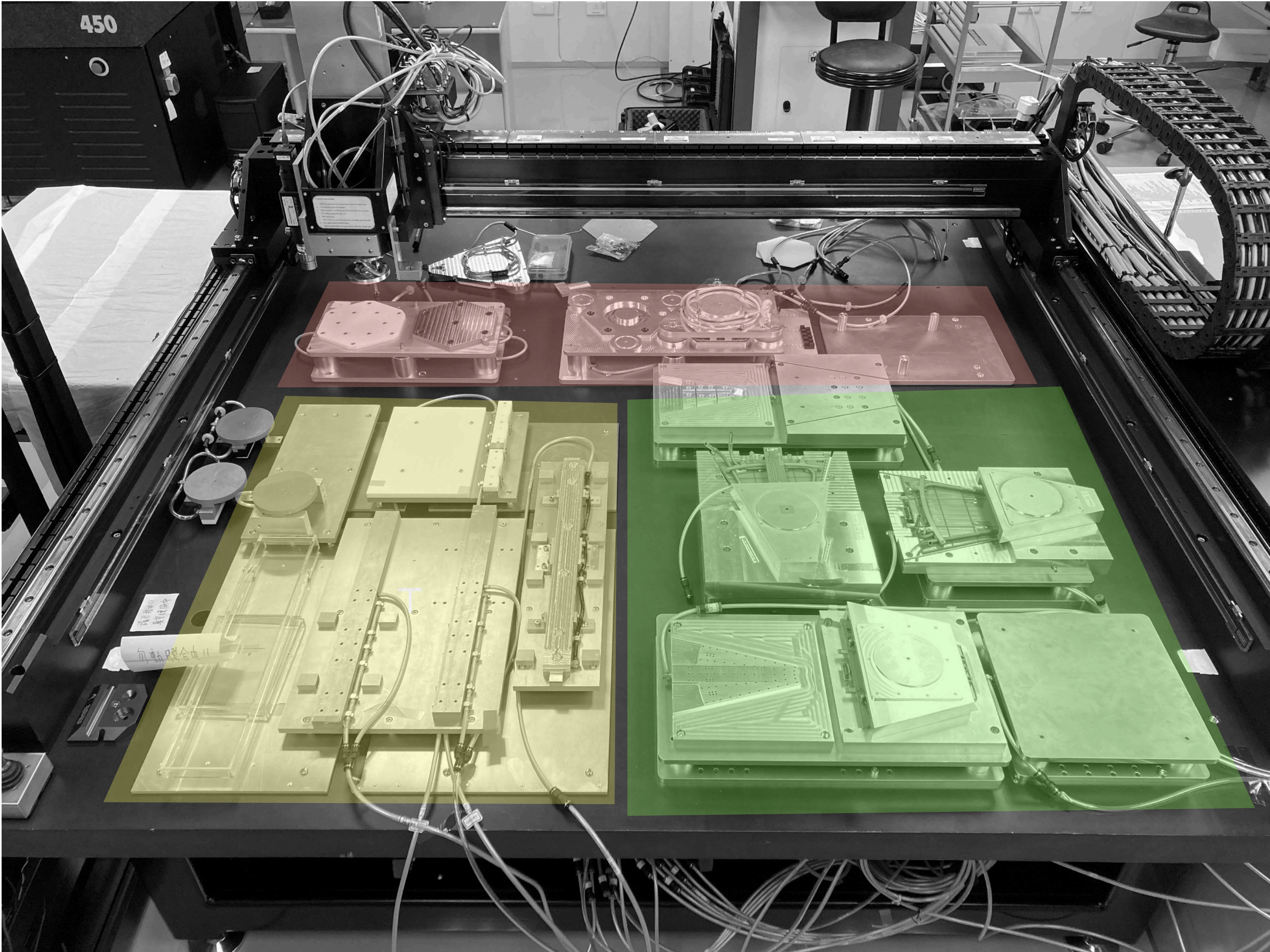


Final Product



Full Production complete next week!

VERY ACTIVE clean room



HGCAL

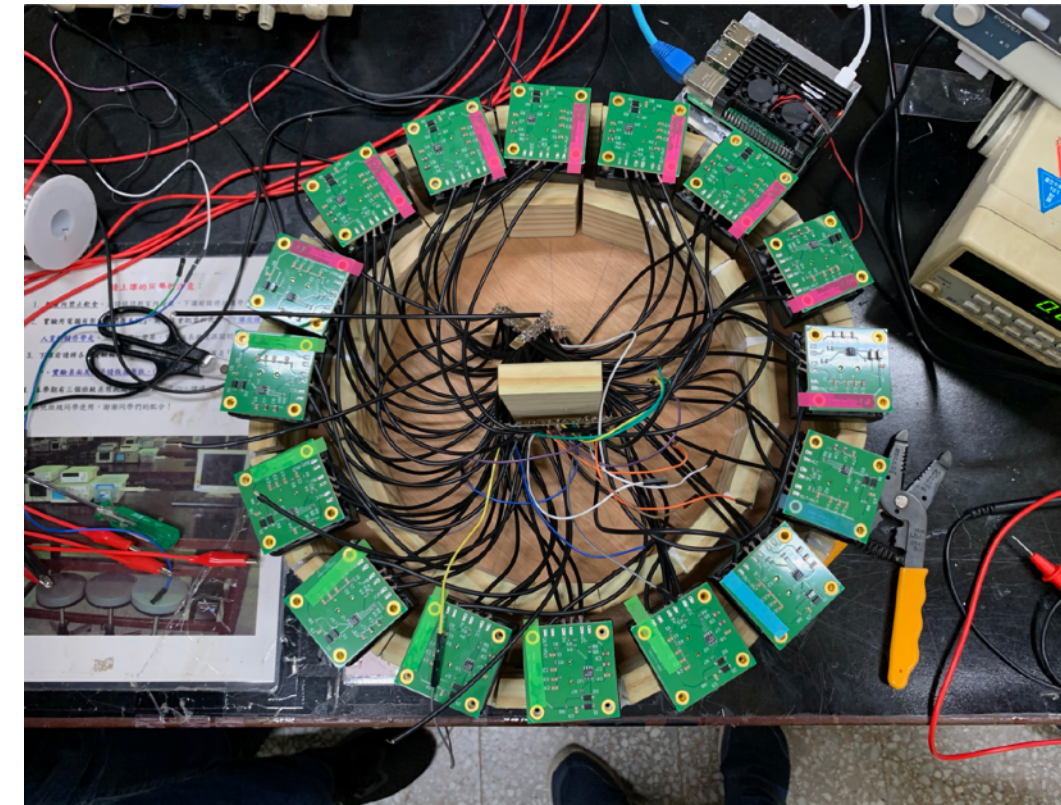
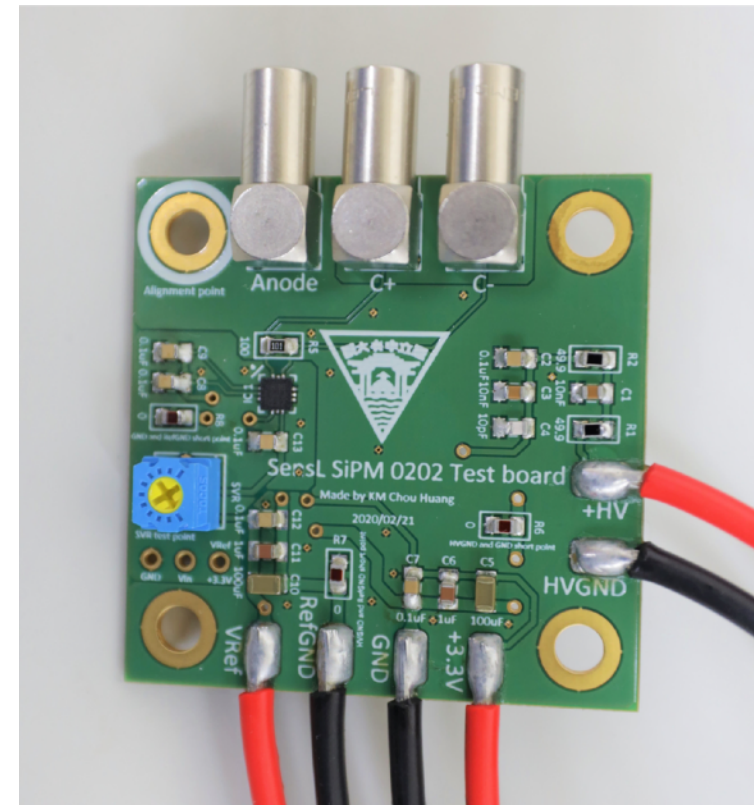
INTT

FST

Non-Collider projects



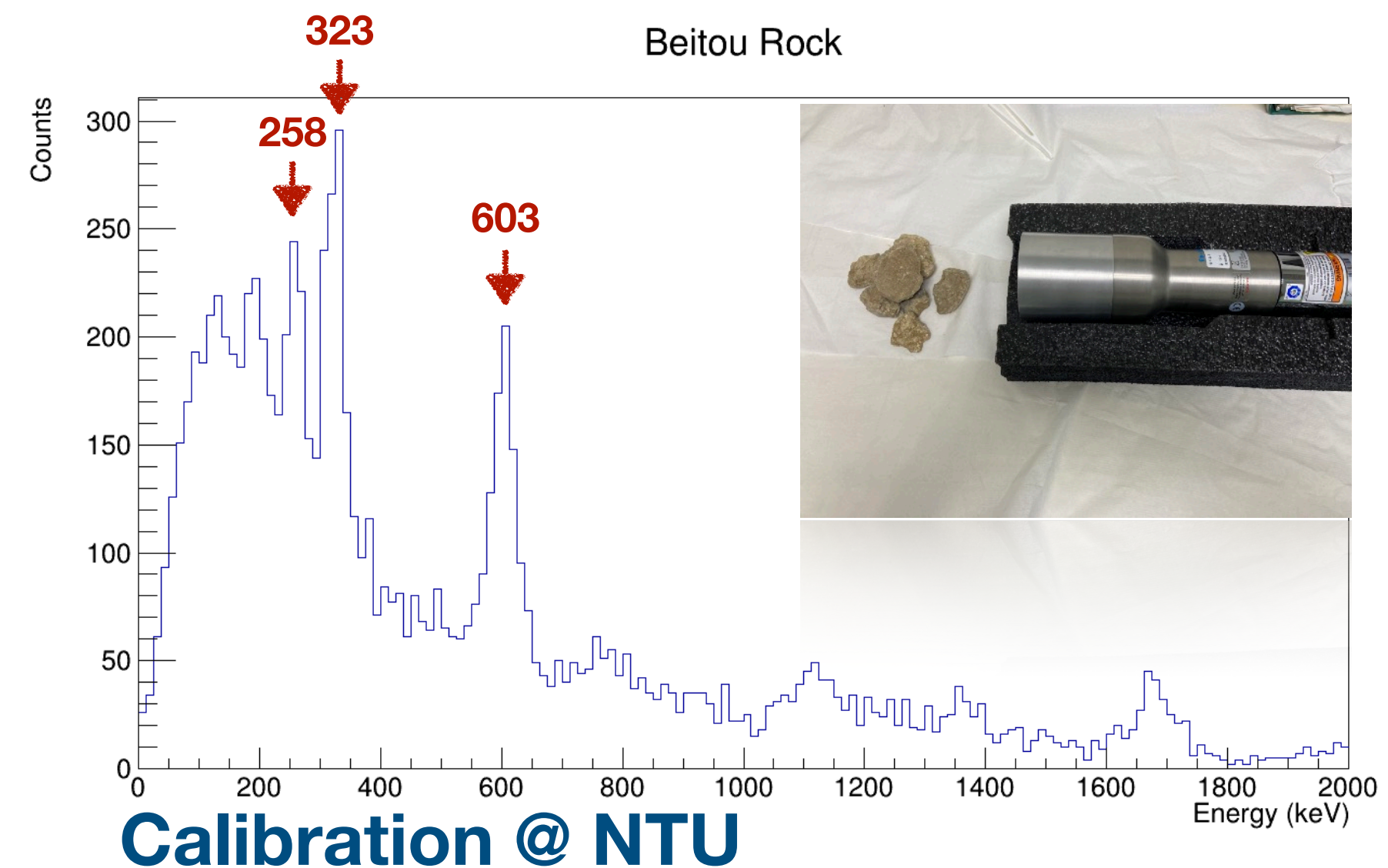
- “Muography”: a scintillator +SiPM detector (NCU/IPAS)



- Radon detector to be placed in seismic stations in Taiwan (NTU/IPAS/NCU)



γ ray detector system



- Taiwan Instrumentation Detector Consortium (TIDC): a collaboration between Institute and University laboratories to deliver world class research on novel detectors.
- Multiple on-going HEP detector projects supported by TIDC.
- Open to new projects and facilities. Welcome!



Consortium initiation ceremony (Jan 2021)