

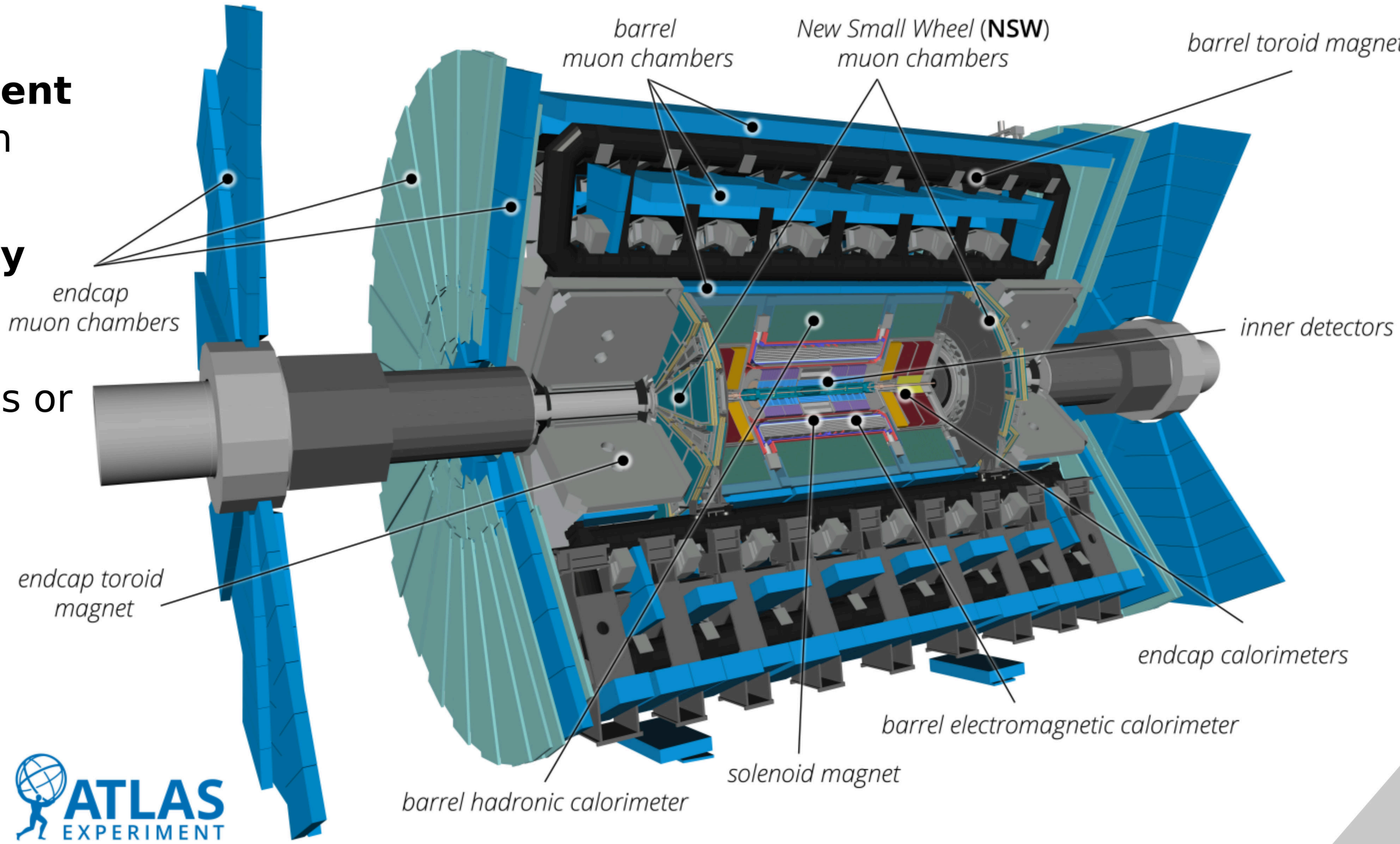
Module production at LPNHE for the ITk pixel upgrade of ATLAS experiment

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¹LPNHE

On behalf of the ATLAS ITk collaboration

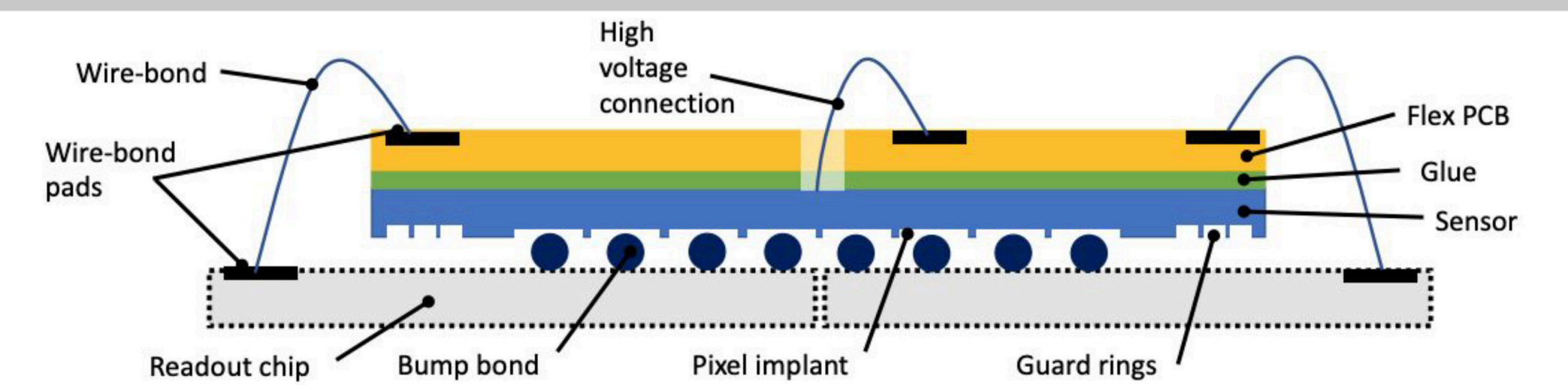
The **ATLAS** experiment is to be upgraded in 2029

- LHC High luminosity
- Probe Standard Model deeper and search for new Physics or BSM
- Improvement of detector



The **Inner Tracker** consists of pixel detectors placed in concentric cylinders

- Particles generated in collisions
- Magnetic field bending the particles
- Charged particles generates charges in silicon
- Energy deposition in several layers -> path of particle

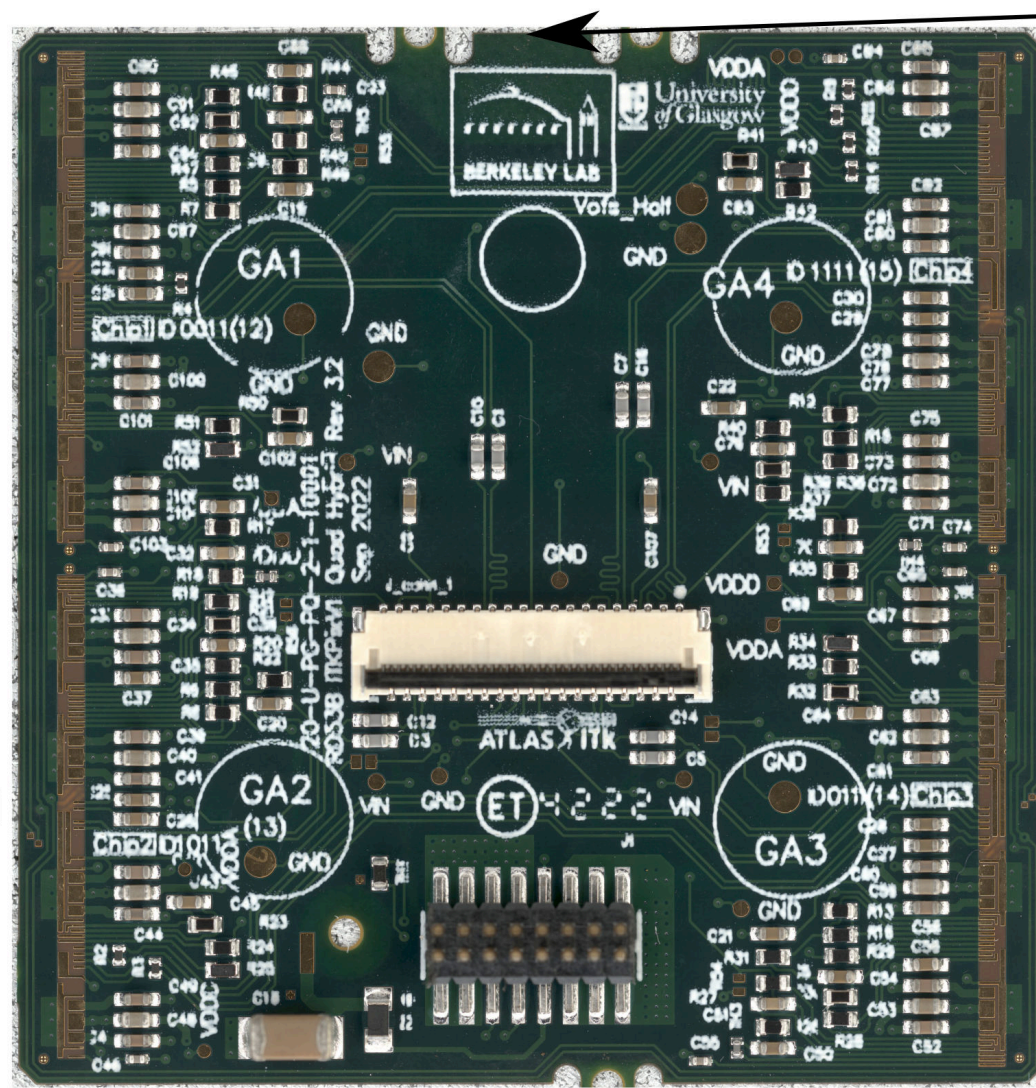


The tracker is made of hybrid detectors

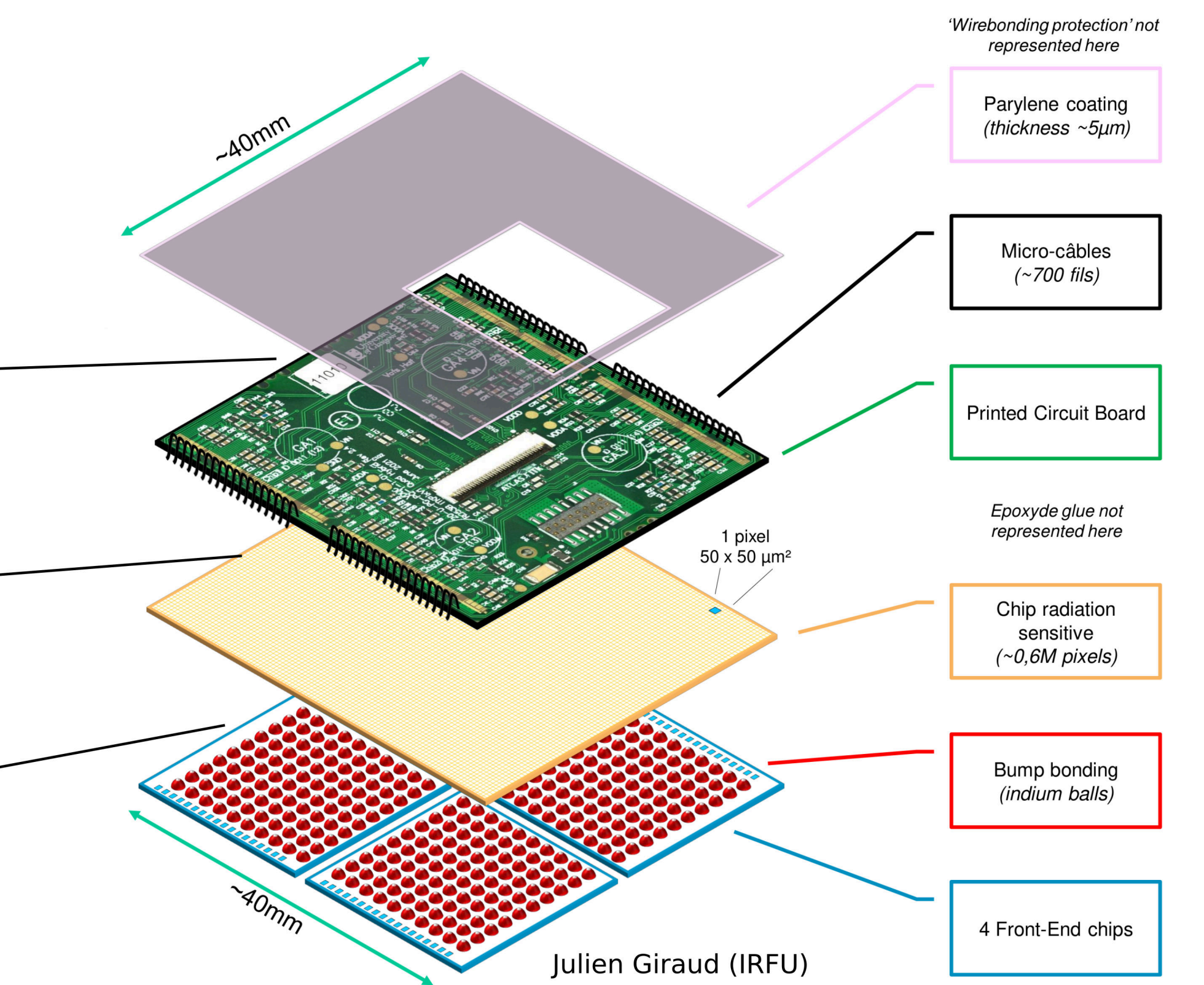
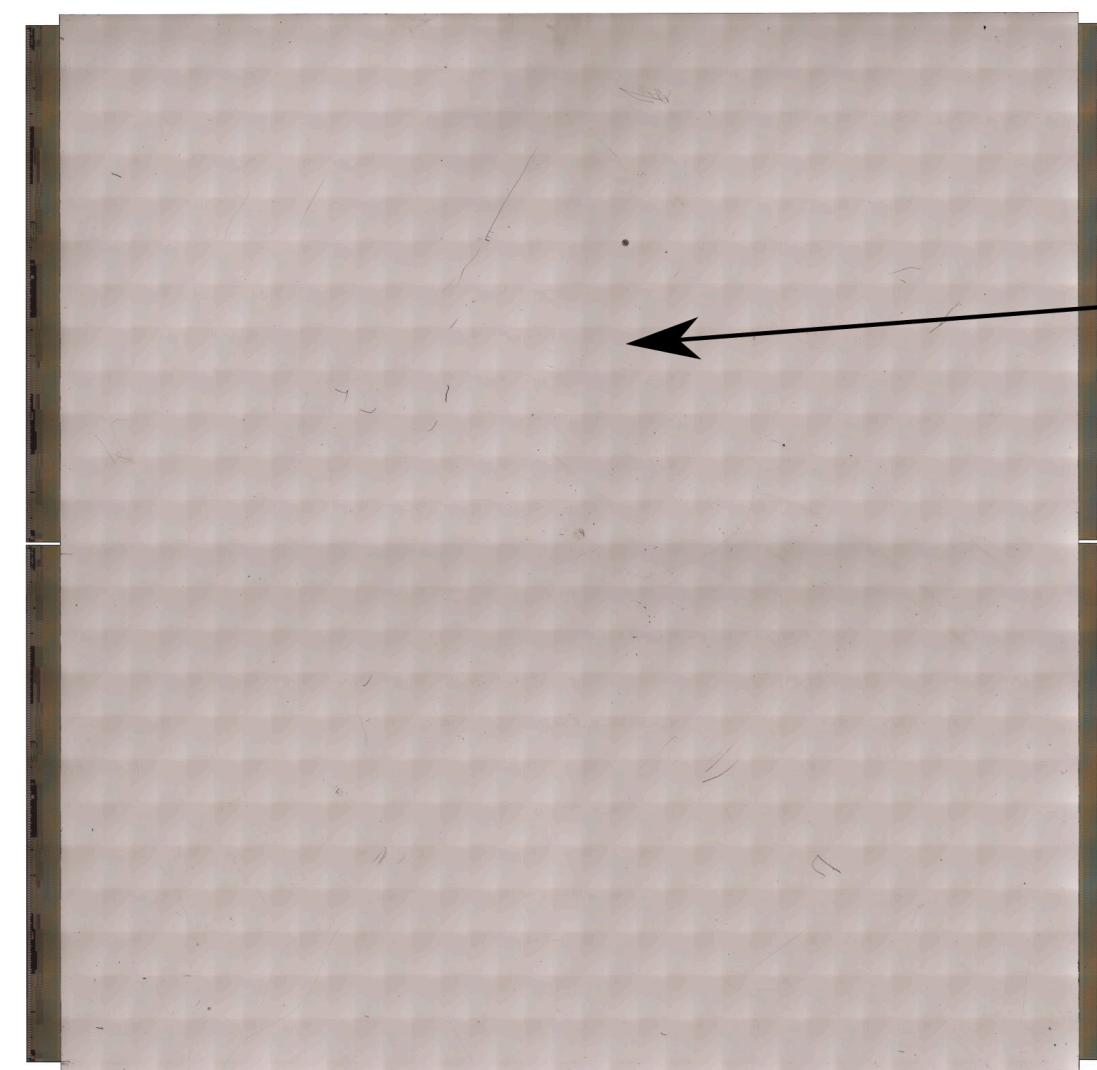
- Sensor -> particles passing generates charges, bias voltage collects charges
 - Chip -> the signal is amplified, digitalized and read
 - The sensor and chips are **glued** to a PCB
 - The chips are **wire-bonded** to the PCB for connection
 - The assembly is **coated with parylene** layer -> prevent electric arcs from bias voltage
- All steps** from reception to testing can be performed at **LPNHE**

Reception, metrology, visual inspection, performed at LPNHE with :

- Metrology machine
- Probe station
- Microscope

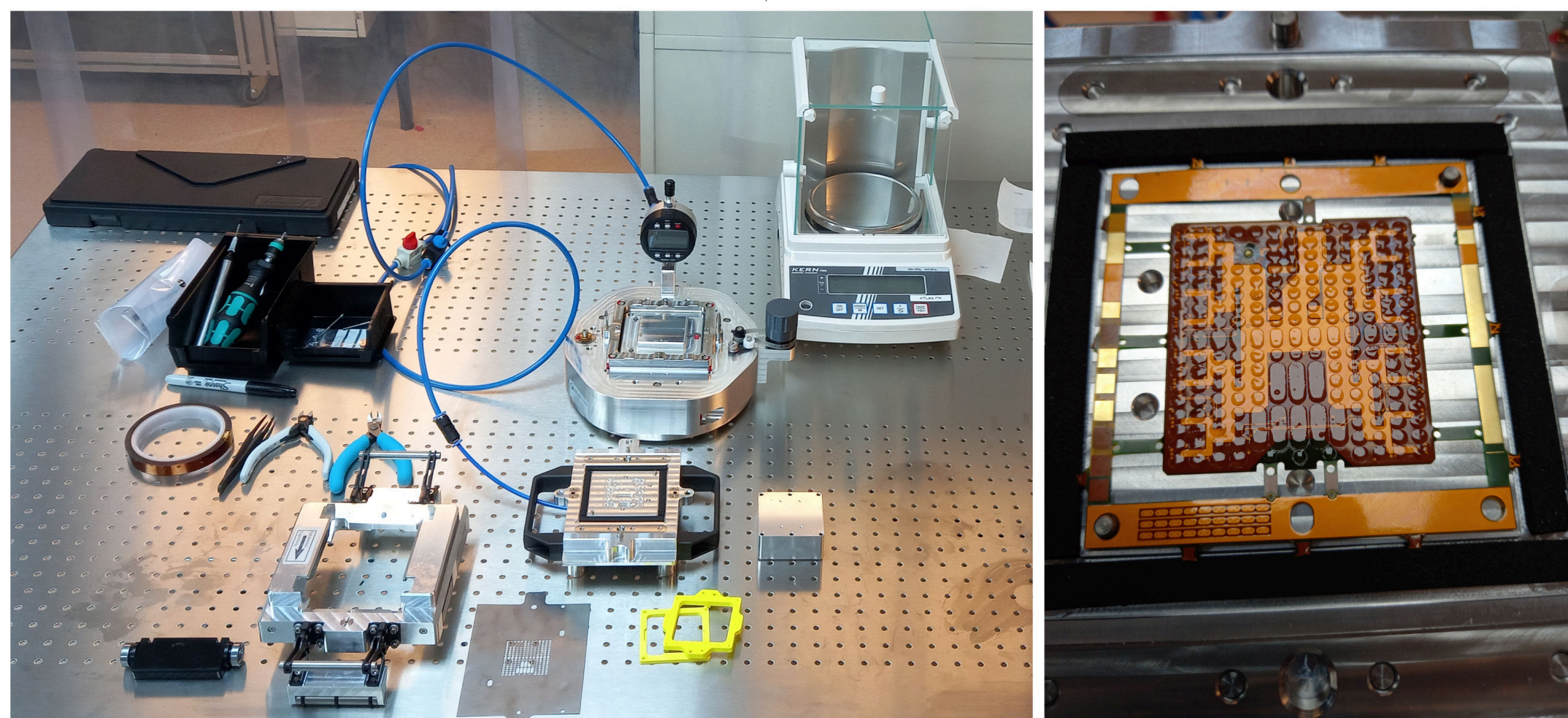


Gluing

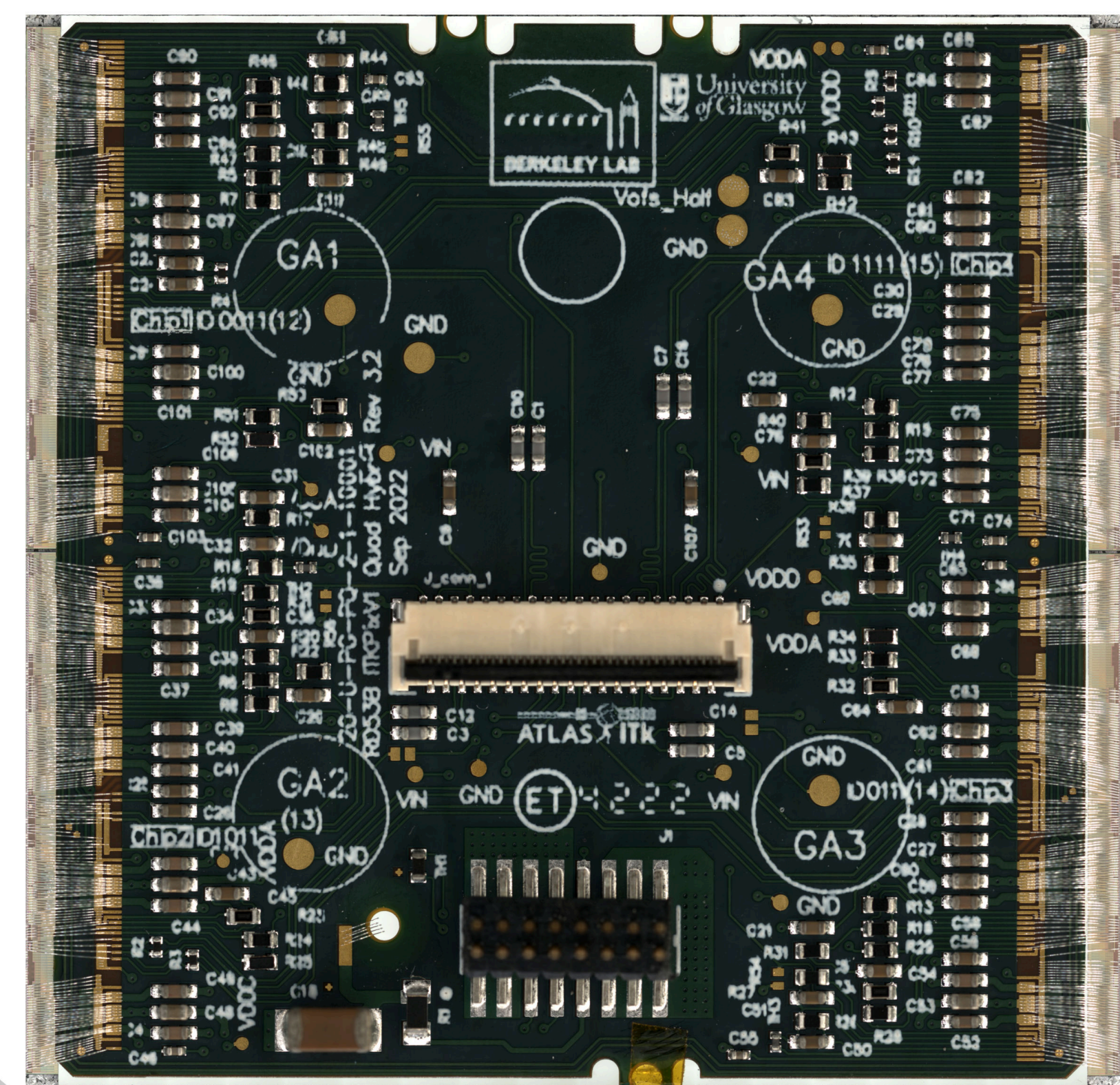


Gluing is performed with special tool for accurate glue deposition

- Weight of glue
- Metrology of assembly with custom program



Wirebonding

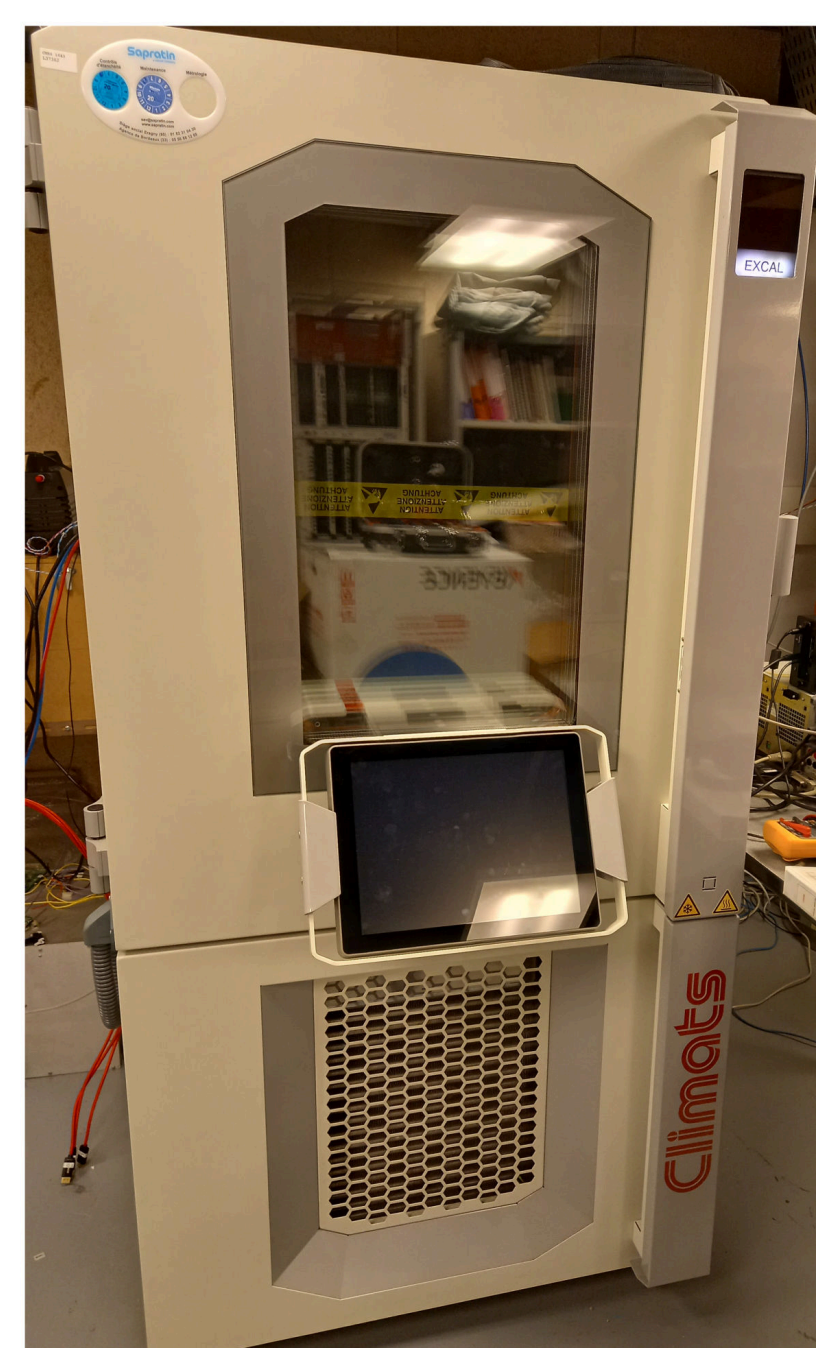
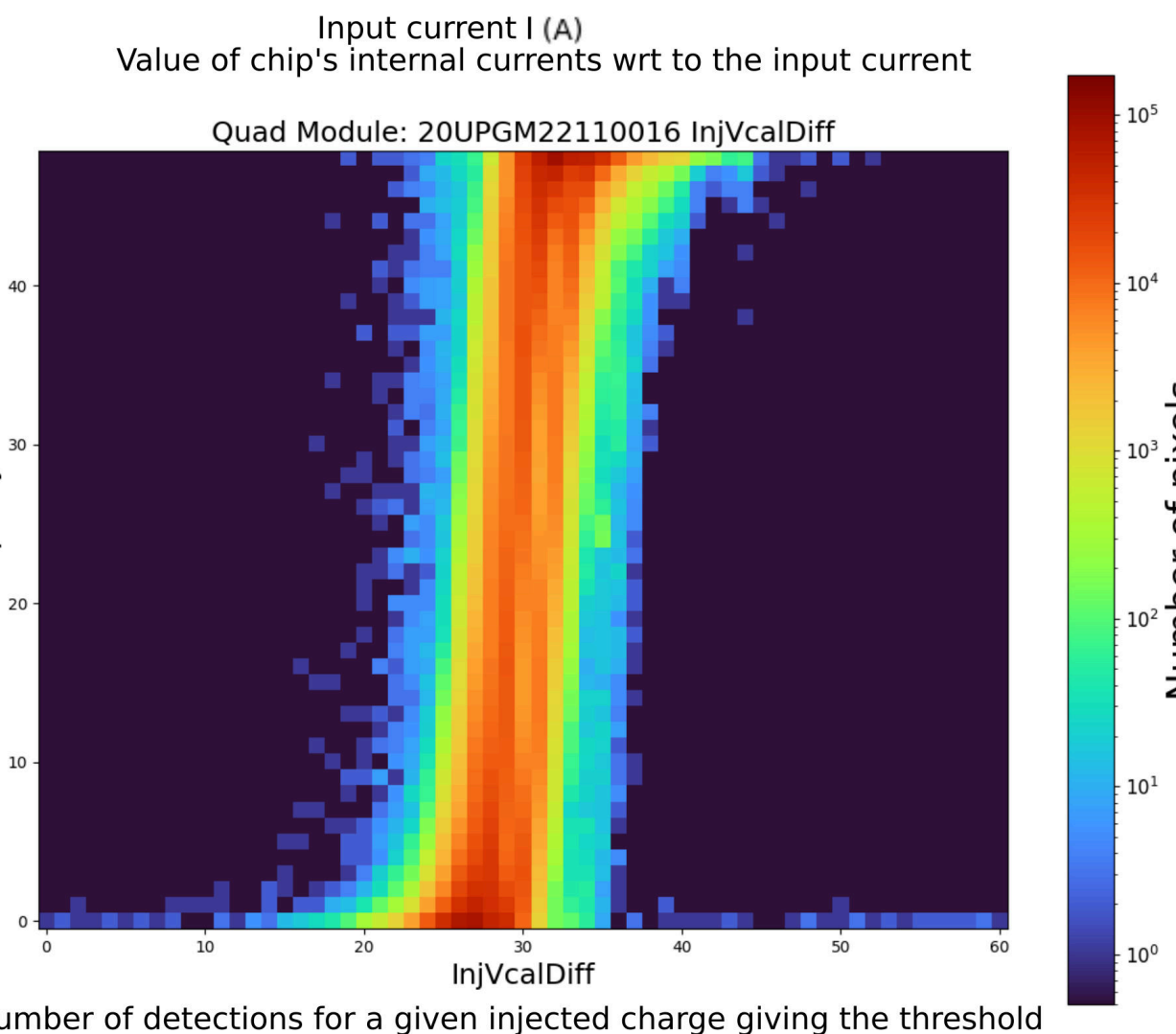
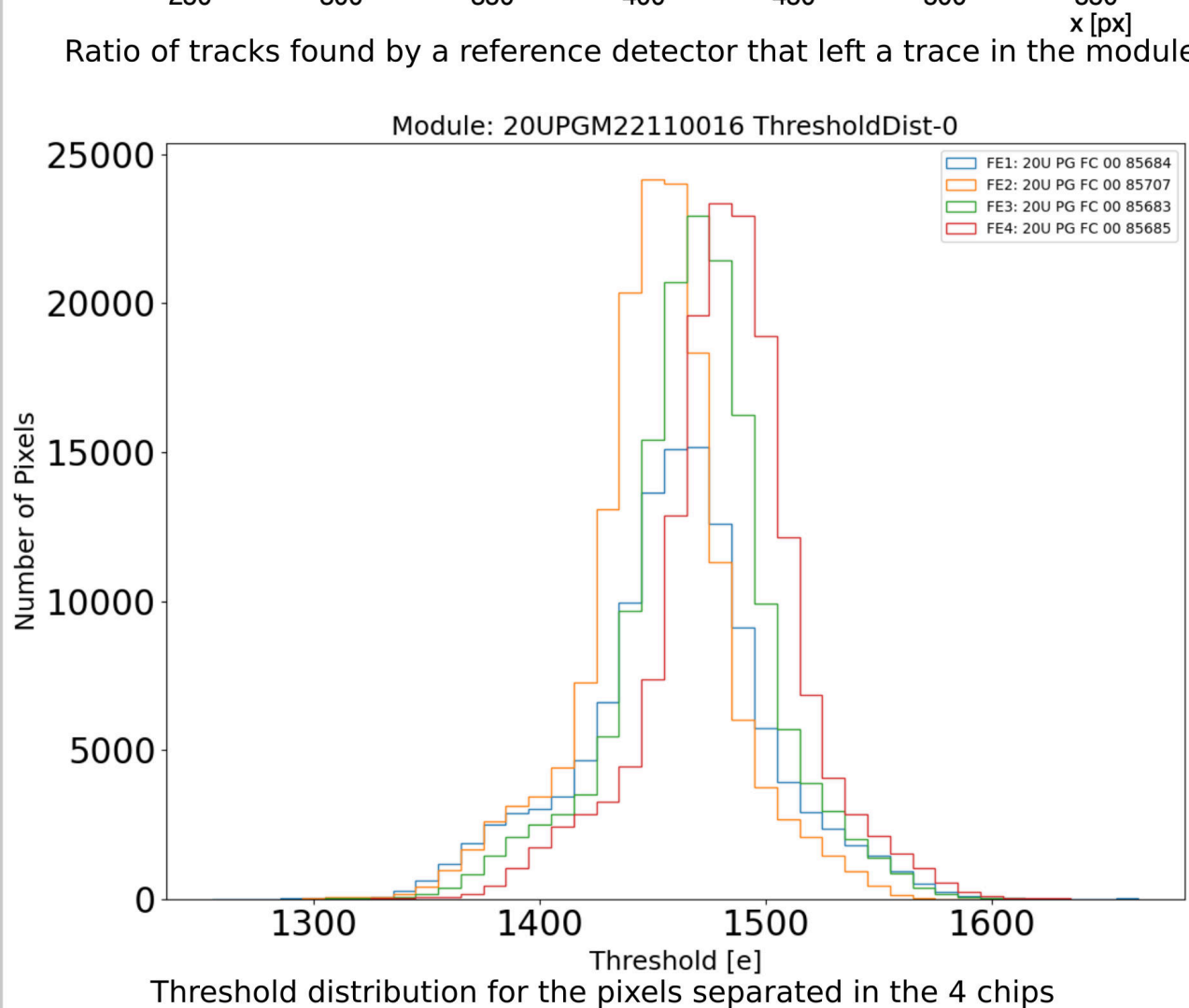
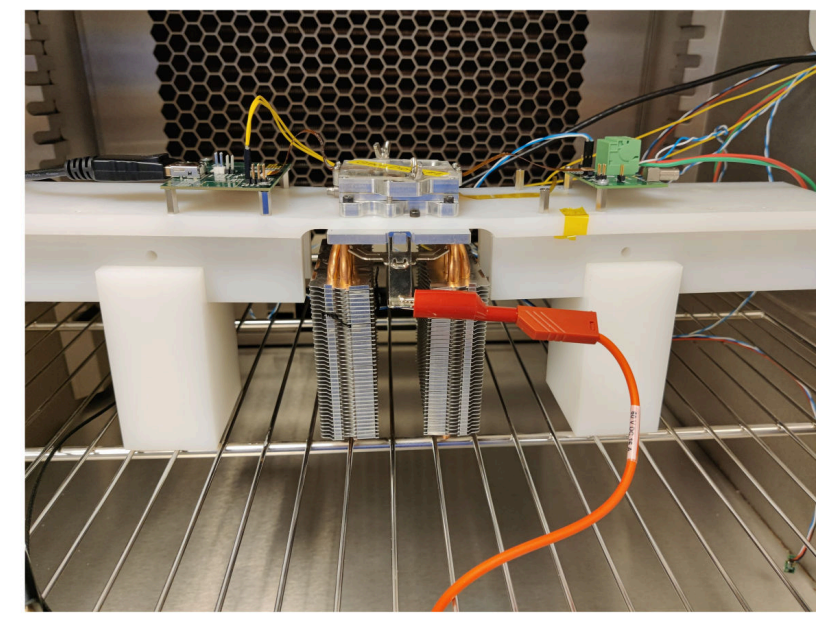
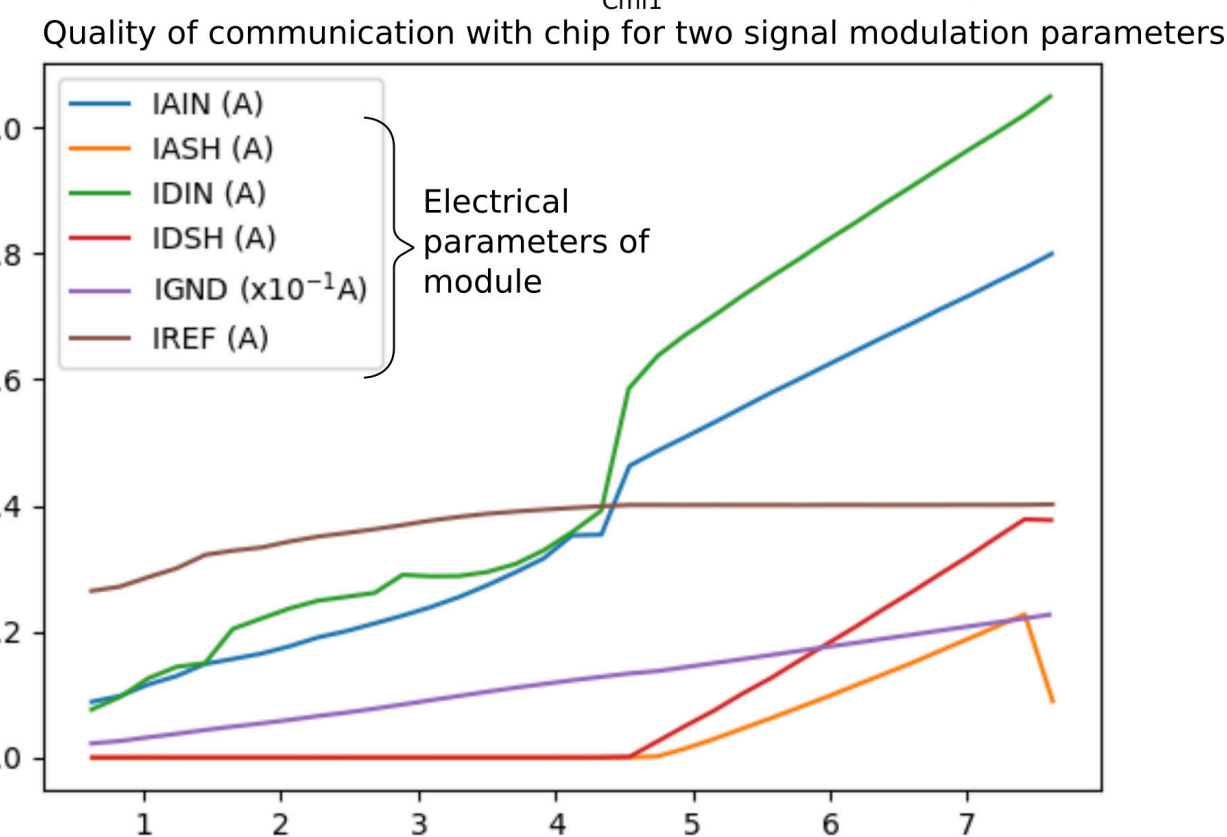
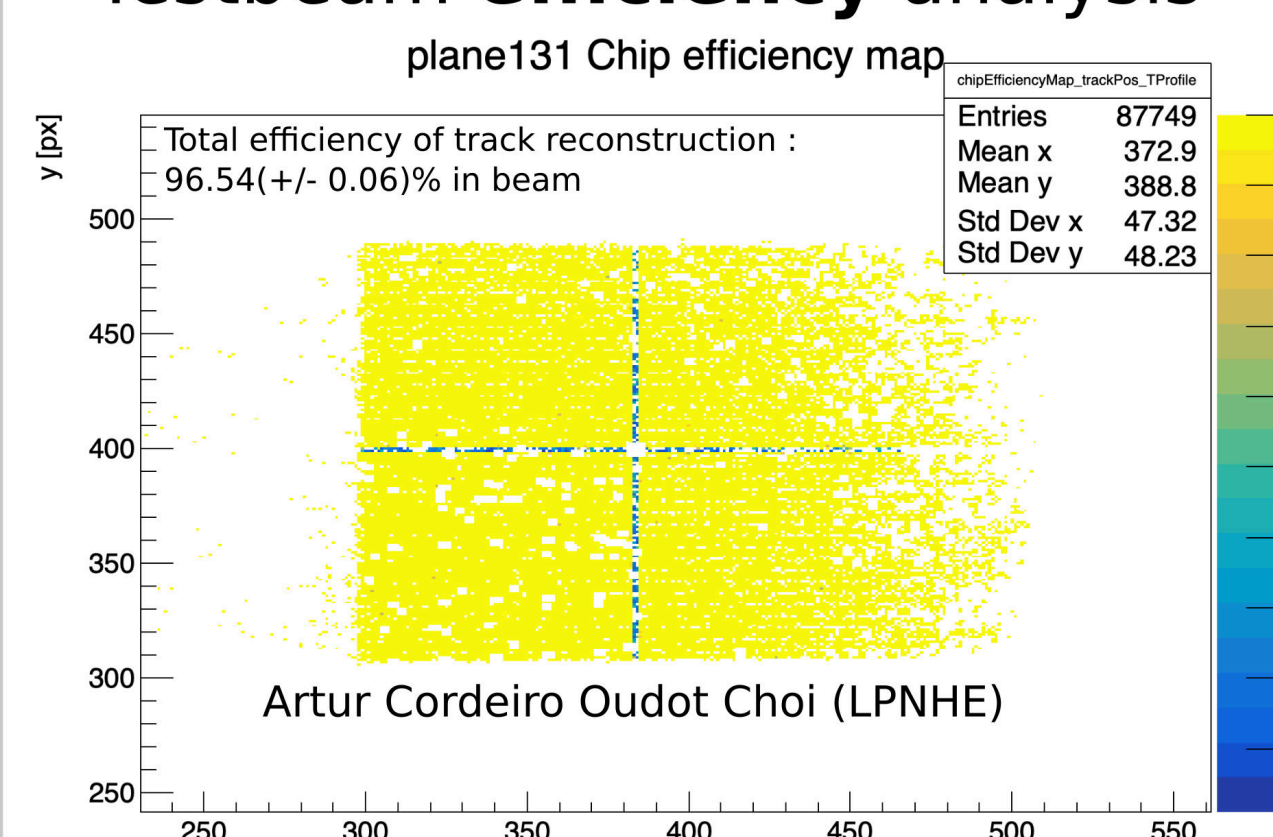
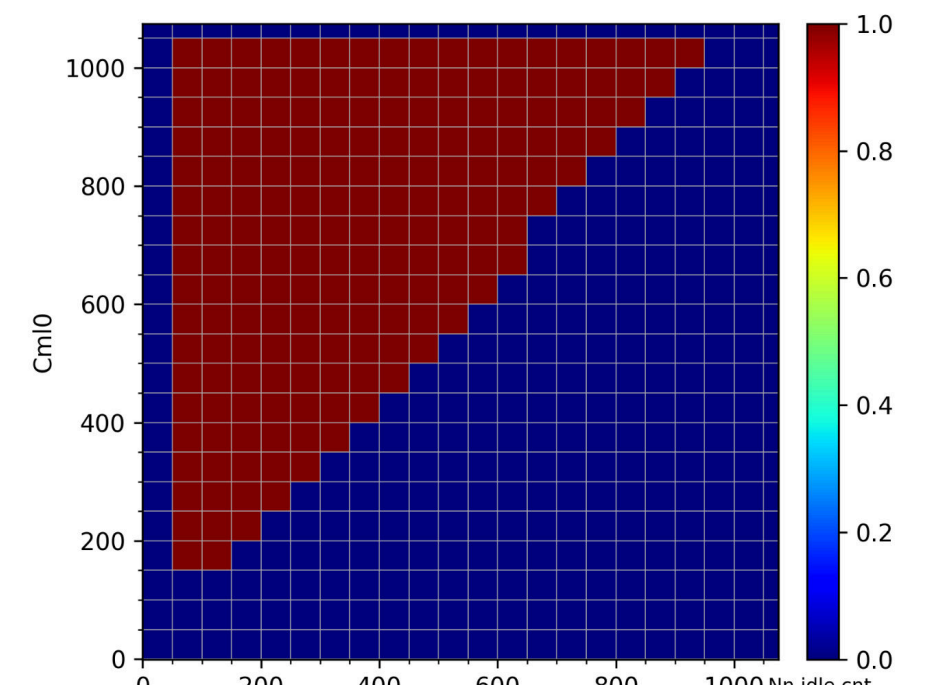


Wirebonding in LPNHE cleanroom

- Visual inspection
- Pull tests

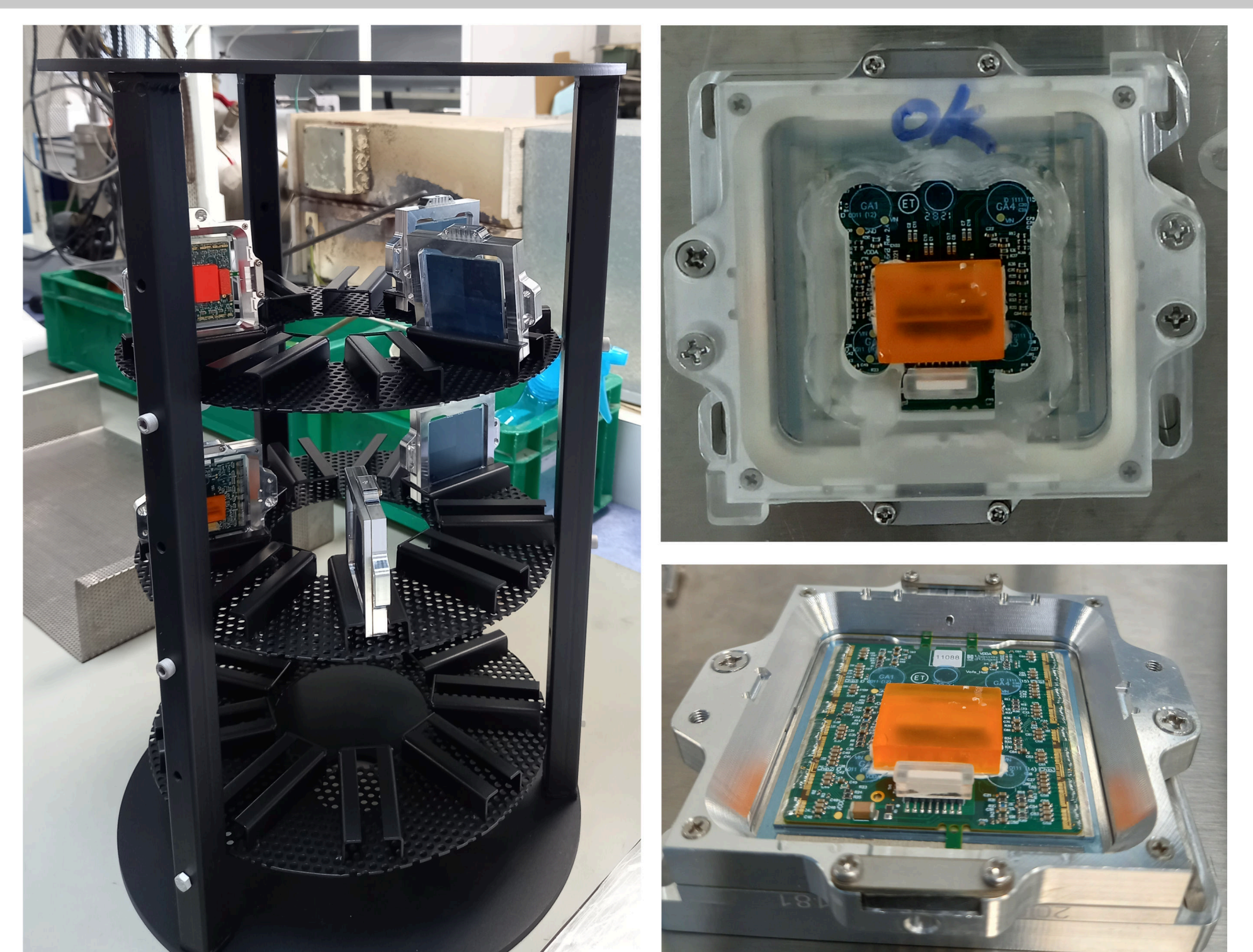
After assembly, tests are conducted

- Connectivity check
- Sensor IV after assembly
- Thermal cycling
- Analog and digital scans
- Tuning of thresholds
- X-ray scans
- Testbeam efficiency analysis



Masking and parylene coating

Testing



Parylene layer deposited

- Masks on connectors
- Coating made at external firm