DSSC2 Detector Integration

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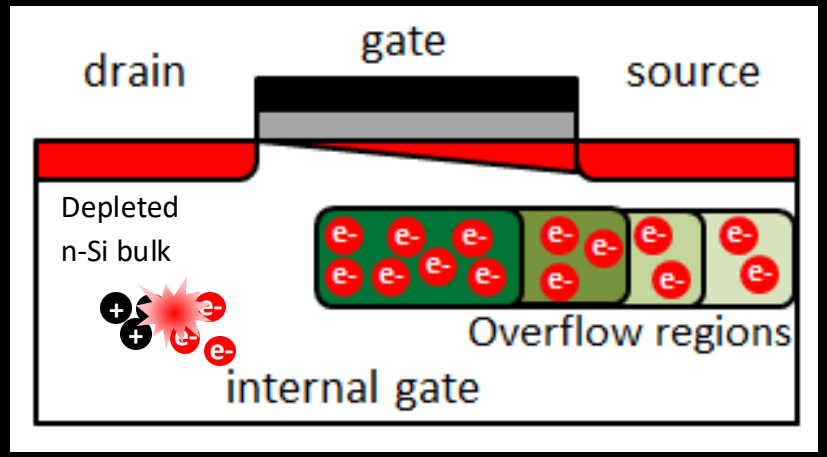
06.02.2024

Outlook

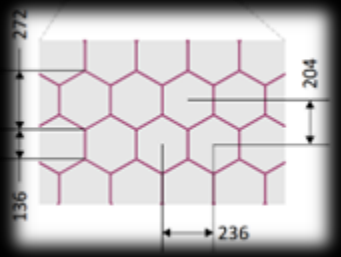
- DSSC detector overview: working principle and geometry
- DSSC2 Integration process:
  - Infrastructure
  - Power system
  - Vacuum system
  - Cooling system and interfacing in vacuum
  - Sensor qualification and installation on a cooling block
  - Detector assembly
  - Commissioning and calibration
  - Tools used

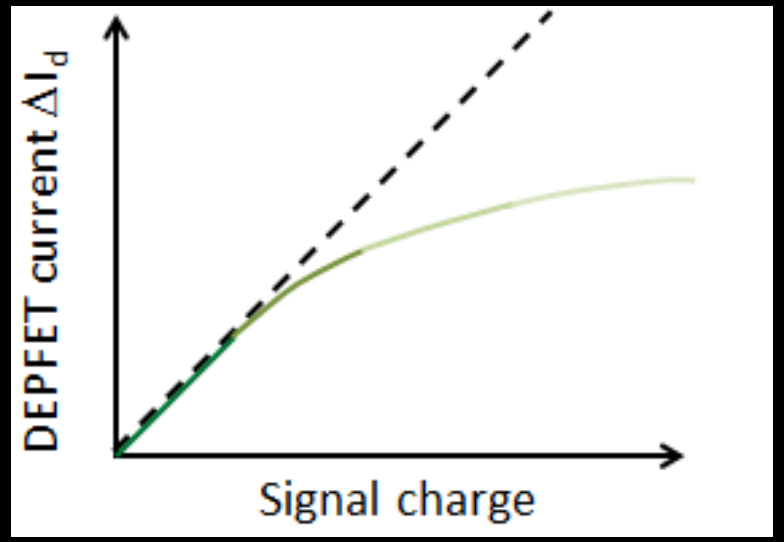
DEPFET Principle

- Non-Linear DEPFET
  - DEPFET – Depleted P-channel Field Effect Transistor
  - Detection and amplification of the signal in the same pixel
  - Charges in OR have less effect on FET current
  - Improving CHC of the pixel
  - Capability to cope with both single photon resolution and large DR



- DSSC: DEPFET Sensor with Signal Compression at sensor level
  - 1 MPx camera with frame rates of up to 4.5 MHz
  - 4 Quadrants, each has four ladders
  - One Quadrant: 2×4 DEPFET sub-sensors (128×256 pixels)
  - 64×64 hexagonal pixels in a sub-sensor are read out by one ASIC
- Applications:
  - Time-resolved X-ray imaging experiment

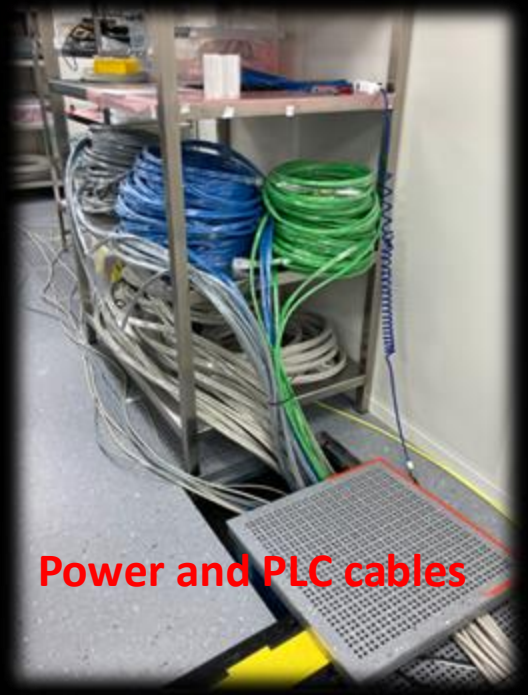


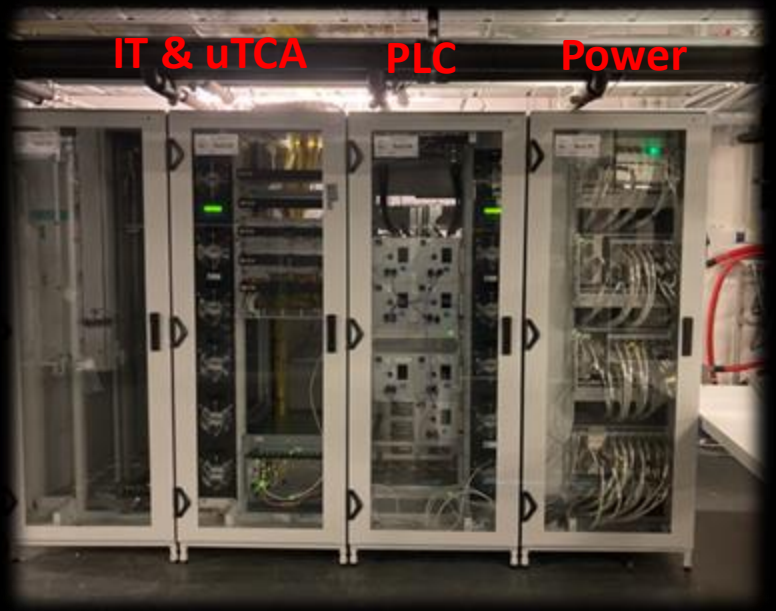


The DSSC2 Assembly and Integration: Infrastructure

CLEAN ROOM ISO6 (290/m3, >5um particles)

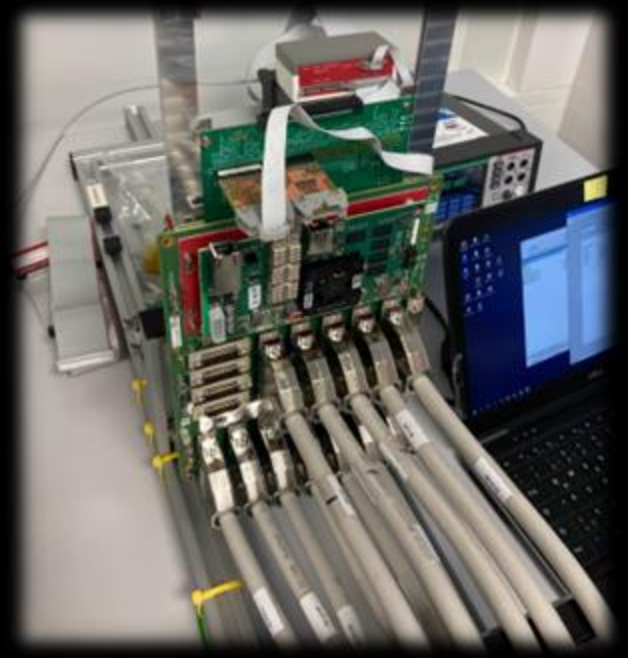
Power system: 4 Full Scale MPOD crates, 80 Cables, 500 Ch.
PLC: Vacuum Pumps, Motors, Chiller, Safety Interlock
Cooling: -20C Operations, piping to clean room.
Timing: C&C and VETO (Trigger based event selection)
Karabo, DAQ and event display: 34 GB/s


Power and PLC cables



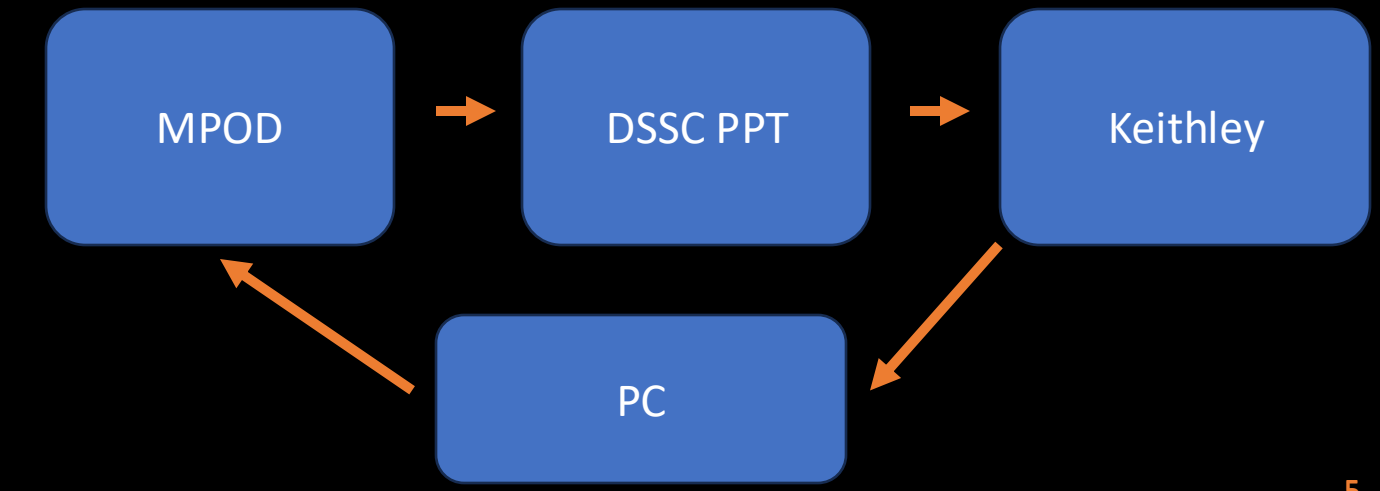

Cooling (-40C)

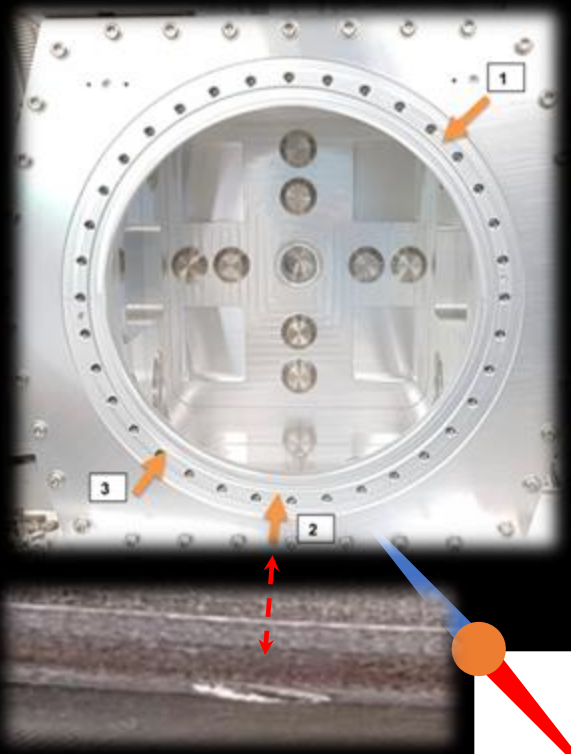

The clean room (ISO6)

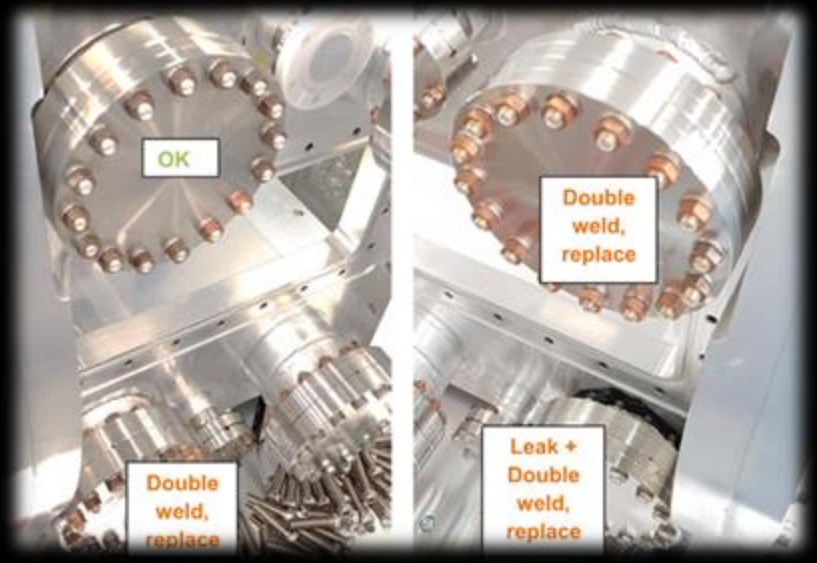


Power system acceptance test

- MPODs and Cables have been tested after installation using dedicated test bench
- 2 x HV cables found with malfunction and recovered
- 3 x ISEG HV boards found dead
  - Returned to WIENER for refurbishment





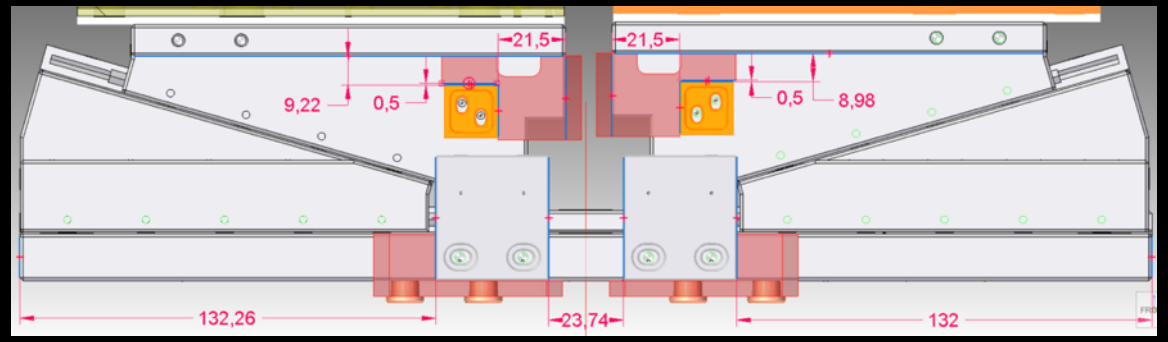


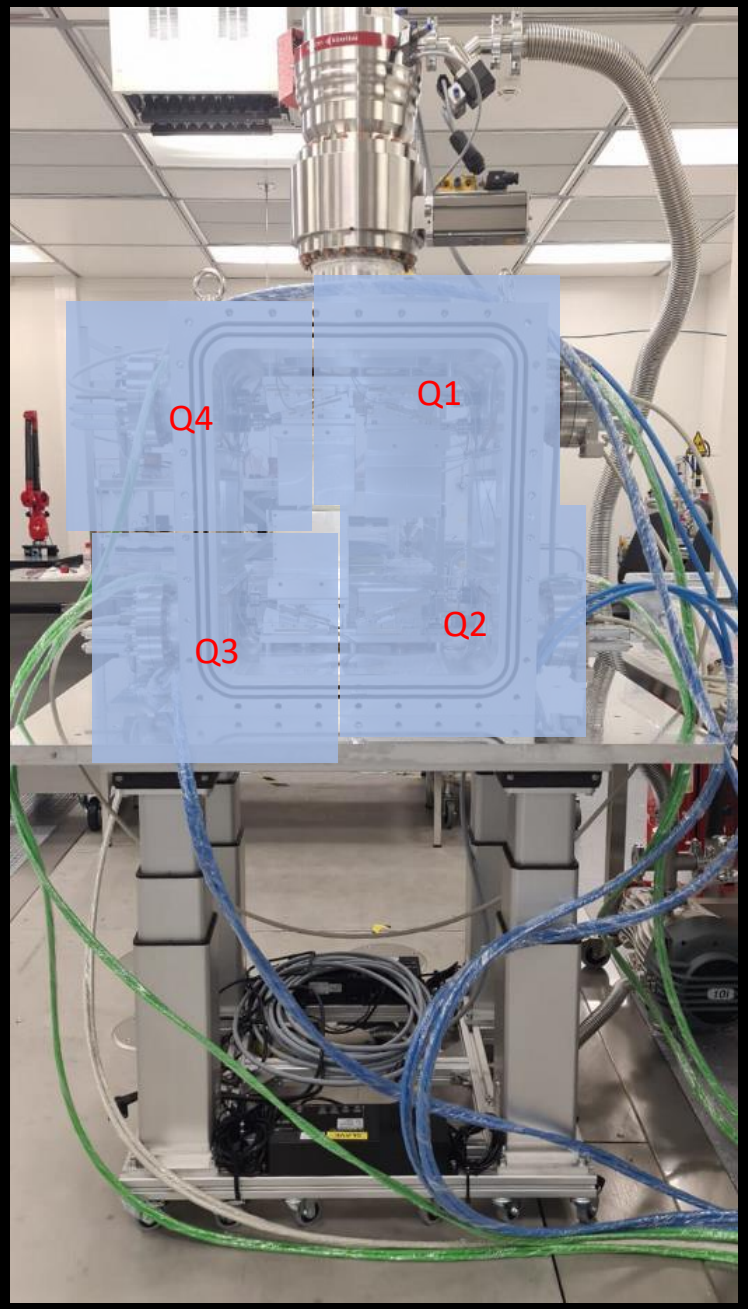
The Vacuum Vessel Acceptance Tests

Helium deposited at joints of vessel under vacuum

Scratches on DN450 and DN350 flanges – fixed

Leaks on welding joints of side flanges – rewelding done



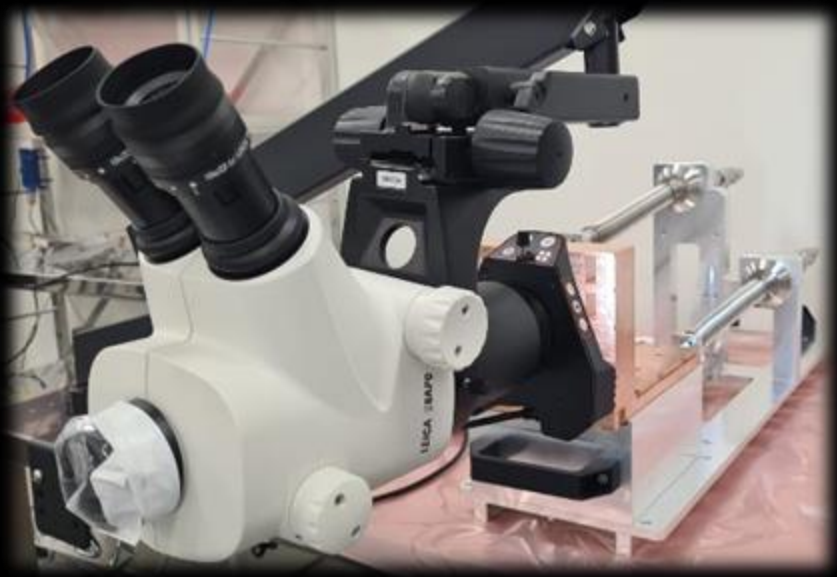


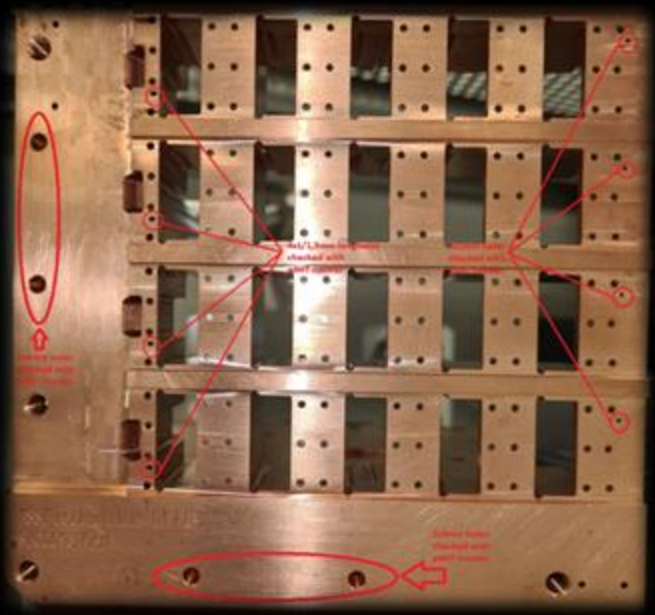
Motion stages installation and alignments

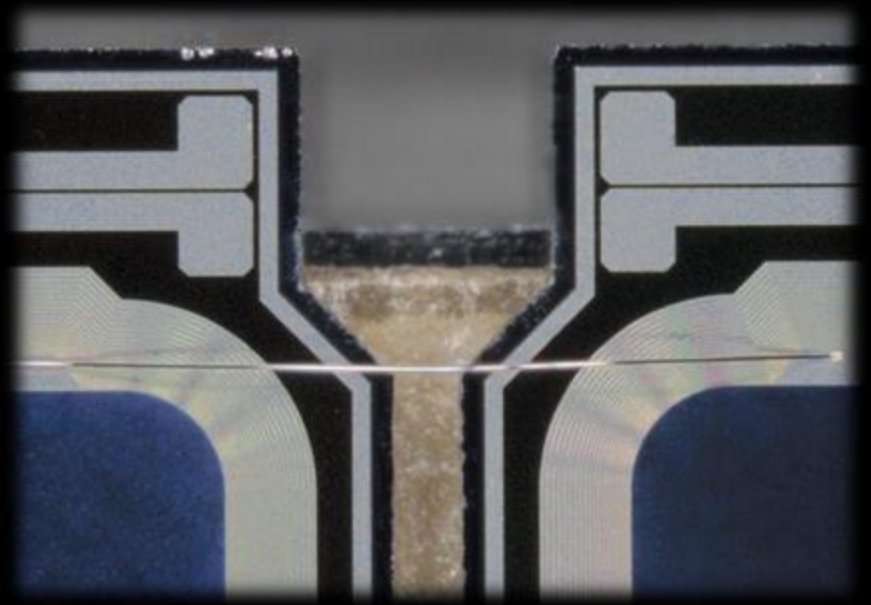
- **Diagonal motion stages** installed and precisely aligned
- **Encoders** installation and alignment
- **Limit and collision switches** installation and calibration
- **Cables** vacuum interface
- **RGA** measurement
- Controls (**Karabo**) implementation
- **System commissioning** with dummy quadrants

Cooling blocks preparation

- Cleaning
- Deburring
- Tolerances check
- Sniffing leak search

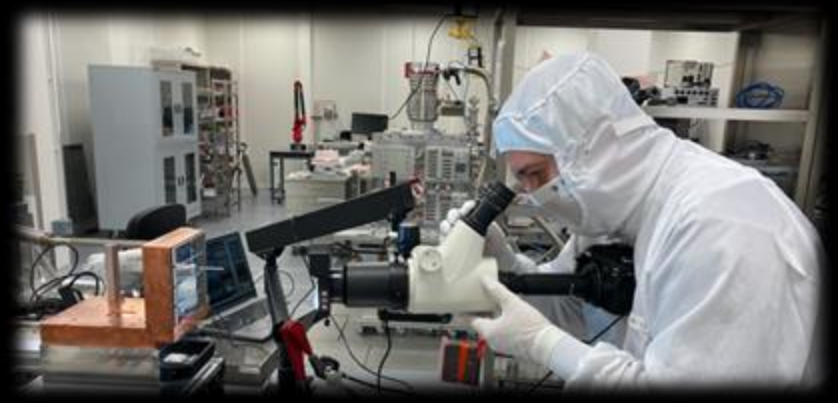


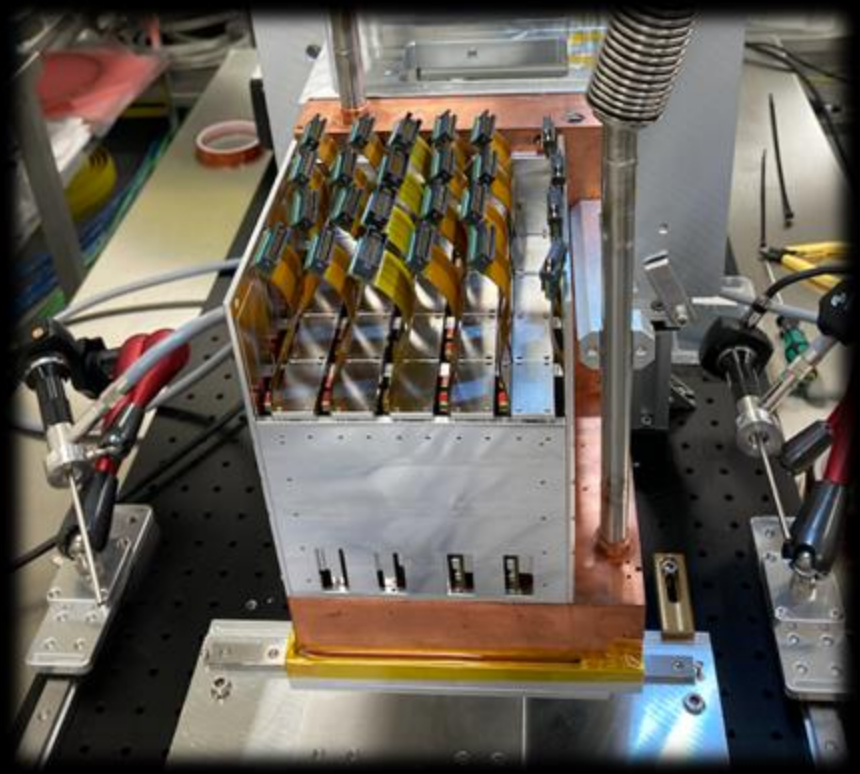




Sensor quality check

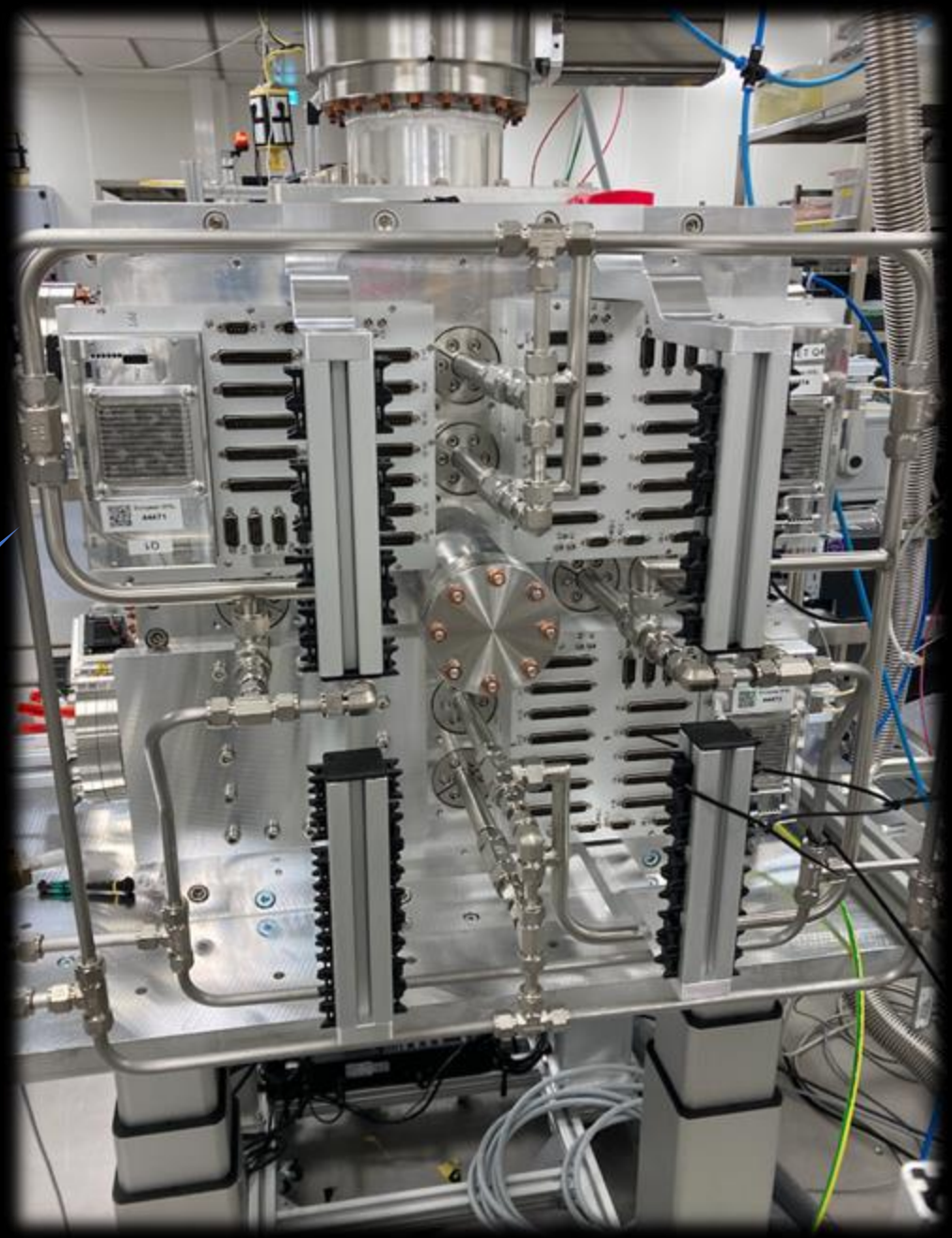
- Checks for **impurities**
- Inspect and correct **wire bonds** when applicable
- Detect and document **overall sensor quality**





Quadrant assembly bench

- Endoscopic cameras for **process monitoring**
- **5-way stage** for precise sensor positioning
- **FPMs installation** on cooling blocks and inspection
- In-vacuum electronics (**RBs, IOB, MIB) installation**
- Preliminary **functional test**
- Quadrant test in ambient conditions: **full power-up**, **FPM**, and **ASIC performance check**

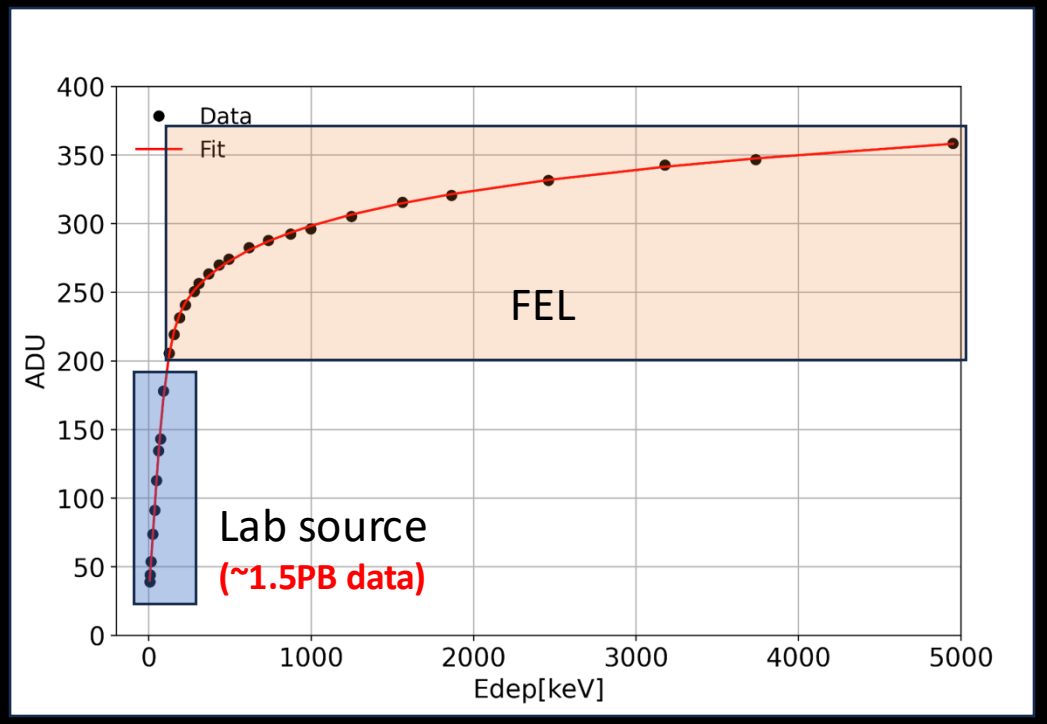


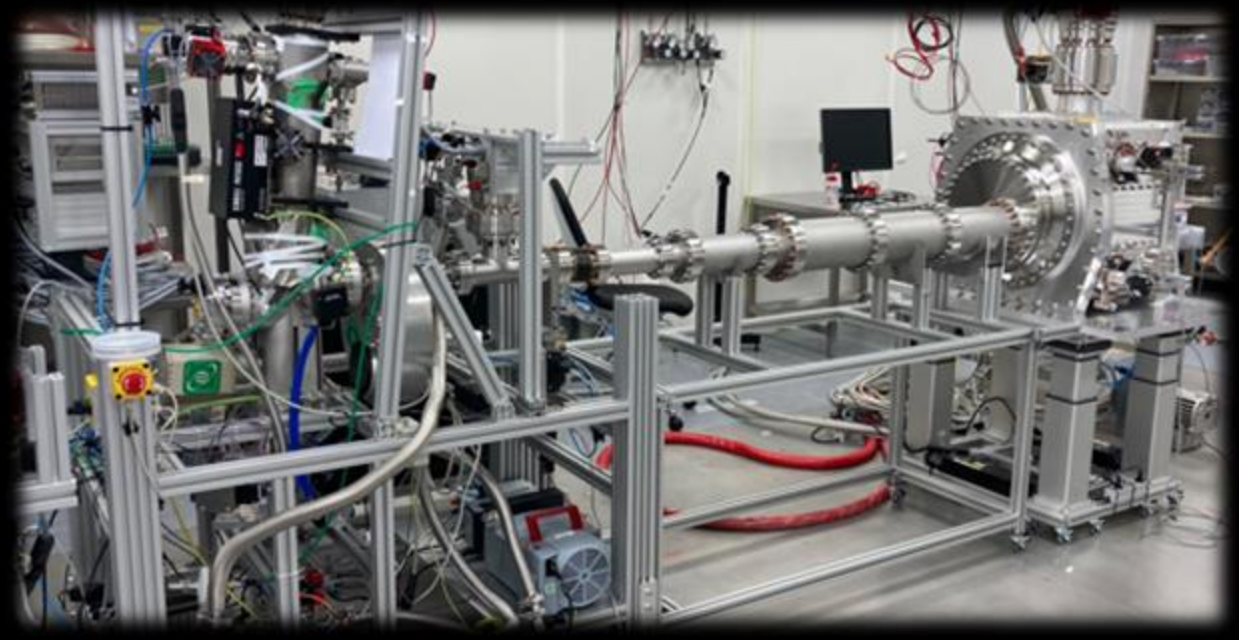
Detector assembly

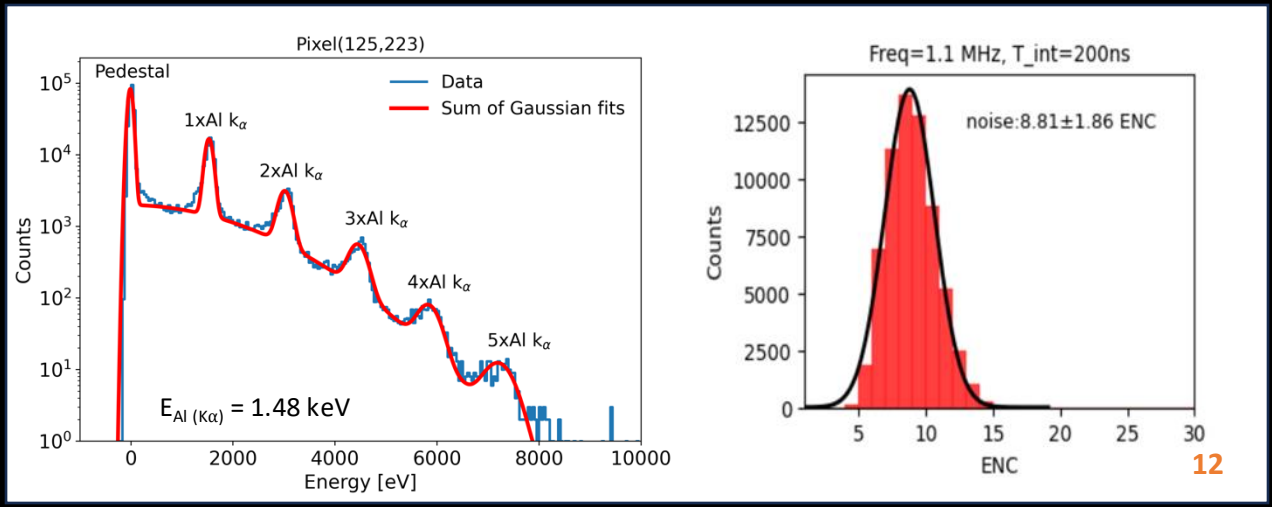
- Quadrants inserted using dedicated tool
- Vacuum interfaces applied
- Patch Pannels installed
- Cooling and guard vacuum lines installed

Commissioning and Calibration

- **System operation** and **Synchronization** studies
- Linear region **calibration with Pulsed X-Ray Lab Source (Pulxar)**
- Non linear region calibration requires **FEL**
- **ENC<10e, SN ~44**

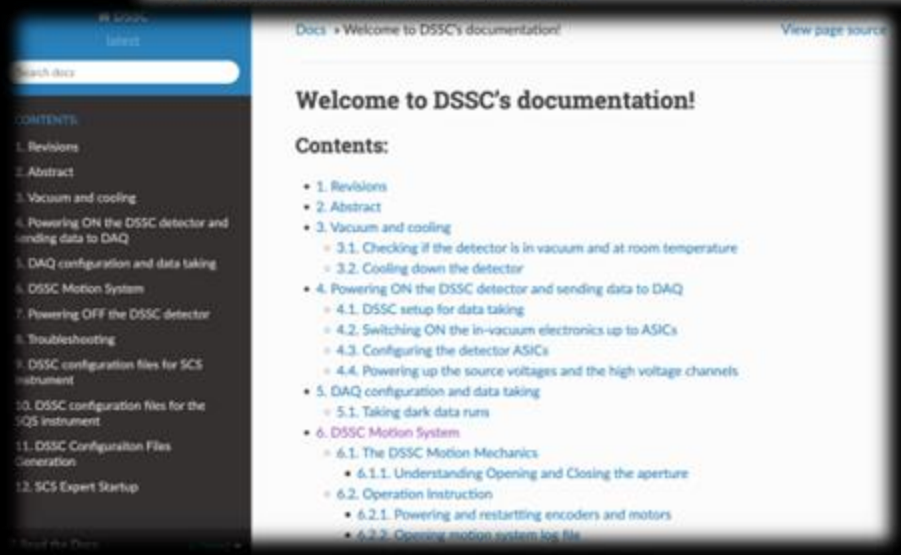


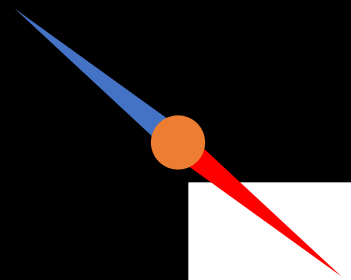




Tools used in Implementation Process

- Two **PMO projects**
- Regular **meetings** (Internal, Consortium, DAC)
- **Redmine system**: Project planning and ticketing
  - Tasks breakdown and critical paths identification
  - Progress monitoring
- Documentation**: E-logs, Alfresco, XIM, Alfresco.**





Thanks for you attention!