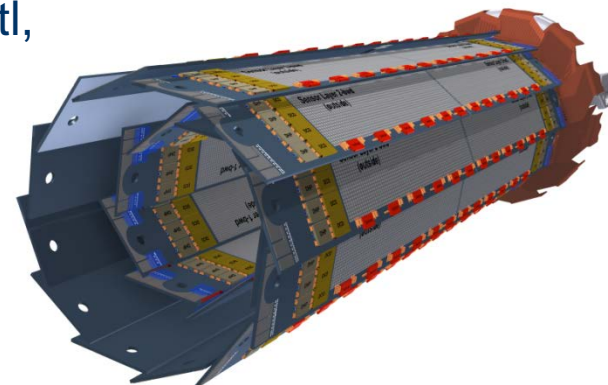




# Test Setup Preparations at MPI for Physics

Quality Tests and Characterization of PXD modules

Christian Koffmane, Philipp Leitl,  
Felix Müller, Eduard Prinker  
10th Belle II VXD Workshop  
Santander – Sep 14, 2016



# Step 1 at Semiconductor Laboratory

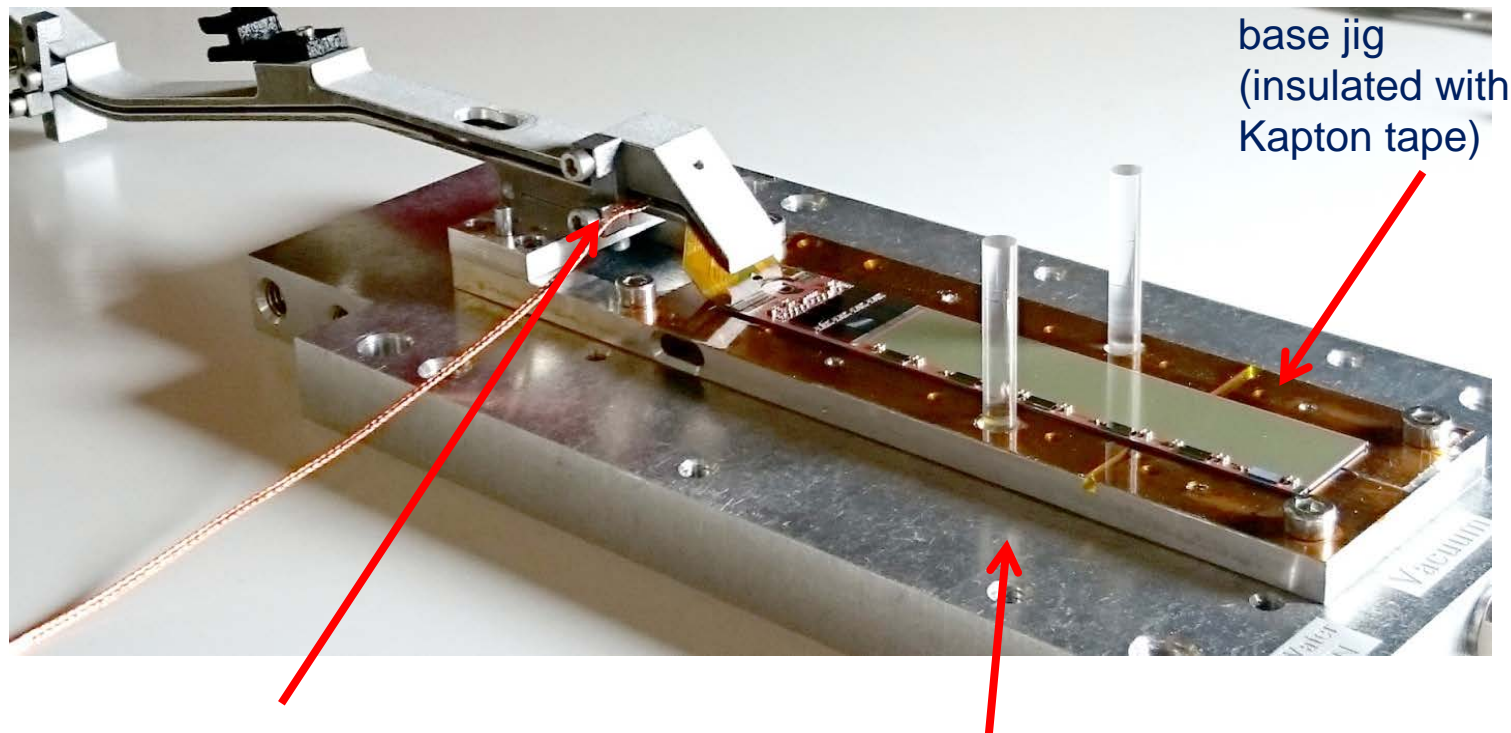


Half-ladder fully equipped with ASICs and passives (resistors, capacitors)

Probe card test: **Basic functionalities**, i.e. JTAG boundary scan, ASIC configuration, data readout

If problems occur → possible rework

# After Kapton Attachment



provisional connection between  
analog and digital ground  
also served as ground  
connection

cooling block

Tests (needle card) are repeated and characterization will be performed

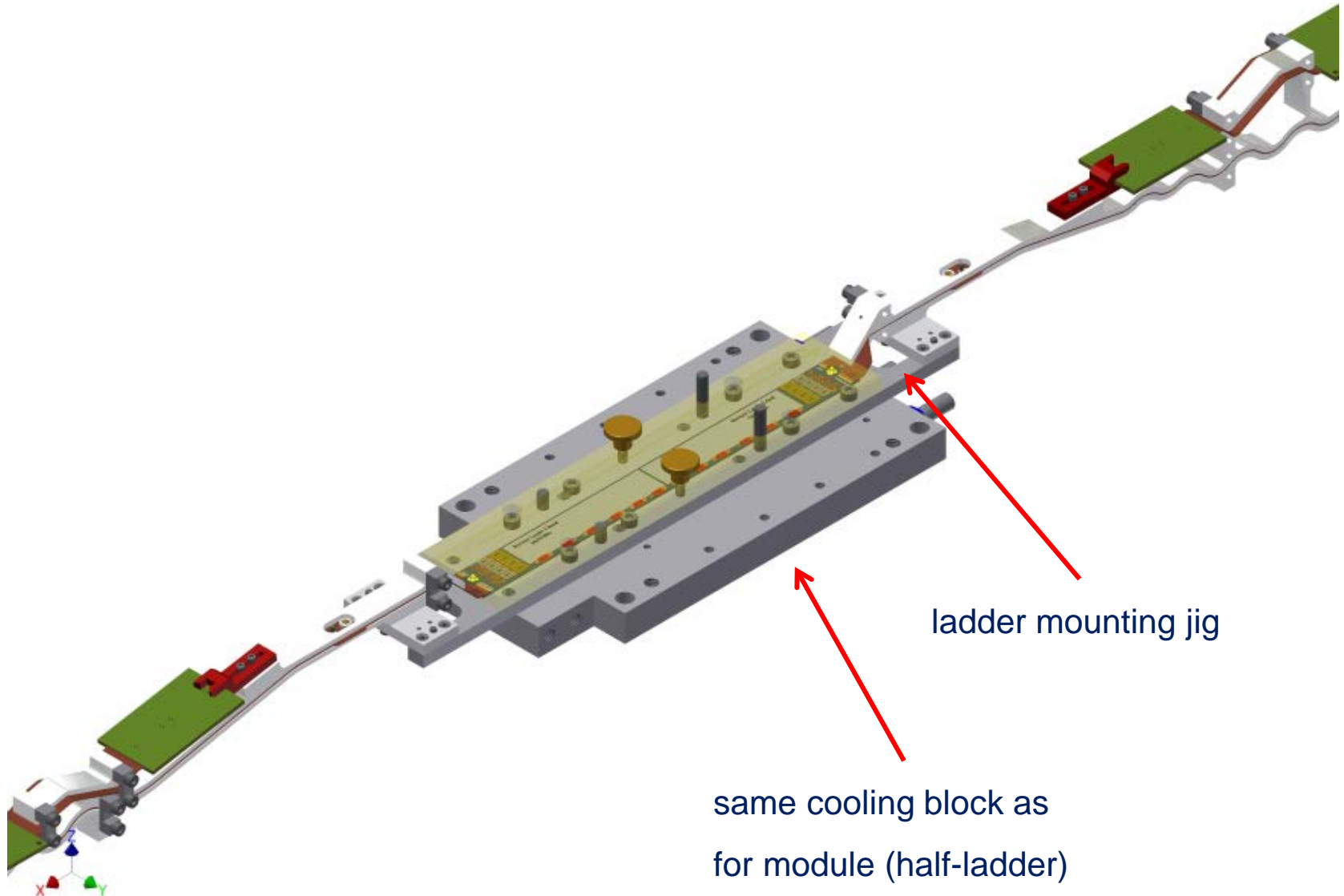
# Mounting blocks



80 mounting blocks (base jigs) are available  
 anodized with parylene (also alignment sticks)  
 Also 3 jigs with laser cutout will be available soon



# Assembly of a ladder (2 glued modules)



Drawing by Karlheinz Ackermann

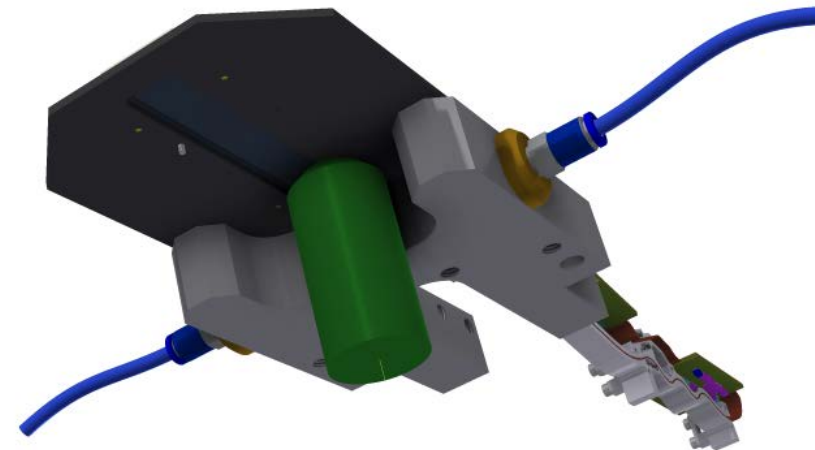
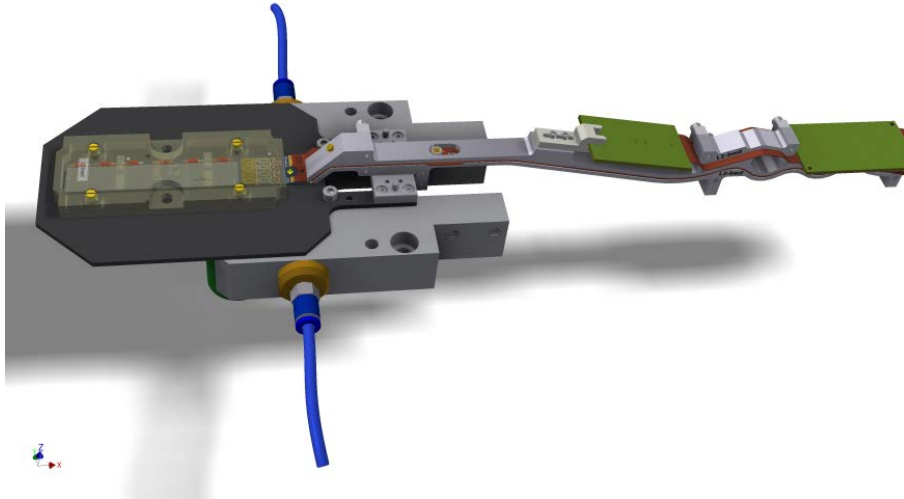
# Cool blocks

6 are available at MPP, 3+3 (new) (not insulated)

Bonn fabricates 3 cooling blocks with laser cutout (Bonn, Goettingen, Munich)

Only for a couple of modules, not all modules from the 'mass production' will be tested with laser scans

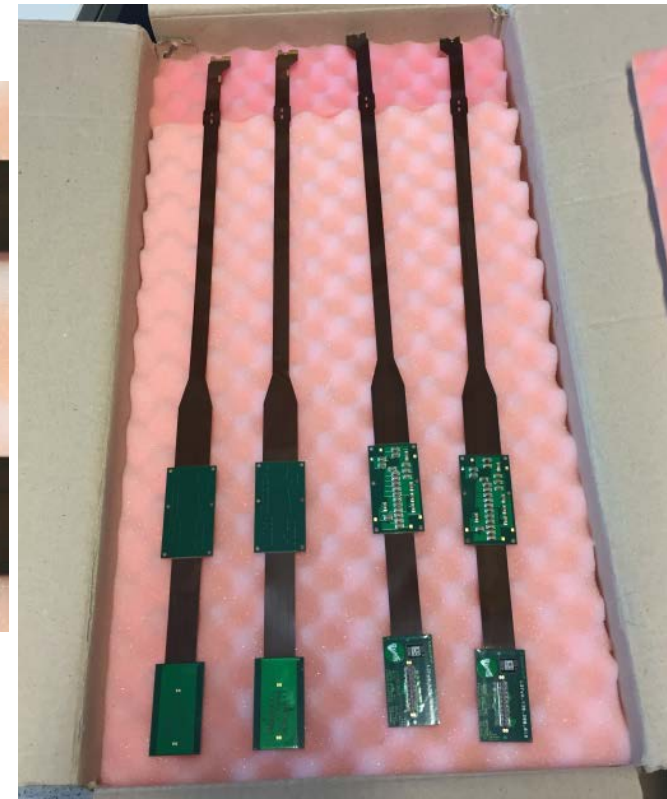
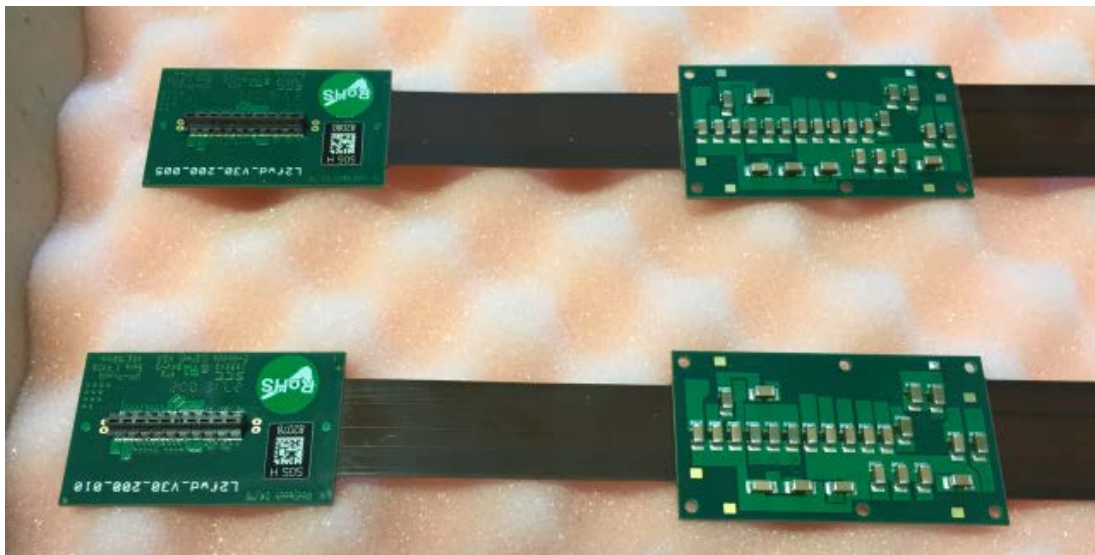
**Cooling:** 1 large chiller available, pipes and switch points



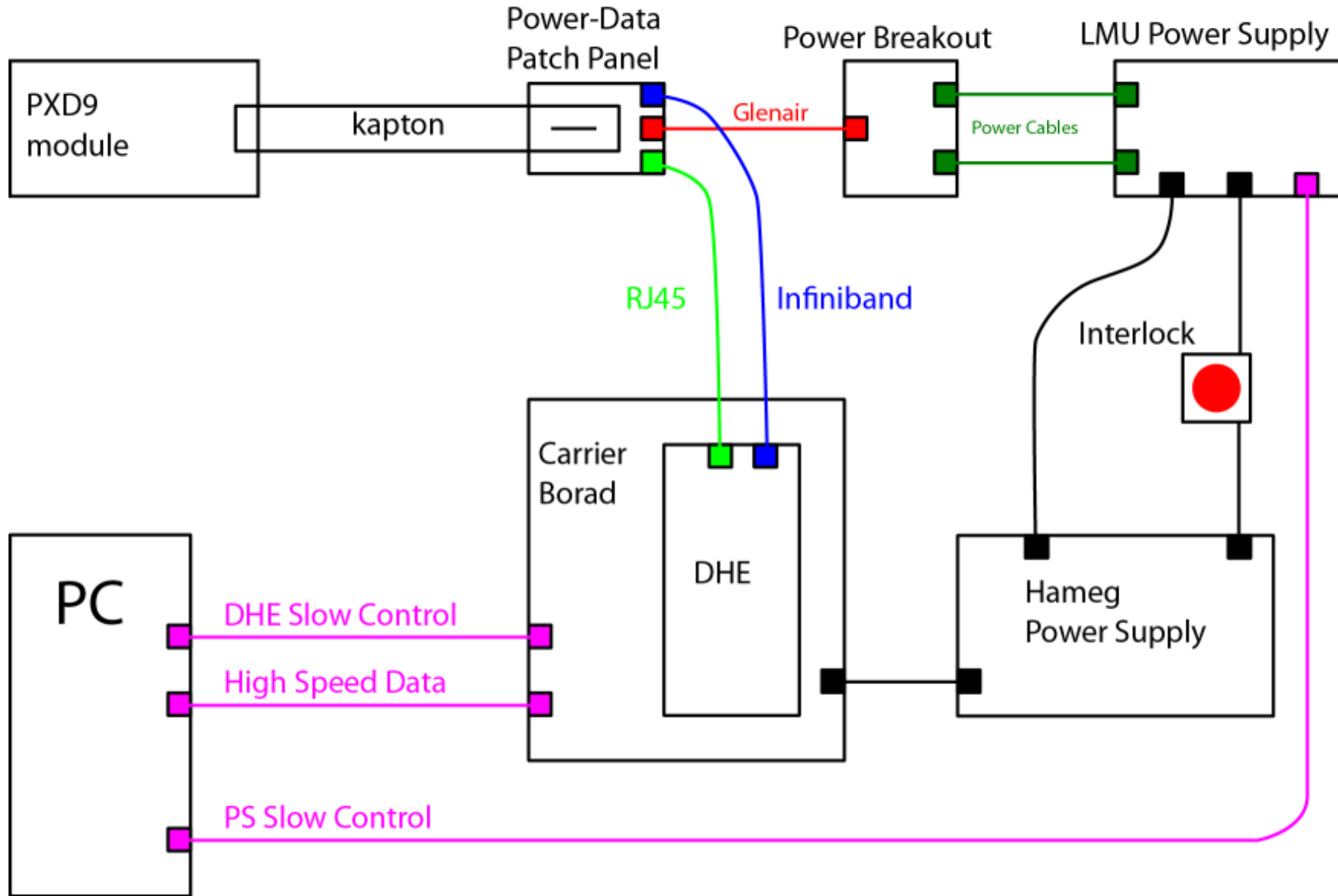
Drawings by Karlheinz Ackermann

# Kaptons from Kaupke

- 5 Kaptons each (4 different designs, Layer 1, Layer 2, Forward, Backward)
- 1 Samtec connector (100 pins) instead of two (Data and Power)



# Complete Setup





# Characterization procedure

- Powerup and JTAG configuration, voltage
  - Sanity check (digital, analog, matrix)
  - JTAG Boundary Scan
  - DHPT link parameters (?)
  - DHPT - DCD communication delay scan
  - Pedestals (bit map working pixels)
  - ADC transfer curves
  - 2bit offset DACs
  - Sample point
  - DEPFET optimization with source ( $\text{Cd}^{109}$ )
  - Clear efficiency
  - Gated mode
- 
- [https://docs.google.com/spreadsheets/d/155aSvn3mvLV5qWFrh0GnLXhELrkM1Mf4Xqo\\_J7SGIs0/edit#gid=1937628899](https://docs.google.com/spreadsheets/d/155aSvn3mvLV5qWFrh0GnLXhELrkM1Mf4Xqo_J7SGIs0/edit#gid=1937628899)

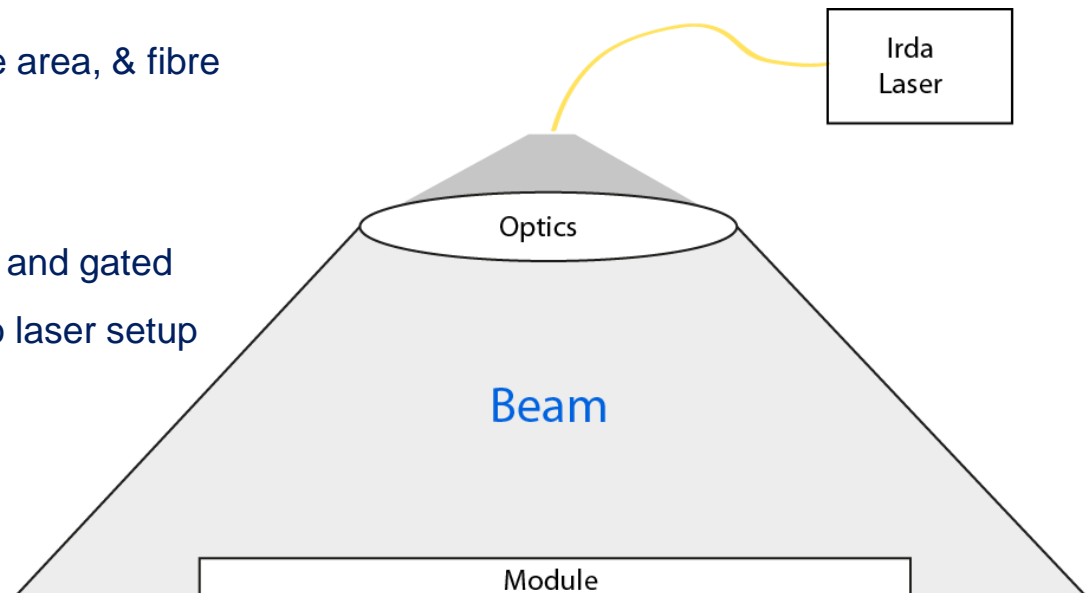
# Radioactive Source and Laser setup

Radioactive  $\text{Cd}^{109}$  Source, in contact with manufacturer regarding geometry (homogenous irradiation over the entire sensitive areas, L1, L2, different geometries)

Special firmware, trigger should be sent not via IPBUS, but by the DHE

Infrared Laser to cover entire module area, & fibre  
(lead time ~4 week)

LED setup to study clear efficiencies and gated  
mode operation, not in pixel scan, no laser setup



# Production DB and Configuration DB

DB = data base

No direct connection between **production DB** (Manfred Valentan, Laci Andricek) and **Configuration DB** (Christian Pulvermacher)

## Configuration DB:

- Each module has a branch with all PVs (process variables, like DHP settings (delays, link parameters), DCD settings ...)
- Module-specific values can be loaded by specifying the commit ID
- Problem: The current status is a mixture between module and (Computer & DHE) -specific values (like DHE parameters: MAC-addresses) -> hence, one cannot easily plug the module Wxy from PCi to PCj without changing PVs

**Where is the commit ID stored? (Open question)**

## Production DB:

- Each module has an own entry
- ASIC version, capacitors (values), resistors (values)
- Serves as lookup
- Results from characterization are stored
- Rating of Modules (A, B, C – not yet defined, experience, statistics)

## 4 test setups for parallel testing

- 4 blackboxes (work in progress)
- 4 bench power supplies ✓
- chiller pipes ✓
- LMU PS and cables (8x green cables, 4x glenair cables) (=> partially available => Stefan's talk)
- Patch Panels (4 different types, in production => Stefan's talk)
- 80 Mounting blocks ✓
- Cooling blocks ✓ (in production @ outsourced to Bonn)
- PCs (3 of 4 are available, already installed SL7 and setup with git?)
- Barcode scanners for Production DB (1 of 4 available) ✓
- DHEs (1 Carrier-Board is missing) (lead time ~ 8 weeks – already ordered)
- Radioactive source (contact with manufacturer, geometries?)
- Light detection, clear efficiency studies, laser setup
- Same cabling as previous lab measurements
- **What is about grounding?**