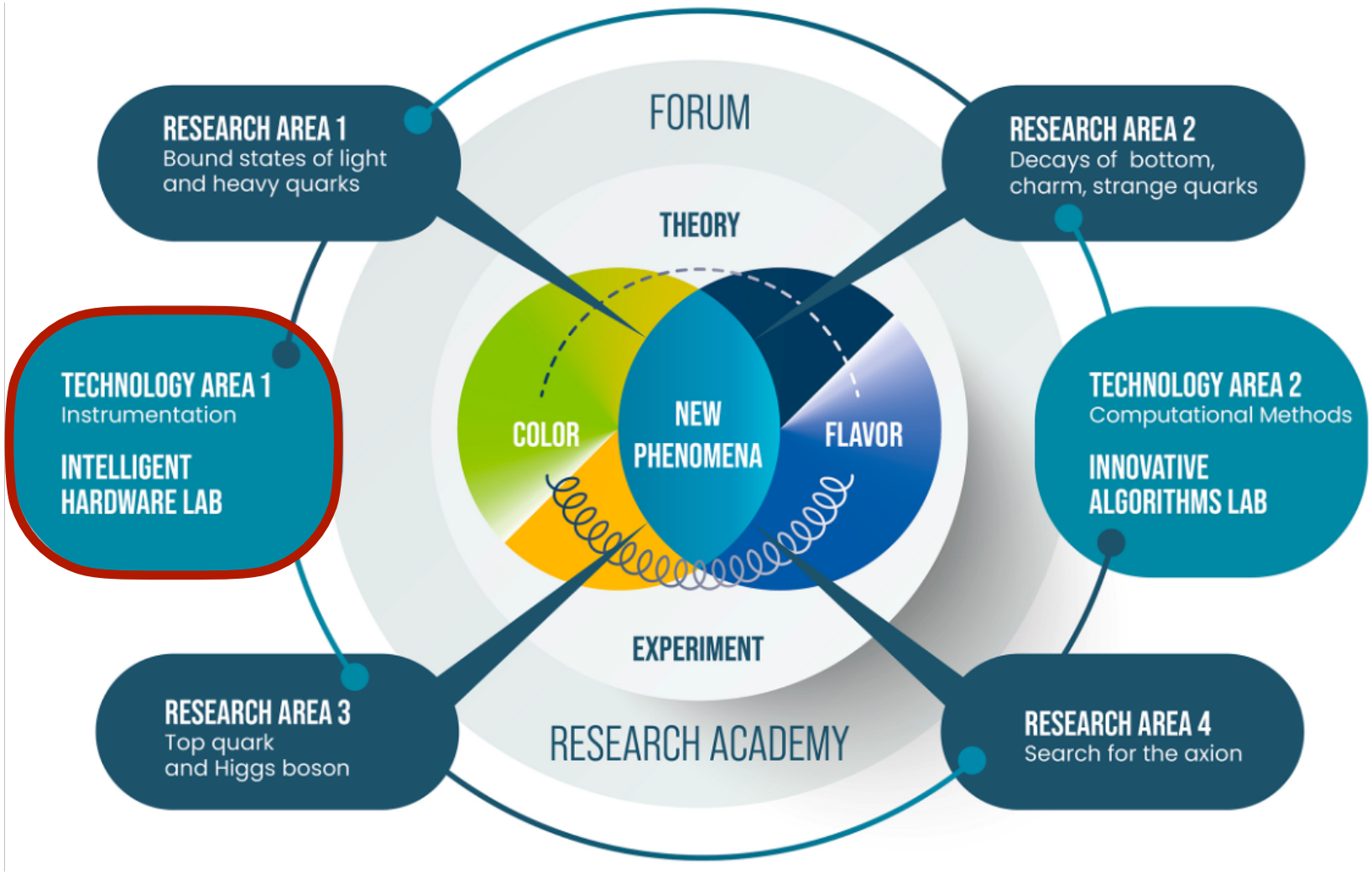
Technology Area 1

Detector R&D



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Overview

- To enable and contribute to upgrades and new experiments in future we want to perform R&D for novel and improved detector technologies
  - capitalising on the expertise of the experimental groups as well as on the excellent infrastructure available

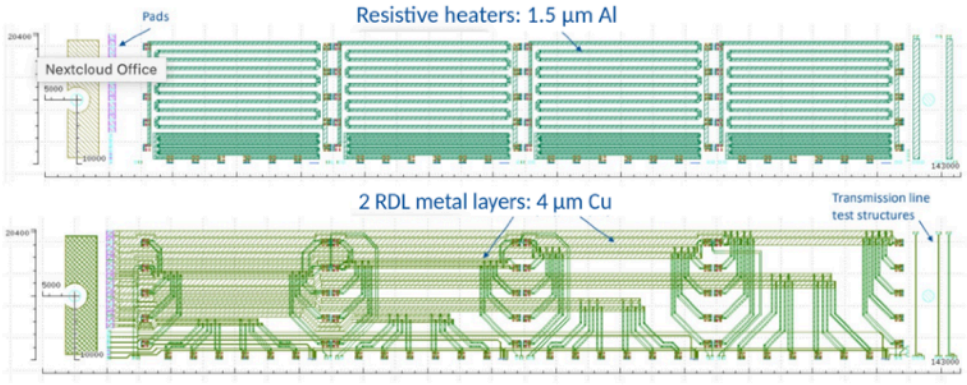
- Focus: micro-structuring as enabling technology -> using our infrastructure (see later talks)

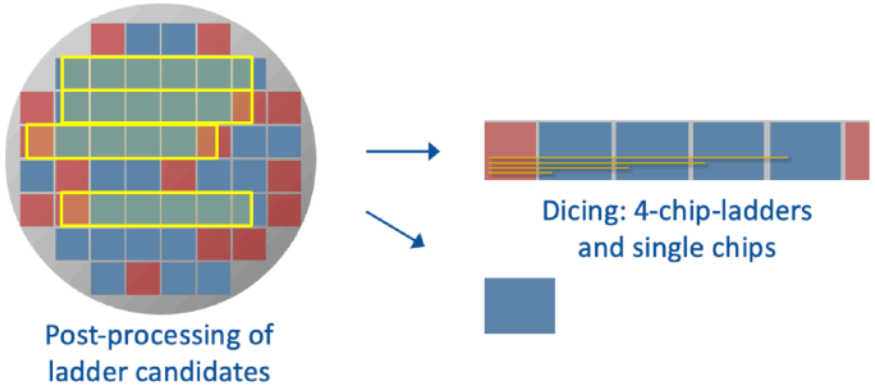
The Future:

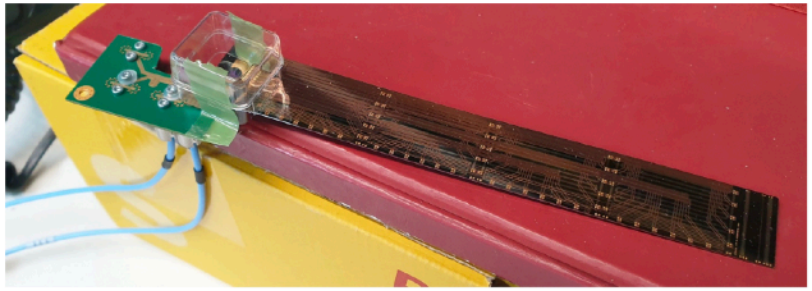
Ultra-light All-Silicon pixel Modules

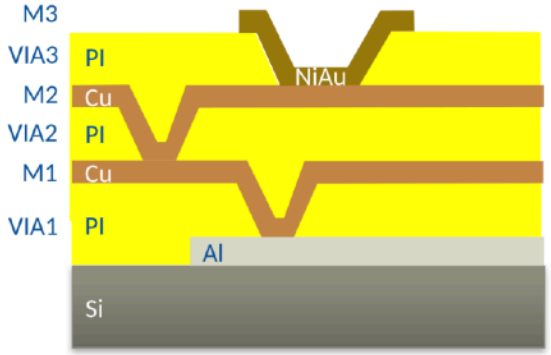
Example

- Ultra-light module design
- Integration of power and readout lines directly on wafer (RDL)
- Test measurements with RDL demonstrator modules (thermal and electrical measurements with TDR)
- Processes established at **FTD**: Al sputtering and etching, polyimide deposition









- Next steps: module with CMOS sensor (Obelix, 65nm …)
  - characterise and integrate

Large-area, low-mass detectors

- Future particle detectors is the need to equip increasingly large areas with cost-efficient high-resolution detectors
- **Goal**: improve the performance in terms of spatial, time, and energy resolution, rate capability, long-term operational stability, and material budget.

- MONolithic STrip Extended Readout Architecture (Monstera)
- Existing (passive) **CMOS strip sensors** extensively studied, results well published
- Continuation into full active strip sensors with front-end directly implemented in each strip
- Working on DRD-3 organised submission in spring 2026

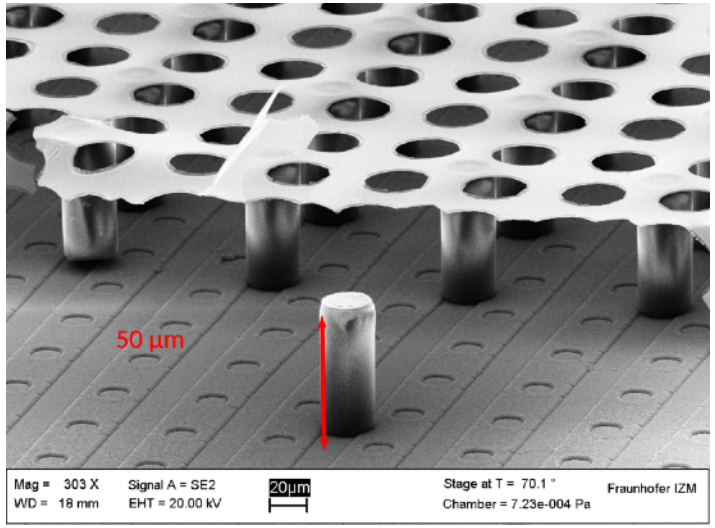
monstera

- Micropattern Gaseous Detectors (MPGDs)
- Infrastructure in cluster allows to produce high quality large area GEMs
- Developments such as stabilised voltage divider to support path towards large area

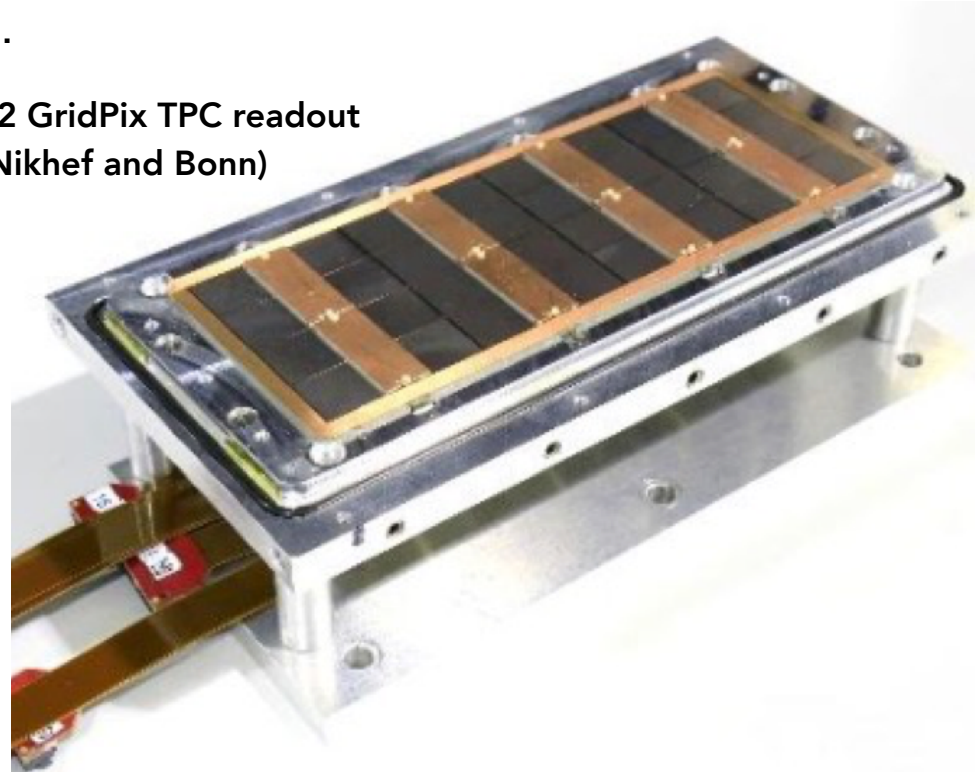
GridPix Technology

- Micromegas amplification structures attached to CMOS pixel readout chip
- Possible detectors for soft X-rays with excellent background rejection and good energy resolution.

- Production of improved **GridPix detectors** being established in the FTD
  - exploiting new ideas for simplified production
- GridPix detectors offer an exciting application potential (e.g. slow neutrondetectors, X-ray polarimetry, charged particle direction measurement in very thin layers).



32 GridPix TPC readout (Nikhef and Bonn)



Discussion - R&D Forum

- Involved universities and institutions provide a perfect incubator for new ideas
  - Combination of knowledge in important areas
- Discuss new ideas and progress from the different technologies
- **To be discussed:**
  - How to optimally exploit this without overloading the calendars?
  - Every three months a forum meeting ?
  - Masteranden - auch Teil des Forums
  - Externe Schulen
  -

DESY Training on Experimental Concepts & Techniques

D.TECT

- Yearly instrumentation school at DESY mainly targeting *early PhD students*
- Two weeks of lectures & **laboratory courses**
- Learn how to...
  - Work in a clean room
  - Characterize a sensor
  - Operate detectors at the testbeam
  - Build your own particle detector
  - Explore control systems & mechanical properties

First edition 8–19/6/2026!
Application opens 01/12/2025
Deadline 01/03/2026

D.TECT 2026