

Detector R&D Opportunities at Humboldt, Oxford and DESY

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Detector R&D: Actions

Detector R&D Task Force (I Bloch, H Lacker, S Worm, D Bortoletto, I Shipsey, T Huffman)

13. List methods, instruments and facilities in Detector R&D
14. Collaborations, projects or thesis topics: between institutes
15. Collaborations, projects or thesis topics: between detector R&D and PP, AP, QO, Accelerator R&D
16. What internship topics could lead to papers?

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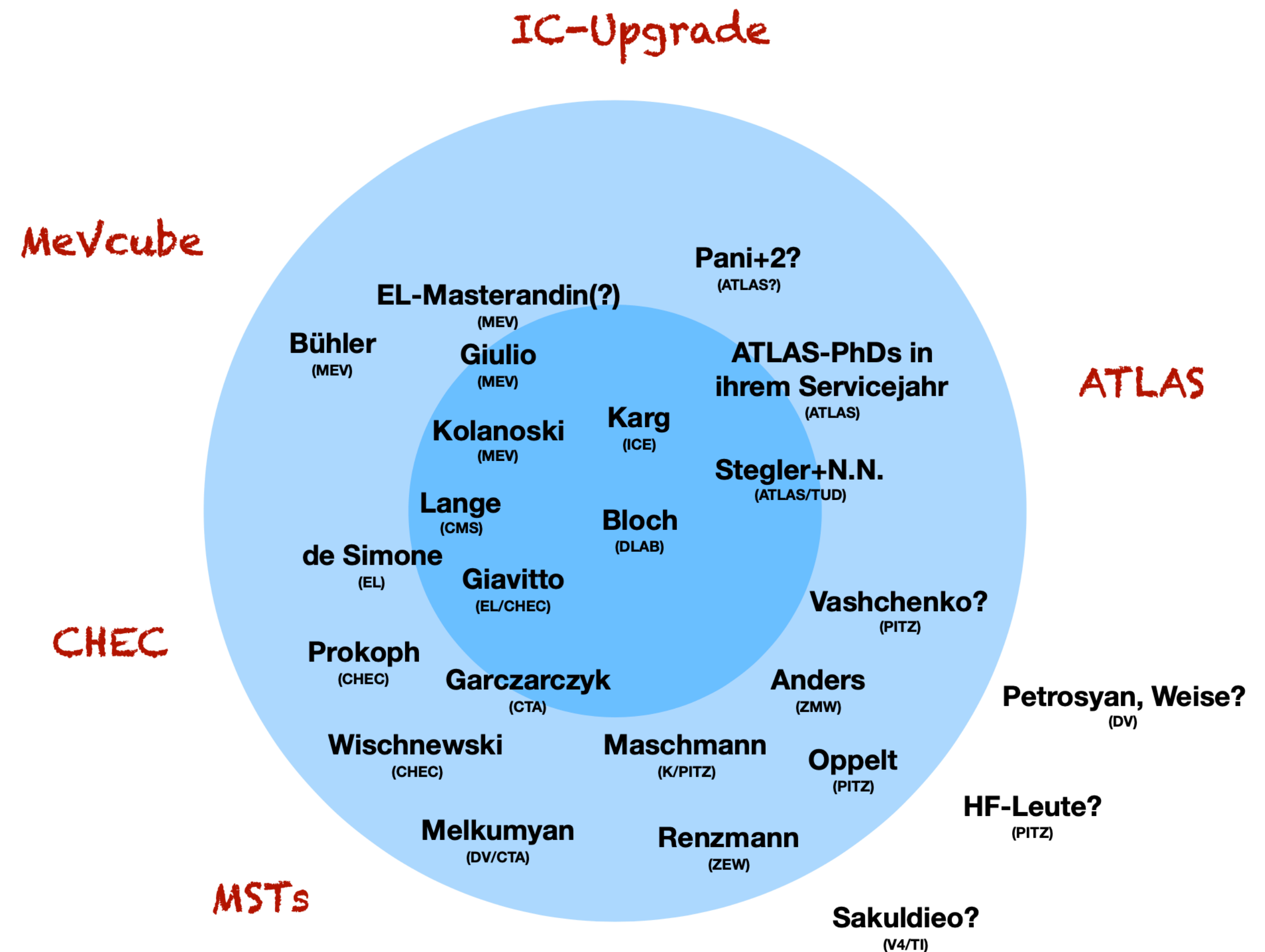
Detector R&D at DESY Zeuthen

Growing Particle/Astroparticle Detector R&D at Zeuthen

- Spans many groups within Astroparticle, Particle
- Existing projects like ATLAS, CTA, IceCube
- New projects ULTRASAT, ZTF, etc.
- Expertise in silicon, optics calibration
- Many staff with detector expertise
- Excellent working relationship w/ HU

National Lab Infrastructure

- Cleanroom and silicon labs (eg ATLAS)
- Distributed Detector Laboratory grant (~€1.5M)
- Emphasis on Detectors in Extreme Environments
- Strong partnerships with Helmholtz institutes



DESY Zeuthen Cleanroom for ATLAS Upgrade Production

Construction



Main Inventory

- 2 fully automatic wire bonding machines
- Bond Pull Tester
- 3 metrology microscopes (3000 - 200 nm resolution)
- Glue robot

Inventory not in the production cleanroom

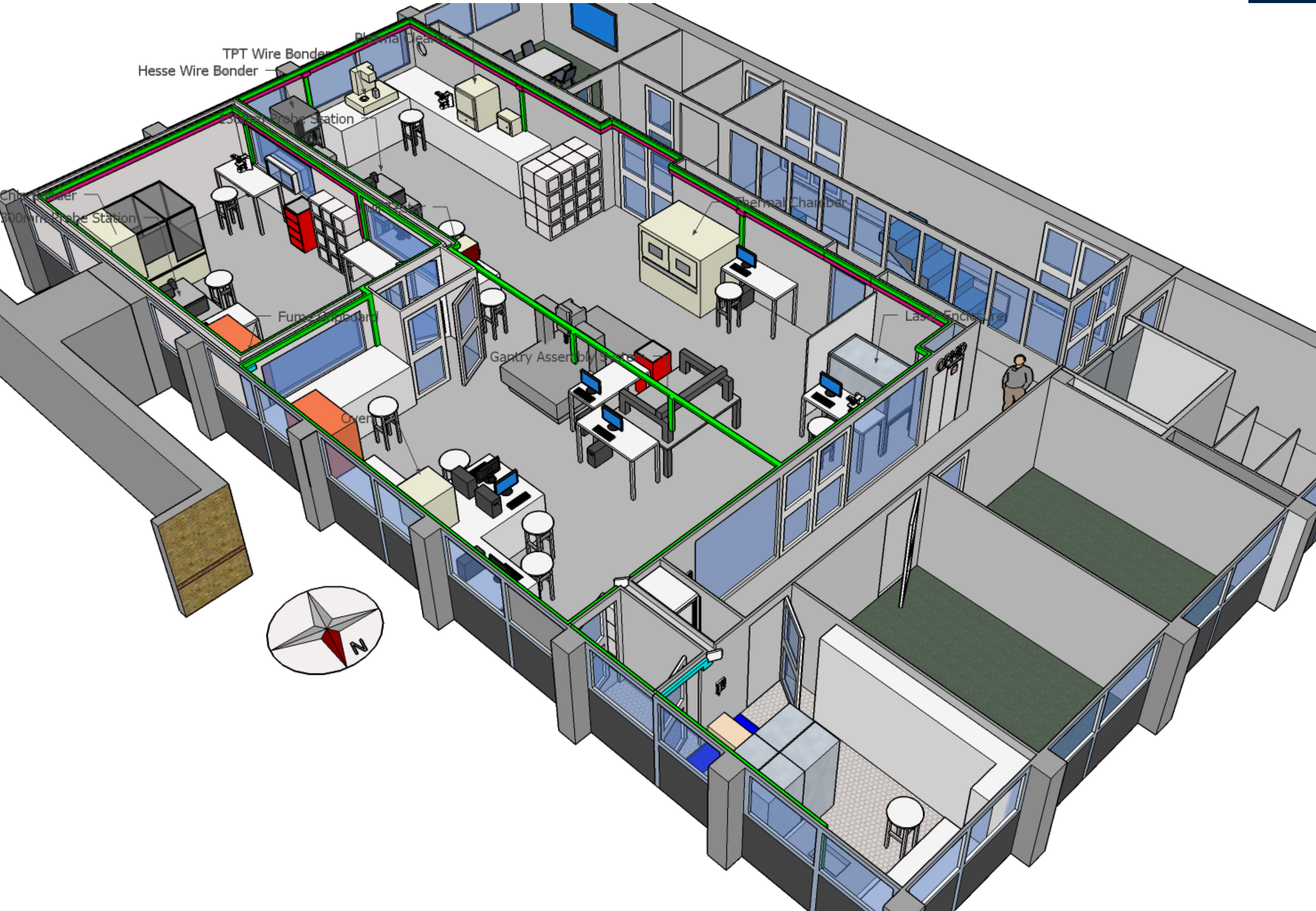
- QC module and hybrid stands
- Beta-Source sensor charge collection test setup
- Automatic probe station with cold chuck
- Edge-TCT setup



OPMD Laboratory



UNIVERSITY OF
OXFORD



ADVANCED MECHANICAL DISTRIBUTED FACILITY



R&D Opportunities: SiPM Development

- SST (CTA) based in part on previous experience with CHEC
- R&D at Oxford, CHEC experience at DESY
- Next-generation SiPM development opportunities, including (e.g.) on-chip digitisation and readout



Deutsches Elektronen-Synchrotron DESY
A Research Centre of the Helmholtz Association

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ASTROPARTICLE PHYSICS
DESY advances Multimessenger Astronomy for a new view of our cosmos.

- NEUTRINO ASTRONOMY >>
- GAMMA ASTRONOMY >>
- THEORY >>
- DEVELOPMENT >>
- NETWORKING >>

INFORMATION



We explore high-energy processes in our universe. We study messengers from outer space and thus contribute significantly to the understanding of the development of our universe.



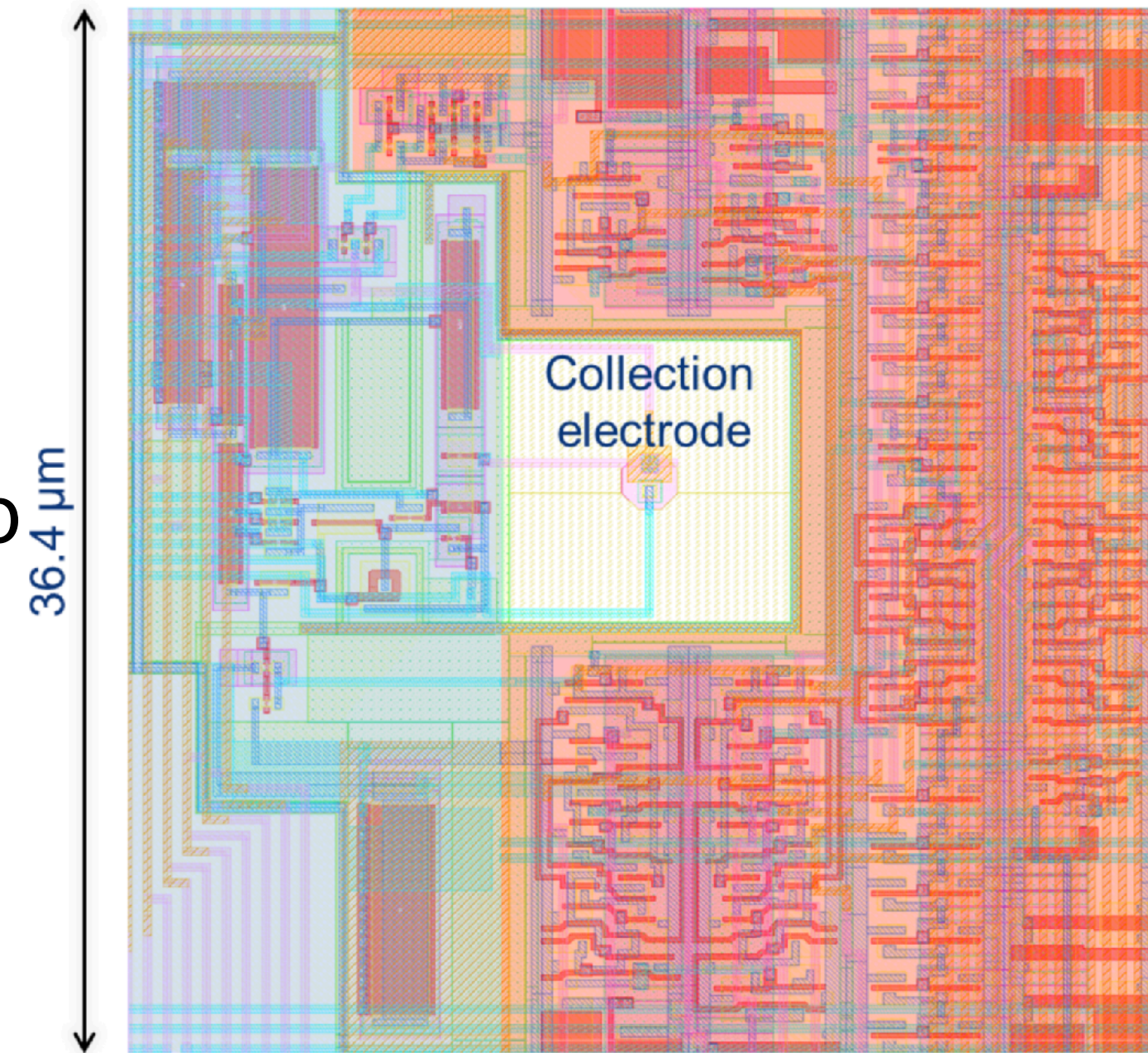
R&D Opportunities: MAPs development

Malta Pixel Specifications

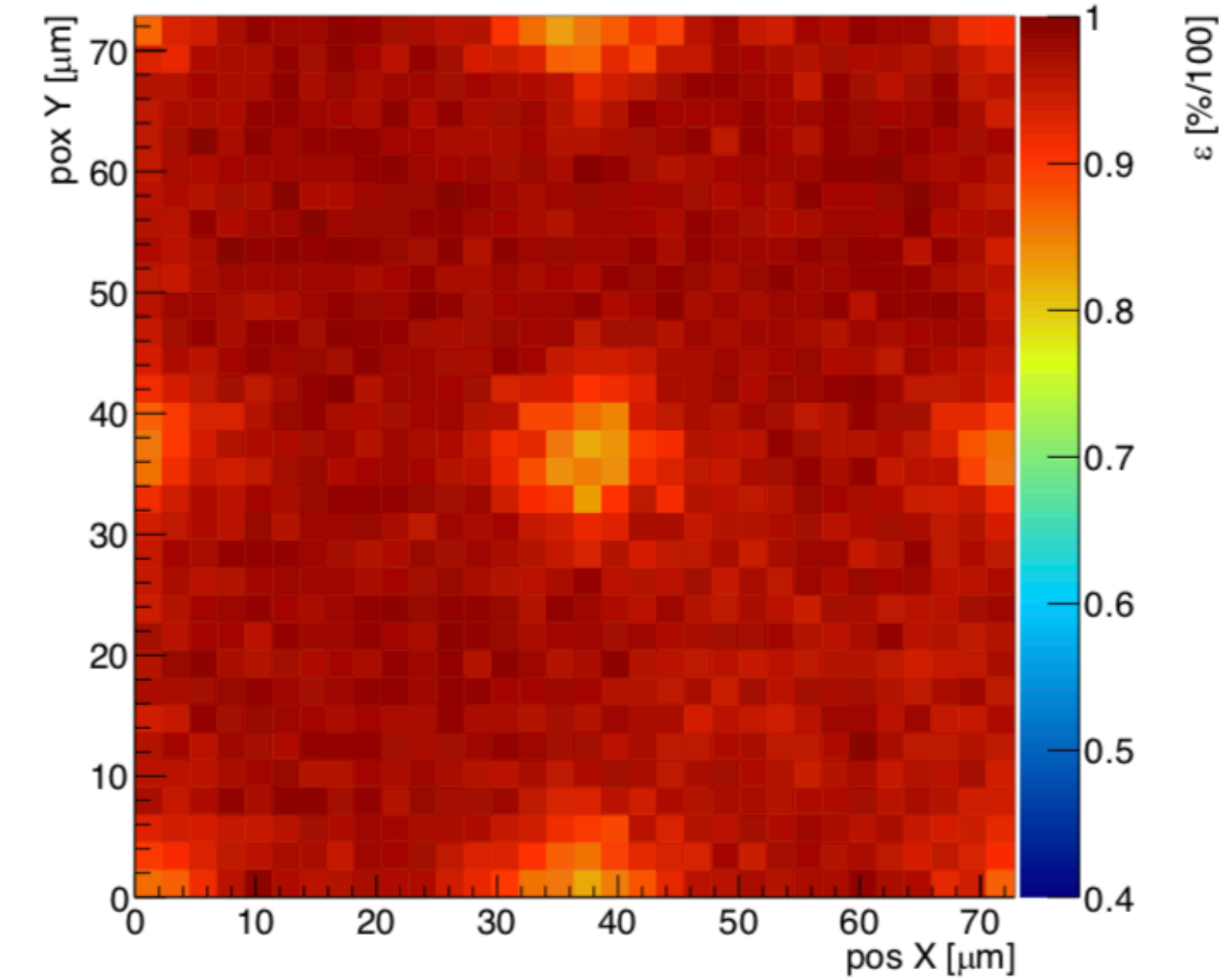
- 36.4 x 36.4 μm^2 pixels
- Foundry: TowerJazz 180nm
- In-pixel amplifier + discriminator + flip-flop
- Low capacitance, low operating voltage
- Good radiation tolerance
- Several designs tested
- Existing area of overlap

Collaboration opportunities

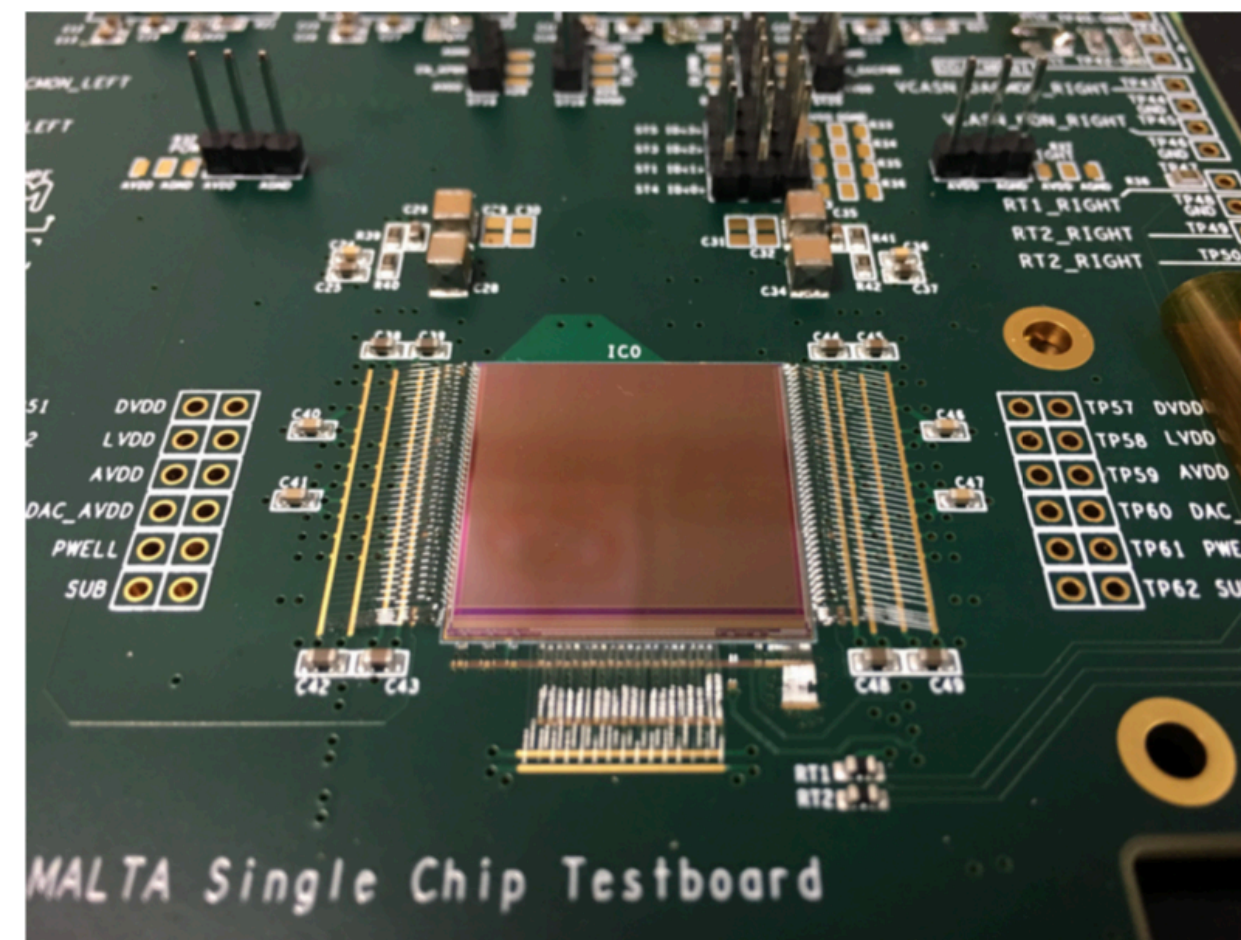
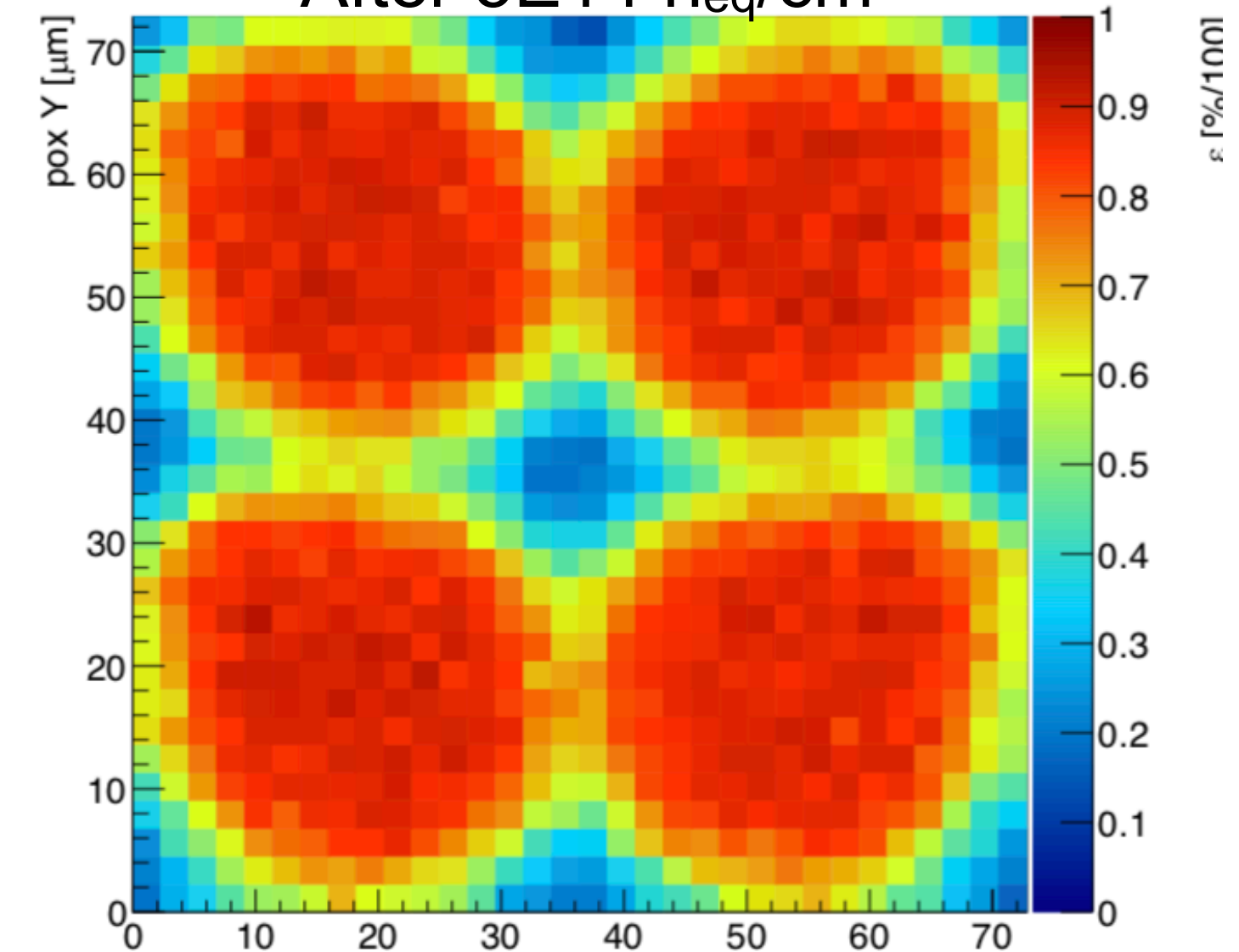
- Testbeam studies
- Cz substrate device tests
- New chip submission



Before Irradiation



After 5E14 n_{eq}/cm²

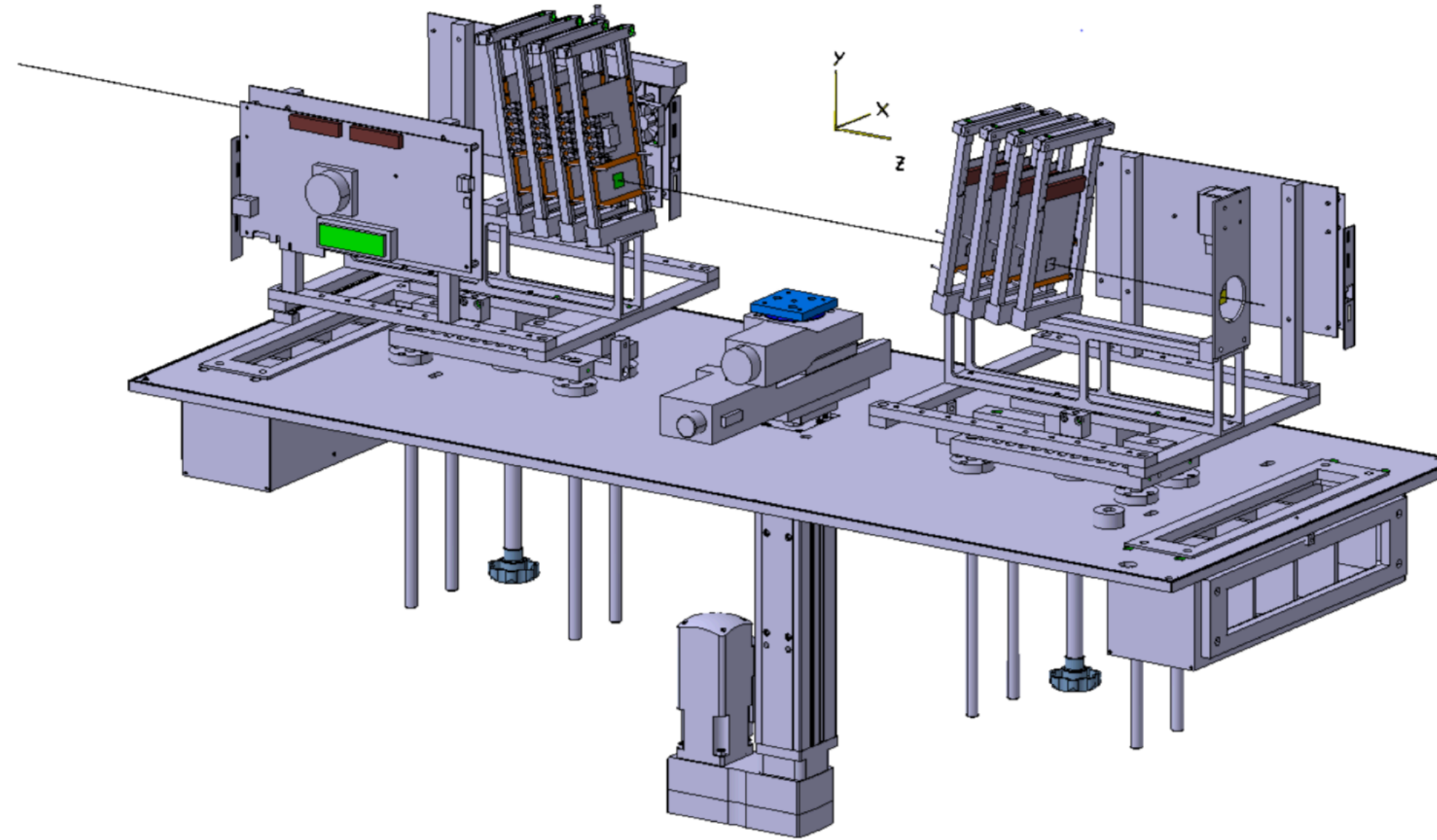


R&D Opportunities: TauFV and TimePix4

- Beam Telescope using TimePix4
- Aim for tens of ps timing
- TauFV, LHCb Upgrade II
- Growing collaboration with CERN, Oxford, Nikhef, ...
- Medical applications
- Other applications?

<https://arxiv.org/pdf/1902.09755.pdf>

Build on experience of Timepix3 telescope



- timing resolution:
 - 99ops/plane shown
 - infer 35ops/track

• pointing resolution $\sim 4\mu\text{m}$

