H.3

Novel high precision detection techniques

- Cover essential aspects for future detector development
- Based on our competence in detector technologies
- Supported by the Platform for Innovation in Detector Science & Platform for Challenges in Data Science

Research objectives:

H3.1 — 5D detectors

H3.2 — Multi-dimensional reconstruction algorithms

H3.3 — Next-generation pixel detectors and microelectronics

H3.1 — 5D detectors

1. Design a 5D detector system for a highly granular calorimeter in a high radiation environment with high pile-up (HGCAL)

2. Optimise the 5D design for specific requirements both in particle and in neutrino physics experiments, incorporating advances in sensor and microelectronic

   ➔ Input to Platform for Future Facilities

3. Liquid-scintillator detectors with the highest resolution combining Cherenkov and scintillation-light readout with the Large-Area Picosecond Photodetector (LAPPD).
   PhD position: Large volume scintillator detectors (Hagner)

H3.2 — Multi-dimensional reconstruction algorithms

1. Development of algorithms for 5D particle reconstruction, e.g., novel particle flow algorithms including time information and topological reconstruction methods

   ➔ supported by Platform Challenges in Data Science

2. Concrete applications for LHC, future collider, and neutrino experiments

   ➔ Input to Platform for Future Facilities

PhD position: Tracking reco / 5D particle flow (Behnke/Kasieczka)

H3.3 — Next-generation pixel detectors and microelectronics

1. Fast timing silicon detectors:
   explore next-generation chip technology (beyond the 65 nm node)
   combined with 3D integration technologies
   ➔ supported by Platform for Innovation in Detector Science

   PD position: Pixel detectors & microelectronics (Garutti/Gregor)
   ➔ development of LGAD-based timing layer for TB telescope

New DESY-UHH professorship:
focus on novel technologies, in particular microelectronics, alternative semiconductor sensor designs, 3D integration, ...