ESPPU 2026 – Input from the German Particle Physics Community

Detectors

Felix Sefkow, Draft 2, 19.1.2025

The **physics** programme of the proposed future particle physics facilities demands **innovative detectors** beyond the present state of the art. Strategic developments as defined in the **ECFA Roadmap for Detector R&D** are needed, and the newly created **R&D collaborations** should increasingly be supported at CERN, national laboratories and universities, while **emerging technologies** should also be explored.

The **German** community has created or upgraded performant **infrastructure** for the development, construction and test of detectors, including test beam facilities. It has built up **expertise** in large ongoing construction projects, for example in **silicon** detectors, **calorimeters** and large-area **gas detectors** for the upgrade of the LHC experiments, and in advanced **trigger and DAQ** systems. Smaller **non-collider experiments** are also on the way, some of which serve as incubators for **novel technologies such as quantum sensors**.

It is vital to **maintain this expertise and infrastructure** for contributions to experiments for the **next big collider project** as well as for the prioritised next generation of **non-collider** experiments, once the ongoing activities are nearing completion. To further expand capabilities, the potential of new technologies such as **fast-timing** electronics and **Artificial Intelligence** must be explored across the field. The unique expertise of **CERN** in design and construction of **large magnets** and electromagnetic cavities should be strengthened for both collider and non-collider projects.