

Track 2: Silicon Systems

Precise beam telescopes became an indispensable tool at test beams for the research & development of future particle detectors. They are essentially small tracking detectors with the same main element as for example a vertex pixel detector, but optimised for the use at a test beam. The DESY pixel telescopes are based on six pixel sensors used as reference particle tracking detector with an excellent pointing resolution ($< 5\mu\text{m}$), i.e. the position of the impinging particle is known this precise.

In this track, students will work with the pixel beam telescopes learning about the trigger and DAQ system in the lab, learning how to align the telescope with respect to the particle beam at the DESY II test beam facility, investigating the charge sharing of a silicon pixel cells, and study how the particle beam will be deflected by material or within a magnetic field.

Task 1: TDAQ performance

The basics of the telescope's trigger/DAQ (TDAQ) system are studied. A LED system is used as a synchronised source of signals fed into a pixel sensor. Basic parameters are changed and the response of the sensor monitored such as the threshold which defines when a signal is considered as a hit on the sensor.

Task 2: Telescope alignment

The basics of the DESY II electron test beam facility and of the alignment of the telescope with respect to the beam line are studied. This will help to understand basic tracking, interpreting plots and learning the concept of a simple trigger system.

Task 3: Spatial resolution

The spatial resolution of a pixel sensor is studied. By rotating the sensor with respect to the horizontal axis the cluster size distribution is measured while electrons are passing through the material.

Task 4: Beam deflection

The electrons of the DESY test beam are deflected by a magnetic field and/or by material along the beam path due to multiple scattering. The impact of is studied with the beam telescope either by turning the magnet in TB21 on or by placing various materials in the centre of the telescope.

