Introduction
For many applications in high-energy Physics, especially for near-event instrumentalisation, extremely robust and fast solid-state detectors are needed. The use of semiconductor devices for particle detection has grown significantly over the past decades. In particular, sapphire detectors represent one of the best materials for high-energy physicists to use. In this paper, we report on the performance of a multi-channel sapphire stack in an electron beam experiment. The results show the potential of using sapphire detectors for single particle detection.

Sapphire advantages:
- has a high breakdown electric field,
- has a very high mobility-electric field parameter,
- has a high carrier drift velocity,
- has an electron trap density of about 10^14 cm^-3.

Application
Sapphire detectors have been used for a variety of tasks such as fast, radiation-hard, and position-sensitive detectors.

Radiation hardness
Sapphire sensors have been fabricated as planar detectors with a silicon-like band gap, having both potential and high-field applications. Sapphire detectors are highly advantageous due to the following properties.

Sapphire detector stack design
Sapphire sensor stacks are used in high-energy physics experiments to detect charged particles. The sapphire sensors are mounted inside the EUDET telescope. The telescope design is shown in Fig.1. The EUDET telescope is a multi-plane detector with a total of 64 planes. The sapphire sensors are mounted in the middle of the 6 planes of the EUDET telescope.

Test beam setup, DESY-II
The test beam was scattered on the middle of 6 planes of the EUDET telescope in the DESY-II electron beam. The electron beam was directed to a charge sensitive preamplifier (CSP) and a standard RC-CR shaper. The signals from the CSP were amplified by 500 kV. The charge signal was measured by a charge sensitive amplifier. The charge signal was then used to determine the position of the primary interaction point.

Data synchronization and analysis
For the synchronization of the EUDET telescope and the stack, a trigger was provided by the signal from the readout system.

Fig.1: The CCE as a function of the bias voltage for all plates of the stack. The data was measured in the energy range of 5-10 GeV electrons.

Table 1: The performance of the multi-channel sapphire stack in a test beam at DESY-II. The results show the potential of using sapphire detectors for single particle detection.

Conclusions and outlook
Results of the performance of a multi-channel sapphire stack in a test beam at DESY-II are presented. The results show the potential of using sapphire sensors for single particle detection. The CCE shows a strong dependence on the bias voltage, reaching a value of 0.2 for a bias of 1000 V. This result is promising for future applications in high-energy physics experiments.

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