Contribution ID: **125** Type: **Oral**

KALYPSO LGAD - A MHz repetition rate line camera based on trench isolated low gain avalanche detector

Friday, 4 October 2024 10:50 (20 minutes)

Designed for accelerator beam diagnostics and photon science applications, KALYPSO is a line array camera that stands out for its high-speed performance with the ability to operate at rates upto 12 Mfps in continuous readout mode while maintaining full occupancy. In this contribution, the KALYPSO system with sensor based on TI-LGAD is presented. The latest version of this system is employed as a beam diagnostic imaging sensor to measure radiation profiles of the particle beam at the KIT accelerator, KARA. The system's key features will be presented, including its linearity, sensitivity, and dynamic range.

Summary (500 words)

KALYPSO (KArlsruhe Linear arraY detector for MHz rePetition rate SpectrOscopy) represents an advanced line array camera renowned for its high-speed data acquisition capabilities, reaching frequencies in the MHz range. Its adaptability extends to the integration of various semiconductor-based sensors, allowing for customization to operate across diverse spectral regions. Presently, KALYPSO accommodates sensors utilizing TI-LGAD (Trench-Isolated Low Gain Avalanche Detector) technology, interfaced with the ASIC Gotthard-KIT. This ASIC incorporates a charge-sensitive amplifier (CSA) functioning at a 100 MHz switching frequency and is capable of a framerate upto 12Mfps. A total of 48 strips of the TI-LGAD with a pitch of 50 µm have been wirebonded to the input of the ASIC. The ASIC also incorporates a correlated double sampling (CDS) stage in order to remove any stray offsets. Directly interfacing with a commercial analog to digital converter (ADC), the ASIC's output channels are further processed via an FPGA-based DAQ system. In addition to its conventional application in particle detection, the LGAD technology within KALYPSO serves as an imaging sensor, enabling the precise measurement of radiation profiles within the visible spectrum (450 nm - 550 nm). Deployed at the Karlsruhe Research Accelerator (KARA), this system effectively captures horizontal bunch profiles of synchrotron radiation, even under low bunch charges (below 18 pC). This contribution describes the KALYPSO-LGAD system, offering insights into its operational characteristics, including linearity, sensitivity, and dynamic range.

Primary authors: PATIL, Meghana (Karlsruhe Institute of Technology); Dr CASELLE, Michele (KIT - Karlsruhe Institute of Technology (DE)); STANKOV, Svetoslav (Karlsruhe Institute of Technology)

Co-authors: KOPMANN, Andreas; MUELLER, Anke-Susanne (Max Planck Society (DE)); Dr BRÜNDERMANN, Erik; BORGHI, Giacomo (Fondazione Bruno Kessler); PATERNOSTER, Giovanni (Fondazione Bruno KEssler); NIEHUES, Gudrun (Karlsruhe Institute of Technology); STEINMANN, Johannes; CENTIS VIGNALI, Matteo (FBK); BOSCARDIN, Maurizio (FBK Trento); CHILINGARYAN, Suren (KIT)

Presenter: PATIL, Meghana (Karlsruhe Institute of Technology)

Session Classification: Module, PCB and Component Design

Track Classification: Module, PCB and Component Design