



Contribution ID: 175

Type: **Parallel session talk**

AstroPix: Low power high voltage CMOS active pixel sensors for future space and collider experiments

Tuesday 7 October 2025 15:00 (20 minutes)

AstroPix is a novel monolithic high-voltage CMOS (HV-CMOS) active pixel sensor and has the advantages of a fully monolithic structure with low power consumption, low manufacturing cost, low material budget, fast charge collection, and high radiation tolerance. AstroPix is inspired by ATLASPix3 and MuPix (for High-Luminosity Large Hadron Collider) and is designed using a 180 nm CMOS process for future space-based applications, specifically gamma-ray astrophysics missions.

To ensure high precision and sensitivity, a next-generation Pair/Compton telescopes targeting a medium-energy (MeV) γ -ray from extreme explosions and accelerators requires detectors with good energy and position resolution in three dimensions with a low energy threshold. AstroPix provides low-power operation with large sensitive areas, low noise, wide dynamic range, and good energy/spatial resolution. At the ComPair2 tracker prototype, 10 tracking layers with a total area of 10 m² are designed with AstroPix sensors. The speaker will describe the integration of the AstroPix MAPS sensor in the ComPair2, a tracker prototype. Considering the features of the AstroPix sensor, it is selected as a baseline silicon sensor for the imaging part in the barrel electromagnetic calorimeter (BIC) for the Electron-Proton/Ion Collider (ePIC) experiment at the Electron-Ion Collider (EIC). The presentation will provide an overview of Astropix, highlighting the characterization and performance evaluation results, and describe the application of AstroPix in ComPair2 and BIC-ePIC detectors.

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Session Classification: SHARED SESSION

Track Classification: RDC 3 Solid State Tracking