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Schwarzschild-Couder Telescope for the Cherenkov Telescope Array Observatory: Status and Progress

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The 9.7m aperture Schwarzschild-Couder Telescope (SCT) is being developed as an alternative advanced design of the medium-sized telescope for the Cherenkov Telescope Array Observatory (CTAO), which covers the CTAO's core energy range, from about 150 GeV to 5 TeV. The novel aplanatic dual-mirror optics of the SCT makes it possible to simultaneously achieve a wide 8-degree field of view and unprecedented 0.068-degree imaging resolution of the telescope camera, which is instrumented with 11,328 silicon photomultiplier (SiPM) detectors. The SCT project, with the goal to demonstrate these new capabilities, is advancing at the Fred Lawrence Whipple Observatory in Arizona, USA. The positioning and optical systems of the SCT have achieved design specifications and enabled the detection of the Crab Nebula with a statistical significance of 8.6 sigma using a partially instrumented 1,536-pixel prototype camera. An SCT camera upgrade is currently underway to fully populate it with advanced SiPMs and high-density electronics. Once completed by the end of 2025, the project is expected to verify SCT performance end-to-end and to provide the foundation for SCT subarray deployment during the enhancement phase of the CTAO construction. The sub-array of SCTs in the CTAO installation would offer improved sensitivity and unprecedented angular resolution. These technology advances would significantly boost the observatory's scientific output for detection of multi-messenger transients, mapping the morphology of gamma-ray sources with large angular extent, and conducting galactic plane sky surveys with the improved confusion limit. This poster highlights the SCT project achievements and its transformative science-enabling potentials in the enhanced CTAO configuration.

Primary author: JIN, Weidong (University of California, Los Angeles)

Presenter: JIN, Weidong (University of California, Los Angeles)

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