

The ASTRI Mini-Array Core Science Program

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Celestial sources emitting at high-energy (HE, $E > 100$ MeV) and at very high-energy (VHE, $E > 100$ GeV) are of the order of a few thousands and a few hundreds, respectively. On the other hand, the number of sources emitting at ultra high-energy (UHE, $E >$ several tens of TeV) are just a few dozens, and are currently being investigated by means of both ground-based imaging atmospheric Cherenkov telescopes (IACTs) and particle shower arrays. These rare VHE and UHE sources represent a new frontier in astrophysics. An array composed of nine ASTRI Cherenkov telescopes is under construction at the Observatorio del Teide (Tenerife, Spain). The ASTRI Mini-Array aims at providing robust answers to a few selected open questions in the VHE and UHE domains. The scientific program during the first four observing years will be devoted to the following Core Science topics: the origin of cosmic rays, the extra-galactic background light and the study of fundamental physics, the novel field in the VHE domain of gamma-ray bursts and multi-messenger transients, and finally the usage of the ASTRI Mini-Array to investigate ultra high-energy cosmic rays and to undertake stellar intensity interferometry studies. We review the scientific prospects assessed through dedicated simulations, proving the potential of the ASTRI Mini-Array in pursuing breakthrough discoveries and discuss the synergies with current and future VHE facilities in the Northern hemisphere, such as MAGIC, LHAASO, HAWC, Tibet AS-gamma, and CTAO-N.

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