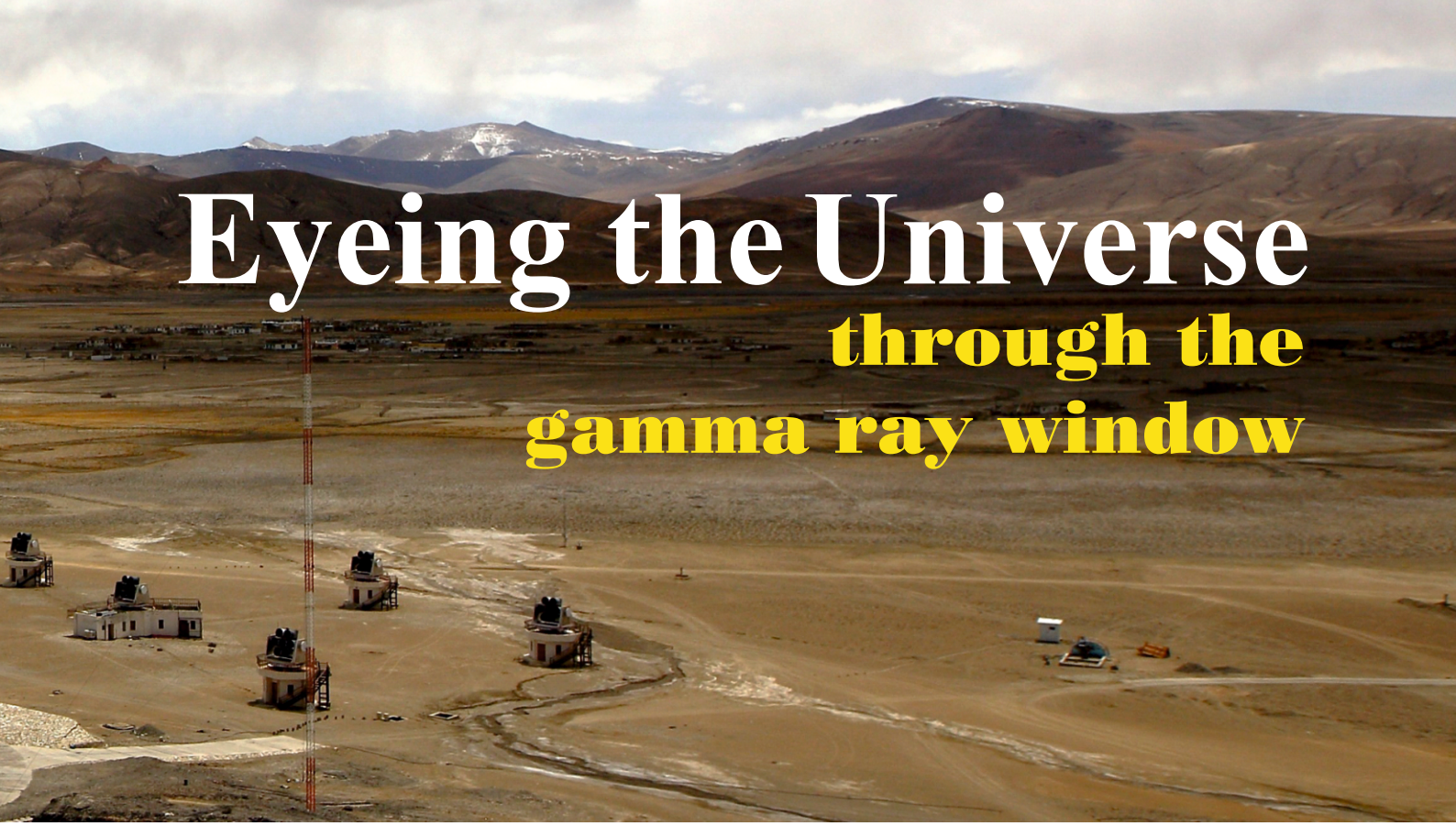

Eyeing the Universe through the gamma ray window

ASSOCIATE EDITORS' message

It is indeed a matter of great pleasure to bring out this special issue on the MACE telescope which has recently become operational at Hanle in the UT of Ladakh. The telescope has been installed by BARC with the motivation of answering several outstanding questions in high energy astrophysics and exploring the mysteries of the Universe. Studies related to the origin of cosmic rays, gamma-ray emission from the extreme environments of the astrophysical compact objects like super-massive black holes and neutron stars, relativistic particle acceleration at different astrophysical sites, cosmic gamma-ray horizon, and nature of dark matter particle candidates are the main science objectives of MACE. Setting up of the MACE telescope has a deep historical connection with the early cosmic ray research activities initiated by the Department of Atomic Energy in India.

The overall design and location of MACE have been strategically evolved in order to augment the ongoing global efforts in the field of Very High Energy (VHE) gamma-ray astronomy for exploring the sky in the hitherto unexplored energy range below 100 GeV (1GeV=109 eV). This can be achieved by using a large optical reflector at high altitude. The MACE telescope, equipped with a quasi-parabolic reflector of 21m diameter and located at an altitude of 4.3km above sea level, has capability of detecting astrophysical gamma-ray photons of energy above 20 GeV with high sensitivity. Its development has led to technology spin offs like diamond turning of large size metallic mirror facets and high speed data acquisition system in collaboration with the industries. A software pipe-line called MAP (MACE data Analysis Package) has been developed in-house for processing and analysis of the MACE data using C++ and ROOT frame-works. All the power requirements for the telescope operation as well as on-site local livelihood are met by a dedicated 240kW solar power station. Being a dry desert with very low atmospheric water vapor content and annual precipitation of rain and snow below 10cm, Hanle site offers an excellent duty cycle with uniformly distributed exceptionally dark nights throughout the year so that one can do astronomy by observing celestial objects at all right ascensions in the northern hemisphere. Also, the geographical location of Hanle (Latitude 32.8°N, Longitude 78.9°E, Altitude 4270m) appropriately fills the longitudinal gap among the other major gamma-ray observatories operating around the globe.

MACE had its first light in April 2021 after performing a number of engineering and technical trial runs of more than 350 hours. The telescope successfully detected VHE gamma-ray signal from the direction of standard candle Crab Nebula on the night of April 1, 2021 in a live exposure time of about 1 hour. Following this detection of gamma-ray signal, MACE was officially commissioned at Hanle site in September 2021. The telescope is now deployed for its regular science observations.