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ADVANCEMENTS IN EARTH OBSERVATION WITH CSES-02: HEPD-02 AND EFD-02 AS  
CUTTING-EDGE NON-IMAGING INSTRUMENTS

**Abstract**

The China Seismo-Electromagnetic Satellite (CSES) program, a joint initiative of the China National Space Administration (CNSA) and the Italian Space Agency (ASI), aims to deepen our understanding of Earth's geophysical phenomena. The forthcoming CSES-02 satellite represents a significant advancement in non-imaging Earth observation, featuring innovative instrumentation poised to enhance our capabilities in this field.

HEPD-02, the High Energy Particle Detector, is designed to investigate cosmic rays and particles trapped in the Van Allen belts. Operating in the 1-100MeV energy range, HEPD-02 will identify particle species, measure energy, and determine arrival direction with unprecedented precision. Its enhanced measurement quality and robustness promise to provide valuable insights into space weather phenomena, contributing to our understanding of Sun-Earth interaction.

EFD-02, the Electric Field Detector, is engineered to measure ionospheric electric field components across a wide frequency band (DC to 3.5 MHz) with exceptional resolution (down to  $0.1 \mu\text{V}/\text{m}$ ). Deployed on the CSES-02 satellite, EFD-02 will monitor electric field variations by measuring voltages between probes positioned on booms extended from the satellite. Its state-of-the-art sensitivity enables thorough observations under varying magnetic field conditions encountered in orbit, offering valuable insights into electromagnetic phenomena and their potential correlation with seismic activity.

HEPD-02 and EFD-02, as cutting-edge non-imaging instruments aboard CSES-02, hold promise for advancing our understanding of Earth's geophysical processes. By expanding our knowledge of cosmic rays and ionospheric electric fields, these instruments will facilitate breakthroughs in space weather monitoring and geophysics.

This abstract underscores the significant potential of HEPD-02 and EFD-02 in advancing our understanding of Earth's geophysical phenomena. As integral components of the CSES-02 mission, these instruments are poised to contribute valuable data, shedding light on the intricate interactions shaping our planet's environment.