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## Trigger and data acquisition system of the High Energy Particle Detector on board the CSES-02 satellite

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This contribution describes the system performing the trigger and the readout of the PMTs for the High Energy Particle Detector (HEPD-02) onboard the second satellite of the China Seismo Electromagnetic Satellite (CSES-02) mission.

CSES is a project developed to research the ionospheric perturbations associated with earthquakes. The mission aims at building a constellation of multi-instrument satellites to conduct a thorough study of ionospheric phenomena.

The HEPD-02 is designed to detect cosmic rays, i.e., electrons and protons, along with light nuclei, in the energy range between a few MeV and a few hundreds of MeV. The instrument consists of a tracker, a trigger and a calorimeter surrounded by a veto.

All scintillating detectors are readout by a single board which also issues and manages the trigger signals for the whole apparatus. The HEPD-02 trigger system must be extremely versatile because along the orbit of CSES-02 particle fluxes span several orders of magnitude and data acquisition must guarantee the measurement of energy spectra with a high duty cycle. The HEPD-02 trigger system features concurrent trigger configurations and prescaling capability to match the amount of data the instrument can process and send to the ground. Each trigger pattern is optimized after scientific requirements about the field of view and the nature of particles impinging in HEPD-02, with prescaling settings suitably adjusted.

All the trigger configurations will be monitored by ratemeters. In addition, a trigger configuration dedicated to gamma-rays will be tracked on a time basis of 10 milliseconds, to measure photon fluxes in the MeV-tens of MeV energy range and provide sensitivity for Gamma Ray Bursts. We provide a comprehensive description of the design criteria and the architecture of the trigger system, including results from laboratory tests on engineering and pre-flight models.

### Collaboration

**Primary author:** SCOTTI, Valentina (Istituto Nazionale di Fisica Nucleare)

**Presenter:** SCOTTI, Valentina (Istituto Nazionale di Fisica Nucleare)

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