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Crystal Eye: a new X and gamma ray all sky monitor for space missions

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The Crystal Eye detector is proposed as a space-based X and gamma ray all-sky monitor to be active from 10keV up to 30MeV.

In its full scale configuration, it consists in a 32cm diameter hemisphere, made by 112 pixels, with an overall weight lower than 50kg, wide field of view (FOV, about 6sr), full sky coverage and very large effective area (about 6 times higher than Fermi-GBM at 1MeV) in the energy range of interest.

Each pixel consists of two layers of scintillating LYSO crystals, read by arrays of Silicon PhotoMultipliers (SiPMs), equipped with a segmented anticoincidence detector for charged Cosmic Ray (CR) identification and hard X rays detection.

The primary scientific goals include the observation of transient X and gamma flashes from Gamma Ray Bursts (GRBs), GW follow up, SN explosions, etc. and stable gamma ray source observation in the MeV energy range. The pioneering design optimizes these observations in terms of localization of the source and timing. By using specific triggers for charged particles, solar flares and space weather phenomena could also be studied.

A custom electronics based on the CITIROC1A asic is in use. A pathfinder mission is foreseen onboard of the Space Rider vehicle run by ESA, allowing technology tests and qualification and both deep space and Earth observation during the mission. We here present the Crystal Eye technology and the prototype for the pathfinder mission.

Collaboration

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