

# New Mission Concept: Galactic Explorer with a Coded Aperture Mask Compton Telescope (GECCO)

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We present a novel concept for a next-generation  $\gamma$ -ray telescope that will cover the hard X-ray - soft  $\gamma$ -ray region. Despite the progress made by the European Space Observatory INTEGRAL, this energy range is still under-explored. GECCO will conduct high-sensitivity measurements of the cosmic  $\gamma$ -radiation in the energy range from 50-100 keV to  $\sim 10$  MeV and create intensity maps with high spectral and spatial resolution, focusing on sensitive separation of diffuse and point-source components. These observations will enable the following major objectives for GECCO:

- a) understand the nature, composition and fine structure of the inner Galaxy
- b) localize and discern the origin(s) of the positron annihilation 511 keV line,
- c) resolve Galactic chemical evolution and sites of explosive element synthesis
- d) provide identification and precise localization of gravitational wave and neutrino events
- e) test as-yet unexplored candidates for the dark matter

The instrument is based on a novel CdZnTe Imaging calorimeter and a deployable coded aperture mask. The unique feature of GECCO is that it combines the advantages of two techniques –the high-angular resolution possible with coded mask imaging, and a Compton telescope mode providing high sensitivity measurements of diffuse radiation. Expected GECCO performance is as follows: energy resolution  $<1\%$  at 0.5-5 MeV, angular resolution  $\sim 1$  arcmin in the Mask mode (3-4 degree field-of-view,  $\sim 2,000$  sq.cm effective area), and 3-5 degrees in the Compton mode ( $\sim 60$  degree field-of-view,  $\sim 500$  sq.cm effective area). The continuum sensitivity is expected to be  $\sim 10$ – $6$  MeV/sq.cm/s at 1 MeV. GECCO can be considered for a future NASA Explorer mission.

## Keywords

Compton telescope; Coded Aperture Mask; CZT detector; Galactic plane

## Collaboration

### other Collaboration

GECCO

### Subcategory

Future projects

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