

# **ASTROGAM Discussion**

# Discussion

- **ASTROGAM: the only gamma-ray mission in M4**
- **sharpening key science objectives**
- **communities: Europe, Russia, US, Japan**
- **establishing or re-enforcing an international GAMMA-WG**
- **TIGER TEAM to prepare for ESA questions & presentation**

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- **ASTROGAM: the only gamma-ray mission in M4**
  - International context, other missions, ESA, NASA, ...
  - ATHENA, EUCLID, PLATO, JUICE, Solar Orbiter, Cheops
  - GAMMA-400
  - M4 proposals:
    - Earth magnetosphere
    - solar
    - Exoplanets
    - Equivalence principle
    - X-rays: LOFT and X-ray Polarimeter

- **ASTROGAM: the only gamma-ray mission in M4**
- **Very broad science !**
  - Galaxy
  - AGNs
  - The most energetic events in the Universe
  - Dark Matter studies
  - Solar physics
  - Terrestrial high-energy physics

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**ASTROGAM is an  
Observatory !**

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**ASTROGAM is an  
Observatory**

**combining broad spectral information  
(MeV & GeV) & sensitivity  
improvements by > 10 !!!**

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**ASTROGAM is an  
Observatory !**

**huge FoV !**

**huge community...**

**(radio, optical, X-rays, TeV)**



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  - M4 proposals:
    - Earth magnetosphere                      Terrestrial physics
    - Solar    solar physics, space weather
    - Exoplanets
    - Equivalence principle                      Dark Matter studies
    - X-rays: LOFT and X-ray Polarimeter      broad-spectr.

- **Theme-1: Matter and antimatter in our Galaxy and beyond**
- **Theme-2: Accelerators in the nearby & distant Universe**
- **Theme-3: Fundamental Physics and new messengers**

- **How feasible are ASTROGAM science objectives ???**

- **PHOTONS**

- **PSF**

- **BROAD ENERGY RANGE**

- **FOV**

- **How feasible are ASTROGAM science objectives ???**

**– PHOTONS !!!**

**– PSF**

**– BROAD ENERGY RANGE**

**– FOV**

- **ASTROGAM pointing plan**
- **exposure on specific regions**
- **link to high-priority objectives**

- **Make ASTROGRAM interesting for other communities**
  - **Stars, star formation**
  - **Solar**
  - **Earth and planetary science**
  - **Cosmology, fundamental physics**

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## **sharpening ASTROGAM key science objectives for ESA**

- **Science focus**
- **Weak spots**
- **Readiness to tough questions**
- **Science feasibility**





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# miscellanea

- **DM searches in spheroids, DM mass range unachievable by other means, unique.**
- **Large FoV ! Unique for GW source identification and detection.**
- **End-phase of star life... and starting phase !**

- **Theme-1: Matter and antimatter in our Galaxy and beyond**
  - *How is nuclear enrichment in our Galaxy related to SN activity and star formation? What is the physics of thermonuclear and core-collapse supernovae?*
  - *What is the cosmic-ray density in our Galaxy? Are supernova remnants responsible for cosmic-ray acceleration up to PeV energies?*
  - *How is the central black hole in the Galactic Center powering the surrounding regions? What is the source of the puzzling antimatter in the Galactic Center?*
- **Theme-2: Accelerators in the nearby & distant Universe**
  - *How are relativistic jets launched? How does the disk/jet transition occur?*
  - *Is magnetic field reconnection at work in high-energy sources?*
  - *How is the MeV extragalactic background produced? Where do ultra-high-energy cosmic rays (UHECRs) originate?*
  - *What is the physics of acceleration and transient nuclear spectroscopy in solar flares?*
  - *How are Terrestrial Gamma Ray Flashes (TGFs) generated? What is their impact on the Earth environment and connection with global climate?*
- **Theme-3: Fundamental Physics and new messengers**
  - *What is the nature of Dark Matter?*
  - *Are MeV-GeV sources related to the emission of gravitational waves and neutrinos? What is the connection of gamma-ray bursts (GRBs) to gravitational collapse?*



## Galactic Radioactivities

$^{26}\text{Al}$ ,  $^{60}\text{Fe}$ ,  $^{44}\text{Ti}$  lines, star formation

## Inner Galaxy and Antimatter

resolving the mystery of the GC,  $e^+$  sources

## Compact Sources

binaries,  $\mu$ -quasars, AGNs, **polarization !**

## Gamma-Ray Bursts

localization, spectroscopy, **polarization !**

## Cosmic gamma-ray background

MeV background

## Dark Matter & Fundamental Physics

DM signatures, fundamental physics, linked with: Athena, GWs, TeV, neutrino astronomy

