The GAMMA-400 Space Mission

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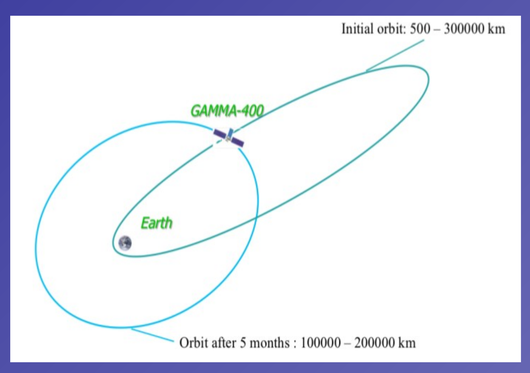
GAMMA-400 is a new space mission which will be installed on-board the Russian space platform Navigator. It is scheduled to be launched at the beginning of the next decade. GAMMA-400 is designed to study simultaneously both gamma-rays (up to 3 TeV) and cosmic-rays (electrons and positrons from 1 GeV to 20 TeV, nuclei up to 10^{15}-10^{16} eV). Being a dual-purpose mission, GAMMA-400 will be able to address some of the most impelling science topics, such as search for signatures of dark matter, the cosmic-rays origin and propagation and the nature of transients. GAMMA-400 will try to solve the unanswered questions on these topics by high-precision measurements of the Galactic and extragalactic gamma-ray sources, Galactic and extragalactic diffuse emission and the spectra of cosmic-ray electrons + positrons and nuclei, thanks to excellent energy and angular resolution.

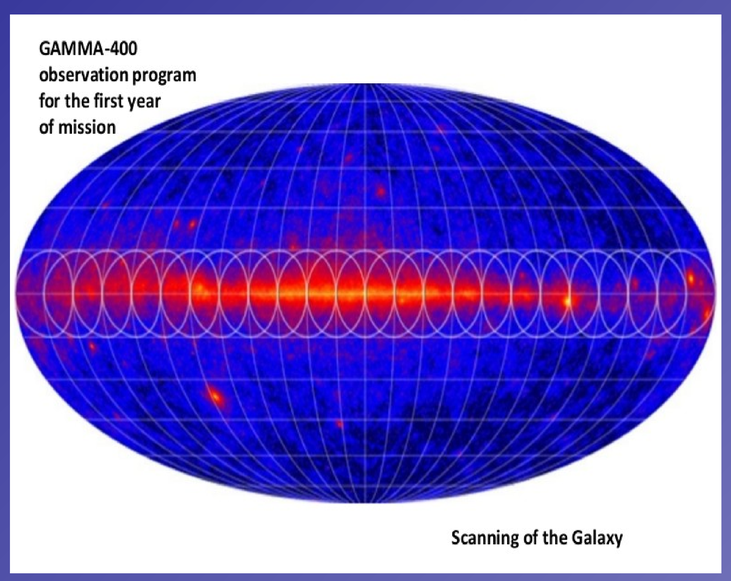
Main Characteristics

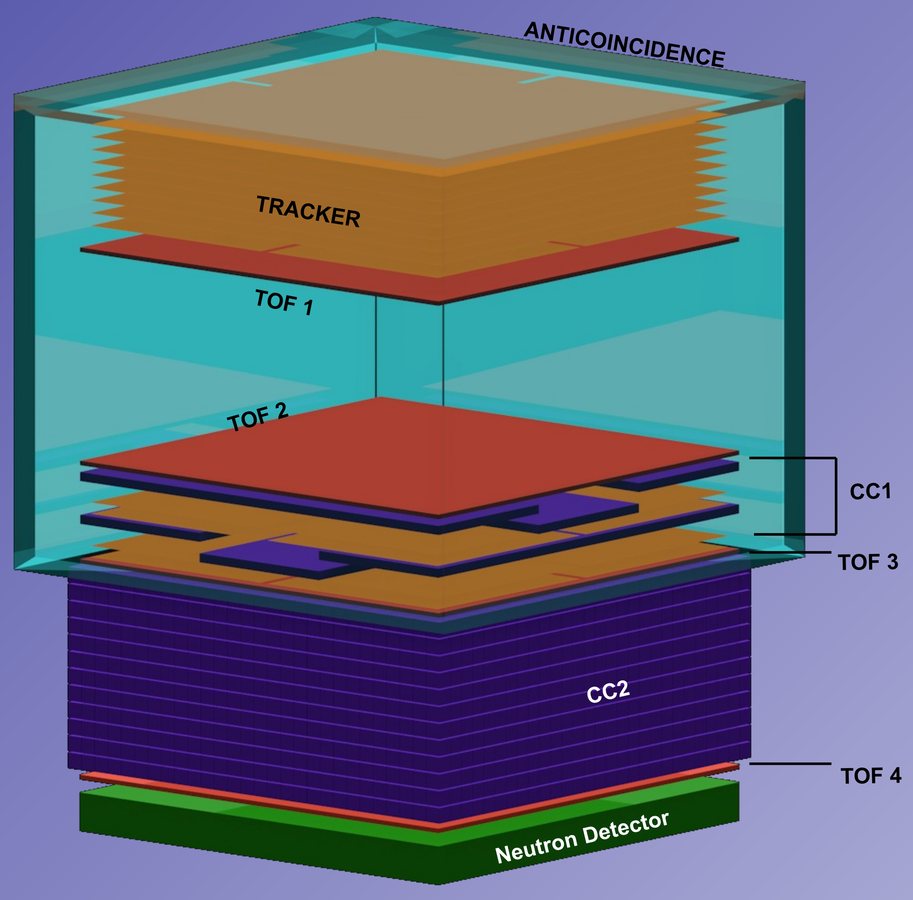
Launch	Beginning 2020
Payload mass	4000 kg
Power budget	2000 W
Telemetry downlink capability	100 GB/day
Lifetime	> 7 years
Dimensions (w x l x h)	~ 150 x 150 x 200 cm3



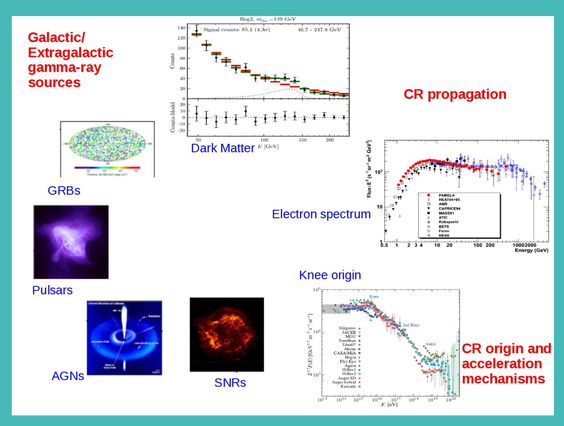
Focus on:

Gamma-rays	100 MeV – 3 TeV
Electrons	1 GeV – 20 TeV
Protons and nuclei	Up to 10^{15}-10^{16} eV



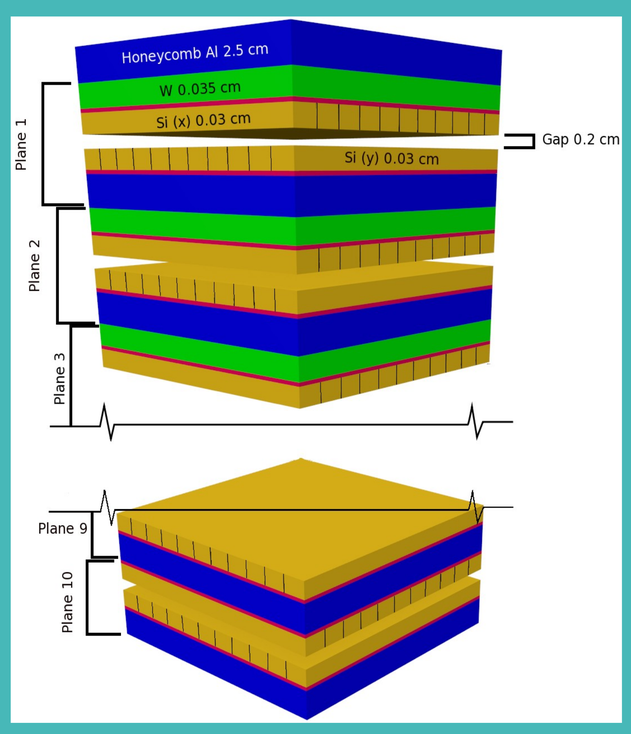


Scientific objectives:



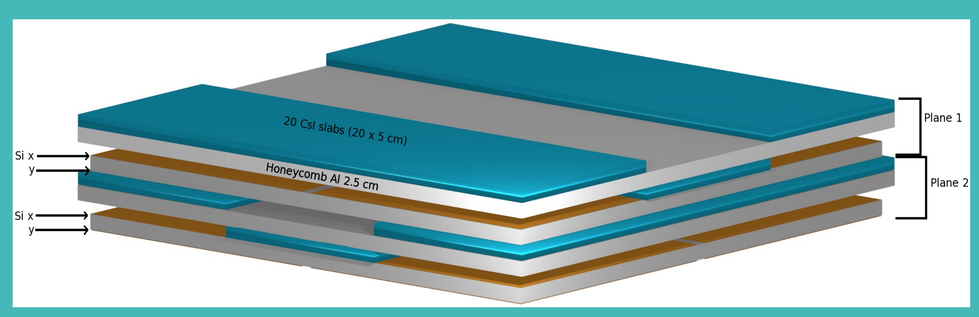
- Search for possible dark matter signal
- Study of Galactic and extragalactic gamma-ray sources:
  - AGN
  - SNRs
  - Pulsars
  - GRBs
- Study the high energy electron spectrum
- Study the spectrum of protons and nuclei up to the knee

Tracker:



Total dimension	99.3 x 99.3 x 30.4 cm^3
N towers	2 x 2
N planes	10
Plane structure	- Si (x view) - Honeycomb Al support - First 8 planes: W (0.1 X_0) - Si (y view)
Plane dimension	48.9 x 48.9 cm^2
Plane height	- 2.794 cm (first 8 planes) -2.772 cm (last 2 planes)
Tiles per plane	5 x 5
Tile dimension	9.7 x 9.7 cm^2
Strip per tile	768
Strip pitch	120 μm
Read-out	Analog

Pre-Shower (CC1):

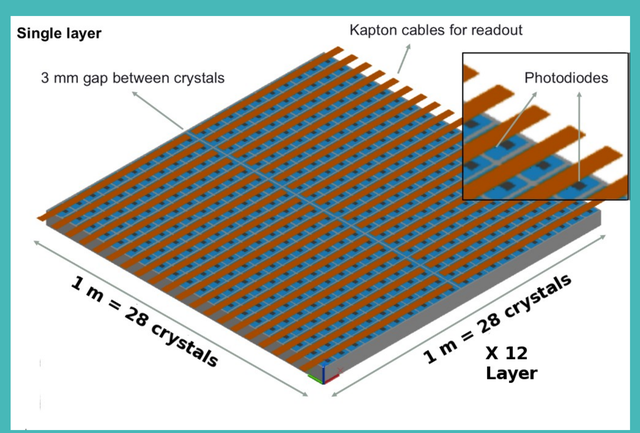


Distance from Tracker	50 cm
N planes	2
Plane structure	- CsI(Tl) slabs (x or y view) - Si (x view) -Si (y view)
Segmentation CsI(Tl)	20 x 3 slabs
Slab dimension	33.3 x 5 x 2 cm^3
Total radiation length	2 X_0

Calorimeter (CC2):

Total dimension	109.2 x 109.2 x 46.8 cm^3
Scintillating medium	CsI(Tl)
Segmentation	28 x 28 x 12 cubes
Cube side	3.6 cm
Gap size	0.3 cm
N crystal	9408
Depth	54 x 54 x 23 X_0 2.6 x 2.6 x 1.1 λ_I
Total mass	1981 kg

PERFORMANCE	PRELIMINARY
Planar GF	9.9 m^2sr
Gf_{eff}	~ 3 m^2sr
Energy resolution (protons)	~35 %
e/h rejection factor	~10^5



Also mounted on the platform:

- 2 Magnetometers

- 2 Star Sensors (accuracy ≈5")

- 6 Konus-FG detectors to study Gamma-Ray Bursts in the 15 keV – 15 MeV energy range (FOV: 2π sr): 4 direction detectors (0.5° – 3° accuracy) + 2 spectrometric detectors

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For more information on the gamma-ray performance of GAMMA-400 see the poster:
"Gamma-ray performance of the GAMMA-400 detector"