Russian Academy of Sciences
P.N.Lebedev Physical Institute
L P I

The Oskar Klein Centre and AlbaNova University Center announce the
7th TeVPA Conference
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Stockholm, Sweden

A. Galper, S. Suchkov for the GAMMA-400 collaboration

GAMMA-400 TEAM

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SCIENTIFIC GOALS

- **Study of a nature of acceleration processes in active astrophysical objects responsible for the origin of gamma-ray emission in the energy range from 100 MeV to several TeV including the temporal variation of emission.**
- **Study of a nature and properties of dark matter particles through their contribution in cosmic gamma rays, electrons, and positrons.**

N E W R E Q U I R E M E N T S

To explain many new problems occurred after the EGRET, AGILE, ATIC, FERMI, PAMELA observations it is necessary to:

1. Improve angular resolution up to ~0.01° (to identify many discrete gamma-ray sources).

2. Improve energy resolution up to ~1% (to reveal features in the energy spectra of gamma rays, electrons, and positrons, which are found to be connected with the dark matter).

3. Extend the energy range up to several TeV (to explain space-based and ground-based observation data, to clarify features in electron (positron) fluxes in the energy range of 100-3000 GeV).

4. Increase the efficiency of gamma-ray and electron selection.

GAMMA-400 PHYSICAL SCHEME

AC - anticoincidence detectors

C - Converter-Tracker - total 1 Xo
20 layers W 0.05 Xo +Si (x,y) pitch 0.1mm

CDmidl - Si (x,y) detectors (pitch 0.1 mm)

S1, S2 - TOF detectors

S3, S4 - calorimeter scintilator detectors

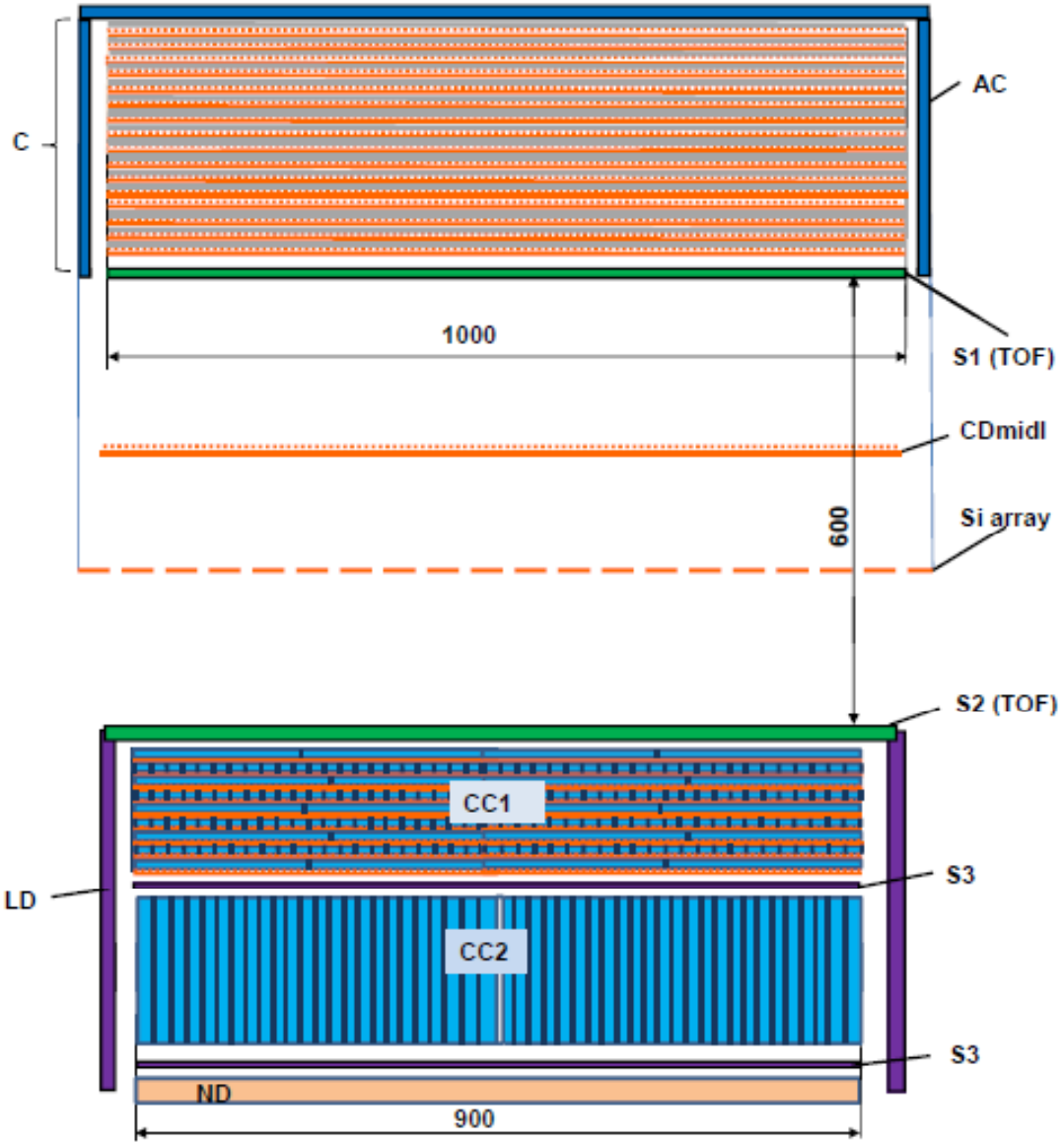
CC1 - imaging calorimeter (10Xo)
10 layers - BGO 1Xo + Si(x,y)(pitch 0.5 mm)

CC2 - electromagnetic calorimeter BGO (14Xo)

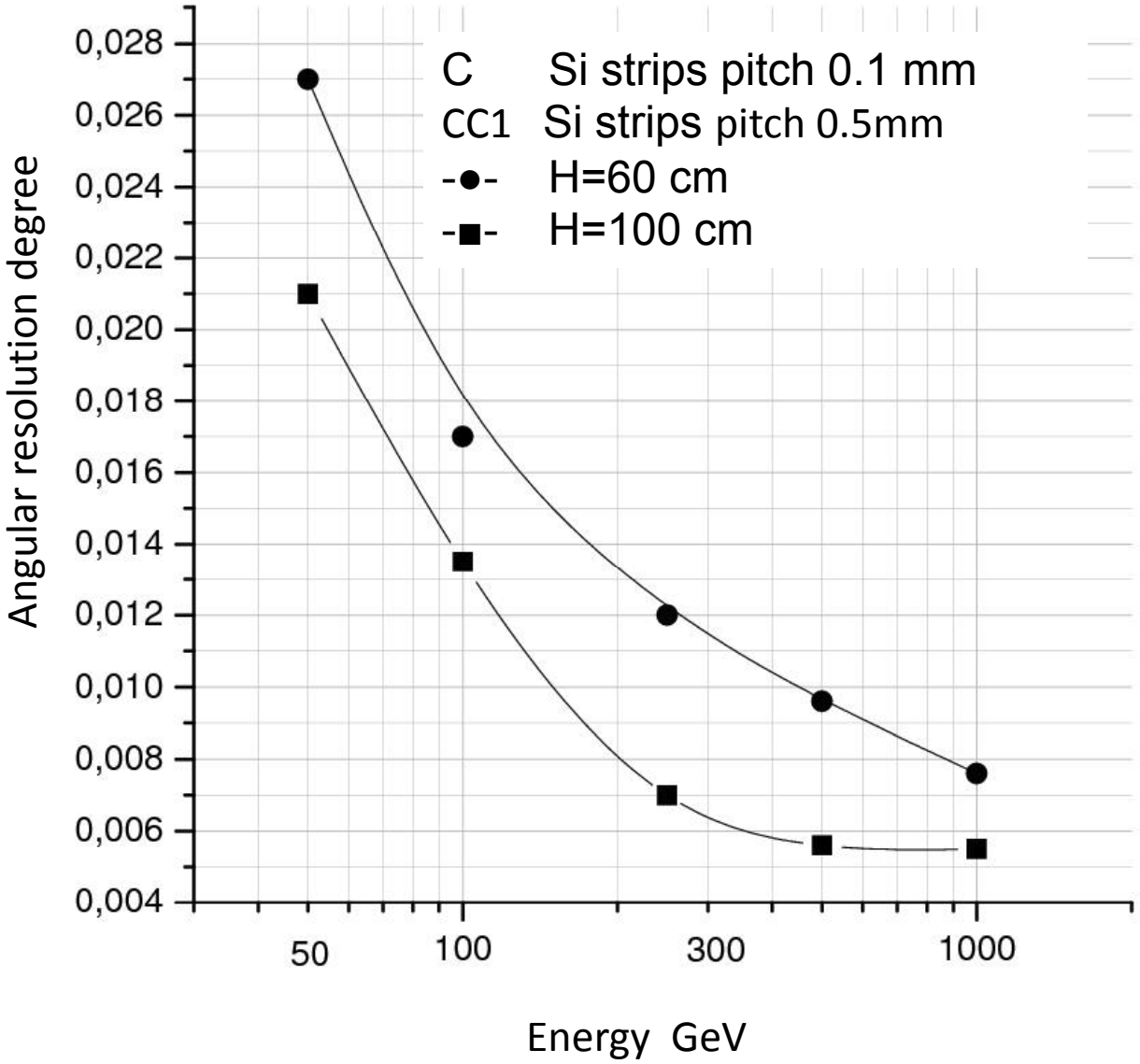
ND - neutron detector

Si array - Si pad (1x1cm) detector

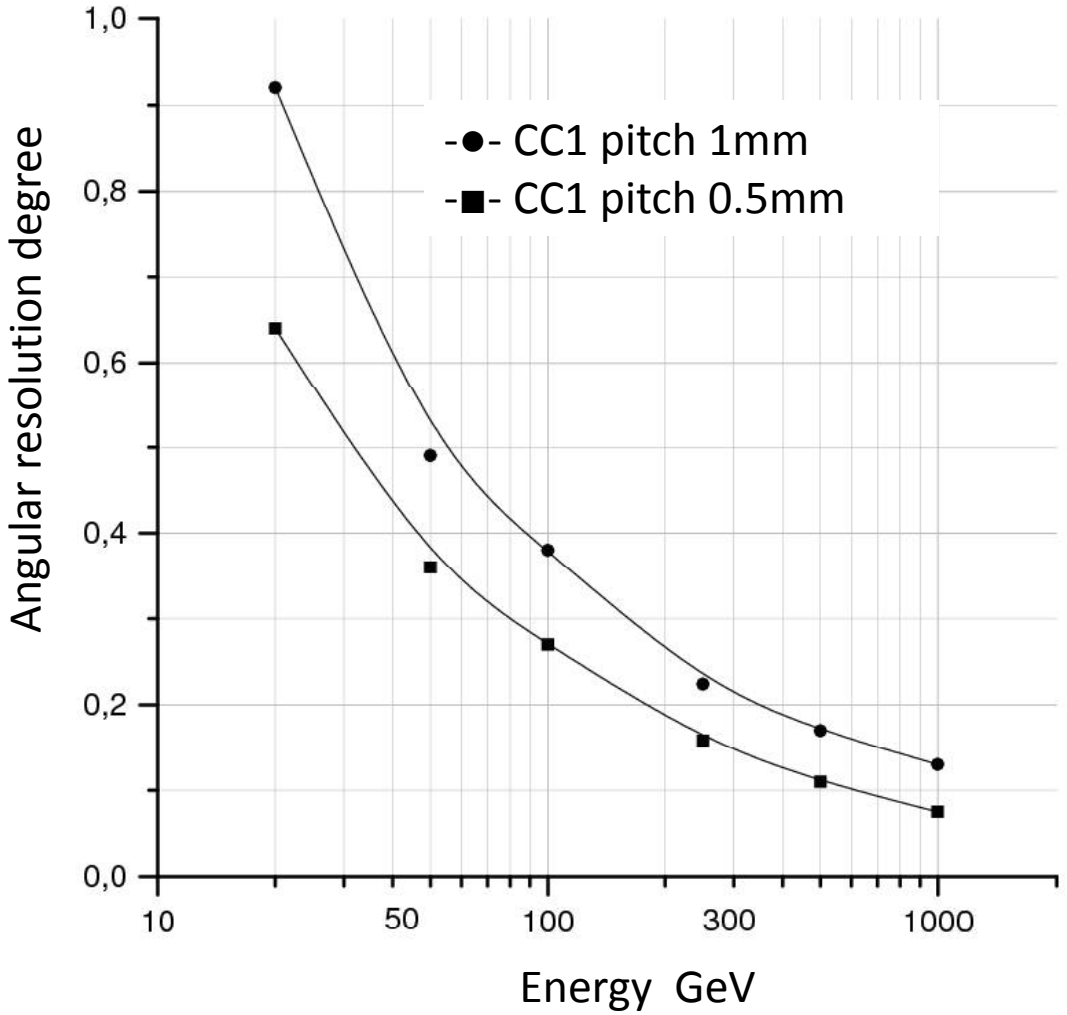
LD - 4 lateral calorimeter detectors
(Si array + preshower)



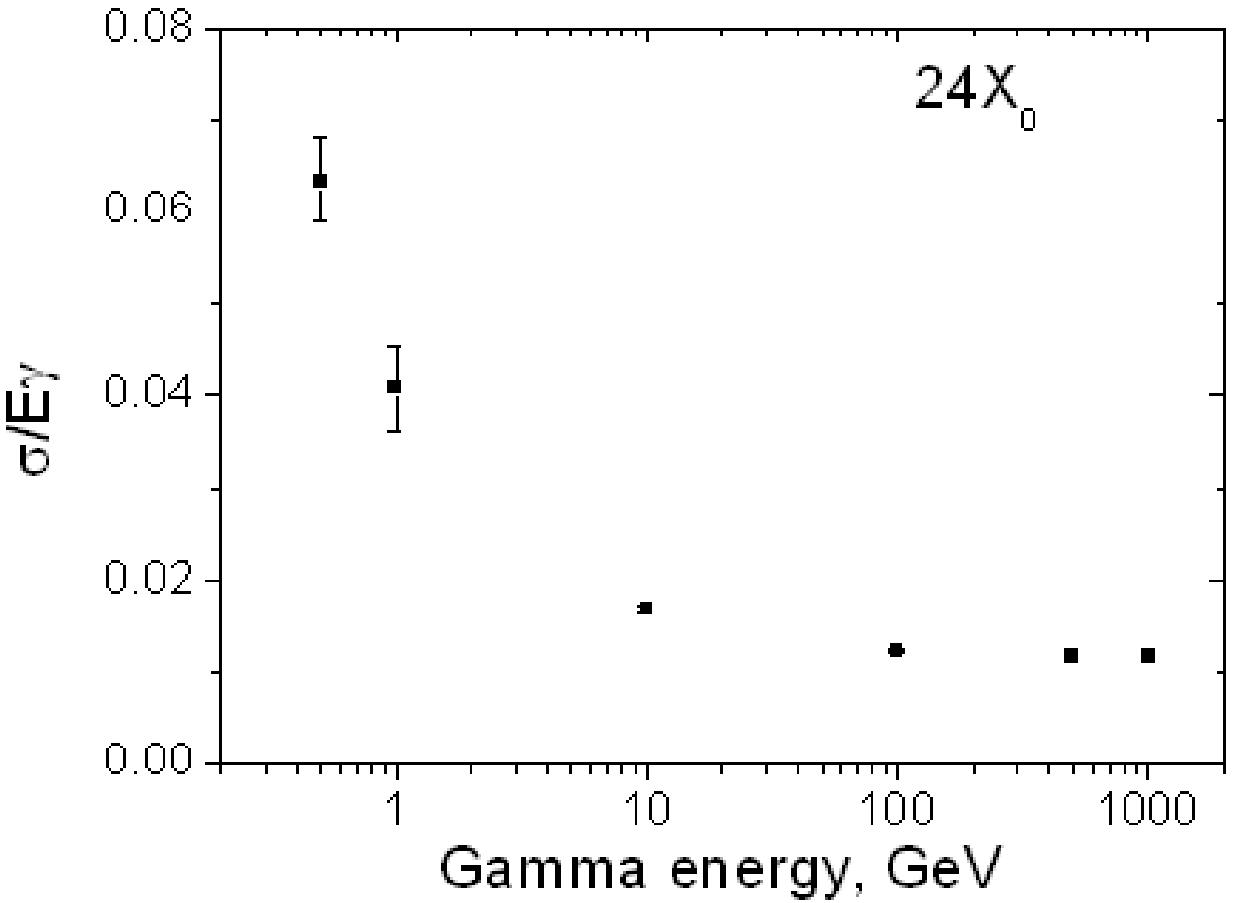
GAMMA-400 TELESCOPE
ANGULAR RESOLUTION



GAMMA-400 CALORIMETER ANGULAR RESOLUTION



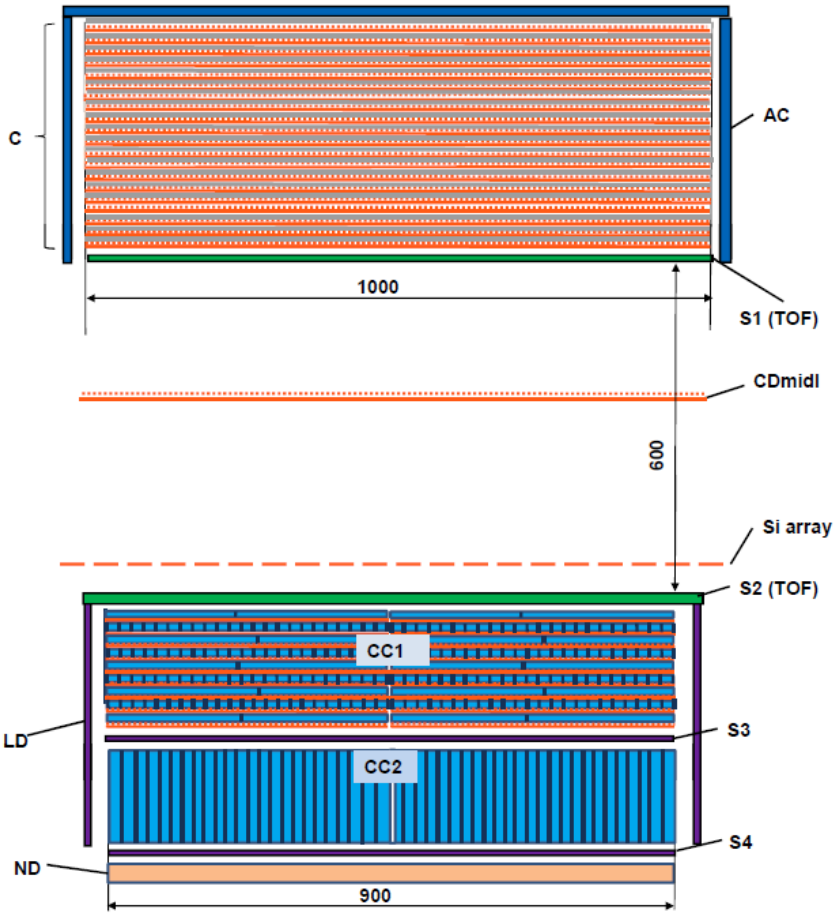
GAMMA-400 ENERGY RESOLUTION



telescope

γ: 0.1 -3000 GeV

$e^{\pm}$, nuclei: 1 -3000 GeV



GF ~ 0.4 m^2sr

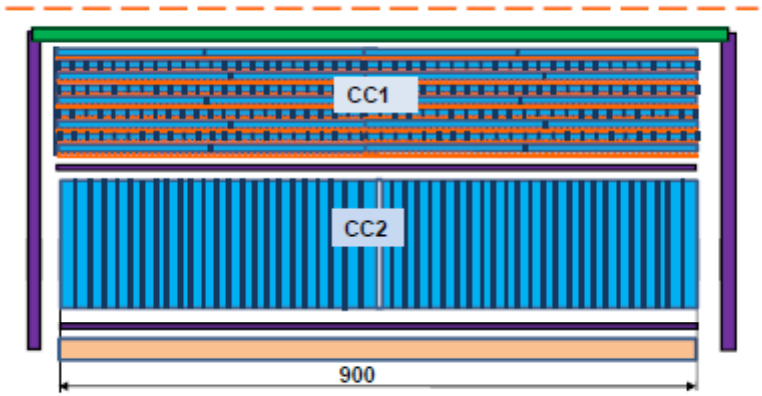
$\Delta\Theta_\gamma \sim 0.01°$ ($E_\gamma \sim 100$ GeV)

calorimeter

γ : 10 GeV - 3 TeV

$e^{\pm}$: 10 GeV - 3 TeV

nuclei: 10 GeV - 0.1 PeV/nucleon



From above:

GF ~ 1 m^2sr, 24Xo, 1,5λ

$\Delta\Theta_\gamma \sim 0.2°$ ($E_\gamma \sim 100$ GeV)

From side direction:

GF ~ 0.8 m^2*sr (for 4 side),

80Xo, 4 λ

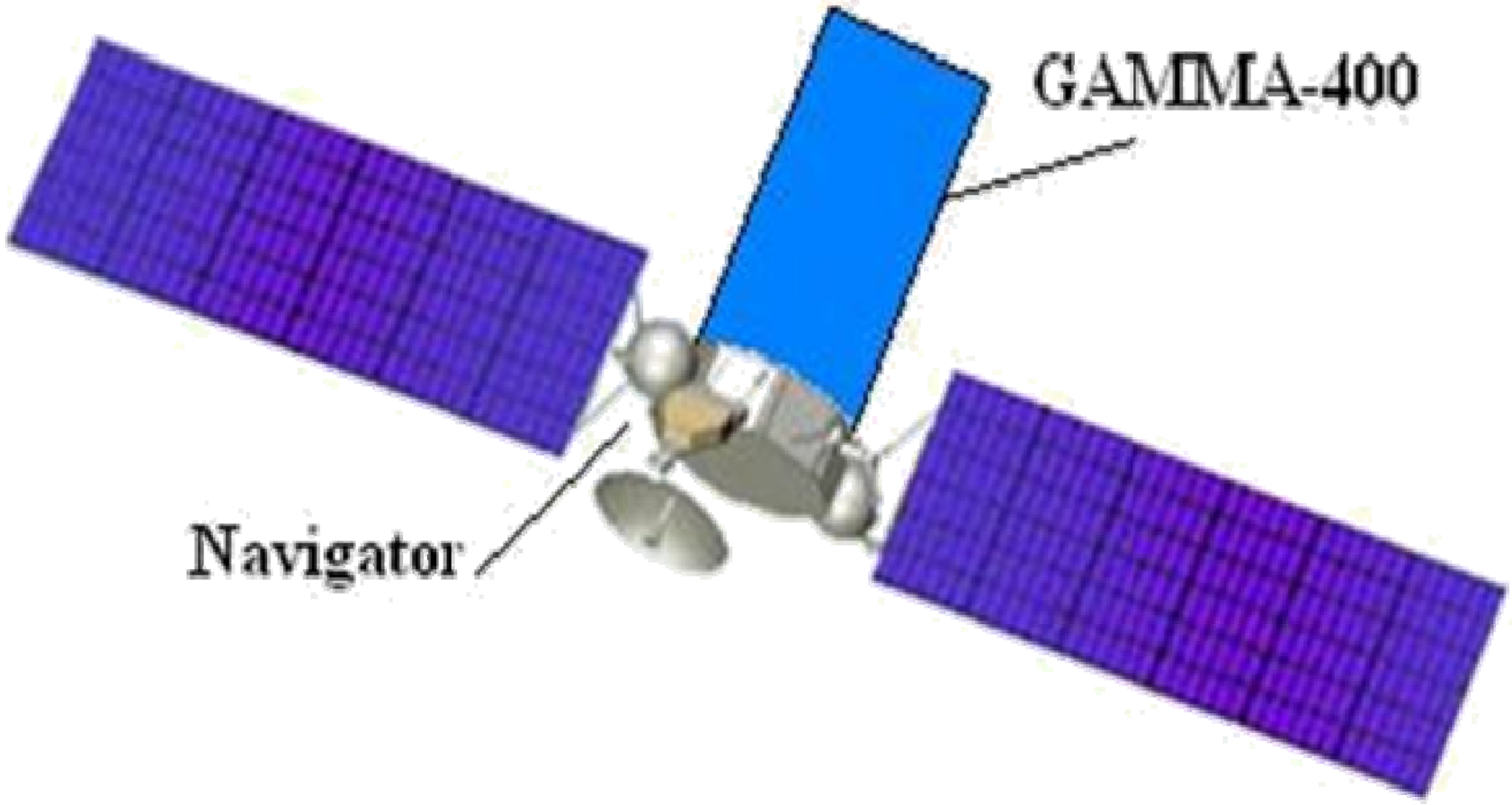
MAIN GAMMA-400 PARAMETERS

Gamma-ray energy range	100 MeV-3000 GeV
Multilayer converter	100 x 100 cm^2 1 X_o
Calorimeter	90 x 90 cm^2 ~ 24 X_o
Angular resolution ($E\gamma > 100$ GeV)	~ 0.01°
Energy resolution ($E\gamma > 100$ GeV)	~ 1%
Proton rejection	10^6
Telemetry downlink	100 GB/day
Power consumption	2000 W
Max. dimensions	2x2x3 m^3
Total mass	2600 kg

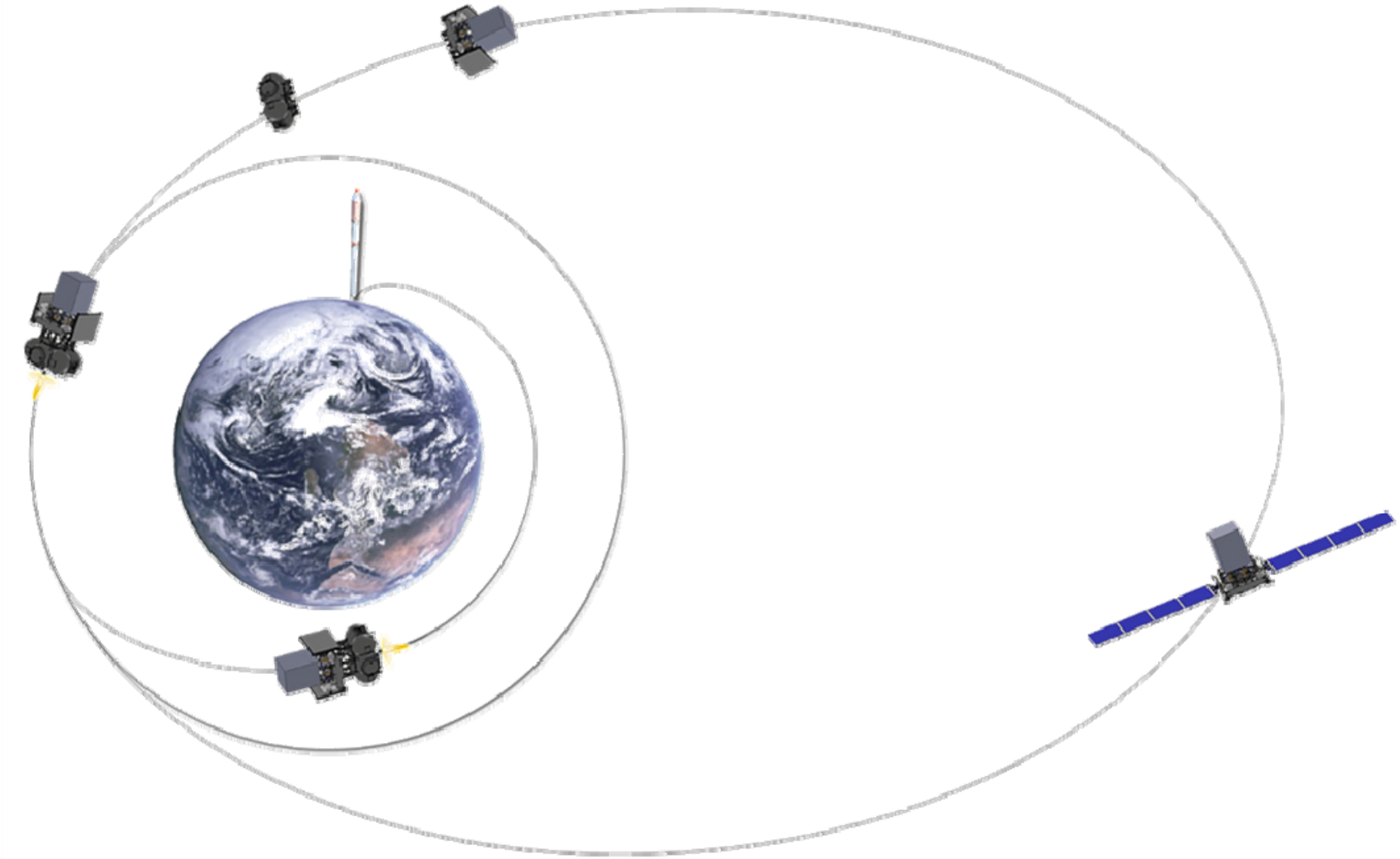
COMPARISON OF THE MAIN PERFORMANCES OF GAMMA-RAY TELESCOPES

	SPACED-BASED					GROUND-BASED		
	EGRET	AGILE	FERMI	CALET	**GAMMA-400**	H.E.S.S.	MAGIC	VERITAS
ENERGY RANGE, GeV	0.03-30	0.03-50	0.1-300	10-10000	**0.1-3000**	> 100	> 100	> 100
ANGULAR RESOLUTION, deg (E_γ > 100 GeV)	0.5	0.1	0.1	0.1	**~0.01**	0.1	0.1	0.1
ENERGY RESOLUTION, % (E_γ > 100 GeV)	20	50	10	2	**~1**	15	12	15

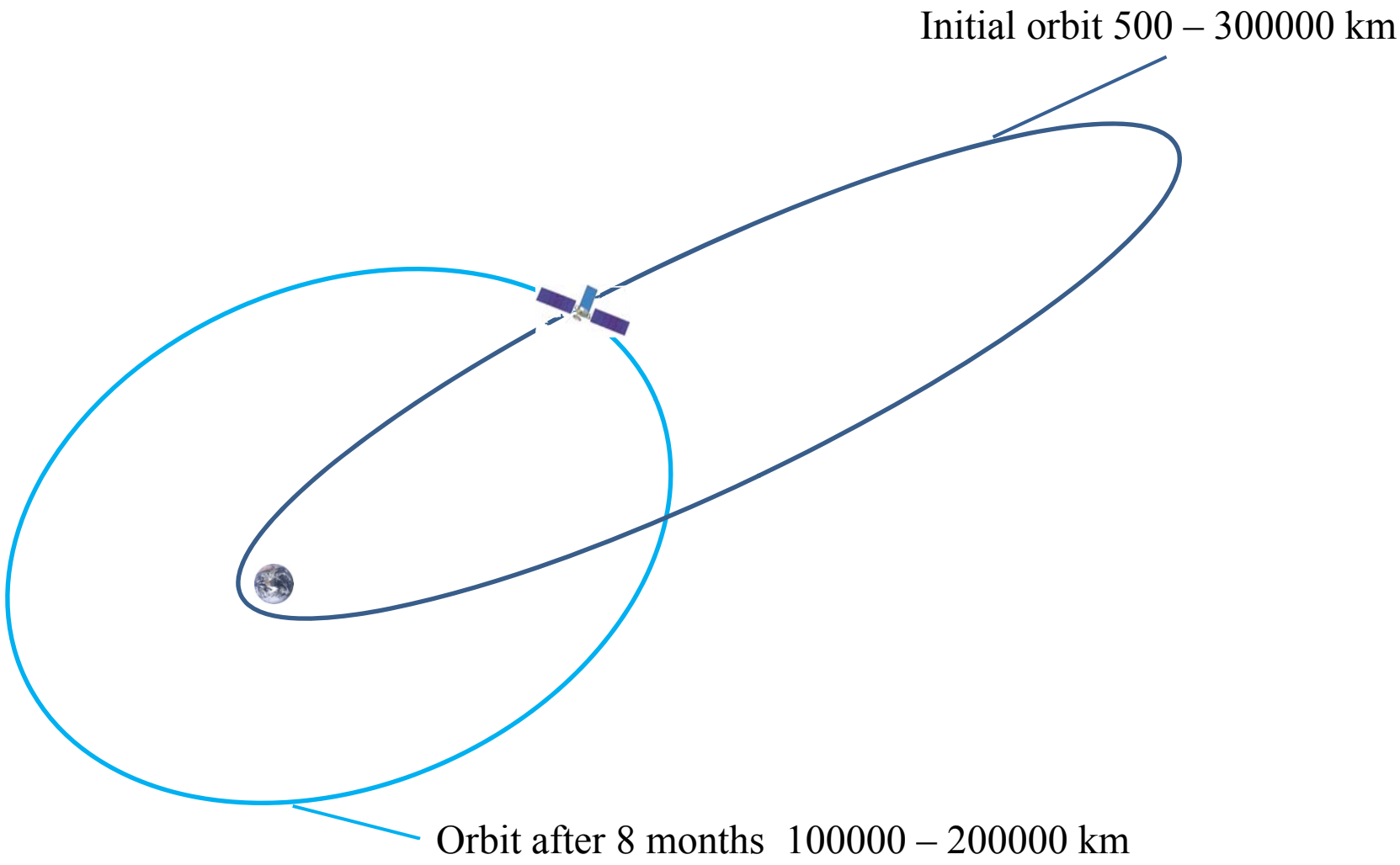
GAMMA-400 ON THE NAVIGATOR SPACECRAFT



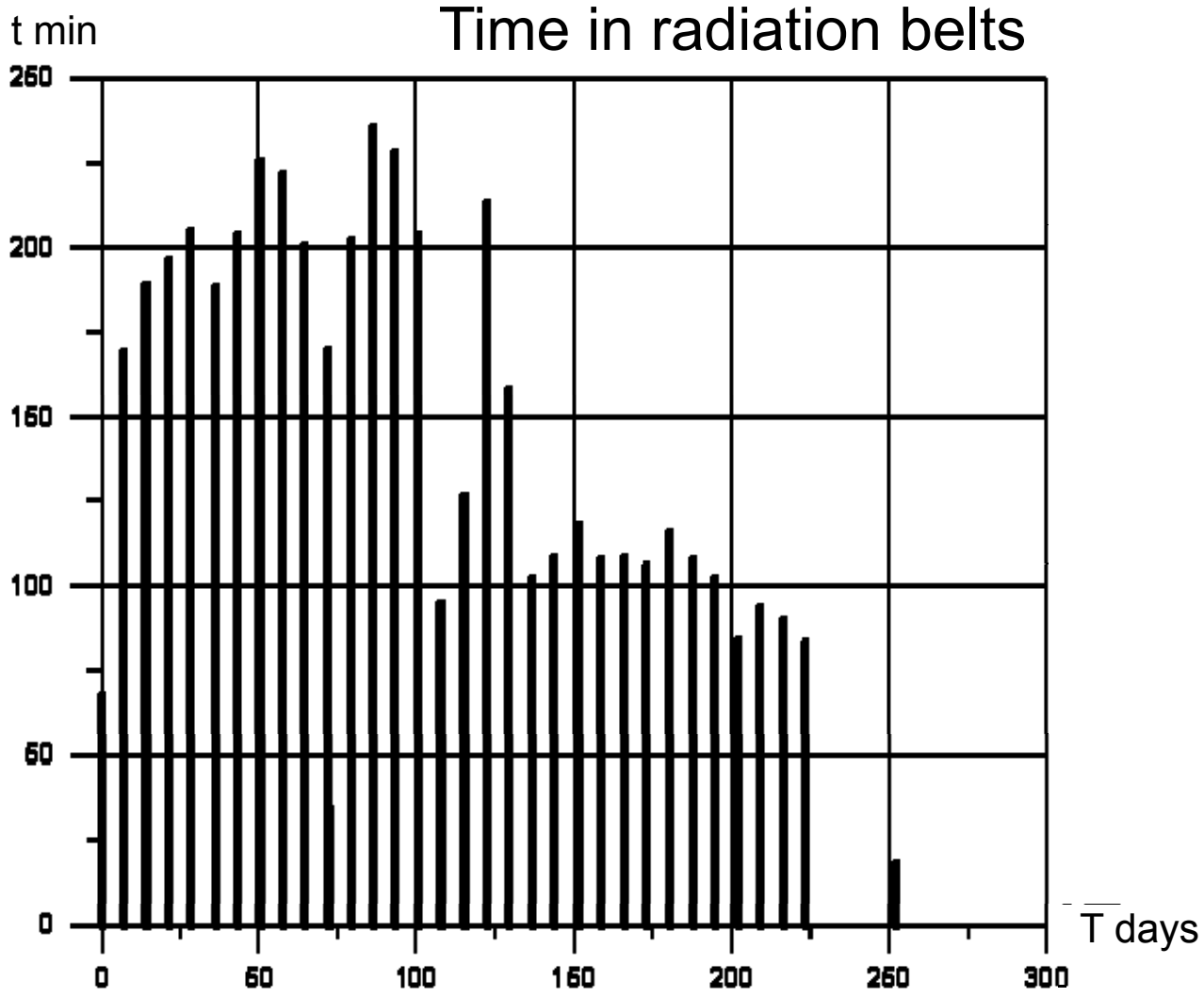
GAMMA-400 LAUNCHING SCHEME



ORBIT EVOLUTION



Orbit evolution



GAMMA-400 PROJECT SCHEDULE

Included in the Russian Federal Space Program

- Design 2011-2013
- Production 2013-2015
- Testing 2015-2016
- Launch 2017