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L P I

GAMMA-400 gamma-ray telescope construction features

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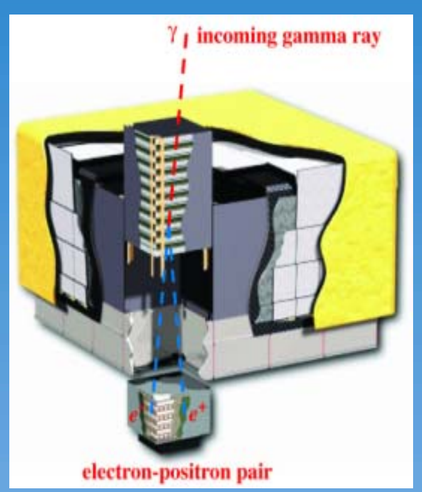
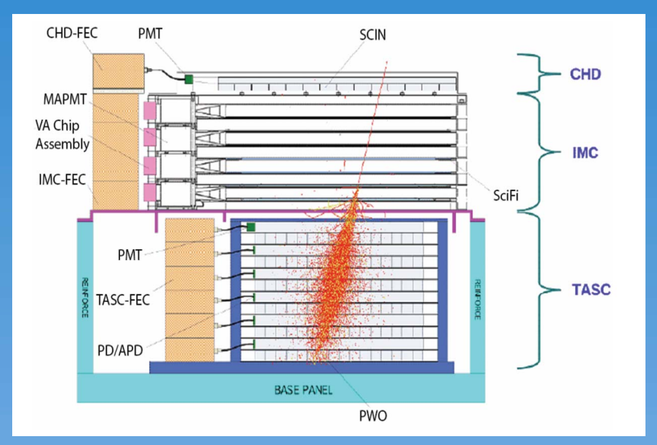
AGILE

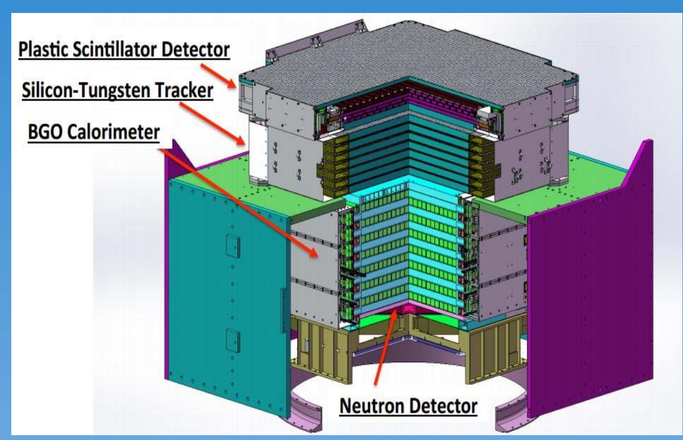
Fermi-LAT
main mode - sky survey



CALET

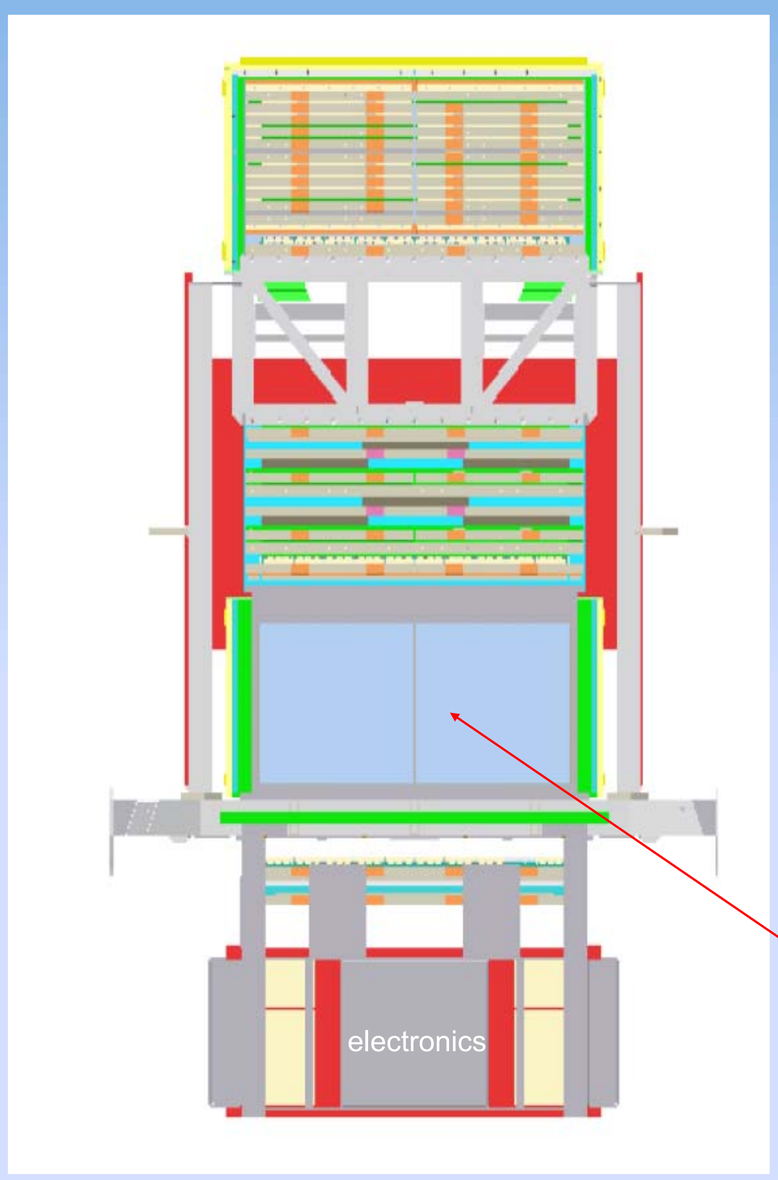


DAMPE

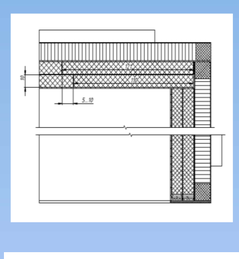


GAMMA-400 gamma-ray telescope

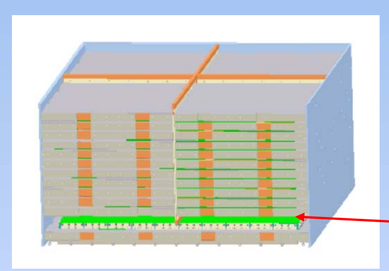
main mode is point source (region of interest) observation



Main systems

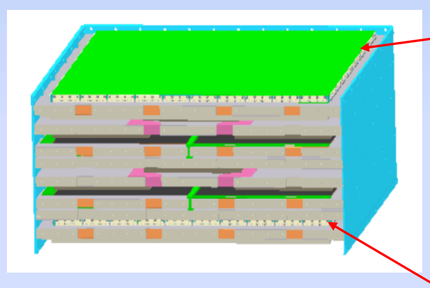


AC
double layer thickness 10×2 mm, overlay 5 –10mm
Efficiency of 0.999995



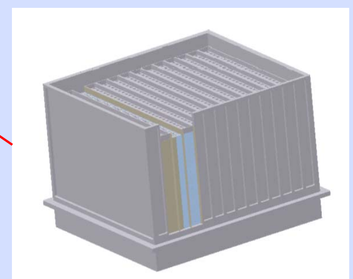
Converter-tracker
- The single-sided SSDs strips with 80 μm pitch,
- 13 pair SSD (X, Y)
- 7 paired layers (W 0.1 radiation lengths)
- 4 paired layers (W 0.02 radiation lengths)
- Last 2 paired layers no W.
- **Analog readout**

TOF
- C1 upper counter - two layers of fast plastic scintillators
- C2 upper counter - two layers of fast plastic scintillators
- distance C1 – C2 500 mm



CC1 imaging calorimeter
- Two super layers
- CsI(Tl) 20 mm + Si strip detectors X,Y SSD pitch 80 μm)
- 2 radiation lengths

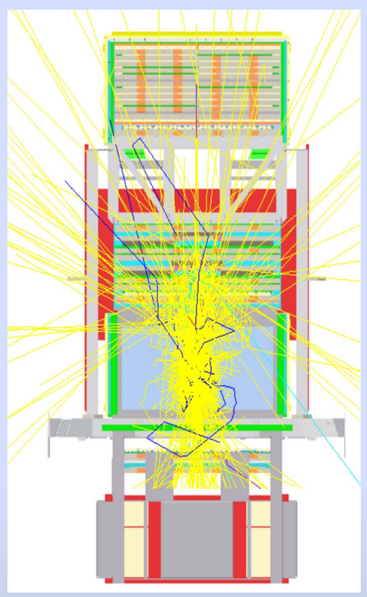
C3 calorimeter trigger counter
two layers of fast plastic scintillators



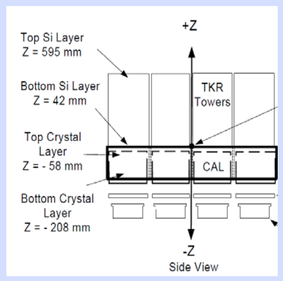
CC2 electromagnetic calorimeter
CsI(TL)crystals 20 radiation lengths
- The total vertical depth of the calorimeter is **22 radiation lengths**
- e/p rejection ~5x10^5

GAMMA-400 more deep calorimeter allows more precisely determine the shower axis and, therefore, in the reconstruction of the track to reduce the number of hits strips (noise) - and thereby improve the angular resolution (0,01°)
- improve energy resolution (1%)
- improve proton rejection (10^5)
- additional possibilities – observations lateral direction

Backsplash effect from gamma-quantum of 30 GeV



Backsplash influence in GAMMA-400 significantly reduced
Distance from calorimeter crystal CsI to bottom tracker SSD
Fermi-LAT **10 cm**, GAMMA-400 **110 cm**.

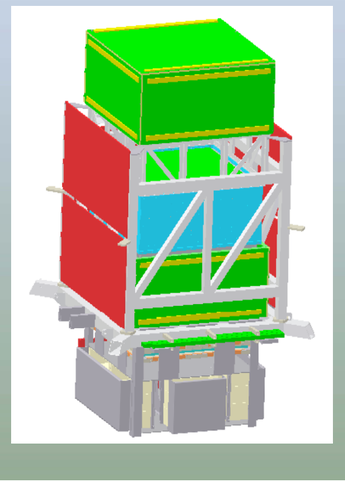


GAMMA-400 trigger system (fast signal)
- TOF
- VETO ACD
- S3 (LO or HI)

The time between a particle interaction in the LAT that causes an event trigger and the latching ~50 ns)

Fermi-LAT (slow signal)
The time between a particle interaction in the LAT that causes an event trigger and the latching ~2.5 μs)

- Gamma-400 - further development of gamma-ray telescopes after Fermi-LAT in energy range 20 MeV-10 TeV.
- allow to measure astrophysical objects with qualitatively new parameters in the field of high-energy, the angular resolution of 2 - 10 times better energy resolution of 5 - 10 times better
- In this range parameters GAMMA-400 is also superior being developed ground gamma telescopes CTA angular resolution 10 times, energy resolution 5 - 10 times.
- Allow a search for traces of decay and annihilation of particles of dark energy



According to the Russian Federal Space Program 2016-2025 GAMMA-400 continues to be funded by Roscosmos and the GAMMA-400 space observatory is scheduled to launch in 2025-2026