All-sky **M**edium **E**nergy **G**amma-ray **O**bservatory

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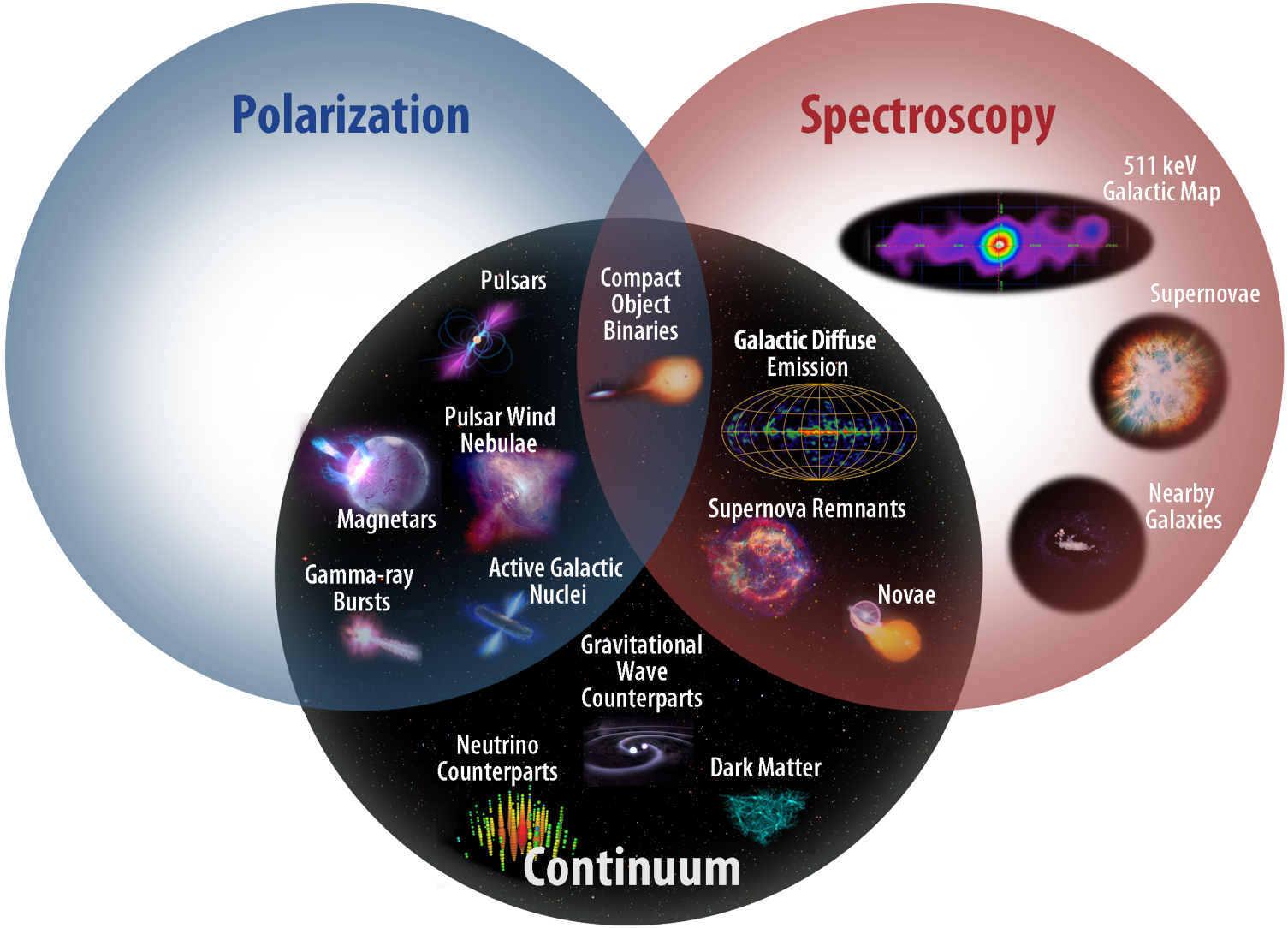
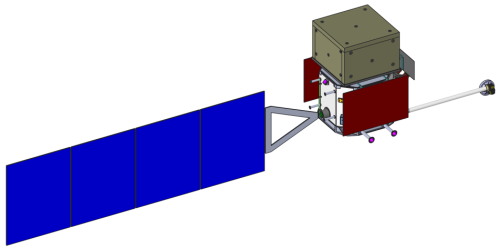
on behalf of the AMEGO team:

NASA/GSFC, G. Wash. Univ., Clemson Univ., NRL, UC Berkeley, Wash. Univ., UNH, NASA/MSFC, UAH, USRA, OSU, UIUC, UNLV, UDel, UCSC, SLAC, Stanford, UNF, Yale, RICE, INFN, Pisa Univ., Padova Univ., Stockholm Univ., INAF, LIP, Udine Univ., Rome Univ., CSNSM

A Gamma-ray Discovery Mission in the MeV Band



What is AMEGO?

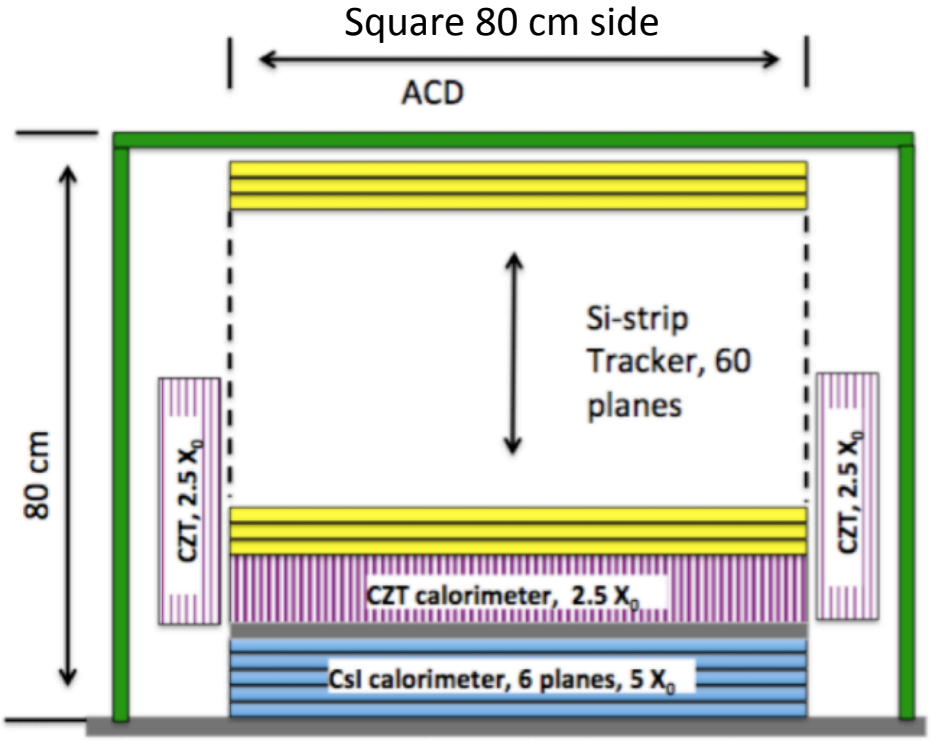
- From ComPair  to AMEGO
- ComPair was a Compton-Pair telescope mission designed to Explorer scale (e.g. Swift).
  - Optimized for continuum medium-energy science with a wide field of view. Very limited in line spectroscopy and polarization capabilities.
- AMEGO is designed to “Probe” scale (larger cost cap, e.g. Fermi).

Why a Probe?

- Suitable for broad observatory science.
- Allows expansion of ComPair mission design, opening additional energy range and science capabilities.
- NASA will support 4-5 probe studies as inputs to the next National Academy decadal survey.
  - AMEGO probe study proposal submitted November 2016
  - Results will be announced later this month.

Instrument Concept

Si Tracker
DSSD in 60 layers with 1 cm spacing. Strip pitch 0.5 mm.



Anticoincidence Detector
Plastic scintillator shell for charged particle rejection.

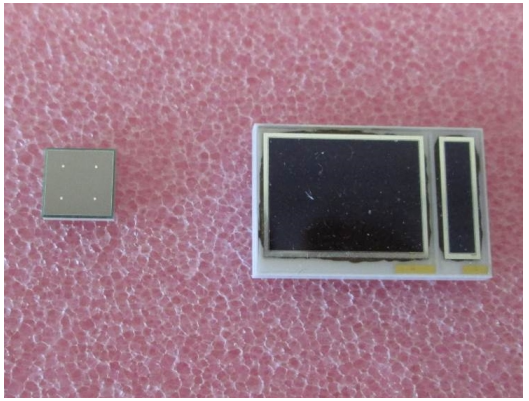
CZT Calorimeter
Drift configuration with single layer array of 0.6 cm x 0.6 cm x 2 cm bars surrounding lower tracker layers.

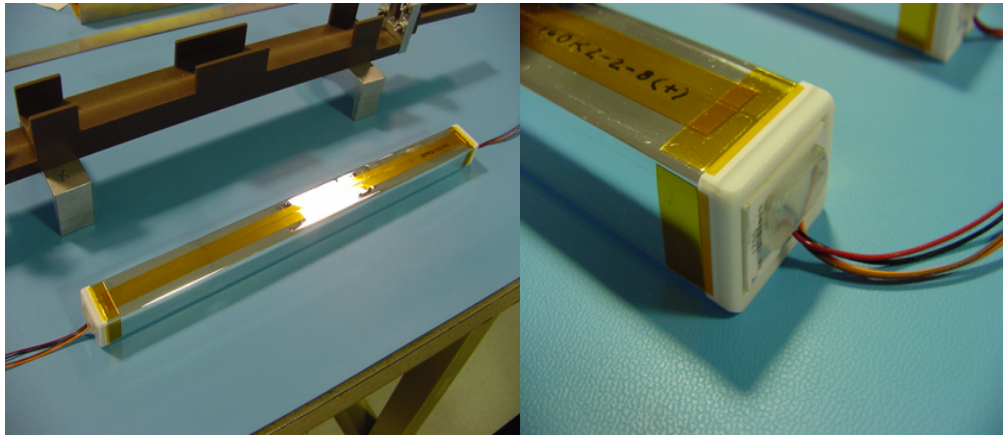
CsI Calorimeter
Hodoscopic arrangement of 1.5 cm x 1.5 cm CsI bars in 6 layers with SiPM sensors.

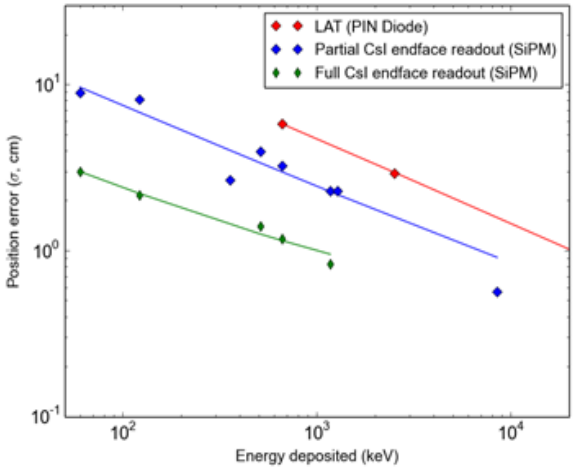
Mission and spacecraft design can build on development for ComPair

CsI Calorimeter

- Enhance LAT calorimeter configuration with use of SiPMs in place of photodiodes
  - Enhanced spatial and energy resolution

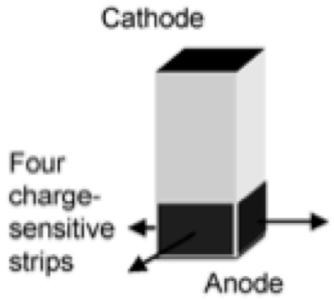


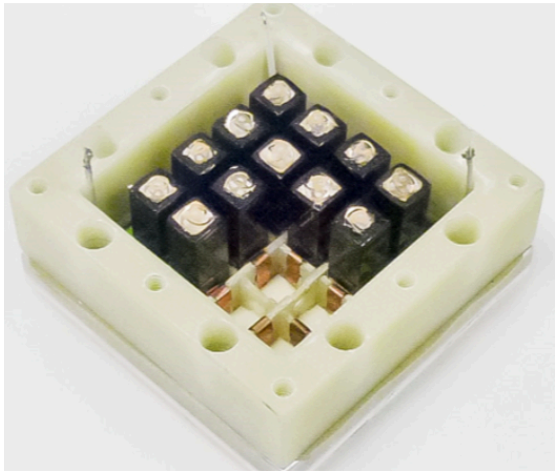




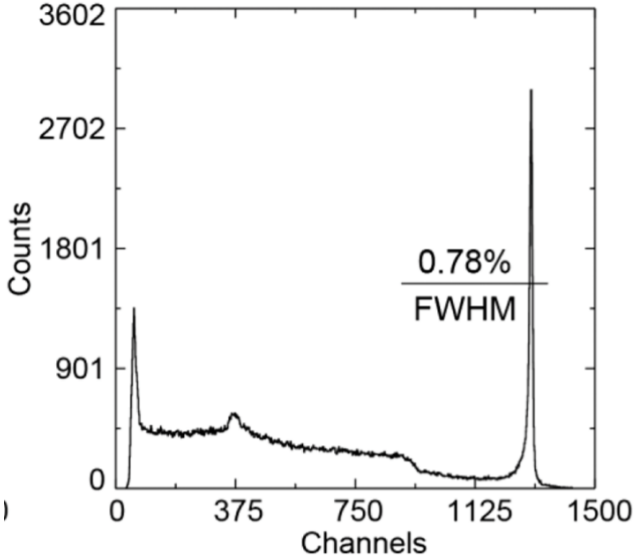
High Resolution CZT calorimeter

Following work at BNL (A. Bolotnikov+ 2014), testing 3D segmented CZT drift detector, array of 0.6 cm x 0.6 cm x 2.0 cm CZT bars in Frisch-grid configuration.





Single bar at 662 keV

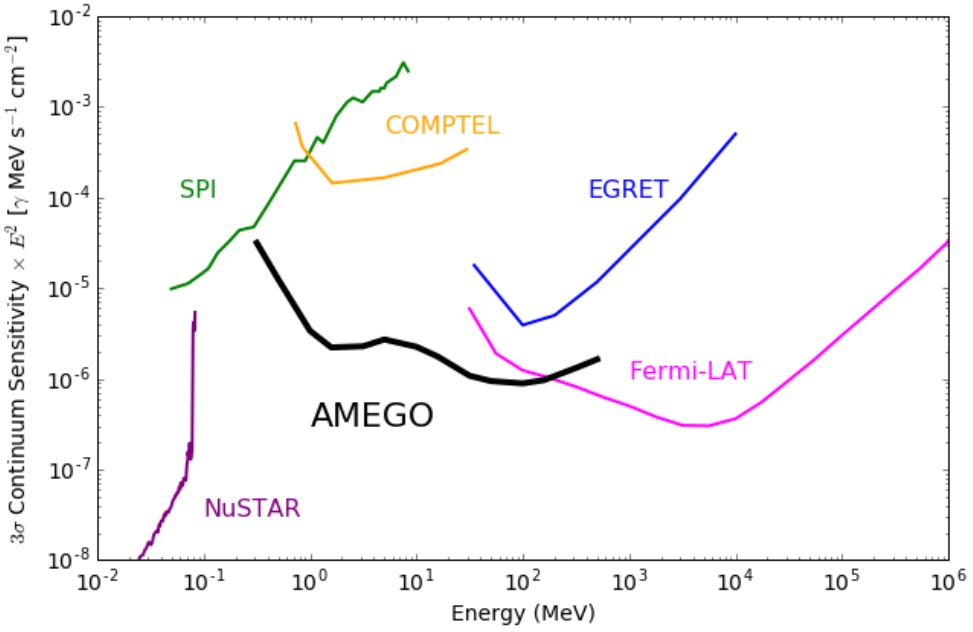


Reduces number of channels required while retaining good energy resolution.
Relaxes requirements on crystal purity by using charge loss correction.

Energy resolution approaching 1-2% dE/E.
Virtual voxels as small as 0.1 mm

Performance

Sensitivity



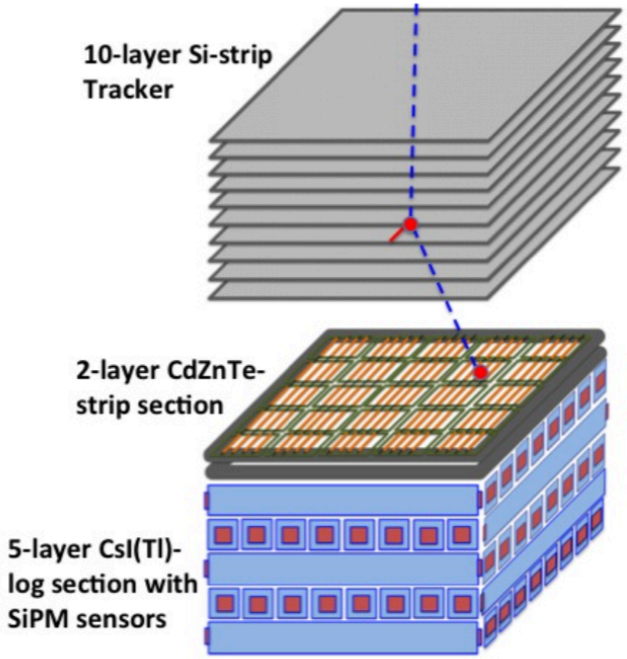
Goals

- >20x COMPTEL
- 200 keV - >10 GeV
- Angular Res.
  - 3° (1 MeV)
  - 10° (10 MeV)
  - 1.5° (100 MeV)
- FOV > 2.5 sr

Current NASA support

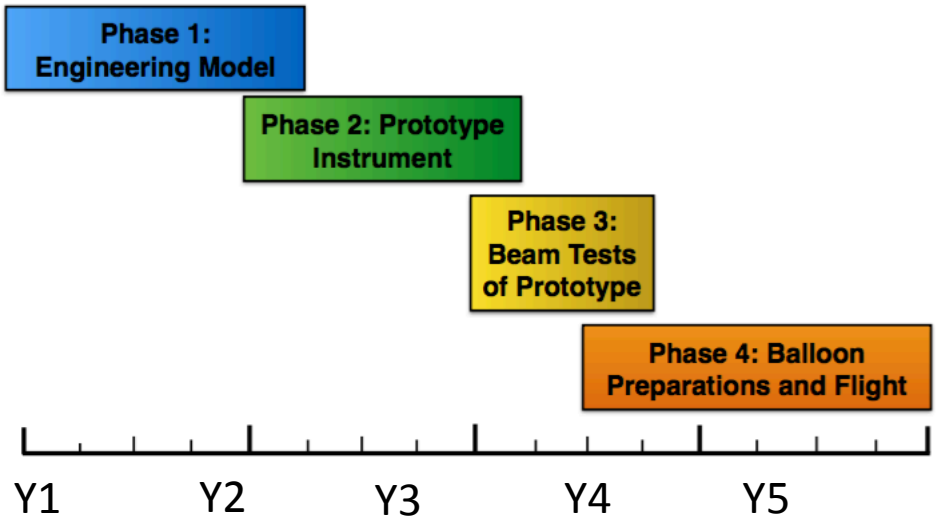
- 5-year award to build a prototype, conduct beam testing and fly as a balloon payload.
- Additional funding supports CZT calorimeter development.
- Additional funding supports CsI calorimeter development.

Prototype Concept



Future Plans

- Continue to mature concept and develop simulations and reconstruction algorithms
- Lab testing of subsystem technologies
- Prototype assembly
- Beam test
- Balloon flight



Summary

- AMEGO designed to explore MeV science using high flux sensitivity and wide field-of-view over a broad energy range.
- Results of NASA probe study selection later this month
- Funding to explore calorimeter technology
- Funding for prototype, beam tests and balloon flight

Logo inspiration?