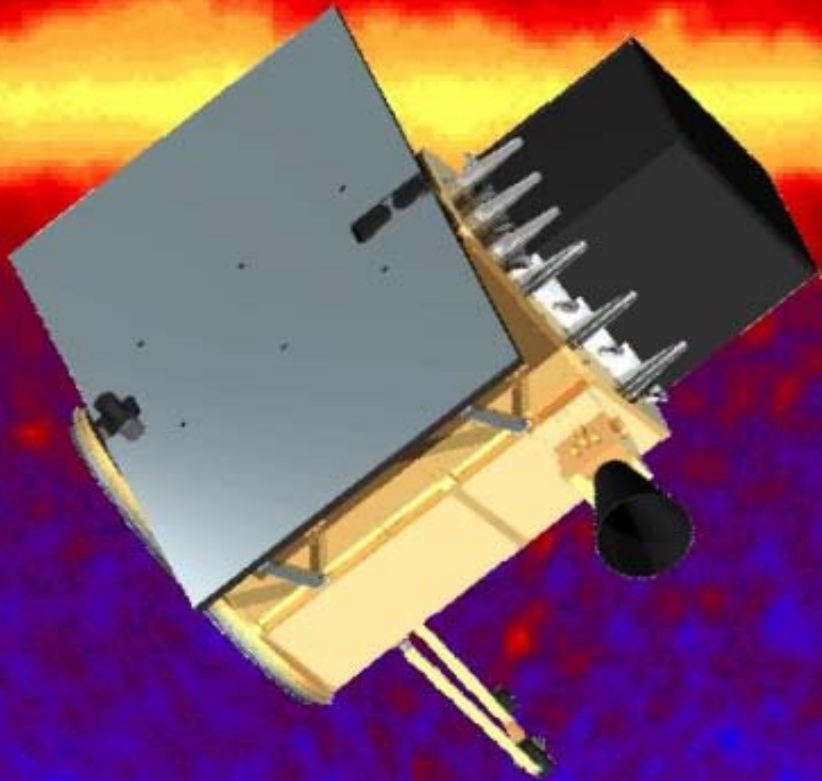


AGILE

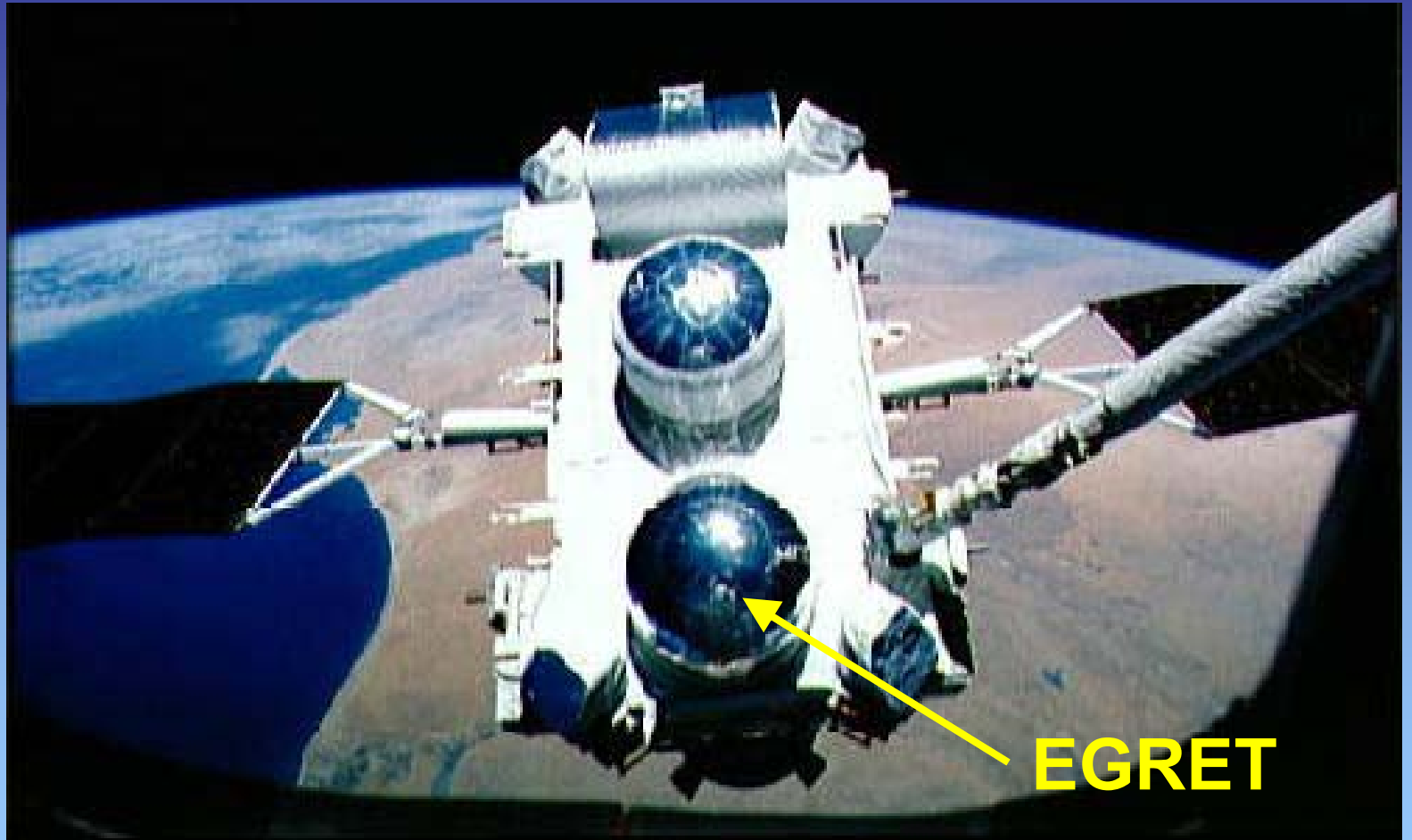
Mini-Workshop, LNF



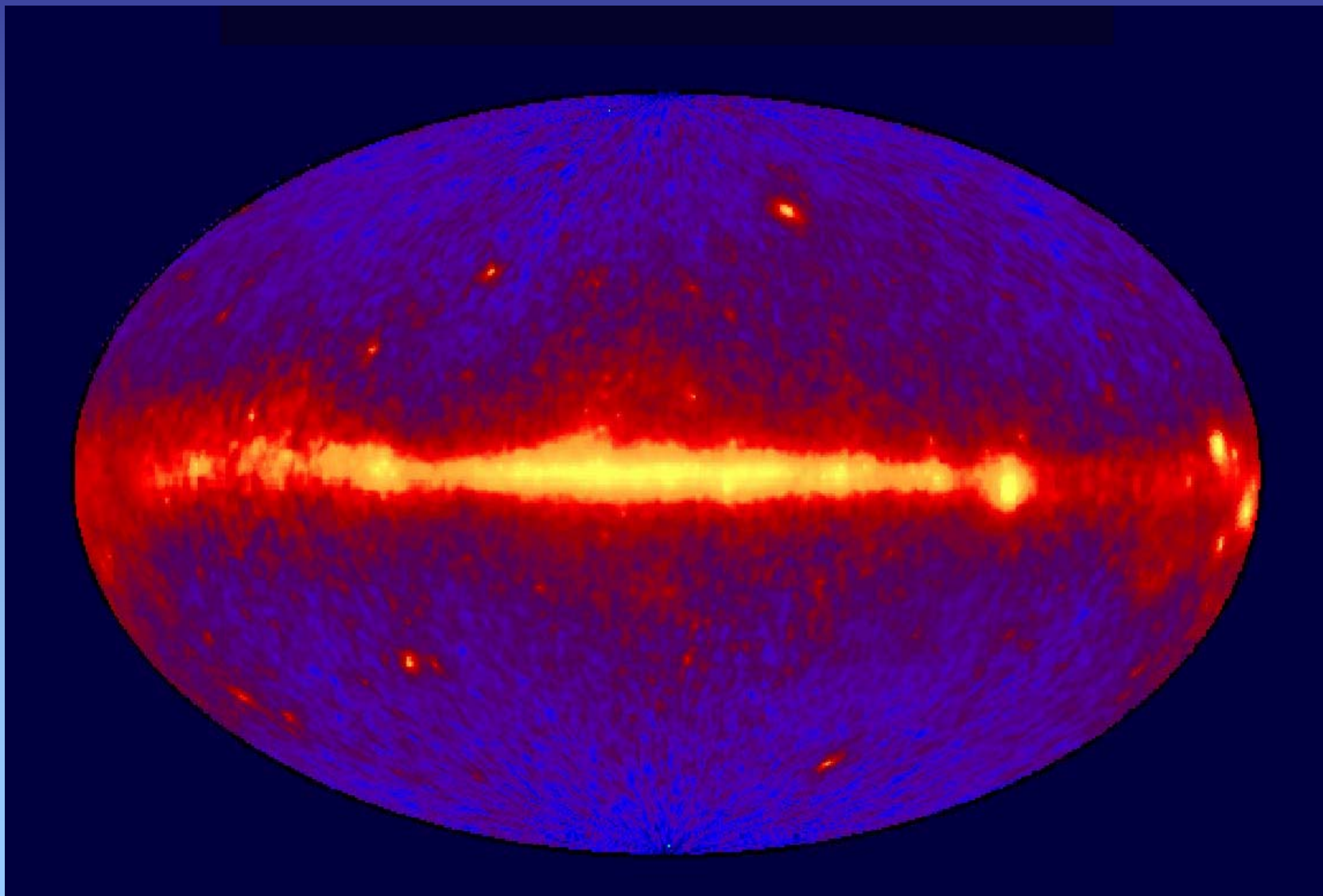
M. Tavani

17 novembre 2005



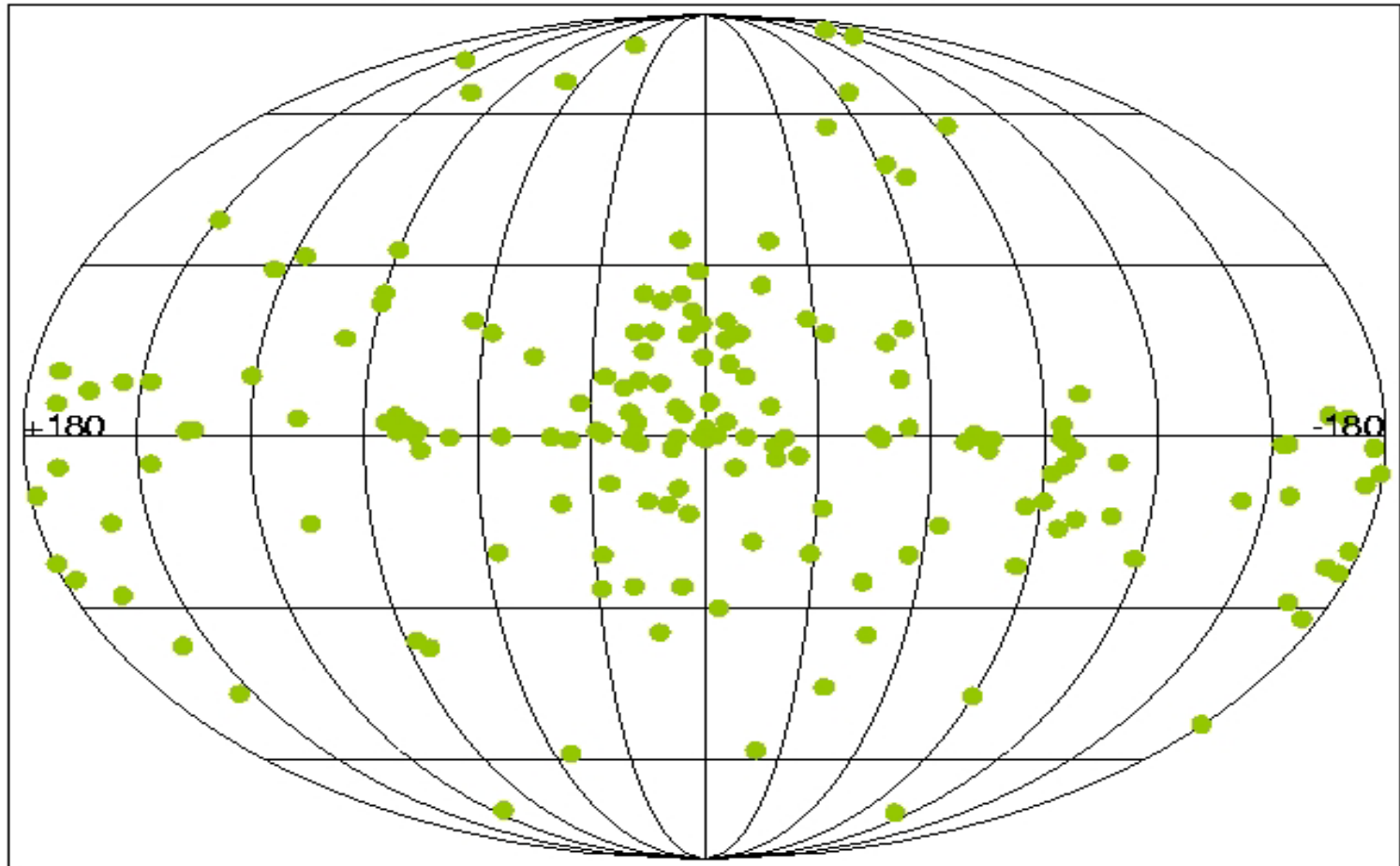


EGRET/GRO gamma-ray sky map, $E > 100$ MeV

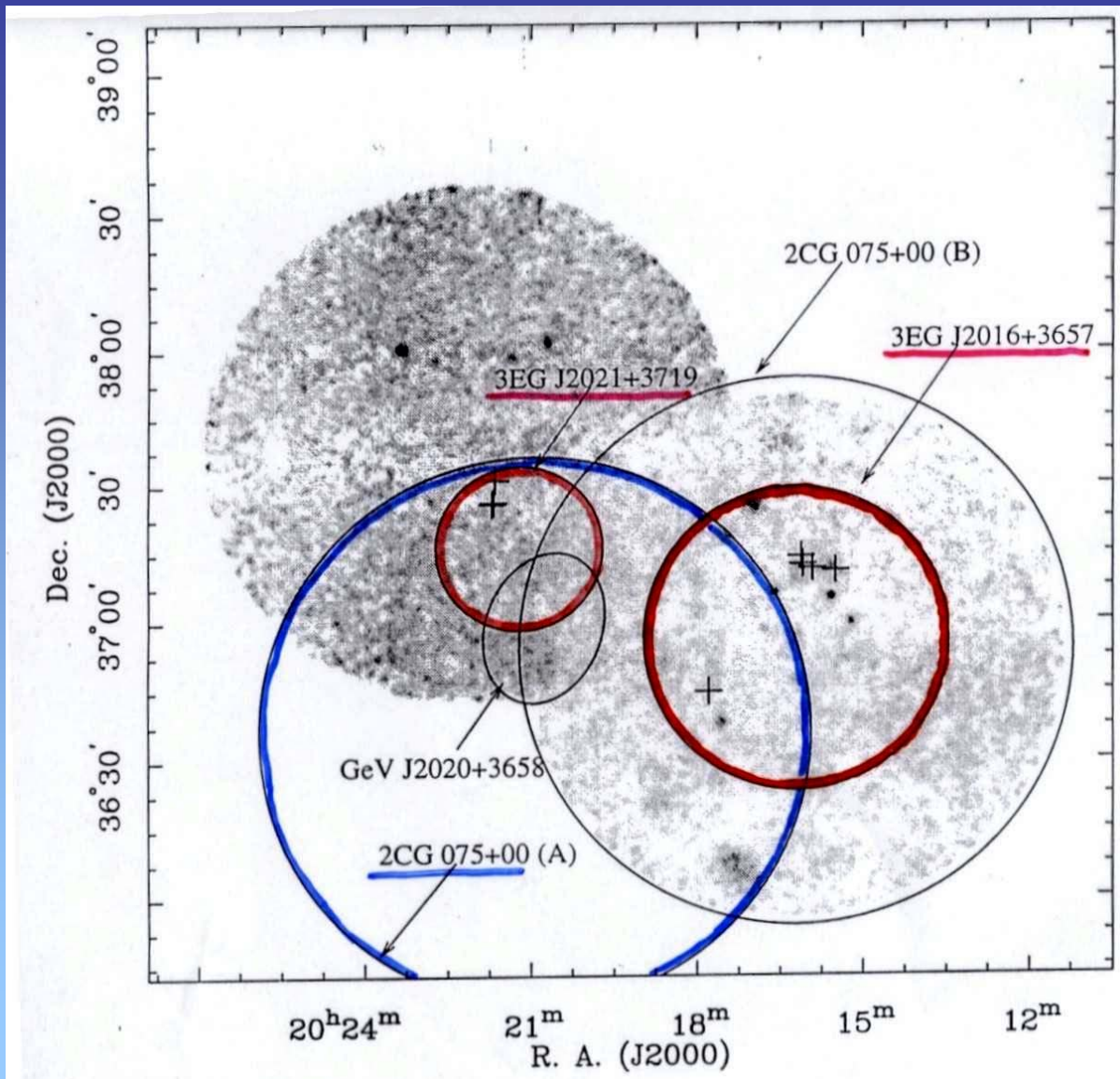


The challenge of the unidentified gamma-ray sources

Sorgenti Gamma non Identificate



Identifications: difficult business...



The future

- **AGILE (2006-2008)**
- **GLAST (2007-2011 and beyond)**

To make progress we need:

- **Excellent gamma-ray imaging with a large Field-of-View**
- **Simultaneous broad-band spectral information**
- **Microsecond timing**
- **Efficient transient detection and alerts**

For both AGILE and GLAST the goal is

“arcminute” γ -ray astrophysics

employing two very different methods:

1. Using the **simultaneous** imaging information in the 15-45 keV and 30 MeV-30 GeV (by AGILE)
2. Using a large collecting area for imaging in the 30 MeV-100 GeV range (by GLAST)

AGILE



*Astro-rivelatore Gamma
a Immagini Leggero*



INAF



Alenia
spazio

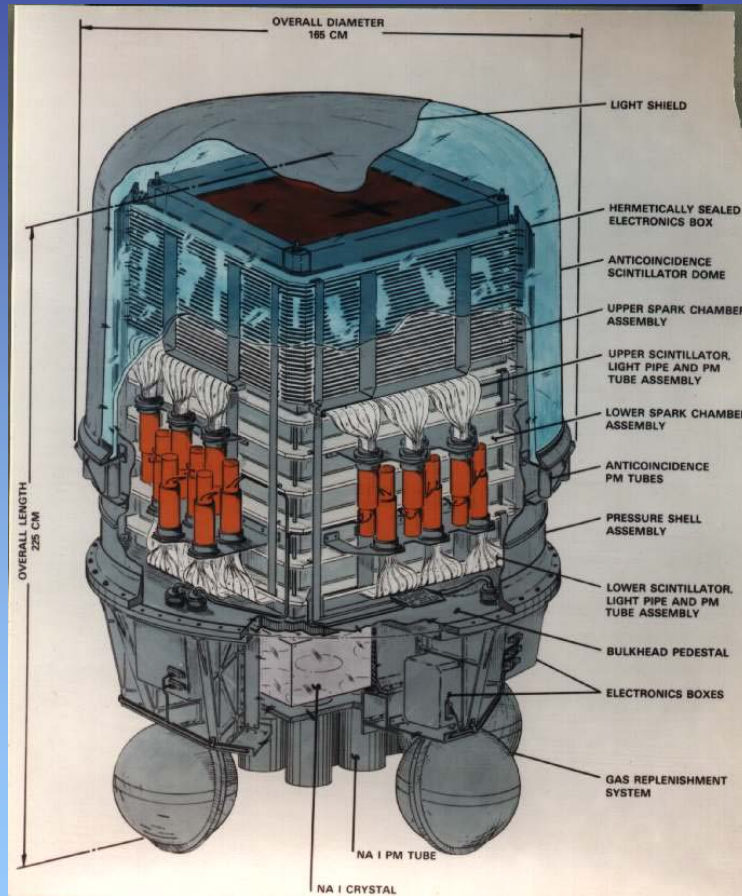


telespazio

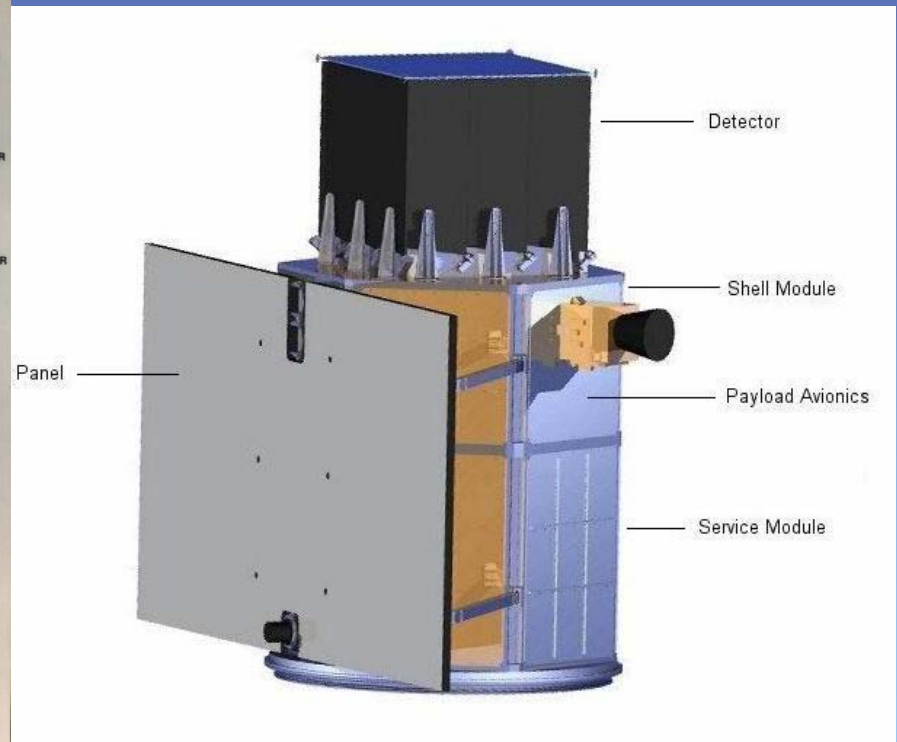


- **AGILE, is a Scientific Mission supported by ASI (Phase B: June 1999) with scientific and programmatic participation by INAF and INFN**
- **Total satellite mass ~ 350 kg**
- **Scientific Instrument mass: 120 kg**

EGRET



AGILE



Scientific Institutes involved in the development of AGILE

PI: M. Tavani (INAF-IASF-Roma e Univ. Tor Vergata)

co-PI: G. Barbiellini (INFN e Univ. Trieste)

- INAF-IASF Milano
- INAF-IASF Bologna
- INAF-IASF Roma
- INFN- Sez. Trieste
- INFN- Sez. Roma I
- INFN- Sez. Roma II
- Università di Trieste
- Università di Roma “Tor Vergata”
- Università “La Sapienza”
- CIFS - Consorzio Interuniversitario per la Fisica Spaziale (Torino)



AGILE Team

- **M. Tavani** (Principal Investigator)
IASF sez. Roma, and Univ. "Tor Vergata"
- **G. Barbiellini** (Co-PI) Università di Trieste, and INFN sez. Trieste
- **A. Argan** INAF-IASF sez. Milano
- **A. Bulgarelli** INAF-IASF Bologna
- **P. Caraveo** IASF sez. Milano
- **A. Chen** CIFS Torino, and INAF-IASF Milano
- **V. Cocco** Università "Tor Vergata", Roma
- **E. Costa** INAF-IASF Roma
- **I. Donnarumma** INAF-IASF Roma
- **A. Del Monte** INAF-IASF Roma
- **G. Di Cocco** INAF-IASF Bologna
- **M. Feroci** INAF-IASF Roma
- **M. Fiorini** INAF-IASF Milano
- **T. Froyland** CIFS Torino, and INFN sez. Roma
- **M. Galli** ENEA sez. Bologna
- **F. Gianotti** INAF-IASF Bologna
- **A. Giuliani** INAF-IASF Milano
- **C. Labanti** INAF-IASF Bologna
- **I. Lapshov** IKI, Moscow, and IASF sez. Roma
- **F. Lazzarotto** CIFS Torino, and INAF-IASF Roma
- **P. Lipari** Università "La Sapienza", and INFN sez. Roma
- **F. Longo** CIFS Torino, and INFN sez. Trieste
- **M. Marisaldi** INAF-IASF Bologna
- **A. Mauri** ENEA sez. Bologna
- **F. Mauri** INFN sez. Pavia
- **M. Mastropietro** IASF sez. Roma

AGILE Team (cont'd)

- **E. Mattaini** INAF-IASF sez. Milano
- **S. Mereghetti** INAF-IASF sez. Milano
- **E. Morelli** INAF-IASF sez. Bologna
- **A. Morselli** Università "Tor Vergata", and INFN sez. Roma
- **L. Pacciani** INAF-IASF Roma
- **A. Pellizzoni** INAF-IASF Milano
- **F. Perotti** IASF sez. Milano
- **P. Picozza** Università "Tor Vergata", and INFN sez. Roma
- **C. Pontoni** CIFS Torino, and INFN sez. Trieste
- **G. Pucella** INAF-IASF Roma
- **M. Prest** INFN sez. Trieste, and Università dell'Insubria (Como)
- **M. Rapisarda** ENEA, sez. Roma
- **E. Rossi** INAF-IASF sez. Bologna
- **A. Rubini** INAF-IASF sez. Roma
- **E. Sant'Ambrogio** INAF-IASF sez. Milano
- **P. Soffitta** INAF-IASF sez. Roma
- **A. Traci** INAF-IASF sez. Bologna
- **M. Trifoglio** INAF-IASF sez. Bologna
- **E. Vallazza** INFN sez. Trieste
- **S. Vercellone** INAF-IASF Milano
- **D. Zanello** INFN sez. Roma, and Università "La Sapienza"

AGILE Payload System Team (AST)

- **A. Zambra** **Payload Manager**
- **G. De Paris** **System Engineer and PA**

- **B. Schena** **Scientific Secretariat, AGILE Team Office**



AGILE Program Office:

F. Viola, G. Guarrera

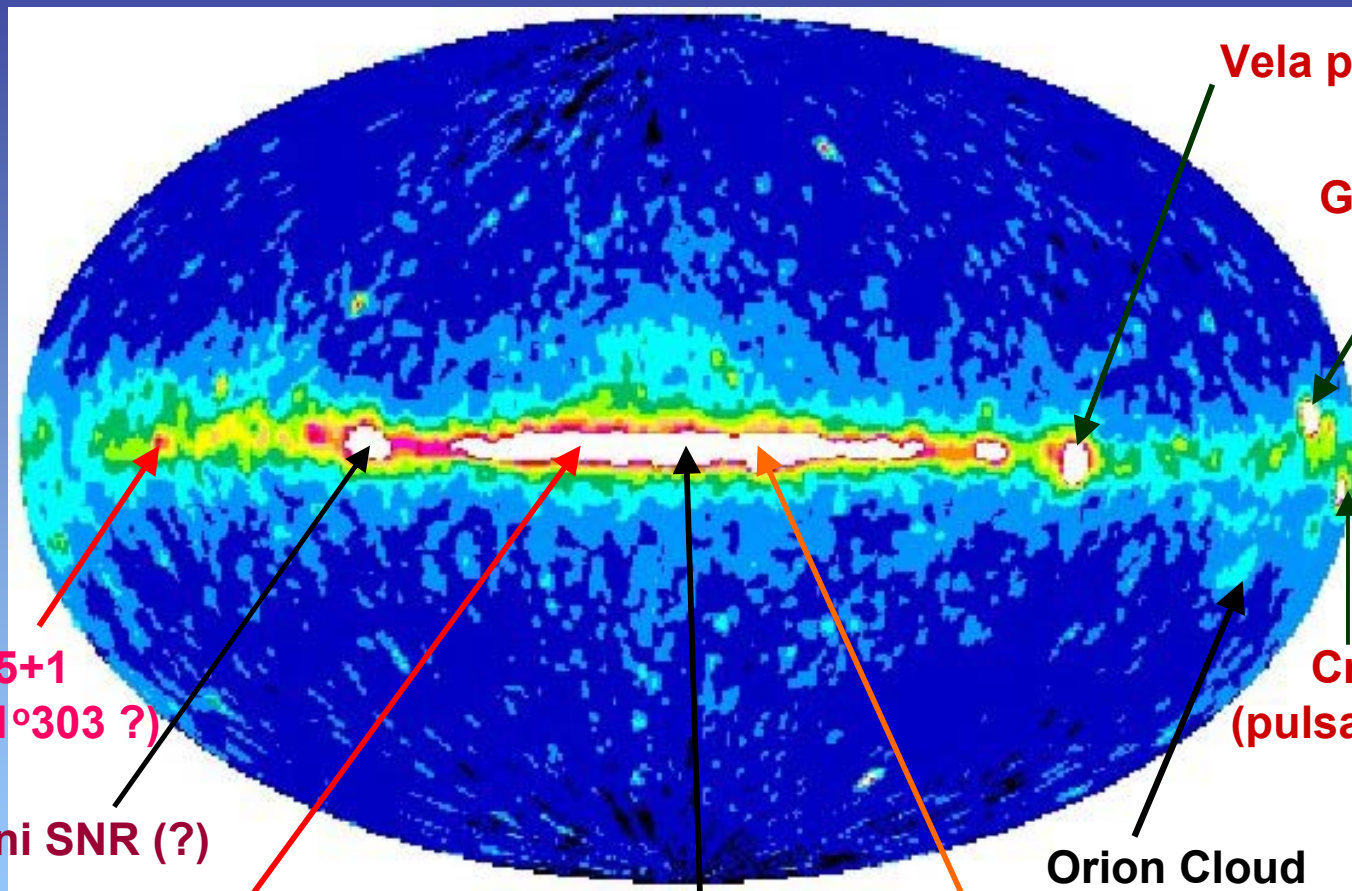
Unità Osservazione dell'Universo:

S. Di Pippo, P. Giommi

Main industrial contractors

- **Carlo Gavazzi Space**
- **Alcatel-Alenia Spazio - Laben**
- **Oerlikon Contraves**
- **Telespazio**

Gamma-ray Galactic Sources (>100 MeV)



Vela pulsar

Geminga

Crab
(pulsar & SNR)

Orion Cloud

SNR RX J1713.7-3946 (?)

Galactic Center

3EG J1837-0423
(unidentified transient)

γ -Cygni SNR (?)

2CG 135+1
(LSI +61°303 ?)

Main industrial contractors

- **Carlo Gavazzi Space**
- **Alcatel-Alenia Spazio - Laben**
- **Oerlikon Contraves**
- **Telespazio**

AGILE science topics

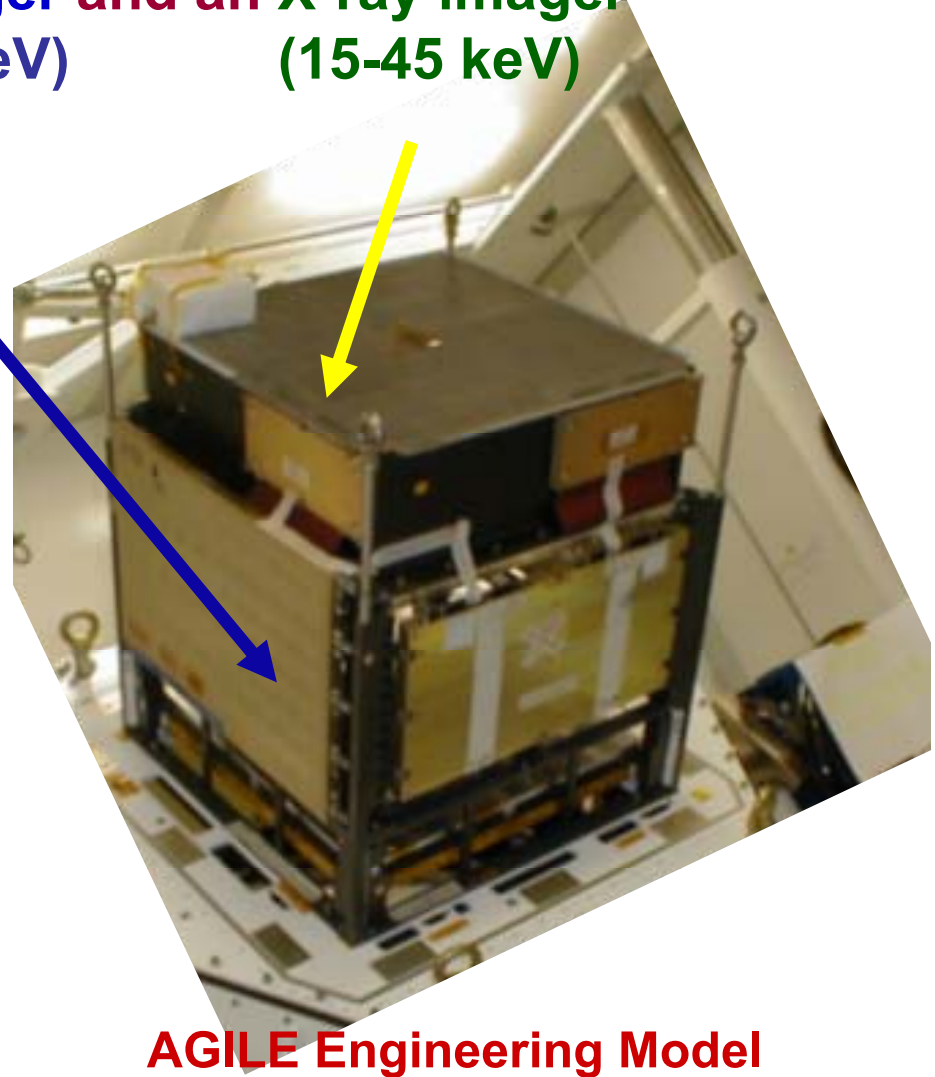
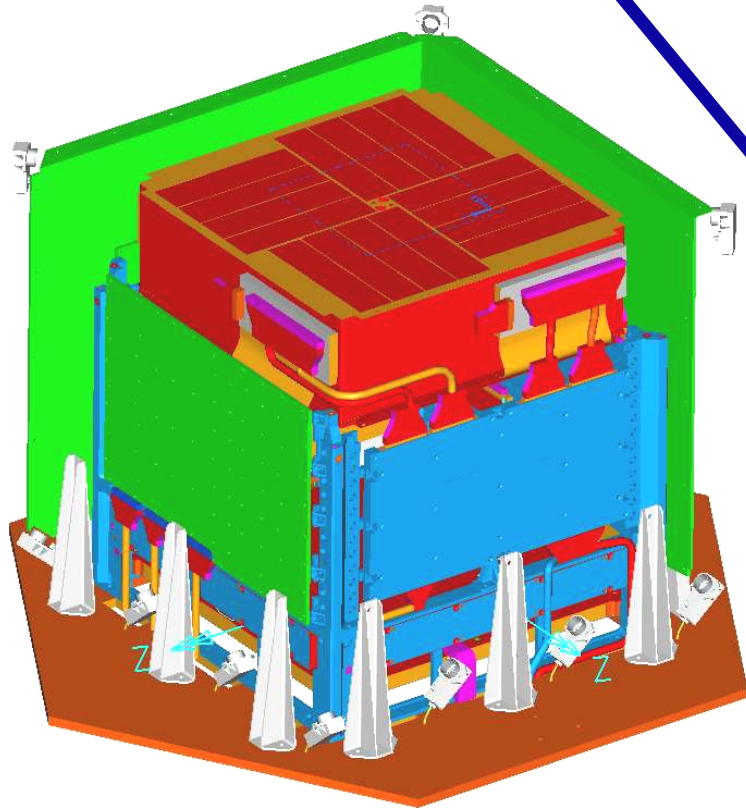
- **Active Galactic Nuclei**
- **Gamma-Ray Bursts**
- **Pulsars**
- **Unidentified TeV sources**
- **SNRs and origin of cosmic rays**
- **Diffuse gamma-ray background**
- **Unidentified gamma-ray sources**
- **Microquasars**
- **Galactic accreting Neutron Stars and Black Holes**
- **Soft Gamma-Ray Repeaters**
- **Fundamental Physics**

Mission Schedule:

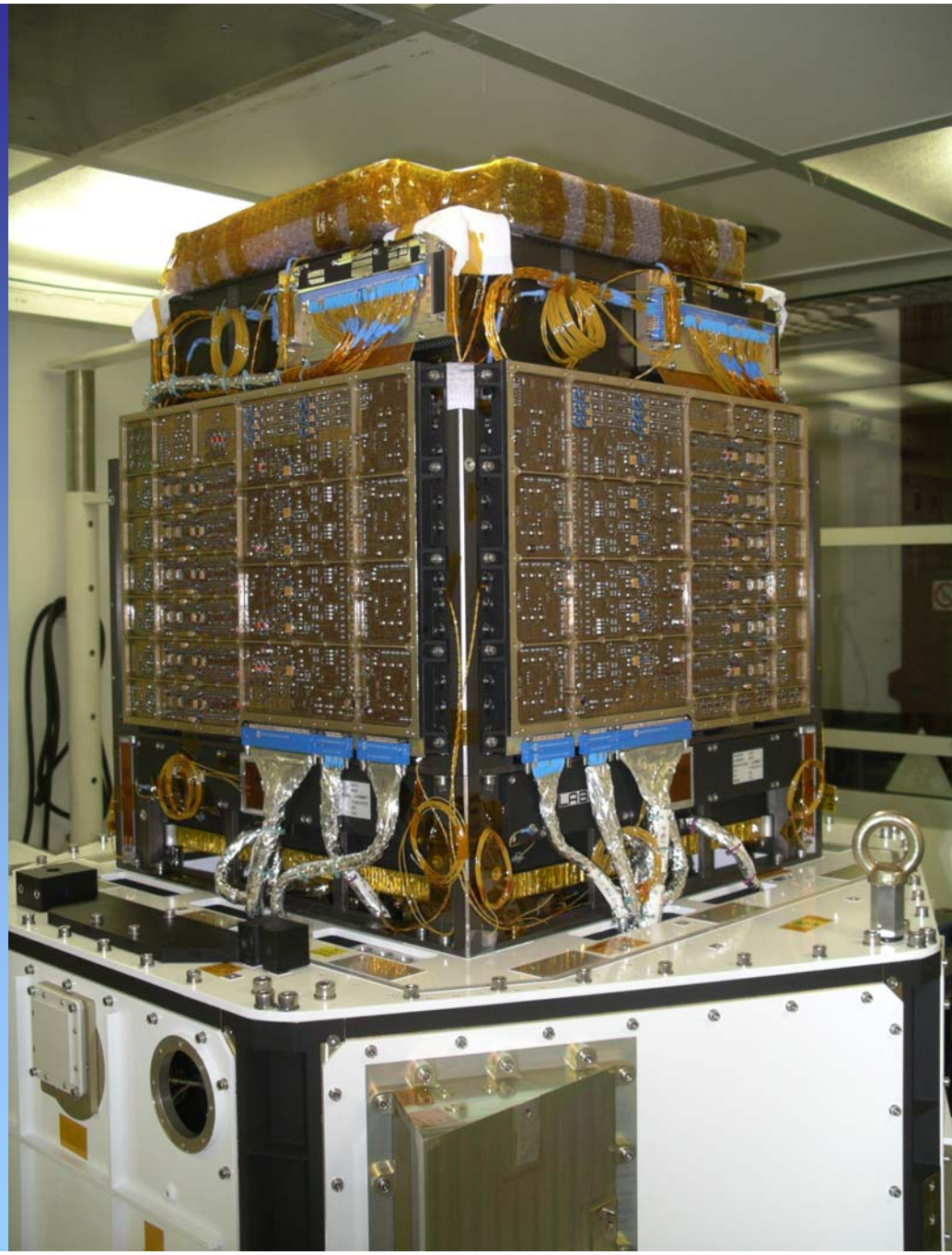
- **Payload AIV completion: October 2005**
- **Instrument calibration at INFN-LNF-BTF: November 2005**
- **P/L qualification & final testing by early Dec. 2005**

- **MITA spacecraft ready by Nov. 2005**
- **AGILE launch (PSLV) campaign: January-February 2006**
- **AGILE in-flight commissioning: March-April 2006**
- **Start of AGILE scientific operations: Summer 2006**

**Agile: FIRST and unique combination
of a gamma-ray imager and an X-ray imager
(30 MeV-30 GeV) (15-45 keV)**



AGILE Engineering Model





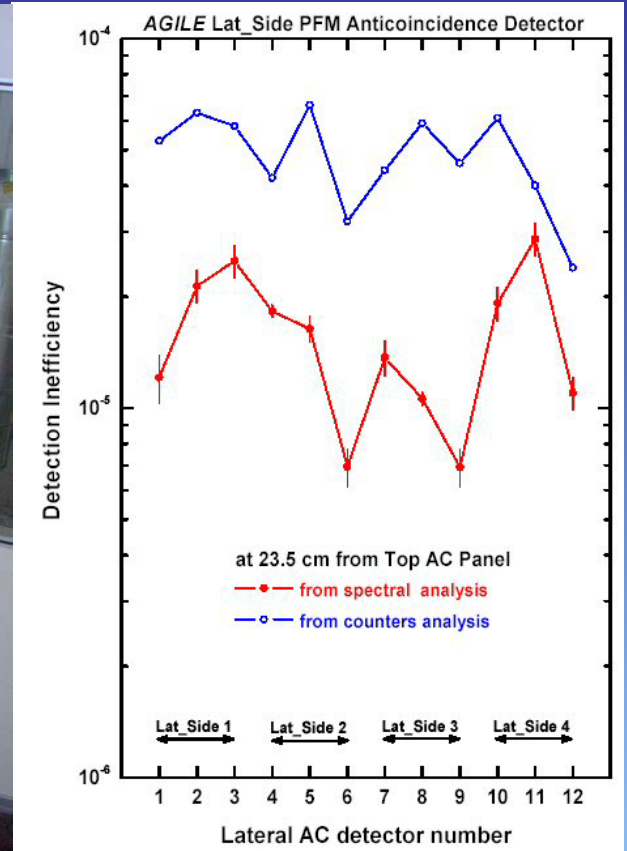
Anticoincidence System

(INAF-IASF-Milano)

AC System (INAF-IASF Milano: F. Perotti et al.)



The AGILE Anticoincidence System developed by INAF-IASF Milano (F. Perotti) during the vibration test campaign (January 2005).

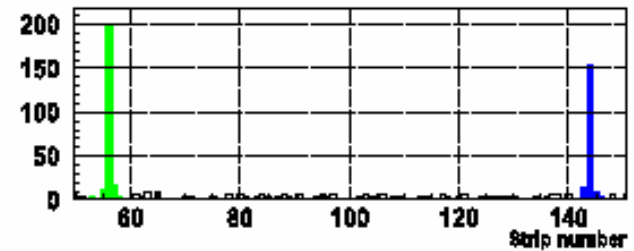
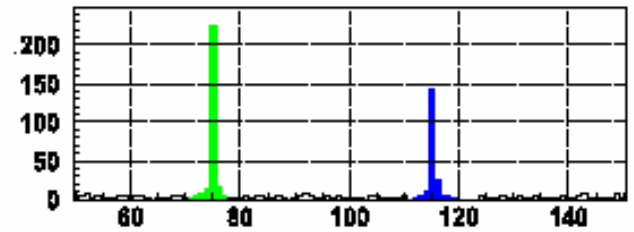
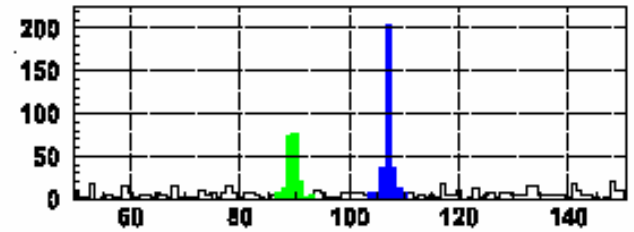
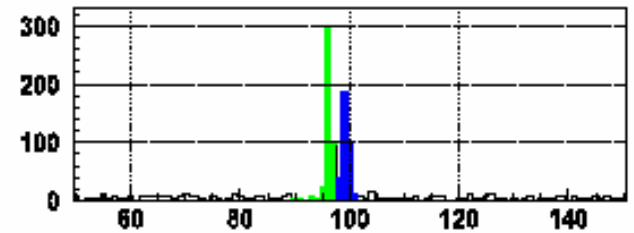
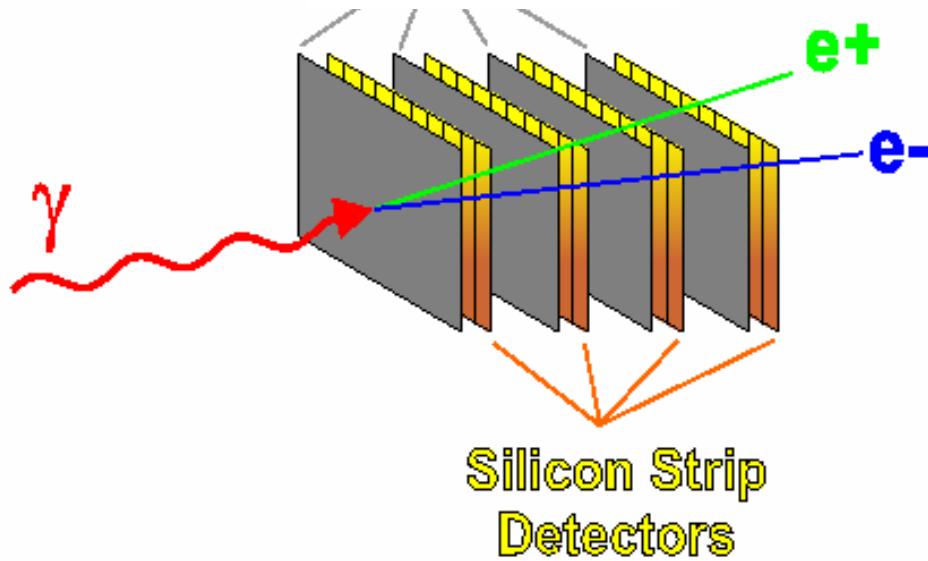


Detection inefficiency of the 12 Lateral_Side AC detectors, measured at 23.5 cm from the top edges along the main axis of symmetry.

Silicon Tracker

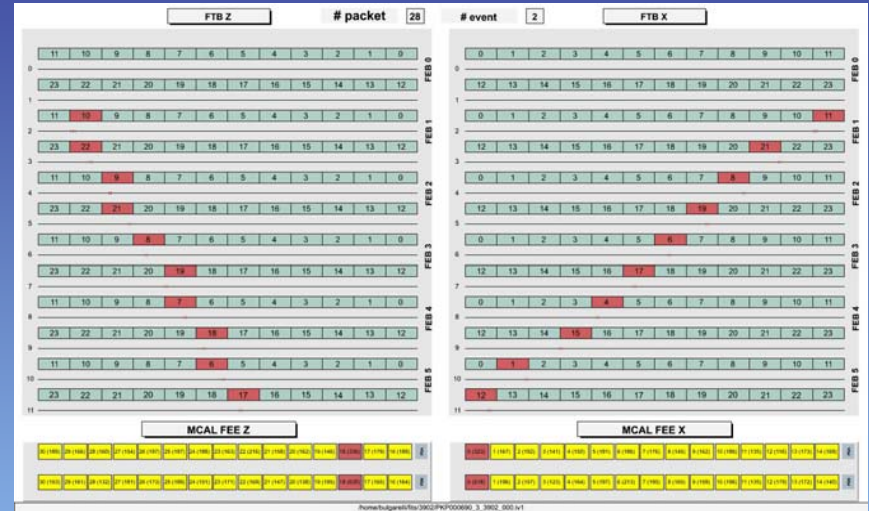
(INFN Trieste e Milano-Como)

Tungsten
absorbers



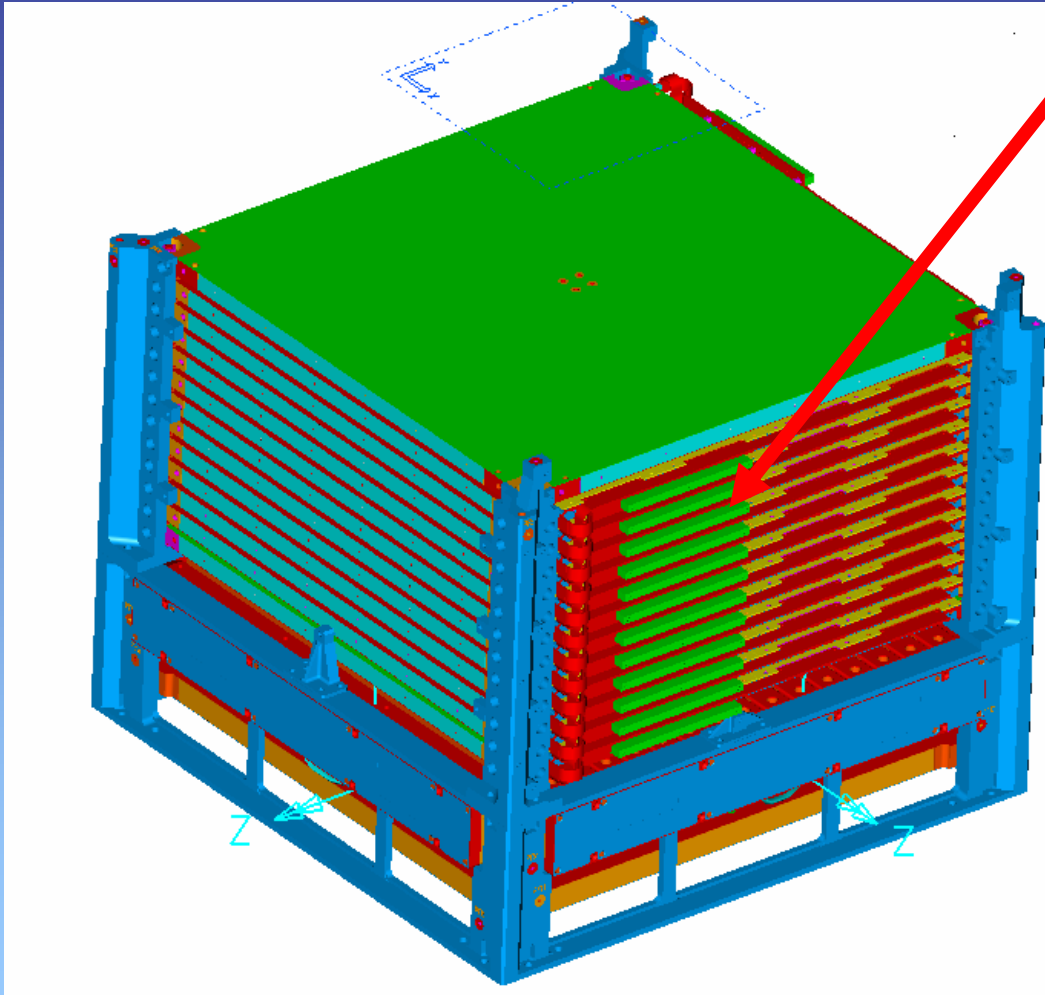


The AGILE Silicon Tracker developed by INFN Trieste (G. Barbiellini, M. Prest) in the MIPOT laboratories before being delivered to LABEN on June 30, 2005.



One of the hundreds of cosmic ray muons interacting every second with the AGILE Tracker and Mini-Calorimeter (August 25, 2005).

SILICON TRACKER



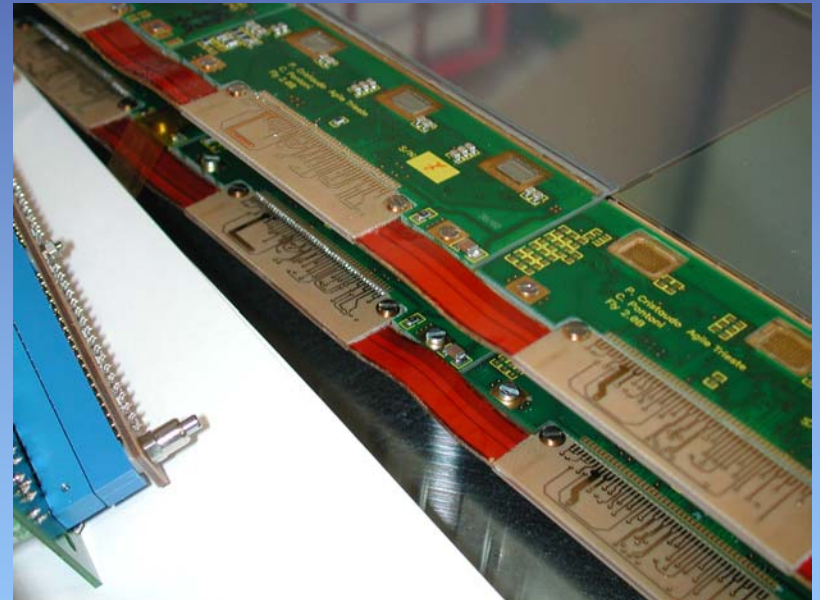
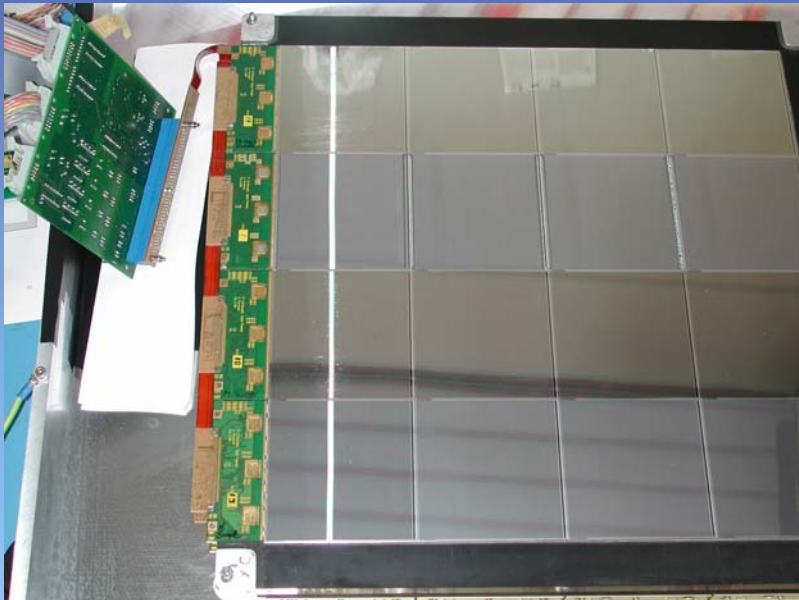
10 planes with
* $0.07 X_0$

* 40 micron
resolution

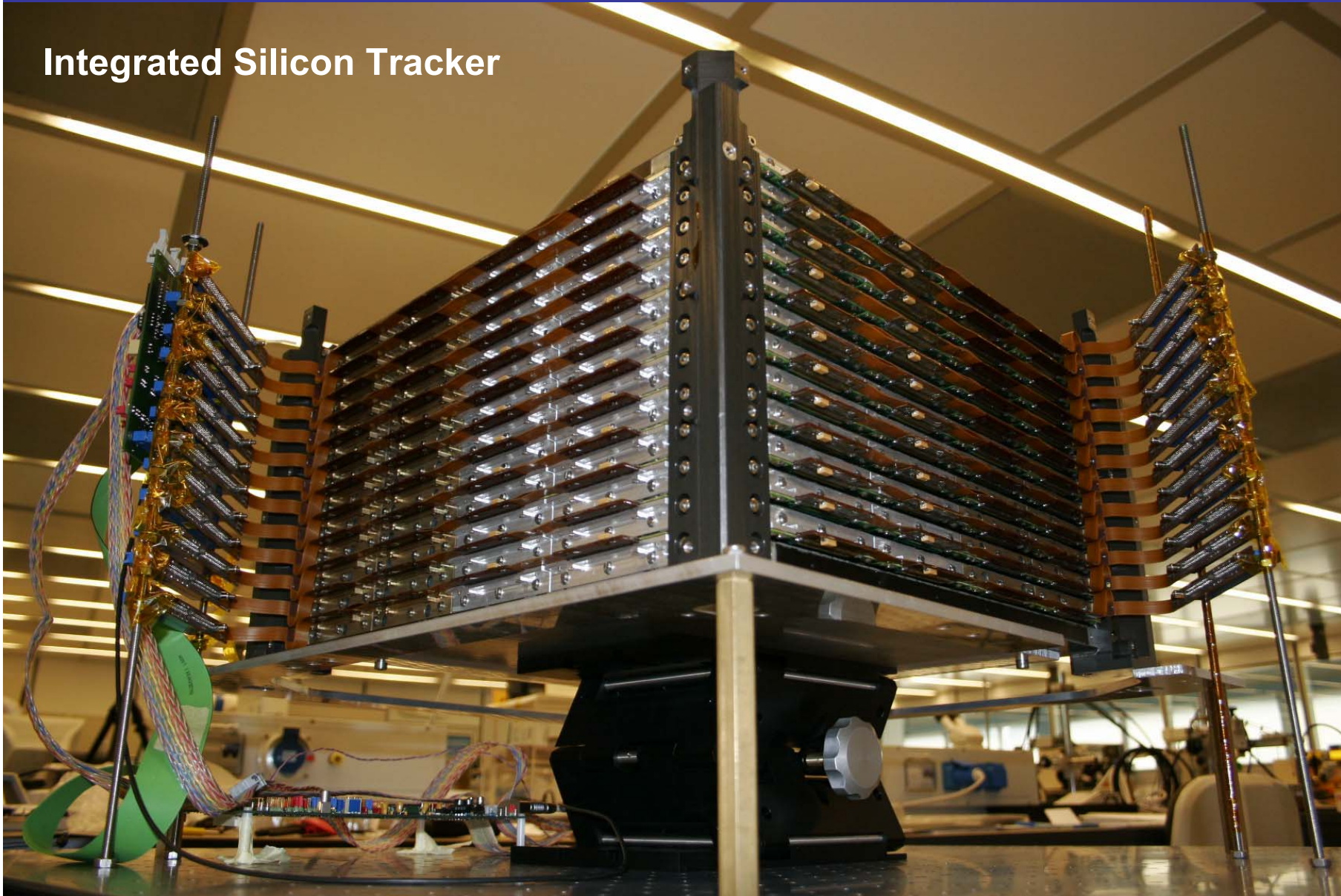
Total: $0.8 X_0$

Silicon Tracker

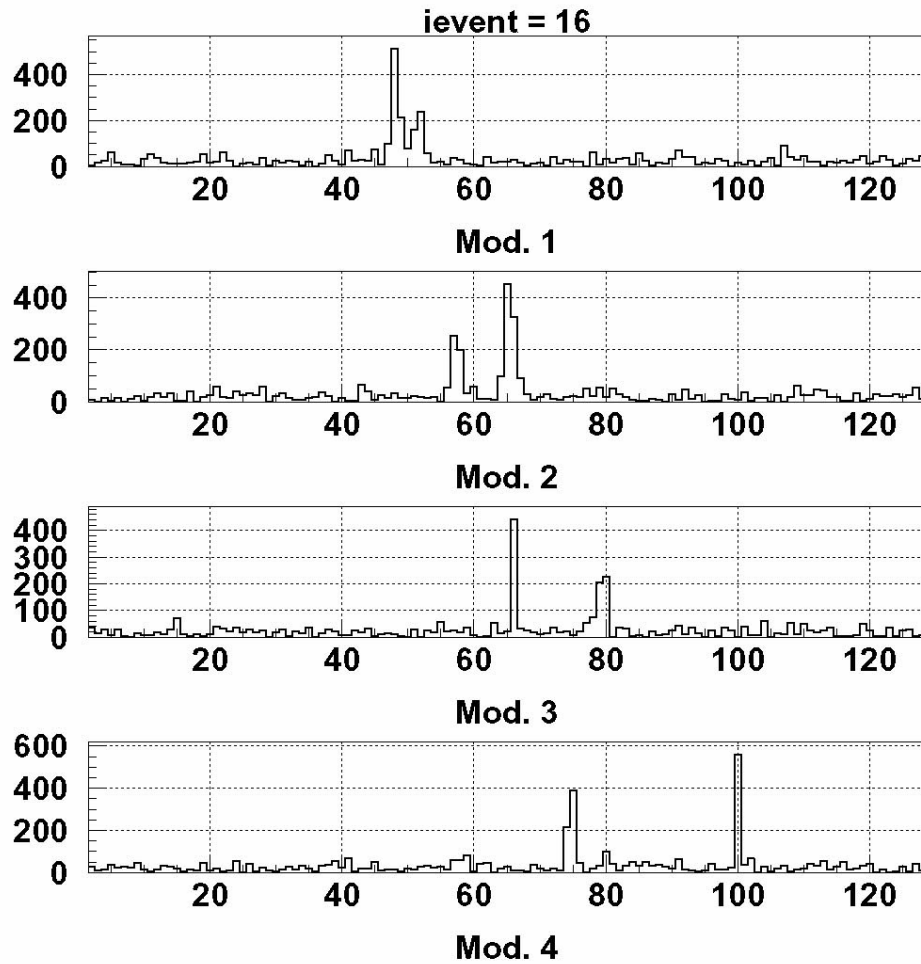
(INFN Trieste: G. Barbiellini, M. Prest, E. Vallazza, et al.)



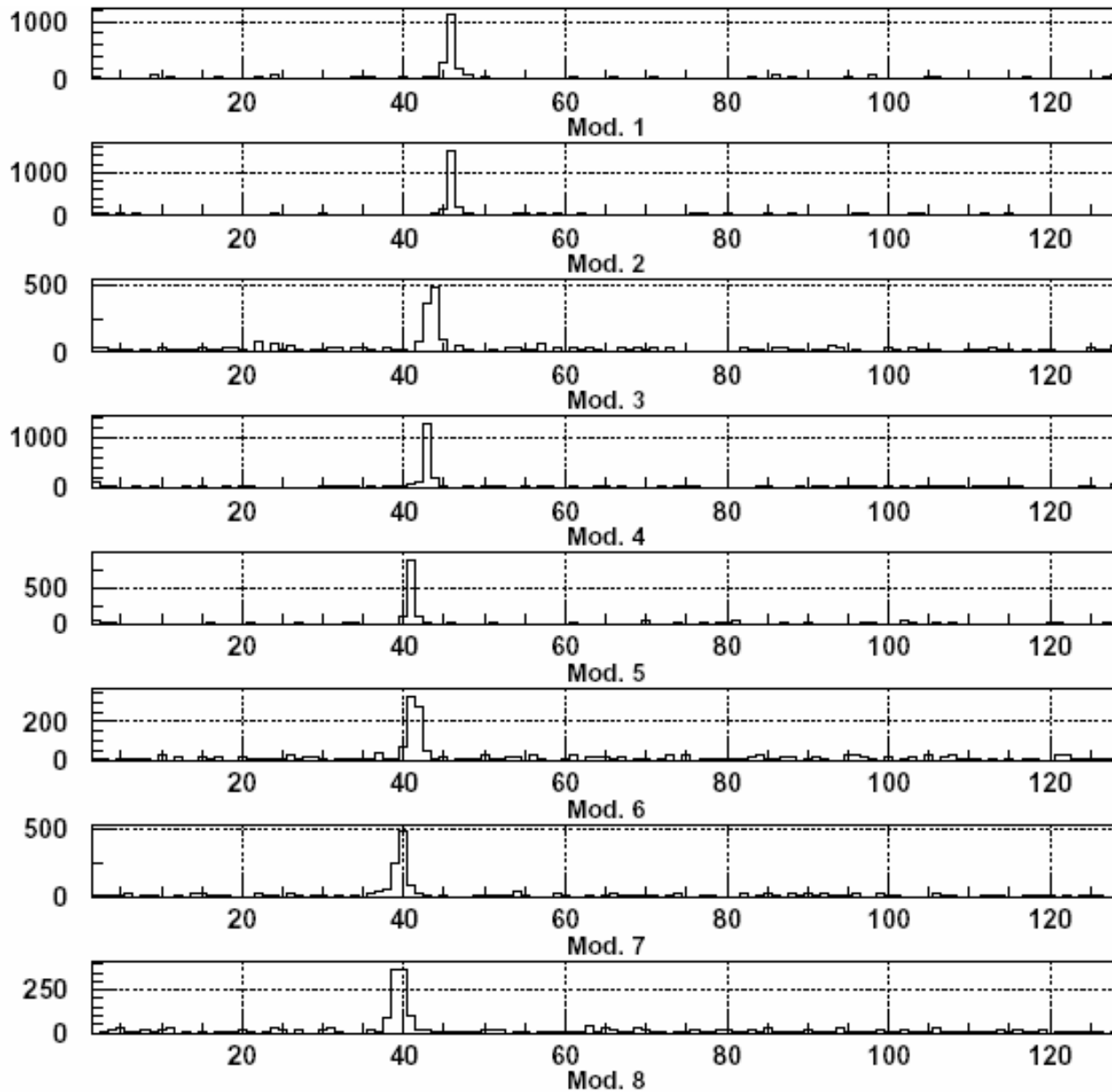
Integrated Silicon Tracker



“first” gamma-ray detected by the AGILE Tracker PFM



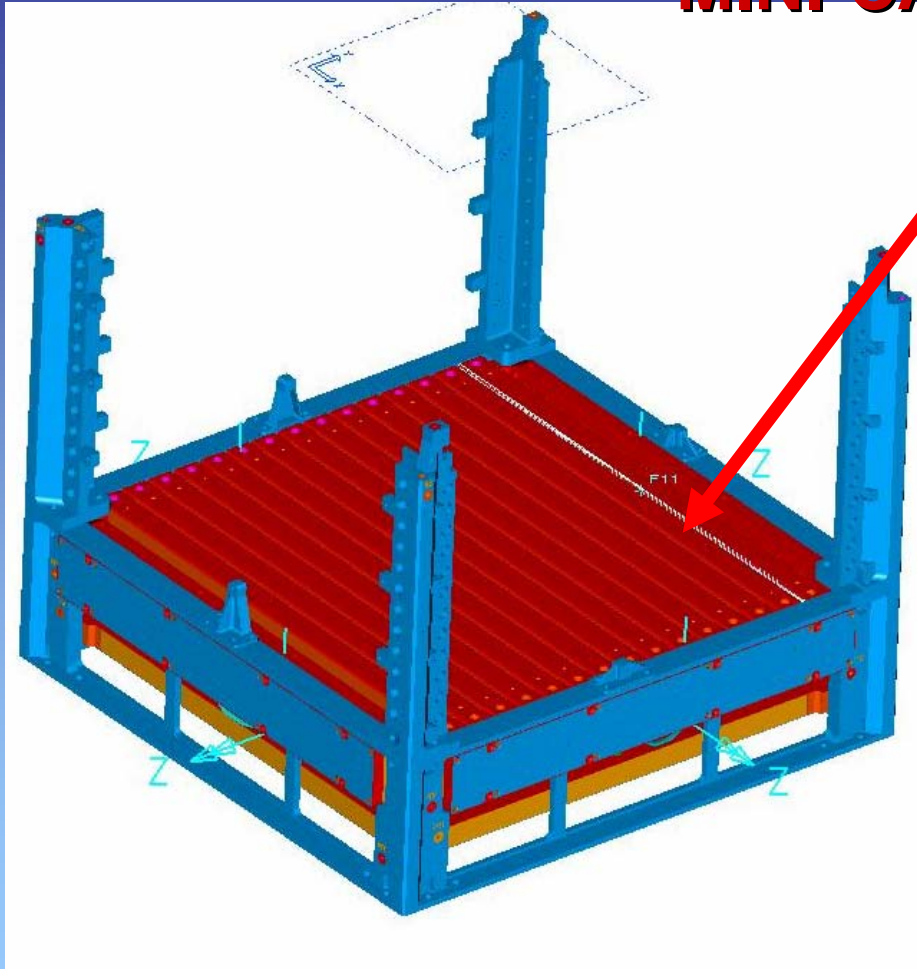
Cosmic-ray (muon) detected by the AGILE Tracker PFM



Mini-Calorimeter

(LABEN e INAF-IASF-Bologna)

MINI-CALORIMETER



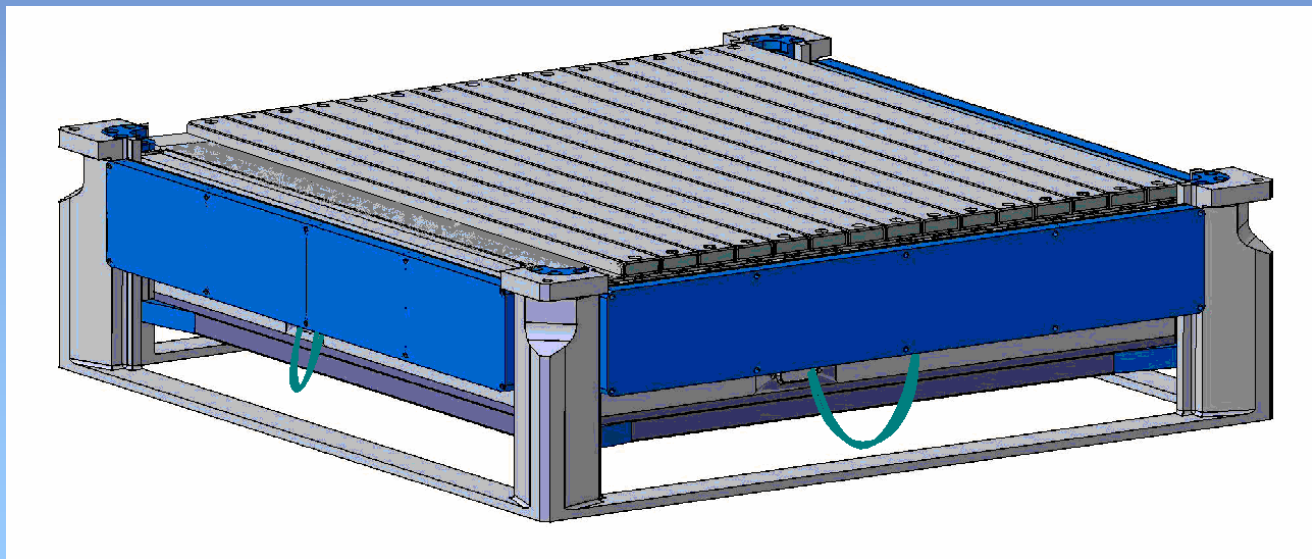
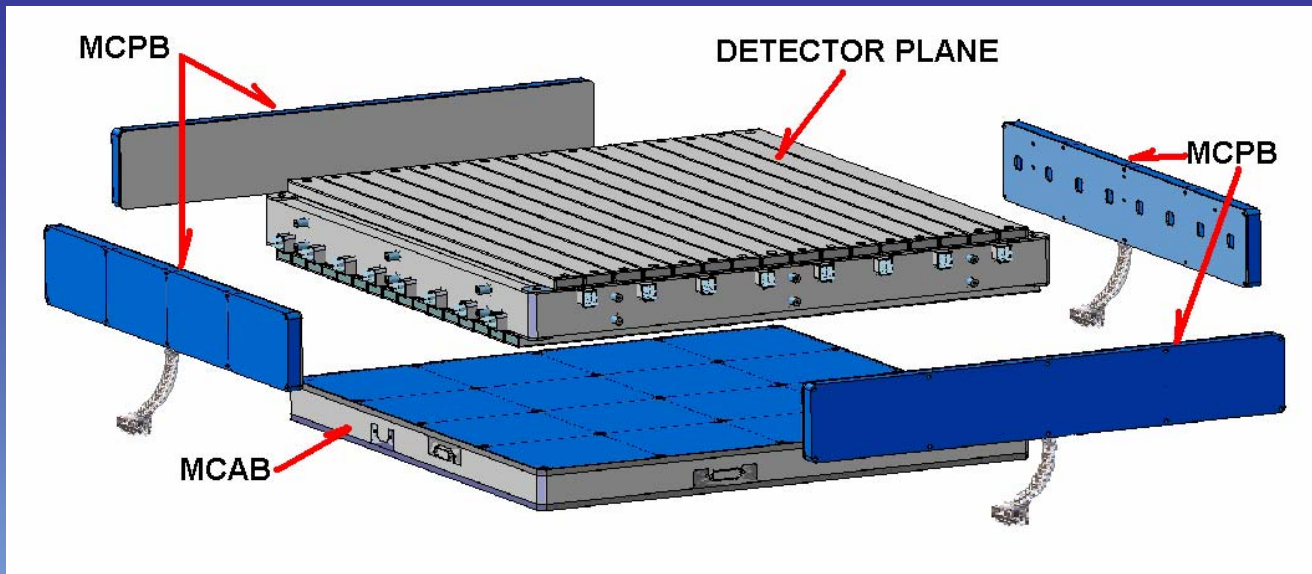
2 layers

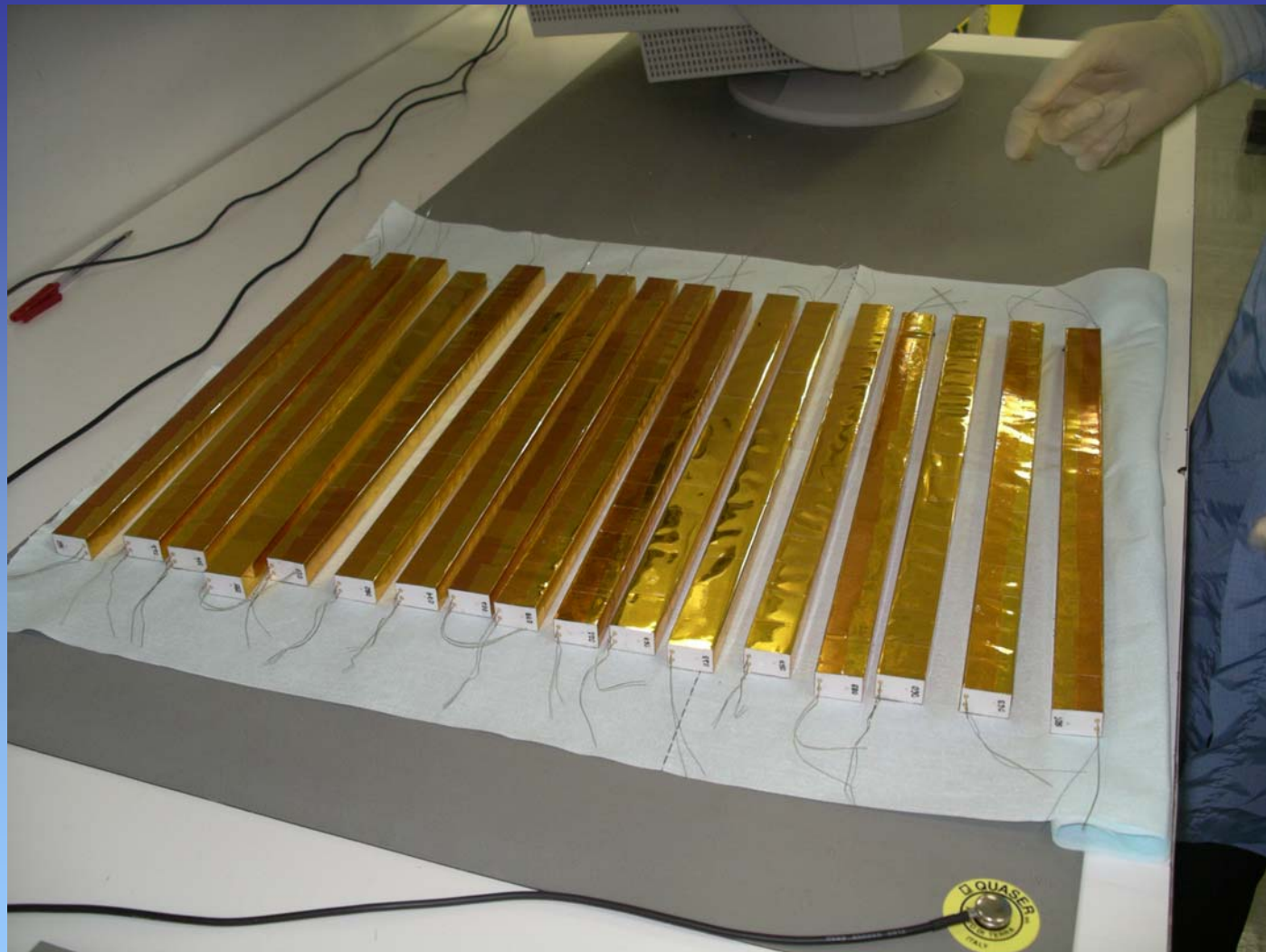
30 CsI bars

300 keV-100 MeV

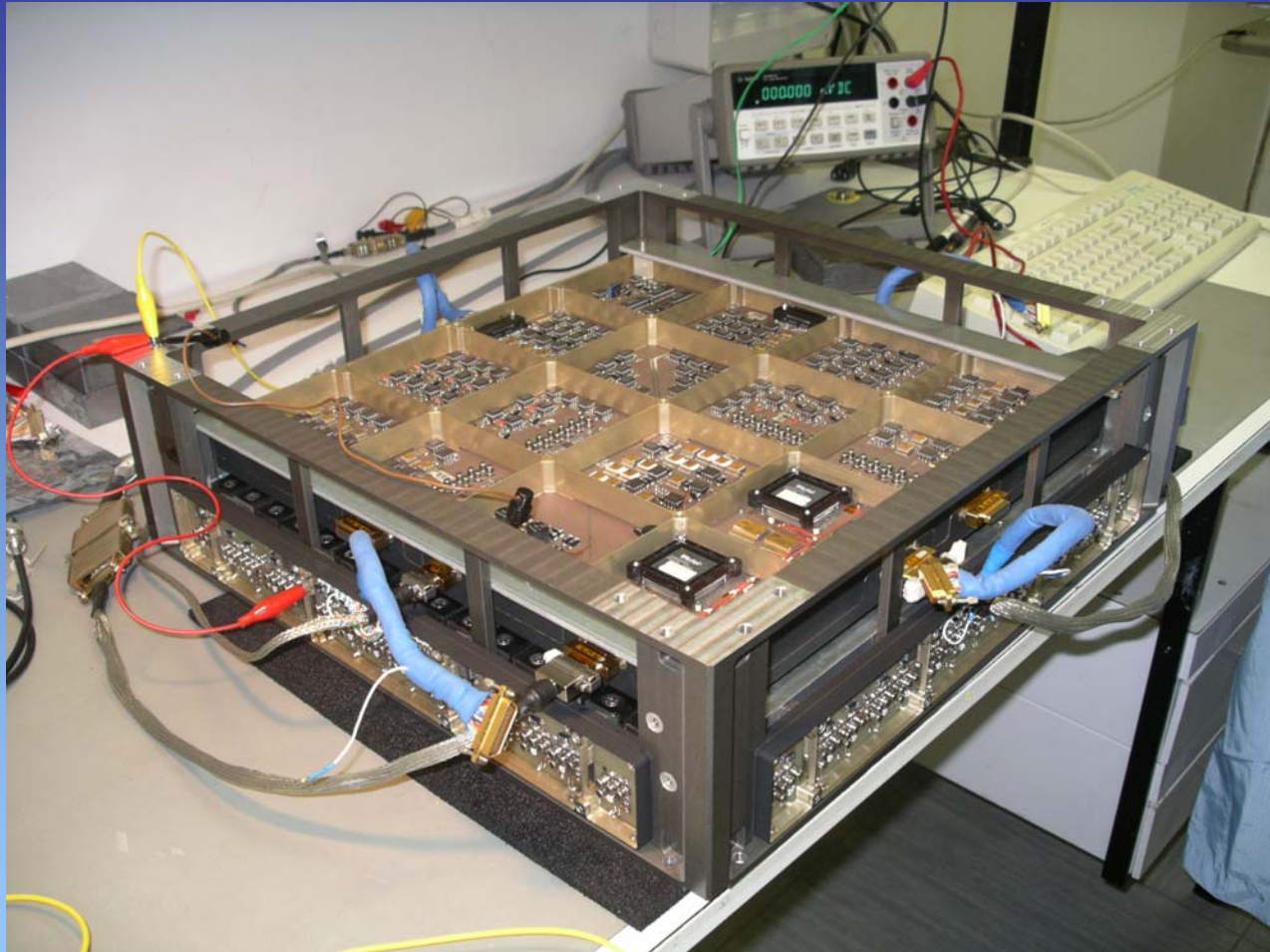
$A_{\text{eff}} \sim 400 \text{ cm}^2$

(@1-10 MeV)



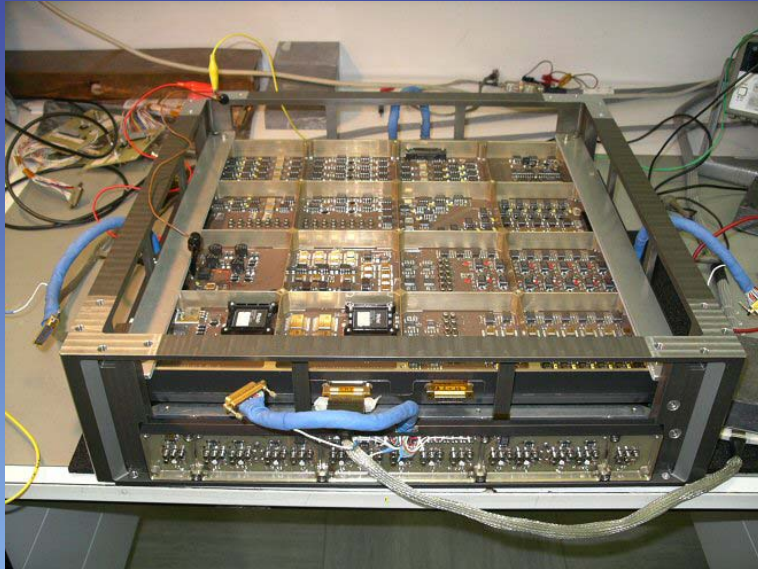




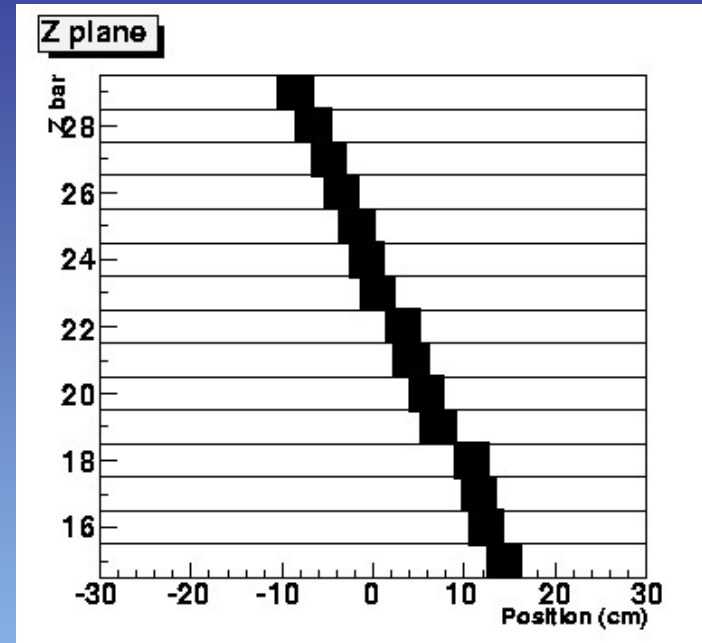


Mini-Calorimeter

(INAF-IASF Bologna: G. Di Cocco, C. Labanti, M. Marisaldi, et al.)



The AGILE Mini-Calorimeter developed by LABEN with science supervision of INAF-IASF Bologna (G. Di Cocco, C. Labanti) during its final tests (June 15, 2005).

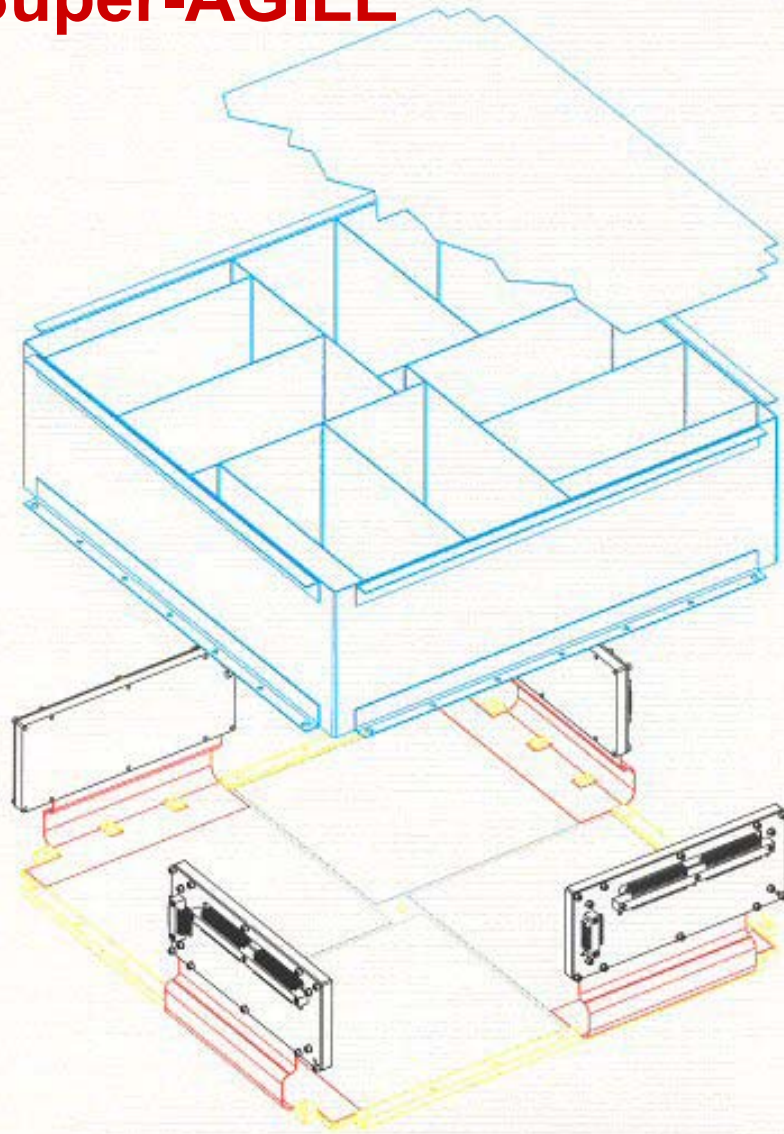


A Track of a horizontally incident muon detected by the Z-layer of the AGILE Mini-Calorimeter.

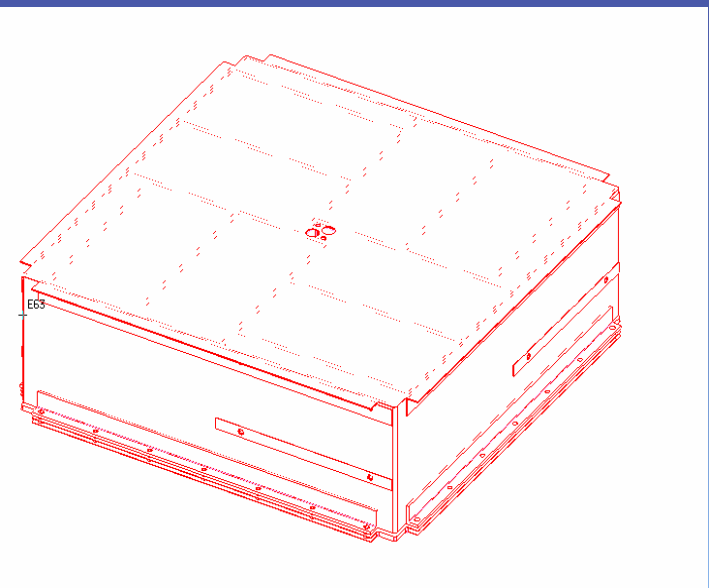
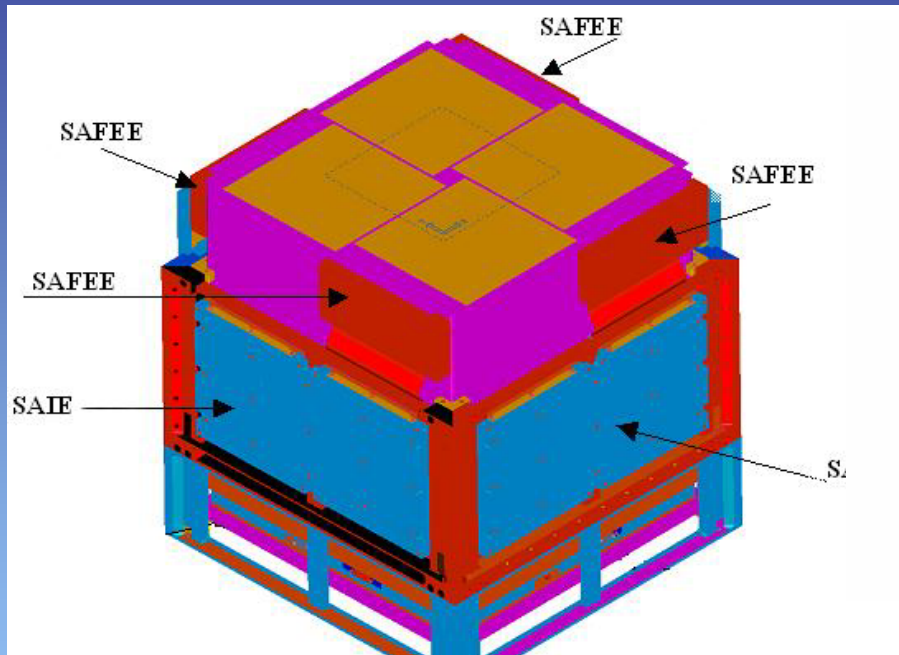
Super-AGILE

(INAF-IASF-Roma)

Super-AGILE

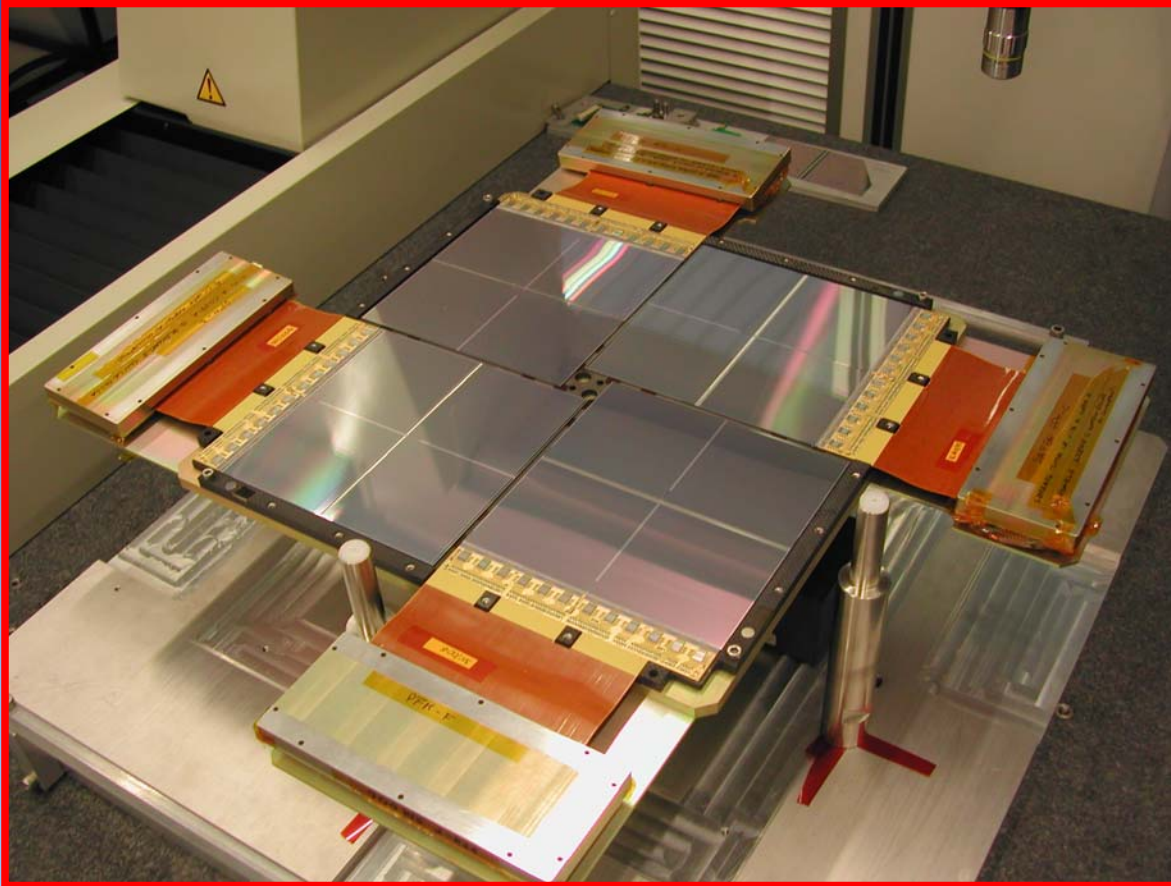


Hard X-ray imager (15-45 keV)



B) SuperAgile - Sviluppo Unità PFM

S
A
D
E
T
E
C
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R
T
R
A
Y

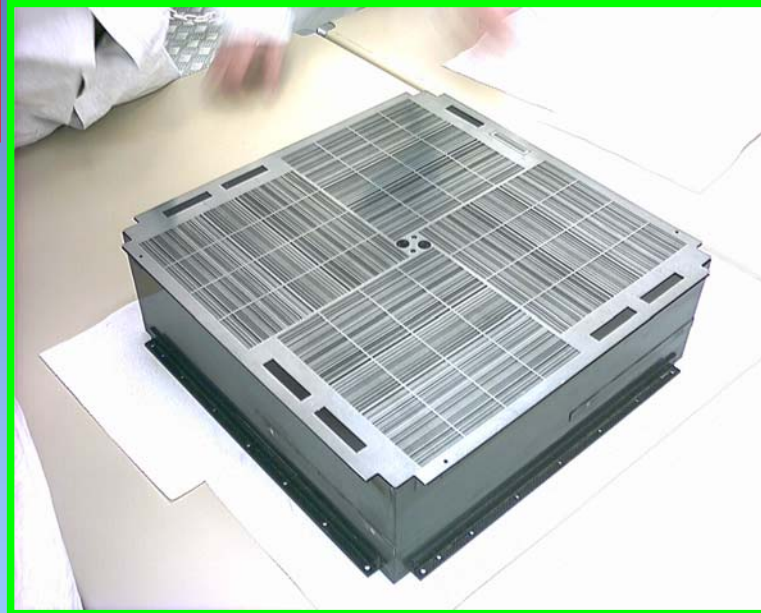


B) SuperAgile - Sviluppo Unità PFM

COLLIMATORE-MASCHERA



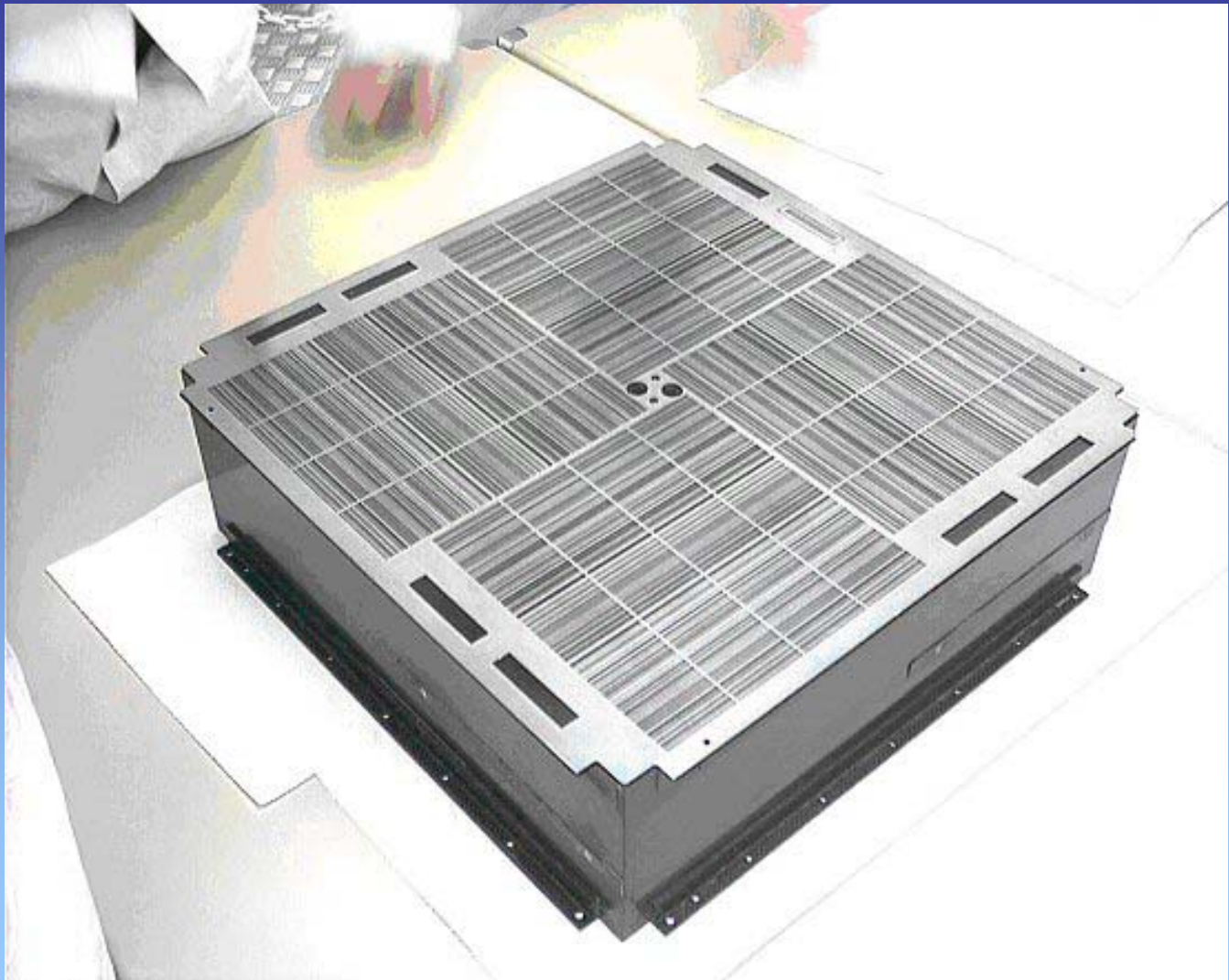
Collimatore



Assembly

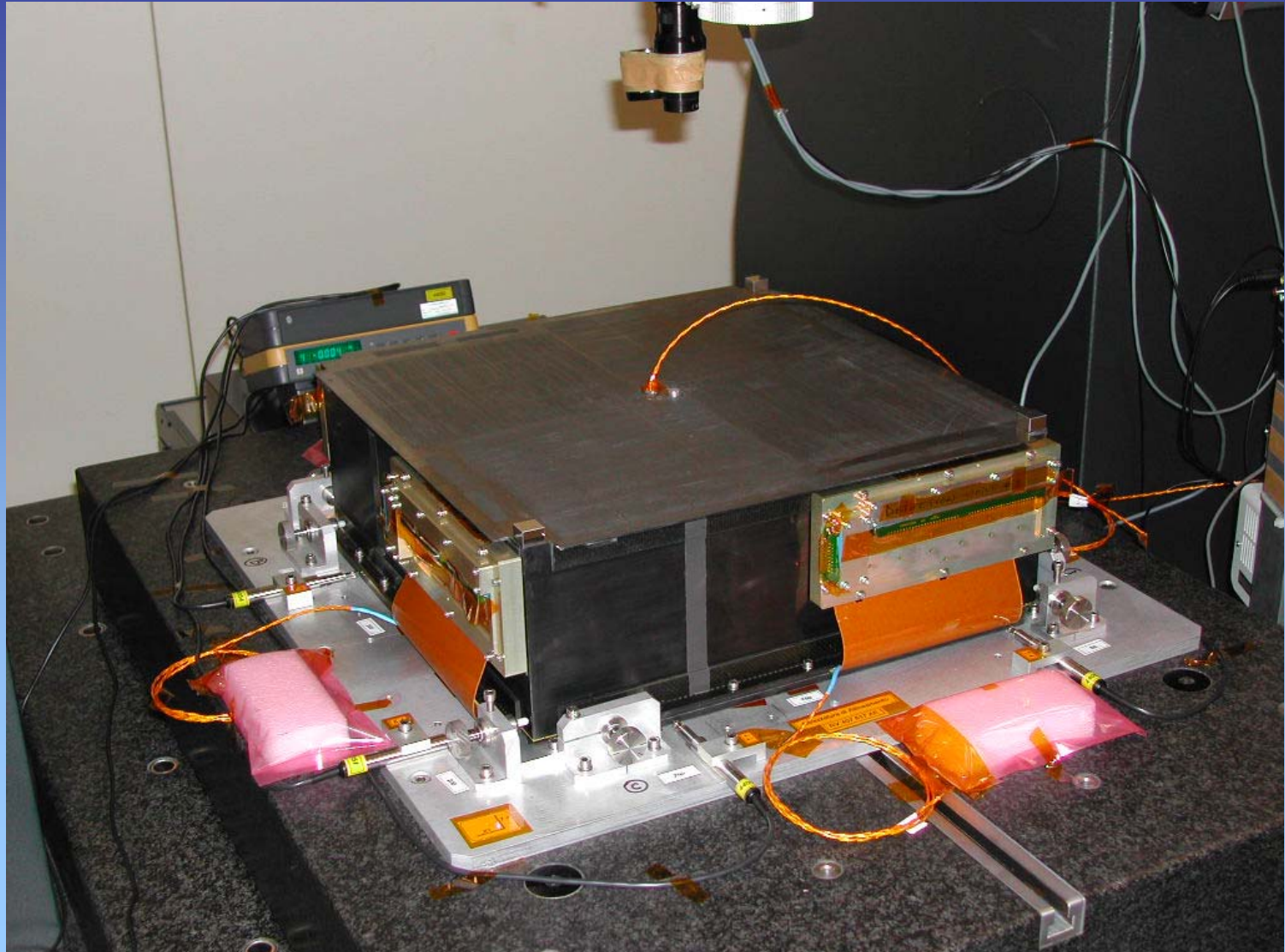


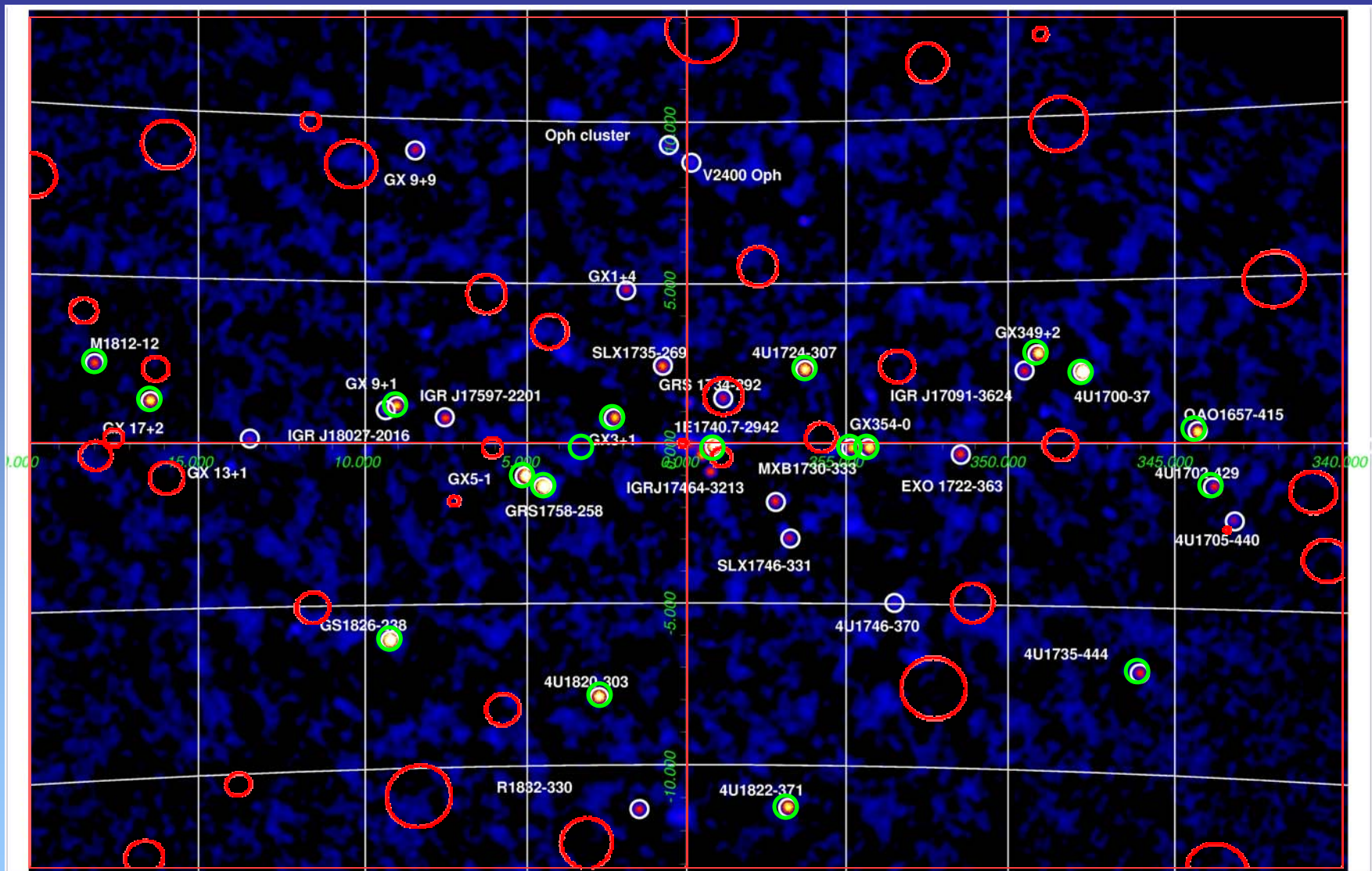
Maschera

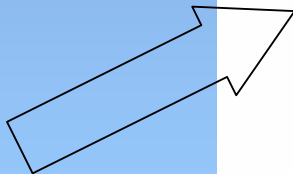
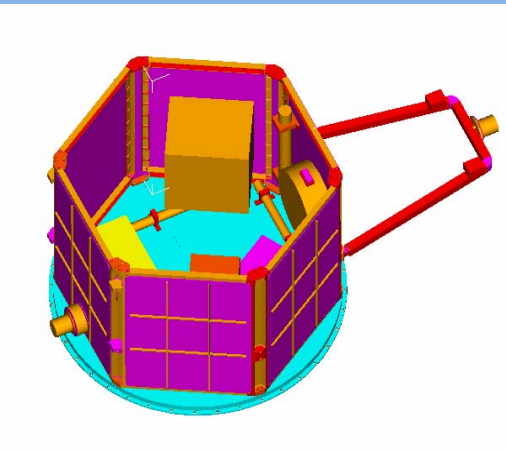
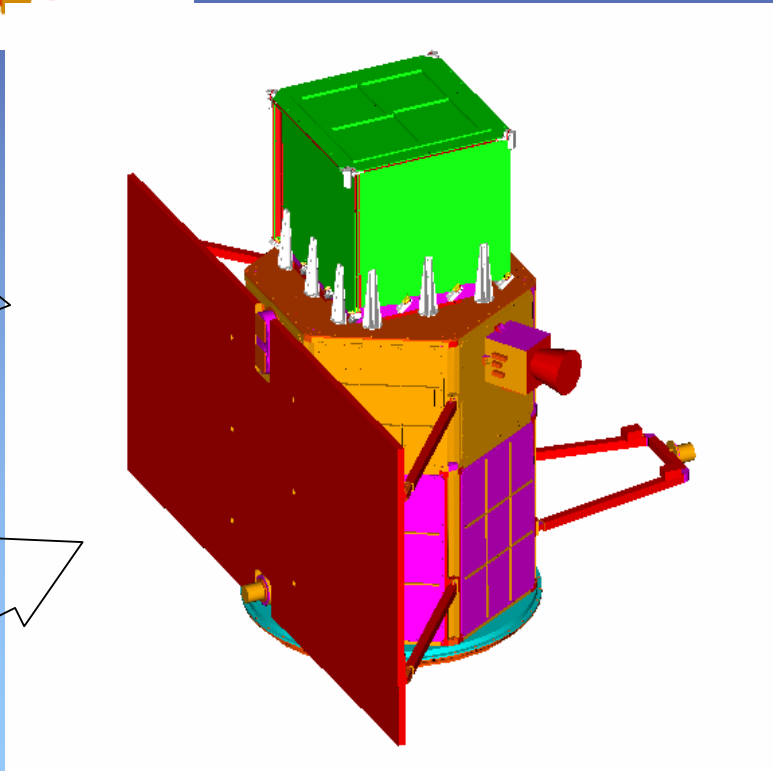
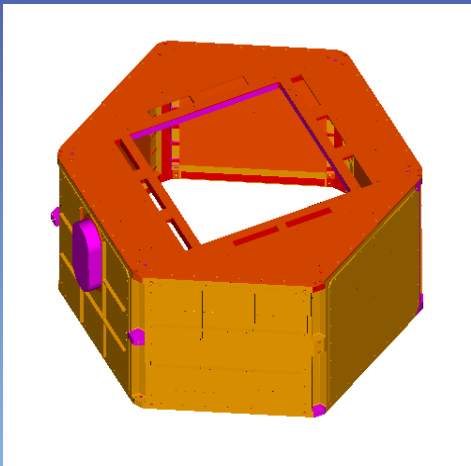
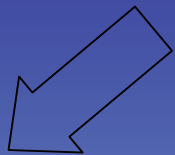
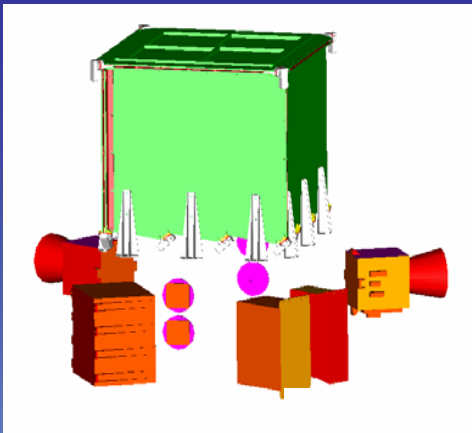


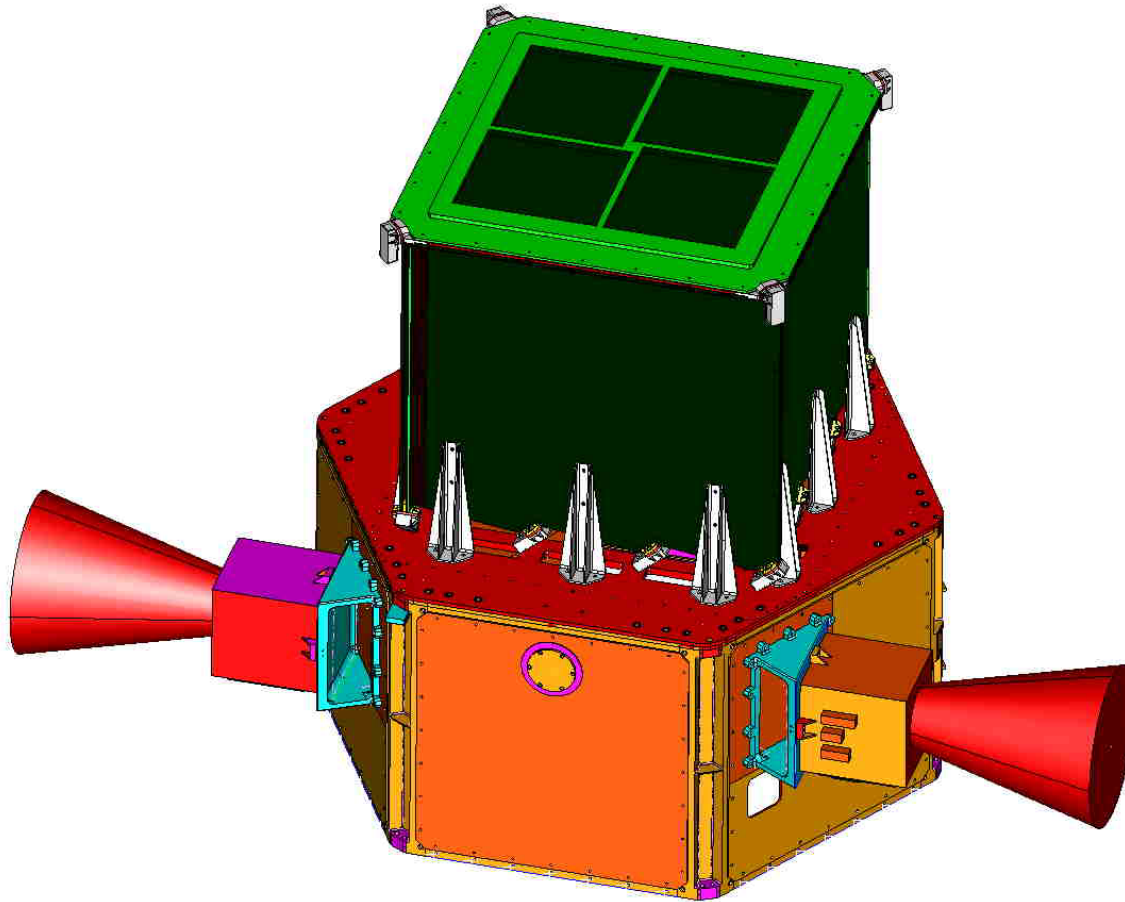
Super-Agile

(INAF-IASF Roma: E. Costa, M. Feroci, P. Soffitta, et al.)



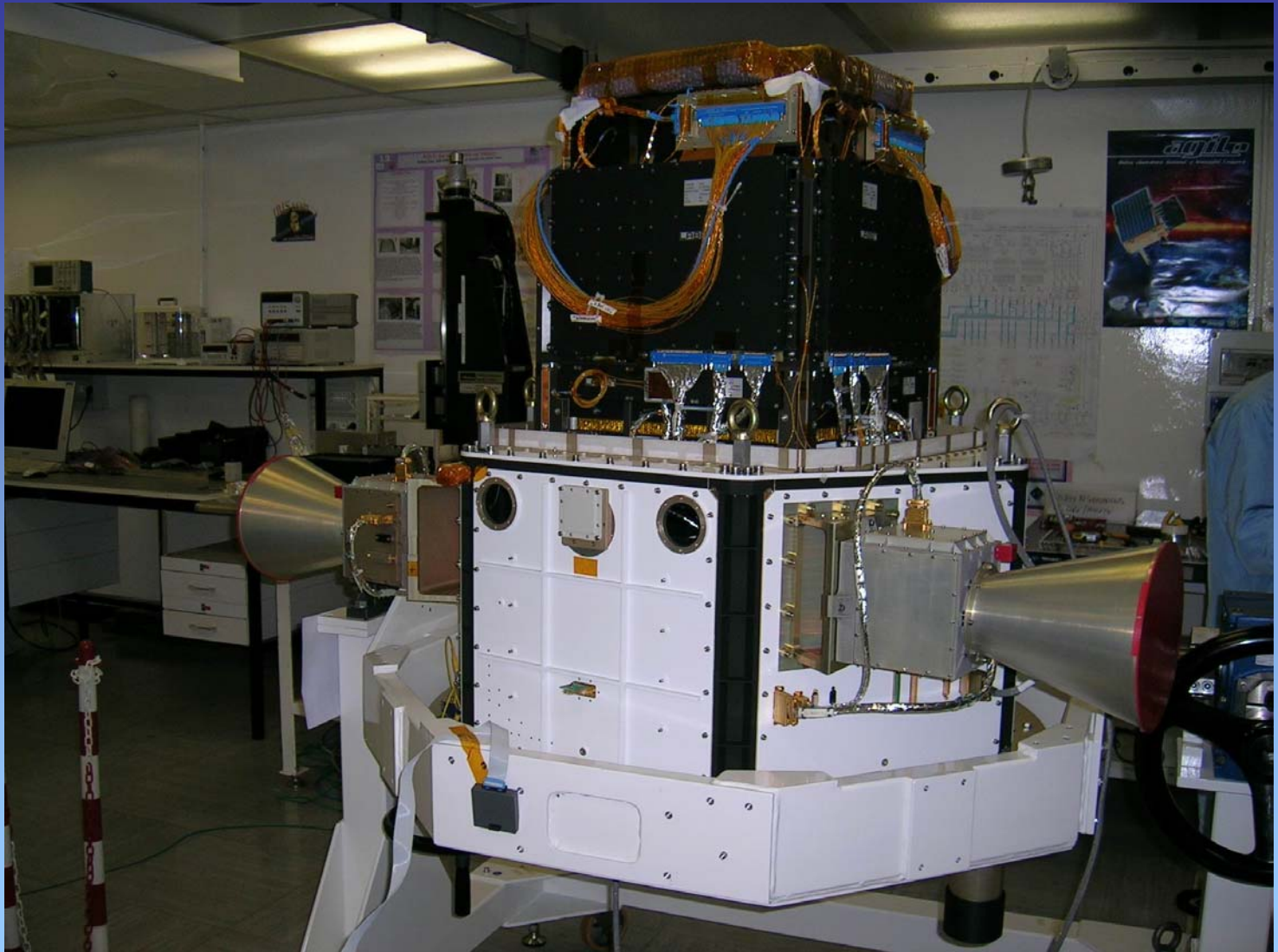


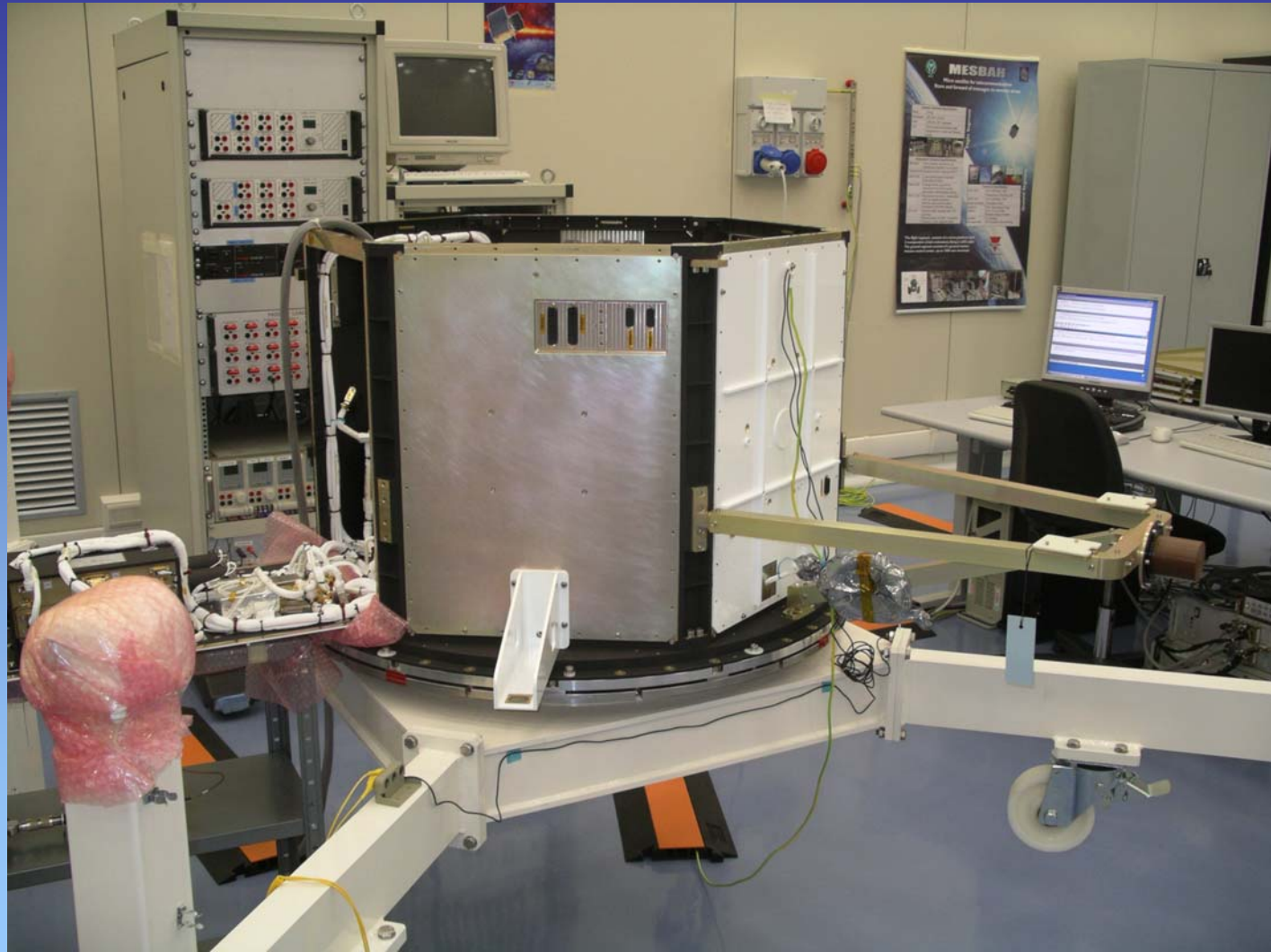




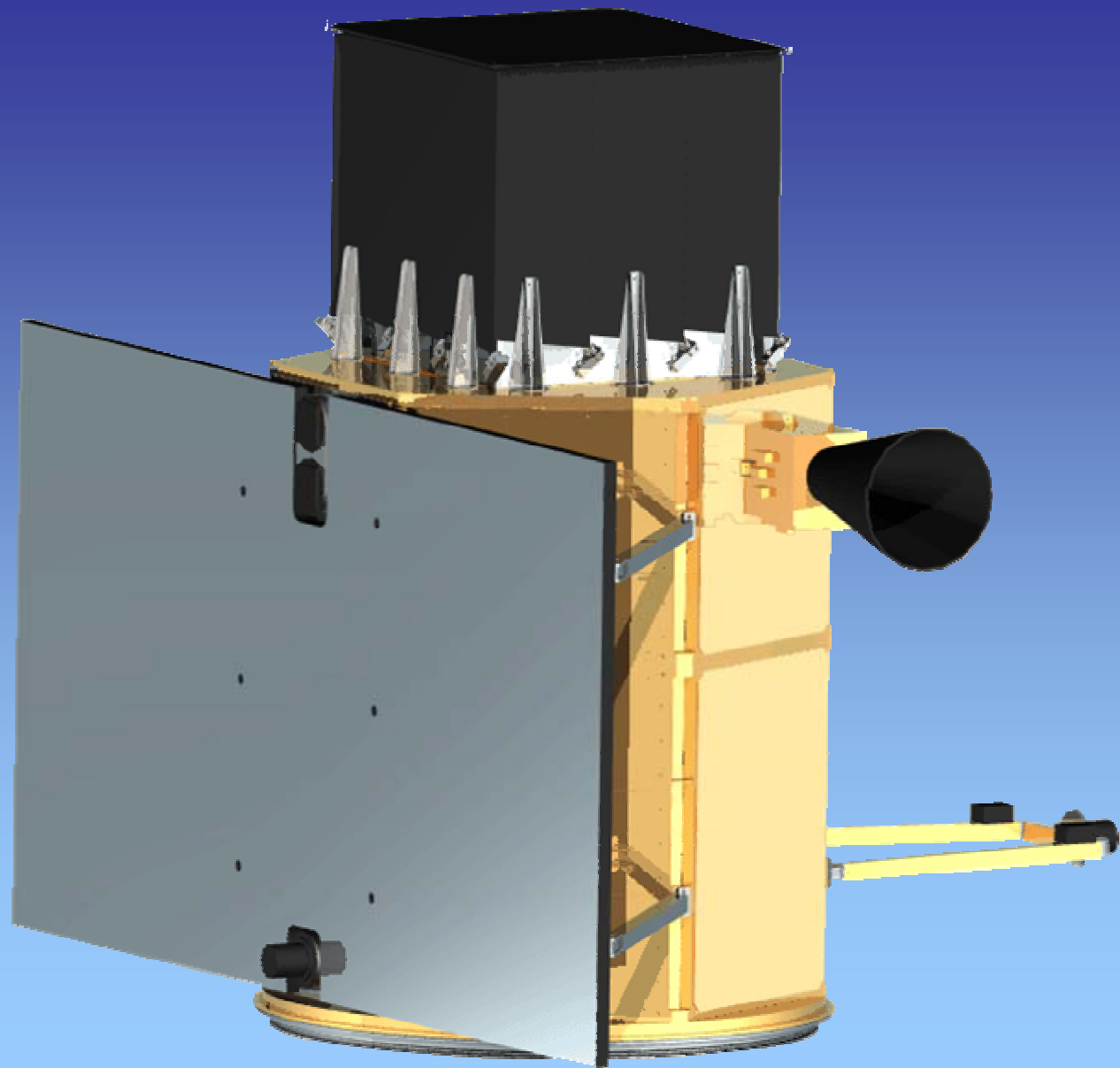
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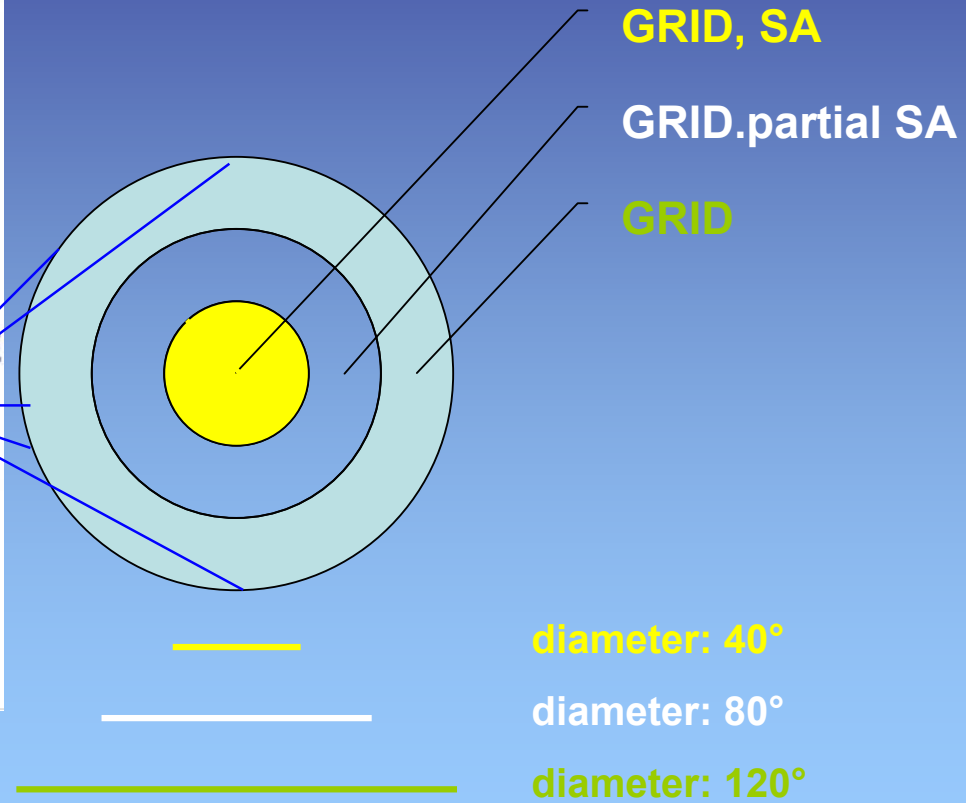
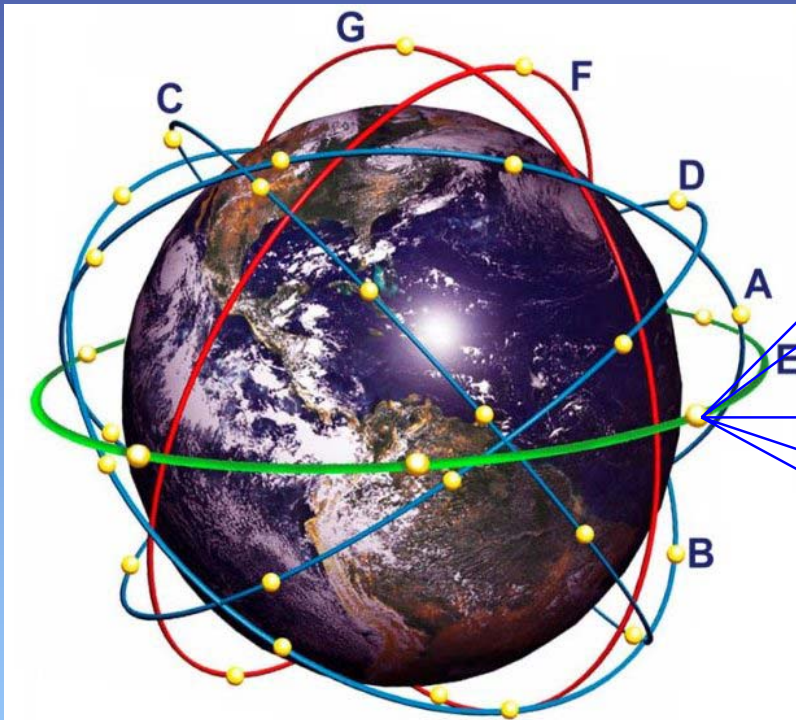








Alerts for GRB and other transients: **AGILE Fast Link (ORBCOMM)**



GPS satellite

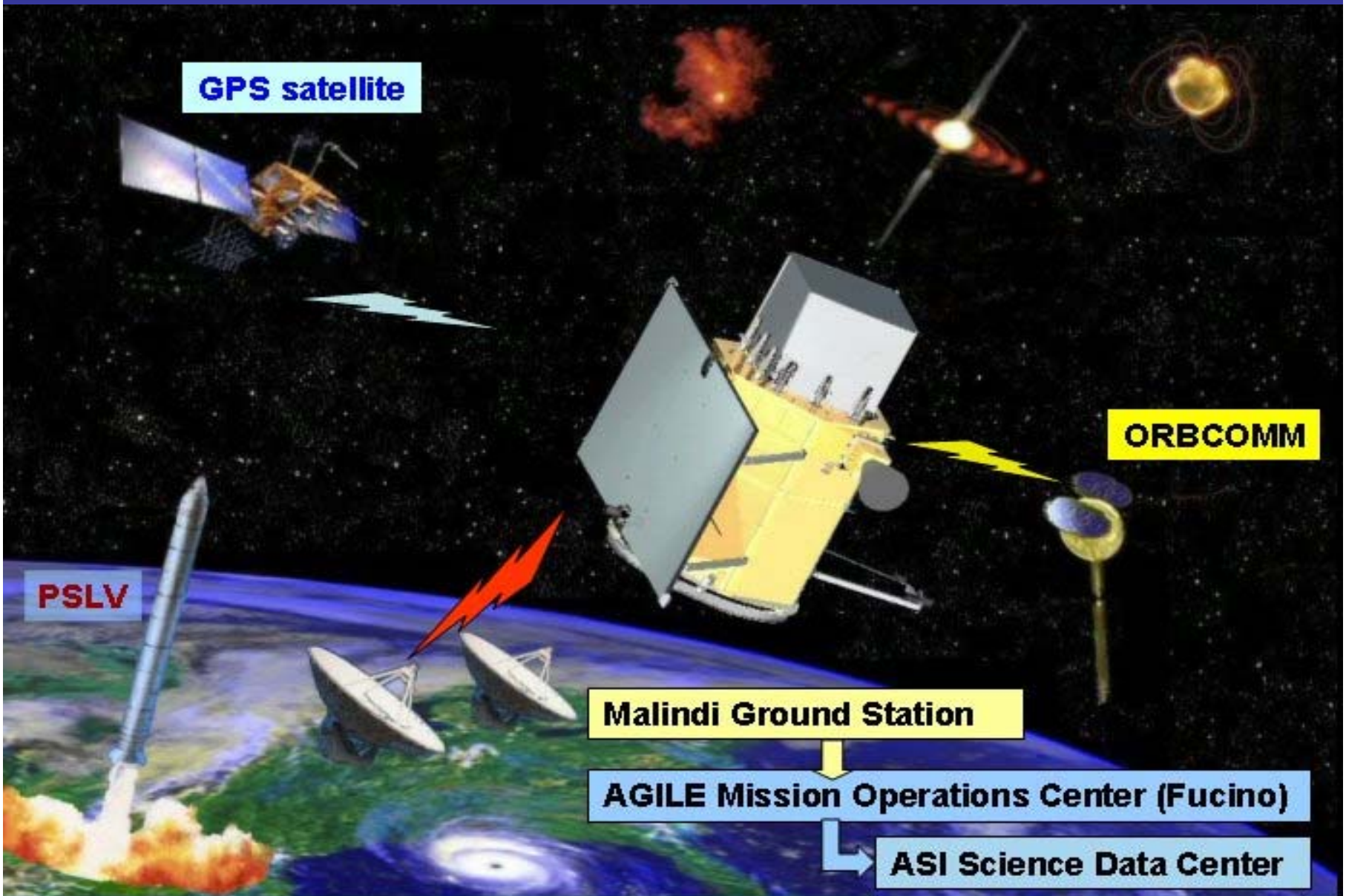
ORBCOMM

PSLV

Malindi Ground Station

AGILE Mission Operations Center (Fucino)

ASI Science Data Center

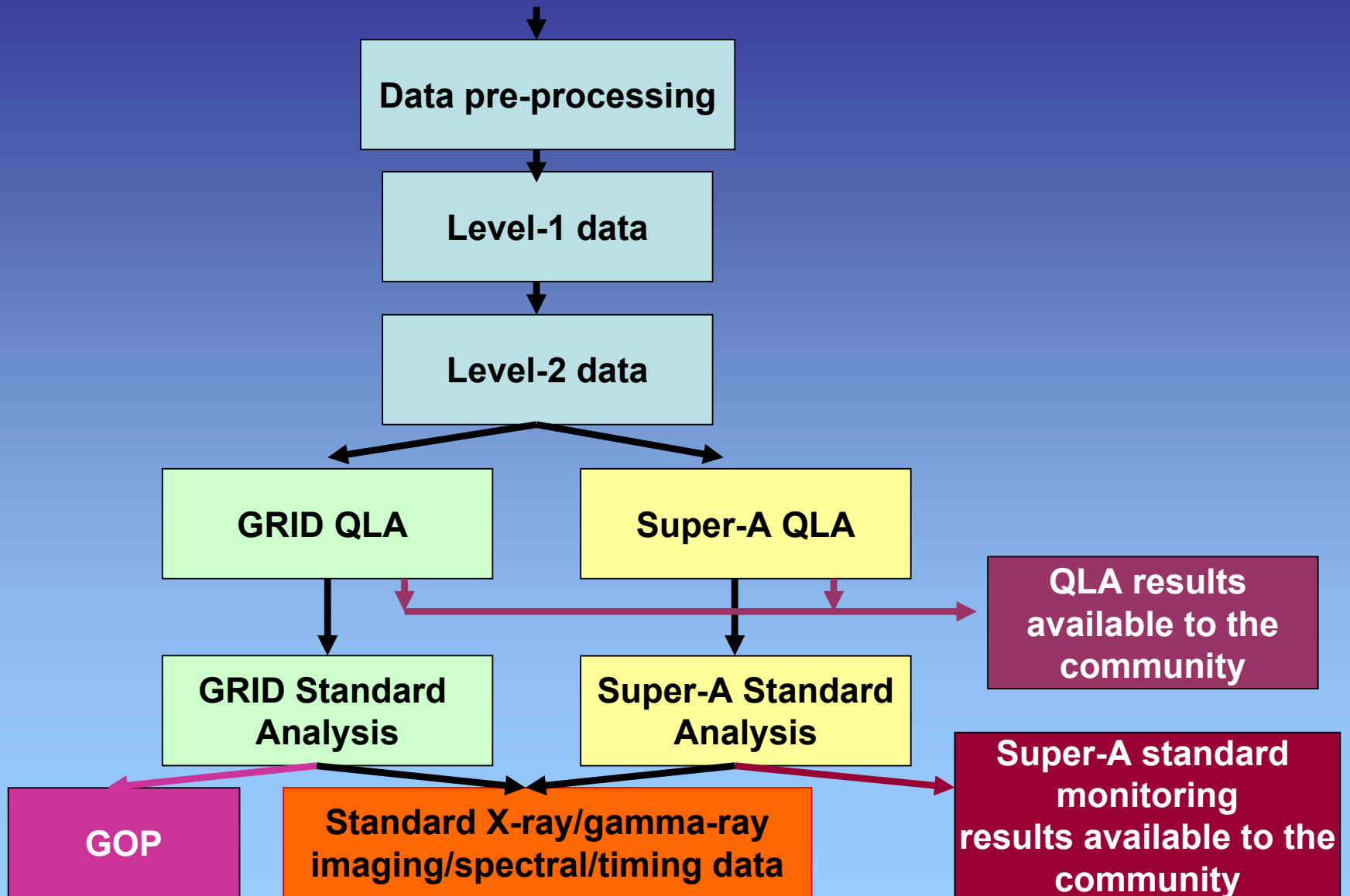


**AGILE Scientific
Ground Segment and Science
Analysis**

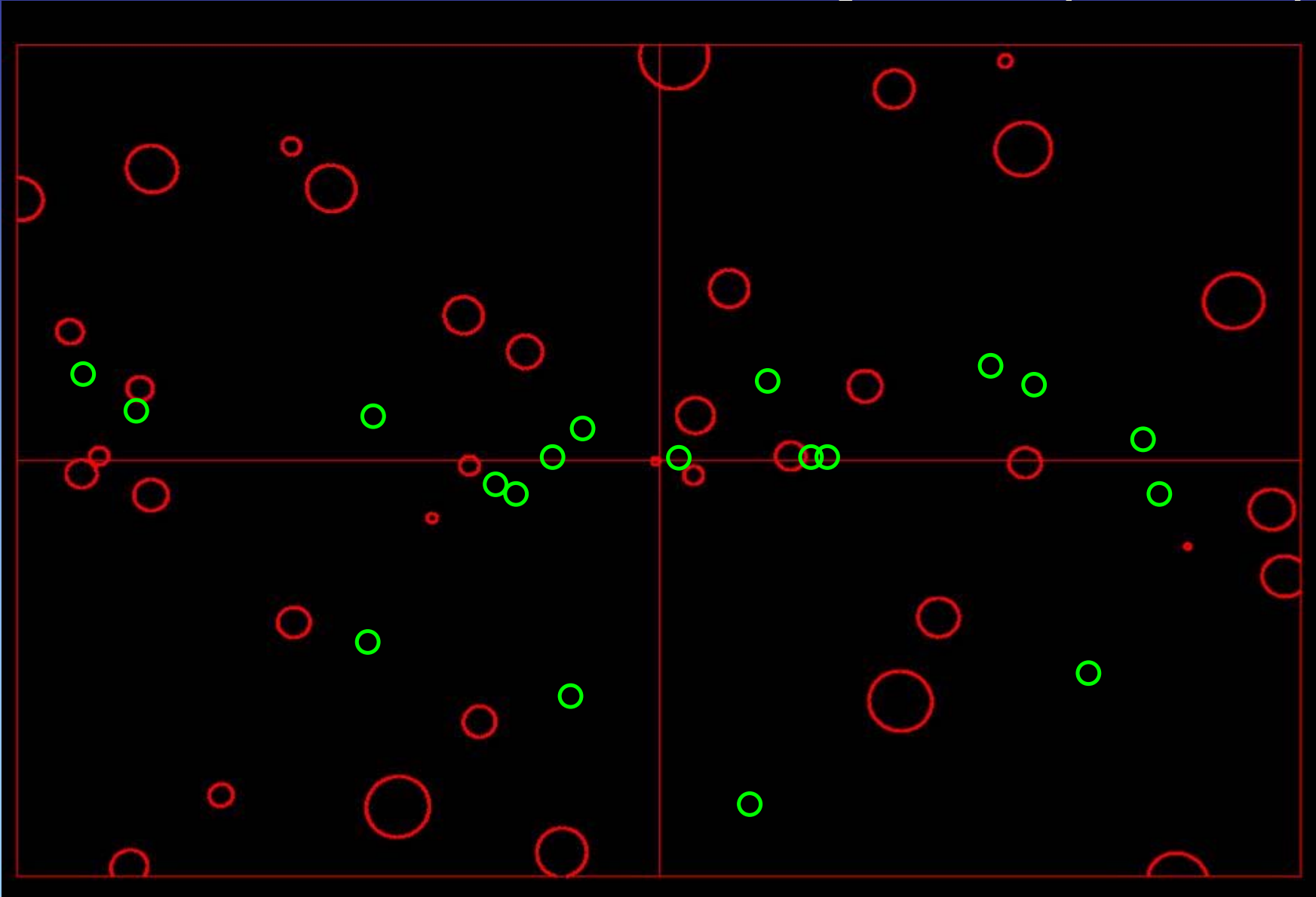
AGILE Science Program

- **AGILE Science Management Plan**
- **Pointing Program**
- **AGILE Guest Observer Program (Cycle-1)**
- **Multi- λ Program**
- **AGILE Science Workshops**

AGILE data flow (at ASDC)



Simulated Galactic Center view by AGILE (40° x 30°)



agila

Astro rivelatore Gamma a Immagini Leggero



AGILE web site

<http://agile.rm.iasf.cnr.it>