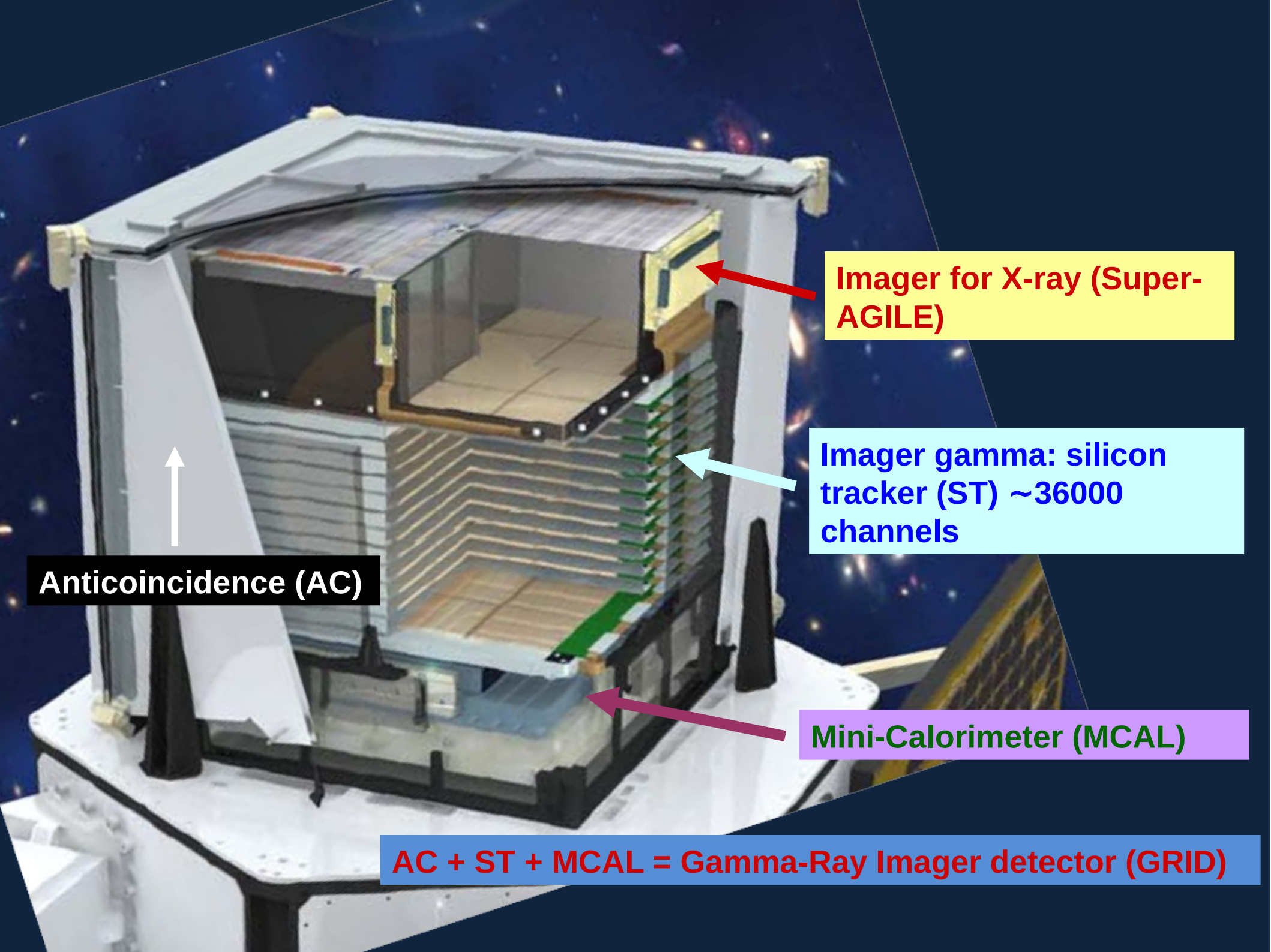# The AGILE pipeline for Gravitational Waves events follow-up

A. Zoli, A. Bulgarelli, M. Tavani, V. Fioretti, M. Marisaldi, N. Parmiggiani, F. Fuschino, F. Gianotti, M. Trifoglio

INAF/IASF Bologna, INAF/IAPS Rome and University of Modena and Reggio Emilia
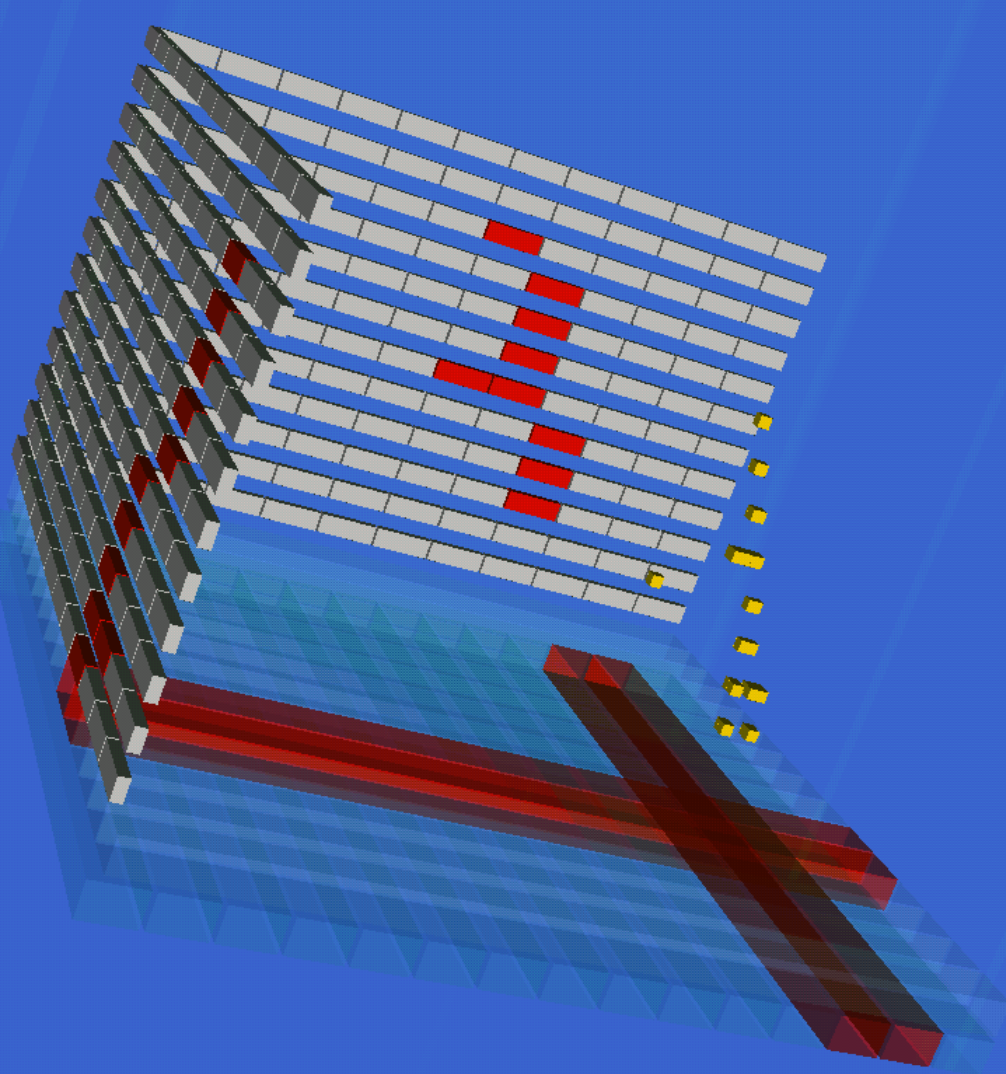on behalf of AGILE Team

Imager for X-ray (Super-AGILE)

Imager gamma: silicon tracker (ST) ~36000 channels
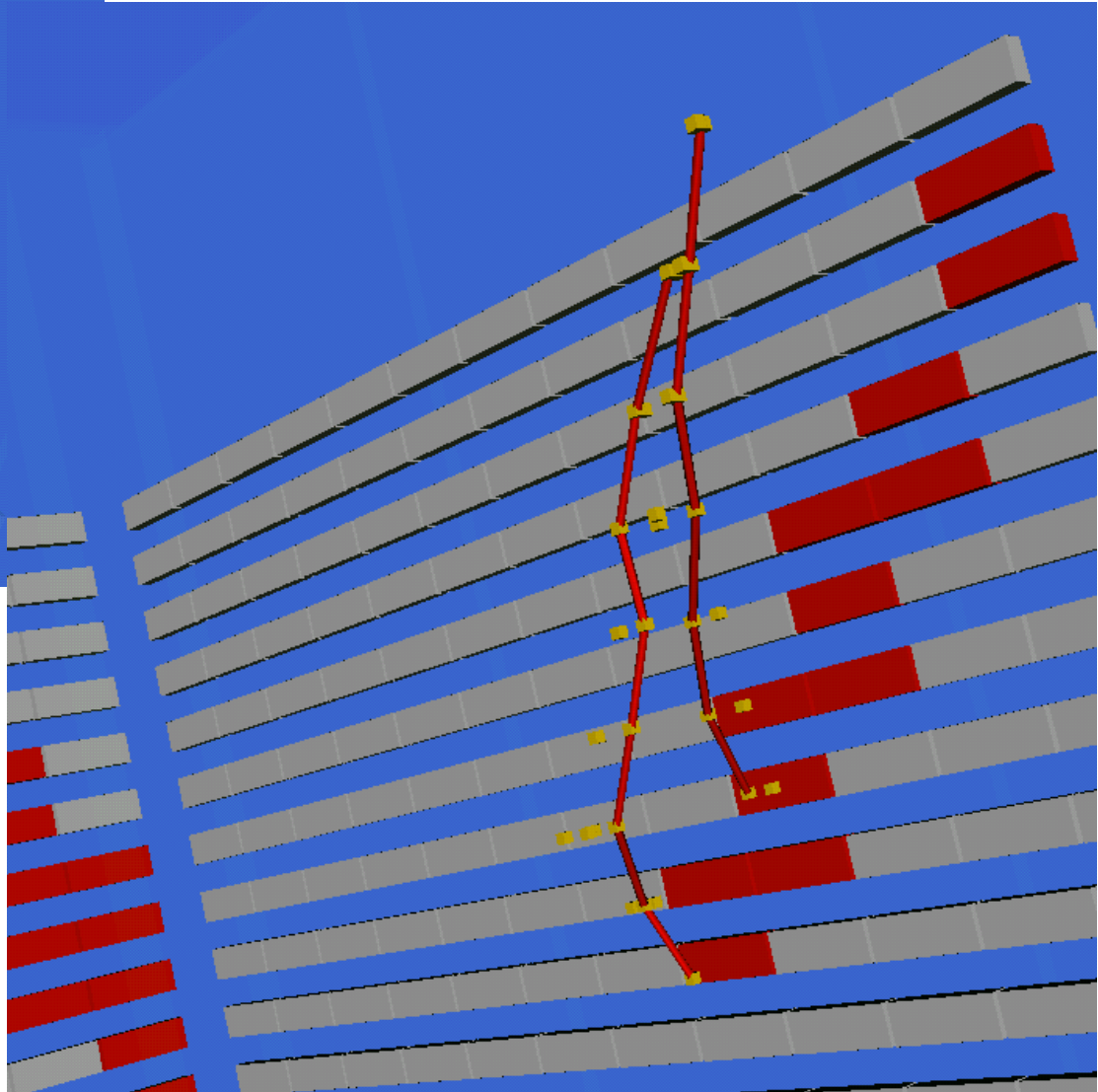
Anticoincidence (AC)

Mini-Calorimeter (MCAL)

AC + ST + MCAL = Gamma-Ray Imager detector (GRID)

- The Silicon Tracker **converts the gamma-ray in electron/positron pair**.
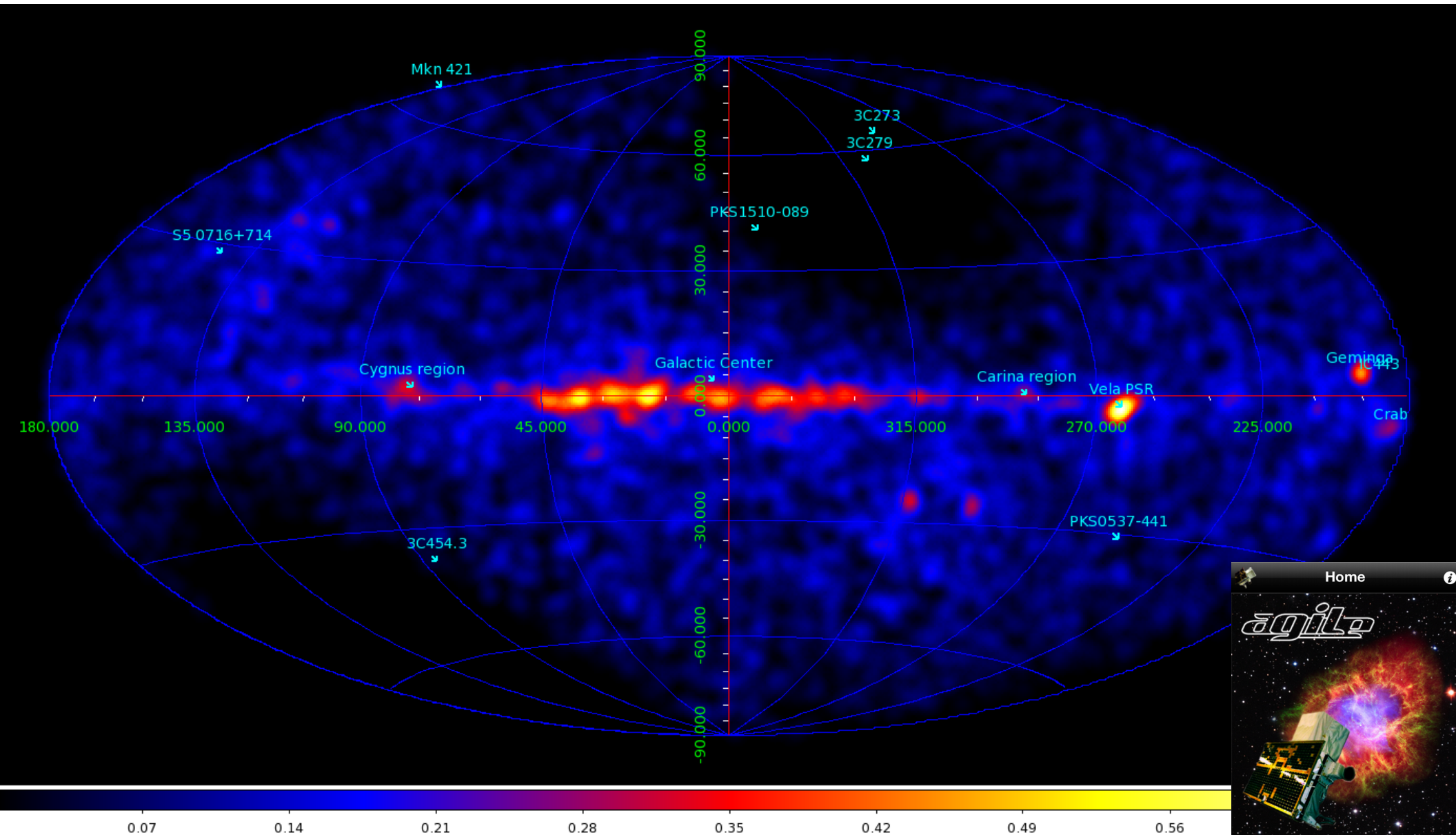- Some examples of acquired photons

- **The Silicon Tracker is very small: 21 x 40 x 40 cm** and therefore the Silicon Tracker is *the lightest and most compact gamma-ray imager sent in orbit*).
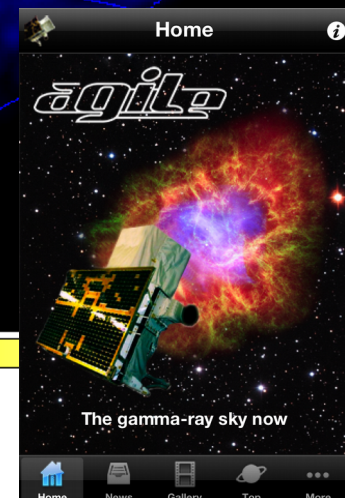
AGILE gamma-ray sky now

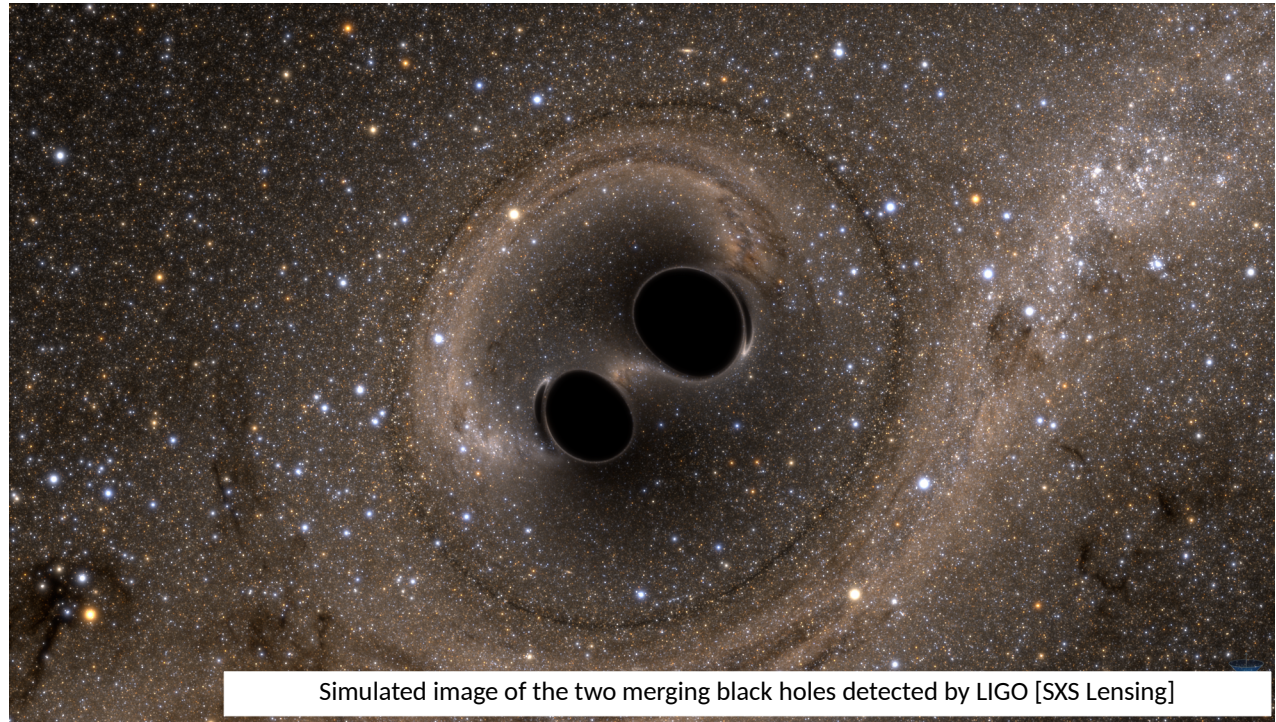AGILE is a full-sky mission (Field of view of 2.5 sr)

Gravitational waves era

LIGO

GW150914: first gravitational wave discovery

Simulated image of the two merging black holes detected by LIGO [SXS Lensing]

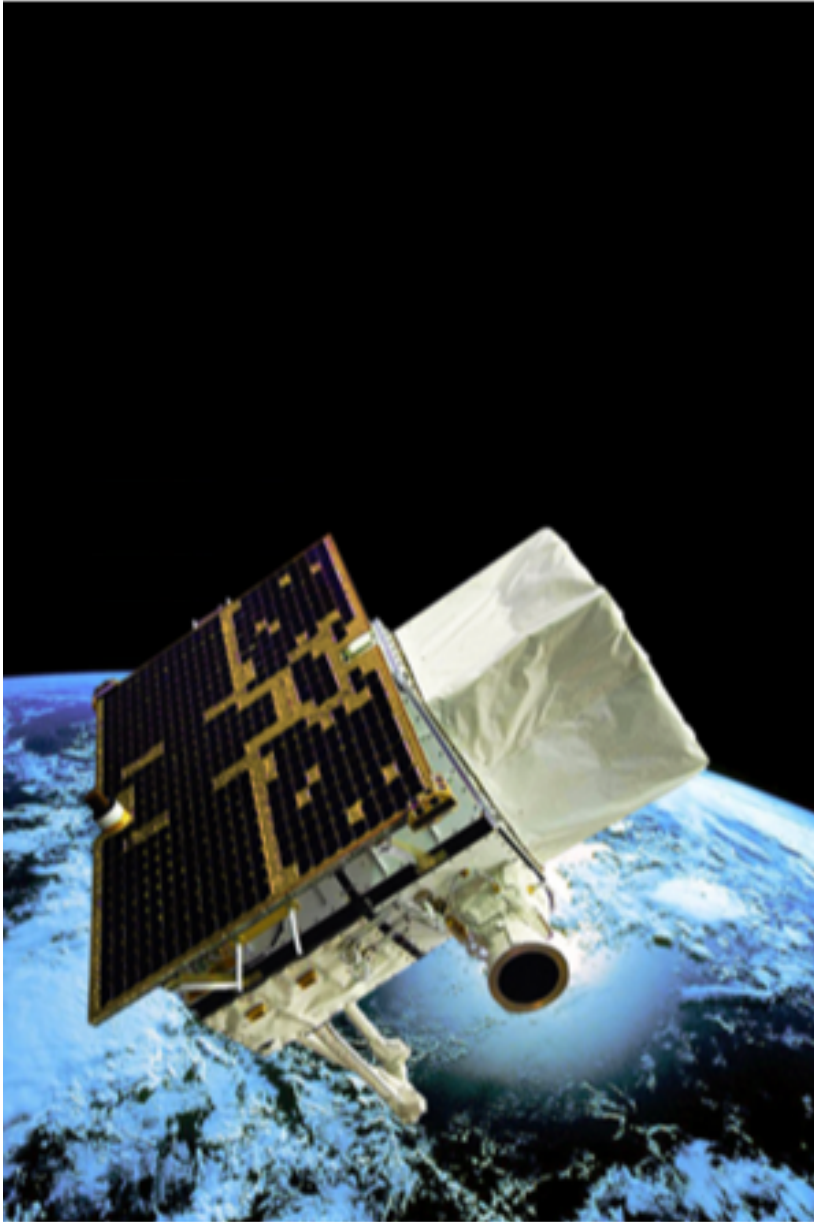## AGILE Satellite

Signed an MoU

Gravitational wave electromagnetic counterpart?
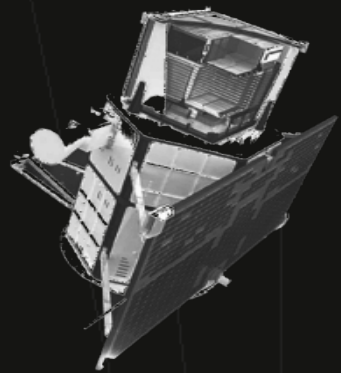
AGILE capabilities for GW follow-up

- Spinning mode: 80% of the sky, every 7 min
- A very large FoV 2.5 sr
- Detects gamma-ray transients timescale [< 1 ms, 100 s]
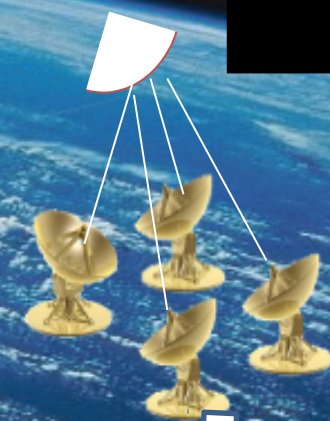- 100-150 passes a day for accessible sky regions

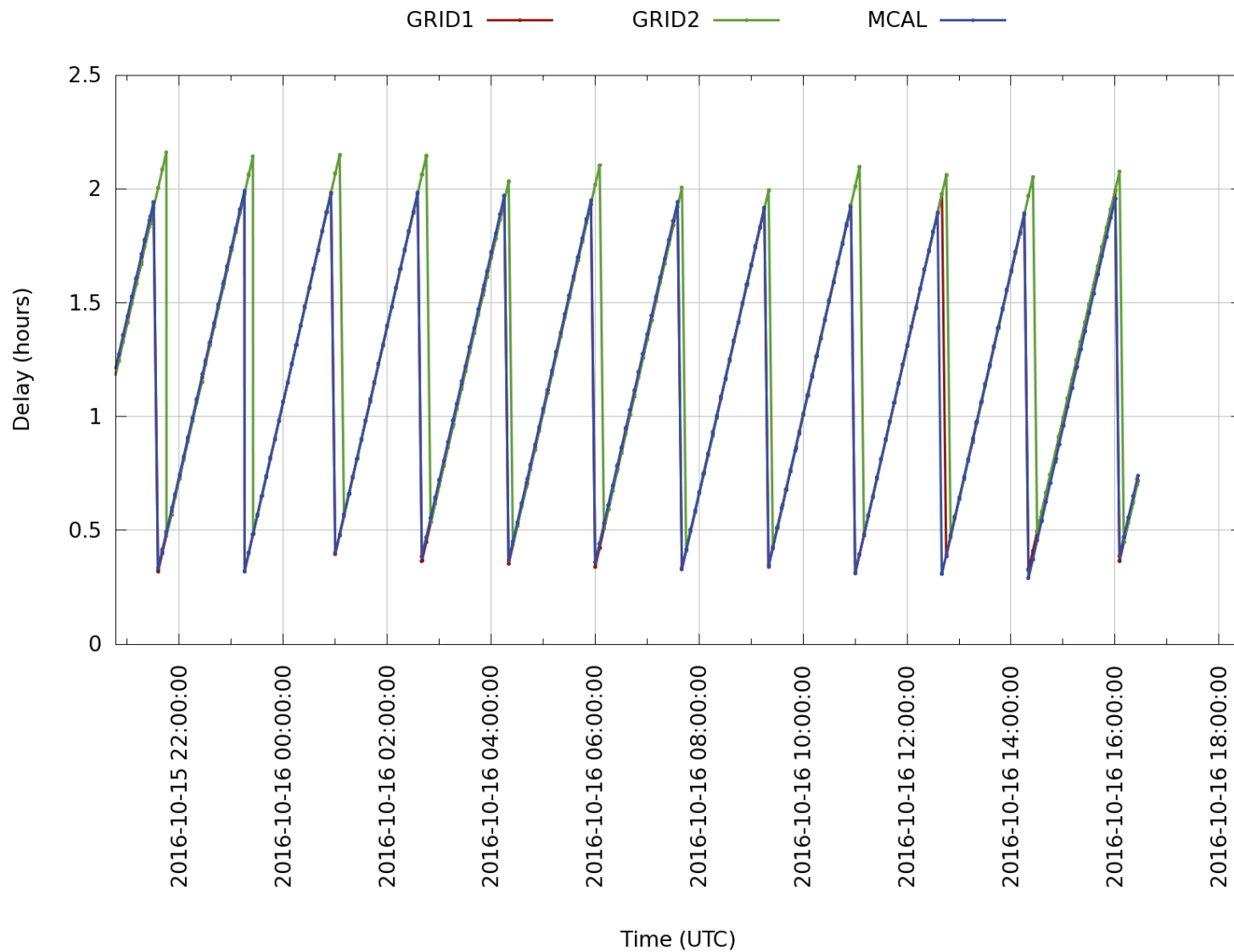AGILE

INTELSAT

Telespazio @ Fucino (Italy)

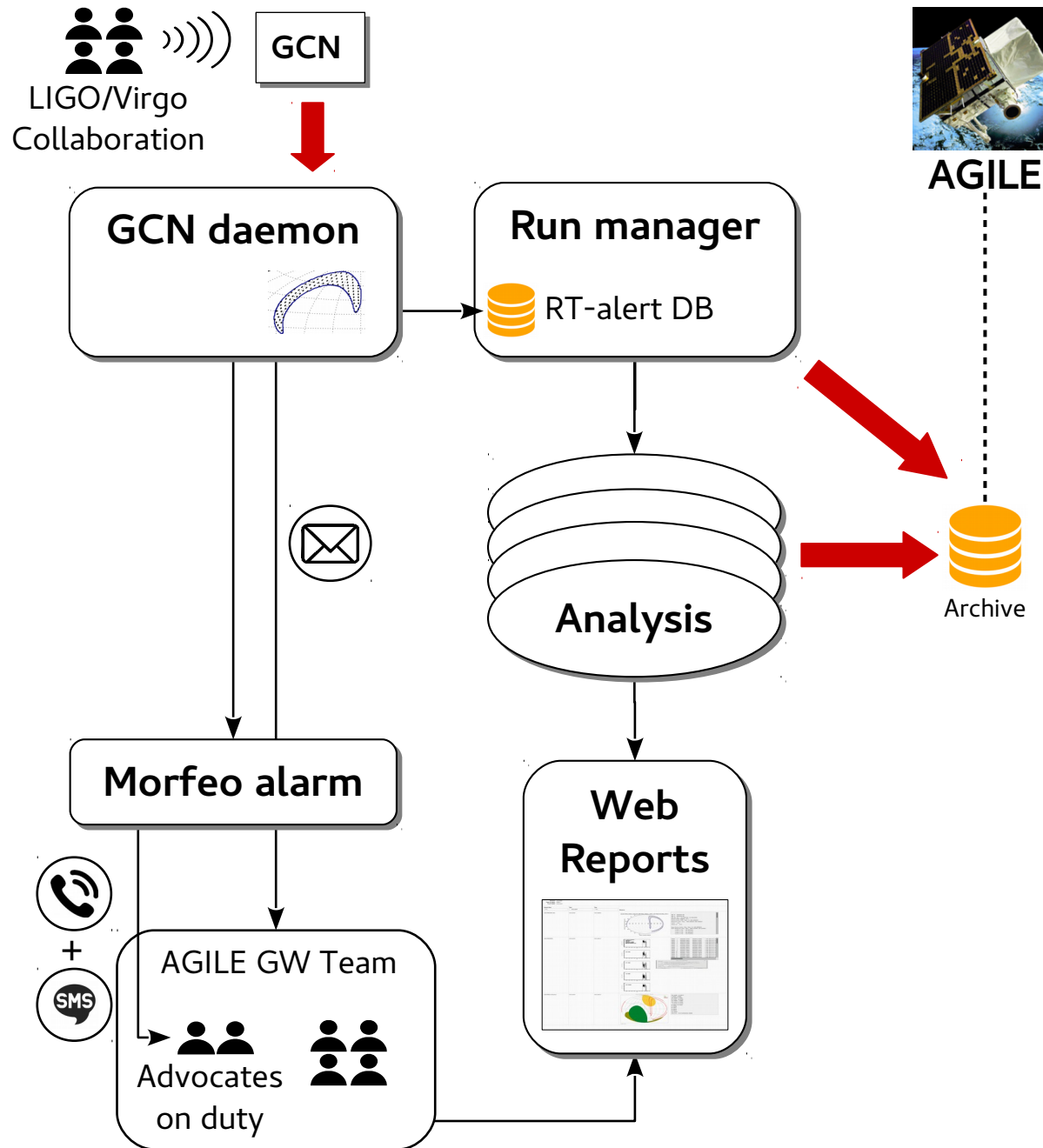Malindi (Kenya)

To AGILE Collaboration

Every 96 minutes...

AGILE data path

- Restored full speed downlink
- Telemetry tuned
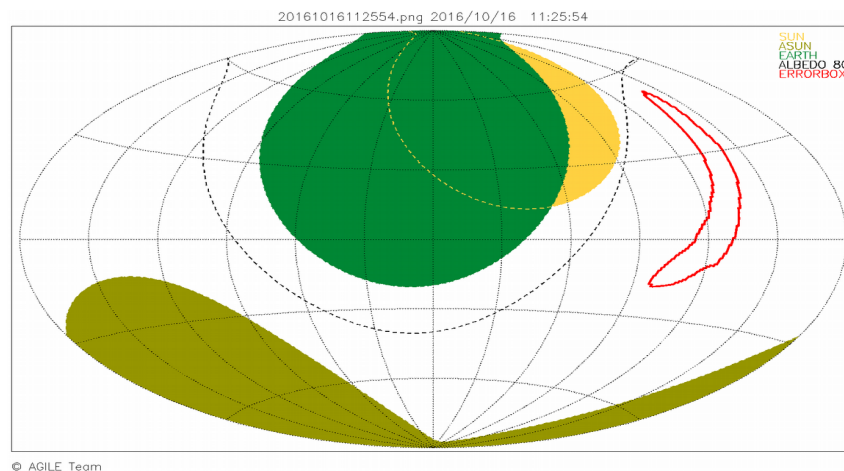
- Optimizations on pre-processing and archiving
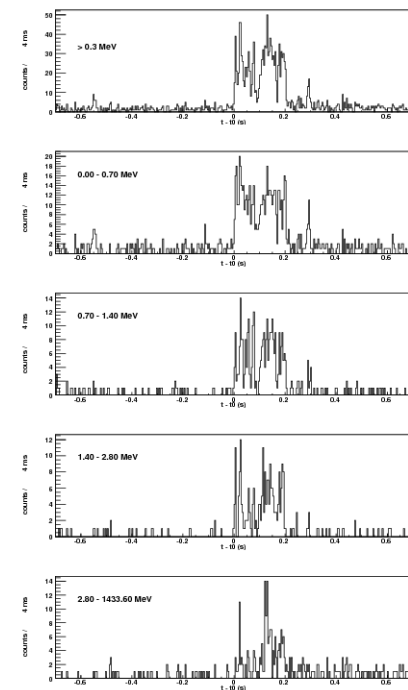
GW pipeline: architecture
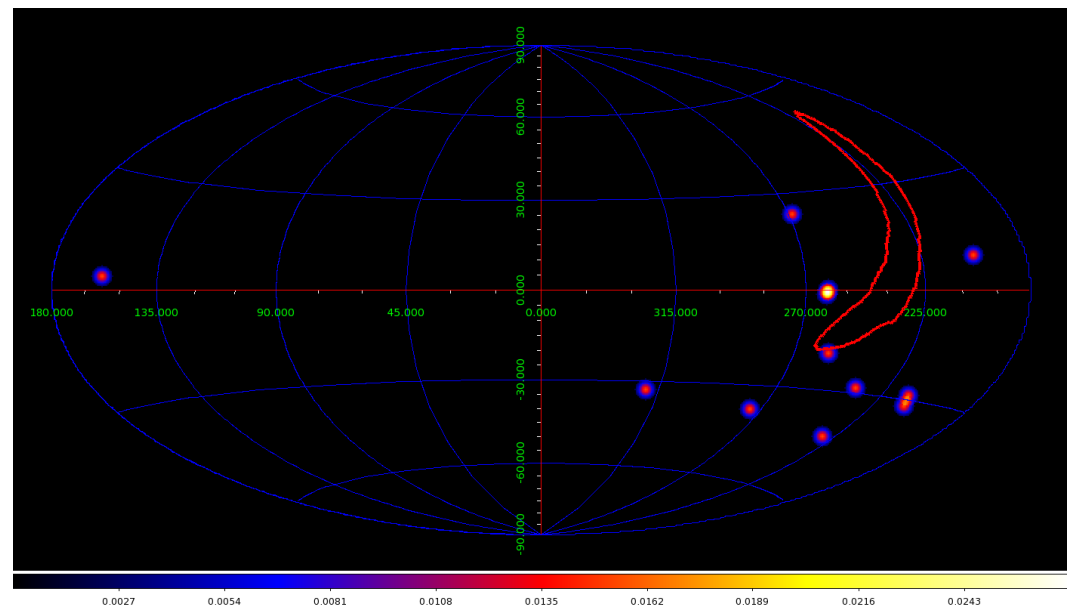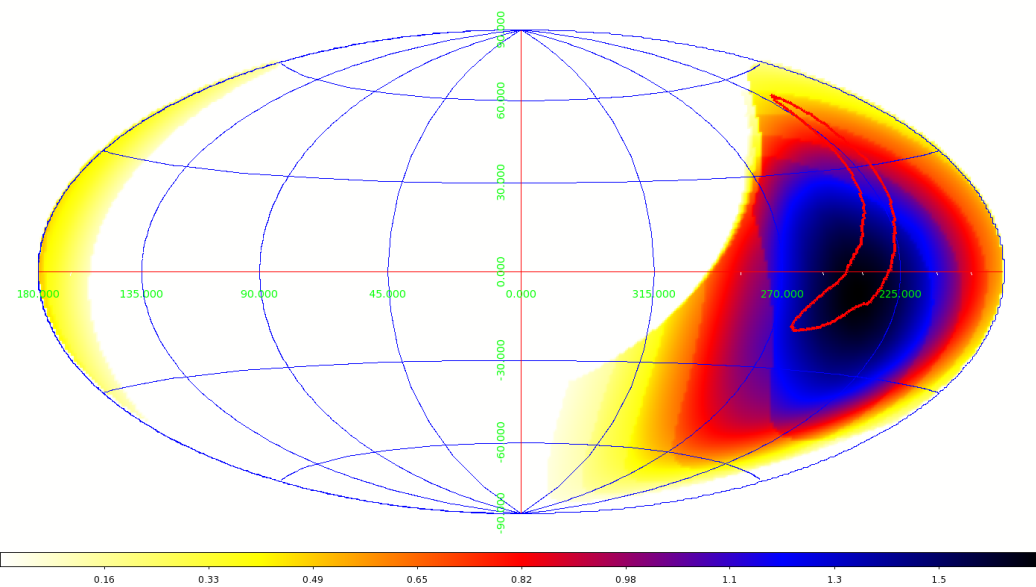
GW pipeline: automated analysis
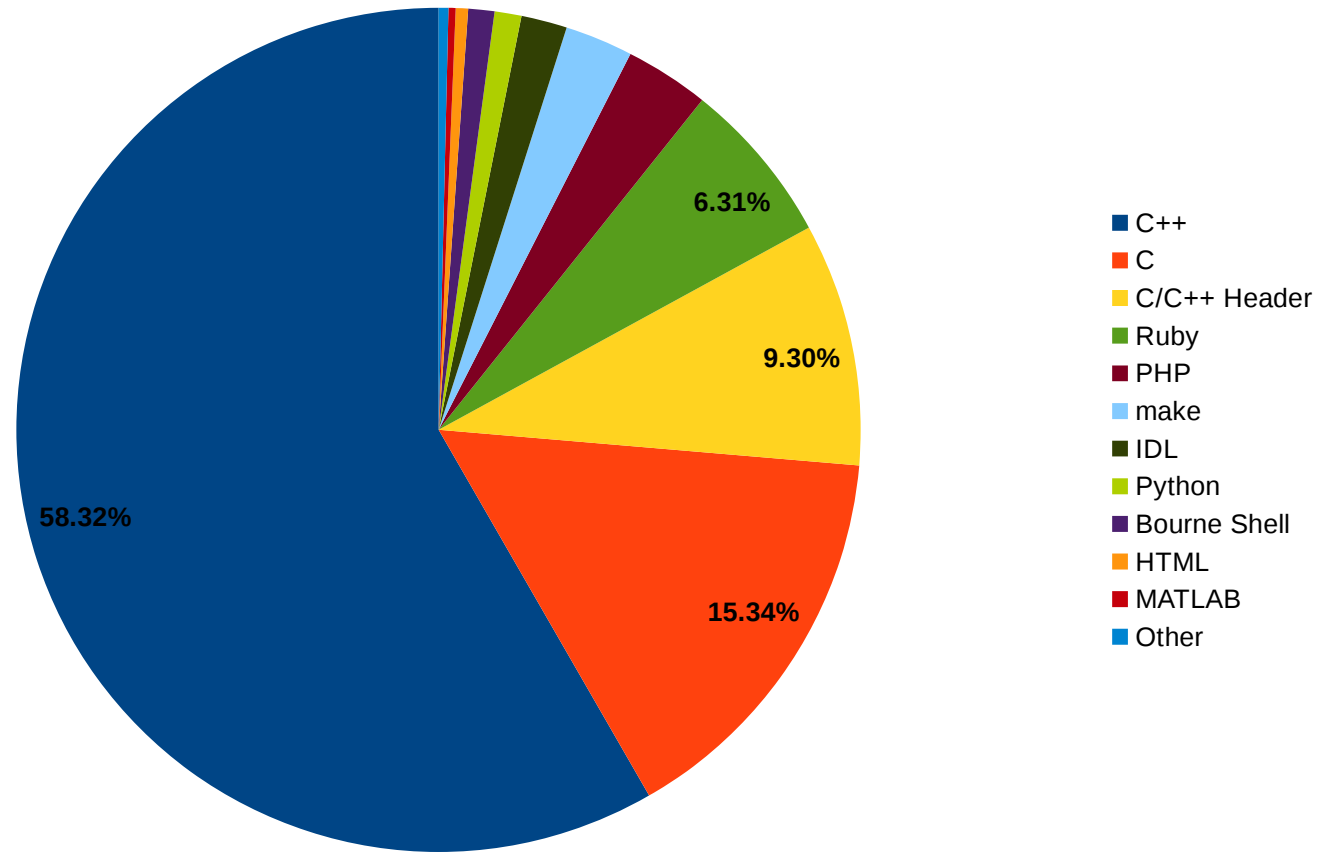

Visibility Check

MCAL

Tracker imaging

+ Ratemeters, AC, Aperture Photometry analysis

< 10 min

GW pipeline: Line of codes

58.32%
15.34%
9.30%
6.31%

Legend:
- C++
- C
- C/C++ Header
- Ruby
- PHP
- make
- IDL
- Python
- Bourne Shell
- HTML
- MATLAB
- Other

Conclusions

1) AGILE has unique capabilities for GW follow-up

2) Fast GW follow-up: 40m to 2.2h

3) New AGILE GW pipeline is up and running

Ready for next LIGO Observation Run, so stay tuned!