

# **POLAR-2, the next generation of GRB polarization detector**

International X-ray POlarimetry Symposium

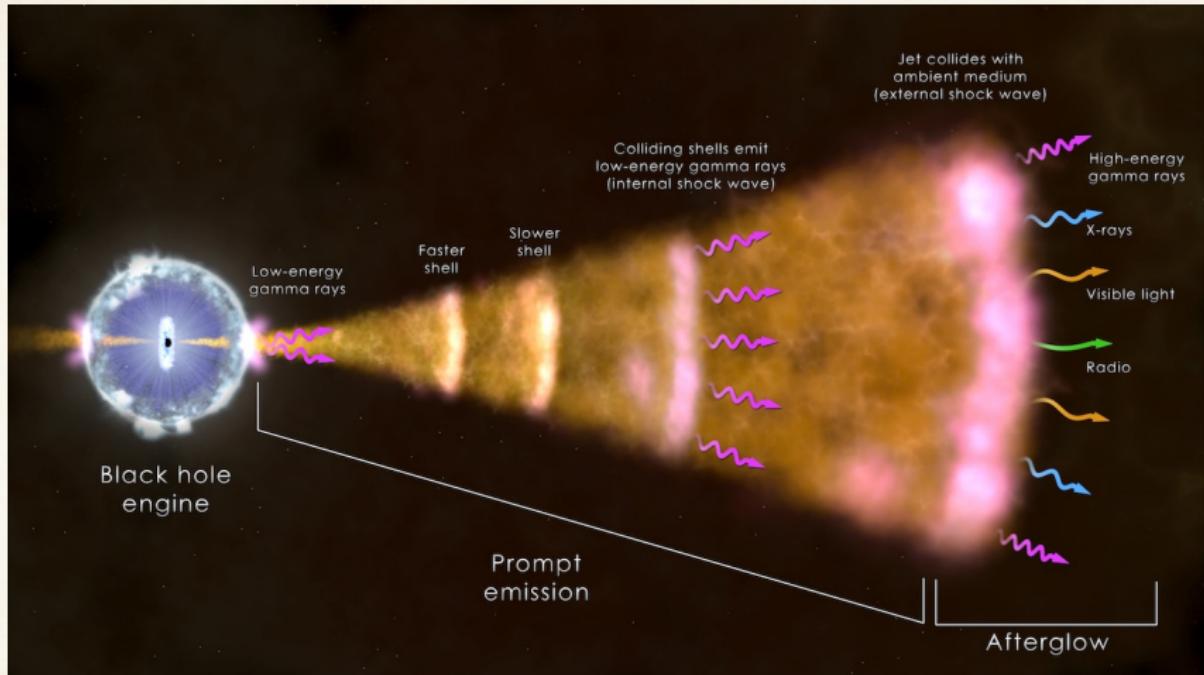
Huntsville, USA – 17<sup>th</sup> September 2024

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Nicolas De Angelis – [nicolas.deangelis@inaf.it](mailto:nicolas.deangelis@inaf.it)

INAF-IAPS, Rome, Italy

# Gamma-Ray Burst paradigm



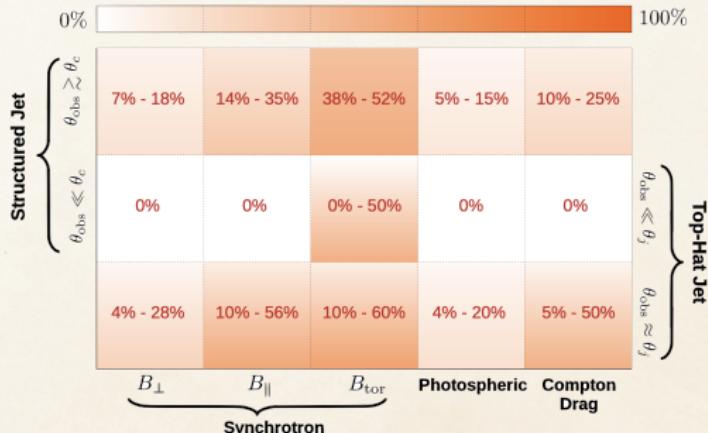
(Credit: NASA's Goddard Space Flight Center)

# GRB prompt emission polarimetry

Spectral information alone does not allow to disentangle the existing emission models.

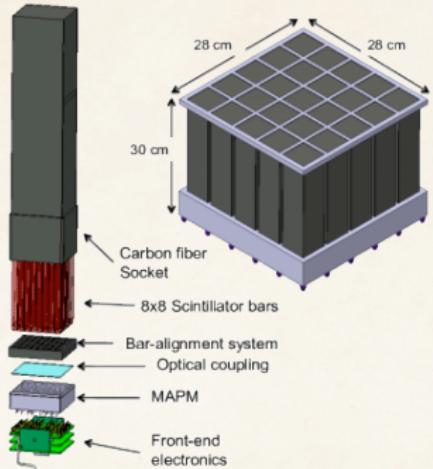
Measuring polarization is a very powerful tool to probe the physics of GRBs, as it can inform us about:

- The **emission mechanism** at play in the source (synchrotron vs. photospheric)
- The **outflow dynamics**: Kinetic Energy vs. Poynting Flux Dominated
- The **jet angular structure**: top hat jet, with smooth edges, truly structured
- The **magnetic field configuration** (random, ordered)

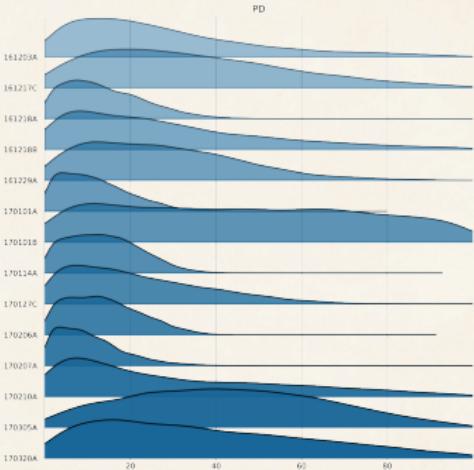


Gill, Granot, Kole 2021

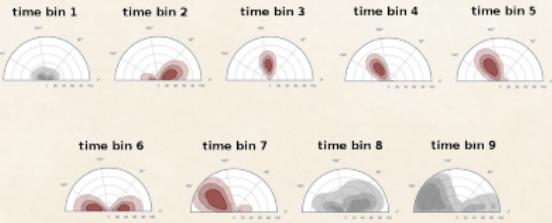
# POLAR results



NIM-A 877 259-268 (2018)



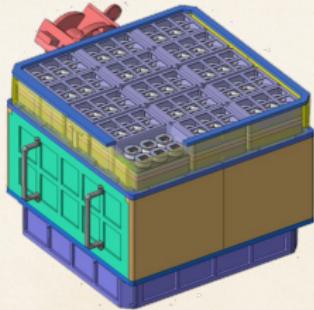
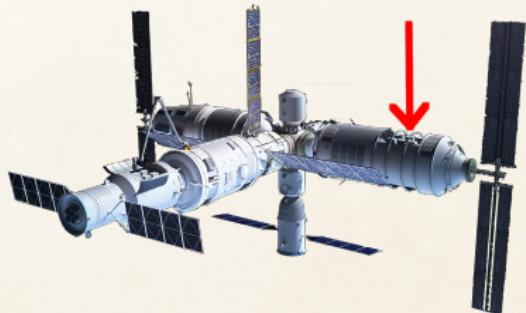
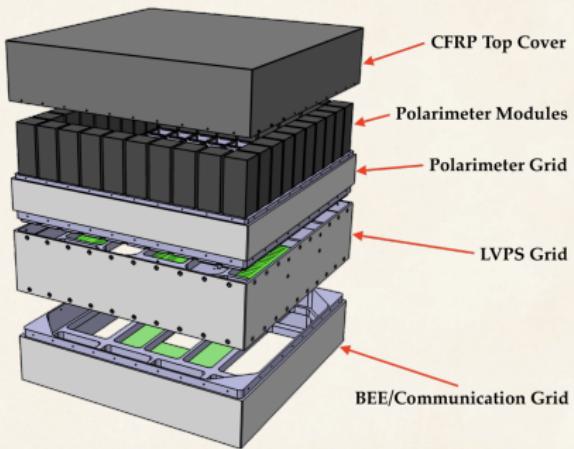
A&A 644, A124 (2020)



A&A 627, A105 (2019)

# The POLAR-2 mission

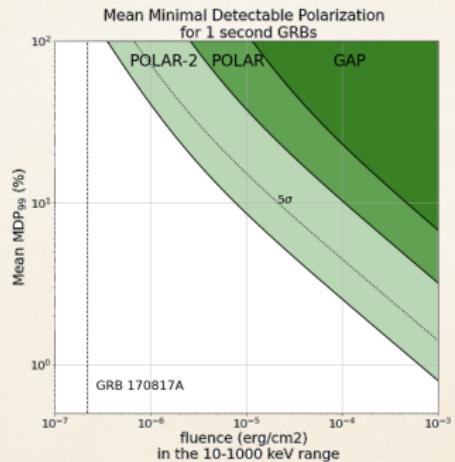
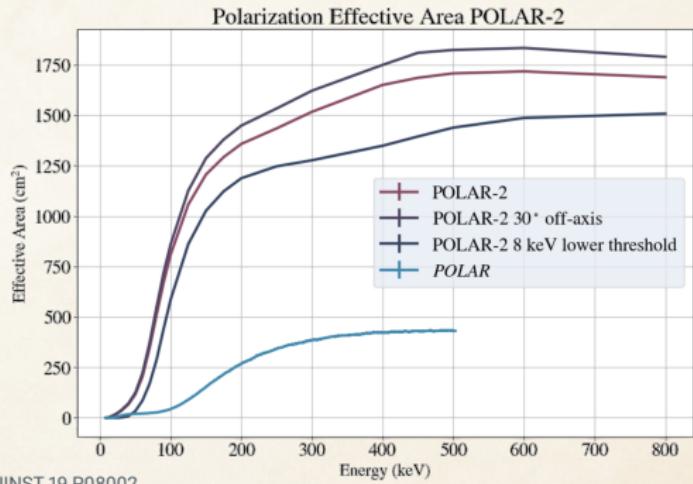
- Large scale GRB polarimeter based on POLAR's legacy
- Compton polarimeter made of 6400 plastic scintillators
- Two other payloads (low energy polarimeter and spectral imager) being developed
- Planned for a launch to the CSS



LPD

BSD

- Effective area greatly increased, especially at low energies  
→ **one order of magnitude more sensitive to GRB spectra**
- Energy threshold for polarimetry improved from 50 keV down to 20 keV
- Great improvement of the modulation factor  $\mu_{100}$  compared to POLAR
- About 50 GRBs/year with quality equal or higher than the best POLAR measurements



Galaxies 2021, 9, 82.