Noname manuscript No.
(will be inserted by the editor)

GRBs and e-ASTROGAM

The e-ASTROGAM Collaboration,
http://eastrogam.iaps.inaf.it/

February 24, 2017; Submitted to Experimental Astronomy.

GRBs are among the most intriguing and puzzling phenomena in astrophysics. They are believed to originate from coalescing NSs or BHs (short-GRBs, of duration $\lesssim$2 s) or from the final collapses of massive stars (long-GRBs). Their radiative output is believed to originate from highly relativistic outflows.

e-ASTROGAM will allow unprecedented studies of both classes of GRBs, thanks to the combined interplay between the imaging Tracker, the Calorimeter, and the AC system, providing excellent sensitivity for spectral and timing studies combined with polarization capability. It will be possible to detect GRBs with durations from sub-millisecond to hundreds of seconds and study them in the energy range where their emission peaks. The e-ASTROGAM spectral performance will be very relevant, because of the role played by the MeV range in constraining theoretical models of particle acceleration. The total number of GRBs detectable by e-ASTROGAM is estimated to be $\sim$600 during the first 3 years.

The e-ASTROGAM imaging Tracker can localize GRBs within 0.1°-1° (depending on their intensity), and the information can be processed onboard for a fast communication. The delay of the alerts is similar to *Fermi*-LAT, being the procedure (event rates onboard, plus simple localization based on onboard fast reconstruction) the same. This translates into an initial alert with an accuracy of 1°-2° within (2-4) s, to be confirmed with similar accuracy within 30 s and then made public. Within 4h-8h the final alert accuracy of 0.1°-1° can be reached. The alerts issued by e-ASTROGAM will be extremely valuable for observatories such as CTA. The Calorimeter can act as an independent detector extending the energy range down to 30 keV: an on-board trigger logic spanning timescales from sub-ms up to seconds will be implemented.

For bright GRBs, e-ASTROGAM will detect polarization in the MeV range. The Tracker can provide information down to (150-200) keV, also for

Address(es) of author(s) should be given

Type	3 yr	New sources
Total	3000 – 4000	∼1800 (including GRBs)
Galactic	∼ 1000	∼400
MeV blazars	∼ 350	∼ 350
GeV blazars	1000 – 1500	∼ 350
Other AGN (<10 MeV)	70 – 100	35 – 50
Supernovae	10 – 15	10 – 15
Novae	4 – 6	4 – 6
GRBs	∼600	∼600

Table 1: Estimated number of sources of various classes detectable by e-ASTROGAM in 3 years. The last column gives the number of sources not known before in any wavelength.

polarization measurements. We can estimate as 42 GRBs/year the number of events with a detectable polarization fraction of 20%; for a polarization fraction of 10% the number is about 16 GRBs/year. The polarization information, combined with spectroscopy in the MeV-GeV band, will provide a unique diagnostic to address the role of magnetic fields in the radiative output and dynamics of the most relativistic outflows in our Universe.

The e-ASTROGAM sensitivity to short and long GRBs will be very useful also for the detection of electromagnetic counterparts of impulsive gravitational wave events.