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Ultra-Long Gamma-Ray Bursts detection with SVOM/ECLAIRs

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Ultra-long Gamma-Ray Bursts (ulGRBs) are Gamma-Ray Bursts (GRBs) with an unusually long emission in X and gamma rays, reaching durations of thousands of seconds. They could form a specific class of high-energy transient events, whose origin is still under discussion. The current sample of known ulGRBs consists of a few 10s of events which have been detected so far by the Burst Alert Telescope (BAT) aboard the Neil Gehrels Swift Observatory and some other instruments. The SVOM mission which is scheduled to begin operations after 2021 could help to detect and observe more ulGRBs thanks to its soft gamma-ray telescope ECLAIRs. After an introduction on ulGRBs and the SVOM mission, we present the results of our simulations on the capabilities of ECLAIRs to detect ulGRBs. First we use the sample of ulGRBs detected by Swift/BAT and simulate these events through a model of the instrument and the prototype trigger software that will be implemented onboard ECLAIRs. Then we present a study of the ECLAIRs capabilities to detect a synthetic population of ulGRBs built by transporting the ulGRBs detected by Swift/BAT to higher redshifts. Finally we give an estimate of the ulGRB rate expected to be detected by ECLAIRs and show that it could be at least a factor 1-2 higher than the one of Swift/BAT, mainly thanks to the long-duration times scales of up to 20 min foreseen to be used onboard ECLAIRs in its image trigger, as well as to the low energy threshold of the instrument of 4 keV, which permits to enhance the detection capability of soft spectrum and hence potentially redshifted GRBs.

Field

Instrumentation

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