Contribution ID: **64**   Type: **Poster**

The AGILE real-time analysis pipelines in the multi-messenger era.

Friday 16 July 2021 12:00 (12 minutes)

In the multi-messenger era, space and ground-based observatories usually develop real-time analysis (RTA) pipelines to rapidly detect transient events and share information with the scientific community as quickly as possible, allowing follow-up observations. These RTA pipelines can also react to science alerts shared by other observatories through networks such as the Gamma-Ray Coordinates Network (GCN).

AGILE is a space mission launched in 2007 to study X-ray and gamma-ray phenomena. This work presents the technologies used to develop the AGILE RTA pipelines and an overview of the main scientific results.

Two types of AGILE RTA pipelines were developed using the RTApipe framework. The first type performs automated analyses on new AGILE data to detect transient events. Since May 2019, whenever the pipeline detects a transient event, it automatically sends an AGILE Notice to the GCN network. This RTA pipeline sent more than 40 Notices with a few minutes delay since the data arrival.

The second type of RTA pipeline reacts to multi-messenger external alerts (neutrinos, gravitational waves, GRBs, and other transients) received through the GCN network performing hundreds of analyses searching for counterparts in all AGILE instruments' data.
The AGILE Team uses these RTA pipelines to perform a fast follow-up of science alerts reported by others observatories and published several ATels and GCN Circulars. The main scientific results were also published in refereed journals.

The RTApipe framework will also be used to develop the Cherenkov Telescope Array and ASTRI Mini Array online analysis pipelines.

Keywords

multi-messenger; real-time analysis pipeline; gamma-ray transients; gamma-ray bursts; real-time framework; neutrino; gravitational waves; online analysis;

Collaboration

other (fill field below)

other Collaboration

AGILE

Subcategory

Experimental Methods & Instrumentation

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Session Classification: Discussion

Track Classification: Scientific Field: MM | Multi-Messenger