Contribution ID : **179** Type : **Oral talk**

A search for correlation of neutrino events in the Borexino detector with transient astrophysical phenomena

Wednesday, 23 October 2024 18:24 (12)

Studying of transient phenomena reveals some of the most dynamic and explosive objects in the Universe. These transients are crucial for gaining insight into the behavior and evolution of the cosmos. They also help us understand the physics behind non-transient sources, such as how supernovae provide clues about stellar evolution. Regardless of how transients are used to explore different aspects of the universe, they will remain a key focus in astronomy, especially as new telescopes and surveys are developed to observe our ever-changing cosmos.

In current work, we studied transient events such as Fast Radio Bursts (FRBs) and Gravitational Waves (GWs) using the Borexino detector signals ± 5000 s within time windows around the prompt event. We searched for temporal correlations for 42 FRBs with ΦFRBi > 40 Jy·ms, and also investigated temporal correlations for 74 GWs, including those presumably originating from black hole mergers and neutron star mergers. In both searches no statistically significant excess of events was observed. As a result, new strict upper limits have been set on ν_x fluences in the 0.5–15 MeV energy range for temporal correlations with FRBs, and new limits on ν_x fluences in the 0.5–50 MeV range for GW events.

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Session Classification : Astroparticle

Track Classification : Astroparticle physics