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The study of neutrinos and antineutrinos from astrophysical sources by Borexino

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The recent observation of CNO solar neutrinos by Borexino (BX) has proven the high potential offered by large underground ultrapure liquid scintillators to disclose weak neutrino and antineutrino fluxes. Supernovae explosions, gamma-ray bursts, solar flares and Gravitational Waves (GW) are among the possible extra-terrestrial sources of neutrinos and antineutrinos. The extreme radiopurity of the BX detector has already allowed to get the best upper limits on all flavor fluences in the few MeV energy range from GRB, to set limits on the diffuse supernova antineutrino background in the unexplored energy region below 8 MeV and to get the strongest upper limits on fast radio bursts associated neutrino fluences in the 0.5–50 MeV energy range. Recently, BX has searched for neutrino events in correlation with GW events for three runs from 2015 to 2020 using the BX data-set of the same periods. GW candidates originated by merging binaries of black holes, neutron stars and neutron star and black hole have been analysed separately, looking both for neutrino electron scattering and antineutrinos inverse beta decay interactions. The strongest upper limits on GW-associated neutrino and antineutrino fluences for all flavors (ν_e, ν_μ, ν_τ) have been obtained in the (0.5 - 5.0) MeV neutrino energy range.

The talk is aimed to summarise BX results on the possible signals from astrophysical sources, with a particular focus on the new search for GW-associated neutrinos.

Submitted on behalf of a Collaboration?

Yes

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