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Antineutrinos from the Sun and Cosmos

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Astrophysical neutrinos cover at least 18 orders of magnitude in energy, starting from meV (relic neutrinos) till PeV, the highest energy neutrinos ever detected as of today. Among the possible extraterrestrial sources of antineutrinos are the supernovae explosions, gamma ray bursts, neutron and black hole mergers and solar flares. In the Sun, the conversion of solar neutrinos into antineutrinos in the strong magnetic field could cause a small antineutrino flux in the case of an anomalous neutrino magnetic moment.
Neutrino detectors start playing a substantial role in multi-messenger astronomy. The Borexino detector at the Laboratori Nazionali del Gran Sasso in Italy has proven its potential in the various fields of experimental neutrino astronomy.
The extreme radiopurity of the detector allowed to set new limits on diffuse supernova antineutrino background in the previously unexplored energy region below 8 MeV, and to get, even with very conservative assumptions, competitive results between 7.8 and 16.8 MeV. Among the recent achievements there are the best upper limits on all flavor antineutrino fluences in the few MeV energy range from gamma-ray bursts and from gravitational wave events. Finally a limit for a solar $\bar{\nu}_e$ flux of 384 cm^{-2} s^{-1} (90% C.L.) was obtained, that corresponds to a transition probability $p_{\nu_e \to \bar{\nu}_e} < 7.2 \times 10^{-5}$ (90% C.L.) for $E_{\bar{\nu}_e} > 1.8$ MeV.
In the talk a comprehensive review of the all the Borexino results on antineutrinos fluxes from astrophysical sources will be presented.

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