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Constraining the contribution to Gamma-Ray Bursts to the high-energy diffuse neutrino flux with 10 years of ANTARES data

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Gamma-Ray Bursts (GRBs) are considered very interesting astrophysical sources to be studied in the context of the neutrino astronomy. Indeed, their jet composition continues to be an open issue. Within the framework of the fireball model, mesons can be produced during photo-hadronic interactions occurring in the internal shocks between shells emitted by the central engine. From their decays, high-energy gamma rays and neutrinos are expected to be generated. Neutrino telescopes are particularly interested in GRBs: being the most powerful explosions observable in the Universe, they are potentially able to achieve the energetics required to reproduce the diffuse astrophysical neutrino flux measured few years ago and, thus, they are expected to give a contribution to such astrophysical neutrino flux. The analysis here presented relies on the search of time and space coincidence between neutrinos and the GRB emission. The undersea neutrino telescope ANTARES, operational in the Northern hemisphere since 2008 in its full configuration, plays an important role in the cosmic neutrino searches. In this contribution, the results of a stacked search for muon astrophysical neutrinos are presented for 784 GRBs in the period 2007-2017 using the ANTARES data. Given the absence of coincidences between a neutrino and a GRB in the considered sample, this analysis has allowed us to constrain the contribution of the detected GRB population to the neutrino diffuse flux to be less than 10% around 100 TeV, within the context of the internal shock model. In addition, for the first time in this kind of analysis, the uncertainties on the not well characterized GRB parameters, needed to compute the neutrino flux expectations, are taken into account for each individual burst and then propagated to the diffuse flux from GRBs and to the stacked limit.

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