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GRB neutrino searches with ANTARES and KM3NeT

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Gamma-Ray Bursts (GRBs) are considered promising neutrino emitters. They appear as extremely intense bursts of gamma-ray radiation of extragalactic origin observed isotropically in the sky and constitute the most powerful explosions observable in the Universe. A lot has been learnt about these sources in the last years, however their jet composition remains still an open issue. Within the framework of the fireball model, mesons can be produced in photo-hadronic interactions occurring at internal shocks between shells emitted by the central engine. Then, if hadrons are accelerated from mesons decay, high-energy gamma rays and neutrinos are expected to be generated. By exploiting data collected by neutrino telescopes, temporal and spatial coincidences between high-energy neutrinos and GRBs can be searched for. In the context of identifying cosmic neutrino sources, an important role has been played over the last decade by ANTARES, the first undersea neutrino telescope located in the Northern hemisphere. Since investigations with ANTARES data have shown no coincidences so far, it was possible to set limits to the contribution of the detected GRB population to the diffuse neutrino flux measured by IceCube, as well as to the neutrino emissions expected from bright GRBs and from the recently detected emitting TeV GRBs. GRBs will be subject of investigation also for KM3NeT-ORCA and KM3NeT-ARCA, the next generation neutrino detectors under construction in two different sites of the Mediterranean Sea. Thanks to their geometry, both KM3NeT detectors will cover a broad neutrino energy range, from MeV to PeV, with a significant sensitivity improvement as compared to ANTARES. This will enable us to further investigate GRB emissions, providing new insights into their possible neutrino production. In this contribution, the results achieved over the last decade on GRB neutrino searches with ANTARES data are presented, as well as preliminary KM3NeT performances to detect such transient neutrino fluxes.

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