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Joint search for gravitational waves and high energy neutrinos with the VIRGO-LIGO and ANTARES detectors

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Cataclysmic cosmic events can be plausible sources of both gravitational waves (GW) and high energy neutrinos (HEN), alternative cosmic messengers carrying information from the innermost regions of the astrophysical engines. Possible sources include long and short gamma-ray bursts (GRBs) but also low-luminosity or choked GRBs, with no or low gamma-ray emissions.

The ANTARES Neutrino Telescope can determine accurately the time and direction of high energy neutrino events, and the Virgo/LIGO network of gravitational wave interferometers can provide timing/directional information for gravitational wave bursts. Combining these informations through GW+HEN coincidences provides a novel way of constraining the processes at play in the sources, and also enables to improve the sensitivity of both channels relying on the independence of backgrounds of each experiment.

We will describe the joint GW+HEN searches performed using data taken with the ANTARES telescope both in 2007 (while Antares was half its final size) and in 2009-2010 (with the full Antares detector) combined with data from the Virgo/LIGO interferometers during the VSR1/S5 and VSR2-3/S6 (with improved sensitivities) science runs. The 2007 search has allowed to place the first upper limits on the density of joint GW+HEN emitters, and the 2009-2010 analysis will allow a significant improvement in sensitivity.

Collaboration

ANTARES

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