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Astroparticle multi-messenger physics

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My PhD work focuses primarily on astroparticle multi-messenger physics. Thus far, a particular emphasis has been placed on strategies for expanding the limits of the detection capabilities of ground-based observatories to maximise signal background discrimination efficiency and to encompass more messengers. More specifically, one of the objectives of my PhD work is to determine whether a gamma-ray observatory located at the Earth's surface is capable of measuring VHE- UHE neutrinos, and its expected performance. This implies the study of highly inclined extensive air showers induced by descending and ascending neutrinos, which are taken as signal events. Conversely, the background is composed of very steep showers induced by cosmic rays. The strategy employed to discriminate between signal and background is based on the balance between the total electromagnetic signal and the total muonic signal registered at the ground. In addition to this, my PhD work also aims to create and evaluate the performance of new variables in relation to signal-background discrimination efficiency. These analyses entail the simulation of extensive air showers and of the detector response, followed by the parsing of the large amounts of data generated.

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