The global network of optical magnetometers for exotic physics searches (GNOME)

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GNOME is a novel experimental scheme which enables the investigation of exotic spin couplings between nuclei and exotic fields generated by astrophysical sources measuring spin precession. It consists of a network of geographically separated (>100km), time synchronized, ultrasensitive optical magnetometers in a magnetically shielded environment. Such a configuration enables the study of global transient effects.

Currently, the network is composed of nine atomic optical magnetometers of different characteristics located around the globe. The exotic field is expected to directly interact with the spins within the atom, either with the nucleons or the electrons. This interaction is observed as an energy shift on the Zeeman levels. Information about the dark matter source and properties can be extracted from relative signal amplitudes and delays between the different sensors.

The GNOME network performance to detect exotic physics sources is analyzed offering new ways to improve the network. Magnetic field data from nine sensors has been collected for a month. The analysis of these data for finding axion domain walls is discussed.