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Directional Dark Matter searches and current status of experimental efforts

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The presence of Dark Matter (DM) in the Universe is nowadays an established, yet still mysterious, paradigm: deciphering its essence is one of the most compelling tasks for fundamental physics today. While the majority of direct DM search experiment look for very low energy deposits by nuclear recoils induced by scattering with potential DM candidates, a much more robust signature is represented by the possibility to measure the directional modulation of a DM signal. This originates from the orientation of solar system motion inside the DM halo that embeds our Galaxy and which happens to point towards the constellation Cygnus. This represent a directional correlation with an astrophysical source that no background whatsoever can mimic. A detector sensitive to direction and sense of the arrival of particles can therefore hold the key to an unambiguous, positive observation of a DM signal and at the same time be able to continue DM searches also inside the so-called “Neutrino Fog”, which has today become a reality after the recent evidence of 8B solar neutrinos coherent scattering by the XenonNT experiment. In this talk, we will review the status and the latest progresses of the experimental efforts in directional DM searches, and how these are joining together in the CYGNUS project aiming at establishing a Galactic Directional Recoil Observatory at the ton-scale.

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