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New Background Discrimination Methods for the NEWS-G Dark Matter Search Experiment

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In Fall 2019, the NEWS-G experiment used its latest detector, a 140 cm diameter Spherical Proportional Counter (SPC) to search for low mass dark matter at the *Laboratoire souterrain de Modane* (LSM), in France. When a particle interacts with an atom of gas inside the SPC, the ensuing recoil ionizes the gas and produces primary electrons that drift towards the centre of the sphere due to a radial electric field. Close to the central anode, the electric field is so strong that the electrons start themselves ionizing the gas, resulting in a Townsend avalanche. All the drifting secondary ions induce a current in the sensor which produces a characteristic signal.

Although lead and polyethylene shields protect the detector against most of the background coming from the environment, the majority of the detected signals are still unrelated to WIMP interactions. In particular, electronic spikes and events correlated to alpha particles are a significant source of undesirable signals. Some of these unwanted background events can be discriminated against by their pulse shape, which differs from the characteristic shape of physical pulses. The objective of the background discrimination is to correctly identify and remove a maximum of the background signals, while keeping the maximal proportion of potential events of interest. This talk will present a description of the newly developed algorithms to exclude the signals coming after alphas and differentiate spikes from WIMP candidate events.

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Please select: Experiment or Theory

Experiment

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