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Distinguishing WIMP-nucleon interactions with directional dark matter experiments

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The framework of non-relativistic effective field theory (NREFT) aims to generalise the standard analysis of direct detection experiments, which is typically framed in terms of spin-dependent (SD) and spin-independent (SI) interactions. I will show that a number of these more general NREFT operators lead to distinctive new directional signatures, such as prominent ring-like features in the directional recoil rate, even for relatively low mass WIMPs. I will focus on how well different operators can be distinguished in directional and non-directional direct detection experiments. In particular, I will show that for certain NREFT operators, directional sensitivity provides the only method of distinguishing them from the standard SI/SD operators, highlighting the importance of directional detectors in probing the particle physics of dark matter.

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Session Classification: Dark Matter

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