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Superconducting thermometers for the direct detection of dark matter

In the past decades, numerous experiments have emerged to unveil the nature of dark matter (DM), one of the most discussed open questions in modern particle physics. Direct detection experiments aim to measure the scattering of DM particles off a target, where a low detection threshold is crucial to measure light DM. The lowest nuclear recoil thresholds today are of O(10 eV) and are reached with detectors that use superconducting thermometers for the collection of athermal phonons from monocrystalline targets. In this talk, we review several of the current developments and challenges for such experiments: sensitivity can be improved with optimized designs and target materials; large multi-detector setups can test lower interaction cross sections – their operation and analysis can be automated with machine learning; excesses with instrumental and not yet fully understood origin are harmful low-energy background sources. Finally, we discuss the relations to other superconducting thin-film technologies, e.g. ~quasiparticle poisoning in superconducting qubits.