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## **QUEST-DMC: Low Mass Dark Matter Search with Helium-3**

*Thursday 31 August 2023 16:00 (15 minutes)*

The QUEST-DMC experiment aims to utilise superfluid He-3 instrumented with quantum sensors to access sub-GeV dark matter parameter space. The experiment will have a superfluid 3-He target, operated below 100 microKelvin, contained in cubic cells instrumented with nanomechanical resonators read out by SQUIDs. Superfluid He-3 is an ideal target medium for sub-GeV dark matter searches, in particular spin-dependent interactions, as well as a wide range of theoretically well-motivated models. The small superfluid energy gap for quasiparticle excitations,  $1\text{E-}7$  eV, and amplification of signals from Andreev scattering make the system a unique bolometer. With the addition of very low noise readout using quantum sensors there is the potential to reach ultra-low energy thresholds, below the eV scale.

Here, we will present work on optimisation and projected sensitivity of the experiment, plus development of the key enabling technologies. This includes background assay results and GEANT4 simulations, modelling of the detector response and readout noise. The resulting projected sensitivity of the experiment to various dark matter models will be presented. Recent developments in nanowire fabrication, bolometric measurements and quantum sensor readout will also be shown.

### **Submitted on behalf of a Collaboration?**

Yes

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**Session Classification:** Dark matter and its detection

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