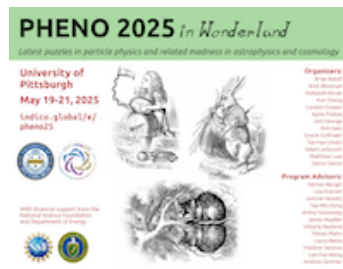


# Phenomenology 2025 Symposium



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## New approach to using optomechanically levitated sensors to detect ultralight dark matter

*Tuesday 20 May 2025 17:15 (15 minutes)*

Optically levitated quantum sensors have recently been increasingly popular in proposals to detect ultralight dark matter and gravitational waves due to their world-leading sensitivities to forces. Although historically less optimized to search for many DM couplings than e.g. magnetic traps, optical traps can reach much higher frequencies (kHz-to-GHz). After outlining the necessary concepts in optomechanical quantum sensing, we compare sensitivities to ultralight dark matter couplings with currently used optical traps versus a newly proposed optimised setup, improving these sensitivities by several orders of magnitude and reaching new dark matter parameter space. We also discuss near-future prospects of improving this by reaching the on-resonance standard quantum limit to explore the ultimate sensitivity of these novel detectors.

### Mini Symposia (Invited Talks Only)

### Plenary (Invited talks only)

**Author:** Dr HAMAIDE, Louis (INFN Naples)

**Co-author:** Dr BANKS, Hannah (U. of Cambridge - DAMTP)

**Presenter:** Dr HAMAIDE, Louis (INFN Naples)

**Session Classification:** Dark Matter

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