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Spin-2 ULDM Detection with Levitated Superconductors

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Ultraprecise mechanical sensors such as magnetically levitated (Maglev) superconductors offer new ways to test the coupling between ultra-light dark matter and electromagnetism. In this talk, building on the ideas and technology proposed for spin-0 and spin-1, I will show how magnetically levitated resonators can be used as detectors for spin-2 dark matter, also known as dark gravitons. I will discuss the peculiarities of the dark graviton effects compared to other dark matter models, and in particular how the dark graviton, described by the Fierz-Pauli Lagrangian, couples simultaneously to matter and light. Both couplings can drive the mechanical motion of the levitated sensor, displacing it from its equilibrium position, an effect which is resonantly amplified when the Compton frequency of the dark matter matches the trapping frequency of the sensor. Finally, I will present a specific experimental setup that is sensitive to dark graviton dark matter and conclude with a forecast for its sensitivity.

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