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New Probes for Ultra-Low-Mass Dark Matter

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Ultra-low-mass bosonic dark matter particles produced after the Big Bang may form an oscillating classical field, which can be sought for in a variety of low-energy laboratory experiments based on spectroscopic, interferometric and magnetometric techniques, as well as in astrophysical phenomena. These bosonic particles can also mediate anomalous fifth forces between ordinary-matter particles. Recent measurements in atoms and astrophysical phenomena have already allowed us to improve on existing constraints on a broad range of non-gravitational interactions between dark bosons and ordinary-matter particles by many orders of magnitude (up to 15 orders of magnitude in the case of ultra-low-mass dark matter) [1-12]. Several other groups have recently reported new limits on ultra-low-mass dark matter from related measurements [13-17].

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Summary

Ultra-low-mass bosonic dark matter particles produced after the Big Bang may form an oscillating classical field, which can be sought for in a variety of low-energy laboratory experiments based on spectroscopic, interferometric and magnetometric techniques, as well as in astrophysical phenomena. These bosonic particles can also mediate anomalous fifth forces between ordinary-matter particles. Recent measurements in atoms and astrophysical phenomena have already allowed us to improve on existing constraints on a broad range of non-gravitational interactions between dark bosons and ordinary-matter particles by many orders of magnitude (up to 15 orders of magnitude in the case of ultra-low-mass dark matter).

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