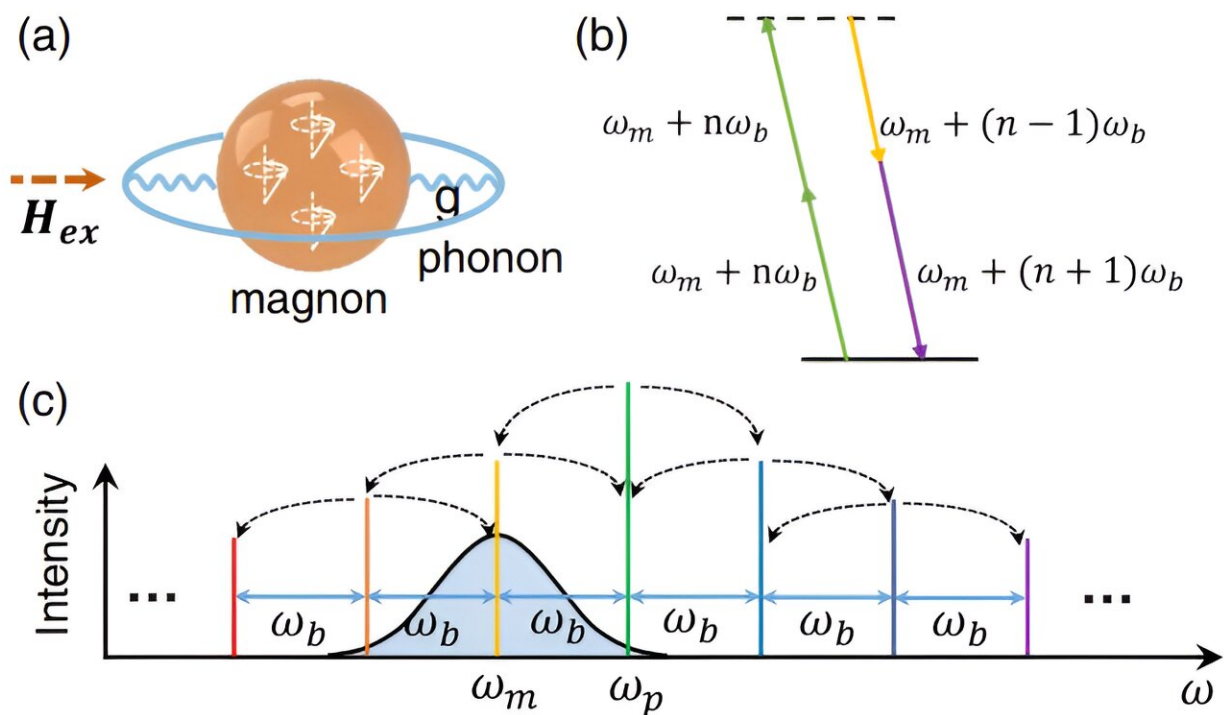


Research team realizes magnonic frequency comb

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Schematic illustration of the coupling between magnon and phonon. Credit: *Physical Review Letters* (2023). DOI: 10.1103/PhysRevLett.131.243601

The optical frequency comb, a spectrum of optical radiation composed of evenly spaced and phase-coherent narrow spectral lines, was initially developed for precise time and frequency measurements. Over the past two decades, it has shown broad application prospects in fields such as

astronomy, cosmology, optical atomic clocks and quantum key distribution. However, the implementation of magnonic frequency combs for high-precision magnonic frequency measurements remains a challenge.

A team led by Prof. Dong Chunhua from the University of Science and Technology of China (USTC) has generated a new magnonic frequency comb in a resonator through magnomechanical interaction. Their work is [published](#) in *Physical Review Letters*.

To realize the magnonic frequency comb in a resonator, the team first used an external strong pump to enhance the nonlinear magnomechanical interaction induced by magnetostrictive effect. When the pump power is sufficiently strong, the nonlinear magnomechanical interaction becomes prominent, leading to a cascaded four-wave mixing similar to the Kerr-frequency comb effect.

As a result, a magnon frequency comb consisting of up to 20 comb lines is generated, with a frequency spacing of 10.08 MHz, equal to the resonant frequency of the mechanical [resonator](#). Furthermore, the team utilized [injection](#) locking to stabilize and control the frequency spacing of the magnonic frequency comb.

This work not only propels the research on the nonlinearity of magnon systems, but also reveals the application potential of magnon frequency combs for sensing and metrology.

More information: Guan-Ting Xu et al, Magnonic Frequency Comb in the Magnomechanical Resonator, *Physical Review Letters* (2023).
[DOI: 10.1103/PhysRevLett.131.243601](https://doi.org/10.1103/PhysRevLett.131.243601). On *arXiv*: [DOI: 10.48550/arxiv.2306.07985](https://arxiv.org/abs/2306.07985)

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