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Editor's Focus

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A new scheme of fully stabilized soliton microcombs

More stable frequency standard has been the focus of studies for a long time [1,2]. Dissipative Kerr solitons (DKSs) in microresonators have attracted much interest for their potential in on-chip frequency standards [1]. DKSs provide frequency combs characterized by high coherence, expansive bandwidth, and microwave-repetition rates. They have been successfully utilized in various applications, including optical ranging, dual-comb spectroscopy, and optical clocks [3]. Among these applications, achieving a fully stabilized microcomb laser source is crucial. Traditional stabilization of soliton microcombs often necessitates a bulky reference fiber comb system, *f*-2*f* technology and multiple locking loops, resulting in a large footprint [4]. However, recent advancements in integrated photonic-atomic systems hint at the possibility of constructing a fully stabilized soliton microcomb on a chip scale [4].

In a recent study, Niu et al. [5] from the University of Science and Technology of China have introduced an innovative method for stabilizing the frequency of comb lines. Their approach involves referencing the frequency-doubled pump laser to atomic transition of ^{87}Rb and referencing the repetition rate to the atomic-clock-stabilized RF oscillator through injection locking. Consequently, this stabilizes the entire set of comb lines to an absolute frequency corresponding to the rubidium atom with a remarkable precision, eliminating the need for an additional reference laser system. In their research, only the pump laser requires locking, simplifying the process and circumventing the need for *f*-2*f* technology. This is applicable to other cavities and wavelength bands as well. This study presents a more versatile and novel approach to stabilize soliton microcomb systems and holds substantial potential for applications in precision spectroscopy, optical clocks, and optical ranging.

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