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【112】Optical injection locking enables coherent dual-comb spectroscopy

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Mid-infrared dual-comb spectroscopy is emerging as powerful tool for broadband and high-speed molecular spectroscopy. Chip-scale frequency combs based on quantum cascade lasers (QCLs) have become an invaluable technology, because they are electrically pumped, have a small footprint and offer an unrivalled power per mode. However, the mutual drift of both combs over time limits the averaging time and thus the sensitivity. Here, we show that two QCL frequency combs can be fully synchronized by optical injection locking. A passive optical filter enables an optical link between the combs, which locks their offset frequencies and establishes phase-coherence. Hence, the achieved signal-to-noise ratio is enhanced by more than an order of magnitude.

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