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PRESS RELEASE

Versatile, High Performance Terahertz Gas Spectroscopy using Frequency Comb

～Expectations for the analysis of volatile organic compound gases that generate air pollution～

Researchers in Tokushima University, Japan, Beihang University, China, and Université du Littoral Côte d'Opale, France, have developed THz spectroscopy featuring both versatility and high performance.

The terahertz (THz) region of the spectrum is a characteristic frequency band where rotational transitions of polar gas molecules including volatile organic compound gases can be seen. Furthermore, the relationship between the wavelength of THz radiation and the size of minute particles means far less susceptibility to optical scattering caused by aerosols. To discern a target gas, THz spectroscopy based on THz frequency comb, namely THz dual-comb spectroscopy or THz-DCS, has attracted attention due to high spectral resolution, high spectral accuracy, and broad spectral coverage in the THz region. Still, THz-DCS for practical use is hampered by the need for a pair of complex, expensive repetition-rate-stabilized lasers as optical frequency comb sources. Recently, a single-cavity dual-comb fiber laser has appeared as a new way to reduce the expense and complexity, as a single laser without need for stabilization control. However, the residual timing jitter of the laser has hindered high spectroscopic performance in THz-DCS.

To solve the problem above, versatile, high performance THz-DCS has been demonstrated by combining a single-cavity dual-comb fiber laser with an adaptive sampling method. The proposed method prevents degradation of spectroscopic performance by detecting the frequency fluctuation in the single-cavity dual-comb fiber laser and compensating the distorted spectral shape with the frequency fluctuation. Such versatile, high performance THz-DCS will be a powerful tool for monitoring of air pollution.

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Journal Information

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