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## **A novel single-shot characterization method for attosecond FEL pulses using self-referenced spectral interferometry**

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The complete spectrotemporal characterization of attosecond X-ray free-electron lasers (FELs) is of great importance for the ultrafast scientific experiments. Currently, the lack of high-precision characterization methods has become a key bottleneck that limits the application of attosecond X-ray FELs to some extent. To address this issue, we proposed a novel method, demonstrated by a proof-of-principle experiment, for single-shot characterization of ultrashort FELs based on self-referenced spectral interferometry. A pair of replica pulses with suitable spectral shear can be generated by using the frequency-pulling effect, and then, the complete spectrotemporal information of attosecond FELs can be extracted from the spectral shearing interferogram of these two frequency-sheared pulses. Recently, we are planning to conduct ultrafast experiments at SXFEL in order to further validate this characterization method in the X-ray range. This would provide an excellent diagnostic approach for the optimization and fine-tuning of ultrafast FELs and future attosecond scientific experiments based on X-ray FELs.

### **Footnotes**

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