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Terawatt-scale attosecond soft X-ray pulses from a superradiant free-electron laser cascade

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High-power attosecond X-ray pulses are ideal probes of ultrafast nonlinear interactions in quantum systems. We demonstrate the production of soft X-ray pulses with terawatt-scale peak powers and few hundred attosecond pulse durations in a two-stage cascaded X-ray free-electron laser. We diagnose the pulse properties in the time domain with angular streaking. Our results exceed the peak power of previous state-of-the-art attosecond XFELs by an order of magnitude. Furthermore, our data provides strong evidence of operation in the soliton-like superradiant regime of the free-electron laser at X-ray wavelengths.

Footnotes

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