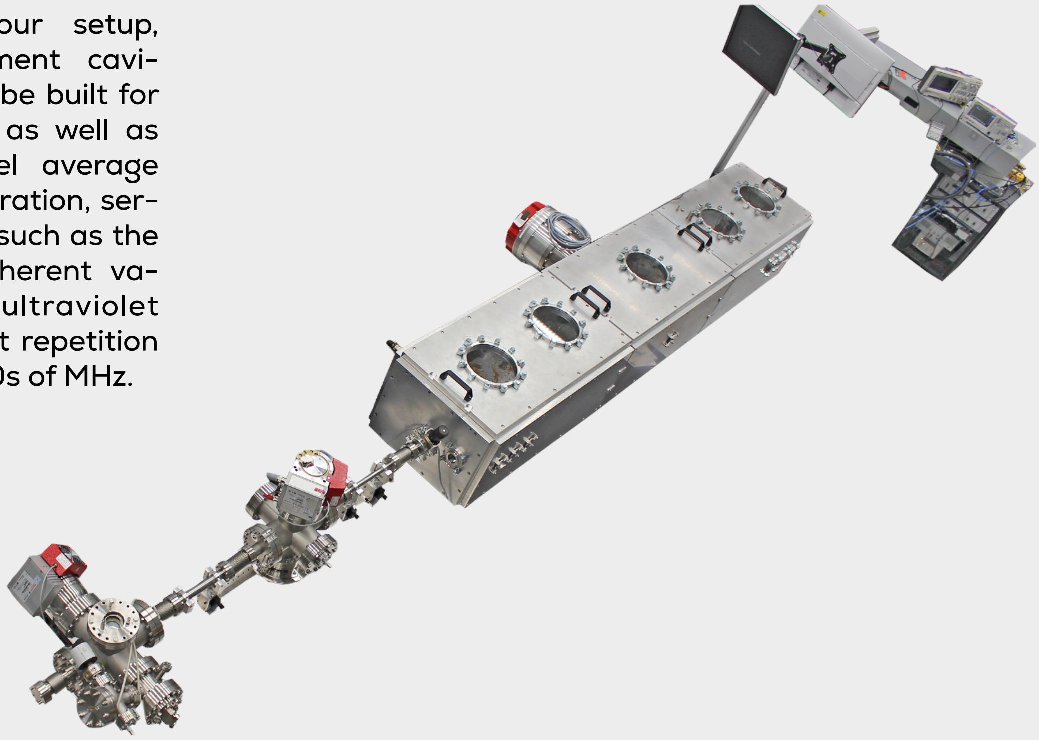
UltraFast Innovations

YOUR KEY to innovation and success

Enhancement cavity for continuous-wave / pulsed laser light
CALDERA

Tailored to your setup, the enhancement cavity CALDERA can be built for continuous-wave as well as for multi-kW-level average power pulsed operation, serving applications such as the generation of coherent vacuum-/extreme-ultraviolet (XUV) radiation at repetition rates of several 10s of MHz.



Key Product Features:

- State-of-the-art broadband cavity optics
- Advanced designs tailored to specific applications
- Ready for average powers on the 100-kW level
- Stable operation at repetition rates ≥10 MHz

東京インスツルメンツ
TOKYO INSTRUMENTS
グローバルにネットワークを広げ、最先端の科学をお客様に提供

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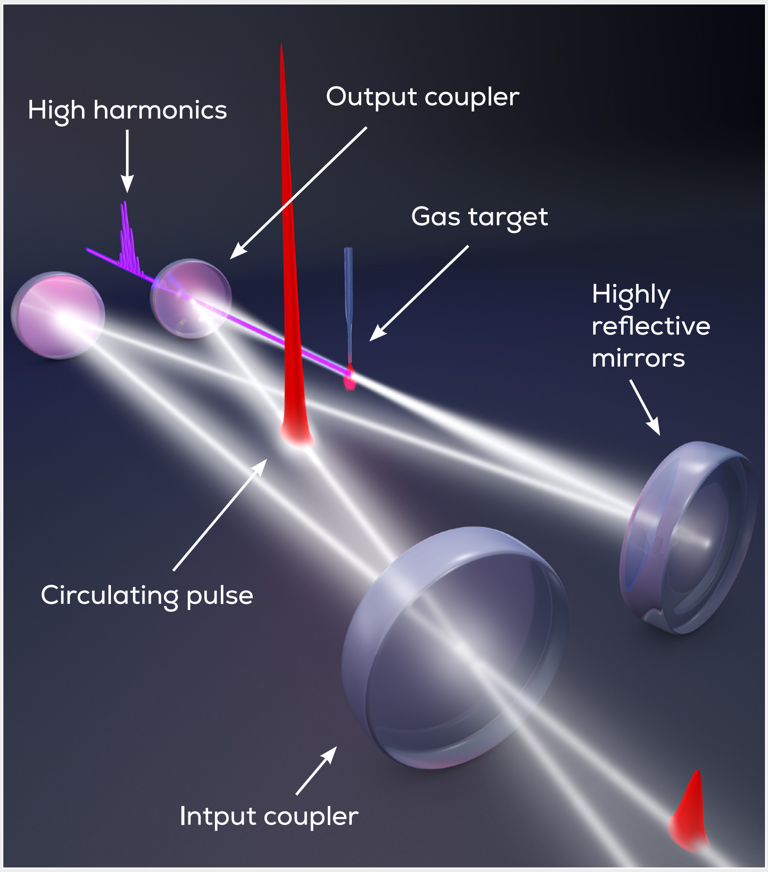
Working principle:

Femtosecond enhancement cavity: a MHz-repetition-rate pulse train is coherently coupled to a passive optical resonator via a partially transmitting input coupler, giving rise to a circulating pulse with a power increased by up to a few orders of magnitude.
The intracavity pulse can be focused to a gas target to generate coherent vacuum-/extreme-ultraviolet (XUV) radiation at repetition rates of several 10's of MHz.
Coherent XUV radiation obtained by cavity-enhanced high-harmonic generation combines high pulse repetition rates with high photon energies at high XUV photon flux, and serves a host of time-domain and frequency-domain precision metrology applications [1].



Components and working principle of the enhancement cavity. Picture: Christian Hackenberger

Applications:

- Vacuum- and extreme-ultraviolet frequency combs [1]
- MW-level picosecond pulses for hard x-ray generation via inverse Compton scattering [3]
- Multi-MHz-repetition-rate photoemission spectroscopy [2]
- and more ...

References:

[1] I. Pupeza, C. Zhang, M. Högner, J. Ye, „Extreme-ultraviolet frequency combs for precision metrology and attosecond science," Nature Photonics **15**, *175–186 (2021)*

[2] T. Saule, S. Heinrich, J. Schötz, N. Lilienfein, M. Högner, O. de Vries, M. Plötner, J. Weitenberg, D. Esser, J. Schulte, P. Rußbüldt, J. Limpert, M. F. Kling, U. Kleineberg, I. Pupeza, "High-Flux, Ultrafast Extreme-Ultraviolet Photoemission Spectroscopy at 18.4 MHz Pulse Repetition Rate," Nature Communications, **10:458** *(2019)*

[3] H. Carstens, N. Lilienfein, S. Holzberger, C. Jocher, T. Eidam, J. Limpert, A. Tuennermann, J. Weitenberg, D.C. Yost, A. Alghamdi, Z. Alahmed, A. Azzeer, A. Apolonski, E. Fill, F. Krausz, I. Pupeza, "Megawatt-scale average-power ultrashort pulses in an enhancement cavity," Optics Letters **39**, *2595 (2014)*