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Toward a compact XUV frequency comb source

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Is there any new physics out there? Of course, for example, what is dark matter, can we detect it, and how? One intriguing approach to detecting dark matter involves the development of precise and sensitive nuclear clocks.
I will report on setting up the light source for performing the spectroscopy of the Thorium isotope (^{229}Th) transition, which plays a crucial role in nuclear clocks. The XUV light source is envisioned to be used for many other applications in fundamental spectroscopy. The XUV source is based on the world's highest peak power oscillator, delivering 200 W average power, 14 MHz repetition rate, and 110 MW peak power with 120 fs pulse duration. This output is being spectrally broadened and compressed in the cascaded multipass cells down to 8 fs and increasing peak power to nearly 1 GW. The XUV generation is being performed using high harmonic generation in a gas jet. The picture of the experimental setup is shown below.

A key technology driving this project is pulse shortening in multipass cells performed closely with startup company n2-Photonics. Also I am going to address a few potential practical applications of this pulse-shortening technology in the field of glass micromachining.