

■ Discussion leader

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High-Order Harmonic Generation and Attosecond Science

Abstract

Since the first observation of high-order harmonic generation (HHG) around 1987, almost thirty years have passed. Although there has been strong interest in related physical phenomena, many researchers expected that HHG would not be useful as a practical source at that time because of its small photon number associated with low conversion efficiency. Contrary to their expectations, however, HHG is now established as a high-output coherent light source in the XUV region [1] and the sole source of attosecond pulses. Here I introduce a brief history of HHG and attosecond science, and then present our recent efforts [2,3] on generation of intense high harmonics by using advanced solid-state laser technology [4,5] including high energy light waveform synthesizer for intense attosecond pulses and high-power ring-type mode locked oscillator for MHz repetition rate XUV pulses. The high-energy infrared synthesizer developed at RIKEN can create sub-keV soft x-ray coherent lights with an ultrashort pulse duration down to 50 attoseconds.

References

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About the Author

Katsumi Midorikawa is Director of RIKEN Center for Advanced Photonics. He received the B. S., M. S., and Ph.D. degrees in electrical engineering from Keio University, in 1978, 1980, and 1983, respectively. In 1983, he joined laser science research group, RIKEN. Since 1997, he had been a chief scientist of laser technology laboratory, RIKEN. He has served as President of The Spectroscopical Society of Japan from 2012 to 2015 and as Chair of Asian Intense Laser Network from 2015. Currently, his research focuses on high harmonic generation and attosecond science. He also interests in ultrashort high-intensity laser-matter interaction including application to multiphoton microscopy and laser micro-processing. He received several awards including Prizes for Science and Technology from MEXT, Japan in 2006, Chang Jiang Scholars from Chinese Ministry of Education in 2008, and "Hokou" Award in 2011. Katsumi Midorikawa is a fellow of IEEE Photonics Society, the Optical Society of America, American Physical Society, Japan Society of Applied Physics, and The Laser Society of Japan.