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High harmonic generation by surface plasmon resonance: Design of plasmonic devices and their applications

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Seung-Woo Kim has been researching femtosecond ultrafast optics for ultraprecision manufacturing technologies including EUV and X-ray generation. Recently, he and his colleagues achieved a novel method of high-harmonic generation by exploiting the local field enhancement in the nanogap induced by resonant plasmons within a metallic nanostructure consisting of bow-tie shaped gold elements on a sapphire substrate. Plasmonic gold elements enhance the pulse intensity enough to induce high harmonic generation with no extra cavities at all. By injection of argon and xenon gas jets onto bow-tie nanostructures, high harmonics up to 21st (38 nm) order were produced while the incident laser intensity remained only 10^{11} Wcm^{-2} . Other nanostructures such as tapered cones are now being investigated to construct laptop-sized coherent EUV sources for advanced lithography and high resolution imaging applications.