Toward real time observation of electron dynamics in atoms and molecules

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Another step has been taken in matter imaging. By using very short flashes of light produced by a technology developed at the national infrastructure Advanced Laser Light Source (ALLS) located at INRS University, researchers have obtained groundbreaking information on the electronic structure of atoms and molecules by observing for the first time ever electronic correlations using the method of high harmonic generation (HHG).

Made by a team of researchers from the Energy, Materials, and Telecommunications Center of INRS and the National Research Council Canada/University of Ottawa Joint Attosecond Science Laboratory, this scientific breakthrough opens new opportunities for investigating electron dynamics on the timescale of the attosecond.

Researchers used a new laser source developed at ALLS by Professor François Légaré's team from the Energy, Materials, and Telecommunications Center in collaboration with colleagues from INRS University, NRC Canada, and the University of Ottawa. This laser source proves to be an ideal tool for HHG from atoms and molecules. The HHG spectra obtained through interaction of the laser source with xenon atoms provide information on electronic correlations by highlighting the giant resonance of xenon. In addition, results obtained at ALLS show that the laser source is ideal for developing a soft X-ray beamline delivering ultrafast x-ray laser pulses down to the nanometer wavelength.

Built on national scientific collaboration, this study was conducted at ALLS by researchers Bruno E. Schmidt, Jean-Claude Kieffer, and François Légaré of the Energy, Materials, and Telecommunications Center of INRS and by Andrew D. Shiner, Carlos Trallero-Herrero, Hans J. Wörner, Serguei Patchkovskii, Paul B. Corkum, and David M. Villeneuve of the NRC Canada/University of Ottawa Joint Attosecond Science Laboratory. The project was funded by the Natural Sciences and Engineering Research Council of Canada, Fonds québécois de recherche sur la nature et les technologies, the Canadian Institute for Photonic Innovations, and the Canada Foundation for Innovation.

More information: Research results have just been published in the prestigious journal *Nature Physics*. www.nature.com/nphys/journal/v …/full/nphys1940.html

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