Extreme metrology for ultrafast electron dynamics in atomic scales

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Abstract

If we look back the history of science in the 20th century, quantum theory has been developed, opening up our eyes and leading us to the better understanding of atomic, chemical, condensed phase of materials. Overall, one may say that the 20th science has more concerned about how quantum systems are organized and manifest their properties and functionalities, and has hence dealt with phenomena in equilibrium. Even though there are still the questions to be addressed and explored in equilibrium, there is a growing demand to and interest in the study of how quantum systems evolve and, eventually, how to render such quantum systems perform as desired. In this sense, we are entering a new sceintific paradigm, “Control Age.” For example, scientists would like to move electrons around during chemical reaction processes far from equilibrium.

The new era of science calls for controlling electron behavior in matters at the utmost time scale (attosecond and/or femtosecond) with atomic spatial resolution. The last decade has observed an exciting advance in the source development of attosecond visible and extreme ultraviolet (XUV) pulse, and femtosecond hard x-ray pulse along with appropriate metrologies for the proper utilization of such sources.

In this talk, I would like to share this excitement in the development of new metrologies and new insights gained with these new tools in the aspects of both fundamental science and future technology: in atomic physics, condensed matter physics and XFEL science.

Keywords: *ultrafast science and technology, few-cycle lasers, attosecond metrology*

Biography

- Asian Director, Max Planck Center for Attosecond Science, 2010 – now
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- Director, Max Planck POSTECH / KOREA Res. Initiative 2010 – 2014
- Acting chairman, Physics Department, 2009
- Visiting professor, Lawrence Livermore National Lab. USA, 2006
- Visiting professor, Max Planck Inst. for Quantum Optics, Germany, 2006
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