MS06.O02

Status and future for time-resolved applications at Japanese XFEL facility SACLA

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Following the five-year construction and commissioning, SACLA has started operation for users in March 2012. As typical parameters, SACLA provides XFEL light in a photon energy range from 4 to 15 keV with a pulse energy of 0.5 mJ at 10 keV and a pulse duration less than 10 fs[1a,b]. Various fields of researches, including SFX/CDI, ultrafast chemistry, AMO, HEDS, and X-ray quantum optics are performed [2a]. ~50 proposals are performed per every year. For expanding the capacity, we are constructing new XFEL beamline, which will be open in 2015. For conducting high-resolution time-resolved experiments, it is crucially important for compensating possible timing jitter between XFEL and optical laser pulses. For this purpose, we have developed a timing diagnostic scheme, which utilizes x ray-pumped transient absorption of optical laser in semiconductor. We have evaluated a typical jitter as 130 fs in rms [2b]. Based on the scheme, we are constructing a dedicated system for post-process analysis, which will be operated in the autumn of 2014. We have developed a new scheme for time-resolved absorption spectroscopy, which combines a dispersive spectrometer with a grating-based beam splitter. Following the proof-of-principle test [3 a], we have successfully observed transient absorption signal in iron complex [3 b] in sub-ps resolution. For performing jitter-free X-pump/X-probe experiments, we have developed a two-color double-pulse scheme that uses variable-gap undulators and a small chicane [3 c]. A large and flexible wavelength separation of more than 30% with an ultraprecisely controlled time interval in the attosecond regime was achieved.

[1] *(a) T. Ishikawa et al. Nature Photon. 6, 540 (2012); (b) Y. Inubushi et al. Phys. Rev. Lett. 109, 144801 (2012).,* ***[2]*** *(a) http://xfel.riken.jp/eng/research/indexnne.html; (b)T. Sato et al. submitted.,* ***[3]*** *(a) T. Katayama et al. Appl. Phys. Lett. 103, 131105 (2013); (b) Y. Obara et al. Opt. Exp. 22, 1105 (2014); (c) T. Hara et al. Nature Comm. 4, 2919 (2013)*

Keywords: XFEL