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Design of ultrafast electron microscopy with superconducting rf gun

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Observation of ultrafast structural dynamics is very important for elucidating functions and creating new materials. We have been promoting research and development of ultrafast electron microscopes by generating relativistic femtosecond electron beam pulses using radio frequency (RF) accelerator technology. So far, we have fabricated the world's first ultrafast electron microscope using a normal-conducting S-band RF electron gun and demonstrated its feasibility in demonstration experiments. However, the normal-conducting RF electron gun uses high-power RF pulses, which causes limitations of low beam repetition rate and pulse-by-pulse energy stability. In this study, we have devised an L-band Nb3Sn superconducting RF electron gun that breaks through these limitations and are aiming to develop an ultrafast electron microscope using this gun. We will report the design of the Nb3Sn superconducting RF electron gun, beam simulation results, and conceptual design of an ultrafast electron microscope using the gun.

Footnotes

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Primary author: YANG, Jinfeng (Osaka University)

Presenter: YANG, Jinfeng (Osaka University)

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