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Commissioning of new photocathode RF gun for oscillator-type mid-infrared free-electron laser at Kyoto University

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The oscillator-type mid-infrared free-electron laser at Kyoto University named Kyoto University FEL (KU-FEL) has achieved the extraction efficiency of 9.4% and the micro-pulse duration of 4.2 cycle with the electron bunch charge of about 200 pC by the photocathode operation of 4.5-cell thermionic RF gun. Then the micro-pulse energy obtained was 100 micro-J. A new and dedicated 1.6-cell RF gun for the photocathode operation was fabricated and installed for increasing the electron bunch charge up to 1 nC and increasing the micro-pulse energy up to 1 mJ. The RF gun has curved cavity profile and elliptical cross-section of the connection between the half and full cell with a demountable cathode. This cavity design reduces the surface field of the inner cavity wall**. This improvement is important for having long macro-pulse (~10 micro-s) operation of the gun, which is essential for the oscillator-type FEL. The commissioning of the RF gun is undergoing. Results of commissioning experiments will be presented in the conference.

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Footnotes

H. Zen et al., *Appl. Phys. Express* 13, 102007 (2020). H. Zen et al., *arXiv:2208.11091* (2022). **Y. Song et al., *Nucl. Instrum. Meth. A* 1031, 166602 (2022).

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Yes

Primary authors: ZEN, Heishun (Kyoto University); TANAKA, Kotaro (Kyoto University); ZHAO, Yuhao (Kyoto University); OHGAKI, Hideaki (Kyoto University)

Presenter: ZEN, Heishun (Kyoto University)

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