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Improvement of extraction efficiency of oscillator-type mid-infrared free-electron laser at Kyoto University

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The oscillator-type mid-infrared free-electron laser (FEL) at Kyoto University named Kyoto University FEL (KU-FEL) has achieved the extraction efficiency of 9.4%. *A 1-D simulation predicted that the extraction efficiency can be further increased by reducing the optical cavity loss or increasing FEL gain**. A new photocathode RF gun is installed for increasing the FEL gain by increasing the electron bunch charge. For further increase of the extraction efficiency in addition to the increase of bunch charge, several developments are underway. First one is reduction of the optical cavity loss by changing the out-coupling method from the hole-coupling to the scraper out-coupling. The second one is increase of FEL gain by reducing the minimum gap of the undulator. The third one is optimizing the curvature of optical cavity mirrors. Current status of these activities will be presented in the conference.

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Footnotes

*H. Zen et al., Appl. Phys. Express 13, 102007 (2020).**R. Hajima, Atoms 9, 15 (2021).

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