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3D intra-bunch beam position measurement system and its application in FELiChEM

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a new infrared free-electron laser FEL facility named FELiChEM has been built at University of Science and Technology of China in Hefei. It is a user facility dedicated for energy chemistry research and can deliver the infrared laser in the spectral range of 2.5-200 μm to five research stations. FELiChEM consists of mid-infrared MIR and far-infrared FIR free-electron laser oscillators driven by a 60 MeV linac. The time structure of the electron beam can be easily tuned with the macrobunch width of less than 10 μs macrobunch repetition rate of 1–10 Hz and optional microbunch repetition rate within 238, 119, 59.5 and 29.75 MHz. A 3D bunch-by-bunch position measurement system was developed to monitor not just the average position of the macrobunch but also every individual bunch position in the train. With this toolkits, a significant beam loading effect can be easily observed downstream of the linear accelerator structure, and a strong dispersion effect is observable downstream of the optical oscillator. This diagnostic tool proves to be very useful for analyzing the status of the machine and implementing corresponding optimization measures. This paper will give a brief introduce of the machine, the hardware and software structure of the 3D position measurement system, and its application in machine commissioning and operation.

Footnotes

Funding Agency

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Yes

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