

# Development of FEL code to simulate the integrated undulator line

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Simulator for Free Electron Laser (FEL) realizes exploring non-linear phenomena between electron beams and undulators. There are some FEL codes for different purposes, but most popular code is GENESIS1.3 pursuing the averaged-frequency scheme which has fast calculation speed and can show time profiles of FEL as well as spectral features. To simulate real FEL, users have to consider various situations such as undulator tapering, transport section, wakefields generated by an electron beam in a cavity, bunch compressor, phase shifters, quadrupoles, self-seeding, and do on. Each consideration has different physical background, so sometimes users suffer from implementing those scenarios.

In this presentation, we introduce a developed FEL code (CoFELIS stands for the COde of Free-Electron-Laser with Integrated Slices) including diverse functions. The CoFELIS includes diverse modules mentioned above and is bench-marked with GENESIS1.3 and SIMPLEX as well as measurements at PAL-XFEL facility. Basic FEL equations follow GENESIS1.3, but treatment of electron beam slices is different by loading all slices at once. To simulate especially PAL-XFEL facility, the electron beam input mimics the measured phase space of the electron beam and undulator tapering. The result well-matches with the measurements. Overall code design inspired from SIMPLEX which is really easy to use due to the Window-based GUI. But the CoFELIS is written in C language and run in Linux system. However the texted input-file is designed for easy implementation for diverse functions. The talk will close with future development.

## Paper submission Plan

No

## Best Presentation

No

## Contribution track

ICABU WG2. Beam Physics, Diagnostics & Novel Techniques

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