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Session K6S - Poster Session: Radiation Sources; Reconnection.
POSTER session, Wednesday afternoon, November 18
Imperial Ballroom, Fairmont

[K6S.02] Ginzburg-Landau Model for a Long-Pulse Low-Gain Free-Electron Laser Oscillator

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The Ginzburg-Landau model for the radiation field of a free-electron laser (FEL) was originally derived for a high-gain amplifier. With a view to making precise comparisons with experimental data from the long-pulse FEL oscillator at the University of California at Santa Barbara (UCSB), we have developed a new formulation of the Ginzburg-Landau model starting from the low-gain oscillator equations. We implement a small-amplitude expansion of the radiation field, and derive the coefficients of the Ginzburg-Landau equation by analysis as well as by MATHEMATICA. Stability analysis of the Ginzburg-Landau equation produces results similar to those obtained by Antonsen and Levush. These include the stability of the main mode (no Benjamin-Feir instability) with phase unstable off-centered modes (Eckhaus instability), as well as relaxation to the single mode which occurs much faster in amplitude than in phase. We obtain the saturated radiation amplitude a_0 as functions of the detuning parameter p_inj and cavity loss, and determine the phase instability boundary in the a_0-p_inj plane. The probability of realizing a single mode starting with random initial conditions is calculated and compared with spectral measurements.

- **Part K of program listing**