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A one-dimensional model of superradiant spike saturation

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In this talk I will discuss some of the colleagues I have had the pleasure of working with and some of the research we have carried out in the field of Free Electron Lasers. In particular, I will focus on superradiance and give a 1-dimensional description of the highly non-linear saturation process of a single superradiant spike. The sub-wavelength pulse structures that evolve and the very high powers involved require simulations using an un-averaged FEL simulation code. The scaling of the superradiant spike saturation process is shown to be in good agreement with a simple hypothesis that saturation occurs when an initially resonant electron propagating through the pulse can lose sufficient energy within one half of an undulator period to propagate a full resonant radiation wavelength relative to the pulse. The saturation process is demonstrated using animations of the simulations.

Footnotes

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