

Taking Advantage of Microbunching Instability: A Breakthrough in Accelerator Design

Scientific Achievement

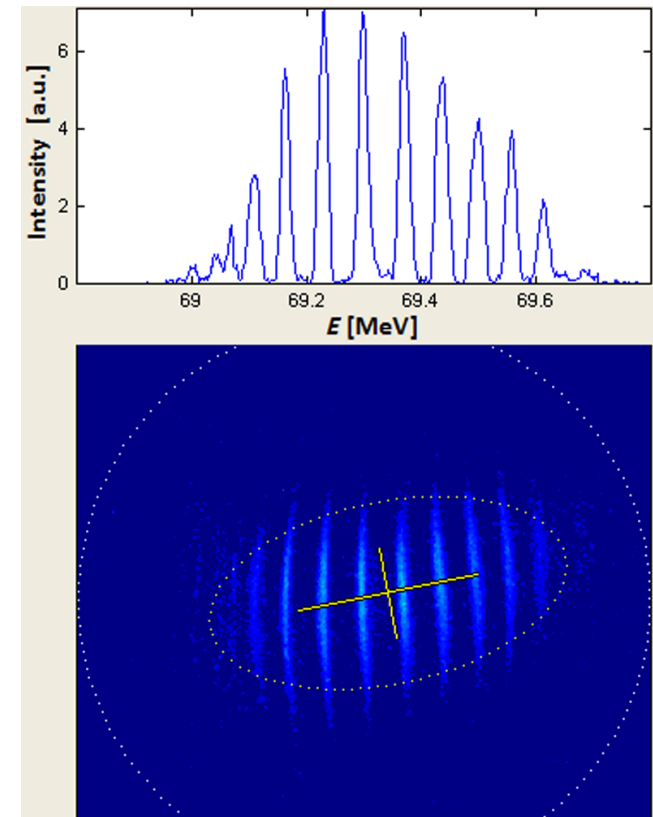
Characterized microbunching instability in particle accelerators and proved that instability can also be used constructively to control electron bunch shape

Significance and Impact

This first-time demonstration that microbunching instability can be used to advantage opens the way to enhancing performance of 4th-generation light sources

Research Details

- Systematically characterized microbunching instability and compared measurements to theory
- Showed how to “seed” the instability at a particular frequency so beam develops microstructures in controlled fashion
- Important for significantly enhancing performance of linac-based sources of multicycle coherent terahertz radiation; also has potential applications for FELs



Controlled micro-bunching as seen on a spectrometer screen (lower picture). The upper graph shows intensity of microbunches in arbitrary units. The distance between the microbunching peaks is 25 micrometers.

S Seletskiy, B Podobedov, Y shen, and X Yang, *Physical Review Letters* 111, 034803 (2013)

Work was performed at Brookhaven National Laboratory



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