

SENSITIVITY OF LCLS SELF-SEEDED PEDESTAL EMISSION TO LASER HEATER STRENGTH

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Abstract

Measurements of the soft X-ray, self-seeding spectrum at the LCLS free-electron laser generally display a pedestal-like distribution around the central seeded wavelength that degrades the spectral purity. We have investigated the detailed experimental characteristics of this pedestal and found that it is comprised of two separate components: (1) normal SASE whose total strength is nominally insensitive to energy detuning and laser heater (LH) strength; (2) sideband-like emission whose strength positively correlates with that of the amplified seed and negatively with energy detuning and LH strength. We believe this latter, non-SASE component arises from comparatively long wavelength amplitude and phase modulations of the main seeded radiation line. Its shot-to-shot variability and LH sensitivity suggests an origin connected to growth of the longitudinal microbunching instability on the electron beam. Here, we present experimental results taken over a number of shifts that illustrate the above mentioned characteristics.

INTRODUCTION

This work was recently accepted for publication in *Physical Review Accelerator and Beams* [1].

REFERENCES

- [1] G. Marcus *et al.*, "Experimental observations of seed growth and accompanying pedestal contamination in a self-seeded, soft x-ray free-electron laser," *Phys. Rev. Accel. and Beams*, vol. 22, pp. 080702, 2019. doi:10.1103/PhysRevAccelBeams.22.080702