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## **Operational experience with attosecond soft x-rays at LCLS**

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Attosecond physics is an emerging as one of the fastest-growing, highest-impact, areas of science at FELs. In this proceeding, we compare several methods for generating single-spike attosecond soft x-ray pulses at LCLS. Over the last several years we have measured more than 30 independent attosecond SXR configurations, across which we can explore a variety of techniques, including: cathode-modulation, laser-heater pulse shaping, and wiggler-induced changes to the beamline impedance. In each configuration, we optimize the undulator taper to selectively lase on the strongly chirped portion of a narrow-current spike in the middle of the electron beam. From the taper optimization we can then infer properties of the attosecond radiation which we compare across multiple techniques.

### **Footnotes**

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