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## **An Active Q-switched X-ray Regenerative Amplifier Free-Electron Laser**

*Tuesday, 9 May 2023 16:30 (2 hours)*

We describe active Q-switched X-ray regenerative amplifier FEL scheme to produce fully-coherent, high-brightness hard X-rays. In this scheme, a moderate energy chirp is introduced to the electron beams to shift the Free Electron Laser (FEL) radiation frequency outside the reflectivity bandwidth of the Bragg crystal. By actively controlling the chirp of the electron beam, the ratio of the out-coupled and recirculated pulse energy can be manipulated flexibly. This allows hard X-ray cavities driven by electron beams with reduced beam repetition rate, relatively low beam energy, and short cavity length. In contrast to typical XRFEL outcoupling designs involving X-ray optics manipulation, this approach only requires the control of energy chirp of the electron beams, which can be simple and straightforward to implement. We report theoretical and numerical studies as well as error tolerance analysis on this scheme. We further discuss the experimental plans based on self-seeding or cavity-based XFELs on LCLS-II.

### **Funding Agency**

### **Footnotes**

### **I have read and accept the Privacy Policy Statement**

Yes

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