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Active Q-switched X-Ray Regenerative Amplifier Free-Electron Laser

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Despite tremendous progress in x-ray free-electron laser science over the last decade, future applications still demand fully coherent, stable X rays that have not been demonstrated in existing X-ray FEL facilities. Cavity-based x-ray free electron lasers (CBXFELs) such as the x-ray regenerative amplifier FEL (XRAFEL) and the XFEL oscillator (XFELO) are poised to revolutionize the landscape. In this presentation, I'll introduce some innovative schemes for CBXFELs. First I will talk about the active Q-switched XRAFEL. By using simple electron-beam phase space manipulation, we show this scheme is flexible in controlling the x-ray cavity quality factor Q and hence the output radiation. This section encompasses numerical simulations and planned experiments. In the second part, I will discuss a novel concept staging XRAFEL and XFELO to generate hard X-ray pulses with very narrow bandwidth (~meV) while maintaining high pulse energy (~mJ).

Footnotes

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Primary authors: Dr HALAVANAU, Aliaksei (SLAC National Accelerator Laboratory); ZHU, Diling (SLAC National Accelerator Laboratory); HEMSING, Erik (SLAC National Accelerator Laboratory); MORGAN, Jenny (SLAC National Accelerator Laboratory); TANG, Jingyi (Stanford University); SINGLETON, Madison (SLAC National Accelerator Laboratory); ZHANG, Zhen (SLAC National Accelerator Laboratory); HUANG, Zhirong (SLAC National Accelerator Laboratory)

Presenter: TANG, Jingyi (Stanford University)

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