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# The Compact XFEL Project

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Arizona State University (ASU) is pursuing a concept for a compact x-ray FEL (CXFEL) that uses nanopatterning of the electron beam via electron diffraction and emittance exchange to enable fully coherent x-ray output from electron beams with an energy of a few tens of MeV. This low energy is enabled by nanobunching and use of a short pulse laser field as an undulator, resulting in an XFEL with 10 m total length and modest cost. The method of electron bunching is deterministic and flexible, rather than dependent on SASE amplification, so that the x-ray output is coherent in time and frequency. The phase of the x-ray pulse can be controlled and manipulated so that new opportunities for ultrafast x-ray science are enabled using attosecond pulses, very narrow line widths, or extremely precise timing among multiple pulses with different colors. These properties may be transferred to large XFELs through seeding with the CXFEL beam. Construction of the CXFEL accelerator and laboratory are underway, along with initial experiments to demonstrate nanopatterning via electron diffraction. An overview of the methods and project are presented.

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