

The Beams and Applications Seminar Series

Sub-Angstrom Stabilization of an X-ray Free Electron Laser Oscillator and Nuclear Resonance Metrology

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Advanced Photon Source

**Bldg. 401, Room B-4100
Tuesday June 26, 11:00 am**

A scheme is described in which the cavity roundtrip path length of an x-ray free-electron laser oscillator is stabilized to the sub-Angstrom level by locking one of the cavity modes to the narrow resonance line of ^{57}Fe nuclei. A standing-wave pattern formed by the output of the stabilized oscillator is probed through resonance fluorescence by another ^{57}Fe sample while its displacement over about one meter is measured with a laser interferometer based on an optical length standard. This will improve by about four orders of magnitude the accuracy at which the ^{57}Fe resonance wavelength can be measured. The technique can be refined for other, narrower resonances such as ^{181}Ta , opening up precision x-ray metrology for, e.g., experimental quantum gravity and nanotechnology.

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