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RF-Compressed Ultrafast Electron Diffraction: Long-Term Sub-50 fs Phase Stabilization in High-Brightness Instruments

Tuesday 14 June 2016 19:06 (2 minutes)

Ultrafast electron diffraction is a powerful table-top technique to characterize structural dynamics in condensed matter. We present an analysis of the phase stability of a 3 GHz radio-frequency electron pulse compression cavity. We implement low-noise microwave phase detection electronics to measure the slow drift (greater than 1 s) of the cavity resonance, allowing for continuous feedback and stabilization during an experiment. By optimally tuning the parameters of the feedback system, the additive drift of the cavity phase is reduced from ~ 1 ps to ~ 50 fs, yielding a significant improvement in the time resolution of the instrument.

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Track Classification: Instrumentation and Measurement Physics / Physique des instruments et mesures (DIMP-DPIM)