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Wavefront splitting Hard X-ray Split-Delays development at the Linac Coherent Light Source

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The ability to separate femtosecond free electron laser pulses and recombine them with an adjustable delay has numerous scientific applications such as X-ray Photon Correlation Spectroscopy and X-ray pump X-ray probe measurements. Split-delay X-ray optics, rely on X-ray optical arrangements that offer the possibility to provide two pulses from a single FEL pulse which time separation that can range from femtoseconds to hundreds of picoseconds. Such a hard X-ray split and delay was recently commissioned at the Linac Coherent Light Source.However, the split and delay performances heavily rely on the ability to maintain the spatial overlap between the two beams at the sample location, while adjusting the temporal separation between the two pulses. To relax the angular stability requirements, we present a compact hard X-ray split-delay concept using 4 channel-cut crystals, two of which have a variable gap. The path length difference between both beams can be simply adjusted by the linear translation of the two crystals having non-parallel gaps. By using two Bragg reflections from the same monolithic crystal in the opposite direction cancels positioning errors from underlying stages. As a result, this concept has lower motion precision requirements, and yet leads to significantly higher output beam angular stability.We present here a detailed study of this concept that would cover an energy range from 7 to 12 keV and provide a delay range from -3 to 10 ps at 9 keV.

Choix de session parallèle

6.4 Résultats scientifiques récents obtenus avec les XFEL

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