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Virtual Young's Double Slit Experiment for Hard X-ray Photons[1]

ABDEL ISAKOVIC, K. EVANS-LUTTERODT, D.P. SIDDONS, A. STEIN, J.B. WARREN, BNL-NSLS, A. SANDY, S. NARAYANAN, ANL-APS, M. METZLER, Cornell-CNF — Coherent hard X-ray beams underlie many of the recent advances in X-ray imaging and characterization, and it is crucial to quantify the coherence properties of X-ray beams for further advances. The classic Young's double slit experiment is an accepted method from which one can deduce the transverse coherence length, but unfortunately the double slit experiment is difficult to implement at these wavelengths. Micro-fabricated prisms are used to implement a virtual Young's double slit experiment, and interference fringes are quantified by X-ray fluorescence from a 30 nm Cr film in addition to being recorded with YAG crystal and CCD. The maximum number of fringes in the classical overlap region is comparable to $\delta/4\pi\beta$, the ratio of real to imaginary parts of the X-ray refractive index of the prism material. We have measured the horizontal and vertical transverse coherence lengths at beamline APS 8-ID. We suggest this to be a flexible, easily applied method that can be implemented at X-ray laboratories for both, coherence measurements and interferometric imaging. http://arxiv.org/abs/0910.5524

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