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Recent developments in X-ray speckle-based techniques at Diamond Light Source

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Over the last decade, X-ray speckle-based techniques have been extensively developed for advanced imaging and high precision metrology of X-ray optics. The speckle-based techniques have gained popularity due to their relatively simple experimental requirements and ease of use. At Diamond, we have worked extensively since 2012 to enhance the technique and to apply it to a range of X-ray imaging and metrology applications [1-3]. In this presentation, we are going to present our recent developments of these techniques and their latest applications. First, we show that the omnidirectional differential phase and dark-field images can be simultaneously extracted from a single speckle data set [4]. Further, we demonstrate the link between the irregular patterns in the far-field intensity image and the local wavefront curvature through beamline measurements and optics theory [5]. Finally, we have extended our techniques to the temporal applications [6] and have shown that it is possible to achieve very fast temporal measurements using conventional hardware. This new technique has great potential for time-resolved or real-time applications for X-ray instrumentation.

Reference

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Primary authors: WANG, Hongchang (Diamond Light Source); Dr HU, LINGFEI (Diamond Light Source); Dr FOX, Oliver (Diamond Light Source); Dr SUTTER, John (Diamond Light Source); Dr SAWHNEY, KAWAL (Diamond Light Source Ltd)

Presenter: WANG, Hongchang (Diamond Light Source)

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