[14]. The difference between these intensity profiles can be attributed to a slight shift of the illumination relative to the section of metrology data used to simulate the mirror surface, evident at the right hand side of Figs. 4(a) and 4(b).

5. Conclusion

In summary, we find that 2-D and 1-D phase retrieval reconstructions were not only able to accurately assess the mirror performance due to the figure errors but they also allowed us to quantitatively deduce the mirror misalignment. This capability will make this technique a very valuable tool for alignment of nanofocusing optics. Moreover, the accuracy with which one can recover the wavefronts in the exit pupil of the optical system, and thereby obtain information about the quality of the focusing optics as a function of position, will provide a useful addition to X-ray wavelength metrology techniques and coherent beam diagnostics, for example at X-ray free electron laser sources.

Acknowledgements

The authors acknowledge Peter Jemian, Joseph Xu, Kurt Goetze, and David Kline from Argonne National Laboratory for their assistance with the positioning system and control software, Andreas Menzel from Swiss Light Source for stimulating discussions regarding the K-B mirror design, and Xavier Donath for technical support at the cSAXS beamline. We acknowledge the efforts of Pierre Thibault, Martin Dierolf, Franz Pfeiffer, and Andreas Menzel in developing reconstruction software. M. Guizar-Sicairos thanks Argonne National Laboratory for travel support to perform the experiment. Synchrotron experiments were performed on the cSAXS beamline X12SA at the Swiss Light Source, Paul Scherrer Institut, Villigen, Switzerland. Work performed at Argonne National Laboratory was supported by the U.S. Department of Energy, Office of Science, Office of Basic Energy Sciences, under Contract No. DE-AC02-06CH11357.

#132938 - $15.00USD Received 4 Aug 2010;revised 13 Sep 2010;accepted 26 Sep 2010;published 22 Oct 2010