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X-ray Fourier-transform holography with customizable references

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Holographic references can enhance the robustness of coherent diffraction imaging experiments and greatly simplify data analysis. However, to date holography has only been possible with a limited set of special reference waves. We present a new approach to x-ray Fourier-transform holography with an almost unrestricted choice for the reference wave, opening up new avenues to optimize signal-to-noise and resolution. Two geometries that exploit this flexibility are to have the reference and object in separate planes and to have a reference that fills the field of view. Both of these advantages featured in an experiment we performed at the Australian Synchrotron where we explored the potential of our method. In future experiments, our goal is to optimize holography for robustness and resolution by optimizing the reference design to help establish holography as a reliable, accessible, high-resolution coherent imaging technique.

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