Invalidity of Low-pass Filtering in Atom-resolving X-ray Holography

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Atom-resolving x-ray holography is a recently developed method for direct imaging of local three-dimensional structures at the atomic level. We investigate analytically and numerically additional effects arising from the long-range order in an object. It is shown that they are not correctly taken into account by existing image reconstruction procedures used commonly in the analysis of experimental data. We prove that low-pass filtering may lead to strong artefacts and cannot be used for extracting information about the short-range order in crystalline samples. Possible ways for solving the problem are discussed.