Quantitative high-resolution off-axis electron holography of 2D materials — •Florian Winkler[1, 2], Juri Barthel[1, 3], Sven Borghardt[4], Amir H. Tavabi[1, 2], Emrah Yucelen[5], Beata E. Kardynal[4], and Rafal E. Dunin-Borkowski[1, 2] — [1]Ernst Ruska-Centre for Microscopy and Spectroscopy with Electrons (ER-C), Forschungszentrum Jülich, D-52425 Jülich, Germany — [2]Peter Grünberg Institute 5 (PGI-5), Forschungszentrum Jülich, D-52425 Jülich, Germany — [3]Gemeinschaftslabor für Elektronenmikroskopie (GFE), RWTH Aachen University, D-52074 Aachen, Germany — [4]Peter Grünberg Institute 9 (PGI-9), Forschungszentrum Jülich, D-52425 Jülich, Germany — [5]FEI Company, Achtseweg Noord 5, Eindhoven 5600 KA, The Netherlands

Usually, phase information in conventional transmission electron microscopy (TEM) is lost. A fully recorded electron wave function with its amplitude and phase would allow for post-acquisition removal of residual aberrations and thus an accurate quantitative description of a material's atomic structure.

Here, we present electron wave functions reconstructed from high-resolution electron holograms of two-dimensional WSe_2. We show that a very precise knowledge of microscope and sample-related parameters, such as image spread, Debye-Waller factor and specimen tilt, can be obtained by comparing experimental wave functions with simulations. Furthermore, we are able to remove residual aberrations from the experimental data, which enables a quantitative description of the atomic structure, including the detection of structural defects.