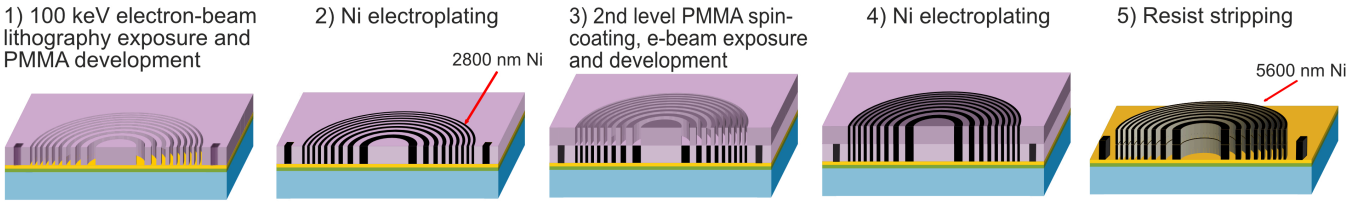
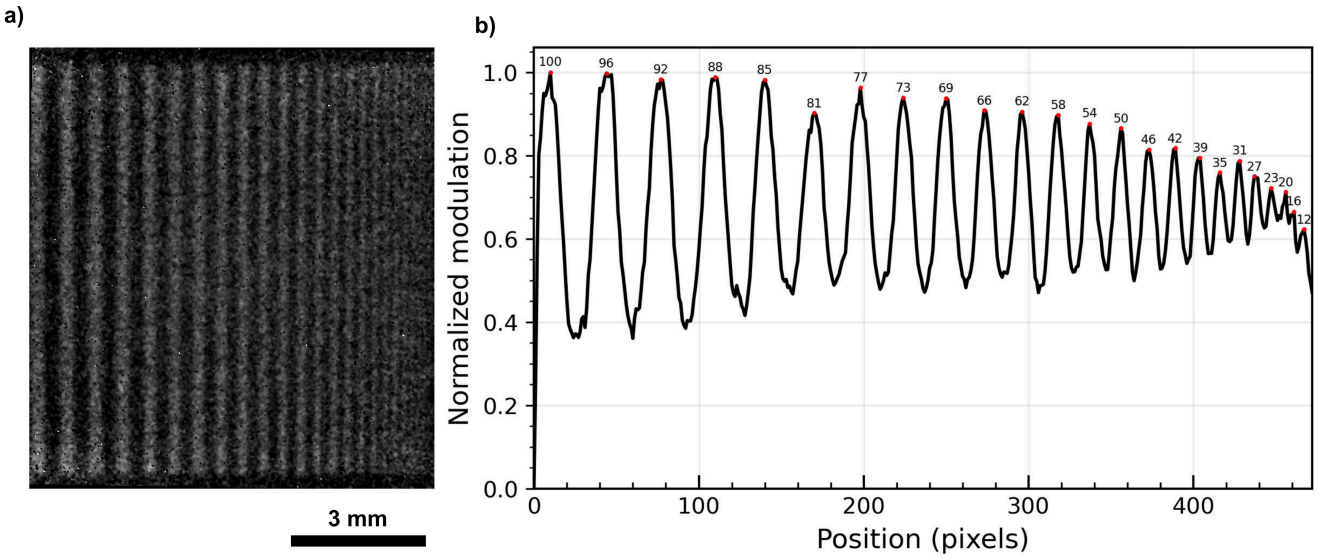
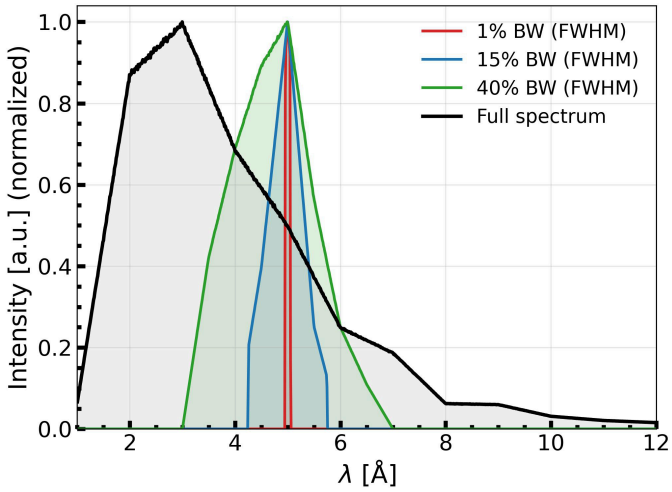
Extended data



Extended Data Fig.1| Schematic illustration of the two-level FZP fabrication process. A 100 keV electron-beam lithography exposure is performed in 2800 nm-thick PMMA, followed by development to define the first-level zone pattern and the markers. Nickel is electroplated into the developed trenches to form the first 2800 nm-thick Ni level. A second PMMA layer is then spin-coated over, exposed by e-beam lithography aligned to the markers in the first level, and developed. A second Ni electroplating step increases the zone height to a total of ≈ 5600 nm. Finally, the remaining resist is removed, yielding the two-level Ni FZP structure.



Extended Data Fig.2| High resolution neutron image of a chirped grating. **a**, Magnified neutron image a 3 mm side, 25 line Gd chirped grating with the achromat as the objective lens. The grating has structures from 100 µm to 8 µm line-width. **b**, Vertically pixel-wise averaged line profile of the image presented in (**a**), the line widths corresponding to each modulation are annotated on the top of the peak.



Extended Data Fig.3| Spectra at different bandwidths used as input for the McStas imaging simulations. The *Full spectrum* curve approximates the emission from a cold neutron source typically used in a neutron imaging beamline (NeXT beamline at ILL or ICON beamline at SINQ), while the other curves are obtained by applying a triangular transmission function that mimics a velocity selector centred at a given wavelength, with a specified FWHM bandwidth.