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Supporting information for article:

A Monte Carlo Ray Tracing Simulation of Coherent X-ray Diffractive Imaging

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S1. Effect of subvoxel size

The blurring effect mentioned in section **Error! Reference source not found.** is illustrated in Figure S1. Such an effect is due to an improper choice of the subpixel size W. The effect starts becoming visible as the subpixel size approaches the size of the illumination. In this case, the size of the grating covers a 5×5 μm^2 area and the effects become visible with a 0.1 μm subpixel size.

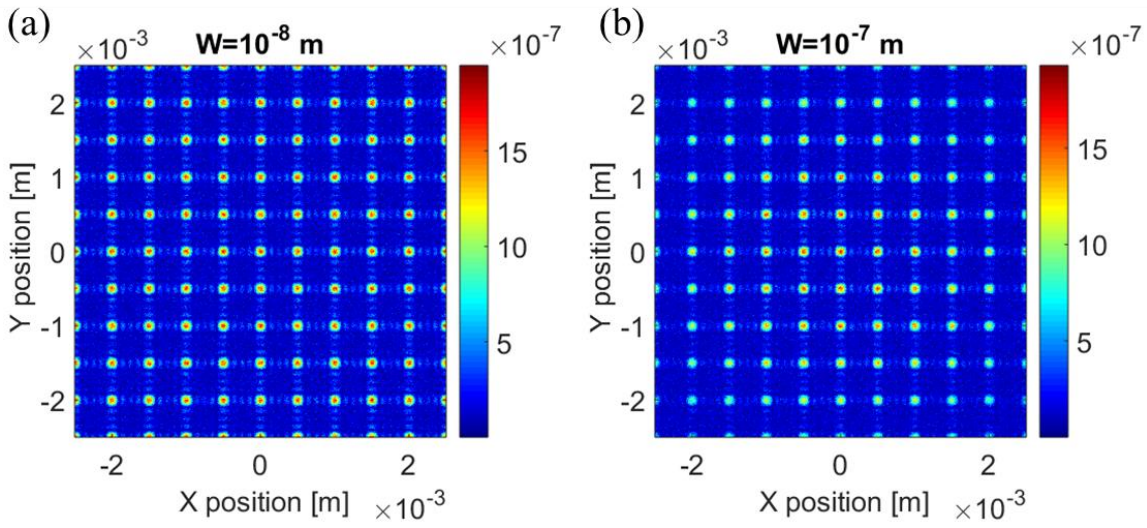

Figure S1 Diffraction pattern of grating from section **Error! Reference source not found.** for different subpixel sizes. No blurring appears in (a), whereas the peaks at higher angular values are dampened in (b). In both patterns N=10^8 rays are traced.

S2. Resolution assessment

We have used Fourier Ring Correlation (FRC) method (Nieuwenhuizen *et al.*, 2013; Van Heel & Schatz, 2005) to compare objects retrieved in the CDI and ptychography simulations. All plots are computed with the FRC function in the "cSAXS matlab package" (Vila-Comamala *et al.*, 2011).

As the comparison is made with the ground truth, we chose to use the 1-bit threshold criterion. Also, we only refer to the amplitudes of the retrieved objects, as the phases give overly pessimistic estimates due to phase wrapping artifacts present in the reconstructions.

S2.1. Full field CDI vs. Ptychography

A slightly smaller portion of the object has been used for FRC in the ptychography case, to exclude borders where reconstruction is less effective because of lower overlap. The areas used for the FRC are depicted in Figure S3.

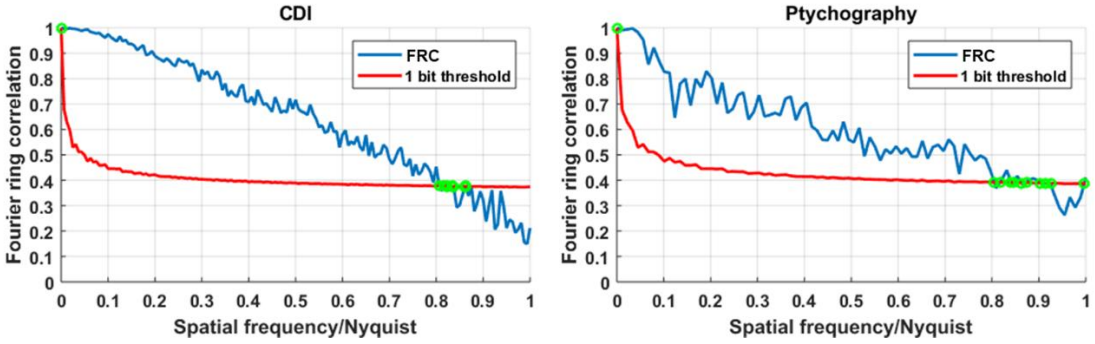

Figure S2 Comparison of Fourier Ring Correlation for amplitudes of the objects retrieved from the CDI and the ptychography simulation. As correlations are independent of the reconstructed pixel size, different in the two cases, a comparison can be made. The object simulated and retrieved with ptychography correlates up to a higher frequency than that of CDI.

Table S1 Summary of FRC results for CDI and ptychography.

	Reconstructed Pixel Size [nm]	Intersections [1] (min, max)	Resolution [nm] (max, min)	Average SNR [1]
CDI	25	(0.81, 0.86)	(31.0, 29.0)	5.53
Ptychography	14.29	(0.80, 0.99)	(17.8, 14.3)	3.33

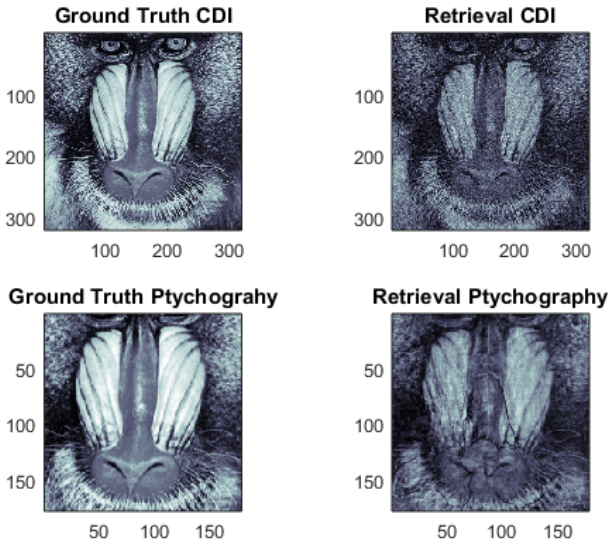

Figure S3 Areas of the retrieved objects' amplitudes selected for FRC.

S2.2. Speckle example, CDI

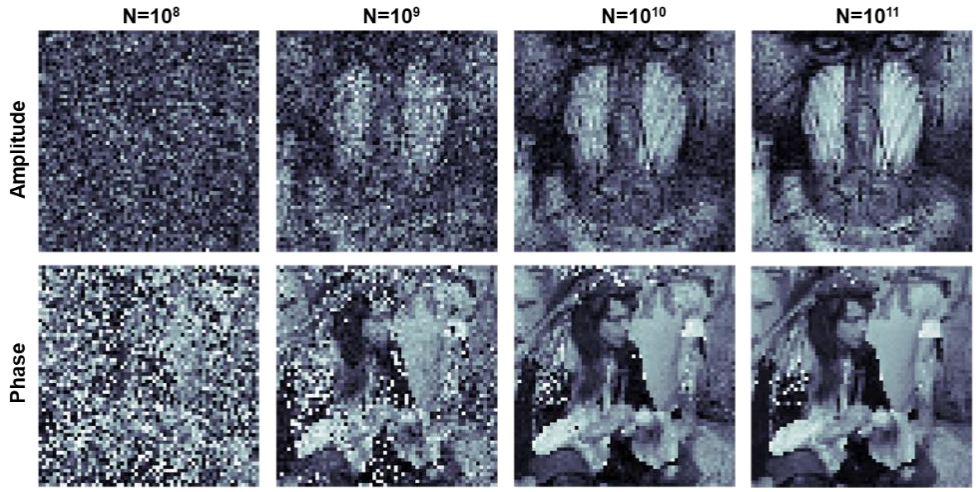

Figure S4 Inverse Fourier Transform of the speckle patterns in **Error! Reference source not found.**. Due to the reduced size of the detector, the reconstructed pixel size is larger than the previous example (125 nm) and therefore the retrieved object is represented on a 72×72 pixel array.

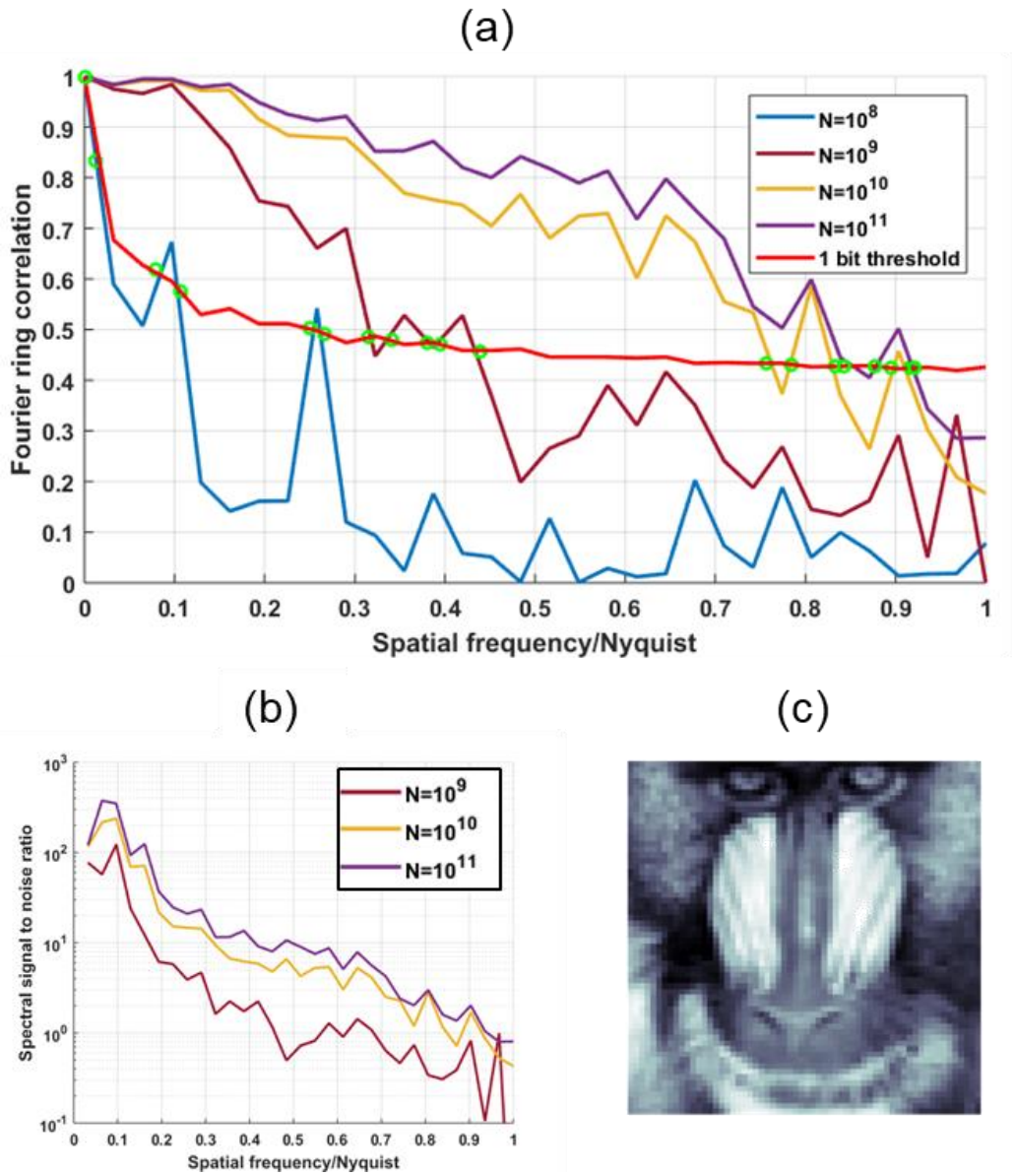

Figure S5 a) FRC of the four images in Figure S4; b) spectral signal to noise ratio for the three cases where a visible image is retrieved; c) ground truth correlated with the amplitude of the four images.

The spectral signal to noise ratio is evaluated as in (Huang *et al.*, 2009). The average SNR from the spectral signal to noise ratio are respectively: 2.5; 7.5; 11.6 for the cases $N = 10^9; 10^{10};\ 10^{11}$.