qDPC

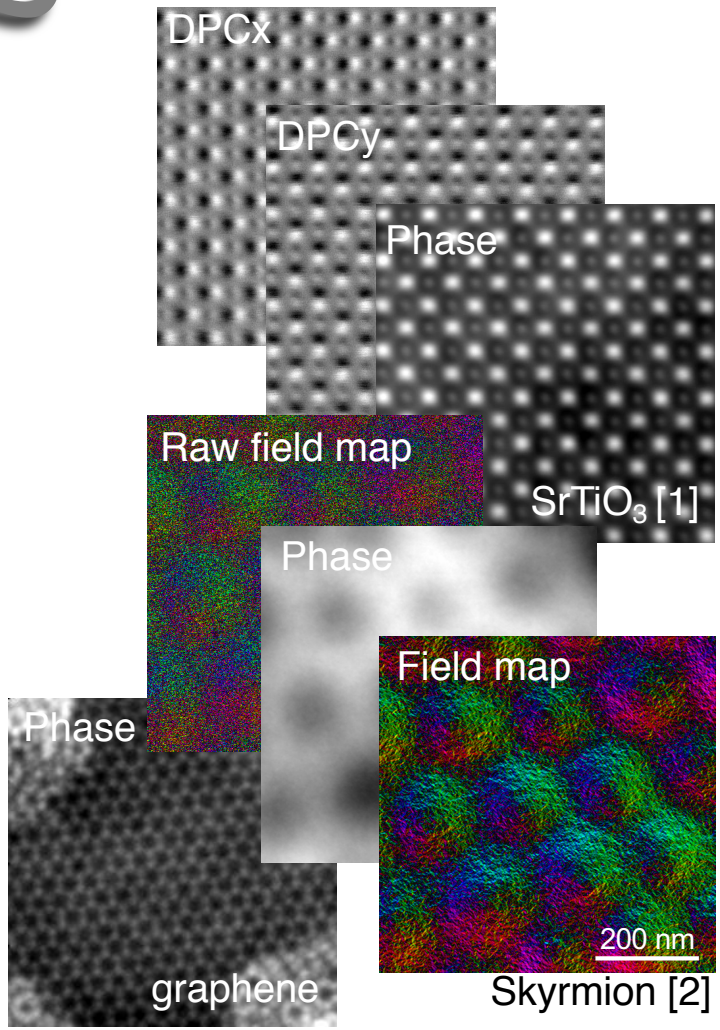
DigitalMicrograph Plug-in

Quantitative Differential Phase Contrast
and 4D STEM/Segmented Detector module

Microscopy TODAY 2018 Innovation Award

Boundary-artifact-free phase determination from DPC signals

qDPC integrates DPC (Differential Phase Contrast) signals to obtain a phase contrast image. qDPC gives a boundary-artifact-free solution contrary to the solution given by FFT (Fast Fourier transform) [3].



Skyrmion [2]

4D STEM module (Optional) creates more quantitative DPC signals at each 2D diffraction pattern than those from the segmented detector. The calculated DPC signals can then be processed by qDPC to give a quantitative phase distribution (graphene/4DCanvas).

Segmented Detector module (Optional) captures the signals from the segmented detector using *Gatan*'s *DigiScan II*, and calculates a phase distribution in real time.

Key Features

- Integrates DPC signals to obtain a phase contrast image ($SrTiO_3$).
- DPC is ideal for a high-performance STEM, since a phase contrast image is obtained even with zero objective-lens aberrations that conform to other STEM signals, such as HAADF image.
- Works with low-dose DPC signals, and gives a smoothed phase image (skyrmion).
- *Software Descan* eliminates residual misadjustments of scan-control.

References:

[1] Shibata N, Findlay SD, Kohno Y, Sawada H, Kondo Y & Ikuhara Y: Differential phase-contrast microscopy at atomic resolution, *Nature Physics* **8**, 611 (2012).

[2] Matsumoto, T, So, YG, Kohno, Y, Ikuhara, Y & Shibata, N: Stable magnetic skyrmion states at room temperature confined to corrals of artificial surface pits….., Nano letters **18**, 754 (2018)

[3] Ishizuka A, Oka M, Seki T, Shibata N and Ishizuka K: Boundary-artifact-free determination of potential distribution from differential phase contrast signals, Microscopy **66**, 397 (2017).