Using guide for NORDIF CD camera in the TSL EBSD systems at the EM lab

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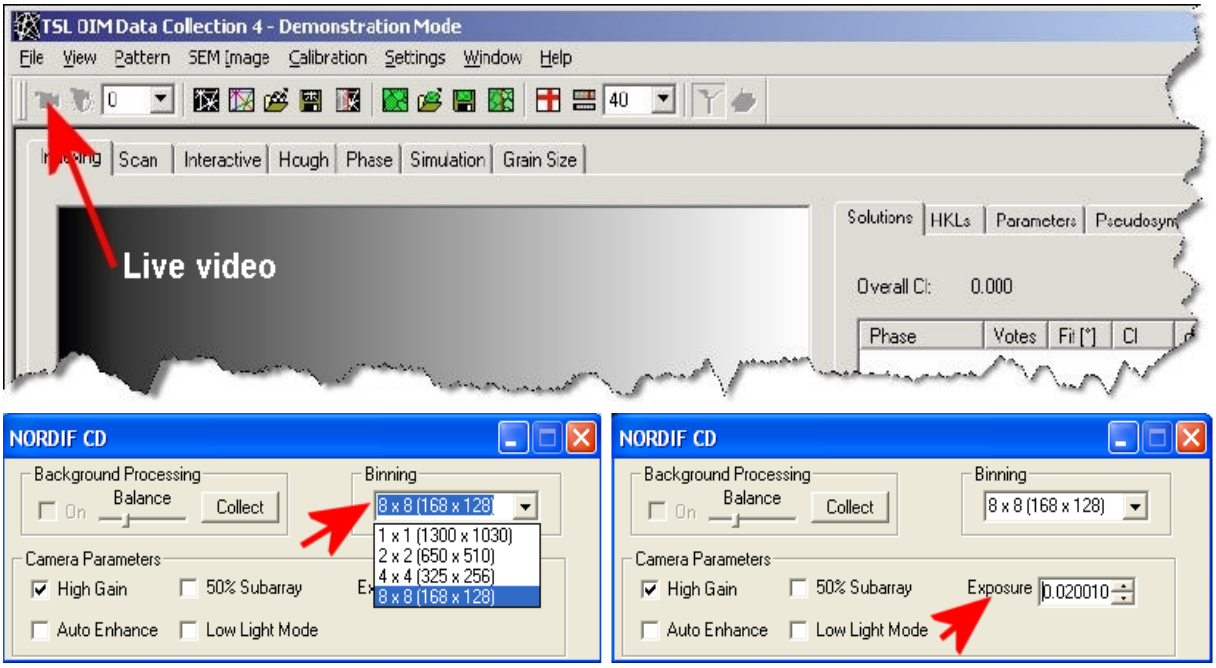
Electron backscatter diffraction (EBSD) patterns are obtained in SEM by focusing the electron beam on a crystalline sample. The EBSD system used to obtain and analyze the Orientation Imaging Microscopy (OIM) data at the EM Lab FEG SEMs is manufactured by TSL.

The specimen is tilted to approximately 70 degrees with respect to the horizontal. The diffraction pattern is imaged on a phosphor screen and the image is captured using the CCD camera (**NORDIF CD camera).**

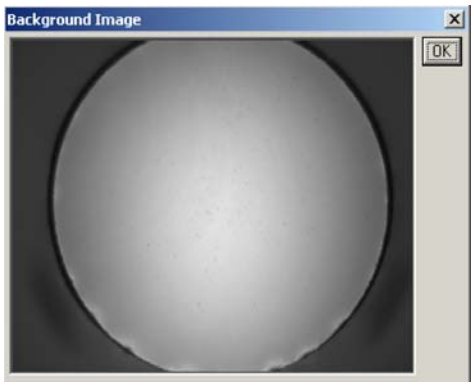
Before performing the EBSD mapping, the camera background calibration should be carried out for the NorDiff CCD camera. To click the desktop icon of the OIM Data Collection 4.5, it will launch the OIM program, together with a floating dialog box to control the **NORDIF CCD camera**, as shown in the below figures.



In the camera control panel, there are 4 preset Binning Modes, i.e. from 1 x 1 (without binning) to max 8 x 8 binning. The 1 x 1 binning provides the best resolution but needs much longer exposure time for acquiring an EBSD pattern, which is only used for high quality EBSD pattern acquisition. The 8 x 8 binning provides the maximum dynamical range with the shortest exposure time, which is used for a large area EBSD mapping. Most of time for balance between the resolution and exposure time, the 4 x 4 binning is employed.

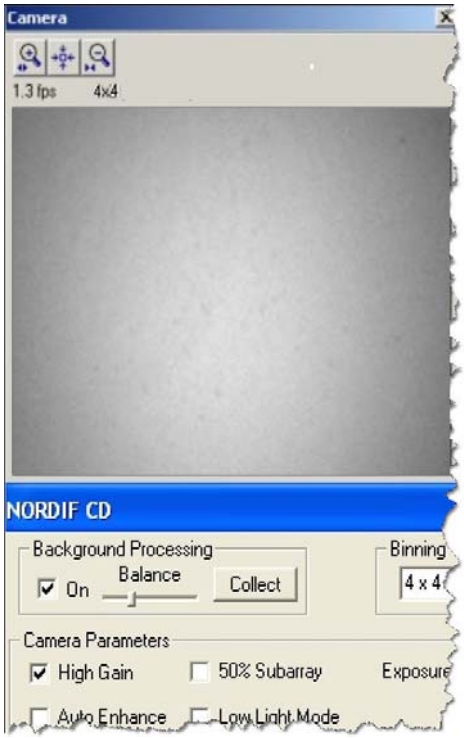
Within a selected binning mode, the faster scan rate is critical for a large area EBSD mapping. Therefore the SEM should be setup at the higher beam emission mode, together with using the camera high gain mode and a higher output frame rate (? which is provides at the new generation of **NORDIF CD camera**).

Turn on the camera window by clicking the Live Video button on the OIM toolbar, as marked by arrow in the above figure, then a live image from the phosphor screen will be shown in a floating window as shown in the right figure. Adjust the exposure time as marked in the above figure, to obtain a suitable illumination across the phosphor screen. Then press the Collect button to capture this image as the system background noise reference for the later image processing. If this background is acceptable, then press OK to save it.



It should be noticed the beam illumination conditions etc. during the background calibration should be similar as that used during the later EBSD mapping. Also it is very important to notice, there is no visible EBSD pattern appeared on the background image during calibration. However it is very hard to avoid for some fine crystalline specimens, such as Si wafer etc. In such cases, the SEM should be setup at the fast TV scan mode, together with a relative lower SEM magnification.

To apply the background correction, click the On box in the camera control panel, then a homogenous illumination will be obtained from the phosphor screen, as shown in the right figure. Close the floating camera window, and Minimize the floating camera control panel for the next step EBSD mapping.



For further EBSD mapping, the beam scans the selected sample surface in a rectangular grid. At each step in the TSL program, the EBSD pattern is automatically indexed and the orientation is recorded, as well as the pattern quality of the EBSD pattern, and the image quality. As the beam is moved from grain to grain the EBSD patterns will change due to the change in the orientations of the crystal lattice in the diffracting volume.