

A list of topics to talk about

Question: How to select the best microscope parameters (mag, dose rate, frame numbers) for a targeted resolution and why for the chosen camera ?

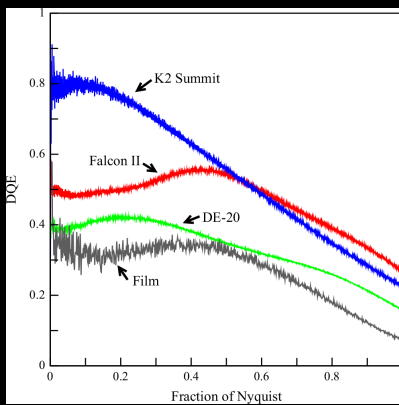
Cameras: DE (Direct Electron), Falcon (FEI), and K2 Summit (Gatan)

Things to consider:

Camera: DQE, pixel size, and camera mechanism;

Microscope: Magnification, beam setting, dose rate;

DQE and other parameters



McMullan et al. (2014) Ultramicroscopy

Pixel size, DQE -> magnification;

* small pixel size of K2 requires lower magnification to give desired image pixel size at specimen.

* Tecnai microscope performance at low mag?

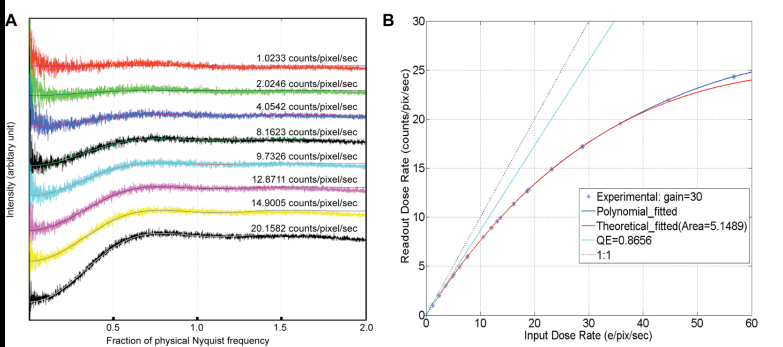
Exposure time (dose rate)
-> camera dependent.

DE and Falcon cameras: integration;
K2 Summit: counting;

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Tecnai Polara: 31K Mag, $1.2\text{\AA}/\text{pixel}$,

10e/pixel/sec on camera, $\sim 7\text{e}/\text{\AA}^2/\text{sec}$ on specimen

3 sec exposure $\rightarrow \sim 20\text{e}/\text{\AA}^2$; 5 frames/sec \rightarrow 15 frames

6 sec exposure $\rightarrow \sim 40\text{e}/\text{\AA}^2$; 5 frames/sec \rightarrow 30 frames

5e/pixel/sec on camera, $\sim 3\text{e}/\text{\AA}^2/\text{sec}$ on specimen

7 sec exposure $\rightarrow \sim 20\text{e}/\text{\AA}^2$; 5 frames/sec \rightarrow 35 frames

15 sec exposure $\rightarrow \sim 40\text{e}/\text{\AA}^2$; \rightarrow 75 frames

Tecnai Polara: 20K Mag, $2.0\text{\AA}/\text{pixel}$,

10e/pixel/sec on camera, $\sim 2.5\text{e}/\text{\AA}^2/\text{sec}$ on specimen

8 sec exposure $\rightarrow \sim 20\text{e}/\text{\AA}^2$; 5 frames/sec \rightarrow 40 frames

16 sec exposure $\rightarrow \sim 40\text{e}/\text{\AA}^2$; \rightarrow 80 frames

Tecnai Polara: 39K Mag, $0.9\text{\AA}/\text{pixel}$,

10e/pixel/sec on camera, $\sim 12\text{e}/\text{\AA}^2/\text{sec}$ on specimen

2 sec exposure $\rightarrow \sim 24\text{e}/\text{\AA}^2$; 5 frames/sec \rightarrow 10 frames

4 sec exposure $\rightarrow \sim 48\text{e}/\text{\AA}^2$; \rightarrow 20 frames

5e/pixel/sec on camera, $\sim 6\text{e}/\text{\AA}^2/\text{sec}$ on specimen

4 sec exposure $\rightarrow \sim 24\text{e}/\text{\AA}^2$; 5 frames/sec \rightarrow 20 frames

8 sec exposure $\rightarrow \sim 48\text{e}/\text{\AA}^2$; \rightarrow 40 frames

Counting v.s. non-counting

Counting: no-readout noise; coincidence loss

ideally: low dose rate, long exposure

Integration: readout noise; no coincidence loss

ideally: high dose rate, short exposure