Supplementary material

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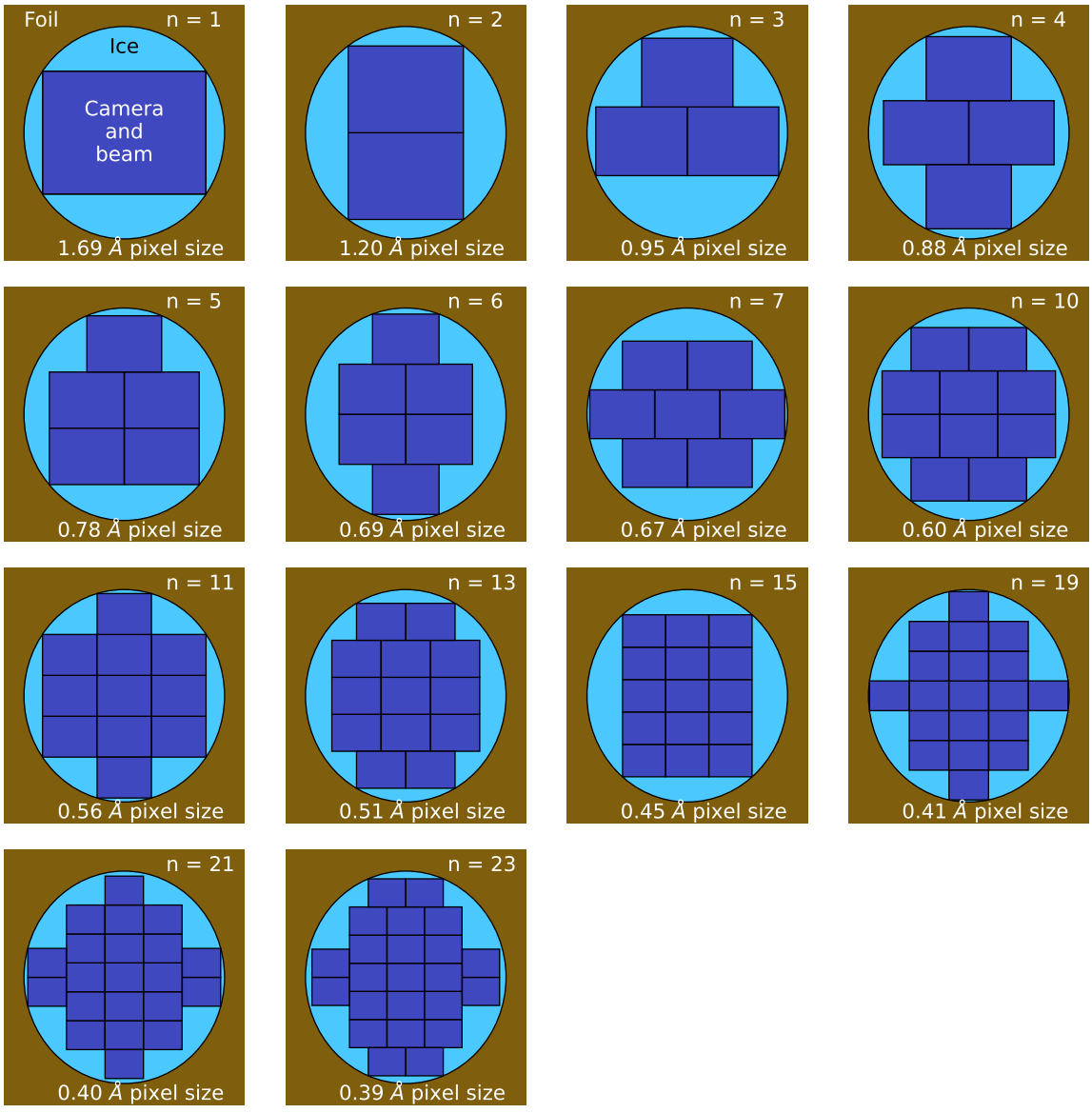

Figure S1: Multishot configurations for a rectangular K3 camera and matching beam (5760 × 4092 pixel) camera inside a 1.2 μm diameter foil hole used to generate the efficiency measurements presented in Fig. 2 of the main text.

Magnification	Pixel (Å)	Sensor (nm)	Beam (nm)	Aperture (μm)
79,000	1.71	656	956	29.5
100,000	1.33	510	820	24.5
130,000	1.03	395	695	20.5
165,000	0.788	302	602	17.5

Table 1: Different acquisition magnifications commonly used in our Talos Arctica microscope with the calibrated pixel size, size of the acquisition region on a 4096 × 4096 pixel K2 camera, the required size of the beam, factoring in the 75 nm Fresnel fringes and the final size of the aperture which factored in another 75 nm to account for beam drift during an acquisition.

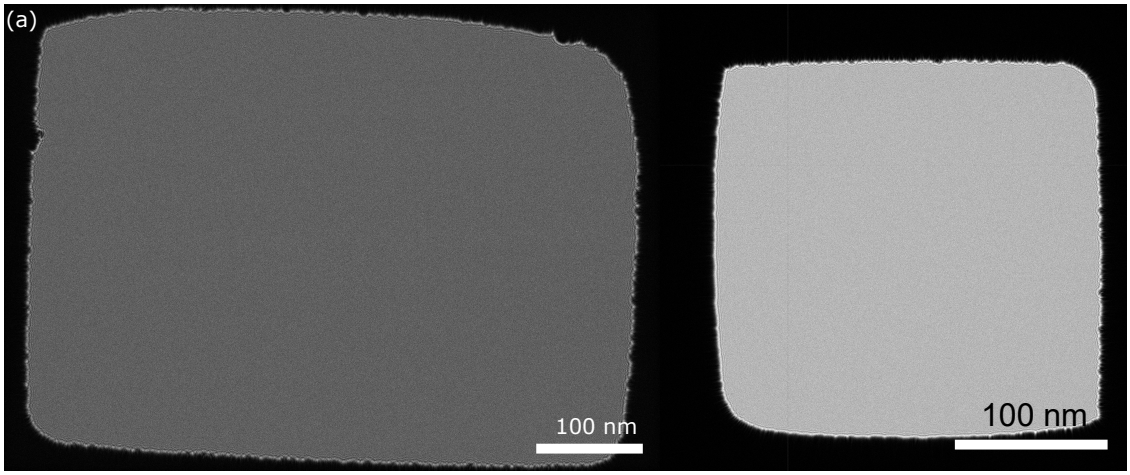

Figure S2: (a) Image of the beam with a rectangular aperture recorded on the K3 camera and (b) the beam formed by a square aperture with the Falcon IV camera. alignment is to within 10° with the camera and fringes at the edge measure less than 1 nm with the fringe-free illumination system. Imperfect etching seen in Fig. 1(d) is visible in the beam resulting in rounded edges.

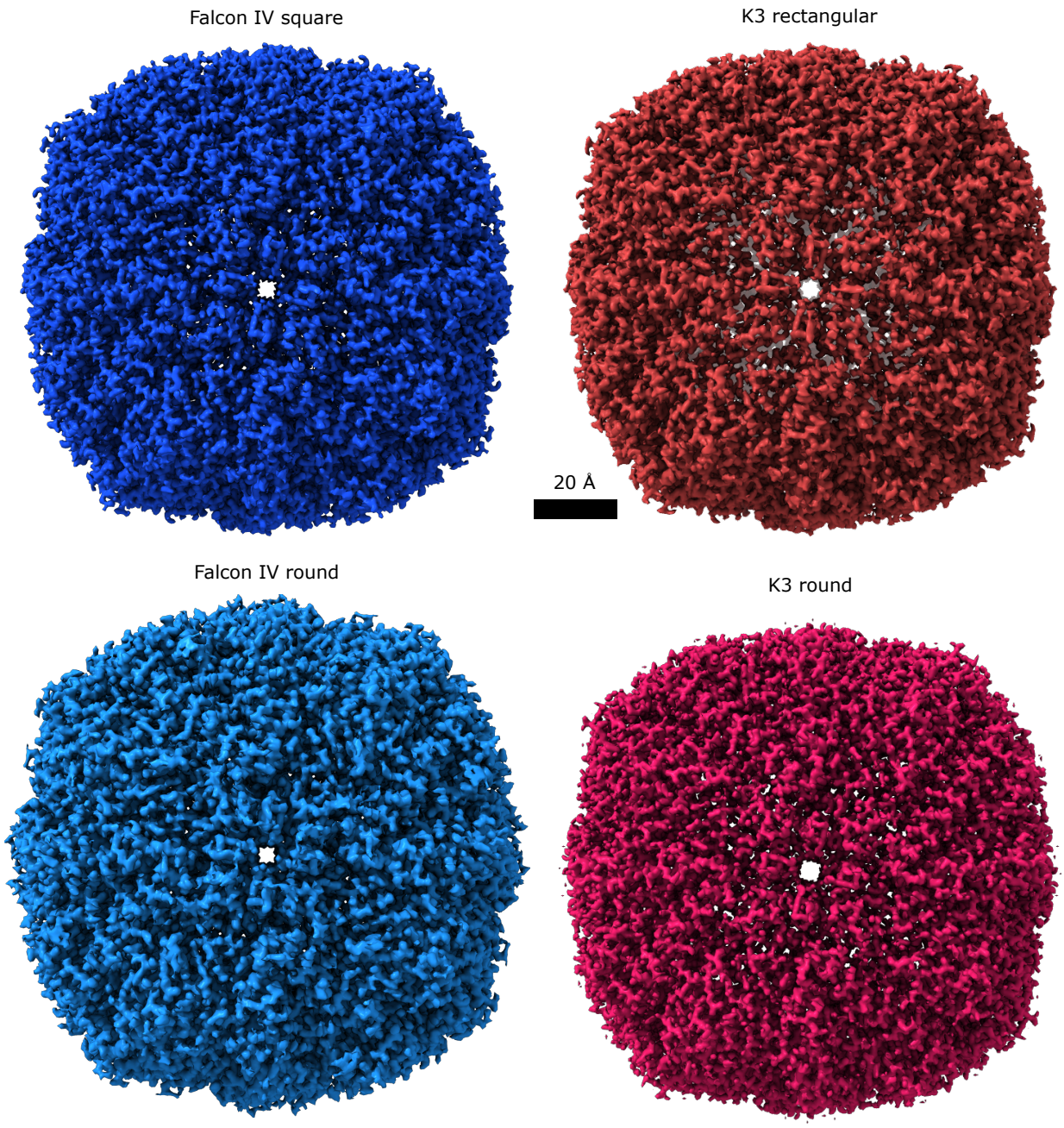

Figure S3: 3D models of apo-ferritin from each of the benchmarking datasets described in the main text.