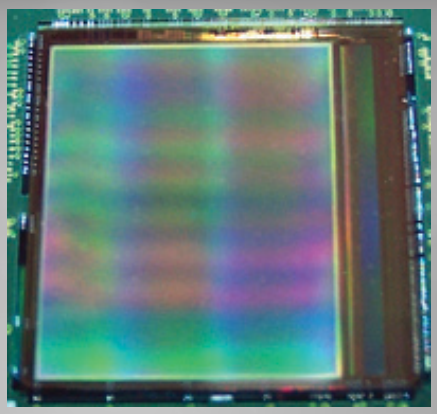
DE Innovations

consistently leading the industry in innovation

Direct Electron®
INNOVATION PROPELLING DISCOVERY

Innovation Propelling Discovery

- Direct Electron's passion and commitment is to bring the latest innovations in electron imaging to TEM users worldwide.
- We like to collaborate with our customers (either to generate new results or to develop new methods).
- Our customers are confident that they're camera represents the state-of-the-art technology for electron detection.
- Our customers are the first to access and apply our new innovations in data collection techniques and image processing (many of our software innovations are free and open-source for our customers).



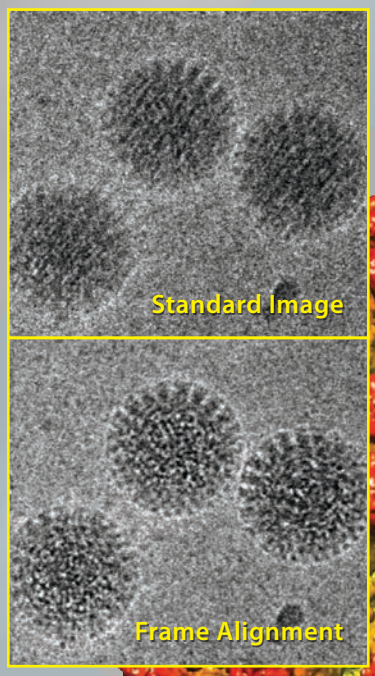
First generation DE-12 Direct Detection Device (DDD®) sensor. The DE-12 was officially initially launched in 2009 as the first commercially-available direct detection TEM camera.

Direct Electron's Customer Experience:

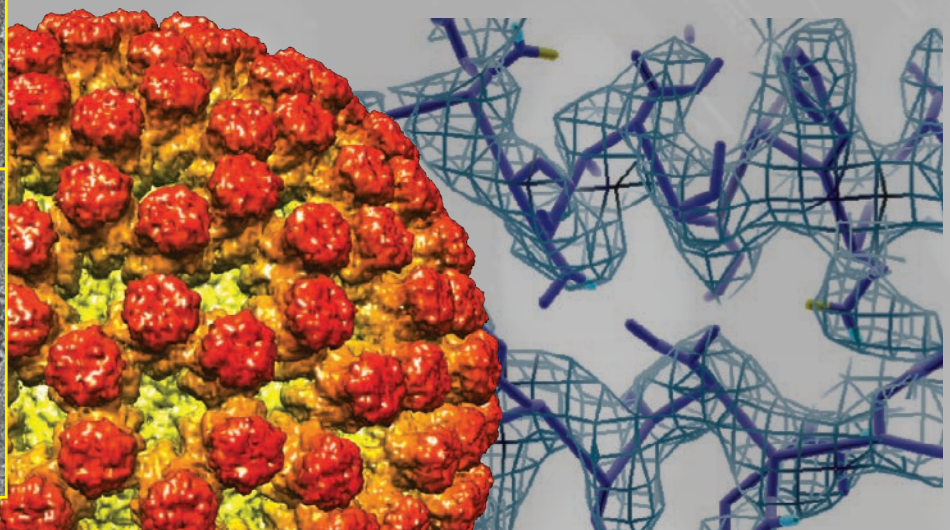
focus on innovation

count on exceptional service

generate results



The first published 200 kV near-atomic resolution cryo-EM structure, using a direct detection camera with motion correction. This reconstuction of Rotavirus DLP used the DE-12 camera system with "movie mode." Images were collected at 1.42 Å/pixel on a FEI TF20 TEM operating at 200 kV. Particles in each "movie" were translationally aligned prior to 3D reconstruction. The final reconstruction reached 4.4 Å resolution using only 807 particles. *Courtesy of Niko Grigorieff (Janelia Farm). Data collected at the Scripps Research Institute.*



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more info

Innovations by Direct Electron & Our Customers

- First to develop direct detection for TEM (Milazzo, et al., 2005, *Ultramicroscopy* 104, 152-9).
- First to demonstrate electron tomography with a direct detector (Jin, et al., 2008, *J. Struct. Biol.* 161, 352-8).
- First to develop and demonstrate drift correction using the "movies" from a direct detector (Jin,et al., 2008, *J. Struct. Biol.* 161, 352-8).
- First to develop and demonstrate single electron counting using a direct detector (Jin, 2009, dissertation, "Direct electron detection in transmission electron microscopy").
- First to demonstrate a cryo-EM 3D reconstruction using a direct detector (Milazzo, et al., 2011, *J. Struct. Biol.* 176, 404-8).
- First to demonstrate cryo-EM 3D reconstructions reaching resolutions beyond ¾ Nyquist frequency (Bammes, et al., 2012, *J. Struct. Biol.* 177, 589-601).
- First to subnanometer resolution cryo-EM 3D reconstructions from images collected at <40k× magnification (Bammes, et al., 2012, *J. Struct. Biol.* 177, 589-601).
- First to visualize beam-induced specimen movement of cryo specimens (Brilot, et al., 2012, *J. Struct. Biol.* 177, 630-7).
- First to demonstrate a near-atomic resolution cryo-EM 3D reconstruction using a direct detector (Campbell, et al., 2013, *Structure* 20, 1-6).
- First to develop and use "damage compensation" (radiation damage weighted filtering to improve SNR across a broad range of spatial frequencies) (Bammes, et al., 2013, *Microsc. Microanal.* S2, 1320-1).
- First to demonstrate large-format, high-framerate in situ "movie" acquisition (Zeng, et al., 2014, *Nano Lett.* 14, 1745–50).
- First to demonstrate energy loss spectroscopy (EELS) imaging with a direct detection camera (Ramachandra, et al., 2014, *Microsc. Microanal. FirstView* 1-9).

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BACKGROUND: Close-up view of a field-replaceable DE-20 sensor module.