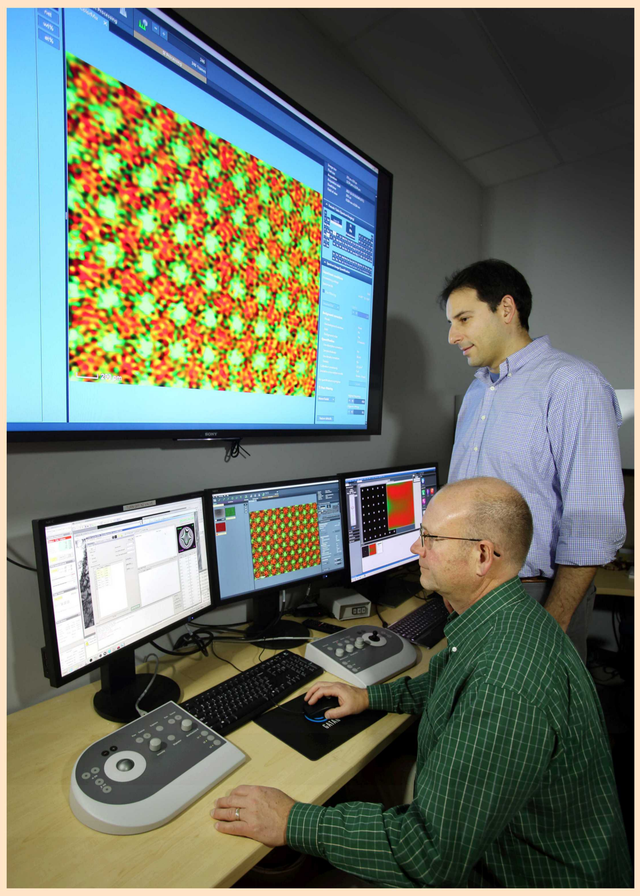
SAND2019-10413D

Themis Z Scanning Transmission Electron Microscope:
Advanced capabilities for atomic to micron-scale characterization



Sandia's Themis Z STEM is a state-of-the-art Scanning/Transmission Electron Microscope used for characterization of structure, composition, and bonding of materials over length-scales ranging from atomic dimensions to tens of microns. This probe-corrected and monochromated instrument operates over electron acceleration voltages of 60 kV to 300 kV and includes advanced detectors for imaging, energy dispersive x-ray spectroscopy, and electron energy loss spectroscopy. The instrument is equipped with a variety of specimen holders for high quality analytical measurements, tomographic analyses, and *in situ* experiments.

Electron Gun

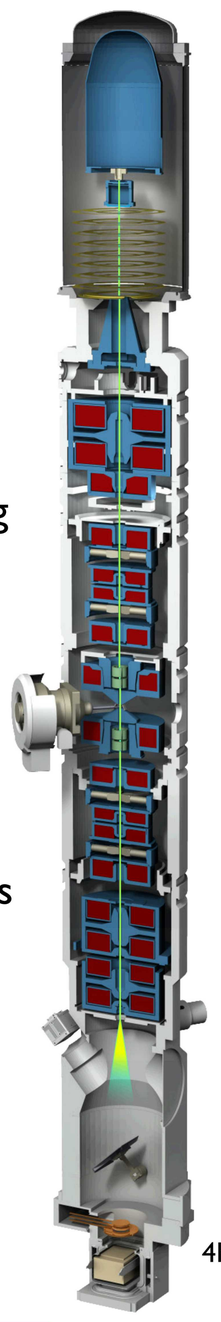
Accelerator

Probe Forming Optics

Specimen Stage

Imaging Optics

Imaging Detectors



High brightness Schottky Field Emission Source (XFEG) with integrated monochromator

60 kV – 300 kV

Constant power, 3-condenser lens

DCOR aberration corrector (probe)

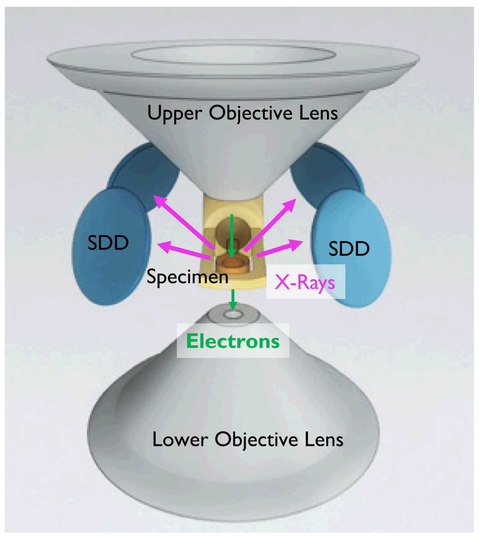
Silicon Drift X-ray Detector Array (SDD)

Piezo driven stage

STEM: HAADF, BF, iDPC

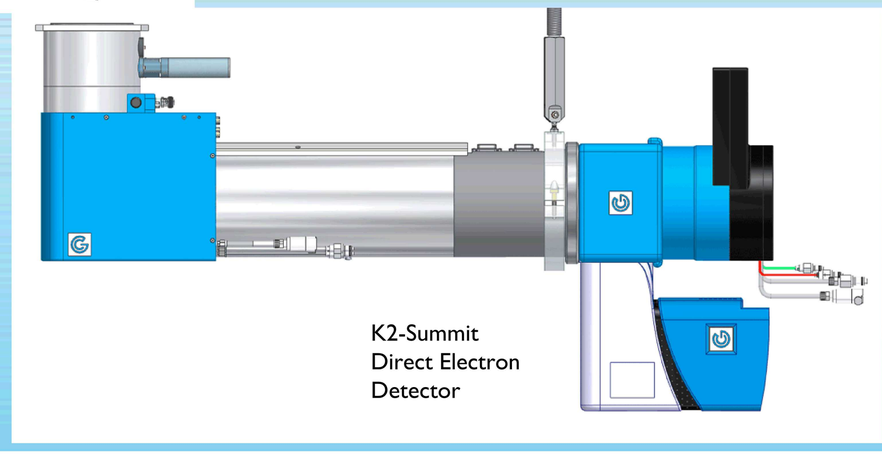
4Kx4K CMOS sensor

Large Solid Angle detectors enable rapid Energy Dispersive X-ray Spectrum imaging



Monochromator and Direct Electron Detector provide state-of-the-art electron energy loss spectroscopy (EELS)

Electron Energy Loss Spectrometer/ Imaging Filter



K2-Summit Direct Electron Detector

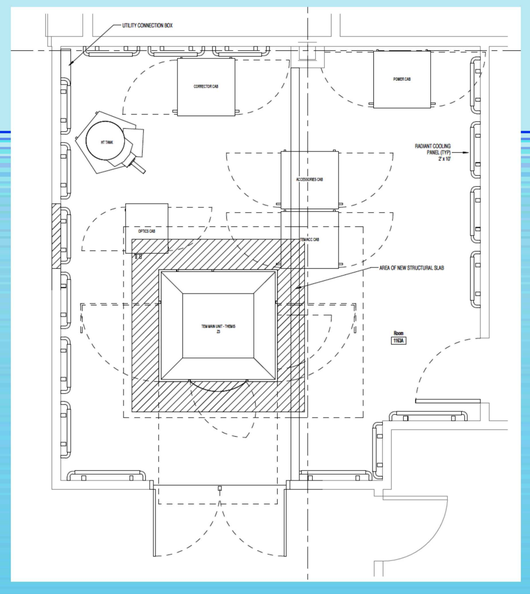
Extensive Facilities Modifications Provide Stable Environment for Advanced Microscopy

Laboratory designed to meet tight environmental tolerances

- Separate control room to minimize user-induced vibrations and thermal fluctuations.
- Acoustic shielding to suppress ambient noise.
- Rework of air handling and temperature control systems to meet thermal and airflow requirements.
- Redesign of electrical systems and installation of active field cancellation system to meet strict magnetic field requirements.

Close collaboration between facilities, procurement, and S&T community

- Acquisition, design, construction, and installation completed over accelerated 8-month schedule.



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