Instrumentation Profiles and Access

The EMC Staff strives to facilitate users' research while ensuring that instruments are used in a manner that optimizes and preserves their capabilities for everyone. The EMC Proposal Review Committee decides which instruments are initially appropriate for each particular research proposal. Each electron microscope in the facility has a unique set of distinguishing attributes that characterizes its best operating mode, and in order for an individual to be granted permission to become a user of a given instrument it will be necessary to demonstrate to the EMC Staff that a reasonable attempt has been made to utilize a "lower level" instrument. For example, depending on prior experience, TEM users may be required to first become expert in the operation of the JEOL JEM-100CXII, and then will be allowed to graduate to higher-performance instruments as their proficiency and needs develop. The electron microscopes that are currently in the AEM section of the EMC are documented in Tables 2 and 3.

Table 2
Nominal Performance Specifications and Characteristics of AEM's

Instrument	Operating Modes	Specimen Holders	Resolution
JEOL JEM-100CXII 10 – 100 kV	CTEM, SAED, STEM, SEM (SEI), Lorentz.	*Double Tilt (±60°):* double specimen, & cooling (93 K). *Single Tilt:* double specimen & bulk.	~0.7 nm pt-pt ~0.3 nm lattice
JEOL JEM-4000EXII 100 – 400 kV	HREM, CTEM, SAED, TV-rate video, digital imaging, electron dosimetry, fluctuation.	*Top-Entry Double Tilt (±20°):* 3. *Top-Entry Zero Tilt:* 2.	~0.165 nm pt-pt ~0.1 nm lattice
Philips CM30T ≤ 300 kV	CTEM, CBED, SAED, EDXS, PEELS, TV-rate video, digital imaging, electron dosimetry.	*Double Tilt (±60°):* Be cup for EDXS, cooling (93 K) with Be cup, & heating (1250 K). *Single Tilt:* one. *Tilt/rotate (±60°, 360°):* one.	~0.25 nm pt-pt ~0.14 nm lattice
Hitachi S-4700-II 0.5 – 30 kV	Cold FEG SEM (SEI & BEI), EDXS with mapping.	5-axis motorized stage. Maximum sample size: 27 mm (H) x 150 mm (dia.).	SE resolutions: 1.5 nm at 15 kV 2.5 nm at 1.0 kV
FEI Tecnai F20ST ≤ 200 kV	Schottky FEG (S)TEM, HAADF, holography, Lorentz, EDXS, PEELS, mapping, EFI, digital imaging, etc.	*Side-entry "compustage":* double tilt with Be cup, single tilt, cooling (93 K) with Be cup, magnetic field holder, older Philips holders.	TEM: 0.24 nm pt-pt 0.1 nm lattice STEM ≤ 3 nm
LEO 1540XB FIB 0.2–30 kV	FIB with 5 gas injectors, Schottky FEG SEM (SEI, BEI, & STEM), EDXS.	6-axis motorized eucentric stage.	SE resolutions: 1.1 nm at 20 kV 2.5 nm at 1.0 kV

Table 3
Typical Investigations Using AEM's in the EM Center

Instrument	Typical Investigations
JEOL JEM-100CXII 10–100 kV	Morphological and diffraction contrast studies of defects. Specimen-checking for other AEM instruments. Nanomaterials investigations.
JEOL JEM-4000EXII 100–400 kV	Ultra-high resolution imaging. Fluctuation microscopy.
Philips CM30T ≤ 300 kV	Quantitative EDXS & EELS. High resolution CTEM. High spatial resolution CBED. *In situ* heating & cooling studies. Electron crystallography. Weak beam studies of defects.
Hitachi S-4700-II 0.5–30 kV	High resolution SEI. EDXS mapping.
FEI Tecnai F20ST ≤ 200 kV	**For collaborative research only with EMC staff.** Magnetic materials imaging by holography and Lorentz. Structure and chemistry of nanomaterials.
LEO 1540XB FIB 0.2–30 kV	TEM sample preparation by FIB with gas injection. Orientation Image Mapping (OIM) of polycrystalline materials.