The NCFL's Helios 600 NanoLab platform includes:

- Ultra-high resolution electron optics (magnetic immersion lens with ultra-high brightness emitter) with electrostatic scanning, advanced SE and BSE in-lens detection and STEM imaging
- High-resolution (field emission) ion optics (Sidewinder column)
- ConstantPower design of electromagnetic lenses for ultimate stability, high controllability and reproducibility of the electron beam
- Advanced control of Gas Chemistries including FEI proprietary gasses such as Delineation Etch or Selective Carbon Mill
- High-precision specimen goniometer with full 150 mm travel along the x and y axes
- A high-resolution, 16-bit digital patterning engine capable of Simultaneous Pattern and Imaging
- Automation with full access to E-beam, I-beam, patterning and gas chemistry functionality
- A Windows XP 4-quadrant "Beam per Quad" User Interface
- System architecture is optimized for automation (AutoFIB, AutoTEM, Autoslice and View)

Features and specifications

Geometry On a 21-port specimen chamber the electron and ion column are mounted at 52 degrees to each other. The beam coincidence point is at 4 mm working distance, which is also the eucentric working distance of the stage and the analytical working distance. There are 5 GIs-ports grouped around the ion column.

Vacuum The Helios NanoLab uses a vacuum system, which is entirely oil-free and which includes an Edwards SDXI 0 scroll pump. Differential pumping on the electron column ensures tip operation at the ultra-high vacuum levels (10^{-10} mbar) even with a controlled gas flow in the specimen chamber.

Sample navigation The Helios NanoLab is equipped with a 5-axes motorized x-y-z-rotate-tilt stage, of which x, y and rotation movements are piezo-controlled. Travel along the x and y-axis is 150 mm, the tilt range is -5 to 60 degrees. The motorized z-range is 10 mm. Minimum step size is 100 nm, repeatability at 0 degrees tilt is 1 urn, and 2 pm at 52 degrees tilt. A suite of sample holder kits is optionally available (including stub holders, TEM sample holders, vise specimen holders, wafer holders). Joystick stage control is available as an option.

Electron optics Magnetic immersion lens electron optics with ultra-high brightness NG emitter

- Source: Schottky field emitter mounted on the NG hot-swap gun module
- Voltage: 350 V to 30 kV, continuously adjustable
- Beam current: S22 nA
- Resolution: 0.9 nm @ 15 kV, 1.4 nm @ 1 kV (¡ 60 dBC) (at optimum working distance)
- Detection: in-lens SE and BSE

Ion optics Sidewinder field emission focused ion beam optics with liquid Gallium ion emitter

- Source lifetime: 1000 hours
- Voltage: 0.5 kV to 30 kV
- Beam current: 1.5 pA
- 20 nA (15-position aperture strip)
- Resolution: 5.0 nm @ 30 kV (at coincident point)
- Detection: CDEM detector (direct ion detector) (optionally available)

Scanning system High-resolution digital scanning engine controlled from the User Interface

- Resolution: 512x442, 1024x884, 2048x1768, 4096x3536 pixels
- Minimum Dwell Time: 25 ns/pixel
- Electronic scan rotation by n x 360 degrees

Patterning system High-resolution digital patterning engine controlled from the User Interface

- Maximum resolution: 64k x 64k
- Minimum Dwell Time: 25 nslpixel
- Maximum Dwell Time: 25 mslpixel
- Multiple pattern shapes
- Variable dwell time pattern to give 3D milling
- Complex milling patterns through Bitmap import

Detection The Helios NanoLab features in-lens SE and BSE detection specially designed for ultra-high resolution imaging at both high and low kV's, as well as an Everhart-Thornley SE detector for conventional SE detection. Optionally available is a 2-segment solid-state STEM detector for both bright- and dark-field imaging and Nano-analysis of FIB-prepared cross-sections. An integrated IR-CCD camera is standard included for in-chamber viewing. Electron Beam Current Measurement is also standard supplied.

Imaging Images are displayed in an area of 1024 x 884 pixels, configurable for single frame display or 4-quadrant display. Images can be viewed live, averaged or integrated. Images can be saved in TIFF, BMP or JPEG file formats, and in 8-bit or 16-bit depth, to the hard disk or LAN from the graphical user interface. Image printing is also available from the user interface. Patterning Predefined patterns can be drawn in overlay in any of the four quadrants in the Ul. Progress of the patterning is monitored in the User Interface through a progress bar. End-point detection is available through a software-integrated Real-Time Monitor. Simultaneous imaging and patterning is a standard feature of the Helios NanoLab.

System control The Helios NanoLab is controlled from a Windows XP Graphical User Interface running at 1280 x 1024 screen resolution on a dedicated microscope controller. A support computer is standard on the system for software utilities that could interfere with the control software running on the controller (e.g. LAN connection). A software-controlled switchbox (Magicswitch) is included which enables using only one mouse and keyboard for operating both the controller and the support PC. The system includes two 19-inch LCD monitors, an optical mouse and a height-adjustable office desk. A manual user interface is optionally available.

PV4040110 PegasusH - XM 4 Integrated EDS & EBSD System Pegasus System - Genesis XM 4 & OIM XM 4 Sapphire for the Si(Li) type SEM 10 liter dewar Detecting Unit with SUTW, 10mm2: Si(Li) type SEM Detecting Unit with Super Ultra Thin Window for detection of all elements down to and including Beryllium. Active detector area is 1 0mm2. The crystal is automatically protected against warm-up. Includes preamplifier, amplifier, cables and 10 liter dewar. Resolution of 132eV or better, measured at MnK, 1000CPS and with the time constant IOOusec. Peak to background is 20,000: 1 or better. Acquisition module used to collect and digitize the x-ray signal input from the Si(Li) detecting unit. It includes the acquisition boards and high voltage bias supply and housing cabinet. Image acquisition board is also included in the EDAM when purchasing an imaging level system. The box has 7 PC1 slots available.

- 8 Digital SCA Outputs
- Dedicated high speed PC1 bus
- 7 Selectable processing times (from 1.6 s to 102.4 s)
- Universal input, 90-260 VAC 60-50 Hz
- High Voltage Channel
- 5 level fast discriminator
- 1 Serial, I USB & I Parallel Port
- Input Count rates ¿500Kcps
- Throughput ¿100Kcps
- 3 evlch selections (5, 10 & 20)

OIM DC features include: Complete integration and software control of the DigiView CCD camera for enhanced EBSD pattern acquisition (Hikari camera, with integrated forward scatter detector). Including integrated controls for exposure, black level, binning, and background subtraction Integration with the SEM for direct electron image collection, display and processing. Automated OIM scans utilizing hexagonal grid sampling. Patented indexing routine utilizing triplet voting. Simultaneous EBSD and EDAX EDS data collection with suitable SEM models. Unique Confidence Index value calculated for each data point. Scan Stitching joins two or more scans creating super sized data sets. Interactive material file editor

Hikari EBSD Detector:

- Mega-pixel resolution: 640 (H) x 480 (V) pixels x 12 bit
- Camera Speed: ¿ 99% indexing success rate at 200 indexed patterns per second on EDAX Ni standard at beam currents of ¿ 2 nA
- Binning at 1x1, 2x2, 4x4, 5x5, 6x6, 8x8
- Round phosphor screen
- Motorized, high-precision camera slide
- Digital slide control for user-defined camera positioning and FSD optimization
- Touch sensor for collision prevention
- Camera controller integrated within OIM Data Collection
- Customizable image enhancement integrated within OIM Data Collection
- Thermoelectric cooler
- Integrated Forward Scatter Detector
- Multiple contrast combinations: orientation, compositional, topographical
- Integrated FSD imaging interface within OIM Data Collection

Lithoqraphy Package: NSR Electrostatic Beam Blanker The Electrostatic Beam Blanker is an essential tool for Lithography applications on SEM and Small Dual Beam. This option will blank the Electron Beam with a decaylrise time of 1 ns when an external blanking voltage of +8 V is applied. The E-Beam will pass the column undisturbed when a voltage of 0 V is applied.

- Termination resistor = 50 Ohm
- 0n:Off ratio = 1,000:1
- Blanker plate spacing: 0.25, 0.5, 1.0 or 2.0 mm (manually selectable)
- Connecting cable with BNC-male connector included
- Pattern generator excluded.

FP 6878150 External Scan Interface Hardware interface to allow an external scan generator, usually from a Lithography system, to control the deflection plates and the blanking plates of the Ion Beam column in a Small DualBeam instrument. A manual switchbox allows the user to apply the external scan generator signal to the scan coils of the Electron Beam column. Requires a 25 V signal from the external scan generator output. NabityNPGS Nabity Litho. Package NPGS V9.0