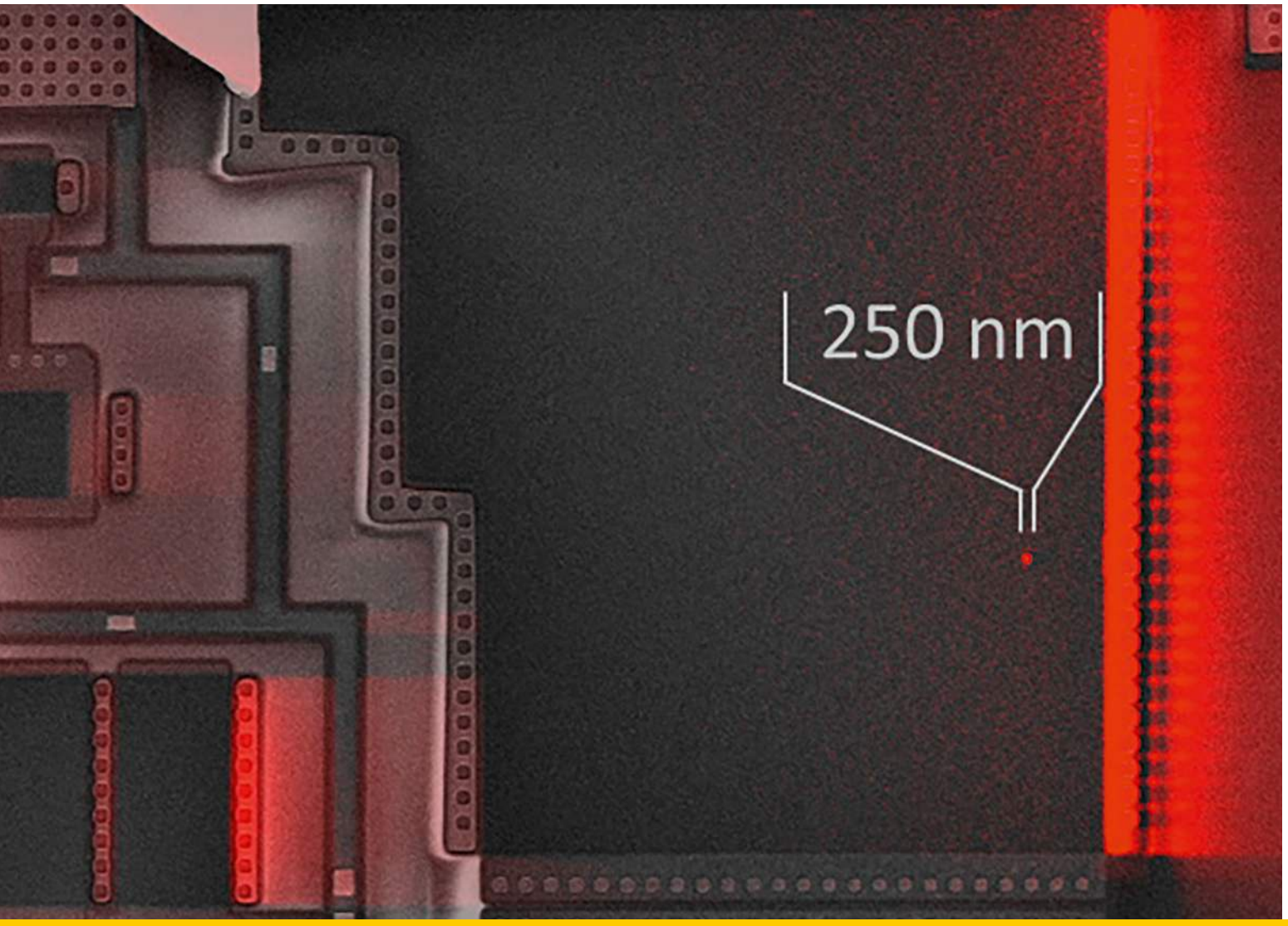


Electrical Failure Analysis

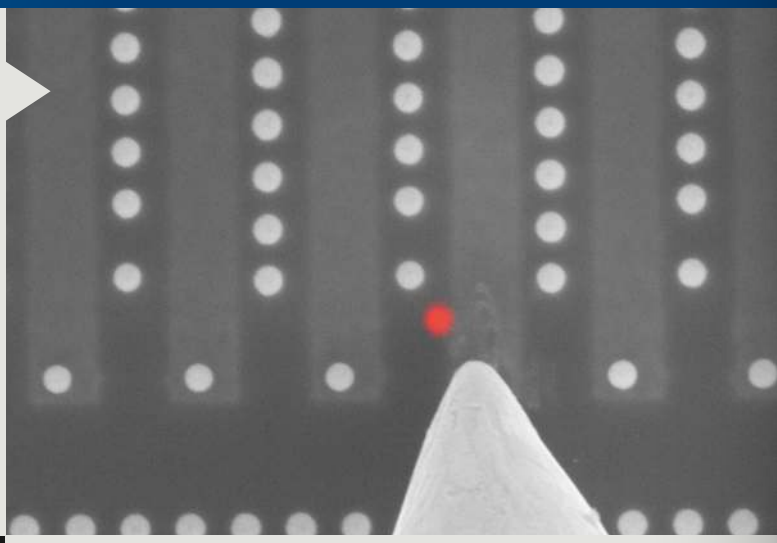
Dedicated equipment for Failure Analysis, from entry-level to the cutting edge

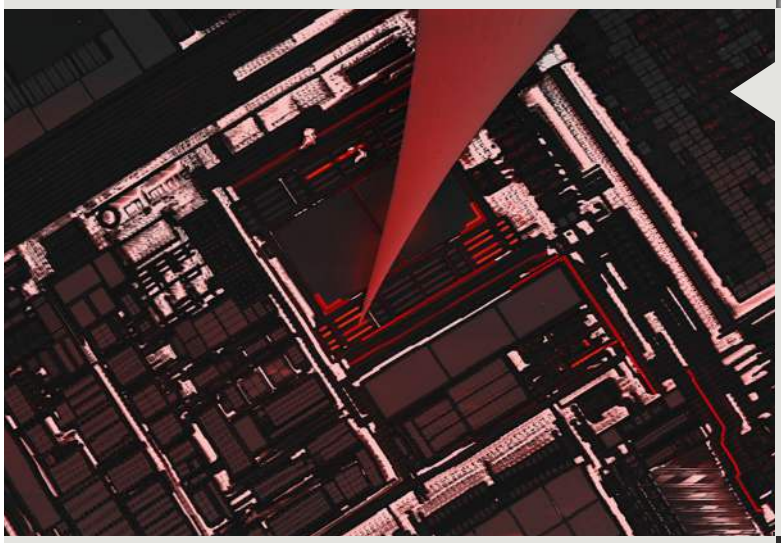
point electronic

The unique benefits of Electrical Failure Analysis

Employ the full range of EFA techniques

- Electron Beam Induced Current (EBIC)
- Electron Beam Absorbed Current (EBAC)
- Resistive Contrast Imaging (EBAC/RCI)
- Electron Beam Induced Resistance Change (EBIRCh)



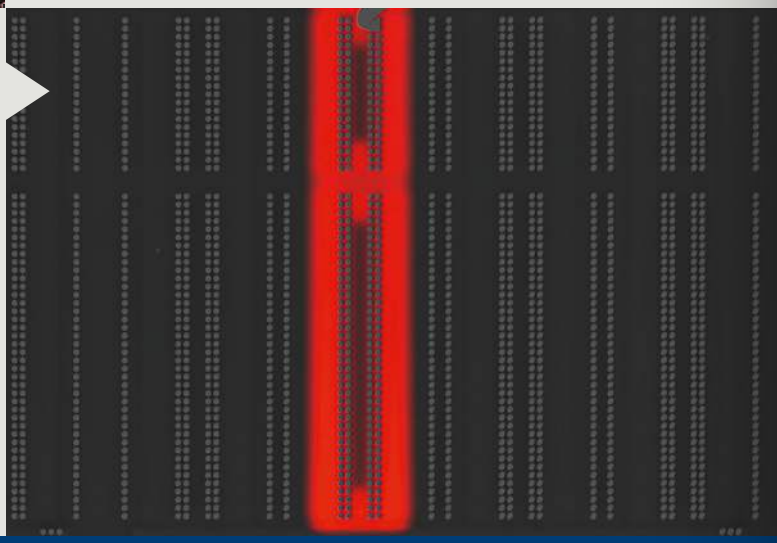


Characterize interconnects with highest resolution

- Reveal electrical integrity of nets with sub-micron lateral resolution and bridge from EFA to PFA
- Diagnose fabrication and long term issues, including contamination, metal patterning defects, resistive interconnectors, or electro-migration
- Directly isolate defects to the exact layer and die location, and improve time to product improvement actions

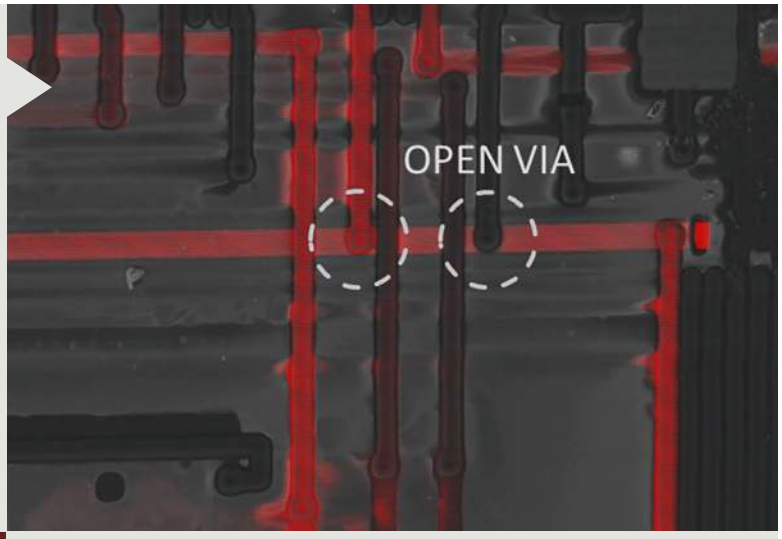
Map junctions and defects with the highest possible resolution

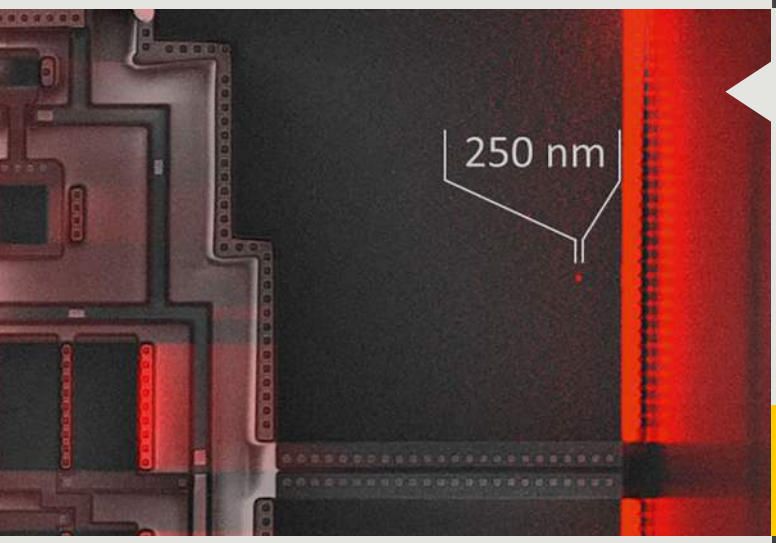
- Correlate structural defects with electrical activity
- Map active areas of junctions and electrical fields
- Validate doping profiles and areas



Find exact location of any open, resistive or shorting defect

- Localize metal line cuts caused by cracking, corrosion, electro-migration, or foreign particles
- Identify resistive opens caused by interface contamination at via interconnects
- Pinpoint location for direct TEM lamella FIB preparation





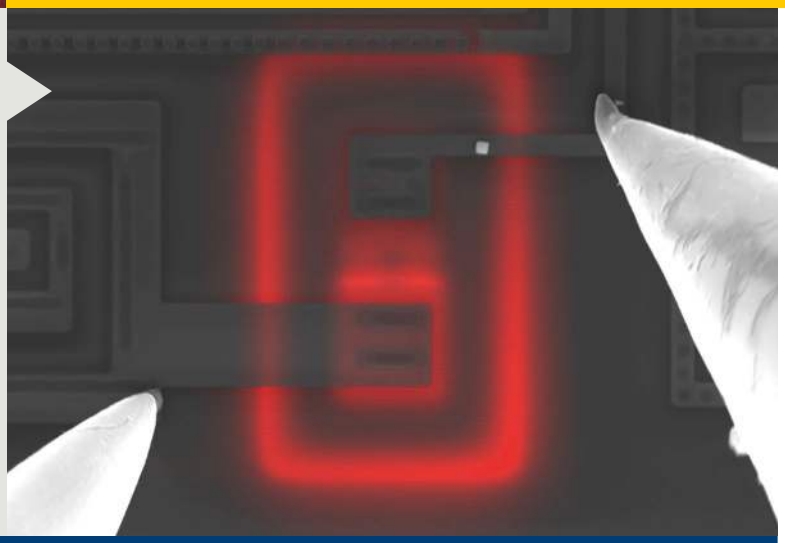
Localize defects in thin dielectric layers

- Visualise and localise weaknesses in gate oxide (GOX) and capacitor oxide (COX) before breakdown
- Pinpoint oxide shorts caused by ESD or EOS with sub-micron resolution
- Preserve the original defect signature with power dissipation in the lower nW range during localization

EFA

Verify device operation modes with built-in biasing and live colour

- Image junctions and fields in delayered devices
- Map electrical activity of solar cells under bias
- Compare imaged behaviour with device modelling



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Designed for ease-of-use and performance

Electronics for FA workflows

- Automated routing to probes
- Fast and low-noise amplification
- Integrated live imaging*
- Automated needle cleaning*
- In-situ preamp for low impedance cases*

* optional

EFA

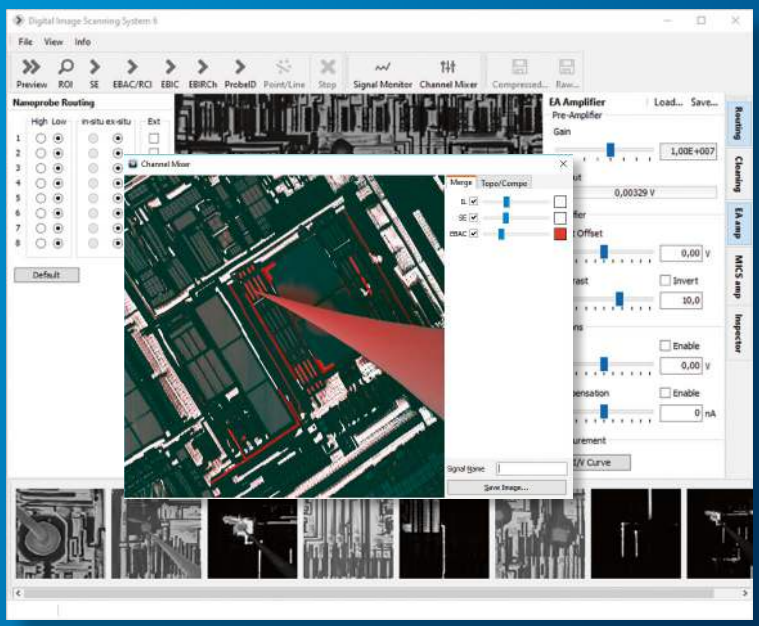
EA DISS6 imaging

- Integrated scan generator and image acquisition
- Very large resolution and high speed
- High bit depth EFA analog-to-digital conversion
- Simultaneous SE and EFA inputs

EFA controller

- Automated routing for up to 8 probes
- In-situ electronics for low impedance failure cases
- Two stage amplification for maximum range & highest speed
- Built-in sources for voltage bias and current compensation
- New optional integrated needle cleaning PSUs

point electronic

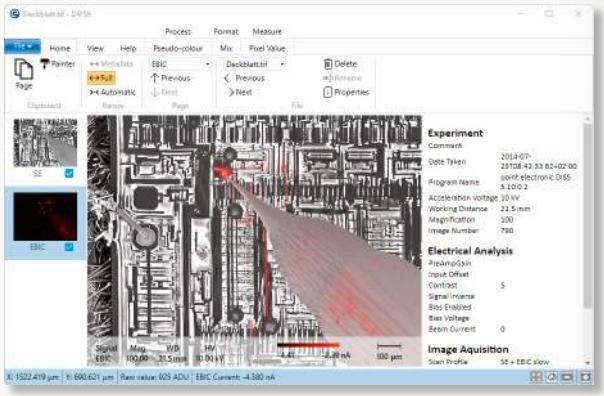


DISS6 - control and acquisition app

- Routing and amplification control
- Live colour mix for localisation
- Current-Voltage sweep tool
- Needle cleaning tool
- Automatic quantification to fA ... µA units
- Standard file formats

DIPS6 - processing app

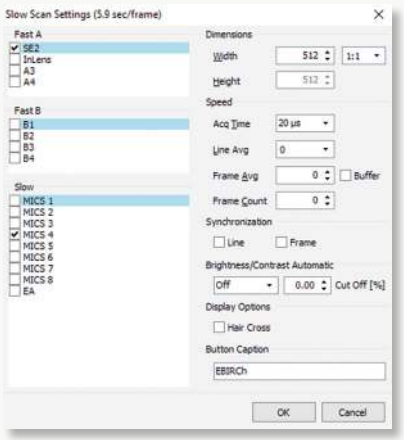
- Colour mix of pages for localisation
- Full image and metadata viewer
- Automatic quantification to µA...fA
- Gradient-based pseudocolours
- Export of quantitative pixel values



Needle cleaning tool

- High voltage mode to break oxide
- High current mode to evaporate contamination
- Procedure is automated for ease-of-use
- Power is carefully controlled to maximise success rate

Integrated and easy-to-use quantitative software



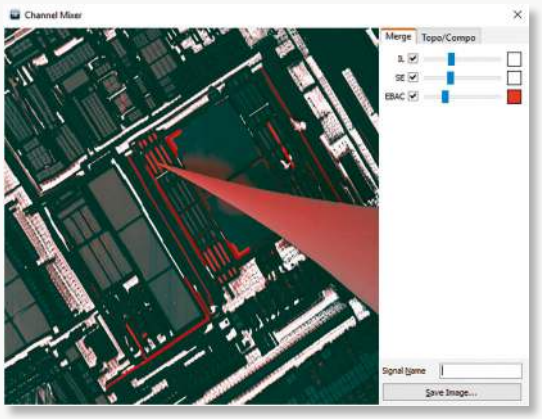
Optimised configurable workflow

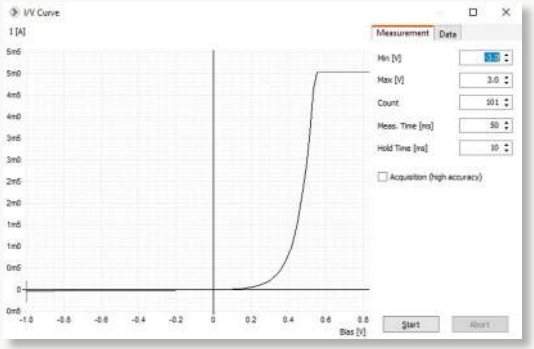
- Set scan profiles for highest efficiency
- Fast scans for navigation and aligment
- Simultaneous scan profile for localization
- High resolution scan profile for data acquisition

EFA

Live colour view

- Fast EBAC profile for alignment and navigation
- Simultaneous SE/EBAC profile for localization
- High resolution EBAC profile for mapping and analysis





Current-voltage (IV) tool

- Determine if electrical connections are made
- Double check for electron beam damage
- Select suitable bias voltage for EBIRCh and EBIC

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EFA controller

Inputs	8x BNC inputs from nanoprober
Outputs	8x BNC outputs for external device analyser(s)
	1x BNC amplifier EFA signal for imaging
	1x D-SUB power and control for in-situ electronics
Routing	8x to in-situ/ex-situ high/low or external
	High to EA amp or needle cleaning (optional)
	Low to Ground or Bias Voltage
Ex-situ pre-amplifier	10^3 … 10^{10} V/A variable **ex-situ gain**
	0.5 MHz bandwidth at 10^9 V/A
EA amplification	0.1 … 100x, 16-bit contrast
	0...1 V, 16-bit brigthness
	Analog signal inversion
	8 levels low-pass filter
	manual zero/dark correction
Internal sources	-10 … 10 V, 16-bit bias voltage
	-10 ... 10 µA, 16-bit compensation current
In-situ preamplifiers (optional)	8x 10^7 V/A fixed in-situ gain
	0.1 MHz bandwidth
Needle cleaning (optional)	0 ... 10 V, 0 ... 10 µA mode to break oxide
	0 ... 2 V, 0 ... 20 mA mode to evaporate contamination
	Programmable automatic ramps/sweeps
	Live current and voltage monitors

EFA DISS6 imaging

Signal inputs	1x calibrated ex-situ EA
	8x calibrated in-situ EA (optional)
	4x calibrated SEM
MICS amplification (optional)	-1…1 V input offset (calibrated brightness 1…4)
	1…1,800× gain (calibrated contrast 1….4)
	-1…1 V output offsets (calibrated reference 1…4)
	3.4 MHz … 34 Hz low-pass filter
Digitization	16-bit ex-situ EA
	12-bit in-situ EA
	12-bit SEM, saved to 16-bit
	32,000× max. oversampling (pixel averaging)
Scan generator	X and Y scan outputs (calibrated)
	beam blank output (optional)
	64k × 64k pixels maximum resolution
	0.5 GPixels maximum frame size (software limit)
	1 µs minimum pixel dwell time (EA input limit)
	6 milliseconds maximum pixel dwell time
	256× max. frame average
	50x max. line average
	frame, line, pixel synchronization (optional)

PC/Laptop, Display

PC/Laptop	Intel Core i3 minimum
	2x USB 2.0 minimum
Display	1,280 x 1,024 resolution minimum
Operating systems	Windows 11 … 7
	Network recommended for remote support

DISS6 app

EFA routing	8x probes to in-situ, ex-situ or external
	EA amplifier, Bias, Compensation or Needle Cleaning
Current voltage (IV) control	Voltage range, steps, time
	CSV data export
EA amplifier control	Gain, Contrast, Brightness, Bias, Compensation, Inv.
	Save/load amplifier profile
MICS amplifier control	8x Brightness and Contrast
DISS6 imaging control	Configurable scan profiles
	Signals, pixel size, speed, averaging, sync
	Manual/automatic image range
Inspector tool	Automatic quantification of pixel values
	Editable formula files
Image mixing tool	Manual colour assignment
	Live mix with image export
Save file formats	uncompressed 8-bit or 16-bit multi-page TIF
	compressed JPEG
	XMP metadata embedded into TIF and JPEG
Operating systems	Windows 11 … 7

DIPS6 app

Input file formats	uncompressed 8-bit or 16-bit multi-page TIF
	compressed JPEG
	XMP metadata embedded into TIF and JPEG
Export file formats	PNG images
	CSV data with pixel values
View modes	Single page image and metadata
	Multiple pages/file
	Layers/image mix view
Quantification	Automatic, using XMP values and formulas
	Manual, using XML formulas
Pseudo-colour	GGR gradient based colour mapping
	Automatic and manual control of range
Operating systems	Windows 11 … 7

Parts and Cables

EFA controller	Standard	1x
EFA DISS6 imaging	Standard	1x
EFA ground strap	Standard	1x
EFA signal cable	Standard	1x
SEM external scan interface cable	Standard	1x
USB cables	Standard	2x
USB memory stick with software	Standard	1x
EA reference samples	Optional	-
EFA in-situ electronics	Optional	-
Flange with feedtrough	Optional	-
PC, keyboard, mouse	Optional	1x
Display	Optional	1x

Software packages

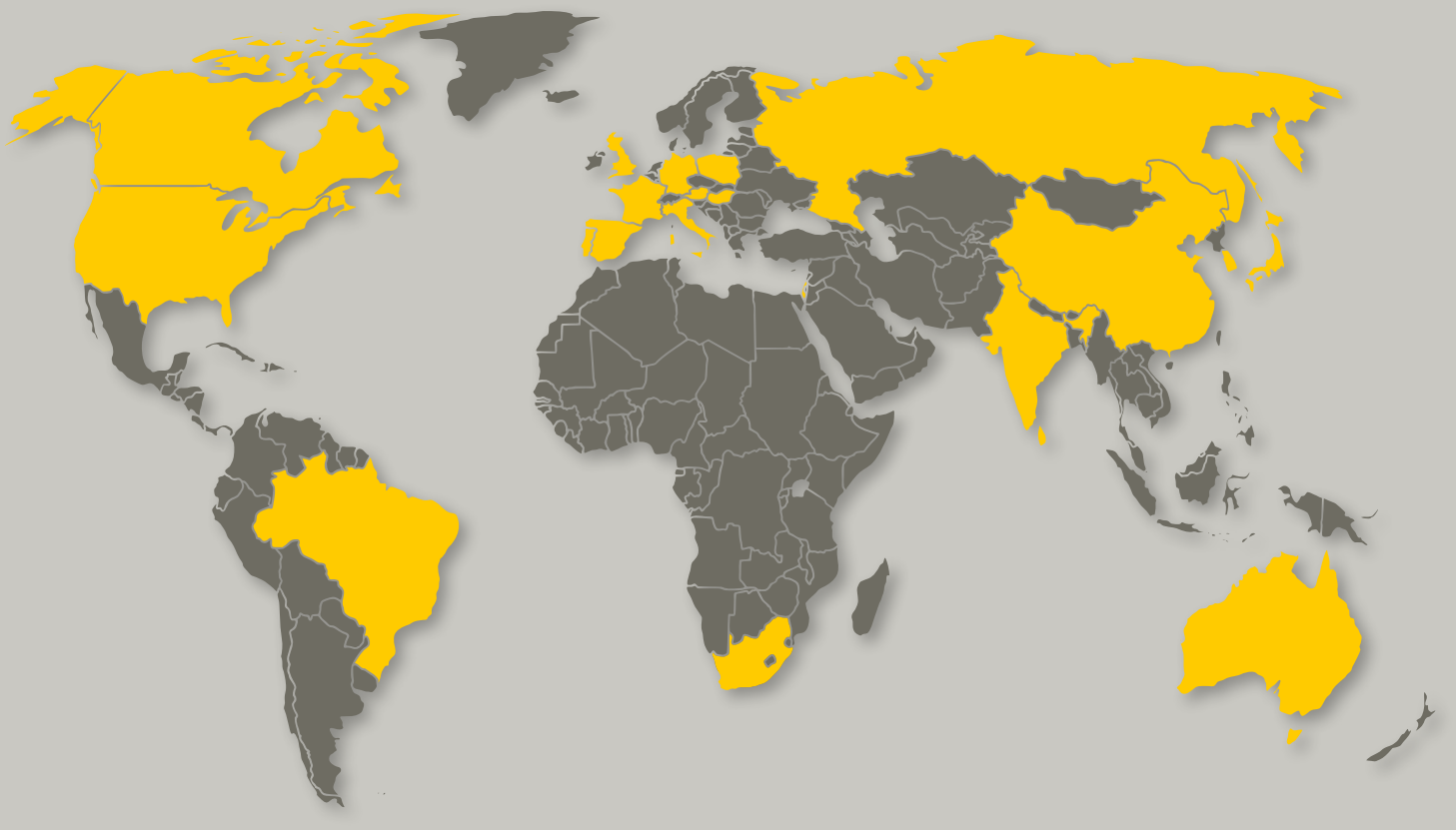
Drivers	PEUSB
Libraries	EBICControl
	DISS6Control
Apps	DISS6 app
	DIPS6 app
Server	EMGateway

Weight & Dimensions

EFA controller	23.5 x 8.7 x 29.5 cm
	typ. 3.1 kg
EFA DISS6 imaging	23.5 x 8.7 x 29.5 cm
	typ. 3.7 kg typ.
Shipping	typ. 8.5 kg
	typ. 36 x 32 x 56 cm

Site requirements

Power	1x mains 110/220 VAC single phase 50-60 Hz
	on the same earth as the microscope
Microscope	8x connections to nanoprobes
	1x connection to in-situ electronics (optional)
	1x connection to SEM earth
	1x mixed scan interface and SEM signals connection
Space	EFA controller may be placed in a 19-inch rack or table
	EFA DISS6 imager may be placed on a 19-inch rack or table



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