



## Product Portfolio

**RA** **RAITH**  
NANOFABRICATION

# EBPG Plus



## Performance that matters

Lithography with an extra Plus in precision, throughput, and automation

The new EBPG series system is the latest progression of many years of system development. The EBPG Plus system is well established in industrial compound semiconductor manufacturing and is the system of choice in the world's leading universities and centers of excellence for nanotechnology research.

By harmonizing throughput, stability, fidelity, and precision, the EBPG Plus ensures perfect interaction between all performance parameters to deliver optimum nanolithography results.

The efficient data processing and multiple options for adapting the exposure sequence to the geometric properties of the design result in nanostructures with highest pattern fidelity.

Hardware and software are designed to enable even the most challenging applications while supporting stable and convenient system operation in a true multi-user environment.

### Main Applications

- High frequency devices
- Quantum technology devices
- 5G telecom devices
- DFB lasers
- Anti-counterfeiting OVDs
- DOE
- Metasurfaces (lenses, AR/VR gratings)

### Column Technology

- EBPG
- Electron
- 100 kV

### Stage

- 6" or 8" Stage
- 2 or 10 holder airlock

# VOYAGER



## Speed up! – Fast, smart, innovative and economical

### VOYAGER – a new class of Electron Beam Lithography technology

VOYAGER™ is recommended for all industrial and academic Electron Beam Lithography applications where the important objectives are high write throughput and high-resolution. As well as the newly developed, innovative eWrite system architecture, Raith attaches great importance to an attractive price/performance ratio throughout the lifetime of the system.

The hardware and software have been consistently designed for automated exposure operations. The state-of-the-art high-performance pattern generator and electron optics have been optimally aligned.

Samples of up to 8 inches are exposed at high speed. The necessary system stability is ensured, even in difficult environments, by a thermally stabilized and environmentally tolerant housing.

#### Main Applications

- Nanolithography
- High speed direct write
- Diffractive optical elements
- Anti-counterfeiting security elements
- Compound semiconductor devices
- Communication devices and DFB lasers

#### Column Technology

- eWrite
- Electron
- 50 kV
- High-speed ET SE detector and high-speed post-lens BSE detector

#### Stage

- 4" - 6" full travel (8" wafer loading)
- Large Z travel

# RAITH150 Two



## Bridge your technology needs

**RAITH150 Two – Raith’s environmentally tolerant, ultra-high resolution direct write system**

Since its introduction, the RAITH150 Two has established itself as a bestseller among universal, high resolution Electron Beam Lithography systems. It is used in research centers and nanotechnology centers worldwide.

RAITH150 Two exposes structures smaller than 5 nm. Process operation and documentation is enabled by outstanding scanning electron microscope (SEM) properties. RAITH150 Two works with sample sizes from a few mm to 8-inch silicon wafers.

The system stability, even in difficult environments, required for demanding exposures is made possible by a thermally stabilized and environmentally tolerant housing.

### Main Applications

- Nanolithography
- Imaging
- Low-voltage EBL
- Large-area SEM image acquisition, sample navigation, metrology

### Column Technology

- Gemini
- Electron
- 30 kV
- ET SE detector, in-lens SE detector, energy selective in-lens BSE detector and post-lens angle selective BSE detector

### Stage

- 6" full travel (8" wafer loading)
- Large Z travel
- Rotation and tilt sample holder (option)



## FIB-SEM where FIB truly comes first

### VELION – FIB-SEM for FIB-centric nanofabrication

VELION is a novel FIB-SEM instrument dedicated to advanced nanofabrication, in which FIB is the true priority technique. Supported by a Raith proprietary SEM and laser interferometer-controlled sample stage, it allows for very versatile use.

The unique FIB-centric architecture combines direct processing techniques with the unrivaled stability, automation, and precision of a lithography instrument. Featuring the latest-generation ion column, pattern generator, and software platform plus a tailored field emission SEM column, VELION offers unique capabilities for advanced FIB nanofabrication while also allowing sample preparation, process control, and e-beam lithography – all in one tool!

With various additional options, such as IONselect to provide multiple non-Ga ion species for unique processes, gas injection systems, nanomanipulators, and many more, VELION can be configured for individual needs. The open platform can be customized and upgraded for a wide range of applications and helps to keep pace with emerging research trends.

Main Applications	Column Technology	Stage
<ul style="list-style-type: none"> <li>• Direct and 3D FIB techniques</li> <li>• Ga-free FIB nanofabrication</li> <li>• Nanoengineering platform</li> <li>• Sample preparation</li> <li>• SEM inspection and lithography</li> </ul>	<ul style="list-style-type: none"> <li>• nanoFIB™ Three</li> <li>• IONselect</li> <li>• Ion column 35 kV Ga (Au, Si, Ge)</li> <li>• FE-SEM column 30 kV</li> </ul>	<ul style="list-style-type: none"> <li>• 4" full travel</li> <li>• Large Z travel</li> <li>• Rotation and tilt sample holder</li> <li>• Other tilt setups</li> </ul>

# eLINE Plus



## Discover nanoengineering beyond Electron Beam Lithography

eLINE Plus – the swiss army knife for nano-fabrication

eLINE Plus™ is the optimum, widely distributed system for universities and research centers that want to combine an efficient and uncompromising Electron Beam Lithography system with an open platform for further nanofabrication processes and techniques.

In order to be prepared for the broadest bandwidth of applications, modern nanotechnology research today requires multiple techniques beyond classic and pure Electron Beam Lithography (EBL) – preferentially *in-situ*.

In addition to fully integrated nanomanipulators and a mechanism for electron beam induced deposition and etching, a range of further options is available that identifies eLINE Plus as currently the most versatile and unique nanoengineering EBL system.

### Main Applications

- Nanolithography
- (Large-area) SEM image acquisition, sample navigation, metrology
- FEBIP
- Nanoprobng, nanomanipulation, nanoprofilometry
- Material and structural analysis
- Customized applications

### Column Technology

- Gemini
- Electron
- 30 kV
- ET SE detector, in-lens SE detector, energy selective in-lens BSE detector and post-lens angle selective BSE detector

### Stage

- 4" full travel
- Large Z travel
- Rotation and tilt sample holder (option)

# PIONEER Two



## Best of both worlds: Direct write and direct view

**PIONEER Two – top technology for the best of both worlds: EBL and imaging in a single system**

PIONEER Two™ is the ideal solution for all universities and scientists with equal requirements for both an Electron Beam Lithography system and an analytical Scanning Electron Microscope for imaging purposes.

PIONEER Two, as an ideal EBL-SEM hybrid, integrates all ingredients for professional EBL and SEM into one complete turnkey system. The system stands for almost unlimited bandwidth of nanolithography, imaging and analytical applications.

The system architecture has been designed and developed with particular consideration of given research budgets in university environments. At the same time, PIONEER Two delivers guaranteed EBL performance in linewidth, stitching and overlay.

### Main Applications

- Nanolithography
- SEM imaging
- Material and structural analysis
- Large-area SEM image acquisition, sample navigation, metrology

### Column Technology

- Gemini
- Electron
- 30 kV
- ET SE detector, in-lens SE detector, energy selective in-lens BSE detector and post-lens angle selective BSE detector

### Stage

- 2" full travel
- Large Z travel
- Full rotation and tilt integrated (option)

# ELPHY



## Unlock the full nanopatterning potential of your SEM, FIB-SEM, or HIM

ELPHY – the easiest and most economical access to professional nanolithography and nanofabrication

Raith offers the ELPHY™ product family, a nanolithography upgrade kit, that enables scanning electron microscopes (SEMs), focused ion beam microscopes (FIBs), helium ion microscopes (HIMs), or combined systems (FIB-SEMs) to deliver professional nanolithography applications.

This spectrum of solutions begins with ELPHY Quantum, the most widely distributed Raith SEM/FIB attachment in the market. The entire range of processes (CAD layout and processing, control of exposure parameters, remote control of each microscope etc.) is integrated within a single user interface, the Raith NanoSuite. The specially developed hardware is supplied on Windows-based PCs.

ELPHY Plus was developed for more demanding applications or on field-emission SEMs with higher current density and in connection with a Laser Interferometer Controlled Sample Stage. A well-engineered and fast pattern generator hardware delivers the required performance.

Raith has set new standards in the market for nanolithographic solutions (“Attachments”) with ELPHY MultiBeam. The ELPHY MultiBeam combines the latest technology for three-dimensional FIB and other 3D nanofabrication techniques with the very best EBL performance, and helps to exploit the full nanofabrication potential of any FIB-SEM or FIB system.

### Main Applications

- Nanolithography
- SEM lithography
- FIB-SEM lithography and nanopatterning
- Helium Ion Microscopy – HIM-lithography and nanopatterning
- (3D) nanoprototyping
- Attach to analytical SEM, FIB-SEM, FIB, HIM supplier instrumentation

### Stage

- Standard stage delivered by analytical SEM, FIB-SEM, FIB, HIM supplier

# CHIPSCANNER



## True large-area image acquisition

**CHIPSCANNER – the Raith solution for chip design recovery, layout reconstruction, anti-counterfeiting, and IP protection**

For reverse engineering applications, cm<sup>2</sup>-large chip areas need to be scanned with nm resolution and excellent layer-to-layer accuracy ('3D stitching') for layout and schematic extraction.

CHIPSCANNER delivers the necessary performance for this demanding operation. CHIPSCANNER uniquely combines high-resolution electron optics, multiple, highly efficient electron detectors and most precise laser interferometer stage technology.

Calibrated image scans of up to 50,000 x 50,000 pixels reduce the number of images and seams while retaining smallest pixel sizes. Height-sensor-based focus correction, sample preleveling technologies and built-in temperature stabilization deliver homogenous large-area image mosaics with smallest stitching errors and stable brightness/contrast values.

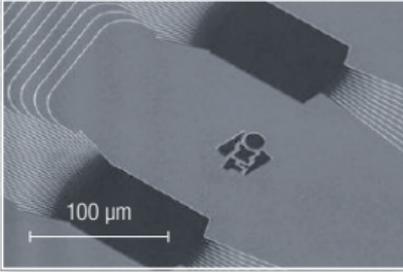
Depending on the selected stage travel range, several samples can be loaded and image mosaics can automatically be acquired without user interaction.

Software tools are available to extract and optimize valuable GD-SII-CAD data from the images for further processing.

Main Applications	Column Technology	Stage
<ul style="list-style-type: none"> <li>• Chip design recovery</li> <li>• Layout reconstruction</li> <li>• Anti-counterfeiting analysis</li> <li>• IP protection</li> <li>• Chip obsolescence management</li> <li>• Large-area SEM image acquisition, sample navigation, metrology</li> </ul>	<ul style="list-style-type: none"> <li>• Gemini</li> <li>• Electron</li> <li>• 30 kV</li> <li>• ET SE detector, in-lens SE detector, energy selective in-lens BSE detector and post-lens angle selective BSE detector</li> </ul>	<ul style="list-style-type: none"> <li>• 2" - 6" (8" wafer loading)</li> </ul>

# traxx & periodixx

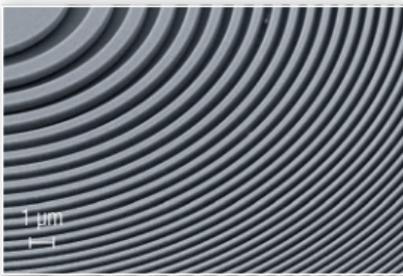
The stitching-error-free lithography options traxx and periodixx are available for many of the Raith products. These have been developed for the purpose of performing nanolithographic exposures without stitching errors that are inherent to every step and repeat exposure technique. traxx and periodixx are available for eLINE Plus, VELION, RAITH150 Two and VOYAGER.



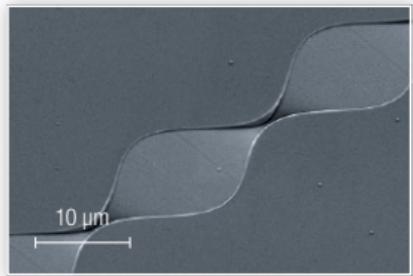
*Stitching-error-free fabrication of nano-photonic components on SOI with traxx*  
R. Schmits, TNO Technical Sciences, Delft, Netherlands

## Application areas

With its range of solutions, Raith operates in all areas where nano-structures are deployed as indispensable components of products and technologies. Such systems could be in quantum physics, materials science, nanobiotechnology, nanoelectronics or nanomedicine. Some of the largest areas of application are in semiconductor technology, for example, and in information and data storage technology.



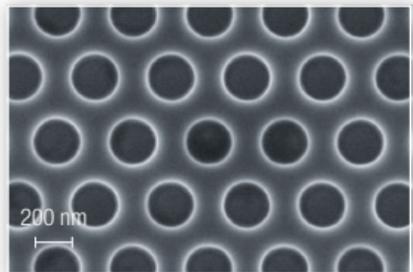
*X-ray zone plate in 500 nm thick gold*  
Max-Planck-Institute Stuttgart, Germany



*FIB 3D stitching*  
A. Nadzeyka, Raith GmbH, Germany



*EBID fabricated nano chess pieces*  
A. Linden, Raith GmbH, Germany



*Photonic crystals written with FLEXposure mode in ZEP520a*  
Prof. Thomas Krauss, University of York, UK



## About Raith

Raith is a leading precision technology solution provider for nanofabrication, electron beam lithography, focused ion beam fabrication, nano-engineering and reverse engineering applications. The company offers solutions for researchers and engineers in both academic and industry settings.

Founded in 1980 and headquartered in Dortmund, Germany, Raith employs around 200 people. The company works as closely as possible with customers in the most important global markets through subsidiaries in the Netherlands, the USA and Asia, and through an extensive partner and service network.

In February 2013, Raith joined forces with Vistec Gaussian Beam Lithography, another leading lithography equipment manufacturer with more than 45 years of experience. With this ideal extension to the product portfolio, customers now are able to select from a comprehensive range of nanofabrication systems.

Raith customers benefit from innovative, intelligently configured high-tech systems at an excellent price-performance ratio. With the world's largest service and support infrastructure in the area of nanofabrication, the world's greatest customer community, and highly trained personnel, customers can be sure of making a solid investment with the company.

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