ARCNL's metrology department: new light on nanostructures

Stefan Witte

Groups:
EUV Generation and Imaging (Witte, Eikema)
EUV Targets (Planken)
HHG and EUV Science (Kraus)
Computational imaging for advanced metrology (den Boef)
Nanoscale imaging and Metrology (Amitonova)

Metrology at ARCNL: people involved

EUV Generation and imaging:

- Stefan Witte (PI)
- Kjeld Eikema (PI)
- Nik Noest (technician)
- Hao Zhang (postdoc)
- Anne de Beurs (PhD)
- Kevin Liu (PhD)
- Alessandro Antoncecchi (PhD)
- Mengqi Du (PhD)
- Lars Loetgering (postdoc)

HHG and EUV science:

- Peter Kraus (PI)
- Reinout Jaarsma (technician)
- Filippo Campi (postdoc)
- Sylvianne Roscam Abbing (PhD)
- Maarten vd Geest (PhD)

EUV Targets:

- Paul Planken (PI)
- Thomas Meijvogel (technician)
- Stephen Edward (PhD)
- Vanessa Verrina (PhD)
- Guido de Haan (PhD)

Computational imaging for advanced metrology

- Arie den Boef (PI)
- Perry van Schaijk (postdoc)
- Christos Messinis (PhD)

Nanoscale imaging and Metrology

- Lyuba Amitonova (PI)

Several open PhD and postdoc positions!

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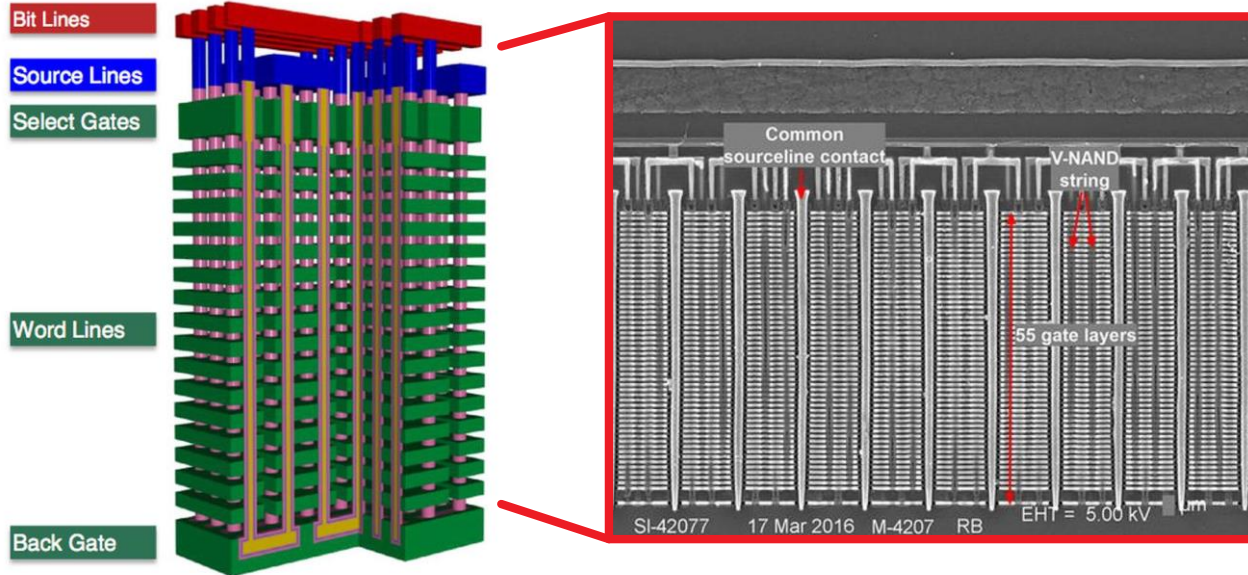# Metrology challenges in nanolithography

Modern semiconductor devices are often multi-element 3D nanostructures

→   So how do you characterize such devices?

Metrology challenges in nanolithography

3D-NAND schematic and SEM cross section:

How to achieve high-NA, aberration-free metrology in the presence of thick multilayer structures, opaque hardmasks and photosensitive resists?

ARCNL Metrology: Program overview

Key objective: Technology development for future semiconductor metrology needs

Lensless and computational imaging

- *Visible light microscopy with 'simple' hardware*
- *High-NA metrology in complex stacks*

Goal: Push metrology beyond conventional hardware limits through computational methods

EUV and soft-X-ray metrology

- *3D metrology of (non-)periodic device patterns*
- *EUV lensless imaging methods*

Goal: Contribute to the development of novel EUV/soft-X-ray-based wafer metrology tools

Pump-probe metrology methods

- *Metrology through opaque layers*
- *Ultrafast photo-acoustics*

Goal: Understand and control light-matter interactions for metrology through opaque materials.

High-harmonic generation sources

- *HHG source development and optimization*
- *EUV/soft-X-ray spectroscopy*

Goal: Understand HHG source optimization, and develop new materials characterization methods.

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ARCNL Metrology: Program overview

Key objective: Technology development for future semiconductor metrology needs

Lensless and computational imaging

- Visible light microsco~~py~~ _____ware
- High-NA me~~trology~~ _____ stacks

Talk S106 - Christos Messinis

G____ metrology beyond conventional hardware limits through computational methods

EUV and soft-X-ray metrology

- 3D metrology of (non-)p___ _____ _ms
- EUV lensless i_____

Talk S51 – Stefan Witte

G____ __te to the development of novel EUV/soft-X-ray-based wafer metrology tools

Pump-probe metrology methods

- Metrology through op__
- Ultrafast ph___

Talk S110 – Stephen Edward

G____ __ and control light-matter interactions for metrology through opaque materials.

High-harmonic generation sources

- HHG source development a__
- EUV/soft-X-ra___

Talk S105 – Peter Kraus

Goa___ __HG source optimization, and develop new materials characterization methods.

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Showcasing ARCNL metrology