

nano  LabnL



The role of national infrastructure for the innovative landscape in nanotechnology

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and managing director Kavli Nanolab Delft

Contents

- NanolabNL - organisation and way-or-working
- User examples
- Conclusions

About NanoLabNL

- National consortium
- Offering basic infrastructure and expert techniques
- Research, development, prototyping, small volume production
- On 4 locations:

- Eindhoven
- Groningen
- Twente
- Delft

PHILIPS **TU/e** Technische Universiteit
Eindhoven
University of Technology

 **rijksuniversiteit
 groningen**

UNIVERSITY OF TWENTE.

TU Delft
Delft University of Technology

TNO innovation
for life



The NanoLabNL locations and their expert techniques

Zernike NanoLab Groningen

- Soft Molecular Landing deposition

Kavli NanoLab Delft

- Particle beam processing
- Large area e-beam lithography
- Advanced reactive plasma etching
- Superconducting film growth
- Bionanoimaging and super resolution techniques

TNO NanoLab Delft

- Contamination analysis and plasma cleaning
- Nano-lithography & beaminduced deposition
- Ultra-high precision metrology stage platform
- Helium-ionbeam microscopy

MESA+ NanoLab Twente

- Nano-imprint lithography
- Thin film growth complex materials
- Hybrid technologies
- Wide spectrum of analysis

Philips Innovation Services

NanoLab@TU/e

- Fabrication of III-V semiconductor and photonic devices
- Deposition of organic, magnetic, and electronic nanostructured materials

About NanoLabNL

Investment programs

- Start in 2004 as special flagship in NanoNed
Investments 2003-2009: 87 M€
Focus on basic infrastructure and expert functions
New buildings in Delft, Eindhoven, Twente
- Continuation of NanolabNL
Current investment program 37 M€ for 2009 – 2013
Bionano, nanomedicine, risk analysis (aligned to NanoNextNL)
- On the Dutch roadmap for [Large-Scale Research Facilities](#) and
on the Top sector [High Tech Systems and Materials](#) roadmap
Proposed program: Quantum Electrical Engineering Nanotechnology
- Re-investment fund: 7 M€



About NanoLabNL

Organization

- NanoLabNL foundation strategic
- Steering board operational
- Program office @ technology foundation STW
- Joint investment strategy, joint communication
- Open access, tariffs public and private
- Innovation Vouchers for SME's
 for new users
 € 7500 / 50-75 hours access
 3rd call ending 7 Oct 2013

Our users



From a user's perspective

- Users do the processing themselves
- Introduction, safety course, equipment training
- Agreement based on an hourly rate
- If IP, then for user
- Book equipment through web application
- Link to other facilities

our users – some examples

Fundamental research

Applied research

Start-ups

Development

Small scale production

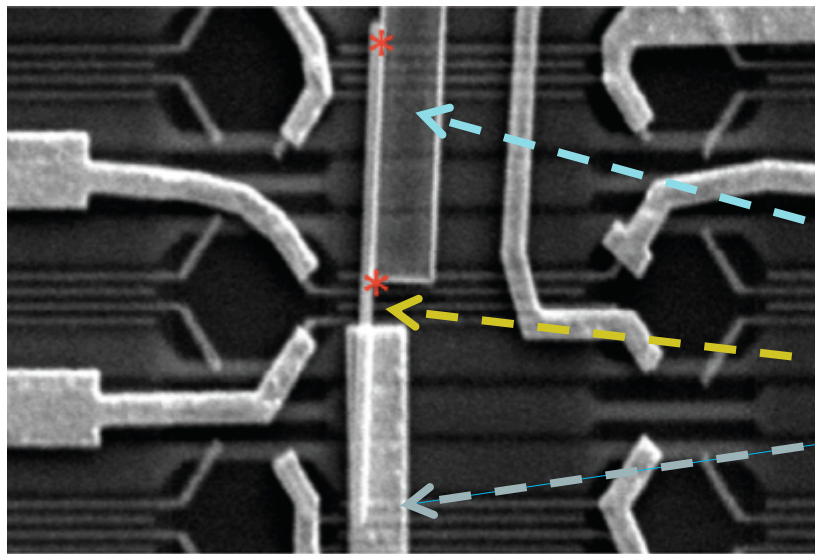
Foundry services



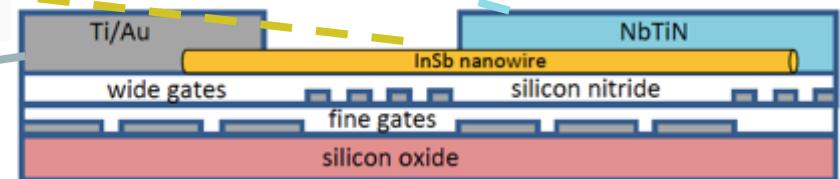
First experimental signatures of Majorana Fermions

(fundamental particle identical to its antiparticle and with zero properties)

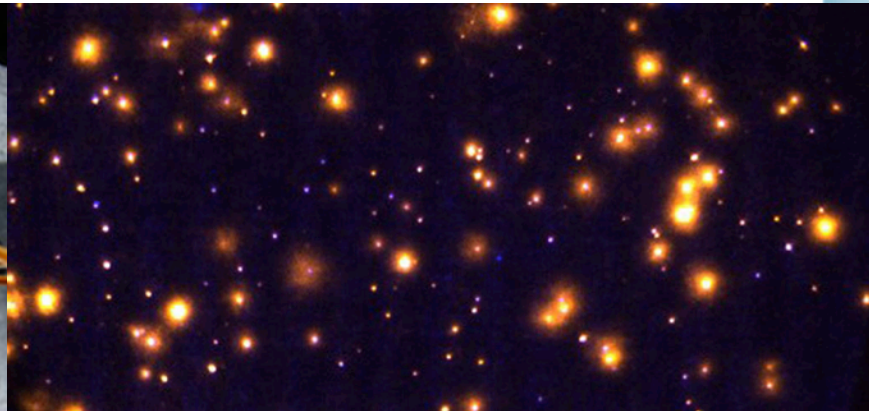
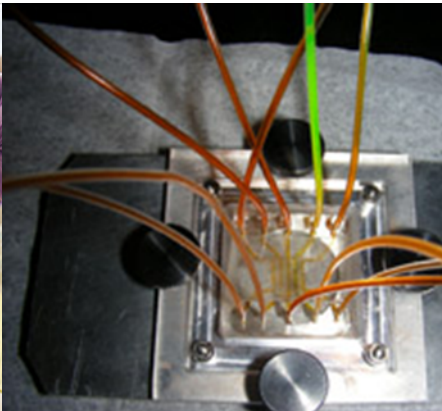
- Device: semiconductor InSb nanowire and NbTiN superconductor
- Technology: MOVPE, PVD and e-beam lithography
- Application: basic building block (qubit) for quantum computing



* anticipated position of 2 Majorana fermions

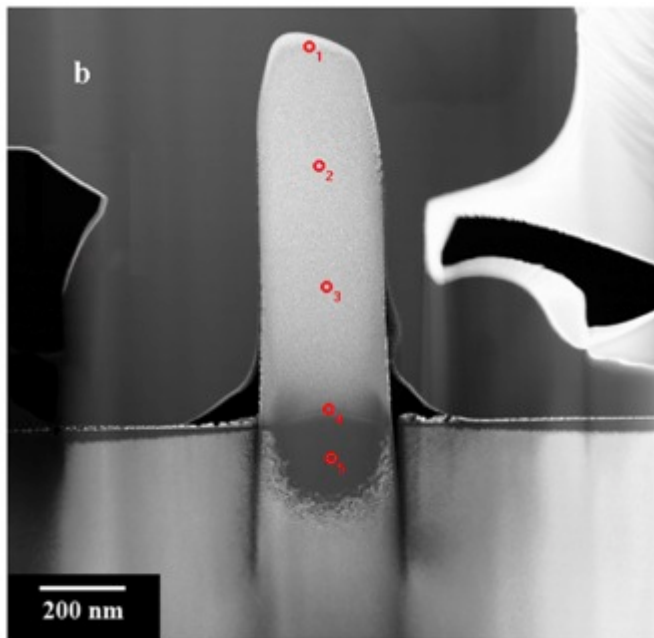


- Collaboration with pharma for new approaches to antiviral therapies and vaccination
- From single-virus studies to antiviral therapeutics
- Visualization of infection process of individual influenza viruses



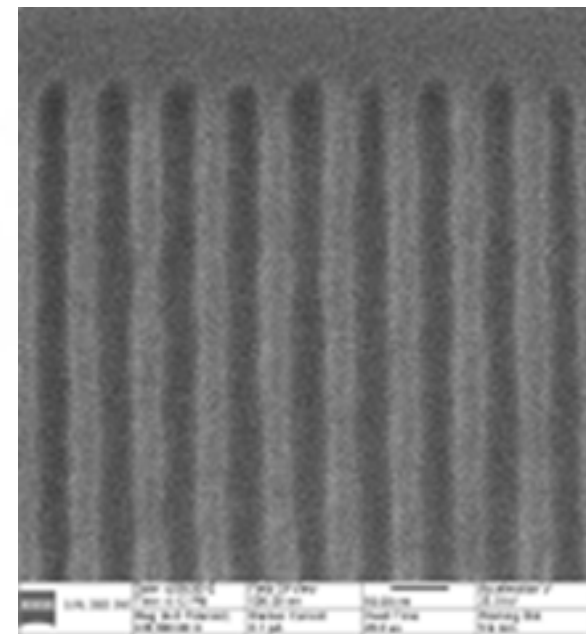
Single-Molecule Biophysics (van Oijen), Zernike Institute for Advanced Materials

- Helium Ion Microscopy (HIM)
- Ion beam induced Pt deposition on silicon
- EUV circuit editing and mask repair



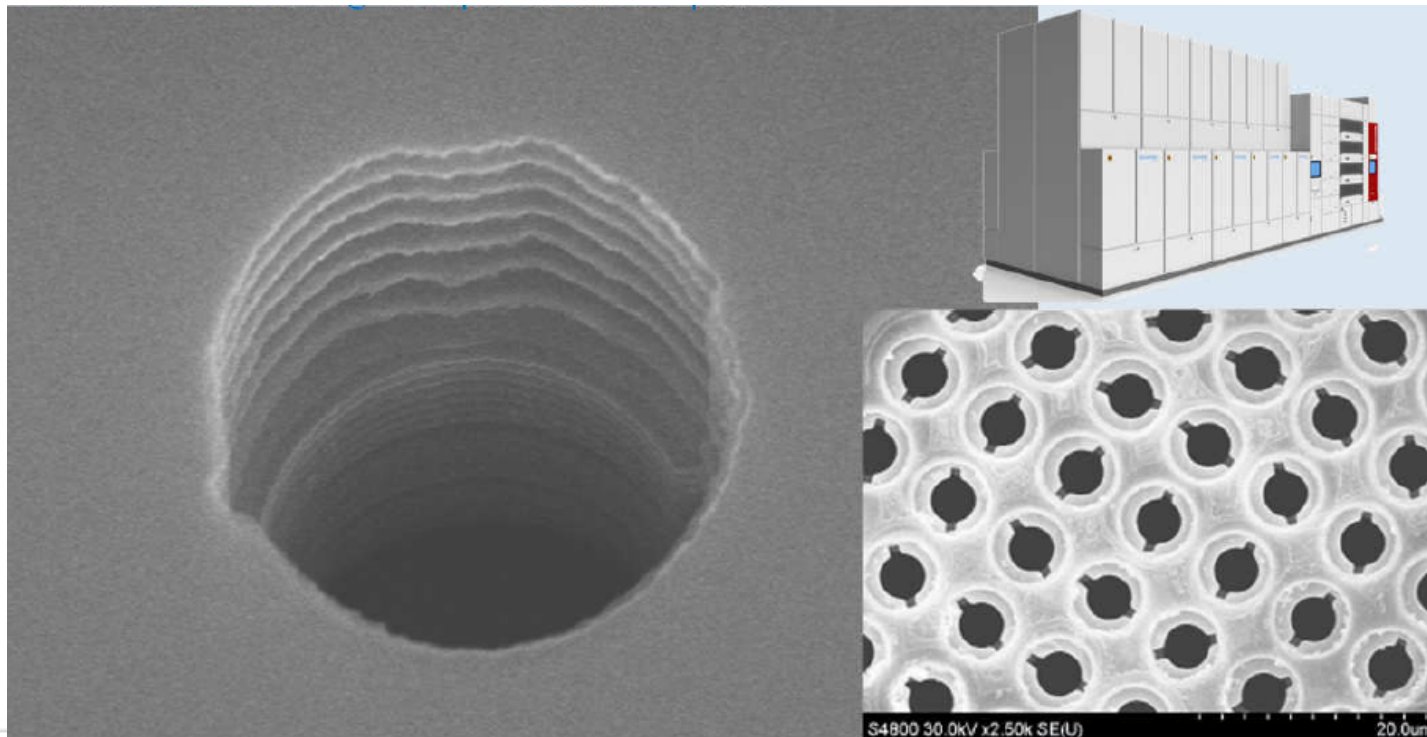
- Helium Ion Microscopy (HIM)
- EUV resist metrology
- Critical Dimension measurement

50 nm



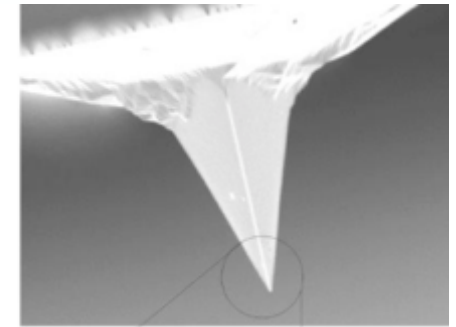
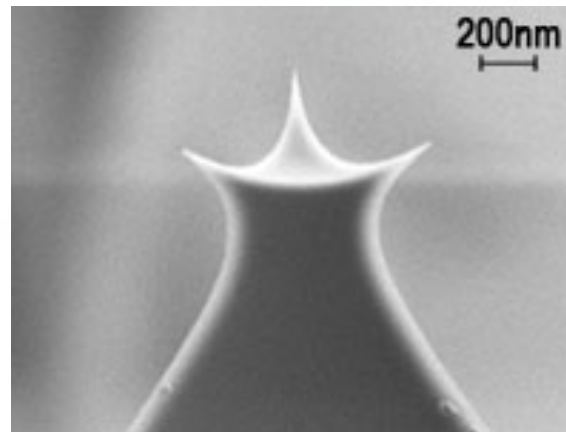
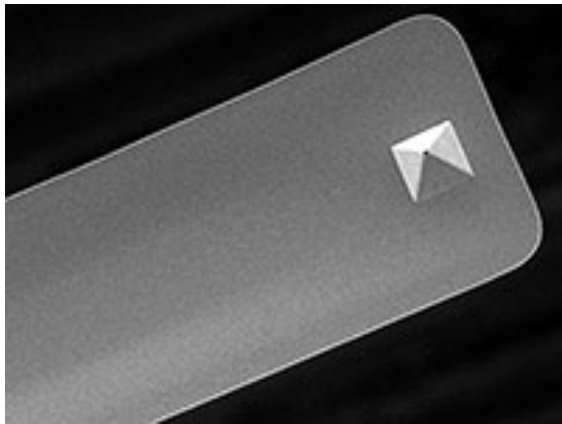
Equipment for maskless lithography by e-beam arrays

- High accuracy alignment structures by e-beam lithography
- Electron optical elements by MEMS technology



Scanning probe products:

- Magnetic Probes
- Chemical Probes
- Micro-fluidic Probes
- Special Probes

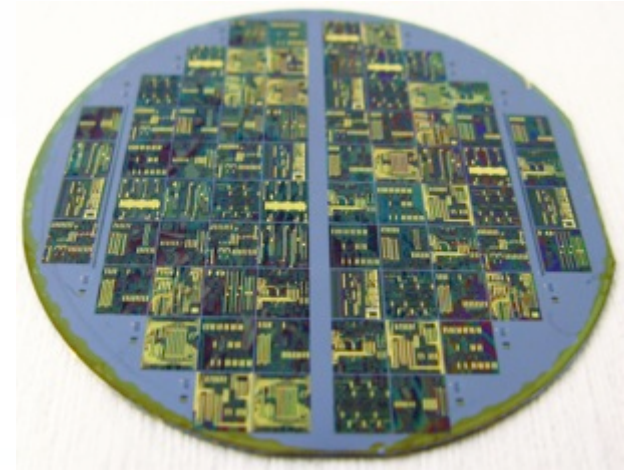
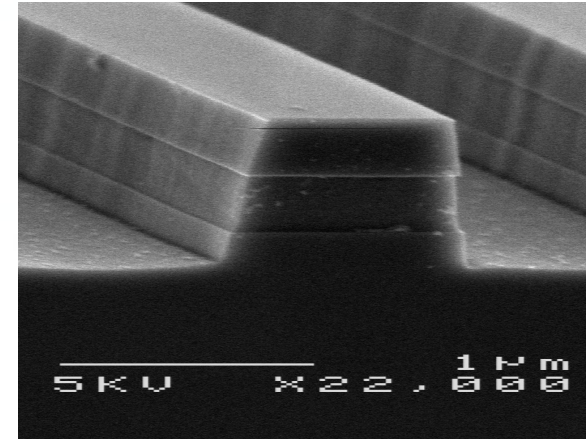


InP processing

- Epitaxial growth
- Unique Litho capabilities
- Lapping & Polishing

Products

- Discrete components (Lasers, Sensors, Amplifiers)
- Multi Project Wafer (MPW) runs of Photonic Integrated Products (PICS)



Conclusions

- Coordination function on investments, communication and organisation
- Open access policy, no IP restrictions
- Labs organized as user facility
- Expert functions strongly coupled to home institutes and research groups

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