

Research Accelerator Programme

“Automated Metrology: Unleashing the power of unprejudiced metrology in University-scale nanofabrication”

Preliminary programme

Where: Chalmers University of Technology, Gothenburg, Sweden

When: June 24, 25 and 26, 2025

Application Deadline: February 17th, 2025, 10AM CET



Summary

At Chalmers, we offer hands-on training on advanced automated metrology focusing on specific cases at a wafer scale. Our cleanroom provides a unique opportunity to access automated tools for image acquisition and data analysis which can be included in your process to improve the tracking of your process status over time and reducing the human factor.

Together, we will explore various real-life practical cases, which will guide your understanding of the capabilities of automated characterization.

Ultimately, we would like to create an awareness of how your processes and samples can profit from automated metrology.

INFRACHIP will support costs for travel, accommodation and access to infrastructure for up to 6 applicants. Applicants should be PhD students and junior researchers with a PhD completed in the last 2 years.

Description

At Chalmers a bit more than 7 years ago, we started realizing, that generating large datasets for trouble shooting our tools can be of high value. However, it is almost impossible to generate them unprejudiced and with manual tools. Humans are great and very efficient in universal pattern recognition and providing qualitative results. Unfortunately, it is very challenging to keep the quality

of the data produced by humans on a high level over time, as well as it is hard for us to provide good quantitative measurement results on repetitive tasks. Luckily, machines and computers are great complimentary resources. They work algorithmically, are not biased by their expectations, and can provide high quality data during the operations time.

When Chalmers cleanroom started these efforts on automatic metrology, an optical microscope with automated XYZ-stage and laser focusing was acquired. Very fast it proved its value for quality management of the EBL system and for 2D materials. Since then, it is always the ambition to include automation capabilities into metrology systems during the acquisition process. Currently, Chalmers cleanroom provides user access to automated:

- optical Microscope (Nikon L200ND), SEM (Raith CHIPSCANNER150Two-HS), optical profiler (Sensofar NEOx) and ellipsometer (J.A. Woolam RC2 ESM-300)

Therefore, let the repetitive work be done by a machine and focus on the design of your experiment, data analysis, and enjoy a cup of coffee!

Project Goal

With this course we would like to spread the word about how automated metrology can be used to improve process development and trouble shooting in university cleanrooms. Acquiring larger and more complete datasets with higher quality about samples fabricated in our facilities help us to understand our processes better and have been helping to optimize fabrication recipes, improving fabrication yield, and allow for resource optimisation. Our goal is to have an interactive workshop, discussing different approaches and mindsets for designing tests, develop recipes and analyse data. Further, we would like to provide hands on experience with our tools to learn as much as possible from each other.

Use cases

During the workshop we plan to visit at least 2 of our most advanced use cases. The first will be targeting process improvements for uniformity and reproducibility on wafer scale. We will look at Josephson Junction (JJ) fabrication for quantum computing devices and especially how the evaporation process is influencing the room temperature resistance uniformity of resulting JJs. We will correlate the resistance data with junction size data and investigate the implemented improvements on the design level. The second use case is targeting substrate quality investigation for photonic devices. We will investigate crack formation and defect formation in thick CVD grown stressed films and how to detect them. The gained information can be used to optimise pattern creation and chip placement to avoid fabrication in the areas of crack of high defect rates. By preselection of substrates the yield can be improved as well as expensive serial fabrication steps can be skipped for damaged devices.

We are looking very much forward to meet in June 2025, spending 3 days on how to reduce manual work and spending more time on drinking coffee.



Workshop plan

Day 1: Tuesday 24th June

9:00	Meeting at Chalmers MC2 Building
9:30	Introduction round
10:00	Workshop introduction and collecting wishes
	Short safety introduction
	Cleanroom tour including sub fab
12:00	Lunch
13:30	Intro Quantum Computing related fabrication – Techniques, Tools and Challenges
15:00	Coffee break
15:30	Electrical probing at room temperature - data acquisition and analysis
17:00	End of day 1

Day 2: Wednesday 25th June

9:00	Meeting at Chalmers MC2 Building
9:30	JJ dimension measurements and correlation to electrical data
12:00	Lunch
13:30	Effects of material deposition thickness - measurements and defect correlation
15:00	Coffee break
15:30	Optical imaging for defect correlation and summary of use case 1
17:00	End of day 2

Day 3: Thursday 26th June

9:00	Meeting at Chalmers MC2 Building
9:30	Full wafer imaging for film defect detection
11:30	Lunch
13:00	Developing a defect map-based fabrication scheme and summary of use case 2
14:30	Coffee break
15:00	Summary of the workshop and feedback
16:00	End of day 3

To apply, please fill the form on the dedicated RAP website page: <https://infrachip.eu/research-accelerator-programme>

In case of troubles, please contact us – contact@infrachip.fr