Silvan Schmid

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Languages: German (native), English (fluent), French and Danish (conversant)

Research Interests

In the Research Unit of Micro and Nanosensors, we study the dynamics, dissipation mechanisms, and noise limits of nanomechanical systems and use this understanding to develop ultrasensitive sensors. A central theme is minimizing energy dissipation to provide ultrahigh-Q resonators for quantum optomechanics and fundamental physics. Applications include nanomechanical photothermal spectroscopy and microscopy of single molecules and particles, NEMS-IR and NEMS-FTIR for picogram-level chemical analysis, vacuum pressure sensing, and mass spectrometry.

Positions

2016– **Full Professor (Univ.-Prof.)**, Institute of Sensor and Actuator Systems, TU Wien, Austria. Head of the Research Unit of Micro and Nanosensors.

2021– **Dean of Academic Affairs**, Faculty of Electrical Engineering and Information Technology, TU Wien.

2019– **Co-founder and Scientific Advisor**, Invisible-Light Labs GmbH, Vienna, Austria.

2014–2016 **Associate Professor**, DTU Nanotech, Technical University of Denmark. Subgroup leader in the Nanoprobes group (Prof. A. Boisen).

2011–2014 **Assistant Professor**, DTU Nanotech, Technical University of Denmark.

2009–2011 **Postdoc**, DTU Nanotech, Technical University of Denmark.

Education

2009 **Dr. sc. ETH Zurich**, with distinction (ETH Medal), Micro and Nanosystems Group, ETH Zurich, Switzerland.

2003 **Dipl. Ing. ETH**, Mechanical Engineering, ETH Zurich, Switzerland.

Research Grants

2026–2028 **R&D contract**, INFICON AG (PI).

2023–2027 **FWF WEAVE International Project**, Austrian Science Fund (PI), with the Spin Physics Group, ETH Zurich.

2023–2027 **Interdisciplinary Synergy Programme**, Novo Nordisk Foundation (Co-PI), with ETH Zurich and the Niels Bohr Institute.

2023–2025 **DARPA Optomechanical Thermal Imaging (OpTIm)** (Co-PI), with Yale University and Caltech.

2022–2024 **EIC Transition**, European Innovation Council (Co-PI), with Invisible-Light Labs GmbH.

2019–2021 **ERC Proof of Concept Grant**, European Research Council (PI).

2019–2020 **aws Preseed**, Austria Wirtschaftsservice (Co-PI), with Invisible-Light Labs GmbH.

2016–2021 **ERC Starting Grant**, European Research Council (PI).

2014–2016 **Discovery Project**, Australian Research Council (Co-PI).

2012–2016 **Young Investigator Programme**, Villum Foundation, Denmark (PI).

2006–2008 **PhD project funding**, Swiss National Science Foundation (Co-PI).

Publications and Patents

More than 130 peer-reviewed journal and proceedings articles; 1 book, 2 book chapters, 2 review articles; h-index 37, more than 5,500 citations (Google Scholar); 12 patents filed, 3 licensed.

Service to the Scientific Community

2023– **Associate Editor**, Scientific Reports (Nature Portfolio). 2021–2023: Microsystem Technologies (Springer).

2022– **Full member**, Wolfgang Pauli Institute Vienna.

2019– **Technical Program Committee**, IEEE MEMS and Transducers.

2026 **Mini-colloquium organizer** at ÖPG-CMD JOINT MEETING 2026, Graz, Austria.

2024 **Chair**, International Workshop on Nanomechanical Sensing (NMC 2024), Vienna.

2019 **Short Course Chair**, Transducers 2019 and EUROSENSORS XXXIII, Berlin.

External PhD examiner at EPFL, ETH Zurich, University of Copenhagen, Aalto University, TU Delft, Trinity College Dublin, University of Queensland, TU Graz, and University of Vienna.

Reviewer for Nature, Nature Nanotechnology, PNAS, Nano Letters, and others.

Selected Publications

1. Timarac-Popovic, J. *et al.* Picogram-level nanoplastic analysis with nanoelectromechanical system Fourier transform infrared spectroscopy: NEMS-FTIR. *ACS Nano* **20,** 11193–11208 (2026).
2. Kanellopulos, K. *et al.* Comparative analysis of nanomechanical resonators: sensitivity, response time, and practical considerations in photothermal sensing. *Microsystems & Nanoengineering* **11,** 28 (2025).
3. Martini, P. *et al.* Uncooled thermal infrared detection near the fundamental limit using a silicon nitride nanomechanical resonator with a broadband absorber. *Communications Physics* **8,** 166 (2025).
4. Schmerling, K., Bešić, H., Kugi, A., Schmid, S. & Deutschmann-Olek, A. Optimal sensing of momentum kicks with a feedback-controlled nanomechanical resonator. *Physical Review Applied* **23,** 054016 (2025).
5. Kanellopulos, K. *et al.* Stress-dependent optical extinction in low-pressure chemical vapor deposition silicon nitride measured by nanomechanical photothermal sensing. *Nano Letters* **24,** 11262–11268 (2024).
6. Bešić, H., Demir, A., Steurer, J., Luhmann, N. & Schmid, S. Schemes for tracking resonance frequency for micro- and nanomechanical resonators. *Physical Review Applied* **20,** 024023 (2023).
7. Kanellopulos, K., West, R. G. & Schmid, S. Nanomechanical photothermal near infrared spectromicroscopy of individual nanorods. *ACS Photonics* **10,** 3730–3739 (2023).
8. Kähler, H., Platz, D. & Schmid, S. Surface acoustic wave coupling between micromechanical resonators. *Communications Physics* **5,** 118 (2022).
9. Piller, M. *et al.* Thermal IR detection with nanoelectromechanical silicon nitride trampoline resonators. *IEEE Sensors Journal* **23,** 1066–1071 (2022).
10. Chien, M.-H., Steurer, J., Sadeghi, P., Cazier, N. & Schmid, S. Nanoelectromechanical position-sensitive detector with picometer resolution. *ACS Photonics* **7,** 2197–2203 (2020).
11. Luhmann, N. *et al.* Ultrathin 2 nm gold as impedance-matched absorber for infrared light. *Nature Communications* **11,** 2161 (2020).
12. Sadeghi, P., Demir, A., Villanueva, L. G., Kähler, H. & Schmid, S. Frequency fluctuations in nanomechanical silicon nitride string resonators. *Physical Review B* **102,** 214106 (2020).
13. Chien, M.-H., Brameshuber, M., Rossboth, B. K., Schütz, G. J. & Schmid, S. Single-molecule optical absorption imaging by nanomechanical photothermal sensing. *Proceedings of the National Academy of Sciences* **115,** 11150–11155 (2018).
14. Kurek, M. *et al.* Nanomechanical infrared spectroscopy with vibrating filters for pharmaceutical analysis. *Angewandte Chemie International Edition* **56,** 3906–3910 (2017).
15. Bagci, T. *et al.* Optical detection of radio waves through a nanomechanical transducer. *Nature* **507,** 81–85 (2014).
16. Schmid, S., Wu, K., Larsen, P. E., Rindzevicius, T. & Boisen, A. Low-power photothermal probing of single plasmonic nanostructures with nanomechanical string resonators. *Nano Letters* **14,** 2318–2321 (2014).
17. Villanueva, L. G. & Schmid, S. Evidence of surface loss as ubiquitous limiting damping mechanism in SiN micro- and nanomechanical resonators. *Physical Review Letters* **113,** 227201 (2014).
18. Larsen, T., Schmid, S., Villanueva, L. G. & Boisen, A. Photothermal analysis of individual nanoparticulate samples using micromechanical resonators. *ACS Nano* **7,** 6188–6193 (2013).
19. Schmid, S., Kurek, M., Adolphsen, J. Q. & Boisen, A. Real-time single airborne nanoparticle detection with nanomechanical resonant filter-fiber. *Scientific Reports* **3,** 1288 (2013).
20. Larsen, T. *et al.* Ultrasensitive string-based temperature sensors. *Applied Physics Letters* **98** (2011).
21. Schmid, S., Jensen, K. D., Nielsen, K. H. & Boisen, A. Damping mechanisms in high-Q micro and nanomechanical string resonators. *Physical Review B* **84,** 165307 (2011).
22. Schmid, S., Wendlandt, M., Junker, D. & Hierold, C. Nonconductive polymer microresonators actuated by the Kelvin polarization force. *Applied Physics Letters* **89** (2006).