

Biographical Sketch

Alexander Eichler

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A. PROFESSIONAL PREPARATION

ETH Zürich, CH	Spin Physics group	Postdoc, 2013-2018
ICN and ICFO, ES	Bachtold group	Postdoc, 2010-2013
University of Basel, CH	Schönenberger group	PhD., 2006-2009
University of Basel, CH	Physics Department	MSc, 2001-2006

B. APPOINTMENTS

Privatdozent at ETH Zürich, CH	2022-now
Senior Scientist (<i>permanent position</i>), ETH Zürich, CH	2019-now
Postdoctoral Researcher and Senior Researcher, ETH Zürich, CH	2013-2018
Postdoctoral Researcher, ICN and ICFO in Barcelona, ES	2010-2013

C. AWARDS AND HONORS

KITE Award (<i>shared</i>)	2022
Swiss Physical Society ABB Award (<i>shared</i>)	2012
Marie-Curie IEF Fellowship (<i>declined</i>)	2012
Marie-Curie IEF Fellowship	2010
SNSF prospective researcher fellowship	2009

D. TEACHING AND EDUCATION

1. Data Analysis in Physics (*initiator and lecturer*), Student Practical Labs (*lecturer, steering committee*), graduate classes in Parametric Phenomena (*initiator and lecturer*) and undergraduate classes in General Physics (*substitution lecturer*) at ETH (2013-2019)
2. Conferences and Seminars to expert audiences (total > 50)
3. Supervision of PhD students (15), Master students (13), Semester and project students (22)
4. Jury member on 11 PhD thesis committees

F. FUNDING

1. ETH Research Grant (2025-now), PI
2. SNSF Sinergia (2022-now), co-PI
3. SNSF Project (2021-now), PI
4. ETH Research Grant (2020-now), lead PI
5. SNSF Sinergia (2018-now), project partner and coordinator
6. ETH D-PHYS g-money (2016 and 2018), co-PI

E. SYNERGISTIC ACTIVITIES AND EXPERTISE

1. Initiator and organizer for the QSIT Workshop “Parametric Phenomena” (2017), the “Swiss NanoMRI meeting” (2017) and the “Swiss Nanomechanics Meeting” (2018) in Zürich, CH
2. Co-organizer for the conference “NanoMRI 7” held 2022 in Barcelona, ES
3. Co-organizer for the “Workshop on Parametric Phenomena” held 2023 in Zurich, CH
4. Local co-organizer for the “3rd SPM User Meeting” in Zürich, CH (2019)
5. Peer reviewer for journals (>70) and funding agencies (6)

List of Publications

Alexander Eichler

For a full list of my publications, see my [Publons](#) and [Google Scholar](#) IDs

50. *Slow and fast topological dynamical phase transitions in a Duffing resonator driven by two detuned tones*

L. Catalini, J. del Pino, S. S. Kumar, V. Dumont, G. Margiani, O. Zilberberg, and [A. Eichler](#)

Under review, arXiv:2408.15794

49. *Differential magnetic force microscopy with a switchable tip*

S. Misra, R. Peremadathil Pradeep, Y. Feng, U. Grob, A. Oana Mandru, C. L. Degen, H. J. Hug, and [A. Eichler](#)

Under review, arXiv:2412.04165

48. *Vibrational squeezing via spin inversion pulses*

M. D. Krass, N. Prumbaum, R. Pachlatko, C. L. Degen, and [A. Eichler](#)

*Appl. Phys. Lett. **125**, 164101 (2024)*

47. *Topological classification of driven-dissipative nonlinear systems*

G. Villa, J. del Pino, V. Dumont, G. Rastelli, M. Michałek, [A. Eichler](#), and O. Zilberberg

Under review, arXiv:2406.16591

46. *Enhancing membrane-based scanning force microscopy through an optical cavity*

T. Gisler, D. Hälg, V. Dumont, S. Misra, L. Catalini, E. C. Langman, A. Schliesser, C. L. Degen, and [A. Eichler](#)

*Phys. Rev. Applied **22**, 044001 (2024), Editor's Suggestion*

45. *The Stochastic Guitar*

A. Eggenberger and [A. Eichler](#)

Under review, arXiv:2404.04045

44. *Energy landscape and flow dynamics measurements of driven-dissipative systems*

V. Dumont, M. Bestler, L. Catalini, G. Margiani, O. Zilberberg, and [A. Eichler](#)

*Phys. Rev. Research **6**, 043012 (2024)*

43. *Near-resonant nuclear spin detection with high-frequency mechanical resonators*

D. A. Visani, L. Catalini, C. L. Degen, [A. Eichler](#), and J. del Pino

Under review, arXiv:2311.16273

42. *Proliferation of unstable states and their impact on stochastic out-of-equilibrium dynamics in two coupled Kerr parametric oscillators*

T. L. Heugel, R. Chitra, [A. Eichler](#), and O. Zilberberg

*Phys. Rev. E **109**, 064308 (2024)*

41. *Roadmap on nanoscale magnetic resonance imaging*

R. Budakian, A. Finkler, [A. Eichler et al.](#)

*Nanotechnology **35**, 412001 (2024)*

40. *A biased Ising model using two coupled Kerr parametric oscillators with external force*

P. Álvarez, D. Pittilini, F. Miserocchi, S. Raamamurthy, G. Margiani, O. Ameye, J. del Pino, O. Zilberberg, and [A. Eichler](#)

*Phys. Rev. Lett. **132**, 207401 (2024)*

39. *2024 Roadmap on Magnetic Microscopy Techniques and Their Applications in Materials Science*

Dennis Valbjørn Christensen *et al.*

J. Phys. Mater. **7** 032501 (2024)

38. *Nanoscale magnets embedded in a microstrip*

R. Pachlatko, N. Prumbaum, M. D. Krass, U. Grob, C. L. Degen, and A. Eichler

Nano Letters **24**, 2081 (2024)

37. *Deterministic and stochastic sampling of two coupled Kerr parametric oscillators*, G. Margiani, J. del Pino, T. L.

Heugel, N. E. Bousse, S. Guerrero, T. W. Kenny, O. Zilberberg, D. Sabonis, and A. Eichler,

Phys. Rev. Research **5**, L012029 (2023)

36. *The role of fluctuations in quantum and classical time crystals*

T. L. Heugel, A. Eichler, R. Chitra, and O. Zilberberg

SciPost Physics Core **6**, 53 (2023)

35. *Ultra-high-Q nanomechanical resonators for force sensing*, A. Eichler, *Materials for Quantum Technology* **2**,

043001 (2022)

34. *Force-detected magnetic resonance imaging of influenza viruses in the overcoupled sensor regime*

M. D. Krass, N. Prumbaum, R. Pachlatko, U. Grob, H. Takahashi, Y. Yamauchi, C. L. Degen, and A. Eichler

Phys. Rev. Applied **18**, 034052 (2022), **Editor's Suggestion**

33. *Nanomechanical Resonators: Toward Atomic Scale*

B. Xu, P. Zhang, J. Zhu, Z. Liu, A. Eichler, X.-Q. Zheng, J. Lee, A. Dash, S. More, S. Wu, Y. Wang, H. Jia, A. Naik, A. Bachtold, R. Yang, P. X.-L. Feng,.. and Z. Wang

Ac Nano **16**, 15545 (2022)

32. *Soft-clamped silicon nitride string resonators at millikelvin temperatures*

T. Gisler, M. Helal, D. Sabonis, U. Grob, M. Heritier, C. L. Degen, A. H. Ghadimi, and A. Eichler

Phys. Rev. Lett. **129**, 104301 (2022)

31. *Extracting the lifetime of a synthetic two-level system*

G. Margiani, S. Guerrero, T. L. Heugel, C. Marty, R. Pachlatko, T. Gisler, G. D. Vukasin, H. K. Kwon, J. M. L. Miller, N. E. Bousse, T. W. Kenny, O. Zilberberg, D. Sabonis, and A. Eichler

Applied Physics Letters **121**, 16 (2022)

30. *Strong parametric coupling between two ultra-coherent membrane modes*

D. Hälg, T. Gisler, E. C. Langman, S. Misra, O. Zilberberg, A. Schliesser, C. L. Degen, and A. Eichler

Phys. Rev. Lett. **128**, 094301 (2022)

29. *Ising machines with strong bilinear coupling*

T. L. Heugel, O. Zilberberg, C. Marty, R. Chitra, and A. Eichler

Phys. Rev. Research **4**, 013149 (2022)

28. *Spatial Correlation between Fluctuating and Static Fields over Metal and Dielectric Substrates*

M. Héritier, R. Pachlatko, Y. Tao, J. M. Abendroth, C. L. Degen, and A. Eichler

Phys. Rev. Lett. **127**, 216101 (2021)

27. *Membrane-based scanning force microscopy*

D. Hälg, T. Gisler, Y. Tsaturyan, L. Catalini, U. Grob, M. D. Krass, M. Héritier, H. Mattiat, A. K. Thamm, R. Schirhagl, E. C. Langman, A. Schliesser, C. L. Degen, and A. Eichler

Phys. Rev. Applied **15**, L021001 (2021), **Editor's Suggestion**

See APS Focus story: [Force Scanning on a Shaky Membrane](#),

ETH D-PHYS news article: [New microscopy concept enters into force](#)

and the AIP news article [MRI with a Trampoline](#)

26. *Spin detection via parametric frequency conversion in a membrane resonator*
J. Kosata, O. Zilberberg, C. L. Degen, R. Chitra, and A. Eichler
Phys. Rev. Applied **14**, 014042 (2020)

25. *Magnetic resonance force microscopy with a one-dimensional resolution of 0.9 nanometers*
U. Grob, M. D. Krass, M. Héritier, R. Pachlatko, J. Rhensius, J. Košata, B. A. Moores, H. Takahashi, A. Eichler, and C. L. Degen
Nano Letters **19**, 7935 (2019)

24. *Rapid flipping of parametric phase states*
M. Frimmer, T. L. Heugel, Ž. Nosan, F. Tebbenjohanns, D. Hälg, A. Akin, C. L. Degen, L. Novotny, R. Chitra, O. Zilberberg, and A. Eichler
Phys. Rev. Lett. **123**, 254102 (2019)

23. *Classical many-body time crystals*
T. L. Heugel, M. Oscity, A. Eichler, O. Zilberberg, and R. Chitra
Phys. Rev. Lett. **123**, 124301 (2019)
See news article: [Appreciating the classical elegance of time crystals](#)

22. *Gate-controlled phase switching in a parametron*
Ž. Nosan, P. Märki, N. Hauff, C. Knaut, and A. Eichler
Phys. Rev. E **99**, 062205 (2019)

21. *GHz nanomechanical resonator in an ultraclean suspended graphene p–n junction*
M. Jung, P. Rickhaus, S. Zihlmann, A. Eichler, P. Makk, and C. Schönenberger
Nanoscale **11**, 4355 (2019)

20. *A parametric symmetry breaking transducer*
A. Eichler, T. Heugel, A. Leuch, C. L. Degen, R. Chitra, and O. Zilberberg
Appl. Phys. Lett. **112**, 233105 (2018)

19. *Little is lost (perspective article)*
A. Eichler
Science **360**, 706 (2018)

18. *Nanoladder cantilevers made from diamond and silicon*
M. Héritier, A. Eichler, Y. Pan, U. Grob, I. Shorubalko, M. D. Krass, Y. Tao, and C. L. Degen
Nano Lett. **18**, 1814 (2018)

17. *Nanoscale imaging of current density with a single-spin magnetometer*
K. Chang, A. Eichler, J. Rhensius, L. Lorenzelli, and C. L. Degen
Nano Lett. **17**, 2367 (2017)

16. *Parametric symmetry breaking in a nonlinear resonator*
A. Leuch, L. Papariello, O. Zilberberg, C. L. Degen, R. Chitra, and A. Eichler
Phys. Rev. Lett. **117**, 214101 (2016)

15. *Ultrasensitive mechanical detection of magnetic moment using a commercial disk drive write head*
Y. Tao, A. Eichler, T. Holzherr, and C. L. Degen
Nature Communications **7**, 12714 (2016)

14. *Ultrasensitive hysteretic force sensing with parametric nonlinear oscillators*
L. Papariello, O. Zilberberg, A. Eichler, and R. Chitra
Phys. Rev. E **94**, 022201 (2016)
See ETHZ news article: [Measuring forces with oscillations](#)

13. Accelerated nanoscale magnetic resonance imaging through phase multiplexing

B. Moores, A. Eichler, Y. Tao, H. Takahashi, P. Navaretti, and C. Degen

Appl. Phys. Lett. **106**, 213101 (2015)

Cover story. See news article: [New Technique Speeds nanoMRI Imaging](#)

12. Nanotube mechanical resonators with quality factors reaching 5 million

J. Moser, A. Eichler, J. Güttinger, M. I. Dykman, and A. Bachtold

Nature Nanotechnology **9**, 1007 (2014)

11. Atomic monolayer deposition on the surface of nanotube mechanical resonators

A. Tavernarakis, J. Chaste, A. Eichler, G. Ceballos, M. C. Gordillo, J. Boronat, and A. Bachtold

Phys. Rev. Lett. **112**, 196103 (2014)

10. Symmetry breaking in a mechanical resonator made from a carbon nanotube

A. Eichler, J. Moser, M. I. Dykman, and A. Bachtold

Nature Communications **4**, 2843 (2013)

9. Ultrasensitive force detection with a nanotube mechanical resonator

J. Moser, J. Güttinger, A. Eichler, M. J. Esplandiu, D. E. Liu, M. I. Dykman, and A. Bachtold

Nature Nanotechnology **8**, 493 (2013)

8. Strong coupling between mechanical modes in a nanotube resonator

A. Eichler, M. del Álamo Ruiz, J. A. Plaza, and A. Bachtold

Phys. Rev. Lett. **109**, 025503 (2012)

7. A Nanomechanical Mass Sensor with Yoctogram Resolution

J. Chaste, A. Eichler, J. Moser, G. Ceballos, R. Rurrali, and A. Bachtold

Nature Nanotechnology **7**, 301 (2012)

6. Parametric Amplification and Self-Oscillation in a Nanotube Mechanical Resonator

A. Eichler, J. Chaste, J. Moser, and A. Bachtold

Nano Letters **11**, 2699 (2011)

5. Nonlinear Damping in Mechanical Resonators Made from Carbon Nanotubes and Graphene

A. Eichler, J. Moser, J. Chaste, M. Zdrojek, I. Wilson-Rae, and A. Bachtold

Nature Nanotechnology **6**, 399 (2011)

4. Gate-tunable Split-Kondo Effect in a Carbon Nanotube Quantum Dot

A. Eichler, M. Weiss, C. Schönenberger

Nanotechnology **22**, 265204 (2011)

3. Permalloy-based carbon nanotube spin-valve

H. Aurich, A. Baumgartner, F. Freitag, A. Eichler, J. Trbovic, and C. Schönenberger

Appl. Phys. Lett. **97**, 153116 (2010)

2. Tuning the Josephson current in carbon nanotubes with the Kondo effect

A. Eichler, R. Deblock, M. Weiss, C. Karrasch, V. Meden, C. Schönenberger, and H. Bouchiat

Phys. Rev. B **79**, 161407(R) (2009)

1. Even-odd Effect in Andreev Transport through a Carbon Nanotube Quantum Dot

A. Eichler, M. Weiss, S. Oberholzer, A. Levy-Yeyati, J. C. Cuevas, A. Martín-Rodero, and C. Schönenberger

Phys. Rev. Lett. **99**, 126602 (2007)