Univ. Prof. Dr. Markus Arndt

Personal Information

Birth	14.09.1965, Unkel/Rh. (Germany)
Nationality	Germany
Marital status	Married, 2 children
Address	University of Vienna, Faculty of Physics, Boltzmanngasse 5, A-1090 Vienna
WWW	www.quantumnano.at
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ORCID	0000-0002-9487-4985

Career development

since 2008	Full Professor of Quantum Nanophysics at University of Vienna,
2004 - 2008	Professor of Quantum Nanophysics at University of Vienna,
2002	Docent / Ao. Univ. Prof. at University of Vienna (Habilitation)
1999 - 2002	Universitätsassistent at University of Vienna, with Anton Zeilinger.
1997 - 1998	Postdoc at University of Innsbruck, with Anton Zeilinger.
1995 - 1997	Postdoc at Ecole Normale Supérieure, Paris with Jean Dalibard
1994 - 1995	Postdoc at MPQ, Garching, with A. R. Weis and T. W. Hänsch
1991 - 1994	PhD (LMU, Munich) at MPQ, Garching: with A. R. Weis and T. W. Hänsch
1990 - 1991	Diploma Work at LMU Munich, with Herbert Walther

Professional activities

07/2020 – 9/2026	Scientific Director & V-DSPL, Vienna Doctoral School in Physics
10/2018 – 9/2022	Vice Dean, Faculty of Physics, University of Vienna
01/2020-12/2022	Coordinator, EU FET Open *SuperMaMa*
Since 9/2016	Speaker, Erwin Schrödinger Center for Quantum Science & Technology ESQ Austria
03/2016 – 06/2020	Speaker, Vienna Doctoral School in Physics
03/2013 – 02/2016	Coordinator, EU FET Open *NANOQUESTFIT*
2013 - 2015	PI & Founding member, Research Platform *QuNaBioS*
10/2012 – 09/2014	Dean, Faculty of Physics, University of Vienna
01/2007 – 09/2012	Speaker, Quantum optics, Q-nanophysics and Q-information
2006 - 2013	Speaker, Vienna FWF Graduate Program Complex Quantum Systems
2007 - 2011	Coordinator, ESF network: Molecule Interferometry & Metrology *MIME*
2008 - 2013	Member, Steering Committee to the ESF Network *Casimir*

Awards, Distinctions & Research Prizes

2020	Schrödinger Prize of the Austrian Academy of Sciences, ÖAW, with L. Erdös
2019	Robert-Wichard-Pohl Prize, German Physical Society, DPG
2018	Fetzer Pioneer Award, Fetzer Foundation
2014	Outstanding Referee for the journals of the American Physical Society (APS)
2013	Prize for Natural and Technical Sciences, City of Vienna
2012	ERC Advanced Grant, European Research Council
2008	Wittgenstein Prize, Ministry for Science and Research, BMWF & FWF
2006	Science Communication Award (3rd), Austrian Science Fund, FWF
2001	START Prize, Ministry of Education, Science & Culture & FWF
2000	Fritz-Kohlrausch Prize, Austrian Physical Society, ÖPG
2000	Erich-Schmid-Prize, Austrian Acad. of Sciences, ÖAW, with G. Springholz

5 Distinguished fellowships and memberships

Since 2022	Member of the European Academy of Sciences and Arts
Since 2014	Corresponding Member, Austrian Academy of Sciences (ÖAW)
2008-2013	Member Young Curia , Austrian Academy of Sciences (ÖAW)
1996-1997	DFG research fellowship
1995-1996	Feodor-Lynen fellowship, Alexander von Humboldt foundation
1986-1991	Fellowship, Studienstiftung des deutschen Volkes

Research Interests

- **Universal matter-wave interferometry**
  with atoms, clusters, tailored molecules, biomolecules and nanoparticles.
- **Quantum physics at the interface to the classical world:**
  decoherence and interferometric tests of wave function collapse.
- **Quantum physics at the interface to chemistry:**
  Quantum nanorulers to measure electric, magnetic, optical and structural properties of molecules.
- **Quantum physics at the interface to biology:**
  Matter-wave experiments with vitamins, antibiotics and polypeptides.
- **Quantum physics at the interface to mass spectrometry technologies**
  Quantum nanowire detectors for biomolecular beams
- **Quantum physics at the interface to optomechanics:**
  Optical cooling of dielectric nanospheres in high-finesse microcavities as well as rotational cooling

A) Publications listed in the Science Citation Index

1. Klavs Hansen, Vitaly Kresin, Ragheed Alhyder, Mikhail Lemeshko, Michal Fárník, Juraj Fedor, Piero Ferrari, Laura X. Worutowicz, Rick J. Louwerse, Denis Kiawi, Laurens B. F. M. Waters, Sandra M. Lang, Joost M. Bakker, Bernd von Issendorff, Wei Kong, Jannik Mehmel, Rolf Schäfer, Sebastian Pedalino, Bruno E. Ramírez-Galindo, Richard Festl, Severin Sindelar, Stefan Gerlich, Markus Arndt, Scott G. Sayres & Lai-Sheng Wang
Reflections on future problems in cluster science
Eur. Phys. J. D 80, 50 (2026), DOI: 10.1140/epjd/s10053-026-01126-x

2. S. Troyer, F. Fechtel, L. Hummer, H. Rudolph, B. A. Stickler, U. Delić and M. Arndt
Quantum ground-state cooling of two librational modes of a nanorotor
Nature Physics, 22, 584–590 (2026), DOI:10.1038/s41567-026-03219-1

3. S. Pedalino, R. Ferstl, B. E. Ramírez-Galindo, S. Sindelar, S. Gerlich and M. Arndt
de Broglie and moiré metrology: From atoms to massive metal clusters
AVS Quantum Sci. 8, 013201, (2026), DOI: 10.1116/5.0301389
Scilight: 10.1063/10.0042205

4. S. Pedalino, B. E. Ramírez-Galindo, R. Ferstl, K. Hornberger, M. Arndt and S. Gerlich
Probing quantum mechanics with nanoparticle matter-wave interferometry
Nature 649, 866-870 (2026), DOI: 10.1038/s41586-025-09917-9
Nature Podcast: https://www.nature.com/articles/d41586-026-00227-2

5. O. Rybakova, J. Reisinger, P. Rieser, P. Geyer, S. Gerlich, M. Arndt, A. Kumar, D. Häussinger, M. Mayor and V. Köhler
Photocleavable Porphyrin Derivatives for Quantum Optics
Helv. Chim. Acta (2025), e202500022, DOI: 10.1002/hlca.202500022

6. Y. Hua, D. Häussinger, M. Mayor, V. Köhler, M. Strauss, M. F. X. Mauser, T. Kostersitz, P. Geyer, M. Arndt
Neutralization of an Oxytocin Derivative by 355 nm Photocleavage in High Vacuum
Helv. Chim. Acta (2025), DOI: 10.1002/hlca.202400167

7. L. Martinetz, B. A. Stickler, K. Simonović, R. Ferstl, C. Brand, M. Arndt, and K. Hornberger
Probing molecular photophysics in a matter-wave interferometer
Phys. Rev. Research 6, 043270 (2024), DOI: 10.1103/PhysRevResearch.6.043270

8. M. Strauß, R. Gourgues, M. F. X. Mauser, L. Kulman, M. Castaneda, A. Fognini, A. Shayeghi, P. Geyer, M. Arndt
Superconducting Nanowire Detection of Neutral Atoms and Molecules via Their Internal and Kinetic Energy in the eV Range
Adv. Phys. Res. (2024), DOI: 10.1002/apxr.202400133
Adv. Phys. Res. Inside Front Cover & Featured as a recommended article

9. K. Simonović, R. Ferstl, A. Di Silvestro, M. Mayor, L. Martinetz, K. Hornberger, B. A. Stickler, C. Brand and M. Arndt
Diffracting molecular matter-waves at deep-ultraviolet standing-light waves

Phys. Chem. Chem. Phys., (2024), DOI: 10.1039/D4CP03059A

10. P. Rieser, N. Rahaman, F. Donnerbauer, S. Putz, A. Shayeghi, S. Troyer, M. Arndt
An on-demand source of nanoparticles for optomechanics
Appl. Phys. Lett. 125, 094101 (2024), DOI: 10.1063/5.0221965

11. K. Simonović, R. Ferstl, A. Barlow, A. Shayeghi, C. Brand, M. Arndt
Diffraction of polar molecules at nanomasks with low charge density
Phys. Rev. Research 6, 033109 (2024), DOI: 10.1103/PhysRevResearch.6.033109

12. F. Suzuki, S. A. Shah, D. A. R. Dalvit, and M. Arndt
Requirements for probing chiral Casimir-Polder forces in a molecular Talbot-Lau interferometer
Phys. Rev. Research 6, 023145 (2024), DOI: 10.1103/PhysRevResearch.6.023145

13. M. Strauß, A. Shayeghi, M. Mauser, P. Geyer, T. Kostersitz, J. Salapa, O. Dobrovolskiy, S. Daly, J. Commandeur, Y. Hua, V. Köhler, M. Mayor, J. Benserhir, C. Bruschini, E. Charbon, M. Castaneda, M. Gevers, R. Gourgues, N. Kalhor, A. Fognini and M. Arndt
Highly sensitive single-molecule detection of macromolecule ion beams
Sci. Adv. 9, 48, (2023), DOI: 10.1126/sciadv.adj2801

14. C. Brand, C. Knobloch, K. Simonović, and M. Arndt
Multi-Watt cavity for 266nm light in vacuum
Phys. Scr. 98 085521 (2023), DOI: 10.1088/1402-4896/ace300

15. Y. Hua, M. Strauss, S. Fisher, M. F. X. Mauser, P. Manchet, M. Smacchia, P. Geyer, A. Shayeghi, M. Pfeffer, T. H. Eggenweiler, S. Daly, J. Commandeur, M. Mayor, M. Arndt, T. Šolomek, V. Köhler
Giving the green light to photochemical uncaging of large biomolecules in high vacuum
JACS Au (2023), DOI: 10.1021/jacsau.3c00351

16. V. M. Bevz, M. Yu. Mikhailov, B. Budinská, S. Lamb-Camarena, S. O. Shpilinska, A. V. Chumak, M. Urbánek, M. Arndt, W. Lang, and O. V. Dobrovolskiy
Vortex counting and velocimetry for slitted superconducting thin strips
Phys. Rev. Applied 19, 034098 (2023), DOI: 10.1103/PhysRevApplied.19.034098

17. R. Kaltenbaeck, M. Arndt, M. Aspelmeyer, P. F. Barker, A. Bassi, J. Bateman, A. Belenchia, J. Bergé. C. Braxmeier, S. Bose, B. Christophe, G.D. Cole, C. Curceanu, A. Datta, M. Debiossac, U. Delic, L. Diósi, A. A. Geraci, S. Gerlich, C. Guerlin, G. Hechenblaikner, A. Heidmann, S. Hermann, K. Hornberger, U. Johann, N. Kiesel, C. Lämmerzahl, T. W. LeBrun, G.J. Milburn, J. Millen, M. Mohageg, D.C. Moore, G.W. Morley, S. Nimmrichter, L. Novotny, D.K.L. Oi, M. Paternostro, C.J. Riedel, M. Rodrigues, L. Rondin, A. Roura, W.P. Schleich, T. Schuldt, B.A. Stickler, H. Ulbricht, C. Vogt, and L. Wörner
Research campaign: Macroscopic quantum resonators (MAQRO)
Quantum Sci. Technol. 8, 014006 (2023), DOI: 10.1088/2058-9565/aca3cd

18. Y.Y. Fein, S. Pedalino, A. Shayeghi, F. Kiałka, S. Gerlich, and M. Arndt
Nanoscale magnetism probed in a matter-wave interferometer
Phys. Rev. Lett. 129, 123001 (2022), DOI: 10.1103/PhysRevLett.129.123001
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19. S. Pedalino, T. de Sousa, Y.Y. Fein, S. Gerlich, and M. Arndt
Exploring metal nanoparticles for matter-wave interferometry
Phys. Rev. A 106, 023312 (2022), DOI: 10.1103/PhysRevA.106.023312

20. *A roadmap for universal high-mass matter-wave interferometry*
F. Kialka, Y. Y. Fein, S. Pedalino, S. Gerlich, and M. Arndt
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21. High finesse microcavities in the optical telecom O-band
J. Fait, S. Putz, G. Wachter, J. Schalko, U. Schmid, M. Arndt, and M. Trupke
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22. *Single-, double-, and triple-slit diffraction of molecular matter-waves*
C. Brand, S. Troyer, C. Knobloch, O. Cheshnovsky, and M. Arndt
Am. J. Phys. 89, 1132 (2021), DOI: 10.1119/5.0058805
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23. W. C.-W. Huang, H. Batelaan, M. Arndt
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24. C. Brand, M. R. A. Monazam, C. Mangler, Y. Lilach, O. Cheshnovsky, M. Arndt, J. Kotakoski
The morphology of doubly-clamped graphene nanoribbons
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25. C. Brand, F. Kialka, S. Troyer, C. Knobloch, K. Simonovic, B.A. Stickler, K. Hornberger, M. Arndt,
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Phys. Rev. Lett. (2020), DOI: 10.1103/PhysRevLett.125.033604
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26. Y.Y. Fein, A. Shayeghi, F. Kialka, P. Geyer, S. Gerlich, M. Arndt,
Quantum-assisted diamagnetic deflection of molecules
Phys. Chem. Chem. Phys. (2020), DOI: 10.1039/d0cp02211j
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27. J. Schätti, V. Köhler, M. Mayor, Y.Y. Fein, P. Geyer, L. Mairhofer, S. Gerlich, M. Arndt,
Matter-wave interference and deflection of tripeptides decorated wth fluorinated alkyl chains
J Mass Spectrom. (2020), DOI:10.1002/jms.4514

28. A. Shayeghi, P. Rieser, G. Richter, U. Sezer, J.H. Rodewald, P. Geyer, T.J. Martinez, M. Arndt,
Matter-wave interference of a native polypeptide
Nature Comm., 11, 144 (2020), DOI: 10.1038/s41467-020-15280-2

29. C. Brand, K. Simonovic, F. Kialka, S. Troyer, P., Geyer, M. Arndt,
A fiber-based beam profiler for high-power laser beams in confined spaces and ultra-high vacuum

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30. Y. Y. Fein, F. Kialka, P. Geyer, S. Gerlich, M. Arndt,
Coriolis compensation via gravity in a matter-wave interferometer
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31. Y. Y. Fein, A. Shayeghi, L. Mairhofer, F. Kialka, P. Rieser, P. Geyer, S. Gerlich, M. Arndt,
Quantum-Assisted Measurement of Atomic Diamagnetism
Phys. Review X 10, 011014(2020), DOI: 10.1103/PhysRevX.10.011014

32. Y. Y. Fein, P. Geyer, F. Kiałka, S. Gerlich, M. Arndt,
Improved accuracy fullerene polarizability measurements in a long-baseline matter-wave interferometer
Phys. Rev. Res. 1, 033158 (2019), DOI: 10.1103/PhysRevResearch.1.033158

33. Y. Y. Fein, P. Greyer, P. Zwick, F. Kiałka, S. Pedalino, M. Mayor, S. Gerlich and M. Arndt,
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34. J. Schätti, M. Kriegleder, M. Debiossac, M. Kerschbaum, P. Geyer, M. Mayor, M. Arndt, V. Köhler,
Neutralization of insulin by photocleavage under high vacuum,
Chem. Commun. (2019), DOI: 10.1039/c9cc05712a

35. G. Wachter, S. Kuhn, S. Minniberger, C. Salter, P. Asenbaum, J. Millen, M. Schneider, J. Schalko, U. Schmid, A. Felgner, D. Hüser, M. Arndt, M. Trupke,
Silicon microcavity arrays with open access and a finesse of half a million,
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36. C. Brand, M. Debiossac, T. Susi, F. Aguillon, J. Kotakoski, P. Roncin, M. Arndt
Coherent diffraction of hydrogen through the 246 pm lattice of graphene
New J. Phys. (2019), DOI: 10.1088/1367-2630/ab05ed

37. F. Kiałka, B. Stickler, K. Hornberger, Y.Y. Fein, P. Geyer, L. Mairhofer, S. Gerlich, M. Arndt,
Concepts for long-baseline high-mass matter-wave interferometry
Phys. Scr. 94 (2019), DOI: 10.1088/1402-4896/aaf243

38. J. Schätti, P. Rieser, U. Sezer, G. Richter, P. Geyer, G. G. Rondina, D. Häussinger, M. Mayor, A. Shayeghi, V. Köhler, M. Arndt
Pushing the mass limit for intact launch and photoionization of large neutral biopolymers
Commun. Chem. 1, 93 (2018), DOI: 10.1038/s42004-018-0095-y

39. B. A. Stickler, B. Papendell, S. Kuhn, B. Schrinski, J. Millen, M. Arndt, K. Hornberger
Probing macroscopic quantum superpositions with nanorotors
New J. Phys. 20, 122001 (2018), DOI: 10.1088/1367-2630/aaece4

40. C. Brand, B.A. Stickler, C. Knobloch, A. Shayeghi, K. Hornberger and M. Arndt
Conformer-selection by matter-wave interference

Phys. Rev. Lett. 121, 173002 (2018), DOI: 10.1103/PhysRevLett.121.173002

41. L. Mairhofer, S. Eibenberger, A. Shayeghi and M. Arndt
A quantum ruler for magnetic deflectometry
Entropy 20, 516 (2018), DOI: 10.3390/e20070516

42. M. Debiossac, J. Schätti, M. Kriegleder, P. Geyer, A. Shayeghi, M. Mayor, M. Arndt. andV. Köhler
Tailored photocleavable peptides: Fragmentation and neutralization pathways in high vacuum
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Isotope-selective high-order interferometry with large organic molecules in free fall
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44. S. Kuhn, G. Wachter, F. Wieser, J. Millen, M. Schneider, J. Schalko, U. Schmid,
M. Trupke and M. Arndt
Nanoparticle detection in an open-access silicon microcavity
Appl. Phys. Lett. 111, 253107 (2017), DOI: 10.1063/1.5008492
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45. S. Kuhn, B. A. Stickler, A. Kosloff, F. Patolsky, K. Hornberger, M. Arndt and J. Millen
Optically driven ultra-stable nanomechanical rotor
Nature Comm. 8 (1) (2017), DOI: 10.1038/s41467-017-01902-9
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46. J. P. Cotter, C. Brand, C. Knobloch, Y. Lilach, O. Cheshnovsky and M. Arndt
In search of multipath interference using large molecules
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47. L. Mairhofer, S. Eibenberger, J. P. Cotter, M. Romirer, A. Shayeghi and M. Arndt
Quantum-assisted metrology of neutral vitamins in the gas-phase
Angew. Chem. Int. Ed. 56, 6 (2017), DOI: 10.1002/ange.201704916
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Long-pulse laser launch and ionization of tailored large neutral silver nanoparticles with atomic mass assignment
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50. J. Rodewald, P. Haslinger, N. Dörre, B.A. Stickler, A. Shayeghi, K. Hornberger and M. Arndt
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60. M. Tomandl, T. Mieling, C. Losert-Valiente Kroon, M. Hopf and M. Arndt
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JOSA B 32, 114–120 (2015), DOI: 10.1364/JOSAB.32.000114

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Phys. Today 67, 30-36, (2014), DOI: 10.1063/PT.3.2381

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