Curriculum Vitae, Andrii Chumak

Name:	Andrii V. Chumak, Univ.-Prof. Dr. habil. 20.01.1982, male, married, two children
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CURRENT POSITION

University Professor (Full Professor) — *since* 2019
Head of the **Nanomagnetism and Magnonics Research Unit**
Faculty of Physics, University of Vienna, Austria

PREVIOUS POSITIONS

Assistant Professor of Experimental Physics and Leader of ERC Research Group — 2017–2019
Faculty of Physics, University of Kaiserslautern, Germany

Research Associate and *Privatdozent* of Experimental Physics (since 2016) — 2011–2016

Postdoctoral Researcher, Faculty of Physics, University of Kaiserslautern, Germany — 2009–2010

Doctoral Student, Faculty of Radiophysics, T. Shevchenko National University of Kyiv, Ukraine — 2005–2008

Visiting Researcher, Department of Physics, Colorado State University, USA — 2004

EDUCATION

Habilitation, Faculty of Physics, University of Kaiserslautern, Germany — 13.06.2016
Topic: “Magnonic crystals for magnon-based data processing”, group of Prof. B. Hillebrands

Ph.D., Faculty of Radiophysics, Taras Shevchenko National University of Kyiv, Ukraine — 28.04.2009
Topic: “Parametric restoration of elastically-scattered spin-wave signals”, advisor: Prof. G.A Melkov

Master’s and *Bachelor*’s in Radiophysics and Electronics, Diplomas with Honours — 1999–2005
Faculty of Radiophysics, Taras Shevchenko National University of Kyiv, Ukraine

MAIN SCIENTIFIC INTERESTS

RF applications and magnetization dynamics
Nano-scale exchange magnonics, nonuniform and nonstationary systems, magnonic crystals, 5G RF devices

Quantum magnonics
Single-magnon superconducting qubit physics, paramagnonics, cryogenic magnonics

Magnonics, inverse-design magnonics, unconventional computing
Inverse-design magnonics, spin-wave logic and non-Boolean circuits, stochastic computing

Nonlinear wave physics
Parametric instability, multi-magnon scattering, wavefront reversal, Bose-Einstein condensation

Spin-orbit spintronics and magnon spintronics
Spin pumping, spin-transfer torque (STT), spin Hall effect (SHE), spin Seebeck effect (SSE)

PUBLICATIONS AND PRESENTATIONS

3 book chapters and 12 invited reviews

119 peer-reviewed articles, 1 patent, 12k citations (>1.6k in 2023), *h*-index = 50 (Scopus)

137 contributions to conferences and seminars (incl. 69 invited talks and 28 seminars)

SUPERVISING OF GRADUATE STUDENTS AND POSTDOCTORAL FELLOWS

2016 – 2 habilitations and/or support to professorship (Qi Wang and Oleksandr Dobrovolskiy) and 2 ongoing (Sebastian Knauer and Khrystyna Levchenko)

5 PostDocs (Thomas Brächer, Khrystyna Levchenko, Michael Kerber, Qi Wang) including one MSCA Fellow (Sebastian Knauer), TU Kaiserslautern and University of Vienna

9 PhD students including 5 ongoing, TU Kaiserslautern and University of Vienna, 9 Master's and 9 Bachelor's students including ongoing

THIRD-PARTY FUNDS AND RELATED PROJECTS

Throughout my academic career at the University of Kaiserslautern and the University of Vienna, I have served as PI for 14 European and national third-party funded projects, amassing a total funding of more than €5.5 million. The highlights are the ERC Starting Grant *MagnonCircuits* and the ERC Proof of Concept Grant *5G-Spin*.

MOST SIGNIFICANT SCIENTIFIC RESULTS

Inverse-design magnonics 2021

Inverse-design magnonics [Nature Comm. 2021] allows to specify any functionality first, and a feedback-based computational algorithm is used to obtain the device design. we have recently achieved the experimental realisation of inverse design without the use of numerical simulations [Nature Electr. 2025].

The realization of nano-scale magnon directional coupler 2018-2020

The simulated [Science Adv. 2018] and realized experimentally [Nature Electr. 2020] nano-scale spin-wave directional coupler is a universal device for binary logic, rf applications and unconventional computing. It is the key building block of the half-adder – the first integrated magnonic circuit.

The formation of Bose-Einstein Condensation of magnons by rapid cooling 2020

We proposed and experimentally realized [Nature Nanotech. 2020] a conceptually new method of the formation of BEC of the quasiparticles. It is based on the rapid decrease in the phonons' temperature of a system and does not use any coherent source like in the previous studies.

The investigation of spin waves in sub-100 nm structures 2019-2020

We reported [PRL 2019] on the first fabrication and experimental characterization of spin waves in the insulating magnon waveguides with the lateral sizes down to 50 nm. The phenomenon of "exchange unpinning" was discovered. Propagating spin-wave packets in such nano-waveguides were investigated [Nano Lett. 2020] and proven the feasibility of magnonics on the CMOS scale.

The development of magnon transistor 2014

The proof-of-concept magnon transistor was realized [Nature Commun. 2014] and opened a way for all-magnon technology in which data is carried and processed by magnons rather than by electrons. Nowadays, magnon computing is a broad research direction [JAP Tutorial 2020].

The usage of spin-orbit torque in magnonics (magnon spintronics) *since* 2011

It was shown in a set of >10 papers that the magnons, independently of their nature, coherency and properties, can be efficiently detected via SP/ISHE [APL 2021] and excited via SHE/STT [PRL 2021].

A set of investigations on magnonic crystals 2008-2017

In a set of around 20 papers, different types of magnonic crystals were proposed, investigated experimentally, and utilized for data processing [JPD 2017]. In particular, a dynamic [Nature Comm. 2010] and an optically-reconfigurable [Nature Phys. 2015] magnonic crystals were developed.

FUNCTIONS IN RESEARCH SOCIETIES

Head of the Condensed Matter Section of the Austrian Physical Sosciety (ÖPG)	*since* 2025
Chair of the WPI "*Inverse-design magnonics"* Workshop, Vienna, February 18-20, 2024	2024
Member of International Advisory Committee of JEMS	*since* 2020
Member of Faculty Conference and Vienna Doctoral School, Faculty of Physics, Uni. Vienna	*since* 2020
Full Member of the Wolfgang Pauli Institute (WPI), Vienna, Austria	*since* 2020
Member IEEE Magnetics Society Technical (since 2016) and Education Committee (since 2020)	*since* 2016
Co-Chair of the 3rd International School on Magnonics, Sept. 16-21, 2018, Kyiv, Ukraine	2018
Chair of the Nano-Magnonics 2018 Workshop, Diemerstein, February 19-21, 2018	2018
Chair of WE-Heraeus-Seminar and Guest Editor of JPD, January 6-8, 2016, Bad Honnef, Germany	2016
Member of the Editorial Review Board of the IEEE Magnetics Letters	2014 – 2016
Publication Chair of the ICMM 2012 and Guest Editor of the IEEE Trans. on Magnetics	2012
Program Committee Member: LT30, ICM 2024, Magnonics 2023, Intermag 2023, JEMS 2022, Intermag 2021 (online), MAINZ Summer School 2018, ICM 2018, Magnonics 2017, MAINZ Summer School 2017, Intermag 2017, Intermag 2014, Intermag 2012	*since* 2012
Memberships: IEEE MagSoc (*since* 2011), DPG (*since* 2011), Senior Member of IEEE MagSoc. (*since* 2016), ÖPG (*since* 2019), UPV (*since* 2019), EMA (*since* 2020)	*since* 2011

PRIZES AND AWARDS

ERC Proof of Concept Grant 101082020 *5G-Spin*	2022
ERC Starting Grant 678309 *MagnonCircuits*	2015
Scholarship for PhD studies, Taras Shevchenko National University of Kyiv, Ukraine	2005 – 2008
Award from the National Academy of Sciences of Ukraine	2004

10 SELECTED PUBLICATIONS

1. N. Zenbaa, C. Abert, F. Majcen, M. Kerber, R. O. Serha, S. Knauer, Q. Wang, T. Schrefl, D. Suess, **A. V. Chumak**, *A universal inverse-design magnonic device*, Nature Electr. (2025), DOI: 10.1038/s41928-024-01333-7
2. Q. Wang, R. Verba, K. Davidkova, B. Heinz, S. Tian, Y. Rao, M.X. Guo, C. Dubs, P. Pirro, **A. V. Chumak**, *All-magnonic repeater based on bistability*, Nature Comm. **15**, 7577 (2024), DOI: 10.1038/s41467-024-52084-0
3. R. O. Serha, … , **A. V. Chumak**, *Magnetic anisotropy and GGG substrate stray field in YIG films down to mK temperatures*, npj Spintronics **2**, 29 (2024), DOI: 10.1038/s44306-024-00030-7
4. Q. Wang, **A. V. Chumak** and P. Pirro, *Inverse-design magnonic devices*, Nature Commun. **12**, 2636 (2021), DOI: 10.1038/s41467-021-22897-4
5. Q. Wang, M. Kewenig, M. Schneider, R. Verba, F. Kohl, B. Heinz, M. Geilen, M. Mohseni, B. Lägel, F. Ciubotaru, C. Adelmann, C. Dubs, S. D. Cotofana, O. V. Dobrovolskiy, T. Brächer, P. Pirro, and **A. V. Chumak**, *A magnonic directional coupler for integrated magnonic half-adders*, Nature Electronics **3**, 765 (2020), DOI: 10.1038/s41928-020-00485-6
6. M. Schneider, T. Brächer, D. Breitbach, V. Lauer, P. Pirro, D.A. Bozhko, H. Yu. Musiienko-Shmarova, B. Heinz, Q. Wang, T. Meyer, F. Heussner, S. Keller, E.Th. Papaioannou, B. Lägel, T. Löber, C. Dubs, A. N. Slavin, V. S. Tiberkevich, A. A. Serga, B. Hillebrands, and **A. V. Chumak**, *Bose–Einstein condensation of quasiparticles by rapid cooling*, Nature Nanonotech. **15**, 457 (2020), DOI: 10.1038/s41565-020-0671-z
7. Q. Wang, B. Heinz, R. Verba, M. Kewenig, P. Pirro, M. Schneider, T. Meyer, B. Lägel, C. Dubs, T. Brächer, and **A. V. Chumak**, *Spin pinning and spin-wave dispersion in nanoscopic ferromagnetic waveguides*, Phys. Rev. Lett. **122**, 247202 (2019), DOI: 10.1103/PhysRevLett.122
8. **A. V. Chumak**, A. A. Serga, and B. Hillebrands, *Magnonic crystals for data processing (invited review)*, J. Phys. D: Appl. Phys. **50**, 244001 (2017), DOI: 10.1088/1361-6463/aa6a65
9. **A. V. Chumak**, V. I. Vasyuchka, A. A. Serga, and B. Hillebrands, *Magnon spintronics*, Nature Phys. **11**, 453 (2015), DOI: 10.1038/nphys3347
10. **A. V. Chumak**, A. A. Serga, and B. Hillebrands, *Magnon transistor for all-magnon data processing*, Nature Commun. **10**, 1038 (2014), DOI: 10.1038/ncomms5700