

Curriculum Vitae, Andrii Chumak

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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 Group**
Faculty of Physics, University of Vienna, Austria

PREVIOUS POSITIONS

Junior 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
AG Magnetismus, Faculty of Physics, University of Kaiserslautern, Germany

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

Doctoral Student 2005–2008
Faculty of Radiophysics, Taras Shevchenko National University of Kyiv, Ukraine

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

EDUCATION

Habilitation, Faculty of Physics, University of Kaiserslautern, Germany 13.06.2016
Topic: “Magnonic crystals for magnon-based data processing”, mentor: Prof. Dr. 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”, super. Prof. G.A Melkov

Masters in Radiophysics and Electronics, Master Diploma w. Honours (20.06.2005) 2003–2005
Faculty of Radiophysics, Taras Shevchenko National University of Kyiv, Ukraine

Bachelor's in applied physics, Bachelor Diploma with Honours (23.06.2003) 1999–2003
Faculty of Radiophysics, Taras Shevchenko National University of Kyiv, Ukraine

MAIN SCIENTIFIC INTERESTS

Magnonics, Magnetization Dynamics and RF applications

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

Quantum magnonics

Cryogenic magnonics, magnon fluxonics, single-magnon physics

Unconventional computing and inverse-design machine learning magnonics

Inverse-design magnonics, spin-wave logic, Boolean 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 11 invited reviews

108 peer-reviewed articles, 9948 citations in Scopus (1569 in 2022), *h*-index = 48

125 contributions to conferences and seminars (incl. 57 invited talks and 28 seminars)

MOST SIGNIFICANT SCIENTIFIC RESULTS

Inverse-design magnonics

2021

Inverse-design magnonics [[Nat. Comm. 2021](#)] allows to specify any functionality first, and a feedback-based computational algorithm is used to obtain the device design.

The realization of nano-scale magnon directional coupler

2018-2020

The simulated [[Sci. Adv. 2018](#)] and realized experimentally [[Nat. 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 [[Nat. 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 [[Nat. 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 and amplified or excited via SHE/STT.

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 [[Nat. Comm. 2010](#)] and an optically-reconfigurable [[Nat. Phys. 2015](#)] magnonic crystals were developed.

CURRENT PROJECTS

FWF-WEAVE project 66155 *Paramagnonics*

01/2024 – 12/2026

Propagating Low-Energy 4f Paramagnons, 295 k€

ERC Proof of Concept Grant 101082020 *5G-Spin*

09/2022 – 02/2024

Nanoscale spin-wave RF filters and multiplexers for 5G communication systems, 150 k€

FWF-ANR project I 4917-N *MagFunc*

10/2020 – 09/2024

Non-reciprocal 3D architectures for magnonic functionalities, 405 k€

FUNCTIONS IN RESEARCH SOCIETIES

Member of International Advisory Committee of JEMS	since 2020
Full Member of the Wolfgang Pauli Institute (WPI), Austria	since 2020
Member IEEE Magnetics Society Technical 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
Guest Editor of the Journal of Physics D (WEH Seminar special issue)	2016 – 2017
Chair of WE-Heraeus-Seminar, 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, August 26-29, 2012, Kaiserslautern, Germany	2012
Guest Editor and Editor in Chief of the IEEE Transactions on Magnetics	2012
Program Committee Member: Intermag 2021 (online), MAINZ Summer School 2018 (Beijing), ICM 2018 (San Francisco), Magnonics 2017 (Oxford), MAINZ Summer, School 2017 (Beijing), Intermag 2017 (Dublin), Intermag 2014 (Dresden), Intermag 2012 (Vancouver)	since 2012
Memberships: IEEE MagSoc (since 2011), DPG (since 2011), Senior Member of IEEE Mag. Soc. (since 2016), ÖPG (since 2019), UPV (since 2019), EMA (since 2020)	since 2012

PRIZES AND AWARDS

ERC Starting Grant 678309 <i>MagnonCircuits</i>	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. Q. Wang, R. Verba, B. Heinz, M. Schneider, O. Wojewoda, K. Davidková, K. Levchenko, C. Dubs, N. J. Mauser, M. Urbánek, P. Pirro, **A. V. Chumak**, *Deeply nonlinear excitation of self-normalized short spin waves*, Sci. Adv. 9, eadg4609 (2023), DOI: [10.1126/sciadv.adg4609](https://doi.org/10.1126/sciadv.adg4609)
2. Q. Wang, **A. V. Chumak** and P. Pirro, *Inverse-design magnonic devices*, Nat. Commun. **12**, 2636 (2021), DOI: [10.1038/s41467-021-22897-4](https://doi.org/10.1038/s41467-021-22897-4)
3. Q. Wang, M. Kewenig, M. Schneider, R. Verba, F. Kohl, B. Heinz, M. Geilen, M. Mohseni, B. Lägel, F. Ciubotaru, C. Adelman, C. Dubs, S. D. Cotozana, O. V. Dobrovolskiy, T. Brächer, P. Pirro, and **A. V. Chumak**, *A magnonic directional coupler for integrated magnonic half-adders*, Nat. Electronics **3**, 765 (2020), DOI: [10.1038/s41928-020-00485-6](https://doi.org/10.1038/s41928-020-00485-6)
4. 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*, Nat. Nanotech. **15**, 457 (2020), DOI: [10.1038/s41565-020-0671-z](https://doi.org/10.1038/s41565-020-0671-z)
5. 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](https://doi.org/10.1103/PhysRevLett.122)
6. Q. Wang, P. Pirro, R. Verba, A. Slavin, B. Hillebrands, and **A. V. Chumak**, *Reconfigurable nano-scale spin-wave directional coupler*, Sci. Adv. **4**, e1701517 (2018), DOI: [10.1126/sciadv.1701517](https://doi.org/10.1126/sciadv.1701517)
7. **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](https://doi.org/10.1088/1361-6463/aa6a65)
8. **A. V. Chumak**, V. I. Vasyuchka, A. A. Serga, and B. Hillebrands, *Magnon spintronics*, Nature Phys. **11**, 453 (2015), DOI: [10.1038/nphys3347](https://doi.org/10.1038/nphys3347)
9. **A. V. Chumak**, A. A. Serga, and B. Hillebrands, *Magnon transistor for all-magnon data processing*, Nat. Commun. **10**, 1038 (2014), DOI: [10.1038/ncomms5700](https://doi.org/10.1038/ncomms5700)
10. A. A. Serga, **A. V. Chumak**, and B. Hillebrands, *YIG magnonics*, J. Phys. D: Appl. Phys. **43**, 264002 (2010), DOI: [10.1088/0022-3727/43/26/264002](https://doi.org/10.1088/0022-3727/43/26/264002)