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 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. 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 with 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
Single-magnon superconducting qubit physics, paramagnonics, cryogenic magnonics, magnon fluxonics

Unconventional computing and inverse-design machine learning magnoncis
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 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 [APL 2021] and amplified or 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 [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 4*f* 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), 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: ICM 2024, Intermag 2023, 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 Mag. Soc. (*since* 2016), ÖPG (*since* 2019), UPV (*since* 2019), EMA (*since* 2020)	*since* 2012

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. Q. Wang, R. Verba, B. Heinz, M. Schneider, O. Wojewoda, K. Davídková, 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
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
3. 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*, Nat. Electronics **3**, 765 (2020), DOI: 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. Nanonotech. **15**, 457 (2020), DOI: 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
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
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
8. **A. V. Chumak**, V. I. Vasyuchka, A. A. Serga, and B. Hillebrands, *Magnon spintronics*, Nature Phys. **11**, 453 (2015), DOI: 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
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