MA 52: Poster Magnetism III

Time: Thursday 15:00–17:00 Location: P4

MA 52.1 Thu 15:00 P4

Coupling between spin waves and excitons in CrSBr bilayers — •Luis Rolf Gieselmann, Thorsten Deilmann, and Michael Rohlfing — Institute of Solid State Theory, University of Münster, Germany

CrSBr is a layered van der Waals semiconductor characterized by its peculiar magnetic structure, possessing ferromagnetic ordering within and antiferromagnetic ordering between its layers.

The antiparallel alignment of spins in neighboring layers directly affects the excitonic properties of the material, as interlayer transitions of electrons and holes are thus optically forbidden in the magnetic ground state. External manipulation of the spins, however, produces partially parallel alignments between layers and thus enables excitations of interlayer excitons.

Such excitonic effects have previously been studied for canting by an external magnetic field. In our work, we have considered an alternative, namely canting of the spins induced by spin waves within CrSBr bilayers. The spin wave behavior of the material is studied using coherent states and then employed in a simple model Hamiltonian to calculate the change of excitonic energies.

MA 52.2 Thu 15:00 P4

Holstein-Primakoff Expansions and the Goldstone Theorem for Ferromagnetic Spin Chains — •Hendrik Wächter, Fred Hucht, and Jürgen König — University of Duisburg-Essen, Faculty of Physics, Duisburg, Germany

A common approach to investigate collective magnetic excitations is to represent spins as bosons. A popular representation that achieves this is the Holstein-Primakoff transformation, which comes at the cost of introducing square roots containing the occupation number operator to the spin ladder operators. For many applications, it is preferable to expand these square roots in power series. Typically, this is done by a Taylor series expansion in powers of $1/S$, sacrificing essential virtues of the Holstein-Primakoff transformation by coupling to an unphysical Hilbert space. We consider Newton series expansions as an alternative [1]. Ferromagnetic spin chains are used to compare the efficacy of both expansions, focusing on ground-state and low-energy excitation properties, notably including Goldstone modes. Matrix product states and the density-matrix renormalization group method are used to obtain highly accurate numerical results. We find that the Newton series expansion up to a finite order respects the existence of gapless spin excitations within the relevant Hilbert space.

[1] J. König and A. Hucht, SciPost Phys. **10**, 007 (2021)

MA 52.3 Thu 15:00 P4

Local Spin Seebeck Effect in Hematite — •Florian Kraft[1], Maximilian Thiel[1], Katharina Lasinger[1,2], Matthias R. Schweizer[1], and Mathias Weiler[1] — [1]Fachbereich Physik and Landesforschungszentrum OPTIMAS, RPTU Kaiserslautern-Landau, Germany — [2]Clarendon Laboratory, Department of Physics, University of Oxford, United Kingdom

Antiferromagnets such as hematite (α-Fe_2O_3) are key candidates for spintronic and magnonic devices due to their ultra-low magnetic damping and vanishing stray fields. However, the inherent compensation of magnetic moments makes probing the magnetic order challenging.

We employ the Local Spin Seebeck Effect (LSSE), generated by focused laser heating of an α-Fe_2O_3/Pt bilayer, to spatially resolve thermal spin currents. Our measurements are performed at room temperature, where hematite orders in a weak ferromagnetic state, characterized by an intrinsic net magnetization ($\mathbf{m}$). In our r-cut single crystal, the crystallographic c-axis is obliquely aligned relative to the surface plane, thus enabling us to vary the in-plane and oblique components of $\mathbf{m}$ and the Néel vector $\mathbf{n}$ by rotating the external magnetic field.

The local heat-to-spin conversion mechanism is analyzed through the field and field-angle dependence of the LSSE signal. We place particular emphasis on alignments close to the in-plane projection of the c-axis, as this direction maximizes the competition between the magnetic field and intrinsic anisotropies. Resolving the contributions of the in-plane and oblique components of $\mathbf{m}$ and $\mathbf{n}$ is critical for understanding magnon transport in complex antiferromagnetic systems.

MA 52.4 Thu 15:00 P4

Entanglement and Dissipation in Quantum Spin Systems — •Jakob Wagner, Daniel K. J. Boness, and Wolfgang Belzig — Department of Physics, University of Konstanz, D-78457 Konstanz, Germany

Squeezing in quantum systems allows the reduction of quantum fluctuations in one observable of interest at the cost of enhanced uncertainty in its conjugate. Spin systems common in magnonics naturally exhibit squeezing [1, 2]. Generally, dissipation changes the amount of squeezing, possibly also amplifying it [3, 4]. Here, we relate the effects of dissipation in spin systems to linearized bosonic systems. We extend previous considerations by assuming a general linear system-bath coupling. Associating the position coordinate of the bosonic system with spin fluctuations in one direction, as well as the momentum coordinate with the orthogonal direction we demonstrate the equivalence of the Landau-Lifschitz-Gilbert equation to an unconventionally damped harmonic oscillator. We demonstrate several coupling dependent effects like control of the squeezing direction and modified entanglement properties. Our results thus give new controls over decoherence in magnonic systems via engineered dissipation.

[1] A. Kamra et al, Phys. Rev. B 100, 174407 (2019)
[2] D. Wuhrer et al, Appl. Phys. Lett. 125, 022404 (2024)
[3] G. Rastelli, New. J. Phys. 18, 053033 (2016)
[4] H. Y. Yuan et al, Phys. Rev. B 106, 224422 (2022)

MA 52.5 Thu 15:00 P4

Silicon ion implantation of YIG thin films for magnonics — •Richa Bhardwaj[1], Jannis Bensmann[1], Robert Schmidt[1], Kirill O. Nikolaev[2], Dimitri Raskhodchikov[1], Shraddha Choudhary[1], Shabnam Taheriniya[3,4], Sven Niehues[1], Akhil Varri[1,3], Ahmad El Kadri[1], Johannes Kern[1], Wolfram H. P. Pernice[1,3,4], Sergej O. Demokritov[2], Vladislav E. Demidov[2], Steffen Michaelis de Vasconcellos[1], and Rudolf Bratschitsch[1] — [1]Institute of Physics and Center for Nanotechnology(CeNTech), UniversityofMünster — [2]InstituteofAp- plied Physics, University of Münster — [3]Center for Soft Nanoscience, University of Münster — [4]Kirchhoff-Institute for Physics, Heidelberg University

Magnons hold the promise for novel computing architectures due to their low power consumption. Recently, magnonic YG waveguides have been demonstrated using a maskless silicon ion-implantation technique [1]. Here, we examine how silicon ion implantation modifies the structural, optical, and magneto-optical properties of YIG thin films. Our findings establish design guidelines for YIG improved spin-wave manipulation for magnonic integrated circuits. Reference: [1] J. Bensmann, et al., Nat. Mater. 24, 1920-1926 (2025).

MA 52.6 Thu 15:00 P4

Linear Spin Wave Theory for Resonant Inelastic X-ray Scattering — •Paul Hille and Maurits W. Haverkort — Institute for Theoretical Physics, Heidelberg University, 69120 Heidelberg

Magnon excitations provide a key window into the collective magnetic behavior of correlated materials. While inelastic neutron scattering (INS) has long been the standard technique to map magnon dispersion relations and intensities, in recent years, resonant inelastic X-ray scattering (RIXS) has grown into a complementary technique to measure dispersing magnetic excitations. Within the RIXS process one can not only excite single magnons but also multiple magnetic excitations with a single photon.

The central goal of this work is to extend existing linear spin wave theory (LSWT) routines for INS to handle multi-magnon excitations characteristic of RIXS spectra. This is combined with an effective RIXS scattering operator incorporating the resonant energy and light polarisation dependence. We obtain a general and extensible computational framework that enables RIXS modeling for realistic magnetic materials within LSWT. Furthermore, quantitative comparison with experimental RIXS data enables assessment of the validity of treating magnons as non-interacting quasiparticles.

MA 52.7 Thu 15:00 P4

Electric Control of Magnon Phase via the Aharonov–Casher Effect — •Gabriel Schwöbel[1], Rostyslav O. Serha[2], Matthias R. Schweitzer[1], Vitaliy I. Vasyuchka[1], Mathias Weiler[1], Burkard Hillebrands[1], and Aleksander A. Serga[1]

— [1]Fachbereich Physik and Landesforschungszentrum OPTIMAS, RPTU Kaiserslautern-Landau, Kaiserslautern, Germany — [2]Faculty of Physics, University of Vienna, Vienna, Austria

A promising approach toward nonreciprocal magnon phase manipulation is offered by the Aharonov–Casher effect—a mechanism whereby particles or quasiparticles with a magnetic moment acquire an additional phase when traveling through an electric field. While this effect has been theoretically predicted for magnons, direct experimental confirmation is still lacking. Additionally, electric fields also influence magnetic systems through the magnetoelectric effect by modifying the magnetization.

Our experiments demonstrate that the Aharonov–Casher effect and magnetoelectric contributions can be independently quantified and unambiguously distinguished. By applying an in-plane electric field to a perpendicularly magnetized YIG film, we achieve controlled manipulation of the phase of the forward-volume magnetostatic spin waves. The resulting phase shifts depend on both the propagation direction and the polarity of the applied electric field, demonstrating electric-field tunability of magnon transport and offering a pathway toward nonreciprocal phase control in magnonic systems.

MA 52.8 Thu 15:00 P4

Femtosecond noise correlation spectroscopy of magnon fluctuations in bismuth doped yttrium iron garnet — •C. Runge[1], F. S. Herbst[1], M. A. Weiss[1], N. Beaulieu[2], J. B. Youssef[2], A. Leitenstorfer[1], M. Lammel[1], R. Schlitz[1], and S. T. B. Goennenwein[1] — [1]Department of Physics, University of Konstanz, Germany — [2]LabSTICC, CNRS, Université de Bretagne Occidentale, France

Magnetic systems exhibit a rich variety of dynamic phenomena on ultrafast timescales, which are of both fundamental and technological interest. For example, magnons, the quanta of spin waves, are discussed as promising candidates for information carriers due to their ability to propagate without charge transport. Femtosecond noise correlation spectroscopy (FemNoC) has been established [1] as a time-resolved optical technique that directly probes the local magnetization correlation function of a spin system. Thus, FemNoC is sensitive to incoherent magnetization dynamics like thermal magnons or random telegraph switching in the anisotropy landscape and allows to distinguish them by their respective correlation characteristics [1]. Here, we apply FemNoC to bismuth doped yttrium iron garnet. We investigate the magnon population of the sample both in thermal equilibrium and excited by ferromagnetic resonance. Introducing a quantitative model we can fit both regimes and determine the number of magnons induced by the resonant drive.

[1] M. A. Weiss et al., Nat. Commun. **14**, 7651 (2023).

MA 52.9 Thu 15:00 P4

Active noise spectroscopy of magnon-photon polaritons — •Lars Nikolas Hess, Philipp Schwenke, Vitaliy Vasyuchka, Kevin Künstle, and Mathias Weiler — Fachbereich Physik and Landesforschungszentrum OPTIMAS, Rheinland-Pfälzische Technische Universität Kaiserslautern-Landau, 67663 Kaiserslautern, Germany

Microwave (MW) cavities offer a wide range of applications for exciting ferromagnetic resonance (FMR) in solid-state magnets [1]. Due to the interaction of resonant MW photons with the magnonic excitations of a magnetic sample, their coupling behaviour can be studied in detail [2]. In this study, we use a MW cavity designed to operate in the frequency range from 500 MHz to 600 MHz to investigate the thermally excited MW photons and their coupling to magnons in the ferrimagnetic insulator $Y_3Fe_5O_{12}$ (YIG). To this end, a 2 *m thick YIG film is positioned inside the cavity. The resonant coupling between the MW photons and the YIG FMR is realised. An active feedback loop inspired by a similar setup for surface acoustic wave resonators [3] is implemented to specifically amplify the thermal photons in the MW cavity, that couple to the magnetic excitations in YIG. The resonator used in combination with the active amplification process makes it possible to determine characteristic parameters of the coupled systems without the use of an external MW source.

[1] H.Huebl *et. al*, Phys. Rev. Lett. **111**, 127003 (2013)
[2] L.Liensberger *et. al*, Phys. Rev. B **104**, L100415 (2021)
[3] Z.Xi *et. al*, Phys. Rev. App. **23**, 024054 (2025)

MA 52.10 Thu 15:00 P4

Low-temperature-compatible iron garnet films grown by liquid phase epitaxy — Jamal Ben Youssef[1], Nathan Beaulieu[1], Richard Schlitz[2], Davit Petrosyan[3], •Michaela Lammel[2], and William Legrand[4] — [1]LabSTICC-CNRS, Université Bretagne Occidentale, Brest — [2]Department of Physics, University of Konstanz, Konstanz — [3]Department of Materials, ETH Zurich, Zurich — [4]CNRS, Institute Néel, Université Grenoble Alps, Grenoble

Integrating thin epitaxial yttrium iron garnet (YIG) - one of the prototypical material systems in the field of magnonics, owing to its record-low damping of the magnetization dynamics - into hybrid (quantum) systems promises a platform to study the interaction of magnons with other (quasi)particles. However, up to now the usability of YIG in such devices is limited due to the losses occurring at low temperatures due to the paramagnetic gadolinium gallium garnet (GGG) substrate, and eventually Gd intermixing in the first layers. To circumvent this problem, we use liquid phase epitaxy (LPE) to grow ultrathin films of strained YIG on a commercial diamagnetic substrate, yttrium scandium gallium garnet (YSGG) [arXiv:2509.06242]. We investigate their magnetization dynamics between 3 K and 300 K, and compare them to films grown on paramagnetic GGG. We demonstrate that our LPE YIG on YSGG substrates features a ferromagnetic resonance linewidth below 1 mT at 3 K, together with a very weak temperature and frequency dependence of the losses. Therewith, the growth of YIG/YSGG by LPE provides a straightforward approach for the fabrication of YIG thin films for low-temperature investigations.

MA 52.11 Thu 15:00 P4

Magnetoacoustic interaction in Yttrium-Iron-Garnet / Aluminium-Scandium-Nitride heterostructures — •Kaya Gauch[1], Kevin Künstle[1], Yannik Kunz[1], Agne Žukauskaite[2,3], Stephan Barth[2], and Mathias Weiler[1] — [1]Fachbereich Physik and Landesforschungszentrum OPTIMAS, Rheinland-Pfälzisch Technische Universität Kaiserslautern-Landau, 67663 Kaiserslautern, Germany — [2]Fraunhoferr Institute for Electron Beam und Plasma Technology FEP, 01277 Dresden, Germany — [3]Institute of Solid State Electronics, Technische Universität Dresden, 01062 Dresden, Germany

The magnetoelastic interaction between surface acoustic waves (SAWs) and spin waves (SWs) has attracted considerable attention in recent years. Magnetoelastic excitation of SWs is particularly promising in low-damping ferrimagnets such as yttrium iron garnet (YIG). Electri cal excitation of SAWs necessitates a piezoelectric layer, such as ZnO [1]. Here, we investigate magnetoelastic interactions in a heterostruc ture consisting of a YIG/GGG bilayer coated with a piezoelectric AlScN thin film. The coupling between SAWs and SWs is characterized using micro-focused Brillouin light scattering (BLS) spectroscopy and vector network analyzer (VNA) measurements. In addition, the ob served magnetoelastic interaction is benchmarked against the coupling in the more established ZnO/YIG/GGG heterostructure. [1] Ryburn et al., Phys. Rev. Appl. 23, 034062 (2025)

MA 52.12 Thu 15:00 P4

Distinctive Propagation of Phonon-mediated Magnons in YIG/GGG — •Youngseon Soon[1], Moojune Song[1], Phuoc Cao Van[2], Jinhyun Baek[1], Byong-Guk Park[3], Jong-Ryul Jeong[2], Albert Min Gyu Park[1], and Kab-Jin Kim[1] — [1]Department of Physics, Korea Advanced Institute of Science and Technology, Daejeon 34141, Republic of Korea — [2]Department of Materials Science and Engineering, Chungnam National University, Daejeon 34134, Republic of Korea — [3]Department of Materials Science and Engineering, Korea Advanced Institute of Science and Technology, Daejeon 34141, Republic of Korea

Magnonic systems enable information processing via collective spin excitations and couple efficiently to other quasiparticles. We study magnetostatic surface spin waves (MSSWs) coupled to standing acoustic waves in a 200-nm YIG film on GGG. Using two microwave antennas and VNA measurement, we observe 3.5 MHz periodic modulation in transmission spectra arising from magnetoelastic interaction. As the magnon wave vector k increases, these phononic signatures weaken and eventually vanish, reflecting both the k-dependence of the coupling and the momentum selectivity of antennas. Phonon-mediated magnon modes emerge at lower frequencies than directly excited MSSWs and propagate much farther, providing a low-k channel for long-distance spin-wave transport without acoustic resonators. These distinctive features highlight the wavevector-dependent magnon-phonon hybridization and demonstrate that both coupling strength and propagation behavior can be engineered through excitation geometry.

MA 52.13 Thu 15:00 P4

Broadband Floating-Electrode SAW Transducers for Mag-

netoelastic Spin-Wave Excitation in CoFeB thin films — •Kawa Noman[1], Ryusuke Hisatomi[2], Kotaro Taga[2], Teruo Ono[2], Vitaliy Vasyuchka[1], and Mathias Weiler[1] — [1]Fachbereich Physik and Landesforschungszentrum OPTIMAS, Rheinland-Pfälzische Technische Universität Kaiserslautern-Landau, 67663 Kaiserslautern, Germany — [2]Kyoto University, Institute for Chemical Research,Kyoto,Japan

Microwave filters based on surface acoustic wave (SAW) devices exhibit low insertion loss and enable wideband operation in the GHz range. In this study, we microfabricate custom-designed floating-electrode in terdigital transducers (FE-IDTs) on piezoelectric LiNbO3 substrates, whose unique geometry with additional electrically floating metal fin gers enhances electromechanical coupling and broadband SAW exci tation [1]. We then deposit a 10 nm CoFeB thin film by DC mag netron sputtering within the SAW propagation path. We investigate the magnetic-field dependence of the SAW-driven magnetoelastic spin-wave resonance using vector network analysis. Systematic variation of the electrode material, aperture, and duty cycle reveals a rich spec trum of high-amplitude Rayleigh modes at odd and even harmonics of FE-IDT excitation. Moreover, we observe clear signatures of SAW-driven magnetoelastic excitation of spin-waves in CoFeB. High-amplitude SAWs enable non linear magnon generation [2].

[1] K. Yamanouchi et al., IEEE Ultrasonics Symposium (2013)
[2] M. Geilen et al., Applied Physics Letters 120, 242404 (2022)

MA 52.14 Thu 15:00 P4

Backward volume spin waves in ion-implanted magnonic YIG waveguides — •Sven Niehues[1], Jannis Bensmann[1], Robert Schmidt[1], Kirill O. Nikolaev[2], Dimitri Raskhodchikov[1], Shraddha Choudhary[1], Richa Bhardwaj[1], Shabnam Taheriniya[1,3,4], Akhil Varri[1,3], Ahmad El Kadri[1], Johannes Kern[1], Wolfram H. P. Pernice[1,3,4], Sergej O. Demokritov[2], Vladislav E. Demidov[2], Steffen Michaelis de Vasconcellos[1], and Rudolf Bratschitsch[1] — [1]Institute of Physics and Center for Nanotechnology (CeNTech), University of Münster — [2]Institute of Applied Physics, University of Münster — [3]Center for Soft Nanoscience, University of Münster — [4]Kirchhoff-Institute for Physics, Heidelberg University

Magnonics offers a promising alternative approach to conventional information processing due to the low-energy nature of spin waves and distinctive features such as nm-scale wavelengths. Recently, the fabrication of dispersion-tunable magnonic waveguides and a large-scale spin-wave network with 198 crossings have been demonstrated using a newly developed maskless silicon ion implantation technique [1]. Here, we show that backward volume spin waves (BVSW) propagate in silicon-ion implanted waveguides written into YIG thin films. Using time-resolved Faraday rotation spectroscopy, we extract the dispersion relation, the mode profile and damping of the BVSWs. Our results demonstrate the versatility of silicon-ion implanted magnonic waveguides, offering a promising route toward magnonic integrated circuits. Reference: [1] J. Bensmann, et al. Nat. Mat. 24, 1920-1926 (2025).

MA 52.15 Thu 15:00 P4

Quantum Geometry of Magnons — •Sidhartha Chatterjee[1], Andreas Haller[1], Peter P. Orth[2], and Thomas L. Schmidt[1] — [1]University of Luxembourg — [2]Saarland University

We develop a theoretical framework for magnon dynamics in a one-dimensional antiferromagnetic Heisenberg chain that includes next-nearest-neighbour Dzyaloshinskii-Moriya interaction (DMI) and a position-dependent magnetic field applied along the easy axis. This combination leads to a spin spiral ground state. The collective excitations above the ground state are magnons, spin-1 bosonic modes. We perform the Holstein-Primakoff transformation to obtain the magnon Hamiltonian, which is quadratic in nature. For the diagonalisation, we use the Bogoliubov transformation, and we show that the quantum geometric tensor of magnons naturally exhibits symplectic structure. This geometric structure yields corrections to the semiclassical equations of motion for magnon wave packets, resulting in anomalous velocity terms and metric-driven contributions. Overall, the framework provides a systematic route for incorporating geometric effects and symplectic structure into magnon dynamics, where no particle number conserving framework exists, and offers a pathway for engineering transport phenomena in magnetic materials through the direct manipulation of the quantum geometry of their collective excitations.

MA 52.16 Thu 15:00 P4

Impact of Magnetic Ground State on the Generation of an All-Magnonic Frequency Comb — •Alexandra Schrader, Chris Körner, Rouven Dreyer, and Georg Woltersdorf — Martin Luther University Halle-Wittenberg

We have observed the emergence of a magnonic frequency comb in extended Permalloy films as well as in microstructures of Permalloy and CoFeB. Since the frequency comb generation appears to be a unique feature of softmagnetic materials at very low bias fields (below 2 mT), we anticipate a strong correlation between the static ground state and the emerging dynamics. In the case of microstructures, the higher harmonic generation is indeed connected to the non-uniform domain structure at the edges.

However, the presence of these edge effects reduces the frequency multiplication efficiency. In this work, stripes of different aspect ratios are investigated to bridge the gap between extended layers and microstructures. This allows to explore the correlation between the static magnetization pattern obtained in Kerr microscopy and the generation of the frequency comb revealed via SNS-MOKE and NV-center microscopy. Both static and dynamic features are complemented by micromagnetic simulations.

MA 52.17 Thu 15:00 P4

Surface Acoustic Wave Generation and Detection in AlScN/GGG Heterostructures — •Karl Heimrich[1], Seth Kurfman[1], Frank Heyroth[2], Katrin Lehmann[2], Fabian Lofink[3], and Georg Schmidt[1,2] — [1]Martin Luther Universität Halle-Wittenberg Institut für Physik, Halle, Germany — [2]Interdisziplinäres Zentrum für Materialwissenschaften, Halle, Germany — [3]Frauenhofer ISIT, Itzehoe, Germany

Surface acoustic waves (SAWs) can be excited and detected in piezoelectric materials using interdigitated transducers (IDTs). In magnetostrictive materials, particularly with low-loss magnetic properties (e.g. Yttrium-Iron-Garnet, YIG), the coupling between SAWs and magnons provides unique opportunities for device applications. Different groups have already successfully demonstrated the coupling of ferromagnetic resonance with acoustic surface waves [1, 2, 3, 4]. Even the coupling to the low loss material YIG has been shown[3, 5]. Here we demonstrate the use of an Aluminium-Scandium-Nitride (AlScN)/Gallium-Gadolinium-Garnet (GGG) heterostructure to excite and detect SAWs that propagate in a pure GGG surface, offering the possibility to couple into micropatterned or even suspended YIG structures [6].

[1] Weiler et al., PRL: 106.11 (2011): 117601. [2] Dreher et al., PRB: 86.13 (2012): 134415. [3] Kunz et al., arXiv preprint: 2503.11203 (2025). [4] Rayburn et al., PRA: 23.3 (2025): 034062. [5] Wong et al., APL 349.6246 (2024): 125.5 [6] Heyroth, Schmidt et al., PRA: 12.5 (2019): 054031

MA 52.18 Thu 15:00 P4

Magnon-phonon coupling in suspended nanostructure — •Giovanni Del Bufalo[1,2], Matthias Grammer[1,2], Johannes Weber[1,2], and Hans Huebl[1,2,3] — [1]Walther-Meißner-Institut, Bayerische Akademie der Wissenschaften, Garching, Germany — [2]TUM School of Natural Sciences, Technische Universität München, Garching, Germany — [3]Munich Center for Quantum Science and Technology (MCQST), Munich, Germany

High-overtone bulk acoustic wave resonators were among the first mechanical systems explored in the quantum regime, enabling studies of vacuum fluctuations and non-classical states. Integrating magnetic thin films with these resonators creates hybrid magneto-phononic excitations through magnetoelastic coupling, allowing energy exchange between phonons and magnons. Beyond energy transfer, these hybrid modes can inherit angular momentum from their constituent excitations, raising a fundamental question: how is angular momentum transferred and shared between phonons and magnons in such systems? We address this by implementing a suspended silicon membrane as a bulk acoustic wave resonator, coupled to a 40nm $Co_{25}Fe_{75}$ metallic film. Using broadband ferromagnetic resonance spectroscopy at cryogenic temperatures, we quantify the magnon-phonon coupling strength and assess its implications for angular momentum transfer and magnetization damping. Our results highlight the potential of this device architecture for probing spin-mechanical interactions and advancing hybrid quantum systems that combine magnetic and mechanical degrees of freedom.

MA 52.19 Thu 15:00 P4

Characterization of spin-Hall nano-oscillators — •Christine Strickler, Moritz Bechberger, Julien Schäfer, Björn

Heinz, and Philipp Pirro — Fachbereich Physik and Landesforschungszentrum OPTIMAS, Rheinland-Pfälzische Technische Universität Kaiserslautern-Landau, D-67663 Kaiserslautern, Germany

Within the research field of spintronics, spin-Hall nano-oscillators (SHNOs) have emerged as promising candidates for building blocks in neuromorphic computing. These devices typically consist of a bi layer comprising a ferromagnetic (FM) and a heavy metal (HM) layer. Typically, a direct charge current is applied to the HM, which injects a spin current into the FM via the spin Hall effect, exerting spin orbit torques that can counteract the natural damping of the FM and thereby excite coherent auto-oscillations. We perform ferromagnetic resonance spectroscopy on fabricated full-film bilayer systems to opti mize the material stack in terms of FM-layer thickness and FM/HM interface quality. The materials selected for this study are CoFeB and NiFe as FM and Pt and W as HM, which leads to four potential ma terial stacks. The optimized stacks are fabricated in several SHNO geometries and sizes to investigate their properties concerning mode spectrum and threshold current for auto-oscillation via Brillouin light scattering spectroscopy. This study of SHNO fabrication paves the way for further investigation into such structures and their potential coupling phenomena.

MA 52.20 Thu 15:00 P4

Frequency-dependent parametric injection of magnons in yttrium iron garnet — •Lars Schiesser, Franziska Kühn, Matthias R. Schweizer, Vitaliy Vasyuchka, Alexander A. Serga, and Mathias Weiler — Fachbereich Physik and Landesforschungszentrum OPTIMAS, RPTU Kaiserslautern-Landau, 67663 Kaiserslautern, Germany

Parametric generation of magnons in low-damping yttrium iron garnet (YIG) films offers a flexible approach to excite magnons across a broad range of wavenumbers, enabling the creation of high magnon densities, which are essential for the preparation of magnon gases preceding condensation phenomena. Using parallel parametric pumping driven by a broadband stripline antenna, we investigate the frequency dependence of pumping thresholds and the ensuing nonlinear scattering processes. By tuning both the external magnetic field and the pumping frequency, we selectively control the initial position of parametrically injected magnons in momentum space and thus define the starting conditions for subsequent multi-magnon scattering dynamics. Time-resolved Brillouin light scattering (BLS) spectroscopy is employed for the direct observation of the temporal and spectral evolution of the magnon population.

These frequency characteristics provide the basis for the implementation of pumping schemes with arbitrary waveforms, which will enable the realization of complex, tailored excitation signals, opening new pathways for the precise control of nonlinear magnon dynamics.

MA 52.21 Thu 15:00 P4

Spatially-Localized Second Harmonic Generation via Spin Wave Concentration in Patterned YIG Structures — •Marc Eger[1], Stephanie Lake[1], Philipp Geyer[1], Seth Kurfman[1], Rouven Dreyer[1], and Georg Schmidt[1,2] — [1]Martin-Luther-Universität Halle-Wittenberg Insitut für Physik, Halle, Germany — [2]Interdisziplinäres Zentrum für Materialwissenschaften, Martin-Luther-Universität Halle-Wittenberg, Halle, Germany

The anisotropic dispersion and inherent non-linearity of (magnetostatic) spin waves in thin films and confined structures provide unique opportunities for implementation in next-generation radio-frequency devices [1]. A particular challenge remains in establishing effective and useful means to locally generate and subsequently exploit higher harmonics without extraneous non-linear losses [2]. In order to compensate these losses, one method to achieve this is to focus low-intensity spin waves in a low-loss magnetic material to a localised region far from the exciting antenna. This can be done, for example, with deterministically tuning the dispersion relation by modifying film thickness along with a geometric confinement through standard patterning processes. Here we compare micromagnetic simulations and experimental results obtained by frequency- and spatially-resolved SNS MOKE [3] within passive, lithographically-patterned YIG funnel structures, wherein we demonstrate second harmonic generation of magnons.

[1] Ustinov et. al, IEEE Magnetics Letters 10, 1-4, 2019
[2] T. Hula et. al, Appl. Phys. Lett. 117, 042404, 2020
[3] Rouven Dreyer et. al., Phys. Rev. Materials 5, 064411, 2021

MA 52.22 Thu 15:00 P4

Enhancing Mechanical Stability of Heusler Alloys via the Powder-in-Tube Method — •T. Niehoff[1,2], L Beyer[3,4], J. Puy[5], J. Freudenberger[3,4], O. Gutfleisch[5], J. Wosnitza[1,2], F. Scheibel[5], and T. Gottschall[1] — [1]Dresden High Magnetic Field Laboratory (HLD-EMFL), Helmholtz-Zentrum Dresden-Rossendorf, Dresden, Germany — [2]Institut für Festkörper- und Materialphysik, TU Dresden, Dresden, Germany — [3]Leibniz-Institut für Festkörper- und Werkstoffforschung IFW, Dresden, Germany — [4]TU Bergakademie Freiberg, Freiberg, Germany — [5]Institute of Materials Science, Technical University of Darmstadt Darmstadt, Germany

We address the long-standing problem of mechanical fatigue in Heusler-based elastocaloric and multicaloric materials by applying the Powder-in-Tube (PIT) method to stabilize the material inside a steel shell. This significantly enhances mechanical robustness. Under cyclic loading up to 100,000 cycles and high-load tests, PIT samples retain their structural integrity, showing only minor, non-critical end cracks while the core remains thermally connected to the shell. Even after plastic deformation, the Heusler core stays intact. Magnetization before and after cycling exhibits only minimal changes, confirming durability, and magnetocaloric measurements demonstrate excellent thermal coupling between core and metal shell. Overall, the PIT method extends the operational lifetime of Heusler alloys by orders of magnitude and allows independent optimization of mechanical stability and caloric performance.

MA 52.23 Thu 15:00 P4

Significant Enhancement of Magnetocaloric Performance of LaFe12B6 via Microstructure Optimization — •Protyasha Prachurja, Wei Liu, Alex Aubert, Benedikt Beckmann, Konstantin Skokov, and Oliver Gutfleisch — Institute of Materials Science, Technische Universität Darmstadt, Darmstadt, Germany

Light rare-earth magnetocaloric (MC) materials are appealing because of their abundance and reduced criticality risks [1]. Within this group of materials, LaFe12B6 - a first-order MC compound - undergoes a phase transition around 36 K, making it a potential candidate for hydrogen liquefaction applications [2]. However, its pronounced MC effect emerges only under relatively high magnetic fields (>5 T), which restricts its performance at lower fields [3]. This limitation is linked to its antiferromagnetic ground state and the presence of secondary phases in the microstructure. We carried out a systematic optimization of the synthesis conditions to improve phase purity and magnetocaloric properties. We found that annealing at 1383 K for 24 hours with a 3% La excess reduced the secondary phase content from 13.2 to 7.7 wt.% and sharpened the first-order transition. Consequently, the peak magnetic entropy change increased significantly from -1 to -10 J/kgK under a 5 T field. References: [1] Wei Liu et al. J. Phys. Energy, 2023, 5.3, 034001; [2] L.V.B. Diop; O. Isnard; J. Rodríguez-Carvajal Phys. Rev. B, 2016, 93.1, 80; [3] L.V.B. Diop; O. Isnard J. App. Phys., 2016, 119.21, 213904. Acknowledgement: We acknowledge financial support by the DFG within the CRC/TRR 270 (Project-ID 405553726).

MA 52.24 Thu 15:00 P4

Superconducting magnetic system for magnetocaloric hydrogen liquefaction — •C. Estillac Leal Silva[1,2], T. Platte[4], M. Strassheim[1,3], T. Niehoff[1,3], C. Salazar-Meija[1], J. Wosnitza[1,3], and T. Gottschall[1] — [1]Dresden High Magnetic Field Laboratory (HLD-EMFL), Helmholtz-Zentrum Dresden-Rossendorf Dresden, Germany — [2]TU Bergakademie Freiberg, Freiberg, Germany — [3]Institüt für Festkörper und Materialphysik, TU Dresden, Dresden, Germany — [4]Magnotherm Solutions GmbH, Darmstadt, Germany

As hydrogen's importance in the clean-energy sector continues to expand, improving its liquefaction efficiency becomes crucial, since the liquid form provides high volumetric energy density for storage and transport. Traditional compression systems, however, remain both costly and energy-intensive, prompting interest in magnetic refrigeration as an alternative process. This approach employs the adiabatic temperature variation of magnetocaloric materials in an Active Magnetocaloric Regenerator (AMR) to reach the final cooling stage required for hydrogen liquefaction. Achieving large temperature spans requires large variations in the magnetic field. In addition, higher operating frequencies are needed to reach greater cooling powers. Therefore, a magnetic system capable of sustaining high fields while supporting rapid cycling, whether through linear or rotary motion of the magnetocaloric material, is necessary. This presentation discusses the development of a superconducting magnetic system meeting these requirements, targeting a concentrated 5-7 T field which enables a sharp field change.

MA 52.25 Thu 15:00 P4

MnCrNiGeSi high-entropy alloy: structural, magnetic and magnetocaloric properties — •Atakan Tekgül[1] and Kağan Şarlar[2] — [1]Uludag University, Bursa, Turkey — [2]Karamanoglu Mehmetbey University, Bursa, Turkey

This study investigates the structural, magnetic, and magnetocaloric properties of two rare-earth-free high-entropy alloys, $Mn_{20}Cr_{14}Ni_{33}Ge_{25}Si_5$ and $Mn_{24}Cr_{10}Ni_{33}Ge_{25}Si_8$, produced by arc melting. Rietveld refinement of X-ray diffraction data confirms that both alloys crystallize in an orthorhombic Pnma structure. Increasing the Mn content from 20% to 24% strengthens the ferromagnetic exchange interactions, resulting in an enhancement of the saturation magnetization (43.8->56.7 $Am^{-1}kg^{-1}$) and an upward shift of the Curie temperature (361->387 K). Isothermal magnetization measurements and Arrott plot analyses reveal a second-order magnetic phase transition. The magnetocaloric effect, calculated via the Maxwell relation, yields a magnetic entropy change of 2.1 $Jkg^{-1}K^{-1}$ for the alloy with 20% Mn and 3.6 $Jkg^{-1}K^{-1}$ for the Mn-rich alloy under a magnetic field of 2 T. The combination of low hysteresis, high Curie temperature, and enhanced entropy change demonstrates that Mn-enriched Mn-Cr-Ni-Ge-Si HEAs offer promising performance for environmentally friendly, high-temperature magnetic refrigeration. These results confirm that compositional tuning, particularly Mn substitution, is an effective route for optimizing the magnetocaloric response in rare-earth-free HEAs.

MA 52.26 Thu 15:00 P4

Spin structure analysis on Fe_2AlB_2 powder and single-crystals — •Joachim Landers[1], Niels Kubitza[2], Soma Salamon[1], Ulf Wiedwald[1], Christina Birkel[2,3], and Heiko Wende[1] — [1]Faculty of Physics and CENIDE, University of Duisburg-Essen — [2]Department of Chemistry and Biochemistry, TU Darmstadt — [3]School of Molecular Sciences, Arizona State University

The MAB phase Fe_2AlB_2 exhibits ferromagnetic ordering below the Curie temperature $T_C \approx 290$ K, showing a strong magnetocaloric effect close to room temperature, which makes it a promising candidate for magnetic cooling applications. We utilize Mössbauer spectroscopy under high magnetic fields to analyze the spin structure and ferro- to paramagnetic phase transition of Fe_2AlB_2 microparticle powders. Field- and temperature-dependent measurements on an Fe_2AlB_2 single-crystal sanded down to appropriate thickness for transmission experiments are used as reference and allow for specific characterization along easy and hard magnetic directions with regards to magnetic alignment. Funding by the DFG via CRC/TRR 270 (project number 405553726, subprojects B02, B03, and B05) is gratefully acknowledged. We thank T. Ouisse and H. Pazniak (LMGP, Grenoble) for providing single crystals.

MA 52.27 Thu 15:00 P4

Combining X-ray absorption spectroscopy with a multifunctional probe to decipher first-order phase transitions — •Benedikt Eggert[1], Alex Aubert[2], Shingo Yamamoto[3], Ana Kurtanidze[3,4], Thomas Herrmannsdörfer[3], Oliver Gutfleisch[2], Kurt Kummer[5], Nick Brookes[5], Jochen Wosnitza[3,4], Katharina Ollefs[6], Konstantin Skokov[2], and Heiko Wende[1] — [1]University Duisburg-Essen — [2]TU Darmstadt — [3]HZDR, HLD-EMFL — [4]TU Dresden — [5]ESRF — [6]KIP, University Heidelberg

Here, we present a new instrumental setup designed for the investigation of magnetostructural phase transition, installed within the high field magnet at beamline ID32 of the European Synchrotron Radiation Facility in Grenoble, France. With these newly established setups, we can perform dichroic X-ray absorption spectroscopy, while accessing other subsystems via bulk probes (e.g., lattice expansion or change in electrical resistivity) within a temperature range from 4 K to 650 K in the soft X-ray regime.

Here, we will show first experimental results from La(Fe,Si)13 during the field and temperature-induced magnetostructural phase transition showcasing some of the possibilities.

Funding by the BMFTR under Grant BMBF-Projekt05K2022, and the Deutsche Forschungsgemeinschaft via CRC/TRR 270 HoMMage (Project-ID 405553726) is gratefully acknowledged. We thank the ESRF for the allocation of beamtime.

MA 52.28 Thu 15:00 P4

Magnetic and transport properties of compensated ferrimagnetic Heusler alloys at finite-temperature predicted by *ab initio* spin fluctuation theory — •Shogo Yamashita[1], Esita Pandey[1], Gerhard Fecher[1], Claudia Felser[1], and Atsufumi Hirohata[1,2] — [1]Max-Planck-Institute for Chemical Physics of Solids, Dresden, Germany. — [2]Center for Science and Innovation in Spintronics, Tohoku University, Sendai, Japan

Fully compensated ferrimagnets have been attractive for spintronics because their net zero magnetization suppresses stray fields, enabling high-density memory integration. Among them, Heusler alloys which have 24 valence electrons are of particular interest since they can exhibit both half-metallicity with 100 % spin polarization at the Fermi level and fully compensated ferrimagnetism. However, a fully compensated half metallic Heusler alloy $Mn_{1.5}V_{0.5}FeAl$ reported previously has a Curie temperature below room temperature, limiting its device applications. To find alternatives, we investigated $Mn_2Co_{0.5}V_{0.5}Al(Ga)$, which is regarded as a mixture of half-metallic $Mn_2VAl(Ga)$ and $Mn_2CoAl(Ga)$ exhibiting high Curie temperature, with 24 valence electrons. Using an *ab inito* spin-fluctuation theory based on the coherent potential approximation and disordered local moments, we examined its electronic structure, magnetic properties, and spin conductivities at finite-temperature. In this presentation, we will also discuss possible future control in the properties.

MA 52.29 Thu 15:00 P4

Broadly tunable compensation in ferrimagnetic MnFeVAl Heusler alloy — •Esita Pandey[1], Shogo Yamashita[1], Edouard Lesne[1], Gerhard Fecher[1], Claudia Felser[1], and Atsufumi Hirohata[1,2] — [1]Max-Planck-Institute for Chemical Physics of Solids, Dresden, Germany — [2]Tohoku University, Sendai, Japan

Zero-moment spintronic systems are highly desirable, as they minimize stray fields while maintaining stability against external magnetic perturbations. Unlike antiferromagnets, compensated ferrimagnets offer an ideal solution, combining a net-zero magnetic moment with spin-polarized conduction [1-3]. In this study, we demonstrate the realization of a near-zero-moment state in Mn1.5V0.5FeAl Heusler alloy thin films with a wide tunable compensation range. Films of varying thickness were fabricated on thermally oxidized Si substrates with a W buffer layer using simultaneous triple-target sputtering in an ultra-high-vacuum system. Structural analysis via X-ray diffraction shows that the W underlayer is stabilized in the body-centered cubic (bcc) α-phase with (110) orientation, while the Heusler films exhibit pronounced [110] texture and a lattice parameter close to bulk values. Magnetometry measurements reveal that the samples are magnetically isotropic and exhibit an exceptionally low saturation magnetization at RT. These results position MnFeVAl films as promising candidates for thermally stable, stray-field-free spintronic devices with robust spin-polarized transport. Reference: [1] V. Baltz et al., Rev. Mod. Phys. Vol. 90, No. 1 (2018); [2] A. Hirohata, Magnetochemistry 8, 37 (2022); [3] R. Stinshoff et al., Phys. Rev. B 95, 060410(R) (2017).

MA 52.30 Thu 15:00 P4

Halbach 2.0 - Creating homogenous fields with finite size magnets — •Peter Blümler[1] and Ingo Rehberg[2] — [1]Institute of Physics, University of Mainz, 55128 Mainz, Germany — [2]Institute of Physics, University of Bayreuth, 95440 Bayreuth, Germany

Homogeneous magnetic fields can be generated with permanent magnet arrangements, most notably Halbach rings made of idealized, infinitely long magnetic rods. However, this classical concept is limited when using real, finite magnets. To address this, three-dimensional configurations have been investigated. Optimal single and stacked rings of point dipoles are identified, offering greater field strength and homogeneity than traditional Halbach designs and earlier numerical estimates.

A central innovation is the "focused configuration" (I.R. & P.B., Phys. Rev. Appl. 23 (2025) 064029), where dipoles are tilted out of the ring plane, producing highly homogeneous fields shifted away from the magnet plane. Rotating multiple tilted rings relative to each other further improves homogeneity, though at the cost of a fixed field direction (still confined to the transverse plane).

Experiments with cuboid magnets confirm the theoretical predictions, showing that these configurations overcome finite-magnet limitations and provide enhanced field strength and homogeneity. All configurations can be explored and exported for 3D printing using a dedicated Python GUI (https://zenodo.org/records/15064360).

MA 52.31 Thu 15:00 P4

Towards Sustainable NdFeB Magnets Using Advanced Recycling — •Aybike Paksoy[1], Amrita Khan[1], Abdullatif Durgun[1], Mario Schönfeldt[2], Hasan Mahmudul[2], Iliya Radulov[2], Imants Dirba[1], and Oliver Gutfleisch[1] — [1]Functional Materials, Technical University of Darmstadt, Darmstadt, Germany — [2]Fraunhofer IWKS, Fraunhofer Research Institution for Materials Recycling and Resource Strategies, Hanau, Germany

NdFeB permanent magnets exhibit the highest maximum energy product (BH)max at room temperature, making them important for many technologies essential to the clean energy transition. However, their reliance on critical rare earth elements raises significant environmental, economic, and geopolitical challenges [1]. Consequently, increasing attention has been directed toward the recycling of end-of-life NdFeB permanent magnets. Enhancing the sustainability of rare earth permanent magnets and reducing their criticality are key requirements for environmentally responsible products. The magnetic properties of NdFeB magnets are strongly governed by their microstructure. Recycling routes can alter grain size, crystallographic texture, and defect density, which in turn influence magnetic performance. In this work, advanced recycling strategies are explored with the aim of producing sustainable NdFeB magnets while preserving their functional properties. [1] M. Schönfeldt et al., J. Alloys and Compounds (2023) https://doi.org/10.1016/j.jallcom.2023.168709

MA 52.32 Thu 15:00 P4

Resource efficient recycling and additive manufacturing of Nd-Fe-B magnets — •Amrita Khan[1], Lukas Schäfer[1], Priyatosh Sahoo[1], Iliya Radulov[2], Mahmudul Hasan[2], Konstantin Skokov[1], Igor Lubomirsky[3], and Oliver Gutfleisch[1] — [1]TU Darmstadt, Darmstadt, Germany — [2]Fraunhofer IWKS, Hanau, Germany — [3]Weizmann Institute of Science, Rehovot, Israel

Recycling Nd-Fe-B magnets is crucial for maintaining a sustainable supply of rare-earth elements for clean energy applications while significantly reducing the environmental impact and energy footprint. Additive manufacturing (AM) is a promising production route for functional magnetic materials, especially for achieving high geometric complexity, energy-efficient processing, and waste minimization. In this work, the PBF-LB/M process is used to directly produce permanent magnets, which are not yet optimized with regard to magnetic performance. The recycling of Nd-Fe-B scrap magnets and powder production is a critical step for successful processing via PBF-LB/M. In this study, different recycling processes are investigated: (i) hydrogen decrepitation, (ii) electrolytic decrepitation, and (iii) ultrasonic atomization, which are characterized regarding their particle size distribution, morphology, and flowability. The goal is to identify the influence of the powder properties on the PBF process and the resulting magnetic performance of additively manufactured magnets. This work was supported by the Volkswagen-Stiftung through the project MagCycleAM (9D878 Project No. 0071952-00).

MA 52.33 Thu 15:00 P4

Inverse garnet/Pt heterostructures by lateral crystallization — •Christian Holzmann[1], Stephan Glamsch[1], David Stein[1], Maximilian Mihm[1], Aladin Ullrich[1], Richard Schlitz[2], Michaela Lammel[2], Johannes Boneberg[2], and Manfred Albrecht[1] — [1]Institute of Physics, University of Augsburg, 86159 Augsburg, Germany — [2]Department of Physics, University of Konstanz, 78457 Konstanz, Germany

Rare-earth iron garnet thin films are known for their low Gilbert damping, insulating nature, and tunable magnetic properties. These favorable properties are mostly limited to single-crystalline films grown on specific substrates like GGG, which limits their applications [1]. To expand the functionallity of garnet thin films, we grow a thulium iron garnet film on a thin Pt layer by means of lateral crystallization. The Pt layer is sputter-deposited on a GSGG substrate, followed by garnet deposition by PLD. Hereby, a hole pattern in the Pt layer - either created naturally by thermal dewetting or artifically patterned - acts as crystallization seed. While the as-grown film is amorphous, post-deposition annealing at 700°C results in a lateral garnet crystallization rate of about 1 um/min and a single-crystalline garnet film on top of the Pt layer. This garnet film exhibits similar properties to an epitaxially grown film, including Gilbert damping as low as 0.008 [2]. Therefore, the lateral crystallization of garnet films opens up new possibilities to combine garnet and metal films for spintronic devices.

[1] Sailler, S. et al., Phys. Rev. Mater. 8, L020402 (2024).
[2] Holzmann, C. et al., Phys. Rev. Mater. 9, 114416 (2025).

MA 52.34 Thu 15:00 P4

FMR in chiral Mn_2TiO_4 — •Amruthavarshini Anand[1], Rajendra Loke[1], Ahmed Rasheed[1], Agustinus Agung Nugroho[2], and Joachim Hemberger[1] — [1]Institute of Physics II, University of Cologne, 50937 Cologne, Germany — [2]Institut Teknologi Bandung, Bandung 40116, Indonesia.

Ferromagnetic resonance (FMR) is a powerful technique for probing the dynamic magnetic properties of materials. In this study, we investigate FMR in Mn_2TiO_4, an inverse spinel tetragonal oxide. When Mn occupy full of tetrahedrally coordinated A site and half of B site, the space group $P4_322$, posses a chiral axis along c. Which via spin orbit coupling influences the magnetic resonance.

FMR measurements performed across different frequencies and magnetic field orientations allow us to extract resonance fields, linewidths, damping parameters, and magnetic anisotropy constants. Analysis of the FMR data using Kittel fitting enables determination of the frequency-field relationship, effective magnetization, and g-factors, while linewidth fitting provides quantitative values of the Gilbert damping parameter. And we also performed a FMR configuration with circularly polarized microwave excitation to enhance sensitivity to chiral magnetic effects and enable a more comprehensive investigation of the system's frequency- and field-dependent behaviour.

MA 52.35 Thu 15:00 P4

Magnetic interactions in compositionally complex and high entropy perovskites BaIn1-xMxO3-δ (M = Fe, Co, Sn, Ti) — •Auguste Stanionyte[1], Laura T. Corredor[2], Richard Matyšek[2,3], Anja U. B. Wolter[4], Giuditta Perversi[3], and Anna Isaeva[1,2] — [1]University of Amsterdam, The Netherlands — [2]TU Dortmund University and Research Center Future Energy Materials and Systems, Germany — [3]Maastricht University, The Netherlands — [4]Leibniz IFW Dresden, Germany

High configurational entropy exerts unprecedented effects on a material's phase stability and functional properties and raises questions about possible interrelationships between the two.[1] In our recent work, the BaIn1-xMxO3-δ series were obtained as phase-pure cubic perovskites where Co, Fe, Sn, Ti and In share the B-site in increasing configurational entropy.[2] The present study investigates the magnetic behavior of these compounds. We observe antiferromagnetic-like behavior in the M(T) curves below 20 K, and varying levels of hysteresis in the M(H) experiments at 2K. Specific heat measurements show a field-dependent magnetic entropy release at low temperatures, but neutron diffraction rules out long-range order. With AC susceptibility measurements showing a shift in transition temperatures for higher frequencies, the study so far indicates a glassy magnetic structure with clusters. Altogether, our experimental results give an intriguing look into the emergent properties of such complex and disordered structures, but the exact microscopic mechanism remains to be uncovered. [1] Adv. Sci. (2022) 9, 2200391; [2] Solid State Ion. (2024) 427, 116901.

MA 52.36 Thu 15:00 P4

FMR in chiral Mn_2TiO_4 — •Amruthavsarshini Anand[1], Rajendra Loke[1], Ahmed Rasheed[1], Agustinus Agung Nugroho[2], and Joachim Hemberger[1] — [1]Institute of Physics II, University of Cologne, 50937 Cologne, Germany — [2]Institut Teknologi Bandung, Bandung 40116, Indonesia.

Ferromagnetic resonance (FMR) is a powerful technique for probing the dynamic magnetic properties of materials. In this study, we investigate FMR in Mn_2TiO_4, an inverse spinel oxide. The magnetic Mn^{2+} ions occupy tetrahedrally coordinated (A) sites and half of octahedrally coordinated (B) sites. The space group $P4_322$ possesses a chiral axis along c, which via spin orbit coupling influences the magnetic resonance.

FMR measurements performed across different frequencies allow us to extract resonance fields and linewidths for different crystal orientations. The data can be analysed using Kittel's formula revealing magnetic anisotropy constants and g-factor, while linewidth fitting provides quantitative values of the Gilbert damping parameter. We also utilise circularly polarized microwave excitation to directly address chirality and the resulting non-reciprocity of the magnetic response.

MA 52.37 Thu 15:00 P4

Emergent electromagnetic inductance of nontrivial magnetic textures in $SrRuO_3$/$SrIrO_3$ bilyers — •Ludwig Scheuchenpflug[1], Sebastian Esser[2], Robert Gruhl[1], Max Hirschberger[2,3], and Philipp Gegenwart[1] — [1]Universität Augsburg, Lehrstuhl für Experimentalphysik VI — [2]Department of Applied Physics, University of Tokyo, Japan — [3]RIKEN Center for Emergent Matter Science, Japan

Emergent electromagnetic induction (EEMI) by current-driven spin dynamics was proposed and observed in the spin helix magnet $Gd_3Ru_4Al_{12}$ [1], where the (current-nonlinear) imaginary impedance at kHz frequency was associated with the motion of helical spin structures.

To explore the possibility of EEMI arising from current-driven dynamics of nontrivial magnetic structures, we fabricated and microstructured epitaxial thin film bilayers of ferromagnetic $SrRuO_3$ and paramagnetic $SrIrO_3$ on STO. This bilayer system is suspected to host DMI-stabilized Néel-skyrmions, indicated by the topological Hall-effect (THE) [2]. We observe in AC-measurements a large and current-linear imaginary impedance at low temperatures over broad current density and frequency ranges, signaling the EEMI of nontrivial textures.

[1] Naoto Nagaosa, Jpn. J. Appl. Phys. (2019) 58 120909, Yokouchi et al., Nature 586, 232 (2020).
[2] J. Matsuno et al., Science Adv. 2 (2016) e1600304, S. Esser et al., Phys. Rev. B 103 (2021) 214430.

MA 52.38 Thu 15:00 P4

SQUID magnetometry of weakly diamagnetic samples using custom 3D-printed sample holders — •Thomas Kerschenbauer, Luca Bischof, and Rüdiger Klingeler — Kirchhoff Institut for Physics, Heidelberg, Germany

Magnetization studies of weakly diamagnetic samples by means of SQUID magnetometers using conventional sample holders often produce background signals comparable to the sample signal. Therefore, accurate background measurement and subtraction processes are necessary, which are challenging with conventional sample holders. Here, we present high-resolution magnetization data on representative diamagnetic samples, including the aromatic compounds naphthalene and anthracene. We obtained these results through SQUID measurements using custom sample holders designed for the Quantum Design MPMS 3 with SLA 3D printing technology. This offers a versatile and cost-effective solution for manufacturing improved sample holders. These sample holders allow us, e.g., to improve the positioning of the sample, which requires high precision for background subtraction. It also allows for flexibility in sample shape, size, and orientation. These improvements can be used to study weakly magnetic materials and enable measurements that are limited by background signals of conventional sample holders.

MA 52.39 Thu 15:00 P4

Quantitative Distance Calibration and Magnetic Noise Imaging with Scanning NV Magnetometry — •Nikhita Khera, Ephraim Spindler, Kristin Kuehl, and Elke Neu Ruffing — RPTU in Kaiserslautern, Rheinland Pfalz, Germany

Nitrogen-vacancy (NV) enters in diamond are widely used as quantum sensors for nanoscale magnetometry and the study of spin dynamics. As part of ongoing work using a Scanning NV Magnetometer, we report progress towards quantitatively calibrated scanning NV measurements and applications to low-magnetisation systems. A central part of this work is the calibration if the sensor sample distance for scanning NV tips, which is essential for reliable spatial resolution. Using perpendicular magnetic anisotropy (PMA) reference sample, we perform distance calibration and aim to determine the NV orientation in the tip. When combined with complementary approaches such as reverse AFM to determine the NV position within the tip, this enables access to the full three-dimensional localisation of the quantum sensor. Beyond calibration, we explore magnetic fluctuations in antiferromagnetic insulators by measuring the NV spin relaxation times T1, giving insight into their local magnetic noise and spin dynamics. We also use scanning NV magnetometers to map stray fields - from exfoliated 2D- hematite flakes revealing nanoscale field structures associated with antiferromagnetic domain structures, and from 3-D printed nickel microstructures. Altogether, this work pushes forward scanning NV magnetometry and showcases its use across a variety of magnetic materials.

MA 52.40 Thu 15:00 P4

User-Interactive Magnetic Field Characterization Employing a 3D Printer as a Three-Axis Motor Stage — •Daniel Feser[1,2], Nikolai Weidt[1,2], Nikita Popkov[2,3], Rico Huhnstock[1,2], and Arno Ehresmann[1,2] — [1]Institute for Physics and CINSaT, University of Kassel, Heinrich-Plett-Str. 40, 34132 Kassel, Germany — [2]AIM-ED, Joint Lab of Helmholtzzentrum für Materialien und Energie, Berlin (HZB) and University of Kassel, Hahn-Meitner-Platz 1, 14109, Berlin, Germany — [3]Intelligent Embedded Systems, University of Kassel, Wilhelmshöher Allee 71-73, 34121, Kassel, Germany

This project presents a flexible, user-interactive system for three-dimensional magnetic field mapping that repurposes a consumer-grade 3D printer as a precise three-axis positioning platform. A teslameter probe is mounted in a custom-designed and 3D-printed printhead, ensuring stable and accurate field measurements. The printer is controlled through Python-generated G-code, with device coordination handled via the Tango server framework. This system allows users to manually configure scan volumes, adjust measurement parameters, and safely map magnetic fields around sensitive samples while avoiding collisions. The acquired magnetic field data are processed and displayed as heatmaps, enabling intuitive analysis of spatial field variations. Overall, the platform demonstrates a low-cost, adaptable approach to magnetic field characterization using accessible hardware and open-source software.