10th NRW Nano Conference

Innovations in Materials and Applications

23rd - 24th May 2023 – The Dortmund Congress Centre

NMWP.NRW
Cluster NanoMicroMaterialsPhotonics

City of Dortmund
Economic Development
Agency

Ministry of Economic Affairs,
Industry, Climate Action and Energy
of the State of North Rhine-Westphalia

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CONTENTS

Imprint/Publisher	2
Forewords	4 - 5
Sessions of the 10th Nano-Conference	6 - 7
Program at a Glance	8 - 9
Elements of the 10th Nano-Conference	10
Program 23rd May	11 - 13
Program 24th May	14 - 15
Plenary Talk/Keynotes	16 - 17
Speakers / Short Abstracts	
Session: Quantum Technologies	18 - 23
Session: Energy	24 - 25
Session: Health	26 - 28
Session: Advanced Materials	29 - 31
Session: Electronics	32 - 33
Session: NRW Innovation Projects	34 - 35
Session: Photonics	36 - 39
Poster Exhibition	40 - 46
Advisory Board	46
Exhibitors	48 - 58
Sponsors/Media partners	59
Exhibitor Overview	60 - 61
Floor Plans	62 - 63
Networking Event & Specials	64 - 65

Greetings

Dear Ladies and Gentlemen,

being present on the world's leading markets with forward-looking products is a top priority for North Rhine-Westphalia as an economic powerhouse and one of Germany's key centres of business and research.

Especially when it comes to nanotechnologies, advanced materials and a wide range of applications, North Rhine-Westphalia has taken a leading role in research and development throughout Europe. The importance of key technologies for dealing with global challenges such as sustainability and resource efficiency is undisputed. North Rhine-Westphalia has developed outstanding expertise in this field and makes a valuable contribution to the development of highly innovative solutions.

Indeed, North Rhine-Westphalia is home to a multitude of companies and research institutions specialised in the development and application of nanotechnology and advanced materials as well as photonics, quantum technologies and a lot more. These companies and institutions work closely with each other to create innovations that pave the way for a wide range of applications in nearly every single industry.

As entrepreneurs, scientists and researchers, you are the driving force behind these developments. Your work helps push the boundaries of our knowledge and develop new technologies, materials and applications. I am confident that the 10th NRW Nano Conference will be an important milestone in this process, making a valuable contribution to the further high-tech and deep-tech development.

Please enjoy a successful and productive conference with many new insights and contacts as well as some inspiring discussions.

Mona Neubaur
Minister of Economic Affairs, Industry, Climate Action and Energy
of the State of North Rhine-Westphalia

Dear Ladies and Gentlemen,

our strength in Dortmund and North Rhine-Westphalia has always been the ability to adapt to change. The challenges caused by climate change, digitalization, changing demographics and shifting international relations have made this ability for transformation even more crucial. Micro- and nanotechnology offer the foundation for solutions to these challenges and its potential is growing further.

I am delighted that once again the state of North Rhine-Westphalia has decided to continue to promote these technologies by holding the 10th NRW Nano-Conference in Dortmund – to which I gladly invite you.

Dortmund, one of Europe's leading micro- and nanotechnology hubs in Europe, has a long history of breeding innovation by fostering long lasting collaborations between research institutes, businesses and young entrepreneurs. I am happy to welcome you to Dortmund to be part of this innovation process at the NRW Nano-Conference. Please enjoy top-class international speakers, seven pioneering subjects and meet established businesses as well as new start-ups.

I wish all of you fruitful discussions, an enlightening knowledge exchange and inspiring networking at this year's conference!

Heike Marzen
CEO Economic Development Agency Dortmund

Dear Ladies and Gentlemen,

In the past decades, the fusion of nanotechnologies and material sciences has turned out to be a great gain for both disciplines. Even if nanotechnologies have faded into the background in terms of communication, these technologies rather gained even more relevance, in nanoelectronics, for example. As Europe's economic powerhouse, North Rhine-Westphalia combines scientific excellence with economic (innovation) power, which makes NRW a leading region with regard to nano and advanced materials. Since NRW, with its innovative power, provides countless answers to major global challenges and many sustainable development goals, the 10th NRW Nano Conference creates an exciting balance between basic technologies and innovative fields of application.

With three keynotes, a plenary talk, a panel discussion, seven exciting technical sessions, a large accompanying exhibition where companies and institutes present their innovative services, products and processes, as well as an exhibition of around one hundred scientific posters by young academics, the anniversary edition of this great conference joins the top-class series of previous conferences.

I am very sure that such a comprehensive and diverse programme will provide you with perfect conditions for exciting discussions on future innovations. Therefore, I wish all participants inspiring lectures, exciting discussions and stimulating exchange. We look forward to welcoming you in Dortmund.

Dr.-Ing. Harald Cremer
Cluster Manager NanoMicroMaterialsPhotonics.NRW

Sessions of the 10th NRW Nano Conference 2023

■ Advanced materials

Additive manufacturing | Fibres and composites | Functional surfaces and films | Recycling | Characterisation and simulation | 2D materials | Graphene

Innovative (smart) materials allow a whole new range of applications and optimise the use of resources, thus helping to protect the environment. Tailor-made surfaces, fibre-based composite materials and additive manufacturing result in increased efficiency and improved performance. By applying characterisation technologies to and running simulations on these nanomaterials and -structures, their value to future applications can be tested.
Chair: Prof. Barbara Milow, Deutsches Zentrum für Luft- und Raumfahrt

■ Electronics

Optoelectronics | Artificial intelligence | Information and Communication technology | Neural networks

Nothing has impacted our lives more in the past two decades than the advances in information and communication technology. And this development continues creating the need to constantly develop smaller and more effective electronic components to cope with the increasing need for accurate data.
Chair: Prof. Dr. rer. nat. Gerd Bacher, University of Duisburg-Essen

■ Energy

Energy efficiency | Batteries | Intelligent production

Finding alternatives for fossil energy sources and ensuring a more efficient use of energy is paramount in today's world. The increased energy demand from industry and society requires innovative ways to optimise existing technologies as well as finding alternatives to meet the growing need. Enhancing portable energy storage systems, while reducing their environmental impact is of major importance for future technologies. The key enabling technologies play a vital role in ensuring these important aims are achieved.
Chair: Prof. Gabi Schierning, Research Center Future Energy Materials and Systems, Research Alliance Ruhr

■ Health

Nano medicine | Medical technology & diagnostics

The past months have shown the demand for medical development and the need to implement new technologies to combat global health issues. Nanotechnology plays an important role when it comes to developing new and innovative methods and therapies. The application ranges from drug design and delivery to monitoring and diagnostics, always looking for ways to optimise procedures and improve everyone's state of health.
Chair: Dr. Holger Winter, CeNTech GmbH

■ NRW Innovation Projects & INTERREG/EU Innovation Projects

For the economically strong industrial state of North Rhine-Westphalia (NRW), it is of highest priority to be present in the leading markets worldwide with economically viable products. Innovation projects within NRW or in cooperation with companies or research institutes from Europe e.g. within the INTERREG programme are crucial to the development of these products and their manufacturing. The sessions focusing on NRW innovation projects on the one hand and on European innovation projects on the other hand highlight successful project proposals and projects by giving insights into the R&D projects based on key enabling technologies.
Chair: Ilka Meisel, Ministerium für Wirtschaft, Industrie, Klimaschutz und Energie des Landes Nordrhein-Westfalen

Sessions of the 10th NRW Nano Conference 2023

Photonics

Photonics is a rapidly enhancing field that focuses on the use of light for a wide range of applications, from communication and sensing to medicine and manufacturing. It involves the use of lasers, fiber optics, and other advanced technologies to manipulate and control light waves in precise ways. One of the most exciting areas of modern photonics is quantum photonics, which uses the principles of quantum mechanics to develop new technologies for communication, computing, and cryptography.
Chair: Dirk Kalinowski, NMWP.NRW state cluster

Quantum technologies

Quantum communication | Quantum computing | Quantum enabling technologies | Quantum sensing | Quantum simulation

Quantum technologies offer new opportunities for improved computation, sensing applications and cybersecurity, allowing new and/or improved products and application fields for industry with rapidly increasing dynamics. This is also reflected in the increase of business activities and governmental funding schemes in the past years. Quantum technologies hence are one of the hot topics of science and are considered disruptive technologies which have the potential to affect a broad range of business cases. Also, increased efficiency combined with reduced energy consumption during operation can be reached using second generation quantum tech.
Chair: Prof. Dr. Christof Wunderlich, University of Siegen, Department of Physics

The programme at a glance

Day 1: Tuesday, 23 May 2023

8:30 am	Registration		
9:00 am	Opening of the Exhibition		
from 09:45 am	**Opening of the 10th NRW Nano-Conference** Dr.-Ing. Harald Cremer, Cluster NMWP.NRW Mona Neubaur, Ministry of Economic Affairs, Industry, Climate Action and Energy of the State of North Rhine-Westphalia Heike Marzen, Economic Development Agency Dortmund		
10:15 - 11:35 am	**Keynote** Dr. Heike Riel, IBM Quantum **Keynote** Prof. Dr. rer. nat. Constantin Häfner, Fraunhofer Institute for Laser Technology ILT		
11:35 - 12:05 pm	**Poster Session (first floor)**		
12:05 - 13:05 pm	Lunch Break	**Exhibition**	**Business Pitches**
13:05 - 14:55 pm	**Quantum Technologies** (part 1)	**Energy**	**Health**
14:55 - 15:15 pm	Coffee Break	**Exhibition**	**Poster Exhibition**
15:15 - 16:45 pm	**Quantum Technologies** (part 2)	**Advanced Materials** (part 1)	
16:45 - 17:05 pm	Coffee Break	**Exhibition**	**Poster Exhibition**
17:05 - 18:05 pm	**Quantum Technologies** (part 3)	**Advanced Materials** (part 2)	
19:00-21:30 pm	**Networking Event with Award Ceremony “Best Exhibitor Award”**		

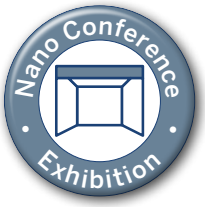
Day 2: Wednesday, 24 May 2023

9:00 am	Registration / Opening of the Exhibition		
09:45 - 10:15 am	**Plenary Talk** Dr. Lutz Aschke, President of Photonics21, CFO / CIO Carl Mahr GmbH & Co. KG		
10:15 - 10:55 am	**Keynote** Prof. Dr. Zhighilei, University of Virginia, Department of Materials Science and Engineering		
10:55 - 11:55 am	**Panel Discussion** "Reshuffeling the cards – new horizons for European chip production"		
11:55 - 12:10 pm	**Welcome Young Academics + Best Poster Award**		
12:10 - 13:40 pm	Lunch Break	**Exhibition**	**Poster Exhibition**
13:40 - 14:30 pm	**Electronics** (Part 1)	**NRW Innovation Projects** (Part 1)	**Photonics** (Part 1)
14:30 - 14:50 pm	Coffee Break	**Exhibition**	**Poster Exhibition**
14:50 - 15:50 pm	**Electronics** (Part 2)	**NRW Innovation Projects** (Part 2)	**Photonics** (Part 2)
15:50 pm	**End of programme**		

Elements of the 10th NRW Nano Conference

Sessions

The core element of the NRW Nano Conference is the scientific programme. A plenary talk, keynote speeches, technical lectures from the Call for Presentations as well as scientific posters from the Call for Posters make up this highlight of the conference.
For the first time in its history, the conference focuses not only on nanotechnologies but on innovations in materials and applications and this, a novelty as well, in four parallel sessions!



Exhibition with Best Exhibitor Award

The extensive exhibition of the Nano Conference offers visitors a platform to learn about products, services and innovations. The Best Exhibitor Award will be bestowed to the three best exhibitors at the Networking Event on the evening of the first conference day.

Poster Exhibition with Best Poster Award

A selection of nearly 120 posters will be presented to accompany the NRW Nano Conference. Within the framework of the Young Academics Program sponsored by Covestro Deutschland AG, the three best posters are assessed by an expert jury from the Advisory Board. The winners are honored during the Award Ceremony on the second conference day.

Business Pitches

Exhibitors present themselves in a 240 second talk. The business pitches take place during he lunch breaks and prior to the Networking Event on the evening of the first day.

Business Matchmaking

Networking of all actors from key enabling technologies along the complete value chains is one of the core goals of the NRW Nano Conference. In order to pave the way for successful networking with other conference participants with whom you share for instance common research project ideas but are so far unfamiliar to you, the Networkind Event at the evening of the first conference day is planned. As the number of participants is limited, prior registration is required.

Plenary Session			
8:30 am	Registration		
9:00 am	Opening of the Exhibition		
from 09:45 am	**Opening of the 10th NRW Nano-Conference** **Greeting and presentation** **Dr.-Ing. Harald Cremer** Cluster NMWP.NRW **Greeting** **Mona Neubaur** Ministry of Economic Affairs, Industry, Climate Action and Energy of the State of North Rhine-Westphalia **Heike Marzen** Economic Development Agency Dortmund		
10:15 - 11:35 am	**Keynote 1** **Dr. Heike Riel** IBM Quantum **Keynote 2** **Prof. Dr. rer. nat. Constantin Häfner** Fraunhofer Institute for Laser Technology ILT		
11:35 - 12:05 pm	**Poster Session**		
12:05 - 13:05 pm	Lunch Break	**Exhibition**	**Business Pitches**
	Quantum Technologies (part 1) Chair: Prof. Dr. Christof Wunderlich, University of Siegen, Department of Physics	**Energy** Chair: Prof. Gabi Schierning, Research Center Future Energy Materials and Systems, Research Alliance Ruhr	**Health** Chair: Dr. Holger Winter, CeNTech GmbH (Center for Nanotechnology)
13:05 pm	| **Nearly noise-free quantum frequency conversion as a milestone on the way to a future quantum internet** Dr. rer. nat. Bernd Jungbluth, Fraunhofer Institute for Laser Technology ILT	| **Materials engineering as a key function for process development** Dr. Frank Neumann, RWE Technology	| **DNA origami nanostructures for antimicrobial therapy** Dr. Adrian Keller, Universität Paderborn, Technische und Makromolekulare Chemie

	| Nanopositioning and optical coherent manipulation of quantum light emitters in hBN Dr. Steffen Michaelis de Vasconcellos, Westfälische Wilhelms-Universität Münster, Physikalisches Institut	**| The I-TESS Project: Scalable Thermochemical Energy Storage, Development of a Novel Pilot Plant** Dr. Matthias Schmidt, Deutsches Zentrum für Luft- und Raumfahrt, Institut für Technische Thermodynamik	**| Carbon nanotubes as powerful platform for optical biosensing** Julia Ackermann, Fraunhofer Institut für Mikroelektronische Schaltungen und Systeme, Biomedical Nanosensors
	| Bias-Tee Quantum Current Sensor based on randomly orientated Microdiamonds with NV-Centers Jens Pogorzelski, FH Münster	**| Potentials in manufacturing and layer development for metallic bipolar plates** Maurizio Giorgio, Fraunhofer-Institut für Werkstoff- und Strahltechnik IWS	**| Therapy enhancing effects of metal nanoparticles in proton therapy are ruled by surface chemistry at the nano-water-interface and range effects on the nanoscale** Christoph Rehbock, Universität Duisburg-Essen, Technische Chemie I
	| Presentation 6DLR/BMWK-Initiative – establishing a German industrial ecosystem for Quantum Computing Dr. Uwe Müller, Deutsches Zentrum für Luft- und Raumfahrt – QCI	**| Opportunities of High Throughput Spatial Atomic Layer Deposition in Energy Applications: do more with less!** Dr. Hindrik de Vries, SALD B.V.	**| Multi-target electrochemical aptamer-based biosensors for accurate disease diagnosis** Dr. Gabriela Figueroa Miaranda, Forschungszentrum Jülich, Institute of Biological Information Processing, Bioelectronics (IBI-3)
	| Hardware-Software-Codesign for Quantum Computers at DLR Dr. Gary Schmiedinghoff, Deutsches Zentrum für Luft- und Raumfahrt		**| A high-effective microbicidal coating to control the indirect microbial transmission** Dr. Alessandra Scano, Department of Chemical and Geological Sciences, University of Cagliari and Cagliari Research Unit of the National Consortium of Materials Science and Technology (INSTM), Cagliari, Italy
14:55 pm	Coffee Break	**Exhibition**	**Poster Exhibition**
	Quantum Technologies (part 2) Chair: Prof. Dr. Christof Wunderlich, University of Siegen, Department of Physics	**Advanced Materials** (part 1) Chair: Prof. Barbara Milow, Deutsches Zentrum für Luft- und Raumfahrt	
15:15 pm	**| How to approach quantum computing for industrial needs using MAGIC** Dr. Michael Johanning, eleQtron GmbH	**| Metal-organic chemical vapor deposition of two-dimensional materials and their heterostructures for industrial applications** Prof. Dr.-Ing. Michael Heuken, AIXTRON SE	

	| From Lab to Industry: Magnetic Quantum Sensors for Industrial Applications Dr. Robert Staacke, Quantum Technologies GmbH **| Quantum Computer for Industrial Applications** Prof. Dr. Jan Berend Meijer, Universität Leipzig **| Superconducting Nanowire Single-Photon Detectors: Advances and Applications in QT and Industry** Martin Wolff, Pixel Photonics GmbH	**| Upscaled production of Carbon Nanomembranes** Dr. Nikolaus Meyerbröker, CNM-Technologies GmbH **| Laser-assisted synthesis of metal-ceramic composite powders for laser powder bed fusion of oxide dispersion strengthened steels** Mareen Goßling, Bergische Universität Wuppertal, Materials Science and Additive Manufacturing **| Improving the magnetic properties of additively manufactured permanent magnets with nanofunctionalization** Philipp Gabriel, University Duisburg-Essen, TC1	
16:45 pm	Coffee Break	**Exhibition**	**Poster Exhibition**
	Quantum Technologies (part 3) Chair: Prof. Dr. Christof Wunderlich, University of Siegen, Department of Physics	**Advanced Materials** (part 2) Chair: Prof. Barbara Milow, Deutsches Zentrum für Luft- und Raumfahrt	
17:05 pm	**| A mixed reality learning environment for acquiring basic competences in quantum technologies** Adrian Abazi,WWU Münster, Institute of Physics, AG Schuck, Integrated Quantum Technology **| Electrical excitation of color centers in phosphorus-doped diamond Schottky diodes** Florian Sledz,Universität Siegen, Laboratory of Nano-Optics	**| Dark exciton anti-funneling in inhomogeneously strained monolayer transition metal dichalcogenides** Dr. Robert Schmidt, Westfälische Wilhelms-Universität (WWU) Münster Institute of Physics **| Easy understanding and measurement of Zetapotential** Dr. Daniel Hagmeyer, Microtrac Retsch GmbH	
19:00-21:30 pm	**Networking Event with Award Ceremony "Best Exhibitor Award"**		

Program Wednesday, 24 May 2023

Plenary Session			
9:00 am	Registration / Opening of the Exhibition		
09:45 am	**Plenary Talk** **| Strategic Autonomy: Photonics critical Value Chains in the EU Policy Environment** **Dr. Lutz Aschke** President of Photonics21, CFO / CIO Carl Mahr GmbH & Co. KG		
10:15 am	**Keynote 3** **| Multiscale modeling of nanomaterials: From carbon fibers and nanotube networks to laser-induced structural transformations** **Prof. Leonid V. Zhigilei** University of Virginia, Department of Materials Science and Engineering		
10:55 am	**Panel Discussion** **Reshuffeling the cards – new horizons for European chip production** Dr.-Ing. Harald Cremer (NMWP.NRW), Dr. Volker Sinhoff (ELEMENT 3-5 GmbH), Prof. Dr. Max Lemme (AMO GmbH), Dr. Lutz Aschke (Photonics21, Mahr GmbH & Co. KG) & Dr. Ralf Jede (Raith GmbH). Moderation: Dr. Daniel Stadler		
11:55 am	**Welcome Young Academics + Best Poster Award**		
12:10 pm	Lunch Break	**Exhibition**	**Poster Session**
	Electronics (part 1) Chair: Prof. Dr. rer. nat. Gerd Bacher, University of Duisburg-Essen	**NRW Innovation Projects** (part 1) Chair: Ilka Meisel, Ministerium für Wirtschaft, Industrie, Klimaschutz und Energie des Landes Nordrhein-Westfalen	**Photonics** (part 1) Chair: Dirk Kalinowski, NMWP.NRW
13:40 pm	**| Two-Dimensional Materials for Future Electronics – Made in NRW** Prof. Dr.-Ing. Max C. Lemme, AMO GmbH	**| Nano meets energy – the SuperLink project** Prof. Michael Bäcker, MaTech-Consult GmbH	**| From Fundamentals to industrial application – the production of microstructured optics and their relevance for the business location North Rhine-Westphalia** Prof. Dr.-Ing. Thomas Bergs, Fraunhofer IPT / WZL der RWTH Aachen University, Technologie der Fertigungsverfahren
	| Memristor Devices beyond Memory Applications Prof. Dr.-Ing. Stefan Tappertzhofen, Technische Universität Dortmund, Lehrstuhl für Mikro- und Nanoelektronik	**| Innovative use of rCF in aerospace applications** Rebecca Emmerich, RWTH Aachen University, Institut für Textiltechnik Aachen	**| Laser based micro and nano structuring for battery and fuel cell manufacturing** Prof. Dr.-Ing. Arnold Gillner, Fraunhofer-Institut für Lasertechnik ILT

14:30 pm	Coffee Break	**Exhibition, Poster Session**	**| Photonic Black-Box Optimization Through Reinforcement Learning** Marco Butz, Center for Soft Nanoscience
	Electronics (part 2) Chair: Prof. Dr. rer. nat. Gerd Bacher, University of Duisburg-Essen	**NRW Innovation Projects** (part 2) Chair: Ilka Meisel, Ministerium für Wirtschaft, Industrie, Klimaschutz und Energie des Landes Nordrhein-Westfalen	**Photonics** (part 2) Chair: Dirk Kalinowski, NMWP.NRW
14:50 pm	**| Enabling advanced Photonics and Optoelectronics Applications: About perfectioning large Area photonic Waveguide and Metalens Nanofabrication by Electron Beam Lithography** Dr. Frank Nouvertne, Raith GmbH	**| Digital Twins meets High-Tech** Dr. Matthias Grosch, NMWP.NRW	**| New Material Properties and Production Processes Using Tailored Laser Beam Shapes** Dirk Hauschild, Focuslight Technologies Inc.
	| Graphene Time-of-Flight Photodetector for 3D Imaging Applications Paul Kienitz, Universität Siegen, Graphen-basierte Nanotechnologie	**| The Einstein telescope in the Euregio Meuse-Rhine – subsurface research for the stars** Prof. Dr. rer. nat. Achim Stahl, RWTH Aachen University, Lehrstuhl für Experimentalphysik III B	**| Quick and cool – cold-brewed coffee within minutes** Dr. Anna Rosa Ziefuss, Universität Duisbug-Essen, Technische Chemie I
			| Square Wave Phase-Sensitive Detection for NV Magnetometry Ludwig Horsthemke, FH Münster, Department of Electrical Engineering and Computer Science
15:50 pm	**End of programme**		

Dr. rer. nat. Dr. h.c. Heike Riel

IBM Fellow
Head Science of Quantum & Information Technologies
Lead IBM Research Quantum Europe & Africa

» Quantum Computing is a nascent technology expected to solve valuable problems that today's most powerful classical supercomputers cannot solve and never will. By exploring quantum computers' possibilities today, we are shaping the world of tomorrow. «

Keynote 1 | Tuesday, 23 May 2023

Prof. Dr. rer. nat. Constantin Häfner

Fraunhofer Institute for Laser Technology ILT

» Laser technology is one of the key technologies that not only enables our current way of life with fast communication, high productivity or gentle therapies. Rather, it drives the further development of technological solutions for major challenges facing society. These include satellite-based LIDAR systems for climate research and optimised weather forecasting, laser-based sensor technology for automated mobility or spectroscopic measuring instruments for resource-saving recovery of materials in the recycling process. Let's shape the future together with laser technology from NRW! «

Keynote 2 | Tuesday, 23 May 2023

Professor Leonid V. Zhigilei

University of Virginia
Department of Materials Science and Engineering

» Computational materials science is playing an increasingly important role in the development of advanced materials with unprecedented properties. The predictive power of the computationally-driven materials design is defined by the ability of modern computational methods to account for the interplay of processes occurring in materials at different time and length scales. «

Keynote 3 | Wednesday, 24 May 2023

Dr. Lutz Aschke

President of Photonics21, CFO / CIO Carl Mahr GmbH & Co. KG

» Photonics has a critical role for achieving strategic autonomy in key EU economic sectors and for strengthening the resilience of key EU strategic value chains and reduce trade dependencies. A new Multiannual Strategic Research and Innovation Agenda (SRIA) is therefore uniquely shaped by this context. «

Plenary Talk | Wednesday, 24 May 2023

Nearly noise-free quantum frequency conversion as a milestone on the way to a future quantum internet

Dr. rer. nat. Bernd Jungbluth,
Fraunhofer Institute for Laser Technology ILT

Recent findings in quantum science technology promise a paradigm shift in the field of computing and information technology with exceptional opportunities for those who find solutions for its technical implementation: Powerful quantum computers will enable applications not feasible with classical computers e.g., computer aided design of new materials or substances and the decryption of former secure binary communication. In addition, a future quantum internet will interconnect quantum communication terminals, sensors and computers at any two points on earth. This will not only allow inherently secure communication and give access to powerful quantum computer clusters in full privacy, but it will also – literally – entangle realities at any two points on earth. By analogy with classical ICT, experts expect this to take the applications of quantum technology to an entire new level.

Nanopositioning and optical coherent manipulation of quantum light emitters in hBN

Dr. Steffen Michaelis de Vasconcellos,
Westfälische Wilhelms-Universität Münster, Physikalisches Institut

The coherent control of single-photon emitters is a key challenge in the development of quantum networks and communications. Recently, the family of solid-state quantum light emitters was joined by optically active states in the 2D material hexagonal boron nitride (hBN), which efficiently emits single photons even at room temperature. The wide variability of the emission wavelength, narrow emission lines and tunability makes this emitter particularly interesting for quantum sensing and wavelength division multiplexed quantum communications. We fabricate large arrays of thousands of single-photon emitters by capillary assembly using commercially available hBN nanocrystals. We further demonstrate the coherent state manipulation of an individual hBN quantum emitter with ultrafast laser pulses and investigate the coherence properties of the two-level system revealing the effects of different sources of spectral jitter and the impact of phonons on the ultrafast coherence dynamics.

Bias-Tee Quantum Current Sensor based on randomly orientated Microdiamonds with NV-Centers

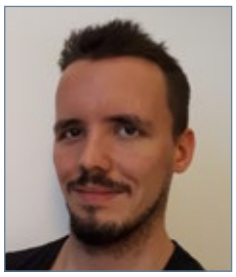
Jens Pogorzelski,
FH-Münster - University of Applied Sciences

Optical detected magnetic resonance (ODMR) with NV-Centers is well-known and a promising opportunity for various approaches in Quantum Sensing applications. A new approach for current sensing with NV-Centers in microdiamonds is shown. For applying the DC current and the microwave excitation a self-developed Bias-Tee is used and five diamonds are distributed evenly. The diamonds are arranged arbitrarily in their orientation in respect to the applied DC field which shall be measured. DC currents are varied from 0A to 8A. Nevertheless, the resulting function can above a threshold of approx. 1mT clearly show a linear dependence between current and measured magnetic field which is the theoretically expected ratio.

DLR/BMWK- Initiative - establishing a German industrial ecosystem for Quantum Computing

Dr. Uwe Müller,
Deutsches Zentrum für Luft- und Raumfahrt – QCI

The German Federal Ministry of Economics BMWK has provided the German Aerospace Center DLR with 740 million € until 2026 to build up competencies in the field of quantum computing (hardware, software, applications) and the technologies required for this together with partners from industry and startups. Eighty percent of the funds will go to industry, while DLR will use twenty percent for its own research. At two innovation centers based in Ulm and Hamburg, laboratories and offices are made available to industrial partners, and quantum computing hardware based on various platforms (NV centers, ion traps, photonic, neutral atoms, solid-state spins) will be provided there. With this close connection of research and science to industry, DLR supports Germany's way to an international top position in quantum computing. The presentation will provide an overview of the current status of activities in the initiative as well as of the planned hardware/software and application projects.



Hardware-Software-Codesign for Quantum Computers at DLR

Dr. Gary Schmiedinghoff,
Deutsches Zentrum für Luft- und Raumfahrt

Quantum computation is going through an exciting period of time. While the long-term goal for the coming decades are fault-tolerant quantum devices, noisy intermediate-scale quantum (NISQ) computers are already available today. To achieve quantum advantage with these devices, it is necessary to concurrently advance hardware platforms, algorithmic advances and software implementations.

In Hardware-Software-Codesign, quantum algorithms and their compilers are tailored to the specifications of the available hardware while the development of the hardware is adjusted towards the requirements of the algorithms and their real-world applications.

In this presentation, we will discuss the DLR approach towards Hardware-Software-Codesign in order to achieve a quantum advantage on a variety of different near-term quantum devices.

How to approach quantum computing for industrial needs using MAGIC

Dr. Michael Johanning,
eleQtron GmbH

Quantum computing holds the promise of tackling a range of everyday problems, unsolvable even for today's supercomputers, such as optimization problems in logistics or finance, as well as the modelling of materials and chemical compounds with dramatic impact on energy management and healthcare. Among the platforms pursued towards quantum computing, trapped ions are very promising due to their unrivalled reproducibility of identical qubits, large coherence times due to shielding from the environment and excellent control resulting in the best gates ever performed and the highest number of gates within the coherence time. In addition, substantially reduced gate overhead is achieved due to all-to-all connectivity. A daunting task for any quantum computing platform is to scale it from small proof of concept level to a size that it capable of solving problem sizes relevant for industrial needs, handling error correction. For trapped ions this involves the integration of control signals, as e.g lasers used for qubit control and the integration of of lasers can be challenging. The MAGIC scheme invented by a founder of eleQtron dramatically reduces the demands on laser performance and relies on qubit control based on microwave fields. It benefits from already accomplished miniaturization and integration of microwave technology and promises scaling towards hundreds of qubits.

From Lab to Industry: Magnetic Quantum Sensors for Industrial Applications

Dr. Robert Staacke, Quantum Technologies GmbH

Quantum sensors are common in scientific environments but almost non-existing in industry. One major difficulty is the transition from the lab to an industrial application where robustness, size and cost are often the most important factors.

To meet these requirements, our quantum sensors exploit the magnetic field dependence of the spin states of nitrogen defect centers in diamond and their fluorescence, while operating at room temperature and micro-wave-free.

As fiber coupled version, the sensor head is no thicker than a human hair, chemically inert, non-magnetic, non-conducting and thus perfectly galvanically isolated. In an alternative design, our sensor can be used as magnetic field camera with megapixel resolution and a field of view of several centimeters. Compared to conventional semiconductor sensors, this opens completely new areas of application in magnetic field sensor technology.

Quantum Computer for Industrial Applications

Prof. Dr. Jan Berend Meijer, Universität Leipzig

The presentation will address applications of quantum technology for the mass market. While many start-ups are still in the trail phase, some companies are already developing application-oriented concepts for the mass market.

The talk will also present a mobile room-temperature quantum computer and what consequences the imminent availability of such personal quantum computers (PQC) will have for the semiconductor industry. Finally, the talk presents examples of how modern automotive semicon-ductor manufacturers are meeting the resulting challenge using post-quantum cryptography (PQC) and quantum random number generators (QRNG).

Quantum Technologies

Superconducting Nanowire Single-Photon Detectors: Advances and Applications in QT and Industry

Martin Wolff, Pixel Photonics GmbH

Superconducting nanowire single-photon detectors (SNSPDs) have become a leading sensor technology for ultraviolet to mid-infrared light due to their high timing accuracy, low dark count rates and high detection efficiencies. By integrating SNSPDs on top of wideband nanophotonic waveguides, their application space expands through the photonic toolbox, allowing for the combination of additional quantum technologies on a monolithic platform.

Here, we present the integration of SNSPDs on a variety of photonic platforms, including silicon nitride, tantalum pentoxide and lithium niobate, and demonstrate their integration with active and passive photonic elements. By additionally combining waveguide-integrated SNSPDs with broadband and efficient optical interfaces, they empower out-of-lab applications, such as imaging in life science and quantum secure communication using photons.

Furthermore, we showcase the scalability of our detector design by increasing the number of detectors for individual optical addressable channels and multi-photon detection.

A mixed reality learning environment for acquiring basic competences in quantum technologies

Adrian Abazi,WWU Münster, Institute of Physics, AG Schuck, Integrated Quantum Technology

The growing field of quantum technologies in turn raises a demand for new quantum proficient personnel. Quantum physics is still widely seen as abstract and counterintuitive. Therefore, to meet this demand new teaching approaches are required.

Here we present a mixed reality quantum learning environment, consisting of a augmented reality (AR) enhanced real quantum optics experiment. Using AR-headsets holograms are rendered onto the setup in real time. The holograms perform different functions such as visualizing the physical model and measurement results. Other holograms recognise user input and act as a control system for the measurement apparatus.

Experiments such as measuring bell's inequality and quantum key distribution can be conducted with the learning environment. The environment is implemented in undergraduate lab courses and is being quantitatively evaluated at the time of writing.

Electrical excitation of color centers in phosphorus-doped diamond Schottky diodes

Florian Sledz, Universität Siegen, Laboratory of Nano-Optics

A robust single-photon source operating upon electrical injection at ambient condition is desirable for quantum technologies. Silicon-vacancy (SiV) color centers in diamond are promising candidates as their emission is concentrated in a narrow zero-phonon line with a short excited-state lifetime of ~1 ns. Creating the color centers in n-type diamond (phosphorus-doped) allows the implementation of a Schottky-diode configuration. This provides a simpler approach than the traditional complex diamond semiconductor junctions (e.g., p-i-n). Selective optical excitation allows addressing of single silicon-vacancy color centers while suppressing background from mainly nitrogen-vacancy (NV) defects created during Si ion implantation. This paves a way for the realization of the predicted bright electroluminescence of color centers.

Materials engineering as a key function for process development

Dr. Frank Neumann, Quality Centre of Competence, RWE Technology

Materials science and process development have always entered into a mutually beneficial symbiosis, with new materials expanding the horizons of process technology. Once a process was established, decisive efficiency increases and process development steps were initiated and implemented by materials with correspondingly improved properties.

This development is illustrated using various examples, especially from the field of energy technology. In addition, the article also provides an overview of how research and development at RWE Power is set up, especially in the field of materials technology, and what the current challenges are.

Energy

The I-TESS Project: Scalable Thermochemical Energy Storage, Development of a Novel Pilot Plant

Matthias Schmidt, Deutsches Zentrum für Luft- und Raumfahrt, Institut für Technische Thermodynamik

The heat demand of buildings still mainly depends on the combustion of fossil fuels and therefore accounts for almost 30 % of all yearly energy related CO2 emissions in Germany. Renewable heat supply for buildings, remains technologically challenging, since the highest demand occurs during the winter time when the production from renewable sources is very limited. The I-TESS project addressed the development of a thermo-chemical energy storage system, capable to overcome the seasonal discrepancy between excess renewable production and the intense thermal energy demand of district heating networks during the winter time.

The system is based on the reversible reaction of Ca(OH)2 to CaO and water vapour. The reaction is promising for a long-term energy storage system, due to several reasons: the storage period is free of energy losses, the energy density is several times higher than conventional thermal storage technologies and the storage material is very inexpensive and abundantly available. However for a cost efficient upscaling of the system into the MWh-capacity range a fundamental technological challenge remains. The realization of a suitable concept where the storage unit is detached from the reactor unit and both can be scaled and designed independently from each other.

Energy

Potentials in manufacturing and layer development for metallic bipolar plates

Maurizio Giorgio, Fraunhofer-Institut für Werkstoff- und Strahltechnik IWS

The energy transition leads to considerable and in some cases new demands on materials technology as well as the development of processes and process chains. In this context, technologies and materials face increasingly stringent requirements in terms of ecological and economic sustainability. Steel as a material for bipolar plates can offer some advantages, for example in terms of cost, weight and recyclability. With regard to high-rate processes, Fraunhofer IWS is investigating coil processes and is developing suitable technologies for this purpose. There is a particular need for the development of suitable layer systems to reduce the contact resistance and especially to improve the corrosion protection of the steel. Therefore, a coil-manufacturing concept for bipolar plates is presented with a focus on layer development. Here, two coating variants are compared, each from a batch and a coil process, and new development perspectives for coatings are shown.

Opportunities of High Throughput Spatial Atomic Layer Deposition in Energy Applications: do more with less!

Dr. Hindrik de Vries, SALD B.V.

SoLayTec, a spin off company of TNO, industrialized a dedicated spatial Atomic Layer Deposition (ALD) platform for the surface passivation of silicon solar cells. Spatial-ALD is a technology that produces very thin, conformal films with thickness control and composition at the atomic level. The sister company SALD B.V. founded in 2019 is focussing on novel applications of spatial-ALD. Hence, a more versatile “SALD platform” has been developed to enable robust handling and processing of rigid and flexible substrates.

In this talk I want to give an update of the progress on application development of spatial-ALD with a particular emphasis on energy applications. Our main focus at the moment is on the generation (solar cells), storage (batteries) and conversion (electrolyzers) of electricity. Applications in the energy domain require large scale production solutions and our novel SALD platform is specifically designed for such high throughput processing. Together with our German based partner Coatema, a dedicated roll-to-roll spatial ALD system is being developed for large scale industrial processing. Several examples of functional layers in large area devices will be discussed in more depth.

DNA origami nanostructures for antimicrobial therapy

Dr. Adrian Keller, Universität Paderborn, Technische und Makromolekulare Chemie

The DNA origami method enables the rapid and high-yield synthesis of fully biocompatible, biodegradable, and nontoxic nanostructures for applications in biomedicine. While DNA origami nanostructures have traditionally been employed in cancer therapy and diagnostics, the potential of DNA origami nanostructures to aid in the fight against infectious diseases has been recognized only recently. This presentation will summarize our recent and ongoing activities that explore applications of DNA origami nanostructures in antibiotic drug delivery and antimicrobial photodynamic therapy. The loading of the DNA origami nanostructures with conventional photosensitizers and their covalent modification with established antibiotics will be presented. Both approaches are tested against model bacteria and the most promising formulations are identified. Potential strategies for a further enhancement of antimicrobial activity will be discussed.

Health

Carbon nanotubes as powerful platform for optical biosensing

Julia Ackermann, Fraunhofer Institut für Mikroelektronische Schaltungen und Systeme, Biomedical Nanosensors

Single-walled carbon nanotubes (SWCNTs) are an emerging material for chemical imaging, in-situ diagnostics, and process control. Their near-infrared (NIR, 870 – 1700 nm) fluorescence is characterized by an ultralow background of biological samples. Chemical modification enables molecular recognition of various analytes with high sensitivity and selectivity.

We developed a SWCNT-based sensor paint to map dynamic dopamine release from neurons with unprecedented spatio-temporal resolution. Since NIR imaging requires specialized cameras, we furthermore developed an approach to enable SWCNT-based NIR biosensing with high-resolution standard cameras. We efficiently separated (6,4)-SWCNTs (880 nm) from commercial SWCNT mixtures and tailored them as dopamine sensors using specific DNA sequences. We achieved fast imaging (< 50 ms) with standard cameras and these sensors were 1.7-fold brighter and 7.5x more sensitive to the neurotransmitter dopamine. Thus, the assembly of biosensors from (6,4)-SWCNTs combines the advantages of nanosensors working in the NIR with the sensitivity of standard cameras.

Health

Therapy enhancing effects of metal nanoparticles in proton therapy are ruled by surface chemistry at the nano-water-interface and range effects on the nanoscale

Christoph Rehbock, Universität Duisburg-Essen, Technische Chemie I

We studied the effect of colloidal Pt and Au nanoparticles from laser ablation in liquids as radiosensitizers on generation of reactive oxygen species (ROS) in water phantoms upon irradiation with protons. We find a higher efficiency of smaller 5 nm AuNP in contrast to their 30 nm counterparts even at the same total surface area, which points at effects driven by surface chemistry. This is complemented by the fact that PtNP were more active than AuNP, linked to the higher catalytic activity of Pt surfaces in generation of ROS. Furthermore, the presence of cationic polyethyleneimine (PEI) ligands on the nanoparticles yields significant enhancement of DNA breakage. This is because PEI-NP conjugates are electrostatically attracted to DNA. This reduces the distance between NP and DNA and verifies that distances between NP and DNA on the nanoscale are critical for the efficiency of NP radiosensitizers in proton therapy.

Health

Multi-target electrochemical aptamer-based biosensors for accurate disease diagnosis

Dr. Gabriela Figueroa Miaranda, Forschungszentrum Jülich, Institute of Biological Information Processing, Bioelectronics (IBI-3)

At our group, we work on the developed of quantitative disease biosensors with enhanced accuracy by implementing novel and robust aptamer receptor molecules. Aptamers, here single strand DNA molecules, bind with high specificity to their target analytes allowing a reliable biomarker detection. With the utilization of multi-electrode arrays fabricated on flexible polymer substrate (flexMEAs), we manufactured in a simple way affordable multi-target biosensors with first application for malaria biomarker detection. The multi-target biosensor contains 4 different immobilized aptamer receptors that provide highly redundant signals from individually addressable electrodes that can be easily processed as simple logic gates helping to distinguish between different types of malaria parasites. Currently, we work on the transfer of the biosensor technology to the detection of other infectious diseases such as COVID-19, and on the development of a portable measuring unit with data transfer capability for future implementation as Point-of-Care tests.

Health

A high-effective microbicidal coating to control the indirect microbial transmission

Dr. Alessandra Scano, Department of Chemical and Geological Sciences, University of Cagliari and Cagliari Research Unit of the National Consortium of Materials Science and Technology (INSTM), Cagliari, Italy

We present our solution to overcome the limits of classical disinfection: a colorless, transparent, biocompatible, and easy to lay microbicidal coating (WO2021255496A1 patent). It resulted in 100% bactericidal activity against Gram negative (E. coli) and positive (S. aureus and MRSA) bacteria, and it was also highly effective in reducing the initial infectious load of the alphacoronavirus 229E; boasting an action which lasts over time. MTT test in A375 cells showed no toxicity after a 24h exposure time.

The coating showed a good adhesion on different material surfaces, keeping its microbicidal activity. Our excellent results open up the way to the use of the microbicidal coating for relevant applications such as the medical sector.

Metal-organic chemical vapor deposition of two-dimensional materials and their heterostructures for industrial applications

Prof. Dr.-Ing. Michael Heuken, AIXTRON SE

In this talk we will present recent progress on growth of two-dimensional (2D) materials such as transition-metal dichalcogenides, graphene and hexagonal boron nitride in commercial AIXTRON reactors. Whilst mechanically exfoliated 2D films have been used extensively to show proof-of-concept of various device applications, problems associated with transfer processes make such an approach difficult to implement on an industrial scale. On the other hand, metal-organic chemical vapor deposition (MOCVD) enables synthesis of 2D materials on the wafer scale, as well as provide a route for 2D heterostructures with well-defined interfaces, making MOCVD the technique of choice when high volume manufacturing is considered.

Upscaled production of Carbon Nanomembranes

Dr. Nikolaus Meyerbröker, CNM-Technologies GmbH

Carbon Nanomembranes (CNMs) are a unique class of 2-dimensional materials offering an outstanding permeability of water paired with a high rejection of organic molecules, anions and cations. For commercial water filtration applications, CNM Technologies has developed a concept of a composite membrane consisting of the free-standing nanometre-thin CNM and a mechanical stable, porous support. We currently produce in a bench-scale roll-to-roll process on 25 mm wide ribbons, which are welded into tubular membranes, which are implemented into pilot demonstrations of demanding water filtration tasks. The next step involves the build-up of a pilot production with a capacity of several 10,000 square metres a year.

Advanced Materials

Laser-assisted synthesis of metal-ceramic composite powders for laser powder bed fusion of oxide dispersion strengthened steels

Mareen Goßling, Bergische Universität Wuppertal,
Materials Science and Additive Manufacturing

Oxide dispersion strengthened (ODS) alloys are a prominent representative of a composite material, highly demanded in high temperature and corrosive environments. Additive manufacturing technologies allow the economical utilization of this cost-intensive material by direct near-net-shaped manufacturing significantly expanding the range of applications. In this study, the generation of oxide nanoparticles (ZrO2) by the laser-based ablation in liquids (LAL) from a Zr metal target and subsequent deposition on gas atomized steel powder (Fe-20Cr (wt.%)) an ODS composite powder material suitable for the additive manufacturing process of laser powder bed fusion (PBF-L/M) is produced. Thus, a complete laser-based additive manufacturing chain for metal-ceramic composites from powder particle to a final component is presented.

Improving the magnetic properties of additively manufactured permanent magnets with nanofunctionalization

Philipp Gabriel, University Duisburg-Essen, TC1

Permanent magnets play an essential role in everyday and industrial applications. However, the rare-earth elements represent critical factors, and novel technologies that minimize the use of such elements in permanent magnets need to be developed immediately. Laser powder bed fusion (PBF-LB) is an established additive manufacturing method allowing the production of complex permanent magnets under low waste conditions, which will reduce the amount of rare earth elements needed. However, PBF-LB of permanent magnets typically results in low coercivity, demanding new techniques to overcome this issue.

Here, we address this issue by nano-additivation of the permanent magnet feedstock material and found improved magnetic behavior of the as-built parts. We investigate and characterize the whole process chain, from the nanoparticle synthesis to the nano-additivated magnetic powder and the properties of the printed parts.

Dark exciton anti-funneling in inhomogeneously strained monolayer transition metal dichalcogenides

Dr. Robert Schmidt, Westfälische Wilhelms-Universität (WWU) Münster, Institute of Physics

Strain engineering of monolayer transition metal dichalcogenides (TMDs) can be used to tune their optical properties, such as the transition energy, exciton-phonon coupling, Stokes shift, and exciton diffusion coefficient.

Here, we demonstrate how excitons move in an inhomogeneous strain landscape by measuring their spatially resolved photoluminescence dynamics. This allows us to trace their path in space and time. Due to the redshift of the exciton resonances with applied strain, it is expected that excitons move towards high-strain regions – the so-called "funneling" effect. However, in the case of monolayer WS2, we observe exactly the opposite effect ("anti-funneling"). We attribute this behavior to the drift of momentum-dark KΛ excitons, which, in contrast to bright excitons, shift to higher energies with strain.

Our study yields new insights into the role of momentum-dark excitons for the dynamics in monolayer TMDs and provides crucial design guidelines for TMD devices based on exciton transport.

Easy understanding and measurement of Zetapotential

Dr. Daniel Hagmeyer, Microtrac Retsch GmbH

When measuring zeta potential, a lot of problems like reproducibility, dilution and more can occur.

These issues mainly apply to analyses using classical electrophoretic methods to measure zeta potential. The mechanical measurement of zeta potential with the streaming potential method does not have the problems described. Streaming potential determines five parameters directly and simultaneously within a few seconds: Zeta potential, streaming potential, conductivity, pH value and temperature. This gives a complete overview of the sample, as zeta potential, pH value and conductivity are closely linked. The easy-to-use „Mix and Measure" method, allows zeta potential measurements and very fast titrations in a time-saving manner. The particle size range for zeta potential measurements is significantly higher, from 0.3 nm to 300 µm. Also, the sample concentration can be up to 40vol.%.

Two-Dimensional Materials for Future Electronics – Made in NRW

Prof. Dr.-Ing. Max C. Lemme, AMO GmbH

The class of two-dimensional (2D) materials has been heavily researched over the past two decades. Now 2D materials appear ready to enter various areas of microelectronics. I will discuss some of the potential applications in the semiconductor field, from nanometer-scale transistors that extend Moore's Law, to optoelectronics and photonics for communication and sensing, to future device concepts for neuromorphic and quantum computing. Several specific examples will be shown based on our recent experiments on optoelectronic, nanoelectromechanical and neuromorphic devices. There are, however, several key bottlenecks towards industrial manufacturing. These will be discussed in the context of the work carried out in the region within the European 2D Material Experimental Pilot Line (2D-EPL). This EU project recently completed the world's first multi-project wafer run for graphene devices at AMO, with more to come. Finally, the activities of the BMBF Cluster4Future NeuroSys will be reviewed.

Electronics

Memristor Devices beyond Memory Applications

Prof. Dr.-Ing. Stefan Tappertzhofen, Technische Universität Dortmund, Lehrstuhl für Mikro- und Nanoelektronik

Memristors and memristive systems have been theoretically introduced by L. Chua in 1971 as the forth passive circuit element. First experimental realizations of nanoscale memristive devices have been demonstrated in the 2000s. These devices were suggested as future replacement of state-of-the-art Flash based non-volatile memories. However, due to their non-linear switching dynamics and low power consumption they also attracted high attention aside of memory operation including for example in neuromorphics and in-memory computing. This talk reviews latest advances of application of memristive devices for nano-plasmonics and sensorics.

Electronics

Enabling advanced Photonics and Optoelectronics Applications: About perfectioning large Area photonic Waveguide and Metalens Nanofabrication by Electron Beam Lithography

Dr. Frank Nouvertné, Raith GmbH

Optical waveguide performance and corresponding signal attenuation over its entire length scales with the number and size of scattering sites that emerge due to line edge roughness (LER) and stitching errors in EBL and that need to be minimized for optimum device quality. A new method for low LER waveguide nanofabrication including long tapers, seamlessly fabricated without stitching errors, is presented.

Corresponding design data file sizes of ~cm2 sized metalenses can grow up to several hundreds of GB making it extremely challenging if not impossible to be handled with conventional EBL systems. We present an enabling, innovative, and extremely efficient EBL workflow that circumvents the necessity for generating GDSII designs by exploiting the algorithmic (formula-based) description of the metalens pattern - and from this creating an almost zero overhead exposure pixel stream “on-the-fly”.

Graphene Time-of-Flight Photodetector for 3D Imaging Applications

Paul Kienitz, Universität Siegen, Graphen-basierte Nanotechnologie

Increasing performance in industrial automation, automotive industry, robotics or consumer electronics applications require a new generation of enhanced high-performance 3D imaging sensors. The novel graphene photodetector presented here exploits highly sensitive intrinsic optoelectronic frequency mixing that is utilized for indirect time-of-flight (ToF) distance measurements. Operation frequencies above 3.8 MHz up to a distance of at least 1 m with an average accuracy of 41.7 mm are demonstrated. This technology features easy back-end integration on top of CMOS electronics and achieves geometric fill factors close to 100% due to its scalable More than Moore detector approach. High carrier mobilities in graphene can further enable significant bandwidth and depth resolution enhancements compared to current silicon technology.

Nano meets energy – the SuperLink project

Prof. Michael Bäcker, MaTech-Consult GmbH, ivSupra e.V., NMWP.NRW e.V.

High temperature superconducting cables (HTSL) could form a vital link in the energy turnaround strategy, as they enable easier and shorter installation time, low impact on the environment and high power carrying capacity without significant energy losses.

In 2022, a consortium of partners from science and industry with strong participation of NRW started the SuperLink-project funded by Germany's Ministry for Economic affairs and Energy. SuperLink is expected to become a 12 km link with a power rating of 500 MW being integrated into Munich's high-voltage distribution grid.

Beyond the enabling of the transition to renewable energy in dense urban areas due to the high power-to-size ratio superconducting cables are also considered as an optimum solution for transnational European grids for the transmission of volatile renewable energy.

Innovative use of rCF in aerospace applications

Rebecca Emmerich, RWTH Aachen University, Institut für Textiltechnik Aachen

Due to the high emissions during the use phase of aircrafts the aerospace sector is under pressure. To reduce the emissions, weight reduction is the most important factor. Here lightweight material such as carbon fibre reinforced plastics are being used for years. For the fibrous waste that occurs during production and in the end-of-life phase, new processes and applications are needed, as pressure from the public, economic and ecologic stakeholders is rising. Therefore, a concept for sandwich panels for aircraft cabins floors is developed, where suitable textile reinforcements from recycled carbon fibres are developed to substitute virgin carbon fibres within the top layers. An additional sustainable cork layer is being investigated in order to improve the impact resistance of these panels.

NRW Innovation Projects

Digital Twins meets High-Tech

Dr. Matthias Grosch, NMWP Management GmbH

The ongoing digitalisation of various industrial areas profits from many novel technologies. The technology of Digital Twinning is being rolled out and increases the efficiency of various industrial sectors already. Having its history in the space sector, today many application fields for Digital Twins (DTs) are explored. And not only do the fields of application rise, but also latest technological advancements in the key enabling technologies (KET) of nanosystems, microelectronics and photonics (and quantum technologies) are applied in Digital Twins.

The talk will briefly state the definition of a Digital Twin and present the implementation of several KETs in DTs. The potential and benefits of well applied DTs will be presented along use cases. Also lessons learned in the EMR project "Digital Twin Academy" will be presented.

The Einstein Telescope – subsurface research for the stars

Prof. Dr. rer. nat. Achim Stahl, RWTH Aachen University, Lehrstuhl für Experimentalphysik III B

Gravitational waves are tiny ripples in the fabric of space, emitted by compact massive objects, such as black holes, neutron stars, or super novae. They tell us about the evolution of the universe back the earliest observable times. Gravitational waves can be detected with sophisticated laser interferometers with kilometre-long arms. The Einstein Telescope is the European project of a next generation of gravitational wave detectors. It might be constructed in the Euregio between the Netherlands, Belgium and Germany.

I will report on the astrophysical perspectives and the technology behind the telescope. A technology that allows the detection of changes in distances far below the nanometre scale.

NRW Innovation Projects

From Fundamentals to industrial application – the production of microstructured optics and their relevance for the business location North Rhine-Westphalia

Prof. Dr.-Ing. Thomas Bergs, Fraunhofer IPT / WZL der RWTH Aachen University, Technologie der Fertigungsverfahren

Microstructures exhibit fascinating properties. Especially in combination with light, they are used for various purposes. For example, moth-eye structures are a promising way to avoid the today used AR-coatings on precision optics.

Efficient production of the structured components is key for applications aside from science and research. The technology Precision Glass Molding is able to combine high-precision and high-volume production. It allows the macroscopic molding and the manufacturing of microscopic structures to be carried out simultaneously.

This presentation provides insights into the technology itself and its transfer into industry: The »Aachen Center for Optics Production (ACOP)« is a thriving consortium of (local) high-tech companies working hand in hand under the guidance of Fraunhofer IPT. Innovations from science and research – such as microstructured optics – find their direct way into application. The center demonstrates the success of structural change in North Rhine-Westphalia through a close collaboration of academia and industry.

Photonics

Laser based micro and nano structuring for battery and fuel cell manufacturing

Prof. Dr.-Ing. Arnold Gillner, Fraunhofer-Institut für Lasertechnik ILT

Batteries and fuel cells are central elements of a future energy system that can be used to promote and implement a climate-neutral energy policy. While batteries are used primarily in the field of mobility and generally in drive technology, fuel cells and electrolysers serve to establish and operate a hydrogen economy that can be used to make the transition from fossil fuels to a sustainable energy technology.

Laser processes for micro- and nanoscale surface structuring can be used to improve the fast-charging capability and stability of the electrodes in batteries, enabling shorter diffusion paths for the Li-ions. In the case of fuel cells, the surface structuring serves to improve the media flow and to increase the catalyst area, thus significantly increasing the system efficiency. For large scale processing a new roll-to-roll system will be presented in which a high power ultra short pulsed laser system is used.

Photonics

Photonic Black-Box Optimization Through Reinforcement Learning

Marco Butz, Center for Soft Nanoscience, Münster

Photonic integrated circuits (PICs) have led to a significant increase in the performance of classical information and communication technology in recent years, which is inspiring a similar transition of complex quantum photonic technology from free space setups to PICs. To satisfy the challenging requirements of corresponding PICs in footprint, performance, and even novel functionalities new design tools are needed because current algorithms suffer from reliance issues of convex optimization methods in non-convex environments or yield structures not accessible in even most advanced nanofabrication processes. Here, we show a novel inverse-design method based on reinforcement learning, capable of producing highly efficient, pixel-discrete nanophotonic devices with any desired functionality and small footprints. Freely configurable design constraints can be realized through multiple interfaces enabling manipulation of the internal data flow. To demonstrate the capabilities of our method we show the fully automated design of a silicon-on-insulator waveguide-mode converter with > 95% conversion efficiency.

New Material Properties and Production Processes Using Tailored Laser Beam Shapes

Dirk Hauschild, Focuslight Technologies Inc.

The use of laser sources for material processing and smart sensing is one of the key technologies of the 21st century. The generation of laser light within a wide spectral range and continuous scaling of power is the basis to use laser in challenging high-end applications and low-cost consumer applications as well. In the past 10 years the focus on the generation of laser light has been supplemented with the tasks how to make the laser power more compatible with production processes and the productivity needed to use the laser with the maximum economical and technical benefits for the individual use cases. Within the presentation we will introduce the shaping and scaling technologies using laser sources to become compatible with the required light-material interaction and productivity to generate a maximum value for the users.

Quick and cool – cold-brewed coffee within minutes

Dr. Anna Rosa Ziefuss, Universität Duisbug-Essen, Technische Chemie I

In recent years, cold brew coffee has become increasingly popular, with over 460% retail growth. Its production is typically a process that takes several hours due to the day-long brewing time. This causes inconvenience, requires patience, and slows down recipe development.

Here we present a route by which an ultrashort-pulsed laser produces cold-brew coffee in only three minutes. Dispersed coffee powder in water, irradiated by the picosecond laser, is compared with commercially cold brew coffee and hot brewed filter coffee. To rule out undesirable by-product formation, we examined the liquid and gas phase by liquid-phase and headspace gas chromatography with mass spectroscopy and found no relevant difference to cold-brewed coffee. While the cold- and laser-brewed coffee show a comparable headspace and liquid-phase chemical composition, the hot-brewed variant bears a lower caffeine and trigonelline content in the liquid phase. Moreover, laser-brewing is two orders more time-efficient in caffeine extraction.

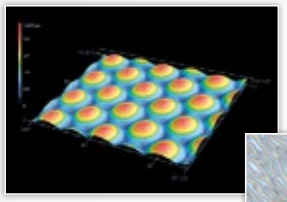
Square Wave Phase-Sensitive Detection for NV Magnetometry

Ludwig Horsthemke, FH Münster – University of Applied Sciences, Steinfurt

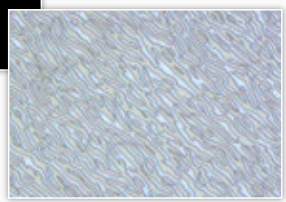
A compact lock-in amplifier for the application of all-optical magnetometry using NV-centers in diamonds has been realized. The system features a squarewave excitation and synchronous rectification in the analog domain allowing for a simple and low-cost implementation. In a given setup the amplifier exhibits an average noise floor of 3.29 µV/√Hz at a system frequency of $\omega ref /2\pi$ = 500 kHz within its bandwidth f3dB = 14.6 kHz. The noise floor is comparable to one obtained from a commercial lock-in amplifier, suggesting the presented circuit not to be the limiting factor.

System Solutions
From Micro- to Nanofabrication

LASER

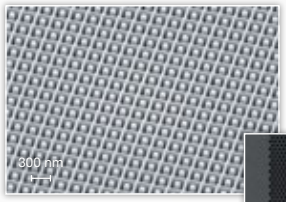


Grayscale Lithography

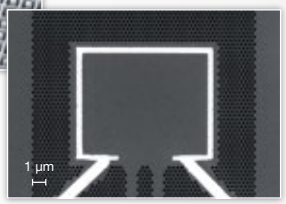


Augmented/ Virtual Reality

FIB

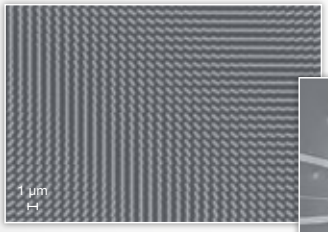


Metasurfaces

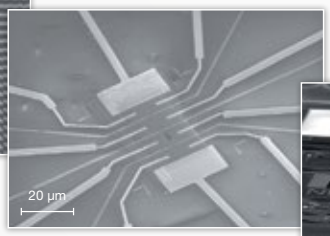


Phononic Engineering

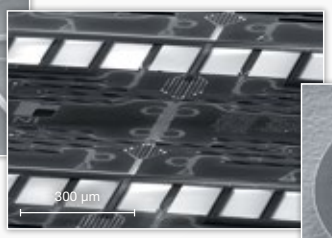
E-BEAM



Photonics



Nanoscale Science



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The NRW Nano-Conference offers a dedicated Poster Session addressing in particular the Young Academic Community. Young scientists have the opportunity to present their latest research, share their ideas, network with each other and potentially meet their prospective employer. Out of nearly 100 posters the three best presentations by Young Academics will be identified by a jury of experts. The winners are honored during the Award Ceremony on the second conference day.

Author/Institute/Company	Title	No.
Annika Adick Westfälische Wilhelms-Universität Münster	The nanoparticle albumin bound™ Technology: From Abraxane® to Screening Platform	82
Raphael Ahlmann Technische Universität Dortmund	Memristor-based gas sensors for the detection of hydrogen and oxidizing gases	40
Farzana Akther Universität Siegen	Hybrid Quantum System Based on Plasmon Coupled Diamond Nanocrystals	14
Aysha Awan Universität Siegen	Tuning the photoluminescence of porous silicon single layers using different oxidation methods	42
Patrick Barthel Universität Siegen"	Robust Two-Qubit Gates Using Pulsed Dynamical Decoupling	15
Tim Robertino Baumann Universität Bielefeld	Investigation in µ-filtration for water purification	94
Malte Becher **Ruhr-Universität Bochum**	Ultrashort pulse Laser processing of 2D materials	34
Sarah Emily Beck Technische Universität Dortmund	Spectroscopic ellipsometry analysis of PVD- and CVD-Silicon thin-films as an indication for electron mobility	41
Yannick Beckmann **Universität Duisburg-Essen**	Scalable Photodetectors Based on Directly Grown 2D Material Heterostructures	43
Jannis Bensmann Westfälische Wilhelms-Universität Münster	Nanoimprint lithography for creating inhomogeneous strain profiles in 2D materials	44
Omkar Bhalerao AMO GmbH	Plasmonic Mach-Zehnder Interferometers Based On SU-8 Waveguides	95
Leonard Böhm Westfälische Hochschule Gelsenkirchen	Finding Ni-Mo: Electrodeposition of Ni-Mo catalysts with optimized composition for hydrogen evolution reaction in AEN`M-electrolysis	02
Marco Brand Westfälische Hochschule Gelsenkirchen Bocholt Recklinghausen	Microstructure and corrosion behavior of stainless steel (316L) additively manufactured by Directed Energy Deposition-Arc	45

Author/Institute/Company	Title	No.
Tristan Brückner **Fraunhofer-Institut für Schicht- und Oberflächentechnik IST**	Self-Organizing Ti-Si-B-C-N Nanocomposite Multiphase Coatings for Wear Reduction	46
Benjamin Bürger Universität Siegen	An ion-trap chip with integrated elements for a scalable quantum processor	16
Maximilian Cieluch Westfälische Hochschule Gelsenkirchen	In-situ characterisation of electrodeposited catalyst-coated substrates and glass fibre reinforced PFSA/ssPS composite membranes as membrane-electrode-assemblies for PEMWE	03
Nicola Cusick Universität Siegen	Smart stealth nanocarriers encapsulating photosensitizers for targeted antibacterial activity in wound dressings	83
Tamara Czerny Universität Duisburg-Essen	Narrowband Photoconductivity through the Excitonic Resonance in 2D Perovskites	35
Dr. Jörg Debus Technische Universität Dortmund	Structural-chemical analysis of the transfer material at 100Cr6 surfaces tribologically worn against element-modified MoS2 films	80
Dr. Jörg Debus **Technische Universität Dortmund**	Tribologically induced changes in the molecular structure of simulated human body fluid at hip-implant taper junctions	81
Julia Demmer Hochschule Niederrhein	Quantum dot-based electro-luminescent textiles	36
Robert Epkenhans Universität Bielefeld	Measuring of nonlinear electrophoresis with alternating voltages	84
Elham Esteki Universität Siegen	Dressed 171Yb+ Hyperfine Qubits in a Multi-layer Planar Ion Trap	17
Ardeshir Esteki RWTH Aachen University	Damage-free deposition of AlON high-K dielectrics on graphene by plasma enhanced atomic layer deposition	37
Dr. Assegid Flatae **Universität Siegen**	Vector Magnetometry Based on Polarimetric Optically Detected Magnetic Resonance	18
Paolo Fortugno Universität Duisburg-Essen	Novel aerosol-based approach towards mesoporous silica nanoparticles	96
Vanessa Frettlöh gemeinnützige KIMW Forschungs-GmbH	Process-integrated and sustainable deposit, wear and corrosion protection of tool surfaces in plastics processing by CVD coatings	47
Jonas Frühling Fraunhofer-Institut für Lasertechnik ILT	Laser-based crystallization of yttrium-doped barium zirconate for Solid Oxide Fuel Cells	04

Poster Exhibition

Author/Institute/Company	Title	No.
Sandra Gellner Hochschule Niederrhein	Colour variation of Light-Emitting Electrochemical Cells by Implementation of Quantum Dots	19
Lars Gierschner Hochschule Niederrhein	Wearable healthcare sensor-system for the treatment of patients with Diabetic Foot Syndrome	38
Timo Gräßer Technische Universität Dortmund	Simulating infinite temperature spin dynamics by a dynamic mean-field theory	20
Dr. Alex Greilich Technische Universität Dortmund	Spin noise spectroscopy	21
Michael Gutnikov Technische Universität Dortmund	Angle-resolved photoemission study of organic molecules on 2D antiferromagnetic metal phosphorus trisulfides	48
Patrick Häuser Universität Duisburg-Essen	FIB/TEM of a freestanding GaN Nanowire grown by Polarity- and Site-Controlled Growth	49
Jacqueline Hausherr Universitätsklinikum Essen AöR	Using a perfluoro decalin nanoemulsion in a cardiomyocyte in vitro model of ischemia-reperfusion injury	85
Andreas Heller FH Münster	Sim-to-Real transition for estimating agitation Efficiencies of Biogas Plants	05
Sarah Hester Westfälische Wilhelms-Universität Münster“	Triglyceride-filled albumin nanocapsules: A new possibility to formulate poorly water-soluble drug candidates	86
Renée Hoffmann Universität Siegen	Thermally triggered cell deatchment from end-group functionalised thermoresponsive polymer brushes	50
Patrick Huber Universität Siegen	A quantum perceptron gate and a classical Toffoli gate with microwave-driven trapped ions	22
Tim Hülser Institut für Energie und Umwelttechnik e.V. (IUTA)	Laser generated surface oxidized iridium nanoparticles decorated on Boron-doped silicon ultrasonically deposited on titanium substrate as electrocatalysts for the oxygen evolution reaction	51
Julia Jagosz Ruhr-Universität Bochum	Wafer-scale growth of polycrystalline MoS2 by low-temperature PEALD on SiO2/Si and glass	52
Vikas Jangra RWTH Aachen University	Laser Induced Reduction of the Metal-Graphene Contact Resistivity	97
Kawaljit Kaur Universität Siegen	Antimicrobial photodynamic therapy with Ru(II)-based nanocarriers for eradication of antimicrobial-resistant bacteria	87
Umut Kaya Universität Duisburg-Essen	PECVD-grown graphene as transparent conductive electrode in Nitride-Based UV-LEDs	53

Author/Institute/Company	Title	No.
Sana Khan AMO GmbH	Understanding Charge/Energy Dynamics from Halide Perovskite nanocubes/Semiconductor Heterostructures	06
Evelyn Kimmerle RWTH Aachen University	Exploring Photonic Quantum Computing	23
Julia Kölbel Elmos Semiconductor SE	Semiconductor-based Quantum Random Number Generator	24
Florian Köppen Universität Siegen	Towards solving Computer Vision optimisation problems on an ion-trap-based quantum computer	25
Robin Kress Universität Duisburg-Essen	THz-Antennas for InP RTD-Emitters	39
Jan Lino Kricke Bergische Universität Wuppertal	Uniaxial Assembly of FeNi Nanoparticles Enables Miniaturized Magnetic Actuators by Vat Photopolymerization	54
Benedikt Kruse Universität Duisburg-Essen	Synthesis and cytotoxicity of doxorubicin-functionalized ultrasmall gold nanoparticles	88
Dr. Yurii Kutovyi Forschungszentrum Jülich GmbH	Shadow-wall epitaxy for all-in-situ fabrication of compound-semiconductor-based nanodevices	26
Jimin Lee RWTH Aachen University	Co-planar Stripline Based On-Chip Terahertz Sensor With Interchangeable Substrates for Two-Dimensional Material Analysis	55
Andre Löchte FH Münster	Electrochemical Model of a Rechargeable Zinc-Air Cell	01
Viktor Mackert ZBT - Zentrum für Brennstoffzellentechnik GmbH	Effects of frost exposure on nano- and microstructure of the membrane-electrode assembly in PEM Fuel Cells	56
Jan Meier Interzero Plastics Recycling	Gasification of packaging waste residues as an alternative to incineration – An insight from the waste management industry	07
Dr. Steffen Michaelis Westfälische Wilhelms-Universität Münster	Ultra-low-fluorescence 3D-printed microlenses for efficient narrow-beam single-photon sources	27
Dr. Maryam Mohammadi AMO GmbH	Toward single photon sources based on 2D metal-organic chalcogenolates (MOCs)	57
Paul Valerian Möllers Westfälische Wilhelms-Universität Münster	Chirality-Induced Electron Spin Polarization in Chiral CuO and CoO	08
Dr. David Mueller Forschungszentrum Jülich GmbH	Shining light on deposition processes of functional materials	58

Poster Exhibition

Author/Institute/Company	Title	No.
Ann-Kathrin Müller RWTH Aachen University	Building a heterogeneous quantum network	28
Henrik Myja Universität Duisburg-Essen	Scalable light emitting devices based on MOCVD grown WS2 monolayers	59
Babita Negi RWTH Aachen University	Temperature dependent optoelectronic properties of two-dimensional MoS2 based photodetectors	60
Nour Negm AMO GmbH	Waveguide-integrated thermal infrared Graphene emitter	61
Dr. Viraj Nirwan Hochschule Rhein-Waal	Quantum dots templated hybrid nanofibers fabricated via electrospinning	62
Fabian Nocke University Hospital Essen	A new stable emulsion with a mixed shell composition for oxygen delivery	89
Markus Nünnerich Universität Siegen	Cooling 171Yb+- ions in a magnetic field gradient with magnetic field offsets	29
Simon Öchsner TH Köln	Development of Electrophotography based 3D printing Process	63
Shayan Parhizkar AMO GmbH	2D Platinum Diselenide for Integrated Optoelectronics	64
Hemangi Patel Deutsches Zentrum für Luft- und Raumfahrt	Carbon aerogels for battery applications	65
Marina Penzel Universitätsklinikum Essen	Optimization of the stability of an albumin-based perfluorocarbon emulsion by changing the synthesis parameters	90
Agata Piacentini AMO GmbH	Stable Al2O3 encapsulation of MoS2-FETs enabled by CVD grown h-BN	66
Dr. Apurba Ray Institute of Materials Research, German Aerospace Center (DLR)	All-Solid Supercapacitors for Aerospace and Aircraft applications	09
Christopher Rojas CNM Technologies GmbH	Improving metal anode batteries performance by anode and separator interfaces modification with Carbon Nanomembranes	10
Dr. Elena Rozas Technische Universität Dortmund	Exploring quantum coherence dynamics in polariton condensates	30
Jasper Ruhkopf AMO GmbH	Graphene diffusion barrier for direct methanol fuel cells	67
Dr. Alessandra Scano University of Cagliari	A high-effective microbicidal coating to control the indirect microbial transmission	68

Author/Institute/Company	Title	No.
Robert Schmidt Westfälische Wilhelms-Universität Münster	Dark exciton anti-funneling in inhomogeneously strained monolayer transition metal dichalcogenides	69
Dr.-Ing. Philip Schmitt Ruhr-Universität Bochum	Self-sufficient measurement acquisition chains with non-volatile analog memories for condition monitoring applications	98
Thomas Schneiders Institut für Textiltechnik der RWTH Aachen University	Improving the adhesion of polymer nanofibres to nitinol for stent applications	91
Joshua Schumacher Universität Siegen	Synthesis and characterization of a polymer brush prodrug system	70
Eui-young Shin Deutsches Textilforschungszentrum Nord-West gGmbH	TEXTILE SUPERCAPACITORS BASED ON CARBON NANOFIBERS (CNFs) FROM POLYACRYLONITRILE (PAN) PRECURSORS AS ENERGY STORAGE DEVICE	11
Hendrik Siebeneich Universität Siegen	Segmented multi-ion trap for transportable optical clock	31
Radhakant Singh AMO GmbH	Aluminium Nitride Waveguides for Integrated Photonics	32
Leon Spee Universität Duisburg-Essen	Photo-Gating induced Highly Responsive 2D/2D TMDC/Perovskite photodetector	71
Kai Steffens Universität zu Köln	Flexible Hybrid Silica-Aerogels: Studying the Influences of Different Geometries and Shapes	72
Maximilian Steinhorst Fraunhofer-Institut für Werkstoff- und Strahltechnik IWS	Effect of interlayer thickness on the properties of carbon-based coatings for metallic bipolar plates	73
Jan-Eric Sydow University Hospital Essen, University of Duisburg-Essen	Interactions between artificial oxygen carriers and erythrocytes	92
Linda Tchuendem Institut für Physiologie, IG 1	Do primary human macrophages (PHM) and murine J774 macrophages interact differently with albumin-derived perfluorocarbon-based artificial oxygen carriers (A –AOCs)?	93
Tobias Tertel Universitätsklinikum Essen	Single EV analysis by imaging flow cytometry and identification of new biomarkers	99
Naghmeh Torabi RWTH Aachen University	Enhancing Graphene-Based Detection through a Planar Antenna	74
Lukas Völkel RWTH Aachen University	2D Hexagonal Boron Nitride Threshold Memristors with Nickel Electrodes	75

Author/Institute/Company	Title	No.
Dr. Richard von Goetze Interzero Plastics Recycling	Sortierung für Chemisches Recycling von LVP Resten	76
Timo Wagner Universität Duisburg-Essen	Changing surface morphology and chemistry by scalable atmospheric pressure plasma treatment	12
Leander Willeke Ruhr-Universität Bochum	Low-temperature ALD and ALE processes for advanced integration of 2D materials in an industrial scale	77
Felix Winters FH Münster	Electrochemical Model of a Rechargeable Zinc-Air Cell	13
Aydan Yadigarli Universität Siegen	Adsorption Differences of Organic Molecules on the Metal Oxide Surfaces	78
Pedram Yaghoubi Universität Siegen	Sympathetic Cooling of Ytterbium Ions Using Sub-Doppler Cooled Barium Ions in a Micro-Structured Segmented Linear Paul Trap	33
Dr. Zhen Yao University of Bielefeld	Carbon nanomembranes fabricated from amorphous molecular layers	79

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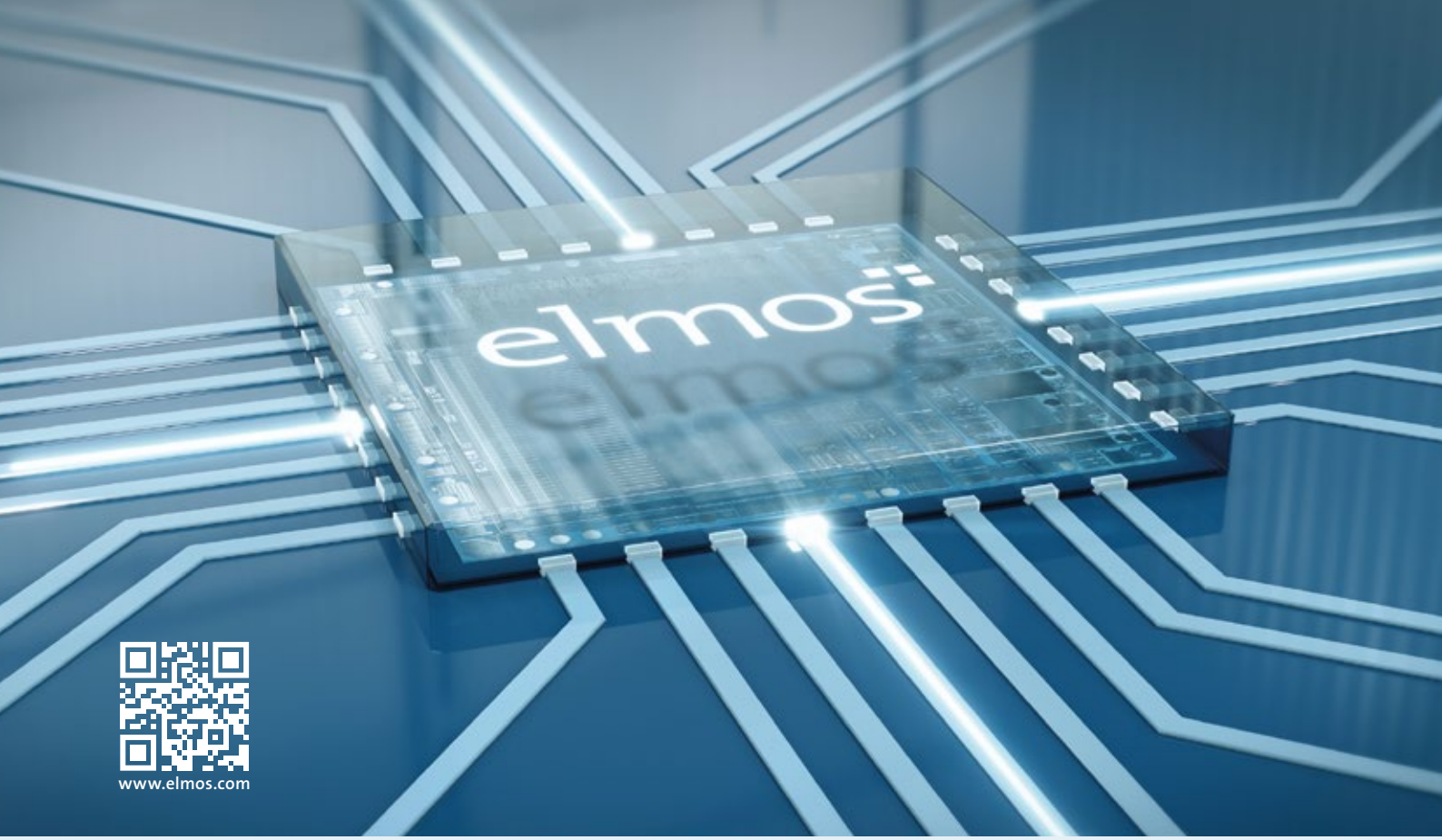

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The Center for Nanointegration Duisburg-Essen (CENIDE) at the University of Duisburg-Essen is internationally recognized for its cutting-edge materials research and development: Here, more than 85 research groups seek to integrate the fundamental understanding on the nanoscale to create new sustainable solutions for major societal challenges in the fields of energy, information technology, and health. CENIDE provides access to state-of-the-art infrastructure such as the unique research building NanoEnergieTechnik-Zentrum (NETZ) and the Interdisciplinary Center for Analytics on the Nanoscale (ICAN). The CENIDE start-up nextract develops fully automated machines for fast, easy and reliable synthesis of a variety of colloidal nanoparticles.

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Cluster NanoMicroMaterialsPhotonics.NRW

The NanoMicroMaterialsPhotonic.NRW (NMWP.NRW) state cluster is a public service body. It was set up in 2009 by North Rhine-Westphalia´s state government aimed at consolidating NRW's position in nanotechnology, microtechnology, advanced materials and photonics. The cluster operates as an association, i.e. it represents the interests of its members from the respective fields. Specifically, this means that the cluster acts as a network for organisations from industry and commerce, science and politics, for example by organising trade congresses, joint trade fair booths in Germany and abroad, or by initiating workshops on selected topic areas. The cluster also particularly supports cooperation ventures between the corporate, research and political environments in NRW.

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Preceeding Projects of the Einstein Telescope: E-TEST & ET2SMEs

The Einstein Telescope is an advanced gravitational-wave observatory, currently in the planning stage. The border region between the Netherlands, Belgium and Germany is being considered as a possible location. This is because of its tranquillity, stable ground and strong ecosystem of scientific institutions and high-tech companies.

The ET2SMEs project is carried out under the Interreg V-A Euregio Meuse-Rhine Program, with € 1.15 million from the European Regional Development Fund (ERDF). By investing EU funds in Interreg projects, the European Union invests directly in economic development, innovation, territorial development, social inclusion and education in the Euregio Meuse-Rhine.

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www.ilt.fraunhofer.de

Fraunhofer Institute for Laser Technology ILT

The Fraunhofer Institute for Laser Technology ILT is worldwide one of the most important development and contract research institutes in the field of laser development and laser applications. The activities cover a wide range of areas such as new laser beam sources for space metrology, high power ultrashort pulsed lasers, laser amplifiers and related components. For the application of lasers and laser processes, the ILT develops innovative processes for welding, cutting, drilling, additive manufacturing and surface treatment, which are applied in the business fields energy, automotive, aerospace and medicine. With new solutions for laser based medical applications, future fields in cancer treatment and tissue engineering are addressed.

booth 16

Fraunhofer IMS

Fraunhofer-Institut für Mikroelektronische Schaltungen und Systeme IMS
Dr. Sascha Weyers
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47057 Duisburg
0203 3783-0
sales@ims.fraunhofer.de
www.ims.fraunhofer.de

Fraunhofer-Institute for Microelectronic Circuits and Systems IMS

The development of CMOS and MEMS based sensor technologies opens up the possibilities for state-of-the-art smart sensor systems for science, industry, medicine, and aerospace. Our technologies for optical sensors cover the spectrum from X-rays to UV and far-infrared. We offer biomedical applications with technologies for pressure sensors, nanoneedles for cell contacting and CarboNanoTube-based bionano-sensors. Integration of photonics on CMOS opens up new possibilities for sensors and communication. For optimal solutions in each case, we rely both on fully integrated sensor technologies as well as postprocessing with foundry technologies.

booth 07

Fraunhofer IST

Fraunhofer-Institut für Schicht- und Oberflächentechnik IST
Fraunhofer IST am DOC
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D-44145 Dortmund
Tel.: +49 (0) 231 8445464
www.ist.fraunhofer.de

Fraunhofer Institute for Surface Engineering and Thin Films IST

Fraunhofer IST in Dortmund is working at the Dortmunder OberflächenCentrum (DOC) within the Fraunhofer Project Group. Our technological alignment covers surface and edge zone modifications using diffusion treatment processes and PECVD coatings. We develop, offer and characterize solutions to increase efficiency of tools and components in various application areas. These include structured surfaces for wear resistance, especially in thermal process environments. Additionally, diffusion process approaches for applications in tribocorrosive environment or adhesion-reducing solutions for aluminum processing are focused in current work.

booth 26

Fraunhofer Institute for Material and Beam Technology IWS

The Dortmunder OberflächenCentrum DOC® develops tailored coatings using continuous processing of steel band. Development goals include the further development of functions such as corrosion resistance, scratch resistance, electric conductivity and cleaning properties. The Fraunhofer IWS is a partner at the DOC® and has a project group operating on site. This group develops coating processes based on PVD and spraying techniques as well as focuses on laser materials processing. The vacuum coating capabilities include machines that handle band processes as well as meter sized and ton heavy parts.

booth 27

Fraunhofer-Institut für Werkstoff- und Stahltechnik IWS
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GEMESYS GmbH

Current hardware for artificial intelligence is inefficient. For today's supercomputer center, it takes a long time, huge datasets and the energy of a whole power plant to train a high-end AI model, resulting in high costs and unsustainability. The problem is rooted in the fundamental architecture of today's digital hardware itself, since it has nothing in common with the way the human brain works. GEMESYS Technologies offers an analog chip design based on the same information-processing mechanisms as the human brain. This enables AI hardware vendors to distribute a novel chip, that trains neural networks 2,000 times more energy-efficient than current technology. It not only significantly reduces the cost, time and amount of data required to train a neural network, but also increases overall quality as well as performance. Its small size and high energy efficiency allows it to be embedded in nearly every device, enabling decentralized on the edge training, data processing and decision making.

booth 17

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www.gemesys.tech

HIGH-TECH.NRW

HIGH-TECH.NRW is a network for a strong deep-tech economy in NRW. As an early-stage start-up accelerator for high-tech and deep-tech start-ups, it is commissioned by the Ministry of Economic Affairs, Industry, Climate Protection, and Energy of the State of North Rhine-Westphalia, and implemented and orchestrated by the think tank NMWP Management GmbH. HIGH-TECH.NRW is a venture platform and offers a tailored 12-week accelerator program for high-tech and deep-tech start-ups. The program ensures networking with investors, industry, and politics as well as an active further development from a technology to a sustainable business model. The Accelerator focuses on: New Materials, Nanotechnology, Microsystems Technology, Nano- and Microelectronics, Optical Technology, Quantum Technology, Manufacturing and Process Engineering, Energy and Environmental Technology, Medical Technology and Healthcare. High-tech & deep-tech ventures. Accelerated.

booth 17

HIGH-TECH.NRW
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www.high-tech.nrw

IBM Quantum

Qoffee Maker is based on Quantum Computing and will produce a coffee, capuccino, etc based on the measurement result of a Quantum Circuit. To get your favorite type of beverage, just create the correct quantum circuit.

Sounds complicated?

Be assured it isn't. Visit us at the IBM booth. We'll be happy to discuss use-cases, the IBM Quantum Computing roadmap, a path to quantum advantage, and other relevant aspects of quantum computing as well.

IBM Technology
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Principal Ecosystem Manager
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https://www.ibm.com/quantum

booth 18

kaeyros ANALYTICS

We Build Your Data Products
We put our creativity and data-driven know-how at the service of our clients and to enable a successful digital transformation of their businesses and processes. Kaeyros Analytics is a Germany-based provider of Data Product & Software Development Services, Consultancy and Digital Training Services with an International Expert Team of Data Scientists, Software Engineers and Analysts across Europe and Africa. As expressed in our condensed vision From Data to Value, we transform the Data Potential of our Customers and partners into actionable allowing them to optimize their production, their processes and enhance their product portfolio with new Data Products.

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booth 17

Microtrac Retsch GmbH

SILVER SPONSOR

Under the brand name Microtrac MRB, three renowned manufacturers of particle analysis equipment have joined forces: Retsch Technology, Microtrac and MicrotracBEL. The merger has resulted in a product portfolio for particle characterization that is unparalleled worldwide. The technologies on offer comprise laser diffraction, dynamic light scattering, dynamic and static image analysis and gas adsorption to determine surface area and pore size distribution.

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booth 21

Midel Photonics GmbH

Midel Photonics designs and produces beam shaping solutions for laser applications. Our focus is on laser material processing suitable for high power continuous-wave to ultra-short pulse lasers. With our unique manufacturing technology, we offer customized solutions to optimize the laser beam shape for the specific process, increasing quality and speed. Our product portfolio includes two- and three-dimensional shaping, multi-spot geometry generation and focus control. We support our customers from the initial idea to series production.

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booth 17

N-Level

Our patent-based control system enables manufacturers of batteries, battery storage systems and power transformation products to offer cheaper, better performing and much safer energy storage systems.

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http://nlevel.de

booth 17

Paderborn University, Institute for Photonic Quantum Systems (PhoQS)

At the Institute for Photonic Quantum Systems (PhoQS), founded in 2018, the University of Paderborn combines interdisciplinary competences for holistic research in the field of quantum photonics. Internationally renowned experts in system and application design, engineering and fabrication, algorithm development and fundamental research pursue the common goal of developing all-encompassing concepts for photon-based quantum applications. The “Photonic Quantum Systems Laboratory” (PhoQS Lab), under construction since March 2022, provides the necessary infrastructure for pioneering quantum research in an interdisciplinary approach.

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booth 11

Physik Instrumente (PI) GmbH & Co. KG

Physik Instrumente is market leader for high-precision positioning solutions and piezo technology applications in the semiconductor industry, life sciences, photonics, and industrial automation. Working closely with customers around the world, PI has been pushing technological boundaries and developing solutions to drive future market trends for more than 50 years. Over 400 patents underline the company's claim to innovation. PI develops, manufactures, and qualifies their entire core technology: From piezo elements and motors as well as magnetic direct drives through air bearings, magne-tic and flexure guides to sensors, controllers, and software. With nine production sites and 16 sales and service offices in Europe, North America and Asia, the PI Group is well positioned in all key technology regions. PI is privately owned with a healthy growth and more than 1400 employees worldwide.

booth 02

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Koordinierungsstelle Quantentechnologien in NRW

Quantum technology (QT) is a future technology that offers groundbreaking potential in the fields of simulation, optimization and security. QT.NMWP.NRW identifies and connects quantum technology stakeholders in the federal state of NRW and beyond. Simultaneously, we collect valuable input from our industry partners and help identifying the best value for their businesses. Based on our growing network in this field, we help you to stay informed, connected and entangled to this high-tech field.

booth 04

Koordinierungsstelle Quantentechnologien in NRW
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qt.nrw.de

QUBITRIUM

Qubitrium is founded in 2020 with the aim of developing advanced quantum technologies on the brink of the second quantum revolution. Company offers solutions to problems in the fields of quantum communication and quantum sensing. It provides services to develop and manufacture advanced quantum products, as well as to deliver educational programs in quantum technologies to industrial organizations. One of the key competencies of Qubitrium is the development of CubeSat compatible miniaturized and compact entangled photon sources, photon sensors and fully automated embedded system designs for platforms requiring fire-and-forget modules. The components developed are to be used in areas such as quantum sensing, imaging, communication/ cryptography, and precision measurements. Qubitrium is preparing for the launch of a CubeSat with QKD payload, to demonstrate the first CubeSat-to-ground QKD, in the first quarter of 2024.

booth 17

QUBITRIUM
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Quantum Technologies GmbH

Quantum Technologies is a Leipzig-based start-up engaged in the development, production and distribution of sensor solutions based on quantum effects. Although only founded in 2020, Quantum Technologies already owns one of the largest German patent portfolios in the field of quantum technologies.

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Dr. Robert Staacke
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04103 Leipzig
info@quantumtechnologies.de
quantumtechnologies.de

booth 05

Raith GmbH Nanofabrication

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As a world leading manufacturer of nanofabrication instrumentation, Raith helps customers to achieve great results in their field of work. Backed by 50 years of experience and an international service and support structure, Raith supplies the best solutions for nanofabrication, electron beam lithography, FIB-SEM nanofabrication, nanoengineering, large area SEM imaging and IC reverse engineering applications. Be at the top of the game in your area of expertise, with the best Raith solution for realizing your application.

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www.raith.com

booth 06

SALD bv

Spatial Atomic Layer Deposition (Spatial ALD, or just SALD) is a form-following high-quality coating at the atomic level. Compared with conventional ALD, this ingenious technology stacks atomic layers many times faster. Maximum throughput at the lowest possible costs, improved functionality, efficiency and sustainability, material reduction, and longer life span are some of the added values Spatial ALD brings. Our in-depth expertise in Spatial ALD technology, combined with the unique ability to transfer it fast from lab to high-volume production, offers you excellent opportunities in today's growth markets. We offer atmospheric Spatial ALD solutions for tandem PV systems, batteries, packaging, electrolysers and fuel cells.

Stay ahead of the competition. Let's explore, develop and integrate together!

SALD bv
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booth 17

TechnologieZentrumDortmund, MST.factory dortmund

The MST.factory dortmund is the competence center for micro and nanotechnology of the TechnologieZentrumDortmund, one of the largest innovation centers and start-up centers in all of Europe. The MST.factory dortmund in the PHOENIX technology park is the driving force within the local micro and nanotechnology cluster. Being incorporated in an efficient network of experts, mentors and consultants, the center management helps and advises the start-up firms in a wide variety of organizational and strategic issues. The companies can concentrate on their core competencies and push and accelerate their product developments. The center is closely linked with the local companies, science and research institutions, investors, public administrations and policy-decision makers.

booth 25

MST.factory dortmund
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www.tzdo.de

University of Cagliari - DSCG, DiSB and DISVA

The University of Cagliari (UNICA) was founded in 1606. It is a public state University and has about 30,000 enrolled students, over 1,000 teaching staff and more than 1,000 professionals at the technical administrative staff. There are 15 Departments located in several main campuses in and on the edge of the city. The largest campus is located in Monserrato (Cagliari). It hosts many departments and one of the University General Hospitals. At the moment the University of Cagliari is one of the largest enterprises in the Region of Sardinia. The main activities of University of Cagliari concerns Research and Education. We present RiV4U, our innovative antimicrobial coating, coming from a collaboration between the Department of Chemical and Geological Sciences, the Department of Life and Environmental Sciences and the Department of Biomedical Sciences. RiV4U, for a word at your touch!

booth 23

University of Cagliari, DSCG, DiSB and DISVA
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www.unica.it

Universität Siegen - School of Science and Technology

The key benefit of the “School of Science and Technology”, located at the University of Siegen, is its interdisciplinary oriented research profile. Two domains, namely material science and sensor technologies including sensor data processing, establish a basis for multidisciplinarity among the different research fields. Research at the School of Science and Technology addresses not only questions of technical fundamentals but also develops solutions for industrial applications. Fields of research include e.g. topics like Cyber-Physical Systems and Interfaces or "smart materials" based on nanotechnologies.

booth 15

University of Siegen
School of Science and Technology
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andreas.bablich@uni-siegen.de
www.uni-siegen.de/nt/nano

City of Dortmund
Economic Development Agency

Economic Development Agency Dortmund

With a wide array of internationally operating businesses the city is one of Europe's leading locations for micro- and nanotechnology and it's adjacent high-tech industries. With a lively start-up scene, specialist suppliers and international market leaders Dortmund offers a dynamic innovation eco-system. Dortmund's role as innovation hub is underlined by 19 scientific and high-tech institutions.

As a breeding ground for innovation and transformation Dortmund has received the "European Innovation Capital" award in 2021. You are welcome to be part of this development. Welcome to Dortmund!

Wirtschaftsförderung Dortmund
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booth 03

ZENIT enterprise europe network Business Support on Your Doorstep NRW.Europa

ZENIT GmbH / NRW.Europa

Under the name of NRW.Europa, ZENIT GmbH, NRW.BANK and NRW.International GmbH are together offering the best possible support in the area of transnational European business. Our service package encompasses comprehensive advice, for example for internationalisation and innovation projects, in the search for national and international business partners as well as in applications for public funding. Our services are available to enterprises, organisations close to the business and research communities, as well as universities in North Rhine-Westphalia. Our main target group are small and medium-sized enterprises (SMEs).

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booth 13

MEDIA PARTNERS

BIO NRW red
IHK Industrie- und Handelskammer zu Dortmund
IVAM.
Kompetenznetzwerk Umweltwirtschaft.NRW
MEDIZIN NRW
Nano in Germany
NRW. innovativ
Werkstoffe in der Fertigung
ZENIT enterprise europe network Business Support on Your Doorstep NRW.Europa

Overview Exhibitors

Exhibitor	Booth
AIXTRON SE	22
AMO GmbH	12
Center for Nanotechnology (CeNTech)	24
Cluster NanoMicroMaterialsPhotonics.NRW	04
duotec GmbH	05
Einstein Teleskop	14
ELEMENT 3-5 GmbH	20
eleQtron GmbH	19
Elmos Seminconductor SE	08
The Ernst Ruska-Centre (ER-C) for Microscopy and Spectroscopy with Electrons	10
Forschungszentrum Jülich GmbH, Peter Grünberg Institut	09
Fraunhofer-Institut für Lasertechnik ILT	16
Fraunhofer-Institut für Mikroelektronische Schaltungen und Systeme IMS	07
Fraunhofer-Institut für Schicht- und Oberflächentechnik IST	26
Fraunhofer-Institut für Werkstoff- und Stahltechnik IWS	27
GEMESYS GmbH / **Start-up Booth**	17
HIGH-TECH.NRW / **Start-up Booth**	17
IBM Technology	18
kaeyros ANALYTICS / **Start-up Booth**	17
Microtrac Retsch GmbH	21
Midel Photonics GmbH / **Start-up Booth**	17
N-Level / **Start-up Booth**	17
Paderborn University, Institute for Photonic Quantum Systems (PhoQS)	11
Physik Instrumente (PI) GmbH & Co. KG	02
QUBITRIUM / **Start-up Booth**	17
Koordinierungsstelle Quantentechnologien in NRW (Cluster NMWP.NRW)	04

Exhibitor	Booth
Quantum Technologies GmbH	05
Raith GmbH	06
SALD bv / **Start-up Booth**	17
TechnologieZentrumDortmund, MST.factory dortmund	25
Universität Duisburg-Essen, CENIDE - Center for Nanointegration Duisburg-Essen	01
University of Cagliari, Department of Chemical and Geological Sciences	23
University of Siegen, School of Science and Technology	15
Wirtschaftsförderung Dortmund	03
ZENIT GmbH / NRW.Europa	13

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AIXTRON

ELEMENT 3|5

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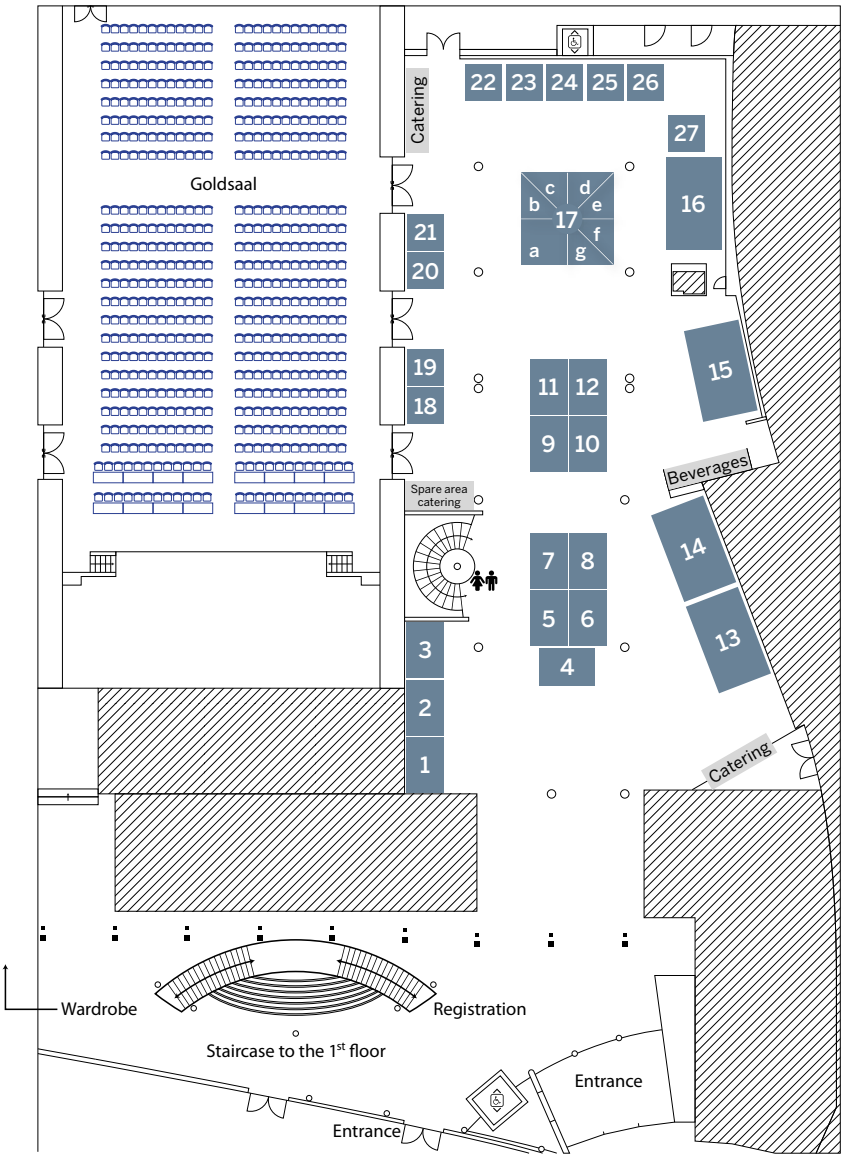
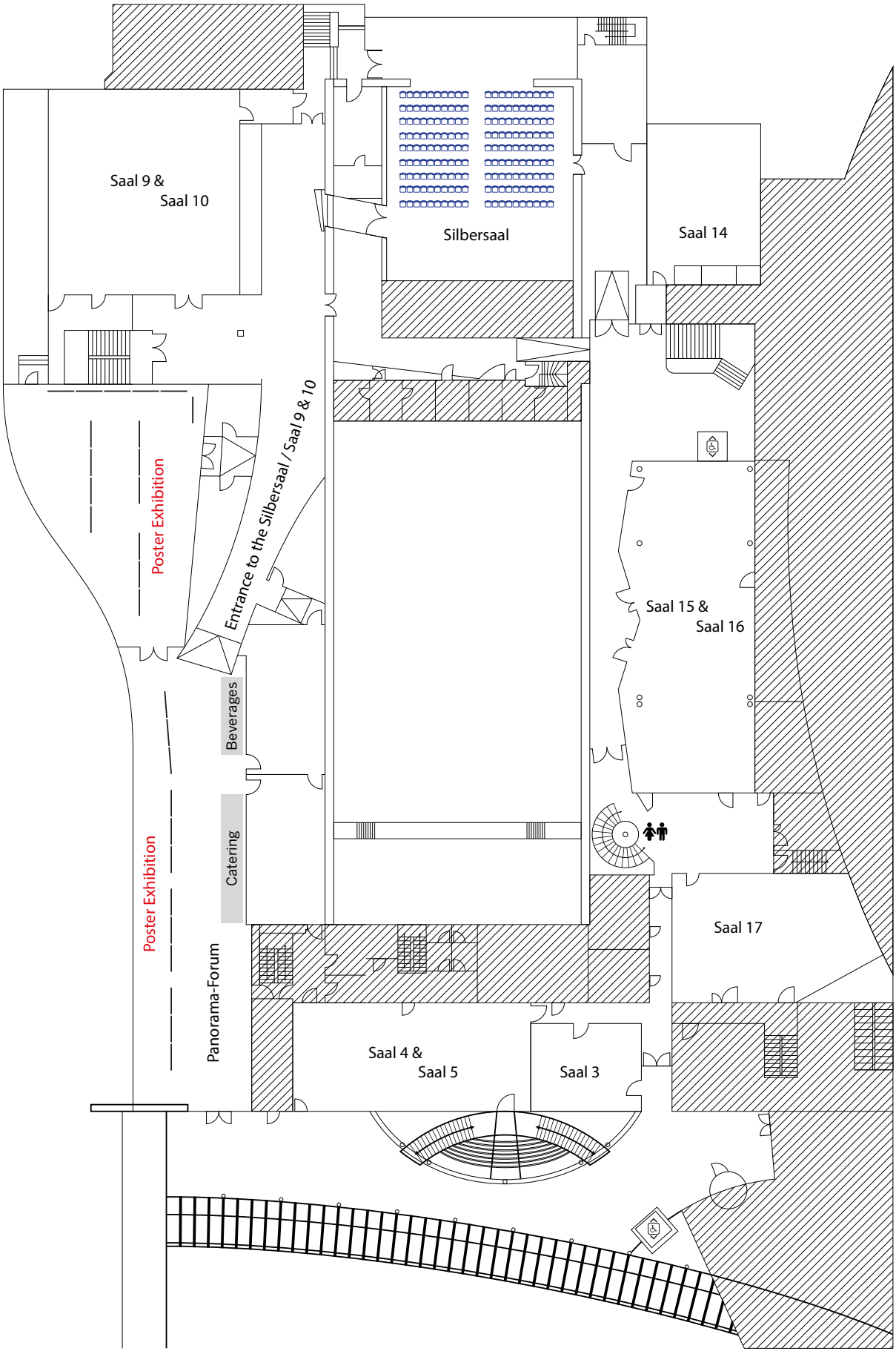
Room Allocation

The Plenary Sessions on Wednesday morning and on Thursday noon take place in the "Goldsaal", while the three parallel topical sessions take place in the conference halls and rooms "Goldsaal", "Silbersaal", "Saal 9 & Saal 10".

The Business Pitches take place in the "Goldsaal", while the Matchmaking Area is located in "Saal 4 & Saal 5". Here, you will find some workplaces as well.



1st Floor Plan



Networking Event with Award Ceremony “Best Exhibitor Award”

Networking and exchange at the highest level – the Networking Event on the evening of the first conference day provides a great opportunity to establish and deepen contacts. With food, drinks and music, the first day of the 10th NRW Nano Conference comes to an end in a relaxed atmosphere.

The event starts at 7.00 pm and takes place in a very exciting location: The “Eventkirche Dortmund”. Indulge in a mouth-watering selection of appetizers and exquisite food, expertly prepared by talented chefs, and savor the flavors of our specially curated menu. Relax and unwind to the soothing sounds of live smooth jazz music, performed by some of the best musicians in the area.

Our network event is the perfect opportunity to meet like-minded professionals, expand your business connections, and enjoy an evening of sophisticated fun. Whether you’re looking to network with other professionals in your industry or simply enjoy a fun and engaging evening with friends, this event is not to be missed.

As part of the Networking Event, the Best Exhibitor Award will be presented to the three exhibitors with the best exhibition stands and most intriguing exhibits.

Address: Hochstraße 10-12
44149 Dortmund

Getting there by car:
A40 junction Dortmund-Barop, then follow the signs towards Do-Dorstfeld.
(You will see the church tower shortly after the motorway exit).

Getting there by train:
By lines S1, S2 & S4 Get off at Dorstfeld S-Bahn station.
(The church is on the opposite side of the street)

As the number of participants is limited, prior registration was required.

Nano Workshop powered by KITZ.do

This year, the NRW Nano Conference offers a special programme about the vital subjects of science and technology for our youngest talents. In the Nano Workshop, KITZ.do offers pupils aged 16 and over the opportunity to explore the world of nano-technology with various experiments.

KITZ.do offers many opportunities for children and young people to get a vivid picture of subjects and professions beyond the familiar clichés. Creativity and the realisation of one's own ideas instead of dry numbers and formulas. The offers are intended to promote children's and young people's interest in STEM (Science - Technology - Engineering - Mathematics) and inspire them with STEM. KITZ.do offers children and young people space and opportunities to do their own research and experience "science at first hand".

The workshops are held twice a day and start at 10 a.m. and 12 noon.

Experiments on the following topics are offered:

- Lotus effect
- Ferrofluids
- Creation of hydrophobic surfaces
- Shape memory alloys
- From sand to chip
- Electrically conductive glass surfaces

KITZ.do
NEUGIER MACHT SCHLAU

Notes

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