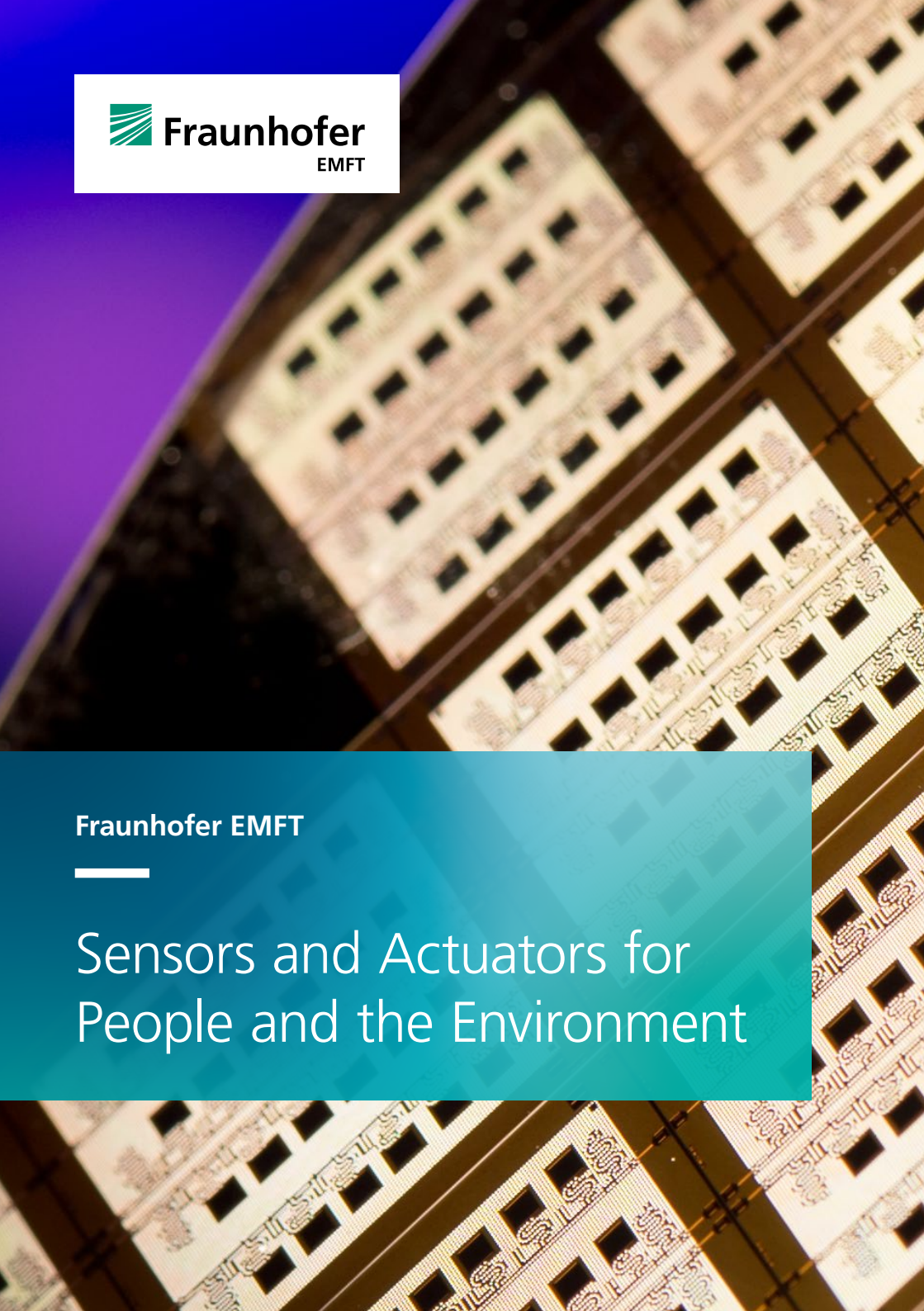


Fraunhofer EMFT

Sensors and Actuators for People and the Environment

Welcome message

Dear customers, cooperation partners and supporters of Fraunhofer EMFT,

If we had to describe Fraunhofer EMFT in just one word, it would be without a doubt: diversity. This diversity is reflected in our exciting research topics, varied projects and numerous cooperation partners. We are particularly proud of the diversity of the people who work at our institute. This diversity is not only a pillar of our identity, but also a key driver of innovation.

However, in times characterized by geopolitical and economic challenges, it is equally important to join forces and focus clearly on common goals. This is exactly what we are doing in close cooperation with our FMD partner institutes and numerous European research institutions with the APECS pilot line launched in December: as part of the EU Chips Act, the initiative aims to drive chiplet innovation and strengthen research and production capacities for semiconductors in Europe. The pilot line will provide large industrial companies as well as SMEs and start-ups with easy access to state-of-the-art technologies and ensure secure, resilient semiconductor value chains.

This is an important prerequisite for ensuring that Europe remains a dynamic ecosystem of companies, research institutes and universities, whose competitive advantage is also based on advanced semiconductor solutions. We are optimistic that, in such an environment, we will be able to maintain our scientific creativity, innovative strength and thus also the diversity mentioned at the beginning.

See for yourself on the following pages how broad our R&D portfolio is, through which our employees develop new answers to key challenges for people and the environment every day.
We hope you enjoy reading this report!

Kind regards,

Prof. Dr. Amelie Hagelauer

Prof. Dr. Christoph Kutter

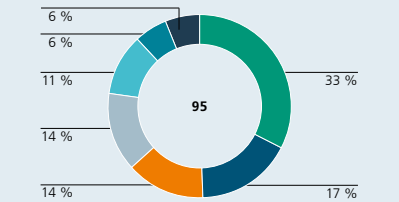
Content

Superconducting flexible shielded cable with PCB direct connection, mounted in the cryostat. The flex cable replaces 16 conventional coax cables
© Fraunhofer EMFT / Bernd Müller

People, facts and figures

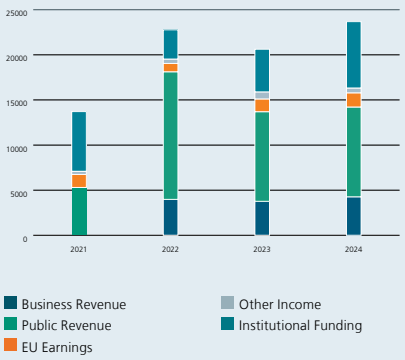
In 2024, the Fraunhofer EMFT team actively contributed to solving societal challenges in a total of **95 projects**. 33 % of the projects are in the field of **micro- and nanotechnologies**. Together with the other expertise in **sensor technology, micropumps, AI system solutions, electrical interconnection technology, circuit design** and **test and analysis,** this focus creates the basis for innovative solutions for people and the environment

Share of Research Projects by Competence



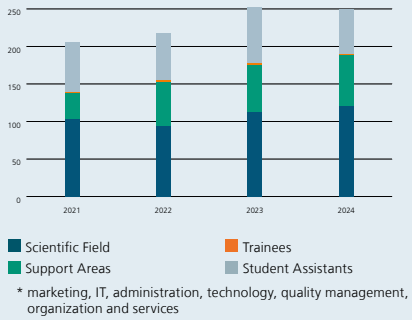
The operating budget of Fraunhofer EMFT was around **23.7 million euros** in 2024. Industrial contracts generated a total volume of around **4.3 million euros**, or **18.1 %** of the operating budget.

Financial Budget in k€



We are successful only thanks to our strong team. Our workforce has grown to **190 people**, **121 of whom work in science** and **67 in support areas** such as marketing, IT, administration and technology. **Two trainees** and **59 student assistants**, working on research projects or final theses, complete our team.

Team Size



* marketing, IT, administration, technology, quality management, organization and services

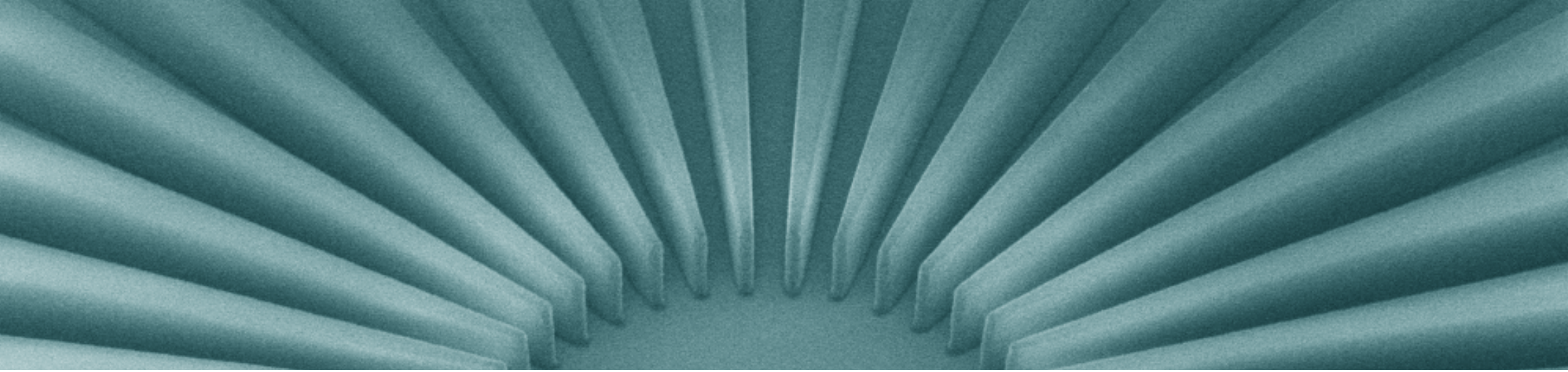
We are a multinational community from **27 countries.** Our diversity drives us to explore scientific challenges from multiple vantage points, fostering a culture of mutual learning and growth. This is how we successfully advance research into sensors and actuators for people and the environment.

⟶ More info: *emft.fraunhofer.de/**facts-figures***

Global Expertise

Austria
Bulgaria
Canada
China
Croatia
Czech Republic
Egypt
Finland
France
Germany
India
Iran
Israel

Italy
Mexico
Moldova
Morocco
Netherlands
Pakistan
Philippines
Portugal
Romania
Russia
Slovenia
Spain
Turkey
Vietnam



Structure for lithography test © Fraunhofer EMFT

What sets us apart?

Fraunhofer EMFT is committed to applied research in the field of sensor and actuator systems. Its expertise is based on in-depth know-how and many years of experience in the areas of micro-electronics and microsystems technology, as well as an extensive range of micro- and nanotechnological technologies, which enables cutting-edge research and attractive development opportunities for industrial clients.

The overarching vision of Fraunhofer EMFT is to be an important innovator and central player in Bavaria, Germany and Europe, achieving a high level of industry impact with its expertise and R&D services and occupying a strong position in the scientific community.

Fraunhofer EMFT has defined three pillars. These three guiding principles summarize the central pillars of the institute:

1. **Scientific excellence** is indispensable for an applied research institute. The institute's innovative strength is strengthened by close personal links with numerous universities.

2. **Strong partnerships with industry** are a prerequisite for success, especially for a Fraunhofer Institute. Fraunhofer EMFT wants to help its clients succeed, because successful clients are also satisfied clients who will come back.

3. **Fun and motivation at work** are what drive our employees and encourage them to deliver top performance. The personnel structure, which includes both experienced and young employees, enables a strong line-up with a mix of dynamism, experience and courage.

HIGHLIGHTS

© Fraunhofer AISEC / Wiebke Ramm

A BRILLIANT START: MFHS CONFERENCE 2024

The Microfluidic Handling Systems Conference in Munich, organized by the University of Twente and Fraunhofer EMFT, opened in 2024 with first-class lectures and lively discussions. Highlights included prizes for outstanding contributions, a magic show by Louis von Eckstein and a lab tour at Fraunhofer EMFT with insights into current research.

TDVE 2024: SECURITY AND TRUST IN MICROELECTRONICS

At TdvE (Tage der vertrauenswürdigen Elektronik) 2024 in Munich, experts from research, industry and politics discussed the security and resilience of electronic systems. Practical workshops and lectures promoted the development of trustworthy electronics in Europe, with a focus on transparency and collaboration in microelectronics.

50 YEARS OF FRAUNHOFER EMFT

On September 17, 2024, Fraunhofer EMFT celebrated its 50th anniversary with associated friends and partners from the fields of politics, research and business. Welcoming addresses by prominent speakers and exciting contributions by employees and doctoral students highlighted the development of the institute and its innovative spirit. Looking to the past and the future shows that Fraunhofer EMFT is ready for new challenges.

AWARD FOR TOBIAS NABER

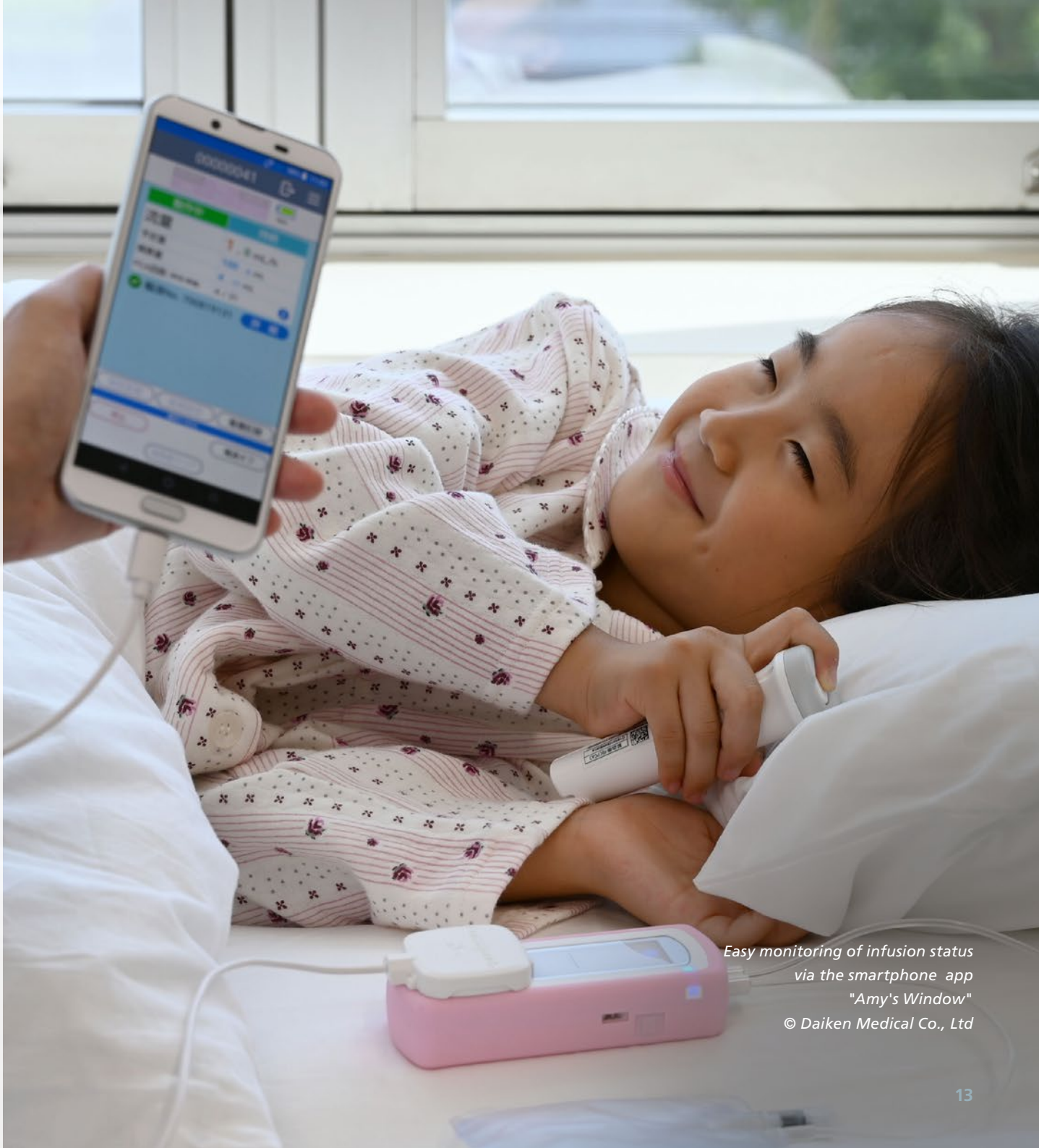
Tobias Naber, research scientist at Fraunhofer EMFT, was honored for the best presentation at the 13th BBMEC conference 2024 in Izmir, Turkey. He presented the "TER-Ox" method, which enables the simultaneous, non-invasive monitoring of the barrier function and metabolic activity of cell layers – an innovation with potential for cancer research and drug development.

New technologies for precise pain therapy

The medical technology is rapidly evolving, with innovative technologies playing a crucial role in improving patient care. An outstanding example of this is the successful technology transfer of the patented micromembrane pump from Fraunhofer EMFT to the Japanese medical technology company Daiken Medical in Osaka. With this technology, Daiken Medical is developing the PCA system "Amy", which enables patients to manage their pain treatment independently.

The PCA system "Amy" (PCA: Patient Controlled Analgesia) from Daiken Medical – available on the Japanese market since 2021 – utilizes the highly precise micromembrane pump measuring 10x10x2 mm³. The device also incorporates a safety valve licensed from Fraunhofer EMFT, to ensure safe and accurate infusion of pain medications. The micromembrane pump is positioned between the medication reservoir and the control unit and is integrated into the medication tubing as a disposable component. During use, it is inserted by the doctor into the control unit. User-friendliness is enhanced by a companion smartphone app (Amy's Window), which allows for easy monitoring of pain therapy and provides additional comfort to patients.

Learn more about the project:
*emft.fraunhofer.de/**pain-therapy***



Easy monitoring of infusion status via the smartphone app "Amy's Window"
© Daiken Medical Co., Ltd

Bee-friendly pesticides thanks to biosensor technology

A research team at Fraunhofer EMFT is using biosensor technology to identify "bee-unfriendly" substances in new crop protection products. The sensors are isolated insect cells function as sensors, reacting to active substances and indicating their influence on cell metabolism. The reaction is documented in real time using electrochemical impedance measurements. This enables early compatibility testing of new active substances and promotes environmentally friendly pesticide solutions.

Learn more about the project.
*emft.fraunhofer.de/**insectcells***

Platform for automated real-time analysis of the ecotoxicological effects of environmental media on cells
© Fraunhofer EMFT / Bernd Müller

Reduced emissions in semiconductor manufacturing

According to a McKinsey study (2022), approximately 35 percent of greenhouse gas emissions in semiconductor manufacturing result from direct emissions from production facilities, 80 percent of which are caused by the used process gases. Fraunhofer EMFT uses analysis systems in combination with an abatement system to monitor the emissions of the process gases used in semiconductor production in its research clean room and to reduce them by adjusting the process parameters. For this purpose, a mass spectrometer was installed to measure the rest gases and a burner/scrubber to minimize emissions. The exhaust gas purification system for detecting emissions from etching and PECVD chambers is also open for inspection by interested partners from industry and business.

Learn more about our abatement-system!
*emft.fraunhofer.de/**abatement***

Abatement system for monitoring greenhouse gas emissions from semiconductor manufacturing processes
© Fraunhofer EMFT / Bernd Müller

Research areas

In its thematic focus "Sensors and Actuators for People and the Environment", the Institute focuses on the following research areas, which make a decisive contribution to improving living conditions for people and protecting our environment.

SENSORS AND ACTUATORS FOR INTELLIGENT MEDICINE

The Fraunhofer EMFT **micropump** is widely used in medical therapy and therefore plays a key role in this field of research. Our scientists use their competences in **sensor solutions** for developing new methods and systems for improved diagnostics. We combine **system solutions with AI** for data analysis in combination with sensors and actuators, for intelligent solutions for diagnosis and therapy.

MICROELECTRONICS FOR QUANTUM TECHNOLOGIES

Fraunhofer EMFT's competencies in **micro- and nanoelectronics, electrical interconnection technology** as well as **test and analysis** are important enablers for the application of quantum technologies. The R&D activities of Fraunhofer EMFT are aimed at the reliable and scalable development and manufacture of qubit chips, as well as their integration and miniaturization, in order to realize the most powerful, reliable and energy-efficient quantum systems possible.

TRUSTED ELECTRONICS

Fraunhofer EMFT's expertise in micro- and nanotechnologies and analysis and testing enables research into the causes of complex faults and reliability problems, the monitoring of electrical connections and the development of concepts for hardware security and tamper protection for electronic systems.

NEUROMORPHIC COMPUTING

Fraunhofer EMFT uses its expertise in **micro- and nanoelectronics** to conduct research into neurologically inspired computer architectures – such as memristors or the use of novel 2D nanomaterials. Our expertise in **circuit design** is used, to develop novel analog and digital neuromorphic circuits that are significantly faster and more efficient than conventional processors.

Optical sensor based on infrared LEDs and detectors to estimate the effective concentration delivered to a patient under nebulization treatment
© Fraunhofer EMFT / Bernd Müller

RESOURCE EFFICIENCY IN MICROELECTRONICS

Fraunhofer EMFT conducts research into the use of more environmentally friendly materials and processes in **microelectronics and nanoelectronics** and their transfer to industry. Monitoring the energy consumption of semiconductor processes using intelligent **sensor solutions,** innovative abatement concepts and the development of more energy-efficient **integrated circuits** are further important research areas for greater resource efficiency in microelectronics.

SENSORS AND ACTUATORS FOR SMART FARMING

The use of information and communication technologies in agriculture makes it possible to combine economic and ecological goals in food production. Fraunhofer EMFT's expertise in the areas of **sensor solutions, micropumps** and **system solutions with AI** is currently being used here for the phenotyping of plants, emission analyses in animal husbandry and the monitoring of supply chains in the food industry, among other things.

ARTIFICIAL INTELLIGENCE (AI) IN SENSOR TECHNOLOGY

Analyzing the collected raw data directly at the sensor node increases the data security, energy efficiency and reaction speed of the overall system. By combining its expertise in **sensor solutions** and **system solutions with AI**, Fraunhofer EMFT uses various data analysis methods to develop intelligent sensor nodes for environmental monitoring, medical wearables or production process monitoring, for example.

Learn more about
the research areas of Fraunhofer EMFT!
*emft.fraunhofer.de/**research-areas***

Expertise

The R&D activities of Fraunhofer EMFT are based on six areas of expertise whose interdisciplinary interaction enables the development of pioneering solutions.

MICRO- AND NANOTECHNOLOGIES

Fraunhofer EMFT has an extensive, state-of-the-art technology park and comprehensive expertise in the field of micro- and nanotechnologies. These capabilities enable the development of innovative electronic components and systems and form the basis for the institute's other areas of expertise.

MICROPUMPS

The nanoliter-precise dosing of gases and liquids using micropumps is a key area of expertise at Fraunhofer EMFT. The portfolio includes highly miniaturized silicon, stainless steel and titanium micropumps as well as dosing system solutions for applications ranging from medical technology and industrial applications to consumer electronics.

Development of a machine learning-based predictive maintenance solution for manufacturing equipment.
© Fraunhofer EMFT / Bernd Müller

TEST AND ANALYSIS

Fraunhofer EMFT has a wide range of expertise and an extensive infrastructure in the field of analysis and testing of electrical components and systems. The R&D activities include failure analyses, ESD test and protection concepts, component preparation for safety analyses as well as testing and characterization of semiconductor components. Fraunhofer EMFT also has a CC-EAL6 certified safety laboratory.

SENSOR SOLUTIONS

One of Fraunhofer EMFT's key areas of expertise is the design of innovative, high-performance sensor solutions that enable perfect interaction between the sensor technology and its environment and can be used in a variety of ways tailored to the respective application. In-house developments are also combined with existing solutions.

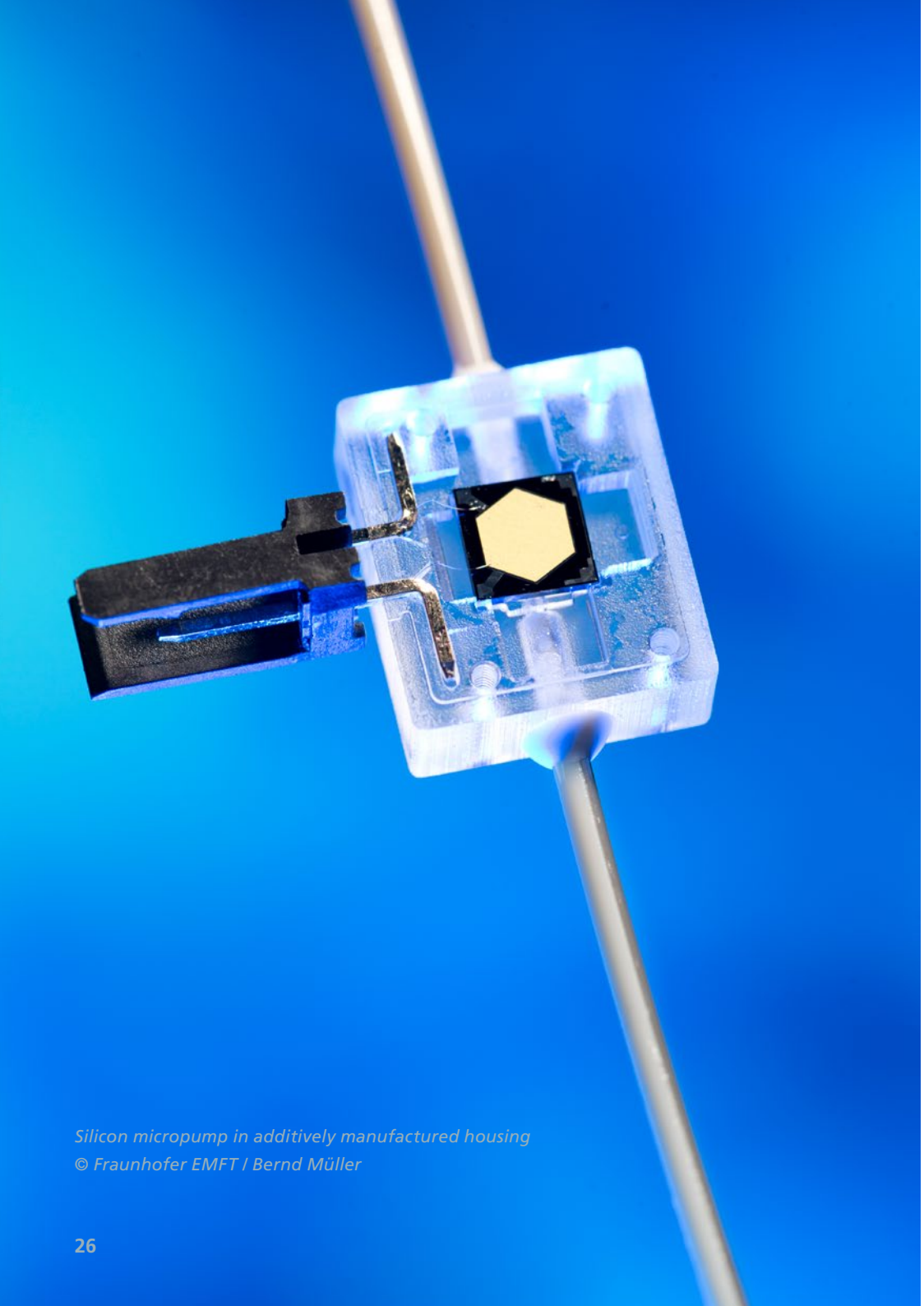
CIRCUIT DESIGN

The Fraunhofer EMFT team has important key competencies for the development of integrated circuits. In addition to in-house developments, external circuit blocks (IP) are also integrated within this framework. The focus is on the design of circuit blocks and complete ASICs and systems-on-chip for very high frequencies, low-noise amplifiers, power amplifiers and AD converters.

AI SYSTEM SOLUTIONS

One of Fraunhofer EMFT's areas of expertise is the design of high-performance system solutions deploying sensors and actuators in various fields of application. The functionality of the system solutions can be expanded using AI methods to develop intelligent systems that save energy and bandwidth, shorten response times and at the same time allow sensitive data to be handled securely.

Discover our expertise!
*emft.fraunhofer.de/**expertise***



Silicon micropump in additively manufactured housing
© Fraunhofer EMFT / Bernd Müller

Scientific excellence

Bachelor's Theses

Chalabi, M. (2024).
Intelligent Control of Piezoelectric Micropumps.
Supervision: Axelsson, K.
German Jordanian University

Herzog, L. (2024).
Entwicklung und Evaluation eines miniaturisierten Olfaktometers für mobile Anwendungen.
Supervision: Anheuer, D.
Technische Universität München

Klumpp, S. (2024).
Entwicklung von portablen Duftdosiersystemen mit Mikropumpen für mobile Anwendungen.
Supervision: Anheuer, D.
Hochschule München University of Applied Sciences

Krupitschka, A. (2024).
Impedance-based Detection of Apoptosis: Comparative Analysis of Various Assay Formats.
Supervision: Wegener, J.
Universität Regensburg

Martini, L. (2024).
Reliable drug dosing for piezoelectric actuators through self-sensing bubble detection.
Supervision: Axelsson, K.
City University of Applied Sciences Bremen

Nguyen, D.C.T. (2024).
Effect analysis of pesticides: Electrochemical sensor technology for the creation of a phenotypic effect profile.
Supervision: Wegener, J.
Universität Regensburg

Nguyen, T.N. (2024).
Entwicklung eines virenfreien Neutralisationsassays für SARS-CoV2.
Supervision: Wegener, J.
Universität Regensburg

Master's Theses

Anarat, A. (2024).
Modeling of RF Receiver Circuit Blocks.
Supervision: Hagelauer, A.
Technische Universität München

Balbach, S. (2024).
Sustainable Approach to Wireless Communication for TinyML Sensor Platforms.
Supervision: Fraidling, F.
Technische Universität München

Cömert, H.K. (2024).
Design and Evaluation of a Direction of Arrival Measurement System using High-Performace Hardware and Machine Learning Principles.
Supervision: Hagelauer, A.
Technische Universität München

Geißler, R. (2024).
Design, Development and Verification of a Multi-Channel Surface Electromyogram Measurement System for the Analysis of Muscle Activity in Athletes.
Supervision: Hagelauer, A.
Technische Universität München

Goldbrunner, J. (2024).
Life Cycle Assessment von Metallisierungsprozessen auf flexiblen Trägermaterialien.
Supervision: Scherbaum, S.
Universität Bayreuth

Hug, D. (2024).
Untersuchungen zum Pulsstromverfahren zur Fertigung von Leiterbahnen auf flexiblen Substraten.
Supervision: Yacoub-George, E.
Hochschule München University of Applied Sciences

Kopp, M. (2024).
Manufacturing and Characterization of Silicon Electrostatic Micropumps on chip-level.
Supervision: Anheuer, D.
Hochschule München University of Applied Sciences

Le Phuong Lang, T. (2024).
Design of an Analog Feature Extraction for Event-Based Neuromorphic Processor.
Supervision: Panter, D.; Zhang, L.
University Jean Monnet

Liu, X. (2024).
Development of Methods to Analyze Automotive On-Board Power System Data Using Machine Learning Models in the Context of Data-Driven Development.
Supervision: Hagelauer, A.
Technische Universität München

Mehta, A. (2024).
Pretraining Transformers for Predictive Maintenance in Manufacturing.
Supervision: Heinrich, F.
Friedrich-Alexander-Universität Erlangen-Nürnberg

Music, E. (2024).
Design and Simulation of Fluidic Resistances for an Electrically Controllable Respiratory Training Device.
Supervision: Zett, O.
Technische Universität München

Schilling, R. (2024).
Robust Modeling of Machine Vibration Based on Control Loop Data for Predictive Maintenance.
Supervision: Rieger, F.
Technische Universität München

Schmauß, J. (2024).
Development of an impedance-based sensor for the detection of cellular stress with intrinsic amplification.
Supervision: Wegener, J.
Universität Regensburg

Schneider, F. (2024).
Investigations on the design of large scale superconducting qubit chips.
Supervision: Hagelauer, A.
Technische Universität München

Senser, C.-A. (2024).
Development and characterization of molecularly imprinted polymers for recognition and antagonization of the endothelin receptor.
Supervision: Wegener, J
Universität Regensburg

Simone, G. (2024).
AI-based design and optimization of a D-band transformer.
Supervision: Tas D.
Technische Universität München

Vadachkoria, M. (2024).
Design of an Event-based Zero-Crossing ADC for Interfacing Analog Frontend and SNN Accelerator.
Supervision: Panter, D.; Zhang, L.
Technische Universität München

Zarekarizi, A. (2024).
Design and Simulation of a Time-Based Read Circuit for Resistive Integrated Memory.
Supervision: Hagelauer, A.
Technische Universität München

Zhou, S. (2024).
System Test of the Quartz Crystal Oscillator for AURIX TC4x Microcontroller.
Supervision: Hagelauer, A.
Technische Universität München

Promotions

Azzam, S.S. (2024). **Dissecting the Wholistic Impedance Profile of GPCR Signaling by Combining Functional Assays.**

The doctoral thesis was the result of a collaboration between the Fraunhofer Institute for Electronic Microsystems and Solid State Technologies EMFT (cell-based sensor technology) and the University of Regensburg. The dissertation was supervised by Prof. Joachim Wegener.

Bäumler, S. (2024). **A Novel Measurement Setup for Impedance-based Analysis of 3D Tissue Models: Design, Characterization and Application.**

The doctoral thesis was the result of a collaboration between the Fraunhofer Institute for Electronic Microsystems and Solid State Technologies EMFT (cell-based sensor technology) and the University of Regensburg. The dissertation was supervised by Prof. Joachim Wegener.

Brandmeier, J.C. (2024). **Upconversion Nanoparticles: Shining a New Light for Ultrasensitive Bioanalytical Assays.**

The doctoral thesis was the result of a collaboration between the Fraunhofer Institute for Electronic Microsystems and Solid State Technologies EMFT (cell-based sensor technology) and the University of Regensburg. The dissertation was supervised by Prof. Joachim Wegener.

Frank, L. (2024). **In silico Analyse der Sauerstoffverteilung in Zellen und Geweben mittels der Finiten-Elemente-Methode.**

The doctoral thesis was the result of a collaboration between the Fraunhofer Institute for Electronic Microsystems and Solid State Technologies EMFT (cell-based sensor technology) and the University of Regensburg. The dissertation was supervised by Prof. Joachim Wegener.

Kade, C. (2024). **Label-free Sensing Strategies to Monitor Disease Models of Glaucoma In Vitro.**

The doctoral thesis was the result of a collaboration between the Fraunhofer Institute for Electronic Microsystems and Solid State Technologies EMFT (cell-based sensor technology) and the University of Regensburg. The dissertation was supervised by Prof. Joachim Wegener.

Reiser, D.L. (2024). **Untersuchungen zur Temperaturabhängigkeit des Widerstandsverhaltens memristiver Bauelemente auf der Basis von TiO2.**

The doctoral thesis was the result of a collaboration between the Fraunhofer Institute for Electronic Microsystems and Solid State Technologies EMFT and the Technical University of Munich. The dissertation was supervised by Prof. Marc Tornow.

Patents 2024

EP 4318254
Pscheidl, F.; Leugering, J.
Interfaces and control flow for a multi-core system architecture for globally asynchronous processing of continuous time binary valued signals

EP 4131086
Ramm, P., Weber, J., Klumpp, A.
Kryo-kompatible Quanten-Computing-Anordnung und Verfahren zum Herstellen einer kryo-kompatiblen Quanten-Computing-Anwendung

EP 4152394
Kutter, C.
Anodic Channel Hole Etch

EP 4152395
Heigl, M., Bui-Tran, T., Merkel, K.
Silicium / Silicium-Germanium Stapel in Halbleiter-Speichern

US 11,624,741
Richter, M., Grünerbel, L., Kibler, S., Bußmann, A., Congar, Y., Leistner H.
Micropump with gas sensor

WO 2022053132
Leistner, H., Wackerle, M., Richter, M., Wieland R.
An Electrostatic Micro-Pump and a Process to Produce an Electrostatic Micro-Pump

EP 4168676
Bußmann, A., Grünerbel, L., Wald, C., Kibler,S.
Mikromembranpumpeinrichtung

WO 2021204382
Richter, M., Grünerbel, L., Kibler, S.
Pressure difference measurement in the body

EP 3859878
Landesberger, C., Ramm, P., Palavesam, N., Weber, J.
3D Glas-Wafer RF-Package

US 12,166,073
Ramm, P., Klumpp, A.
Vertical Compound Semiconductor Structure and Method for Producing the same

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Multi-module R2R screen printing and dispensing tool by Aurel © Fraunhofer EMFT / Bernd Müller

Technology offering

- **Silicon semiconductor technologies**
  - 200 mm CMOS and MEMS cleanrooms
  - Wafer processing
  - Wafer characterization
- **Flexible electronics**
  - Processing thin silicon substrates
  - Roll-to-roll process for flexible electronics
- **Test and analysis of electronic components and systems**
  - Damage and material analysis
  - Package and chip level analysis
  - ESD tests and protective structures
  - Cryogenic measurements / cryogenics
  - Climate and reliability laboratories
- **CC-EAL6 certified safety laboratory**
- **Gas measurement laboratory**
- **Electronics laboratory**
  - Modern electrical measurement technology
  - Rapid prototyping with 3D printing
  - Soldering technology
  - Simulation and design
- **Laboratory for cell culture technology**
  - Culture of animal cells and micro-organisms
  - Microscopy
  - Photolithography
  - Cell cultures
- **Labor for microfluidics**
  - Fluidic test at wafer level
  - Microassembly of microfluidic systems
  - Fluidic characterization of microfluidic devices
- **Chip design measurement lab**
  - RF chip characterization
  - Characterization of ultrasonic MEMS transducers

Learn more about our technology offering!
*emft.fraunhofer.de/**labs-cleanrooms***

funded by:

Forschungsfabrik Mikroelektronik Deutschland

Bundesministerium für Bildung und Forschung

Europäische Union – Europäischer Fonds für regionale Entwicklung als Teil der Reaktion der Union auf die COVID-19-Pandemie finanziert – REACT-EU

Bayerisches Staatsministerium für Wirtschaft, Landesentwicklung und Energie

Schoolgirls discover the wafer up close
© MQV / Mikka Stampa

Career and youth development

At Fraunhofer EMFT, we continued to actively support young scientists in 2024. New this year was our participation in the IKOM career fair at the TUM campus in Garching. Additionally, we regularly host school groups and organize the traditional Girls' Day.

IKOM 2024

In June 2024, our team participated in IKOM, the most significant career forum for students in Germany, alongside the Fraunhofer IVV, IBP, and IGCV institutes of Fraunhofer LZSiS.

Our experts presented their innovative projects in the fields of electronic microsystems, sustainable food and packaging solutions, building physics, and production optimization. In this inspiring environment, students seized the opportunity to engage with our HR colleagues about exciting career opportunities and gain valuable insights into the diverse perspectives for their professional future.

Girls‘ Day 2024

On Girls‘ Day we welcomed a group of young girls in collaboration with Munich Quantum Valley (MQV) to explore the world of quantum technology. They examined our wafers, participated in a lab tour, and conducted experiments where they built a circuit and analyzed the generated heat with an infrared camera. Particularly inspiring was the exchange with our trainee Victoria Rahnsch, who participated in Girls' Day herself a few years ago and is now learning to become a microtechnologist – an impressive example of the significance of such events for young women.

School groups visiting the institute

In spring, we had the pleasure of welcoming two school groups from Burgenland and Munich to our institute. They were presented with a wide range of topics, from micropumps to secure electronics, flexible technologies and AI. After a brief introduction to the world of steel and silicon micropumps, the groups explored our clean rooms and laboratories.

Ferdinand Pscheidl, scientist, Circuit Design

I am Ferdinand Pscheidl, a research associate in the field of circuit design. After completing my master's thesis at Fraunhofer EMFT, I have been working since May 2021 on the development of neuromorphic processors for Spiking Neural Networks (SNNs) with very low latency in the nanosecond range.

Ferdinand Pscheidl © Fraunhofer EMFT

In this role, I deal with the entire technology stack, from transistor level to software, and work closely with other Fraunhofer institutes, particularly Fraunhofer IIS, in an interdisciplinary design team. Additionally, I am involved in the network of the Fraunhofer research field for Next Generation Computing.

I appreciate the creative freedom, the support of my helpful colleagues, and the diverse training opportunities at Fraunhofer EMFT and within the Fraunhofer network. After completing our first neuromorphic processor, I aim to successfully acquire follow-up projects and drive research transfer into industry.

Victoria Rahnsch, trainee in the field of microtechnology

I have been a trainee in the research area of microtechnology at Fraunhofer EMFT in the Silicon Technologies and Devices department since September 2023. There, I am learning the fundamentals of semiconductor technology and how to operate modern equipment in the clean room. I carry out exciting processes such as etching and deposition, monitor the results using measurement devices, and gain insights into various departments to better understand the interconnections.

I appreciate the varied structure of my workday and the friendly colleagues. My next goal is to achieve good grades in the final examination in summer 2026.

Victoria Rahnsch © Fraunhofer EMFT

»Every day is different, and in the evening you often go home with new insights that you wouldn't have expected in the morning.«

Victoria Rahnsch,
Fraunhofer EMFT

Network

© Pixabay

ZVE

The Center for Electronic Connection Technologies (ZVE) of Fraunhofer EMFT has been imparting knowledge about electrical connection technology for over 40 years. The focus is on manual techniques, practical training formats and R&D on IoT and autonomous systems.

LZSiS

As part of the Fraunhofer Center "Secure Intelligent Systems" (LZSiS), five Fraunhofer institutes are working together with universities in Munich to support companies in the region. Through interdisciplinary collaboration, the LZSiS offers a unique portfolio of services for the secure implementation of the potential of digitalization. Possible fields of application range from industrial automation and networked mobility to smart home and smart health. Fraunhofer EMFT contributes with its microsystems expertise to the collaboration.

⟶ More info: *www.lz-sis.de/en.html*

FMD

Since 2017, Fraunhofer EMFT has been part of the Research Fab Microelectronics Germany (FMD), which brings together eleven Fraunhofer institutes and other partners. The FMD offers solutions in sensor systems, power electronics and MEMS and supports projects such as "Green ICT @ FMD". Initiatives like the APECS pilot line as a part of the EU Chips Act promote the innovative strength of European microelectronics.

⟶ More info: *www.forschungsfabrik-mikroelektronik.de/en*

SENS-FIP@TAU

Since 2022, Fraunhofer EMFT has been operating FIP-SENS@TAU with Tel Aviv University for sensor research and technology transfer. Highlights include the EU project "UnderSec" and work on biosensors for plant monitoring. The platform stands for the successful international networking of Fraunhofer EMFT in sensor research.

⟶ More info: *emft.fraunhofer.de/**FIP-SENS-TAU***

MQV

Munich Quantum Valley was founded to strengthen quantum science in Bavaria. In this initiative, Fraunhofer EMFT is developing quantum processors and integrating quantum computing with microelectronics. By working closely with partners, it is contributing to the development of scalable technologies and strengthening Bavaria's role in quantum research.

⟶ More info: *www.munich-quantum-valley.de*

BWSF

The initiative "Biogenic Value Creation and Smart Farming" is developing technologies for sustainable agriculture, for example using AI, sensors and big data. In this context, Fraunhofer EMFT is working on solutions for the shortage of specialists and scarcity of resources and is supporting knowledge transfer with the webinar series "Agriculture of the Future".

⟶ More info: *emft.fraunhofer.de/**smartfarming***

TrEB

The Trusted Electronics Bavaria Center (TrEB) researches technologies for trusted electronics and tests them in prototypical implementations. The institutes work closely with the Bavarian Chip Design Center and the BMBF project Velektronik. Projects like Velektronik and collaborations with the Bavarian Chip Design Center secure critical infrastructures.

BCDC

The Bavarian Chip Design Center (BCDC) has set itself the goal of further expanding chip design capabilities in Bavaria and enabling companies, in particular start-ups and SMEs, to gain easier access to chip design and the necessary supply chains. Fraunhofer EMFT provides support in the form of expertise in microelectronics and 3D integration. The center promotes SMEs, start-ups and the development of skilled workers.

⟶ More info: *www.iis.fraunhofer.de/en/ff/sse/bavarian-chip-design-center*

APECS

The APECS pilot line for advanced packaging and heterogeneous integration strengthens semiconductor manufacturing in Europe and promotes chiplet innovation as part of the EU Chips Act.
It enables large companies, SMEs and start-ups to access cutting-edge technology more easily and creates a solid foundation for European semiconductor supply chains. APECS is co-funded with €730 million over 4.5 years by the Chips Joint Undertaking and national funding authorities.

⟶ More info: *www.apecs.eu*

Sustainability – Researching with Responsibility

Sustainability, climate, and environmental protection are central elements of our corporate strategy. To achieve our sustainability goals, we focus on measures for energy conservation, climate protection, and responsible resource management. Initial improvements in the use of our buildings, laboratories, clean rooms, and offices have already been implemented. Additionally, we employ modern technologies and sustainable practices to enhance our efficiency and minimize our ecological footprint. Our construction project at the research campus in Garching also adheres to the highest sustainability standards. We promote environmentally friendly mobility in the workplace and place great importance on the well-being of our employees. Our research fields and projects pursue innovative approaches that benefit society and the environment, including sustainable agriculture, climate-friendly production processes in microelectronics and much more.

Learn more about sustainability at Fraunhofer EMFT:
emft.fraunhofer.de/***sustainability-emft***

Bicycle instead of car: Institute director Prof. Christoph Kutter promotes green mobility © Fraunhofer EMFT / Puneet Sansare

Variety as a strength: Diversity at Fraunhofer EMFT

Shaping Diversity Together – this is our guiding principle and an integral part of our corporate culture. By bringing together different perspectives, we foster a creative working environment that supports innovation and equal opportunities.

We support knowledge exchange in age-diverse teams, promote young talents, and ensure that all employees feel safe and respected, regardless of gender, origin, or sexual orientation.

Our commitment to diversity is also reflected in our training offerings, language courses, and cultural sensitivity programs. This creates an inclusive working environment where every individual can reach their full potential.

Learn more about diversity at Fraunhofer EMFT:
*emft.fraunhofer.de/**diversity-emft***

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Close-up of the carrier chip on an 8-inch wafer for flip-chip-bonding of a 24 fixed-frequency qubit chip
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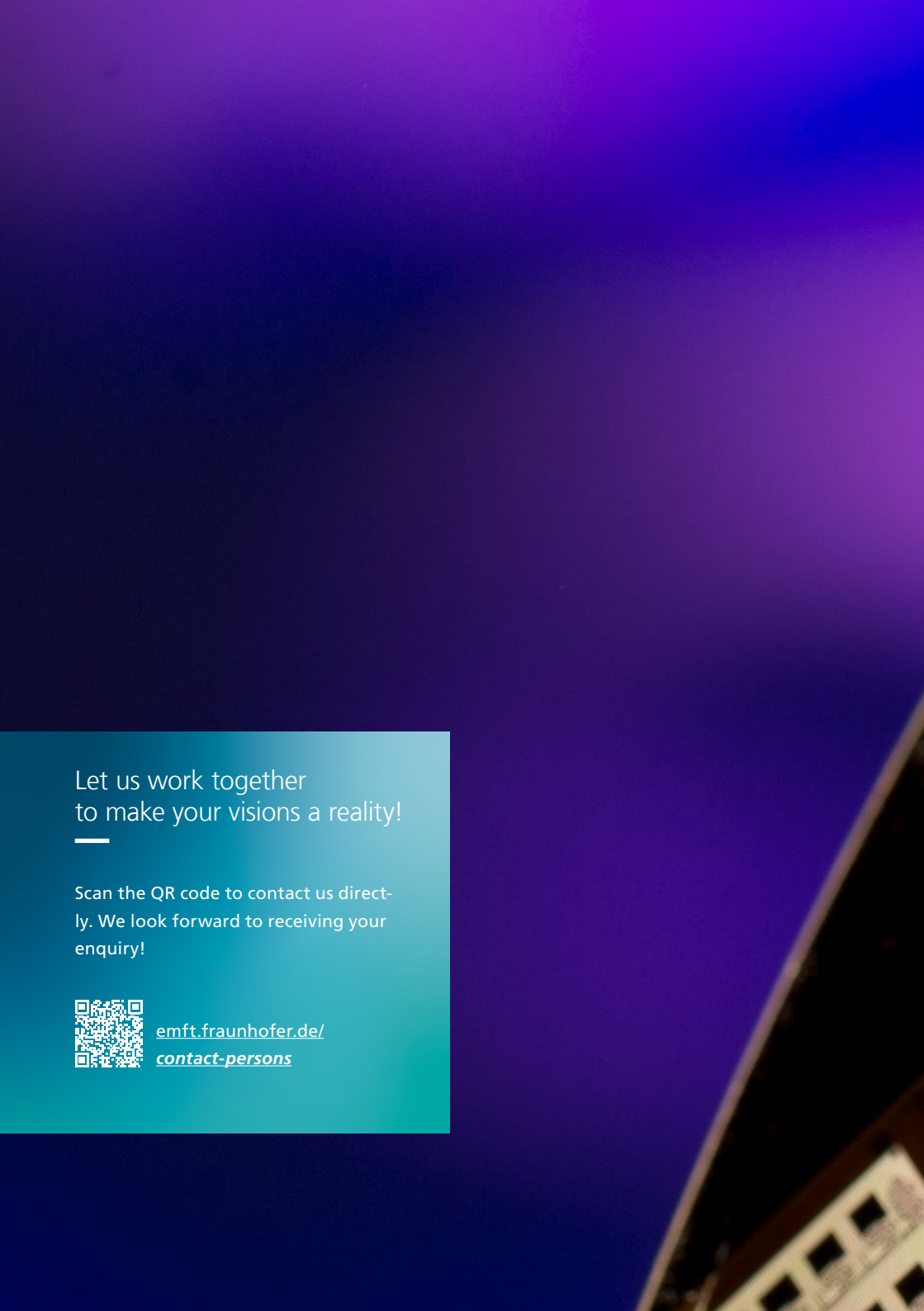

Let us work together to make your visions a reality!

Scan the QR code to contact us directly. We look forward to receiving your enquiry!

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