

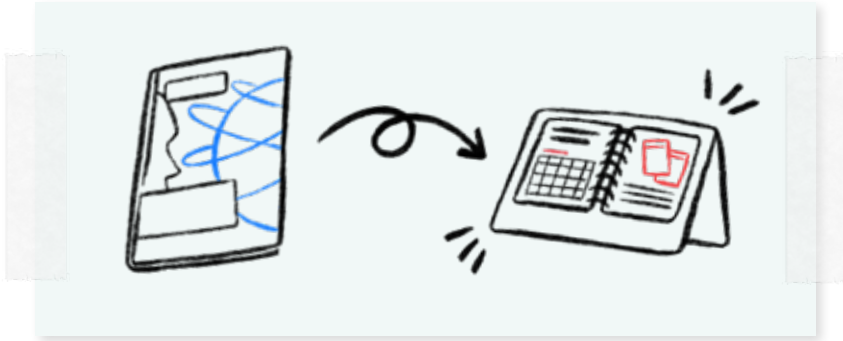


2026

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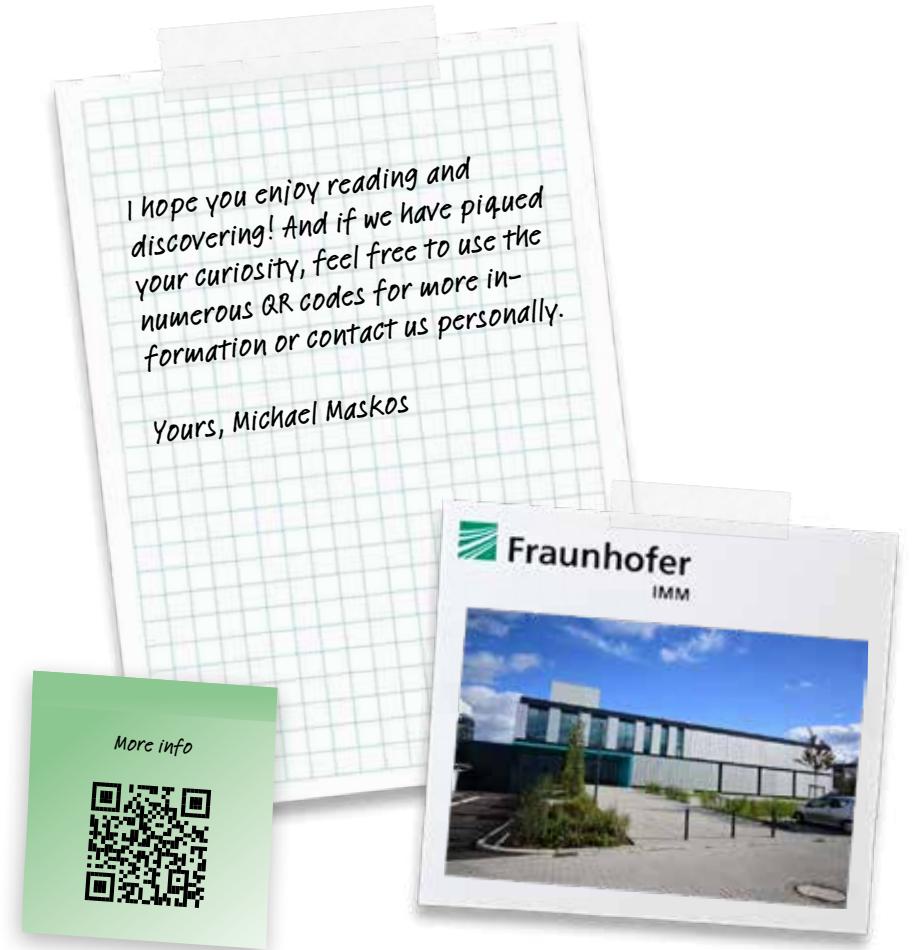
ONE YEAR – 12 HIGHLIGHTS

# Can we turn an annual report into a desk calendar?



We asked ourselves how we could save resources without completely doing away with our annual report. How we could provide information and offer additional value.

Ta-da! Here it is, our first annual report 2025 in calendar form. Less text, less paper, but a beautiful and useful calendar for your desk!



## Kernfusion

# Can chips survive fusion's fire?

## JANUARY

MON	TUE	WED	THU	FRI	SAT	SUN
			Neujahr 1	2	3	4
5	Heilige Drei Könige 6	7	8	9	10	11
12	13	14	15	16	17	18
19	20	21	22	23	24	25
International Day of Clean Energy 26	IMM at Hyvolution Paris		29	30	31	

Fusion is considered a key technology for a sustainable energy future. But its potential can only be realized if its output can be measured and controlled with precision. At Fraunhofer IMM, engineers are developing highly sensitive bolometers that deliver reliable data even under extreme conditions – enabling precise plasma control and energy balance calculation.



*These silicon chips withstand extreme fusion environments (neutrons, X rays, heat cycles) and precisely measure plasma radiation from IR to hard X rays. Gold/platinum absorbers and platinum meanders convert radiation into resistance change – reliable data where precision matters.*

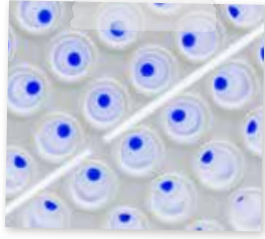


More info



LZ-EZT

# Can one cell change everything?



FEBRUARY

MON	TUE	WED	THU	FRI	SAT	SUN	
						1	
2	3	World Cancer Day 	4	5	6	7	8
9	10	11	12	13	14	15	
16	17	18	19	20	21	22	
23	24	25	26	27	Rare Disease Day 	28	

The medicine of the future is personalized. Single-cell technologies enable us to understand the heterogeneity of cell populations and analyze individual cells in terms of their genetic and functional properties. This is crucial for decoding disease mechanisms and developing personalized therapeutic approaches.



The LZ-EZT offers a unique combination of microfluidics, clinical health research, and automation.

Mainly driven by Fraunhofer IMM and IPA

## Core functions

- Development and integration of microfluidic systems for single cell isolation, detection, and analysis
- Promotion of interdisciplinary cooperation for technology transfer
- Establishment of a dynamic ecosystem for science and industry



More info



# Can a patch save lives?

MARCH

MON	TUE	WED	THU	FRI	SAT	SUN
						1
2	3	4	5	6	7	8 <small>International Women's Day</small>
9	10	11	12 <small>World Kidney Day</small>	13	14	15
16 <small>St. Patrick's Day</small> 	17	18	19	20	21	22
23	24	25	26	27	28	29 
30	31					

*IMM at analytica*

**potassium:**

- vital electrolyte that controls the functioning of the heart, nerves, and muscles. A permanently elevated potassium level can trigger dangerous cardiac arrhythmias / cardiac arrest
- regular checks crucial to avoid life-threatening complications



Sterile disposable micro patch, developed in cooperation between Fraunhofer IMM and the start-up KiTech, that takes a few microliters of interstitial fluid in a minimally invasive manner, quantifies kidney and heart biomarkers within seconds, and transmits the results via a smartphone app to a cloud-based care platform.



More info



# Can we ensure water safety – everywhere?

## APRIL

MON	TUE	WED	THU	FRI	SAT	SUN
		World Aquatic Animal Day 1	Gründonnerstag 2	Karfreitag 3	4	Ostersonntag 5
Ostermontag 6	World Health Day 7	8	9	10	11	12
13	14	15	16	17	18	19
IMM at 20	21	World Earth Day 22	Hannover Messe 23	24	World Malaria Day 25	26
27	28	29	30			

### InBaDtec in action

- ✓ Automated concentration from 1 liter to 200 µl in < 10 minutes
- ✓ Detection sensitivity increased by a factor of 1,000
- ✓ Compact, robust, reusable
- ✓ Ready for use in industry, pharmaceuticals, food, aquaculture, and more



Microbiological hazards in water and industrial processes are often detected too late – with fatal consequences. Legionella, for example, can cause severe pneumonia and even death. Current detection methods are too slow and miss non-culturable pathogens. Fraunhofer IMM is developing InBaDtec, a compact, fully automated point-of-use device for the rapid preparation of water samples. Its goal: enable on-site detection of pathogens within one hour using qPCR.



### More info



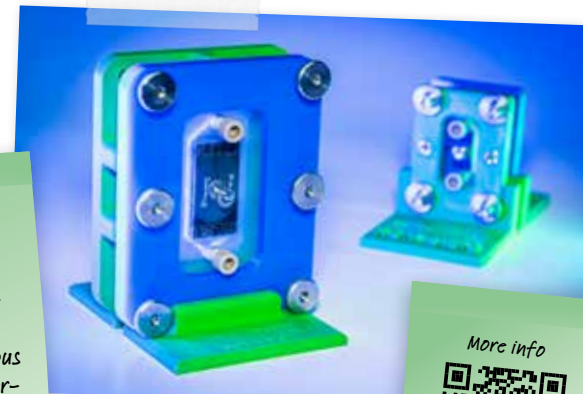
The project is funded by Fraunhofer ATTRACT, SAP-no. 40-00440.

# Can we locally produce tomorrow's medicines?

MAY

MON	TUE	WED	THU	FRI	SAT	SUN
				Tag der Arbeit	1	2
					3	
IMM at IFAT			World Smart Medication Day Conference	7	8	9
4	5	6			10	
			Christi Himmelfahrt			
11	12	13	14	15	16	17
				International Day for Biological Diversity		Pfingstsonntag
18	19	20	21	22	23	24
Pfingstmontag						
25	26	27	28	29	30	31

Using microreactors and bio electrocatalysis, KOM-e-BIO achieves high selectivity and low waste. Optimized electrodes and minimal salt usage reduce by products; continuous flow operation minimizes energy losses and enables sustainable CO<sub>2</sub> factor regeneration.



More info



The COVID pandemic and energy crises exposed Germany's dependence on global supply chains. Shortages in active pharmaceutical ingredients revealed the fragility of drug production. Policymakers and industry now call for key synthesis steps to return to Europe – while chemical manufacturing must become more sustainable.

With KOM-e-BIO, Fraunhofer IMM supports this shift by merging bioelectrocatalysis, microreactor technology and flow synthesis to manufacture chiral fine chemicals for pharmaceuticals locally, efficiently and eco consciously.

Activities funded by the Ministry of Science and Health of the State of Rhineland-Palatinate, Grant no. 724-0032#2023/0005-1501 15402.

# Can a seed coat fight drought and herbicides?

## JUNE

MON	TUE	WED	THU	FRI	SAT	SUN
1	2	3	4 Fronleichnam	5 World Environment Day 	6	7
8	9	10	11	12	13	14
15	16	17 Day to Combat Desertification and Drought	18	19	20	21
22	23	24	25	26	27	28
29	30					

Seeds must reliably germinate immediately after sowing – sufficient water uptake is essential, and at the same time seedlings need protection from herbicides. Under drought stress, limited water availability often leads to uneven field emergence and yield losses. In the Fraunhofer project SeedPlus, a microplastic free, biodegradable seed coating is being developed that:

- regulates water absorption, storage, and release in a targeted way – especially under drought stress and
- provides a selective barrier against herbicides without inhibiting germination or growth.

- Biodegradable coatings instead of microplastics
- Capsules (150 nm – 20 µm) with additives for enhanced coating functionality
- Environmental testing strategy to assess degradation and ecotoxicity
- Adaptable to different seed types and additives (e.g. nutrients)



The project is funded by Fraunhofer PREPARE, SAP-no. 40-04089.

SMARTFORM

# Can AI design better nanomedicines?



JULY

MON	TUE	WED	THU	FRI	SAT	SUN
		1	2	3	4	5
6	7	8	9	10	 11	12
13	14	15	16	17	18	19
20	21	22	23	24	25	26
27	28	29	30	31		



Activities funded by the Ministry of Science and Health of the State of Rhineland-Palatinate, Grant no. 7240022# 2024/0005-1501 15402.

The COVID pandemic exposed how fragile global supply chains are – especially for medicines. At the same time, sustainability and resource efficiency are becoming central to pharmaceutical manufacturing. With SmartForm, Fraunhofer IMM and ITWM are developing a KI-powered platform to accelerate and systematize the formulation of nanomedicines.


In the project, an AI powered platform is being developed to make nanotherapeutic formulation processes predictable and optimized.

- Established nanomedicine formulations are systematically produced under varying parameters such as temperature, flow rate, and concentration, analyzed, and converted into simulation models.
- The goal: robust predictive models, more efficient experiments, and improved transferability of new formulations to industrial scale.

The goal: make production not just faster, but more robust, scalable, and environmentally conscious – for both tailored therapies and mass vaccines.

# Can membranes keep fuel cells “young” – by keeping their moisture alive?

## AUGUST

MON	TUE	WED	THU	FRI	SAT	SUN
					1	2
3	4	5	6	7	8	9
10	11	International Youth Day	13	14	Mariä Himmelfahrt 15	16
17	18	19	20	21	 22	23
24	25	26	27	28	29	30
31						

PEM fuel cells deliver emission free energy, but they require precise air humidification to operate efficiently. Membranes that dry out lead to performance decline and accelerated wear. A robust membrane that functions reliably for longer reduces maintenance costs and boosts system dependability.

Parker Hannifin’s Engine Mobile Filtration (EMFE) and Fraunhofer IMM are jointly working to optimize a novel hollow fiber membrane technology for fuel cell humidification. The goal: longer lifespan, increased efficiency, and more robust systems that advance the deployment of fuel cells in low emission applications.

- Efficiency measurements of existing Parker humidifiers
- Construction and operation of a specialized test rig
- Simulations to analyze fiber length, diameter & permeability
- Evaluation of how membrane properties affect performance



GAMMA

# Can we ship goods without emissions?



SEPTEMBER

MON	TUE	WED	THU	FRI	SAT	SUN
	IMM at SMM					
	1	2	3	4	5	6
7	8	9	10	11	12	13
14	15	16	17	18	19	20
21	22	23	24	25	26	27
28	29	30				

International Day for the Preservation of the Ozone Layer

Zero Emissions Day

World Maritime Day



International shipping accounts for around 80–90% of global freight traffic and contributes significantly to global greenhouse gas emissions.



More info



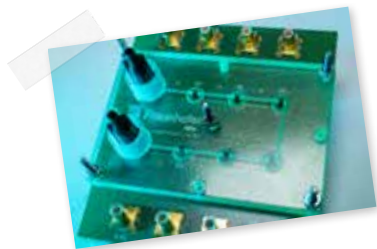
The European project GAMMA aims to make shipping climate-neutral. A bulk carrier with a payload of 60,000 tons is being retrofitted with an innovative fuel system that uses e-fuels such as green methanol and ammonia. These are converted into hydrogen on board, which is then used in fuel cells to generate power supply for the vessel. Additional energy is provided by photovoltaic modules on the ship's hatch

covers. Fraunhofer IMM is making a significant contribution to the implementation of this project with the development of a 600 kW methanol reformer and a 400 kW ammonia cracker.

The GAMMA project is funded by the European Commission, Grant no. 101138620.

## AUTONUTRI

# Can we grow more with less?



## OCTOBER

MON	TUE	WED	THU	FRI	SAT	SUN
			1	2	3 <small>Tag der Deutschen Einheit</small>	4
5	6	7	8	9	10	11
12	13	14	15 <small>World Food Day</small>	16 	17	18
19 <small>IMM at Hydrogen Technology World Expo</small>	20	21	22	23	24 	25
26	27	28	29	30 <small>Reformationstag</small>	31	

The BMBF is kindly acknowledged for funding the work within the I&STC 2+2 program in the project AUTONUTRI, under grant number I&STC\_IND19I&Z1-28.

### Corefunctions

- Direct potentiometric determination of ions using ion-selective sensors
- Integration into a microfluidic system for automatic sampling and measurement matrix adaptation
- Modular laboratory demonstrator consisting of sensor technology, microfluidic chip, actuators, electronics, and software control



More info



In light of climate change and increasing periods of drought, agricultural systems are facing the challenge of using water and nutrients more efficiently. In vertical hydroponic systems in particular, precise control of nutrient supply is crucial to both maximize yields and minimize environmental impact.

*We developed AutoNutri, an on-site multi-ion monitoring system for automated online control of nutrient supply in closed hydroponic circuits.*

# Can we turn waste CO<sub>2</sub> into usable methane?

## NOVEMBER

MON	TUE	WED	THU	FRI	SAT	SUN
						Allerheiligen 1
2	3	4	5	6	7	8
9	10	11	12	13	14	15
16	17	18	19	20	21	22
23	24	25	26	27	28	29
30	31					



World Science Day for Peace and Development

International Day for Tolerance

Buß- und Bettag

Biogas plants typically produce about 60 % methane and 40 % carbon dioxide (CO<sub>2</sub>). This CO<sub>2</sub> is largely emitted unused – a missed opportunity in the energy transition.

In the ICOCAD2 project, a process is being further developed that converts the CO<sub>2</sub> produced using green hydrogen into additional methane, thereby significantly increasing the methane yield.

- Scaling up demonstration plants targeting 50 kW thermal capacity  
**Challenge:** Highly dynamic operation, since the electricity output for producing green hydrogen can fluctuate
- Microstructured reactors with efficient catalyst coatings increase the gas-catalyst contact area  
**Goal:** > 97 % conversion of the fed CO<sub>2</sub> via heat integration and optimized reactor configuration

### Did you know?

In Germany there are about 3,700 biogas plants, where bacteria decompose biomass under anaerobic conditions into biogas.



More info



Funded by the Federal Ministry of Agriculture, Food and Regional Identity, Grant no. 2220NR279A.

# Can ammonia power tomorrow's industries?

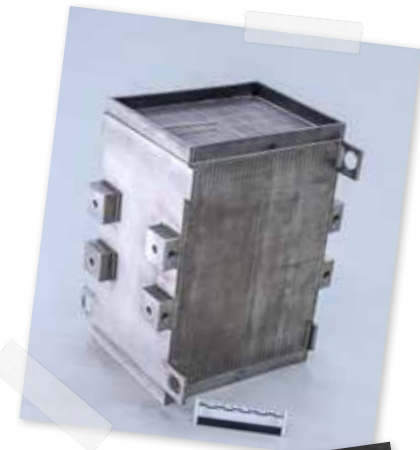


## DECEMBER

MON	TUE	WED	THU	FRI	SAT	SUN
	1	2	3	4	5	6
International Civil Aviation Day 7	8	9	10	International Mountain Day 11	12	13
14	15	16	17	18	19	20
21	22	23	24	1. Weih-nachtstag 25	2. Weih-nachtstag 26	27
28	29	30	31			

Germany faces a substantial industrial demand for electricity and process heat that cannot be met without imports. Pure hydrogen is promising, but its transport, storage and decentralized distribution are energy-intensive and costly.

Ammonia, as a carbon free hydrogen carrier, offers potential: it can be transported in liquid form, uses existing infrastructure, and can be deployed in decentralized systems.



The Fraunhofer flagship project AmmonVektor, coordinated by UMSICHT, unites expertise from ICT, IGB, IKTS, IML, IMM and ITWM to advance green ammonia as a decentralized energy carrier.



*This work was supported as a Fraunhofer FLAGSHIP PROJECT.*

*IMM is responsible for developing compact, high efficiency ammonia cracking technologies - specifically microstructured reactors and novel catalysts for splitting  $NH_3$  into hydrogen and nitrogen in decentralized systems.*

# Our numbers 2024

< 56%

Public

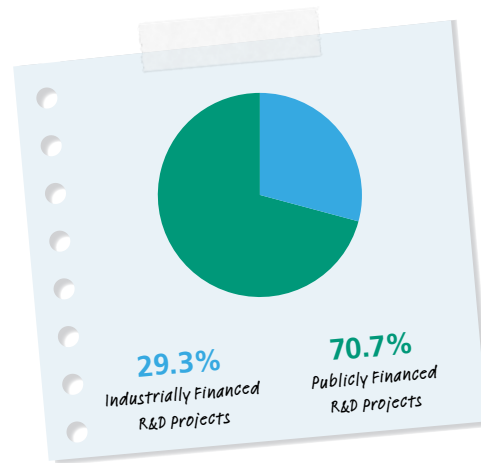
101

Projects

> 44%

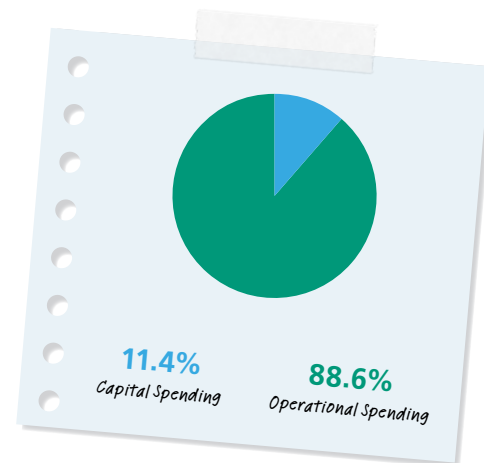
Industrial

## NOTES

**Revenues**  
from external funding  
sources research

**13.7 Mio €**  
Contract research



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