
Fraunhofer
EMI
Fraunhofer Institute for High-Speed Dynamics, Ernst-Mach-Institut, EMI
EMI

WHO WE ARE

s.fhg.de/emi-mission-statement

The Fraunhofer Institute for High-Speed Dynamics, Ernst-Mach-Institut, EMI, is an institute of the Fraunhofer-Gesellschaft, the world's leading applied-research organization.

It is our mission to offer first-class research services and cutting-edge technology to our customers from the industries and the public sector in the fields of defense, security and resilience, automotive, space and aviation. For the German Federal Ministry of Defence (BMVg), we act as excellent and independent partner with our analyzing and consulting expertise concerning questions of research and technology.

Our cooperation partners comprise universities, research institutions and industrial companies in Germany, Europe, America, Asia and Australia. In Freiburg, we join forces with the other resident Fraunhofer institutes and the University of Freiburg within the framework of the the Sustainability Center Freiburg.

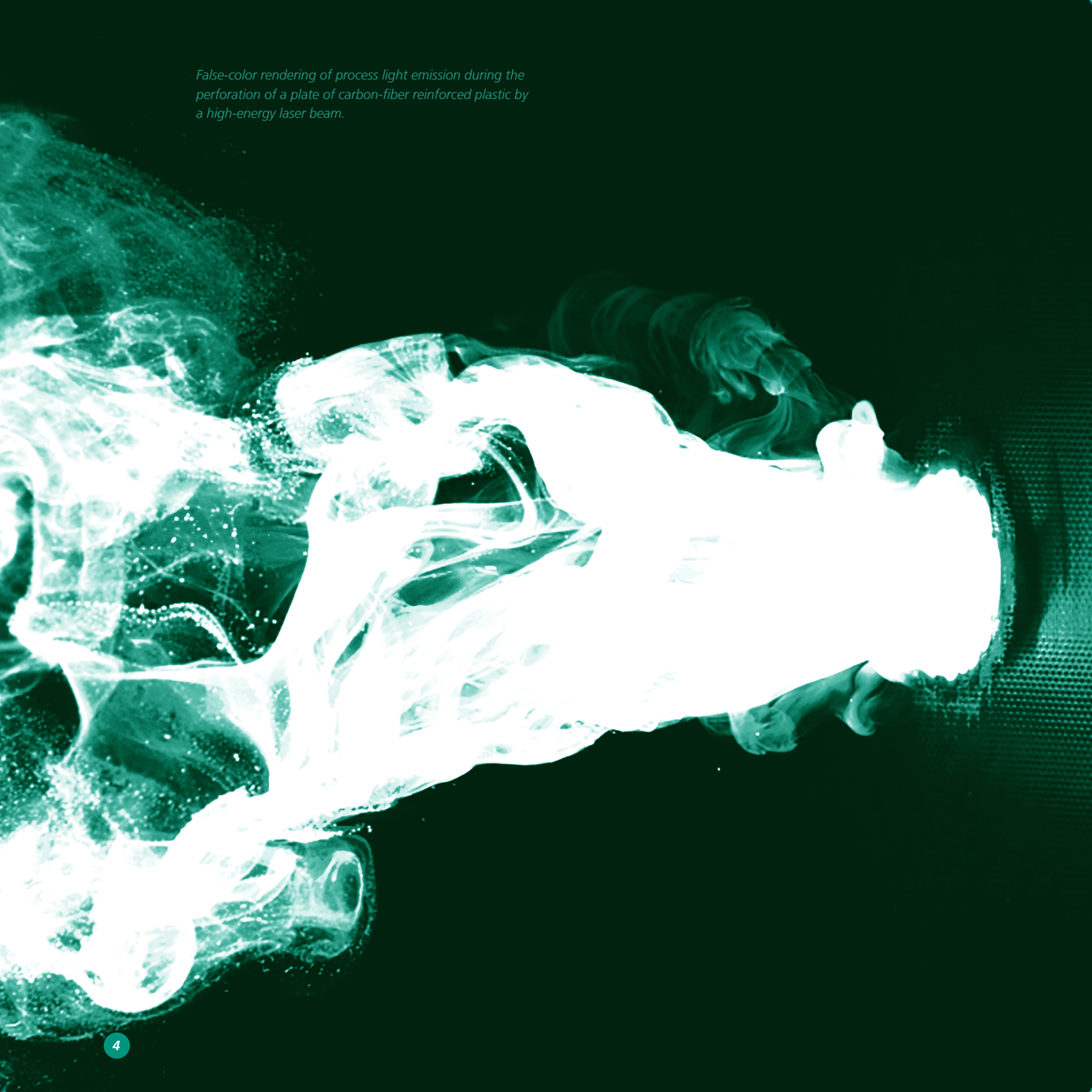
OUR SERVICE OFFER

We offer testing and modeling of materials, components and full vehicles under dynamic loads as well as the implementation and development of novel sensors and measurement technology. We develop numerical calculation methods and customized software solutions. In experiments, we examine high-speed impact at velocities up to 10,000 meters per second and analyze the effects of intense laser radiation.

s.fhg.de/emi-service-offer

SELECTION FROM OUR EQUIPMENT

- Unique laboratory accelerators and laboratories for material testing
- Crash Center of the Fraunhofer-Gesellschaft (component and full-vehicle crash) using X-ray car-crash (X-CC) technology
- Shock-tube facility for the examination of building elements under blast loads
- 3D-Printing Lab Metals and Structural Materials
- Laser Technology Lab for the examination of intense laser radiation
- Satellite Lab for hard- and software development for nanosatellites



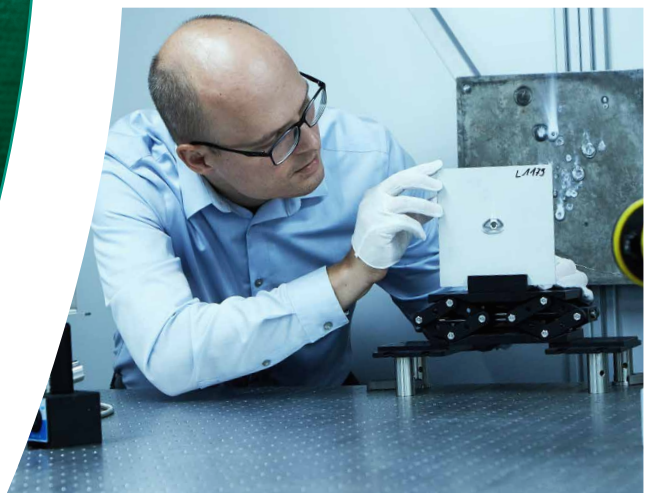
False-color rendering of process light emission during the perforation of a plate of carbon-fiber reinforced plastic by a high-energy laser beam.

BUSINESS UNIT DEFENSE

The German Federal Armed Forces (Bundeswehr) need high-performance systems for land, air and sea. As a strategic partner of the German Federal Ministry of Defence (BMVg) regarding high-speed dynamics research and technology, Fraunhofer EMI explores scientific and technological issues regarding protection, armor and effects.

Research at EMI combines highly instrumented laboratory experiments with the modeling of material behavior and numerical simulation and covers the fields of impact and shock-wave physics, ballistics, blast effects and explosion mechanics as well as laser effects.

s.fhg.de/emi-defense



RESEARCH IN ACTION

"We examine phenomena and effects of high-energy laser radiation. From our research, the Bundeswehr gains knowledge how to protect soldiers against laser weapons."

Dr. Matthias Wickert,
Head of business unit Defense

The floods in the Ahr valley have shown how vulnerable our networked infrastructures are. © Adobe Stock

BUSINESS UNIT SECURITY AND RESILIENCE

Recent disasters around the world, both man-made and caused by extreme weather conditions, demonstrate dramatically that our societies face ever-increasing challenges to our security and resilience. Growing complexity at all levels entails risks and makes systems vulnerable. Fraunhofer EMI investigates technologies and develops new solutions to make our society and infrastructure robust, tolerant and therefore resilient against multi-faceted threats like terrorist attacks, natural disasters or accidents. Apart from issues concerning calculable risks, robustness and resilience aspects of sociotechnical systems are gaining more and more attention in research.

s.fhg.de/emi-security-and-resilience

RESEARCH IN ACTION

"For the planning and operation of infrastructures, we want to make the broad concept of resilience measurable and predictable: Unique experiments and increasingly accurate simulations help to understand the behavior of systems before, during and and after a crisis."

Daniel Hiller,
Head of business unit
Security and Resilience

The risk of head, neck, chest and abdominal injuries is examined using the THOR-50M dummy in X-ray crash tests.

BUSINESS UNIT AUTOMOTIVE

We contribute to a safer future mobility for all road users. For this sake, we draw on our Crash Center of the Fraunhofer-Gesellschaft, our tomography lab and the battery test bench for destructive dynamic testing of electric energy-storage devices.

For the validation of numerical crash simulations, we develop a novel measuring and evaluation method that enables the observation of the dynamic behavior of hidden vehicle structures during crash.

On the way to safer traffic, agent-based traffic simulations are gaining in importance, for example, to identify critical situations.

s.fhg.de/emi-e-automotive

RESEARCH IN ACTION

"Road-traffic safety is the ultimate goal. Developments concerning vehicle designs and propulsion systems pose ever-exciting challenges. At the same time, we have our finger on the pulse of time pursuing new research solutions by using innovative dummies."

Dr. Jens Fritsch,
Head of business unit Automotive

At EMI, we develop our own nanosatellite ERNST.

BUSINESS UNIT SPACE

We provide solutions for New Space Economy and Space Sustainability. New Space Economy is revolutionizing global space activities. In our Satellite Lab, we develop innovative small satellite systems with compact scientific payloads. Our research focus is on real-time Earth observation methods and methods to enhance the resilience of commercial-off-the-shelf systems.

The growing number of spacecraft in Earth orbits threaten the safety of space systems. We apply unique experimental and numerical methods for impact risk assessment, collision effects analysis and protective design of spacecraft. We develop methods, tools and technologies that help making the use of space sustainable.

s.fhg.de/emi-space

RESEARCH IN ACTION

"We apply unique science-based methods for enhancing the safety of spacecraft. We enable innovative services based on resilient small satellite systems. With exciting new projects, such as our nanosatellite ERNST, we will continue shaping the future of space research and technology."

Prof. Dr. Frank Schäfer,
Head of business unit Space

The increasing availability of aerial drones presents a potential danger for air traffic. Fraunhofer EMI investigates collision scenarios between drones and aircraft in order to quantify this danger.
© Adobe Stock

BUSINESS UNIT AVIATION

The research in the business unit Aviation pursues the goal of ensuring the maximum of safety for aircraft and their components. For this purpose, Fraunhofer EMI carries out specialized tests and predictive simulations in order to support the aviation industry in safety-critical issues such as bird strike, hail impact or collisions with drones.

In the aerospace industry, additive manufacturing of metallic components is gaining in importance. At Fraunhofer EMI, we develop design approaches enabling the aviation industry to fully exploit the potential of additive manufacturing.

s.fhg.de/emi-aviation

RESEARCH IN ACTION

"Being able to shape the future of aviation with respect to safety and eco-friendliness is highly satisfying."

Dr. Michael May,
Head of business unit Aviation

s.fhg.de/cooperation-with-emi

HOW TO WORK WITH US

In line with the research and development needs of your company, we cooperate with you to develop individual solutions in the fields of material testing, process optimization, security and resilience analysis. We are your strategic partner in the development of new software, new testing methods, new materials and new technologies up to comprehensive technology demonstrators.

As a doctoral candidate, you will experience working at the interface between research and industry.

Together with you as a research institution or company, we will collaborate in publicly funded projects on a national and European level.

Through our Sustainability Center Freiburg, your company will gain access to the five Freiburg Fraunhofer Institutes and the University of Freiburg to promote marketable products and services.

OUR INSTITUTE MANAGEMENT

Prof. Dr. Stefan Hiermaier, director
Prof. Dr. Frank Schäfer, deputy director
Dr. Matthias Wickert, deputy director

OUR LOCATIONS AND CONTACT

Freiburg
Ernst-Zermelo-Strasse
479104 Freiburg
Germany
Phone +49 761 2714-0

Efringen-Kirchen
Am Klingelberg 1
79588 Efringen-Kirchen
Germany
Phone +49 7628 9050-0

Kandern
Am Christianswuhr 2
79400 Kandern
Germany
Phone +49 7626 9157-0

Press and Public Relations:
Birgit Bindnagel

info@emi.fraunhofer.de **www.emi.fraunhofer.de/en.html**

s.fhg.de/emi-career

s.fhg.de/emi-newsletter-subscribtion

s.fhg.de/fraunhofer-emi-linkedin

s.fhg.de/fraunhofer-emi-youtube