

Press Release

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Fraunhofer IOF Develops Compact goVISCAN Sensor for Contactless Measurement of Vital Signs

Vital Signs at a Glance without Contact

Jena / Stuttgart (Germany)

Measuring heart rate, respiratory rate, and oxygen saturation without electrodes on the skin or invasive sensors on the body. This is enabled by goVISCAN: a new, compact sensor developed by Fraunhofer IOF in collaboration with partners in the AMI research alliance. The sensor is now being unveiled for the first time at the W3+ trade show in Jena and the VISION trade show in Stuttgart.

Whether in a hospital, a vehicle, or a manufacturing facility: Monitoring a person's health without touching them or restricting their freedom to move can be useful in numerous situations. However, conventional measurement methods often require electrodes, cables, or sensors worn on the body. On the one hand, this compromises comfort; on the other, it poses special hygiene challenges, particularly in healthcare and nursing applications.

Researchers at Fraunhofer Institute for Applied Optics and Precision Engineering IOF in Jena have therefore been working for many years on solutions to measure key vital signs completely contactless and solely through optical measurement. And they have been successful: Earlier systems developed by the institute were already capable of measuring heart rate, respiratory rate, and oxygen saturation contactlessly, but these were bulkier and more complex to build and use. "Many existing camera-based methods work under ideal conditions only," explains Martin Hubold, a researcher at Fraunhofer IOF. "As soon as the measurement scene is not optimally illuminated or the person being measured moves, the weak physiological signals are quickly overlaid by perturbations."

A new sensor named goVISCAN, developed by Fraunhofer IOF in collaboration with partners in the "Advanced Multimodal Imaging" (AMI) research consortium, significantly reduces these limitations. The consortium, which received funding through the "Regional Entrepreneurial Alliances for Innovation" (RUBIN) program, focused on a particularly compact design: goVISCAN is sized just 10 × 7.5 × 2.5 centimeters. At the same time, the sensor is designed to enable reliable measurements even under varying lighting conditions and when the subject is moving. "Our goal was to create a sensor that measures reliably even under realistic

conditions—and is compact enough to be discreetly integrated into everyday environments,” says Hubold.

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Nine spectral channels for precise vital sign measurements

The core technology of the goVISCAN vital sign sensor is a novel multispectral camera. It consists of a high-precision arrangement of nine micro-lenses—a so-called micro-lens array. Although this micro-lens array is monolithic, meaning it's made from a single piece of glass, each lens is optimized for a specific wavelength range—from blue over green and red to the near-infrared range, which is invisible to the human eye. “This means that each micro-lens works like a single objective and generates its own image,” explains Hubold, who led the development of the system design. Each lens maps the scene onto its individual section of a shared image sensor with a resolution of 1.25 megapixels and an f/4 aperture.

“Combining the image information from the various spectral channels makes the system particularly powerful and versatile,” says Hubold. This combination enables goVISCAN to detect even weak fluctuations in skin brightness, such as those caused by pulsating blood flow within the skin.

Potential Applications in Healthcare, Automotive Industry, and Safety

goVISCAN currently covers a 40-degree field of view and operates at distances ranging from 70 centimeters to 1.3 meters from the person being analyzed. A potential application is obviously the field of healthcare and nursing, for example, to monitor patients in hospital beds as well as future uses in telemedicine, where doctors are connected digitally. Other potential use cases are driver monitoring in automotive applications to detect fatigue and monitor alertness or in control rooms where attention and stress levels play a significant role.

In an initial pilot study, the researchers tested the new goVISCAN sensor with twelve participants under controlled laboratory conditions. “The study demonstrates the technology’s potential,” Hubold concludes. “Compared to the finger pulse oximeter as a reference system, the mean error was 1.3 breaths per minute for respiratory rate, 2.8 beats per minute for heart rate, and 3.8 percentage points for oxygen saturation.” The next step is now to test the system in a clinical setting.

Exhibition at the W3+ and VISION 2026 trade shows in Germany

Fraunhofer IOF will be showcasing the new goVISCAN vital sign sensor to the public for the first time starting September 23 at the W3+ high-tech trade show in Jena at Booth A3 in the main hall, and starting October 6 at the VISION international imaging trade show in Stuttgart at Booth C92 in Hall 10. Visitors can learn about the technology, its optical components, and its potential applications.

Developed by the AMI Research Consortium as part of the RUBIN program

The vital sign sensor was developed within the “**A**dvanced **M**ultimodal **I**maging” (AMI) research consortium. Launched in 2022 and concluding in 2025, the

consortium brought together eleven partners from academia and industry, including eight small and medium-sized enterprises as well as the Technical University of Ilmenau and Fraunhofer IOF.

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AMI's guiding principle was "Utilize the Unseen." The goal was to make information invisible to the human eye or conventional cameras usable through multimodal imaging. In addition to the vital sign sensor, the alliance also developed solutions for the sort-specific recognition of plastic packaging and the analysis of construction debris.

AMI received approximately nine million euros in funding from the Federal Ministry of Research, Technology, and Space (BMFTR) as part of the "Regional Entrepreneurial Alliances for Innovation" (RUBIN) program. RUBIN supports regional research and industry consortia in developing new technologies and translating them into concrete applications and marketable solutions.

Publication

Martin Hubold, Johanna Karl, Kevin Srokos, et al.: "Contactless vital sign parameter measurement using compact snapshot multispectral multiaperture camera: design, realization, application, evaluation," Proc. SPIE 14111, Optical Instrument Science, Technology, and Applications IV, 1411103 (May 28, 2026). URL: <https://doi.org/10.1117/12.3099761>

Further Information

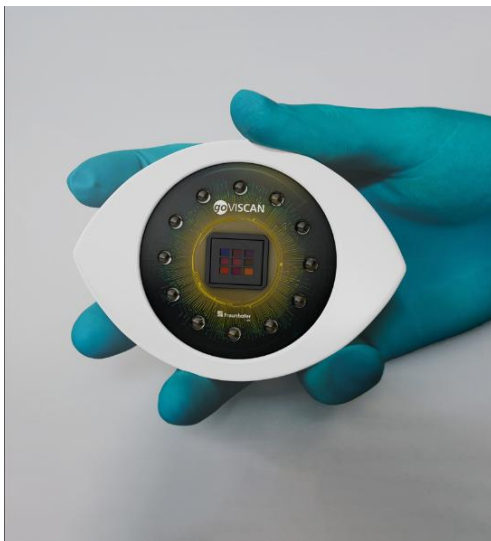
- Further information about the AMI research alliance and its partner organizations: <https://www.rubin-ami.de>
- Fraunhofer IOF press release on the launch of the AMI 2022 research alliance: <https://www.iof.fraunhofer.de/de/presse-medien/Aktuelles/Start-AMI.html>

About Fraunhofer IOF

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The Fraunhofer Institute for Applied Optics and Precision Engineering IOF in Jena conducts application-oriented research in the field of photonics and develops innovative optical systems for controlling light - from its generation and manipulation to its application. The institute's range of services covers the entire photonic process chain from opto-mechanical and opto-electronic system design to the production of customer-specific solutions and prototypes. At Fraunhofer IOF, about 500 employees work on the annual research volume of 40 million euros.

For more information, please visit: www.iof.fraunhofer.de/en.html



The goVISCAN vital sign sensor: At the center is the multispectral camera with a 3 x 3 micro-lens array that captures the spectral bands. LEDs are arranged in a circle around it to illuminate the measurement scene.

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All nine micro-lenses are manufactured as a single compact embossed micro-lens array. © Fraunhofer IOF



Thanks to its compact design, goVISCAN can be integrated into everyday environments—here, for example, while working at a computer. © Fraunhofer IOF

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