Fraunhofer IPMS

FRAUNHOFER INSTITUTE FOR PHOTONIC MICROSYSTEMS IPMS

PRESS RELEASE

Fraunhofer IPMS presents innovative solutions in ultrasonic measurement at Sensor + Test fair

Ultrasonic measurement technology of the future

The Fraunhofer Institute for Photonic Microsystems IPMS in Dresden has been developing robust, reliable and versatile ultrasonic sensors for many years. Due to their small size, the so-called MUTs, Micromachined Ultrasonic Transducers, enable energy-saving, multifunctional, environmentally friendly and extremely compact sensor systems. At the digital trade fair SENSOR+TEST, the world's leading forum for sensor, measurement and testing technology, which is free of charge for visitors, the institute will present its latest developments to the public from May 4 - 6, 2021.

Nowadays, ultrasonic sensors are fully integrated into everyday life. They support the driver as parking assistance in automobiles, ensure safety when humans and robots work together, secure filling levels and material flow in the beverage and food industry, or serve as imaging methods for the examination of embryos or organic tissue in medicine. This versatility is made possible by the propagation and detection of high-frequency sound pulses that are inaudible to humans. These ensure non-contact, reliable and accurate detection of objects for a wide variety of materials regardless of aggregate state, shape and color under almost any circumstances and in virtually any environment.

The micromachined ultrasonic transducers (MUT) developed by Fraunhofer IPMS are based on micro-electro-mechanical systems (MEMS) and are key to the miniaturization of components and devices without which no high-growth technical sector could survive. "Our miniaturized capacitive miromachined ultrasonic transducers (CMUT) benefit from reliable manufacturing processes in CMOS technology. This enables cost-effective and RoHS-compliant production in high volumes. This is not the case with classic piezoelectric ultrasonic sensors, which are manufactured in a complex precision mechanical process and often contain lead," explains Dr. Sandro Koch, scientist at Fraunhofer IPMS. The sensors can be manufactured for a wide range of ultrasonic frequencies, so that application-specific ranges and resolutions are possible. Sensor solutions can be manufactured in single-channel structures as well as in any two-dimensional array structures. The latter enable, for example, the application of imaging methods for environmental monitoring and are thus pioneering in safe human-robot collaboration.

In order to provide interested parties with a quick introduction to the innovative sensor technologies of Fraunhofer IPMS, the institute offers an evaluation kit. It consists of either one or two CMUT sensor modules, adapted control electronics, and software as

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a web application that controls the ultrasonic sensor via plug-and-play. In the specific working range, the system is able to send or receive ultrasonic signals with high sensitivity and resolution. The system transmits the data to the web application via Ethernet or Wifi, enabling simultaneous visualization. Users can thus convince themselves of the technical advantages of Fraunhofer IPMS' CMUT technology with little effort and evaluate this sensor technology for various application scenarios – such as close-range monitoring, acoustic spectroscopy, flow measurement – in which there is a need for miniaturization with simultaneously increased sensitivity.

One of the latest developments of Fraunhofer IPMS is the Nanoscopic Electrostatic Drive (NED) MEMS ultrasonic transducer. This technology makes it possible to dispense with the membrane used in conventional ultrasound transducers. Instead, microscopic bending beams are used, which are set in vibration by a signal. To generate sound, these bending beams are arranged in sound chambers. Sound exits the sound chambers through inlet and outlet slits. The advantages of this system are very low power requirements and RoHS compatibility, as well as a high number of degrees of freedom in design.

At Sensor+Test's accompanying conference, Sensor Measurement and Science International (SMSI), Jorge Mario Monsalve Guaracao, scientist at Fraunhofer IPMS, will present a micromechanical ultrasonic transducer (MUT), which is used, for example, in the field of gesture recognition.

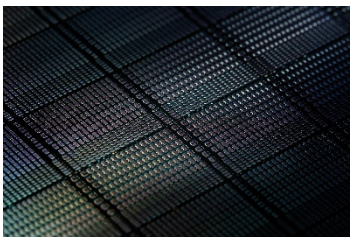
Visitors can register for the free digital trade fair Sensor+Test via the organizer's website at: https://www.sensor-test.de/sensor-test-2021-for-visitors/exhibition-ticket/

About Fraunhofer IPMS

The Fraunhofer Institute for Photonic Microsystems IPMS stands for applied research and development in the fields of industrial manufacturing, medical technology and improved quality of life. Our research focuses on miniaturized sensors and actuators, integrated circuits, wireless and wired data communication, and customized MEMS systems. Fraunhofer IPMS has many years of experience in the development of CMUT components and systems. In this context, a manufacturing process for CMUTs specially developed at Fraunhofer IPMS is used, which enables CMUTs to be manufactured in the back-end-of-line (BeoL) process module. Thus, the CMUT module can be integrated on standard CMOS processes, a unique feature of this technology. Coupled with the

competencies in electronics development and ultrasonic signal processing, Fraunhofer IPMS offers the entire value chain for the research and development of CMUTs.

Images



CMUT chips. © Fraunhofer IPMS

Customer evaluation kit für CMUT.
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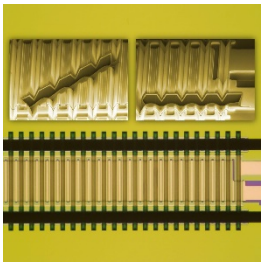

MEMS-based bending actuator V-NED.
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