

# PRESS RELEASE

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## **“eHarsh” – Workshop on Sensor Systems for Extremely Harsh Environments**

**Eight Fraunhofer institutes have joined forces to develop sensor technology for extremely harsh environments. They will present the current status of their work in an online seminar from November 29 to December 3, 2021, showing details along the entire process chain. Viewers will have a “front row seat” during five live laboratory tours. This should be exciting for a wide range of industries: The applications of the new technology range from aviation to the chemical industry and the steel industry all the way to geothermal energy.**

Sensors provide the pulse of modern industry, and in the age of the Fourth Industrial Revolution in particular, it is impossible to imagine life without them. Sensor technology is also required as environmental regulations and requirements for high quality grow. However, there are still industrial processes that take place in such harsh environments that data acquisition is difficult or even impossible. High temperatures, mechanical loads such as pressure or vibration, or a chemically aggressive environment prevent sensitive electronic components from functioning reliably.

In the online seminar eHarsh, the institutes involved in the Fraunhofer lighthouse project will present their results. These partners are active along the entire process chain; their competencies range from the areas of sensor technology, microelectronics and circuit board design to assembly and laser applications to reliability analysis. The partners are thus developing a technology platform on the basis of which sensor systems and electronics can be manufactured for use in extremely harsh environments.

The seminar will present all of the aspects relevant for constructing high-temperature electronics and sensors: from sensor development and production technology to simulation and reliability tests. This will be complemented by virtual laboratory visits to five different institutes.

Applications of the technology can be found in various fields such as steel processing, jet engines, stationary turbines as well as in deep drilling for oil, gas or geothermal energy production.

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### **Hermetically welded sensor platform**

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An example of the technology to be presented at the eHarsh seminar is the integrated sensor readout platform (see Image 1) based on three chips in a hermetically sealed package. The chipset was implemented in a 0.35-micron SOI CMOS high-temperature technology that enables operating temperatures of up to 300 °C. The chips are built on a multilayer ceramic LTCC board using the flip-chip method. Silver paste or sintering of silver was used for bonding, which results in significantly increasing the chips' lifetime. High-quality flip-chip interconnects can be produced when the process parameters are adapted to the chipset design and that of the ceramic board.

For the hermetic sealing of the housing, Fraunhofer ILT has developed a special laser bonding technique based on a glass feedthrough, which creates a gas-tight connection between the metal housing and the ceramic components.

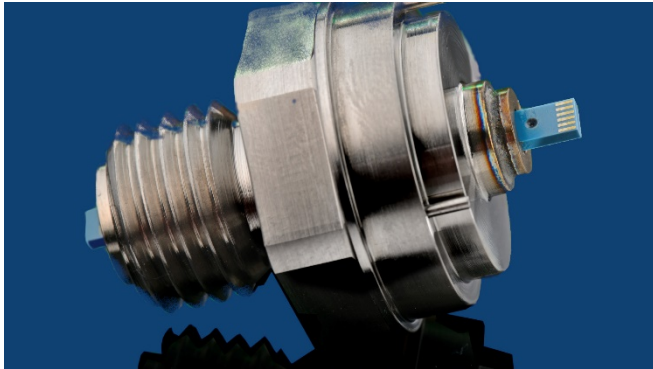
This exemplary project is characterized by how well the various institutes have worked together and mastered the technical challenges of such a development in a sustainable manner.

### **Registration and participation**

Registration for the online seminar eHarsh is still possible until November 12. The seminar will take place from November 29 to December 3, 2021, starting at 1:00 p.m. Details and program for the seminar can be found here: <https://s.fhg.de/2jD>

### **Participating institutes in the Fraunhofer lighthouse project eHarsh**

- Fraunhofer Institute for Electronic Nano Systems ENAS
  - Fraunhofer Institute for Ceramic Technologies and Systems IKTS
  - Fraunhofer Institute for High-Speed Dynamics, Ernst-Mach-Institut EMI
  - Fraunhofer Institute for Laser Technology ILT
  - Fraunhofer Institute for Microelectronic Circuits and Systems IMS
  - Fraunhofer Institute for Microstructure of Materials and Systems IMWS
  - Fraunhofer Institute for Physical Measurement Techniques IPM
  - Fraunhofer Institute for Reliability and Microintegration IZM
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**Image 1:**  
Laser-welded sensor component with helium-tight multilayer ceramic sensor element.  
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**Image 2:**  
The online seminar “eHarsh” will present the development of new compact sensors for industrial processes in harsh environments.

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