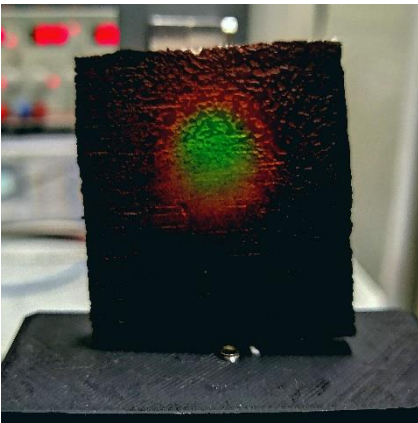


Microwave thermograph

Intelligent indicator materials enable accurate imaging of electromagnetic distribution in the field

Invention

In many applications in the field of high frequency technology – e.g. the calibration of measuring instruments or the verification of EMC requirements – the exact intensity distribution of electromagnetic fields is of great interest. Often, these fields are merely simulated or measured indirectly.



The laboratory image shows field distribution using microwave thermography

Microwave thermography, on the other hand, can be used to show electromagnetic fields in real environments in a way that is accurate and space-resolved, i.e. outside of measurement laboratories. The new microwave thermography technique from the Ruhr-Universität Bochum uses a commercially available optical HD camera and an indicator plate to convert the microwaves into a high-resolution, digital field distribution. The indicator plate consists of a multilayer system that performs both characteristic impedance matching as well as a conversion of the microwave fields into a thermal signature. The surface of the indicator plate is thermochromatic, so that microwave fields of different strengths are displayed using different colours. A normal optical camera can thus capture an image that allows the field distribution to be evaluated accordingly. This means that

with the aid of an underlying model and appropriate calibration, microwave field distributions can be displayed and measured with a high resolution and a great deal of precision. The developed indicator plate allows microwave thermography between 1 GHz and 300 GHz. At the same time, less than 200mW are sufficient to determine the distribution of electromagnetic fields.

Commercial Opportunities

In particular, the invention can be used for measurements outside of laboratories or measuring chambers, e.g. when checking the quality of microwave components in the field of manufacturing or when check the HF tightness of high-frequency devices, such as radar systems, in and on containers and tanks, as well as pipelines. The method is cost-effective and mobile.

Current Status

An application was submitted to the German Patent and Trademark Office, wherein subsequent applications in other countries are possible in the priority year. Laboratory measurements prove the functional capability of the technology. On behalf of Ruhr-Universität Bochum, we are offering interested companies the opportunity to license and continue to develop this technology.

Relevant Publications

Baer, Christoph, Kerstin Orend, Birk Hattenhorst, and Thomas Musch. 2021. "Field Representation Microwave Thermography Utilizing Lossy Microwave Design Materials" *Sensors* 21, no. 14: 4830. <https://doi.org/10.3390/s21144830>

An invention of Ruhr-Universität Bochum.

Competitive Advantages

- Enables measurements in the real field of application
- Simple and inexpensive technique
- Low power consumption
- Large measuring range of 1-300 GHz

Technology Readiness Level

123456789

Technology validated in lab

Industries

- Measurement technology
- Electronic technology
- High frequency and process measurement technology

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