Fraunhofer
FHR

FRAUNHOFER INSTITUTE FOR HIGH FREQUENCY PHYSICS AND RADAR TECHNIQUES FHR

# CONTACT


**Fraunhofer Institute for**
**High Frequency Physics and**
**Radar Techniques FHR**
Fraunhoferstraße 20
53343 Wachtberg

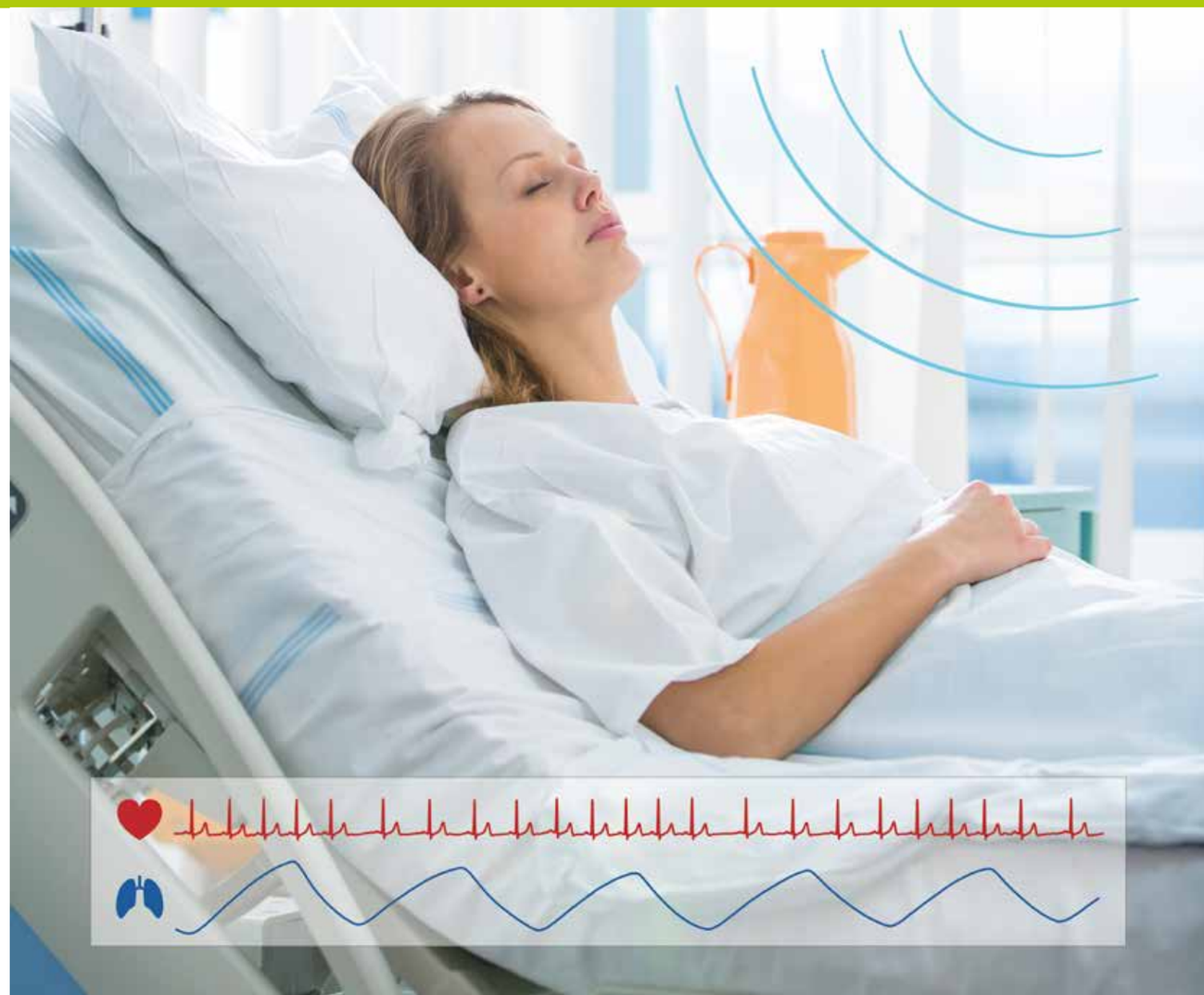
Phone +49 (0)228 9435-227
Fax: +49 (0)228 9435-627
info@fhr.fraunhofer.de
www.fhr.fraunhofer.de

**Head of the Institute**
Prof. Dr.-Ing. Peter Knott (executive)
Prof. Dr.-Ing. Dirk Heberling

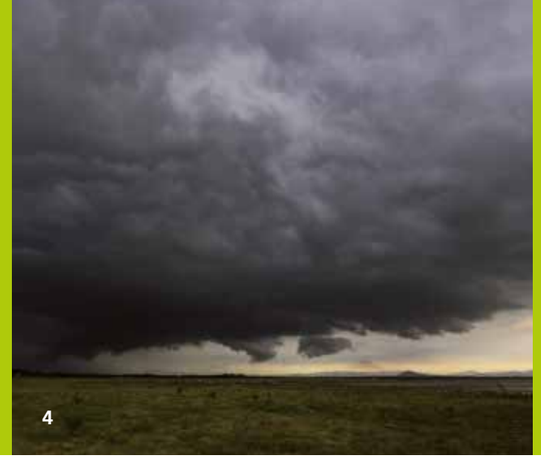
**Speaker Business Unit Human and Environment**
Prof. Dr. rer. nat Jens Bongartz
Phone: +49 2642 932-427
jens.bongartz@fhr.fraunhofer.de


Reference Projects:
http://www.fhr.fraunhofer.de/human-and-environment

# BUSINESS UNIT HUMAN AND ENVIRONMENT



TITLE *Vital parameters can be monitored conveniently and contact-free using radar technology.*



# HERTZ FOR HUMAN AND ENVIRONMENT

Radar is a sensor that plays an increasingly important role not only for humans, but also in the areas of environment and agriculture. Fraunhofer FHR conducts research on these areas in the business unit Human and Environment. Due to its precision and robustness together with the ability to penetrate materials and measure contact-free, radar is opening up new innovative application areas.

## Wind energy

Radar can be used in all weather conditions, during the day, in complete darkness or in dusty and foggy conditions. It is therefore predestined for long-term outdoor applications such as the permanent monitoring of wind farms and their surrounding environment. Fraunhofer FHR has, for example, developed a system which activates warning lights for air traffic on an as-needed basis. This system has been approved by German Air Traffic Control. Radar can also detect approaching birds so that the rotor blades can be turned off to protect the birds. Radar measurements also provide information on the vibration behavior of the individual rotor blades with the result that conclusions can be drawn relating to their structural condition and maintenance requirements. The widely employed passive radar technology is emission-free as it uses the signals from existing radio transmitters and therefore does not require transmitter units. Radar is the invisible companion of wind energy on its path to success.

## Agriculture

The ability to take precise measurements under difficult environmental conditions is also essential in the agricultural area. The development of precision farming calls for high-precision, real-time measurement data during field work. Tens years ago, Fraunhofer FHR was already part of the BMBF-funded competence network CROP.SENs.net, which focused on the development and utilization of innovative sensors for the monitoring of agricultural crops. The ultra-wideband radar technology used within the framework of the network is currently being further developed with ground-penetrating capabilities to detect the expansion of tree roots and allow the tomography of tree trunks and plant stems. Tomographic images show the cross-section of a plant and facilitate the early detection of internal structural changes caused, for example, by fungal infestation. Radar is working towards the provision of plant images that are equivalent to those currently available in human medicine.

## Meteorology

Radar is routinely used in the area of meteorological observation. Fraunhofer FHR is currently working on a solution that will allow the electronic steering of a weather radar in elevation. In addition to greatly reducing the measurement time, this approach will – thanks to the availability of highly integrated and low-cost high frequency components – also significantly lower the cost of the overall system. A twofold advantage for high-precision weather forecasts.

## Human

Radar sensors are becoming more compact and less expensive. This paves the way for application scenarios in the direct environment of humans. Sensors such as these also allow the contact-free monitoring of vital parameters, respiration and heartbeat. Heartbeat-induced movements of the skin surface measuring just a few tenths of a millimeter can also be recorded by analyzing the signal phase. Other potential applications include the monitoring of patients in intensive care, in particular small children and newborns with limited skin surface for the attachment of sensors. People in need of nursing care can also be monitored. Radar beams can penetrate textiles thus facilitating measurement through clothes or duvets. Spatially resolved measurement can also be implemented when using a MIMO radar system (Multiple Input Multiple Output). With this antenna arrangement, several persons can be measured at the same time and a distinction can be made between thoracic and abdominal breathing when measuring the vital parameters. Radar systems are also ideal for utilization in sports training or biomechanics.

In addition to radar techniques, Fraunhofer FHR has expertise in the simulation of electromagnetic fields and metamaterials. This know-how is used in a medical technology research project to improve imaging in modern magnet resonance tomography (MRT). Metamaterial lenses could lead to the creation of fundamentally new concepts for MRT imaging.

The rapid development of radar and high frequency technology is opening up a wide variety of new applications. Use the expertise of Fraunhofer FHR to develop customized solutions for your individual requirements.

1 *High frequency sensors can record the physical condition of agricultural crops and make structural changes visible.*
2 *Small aircraft near wind farms can be detected with the passive radar PARASOL so that the warning lights can be turned on or off as needed.*
3 *Radar sensors can measure the yield at harvest time or issue warnings in the presence of foreign bodies.*
4 *Weather radars are an important data source for more precise weather forecasts.*


Speaker Business Unit
**Prof. Dr. rer. nat.**
**JENS BONGARTZ**
Tel.: +49 2642 932-427
jens.bongartz@fhr.fraunhofer.de