



## FRAUNHOFER IMS

INNOVATION ON SILICON

Fraunhofer IMS in Duisburg has more than 25 years of experience and proven expertise in microelectronic circuits and systems. In the area of system engineering the focus lies on wireless and embedded systems such as sensor transponder tags, transponder readers, and sensor networks. Fraunhofer IMS has detailed know-how, tools and laboratory equipment for hardware engineering such as antenna and RF frontend design, for energy harvesting, and for software engineering with an emphasis on communication protocols.

Numerous projects have been successfully completed, thus creating innovative products for medical, smart home / smart building, and agriculture applications, for logistics and industry automation.

Fraunhofer IMS provides systems operating in various frequency ranges from LF up to microwave using standardized and proprietary communication protocols. In that way flexible solutions for a wide range of applications and environments can be realized.

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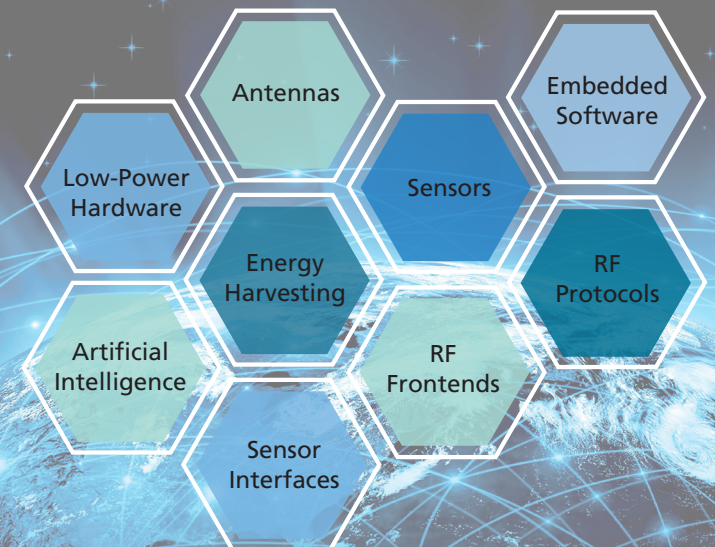
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# WIRELESS & TRANSPONDER SYSTEMS





Tool Management



Smart Factory

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Infrastructure Monitoring

## SOLUTIONS FOR INDUSTRY, HEALTH-CARE AND LOGISTICS

Modern industrial production is realized by digitization in terms of “Smart Factory”. Production can be only controlled, maintenance can only be optimized, wearing can only be minimized and quality documentation can only be produced automatically, if detailed data is available about identities and measurement values of tools, components and machines. Also for digitization in the medical area IDs and sensor data is required from diagnostic and therapy equipment, but also vital data of the patient, even from inside his body.

In these and many other applications the objects of interest are moving, rotating or in other way difficult to access by wired sensors. In these cases wireless solutions are necessary, that means both wireless communication and wireless power supply. Passive sensor transponders and energy harvesting meet this challenge. Solutions based on these technologies can provide important contributions for the implementation of the “Internet of Things” (IoT) in various fields of application:

- Industrial production processes (“Industry 4.0”)
- Medical implants for diagnostics and therapy
- Smart Building / Smart City
- Agriculture

In combination with other technologies such as sensors and embedded systems Fraunhofer IMS provides all technologies that are relevant for the design and development of “Cyber Physical Systems” (CPS).

## SERVICE AND KNOW-HOW

### Service and Support

- Feasibility studies
- System specification and concept development
- Antenna and RF frontend design
- Electromagnetic field simulation
- Development of demonstrators and prototypes
- Production and supply of prototypes and pilot series
- Setup and execution of field trials
- Integration in customer’s applications

### Wireless Systems Know-How

- Transponder tags, readers and network nodes
- Sensor integration
- Systems with optimized operating range
- Systems for all relevant frequencies from LF (125 kHz) up to SHF (5.8 GHz) and beyond
- Systems for harsh, difficult or metallic environments
- Application specific communication protocols
- Wireless Power and Energy Harvesting solutions, e.g. inductive solutions, electromagnetic power transfer

## APPLICATION EXAMPLES

Fraunhofer IMS looks back on a large number of successful projects in the area of wireless systems and solutions. Examples:

- Pressure measurement system for vacuum insulations panels
- Wireless tire pressure measurement system for vehicles
- Wireless crash sensor network system for warehouse security
- Corrosion detection system for concrete constructions
- Passive wireless UHF temperature sensor
- Self-sustaining wireless sensor system for process monitoring
- Wireless monitoring system for overhead power lines
- Wireless temperature monitoring system for industrial processes
- Eye pressure transponder system for glaucoma patients
- Medical implant system for intracranial pressure measurement

### Research activities

- Transponder systems for frequencies beyond 5 GHz
- Inband communication for RFID in security applications
- Software defined radio technology for improvement of receiver performance
- RFID based distance measurement and localization
- IO-Link wireless enhancements for smart factory applications
- Energy harvesting technologies
- Wireless power transfer technologies
- RF resonator based biosensors