



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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WIRELESS & TRANSPONDER SYSTEMS





SENSOR TRANSPONDERS AND SENSOR NETWORKS

Fraunhofer IMS has acquired professional expertise in the development of sensor transponders and related readers. Sensor transponders combine the identification mechanisms known from standard RFID technology and measurement data acquisition.

Sensor transponders are very helpful if the usage of wired sensors is impossible or difficult due to mobile, rotating or inaccessible points of interest. Sensor transponder systems can individually be designed to fit into the user's specific application. Various frequency ranges and energy supply methods can be used to comply with surrounding media, operating distance and data rate.

Passive transponder tags are operating without any local energy source like battery, solar cell or thermal element. Their power supply is realized through the electromagnetic field provided by the reader. Therefore passive transponders are completely maintenance free and have an unlimited lifetime, which makes them very important for several applications, especially for medical implants. Their working distance is limited by the power demand of the transponder.

Active transponder systems – including sensor networks – overcome this restriction, but they need a local power supply which can be realized using energy harvesting mechanisms.



WIRELESS SYSTEMS SERVICE AND KNOW-HOW

Service and Support:

- Feasibility studies
- System specification and concept development
- RF frontend design incl. antenna design
- Electromagnetic field simulation
- Sensor integration
- Development of demonstration model and prototypes
- Production and supply of prototypes and pilot series
- Setup and execution of field trials
- Integration in customer's application

Wireless Systems Know-How:

- Devices with and without sensors
- Transponder tags, readers, and network nodes
- Systems with optimized operating range
- Systems for all relevant frequencies
 - LF / 125 kHz
 - HF / 13.56 MHz
 - UHF / 868 MHz
 - μ W / 2.45 GHz
 - Application defined frequencies
- Systems for harsh, difficult or metallic environments
- Standard and proprietary communication protocols



WIRELESS SYSTEMS APPLICATION EXAMPLES

Fraunhofer IMS looks back on a large number of successful projects within the field of wireless transponder systems and sensor networks.

Examples:

- Eye pressure transponder system for glaucoma patients
- 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
- Medical implant system for intracranial pressure measurement
- Wireless sensor network for humidity measurement of soil
- Sensor network for climate control inside greenhouses
- Measurement system for pH value in the rumen of cows
- Air temperature and humidity transponder for building control

Research activities:

- Indoor localization with high accuracy in multipath conditions
- Optimization of transmission in UHF transponder systems
- Enhancement of transponder performance
- Transponder systems for frequencies beyond 5 GHz