

# 6G Ambient IoT Networks From Vision to Deployment

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Successful R & I in Europe 2025, Düsseldorf

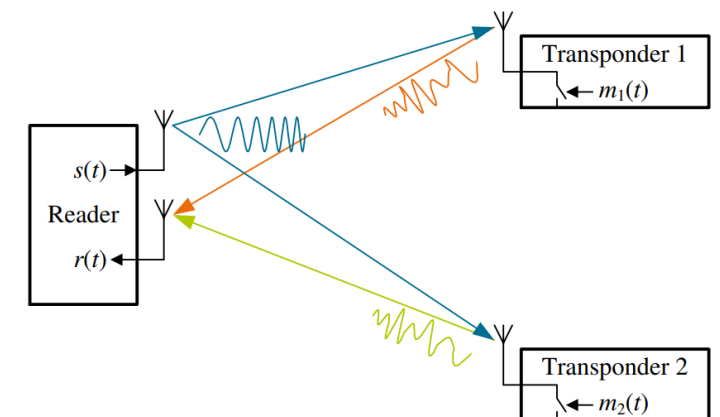
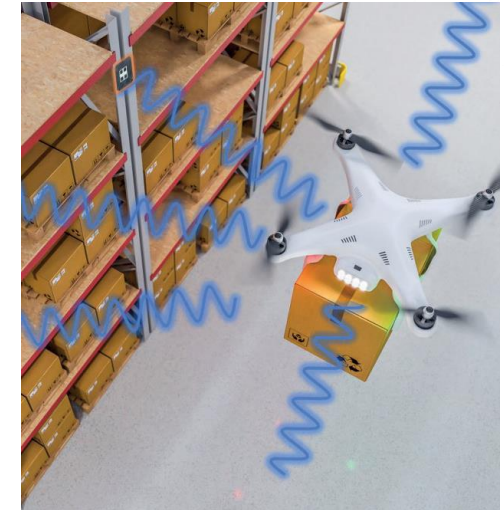


# Field of Recent Research: 6G Ambient IoT Sensor Nodes

Business Unit: Industry & Core Competence: Smart Sensor Systems

## Advanced ranging tags for joint communication and sensing

- **Passive sensor nodes utilizing energy harvesting**
  - Wireless power transfer, temperature differences, light
- **Techniques for small, low power tags employing range enhancement and signal modulation techniques**
  - Antenna arrays increasing the electrical size of the tag for higher range
  - Modulation techniques enabling parallel discrimination and identification of multiple tags



# Proposal: Zero Power Sensor Devices for 6G-Networks

Business Unit: Industry & Core Competence: Smart Sensor Systems

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## Zero power sensors for deployment in future 6G networks

- **For enhanced functionality of 6G networks, there is a need to develop a new IoT technology, that enables devices to directly communicate with a private small cell in campus nets or base stations. With specialised waveforms and modulation techniques, this technology will allow precise cm-level 3D-localisation of zero power sensor devices and parallel unique identification with low latency and thus high location update rate. This will enable optimized and seamless connection stability in fast changing environments for autonomous navigation, enhanced machine object interaction and increased the safety in many applications.**
- We aim to further develop our techniques for ambient IoT and include hardware devices in realistic scenarios and perform adequate tests. By utilizing multiple small antennas, we can achieve passive beam steering with zero power to direct signals at the fixed transmitter of the base station and increase SNR, communication range and reduce fading. Our competencies lay in smart embedded device design, RF- and antenna design and signal processing.

# Proposal: Zero Power Sensor Devices for 6G-Networks

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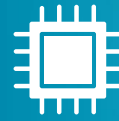
We are seeking a consortium or research partners from the fields of:

- **System or network providers for 6G networks**
  - System integrators
  - Automatization framework providers
- **Developers and distributors of ambient IoT sensor and indoor navigation systems**
  - Energy-harvesting experts
  - System builders
- **Users and adopters for zero power sensor devices in various use cases:**
  - Autonomous robotics for smart factory
  - Smart agriculture



# About Fraunhofer IMS

Additional Business Units



## Subject

Semiconductor and  
Microsystems Technology



## Cooperation

University of  
Duisburg-Essen

## Core Competences



Embedded Software and AI



Smart Sensor Systems



Technology



Center for Sensor Technology



## Health

### Research interests and applications:

#### Non-invasive healthcare

Non-contact vital parameters

#### Medical implants

Implantable pressure sensors

#### In-situ diagnostics

Miniaturized biosensors



## Mobility

#### Autonomous mobility

LiDAR sensors

#### Emission-free mobility

Energy-efficient sensing



## Space & Security

#### Optical sensing for space and security

Person & Object detection

Earth observation

LiDAR for Robotics

## Business Units

# Contact

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