

ENTRAS – SELF-POWERED TRACKING SYSTEM

Advantages

- Flexibility and easy handling without changing batteries
- Low volume and weight due to reduced battery size
- Operation in inaccessible locations
- Pro-active reactions in case of process disturbances based on real-time information
- Enabling big data analytics for product or process optimization

Special Features of the System

- Unlimited operating time enabled by Energy Harvesting and ultra low power consumption
- Interface for any kind of sensors and wireless standards
- Connection and recording of sensor values via short-range wireless radio
- Flexible application scenarios by modular system structure
- Detection of individual sensory movement patterns
- Customized adaptations easily possible

Possible Applications

- Tracking of transport units in- and outdoors (sea, air, rail or road)
- Monitoring of persons in remote or dangerous locations
- Location of wild and farm animals

Fraunhofer Institute for Integrated Circuits IIS

Management of the institute
Prof. Dr.-Ing. Albert Heuberger
(executive)
Dr.-Ing. Bernhard Grill

Am Wolfsmantel 33
91058 Erlangen, Germany

Contact
Dr.-Ing. Peter Spies
Nordostpark 84
90411 Nürnberg
Telefon: +49 911 58061-3310
peter.spies@iis.fraunhofer.de

www.iis.fraunhofer.de/entras





Motivation

The real-time tracking and condition monitoring of shipped products within global supply chains or the localization of persons and animals in remote and/or dangerous locations is getting intensively important nowadays. The tracking technology is improving globally with high speed but there are still some sincere gaps to be filled. One of them is the power supply, which is usually done by rechargeable batteries.

Sincere information gaps about the location of goods and the expected time of arrival had to be secured by costly preventive measures or generated considerable consequential charges and negative environmental influences. Furthermore, often there is a lack of information about the conditions to which freight or people are exposed. For example, what kind of vibrations are present on the rail transport or how high are the temperature variations on a sea ship?

This made real-time optimization and structural analysis over longer periods as good as impossible. Particularly in a context of the development of the Internet of Things and Industry 4.0 with big data and/or artificial intelligence analysis and/or real-time optimization.

With the self-powered tracking system from Fraunhofer IIS a continuous localization in the indoor and outdoor area is possible. It combines satellite-based navigation with localization in wireless sensor networks and power supply by Energy Harvesting. Thus, goods, humans, and animals can be tracked energy-efficiently and parameters such as vibration, temperature or bio-signals are monitored.

Operating Principle

The self-powered tracking system ENTRAS is built by individual components which are modular and can therefore be flexibly adapted to possible application scenarios.

The hardware of a tracking tag consists of several boards for the different functions such as localization and communication, short-range radio, sensors or power supply, which communicate with each other via interfaces. This modular principle applies to the individual function blocks, the different types of power generation as well as interfaces and housing variants. An individual adaptation takes already place during the production of the individual tags as well as the commissioning by configurable software or during the final operation by software control.

The tracking system consists of several tracking tags that can share a cellular connection to keep energy consumption low.

Depending on the field of application, several identical tags in a homogeneous network as well as a combination of different tags in a heterogeneous network can be used.

Unlimited Operation Time

Energy Harvesting uses energy from the environment such as heat, light or motion, to power small electronic devices. Self-powered, maintenance-free and wireless systems with maximum operation time and unlimited standby time become reality.

In addition to a complete battery management system, the power supply module of ENTRAS has an interface in order to use electrical energy from the environment with a wide variety of energy converters such as solar cells, thermal generators, and vibration transducers. This Energy Harvesting technology allows the battery of the tag to be recharged during operation.

Thus, there are no longer maintenance costs for recharging or replacing the batteries necessary. This enables unlimited operation times depending on the application scenario.

With an update rate of one hour, the system can be operated fully autonomously by Energy Harvesting from light and vibration depending on the environmental conditions.