

# Orientation Sensor

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Aalborg University

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## - Determining orientation of an object by RFID

### Technical Field

Electronic Article Surveillance (EAS),  
Wireless technology .

### Background

An orientation sensor detecting the orientation of an object, based on the communication with a standard passive UHF RFID tag attached to it.

### Business Opportunity

Seeking partner to commercialize the technology. Open for collaboration, investment, licensing or spin-out.

### Current State of Technology

A government funded Proof of concept is being carried out resulting in both prototype and demo applications.

### Applications

Since the invention can be incorporated in exciting RFID product lines, it can offer an additional orientation information of an object at virtually no cost. Therefore, this technology essentially applies to any situation where orientation information can be relevant.

The most straightforward applications cover basically any supply chain application handling fragile and/or orientation sensitive objects. However, orientation information may also be highly relevant in other areas, such as during product manufacturing or in hospitals for monitoring equipment or patients.

### Product Advantages

The main feature of this sensor is that it can be implemented in, or together with, existing RFID equipment, as the orientation is detected based on the signal characteristics of the tag reply, and not the content in the reply. The sensor can therefore be implemented in commercial RFID equipment, or in the RFID middleware in an existing RFID setup. Thus, an implementation in a system that is already deployed and operating will require only a software update, making this solution very cost effective.

### The Technology

The technology is detecting the orientation of an RFID tag based on a single parameter, namely the strength of the received tag response. The information from multiple samples of the received signal strength is combined into an estimate of the orientation. The signal strength is a basic signal parameter and is provided by any commercial available RFID reader device, thus the technology is applicable in any commercial RFID system.

### IPR

Patent pending PA 2011 00176.

## The Inventors



**Gert Frølund Pedersen , Professor**, received the B.Sc. E. E. degree, with honour, in electrical engineering from College of Technology in Dublin, Ireland, and the M.Sc. E. E. degree and Ph. D. from Aalborg University in 1993 and 2003. He has been employed by Aalborg University since 1993 where he is now full Professor heading the Antenna, Propagation and Networking group and is also the head of the doctoral school on wireless which some 100 phd students enrolled. His research has focused on radio communication for mobile terminals especially small Antennas, Diversity systems, Propagation and Biological effects and he has published more than 75 peer reviewed papers and holds 20 patents. He has also worked as consultant for developments of more than 100 antennas for mobile terminals including the first internal antenna for mobile phones in 1994 with lowest SAR, first internal triple-band antenna in 1998 with low SAR and high TRP and TIS, and lately various multi antenna systems rated as the most efficient on the market. He has been one of the pioneers in establishing over-the-air measurement systems. The measurement technique is now well established for mobile terminals with single antennas and he was chairing the COST2100 SWG2.2 group with liaison to 3GPP for over-the-air test of MIMO terminals.



**Petar Popovski, Associate Professor**, received the Dipl.-Ing. in electrical engineering and Magister Ing. in communication engineering from Sts. Cyril and Methodius University, Skopje, Macedonia, in 1997 and 2000, respectively and Ph. D. from Aalborg University, Denmark, in 2004. He was Assistant Professor at Aalborg University from 2004 to 2009. From 2008 to 2009 he held part-time position as a wireless architect at Oticon A/S. Since 2009 he is an Associate Professor at Aalborg University. He has more than 100 publications in journals, conference proceedings and books and has more than 25 patents and patent applications. He has received the Young Elite Researcher award from the Danish Free Research Council. He has received several best paper awards, including the ones from IEEE Globecom, IEEE Communication Theory Workshop and CROWNCOM. Dr. Popovski serves on the editorial board of several journals, including IEEE Transactions on Wireless Communications and IEEE Communications Letters. His research interests are in the broad area of wireless communication and networking, information theory and protocol design.



**Rasmus Krigslund, PhD student**, received the B.Sc. degree in Electrical Engineering and Information Technology in 2007 and the M.Sc. (Summa Cum Laude) in Electrical Engineering with specialization in Wireless Communication Systems in 2009, from Aalborg University, Denmark. He is currently pursuing a Ph.D. degree within RFID technology, where he focus on localization of passive tags, passive RFID sensors and reduction of false positive readings in RFID systems. Since 2009 he has been a regular reviewer for IEEE Communication Letters, IEEE Transactions on Wireless Communication and different IEEE conferences.

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Contactperson:



**Jane Bjerregaard Rasmussen**  
Aalborg University  
Phone: + +45 9940 9902  
E-mail: jab@adm.aau.dk