



## TECHNOLOGY SOLUTION

### Sensors

# Agile RFID Antenna System

Uses a [Frequency Multiplexer](#) to boost reader performance for localization and read accuracy

Researchers at the NASA Johnson Space Center have developed a suite of RFID-based technologies focused on improving communication of an RFID reader with a greater number of RFID tags in open and enclosed areas. Typically, RFID reader communications with tags are spectrum-regulated to a narrow bandwidth that makes tag localization difficult. Moreover, RFID communications are complicated by polarization mismatches between the reader and tag antennas. The Agile RFID Antenna System is able to expand these boundaries by integrating an inexpensive frequency multiplexer to the RFID reader antennas, which permits new methods of localization, allows greater antenna functionality with fewer reader RF ports, and provides improved read accuracy and/or range. For enclosed areas, such as a large container, the Agile RFID Antenna System can use smaller antennas, consequently reducing the volume required for an RFID system to operate. A wide range of commercial applications can benefit from this technology, including retail inventory management, manufacturing/assembly line tracking, industrial transportation and logistics, sports bio-analysis, and healthcare.

#### BENEFITS

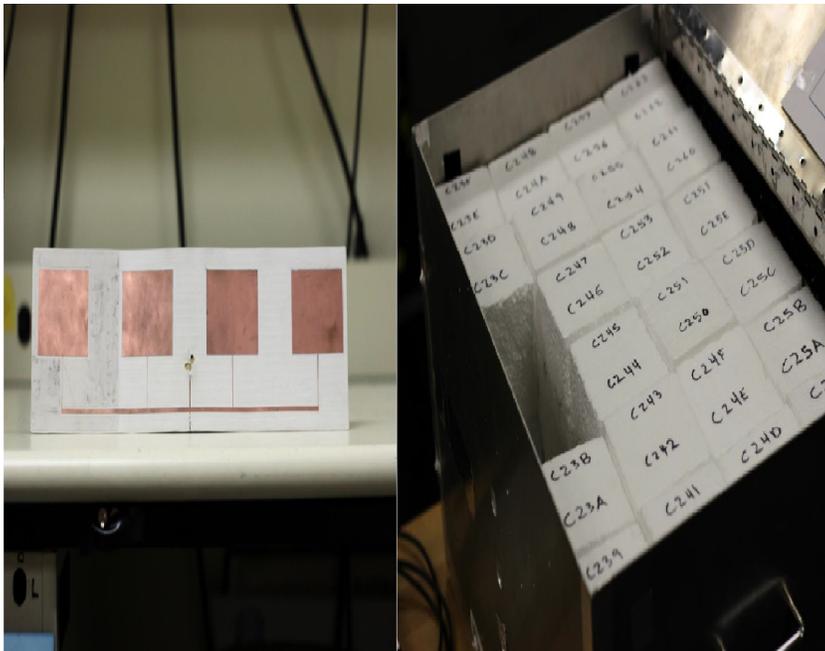
- Flexibility: supports both open and enclosed tracking applications
- Efficiency: increases read accuracy and range
- Technology Integration: can be integrated into standard EPC Global Class 1 Gen 2 RFID Reader without modifications to the reader
- Low Power Requirement: increases RF power available to the tag and returned from the tag



## THE TECHNOLOGY

Current RFID readers, such as the EPC Global Class 1 Gen 2, are limited by narrow bandwidth restrictions, maximum transmit power, and a limited number of RF ports, which results in relatively coarse ranging resolution and accuracy, limited techniques for localization, and limited antenna functionality. Some of the currently available solutions, such as using larger antennas or adding switched multiplexers, often result in unacceptable cost, volume, aesthetics and mass penalties. The Agile RFID Antenna System integrates a frequency multiplexer into the RFID reader antenna system to provide greater antenna functionality without requiring additional reader RF ports, resulting in improvements in reader-tag communications read accuracy, read range, and localization.

The Agile RFID Antenna System is at a TRL 8 (Technology has been proven to work in its final form and under expected conditions) and has been used on the International Space Station to support logistics management and it is now available for your company to license and develop into a commercial product. Please note that NASA does not manufacture products itself for commercial sale.



Prototype of an RFID antenna placed inside an International Space Station (ISS) container loaded with blocks of styrofoam impregnated with RFID Tags.

## APPLICATIONS

The technology has several potential applications:

- Retail Inventory Management: reduces the footprint of the system to track inventory
- Manufacturing/assembly line tracking: tracks and manages parts, tools, equipment, and personnel at various types of industrial plants
- Industrial transportation and logistics: tracks shipment of boxes and containers for trucking, shipping, air transport and just about any other type of freight
- Sports Bio-Analysis: analyzes movement and position of players, limbs, joints, etc.
- Healthcare and Pharmaceuticals: track position and location of medicines, supplies, patients, staff, and equipment

## PUBLICATIONS

Patent No: 10121030; 10,552,651; 10,025,960; 10,567,146; 11,088,812