

4º Comité Português da URSI - "Comunicações rádio pessoais: redes de curto alcance e RFID"

Lisboa, Portugal, September 23- 24 , 2010

UHF RFID Antennas for Self-Confined Tag Detection

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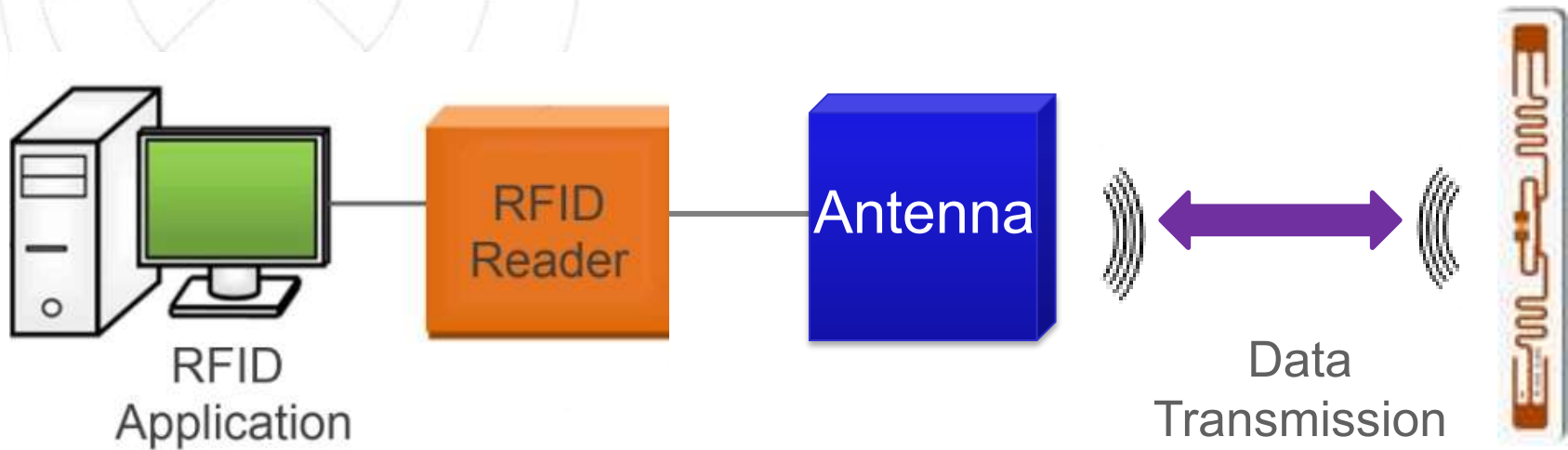
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Outline of presentation

- Motivation and objectives;
- RFID System description;
- RFID UHF Smart Surfaces;
- Conclusions.

How UHF RFID Works



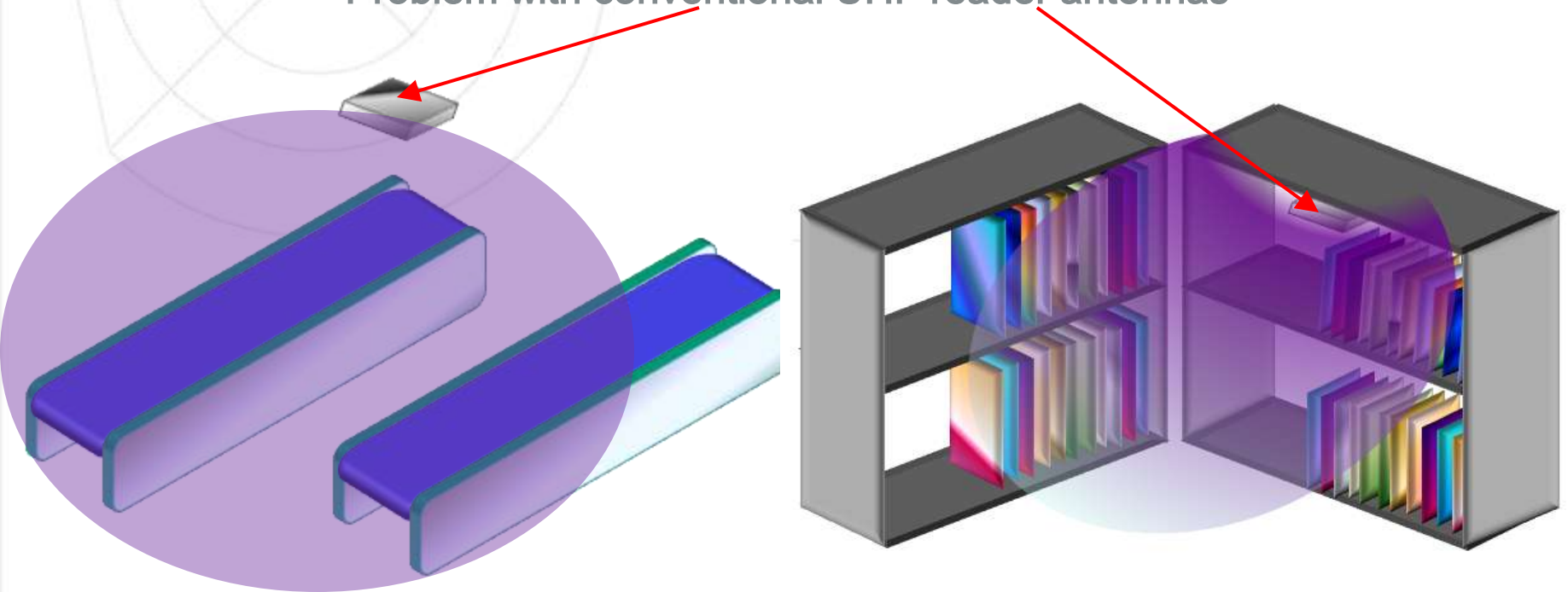
- Non line of sight;
- Allows simultaneous readings.

Motivation

Need for selective UHF RFID reading of tagged objects
Challenge proposed by Creativesystems company!



Problem with conventional UHF reader antennas



Unwanted reading of neighboring systems

Traditional solution: expensive intrusive barriers are required!

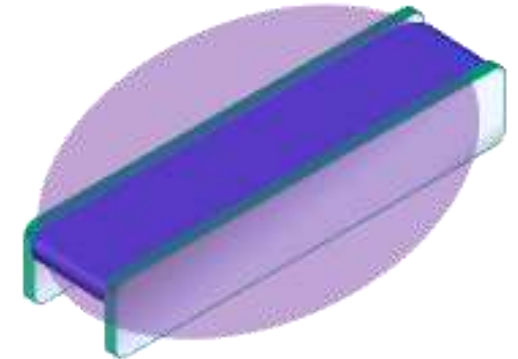
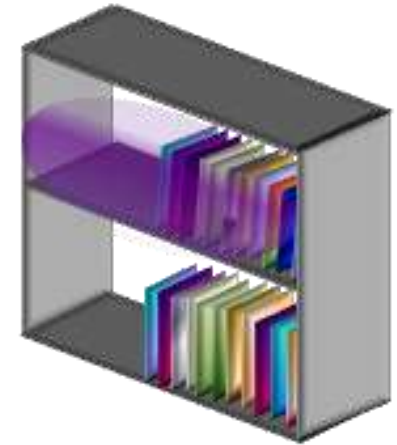
Requirements

Performance requirements:

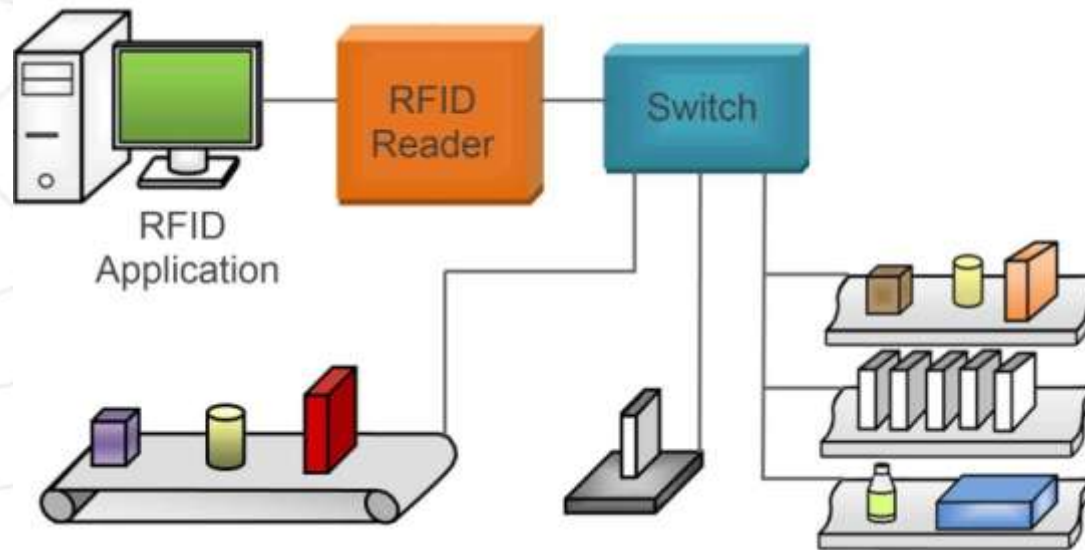
- Confine detection of passive tags to the volume above the device only (without unwanted reading of contiguous devices);
- Ensure detection for all tags above the device surface;

Implementation requirements:

- Create field self-confinement without absorbers or barriers;
- The antenna concept must be adaptable to different shelf and conveyor sizes;
- The antenna must be simple for low-cost mass production.



RFID Smart System



- Single or multiple RFID readers connected in cashiers, factories or transportation systems;
- Sequential reading using a standard electronically actuated RF switch for automatic inventorying;
- Dedicated software application to manage tag reading and data processing.

Basics of proposed solution

- Enables close-range tag detection;
- Operation across the three World assigned UHF bands for RFID.



- Easy frequency rescaling, or adjustment for other device sizes;
- Easy embedding or attaching on top of existing devices



RFID prototypes and setup



- **ALN-9540 - "Squiggle™"**

- World Tag:

- global operation 860 to 960 MHz

- EPC Class 1 Gen 2

- 94.8mm x 8.15mm



- **ALIEN ALR-8800 UHF reader:**

- EPC Gen 2 Reader;

- ETSI EN 302-208, EN 300-220,

- Bistatic reader;

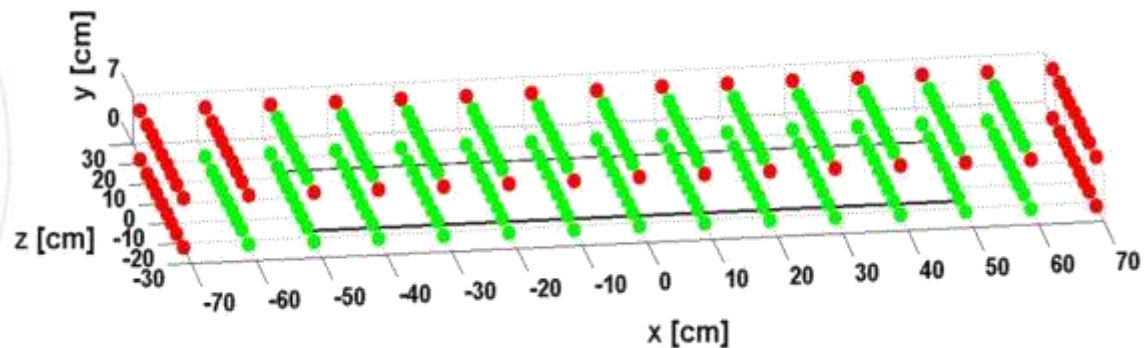
- RF POWER: 2 W ERP.



Tag Reading Score

- Z-axis orientation

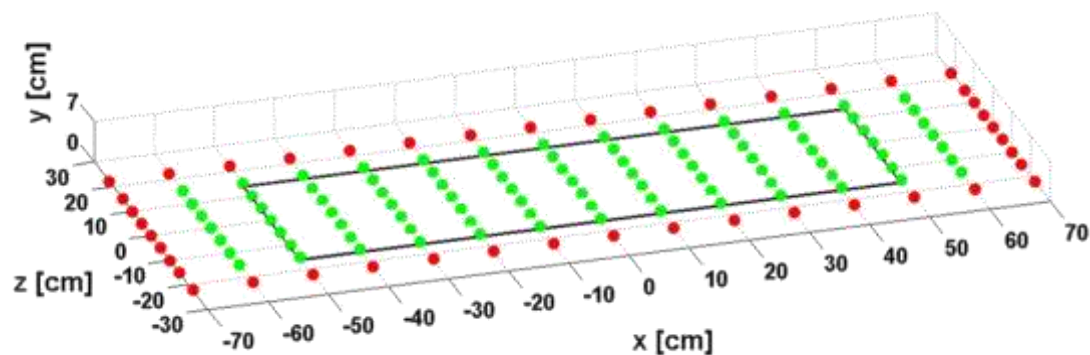
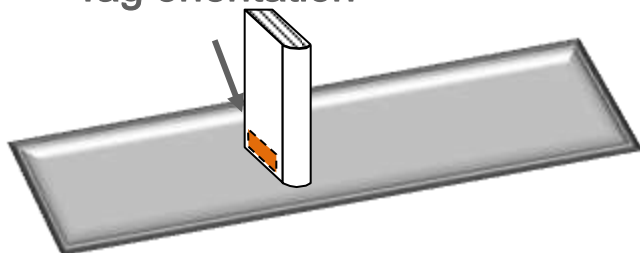
Tag orientation



● Detected ● Undetected ● Intermittent

- Z-axis orientation

Tag orientation



- Maximum detection height for standalone tag: 7-15 cm;
- Shelf design is intended for preferred z-axis tag orientation;
- Near 100% detection score is still possible when the tag inside the book is rotated in the y-z plane;

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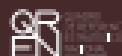
Conveyor-belt

- Smart reading of the product information is performed as it slides over the device.



- Maximum detection height for standalone tag at any orientation: 15-20 cm;
- 100% detection score is achieved for all tag orientations;





IT Contribution

- Patent Inventors:
 - *Carla R. Medeiros, Jorge R. Costa, Carlos A. Fernandes;*
"Device for reading radio frequency identifiers for volumetric confining of the detection region", WO2009/157791, June, 2008.
 - *Carla R. Medeiros, Jorge R. Costa, Carlos A. Fernandes;*
"Dispositivo para Leitura de Identificadores de Radiofrequência garantindo confinamento volumétrico da região de detecção", PT 104121, Junho, 2008.
- Commercial product consulting and testing;
- Test protocol development;
- Technical Specifications definition.

Conclusions

- New and functional UHF RFID smart devices with intrinsic confinement of the electromagnetic fields are proposed;
- A 100% reading score is always achieved with the books and tags in the preferred orientations and a single antenna ensures readings for any tag orientation above the devices.
- The proposed approach avoids detection of tagged objects located outside the interrogated device, without the need of EM isolation barriers;
- Very low-cost and effective solution, easy to manufacture;

• Thank you!

