Omnidirectional Tag Antenna for Passive UHF RFID of Paper Reels

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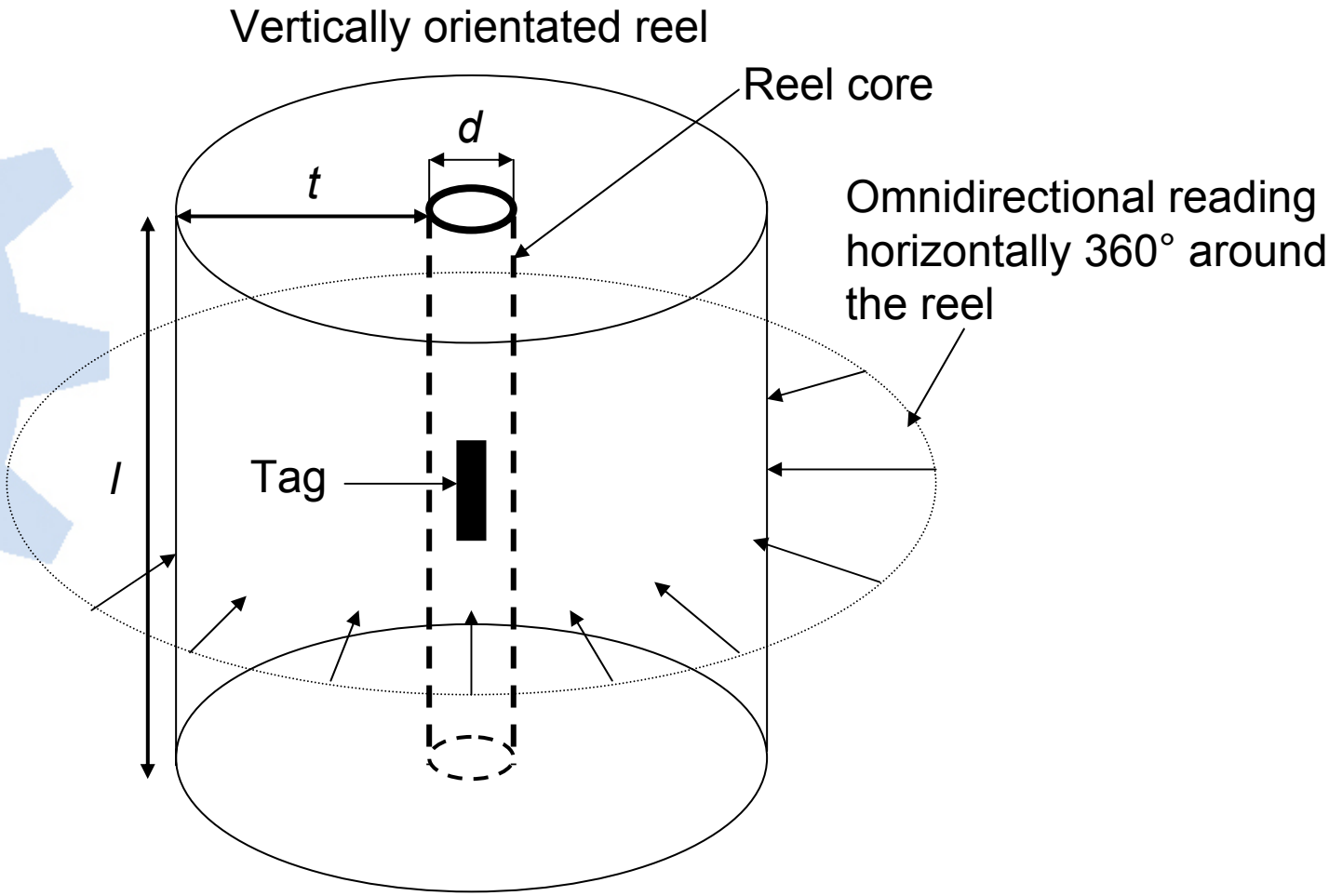
Challenges in Applying Passive UHF RFID in Paper Industry

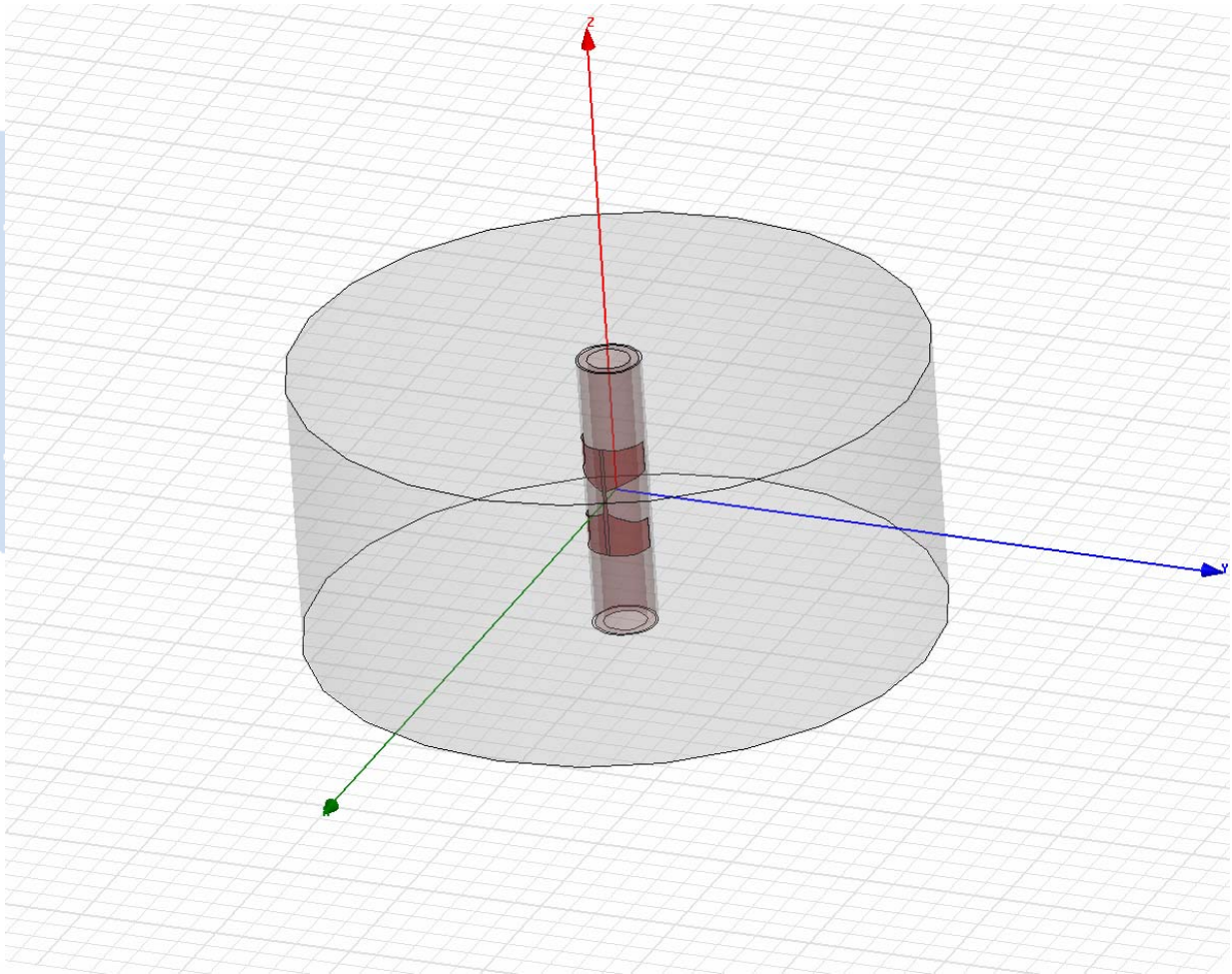
- ID code carried on throughout the whole supply chain of the reel => tag placing on the core under the wrapped paper => effects on the performance of the tag antenna and the RFID system (attenuation of the electromagnetic wave, decrease in the wavelength and its effects on the electrical dimensions of the tag antenna, reflections on the boundaries)
- Industrial environment
- Different paper qualities, cardboard

- The biggest challenge: development of an omnidirectional tag antenna (indisplacable for example in lift truck handling, only one reader antenna needed)

Concept of Omnidirectional Reading



Development of the Omnidirectional Tag: Modeling



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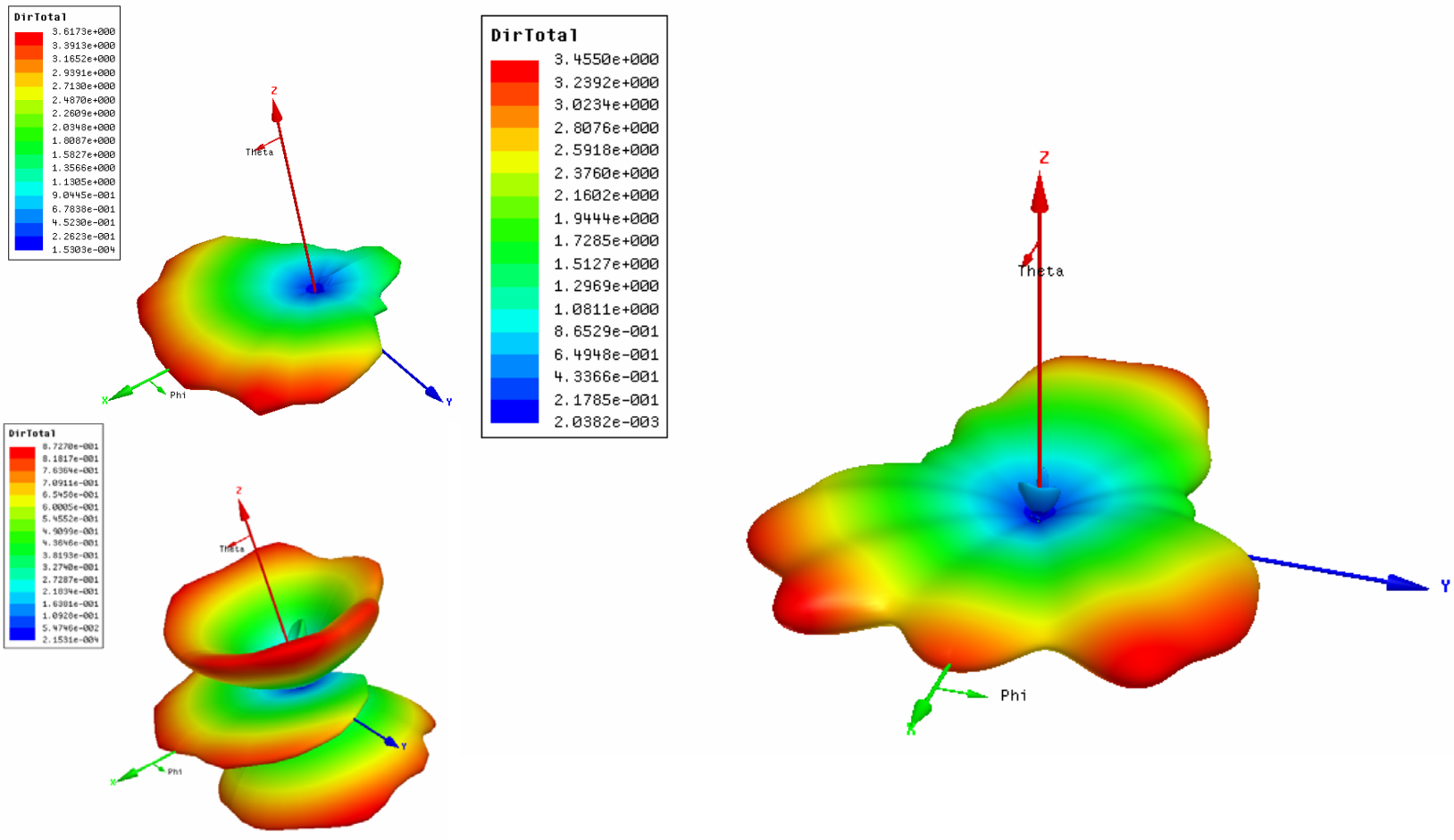
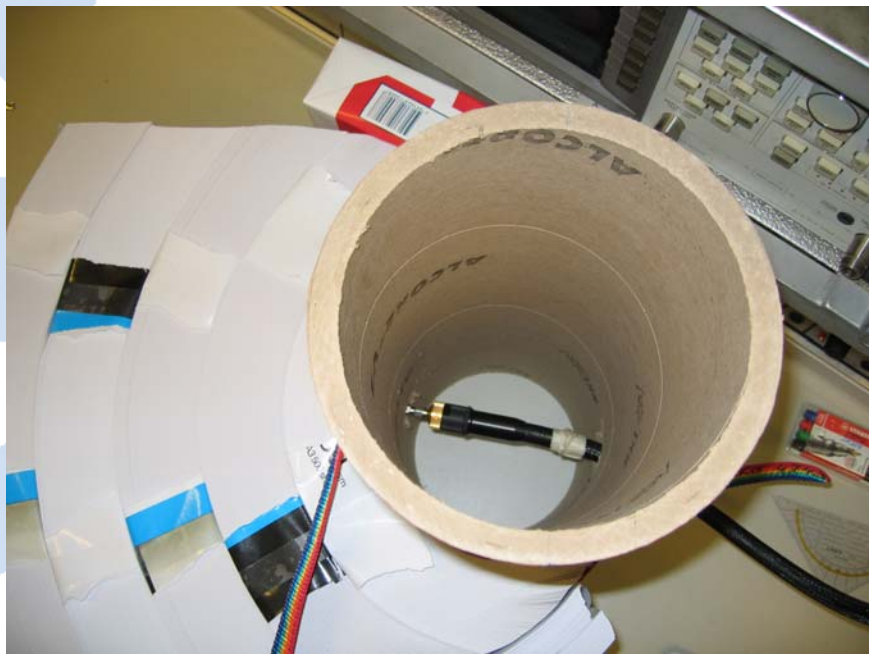


Development of the Omnidirectional Tag: Measurements



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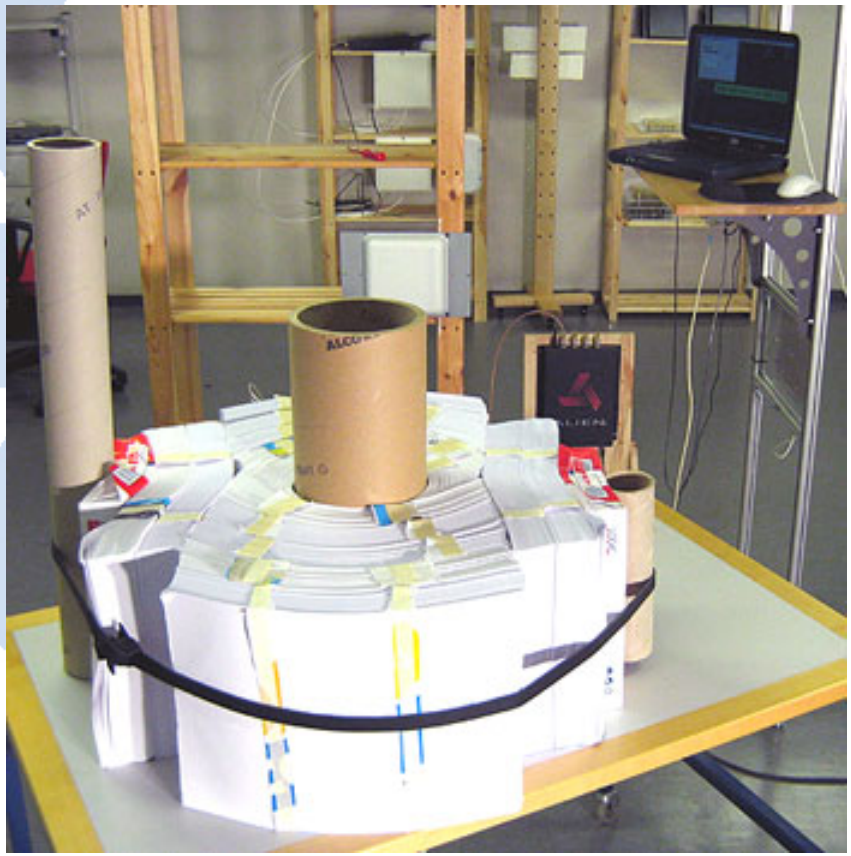
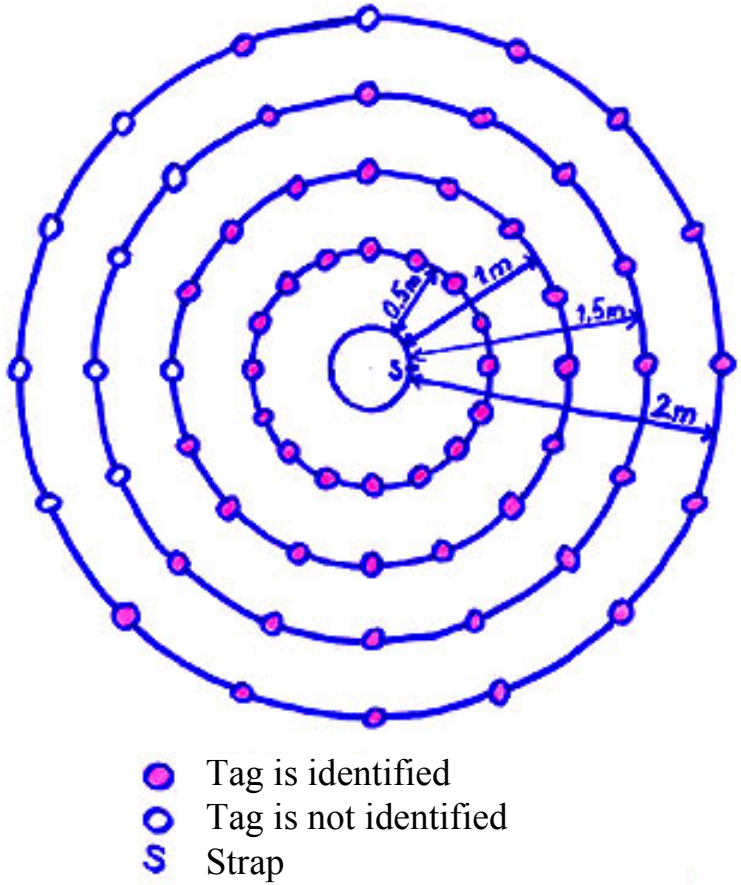
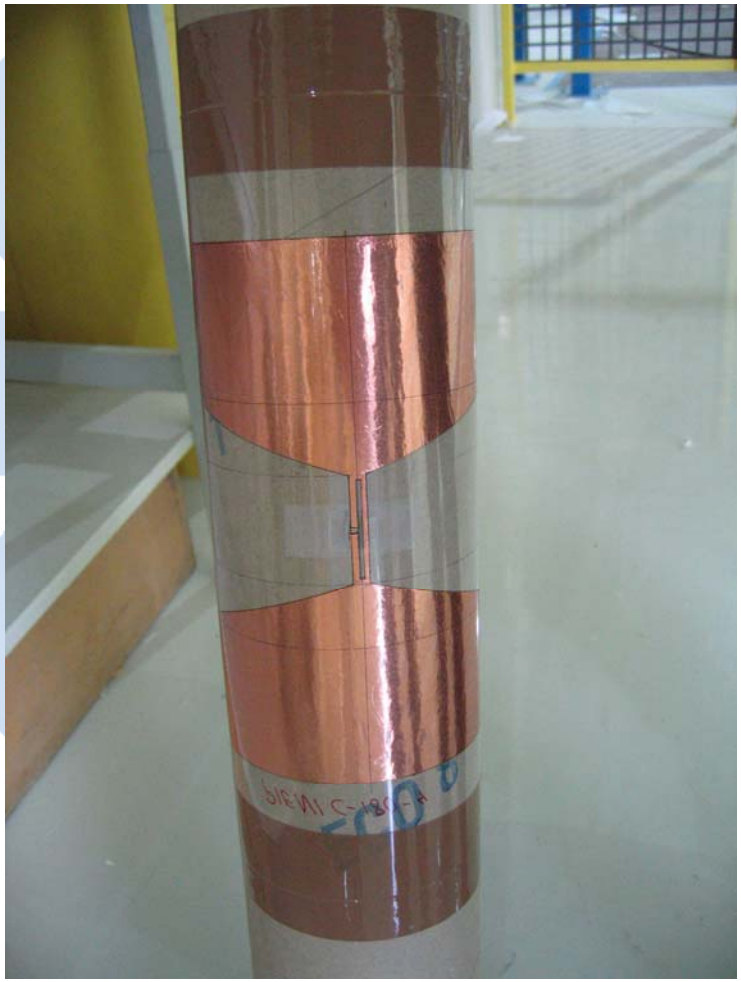
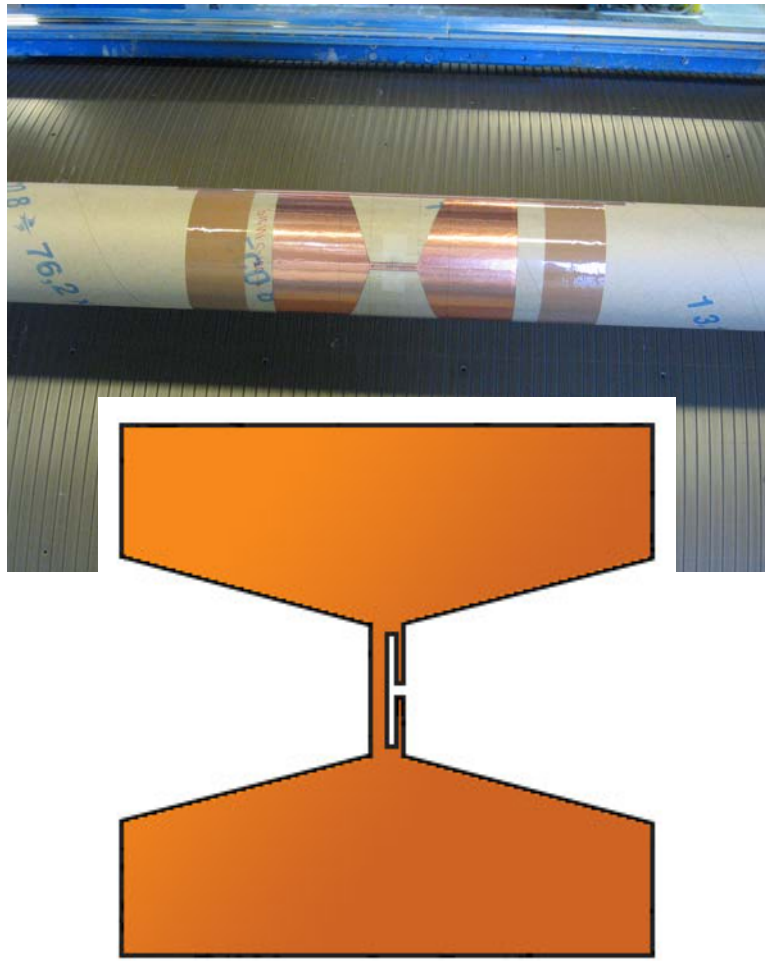




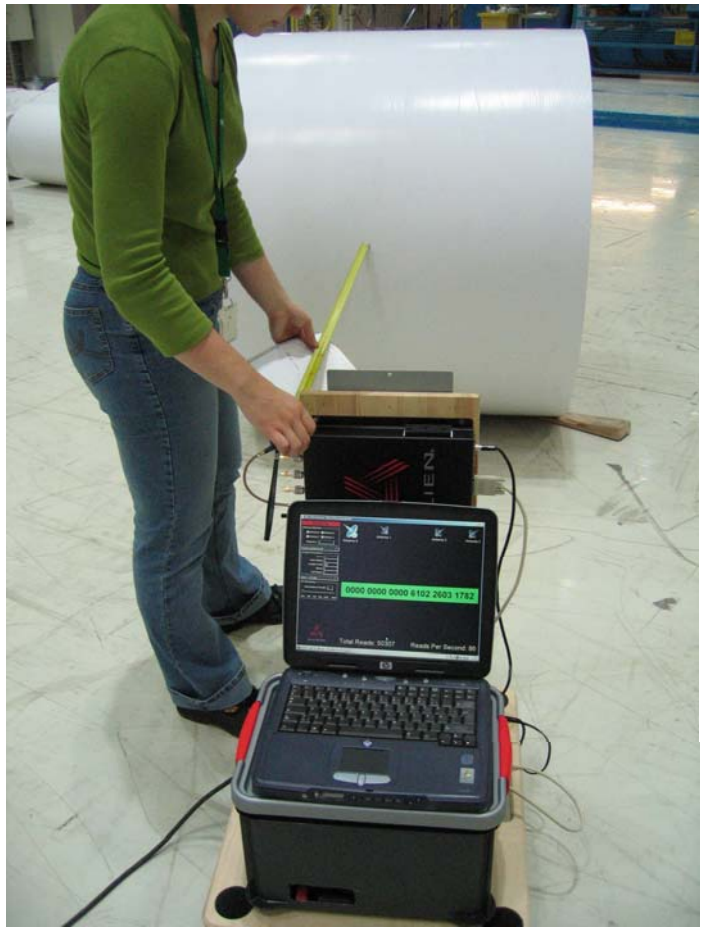
Omnidirectional C-Tag Antenna





Development of the Omnidirectional C-Tag: Practical Testing

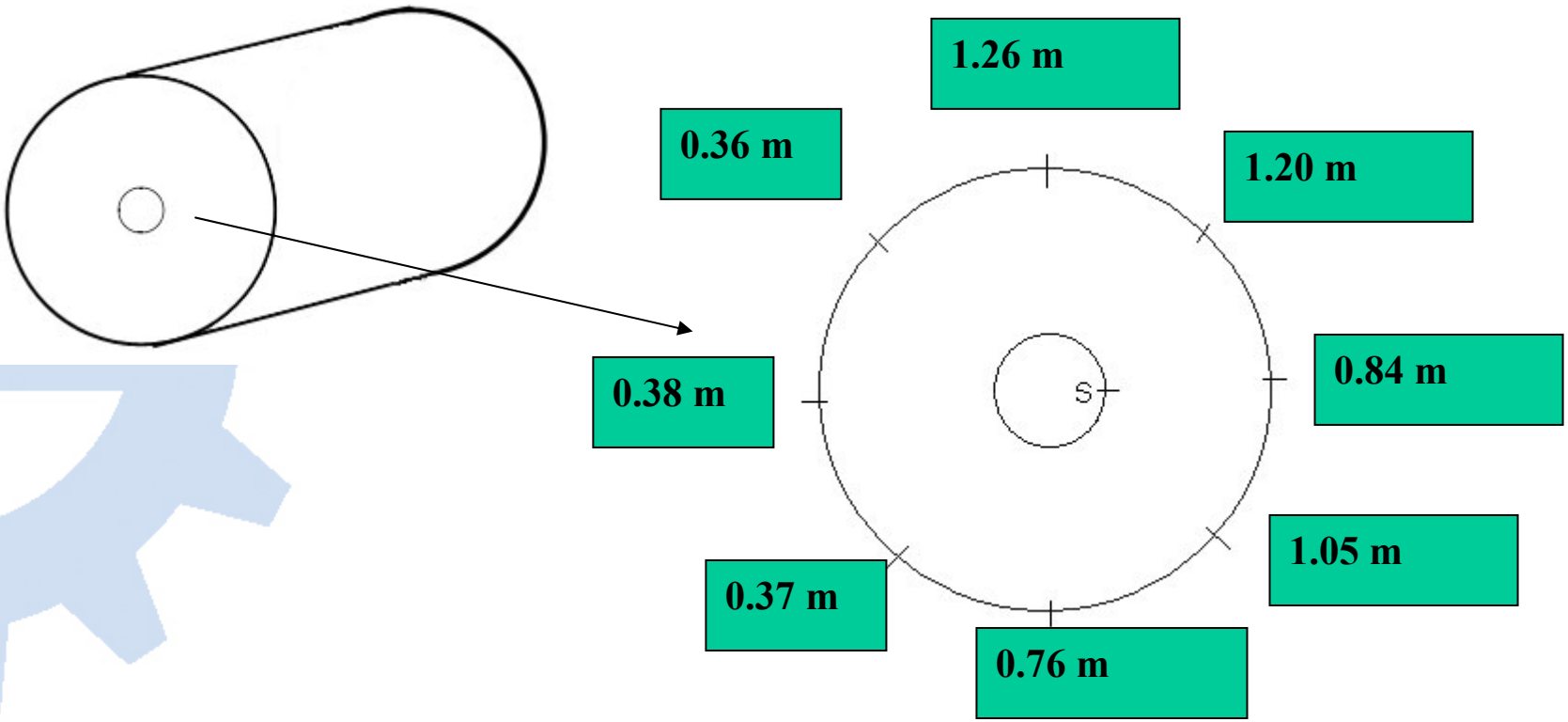
- Alien Technology 866 MHz reader unit
- Alien Technology straps
- 2 W ERP (New ETSI regulations)


0000 0000 0000 6102 2603 1782

-Coated printing
paper
- Reel diameter
1200 mm–1300 mm

Read ranges from the surface of the reel 0.36 m – 1.4 m depending on the direction

Omnidirectional Reading

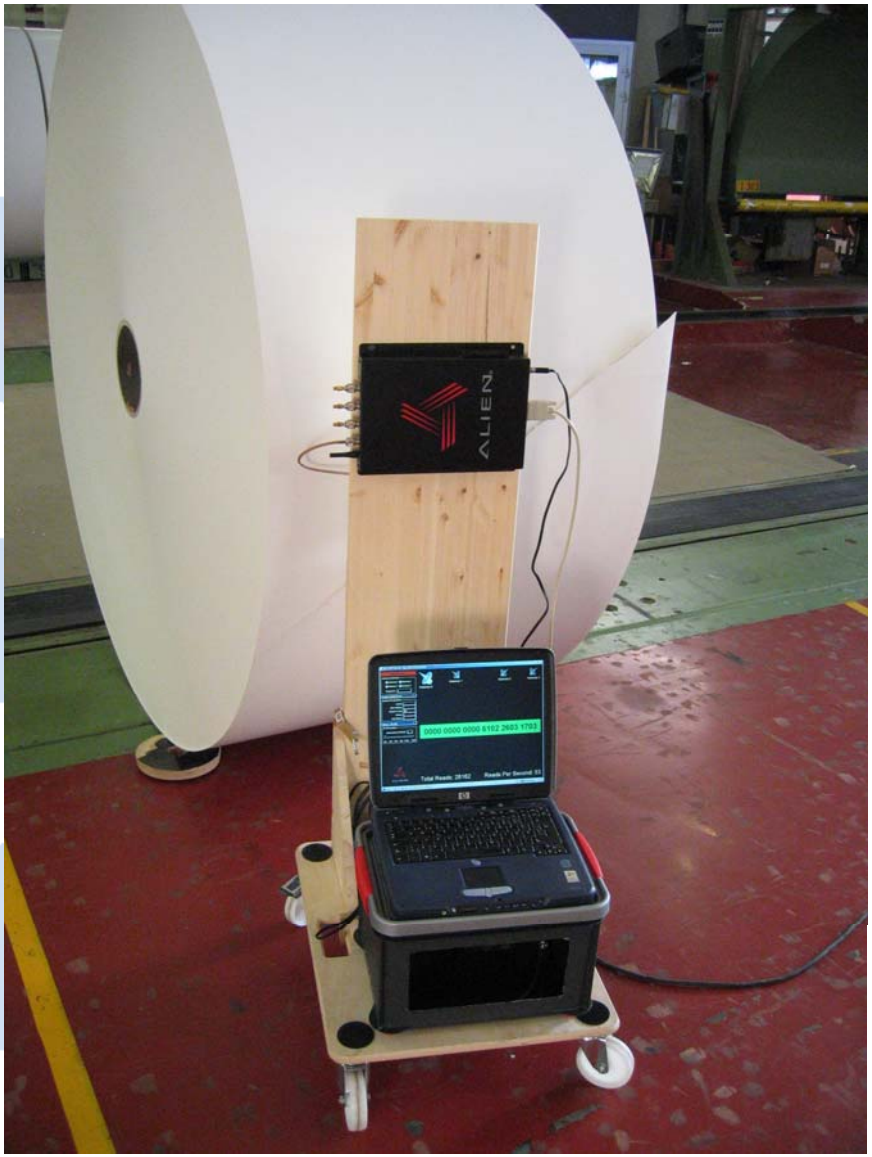


Identification of Cardboard Reels

- Passive UHF RFID of cardboard reels has been impossible with conventional tags
- Challenges: reel size (diameter 1800 mm), the layered and more inhomogeneous structure of cardboard (boundaries => lens effect)

Practical Testing of C-Tag in Cardboard Reels

- Reel diameter 1800 mm
- Goal of the first testing: identification of the tag through the cardboard reel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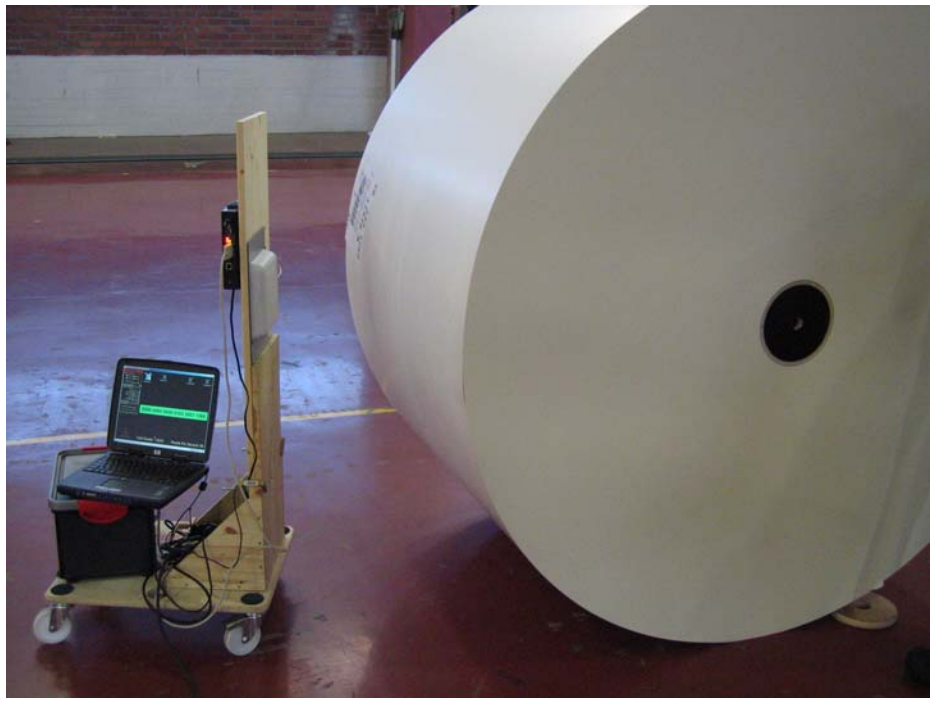
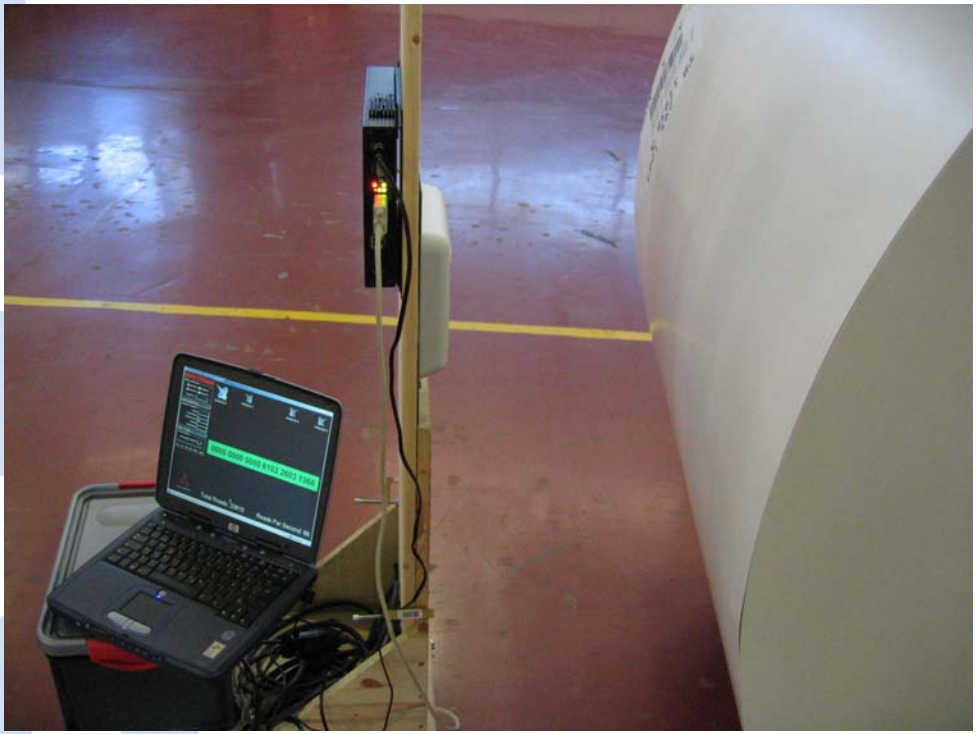


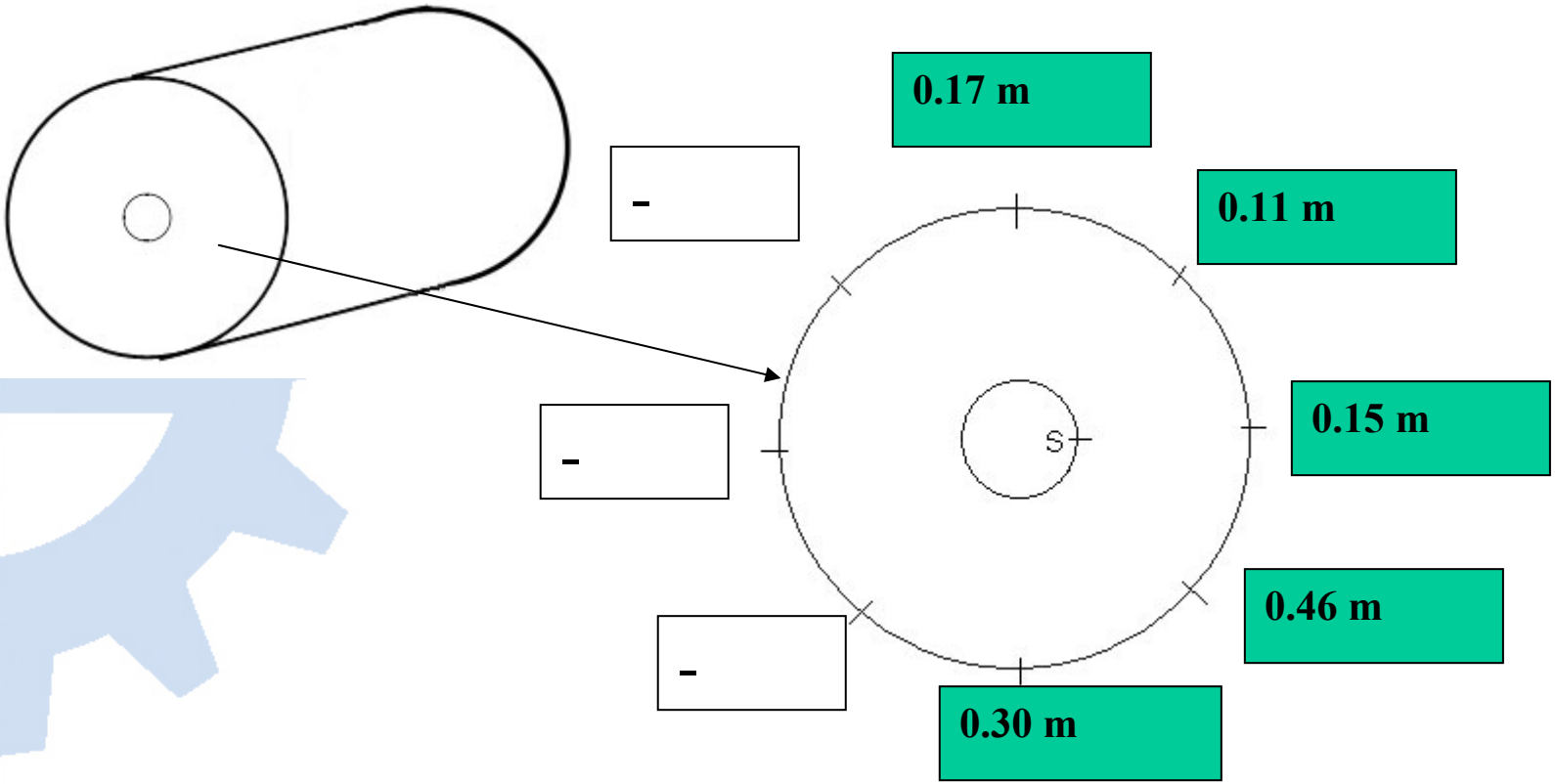


-Tag was identified through cardboard reels having 1800 mm diameter (900 mm cardboard layer on the tag)

-Identification 180 degrees around the reel

- **Read ranges** (180 degree testing): 0.11 m–0.46 m depending on the direction

1800 mm Cardboard Reel



Conclusions and Future Work

- The first omnidirectional tag antenna for passive UHF RFID of paper reels developed
- The tag has been tested with copy paper and coated printing paper
- Also cardboard tested, 180° identification around the reel => development of an omnidirectional tag antenna for cardboard reels

Conclusions and Future Work

- Testing the tag antenna also in American and Asian UHF RFID bands => development of a global tag
- Longer read ranges for both paper and cardboard reels (minimum 0.5 m from paper surface)
- Evaluating the tag in harsh environments (for example in cold temperatures)

Other Research Projects in 2006

- Tag antennas for metallic and liquid-containing objects: miniatyrization of the Albano patch tag