







# Tagri UHF RFID Tags for Agricultural Applications

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## Overview

- Tagri is an innovation action following up the Pervasive\_RFID CominLabs project.
- Focus: UHF RFID for Precision Farming / Agriculture
- Innovative use of RFID: pervasive and resilient data storage, embedded in the environment => Lightweight, local approach: low dependency on remote infrastructures/platforms
- Applications: in situ process tracking/traceability, auditability (phytosanitary processing), ...

## Challenges

- Reliable RFID operations are hard to ensure in uncontrolled environments.
- LF RFID is well known in smart farming (animal tracking), but is very limited for pervasive computing
- UHF behaviour in unknown in agricultural context!
- Complex and variable environment: soil, wood, metal, vegetal, gravel, are present in variable density as well as water/humidity which adversely affect UHF RFID performance.



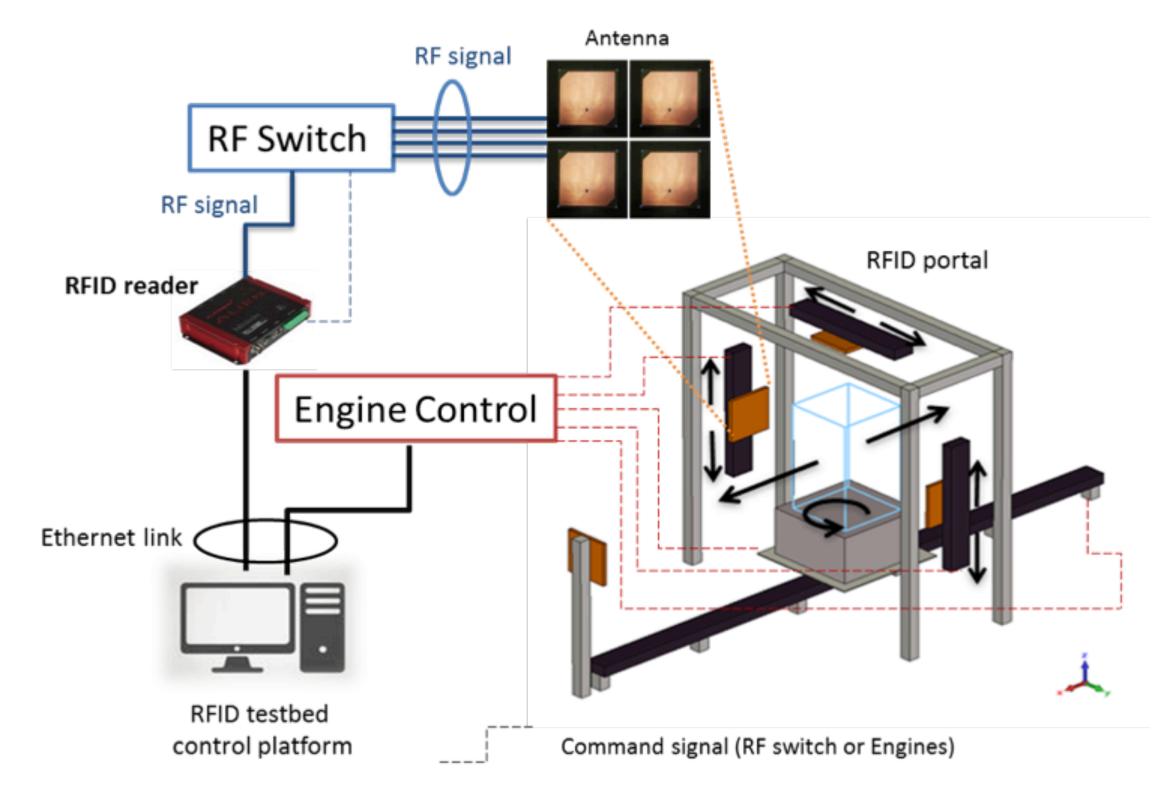




# Background

## CominLabs Project Pervasive\_RFID (INRIA + IETR)

- UHF RFID operations under adverse conditions
- Experimentation facility for designing and testing robust reading protocols

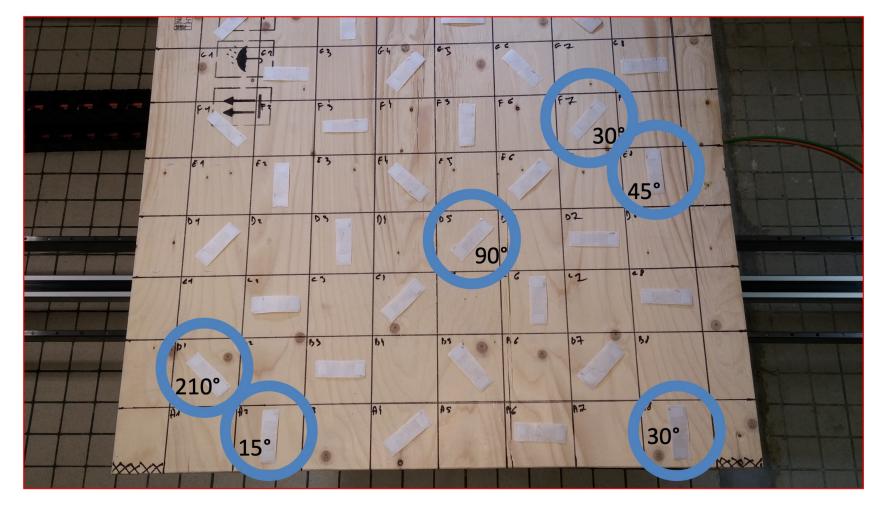


#### **RFID** testbed

- Static and in-motion RFID operations
- Diversity either from motions, or a dedicated 2x2 active patch antenna allowing 10 RF states
- Flexible software control (Python environment)



Test scenario, fading hole => 6 tags missed (out of 32). Progressive recovery with rotation (15° step)



Test scenario with increasing metallic plates or not)

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	Failed reads (%)	Scenario A			Scenario B			Scenario C			<i>E<sub>i</sub></i> < 2.5%
	(1V/m)	E <sub>x</sub>	<b>E</b> <sub>y</sub>	E <sub>z</sub>	E <sub>x</sub>	<b>E</b> <sub>y</sub>	E <sub>z</sub>	E <sub>x</sub>	<b>E</b> <sub>y</sub>	E <sub>z</sub>	2.5 <e;<5%< th=""></e;<5%<>
	Single antenna	0.7	0.8	9.8	4.2	0.7	7.3	7.0	7.3	7.6	<i>E<sub>i</sub></i> >5%
	Diversity antenna	0.1	0.1	0.3	0.5	0.1	0.1	2.2	1.5	0.2	

=> Diversity increases radio coverage and reliability

## Goals

- Design a representative benchmark for UHF RFID operations in typical farming scenarios.
- Investigate current off the shelf equipment performance and identify challenging cases
- Design a set of procedures capable of operational grade reliability
- If possible, in situ validation on a vineyard exploitation

Parameters and conditions to be experimented in Tagri:

- Tag type/antenna size, power/sensivity limits
- Soil density
- Wet/dry conditions
- Influence of grapes/water body
- Influence of other materials





























