



Implementation of RFID Technology in Traffic Signs Database Inventory

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Introduction

- Why is it important to have updated inventory of traffic signs?
- How to manage maintenance activities schedule?
- What does the optimization of road infrastructure lead to?



Traffic Signs Database Inventory

- Online traffic signs database contains information about each traffic sign

- Road / Road section
- Sign code
- Dimension
- GPS location
- Retroreflection coefficient
- Material class
- Photography
- Year of production
- Manufacturer
- Position relative to the road direction
- Chainages
- Way of setting
- Other remarks
- Etc.



- Online traffic signs database

- Easy and quick access for all end users
- Contains information about each traffic sign, including their GPS location
- Easy updating by using RFID technology– synchronization of the database and real-time information



RETROREFLEKSIJA

Application for road markings and traffic signs retroreflection measurements overview

Traffic signs > Hrvatske ceste d.o.o. > Karlovačka županija > DC228 Jurovski Brod (DC 6) - Karlovac (DC 1) 11.09.2015. Marija Ferko Logout

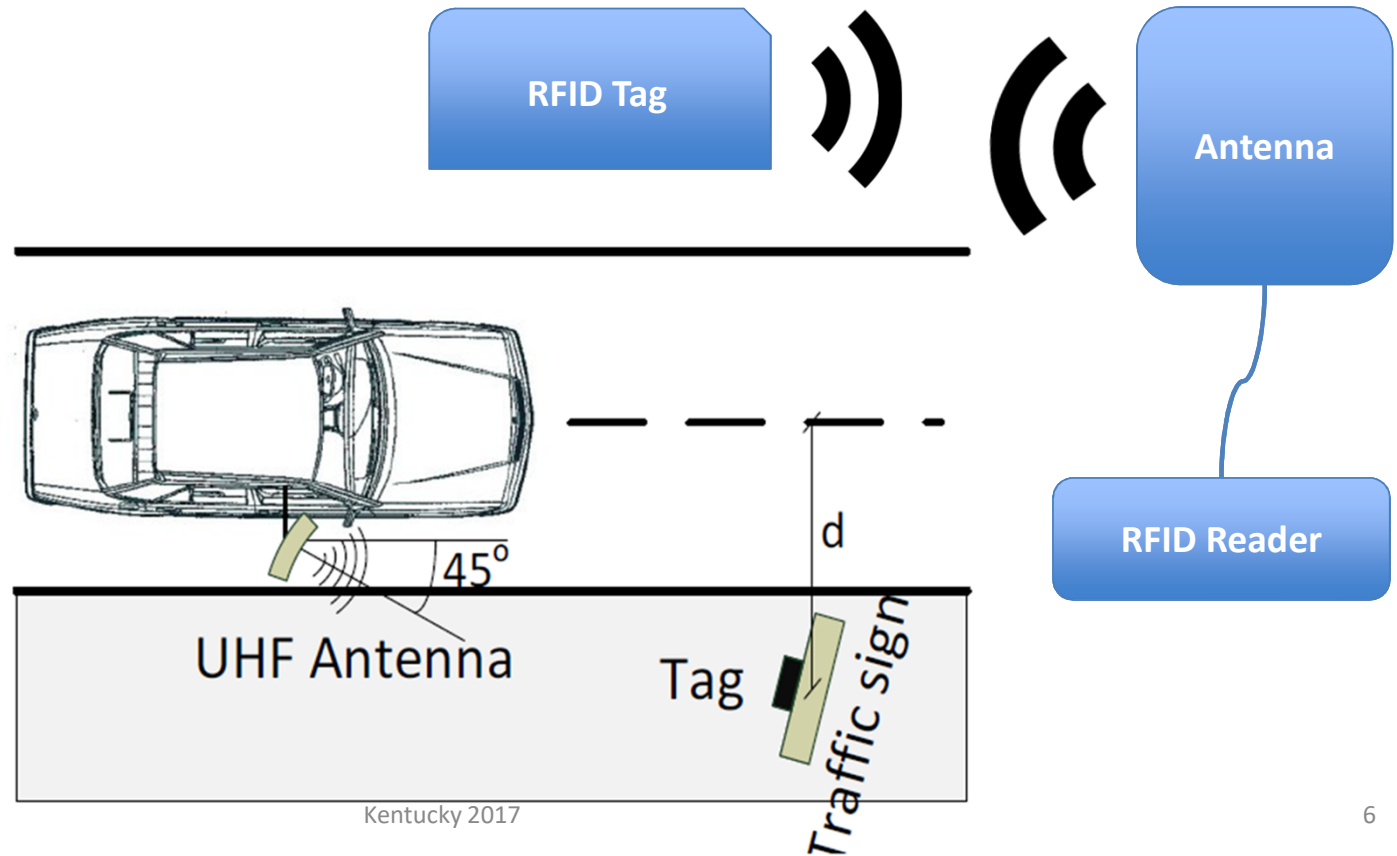
No	Code	Symbol	Chainage	Location	Directio	Pass	Valid	Note
515	C02		1/10,983 (P)	Left	OPP	✓	✓	
516	B02		1/16,984 (P)	Left	OPP	✗	✗	
517	D12		1/16,984 (P)	Left	OPP	✗	✗	Znak nije prema važećem pravilniku o prometnim znakovima, signalizaciji i opremi na cestama (NN 33/2005). Članak 9.: „Prometni znakovi koji se postavljaju na isti nosač moraju biti istih retroreflektirajućih svojstava.“ Članak 45., točka 8.: „Znak označuje smjer ceste za naseljeno mjesto ispisano na znaku i udaljenost u kilometrima (osim u bijelom polju).“
518	C02		1/16,964	Left	OPP	✓	✓	
519	B39		1/16,964	Left	OPP	✗	✗	Znak nije prema važećem pravilniku o prometnim znakovima, signalizaciji i opremi na cestama (NN 33/2005). Članak 9.: „Prometni znakovi koji se postavljaju na isti nosač moraju biti istih retroreflektirajućih svojstava.“
520	A34		1/16,918	Left	OPP	✓	✓	
521	B29		1/16,918	Left	OPP	✓	✗	Znak nije prema važećem pravilniku o prometnim znakovima, signalizaciji i opremi na cestama (NN 33/2005). Članak 9.: „Prometni znakovi koji se postavljaju na isti nosač moraju biti istih retroreflektirajućih svojstava.“
522	B04		1/16,915 (P)	Left	OPP	✗	✗	Prometni znak je oštećen. Prometni znak je zaklonjen.

- Traffic sign database developed by Department of Traffic Signaling

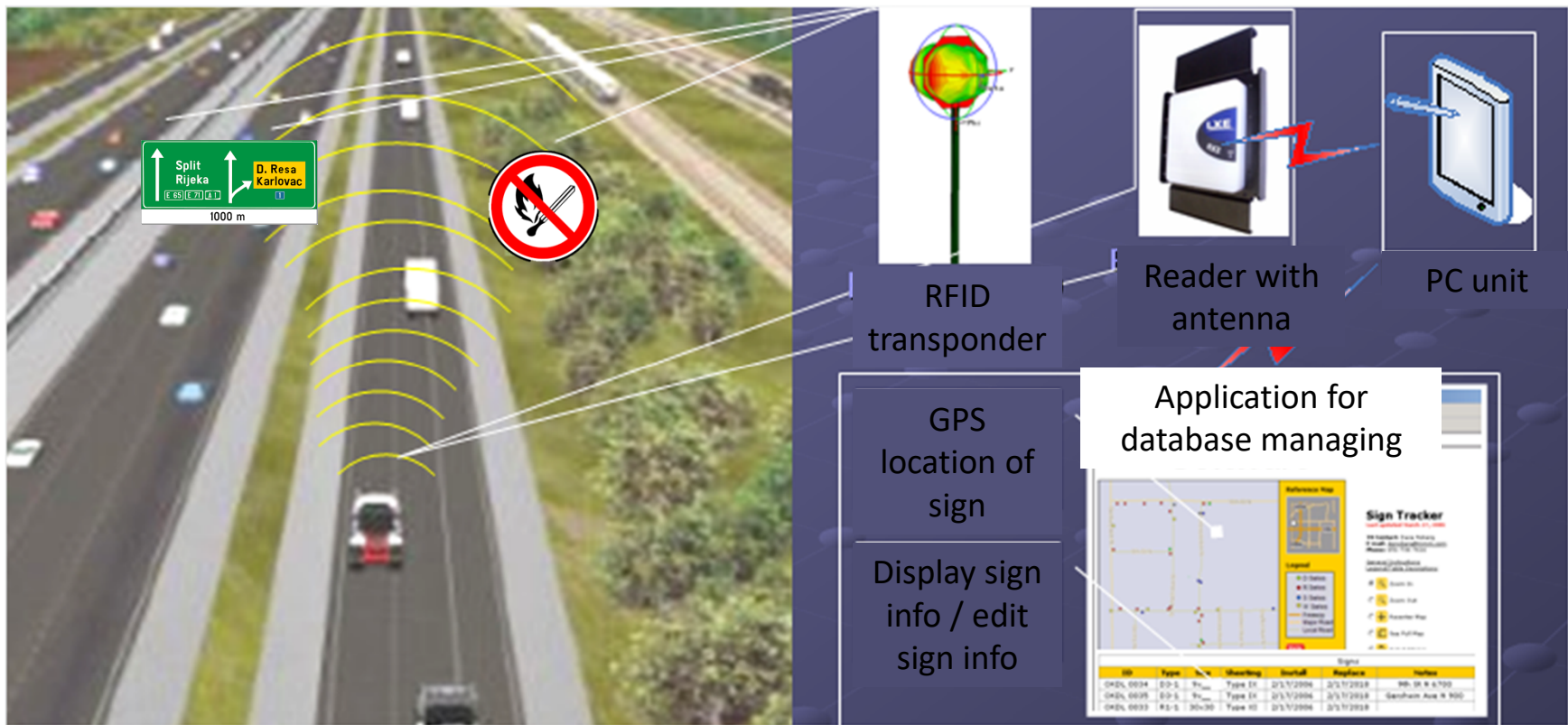


About RFID Technology

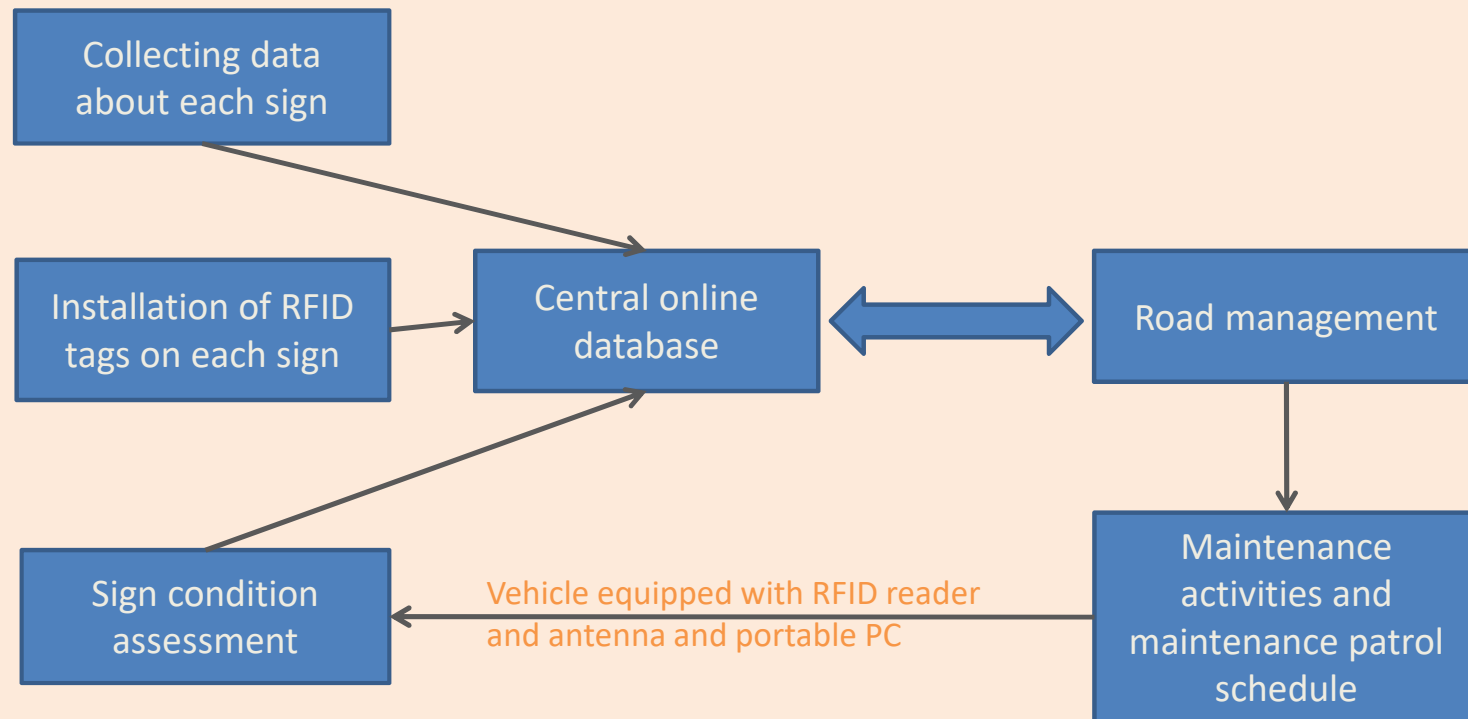
- **Radio Frequency Identification**
- Has been used for vehicle tracking, in logistics etc.
- **Advantages:**
 - Low-cost
 - Low power device
 - Less complicated algorithms than those used in VIP technology



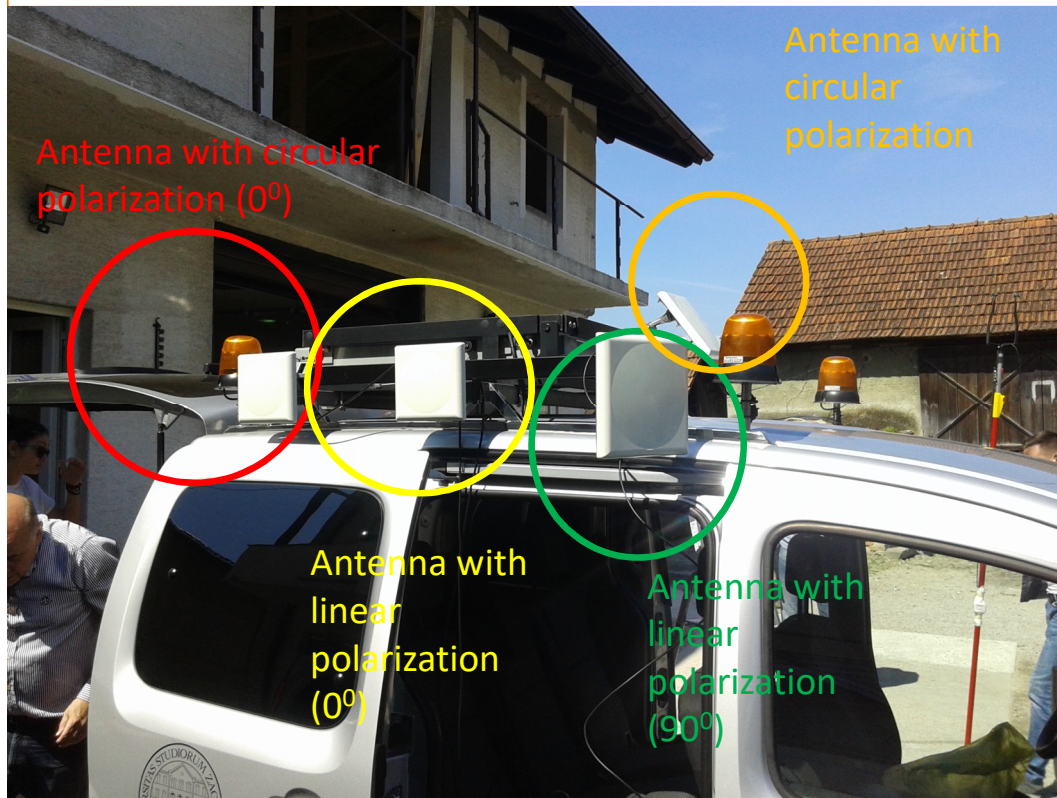
- An example of RFID system with data collectng during the drive



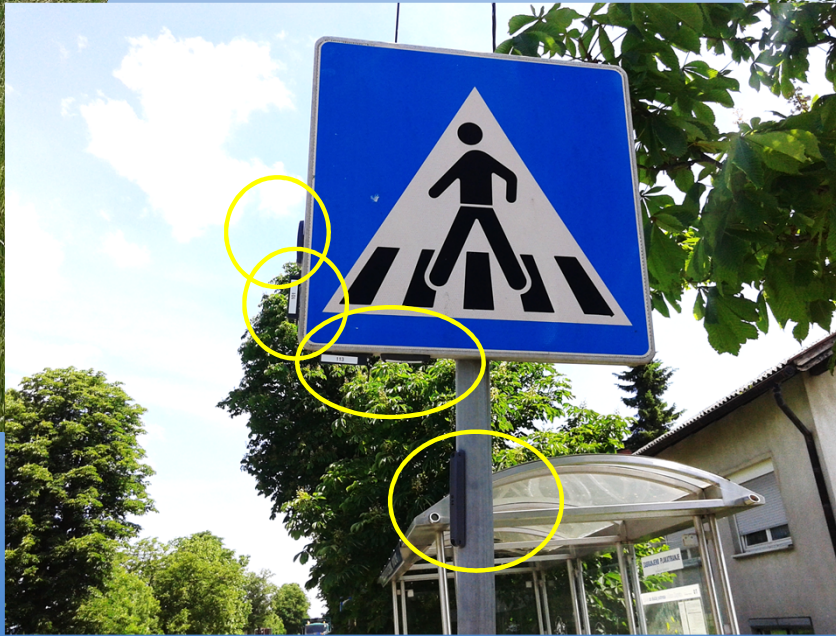
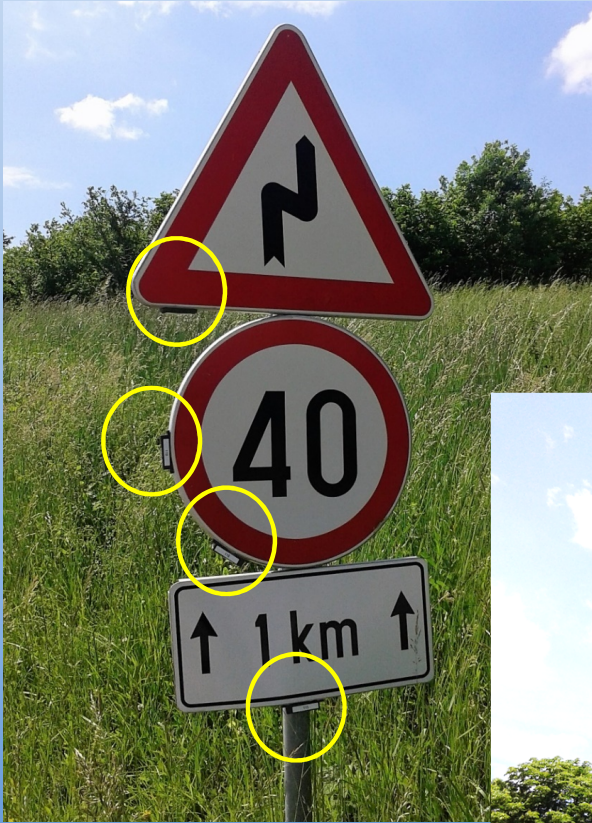
How the system works?



Field Research



- Looking for an optimal:
 - Distance (reading range)
 - Placing of the tag on the sign
 - Tag type
 - Antenna angle
 - Antenna polarization type
 - Vehicle speed



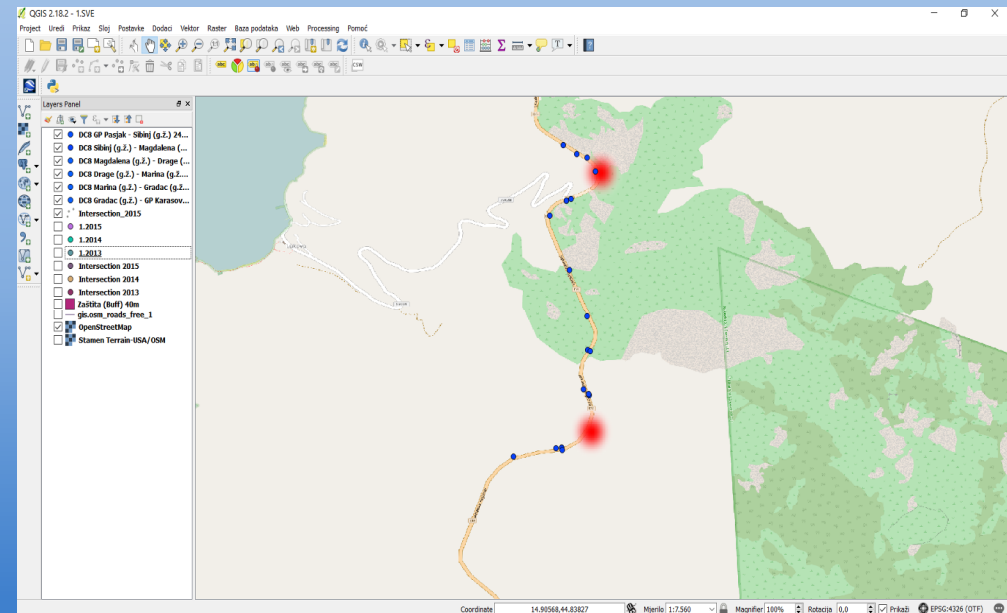
- Testing various tag types and positioning

Field research results

ID	Test 1			Test 2			Test 3			Test 4			Test 5			Test 6				
	A1 L 45°	A2 L 45°	Res.	A1 L 0°	A2 L 0°	Res.	A1 L 10°	A2 L 22°	Res.	A1 K 90°	A2 K 0°	Rez.	A1 K 0°	A2 K 0°	Res.	A1 K 0°	A2 L 0°	A3 L 90°	A4 K car roof	Res.
101	1	1	1	0	1	1	1	1	1		1	1	1	0	1	1	0	1	0	1
102	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
103	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	1	1	0	1
105	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1
109	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	1
10A	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	0	1	0	1
10B	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
110	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	0	1
10E	1	0	1	1	1	1	0	1	1	0	0	0	0	0	0	0	1	1	0	1
112	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	0	1
114	0	0	0	0	1	1	0	0	0	0	0	0	1	1	1	0	0	1	0	1
116	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	1	1	1	0	1
119	0	0	0	0	1	1	0	1	1	0	0	0	0	0	0	1	0	1	0	1
11B	0	0	0	1	1	1	0	0	0	0	0	0	0	0	0	1	1	0	0	1
11C	1	0	1	1	1	1	0	0	0	0	0	0	0	0	0	1	0	0	0	1
11E	1	1	1	1	1	1	1	0	1	0	1	1	0	0	0	1	0	1	0	1
11E	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	0	1
11F	0	0	0	1	1	1	1	0	1	1	1	1	0	0	0	1	1	1	1	1
120	1	0	1	1	1	1	0	0	0	1	1	1	1	1	1	1	1	1	0	1
106	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	1	1	0	1
Tot.	11	8	11	11	16	16	8	8	10	7	9	9	8	7	8	15	14	18	4	20
%	55%	40%	55%	55%	80%	80%	40%	40%	50%	35%	45%	45%	40%	35%	40%	75%	70%	90%	20%	100%

Conclusions

- Benefits of having road equipment database inventory
 - Optimization of road maintenance activities
 - Optimization of road maintenance patrol schedule
 - New info generated by maintenance patrol
 - Useful in legal disputes
 - Leads to cost reduction
 - Leads to increase of road safety



- RFID testing results

ID	Test 1			Test 2			Test 3			Test 4			Test 5			Test 6				
	A1 L 45°	A2 L 45°	Res.	A1 L 0°	A2 L 0°	Res.	A1 L 10°	A2 L 22°	Res.	A1 K 90°	A2 K 0°	Res.	A1 K 0°	A2 K 0°	Res.	A1 K 0°	A2 L 0°	A3 L 90°	A4 K car roof	Res.
Total	11	8	11	11	16	16	8	8	10	7	9	9	8	7	8	15	14	18	4	20
%	55%	40%	55%	55%	80%	80%	40%	40%	50%	35%	45%	45%	40%	35%	40%	75%	70%	90%	20%	100%

- To improve road traffic safety and road management system, it is necessary to regularly maintain road infrastructure
- Traffic signs database with data updating via RFID can be simple and efficient tool for an overview of all the signs on each road, and also for maintenance activities schedule
- RFID technology is relatively cheap and simple to use to collect data on traffic signs or update online data base



Thank you for your attention!

