



UNIVERSITY OF ZAGREB
Faculty of Transport and Traffic Sciences



Implementation of RFID Technology in Traffic Signs Database Inventory

Road Management Systems – Traffic Signs Maintenance

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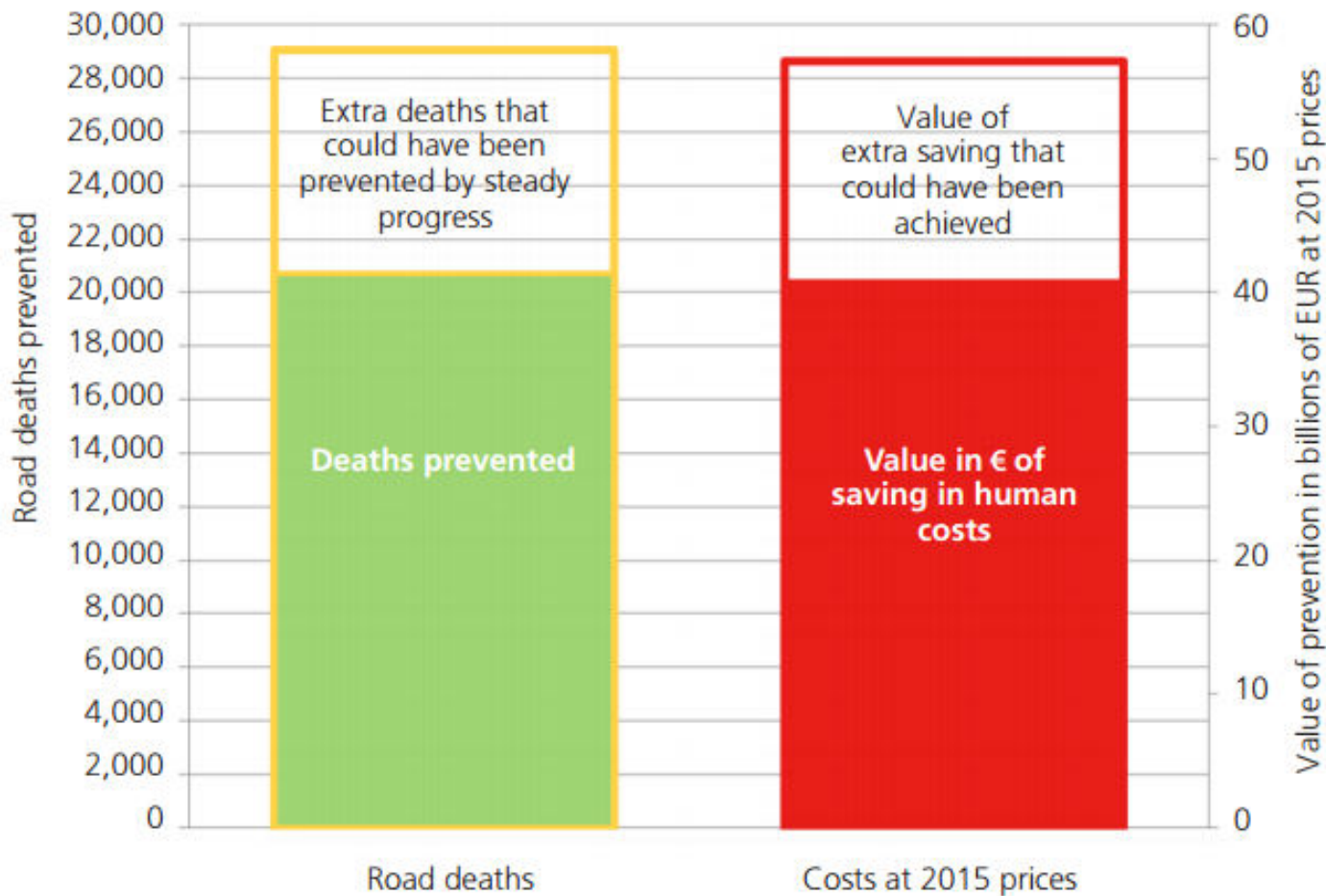
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Introduction

- The optimization of the road infrastructure management can lead to the decrease of road fatalities and accidents
- Having the updated inventory of traffic signs can be important factor to ensure road safety
- Today, many technologies are used in traffic and transport system, such as VIP or RFID





- Reduction in the number of road deaths in EU28 2011-2015 and valuation at 2015 prices and value, together with the additional savings

Data source: RANKING EU PROGRESS ON ROAD SAFETY, 10th Road Safety Performance Index Report, June 2016 (ETSC)



Traffic Signs Database Inventory

- 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 (by driving on the road) – synchronization of the database and real-time information

- Benefits
 - Optimization of road maintenance activities
 - Optimization of road maintenance patrol schedule
 - New info generated by maintenance patrol
 - Useful in legal disputes



Traffic Signs Database Inventory

- Online traffic signs database contains information about each traffic sign:

- Road / Road section
- Sign code
- Dimension
- GPS location
- Chainages
- Photography
- Retroreflection coefficient
- Material class
- Year of production
- Manufacturer

- Position relative to the road direction
- Way of setting
- Other remarks
- Etc.



RETROREFLEKSIJA

Application for road markings and traffic signs retroreflection measurements overview

Traffic signs > Hrvatske ceste d.o.o. > Splitsko-dalmatinska županija > DC512 Makarska (D8) - Ravča (D62) 09.08.2016. Marija Ferko Logout

No	Code	Symbol	Chainage	Location	Direction	Pass	Valid	Note
25	K14		1/1,035	Left	DIR	✓	✓	Details
26	K14		1/1,060	Left	DIR	✓	✓	Details
27	K14		1/1,152	Right	DIR	✓	✓	Details
28	K14		1/1,182	Right	DIR	✓	✓	Details
29	C11		1/1,228	Right	DIR	✓	✓	Details
30	A11		1/1,351	Right	DIR	✓	✓	Details
31	E03		1/1,351	Right	DIR	✓	✓	Details
32	B32		1/1,403	Right	DIR	✓	✓	Details
33	B31		1/1,403	Right	DIR	✓	✓	Details
34	K14		1/1,472	Left	DIR	✓	✓	Details
35	K14		1/1,616	Right	DIR	✓	✓	Details
36	K14		1/1,692	Right	DIR	✓	✓	Details
37	K14		1/1,823	Left	DIR	✓	✓	Details
38	K14		1/1,893	Right	DIR	✓	✓	Details
39	K14		1/1,986	Left	DIR	✓	✓	Details

- Traffic signs database developed by Department of Traffic Signalization



About RFID Technology

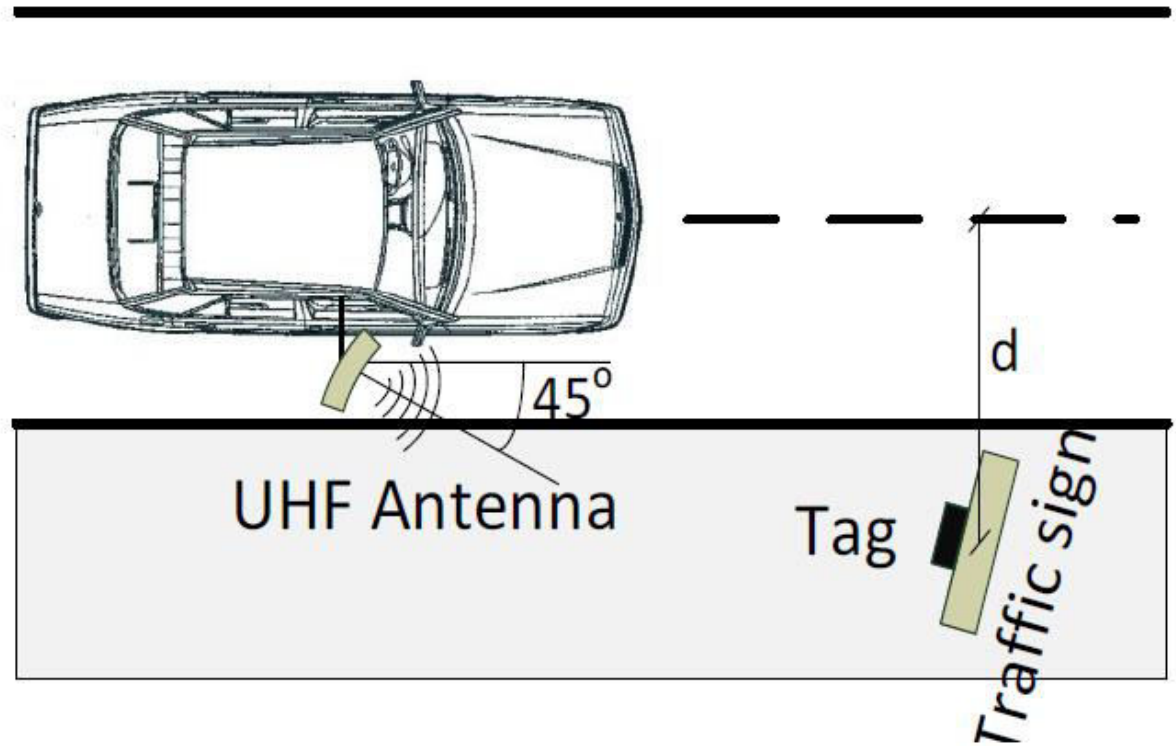
- **Radio Frequency Identification**
- Have been used for vehicle tracking
- **Advantages:**
 - Low-cost, low power device
 - Less complicated algorithms than those used in VIP technology

- **Components:**
 - Tags / transponders
 - Passive
 - Active
 - Reader
 - Antennas



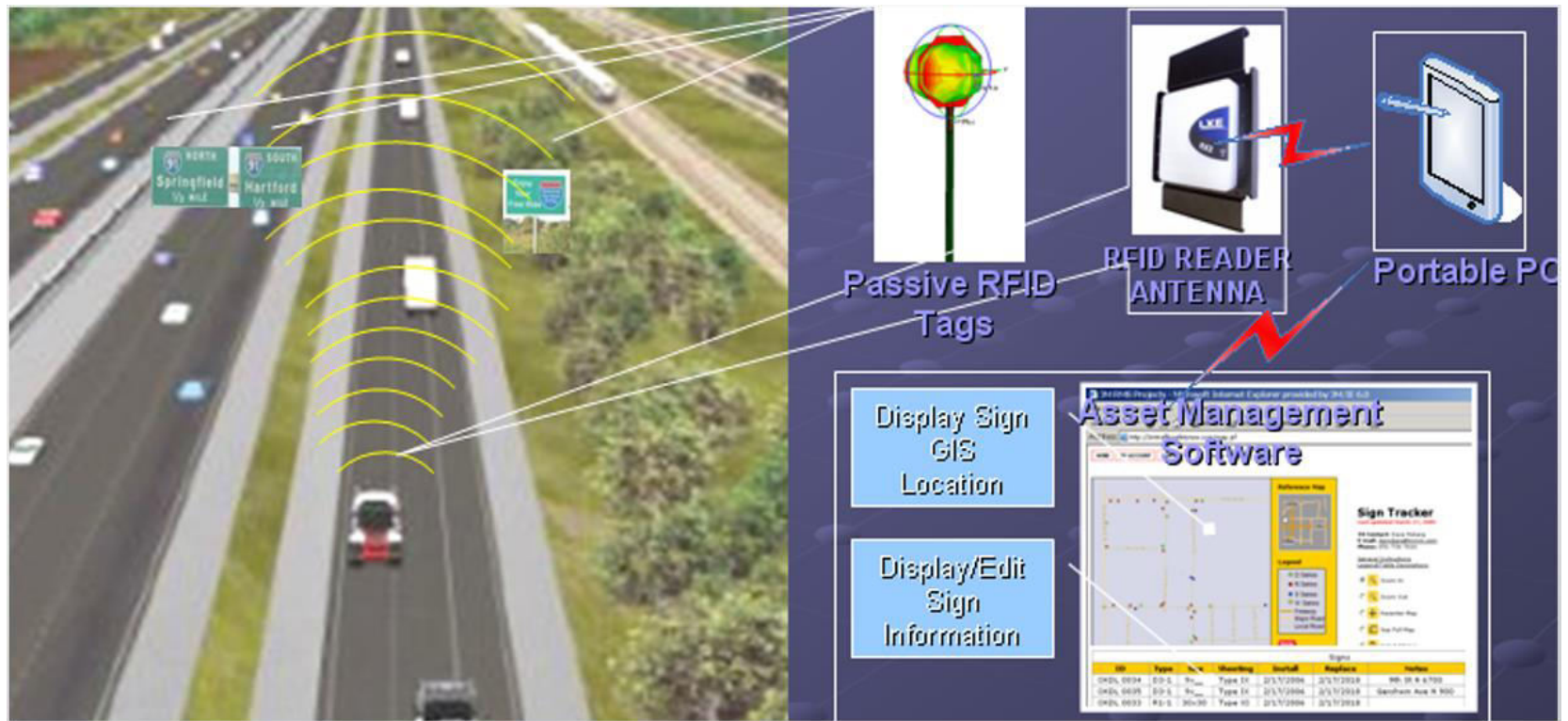
About RFID Technology

- An example of RFID system with testing during the drive

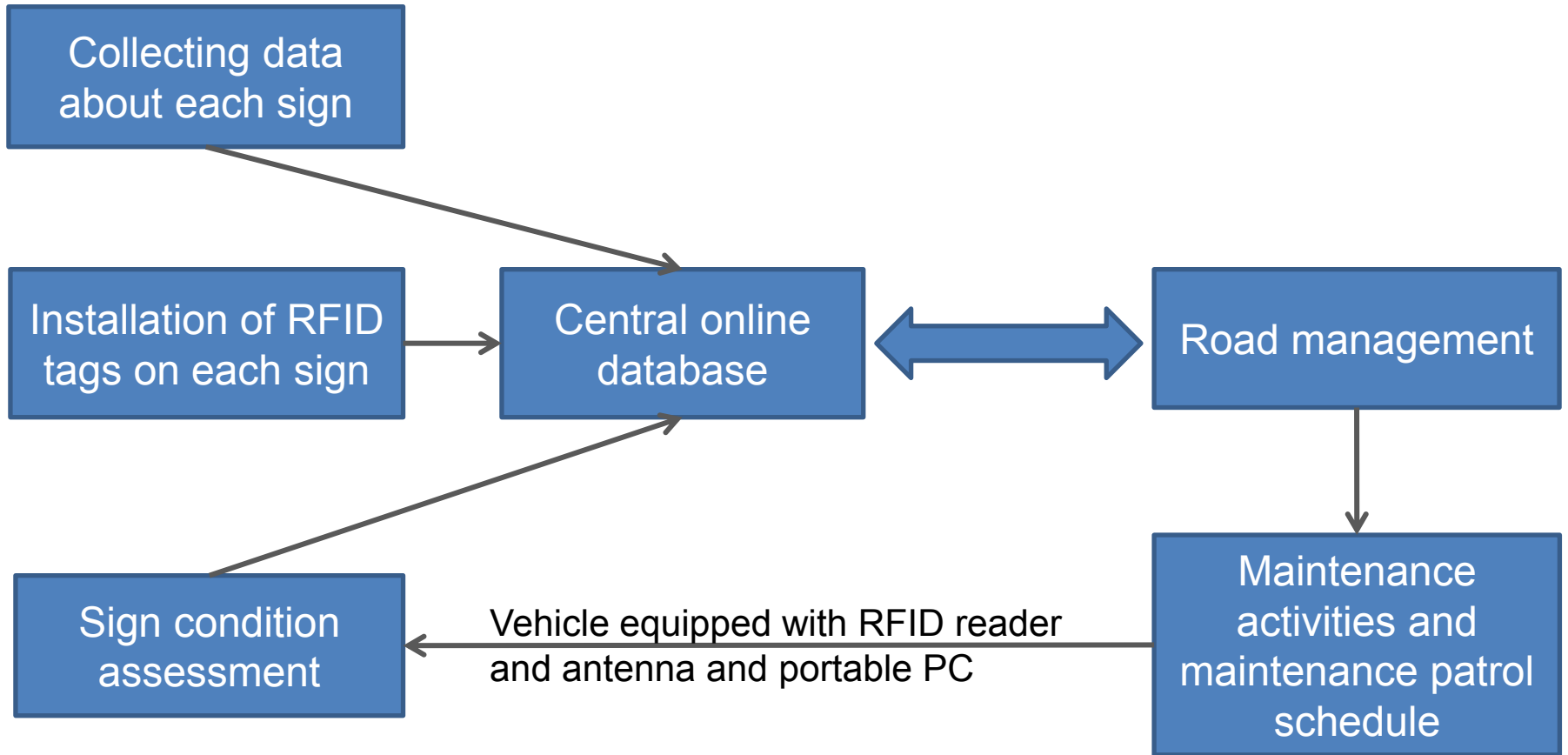


About RFID Technology

- An example of RFID system with testing during the drive

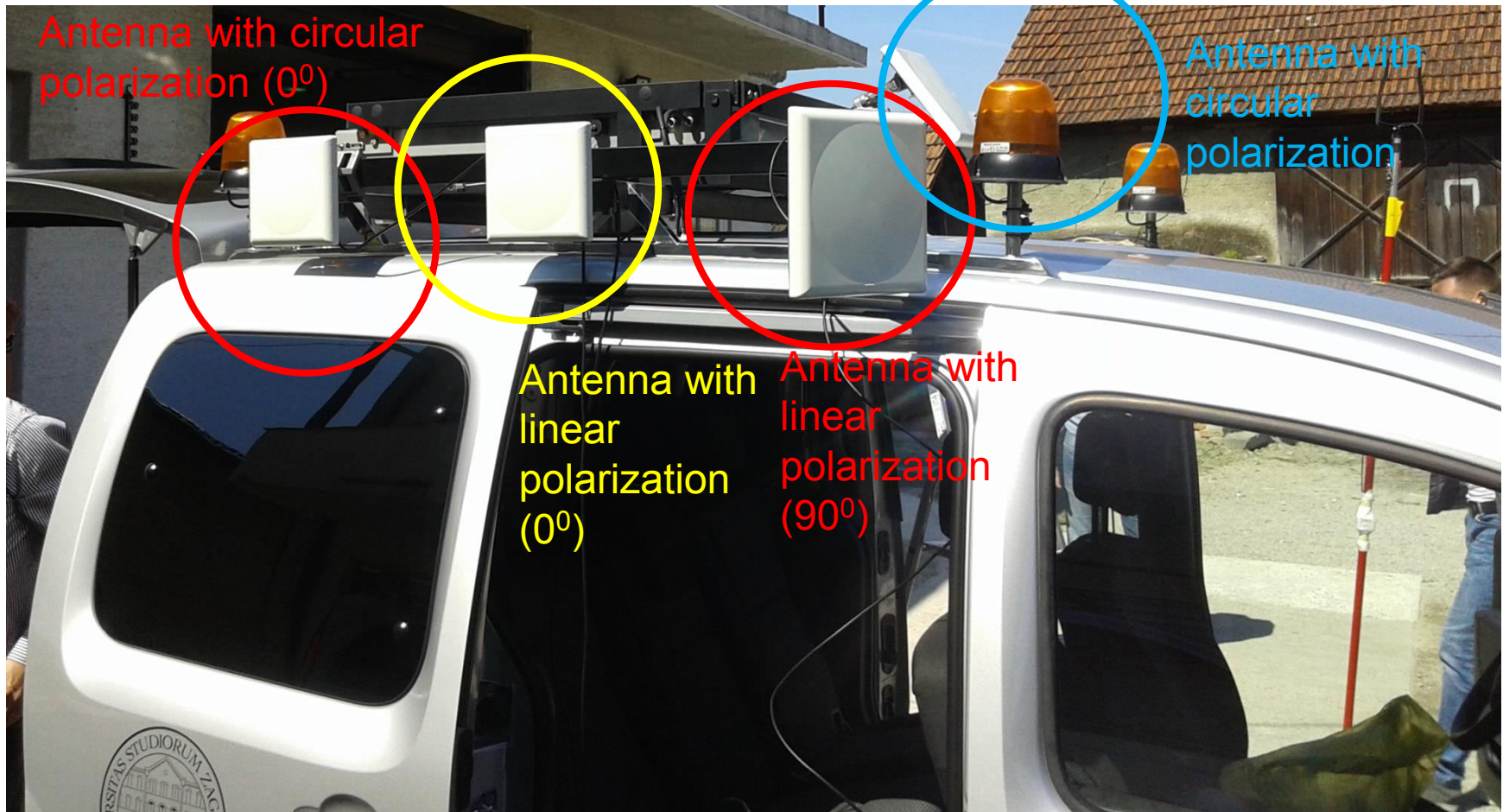


How the system works?



Field Research

- 6 tests were done with different combination of various antennas





- Testing various tag types and positioning



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
Uk.	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%



• Field research results

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



Conclusions

- 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!

Questions?

