

RFID in Rail
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TRAFIKVERKET

Swedish Transport Administration

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RFID

Radio transmission of data between reader and tag/transponder

Definitions – RFID

RFID – Radio Frequency IDentification

- Is a technology for wireless communication between a reader and a transponder/tag

RFID can be split into **active** and **passive** systems:

- Active systems have a battery in the transponder/tag
- Passive systems have no battery in the transponder/tag

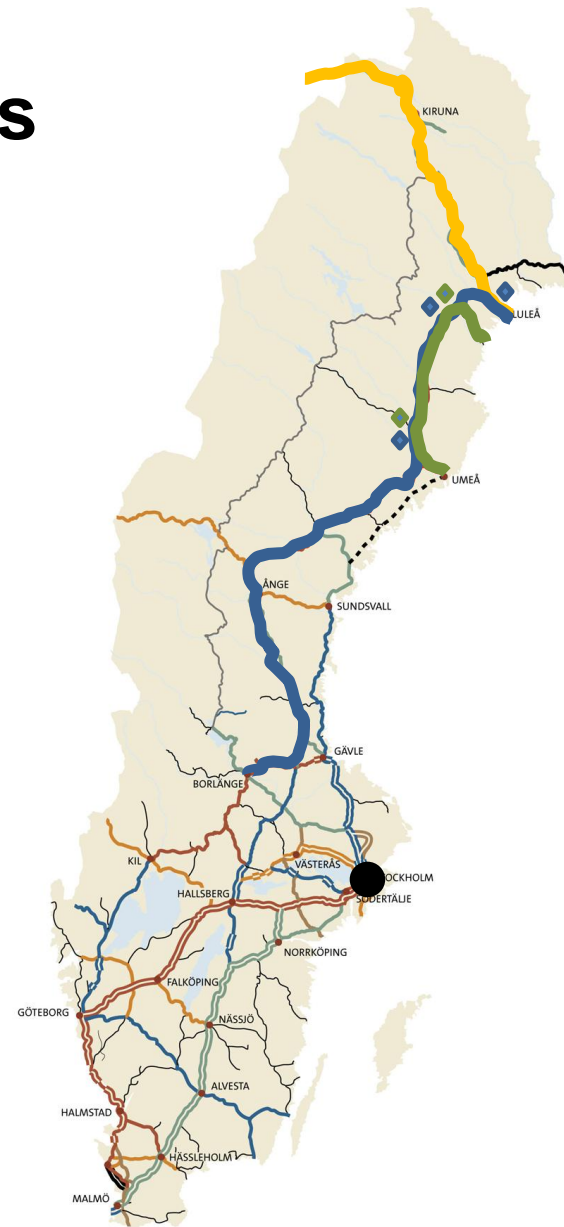
RFID projects with active tags

- Luleå – Narvik (Norway)**
 - LKAB/MTAB, Iron ore train, >1000 wagons
 - Active RFID-tags, Amtech/Transcore
 - 1990 -

- Piteå – Umeå, Freightwise project (EU)**
 - SCA, Paper wagons, 240 wagons
 - Semi active RFID-tags, Tagmaster
 - 2007 - 2010

- Luleå – Borlänge**
 - SSAB, Steel trains, 400 wagons
 - Active RFID-tags, Adage
 - 2008 –

- Stockholm**
 - Commuter train, 20 wagons
 - Semi active RFID-tags, Tagmaster
 - 2007 -2009



Rail traffic in Sweden

60-70% of wagons in Sweden come from other European countries

Need:

- European standard for RFID system
- Standard for information exchange



TSI rolling stock — freight wagons

EU legislation for rail transport in Europe

- RFID transponders/tags are not mandatory
- Two passive transponders/tags per wagon, one on each side
- ISO 18000-6 type A air interface
- Reads the individual tag ID/wagon ID, date and time
- Speeds up to 30 km/h

RFID demands for a pre-study (2009)

- Speed over at least “160” km/h
- Open standard
- Potential EU-standard
- Easy to maintain
- Competitiveness
- Robust
- Possible to use in other transport systems

Pre-study results:

Upgrade TSI

- Upgrade air interface standard to ISO 18000-6 type C / UHF gen 2 class 1
- Speeds up to max speed of the wagon
- Not just for shunting yards but also trackside detection
- Recommend RFID transponder/tag on rolling stock – freight wagons


Position paper


- Finland (RHK) and Sweden (BV)
- EIM – *(ERA)* – *(Commission)*


Published on EIM website: www.eimrail.org/techpapers.html


RFID proof of concept – Passive tags

UHF gen 2 class 1 / ISO18000-6 type C

-  Stockholm – Göteborg
 - Post train - 160 km/h
 - 9 post wagons
 - 2009 –

-  Stockholm – Göteborg
 - High speed train - 200 km/h
 - 30 engines (X2000 Train set), SJ
 - 2010 –

-  Falköping – Göteborg
 - Container wagons
 - Dry Port project, EU
 - 2009 –

-  Olofström – Göteborg – (Gent, Belgium)
 - Container train for Volvo
 - 210 wagons (Green Cargo)
 - 2010 –





RFID reader

Axle counter /
Wheel sensor

Axle counter /
Wheel sensor

RFID Detector

RFID reader: ISO18000-6 C / UHF gen 2 class 1

Axle counters /Wheel sensors

- detect vehicles/wagons without transponders/tags
- speed
- direction
- distance between axles

Tag position on wagon

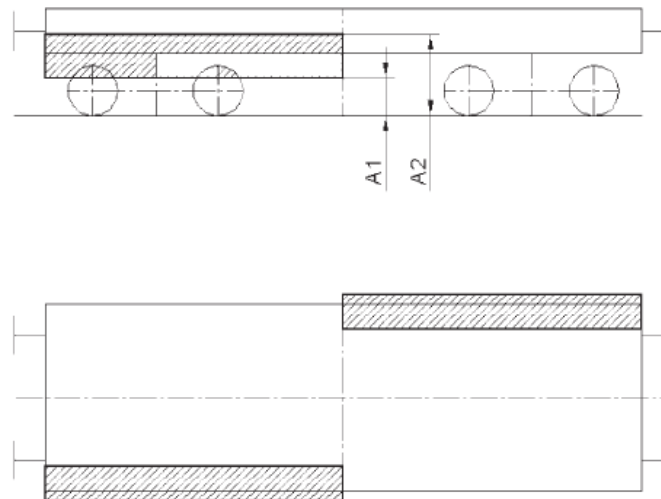
ANNEX F

COMMUNICATION

Vehicle capability to transmit information between ground and vehicle

Fig. F1

Tag position on wagon.



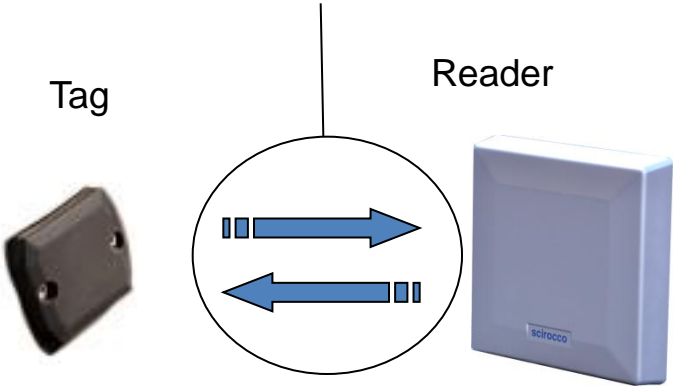
In the Fig. F1 (above), A1 and A2 are respectively the minimum and maximum height above rail for positioning the centres of the tags in all conditions of wagon loading and suspension movement:

A1 = 500 mm

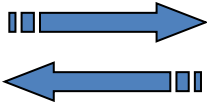
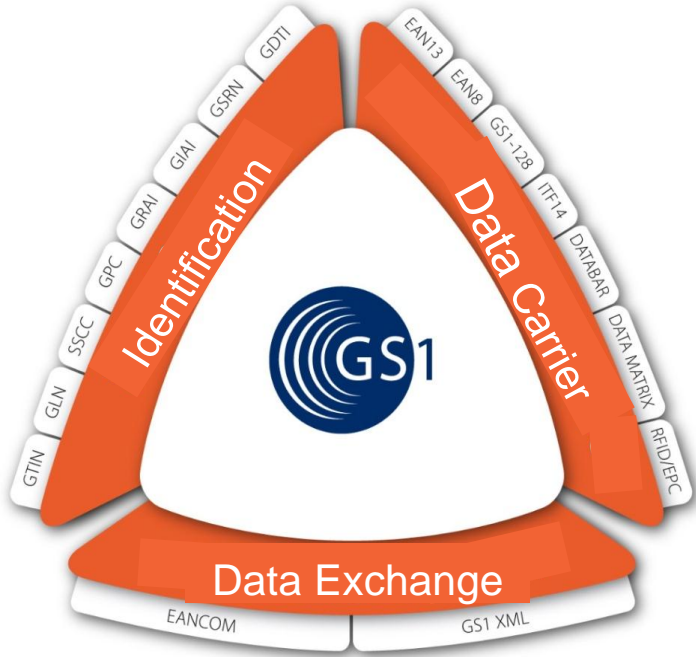
A2 = 1100 mm

STANDARDS

Air interface:
 ISO18000-6 typ C
 UHF Gen2 Class1



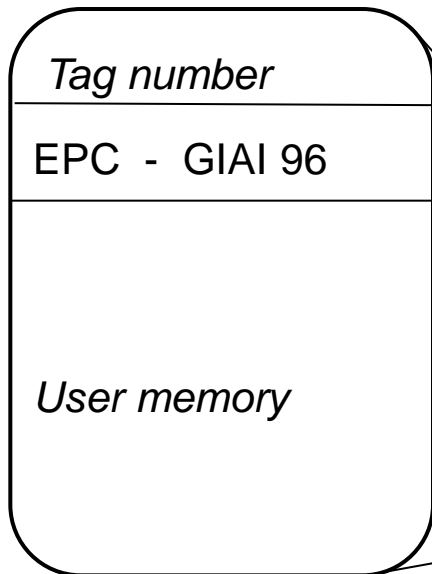
How to structure tag information ?



How to share information ?

Structure of tag information

Transponder/tag



Company prefix, A/B + Wagon number
1/2 + 12 digits





Search by vehicle



VehicleId EPCIS

Search

-- Choose criteria --

- Place
- Vehicle owner
- Partner
- Train direction

Search by axles

1 Min

512 Max



Search by date

Date from



Date To



		Message ID	Passage	Date/Time	Direction	Nr of Axles	Readertype
Passage	Axles	11456	Odensberg_USP	08/02/2011 13:36:58	U	28	Siemens
Passage	Axles	11455	Odensberg_NSP	08/02/2011 13:28:13	U	28	Scirocco
Passage	Axles	11454	Lönsboda	08/02/2011 12:32:18	J	82	Siemens670R
Passage	Axles	11453	Odensberg_NSP	08/02/2011 12:25:24	U	24	Scirocco
Passage	Axles	11452	Sunderbyns_Sjukhus	08/02/2011 11:59:27	J	76	Adage
Passage	Axles	11451	Odensberg_NSP	08/02/2011 11:30:22	U	24	Scirocco
Passage	Axles	11450	Sunderbyns_Sjukhus	08/02/2011 11:22:21	U	164	Adage
Passage	Axles	11449	Goteborg	08/02/2011 11:14:57	J	64	Tagmaster
Passage	Axles	11448	Odensberg_NSP	08/02/2011 10:26:14	U	28	Scirocco
Passage	Axles	11447	Tväråbäck	08/02/2011 10:02:07	U	8	Adage
Passage	Axles	11446	Odensberg_USP	08/02/2011 09:49:43	U	56	Siemens
Passage	Axles	11445	Odensberg_NSP	08/02/2011 09:30:24	U	28	Scirocco
Passage	Axles	11444	Odensberg_USP	08/02/2011 09:30:04	U	28	Siemens
Passage	Axles	11443	Pölsebo	08/02/2011 09:16:39	J	108	Siemens670R
Passage	Axles	11442	Pölsebo	08/02/2011 09:00:04	J	64	Siemens670R
Passage	Axles	11441	Odensberg_NSP	08/02/2011 08:27:01	J	28	Scirocco
Passage	Axles	11440	Pölsebo	08/02/2011 08:18:27	J	56	Siemens670R
Passage	Axles	11439	Odensberg_USP	08/02/2011 07:31:06	U	28	Siemens
Passage	Axles	11438	Odensberg_USP	08/02/2011 06:40:08	U	24	Siemens
Passage	Axles	11437	Lönsboda	08/02/2011 06:31:14	U	88	Siemens670R

|||



Detailed view for:

Passage: L%u00f6nsboda

Timestamp: 2011-02-08 12:32:18

Direction: J

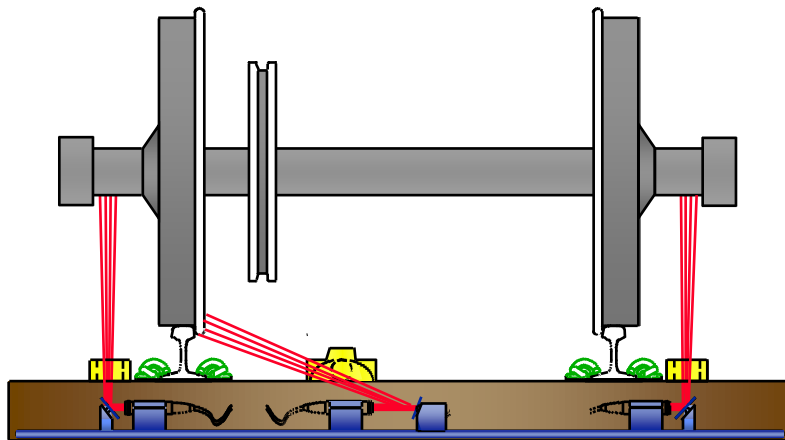
Nr of axles: 82

No.	EPC No.	Järnvägsföretag	VehicleId	Timestamp	A/B
1	340EBCF43290021B92846809	Green Cargo	317445523465	08/02/2011 12:32:18	B
2	340EBCF43290021B92846087	Green Cargo	317445521543	08/02/2011 12:32:18	B
3	340EBCF432900132BDDDF5896	Green Cargo	317445523606	08/02/2011 12:32:18	A
4	340EBCF43290021B92845E0D	Green Cargo	317445520909	08/02/2011 12:32:18	B
5	340EBCF43290021B928460A0	Green Cargo	317445521568	08/02/2011 12:32:18	B
6	340EBCF432900132BDDDF4D6E	Green Cargo	317445520750	08/02/2011 12:32:18	A
7	340EBCF432900132BDDDF50E2	Green Cargo	317445521634	08/02/2011 12:32:18	A
8	340EBCF43290021B92845B34	Green Cargo	317445520180	08/02/2011 12:32:18	B
9	340EBCF432900132BDDDF4E76	Green Cargo	317445521014	08/02/2011 12:32:18	A
10	340EBCF432900132BDDDF50B0	Green Cargo	317445521584	08/02/2011 12:32:18	A
11	340EBCF432900132BDDDF5312	Green Cargo	317445522194	08/02/2011 12:32:18	A
12	340EBCF43290021B92845C67	Green Cargo	317445520487	08/02/2011 12:32:18	B
13	340EBCF43290021B9284617E	Green Cargo	317445521790	08/02/2011 12:32:18	B
14	340EBCF432900132BDDDF584B	Green Cargo	317445523531	08/02/2011 12:32:18	A
15	340EBCF432900132BDDDF4E98	Green Cargo	317445521048	08/02/2011 12:32:18	A
		1 2			

Close

Export to Excel

One main use of RFID is to combine measuring values from wayside monitoring system/detectors with the correct railway wagon



Hot Box/Hot Wheel detection



Hot Box/Hot Wheel detector

Wayside monitoring system/detectors

RFID – systems can give benefits for

- Owner of the infrastructure
- Railway companies
- Customers of cargo transports
- In the future, end customer / private persons

Benefits

- Combine detector measurement and alarms with correct wagon
- Proactive wagon maintenance based on input from detectors
- Track and trace wagons
- Enables intermodal transport
- More effective shunting of freight wagons
- Correct train composition
- Better use of resources/wagons
- Reduced environmental impact

Deployment in Sweden

- Build an infrastructure of 250-500 RFID detectors along Swedish Transport Administration's tracks
 - Major junctions/stations
 - Shunting yards
- Requirements specification for procurement of RFID readers 2011
- Limited installation and deployment 2011
- Full roll-out of RFID readers 2012-2013



Thank you!