



**TEST REPORT CONCERNING THE COMPLIANCE OF AN
INDUCTIVE PROXIMITY CARD READER, OPERATING ON
13.56 MHz
BRAND Nedap, MODEL SMARTCARD BOOSTER LEGIC 2G,
WITH 47 CFR PART 15 (10-1-09 EDITION) AND THE
REQUIREMENTS OF INDUSTRY CANADA:
RSS-GEN AND RSS-210 (ISSUE 8, DECEMBER 2010)**

**11091601.fcc01
February 23, 2012**

FCC listed : 90828
Industry Canada : 2932G-1
VCCI Registered : R-1518, C-1598
R&TTE, LVD, EMC Notified Body : 1856

**TÜV Rheinland EPS B.V.
P.O. Box 15
9822 ZG Niekerk (NL)
Smidshornerweg 18
9822 TL Niekerk (NL)**

Telephone: +31 594 505005
Telefax: +31 594 504804

E-mail: info@tuv-eps.com
Web: www.tuv-eps.com

MEASUREMENT/TECHNICAL REPORT

N.V. Nederlandsche Apparatenfabriek "Nedap"

Brand: Nedap

Model: Smartcard Booster LEGIC 2G

FCC ID: CGDBOOSTER6

IC: 1444A- BOOSTER6

February 23, 2012

This report concerns:	Original grant/certification	Class 2 Permissive Change	Verification
Equipment type:	Inductive Proximity Card Reader		
Report prepared by:	Name	: Onno Hans Hoekstra	
	Company name	: TÜV Rheinland EPS B.V.	
	Address	: Smidshornerweg 18	
	Postal code/city	: 9822 TL Niekerk	
	Mailing address	: P.O. Box 15	
	Postal code/city	: 9822 ZG Niekerk	
	Country	: The Netherlands	
	Telephone number	: + 31 594 505 005	
	Telefax number	: + 31 594 504 804	
	E-mail	: info@tuv-eps.com	

The data taken for this test and report herein was done in accordance with 47 CFR Part 15 (10-1-09 Edition), RSS-GEN AND RSS-210 and the measurement procedures of ANSI C63.4-2009. TÜV Rheinland EPS B.V. at Niekerk, The Netherlands, certifies that the data is accurate and contains a true representation of the emission profile of the Equipment Under Test (EUT) on the date of the test as noted in the test report. I have reviewed the test report and find it to be an accurate description of the test(s) performed and the EUT so tested.

Date: February 23, 2012

Signature:



P. de Beer
Quality and Approvals Manager
Telecom TÜV Rheinland EPS B.V.

Summary

The device under test does:

- fulfill the general approval requirements as identified in this test report
- not fulfill the general approval requirements as identified in this test report

Description of test item

Test item (EUT) : Inductive Proximity Card Reader
Manufacturer : N.V. Nederlandsche Apparatenfabriek "Nedap"
Brand : Nedap
Model(s) : Smartcard Booster LEGIC 2G
Serial number(s) : --
FCC ID : CGDBOOSTER6
IC : 1444A-BOOSTER6
Receipt date : February 14, 2012


Applicant information


Applicant's representative : Mr. J. Hulshof
Company : N.V. Nederlandsche Apparatenfabriek "Nedap"
Address : Parallelweg 2
Postal code : 7141 DC
City : Groenlo
Country : The Netherlands
Telephone number : +31 544 471 162
Telefax number : +31 544 466 475

Test(s) performed

Location : Niekerk
Test(s) started : February 14, 2012
Test(s) completed : February 15, 2012
Purpose of test(s) : Equipment Authorization (Original grant/certification)

Test specification(s) : 47 CFR Part 15 [(10-1-09 Edition)] and RSS-GEN AND RSS-210
Compliance statement : The test has demonstrated that this unit complies with stipulated standards.

Test engineer(s) : O.H. Hoekstra 

Report written by : O.H. Hoekstra 

Report date : February 23, 2012

This report shall not be reproduced, except in full, without the written permission of TÜV Rheinland EPS B.V.
The test results relate only to the item(s) tested.

Table of contents

1	General information.....	5
1.1	Product description.....	5
1.1.1	Introduction.....	5
1.2	Related submittal(s) and/or Grant(s).....	5
1.2.1	General.....	5
1.3	Tested system details.....	5
1.3.1	Description of input and output ports.....	6
1.4	Test Summary.....	7
1.5	Test methodology.....	8
1.6	Test facility.....	8
1.7	Test conditions.....	8
2	System test configuration.....	9
2.1	Justification.....	9
2.2	EUT mode of operation.....	9
2.3	Special accessories.....	9
2.4	Equipment modifications.....	9
2.5	Product Labeling.....	9
2.6	Block diagram of the EUT.....	9
2.7	Schematics of the EUT.....	9
2.8	Part list of the EUT.....	9
3	Radiated emission data.....	10
3.1	Radiated field strength measurements (30 MHz – 1 GHz, E-field).....	10
3.1.1	Test equipment used (for reference see test equipment listing).....	10
3.2	Radiated field strength measurements (frequency range of 0.009-30 MHz, H-field).....	11
3.2.1	Test equipment used (for reference see test equipment listing).....	11
4	Conducted emission data.....	12
4.1	Conducted emission data of the EUT.....	12
5	Carrier stability under special conditions.....	13
5.1	Frequency stability (on 13.56 MHz) in accordance with 47 CFR Part 15, section 15.225 (e) & RSS-Gen section 4.7 and 7.2.4 and RSS-210 section A2.6:.....	13
5.1.1	At 85% and 115% of rated voltage supply level.....	13
5.2	Bandwidth of the emission on 13.56 MHz in accordance with RSS-Gen section 4.7 and 7.2.4 and RSS-210 section A2.6.....	13
5.2.1	Test equipment used (for reference see test equipment listing).....	14
6	Plots of measurement data.....	15
6.1	Bandwidth of the emission.....	15
7	List of utilized test equipment.....	16

1 General information.

1.1 Product description.

1.1.1 Introduction.

The Inductive Proximity Card Reader, brand Nedap model Smartcard Booster LEGIC 2G, hereafter referred to as EUT is an inductive proximity card reader intended to be used in access control for parking lots. The EUT can be positioned on the front window of a car. The EUT is capable of reading 13.56 MHz inductive tags.

The content of this report and measurement results have not been changed other than the way of presenting the data.

1.2 Related submittal(s) and/or Grant(s).

1.2.1 General.

This test report supports the original grant/certification in equipment authorization files under registration number. **FCC ID: CGDBOOSTER6 and IC: 1444A-BOOSTER6.**

1.3 Tested system details.

Details and an overview of the system and all of its components, as it has been tested, may be found below.

EUT	:	Inductive Proximity Card Reader
Manufacturer	:	N.V. Nederlandsche Apparatenfabriek "Nedap"
Brand	:	Nedap
Model	:	Smartcard Booster LEGIC 2G
Serial number	:	--
Voltage input rating	:	3.0 Vdc (internal batteries)
Voltage output rating	:	--
Current input rating	:	--
Antenna	:	Integral
Operating frequency	:	13.56 MHz
Remarks	:	n.a.



Photo 1: EUT

1.3.1 Description of input and output ports.

Number	Ports	From	To	Shielding	Remarks
None	None	-	-	yes / no	None

1.4 Test Summary

The EUT was tested in accordance with the specifications given in Table 1 below.

Test Standard		Description	Pass / Fail
47 CFR Part 15.225 (10-1-09 Edition)	RSS-210 Issue 8, December 2010		
15.207(a)	RSS-Gen(7.2.4)	Conducted emissions	Pass
15.225(a)	RSS-210(A2.6(a))	Emissions in the band 13.553-13.567 MHz	Pass
15.225(d), 15.209	RSS-210(A2.6)	Emissions outside the band 13.110-14.010 MHz	Pass
15.225(e)	RSS-210(A2.6)	Frequency stability	Pass
15.215(c)	RSS-Gen(4.6.1)	Occupied bandwidth	Pass

Table 1: Test specifications

Testmethods: ANSI C63:2009 and RSS-Gen Issue 3, December 2010

1.5 Test methodology.

The test methodology used is based on the requirements of 47 CFR Part 15 (10-1-09 Edition), sections 15.31, 15.35, 15.205, 15.209, 15.209 and 15.225 and RSS-GEN AND RSS-210 (ISSUE 8, DECEMBER 2010).

The test methods, which have been used, are based on ANSI C63.4: 2009.

Radiated emission tests above 30 MHz were performed at a measurement distance of 3 meters.

Radiated emission tests below 30 MHz were performed at a measurement distance of 3 meters.

To calculate the field strength level from these results to the appropriate distance at which the limit is specified, the appropriate extrapolation factor is used.

The receivers are switching automatically to the right bandwidth in accordance with CISPR 16. This is implemented in the receiver. The antenna factors are programmed in the test receiver. The receiver automatically calculates the appropriate correction factor for the utilized antenna and also the appropriate antenna factor for the cable loss. The total correction is automatically added to the measured value.

1.6 Test facility.

The Federal Communications Commission and Industry Canada has reviewed the technical characteristics of the test facilities at TÜV Rheinland EPS B.V., located in Niekerk, 9822 TL Smidshornerweg 18, The Netherlands, and has found these test facilities to be in compliance with the requirements of 47 CFR Part 15, section 2.948(10-1-06 edition).

The description of the test facilities has been filed at the Office of the Federal Communications Commission under registration number 90828. The facility has been added to the list of laboratories performing these test services for the public on a fee basis.

The description of the test facilities has been filed to Industry Canada under registration number 2932G-1. The facility has been added to the list of laboratories performing these test services for the public on a fee basis.

1.7 Test conditions.

Normal test conditions:

Temperature (*)	: +15°C to +35°C
Relative humidity(*)	: 20 % to 75 %
Supply voltage	: 3.0 Vdc (internal batteries)
Air pressure	: 950 – 1050 hPa

When is was impracticable to carry out the tests under these conditions, a note to this effect stating the ambient temperature and relative humidity during the tests are stated separately.

2 System test configuration.

2.1 Justification.

The system was configured for testing in a typical situation as a customer would normally use it.

The justification and manipulation of cables and equipment in order to simulate a worst-case behavior of the test setup has been carried out as prescribed in ANSI C63.4: 2009.

2.2 EUT mode of operation.

The EUT has been tested in active mode, i.e. the EUT is ready to detect a card. To assess the behavior of the EUT while reading the card, the EUT is tested with a card presented such that it continuously reads the card, and continuously sends data to the serial port of the EUT.

The intentional radiator tests (47 CFR Part 15 sections, 15.207, 15.209 and 15.225) have been performed with a complete functioning EUT and interconnections.

2.3 Special accessories.

No special accessories are used and/or needed to achieve compliance.

2.4 Equipment modifications.

Only for the Conducted Emissions testing (section 4) test, the test unit was modified to add a resistive termination in lieu of the antenna as per FCC KDB 174176. Pictures are available to show the modifications. For all other tests no modifications have been made to the equipment.

2.5 Product Labeling

The product labeling information is available in the technical documentation package.

2.6 Block diagram of the EUT.

The block diagram is available in the technical documentation package.

2.7 Schematics of the EUT.

The schematics are available in the technical documentation package.

2.8 Part list of the EUT.

The part list is available in the technical documentation package.

3 Radiated emission data.

3.1 Radiated field strength measurements (30 MHz – 1 GHz, E-field)

Frequency (MHz)	Measurement results @3m Vertical (dBµV)	Measurement results @3m Horizontal (dBµV)	Correction factor (dB)	Results after correction Vertical (dBµV/m)	Results after correction Horizontal (dBµV/m)	Limits @3m (dBµV/m)	Pass/Fail
189.9	14.3	5.5	9.4	23.7	14.9	43.5	Pass
217.0	9.9	0.2	11.4	21.3	11.6	46.0	Pass
393.3	21.5	6.3	17.5	39.0	23.8	46.0	Pass
406.9	19.9	1.1	17.9	37.8	19.0	46.0	Pass
420.4	13.5	3.6	18.3	31.8	21.9	46.0	Pass
474.7	13.1	2.4	20.1	33.2	22.5	46.0	Pass
501.8	13.5	3.1	21.1	34.6	24.2	46.0	Pass
718.9	11.6	0.3	23.8	35.4	24.1	46.0	Pass

Table 2 Radiated emissions of the EUT

The results of the radiated emission tests, carried out in accordance with 47 CFR Part 15 section 15.205, 15.209 and 15.225 and RSS-210 and RSS-Gen, section 2.2 and 2.6 are depicted in Table 2.

Notes:

1. Field strength values of radiated emissions at frequencies not listed in the table above are more than 20 dB below the applicable limit.
2. Measurement uncertainty is ± 5.0 dB.
3. The EUT was varied in three positions, the loop antenna was varied in horizontal and vertical orientations and also around its axis. The reported value is the worst case found at the reported frequency
4. The EUT was tested in both normal mode (i.e. without a label in its proximity) and in activated mode (i.e. with a label in its proximity). Worst case noted.
5. A Quasi-peak detector was used with a bandwidth of 120 kHz.

3.1.1 Test equipment used (for reference see test equipment listing).

99699	99547	99071	99070	99069	99174	12483
99733	99606	99580	99608	99742	99107	12476
12477	15633	99161				

Test engineer

Signature :



Name : O.H. Hoekstra

Date : February 14, 2012

3.2 Radiated field strength measurements (frequency range of 0.009-30 MHz, H-field).

Frequency (MHz)	Measurement results	Detector	Antenna factor	Cable loss	Extrapolation factor	Measurement results (calculated)	Limits	Pass/Fail
	dBµV @3m					dB	dB	
0.009-13.110	< 10.0	Qp	19.5	1	40	< -9.5	29.5	Pass
13.110-13.410	< 10.0	Qp	19.6	1	40	< -9.4	40.5	Pass
13.410-13.553	< 10.0	Qp	19.6	1	40	< -9.4	50.5	Pass
13.564	37.7	Qp	19.6	1	40	18.3	84.0	Pass
13.567-13.710	< 10.0	Qp	19.6	1	40	< -9.4	50.5	Pass
13.710-14.010	< 10.0	Qp	19.6	1	40	< -9.4	40.5	Pass
27.13	< 10.0	Qp	19.7	1	40	< -9.4	29.5	Pass

Table 3 Radiated emissions of the EUT, in the frequency range 0.009 – 30 MHz

The results of the radiated emission tests in the frequency range 0.009 – 30 MHz, carried out in accordance with 47 CFR Part 15 section 15.209, 15.225 and RSS-210 and RSS-Gen are depicted in Table 3.

Notes:

1. Calculated measurement results are obtained by using the 40dB/decade factor (antenna factor and cable loss is included). i.e at 13.564 MHz: 37.7 dBµV + 19.6 dB + 1dB - 40dB= 18.3 dBµV/m.
2. A resolution bandwidth of 9 kHz was used during testing
3. Field strength values of radiated emissions at frequencies not listed in Table 3 are more than 20 dB below the applicable limit
4. The loop antenna was varied in horizontal and vertical orientations and also around it's axis. The reported value is the worst case found at the reported frequency.
5. The EUT was tested in horizontal and vertical orientations. Worst case values noted.
6. Measurement uncertainty is ±5.0dB

3.2.1 Test equipment used (for reference see test equipment listing).

99699	99547	99071	99070	99608	15453	99161
99580						

Test engineer

Signature :



Name : O.H. Hoekstra

Date : February 15, 2012

4 Conducted emission data.

4.1 Conducted emission data of the EUT.

Not applicable, no mains connection, only internal battery supply.

Test engineer

Signature



:

Name : O.H. Hoekstra

Date : February 15, 2012

5 Carrier stability under special conditions.

5.1 Frequency stability (on 13.56 MHz) in accordance with 47 CFR Part 15, section 15.225 (e) & RSS-Gen section 4.7 and 7.2.4 and RSS-210 section A2.6:

- 1) The frequency tolerance of the carrier signal shall be maintained within +/- 0.01% of the operating frequency over a temperature variation of -20 °C to +50 °C at normal supply voltage (see Table 5).

Stability under special conditions	Supply Voltage	Measured frequency (MHz)	Frequency deviation (limit $\pm 0.01\%$) (%)	PASS/FAIL
Temperature (°C)	(Vdc)			
20.0	+3.0	13.563888 (reference)	N.A.	N.A.
-20.0	+3.0	13.564030	< 0.01	PASS
50.0	+3.0	13.563745	< 0.01	PASS

Table 5 The frequency tolerance of the carrier signal

5.1.1 At 85% and 115% of rated voltage supply level

The frequency tolerance of the carrier signal shall be maintained within +/- 0.01% of the operating frequency at 85% and at 115% of the rated power supply voltage (+3.0 Vdc) at 20 °C environmental temperature. The results are stated in Table 6.

Stability under special conditions	Measured frequency (MHz)	Frequency deviation (limit $\pm 0.01\%$) (%)	PASS/FAIL
% variation U			
100.0 (+3.0 Vdc)	13.563888 (reference)	N.A.	N.A.
85.0 (+2.55 Vdc)	13.563854	< 0.01	PASS
115.0 (+3.45 Vdc)	13.563916	< 0.01	PASS

Table 6 The frequency tolerance of the carrier signal

5.2 Bandwidth of the emission on 13.56 MHz in accordance with RSS-Gen section 4.7 and 7.2.4 and RSS-210 section A2.6.

Limit: 20 dB of the bandwidth of the emission shall be within the specified frequency band.
 Bandwidth of the emission is determined at 99% Occupied Bandwidth.
 Specified frequency band: 13553 kHz - 13567 kHz.

Temperature (°C)	Minimum frequency (kHz)	Maximum frequency (kHz)
+20.0	13.563874	13.563896
-20.0	13.564016	13.564038
+50.0	13.563731	13.563753
Bandwidth	13.563731	13.564038

Table 7 Bandwidth of the emission

The measured minimum frequency of 13.563731 MHz and maximum frequency of 13.564038 MHz are well within the specified frequency bandwidth.

5.2.1 Test equipment used (for reference see test equipment listing).

99318	99092	12640	99613	99538	99413	
-------	-------	-------	-------	-------	-------	--

Test engineer

Signature :

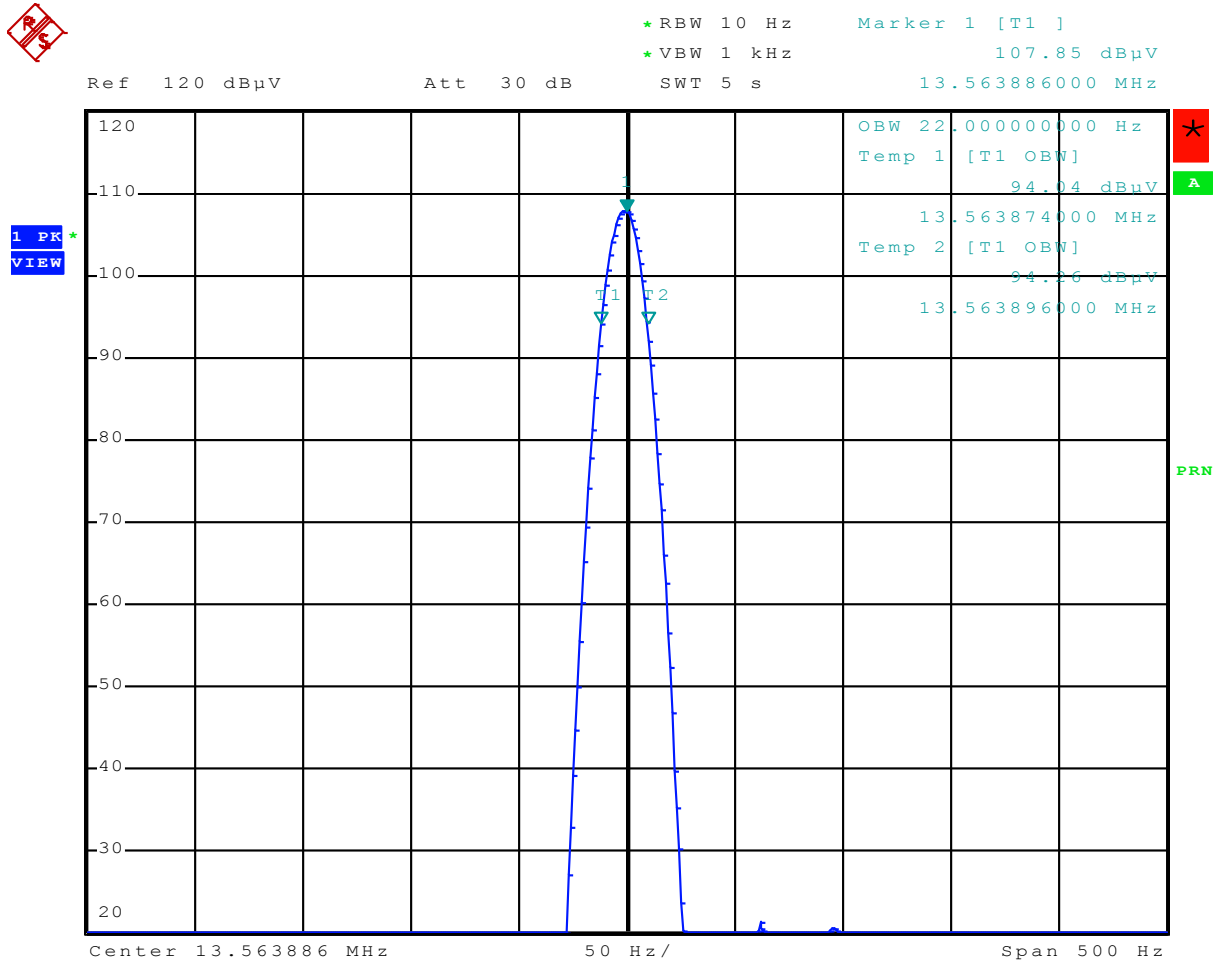


Name : O.H. Hoekstra

Date : February 15, 2012

6 Plots of measurement data

6.1 Bandwidth of the emission



Date: 15.FEB.2012 11:56:56

Plot1: Bandwidth of the emission at 13.56 MHz (Fundamental Carrier), for IC the measured Occupied Bandwidth is 22 Hz. Measured on a spectrum analyzer.

7 List of utilized test equipment.

Inventory number	Description	Brand	Model	Last cal.	Next cal.
12476	Antenna mast	EMCO	TR3	NA	NA
12477	Antenna mast 1-4 mtr	Poelstra	NA	NA	NA
12512	LISN	EMCO	3625/2	01/2012	01/2013
13313	Pulse Limiter	R&S	ESH3-Z2	02/2011	02/2012
15453	Active loopant. 60 cm	Chase	HLA6120	04/2011	04/2012
15633	Biconilog Testantenna	Chase	CBL 6111B	02/2011	02/2012
12640	Temperature chamber	Heraeus	VEM03/500	NA	NA
15667	Measuring receiver	R&S	ESCS30	06/2011	06/2012
99069	Coax 5m RG213 OATS	NMi Certin B.V.	CABLE 5M OATS	11/2011	11/2012
99070	Coax 15m RG213 OATS	NMi Certin B.V.	CABLE 15M OATS	11/2011	11/2012
99071	Coax OATS ground	NMi Certin B.V.	CABLE OATS	11/2011	11/2012
99092	RF Cable	--	Cable A	NA	NA
99161	Variac 120Vac	RFT	LTS001	NA	NA
99107	Controller OATS	Heinrich Deisel	4630-100	NA	NA
99318	Digital multimeter	HP	34401A	10/2011	10/2012
99538	Spectrum analyzer	R&S	FSP40	11/2011	11/2012
99547	Temperature-Humiditymeter	Europe supplies	WS-7082	10/2011	10/2012
99580	OATS	Comtest	FCC listed: 90828	08/2008	08/2011
99161	Variac 250V 6A	RFT	LTS006	NA	NA
99608	Controller (OATS)	EMCS	DOC202	NA	NA
99609	Antenna mast	EMCS	AP-4702C	NA	NA
99613	Temperature-Humiditymeter	Europe supplies	WS-7082	10/2011	10/2012
99623	Power Supply	EA	PS 2016-050	12/2011	12/2012
99651	Variac	NA	Vast Activa: 08-9510	NA	NA
99699	Measuring receiver	R&S	ESCI	02/2011	02/2012
99683	Loop antenna, 6cm	--	7405-901	09/2011	09/2012
99733	Spectrum Analyzer	R&S	FSV30	06/2011	06/2012

NA= Not Applicable