TEST REPORT CONCERNING THE COMPLIANCE OF AN INDUCTIVE PROXIMITY CARD READER, BRAND NEDAP, MODEL PROX-BOOSTER, WITH THE REQUIREMENTS OF INDUSTRY CANADA: RSS-GEN AND RSS-210

FCC listed : 90828
Industry Canada : IC3501
VCCI registered : R-1518, C-1598

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MEASUREMENT/TECHNICAL REPORT

Nedap N.V.

Model : Prox-Booster

Certification number: IC: 1444A-BOOSTER1

February 22, 2007

This report concerns:	Original grant/certification	
Equipment type:	Inductive proximity card reader	
Deferred grant requested per RSP 100		
Report prepared by:	Name	: A. van der Valk, B.Sc.E.E.
	Company name	: TNO Electronic Products & Services (EPS) B.V.
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The data taken for this test and report herein was done in accordance with RSS (Radio Standards Specification) Gen: General Requirements and Information for the Certification of Radiocommunications Equipment and RS 210 : Radio Standards Specification 210.
TNO Electronic Products & Services (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 22, 2007

Signature:

H.J. Pieters
Project Manager TNO Electronic Products & Services (EPS) B.V.

Description of test item

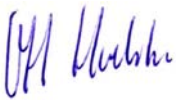
Test item	:	Inductive proximity card reader (120 - 125 kHz)
Manufacturer	:	N.V. Nederlandsche Apparatenfabriek "NEDAP"
Brand	:	Nedap
Model	:	Prox-Booster
Serial number(s)	:	Not available
Revision	:	Not available
Receipt date	:	January 25, 2007

Applicant information

Applicant's representative	:	Mr. J. Hulshof
Company	:	N.V. Nederlandsche Apparatenfabriek "NEDAP"
Address	:	Parallelweg 2
Postal code	:	7141 DC
City	:	Groenlo
PO-box	:	6
Postal code	:	7140 AA
City	:	Groenlo
Country	:	The Netherlands
Telephone number	:	+31 (0) 544 471111
Telefax number	:	+31 (0) 544 463475

Test(s) performed

Location	:	Niekerk
Test(s) started	:	January 25, 2007
Test(s) completed	:	February 21, 2007
Purpose of test(s)	:	Equipment Authorisation (Certification).
Test specification(s)	:	RSS-Gen and RSS-210
Test engineers	:	A. van der Valk O.H. Hoekstra
Report written by	:	A. van der Valk
Report date	:	February 22, 2007



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1 General information.

1.1 Product description.

1.1.1 Introduction.

The EUT is an inductive proximity card reader, which is intended to supplement the detection of 121 kHz inductive tags to the existing NEDAP TRANS IT reader system.

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

Not applicable.

1.3 Tested system details.

Details and an overview of the system in configuration 1 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	:	Prox-Booster
Serial number	:	--
Voltage input rating	:	3 VDC (two AAA batteries in series)
Current input rating	:	--
Frequency	:	120 - 125 kHz
Antenna	:	internal
Remarks	:	none

1.3.1 Description of input and output ports.

The EUT is battery operated only and there are no actual input and output ports present.

1.4 Test methodology.

The test methodology used is based on the requirements stated in RSS-212, which refers for example to ANSI C63.4: 2003.

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 and if necessary at 10 and 30 meters. To calculate the field strength level from these results to the appropriate distance at which the limit is specified, the computation method in appendix 1 has been applied.

1.5 Test facility.

Industry Canada has reviewed the technical characteristics of the test facilities at TNO Electronic Products & Services (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 set forth by Industry Canada.

The description of the test facilities has been filed to Industry Canada under registration number IC 3501A-1. The facility has been added to the list of laboratories performing these test services for the public on a fee basis.

1.6 Test conditions.

Normal test conditions.

Temperature (*)	: +15°C to +35°C
Relative humidity(*)	: 20 % to 75 %
Supply voltage	: 115 VAC
Air pressure	: 950 – 1050 hPa

* When it 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 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: 2003.

2.2 EUT mode of operation.

The EUT has been tested in active mode, i.e. the EUT is ready to detect a card.

All test set-ups have been documented in pictures in the documentation package, which will be submitted to Industry Canada

2.3 Special accessories.

No special accessories are used and/or needed to achieve compliance with the applicable sections of RSS-Gen and RSS-210.

2.4 Equipment modifications.

No modifications have been made to the equipment in order to achieve compliance with the applicable sections of RSS-Gen and RSS-210.

2.5 Block diagram of the EUT.

The block diagram is available in the technical documentation package, which will be submitted to Industry Canada.

2.6 Schematics of the EUT.

The schematics are available in the technical documentation package, which will be submitted to Industry Canada.

2.7 Part list of the EUT.

The part list is available in the technical documentation package and can be submitted to Industry Canada.

3 Radiated emission data.

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

Frequency (MHz)	Measurement results dB(µV)/m @ 3 metres Quasi-peak		Limits dB(µV)/m @ 3 metres Quasi-peak	Margin (dB) Quasi-peak		Result
	Vertical	Horizontal		Vertical	Horizontal	
30 - 300	n.i.	n.i.	40.0 – 46.0	-	-	PASS
300 - 1000	n.i.	n.i.	46.0 – 54.0	-	-	PASS

Table 1: Radiated emissions of the EUT.

The results of the radiated emission tests, carried out in accordance with RSS-210, section 2.6 and 2.7 tables 2 and 3, are depicted in table 1.

Notes:

1. (AV) average detector
2. (QP) quasi peak detector
3. n.i. indicates that no field strength values related to the EUT could be measured for the listed frequency or for the listed frequency range.
4. << indicates that field strength values of radiated emissions are more than 20 dB below the applicable limit.
5. The reported field strength values are the worst case values at the indicated frequency, obtained by rotation of the EUT and orientation of the antenna.
6. Up to the 5 th harmonic of the transmit frequency or beyond because of the incorporation of a digital device was investigated, as per RSS-Gen section 4.7

Test engineer

signature : 

Name : A. van der Valk

Date : January 25, 2007

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

Frequency (kHz)	Measurement results dBµV		Antenna factor dB	Cable loss dB	Calculated results dB(µV)/m	Limits Part 15.209 dB(µV)/m
	3 meters	10 meters				
9.00 – 119.0	n.i.	-	-	-	-	-
120.0	39.1 (AV)	n.i. (AV)	20.1	1	-19.8	25.1 (300 m)
240.0	n.i.	-	20.0	1	<<	19.0 (300 m)
360.0	n.i.	-	20.0	1	<<	16.5 (300m)
360.0- 1705	n.i.	-	-	-	-	-
1.705 MHz – 30.0 MHz	n.i.	-	-	-	-	-

Table 2: Radiated emissions of the EUT.

The results of the radiated emission tests, carried out in accordance with RSS-210, section 2.6 and 2.7 tables 2 and 3, are depicted in table 2. Measurement results are readings from the measuring device in dBµV. Using the appropriate antenna factor and cable losses, these readings are expressed directly into dB (µV)/m and are recalculated at distances as appropriate.

Notes:

1. (AV) average detector
2. (QP) quasi peak detector
3. The computation method for calculation of the field strength at different distances can be found in Appendix 1. The extrapolation factor of 40 dB/decade was used (80 dB for 3 to 300 m).
4. Frequency range: 9-90 kHz and 110-490 kHz: Average detector (AV) used during measurements.
5. n.i. indicates that no field strength values related to the EUT could be measured for the listed frequency or for the listed frequency range.
6. << indicates that field strength values of radiated emissions are more than 20 dB below the applicable limit.
7. The reported field strength values are the worst case values at the indicated frequency, obtained by rotation of the EUT and orientation of the antenna.
8. Peak levels of the emissions more than 40 dB below the applicable limits.

Test engineer

signature : 

Name : A. van der Valk

Date : January 30, 2007

4 Conducted emission data.

4.1 Conducted emission data of the EUT

Not applicable, the EUT is battery operated only.

5 Carrier stability under special conditions.

5.1 Frequency stability

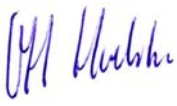
Measured according to RSS-Gen section 7.2.4 and limits RSS-210 section 2.1:
From measurements performed as indicated below, the frequency stability will not cause non-compliant situations with respect to exclusion bands or emissions outside permissible bands (band edges)

Stability under special conditions Temperature (°C)	Measured frequency (kHz)	Frequency deviation Hz
20.0	120.450 (reference)	N.A.
-20.0	120.410	-40
50.0	120.480	30

5.2 Amplitude stability

Not applicable, the EUT is battery operated only.
Measurement data has been derived using new batteries.

Test engineer

signature : 

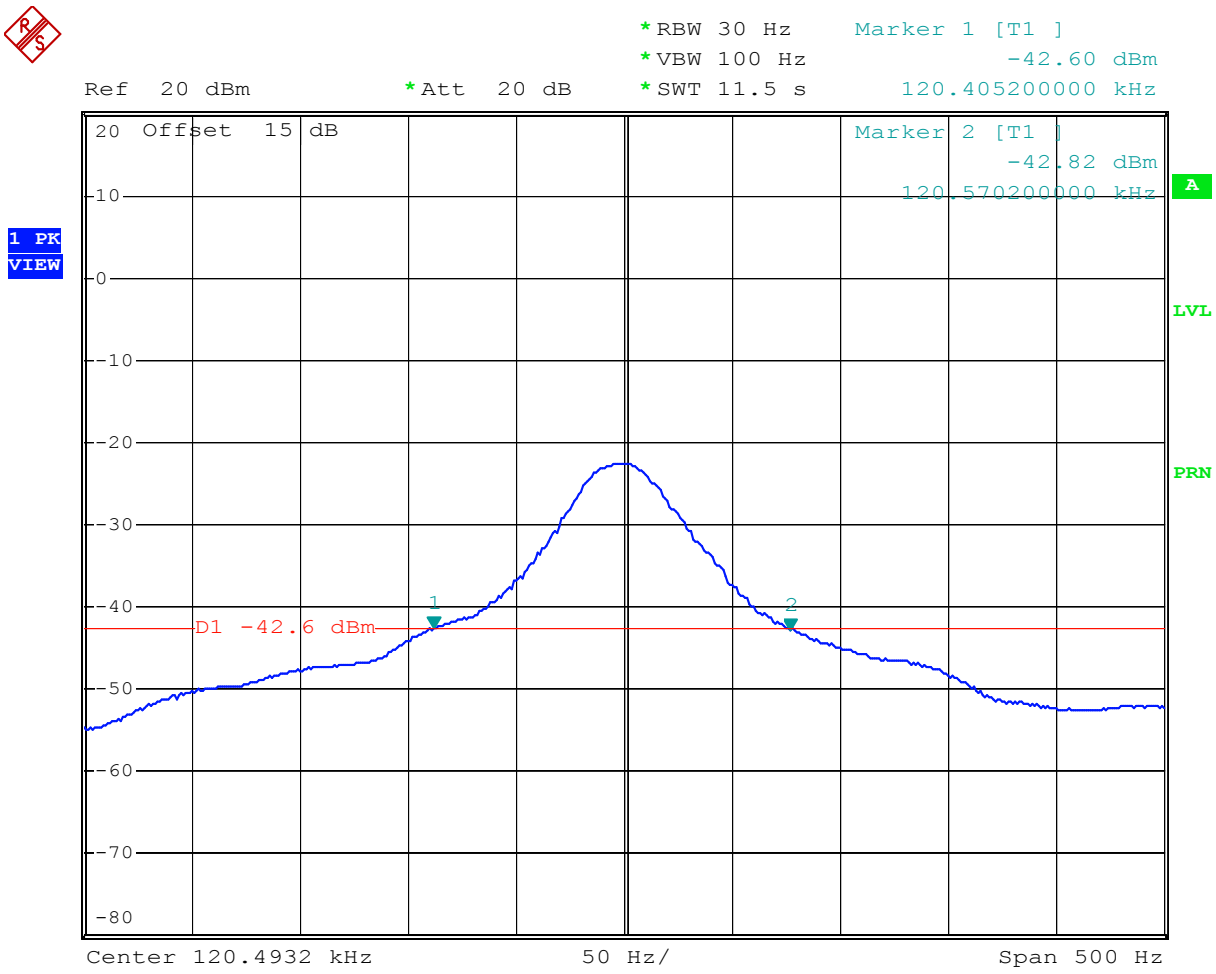
Name : O.H. Hoekstra

Date : January 31, 2007

6 Occupied Bandwidth.

According to RSS-Gen section 4.4.1:

As can be seen in the plot below (-20dB bandwidth is 165 Hz) and from the results in clause 5 of this test report, the occupied bandwidth will not cause non-compliant situations with respect to exclusion bands or emissions outside permissible bands (band edges).



Date: 22.JAN.2007 12:47:24

Test engineer

signature :

Name : O.H. Hoekstra

Date : January 22, 2007

7 List of utilized test equipment.

Inventory number	Description	Brand	Model	Last cal.	Next cal.
12476	Antenna mast	EMCO	TR3	-	-
12477	Antenna mast 1-4 mtr	Poelstra	--	-	-
12482	Loop antenna	EMCO	6507	04/2006	04/2007
12483	Guidehorn	EMCO	3115	03/2006	03/2007
12484	Guidehorn	EMCO	3115	03/2006	03/2007
12533	Signalgenerator	MARCONI	2032	03/2006	03/2007
12605	Calibrated dipole 28MHz-1GHz	EMCO	3121c	09/2002	09/2007
12640	Temperature chamber	Heraeus	VEM03/500	01/2007	01/2008
13664	Spectrum analyzer	HP	HP8593E	08/2006	08/2007
13886	Open Area testsite	Comtest	--	07/2005	07/2007
14051	Anechoic room	Comtest	--	-	-
15633	Biconilog Testantenna	Chase	CBL 6111B	02/2006	02/2007
15667	Measuring receiver	R&S	ESCS 30	04/2006	04/2007
99596	Preamplifier 0.5 GHz - 18 GHz	Miteq	AMF-5D-005180-28-13p	07/2006	07/2007

Appendix 1

Calculated measurements results radiated field strength, H-Field

The rules of RSS-212 section 3.3 allow scaling of the measured values or limits when measurements are made at distances other than those specified. The extrapolation factor for frequencies below 30 MHz are 40 dB/decade which means that for a distance change of 10 to 1 (a decade), the limit, or measured value, may be recalculated by adding(moving closer) or subtracting (moving away) 40 dB, respectively.

It is also possible to make radiated-emission measurements at two different distances and extrapolate to a third distance. The calculation method described below, should then be followed.

General Formula:

d_1 = short distance

d_2 = long distance

So:
$(d_1/d_2)^n = H_{d2}/H_{d1}$

$n \log(d_1/d_2) = \log(H_{d2}/H_{d1})$

Calculation of n:

$n = \log(H_{d2}/H_{d1}) / \log(d_1/d_2)$

Calculation of field strength at other distance (10m --> 300m):

$H_{d2} = H_{d1} (d_1/d_2)^n$