

**TEST REPORT CONCERNING THE COMPLIANCE OF AN  
INDUCTIVE RFID CARD READER,  
OPERATING ON 13.56 MHz.  
BRAND Nedap, MODEL ECO reader**

**WITH 47 CFR PART 15 (10-1-12) AND THE  
REQUIREMENTS OF INDUSTRY CANADA:  
RSS-GEN (ISSUE 3, DECEMBER 2010) AND  
RSS-210 (ISSUE 8, DECEMBER 2010)**

**13091101.fcc01  
December 18, 2013**

FCC listed : 90828  
Industry Canada : 2932G-2  
R&TTE, LVD, EMC Notified Body : 1856

**TÜV Rheinland Nederland B.V.**  
**P.O. Box 37**  
**9350AA Leek**  
**Eiberkamp 10**  
**9351VT Leek**  
**The Netherlands**  
Telephone: +31 594 505005  
Telefax: +31 594 504804

E-mail: [info@tuv-eps.com](mailto:info@tuv-eps.com)  
Web: [www.tuv-eps.com](http://www.tuv-eps.com)

## MEASUREMENT/TECHNICAL REPORT

**Brand: Nedap**  
**Model: ECO reader**

**FCC ID: CGDECO41356**  
**IC: 1444A- ECO41356**

This report concerns: Original grant/certification <del>Class 2 Permissive Change</del> <del>Verification</del>		
Equipment type: Inductive RFID Card Reader		
Report prepared by:	Name	: Richard van der Meer
	Company name	: TÜV Rheinland Nederland B.V.
	Address	: Eiberkamp 10
	Postal code/city	: 9351VT / Leek
	Mailing address	: P.O. Box 37
	Postal code/city	: 9350AA / Leek
	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 (10-1-12 edition) RSS-GEN (ISSUE 3, DECEMBER 2010), RSS-210 (ISSUE 8, DECEMBER 2010) and the measurement procedures of ANSI C63.4-2009. TÜV Rheinland Nederland B.V. at Leek, 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: December 20, 2013

Signature:



O.H. Hoekstra  
Senior Engineer Telecom TÜV Rheinland Nederland 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 RFID Card Reader  
Manufacturer : N.V. Nederlandsche Apparatenfabriek "Nedap"  
Brand : Nedap  
Model : ECO reader  
Serial number(s) : --  
Receipt date : October 21, 2013

**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 : +31 544 463 475

**Test(s) performed**

Location : Leek  
Test(s) started : October 21, 2013  
Test(s) completed : October 22, 2013  
Purpose of test(s) : Equipment Authorization (Original grant/certification)

Test specification(s) : 47 CFR Part 15 (10-1-12 edition) and  
RSS-GEN (ISSUE 3, DECEMBER 2010) AND  
RSS-210 (ISSUE 8, DECEMBER 2010)

Test engineer(s) : R. van der Meer 

Report written by : R. van der Meer 

Report date : December 20, 2013

This report shall not be reproduced, except in full, without the written permission of TÜV Rheinland Nederland 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.....	8
1.4	Test summary.....	9
1.5	Test methodology.....	9
1.6	Test facility.....	10
1.7	Test conditions.....	10
2	System test configuration.....	11
2.1	Justification.....	11
2.2	EUT mode of operation.....	11
2.3	Special accessories.....	11
2.4	Equipment modifications.....	11
2.5	Product Labeling.....	11
2.6	Block diagram of the EUT.....	11
2.7	Schematics of the EUT.....	11
2.8	Part list of the EUT.....	11
3	Radiated emission data.....	12
3.1	Radiated field strength measurements (30 MHz – 1 GHz, E-field).....	13
3.1.1	AUX 3 (PG45).....	13
3.1.2	AUX 4 (PG50).....	13
3.1.3	AUX 5 (Unshielded Shelf).....	14
3.1.4	AUX 5 (Shielded Shelf).....	14
3.2	Radiated field strength measurements (frequency range of 0.009-30 MHz, H-field) in combination with AUX3.15	
3.2.1	AUX 3 (PG45).....	15
3.2.2	AUX 4 (PG50).....	15
3.2.3	AUX 5 (Unshielded Shelf).....	16
3.2.4	AUX 6 (Shielded Shelf).....	16
3.2.5	Test equipment used (for reference see test equipment listing).....	17
4	Conducted emission data.....	18
4.1	AC Power Line Conducted Emission data of the EUT.....	18
4.1.1	Test equipment used (for reference see test equipment listing).....	19
5	Carrier stability under special conditions.....	20
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:.....	20
5.1.1	At 85% and 115% of rated voltage supply level.....	20
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.....	20
5.2.1	Test equipment used (for reference see test equipment listing).....	21
6	Plots of measurement data.....	22
6.1	Bandwidth of the emission.....	22
7	List of utilized test equipment.....	24

## 1 General information.

### 1.1 Product description.

#### 1.1.1 Introduction.

The brand Nedap model ECO reader, hereafter referred to as EUT is an inductive RFID card reader intended to be used in library systems. The EUT can be used in combination with external antennas in the form of a Bookshelf and antennas that can be placed at an entrance of a library for Electronic Article Surveillance (EAS). The EUT can be connected to existing hardware (PC) and/or Library Management Systems. It 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 certification in equipment authorization files under registration number.

**FCC ID: CGDECO41356 and IC: 1444A-ECO41356.**

### 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	:	RFID Card reader operating on 13.56 MHz
Manufacturer	:	N.V. Nederlandsche Apparatenfabriek "Nedap"
Brand	:	Nedap
Model	:	ECO reader
Serial number	:	--
Voltage input rating	:	24 V <sub>DC</sub>
Voltage output rating	:	n.a.
Current input rating	:	--
Antenna	:	External
Operating frequency	:	13.56 MHz
Modulation	:	Modulated carrier
Remarks	:	n.a.

AUX1	:	Laptop PC including power supply adapter
Manufacturer	:	Lenovo
Brand	:	Lenovo
Model	:	Thinkpad R60
Serial number	:	L3-BF847 07/02
Voltage input rating	:	20Vdc
Voltage output rating	:	--
Current input rating	:	3.25 A
Remarks	:	Required to read data from EUT, property TUV Rheinland EPS



AUX2 : Power supply  
Brand : POWER-WIN TECHNOLOGY CORP.  
Model : PW-065A-1Y24F1  
Serial number : --  
Voltage input rating : 100 – 240V 50-60Hz  
Voltage output rating : 24Vdc  
Current input rating : 2A  
Remarks : n.a.

AUX3 : Antenna  
Brand : Nedap  
Model : PG45  
Serial number :  
Voltage input rating : --  
Voltage output rating : n.a.  
Current input rating : n.a.  
Remarks : Only used in vertical position

AUX4 : Antenna  
Brand : Nedap  
Model : PG50  
Serial number :  
Voltage input rating : --  
Voltage output rating : n.a.  
Current input rating : n.a.  
Remarks : Only used in vertical position

AUX5 : Antenna  
Brand : Nedap  
Model : Unshielded Shelf  
Serial number : --  
Voltage input rating : --  
Voltage output rating : n.a.  
Current input rating : n.a.  
Remarks : Only used in vertical position

AUX6 : Antenna  
Brand : Nedap  
Model : Shielded Shelf  
Serial number : --  
Voltage input rating : --  
Voltage output rating : n.a.  
Current input rating : n.a.  
Remarks : Only used in vertical position

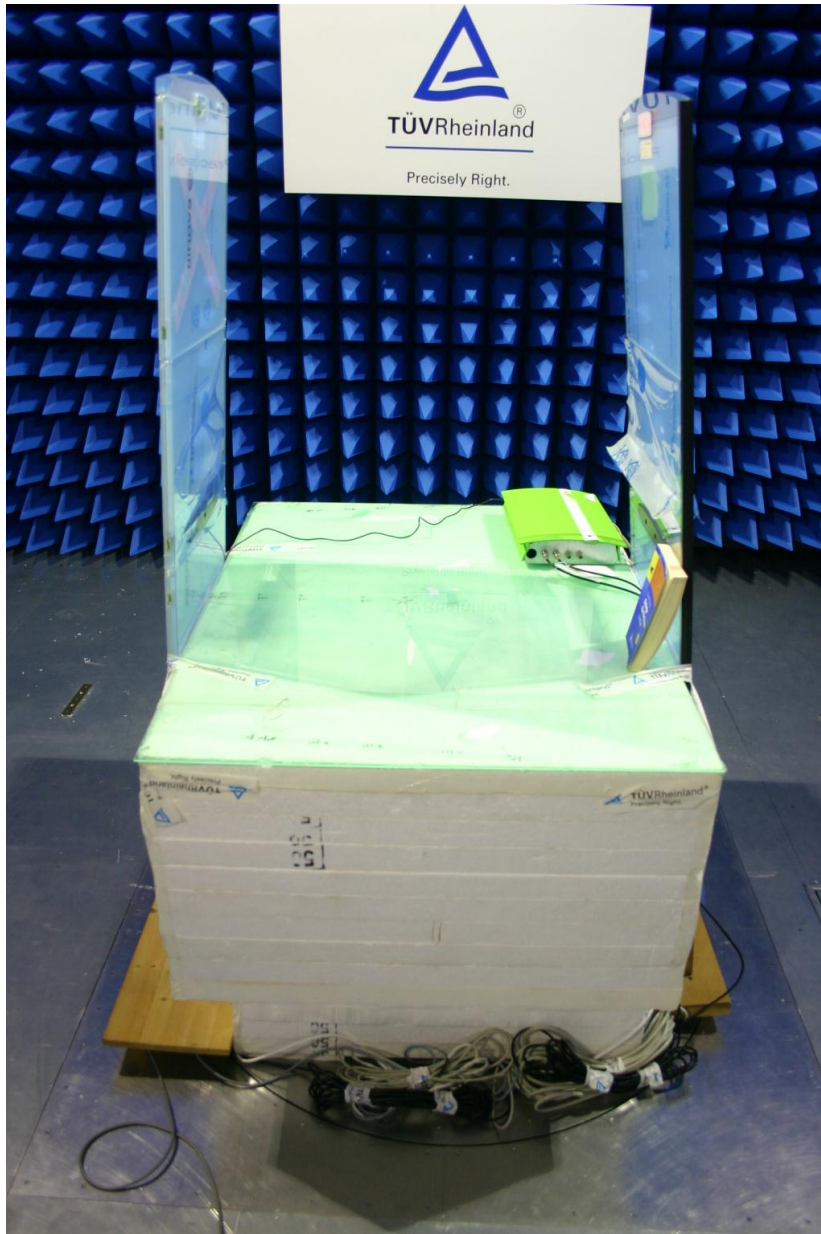


Photo 1: EUT in a typical setup (PG45 antenna's shown)

1.3.1 Description of input and output ports.

Number	Ports	From	To	Shielding	Remarks
1	AC mains	AC mains	EUT	yes / no	None
2	Antenna connection	EUT	AUX3,4,5 or 6	yes / no	None
3	Antenna interconnection	AUX3,4,5 or 6	AUX3,4,5 or 6	yes / no	None
4	LAN	EUT	AUX1	yes / no	None

Operation mode 1: System "Passive", not detecting a tag.  
 Operation mode 2: System "Active", detecting a tag.

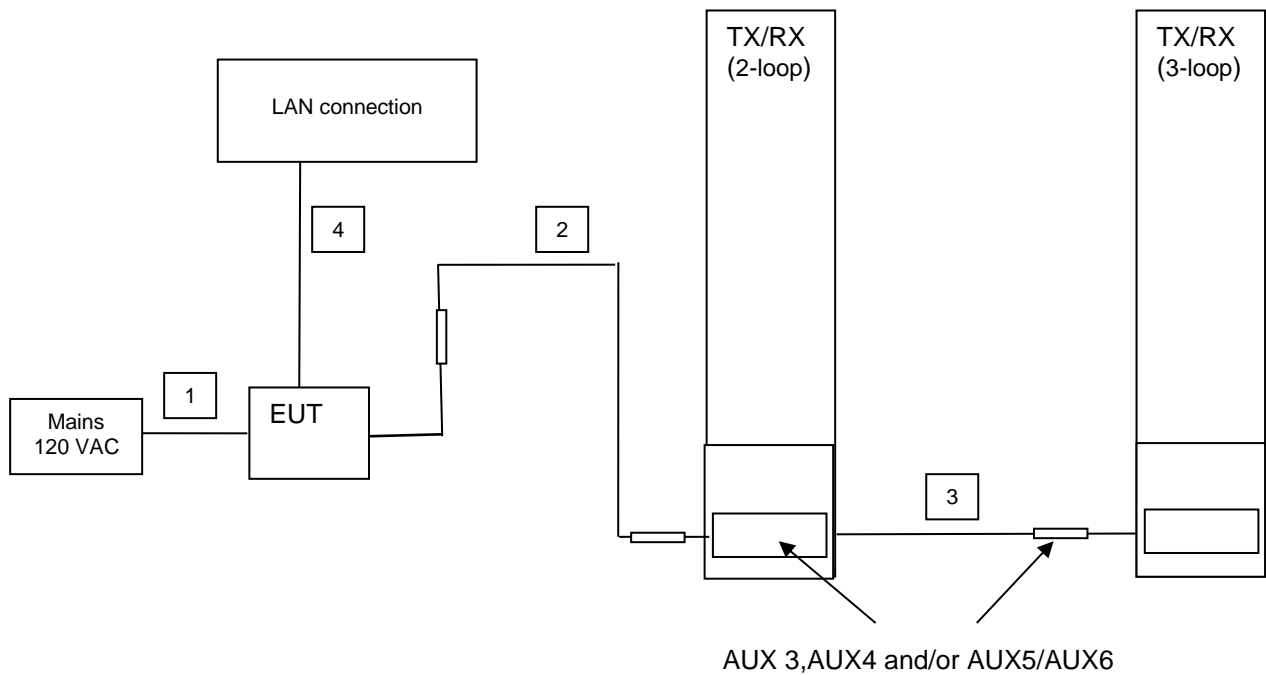


Figure 1: Basic test setup and connections



#### 1.4 Test summary

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

Test Standard		Description	Page	Pass / Fail / Not Applicable
47 CFR Part 15 (10-1-09 Edition)	RSS-210 Issue 8, December 2010			
15.207(a)	RSS-Gen(7.2.4)	Conducted emissions	18 - 19	Pass
15.209, 15.225(a)	RSS-210(A1.1 and A2.6)	Radiated emissions	12 - 17	Pass
15.215(c)	RSS-Gen(4.6.1)	Bandwidth of the emission	14 - 18	Pass
15.225(e)	RSS-210(A2.6)	Frequency stability	20 - 23	Pass

Table 1. : Test specifications

Testmethods: ANSI C63.4:2009 and RSS-Gen.

#### 1.5 Test methodology.

The test methodology used is based on the requirements of 47 CFR Part 15 (10-1-12)), sections 15.31, 15.35, 15.205, 15.209, 15.231 and RSS-GEN (ISSUE 3, DECEMBER 2010) 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, located in Leek, 9351VT Eiberkamp 10, The Netherlands, and has found these test facilities to be in compliance with the requirements of 47 CFR Part 15, section 2.948.

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-2. 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	: 120 V <sub>ac</sub> 60 Hz applied to the ac/dc adapter which is connected to the EUT.
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 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 modulated transmit mode, i.e. the EUT is transmitting while continuously transmitting data. All test set ups have been documented in pictures in the documentation package which will be submitted to the Commission.

### **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.

**RESULT: Pass**

Date of testing: 2013-10-21  
Frequency range: 30MHz - 1GHz

Requirements:

FCC 15.205, FCC 15.209, FCC 15.225(a) and IC RSS-Gen(4.9, 7.2.2 and 7.2.5) and RSS-210(2.5)

Radiated emissions which fall in the restricted bands, as defined in FCC 15.205(a), must comply with the radiated emission limits specified in FCC 15.209(a), FCC 15.225(a) and RSS-210 (A2.6) The field strength of any emissions within the band 13.553-13.567 MHz shall not exceed 84 dB $\mu$ V/m at 30 meters.

Test procedure:

ANSI C63.4-2009, RSS-Gen.

The EUT was placed on a nonconductive turntable 0.8m above the ground plane. Before final measurements of radiated emissions were performed, the EUT was scanned to determine its emission spectrum profile. The physical arrangement of the test system, the associated cabling and the EUT orientation (X, Y, Z) were varied in order to ensure that maximum emission amplitudes were attained.

The spectrum was examined from 30MHz to 1 GHz. Final radiated emission measurements were made at 3m distance.

At each frequency where a spurious emission was found, the EUT was rotated 360° and the antenna was raised and lowered from 1 to 4m in order to determine the emission's maximum level. Measurements were taken using both horizontal and vertical antenna polarizations.

The highest emission amplitudes relative to the appropriate limit were recorded in this report. Field strength values of radiated emissions at frequencies not listed in the tables are more than 20 dB below the applicable limit.

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

#### 3.1.1 AUX 3 (PG45)

Frequency (MHz)	Measurement results @3m Vertical (dB $\mu$ V)	Antenna polarisation	Correction factor (dB)	Results after correction (dB $\mu$ V/m)	Limits @3m (dB $\mu$ V/m)	Pass/Fail
40.68	24.2	Vertical	13.4	37.6	40	Pass
87.88	23.6	Vertical	8.9	32.5	40	Pass
181.48	19.1	Vertical	9.8	28.9	46	Pass
474.64	17.7	Vertical	20.1	37.8	46	Pass

Table 2. Radiated emissions of the EUT

#### 3.1.2 AUX 4 (PG50)

Frequency (MHz)	Measurement results @3m Vertical (dB $\mu$ V)	Antenna polarisation	Correction factor (dB)	Results after correction (dB $\mu$ V/m)	Limits @3m (dB $\mu$ V/m)	Pass/Fail
39.700	3.6	Vertical	13.4	17.0	40	Pass
164.079	5.9	Vertical	10.5	16.4	46	Pass
400.540	6.9	Vertical	17.7	24.6	46	Pass
410.375	5.6	Vertical	18.0	23.6	46	Pass
450.980	1.4	Vertical	19.3	20.7	46	Pass
625.800	0.8	Vertical	22.2	23.0	46	Pass

Table 3. Radiated emissions of the EUT

### 3.1.3 AUX 5 (Unshielded Shelf)

Frequency (MHz)	Measurement results @3m Vertical (dBµV)	Antenna polarisation	Correction factor (dB)	Results after correction (dBµV/m)	Limits @3m (dBµV/m)	Pass/Fail
31.940	16.6	Vertical	17.2	33.8	40	Pass
474.260	-3.6	Vertical	20.1	16.5	46	Pass
450.980	-4.1	Vertical	19.3	15.2	46	Pass
499.480	-3.5	Vertical	20.9	17.4	46	Pass
555.174	-0.5	Vertical	22.5	22.0	46	Pass
625.580	-2.4	Vertical	22.2	19.8	46	Pass

Table 4. Radiated emissions of the EUT

### 3.1.4 AUX 5 (Shielded Shelf)

Frequency (MHz)	Measurement results @3m Vertical (dBµV)	Antenna polarisation	Correction factor (dB)	Results after correction (dBµV/m)	Limits @3m (dBµV/m)	Pass/Fail
31.940	17.1	Vertical	17.2	34.3	40	Pass
400.540	-4.2	Vertical	17.7	13.5	46	Pass
425.760	18.8	Vertical	18.5	37.3	46	Pass
431.580	-2.7	Vertical	18.7	16.0	46	Pass
499.480	-3.5	Vertical	20.9	17.4	46	Pass
625.580	-2.4	Vertical	22.2	19.8	46	Pass

Table 5. 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:**

- Field strength values of radiated emissions at frequencies not listed in the table above are more than 20 dB below the applicable limit.
- Measurement uncertainty is ±5.0dB.
- The EUT was varied in three positions, 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
- The EUT was tested in both normal mode (i.e. without a tag in its proximity) and in activated mode (i.e. with a tag in its proximity). Worst case values noted.
- Tested with AUX3, AUX4, AUX5 and AUX6, worst case values noted.
- Tested with LAN connection, worst case values noted.
- A Quasi-peak detector was used with a bandwidth of 120 kHz.

Used test equipment and ancillaries:

99847/99580	99855	99877	12483	99608	99609	99699
-------------	-------	-------	-------	-------	-------	-------

### 3.2 Radiated field strength measurements (frequency range of 0.009-30 MHz, H-field) in combination with AUX3.

#### 3.2.1 AUX 3 (PG45)

Frequency (MHz)	Measurement results	Detector	Antenna factor	Cable loss	Extrapolation factor	Measurement results (calculated)	Limits	Pass/Fail
	dB $\mu$ V @3m							
1.00 (noise)	30.0	Qp	19.7	1	40	10.7	27.6	Pass
2.00 (noise)	30.0	Qp	19.7	1	40	10.7	29.5	Pass
3.00 (noise)	30.0	Qp	19.5	1	40	10.7	29.5	Pass
4.00 (noise)	30.0	Qp	19.5	1	40	10.7	29.5	Pass
13.56 fundamental	79.0	Qp	19.7	1	40	59.7	84.0	Pass
27.12	28.7	Qp	19.7	1	40	9.7	29.5	Pass

Table 6. Radiated emissions of the EUT in combination with AUX3, in the frequency range 0.009 – 30 MHz

#### 3.2.2 AUX 4 (PG50)

Frequency (MHz)	Measurement results	Detector	Antenna factor	Cable loss	Extrapolation factor	Measurement results (calculated)	Limits	Pass/Fail
	dB $\mu$ V @3m							
1.00 (noise)	30.0	Qp	19.7	1	40	10.7	27.6	Pass
2.00 (noise)	30.0	Qp	19.7	1	40	10.7	29.5	Pass
3.00 (noise)	30.0	Qp	19.5	1	40	10.7	29.5	Pass
4.00 (noise)	30.0	Qp	19.5	1	40	10.7	29.5	Pass
13.56 fundamental	100.5	Qp	19.7	1	40	81.2	84.0	Pass
27.12	38.9	Qp	19.7	1	40	19.6	29.5	Pass

Table 7. Radiated emissions of the EUT in combination with AUX3, in the frequency range 0.009 – 30 MHz

### 3.2.3 AUX 5 (Unshielded Shelf)

Frequency (MHz)	Measurement results	Detector	Antenna factor	Cable loss	Extrapolation factor	Measurement results (calculated)	Limits	Pass/Fail
	dB $\mu$ V @3m							
1.00 (noise)	30.0	Qp	19.7	1	40	10.7	27.6	Pass
2.00 (noise)	30.0	Qp	19.7	1	40	10.7	29.5	Pass
3.00 (noise)	30.0	Qp	19.5	1	40	10.7	29.5	Pass
4.00 (noise)	30.0	Qp	19.5	1	40	10.7	29.5	Pass
13.56 fundamental	82.4	Qp	19.7	1	40	63.1	84.0	Pass
27.12	7.6	Qp	19.7	1	40	-11.7	29.5	Pass

Table 8. Radiated emissions of the EUT in combination with AUX3, in the frequency range 0.009 – 30 MHz

### 3.2.4 AUX 6 (Shielded Shelf)

Frequency (MHz)	Measurement results	Detector	Antenna factor	Cable loss	Extrapolation factor	Measurement results (calculated)	Limits	Pass/Fail
	dB $\mu$ V @3m							
1.00 (noise)	30.0	Qp	19.7	1	40	10.7	27.6	Pass
2.00 (noise)	30.0	Qp	19.7	1	40	10.7	29.5	Pass
3.00 (noise)	30.0	Qp	19.5	1	40	10.7	29.5	Pass
4.00 (noise)	30.0	Qp	19.5	1	40	10.7	29.5	Pass
13.56 fundamental	79.9	Qp	19.7	1	40	60.6	84.0	Pass
27.12	15.3	Qp	19.7	1	40	14.7	29.5	Pass

Table 9. Radiated emissions of the EUT in combination with AUX3, 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 and RSS-210 and RSS-Gen are depicted in Table 3a.

**Notes:**

1. Calculated measurement results are obtained by using the 40dB/decade factor (antenna factor and cable loss is included). i.e at 13.56 MHz: 80.1 dBuV + 19.7 dB + 1dB - 40dB= 60.8 dBuV/m.
2. A resolution bandwidth of 9kHz was used during testing
3. Field strength values of radiated emissions at frequencies not listed in Table 3a are more than 20 dB below the applicable limit, some noise levels are noted.
4. 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.
5. Measurement uncertainty is ±5.0dB
6. Tested with both RS-232 and LAN connection, worst case values noted.
7. The EUT was tested in both normal mode (i.e. without a tag in its proximity) and in activated mode (i.e. with a tag in its proximity). Worst case values noted.

**3.2.5 Test equipment used (for reference see test equipment listing).**

99699	99547	99071	99070	99608	15453	99161
99580	99616					

## 4 Conducted emission data.

### 4.1 AC Power Line Conducted Emission data of the EUT.

**RESULT: Pass.**

Date of testing: 2013-10-23

Requirements: Except when the requirements applicable to a given device state otherwise, for any license-exempt radio communication device equipped to operate from the public utility AC power supply, either directly or indirectly, the radio frequency voltage that is conducted back onto the AC power lines in the frequency range of 0.15 MHz to 30 MHz shall not exceed the limits shown in the following table. The tighter limit applies at the frequency range boundaries.

Frequency of Emission (MHz)	Conducted Limit (dB $\mu$ V) Quasi-Peak	Conducted Limit (dB $\mu$ V) Average
0.15 – 0.5	66 to 56*	56 to 46*
0.5 – 5	56	46
5 - 30	46	50

\*Decreases with the logarithm of the frequency.

Frequency (MHz)	Measurement results dB $\mu$ V Neutral		Measurement results dB $\mu$ V Line 1		Limits dB $\mu$ V		Pass/Fail
	QP	AV	QP	AV	QP	AV	
0.205	47.1	Note 7	46.2	Note 7	63.2	53.2	PASS
0.270	37.2	Note 7	36.3	Note 7	61.1	51.1	PASS
0.480	30.2	Note 7	21.1	Note 7	56.3	46.3	PASS
3.630	31.4	Note 7	33.0	Note 7	56.0	46.0	PASS
13.560	38.3	Note 7	37.4	Note 7	60.0	50.0	PASS
23.825	45.1	Note 7	32.3	Note 7	60.0	50.0	PASS

Table 10. Conducted emission measurements

The results of the conducted emission tests, carried out in accordance with 47 CFR Part 15 section 15.207 & RSS-Gen, section 7.2.4, at the 120 Volts AC mains connection terminals of the AC/DC power supply which was connected to the EUT, are depicted in Table 4.

**Notes:**

1. The test data shown above is of the worst case EUT. Maximum values recorded.
2. The values of conducted emissions at frequencies not listed in the table above are more than 20 dB below the applicable limit.
3. Measurement uncertainty is  $\pm 3.5$ dB
4. Tested without RS-232 and LAN connection, those are tested as part of the unintentional radiator Part 15B tests.
5. The EUT was tested in while continuously transmitting.
6. The test unit was modified to add a resistive termination (99080) in lieu of the antenna as per KDB 174176.
7. QP values already within Av limits, therefor Av not tested.

**4.1.1 Test equipment used (for reference see test equipment listing).**

15667	12512	99161	99548	13313	99616	99080
-------	-------	-------	-------	-------	-------	-------

## 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)	(Vac)			
20.0	120	13.560593 (reference)	N.A.	N.A.
-20.0	120	13.560586	< 0.01	PASS
50.0	120	13.560586	< 0.01	PASS

Table 11. 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 at 20 °C environmental temperature. The reference is taken at 120Vac which is the recommended supply voltage. 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 (120 Vac)	13.560593 (reference)	N.A.	N.A.
85.0 (102 Vac)	13.560591	< 0.01	PASS
115.0 (138 Vac)	13.560591	< 0.01	PASS

Table 12. 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 the points 20 dB down from the modulated carrier.  
 Specified frequency band: 13553 kHz - 13567 kHz.

Temperature (°C)	Minimum frequency (kHz)	Maximum frequency (kHz)
+20.0	13560.5687	13560.61834
-20.0	13560.5607	13560.61110
+50.0	13560.5612	13560.61154
Bandwidth	13560.5607	13560.61834

Table 13. Bandwidth of the emission

The measured minimum frequency of 13560.5607 kHz and maximum frequency of 13560.61834 kHz are well within the specified frequency bandwidth.

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

99318	99733	12640	99318	99683	99077	
-------	-------	-------	-------	-------	-------	--

Test engineer

Signature : 

Name : R. van der Meer

Date : October 25, 2013

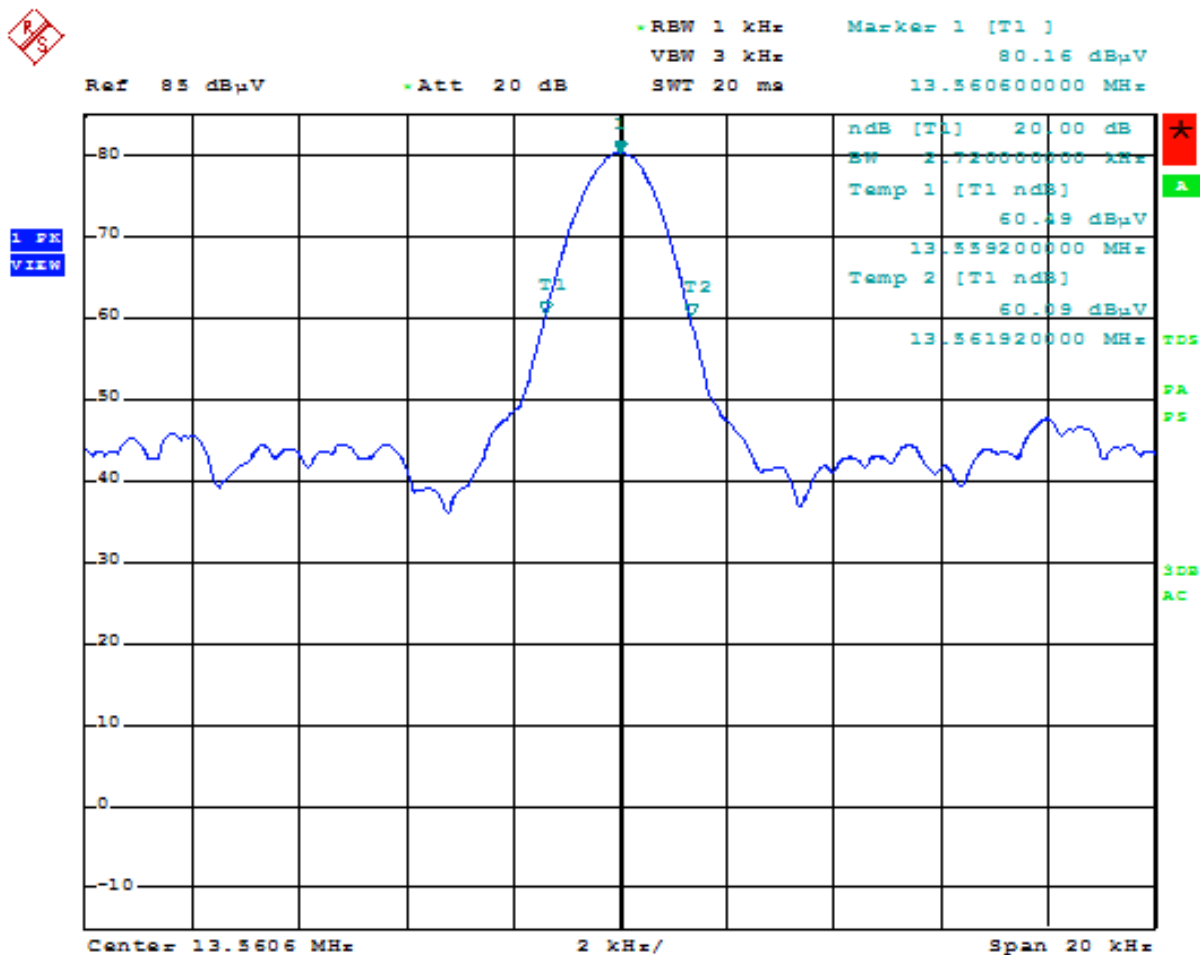
## 6 Plots of measurement data

### 6.1 Bandwidth of the emission

**RESULT: PASS**

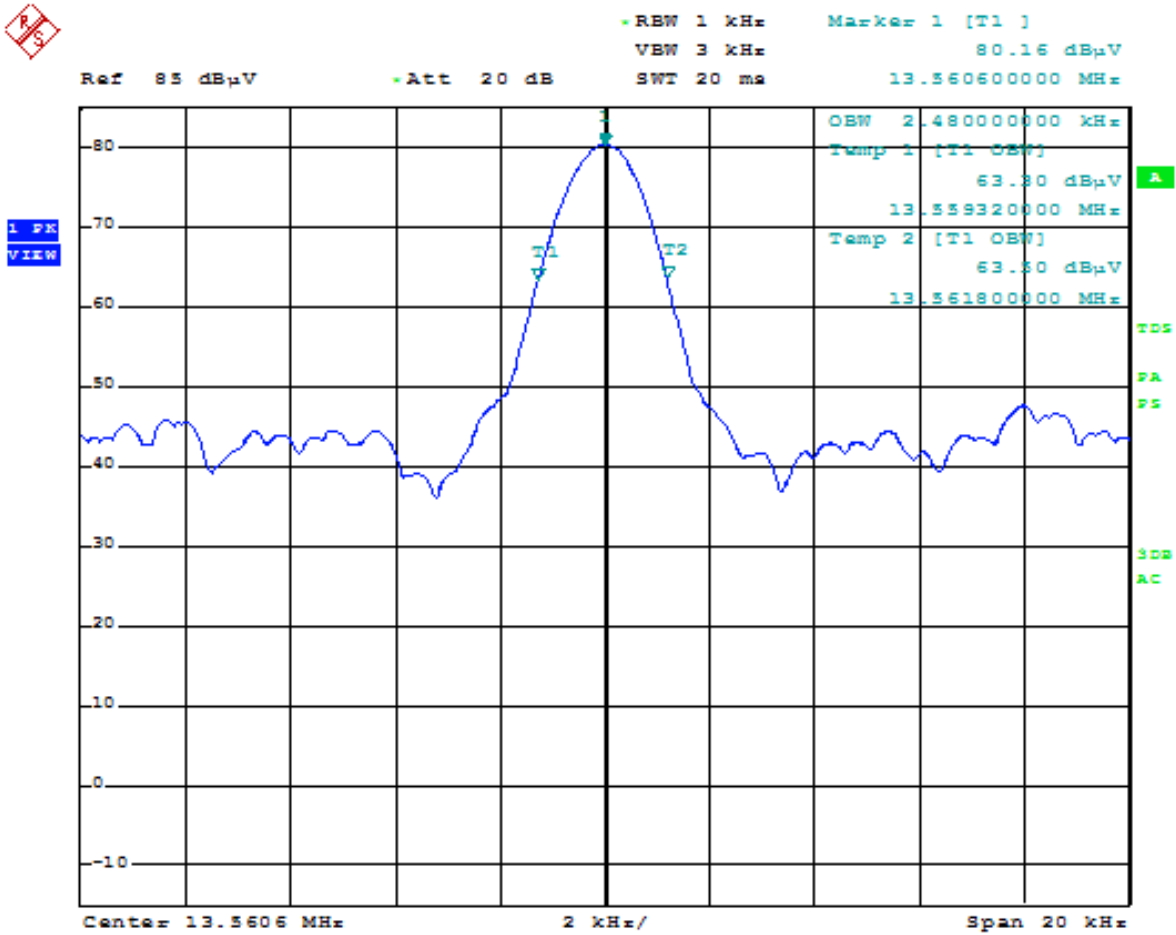
Date of testing: 2013-10-21

Testresult:



Date: 21.OCT.2013 15:43:11

Plot1a: plot of the emission. Measured value is 2.72 kHz as measured on a spectrum analyzer.



Date: 21.OCT.2013 15:42:33

Plot1b: plot of the 99% emission bandwidth. Measured value is 2.48 kHz as measured on a spectrum analyzer.

## 7 List of utilized test equipment.

Inventory number	Description	Brand	Model	Last cal.	Next cal.
12512	LISN	EMCO	3625/2	01/2013	01/2014
12640	Temperature chamber	Heraeus	VEM03/500	NA	NA
13313	Pulse Limiter	R&S	ESH3-Z2	01/2013	01/2014
15453	Active loopant. 60 cm	Chase	HLA6120	05/2013	05/2014
15667	Measuring receiver	R&S	ESCS30	09/2013	09/2014
99877	Biconilog Testantenna	Teseq	CBL 6111D	06/2013	06/2014
99077	Variac 250V 6A	RFT	LTS006	NA	NA
99080	Termination 50 Ohm	--	R404051000-50-9141	10/2013	10/2014
99161	Variac 120Vac	RFT	LTS001	NA	NA
99318	Digital Voltmeter	HP	34401A	09/2013	09/2014
99861	Turntable controller	Maturo	SCU/088/8090811	NA	NA
99852/ 99857	Temperature-Humiditymeter	EXtech	SD500	02/2013	02/2014
99580/ 99847	Test facility	Comtest	FCC listed: 90828 IC listed: 2932G-2	12/2011	12/2014
99608	Controller	EMCS	DOC202	NA	NA
99609	Antenna mast	EMCS	AP-4702C	NA	NA
99651	Variac	NA	Vast Activa: 08-9510	NA	NA
99699	Measuring receiver	R&S	ESCI	03/2013	03/2014
99683	Loop antenna, 6cm	--	7405-901	09/2013	09/2014
99733	Spectrum analyzer	R&S	FSV	05/2013	05/2014
99858	RF Cable S-AR	Gigalink	APG0500	01/2013	01/2014
99876	Temperaturemeter Climatchamber	Tempcontrol	P770	02/2013	02/2014

NA= Not Applicable