TEST REPORT CONCERNING THE COMPLIANCE OF A CATTLE ID-READER, OPERATING ON 134.2 kHz BRAND NEDAP, MODEL VP1910 VELOS WITH 47 CFR PART 15 (10-1-09 EDITION) AND THE REQUIREMENTS OF INDUSTRY CANADA: RSS-GEN AND RSS-210 (ISSUE 8, DECEMBER 2010)

12021504.fcc01

September 12, 2012

FCC listed : 90828
Industry Canada : 2932G-2
VCCI Registered : R-1518, C-1598
R&TTE, LVD, EMC Notified Body : 1856

TÜV Rheinland EPS B.V.
P.O. Box 37
9350 AA Leek (NL)
Eiberkamp 10
9351 VT Leek (NL)

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

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

MEASUREMENT/TECHNICAL REPORT

N.V. Nederlandsche Apparatenfabriek "Nedap"

Brand: Nedap
Model: VP1910 VELOS
FCC ID: CGDVP1910
IC: 1444A-VP1910

This report concerns:	Original grant/certification ~~Class 2 change~~ ~~Verification~~ ~~Verification~~
Equipment type:	Cattle ID Reader

Report prepared by:

Name	: O.H. Hoekstra
Company name	: TÜV Rheinland EPS B.V.
Address	: Eiberkamp 10
Postal code/city	: 9351 VT Leek
Mailing address	: P.O. Box 37
Postal code/city	: 9350 AA 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 (10-1-09 Edition), RSS-GEN AND RSS-210 and the measurement procedures of ANSI C63.4-2009. TÜV Rheinland EPS 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: September 12, 2012 Signature:

R. van der Meer
Engineer 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)	:	Cattle ID Reader
Manufacturer	:	N.V. Nederlandsche Apparatenfabriek “Nedap”
Brand	:	Nedap
Model(s)	:	VP1910 VELOS
Serial number(s)	:	--
FCC ID	:	CGDVP1910
IC	:	1444A-VP1910
Receipt date	:	March 30, 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	:	Leek
Test(s) started	:	March 30, 2012
Test(s) completed	:	August 2, 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	:	September 12, 2012

Table of contents

1 General information.

1.1 Product description.

1.1.1 Introduction.

The Cattle ID Reader, brand Nedap, model VP1910 VELOS, hereafter referred to as EUT is to be used to as a Cattle ID Reader. It is capable of reading 134.2 kHz 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: CGDVP1910 and IC: 1444A-VP1910.

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	:	Cattle ID Reader
Manufacturer	:	N.V. Nederlandsche Apparatenfabriek “Nedap”
Brand	:	Nedap
Model	:	VP1910 VELOS
Serial number	:	--
Voltage input rating	:	25.0 Vdc
Voltage output rating	:	--
Current input rating	:	--
Antenna	:	External
Operating frequency	:	134.2 kHz
Remarks	:	n.a.

Photo 1: EUT

1.3.1 Description of input and output ports.

Number	Terminal	From	To	Remarks
1	DC input	Power Supply model VP2001	EUT	--
2	Ethernet	Switch	EUT	--
3	I/O inputs / outputs	Auxilliary equipment	EUT	
4	Synchronisation input	Auxilliary equipment	EUT	
5	Antenna	EUT	Antenna	--

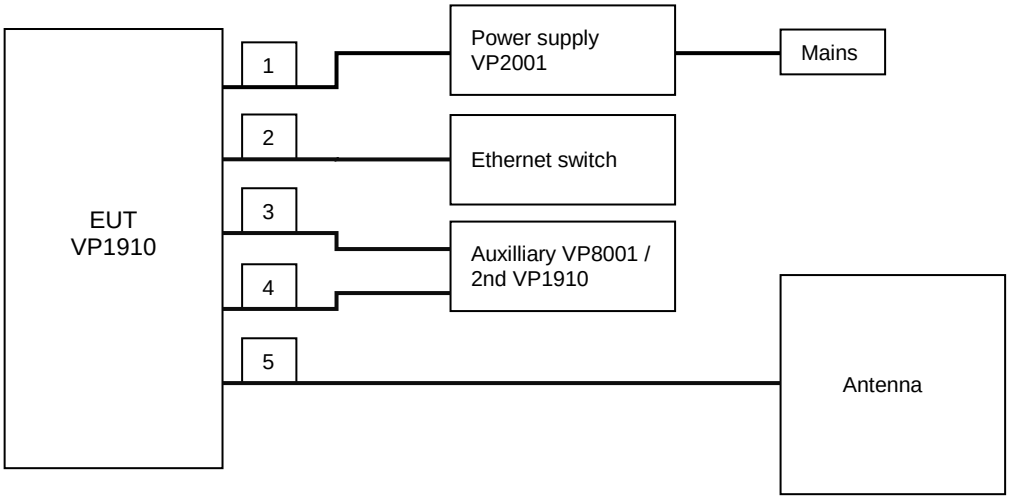


Figure 1. Basic set-up

1.3.2 Antenna configurations

The VP1910 VELOS has been tested with the following antenna configurations:

	Model	Power setting of the VP1910 (%)
1	VP6150	60
2	VP6151	66
3	EWA Walk Through Loop antenna	37
4	VP6154 Walk Through Loop antenna	26
5	EWA Walk Over Loop antenna	55
6	VP6154 Walk Over Loop antenna	39

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 (10-1-09 Edition)	**RSS-210 Issue 8, December 2010**		**Page**	
15.207(a)	RSS-Gen(7.2.4)	Conducted emissions	13	Pass
15.209	RSS-Gen(4.9 and 7.2.5) and RSS-210(2.5)	Radiated emissions	11 - 12	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, 15.207, 15.209 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 and 10 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 at Eiberkamp 10, 9351 VT Leek, 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-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 : 25 Vdc
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 test sample was configured by the applicant to enable continuous transmit.

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 label. To assess the behavior of the EUT while reading the label, the EUT is tested with a label presented such that it continuously reads the label. The intentional radiator tests have been performed with a complete functioning EUT.

2.3 Special accessories.

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

2.4 Equipment modifications.

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
53.0	26.2	17.7	7.0	33.2	24.7	40.0	Pass
305.0	27.4	26.5	14.6	42.0	41.1	46.0	Pass
355.3	27.9	29.5	16.3	44.2	45.8	46.0	Pass
379.0	27.6	27.4	17.0	44.6	44.4	46.0	Pass
701.0	10.4	9.5	23.5	33.9	33.0	46.0	Pass
765.0	7.9	8.1	24.7	32.6	32.8	46.0	Pass

Table 2a Radiated emissions of the EUT with VP6150 antenna

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
53.0	22.1	16.2	7.0	29.1	23.2	40.0	Pass
305.0	27.0	23.3	14.6	41.6	37.9	46.0	Pass
355.3	29.4	29.5	16.3	45.7	45.8	46.0	Pass
379.0	28.5	26.7	17.0	45.5	43.7	46.0	Pass
701.0	8.9	7.5	23.5	32.4	31.0	46.0	Pass
765.0	8.5	9.4	24.7	33.2	34.1	46.0	Pass

Table 2b Radiated emissions of the EUT with VP6151 antenna

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
53.0	24.3	18.8	7.0	31.3	25.8	40.0	Pass
305.0	26.2	21.8	14.6	40.8	36.4	46.0	Pass
355.3	28.9	29.4	16.3	45.2	45.7	46.0	Pass
379.0	28.0	26.9	17.0	45.0	43.9	46.0	Pass
701.0	9.4	9.0	23.5	32.9	32.5	46.0	Pass
765.0	7.9	9.5	24.7	32.6	34.2	46.0	Pass

Table 2c Radiated emissions of the EUT with EWA Walk Through Loop antenna

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
53.0	28.0	22.5	7.0	35.0	29.5	40.0	Pass
305.0	29.3	24.7	14.6	43.9	39.3	46.0	Pass
355.3	26.4	26.2	16.3	42.7	42.5	46.0	Pass
379.0	27.3	28.1	17.0	44.3	45.1	46.0	Pass
701.0	10.7	8.6	23.5	34.2	32.1	46.0	Pass
765.0	11.0	8.5	24.7	35.7	33.2	46.0	Pass

Table 2d Radiated emissions of the EUT with VP6154 Walk Through Loop antenna

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
53.0	19.3	17.6	7.0	26.3	24.6	40.0	Pass
305.0	28.7	24.2	14.6	43.3	38.8	46.0	Pass
355.3	28.6	28.9	16.3	44.9	45.2	46.0	Pass
379.0	27.7	27.6	17.0	44.7	44.6	46.0	Pass
701.0	7.7	7.4	23.5	31.2	30.9	46.0	Pass
765.0	9.6	7.7	24.7	34.3	32.4	46.0	Pass

Table 2e Radiated emissions of the EUT with EWA Walk Over Loop antenna

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
53.0	28.2	21.7	7.0	35.2	28.7	40.0	Pass
305.0	29.7	23.6	14.6	44.3	38.2	46.0	Pass
355.3	29.5	29.3	16.3	45.8	45.6	46.0	Pass
379.0	28.3	28.4	17.0	45.3	45.4	46.0	Pass
701.0	12.1	11.3	23.5	35.6	34.8	46.0	Pass
765.0	10.2	8.6	24.7	34.9	33.3	46.0	Pass

Table 2f Radiated emissions of the EUT with VP6154 Walk Over Loop antenna

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

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 ±5.0dB.
3. The EUT was rotated, the measuring antenna was varied in horizontal and vertical orientations and also around it's axis and height. 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).

15633	99580/ 99847	99609	99613	99699	99733	

Test engineer

Signature :

Name : O.H. Hoekstra
Date : September 12, 2012

3.1 Radiated field strength measurements (frequency range of 0.009-30 MHz, H-field), Peak- and Quasi Peak values, working frequency.

3.1.1 Antenna VP6150

Fundamental Frequency (MHz)	(a) Measurement results (dBµV)		Detector	(b) Antenna factor	(c) Cable loss	(d) Extrapolation factor	Measurement results (calculated =a+b+c-d)	Measurement results (calculated =a+b+c-d)	Measurement results (calculated according to Appendix-1)	Limits Part 15.209
	3 m	10 m		dB	dB	dB	dBµV/m @3m	dBµV/m @10m	dBµV/m	dBµV/m @300m
0.1342	71.7	40.7	Pk	71.0	1	n.a.	143.7	112.7	25.0	45.1

Table 3a Peak values of the emissions of the fundamental of the EUT

Frequency (MHz)	Measurement results Peak	Correction Factor	Average value	Limits Average
	dBµV/m @300m	dB	dBµV/m @300m	dBµV/m @300m
0.1342	25.0	-0.5	24.5	25.1

Table 3b Average values of the emission of the EUT

3.1.2 Antenna VP6151

Fundamental Frequency (MHz)	(a) Measurement results (dBµV)		Detector	(b) Antenna factor	(c) Cable loss	(d) Extrapolation factor	Measurement results (calculated =a+b+c-d)	Measurement results (calculated =a+b+c-d)	Measurement results (calculated according to Appendix-1)	Limits Part 15.209
	3 m	10 m		dB	dB	dB	dBµV/m @3m	dBµV/m @10m	dBµV/m	dBµV/m @300m
0.1342	70.7	39.9	Pk	71.0	1	n.a.	142.7	111.9	25.0	45.1

Table 3c Peak values of the emissions of the fundamental of the EUT

Frequency (MHz)	Measurement results Peak	Correction Factor	Average value	Limits Average
	dBµV/m @300m	dB	dBµV/m @300m	dBµV/m @300m
0.1342	25.0	-0.5	24.5	25.1

Table 3d Average values of the emission of the EUT

3.1.3 Antenna EWA Walk Through Loop antenna

Fundamental Frequency (MHz)	(a) Measurement results (dBµV)		Detector	(b) Antenna factor	(c) Cable loss	(d) Extrapolation factor	Measurement results (calculated =a+b+c-d)	Measurement results (calculated =a+b+c-d)	Measurement results (calculated according to Appendix-1)	Limits Part 15.209
	3 m	10 m		dB	dB	dB	dBµV/m @3m	dBµV/m @10m	dBµV/m	dBµV/m @300m
0.1342	67.7	37.7	Pk	71.0	1	n.a.	139.7	109.7	25.0	45.1

Table 3e Peak values of the emissions of the fundamental of the EUT

Frequency (MHz)	Measurement results Peak	Correction Factor	Average value	Limits Average
	dBµV/m @300m	dB	dBµV/m @300m	dBµV/m @300m
0.1342	25.0	-0.5	24.5	25.1

Table 3f Average values of the emission of the EUT

3.1.4 Antenna VP6154 Walk Through Loop antenna

Fundamental Frequency (MHz)	(a) Measurement results (dBµV)		Detector	(b) Antenna factor	(c) Cable loss	(d) Extrapolation factor	Measurement results (calculated =a+b+c-d)	Measurement results (calculated =a+b+c-d)	Measurement results (calculated according to Appendix-1)	Limits Part 15.209
	3 m	10 m		dB	dB	dB	dBµV/m @3m	dBµV/m @10m	dBµV/m	dBµV/m @300m
0.1342	67.8	37.8	Pk	71.0	1	n.a.	139.8	109.8	25.1	45.1

Table 3g Peak values of the emissions of the fundamental of the EUT

Frequency (MHz)	Measurement results Peak	Correction Factor	Average value	Limits Average
	dBµV/m @300m	dB	dBµV/m @300m	dBµV/m @300m
0.1342	25.1	-0.5	24.6	25.1

Table 3h Average values of the emission of the EUT

3.1.5 Antenna EWA Walk Over Loop antenna

Fundamental Frequency (MHz)	(a) Measurement results (dBµV)		Detector	(b) Antenna factor	(c) Cable loss	(d) Extrapolation factor	Measurement results (calculated =a+b+c-d)	Measurement results (calculated =a+b+c-d)	Measurement results (calculated according to Appendix-1)	Limits Part 15.209
	3 m	10 m		dB	dB	dB	dBµV/m @3m	dBµV/m @10m	dBµV/m	dBµV/m @300m
0.1342	67.7	37.7	Pk	71.0	1	n.a.	139.7	109.7	25.0	45.1

Table 3i Peak values of the emissions of the fundamental of the EUT

Frequency (MHz)	Measurement results Peak	Correction Factor	Average value	Limits Average
	dBµV/m @300m	dB	dBµV/m @300m	dBµV/m @300m
0.1342	25.0	-0.5	24.5	25.1

Table 3j Average values of the emission of the EUT

3.1.6 Antenna VP6154 Walk Over Loop antenna

Fundamental Frequency (MHz)	(a) Measurement results (dBµV)		Detector	(b) Antenna factor	(c) Cable loss	(d) Extrapolation factor	Measurement results (calculated =a+b+c-d)	Measurement results (calculated =a+b+c-d)	Measurement results (calculated according to Appendix-1)	Limits Part 15.209
	3 m	10 m		dB	dB	dB	dBµV/m @3m	dBµV/m @10m	dBµV/m	dBµV/m @300m
0.1342	67.8	37.8	Pk	71.0	1	n.a.	139.8	109.8	25.1	45.1

Table 3k Peak values of the emissions of the fundamental of the EUT

Frequency (MHz)	Measurement results Peak	Correction Factor	Average value	Limits Average
	dBµV/m @300m	dB	dBµV/m @300m	dBµV/m @300m
0.1342	25.1	-0.5	24.6	25.1

Table 3l Average values of the emission of the EUT

Correction factor (Cf) for Pulse operation:

Cf= 20 Log (TON / TPeriod)

Where TON is the On time of the pulse, TON = 65.94 msec.

Where TPeriod is the total time of one pulse period, TPeriod = 69.85 msec

Period time is less than 100msec, the Correction factor in that case:

Cf= 20 log (65.94/69.85)= -0.5 dB

The results of the radiated emission tests on the working frequency, carried out in accordance with 47 CFR Part 15 section 15.209, RSS-210 and RSS-Gen with the EUT operating in continuous transmit mode on 134.2 kHz, are depicted in Tables 3a through 3l.

Notes:

1. Calculated measurement results for the fundamental at 134.2 kHz are obtained by using the calculation as mentioned in Appendix 1.
2. A resolution bandwidth of 9 kHz was used during testing
3. Field strength values of radiated emissions at frequencies not listed in Table 2a, 2d and 2g are more than 20 dB below the applicable limit
4. 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.
5. 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).
6. Measurement uncertainty is ±5.0dB

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

15453	99413	99699				

Test engineer

Signature : 

Name : O.H. Hoekstra
Date : September 12, 2012

3.2 Radiated field strength measurements (frequency range of 0.009-30 MHz, H-field), Peak- and Quasi Peak values, other frequencies than the working frequency.

3.2.1 Antenna VP6150

Frequency (MHz)	Measurement results	Detector	Antenna factor	Cable loss	Extrapolation factor	Measurement results (calculated)	Limits
	dBµV @3m		dB	dB	dB	dBµV/m@30m (unless otherwise stated)	dBµV/m@30m (unless otherwise stated)
0.2684	5.2	Pk	69.2	1	80	-4.6 @300m	39.0 @300m
0.4026	< 0.0	Pk	68.5	1	80	< -10.5 @300m	35.5 @300m
0.5368	< -5.0	Qp	66.8	1	40	< 23.0	33.0

Table 4a Radiated emissions of the EUT, Peak- and Quasi peak values

Frequency (MHz)	Measurement results Peak	Correction Factor	Average value	Limits Average
	dBµV/m @300m	dB	dBµV/m @300m	dBµV/m @300m
0.2684	-4.6	-0.5	-5.1	19.0
0.4026	< -10.5	-0.5	< -11.0	15.5

Table 4b Radiated emission of the EUT

3.2.2 Antenna VP6151

Frequency (MHz)	Measurement results	Detector	Antenna factor	Cable loss	Extrapolation factor	Measurement results (calculated)	Limits
	dBµV @3m		dB	dB	dB	dBµV/m@30m (unless otherwise stated)	dBµV/m@30m (unless otherwise stated)
0.2684	4.1	Pk	69.2	1	80	-5.7 @300m	39.0 @300m
0.4026	< 0.0	Pk	68.5	1	80	< -10.5 @300m	35.5 @300m
0.5368	< -5.0	Qp	66.8	1	40	< 23.0	33.0

Table 4c Radiated emissions of the EUT, Peak- and Quasi peak values

Frequency (MHz)	Measurement results Peak	Correction Factor	Average value	Limits Average
	dBµV/m @300m	dB	dBµV/m @300m	dBµV/m @300m
0.2684	-5.7	-0.5	-6.2	19.0
0.4026	-10.5	-0.5	-11.0	15.5

Table 4d Radiated emission of the EUT

3.2.3 Antenna EWA Walk Through Loop antenna

Frequency (MHz)	Measurement results	Detector	Antenna factor	Cable loss	Extrapolation factor	Measurement results (calculated)	Limits
	dBµV @3m		dB	dB	dB	dBµV/m@30m (unless otherwise stated)	dBµV/m@30m (unless otherwise stated)
0.2684	6.3	Pk	69.2	1	80	-3.5 @300m	39.0 @300m
0.4026	6.0	Pk	68.5	1	80	-4.5 @300m	35.5 @300m
0.5368	< -5.0	Qp	66.8	1	40	< 23.0	33.0

Table 4e Radiated emissions of the EUT, Peak- and Quasi peak values

Frequency (MHz)	Measurement results Peak	Correction Factor	Average value	Limits Average
	dBµV/m @300m	dB	dBµV/m @300m	dBµV/m @300m
0.2684	-3.5	-0.5	-4.0	19.0
0.4026	-4.5	-0.5	-5.0	15.5

Table 4f Radiated emission of the EUT

3.2.4 Antenna VP6154 Walk Through Loop antenna

Frequency (MHz)	Measurement results	Detector	Antenna factor	Cable loss	Extrapolation factor	Measurement results (calculated)	Limits
	dBµV @3m		dB	dB	dB	dBµV/m@30m (unless otherwise stated)	dBµV/m@30m (unless otherwise stated)
0.2684	6.5	Pk	69.2	1	80	-3.3 @300m	39.0 @300m
0.4026	6.5	Pk	68.5	1	80	-4.0 @300m	35.5 @300m
0.5368	< -5.0	Qp	66.8	1	40	< 23.0	33.0

Table 4g Radiated emissions of the EUT, Peak- and Quasi peak values

Frequency (MHz)	Measurement results Peak	Correction Factor	Average value	Limits Average
	dBµV/m @300m	dB	dBµV/m @300m	dBµV/m @300m
0.2684	-3.3	-0.5	-3.8	19.0
0.4026	-4.0	-0.5	-4.5	15.5

Table 4h Radiated emission of the EUT

3.2.5 Antenna EWA Walk Over Loop antenna

Frequency (MHz)	Measurement results	Detector	Antenna factor	Cable loss	Extrapolation factor	Measurement results (calculated)	Limits
	dBµV @3m		dB	dB	dB	dBµV/m@30m (unless otherwise stated)	dBµV/m@30m (unless otherwise stated)
0.2684	3.7	Pk	69.2	1	80	-6.1 @300m	39.0 @300m
0.4026	2.7	Pk	68.5	1	80	-7.8 @300m	35.5 @300m
0.5368	< -5.0	Qp	66.8	1	40	< 23.0	33.0

Table 4i Radiated emissions of the EUT, Peak- and Quasi peak values

Frequency (MHz)	Measurement results Peak	Correction Factor	Average value	Limits Average
	dBµV/m @300m	dB	dBµV/m @300m	dBµV/m @300m
0.2684	-6.1	-0.5	-6.6	19.0
0.4026	-7.8	-0.5	-8.3	15.5

Table 4j Radiated emission of the EUT

3.2.6 Antenna VP6154 Walk Over Loop antenna

Frequency (MHz)	Measurement results	Detector	Antenna factor	Cable loss	Extrapolation factor	Measurement results (calculated)	Limits
	dBµV @3m		dB	dB	dB	dBµV/m@30m (unless otherwise stated)	dBµV/m@30m (unless otherwise stated)
0.2684	4.2	Pk	69.2	1	80	-5.8 @300m	39.0 @300m
0.4026	1.8	Pk	68.5	1	80	-8.7 @300m	35.5 @300m
0.5368	< -5.0	Qp	66.8	1	40	< 23.0	33.0

Table 4k Radiated emissions of the EUT, Peak- and Quasi peak values

Frequency (MHz)	Measurement results Peak	Correction Factor	Average value	Limits Average
	dBµV/m @300m	dB	dBµV/m @300m	dBµV/m @300m
0.2684	-5.8	-0.5	-6.3	19.0
0.4026	-8.7	-0.5	-9.2	15.5

Table 4l Radiated emission of the EUT

Notes:

1. Calculated measurement results are obtained by using the 40dB/decade factor (antenna factor and cable loss is included). i.e at 268.4 kHz: 6.5 dBµV + 69.2 dB + 1dB - 80dB= -3.3 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 Tables 4a – 4l 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.

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

15453	99413	99699				

Test engineer

Signature : 

Name : O.H. Hoekstra
Date : September 12, 2012

4 Conducted emission data.

4.1 Conducted emission data of the EUT

Frequency (MHz)	Measurement results dB(µV) Neutral/L2		Measurement results dB(µV) Line 1		Limits dB(µV)		Result
	QP	AV	QP	AV	QP	AV	
0.209	29.1	27.0	40.0	39.7	63.6	53.6	PASS
0.321	48.0	37.0	48.0	38.0	59.7	49.7	PASS
0.832	31.0	25.7	31.0	28.0	56.0	46.0	PASS
1.87	27.5	22.3	27.5	25.7	56.0	46.0	PASS
3.53	28.8	26.8	18.2	6.0	56.0	46.0	PASS
11.43	24.7	18.8	26.0	20.0	60.0	50.0	PASS

Note: n.m.) Not measured as the Quasi Peak values were already below the average limits.

Table 4 Conducted emission measurements of the EUT

The results of the conducted emission tests, carried out in accordance with 47 CFR Part 15 section 15.207 and RSS-Gen section 7.2.4, at the 120 Volts AC mains connection terminals, are depicted in Table 4. Maximum values were recorded. The system is tested as in whole, so with all equipment as shown in Figure 1 in place and functioning. Being the worst case situation.

Notes:

1. Measurement uncertainty is ±3.5dB
2. The resolution bandwidth used was 9 kHz.
3. The measurements were performed with the VP6151 antenna connected to the VP1910.
4. The power setting of the VP1910 was varied from the minimum setting of 26% to the maximum setting of 66%, maximum values of the conducted emission data was noted down.

Used test equipment and ancillaries:

13313	99161	12512	15667	99852		

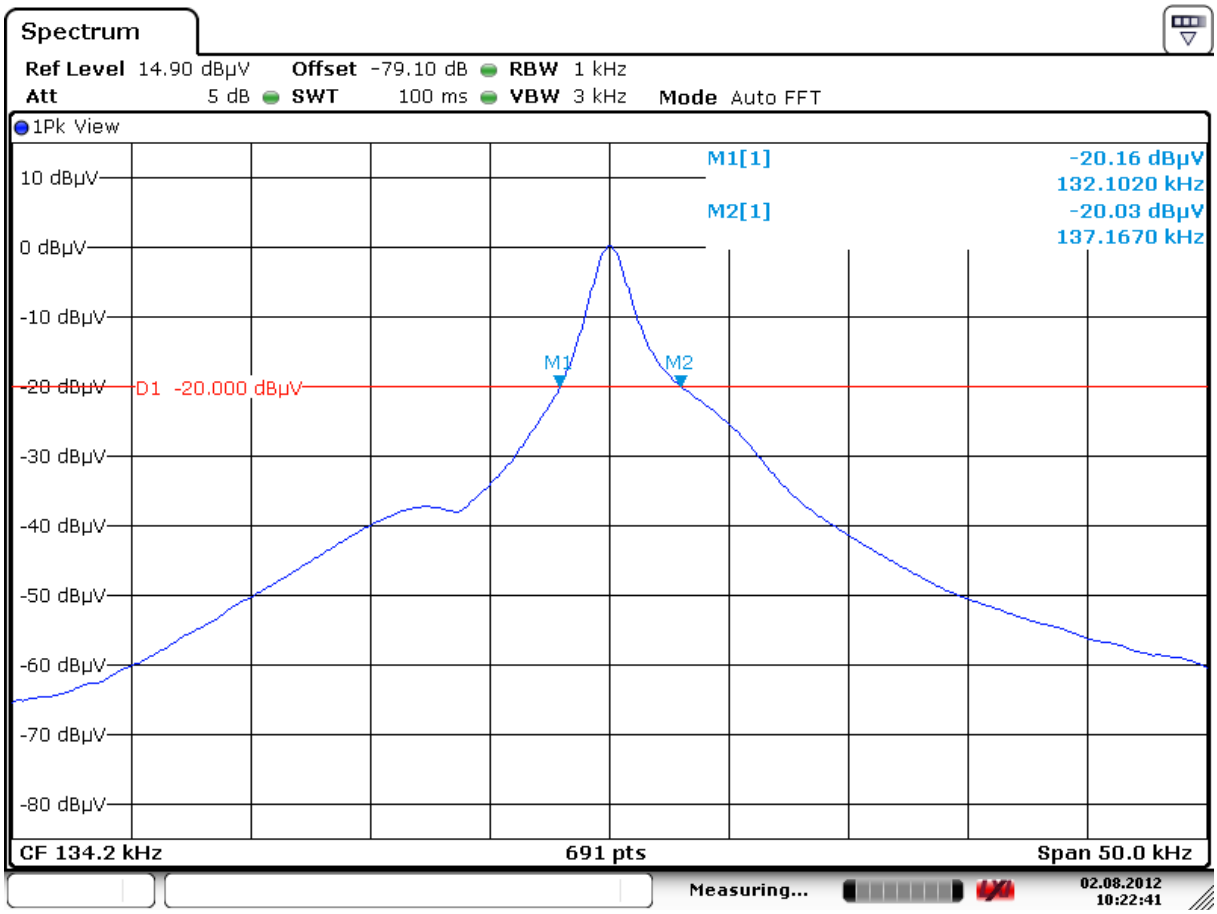
Test engineer

Signature :

Name : O.H. Hoekstra
Date : August 1, 2012

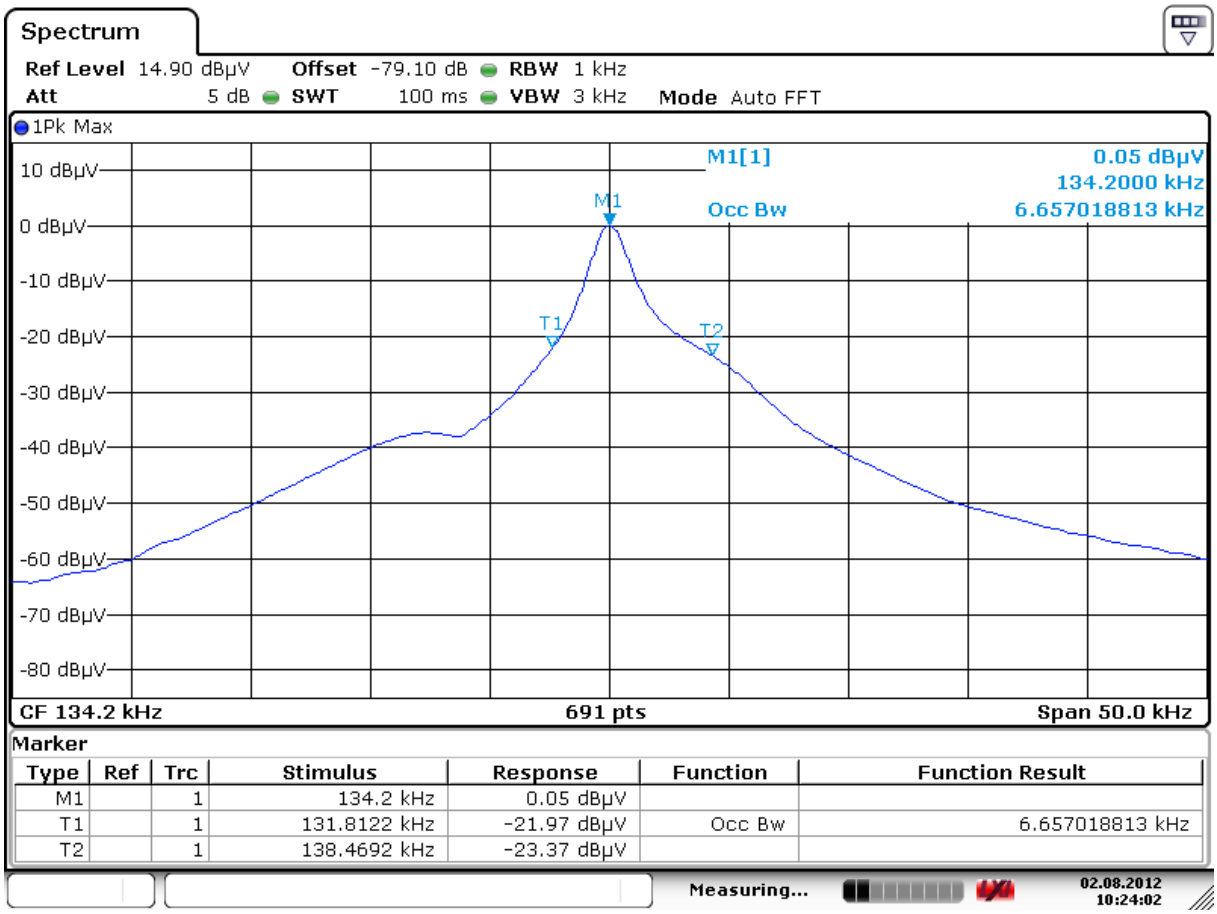
5 Plots of measurement data

5.1 Bandwidth of the emission



Date: 2.AUG.2012 10:22:41

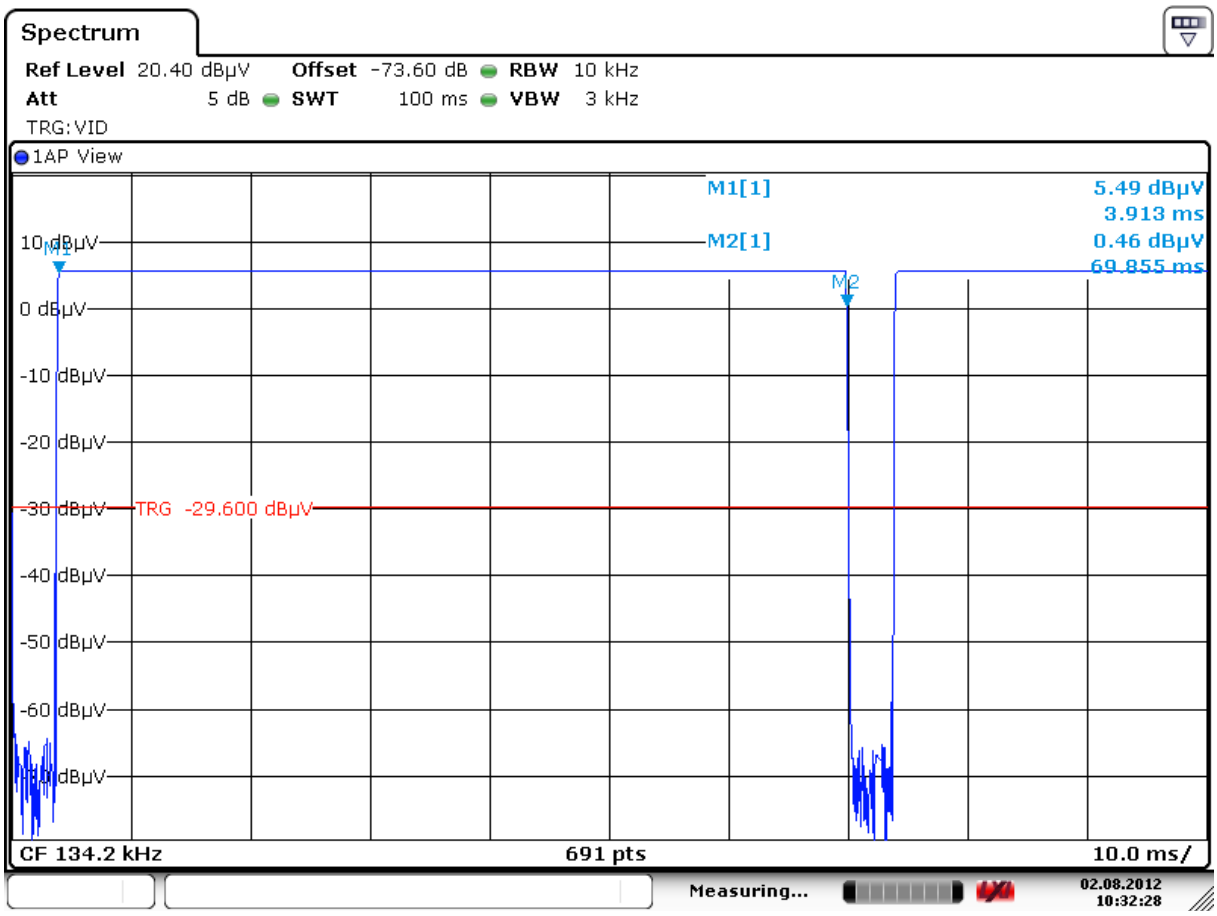
Plot1
Emission Bandwidth (-20 dB down points) of the emission at 134.2 kHz (Fundamental Carrier)



Date: 2.AUG.2012 10:24:02

Plot2
Occupied Bandwidth (99% points) of the emission at 134.2 kHz (Fundamental Carrier),
by using the spectrum analyzer function for 99% Occ BW.

5.2 Duty cycle



Date: 2.AUG.2012 10:32:28

Plot3
Duty cycle

6 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
12479	Passive loop antenna	EMCO	6509	NA	NA
12512	LISN	EMCO	3625/2	01/2012	01/2014
13313	Pulse Limiter	R&S	ESH3-Z2	02/2012	02/2013
15453	Active loopant. 60 cm	Chase	HLA6120	05/2012	05/2013
15633	Biconilog Testantenna	Chase	CBL 6111B	02/2012	02/2013
15667	Measuring receiver	R&S	ESCS30	06/2012	06/2013
99070	Coax 15m RG213	NMi Certin B.V.	Cable 15M	10/2011	10/2012
99107	Controller	Heinrich Deisel	4630-100	NA	NA
99120	DC supply 0-30V/1,2A	Voltcraft	TNG30	NA	NA
99161	Variac 250V 6A	RFT	LTS006	NA	NA
99608	Controller	EMCS	DOC202	NA	NA
99609	Antenna mast	EMCS	AP-4702C	NA	NA
99651	Variac	NA	--	NA	NA
99847/ 99580	S-AR	Siepel	FCC listed: 90828	02/2012	02/2015
99852/ 99855	Humidity/Temperature Datalogger	Extech	SD500	02/2012	02/2013
99858	Cable S-AR	Gigalink	APG0500	01/2012	01/2013
99861	Controller S-AR	Maturo	SCU/088/8090811	NA	NA

NA= Not Applicable

Appendix 1

Calculated measurements results radiated field strength, H-Field

The rules of Part 15 section 15.31 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 300m:

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

Example

For the fundamental frequency of 134.2 kHz the level at a distance of 300m would be calculated as follows:

EUT in combination with VP6150 antenna:

d1= 3m Hd1=143.7 dBµV/m= 15310874 µV/m
d2= 10m Hd2=112.7 dBµV/m= 431519.0 µV/m
Calculation for n: $n= \log(H_{d2}/H_{d1}) / \log(d_1/d_2)$ > $n=\log(15310874 / 431519.0) / \log(3m/10m)$ > $n=2.964$
$H_{d2} = H_{d1} (d_1/d_2)^n$ > $H_{d2} = 15310874 (3/300)^{2.964}$ = 25.0 dBµV/m.