TEST REPORT CONCERNING THE COMPLIANCE OF A CATTLE ID-READER, OPERATING ON 134.2 kHz BRAND NEDAP, MODELS VP5002 VELOS AND VP5004 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)

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MEASUREMENT/TECHNICAL REPORT

N.V. Nederlandsche Apparatenfabriek "Nedap"

Brand: Nedap
Models: VP5002 VELOS and VP5004 VELOS
FCC ID: CGDVP500X
IC: 1444A-VP500X

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

Report prepared by:		
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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: October 15, 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)	:	VP5002 VELOS and VP5004 VELOS
Serial number(s)	:	--
FCC ID	:	CGDVP500X
IC	:	1444A-VP500X
Receipt date	:	July 24, 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	:	July 24, 2012
Test(s) completed	:	July 30, 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	:	October 15, 2012

Table of contents

1 General information.

1.1 Product description.

1.1.1 Introduction.

The Cattle ID Reader, brand Nedap, models VP5002 VELOS and VP5004 VELOS, both handheld products, hereafter refered 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: CGDVP500X and IC: 1444A-VP500X.

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
Models	:	VP5002 VELOS and VP5004 VELOS
Serial number	:	--
Voltage input rating	:	6 Vdc internal accu battery
Voltage output rating	:	--
Current input rating	:	--
Antenna	:	Integral
Operating frequency	:	134.2 kHz
Remarks	:	n.a.

Photo 1a: EUT (front)

Photo 1b: EUT (back)

1.3.1 Description of input and output ports.

Number	Terminal	From	To	Remarks
1	Mains	Mains	AUX1	--
2	Charging adapter	AUX1	EUT	Used in charging mode only

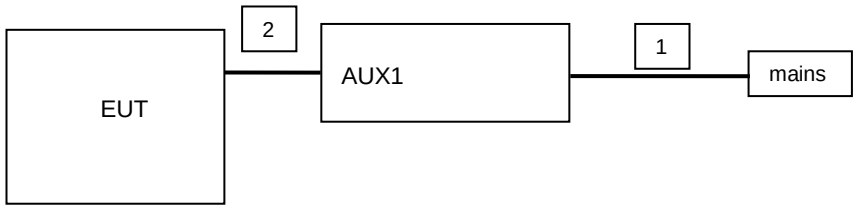


Figure 1. Basic set-up

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 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	: 6 Vdc internal accu battery operated (fully charged)
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
36.0	22.6	<1.0	15.4	38.0	<16.4	40.0	Pass
48.0	21.6	3.5	9.2	30.8	12.7	40.0	Pass
66.2	15.0	7.6	5.4	20.4	13.0	40.0	Pass
98.2	20.8	<4.0	10.1	30.9	<14.1	43.5	Pass
120.0	18.8	7.6	11.7	30.5	19.3	43.5	Pass
216.0	8.0	9.3	11.4	19.4	20.8	43.5	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 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 ±5.0dB.
3. The EUT was varied in three positions, 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.
6. Tests were performed with the VP5002 with keyboard, being the worst case sample.
7. Tests were performed in standby mode with the charger connected and while transmitting with the charger disconnected. The transmit function of the EUT is disabled when the charger is connected. Worst case values are noted down here.

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

15633	99580	99609	99855	99699	99733	

Test engineer

Signature :

Name : O.H. Hoekstra
Date : July 26, 2012

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

Frequency (MHz)	Measurement results	Measurement results	Detector	Antenna factor	Cable loss	Extrapolation factor	Measurement results (calculated)	Limits	Pass/Fail
	dBµV @3m	dBµV @10m		dB	dB	dB	dBµV/m@300m	dBµV/m @300m	
0.1342 (fundamental)	84.3	53.0	Pk	20.1	1	119.8	-14.4	45.1	Pass
0.2684	14.1	--	Pk	20.0	1	119.8	-84.6	39.0	Pass
0.4026	-2.2	--	Pk	20.0	1	119.8	-100.9	35.5	Pass

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

Frequency (kHz)	Measurement results Peak	Detector	Correction factor	Measurement results (calculated Average)	Limits	Pass/Fail
	dBµV @300m		dB	dBµV/m@300m	dBµV/m@300m	
0.1342 (fundamental)	-14.4	Pk	-0,65	-15.05	25,1	Pass
0.2684	-84.6	Pk	-0,65	-85.25	19,0	Pass
0.4026	-100.9	Pk	-0,65	-101.55	15,5	Pass

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

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 and 3b.

Notes:

1. Calculated measurement results are obtained by using a extrapolation factor of 119.8 dB i.e at 134.2 kHz: 84.3 dBµV + 20.1 dB + 1 dB – 119.8 dB= -14.4 dBµV/m.
2. This extrapolation factor is obtained shown in Appendix-1.
3. The correction factor average to calculate the Average value from the peak value is shown in 5.2 Duty cycle.
4. A resolution bandwidth of 9 kHz was used during testing.
5. Field strength values of radiated emissions at frequencies not listed in Table 3 are more than 20 dB below the applicable limit.
6. 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.
7. Tests were performed with the VP5002 with keyboard, from pre/tests being the worst case sample.
8. The EUT was tested in horizontal and vertical orientations. Worst case values noted.
9. Measurement uncertainty is ±5.0dB.

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

15453	99413	99699	99855			

Test engineer

Signature :
Name : O.H. Hoekstra
Date : July 27, 2012

4 Conducted emission data.

4.1 Conducted emission data of the EUT.

4.2 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	
0.17	34.4	n.m.	32.9	n.m.	65.0	55.0	PASS
0.55	32.7	n.m.	35.8	n.m.	56.0	46.0	PASS
1.77	33.4	n.m.	36.7	n.m.	56.0	46.0	PASS
4.93	40.1	n.m.	35.9	n.m.	56.0	46.0	PASS
12.39	24.0	n.m.	37.3	n.m.	60.0	50.0	PASS
20.26	27.3	n.m.	13.1	n.m.	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 of the AC/DC charger (AUX1) which was connected to the EUT, are depicted in Table 4. The EUT was tested in charging mode only, as the transmit mode is disabled while charging the internal accu batteries. 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. Tests were performed with the VP5002 with keyboard, from pre/tests being the worst case sample.
2. Measurement uncertainty is ±3.5dB
3. The resolution bandwidth used was 9 kHz.
4. Average values were not measured as the Quasi Peak values were already below the average limits.
5. No harmonics of the transmitter were present, as the transmit mode is disabled while charging the internal accu batteries.

Used test equipment and ancillaries:

13313	99161	12512	15667	99852	99855	

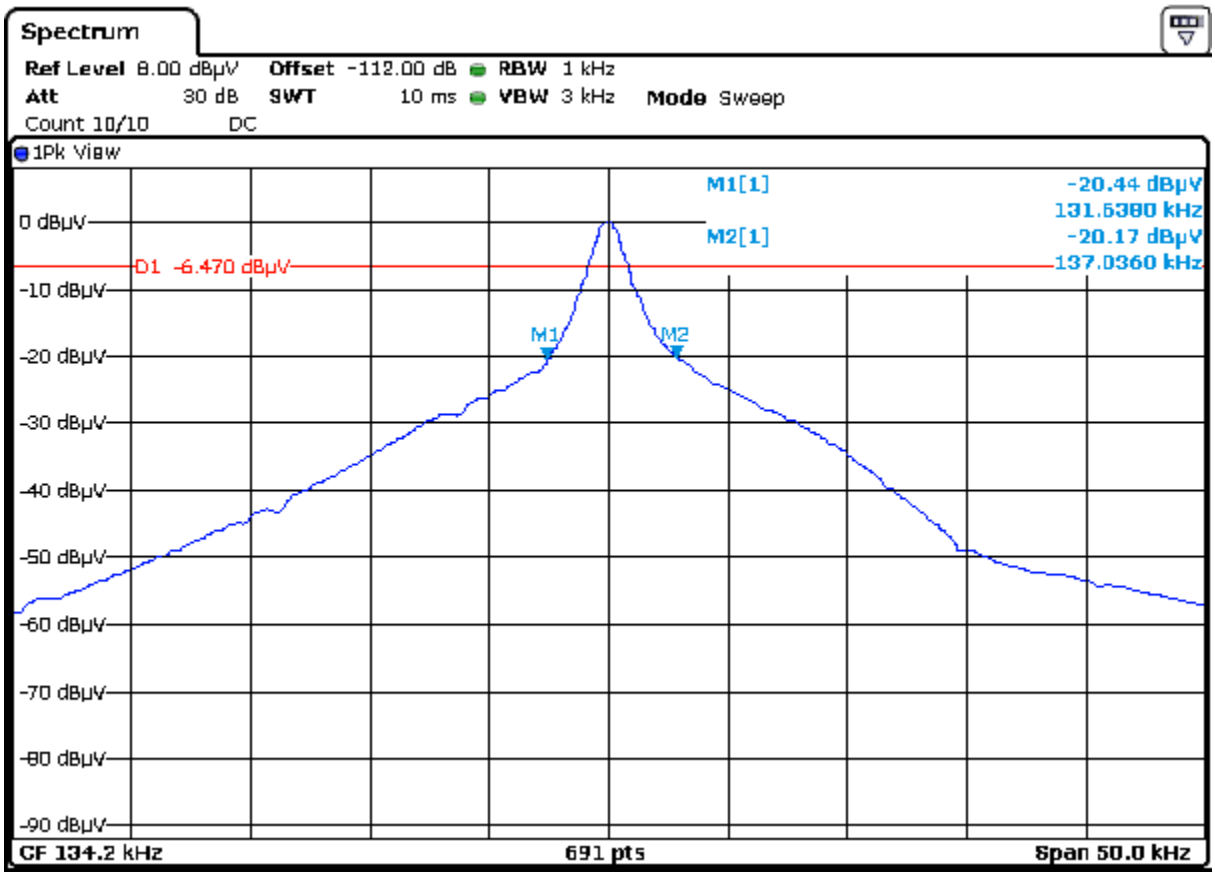
Test engineer

Signature : 

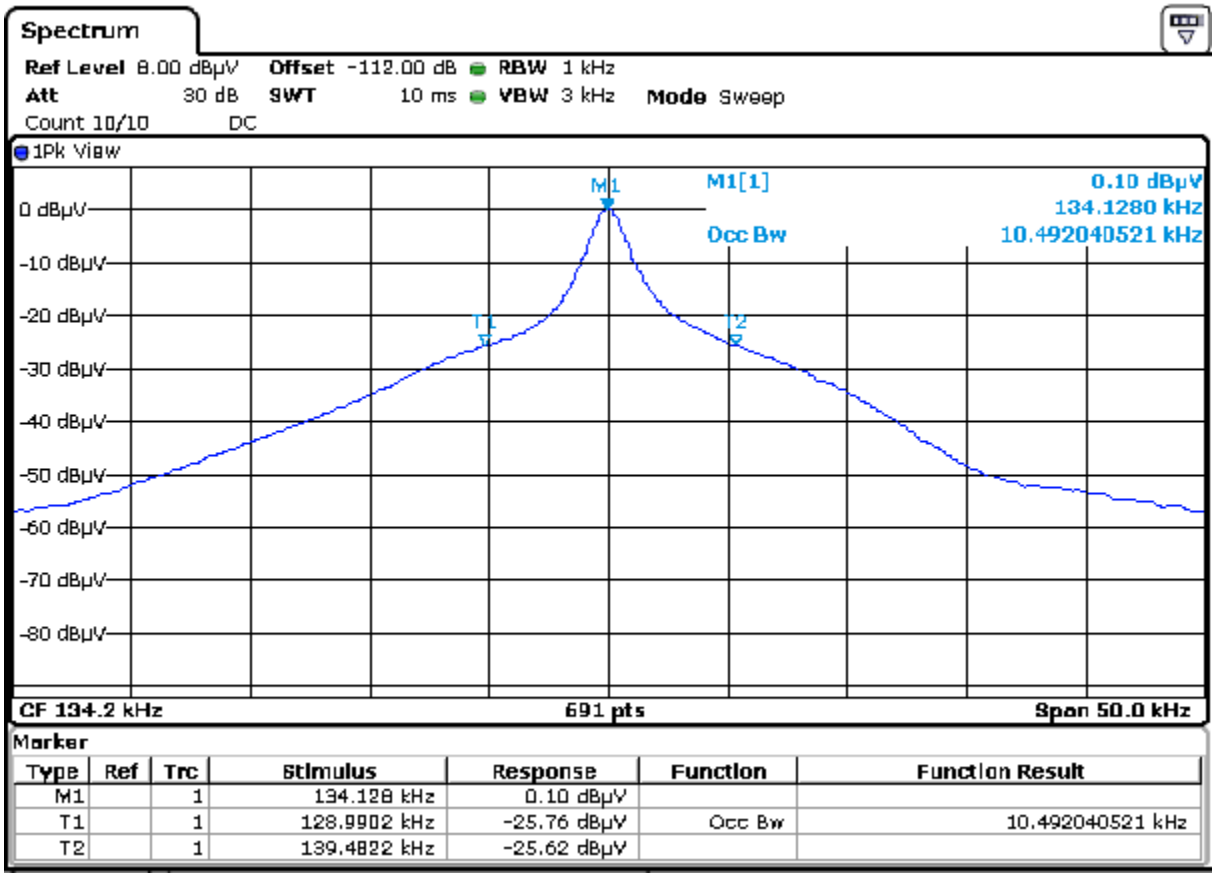
Name : O.H. Hoekstra
Date : July 24, 2012

5 Plots of measurement data

5.1 Bandwidth of the emission



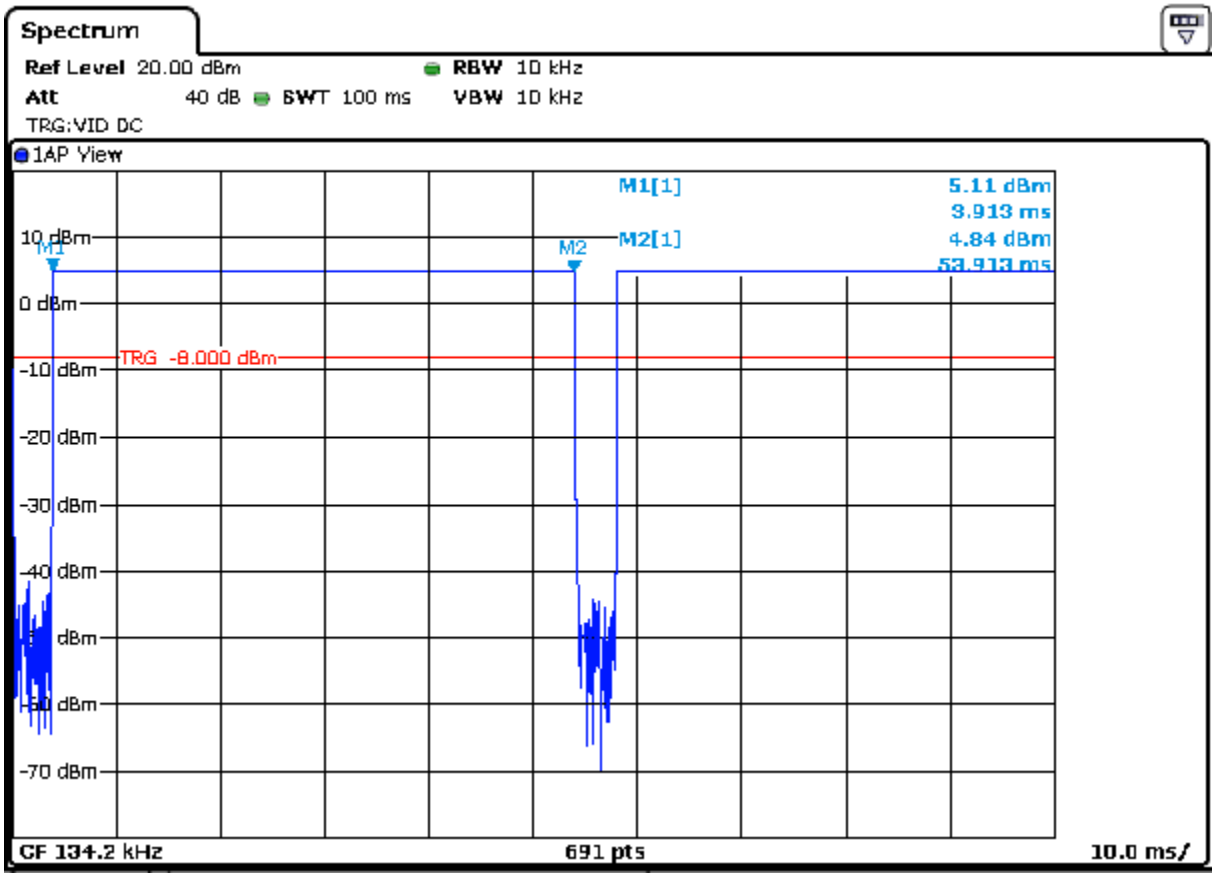
Plot1
Emission Bandwidth (-20 dB down points) of the emission at 134.2 kHz (Fundamental Carrier)



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

Plot 3 below shows the RF On/Off characteristics of the EUT's emissions.
From these characteristics a correction factor is calculated that is required to derive Average values from the measured Peak values of the emissions.



Plot3 Duty cycle

Duty cycle correction factor (Cf) = 20 Log (RF On time / RF On+Off time)

Cf= 20 Log (50.0 ms / 53.913 ms) = -0.65 dB

6 List of utilized test equipment.

Inventory number	Description	Brand	Model	Last cal.	Next cal.
12512	LISN	EMCO	3625/2	01/2012	01/2014
15453	Active loop antenna 60 cm	Chase	HLA6120	04-2012	04-2013
15633	Biconilog Test antenna	Chase	CBL 6111B	01-2012	01-2013
99161	Variac 250V 6A	RFT	LTS006	NA	NA
99318	Digital multimeter	HP	34401A	10-2011	10-2012
99538	Spectrum Analyzer	R&S	FSP	11-2011	11-2012
99580	Semi Anechoïc Room	Siepel	FCC listed: 90828	12-2011	12-2014
99609	Antenna mast	EMCS	AP-4702C	NA	NA
99855	Temperature-Humiditymeter	Extech	SD500	10-2011	10-2012
99623	Power Supply	EA	PS 2016-050	12-2011	12-2012
99699	Measuring receiver	R&S	ESCI	02-2012	02-2013
99733	Spectrum Analyzer	R&S	FSV30	06-2012	06-2013

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:
d1 = short distance
d2 = long distance
So: (d1/d2)^n = Hd2/Hd1

n log(d1/d2) = log(Hd2/Hd1)

Calculation of n: n = log(Hd2/Hd1) / log(d1/d2)

Calculation of field strength at 300m:
Hd2 = Hd1 (d1/d2)^n

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

d1= 3m Hd1=105.4 dBµV/m= 186208 µV/m
d2= 10m Hd2=74.1 dBµV/m= 5070 µV/m
Calculation for n: n= log(Hd2/Hd1) / log(d1/d2) > n=log(5070/ 186208) / log(3m/10m) > n=2.99

Hd2 = Hd1 (d1/d2)^n Hd2 = 186208 (3/300)^2.99 = 0.19 µV/m = -14.4 dBµV/m

The extrapolation factor between 3 and 300 m is thus: 105.4 – (-14.4) = 119.8 dB