TEST REPORT CONCERNING THE COMPLIANCE OF A 134.2 kHz INDUCTIVE PROXIMITY TAG READER, BRAND Nedap, MODEL VP1103 WITH 47 CFR PART 15 (10-1-09) AND THE REQUIREMENTS OF INDUSTRY CANADA: RSS-GEN (ISSUE 3, DECEMBER 2010) AND RSS-210 (ISSUE 8, DECEMBER 2010).

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VCCI Registered : R-1518, C-1598
R&TTE, LVD, EMC Notified Body : 1856

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MEASUREMENT/TECHNICAL REPORT

N.V. Nederlandsche Apparatenfabriek "Nedap"
Model: VP1103

FCC ID: CGDVP1103
IC: 1444A-VP1103

This report concerns:	Original grant/certification ~~Class 2 change Verification~~
Equipment type:	134.2 kHz Inductive RFID tag 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, 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: December 13, 2011

Signature:

O. Hoekstra
Senior 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	:	Inductive RFID tag reader, operating on 134.2 kHz
Manufacturer	:	N.V. Nederlandsche Apparatenfabriek "Nedap"
Brand	:	Nedap
Model(s)	:	VP1103
Serial number(s)	:	B106 0001
FCC ID	:	CGDVP1103
IC	:	1444A-VP1103

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	:	Niekerk
Test(s) started	:	January 12, 2011
Test(s) completed	:	March 09, 2011
Purpose of test(s)	:	Equipment Authorization (Original grant/certification)
Test specification(s)	:	47 CFR Part 15 (10-1-09 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 13, 2011

Table of contents

1 General information.

1.1 Product description.

1.1.1 Introduction.

VP1103 is a module for animals RF detection at a farm with an integrated antenna. The VP1103 is made to read passive tags in or carried by animals. It has one transmitter and two receivers. The first one reads the full duplex tags, the second one the half duplex ones. Full duplex tags transmit the label code with AM modulation at the same frequency as the transmitter, in this case 134.2 kHz. The half duplex tags send their information with help of FSK modulation in the 118 – 140 kHz band.

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 FCC ID: CGDVP1103 and IC: 1444A-VP1103.

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.

EUT1	:	Inductive RFID card reader operating at 134.2 kHz
Manufacturer	:	N.V. Nederlandsche Apparatenfabriek "Nedap"
Brand	:	Nedap
Model	:	VP1103
Serial number	:	B106 0001
Voltage input rating	:	12 - 48 Vdc
Voltage output rating	:	--
Current input rating	:	not provided
Antenna	:	Internal
Remarks	:	--

AUX1	:	Inductive RFID card reader operating at 134.2 kHz
Manufacturer	:	N.V. Nederlandsche Apparatenfabriek "Nedap"
Brand	:	Nedap
Model	:	VP1850
Serial number	:	B110 0001
Voltage input rating	:	12 - 48 Vdc
Voltage output rating	:	--
Remark	:	

AUX2a	:	Power Supply
Manufacturer	:	Deutronic
Brand	:	Deutronic
Model	:	ESC15C-12
Serial number	:	--
Voltage input rating	:	100 – 240 Vac, 0.4A, 47 – 63 Hz
Voltage output rating	:	12 Vdc, 1.1 A
Remark	:	both AUX2a and AUX2b were used during testing

AUX2b	:	Power Supply
Manufacturer	:	UE
Brand	:	UE
Model	:	UE15WCP-1201255SPA
Serial number	:	--
Voltage input rating	:	100 – 240 Vac, 0.4A, 50 – 60 Hz
Voltage output rating	:	12 Vdc, 1.25 A
Remark	:	both AUX2a and AUX2b were used during testing
AUX3	:	Comm cable
Manufacturer	:	N.V. Nederlandsche Apparatenfabriek "Nedap"
Brand	:	Nedap
Model	:	7706987
Serial number	:	B106 0001
Voltage input rating	:	--
Voltage output rating	:	--
Remark	:	--
AUX4	:	Notebook Computer
Manufacturer	:	HP
Brand	:	HP
Model	:	Compaq nc4400
Serial number	:	CND70920R5
Voltage input rating	:	18.5 Vdc
Voltage output rating	:	--
Remark	:	Property N.V. Nederlandsche Apparatenfabriek "Nedap"
EUT6	:	Power supply
Manufacturer	:	HP
Brand	:	HP
Model	:	463552-002
Serial number	:	F3-08101006860B
Voltage input rating	:	100 – 240Vac, 1.7A
Voltage output rating	:	18.5Vdc, 3.5A
Remark	:	provides power to AUX4

1.4 Test Summary

The EUT was tested in accordance with the specifications given in the table 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	14	Pass
15.209	RSS-Gen(4.9 and 7.2.5) and RSS-210(2.5)	Radiated emissions	11 - 13	Pass
15.215(c)	RSS-Gen(4.6.1)	Occupied bandwidth	15	Pass

Table : testspecifications

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

1.4.1 Description of input and output ports.

Number	Terminal	From	To	Remarks	
1	Mains	Mains	AUX2a/b	Shielded cable	
2	DC Power	AUX2a/b	AUX3	Shielded cable	
3	DC Power + comms	AUX3	EUT1	Shielded cable	
4	DC Power + comms	AUX3	AUX1	Shielded cable	
5	Antenna Sync	EUT1	AUX1	Shielded cable	
6	LAN/RS232	AUX3	AUX4	Shielded cable	

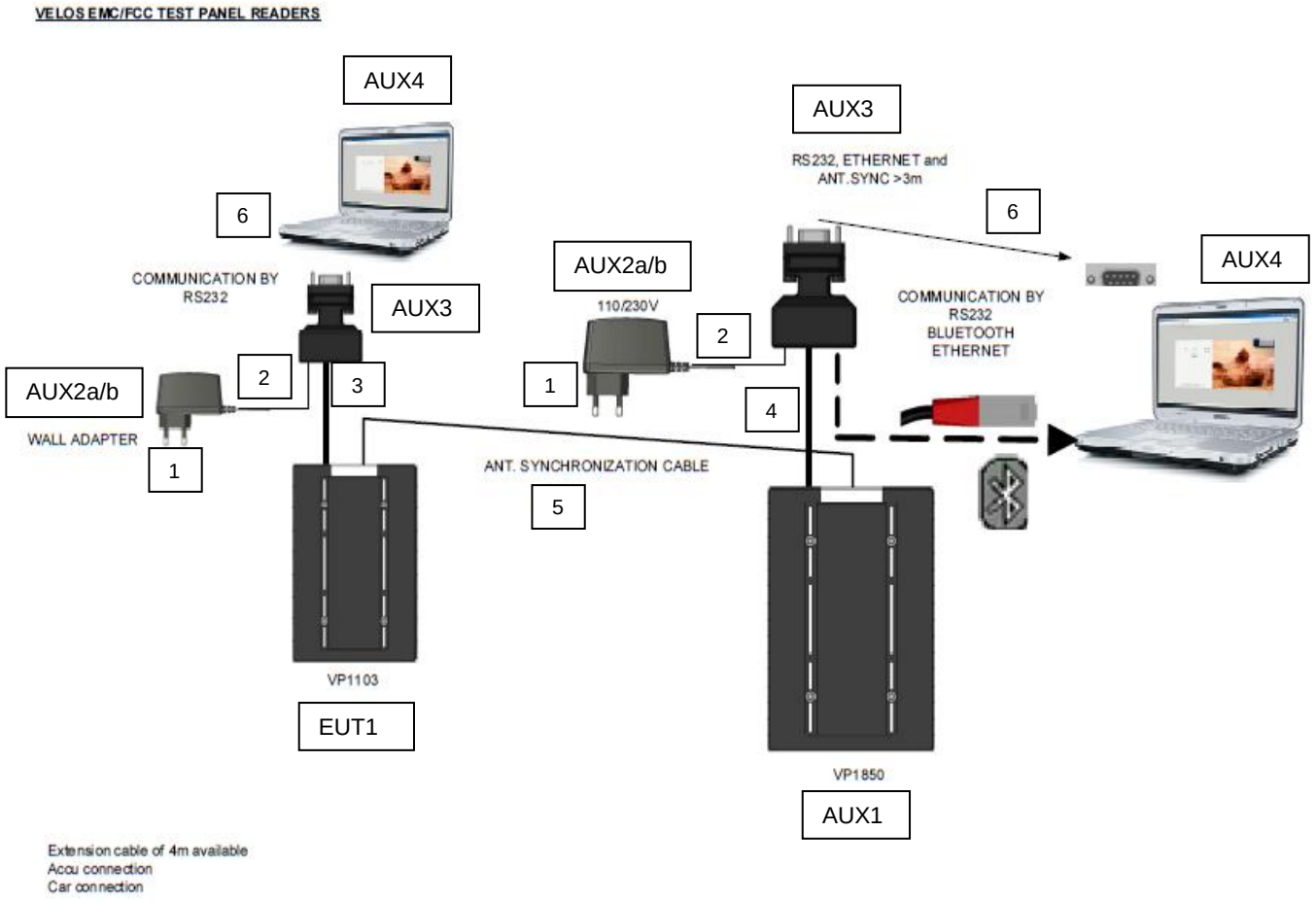


Figure 1. Basic set-up

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, 15.207 and 15.209, 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 and 10 meters. To calculate the field strength level from these results to the appropriate distance at which the limit is specified, the calculation on Appendix 1 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	: 120VAC/60Hz to the AC/DC Power Supply – the DC output was varied across the voltage range specified by the manufacturer
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 both passive, i.e. the EUT is ready to detect a tag and active mode i.e. the EUT is reading a tag. To assess the behavior of the EUT while reading the tag, the EUT is tested with a tag presented such that it continuously reads the tag. The intentional radiator tests 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.

No modifications have been made to the equipment in order to achieve compliance.

2.5 Product Labelling

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
45.75	19.9	19.0	11.1	31.0	30.1	40	Pass
139.03	13.3	12.8	14.0	27.3	26.8	43.5	Pass
182.0	16.5	15.5	12.1	28.6	27.6	43.5	Pass
218.47	13.6	13.0	12.9	26.5	25.9	46	Pass
232.8	6.3	6.0	14.3	20.6	20.3	46	Pass
240.04	7.5	7.0	15.2	22.7	22.2	46	Pass
256.36	7.1	7.0	16.6	23.7	23.6	46	Pass
288.05	7.2	7.0	17.4	24.6	24.4	46	Pass
300.0	12.1	12.0	17.7	29.8	29.7	46	Pass
400.0	3.4	3.3	21.4	24.8	24.7	46	Pass
500.0	2.2	2.2	24.4	26.6	26.6	46	Pass

Table 1 Radiated emissions of the EUT

The results of the radiated emission tests, carried out in accordance with 47 CFR Part 15 section 15.209, RSS-210 and RSS-Gen with the EUT operating on 134.2 kHz are depicted in Table 1. 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. 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 reported field strength values are the worst case values at the indicated frequency. The EUT was varied in three positions, the antenna was varied in horizontal and vertical orientations and also in height (between 1m and 4m).
4. A Quasi-peak detector was used with a resolution bandwidth of 120 kHz.
5. The EUT was tested in both passive mode (i.e. without a tag in its proximity) and in activated mode (i.e. with a tag in its proximity). Maximum values have been noted.
6. Measurements were performed up to 1350 MHz.

Used test equipment and ancillaries:

99069	99070	99071	99107	99608	99609	99699	99547	15453
99580								

Test engineer

Signature : 

Name : Richard van der Meer
Date : January 12, 2011

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

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	46.9	Pk	20.1	1	80	-12.5 @300m	39.0 @300m
0.4026	52.4	Pk	20.0	1	80	-6.6 @300m	35.5 @300m
0.5368	24.8	Qp	20.0	1	40	5.8	33.0
0.8052	23.5	Qp	20.0	1	40	4.5	29.5
0.9394	22.6	Qp	20.0	1	40	3.6	28.2
1.0736	22.6	Qp	20.0	1	40	3.6	27.0
1.2078	21.2	Qp	19.7	1	40	1.9	26.0
1.3420	20.8	Qp	19.7	1	40	1.5	25.1
6.164	45.1	Qp	19.5	1	40	25.6	40.0
13.441	41.3	Qp	19.6	1	40	21.9	40.0
15.836	33.9	Qp	19.7	1	40	14.6	40.0
21.577	41.6	Qp	20.0	1	40	22.6	40.0

Table 2a Radiated emissions of the EUT, Peak- and Quasi peak values

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	108.3	80.0	Pk	20.1	1	n.a.	129.4	101.1	21.15	45.05

Table 2b Emissions of the fundamental of the EUT

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

Frequency (MHz)	Measurement results Peak	Correction Factor	Average value	Limits Average
	dBµV/m @300m	dB	dBµV/m @300m	dBµV/m @300m
0.1342	21.15	0.0	21.15	25.05
0.2684	-3.3	0.0	-3.3	19.0
0.4026	-3.9	0.0	-3.9	15.5

Table 2c Radiated 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 = 100 msec.

Where TPeriod is the total time of one pulse period, TPeriod = 104 msec

Period time exceeds 100msec, the Correction factor in that case:

Cf= 20 log (100/100)= 0.0 dB

Note: TON time varies between 70msec and 100 msec, depending on the quality of reception and the distance between the EUT and the tag. In a worst case situation the TON time will be 100msec, while the total time remains 104 msec.

The results of the radiated emission tests, 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 Table 2a,2b & 2c. The fundamental emissions levels from Table 2b are measured from the EUT alone, so without the other transmitter (AUX1) present, so not to influence the emissions from the EUT. The different testsetups from Table 2a and Table 2b can be found in the Test Set-up Photographs document.

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 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 it's 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

Used test equipment and ancillaries:

99069	99070	99107	99120	15453	99608	99609	99699	99547
99580								

Test engineer

Signature : 

Name : R. van der Meer

Date : March 09, 2011

4 Conducted emission data.

4.1 Conducted emission data of the EUT

Frequency (MHz)	Measurement results dB(µV) Neutral		Measurement results dB(µV) Line 1		Limits dB(µV)		Result
	QP	AV	QP	AV	QP	AV	
0.490	46.8	41.0	46.7	40.0	56.2	46.2	PASS
0.570	49.8	45.9	51.8	46.0	56	46	PASS
0.620	51.8	42.9	50.3	42.8	46	46	PASS
0.970	46.8	36.1	47.8	36.0	56	46	PASS
1.370	43.0	31.9	42.8	31.8	56	46	PASS
1.705	44.2	36.1	46.4	36.7	56	46	PASS
2.360	47.8	38.5	48.0	39.5	56	46	PASS
11.37	37.8	31.1	36.0	30.1	60	50	PASS
12.205	37.8	32.3	39.2	33.3	60	50	PASS

Table 3 Conducted emission measurements

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 power supply which was connected to the EUT, are depicted in Table 3. The EUT was tested in both passive and active mode (while detecting a card). Maximum values 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. Tested with both power supplies (AUX2a and AUX2b), maximum values noted.

Used test equipment and ancillaries:

99548	99161	12512	15667	13313		

Test engineer

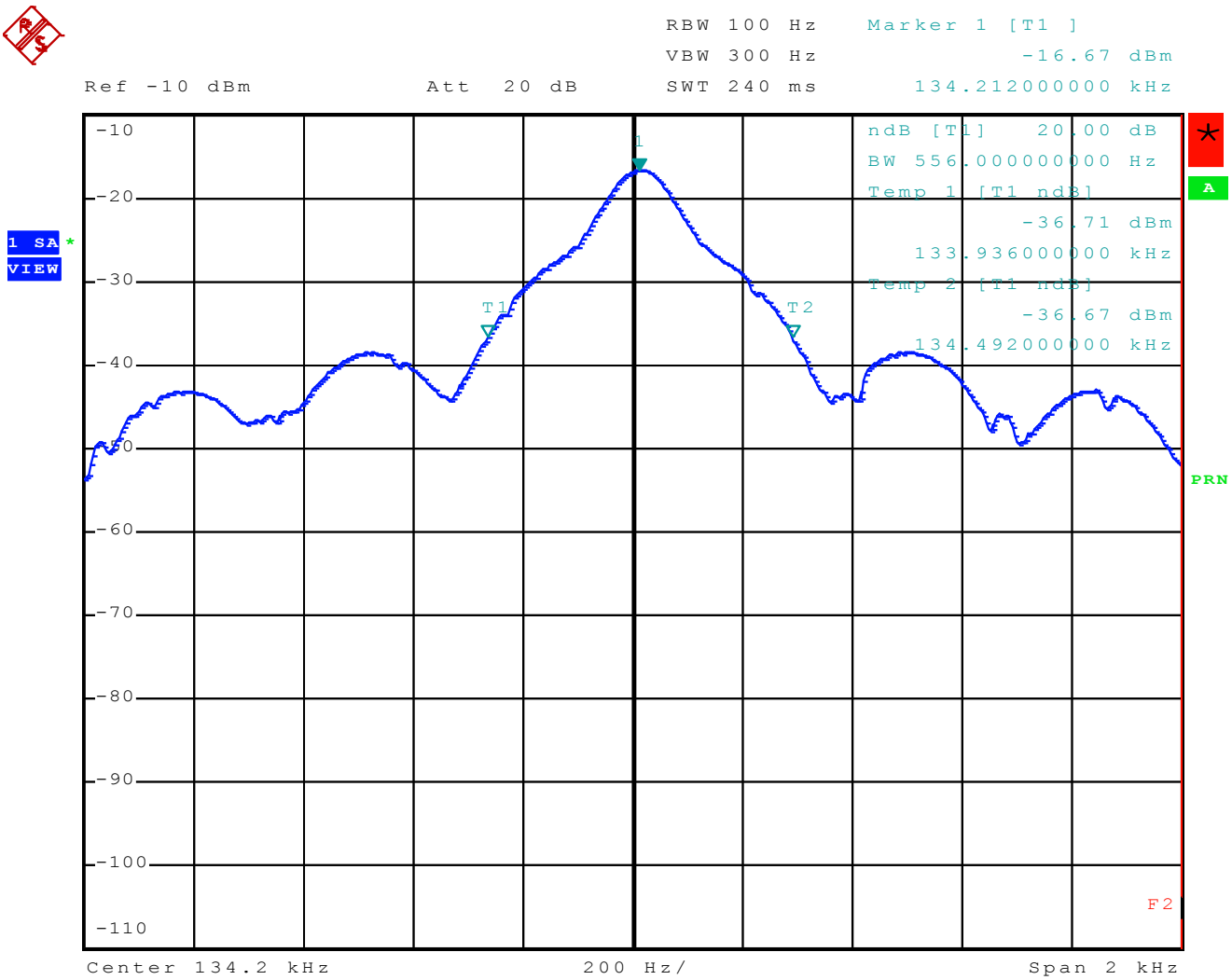
Signature : 

Name : R. van der Meer

Date : March 03, 2011

5 Plots of the emissions

The plot below shows compliance with the 47 CFR Part 15 section 15.215(c), this section requires the 20 dB emission bandwidth is within the frequencyband designated.



Plot : Occupied bandwidth is 556.0 Hz, measured on a spectrum analyzer

6 List of utilized test equipment.

Inventory number	Description	Brand	Model	Last cal.	Next cal.
12512	LISN	EMCO	3625/2	01/2010	01/2012
13313	Pulse Limiter	R&S	ESH3-Z2	02/2011	02/2012
15453	Active loopant. 60 cm	Chase	HLA6120	05/2010	05/2011
15633	Biconilog Testantenna	Chase	CBL 6111B	02/2011	02/2012
15667	Measuring receiver	R&S	ESCS30	06/2010	06/2011
99069	Coax 5m RG213 OATS	NMi Certin B.V.	KABEL 5M OATS	10/2010	10/2011
99070	Coax 15m RG213 OATS	NMi Certin B.V.	KABEL 15M OATS	10/2010	10/2011
99071	Coax OATS ground	NMi Certin B.V.	KABEL GROND OATS	10/2010	10/2011
99107	Controller OATS	Heinrich Deisel	4630-100	NA	NA
99161	Variac 250V 6A	RFT	LTS006	NA	NA
99547	Temperature-Humiditymeter	Europe supplies	WS-7082	10/2010	10/2011
99580	OATS	Comtest	FCC listed: 90828	08/2008	08/2011
99608	Controller (OATS)	EMCS	DOC202	NA	NA
99609	Antenna mast	EMCS	AP-4702C	NA	NA
99613	Temperature-Humiditymeter	Europe supplies	WS-7082	10/2010	10/2011
99699	Measuring receiver	R&S	ESCI	02/2011	02/2012
99721	GSM Basestation emulator	Willtek	2201 ProLock	NA	NA
12476	Antenna mast	EMCO	TR3	NA	NA
12477	Antenna mast 1-4 mtr	Poelstra	NA	NA	NA
99608	Controller (OATS)	EMCS	DOC202	NA	NA
99609	Antenna mast	EMCS	AP-4702C	NA	NA
99651	Variac	NA	Vast Activa: 08-9510	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:

d1= 3m Hd1=129.4 dBµV/m=2951209 µV/m
d2= 10m Hd2=101.1 dBµV/m= 113501 µV/m
Calculation for n: $n= \log(H_{d2}/H_{d1}) / \log(d_1/d_2)$ > n=log(113501 / 2951209)/ log(3m/10m) > n=2.706172
$H_{d2} = H_{d1} (d_1/d_2)^n$ > $H_{d2} = 2951209 (3/300)^{2.706172}$ = 21.15 dBµV/m.