



**TEST REPORT CONCERNING THE COMPLIANCE OF A
DIGITAL TRANSMISSION SYSTEM OPERATING IN THE
FREQUENCYRANGE 2401 – 2483 MHZ,
BRAND NEDAP, MODEL CONTROL UNIT
WITH 47 CFR PART 15 (JULY 10, 2008).**

FCC listed : 90828
Industry Canada : 2932G-1
VCCI Registered : R-1518, C-1598
R&TTE, LVD, EMC Notified Body : 1856

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MEASUREMENT/TECHNICAL REPORT

Nedap Light Controls
Model : Control Unit

FCC ID: CGD-SF-CU

August 26, 2009

This report concerns:		Original grant/certification	Class 2 change	Verification
Equipment type:		Digital Transmission System		
Deferred grant requested per 47 CFR 0.457(d)(1)(ii) ?		Yes	No	n.a.
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The data taken for this test and report herein was done in accordance with 47 CFR Part 15 (july 10, 2008) and the measurement procedures of ANSI C63.4-2003. 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: August 26, 2009

Signature:



O. Hoekstra
 Senior Engineer Telecom TÜV Rheinland EPS B.V.

Description of test item

Test item : Digital Transmission System operating in the range 2401-2483 MHz
Manufacturer : Nedap Light Controls
(division of N.V. Nederlandsche Apparatenfabriek "Nedap")
Brand : Nedap
Model(s) : Control Unit
Serial number(s) : n.a. (but ID= EA7C)
Revision : n.a.

Applicant information

Applicant's representative : Mr. R. Hogenkamp
Company : Nedap Light Controls
Address : Parallelweg 2
Postal code : 7141 DC
City : Groenlo
Country : The Netherlands
Telephone number : +31 544 471 444
Telefax number : +31 544 466 839

Test(s) performed

Location : Niekerk
Test(s) started : April 22, 2009
Test(s) completed : May 25, 2009
Purpose of test(s) : Equipment Authorization (Original grant/certification)
Test specification(s) : 47 CFR Part 15 (July 10, 2008)

Test engineer(s) : R. van der Meer



Report written by : R. van der Meer



Report date : August 26, 2009

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The test results relate only to the item(s) tested.

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1 General information.

1.1 Product description.

The brand Nedap , model Control Unit (hereafter referred to as EUT), is used to control the SenzaFil system and is designed to operate in the 2.4 GHz frequency band (2401 MHz to 2483 MHz). SenzaFil is a new generation of lighting systems featuring innovative technology that makes it possible to create and control any lighting situation from a distance (wireless). The SenzaFil systems consists of three components: Lampdriver, Control Unit and USB key (for computer/laptop).

1.1.1 Introduction.

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: **CGD-SF-CU**.

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	:	Digital Transmission System
Manufacturer	:	Nedap Light Controls
Brand	:	Nedap
Model	:	Control Unit
Serial number	:	N.a.
Voltage input rating	:	24Vdc \pm 2%
Voltage output rating	:	--
Current input rating	:	not provided
Antenna	:	Internal
Remarks	:	ID=
Auxiliary equipment (AUX1)	:	Power Supply Adapter
Manufacturer	:	ELJINTEK
Brand	:	MEAN WELL
Model(s)	:	GPSU15E-6
Serial number	:	n.a.
Voltage input rating	:	100 – 240Vac 50/60Hz 0.5A
Voltage output rating	:	24Vdc 0.62A, 15W max.
Remark	:	used as a power supply for EUT1
Auxiliary equipment 2 (AUX2)	:	Notebook computer
Brand	:	Hewlett-Packard
Model	:	compaq nc8000
Serial number	:	CNU 435 FBKD
Voltage input rating	:	18.5 Vdc
Current input rating	:	3.50 A

Auxiliary equipment 3 (AUX3) :	AC Adaptor
Brand :	Hewlett-Packard
Series :	PPP012HA
Voltage input rating :	100 - 240 Vac
Current input rating :	1.5 A
Voltage output rating :	18.5 Vdc
Current output rating :	4.9A
Auxiliary equipment 4 (AUX4) :	USB key
Manufacturer :	Nedap Light Controls
Brand :	Nedap
Series :	Senzafil USB key
Voltage input rating :	5Vdc
Current input rating :	--
Voltage output rating :	--
Current output rating :	--
Remarks " :	Used to program EUT

The 'PC ControlUnit V2.4.2' software (as installed on AUX3) is used to program the operating frequency of the Control Unit. AUX2, AUX3 and AUX4 were used only to program the operating frequency and once set these three auxiliary items were removed from the test-setup and the EUT operates on it's own. Once the Control Unit is set for frequency it can be set to continues transmit by means of a switch. The switch for "Cont. TX" and the switch for "NORM/CONT" are for testing purposes only and are normally not fitted.

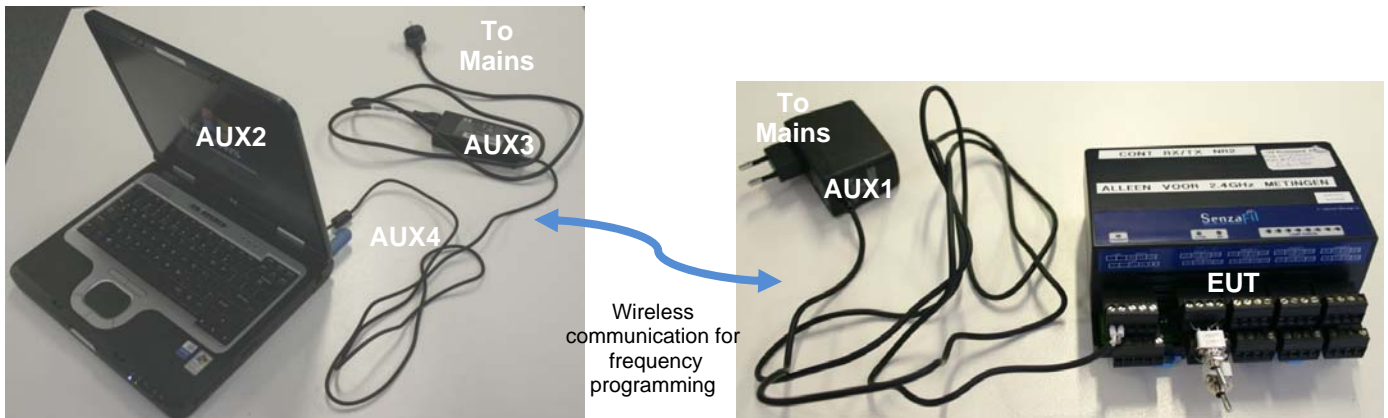


Photo 1: basic setup for frequency programming

1.3.1 Description of input and output ports.

Number	Terminal	From	To	Remarks
1	Mains	Mains	Power supply (AUX1)	Shielded cable
2	24Vdc	AUX1	EUT	Shielded cable

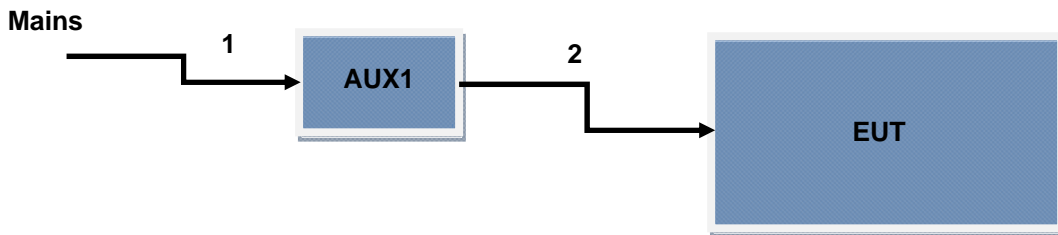


Figure 1. Basic set-up

1.4 Test methodology.

The test methodology used is based on the requirements of 47 CFR Part 15 (July 10, 2008), sections 15.31, 15.207, 15.209 and 15.249.

The test methods, which have been used, are based on ANSI C63.4: 2003.

Radiated emission tests above 30 MHz were performed at a measurement distance of 3 meters.
Radiated emission tests below 30 MHz were performed at a measurement distance of 3 meters.

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.

1.5 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, per October 23, 2000.

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.

1.6 Test conditions.

Normal test conditions:

Temperature (*)	: +15°C to +35°C
Relative humidity(*)	: 20 % to 75 %
Supply voltage	: 115VAC/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 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 fashion (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: 2003.

2.2 EUT mode of operation.

The EUT has been tested in continues transmit mode with a modulated carrier.. The output power was set for maximum output by the applicant. The intentional radiator tests (47 CFR Part 15 sections, 15.207, 15.209 and 15.249) 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 (above 30 MHz, E-field), Av and QP values

3.1.1 Radiated field strength measurements (above 30 MHz, E-field), EUT's TX Frequency 2401 MHz

Frequency (MHz)	Measurement results @3m Vertical (dBuV/m)	Measurement results @3m Horizontal (dBuV/m)	Limits @3m (dBuV/m)	Pass/Fail
30-88	<35	<35	40	pass
88-216	<35	<35	43.5	pass
216-960	<40	<40	46	pass
2401.0 (fundamental)	69.0	69.1	94	pass
3607.5	45.2	45.2	54	pass
4807.5	50.7	50.6	54	pass
7215.0	50.4	50.7	54	pass
9615.0	45.2	45.2	54	pass

Table 1a

3.1.2 Radiated field strength measurements (above 30 MHz, E-field), EUT's TX Frequency 2450 MHz

Frequency (MHz)	Measurement results @3m Vertical (dBuV/m)	Measurement results @3m Horizontal (dBuV/m)	Limits @3m (dBuV/m)	Pass/Fail
30-88	<35	<35	40	pass
88-216	<35	<35	43.5	pass
216-960	<40	<40	46	pass
2450.0 (fundamental)	68.0	68.9	94	pass
3682.5	45.2	45.2	54	pass
4905.0	49.6	49.6	54	pass
7365.0	50.3	50.0	54	pass
9810.0	51.8	52.7	54	pass

Table 2b

3.1.3 Radiated field strength measurements (above 30 MHz, E-field), EUT's TX Frequency 2483 MHz

Frequency (MHz)	Measurement results @3m Vertical (dBuV/m)	Measurement results @3m Horizontal (dBuV/m)	Limits @3m (dBuV/m)	Pass/Fail
30-88	<35	<35	40	pass
88-216	<35	<35	43.5	pass
216-960	<40	<40	46	pass
2483.0 (fundamental)	68.0	68.7	94	pass
3735.0	45.2	45.2	54	pass
4972.5	45.2	47.6	54	pass
7455.0	50.2	50	54	pass
9945.0	50	49	54	pass


Table 3c

Radiated emissions of the EUT. The results of the radiated emission tests, carried out in accordance with 47 CFR Part 15 section 15.209 and 15.249 with the EUT operating in continuous transmit mode (Cont. TX) are depicted in table 1a, 1b and 1c.

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 ± 5.0 dB
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. The EUT was tested in on the lowest frequency (2401 MHz), a middle frequency (2450 MHz) and the highest frequency (2483 MHz) in the 2401 – 2483 MHz band wherein it operates.
5. A Quasi-peak detector was used with a resolution bandwidth of 120 kHz, except for frequencies above 960 MHz where an average detector was used.

Test engineer

Signature : 

Name : Richard van der Meer

Date : April 24, 2009

3.2 Radiated field strength measurements (above 30 MHz, E-field), Peak values

3.2.1 Radiated field strength measurements (above 30 MHz, E-field), EUT's TX Frequency 2401 MHz

Frequency (MHz)	Measurement results @3m Vertical (dBuV/m)	Measurement results @3m Horizontal (dBuV/m)	Detector	Resolution Bandwidth (kHz)	Limits @3m (dBuV/m)	Pass/Fail
2401.0 (fundamental)	69.0	69.1	Peak	1000	114	pass
3607.5	45.2	45.2	Peak	1000	74	pass
4807.5	53.7	56.9	Peak	1000	74	pass
7215.0	52.4	50.7	Peak	1000	74	pass
9615.0	45.2	45.2	Peak	1000	74	pass

Table 4d

3.2.2 Radiated field strength measurements (above 30 MHz, E-field), EUT's TX Frequency 2450 MHz

Frequency (MHz)	Measurement results @3m Vertical (dBuV/m)	Measurement results @3m Horizontal (dBuV/m)	Detector	Resolution Bandwidth (kHz)	Limits @3m (dBuV/m)	Pass/Fail
2450.0 (fundamental)	68.0	68.9	Peak	1000	114	pass
3682.5	45.2	45.2	Peak	1000	74	pass
4905.0	51.6	53.4	Peak	1000	74	pass
7365.0	52.3	54.1	Peak	1000	74	pass
9810.0	51.8	54.1	Peak	1000	74	pass

Table 5e

3.2.3 Radiated field strength measurements (above 30 MHz, E-field), EUT's TX Frequency 2483 MHz

Frequency (MHz)	Measurement results @3m Vertical (dBuV/m)	Measurement results @3m Horizontal (dBuV/m)	Detector	Resolution Bandwidth (kHz)	Limits @3m (dBuV/m)	Pass/Fail
2483.0 (fundamental)	68	68.7	Peak	1000	114	pass
3735.0	45	45	Peak	1000	74	pass
4972.5	47	47.6	Peak	1000	74	pass
7455.0	58.3	55.7	Peak	1000	74	pass
9945.0	50	51	Peak	1000	74	pass

Table 6f

Radiated emissions of the EUT. The results of the radiated emission tests, carried out in accordance with 47 CFR Part 15 section 15.209 and 15.249 with the EUT operating in continuous transmit mode (Cont. TX) are depicted in table 1d, 1e and 1f.

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 ± 5.0 dB
- 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).
- The EUT was tested in on the lowest frequency (2401 MHz), a middle frequency (2450 MHz) and the highest frequency (2483 MHz) in the 2401 – 2483 MHz band wherein it operates.

Test engineer

Signature :



Name : Richard van der Meer

Date : April 24, 2009

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

Frequency (MHz)	Measurement results (dB μ V)		Antenna factor (dB)	Cable loss (dB)	Measurement results (calculated) (dB(μ V)/m)	Limits Part 15.209
	3 meters	10 meters				dB(μ V)/m
0.009 - 0.490	<20	n.i	20.1	1	n.i	48.5 – 13.8 (300 m)
0.490 - 1.705	<20	n.i.	19.7	1	n.i	33.8 - 22.9 (30 m)
1.705 – 30.0	<40	n.i	19.5	1	<21	29.5 (30 m)

Table 2

Radiated emissions of the EUT. The results of the radiated emission tests, carried out in accordance with 47 CFR Part 15 section 15.209 and 15.249 with the EUT operating in continuous transmit mode are depicted in table 2.

Notes:

1. Calculated measurement results are obtained by using the 40 dB/decade correction factor and the antenna factor and cable loss is included.
2. Frequency range:
 except for a. and b. below a Quasi-Peak detector was used during testing.
 - a. 9- 90 kHz Average detector used during measurements
 - b. 110-490 kHz Average detector used during measurements
3. A resolution bandwidth of 9kHz was used during testing
4. n.i. Indicates that no field strength values could be measured on the listed frequencies or in the listed frequency range.
5. Field strength values of radiated emissions at frequencies not listed in table 2 are more than 20 dB below the applicable limit
6. 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.
7. The EUT was tested in on the lowest frequency (2401 MHz), a middle frequency (2450 MHz) and the highest frequency (2483 MHz) in the 2401 – 2483 MHz band wherein it operates.
8. Measurement uncertainty is ± 5.0 dB

Test engineer

Signature : 

Name : R. van der Meer

Date : April 24, 2009

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	
0.150 – 0.160	35	18	34	17	66	56	PASS
0.169	45	35	46	33	65	55	PASS
0.205	43	28	43	28	63.2	53.2	PASS
4.71	28	21	28	21	56	46	PASS

Table 7

Conducted emission measurements. The results of the conducted emission tests, carried out in accordance with 47 CFR Part 15 section 15.207, at the 115 Volts AC mains connection terminals of the AC/DC power supply which was connected to the EUT, are depicted in table 7. Maximum values recorded.

Notes:

1. Measurement uncertainty is ± 3.5 dB
2. The resolution bandwidth used was 9 kHz
3. The EUT was tested in on the lowest frequency (2401 MHz), a middle frequency (2450 MHz) and the highest frequency (2483 MHz) in the 2401 – 2483 MHz band wherein it operates.
4. Values of conducted emissions at frequencies not listed in table 7 are more than 20 dB below the applicable limit

Test engineer

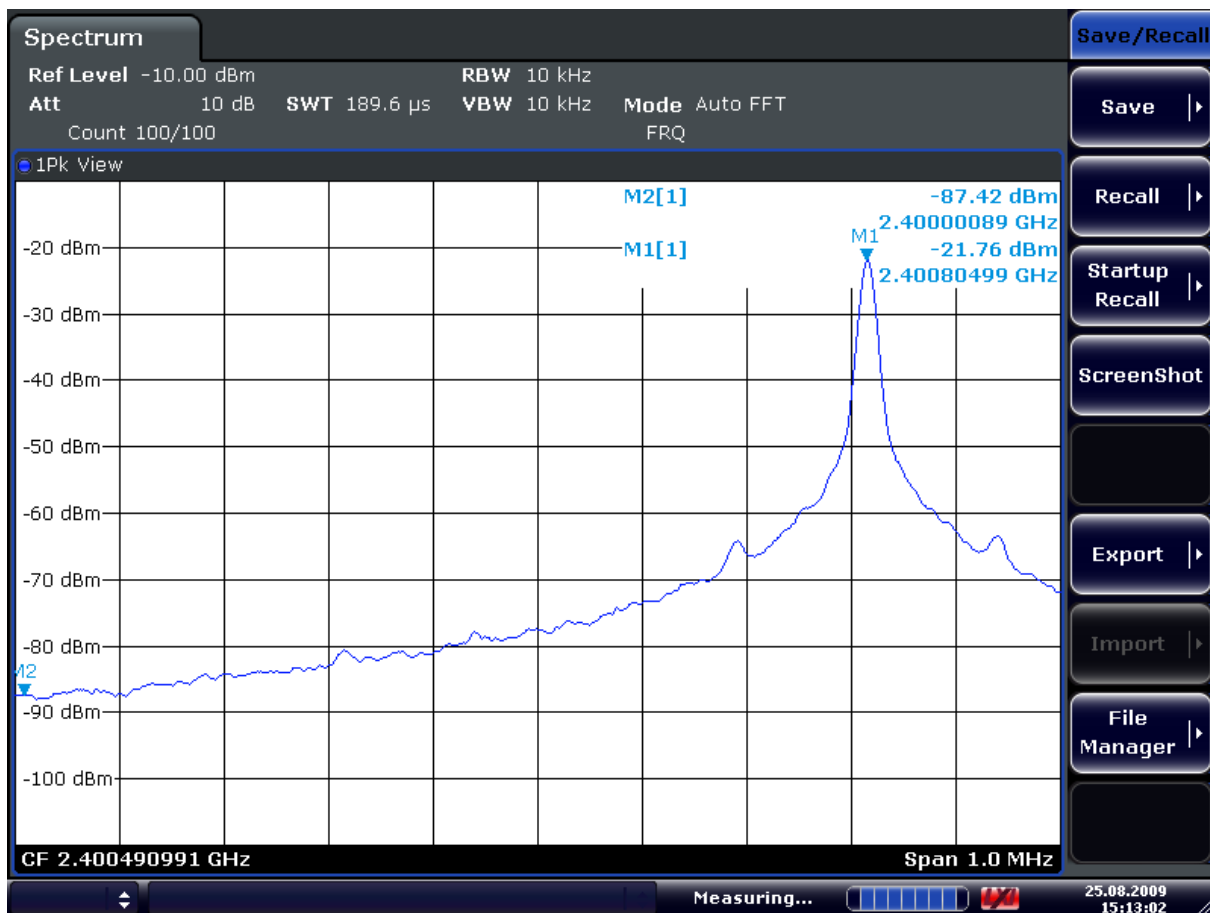
Signature : 

Name : R. van der Meer

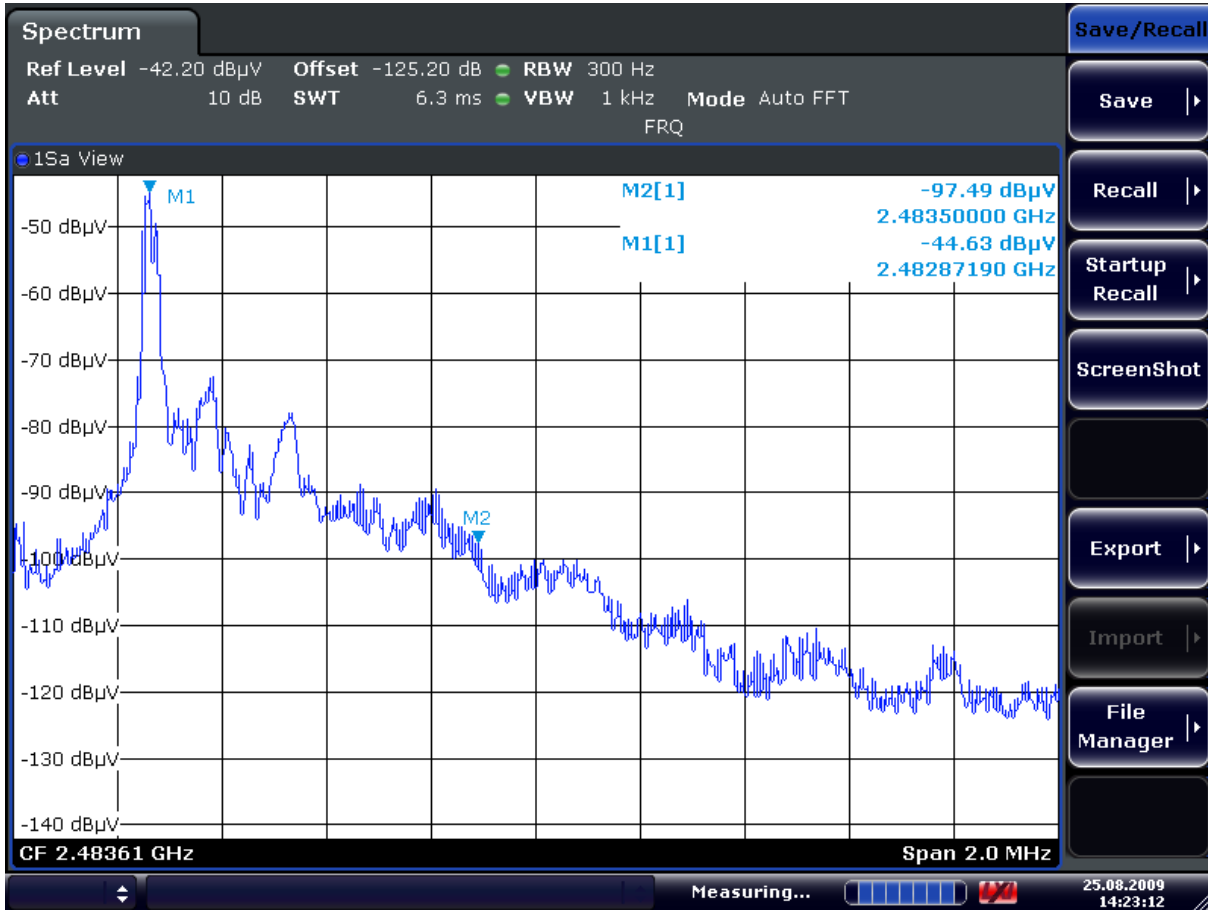
Date : May 22, 2009

5 Emissions at the band edges

The plots below show compliance with the 47 CFR Part 15 section 15.209(d), this section requires the emissions at the 2400 and 2483.5 MHz band edges to be attenuated by at least 50 dB below the level of the fundamental or to the general radiated emission limits in section 15.209, whichever is the lower attenuation.



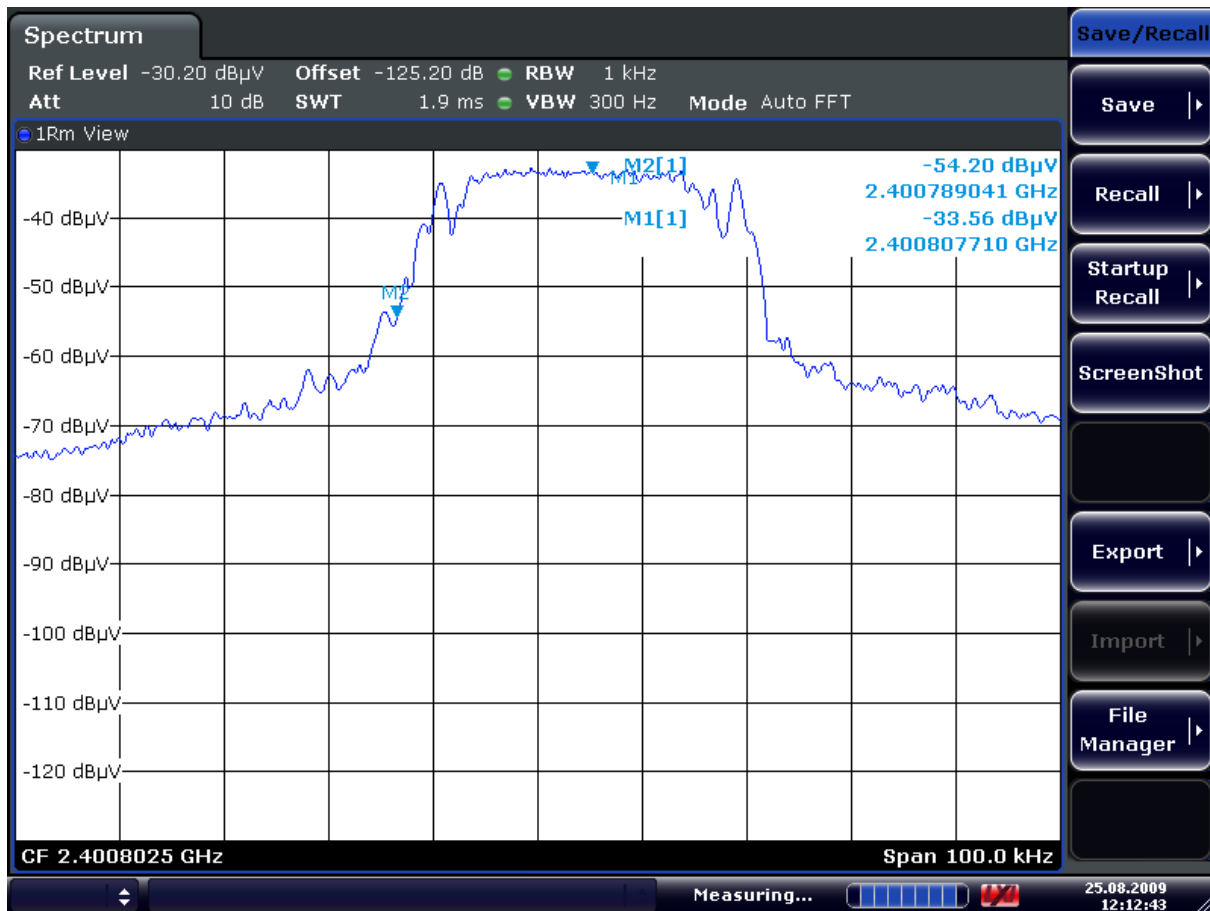
Plot of the lower band edge



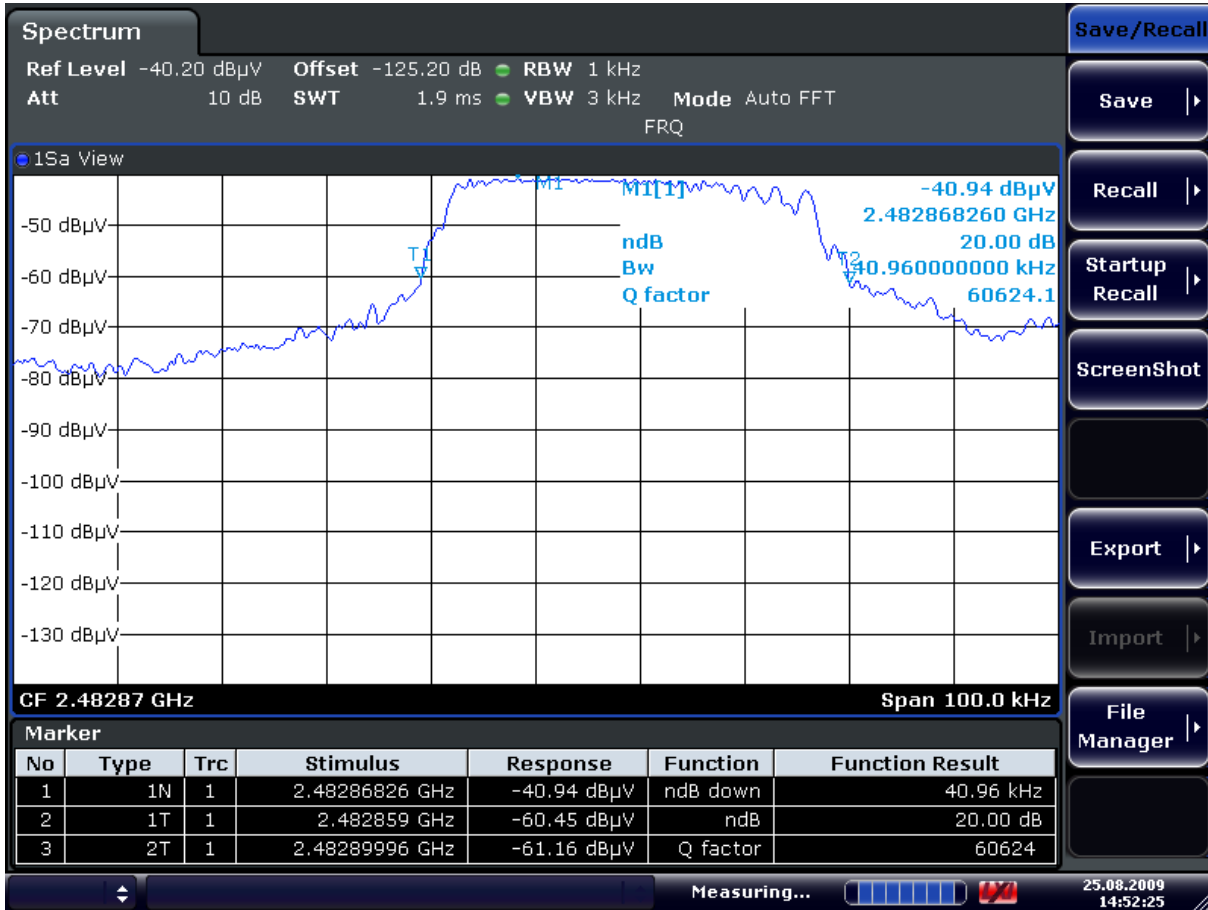
Plot of the higher band edge

6 Bandwidth of the emission

The plots below show compliance with the 47 CFR Part 15 section 15.215(c), this section requires the 20 dB emission bandwidth is within the frequencyband designated in section 15.249.



Plot lowest channel



Plot highest channel

7 List of utilized test equipment.

Inventory number	Description	Brand	Model	Last cal.	Next cal.
12513	LISN	EMCO	3625/2	01/2008	01/2010
13664	Spectrum analyzer	HP	8593E	09/2008	09/2009
15275	Spectrum analyzer	HP	8594E	10/2008	10/2009
15633	Biconilog Testantenna	Chase	CBL 6111B	02/2009	02/2010
99045	Power supply	Delta	E030-3	04/2009	04/2010
99069	Coax 5m RG213 OATS	NMi Certin B.V.	KABEL 5M OATS	11/2008	11/2009
99070	Coax 15m RG213 OATS	NMi Certin B.V.	KABEL 15M OATS	11/2008	11/2009
99071	Coax OATS ground	NMi Certin B.V.	KABEL GROND OATS	11/2008	11/2009
99107	Controller OATS	Heinrich Deisel	4630-100	NA	NA
99538	Spectrum analyzer	R&S	FSP40	04/2009	04/2010
99547	Temperature-Humiditymeter	Europe supplies	WS-7082	10/2008	10/2009
99552	WLAN software	—	—	NA	NA
99580	OATS	Comtest	FCC listed: 90828	08/2008	08/2011
99580	Open Area testsite	Comtest	NA	09/2006	09/2009
99608	Controller (OATS)	EMCS	DOC202	NA	NA
99609	Antenna mast	EMCS	AP-4702C	NA	NA
99613	Temperature-Humiditymeter	Europe supplies	WS-7082	10/2008	10/2009
99615	Laptop with 99552 WLAN software	IBM	Lenovo 9456-HTG	NA	NA
99651	Variac	NA	Vast Activa: 08-9510	NA	NA
99683	Loop antenna, 6cm	NA	7405-901	9/2008	9/2009
99699	Measuring receiver	R&S	ESCI	11/2008	11/2009
99733	Spectrum Analyzer	R&S	FSV30	05/2009	05/2010

NA= Not Applicable