

RADIO TEST REPORT

1026496-4 Rev. B

RF performance

EQUIPMENT UNDER TEST

Equipment : Medical device for treatment of dropfoot
Type / model : ActiGait System, EXU
Manufacturer : Neurodan A/S
Tested by request of : Neurodan A/S

SUMMARY

The equipment complies with the requirements of the following standards:

47 CFR, Part 15, Subpart B (2010) and Subpart C (2010);

RSS-GEN, Issue 3 (December 2010)

RSS-210, Issue 8 (December 2010)

Industry Canada listed test facility No. IC 2042G-2

Date of issue: June 8, 2012

Tested by:



Stefan Andersson

Approved by:



Niklas Boström

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Revision History

Rev.	Date	Order#	Description
A	2011-03-31	1026496	First release
B	2012-06-08	1026496	Marker delta method for band-edge added

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1 CLIENT INFORMATION

The EUT has been tested by request of

Company: Neurodan A/S
Sofiendalsvej 85
DK-9200 Aalborg SV
Denmark

Name of contact: Eigil Myrholm Nielsen

2 EQUIPMENT UNDER TEST (EUT)

2.1 Identification of the EUT according to the manufacturer/client declaration

Equipment: Medical device for treatment of dropfoot

Type/Model: ActiGait, EXU

Brand name: ActiGait

Serial number: Unmarked

Manufacturer: Neurodan A/S

Frequency range: 2401 MHz (one channel)

Frequency agile or hopping:	☐ Yes	☒ No
Antenna:	☒ Internal antenna	☐ External antenna
Antenna connector:	☒ None, internal antenna	☐ Yes
Antenna gain:	< 0 dBi	
Rating RF output power:	0 dBm	
Duty cycle:	-	
Type of modulation:	MSK	

2.2 Peripheral equipment

Peripheral equipment is defined as equipment needed for correct operation of the EUT during the tests, but not included as a part of the testing and evaluation of the EUT.

Manufacturer / Type	Serial number
Neurodan, ActiGait, ANT	Unmarked

2.3 Test signals

1. Continuous TX with modulation (white noise)
2. Continuous TX without modulation

3 TEST SPECIFICATIONS

3.1 Standards

FCC 47 CFR part 15 (2010) Subpart B – Unintentional radiators

FCC 47 CFR part 15 (2010) Subpart C – Intentional Radiators; §15.249 Operation within the bands 902-928 MHz, 2400 – 2483.5 MHz, 5725 – 5850 MHz and 24.0 – 24.25 GHz

RSS-Gen, Issue 3 (December 2010): General Requirements and Information for the Certification of Radiocommunication Equipment

RSS-210, Issue 8 (December 2010): Low Power Licence-Exempt Radio communication Devices (All Frequency Bands): Category I Equipment.

Measurements methods according to

ANSI C63.4-2009 - Methods of Measurements of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz

and

ANSI C63.10-2009 - Standard for Testing Unlicensed Wireless Devices

3.2 Additions, deviations and exclusions from standards

No deviations or exclusions have been made from standards and accreditation.

3.3 Test facility

Measurements were performed at Intertek Semko AB, located in Stockholm, Sweden

3.4 Test set-up

The EUT was connected to a measuring instrument by cable if not otherwise specified in the report.

3.5 Test conditions

If not additionally specified, the tests were performed under the following environmental conditions:

Parameter	Normal
Supplying voltage, V	3,6
Air temperature, °C	20-25

4 TEST SUMMARY

The results in this report apply only to the tested sample:

Test	FCC Reference	IC Reference	Result
Radiated output power	15.249	RSS-210, A2.9	Pass
Occupied bandwidth	15.215(c)	RSS-GEN, 4.6.1	Pass
Out of band spurious emission, radiated	15.249	RSS-210, A2.9	Pass
Band edge	15.249	RSS-210, A2.9	Pass

NT = Not Tested

NA = Not Applicable

5 RADIATED OUTPUT POWER

Date of test: 2011-02-17

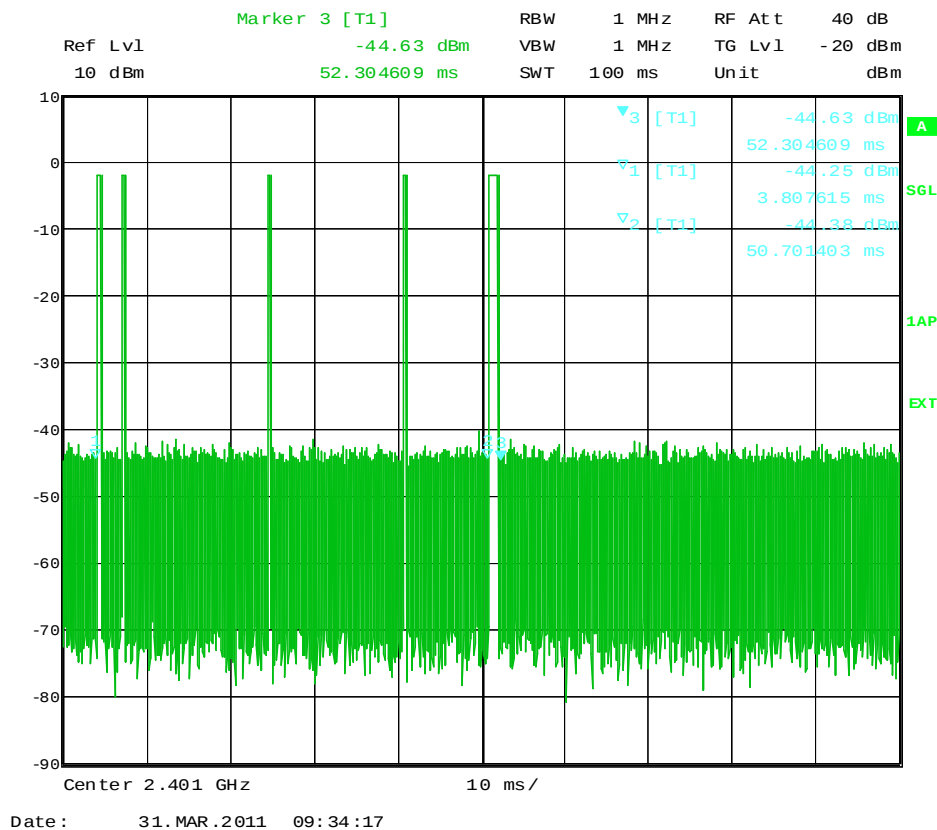
Ambient temperature 21 °C Relative humidity 23 %

5.1 Test protocol

Detector	Radiated Power [dBμV/m]
	2401 MHz
Average	88,5
Peak	96,3

Measurement results are corrected for attenuation in the set-up configuration.

The EUT transmits pulsed emission. Pulse train is 48.5 ms and transmitter on time is less than 5*1.6 ms. This gives an average factor of -7,8 dB.



5.2 Limit

The equivalent isotropic radiated power shall be equal to or less than 94.0 dBμV/m Average and 114.0 dBμV/m Peak.

Fulfil requirements: Yes

6 SPURIOUS EMISSIONS (RADIATED)

Date of test: 2011-01-31

Ambient temperature: 22 °C Relative humidity: 19 %

6.1 Measurement uncertainty

Radiated disturbance electric field intensity, 30 – 1000 MHz: $\pm 4,6$ dB

Radiated disturbance electric field intensity, 1000 – 26000 MHz: $\pm 6,0$ dB

The measurement uncertainty describes the overall uncertainty of the given measured value during operation of the EUT. Measurement uncertainty is calculated in accordance with EA-4/02-1997. The uncertainty is given with a level of confidence of approximately 95% (k=2).

6.2 Test equipment

Equipment	Manufacturer	Type	Inv. No.	Calibration due date
<i>Test site: Semi-anechoic shielded chamber, Stora Hallen</i>			30300	
Software	Rohde & Schwarz	EMC 32		
Measurement receiver	Rohde & Schwarz	ESU 8	12866	2011-06
Measurement receiver	Rohde & Schwarz	ESU 40	13178	2011-07
Antenna, bilog	Chase	CBL6111	8578	2011-09
Preamplifier	Semko	AM1331	7992	2011-07
Cable	Suhner	Sucoflex 104PEA	40035	2011-07
Cable	Suhner	RG214	30224	2011-07
Horn antenna	Rohde & Schwarz	HF907	31245	2013-11
Preamplifier	BONN Elektronik	BLMA 0118-M	31246	2011-07
Cable	Rosenberger	Utiflex FA142A	9747	2011-07
Horn antenna with preamplifier	BONN Elektronik	BLMA 1826-5A	31247	2013-12
Horn antenna with preamplifier	BONN Elektronik	BLMA 2640-5A	31248	2013-12
Cable	Rosenberger	Utiflex FB311A	9748	2011-07
High pass filter	K & L Microwave Inc.	4410-X4500/18000-0	5133	2011-07
Band rejection filter	K & L Microwave Inc.	6N45-2450/T 100-0/0	12389	2011-07

6.3 Measurement set-up

Test site Semi-anechoic shielded chamber

The radiated disturbance electric field intensity was measured in a semi-anechoic chamber at a distance of 3 m and the EUT was placed on a non-metallic table, 0,8 m above the reference ground plane. The specified test mode was enabled. Test set-up photos are given below.

An overview sweep with peak detection of the electric field intensity was performed with the measurement receiver in max-hold and with the antenna placed 1,5 m above the floor. The polarisation was horizontal and vertical. The measurements were repeated with the EUT rotated in 90-degree steps.

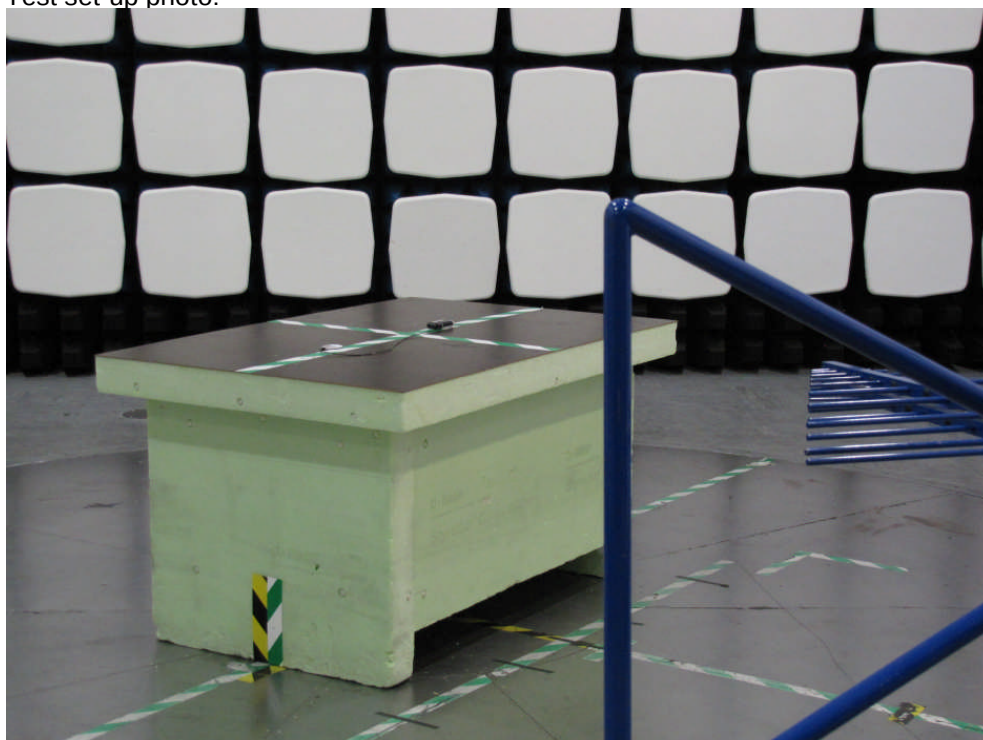
Above 1 GHz the overview sweep was performed in a fully anechoic chamber.

At the frequencies where high disturbance levels were found a search for max disturbance level was performed. With the EUT and antenna in the worst-case configuration new measurements with the correct detector(s) were carried out.

Example calculation

Measured level [dB μ V/m] = Analyser reading [dB μ V] + cable loss [dB] – preamplifier gain [dB] + antenna factor [1/m]

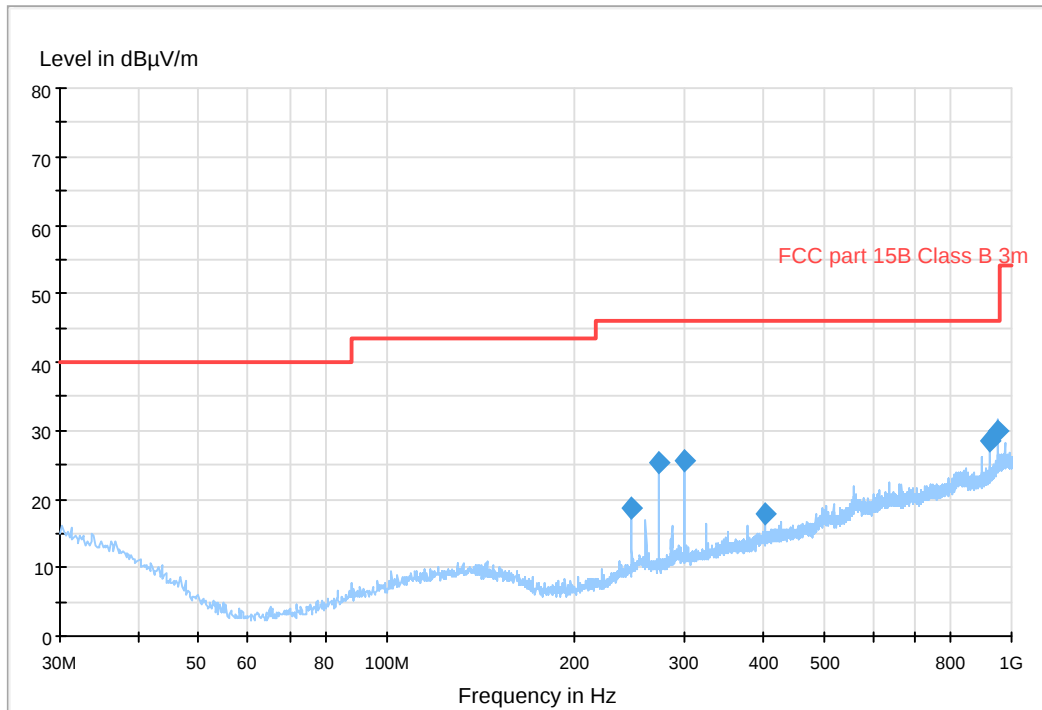
Test set-up photo:



6.4 Test graphs, TX mode

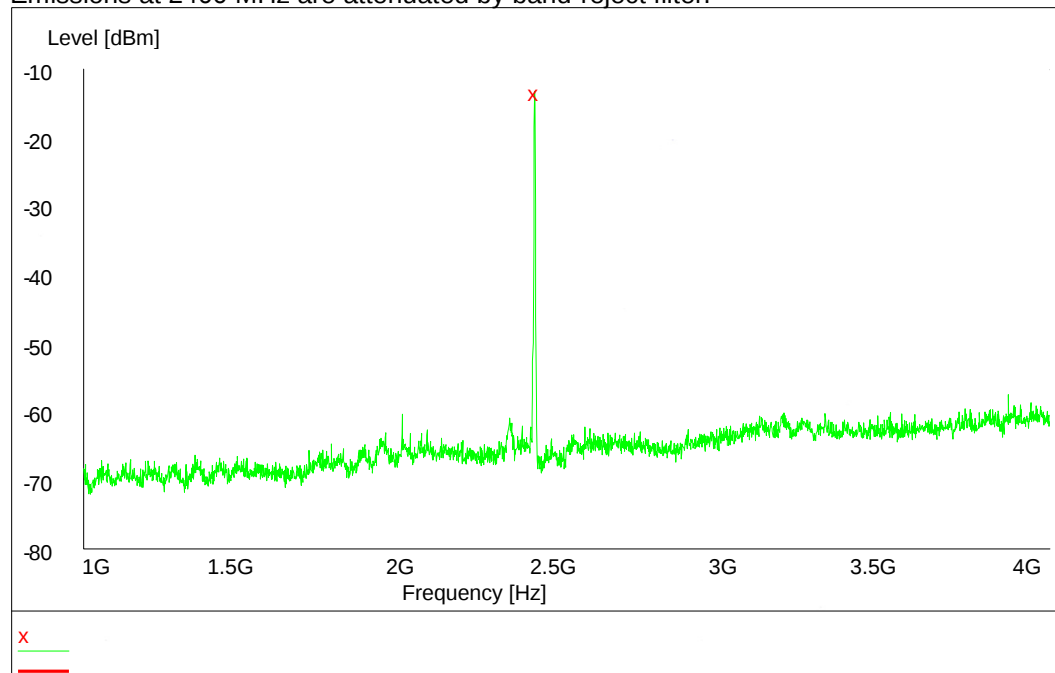
30 – 1000 MHz, max peak at a distance of 3 m

FCC 30 - 1000 MHz FCC class B 3m

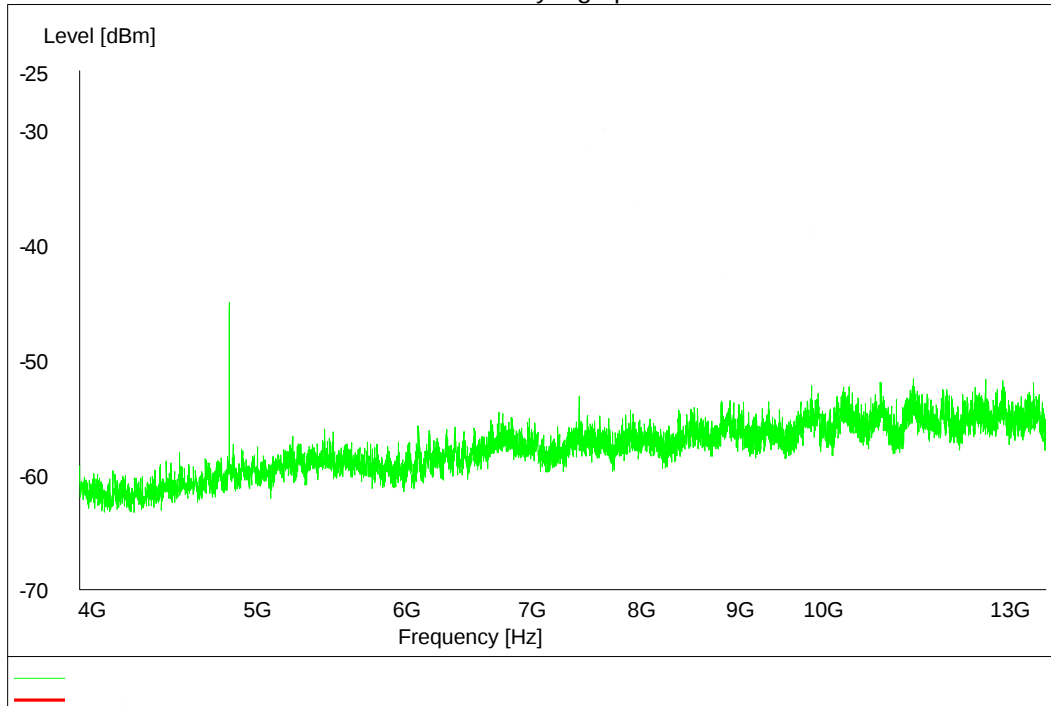


1000 – 4000 MHz, max peak at a distance of 3 m

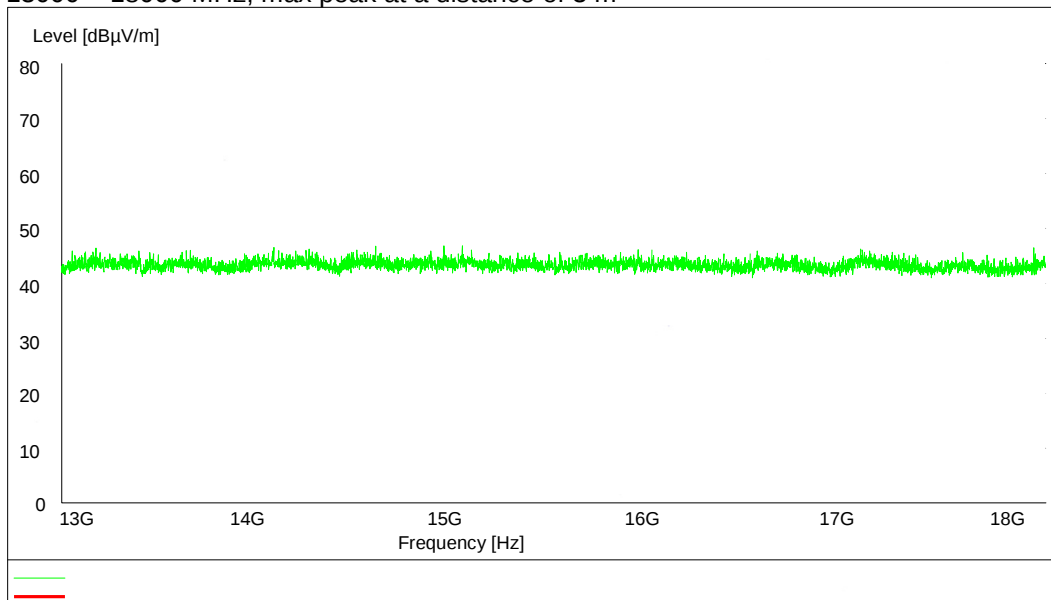
Emissions at 2400 MHz are attenuated by band-reject filter.



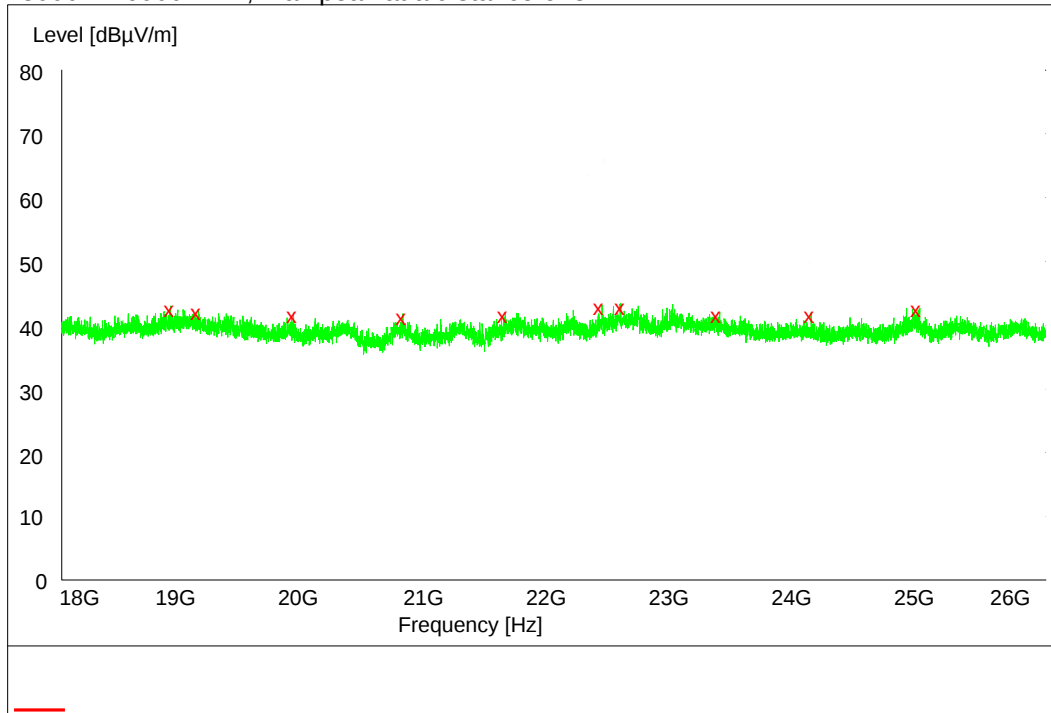
4000 – 13000 MHz, max peak at a distance of 3 m
Emissions below 4000 MHz are attenuated by high-pass filter.



13000 – 18000 MHz, max peak at a distance of 3 m



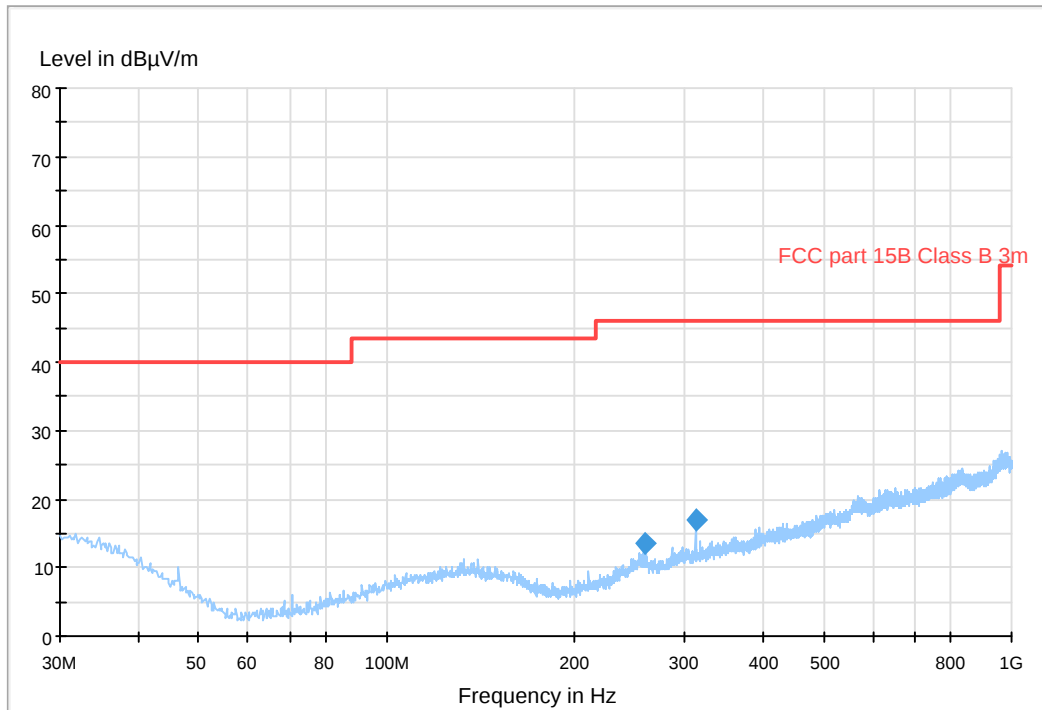
18000 – 26000 MHz, max peak at a distance of 3 m



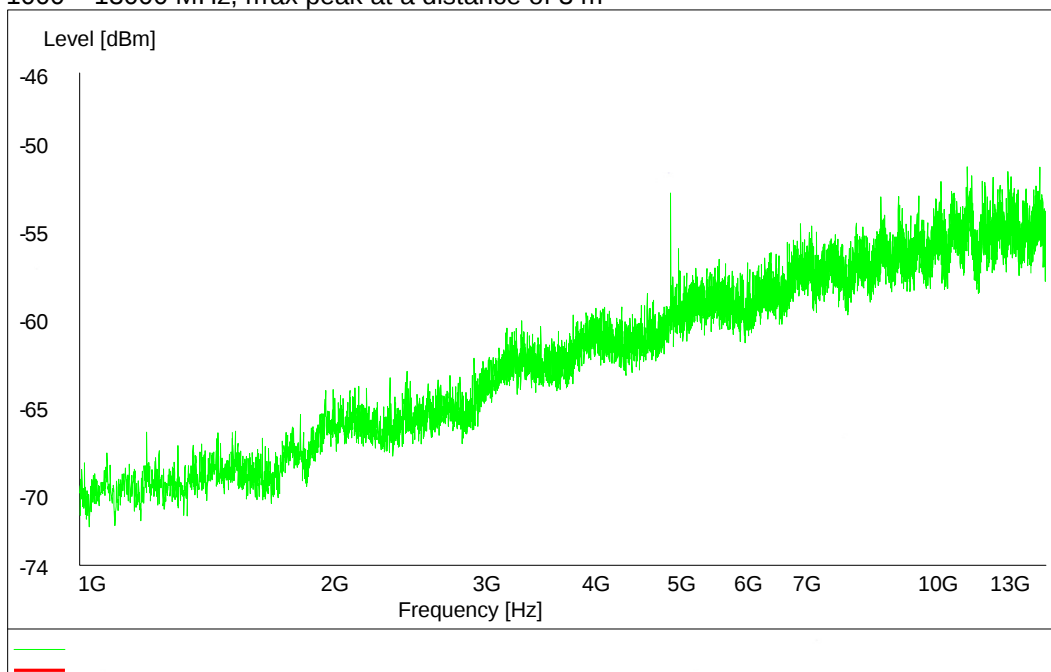
6.5 Test graphs, Standby/RX mode

30 – 1000 MHz, max peak at a distance of 3 m

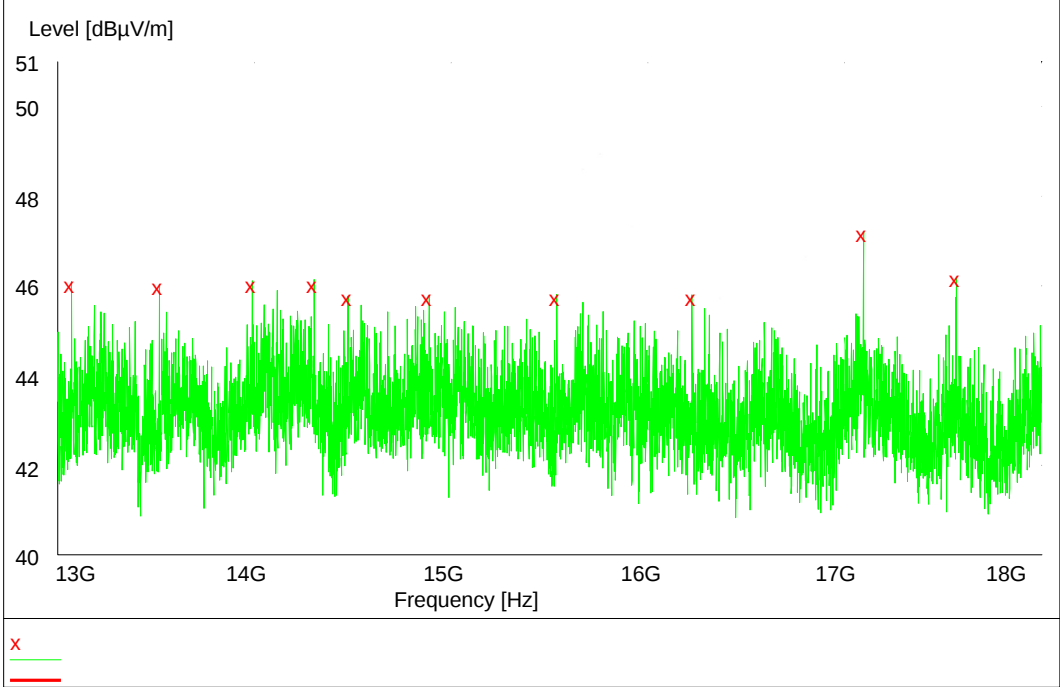
FCC 30 - 1000 MHz FCC class B 3m



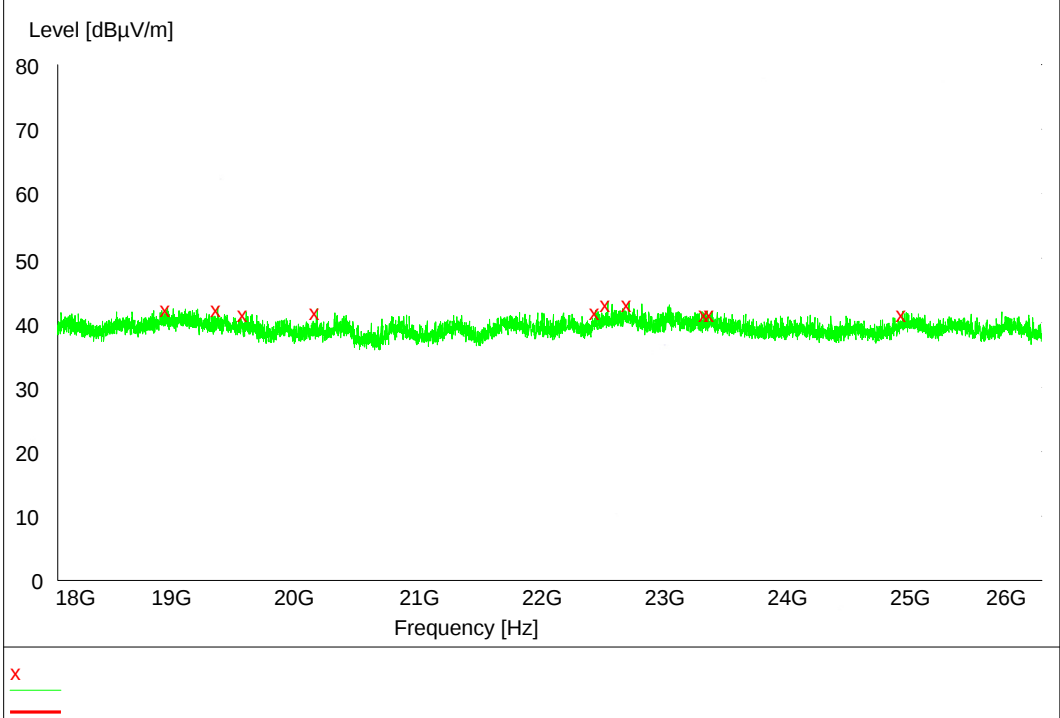
1000 – 13000 MHz, max peak at a distance of 3 m



13000 – 18000 MHz, max peak at a distance of 3 m



18000 – 26000 MHz, max peak at a distance of 3 m



6.6 Test protocol, TX mode

SPURIOUS EMISSIONS LEVEL RADIATED				
Frequency- [MHz]	Detector QP/Av/Pk	Measured value [dBμV/m]	Limits [dBμV/m]	Comment / Note
247.016	QP	18.8	46.0	
272.985	QP	25.4	46.0	
299.019	QP	25.6	46.0	
403.000	QP	17.7	46.0	
923.017	QP	28.5	46.0	
948.987	QP	30.1	46.0	
4801.90	Pk	52.4	74.0	
	Av	46.0	54.0	
13000-18000	-	-	-	Noise floor
18000-26000	-	-	-	Noise floor

6.7 Test protocol, Standby/RX mode

SPURIOUS EMISSIONS LEVEL RADIATED				
Frequency- [MHz]	Detector QP/Av/Pk	Measured value [dBμV/m]	Limits [dBμV/m]	Comment / Note
30-1000	-	-	-	Noise floor
4801.69	Pk	49.0	74.0	
	Av	39.8	54.0	
13000-18000	-	-	-	Noise floor
18000-26000	-	-	-	Noise floor

Fulfil requirements = YES

7 OCCUPIED BANDWIDTH

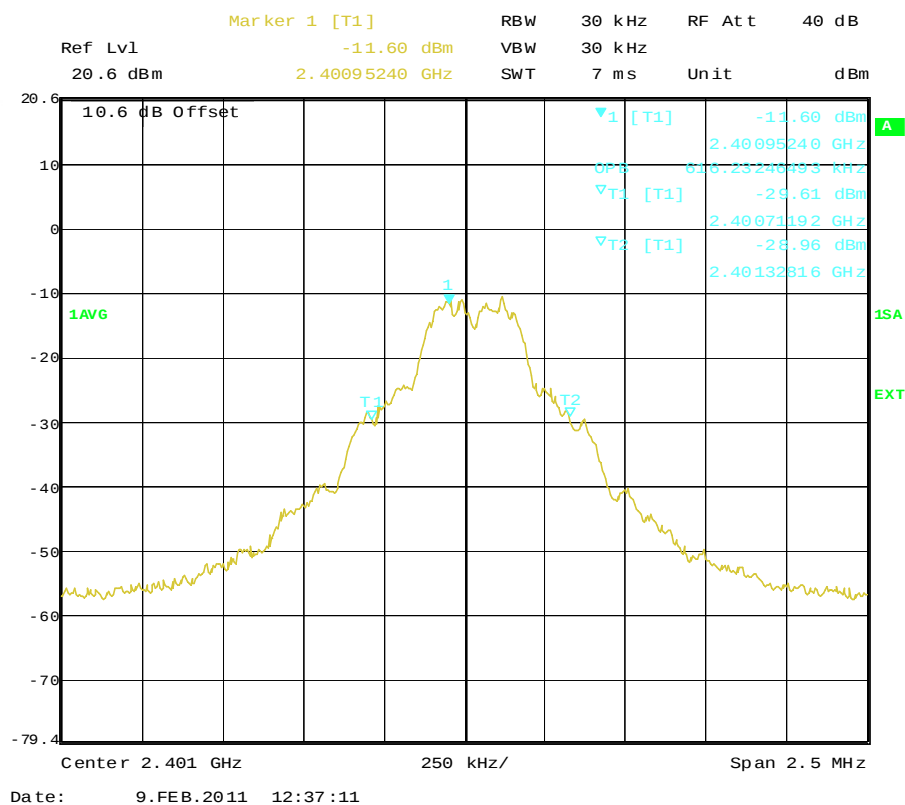
7.1 Test equipment

Equipment	Manufacturer	Type	Inv. No.	Calibration due date
Signal Analyzer	Rhode & Schwarz	FSIQ	12793	2011-07
Cable	Huber + Suhner	Sucoflex 104	5188	2011-07
RF attenuator	Hewlett Packard	8491A	30088	2011-07

7.2 Test protocol

Date of test: 2011-02-09

Channel	99% Bandwidth	Low frequency	High frequency	Allowed frequency band	Pass/Fail
MHz	MHz	MHz	MHz	MHz	
2401.0	0.616	2400.71	2401.32	2400.0 - 2483.5	Pass



8 BAND EDGE

8.1 Test equipment

Equipment	Manufacturer	Type	Inv. No.	Calibration due date
Signal Analyzer	Rhode & Schwarz	FSIQ	12793	2011-07
Cable	Huber + Suhner	Sucoflex 104	5188	2011-07
RF attenuator	Hewlett Packard	8491A	30088	2011-07

8.2 Test protocol

Date of test: 2011-02-09

Test performed according to ANSI C63.10 2009 Clause 6.9.3

	Inband field strength [dBuV/m]	Delta [dB]	Emission at band edge [dBuV/m]	Limit [dBuV/m]	Pass/Fail
Upper band edge	88.5 Average 96.3 Peak	> 40	48.5 Average 56.3 Peak	54.0 Average 74.0 Peak	Pass
Lower band edge	88.5 Average 96.3 Peak	> 40	48.5 Average 56.3 Peak	54.0 Average 74.0 Peak	Pass

PHOTO OF THE EUT

