

Test Report No.:		14120301.fcc01		Page 1 of 41	
<i>Client:</i>		Ambient Systems B.V. Demmersweg 66, 7559BN Hengelo (Ov), Netherlands			
<i>Test Item:</i>		Digital Transmission System (DTS) Self-configuring mesh-routing device			
<i>Identification:</i>		GW3030v2		<i>Serial Number:</i> --	
<i>Project No.:</i>		14120301		<i>Date of Receipt:</i> March 04, 2015	
<i>Testing Location:</i>		TÜV Rheinland Nederland B.V. Eiberkamp 10 9351VT Leek			
<i>Test Specification:</i>		FCC 47 CFR Part 15, Subpart C, Section 15.247 (10-1-14 Edition) RSS-Gen (Issue 4, November 2014) and RSS-210 (Issue 8, December 2010) ANSI C63.10:2013			
<i>Test Result:</i>		The test item passed the test specification(s).			
<i>Testing Laboratory:</i>		TÜV Rheinland Nederland B.V. Eiberkamp 10 9351 VT Leek			
<i>Tested by:</i>		<i>Reviewed by:</i>			
					
2015-03-25 R. van der Meer / Inspector		2015-03-25 P. de Beer / Reviewer			
<i>Date</i>	<i>Name/Position</i>	<i>Signature</i>	<i>Date</i>	<i>Name/Position</i>	<i>Signature</i>
<i>Other Aspects:-.</i>					
<i>Abbreviations:</i> P(ass) = passed F(ail) = failed N/A = not applicable N/T = not tested					
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TEST SUMMARY

5.1.1 CONDUCTED MEASUREMENTS AT ANTENNA PORT

RESULT: PASS

5.1.2 6dB AND 99% BANDWIDTH

RESULT: PASS

5.1.3 PEAK POWER SPECTRAL DENSITY

RESULT: PASS

5.1.4 BAND EDGE CONDUCTED EMISSIONS

RESULT: Pass

5.1.5 RADIATED SPURIOUS EMISSIONS OF TRANSMITTER

RESULT: PASS

5.1.6 RADIATED SPURIOUS EMISSIONS OF TRANSMITTER IN RESTRICTED BANDS

RESULT: PASS

5.2.1 AC POWER LINE CONDUCTED EMISSION OF TRANSMITTER

RESULT: PASS

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1. General Remarks

1.1 Complementary Materials

Appendix: Identical Equipment Declaration.

2. Test Sites

2.1 Test Facilities

The Federal Communications Commission and Industry Canada has reviewed the technical characteristics of the test facilities at TÜV Rheinland Nederland B.V., located in Leek, 9351VT Eiberkamp 10, The Netherlands, and has found these test facilities to be in compliance with the requirements of 47 CFR Part 15, section 2.948.

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.

Normal test conditions:

Temperature (*)	: +15°C to +35°C
Relative humidity(*)	: 20 % to 75 %
Supply voltage	: 120VAC/60Hz
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.

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2.2 List of Test and Measurement Instruments

Table 1: List of Test and Measurement Equipment

Kind of Equipment	Manufacturer	Model Name	Inventory number	Calibration date (mm/yyyy)	Calibration due date (mm/yyyy)
For Antenna Port Conducted Emissions					
Temperature-Humiditymeter	Extech	SD500	A00446	03-12/2015	03-12/2016
Spectrum Analyzer	Rohde & Schwarz	FSV	A00337	08/2014	08/2015
RF Cable	H+S	Secuflex	A00347	04/2014	04/2015
For Radiated Emissions					
Measurement Receiver	Rohde & Schwarz	ESCS30	A00726	09/2014	09/2015
RF Cable S-AR <1GHz	Gigalink	APG0500	A00447	01/2015	01/2016
RF Cable >1GHz	H+S	Sucoflex	A00339	04/2014	04/2015
RF Cable >1GHz	H+S	Sucoflex	A00343	04/2014	04/2015
Controller	Maturo	SCU/088/8090811	A00450	N/A	N/A
Controller	EMCS	DOC202	A00257	N/A	N/A
Test facility	Comtest	FCC listed: 90828 IC: 2932G-2	A00235	04/2014	04/2017
Spectrum Analyzer	Rohde & Schwarz	FSV	A00337	08/2014	08/2015
Antenna mast	EMCS	AP-4702C	A00258	N/A	N/A
Temperature-Humiditymeter	Extech	SD500	A00444	03-12/2015	03-12/2016
Guidehorn 1-18 GHz	EMCO	3115	A00009	04/2014	04/2015
Guidehorn 18-26.5 GHz	EMCO	3160-09	A00209	04/2014	04/2015
Amplifier for Guidehorn 18-26.5 GHz	EMCS	--	A00378	04/2014	04/2015
Biconilog Testantenna	Teseq	CBL 6111D	A00466	06/2014	06/2015
2.4 GHz bandreject filter	BSC	XN-1783	A00065	N/A	N/A
Bandpass filter 4-10 GHz	Reactel	7AS-7G-6G-511	A00131	N/A	N/A
Bandpass filter 10-26 GHz	Reactel	9HS-10G/26.5G-S11	A00151	N/A	N/A
Preamplifier 0.5 - 18 GHz	Miteq	AMF-5D-005180-28-13p	A00247	N/A	N/A
Filterbox	EMCS	RFS06S	A00255	08/2014	08/2015
Non conducting support 70cm	NMi Certin	--	A00166	N/A	N/A

Continues on next page.

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Kind of Equipment	Manufacturer	Model Name	Inventory number	Calibration date (mm/yyyy)	Calibration due date (mm/yyyy)
For AC Powerline Conducted Emissions					
Pulse limiter	R&S	ESH3-Z2	A00051	01/2015	01/2016
Variac	RFT	LSS020	A00171	NA	NA
LISN	EMCO	3625/2	A00022	01/2014	01/2016
Measurement Receiver	Rohde & Schwarz	ESCS30	A00726	09/2014	09/2015
Shielded room for Conducted emissions	--	--	A00437	NA	NA
Temperature-Humiditymeter	Extech	SD500	A00441	03-12/2015	03-12/2016

Conformance of the used measurement and test equipment with the requirements of ISO/IEC 17025:2005 has been confirmed before testing.

2.3 Measurement Uncertainty

Table 2: Emission Measurement Uncertainty

Measurement Type	Frequency	Uncertainty
Antenna Port Conducted Emission	< 1GHz	±0.5dB
	> 1GHz	±0.7dB
Radiated Emission	150kHz - 30MHz	±5.0dB
	30MHz - 1GHz	±5.0dB
	> 1GHz	±5.5dB
AC Powerline Conducted Emissions	150kHz - 30MHz	±3.5dB

3. General Product Information

3.1 Product Function and Intended Use

The Digital Transmission System brand ambient model GW3030v2, hereafter referred to as EUT, is designed to operate in the 2.4 GHz ISM frequency band, frequency range 2405 MHz to 2480 MHz (ZigBee channels 11 to 26). The module will support and utilizes OQPSK modulation techniques. The EUT is equipped with an external antenna connector. A dedicated antenna is included with the EUT.

The product identical (model MR3000v2) to EUT (but not included in the tests) is described in the annexed Letter of Similarity. The judgment of the conformity of the model MR3000v2 is outside of the scope of TÜV Rheinland Nederland B.V.

The content of this report and measurement results have not been changed other than the way of presenting the data.

3.2 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	:	Ambient Systems B.V.
Brand	:	ambient
Model(s)	:	GW3030v2
Serial Number	:	--
Voltage input rating	:	5 - 48 Vdc
Voltage output rating	:	--
Current input rating	:	--
Antenna	:	Internal, integrated on the PCB
Antenna Gain	:	2.15 dBi (declared)
Operating frequency	:	2405MHz-2480MHz.
Modulation	:	OQPSK
Remarks	:	n.a.



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Table 3: Interfaces present on the EUT

No.	Port	From	To	Remarks
1.	Mains	Mains	Laptop (AUX1)	Unshielded cable <3m
2.	Data com.	Laptop USB	EUT	Shielded cable <1m; (either by USB or USB > RS-232)
3.	DC power	AUX2	EUT	Unshielded cable <3m
4.	Antenna port	EUT	Spectrum analyzer	Conducted tests, shielded cable 30cm

3.3 Countermeasures to achieve EMC Compliance

No additional measures were employed to achieve compliance.

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4. Test Set-up and Operation Modes

4.1 Test Methodology

The test methodology used is based on the requirements of RSS-GEN, RSS-210, 47 CFR Part 15, Sections 15.31, 15.33, 15.35, 15.205, 15.207, 15.209, 15.247 and ANSI C63.10:2013

The test methods, which have been used, are based on ANSI C63.10-2013.

For details, see under each test item.

4.2 Operation Modes

Testing was performed at the lowest operating frequency (2405 MHz), at the operating frequency in the middle of the specified frequency band (2440 MHz) and at the highest operating frequency (2480 MHz). These operation modes were selected after review of the capabilities and characteristics of the EUT. The test software as mentioned in section 4.4 enabled the settings of these modes.

The EUT has been tested in the modes as described in table below

Operation Mode	EUT Status	Channel	Frequency (MHz)	TX power
Transmit (Tx)	On	11	2405	41
Transmit (Tx)	On	18	2440	50
Transmit (Tx)	On	26	2480	62

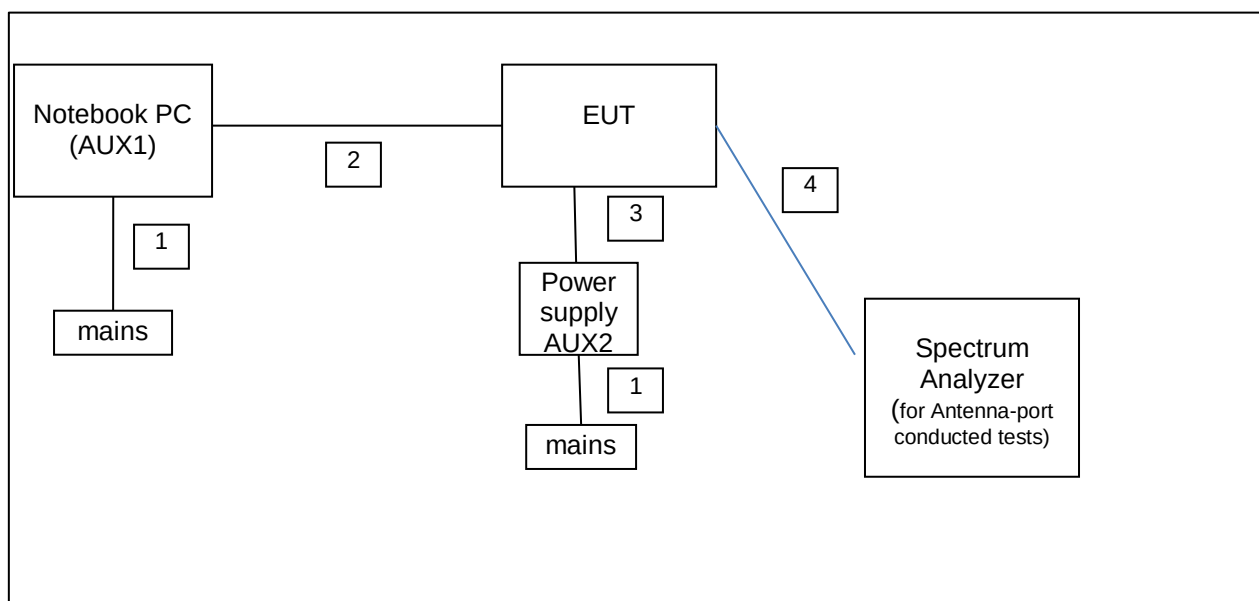
4.3 Physical Configuration for Testing

The EUT was connected to the usb port of a laptop computer. The laptop computer was used to configure the EUT to continuously transmit at a specified output power and channel as specified in the testdata. See section 4.5 for Auxiliary details.

The EUT was tested on a stand-alone basis and the test system was configured in a typical fashion (as a customer would normally use it). For radiated tests the EUT was powered with batteries and for conducted tests the EUT was powered by a power supply.

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 C63.10-2013.

Figure 1: Test Setup Diagram



Notes:

For more details, refer to the document: Test Set-Up Photographs document.

4.4 Test Software

A continuous transmit or receive mode could be initiated by using test software as supplied by Intel Corporation. The test software was used to define various different operational modes of the EUT for the purpose of compliance testing. The version of the test software, as supplied by the applicant and used during all tests is:

Test software : Ambient Studio 3000
Version : 1.1 p0 (r8425)

This software was running on a notebook PC (AUX1). It was used to enable the test operation modes listed in section 4.2 as appropriate (a screenshot of the testsoftware is shown below).

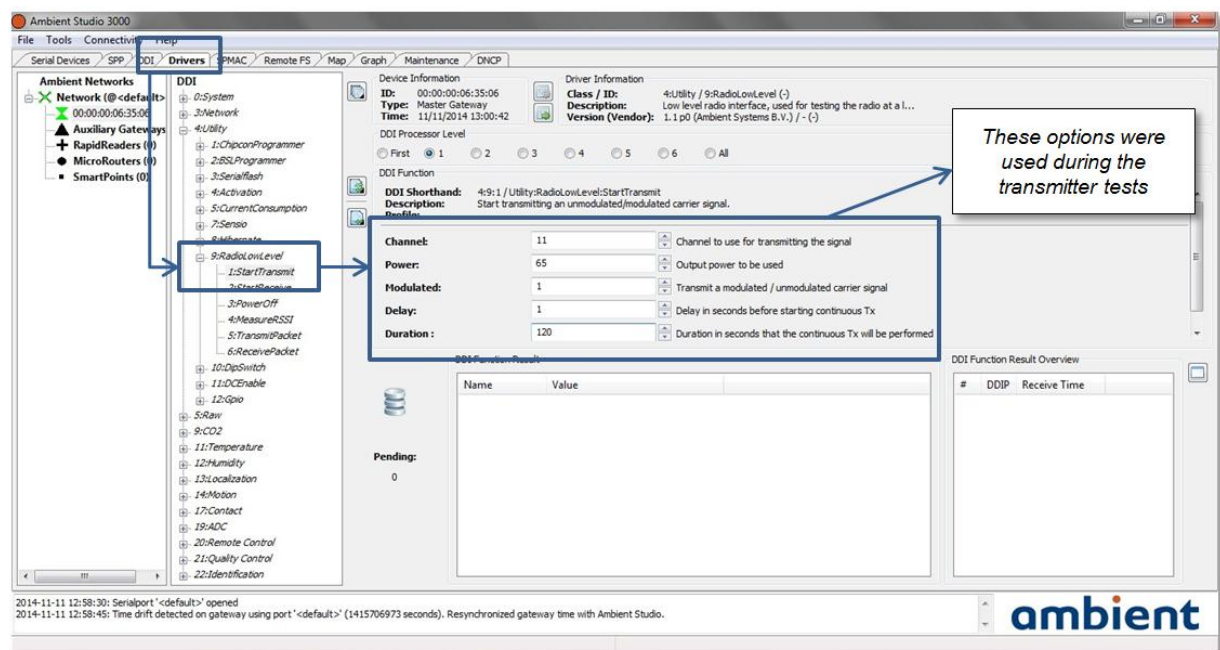


Figure: GUI-Ambient test software

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4.5 Special Accessories and Auxiliary Equipment

The product has been tested together with the following additional accessories:

1. AUX1
Product: Notebook PC
Brand: HP
Model: Compaq 610
Serial Number: CNU94710WB
Remark: host for testsoftware
2. AUX2
Product: Power supply
Brand: HN Power Germany
Model: HNP06-090
Serial Number: --
Input: 100-240 Vac 50/60 Hz 0.3A
Output: 9.0 Vdc 670mA
Remark: used to power EUT
3. AUX3
Product: USB to RS-232 converter
Brand: --
Model: UC-232A
Serial Number: --
Remark: for communication between AUX1 and EUT



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5. Test Results

5.1 Conducted Measurements at Antenna Port

5.1.1 Conducted Output Power

RESULT: PASS

Date of testing: 2015-03-25

Requirements:

FCC 15.247(b)(3), RSS-210 A8.4(4)

FCC: For systems using digital modulation in the 2400-2483.5 MHz band, the maximum peak output power is 1W (+30dBm).

RSS-Gen: the e.i.r.p. shall not exceed 4 W (36 dBm).

Test procedure:

ANSI C63.10:2013

The Peak Conducted Output Power was measured using the channel integration method according to section 11.9.1.1 in ANSI C63.10:2013

The maximum peak output power (conducted) was measured at the antenna connector with a spectrum analyzer. The final measurement takes into account the loss generated by all the involved cables.

The EIRP power (dBm) is calculated by adding the declared maximum antenna gain to the measured conducted power.

Notes: $\text{mW} = 10^{(\text{dBm}/10)}$
 $\text{dBm} = 10 \times \log(\text{mW})$

plots : Peak power plots,

Figures A, B and C show plots of the Peak Power outputs, correction factors (= 0.5dB Cableloss) included in the reading.

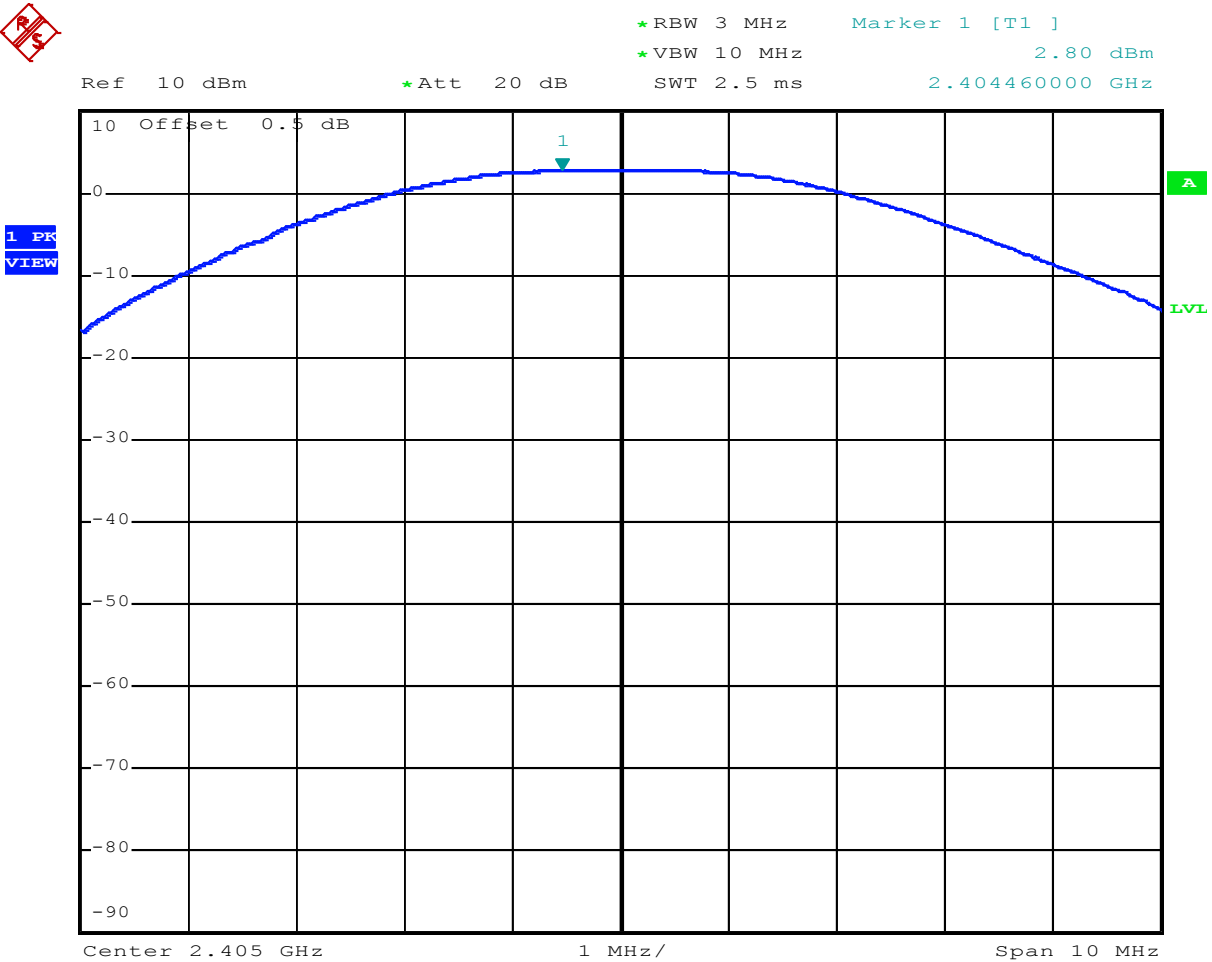
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Conducted Output Power

Freq- uency [MHz]	Output Power [dBm]	Output Power [mW]	Limit [dBm]	Limit [mW]	Antenna Gain (dBi)	EIRP (dBm)	EIRP (mW)	Plot number
2405	2.80	1.91	+30	1000	2.15	4.95	3.13	A
2440	2.74	1.88	+30	1000	2.15	4.89	3.08	B
2480	3.83	2.42	+30	1000	2.15	5.98	3.96	C



Date: 25.MAR.2015 10:57:47

Plot A

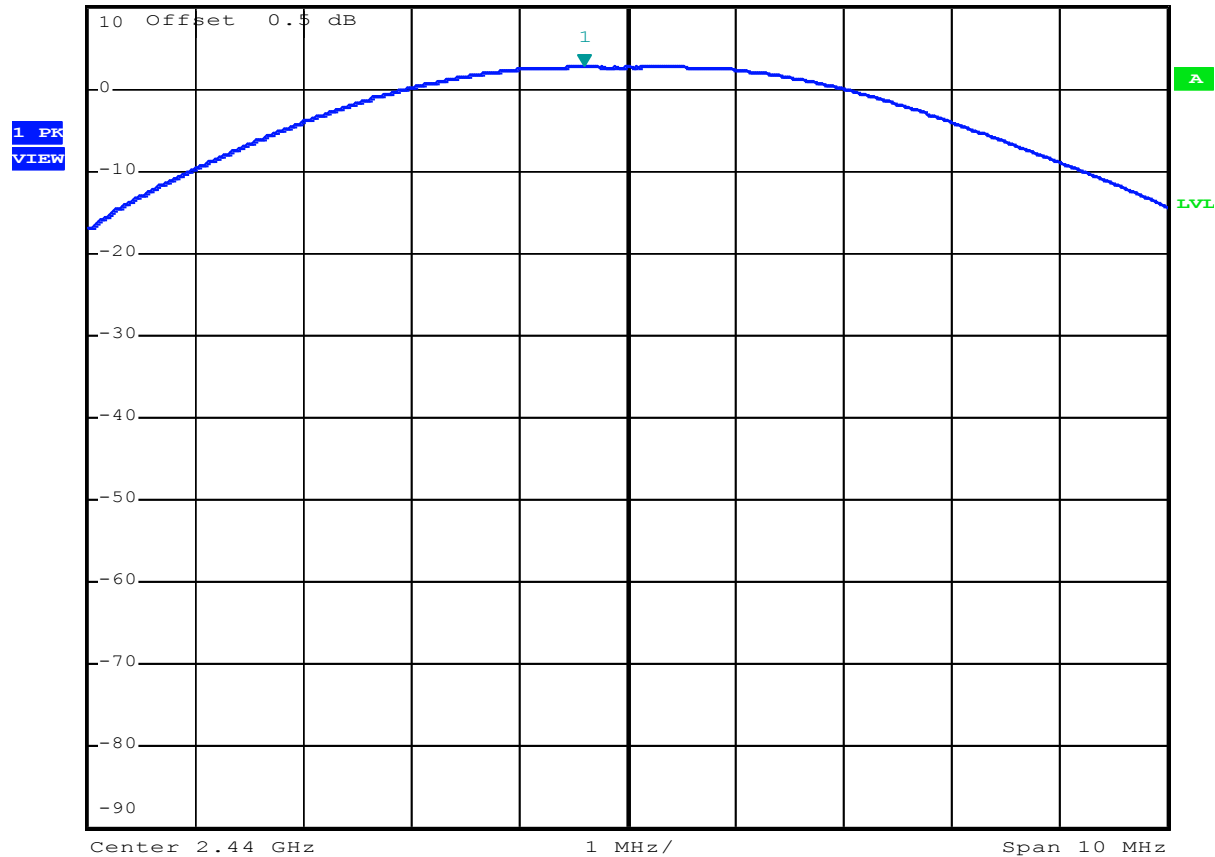
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*RBW 3 MHz Marker 1 [T1]
*VBW 10 MHz 2.74 dBm
*Att 20 dB 2.439600000 GHz
Ref 10 dBm SWT 2.5 ms



Date: 25.MAR.2015 10:59:12

Plot B

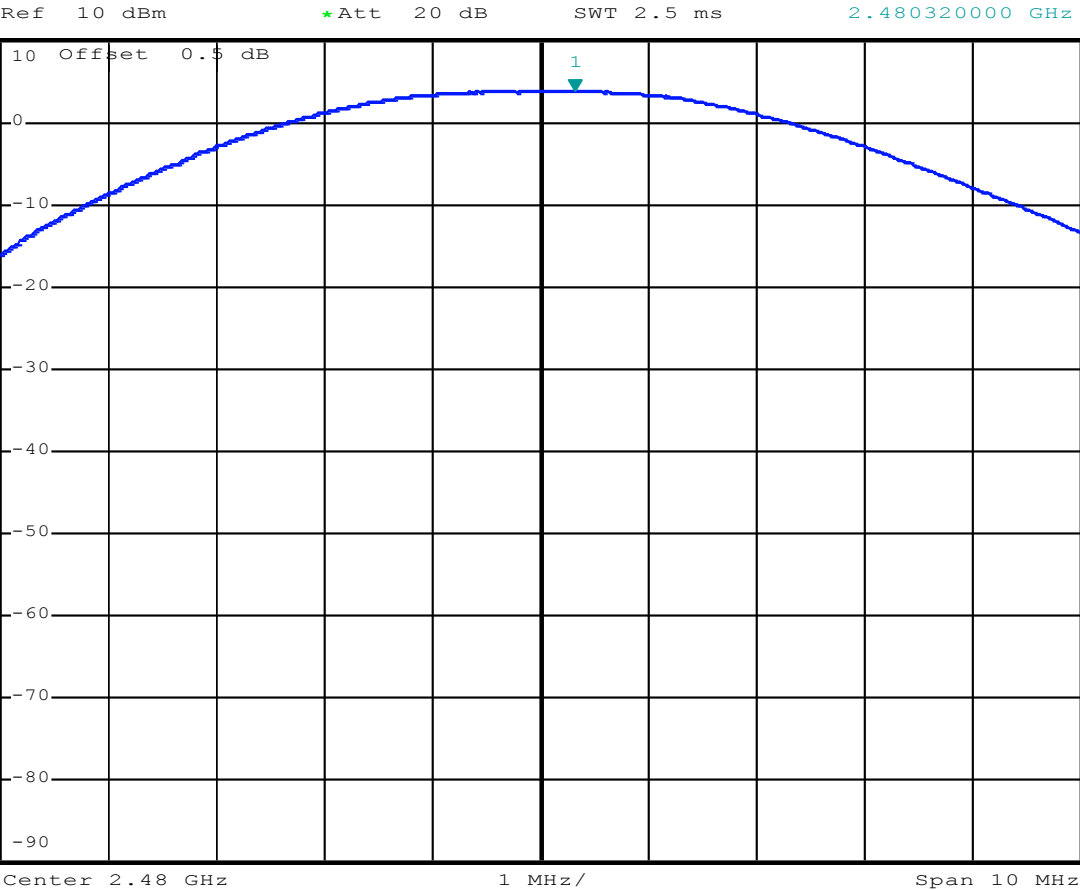
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*RBW 3 MHz Marker 1 [T1]
*VBW 10 MHz 3.83 dBm
SWT 2.5 ms 2.480320000 GHz



Date: 25.MAR.2015 10:59:59

Plot C

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5.1.2 6dB and 99% Bandwidth

RESULT: PASS

Date of testing:

2015-03-25

Requirements:

FCC 15.247(a)(2), RSS-210 A8.2(a)

For systems using digital modulation in the 2400-2483.5MHz band, the 6dB bandwidth shall be at least 500kHz.

For 99% Bandwidth: RSS-Gen Section 4.6.1: No requirement is given.

Test procedure 6dB bandwidth:

ANSI C63.10:2013

Section 11.8.2

A spectrum analyzer was connected to the antenna port of the EUT. The spectrum analyzer resolution bandwidth was set to 100kHz, video bandwidth to 300kHz and the span wide enough to capture the modulated carrier.

For 99% Bandwidth:

ANSI C63.10-2013 and RSS-Gen.

The transmitter shall be operated at its maximum carrier power measured under normal test conditions. The span of the analyzer shall be set to capture all products of the modulation process, including the emission skirts. The resolution bandwidth shall be set as close to 1% of the selected span as is possible without being below 1%. The video bandwidth shall be set to 3 times the resolution bandwidth. Video averaging is not permitted. Where practical, a sampling detector shall be used given that a peak or peak hold may produce a wider bandwidth than actual.

A spectrum analyzer was connected to the antenna port of the EUT. The spectrum analyzer resolution bandwidth was set to 1% of the selected span, Video bandwidth was set to 3 times the resolution bandwidth. The span was set to capture the whole modulation process. The Spectrum analyzers automated function for 99% BW was used.

Plots A1,B1 and C1 shown on the next pages are of the 6 dB bandwidth.

Plots A2,B2 and C2 shown on the next pages are of the 99% bandwidth

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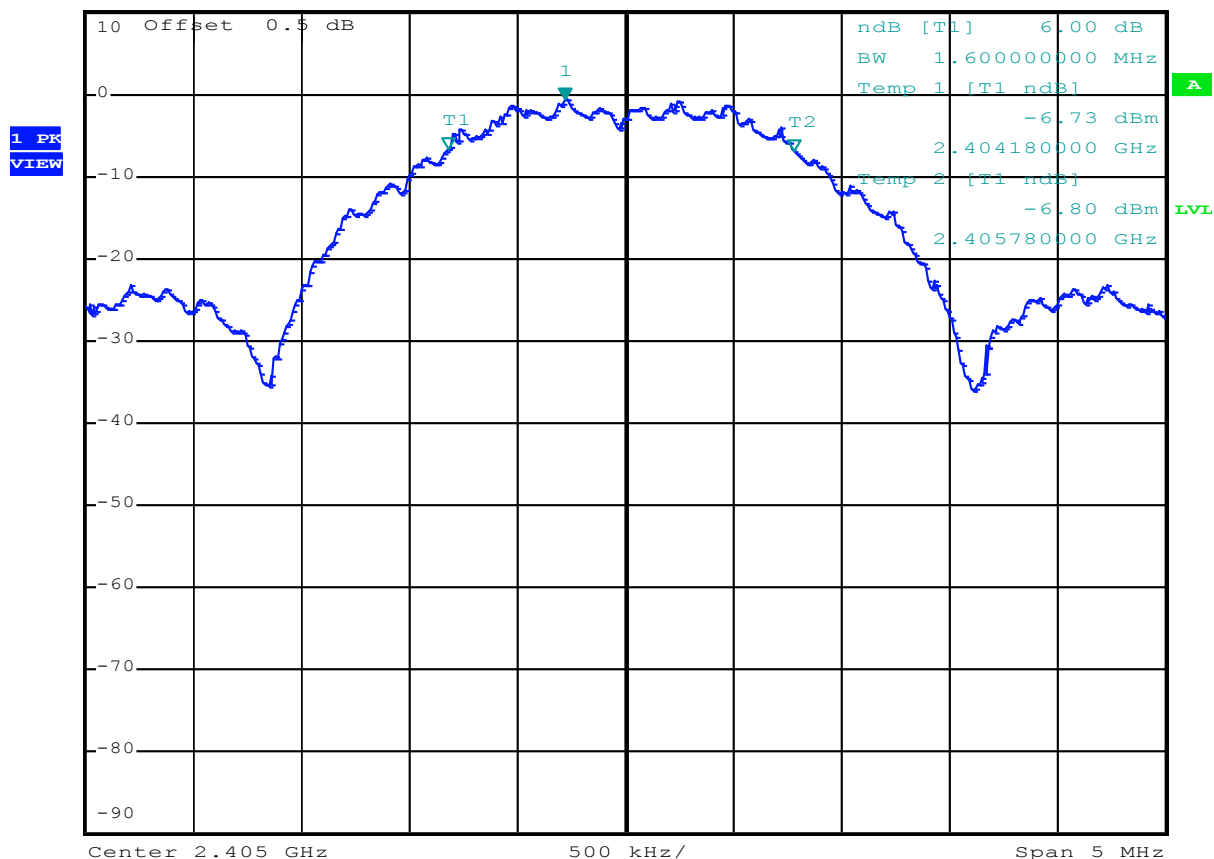
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6dB Bandwidth

Operating Frequency [MHz]	99% Bandwidth [kHz]	6dB Bandwidth [kHz]	Limit [kHz]	Verdict [Pass/Fail]	Plot number
2405	2.58	1.60	>500	Pass	A1/A2
2440	2.57	1.61	>500	Pass	B1/B2
2480	2.57	1.61	>500	Pass	C1/C2



*RBW 100 kHz Marker 1 [T1]
*VBW 300 kHz -0.58 dBm
Ref 10 dBm *Att 20 dB SWT 2.5 ms 2.404720000 GHz



Date: 25.MAR.2015 11:05:33

Plot A1

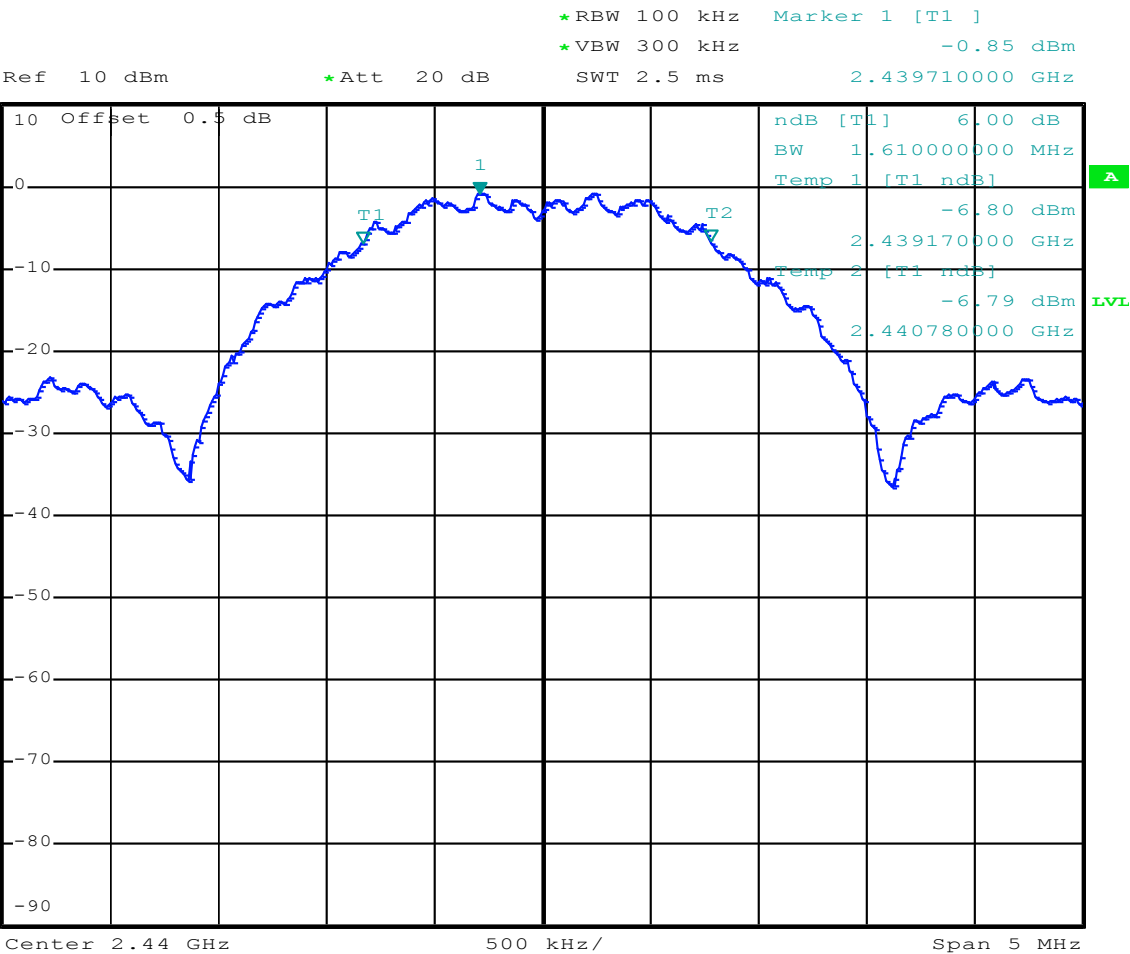
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1 PK
VIEW



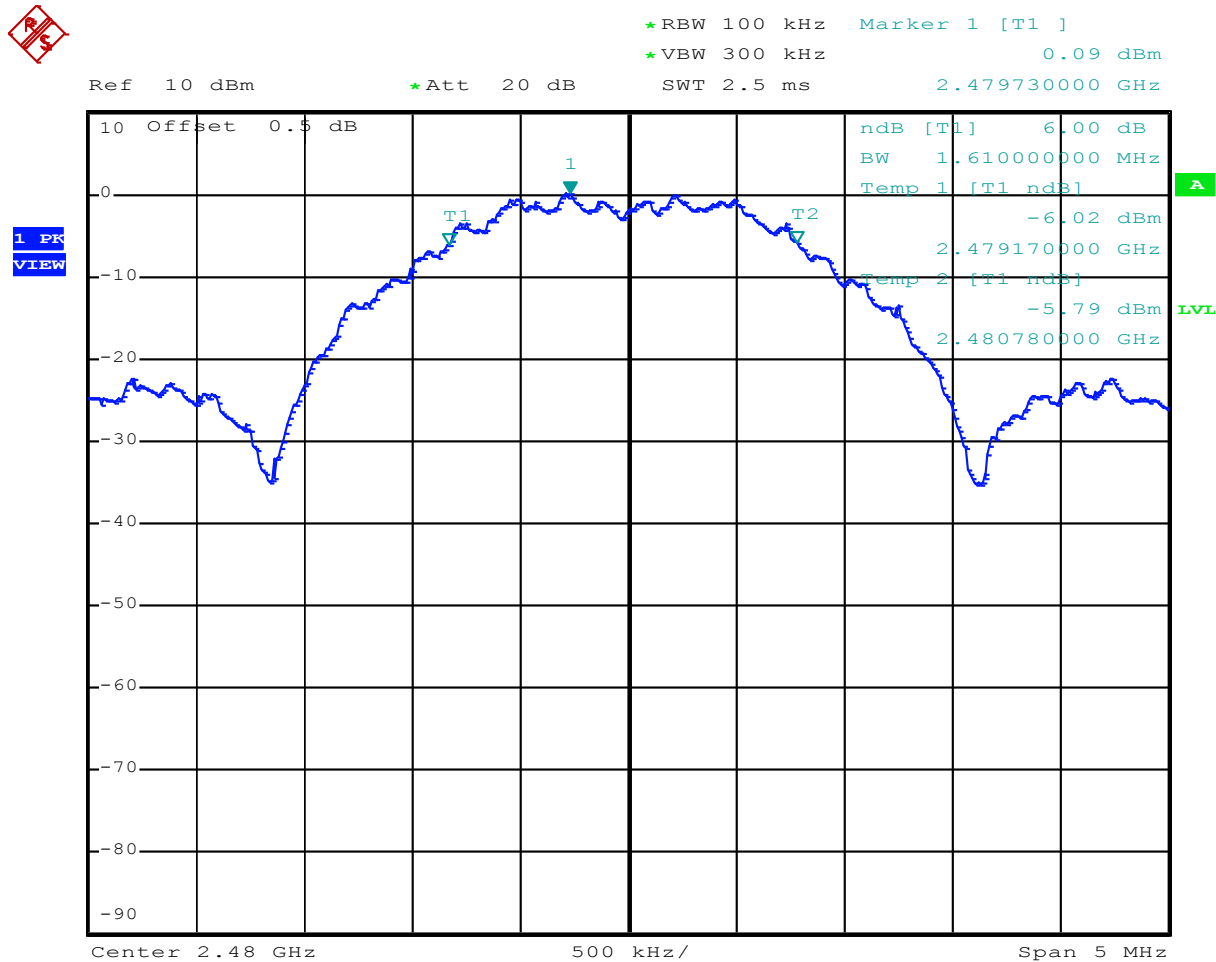
Date: 25.MAR.2015 11:03:36

Plot B1

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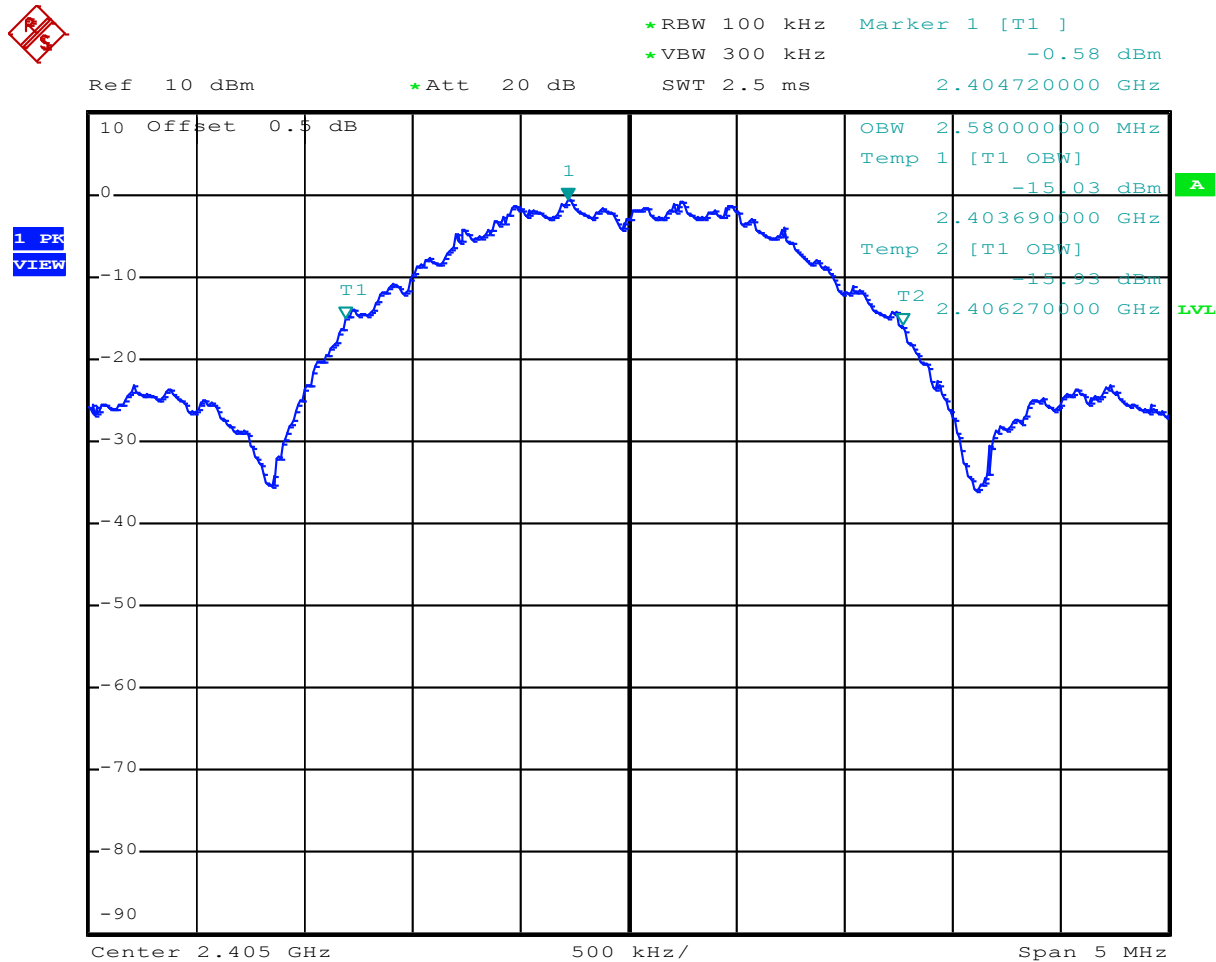
Date: 25.MAR.2015 11:01:24

Plot C1

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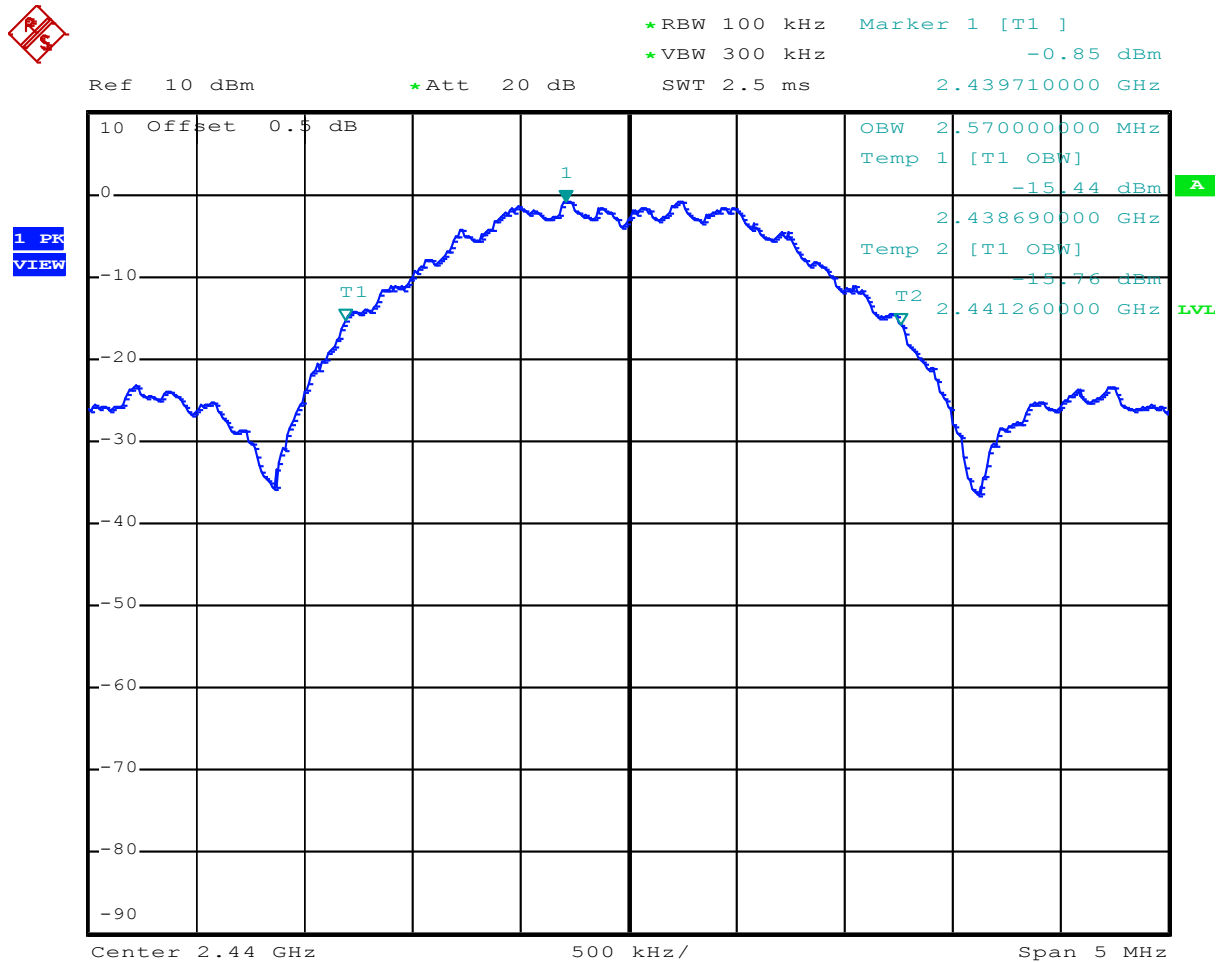
Date: 25.MAR.2015 11:06:10

Plot A2

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Date: 25.MAR.2015 11:04:01

Plot B2

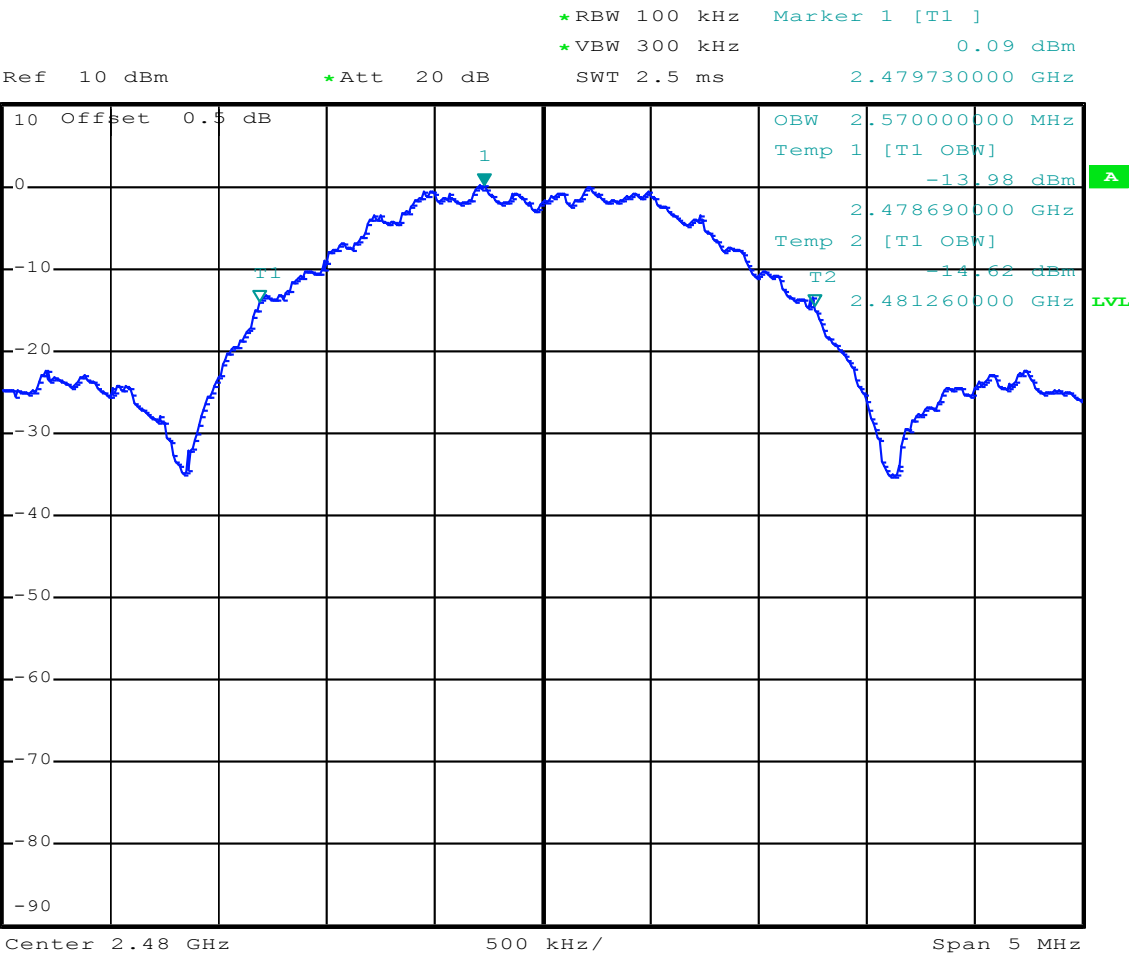
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1 PK
VIEW



Date: 25.MAR.2015 11:02:05

Plot C2

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5.1.3 Peak Power Spectral Density

RESULT: Pass

Date of testing: 2015-03-25

Requirements:

FCC 15.247(e) and RSS-210 section A8.2(b)

For digitally modulated systems, the power spectral density (PSD) conducted from the intentional radiator to the antenna shall not be greater than 8dBm in any 3kHz band during any time interval of continuous transmission.

Test procedure:

ANSI C63.10:2013

The section 11.10.2 PKPSD peak PSD procedure was used. A spectrum analyzer was connected to the antenna port of the EUT. The analyzer resolution bandwidth was set to 3kHz and the video bandwidth was set to 10kHz. The sweep time was set to auto couple and the trace was allowed to stabilize before making the final measurement. By using the Peak marker function the maximum amplitude was determined. The final measurement takes into account the loss generated by all the involved cables (0.5 dB).

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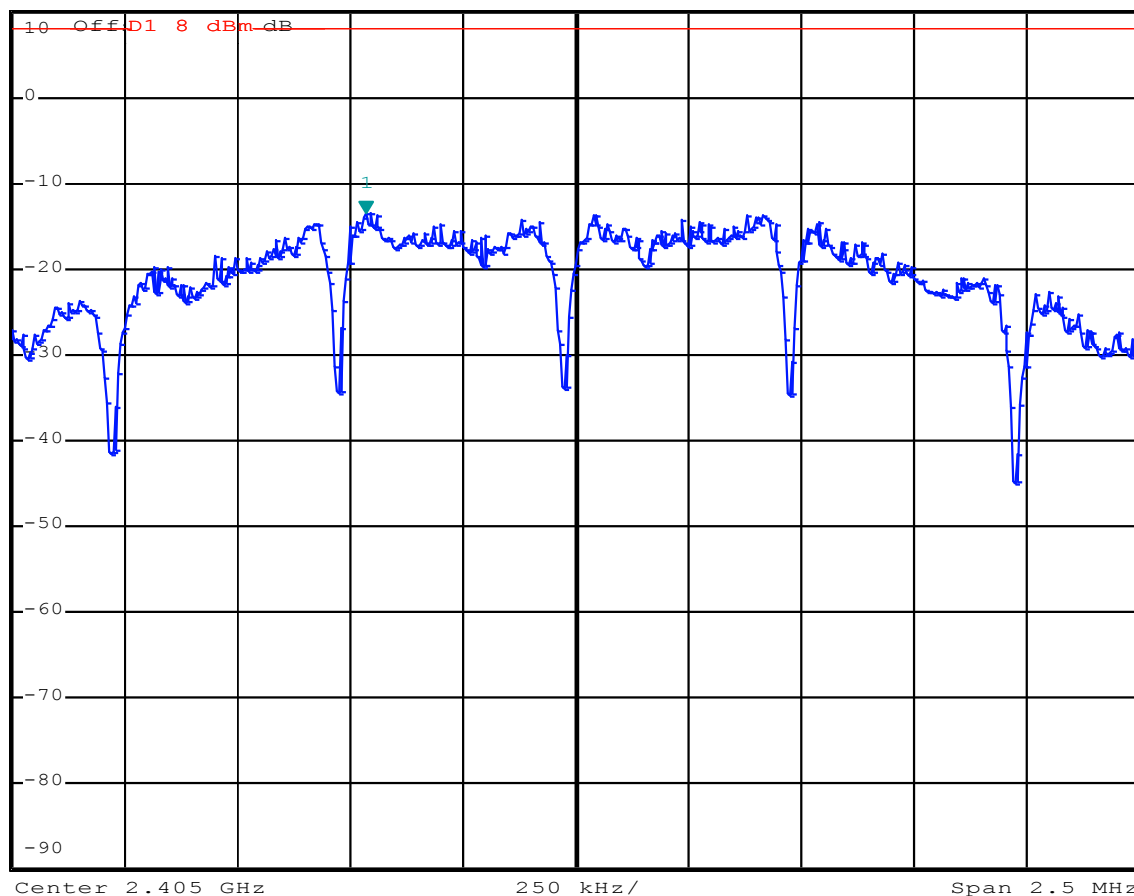
Peak Power Spectral Density

Operating Frequency [MHz]	Max PSD [dBm]	Limit [dBm]	Verdict [Pass/Fail]	Plot
2405	-13.38	8	Pass	A
2440	-12.90	8	Pass	B
2480	-11.30	8	Pass	C



*RBW 3 kHz Marker 1 [T1]
*VBW 10 kHz -13.38 dBm
Ref 10 dBm *Att 20 dB SWT 280 ms 2.404535000 GHz

1 PK
VIEW



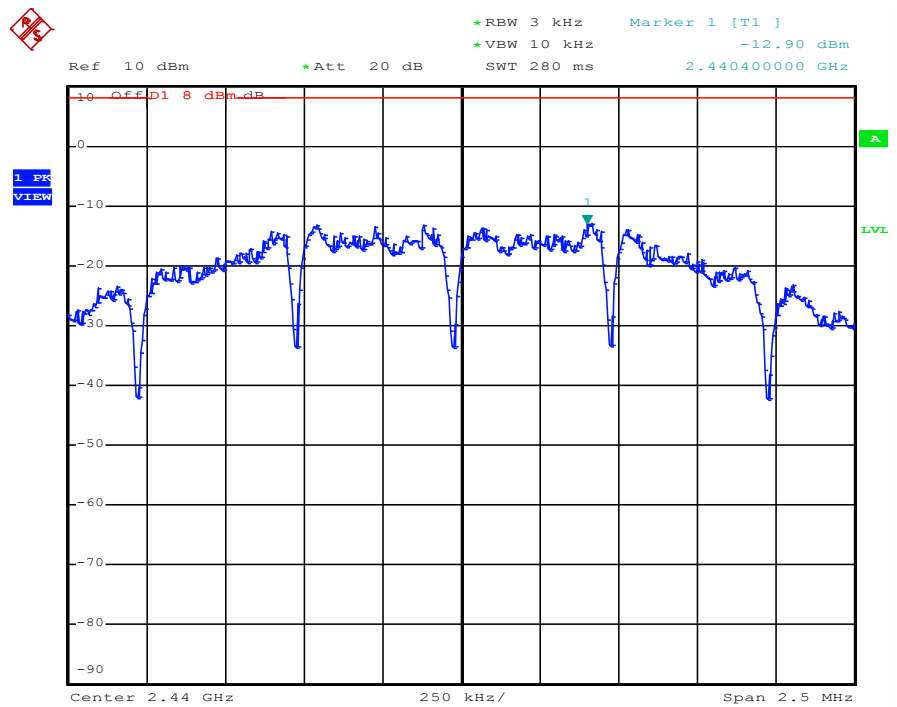
Date: 25.MAR.2015 11:10:07

Plot A:

Test Report No.:

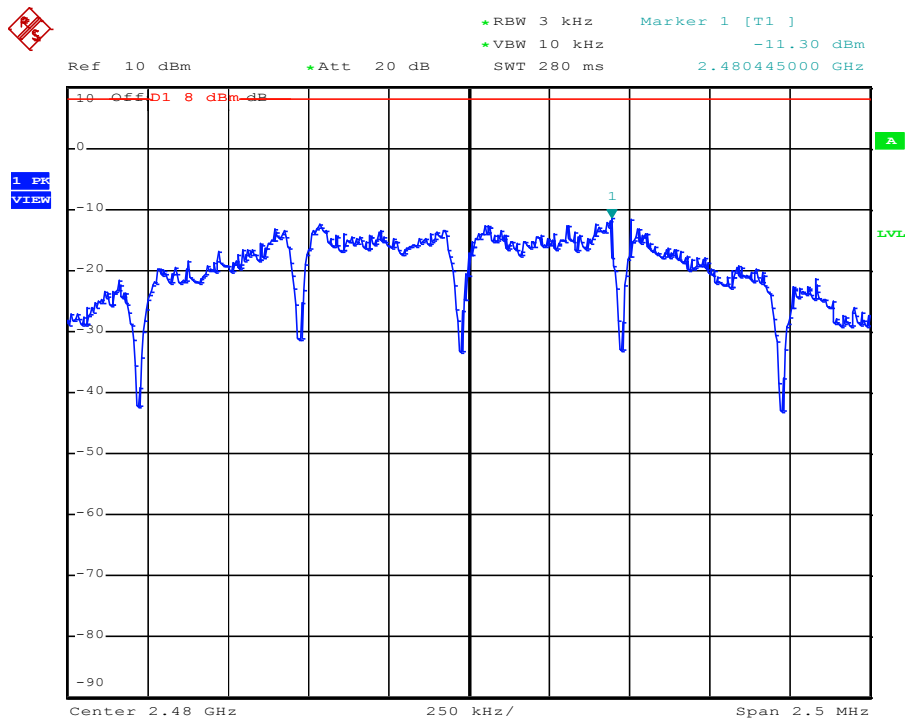
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Date: 25.MAR.2015 11:11:16

Plot B



Date: 25.MAR.2015 11:12:09

Plot C

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5.1.4 Band Edge Conducted Emissions

RESULT: Pass

Date of testing: 2015-03-25

Requirements:

FCC 15.205, FCC 15.209, FCC 15.247(d) and RSS-210 section A8.5

In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits.

Test procedure:

ANSI C63.10:2013

.

The marker-delta method, as described in ANSI C63.10 was used.

Measurements were performed using a spectrum analyzer with a suitable span to encompass the peak of the fundamental and using the following settings:

RBW = 100kHz, VBW = 300kHz.

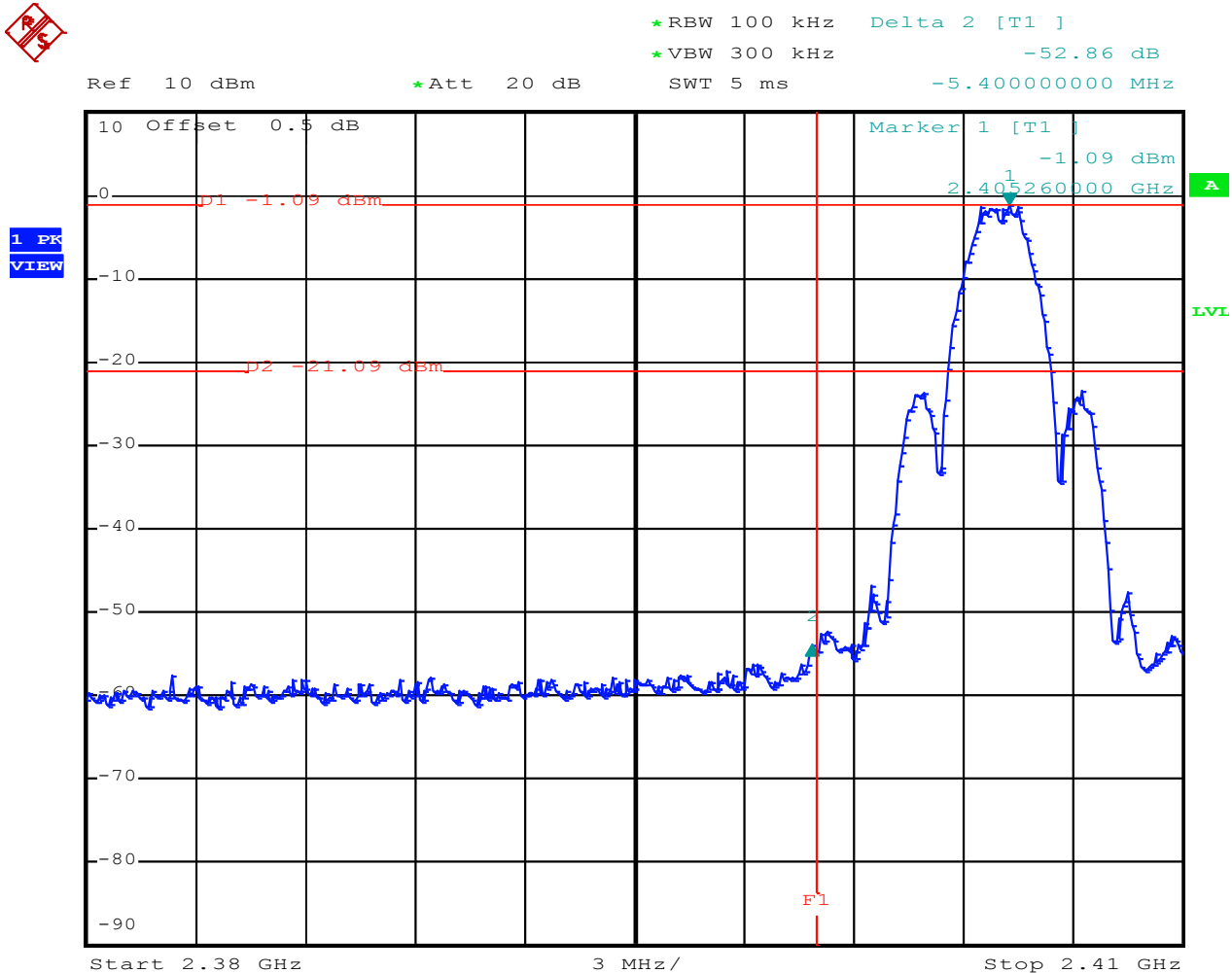
The highest emission amplitudes relative to the appropriate limit were measured and recorded in this report.

Results: All out of band spurious emissions are more than 20 dB below the fundamental. See the figures on the following pages.

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Plot: Band Edge Conducted Emission, Spectral Diagram, 2405 MHz

Plot showing more than 20 dB band edge attenuation.

F1 shows the band edge frequency of 2400 MHz.

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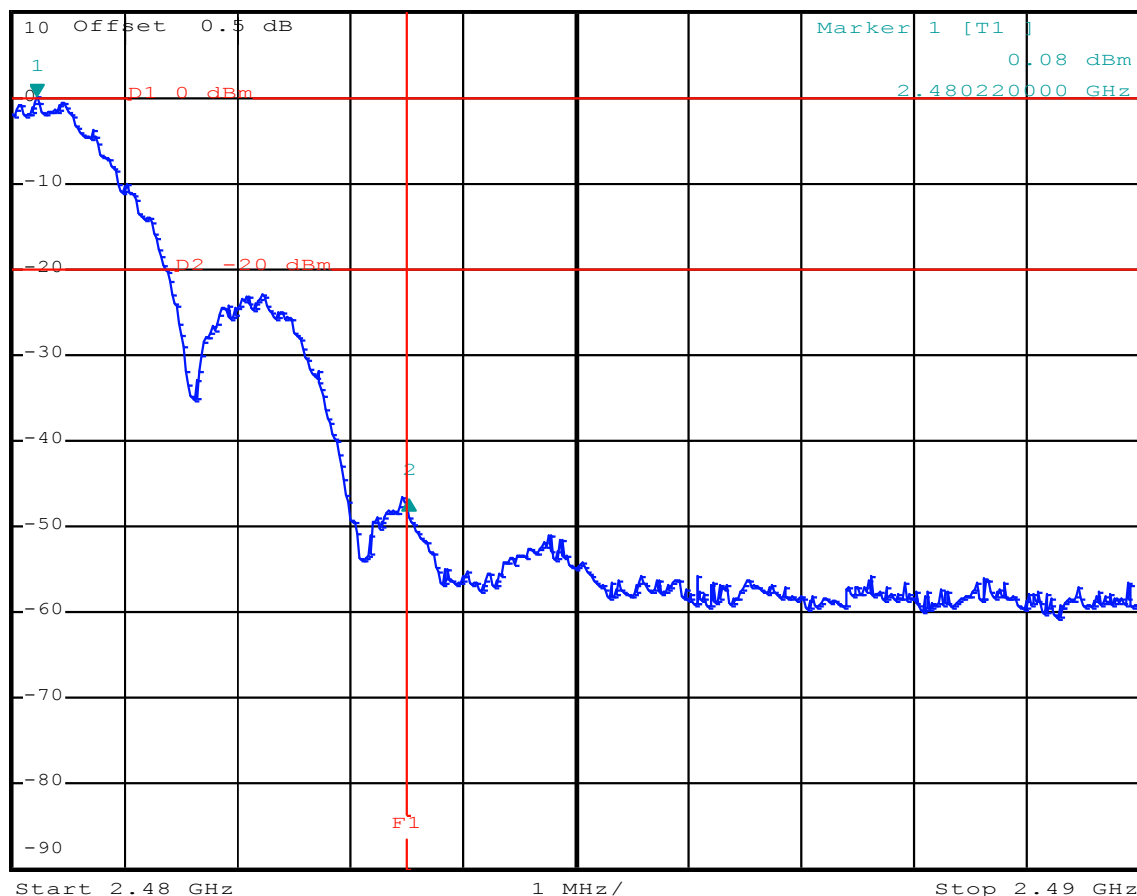
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*RBW 100 kHz Delta 2 [T1]
*VBW 300 kHz -47.02 dB
Ref 10 dBm *Att 20 dB SWT 2.5 ms 3.300000000 MHz

1 PK
VIEW



Date: 25.MAR.2015 11:22:02

Plot: Band Edge Conducted Emission, Spectral Diagram, 2480 MHz.
Plot showing more than 20 dB band edge attenuation.
F1 shows the band edge frequency of 2483,5 MHz.

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5.1.5 Radiated Spurious Emissions of Transmitter

RESULT: Pass

Date of testing: 2015-03-26 and 2015-04-02

Frequency range: 30MHz - 25GHz

Requirements:

FCC 15.209 and FCC 15.247(d) and RSS-Gen

Radiated emissions which fall outside the operation frequency band and outside restricted bands shall either meet the limit specified in FCC 15.209(a) or be attenuated at least 20dB below the power level in the 100kHz bandwidth within the band that contains the highest level of the desired power (the less severe limit applies).

Radiated emissions which fall in the restricted bands, as defined in FCC 15.205(a), must comply with the radiated emission limits specified in FCC 15.209(a).

Test procedure:

ANSI C63.10:2013

The EUT was placed on a nonconductive turntable 0.8m above the ground plane. Before final measurements of radiated emissions were performed, the EUT was scanned to determine its emission spectrum profile. The physical arrangement of the test system, the associated cabling and the EUT orientation (X, Y, Z) were varied in order to ensure that maximum emission amplitudes were attained.

The spectrum was examined from 30MHz to the 10th harmonic of the highest fundamental transmitter frequency (25GHz). Final radiated emission measurements were made at 3m distance.

At each frequency where a spurious emission was found, the EUT was rotated 360° and the antenna was raised and lowered from 1 to 4m in order to determine the emission's maximum level. Measurements were taken using both horizontal and vertical antenna polarizations.

The highest emission amplitudes relative to the appropriate limit were recorded in this report. Field strength values of radiated emissions at frequencies not listed in the tables are more than 20 dB below the applicable limit. The levels are expressed in dBm which are derived from $\text{dBm} = E(\text{dB}\mu\text{V/m}) - 95.2\text{dB}$. Where Peak (Pk) values were at least 6 dB under the Average (Av) limits, Av value was not tested. Where Average values were tested, Average values were measured using a 10Hz Video Bandwidth.

Correction factors are incorporated in the spectrum analyzers as an automated function.

Refer to section 4.2 for the power settings and modes.

Correction factors includes: antenna factor, cable loss and pre-amplifier gain.

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Radiated Emission, Quasi Peak Data, 30MHz - 1GHz, Horizontal and Vertical Antenna Orientations

Frequency [MHz]	Antenna Orientation	Level QP [dB μ V/m]	Limit [dB μ V/m]	Verdict [Pass/Fail]
41.869	Vertical	36.5	40.0	Pass
51.464	Vertical	38.1	40.0	Pass
58.000	Vertical	30.7	40.0	Pass
76.533	Vertical	15.6	40.0	Pass
211.372	Horizontal	42.7	43.5	Pass
272.480	Horizontal	17.8	46.0	Pass

Note:

- Quasi Peak detector used with a bandwidth of 120 kHz
- Tested in modes as described in section 4.2, highest values noted.
- Preliminary measurements indicated that the radiated emissions from EUT were not affected by the EUT's operating frequency.
- The EUT was varied in 3 positions.
- Test performed on April 02,2015

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**Radiated Emission, 1 - 25GHz, Horizontal and Vertical Antenna Orientations,
2405 MHz.**

Frequency [MHz]	Antenna Orientation	Detector	Resolution Bandwidth (kHz)	Level Pk [dBm]	Limit Av/Pk [dBm]*1	Result
1080.5 ^{*R}	Vertical	Peak (Pk)	1000	-61.2	-41.2 / -21.2	Pass
1445.2 ^{*R}	Horizontal	Peak (Pk)	1000	-60.8	-41.2 / -21.2	Pass
2341.0 ^{*R}	Horizontal	Peak (Pk)	1000	-52.9	-41.2 / -21.2	Pass
4810 ^{*H/R}	Horizontal	Peak (Pk)	1000	-39.9	-21.2	Pass
4810 ^{*H/R}	Horizontal	Average (Av)	1000	-51.2	-41.2	Pass
11499 ^{*R}	Vertical	Peak (Pk)	1000	-43.3	-21.2	Pass
11499 ^{*R}	Vertical	Average (Av)	1000	-55.7	-41.2	Pass
17987 ^{*R}	Vertical	Peak (Pk)	1000	-38.2	-21.2	Pass
17987 ^{*R}	Vertical	Average (Av)	1000	-51.6	-41.2	Pass

See notes on page 33

**Radiated Emission, 1 - 25GHz, Horizontal and Vertical Antenna Orientations,
2440 MHz.**

Frequency [MHz]	Antenna Orientation	Detector	Resolution Bandwidth (kHz)	Level Pk [dBm]	Limit Av/Pk [dBm]*1	Result
1088.1 ^{*R}	Horizontal	Peak (Pk)	1000	-60.9	-41.2 / -21.2	Pass
1440.6 ^{*R}	Horizontal	Peak (Pk)	1000	-61.8	-41.2 / -21.2	Pass
2335.3 ^{*R}	Vertical	Peak (Pk)	1000	-55.6	-41.2 / -21.2	Pass
4880 ^{*H/R}	Horizontal	Peak (Pk)	1000	-38.6	-21.2	Pass
4880 ^{*H/R}	Horizontal	Average (Av)	1000	-52.6	-41.2	Pass
11798 ^{*R}	Horizontal	Peak (Pk)	1000	-44.4	-21.2	Pass
11798 ^{*R}	Horizontal	Average (Av)	1000	-64.4	-41.2	Pass

See notes on page 33

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Radiated Emission, 1 - 25GHz, Horizontal and Vertical Antenna Orientations, 2480 MHz.

Frequency [MHz]	Antenna Orientation	Detector	Resolution Bandwidth (kHz)	Level Pk [dBm]	Limit Av/Pk [dBm]*1	Result
1080.8 ^{*R}	Horizontal	Peak (Pk)	1000	-60.3	-41.2 / -21.2	Pass
1440.3 ^{*R}	Horizontal	Peak (Pk)	1000	-60.3	-41.2 / -21.2	Pass
4960 ^{*H*}	Horizontal	Peak (Pk)	1000	-47.1	-21.2	Pass
4960 ^{*H*}	Horizontal	Average (Av)	1000	-57.5	-41.2	Pass
11577 ^{*R}	Vertical	Peak (Pk)	1000	-49.3	-41.2 / -21.2	Pass
17944 ^{*R}	Vertical	Peak (Pk)	1000	-38.4	-41.2 / -21.2	Pass
17944 ^{*R}	Vertical	Peak (Pk)	1000	-52.0	-41.2 / -21.2	Pass

- Note:
- Peak detector used with a bandwidth of 1 MHz
 - Tested in modes as described in section 4.2, highest values noted.
 - Peak value were already within Average limits, therefor Average not tested.
 - From pre-scan the worst case situation proved to be EUT in horizontal position with its antenna's in vertical position.
 - ^{*1}: Derived from the expression dBm = dBμV/m – 95.2dB.
 - ^{*R} refers to a frequency in a restricted band.
 - ^{*H} refers to a frequency which is a harmonic of the fundamental.
 - Test performed on March 26,2015

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5.2 AC Power Line Conducted Measurements

RESULT: PASS.

Date of testing: 2015-03-25

Requirements: FCC 15.109 and RSS-Gen Section 8.8.

For equipment that is designed to be connected to the public utility (AC) power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies within the band 150 kHz to 30 MHz shall not exceed the limits in the following table, as measured using a 50 μ H/50 ohms line impedance stabilization network (LISN). Compliance with the provisions of this paragraph shall be based on the measurement of the radio frequency voltage between each power line and ground at the power terminal. The lower limit applies at the band edges.

Frequency of Emission (MHz)	Conducted Limit (dB μ V) Quasi-Peak	Conducted Limit (dB μ V) Average
0.15 – 0.5	66 to 56*	56 to 46*
0.5 – 5	56	46
5 - 30	46	50

*Decreases with the logarithm of the frequency.

Test procedure:

ANSI C63.10-2013.

Each phase and neutral of the AC power line were measured with respect to ground. Measurements were performed using a 50 μ H / 50 Ω LISN. The frequency range from 150kHz to 30MHz was searched. The six highest EUT emissions relative to the limit were noted. The EUT was positioned at least 80cm from the LISN.

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5.2.1 AC Power Line Conducted Emission of Transmitter

Frequency (MHz)	Measurement results (dBµV) L1		Measurement results (dBµV) L2/Neutral		Limits (dBµV)		Verdict (Pass/Fail)
	QP	AV	QP	AV	QP	AV	
0.150	57.3	32.0	55.7	33.1	66.0	56.0	Pass
0.215	43.4	26.0	43.3	32.1	62.8	52.8	Pass
0.245	46.4	28.4	48.9	35.6	61.8	51.8	Pass
0.330	45.3	29.5	48.0	37.2	59.5	49.5	Pass
0.425	43.3	29.0	48.1	40.1	57.3	47.3	Pass
0.505	44.6	29.8	47.9	37.6	56.0	46.0	Pass
0.585	42.6	27.7	45.9	36.0	56.0	46.0	Pass
0.685	42.4	28.2	45.0	35.0	56.0	46.0	Pass
0.855	40.7	25.1	43.8	33.3	56.0	46.0	Pass
0.955	37.6	21.8	43.4	32.0	56.0	46.0	Pass
1.180	36.0	19.9	42.0	29.9	56.0	46.0	Pass
10.625	44.5	33.4	47.1	40.4	60.0	50.0	Pass
14.450	50.1	40.5	52.4	45.7	60.0	50.0	Pass
21.260	45.5	39.0	47.3	41.4	60.0	50.0	Pass
26.055	40.0	33.3	43.5	36.1	60.0	50.0	Pass

Results of the EUT with USB connection

Frequency (MHz)	Measurement results (dBµV) L1		Measurement results (dBµV) L2/Neutral		Limits (dBµV)		Verdict (Pass/Fail)
	QP	AV	QP	AV	QP	AV	
0.150	57.3	32.2	56.1	33.2	66.0	56.0	Pass
0.215	39.0	23.0	43.6	31.9	62.8	52.8	Pass
0.260	47.0	30.0	48.3	35.0	61.4	51.4	Pass
0.330	44.0	28.7	48.1	37.3	59.5	49.5	Pass
0.425	43.3	30.6	46.6	38.1	57.3	47.3	Pass
0.510	44.2	29.0	48.0	38.2	56.0	46.0	Pass
0.590	41.5	26.9	46.0	36.1	56.0	46.0	Pass
0.670	41.5	26.3	45.3	35.1	56.0	46.0	Pass
0.855	39.1	22.2	43.4	33.0	56.0	46.0	Pass
1.085	37.2	20.3	41.0	29.0	56.0	46.0	Pass
12.975	39.2	28.2	41.4	34.1	60.0	50.0	Pass
29.845	33.6	26.3	25.0	20.0	60.0	50.0	Pass

Results of the EUT with USB to RS-232 connection

The results of the conducted emission tests, carried out in accordance with FCC Part 15.109 and RS-Gen section 8.8, at the 120 Volts/ 60 Hz AC mains connection terminals of the EUT, are depicted in the tables above. See notes on the next page.

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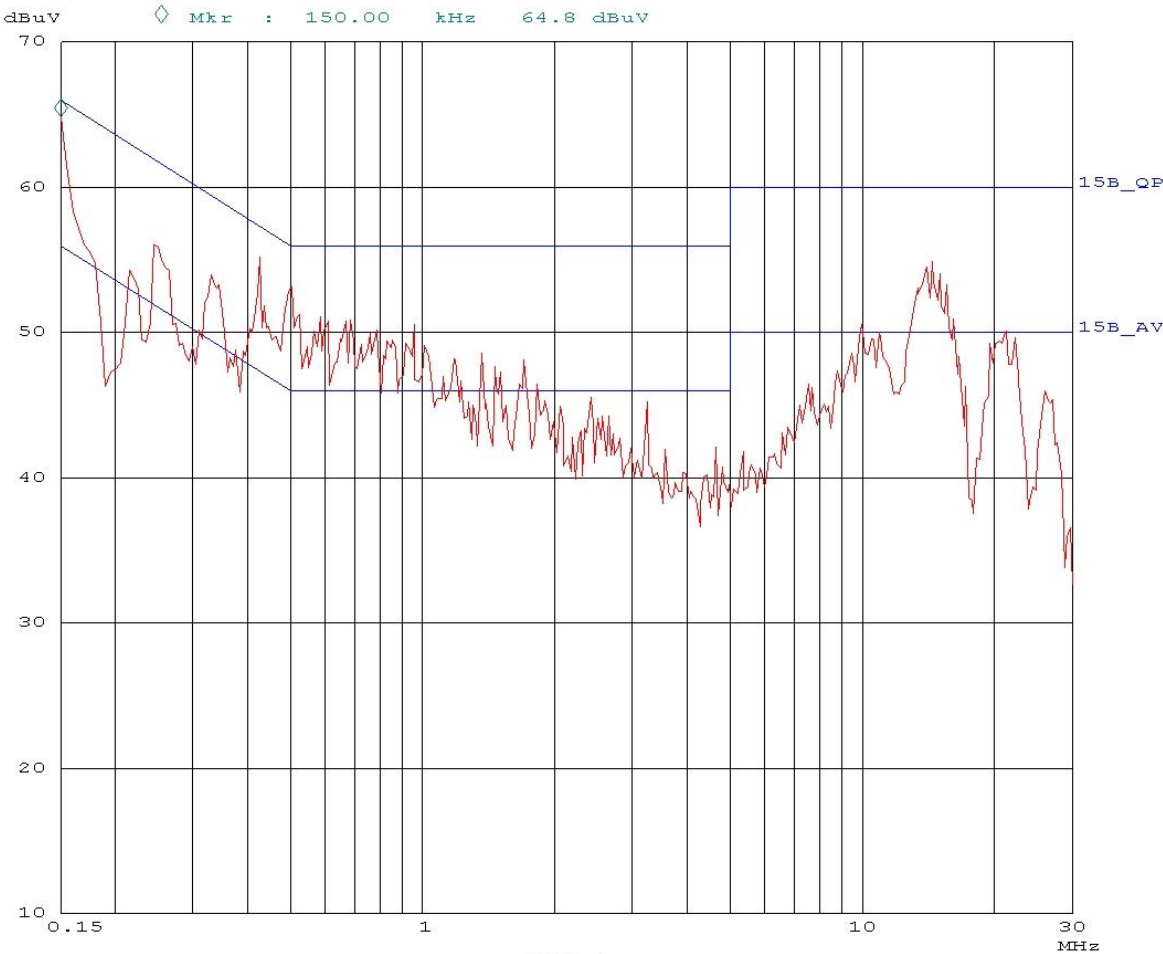
Notes:

1. The resolution bandwidth used was 9 kHz.
2. Preliminary measurements indicated that the emissions from EUT were not affected by the EUT's operating frequency. Worst case values noted.
3. Plots are provided on the next pages

5.2.2 Plots of the AC Power-line Conducted Emissions

25. Mar 15 14:24

Scan Settings (1 Range) |----- Receiver Settings -----|
|----- Frequencies -----|
Start Stop Step IF BW Detector M-Time Atten Preamp
150k 30M 5k 9k PK 20ms 0dB LN OFF



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Plot of the AC Power-line Conducted emissions on L1, USB connection

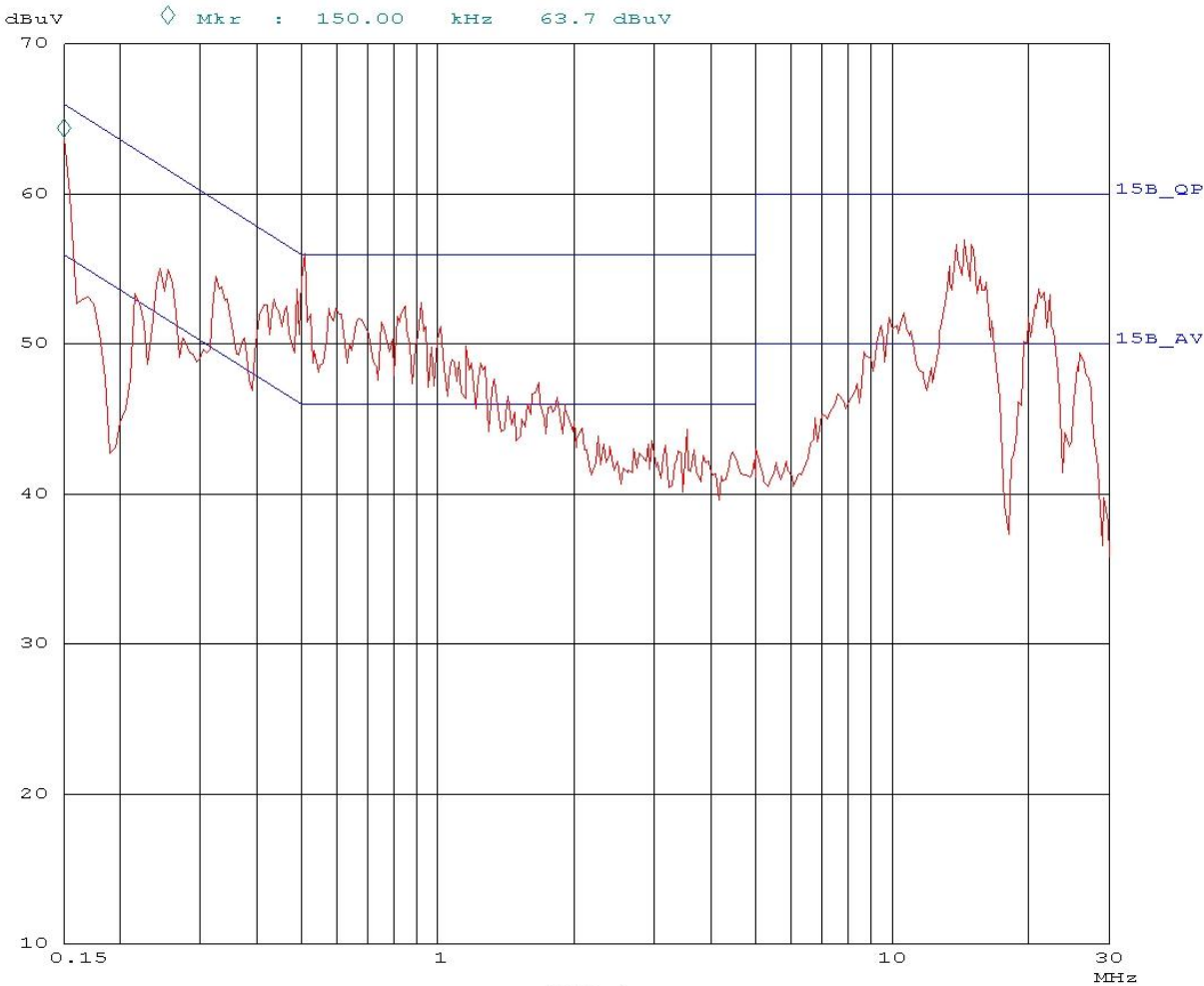
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25. Mar 15 14:44

Scan Settings (1 Range)				Receiver Settings			
----- Frequencies -----				-----			
Start	Stop	Step	IF BW	Detector	M-Time	Atten	Preamp
150k	30M	5k	9k	PK	20ms	0dB LN	OFF



Plot of the AC Power-line Conducted emissions on L2, USB connection

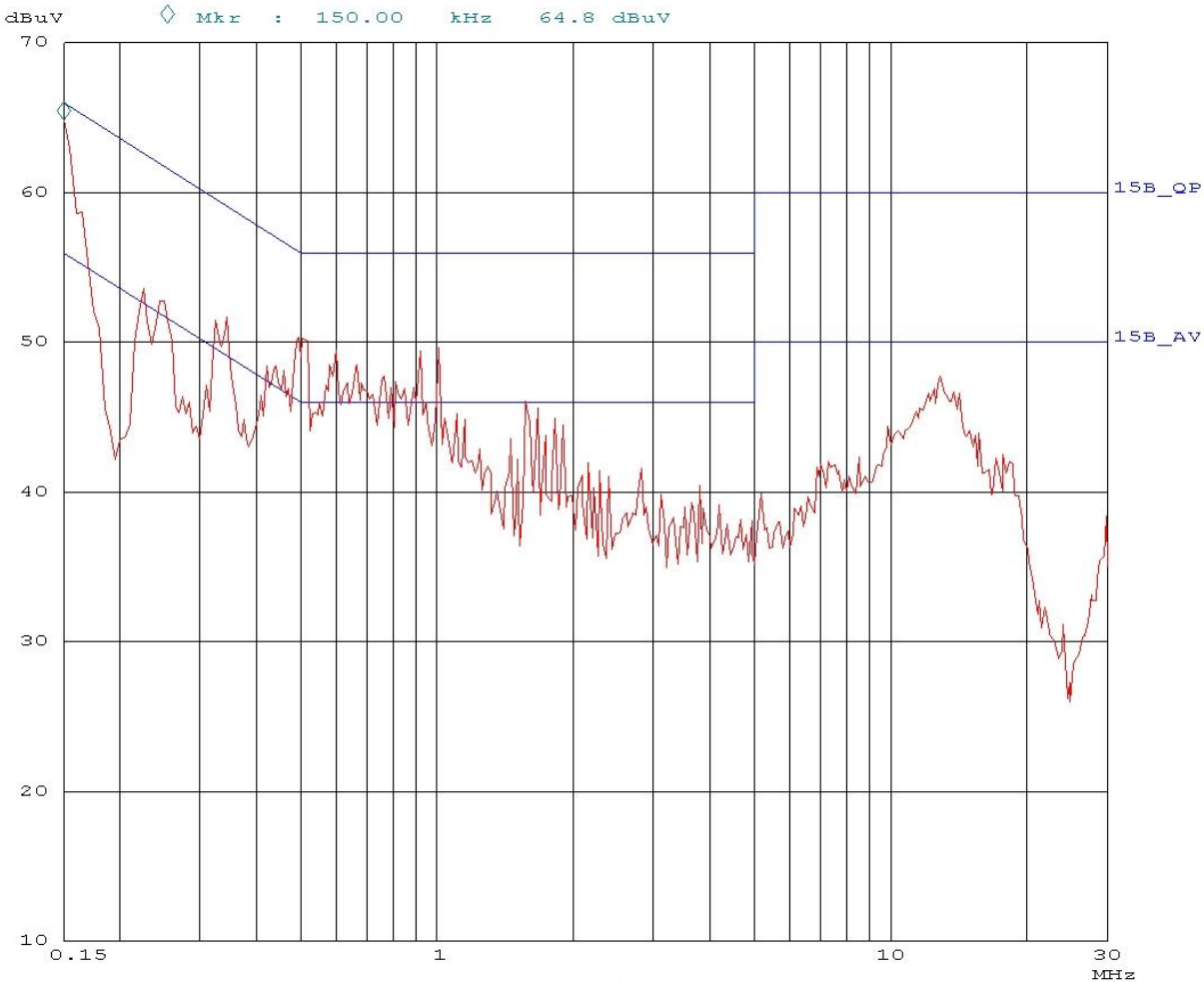
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25. Mar 15 15:17

Scan Settings (1 Range)				Receiver Settings			
----- Frequencies -----				-----			
Start	Stop	Step	IF BW	Detector	M-Time	Atten	Preamp
150k	30M	5k	9k	PK	20ms	0dB	OFF



Plot of the AC Power-line Conducted emissions on L1, USB to RS-232 connection

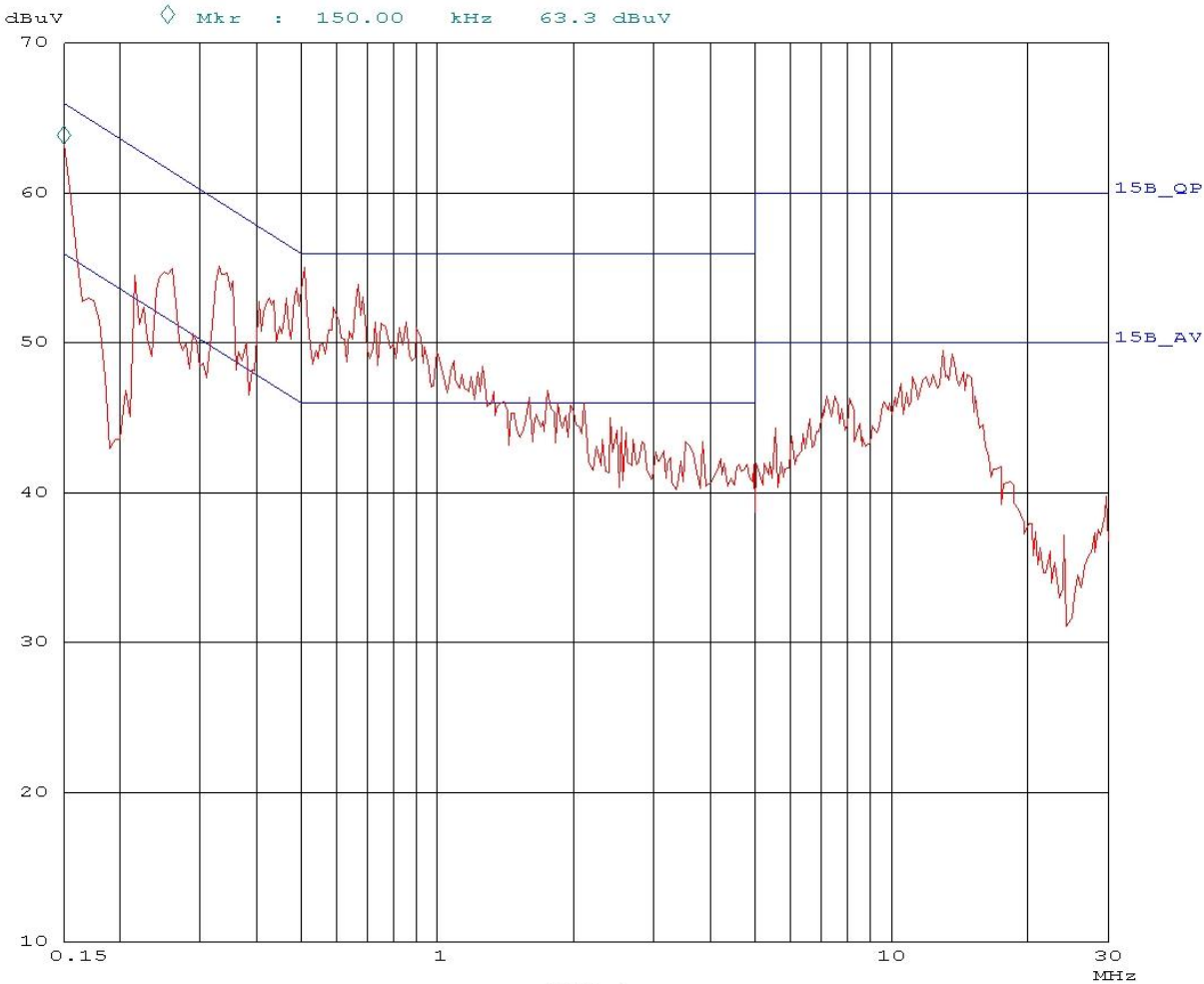
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25. Mar 15 15:07

Scan Settings (1 Range)				Receiver Settings			
----- Frequencies -----				-----			
Start	Stop	Step	IF BW	Detector	M-Time	Atten	Preamp
150k	30M	5k	9k	PK	20ms	0dB	LN OFF



Plot of the AC Power-line Conducted emissions on L2, USB to RS-232 connection

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End of report

Ambient Systems B.V.
Attn Mr. L. van Hoesel
Demmersweg 66
7556BN Hengelo
The Netherlands

Date: 2014-11-14

Subject: Identical Equipment Declaration

To whom it may concern:

The RF portion of GW3030v2 is identical to the RF portion of MR3000v2 from hw/firmware point of view. MR3000v2 has no serial port and is a de-populated version of GW3030v2.

Yours sincerely



L. van Hoesel
CTO