

**ELECTROMAGNETIC COMPATIBILITY  
TEST REPORT TO**

**Industry Canada RSS 210 Issue 8, CFR 47 FCC Part 15 Subpart C Section  
15.247**

**INTENTIONAL TRANSMITTER STANDARDS FOR LOW-POWER LICENCE-  
EXEMPT RADIOCOMMUNICATION DEVICES & DIGITALLY MODULATED  
INTENTIONAL RADIATORS OPERATING IN THE 2400-2483.5 MHz BAND**

**Report Number:** E10445-1202-4  
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**Testing Laboratory:** Quality Auditing Institute  
**Address:** #16 – 211 Schoolhouse Street, Coquitlam, BC, V3K 4X9, Canada


**ISO 17025 Accreditation:**



**Standard Council of Canada: Accredited Laboratory No. 743**

**International Accreditation Service Inc.: Accredited Laboratory No. TL-239**

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<b>Test Specifications</b>	
<b>Standards:</b>	Industry Canada RSS 210 Issue 8, CFR 47 FCC Part 15 Subpart C Section 15.247
<b>Procedures:</b>	As called by the standards above.
<b>Non-Standard Test Methods:</b>	NA
<b>Test Item Description:</b>	Wireless Module.
<b>Trade Mark:</b>	
<b>Manufacturer:</b>	Cleankeys Inc.
<b>Model Numbers:</b>	CKW
<b>FCC ID # (Wireless Adapter)</b>	XWS-CKW
<b>IC ID # (Wireless Adapter)</b>	8721A-CKW



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## Section I: EMC Test Description

### Testing Location

**Testing Laboratory:** Quality Auditing Institute  
**Laboratory Address:** #16 – 211 Schoolhouse Street, Coquitlam, BC, V3K 4X9, Canada  
**Associated EMC Laboratory:** Quality Auditing Institute: Pitt Meadows & Maple Ridge Locations  
**Testing Location & Address:** 19473 Fraser Way, Pitt Meadows, BC, V3Y 2V4, Canada  
**Phone Number:** (604) 527-8378  
**FCC Test Site Registration Number: 10 Meter Open Air Test Site and 5 Meter Semi-Anechoic Chamber:** 226383  
**Industry Canada Site Registration Number: 5 Meter SAC:** 9543B-1  
**Industry Canada Test Site Registration Number: 10 Meter OATS:** 9543C-1

### EUT Receiving Details

**Model Number:** CKW  
**Company:** Cleankeys Inc  
**Received Date:** August 29<sup>th</sup>, 2012  
**Received By:** Simon Howkins  
**Test Sample Log:** QAI Product Control Log: QM 1301 -Test Sample Inventory

### Environmental Test Conditions: Indoors

Day 1: August 29 <sup>th</sup> , 2012	Temperature: 23°C	R.H.: 55%
Day 2: September 4 <sup>th</sup> , 2012	Temperature: 24°C	R.H.: 43%
Day 3: September 5 <sup>th</sup> , 2012	Temperature: 24°C	R.H.: 48%
Day 4: September 6 <sup>th</sup> , 2012	Temperature: 25°C	R.H.: 50%
Day 5: September 7 <sup>th</sup> , 2012	Temperature: 23°C	R.H.: 46%
Day 6: September 10 <sup>th</sup> , 2012	Temperature: 24°C	R.H.: 44%
Day 7: September 11 <sup>th</sup> , 2012	Temperature: 24°C	R.H.: 43%
Day 8: September 12 <sup>th</sup> , 2012	Temperature: 25°C	R.H.: 42%
Day 9: September 13 <sup>th</sup> , 2012	Temperature: 25°C	R.H.: 39%
Day 10: September 14 <sup>th</sup> , 2012	Temperature: 24°C	R.H.: 44%
Day 11: September 17 <sup>th</sup> , 2012	Temperature: 24°C	R.H.: 45%
Day 12: September 20 <sup>th</sup> , 2012	Temperature: 23°C	R.H.: 43%



## **Environmental Test Conditions: Outdoors**

Day 2: September 4<sup>th</sup>, 2012

Temperature: 16°C    R.H.: 70%



## EMC Test Summary

The following tests demonstrate testimony for the FCC & IC Marks for intentional transmitter / electromagnetic compatibility testing for the **CKW** manufactured by **Cleankeys Inc.**

Test / Requirement Description	Deviations from:		Pass / Fail	Applicable FCC Rule Parts	Applicable Industry Canada Rule Parts
	Base Standard	Test Basis			
Power line Conducted Emissions	No	No	Pass	FCC Subpart C 15.207 (a)	RSS-Gen Issue 3 7.2.4
6 dB Bandwidth	No	No	Pass	FCC Subpart C 15.247 (a) (2)	RSS 210 Issue 8 A8.2(a)
Occupied Bandwidth (99% emissions bandwidth)	No	No	Pass	N/A	RSS-Gen Issue 3 4.6.1
Peak Power Output	No	No	Pass	FCC Subpart C 15.247 (b) (3)	RSS 210 Issue 8 A8.4 (4)
Power Spectral Density	No	No	Pass	FCC Subpart C 15.247 (e)	RSS 210 Issue 8 A8.2 (b)
Conducted Spurious Emissions	No	No	Pass	FCC Subpart C 15.247 (d)	RSS 210 Issue 8 A8.5
Conducted Spurious Emissions Band Edge	No	No	Pass	FCC Subpart C 15.247 (d)	RSS 210 Issue 8 A8.5
Duty Cycle Correction Factor	No	No	N/A	FCC Subpart C 15.35 (c)	RSS-Gen Issue 3 4.5
Radiated Spurious Emissions Band Edge	No	No	Pass	FCC Subpart C 15.247, 15.205	RSS 210 Issue 8 2.5, A8.5
Radiated Spurious Emissions (TX and RX) 4 MHz – 18 GHz	No	No	Pass	FCC Subpart C 15.247, 15.205	RSS 210 Issue 8 2.5, A8.5 RSS Gen Issue 3 4.10
Antenna Gain Measurement	No	No	N/A	FCC Subpart C 15.247, 4 (b)	N/A
Maximum Field Strength Measurement	No	No	N/A	FCC Subpart C 15.249, (a)	N/A

X

Tested By & Report Written By  
Simon Howkins, EMC Engineer

X

Reviewed By  
David Johanson RF/ EMC Test Engineer

Tests were conducted on a sample of the equipment for the purpose of demonstrating compliance with CFR 47 FCC Part 15 Subpart C Section 15.247, Industry Canada RSS 210 Issue 8: Intentional Transmitter Standards For Low-Power Licence-Exempt Radiocommunication Devices & Digitally Modulated Intentional Radiators Operating in the 2400-2483.5 MHz Band. The manufacturer is responsible for the tested product configuration, continued product compliance with these standards listed, and for the appropriate auditing of subsequent products as required.



## **Measurement Uncertainty**

Radio Frequency:	$\pm 1.5 \times 10^{-5}$
Total RF Power: Conducted:	$\pm 1$ dB
RF Power Density: Conducted	$\pm 2.75$ dB
Spurious Emissions: Conducted	$\pm 3$ dB
All Emissions: Radiated	$\pm 3.5$ dB
Temperature	$\pm 1^{\circ}\text{C}$
Humidity	$\pm 5$ %
DC and Low Frequency Voltages	$\pm 3$ %

## **Test Equipment List**

### **OATS Equipment List**

Manufacturer	Model	Description	Serial No.	Last Cal	Cal Due Date
Sunol Sciences	SM46C	Turntable	051204-2	N/A	N/A
Sunol Sciences	TWR95	Mast	TREML0001	N/A	N/A
Sunol Sciences	JB3	Antenna	A042004	7-Dec-2007	7-Dec-2010
Sunol Sciences	JB3	Antenna	A042004	Verified: 12-Mar-2012	
Rohde & Schwarz	ESCI	EMI Receiver	1000123	4-Mar-2011	29-Mar-2014

### **Semi-Anechoic Chamber Equipment List**

Manufacturer	Model	Description	Serial No.	Last Cal	Cal Due Date
ETS Lindgren	2165	Turntable	00043677	N/A	N/A
ETS Lindgren	2125	Mast	00077487	N/A	N/A
Sunol Sciences	JB3	Antenna	A120106	28-Oct-2008	28-Oct-2011
Sunol Sciences	JB3	Antenna	A120106	Verified: 12-Mar-2012	
Rohde & Schwarz	ESU40	EMI Receiver	100011	26-June-2012	26-June-2015
COM-POWER	LI-115	LISN	241036	9-Mar-2011	9-March-2014
A.H. Systems	PAM-0118	Preamplifier	189	13-Dec-2006	N/A
A.H. Systems	PAM-0118	Preamplifier	189	Verified: 11-Sept-2011	
COM-POWER	AHA-118	Dual Ridge Horn Antenna	711040	11-Mar-2011	11-Mar-2014
ETS Lindgren	S201	5 meter Semi-Anechoic Chamber	1030	N/A	N/A
EMCO	6502	Active Loop Antenna	2178	5-Feb-2011	5-Feb-2014

### **Measurement Software List**

Manufacturer	Model	Version	Description
Rhode & Schwarz	EMC 32	6.20.0	Emissions Pre-scan Test Software





## Section II: Equipment Under Test Information

### Product Description

Intentional transmitter tests were performed on the wireless module CKW with the PPPMnnWK30 main board as ancillary equipment. The main board was required as it configures the radio using a SPI link. The main board also provides power to the wireless module.

### EUT Testing Information

	Name:	Model:	HW Revision:
EUT (Intentional Transmitter)	Cleankeys Wireless Module	CKW with PPPMnnWK30	1.03
Cable:	Length = 2 meters; Type = Male A - Male mini B USB		
Voltage:	5V DC via USB cable		
Current Draw:	1A (max)		

Manufacturer	Cleankeys Inc.
Product Software/Firmware Revision	RF Test FW Rev. 1.0.0.7202
Model Numbers	CKW & PPPMnnWK30
Serial Numbers	CKW-67 (Wireless with Antenna) CKWP4-65 (Wireless module with reverse thread SMA Port) & P702

### Summary of On Board Frequencies

Frequency:	Module:	Signal:
8MHz	Microcontroller Crystal	Reference Clock
48MHz	USB	USB Clock
96MHz	Microcontroller (UC3L)	System Clock
72MHz	Microcontroller (STM32)	System Clock
4.5MHz	SPI	SPI Clocks



## **Auxiliary Equipment**

Description	Manufacturer	Model Number	Serial Number
Variable AC Power Supply	Elgar	EW3001-2	005110008
Acer Aspire One Laptop	Acer	ZG5	LUS410B0729121B8C42547
Acer Laptop DC Power Supply	Delta Electronics	ADP-30JH B	202W93C0MCR
LiPo Battery	Cleankeys	E855085-03X	09-2010

## **EUT Cabling Configuration**

Description	Number of Lines	Connection Type	Load or Termination	Shielded	Ferrites
AC/DC Converter	2	DC Connector	Yes	No	Yes
USB to EUT	4	USB Connector	Yes	Yes	Yes

## **EUT EMC Test Firmware**

The EUT has a special version of firmware loaded for stand alone radio measurements. This EMC firmware configures the radio for maximum output power and maximum transmit duty cycle. It allows the EUT to transmit in carrier mode and in modulated carrier mode with psuedo random payload at low, mid, and high channels. The firmware also allows for the radio to be configured in receive mode at low, mid, and high channels.



## Section III: Intentional Transmitter Testing to CFR 47 FCC Part 15, Subpart C, Section 15.247 and Industry Canada RSS 210 Issue 8

### Summary of Intentional Transmitter Tests

Test / Requirement Description	Deviations from:		Pass / Fail	Applicable FCC Rule Parts	Applicable Industry Canada Rule Parts
	Base Standard	Test Basis			
Power line Conducted Emissions	No	No	Pass	FCC Subpart C 15.207 (a)	RSS-Gen Issue 3 7.2.4
6 dB Bandwidth	No	No	Pass	FCC Subpart C 15.247 (a) (2)	RSS 210 Issue 8 A8.2(a)
Occupied Bandwidth (99% emissions bandwidth)	No	No	Pass	N/A	RSS-Gen Issue 3 4.6.1
Peak Power Output	No	No	Pass	FCC Subpart C 15.247 (b) (3)	RSS 210 Issue 8 A8.4 (4)
Power Spectral Density	No	No	Pass	FCC Subpart C 15.247 (e)	RSS 210 Issue 8 A8.2 (b)
Conducted Spurious Emissions	No	No	Pass	FCC Subpart C 15.247 (d)	RSS 210 Issue 8 A8.5
Conducted Spurious Emissions Band Edge	No	No	Pass	FCC Subpart C 15.247 (d)	RSS 210 Issue 8 A8.5
Duty Cycle Correction Factor	No	No	N/A	FCC Subpart C 15.35 (c)	RSS-Gen Issue 3 4.5
Radiated Spurious Emissions Band Edge	No	No	Pass	FCC Subpart C 15.247, 15.205	RSS 210 Issue 8 2.5, A8.5
Radiated Spurious Emissions (TX and RX)	No	No	Pass	FCC Subpart C 15.247, 15.205	RSS 210 Issue 8 2.5, A8.5 RSS Gen Issue 3 4.10
Antenna Gain Measurement	No	No	N/A	FCC Subpart C 15.247, 4 (b)	N/A
Maximum Field Strength Measurement	No	No	N/A	FCC Subpart C 15.249, (a)	N/A

**NOTE: See Appendix A for all Intentional Transmitter Testing Data**



## Appendix A: Report of Measurement Data and Plots

### Conducted Emissions Testing

DATE: August 29<sup>th</sup>, 2012

TEST STANDARD: FCC CFR47, Part 15, Subpart B & RSS-Gen Issue 3: 7.2.4

TEST VOLTAGE: 120VAC, 60Hz

MINIMUM STANDARD: Class B Limit:

Frequency (MHz)	Conducted Limit (dB $\mu$ V)	
	Quasi-Peak	Average
0.15 - 0.50	66 to 56	56 to 46
0.50 - 5	56	46
5 - 30	60	50
Note 1 The lower limit shall apply at the transition frequencies.		
Note 2 The limit decreases linearly with the logarithm of the frequency in the range 0.15 MHz to 0.50 MHz.		

TEST SETUP: The EUT was connected to the conducted emissions LISN apparatus. The equipment was operated and tested at 120VAC at 60Hz while operating continuously.

METHOD OF MEASUREMENT: Measurements were made using a test receiver with a 9 kHz bandwidth, CISPR Quasi-Peak detector and Average detector.

DEVICE DESCRIPTIONS: As described in the Equipment Under Test Section above.

CABLING DETAILS: Refer to Equipment Under Test Section for Cabling.

MODIFICATIONS: No modifications were required for the EUT to pass the test.

NOTES: Both the AC Charger and the Laptop Power Supply conducted emissions were measured while the EUT test software was executed.

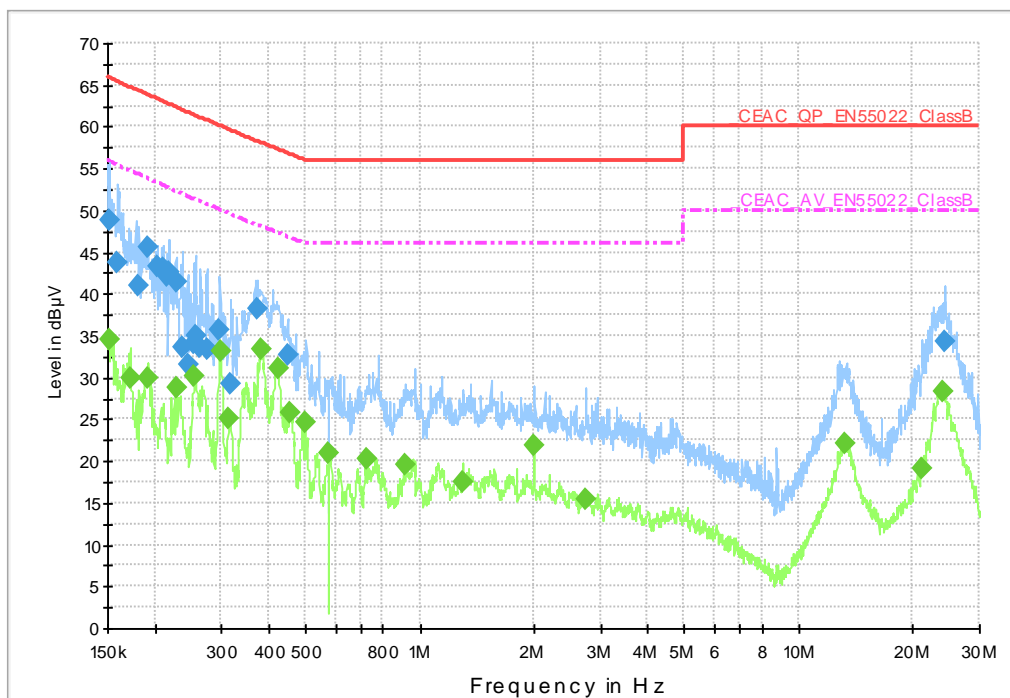
MEASUREMENT DATA: See Appendix A for the conducted emissions plots and corresponding frequencies.

PERFORMANCE: PASS: Complies with the standard.



## Conducted Emissions: USB Connected

120 VAC, 60 Hz: Line 1



Conducted Emissions Plot

Frequency (MHz)	QuasiPeak (dBµV)	Meas. Time (ms)	Bandwidth (kHz)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)
0.151204	48.9	1000.00	9.000	On	L1	0.4	17.0	65.9
0.159904	43.8	1000.00	9.000	On	L1	0.4	21.6	65.4
0.181716	41.0	1000.00	9.000	On	L1	0.3	23.3	64.3
0.191023	45.6	1000.00	9.000	On	L1	0.3	18.3	63.9
0.203229	43.3	1000.00	9.000	On	L1	0.3	20.0	63.3
0.209830	43.1	1000.00	9.000	On	L1	0.3	19.9	63.0
0.215352	42.2	1000.00	9.000	On	L1	0.3	20.6	62.8
0.218385	42.6	1000.00	9.000	On	L1	0.3	20.1	62.7
0.227288	41.5	1000.00	9.000	On	L1	0.3	20.9	62.4
0.236083	33.7	1000.00	9.000	On	L1	0.3	28.3	62.0
0.243752	31.6	1000.00	9.000	On	L1	0.3	30.2	61.8
0.252678	34.1	1000.00	9.000	On	L1	0.2	27.4	61.5
0.255214	35.1	1000.00	9.000	On	L1	0.2	26.3	61.4
0.264032	33.7	1000.00	9.000	On	L1	0.2	27.4	61.1
0.273700	33.3	1000.00	9.000	On	L1	0.2	27.5	60.8
0.295290	35.7	1000.00	9.000	On	L1	0.2	24.5	60.2
0.317312	29.1	1000.00	9.000	On	L1	0.2	30.5	59.6
0.371567	38.2	1000.00	9.000	On	L1	0.2	20.1	58.3
0.447440	32.8	1000.00	9.000	On	L1	0.2	24.1	56.9
24.332011	34.3	1000.00	9.000	On	L1	0.8	25.7	60.0

Conducted Emissions Table: Quasi-Peak Measurements

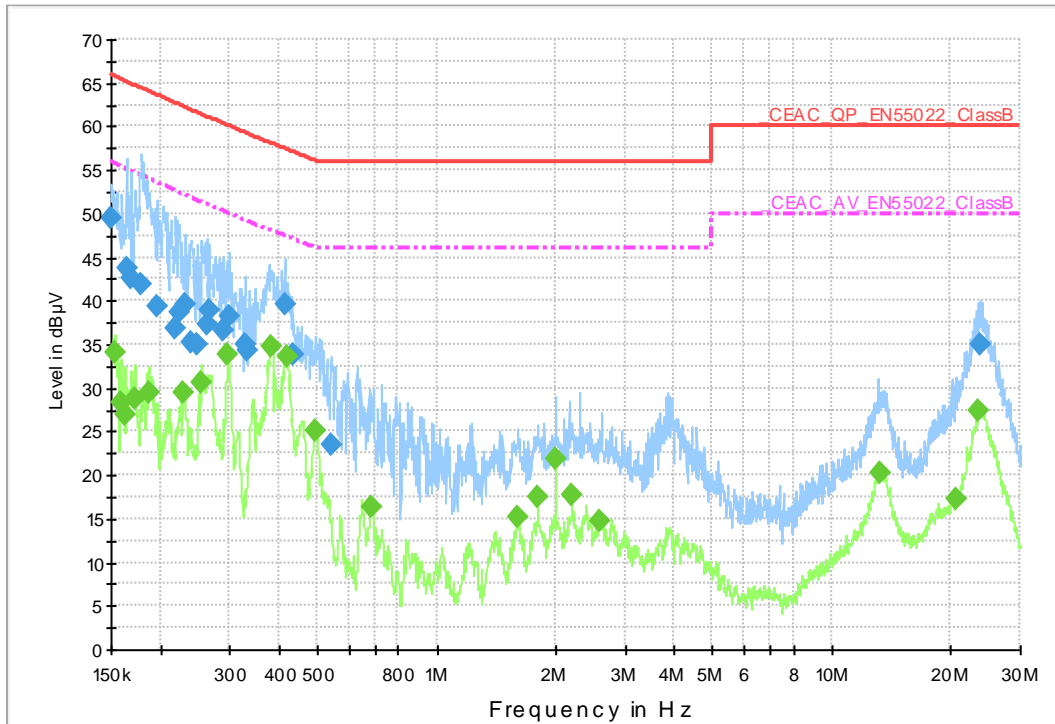


Frequency (MHz)	Average (dBµV)	Meas. Time (ms)	Bandwidth (kHz)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)
0.152417	34.6	1000.00	9.000	On	L1	0.4	21.3	55.9
0.171829	30.0	1000.00	9.000	On	L1	0.4	24.8	54.8
0.191023	29.9	1000.00	9.000	On	L1	0.3	23.9	53.8
0.228198	28.7	1000.00	9.000	On	L1	0.3	23.6	52.3
0.254705	30.1	1000.00	9.000	On	L1	0.2	21.3	51.4
0.297659	33.1	1000.00	9.000	On	L1	0.2	17.0	50.1
0.314158	25.0	1000.00	9.000	On	L1	0.2	24.6	49.6
0.380583	33.5	1000.00	9.000	On	L1	0.2	14.6	48.1
0.421408	31.0	1000.00	9.000	On	L1	0.2	16.3	47.3
0.456470	25.8	1000.00	9.000	On	L1	0.2	20.9	46.7
0.497421	24.6	1000.00	9.000	On	L1	0.2	21.4	46.0
0.575530	20.9	1000.00	9.000	On	L1	0.2	25.1	46.0
0.727095	20.3	1000.00	9.000	On	L1	0.2	25.7	46.0
0.918575	19.6	1000.00	9.000	On	L1	0.2	26.4	46.0
1.297868	17.6	1000.00	9.000	On	L1	0.2	28.4	46.0
1.998289	22.0	1000.00	9.000	On	L1	0.2	24.0	46.0
2.740049	15.5	1000.00	9.000	On	L1	0.2	30.5	46.0
13.202471	22.1	1000.00	9.000	On	L1	0.4	27.9	50.0
21.029761	19.1	1000.00	9.000	On	L1	0.7	30.9	50.0
24.042060	28.4	1000.00	9.000	On	L1	0.8	21.6	50.0

Conducted Emissions Table: Average Measurements



120 VAC, 60 Hz: Neutral Line



Conducted Emissions Plot

Frequency (MHz)	QuasiPeak (dBμV)	Meas. Time (ms)	Bandwidth (kHz)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dBμV)
0.150601	49.4	1000.00	9.000	On	N	0.4	16.6	66.0
0.163784	43.7	1000.00	9.000	On	N	0.4	21.5	65.2
0.168767	42.5	1000.00	9.000	On	N	0.4	22.4	64.9
0.178477	41.9	1000.00	9.000	On	N	0.3	22.6	64.5
0.196050	39.5	1000.00	9.000	On	N	0.3	24.1	63.6
0.217514	36.8	1000.00	9.000	On	N	0.3	25.9	62.7
0.224132	38.8	1000.00	9.000	On	N	0.3	23.7	62.5
0.230490	39.7	1000.00	9.000	On	N	0.3	22.5	62.2
0.238930	35.2	1000.00	9.000	On	N	0.3	26.7	61.9
0.249168	35.1	1000.00	9.000	On	N	0.2	26.5	61.6
0.261407	37.4	1000.00	9.000	On	N	0.2	23.8	61.2
0.266683	38.9	1000.00	9.000	On	N	0.2	22.1	61.0
0.288294	36.7	1000.00	9.000	On	N	0.2	23.7	60.4
0.297659	38.2	1000.00	9.000	On	N	0.2	21.9	60.1
0.327620	34.9	1000.00	9.000	On	N	0.2	24.4	59.3
0.332234	34.4	1000.00	9.000	On	N	0.2	24.8	59.2
0.412248	39.7	1000.00	9.000	On	N	0.2	17.8	57.5
0.434229	33.9	1000.00	9.000	On	N	0.2	23.2	57.1
0.540964	23.4	1000.00	9.000	On	N	0.2	32.6	56.0
23.755564	35.0	1000.00	9.000	On	N	0.8	25.0	60.0

Conducted Emissions Table: Quasi-Peak Measurements



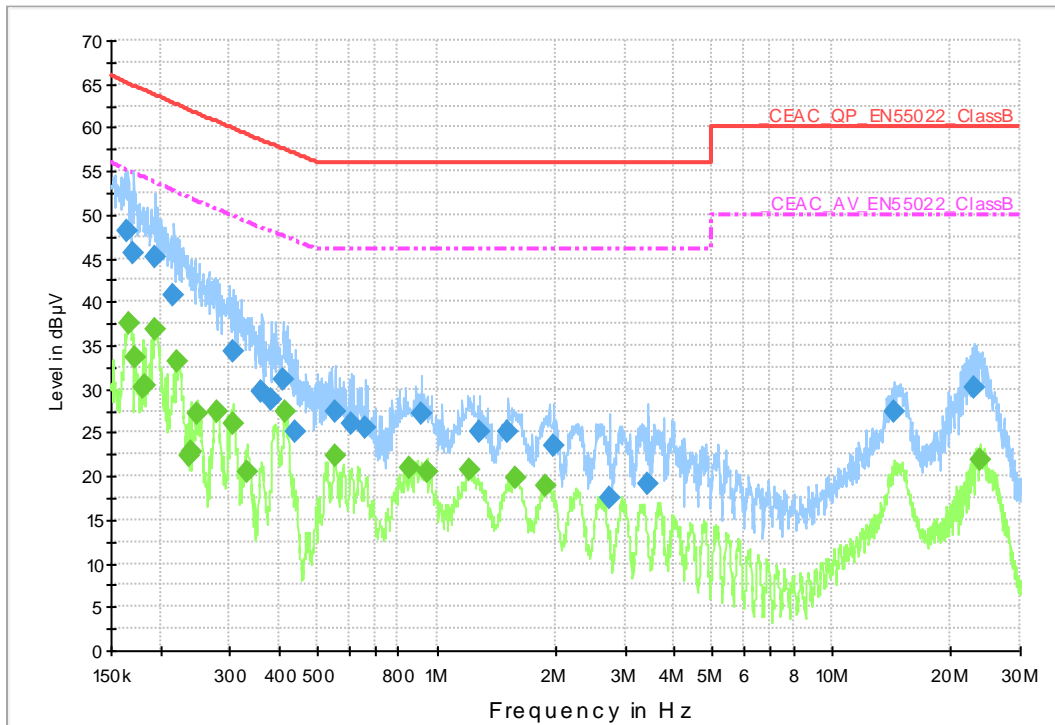
Frequency (MHz)	Average (dBµV)	Meas. Time (ms)	Bandwidth (kHz)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)
0.153333	34.1	1000.00	9.000	On	N	0.4	21.7	55.8
0.159904	28.2	1000.00	9.000	On	N	0.4	27.2	55.4
0.162480	26.9	1000.00	9.000	On	N	0.4	28.4	55.3
0.173208	28.7	1000.00	9.000	On	N	0.4	26.0	54.7
0.187619	29.4	1000.00	9.000	On	N	0.3	24.6	54.0
0.228655	29.6	1000.00	9.000	On	N	0.3	22.7	52.3
0.254705	30.6	1000.00	9.000	On	N	0.2	20.8	51.4
0.295881	33.8	1000.00	9.000	On	N	0.2	16.3	50.1
0.382107	34.7	1000.00	9.000	On	N	0.2	13.4	48.1
0.417220	33.6	1000.00	9.000	On	N	0.2	13.8	47.4
0.492477	25.2	1000.00	9.000	On	N	0.2	20.9	46.1
0.684793	16.4	1000.00	9.000	On	N	0.2	29.6	46.0
1.600815	15.2	1000.00	9.000	On	N	0.2	30.8	46.0
1.801096	17.4	1000.00	9.000	On	N	0.2	28.6	46.0
1.998289	21.8	1000.00	9.000	On	N	0.2	24.2	46.0
2.199424	17.8	1000.00	9.000	On	N	0.2	28.2	46.0
2.596151	14.9	1000.00	9.000	On	N	0.2	31.1	46.0
13.228876	20.4	1000.00	9.000	On	N	0.4	29.6	50.0
20.654983	17.3	1000.00	9.000	On	N	0.7	32.7	50.0
23.566466	27.4	1000.00	9.000	On	N	0.8	22.6	50.0

Conducted Emissions Table: Average Measurements





230 VAC, 50 Hz: Line 1



Conducted Emissions Plot

Frequency (MHz)	QuasiPeak (dBµV)	Meas. Time (ms)	Bandwidth (kHz)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)
0.165428	48.1	1000.00	9.000	On	L1	0.4	17.0	65.1
0.171486	45.6	1000.00	9.000	On	L1	0.4	19.2	64.8
0.193327	45.2	1000.00	9.000	On	L1	0.3	18.6	63.8
0.216214	40.8	1000.00	9.000	On	L1	0.3	22.0	62.8
0.306715	34.4	1000.00	9.000	On	L1	0.2	25.5	59.9
0.361317	29.8	1000.00	9.000	On	L1	0.2	28.7	58.5
0.381344	28.7	1000.00	9.000	On	L1	0.2	29.4	58.1
0.408966	31.2	1000.00	9.000	On	L1	0.2	26.4	57.6
0.440345	25.1	1000.00	9.000	On	L1	0.2	31.9	57.0
0.552985	27.4	1000.00	9.000	On	L1	0.2	28.6	56.0
0.608645	26.0	1000.00	9.000	On	L1	0.2	30.0	56.0
0.660603	25.5	1000.00	9.000	On	L1	0.2	30.5	56.0
0.916742	27.2	1000.00	9.000	On	L1	0.2	28.8	56.0
1.284967	25.2	1000.00	9.000	On	L1	0.2	30.8	56.0
1.519779	25.1	1000.00	9.000	On	L1	0.2	30.9	56.0
1.974477	23.4	1000.00	9.000	On	L1	0.2	32.6	56.0
2.751020	17.4	1000.00	9.000	On	L1	0.2	38.6	56.0
3.427229	19.1	1000.00	9.000	On	L1	0.3	36.9	56.0
14.415674	27.3	1000.00	9.000	On	L1	0.4	32.7	60.0
22.916398	30.1	1000.00	9.000	On	L1	0.7	29.9	60.0

Conducted Emissions Table: Quasi-Peak Measurements

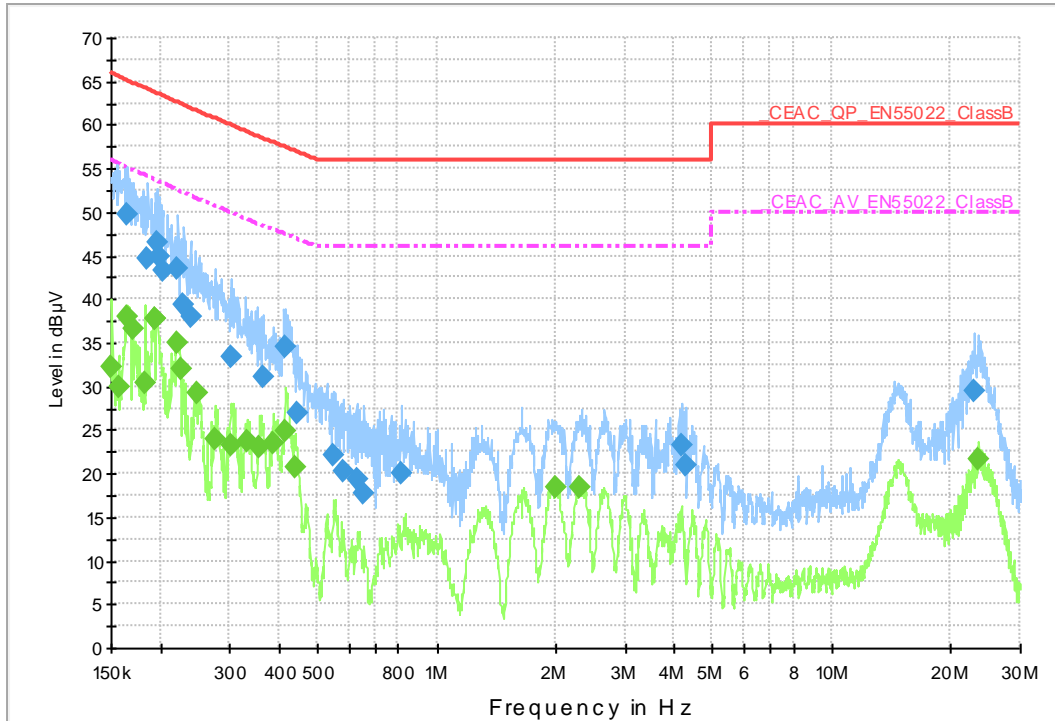


Frequency (MHz)	Average (dBµV)	Meas. Time (ms)	Bandwidth (kHz)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)
0.165759	37.5	1000.00	9.000	On	L1	0.4	17.6	55.1
0.171829	33.7	1000.00	9.000	On	L1	0.4	21.1	54.8
0.180269	30.2	1000.00	9.000	On	L1	0.3	24.1	54.3
0.182808	30.4	1000.00	9.000	On	L1	0.3	23.8	54.2
0.193713	36.9	1000.00	9.000	On	L1	0.3	16.8	53.7
0.220137	33.3	1000.00	9.000	On	L1	0.3	19.4	52.6
0.235611	22.4	1000.00	9.000	On	L1	0.3	29.6	52.0
0.239408	22.8	1000.00	9.000	On	L1	0.3	29.1	51.9
0.249168	27.2	1000.00	9.000	On	L1	0.2	24.3	51.5
0.277555	27.4	1000.00	9.000	On	L1	0.2	23.2	50.6
0.306715	26.1	1000.00	9.000	On	L1	0.2	23.7	49.8
0.330909	20.5	1000.00	9.000	On	L1	0.2	28.7	49.2
0.415556	27.4	1000.00	9.000	On	L1	0.2	20.0	47.4
0.554091	22.4	1000.00	9.000	On	L1	0.2	23.6	46.0
0.856534	21.0	1000.00	9.000	On	L1	0.2	25.0	46.0
0.942747	20.4	1000.00	9.000	On	L1	0.2	25.6	46.0
1.215054	20.7	1000.00	9.000	On	L1	0.2	25.3	46.0
1.578582	19.7	1000.00	9.000	On	L1	0.2	26.3	46.0
1.878274	18.9	1000.00	9.000	On	L1	0.2	27.1	46.0
23.708147	21.9	1000.00	9.000	On	L1	0.8	28.1	50.0

Conducted Emissions Table: Average Measurements



## 230 VAC, 50 Hz: Neutral Line



Conducted Emissions Plot

Frequency (MHz)	QuasiPeak (dBμV)	Meas. Time (ms)	Bandwidth (kHz)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dBμV)
0.165428	49.7	1000.00	9.000	On	N	0.4	15.4	65.1
0.186125	44.6	1000.00	9.000	On	N	0.3	19.5	64.1
0.196050	46.6	1000.00	9.000	On	N	0.3	17.0	63.6
0.198811	44.9	1000.00	9.000	On	N	0.3	18.6	63.5
0.202823	43.3	1000.00	9.000	On	N	0.3	20.0	63.3
0.221461	43.6	1000.00	9.000	On	N	0.3	19.0	62.6
0.229570	39.3	1000.00	9.000	On	N	0.3	23.0	62.3
0.237977	37.9	1000.00	9.000	On	N	0.3	24.1	62.0
0.301852	33.4	1000.00	9.000	On	N	0.2	26.6	60.0
0.363490	31.1	1000.00	9.000	On	N	0.2	27.4	58.5
0.415556	34.5	1000.00	9.000	On	N	0.2	22.9	57.4
0.443878	27.0	1000.00	9.000	On	N	0.2	29.9	56.9
0.550780	22.1	1000.00	9.000	On	N	0.2	33.9	56.0
0.580148	20.2	1000.00	9.000	On	N	0.2	35.8	56.0
0.627162	19.2	1000.00	9.000	On	N	0.2	36.8	56.0
0.655345	17.8	1000.00	9.000	On	N	0.2	38.2	56.0
0.814801	20.1	1000.00	9.000	On	N	0.2	35.9	56.0
4.176838	23.3	1000.00	9.000	On	N	0.3	32.7	56.0
4.261130	20.9	1000.00	9.000	On	N	0.3	35.1	56.0
23.008155	29.5	1000.00	9.000	On	N	0.7	30.5	60.0

Conducted Emissions Table: Quasi-Peak Measurements



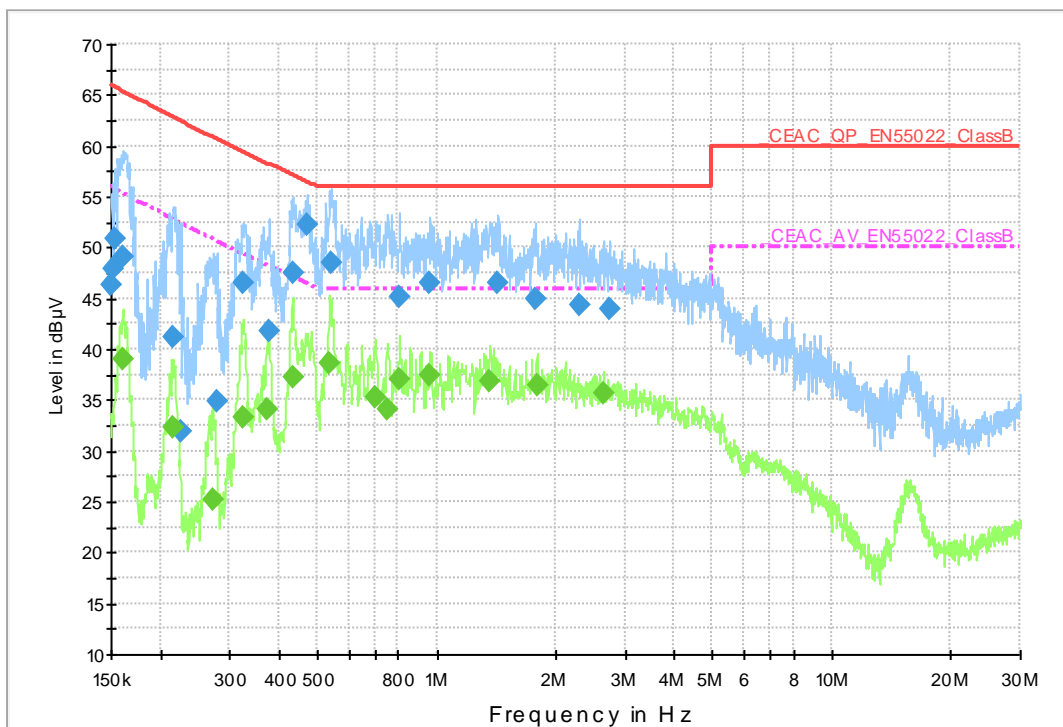
Frequency (MHz)	Average (dBμV)	Meas. Time (ms)	Bandwidth (kHz)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dBμV)
0.150601	32.3	1000.00	9.000	On	N	0.4	23.7	56.0
0.156428	29.9	1000.00	9.000	On	N	0.4	25.7	55.6
0.165428	37.9	1000.00	9.000	On	N	0.4	17.2	55.1
0.169781	36.6	1000.00	9.000	On	N	0.4	18.3	54.9
0.182808	30.5	1000.00	9.000	On	N	0.3	23.7	54.2
0.192941	37.7	1000.00	9.000	On	N	0.3	16.0	53.7
0.194878	37.7	1000.00	9.000	On	N	0.3	16.0	53.7
0.221461	34.9	1000.00	9.000	On	N	0.3	17.6	52.5
0.225930	32.1	1000.00	9.000	On	N	0.3	20.3	52.4
0.248174	29.2	1000.00	9.000	On	N	0.3	22.4	51.6
0.275346	23.8	1000.00	9.000	On	N	0.2	26.9	50.7
0.303667	23.2	1000.00	9.000	On	N	0.2	26.7	49.9
0.331571	23.8	1000.00	9.000	On	N	0.2	25.4	49.2
0.357726	23.1	1000.00	9.000	On	N	0.2	25.5	48.6
0.386715	23.5	1000.00	9.000	On	N	0.2	24.5	48.0
0.414726	24.9	1000.00	9.000	On	N	0.2	22.5	47.4
0.439466	20.8	1000.00	9.000	On	N	0.2	26.2	47.0
2.006290	18.3	1000.00	9.000	On	N	0.2	27.7	46.0
2.293671	18.5	1000.00	9.000	On	N	0.2	27.5	46.0
23.613599	21.6	1000.00	9.000	On	N	0.8	28.4	50.0

Conducted Emissions Table: Average & Quasi-Peak Measurements



## Conducted Emissions: AC Charger

120 VAC, 60 Hz: Line 1



Conducted Emissions Plot

Frequency (MHz)	QuasiPeak (dBμV)	Meas. Time (ms)	Bandwidth (kHz)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dBμV)
0.150000	46.2	1000.00	9.000	On	L1	0.4	19.8	66.0
0.151506	47.8	1000.00	9.000	On	L1	0.4	18.1	65.9
0.153947	50.8	1000.00	9.000	On	L1	0.4	15.0	65.8
0.161187	49.1	1000.00	9.000	On	L1	0.4	16.3	65.4
0.216214	41.2	1000.00	9.000	On	L1	0.3	21.6	62.8
0.225479	31.9	1000.00	9.000	On	L1	0.3	30.5	62.4
0.278110	34.9	1000.00	9.000	On	L1	0.2	25.8	60.7
0.323070	46.5	1000.00	9.000	On	L1	0.2	12.9	59.4
0.376800	41.8	1000.00	9.000	On	L1	0.2	16.4	58.2
0.431634	47.5	1000.00	9.000	On	L1	0.2	9.6	57.1
0.469419	52.2	1000.00	9.000	On	L1	0.2	4.3	56.5
0.539884	48.6	1000.00	9.000	On	L1	0.2	7.4	56.0
0.805091	45.1	1000.00	9.000	On	L1	0.2	10.9	56.0
0.963696	46.4	1000.00	9.000	On	L1	0.2	9.6	56.0
1.434223	46.6	1000.00	9.000	On	L1	0.2	9.4	56.0
1.772536	45.0	1000.00	9.000	On	L1	0.2	11.0	56.0
2.289093	44.3	1000.00	9.000	On	L1	0.2	11.7	56.0
2.745529	43.9	1000.00	9.000	On	L1	0.2	12.1	56.0

Conducted Emissions Table: Quasi-Peak Measurements

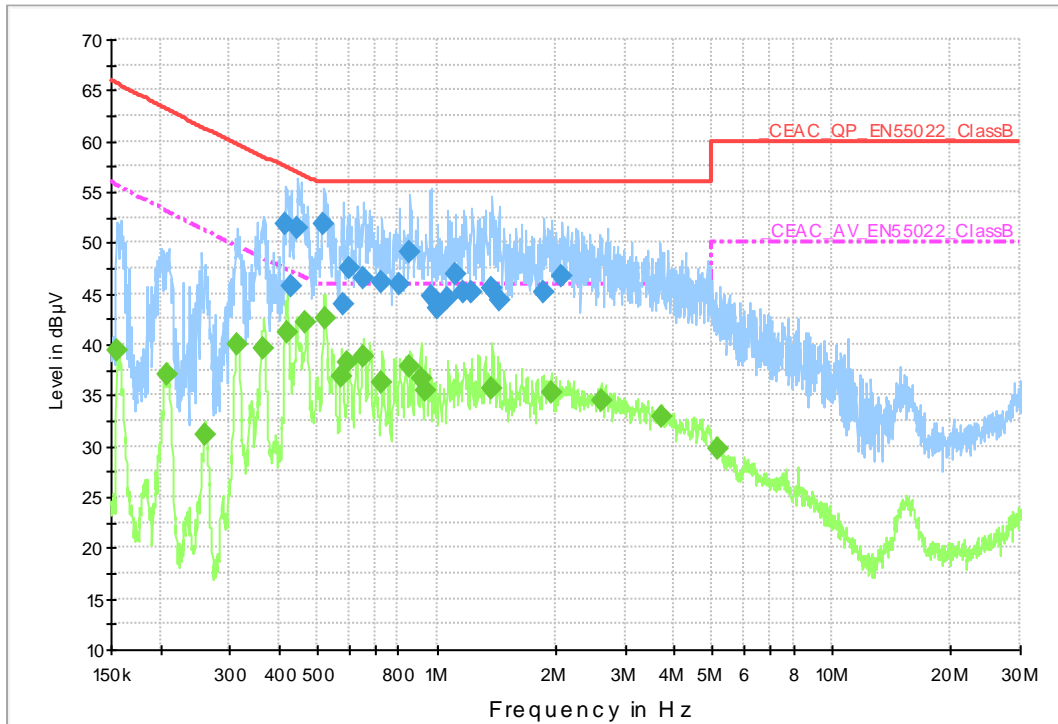


Frequency (MHz)	Average (dBμV)	Meas. Time (ms)	Bandwidth (kHz)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dBμV)
0.160544	39.0	1000.00	9.000	On	L1	0.4	16.4	55.4
0.214922	32.4	1000.00	9.000	On	L1	0.3	20.4	52.8
0.270439	25.1	1000.00	9.000	On	L1	0.2	25.8	50.9
0.323716	33.3	1000.00	9.000	On	L1	0.2	16.1	49.4
0.374548	34.0	1000.00	9.000	On	L1	0.2	14.2	48.2
0.431634	37.2	1000.00	9.000	On	L1	0.2	9.9	47.1
0.536658	38.6	1000.00	9.000	On	L1	0.2	7.4	46.0
0.700011	35.3	1000.00	9.000	On	L1	0.2	10.7	46.0
0.749216	34.1	1000.00	9.000	On	L1	0.2	11.9	46.0
0.805091	37.1	1000.00	9.000	On	L1	0.2	8.9	46.0
0.963696	37.5	1000.00	9.000	On	L1	0.2	8.5	46.0
1.367072	36.8	1000.00	9.000	On	L1	0.2	9.2	46.0
1.793913	36.4	1000.00	9.000	On	L1	0.2	9.6	46.0
2.648543	35.6	1000.00	9.000	On	L1	0.2	10.4	46.0

Conducted Emissions Table: Average Measurements



120 VAC, 60 Hz: Neutral Line



Conducted Emissions Plot

Frequency (MHz)	QuasiPeak (dBμV)	Meas. Time (ms)	Bandwidth (kHz)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dBμV)
0.416387	51.9	1000.00	9.000	On	N	0.2	5.5	57.4
0.429055	45.7	1000.00	9.000	On	N	0.2	11.5	57.2
0.446547	51.4	1000.00	9.000	On	N	0.2	5.5	56.9
0.519773	51.9	1000.00	9.000	On	N	0.2	4.1	56.0
0.581308	43.9	1000.00	9.000	On	N	0.2	12.1	56.0
0.598994	47.5	1000.00	9.000	On	N	0.2	8.5	56.0
0.654037	46.6	1000.00	9.000	On	N	0.2	9.4	56.0
0.728549	46.2	1000.00	9.000	On	N	0.2	9.8	56.0
0.808315	45.9	1000.00	9.000	On	N	0.2	10.1	56.0
0.858247	49.1	1000.00	9.000	On	N	0.2	6.9	56.0
0.965623	44.8	1000.00	9.000	On	N	0.2	11.2	56.0
1.002985	43.6	1000.00	9.000	On	N	0.2	12.4	56.0
1.069206	44.6	1000.00	9.000	On	N	0.2	11.4	56.0
1.119487	46.9	1000.00	9.000	On	N	0.2	9.1	56.0
1.174477	45.1	1000.00	9.000	On	N	0.2	10.9	56.0
1.224804	45.2	1000.00	9.000	On	N	0.2	10.8	56.0
1.383559	45.5	1000.00	9.000	On	N	0.2	10.5	56.0
1.437091	44.4	1000.00	9.000	On	N	0.2	11.6	56.0
1.859604	45.2	1000.00	9.000	On	N	0.2	10.8	56.0
2.071464	46.8	1000.00	9.000	On	N	0.2	9.2	56.0

Conducted Emissions Table: Quasi-Peak Measurements



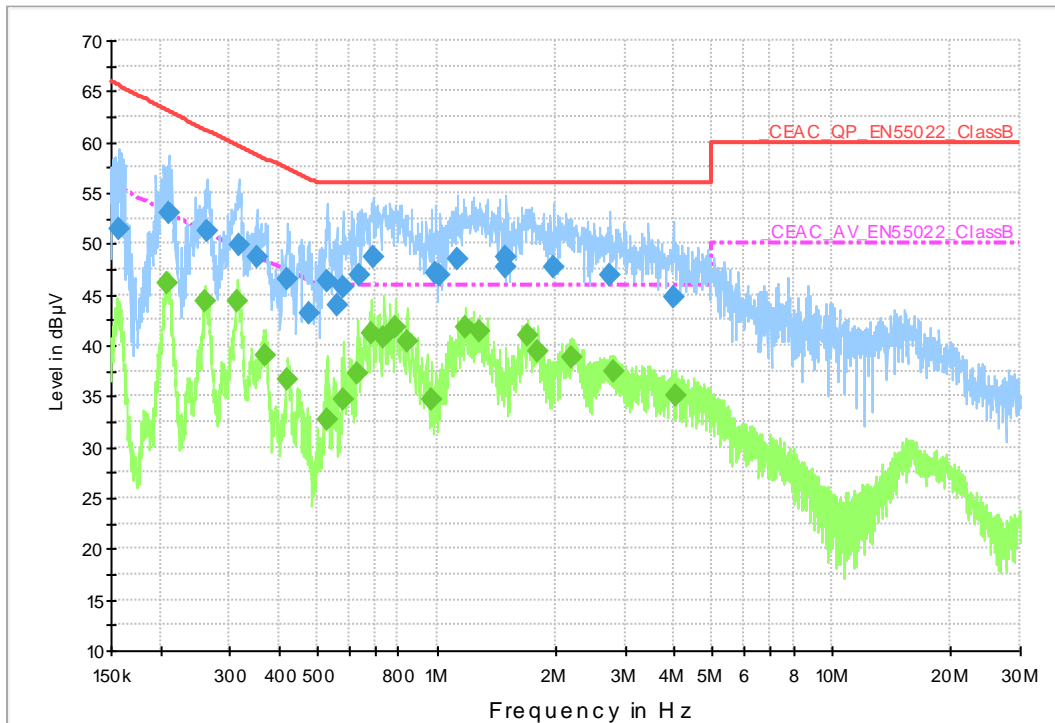
Frequency (MHz)	Average (dBµV)	Meas. Time (ms)	Bandwidth (kHz)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)
0.155182	39.3	1000.00	9.000	On	N	0.4	16.4	55.7
0.207745	37.0	1000.00	9.000	On	N	0.3	16.1	53.1
0.258809	31.2	1000.00	9.000	On	N	0.2	20.0	51.2
0.312281	39.9	1000.00	9.000	On	N	0.2	9.8	49.7
0.365675	39.7	1000.00	9.000	On	N	0.2	8.7	48.4
0.418890	41.2	1000.00	9.000	On	N	0.2	6.1	47.3
0.466613	42.1	1000.00	9.000	On	N	0.2	4.4	46.5
0.520813	42.5	1000.00	9.000	On	N	0.2	3.5	46.0
0.573235	36.8	1000.00	9.000	On	N	0.2	9.2	46.0
0.597798	38.2	1000.00	9.000	On	N	0.2	7.8	46.0
0.651428	38.7	1000.00	9.000	On	N	0.2	7.3	46.0
0.728549	36.3	1000.00	9.000	On	N	0.2	9.7	46.0
0.858247	37.8	1000.00	9.000	On	N	0.2	8.2	46.0
0.911263	36.6	1000.00	9.000	On	N	0.2	9.4	46.0
0.935242	35.5	1000.00	9.000	On	N	0.2	10.5	46.0
1.383559	35.7	1000.00	9.000	On	N	0.2	10.3	46.0
1.947054	35.4	1000.00	9.000	On	N	0.2	10.6	46.0
2.606546	34.4	1000.00	9.000	On	N	0.2	11.6	46.0
3.697572	32.9	1000.00	9.000	On	N	0.3	13.1	46.0
5.131247	29.6	1000.00	9.000	On	N	0.3	20.4	50.0

Conducted Emissions Table: Average Measurements





230 VAC, 50 Hz: Line 1



Conducted Emissions Plot

Frequency (MHz)	QuasiPeak (dBµV)	Meas. Time (ms)	Bandwidth (kHz)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)
0.157683	51.5	1000.00	9.000	On	L1	0.4	14.1	65.6
0.209412	53.1	1000.00	9.000	On	L1	0.3	10.0	63.1
0.261930	51.2	1000.00	9.000	On	L1	0.2	10.0	61.2
0.316047	49.8	1000.00	9.000	On	L1	0.2	9.8	59.6
0.349949	48.7	1000.00	9.000	On	L1	0.2	10.1	58.8
0.418054	46.4	1000.00	9.000	On	L1	0.2	11.0	57.4
0.474132	43.2	1000.00	9.000	On	L1	0.2	13.2	56.4
0.526042	46.4	1000.00	9.000	On	L1	0.2	9.6	56.0
0.558537	44.0	1000.00	9.000	On	L1	0.2	12.0	56.0
0.580148	45.8	1000.00	9.000	On	L1	0.2	10.2	56.0
0.637267	46.9	1000.00	9.000	On	L1	0.2	9.1	56.0
0.688910	48.6	1000.00	9.000	On	L1	0.2	7.4	56.0
0.995001	47.1	1000.00	9.000	On	L1	0.2	8.9	56.0
1.021184	46.9	1000.00	9.000	On	L1	0.2	9.1	56.0
1.128470	48.6	1000.00	9.000	On	L1	0.2	7.4	56.0
1.492695	48.6	1000.00	9.000	On	L1	0.2	7.4	56.0
1.498672	47.7	1000.00	9.000	On	L1	0.2	8.3	56.0
1.974477	47.8	1000.00	9.000	On	L1	0.2	8.2	56.0
2.751020	47.0	1000.00	9.000	On	L1	0.2	9.0	56.0
3.965399	44.8	1000.00	9.000	On	L1	0.3	11.2	56.0

Conducted Emissions Table: Quasi-Peak Measurements

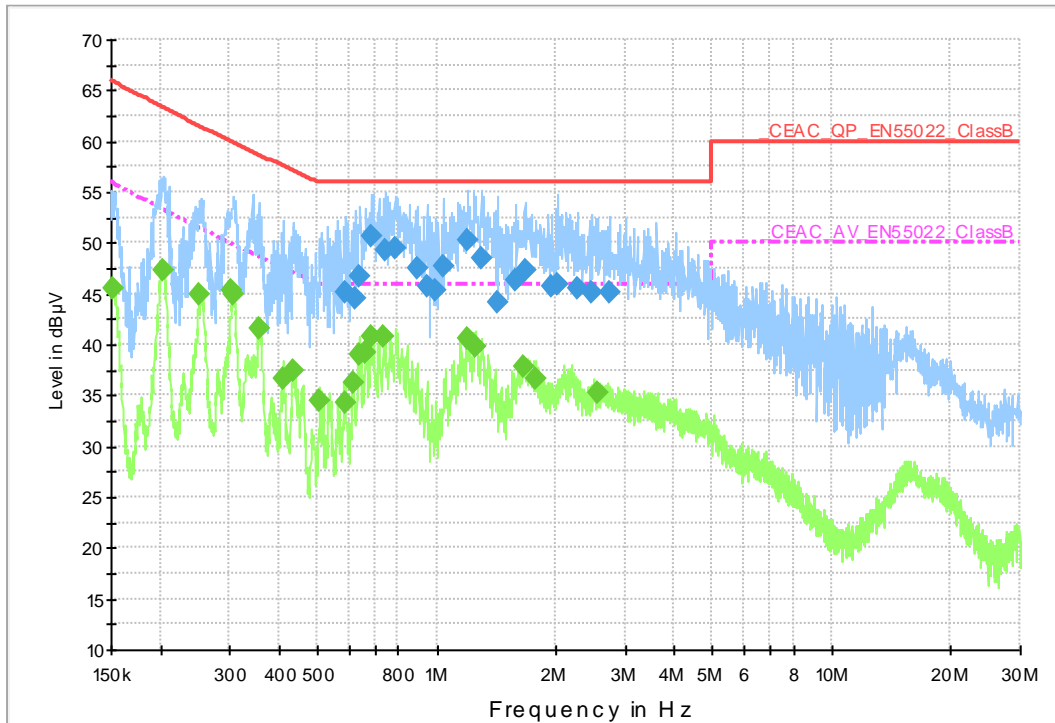


Frequency (MHz)	Average (dBµV)	Meas. Time (ms)	Bandwidth (kHz)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)
0.207330	46.1	1000.00	9.000	On	L1	0.3	7.0	53.1
0.259845	44.3	1000.00	9.000	On	L1	0.2	6.9	51.2
0.313531	44.3	1000.00	9.000	On	L1	0.2	5.3	49.6
0.367139	39.1	1000.00	9.000	On	L1	0.2	9.3	48.4
0.419728	36.6	1000.00	9.000	On	L1	0.2	10.7	47.3
0.528148	32.7	1000.00	9.000	On	L1	0.2	13.3	46.0
0.581308	34.7	1000.00	9.000	On	L1	0.2	11.3	46.0
0.633459	37.3	1000.00	9.000	On	L1	0.2	8.7	46.0
0.683427	41.2	1000.00	9.000	On	L1	0.2	4.8	46.0
0.737336	40.8	1000.00	9.000	On	L1	0.2	5.2	46.0
0.787590	41.8	1000.00	9.000	On	L1	0.2	4.2	46.0
0.839590	40.4	1000.00	9.000	On	L1	0.2	5.6	46.0
0.971429	34.8	1000.00	9.000	On	L1	0.2	11.2	46.0
1.176826	41.7	1000.00	9.000	On	L1	0.2	4.3	46.0
1.287537	41.5	1000.00	9.000	On	L1	0.2	4.5	46.0
1.703102	40.9	1000.00	9.000	On	L1	0.2	5.1	46.0
1.811924	39.4	1000.00	9.000	On	L1	0.2	6.6	46.0
2.208231	38.9	1000.00	9.000	On	L1	0.2	7.1	46.0
2.800937	37.4	1000.00	9.000	On	L1	0.2	8.6	46.0
4.013222	35.0	1000.00	9.000	On	L1	0.3	11.0	46.0

Conducted Emissions Table: Average Measurements



## 230 VAC, 50 Hz: Neutral Line



Conducted Emissions Plot

Frequency (MHz)	QuasiPeak (dBμV)	Meas. Time (ms)	Bandwidth (kHz)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dBμV)
0.587145	45.2	1000.00	9.000	On	N	0.2	10.8	56.0
0.620928	44.5	1000.00	9.000	On	N	0.2	11.5	56.0
0.641099	46.7	1000.00	9.000	On	N	0.2	9.3	56.0
0.683427	50.6	1000.00	9.000	On	N	0.2	5.4	56.0
0.740288	49.2	1000.00	9.000	On	N	0.2	6.8	56.0
0.790743	49.5	1000.00	9.000	On	N	0.2	6.5	56.0
0.889675	47.4	1000.00	9.000	On	N	0.2	8.6	56.0
0.942747	45.8	1000.00	9.000	On	N	0.2	10.2	56.0
0.993015	45.3	1000.00	9.000	On	N	0.2	10.7	56.0
1.039713	47.7	1000.00	9.000	On	N	0.2	8.3	56.0
1.195787	50.2	1000.00	9.000	On	N	0.2	5.8	56.0
1.303065	48.5	1000.00	9.000	On	N	0.2	7.5	56.0
1.422806	44.1	1000.00	9.000	On	N	0.2	11.9	56.0
1.578582	46.3	1000.00	9.000	On	N	0.2	9.7	56.0
1.672750	47.2	1000.00	9.000	On	N	0.2	8.8	56.0
1.954850	45.6	1000.00	9.000	On	N	0.2	10.4	56.0
2.018352	46.0	1000.00	9.000	On	N	0.2	10.0	56.0
2.270871	45.5	1000.00	9.000	On	N	0.2	10.5	56.0
2.474597	45.2	1000.00	9.000	On	N	0.2	10.8	56.0
2.740049	45.1	1000.00	9.000	On	N	0.2	10.9	56.0

Conducted Emissions Table: Quasi-Peak Measurements



Frequency (MHz)	Average (dBμV)	Meas. Time (ms)	Bandwidth (kHz)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dBμV)
0.152113	45.5	1000.00	9.000	On	N	0.4	10.4	55.9
0.202823	47.2	1000.00	9.000	On	N	0.3	6.1	53.3
0.251670	45.0	1000.00	9.000	On	N	0.2	6.5	51.5
0.303667	45.3	1000.00	9.000	On	N	0.2	4.6	49.9
0.305492	44.9	1000.00	9.000	On	N	0.2	5.0	49.9
0.354170	41.5	1000.00	9.000	On	N	0.2	7.2	48.7
0.408966	36.7	1000.00	9.000	On	N	0.2	10.8	47.5
0.432498	37.4	1000.00	9.000	On	N	0.2	9.7	47.1
0.507460	34.5	1000.00	9.000	On	N	0.2	11.5	46.0
0.587145	34.3	1000.00	9.000	On	N	0.2	11.7	46.0
0.612304	36.2	1000.00	9.000	On	N	0.2	9.8	46.0
0.635995	39.1	1000.00	9.000	On	N	0.2	6.9	46.0
0.663248	39.2	1000.00	9.000	On	N	0.2	6.8	46.0
0.686163	40.9	1000.00	9.000	On	N	0.2	5.1	46.0
0.737336	40.7	1000.00	9.000	On	N	0.2	5.3	46.0
1.195787	40.6	1000.00	9.000	On	N	0.2	5.4	46.0
1.249522	39.9	1000.00	9.000	On	N	0.2	6.1	46.0
1.659435	37.8	1000.00	9.000	On	N	0.2	8.2	46.0
1.783193	36.6	1000.00	9.000	On	N	0.2	9.4	46.0
2.560094	35.4	1000.00	9.000	On	N	0.2	10.6	46.0

Conducted Emissions Table: Average & Quasi-Peak Measurements



## **6 dB Bandwidth**

DATE: September 11<sup>th</sup> 2012

BASE STANDARD: FCC Part 15.247 (a) (2) & RSS 210 Issue 8 A8.2 (a)

TEST METHOD: FCC Publication 558074 & RSS 210 Issue 8 A8.2 (a)

TEST VOLTAGE: 120VAC, 60Hz

MINIMUM STANDARD: 15.247 (a) (2): Systems using digital modulation techniques may operate in the 902-928 MHz, 2400-2483.5 MHz, and 5725-5850 MHz bands. The minimum 6dB bandwidth shall be at least 500 kHz.

TEST SETUP: The EUT was provided with a 50 Ohm reverse thread SMA connector on the transmitter output. The transmitter output was connected to a spectrum analyzer and the 6 dB bandwidth measured.

METHOD OF MEASUREMENT: KDB 558074 DTS Measurements

The EUT's modulation was turned on and the trace on the spectrum analyzer was set to a maximum hold setting. The trace stabilized then a marker was put at the peak and two delta markers were put 6 dB down from the peak on either side of the peak.

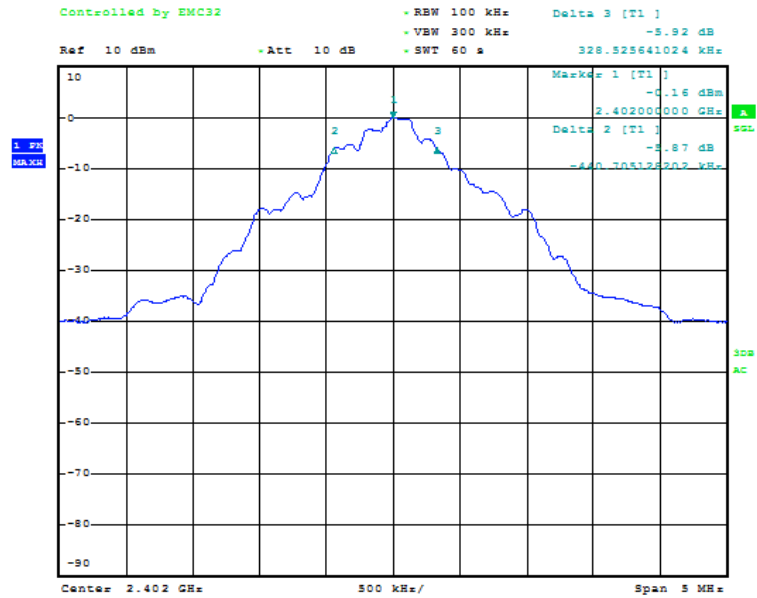
### TEST RESULTS:

Channel	Frequency (MHz)	6 dB Bandwidth (kHz)
Low	2402	769.231
Mid	2440	777.244
High	2481	777.244

MEASUREMENT DATA: See below for the 6 dB Bandwidth plots.

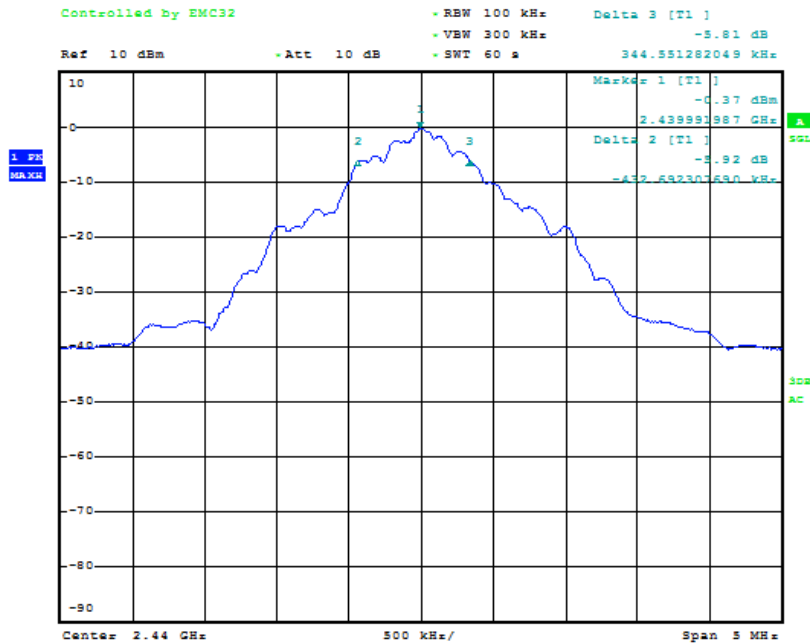
MODIFICATIONS: The EUT did not require any modifications.

PERFORMANCE: PASS: Complies with the applicable standard.



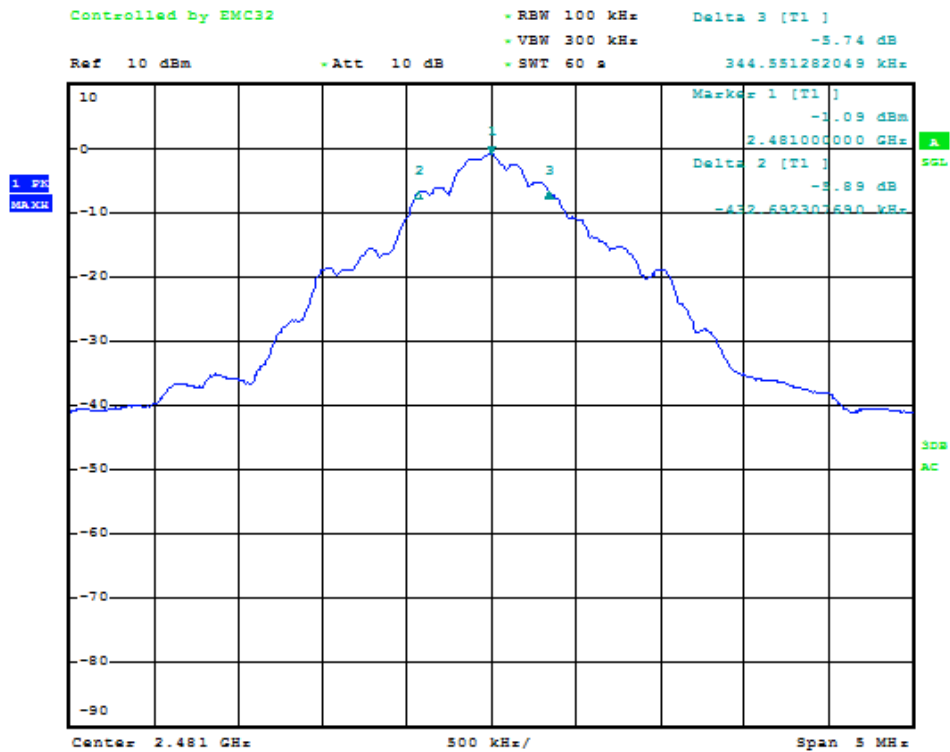
TTTTTT  
Date: 11.SEP.2012 03:16:43

### Low Channel 6 dB Bandwidth



TTTTTT  
Date: 11.SEP.2012 03:23:14

### Mid Channel 6 dB Bandwidth



TTTTTT

Date: 11.SEP.2012 03:27:36

### High Channel 6 dB Bandwidth



## **Occupied Bandwidth**

DATE: September 12<sup>th</sup> 2012

BASE STANDARD: RSS-Gen Issue 3: 4.6.1

TEST METHOD: RSS-Gen Issue 3: 4.6.1

TEST VOLTAGE: 120VAC, 60Hz

MINIMUM STANDARD: When an occupied bandwidth value is not specified in the applicable RSS, the transmitted signal bandwidth to be reported is to be its 99% emission bandwidth, as calculated or measured.

TEST SETUP: The EUT was provided with a 50 Ohm reverse thread SMA connector on the transmitter output. The transmitter output was connected to a spectrum analyzer and the 99% occupied bandwidth measured.

METHOD OF MEASUREMENT: KDB 558074 DTS Measurements

The EUT's modulation was turned on and the trace on the spectrum analyzer was set to a maximum hold setting. The trace stabilized then the occupied bandwidth measurement function of the spectrum analyzer was used to measure the 99% occupied bandwidth.

TEST RESULTS:

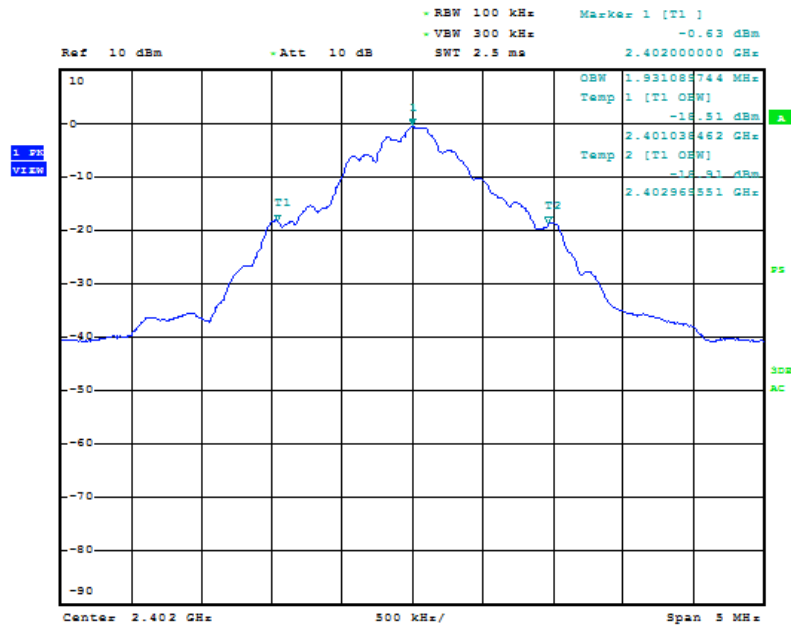
Channel	Frequency (MHz)	Occupied Bandwidth (MHz)
Low	2402	1.931
Mid	2440	1.931
High	2481	1.923

MEASUREMENT DATA: See below for the 99% Occupied Bandwidth plots.

MODIFICATIONS: The EUT did not require any modifications.

PERFORMANCE: N/A

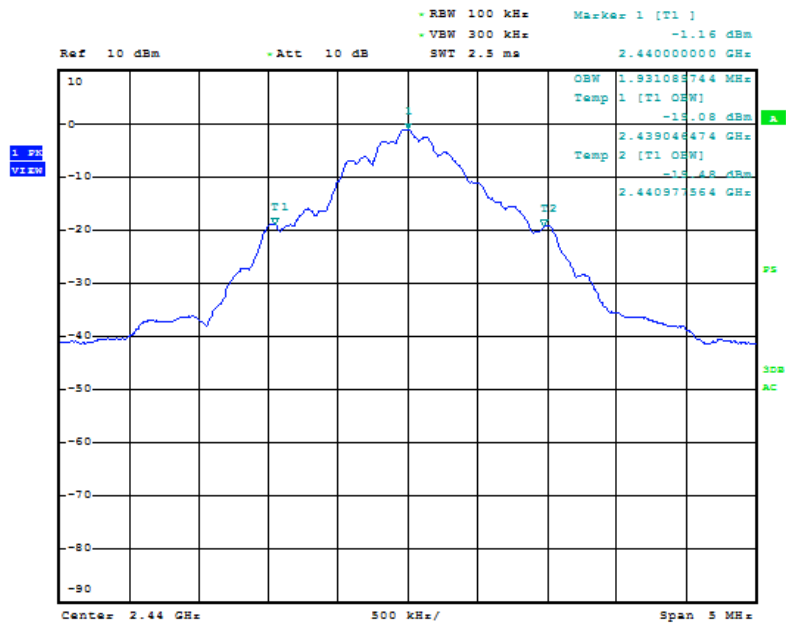




TTTTTT

Date: 12.SEP.2012 18:35:25

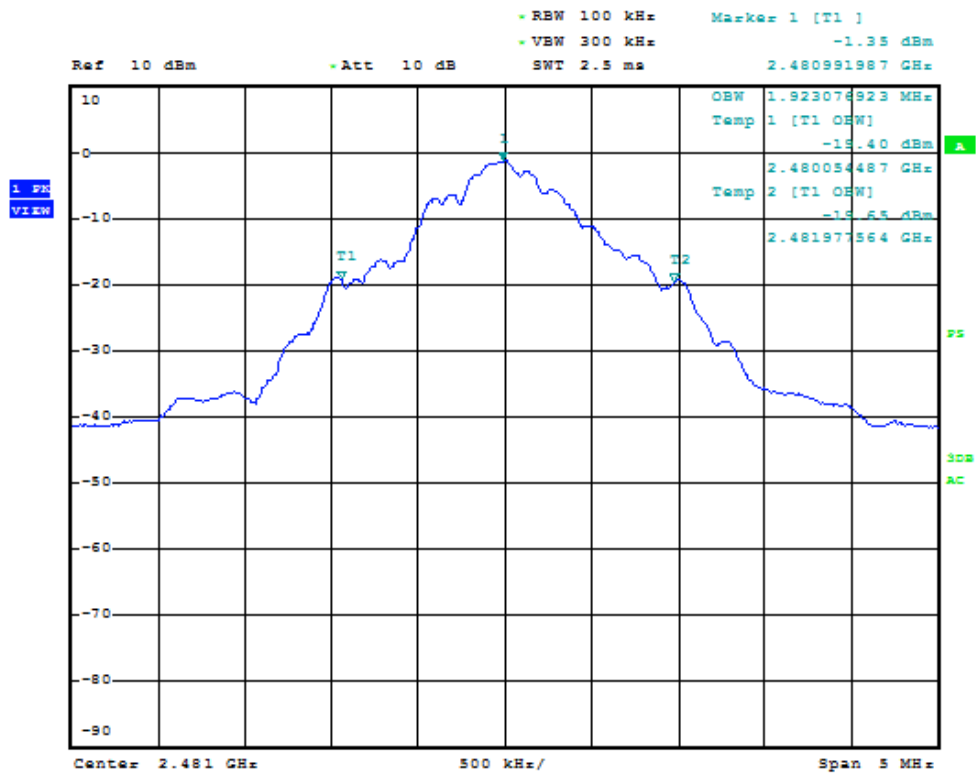
### Low Channel 99% Occupied Bandwidth



TTTTTT

Date: 12.SEP.2012 18:36:56

### Mid Channel 99% Occupied Bandwidth



TTTTT

Date: 12.SEP.2012 18:37:50

### High Channel 99% Occupied Bandwidth



## **Peak Power Output**

DATE: September 12<sup>th</sup> 2012

BASE STANDARD: FCC 15.247 & RSS 210 Issue 8 A8.2

TEST METHOD: FCC Publication 558074 & RSS-Gen Issue 3: 4.8

TEST VOLTAGE: 120VAC, 60Hz

MINIMUM STANDARD: The maximum peak output power shall not exceed 30 dBm in the 2400-2483.5 MHz band.

TEST SETUP: The EUT was provided with a 50 Ohm reverse thread SMA connector on the transmitter output. The transmitter output was connected to a spectrum analyzer and the peak output power measured.

METHOD OF MEASUREMENT: KDB 558074 DTS Measurements

The EUT's modulation was turned on and the trace on the spectrum analyzer was set to a maximum hold setting. The trace stabilized then the peak power was measured. The RBW of the spectrum analyzer was set to 10 MHz which is greater than 3 times the emission bandwidth. Cable losses were added to the plots seen below to obtain the data seen in the table below.

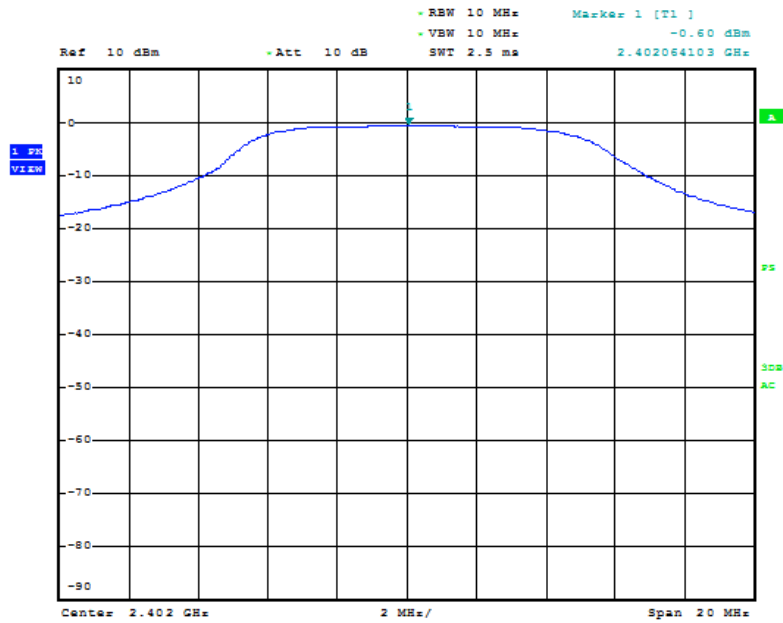
TEST RESULTS:

Channel	Frequency (MHz)	Peak Power (dBm)
Low	2402	-0.23
Mid	2440	-0.68
High	2481	-0.74

MEASUREMENT DATA: See below for the uncorrected peak power measurements.

MODIFICATIONS: The EUT did not require any modifications.

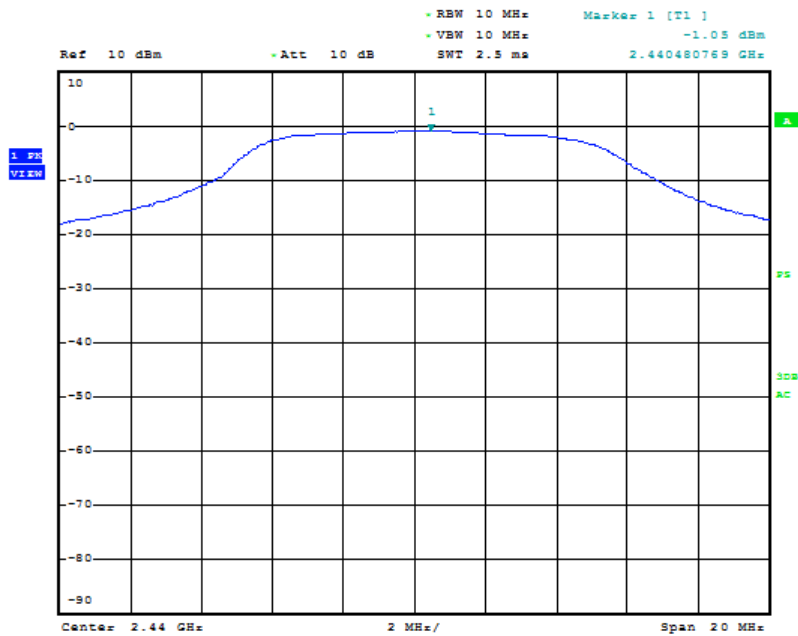
PERFORMANCE: PASS: Complies with the applicable standard.



TTTTTT

Date: 12.SEP.2012 18:42:23

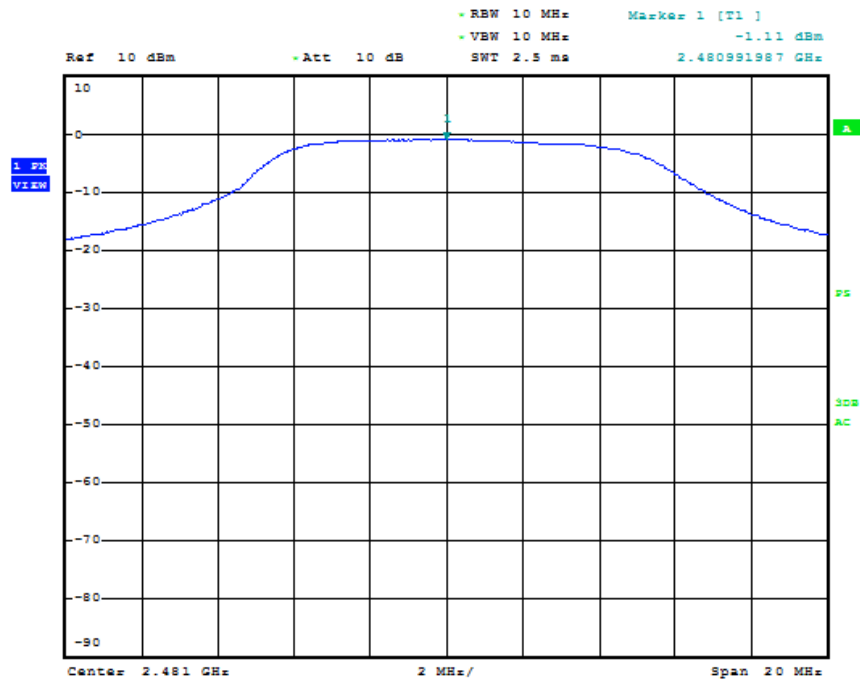
### Low Channel Peak Output Power



TTTTTT

Date: 12.SEP.2012 18:43:05

### Mid Channel Peak Output Power



TTTTTT

Date: 12.SEP.2012 18:41:14

### High Channel Peak Output Power



## **Power Spectral Density**

DATE: September 12<sup>th</sup> 2012

BASE STANDARD: FCC 15.247 (e) & RSS 210 Issue 8 A8.2 (b)

TEST METHOD: FCC Publication 558074 & RSS 210 Issue 8: A8.2 (b)

TEST VOLTAGE: 120VAC, 60Hz

MINIMUM STANDARD: 15.247 (e) For digitally modulated systems, the power spectral density conducted from the intentional radiator to the antenna shall not be greater than 8 dBm in any 3 kHz band during any time interval of continuous transmission.

TEST SETUP: The EUT was provided with a 50 Ohm reverse thread SMA connector on the transmitter output. The transmitter output was connected to a spectrum analyzer and the power spectral density was measured on the low, mid and high channels.

METHOD OF MEASUREMENT: KDB 558074 DTS Measurements

The EUT's modulation was turned on and the trace on the spectrum analyzer was set to a maximum hold setting. A single 500 second sweep was taken with the RBW equal to 3 kHz, the VBW equal to 10 kHz. The span was set to 150 KHz. The peak reading was taken off the trace and cable losses were added to it to obtain the data seen in the table below.

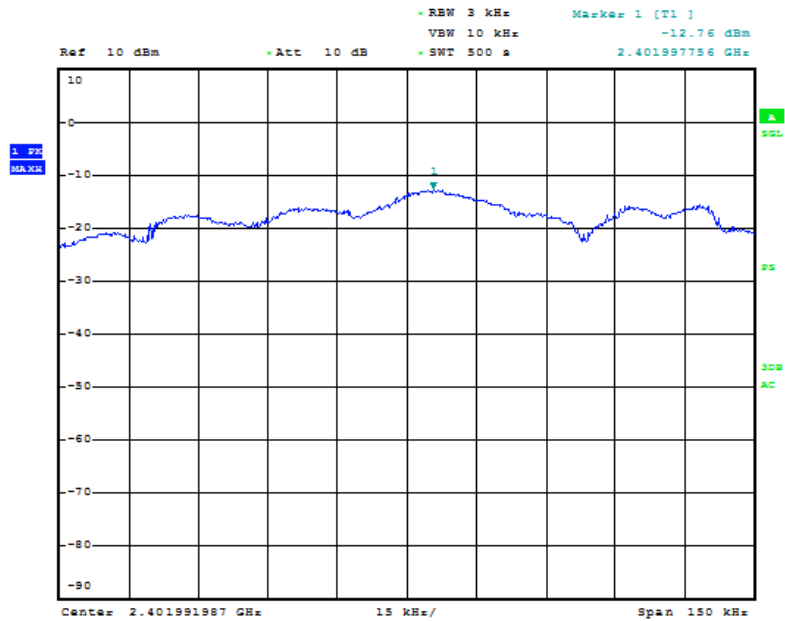
### TEST RESULTS:

Channel	Frequency (MHz)	Power Spectral Density (dBm)
Low	2402	-12.39
Mid	2440	-11.02
High	2481	-12.38

MEASUREMENT DATA: See below for the uncorrected power spectral density measurements.

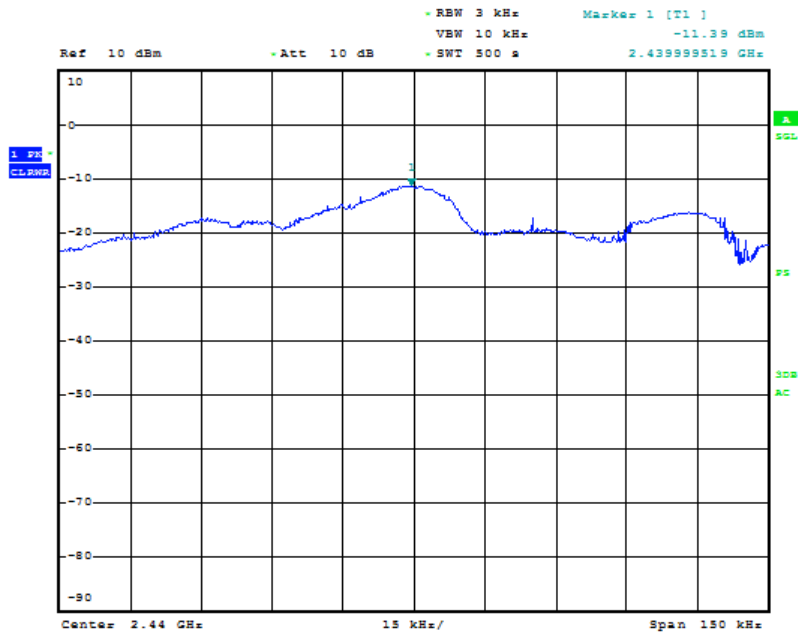
MODIFICATIONS: The EUT did not require any modifications.

PERFORMANCE: PASS: Complies with the applicable standard.



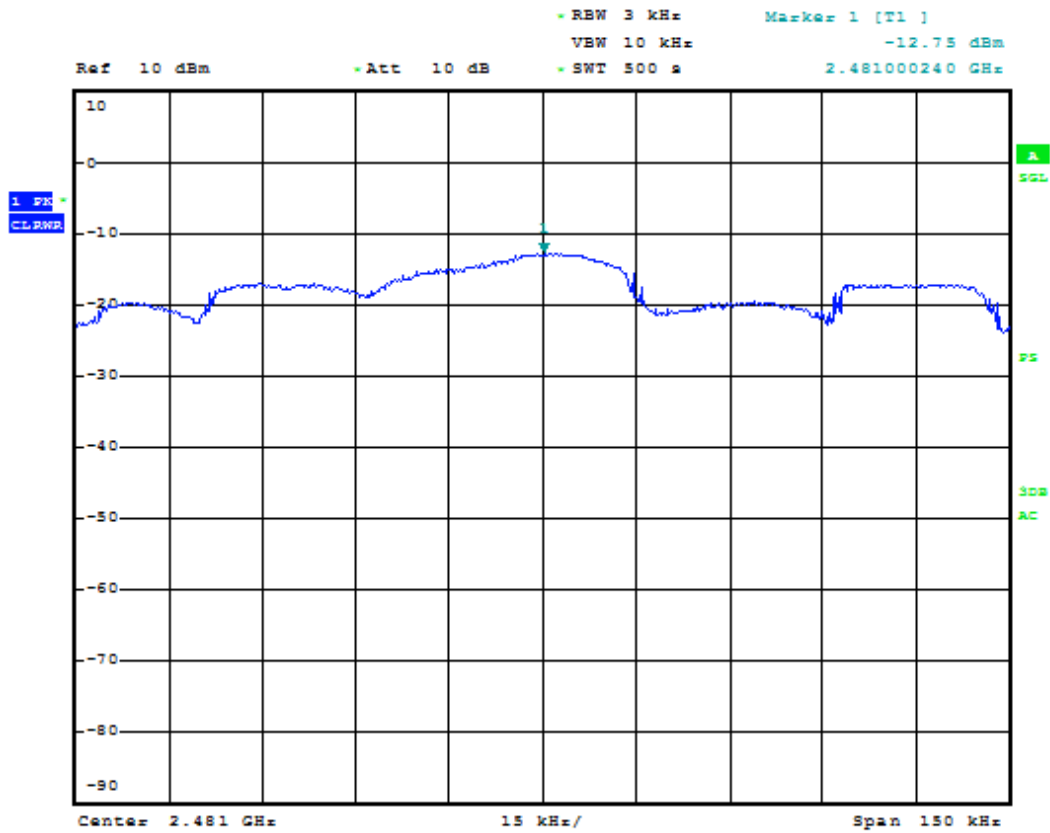
TTTTTT  
Date: 12.SEP.2012 18:55:00

### Low Channel Power Spectral Density



TTTTTT  
Date: 12.SEP.2012 19:07:36

### Mid Channel Power Spectral Density



TTTTTT

Date: 12.SEP.2012 19:18:52

### High Channel Power Spectral Density





## **Conducted Spurious Emissions (TX)**

DATE: September 12<sup>th</sup> 2012

BASE STANDARD: FCC 15.247 (d) & RSS 210 Issue 8 A8.5

TEST METHOD: FCC Publication 558074 & RSS 210 Issue 8: A8.5

TEST VOLTAGE: 120VAC, 60Hz

MINIMUM STANDARD: 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. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under paragraph (b)(3) of this section, the attenuation required under this paragraph shall be 30 dB instead of 20 dB. Attenuation below the general limits specified in §15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emission limits specified in §15.209(a) (see §15.205(c)).

TEST SETUP: The EUT was provided with a 50 Ohm reverse thread SMA connector on the transmitter output. The transmitter output was connected to a spectrum analyzer and the conducted spurious emissions were measured on the low, mid and high channels.

METHOD OF MEASUREMENT: KDB 558074 DTS Measurements

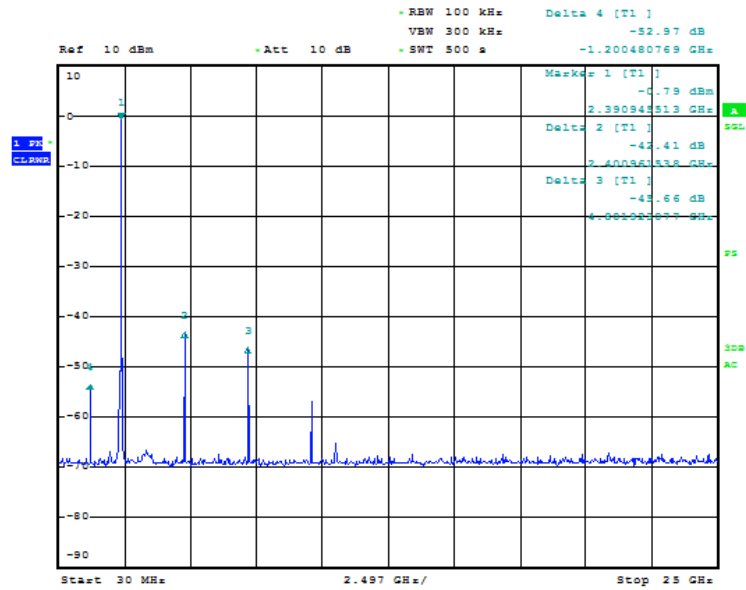
The EUT's modulation was turned on and the trace on the spectrum analyzer was set to a maximum hold setting. A single 500 second sweep was taken with the RBW equal to 100 kHz, the VBW equal to 300 kHz. The start frequency was set to 30MHz and the stop frequency set to 25 GHz. The peak reading was taken off the trace and three delta reading were taken with respect to the peak reading.

TEST RESULTS: Compliant. The worst case emission was 41.70 dB below the carrier power in the high channel at 4.952 GHz. This is a corrected value.

MEASUREMENT DATA: See below for the uncorrected conducted spurious emission measurements.

MODIFICATIONS: The EUT did not require any modifications.

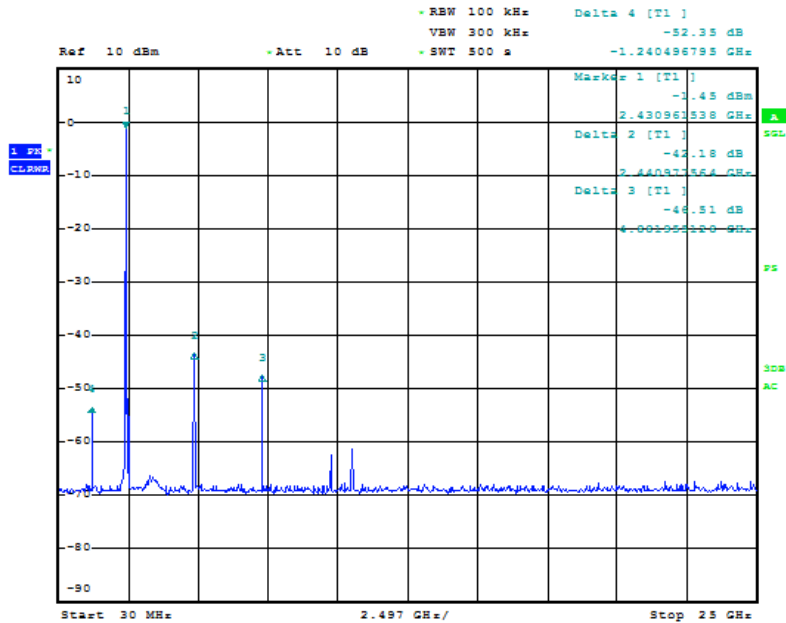
PERFORMANCE: PASS: Complies with the applicable standard.



TTTTTT

Date: 12.SEP.2012 19:38:57

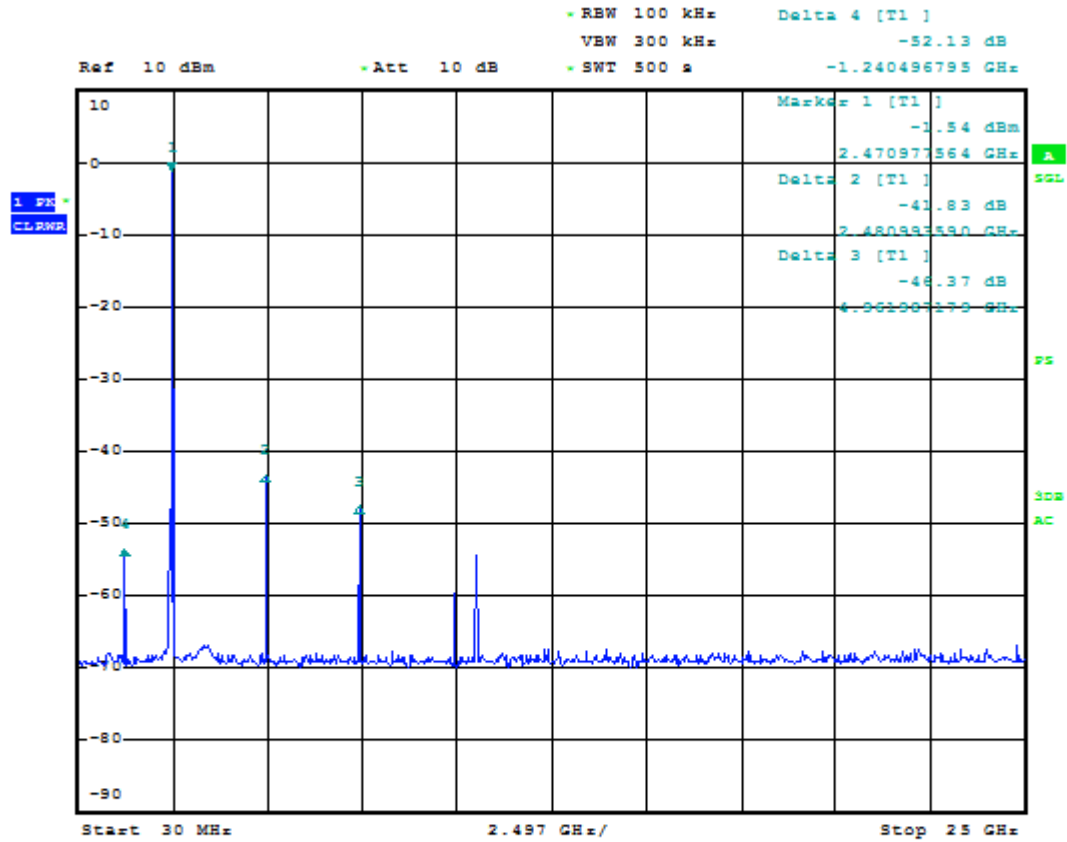
### Low Channel Conducted Spurious Emissions (TX)



TTTTTT

Date: 12.SEP.2012 19:50:10

### Mid Channel Conducted Spurious Emission (TX)



TTTTTT

Date: 12.SEP.2012 19:29:57

### High Channel Conducted Spurious Emissions (TX)



## **Conducted Spurious Emissions Band Edge**

DATE: September 12<sup>th</sup> 2012

BASE STANDARD: FCC 15.247 (d) & RSS 210 Issue 8 A8.5

TEST METHOD: FCC Publication 558074 & RSS 210 Issue 8: A8.5

TEST VOLTAGE: 120VAC, 60Hz

MINIMUM STANDARD: 15.247 (d) 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. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under paragraph (b)(3) of this section, the attenuation required under this paragraph shall be 30 dB instead of 20 dB. Attenuation below the general limits specified in §15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emission limits specified in §15.209(a) (see §15.205(c)).

TEST SETUP: The EUT was provided with a 50 Ohm reverse thread SMA connector on the transmitter output. The transmitter output was connected to a spectrum analyzer and the conducted spurious emissions band edge was measured on the low and high channels.

METHOD OF MEASUREMENT: KDB 558074 DTS Measurements

The EUT's modulation was turned on and the trace on the spectrum analyzer was set to a maximum hold setting. A single 60 second sweep was taken with the RBW equal to 100 kHz, the VBW equal to 300 kHz. The center frequency was set to either the high of low band edge and marker was used to measure the power level.

TEST RESULTS: Compliant.

Channel	Frequency (MHz)	Conducted Band Edge (dB)
Low	2400	38.75
High	2483.5	39.95

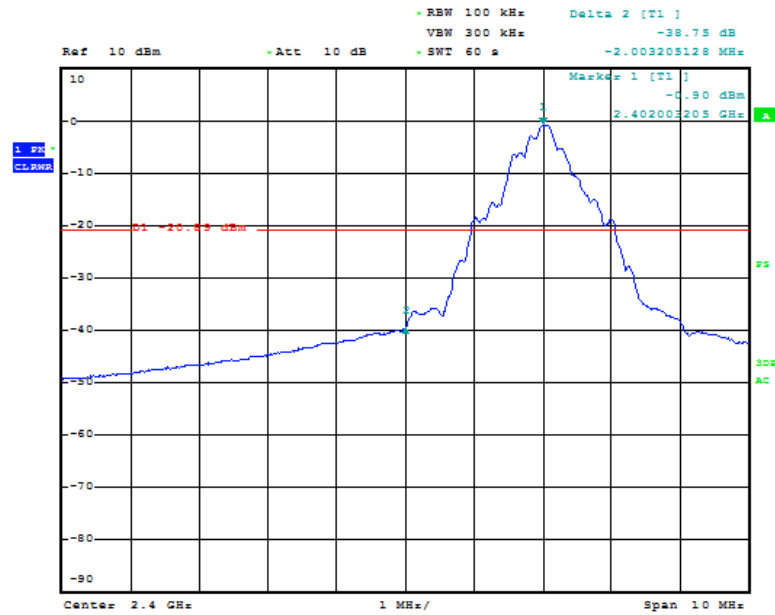
The worst case spurious emission was 38.75 dB below the carrier.

All final reported values are corrected values.

MEASUREMENT DATA: See below for the conducted spurious emissions bandedge measurements.

MODIFICATIONS: The EUT did not require any modifications.

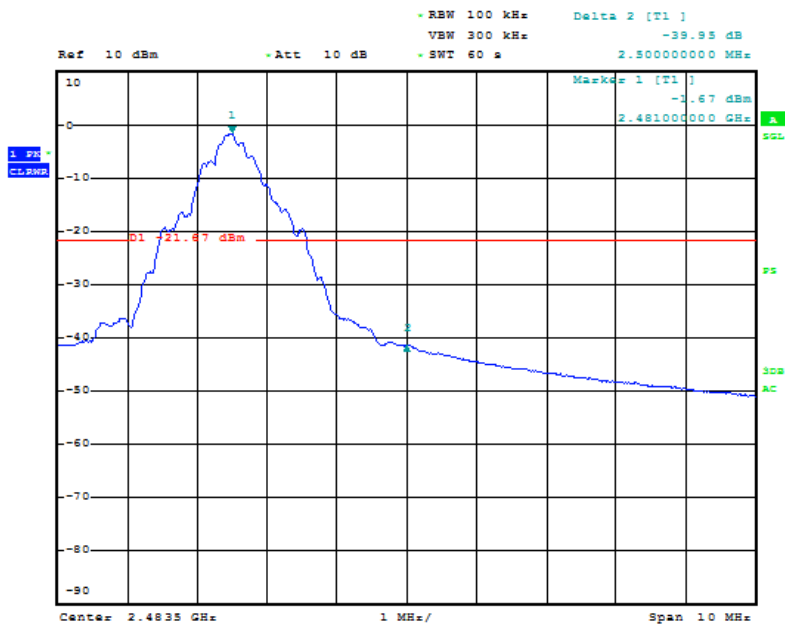
PERFORMANCE: PASS: Complies with the applicable standard.



TTTTTT

Date: 12.SEP.2012 20:01:03

### Low Channel Conducted Band Edge Measurement



TTTTTT

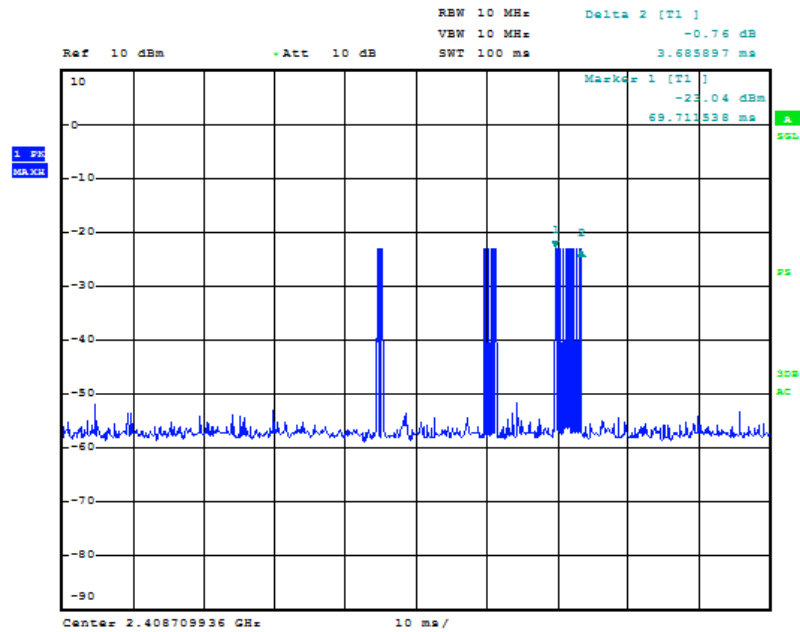
Date: 12.SEP.2012 20:06:28

### High Channel Conducted Band Edge Measurement



## **Duty Cycle Correction Factor**

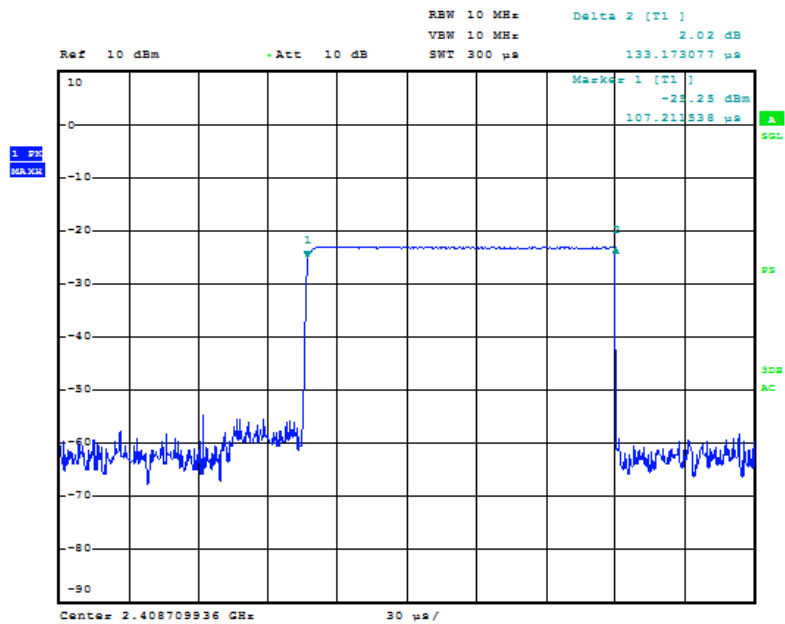
DATE:	September 12 <sup>th</sup> 2012
BASE STANDARD:	FCC 15.35 (c) & RSS-Gen Issue 3: 4.5
TEST METHOD:	FCC Publication 558074 & RSS-Gen Issue 3: 4.5
TEST VOLTAGE:	120VAC, 60Hz
MINIMUM STANDARD:	15.35 (c) Unless otherwise specified, e.g. §15.255(b), when the radiated emission limits are expressed in terms of the average value of the emission, and pulsed operation is employed, the measurement field strength shall be determined by averaging over one complete pulse train, including blanking intervals, as long as the pulse train does not exceed 0.1 seconds. As an alternative (provided the transmitter operates for longer than 0.1 seconds) or in cases where the pulse train exceeds 0.1 seconds, the measured field strength shall be determined from the average absolute voltage during a 0.1 second interval during which the field strength is at its maximum value. The exact method of calculating the average field strength shall be submitted with any application for certification or shall be retained in the measurement data file for equipment subject to notification or verification.
TEST SETUP:	The EUT was provided with a 50 Ohm reverse thread SMA connector on the transmitter output. The transmitter output was connected to a spectrum analyzer and the duty cycle was measured.
METHOD OF MEASUREMENT:	KDB 558074 DTS Measurements  The EUT was put into its normal operating mode with the EMC firmware operating. This ensured that there were continuous key strokes and mouse movement. This is the worst case.
TEST RESULTS:	Duty cycle correction factor = $20 \cdot \log(0.133 \cdot (32/100)) = -27.42 \text{ dB}$ Therefore the maximum allowable Duty cycle correction factor of -20 dB can be applied. NOTE: Maximum 32 pulses in 100 ms.
MEASUREMENT DATA:	See below for the duty cycle correction factor plots.
MODIFICATIONS:	The EUT did not require any modifications.
PERFORMANCE:	N/A



TTTTTT

Date: 12.SEP.2012 20:33:39

### Duty Cycle Period



TTTTTT

Date: 12.SEP.2012 20:35:32

### Duty Cycle On Time



## **Radiated Spurious Emissions Band Edge**

DATE: September 12<sup>th</sup> 2012 & September 13<sup>th</sup> 2012.

BASE STANDARD: FCC Part 15.209 – Radio Frequency Devices  
FCC Part 15.205 – Restricted Bands of Operation  
RSS 210 Issue 8 A8.5

TEST METHOD: FCC Publication 558074 & FCC Publication 913591

TEST VOLTAGE: 120VAC, 60Hz

MINIMUM STANDARD: FCC 15.205 and RSS 210 Issue 8 2.2 Restricted Bands of Operation

MHz	MHz	MHz	GHz
0.090-0.110	16.42-16.423	399.9-410	4.5-5.15
0.495-0.505	16.69475-16.69525	608-614	5.35-5.46
2.1735-2.1905	16.80425-16.80475	960-1240	7.25-7.75
4.125-4.128	25.5-25.67	1300-1427	8.025-8.5
4.17725-4.17775	37.5-38.25	1435-1626.5	9.0-9.2
4.20725-4.20775	73-74.6	1645.5-1646.5	9.3-9.5
6.215-6.218	74.8-75.2	1660-1710	10.6-12.7
6.26775-6.26825	108-121.94	1718.8-1722.2	13.25-13.4
6.31175-6.31225	123-138	2200-2300	14.47-14.5
8.291-8.294	149.9-150.05	2310-2390	15.35-16.2
8.362-8.366	156.52475-156.52525	2483.5-2500	17.7-21.4
8.37625-8.38675	156.7-156.9	2690-2900	22.01-23.12
8.41425-8.41475	162.0125-167.17	3260-3267	23.6-24.0
12.29-12.293	167.72-173.2	3332-3339	31.2-31.8
12.51975-12.52025	240-285	3345.8-3358	36.43-36.5
12.57675-12.57725	322-335.4	3600-4400	N/A
13.36-13.41	N/A	N/A	N/A

(b) The field strength of emissions appearing within these frequency bands shall not exceed the limits shown in §15.209. At frequencies equal to or less than 1000 MHz, compliance with the limits in §15.209 shall be demonstrated using measurement instrumentation employing a CISPR quasi-peak detector. Above 1000 MHz, compliance with the emission limits in §15.209 shall be demonstrated based on the average value of the measured emissions. The provisions in §15.35 apply to these measurements.

METHOD OF MEASUREMENT: KDB 558074 DTS Measurements

TEST SETUP: The EUT was setup in a 3 meter semi anechoic chamber. For peak measurements above 1 GHz the RBW was set to 1MHz, and the VBW was also set to 1MHz. The marker delta method was used to correct the peak readings using a RBW of 30 kHz and a VBW of 100 kHz. The average levels were derived from corrected peak levels by subtracting the peak-average correction factor. The EUT was tuned to a low and high channel in continuous transmit mode at maximum RF output and maximum duty cycle.

TEST RESULTS: Compliant.





Frequency (MHz)	Polarization	Measured Carrier Level (dBuV/m)	Marker Delta (dB)	Peak Level (dBuV/m)	Duty Cycle Correction Factor (dB)	Average Level (dBuV/m)	Peak Limit (dBuV/m)	Average Limit (dBuV/m)	Margin (dB)
2390.0	H	100.26	59.40	40.86	20	20.86	73.98	53.98	33.12
2483.5	H	96.64	44.01	52.63	20	32.63	73.98	53.98	21.35

All final reported values are corrected values.

SAMPLE CALCULATIONS: Part 15.209 Average Limit 500uV/m @ 3m =  $20 \cdot \log(500) = 53.98 \text{ dBuV/m}$ .

Peak Limit = 73.98 dBuV/m

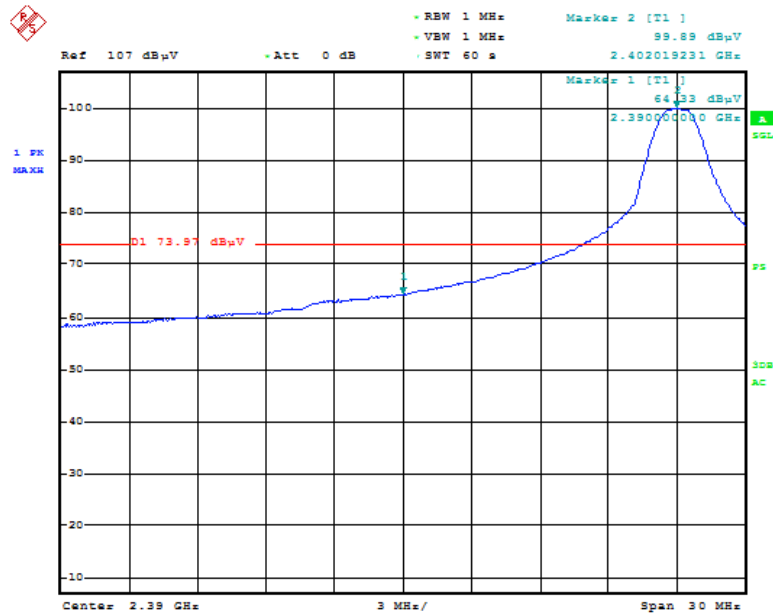
Average Level (dBuV/m) = Peak Level (dBuV/m) – Duty Cycle Correcetion Factor (dB)

Margin (dB) = Peak Level (dBuV/m) - Peak Limit (dBuV/m) or Average level (dBuV/m) – Average Limit (dBuV/m)

MEASUREMENT DATA: See below for the uncorrected radiated spurious emissions bandedge measurements.

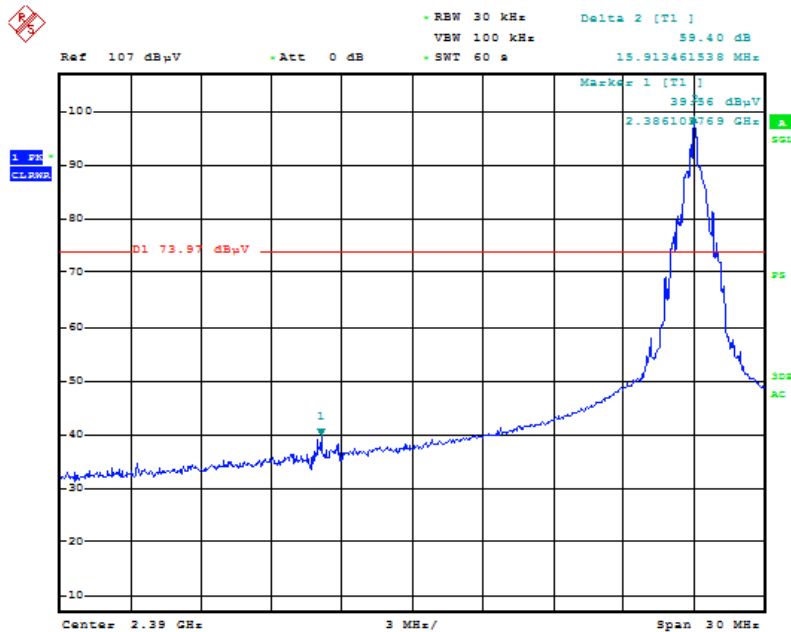
MODIFICATIONS: The EUT did not require any modifications.

PERFORMANCE: PASS: Complies with the applicable standard.



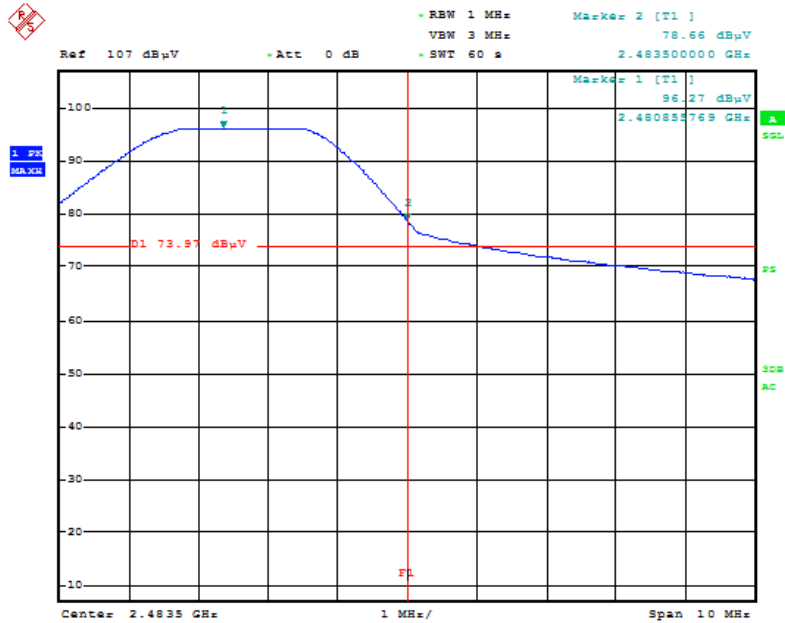
TTTTT  
 Date: 12.SEP.2012 21:47:14

### Low Channel Peak



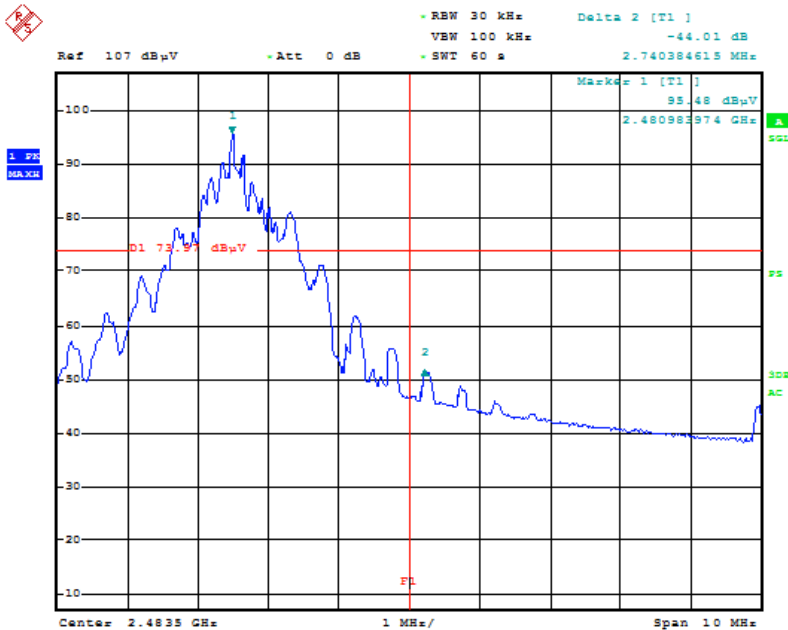
TTTTT  
 Date: 12.SEP.2012 22:08:05

### Low Channel Marker Delta



TTTTT  
Date: 13.SEP.2012 19:28:02

### High Channel Peak



TTTTT  
Date: 13.SEP.2012 19:32:41

### High Channel Marker Delta



## **Radiated Spurious Emissions (TX and RX)**

DATE: September 12<sup>th</sup> 2012, September 13<sup>th</sup> 2012, September 14<sup>th</sup> 2012, September 17<sup>th</sup> 2012 & September 20<sup>th</sup> 2012

BASE STANDARD: FCC Part 15.209 – Radio Frequency Devices  
FCC Part 15.205 – Restricted Bands of Operation  
RSS 210 Issue 8 2.5 and A8.5  
RSS-Gen Issue 3: 4.10 and 6.1 Receiver Spurious Emissions

TEST METHOD: ANSI C63.4-2009

TEST VOLTAGE: 120VAC, 60Hz

MINIMUM STANDARD: FCC 15.205 and RSS 210 Issue 8 2.2 Restricted Bands of Operation

(a) Only spurious emissions are permitted in any of the frequency bands listed below.

MHz	MHz	MHz	GHz
0.090–0.110	16.42–16.423	399.9–410	4.5–5.15
0.495–0.505	16.69475–16.69525	608–614	5.35–5.46
2.1735–2.1905	16.80425–16.80475	960–1240	7.25–7.75
4.125–4.128	25.5–25.67	1300–1427	8.025–8.5
4.17725–4.17775	37.5–38.25	1435–1626.5	9.0–9.2
4.20725–4.20775	73–74.6	1645.5–1646.5	9.3–9.5
6.215–6.218	74.8–75.2	1660–1710	10.6–12.7
6.26775–6.26825	108–121.94	1718.8–1722.2	13.25–13.4
6.31175–6.31225	123–138	2200–2300	14.47–14.5
8.291–8.294	149.9–150.05	2310–2390	15.35–16.2
8.362–8.366	156.52475–156.52525	2483.5–2500	17.7–21.4
8.37625–8.38675	156.7–156.9	2690–2900	22.01–23.12
8.41425–8.41475	162.0125–167.17	3260–3267	23.6–24.0
12.29–12.293	167.72–173.2	3332–3339	31.2–31.8
12.51975–12.52025	240–285	3345.8–3358	36.43–36.5
12.57675–121.57725	322–335.4	3600–4400	N/A
13.36–13.41	N/A	N/A	N/A

(b) The field strength of emissions appearing within these frequency bands shall not exceed the limits shown in §15.209. At frequencies equal to or less than 1000 MHz, compliance with the limits in §15.209 shall be demonstrated using measurement instrumentation employing a CISPR quasi-peak detector. Above 1000 MHz, compliance with the emission limits in §15.209 shall be demonstrated based on the average value of the measured emissions. The provisions in §15.35 apply to these measurements.

TEST SETUP: The EUT was setup in a 3 meter semi anechoic chamber. For peak measurements above 1 GHz the RBW was set to 1 MHz and the VBW set to 10 MHz. Average levels were measured with a RBW of 1 MHz and an average detector. For measurements below 1 GHz a CISPR Quasi-Peak Detector with a 120kHz bandwidth was used.

OPERATING MODE OF EUT: The EUT was setup to run its EMC firmware which output keystrokes and mouse movements continuously.



## TESTS COMPLETED:

The EUT was put into its Low, Mid and High channels and the spurious emission were measured from 1 GHz to 18 GHz using a horn antenna.

The EUT was put into its transmitter sweep mode and the spurious emissions were measured from 4 MHz to 1 GHz. From 4 MHz to 30 MHz and active loop antenna was used, and from 30 MHz to 1 GHz a log-periodic array antenna was used.

The EUT was put into its receiver mode and tuned to the mid channel and the emissions were measured from 4 MHz to 18 GHz using the appropriate detectors and antennas.

## METHOD OF MEASUREMENT: KDB 558074 DTS Measurements

## TEST RESULTS:

Compliant.

See the plots and tables below for all the measured values.

All final reported values are corrected values.

The worst 6 emissions from the transmitter and receiver can be seen in the two tables below.

Channel	Frequency (MHz)	Polarization	Measurement Type (Quasi-Peak, Average or Peak)	Measured Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)
RX Mid Channel	184.473960	H	Quasi-Peak	35.4	40.5	5.1
	2790.85333	H	Average	44.6	54.0	9.4
	301.623400	H	Quasi-Peak	35.3	47.5	12.2
	103.188240	V	Quasi-Peak	27.5	40.5	13.0
	1395.43000	H	Average	28.9	54.0	25.1
	2790.85333	H	Peak	45.1	74.0	28.9
TX Sweep	189.618160	H	Quasi-Peak	33.6	40.5	6.9
	95.093680	V	Quasi-Peak	32.4	40.5	8.1
	256.275760	H	Quasi-Peak	33.0	47.5	14.5
	699.480240	V	Quasi-Peak	31.2	47.5	16.3
TX Low Channel	4804.00000	H	Average	34.5	54.0	19.5
TX High Channel	4961.943333	H	Average	34.2	54.0	19.8

## NOTE:

There are no radiated emissions below 30.0 MHz to report.

## SAMPLE CALCULATIONS:

Average limit for above 960 MHz =  $500\mu\text{V/m}$  @ 3m =  $20 \cdot \log(500) = 53.98$  dBuV/m  
= ~54 dBuV/m

Peak Limit for above 960 MHz = Average Limit + 20 (dB) = 73.98 dBuV/m  
= ~74 dBuV/m

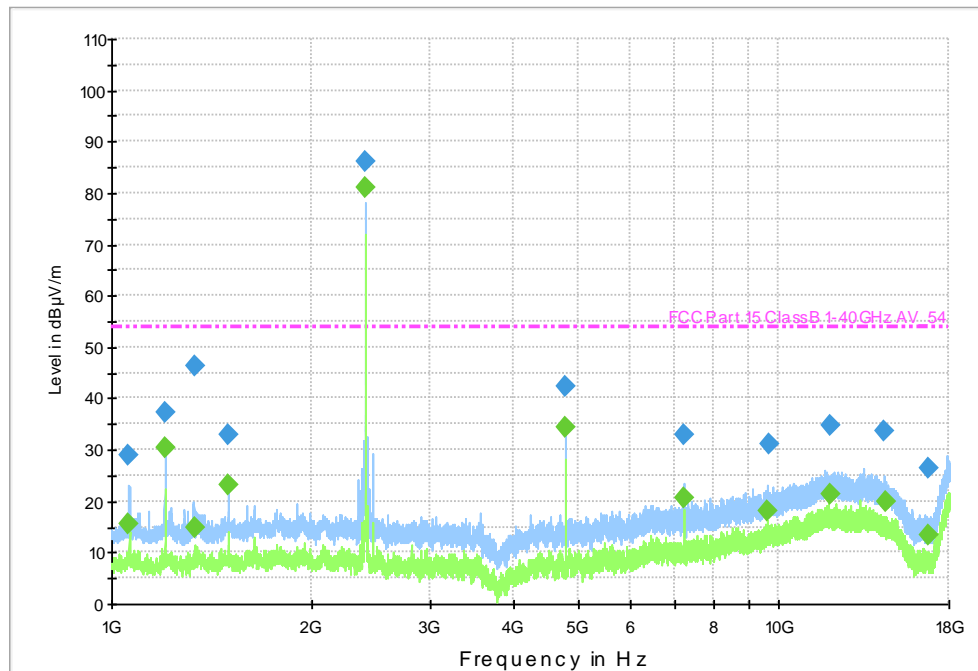


Margin (dB) = Peak level (dB $\mu$ V/m) - Peak Limit (dB $\mu$ V/m) or Average level (dB $\mu$ V/m) - Average Limit (dB $\mu$ V/m)

MEASUREMENT DATA: See below for the corrected radiated spurious emissions measurements.

MODIFICATIONS: The EUT did not require any modifications.

PERFORMANCE: PASS: Complies with the applicable standard.



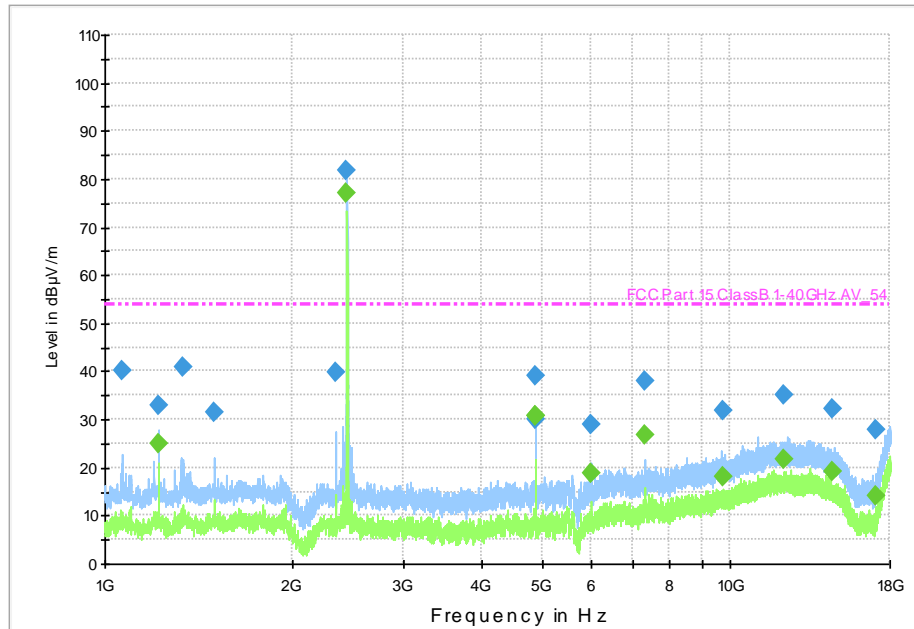
### Low Channel, High Frequency Radiated Spurious Emissions

Frequency (MHz)	MaxPeak (dBµV/m)	Bandwidth (kHz)	Antenna height (cm)	Polarity	Turntable position (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)
1062.100000	28.9	1000.000	225.0	V	138.0	-15.5	45.1	74.0
1201.033333	37.2	1000.000	100.0	H	284.0	-16.1	36.8	74.0
1332.186667	46.3	1000.000	194.0	V	30.0	-14.5	27.7	74.0
1500.086667	32.9	1000.000	135.0	V	156.0	-13.9	41.1	74.0
4804.036667	42.3	1000.000	100.0	H	2.0	-10.2	31.7	74.0
7206.366666	32.8	1000.000	100.0	H	3.0	-4.6	41.2	74.0
9651.993333	31.1	1000.000	207.0	H	274.0	0.2	42.9	74.0
11987.96666	34.8	1000.000	205.0	H	69.0	4.1	39.2	74.0
14408.89000	33.8	1000.000	100.0	H	250.0	2.6	40.2	74.0
16775.59666	26.4	1000.000	225.0	H	125.0	-4.4	47.6	74.0

### Low Channel, High Frequency Radiated Peak Emissions Table

Frequency (MHz)	Average (dBµV/m)	Bandwidth (kHz)	Antenna height (cm)	Polarity	Turntable position (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)
1062.136667	15.4	1000.000	100.0	V	3.0	-15.5	38.6	54.0
1201.086667	30.2	1000.000	100.0	H	252.0	-16.1	23.8	54.0
1329.340000	14.7	1000.000	124.0	V	281.0	-14.5	39.3	54.0
1500.076667	23.2	1000.000	100.0	V	272.0	-13.9	30.8	54.0
4804.000000	34.5	1000.000	100.0	H	3.0	-10.2	19.5	54.0
7205.933333	20.8	1000.000	100.0	H	3.0	-4.6	33.2	54.0
9611.040000	17.9	1000.000	225.0	V	111.0	0.1	36.1	54.0
11978.99000	21.3	1000.000	100.0	H	195.0	4.1	32.7	54.0
14443.17333	20.0	1000.000	124.0	H	180.0	2.5	34.0	54.0
16806.28333	13.2	1000.000	147.0	H	180.0	-4.4	40.8	54.0

### Low Channel, High Frequency Radiated Average Emissions Table



### Mid Channel, High Frequency Radiated Spurious Emissions

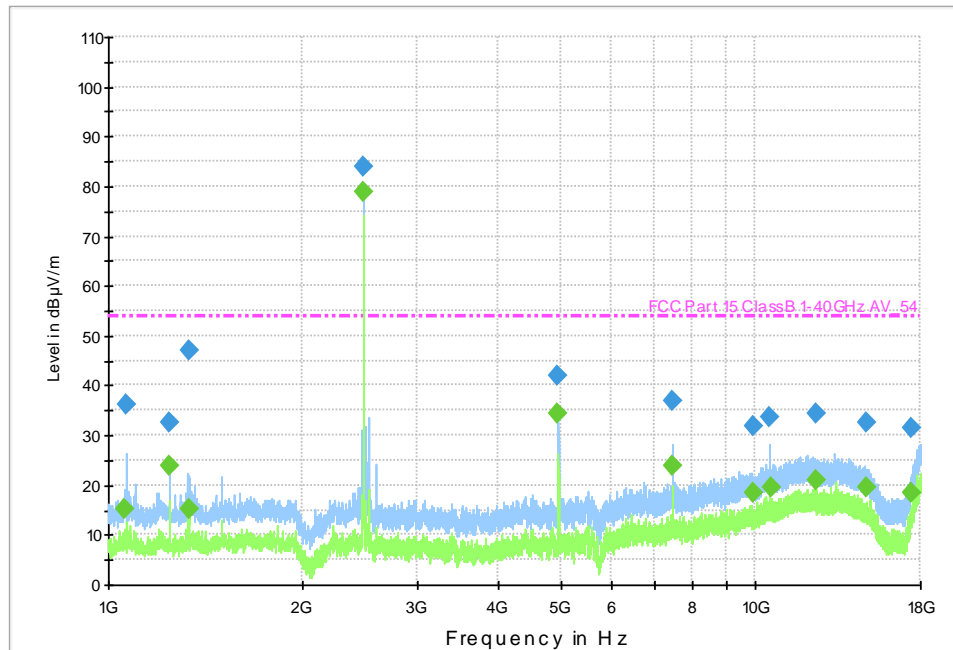
Frequency (MHz)	MaxPeak (dBµV/m)	Bandwidth (kHz)	Antenna height (cm)	Polarity	Turntable position (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)
1066.016666	40.1	1000.000	183.0	V	2.0	-15.5	33.9	74.0
1219.986667	33.0	1000.000	136.0	H	148.0	-16.1	41.0	74.0
1333.763333	40.8	1000.000	168.0	V	21.0	-14.5	33.2	74.0
1500.050000	31.6	1000.000	125.0	V	217.0	-13.9	42.4	74.0
2345.590000	39.6	1000.000	100.0	H	153.0	-13.6	34.4	74.0
4879.866667	30.1	1000.000	192.0	V	290.0	-10.4	43.9	74.0
4879.903334	39.0	1000.000	100.0	H	3.0	-10.0	35.0	74.0
6000.316667	28.8	1000.000	100.0	V	20.0	-7.7	45.2	74.0
7319.816666	37.9	1000.000	173.0	H	71.0	-4.4	36.1	74.0
9761.253333	32.0	1000.000	100.0	V	91.0	0.4	42.0	74.0
12165.00333	35.1	1000.000	207.0	V	38.0	3.8	38.9	74.0
14599.80000	32.2	1000.000	225.0	H	178.0	2.3	41.8	74.0
17128.34333	27.8	1000.000	225.0	H	156.0	-3.0	46.2	74.0

### Mid Channel, High Frequency Radiated Peak Emissions Table

Frequency (MHz)	Average (dBµV/m)	Bandwidth (kHz)	Antenna height (cm)	Polarity	Turntable position (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)
1220.026667	25.1	1000.000	100.0	H	60.0	-16.1	28.9	54.0
4879.940000	30.6	1000.000	100.0	H	3.0	-10.0	23.4	54.0
4880.063333	30.7	1000.000	100.0	H	4.0	-10.0	23.3	54.0
6000.303334	18.9	1000.000	100.0	V	3.0	-7.7	35.1	54.0
7319.903333	26.7	1000.000	158.0	H	57.0	-4.4	27.3	54.0
9748.600000	18.2	1000.000	147.0	V	165.0	0.4	35.8	54.0
12176.40666	21.6	1000.000	225.0	V	210.0	3.8	32.4	54.0
14611.64666	19.2	1000.000	171.0	V	177.0	2.0	34.8	54.0
17088.94000	14.0	1000.000	157.0	H	149.0	-3.5	40.0	54.0

### Mid Channel, High Frequency Radiated Average Emissions Table





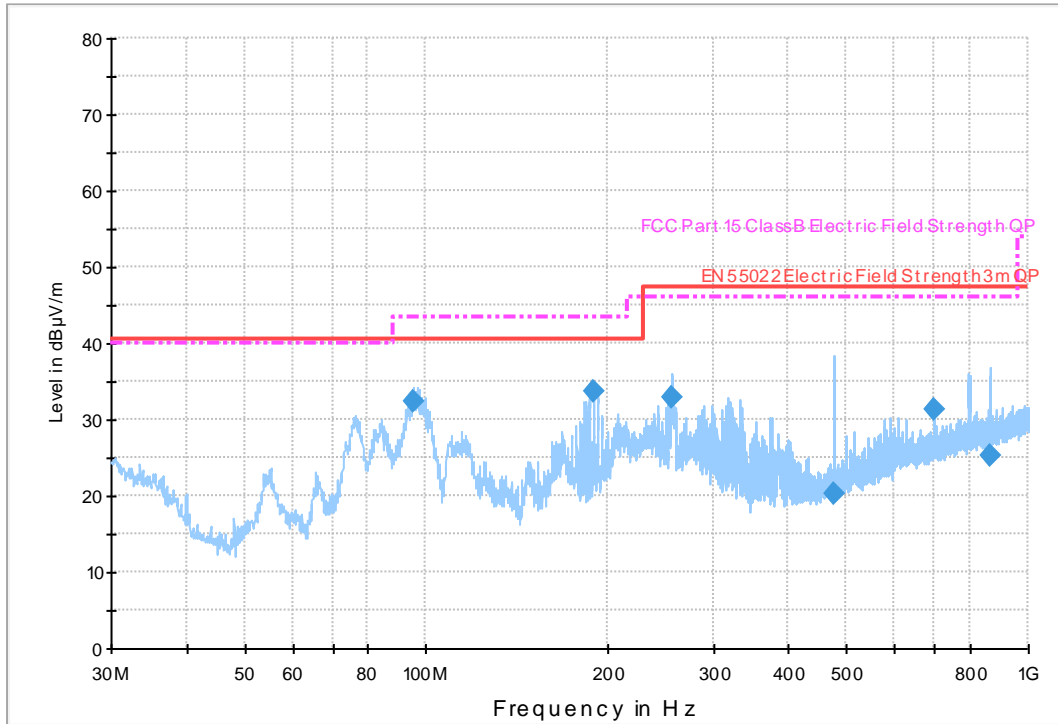
### High Channel, High Frequency Radiated Spurious Emissions

Frequency (MHz)	MaxPeak (dBμV/m)	Bandwidth (kHz)	Antenna height (cm)	Polarity	Turntable position (deg)	Corr. (dB)	Margin (dB)	Limit (dBμV/m)
1065.440000	36.3	1000.000	102.0	V	55.0	-15.5	37.7	74.0
1240.526667	32.6	1000.000	142.0	H	289.0	-16.0	41.4	74.0
1332.106667	47.2	1000.000	160.0	V	38.0	-14.5	26.8	74.0
4961.870000	42.1	1000.000	102.0	H	19.0	-9.8	31.9	74.0
7442.996667	36.8	1000.000	151.0	H	94.0	-4.3	37.2	74.0
9929.000000	31.7	1000.000	227.0	H	132.0	0.8	42.3	74.0
10512.15333	33.8	1000.000	149.0	V	272.0	1.8	40.2	74.0
12392.30000	34.2	1000.000	137.0	V	38.0	3.5	39.8	74.0
14900.53000	32.5	1000.000	126.0	H	217.0	1.9	41.5	74.0
17397.57666	31.4	1000.000	162.0	H	351.0	0.5	42.6	74.0

### High Channel, High Frequency Radiated Peak Emissions Table

Frequency (MHz)	Average (dBμV/m)	Bandwidth (kHz)	Antenna height (cm)	Polarity	Turntable position (deg)	Corr. (dB)	Margin (dB)	Limit (dBμV/m)
1062.086666	15.0	1000.000	183.0	V	20.0	-15.5	39.0	54.0
1240.466667	23.9	1000.000	102.0	H	93.0	-16.0	30.1	54.0
1332.500000	15.1	1000.000	136.0	V	57.0	-14.5	38.9	54.0
4961.943333	34.2	1000.000	102.0	H	18.0	-9.8	19.8	54.0
7442.843333	23.8	1000.000	150.0	V	161.0	-4.3	30.2	54.0
9948.130000	18.5	1000.000	227.0	H	180.0	0.8	35.5	54.0
10556.08000	19.5	1000.000	102.0	V	0.0	1.9	34.5	54.0
12410.08666	21.1	1000.000	227.0	V	52.0	3.4	32.9	54.0
14866.95666	19.4	1000.000	127.0	H	323.0	1.9	34.6	54.0
17409.49000	18.3	1000.000	227.0	V	151.0	0.3	35.7	54.0

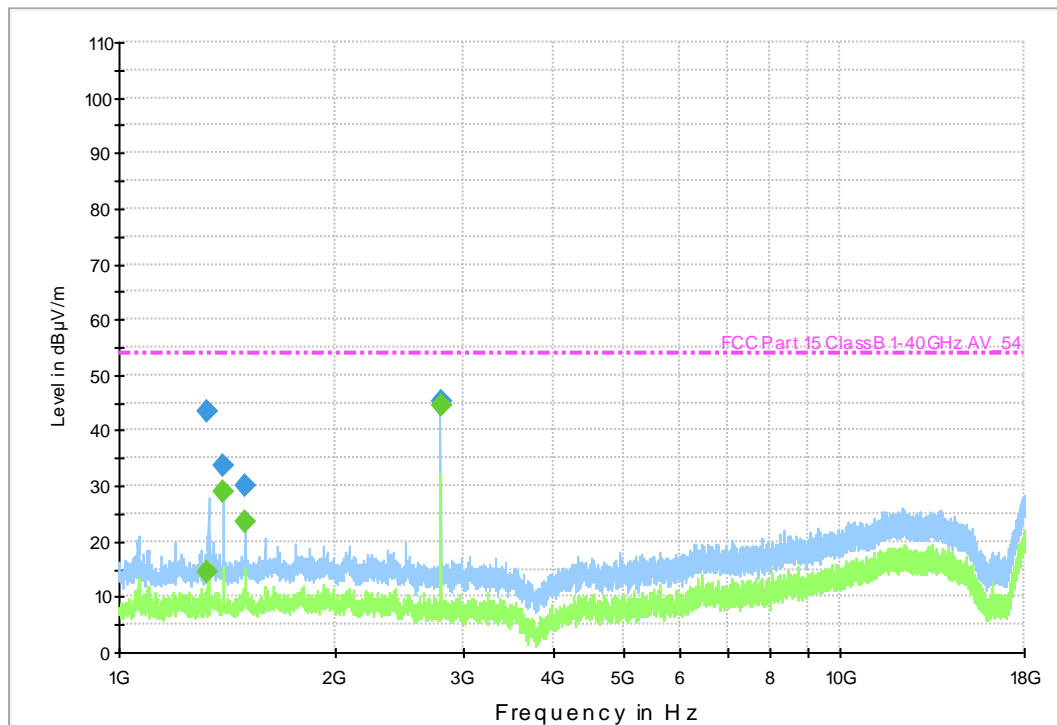
### High Channel, High Frequency Radiated Average Emissions Table



### Transmitter Sweep, Low Frequency Radiated Spurious Emissions

Frequency (MHz)	QuasiPeak (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Antenna height (cm)	Polarity	Turntable position (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)
95.093680	32.4	1000.00	120.000	100.0	V	270.0	10.5	8.1	40.5
189.618160	33.6	1000.00	120.000	159.0	H	135.0	13.0	6.9	40.5
256.275760	33.0	1000.00	120.000	133.0	H	327.0	13.8	14.5	47.5
475.120640	20.2	1000.00	120.000	150.0	H	335.0	19.8	27.3	47.5
699.480240	31.2	1000.00	120.000	150.0	V	225.0	22.9	16.3	47.5
864.669240	25.1	1000.00	120.000	197.0	V	7.0	24.6	22.4	47.5

### Transmitter Sweep, Low Frequency Radiated Quasi-Peak Emissions Table



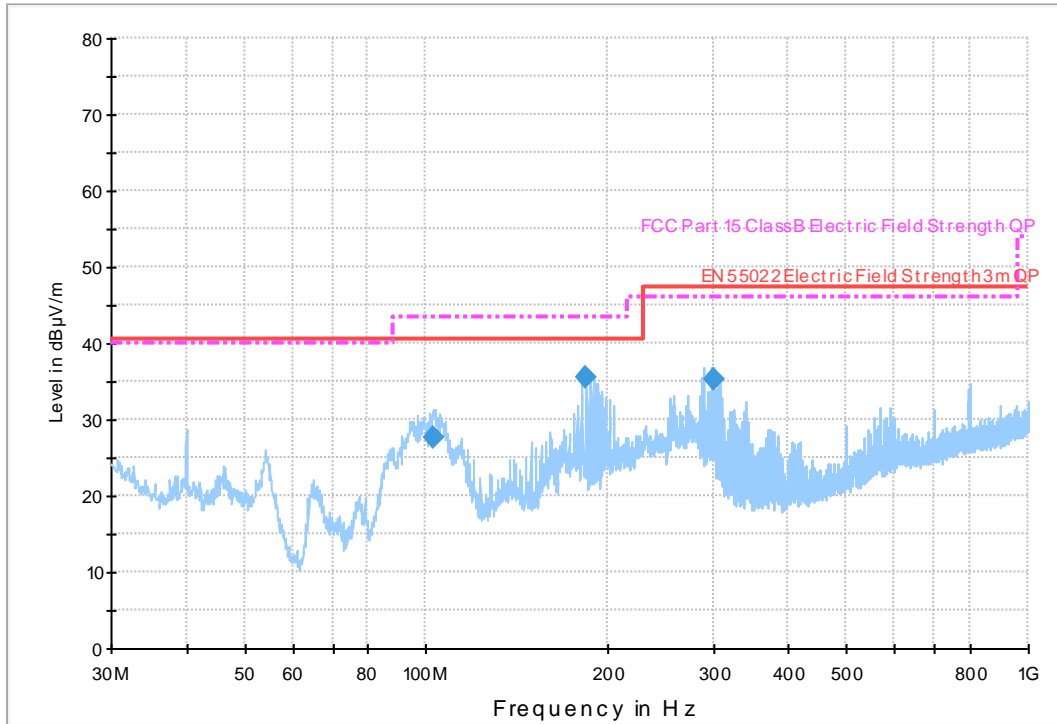
#### Receiver Mid Channel, High Frequency Radiated Spurious Emissions

Frequency (MHz)	MaxPeak (dBµV/m)	Bandwidth (kHz)	Antenna height (cm)	Polarity	Turntable position (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)
1326.18333	43.5	1000.000	133.0	V	30.0	-14.6	30.5	74.0
1395.42333	33.6	1000.000	100.0	H	84.0	-15.4	40.4	74.0
1500.08666	30.0	1000.000	100.0	V	132.0	-13.9	44.0	74.0
2790.85333	45.1	1000.000	209.0	H	44.0	-13.5	28.9	74.0

#### Receiver Mid Channel, High Frequency Radiated Peak Emissions Table

Frequency (MHz)	Average (dBµV/m)	Bandwidth (kHz)	Antenna height (cm)	Polarity	Turntable position (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)
1327.42666	14.5	1000.000	181.0	V	3.0	-14.5	39.5	54.0
1395.43000	28.9	1000.000	100.0	H	84.0	-15.4	25.1	54.0
1500.06000	23.5	1000.000	204.0	V	274.0	-13.9	30.5	54.0
2790.85333	44.6	1000.000	207.0	H	44.0	-13.5	9.4	54.0

#### Receiver Mid Channel, High Frequency Radiated Average Emissions Table



#### Receiver Mid Channel, Low Frequency Radiated Spurious Emissions

Frequency (MHz)	QuasiPeak (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Antenna height (cm)	Polarity	Turntable position (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)
103.188240	27.5	1000.00	120.000	100.0	V	225.0	12.5	13.0	40.5
184.473960	35.4	1000.00	120.000	160.0	H	108.0	12.7	5.1	40.5
301.623400	35.3	1000.00	120.000	100.0	H	90.0	15.5	12.2	47.5

#### Receiver Mid Channel, Low Frequency Radiated Quasi-Peak Emissions Table



## **Antenna Gain Measurement**

DATE: September 13<sup>th</sup> 2012

METHOD OF MEASUREMENT: KDB 558074 DTS Measurements

The EUT was set up in a 3 meter semi anechoic chamber. The EUT was setup in multiple orientations to find the orientation that would produce the greatest field strength reading. The fundamental emission was maximized and the power received was measured.

The EUT was provided with a 50 Ohm reverse thread SMA connector on the transmitter output. The transmitter output was connected to a spectrum analyzer. The EUT's modulation was turned off and the TX set to its low, mid and high channels. The EUT's conducted transmit power was measured.

CALCULATING GAIN: The Friis transmission equation was used to calculate the gain of the EUT's antenna. The equation can be seen below:

$$P_r = P_t + G_t + G_r + 20 \log_{10} \left( \frac{\lambda}{4\pi R} \right)$$

All power and gain units are in dBm and dBi.

TEST RESULTS:  $P_r = 62.15 \text{ dBuV} = -45.10 \text{ dBm}$ .  
Cable Losses = 5.0 dB  
 $P_t = -0.6 \text{ dBm}$   
 $G_r = 9.12 \text{ dBi}$   
 $\lambda = 0.12448 \text{ m}$  at 2.402GHz  
 $R = 3 \text{ m}$

Therefore  $G_t = 1.005 \text{ dBi} = 1.01 \text{ dBi}$

MODIFICATIONS: The EUT did not require any modifications.

PERFORMANCE: N/A



## **Field Strength Measurements at 3 Meters**

DATE: September 11<sup>th</sup> 2012

METHOD OF MEASUREMENT: KDB 558074 DTS Measurements

The EUT was set up in a 3 meter semi anechoic chamber. The EUT was setup in multiple orientations to find the orientation that would produce the greatest field strength reading. The fundamental emission was maximized and the field strength reading was measured.

EUT ORIENTATIONS: The EUT was orientated in 2 different positions. The first position was with the EUT lying flat. The second position was with the EUT standing straight up with the antenna side up and the cable side down.

TEST RESULTS:

<b>EUT Position</b>	<b>Frequency (GHz)</b>	<b>Polarization (H or V)</b>	<b>Turntable (deg)</b>	<b>Mast (cm)</b>	<b>Peak Measurement (dBuV/m)</b>
1	2.402	H	356.9	100.0	88.4
1	2.402	V	167.7	100.0	80.5
1	2.440	H	3.7	113.9	78.5
1	2.440	V	241.8	106.0	77.7
1	2.481	H	0.0	100.0	82.9
1	2.481	V	85.8	100.0	79.7
2	2.402	H	299.0	182.8	86.6
2	2.402	V	185.9	140.3	86.3
2	2.440	H	271.2	188.7	78.0
2	2.440	V	159.5	192.1	79.7
2	2.481	H	273.1	162.4	83.4
2	2.481	V	214.1	192.6	81.9

MODIFICATIONS: The EUT did not require any modifications.

PERFORMANCE: N/A

## Appendix B: EUT Photos During EMC Testing



Conducted Emissions Setup in the Semi-Anechoic Chamber: PC Connected



Conducted Emissions Setup in the Semi-Anechoic Chamber: AC Charger





Radiated Emission Test Setup in the Semi-Anechoic Chamber: PC Connected



Radiated Emissions Test Set-Up in the Semi-Anechoic Chamber: PC Connected

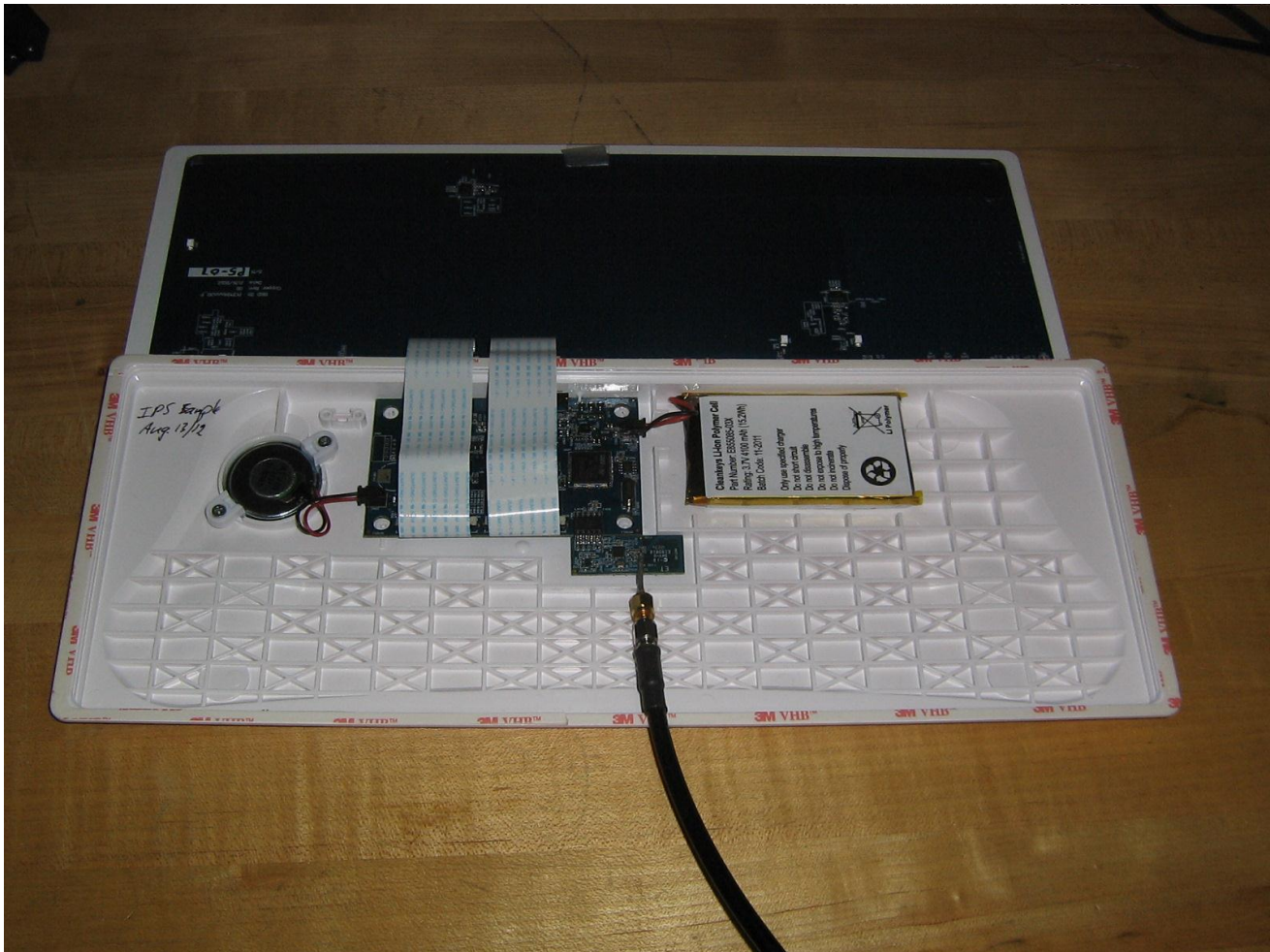




Radiated Emission Test Setup in the Semi-Anechoic Chamber: AC Charger



Radiated Emission Test Setup in the Semi-Anechoic Chamber: AC Charger



Intentional Transmitter RF Conducted Test Setup