

Prüfbericht-Nr.: <i>Test Report No.:</i>	15069613 001	Auftrags-Nr.: <i>Order No.:</i>	154031076	Seite 1 von 51 Page 1 of 51
Kunden-Referenz-Nr.: <i>Client Reference No.:</i>	405064	Auftragsdatum: <i>Order date:</i>	15.07.2013	
Auftraggeber: <i>Client:</i>	Shanghai Huace Navigation Technology Ltd. Floor 5, Building 35 No. 680 Guiping Road Shanghai 200223 P.R. China			
Prüfgegenstand: <i>Test item:</i>	Handheld GPS receiver			
Bezeichnung / Typ-Nr.: <i>Identification / Type No.:</i>	LT400XY FCC ID :SY4-B01003			
Auftrags-Inhalt: <i>Order content:</i>	Complete test			
Prüfgrundlage: <i>Test specification:</i>	FCC CFR47 Part 15, Subpart C ANSI C63.4-2009 Public Notice DA 00-705: Filing and Measurement Guidelines for Frequency Hopping Spread Spectrum Systems (March 30, 2000)			
Wareneingangsdatum: <i>Date of receipt:</i>	19.07.2013			
Prüfmuster-Nr.: <i>Test sample No.:</i>	A02 and B02			
Prüfzeitraum: <i>Testing period:</i>	13.01.2014 – 19.03.2014			
Ort der Prüfung: <i>Place of testing:</i>	QuieTek Technology(Suzhou)Co.,Ltd.			
Prüflaboratorium: <i>Testing laboratory:</i>	TÜV Rheinland (Shanghai) Co., Ltd.			
Prüfergebnis*: <i>Test result*:</i>	Pass			
geprüft von / tested by: Adrian Shi		kontrolliert von / reviewed by: Sam Lin		
31.03.2014	Adrian Shi / Project Engineer	31.03.2014	Sam Lin / Technical Certifier	
Datum <i>Date</i>	Name / Stellung <i>Name / Position</i>	Unterschrift <i>Signature</i>	Datum <i>Date</i>	Name / Stellung <i>Name / Position</i>
Sonstiges / Other: Please combine with the reports No.15069614 001, 15069615 001, 15070817 001, 13020638-FCC-H as a total certificate report.				
Zustand des Prüfgegenstandes bei Anlieferung: <i>Condition of the test item at delivery:</i>		Prüfmuster vollständig und unbeschädigt <i>Test item complete and undamaged</i>		
* Legende: 1 = sehr gut 2 = gut 3 = befriedigend 4 = ausreichend 5 = mangelhaft P(ass) = entspricht o.g. Prüfgrundlage(n) F(all) = entspricht nicht o.g. Prüfgrundlage(n) N/A = nicht anwendbar N/T = nicht getestet Legend: 1 = very good 2 = good 3 = satisfactory 4 = sufficient 5 = poor P(ass) = passed a.m. test specification(s) F(all) = failed a.m. test specification(s) N/A = not applicable N/T = not tested				
Dieser Prüfbericht bezieht sich nur auf das o.g. Prüfmuster und darf ohne Genehmigung der Prüfstelle nicht auszugsweise vervielfältigt werden. Dieser Bericht berechtigt nicht zur Verwendung eines Prüfzeichens. <i>This test report only relates to the a. m. test sample. Without permission of the test center this test report is not permitted to be duplicated in extracts. This test report does not entitle to carry any test mark.</i>				

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TEST SUMMARY

3.2.1 VOLTAGE REQUIREMENTS, FCC 15.31(E)

RESULT: PASS

3.2.2 ANTENNA REQUIREMENTS, FCC 15.203, FCC 15.204

RESULT: PASS

5.1.1 CONDUCTED OUTPUT POWER, FCC 15.247(B)(1)& (3)

RESULT: PASS

5.1.2 CARRIER FREQUENCY SEPARATION, FCC 15.247(A)(1)

RESULT: PASS

5.1.3 20dB BANDWIDTH & 99% BANDWIDTH, FCC 15.247(A)(1)& (2)

5.1.4 NUMBER OF HOPPING FREQUENCIES, FCC 15.247(A)(1)(III)

RESULT: PASS

5.1.5 AVERAGE TIME OF OCCUPANCY, FCC 15.247(A)(1)(III)

RESULT: PASS

5.1.6 CONDUCTED SPURIOUS EMISSION, FCC 15.247(D)

RESULT: PASS

5.1.7 BAND EDGE COMPLIANCE OF RF CONDUCTED EMISSION, FCC 15.247(D)

RESULT: PASS

5.1.8 CONDUCTED EMISSIONS, FCC 15.207

RESULT: PASS

6.1.1 BAND EDGE RADIATED EMISSION, FCC 15.205, FCC 15.209, FCC 15.247(D)

RESULT: Pass

6.1.2 RADIATED SPURIOUS EMISSION OF TRANSMITTER, FCC 15.205, FCC 15.209, FCC 15.247(D)

RESULT: PASS

6.2.1 RADIATED SPURIOUS EMISSION OF RECEIVER, FCC 15.109

RESULT: PASS

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1. General Remarks

1.1 Complementary Materials

All attachments are integral parts of this test report.

2. Test Sites

2.1 Test Facilities

QuieTek Technology(Suzhou)Co.,Ltd.

No.99 Hongye RD.Suzhou Industnal Park Loufeng Hi-Tech Development
Zone.,Suzhou,China

The used test equipment is in accordance with CISPR 16 for measurement of radio
interference.

The Federal Communications Commission has reviewed the technical characteristics of
the radiated and conducted emission facility, and has found these test facilities to be in
compliance with the requirements of section 2.948 of the FCC rules. The description of
the test facility is listed under FCC registration number 800392.

The Industry Canada has reviewed the technical characteristics of the radiated and
conducted emission facility, and has found these test facilities to be in compliance. The
description of the test facility is listed under chambers filing number 4075B.

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2.2 List of Test and Measurement Instruments

Table 1: List of Test and Measurement Equipment

Equipment	Model	Serial no.	Cal. due date
3m modified semi-anechoic chamber	SAC	N/A	10.12.2014
EMI test receiver	ESCI	100280	08.11.2014
broadband antenna	BTA-H	040005H	28.07.2014
Spectrum analyzer	FSP30	100192	21.07.2014
Spectrum analyzer	E4440A	MY42510355	08.05.2014
Broadband coaxial preamplifier	BBV 9718	9718-012	04.07.2014
Double ridged broadband horn antenna	BBHA 9120 D	9120D-433	15.05.2014

2.3 Measurement Uncertainty

Table 2: Emission Measurement Uncertainty

Measurement Type	Frequency	Uncertainty
Antenna Port Conducted Emission	< 1GHz	±0.39dB
	> 1GHz	±0.68dB
Radiated Emission	30MHz - 1GHz	±5.34dB
	> 1GHz	±5.40dB

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3. General Product Information

3.1 Product Function and Intended Use

The EUT (Equipment Under Test) is Handheld GPS receiver.
The Applicant declares that the model LT400XY ,Model LT400XY, X is variable, it indicated A-Z or 0-9, Y is variable, it indicated A-Z, 0-9 or blank.due to sales purpose in different countries or regions. The internal PCB design are no difference, but only distinct in colours and model names.The test model name is LT400H.

3.2 System Details

Radio standard:	Bluetooth
Max output power:	0.83dBm
Antenna gain:	-0.24dBi
Antenna type:	PCB antenna
Antenna mounting type:	Printed
Antenna cable length:	N/A
Frequency range:	2402 – 2480MHz
Number of channels:	79
Channel spacing:	1MHz
Modulation type:	GFSK; π /4-DQPSK ;8DPSK
Low test temperature:	-20°C
Normal test temperature:	24°C
High test temperature:	55°C
Low test voltage:	DC 3.6V
Normal test voltage:	DC 3.7V
High test voltage:	DC 4.2V

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3.2.1 Voltage Requirements, FCC 15.31(e)

RESULT: **PASS**

All the tests were performed using steady DC 3.7V. Hence it complies with the power supply requirements.

3.2.2 Antenna Requirements, FCC 15.203, FCC 15.204

RESULT: **PASS**

The EUT has an PCB antenna which is not user accessible. Hence it complies with the requirements.

3.3 Independent Operation Modes

The EUT was tested on a stand-alone basis (only attached to the test jig) and the test system was configured in a typical fashion (as a customer would normally use it).

The justification and manipulation of cables and equipment in order to simulate a worst-case behavior of the test setup has been carried out as prescribed in ANSI C63.4:2009.

Bluetooth BDR and EDR mode :

Testing was performed at the lowest operating frequency (2402MHz), at the operating frequency in the middle of the specified frequency band (2441MHz) and at the highest operating frequency (2480MHz) with different modulation types.

Bluetooth BDR and EDR mode basic operation in (GFSK; $\pi/4$ -DQPSK ;8DPSK) :

- A. EUT transmits (TX mode), with full power, at lowest channel (2402MHz), a continuous modulated signal streaming with 100% duty cycle.
- B. EUT transmits (TX mode), with full power, at middle channel (2441MHz), a continuous modulated signal streaming with 100% duty cycle.
- C. EUT transmits (TX mode), with full power, at highest channel (2480MHz), a continuous modulated signal streaming with 100% duty cycle.
- D. EUT receives (RX mode), at lowest channel (2402MHz), continuously.
- E. EUT receives (RX mode), at middle channel (2441MHz), continuously.
- F. EUT receives (RX mode), at highest channel (2480MHz), continuously.
- G. EUT transmits on pseudo-random sequence on all channels (hopping mode).

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3.4 Noise Suppressing Parts

Refer to schematics and internal photos.

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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 47 CFR Part 15, Sections 15.31, 15.33, 15.35, 15.205, 15.207, 15.209

The test methods, which have been used, are based on Public Notice DA 00-705 and ANSI C63.4-2009

4.2 Physical Configuration for Testing

One test sample was available. Both for antennas conducted measurements and for radiated measurements.

For antennas conducted measurements with 50Ω connector and radiated measurements more details, refer to section: Photographs of the Test Set-Up.

4.3 Test Operation and Test Software

Software used for testing: Test mode in EUT

This software was running on the EUT. It was used to enable the test operation modes listed in section 3.3 as appropriate.

4.4 Special Accessories and Auxiliary Equipment

N/A

4.5 Countermeasures to achieve EMC Compliance

No additional measures were employed to achieve compliance.

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5. Test Results of Conducted Measurements at Antenna Port

5.1 Transmitter Parameters

5.1.1 Conducted Output Power, FCC 15.247(b)(1)& (3)

RESULT:

PASS

Date of testing: 2014-03-19

Ambient temperature: 22.3°C

Relative humidity: 40.1%

Atmospheric pressure: 101.7hPa

Requirements:

For frequency hopping systems operating in the 2400-2483.5MHz band employing at least 75 non-overlapping hopping channels, the maximum peak output power shall be 1W (30dBm). For other hopping systems operating in the 2400-2483.5MHz band, the maximum peak output power shall be 0.125W (21dBm).

Test procedure:

Public Notice DA 00-705 and ANSI C63.4-2009

The maximum peak output power (conducted) was measured at the antenna connector with a spectrum analyzer. The analyzer resolution bandwidth was set to 3MHz and the video bandwidth to 10MHz. The final measurement takes into account the loss generated by all the involved cables.

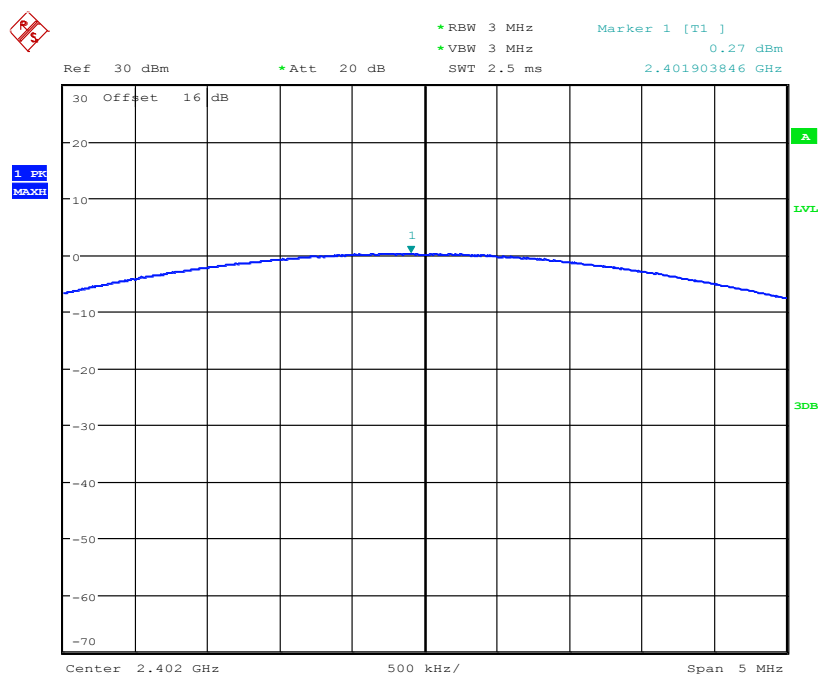
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Table 3: Conducted Output Power, Mode A

Data Rate [Mbps]	RBW [MHz]	Output Power [dBm]	Limit [dBm]
1	3	0.25	21
2	3	0.01	21
3	3	0.27	21

Figure 1: Conducted Output Power, Mode A



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Table 4: Conducted Output Power, Mode B

Data Rate [Mbps]	RBW [MHz]	Output Power [dBm]	Limit [dBm]
1	3	0.18	21
2	3	0.10	21
3	3	0.20	21

Figure 2: Conducted Output Power, Mode B

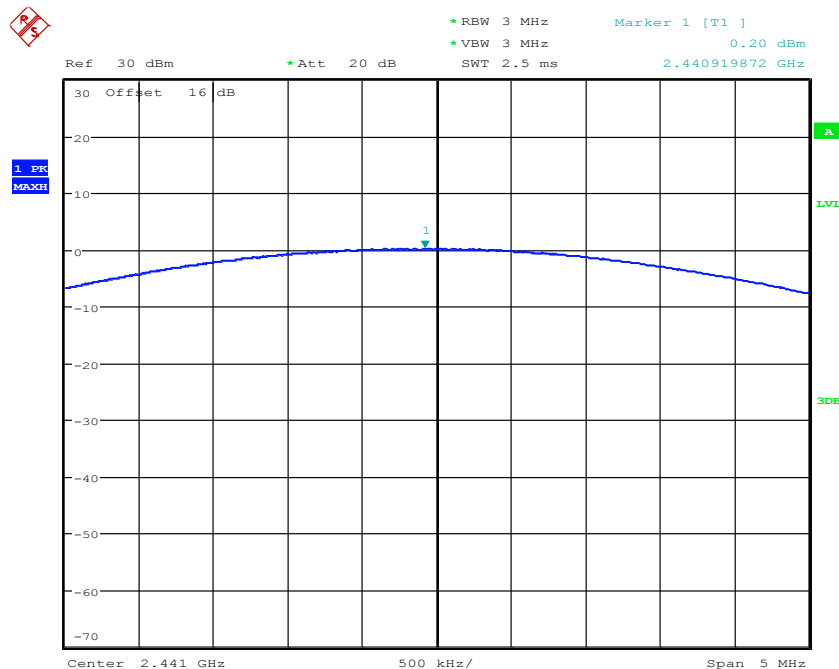


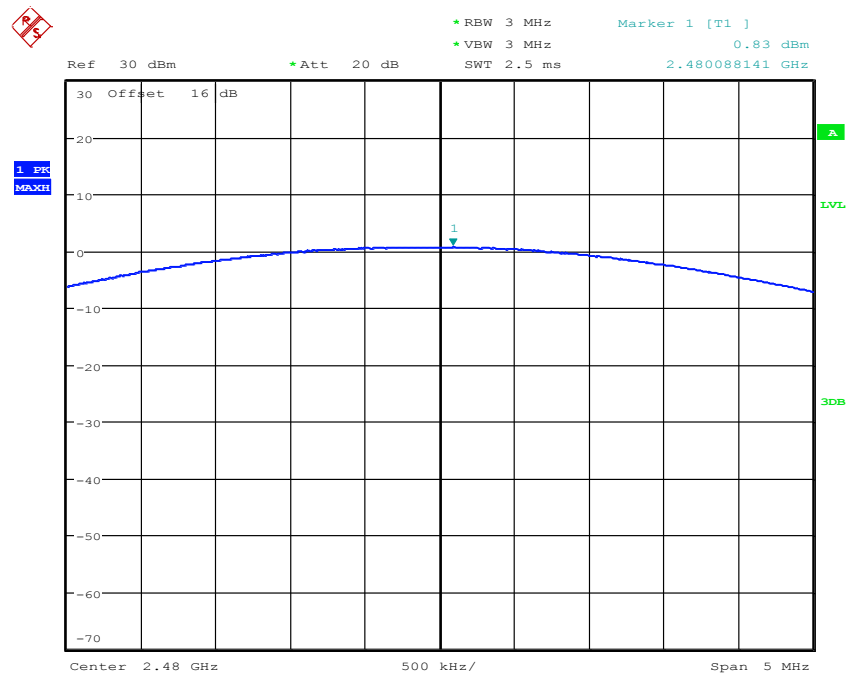
Table 5: Conducted Output Power, Mode C

Data Rate [Mbps]	RBW [MHz]	Output Power [dBm]	Limit [dBm]
1	3	0.80	21
2	3	0.62	21
3	3	0.83	21

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Figure 3: Conducted Output Power, Mode C



Remark:

The above results show that the BDR and EDR worst case output power is found at the data rate of 3Mbps.

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5.1.2 Carrier Frequency Separation, FCC 15.247(a)(1)

RESULT:

PASS

Date of testing: 2014-03-14

Ambient temperature: 22.3°C

Relative humidity: 40.1%

Atmospheric pressure: 101.7hPa

Requirements:

Frequency hopping systems operating in the 2400-2483.5MHz band shall have hopping channel carrier frequencies separated by a minimum of 25kHz or the 20dB bandwidth of the hopping channel, whichever is greater. In case of an output power less than 125mW, the frequency hopping system may have channels separated by a minimum of 25kHz or two-thirds of the 20dB bandwidth of the hopping channel, whichever is greater.

Test procedure:

ANSI C63.4-2009 and Public Notice DA 00-705.

A spectrum analyzer

was connected to the antenna port of the EUT. The analyzer resolution bandwidth was set to 30kHz and the video bandwidth to 100kHz. The Delta Marker function was used to determine the separation between the peaks of two adjacent channels.

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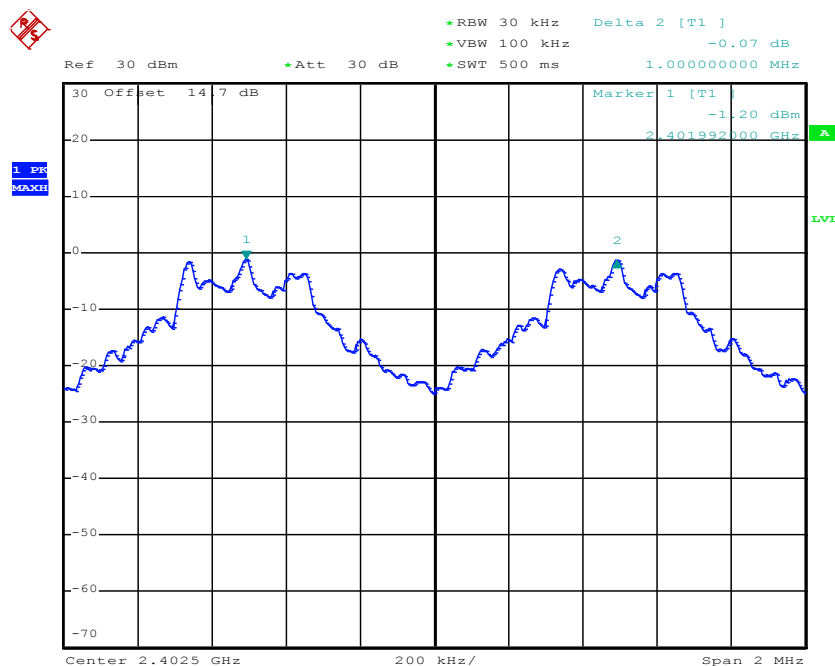
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Table 6: Carrier Frequency Separation

Channel	Channel Separation [kHz]	20dB Bandwidth [kHz](8DPSK)	Limit [kHz]
Low	1000	834	556
Middle	1020	840	560
High	1001	840	560

Notes: Limit = 20dB bandwidth * 2/3 since it is greater than 25kHz and the output power is less than 125mW.

Figure 4: Carrier Frequency Separation, Mode A



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Figure 5: Carrier Frequency Separation, Mode B

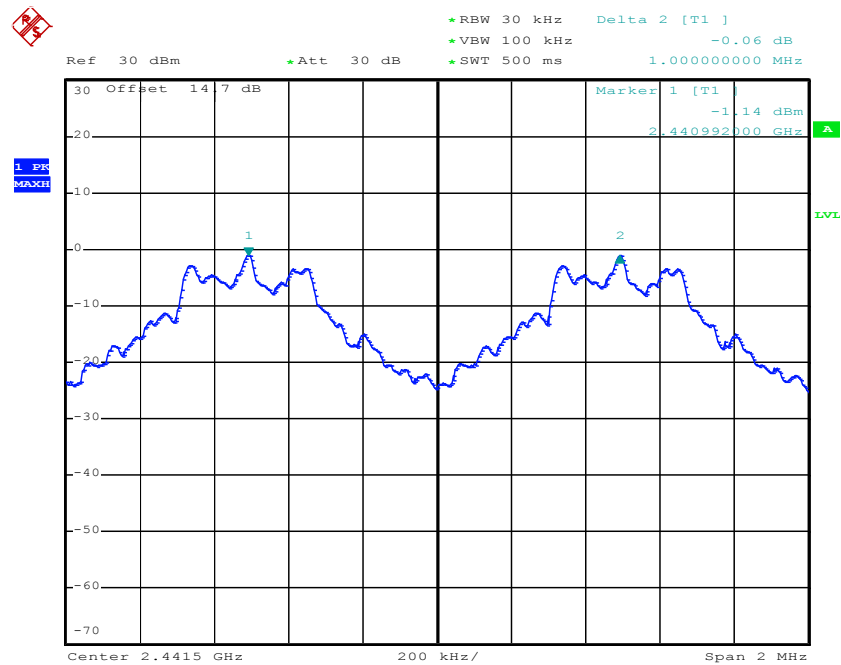
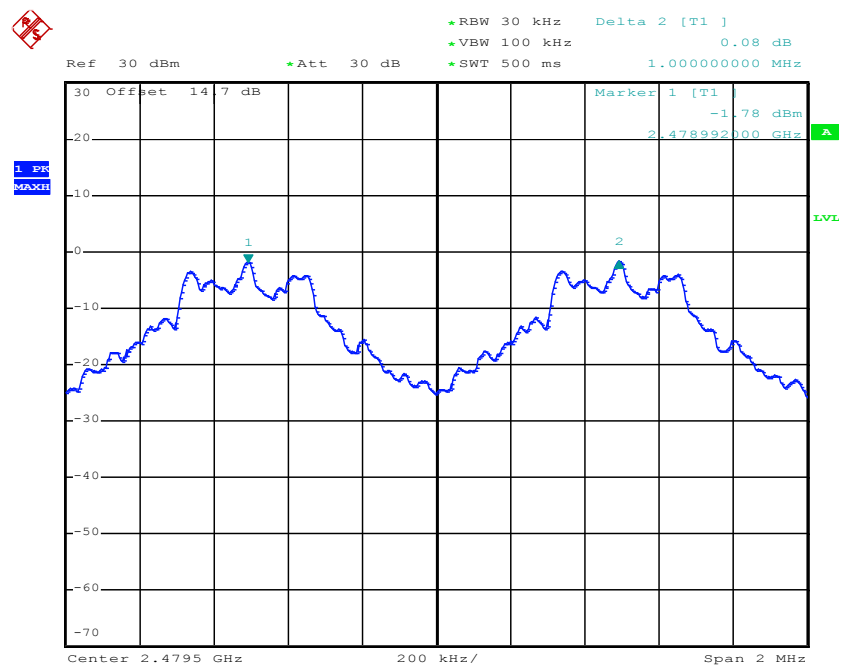


Figure 6: Carrier Frequency Separation, Mode C



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5.1.3 20dB Bandwidth & 99% Bandwidth, FCC 15.247(a)(1)& (2)

Date of testing: 2014-03-14

Ambient temperature: 22.3°C

Relative humidity: 40.1%

Atmospheric pressure: 101.7hPa

Requirements:

For frequency hopping systems operating in the 2400-2483.5MHz band, no bandwidth limit is specified. Test data is provided for reference.

Test procedure:

Public Notice DA 00-705 and ANSI C63.4-2009

A spectrum analyzer was connected to the antenna port of the EUT. The spectrum analyzer resolution bandwidth was set to 30kHz, the video bandwidth to 300kHz and the span to 1.5MHz.

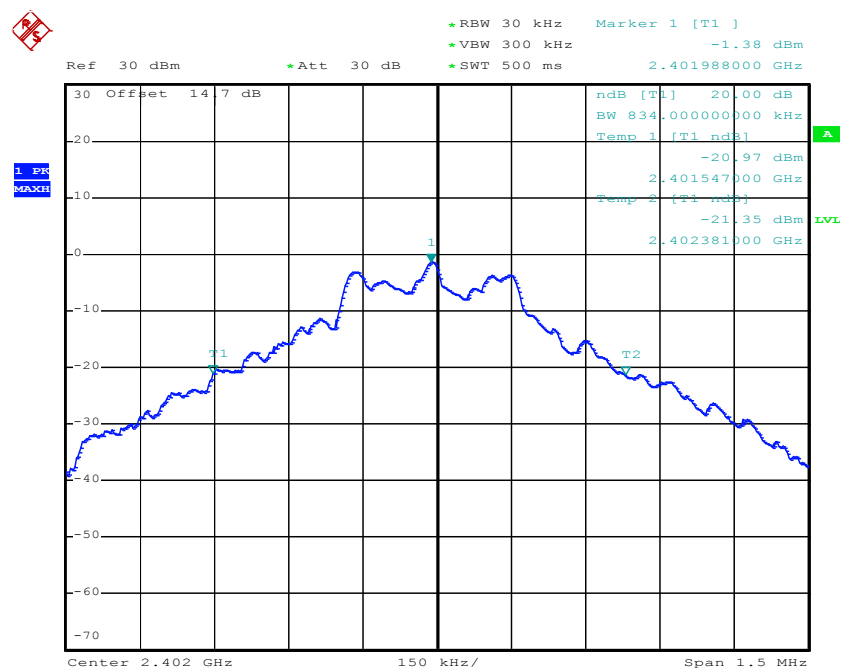
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Table 7: 20dB &99% Bandwidth

Operating Frequency [MHz]	20dB Bandwidth [kHz](8DPSK)	99% Bandwidth [kHz](8DPSK)
2402	834	846
2441	840	846
2480	840	846

Figure 7: 20dB &99% Bandwidth, Mode A



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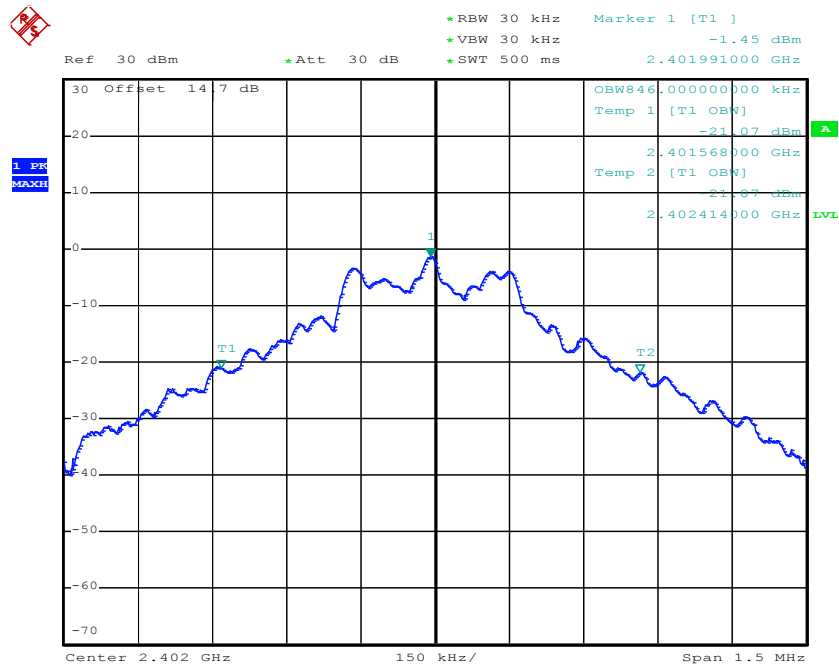
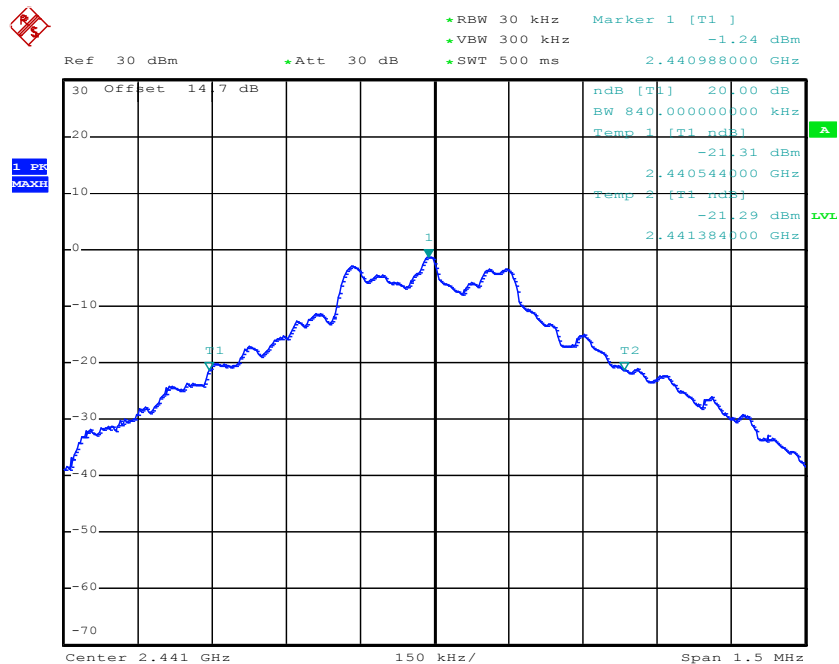


Figure 8: 20dB Bandwidth, Mode B



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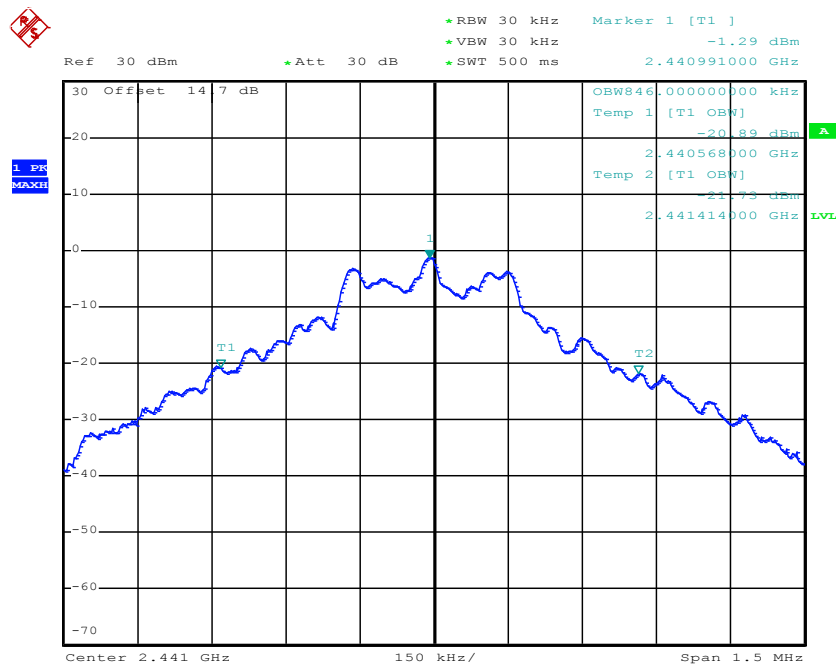
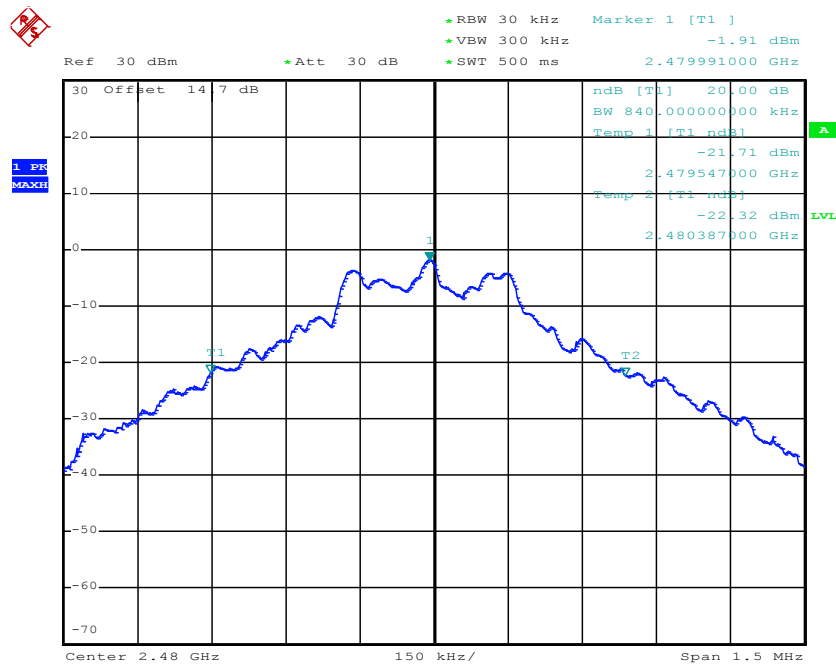
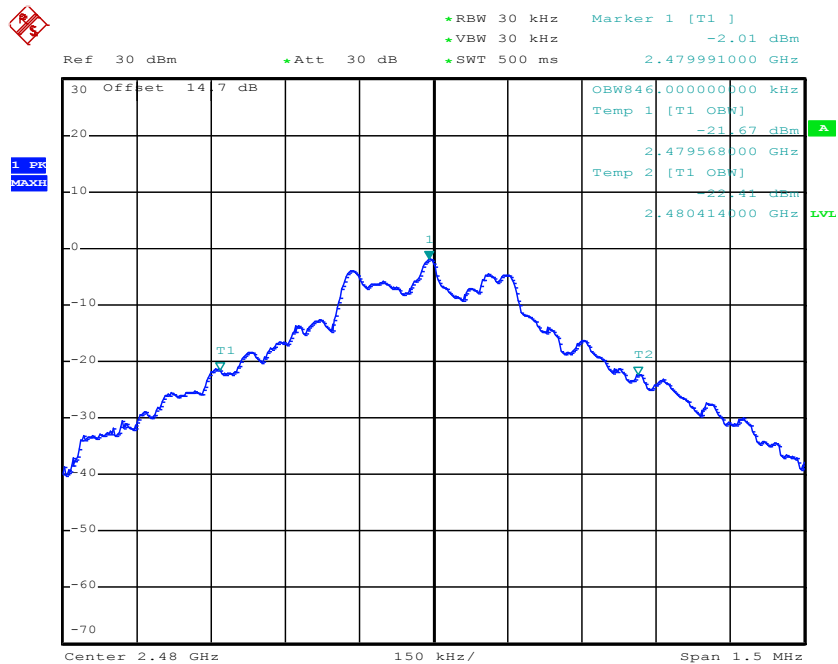


Figure 9: 20dB Bandwidth, Mode C



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5.1.4 Number of Hopping Frequencies, FCC 15.247(a)(1)(iii)

RESULT:

PASS

Date of testing: 2014-03-14

Ambient temperature: 22.3°C

Relative humidity: 40.1%

Atmospheric pressure: 101.7hPa

Requirements:

Frequency hopping systems operating in the 2400-2483.5MHz band shall use at least 15 channels.

Test procedure:

ANSI C63.4-2009 and Public Notice DA 00-705.

A spectrum analyzer was connected to the antenna port of the EUT. The analyzer resolution bandwidth was set to 300kHz and video bandwidth was set to 1MHz. The spectrum was broken in three plots to show all the hopping frequencies.

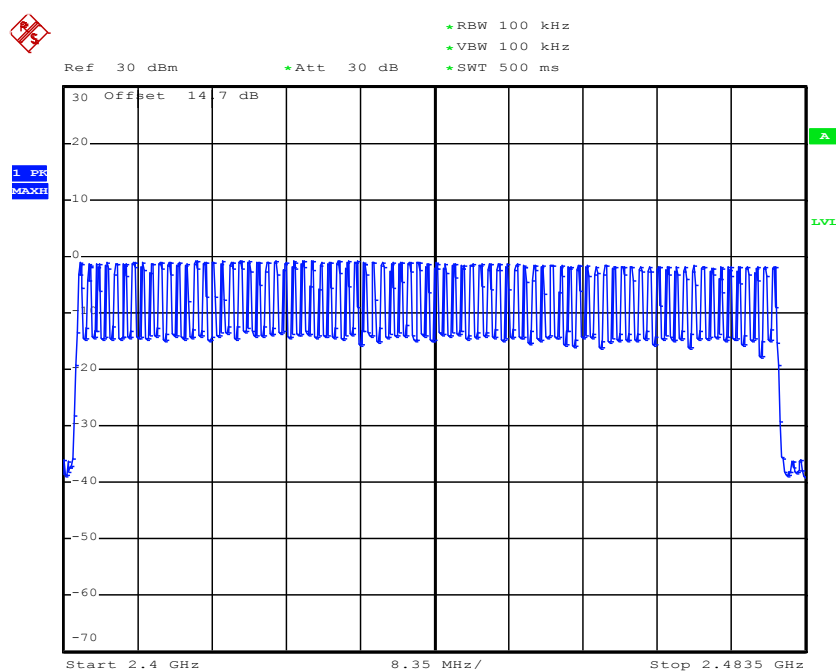
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Table 8: Number of Hopping Frequencies

Number of Hopping Frequencies	Limit	BDR AND EDR
79	15	

Figure 10: Hopping Frequencies BDR and EDR, Mode G



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5.1.5 Average Time of Occupancy, FCC 15.247(a)(1)(iii)

RESULT:

PASS

Date of testing: 2014-03-14

Ambient temperature: 22.3°C

Relative humidity: 40.1%

Atmospheric pressure: 101.7hPa

Requirements:

For frequency hopping systems operating in the 2400-2483.5MHz band, the average time of occupancy on any channel shall not be greater than 0.4s within a period of 0.4s multiplied by the number of hopping channels employed.

Test procedure:

ANSI C63.4-2009 and Public Notice DA 00-705.

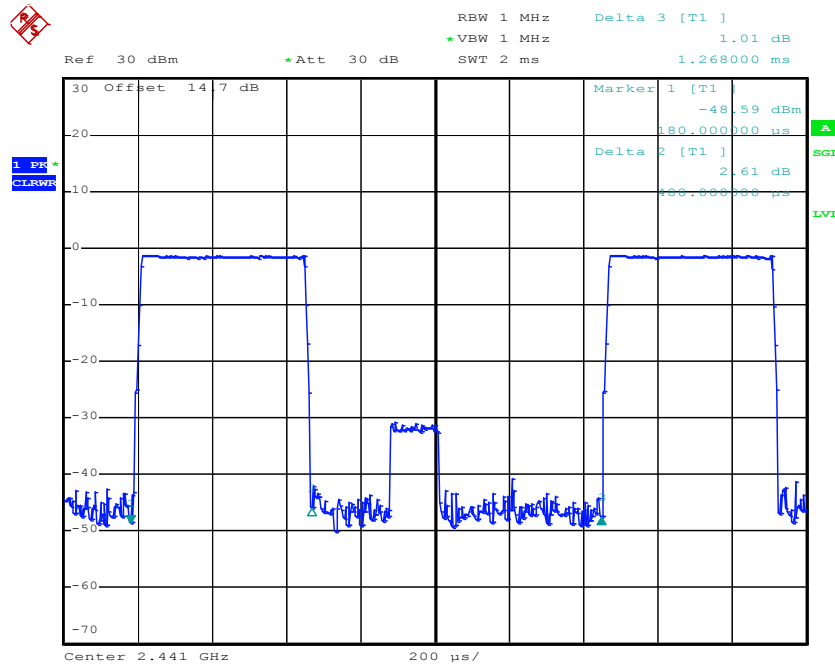
A spectrum analyzer was connected to the antenna port of the EUT. The analyzer resolution bandwidth and video bandwidth were set to 1MHz. The average time of occupancy was obtained by measuring first the dwell time of a single packet with the Delta Marker function using a zero span centered on a hopping channel and by counting then the number of hops per channel in a 31.6s period (0.4s times the number of hopping channels).

Table 9: Average Time of Occupancy

Channel	Packet Type	Packet Duration [ms]	Number of Hops per Channel in a 31.6s Period	Average Time of Occupancy [ms]	Limit [ms]
Mid	1M-DH1	0.49	106.81	52.34	400
Mid	1M-DH3	1.76	106.81	187.99	400
Mid	1M-DH5	3.02	106.81	322.57	400

Notes: Average time of occupancy = Packet duration * Number of hops per channel in a 31.6s period

Figure 11: Dwell Time, Mode (Hopping), 1M-DH1, Mode B



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Figure 12: Dwell Time, Mode (Hopping), 1M-DH3, Mode B

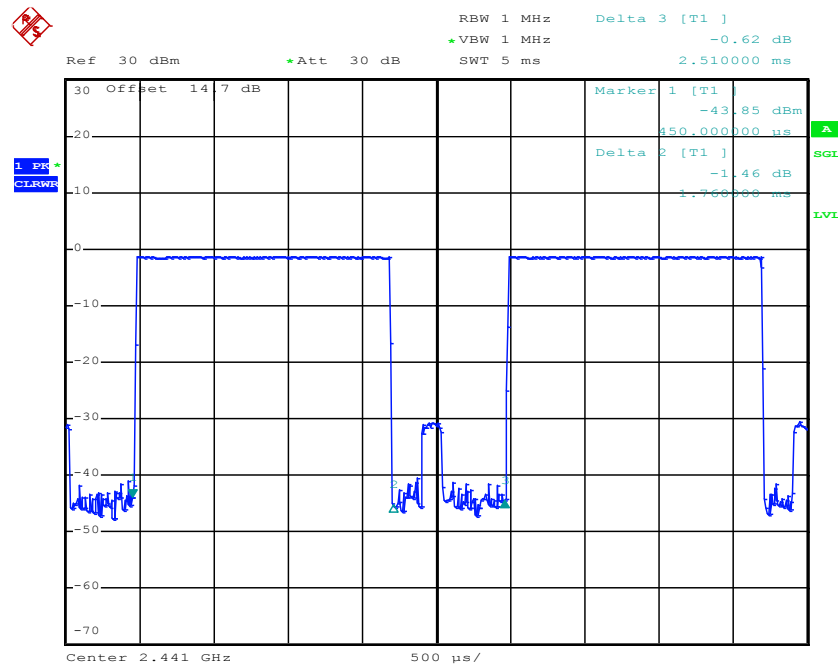
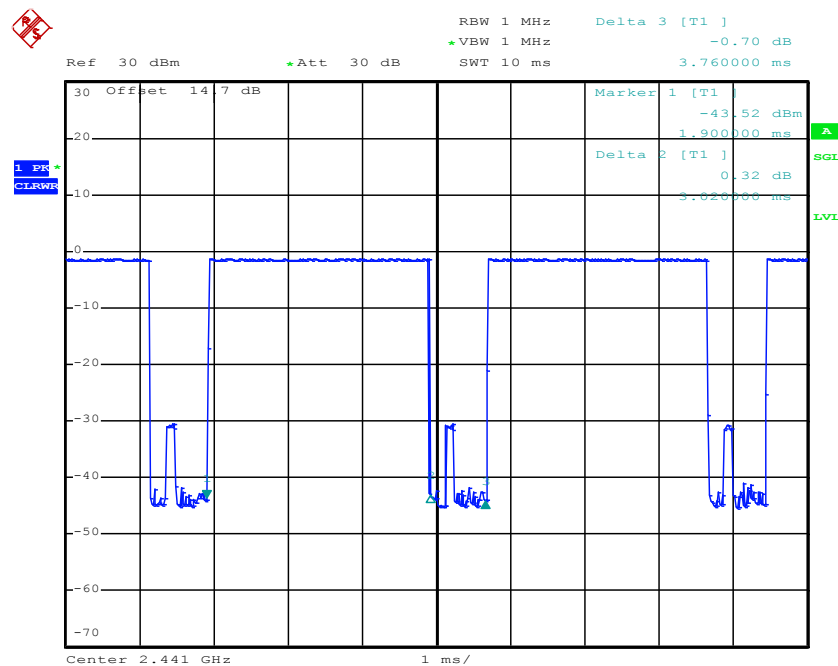


Figure 13: Dwell Time, Mode (Hopping), 1M-DH5, Mode B



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5.1.6 Conducted Spurious Emission, FCC 15.247(d)

RESULT:

PASS

Date of testing: 2014-03-19

Ambient temperature: 22.3°C

Relative humidity: 40.1%

Atmospheric pressure: 101.7hPa

Requirements:

In any 100kHz bandwidth outside the frequency band, the RF power shall be at least 20dB below that of the maximum in-band 100kHz emission.

Test procedure:

ANSI C63.4-2009 and Public Notice DA 00-705.

.

A spectrum analyzer was connected to the antenna port of the EUT. The analyzer resolution bandwidth was set to 100kHz. For each channel investigated, the in-band and out-of-band emission measurements were performed. The out-of-band emissions were measured from 30MHz to 25GHz (10th harmonics).

The final measurement takes into account the loss generated by all the involved cables.

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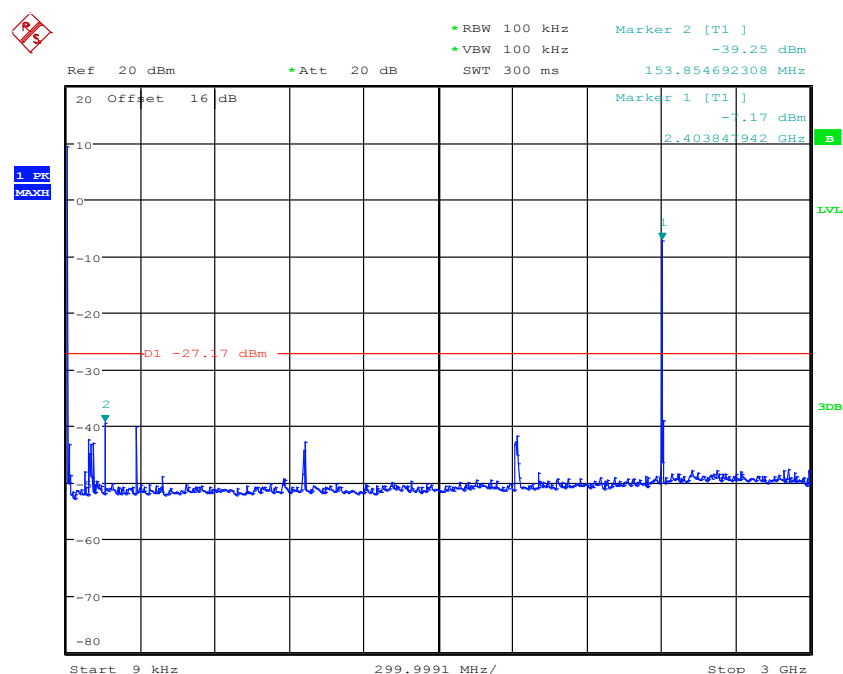
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Table 10: Conducted Spurious Emission, Mode A

Frequency [MHz]	Reading [dBm]	Limit [dBm]	Over Limit [dB]
154	-39.25	-27.17	-12.08
24436	-47.32	-27.17	-20.15
2404	-7.17	N/A	N/A

Notes: Limit = Reading of fundamental – 20dB

Figure 14: Conducted Spurious Emission, 30MHz – 3GHz, Mode A



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Figure 15: Conducted Spurious Emission, 3 – 25GHz, Mode A

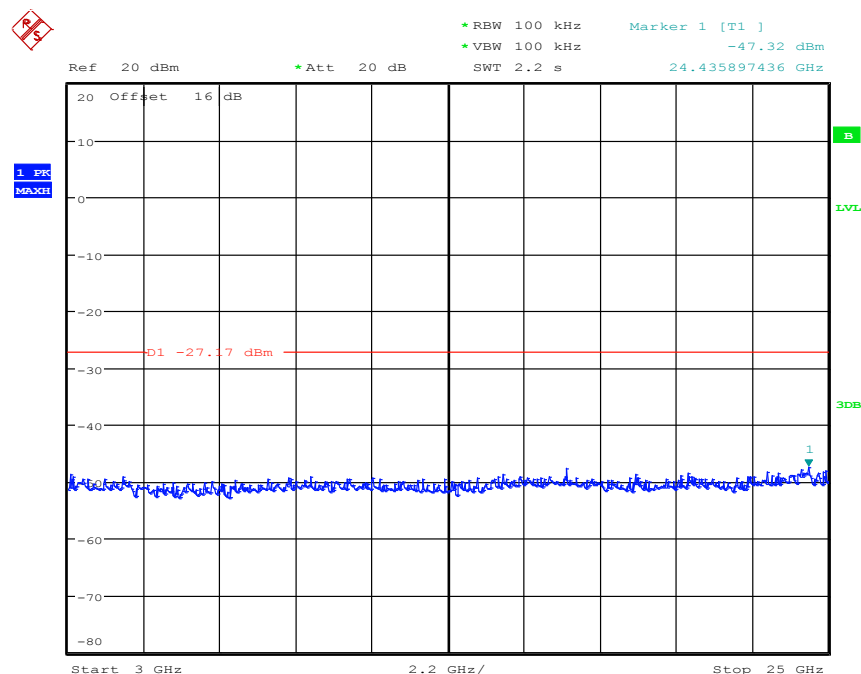


Table 11: Conducted Spurious Emission, Mode B

Frequency [MHz]	Reading [dBm]	Limit [dBm]	Over Limit [dB]
1995	-38.81	-19.65	-19.16
24471	-46.86	-19.65	-27.21
2442	0.35	NA	N/A

Notes: Limit = Reading of fundamental – 20dB

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Figure 16: Conducted Spurious Emission, 30MHz – 3GHz, Mode B

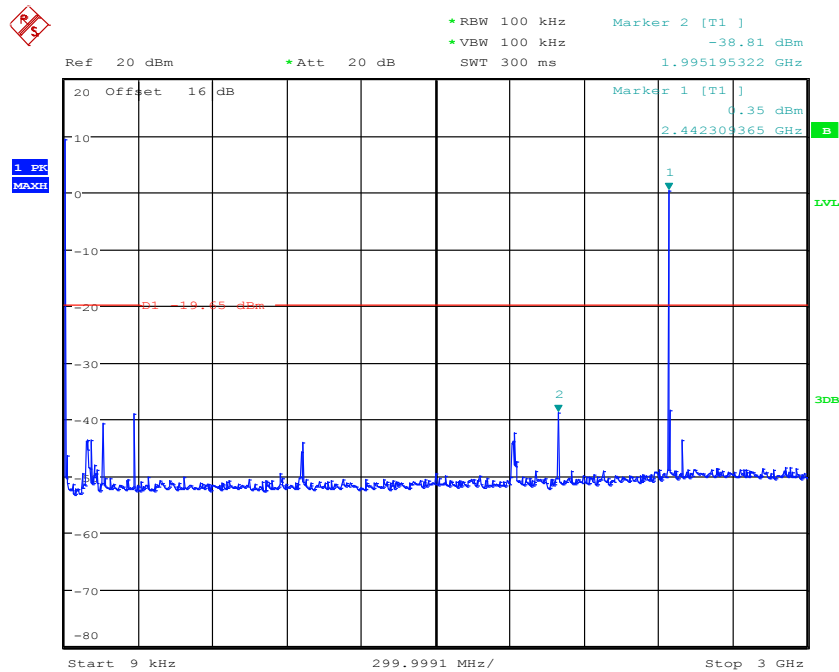
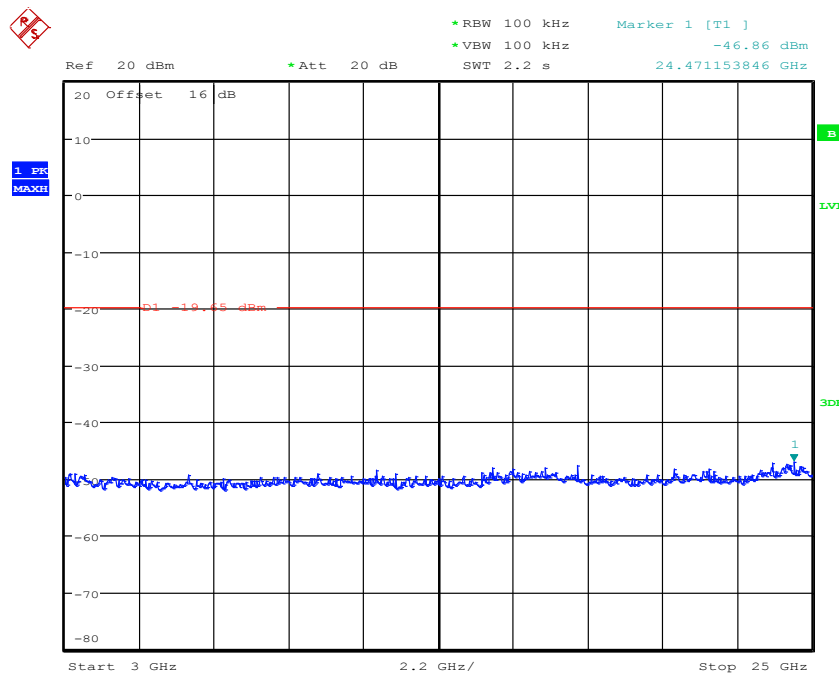


Figure 17: Conducted Spurious Emission, 3 – 25GHz, Mode B



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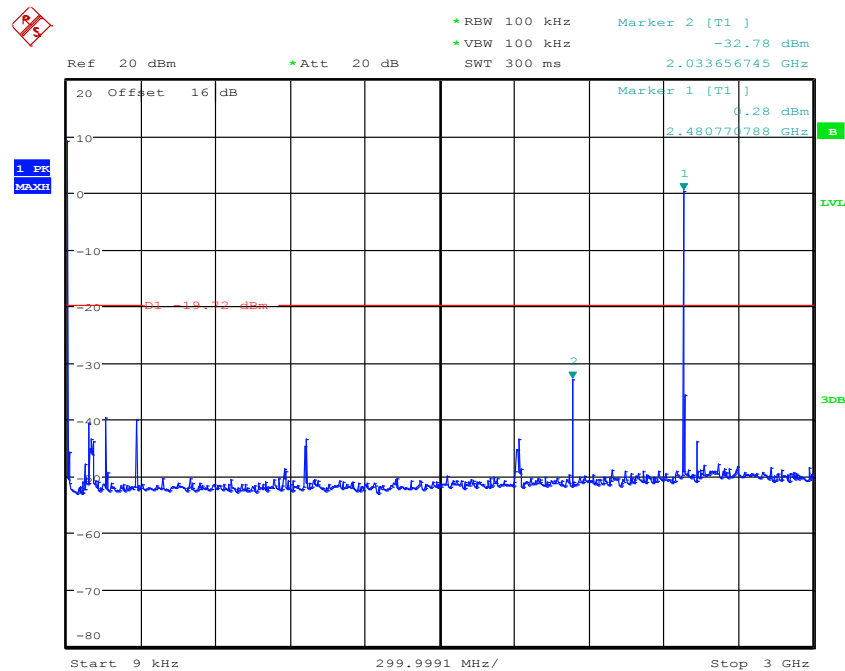
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Table 12: Conducted Spurious Emission, Mode C

Frequency [MHz]	Reading [dBm]	Limit [dBm]	Over Limit [dB]
2034	-32.78	-19.72	-13.06
21862	-47.86	-19.72	-28.14
2481	0.28	N/A	N/A

Notes: Limit = Reading of fundamental – 20dB

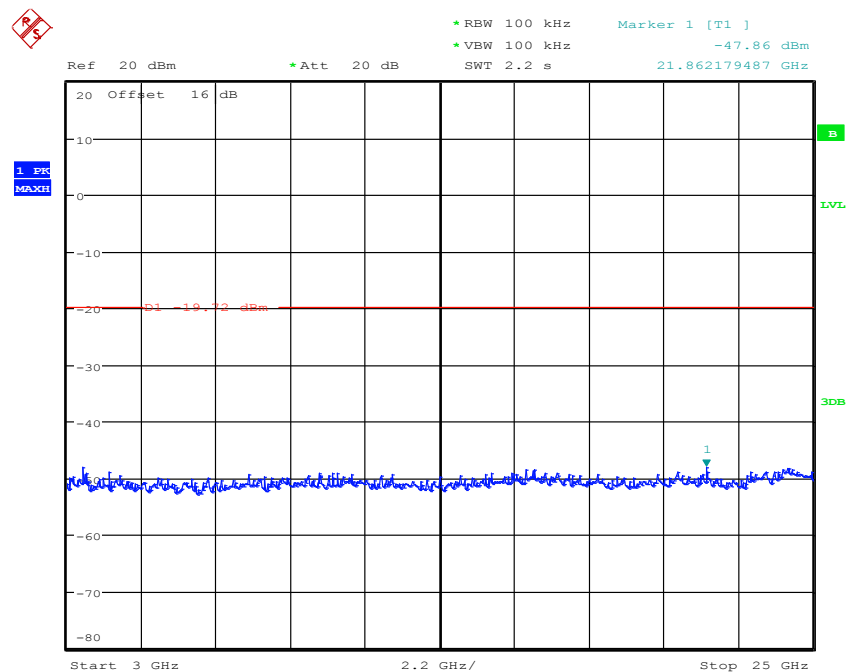
Figure 18: Conducted Spurious Emission, 30MHz – 3GHz, Mode C



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Figure 19: Conducted Spurious Emission, 3 – 25GHz, Mode C



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5.1.7 Band Edge Compliance of RF Conducted Emission, FCC 15.247(d)

RESULT:

PASS

Date of testing: 2014-3-14

Ambient temperature: 20°C

Relative humidity: 39.6%

Atmospheric pressure: 101.5hPa

Requirements:

In any 100kHz bandwidth outside the frequency band, the RF power shall be at least 20dB below that of the maximum in-band 100kHz emission.

Test procedure:

ANSI C63.4-2009 and Public Notice DA 00-705.

A spectrum analyzer was connected to the antenna port of the EUT. The analyzer resolution bandwidth was set to 300kHz and video bandwidth was set to 300kHz. Allow the trace to stabilize. Set the marker on the emission at the band edge, or on the highest modulation product outside of the band, if this level is greater than that at the band edge. Enable the marker-delta function, and then use the marker-to-peak function to move the marker to the peak of the in-band emission.

The final measurement takes into account the loss generated by all the involved cables.

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Figure 20: Lower Band Edge Conducted Mode A

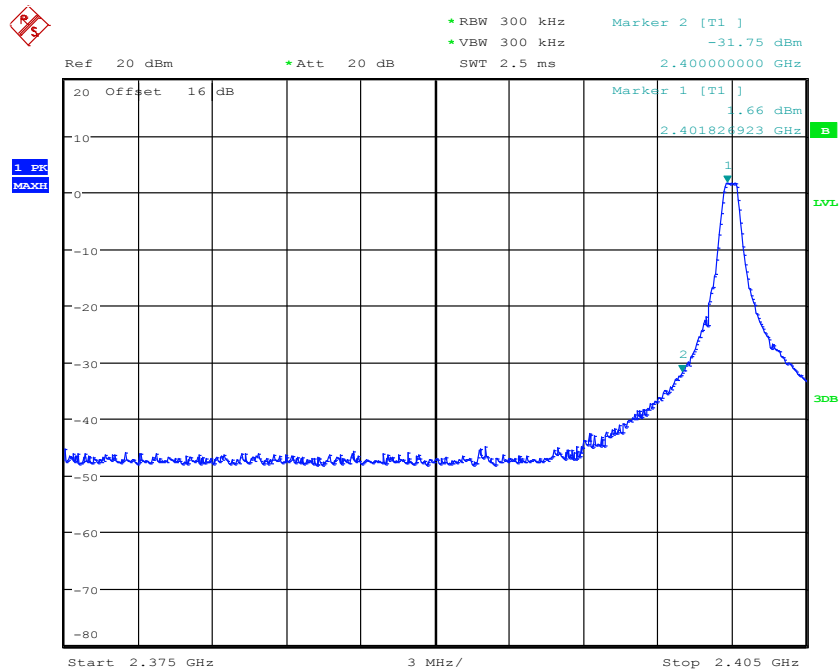
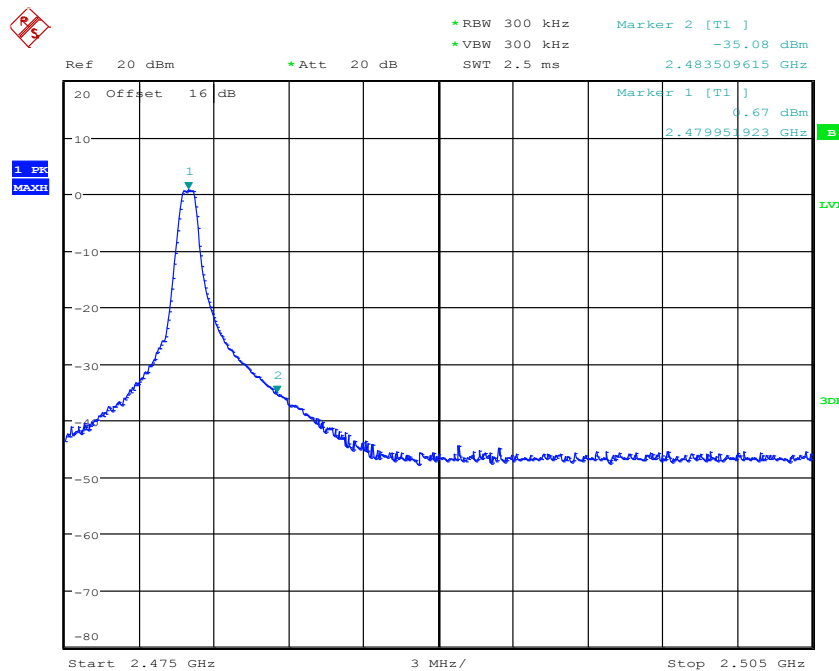


Figure 21: Upper Band Edge Conducted Mode C



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5.1.8 Conducted emissions, FCC 15.207

RESULT:

PASS

Date of testing:	2014-3-8
Input Voltage:	AC 120V, 60Hz
Earthing:	Not Connected
Ambient temperature:	20°C
Relative humidity:	39.6%
Atmospheric pressure:	101.5hPa

Requirements:

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 150kHz to 30MHz shall not exceed limits in FCC Part 15.207.

Test procedure:

ANSI C63.4-2009 and Public Notice DA 00-705.

The EUT was placed 0.4 meter from the conducting wall of the shielding room, and it was kept at least 80 centimeters from any other grounded conducting surface. Connect EUT to the power mains through a line impedance stabilization network (LISN). All the support units are connecting the other LISN. The LISN provides 50 ohm coupling impedance for the measuring instrument. The FCC states that a 50 ohm, 50 microhenry LISN should be used. Both sides of AC line were checked for maximum conducted interference. The frequency range from 150kHz to 30 MHz was searched. Set the test receiver system to Peak Detect Function and specified bandwidth with Maximum Hold Mode.

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Table 13: Conducted Emission

Frequency (MHz)	QuasiPeak (dB μ V)	Meas. Time (ms)	Bandwidth (kHz)	Line	Corr. (dB)	Margin (dB)	Limit (dB μ V)	Comment
0.351488	50.5	150.000	9.000	N	9.7	8.3	58.8	PASS
0.452231	45.9	150.000	9.000	N	9.7	10.9	56.8	PASS
0.474619	45.3	150.000	9.000	N	9.6	11.1	56.4	PASS
0.515662	45.9	150.000	9.000	N	9.7	10.1	56.0	PASS
0.571631	52.4	150.000	9.000	N	9.7	3.6	56.0	PASS
0.631331	49.6	150.000	9.000	N	9.7	6.4	56.0	PASS
0.351488	49.3	150.000	9.000	L	9.7	9.5	58.8	PASS
0.500738	52.5	150.000	9.000	L	9.7	3.5	56.0	PASS
0.549244	46.0	150.000	9.000	L	9.7	10.0	56.0	PASS
0.567900	47.8	150.000	9.000	L	9.7	8.2	56.0	PASS
0.702225	44.9	150.000	9.000	L	9.7	11.1	56.0	PASS
2.385019	45.3	150.000	9.000	L	9.8	10.7	56.0	PASS

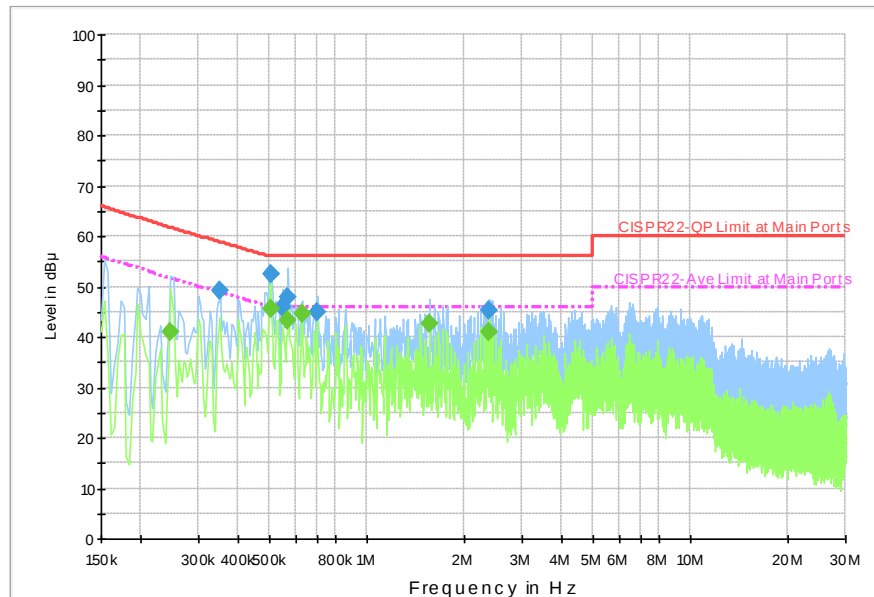
Frequency (MHz)	Average (dB μ V)	Meas. Time (ms)	Bandwidth (kHz)	Line	Corr. (dB)	Margin (dB)	Limit (dB μ V)	Comment
0.198506	40.1	150.000	9.000	N	9.6	13.4	53.5	PASS
0.351488	41.1	150.000	9.000	N	9.7	7.6	48.7	PASS
0.452231	37.0	150.000	9.000	N	9.7	9.8	46.8	PASS
0.474619	37.1	150.000	9.000	N	9.6	9.3	46.4	PASS
0.571631	44.5	150.000	9.000	N	9.7	1.5	46.0	PASS
0.631331	40.2	150.000	9.000	N	9.7	5.8	46.0	PASS
0.247012	40.9	150.000	9.000	L	9.6	10.7	51.6	PASS
0.500738	45.6	150.000	9.000	L	9.7	0.4	46.0	PASS
0.567900	43.4	150.000	9.000	L	9.7	2.6	46.0	PASS
0.627600	44.5	150.000	9.000	L	9.7	1.5	46.0	PASS
1.556681	42.6	150.000	9.000	L	9.8	3.4	46.0	PASS
2.385019	41.0	150.000	9.000	L	9.8	5.0	46.0	PASS

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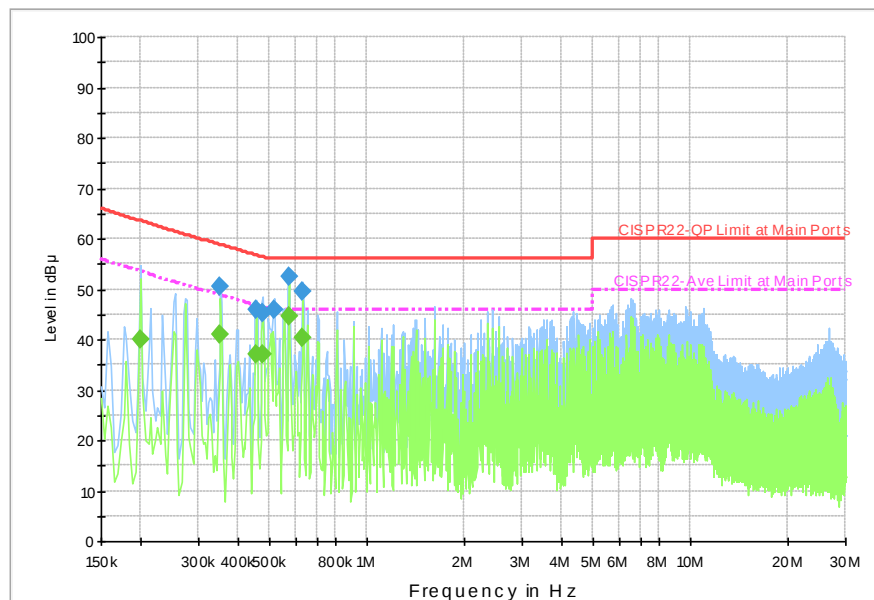
L Phase

EMI_ENV216 AutoTest - L CISPR22



N Phase

EMI_ENV216 AutoTest - N CISPR22



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6. Test Results of Radiated Measurements

6.1 Transmitter Parameters

6.1.1 Band Edge Radiated Emission, FCC 15.205, FCC 15.209, FCC 15.247(d)

RESULT:

Pass

Date of testing: 2014-1-13

Ambient temperature: 22.3°C

Relative humidity: 40.1%

Atmospheric pressure: 101.7hPa

Measurement distance: 3m

Kind of test site: Semi Anechoic Chamber

Requirements:

Radiated emissions which fall in the restricted bands, as defined in FCC 15.205(a) and RSS-210 2.7 (Table 1), must comply with the radiated emission limits specified in FCC 15.209(a) and RSS-210 2.7 (Table 2 and 3).

Test procedure:

ANSI C63.4-2009 and Public Notice DA 00-705.

The EUT was placed on a nonconductive turntable 0.8m above the ground plane. Measurements were made at 3m distance. 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 polarization. The rotation through the three orthogonal axes is normally not needed for equipment that is not hand-held or body-worn. The EUT was pretested in floor-standing condition and in the table position and the worst case condition was table position which was used for the final measurements.

Measurements were performed using a spectrum analyzer with a suitable span to encompass the peak of the fundamental and using the following settings: Peak: RBW & VBW = 1MHz, Average: RBW = 1MHz, VBW = 10Hz.

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

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Table 14: Band Edge Radiated Emission

No	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV/m)	Factor (dB)	Type
1	Horizontal	2390	61.435	25.993	-12.565	74	35.442	PK
2	Horizontal	2399.898	62.224	26.702	-11.776	74	35.522	PK
3	Horizontal	2402.214	81.123	45.581	N/A	N/A	35.542	PK

No	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV/m)	Factor (dB)	Type
1	Horizontal	2390	45.567	10.125	-8.433	54	35.442	AV
2	Horizontal	2399.898	45.543	10.021	-8.457	54	35.522	AV
3	Horizontal	2401.885	76.546	41.007	N/A	N/A	35.539	AV

No	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV/m)	Factor (dB)	Type
1	Vertical	2390	63.456	28.674	-10.544	74	34.782	PK
2	Vertical	2399.898	62.567	27.744	-11.433	74	34.823	PK
3	Vertical	2402.026	80.585	45.753	N/A	N/A	34.832	PK

No	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV/m)	Factor (dB)	Type
1	Vertical	2390	48.345	13.563	-5.655	54	34.782	AV
2	Vertical	2399.898	45.563	10.74	-8.437	54	34.823	AV
3	Vertical	2401.744	75.541	40.71	N/A	N/A	34.831	AV

No	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV/m)	Factor (dB)	Type
1	Horizontal	2479.848	85.548	49.362	N/A	N/A	36.186	PK
2	Horizontal	2483.5	64.378	28.161	-9.622	74	36.217	PK
3	Horizontal	2484.9	64.571	28.343	-9.429	74	36.228	PK

No	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV/m)	Factor (dB)	Type
1	Horizontal	2479.881	75.647	39.459	N/A	N/A	36.188	AV
2	Horizontal	2483.5	47.569	11.352	-6.431	54	36.217	AV
3	Horizontal	2484.9	47.654	11.426	-6.346	54	36.228	AV

No	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV/m)	Factor (dB)	Type
1	Vertical	2479.782	84.436	49.269	N/A	N/A	35.167	PK
2	Vertical	2483.5	62.435	27.252	-11.565	74	35.183	PK
3	Vertical	2484.9	62.453	27.264	-11.547	74	35.189	PK

No	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV/m)	Factor (dB)	Type
1	Vertical	2479.914	77.345	42.177	N/A	N/A	35.168	AV
2	Vertical	2483.5	48.431	13.248	-5.569	54	35.183	AV
3	Vertical	2484.9	46.345	11.156	-7.655	54	35.189	AV

Notes: All correction factors (antenna, cable, pre-amplifier) are included in the measurement values.

Average limit in dBuV/m is calculated as follows: Average limit = $20 \times \log(500\mu\text{V/m})$.

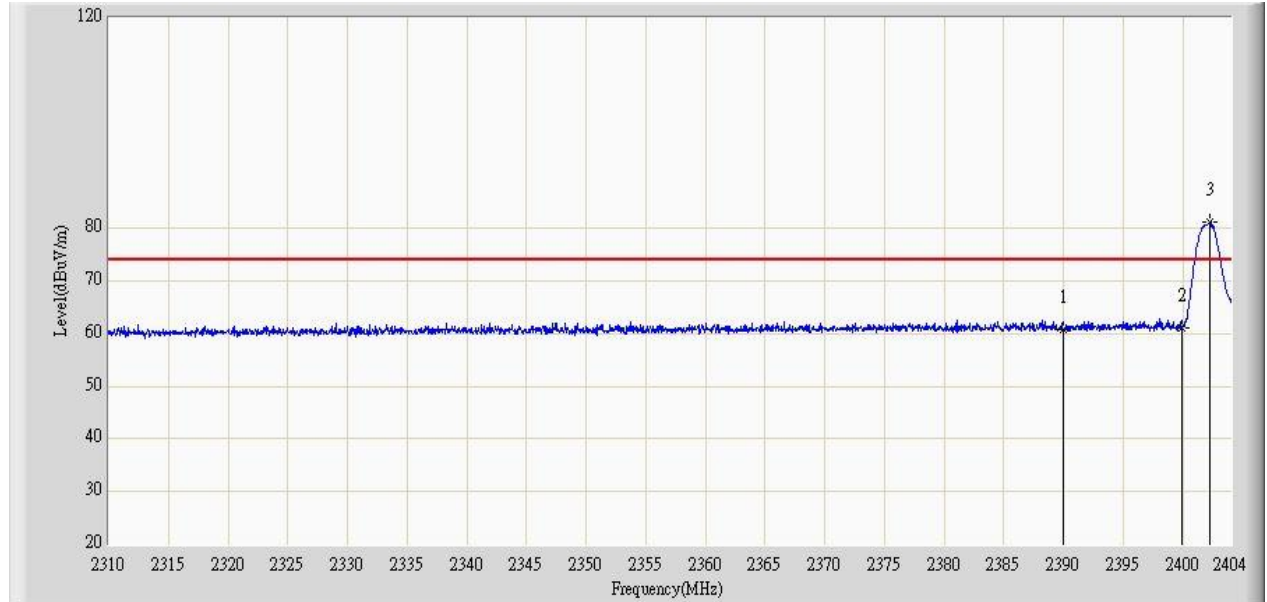
Peak limit in dBuV/m is calculated as follows: Peak limit = Average limit + 20dB.

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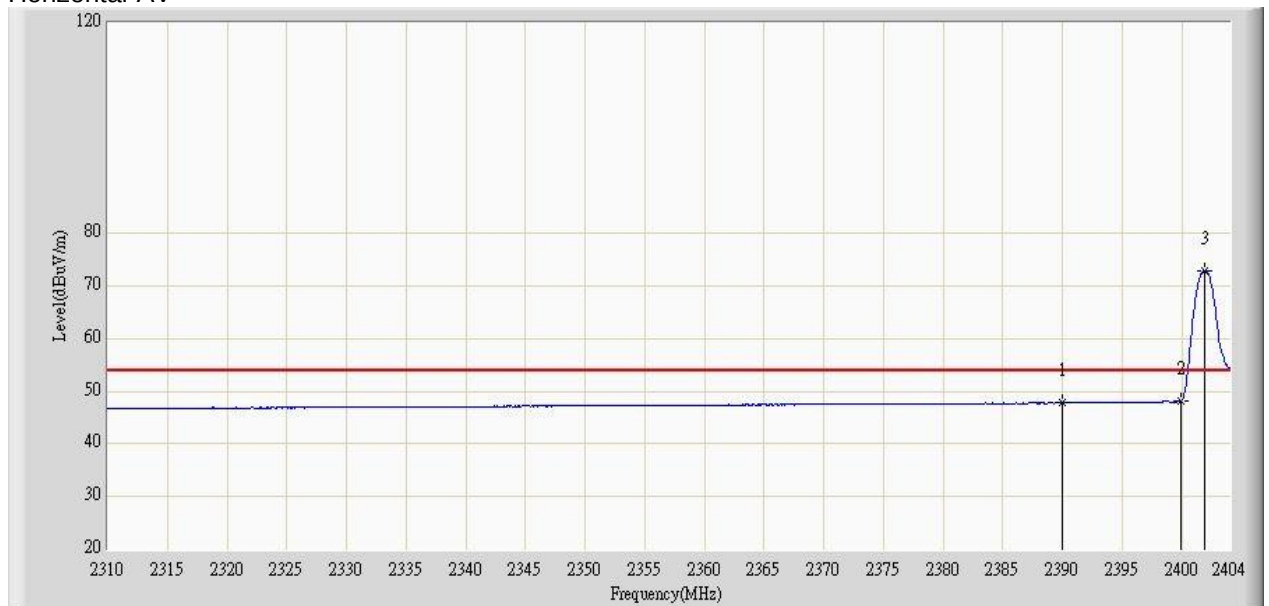
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Figure 22: Band Edge Radiated Emission, Spectral Diagram, Mode A

Horizontal-PK



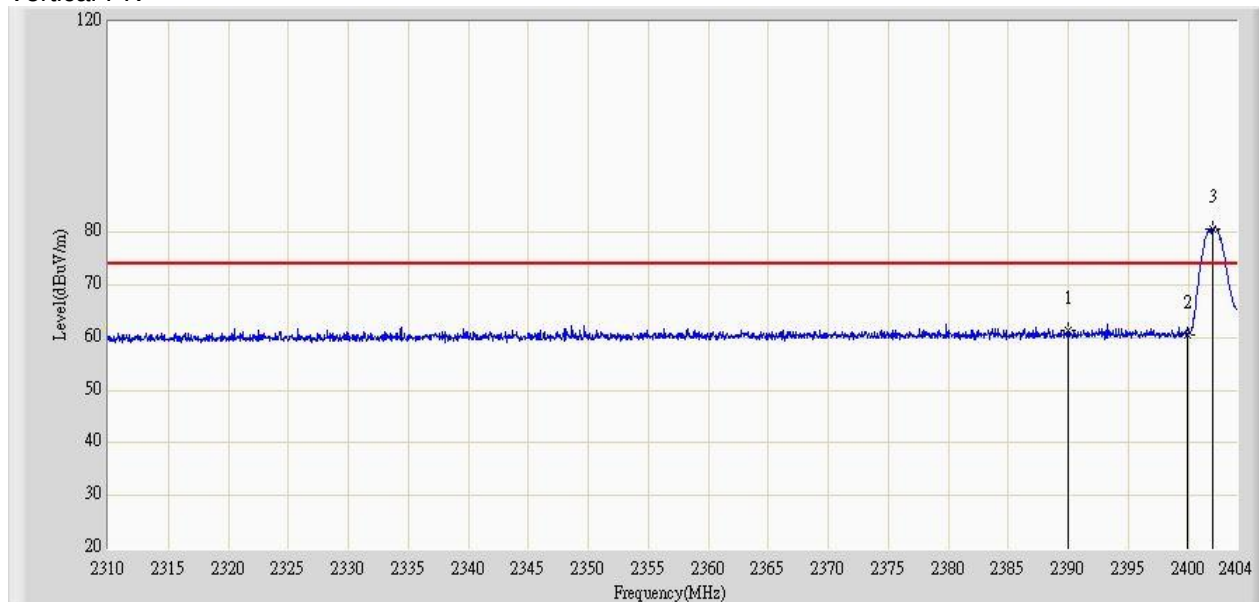
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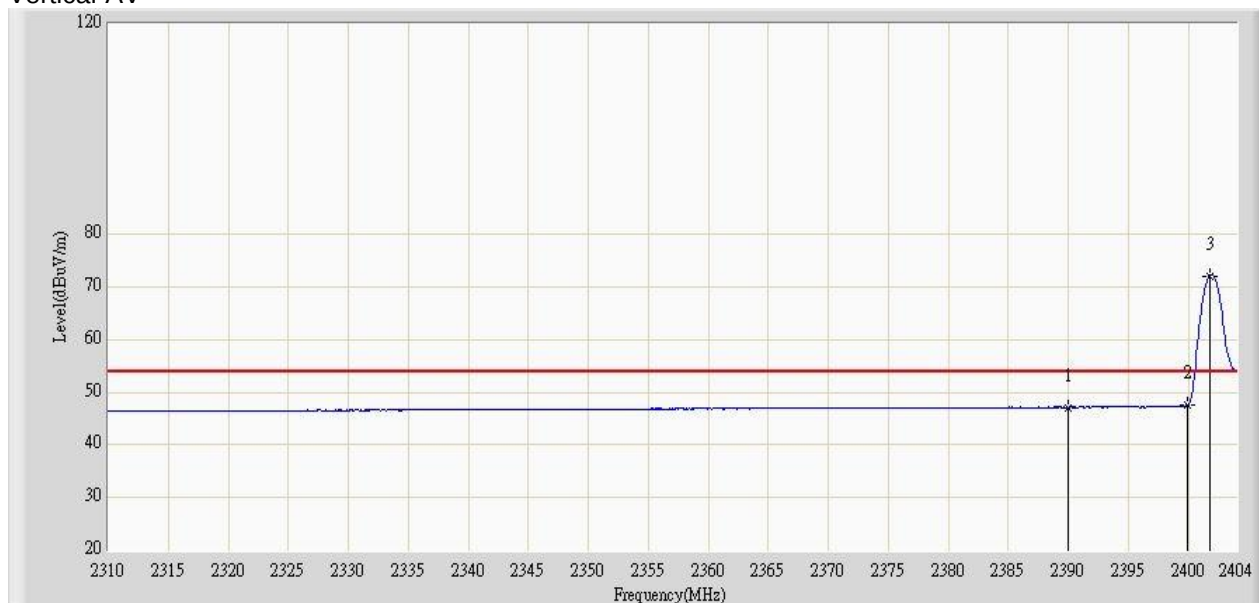
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Vertical-PK



Vertical-AV



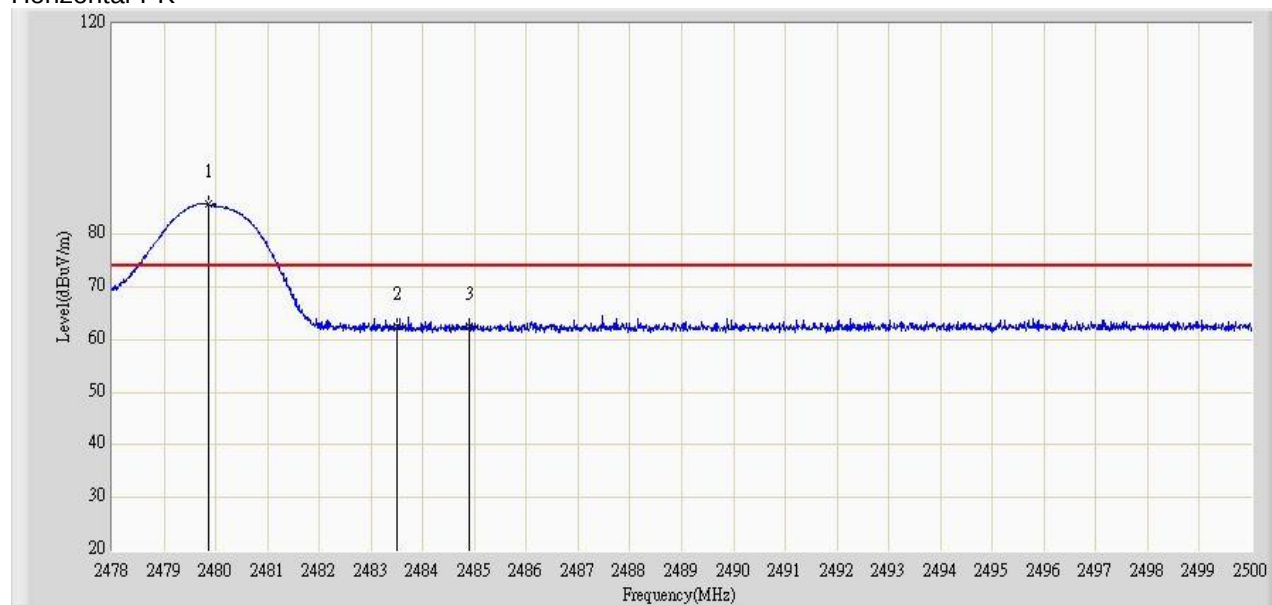
Note: The upper diagram shows the vertical peak value and the lower diagram shows the horizontal value.

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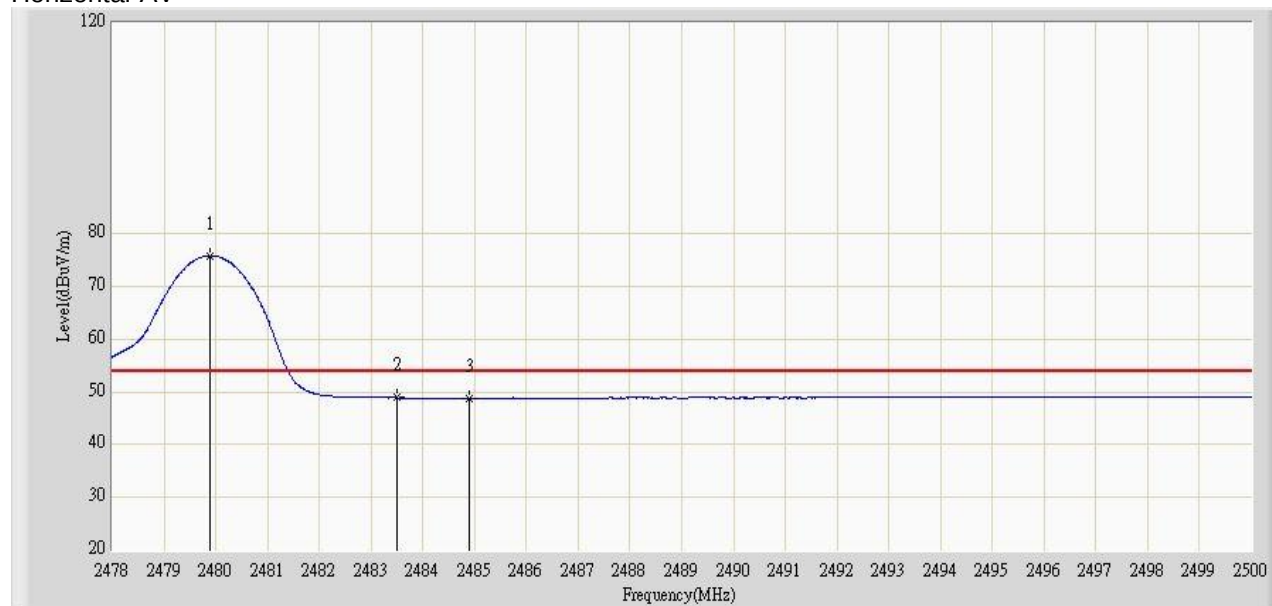
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Figure 23: Band Edge Radiated Emission, Spectral Diagram, Mode C

Horizontal-PK



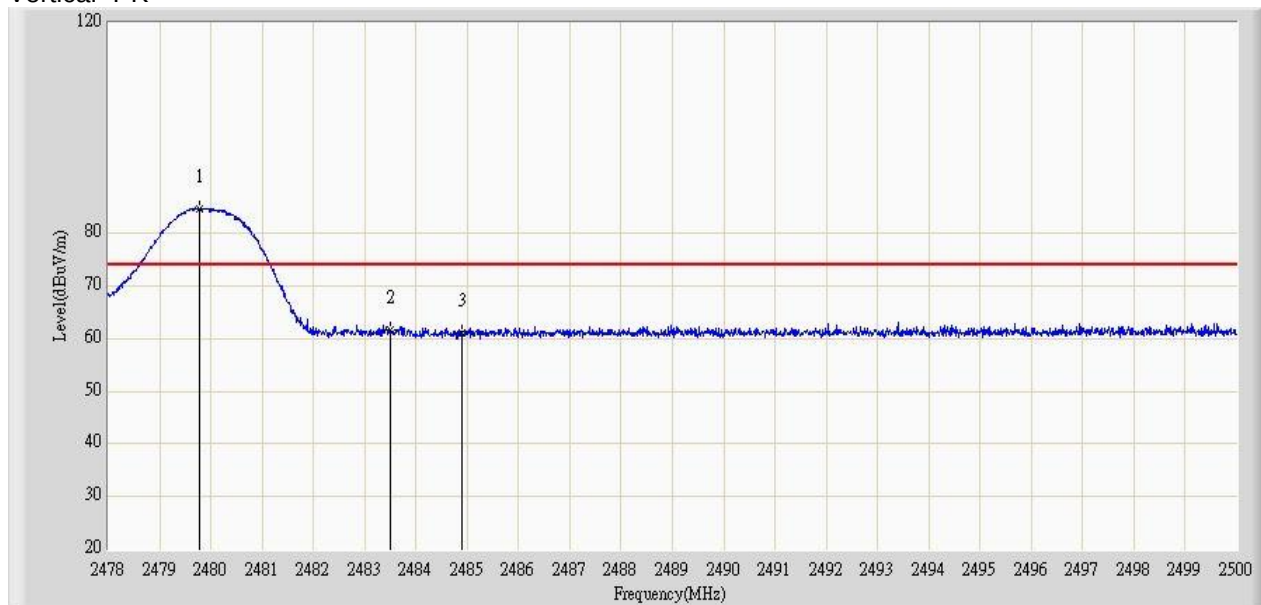
Horizontal-AV



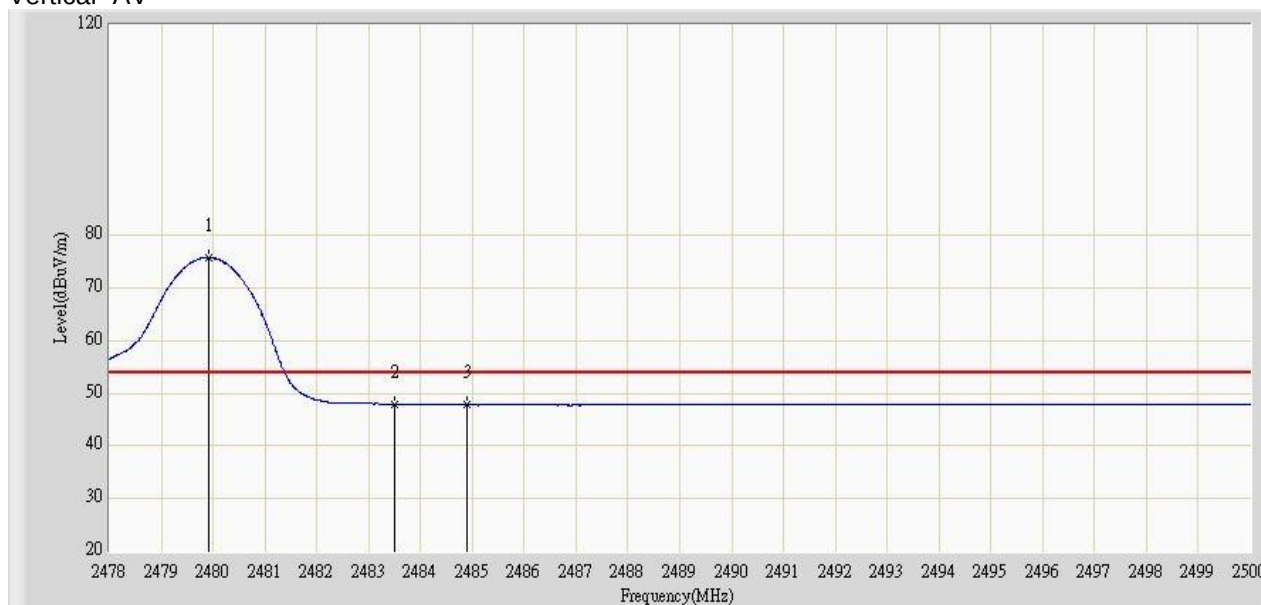
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Vertical -PK



Vertical -AV



Note: The upper diagram shows the vertical peak value and the lower diagram shows the horizontal value.

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6.1.2 Radiated Spurious Emission of Transmitter, FCC 15.205, FCC 15.209, FCC 15.247(d)

RESULT:

PASS

Date of testing:	2014-01-13
Ambient temperature:	22.3°C
Relative humidity:	40.1%
Atmospheric pressure:	101.7hPa
Frequency range:	30MHz – 25GHz
Measurement distance:	3m
Kind of test site:	Semi Anechoic Chamber

Requirements:

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 C63.4-2009 and Public Notice DA 00-705.

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 EUT was pretested in floor-standing condition and in the table position and the worst case condition was table position which was used for the final measurements. The rotation through the three orthogonal axes is normally not needed for equipment that is not hand-held or body-worn.

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.

For frequencies between 30MHz and 1GHz, the spectrum analyzer's 6 dB bandwidth was set to 120 kHz, and the analyzer was operated in the CISPR quasi-peak detection mode. For emissions above 1GHz, measurements were performed using the following settings: Peak: RBW & VBW = 1MHz, Average: RBW = 1MHz, VBW = 10Hz.

The highest emission amplitudes relative to the appropriate limit were recorded in this report. Emissions other than those mentioned are small or not detectable.

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Table 15: Radiated Emission, Average and Peak Data, 1 – 25GHz, Horizontal and Vertical Antenna Orientations, Mode A

No	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV/m)	Factor (dB)	Type
1	Horizontal	7618.8	42.92	10.93	-31.08	74	31.99	PK
2	Vertical	7818.4	44.73	12.4	-29.27	74	32.33	PK

Note: All correction factors (antenna, cable, pre-amplifier) are included in the measurement values.

Table 16: Radiated Emission, Average and Peak Data, 1 – 25GHz, Horizontal and Vertical Antenna Orientations, Mode B

No	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV/m)	Factor (dB)	Type
1	Horizontal	7618.4	42.47	10.48	-31.53	74	31.99	PK
2	Vertical	7818.1	42.46	10.14	-31.54	74	32.32	PK

Table 17: Radiated Emission, Average and Peak Data, 1 – 25GHz, Horizontal and Vertical Antenna Orientations, Mode C

No	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV/m)	Factor (dB)	Type
1	Horizontal	7618.5	42.56	10.57	-31.44	74	31.99	PK
2	Vertical	7818.2	42.97	10.63	-31.03	74	32.34	PK

Note: All correction factors (antenna, cable, pre-amplifier) are included in the measurement values. Above 18 GHz emission far below limit

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6.2 Receiver Parameters

6.2.1 Radiated Spurious Emission of Receiver, FCC 15.109

RESULT:

PASS

Date of testing:	2014-01-13
Ambient temperature:	22.3°C
Relative humidity:	40.1%
Atmospheric pressure:	101.7hPa
Frequency range:	30MHz – 12.5GHz
Measurement distance:	3m
Kind of test site:	Semi Anechoic Chamber

Requirements:

The emissions from the unintentional radiator shall not exceed the field strength specified in 15.109(a).

Test procedure:

ANSI C63.4-2009.

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 EUT was pretested in floor-standing condition and in the table position and the worst case condition was table position which was used for the final measurements. The rotation through the three orthogonal axes is normally not needed for equipment that is not hand-held or body-worn. The spectrum was examined from 30MHz to the 5th harmonic of the highest fundamental operation frequency (12.5GHz). Final radiated emission measurements were made at 3m distance.

Measurements were taken using both horizontal and vertical antenna polarizations.

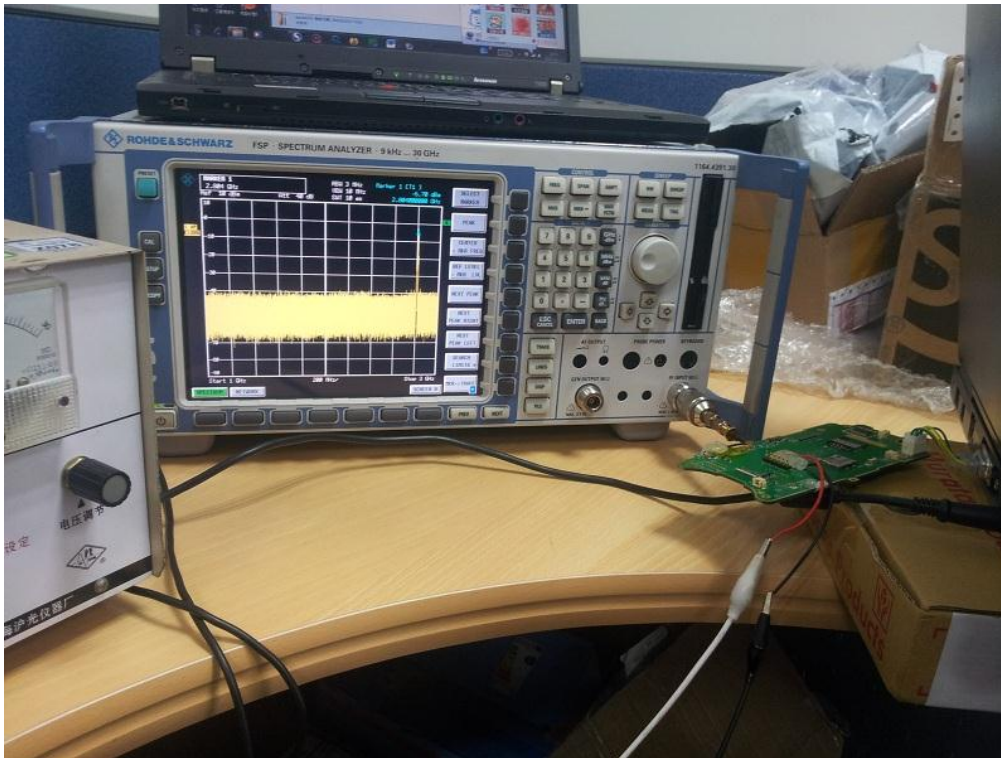
For frequencies between 30MHz and 1GHz, the spectrum analyzer's 6 dB bandwidth was set to 120 kHz, and the analyzer was operated in the CISPR quasi-peak detection mode. For emissions above 1GHz, measurements were performed using the following settings: Peak: RBW & VBW = 1MHz, Average: RBW = 1MHz, VBW = 10Hz. The highest emission amplitudes relative to the appropriate limit were recorded in this report. No spurious emission was found in the range 30MHz – 12500MHz. emission in mode D, E, F. All signals found in the pre-testing were more than 20 dB below the limit .

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7. Photographs of the Test Setup

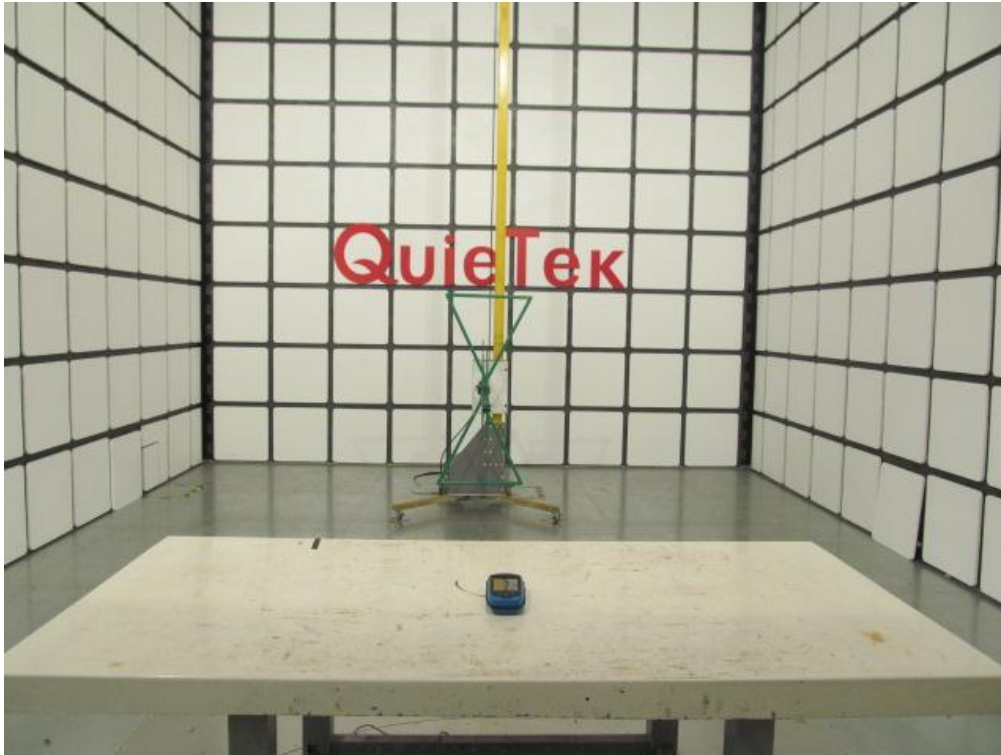
Photograph 1: Set-up for Conducted RF test at Antenna Port



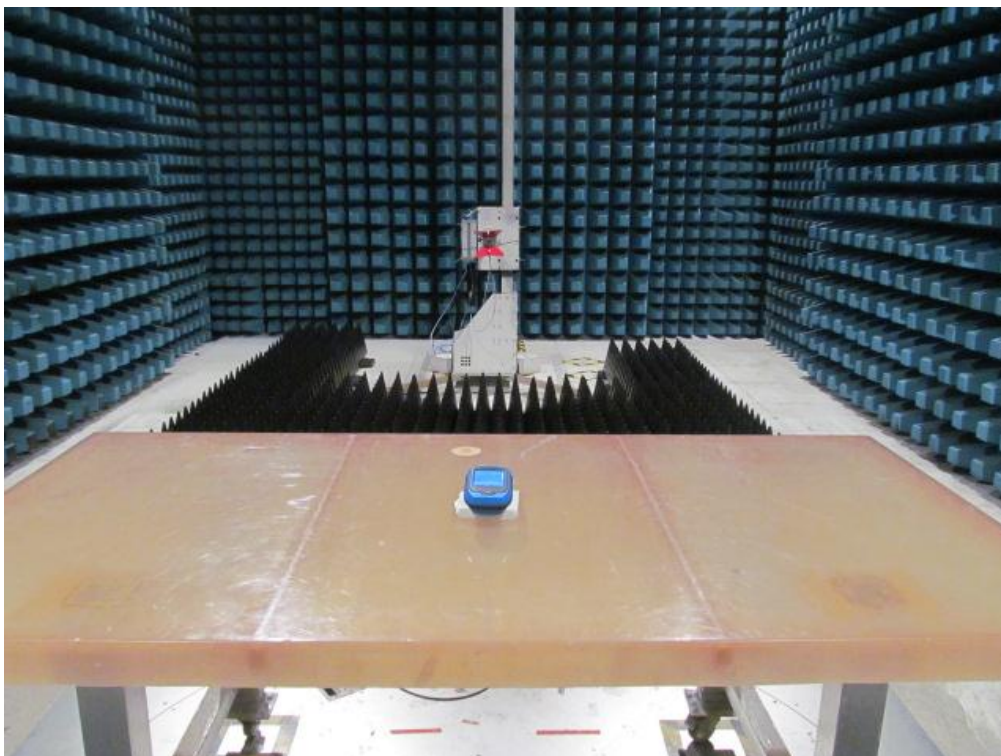
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Photograph 2: Set-up for Radiated Emission, 30MHz-1000MHz



Photograph 3: Set-up for Radiated Spurious Emission, Above 1GHz



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