China

FCC/IC - TEST REPORT

Report Number	:	**68.920.14.025.01**	Date of Issue:	November 27, 2014

Model	:	BH2200
Product Type	:	Bluetooth Headphones
Applicant	:	ASDER ELECTRONICS CO., LTD
Address	:	3F-1 NO22, SEC.2, KEELUNG ROAD, TAIPEI, TAIWAN, R.O.C
Production Facility	:	DONGGUAN CHANG AN SHA TOU UNI WORLD TOY MANUFACTORY
Address	:	No.97, Jinghai W. Rd., Shatou S. Dist., Chang'an Town, Dongguan City, Guangdong Province, China

Test Result	:	■ **Positive** ☐ **Negative**
Total pages including Appendices	:	38

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2 Details about the Test Laboratory

Details about the Test Laboratory
Test Site 1

Company name: TÜV SÜD Certification and Testing (China) Co., Ltd. Shenzhen Branch
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Test Site 2
Company name: Global United Technology Services Co., Ltd.
Floor, Block No.2, Laodong Industrial Zone,
Xixiang Road Baoan District,
Shenzhen, China 518102

Telephone: 86 755 2779 8480
Fax: 86 755 2779 8960

3 Description of the Equipment Under Test

Product:	Bluetooth Headphones
Model no.:	BH2200
FCC ID:	2ADG5-BH2200
IC ID:	NIL
Brand Name:	ASDER
Options and accessories:	Bluetooth 3_CSR 2.4.8
Rating Voltage:	DC 3.7V by Li-ion Battery
Rating Current:	Charging: 200mA; Playing: 70mA
RF Transmission Frequency:	2402-2480MHz
No. of Operated Channel:	79
Modulation:	GFSK, π/4-DQPSK, 8DPSK
Antenna Type:	PCB
Antenna Gain:	0dBi
Description of the EUT:	The Equipment Under Test (EUT) is a Bluetooth Headphones operated at 2.4GHz

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4 Summary of Test Standards

Test Standards	
FCC Part 15 Subpart C 10-1-2013 Edition	PART 15 - RADIO FREQUENCY DEVICES Subpart C - Intentional Radiators
RSS-Gen Issue 3 December 2010	General Requirements and Information for the Certification of Radio Apparatus
RSS-210 Issue 8 December 2010	RSS-210 — Licence-exempt Radio Apparatus (All Frequency Bands): Category I Equipment

All the test methods were according to Public Notice DA 00-705 -Frequency Hopper Spread Spectrum Test Procedure released by FCC on March 30, 2000 and C63.10 (2013).

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5 Summary of Test Results

Technical Requirements					
FCC Part 15 Subpart C, RSS-Gen, RSS-210					
Test Condition			Pages	Test Site	Test Result
§15.207	RSS-GEN A7.2.4	Conducted emission AC power port	10	Site 2	Pass
§15.247(b)(1)	RSS-210 A8.4	Conducted peak output power	13	Site 2	Pass
§15.247(a)(2)	RSS-210 A8.2(a)	6dB bandwidth	---	---	N/A
§15.247(a)(1)	RSS-210 A8.1(a) & RSSGEN 4.6.2	20dB bandwidth and 99% Occupied Bandwidth	15	Site 2	Pass
§15.247(a)(1)	RSS-210 A8.1(b)	Carrier frequency separation	20	Site 2	Pass
§15.247(a)(1)(iii)	RSS-210 A8.1(d)	Number of hopping frequencies	22	Site 2	Pass
§15.247(a)(1)(iii)	RSS-210 A8.1(c)	Dwell Time	24	Site 2	Pass
§15.247(e)	RSS-210 A8.2(b)	Power spectral density*	---	---	N/A
§15.247(d)	RSS-210 A8.5	Spurious RF conducted emissions	27	Site 2	Pass
§15.247(d)	RSS-210 A8.5	Band edge	33	Site 2	Pass
§15.247(d) & §15.209 &	RSS-210 2.5 & RSSGEN 7.2.5 & RSSGEN 6.1	Spurious radiated emissions for transmitter and receiver	38	Site 2	Pass
§15.203	RSSGEN 7.1.2	Antenna requirement	See note 2		Pass

Note 1: N/A=Not Applicable.
Note 2: The EUT uses a permanently ceramic antenna, which gain is 0dBi. In accordance to §15.203, It is considered sufficiently to comply with the provisions of this section.

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6 General Remarks

Remarks

This submittal(s) (test report) is intended for FCC ID: 2ADG5-BH2200 complies with Section 15.207, 15.209, 15.247 of the FCC Part 15, Subpart C Rules and RSS-210.

SUMMARY:

All tests according to the regulations cited on page 5 were

■ - Performed

☐ - **Not** Performed

The Equipment Under Test

■ - **Fulfills** the general approval requirements.

☐ - **Does not** fulfill the general approval requirements.

Sample Received Date: October 31, 2014

Testing Start Date: October 31, 2014

Testing End Date: November 24, 2014

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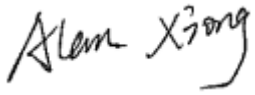
Reviewed by:

John Zhi
EMC Project Manager

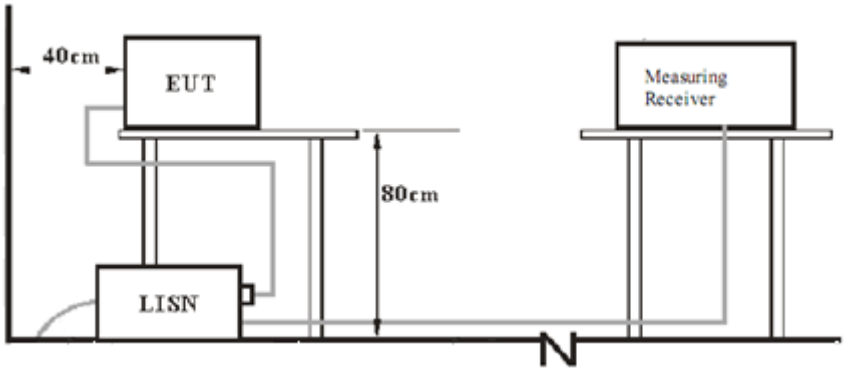
Prepared by:



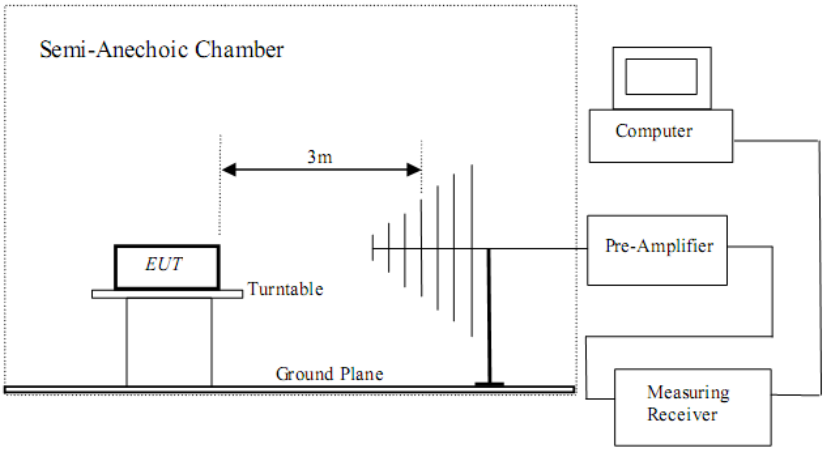
Alan Xiong
EMC Project Engineer

7 Test Setups

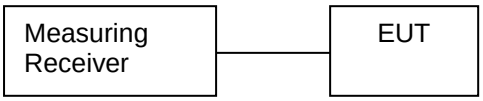
7.1 AC Power Line Conducted Emission test setups



7.2 Radiated test setups



7.3 Conducted RF test setups



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8 Systems test configuration

Auxiliary Equipment Used during Test:

DESCRIPTION	MANUFACTURER	MODEL NO.(SHIELD)	S/N(LENGTH)
NoteBook	Lenovo	X220	---
Phone	HUAWEI	G610	---

Test software: CSR_Bluetooth 3, which used to control the EUT in continues transmitting mode

The system was configured to hopping mode and non-hopping mode.

Hopping mode: typical working mode (normal hopping status)

Non-hopping mode: The system was configured to operate at a signal channel transmitting. The test software allows the configuration and operation at the worst-case duty and the highest transmit power

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9 Technical Requirement

9.1 Conducted peak output power

Test Method

1. Use the following spectrum analyzer settings:
   Span = approximately 5 times the 20 dB bandwidth, centered on a hopping channel
   RBW > the 20 dB bandwidth of the emission being measured, VBW≥RBW,
   Sweep = auto, Detector function = peak, Trace = max hold
2. Add a correction factor to the display.
3. Allow the trace to stabilize. Use the marker-to-peak function to set the marker to the peak of the emission. The indicated level is the peak output power

Limits

According to §15.247 (b) (1) and RSS-210 A8.4, conducted peak output power limit as below:

Frequency Range MHz	Limit W	Limit dBm
2400-2483.5	≤1	≤30

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Conducted peak output power

Bluetooth Mode GFSK modulation Test Result

Frequency MHz	Conducted Peak Output Power dBm	Result
Low channel 2402MHz	2.16	Pass
Middle channel 2441MHz	3.82	Pass
High channel 2480MHz	3.76	Pass

Bluetooth Mode 8DPSK modulation Test Result

Frequency MHz	Conducted Peak Output Power dBm	Result
Low channel 2402MHz	0.63	Pass
Middle channel 2441MHz	3.27	Pass
High channel 2480MHz	3.35	Pass

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9.2 20 dB bandwidth and 99% Occupied Bandwidth

Test Method

1. Check the calibration of the measuring instrument using either an internal calibrator or a known signal from an external generator.
2. Position the EUT without connection to measurement instrument. Turn on the EUT and connect it to measurement instrument. Then set it to any one convenient frequency within its operating range. Set a reference level on the measuring instrument equal to the highest peak value.
3. Measure the frequency difference of two frequencies that were attenuated 20 dB from the reference level. Record the frequency difference as the emission bandwidth.
4. Repeat above procedures until all frequencies measured were complete.

Limit

Limit [kHz]
N/A

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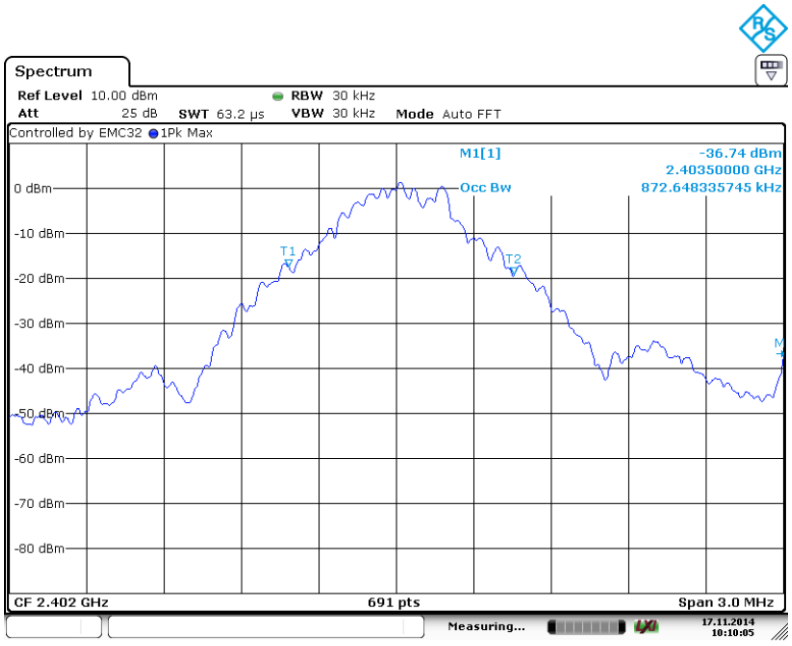
20 dB bandwidth and 99% Occupied Bandwidth

Bluetooth Mode GFSK Modulation test result

Frequency MHz	20 dB Bandwidth kHz	99% Bandwidth kHz	Limit kHz	Result
2402	946.5	872.6	--	Pass
2441	955.1	864.0	--	Pass
2480	955.1	864.0	--	Pass

99% Bandwidth



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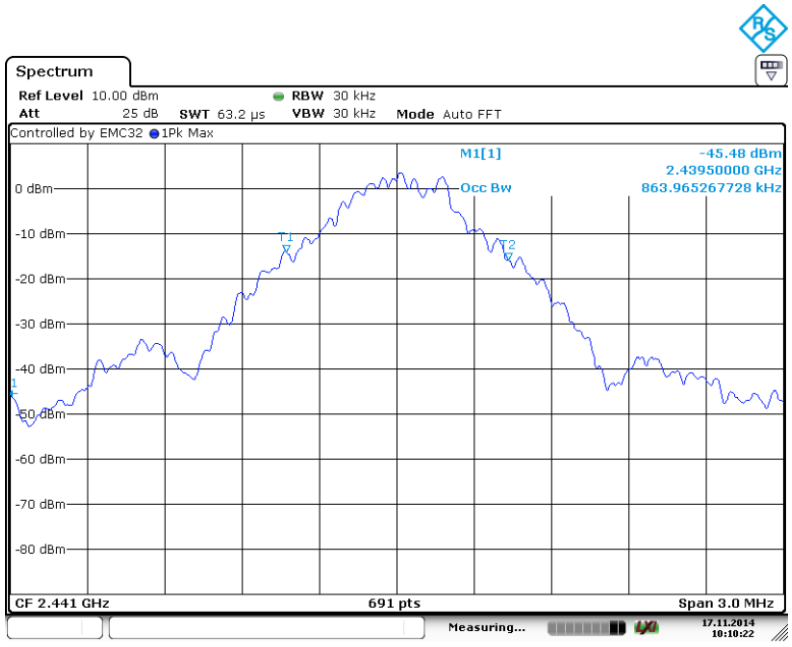

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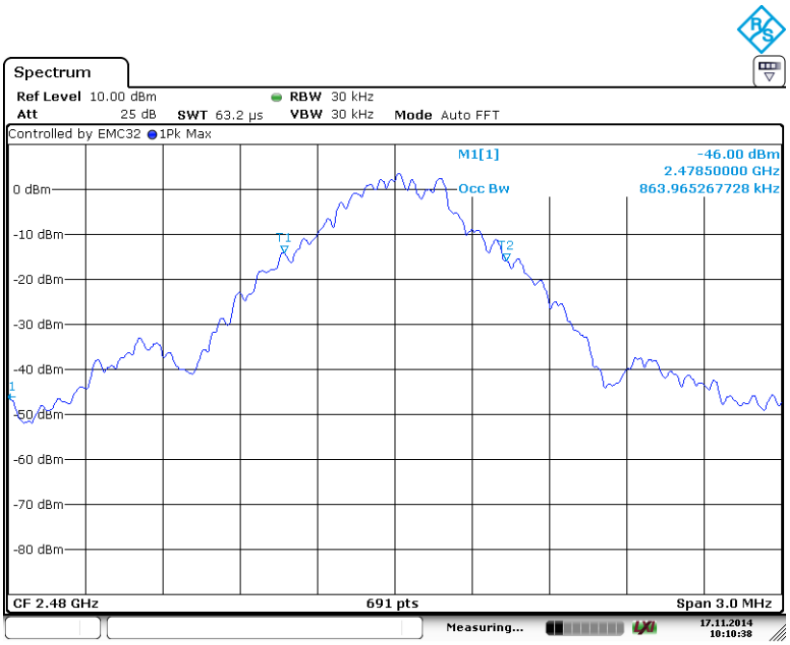

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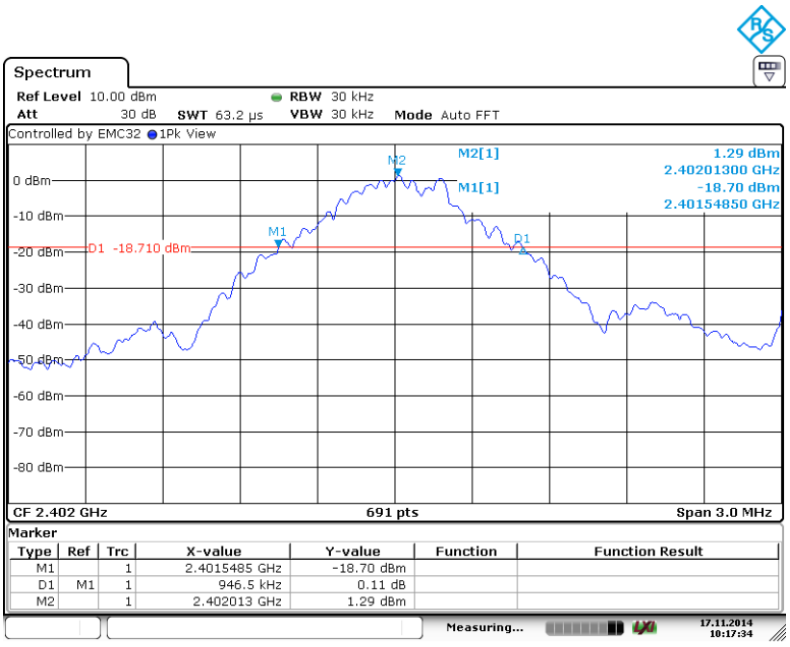
20dB Bandwidth



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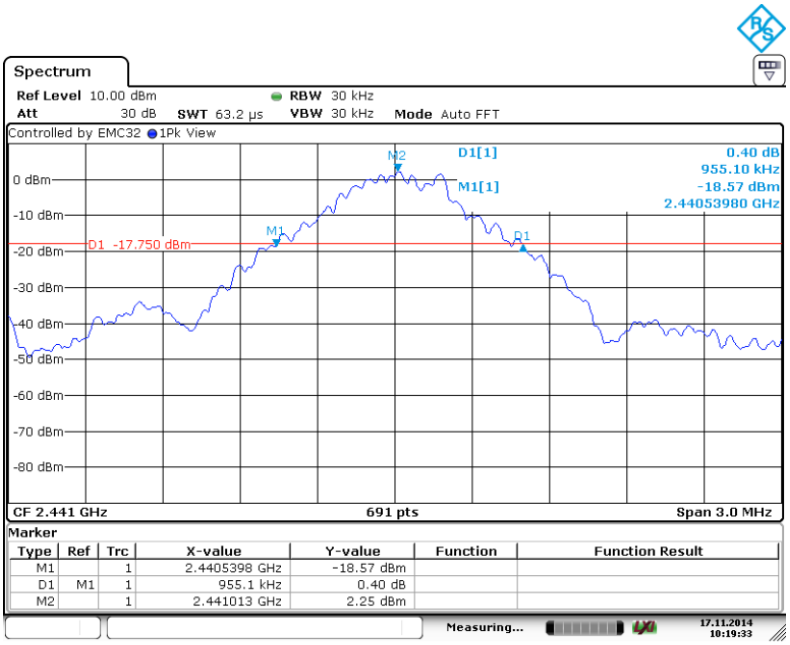

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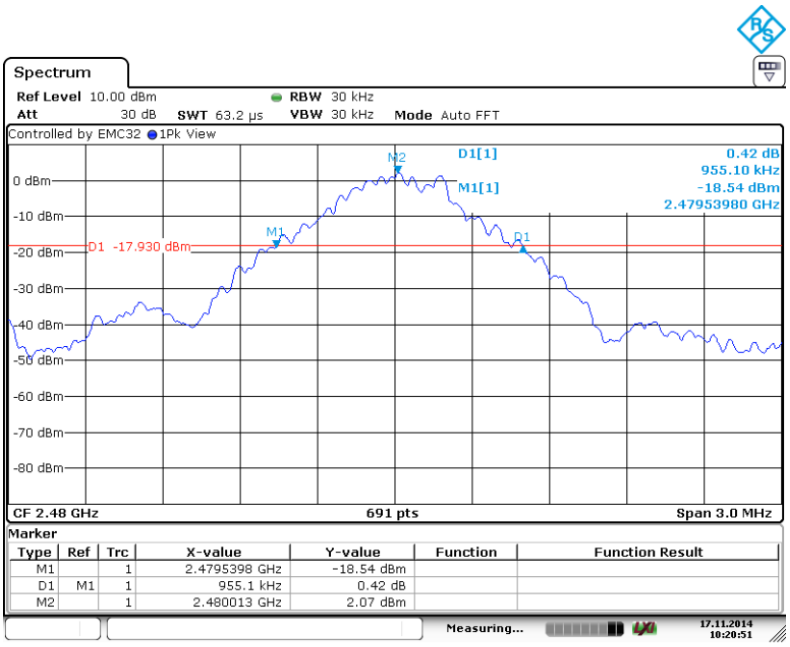

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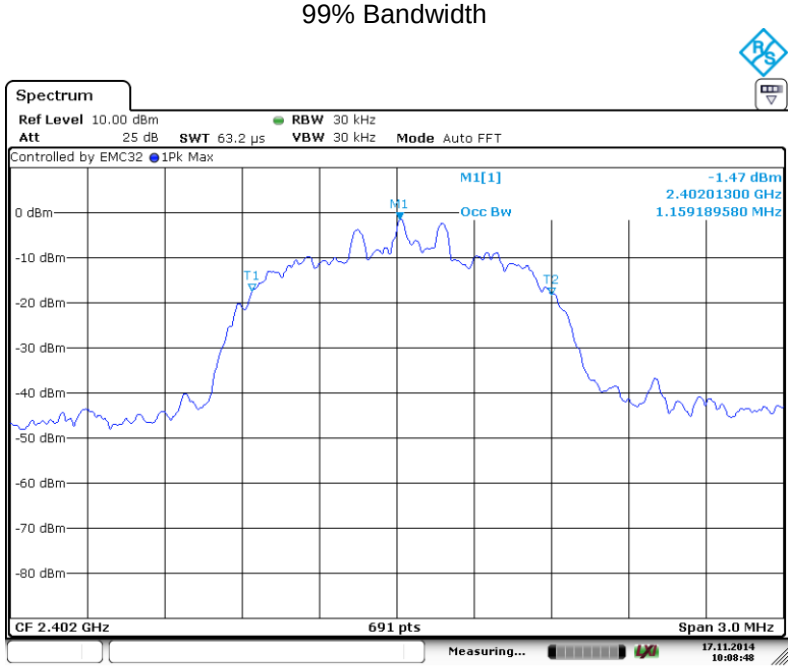
20 dB bandwidth and 99% Occupied Bandwidth

Bluetooth Mode 8DPSK Modulation test result

Frequency MHz	20 dB Bandwidth kHz	99% Bandwidth kHz	Limit kHz	Result
2402	1272	1159	--	Pass
2441	1263	1159	--	Pass
2480	1268	1159	--	Pass

99% Bandwidth



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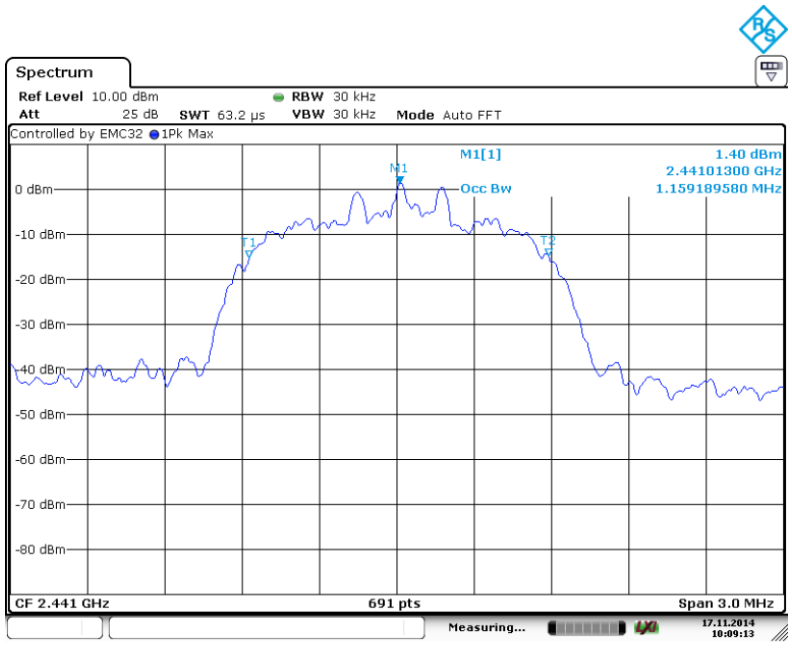

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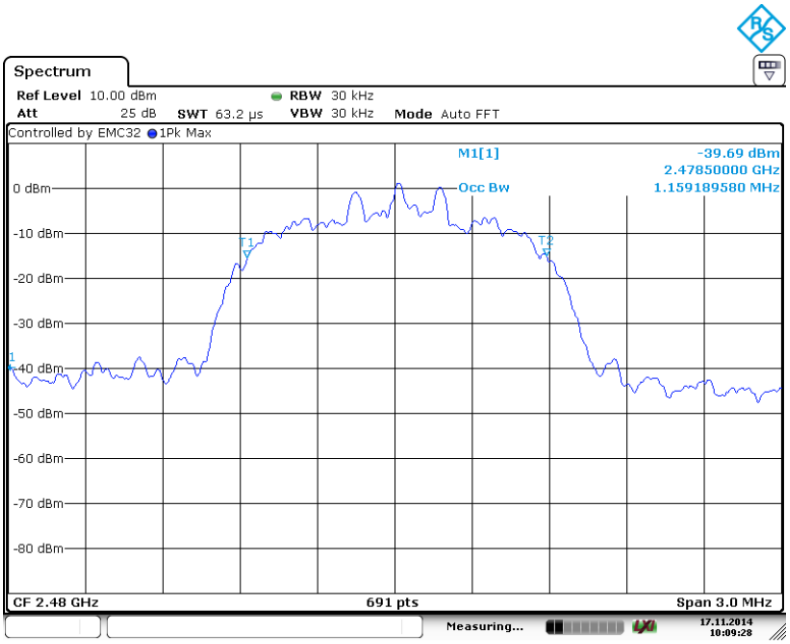

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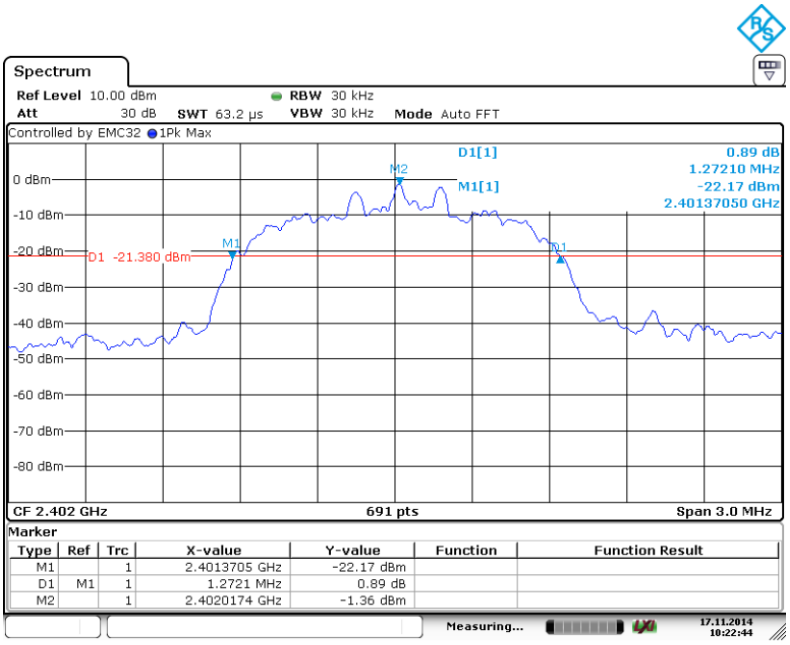
20dB Bandwidth



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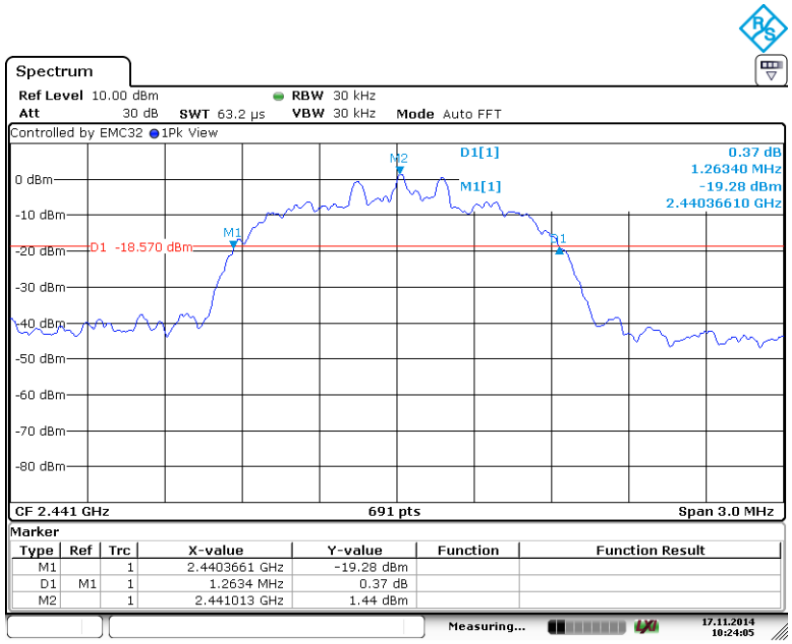

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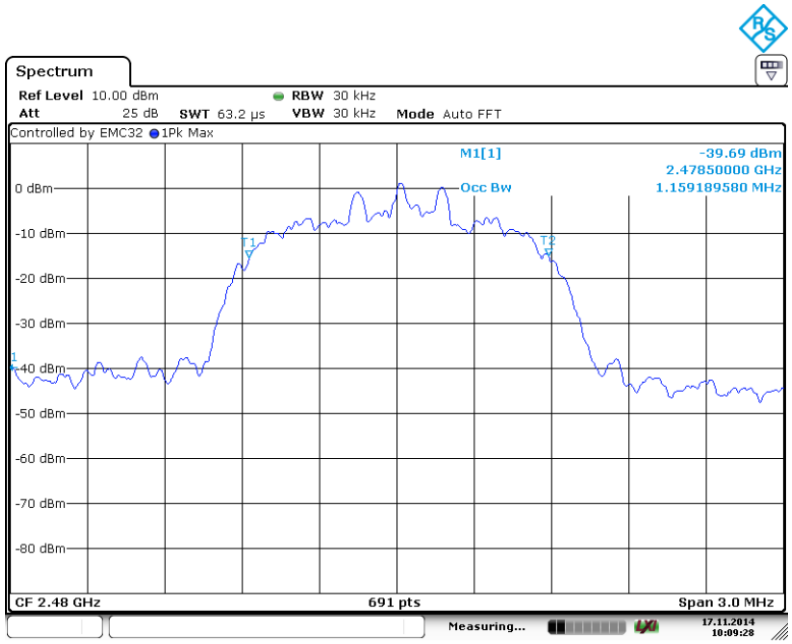

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9.3 Carrier Frequency Separation

Test Method

1. Use the following spectrum analyzer settings:
   Span = wide enough to capture the peaks of two adjacent channels, RBW ≥ 1% of the span, VBW) ≥RBW, Sweep = auto, Detector function = peak
2. By using the Max-Hold function record the separation of two adjacent channels.
3. Measure the frequency difference of these two adjacent channels by spectrum analyzer marker function.
4. Repeat above procedures until all frequencies measured were complete.

Limit

Limit kHz
≥25KHz or 2/3 of the 20 dB bandwidth which is greater

GFSK Modulation Limit

Frequency MHz	2/3 of 20 dB Bandwidth kHz
2402	631.0
2441	636.7
2480	636.7

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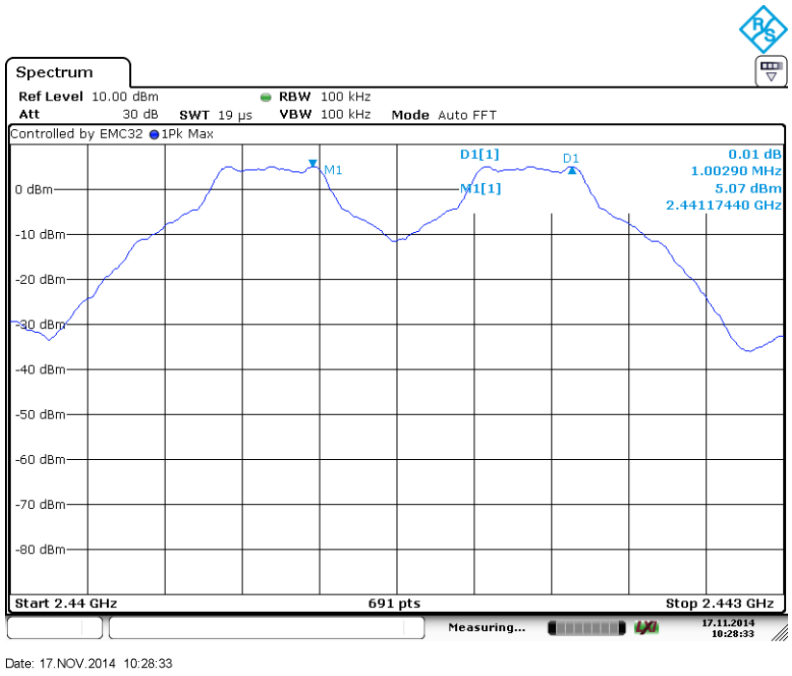
Carrier Frequency Separation

Test result: The measurement was performed with the typical configuration (normal hopping status), here GFSK modulation mode was used to show compliance.

GFSK Modulation test result

Frequency MHz	Carrier Frequency Separation kHz	Result
2441	1000	Pass



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9.4 Number of hopping frequencies

Test Method

1. Use the following spectrum analyzer settings:
   Span = wide enough to capture the peaks of two adjacent channels, RBW ≥ 1% of the span, VBW) ≥RBW, Sweep = auto, Detector function = peak
2. Set the spectrum analyzer on Max-Hold Mode, and then keep the EUT in hopping mode.
3. Record all the signals from each channel until each one has been recorded.
4. Repeat above procedures until all frequencies measured were complete.

Limit

Limit number
≥ 15

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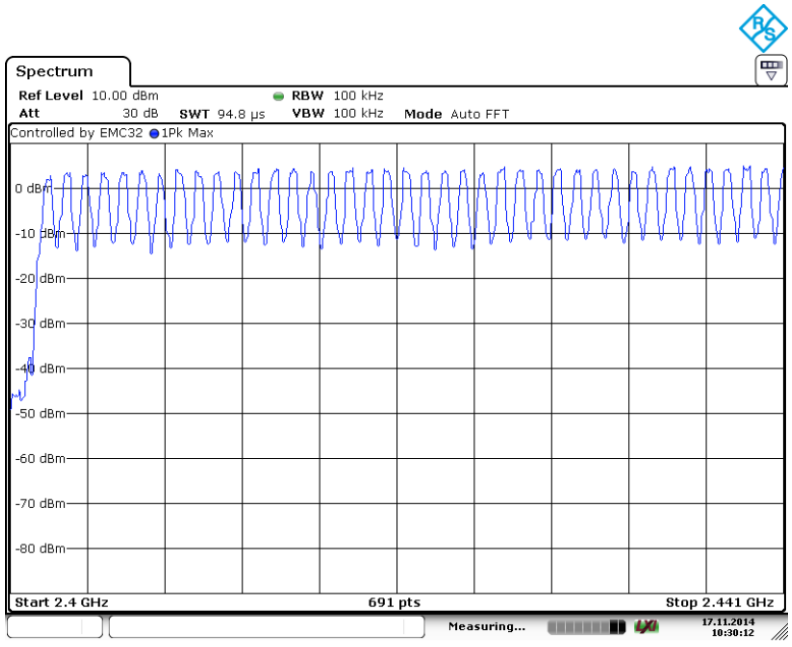
Number of hopping frequencies

Test result: The measurement was performed with the typical configuration (normal hopping status), and the total hopping channels is constant for the all modulation mode according with the Bluetooth Core Specification. Here GFSK modulation mode was used to show compliance.

Number of hopping frequencies	Result
79	Pass



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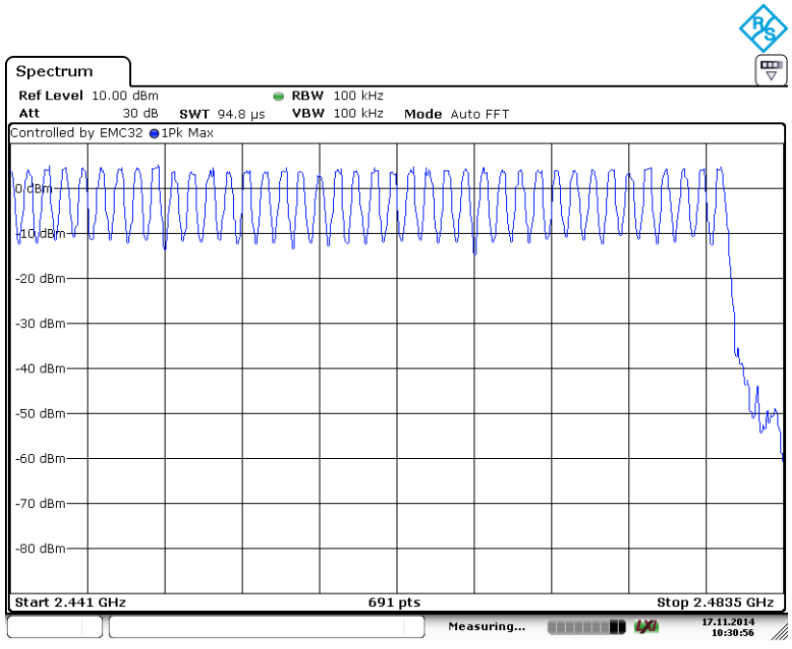

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9.5 Dwell Time

Test Method

1. Connect EUT antenna terminal to the spectrum analyzer with a low loss cable. Equipment mode: Spectrum analyzer
2. RBW: 1MHz; VBW: 1MHz; SPAN: Zero Span
3. Adjust the center frequency of spectrum analyzer on any frequency be measured.
4. Measure the Dwell Time by spectrum analyzer Marker function.
5. Repeat above procedures until all frequencies measured were complete.

Limit

According to §15.247(a)(1)(iii) & RSS-210 A8.1(c) The average time of occupancy on any frequency shall not be greater than 0.4 seconds within a period of 0.4 seconds multiplied by the number of hopping channels employed.

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Dwell Time

Dwell time

The maximum dwell time shall be 0,4 s.
According to the Bluetooth Core Specification, the worse result (DH5 mode) was reported to show compliance.

The Dwell Time = Burst Width * Total Hops. The detailed calculations are showed as follows:
The duration for dwell time calculation: 0.4 [s] * hopping number = 0.4 [s] * 79 [ch] = 31.6 [s*ch];

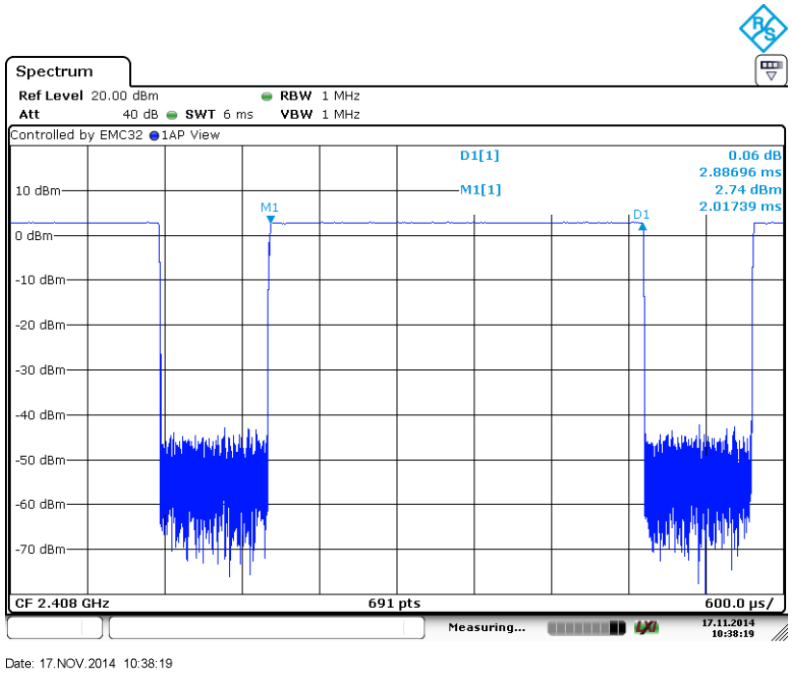
The burst width, which is directly measured, refers to the duration on one channel hop.

The maximum number of hopping channels in 31.6s for DH5=1600 / 6 / 79 *31.6=106.67

Test Result

Modulation	Mode	Reading (μs)	Total Hops	Test Result (ms)	Limit (ms)	Result
GFSK	DH5	2887	106.67	308.0	< 400	Pass
π/4-DQPSK	2DH5	2896	106.67	308.9	< 400	Pass
8-DPSK	3DH5	2904	106.67	309.8	< 400	Pass

GFSK Modulation



DH5

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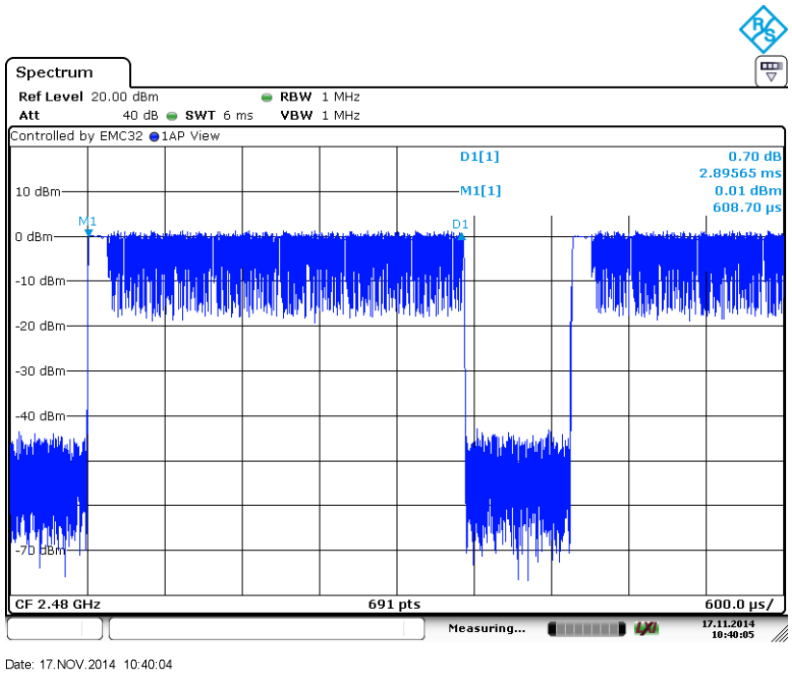
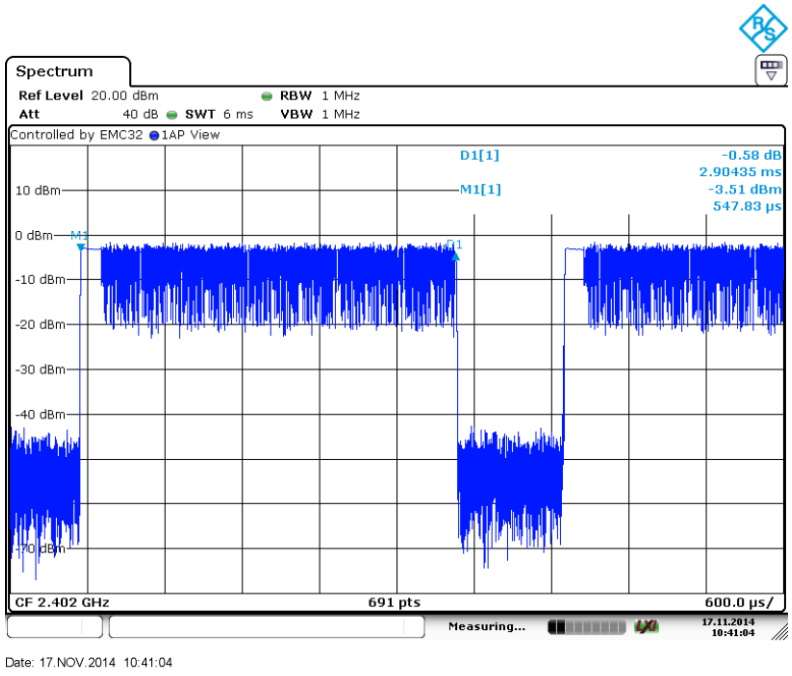
π/4-DQPSK Modulation



2DH5

8-DPSK Modulation



3DH5

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9.6 Spurious RF conducted emissions

Test Method

1. Use the following spectrum analyzer settings:
   Span = wide enough to capture the peak level of the in-band emission and all spurious emissions (e.g., harmonics) from the lowest frequency generated in the EUT up through the 10th harmonic. Typically, several plots are required to cover this entire span.
   RBW = 100 kHz, VBW≥RBW, Sweep = auto, Detector function = peak, Trace = max hold
2. Allow the trace to stabilize. Set the marker on the peak of any spurious emission recorded.
3. The level displayed must comply with the limit specified in this Section. Submit these plots.
4. Repeat above procedures until all frequencies measured were complete.

Limit

Frequency Range MHz	Limit (dBc)
30-25000	-20

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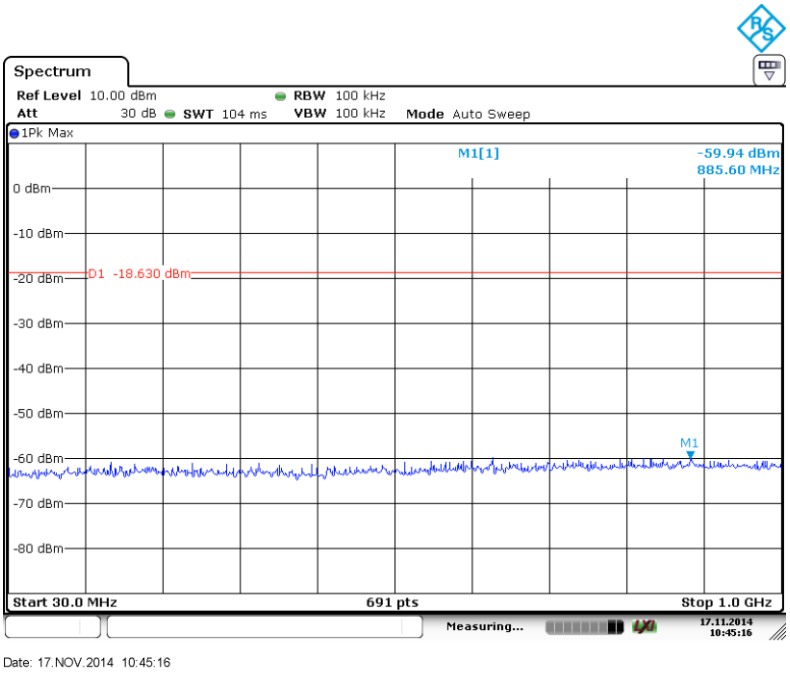
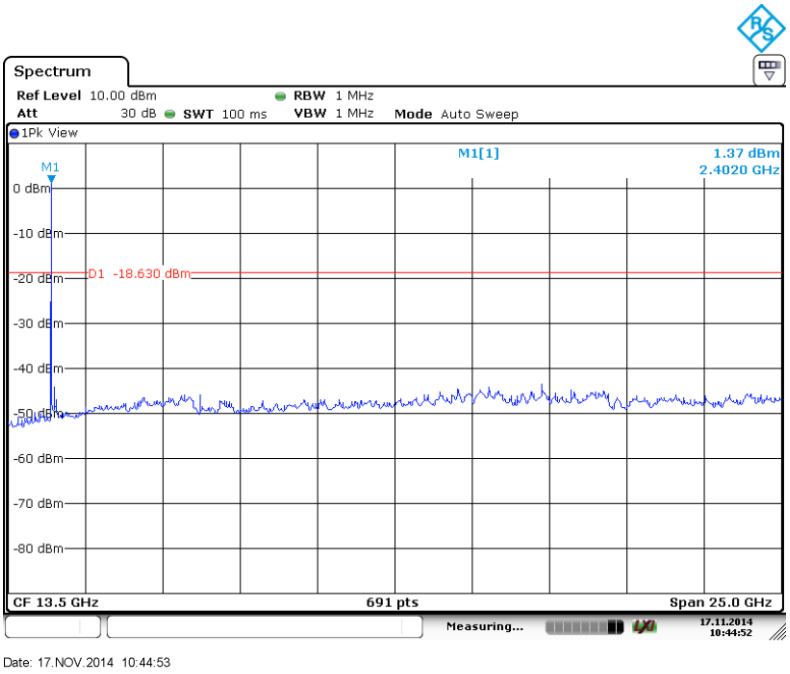
Spurious RF conducted emissions

Only the worse case (which is subject to the maximum EIRP, GFSK mode) test result is listed in the report.

2402MHz



Date: 17.NOV.2014 10:45:16



Date: 17.NOV.2014 10:44:53

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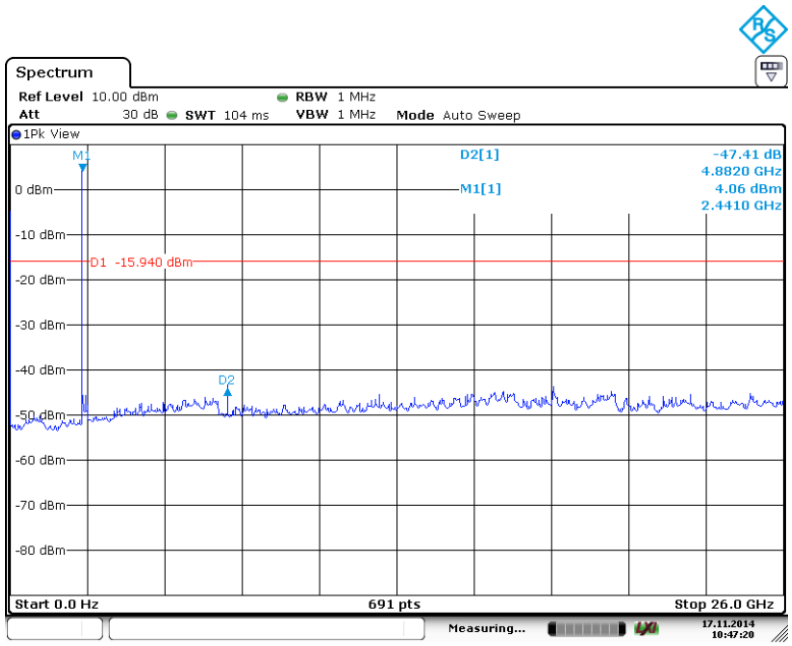
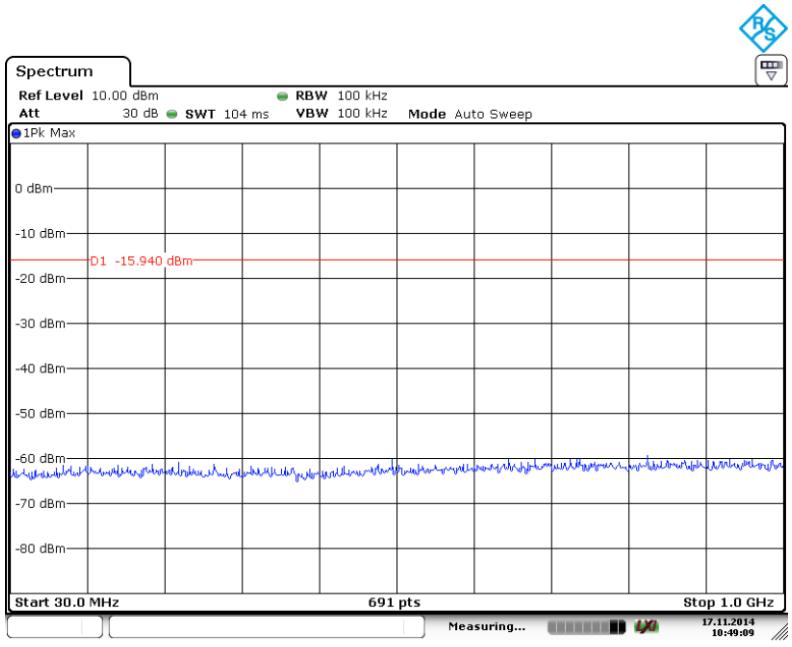
Spurious RF conducted emissions

2441MHz



Date: 17.NOV.2014 10:47:20



Date: 17.NOV.2014 10:49:09

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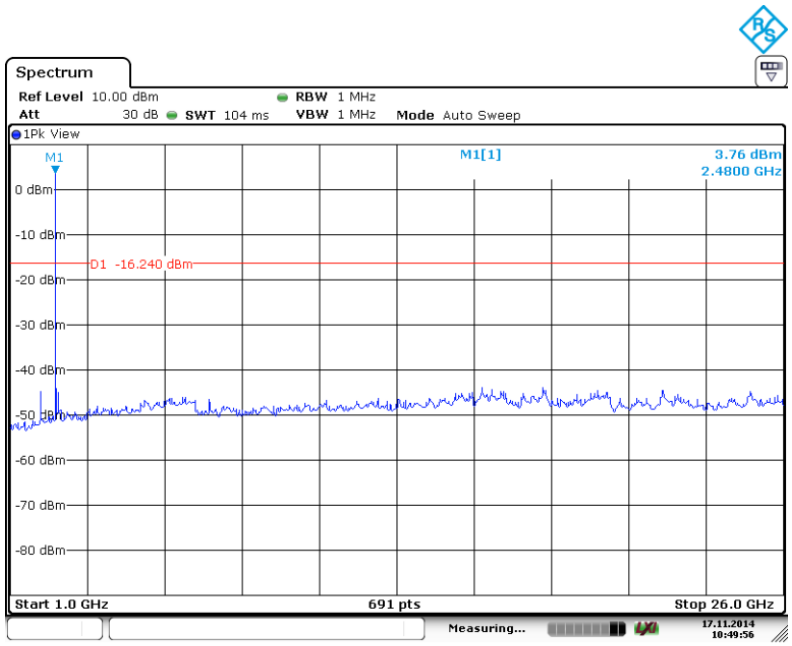
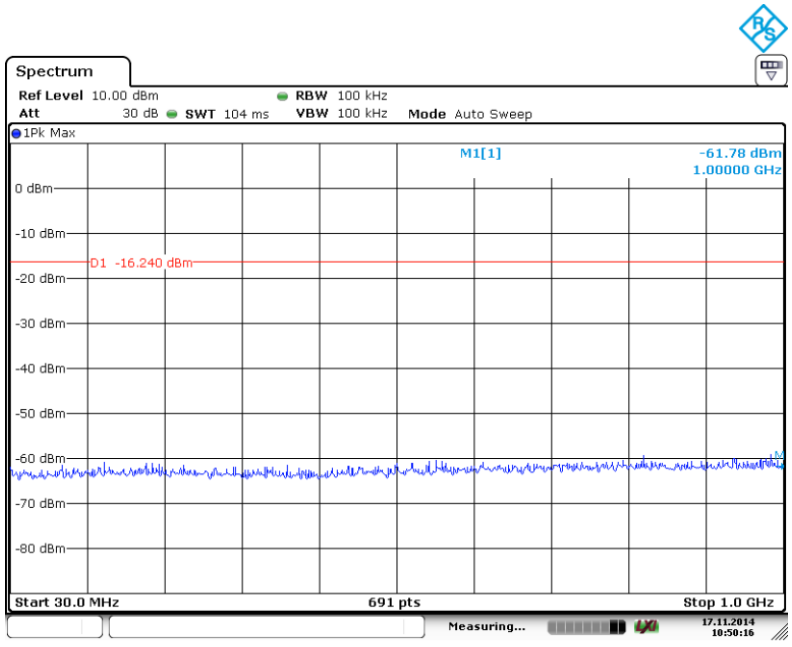
Spurious RF conducted emissions

2480MHz



Date: 17.NOV.2014 10:49:56



Date: 17.NOV.2014 10:50:16

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9.7 Band edge testing

Test Method

1 Use the following spectrum analyzer settings:
Span = wide enough to capture the peak level of the in-band emission and all spurious
RBW = 100 kHz, VBW≥RBW, Sweep = auto, Detector function = peak, Trace = max hold
2 Allow the trace to stabilize, use the peak and delta measurement to record the result.
3 The level displayed must comply with the limit specified in this Section. .
4 Repeat the test at the hopping off and hopping on mode, submit all the plots.

Limit:

According to §15.247(d) and RSS-210 A8.5, in any 100 kHz bandwidth outside the frequency bands in which the spread spectrum intentional radiator in 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. In addition, radiated emissions which fall in the restricted bands, as defined in §15.205(a) and RSS-Gen7.2.2, must also comply with the radiated emission limits specified in 15.209(a) (see Section 15.205(c)) and RSS-Gen.

Only the worse case (which is subject to the maximum EIRP, GFSK mode) test result is listed in the report.

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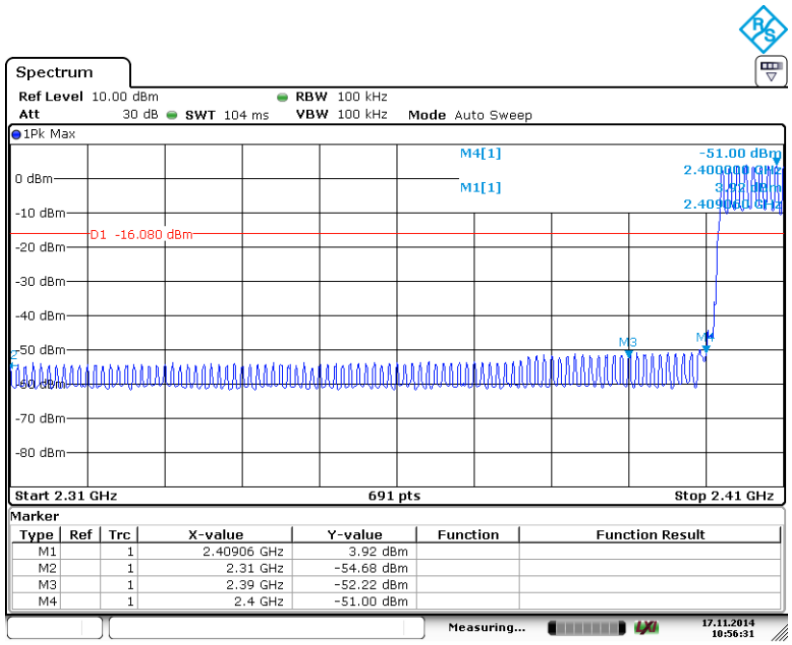
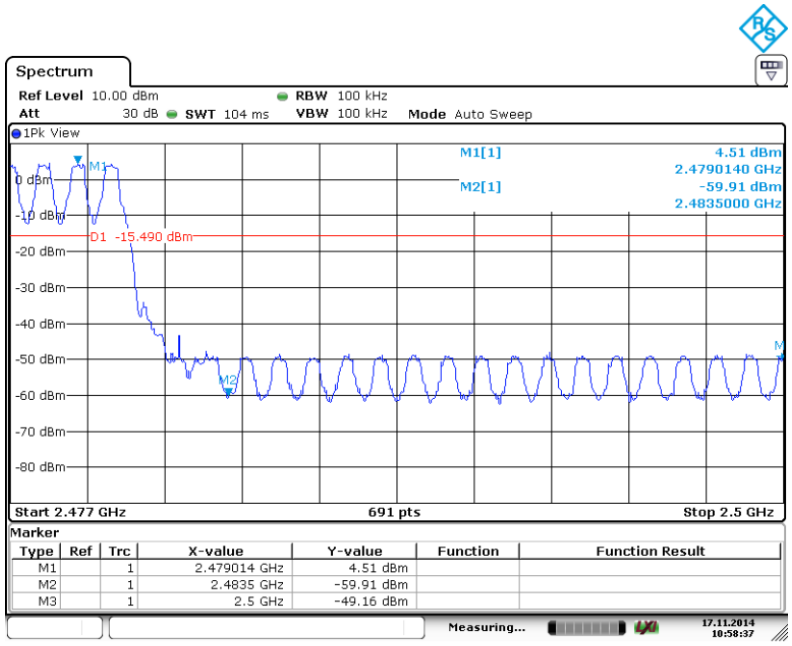
Band edge testing

GFSK Modulation Test Result:
Hopping on mode:



Date: 17.NOV.2014 10:56:32



Date: 17.NOV.2014 10:58:37

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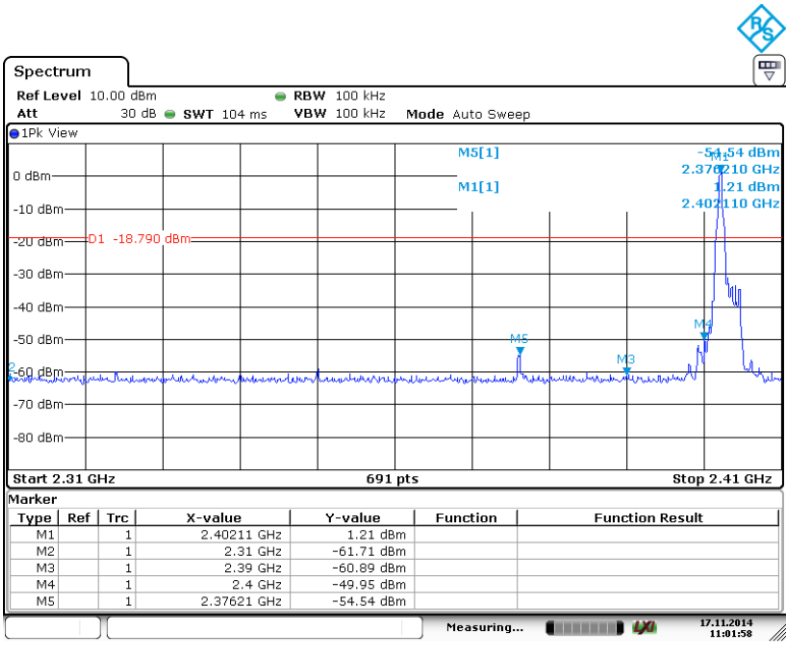
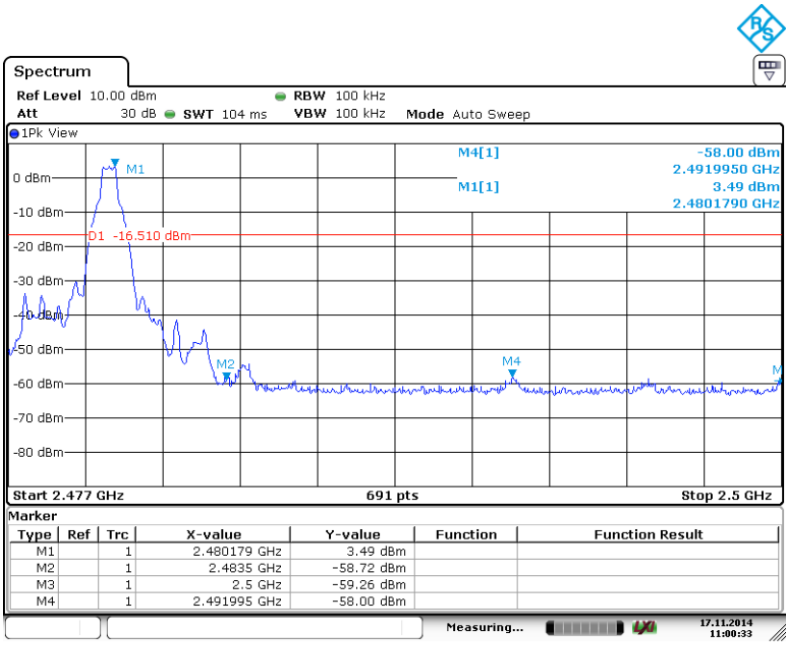
Band edge testing

Hopping off mode:



Date: 17.NOV.2014 11:01:58



Date: 17.NOV.2014 11:00:34

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9.8 Spurious radiated emissions for transmitter and receiver

Test Method

1. The EUT is placed on a turntable, which is 0.8m above ground plane.
2. EUT is set 3m away from the receiving antenna, which is varied from 1m to 4m to find out the highest emissions.
3. Use the following spectrum analyzer settings:
   Span = wide enough to fully capture the emission being measured, RBW = 1 MHz for f ≥ 1GHz, 100 kHz for f < 1 GHz, VBW ≥ RBW, Sweep = auto, Detector function = peak, Trace = max hold
4. Follow the guidelines in ANSI C63.4-1992 with respect to maximizing the emission by rotating the EUT, adjusting the measurement antenna height and polarization, etc.
   The peak reading of the emission, after being corrected by the antenna factor, cable loss, pre-amp gain, etc., is the peak field strength, submit this data. Each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical.
5. Set the VBW to 10 Hz, while maintaining all of the other instrument settings. This peak level, once corrected, must comply with the limit specified in Section 15.209. If the duty cycle per channel of the hopping signal is less than 100 ms, then the reading obtained with the 10 Hz VBW may be further adjusted by a “duty cycle correction factor”, derived from 20log(duty cycle/100 ms), in an effort to demonstrate compliance with the 15.209 limit. Submit this data.

Limit

According to part 15.247(d), the radio emission outside the operating frequency band 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. Radiated emissions which fall in the restricted bands, as defined in section15.205, must comply with the radiated emission limits specified in section 15.209.

Frequency MHz	Field Strength uV/m	Field Strength dBµV/m	Detector
30-88	100	40	QP
88-216	150	43.5	QP
216-960	200	46	QP
960-1000	500	54	QP
Above 1000	500	54	AV
Above 1000	5000	74	PK

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Spurious radiated emissions for transmitter and receiver

According to C63.10, if the peak (or quasi-peak) measured value complies with the average limit, it is unnecessary to perform an average measurement, so AV emission value did not show in below table if the peak value complies with average limit.

The only worse case (which is subject to the maximum EIRP, GFSK mode) test result is listed in the report.

Transmitting spurious emission test result as below:

Bluetooth Mode GFSK Modulation 2402MHz Test Result

Frequency	Emission Level	Limit	Polarization	Margin	Detector	Result
MHz	dBuV/m	dBuV/m		dBμV/m		
155.98	30.94	43.5	Horizontal	12.56	QP	Pass
444.01	34.28	46	Horizontal	11.72	QP	Pass
437.27	30.18	46	Vertical	15.82	QP	Pass
444.01	31.25	46	Vertical	14.75	QP	Pass
*4804	52.98	74	Horizontal	21.02	PK	Pass
*4804	54.11	74	Vertical	19.89	PK	Pass
*4804	49.23	54	Horizontal	4.77	Ave	Pass
*4804	49.11	54	Vertical	4.89	Ave	Pass
*7206	52.98	74	Horizontal	21.02	PK	Pass
*7206	54.11	74	Vertical	24.29	PK	Pass
*7206	49.31	54	Horizontal	4.69	Ave	Pass
*7206	47.38	54	Vertical	6.62	Ave	Pass

Bluetooth Mode GFSK Modulation 2441MHz Test Result

Frequency	Emission Level	Limit	Polarization	Margin	Detector	Result
MHz	dBuV/m	dBuV/m		dBμV/m		
*4882	55.24	74	Horizontal	18.76	PK	Pass
*4882	50.13	74	Vertical	23.87	PK	Pass
*4882	48.31	54	Horizontal	5.69	Ave	Pass
*4882	49.52	54	Vertical	4.48	Ave	Pass
*7323	50.32	74	Horizontal	23.68	PK	Pass
*7323	52.96	74	Vertical	21.04	PK	Pass
*7323	50.11	54	Horizontal	3.89	Ave	Pass
*7323	49.37	54	Vertical	4.63	Ave	Pass

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Bluetooth Mode GFSK Modulation 2480MHz Test Result

Frequency	Emission Level	Limit	Polarization	Margin	Detector	Result
MHz	dBuV/m	dBuV/m		dBµV/m		
*4960	52.37	74	Horizontal	21.63	PK	Pass
*4960	53.36	74	Vertical	20.64	PK	Pass
*4960	50.26	54	Horizontal	3.74	Ave	Pass
*4960	49.69	54	Vertical	4.31	Ave	Pass
*7440	52.64	74	Horizontal	21.36	PK	Pass
*7440	51.39	74	Vertical	22.61	PK	Pass
*7440	49.33	54	Horizontal	4.67	Ave	Pass
*7440	48.72	54	Vertical	5.28	Ave	Pass

Remark:

(1) QP Emission Level= Antenna Factor +Cable Loss + Reading
PK Emission Level= Antenna Factor +Cable Loss - Amp. factor + Reading
AV Emission Level= PK Emission Level+20log(dutycycle)

(2) Data of measurement within this frequency range shown "-" in the table above means the reading of emissions are attenuated more than 20db below the permissible limits or the field strength is too small to be measured.

(3) "*" means the emission(s) appear within the restrict bands shall follow the requirement of section 15.205.

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Receiving emission test result as below:

Frequency	Emission Level	Limit	Polarization	Margin	Detector	Result
MHz	dBuV/m	dBuV/m		dBµV/m		
331.99	34.55	46	Horizontal	11.45	QP	Pass
428.02	35.13	46	Horizontal	10.87	QP	Pass
428.12	31.24	46	Vertical	14.76	QP	Pass
444.03	32.57	46	Vertical	13.43	QP	Pass
1000-25000	--	--	Horizontal	74	PK	Pass
1000-25000	--	--	Vertical	74	PK	Pass

Remark:

(1) QP Emission Level= Antenna Factor +Cable Loss + Reading
PK Emission Level= Antenna Factor +Cable Loss - Amp. factor + Reading
AV Emission Level= PK Emission Level+20log (dutycycle)

(2) Data of measurement within this frequency range shown "--" in the table above means the reading of emissions are the noise floor or attenuated more than 20db below the permissible limits or the field strength is too small to be measured.

(3) "*" means the emission(s) appear within the restrict bands shall follow the requirement of section RSS-Gen.

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10 Test Equipment List

List of Test Instruments

	DESCRIPTION	MANUFACTURER	MODEL NO.	SERIAL NO.	CAL. DUE DATE	
C	Spectrum	Agilent	E4446A	US44300459	May.08, 15	☒
RE < 1 GHz	Test Receiver <1GHz	Rohde & Schwarz	ESVS10	834468/011	May.07, 15	☒
	Amplifier < 1 GHz	HP	8447D	2648A04738	May.07, 15	☒
	HF Cable	Hubersuhne	Sucoflex104	Room 2	May.08, 15	☒
	Bilog Antenna	Schaffner	CBL6111C	2598	Oct.25, 15	☒
RE > 1 GHz	Spectrum > 1GHz	Agilent	E4446A	US44300459	May.08, 15	☒
	Horn Antenna	EMCO	3115	9607-4877	Jun. 24, 15	☒
	Amp > 1 Ghz	HP	8449B	3008A08495	May.08, 15	☒
	HF Cable	Hubersuhne	Sucoflex104	Room1	May.08, 15	☒

C - Conducted RF tests

- Conducted peak output power
- 20dB bandwidth and 99% Occupied Bandwidth
- Carrier frequency separation
- Number of hopping frequencies
- Dwell Time
- Spurious RF conducted emissions
- Band edge

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11 System Measurement Uncertainty

For a 95% confidence level, the measurement expanded uncertainties for defined systems, in accordance with the recommendations of ISO 17025 were:

System Measurement Uncertainty	
Test Items	Extended Uncertainty
Uncertainty for Radiated Emission in 3m chamber 9kHz-30MHz	4.54dB
Uncertainty for Radiated Emission in 3m chamber 30MHz-1000MHz	Horizontal: 4.83dB; Vertical: 4.91dB;
Uncertainty for Radiated Emission in 3m chamber 1000MHz-18000MHz	Horizontal: 4.89dB; Vertical: 4.88dB;
Uncertainty for Conducted Emission 9kHz-150KHz	3.88dB
Uncertainty for Conducted Emission 150kHz-30MHz	3.50dB

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