FCC/IC - TEST REPORT

Report Number	:	**68.920.17.008.01**	Date of Issue:	**June 5, 2017**
Model	:	**Braaper**		
Product Type	:	Bluetooth Speaker		
Applicant	:	LABeL Srl		
Address	:	Via Casali4,20092 Cinisello B. (Ml) - llaly		
Production Facility	:	Dongguan Jinwenhua Digital Technology Co., LTD.		
Address	:	No.1 Huada Road, Longbeiling Industry Zone, Tangxia Town, Dongguan City, Guangdong, China		
Test Result	:	■ **Positive** ☐ **Negative**		
Total pages including Appendices	:	**38**		

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1 Table of Contents

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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 Building 12&13, Zhiheng Wisdomland Business Park, Nantou Checkpoint Road 2, Nanshan District, Shenzhen City, 518052, P. R. China
FCC Registration No.:	502708
IC Registration No:	10320A-1
Telephone:	86 755 8828 6998
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Test Site 2

Company name:	Dongguan Yaxu(AiT) Technology Limited. No.22, Jiangqianling Third Street, Jitigang, Huangjiang, Dongguan, Guangdong, 523753 China
FCC Registration No.:	248337
Telephone:	86-769-82020499
Fax:	86-769-82020495

Note: All test items were performed at Test site 2

3 Description of the Equipment Under Test

Product:	Bluetooth Speaker
Model no.:	Braaper
Brand Name:	Braaper
FCC ID:	2AK8NBRAAPER
Options and accessories:	NIL
Rating:	DC 5V, 1000mA
RF Transmission Frequency:	2402-2480MHz
No. of Operated Channel:	79
Modulation:	GFSK, π/4-DQPSK, 8DPSK
Antenna Type:	Integral Antenna
Antenna Gain:	0dBi
Description of the EUT:	The Equipment Under Test (EUT) is a Bluetooth Speaker operated at 2.4GHz

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4 Summary of Test Standards

Test Standards	
FCC Part 15 Subpart C 10-1-2016 Edition	PART 15 - RADIO FREQUENCY DEVICES Subpart C - Intentional Radiators
RSS-Gen Issue 4 November 2014	General Requirements for the Certification of Radio Apparatus
RSS-247 Issue 2 Feb 2017	RSS-247 —Digital Transmission Systems (DTSs), Frequency Hopping Systems (FHSs) and Licence-Exempt Local Area Network (LE-LAN) Devices

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 (2014).

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5 Summary of Test Results

Technical Requirements					
FCC Part 15 Subpart C					
Test Condition			Pages	Test Site	Test Result
§15.207	RSS-Gen A8.8	Conducted emission AC power port	10	Site 2	Pass
§15.247 (b) (1)	RSS-247 5.4(d)	Conducted peak output power	13	Site 2	Pass
§15.247(a)(1)	RSS-247 5.1(a) & RSS-Gen 6.6	20dB bandwidth&99% bandwidth	15	Site 2	Pass
§15.247(a)(1)	RSS-247 5.1(b)	Carrier frequency separation	18	Site 2	Pass
§15.247(a)(1)(iii)	RSS-247 5.1(d)	Number of hopping frequencies	20	Site 2	Pass
§15.247(a)(1)(iii)	RSS-247 5.1(e)	Dwell Time	22	Site 2	Pass
§15.247(a)(2)	RSS-247 5.2(a)	6dB bandwidth	---	---	N/A
§15.247(e)	RSS-247 5.2(b)	Power spectral density	---	---	N/A
§15.247(d)	RSS-247 5.5	Spurious RF conducted emissions	26	Site 2	Pass
§15.247(d)	RSS-247 5.5	Band edge	30	Site 2	Pass
§15.247(d) & §15.209	RSS-247 5.5 & RSS-Gen 6.13	Spurious radiated emissions for transmitter	35	Site 2	Pass
§15.203	RSS-Gen 8.3	Antenna requirement	See note 2		Pass

Note 1: N/A=Not Applicable.
Note 2: The EUT uses an integral antenna, which gain is 0dBi. In accordance to §15.203 and § RSSGEN 8.3, 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: and IC: complies with Section 15.207, 15.209, 15.247 of the FCC Part 15, Subpart C Rules and RSS-Gen and RSS-247.

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:	06 March 2017
Testing Start Date:	06 March 2017
Testing End Date:	19 May 2017

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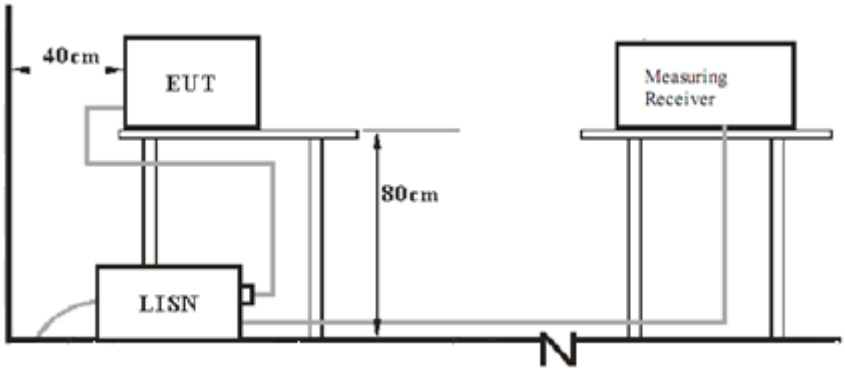
Reviewed by: Prepared by:

John Zhi
Project Manager

Leon Zhang
Project Engineer

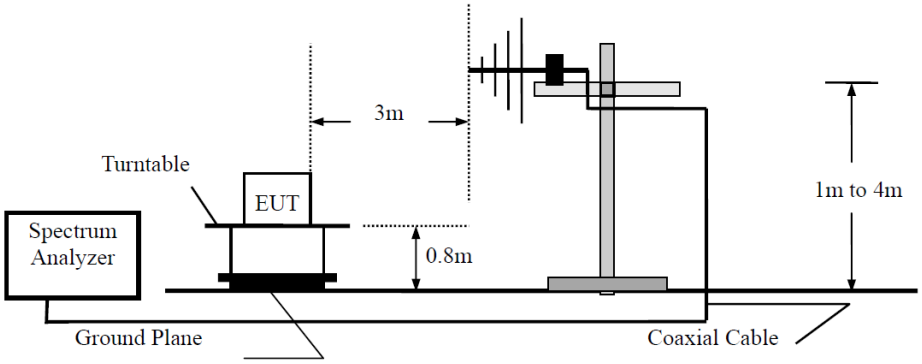
7 Test Setups

7.1 AC Power Line Conducted Emission test setups

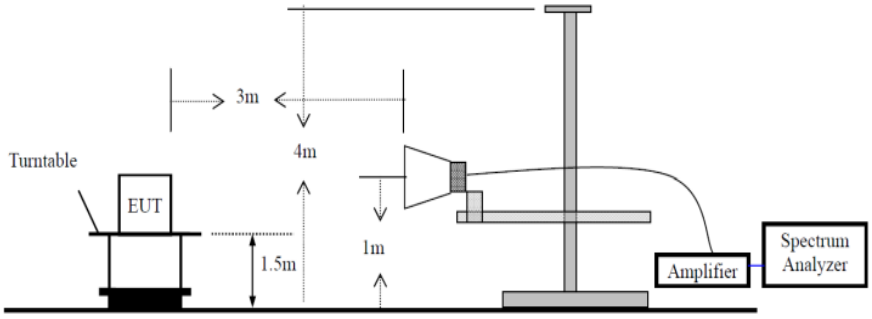


7.2 Radiated test setups

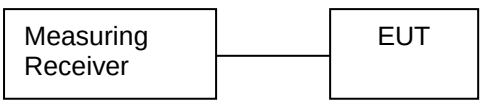
Below 1GHz:



Above 1GHz:



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)

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 Emission

Test Method

1. The EUT was placed on a table, which is 0.8m above ground plane
2. The power line of the EUT is connected to the AC mains through a Artificial Mains Network (A.M.N.).
3. Maximum procedure was performed to ensure EUT compliance
4. A EMI test receiver is used to test the emissions from both sides of AC line

Limit

According to §15.207 & RSS-GEN A8.8, conducted emissions limit as below:

Frequency MHz	QP Limit dBµV	AV Limit dBµV
0.150-0.500	66-56*	56-46*
0.500-5	56	46
5-30	60	50

Decreasing linearly with logarithm of the frequency

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Product Type	:	Bluetooth Speaker
M/N	:	BRAAPER
Operating Condition	:	Normal Working
Test Specification	:	Line
Comment	:	AC 120V/60Hz

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Product Type	:	Bluetooth Speaker
M/N	:	BRAAPER
Operating Condition	:	Normal Working
Test Specification	:	Neutral
Comment	:	AC 120V/60Hz

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9.2 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) & RSS-247 5.4(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

GFSK modulation Test Result

Frequency MHz	Conducted Peak Output Power dBm	Result
Low channel 2402MHz	0.32	Pass
Middle channel 2441MHz	0.35	Pass
High channel 2480MHz	0.43	Pass

π /4-DQPSK modulation Test Result

Frequency MHz	Conducted Peak Output Power dBm	Result
Low channel 2402MHz	-1.45	Pass
Middle channel 2441MHz	-1.38	Pass
High channel 2480MHz	-13.20	Pass

8-DPSK modulation Test Result

Frequency MHz	Conducted Peak Output Power dBm	Result
Low channel 2402MHz	-1.63	Pass
Middle channel 2441MHz	-1.59	Pass
High channel 2480MHz	-1.51	Pass

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9.3 20 dB bandwidth and 99% 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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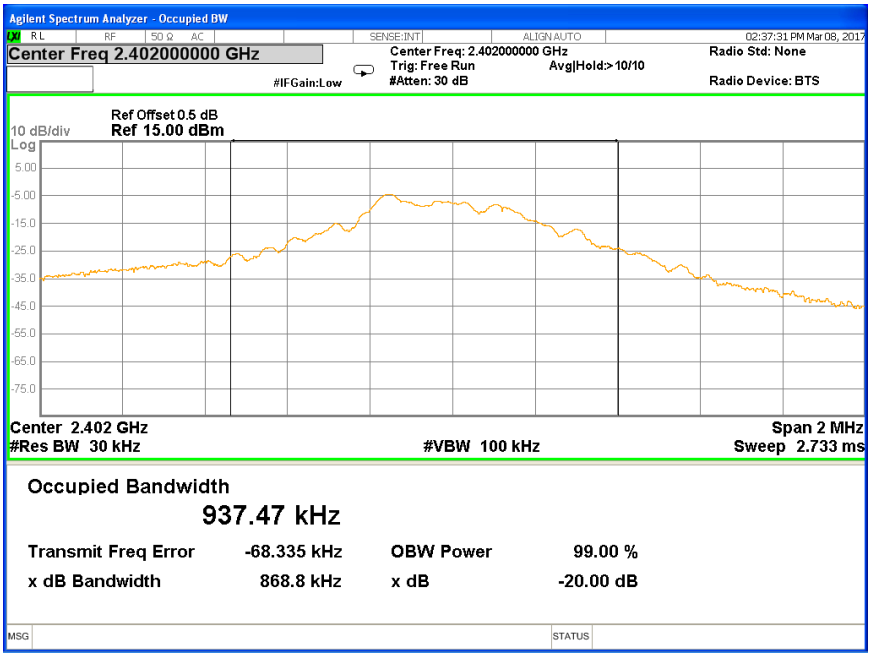
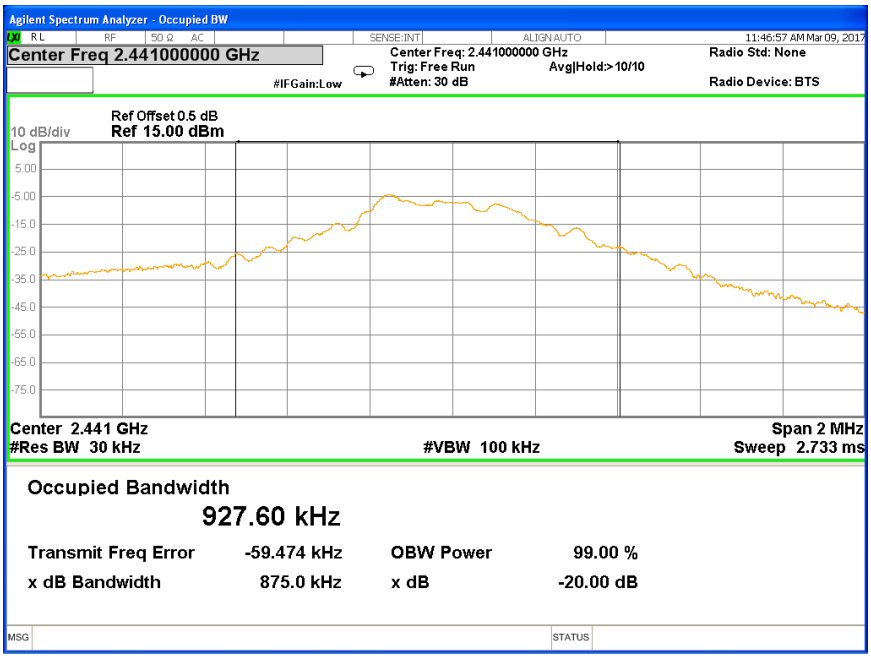
20 dB bandwidth and 99% bandwidth

GFSK Modulation test result

Frequency MHz	20 dB Bandwidth kHz	99% bandwidth kHz	Limit kHz	Result
2402	868.8	937.47	--	Pass
2441	875.0	927.6	--	Pass
2480	884.6	921.88	--	Pass





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20 dB bandwidth and 99% bandwidth

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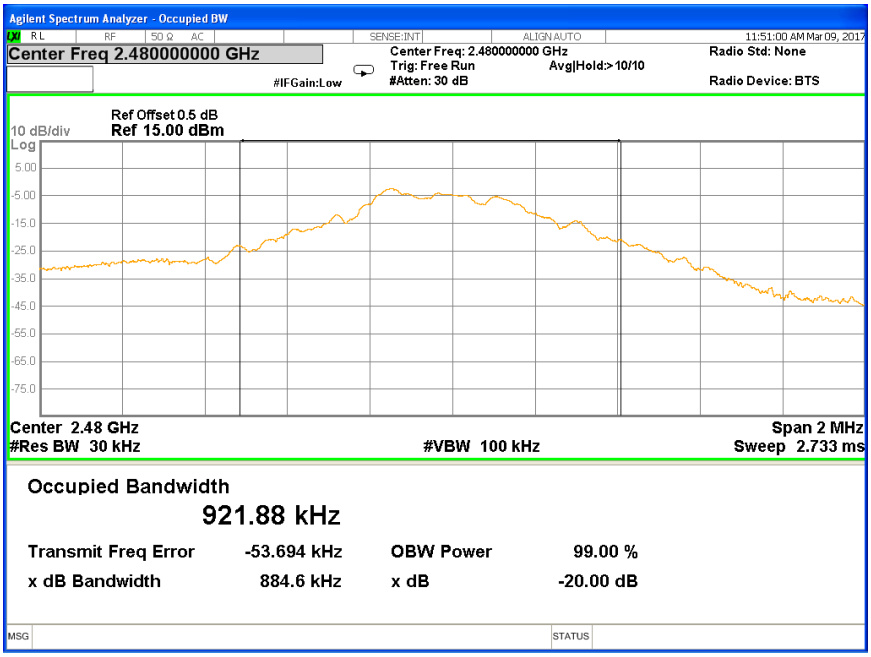
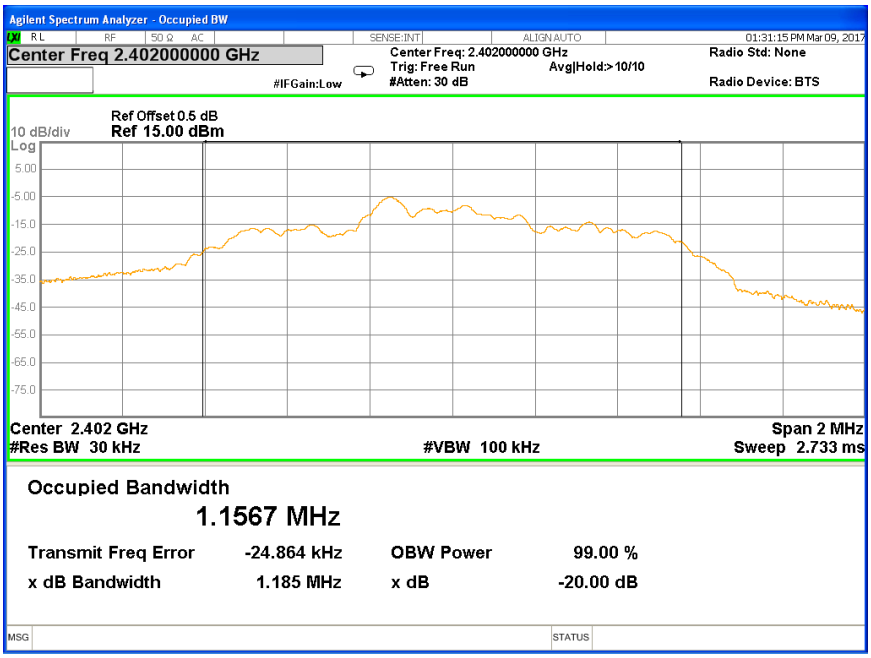


π /4-DQPSK Modulation test result

Frequency MHz	20 dB Bandwidth kHz	99% bandwidth kHz	Limit kHz	Result
2402	1185	1156.7	--	Pass
2441	1188	1156.2	--	Pass
2480	1193	1159.6	--	Pass



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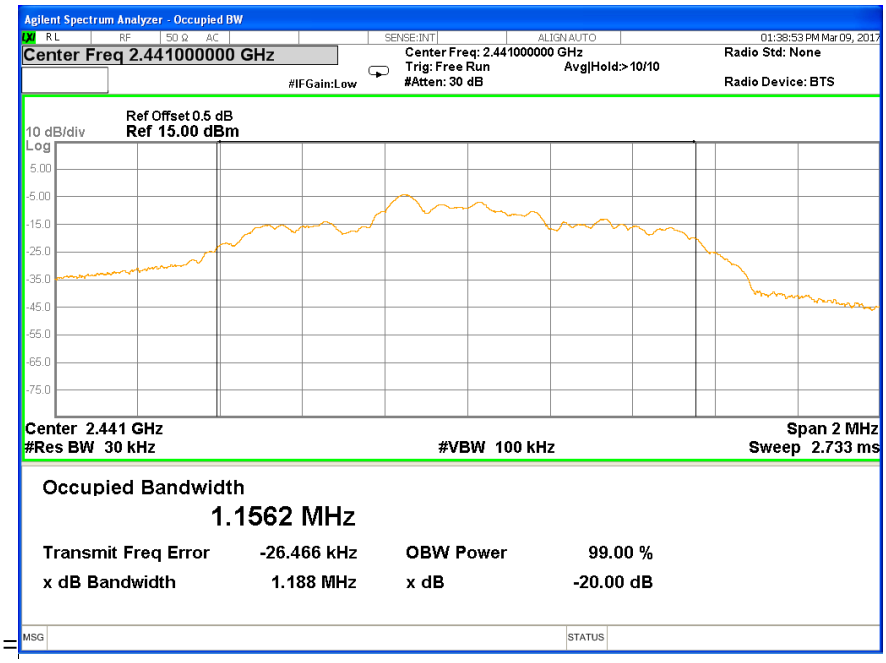
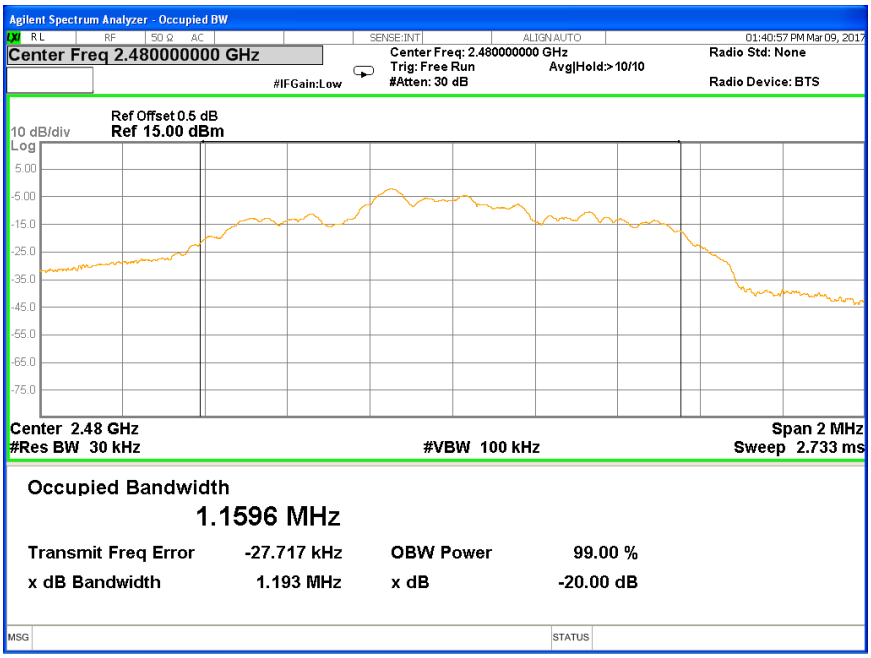
20 dB bandwidth and 99% bandwidth





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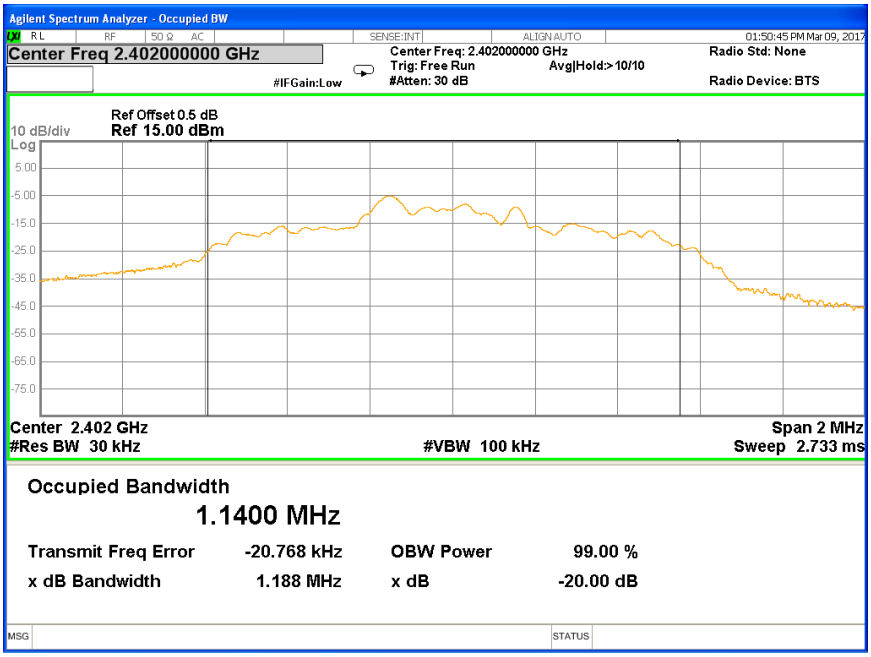
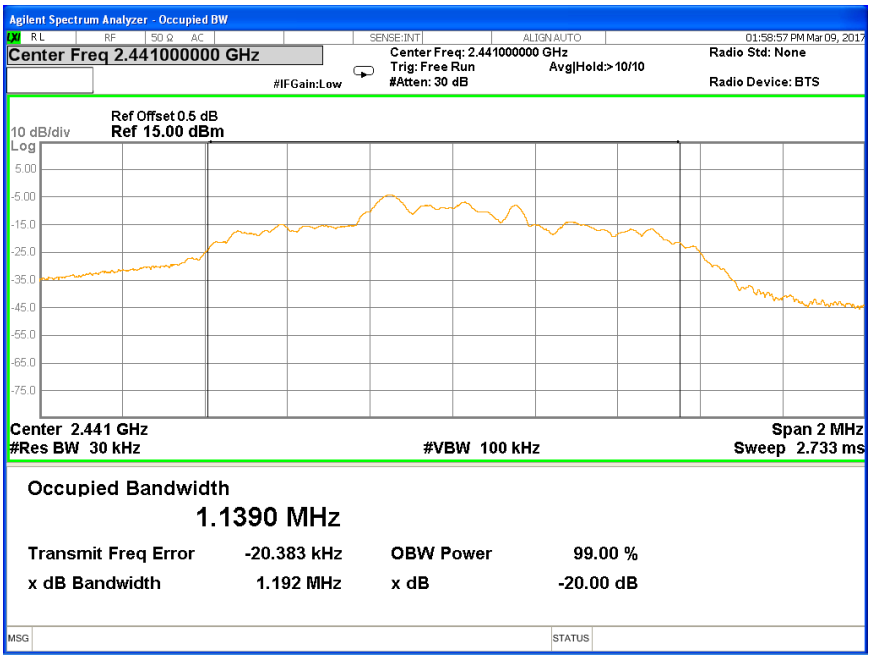
20 dB bandwidth and 99% bandwidth

8-DPSK Modulation test result

Frequency MHz	20 dB Bandwidth kHz	99% bandwidth kHz	Limit kHz	Result
2402	1188	1140.0	--	Pass
2441	1192	1139.0	--	Pass
2480	1197	1142.5	--	Pass





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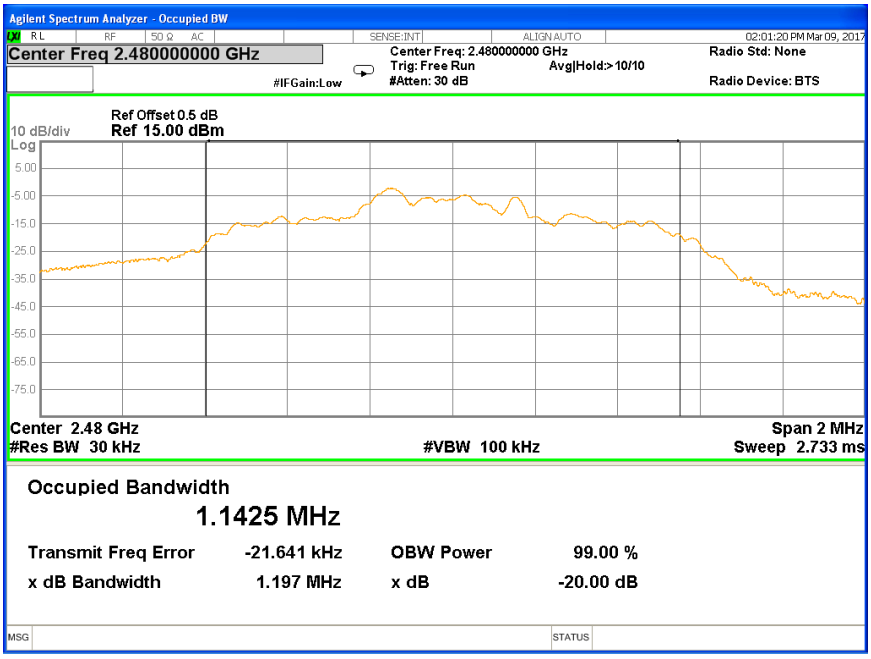
20 dB bandwidth and 99% bandwidth



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9.4 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	579.2
2440	583.3
2480	589.7

π/4 DQPSK Modulation Limit

Frequency MHz	2/3 of 20 dB Bandwidth kHz
2402	790
2440	792
2480	795.3

8-DPSK Modulation Limit

Frequency MHz	2/3 of 20 dB Bandwidth kHz
2402	792
2440	794.7
2480	798

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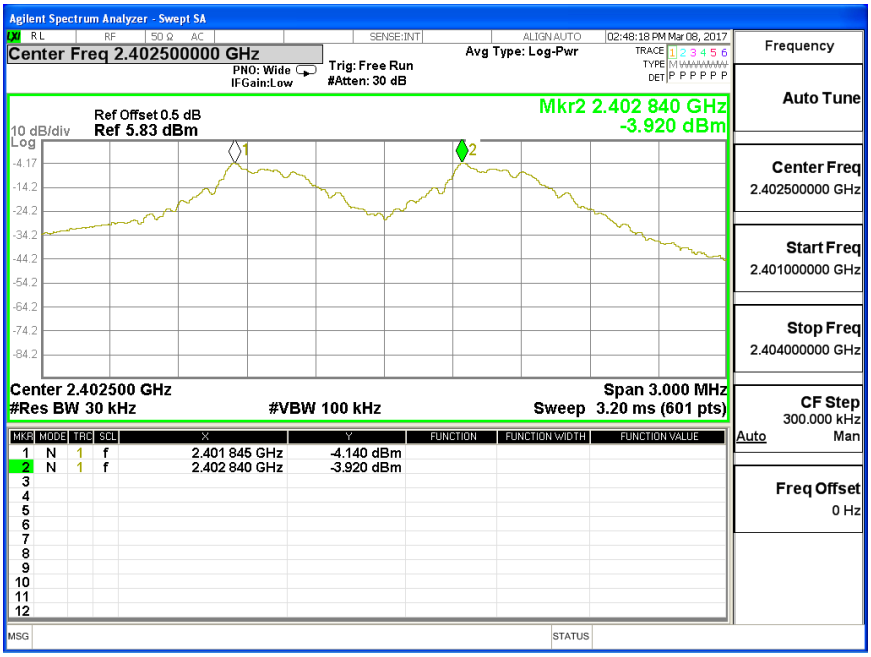
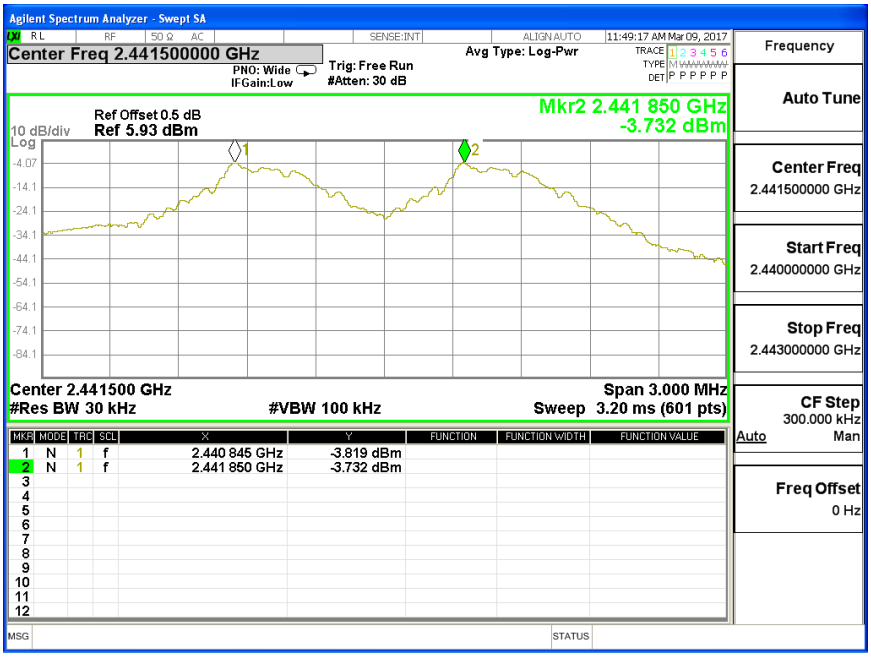
Carrier Frequency Separation

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
2402	995	Pass
2441	995	Pass
2480	1000	Pass





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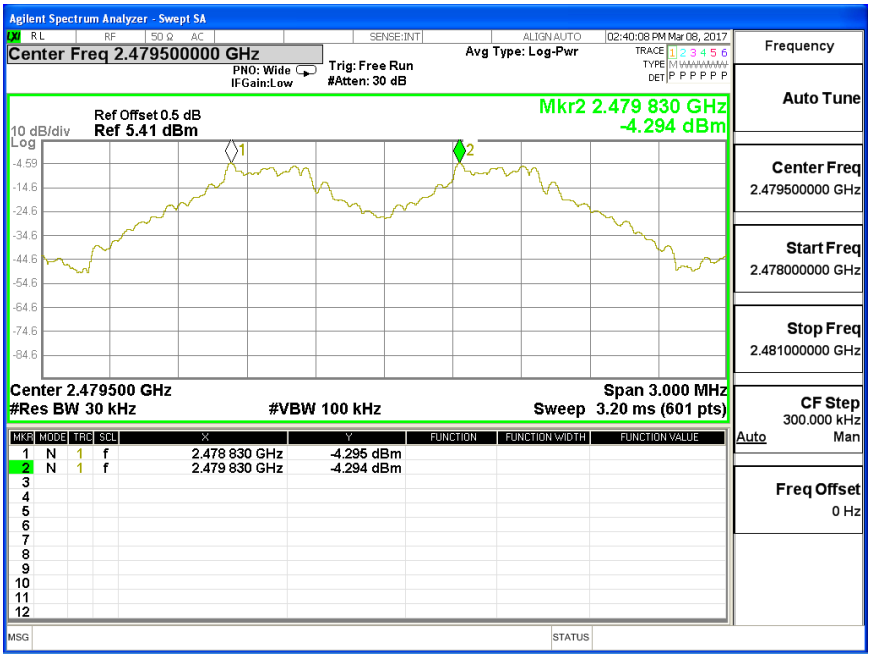
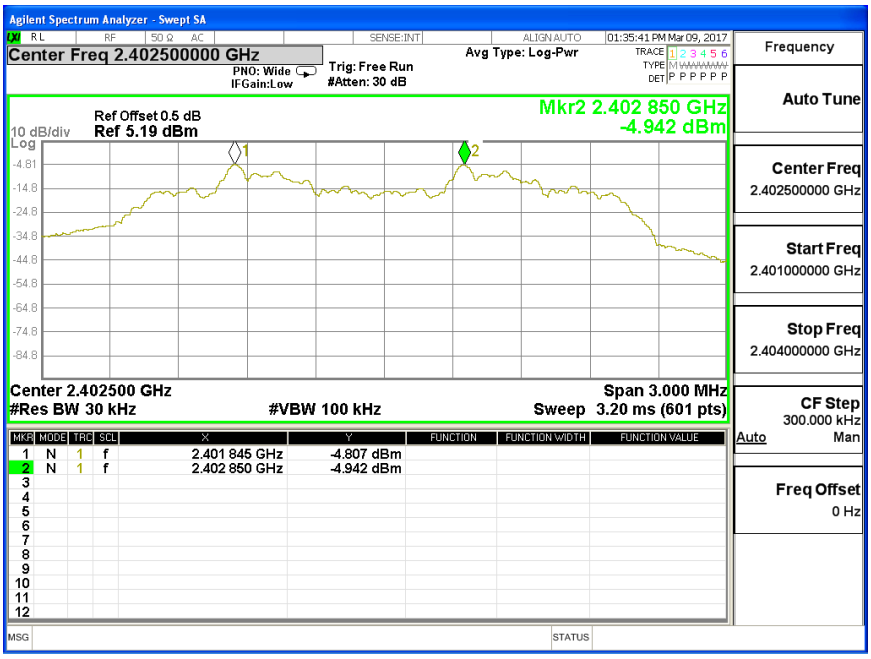
Carrier Frequency Separation



π /4 DQPSK test result

Frequency MHz	Carrier Frequency Separation kHz	Result
2402	1005	Pass
2441	1005	Pass
2480	1000	Pass



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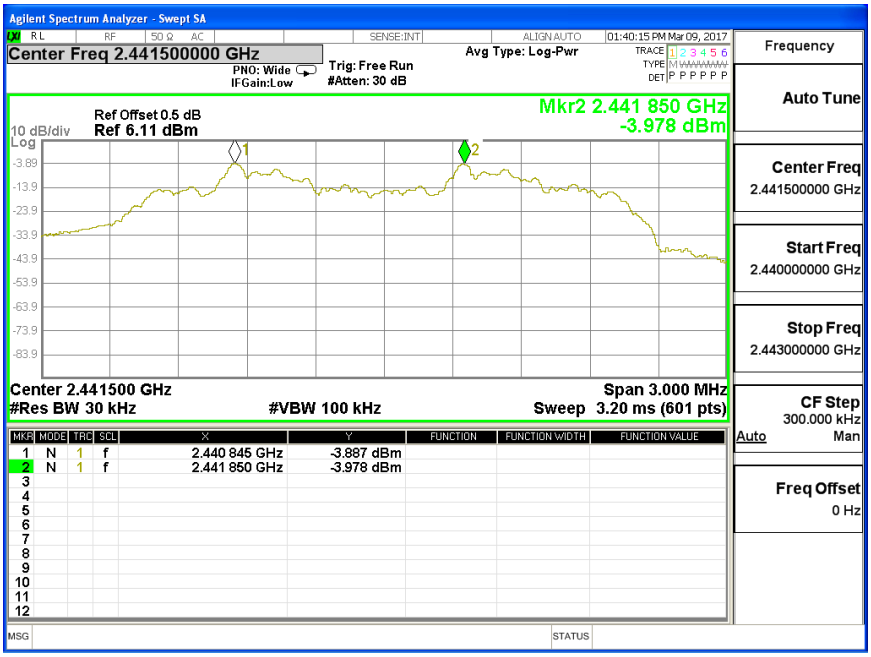
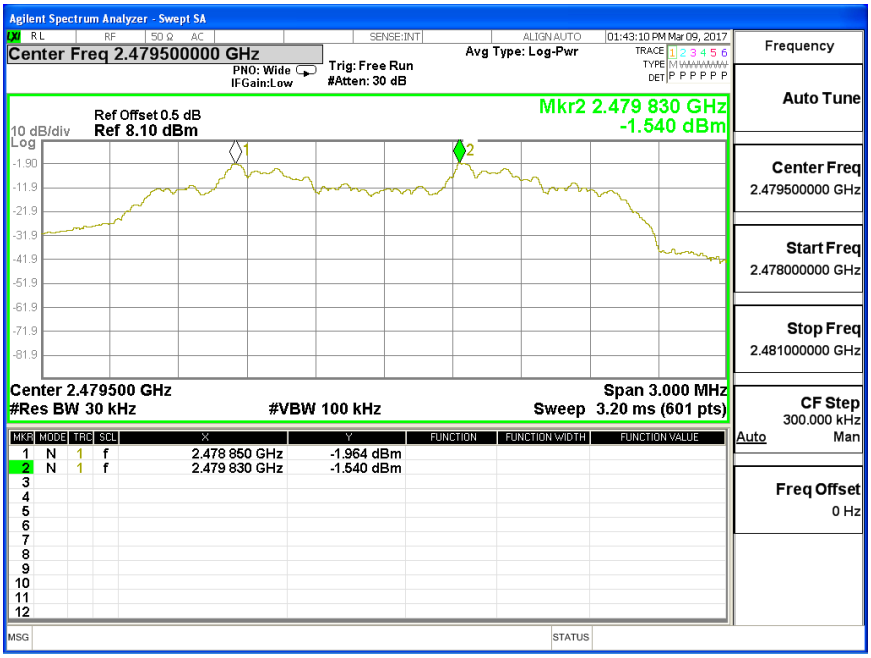
Carrier Frequency Separation





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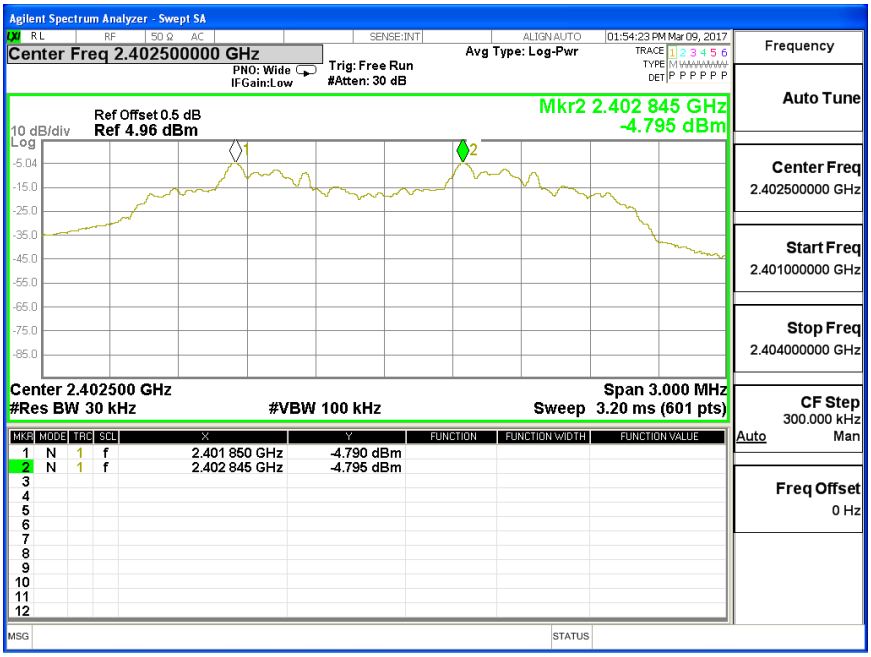
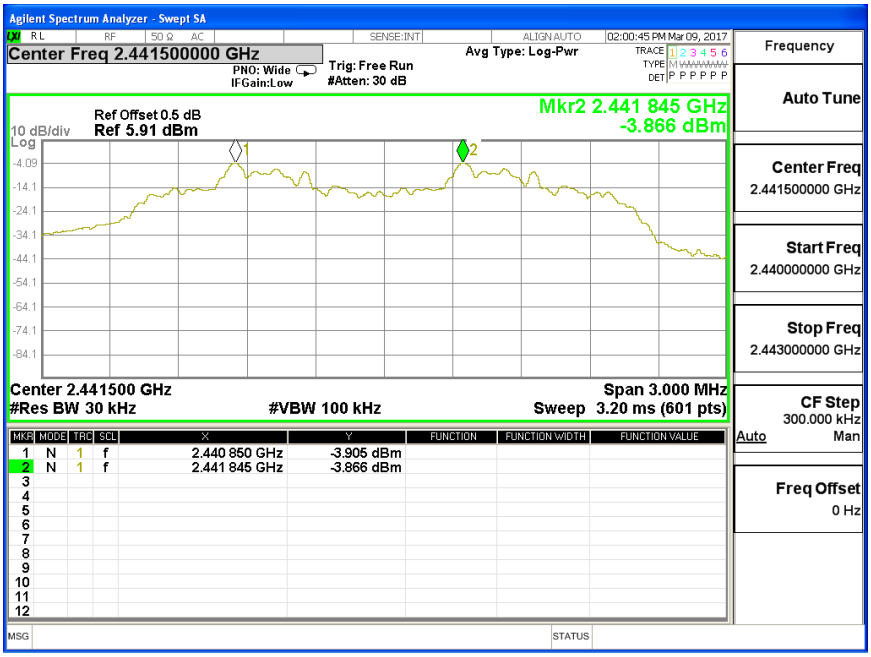
8- DPSK test result

Frequency MHz	Carrier Frequency Separation kHz	Result
2402	995	Pass
2441	996	Pass
2480	1000	Pass





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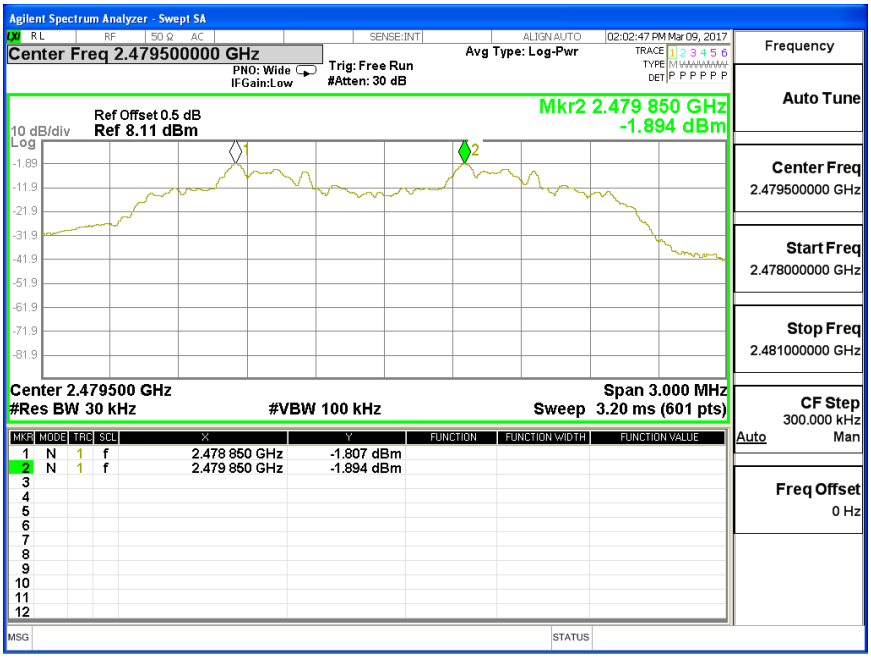
Carrier Frequency Separation



9.5 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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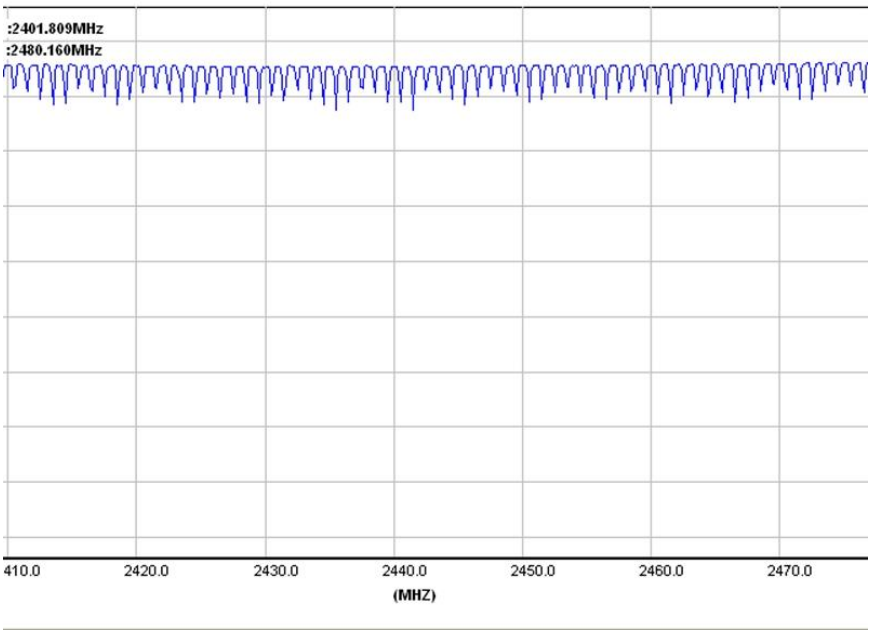
Number of hopping frequencies

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

Number of hopping frequencies	Result
79	Pass



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9.6 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.

Dwell time

The maximum dwell time shall be 0.4 s.
We test Low frequency, middle frequency and high frequency, only worse case recorded in the report.

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 =106.67

Test Result

Modulation	Reading (ms)	Total Hops	Test Result (ms)	Limit (ms)	Result
GFSK	2.880	106.67	307	< 400	Pass
8DPSK	2.890	106.67	308	< 400	Pass

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9.7 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.
5. Here the worst GFSK modulation mode was used to show compliance.

Limit

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

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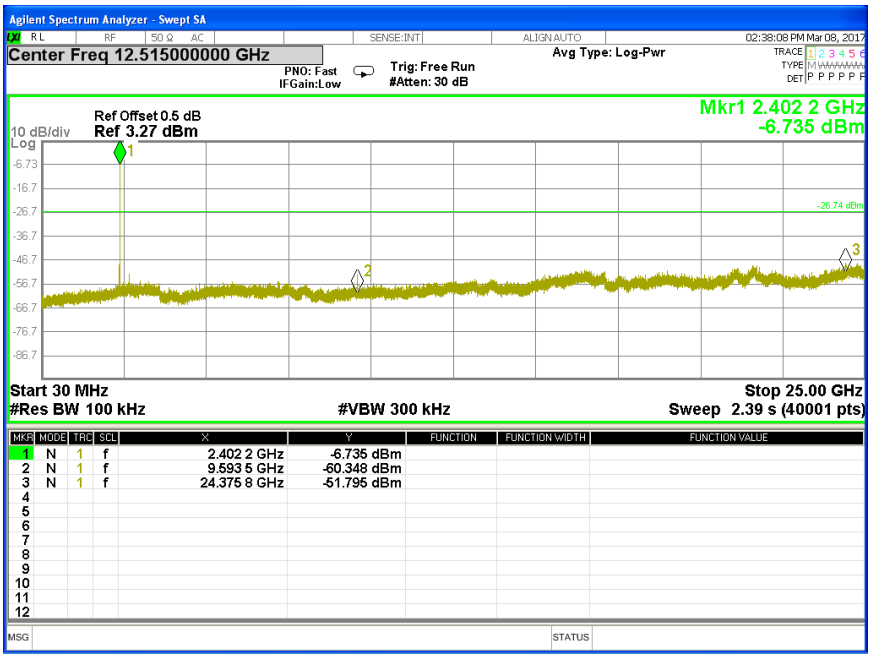
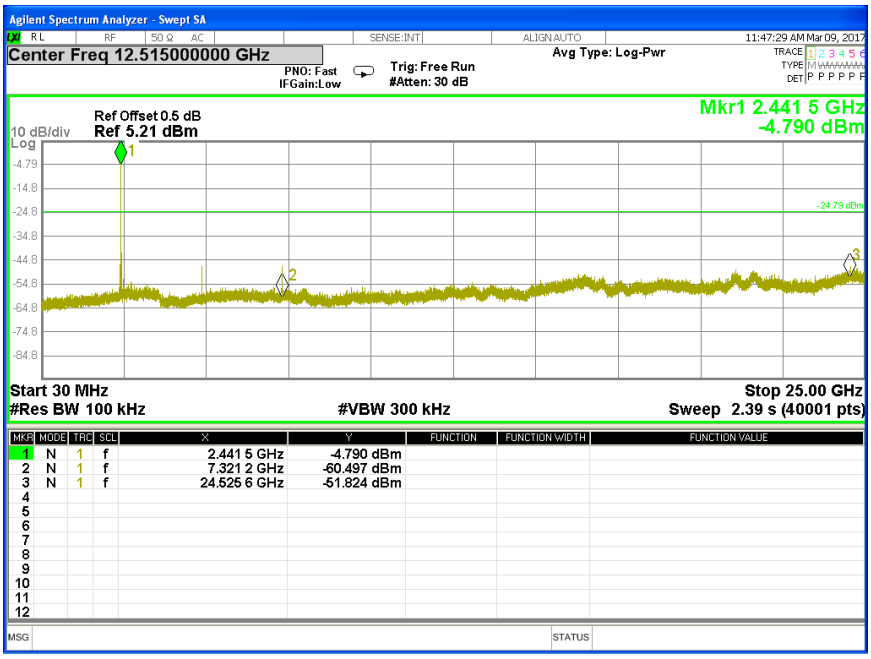
Spurious RF conducted emissions

2402MHz



2441MHz



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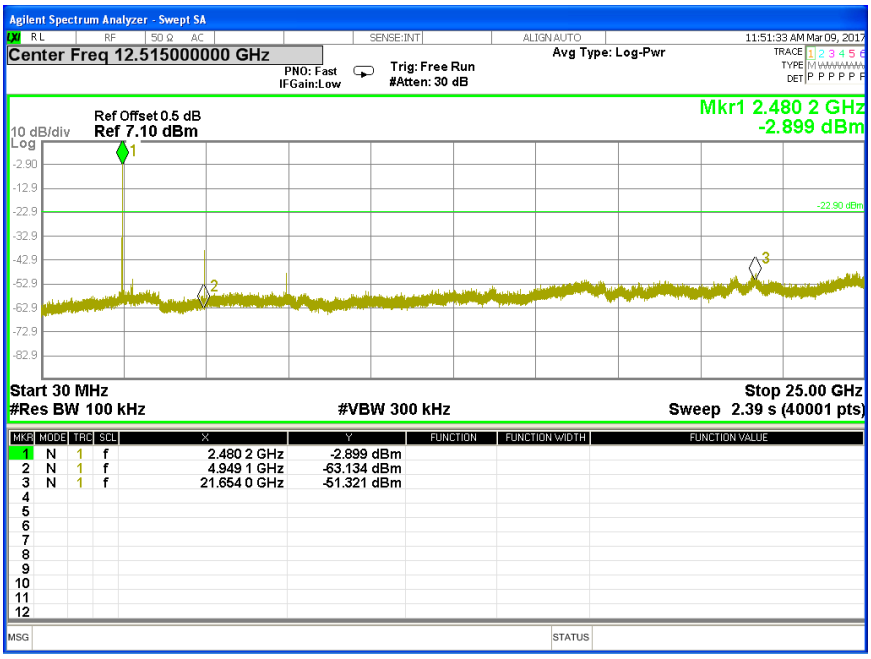
Spurious RF conducted emissions

2480MHz



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9.8 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.
5 Here the worst GFSK modulation mode was used to show compliance.

Limit:

According to §15.247(d) & 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.

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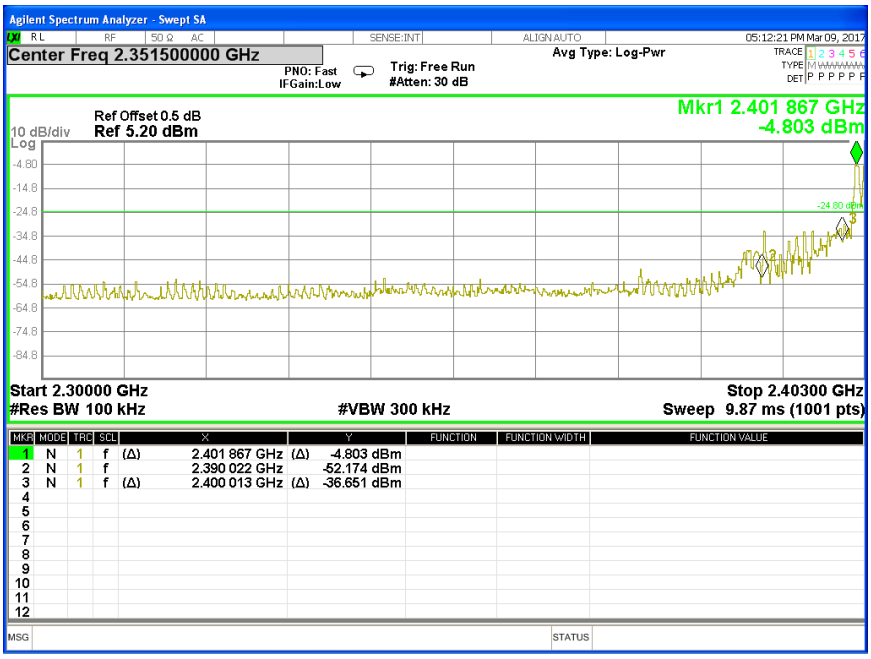
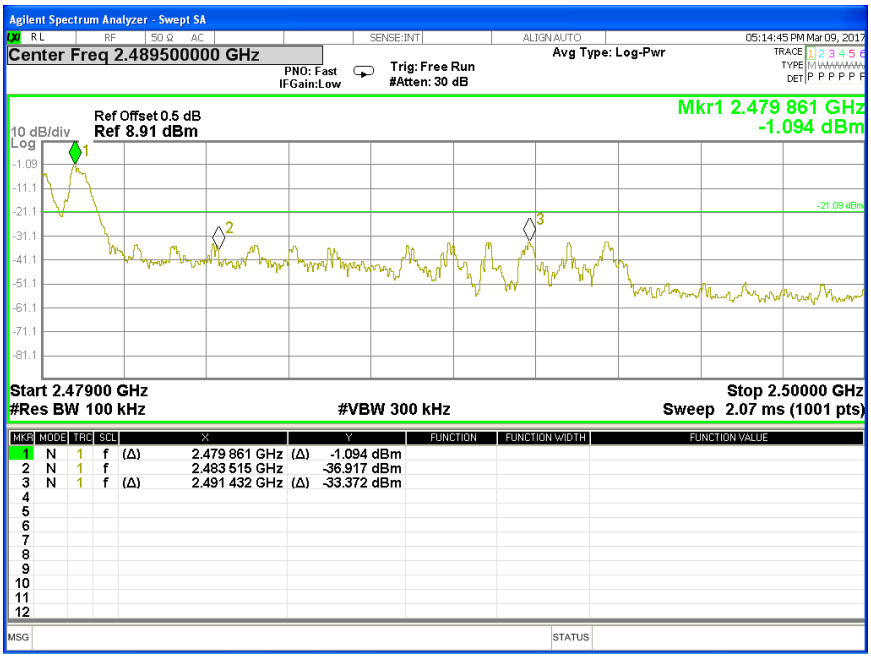
Band edge testing

GFSK Modulation Test Result:

Hopping On:





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9.9 Spurious radiated emissions for transmitter

Test Method

1. The EUT was place on a turn table which is 1.5m above ground plane for above 1GHz and 0.8m above ground for below 1GHz at 3meter chamber room for test. The table was rotated 360 degrees to determine the position of the highest radiation.
2. The EUT was set 3 meters away from the interference – receiving antenna, which was mounted on the top of a variable – height antenna tower.
3. The height of antenna is varied from one meter to four meters above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are set to make the measurement.
4. For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights from 1 meter to 4 meters and the rotatable table was turned
5. Use the following spectrum analyzer settings According to C63.10:
   For Above 1GHz
   Span = wide enough to capture the peak level of the in-band emission and all spurious
   RBW = 1MHz, VBW≥RBW for peak measurement and VBW = 10Hz for average measurement, Sweep = auto, Detector function = peak, Trace = max hold.
   For Below 1GHz
   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 for peak measurement, Sweep = auto, Detector function = peak, Trace = max hold.

Note:

1. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 120 KHz for Quasi-peak detection (QP) at frequency below 1GHz.
2. The resolution bandwidth of test receiver/spectrum analyzer is 1MHz and the video bandwidth is 3MHz for peak detection (PK) at frequency above 1GHz.
3. The resolution bandwidth of test receiver/spectrum analyzer is 1MHz and the video bandwidth is 3MHz for RMS Average ((duty cycle < 98%) for Average detection (AV) at frequency above 1GHz, then the measurement results was added to a correction factor (20log(1/duty cycle)).
4. The resolution bandwidth of test receiver/spectrum analyzer is 1MHz and the video bandwidth is 10Hz (duty cycle > 98%) for Average detection (AV) at frequency above 1GHz.

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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

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:

Transmitting Mode GFSK Modulation 2402MHz Test Result

Frequency	Emission Level	Polarization	Limit	Detector	Margin	Result
MHz	dBuV/m		dBµV/m		dBuV/m	
159.7844	29.97	Horizontal	43.50	QP	13.53	Pass
239.9873	28.42	Horizontal	46.00	QP	17.58	Pass
440.1963	35.30	Horizontal	46.00	QP	10.70	Pass
520.8881	36.53	Horizontal	46.00	QP	9.47	Pass
356.6757	30.99	Vertical	43.50	QP	15.01	Pass
520.8881	32.44	Vertical	46.00	QP	13.56	Pass
601.4265	33.36	Vertical	46.00	QP	12.64	Pass
752.7432	32.14	Vertical	46.00	QP	13.86	Pass
14121.439	46.11	Horizontal	74.00	PK	27.89	Pass
14121.439	45.11	Vertical	74.00	PK	28.89	Pass

Transmitting Mode GFSK Modulation 2441MHz Test Result

Frequency	Emission Level	Polarization	Limit	Detector	Margin	Result
MHz	dBuV/m		dBµV/m		dBuV/m	
14121.439	45.39	Horizontal	74.00	PK	28.61	Pass
14115.442	44.41	Vertical	74.00	PK	29.59	Pass

Transmitting Mode GFSK Modulation 2480MHz Test Result

Frequency	Emission Level	Polarization	Limit	Detector	Margin	Result
MHz	dBuV/m		dBµV/m		dBuV/m	
14133.433	44.39	Horizontal	74.00	PK	29.61	Pass
14115.442	45.80	Vertical	74.00	PK	28.20	Pass

Remark: Testing is carried out with frequency rang 30MHz to 18GHz, the detected values which are noise floor or below the limit 30dB will not be recorded.

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10 Test Equipment List

List of Test Instruments

Test Equipment	Manufacturer	Model No	Serial No	Cal. Date	Cal. Due Date
SIGNAL ANALYZER	R&S	FSV40	101470	2016.06.29	2017.06.28
EMI Measuring Receiver	R&S	ESR	101660	2016.06.29	2017.06.28
Low Noise Pre Amplifier	Tsj	MLA-10K01-B01-27	1205323	2016.06.29	2017.06.28
Low Noise Pre Amplifier	Tsj	MLA-0120-A02-34	2648A04738	2016.06.29	2017.06.28
TRILOG Super Broadband test Antenna	SCHWARZBECK	VULB9160	9160-3206	2016.06.29	2017.06.28
Broadband Horn Antenna	SCHWARZBECK	BBHA9120D	452	2017.01.29	2018.01.28
SHF-EHF Horn	SCHWARZBECK	BBHA9170	BBHA9170367	2016.06.29	2017.06.28
50Ω Coaxial Switch	Anritsu	MP59B	6200264416	2016.06.29	2017.06.28
EMI Test Receiver	R&S	ESCI	100124	2016.06.29	2017.06.28
LISN	Kyoritsu	KNW-242	8-837-4	2016.06.29	2017.06.28
LISN	Kyoritsu	KNW-407	8-1789-3	2016.06.29	2017.06.28
Loop Antenna	ETS	6512	00165355	2016.06.29	2017.06.28

RF Connected Test

Kind of Equipment	Manufacturer	Type No.	Serial No.	Last calibration	Calibrated until
Signal Analyzer	Agilent	N9020A	MY49100060	2016.10.23	2017.10.22

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11 System Measurement Uncertainty

No.	Item	Uncertainty
1	Conducted Emission (9KHz-150KHz)	±2.88dB
2	Conducted Emission (150KHz-30MHz)	±2.67dB
3	RF power,conducted	±0.70dB
4	Spurious emissions,conducted	±1.19dB
5	All emissions,radiated(<30M) (9KHz-30MHz)	±2.45dB
6	All emissions,radiated(<1G) 30MHz-200MHz	±2.83dB
7	All emissions,radiated(<1G) 200MHz-1000MHz	±2.94dB
8	All emissions,radiated(>1G)	±3.03dB
9	Temperature	±0.5°C
10	Humidity	±2%

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