FCC/IC - TEST REPORT

Report Number	:	**60.790.16.701.01R03**	Date of Issue:	May 24, 2016

Model	:	OTE28
Product Type	:	Bluetooth headset
Applicant	:	GN Netcom A/S
Address	:	Lautrupbjerg 7,DK – 2750 Ballerup, Denmark
Production Facility	:	Charter Media (Dongguan) Co., Ltd.
Address	:	Dabandi Industrial Zone, Daning District, Humen Town, Dongguan City, Guangdong Province 523930, P. R. China
Test Result	:	■ **Positive** ☐ **Negative**
Total pages including Appendices	:	53

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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 Hong Kong Ltd.
3/F, West Wing, Lakeside 2,
10 Science Park West Avenue,
Science Park, Shatin, Hong Kong

Test Site 2
Company name: Hong Kong Productivity Council
LG1, HKPC Building,
78 Tat Chee Avenue,
Kowloon, Hong Kong

FCC Registration Number: 90656

IC Registration Number:4780A

3 Description of the Equipment Under Test

Product:	Bluetooth headset
Model no.:	OTE28
Options and accessories:	Nil
Rating:	DC3.7V Supplied by Li-ion Rechargeable Battery DC5.0V Charged by the mini-USB port
RF Transmission Frequency:	2402MHz-2480MHz
No. of Operated Channel:	79
Modulation:	GFSK, π/4-DQPSK, 8-DPSK
Antenna Type:	PIFA
Antenna Gain:	2dBi
Description of the EUT:	The Equipment Under Test (EUT) is a Bluetooth headset operated at 2.4GHz

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4 Summary of Test Standards

Test Standards	
FCC Part 15 Subpart C 10-1-2015 Edition	PART 15 - RADIO FREQUENCY DEVICES Subpart C - Intentional Radiators
RSS-247 Issue 1 2015	Digital Transmission Systems (DTSs), Frequency Hopping Systems (FHSS) and Licence-Exempt Local Area Network (LE-LAN) Devices
RSS-Gen Issue 4 November 2014	General Requirements and Information for the Certification of Radio Apparatus

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 ANSI C63.10-2013.

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5 Summary of Test Results

Technical Requirements					
FCC Part 15 Subpart C/RSS-247 Issue 1/RSS-Gen Issue 4					
Test Condition			Pages	Test Result	Test Site
§15.207	RSS-GEN 8.8	Conducted emission AC power port	10	Pass	Site 2
§15.247(b)(1)	RSS-247 Clause 5.4(2)	Conducted peak output power	19	Pass	Site 2
§15.247(e)	RSS-247 Clause 5.2(2)	Power spectral density*	--	N/A	--
§15.247(a)(2)	RSS-247 Clause 5.2(1)	6dB bandwidth	--	N/A	--
§15.247(a)(1)	RSS-247 Clause 5.1(1)	20dB bandwidth and 99% Occupied Bandwidth	26	Pass	Site 2
§15.247(a)(1)	RSS-247 Clause 5.1(2)	Carrier frequency separation	29	Pass	Site 2
§15.247(a)(1)(iii)	RSS-247 Clause 5.1(4)	Number of hopping frequencies	31	Pass	Site 2
§15.247(a)(1)(iii)	RSS-247 Clause 5.1(4)	Dwell Time	34	Pass	Site 2
§15.247(d)	RSS-247 Clause 5.5	Spurious RF conducted emissions	38	Pass	Site 2
§15.247(d)	RSS-247 Clause 5.5	Band edge	45	Pass	Site 2
§15.247(d) & §15.209 &	RSS-247 Clause 5.5 & RSS-GEN 6.13	Spurious radiated emissions for transmitter and receiver	39	Pass	Site 2
§15.203	RSS-GEN 8.3	Antenna requirement	See note 1	Pass	--

Note 1: N/A=Not Applicable.
Note 2: The EUT uses a patch antenna, which gain is 2dBi. 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:BCE-OTE28, IC: 2386C-OTE28 complies with Section 15.207, 15.209, 15.247 of the FCC Part 15, Subpart C, RSS-247 Issue 1 and RSS-Gen Issue 4 rules.

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: January 18, 2016

Testing Start Date: January 18, 2016

Testing End Date: February 26, 2016

- TÜV SÜD HONG KONG LTD. -

Reviewed by: Prepared by:

Cookies Bu
EMC Project Manager

Felix Li
EMC Project Engineer

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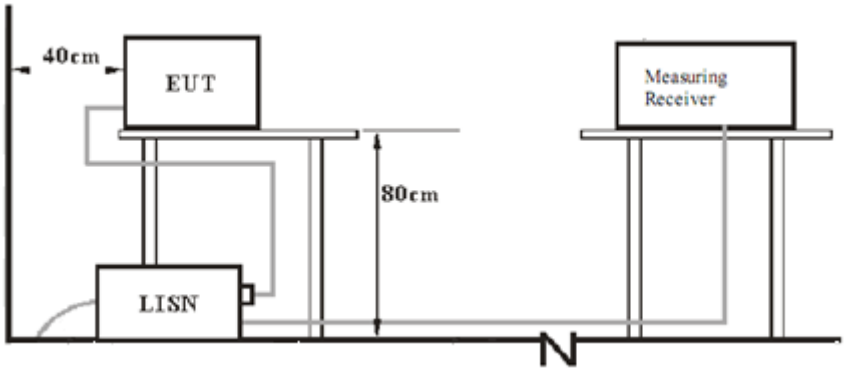
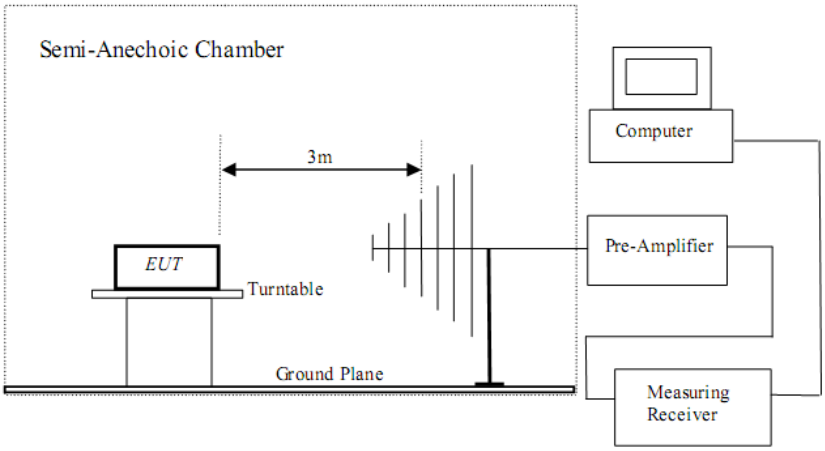
7 Test Setups

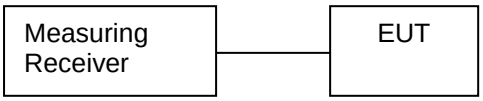
7.1 AC Power Line Conducted Emission test setups



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.	S/N
PC	lenovo	X220	---

Test software: Blue test 3.0, 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 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

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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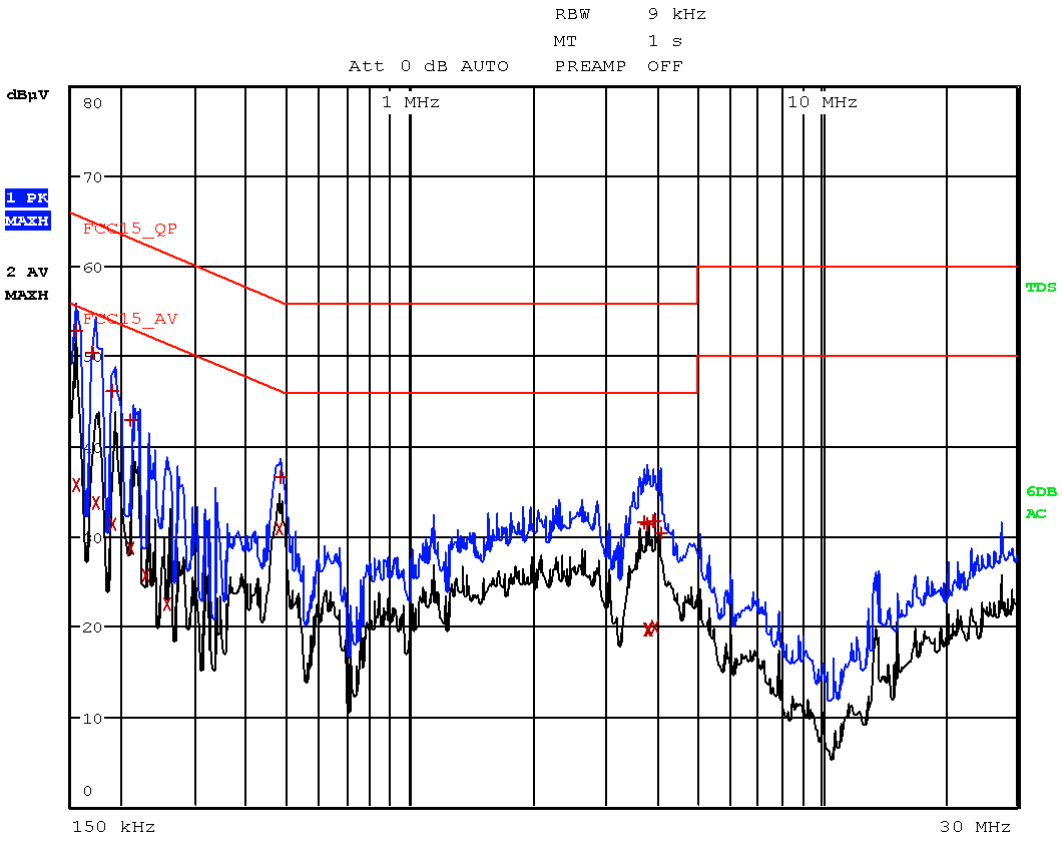
Conducted Emission

Product Type	:	Bluetooth headset
M/N	:	OTE28
Operating Condition	:	Charging & BT
Test Specification	:	Live
Comment	:	AC 120V/60Hz



Trace	Frequency	Level (dBµV)	Detector	Delta Limit/dB
1	154.000000000 kHz	52.91	Quasi Peak	-12.87
2	154.000000000 kHz	35.79	Average	-19.99
1	170.000000000 kHz	50.34	Quasi Peak	-14.62
2	174.000000000 kHz	33.68	Average	-21.09
1	190.000000000 kHz	46.09	Quasi Peak	-17.95
2	190.000000000 kHz	31.29	Average	-22.75
1	210.000000000 kHz	42.93	Quasi Peak	-20.28
2	210.000000000 kHz	28.74	Average	-24.47
2	230.000000000 kHz	25.65	Average	-26.80
2	258.000000000 kHz	22.40	Average	-29.10
2	478.000000000 kHz	30.90	Average	-15.47
1	482.000000000 kHz	36.51	Quasi Peak	-19.79
1	3.714000000 MHz	31.48	Quasi Peak	-24.52
1	3.782000000 MHz	31.41	Quasi Peak	-24.59
2	3.782000000 MHz	19.57	Average	-26.43
2	3.814000000 MHz	19.58	Average	-26.42
1	3.890000000 MHz	31.73	Quasi Peak	-24.27
1	3.950000000 MHz	31.60	Quasi Peak	-24.40
2	3.950000000 MHz	19.84	Average	-26.16
1	4.062000000 MHz	30.36	Quasi Peak	-25.64

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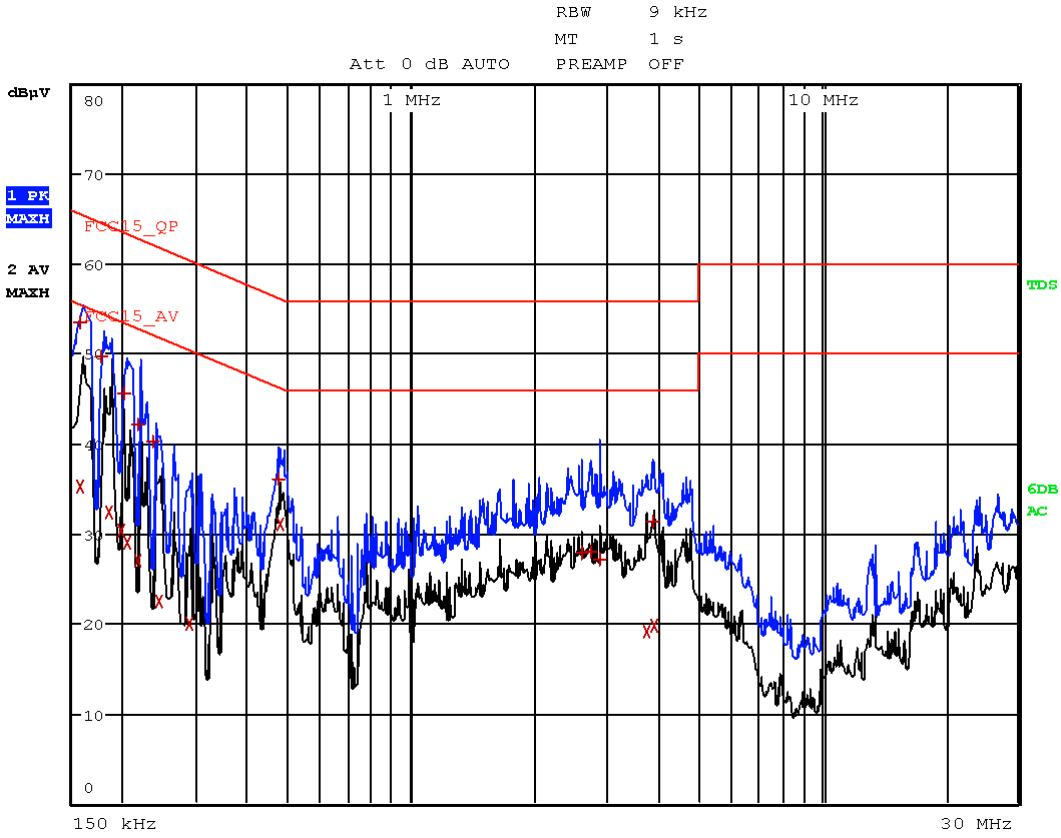
Conducted Emission

Product Type	:	Bluetooth headset
M/N	:	OTE28
Operating Condition	:	Charging & BT
Test Specification	:	Neutral
Comment	:	AC 120V/60Hz



Trace	Frequency	Level (dBµV)	Detector	Delta Limit/dB
1	158.000000000 kHz	53.58	Quasi Peak	-11.99
2	158.000000000 kHz	35.17	Average	-20.40
1	178.000000000 kHz	49.60	Quasi Peak	-14.98
2	186.000000000 kHz	32.29	Average	-21.93
2	198.000000000 kHz	30.32	Average	-23.37
1	202.000000000 kHz	45.62	Quasi Peak	-17.90
2	206.000000000 kHz	29.07	Average	-24.30
1	218.000000000 kHz	42.10	Quasi Peak	-20.80
2	218.000000000 kHz	26.93	Average	-25.97
1	238.000000000 kHz	40.23	Quasi Peak	-21.94
2	246.000000000 kHz	22.44	Average	-29.45
2	290.000000000 kHz	19.89	Average	-30.64
1	474.000000000 kHz	36.07	Quasi Peak	-20.38
2	478.000000000 kHz	30.94	Average	-15.44
1	2.586000000 MHz	27.90	Quasi Peak	-28.10
1	2.726000000 MHz	27.98	Quasi Peak	-28.02
1	2.866000000 MHz	27.20	Quasi Peak	-28.80
2	3.754000000 MHz	19.02	Average	-26.98
1	3.886000000 MHz	31.42	Quasi Peak	-24.58
2	3.894000000 MHz	19.70	Average	-26.30

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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

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

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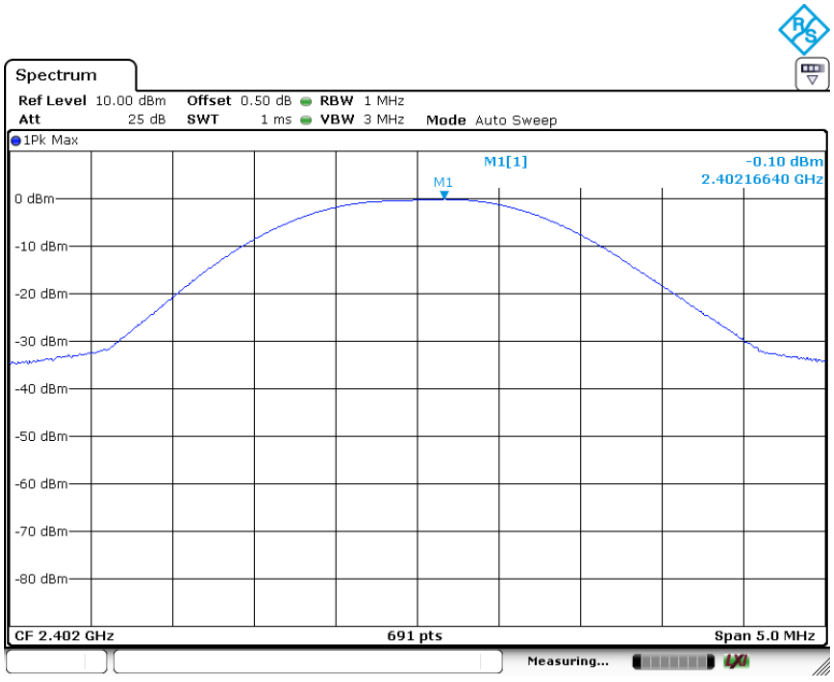
Conducted peak output power

Bluetooth Mode GFSK modulation Test Result

Frequency MHz	Conducted Peak Output Power dBm	Result
Low channel 2402MHz	-0.10	Pass
Middle channel 2441MHz	3.95	Pass
High channel 2480MHz	3.53	Pass

Low channel 2402MHz



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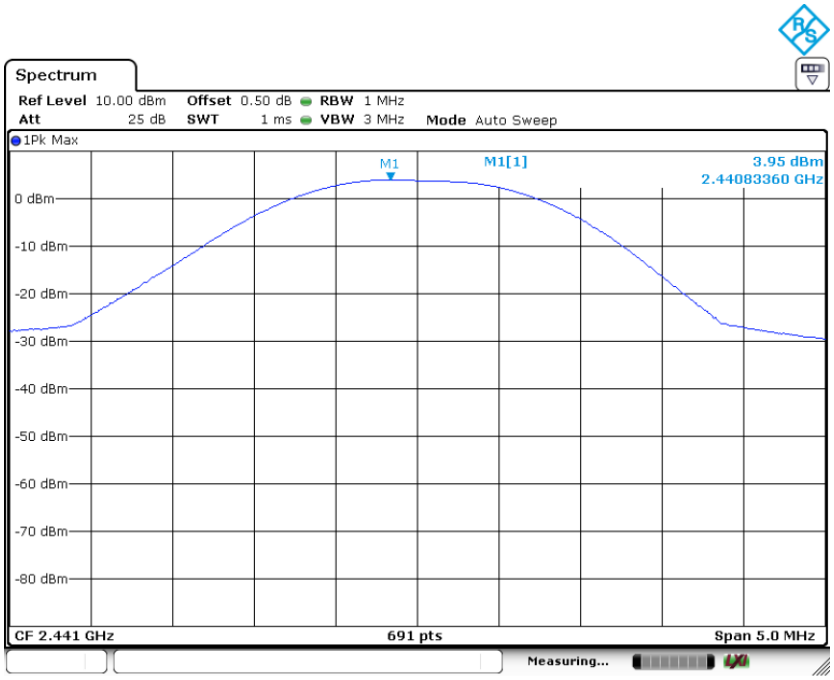
Middle channel 2441MHz



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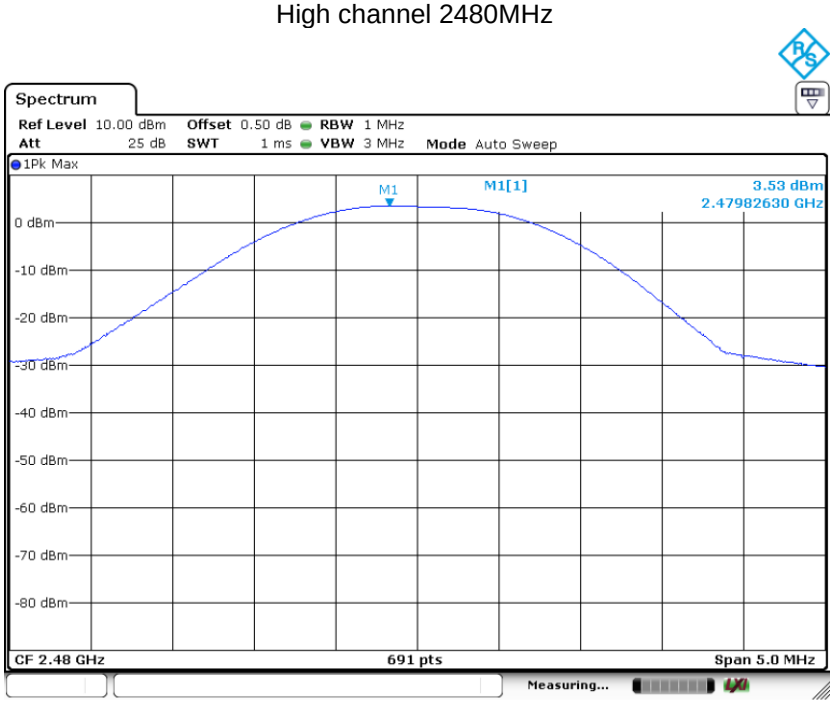
High channel 2480MHz



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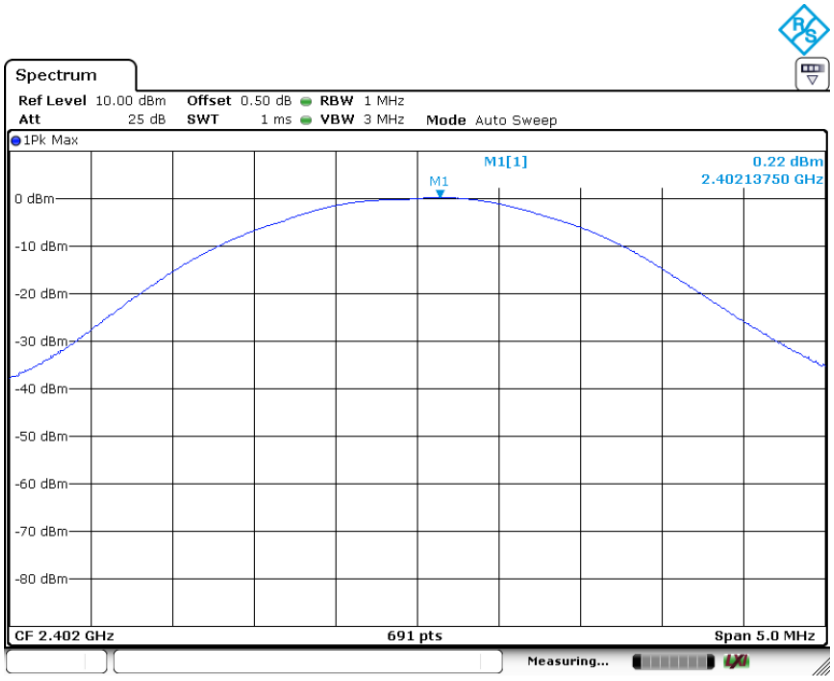
Bluetooth Mode π/4-DQPSK modulation Test Result

Frequency MHz	Conducted Peak Output Power dBm	Result
Low channel 2402MHz	0.22	Pass
Middle channel 2441MHz	3.52	Pass
High channel 2480MHz	3.21	Pass

Low channel 2402MHz



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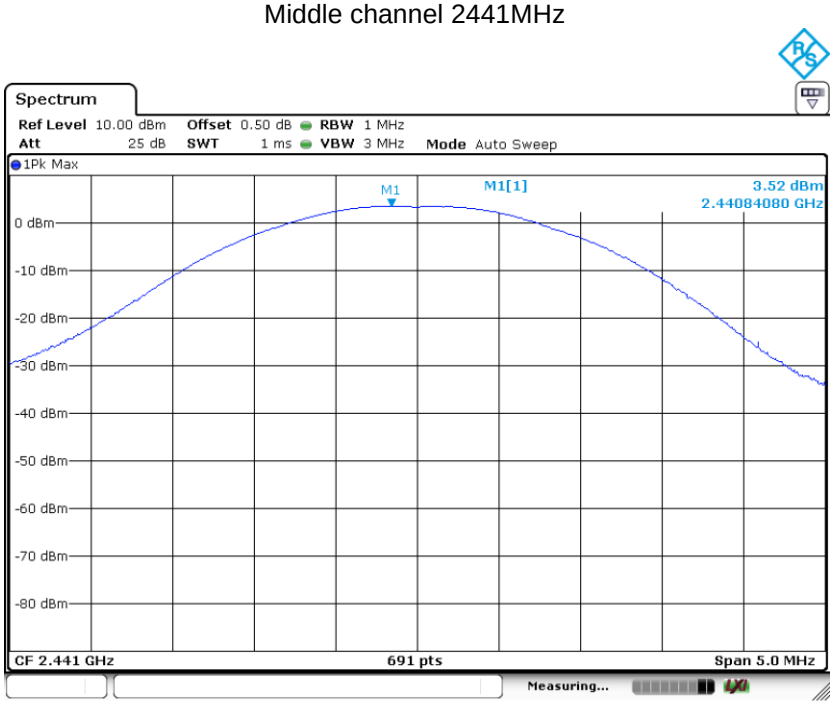
Middle channel 2441MHz



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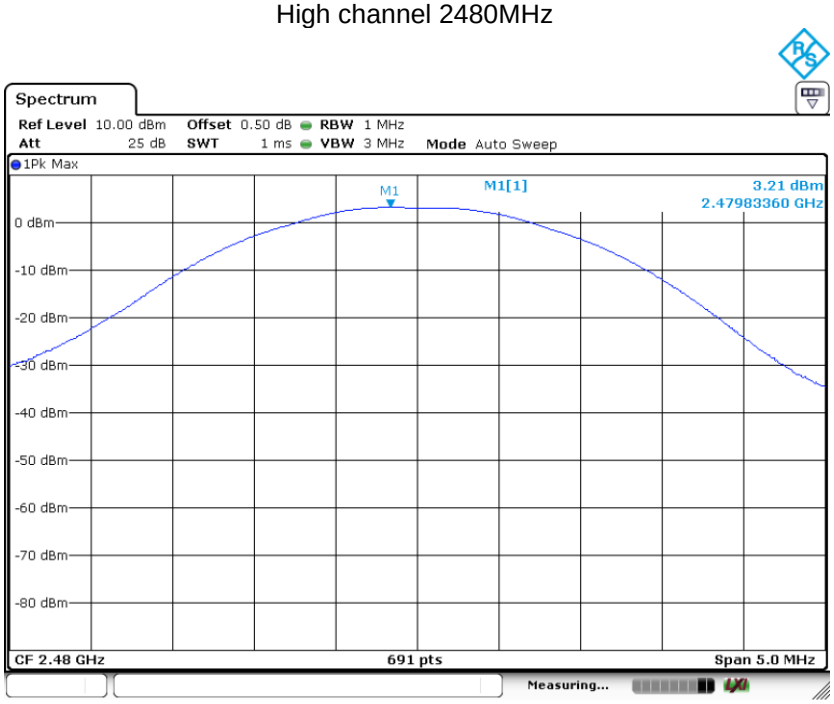
High channel 2480MHz



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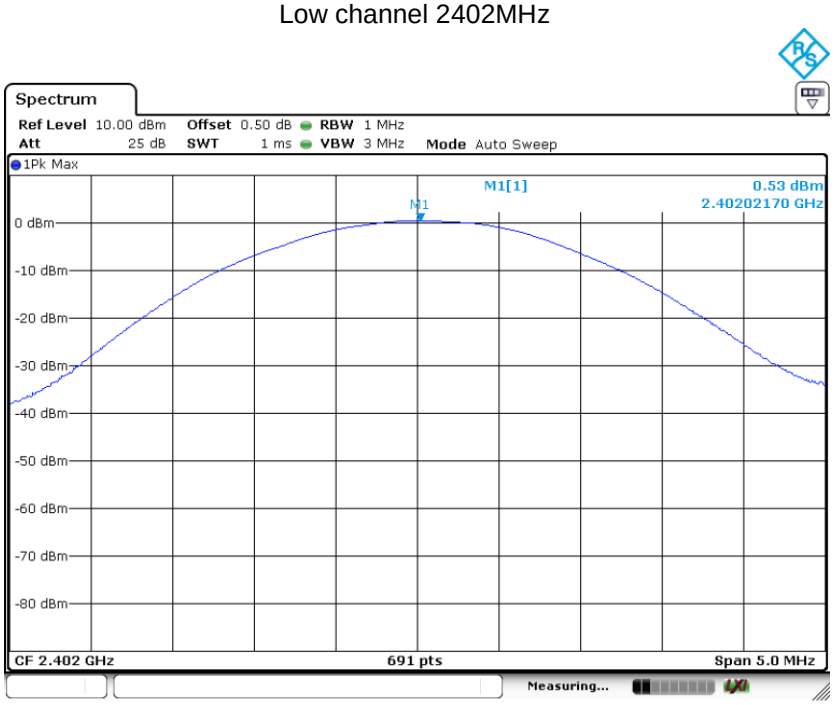
Bluetooth Mode 8DPSK modulation Test Result

Frequency MHz	Conducted Peak Output Power dBm	Result
Low channel 2402MHz	0.53	Pass
Middle channel 2441MHz	4.10	Pass
High channel 2480MHz	3.75	Pass

Low channel 2402MHz



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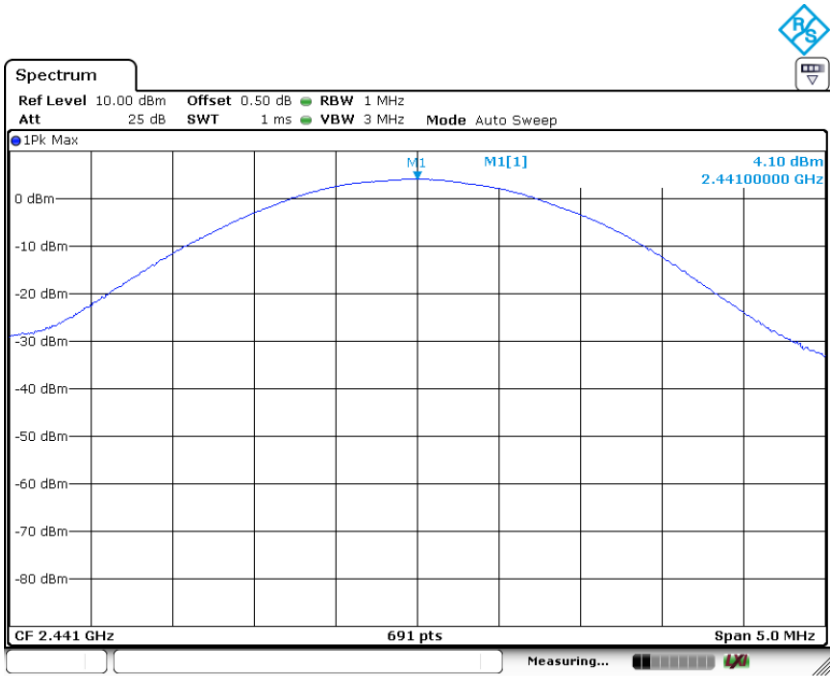
Middle channel 2441MHz



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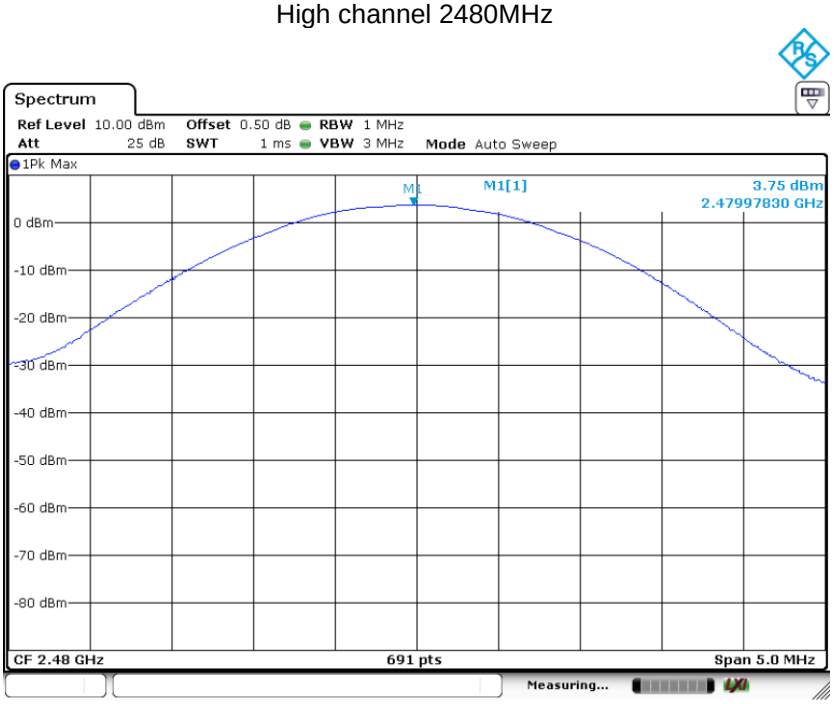
High channel 2480MHz



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9.3 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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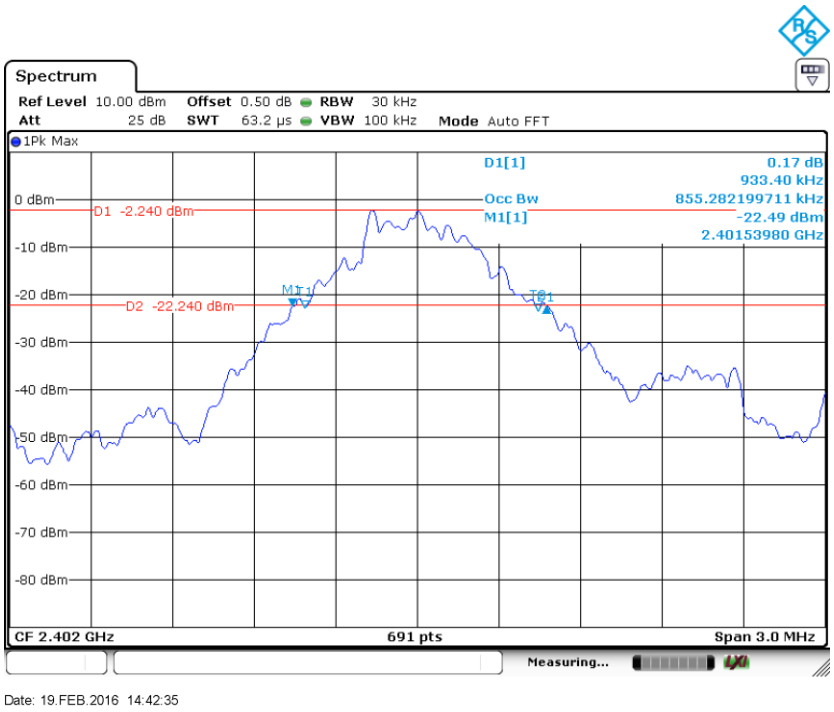
20 dB bandwidth and 99% Occupied Bandwidth

Bluetooth Mode GFSK Modulation test result

Frequency MHz	20 dB Bandwidth kHz	99% Bandwidth kHz	Limit kHz	Result
2402	933.4	855.8	--	Pass
2441	890.0	850.9	--	Pass
2480	890.0	850.9	--	Pass

2402MHz



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2441MHz

Date: 19.FEB.2016 14:41:41

2480MHz

Date: 19.FEB.2016 14:40:33

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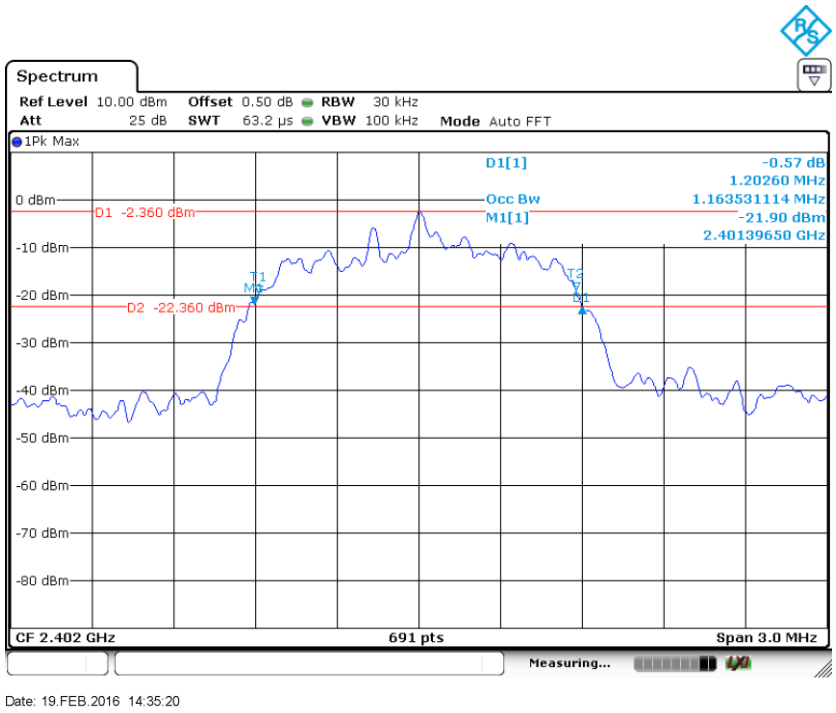
20 dB bandwidth and 99% Occupied Bandwidth

Bluetooth Mode π/4-DQPSK Modulation test result

Frequency MHz	20 dB Bandwidth kHz	99% Bandwidth kHz	Limit kHz	Result
2402	1202.6	1163.53	--	Pass
2441	1220.0	1167.87	--	Pass
2480	1220.0	1167.87	--	Pass

2402MHz



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2441MHz

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2480MHz

Date: 19.FEB.2016 14:39:08

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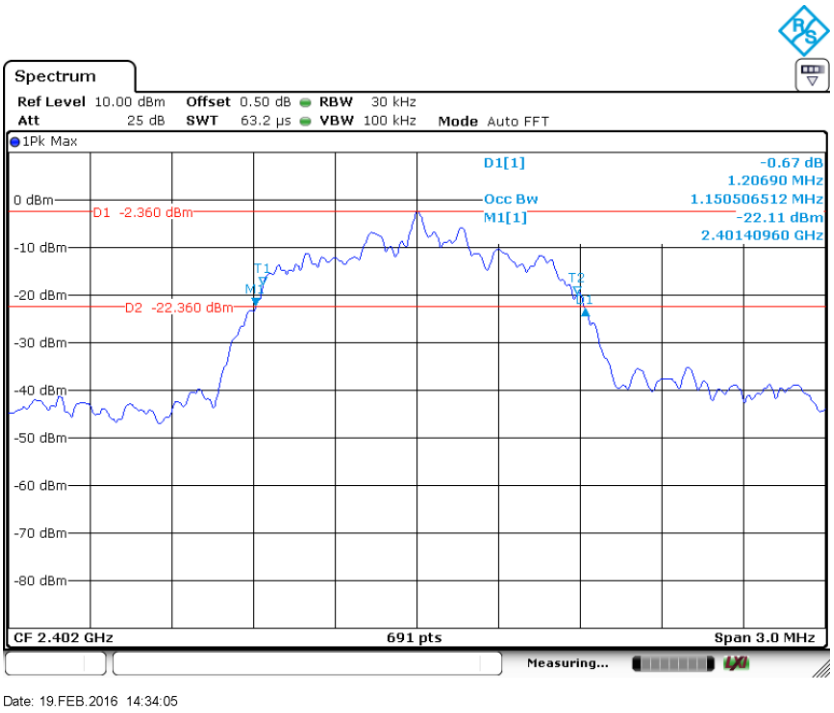
20 dB bandwidth and 99% Occupied Bandwidth

Bluetooth Mode 8DPSK Modulation test result

Frequency MHz	20 dB Bandwidth kHz	99% Bandwidth kHz	Limit kHz	Result
2402	1206.9	1150.6	--	Pass
2441	1211.3	1146.2	--	Pass
2480	1211.3	1150.1	--	Pass

2402MHz



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2441MHz

Date: 19.FEB.2016 14:32:41

2480MHz

Date: 19.FEB.2016 14:31:04

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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	622.27
2441	593.33
2480	593.33

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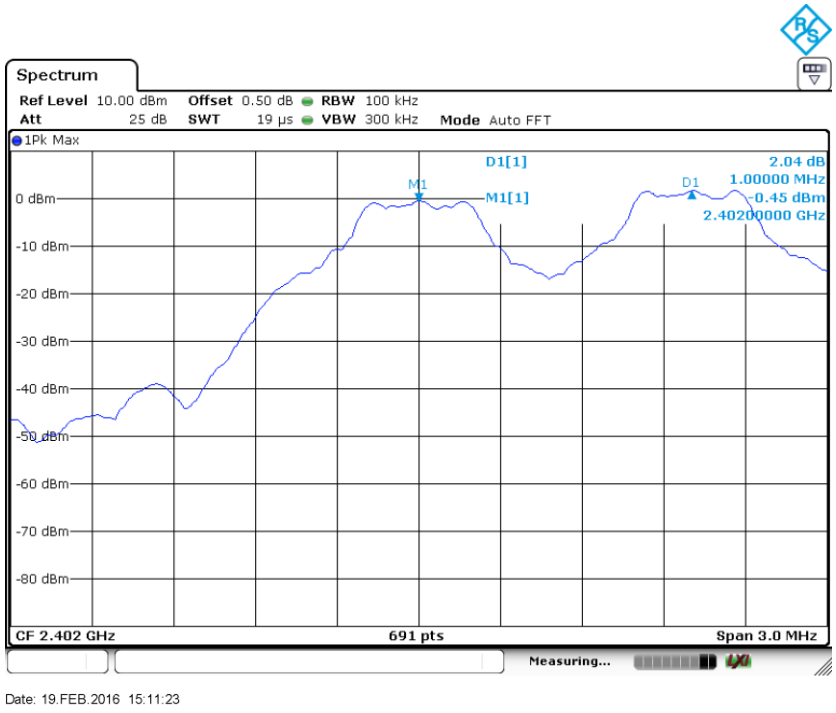
Carrier Frequency Separation

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	1000.0	Pass
2441	1000.0	Pass
2480	1000.0	Pass

Low Channel



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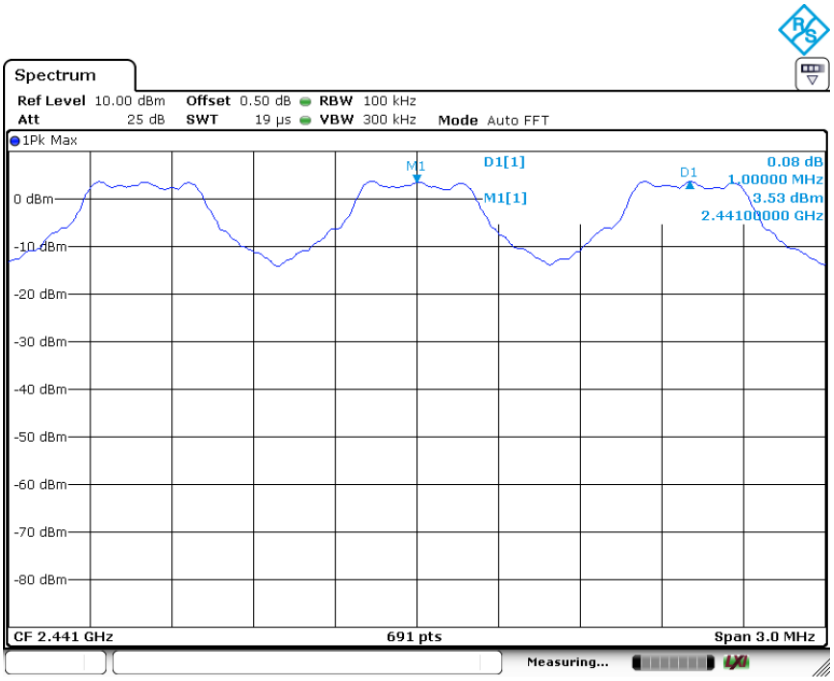
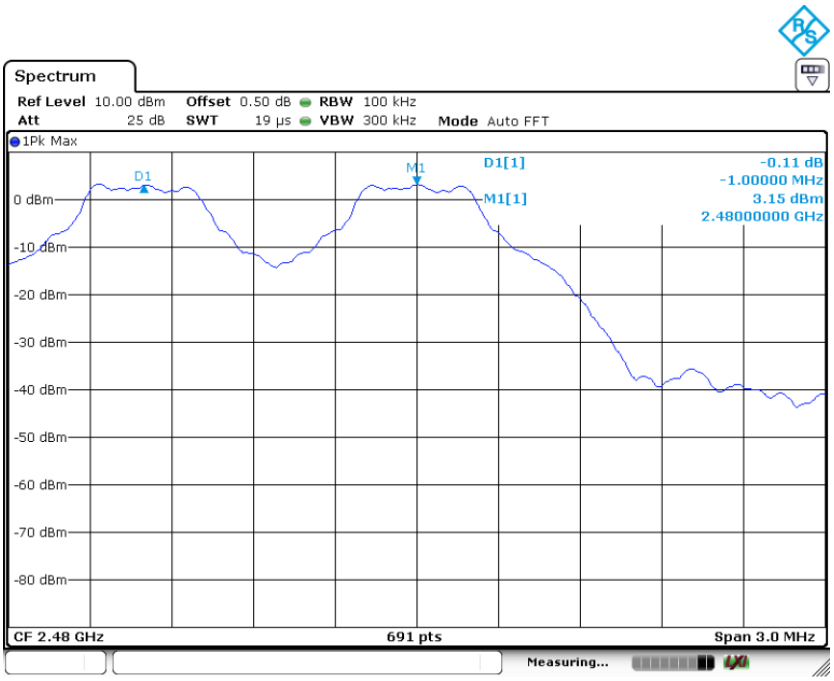
Middle channel



Date: 19.FEB.2016 15:12:10

High Channel



Date: 19.FEB.2016 15:13:25

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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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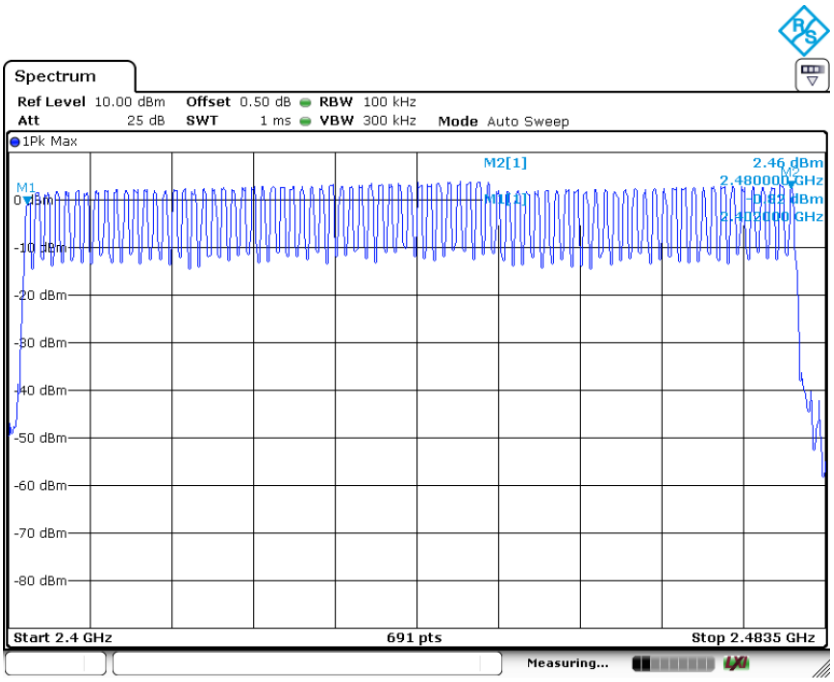
Number of hopping frequencies

Test result: The measurement was performed with the typical configuration (normal hopping status), 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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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

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.

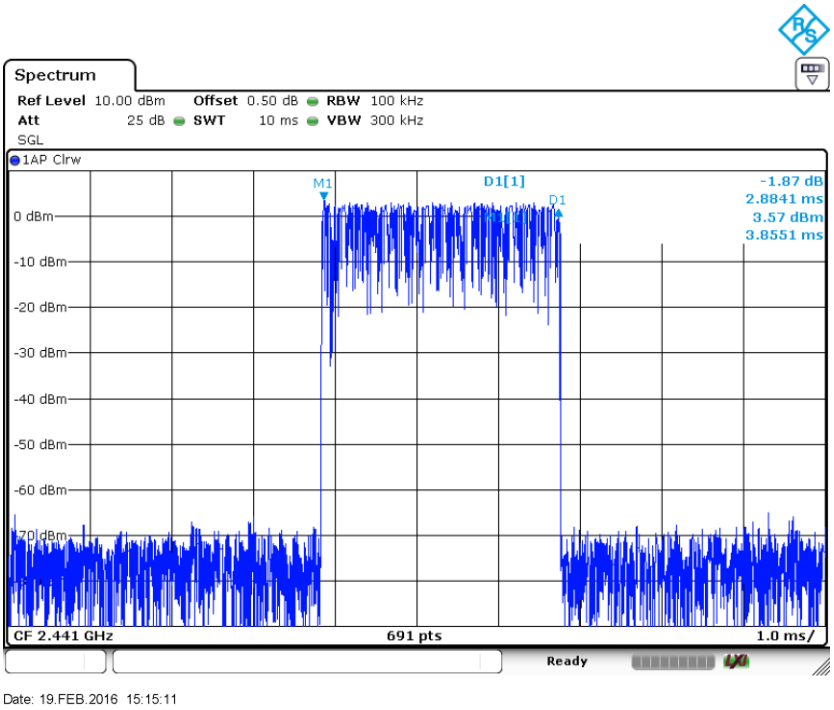
The maximum number of hopping channels in 31.6s for DH5=1600 / 6 / 79 *31.6=106.67

Test Result

Modulation	Mode	Reading (us)	Total Hops	Test Result (ms)	Limit (ms)	Result
GFSK	DH5	2884.1	106.67	307.65	< 400	Pass
π/4-DQPSK	2DH5	2898.6	106.67	309.19	< 400	Pass
8-DPSK	3DH5	2913.0	106.67	310.73	< 400	Pass

GFSK Modulation

DH5



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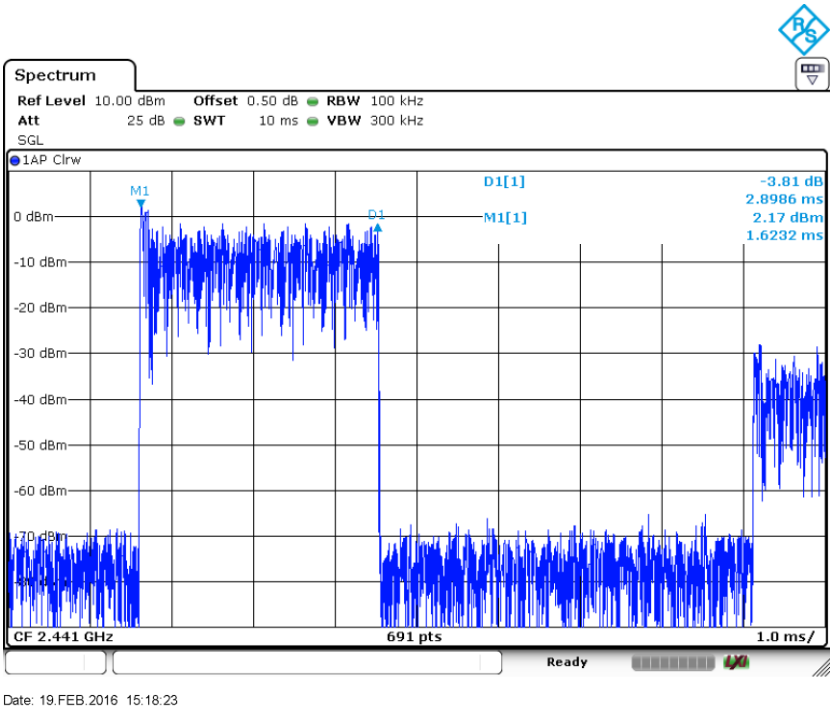
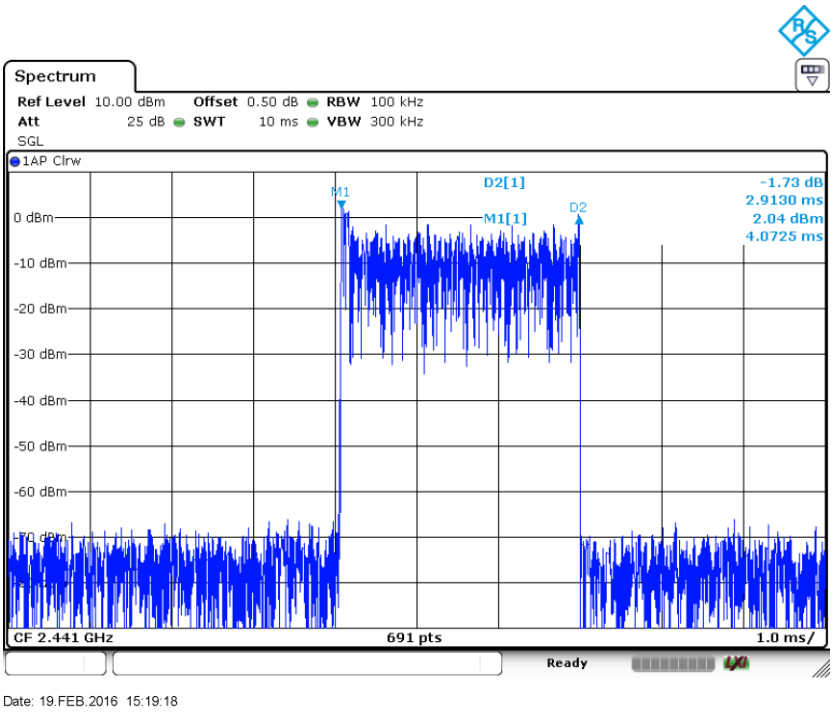
π/4-DQPSK Modulation



2DH5

8-DPSK Modulation



3DH5

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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.

Limit

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

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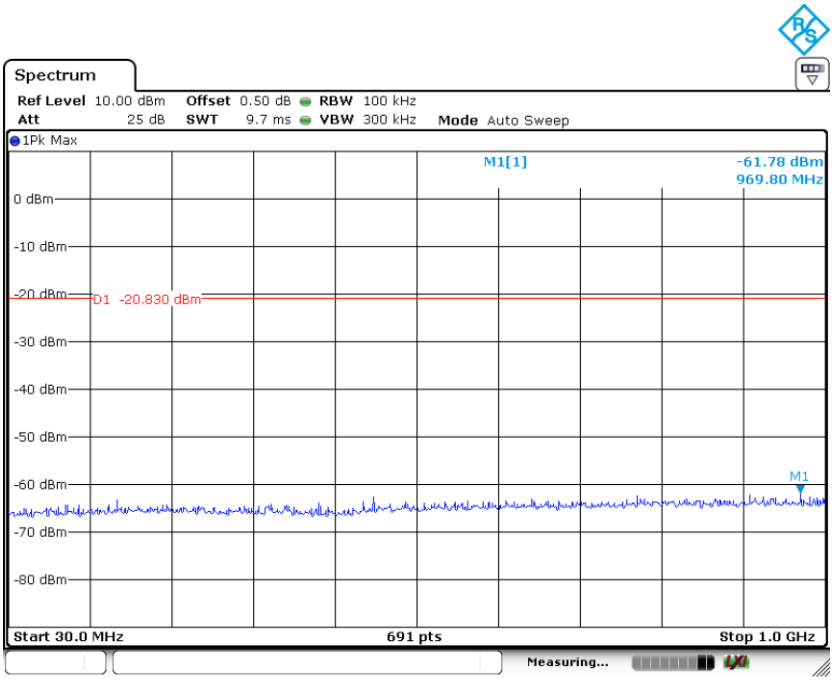
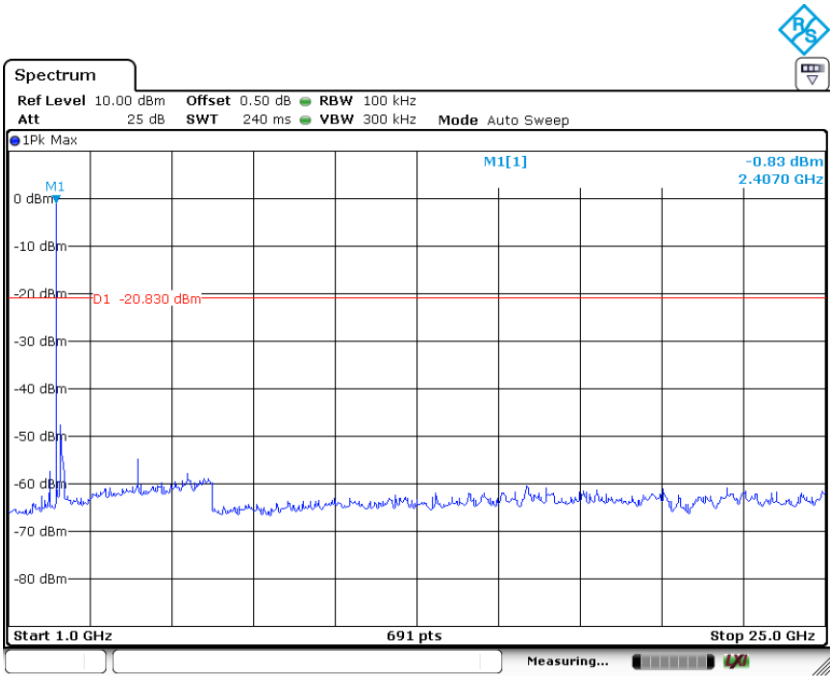
Spurious RF conducted emissions

Only the worse case (which is subject to the maximum EIRP, 8-DPSK mode) test result is listed in the report.
BT3.0 8-DPSK Modulation:
2402MHz



Date: 19.FEB.2016 14:47:15



Date: 19.FEB.2016 14:45:46

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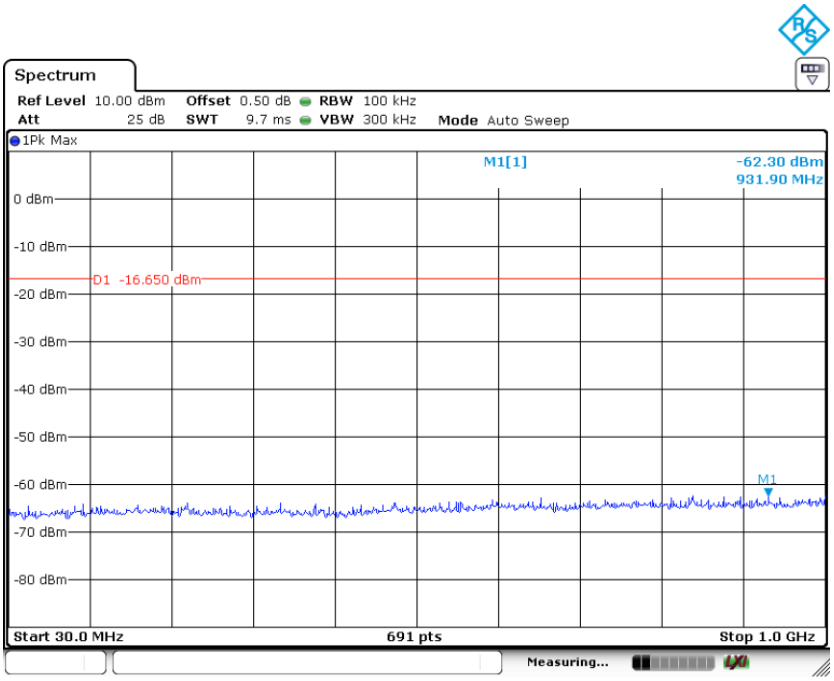
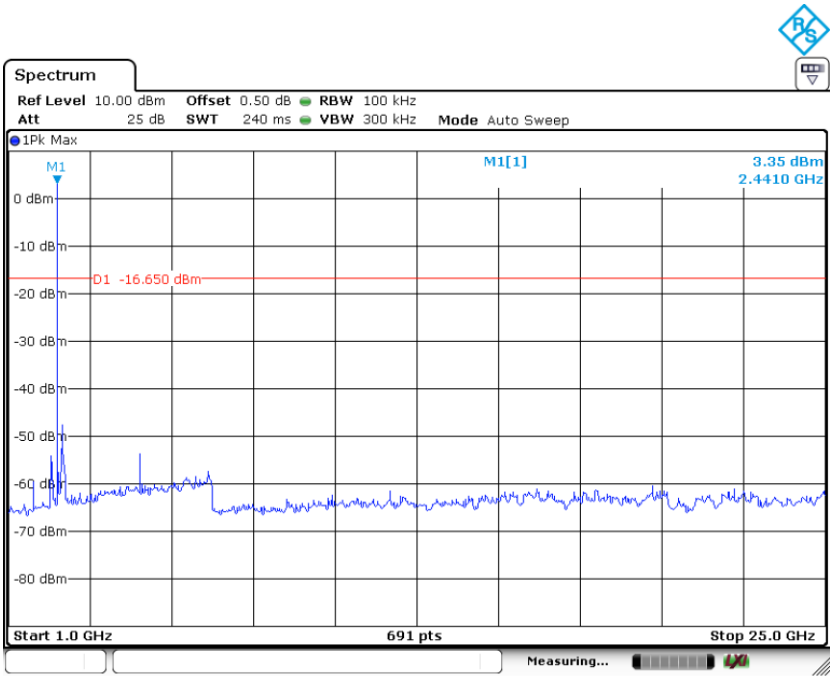
2441MHz



Date: 19.FEB.2016 14:48:54



Date: 19.FEB.2016 14:48:28

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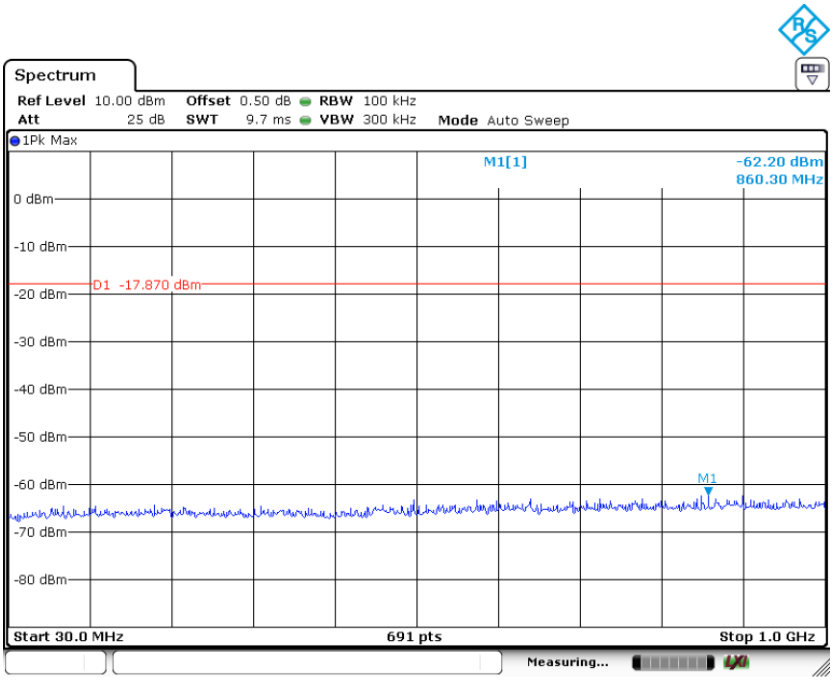
2480MHz



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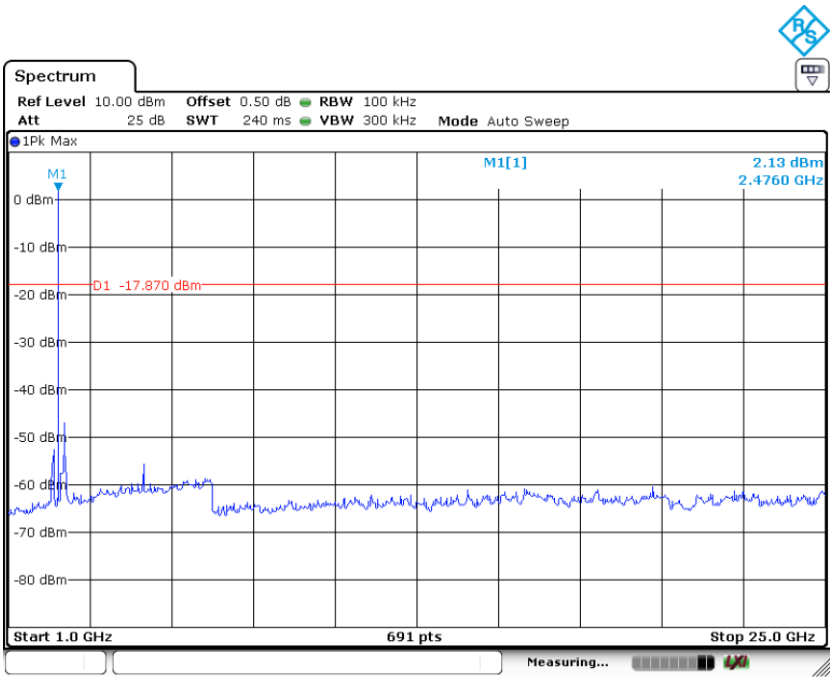

Date: 19.FEB.2016 14:50:58

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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.

Limit:

In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated device is operating, the RF power that is produced shall be at least 20 dB below that in the100 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 that the transmitter demonstrates compliance with the peak conducted power limits.

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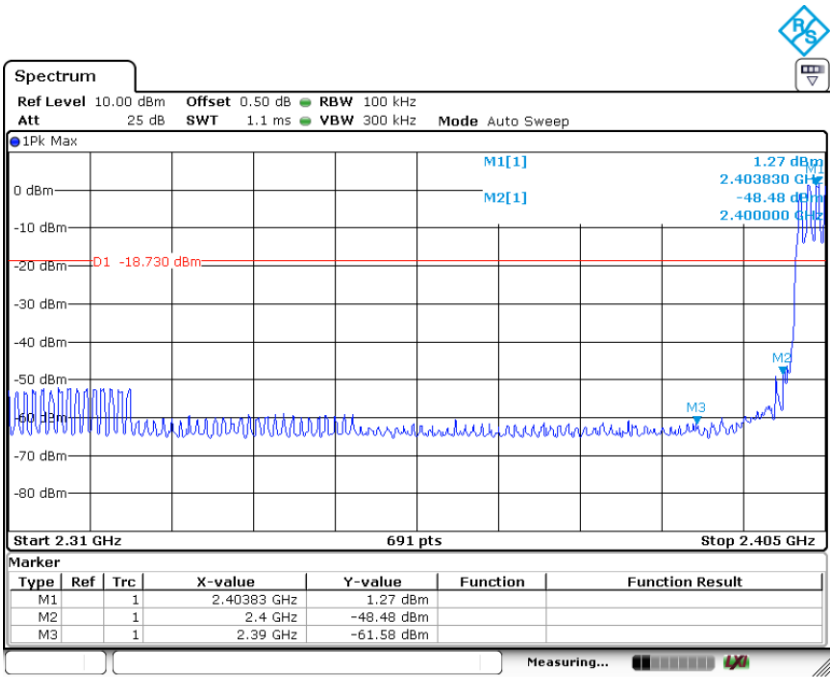
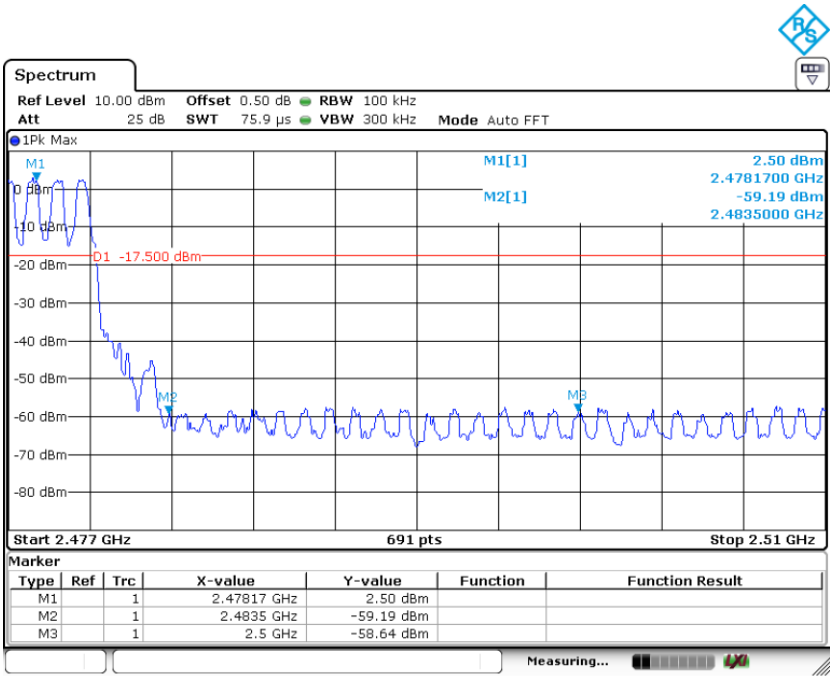
Band edge testing

BT3.0 GFSK Modulation Test Result:
Hopping on mode:



Date: 19.FEB.2016 15:04:53



Date: 19.FEB.2016 14:55:07

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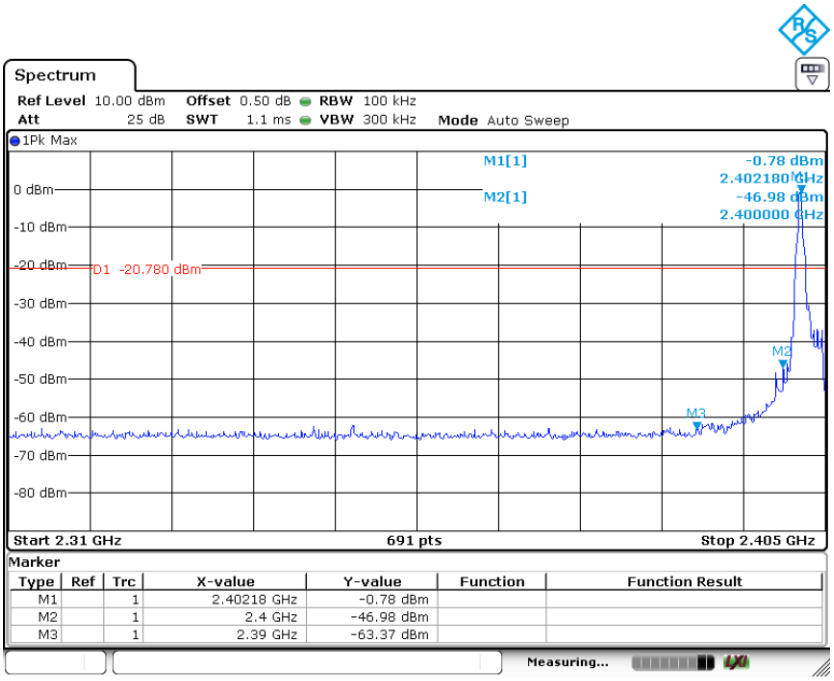
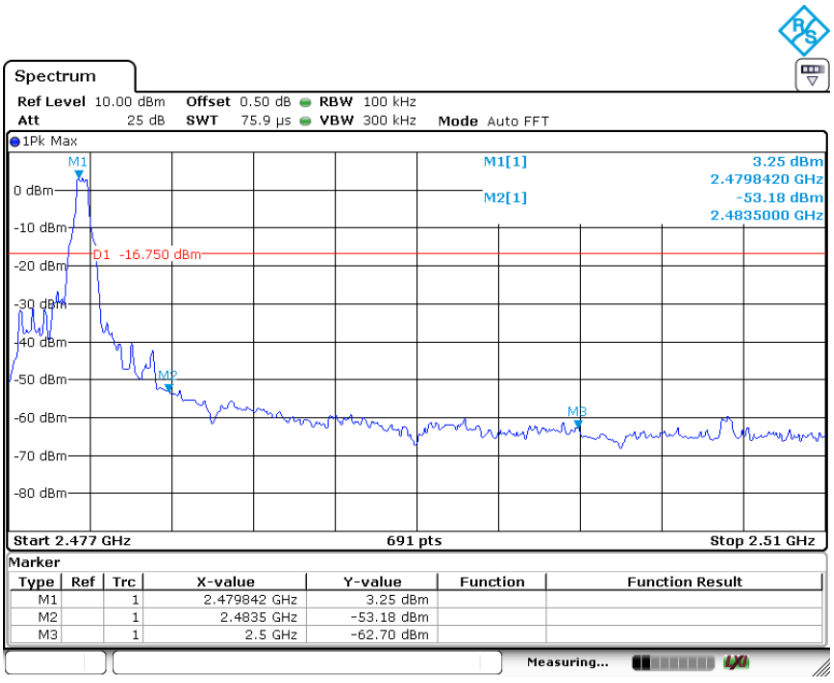
Hopping off mode:



Date: 19.FEB.2016 15:03:16



Date: 19.FEB.2016 14:53:13

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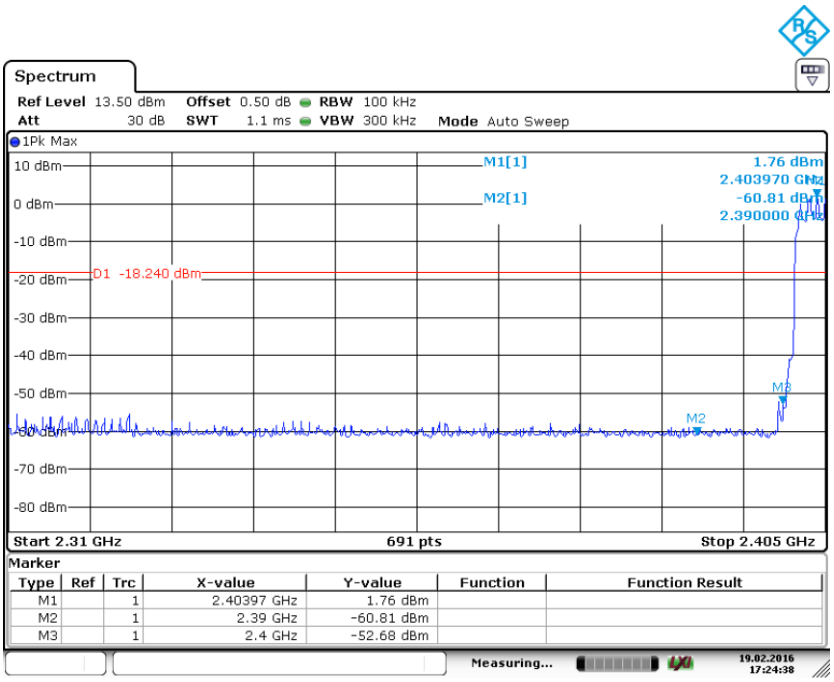
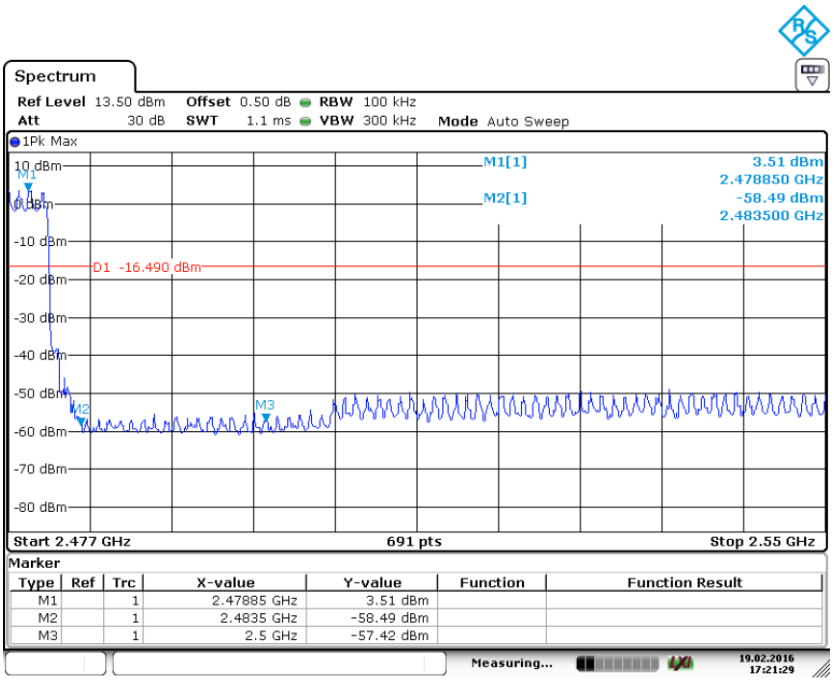
BT3.0 π/4-DQPSK Modulation Test Result:
Hopping on mode:



Date: 19.FEB.2016 17:24:38



Date: 19.FEB.2016 17:21:29

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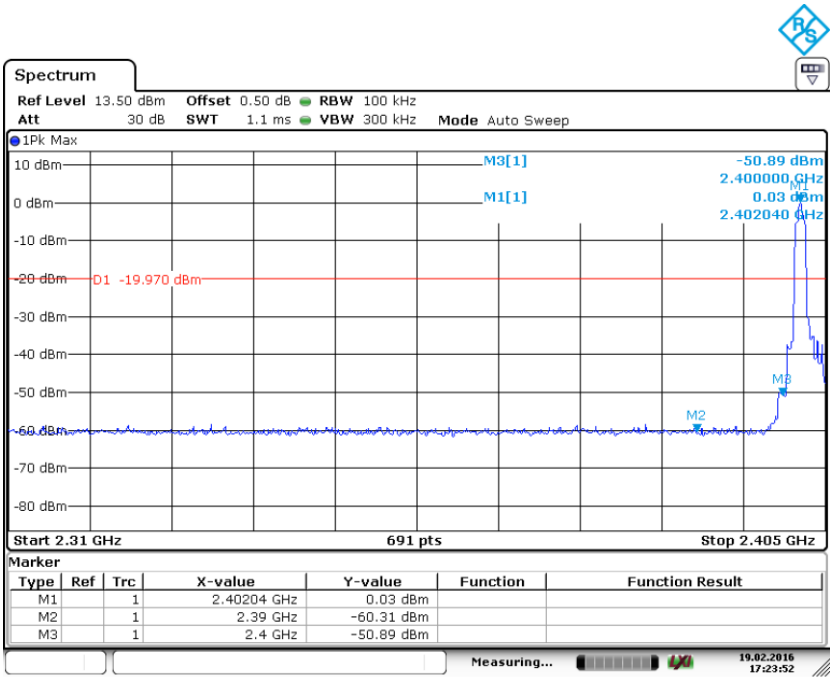
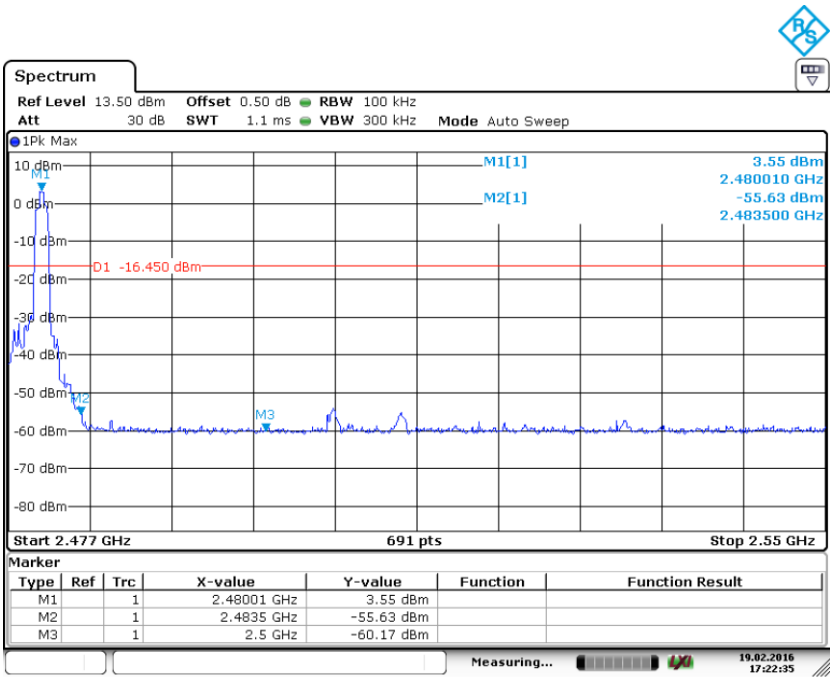
Hopping off mode:



Date: 19.FEB.2016 17:23:52



Date: 19.FEB.2016 17:22:35

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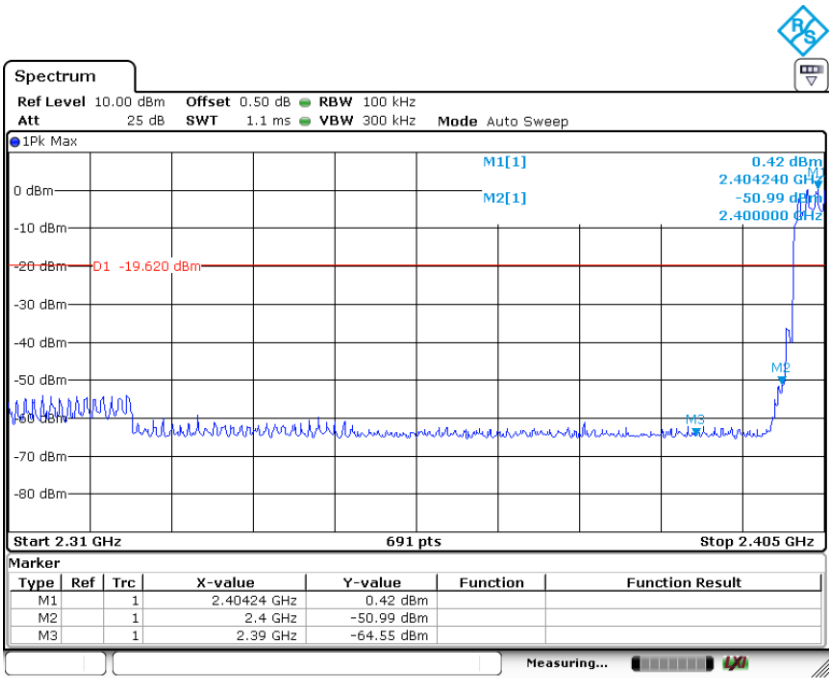
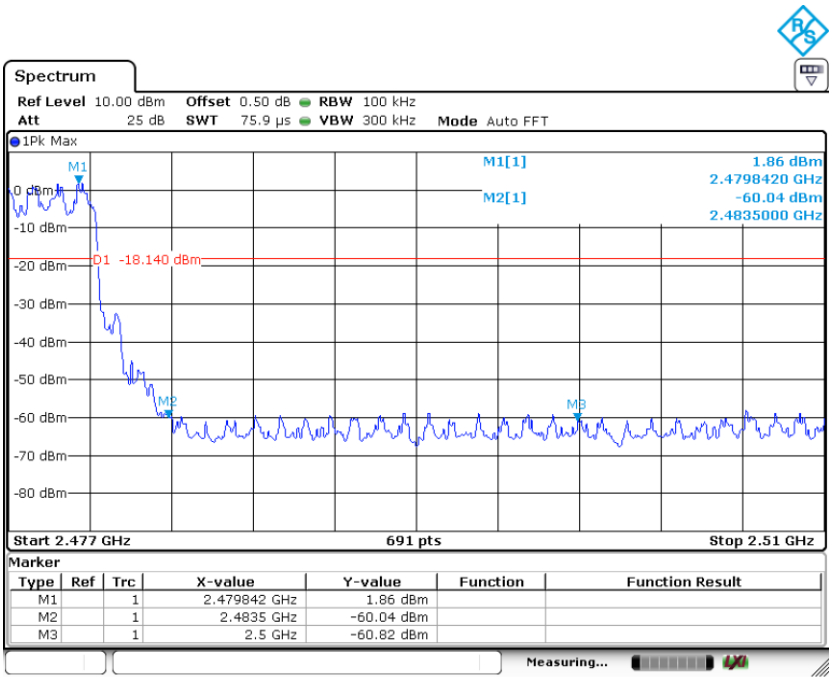
BT3.0 8-DPSK Modulation Test Result:
Hopping on mode:



Date: 19.FEB.2016 14:59:23



Date: 19.FEB.2016 14:57:42

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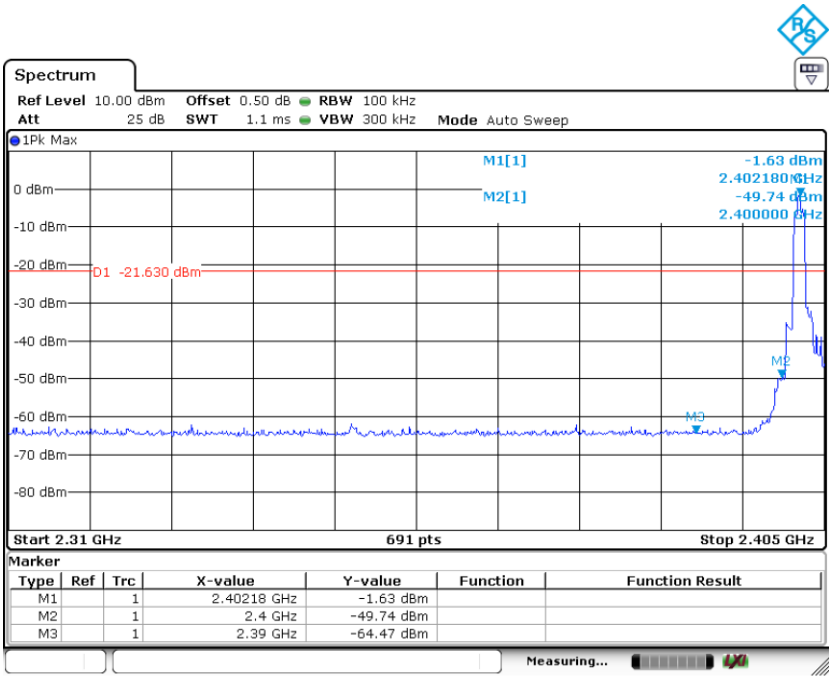
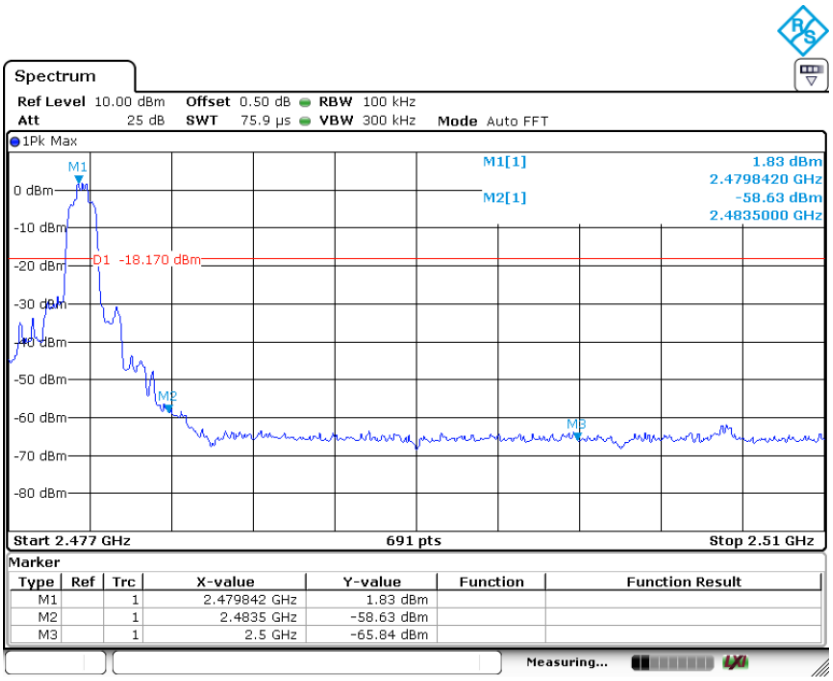
Hopping off mode:



Date: 19.FEB.2016 15:01:54



Date: 19.FEB.2016 14:56:26

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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 3 meter 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 from 0 degrees to 360 degrees to find the maximum reading.

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

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.

Transmitting spurious emission test result as below:

BT3.0 GFSK Modulation 2402MHz Test Result

Frequency Band	Frequency	Emission Level	Polarization	Limit	Detector	Margin	Result
	MHz	dBuV/m		dBµV/m		dBuV/m	
30-1000MHz	152	34.23	H	43.5	QP	9.27	Pass
	152	31.52	V	43.5	QP	11.98	Pass
1000-25000MHz	*4804	40.10	H	74	PK	33.9	Pass
	*7206	36.11	H	74	PK	37.89	Pass
	*4804	35.98	V	74	PK	38.02	Pass
	*7206	37.00	V	74	PK	37	Pass

BT3.0 GFSK Modulation 2441MHz Test Result

Frequency Band	Frequency	Emission Level	Polarization	Limit	Detector	Margin	Result
	MHz	dBuV/m		dBµV/m		dBuV/m	
30-1000MHz	152	34.27	H	43.5	QP	9.23	Pass
	152	31.62	V	43.5	QP	11.88	Pass
1000-25000MHz	*4882	44.35	H	74	PK	29.65	Pass
	*7324	40.27	H	74	PK	33.73	Pass
	*4882	38.25	V	74	PK	35.75	Pass
	*7324	37.33	V	74	PK	36.67	Pass

BT3.0 GFSK Modulation 2480MHz Test Result

Frequency Band	Frequency	Emission Level	Polarization	Limit	Detector	Margin	Result
	MHz	dBuV/m		dBµV/m		dBuV/m	
30-1000MHz	152	34.73	H	43.5	QP	8.77	Pass
	152	31.63	V	43.5	QP	11.87	Pass
1000-25000MHz	*4960	41.45	H	74	PK	32.55	Pass
	*7440	36.89	H	74	PK	37.11	Pass
	*4960	42.56	V	74	PK	31.44	Pass
	*7440	38.05	V	74	PK	35.95	Pass

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BT3.0 π/4-DQPSK Modulation 2402MHz Test Result

Frequency Band	Frequency	Emission Level	Polarization	Limit	Detector	Margin	Result
	MHz	dBuV/m		dBµV/m		dBuV/m	
30-1000MHz	152	34.26	H	43.5	QP	9.24	Pass
	152	31.43	V	43.5	QP	12.07	Pass
1000-25000MHz	*4804	40.78	H	74	PK	33.22	Pass
	*7206	36.78	H	74	PK	37.22	Pass
	*4804	36.49	V	74	PK	37.51	Pass
	*7206	37.24	V	74	PK	36.76	Pass

BT3.0 π/4-DQPSK Modulation 2441MHz Test Result

Frequency Band	Frequency	Emission Level	Polarization	Limit	Detector	Margin	Result
	MHz	dBuV/m		dBµV/m		dBuV/m	
30-1000MHz	152	34.66	H	43.5	QP	8.84	Pass
	152	31.53	V	43.5	QP	11.97	Pass
1000-25000MHz	*4882	44.29	H	74	PK	29.71	Pass
	*7324	39.83	H	74	PK	34.17	Pass
	*4882	38.24	V	74	PK	35.76	Pass
	*7324	36.87	V	74	PK	37.13	Pass

BT3.0 π/4-DQPSK Modulation 2480MHz Test Result

Frequency Band	Frequency	Emission Level	Polarization	Limit	Detector	Margin	Result
	MHz	dBuV/m		dBµV/m		dBuV/m	
30-1000MHz	152	34.34	H	43.5	QP	9.16	Pass
	152	31.25	V	43.5	QP	12.25	Pass
1000-25000MHz	*4960	40.14	H	74	PK	33.86	Pass
	*7440	36.02	H	74	PK	37.98	Pass
	*4960	41.45	V	74	PK	32.55	Pass
	*7440	38.42	V	74	PK	35.58	Pass

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BT3.0 8-DPSK Modulation 2402MHz Test Result

Frequency Band	Frequency	Emission Level	Polarization	Limit	Detector	Margin	Result
	MHz	dBuV/m		dBµV/m		dBuV/m	
30-1000MHz	152	34.38	H	43.5	QP	9.12	Pass
	152	31.60	V	43.5	QP	11.9	Pass
1000-25000MHz	*4804	41.53	H	74	PK	32.47	Pass
	*7286	37.84	H	74	PK	36.16	Pass
	*4804	36.74	V	74	PK	37.26	Pass
	*7275	37.34	V	74	PK	36.66	Pass

BT3.0 8-DPSK Modulation 2441MHz Test Result

Frequency Band	Frequency	Emission Level	Polarization	Limit	Detector	Margin	Result
	MHz	dBuV/m		dBµV/m		dBuV/m	
30-1000MHz	152	34.38	H	43.5	QP	9.12	Pass
	152	31.60	V	43.5	QP	11.9	Pass
1000-25000MHz	*4881.5	44.95	H	74	PK	29.05	Pass
	*7323	40.84	H	74	PK	33.16	Pass
	*4881.5	38.95	V	74	PK	35.05	Pass
	*7323.5	38.25	V	74	PK	35.75	Pass

BT3.0 8-DPSK Modulation 2480MHz Test Result

Frequency Band	Frequency	Emission Level	Polarization	Limit	Detector	Margin	Result
	MHz	dBuV/m		dBµV/m		dBuV/m	
30-1000MHz	152	34.38	H	43.5	QP	9.12	Pass
	152	31.60	V	43.5	QP	11.9	Pass
1000-25000MHz	*4960	43.34	H	74	PK	30.66	Pass
	*7440	38.51	H	74	PK	35.49	Pass
	*4959	41.35	V	74	PK	32.65	Pass
	*7476	39.12	V	74	PK	34.88	Pass

Remark:

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

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10 Test Equipment List

Site 2:

DESCRIPTION	MANUFACTURER	MODEL NO.	SERIAL NO.	CAL. DUE DATE
Test Receiver	R & S	ESU26	100050	12-Feb-2017
Bi-conical Antenna	R & S	HK116	100242	07-Dec-2016
Log Periodic Antenna	R & S	HL223	841516/020	01-Sep-2017
Coaxial cable (50ohm)	Rosenberger	RTK081-05S-05S-10m	LA2-001-10M / 001	01-Sep-2017
Microwave amplifier (0.5-26.5GHz, 25dB gain)	HP	83017A	3123A00437	10-Jun-2016
High Pass Filter (cutoff freq. =1000MHz)	Trilithic	23042	9829213	17-Jul-2016
Horn Antenna	EMCO	3115	9002-3351	28-Oct-2017
Active Loop Antenna	EMCO	6502	9107-2651	26-Aug-2017
RF Voltage Probe	Schwarzbeck	TK9416	None	10-Feb-2017
LISN	R&S	ESH3-Z5	849876/027	15-Jun-2016
Double Shield Cable	Radiall	RG142	Nil	14-Sep-2017
Pulse Limiter	R&S	ESH3-Z2	Nil	04-Jun-2016

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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		
Items		**Extended Uncertainty**
Radiated Emissions	Level accuracy 30 to 200 MHz 200 to 1000 MHz 1000 to 25000 MHz	±4.68 dB ±5.73 dB ±5.57 dB
Conducted Emissions	Level accuracy 9 kHz to 30 MHz	±3.16 dB
Conducted RF Test		≤ 1 dB

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12 Radiofrequency radiation exposure evaluation

FCC -Radiofrequency radiation exposure evaluation

According to§15.247(e)(i) and §1.1307(b)(1), systems operating under the provisions of this section shall be operated in a manner that ensure that the public is not exposed to radio frequency energy level in excess of the Commission's guideline.

According to KDB 447498 D01 Mobile Portable RF Exposure v05r01, no SAR required if power is lower than the flowing threshold:
The 1-g and 10-g SAR test exclusion thresholds for 100 MHz to 6 GHz at test separation distances ≤ 50 mm are determined by:
[(max. power of channel, including tune-up tolerance, mW)/(min. test separation distance, mm)] [√f(GHz)] ≤ 3.0 for 1-g SAR and ≤ 7.5 for 10-g extremity SAR, where

- f(GHz) is the RF channel transmit frequency in GHz
- Power and distance are rounded to the nearest mW and mm before calculation25
- The result is rounded to one decimal place for comparison
- 3.0 and 7.5 are referred to as the numeric thresholds in the step 2 below

The test exclusions are applicable only when the minimum test separation distance is ≤ 50 mm and for transmission frequencies between 100 MHz and 6 GHz.

Calculation method: [(max. power of` channel, including tune-up tolerance, mW)/(min. test separation distance, mm)] ·[√f(GHz)] ≤ 3.0

Conducted Power + tune up tolerance =4.1dBm= 2.57mW
Distance =10 mm
f = 2.441 GHz

[2.57/10] * SQRT (2.441) =0.4
0.4≤ 3.0, therefore, excluded from SAR testing.

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IC -Radiofrequency radiation exposure evaluation

According to RSS-102 § (2.5.1), SAR evaluation is required if the separation distance between the user and/or bystander and the antenna and/or radiating element of the device is less than or equal to 20 cm, except when the device operates at or below the applicable output power level (adjusted for tune-up tolerance) for the specified separation distance defined in below Table:

Table 1: SAR evaluation – Exemption limits for routine evaluation based on frequency and separation distance[4,5]

Frequency (MHz)	Exemption Limits (mW)				
	At separation distance of ≤5 mm	At separation distance of 10 mm	At separation distance of 15 mm	At separation distance of 20 mm	At separation distance of 25 mm
≤300	71 mW	101 mW	132 mW	162 mW	193 mW
450	52 mW	70 mW	88 mW	106 mW	123 mW
835	17 mW	30 mW	42 mW	55 mW	67 mW
1900	7 mW	10 mW	18 mW	34 mW	60 mW
2450	4 mW	7 mW	15 mW	30 mW	52 mW
3500	2 mW	6 mW	16 mW	32 mW	55 mW
5800	1 mW	6 mW	15 mW	27 mW	41 mW

Frequency (MHz)	Exemption Limits (mW)				
	At separation distance of 30 mm	At separation distance of 35 mm	At separation distance of 40 mm	At separation distance of 45 mm	At separation distance of ≥50 mm
≤300	223 mW	254 mW	284 mW	315 mW	345 mW
450	141 mW	159 mW	177 mW	195 mW	213 mW
835	80 mW	92 mW	105 mW	117 mW	130 mW
1900	99 mW	153 mW	225 mW	316 mW	431 mW
2450	83 mW	123 mW	173 mW	235 mW	309 mW
3500	86 mW	124 mW	170 mW	225 mW	290 mW
5800	56 mW	71 mW	85 mW	97 mW	106 mW

Calculation method: Maximum radiated power of the EUT is 4.07mW (EIRP= Conducted Power +Antenna gain=4.10dBm+2dBi=6.10dBm), and the specified separation distance defined by the client is at least 10mm by measuring. According to the above table 1, the output power level is less than 7mw meet Exemption from Routine Evaluation Limits – RF Exposure Evaluation, so SAR evaluation is not necessary.

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