FCC - TEST REPORT

Report Number	:	**68.950.20.0111.01**	Date of Issue:	August 25, 2020
Model	:	BT-BP-Cosmos		
Product Type	:	BuddyPhones Cosmos		
Applicant	:	Onanoff Limited		
Address	:	RM 424, Sino Ind. Plaza, 9 Kai Cheung Road, Kowloon Bay, Kowloon, Hong Kong SAR.		
Factory	:	Onanoff Limited		
Address	:	RM 424, Sino Ind. Plaza, 9 Kai Cheung Road, Kowloon Bay, Kowloon, Hong Kong SAR.		
Test Result	:	■ **Positive** ☐ **Negative**		
Total pages including Appendices	:	61		

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Building 12 & 13, Zhiheng Wisdomland Business Park, Nantou Checkpoint Road 2,
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2 Details about the Test Laboratory

Details about the Test Laboratory

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 518052
P.R. China

Telephone: 86 755 8828 6998
Fax: 86 755 828 5299

FCC Registration No.: 514049

3 Description of the Equipment Under Test

Product:	BuddyPhones Cosmos
Model no.:	BT-BP-Cosmos
Brand Name:	BuddyPhones; Onanoff
FCC ID:	2AN2M-BUDDYPHONESCM
Options and accessories:	USB Cable
Input Rating:	3.7V, 550mA by internal battery, 5V 1A by USB port
RF Transmission Frequency:	2402MHz-2480MHz
No. of Operated Channel:	79
Modulation:	GFSK, π/4-DQPSK, 8-DPSK
Antenna Type:	PCB antenna
Max Antenna Gain:	1dBi
Description of the EUT:	BT-BP-Cosmos is a BuddyPhones with Aux in and Bluetooth function.

4 Summary of Test Standards

Test Standards	
FCC Part 15 Subpart C 10-1-2019 Edition	PART 15 - RADIO FREQUENCY DEVICES Subpart C - Intentional Radiators

All the test methods were according to KDB 558074 D01 v05r02 and Public Notice DA 00-705 - Frequency Hopper Spread Spectrum Test Procedure released by FCC on March 30, 2000 and ANSI C63.10-2013.

5 Summary of Test Results

Technical Requirements			
FCC Part 15 Subpart C			
Test Condition		Pages	Test Result
§15.207	Conducted emission AC power port	--	N/A
§15.247(b)(1)	Conducted peak output power	10	Pass
§15.247(e)	Power spectral density*	--	N/A
§15.247(a)(2)	6dB bandwidth	--	N/A
§15.247(a)(1)	20dB bandwidth and 99% Occupied Bandwidth	27	Pass
§15.247(a)(1)	Min. of Hopping Channel Carrier Frequency Separation	27	Pass
§15.247(a)(1)(iii)	Min number of hopping frequencies	30	Pass
§15.247(a)(1)(iii)	Dwell Time - Average Time of Occupancy	32	Pass
§15.247(d)	Spurious RF conducted emissions	36	Pass
§15.247(d)	Band edge	47	Pass
§15.247(d) & §15.209 &	Spurious radiated emissions for transmitter and receiver	53	Pass
§15.203	Antenna requirement	See note 2	Pass

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

6 General Remarks

Remarks

This submittal(s) (test report) is intended for FCC ID:2AN2M-BUDDYPHONESCM and complies with Section 15.209, 15.247 of the FCC Part 15, Subpart C rules.

This is report for Bluetooth BDR+EDR only.

SUMMARY:

All tests according to the regulations cited on page 6 were

■ - Performed

☐ - **Not** Performed

The Equipment Under Test

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

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

Sample Received Date: January 15, 2020

Testing Start Date: March 2, 2020

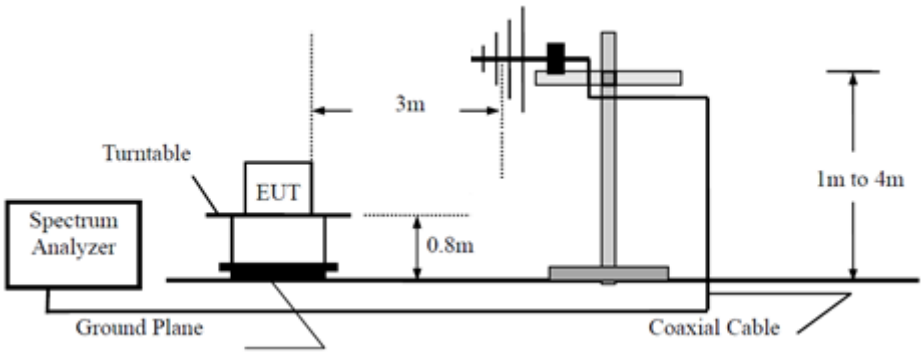
Testing End Date: March 13, 2020

Reviewed by:	Prepared by:	Tested by:
Zhi John	Moon Xiong	Louise Liu
EMC Section Manager	EMC Project Engineer	EMC Test Engineer

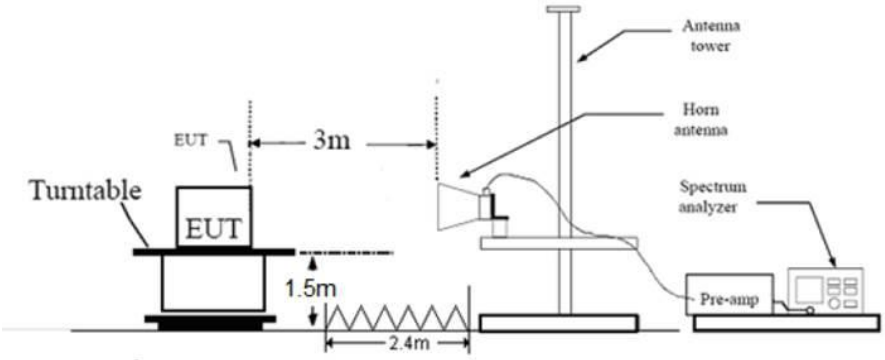
7 Test Setups

7.1 Radiated test setups

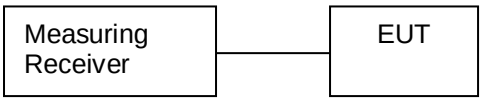
Below 1GHz



Above 1GHz



7.2 Conducted RF test setups



8 Systems test configuration

Auxiliary Equipment Used during Test:

DESCRIPTION	MANUFACTURER	MODEL NO.	S/N
Notebook	lenovo	X220	---

9 Technical Requirement

9.1 Conducted peak output power

Test Method

1. Use the following spectrum analyzer settings:
   Span = approximately 5 times the 20dB bandwidth, centered on a hopping channel
   RBW > the 20dB 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

conducted peak output power limit as below:

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

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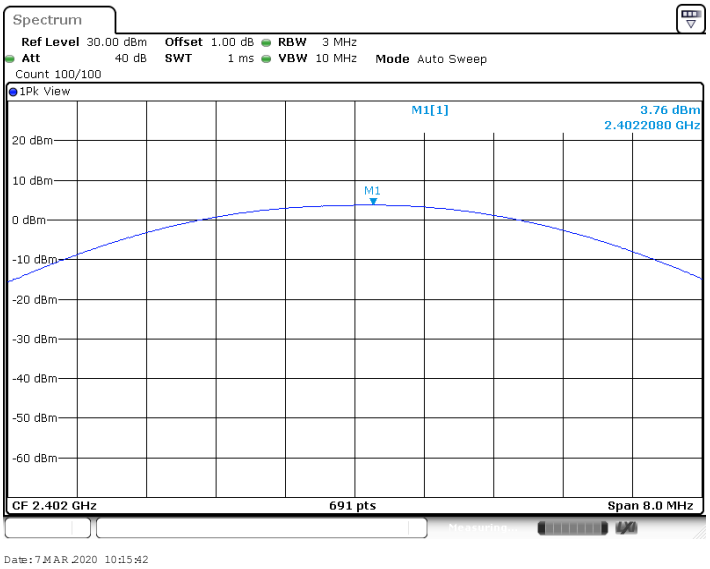
Conducted peak output power

Bluetooth Mode GFSK modulation Test Result

Frequency MHz	Conducted Peak Output Power dBm	Result
Low channel 2402MHz	3.76	Pass
Middle channel 2441MHz	5.23	Pass
High channel 2480MHz	5.45	Pass

Low channel 2402MHz



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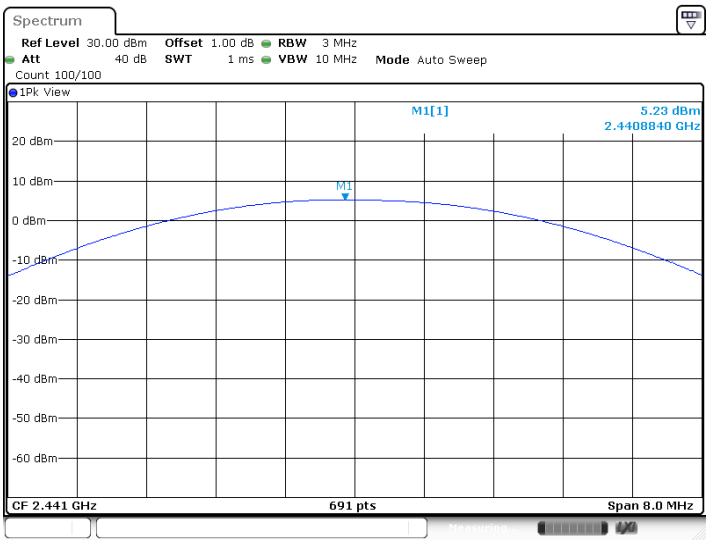
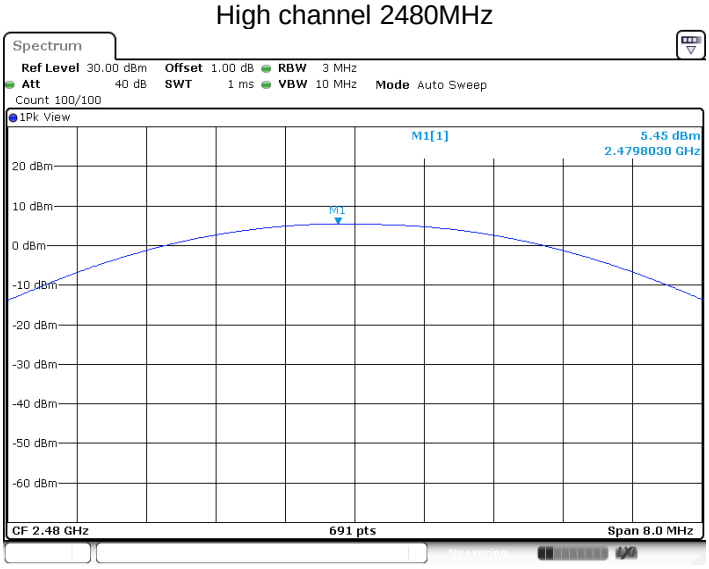
Middle channel 2441MHz



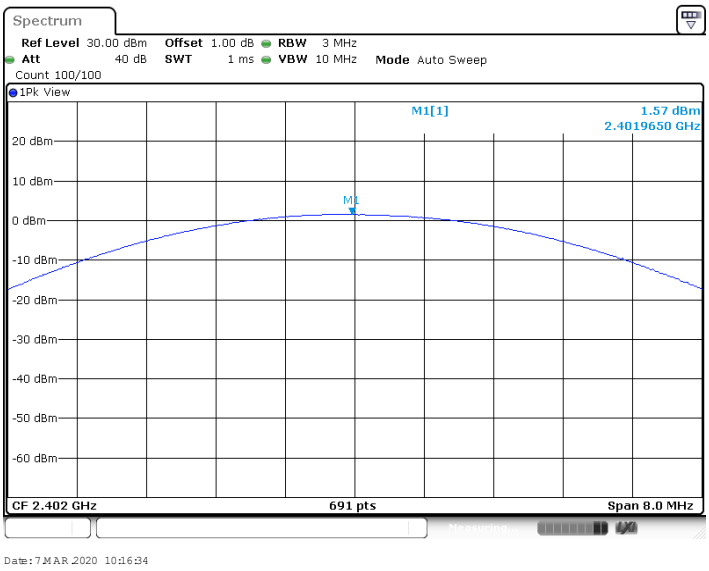
High channel 2480MHz



Bluetooth Mode π/4-DQPSK modulation Test Result

Frequency MHz	Conducted Peak Output Power dBm	Result
Low channel 2402MHz	1.57	Pass
Middle channel 2441MHz	3.24	Pass
High channel 2480MHz	3.44	Pass

Low channel 2402MHz



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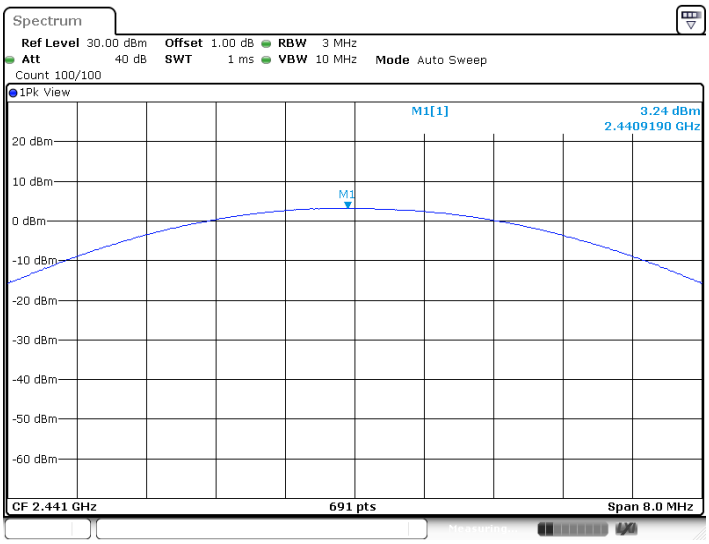
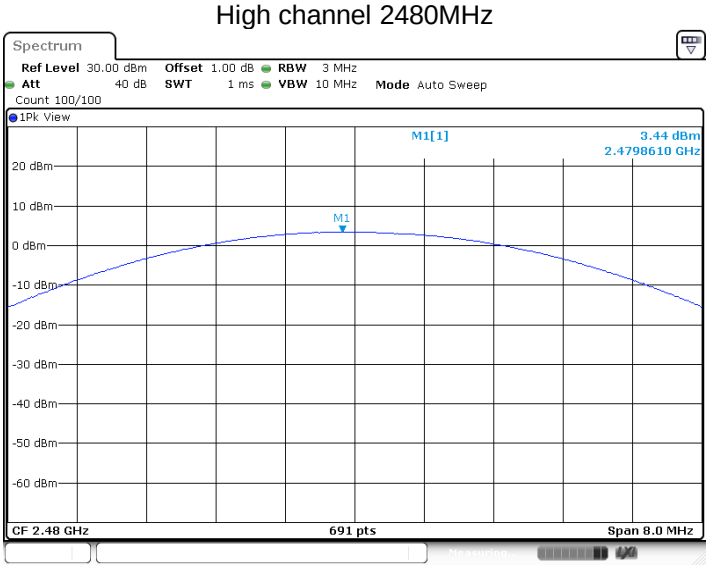
Middle channel 2441MHz



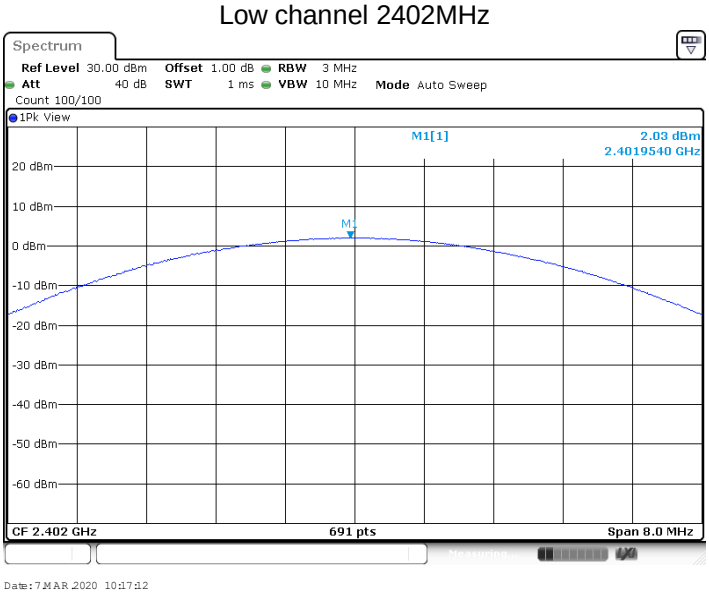
High channel 2480MHz



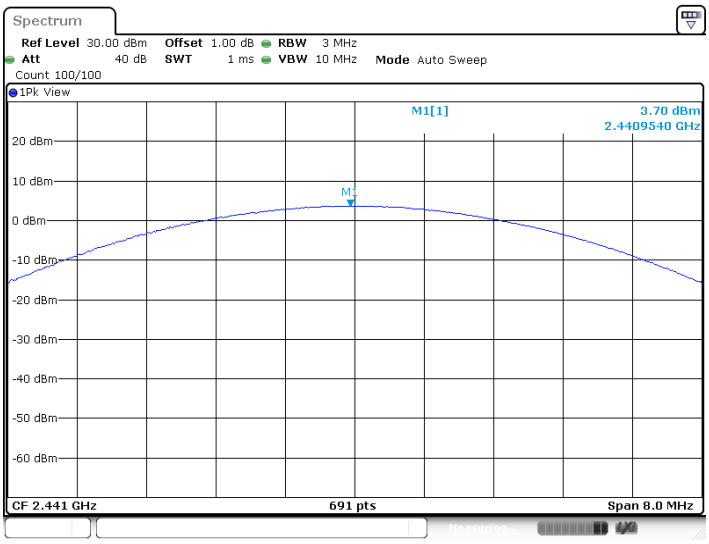
Bluetooth Mode 8DPSK modulation Test Result

Frequency MHz	Conducted Peak Output Power dBm	Result
Low channel 2402MHz	2.03	Pass
Middle channel 2441MHz	3.7	Pass
High channel 2480MHz	3.91	Pass

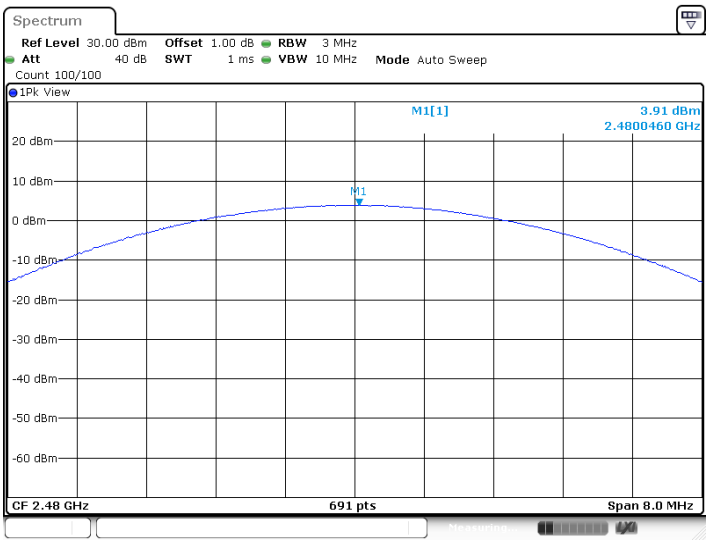
Low channel 2402MHz



Middle channel 2441MHz



High channel 2480MHz



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

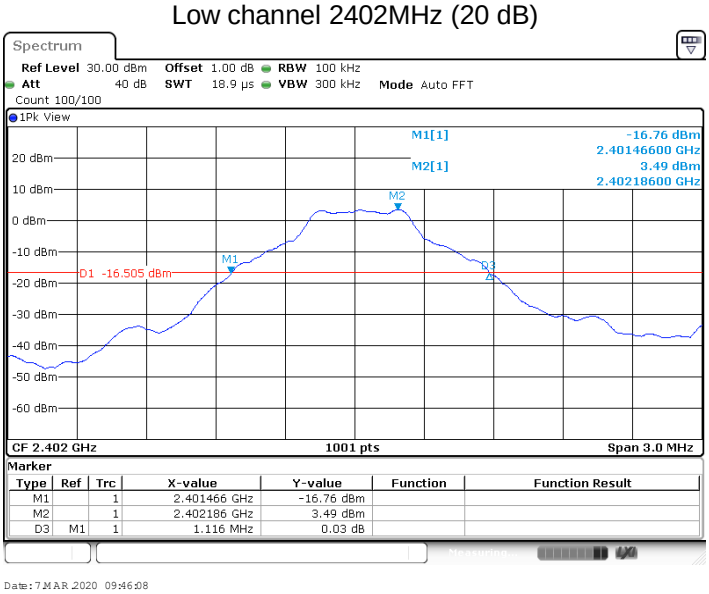
Limit [kHz]
N/A

20 dB bandwidth and 99% Occupied Bandwidth

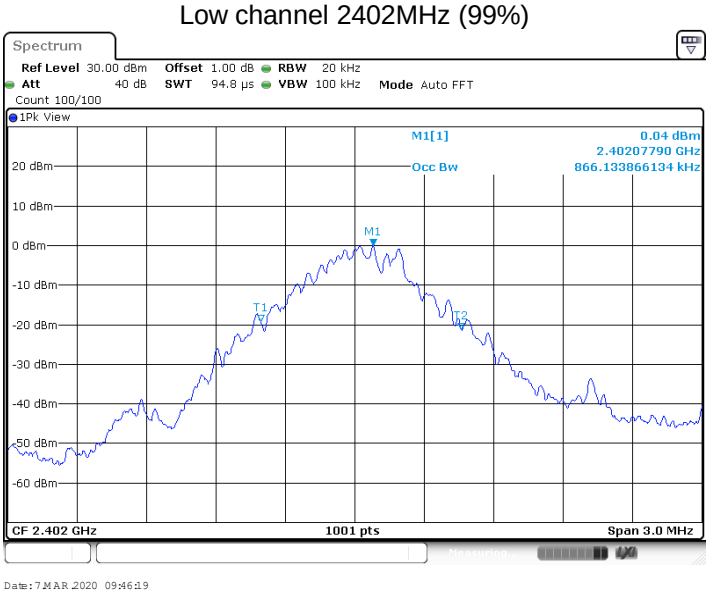
Bluetooth Mode GFSK Modulation test result

Frequency MHz	20 dB Bandwidth kHz	99% Bandwidth kHz	Limit kHz	Result
2402	1116	866	--	Pass
2441	1113	857	--	Pass
2480	1116	857	--	Pass

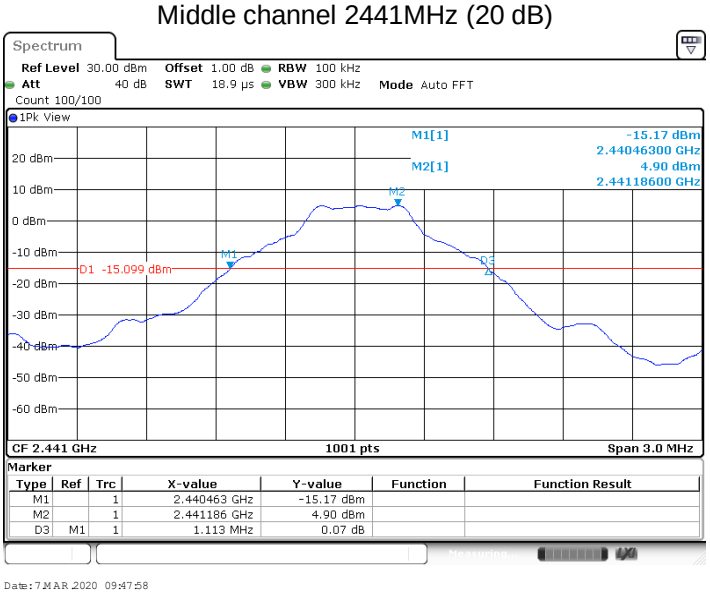
Low channel 2402MHz (20 dB)



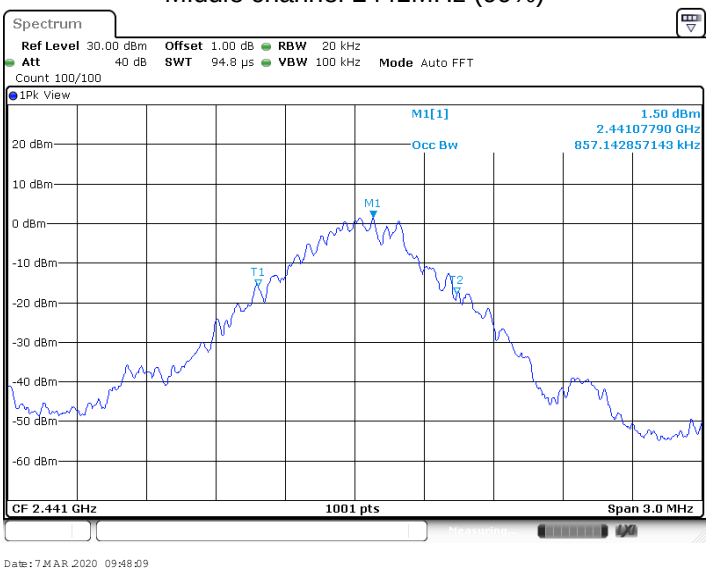
Low channel 2402MHz (99%)



Middle channel 2441MHz (20 dB)



Middle channel 2441MHz (99%)



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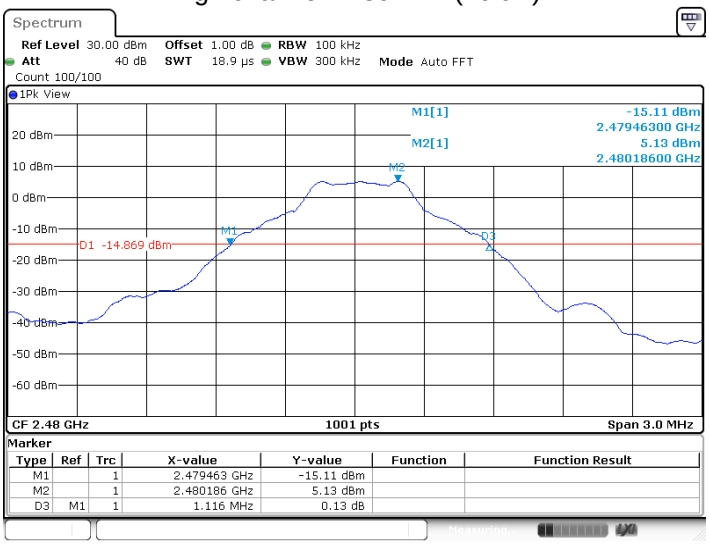
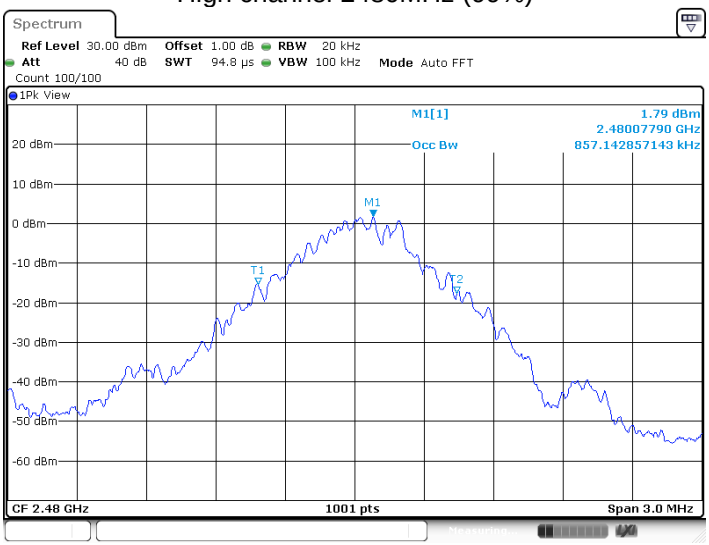
High channel 2480MHz (20 dB)



High channel 2480MHz (99%)



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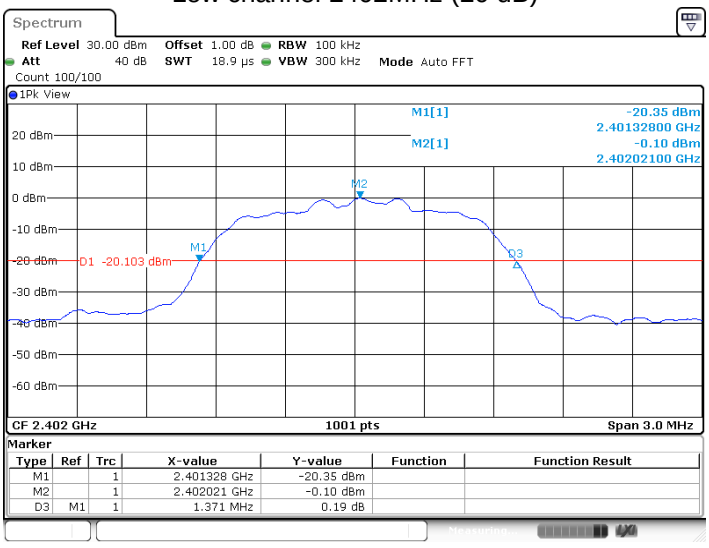
20 dB bandwidth and 99% Occupied Bandwidth

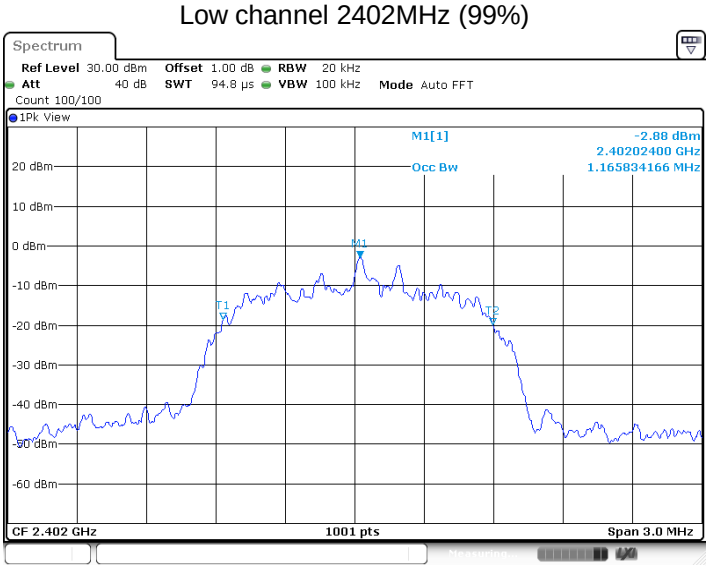
Bluetooth Mode π/4-DQPSK Modulation test result

Frequency	20 dB Bandwidth	99% Bandwidth	Limit	Result
MHz	kHz	kHz	kHz	
2402	1371	1166	--	Pass
2441	1371	1166	--	Pass
2480	1371	1166	--	Pass

Low channel 2402MHz (20 dB)



Low channel 2402MHz (99%)



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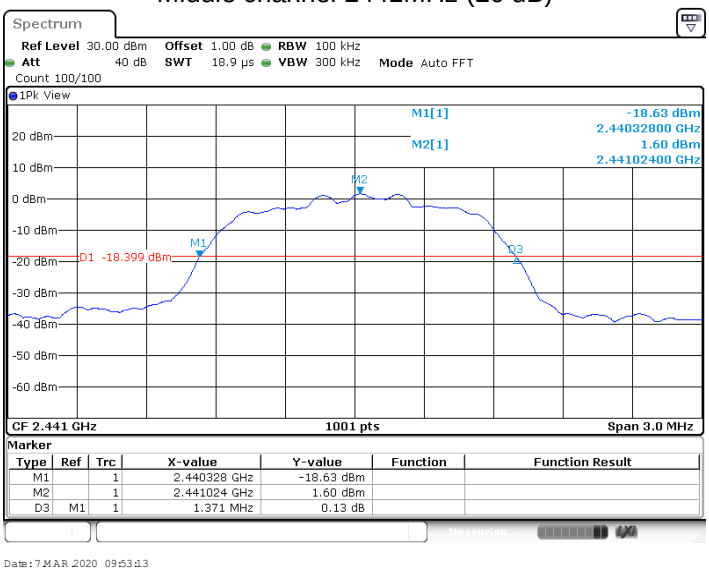
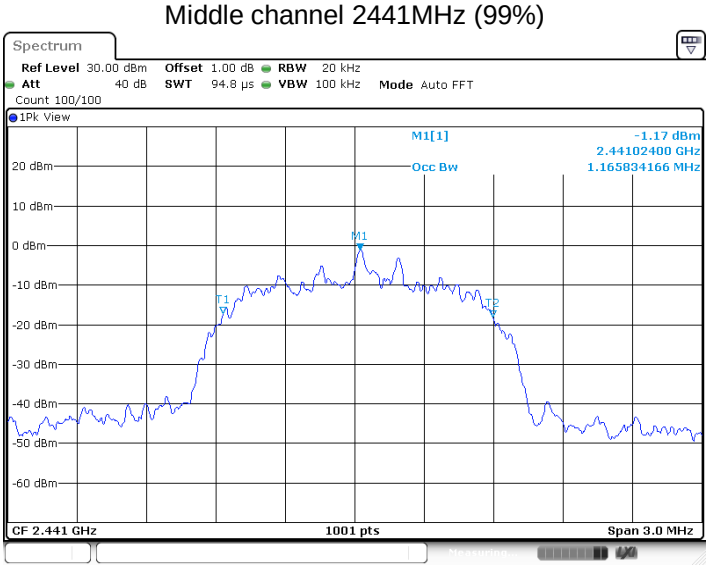
Middle channel 2441MHz (20 dB)



Middle channel 2441MHz (99%)



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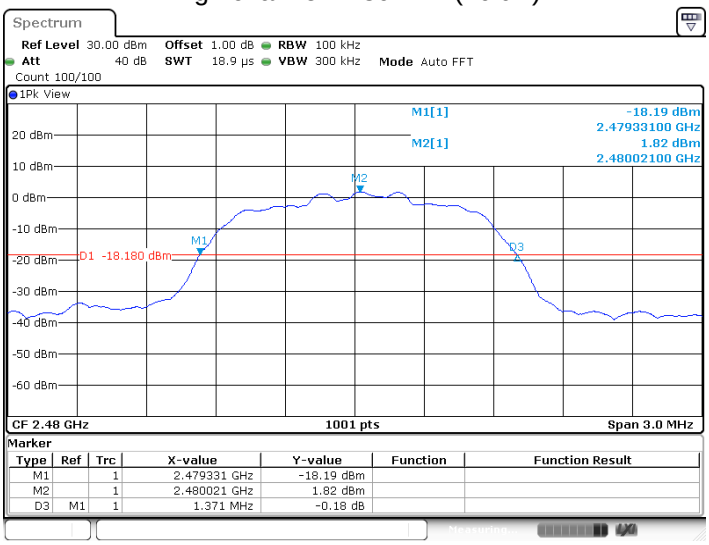
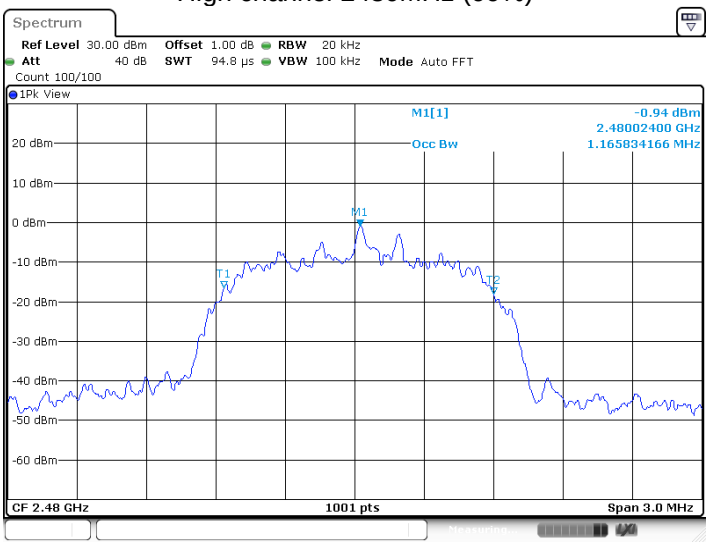
High channel 2480MHz (20 dB)



High channel 2480MHz (99%)



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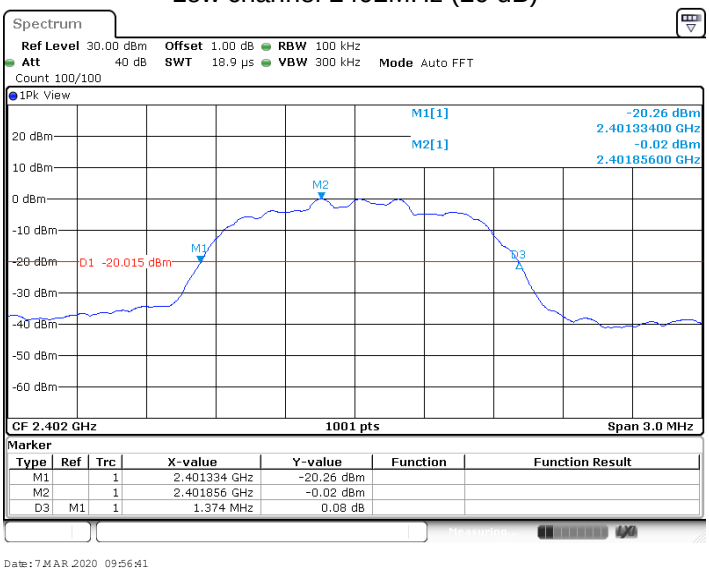
20 dB bandwidth and 99% Occupied Bandwidth

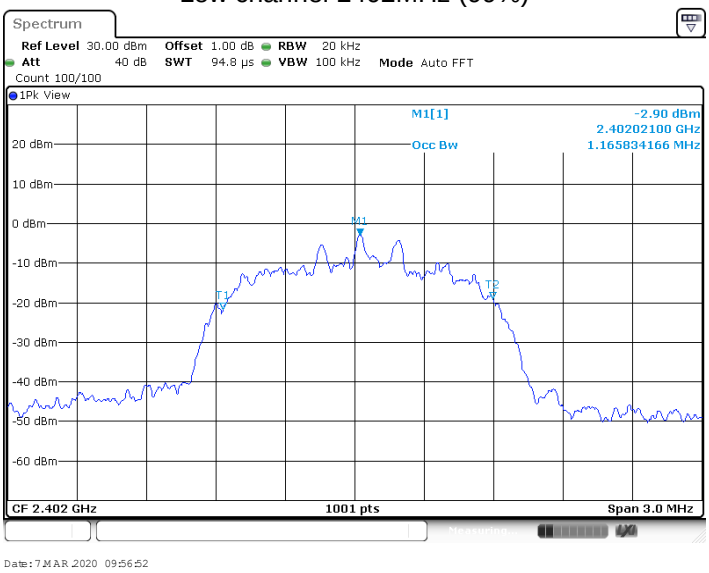
Bluetooth Mode 8DPSK Modulation test result

Frequency	20 dB Bandwidth	99% Bandwidth	Limit	Result
MHz	kHz	kHz	kHz	
2402	1374	1166	--	Pass
2441	1377	1163	--	Pass
2480	1374	1163	--	Pass

Low channel 2402MHz (20 dB)



Low channel 2402MHz (99%)



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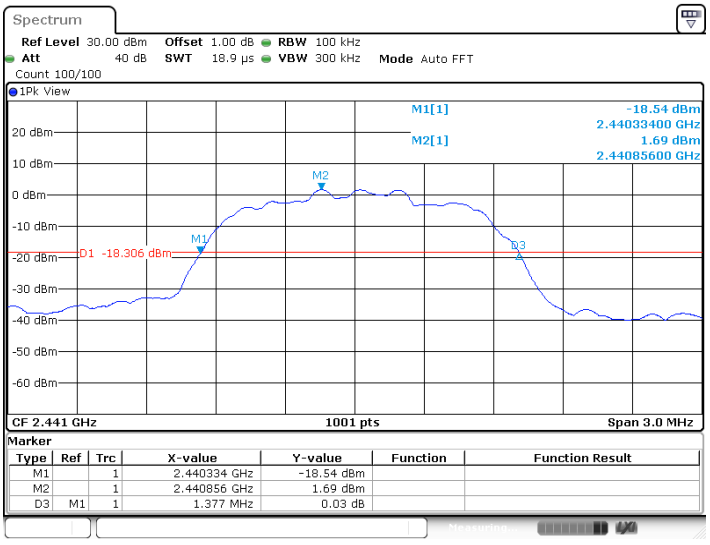
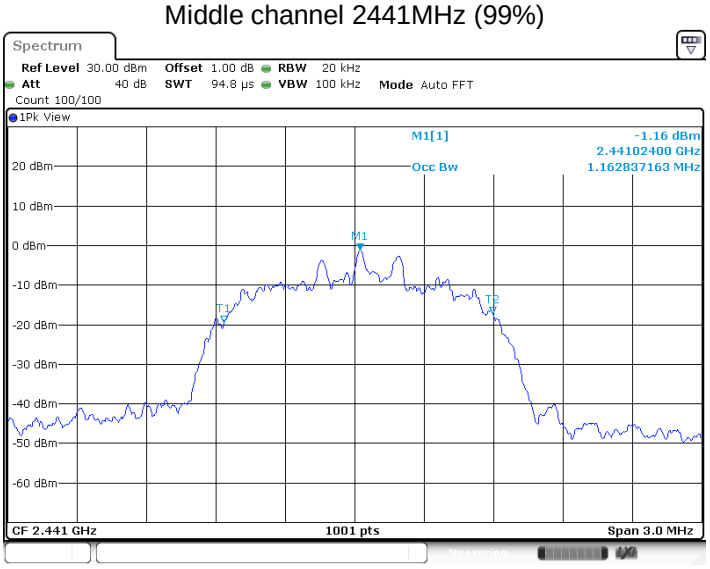
Middle channel 2441MHz



Middle channel 2441MHz (99%)



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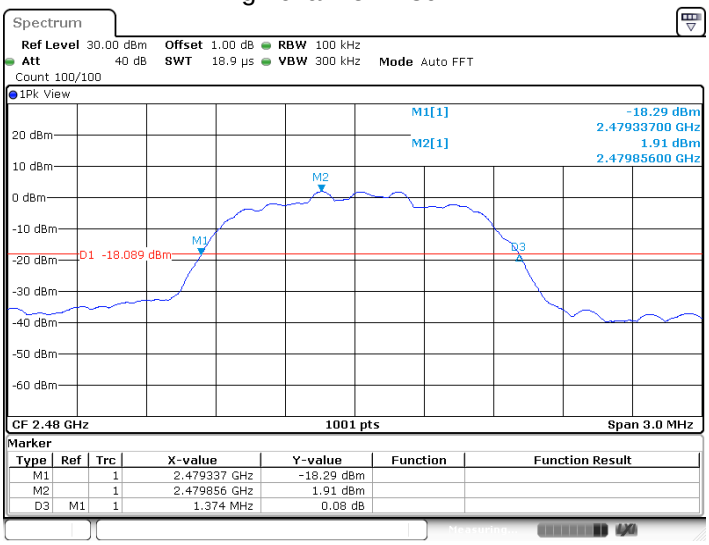
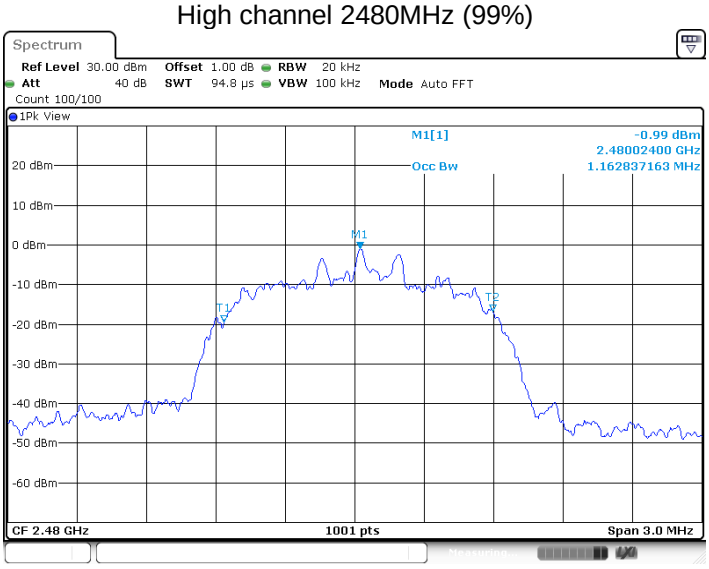
High channel 2480MHz



High channel 2480MHz (99%)



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

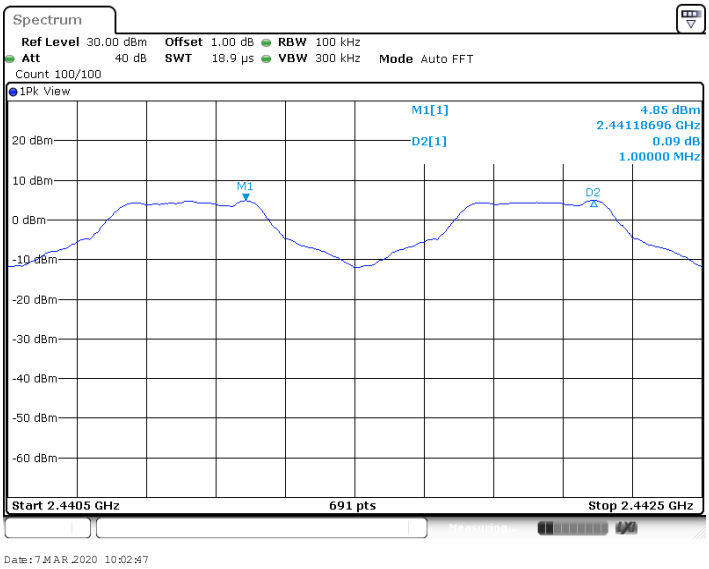
Carrier Frequency Separation

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

Test result

TestMode	Channel	Result MHz	Limit(MHz)	Verdict
DH5	Hop	1	>=0.744	PASS
2DH5	Hop	1.003	>=0.914	PASS
3DH5	Hop	0.997	>=0.918	PASS

DH5-Middle channel 2441MHz



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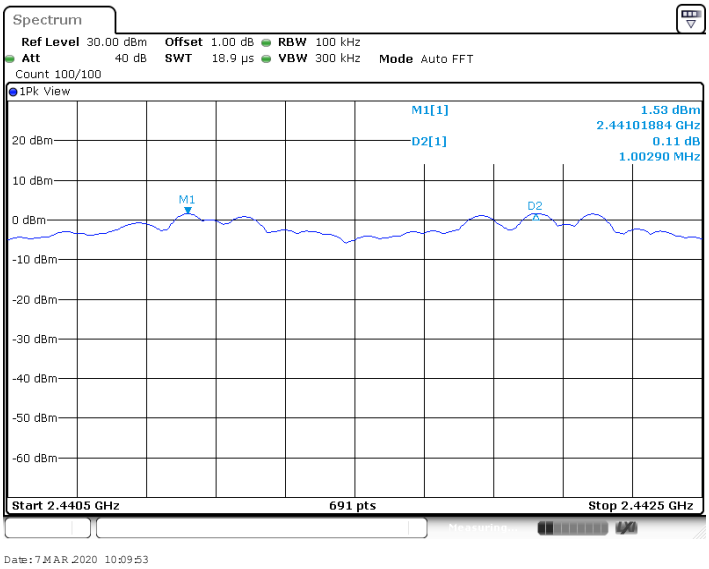
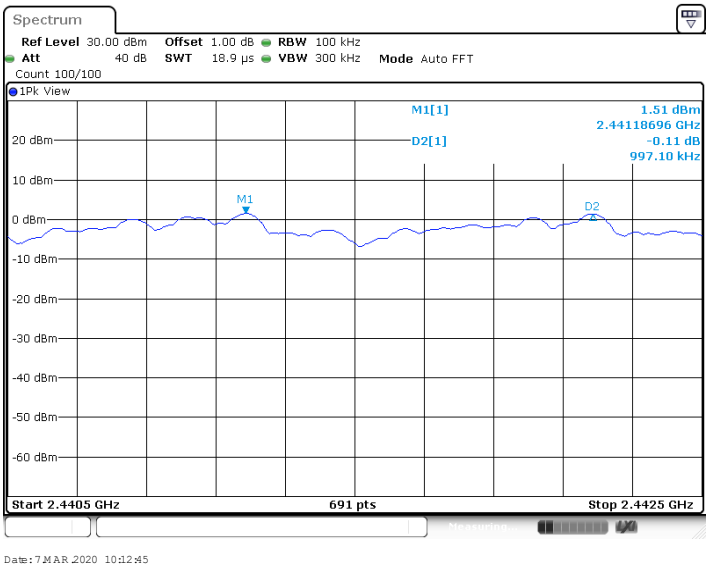
2DH5-Middle channel 2441MHz



3DH5-Middle channel 2441MHz



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.

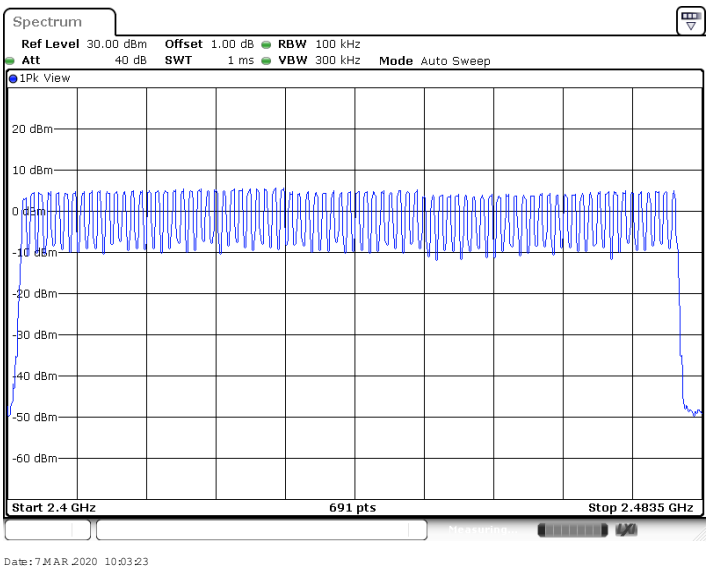
Limit

Limit number
≥ 15

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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Nanshan District, Shenzhen 518052, P.R. China

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

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

Dwell time

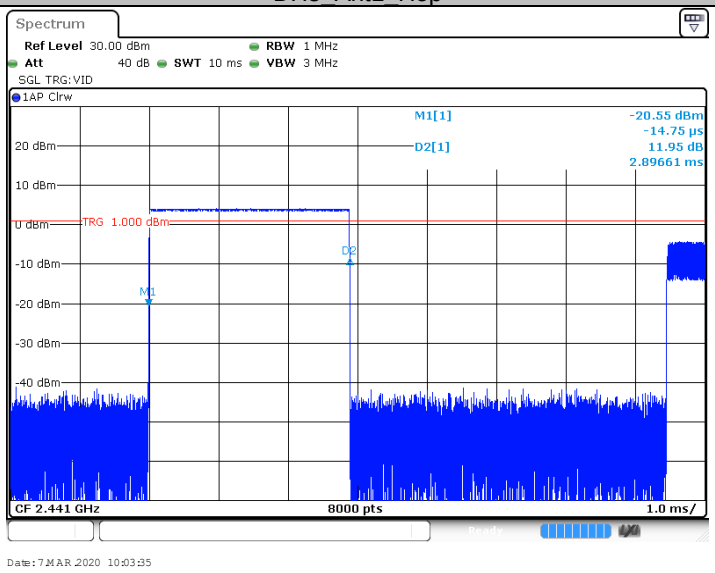
The maximum dwell time shall be 0.4 s.
According to the Bluetooth Core Specification, the worse result (DH5 mode) was reported to show compliance.

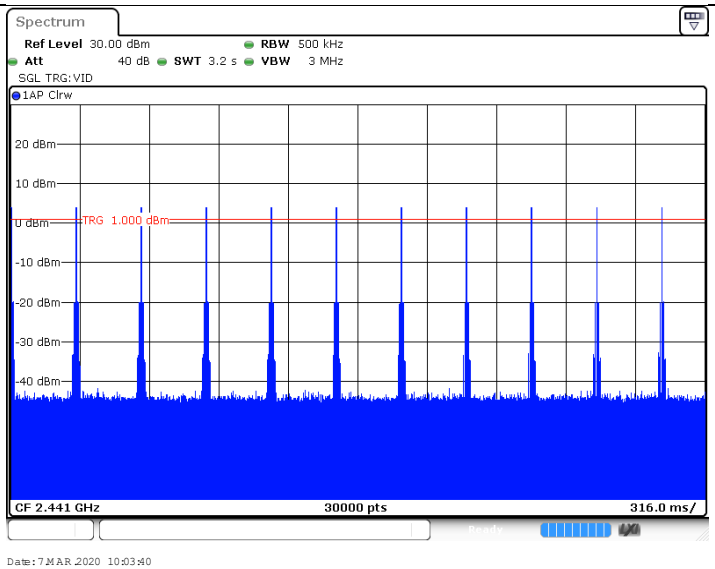
The Dwell Time = Burst Width * Total Hops. The detailed calculations are showed as follows:
The duration for dwell time calculation: 0.4 [s] * hopping number = 0.4 [s] * 79 [ch] = 31.6 [s*ch];

Test Result

TestMode	Channel	BurstWidth(ms)	TotalHops(N)	Result(s)	Limit(s)	Verdict
DH5	Hop	2.90	110	0.319	<=0.4	PASS
2DH5	Hop	2.90	110	0.319	<=0.4	PASS
3DH5	Hop	2.90	110	0.319	<=0.4	PASS

DH5_Ant1_Hop





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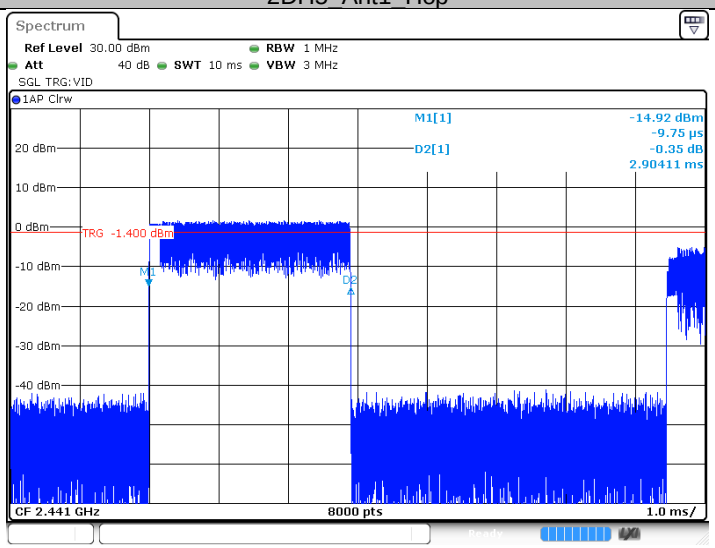
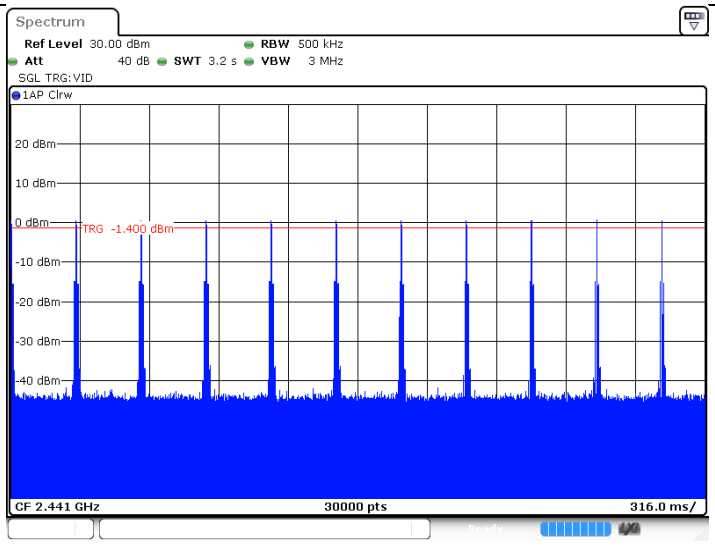
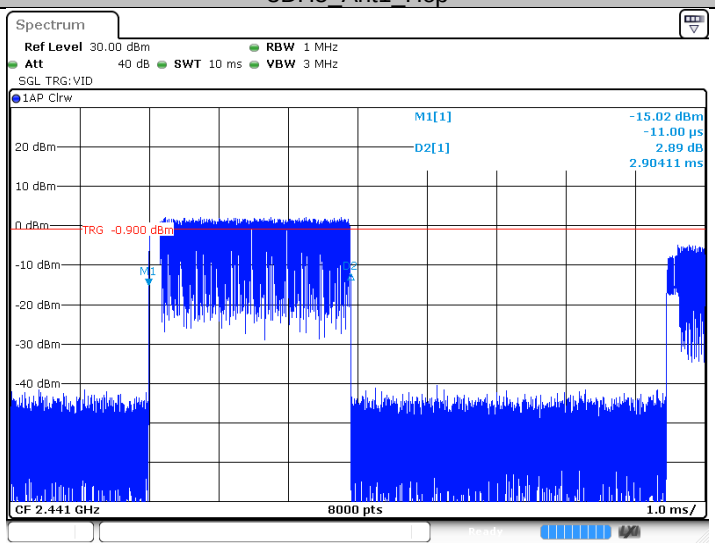
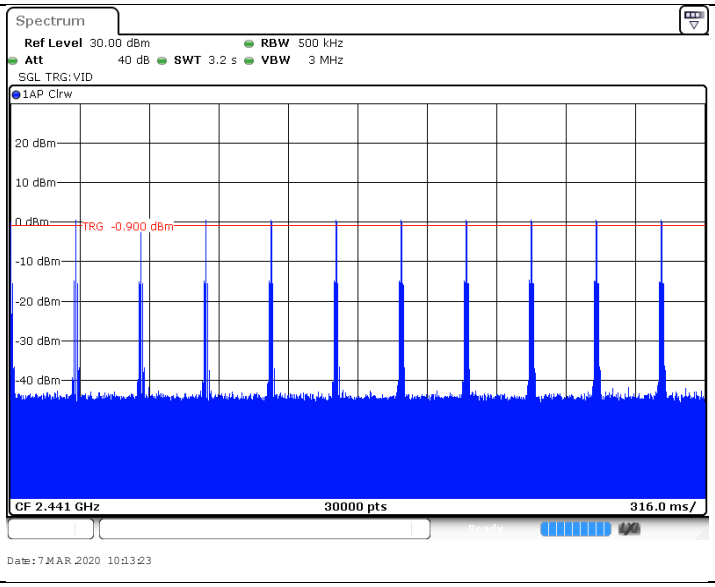
2DH5_Ant1_Hop


3DH5_Ant1_Hop



Spectrum
Ref Level 30.00 dBm
RBW 500 kHz
Att 40 dB SWT 3.2 s VBW 3 MHz
SGL TRG:VID
1AP Clrw
20 dBm
10 dBm
0 dBm
TRG -0.900 dBm
-10 dBm
-20 dBm
-30 dBm
-40 dBm
CF 2.441 GHz
30000 pts
316.0 ms/
Date:7.MAR.2020 10:13:23

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

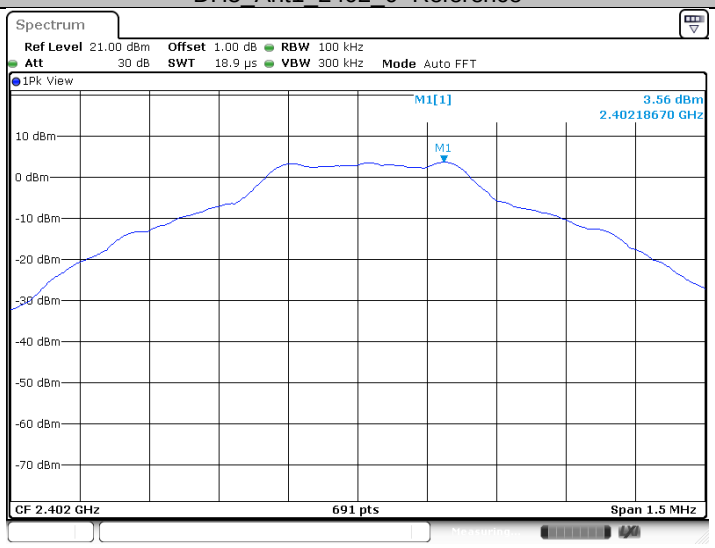
Frequency Range MHz	Limit (dBc)
30-25000	-20

Spurious RF conducted emissions

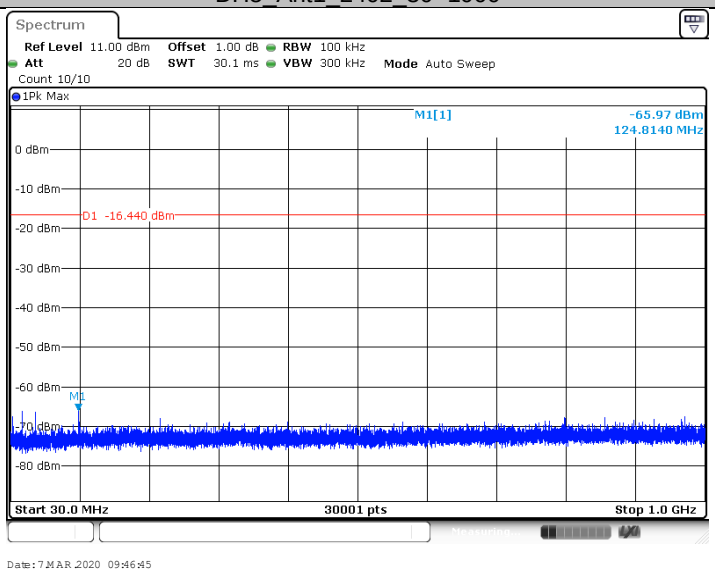
TestMode	Channel	FreqRange(MHz)	RefLevel	Result(dBm)	Limit(dBm)	Verdict
DH5	2402	Reference	3.56dBm	3.56	---	PASS
	2402	30~1000	30~1000 MHz	-65.97	<=-16.44	PASS
	2402	1000~26500	1000~26500 MHz	-43.89	<=-16.44	PASS
	2441	Reference	4.85 dBm	4.85	---	PASS
	2441	30~1000	30~1000 MHz	-60.32	<=-15.15	PASS
	2441	1000~26500	1000~26500 MHz	-44.02	<=-15.15	PASS
	2480	Reference	5.16 dBm	5.16	---	PASS
	2480	30~1000	30~1000 MHz	-67.46	<=-14.84	PASS
	2480	1000~26500	1000~26500 MHz	-43.07	<=-14.84	PASS
2DH5	2402	Reference	-0.06 dBm	-0.06	---	PASS
	2402	30~1000	30~1000 MHz	-67.94	<=-20.06	PASS
	2402	1000~26500	1000~26500 MHz	-51.24	<=-20.06	PASS
	2441	Reference	1.55 dBm	1.55	---	PASS
	2441	30~1000	30~1000 MHz	-67.41	<=-18.45	PASS
	2441	1000~26500	1000~26500 MHz	-47.98	<=-18.45	PASS
	2480	Reference	1.85 dBm	1.85	---	PASS
	2480	30~1000	30~1000 MHz	-66.23	<=-18.15	PASS
	2480	1000~26500	1000~26500 MHz	-48.7	<=-18.15	PASS
3DH5	2402	Reference	0.04 dBm	0.04	---	PASS
	2402	30~1000	30~1000 MHz	-67.31	<=-19.96	PASS
	2402	1000~26500	1000~26500 MHz	-49.73	<=-19.96	PASS
	2441	Reference	1.65 dBm	1.65	---	PASS
	2441	30~1000	30~1000 MHz	-67.36	<=-18.35	PASS
	2441	1000~26500	1000~26500 MHz	-48.62	<=-18.35	PASS
	2480	Reference	1.94 dBm	1.94	---	PASS
	2480	30~1000	30~1000 MHz	-66.15	<=-18.06	PASS
	2480	1000~26500	1000~26500MHz	-45.05	<=-18.06	PASS

Test graphs

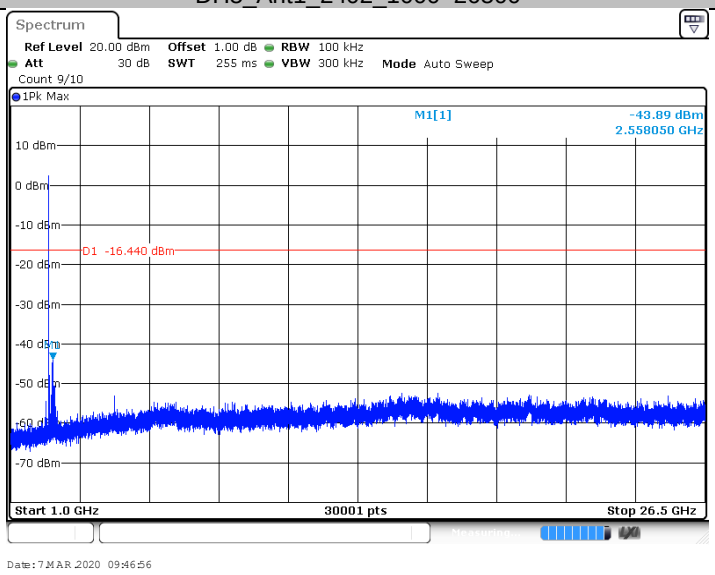
DH5_Ant1_2402_0~Reference



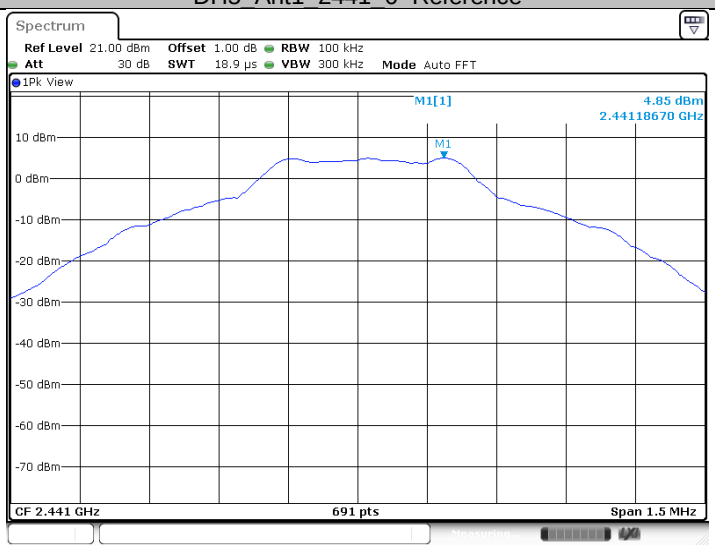
DH5_Ant1_2402_30~1000



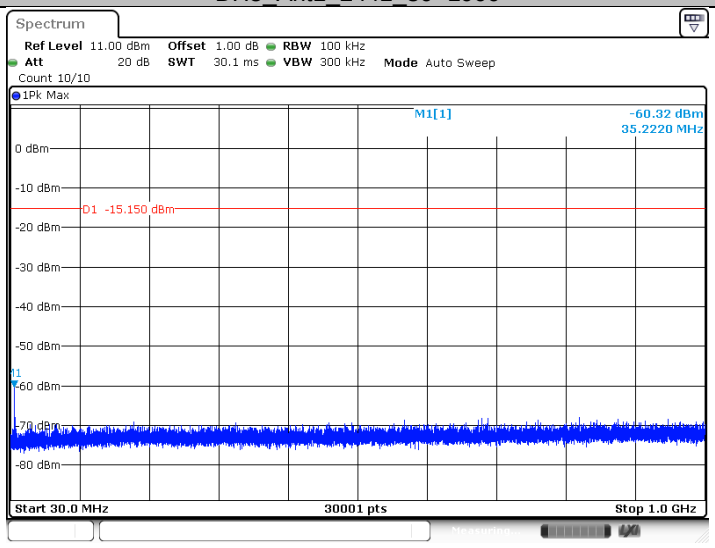
DH5_Ant1_2402_1000~26500



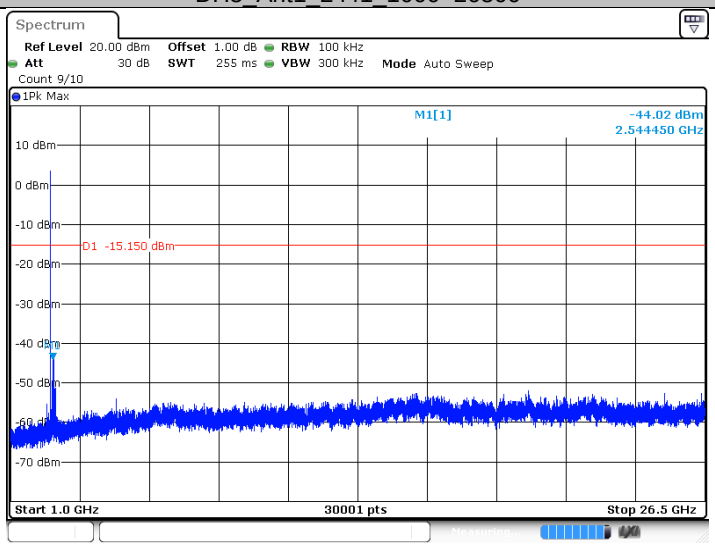
DH5_Ant1_2441_0~Reference



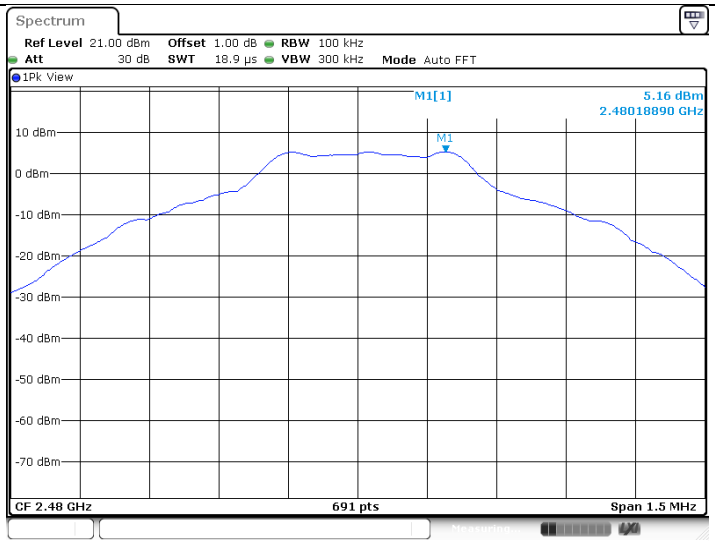
DH5_Ant1_2441_30~1000



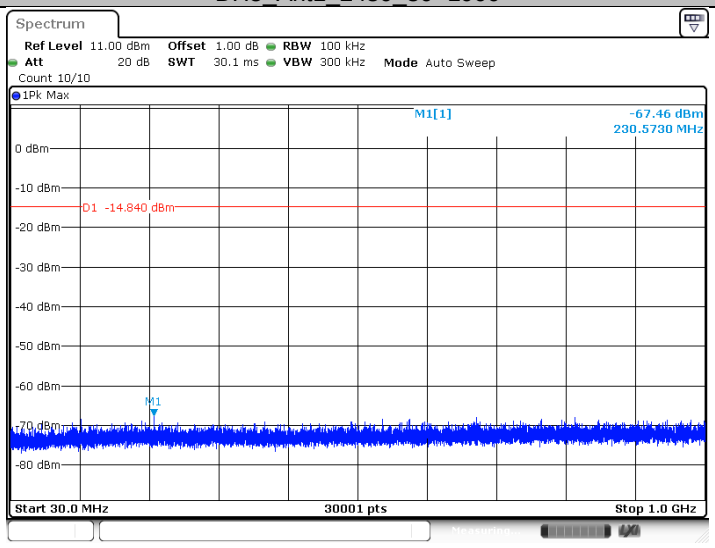
DH5_Ant1_2441_1000~26500



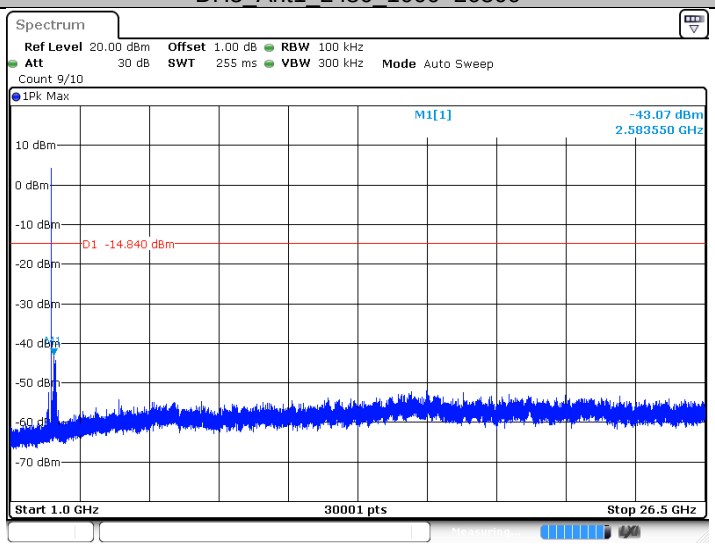
DH5_Ant1_2480_0~Reference



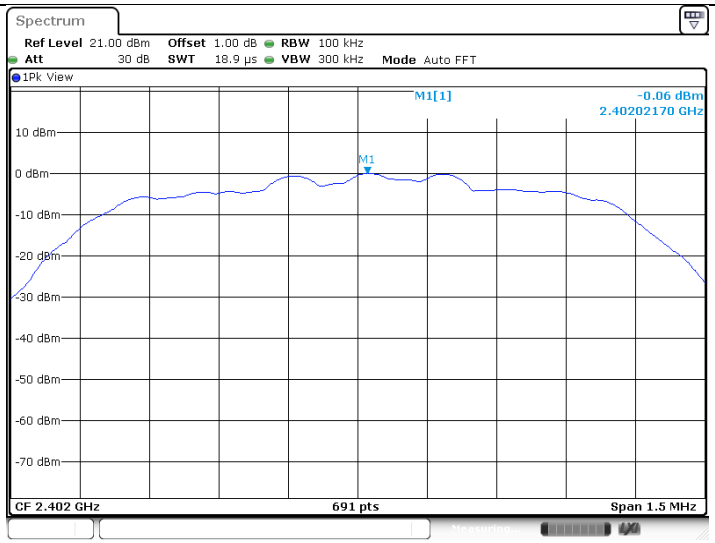
DH5_Ant1_2480_30~1000



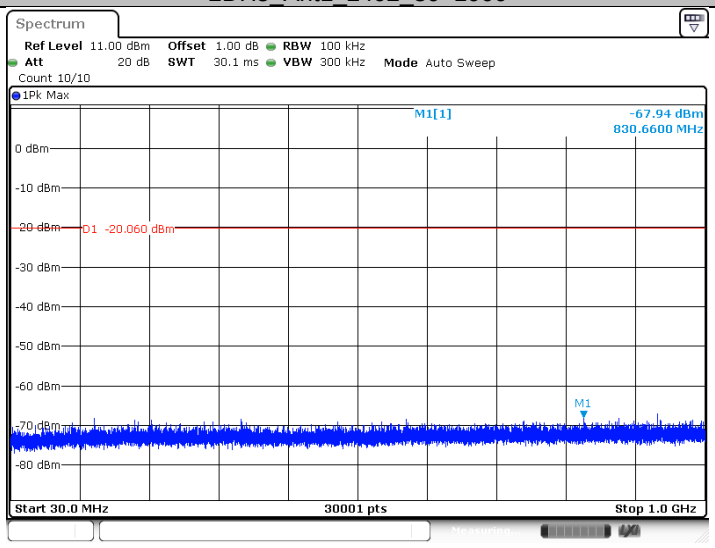
DH5_Ant1_2480_1000~26500



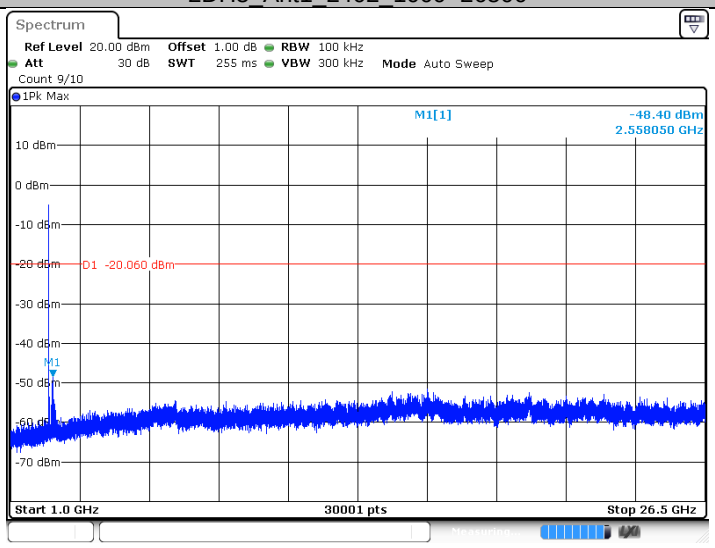
2DH5_Ant1_2402_0~Reference



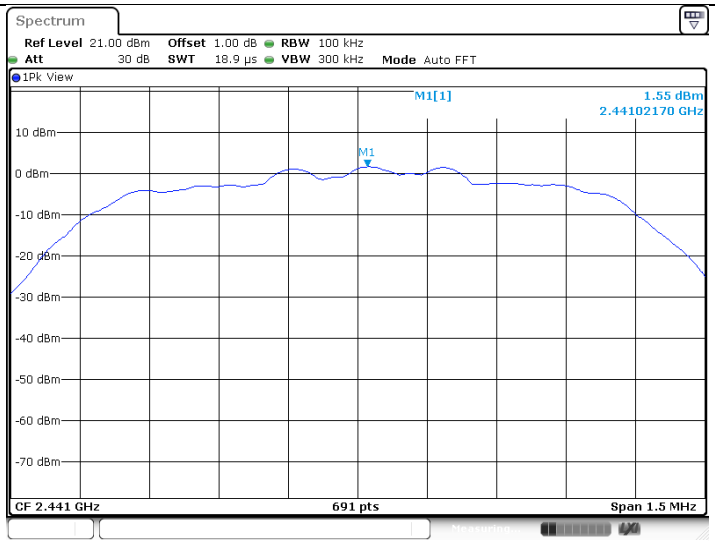
2DH5_Ant1_2402_30~1000



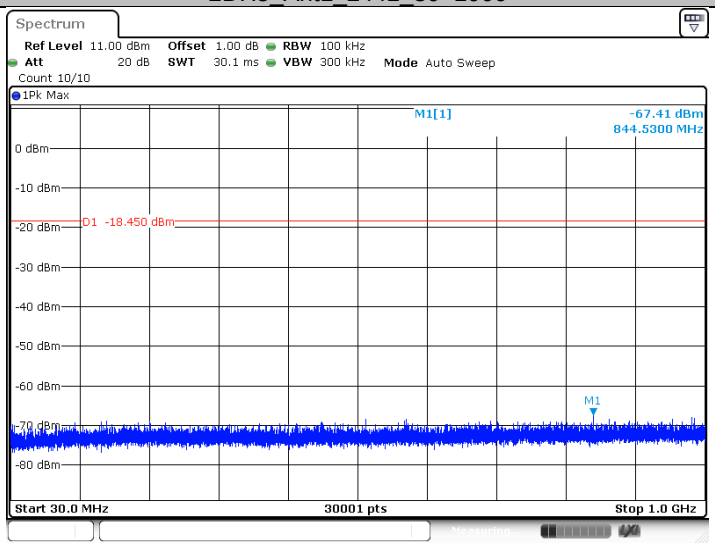
2DH5_Ant1_2402_1000~26500



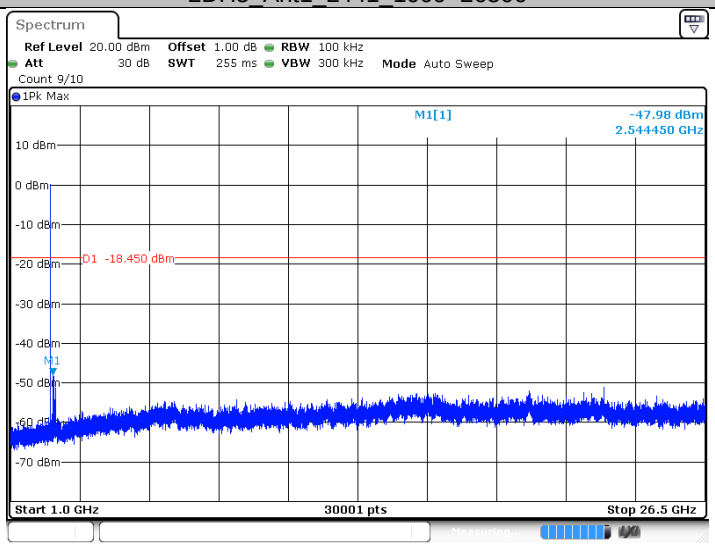
2DH5_Ant1_2441_0~Reference



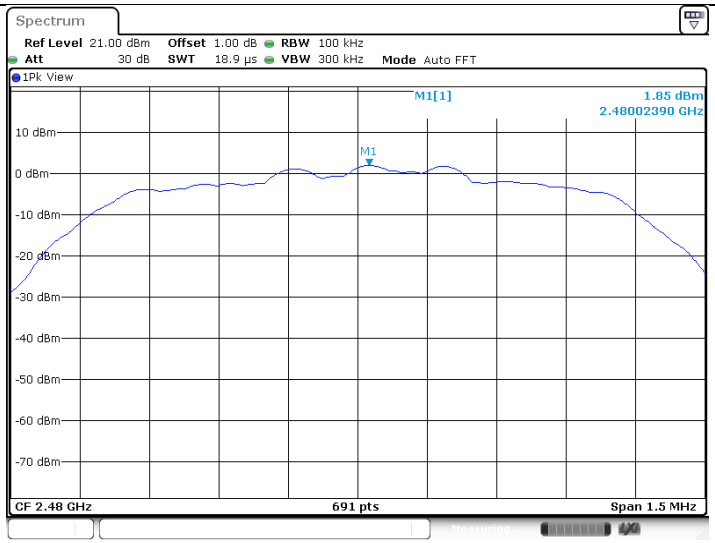
2DH5_Ant1_2441_30~1000



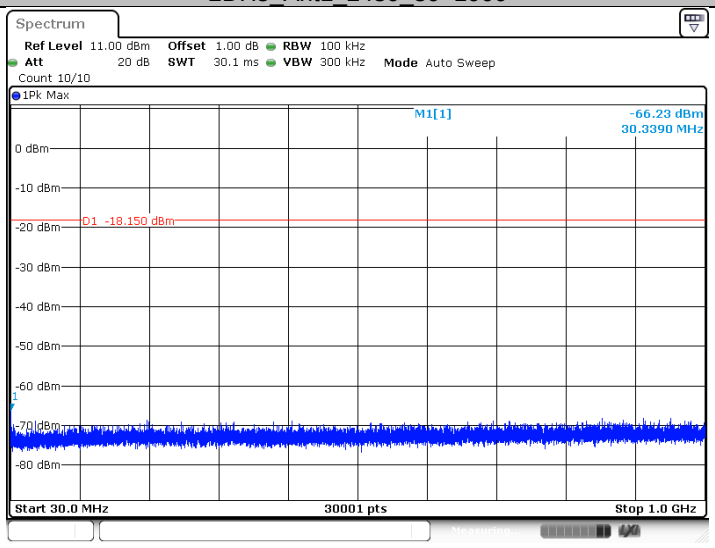
2DH5_Ant1_2441_1000~26500



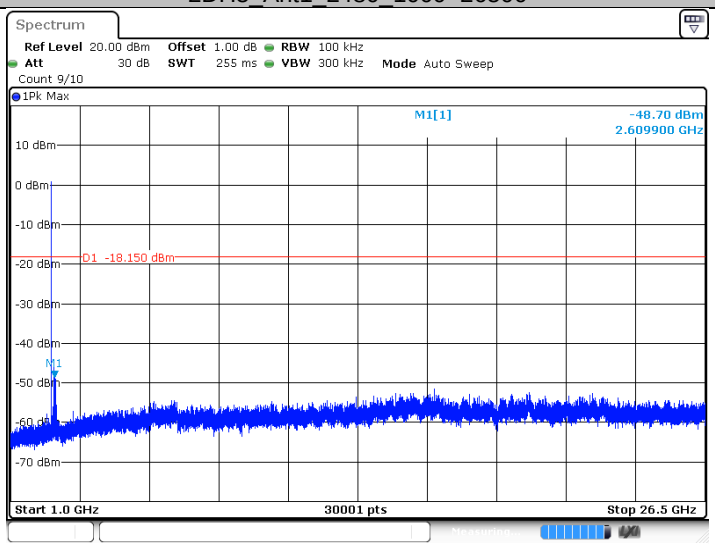
2DH5_Ant1_2480_0~Reference



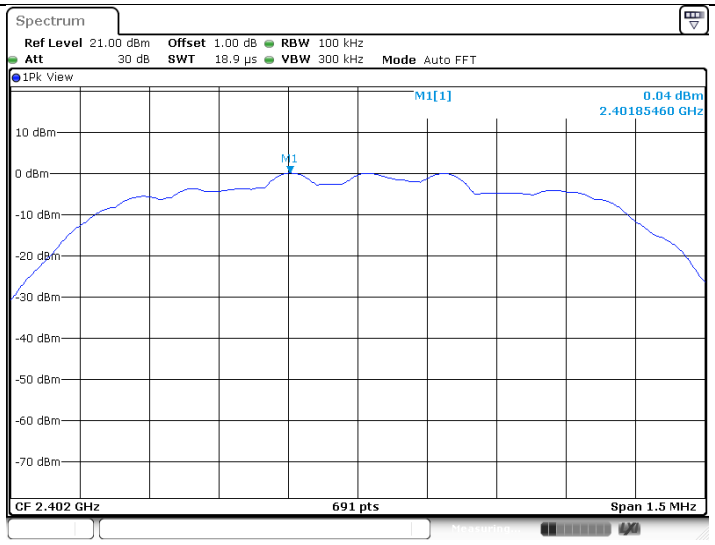
2DH5_Ant1_2480_30~1000



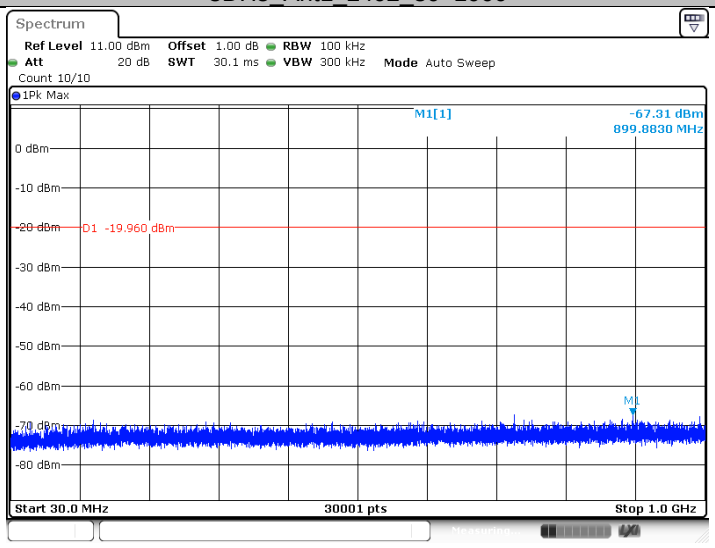
2DH5_Ant1_2480_1000~26500



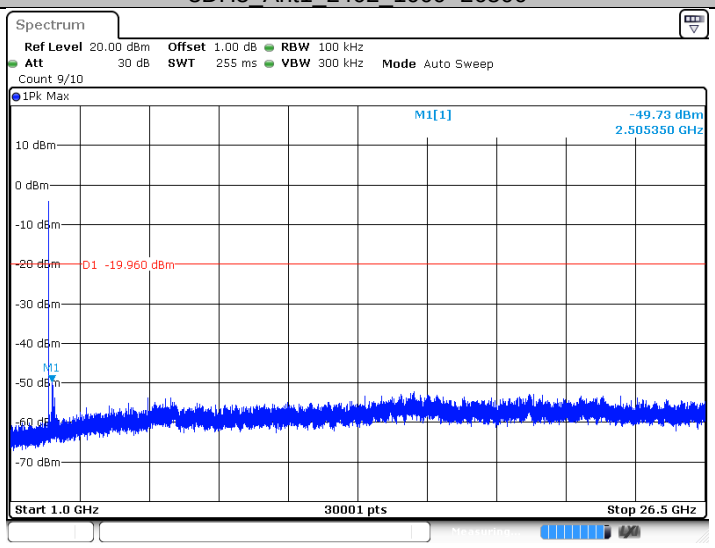
3DH5_Ant1_2402_0~Reference



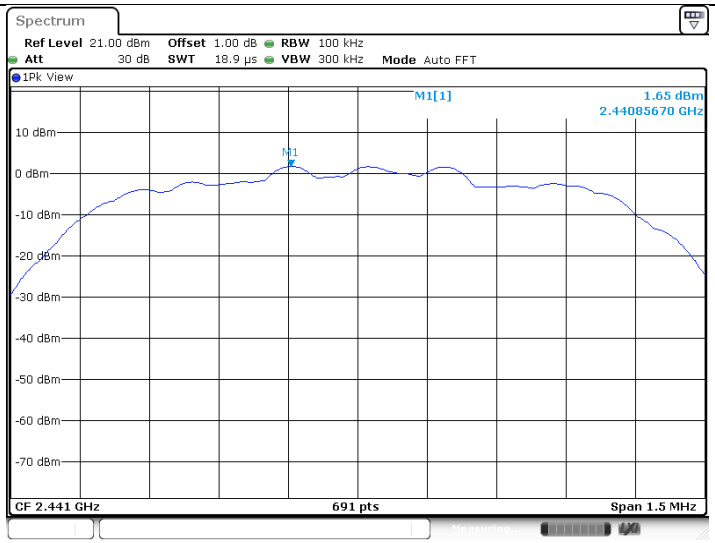
3DH5_Ant1_2402_30~1000



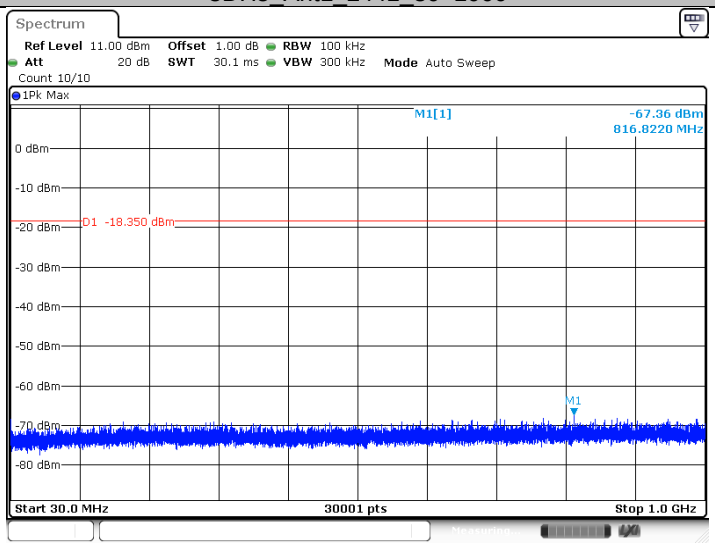
3DH5_Ant1_2402_1000~26500



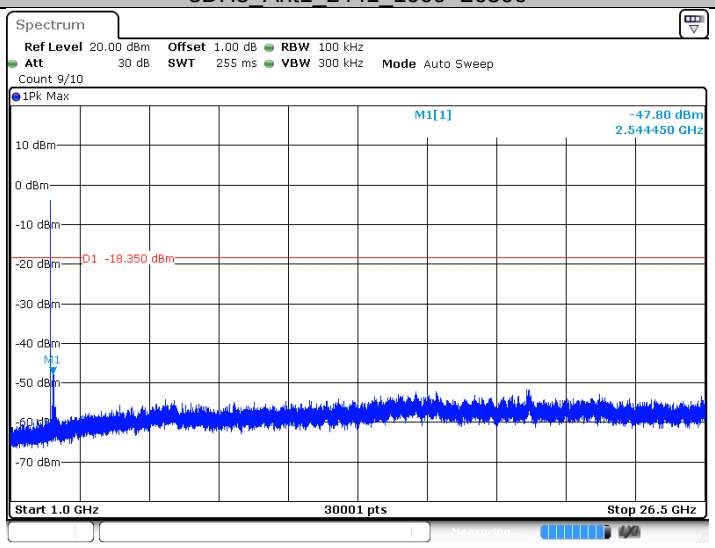
3DH5_Ant1_2441_0~Reference



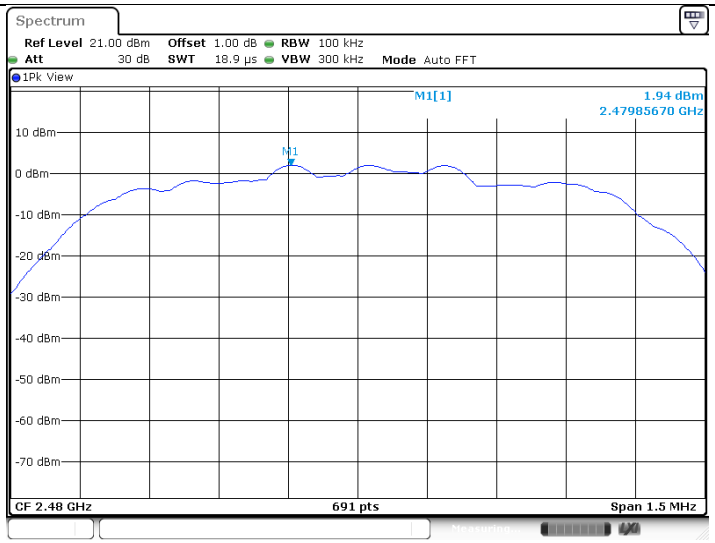
3DH5_Ant1_2441_30~1000



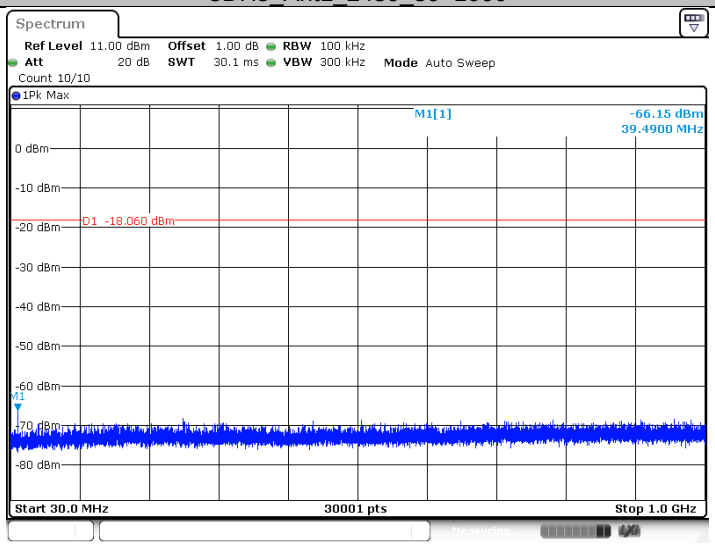
3DH5_Ant1_2441_1000~26500



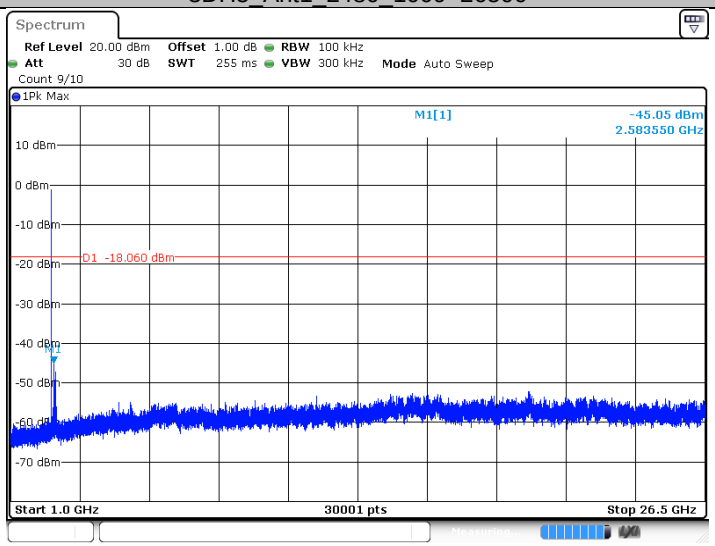
3DH5_Ant1_2480_0~Reference



3DH5_Ant1_2480_30~1000



3DH5_Ant1_2480_1000~26500



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.

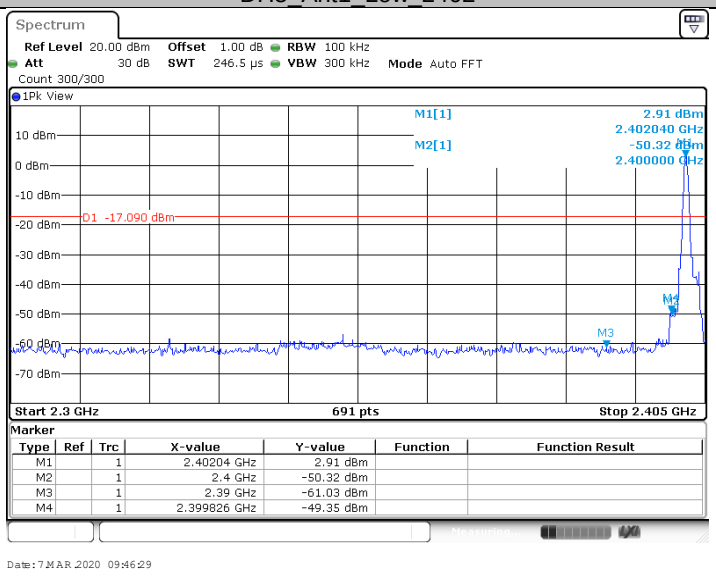
Limit:

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.

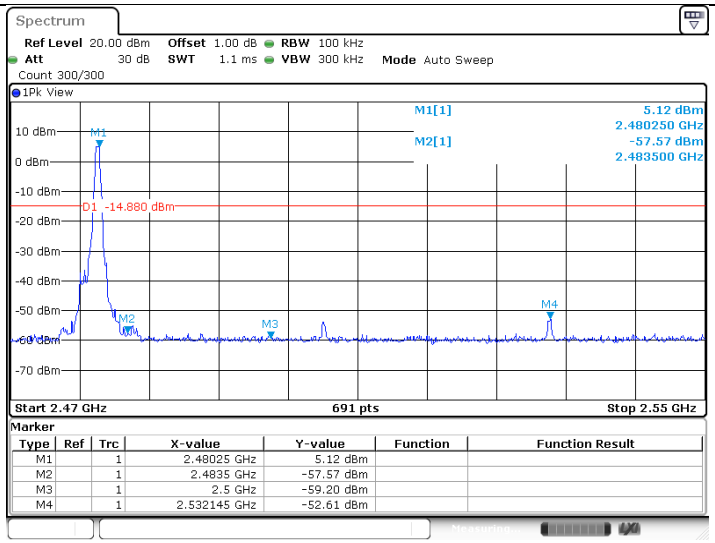
TestMode	ChName	Channel (MHz)	RefLevel (dBm)	Result(dBm)	Limit(dBm)	Verdict
DH5	Low	2402	2.91	-49.35	<=-17.09	PASS
	High	2480	5.12	-52.61	<=-14.88	PASS
	Low	Hop_2402	3.13	-52.34	-16.87	PASS
	High	Hop_2480	4.63	-42.79	-15.37	PASS
2DH5	Low	2402	0.00	-44.79	<=-20	PASS
	High	2480	1.84	-54.47	<=-18.16	PASS
	Low	Hop_2402	-3.04	-50.29	-23.04	PASS
	High	Hop_2480	1.50	-44.83	-18.5	PASS
3DH5	Low	2402	-0.01	-45.75	<=-20.01	PASS
	High	2480	1.96	-54.11	<=-18.04	PASS
	Low	Hop_2402	-4.53	-50.77	-24.53	PASS
	High	Hop_2480	1.58	-45.05	-18.42	PASS

Test Graphs

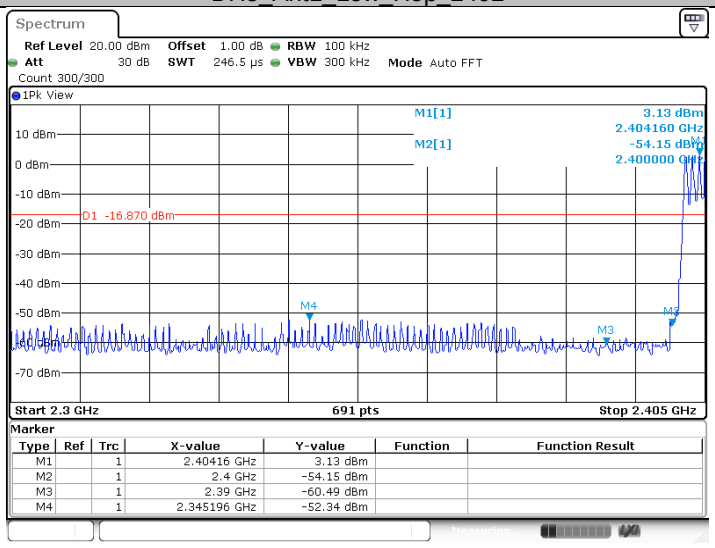
DH5_Ant1_Low_2402



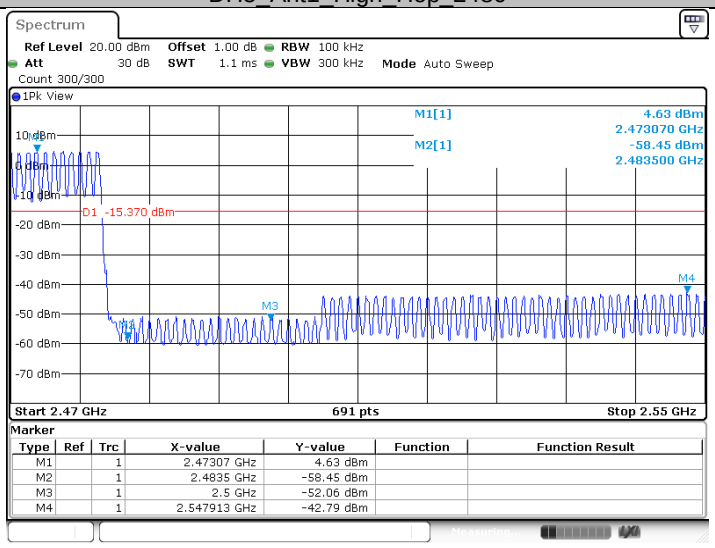
DH5_Ant1_High_2480



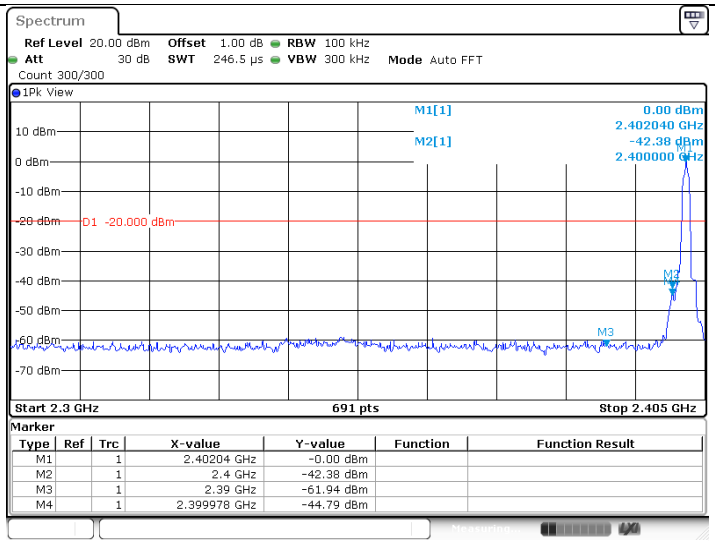
DH5_Ant1_Low_Hop_2402



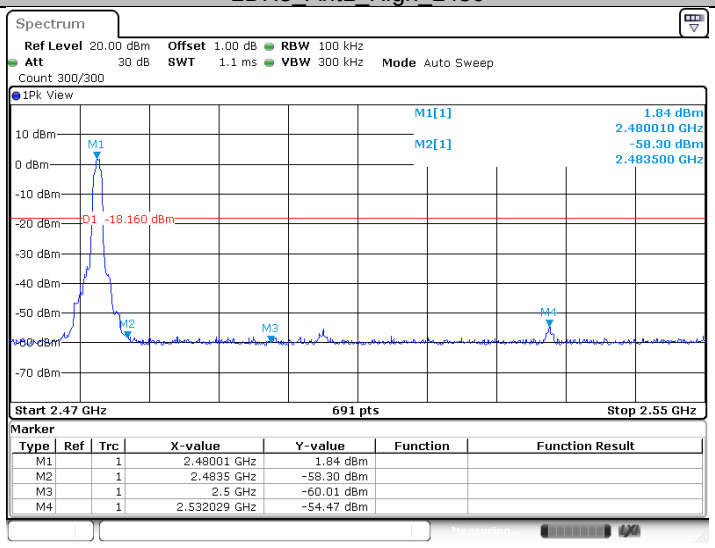
DH5_Ant1_High_Hop_2480



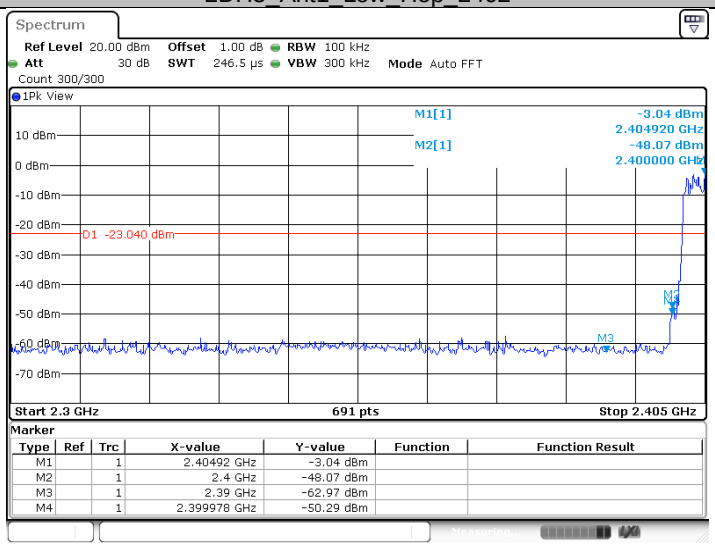
2DH5_Ant1_Low_2402



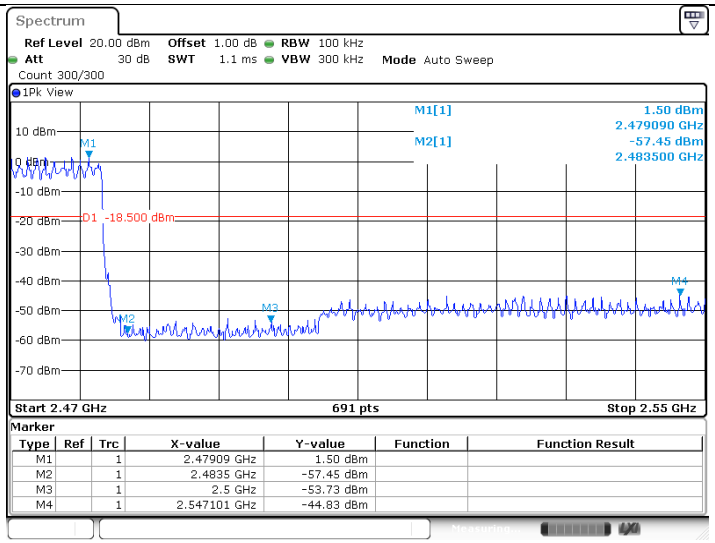
2DH5_Ant1_High_2480



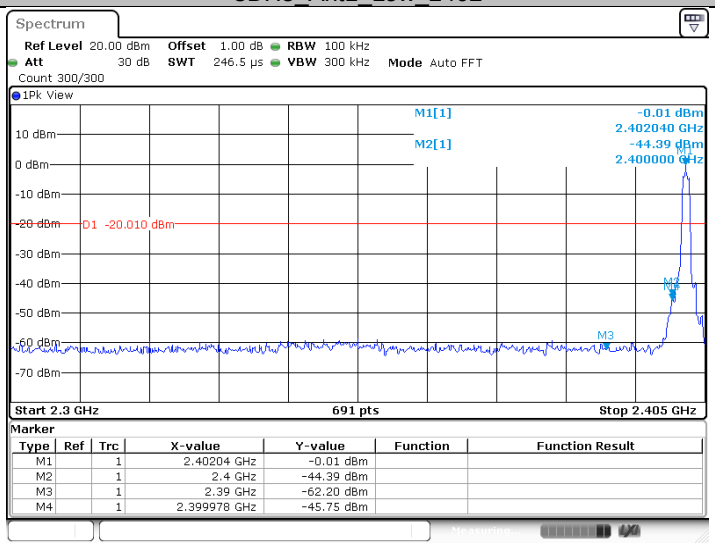
2DH5_Ant1_Low_Hop_2402



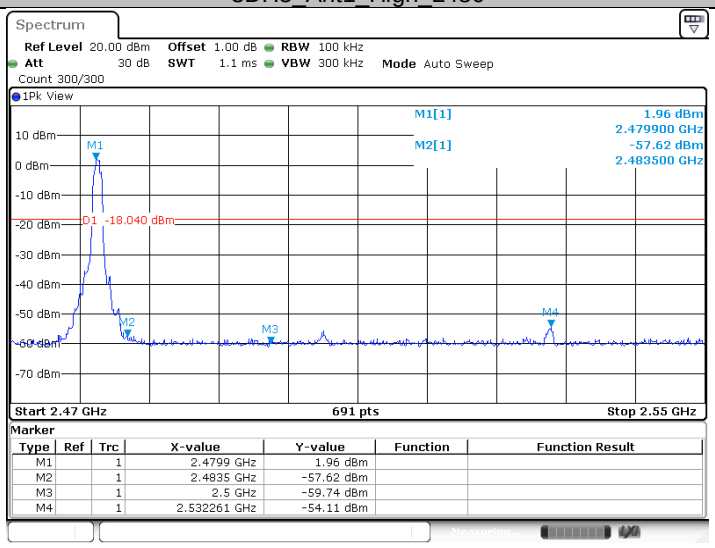
2DH5_Ant1_High_Hop_2480



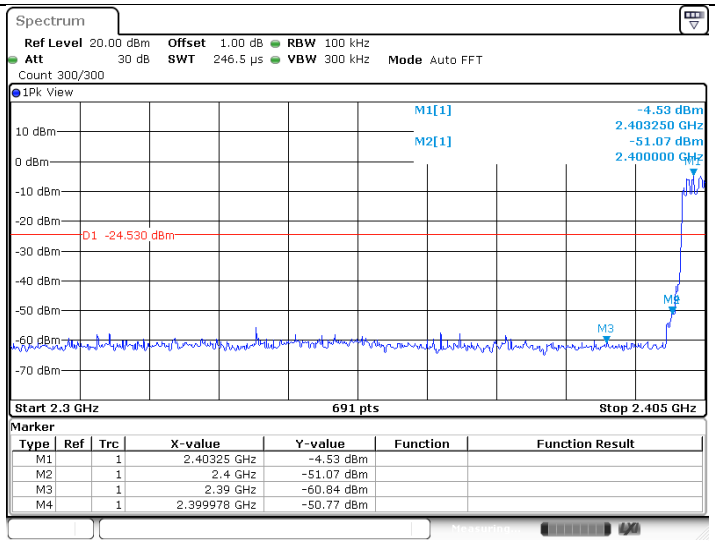
3DH5_Ant1_Low_2402



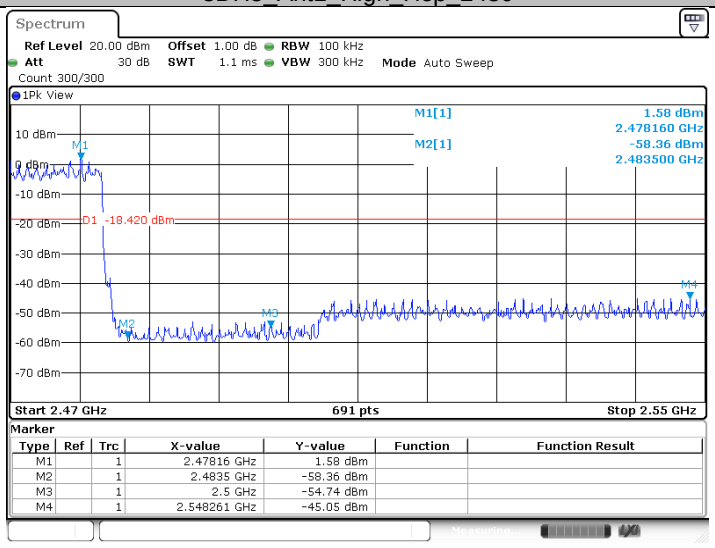
3DH5_Ant1_High_2480



3DH5_Ant1_Low_Hop_2402



3DH5_Ant1_High_Hop_2480



9.8 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 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 to 120KHz, VBW≥RBW for peak measurement, Sweep = auto,
Detector function = peak, Trace = max hold.

For Peak unwanted emissions 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, Sweep = auto,
Detector function = peak, Trace = max hold.

Procedures for average unwanted emissions measurements above 1000 MHz:

Span = wide enough to capture the peak level of the in-band emission and all spurious
RBW = 1MHz, VBW=10Hz, Sweep = auto, Detector function = peak, Trace = max hold.
If the dwell time 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(dwell time/100 ms), in an effort to demonstrate compliance with the 15.209 limit.

If the emission is pulsed, modify the unit for continuous operation; use the settings shown above, then correct the reading by subtracting the peak-average correct factor, derived from the appropriate the duty cycle calculation.

The setting method can refer to DA00-705.

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.

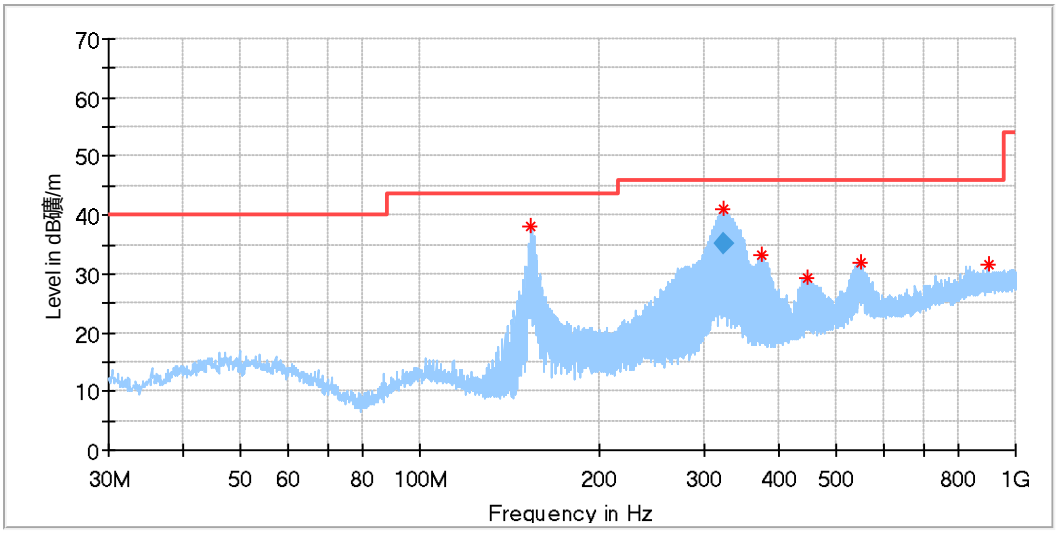
Frequency MHz	Field Strength uV/m	Field Strength dBµV/m	Detector
30-88	100	40	QP
88-216	150	43.5	QP
216-960	200	46	QP
960-1000	500	54	QP
Above 1000	500	54	AV
Above 1000	5000	74	PK

Spurious radiated emissions for transmitter

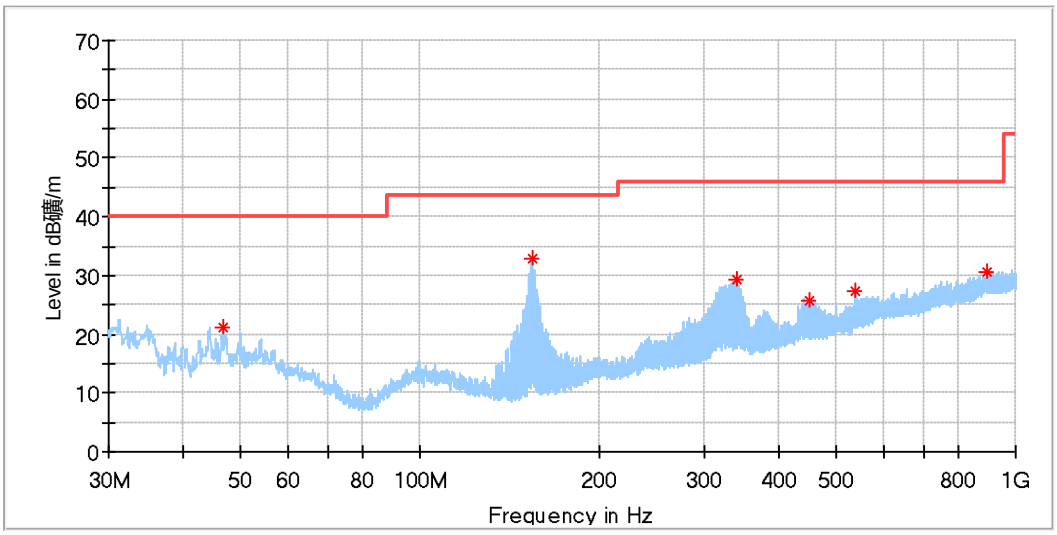
According to C63.10, if the peak (or quasi-peak) measured value complies with the average limit, it is unnecessary to perform an average measurement, so AV emission value did not show in below table if the peak value complies with average limit.

Transmitting spurious emission test result as below:

Below 1G:

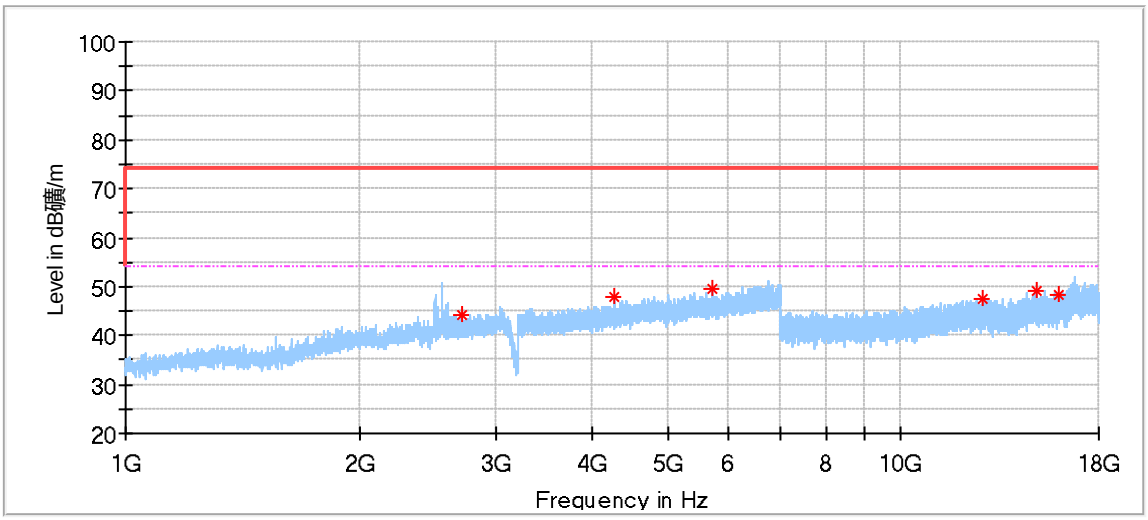


Frequency (MHz)	MaxPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
153.735625	38.00	43.50	5.50	200.0	H	180.0	13
323.015625	35.16	46.00	10.84	128.0	H	258.0	19
373.501250	33.13	46.00	12.87	100.0	H	251.0	21
446.736250	29.36	46.00	16.64	100.0	H	251.0	22
549.556250	31.92	46.00	14.08	200.0	H	0.0	24
900.090000	31.66	46.00	14.34	100.0	H	261.0	30

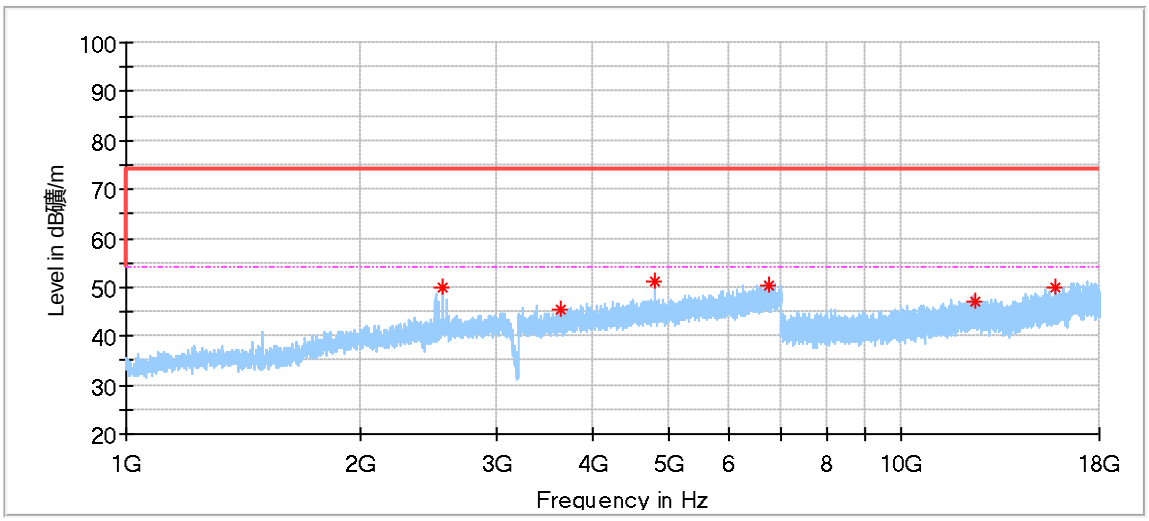


Frequency (MHz)	MaxPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
46.671875	21.09	40.00	18.91	200.0	V	358.0	18
153.978125	32.99	43.50	10.51	200.0	V	251.0	13
339.611875	29.37	46.00	16.63	100.0	V	204.0	20
452.071250	25.79	46.00	20.21	100.0	V	34.0	22
539.250000	27.50	46.00	18.50	200.0	V	61.0	24
894.330625	30.73	46.00	15.27	200.0	V	0.0	29

Above 1G:
GFSK Modulation 2402MHz Test Result

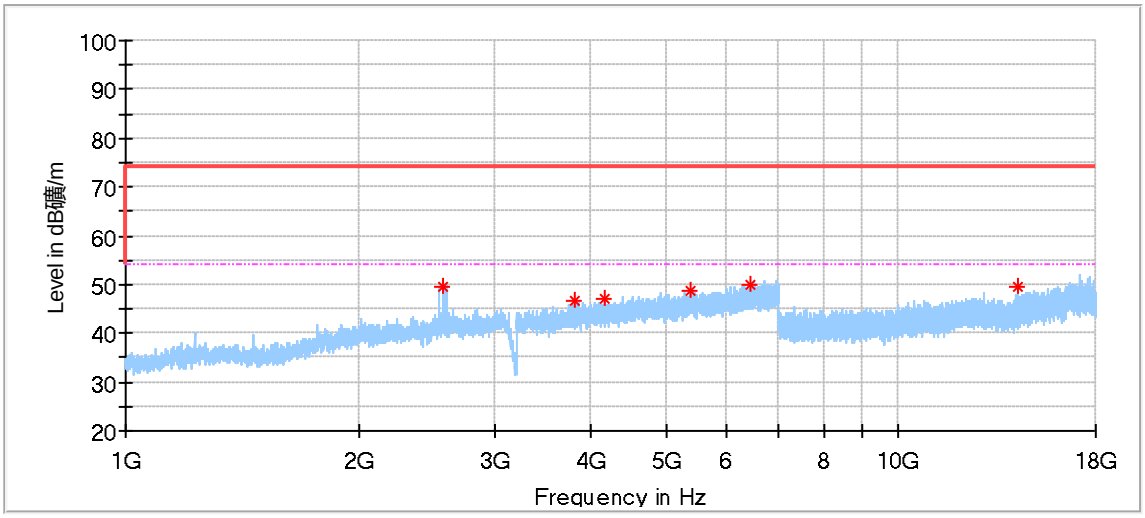


Frequency (MHz)	MaxPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
2722.500000	44.31	74.00	29.69	150.0	H	290.0	-3.1
4280.000000	47.88	74.00	26.12	150.0	H	134.0	1.7
5723.000000	49.34	74.00	24.66	150.0	H	274.0	3.3
12785.000000	47.38	74.00	26.62	150.0	H	179.0	10.1
14943.500000	49.32	74.00	24.69	150.0	H	341.0	12.1
15958.500000	48.18	74.00	25.82	150.0	H	259.0	13.9

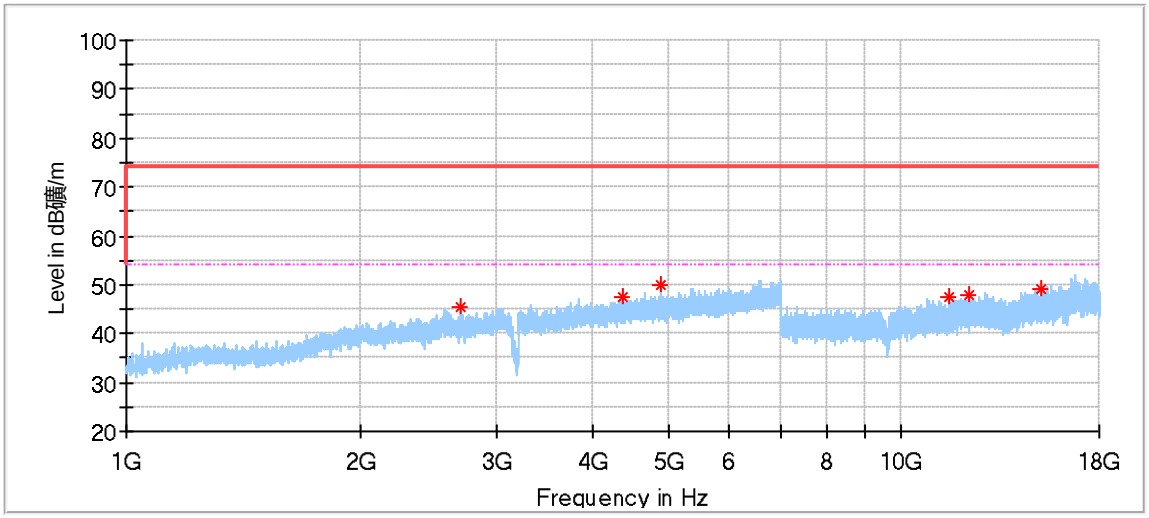


Frequency (MHz)	MaxPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
2558.500000	49.83	74.00	24.17	150.0	V	200.0	-3.3
3629.500000	45.42	74.00	28.58	150.0	V	308.0	-0.6
4804.000000	51.35	74.00	22.65	150.0	V	181.0	2.5
6763.500000	50.47	74.00	23.53	150.0	V	161.0	6.6
12480.500000	47.11	74.00	26.89	150.0	V	117.0	9.9
15778.000000	49.92	74.00	24.08	150.0	V	97.0	13.6

GFSK Modulation 2441MHz Test Result

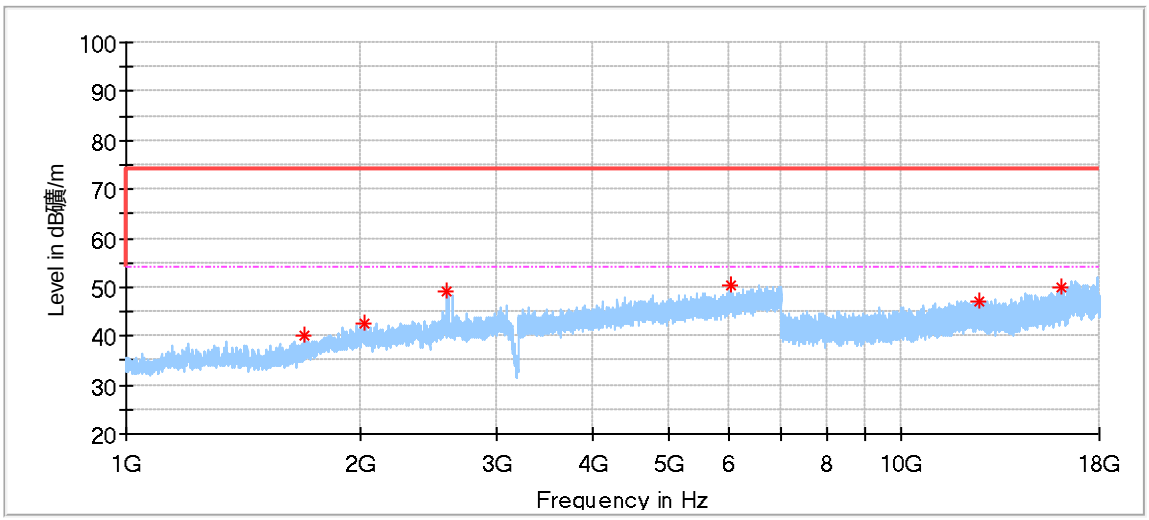


Frequency (MHz)	MaxPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
2571.000000	49.37	74.00	24.63	150.0	H	318.0	-3.1
3807.500000	46.51	74.00	27.49	150.0	H	71.0	0.3
4172.500000	47.27	74.00	26.73	150.0	H	301.0	1.8
5385.000000	48.54	74.00	25.46	150.0	H	323.0	2.9
6416.500000	49.98	74.00	24.02	150.0	H	286.0	6.3
14240.000000	49.43	74.00	24.57	150.0	H	177.0	10.8

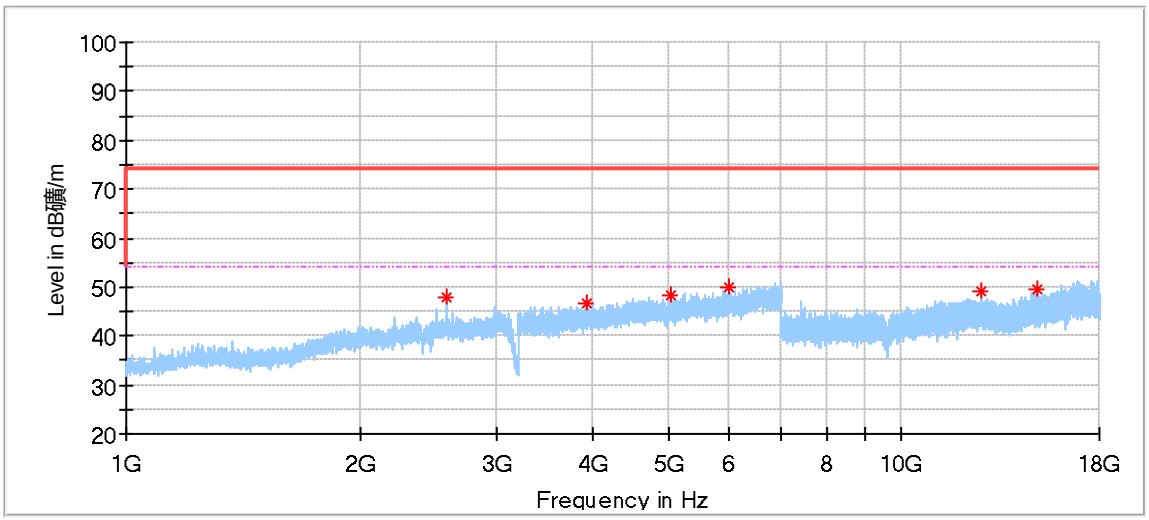


Frequency (MHz)	MaxPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
2692.500000	45.52	74.00	28.48	150.0	V	171.0	-3.3
4359.500000	47.60	74.00	26.40	150.0	V	215.0	2.8
4882.500000	49.87	74.00	24.13	150.0	V	249.0	2.6
11515.000000	47.37	74.00	26.63	150.0	V	117.0	8.8
12213.000000	47.88	74.00	26.12	150.0	V	57.0	9.6
15178.500000	49.27	74.00	24.73	150.0	V	180.0	12.7

GFSK Modulation 2480MHz Test Result



Frequency (MHz)	MaxPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
1700.000000	40.27	74.00	33.73	150.0	H	102.0	-7.4
2035.000000	42.73	74.00	31.27	150.0	H	135.0	-5.0
2584.500000	49.13	74.00	24.87	150.0	H	305.0	-3.2
6025.500000	50.56	74.00	23.44	150.0	H	190.0	5.0
12622.000000	47.14	74.00	26.86	150.0	H	33.0	9.9
16075.500000	49.80	74.00	24.20	150.0	H	54.0	14.1



Frequency (MHz)	MaxPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
2584.500000	47.90	74.00	26.10	150.0	V	220.0	-3.2
3917.500000	46.60	74.00	27.40	150.0	V	166.0	0.7
5035.500000	48.11	74.00	25.89	150.0	V	230.0	2.7
6003.000000	49.89	74.00	24.11	150.0	V	166.0	4.9
12686.000000	49.19	74.00	24.81	150.0	V	161.0	9.9
14986.500000	49.48	74.00	24.52	150.0	V	260.0	11.9

Remark:

(1) The report only shows the worst test case GSFK mode.

(2) Data of measurement within frequency range18-26GHz are the noise floor or attenuated more than 20dB below the permissible limits or the field strength is too small to be measured, so test data does not present in this report;

(3) Level=Reading Level + Correction Factor
Above 1GHz: Corrector factor = Antenna Factor + Cable Loss- Amplifier Gain
Below 1GHz: Corrector factor = Antenna Factor + Cable Loss

10 Test Equipment List

List of Test Instruments

Radiated Emission Test

Description	Manufacturer	Model no.	Serial no.	cal. due date
EMI Test Receiver	Rohde & Schwarz	ESR 26	101269	2020-6-28
Trilog Super Broadband Test Antenna	Schwarzbeck	VULB 9163	707	2020-6-28
Horn Antenna	Rohde & Schwarz	HF907	102294	2020-6-22
Pre-amplifier	Rohde & Schwarz	SCU 18	102230	2020-6-28
Signal Generator	Rohde & Schwarz	SMY01	839369/005	2020-6-28
Attenuator	Agilent	8491A	MY39264334	2020-6-28
3m Semi-anechoic chamber	TDK	9X6X6	----	2020-7-7
Test software	Rohde & Schwarz	EMC32	Version 9.15.00	N/A

Conducted Emission Test

Description	Manufacturer	Model no.	Serial no.	cal. due date
EMI Test Receiver	Rohde & Schwarz	ESR 3	101782	2020-6-28
LISN	Rohde & Schwarz	ENV4200	100249	2020-6-28
LISN	Rohde & Schwarz	ENV432	101318	2020-7-19
LISN	Rohde & Schwarz	ENV216	100326	2020-6-28
ISN	Rohde & Schwarz	ENY81	100177	2020-6-28
ISN	Rohde & Schwarz	ENY81-CA6	101664	2020-6-28
High Voltage Probe	Rohde & Schwarz	TK9420(VT9420)	9420-584	2020-6-24
RF Current Probe	Rohde & Schwarz	EZ-17	100816	2020-7-2
Attenuator	Shanghai Huaxiang	TS2-26-3	080928189	2020-6-28
Test software	Rohde & Schwarz	EMC32	Version9.15.00	N/A
Shielding Room	TDK	CSR	----	2020-7-19

TS8997 Test System

Description	Manufacturer	Model no.	Serial no.	cal. due date
Signal Generator	Rohde & Schwarz	SMB100A	108272	2020-6-28
Vector Signal Generator	Rohde & Schwarz	SMBV100A	262825	2020-6-28
Communication Synthetical Test Instrument	Rohde & Schwarz	CMW 270	101251	2020-5-31
Signal Analyzer	Rohde & Schwarz	FSV40	101030	2020-6-28
Vector Signal Generator	Rohde & Schwarz	SMU 200A	105324	2020-6-28
RF Switch Module	Rohde & Schwarz	OSP120/OSP-B157	101226/100851	2020-6-28
Power Splitter	Weinschel	1580	SC319	2020-7-7
10dB Attenuator	Weinschel	4M-10	43152	2020-7-6
10dB Attenuator	R&S	DNF	DNF-001	2020-6-28
10dB Attenuator	R&S	DNF	DNF-002	2020-6-28
10dB Attenuator	R&S	DNF	DNF-003	2020-6-28
10dB Attenuator	R&S	DNF	DNF-004	2020-6-28
Test software	Tonscend	System for BT/WIFI	Version 2.5.77.0418	N/A

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 Conducted Emission 150kHz-30MHz (for test using AMN ENV432 or ENV4200)	3.21dB
Uncertainty for Radiated Emission in 3m chamber 30MHz-1000MHz	Horizontal: 5.12dB; Vertical: 5.10dB;
Uncertainty for Radiated Emission in 3m chamber 1000MHz-18000MHz	Horizontal: 5.01dB; Vertical: 5.00dB;
Uncertainty for Radiated Spurious Emission 25MHz-3000MHz	Horizontal: 4.81dB; Vertical: 4.89dB;
Uncertainty for Radiated Spurious Emission 3000MHz-18000MHz	Horizontal: 4.69dB; Vertical: 4.68dB;
Uncertainty for Radiated Spurious Emission 18000MHz-40000MHz	Horizontal: 4.89dB; Vertical: 4.87dB;
Uncertainty for Conducted RF test with TS 8997	RF Power Conducted: 1.16dB Frequency test involved: 0.6×10^{-7} or 1%