FCC/IC TEST REPORT

Test Report No.	W21WD-001		
Date of test	Dec. 08, 2020 ~ Dec. 18, 2020	Date of Issuing	Jan. 13, 2021

Applicant	THE YEOLRIM Co.,Ltd.		
Address	D-311, H Business Park 26 Beobwon-ro 9-gil Songpa-gu, Seoul, Korea, 05836		
Manufacturer	THE YEOLRIM Co.,Ltd.		
Address	D-311, H Business Park 26 Beobwon-ro 9-gil Songpa-gu, Seoul, Korea, 05836		
Telephone no.	+82-2-862-3716	Fax No.	+82-2-862-3717

Name of Equipment	Orangeaid Pro		
Model Name	YSH-C2000	FCC ID	2AYGZ-YSH-C2000
Multi Model Name	N/A	Brand Name	N/A

Standards	FCC CFR47, Part15 Subpart C – 15.247 ANSI C63.10:2013
Test Result	Compliance

This report details the results of the testing carried out on one sample, the results contained in this test report do not relate to other samples of the same product. The manufacturer should ensure that all products in series production are in conformity with the product sample detailed in this report.
This report may only be reproduced and distributed in full. If the product in this report is used in any configuration other than that detailed in the report, the manufacturer must ensure the new system complies with all relevant standards.

Tested by: 전준영 2021.1.13
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StandardBank / RF Testing Team

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Revision History

Issued Date.	Issue Report No	Descripsion
Jan. 13, 2021	W21WD-001	Initial Issue
-	-	-

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1. General Information

1.1 Information of Test Laboratory.

Name	Standardbank Co., Ltd.
Address	48, Gunpocheomdansaneop 2-ro, Gunpo-si, Gyeonggi-do, 15880, Republic of Korea
Tel/Fax	(82)31-393-9394 / (82)31-393-9392

1.2 Details of EUT

FCC ID	2AYGZ-YSH-C2000
Equipment Class	DSS – Part 15 Spread Spectrum Transmitter
Frequency Range	2 402 MHz ~ 2 480 MHz
Modulation Type	GFSK (BDR) π/4DQPSK, 8DPSK(EDR)
Number of Channel	79
Antenna Type	Chip Antenna
Antenna Gain	3.7 dBi
RF Power	-5.89 dBm
Power Source	DC 3.7 V (Rechargeable Battery)
Serial No.	N/A
Clock Frequency	19.2 MHz

1.3 Measurement Uncertainty

The measurement instrumentation uncertainly consideration contained in CISPR 16-4-2.

This uncertainty represents an expanded uncertainty expressed at approximately the 95 % confidence level using a coverage factor of k=2.

Test Item	Uncertainty
Radiated Spurious Emission (Below 1 GHz)	4.6 dB
Radiated Spurious Emission (Above 1GHz)	5.7 dB
AC Conducted Emissions	2.4 dB

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1.4 Test Methodolgy

Both conducted and radiated testing was performed according to the procedures in ANSI C63.10:2013. Radiated testing was performed at 3 m from EUT to antenna.

1.5 Test Facility

The Electromagnetic compatibility measurement facilities are located on at **48, Gunpocheomdansaneop 2-ro, Gunpo-si, Gyeonggi-do, 15880, Republic of Korea.**

Description details of test facilities were submitted to the **RRA** (National Radio Research Agency) **in accordance with** the requirement of ISO 17025, **FCC** (Federal Communications Commission) **MRA, Vietnam MRA, TUV SUD CARAT** and approved by **VCCI**.

RRA Designation No. : **KR0144** (Sep. 17, 2009)

KOLAS Accreditation No. : **KT558** (Mar. 27, 2013)

FCC MRA Designation No. : **KR0144** (May 06, 2015)

Vietnam MRA Designation No. : **KR0144** (May 13, 2015)

Canada MRA Designation No. : **KR0144** (Feb. 22, 2019)

TUV SUD CARAT Recognition of Agent's Testing (Jan. 13, 2020), Certificate No. : **CARAT 086270 0003 Rev. 00,**

VCCI member No. : **3096**

- Resistration No :

C-20024 (Facility for measuring conducted emissions at AC mains power ports) : (Feb. 19, 2021)

T-20025 (Facility for measuring conducted emissions at Telecommunication (Wired) ports) : (Apr. 23, 2018)

R-20071 (Facility for measuring radiated emissions below 1 GHz : 10 m method) : (Apr. 22, 2019)

G-20043 (Facility for measuring radiated emissions above 1 GHz : 3 m method) : (Apr. 23, 2018)

1.6 Frequency Table

Channel	Frequency (MHz)
00	2 402
:	:
38	2 440
:	:
78	2 480

1.7 Test Environment

Temperature	Relative Humidity
(21.2 ± 2.0) ℃	(48.8 ± 10.0) % R.H.

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1.8 Test System Details

The model numbers for all the equipments that were used in the tested system is:

DESCRIPTION	MODEL NAME	MANUFACTURE NO.	MANUFACTURE	Remark
Laptop	X552E	N/A	ASUSTeK Computer Inc.	-

2. SUMMARY

FCC part	Parameter	Limit	Test Condition	Test Result
15.247(a)(1)	Carrier Frequency Separation	≥ 25 kHz or ≥ 2/3 of 20 dB BW	Conducted	C Note 1
15.247(a)(1)(iii)	Number of Hopping Frequencies	≥ 15 channels		C
15.247(a)(1)	20 dB Bandwidth	NA Note 1		C
15.247(a)(1)(iii)	Time of occupancy (dwell time)	≤ 0.4 seconds		C
15.247(b)(1)	Maximum Peak Output Power	≤ 1 W, if ≥75 non-overlapping channels used. Others, ≤ 125 mW		C
15.247(d)	Band Edge & Conducted Spurious Emission	> 20 dBc		C
15.247(d), 15.205, 15.209(a)	Radiated Spurious Emission & Restricted Band Edge	15.209	Radiated	C Note 2
15.207(a)	AC Power Line Conducted Emission	15.207	AC Line Conducted	C
15.203	Antenna Requirement	15.203	NA	C

Note 1 : C=Compliance, NC=Not Compliance, NA : Not Applicable

Note 2 : Radiation measurements are investigated in X, Y, Z axis position and 2 402 MHz, 2 440 MHz, 2 480 MHz and GFSK, π/4DQPSK, 8DPSK.Only worst cases("X" and 2 440MHz, GFSK) are shown in the report. The worst case(2 440 MHz) is chosen by Maximum peak output power.

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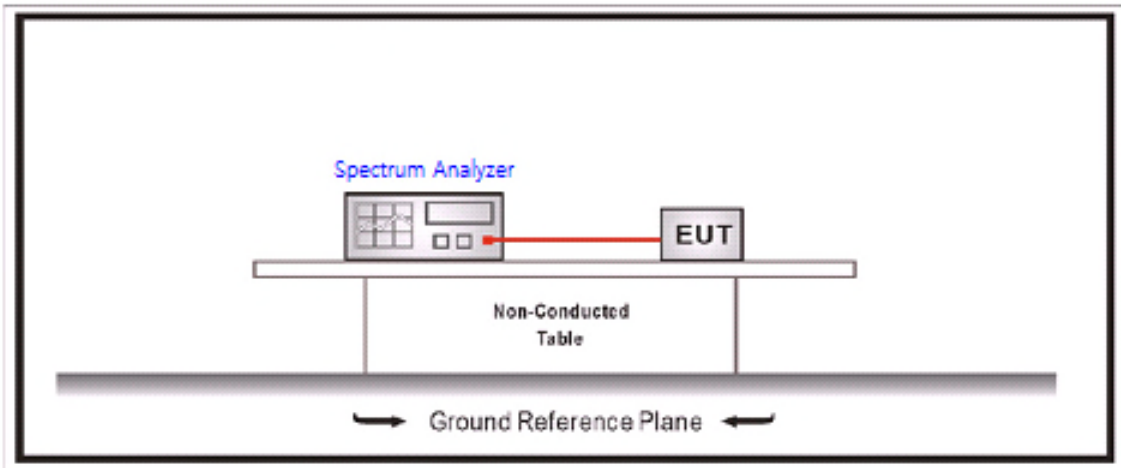
3. Carrier Frequency Separation

3.1 Limit (∮15.247(a)(1))

Frequency hopping systems operating in the 2 400 ~ 2 483.5 ㎒ band may have hopping channel carrier frequencies that are separated by 25 ㎑ or two-third of the 20 ㏈ bandwidth of the hopping channel, whichever is greater.

3.2 Test Configuration

RF Conducted Measurement:



3.3 Test Procedure (ANSI C63.10-2013 Section 7.8.2)

The EUT shall have its hopping function enabled. Use the following spectrum analyzer settings:

a) Span : Wide enough to capture the peaks of two adjacent channels.
b) RBW : Start with the RBW set to approximately 30% of the channel spacing; adjust as necessary to best identify the center of each individual channel.
c) VBW >= RBW
d) Sweep : Auto.
e) Detector : Peak
f) Trace : Max hold
g) Allow the trace to stabilize.

Use the marker-delta function to determine the separation between the peaks of the adjacent channels. Compliance of an EUT with the appropriate regulatory limit shall be determined. A plot of the data shall be included in the test report.

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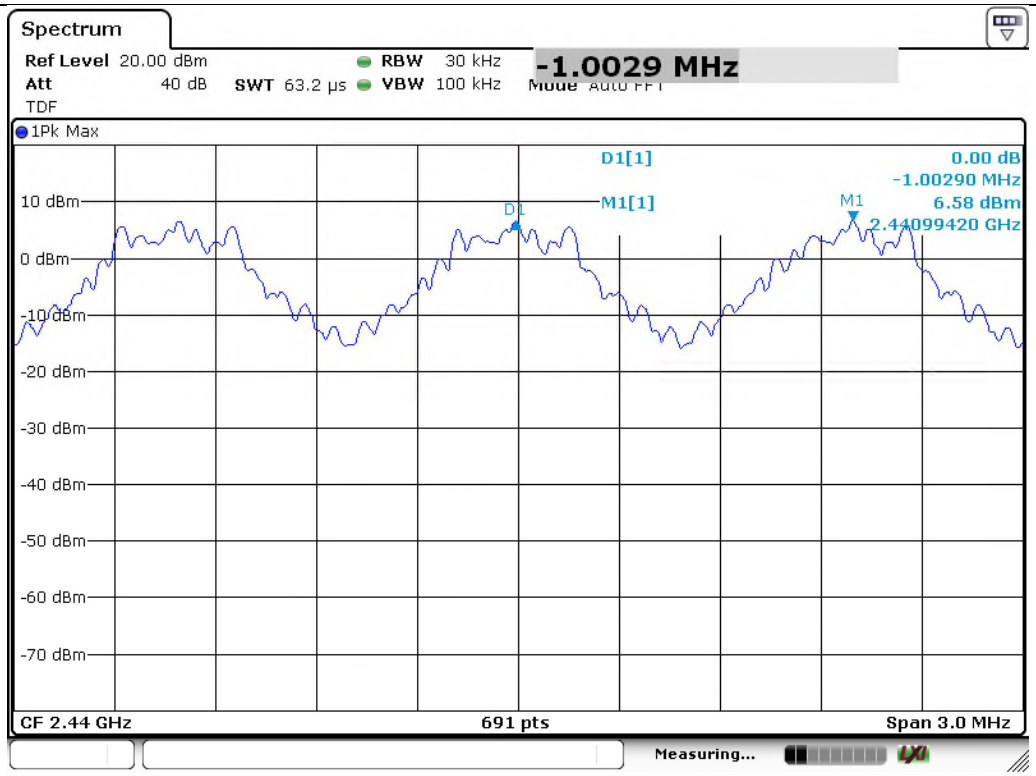
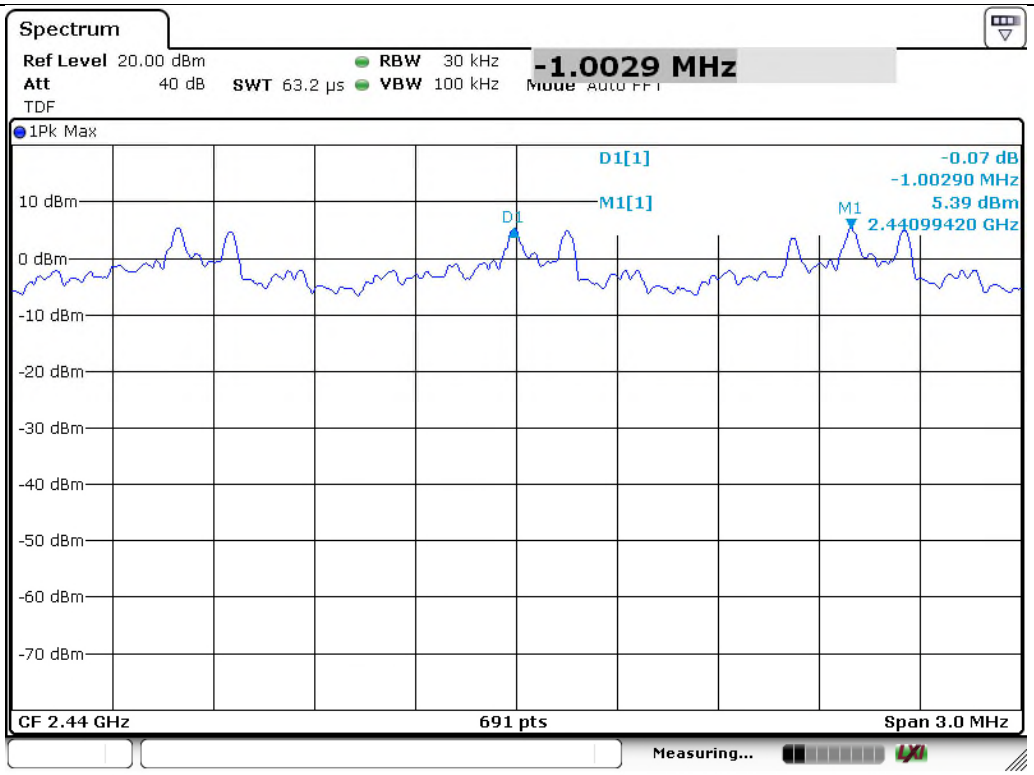
3.4 Test Result

Test Mode	Result (MHz)	Limit (MHz)	Result
GFSK	1.0029	≥ 25 kHz or ≥ 2/3 of 20 dB BW	Pass
8DPSK	1.0029		



GFSK


Spectrum
Ref Level 20.00 dBm
Att 40 dB
SWT 63.2 µs
RBW 30 kHz
VBW 100 kHz
-1.0029 MHz
TDF
1Pk Max
D1[1]
-0.07 dB
-1.00290 MHz
M1[1]
5.39 dBm
2.44099420 GHz
10 dBm
0 dBm
-10 dBm
-20 dBm
-30 dBm
-40 dBm
-50 dBm
-60 dBm
-70 dBm
CF 2.44 GHz
691 pts
Span 3.0 MHz
Measuring...

8DPSK

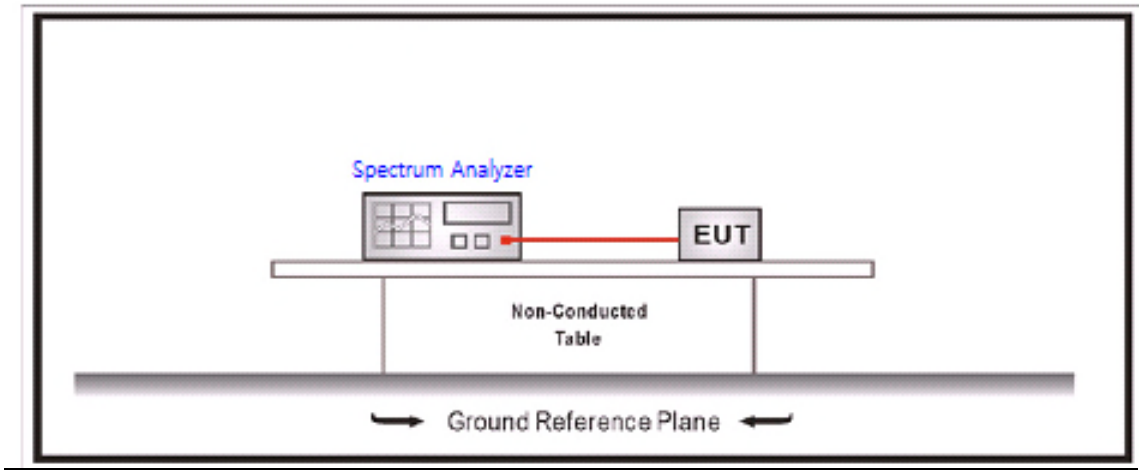
4. Number of Hopping Frequencies

4.1 Limit (∮15.247(a)(1)(iii))

Frequency hopping systems operating in the 2 400 ~ 2 483.5 ㎒ band shall use at least 15 hopping channels.

4.2 Test Configuration

RF Conducted Measurement:



4.3 Test Procedure (ANSI C63.10-2013 Section 7.8.3)

The EUT shall have its hopping function enabled. Use the following spectrum analyzer settings:

a) Span : The frequency band of operation. Depending on the number of channels the device supports, it may be necessary to divide the frequency range of operation across multiple spans, to allow the individual channels to be clearly seen.

b) RBW : To identify clearly the individual channels, set the RBW to less than 30% of the channel spacing or the 20 dB bandwidth, whichever is smaller.

c) VBW) >= RBW

d) Sweep = Auto.

e) Detector = Peak

f) Trace = Max hold

g) Allow the trace to stabilize.

It might prove necessary to break the span up into subranges to show clearly all of the hopping frequencies.

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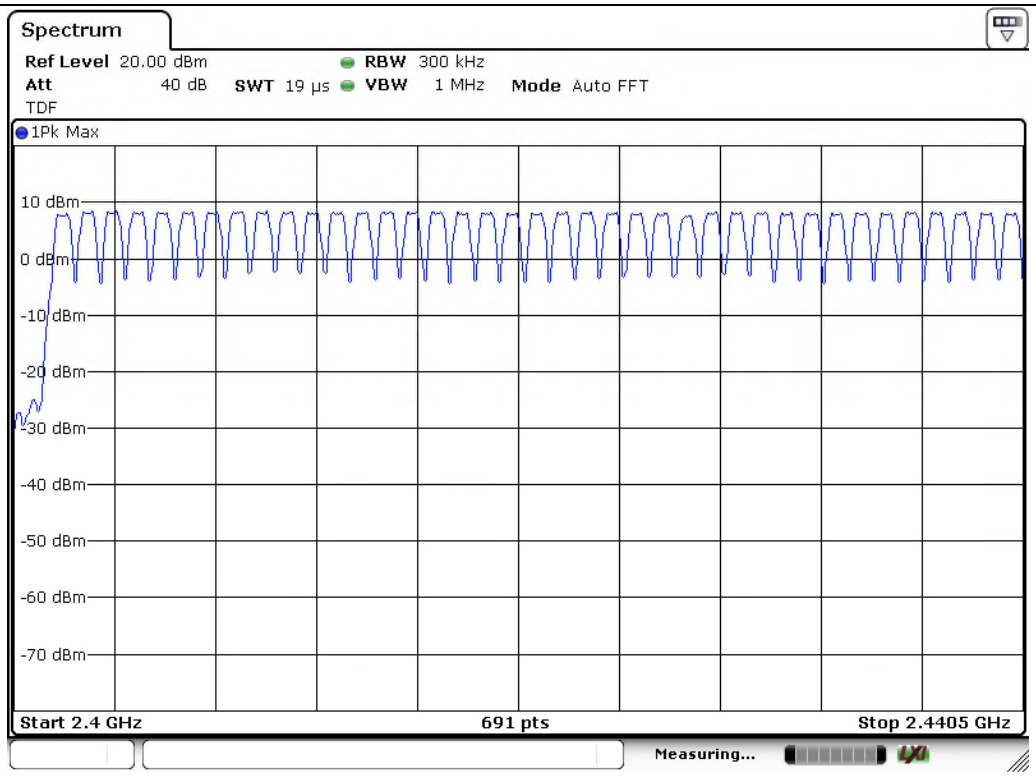
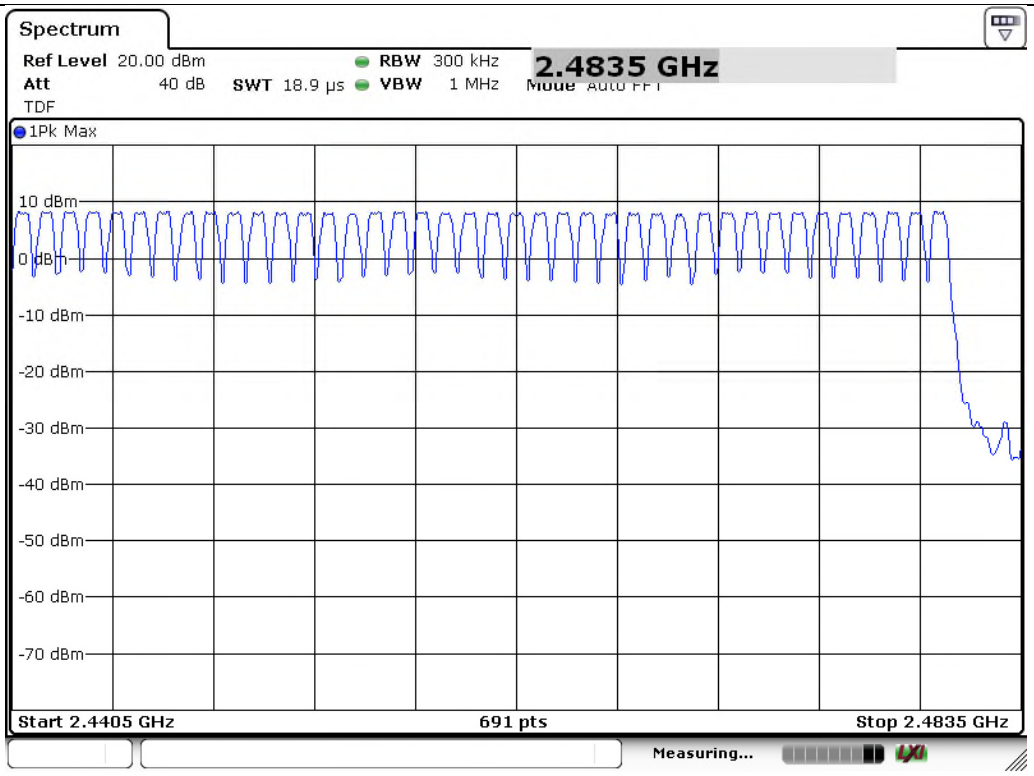
4.4 Test Result

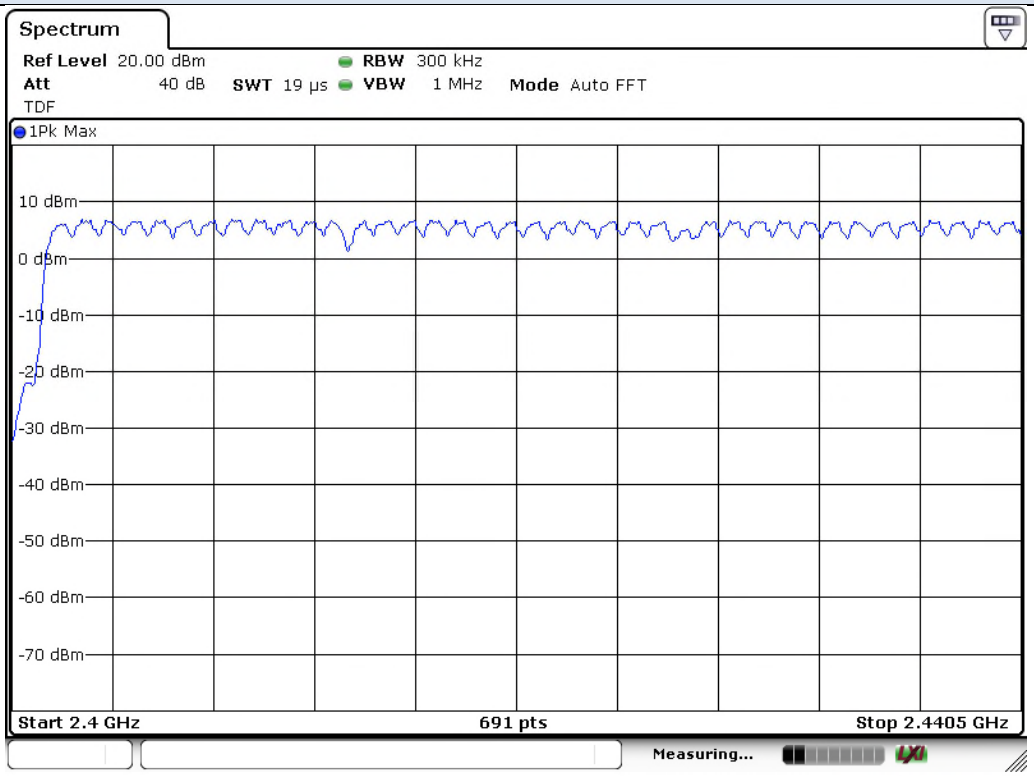
Test Mode	Result	Limit (MHz)	Result
GFSK	79	≥ 15 channels	Pass
8DPSK	79		



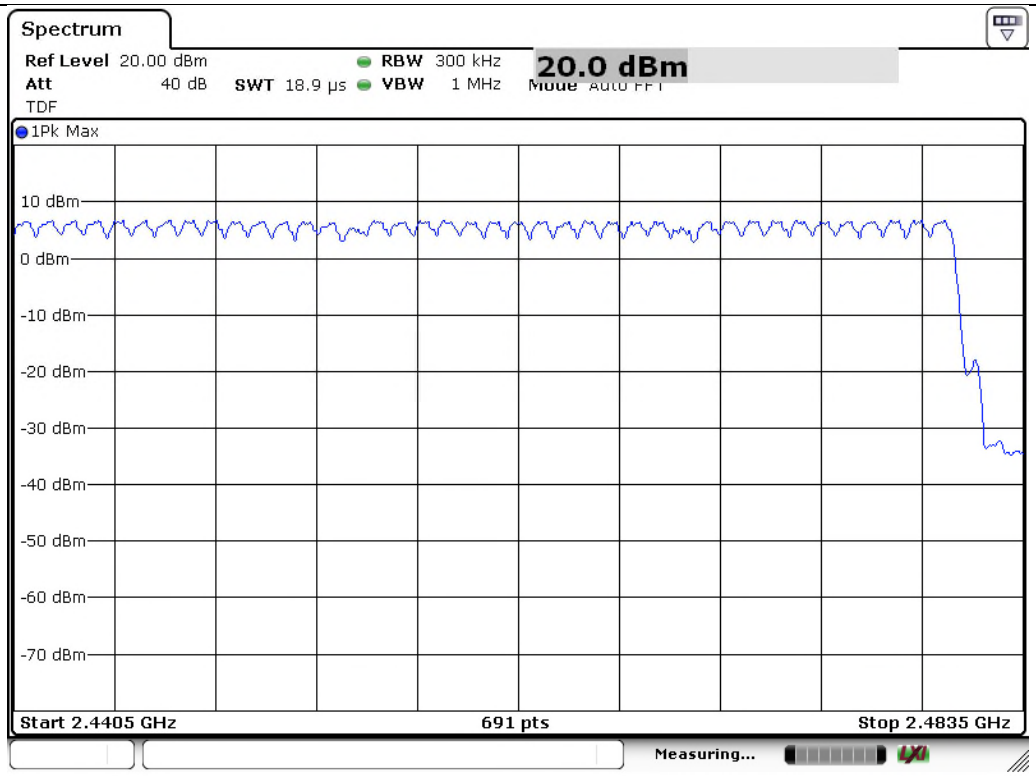
GFSK


Spectrum
Ref Level 20.00 dBm
RBW 300 kHz
2.4835 GHz
Att 40 dB
SWT 18.9 µs
VBW 1 MHz
TDF
1Pk Max
10 dBm
0 dBm
-10 dBm
-20 dBm
-30 dBm
-40 dBm
-50 dBm
-60 dBm
-70 dBm
Start 2.4405 GHz
691 pts
Stop 2.4835 GHz
Measuring...

GFSK


Spectrum
Ref Level 20.00 dBm
RBW 300 kHz
Att 40 dB
SWT 19 µs
VBW 1 MHz
Mode Auto FFT
TDF
1Pk Max
10 dBm
0 dBm
-10 dBm
-20 dBm
-30 dBm
-40 dBm
-50 dBm
-60 dBm
-70 dBm
Start 2.4 GHz
691 pts
Stop 2.4405 GHz
Measuring...

8DPSK


Spectrum
Ref Level 20.00 dBm
Att 40 dB
SWT 18.9 µs
RBW 300 kHz
VBW 1 MHz
20.0 dBm
TDF
1Pk Max
10 dBm
0 dBm
-10 dBm
-20 dBm
-30 dBm
-40 dBm
-50 dBm
-60 dBm
-70 dBm
Start 2.4405 GHz
691 pts
Stop 2.4835 GHz
Measuring...

8DPSK

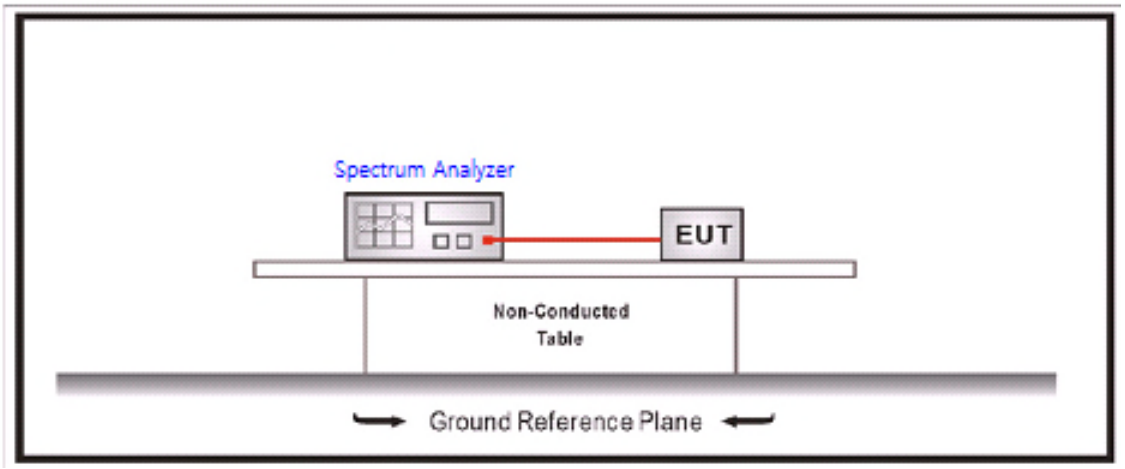
5. 20 dB Bandwidth

5.1 Limit (∮15.247(a)(1))

Not applicable.

5.2 Test Configuration

RF Conducted Measurement:



5.3 Test Procedure (ANSI C63.10-2013 Section 7.8.7 & 6.9.2)

The spectrum analyzer center frequency is set to the nominal EUT channel center frequency.
Use the following spectrum analyser setting :

a) Span = between two times and five times the 20dB Bandwidth
b) RBW = 1% to 5% of the 20dB Bandwidth
c) VBW) >= 3 X RBW
d) Sweep = Auto
e) Detector = Peak
f) Trace = Max hold

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5.4 Test Result

Test Mode	Ch. No.	Freq. (MHz)	20 dB Bandwidth (MHz)	Limit (dBm)	Result
GFSK	0	2402	0.8379	-	Pass
	38	2440	0.8379		
	78	2480	0.8336		
8DPSK	0	2402	1.2634	-	Pass
	38	2440	1.2677		
	78	2480	1.2677		

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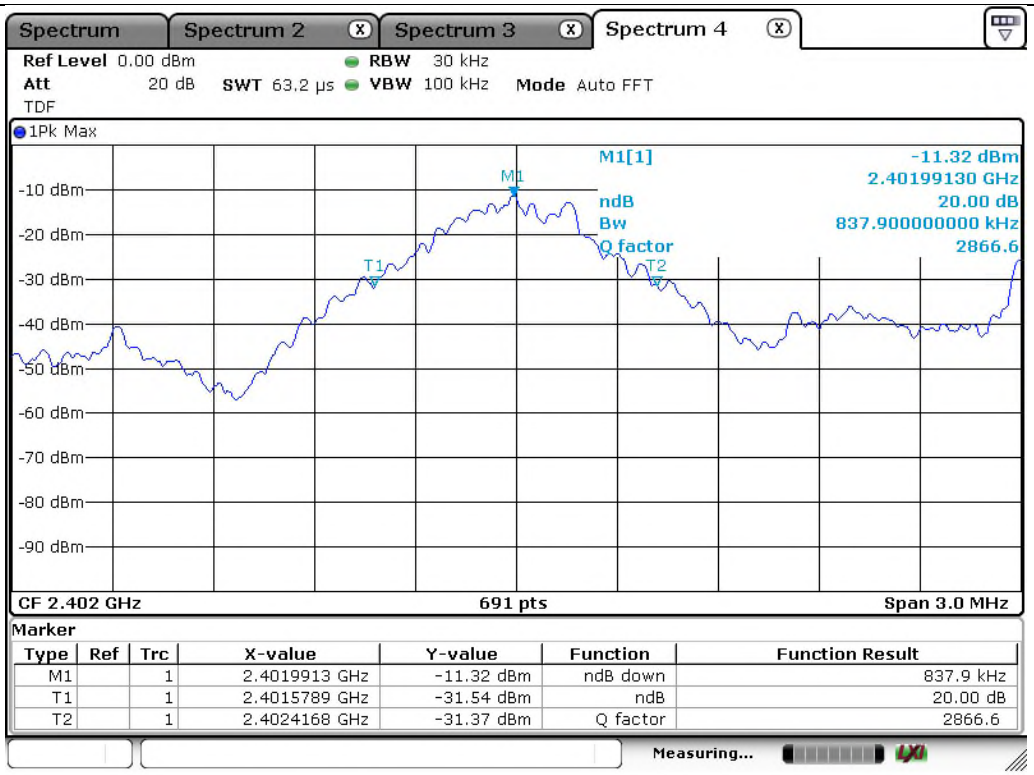
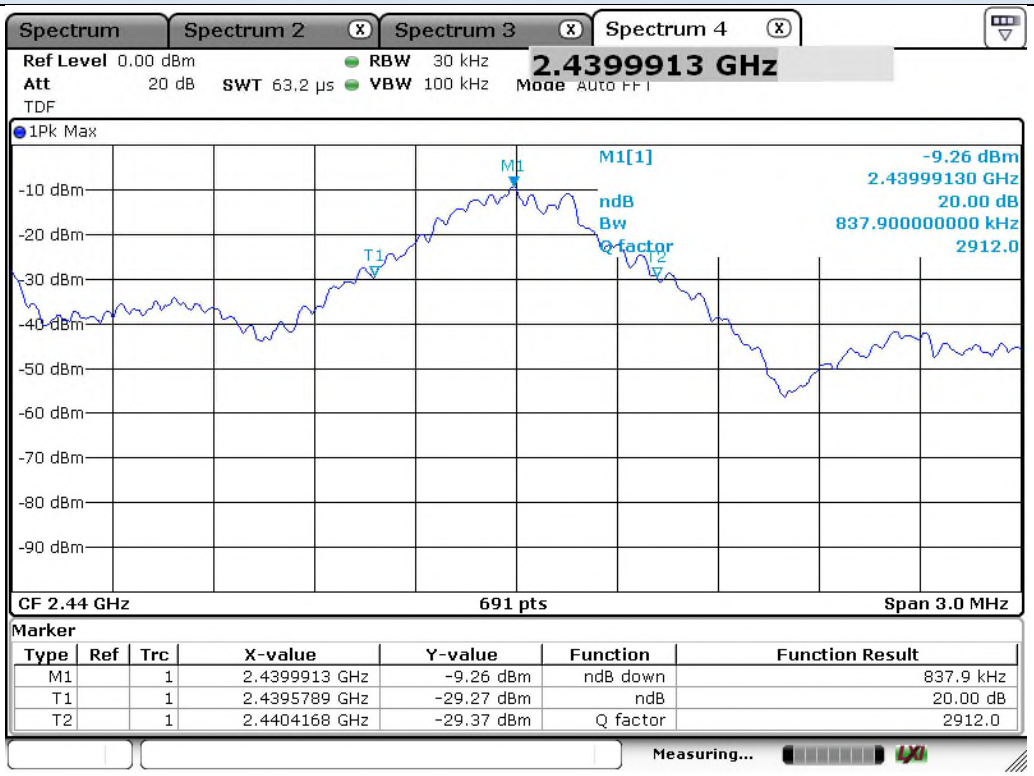
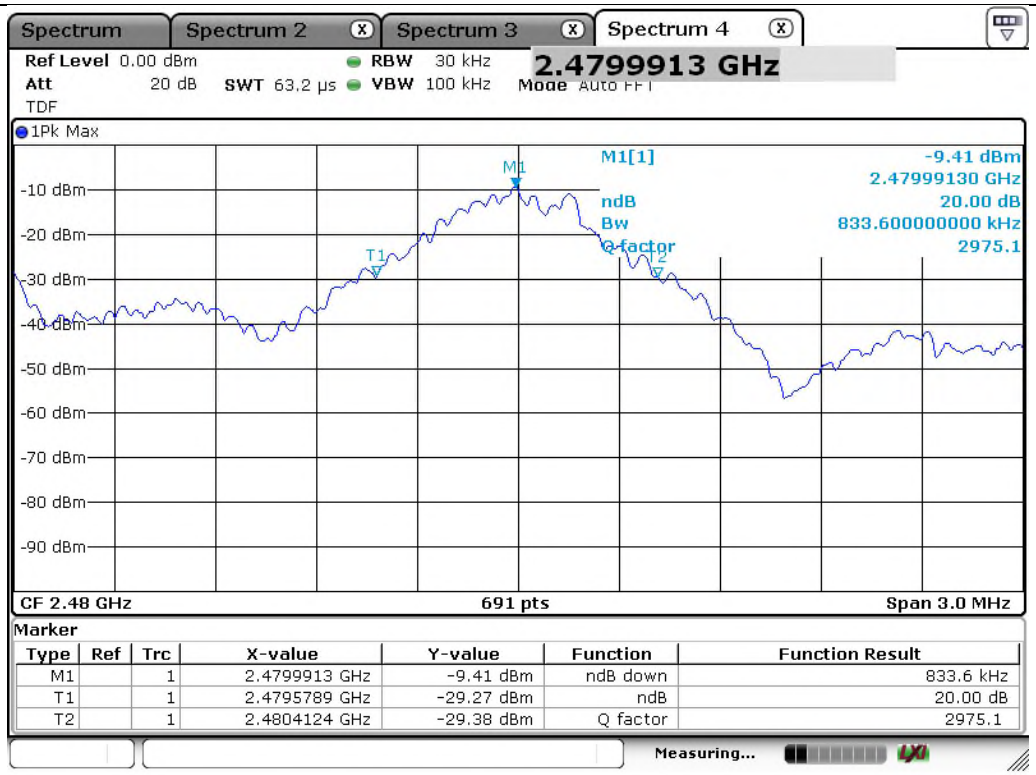


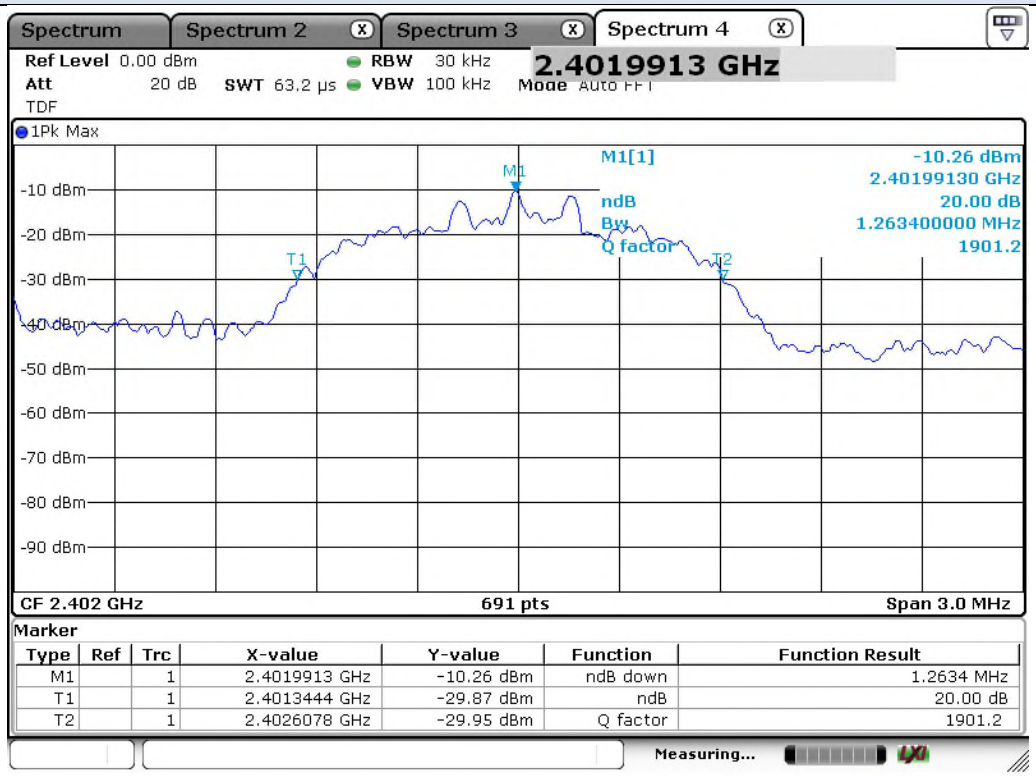
GFSK_2402 MHz



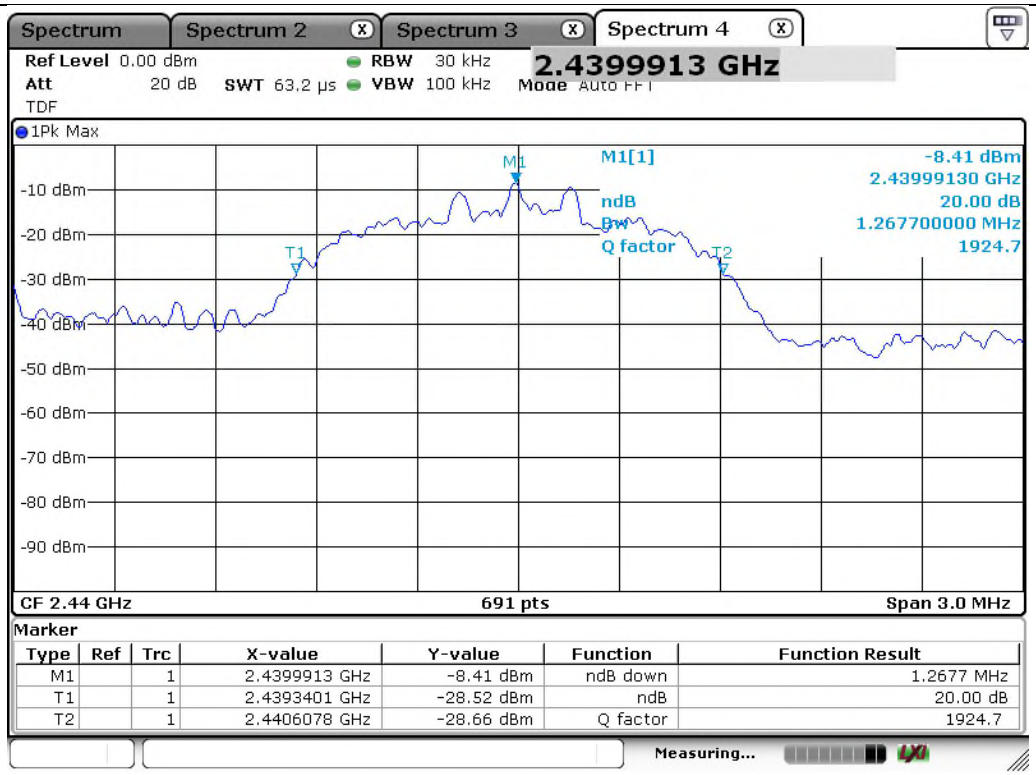
GFSK_2440 MHz



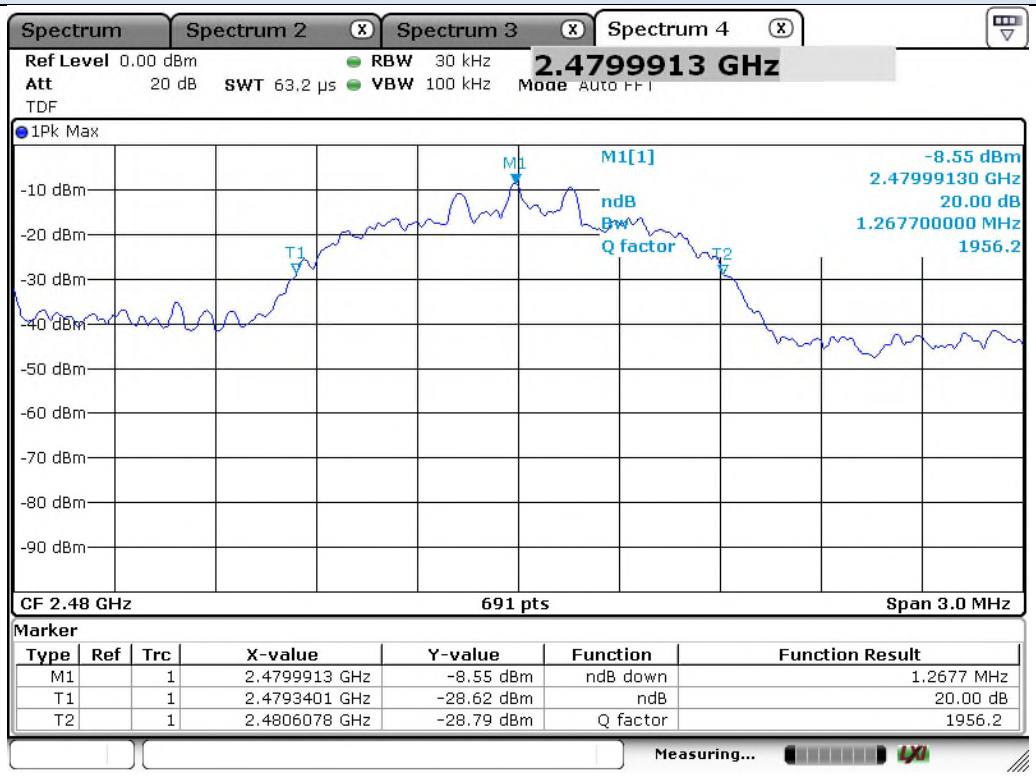
GFSK_2480 MHz



8DPSK_2402 MHz



8DPSK_2440 MHz



8DPSK_2480 MHz

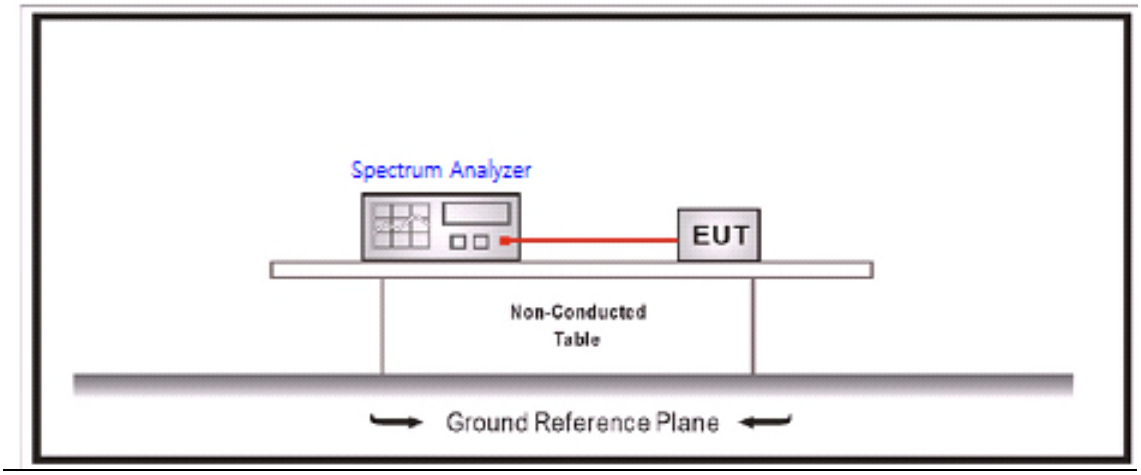
6. Time of occupancy (dwell time)

6.1 Limit (∮15.247(a)(1)(iii)

Frequency hopping systems operating in the 2 400 ~ 2 483.5 ㎒ band, the average time of occupancy on any channel shall not be greater than 0.4 seconds within a period of 0.4 seconds multiplied by the number of hopping channels employed.

6.2 Test Configuration

RF Conducted Measurement:



6.3 Test Procedure (ANSI C63.10-2013 Section 7.8.4)

The EUT shall have its hopping function enabled. Use the following spectrum analyzer settings:

a) Span : Zero span, centered on a hopping channel.
b) RBW shall be ≤ channel spacing and where possible RBW should be set >> 1/T, where T is the expected dwell time per channel.
c) Sweep : As necessary to capture the entire dwell time per hopping channel
d) Detector : Peak
e) Trace : Max hold

Use the marker-delta function to determine the transmit time per hop.

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6.4 Test Result

Non-AFH

Test mode	Number of hopping channels	Burst on time (ms)	Dwell time (ms)	Limit (ms)
GFSK	79	2.886	307.84	400
π/4DQPSK	79	2.906	309.97	
8DPSK	79	2.906	309.97	

AFH

Test mode	Number of hopping channels	Burst on time (ms)	Dwell time (ms)	Limit (ms)
GFSK	20	2.889	154.08	400
π/4DQPSK	20	2.905	154.93	
8DPSK	20	2.891	154.19	

- Dwell time = 0.4 x Hopping channel x Burst On time x [(Hopping rate ÷ Time slots) ÷ Hopping channel]
- Time slots for DH5 = 6 slots (TX = 5 slot, RX = 1 slot)
- Hopping rate = 1600 for non-AFH, 800 for AFH

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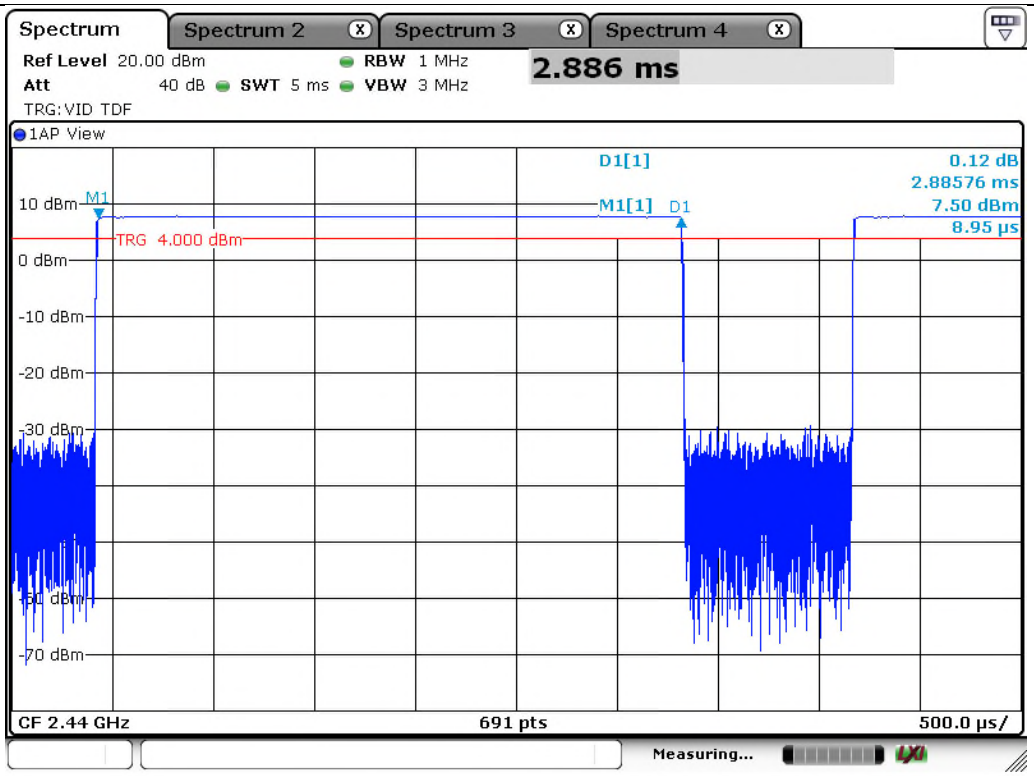
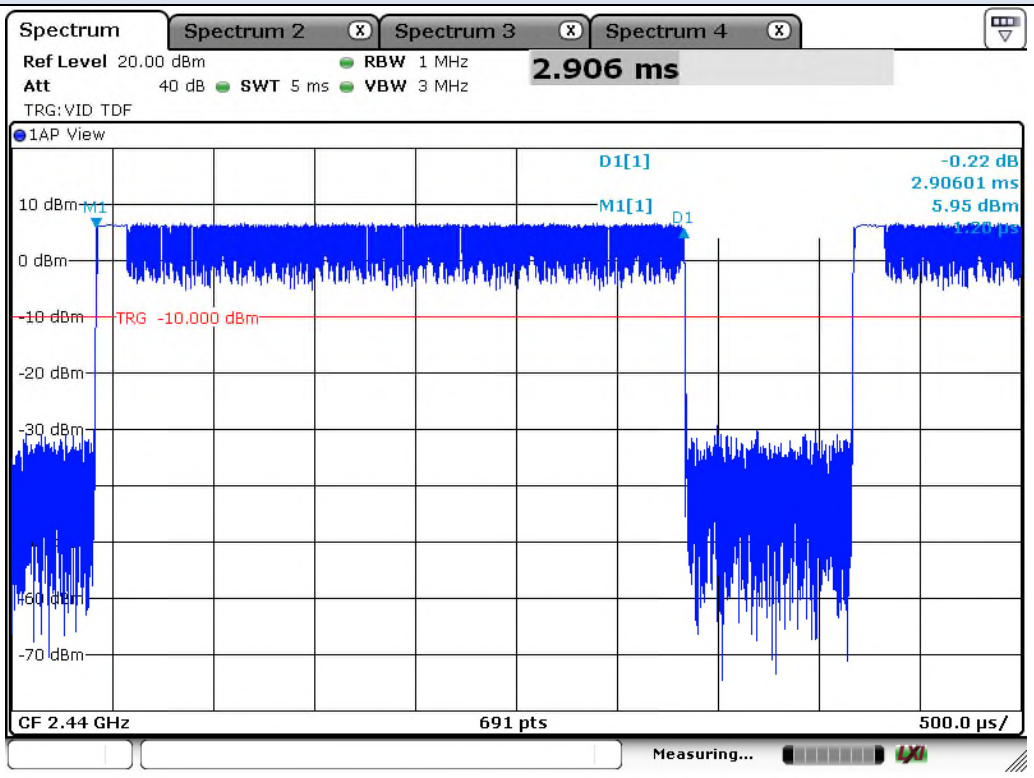
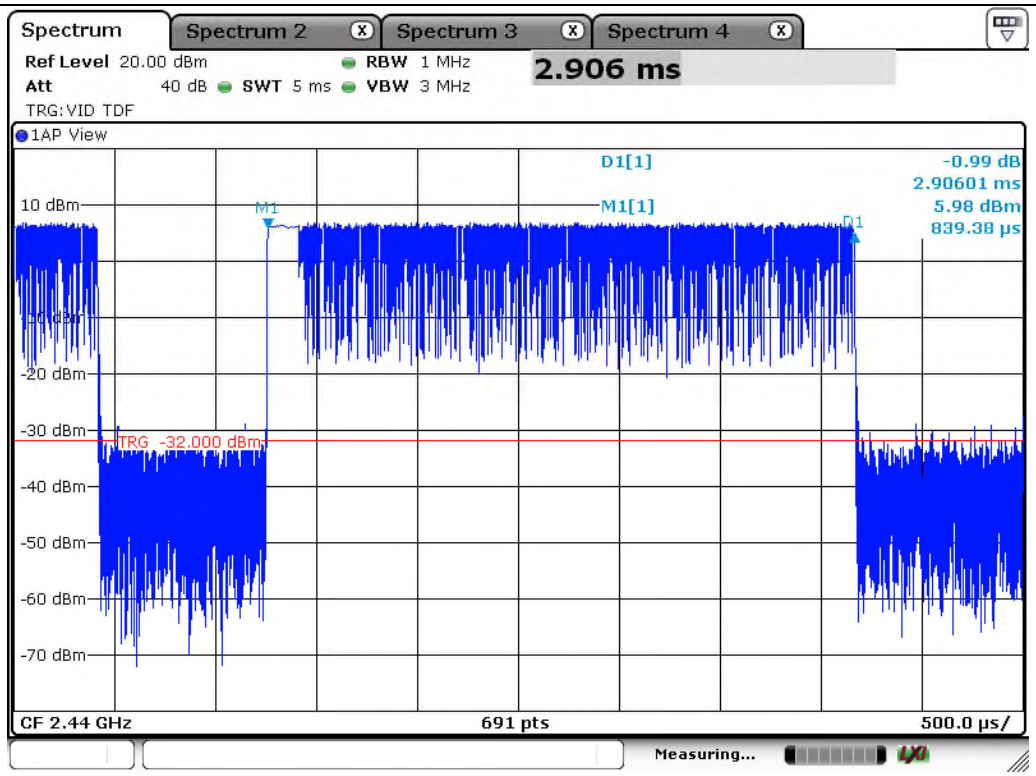


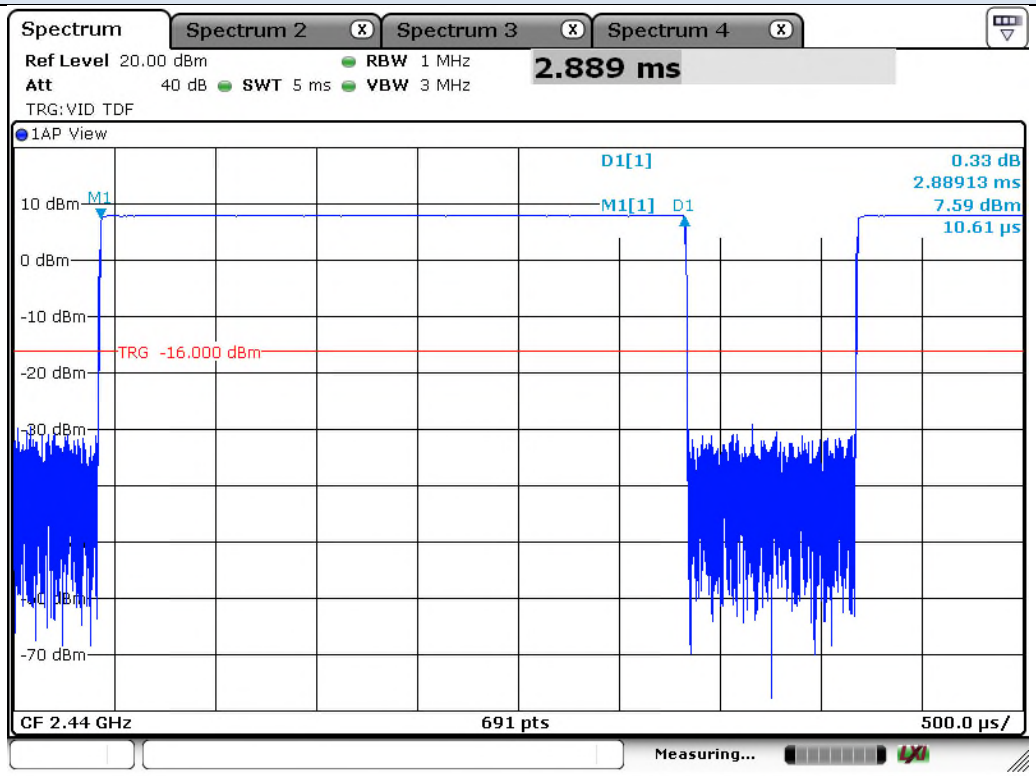
GFSK_Non-AFH



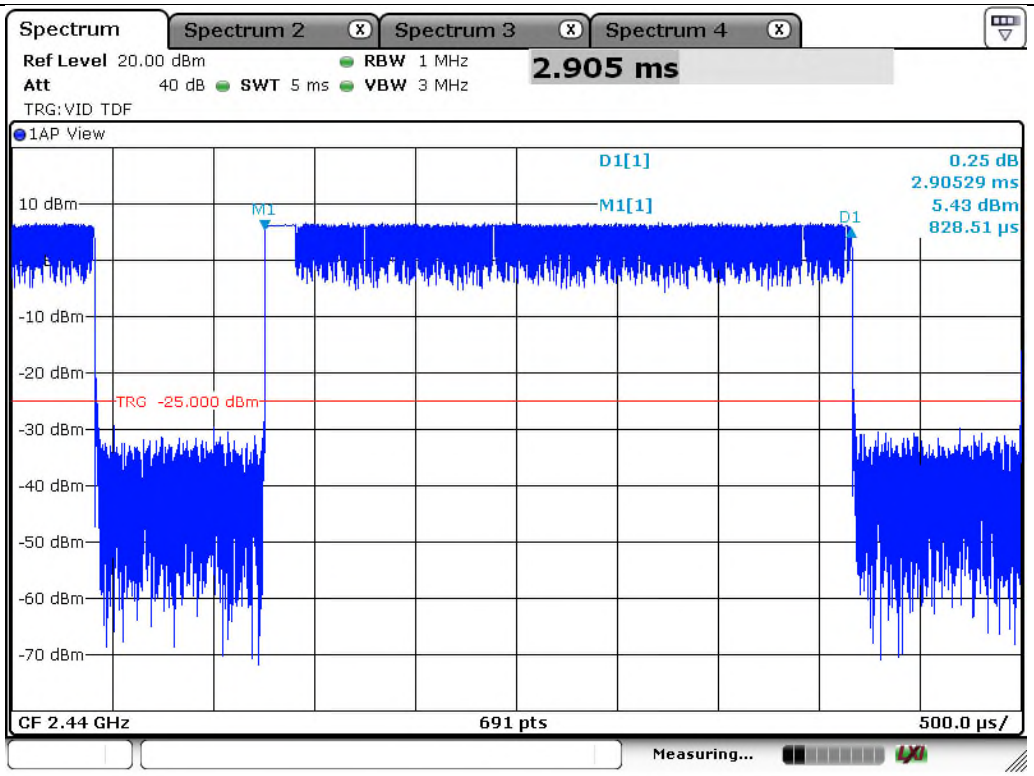
π/4DQPSK_Non-AFH



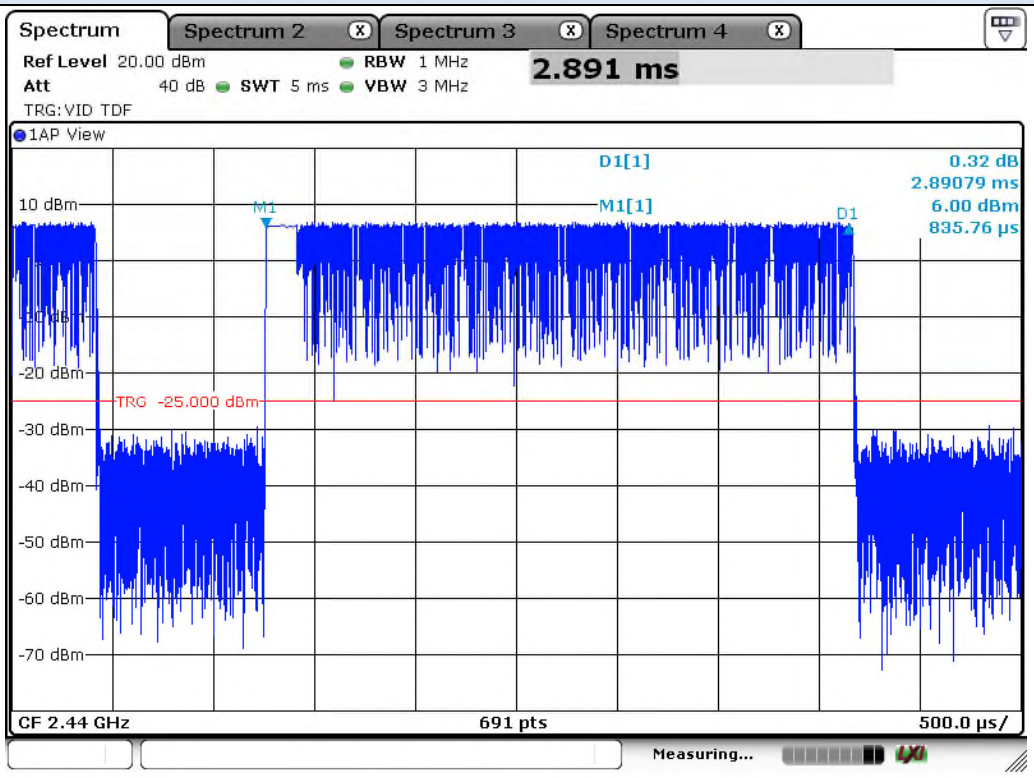
8DPSK_Non-AFH



GFSK_AFH



π/4DQPSK_AFH



8DPSK_AFH

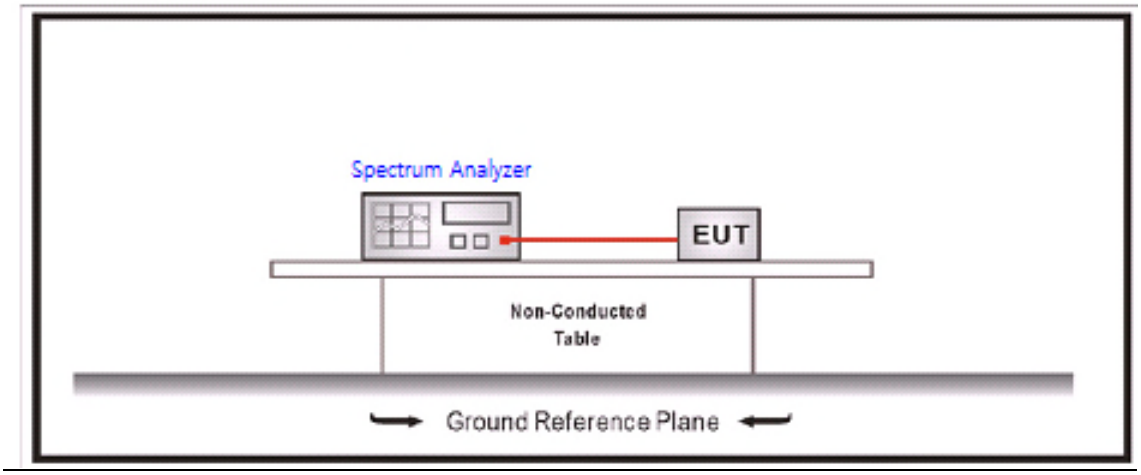
7. Maximum Peak Output Power

7.1 Limit (∮15.247(b)(1))

The maximum peak conducted output power of the intentional radiator shall not exceed the following :
For frequency hopping systems operating in the 2400–2483.5 MHz band employing at least 75 non-overlapping hopping channels, and all frequency hopping systems in the 5725–5850 MHz band: 1 watt.
For all other frequency hopping systems in the 2400–2483.5 MHz band: 0.125 watts.

7.2 Test Configuration

RF Conducted Measurement:



7.3 Test Procedure(ANSI C63.10-2013 Section 7.8.5)

This is an RF-conducted test to evaluate maximum peak output power. Use a direct connection between The antenna port of the unlicensed wireless device and the spectrum analyzer, through suitable attenuation. The hopping shall be disabled for this test. Use the following spectrum analyzer settings:

a) Span = Approximately five times the 20 dB bandwidth, centered on a hopping channel.
b) RBW > 20 dB bandwidth of the emission being measured.
c) VBW ≥ RBW
d) Sweep = Auto
e) Detector = Peak
f) Trace = Max hold

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7.4 Test Result

Test Mode	Ch. No.	Freq. (MHz)	Maxium Peak Output Power		Limit (mW)	Result
			dBm	mW		
GFSK	0	2 402	-8.31	0.148	≤ 125	Pass
	38	2 440	-5.89	0.258		
	78	2 480	-6.52	0.223		
π/4DQPSK	0	2 402	-8.19	0.152		
	38	2 440	-6.31	0.234		
	78	2 480	-6.39	0.230		
8DPSK	0	2 402	-8.28	0.149		
	38	2 440	-6.23	0.238		
	78	2 480	-6.35	0.232		

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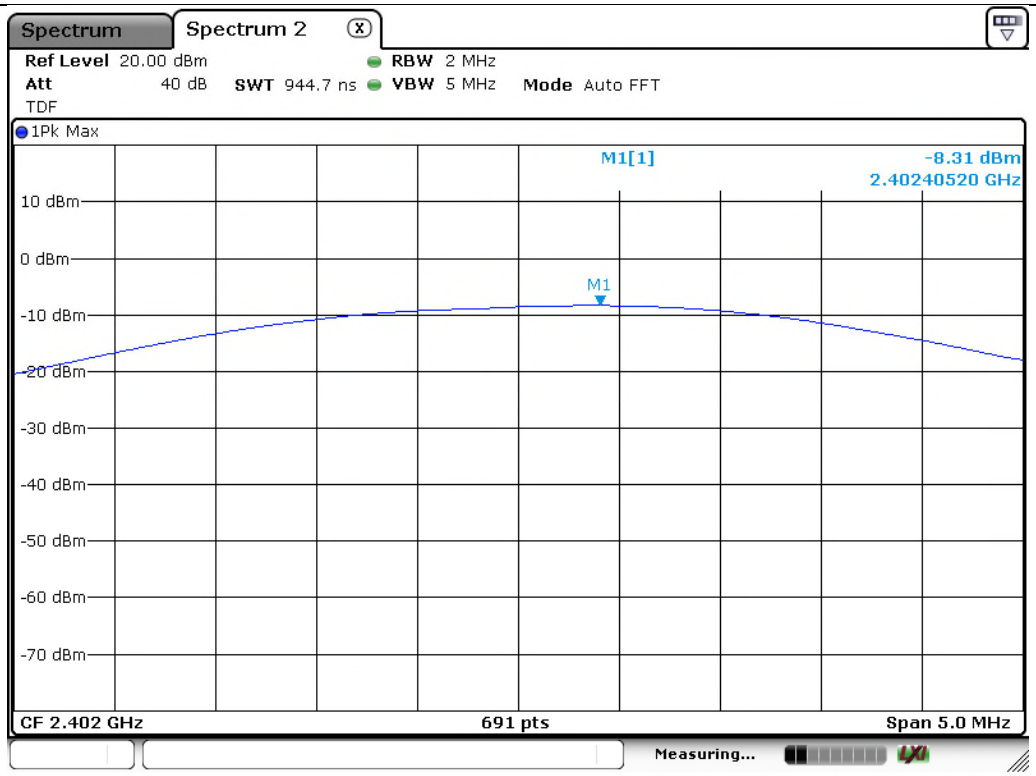
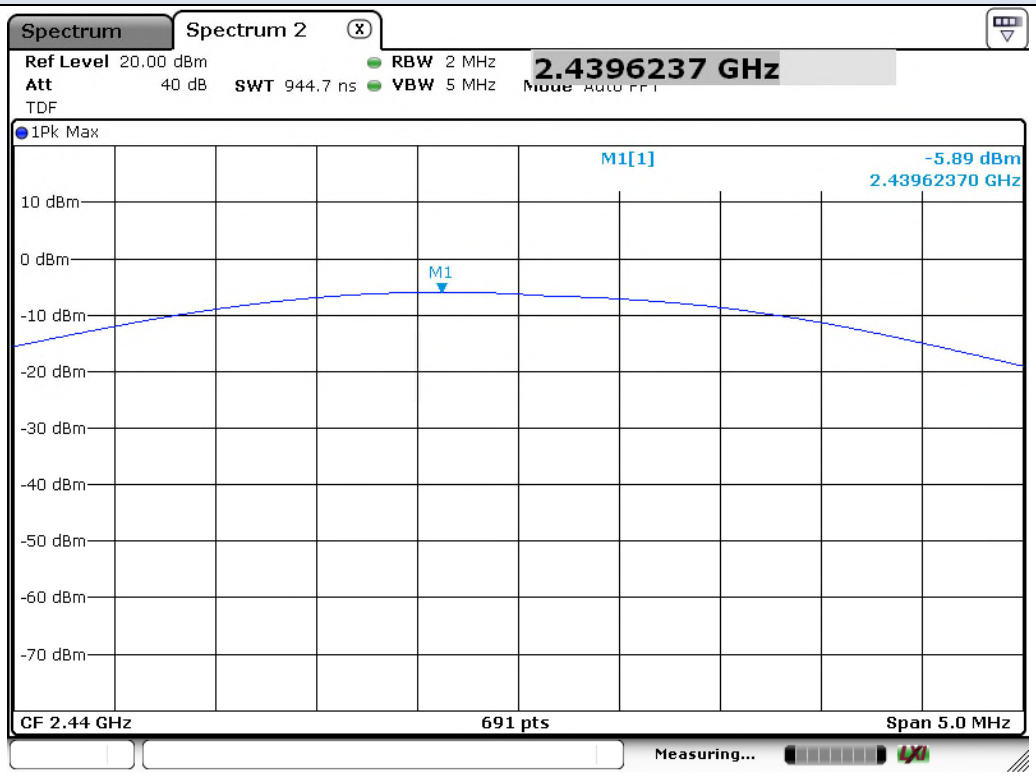
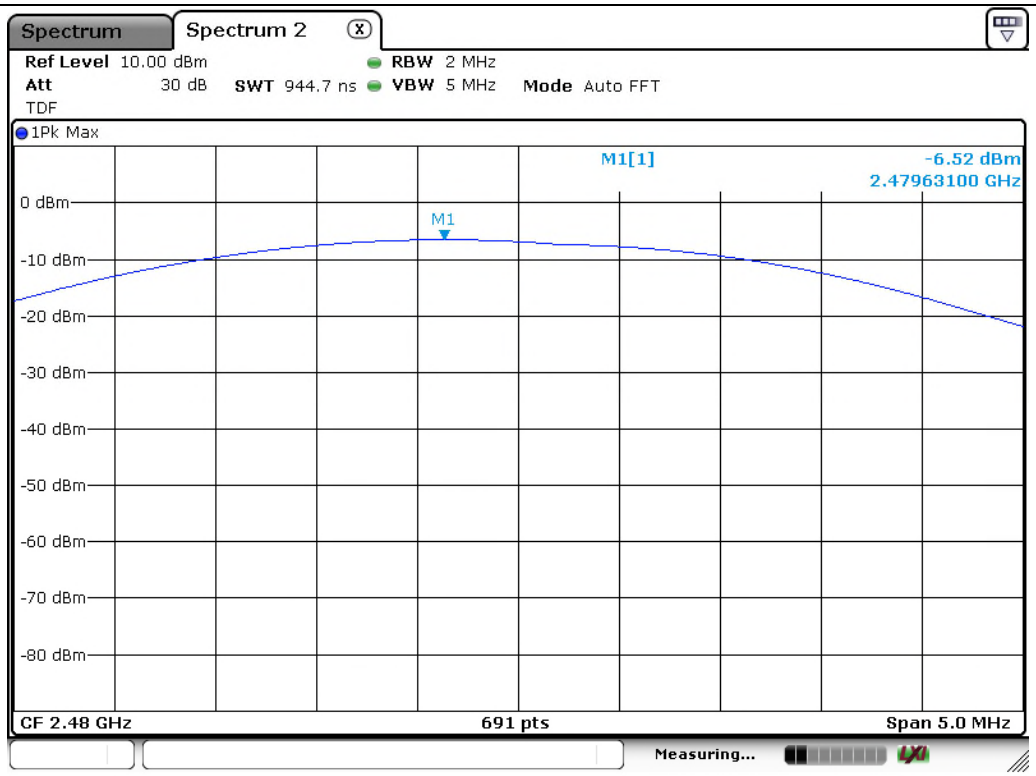


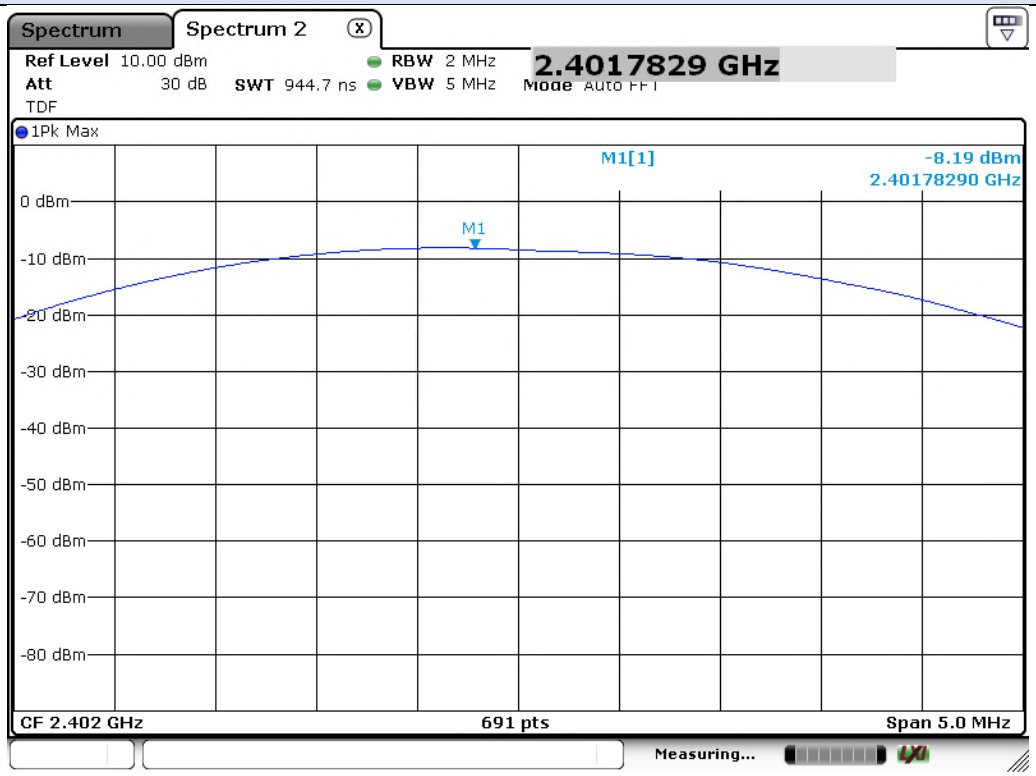
GFSK_2402 MHz



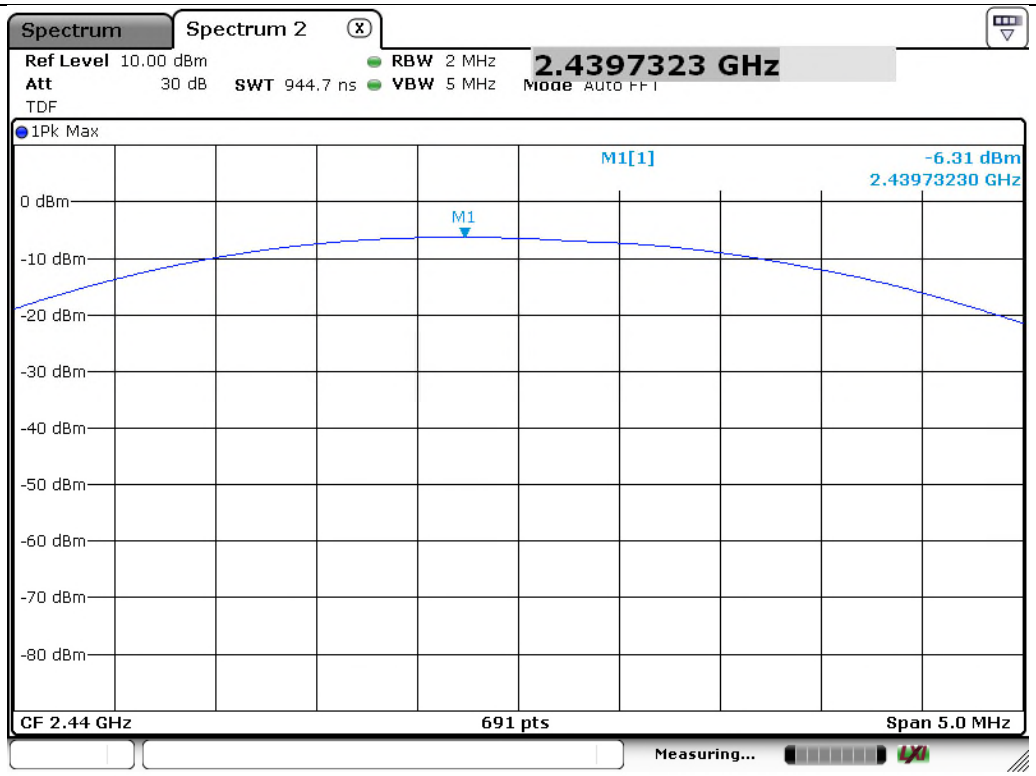
GFSK_2440 MHz



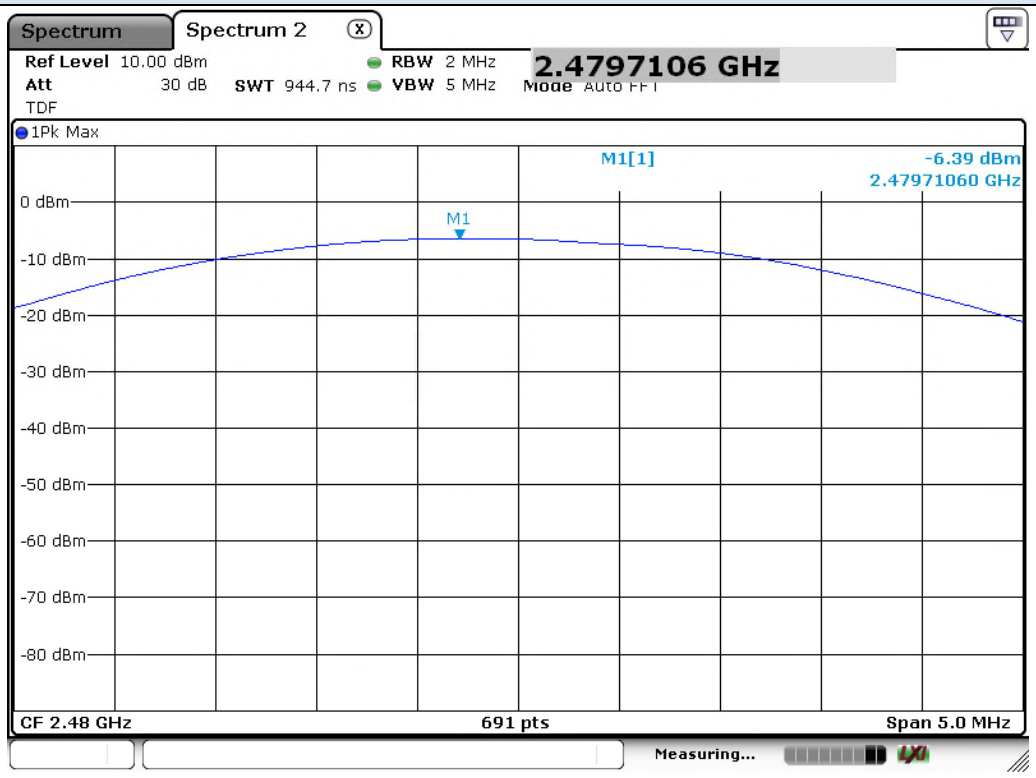
GFSK_2480 MHz



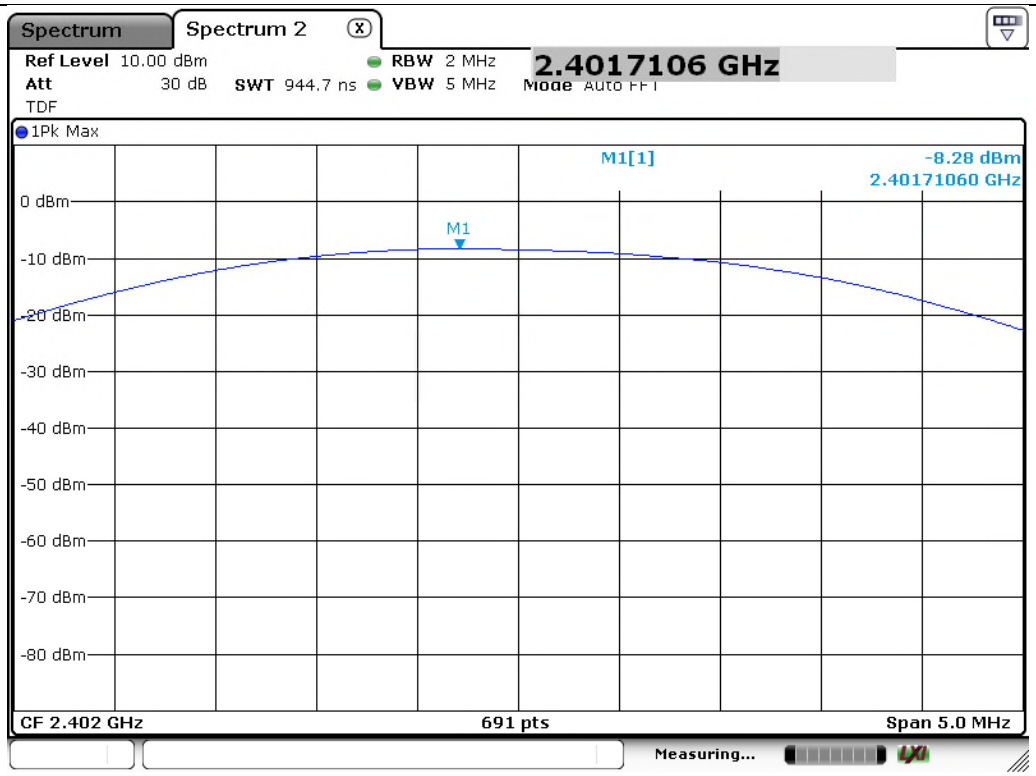
π/4DQPSK_2402 MHz



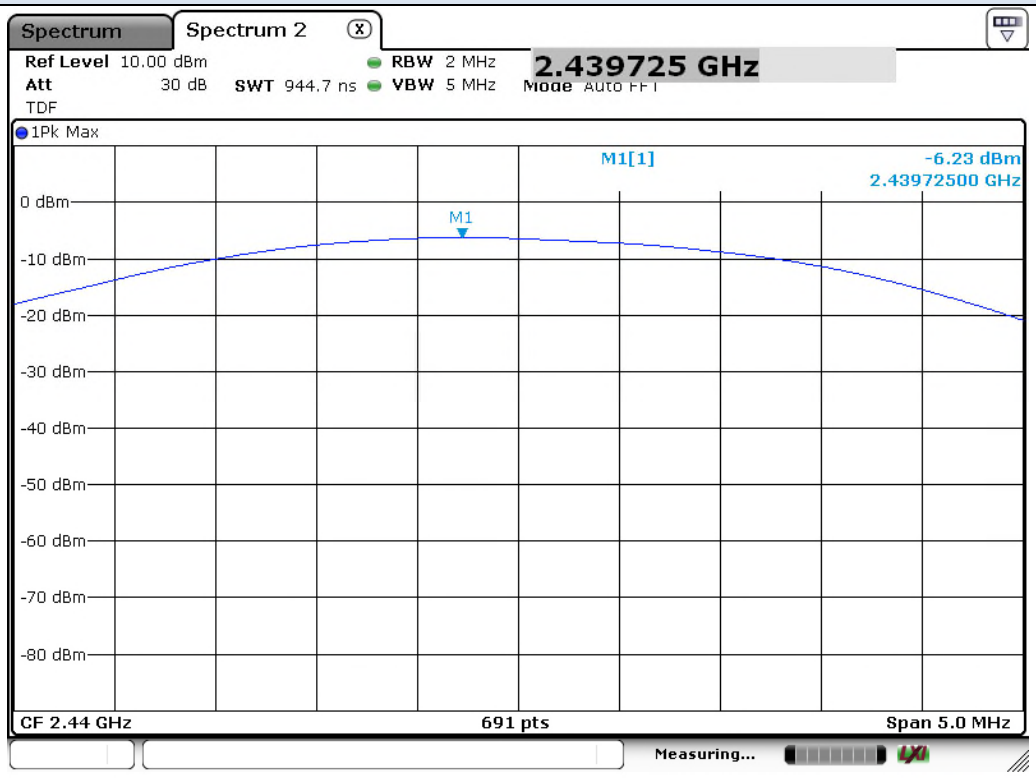
π/4DQPSK_2440 MHz



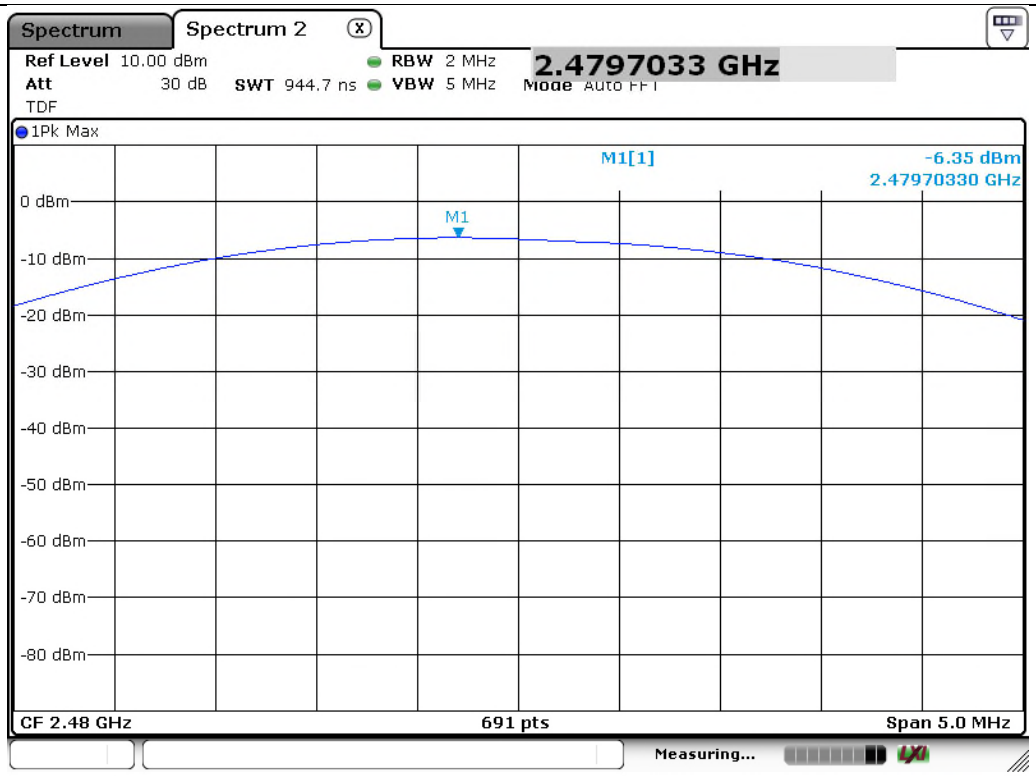
π/4DQPSK_2480 MHz



8DPSK_2402 MHz



8DPSK_2440 MHz



8DPSK_2480 MHz

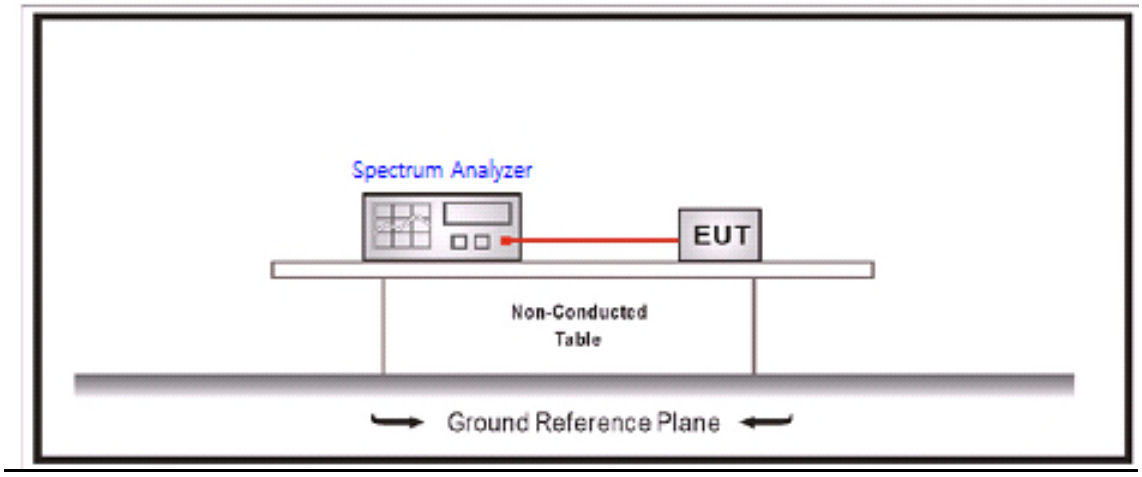
8. Band Edge and Conducted Spurious Emission

8.1 Limit

In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is 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, base on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits base on the use of RMS averaging over a time interval, as permitted under paragraph (b)(3) of thes section, the attenuation required under this paragraph shall be 30 dB instead of 20 dB. Attenuation below the general limits specified in 15.209(a) is not required.

8.2 Test Configuration

RF Conducted Measurement:



8.3 Test Procedure

1. Check the calibration of the measuring instrument using either an internal calibrator or a known signal from an external generator.
2. Set the EUT to the lowest and highest frequency channel, hopping mode.
3. Use the following spectrum analyser setting :
   a) Span : Wide enough to capture the peak level of the emission operating on the channel closest to the band edge, as well as any modulation products that fall outside of the authorized band of operation. (Band Edge) 30 MHz to 10 times the operating frequency in GHz. (Conducted Spurious Emission)
   b) RBW : 100 kHz
   c) VBW : 300 kHz
   d) Sweep time : Coupled
   e) Trace : Max hold
   f) Detector : Peak

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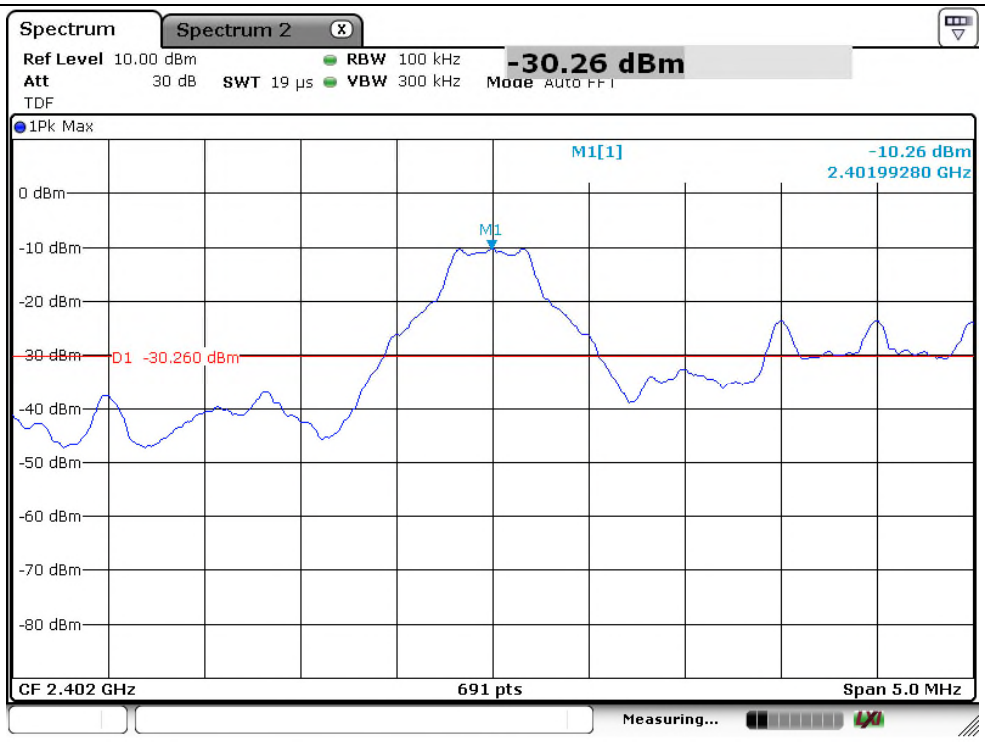
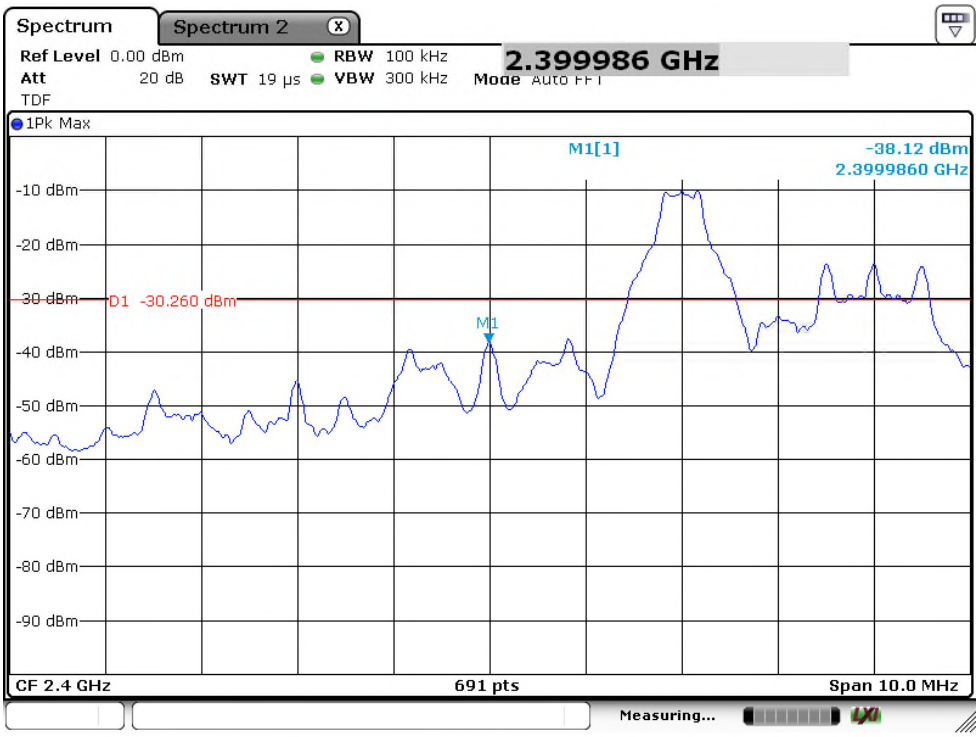
4. Set the marker on the emission at the band edge, or on the highest modulation product outside of the band, if this level is geater than that at the band edge. Enable the marker-delta function, and then use the marker-to-peak function to move the marker to the marker to the peak of the in-band emission. (Band Edge)
   Set marker to the peak of fundamental emission. Enable the marker-delta function, and then use the marker-to-peak function to move the marker to the peak of harmonic emission. (Conducted Spurious Emission)

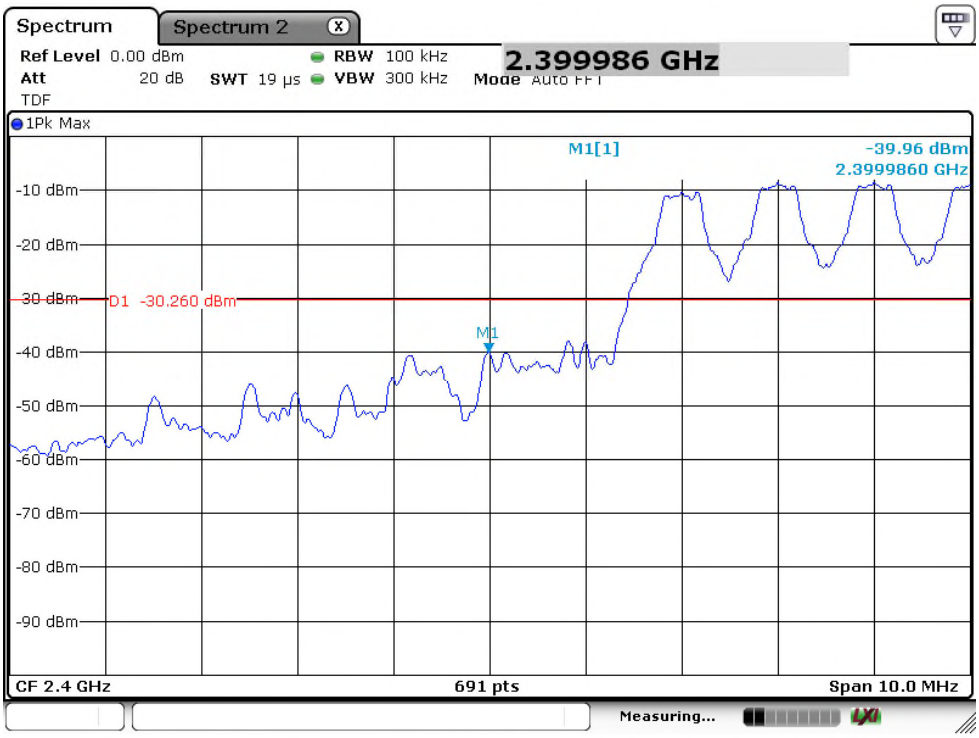
8.4 Test Result



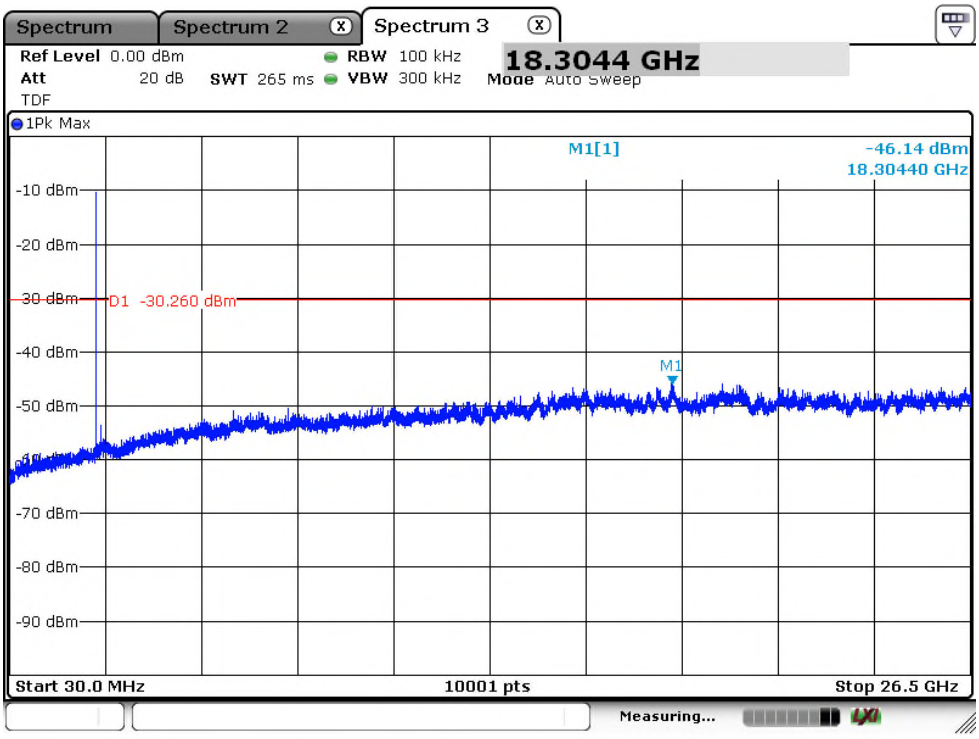
GFSK / 2 402 MHz / Reference Level



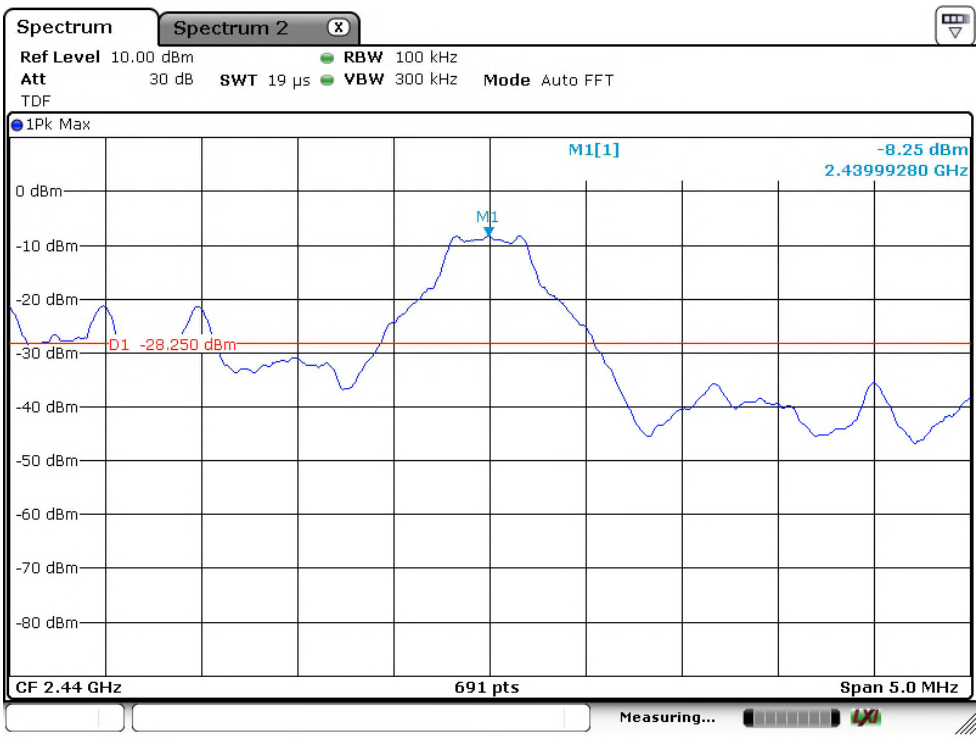
GFSK / 2 402 MHz / Band Edge



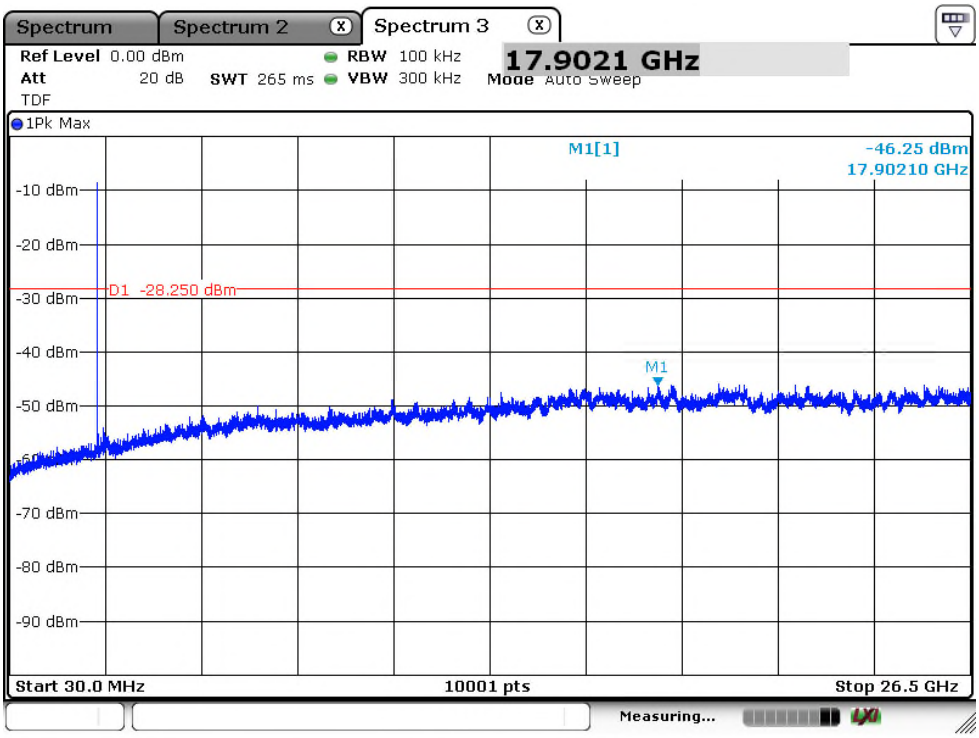
GFSK / Hopping / Band Edge



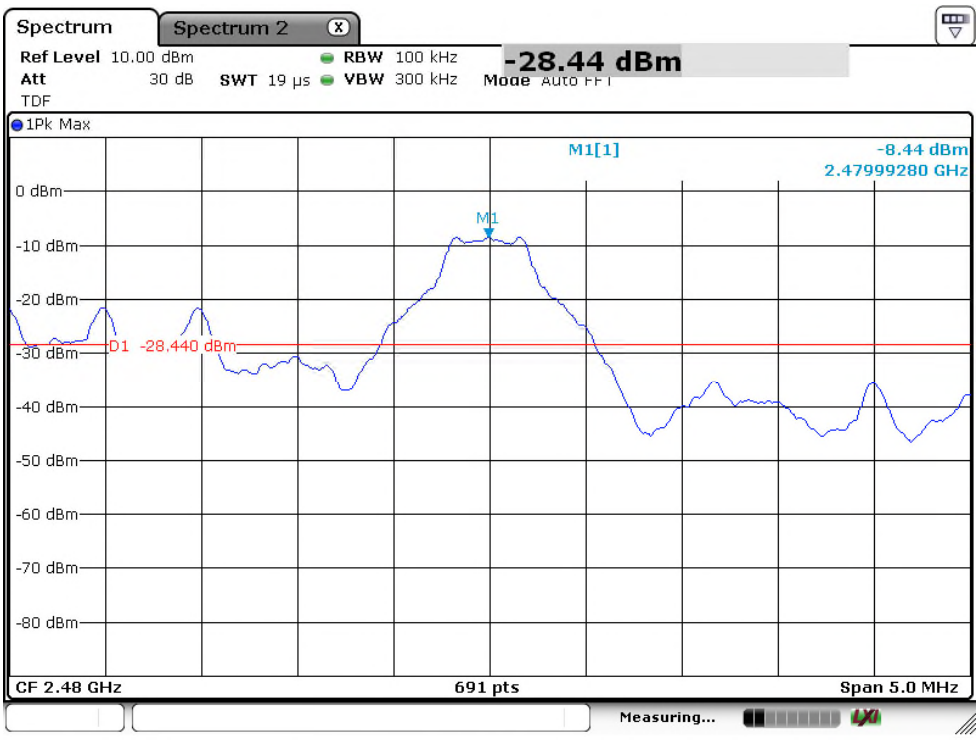
GFSK / 2 402 MHz / Spurious Emission



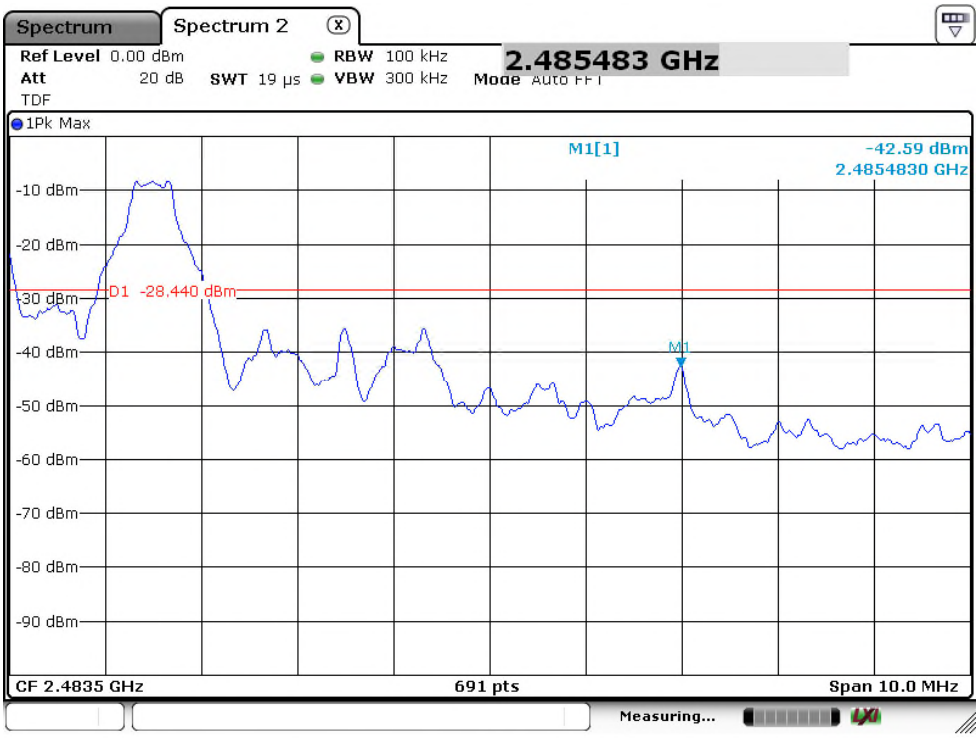
GFSK / 2 440 MHz / Reference Level



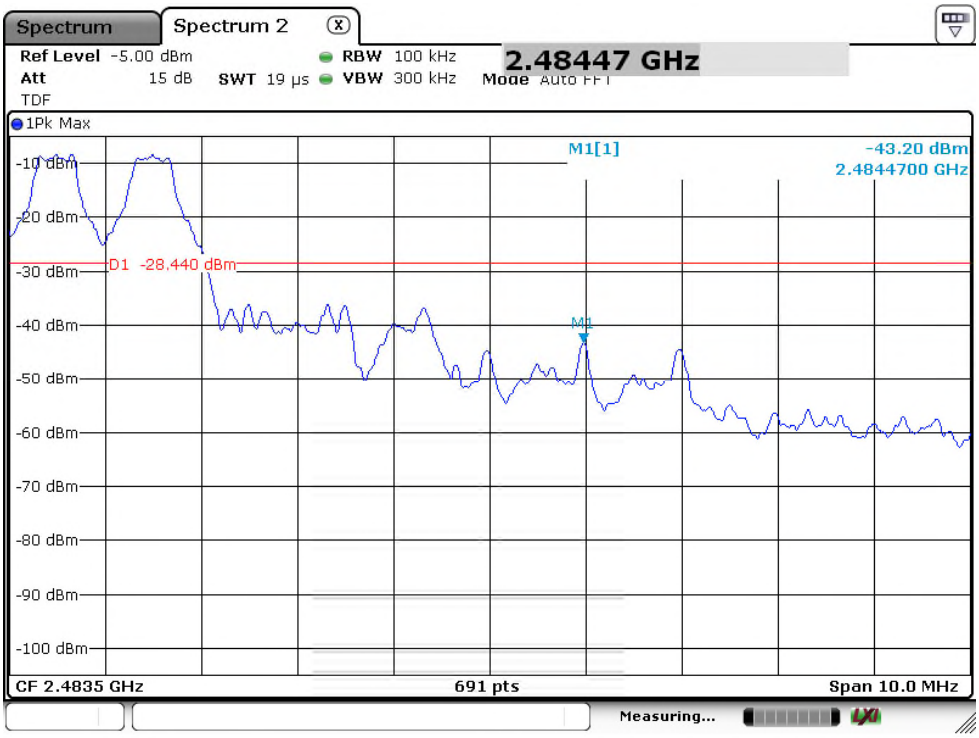
GFSK / 2 440 MHz / Spurious Emission



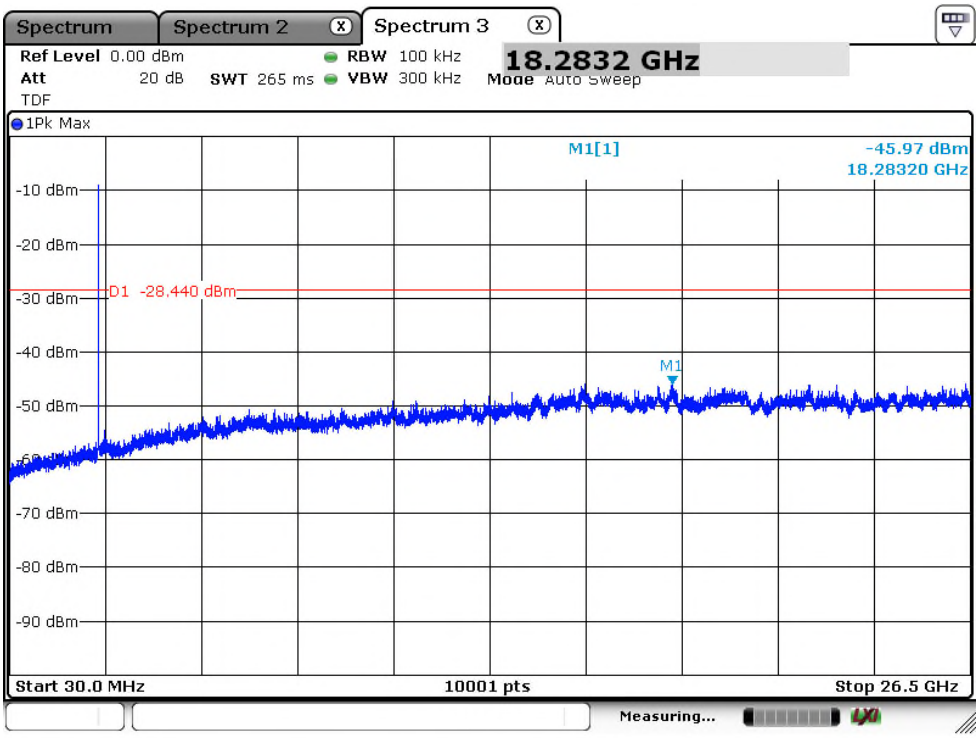
GFSK / 2 480 MHz / Reference Level



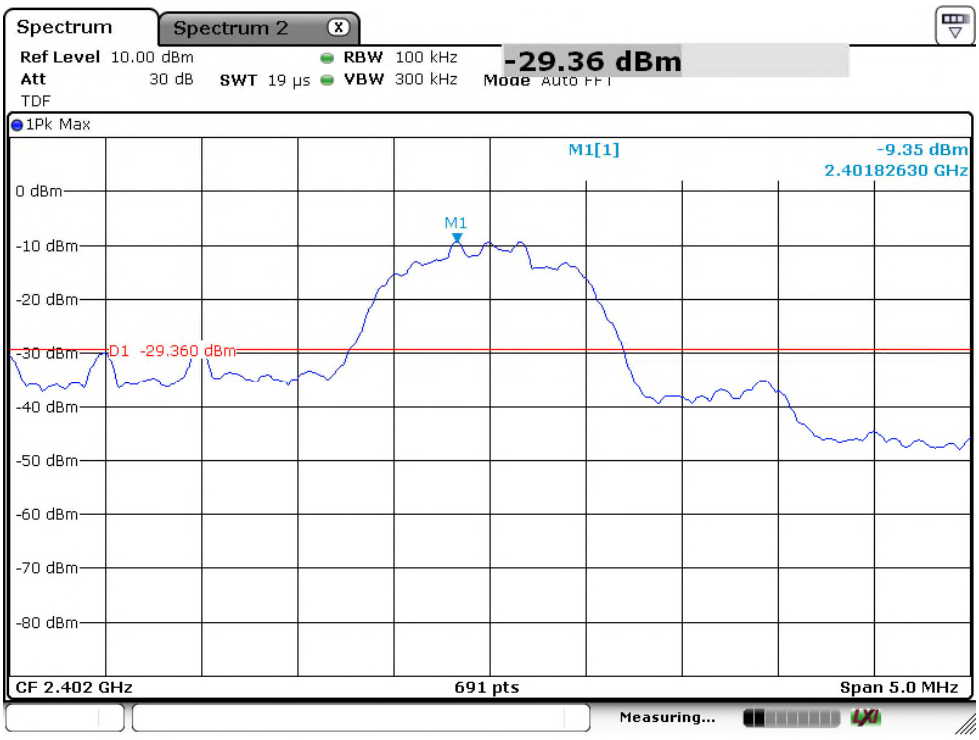
GFSK / 2 480 MHz / Band Edge



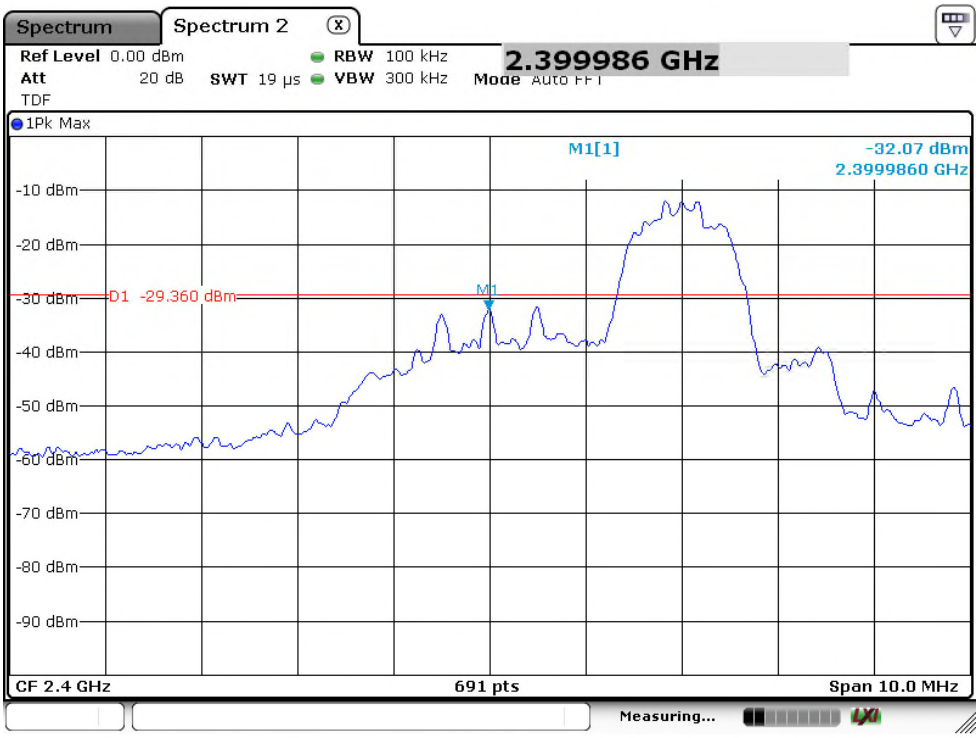
GFSK / Hopping / Band Edge



GFSK / 2 480 MHz / Spurious Emission



8DPSK / 2 402 MHz / Reference Level



8DPSK / 2 402 MHz / Band Edge

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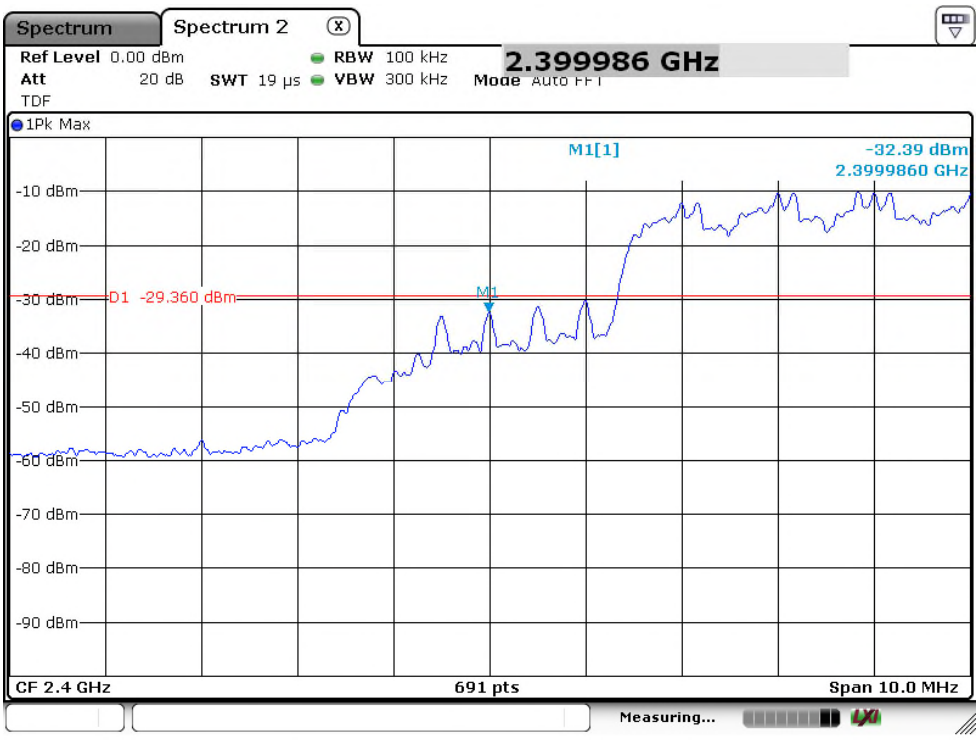
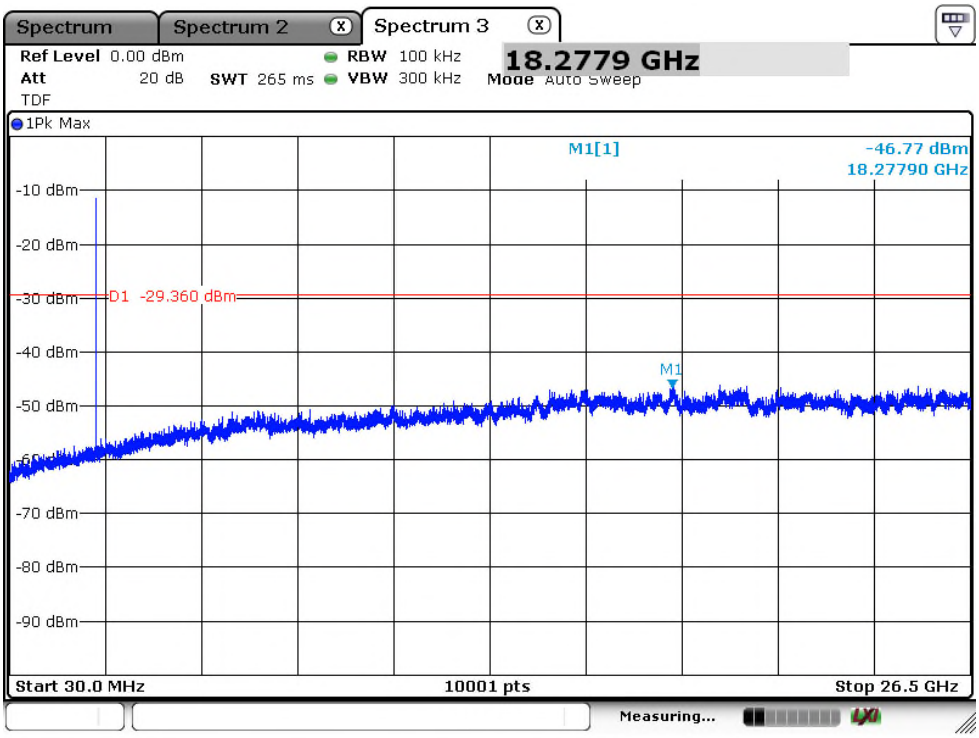
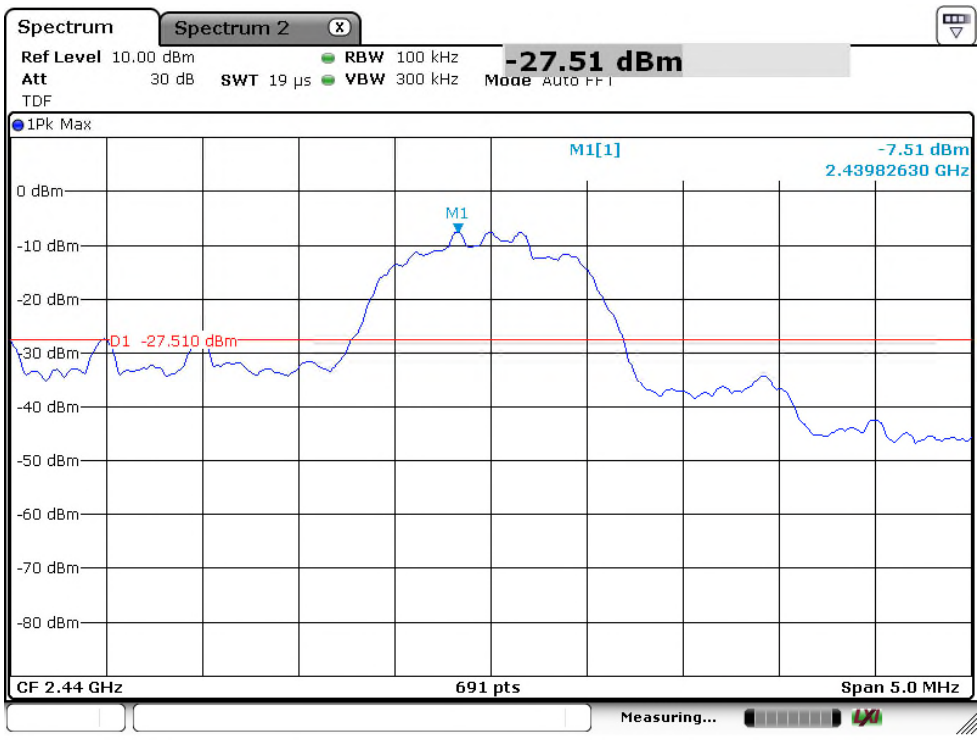


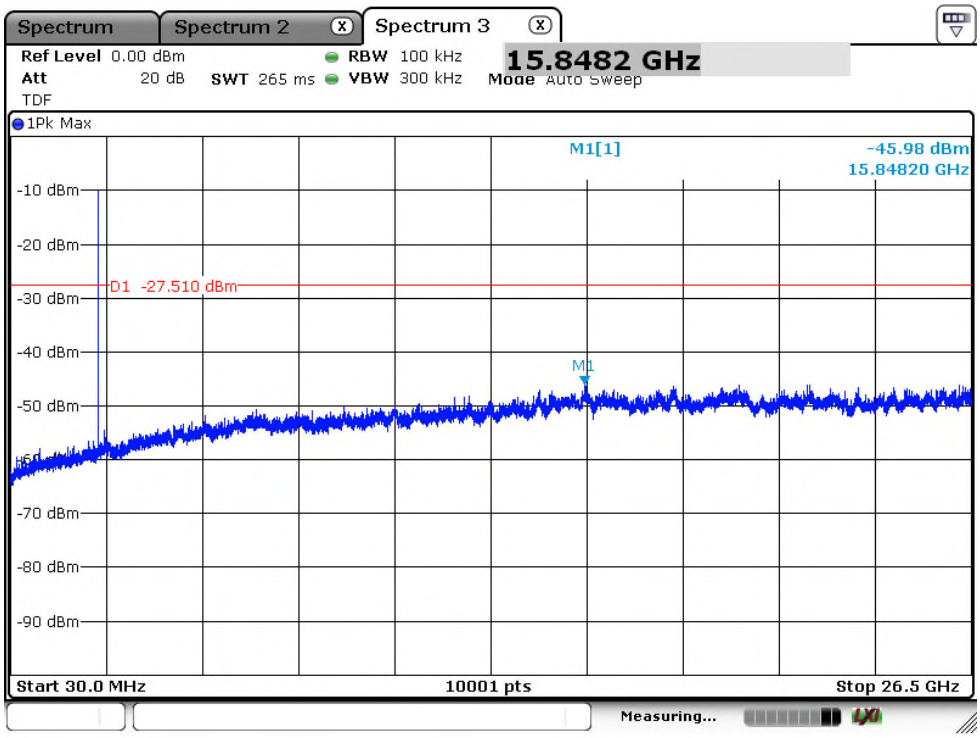
8DPSK / Hopping / Band Edge



8DPSK / 2 402 MHz / Spurious Emission

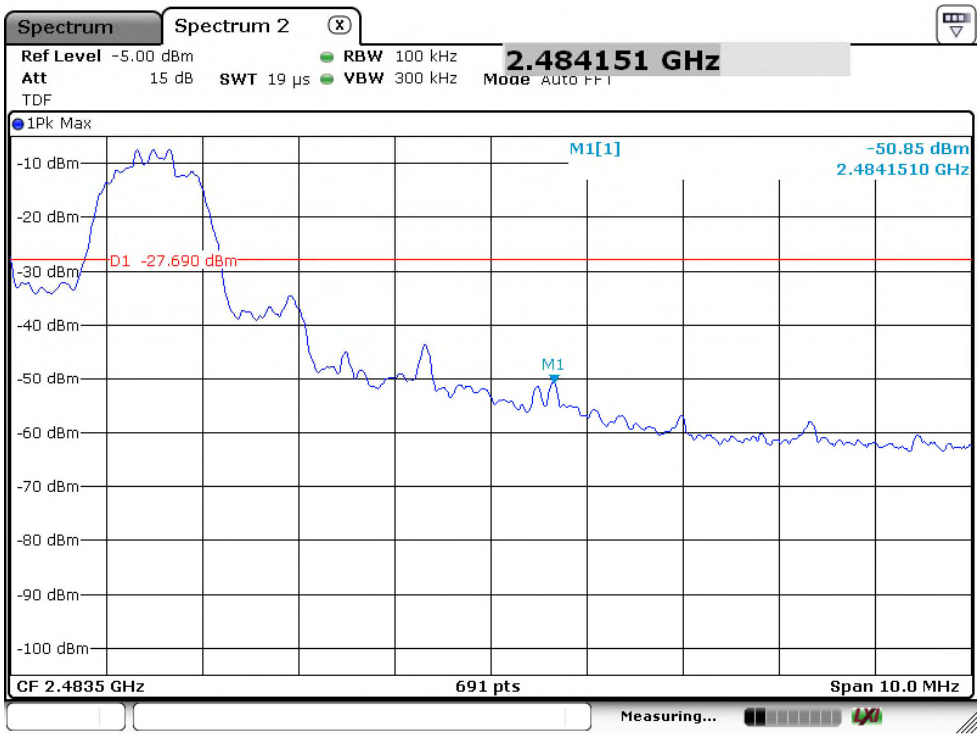


8DPSK / 2 440 MHz / Reference Level

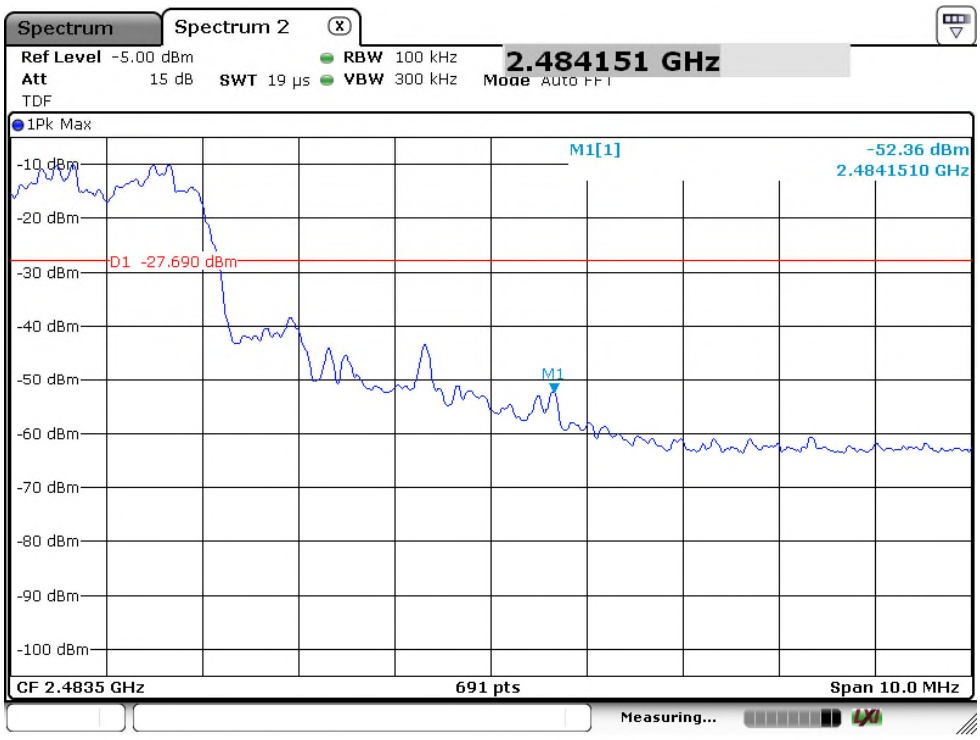


8DPSK / 2 440 MHz / Spurious Emission

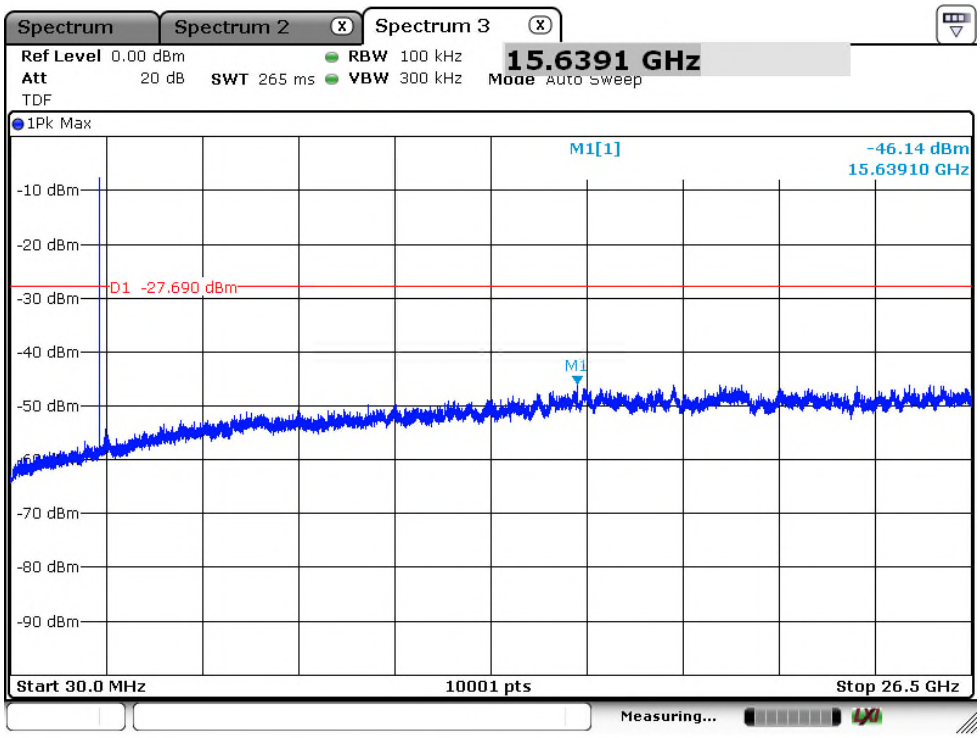
8DPSK / 2 480 MHz / Reference Level



8DPSK / 2 480 MHz / Band Edge



8DPSK / Hopping / Band Edge



8DPSK / 2 480 MHz / Spurious Emission

9. Radiated Spurious Emission and Restricted Band Edge

9.1 Limit

In any 100 kHz bandwidth outside the frequency band in which the spread spectrum intentional radiator is 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.

Attenuation below the general limits specified in section 15.209(a) is not required. In addition, radiated emission which fall in the restricted bands, as defined in section 15.205(a), must also comply with the radiated emission limits specified in section 15.209(a)(see Section 15.205(c).

All emission from a digital device, including any network of conductors and apparatus connected there to shall not exceed the level of field strength specified below:

Frequencies in restricted band are complied to limit on Paragraph 15.209

Frequency Range (MHz)	Distance (m)	Field strength (dBuV/m)
0.009-0.490	300	20log 2400/F (kHz) + 80
0.490-1.705	30	20log 24000/F (kHz) + 40
1.705-30	30	20log 30 + 40
30-88	3	40.0
88-216	3	43.5
216-960	3	46.0
Above 960	3	54.0

- Note : 1. RF voltage (dBuV) = 20 log RF Voltage (uV)
  2. In the Above Table, the tighter limit applies at the band edges.
  3. Distance refers to the distance in meters between the measuring instrument antenna and the EUT
  4. This device used to install a within vehicular. The location of EUT measurements has the Y-plane(Stand).
  5. All scanning using PK detector. And the final emission level was get using QP detector for frequency range from 30 – 1 000 MHz. As to 1 – 26.5 GHz, the final emission level got using PK and AV detector.
  6. If measurement is made at 3m distance.

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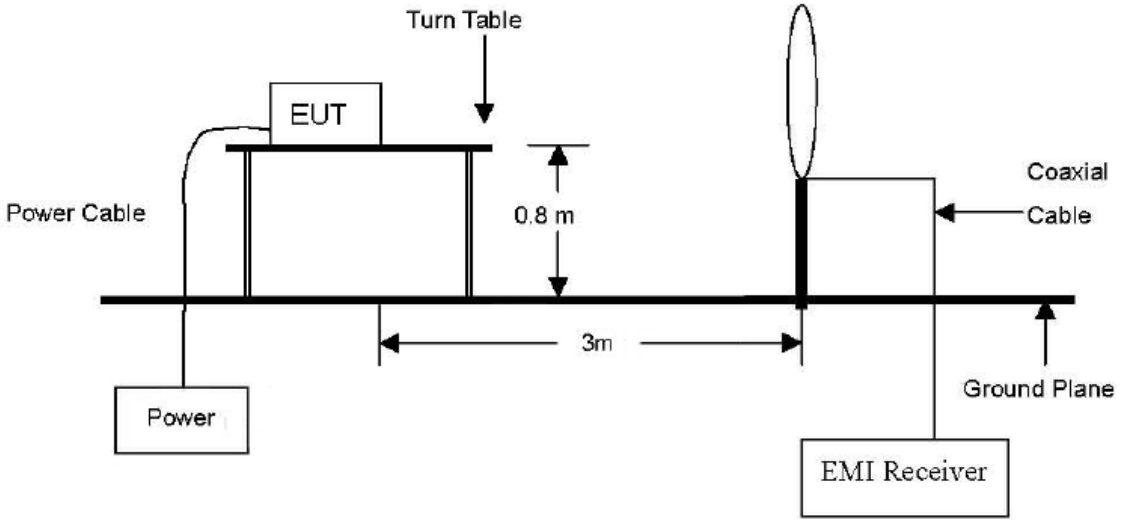
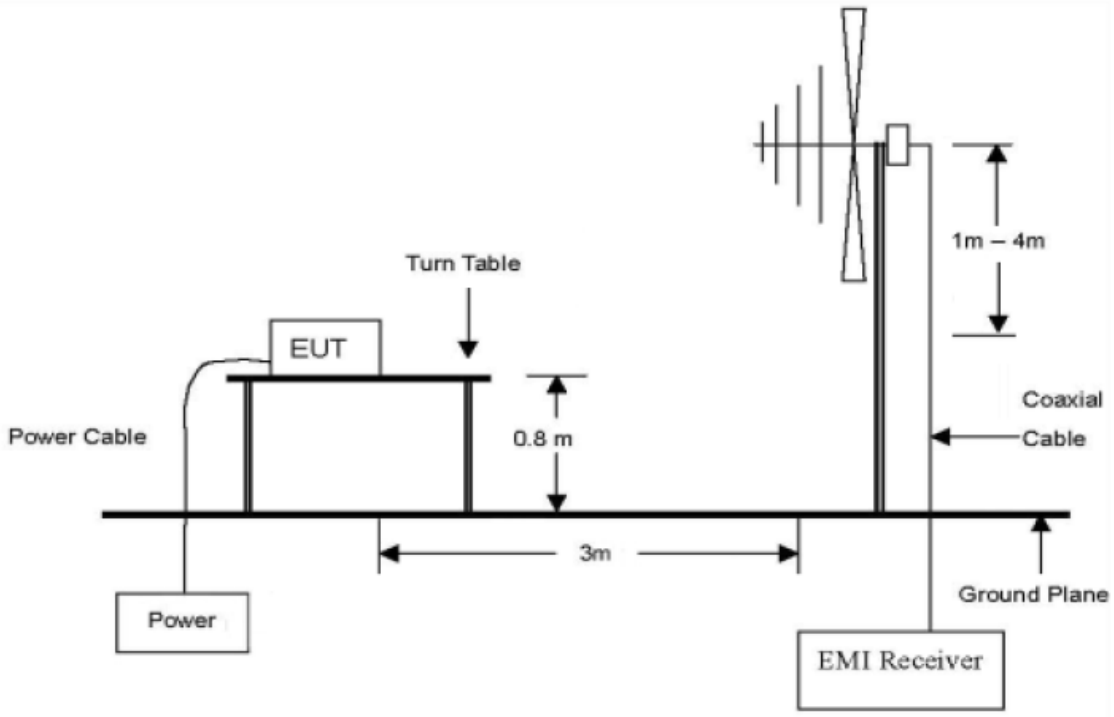
9.2 Test Configuration

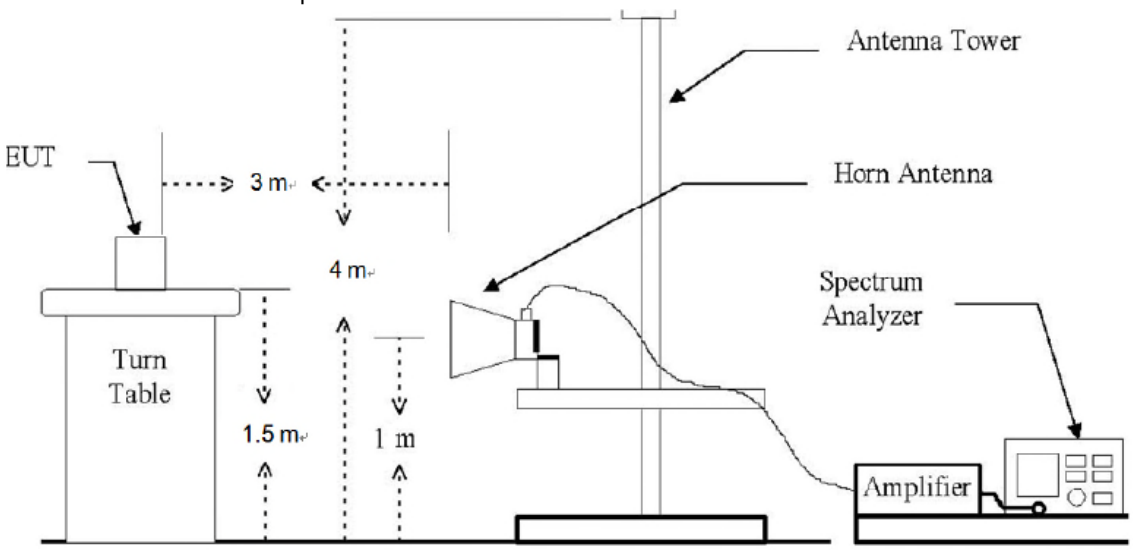
Below 30 MHz



Below 1 GHz Test Setup :



Above 1 GHz Test Setup :



9.3 Test Procedure

The EUT was setup according to ANSI C63.10: 2013 and tested according to DTS test procedure of ANSI C63.10: 2013 for compliance to FCC 47CFR 15.247 requirements.
In case of measurement below 1GHz, The EUT is placed on a turn table which is 0.8 meter above ground. If above 1GHz, that is 1.5 meter above ground.
The turn table is rotated 360 degrees to determine the position of the maximum emission level.
The EUT was positioned such that the distance from antenna to the EUT was 3 meters.
The antenna is scanned between 1 meter and 4 meters to find out the maximum emission level. This is repeated for both horizontal and vertical polarization of the antenna. In order to find the maximum emission, all of the interface cables were manipulated according to ANSI C63.4: 2014 on radiated measurement.
The resolution bandwidth below 1 GHz setting on the field strength meter is 120 kHz and above 1 GHz is 1 MHz. Radiated emission measurements below 1 GHz are made using broadband Bilog antenna and above 1 GHz are made using Horn Antennas.
The measurement is divided into the Preliminary Measurement and the Final Measurement. The suspected frequencies are searched for in Preliminary Measurement with the measurement antenna kept pointed at the source of the emission both in azimuth and elevation, with the polarization of the antenna oriented for maximum response. The antenna is pointed at an angle towards the source of the emission, and the EUT is rotated in both height and polarization to maximize the measured emission. The emission is kept within the illumination area of the 3 dB bandwidth of the antenna. The frequency range from 30 MHz to 10th harmonics is checked.

Field Strength Calculation

The field strength is calculated by adding the Antenna Factor and Cable loss, and subtracting the Amplifier Gain (if any) from the measured reading. For the limit is employed average value, therefore the peak value can be transferred to average value by subtracting the duty factor. The basic equation with a sample calculation is as follows:

Result = Reading + Corrected Factor

Corr. Factor = Antenna Factor + Cable loss - Amplifier Gain

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9.4 Duty Circle Correction Factor (ANSI C63.10-2013 Section 7.5)

- Time to cycle through all channels = T[ms] X 20 minimum hopping channels,
  where T = pulse width = 2.89 ms

- Number of times transmitter hits on one channel = 100 ms / Time to cycle through all channels
  = 100 ms / (2.89 X 20) = 1.73 ≒ 2

- The Worst Case Dwell Time = T[ms] X Number of times transmitter hits on one channel
  = 2.89 X 2 = 5.78 ms

- Duty Circle Correction Factor(D.C.C.F) = 20log(The Worst Case Dwell Time / 100 ms)
  = 20log(5.78 / 100) = -24.76 dB

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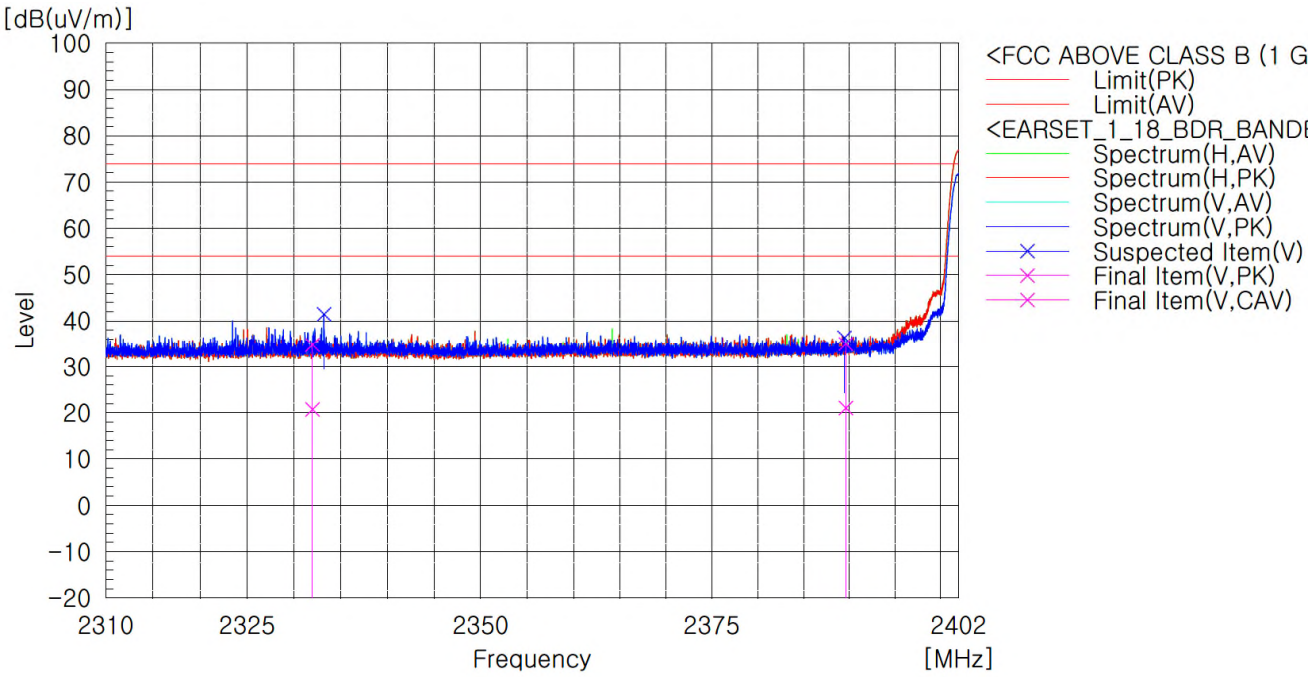
9.5 Test Result - Radiated Restricted Band Edge

Test date	2020.12.11	Meas. Distance	3 m
Temperature	(19.9 ± 1.0) °C	Humidity	(39.7 ± 1.0) % R.H.
Frequency	2 402 MHz	Polarization	Horizontal / Vertical
Mode	GFSK		



Frequency (MHz)	Pol. (H/V)	Detector (Peak/Avg.)	Reading (dBuV/m)	Correction Factor (dB)	D.C.C.F (dB)	Result (dBuV/m)	Limits (dBuV/m)	Margin (dB)
2 389.63	V	Peak	46.0	-11.0	-	35.0	74.0	39.0
2 389.63	V	Avg.	-	-11.0	-24.76	10.2	54.0	43.8

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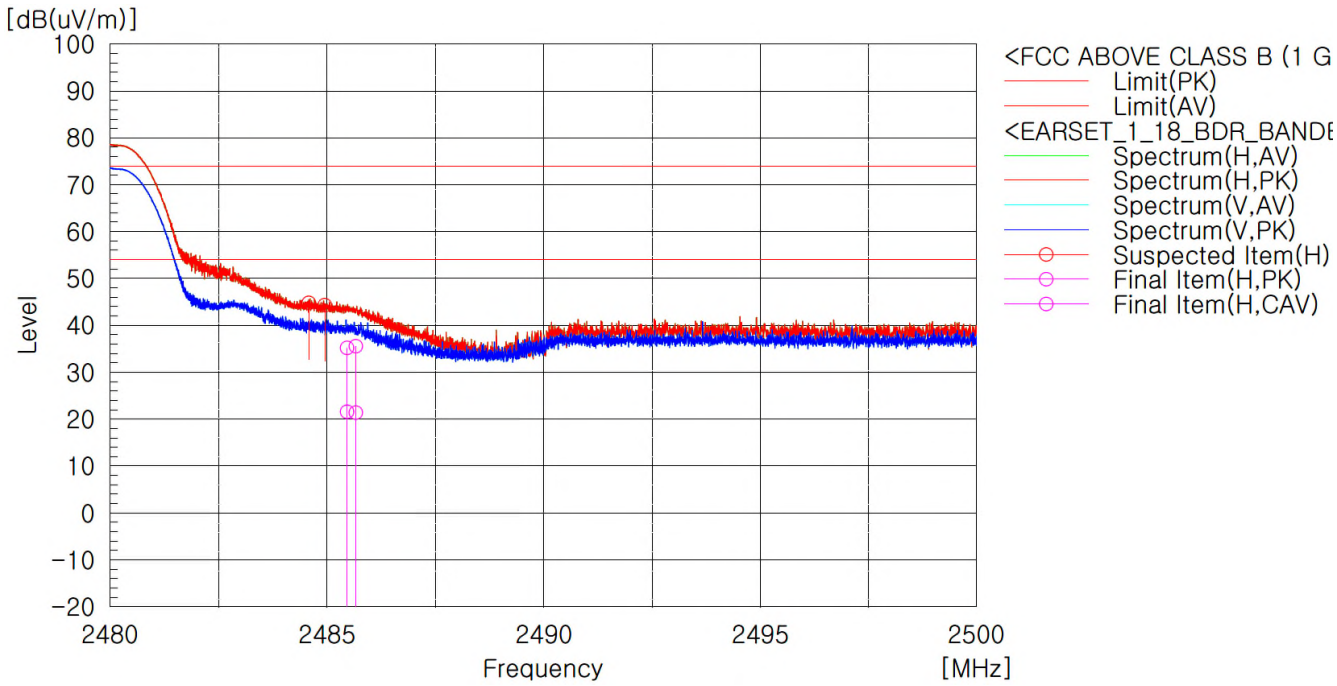
Test date	2020.12.11	Meas. Distance	3 m
Temperature	(19.9 ± 1.0) °C	Humidity	(39.7 ± 1.0) % R.H.
Frequency	2 480 MHz	Polarization	Horizontal / Vertical
Mode	GFSK		



Frequency (MHz)	Pol. (H/V)	Detector (Peak/Avg.)	Reading (dBuV/m)	Correction Factor (dB)	D.C.C.F (dB)	Result (dBuV/m)	Limits (dBuV/m)	Margin (dB)
2 485.66	H	Peak	46.7	-11.1	-	35.6	74.0	38.4
2 485.66	H	Avg.	-	-11.1	-24.76	10.8	54.0	43.2

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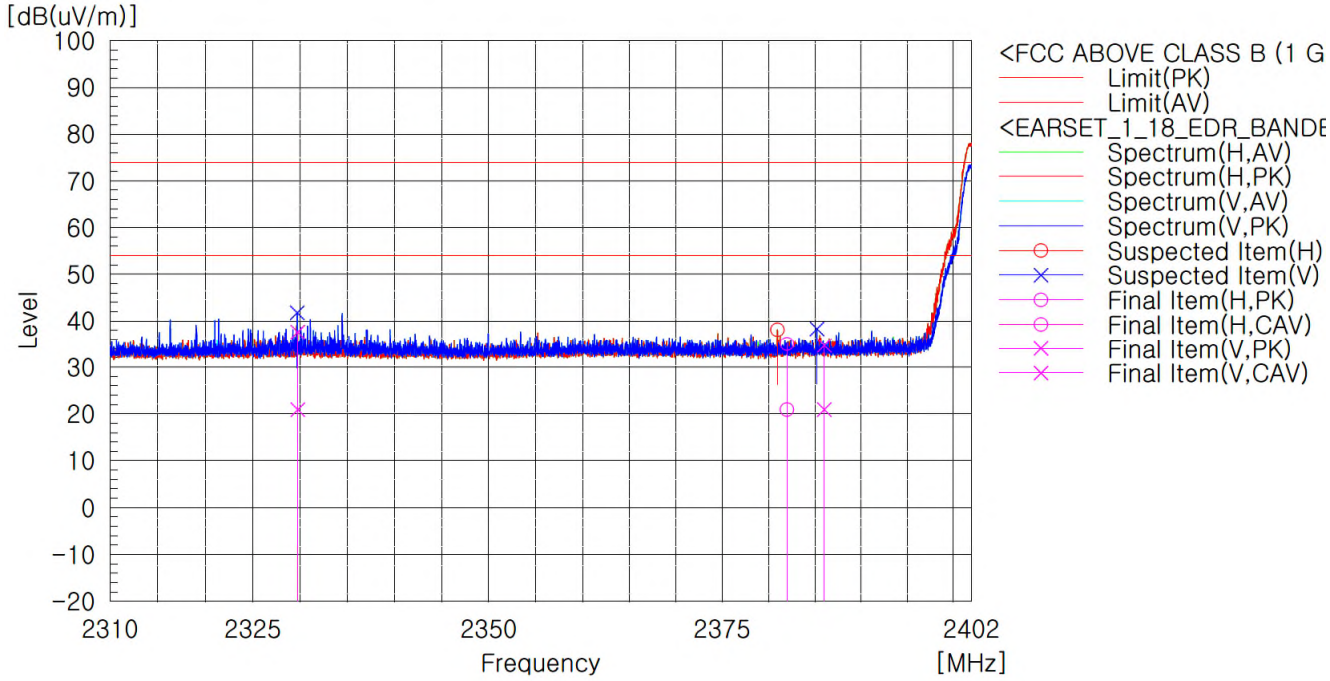
Test date	2020.12.11	Meas. Distance	3 m
Temperature	(19.9 ± 1.0) °C	Humidity	(39.7 ± 1.0) % R.H.
Frequency	2 402 MHz	Polarization	Horizontal / Vertical
Mode	8DPSK		



Frequency (MHz)	Pol. (H/V)	Detector (Peak/Avg.)	Reading (dBuV/m)	Correction Factor (dB)	D.C.C.F (dB)	Result (dBuV/m)	Limits (dBuV/m)	Margin (dB)
2 329.74	V	Peak	49.5	-11.9	-	37.6	74.0	36.4
2 329.74	V	Avg.	-	-11.9	-24.76	12.8	54.0	41.2

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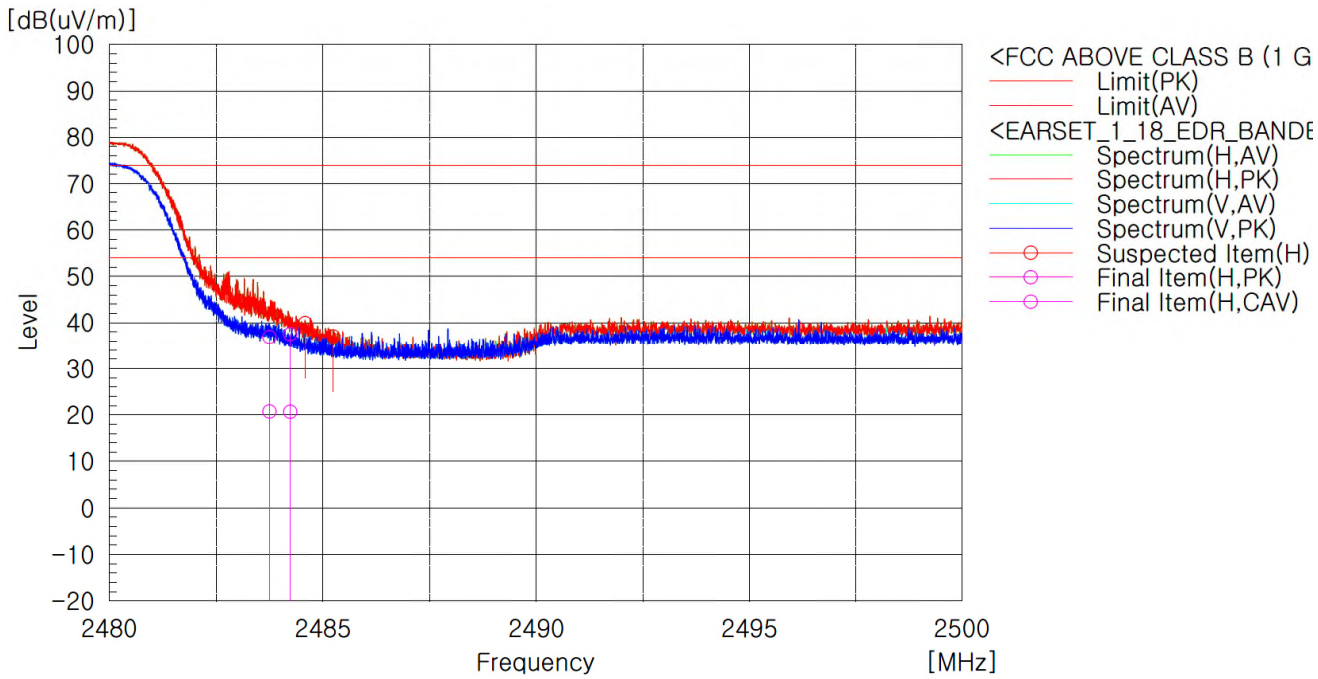
Test date	2020.12.11	Meas. Distance	3 m
Temperature	(19.9 ± 1.0) °C	Humidity	(39.7 ± 1.0) % R.H.
Frequency	2 480 MHz	Polarization	Horizontal / Vertical
Mode	8DPSK		



Frequency (MHz)	Pol. (H/V)	Detector (Peak/Avg.)	Reading (dBuV/m)	Correction Factor (dB)	D.C.C.F (dB)	Result (dBuV/m)	Limits (dBuV/m)	Margin (dB)
2 484.23	H	Peak	48.7	-11.1	-	37.6	74.0	36.4
2 484.23	H	Avg.	-	-11.1	-24.76	12.8	54.0	41.2

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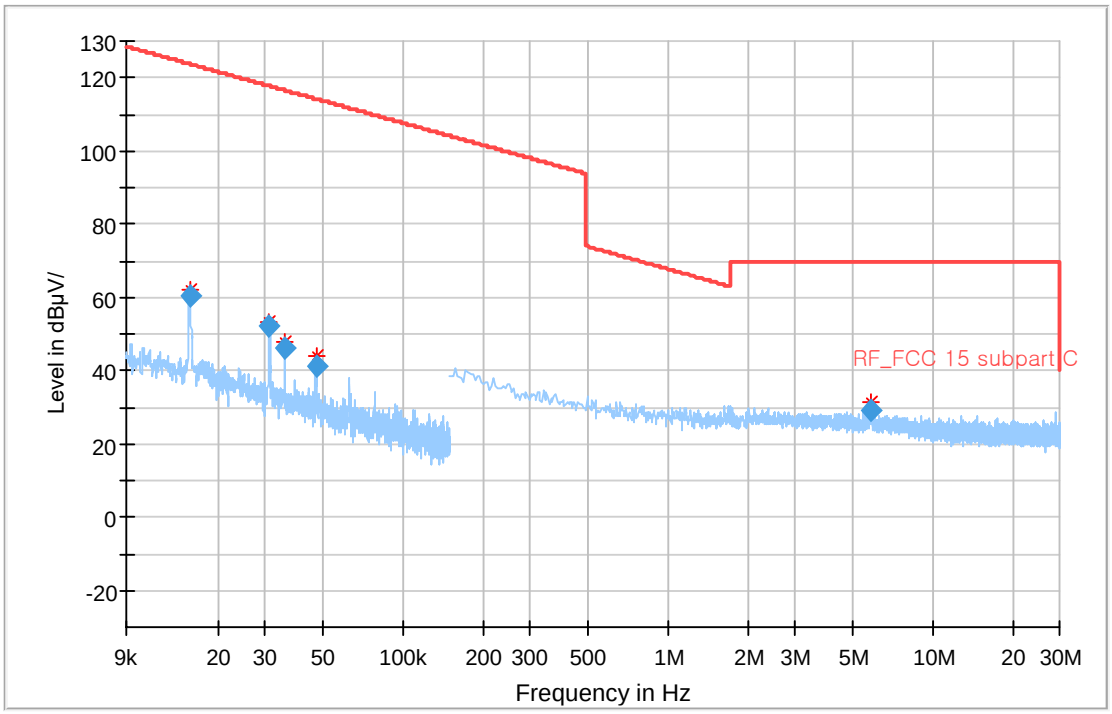
9.6 Test Result - Radiated Spurious Emission (9 kHz to 30 MHz)

Test date	2020.12.17	Meas. Distance	3 m
Temperature	(18.6 ± 0.5) °C	Humidity	(19.9 ± 0.5) % R.H.
Frequency	2 440 MHz	Polarization	Horizontal
Mode	GFSK		



Frequency (MHz)	Pol. (H/V)	Reading (dBuV/m)	Correction Factor (dB)	Result (dBuV/m)	Limits (dBuV/m)	Margin (dB)
-	-	-	-	-	-	-
Other emissions don't exceed the level of 20 dB below the applicable Limit.						
-	-	-	-	-	-	-

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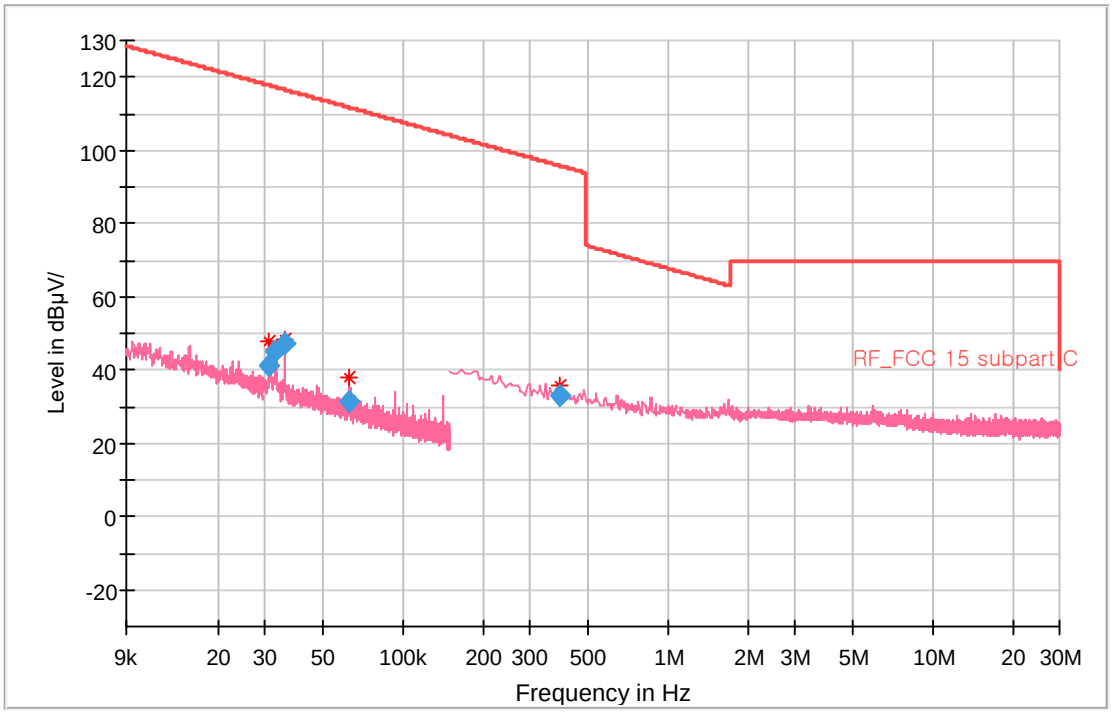
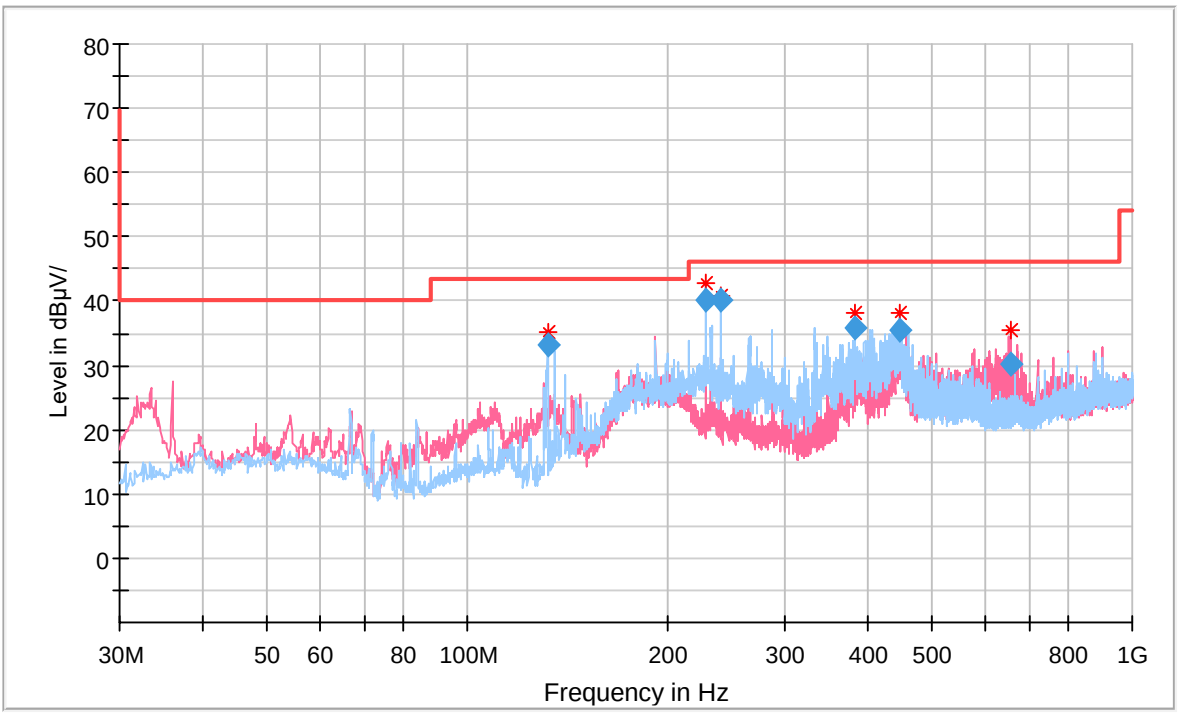
Test date	2020.12.17	Meas. Distance	3 m
Temperature	(18.6 ± 0.5) °C	Humidity	(19.9 ± 0.5) % R.H.
Frequency	2 440 MHz	Polarization	Vertical
Mode	GFSK		



Frequency (MHz)	Pol. (H/V)	Reading (dBuV/m)	Correction Factor (dB)	Result (dBuV/m)	Limits (dBuV/m)	Margin (dB)
-	-	-	-	-	-	-
Other emissions don't exceed the level of 20 dB below the applicable Limit.						
-	-	-	-	-	-	-

9.7 Test Result - Radiated Spurious Emission (30 MHz to 1 GHz)

Test date	2020.12.17	Meas. Distance	3 m
Temperature	(18.6 ± 0.5) °C	Humidity	(19.9 ± 0.5) % R.H.
Frequency	2 440 MHz	Polarization	Horizontal / Vertical
Mode	GFSK		



Frequency (MHz)	QuasiPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
131.850000	33.31	43.52	10.21	400.0	H	135.0	-16.7
228.001250	40.15	46.02	5.87	100.0	H	39.0	-13.0
240.005000	40.20	46.02	5.82	100.0	H	164.0	-12.4
384.050000	35.82	46.02	10.20	200.0	H	266.0	-9.2
446.130000	35.38	46.02	10.64	100.0	H	0.0	-8.2
654.801250	30.02	46.02	16.00	200.0	V	47.0	-4.8

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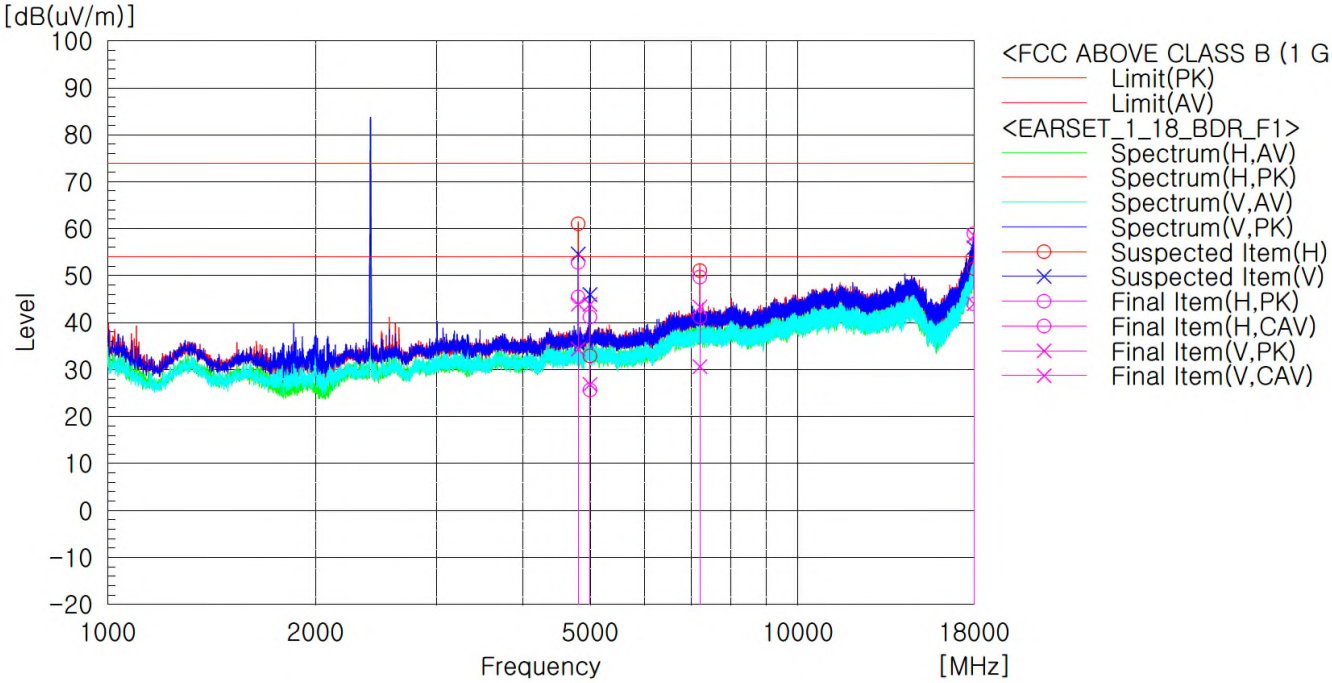
9.8 Test Result - Radiated Spurious Emission (1 to 18 GHz)

Test date	2020.12.11	Meas. Distance	3 m
Temperature	(19.9 ± 1.0) °C	Humidity	(39.7 ± 1.0) % R.H.
Frequency	2 402 MHz	Polarization	Horizontal / Vertical
Mode	GFSK		



Frequency (MHz)	Pol. (H/V)	Detector (Peak/Avg.)	Reading (dBuV/m)	Correction Factor (dB)	D.C.C.F (dB)	Result (dBuV/m)	Limits (dBuV/m)	Margin (dB)
4 804.45	H	Peak	56.3	-3.5	-	52.8	74.0	21.2
4 804.45	H	Avg.	-	-3.5	-24.76	28.0	54.0	26.0
4 995. 99	V	Peak	47.1	-3.2	-	43.9	74.0	30.1
4 995. 99	V	Avg.	-	-3.2	-24.76	19.1	54.0	34.9
7 206.18	H	Peak	45.6	4.1	-	49.7	74.0	24.3
7 206.18	H	Avg.	-	4.1	-24.76	24.9	54.0	29.1
17 990.20	H	Peak	32.0	27.0	-	59.0	74.0	15.0
17 990.20	H	Avg.	-	27.0	-24.76	34.2	54.0	19.8

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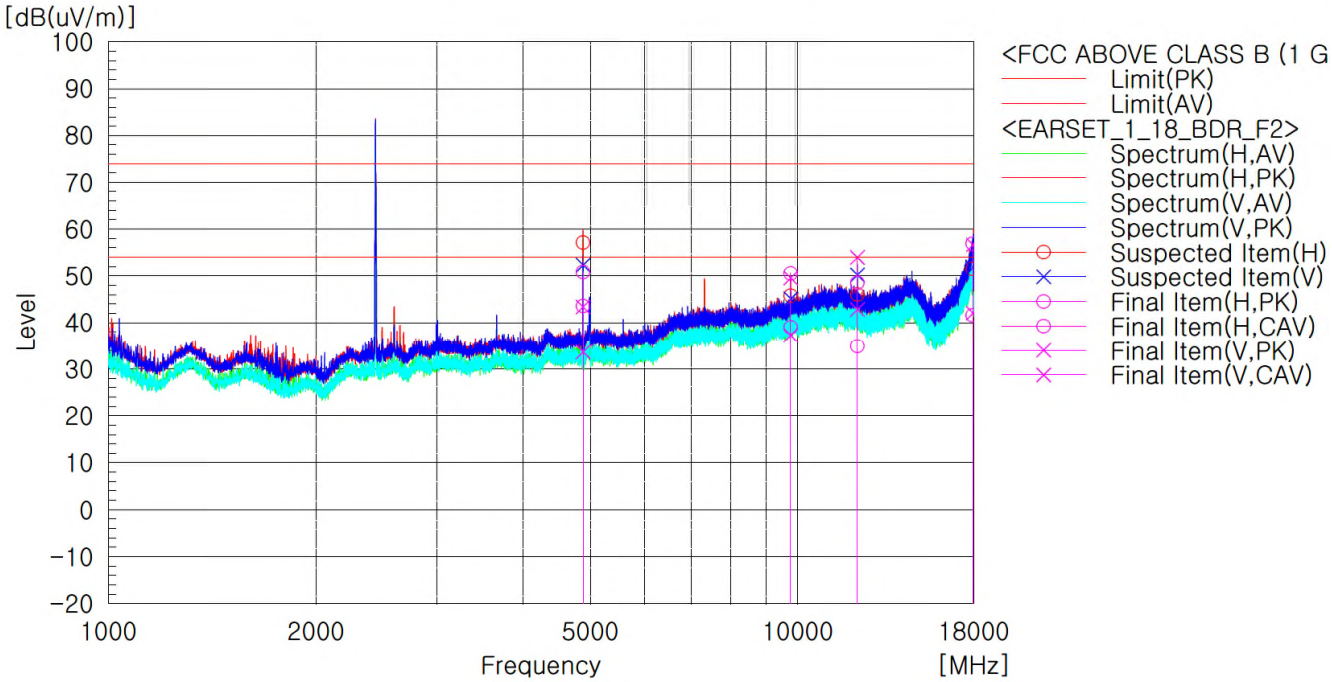
Test date	2020.12.11	Meas. Distance	3 m
Temperature	(19.9 ± 1.0) °C	Humidity	(39.7 ± 1.0) % R.H.
Frequency	2 440 MHz	Polarization	Horizontal / Vertical
Mode	GFSK		



Frequency (MHz)	Pol. (H/V)	Detector (Peak/Avg.)	Reading (dBuV/m)	Correction Factor (dB)	D.C.C.F (dB)	Result (dBuV/m)	Limits (dBuV/m)	Margin (dB)
4 880.08	H	Peak	54.5	-3.6	-	50.9	74.0	23.1
4 880.08	H	Avg.	-	-3.6	-24.76	26.1	54.0	27.9
9 760.90	H	Peak	41.9	8.6	-	50.5	74.0	23.5
9 760.90	H	Avg.	-	8.6	-24.76	25.7	54.0	28.3
12 201.07	V	Peak	42.2	11.8	-	54.0	74.0	20.0
12 201.07	V	Avg.	-	11.8	-24.76	29.2	54.0	24.8
17 937.13	H	Peak	31.6	25.3	-	56.9	74.0	17.1
17 937.13	H	Avg.	-	25.3	-24.76	32.1	54.0	21.9

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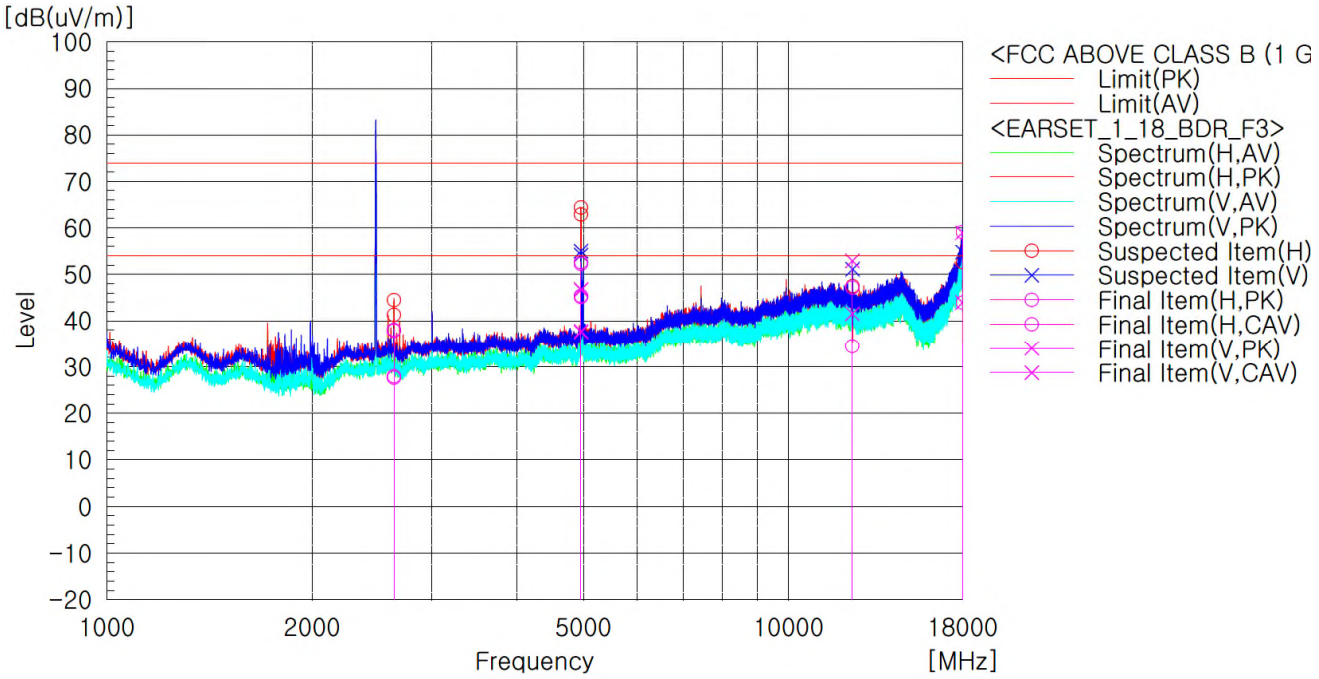
Test date	2020.12.11	Meas. Distance	3 m
Temperature	(19.9 ± 1.0) °C	Humidity	(39.7 ± 1.0) % R.H.
Frequency	2 480 MHz	Polarization	Horizontal / Vertical
Mode	GFSK		



Frequency (MHz)	Pol. (H/V)	Detector (Peak/Avg.)	Reading (dBuV/m)	Correction Factor (dB)	D.C.C.F (dB)	Result (dBuV/m)	Limits (dBuV/m)	Margin (dB)
2 636.18	H	Peak	48.4	-10.3	-	38.1	74.0	35.9
2 636.18	H	Avg.	-	-10.3	-24.76	13.3	54.0	40.7
4 959.79	H	Peak	56.0	-3.3	-	52.7	74.0	21.3
4 959.79	H	Avg.	-	-3.3	-24.76	27.9	54.0	26.1
12 401.07	V	Peak	41.8	11.2	-	53.0	74.0	21.0
12 401.07	V	Avg.	-	11.2	-24.76	28.2	54.0	25.8
17 993.26	H	Peak	32.0	27.1	-	59.1	74.0	14.9
17 993.26	H	Avg.	-	27.1	-24.76	34.3	54.0	19.7

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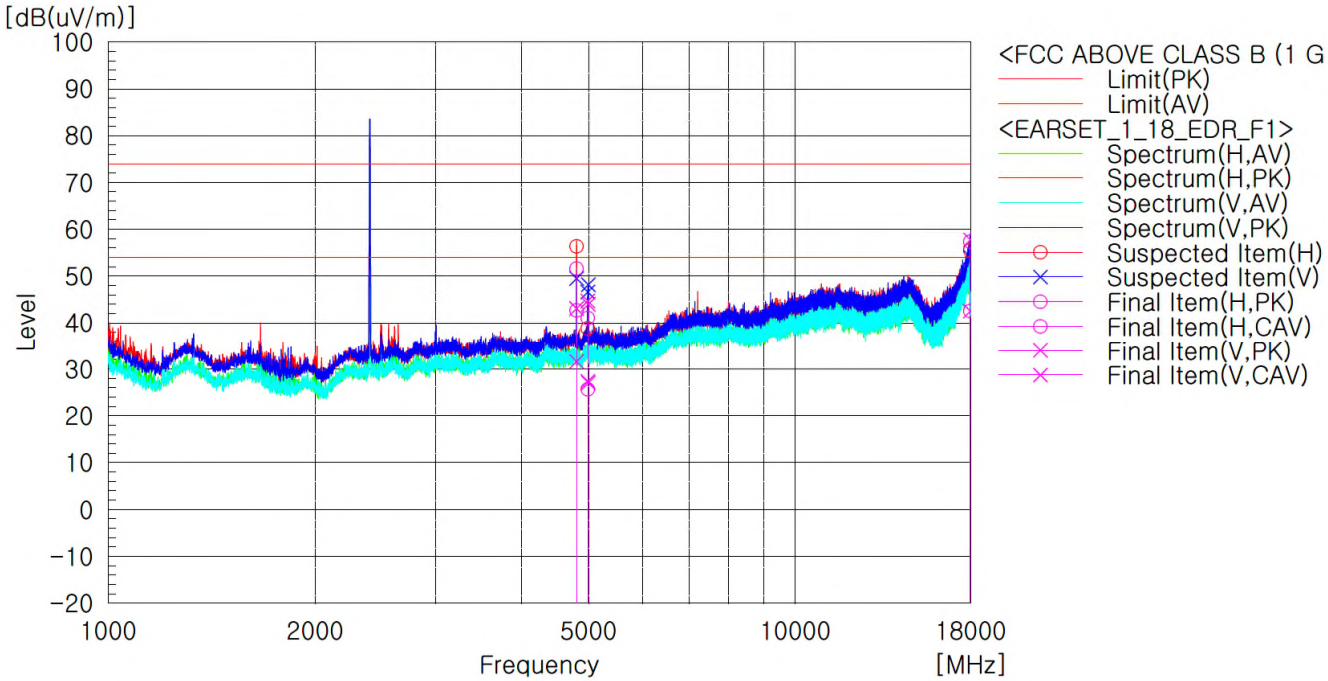
Test date	2020.12.11	Meas. Distance	3 m
Temperature	(19.9 ± 1.0) °C	Humidity	(39.7 ± 1.0) % R.H.
Frequency	2 402 MHz	Polarization	Horizontal / Vertical
Mode	8DPSK		



Frequency (MHz)	Pol. (H/V)	Detector (Peak/Avg.)	Reading (dBuV/m)	Correction Factor (dB)	D.C.C.F (dB)	Result (dBuV/m)	Limits (dBuV/m)	Margin (dB)
4 804.42	H	Peak	55.2	-3.5	-	51.7	74.0	22.3
4 804.42	H	Avg.	-	-3.5	-24.76	26.9	54.0	27.1
4 989.15	V	Peak	48.0	-3.3	-	44.7	74.0	29.3
4 989.15	V	Avg.	-	-3.3	-24.76	19.9	54.0	34.1
17 961.74	V	Peak	31.7	26.1	-	57.8	74.0	16.2
17 961.74	V	Avg.	-	26.1	-24.76	33.0	54.0	21.0

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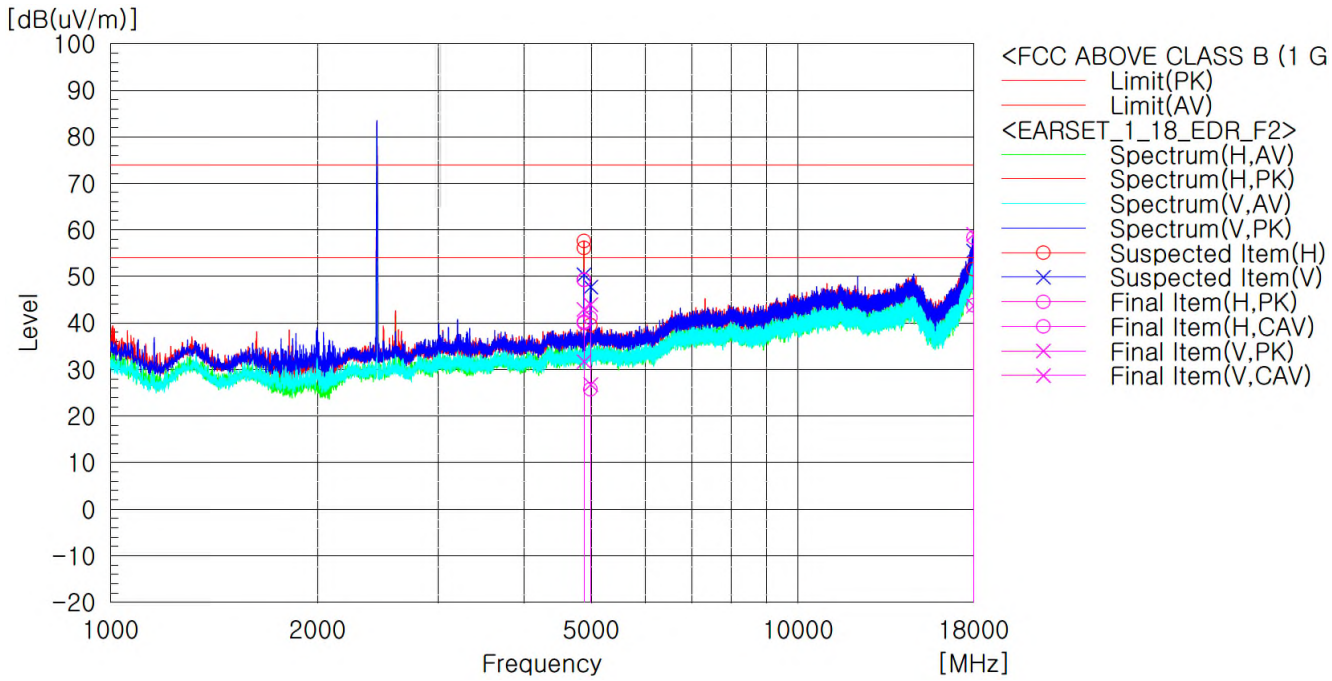
Test date	2020.12.11	Meas. Distance	3 m
Temperature	(19.9 ± 1.0) °C	Humidity	(39.7 ± 1.0) % R.H.
Frequency	2 440 MHz	Polarization	Horizontal / Vertical
Mode	8DPSK		



Frequency (MHz)	Pol. (H/V)	Detector (Peak/Avg.)	Reading (dBuV/m)	Correction Factor (dB)	D.C.C.F (dB)	Result (dBuV/m)	Limits (dBuV/m)	Margin (dB)
4 880.42	H	Peak	52.8	-3.6	-	49.2	74.0	24.8
4 880.42	H	Avg.	-	-3.6	-24.76	24.4	54.0	29.6
4 992.30	V	Peak	47.1	-3.2	-	43.9	74.0	30.1
4 992.30	V	Avg.	-	-3.2	-24.76	19.1	54.0	34.9
17 981.58	V	Peak	32.4	26.7	-	59.1	74.0	14.9
17 981.58	V	Avg.	-	26.7	-24.76	34.3	54.0	19.7

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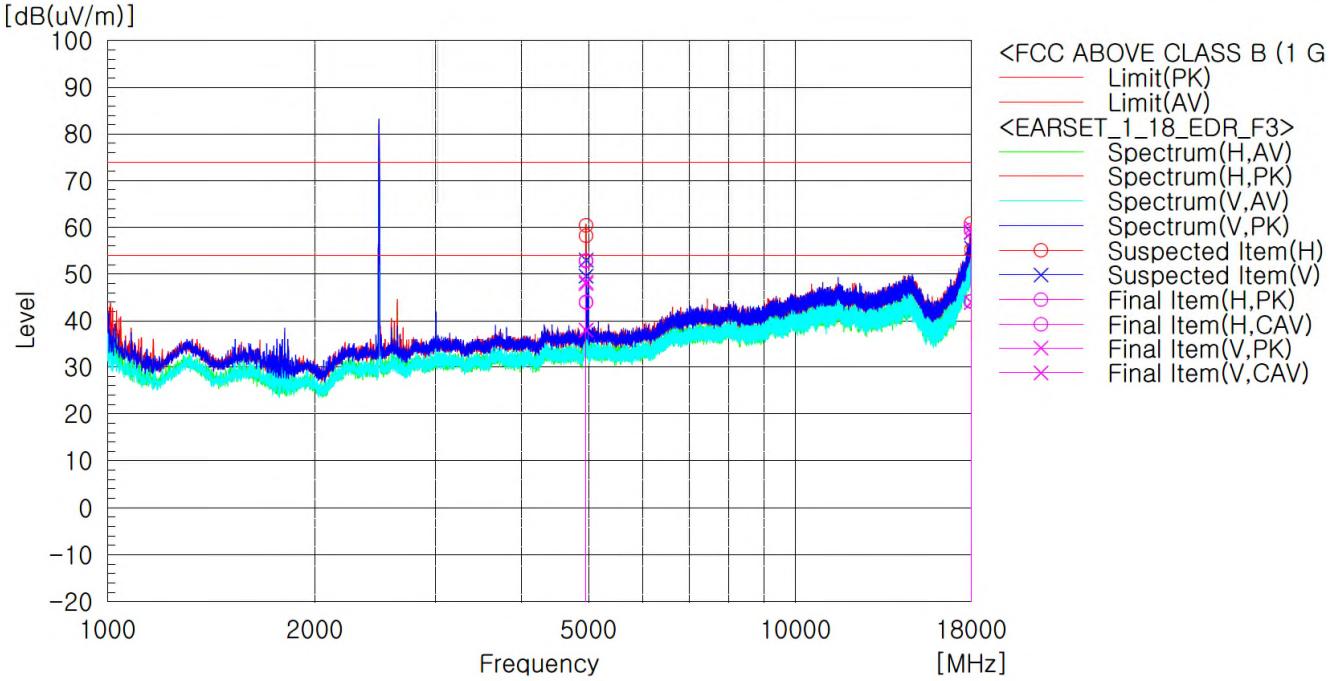
Test date	2020.12.11	Meas. Distance	3 m
Temperature	(19.9 ± 1.0) °C	Humidity	(39.7 ± 1.0) % R.H.
Frequency	2 480 MHz	Polarization	Horizontal / Vertical
Mode	8DPSK		



Frequency (MHz)	Pol. (H/V)	Detector (Peak/Avg.)	Reading (dBuV/m)	Correction Factor (dB)	D.C.C.F (dB)	Result (dBuV/m)	Limits (dBuV/m)	Margin (dB)
4 959.77	H	Peak	56.3	-3.3	-	53.0	74.0	21.0
4 959.77	H	Avg.	-	-3.3	-24.76	28.2	54.0	25.8
17 993.41	V	Peak	32.9	27.1	-	60.0	74.0	14.0
17 993.41	V	Avg.	-	27.1	-24.76	35.2	54.0	18.8

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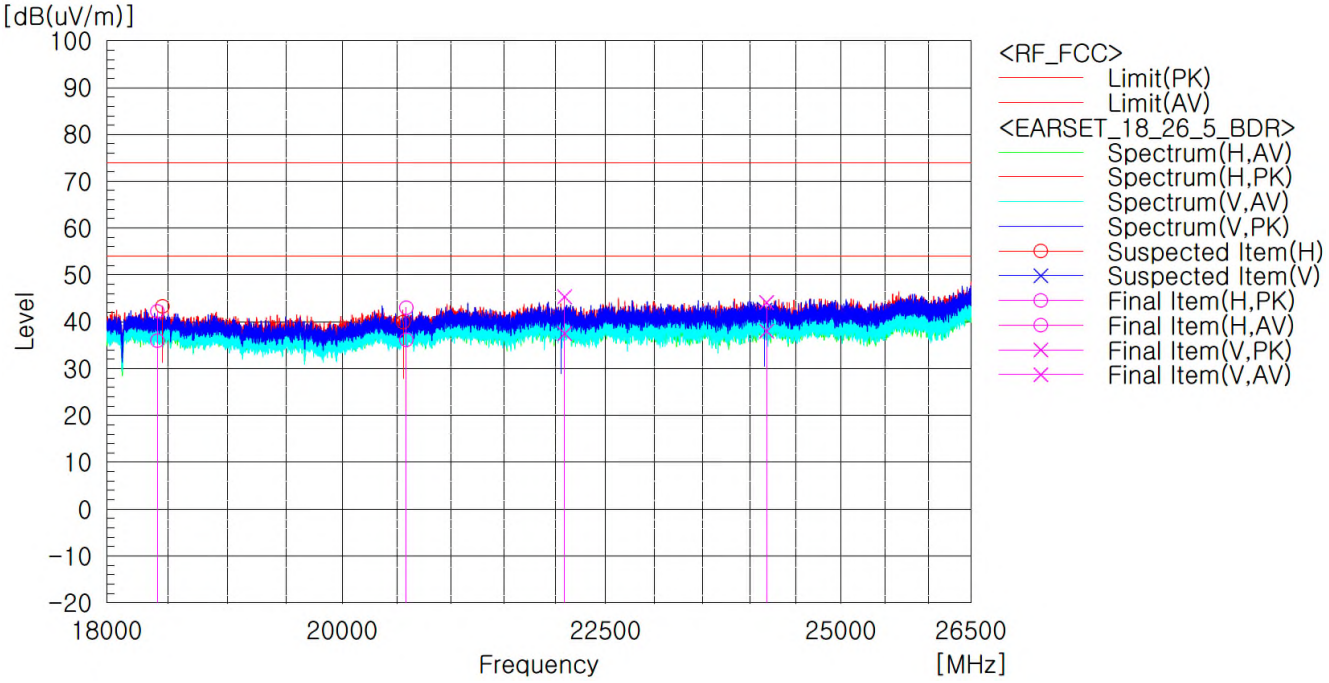
9.9 Test Result - Radiated Spurious Emission (18 to 26.5 GHz)

Test date	2020.12.11	Meas. Distance	3 m
Temperature	(19.9 ± 1.0) °C	Humidity	(39.7 ± 1.0) % R.H.
Frequency	2 440 MHz	Polarization	Horizontal / Vertical
Mode	GFSK		



Frequency (MHz)	Pol. (H/V)	Detector (Peak/Avg.)	Reading (dBuV/m)	Correction Factor (dB)	D.C.F (dB)	Result (dBuV/m)	Limits (dBuV/m)	Margin (dB)
-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-
No other spurious and harmonic emission were detected.								
-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-

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10. AC Power Line Conducted Emission

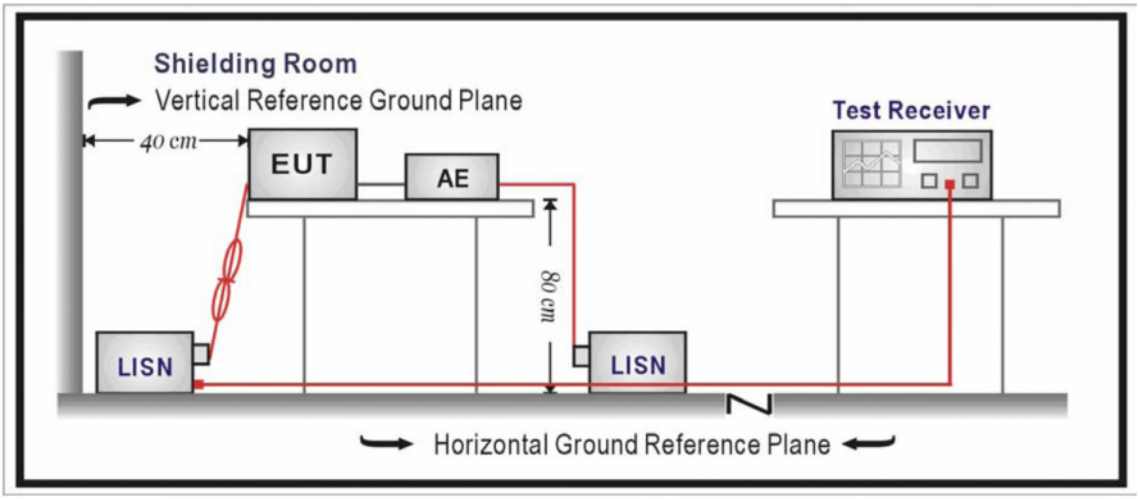
10.1 Limit

Test Specification **:** According to FCC CFR Title 47 Part 15 Subpart C Section 15.207

Frequency (MHz)	Limit (dBuV)	
	Quasi-Peak	Average
0.15 to 0.5	66 to 56 *	56 to 46 *
0.5 to 5	56	46
5 to 30	60	50

Note : * Decrease with the logarithm of the frequency

10.2 Test Configuration



10.3 Test Procedure

The EUT and simulators are connected to the main power through a line impedance stabilization network (L.I.S.N.). This provides a 50 ohm /50 uH coupling impedance for the measuring equipment. The peripheral devices are also connected to the main power through a LISN that provides a 50 ohm/50 uH coupling impedance with 50ohm termination.(Please refers to the block diagram of the test setup and photographs.)

Both sides of A.C. line are checked for maximum conducted interference. In order to find the maximum emission, the relative positions of equipment and all of the interface cables must be changed on conducted measurement.

Conducted emissions were invested over the frequency range from 0.15 MHz to 30 MHz using a receiver bandwidth of 9kHz.

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10.4 Test Result

[AC Power]

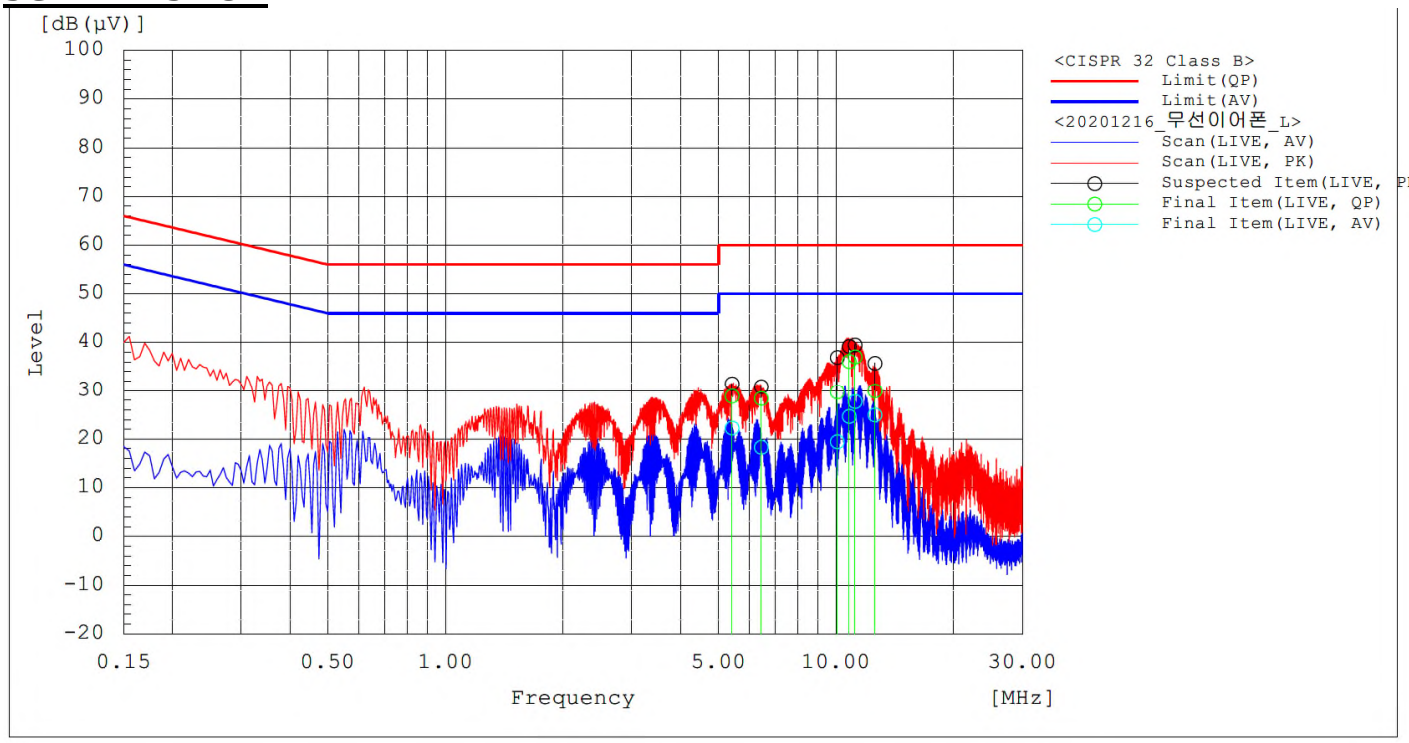
[LIVE]

Conducted Emission Test Report

PROFILE

Applicant	THE YEOLRIM Co.,Ltd.	Standard	FCC Part15 Subpart C
Modelname	YSH-C2000	Date	2020.12.16
Mode	Charging	Operator	J.J.Y
Phase	LIVE	Tem./ Hum.	(18.5 ± 1.0) °C / (16.4 ± 1.0) % R.H.

SCREEN SHOT



Final Result

--- LIVE (QP) ---

No.	Frequency [MHz]	Reading [dB(μV)]	c.f [dB]	Result [dB(μV)]	Limit [dB(μV)]	Margin [dB]
1	10.817	26.2	9.9	36.1	60.0	23.9
2	11.186	27.1	9.9	37.0	60.0	23.0
3	12.576	20.1	9.9	30.0	60.0	30.0
4	10.067	19.9	9.9	29.8	60.0	30.2
5	6.435	18.6	9.8	28.4	60.0	31.6
6	5.413	19.1	9.8	28.9	60.0	31.1

--- LIVE (AV) ---

No.	Frequency [MHz]	Reading [dB(μV)]	c.f [dB]	Result [dB(μV)]	Limit [dB(μV)]	Margin [dB]
1	10.817	14.8	9.9	24.7	50.0	25.3
2	11.186	17.8	9.9	27.7	50.0	22.3
3	12.576	15.1	9.9	25.0	50.0	25.0
4	10.067	9.5	9.9	19.4	50.0	30.6
5	6.435	8.5	9.8	18.3	50.0	31.7
6	5.413	12.5	9.8	22.3	50.0	27.7

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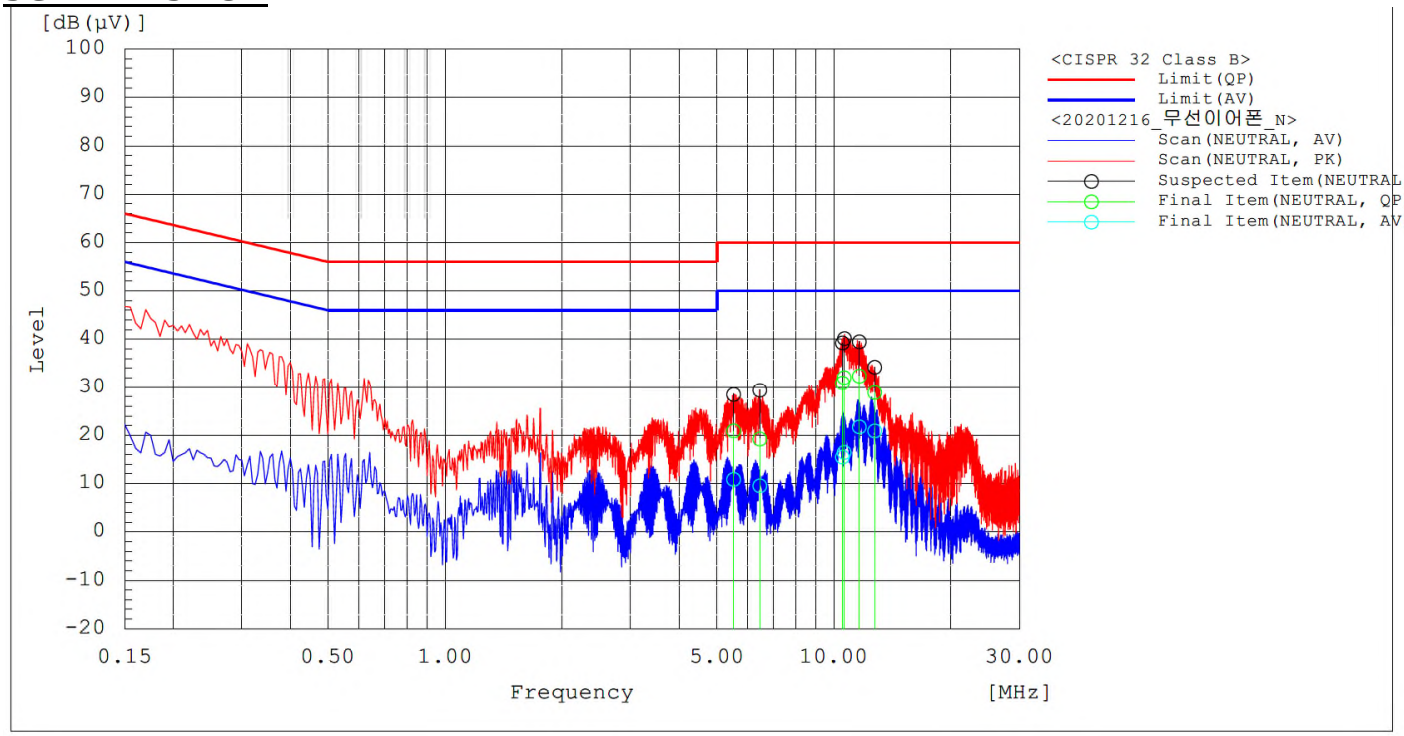
[NEUTRAL]

Conducted Emission Test Report

PROFILE

Applicant	THE YEOLRIM Co.,Ltd.	Standard	FCC Part15 Subpart C
Modelname	YSH-C2000	Date	2020.12.16
Mode	Charging	Operator	J.J.Y
Phase	Neutral	Tem./ Hum.	(18.5 ± 1.0) °C / (16.4 ± 1.0) % R.H.

SCREEN SHOT



Final Result

--- NEUTRAL (QP) ---

No.	Frequency [MHz]	Reading [dB(µV)]	c.f [dB]	Result [dB(µV)]	Limit [dB(µV)]	Margin [dB]
1	10.632	22.2	9.9	32.1	60.0	27.9
2	11.616	22.4	9.9	32.3	60.0	27.7
3	6.450	9.4	9.8	19.2	60.0	40.8
4	5.517	11.1	9.8	20.9	60.0	39.1
5	10.515	21.1	9.9	31.0	60.0	29.0
6	12.739	19.0	9.9	28.9	60.0	31.1

--- NEUTRAL (AV) ---

No.	Frequency [MHz]	Reading [dB(µV)]	c.f [dB]	Result [dB(µV)]	Limit [dB(µV)]	Margin [dB]
1	10.632	6.6	9.9	16.5	50.0	33.5
2	11.616	11.9	9.9	21.8	50.0	28.2
3	6.450	-0.3	9.8	9.5	50.0	40.5
4	5.517	1.1	9.8	10.9	50.0	39.1
5	10.515	5.6	9.9	15.5	50.0	34.5
6	12.739	11.0	9.9	20.9	50.0	29.1

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11. ANTENNA REQUIREMENT

11.1 Applicable Stamdard

According to § 15.203, an intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the provisions of this section.

11.2 Applicable Construction

- The Antenna is permanently attached on the main board

11.3 Test Result

Pass

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12. Equipment List

Test Equipment		Model	Mfg.	Serial No.	Cal. Date	Cal. Due Date
☐	Spectrum Analyzer	E4440A	Agilent	MY45304577	2020.11.27	2021.11.27
☐	Spectrum Analyzer	E4440A	Agilent	MY46115274	2020.11.27	2021.11.27
☒	Spectrum Analyzer	FSV40-N	ROHDE& SCHWARZ	102183	2020.06.01	2021.06.01
☐	10 dB Attenuator	SA26B	FAIRVIEW	N/A	2020.11.30	2021.11.30
☒	10 dB Attenuator	BW-K10-2W44+	Mini-Circuits	1949	2020.06.02	2021.06.02
☒	Double Ridged Horn Antenna	BBHA9120D	SCHWARZBECK	839	2020.05.12	2021.05.12
☒	Low Noise Amplifier	TK-PA18H	TESTEK	170028-L	2020.11.30	2021.11.30
☒	Low Noise Amplifier	TK-PA1840H	TESTEK	170029-L	2020.11.30	2021.11.30
☒	Horn Antenna	BBHA9170	SCHWARZBECK	#794	2020.11.26	2021.11.26
☐	Power Meter	E4416A	Agilent	GB41050459	2020.11.27	2021.11.27
☐	Avg. Power Sensor	E9304A	Agilent	MY51110045	2020.11.27	2021.11.27
☐	Peak & Avg. Power Sensor	E9327A	Agilent	US40440771	2020.11.27	2021.11.27
☒	True RMS Multimeter	87-V	FLUKE	14990137	2020.11.27	2021.11.27
☒	DC Power Supply	IPS-30B05DD	INTERACT	N/A	2020.06.01	2021.06.01
☒	Signal Generator	83640L	Hewlett-Packard	3722A00285	2020.06.01	2021.06.01
☒	MXE TEST RECEIVER	N9038A	KEYSIGHT	MY52260220	2020.09.08	2021.09.08
☒	TWO LINE V-NETWORK	ENV216	ROHDE& SCHWARZ	101771	2021.01.06	2022.01.06
☒	EMI TEST RECEIVER	ESCI 7	ROHDE& SCHWARZ	100971	2020.06.01	2021.06.01
☒	AMPLIFIER	310N	Sonoma Instrument	187066	2020.06.01	2021.06.01
☒	Bilog Antenna	VULB 9163	SCHWARZBECK	9163-417	2020.01.21	2021.01.21
☒	MXE TEST RECEIVER	N9038A	KEYSIGHT	MY55420166	2020.09.08	2021.09.08
☒	Loop Ant.	FMZB1513	SCHWARZBECK	1513-167	2020.11.30	2022.11.30

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