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Order No.: 11715502
Report No.: 17-11715502-FCC-RF1
Date: May 29, 2017
Model No.: OCB-1000
FCC ID : WSX-OCB-1000

FCC
RF Test Report

in accordance with
FCC Part 15 Subpart C §15.247

for

O'Care Bluetooth Bridge

OSANG Healthcare Co., Ltd
132, Anyangcheondong-ro, Dongan-gu, Anyang-si, Gyeonggi-do 14040, Korea

Summary of Test Results:

The following tests were performed on a sample submitted for evaluation of compliance with FCC Part 15 C Section 15.247.

No	FCC Reference Clause No.	Conformance Requirements	Result	Remark
1	15.247(a)(2)	6 dB Bandwidth Occupied Bandwidth	Complied	-
2	15.247(b)(3)	Maximum peak output power	Complied	-
3	15.247(e)	Power spectral density	Complied	-
4	15.247(d)	Band Edge Conducted spurious emission	Complied	-
5	15.205(a) 15.209(a)	Radiated spurious emissions	Complied	-
6	15.207(a)	AC power line conducted emissions	Complied	-

Conclusion:

The test items listed above have been performed and the results recorded by UL Korea Ltd. in accordance with the procedures stated in each test requirement and specification. The test items were determined to ensure the requirements set out in the FCC CFR 47 Part 15 Subpart C §15.247. As a result, the subject product has been verified to comply or not comply as noted in the Summary of Testing with each test specification. The test results relate only to the items tested.

Witness tested by
Hyunsik Yun, WiSE Laboratory Engineer
Consumer Technology Division
UL Korea Ltd.
May 29, 2017

Reviewed by
Changyoung Choi, WiSE Senior Engineer
Consumer Technology Division
UL Korea Ltd.
May 29, 2017

Test Report Details

Witnessed By:	UL Korea Ltd. 26th FL. GFC Center, 737 Yeoksam-dong, Gangnam-gu, Seoul, 135-984, Korea
Test Site:	ONETECH Corp. 43-14, Jinsaegol-gil, Chowol-eup, Gwangju-si, Gyeonggi-do, 12735, Korea
Applicant:	OSANG Helathcare Co., Ltd 132, Anyangcheondong-ro, Dongan-gu, Anyang-si, Gyeonggi-do 14040, Korea
Manufacturer:	OSANG Helathcare Co., Ltd 132, Anyangcheondong-ro, Dongan-gu, Anyang-si, Gyeonggi-do 14040, Korea
Applicant Contact:	Ryu Myungseok
Title:	Senior Engineer
Phone:	82-31-460-0448
E-mail:	msryu@infopia21.com
Product Type:	O'Care Bluetooth Bridge
Model Number:	OCB-1000
Trademark	OSANG Healthcare
Sample Serial Number:	N/A
Test standards:	FCC Part 15 C Section 15.247 Operation within the bands 902–928 MHz, 2400–2483.5 MHz, and 5725–5850 MHz
Sample Receive Date:	April 24, 2017
Testing Start Date:	April 25, 2017
Testing Complete Date:	May 26, 2017
Overall Results:	Pass

The test reports apply only to the specific test samples and test results submitted for UL's review. All samples tested were in good operating condition throughout the entire test program. It is the manufacturer's responsibility to assure that additional production units of this model are manufactured with identical electrical and mechanical components. UL Korea Ltd. shall have no liability for any deductions, inferences or generalizations drawn by the client or others from UL Korea Ltd. issued reports. This report shall not be used to claim, constitute or imply product certification, approval, or any agency of the National Authorities. This report may contain test results that are not covered by the NVLAP or KOLAS accreditation.

Report Directory

1. General Product Information

1.1. Equipment Description

OCB-1000 is an O'Care Bluetooth Bridge.

1.2. Details of Test Equipment (EUT)

- Equipment Type : O'Care Bluetooth Bridge
- Model No. : OCB-1000
- Type of test Equipment : Portable type
- Operating characteristic : Short range wireless device operating in the 2 400 MHz ~ 2 483.5 MHz ISM frequency band
- Manufacturer : OSANG Helathcare Co., Ltd
  132, Anyangcheondong-ro, Dongan-gu, Anyang-si, Gyeonggi-do 14040, Korea

1.3. Equipment Configuration

The EUT is consisted of the following component provided by the manufacturer.

Use*	Product Type	Manufacturer	Model	Comments
EUT	O'Care Bluetooth Bridge	OSANG Helathcare Co., Ltd	OCB-1000	-
Note: Use = EUT - Equipment Under Test, AE - Auxiliary/Associated Equipment. SIM - Simulator (Not Subjected to Test)				

1.4. Technical Data

Item	Description
Frequency Ranges	2 402 MHz ~ 2 480 MHz
Output power	Max. 1.0 dBm
Kind of modulation (s)	GFSK
Channel	40 channels (Bluetooth Low Energy)
Antenna Gain	Max. 0 dBi
Working temperature	-20 ~ 55 ℃
Supply Voltage	DC 5.0 V

Note;
1. All the technical data described above were provided by the manufacturer.

1.5. Antenna Information

Antenna Type : PCB antenna
Manufacturer : ShenZhen RF-STAR Technology Co.,Ltd.
Transmit Gain dBi : Max. 0 dBi

1.6. Equipment Type :

☐ Radio and ancillary equipment for fixed or semi-fixed use
☐ Radio and ancillary equipment for vehicular mounted use
☒ Radio and ancillary equipment for portable or handheld use

☐ Stand alone ☒ Host connected

☐ Self contained single unit ☒ Module with associated connection or interface

1.7. Technical descriptions and documents

The following documents was provided by the manufacturer.

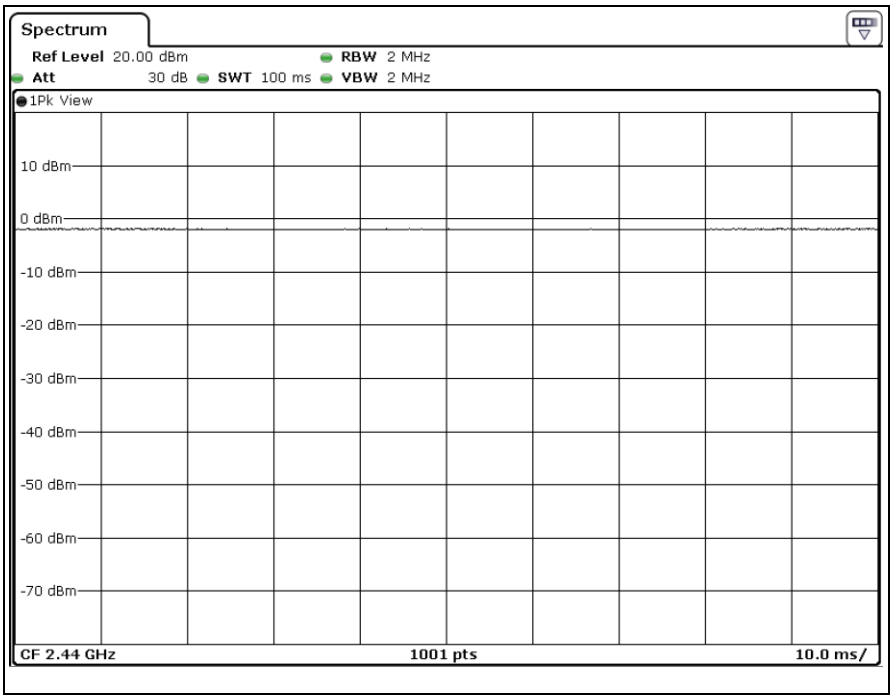
No.	Document Title and Description
1	User Manual

1.8. Equipment Marking Plate

1.9. Duty Cycle

Modulation Type	Data Rate	On Time (ms)	Period (ms)	Duty Cycle X (linear)	Duty Cycle (%)	Duty Cycle Correction Factor(dB)	1/T Minimum VBW(kBW)
GFSK	1 Mbps	-	-	-	100.0	-	-

Note. This EUT can operate continuous transmit mode(100 % duty cycle).



2. Test Specification

The following test specifications and standards have been applied and used for testing.

1) FCC Part 15 C Section 15.247 : Operation within the bands 902–928 MHz, 2400–2483.5 MHz, and 5725–5850 MHz
2) ANSI C63.10:2013 : American National Standard for Testing Unlicensed Wireless Devices and Electronic Equipment in the range of 9 kHz to 40 GHz
3) KDB 558074 v04 : Guidance for Performing Compliance Measurements on Digital Transmission Systems (DTS) Operating Under §15.247

3. Test Conditions

3.1. Equipment Used During Test

Use*	Product Type	Manufacturer	Model	Comments
EUT	O'Care Bluetooth Bridge	OSANG Healthcare Co., Ltd	OCB-1000	-
Note; 1. Use* : EUT=Equipment Under Test, AE=Auxiliary/Associated Equipment, SIM=Simulator (Not Subjected to Test)				

3.2. Input/Output Ports

No	Port Name	Type*	Cable Max. >3m (Y/N)	Cable Shielded (Y/N)	Comments
1	Power Input	DC	N	N	Connected to DC Power supply
2	USB port	I/O	N	Y	Connected to Note PC
Note: *AC = AC Power Port DC = DC Power Port N/E = Non-Electrical I/O = Signal Input or Output Port (Not Involved in Process Control) TP = Telecommunication Ports					

3.3. Power Interface

Mode #	Voltage (V)	Current (A)	Power (W)	Frequency (DC/AC-Hz)	Phases (#)	Comments
Rated	5.0 V	-	-	DC	-	Rating of EUT
1	5.0 V	-	-	DC	-	-
2	120 V	-	-	60 Hz	-	Test notebook PC

3.4. Operating Frequencies

Mode #	Frequency tested
1	Operating frequency range : 2 402 MHz ~ 2 480 MHz (Bluetooth Low Energy) - Low : 2 402 MHz - Mid : 2 440 MHz - High : 2 480 MHz

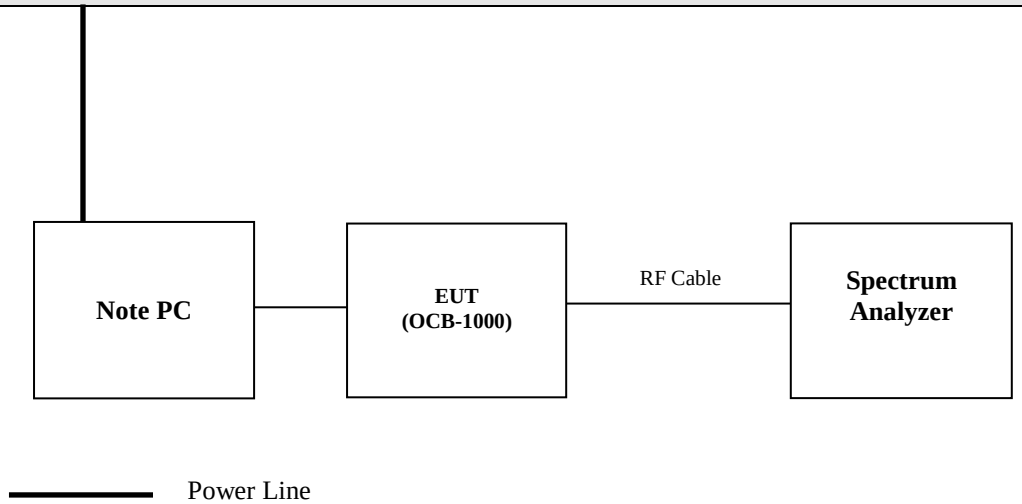
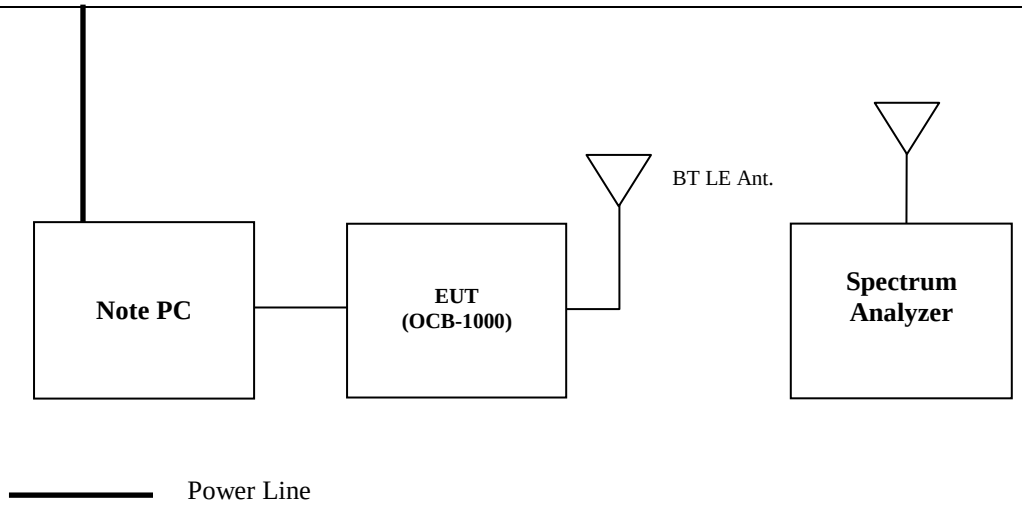
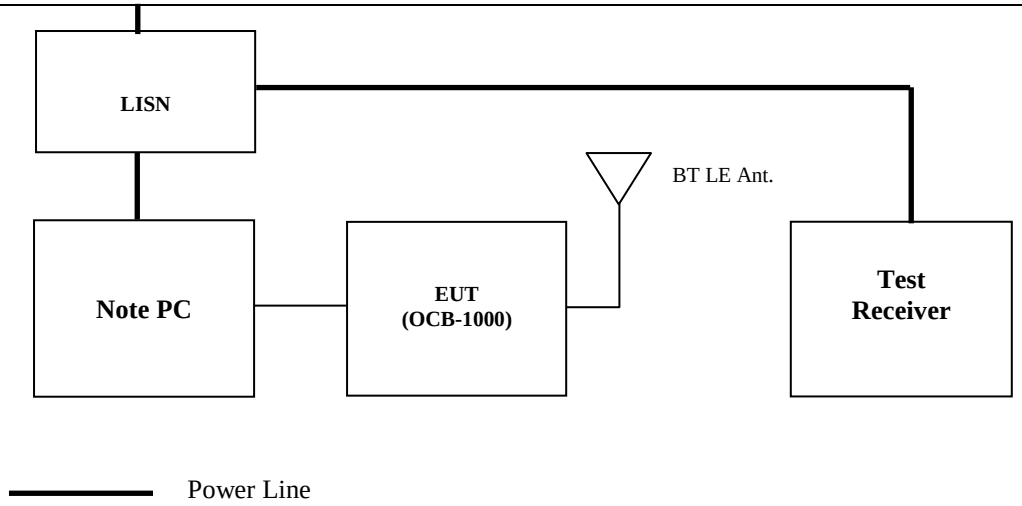
3.5. Operation Modes

Mode #	Description
1	Carrier on mode: Signal from the RF module was generated continuously for the representative channels (Low, Mid, High) by the test program incorporated

3.6. Environment Conditions

Parameters	Environment condition
Temperature	-20℃ to +55℃
Humidity	No more than 80 %
Supply voltage	DC 5.0 V (Rated nominal voltage)
Note ;. - Test has been carried out for three frequencies specified above under the normal condition.	

3.7. Test Configurations

Mode #	Description
1	
2	
3	

3.8. List of Test Equipment

No	Description	Manufacturer	Model	Identifier	Cal. Due
1	FSV30 SIGNAL ANALYZER	Rohde & Schwarz	FSV30	101372	17.11.10
2	EMI Test Receiver	Rohde & Schwarz	ESU	100261	18.04.05
3	AMPLIFIER	Sonoma Instrument	310N	312544	18.04.04
4	Signal Analyzer	Rohde & Schwarz	FSV30	101372	17.11.10
5	PRE-AMPLIFIER	Rohde & Schwarz	SCU-18	102209	17.05.31
6	Antenna Master	HD GmbH	MA240	N/A	-
7	Position Controller	HD GmbH	HD100	N/A	-
8	Turn Table	HD GmbH	DS420S	N/A	-
9	LOOP ANTENNA	Schwarzbeck	FMZB 1513	1513-235	18.06.10
10	TRILOG Broadband Antenna	Schwarzbeck	VULB9163	9163-255	18.05.20
11	Horn Antenna	Schwarzbeck	BBHA9120D	BBHA9120D295	17.08.31
12	Horn Antenna	Schwarzbeck	BBHA9170	BBHA9170178	17.08.31
13	Microwave System Preamplifer	Agilent	83051A	3950M00201	18.04.06
14	EMI Test Receiver	Rohde & Schwarz	ESPI	101278	17.11.01
15	AMN	Schwarzbeck	NSLK8126	8126-404	18.04.03
16	AMN	EMCO	2-25	9109-1867	18.04.07
17	FSV30 SIGNAL ANALYZER	Rohde & Schwarz	FSV30	101372	17.11.10

4. Overview of Technical requirements

The following essential requirements and test specifications are relevant to the presumption of conformity FCC Part 15 C Section 15.247			Reported
FCC Reference Clause No.	Essential technical requirements	Test method	
15.247(a)(2)	6 dB Bandwidth Occupied Bandwidth	KDB 558074	[X]
15.247(b)(3)	Maximum peak output power	KDB 558074	[X]
15.247(e)	Power spectral density	KDB 558074	[X]
15.247(d)	Band Edge Conducted spurious emission	KDB 558074	[X]
15.205(a) 15.209(a)	Radiated spurious emissions	ANSI C63.10 KDB 558074	[X]
15.207(a)	AC power line conducted emissions	ANSI C63.10	[X]

5. Test Results

5.1. 6 dB Bandwidth

TEST: 6 dB Bandwidth			
Method	a) Set RBW = 100 kHz. b) Set the video bandwidth (VBW) ≥ 3 × RBW. c) Detector = Peak. d) Trace mode = max hold. e) Sweep = auto couple. f) Allow the trace to stabilize. g) Measure the maximum width of the emission that is constrained by the frequencies associated with the two outermost amplitude points (upper and lower frequencies) that are attenuated by 6 dB relative to the maximum level measured in the fundamental emission.		
Reference Clause		Part15 C Section 15.247 (a)(2)	
Parameters recorded during the test		Laboratory Ambient Temperature	23.0 ℃
		Relative Humidity	50.1 %
		Frequency range	Measurement Point
Fully configured sample scanned over the following frequency range		2 402 MHz - 2 480 MHz	Enclosure

Configuration Settings

Power Interface Mode # (See Section 3.3)	EUT Operation Mode # (See Section 3.5)	Test Configurations Mode # (See Section 3.7)
1	1	1
Supplementary information: None		

Limits

According to §15.247(a)(2), systems using digital modulation techniques may operate in the 902 ~928 MHz, 2400 ~ 2483.5 MHz, and 5725 ~ 5825 MHz bands. The minimum of 6 dB Bandwidth shall be at least 500 kHz.

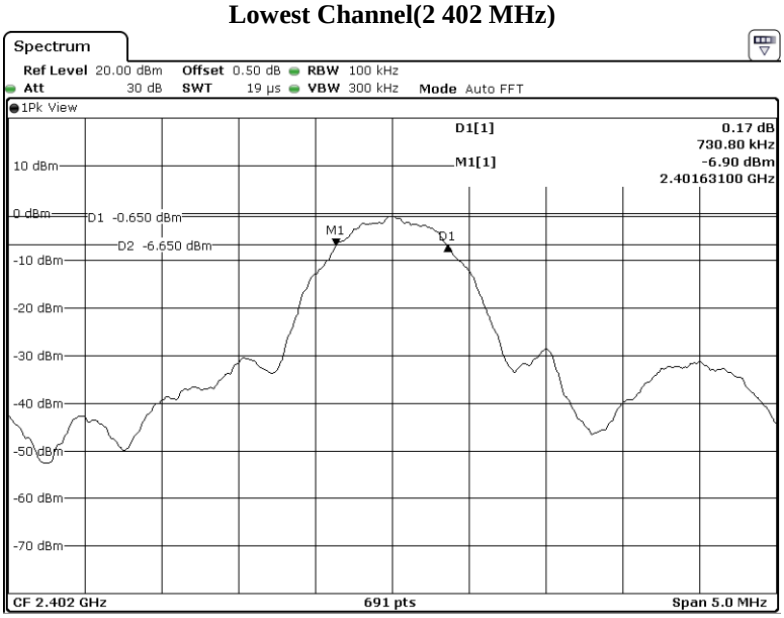
5.1.1.Measurement Results

Table 1. Data Table of 6 dB Bandwidth

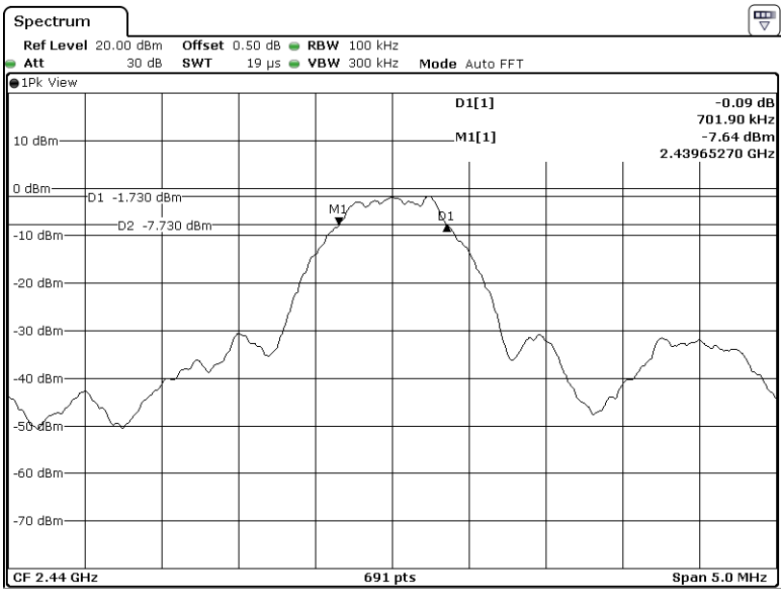
Operating Mode	Data Rate (Mbps)	Channel	Channel Frequency [MHz]	6 dB Bandwidth [MHz]	Limit [MHz]
GFSK	1	Lowest	2 402	0.731	0.5
		Middle	2 440	0.702	
		Highest	2 480	0.745	

Figure 1. Plots of 6 dB Bandwidth

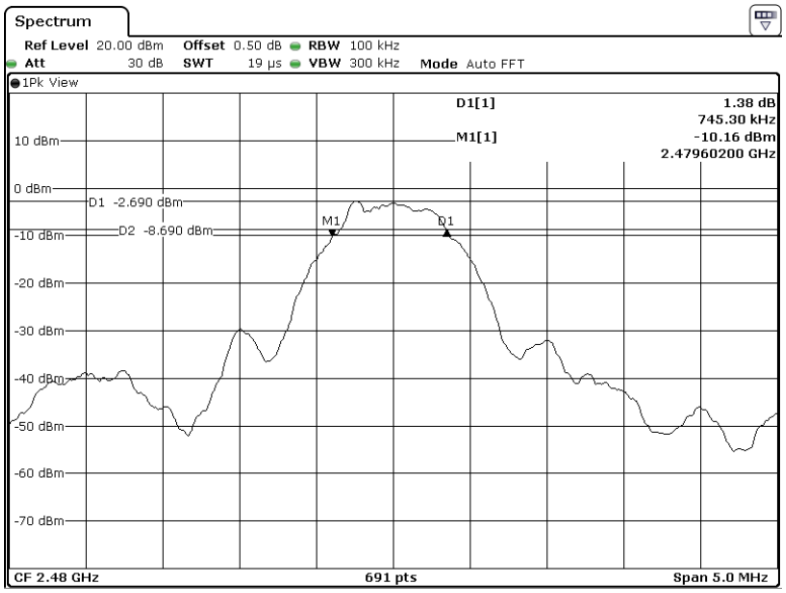
Lowest Channel(2 402 MHz)



Middle Channel(2 440 MHz)



Highest Channel(2 480 MHz)



5.2. Maximum Peak Output Power

TEST: Maximum Peak Output Power		
Method	a) Set the RBW ≥ DTS bandwidth. b) Set VBW ≥ 3 × RBW. c) Set span ≥ 3 × RBW d) Sweep time = auto couple. e) Detector = peak. f) Trace mode = max hold. g) Allow trace to fully stabilize. h) Use peak marker function to determine the peak amplitude level	
Reference Clause	Part15 C Section 15.247 (b)(3)	
Parameters recorded during the test	Laboratory Ambient Temperature	21.1 °C
	Relative Humidity	46.3 %
	Frequency range	Measurement Point
Fully configured sample scanned over the following frequency range	2 402 MHz - 2 480 MHz	Enclosure

Configuration Settings

Power Interface Mode # (See Section 3.3)	EUT Operation Mode # (See Section 3.5)	Test Configurations Mode # (See Section 3.7)
1	1	1
Supplementary information: None		

Limits

According to §15.247(b)(3), for systems using digital modulation in the 902 ~ 928 MHz, 2400 ~2483.5 MHz, and 5725 ~ 5850 MHz band: 1 Watt. As an alternative to a peak power measurement, compliance with the one watt limit can be based on a measurement of the maximum conducted output power. Maximum Conducted output Power is defined as the total transmit power delivered to all antennas and antenna elements averaged across all symbols in the signaling alphabet when the transmitter is operating at its maximum power control level. Power must be summed across all antenna elements. The average must not include any intervals during which the transmitter is off or is transmitting at a reduced power level. If multiple modes of operation are possible (e.g., alternative modulation methods), the maximum conducted output power is the highest total transmit power occurring in any mode.

According to §15.247(b)(4), the conducted output power limit specified in paragraph(b) of this section is based on the use of antenna with directional gains that do not exceed 6 dBi. Except as shown in paragraph(c) of this section, if transmitting antenna of directional gain greater than 6 dBi are used, the conducted output power from the intentional radiator shall be reduced below the stated values in paragraph (b)(1), (b)(2), and (b)(3) of this section, as appropriate, by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

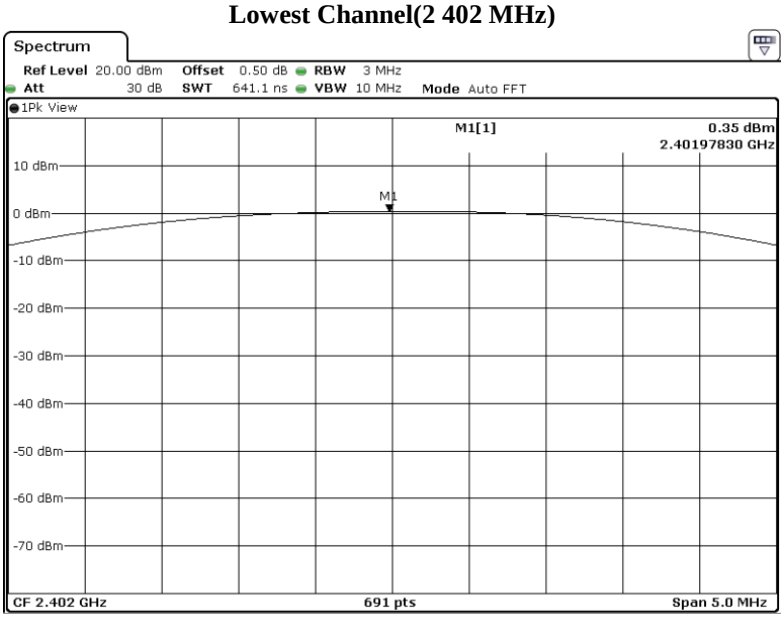
5.2.1. Measurement Results

Table 2. Data Table of Maximum Peak Output Power

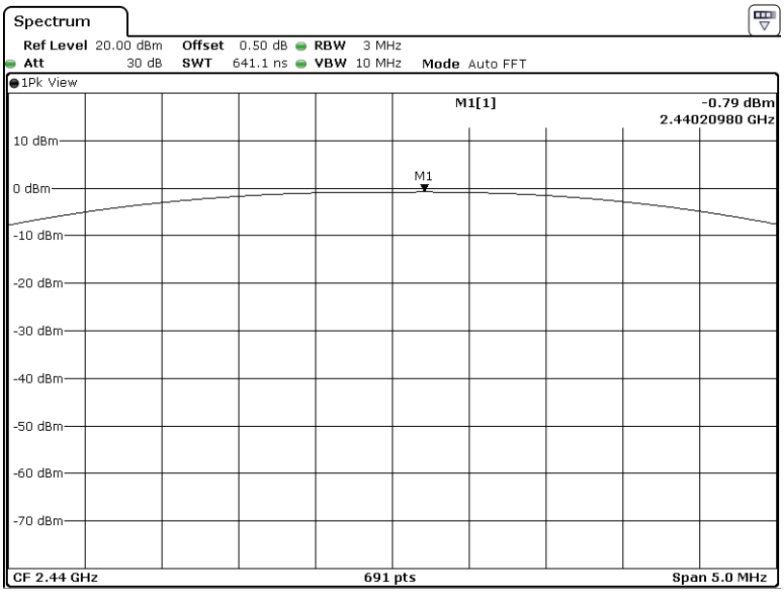
Operating Mode	Data Rate [Mbps]	Channel	Channel Frequency [MHz]	Peak Output Power[dBm]	Limit [dBm]
GFSK	1	Low	2 402	0.35	30
		Middle	2 440	-0.79	
		High	2 480	-2.07	

Figure 2. Plots of Maximum Peak Output Power

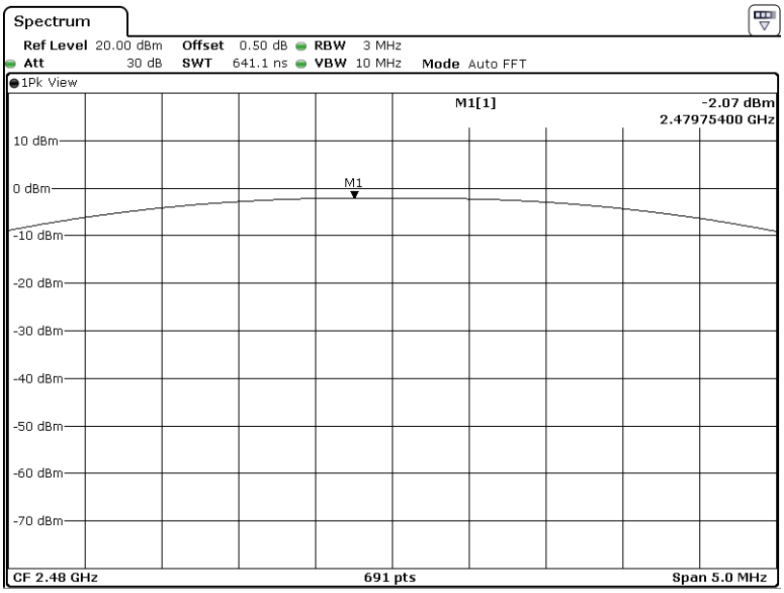
Lowest Channel(2 402 MHz)



Middle Channel(2 440 MHz)



Highest Channel(2 480 MHz)



5.3. Power Spectral Density

TEST: Power Spectral Density		
Method	a) Set analyzer center frequency to DTS channel center frequency. b) Set the span to 1.5 times the *DTS bandwidth*. c) Set the RBW to: 3 kHz ≤ RBW ≤ 100 kHz. d) Set the VBW ≥ 3 × RBW. e) Detector = peak. f) Sweep time = auto couple. g) Trace mode = max hold. h) Allow trace to fully stabilize. i) Use the peak marker function to determine the maximum amplitude level within the RBW. j) If measured value exceeds limit, reduce RBW (no less than 3 kHz) and repeat.	
Reference Clause	Part15 C Section 15.247 (e)	
Parameters recorded during the test	Laboratory Ambient Temperature	23.4 °C
	Relative Humidity	50.1 %
	Frequency range	Measurement Point
Fully configured sample scanned over the following frequency range	2 402 MHz - 2 480 MHz	Enclosure

Configuration Settings

Power Interface Mode # (See Section 3.3)	EUT Operation Mode # (See Section 3.5)	Test Configurations Mode # (See Section 3.7)
1	1	1
Supplementary information: None		

Limits

§15.247(e) For digitally modulated system, the power spectral density conducted from the intentional radiator to the antenna shall not be greater than 8 dB m in any 3 kHz band any time interval of continuous transmission. This power spectral density shall be determined in accordance with the provisions of paragraph (b) of this section. The same method of determining the conducted output power shall be used to determine the power spectral density.

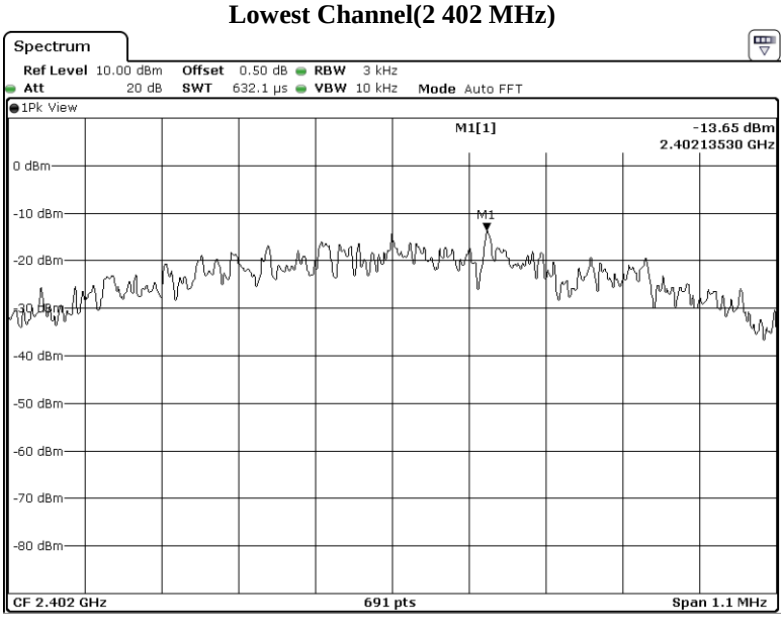
5.3.1. Measurement Result

Table 3. Data Table of Power Spectral Density

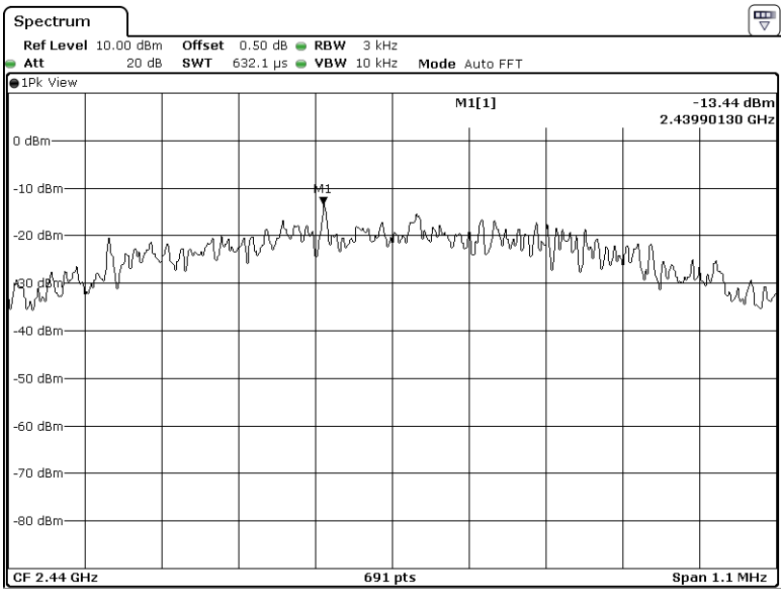
Operating Mode	Data Rate [Mbps]	Channel	Channel Frequency [MHz]	PSD Result [dBm/3 kHz]	Limit [dBm/3kHz]
GFSK	1	Low	2 402	-13.65	8
		Middle	2 440	-13.44	
		High	2 480	-16.36	

Figure 3. Plots of Maximum Peak Power Spectral Density

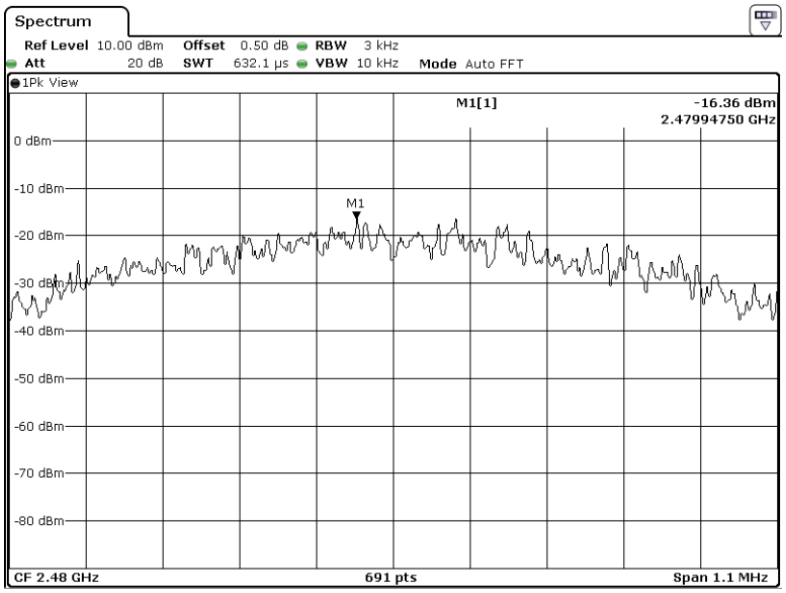
Lowest Channel(2 402 MHz)



Middle Channel(2 440 MHz)



Highest Channel(2 480 MHz)



5.4. Conducted spurious emission Measurement

TEST: Conducted spurious emission measurement		
Method	a) Set the center frequency and span to encompass frequency range to be measured. b) Set the RBW = 100 kHz. c) Set the VBW ≥ 3 x RBW. d) Detector = peak. e) Sweep time = auto couple. f) Trace mode = max hold. g) Allow trace to fully stabilize. h) Use the peak marker function to determine the maximum amplitude level.	
Reference Clause	Part15 C Section 15.247 (d)	
Parameters recorded during the test	Laboratory Ambient Temperature	21.6 °C
	Relative Humidity	52.0 %
	Frequency range	Measurement Point
Fully configured sample scanned over the following frequency range	30 MHz – 26.5 GHz	Enclosure

Configuration Settings

Power Interface Mode # (See Section 3.3)	EUT Operation Mode # (See Section 3.5)	Test Configurations Mode # (See Section 3.7)
1	1	1
Supplementary information: None		

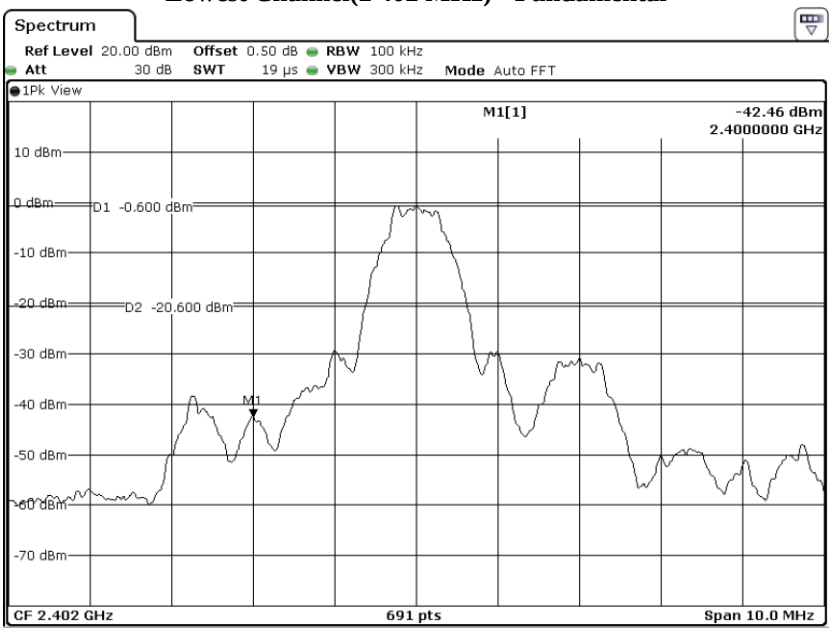
Limits

According to §15.247(d), 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, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits. Attenuation below the general limits specified in section §15.209(a) is not required. In addition, radiated emission which in the restricted band, as define in section §15.205(a), must also comply the radiated emission limits specified in section §15.209(a) (see section §15.205(c))

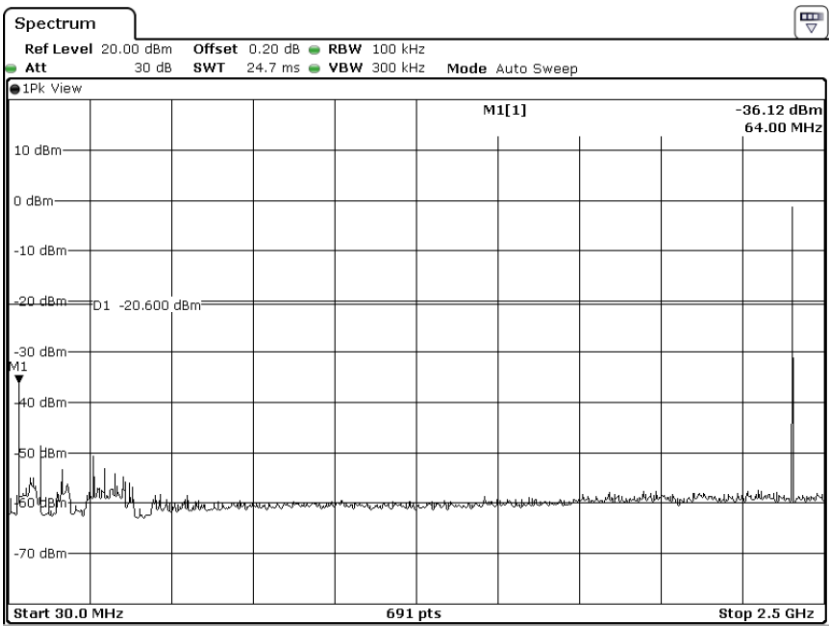
5.4.1. Measurement Results

Figure 4. Plots of Conducted Spurious Emissions

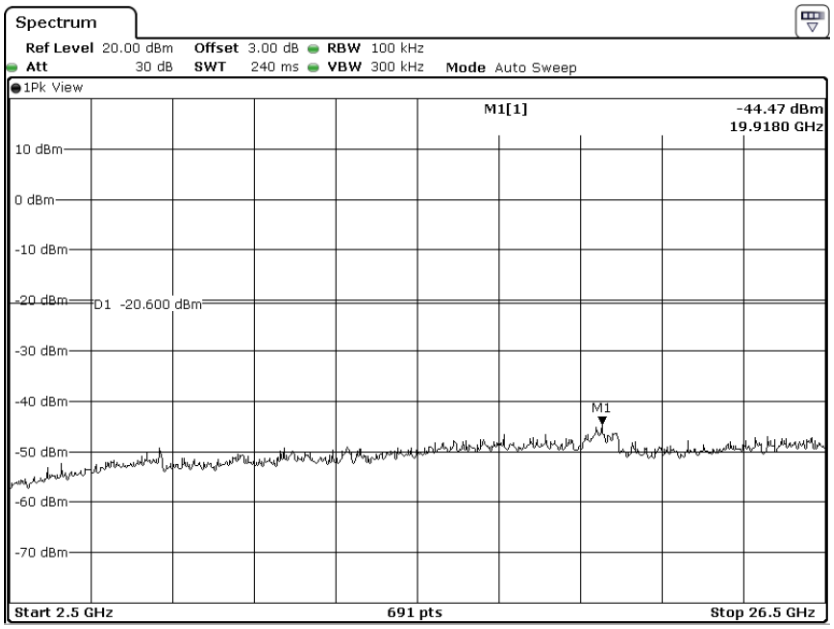
Lowest Channel(2 402 MHz) - Fundamental



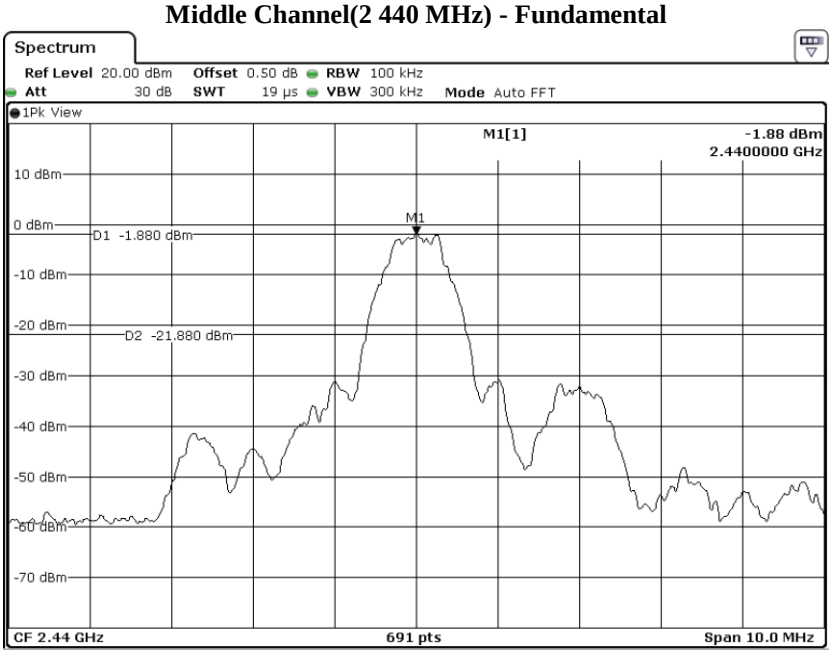
Lowest Channel(2 402 MHz) – 30 MHz ~ 2 500 MHz Spurious



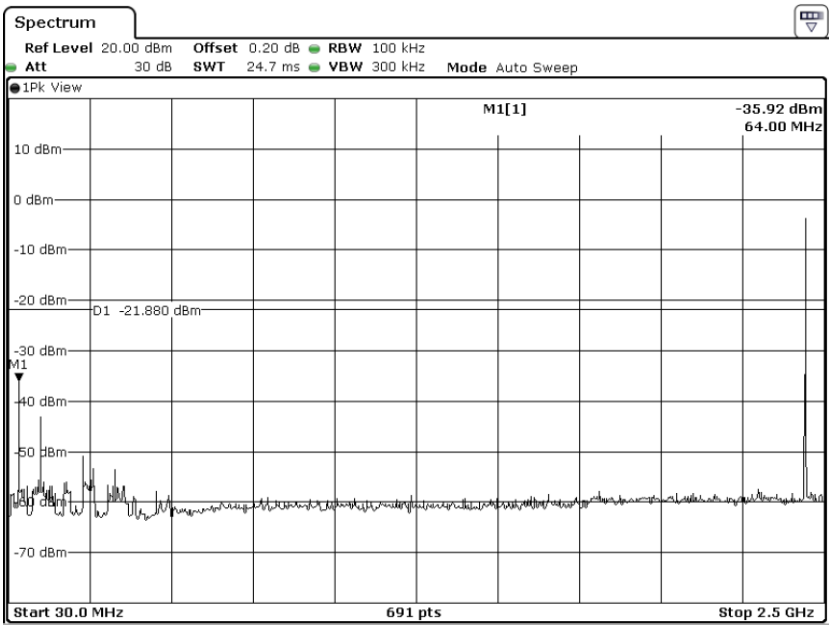
Lowest Channel(2 402 MHz) – 2 500 MHz ~ 26 500 MHz Spurious



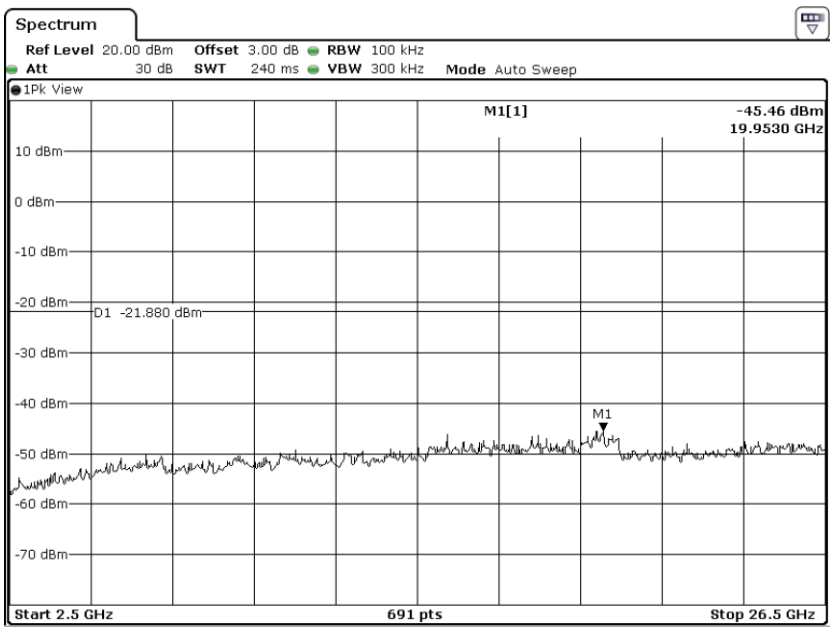
Middle Channel(2 440 MHz) - Fundamental



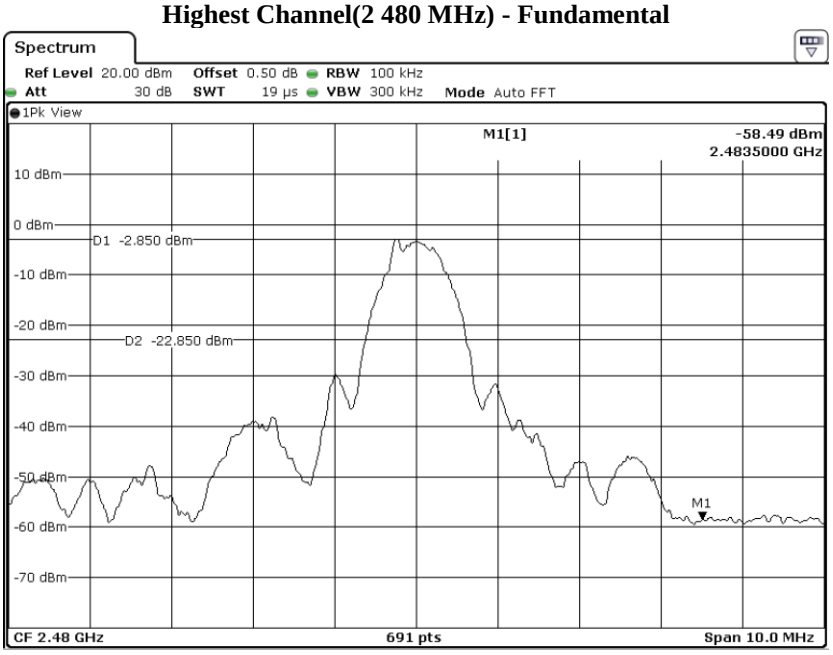
Middle Channel(2 440 MHz) – 30 MHz ~ 2 500 MHz Spurious



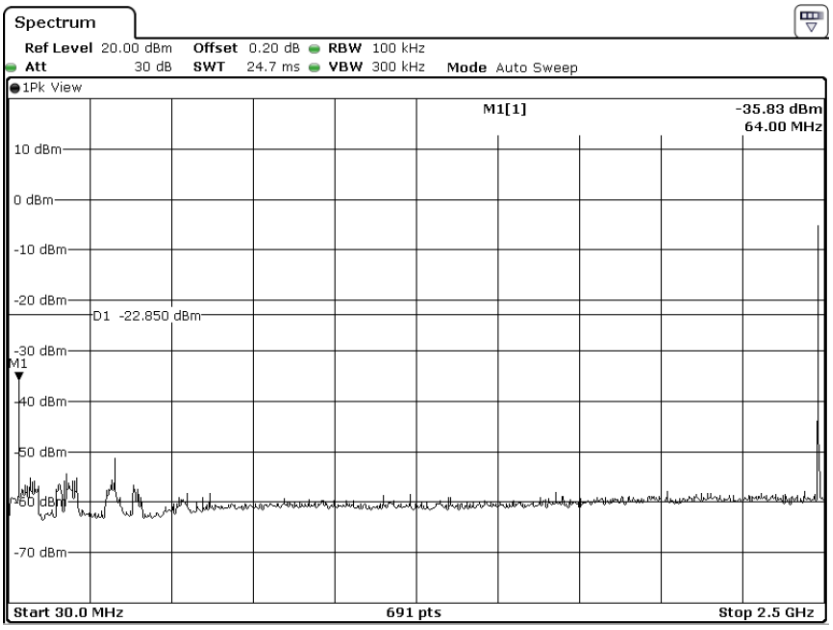
Middle Channel(2 440 MHz) – 2 500 MHz ~ 26 500 MHz Spurious



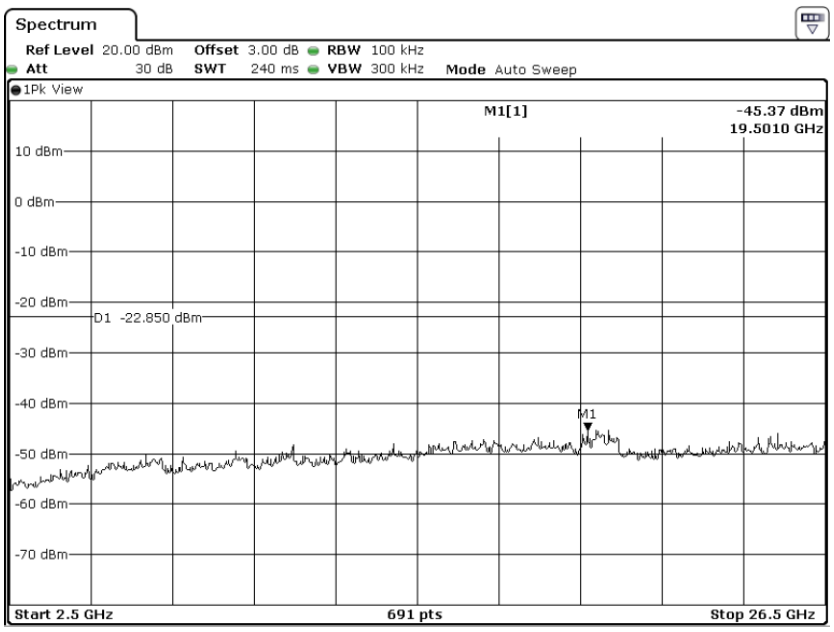
Highest Channel(2 480 MHz) - Fundamental



Highest Channel(2 480 MHz) – 30 MHz ~ 2 500 MHz Spurious



Highest Channel(2 480 MHz) – 2 500 MHz ~ 26 500 MHz Spurious



5.5. Radiated Spurious Emissions Measurement

TEST: Radiated spurious emissions measurement		
Method	Radiated emissions from the EUT were measured according to ANSI C63.10 procedure. 1. The EUT was placed on the top of a rotating table 0.8 meters and 1.5 meters above the ground at a 3 meter anechoic chamber test site. The table was rotated 360 degrees to determine the position of the highest radiation. The antenna is varied from 1 to 4 meters above the ground to find the maximum field strength. Measurement are made with both horizontal and vertical polarizations For fundamental investigation, the EUT was positioned for 3 orthogonal orientations. 2. For measurement below 1GHz, the resolution bandwidth is set to 100 kHz for peak detection or 120kHz for quasi-peak detection measurements. Peak detection is used unless otherwise noted as quasi-peak. 3. For measurements above 1 GHz the resolution bandwidth is set to 1 MHz, then the video bandwidth is set to 3 MHz for peak measurements(for average measurement, duty cycle exceed 98%, duty cycle correction factor do not applied). 4. For 2.4GHz transmitter measurement, the spectrum from 30 MHz to 26GHz is investigated for Low, Mid and High channels.	
Reference Clause	Part15 C Section 15.205 (a), 15.209(a)	
Parameters recorded during the test	Laboratory Ambient Temperature	21.1 °C
	Relative Humidity	46.3 %
	Frequency range	Measurement Point
Fully configured sample scanned over the following frequency range	30 MHz – 26 GHz	Enclosure

Configuration Settings

Power Interface Mode # (See Section 3.3)	EUT Operation Mode # (See Section 3.5)	Test Configurations Mode # (See Section 3.7)
1	1	2
Supplementary information: None		

Limits

According to §15.247(d), 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, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits. In addition, radiated emission which in the restricted band, as define in section §15.205(a), must also comply the radiated emission limits specified in section §15.209(a) (see section §15.205(c))

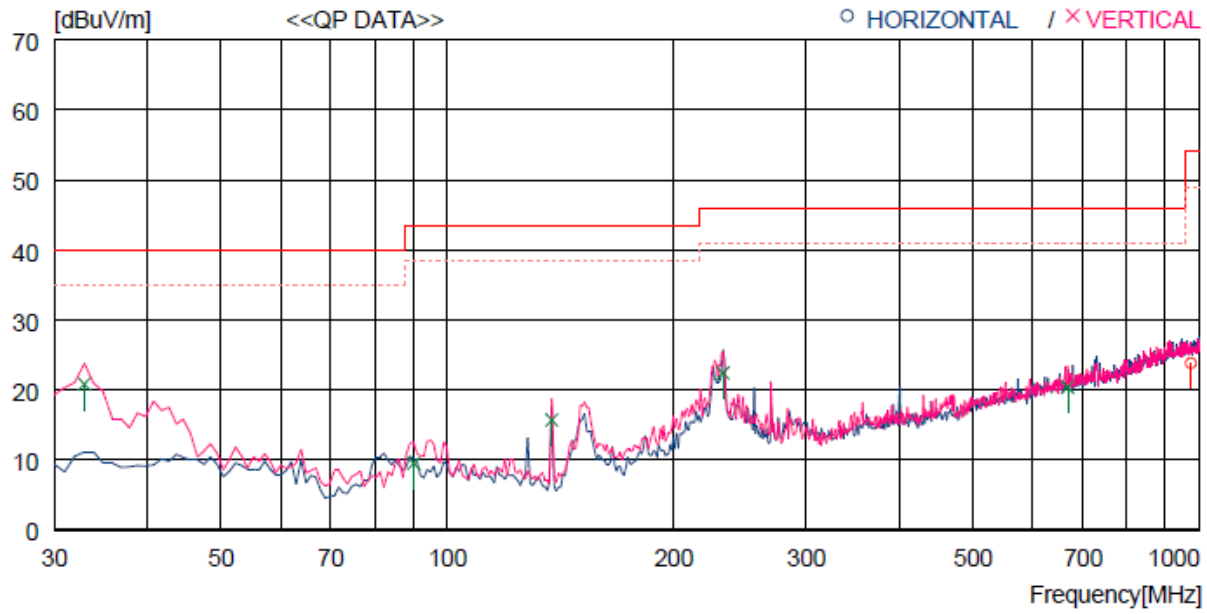
According to § 15.209(a), the emissions from an intentional radiator shall not exceed the field strength levels specified in the following table:

Frequency [MHz]	Distance [meters]	Field Strength [dBuV/m]	Field Strength [uV/m]
30-88	3	40.0	100
88-216	3	43.5	150
216-960	3	46.0	200
Above 960	3	54.0	500

5.5.1. Measurement Results

Measurement method : ☒ Radiated ☐ Conducted
Mode of operation : Continuous Wave
Power setting : Max. Power condition declared by the manufacturer

Table 4. Data Table of Radiated emission Below 1 GHz(Lowest Channel, 2 402 MHz)



No.	FREQ [MHz]	READING QP [dBuV]	ANT FACTOR [dB]	LOSS [dB]	GAIN [dB]	RESULT [dBuV/m]	LIMIT [dBuV/m]	MARGIN [dB]	ANTENNA [cm]	TABLE [DEG]
----- Horizontal ------										
1	975.737	24.4	**22.5**	8.8	31.9	23.8	54.0	30.2	100	178
----- Vertical ------										
2	32.910	39.2	**12.9**	1.7	33.0	20.8	40.0	19.2	100	277
3	90.140	29.4	**10.6**	2.6	33.1	9.5	43.5	34.0	100	186
4	137.670	37.1	**8.6**	3.1	33.1	15.7	43.5	27.8	100	244
5	232.730	39.6	**11.8**	4.0	33.0	22.4	46.0	23.6	200	0
6	668.256	27.2	**19.6**	7.0	33.4	20.4	46.0	25.6	100	359

Supplementary information:
- According to KDB 414788, a used anechoic chamber were equivalent to those on an open fields site based on comparison measurements.
- Factor = Antenna factor + Cable loss + Amp gain
- Result = Reading + Factor
- Margin = Limit (dBuV/m) - Result (dBuV/m)
- Detector = Quasi-Peak

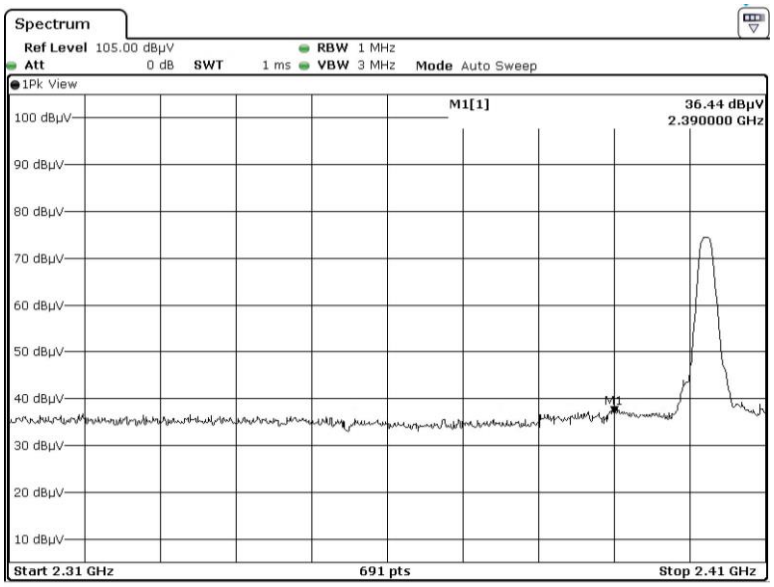
Table 5. Data Table of Radiated emission Above 1 GHz (Lowest Channel, 2 402 MHz)

Frequency [MHz]	Pol.	Detect Mode	Reading [dB(μV)]	Factor* [dB]	Level [dB(μV/m)]	Limit [dB(μV/m)]	Margin [dB]
2 390.00	H	PK	36.44	-3.93	32.51	74.00	41.49
2 390.00	H	AV	27.46	-3.93	23.53	54.00	30.47
2 390.00	V	PK	36.28	-3.93	32.35	74.00	41.65
2 390.00	V	AV	27.36	-3.93	23.43	54.00	30.57
4 804.00	H	PK	42.15	2.46	44.61	74.00	29.39
4 804.00	H	AV	34.15	2.46	36.61	54.00	17.39
4 804.00	V	PK	41.84	2.46	44.30	74.00	29.70
4 804.00	V	AV	33.84	2.46	36.30	54.00	17.70

Supplementary information:
- No other spurious and harmonic emissions were found greater than listed emissions on above table.
- * Factor(PK) = AF + CL + AG (AF : Antenna factor, CL : Cable loss, AG: Pre-Amp gain)
- * Factor(AV) = AF + CL + AG (AF : Antenna factor, CL : Cable loss, AG: Pre-Amp gain)
- Level = Reading + Factor (Factor = AF + CL + AG)
- Margin = Limit (dBuV/m) - Level (dBuV/m)

Figure 5. Plots of Radiated Spurious Emissions (Worst case)

Lowest Channel(2 402 MHz) – Restricted band edge(2 310 MHz ~ 2 390 MHz)



Lowest Channel(2 402 MHz) – Spurious(4 500 MHz ~ 5 150 MHz)

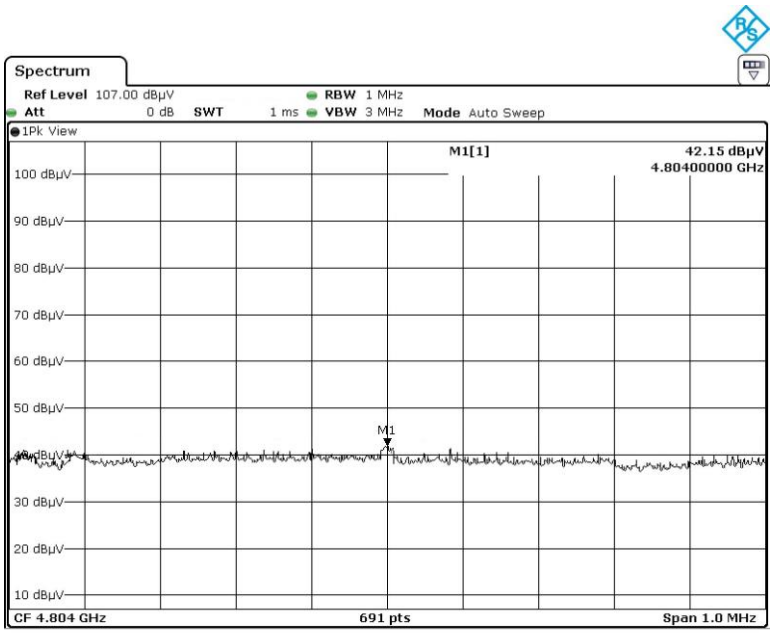
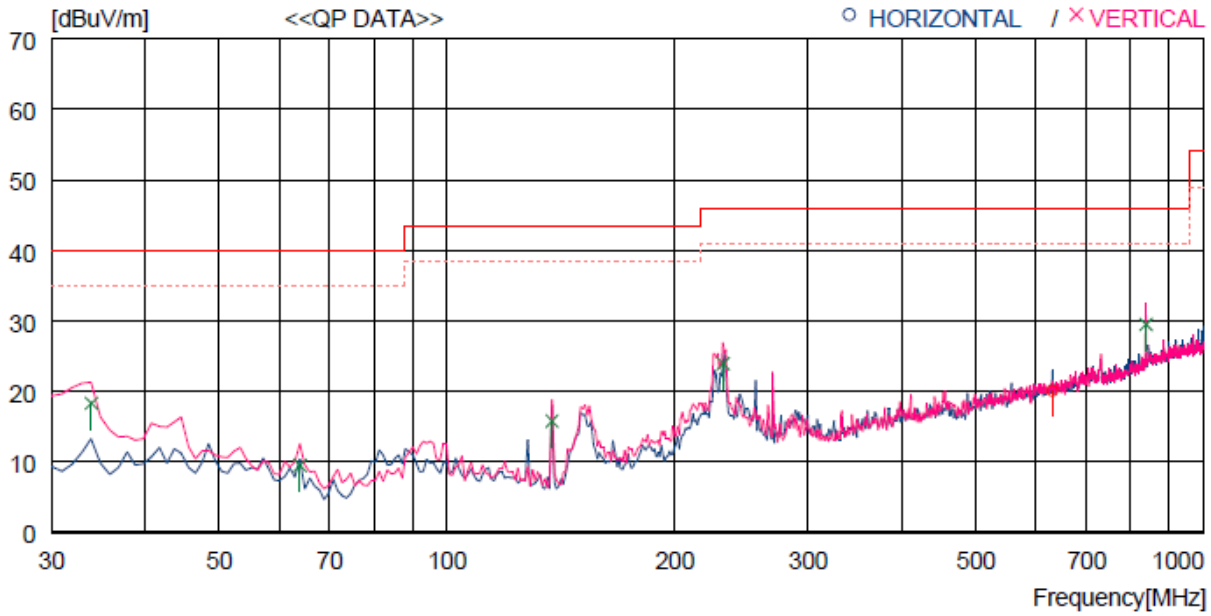


Table 6. Data Table of Radiated emission Below 1 GHz(Middle Channel, 2 440 MHz)



No.	FREQ	READING QP	ANT FACTOR	LOSS	GAIN	RESULT	LIMIT	MARGIN	ANTENNA	TABLE
	[MHz]	[dBuV]	[dB]	[dB]	[dB]	[dBuV/m]	[dBuV/m]	[dB]	[cm]	[DEG]
----- Horizontal ------										
1	631.397	27.4	**19.4**	6.8	33.5	20.1	46.0	25.9	100	0
----- Vertical ------										
2	33.880	36.5	**13.1**	1.7	33.0	18.3	40.0	21.7	100	59
3	63.950	28.6	**11.7**	2.2	33.0	9.5	40.0	30.5	100	223
4	137.670	37.2	**8.6**	3.1	33.1	15.8	43.5	27.7	100	232
5	231.760	41.1	**11.8**	4.0	33.0	23.9	46.0	22.1	200	0
6	838.971	33.1	**21.3**	8.2	33.1	29.5	46.0	16.5	200	293

Supplementary information:

- According to KDB 414788, a used anechoic chamber were equivalent to those on an open fields site based on comparison measurements.
- Factor = Antenna factor + Cable loss + Amp gain
- Result = Reading + Factor
- Margin = Limit (dBuV/m) - Result (dBuV/m)
- Detector = Quasi-Peak

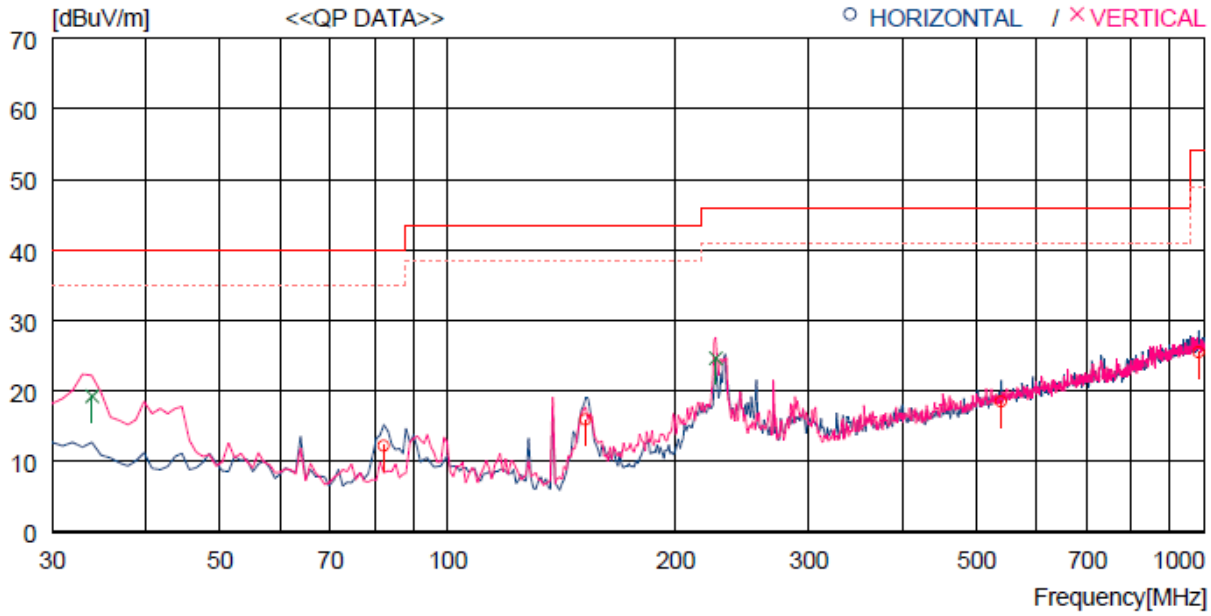
Table 7. Data Table of Radiated emission Above 1 GHz (Middle Channel, 2 440 MHz)

Frequency [MHz]	Pol.	Detect Mode	Reading [dB(μV)]	Factor* [dB]	Level [dB(μV/m)]	Limit [dB(μV/m)]	Margin [dB]
4 880.00	H	PK	42.61	1.79	44.40	74.00	29.60
4 880.00	H	AV	34.55	1.79	36.34	54.00	17.66
4 880.00	V	PK	41.84	1.79	43.63	74.00	30.37
4 880.00	V	AV	34.26	1.79	36.05	54.00	17.95

Supplementary information:

- No other spurious and harmonic emissions were found greater than listed emissions on above table.
- The worst case is y-axis and reported.
- * Factor(PK) = AF + CL + AG (AF : Antenna factor, CL : Cable loss, AG: Pre-Amp gain)
- * Factor(AV) = AF + CL + AG (AF : Antenna factor, CL : Cable loss, AG: Pre-Amp gain)
- Level = Reading + Factor (Factor = AF + CL + AG)
- Margin = Limit (dBuV/m) - Level (dBuV/m)

Table 8. Data Table of Radiated emission Below 1 GHz(High Channel, 2 480 MHz)



No.	FREQ [MHz]	READING QP [dBuV]	ANT FACTOR [dB]	LOSS [dB]	GAIN [dB]	RESULT [dBuV/m]	LIMIT [dBuV/m]	MARGIN [dB]	ANTENNA [cm]	TABLE [DEG]
----- Horizontal ------										
1	82.380	34.5	**8.3**	2.5	33.1	12.2	40.0	27.8	200	171
2	152.220	37.1	**8.6**	3.3	33.1	15.9	43.5	27.6	200	109
3	539.250	27.1	**17.9**	6.8	33.3	18.5	46.0	27.5	400	0
4	983.496	26.1	**22.5**	8.8	31.9	25.5	54.0	28.5	100	359
----- Vertical ------										
5	33.880	37.4	**13.1**	1.7	33.0	19.2	40.0	20.8	100	0
6	225.940	42.0	**11.6**	4.0	33.0	24.6	46.0	21.4	200	191

Supplementary information:

- According to KDB 414788, a used anechoic chamber were equivalent to those on an open fields site based on comparison measurements.
- Factor = Antenna factor + Cable loss + Amp gain
- Result = Reading + Factor
- Margin = Limit (dBuV/m) - Result (dBuV/m)
- Detector = Quasi-Peak

Table 9. Data Table of Radiated emission Above 1 GHz (Highest Channel, 2 480 MHz)

Frequency [MHz]	Pol.	Detect Mode	Reading [dB(μV)]	Factor* [dB]	Level [dB(μV/m)]	Limit [dB(μV/m)]	Margin [dB]
2 483.50	H	PK	45.97	-3.10	42.87	74.00	31.13
2 483.50	H	AV	40.34	-3.10	37.24	54.00	16.76
2 483.50	V	PK	36.15	-3.10	33.05	74.00	40.95
2 483.50	V	AV	28.11	-3.10	25.01	54.00	28.99
4 960.00	H	PK	42.69	3.35	46.04	74.00	27.96
4 960.00	H	AV	33.99	3.35	37.34	54.00	16.66
4 960.00	V	PK	42.18	3.35	45.53	74.00	28.47
4 960.00	V	AV	34.20	3.35	37.55	54.00	16.45

Supplementary information:
- No other spurious and harmonic emissions were found greater than listed emissions on above table.
- * Factor(PK) = AF + CL + AG (AF : Antenna factor, CL : Cable loss, AG: Pre-Amp gain)
- * Factor(AV) = AF + CL + AG (AF : Antenna factor, CL : Cable loss, AG: Pre-Amp gain)
- Level = Reading + Factor (Factor = AF + CL + AG)
- Margin = Limit (dBuV/m) - Level (dBuV/m)

5.6. AC power line conducted emissions

TEST: AC Power line conducted emissions			
Method	Measurements were made on a ground plane that extends 1-meter minimum beyond all sides of the system under test. All power was connected to the system through Artificial Mains Network (AMN). Conducted voltage measurements on mains lines were made at the output of the AMN.		
Reference Clause		Part15 C Section 15.207 (a)	
Parameters recorded during the test		Laboratory Ambient Temperature	22.0 °C
		Relative Humidity	48.1 %
		Frequency range	Measurement Point
Fully configured sample scanned over the following frequency range		0.15 MHz to 30 MHz	AC Input of Note PC

Configuration Settings

Power Interface Mode # (See Section 3.3)	EUT Operation Mode # (See Section 3.5)	Test Configurations Mode # (See Section 3.7)
2	1	3
Supplementary information: None		

Limits

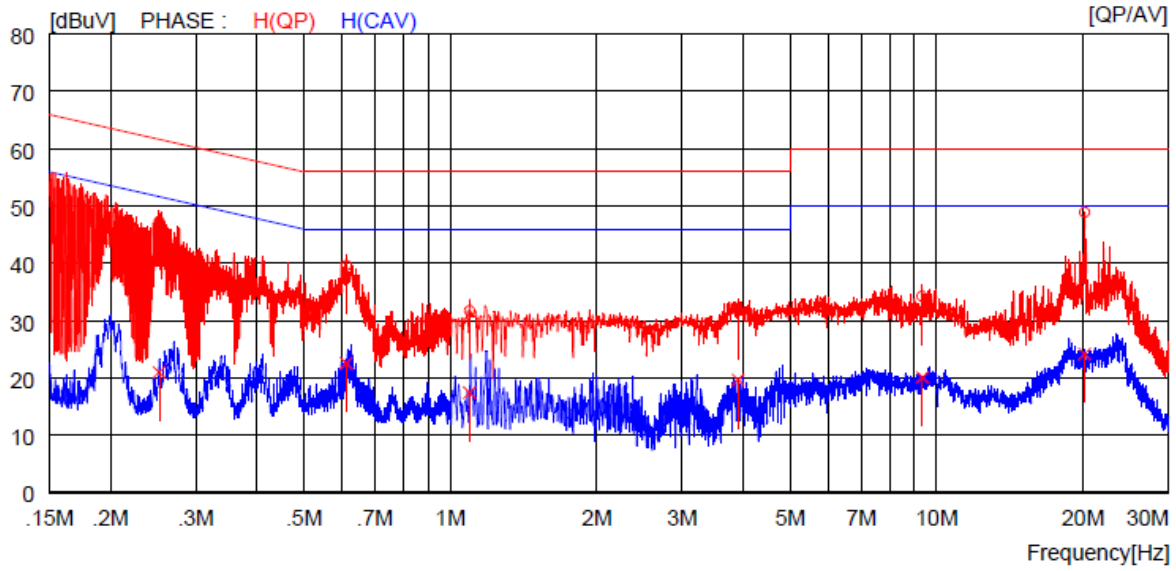
For an intentional radiator that is designed to be connected to the public utility (AC) power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies, within the band 150 kHz to 30 MHz, shall not exceed the limits in the following table, as measured using a 50 μH/50 ohms line impedance stabilization network (LISN). Compliance with the provisions of this paragraph shall be based on the measurement of the radio frequency voltage between each power line and ground at the power terminal. The lower limit applies at the boundary between the frequency ranges.

Frequency[MHz]	Limit[dBuV]	
	Quasi-Peak	Average(2)
0.15 to 0.50	66 to 56(1)	56 to 46(1)
0.50 to 5	56	46
5 to 30	60	50

Note;
1. The level decreases linearly with the logarithm of the frequency.
2. A linear average detector is required.

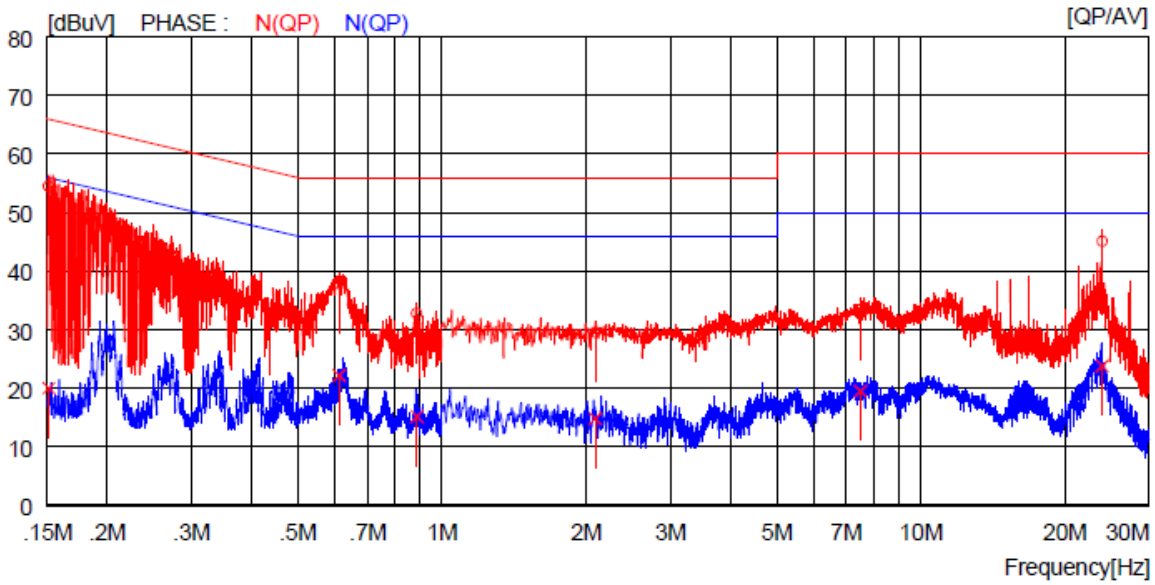
Table 10. Graphical representation & Test Data

[HOT LINE]



NO	FREQ [MHz]	READING QP [dBuV]	READING AV [dBuV]	C.FACTOR [dB]	RESULT QP [dBuV]	RESULT AV [dBuV]	LIMIT QP [dBuV]	LIMIT AV [dBuV]	MARGIN QP [dBuV]	MARGIN AV [dBuV]	PHASE
1	0.25200	47.2	----	0.1	47.3	----	61.7	----	14.4	----	H(QP)
2	0.61200	39.5	----	0.1	39.6	----	56.0	----	16.4	----	H(QP)
3	1.09600	31.6	----	0.1	31.7	----	56.0	----	24.3	----	H(QP)
4	3.90800	31.5	----	0.2	31.7	----	56.0	----	24.3	----	H(QP)
5	9.34500	33.9	----	0.4	34.3	----	60.0	----	25.7	----	H(QP)
6	20.16000	48.2	----	0.7	48.9	----	60.0	----	11.1	----	H(QP)
7	0.25200	----	20.9	0.1	----	21.0	----	51.7	----	30.7	H(CAV)
8	0.61200	----	22.5	0.1	----	22.6	----	46.0	----	23.4	H(CAV)
9	1.09600	----	17.3	0.1	----	17.4	----	46.0	----	28.6	H(CAV)
10	3.90800	----	19.5	0.2	----	19.7	----	46.0	----	26.3	H(CAV)
11	9.34500	----	19.7	0.4	----	20.1	----	50.0	----	29.9	H(CAV)
12	20.16000	----	23.5	0.7	----	24.2	----	50.0	----	25.8	H(CAV)

[NEUTRAL LINE]



NO	FREQ	READING QP [dBuV]	READING AV [dBuV]	C.FACTOR [dB]	RESULT QP [dBuV]	RESULT AV [dBuV]	LIMIT QP [dBuV]	LIMIT AV [dBuV]	MARGIN QP [dBuV]	MARGIN AV [dBuV]	PHASE
1	0.15100	54.4	----	0.1	54.5	----	65.9	----	11.4	----	N(QP)
2	0.61100	37.7	----	0.1	37.8	----	56.0	----	18.2	----	N(QP)
3	0.88700	32.6	----	0.1	32.7	----	56.0	----	23.3	----	N(QP)
4	2.09200	29.4	----	0.1	29.5	----	56.0	----	26.5	----	N(QP)
5	7.49500	33.1	----	0.3	33.4	----	60.0	----	26.6	----	N(QP)
6	24.00000	44.4	----	0.7	45.1	----	60.0	----	14.9	----	N(QP)
7	0.15100	----	19.9	0.1	----	20.0	----	55.9	----	35.9	N(CAV)
8	0.61100	----	22.1	0.1	----	22.2	----	46.0	----	23.8	N(CAV)
9	0.88700	----	15.1	0.1	----	15.2	----	46.0	----	30.8	N(CAV)
10	2.09200	----	14.7	0.1	----	14.8	----	46.0	----	31.2	N(CAV)
11	7.49500	----	19.2	0.3	----	19.5	----	50.0	----	30.5	N(CAV)
12	24.00000	----	23.1	0.7	----	23.8	----	50.0	----	26.2	N(CAV)

5.7. Antenna Requirement

5.7.1. Standard Applicable

For intentional device, according to FCC 47 CFR Section §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. And according to FCC 47 CFR Section § 15.247 (b), if transmitting antennas of directional gain greater than 6 dBi are used, the power shall be reduced by the amount in Db that the gain of the antenna exceeds 6 dBi.

5.7.2. Antenna Connected Construction

The antenna used of this product is PCB Pattern Antenna Assembly and peak max gain of each antennas as below . :

Band	2 402 MHz ~ 2 480 MHz
Antenna Gain	0.0 dBi

APPENDIX A. ACCREDITATIONS AND AUTHORIZATIONS

ONETECH has been accredited / filed / authorized by the agencies listed in the following table;

Certificate	Nation	Agency	Code	Mark
Site Filing	USA	FCC	KR0013	Test Facility list & NSA Data
Site Filing	CANADA	IC	3736A	Test Facility list & NSA Data
Certification	Korea	KC	KR0013	Test Facility list & NSA Data

Quality control in the testing laboratory is implemented as per ISO/IEC 17025 which is the "General requirements for the competent of calibration and testing laboratory".

APPENDIX B. MEASUREMENT UNCERTAINTY

Test Items	Expanded Uncertainty	
Radiated Emissions	30 MHz ~ 300 MHz	± 4.43 dB
	300 MHz ~ 1 000 MHz	± 3.80 dB
	1 000 MHz ~ 6 000 MHz	± 4.20 dB
	6 GHz ~ 40 GHz	± 4.20 dB
Conducted Emissions	0.009 MHz to 30 MHz	± 2.93 dB