

FCC Test Report

Product Name : Handheld Terminal

Brand Name : KEYENCE

Model No. : DX-W600

FCC ID : RF41539G

Applicant : Keyence Corporation

Address : 1-3-14 Higashinakajima, Higashiyodagawa-ku Osaka
533-8555 Japan

Date of Receipt : May 23, 2022

Issued Date : Jul. 21, 2022

Report No. : 2250673R-RFUSBLEV01-A

Report Version : V1.0



The test results relate only to the samples tested.

The test results shown in the test report are traceable to the national/international standard through the calibration of the equipment and evaluated measurement uncertainty herein.

This report must not be used to claim product endorsement by TAF or any agency of the government.

Measurement uncertainties evaluated for each testing system and associated connections are given here to provide the system information for reference. Compliance determinations do not take into account measurement uncertainties for each testing system, but are based on the results of the compliance measurement.

The test report shall not be reproduced except in full without the written approval of DEKRA Testing and Certification Co., Ltd.



Product Name : Handheld Terminal
Applicant : Keyence Corporation
Address : 1-3-14 Higashinakajima, Higashiyodagawa-ku Osaka 533-8555
Japan
Manufacturer : KEYENCE CORPORATION
Address : 1-3-14 Higashinakajima, Higashiyodagawa-ku Osaka 533-8555
Japan
Brand Name : KEYENCE
Model No. : DX-W600
FCC ID : RF41539G
EUT Voltage : DC 5V (host equipment)
DC 3.8V (li-ion battery)
Testing Voltage : AC 120V/60Hz
Applicable Standard : FCC CFR Title 47 Part 15 Subpart C Section 15.247
ANSI C63.10: 2013
Laboratory Name : DEKRA Testing and Certification Co., Ltd.
Hsin Chu Laboratory
Address : No.372-2, Sec. 4, Zhongxing Rd., Zhudong Township, Hsinchu
County 310, Taiwan, R.O.C.
Test Result : Complied

Documented By :



(Amelia Wu / Project Specialist)

Approved By :



(Rueyyan Lin / Supervisor)

The test results relate only to the samples tested.

The test report shall not be reproduced except in full without the written approval of DEKRA Testing and Certification Co., Ltd.

Revision History

Version	Description	Issued Date
V1.0	Initial issue of report	Jul. 21, 2022

TABLE OF CONTENTS

Description	Page
1. General Information	6
1.1 EUT Description	6
1.2 Test Mode	7
1.3 Comments and Remarks	7
1.4 Tested System Details	8
1.5 Configuration of tested System	8
1.6 EUT Operation of during Test	8
1.7 Test Facility	9
1.8 List of Test Equipment	10
1.9 Measurement Uncertainty	11
1.10 Duty Cycle	12
2. AC Power Line Conducted Emission	13
2.1 Test Setup	13
2.2 Test Limit	13
2.3 Test Procedure	13
2.4 Test Specification	13
2.5 Test Result of AC Power Line Conducted Emission	14
3. Maximum Conducted Output Power	16
3.1 Test Setup	16
3.2 Test Limit	16
3.3 Test procedures	16
3.4 Test Specification	16
3.5 Test Result of Maximum Conducted Output Power	17
4. Radiated Emission	18
4.1 Test Setup	18
4.2 Test Limit	19
4.3 Test Procedure	20
4.4 Test Specification	20
4.5 Test Result of Radiated Emissions (30 MHz ~ 1 GHz)	21
4.6 Test Result of Radiated Emissions (1 GHz ~ 10 th Harmonic)	22
5. Antenna Port Conducted Emission	24
5.1 Test Setup	24
5.2 Test Limit	24
5.3 Test Procedure	24
5.4 Test Specification	24
5.5 Test Result of Antenna Port Conducted Emission	25
6. Radiated Emission Band Edge	27
6.1 Test Setup	27
6.2 Test Limit	27
6.3 Test Procedure	28
6.4 Test Specification	28
6.5 Test Result of Radiated Emission Band Edge	29

7.	Occupied Bandwidth & DTS Bandwidth.....	32
7.1	Test Setup.....	32
7.2	Test Limit	32
7.3	Test Procedures.....	32
7.4	Test Specification	32
7.5	Test Result of Occupied Bandwidth.....	33
7.6	Test Result of DTS Bandwidth.....	34
8.	Maximum Power Spectral Density	35
8.1	Test Setup.....	35
8.2	Test Limit	35
8.3	Test Procedures.....	35
8.4	Test Specification	35
8.5	Test Result of Maximum Power Spectral Density	36
Appendix A		37
☐	Test Setup Photograph	37

1. General Information

1.1 EUT Description

Product Name	Handheld Terminal
Brand Name	KEYENCE
Model No.	DX-W600
Frequency Range	1 Mbps: 2402 ~ 2480 MHz
Channel Number	1 Mbps: 40 Channels
Type of Modulation	GFSK

Accessories Information				
No.	Equipment Name	Brand Name	Model No.	Rating
1	Li-ion Battery	KEYENCE	DX-BQ6	3.8Vdc (23.02Wh), 6060mAh

Antenna Information				
Ant.	Brand Name	Model No.	Type	Gain (dBi)
1	ARISTOTLE ENTERPRISES INC.	RFA-25-F77-40-42	PIFA	-8.37

GFSK (1 Mbps)

Working Frequency of Each Channel							
Channel	Frequency	Channel	Frequency	Channel	Frequency	Channel	Frequency
00	2402 MHz	10	2422 MHz	20	2442 MHz	30	2462 MHz
01	2404 MHz	11	2424 MHz	21	2444 MHz	31	2464 MHz
02	2406 MHz	12	2426 MHz	22	2446 MHz	32	2466 MHz
03	2408 MHz	13	2428 MHz	23	2448 MHz	33	2468 MHz
04	2410 MHz	14	2430 MHz	24	2450 MHz	34	2470 MHz
05	2412 MHz	15	2432 MHz	25	2452 MHz	35	2472 MHz
06	2414 MHz	16	2434 MHz	26	2454 MHz	36	2474 MHz
07	2416MHz	17	2436 MHz	27	2456 MHz	37	2476 MHz
08	2418 MHz	18	2438 MHz	28	2458 MHz	38	2478 MHz
09	2420 MHz	19	2440 MHz	29	2460 MHz	39	2480 MHz

Note:

1. Regards to the frequency band operation; the lowest , middle and highest frequency of channel were selected to perform the test, and then shown on this report.
2. The above EUT information is declared by the manufacturer.

1.2 Test Mode

DEKRA has verified the construction and function in typical operation. All the test modes were carried out with the EUT in transmitting operation, which was shown in this test report and defined as follows:

Test Mode	Mode 1: Transmit
-----------	------------------

Test Items	Test Mode	Modulation	Channel	Result
AC Power Line Conducted Emission	Mode 1	GFSK (1 Mbps)	39	Pass
Maximum Conducted Output Power	Mode 1	GFSK (1 Mbps)	00/19/39	Pass
Radiated Emission Below 1 GHz	Mode 1	GFSK (1 Mbps)	39	Pass
Radiated Emission Above 1 GHz	Mode 1	GFSK (1 Mbps)	00/19/39	Pass
Antenna Port Conducted Emission	Mode 1	GFSK (1 Mbps)	00/19/39	Pass
Radiated Emission Band Edge	Mode 1	GFSK (1 Mbps)	00/19/39	Pass
Occupied Bandwidth & DTS Bandwidth	Mode 1	GFSK (1 Mbps)	00/19/39	Pass
Maximum Power Spectral Density	Mode 1	GFSK (1 Mbps)	00/19/39	Pass

Note:

1. Determining compliance shall be based on the results of the compliance measurement, not taking into account measurement instrumentation uncertainty.
2. For below 1 GHz radiated emission and AC Power Line Conducted Emission have performed all modes of operation were investigated and the worst-case emissions are reported.
3. The EUT was performed at X axis, Y axis and Z axis position for radiated emission and band edge tests. The worst case was found at Z axis, so the measurement will follow this same test configuration.

1.3 Comments and Remarks

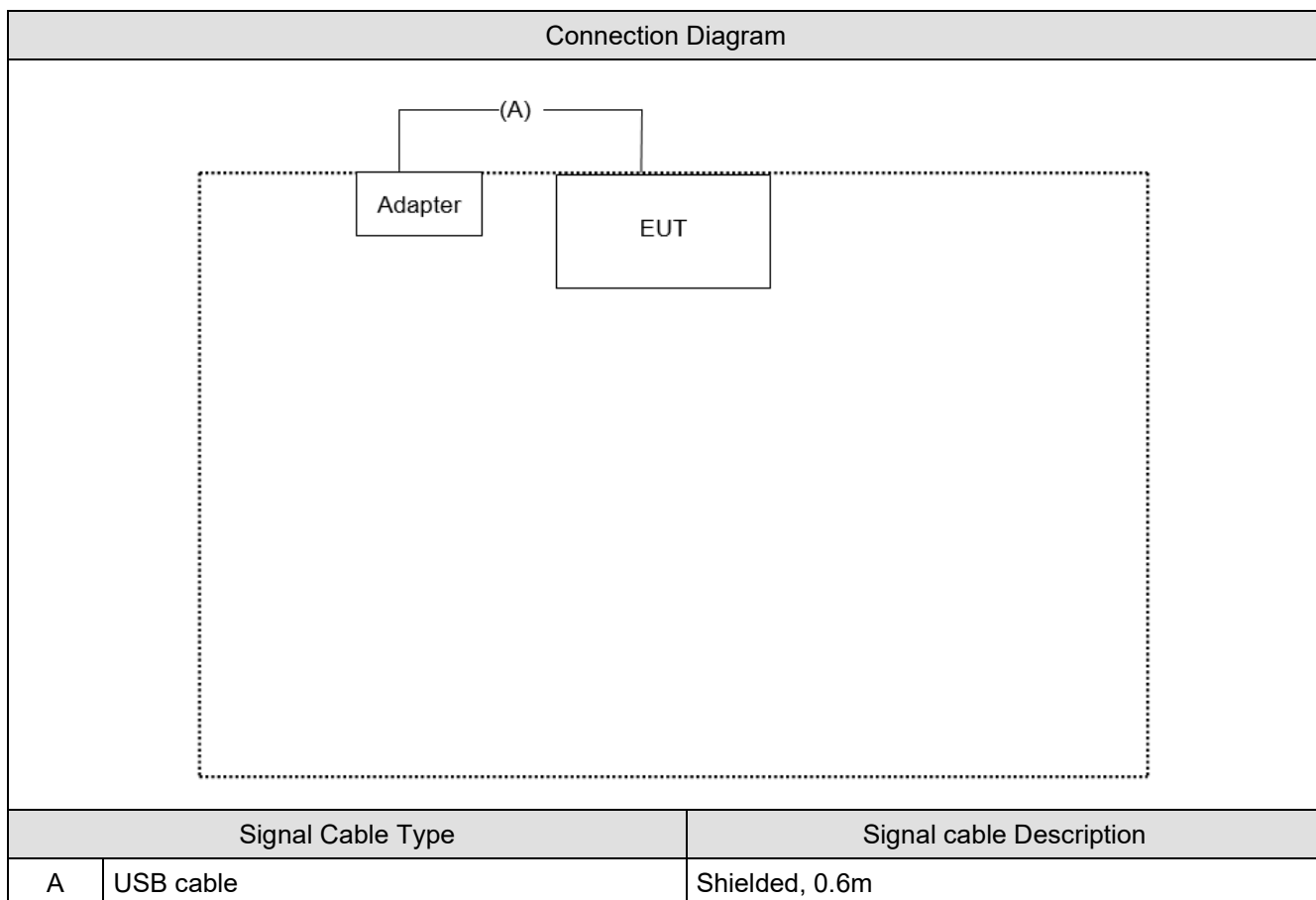
The product specification and testing instructions for the EUT declared in the report are provided by the manufacturer who will take all responsibilities for the accuracy.

1.4 Tested System Details

The types for all equipment, plus descriptions of all cables used in the tested system.

	Product	Manufacturer	Model No.	Serial No.
1	Adapter	ASUS	PA-1070-07	N/A

1.5 Configuration of tested System



1.6 EUT Operation of during Test

1	Set the EUT as shown.
2	Execute the control software MP tool (Version 0.0001.1020.2018)
3	Configure test mode, test channel and data rate.
4	Let the EUT start transmit continuously.
5	Verify that device is working properly

1.7 Test Facility

Ambient conditions in the laboratory:

Items	Test Item	Actually	Tested by	Test Date	Test Site
Temperature (°C)	AC power Line Conducted Emission	23.9	Ling Chen	2022/06/07	HC-SR02
Humidity (%RH)		60			
Temperature (°C)	Maximum Peak Conducted Output Power	24.1	Scott Chang	2022/06/09	HC-SR12
Humidity (%RH)		53			
Temperature (°C)	Radiated Emission	23.6	Ling Chen	2022/06/08	HC-CB04
Humidity (%RH)		60			
Temperature (°C)	Antenna Port Conducted Emission	24.1	Scott Chang	2022/06/09	HC-SR12
Humidity (%RH)		53			
Temperature (°C)	Radiated Emission Band Edge	24.1	Gary Liao	2022/06/07	HC-CB04
Humidity (%RH)		60			
Temperature (°C)	Occupied Bandwidth & DTS Bandwidth	24.1	Scott Chang	2022/06/09	HC-SR12
Humidity (%RH)		53			
Temperature (°C)	Maximum Power Spectral Density	24.1	Scott Chang	2022/06/09	HC-SR12
Humidity (%RH)		53			

Note: Test site information refers to Laboratory Information.

Laboratory Information

USA : FCC Registration Number: TW3024
Canada : CAB identifier : TW3024

The address and introduction of DEKRA Testing and Certification Co., Ltd. laboratories can be founded in our Web site: <http://www.dekra.com.tw>

If you have any comments, please don't hesitate to contact us. Our test sites as below:

Test Laboratory	DEKRA Testing and Certification Co., Ltd.
Address	1. No.372-2, Sec. 4, Zhongxing Rd., Zhudong Township, Hsinchu County 31061, Taiwan, R.O.C. 2. No.372, Sec. 4, Zhongxing Rd., Zhudong Township, Hsinchu County 31061, Taiwan, R.O.C.
Phone number	1. +886-3-582-8001 2. +886-3-582-8001
Fax number	1. +886-3-582-8958 2. +886-3-582-8958
Email address	info.tw@dekra.com
Website	http://www.dekra.com.tw
Note: Test site number for address 1 includes HC-SR02. Test site number for address 2 includes HC-CB02, HC-CB03, HC-CB04, HC-SR10 and HC-SR12.	

1.8 List of Test Equipment

HC-SR02

Instrument	Manufacturer	Model No.	Serial No.	Cal. Date	Next Cal. Date
Artificial Mains Network	R&S	ENV4200	848411/010	2021/12/27	2022/12/26
EMI Test Receiver	R&S	ESR3	102608	2022/05/30	2023/05/29
LISN	R&S	ENV216	100092	2022/04/29	2023/04/28
Coaxial Cable(9 m)	Harbour	RG-400	HC-SR02	2021/08/15	2022/08/14
DEKRA Testing System	DEKRA	Version 2.0	HC-SR02	N/A	N/A

HC-SR12

Instrument	Manufacturer	Model No.	Serial No.	Cal. Date	Next Cal. Date
High Speed Peak Power Meter Dual Input	Anritsu	ML2496A	1602004	2021/11/12	2022/11/11
Pulse Power Sensor	Anritsu	MA2411B	1531043	2021/11/12	2022/11/11
EXA Signal Analyzer	Keysight	N9010A	MY51440132	2022/01/07	2023/01/06
Pulse Power Sensor	Anritsu	MA2411B	1531044	2021/11/12	2022/11/11
Power Meter	Keysight	8990B	MY51000248	2022/05/06	2023/05/05
Power Sensor	Keysight	N1923A	MY57240005	2022/05/06	2023/05/05
Spectrum Analyzer	Agilent	N9010A	US47140172	2022/05/08	2023/05/07
Signal & Spectrum Analyzer	R&S	FSV40	101049	2022/04/25	2023/04/24

HC-CB04

Instrument	Manufacturer	Model No.	Serial No.	Cal. Date	Next Cal. Date
Signal Analyzer	R&S	FSVA40	101455	2021/10/22	2022/10/21
Signal and Spectrum Analyzer	R&S	FSVA40	101435	2022/05/30	2023/05/29
EXA Signal Analyzer	Keysight	N9010A	MY51440132	2022/01/07	2023/01/06
Trilog Broadband Antenna	Schwarzbeck	VULB 9168	1272	2022/05/19	2023/05/18
Horn Antenna	Schwarzbeck	BBHA 9120D	01640	2021/09/03	2022/09/02
Horn Antenna	Schwarzbeck	BBHA 9170	203	2022/02/23	2023/02/22
Pre-Amplifier	EMCI	EMC01820I	980365	2022/04/15	2023/04/14
Pre-Amplifier	EMEC	EM01G18GA	060835	2021/07/12	2022/07/11
Pre-Amplifier	DEKRA	AP-400C	201801231	2021/12/24	2022/12/23
Coaxial Cable(10m)	Suhner	SF102_SF104	HC-CB04	2021/08/09	2022/08/08
Coaxial Cable(3m)	Suhner, Rosnol	SF102_Rosnol	HC-CB04_1	2021/08/17	2022/08/18
EMI Test Receiver	R&S	ESR7	102260	2021/12/22	2022/12/21
Magnetic Loop Antenna	Teseq	HLA 6121	44287	2021/09/06	2022/09/05
Radiated Software	AUDIX	e3 V9	HC-CB04	N/A	N/A

Note: All equipment upon which need to calibrated are with calibration period of 1 year.

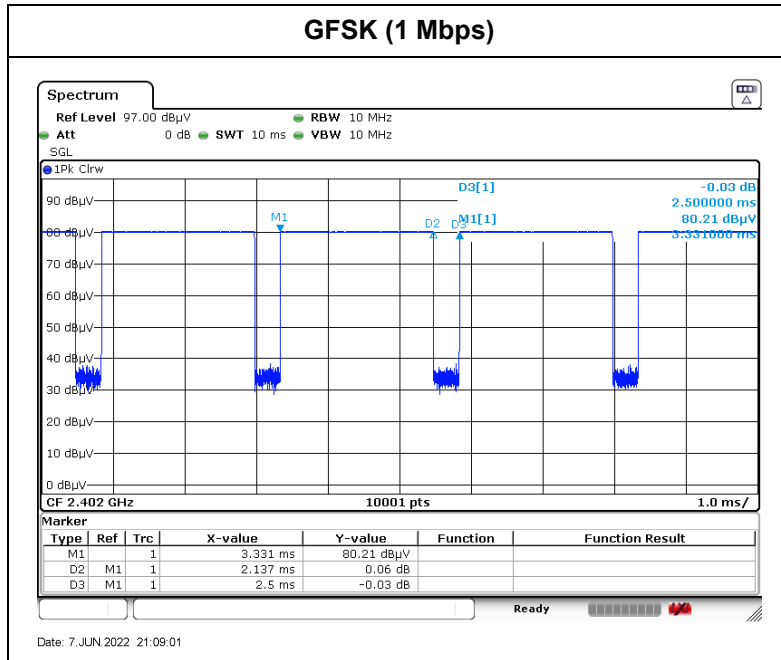
1.9 Measurement Uncertainty

Uncertainties have been calculated according to the DEKRA internal document with the emissions test results be included in the report. The measurement uncertainties given below are based on a 95% confidence level (based on a coverage factor ($k=2$)).

Test item	Uncertainty
AC Power Line Conducted Emission	± 2.10 dB
Maximum Conducted Output Power	± 1.16 dB
Radiated Emission	± 3.25 dB below 1 GHz ± 3.32 dB above 1 GHz
Antenna Port Conducted Emission	± 1.60 dB
Radiated Emission Band Edge	± 3.32 dB
Occupied Bandwidth & DTS Bandwidth	± 282.55 Hz
Maximum Power Spectral Density	± 1.60 dB

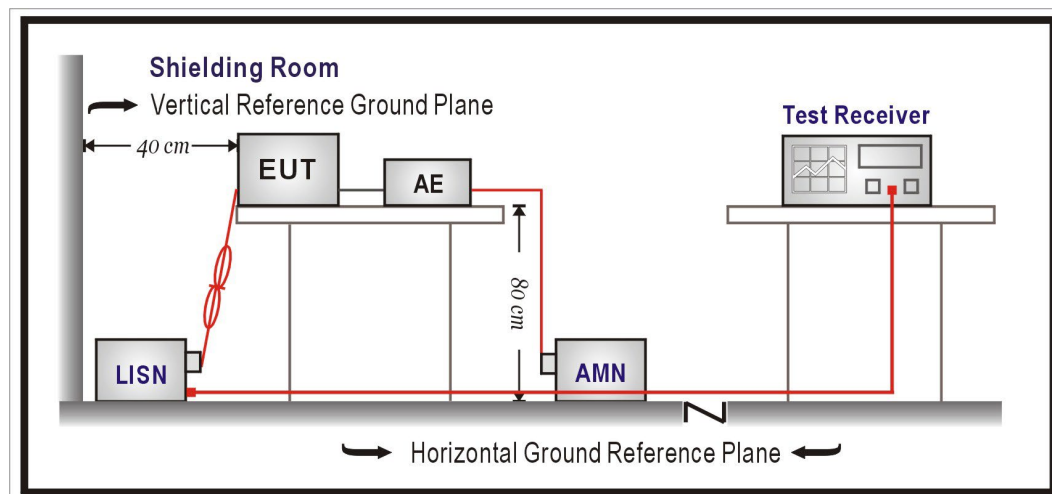
1.10 Duty Cycle

Mode	On Time (ms)	On+Off Time (ms)	Duty Cycle (%)	Duty Factor (dB)	1/T Minimum VBW (kHz)
GFSK (1 Mbps)	2.137	2.500	85.48	0.68	0.468



2. AC Power Line Conducted Emission

2.1 Test Setup



2.2 Test Limit

Frequency (MHz)	QP (dBuV)	AV (dBuV)
0.15 - 0.50	66 - 56	56 - 46
0.50 - 5.0	56	46
5.0 - 30	60	50

Remarks: In the above table, the tighter limit applies at the band edges.

2.3 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 50 ohm termination. (Please refer 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 according to ANSI C63.10: 2013 on conducted measurement.

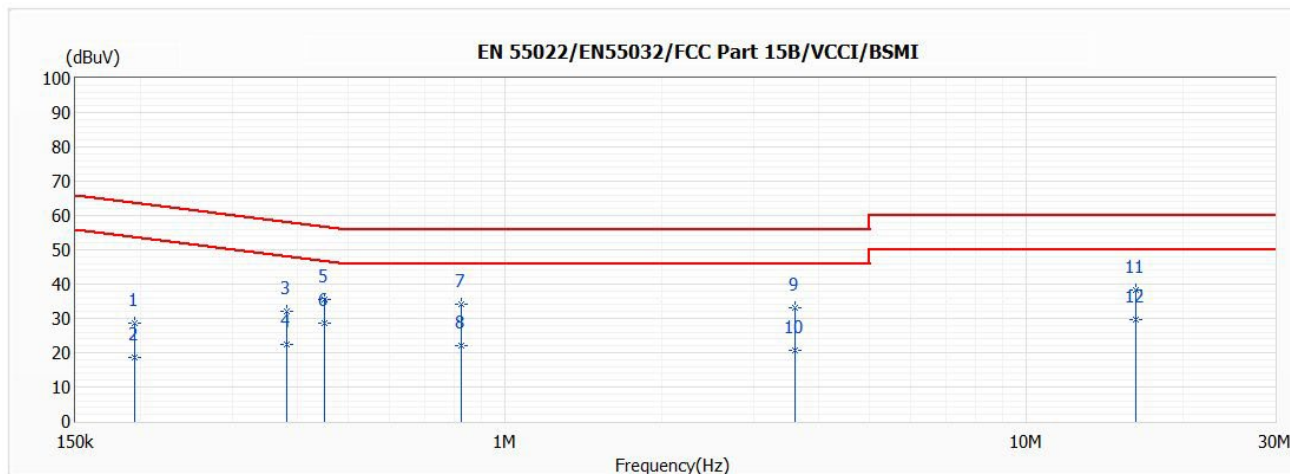
AC Power Line Conducted Emissions were measured over the frequency range from 0.15 MHz to 30 MHz using a receiver bandwidth of 9 kHz.

2.4 Test Specification

According to FCC Part 15 Subpart C Paragraph 15.207.

2.5 Test Result of AC Power Line Conducted Emission

Test Mode	Mode 1: Transmit	Phase	Line
Test Condition	GFSK (1 Mbps) / 2480 MHz		

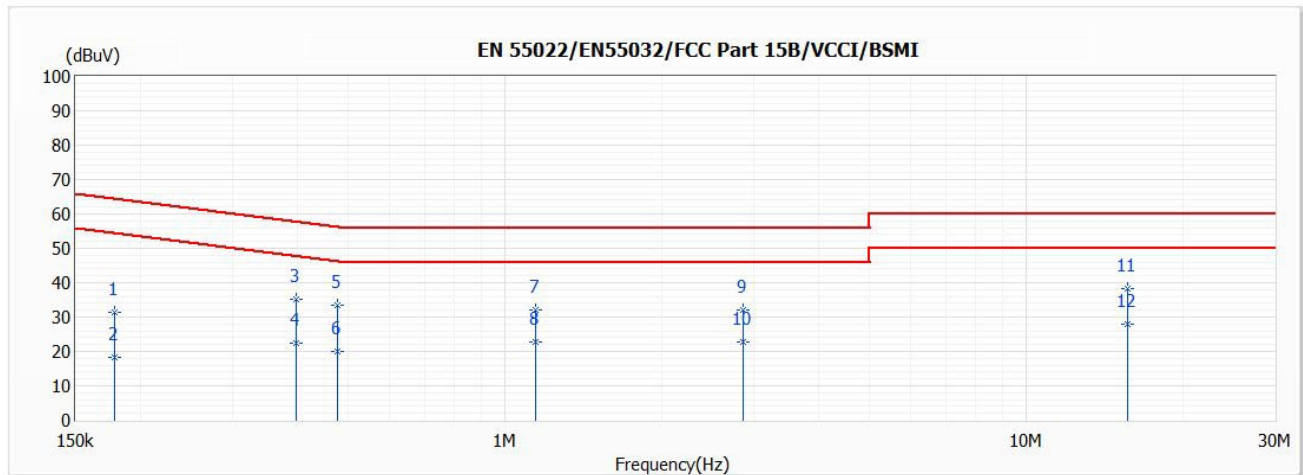


No	Frequency (MHz)	Emission Level (dBuV)	Limit (dBuV)	Margin (dB)	Reading Level (dBuV)	Correct Factor (dB)	Detector Type
1	0.195	28.68	63.84	-35.16	19.06	9.62	QP
2	0.195	18.67	53.84	-35.17	9.05	9.62	AV
3	0.382	31.96	58.24	-26.28	22.32	9.64	QP
4	0.382	22.34	48.24	-25.90	12.70	9.64	AV
5	0.450	35.47	56.88	-21.41	25.82	9.65	QP
*6	0.450	28.48	46.88	-18.40	18.83	9.65	AV
7	0.824	34.14	56.00	-21.86	24.45	9.69	QP
8	0.824	22.05	46.00	-23.95	12.36	9.69	AV
9	3.600	32.96	56.00	-23.04	23.12	9.84	QP
10	3.600	20.83	46.00	-25.17	10.99	9.84	AV
11	16.212	38.40	60.00	-21.60	28.15	10.25	QP
12	16.212	29.72	50.00	-20.28	19.47	10.25	AV

Remark:

1. "*" means this data is the worst emission level.
2. Emission Level = Reading Level + Correct Factor (Correct Factor = LISN Insertion Loss + Cable Loss).
3. Margin = Emission Level - Limit.

Test Mode	Mode 1: Transmit	Phase	Neutral
Test Condition	GFSK (1 Mbps) / 2480 MHz		



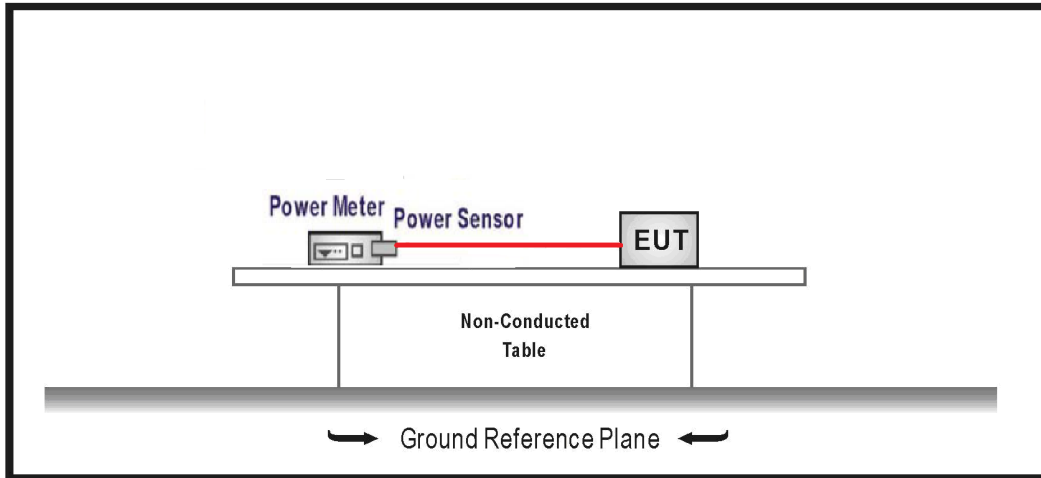
No	Frequency (MHz)	Emission Level (dBuV)	Limit (dBuV)	Margin (dB)	Reading Level (dBuV)	Correct Factor (dB)	Detector Type
1	0.178	31.32	64.58	-33.26	21.71	9.61	QP
2	0.178	18.22	54.58	-36.36	8.61	9.61	AV
3	0.398	35.12	57.90	-22.78	25.48	9.64	QP
4	0.398	22.46	47.90	-25.44	12.82	9.64	AV
5	0.478	33.45	56.38	-22.93	23.80	9.65	QP
6	0.478	19.89	46.38	-26.49	10.24	9.65	AV
7	1.144	32.16	56.00	-23.84	22.45	9.71	QP
8	1.144	22.68	46.00	-23.32	12.97	9.71	AV
9	2.855	32.14	56.00	-23.86	22.34	9.80	QP
10	2.855	22.79	46.00	-23.21	12.99	9.80	AV
*11	15.629	38.25	60.00	-21.75	27.91	10.34	QP
12	15.629	28.00	50.00	-22.00	17.66	10.34	AV

Remark:

1. "*" means this data is the worst emission level.
2. Emission Level = Reading Level + Correct Factor (Correct Factor = LISN Insertion Loss + Cable Loss).
3. Margin = Emission Level - Limit.

3. Maximum Conducted Output Power

3.1 Test Setup



3.2 Test Limit

The Maximum Conducted Output Power shall be less 1 Watt.

3.3 Test procedures

The EUT was setup according to ANSI C63.10: 2013; tested according to DTS test procedure of KDB 558074 D01 v05r02 for compliance to FCC 47CFR 15.247 requirements.

3.4 Test Specification

According to FCC Part 15 Subpart C Paragraph 15.247.

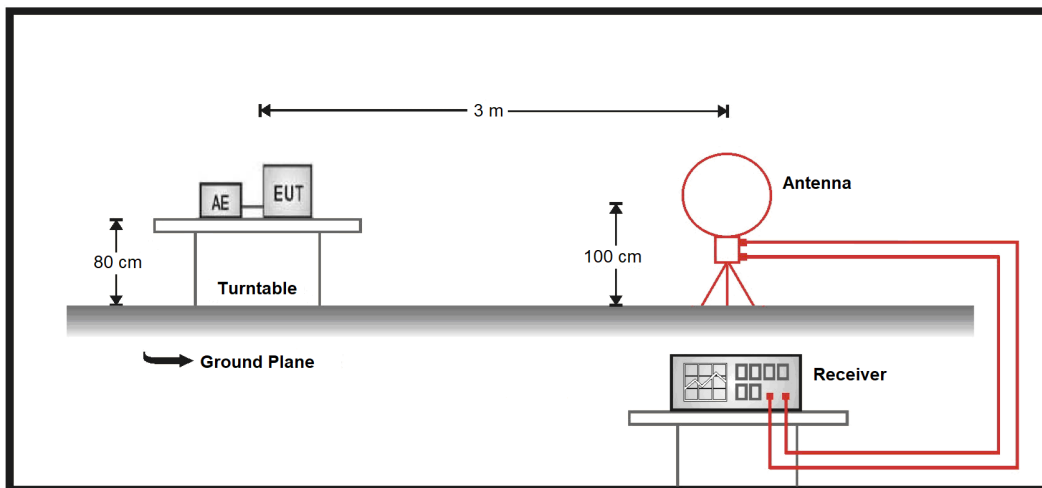
3.5 Test Result of Maximum Conducted Output Power

Modulation	Channel	Frequency (MHz)	Measure Level (dBm)	Limit (dBm)	Result
GFSK (1 Mbps)	00	2402	3.810	≤ 30.00	Pass
	19	2440	3.110	≤ 30.00	Pass
	39	2480	3.020	≤ 30.00	Pass

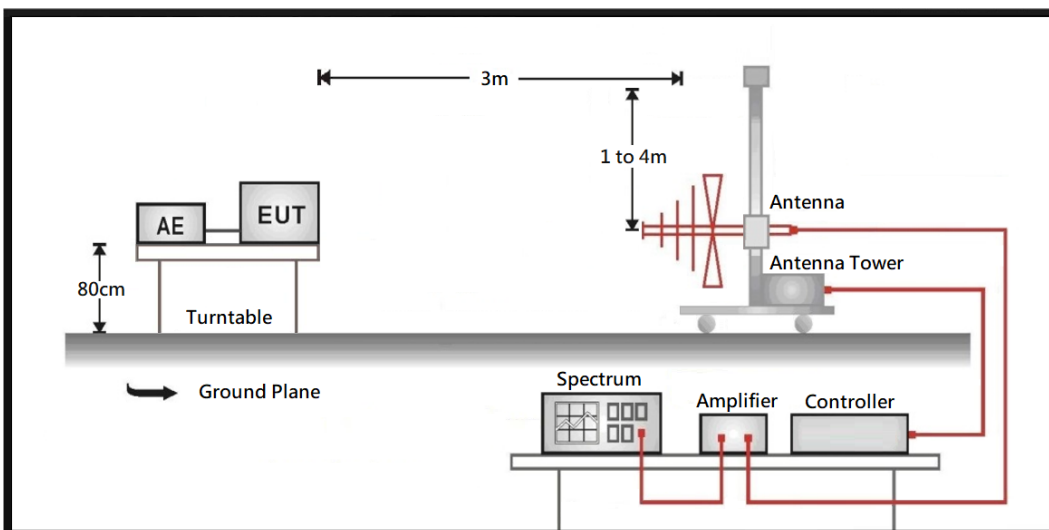
4. Radiated Emission

4.1 Test Setup

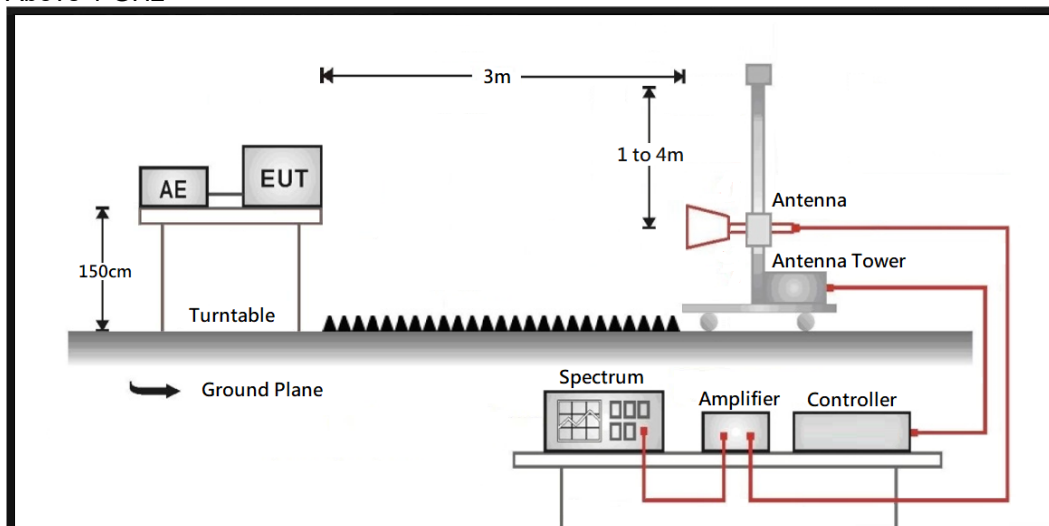
9 kHz ~ 30 MHz



30 MHz ~ 1 GHz



Above 1 GHz



4.2 Test Limit

Emissions radiated outside of the specified frequency bands, except for harmonics, shall be attenuated by at least 20 dB below the level of the fundamental or to the general radiated emission limit in paragraph 15.209, whichever is the lesser attenuation.

Frequency (MHz)	Field strength (uV/m)	Field strength (dBuV/m)	Measurement distance (m)
0.009 – 0.490	2400/F(kHz)	20 log (2400/F(kHz))	300
0.490 – 1.705	24000/F(kHz)	20 log (24000/F(kHz))	30
1.705 - 30	30	29.5	30
30 - 88	100	40	3
88 - 216	150	43.5	3
216 - 960	200	46	3
Above 960	500	54	3

Remarks:

1. Field strength (dBuV/m) = 20 log Field strength (uV/m)
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 closed point of any part of the device or system

4.3 Test Procedure

The EUT was setup according to ANSI C63.10: 2013 and tested according to DTS test procedure of KDB 558074 D01V05r02 for compliance to FCC 47CFR 15.247 requirements.

The EUT and its simulators are placed on a turn table which is 0.8 or 1.5 meter above ground. The turn table can rotate 360 degrees to determine the position of the maximum emission level.

The antenna can move up and down between 1 meter and 4 meters to find out the maximum emission level.

Both horizontal and vertical polarization of the antenna are set on measurement. In order to find the maximum emission, all of the interface cables must be manipulated according to ANSI C63.10: 2013 on radiated measurement.

On any frequency or frequencies from 9 kHz (include The the lowest oscillator frequency generated within the device up to the 10th harmonic) to 1000 MHz, the limit shown are based on measuring equipment employing a quasi-peak detector function and on any frequency or frequencies above 1000 MHz the radiated limit shown are based upon the use of measurement instrumentation employing an average detector function. When average radiated emission measurement are included emission measurement below 1000 MHz, there also is a limit on the radio frequency emissions, as measured using instrumentation with a peak detector function, corresponding to 20 dB above the maximum permitted average limit.

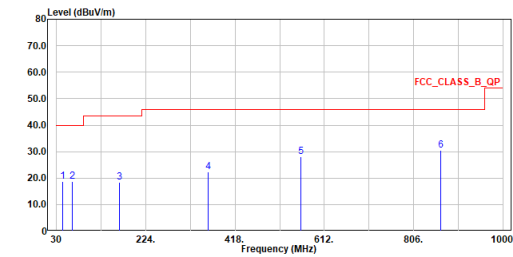
The bandwidth below 1 GHz setting on the field strength meter is 120 kHz and above 1 GHz is 1MHz.

4.4 Test Specification

According to FCC Part 15 Subpart C Paragraph 15.247.

4.5 Test Result of Radiated Emissions (30 MHz ~ 1 GHz)

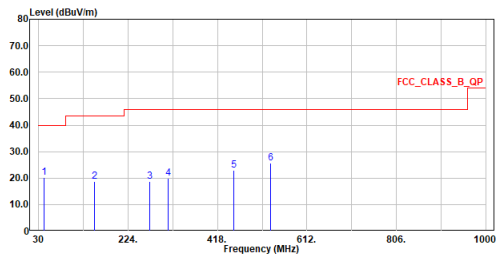
Site :HC-CB04
Condition :3m Horizontal
Mode :BLE_TX_2480MHz
Test By :Ling



No.	Frequency	Level	Limit	Over	Read	Factor	Remark
	MHz	dBuV/m	dBuV/m	Limit	Level	dB	
1	44.259	18.74	40.00	-21.26	21.89	-3.15	QP
2	64.823	18.64	40.00	-21.36	23.04	-4.40	QP
3	167.158	18.38	43.50	-25.12	22.04	-3.66	QP
4	358.927	22.47	46.00	-23.53	24.10	-1.63	QP
5	560.687	28.08	46.00	-17.92	24.96	3.12	QP
6	865.073	30.35	46.00	-15.65	22.23	8.12	QP

Note:
1. Level = Read Level + Factor
2. Factor = Antenna Factor + Cable Loss - Preamp Factor
3. Over Limit = Level - Limit Line
4. The emission under 30MHz was not included since the emission levels are very low against the limit.
5. The other emission levels were very low against the limit.

Site :HC-CB04
Condition :3m Vertical
Mode :BLE_TX_2480MHz
Test By :Ling

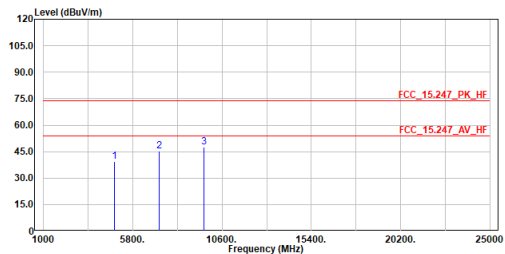


No.	Frequency	Level	Limit	Over	Read	Factor	Remark
	MHz	dBuV/m	dBuV/m	Limit	Level	dB	
1	42.513	20.10	40.00	-19.90	22.85	-2.75	QP
2	151.347	18.59	43.50	-24.91	22.12	-3.53	QP
3	270.366	18.57	46.00	-27.43	22.37	-3.80	QP
4	310.718	19.89	46.00	-26.11	22.64	-2.75	QP
5	454.084	23.02	46.00	-22.98	21.82	1.20	QP
6	533.333	25.59	46.00	-20.41	22.91	2.68	QP

Note:
1. Level = Read Level + Factor
2. Factor = Antenna Factor + Cable Loss - Preamp Factor
3. Over Limit = Level - Limit Line
4. The emission under 30MHz was not included since the emission levels are very low against the limit.
5. The other emission levels were very low against the limit.

4.6 Test Result of Radiated Emissions (1 GHz ~ 10th Harmonic)

Site :HC-CB04
Condition :3m ,Horizontal
Mode :BLE_1M_TX_2402MHz
Test by :Ling

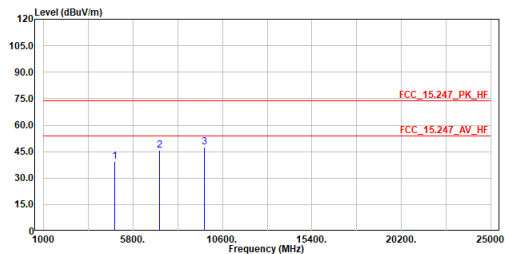


No.	Frequency	Level	Limit	Over	Read	Factor	Remark
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	
1	4804.000	39.50	74.00	-34.50	56.41	-16.91	Peak
2	7206.000	45.42	74.00	-28.58	56.65	-11.23	Peak
3	9608.000	47.62	74.00	-26.38	53.04	-5.42	Peak

Note:

1. Level = Read Level + Factor
2. Factor = Antenna Factor + Cable Loss - Preamp Factor
3. Over Limit = Level - Limit Line
4. The peak result complies with AVG limit, AVG result is deemed to comply with AVG limit.
5. The other emission levels were very low against the limit.

Site :HC-CB04
Condition :3m ,Vertical
Mode :BLE_1M_TX_2402MHz
Test by :Ling

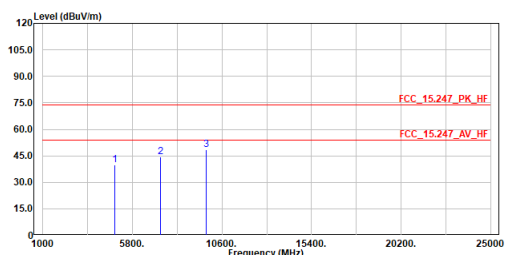


No.	Frequency	Level	Limit	Over	Read	Factor	Remark
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	
1	4804.000	39.51	74.00	-34.49	56.42	-16.91	Peak
2	7206.000	45.77	74.00	-28.23	57.00	-11.23	Peak
3	9608.000	47.35	74.00	-26.65	52.77	-5.42	Peak

Note:

1. Level = Read Level + Factor
2. Factor = Antenna Factor + Cable Loss - Preamp Factor
3. Over Limit = Level - Limit Line
4. The peak result complies with AVG limit, AVG result is deemed to comply with AVG limit.
5. The other emission levels were very low against the limit.

Site :HC-CB04
Condition :3m ,Horizontal
Mode :BLE_1M_TX_2440MHz
Test by :Ling

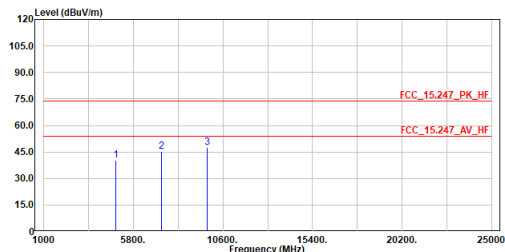


No.	Frequency	Level	Limit	Over	Read	Factor	Remark
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	
1	4880.000	39.66	74.00	-34.34	56.59	-16.93	Peak
2	7320.000	44.57	74.00	-29.43	55.88	-11.31	Peak
3	9760.000	48.39	74.00	-25.61	53.29	-4.90	Peak

Note:

1. Level = Read Level + Factor
2. Factor = Antenna Factor + Cable Loss - Preamp Factor
3. Over Limit = Level - Limit Line
4. The peak result complies with AVG limit, AVG result is deemed to comply with AVG limit.
5. The other emission levels were very low against the limit.

Site :HC-CB04
Condition :3m ,Vertical
Mode :BLE_1M_TX_2440MHz
Test by :Ling

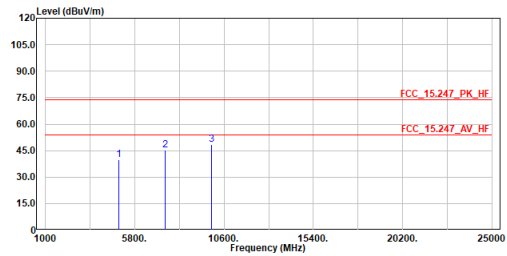


No.	Frequency	Level	Limit	Over	Read	Factor	Remark
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	
1	4880.000	40.11	74.00	-33.89	57.04	-16.93	Peak
2	7320.000	45.13	74.00	-28.87	56.44	-11.31	Peak
3	9760.000	47.55	74.00	-26.45	52.45	-4.90	Peak

Note:

1. Level = Read Level + Factor
2. Factor = Antenna Factor + Cable Loss - Preamp Factor
3. Over Limit = Level - Limit Line
4. The peak result complies with AVG limit, AVG result is deemed to comply with AVG limit.
5. The other emission levels were very low against the limit.

Site :HC-CB04
 Condition :3m ,Horizontal
 Mode :BLE_1M_TX_2480MHz
 Test by :Ling

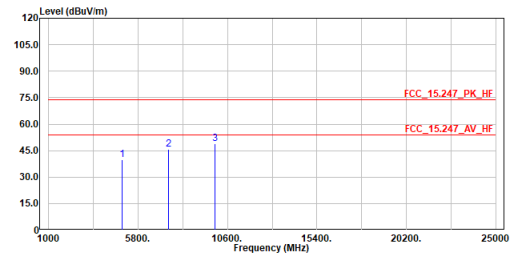


No.	Frequency	Level	Limit	Over	Read	Factor	Remark
	MHz	dBuV/m	dBuV/m	Limit	Level	dB	
1	4960.000	39.81	74.00	-34.19	56.60	-16.79	Peak
2	7440.000	45.33	74.00	-28.67	56.15	-10.82	Peak
3	9920.000	48.60	74.00	-25.40	52.97	-4.37	Peak

Note:

1. Level = Read Level + Factor
2. Factor = Antenna Factor + Cable Loss - Preamp Factor
3. Over Limit = Level - Limit Line
4. The peak result complies with AVG limit, AVG result is deemed to comply with AVG limit.
5. The other emission levels were very low against the limit.

Site :HC-CB04
 Condition :3m ,Vertical
 Mode :BLE_1M_TX_2480MHz
 Test by :Ling



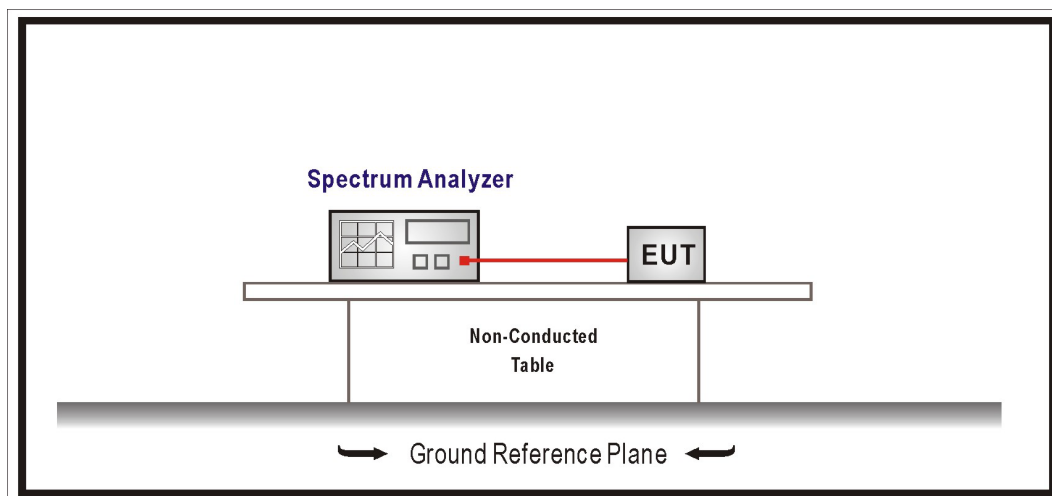
No.	Frequency	Level	Limit	Over	Read	Factor	Remark
	MHz	dBuV/m	dBuV/m	Limit	Level	dB	
1	4960.000	39.96	74.00	-34.04	56.75	-16.79	Peak
2	7440.000	45.66	74.00	-28.34	56.48	-10.82	Peak
3	9920.000	48.73	74.00	-25.27	53.10	-4.37	Peak

Note:

1. Level = Read Level + Factor
2. Factor = Antenna Factor + Cable Loss - Preamp Factor
3. Over Limit = Level - Limit Line
4. The peak result complies with AVG limit, AVG result is deemed to comply with AVG limit.
5. The other emission levels were very low against the limit.

5. Antenna Port Conducted Emission

5.1 Test Setup



5.2 Test 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, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limit. If the transmitter complies with the conducted power limit based on the use of RMS averaging over a time interval, the attenuation required under this paragraph shall be 30 dB instead of 20 dB. Attenuation below the general limit specified in §15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emission limit specified in §15.209(a) (see §15.205(c)).

5.3 Test Procedure

The EUT was setup according to ANSI C63.10: 2013 and tested according to DTS test procedure of KDB 558074 D01 V05r02 for compliance to FCC 47CFR 15.247 requirements.

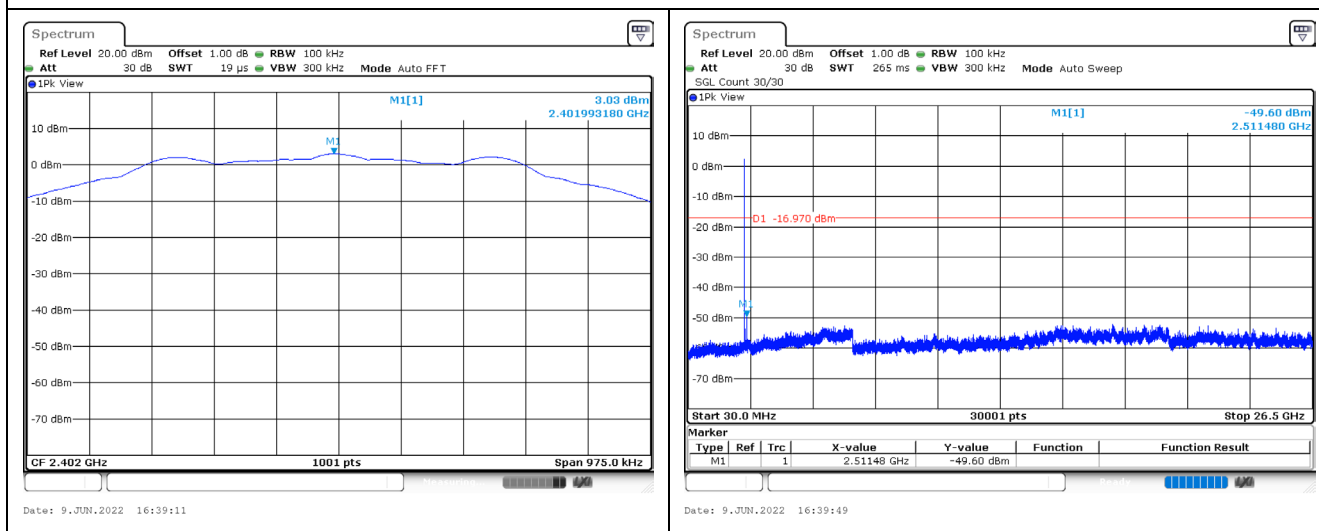
Set RBW = 100 kHz, Set VBW > RBW, scan up through 10th harmonic.

5.4 Test Specification

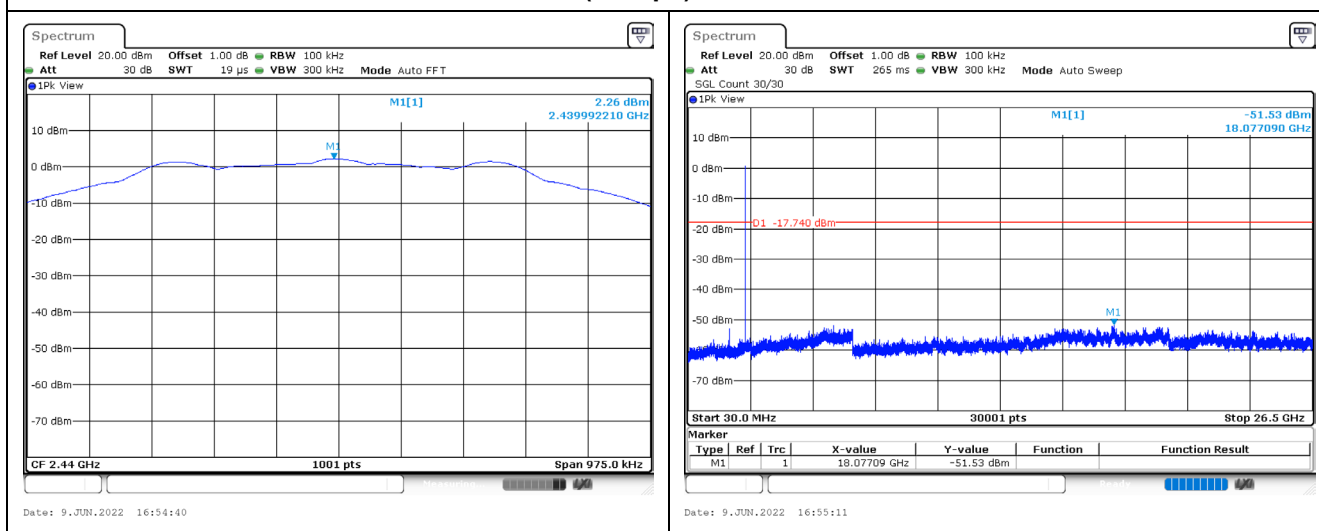
According to FCC Part 15 Subpart C Paragraph 15.247.

5.5 Test Result of Antenna Port Conducted Emission

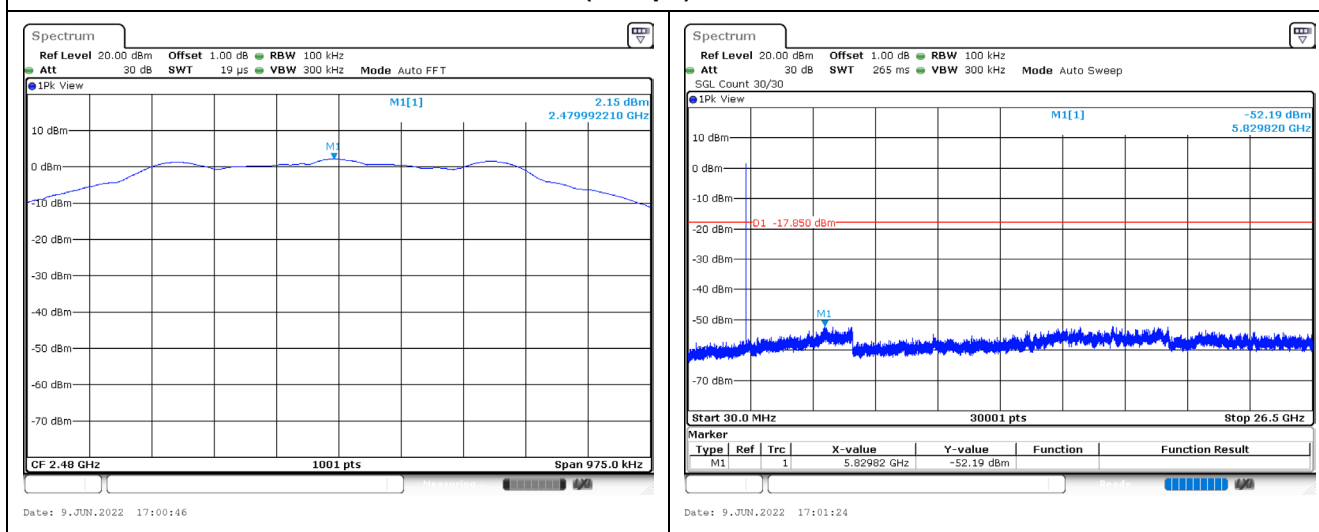
GFSK (1 Mbps) / 2402 MHz

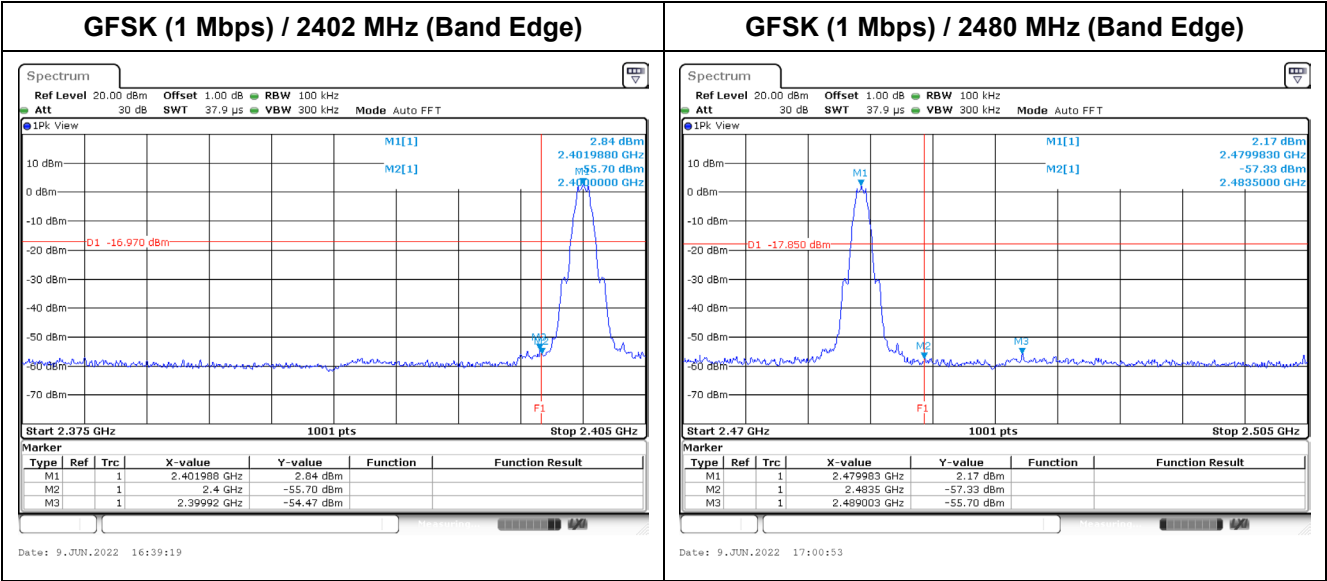


GFSK (1 Mbps) / 2440 MHz



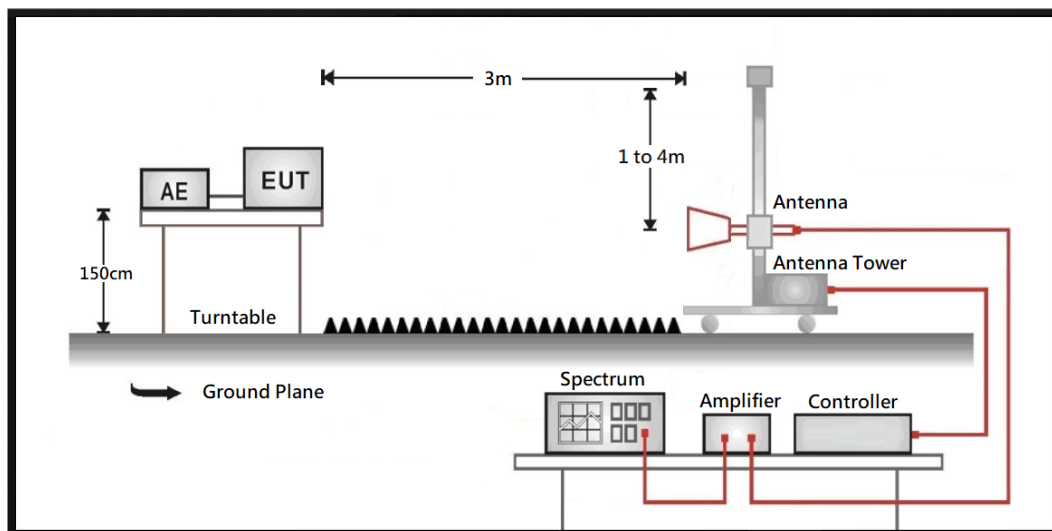
GFSK (1 Mbps) / 2480 MHz





6. Radiated Emission Band Edge

6.1 Test Setup



6.2 Test Limit

Emissions radiated outside of the specified frequency bands, except for harmonics, shall be attenuated by at least 20 dB below the level of the fundamental or to the general radiated emission limit in paragraph 15.209, whichever is the lesser attenuation.

Frequency (MHz)	Field strength (uV/m)	Field strength (dBuV/m)	Measurement distance (m)
30 - 88	100	40	3
88 - 216	150	43.5	3
216 - 960	200	46	3
Above 960	500	54	3

Remarks:

1. Field strength (dBuV/m) = 20 log Field strength (uV/m)
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 closed point of any part of the device or system

6.3 Test Procedure

The EUT was setup according to ANSI C63.10: 2013 and tested according to FHSS test procedure of FCC KDB 558074 D01 v05r02 for compliance to FCC 47CFR 15.247 requirements.

The EUT and its simulators are placed on a turn table which is 1.5 meter above ground. The turn table can rotate 360 degrees to determine the position of the maximum emission level. The antenna can move up and down between 1 meter and 4 meters to find out the maximum emission level.

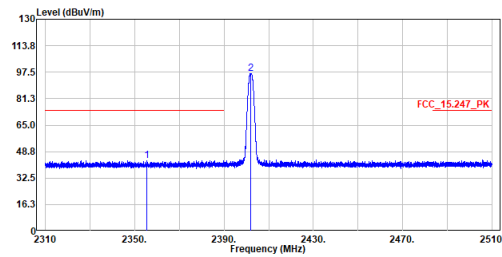
Both horizontal and vertical polarization of the antenna are set on measurement. In order to find the maximum emission, all of the interface cables must be manipulated according to ANSI C63.10: 2013 on radiated measurement.

6.4 Test Specification

According to FCC Part 15 Subpart C Paragraph 15.247.

6.5 Test Result of Radiated Emission Band Edge

Site :HC-CB04
Condition :3m ,Horizontal
Mode :BLE_1M_TX_2402MHz
Test by :Gary

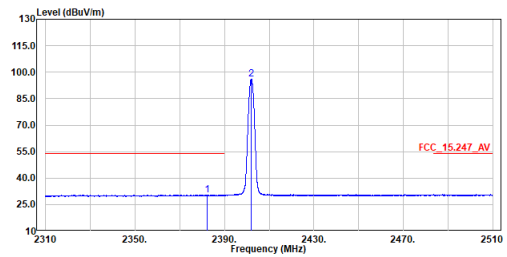


No.	Frequency	Level	Limit	Over	Read	Factor	Remark
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	
1	2355.500	43.36	74.00	-30.64	30.33	13.03	Peak
2	2402.000	96.66	-----	-----	83.76	12.90	Peak

Note:

1. Level = Read Level + Factor
2. Factor = Antenna Factor + Cable Loss - Preamp Factor
3. Over Limit = Level - Limit Line
4. The peak result complies with AVG limit, AVG result is deemed to comply with AVG limit.
5. The other emission levels were very low against the limit.

Site :HC-CB04
Condition :3m ,Horizontal
Mode :BLE_1M_TX_2402MHz
Test by :Gary

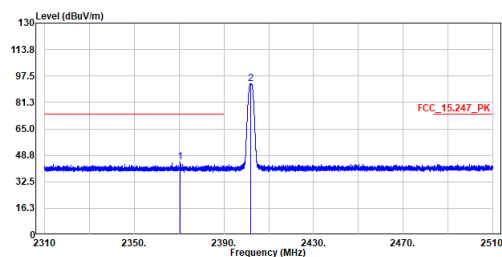


No.	Frequency	Level	Limit	Over	Read	Factor	Remark
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	
1	2382.400	30.58	54.00	-23.42	17.64	12.94	Average
2	2402.020	96.11	-----	-----	83.21	12.90	Average

Note:

1. Level = Read Level + Factor
2. Factor = Antenna Factor + Cable Loss - Preamp Factor
3. Over Limit = Level - Limit Line
4. The peak result complies with AVG limit, AVG result is deemed to comply with AVG limit.
5. The other emission levels were very low against the limit.

Site :HC-CB04
Condition :3m ,Vertical
Mode :BLE_1M_TX_2402MHz
Test by :Gary

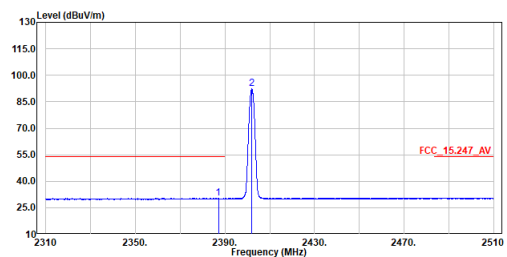


No.	Frequency	Level	Limit	Over	Read	Factor	Remark
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	
1	2370.400	44.40	74.00	-29.60	31.41	12.99	Peak
2	2402.020	92.93	-----	-----	80.03	12.90	Peak

Note:

1. Level = Read Level + Factor
2. Factor = Antenna Factor + Cable Loss - Preamp Factor
3. Over Limit = Level - Limit Line
4. The peak result complies with AVG limit, AVG result is deemed to comply with AVG limit.
5. The other emission levels were very low against the limit.

Site :HC-CB04
Condition :3m ,Vertical
Mode :BLE_1M_TX_2402MHz
Test by :Gary

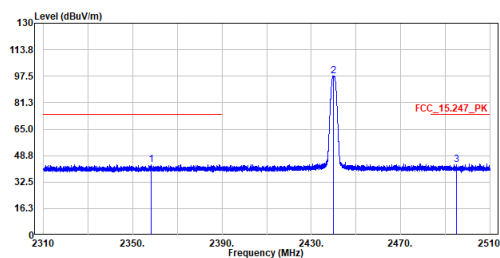


No.	Frequency	Level	Limit	Over	Read	Factor	Remark
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	
1	2387.100	30.39	54.00	-23.61	17.46	12.93	Average
2	2402.000	92.39	-----	-----	79.49	12.90	Average

Note:

1. Level = Read Level + Factor
2. Factor = Antenna Factor + Cable Loss - Preamp Factor
3. Over Limit = Level - Limit Line
4. The peak result complies with AVG limit, AVG result is deemed to comply with AVG limit.
5. The other emission levels were very low against the limit.

Site :HC-CB04
Condition :3m ,Horizontal
Mode :BLE_1M_TX_2440MHz
Test by :Gary

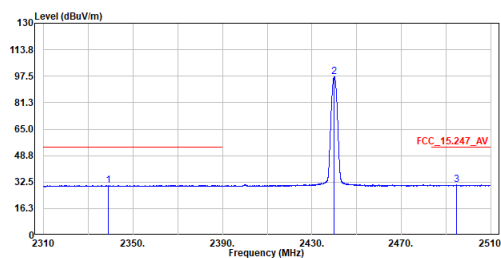


No.	Frequency	Level	Limit	Over	Read	Factor	Remark
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	
1	2358.140	43.37	74.00	-30.63	30.34	13.03	Peak
2	2440.000	97.78	-----	84.78	13.00		Peak
3	2495.000	43.14	74.00	-30.86	30.09	13.05	Peak

Note:

1. Level = Read Level + Factor
2. Factor = Antenna Factor + Cable Loss - Preamp Factor
3. Over Limit = Level - Limit Line
4. The peak result complies with AVG limit, AVG result is deemed to comply with AVG limit.
5. The other emission levels were very low against the limit.

Site :HC-CB04
Condition :3m ,Horizontal
Mode :BLE_1M_TX_2440MHz
Test by :Gary

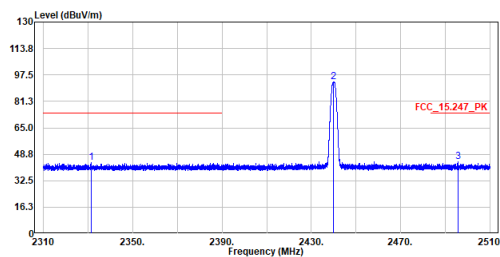


No.	Frequency	Level	Limit	Over	Read	Factor	Remark
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	
1	2338.980	30.41	54.00	-23.59	17.39	13.02	Average
2	2440.000	97.23	-----	84.23	13.00		Average
3	2494.760	30.77	54.00	-23.23	17.72	13.05	Average

Note:

1. Level = Read Level + Factor
2. Factor = Antenna Factor + Cable Loss - Preamp Factor
3. Over Limit = Level - Limit Line
4. The peak result complies with AVG limit, AVG result is deemed to comply with AVG limit.
5. The other emission levels were very low against the limit.

Site :HC-CB04
Condition :3m ,Vertical
Mode :BLE_1M_TX_2440MHz
Test by :Gary

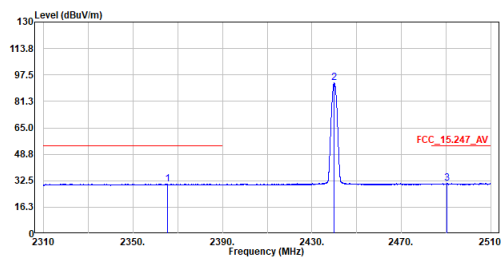


No.	Frequency	Level	Limit	Over	Read	Factor	Remark
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	
1	2331.420	43.81	74.00	-30.19	30.82	12.99	Peak
2	2439.980	93.02	-----	80.02	13.00		Peak
3	2495.800	44.24	74.00	-29.76	31.18	13.06	Peak

Note:

1. Level = Read Level + Factor
2. Factor = Antenna Factor + Cable Loss - Preamp Factor
3. Over Limit = Level - Limit Line
4. The peak result complies with AVG limit, AVG result is deemed to comply with AVG limit.
5. The other emission levels were very low against the limit.

Site :HC-CB04
Condition :3m ,Vertical
Mode :BLE_1M_TX_2440MHz
Test by :Gary

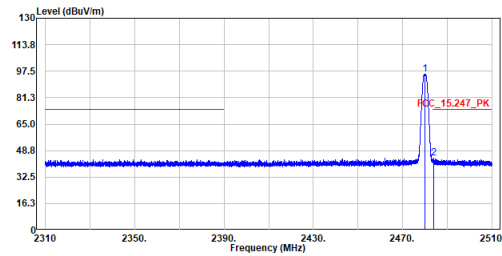


No.	Frequency	Level	Limit	Over	Read	Factor	Remark
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	
1	2365.380	30.51	54.00	-23.49	17.51	13.00	Average
2	2440.020	92.49	-----	79.49	13.00		Average
3	2490.540	30.70	54.00	-23.30	17.64	13.06	Average

Note:

1. Level = Read Level + Factor
2. Factor = Antenna Factor + Cable Loss - Preamp Factor
3. Over Limit = Level - Limit Line
4. The peak result complies with AVG limit, AVG result is deemed to comply with AVG limit.
5. The other emission levels were very low against the limit.

Site :HC-CB04
Condition :3m ,Horizontal
Mode :BLE_1M_TX_2480MHz
Test by :Gary

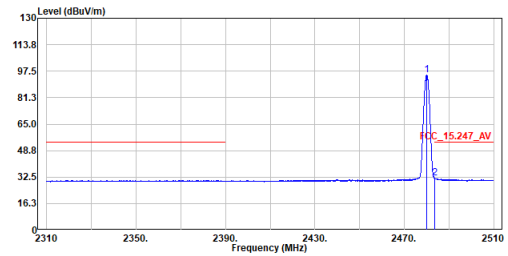


No.	Frequency	Level	Limit	Over	Read	Factor	Remark
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	
1	2480.020	95.80	-----	-----	82.75	13.05	Peak
2	2483.940	44.05	74.00	-29.95	31.01	13.04	Peak

Note:

1. Level = Read Level + Factor
2. Factor = Antenna Factor + Cable Loss - Preamp Factor
3. Over Limit = Level - Limit Line
4. The peak result complies with AVG limit, AVG result is deemed to comply with AVG limit.
5. The other emission levels were very low against the limit.

Site :HC-CB04
Condition :3m ,Horizontal
Mode :BLE_1M_TX_2480MHz
Test by :Gary

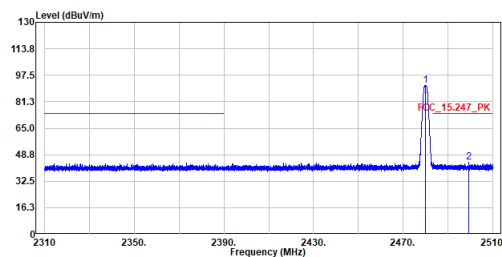


No.	Frequency	Level	Limit	Over	Read	Factor	Remark
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	
1	2480.020	95.23	-----	-----	82.18	13.05	Average
2	2483.640	31.81	54.00	-22.19	18.77	13.04	Average

Note:

1. Level = Read Level + Factor
2. Factor = Antenna Factor + Cable Loss - Preamp Factor
3. Over Limit = Level - Limit Line
4. The peak result complies with AVG limit, AVG result is deemed to comply with AVG limit.
5. The other emission levels were very low against the limit.

Site :HC-CB04
Condition :3m ,Vertical
Mode :BLE_1M_TX_2480MHz
Test by :Gary

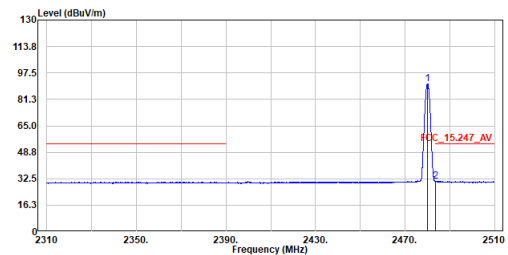


No.	Frequency	Level	Limit	Over	Read	Factor	Remark
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	
1	2479.940	91.44	-----	-----	78.39	13.05	Peak
2	2499.220	44.03	74.00	-29.97	30.97	13.06	Peak

Note:

1. Level = Read Level + Factor
2. Factor = Antenna Factor + Cable Loss - Preamp Factor
3. Over Limit = Level - Limit Line
4. The peak result complies with AVG limit, AVG result is deemed to comply with AVG limit.
5. The other emission levels were very low against the limit.

Site :HC-CB04
Condition :3m ,Vertical
Mode :BLE_1M_TX_2480MHz
Test by :Gary



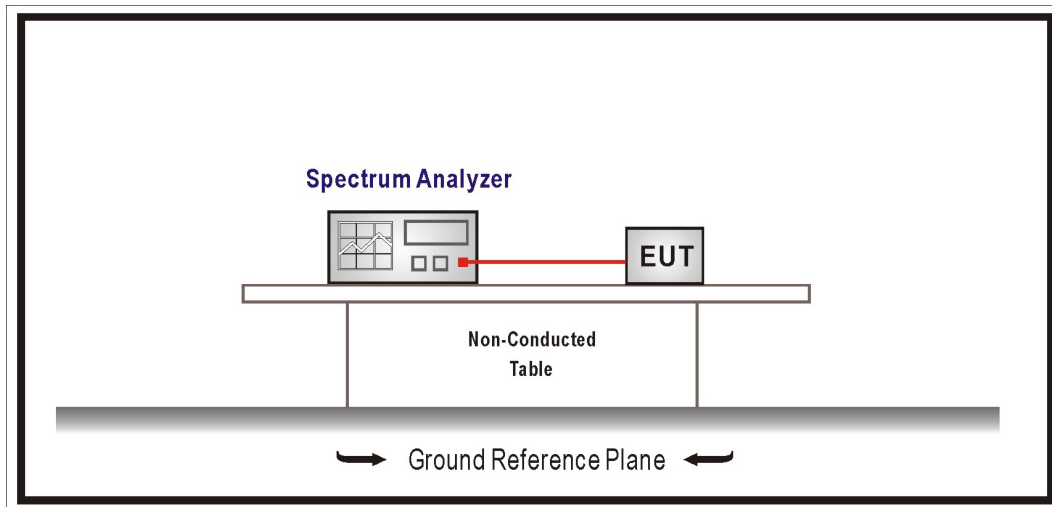
No.	Frequency	Level	Limit	Over	Read	Factor	Remark
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	
1	2480.020	90.92	-----	-----	77.87	13.05	Average
2	2483.520	31.07	54.00	-22.93	18.03	13.04	Average

Note:

1. Level = Read Level + Factor
2. Factor = Antenna Factor + Cable Loss - Preamp Factor
3. Over Limit = Level - Limit Line
4. The peak result complies with AVG limit, AVG result is deemed to comply with AVG limit.
5. The other emission levels were very low against the limit.

7. Occupied Bandwidth & DTS Bandwidth

7.1 Test Setup



7.2 Test Limit

The 6 dB bandwidth: ≥ 500 kHz.

Occupied Bandwidth: NA

7.3 Test Procedures

The EUT was setup according to ANSI C63.10: 2013; tested according to DTS test procedure of KDB 558074 D01 V05r02 for compliance to FCC 47CFR 15.247 requirements.

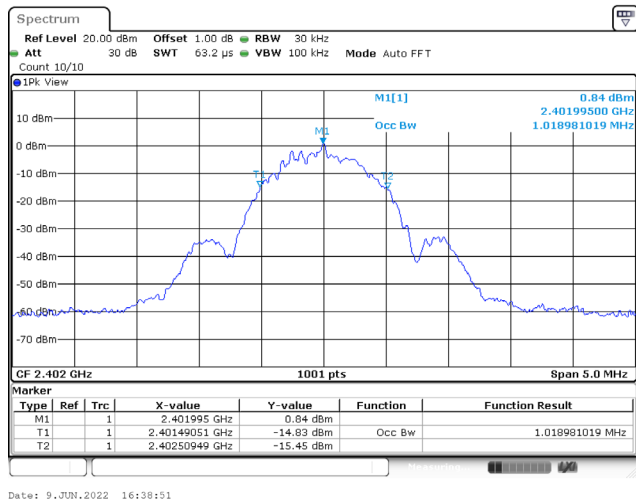
7.4 Test Specification

According to FCC Part 15 Subpart C Paragraph 15.247.

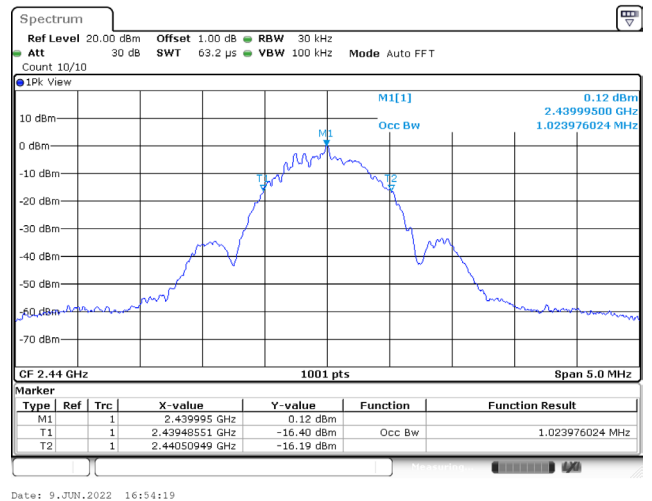
7.5 Test Result of Occupied Bandwidth

Modulation	Channel	Frequency (MHz)	Measure Level (MHz)	Limit (MHz)
GFSK (1 Mbps)	00	2402	1.018	-
	19	2440	1.023	-
	39	2480	1.023	-

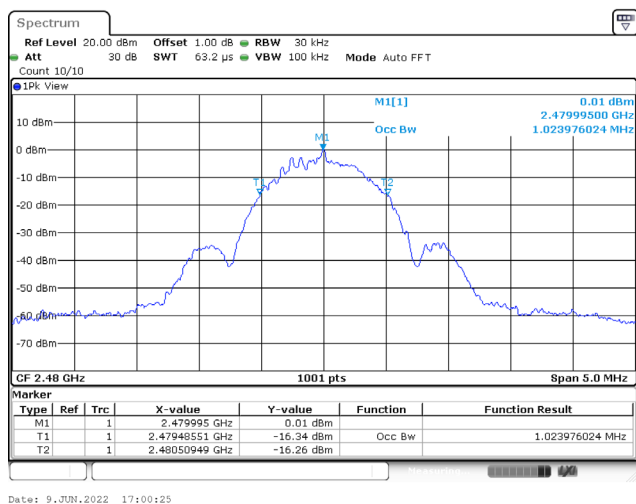
GFSK (1 Mbps) / 2402 MHz



GFSK (1 Mbps) / 2440 MHz



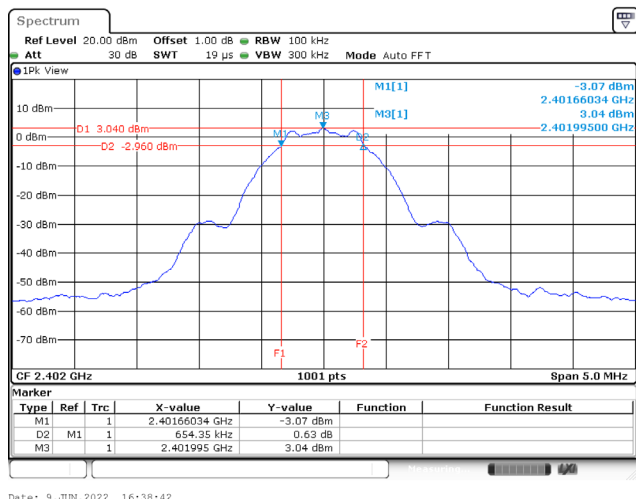
GFSK (1 Mbps) / 2480 MHz



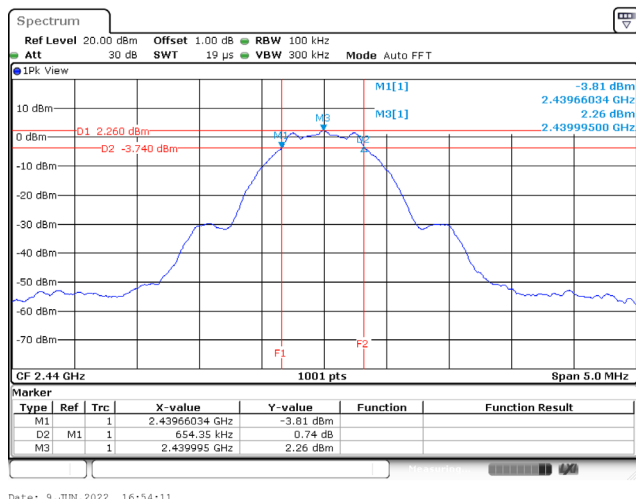
7.6 Test Result of DTS Bandwidth

Modulation	Channel	Frequency (MHz)	Measure Level (MHz)	Limit (MHz)	Result
GFSK (1 Mbps)	00	2402	0.654	≥ 0.500	Pass
	19	2440	0.654	≥ 0.500	Pass
	39	2480	0.654	≥ 0.500	Pass

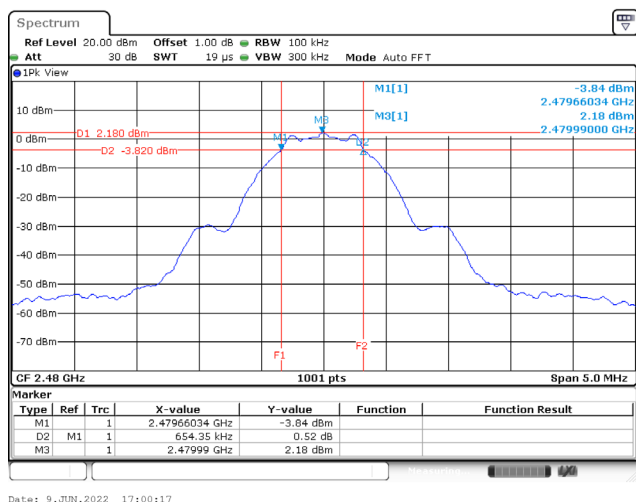
GFSK (1 Mbps) / 2402 MHz



GFSK (1 Mbps) / 2440 MHz

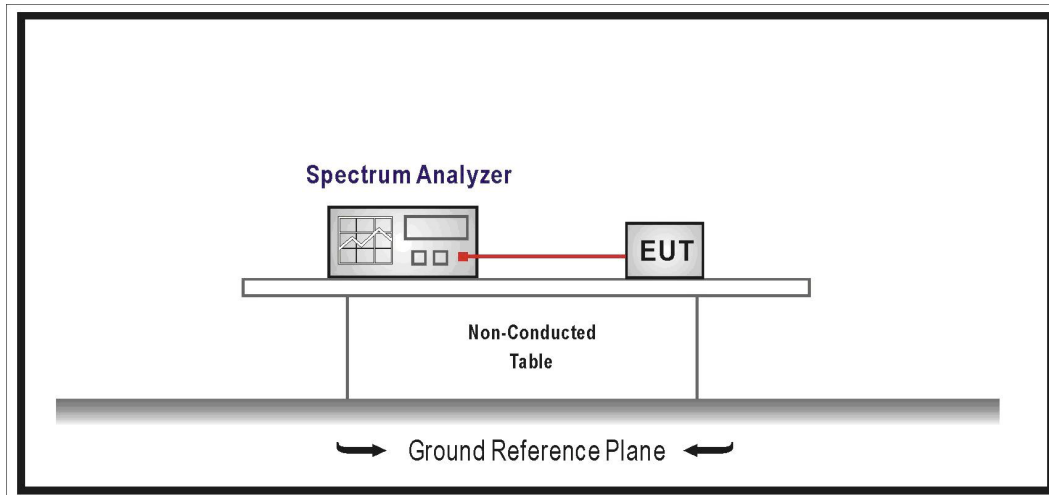


GFSK (1 Mbps) / 2480 MHz



8. Maximum Power Spectral Density

8.1 Test Setup



8.2 Test Limit

The peak power spectral density conducted from the intentional radiated to the antenna shall not be greater than +8 dBm in any 3 kHz band during any time interval of continuous transmission.

8.3 Test Procedures

The EUT was setup according to ANSI C63.10: 2013; tested according to DTS test procedure of KDB 558074 D01 V05r02 for compliance to FCC 47CFR 15.247 requirements.

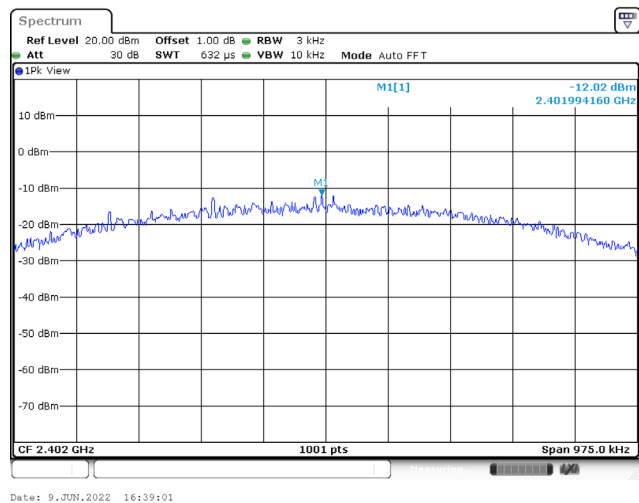
8.4 Test Specification

According to FCC Part 15 Subpart C Paragraph 15.247

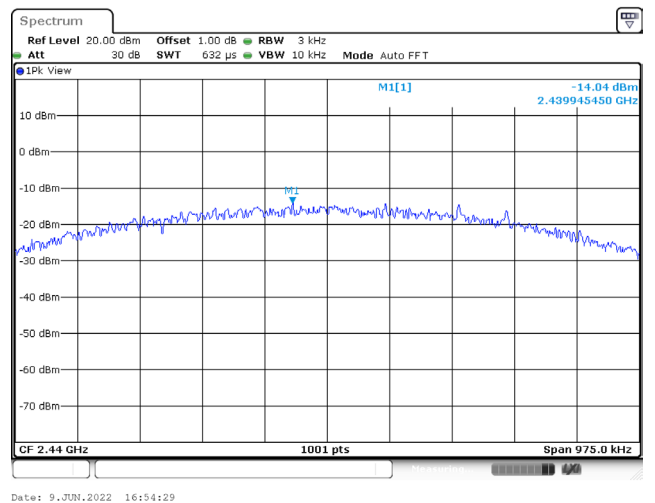
8.5 Test Result of Maximum Power Spectral Density

Modulation	Channel	Frequency (MHz)	Measure Value (dBm/3kHz)	Limit (dBm/3kHz)	Result
GFSK (1 Mbps)	00	2402	-12.020	≤ 8.000	Pass
	19	2440	-14.040	≤ 8.000	Pass
	39	2480	-14.370	≤ 8.000	Pass

GFSK (1 Mbps) / 2402 MHz



GFSK (1 Mbps) / 2440 MHz



GFSK (1 Mbps) / 2480 MHz

