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Shenzhen Branch

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TEST REPORT

Application No.:	SZEM1801000176CR (SHEM1712008629CR)
FCC ID:	2AC8UA1619
Applicant:	Anhui Huami Information Technology Co.,Ltd.
Address of Applicant:	Building A4, 12th Floor, No.800 Wangjiang Road, Hefei, China (230088)
Manufacturer:	Anhui Huami Information Technology Co.,Ltd.
Address of Manufacturer:	Building A4, 12th Floor, No.800 Wangjiang Road, Hefei, China (230088)
Factory:	Anhui Huami Information Technology Co.,Ltd.
Address of Factory:	Building A4, 12th Floor, No.800 Wangjiang Road, Hefei, China (230088)
Equipment Under Test (EUT):	
EUT Name:	Amazfit Stratos
Model No.:	A1619
Standard(s) :	47 CFR Part 15, Subpart C 15.247
Date of Receipt:	2017-12-15
Date of Test:	2017-12-26 to 2018-01-23
Date of Issue:	2018-01-26
Test Result:	**Pass***

* In the configuration tested, the EUT complied with the standards specified above.

Keny Xu
EMC Laboratory Manager

The manufacturer should ensure that all products in series production are in conformity with the product sample detailed in this report. 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. Any mention of SGS International Electrical Approvals or testing done by SGS International Electrical Approvals in connection with, distribution or use of the product described in this report must be approved by SGS International Electrical Approvals in writing.

Revision Record				
Version	**Chapter**	**Date**	**Modifier**	**Remark**
01	*/*	*2018-01-26*	*/*	*Original*

Authorized for issue by:				
				
		Foray Chen /Project Engineer		
				
		Eric Fu /Reviewer		

2 Test Summary

Radio Spectrum Technical Requirement				
Item	**Standard**	**Method**	**Requirement**	**Result**
Antenna Requirement	47 CFR Part 15, Subpart C 15.247	N/A	47 CFR Part 15, Subpart C 15.203 & 15.247(c)	Pass
Other requirements Frequency Hopping Spread Spectrum System Hopping Sequence	47 CFR Part 15, Subpart C 15.247	N/A	47 CFR Part 15, Subpart C 15.247(a)(1),(g),(h)	Pass

Radio Spectrum Matter Part				
Item	**Standard**	**Method**	**Requirement**	**Result**
Conducted Peak Output Power	47 CFR Part 15, Subpart C 15.247	ANSI C63.10 (2013) Section 7.8.5	47 CFR Part 15, Subpart C 15.247(b)(1)	Pass
20dB Bandwidth	47 CFR Part 15, Subpart C 15.247	ANSI C63.10 (2013) Section 6.9	47 CFR Part 15, Subpart C 15.247(a)(1)	Pass
Carrier Frequencies Separation	47 CFR Part 15, Subpart C 15.247	ANSI C63.10 (2013) Section 7.8.2	47 CFR Part 15, Subpart C 15.247a(1)	Pass
Hopping Channel Number	47 CFR Part 15, Subpart C 15.247	ANSI C63.10 (2013) Section 7.8.3	47 CFR Part 15, Subpart C 15.247a(1)(iii)	Pass
Dwell Time	47 CFR Part 15, Subpart C 15.247	ANSI C63.10 (2013) Section 7.8.4	47 CFR Part 15, Subpart C 15.247a(1)(iii)	Pass
Conducted Band Edges Measurement	47 CFR Part 15, Subpart C 15.247	ANSI C63.10 (2013) Section 7.8.6	47 CFR Part 15, Subpart C 15.247(d)	Pass
Conducted Spurious Emissions	47 CFR Part 15, Subpart C 15.247	ANSI C63.10 (2013) Section 7.8.8	47 CFR Part 15, Subpart C 15.247(d)	Pass
Radiated Emissions which fall in the restricted bands	47 CFR Part 15, Subpart C 15.247	ANSI C63.10 (2013) Section 6.10.5	47 CFR Part 15, Subpart C 15.205 & 15.209	Pass
Radiated Spurious Emissions	47 CFR Part 15, Subpart C 15.247	ANSI C63.10 (2013) Section 6.10.4	47 CFR Part 15, Subpart C 15.205 & 15.209	Pass

3 Contents

4 General Information

4.1 Details of E.U.T.

Power supply:	DC 3.8V by Built-in lithium-ion polymer battery (290mAH)
Channel Spacing	1MHz
Modulation Type	GFSK, π/4DQPSK, 8DPSK
Number of Channels	79
Operation Frequency	2402MHz to 2480MHz
Spectrum Spread Technology	Frequency Hopping Spread Spectrum(FHSS)
Antenna Type	Integral antenna (It is shared by WiFi & BT)
Antenna Gain:	-0.5 dBi

4.2 Description of Support Units

Description	Manufacturer	Model No.
Laptop	LENOVO	R400

4.3 Test Environment

Environment Parameter	Selected Values During Tests	
Relative Humidity	Ambient	
Value	Temperature(°C)	Voltage(V)
TNVN	21	DC 3.8

Note:

VN:Normal Voltage VL:Low Extreme Test Voltage VH:High Extreme Test Voltage

TN:Normal Temperature TL:Low Extreme Test Temperature TH:High Extreme Test Temperature

Operation Frequency each of channel							
Channel	Frequency	Channel	Frequency	Channel	Frequency	Channel	Frequency
1	2402MHz	21	2422MHz	41	2442MHz	61	2462MHz
2	2403MHz	22	2423MHz	42	2443MHz	62	2463MHz
3	2404MHz	23	2424MHz	43	2444MHz	63	2464MHz
4	2405MHz	24	2425MHz	44	2445MHz	64	2465MHz
5	2406MHz	25	2426MHz	45	2446MHz	65	2466MHz
6	2407MHz	26	2427MHz	46	2447MHz	66	2467MHz
7	2408MHz	27	2428MHz	47	2448MHz	67	2468MHz
8	2409MHz	28	2429MHz	48	2449MHz	68	2469MHz
9	2410MHz	29	2430MHz	49	2450MHz	69	2470MHz
10	2411MHz	30	2431MHz	50	2451MHz	70	2471MHz
11	2412 MHz	31	2432 MHz	51	2452 MHz	71	2472 MHz
12	2413 MHz	32	2433 MHz	52	2453 MHz	72	2473 MHz
13	2414 MHz	33	2434 MHz	53	2454 MHz	73	2474 MHz
14	2415 MHz	34	2435 MHz	54	2455 MHz	74	2475 MHz
15	2416 MHz	35	2436 MHz	55	2456 MHz	75	2476 MHz

16	2417 MHz	36	2437 MHz	56	2457 MHz	76	2477 MHz
17	2418 MHz	37	2438 MHz	57	2458 MHz	77	2478 MHz
18	2419 MHz	38	2439 MHz	58	2459 MHz	78	2479 MHz
19	2420 MHz	39	2440 MHz	59	2460 MHz	79	2480 MHz
20	2421 MHz	40	2441 MHz	60	2461 MHz		

Using test software was control EUT work in continuous transmitting mode. And select test channel as below:

For GFSK, π/4DQPSK, 8DPSK modulation

Channel	Frequency
The lowest channel (CH1)	2402MHz
The middle channel (CH40)	2441MHz
The highest channel (CH79)	2480MHz

4.4 Measurement Uncertainty

No.	Parameter	Measurement Uncertainty
1	Radio Frequency	< ±1 x 10^{-5}
2	Total RF power, conducted	< ±1.5 dB
3	RF power density, conducted	< ±3 dB
4	Spurious emissions, conducted	< ±3 dB
5	All emissions, radiated	< ±6 dB (Below 1GHz) < ±6 dB (Above 1GHz)
6	Temperature	< ±1°C
7	Humidity	< ±5 %
8	DC and low frequency voltages	< ±3 %

4.5 Test Location

All tests were performed at:

SGS-CSTC Standards Technical Services Co., Ltd., Shenzhen Branch

No. 1 Workshop, M-10, Middle Section, Science & Technology Park, Shenzhen, Guangdong, China. 518057.

Tel: +86 755 2601 2053 Fax: +86 755 2671 0594

No tests were sub-contracted.

4.6 Test Facility

The test facility is recognized, certified, or accredited by the following organizations:

• CNAS (No. CNAS L2929)

CNAS has accredited SGS-CSTC Standards Technical Services Co., Ltd. Shenzhen Branch EMC Lab to ISO/IEC 17025:2005 General Requirements for the Competence of Testing and Calibration Laboratories (CNAS-CL01 Accreditation Criteria for the Competence of Testing and Calibration Laboratories) for the competence in the field of testing.

• A2LA (Certificate No. 3816.01)

SGS-CSTC Standards Technical Services Co., Ltd., Shenzhen EMC Laboratory is accredited by the American Association for Laboratory Accreditation(A2LA). Certificate No. 3816.01.

• VCCI

The 10m Semi-anechoic chamber and Shielded Room of SGS-CSTC Standards Technical Services Co., Ltd. have been registered in accordance with the Regulations for Voluntary Control Measures with Registration No.: G-823, R-4188, T-1153 and C-2383 respectively.

• FCC –Designation Number: CN1178

SGS-CSTC Standards Technical Services Co., Ltd., Shenzhen EMC Laboratory has been recognized as an accredited testing laboratory.

Designation Number: CN1178. Test Firm Registration Number: 406779.

• Industry Canada (IC)

Two 3m Semi-anechoic chambers and the 10m Semi-anechoic chamber of SGS-CSTC Standards Technical Services Co., Ltd. Shenzhen Branch EMC Lab have been registered by Certification and Engineering Bureau of Industry Canada for radio equipment testing with Registration No.: 4620C-1, 4620C-2, 4620C-3.

4.7 Deviation from Standards

None

4.8 Abnormalities from Standard Conditions

None

5 Equipment List

Equipment	Manufacturer	Model No	Inventory No	Cal Date	Cal Due Date
Conducted Emission at AC Power Line					
EMI test receiver	R&S	ESR7	SHEM162-1	2017-12-20	2018-12-19
LISN	Schwarzbeck	NSLK8127	SHEM061-1	2017-12-20	2018-12-19
LISN	EMCO	3816/2	SHEM019-1	2017-12-20	2018-12-19
Pulse limiter	R&S	ESH3-Z2	SHEM029-1	2017-12-20	2018-12-19
CE test Cable	/	CE01	/	2017-12-26	2018-12-25
Conducted Test					
Spectrum Analyzer	R&S	FSP-30	SHEM002-1	2017-12-20	2018-12-19
Spectrum Analyzer	Agilent	N9020A	SHEM181-1	2017-09-26	2018-09-25
Power meter	R&S	NRP	SHEM057-1	2017-12-26	2018-12-25
Power Sensor	R&S	NRP-Z22	SHEM136-1	2017-07-22	2018-07-21
Power Sensor	R&S	NRP-Z91	SHEM057-2	2017-12-26	2018-12-25
Signal Generator	R&S	SMR40	SHEM058-1	2017-07-03	2018-07-02
Signal Generator	Agilent	N5182A	SHEM182-1	2017-09-26	2018-09-25
Communication Tester	R&S	CMW270	SHEM183-1	2017-10-22	2018-10-21
Switcher	Tonscend	JS0806	SHEM184-1	2017-09-26	2018-09-25
Splitter	Anritsu	MA1612A	SHEM185-1	/	/
Coupler	e-meca	803-S-1	SHEM186-1	/	/
High-low Temp Cabinet	Suzhou Zhihe	TL-40	SHEM087-1	2017-09-26	2018-09-25
AC Power Stabilizer	WOCEN	6100	SHEM045-1	2017-12-26	2018-12-25
DC Power Supply	QJE	QJ30003SII	SHEM046-1	2017-12-26	2018-12-25
Conducted test Cable	/	RF01, RF 02	/	2017-12-26	2018-12-25
Radiated Test					
EMI test receiver	R&S	ESU40	SHEM051-1	2017-12-20	2018-12-19
Spectrum Analyzer	R&S	FSP-30	SHEM002-1	2017-12-20	2018-12-19
Loop Antenna (9kHz-30MHz)	Schwarzbeck	FMZB1519	SHEM135-1	2017-04-10	2020-04-09
Antenna (25MHz-2GHz)	Schwarzbeck	VULB9168	SHEM048-1	2017-02-28	2020-02-27
Antenna (25MHz-3GHz)	Schwarzbeck	HL562	SHEM010-1	2017-02-28	2020-02-27
Horn Antenna (1-8GHz)	Schwarzbeck	HF906	SHEM009-1	2017-10-24	2020-10-23
Horn Antenna (1-18GHz)	Schwarzbeck	BBHA9120D	SHEM050-1	2017-01-14	2020-01-13
Horn Antenna (14-40GHz)	Schwarzbeck	BBHA 9170	SHEM049-1	2017-12-03	2020-12-02
Pre-amplifier (9KHz-2GHz)	CLAVIIO	BDLNA-0001-412010	SHEM164-1	2017-08-22	2018-08-21
Pre-amplifier (1-18GHz)	CLAVIIO	BDLNA-0118-352810	SHEM050-2	2017-08-22	2018-08-21
High-amplifier (14-40GHz)	Schwarzbeck	10001	SHEM049-2	2017-12-20	2018-12-19
Band filter	LORCH	9BRX-875/X150-SR	SHEM156-1	/	/
Band filter	LORCH	13BRX-1950/X500-SR	SHEM083-2	/	/
Band filter	LORCH	5BRX-2400/X200-SR	SHEM155-1	/	/
Band filter	LORCH	5BRX-5500/X1000-SR	SHEM157-2	/	/
High pass Filter	Wainwright	WHK3.0/18G-100SS	SHEM157-1	/	/
High pass Filter	Wainwright	WHKS1700-3SS	SHEM157-3	/	/
Semi/Fully Anechoic	ST	11*6*6M	SHEM078-2	2017-07-22	2020-07-21
RE test Cable	/	RE01, RE02, RE06	/	2017-12-26	2018-12-25

6 Radio Spectrum Technical Requirement

6.1 Antenna Requirement

6.1.1 Test Requirement:

47 CFR Part 15, Subpart C 15.203 & 15.247(c)

6.1.2 Conclusion

Standard Requirement:

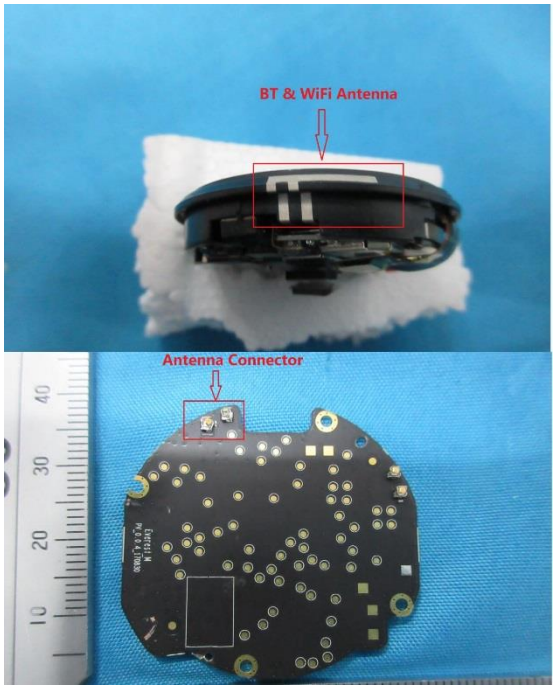
An intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator, the manufacturer may design the unit so that a broken antenna can be replaced by the user, but the use of a standard antenna jack or electrical connector is prohibited.

15.247(b) (4) requirement:

The conducted output power limit specified in paragraph (b) of this section is based on the use of antennas with directional gains that do not exceed 6 dBi. Except as shown in paragraph (c) of this section, if transmitting antennas 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 paragraphs (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.

EUT Antenna:

The antenna is integrated on the main PCB and no consideration of replacement. The best case gain of the antenna is –0.5dBi.



6.2 Other requirements Frequency Hopping Spread Spectrum System Hopping Sequence

6.2.1 Test Requirement:

47 CFR Part 15, Subpart C 15.247(a)(1),(g),(h)

6.2.2 Conclusion

Standard Requirement:

The system shall hop to channel frequencies that are selected at the system hopping rate from a Pseudorandom ordered list of hopping frequencies. Each frequency must be used equally on the average by each transmitter. The system receivers shall have input bandwidths that match the hopping channel bandwidths of their corresponding transmitters and shall shift frequencies in synchronization with the transmitted signals.

Frequency hopping spread spectrum systems are not required to employ all available hopping channels during each transmission. However, the system, consisting of both the transmitter and the receiver, must be designed to comply with all of the regulations in this section should the transmitter be presented with a continuous data (or information) stream. In addition, a system employing short transmission bursts must comply with the definition of a frequency hopping system and must distribute its transmissions over the minimum number of hopping channels specified in this section.

The incorporation of intelligence within a frequency hopping spread spectrum system that permits the system to recognize other users within the spectrum band so that it individually and independently chooses and adapts its hopsets to avoid hopping on occupied channels is permitted. The coordination of frequency hopping systems in any other manner for the express purpose of avoiding the simultaneous occupancy of individual hopping frequencies by multiple transmitters is not permitted.

Compliance for section 15.247(a)(1):

According to Technical Specification, the pseudorandom sequence may be generated in a nine-stage shift register whose 5th and 9th stage outputs are added in a modulo-two addition stage. And the result is fed back to the input of the first stage. The sequence begins with the first ONE of 9 consecutive ONEs; i.e. the shift register is initialized with nine ones.

> Number of shift register stages: 9

> Length of pseudo-random sequence: 29 -1 = 511 bits

> Longest sequence of zeros: 8 (non-inverted signal)

Linear Feedback Shift Register for Generation of the PRBS sequence

An example of Pseudorandom Frequency Hopping Sequence as follow:

Each frequency used equally on the average by each transmitter.

According to Technical Specification, the receivers are designed to have input and IF bandwidths that match the hopping channel bandwidths of any transmitters and shift frequencies in synchronization with the transmitted signals.

Compliance for section 15.247(g):

According to Technical Specification, the system transmits the packet with the pseudorandom hopping frequency with a continuous data and the short burst transmission from the Bluetooth system is also transmitted under the frequency hopping system with the pseudorandom hopping frequency system.

Compliance for section 15.247(h):

According to Technical specification, the system incorporates with an adaptive system to detect other user within the spectrum band s

7 Radio Spectrum Matter Test Results

7.1 Conducted Peak Output Power

Test Requirement 47 CFR Part 15, Subpart C 15.247(b)(1)

Test Method: ANSI C63.10 (2013) Section 7.8.5

Limit:

Frequency range(MHz)	Output power of the intentional radiator(watt)
902-928	1 for ≥50 hopping channels
	0.25 for 25≤ hopping channels <50
	1 for digital modulation
2400-2483.5	1 for ≥75 non-overlapping hopping channels
	0.125 for all other frequency hopping systems
	1 for digital modulation
5725-5850	1 for frequency hopping systems and digital modulation

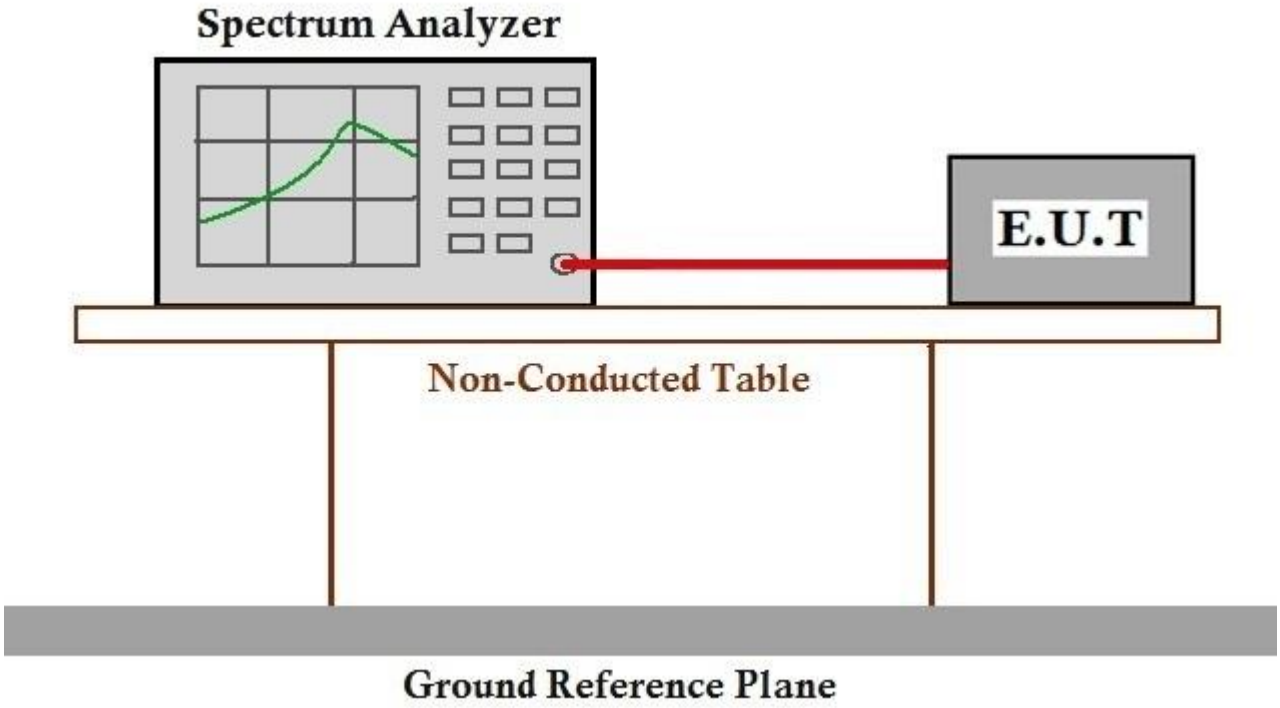
7.1.1 E.U.T. Operation

Operating Environment:

Temperature: 21 °C Humidity: 45 % RH Atmospheric Pressure: 1010 mbar

Test mode b:TX_non-Hop mode_Keep the EUT in continuously transmitting mode with GFSK modulation, π/4DQPSK modulation, 8DPSK modulation. All modes have been tested and only the data of worst case is recorded in the report.

7.1.2 Test Setup Diagram



7.1.3 Measurement Procedure and Data

The detailed test data see: Appendix 15.247 SZEM180100017601(BT)

7.2 20dB Bandwidth

Test Requirement 47 CFR Part 15, Subpart C 15.247(a)(1)

Test Method: ANSI C63.10 (2013) Section 6.9

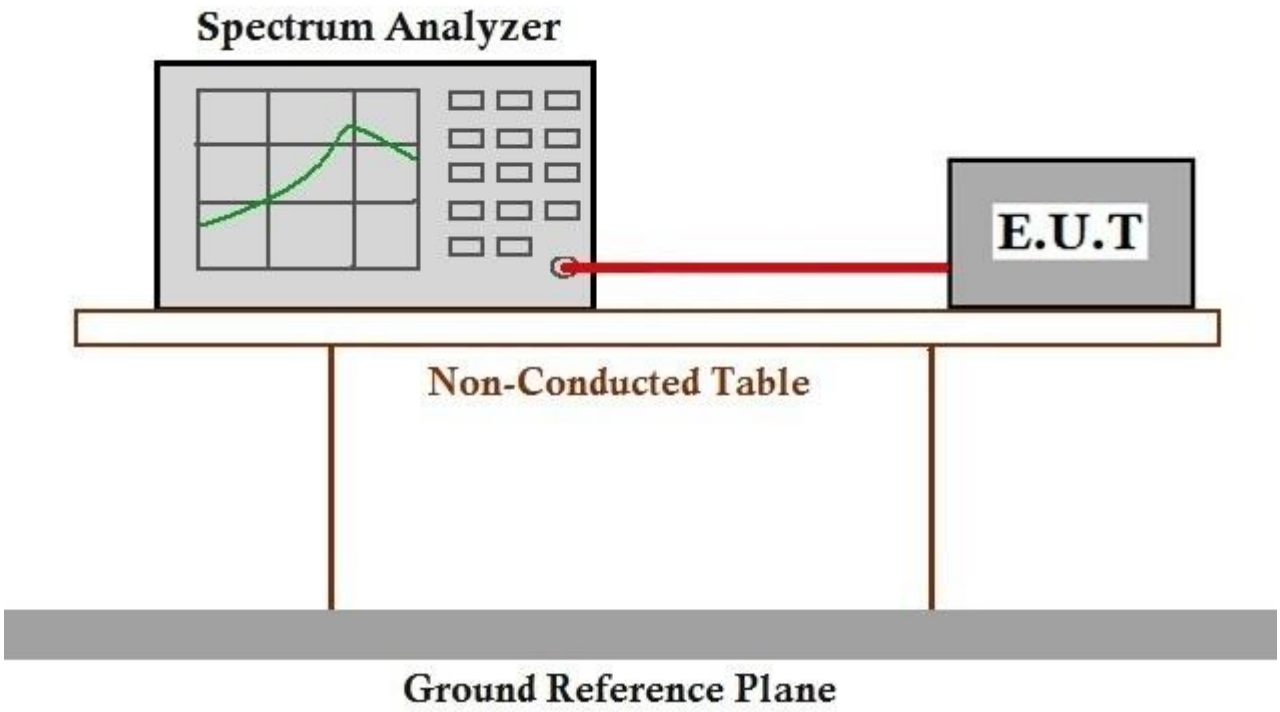
7.2.1 E.U.T. Operation

Operating Environment:

Temperature: 21 °C Humidity: 45 % RH Atmospheric Pressure: 1010 mbar

Test mode b:TX_non-Hop mode_Keep the EUT in continuously transmitting mode with GFSK modulation, π/4DQPSK modulation, 8DPSK modulation. All modes have been tested and only the data of worst case is recorded in the report.

7.2.2 Test Setup Diagram



7.2.3 Measurement Procedure and Data

The detailed test data see: Appendix 15.247 SZEM180100017601(BT)

7.3 Carrier Frequencies Separation

Test Requirement	47 CFR Part 15, Subpart C 15.247a(1)
Test Method:	ANSI C63.10 (2013) Section 7.8.2
Limit:	2/3 of the 20dB bandwidth base on the transmission power is less than 0.125W

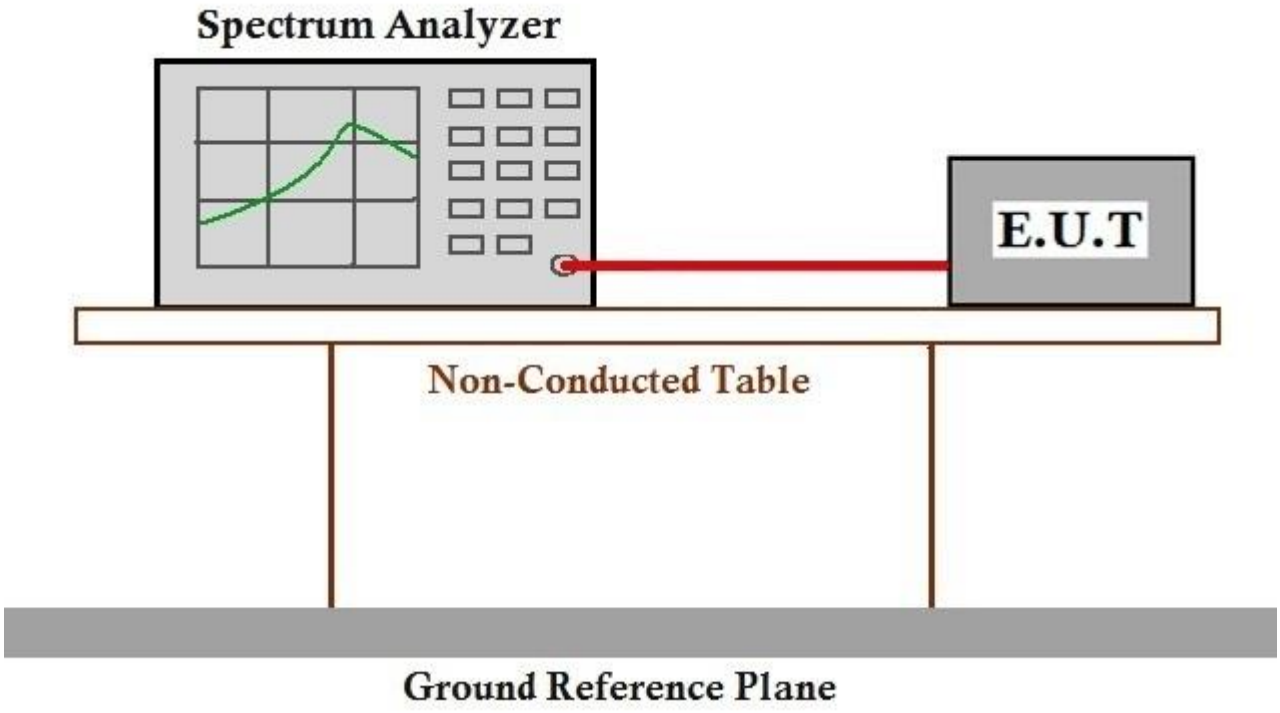
7.3.1 E.U.T. Operation

Operating Environment:

Temperature: 21 °C Humidity: 45 % RH Atmospheric Pressure: 1010 mbar

Test mode a:TX_Hop mode_Keep the EUT in frequency hopping mode with GFSK modulation, π/4DQPSK modulation, 8DPSK modulation. All modes have been tested and only the data of worst case is recorded in the report.

7.3.2 Test Setup Diagram



7.3.3 Measurement Procedure and Data

The detailed test data see: Appendix 15.247 SZEM180100017601(BT)

7.4 Hopping Channel Number

Test Requirement 47 CFR Part 15, Subpart C 15.247a(1)(iii)

Test Method: ANSI C63.10 (2013) Section 7.8.3

Limit:

Frequency range(MHz)	Number of hopping channels (minimum)
902-928	50 for 20dB bandwidth <250kHz
	25 for 20dB bandwidth ≥250kHz
2400-2483.5	15
5725-5850	75

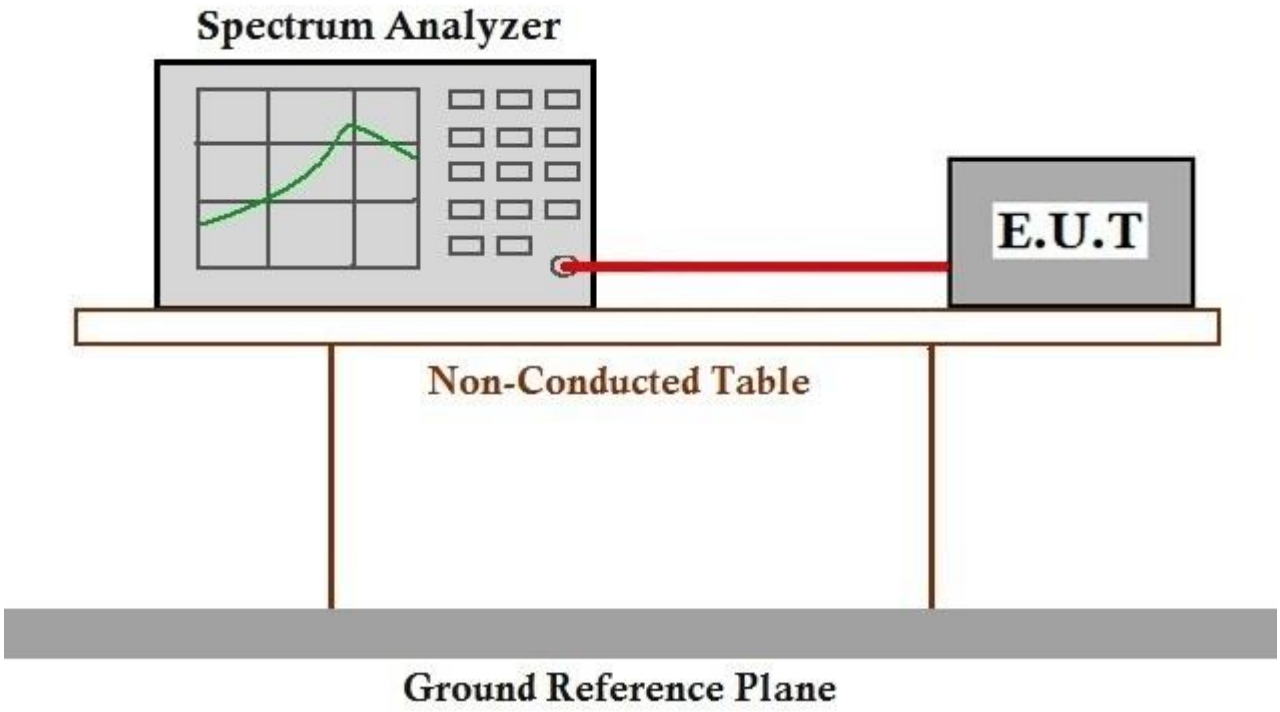
7.4.1 E.U.T. Operation

Operating Environment:

Temperature: 21 °C Humidity: 45 % RH Atmospheric Pressure: 1010 mbar

Test mode a:TX_Hop mode_Keep the EUT in frequency hopping mode with GFSK modulation, π/4DQPSK modulation, 8DPSK modulation. All modes have been tested and only the data of worst case is recorded in the report.

7.4.2 Test Setup Diagram



7.4.3 Measurement Procedure and Data

The detailed test data see: Appendix 15.247 SZEM180100017601(BT)

7.5 Dwell Time

Test Requirement 47 CFR Part 15, Subpart C 15.247a(1)(iii)

Test Method: ANSI C63.10 (2013) Section 7.8.4

Limit:

Frequency(MHz)	Limit
902-928	0.4S within a 20S period(20dB bandwidth<250kHz)
	0.4S within a 10S period(20dB bandwidth≥250kHz)
2400-2483.5	0.4S within a period of 0.4S multiplied by the number of hopping channels
5725-5850	0.4S within a 30S period

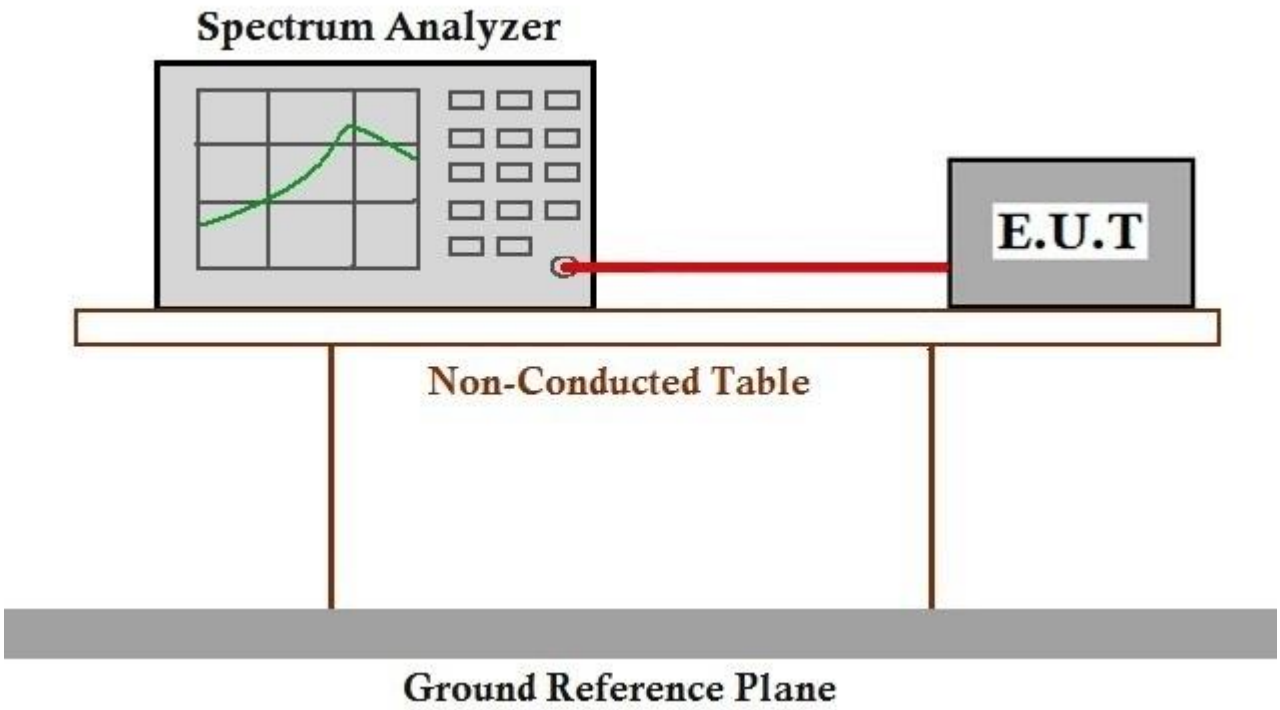
7.5.1 E.U.T. Operation

Operating Environment:

Temperature: 21 °C Humidity: 45 % RH Atmospheric Pressure: 1010 mbar

Test mode a:TX_Hop mode_Keep the EUT in frequency hopping mode with GFSK modulation, π/4DQPSK modulation, 8DPSK modulation. All modes have been tested and only the data of worst case is recorded in the report.

7.5.2 Test Setup Diagram



7.5.3 Measurement Procedure and Data

The detailed test data see: Appendix 15.247 SZEM180100017601(BT)

7.6 Conducted Band Edges Measurement

Test Requirement	47 CFR Part 15, Subpart C 15.247(d)
Test Method:	ANSI C63.10 (2013) Section 7.8.6
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 limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under paragraph (b)(3) of this 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. In addition, radiated emissions which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emission limits specified in §15.209(a) (see §15.205(c)

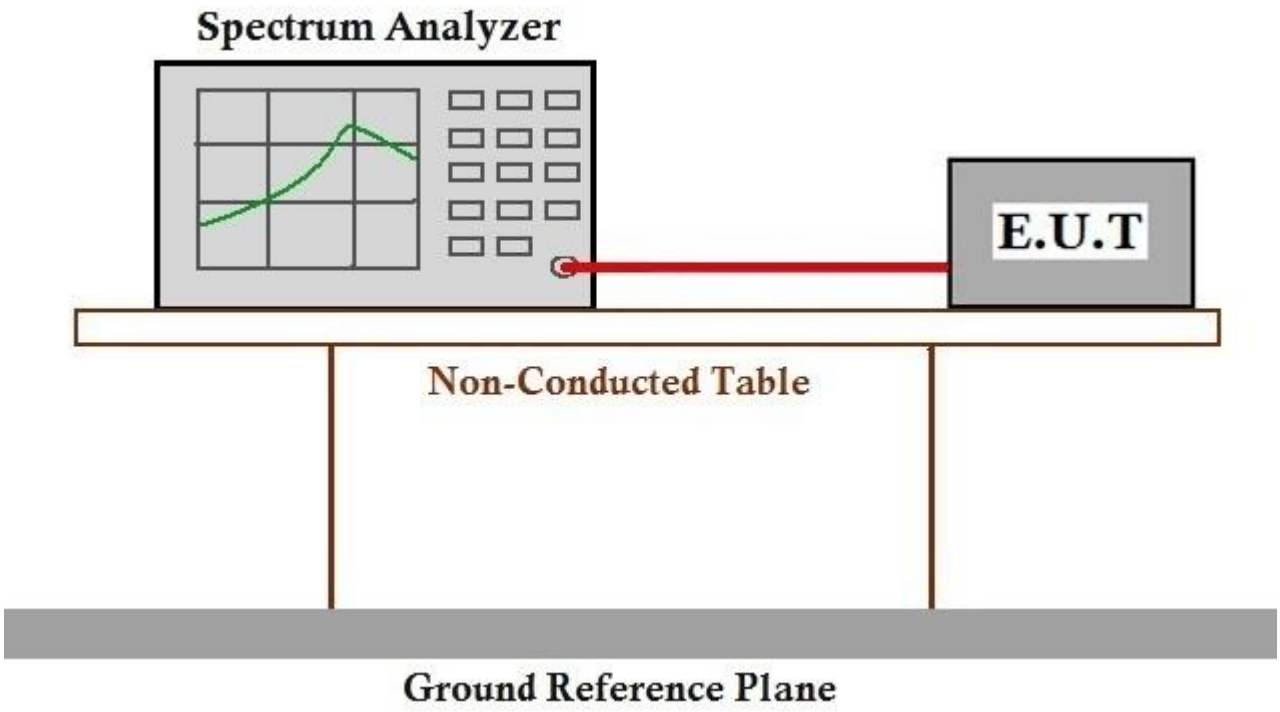
7.6.1 E.U.T. Operation

Operating Environment:

Temperature: 21 °C Humidity: 45 % RH Atmospheric Pressure: 1010 mbar

Pretest these mode to find the worst case:	a:TX_Hop mode_Keep the EUT in frequency hopping mode with GFSK modulation, π/4DQPSK modulation, 8DPSK modulation. All modes have been tested and only the data of worst case is recorded in the report. b:TX_non-Hop mode_Keep the EUT in continuously transmitting mode with GFSK modulation, π/4DQPSK modulation, 8DPSK modulation. All modes have been tested and only the data of worst case is recorded in the report.
The worst case for final test:	a:TX_Hop mode_Keep the EUT in frequency hopping mode with GFSK modulation, π/4DQPSK modulation, 8DPSK modulation. All modes have been tested and only the data of worst case is recorded in the report. b:TX_non-Hop mode_Keep the EUT in continuously transmitting mode with GFSK modulation, π/4DQPSK modulation, 8DPSK modulation. All modes have been tested and only the data of worst case is recorded in the report.

7.6.2 Test Setup Diagram



7.6.3 Measurement Procedure and Data

The detailed test data see: Appendix 15.247 SZEM180100017601(BT)

7.7 Conducted Spurious Emissions

Test Requirement	47 CFR Part 15, Subpart C 15.247(d)
Test Method:	ANSI C63.10 (2013) Section 7.8.8
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 limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under paragraph (b)(3) of this 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. In addition, radiated emissions which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emission limits specified in §15.209(a) (see §15.205(c)

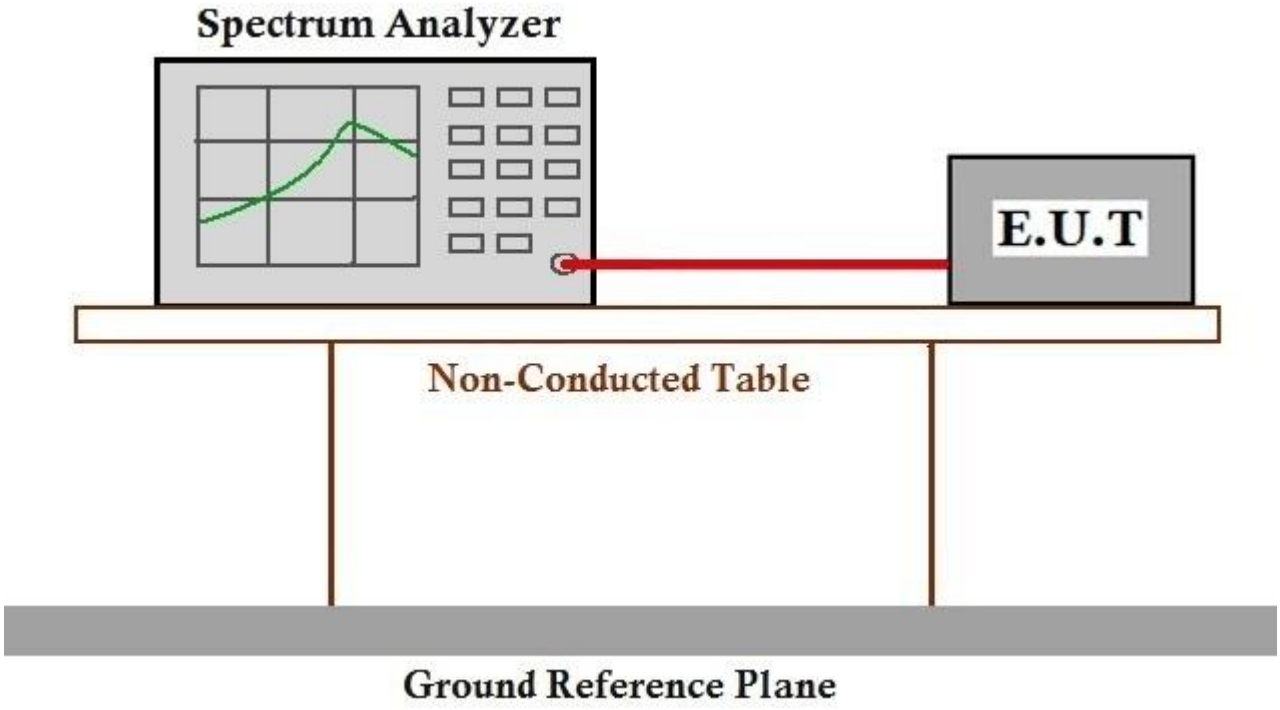
7.7.1 E.U.T. Operation

Operating Environment:

Temperature: 21 °C Humidity: 45 % RH Atmospheric Pressure: 1010 mbar

Test mode b:TX_non-Hop mode_Keep the EUT in continuously transmitting mode with GFSK modulation, π/4DQPSK modulation, 8DPSK modulation. All modes have been tested and only the data of worst case is recorded in the report.

7.7.2 Test Setup Diagram



7.7.3 Measurement Procedure and Data

The detailed test data see: Appendix 15.247 SZEM180100017601(BT)

7.8 Radiated Emissions which fall in the restricted bands

Test Requirement 47 CFR Part 15, Subpart C 15.205 & 15.209
Test Method: ANSI C63.10 (2013) Section 6.10.5
Measurement Distance: 3m
Limit:

Frequency(MHz)	Field strength(microvolts/meter)	Measurement distance(meters)
0.009-0.490	2400/F(kHz)	300
0.490-1.705	24000/F(kHz)	30
1.705-30.0	30	30
30-88	100	3
88-216	150	3
216-960	200	3
Above 960	500	3
Remark: The emission limits shown in the above table are based on measurements employing a CISPR quasi-peak detector except for the frequency bands 9-90kHz, 110-490kHz and above 1000 MHz. Radiated emission limits in these three bands are based on measurements employing an average detector, the peak field strength of any emission shall not exceed the maximum permitted average limits specified above by more than 20 dB under any condition of modulation.		

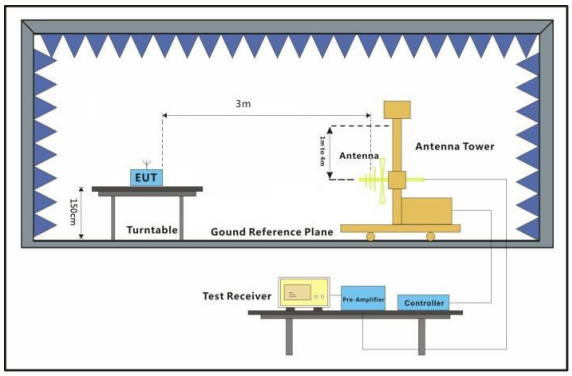
7.8.1 E.U.T. Operation

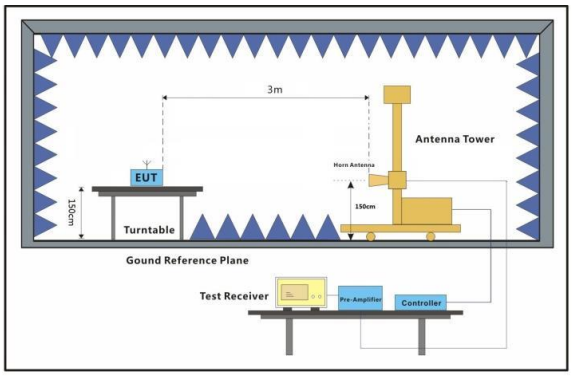
Operating Environment:

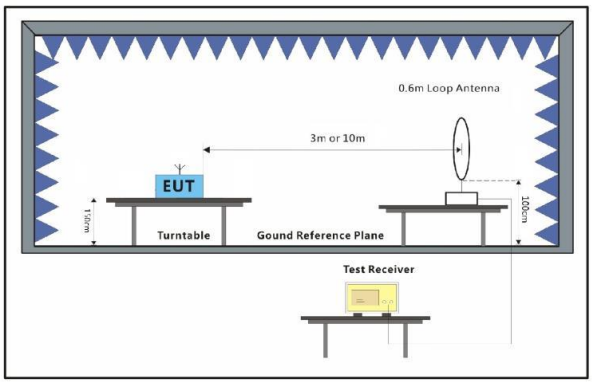
Temperature: 21 °C Humidity: 45 % RH Atmospheric Pressure: 1010 mbar

Test mode b:TX_non-Hop mode_Keep the EUT in continuously transmitting mode with GFSK modulation, π/4DQPSK modulation, 8DPSK modulation. All modes have been tested and only the data of worst case is recorded in the report.

7.8.2 Test Setup Diagram







7.8.3 Measurement Procedure and Data

a. For below 1GHz, the EUT was placed on the top of a rotating table 0.8 meters above the ground at a 3 or 10 meter semi-anechoic chamber. The table was rotated 360 degrees to determine the position of the highest radiation.

b. For above 1GHz, the EUT was placed on the top of a rotating table 1.5 meters above the ground at a 3 meter fully-anechoic chamber. The table was rotated 360 degrees to determine the position of the highest radiation.

c. The EUT was set 3 or 10 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.

d. The antenna height is varied from one meter to four meters above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are set to make the measurement.

e. For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights from 1 meter to 4 meters (for the test frequency of below 30MHz, the antenna was tuned to heights 1 meter) and the rotatable table was turned from 0 degrees to 360 degrees to find the maximum reading.

f. The test-receiver system was set to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.

g. If the emission level of the EUT in peak mode was 10dB lower than the limit specified, then testing could be stopped and the peak values of the EUT would be reported. Otherwise the emissions that did not have 10dB margin would be re-tested one by one using peak, quasi-peak or average method as specified and then reported in a data sheet.

h. Test the EUT in the lowest channel, the middle channel, the Highest channel.

i. The radiation measurements are performed in X, Y, Z axis positioning for Transmitting mode, and found the X axis positioning which it is the worst case.

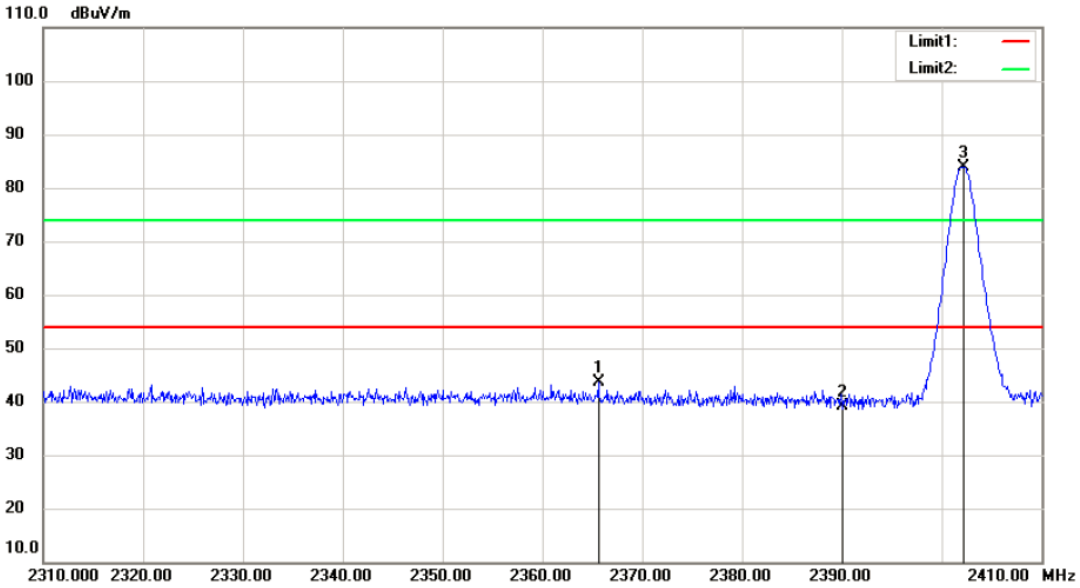
j. Repeat above procedures until all frequencies measured was complete.

Remark: Level= Read Level+ Cable Loss+ Antenna Factor- Preamp Factor

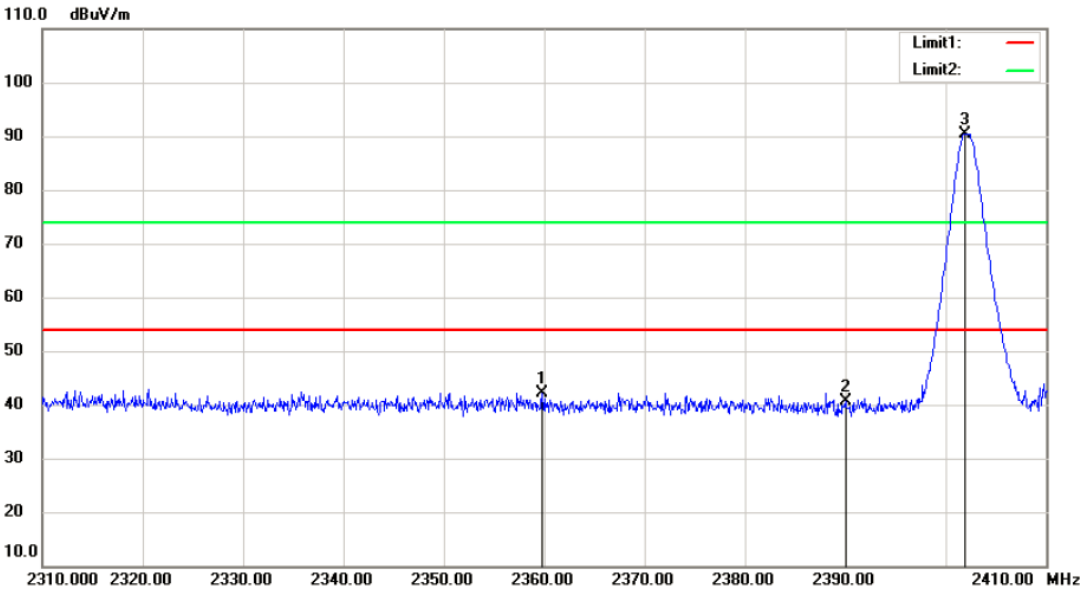
Lowest Channel(2402MHz) **Modulation: GFSK**

MK.	Frequency (MHz)	Reading (dBuV/m)	Corrected factor(dB)	Result (dBuV/m)	Limit (dBuV/m)	Over Limit (dB)	Detector	Polarization
1	2365.6	47.47	-3.81	43.66	54	-10.34	Peak	Vertical
2	2390	42.98	-3.89	39.09	54	-14.91	Peak	Vertical
3	2402.2	87.75	-3.92	83.83	54	29.83	Peak	Vertical
1	2359.8	45.98	-3.8	42.18	54	-11.82	Peak	Horizontal
2	2390	44.45	-3.89	40.56	54	-13.44	Peak	Horizontal
3	2401.9	94.4	-3.91	90.49	54	36.49	Peak	Horizontal

Vertical:



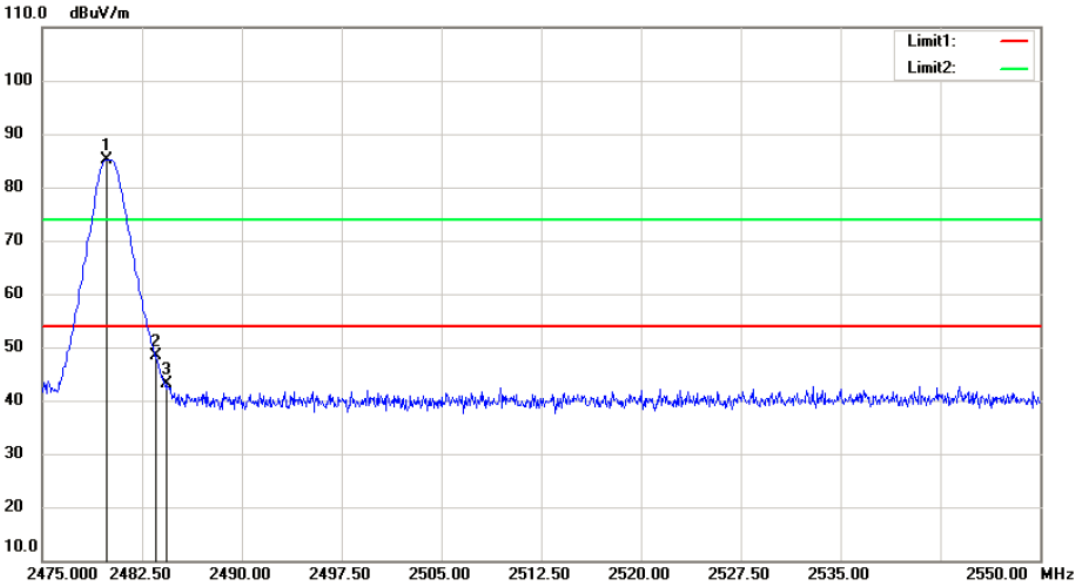
Horizontal:



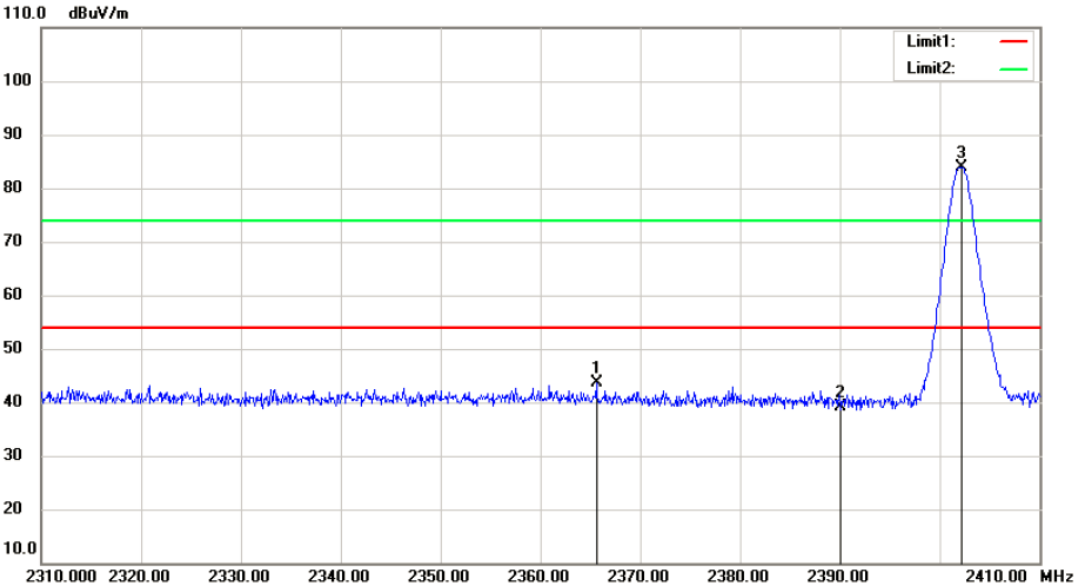
Highest Channel(2480MHz) **Modulation: GFSK**

MK.	Frequency (MHz)	Reading (dBuV/m)	Corrected factor(dB)	Result (dBuV/m)	Limit (dBuV/m)	Over Limit (dB)	Detector	Polarization
1	2479.8	89.15	-4	85.15	54	31.15	Peak	Vertical
2	2483.5	52.41	-4.01	48.4	54	-5.6	Peak	Vertical
3	2484.3	47.16	-4.02	43.14	54	-10.86	Peak	Vertical
1	2479.8	91.61	-4	87.61	54	33.61	Peak	Horizontal
2	2483.5	53.63	-4.01	49.62	54	-4.38	Peak	Horizontal
3	2483.925	50.64	-4.02	46.62	54	-7.38	Peak	Horizontal

Vertical:



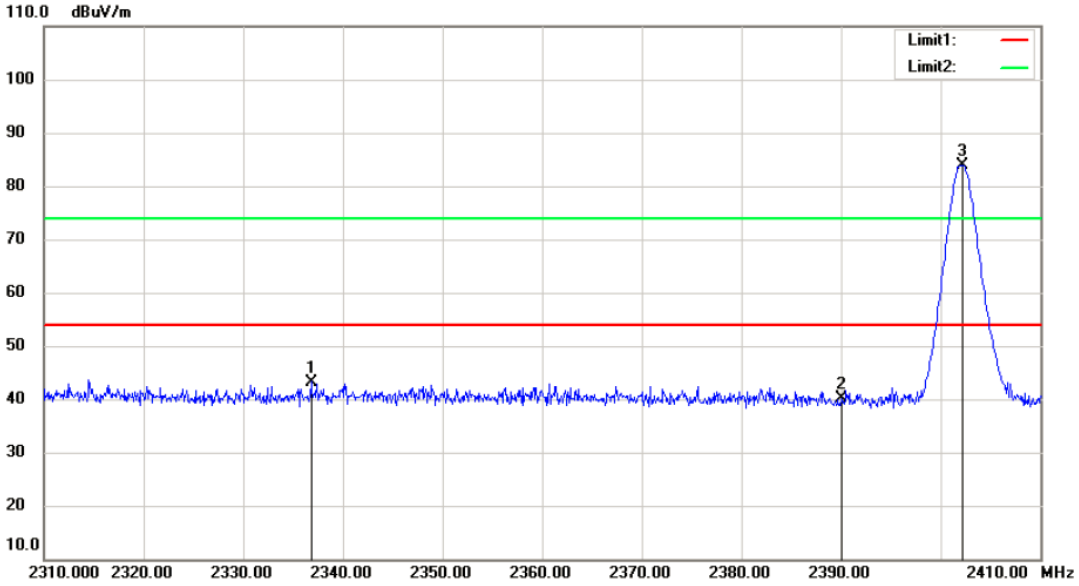
Horizontal:



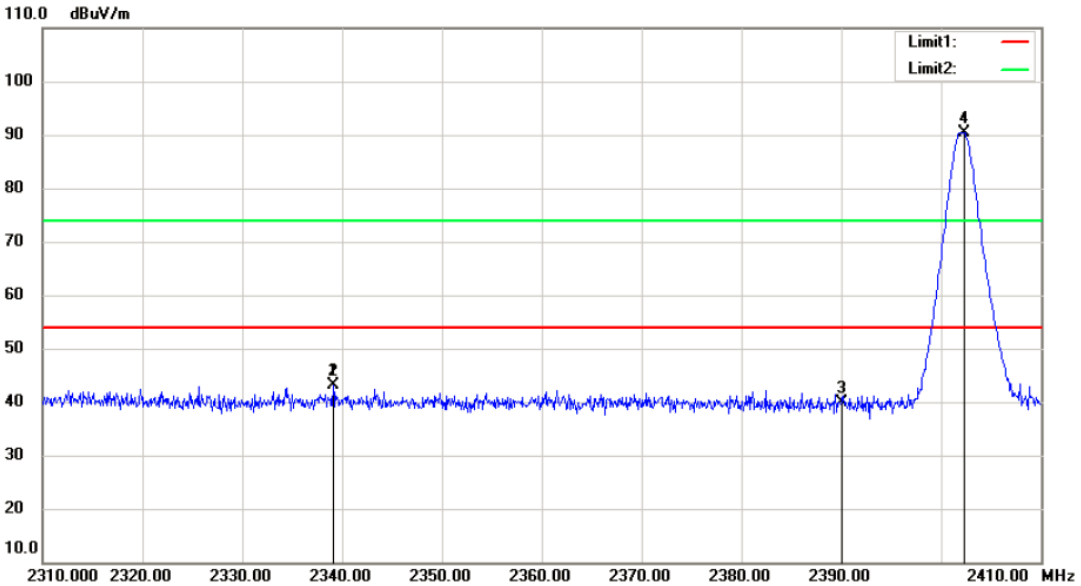
Lowest Channel(2402MHz) **Modulation: π/4DQPSK**

MK.	Frequency (MHz)	Reading (dBuV/m)	Corrected factor(dB)	Result (dBuV/m)	Limit (dBuV/m)	Over Limit (dB)	Detector	Polarization
1	2336.8	46.98	-3.73	43.25	54	-10.75	Peak	Vertical
2	2390	43.92	-3.89	40.03	54	-13.97	Peak	Vertical
3	2402.2	87.79	-3.92	83.87	54	29.87	Peak	Vertical
1	2339.1	46.86	-3.74	43.12	54	-10.88	Peak	Horizontal
2	2339.1	46.86	-3.74	43.12	54	-10.88	Peak	Horizontal
3	2390	43.88	-3.89	39.99	54	-14.01	Peak	Horizontal
4	2402.3	94.4	-3.92	90.48	54	36.48	Peak	Horizontal

Vertical:



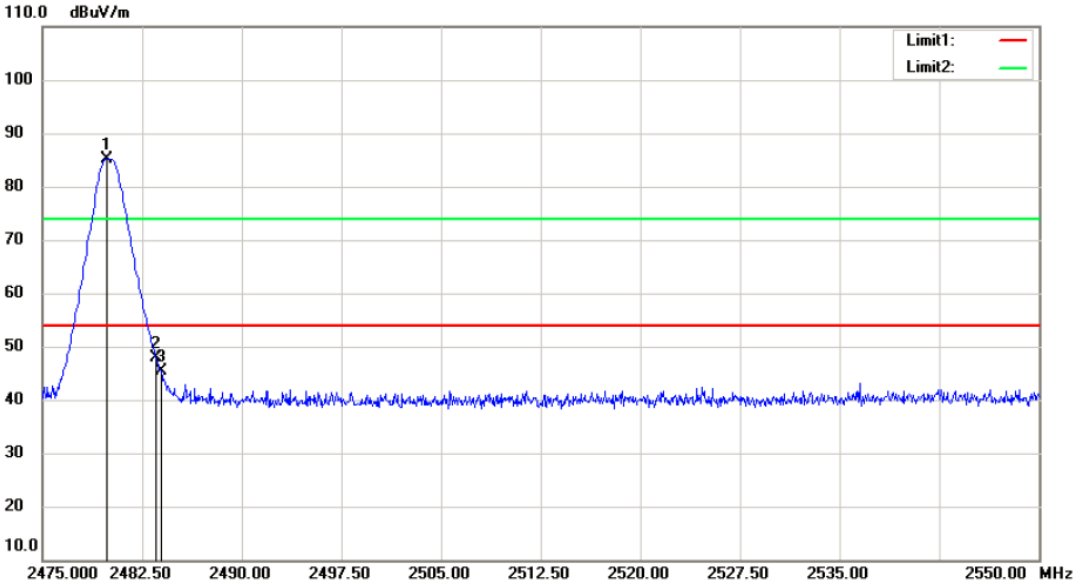
Horizontal:



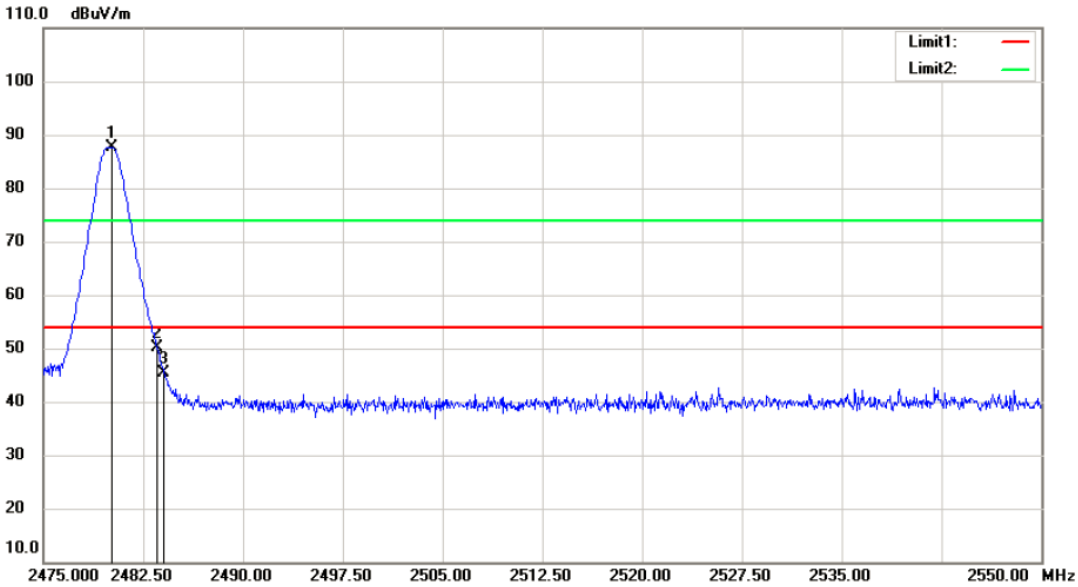
Highest Channel(2480MHz) **Modulation: π/4DQPSK**

MK.	Frequency (MHz)	Reading (dBuV/m)	Corrected factor(dB)	Result (dBuV/m)	Limit (dBuV/m)	Over Limit (dB)	Detector	Polarization
1	2479.8	89.15	-4	85.15	54	31.15	Peak	Vertical
2	2483.5	51.78	-4.01	47.77	54	-6.23	Peak	Vertical
3	2483.925	49.29	-4.02	45.27	54	-8.73	Peak	Vertical
1	2480.175	91.59	-4	87.59	54	33.59	Peak	Horizontal
2	2483.5	54.08	-4.01	50.07	54	-3.93	Peak	Horizontal
3	2484.075	49.51	-4.02	45.49	54	-8.51	Peak	Horizontal

Vertical:



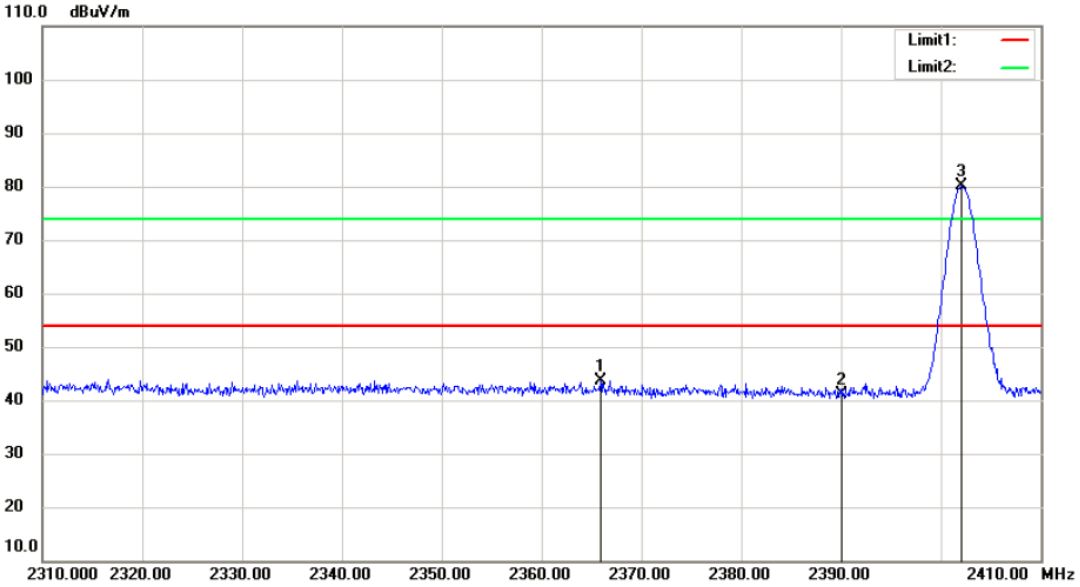
Horizontal:



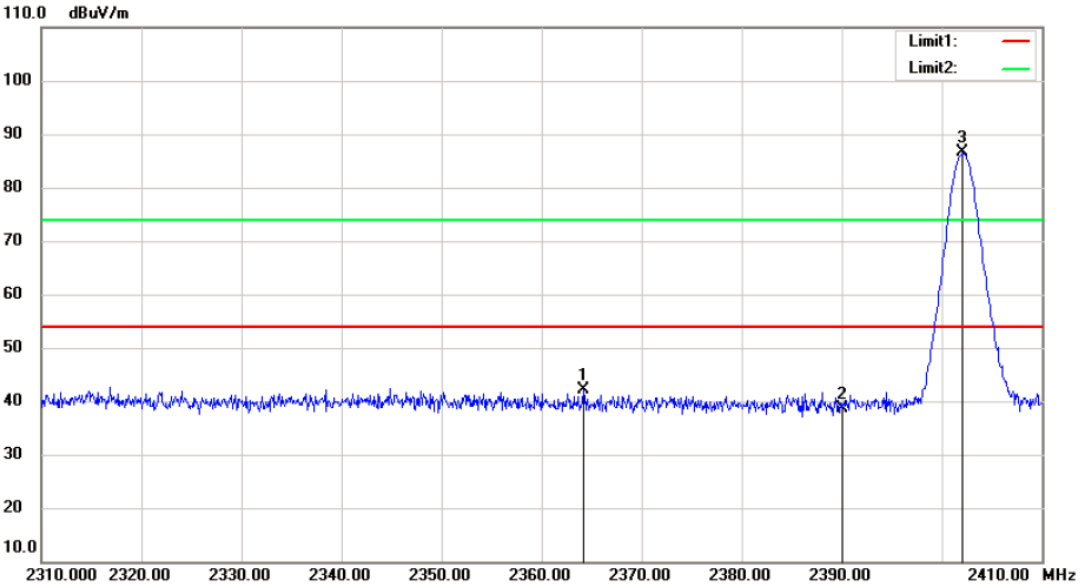
Lowest Channel(2402MHz) **Modulation: 8DPSK**

MK.	Frequency (MHz)	Reading (dBuV/m)	Corrected factor(dB)	Result (dBuV/m)	Limit (dBuV/m)	Over Limit (dB)	Detector	Polarization
1	2365.9	47.54	-3.81	43.73	54	-10.27	Peak	Vertical
2	2390	44.99	-3.89	41.1	54	-12.9	Peak	Vertical
2	2402.1	84.01	-3.92	80.09	54	26.09	Peak	Vertical
1	2364.2	46.02	-3.81	42.21	54	-11.79	Peak	Horizontal
2	2390	42.53	-3.89	38.64	54	-15.36	Peak	Horizontal
3	2402.1	90.65	-3.92	86.73	54	32.73	Peak	Horizontal

Vertical:



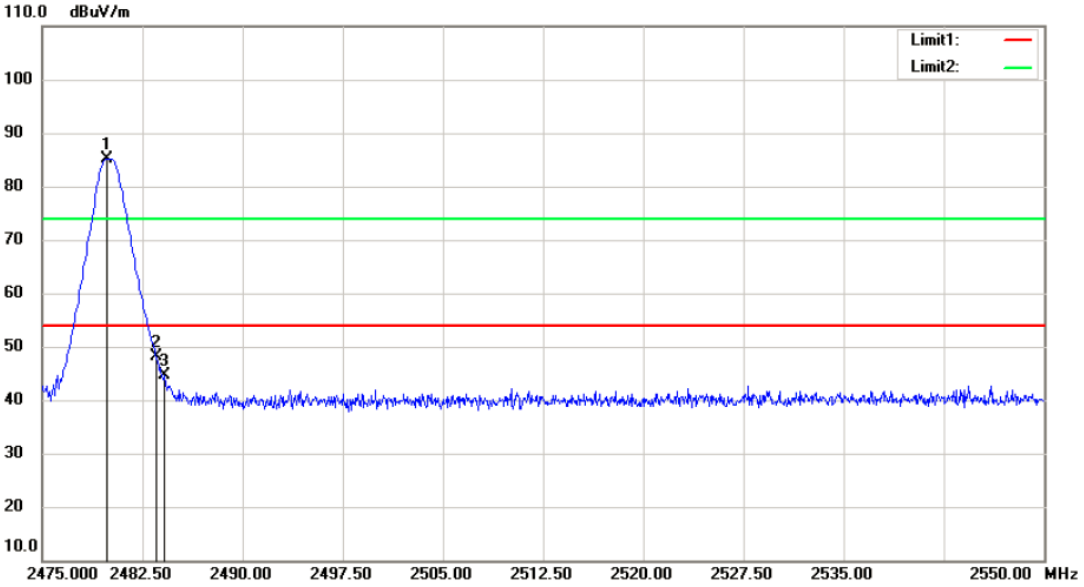
Horizontal:



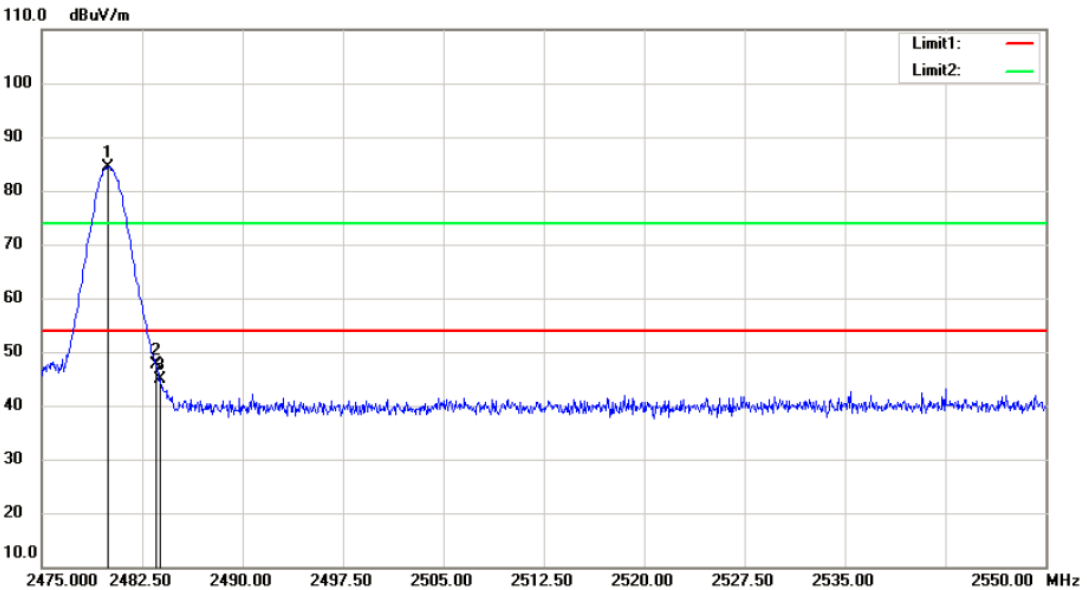
Highest Channel(2480MHz) **Modulation: 8DPSK**

MK.	Frequency (MHz)	Reading (dBuV/m)	Corrected factor(dB)	Result (dBuV/m)	Limit (dBuV/m)	Over Limit (dB)	Detector	Polarization
1	2479.8	89.18	-4	85.18	54	31.18	Peak	Vertical
2	2483.5	52.06	-4.01	48.05	54	-5.95	Peak	Vertical
3	2484.15	48.59	-4.02	44.57	54	-9.43	Peak	Vertical
1	2479.95	88.43	-4	84.43	54	30.43	Peak	Horizontal
2	2483.5	51.58	-4.01	47.57	54	-6.43	Peak	Horizontal
3	2483.85	48.83	-4.02	44.81	54	-9.19	Peak	Horizontal

Vertical:



Horizontal:



7.9 Radiated Spurious Emissions

Test Requirement 47 CFR Part 15, Subpart C 15.205 & 15.209
Test Method: ANSI C63.10 (2013) Section 6.10.4
Measurement Distance: 3m
Limit:

Frequency(MHz)	Field strength(microvolts/meter)	Measurement distance(meters)
0.009-0.490	2400/F(kHz)	300
0.490-1.705	24000/F(kHz)	30
1.705-30.0	30	30
30-88	100	3
88-216	150	3
216-960	200	3
Above 960	500	3
Remark: The emission limits shown in the above table are based on measurements employing a CISPR quasi-peak detector except for the frequency bands 9-90kHz, 110-490kHz and above 1000 MHz. Radiated emission limits in these three bands are based on measurements employing an average detector, the peak field strength of any emission shall not exceed the maximum permitted average limits specified above by more than 20 dB under any condition of modulation.		

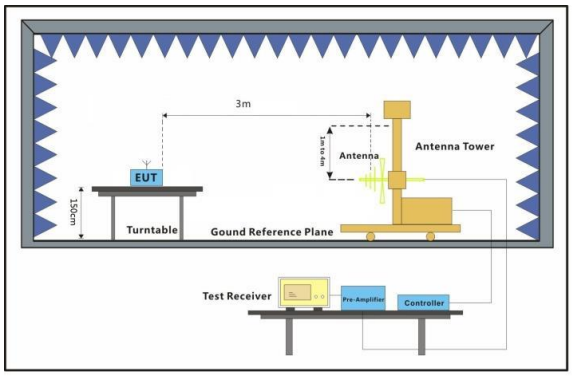
7.9.1 E.U.T. Operation

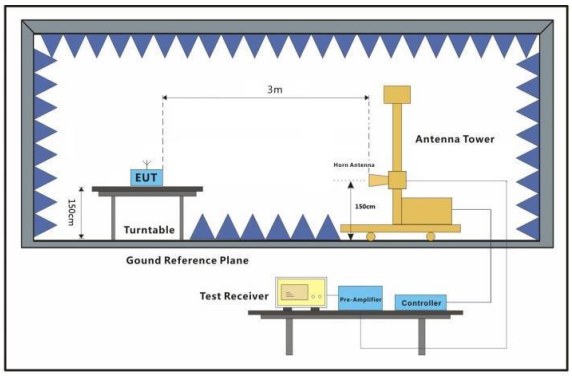
Operating Environment:

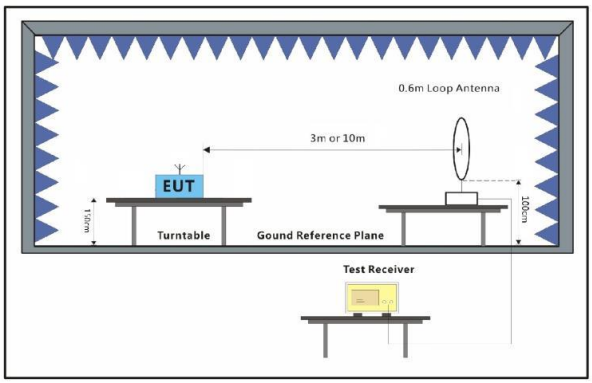
Temperature: 21 °C Humidity: 45 % RH Atmospheric Pressure: 1010 mbar

Test mode b:TX_non-Hop mode_Keep the EUT in continuously transmitting mode with GFSK modulation, π/4DQPSK modulation, 8DPSK modulation. All modes have been tested and only the data of worst case is recorded in the report.

7.9.2 Test Setup Diagram







7.9.3 Measurement Procedure and Data

a. For below 1GHz, the EUT was placed on the top of a rotating table 0.8 meters above the ground at a 3 or 10 meter semi-anechoic chamber. The table was rotated 360 degrees to determine the position of the highest radiation.

b. For above 1GHz, the EUT was placed on the top of a rotating table 1.5 meters above the ground at a 3 meter fully-anechoic chamber. The table was rotated 360 degrees to determine the position of the highest radiation.

c. The EUT was set 3 or 10 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.

d. The antenna height is varied from one meter to four meters above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are set to make the measurement.

e. For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights from 1 meter to 4 meters (for the test frequency of below 30MHz, the antenna was tuned to heights 1 meter) and the rotatable table was turned from 0 degrees to 360 degrees to find the maximum reading.

f. The test-receiver system was set to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.

g. If the emission level of the EUT in peak mode was 10dB lower than the limit specified, then testing could be stopped and the peak values of the EUT would be reported. Otherwise the emissions that did not have 10dB margin would be re-tested one by one using peak, quasi-peak or average method as specified and then reported in a data sheet.

h. Test the EUT in the lowest channel, the middle channel, the Highest channel.

i. The radiation measurements are performed in X, Y, Z axis positioning for Transmitting mode, and found the X axis positioning which it is the worst case.

j. Repeat above procedures until all frequencies measured was complete.

Remark: Level= Read Level+ Cable Loss+ Antenna Factor- Preamp Factor

Mode:b; Polarization:Horizontal; Modulation:GFSK; ; Channel:Low

Mark	Frequency MHz	RX_R dBuV	Factor dB	Emission dBuV/m	Limit dBuV/m	Margin dB	Ant.Pos cm	
	4804	38.59	6.18	44.77	54	-9.23		peak
	7206	39.03	10.63	49.66	54	-4.34		peak
*	9608	34.70	14.38	49.08	54	-4.92		peak

Mode:b; Polarization:Vertical; Modulation:GFSK; ; Channel:Low

Mark	Frequency MHz	RX_R dBuV	Factor dB	Emission dBuV/m	Limit dBuV/m	Margin dB	Ant.Pos cm	
	4804	34.94	6.18	41.12	54	-12.88		peak
	7206	35.75	10.63	46.38	54	-7.62		peak
*	9608	33.32	14.38	47.70	54	-6.30		peak

Mode:b; Polarization:Horizontal; Modulation:GFSK; ; Channel:middle

Mark	Frequency MHz	RX_R dBuV	Factor dB	Emission dBuV/m	Limit dBuV/m	Margin dB	Ant.Pos cm	
	4882	34.77	7.00	41.77	54	-12.23		peak
	7323	37.23	11.13	48.36	54	-5.64		peak
*	9764	31.62	14.36	45.98	54	-8.02		peak

Mode:b; Polarization:Vertical; Modulation:GFSK; ; Channel:middle

Mark	Frequency MHz	RX_R dBuV	Factor dB	Emission dBuV/m	Limit dBuV/m	Margin dB	Ant.Pos cm	
	4882	37.96	7.00	44.96	54	-9.04		peak
*	7323	32.78	11.13	43.91	54	-10.09		peak
	9764	30.85	14.36	45.21	54	-8.79		peak

Mode:b; Polarization:Horizontal; Modulation:GFSK; ; Channel:High

Mark	Frequency MHz	RX_R dBuV	Factor dB	Emission dBuV/m	Limit dBuV/m	Margin dB	Ant.Pos cm	
	4960	34.60	7.49	42.09	54	-11.91		peak
	7440	35.14	11.65	46.79	54	-7.21		peak
*	9920	33.15	14.40	47.55	54	-6.45		peak

Mode:b; Polarization:Vertical; Modulation:GFSK; ; Channel:High

Mark	Frequency MHz	RX_R dBuV	Factor dB	Emission dBuV/m	Limit dBuV/m	Margin dB	Ant.Pos cm	
	4960	37.84	7.49	45.33	54	-8.67		peak
*	7440	34.61	11.65	46.26	54	-7.74		peak
	9920	30.79	14.40	45.19	54	-8.81		peak

Mode:b; Polarization:Horizontal; Modulation:π/4 DQPSK; ; Channel:Low

Mark	Frequency MHz	RX_R dBuV	Factor dB	Emission dBuV/m	Limit dBuV/m	Margin dB	Ant.Pos cm	
	4804	37.82	6.18	44.00	54	-10.00		peak
	7206	36.71	10.63	47.34	54	-6.66		peak
*	9608	31.98	14.38	46.36	54	-7.64		peak

Mode:b; Polarization:Vertical; Modulation:π/4 DQPSK; ; Channel:Low

Mark	Frequency MHz	RX_R dBuV	Factor dB	Emission dBuV/m	Limit dBuV/m	Margin dB	Ant.Pos cm	
	4804	36.42	6.18	42.60	54	-11.40		peak
	7206	33.32	10.63	43.95	54	-10.05		peak
*	9608	34.28	14.38	48.66	54	-5.34		peak

Mode:b; Polarization:Horizontal; Modulation:π/4 DQPSK; ; Channel:middle

Mark	Frequency MHz	RX_R dBuV	Factor dB	Emission dBuV/m	Limit dBuV/m	Margin dB	Ant.Pos cm	
	4882	39.03	7.00	46.03	54	-7.97		peak
	7323	36.98	11.13	48.11	54	-5.89		peak
*	9764	35.16	14.36	49.52	54	-4.48		peak

Mode:b; Polarization:Vertical; Modulation:π/4 DQPSK; ; Channel:middle

Mark	Frequency MHz	RX_R dBuV	Factor dB	Emission dBuV/m	Limit dBuV/m	Margin dB	Ant.Pos cm	
	4882	36.61	7.00	43.61	54	-10.39		peak
*	7323	37.26	11.13	48.39	54	-5.61		peak
	9764	34.25	14.36	48.61	54	-5.39		peak

Mode:b; Polarization:Horizontal; Modulation:π/4 DQPSK; ; Channel:High

Mark	Frequency MHz	RX_R dBuV	Factor dB	Emission dBuV/m	Limit dBuV/m	Margin dB	Ant.Pos cm	
	4960	34.63	7.49	42.12	54	-11.88		peak
	7440	36.75	11.65	48.40	54	-5.60		peak
*	9920	32.90	14.40	47.30	54	-6.70		peak

Mode:b; Polarization:Vertical; Modulation:π/4 DQPSK; ; Channel:High

Mark	Frequency MHz	RX_R dBuV	Factor dB	Emission dBuV/m	Limit dBuV/m	Margin dB	Ant.Pos cm	
	4960	35.13	7.49	42.62	54	-11.38		peak
*	7440	38.16	11.65	49.81	54	-4.19		peak
	9920	33.48	14.40	47.88	54	-6.12		peak

Mode:b; Polarization:Horizontal; Modulation:8DPSK; ; Channel:Low

Mark	Frequency MHz	RX_R dBuV	Factor dB	Emission dBuV/m	Limit dBuV/m	Margin dB	Ant.Pos cm	
	4804	34.94	6.18	41.12	54	-12.88		peak
	7206	34.74	10.63	45.37	54	-8.63		peak
*	9608	32.35	14.38	46.73	54	-7.27		peak

Mode:b; Polarization:Vertical; Modulation:8DPSK; ; Channel:Low

Mark	Frequency MHz	RX_R dBuV	Factor dB	Emission dBuV/m	Limit dBuV/m	Margin dB	Ant.Pos cm	
	4804	36.24	6.18	42.42	54	-11.58		peak
	7206	37.92	10.63	48.55	54	-5.45		peak
*	9608	31.37	14.38	45.75	54	-8.25		peak

Mode:b; Polarization:Horizontal; Modulation:8DPSK; ; Channel:middle

Mark	Frequency MHz	RX_R dBuV	Factor dB	Emission dBuV/m	Limit dBuV/m	Margin dB	Ant.Pos cm	
	4882	38.31	7.00	45.31	54	-8.69		peak
	7323	37.01	11.13	48.14	54	-5.86		peak
*	9764	37.45	14.36	51.81	54	-2.19		peak

Mode:b; Polarization:Vertical; Modulation:8DPSK; ; Channel:middle

Mark	Frequency MHz	RX_R dBuV	Factor dB	Emission dBuV/m	Limit dBuV/m	Margin dB	Ant.Pos cm	
	4882	35.42	7.00	42.42	54	-11.58		peak
*	7323	35.33	11.13	46.46	54	-7.54		peak
	9764	33.57	14.36	47.93	54	-6.07		peak

Mode:b; Polarization:Horizontal; Modulation:8DPSK; ; Channel:High

Mark	Frequency MHz	RX_R dBuV	Factor dB	Emission dBuV/m	Limit dBuV/m	Margin dB	Ant.Pos cm	
	4960	37.14	7.49	44.63	54	-9.37		peak
*	7440	39.03	11.65	50.68	54	-3.32		peak
	9920	36.30	14.40	50.70	54	-3.30		peak

Mode:b; Polarization:Vertical; Modulation:8DPSK; ; Channel:High

Mark	Frequency MHz	RX_R dBuV	Factor dB	Emission dBuV/m	Limit dBuV/m	Margin dB	Ant.Pos cm	
	4960	37.70	7.49	45.19	54	-8.81		peak
*	7440	37.23	11.65	48.88	54	-5.12		peak
	9920	31.43	14.40	45.83	54	-8.17		peak

8 Test Setup Photographs

Refer to the < Test Setup Photos-FCC >

9 EUT Constructional Details

Refer to the < External Photos & < Internal Photos >.

- End of the Report -