Test Report No.:
FCCSZ2024-0004-RF3

RF Test Report

FCC ID	:	**2BEA6IPCRK3588**
EUT	:	**IBOX3588**
MODEL	:	**VT-IPC-RK3588**
BRAND NAME	:	**N/A**
APPLICANT	:	**Vantron Technology, Inc.**
Classification Of Test	:	**N/A**

CVC Testing Technology (Shenzhen) Co., Ltd.

..

Applicant	**Name: Vantron Technology, Inc.** **Address:48434 Milmont Drive Fremont, CA 94538-7324, USA**
Manufacturer	**Name: Vantron Technology, Inc.** **Address:48434 Milmont Drive Fremont, CA 94538-7324, USA**
Equipment Under Test	**Product Name:IBOX3588** **Model/Type: VT-IPC-RK3588** **Brand Name: N/A** **Serial NO.: N/A** **Sample NO.:3-1**

Date of Receipt.	**2024.01.18**	Date of Testing	**2024.01.18～2024.03.12**

Test Specification	**Test Result**
FCC Part 15, Subpart C, Section 15.247	PASS

Evaluation of Test Result	The equipment under test was found to comply with the requirements of the standards applied. Seal of CVC **Issue Date: 2024.03.12**

Tested by:	Reviewed by:	Approved by:
Cai Jianyu	Mo Xianbiao	
Cai Jianyu	Mo Xianbiao	Dong Sanbi
Name Signature	Name Signature	Name Signature

Other Aspects: NONE.

Abbreviations:OK, Pass= passed Fail = failed N/A= not applicable EUT= equipment, sample(s) under tested

This test report relates only to the EUT, and shall not be reproduced except in full, without written approval of CVC.

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RELEASE CONTROL RECORD

ISSUE NO.	REASON FOR CHANGE	DATE ISSUED
FCCSZ2024-0004-RF3	Original release	2024.03.12

1 SUMMARY OF TEST RESULTS

The EUT has been tested according to the following specifications:

APPLIED STANDARD: FCC Part 15, Subpart C			
STANDARD SECTION	**TEST TYPE AND LIMIT**	**RESULT**	**REPORT SECTION**
FCC 15.207	AC Power Conducted Emission	PASS	See section 3.1
--	Occupied Bandwidth Measurement	ONLY FOR REPORTED	Appendix B of FCCSZ2024-0004-RF3-A1
FCC 15.247(a)(1)	Number of Hopping Frequency Used	PASS	Appendix F of FCCSZ2024-0004-RF3-A1
FCC 15.247(a)(1)	Hopping Channel Separation	PASS	Appendix D of FCCSZ2024-0004-RF3-A1
FCC 15.247(a)(1)	Dell Time of Each Channel	PASS	Appendix E of FCCSZ2024-0004-RF3-A1
FCC 15.247(a)(1)	20dB EMISSION BANDWIDTH	PASS	Appendix A of FCCSZ2024-0004-RF3-A1
FCC 15.247(b)	Conducted Output Power	PASS	Appendix C of FCCSZ2024-0004-RF3-A1
FCC 15.247(d), FCC 15.209, FCC 15.205	Radiated Emissions	PASS	See section 3.2
FCC 15.247(d)	Out of band Emission Measurement	PASS	Appendix G&H of FCCSZ2024-0004-RF3-A1
FCC 15.203 FCC 15.247(b)	Antenna Requirement	PASS	See section 3.10

1.1 LIST OF TEST AND MEASUREMENT INSTRUMENTS

Equipment	Manufacturer	Model No.	Serial Number	Cal. interval	Cal. Due
WIFI & Bluetooth Test System					/
Signal&Spectrum Analyzer	Rohde&Schwarz	FSV 30	104408	1 year	2024.5.21
#3Shielding room	MORI	443	N/A	3 year	2026.5.16
Wideband radio communication tester	Rohde&Schwarz	CMW 500	168778	1 year	2024.5.25
Analog signal Generator (100kHz ~ 40GHz)	Rohde&Schwarz	SMB 100A	181934	1 year	2024.5.21
Vector signal Generator (9kHz ~ 6GHz)	Keysight	N5182B	MY57301451	1 year	2024.4.25
Vector signal Generator (9kHz ~ 6GHz)	Rohde&Schwarz	SGT 100A	111724	1 year	2024.5.21
RF control unit(BT/WiFi)	Tonscend	JS0806-2-8CH	20E8060261	1 year	2024.5.21
Radiation Spurious(Above 1GHz)					/
Signal&Spectrum Analyzer	Rohde&Schwarz	FSV 40	101898	1 year	2024.5.21
EMI Test Receiver	Rohde&Schwarz	ESR3	102693	1 year	2024.5.25
Antenna(30MHz~1001MHz)	SCHWARZBECK	VULB 9168	1133	1 year	2025.2.4
Horn antenna(1GHz-18GHz)	ETS	3117	227611	1 year	2024.3.25
Horn antenna(18GHz-40GHz)	QMS	QMS-00880	22051	1 year	2024.3.25
3m anechoic chamber	MORI	966	CS0300011	3 year	2026.5.18
Filter group(RSE-BT/WiFi)	Rohde&Schwarz	WiFi /BT Variant 1	100820	1 year	2024.5.21
Filter group(RSE-Cellular)	Rohde&Schwarz	Cellular Variant 1	100768	1 year	2024.5.21
Preamplifier(10kHz-1GHz)	Rohde&Schwarz	SCU-01F	100299	1 year	2024.5.21
Preamplifier(1GHz-18GHz)	Rohde&Schwarz	SCU-18F	100799	1 year	2024.5.21
Preamplifier(1GHz-18GHz)	Rohde&Schwarz	SCU-18F	100801	1 year	2024.5.21
Preamplifier(18Gz-40GHz)	Rohde&Schwarz	SCU-40A	101209	1 year	2024.5.21
#2 control room	MORI	433	CS0300028	3 year	2024.5.21
Temperature and humidity meter	/	C193561517	C193561517	1 year	2024.5.21
Radiation Spurious(Below 1GHz)					/
EMI Test Receiver	Rohde&Schwarz	ESR 26	101718	1 year	2024.5.25
Loop antenna（8.3k~30MHz）	Rohde&Schwarz	HFH2-Z2E	100951	1 year	2024.5.26
Antenna(30MHz~1000MHz)	SCHWARZBECK	VULB 9168	1132	1 year	2025.2.27
3m anechoic chamber	MORI	966	CS0200019	3 year	2026.5.18
Attenuator	/	SJ-5dB	607684	1 year	2025.2.4
#1 control room	MORI	433	CS0300028	3 year	2026.5.16
Temperature and humidity meter	/	C193561473	CS0200071	1 year	2024.5.21
Conducted emission					/
EMI Test Receiver	Rohde&Schwarz	ESR3	102694	1 year	2024.5.25
limiter（10 dB）	Rohde&Schwarz	ESH3-Z2	102824	1 year	2024.5.16
Voltage probe	Rohde&Schwarz	CVP9222C	28	1 year	2024.5.16
Current probe	Rohde&Schwarz	EZ-17	101442	1 year	2024.5.21
ISN network	Rohde&Schwarz	ENV 81	100401	1 year	2024.5.16
ISN network	Rohde&Schwarz	ENV 81 Cat6	101896	1 year	2024.5.16
LISN（single-phase）	Rohde&Schwarz	ENV216	102569	1 year	2024.4.11
#1Shielding room	MORI	854	N/A	3 year	2026.5.16

1.2 MEASUREMENT UNCERTAINTY

Where relevant, the following measurement uncertainty levels have been estimated for tests performed on the EUT as specified in CISPR 16-4-2:

No.	Item	Measurement Uncertainty
1	Conducted emission test	+/-2.7 dB
2	Radiated emission 9kHz-30MHz	+/-5.6 dB
3	Radiated emission 30MHz-1GHz	+/-4.6 dB
4	Radiated emission 1GHz-18GHz	+/-4.4 dB
5	Radiated emission 18GHz-40GHz	+/-5.1 dB
6	RF power	+/-0.9 dB
7	Power Spectral Density	+/-0.8 dB
8	Conducted spurious emissions	+/-2.7 dB
9	Transmission Time	+/-0.27%
10	Occupied Bandwidth	+/-1.86%
Remark: 95% Confidence Levels, k=2.		

1.3 TEST LOCATION

The tests and measurements refer to this report were performed by EMC testing Lab. of CVC Testing Technology (Shenzhen) Co., Ltd.

CABID:CN0137
Lab Address: No. 1301, Guanguang Road, Xinlan Community, Guanlan Street, Longhua District, Shenzhen City, Guangdong Province 518110 P.R.China
Post Code：518110 Tel：0755-23763060-8805
Fax：0755-23763060 E-mail：sz-kf@cvc.org.cn
FCC(Test firm designation number：CN1363)
IC(Test firm CAB identifier number：CN0137)
CNAS(Test firm designation number：L16091)

2 GENERAL INFORMATION

2.1 GENERAL PRODUCT INFORMATION

PRODUCT	IBOX3588
BRAND	N/A
TEST MODEL	VT-IPC-RK3588
ADDITIONAL MODEL	N/A
POWER SUPPLY	DC 24V From Adapter
MODULATION TYPE	GFSK, π/4 DQPSK, 8DPSK
OPERATING FREQUENCY	2402MHz~2480MHz
NUMBER OF CHANNEL	79
PEAK OUTPUT POWER	6.62dBm (Max. Measured)
ANTENNA TYPE（Remark 5）	External Antenna 2: 2.75dBi
FIX FREQUENCY SOFTWARE	adb
I/O PORTS	Refer to user's manual
CABLE SUPPLIED	N/A

Note:

1. For more detailed features description, please refer to the manufacturer's specifications or the User's Manual.
2. For the test results, the EUT had been tested with all conditions. But only the worst case was shown in test report.
3. EUT photo refer to the report (Report NO.: FCCSZ2024-0004-EUT).
4. Since the above data and/or information is provided by the client, CVC is not responsible for the authenticity, integrity and results of the data and information and/or the validity of the conclusion.
5. The EUT have SISO function, provides 1 completed transmitter and 1 receiver.

2.2 OTHER INFORMATION

Operation frequency each of channel.

Operation Frequency Each of Channel							
For BT (GFSK, π/4 DQPSK, 8 DPSK)							
CHANNEL	**FREQ. (MHz)**	**CHANNEL**	**FREQ. (MHz)**	**CHANNEL**	**FREQ. (MHz)**	**CHANNEL**	**FREQ. (MHz)**
0	**2402**	20	2422	40	2442	60	2462
1	2403	21	2423	41	2443	61	2463
2	2404	22	2424	42	2444	62	2464
3	2405	23	2425	43	2445	63	2465
4	2406	24	2426	44	2446	64	2466
5	2407	25	2427	45	2447	65	2467
6	2408	26	2428	46	2448	66	2468
7	2409	27	2429	47	2449	67	2469
8	2410	28	2430	48	2450	68	2470
9	2411	29	2431	49	2451	69	2471
10	2412	30	2432	50	2452	70	2472
11	2413	31	2433	51	2453	71	2473
12	2414	32	2434	52	2454	72	2474
13	2415	33	2435	53	2455	73	2475
14	2416	34	2436	54	2456	74	2476
15	2417	35	2437	55	2457	75	2477
16	2418	36	2438	56	2458	76	2478
17	2419	37	2439	57	2459	77	2479
18	2420	38	2440	58	2460	**78**	**2480**
19	2421	**39**	**2441**	59	2461		

1. The channels which were indicated in bold type of the above channel list were selected as representative test channel. Therefore only the data of the test channels were recorded in this report.

For BT (GFSK, π/4 DQPSK, 8 DPSK)					
DH5		**2DH5**		**3DH5**	
CHANNEL	**POWER SETTING**	**CHANNEL**	**POWER SETTING**	**CHANNEL**	**POWER SETTING**
0	default	**0**	default	**0**	default
39	default	**39**	default	**39**	default
78	default	**78**	default	**78**	default

2. By means of test software which provided by manufacture, the power levels during the tests were set

2.3 TEST MODE APPLICABILITY AND TESTED CHANNEL DETAIL

Pre-scan has been conducted to determine the worst-case mode from all possible combinations between available modulations, data rates, xyz axis and antenna ports

The worst case was found when positioned on xaxis for radiated emission. Following channel(s) was (were) selected for the final test as listed below:

GFSK, π/4 DQPSK, 8DPSK was tested, GFSK and 8DPSK was worst and the report presents only GFSK and 8DPSK.

EUT CONFIGURE MODE	APPLICABLE TEST ITEMS				DESCRIPTION
	RSE<1G	RSE≥1G	PLC	APCM	
A	√	√	√	√	BT LINK

Where **RSE<1G:** Radiated Emission below 1GHz.**RSE≥1G:** Radiated Emission above 1GHz.
PLC: Power Line Conducted Emission.**APCM:** Antenna Port Conducted Measurement.

RADIATED EMISSION TEST (BELOW 1 GHz):

☒ Pre-Scan has been conducted to determine the worst-case mode from all possible combinations between available modulations, XYZ axis, antenna ports (if EUT with antenna diversity architecture) and packet type.
☒ Following channel(s) was (were) selected for the final test as listed below.

EUT CONFIGURE MODE	TESTED CHANNEL	MODULATION TECHNOLOGY	MODULATION TYPE	PACKET TYPE
A	0	FHSS	GFSK	DH5

RADIATED EMISSION TEST (ABOVE 1 GHz):

☒ Pre-Scan has been conducted to determine the worst-case mode from all possible combinations between available modulations, XYZ axis, antenna ports (if EUT with antenna diversity architecture) and packet type.
☒ Following channel(s) was (were) selected for the final test as listed below.

EUT CONFIGURE MODE	TESTED CHANNEL	MODULATION TECHNOLOGY	MODULATION TYPE	PACKET TYPE
A	0, 39, 78	FHSS	GFSK	DH5
A	0, 39, 78	FHSS	π/4 DQPSK	2DH5
A	0, 39, 78	FHSS	8DPSK	3DH5

POWER LINE CONDUCTED EMISSION TEST:

☒ Pre-Scan has been conducted to determine the worst-case mode from all possible combinations between available modulations, antenna ports (if EUT with antenna diversity architecture), and packet types.

☒ Following channel(s) was (were) selected for the final test as listed below.

EUT CONFIGURE MODE	TESTED CONDITION
-	BT Link

ANTENNA PORT CONDUCTED MEASUREMENT:

☒ This item includes all test value of each mode, but only includes spectrum plot of worst value of each mode.

☒ Pre-Scan has been conducted to determine the worst-case mode from all possible combinations between available modulations, antenna ports (if EUT with antenna diversity architecture), and packet types.

☒ Following channel(s) was (were) selected for the final test as listed below.

EUT CONFIGURE MODE	TESTED CHANNEL	MODULATION TECHNOLOGY	MODULATION TYPE	PACKET TYPE
A	0, 39, 78	FHSS	GFSK	DH5
A	0, 39, 78	FHSS	π/4 DQPSK	2DH5
A	0, 39, 78	FHSS	8DPSK	3DH5

TEST CONDITION:

APPLICABLE TO	ENVIRONMENTAL CONDITIONS	TEST VOLTAGE (SYSTEM)	TESTED BY
RSE<1G	24deg. C, 55%RH	DC 24V from Adapter	Wang Zhiming
RSE≥1G	24deg. C, 55%RH	DC 24V from Adapter	LiuYuan
PLC	24deg. C, 55%RH	DC 24V from Adapter	Wang Zhiming
APCM	25deg. C, 58%RH	DC 24V from Adapter	Cai Jianyu

2.4 GENERAL DESCRIPTION OF APPLIED STANDARDS

The EUT is a RF product, according to the specifications of the manufacturers. It must comply with the requirements of the following standards:

FCC PART 15, Subpart C. Section 15.247
KDB 558074 D01 15.247 Meas Guidance v05r02
ANSI C63.10-2013

All test items have been performed and recorded as per the above standards

2.5 DESCRIPTION OF SUPPORT UNITS

The EUT has been tested as an independent unit together with other necessary accessories or support units. The following support units or accessories were used to form a representative test configuration during the tests.

Support Equipment					
NO	**Description**	**Brand**	**Model No.**	**Serial Number**	**Supplied by**
1	Laptop	Lenovo	K4e-ARE120	MP20kshe	Lab
2	Computer	DELL	783368-01	Vgdt0041	Lab
3	Phone	N/A	4G	1693	Lab
4	Adapter	MW	GST90A24	N/A	Client

Support Cable							
NO	**Description**	**Quantity (Number)**	**Length (cm)**	**Detachable (Yes/ No)**	**Shielded (Yes/ No)**	**Cores (Number)**	**Supplied by**
N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

3 TEST TYPES AND RESULTS

3.1 CONDUCTED EMISSION MEASUREMENT

3.1.1 Limit

Frequency (MHz)	Conducted Limits(dBμV)	
	Quasi-peak	Average
0.15 - 0.5	66 to 56 *	56 to 46*
0.5 - 5	56	46
5 - 30	60	50
NOTE: 1. The lower limit shall apply at the transition frequencies. NOTE: 2. The limit decreases in line with the logarithm of the frequency in the range of 0.15 to 0.50MHz.		

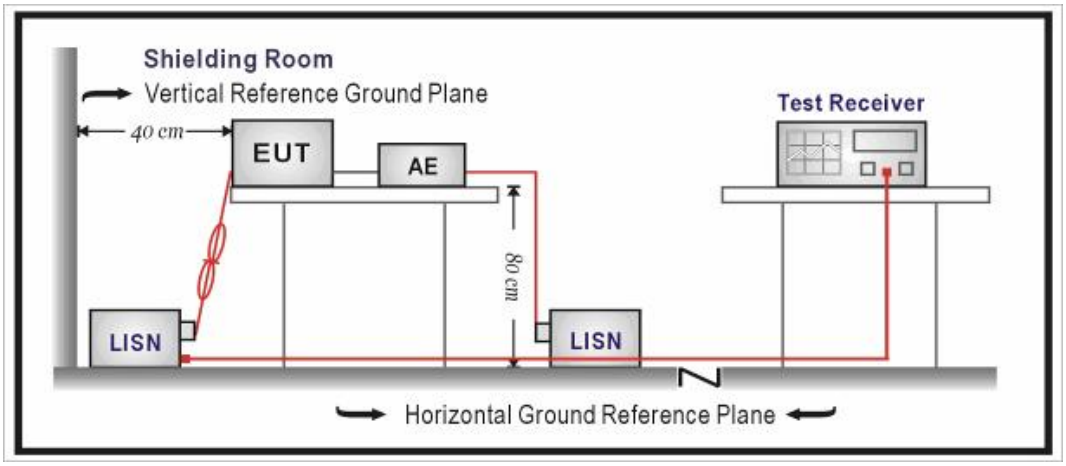
3.1.2 Measurement procedure

a. The EUT was placed on a platform of nominal size, 1 m by 1.5 m, raised 80 cm above the conducting ground plane. The vertical conducting plane was located 40 cm to the rear of the EUT. All other surfaces of EUT were at least 80 cm from any other grounded conducting surface. The EUT and simulators are connected to the main power through a line impedance stabilization network (LISN). The LISN provides a 50 ohm /50uH coupling impedance for the measuring equipment. The peripheral devices are also connected to the main power through a LISN. (Please refer to the Test photographs) Each current-carrying conductor of the EUT power cord, except the ground (safety) conductor, was individually connected through a LISN to the input power source.The equipment under test shall be placed on a support of non-metallic material, the height of which shall be1.5m above the ground,

b. The excess length of the power cord between the EUT and the LISN receptacle were folded back and forth at the center of the lead to form a bundle not exceeding 40 cm in length.

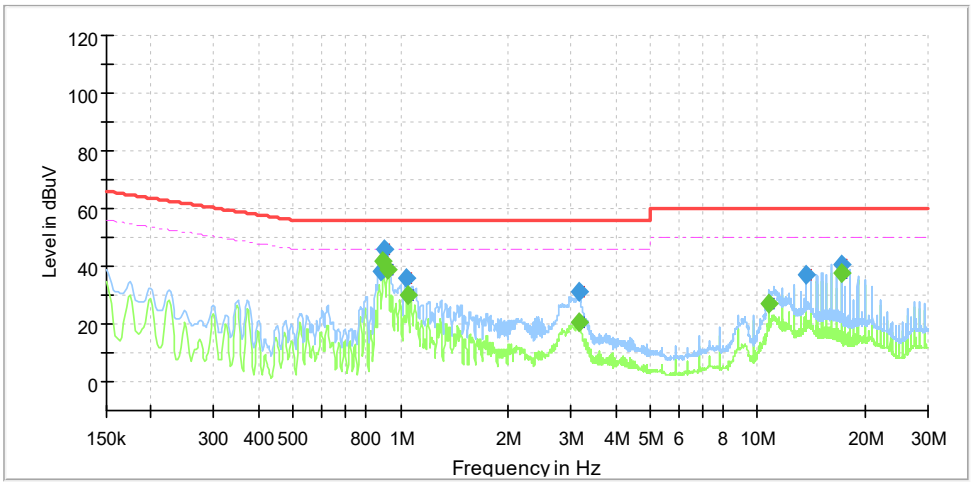
c. Conducted emissions were investigated over the frequency range from 0.15MHz to 30MHz using a receiver bandwidth of 9 kHz.

3.1.3 Test setup



3.1.4 Test results

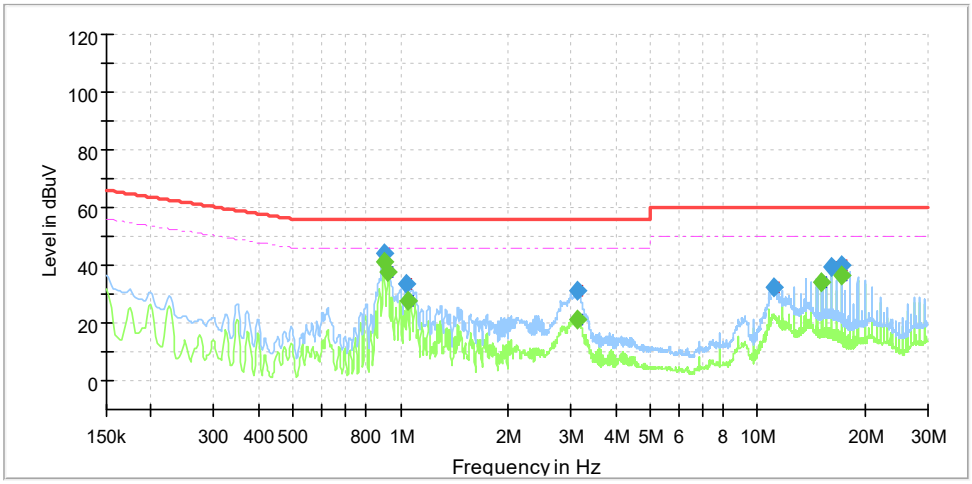
Test Mode	BT Link	Frequency Range	150KHz ~ 30MHz
PHASE	Line (L)		



NO	Frequency (MHz)	QuasiPeak (dBuV)	Average (dBuV)	Limit (dBuV)	Margin (dB)	Line	Corr.Factor (dB)
1	0.877	38.0	---	56.0	18.0	L	10.0
2	0.895	---	42.0	46.0	4.0	L	10.0
3	0.897	46.1	---	56.0	9.9	L	10.0
4	0.920	---	39.0	46.0	7.0	L	10.0
5	1.039	35.9	---	56.0	20.1	L	10.1
6	1.043	---	29.7	46.0	16.3	L	10.1
7	3.156	---	20.6	46.0	25.4	L	10.1
8	3.158	31.0	---	56.0	25.0	L	10.1
9	10.757	---	26.9	50.0	23.1	L	10.4
10	13.691	36.9	---	60.0	23.1	L	10.5
11	17.113	40.7	---	60.0	19.3	L	10.6
12	17.113	---	37.6	50.0	12.4	L	10.6

Remark: The emission levels of other frequencies were very low against the limit.

Test Mode	BT Link	Frequency Range	150KHz ~ 30MHz
PHASE	Line (N)		



NO	Frequency (MHz)	QuasiPeak (dBuV)	Average (dBuV)	Limit (dBuV)	Margin (dB)	Line	Corr.Factor (dB)
1	0.897	---	41.0	46.0	5.0	N	10.0
2	0.899	44.4	---	56.0	11.6	N	10.0
3	0.922	---	37.6	46.0	8.4	N	10.0
4	1.037	33.6	---	56.0	22.4	N	10.0
5	1.046	---	27.9	46.0	18.1	N	10.0
6	3.134	31.3	---	56.0	24.7	N	10.1
7	3.138	---	21.4	46.0	24.6	N	10.1
8	11.103	32.2	---	60.0	27.8	N	10.4
9	15.155	---	33.9	50.0	16.1	N	10.6
10	16.134	39.3	---	60.0	20.7	N	10.6
11	17.111	39.8	---	60.0	20.2	N	10.7
12	17.111	---	36.6	50.0	13.4	N	10.7

Remark: The emission levels of other frequencies were very low against the limit.

3.2 RADIATED EMISSIONS

3.2.1 Limits

Radiated emissions which fall in the restricted bands, as defined in Section 15.205(a), must also comply with the radiated emission limits specified in Section 15.209(a). Other emissions shall be at least 20dB below the highest level of the desired power.

FREQUENCIES (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

NOTE: 1. The lower limit shall apply at the transition frequencies.
NOTE: 2. Emission level (dBuV/m) = 20 log Emission level (uV/m).
NOTE: 3. As shown in 15.35(b), for frequencies above 1000MHz, the field strength limits are based on average detector, however, the peak field strength of any emission shall not exceed the maximum permitted average limits, specified above by more than 20dB under any condition of modulation.

3.2.2 Measurement procedure

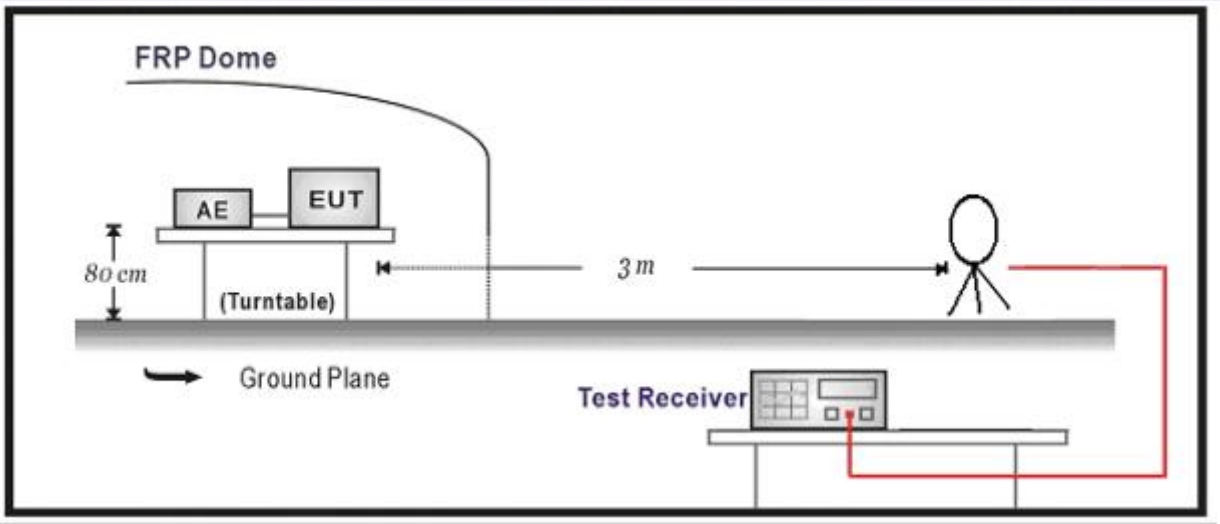
a. The EUT was placed on the top of a rotating table 1.5 meters(above 1GHz) and 0.8 meters(below 1GHz) above the ground at a 3 meters semi-anechoic chamber. The table was rotated 360 degrees to determine the position of the highest radiation.
b. The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.
c. For below 1GHz was used bilog antenna, and above 1GHz was used horn antenna, and its 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.
d. For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights from 1 meter to 4 meters and the rotatable table was turned from 0 degrees to 360 degrees to find the maximum reading.
e. The test-receiver system was set to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.
f. For below 30MHz, a loop antenna with its vertical plane is place 3m from the EUT and rotated about its vertical axis for maximum response at each azimuth about the EUT. And the centre of the loop shall be 1m above the ground.
g. During the test, each emission was maximized by: having the EUT continuously working, investigated all operating modes, rotated about all 3 axis (X, Y & Z) and considered typical configuration to obtain worst position, manipulating interconnecting cables, For battery operated equipment, the equipment tests shall be perform using fresh batteries. The turntable was rotated to maximize the emission level.

NOTE:

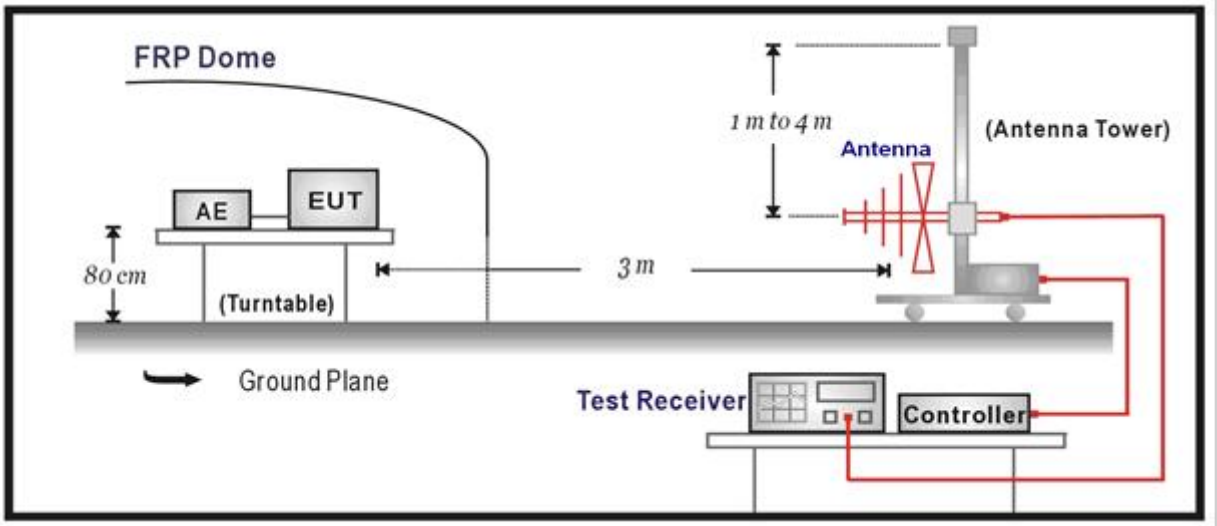
1. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 120kHz for Quasi-peak detection at frequency below 1GHz.
2. The resolution bandwidth of test receiver/spectrum analyzer is 1 MHz and video bandwidth is 3MHz for Peak detection at frequency above 1GHz.
3. The resolution bandwidth of test receiver/spectrum analyzer is 1MHz and the video bandwidth is ⩾ 1/T (Duty cycle < 98%) or 10Hz(Duty cycle > 98%) for Average detection (AV) at frequency above 1GHz.
4. All modes of operation were investigated and the worst-case emissions are reported.
5. The testing of the EUT was performed on all 3 orthogonal axes; the worst-case test configuration was reported on the file test setup photo.

3.2.3 Test setup

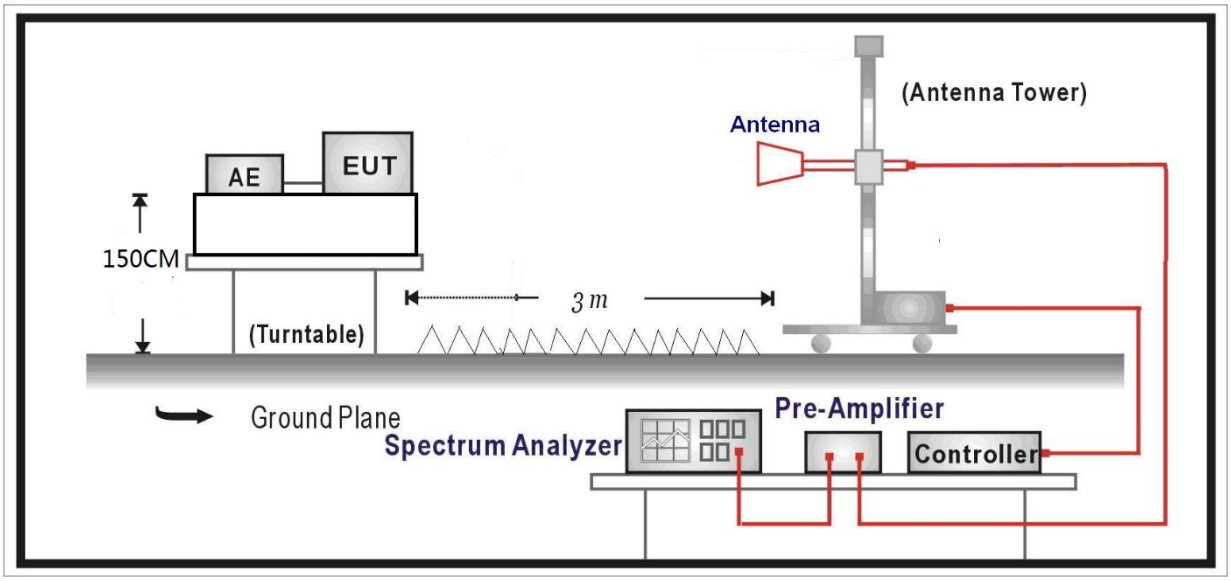
Below 30MHz Test Setup:



Below 1GHz Test Setup:



Above 1GHz Test Setup:

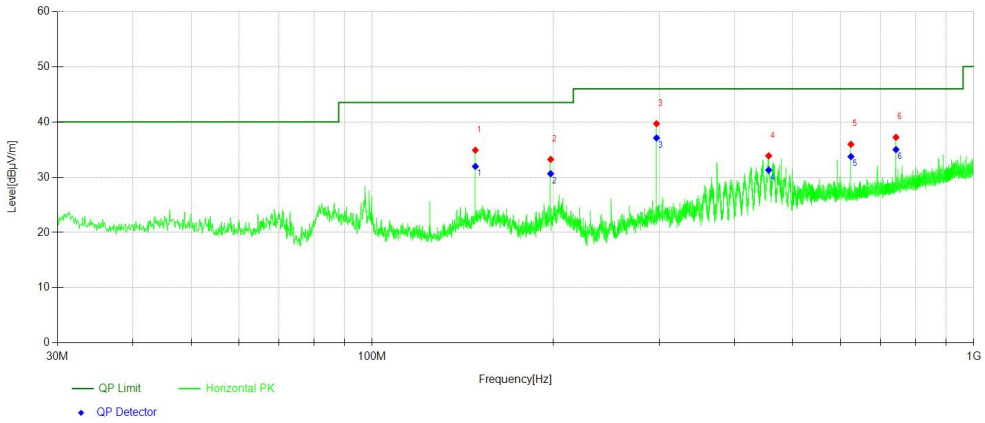


3.2.4 Test results

BELOW 1GHz WORST-CASE DATA:

Test Mode:	**DH5 CH 0**	Frequency Range	9kHz-1000MHz
Detector Function	Quasi-Peak(QP)		

Horizontal

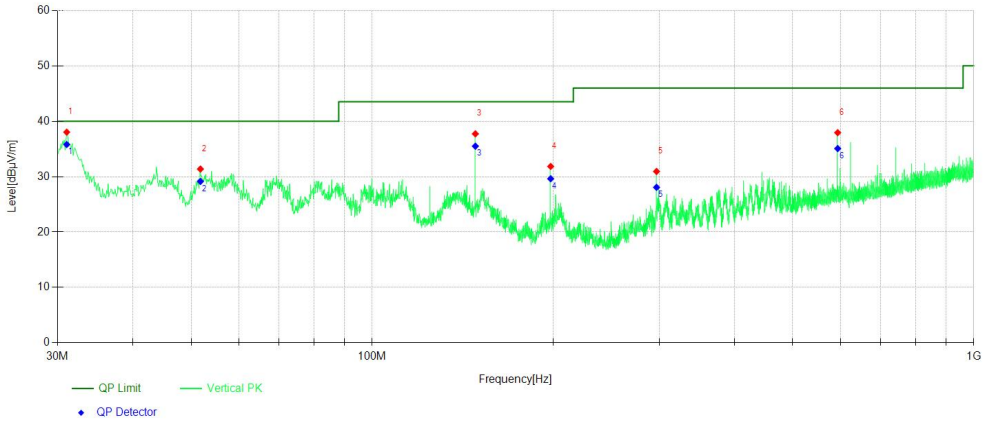


NO.	Freq. [MHz]	Reading [dBμV]	Factor [dB/m]	Level [dBμV/m]	Limit [dBμV/m]	Margin [dB]	Height [cm]	Angle [°]
1	148.4488	10.72	21.23	31.95	43.50	11.55	200	2
2	198.0208	13.39	17.25	30.64	43.50	12.86	100	152
3	296.9707	16.52	20.58	37.10	46.00	8.90	100	295
4	456.1636	6.77	24.52	31.29	46.00	14.71	100	351
5	624.9605	6.33	27.40	33.73	46.00	12.27	100	335
6	742.5363	5.87	29.13	35.00	46.00	11.00	200	360

Remark: 1. The emission levels of 9k - 30MHz were greater than 20dB margin.
2. Level (dBuV/m) = Reading (dBuV) + Factor (dB/m).
3. Factor (dB/m) = Antenna Factor (dB/m) + Cable Factor (dB).
4. Margin(dB) = Limit[dBμV/m] - Level [dBμV/m]

Test Mode:	**DH5 CH 0**	Frequency Range	9kHz-1000MHz
Detector Function	Quasi-Peak(QP)		

Vertical



NO.	Freq. [MHz]	Reading [dBμV]	Factor [dB/m]	Level [dBμV/m]	Limit [dBμV/m]	Margin [dB]	Height [cm]	Angle [°]
1	31.0671	15.57	20.23	35.80	40.00	4.20	100	2
2	51.8272	9.68	19.46	29.14	40.00	10.86	100	17
3	148.4488	14.27	21.23	35.50	43.50	8.00	100	9
4	198.0208	12.37	17.25	29.62	43.50	13.88	100	57
5	296.9707	7.49	20.58	28.07	46.00	17.93	100	25
6	594.0144	8.25	26.82	35.07	46.00	10.93	100	255

Remark: 1.The emission levels of 9k - 30MHz were greater than 20dB margin.
2. Level (dBuV/m) = Reading (dBuV) + Factor (dB/m).
3. Factor (dB/m) = Antenna Factor (dB/m) + Cable Factor (dB).
4. Margin(dB) = Limit[dBμV/m] - Level [dBμV/m]

ABOVE 1GHz DATA
All test modes have been conducted, and the report only presents the worst case.

Channel	**3DH5 CH0**	**Frequency**	2402MHz
Frequency Range	Above 1G	**Detector Function**	PK/AV

Suspected Data List								
NO.	Freq. [MHz]	Reading [dBμV]	Factor [dB/m]	Level [dBμV/m]	Limit [dBμV/m]	Margin [dB]	Detector	Polarity
1	2351.06	40.68	-0.14	40.54	54.00	13.46	AV	Horizontal
2	2360.52	50.45	0.05	50.50	74.00	23.50	PK	Horizontal
3	2390.00	39.39	-0.15	39.24	54.00	14.76	AV	Horizontal
4	2390.00	47.69	-0.15	47.54	54.00	6.46	PK	Horizontal
5	2401.82	89.12	-0.04	89.08			PK	Horizontal
6	2401.89	88.65	-0.04	88.61			AV	Horizontal
7	4804.00	41.80	9.29	51.09	74.00	22.91	PK	Horizontal
8	4804.00	34.10	9.29	43.39	54.00	10.61	AV	Horizontal
9	7206.00	27.44	12.81	40.25	74.00	33.75	PK	Horizontal
10	7206.00	19.68	12.81	32.49	54.00	21.51	AV	Horizontal
11	9608.00	26.85	13.32	40.17	74.00	33.83	PK	Horizontal
12	9608.00	19.46	13.32	32.78	54.00	21.22	AV	Horizontal
13	2360.14	40.29	0.07	40.36	54.00	13.64	AV	Vertical
14	2364.57	50.44	-0.08	50.36	74.00	23.64	PK	Vertical
15	2390.00	48.13	-0.15	47.98	74.00	26.02	PK	Vertical
16	2390.00	39.30	-0.15	39.15	54.00	14.85	AV	Vertical
17	2402.04	95.26	-0.04	95.22			PK	Vertical
18	2402.12	94.80	-0.03	94.77			AV	Vertical
19	4804.00	42.09	9.29	51.38	74.00	22.62	PK	Vertical
20	4804.00	34.31	9.29	43.60	54.00	10.40	AV	Vertical
21	7206.00	28.34	12.81	41.15	74.00	32.85	PK	Vertical
22	7206.00	19.65	12.81	32.46	54.00	21.54	AV	Vertical
23	9608.00	26.20	13.32	39.52	74.00	34.48	PK	Vertical
24	9608.00	19.90	13.32	33.22	54.00	20.78	AV	Vertical

Remark: 1. The emission levels of other frequencies were greater than 20dB margin.
2. Level (dBuV/m) = Reading (dBuV) + Factor (dB/m).
3. Factor (dB/m) = Antenna Factor (dB/m) + Cable Factor (dB).
4. Margin(dB) = Limit[dBμV/m] - Level [dBμV/m]

Channel	3DH5 CH39	Frequency	2441MHz
Frequency Range	Above 1G	Detector Function	PK/AV

Suspected Data List								
NO.	Freq. [MHz]	Reading [dBμV]	Factor [dB/m]	Level [dBμV/m]	Limit [dBμV/m]	Margin [dB]	Detector	Polarity
1	4882.00	41.95	9.83	51.78	74.00	22.22	PK	Horizontal
2	4882.00	34.30	9.83	44.13	54.00	9.87	AV	Horizontal
3	7323.00	20.70	10.96	31.66	54.00	22.34	AV	Horizontal
4	7323.00	27.33	10.96	38.29	74.00	35.71	PK	Horizontal
5	9764.00	26.48	13.23	39.71	74.00	34.29	PK	Horizontal
6	9764.00	18.18	13.23	31.41	54.00	22.59	AV	Horizontal
7	4960.00	41.56	10.70	52.26	74.00	21.74	PK	Vertical
8	4960.00	34.06	10.70	44.76	54.00	9.24	AV	Vertical
9	7440.00	29.16	9.75	38.91	74.00	35.09	PK	Vertical
10	7440.00	20.58	9.75	30.33	54.00	23.67	AV	Vertical
11	9920.00	26.08	13.83	39.91	74.00	34.09	PK	Vertical
12	9920.00	18.89	13.83	32.72	54.00	21.28	AV	Vertical

Remark: 1. The emission levels of other frequencies were greater than 20dB margin.
2. Level (dBuV/m) = Reading (dBuV) + Factor (dB/m).
3. Factor (dB/m) = Antenna Factor (dB/m) + Cable Factor (dB).
4. Margin(dB) = Limit[dBμV/m] - Level [dBμV/m]

Channel	3DH5 CH78	Frequency	2480MHz
Frequency Range	Above 1G	Detector Function	PK/AV

Suspected Data List								
NO.	Freq. [MHz]	Reading [dBμV]	Factor [dB/m]	Level [dBμV/m]	Limit [dBμV/m]	Margin [dB]	Detector	Polarity
1	2479.83	97.15	0.32	97.47			PK	Horizontal
2	2479.83	96.47	0.32	96.79			AV	Horizontal
3	2483.50	46.19	0.45	46.64	74.00	27.36	PK	Horizontal
4	2483.50	36.98	0.45	37.43	54.00	16.57	AV	Horizontal
5	2486.87	38.02	0.59	38.61	54.00	15.39	AV	Horizontal
6	2490.34	47.92	0.71	48.63	74.00	25.37	PK	Horizontal
7	4960.00	33.91	10.70	44.61	54.00	9.39	AV	Horizontal
8	4960.00	41.95	10.70	52.65	74.00	21.35	PK	Horizontal
9	7440.00	20.97	9.75	30.72	54.00	23.28	AV	Horizontal
10	7440.00	27.65	9.75	37.40	74.00	36.60	PK	Horizontal
11	9920.00	18.58	13.83	32.41	54.00	21.59	AV	Horizontal
12	9920.00	26.45	13.83	40.28	74.00	33.72	PK	Horizontal
13	2479.93	104.22	0.31	104.53			PK	Vertical
14	2479.94	103.73	0.31	104.04			AV	Vertical
15	2483.50	37.85	0.45	38.30	54.00	15.70	AV	Vertical
16	2483.50	46.74	0.45	47.19	74.00	26.81	PK	Vertical
17	2484.42	38.20	0.49	38.69	54.00	15.31	AV	Vertical
18	2485.07	47.44	0.52	47.96	74.00	26.04	PK	Vertical
19	4960.00	42.14	10.70	52.84	74.00	21.16	PK	Vertical
20	4960.00	34.17	10.70	44.87	54.00	9.13	AV	Vertical
21	7440.00	29.18	9.75	38.93	74.00	35.07	PK	Vertical
22	7440.00	20.89	9.75	30.64	54.00	23.36	AV	Vertical
23	9920.00	26.68	13.83	40.51	74.00	33.49	PK	Vertical
24	9920.00	19.10	13.83	32.93	54.00	21.07	AV	Vertical

Remark: 1. The emission levels of other frequencies were greater than 20dB margin.
2. Level (dBuV/m) = Reading (dBuV) + Factor (dB/m).
3. Factor (dB/m) = Antenna Factor (dB/m) + Cable Factor (dB).
4. Margin(dB) = Limit[dBμV/m] - Level [dBμV/m]

3.3 NUMBER OF HOPPING FREQUENCY USED

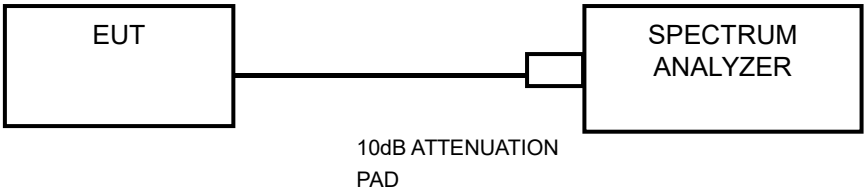
3.3.1 Limits

At least 15 channels frequencies, and should be equally spaced.

3.3.2 Measurement procedure

a. Check the calibration of the measuring instrument (SA) using either an internal calibrator or a known signal from an external generator.
b. Turn on the EUT and connect its antenna terminal to measurement via a low loss cable. Then set it to any one measured frequency within its operating range and make sure the instrument is operated in its linear range.
c. Set the SA on MaxHold Mode, and then keep the EUT in hopping mode. Record all the signals from each channel until each one has been recorded.
d. Set the SA on View mode and then plot the result on SA screen.
e. Repeat above procedures until all frequencies measured were completed.

3.3.3 Test setup



3.4 DWELL TIME ON EACH CHANNEL

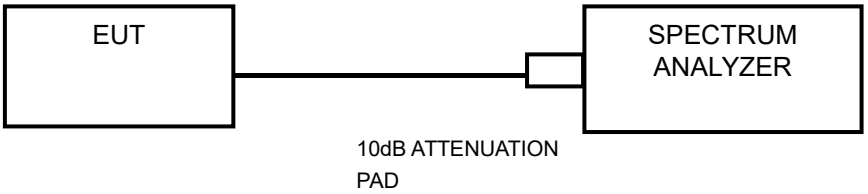
3.4.1 Limits

The average time of occupancy on any channel shall not be greater than 0.4 seconds within a period of 0.4 seconds multiplied by the number of hopping channels employed.

3.4.2 Measurement procedure

a. Check the calibration of the measuring instrument (SA) using either an internal calibrator or a known signal from an external generator.
b. Turn on the EUT and connect its antenna terminal to measurement via a low loss cable. Then set it to any one measured frequency within its operating range and make sure the instrument is operated in its linear range.
c. Adjust the center frequency of SA on any frequency be measured and set SA to zero span mode. And then, set RBW and VBW of spectrum analyzer to proper value.
d. Measure the time duration of one transmission on the measured frequency. And then plot the result with time difference of this time duration.
e. Repeat above procedures until all different time-slot modes have been completed.

3.4.3 Test setup



3.5 20DB EMISSION BANDWIDTH

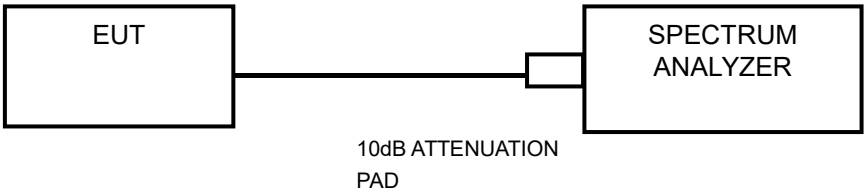
3.5.1 Limits

For frequency hopping system operating in the 2400-2483.5MHz, If the 20dB bandwidth of hopping channel is greater than 25kHz, two-thirds 20dBbandwidth of hopping channel shell be a minimum limit for the hopping channel separation

3.5.2 Measurement procedure

a. Check the calibration of the measuring instrument using either an internal calibrator or a known signal from an external generator.
b. Turn on the EUT and connect it to measurement instrument. Then set it to any one convenient frequency within its operating range. Set a reference level on the measuring instrument equal to the highest peak value.
c. Measure the frequency difference of two frequencies that were attenuated 20dB from the reference level. Record the frequency difference as the emission bandwidth.
d. Repeat above procedures until all frequencies measured were complete.

3.5.3 Test setup



3.6 HOPPING CHANNEL SEPARATION

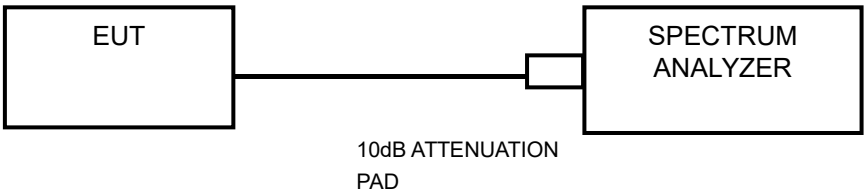
3.6.1 Limits

At least 25kHz or two-third of 20dB hopping channel bandwidth (whichever is greater).

3.6.2 Measurement procedure

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

3.6.3 Test setup



3.7 CONDUCTED OUTPUT POWER

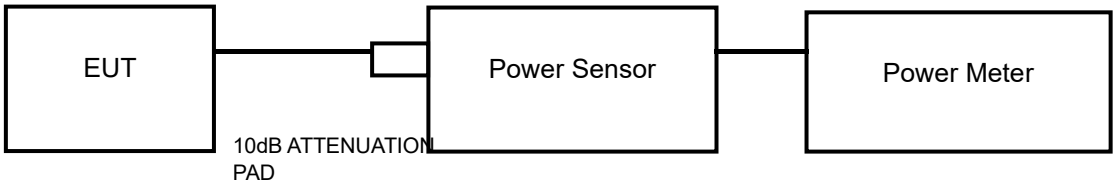
3.7.1 Limits(FCC)

For frequency hopping systems operating in the 2400-2483.5 MHz band employing at least 75 non-overlapping hopping channels, and all frequency hopping systems in the 5725-5850 MHz band: 1 watt. For all other frequency hopping systems in the 2400-2483.5 MHz band: 0.125 watts.

3.7.2 Measurement procedure

a. A peak power sensor was used on the output port of the EUT. A power meter was used to read the response of the peak power sensor and set the detector to PEAK. Record the power level.
b. Anaverage power sensor was used on the output port of the EUT. A power meter was used to read the response of the average power senso and set the detector to AVERAGE. Record the power level.

3.7.3 Test setup



3.8 OUT OF BAND EMISSION MEASUREMENT

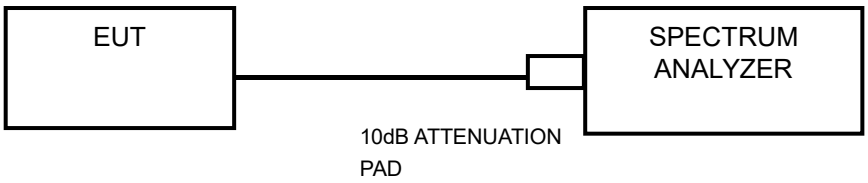
3.8.1 Limits

Below –20dB of the highest emission level of operating band (in 100KHz RBW).

3.8.2 Measurement procedure

The transmitter output was connected to the spectrum analyzer via a low loss cable. of Spectrum Analyzer was set RBW to 100 kHz and VBW to 300 kHz with suitable frequency span including 100 MHz bandwidth from band edge. Detector = PEAK and Trace mode = Max Hold. The band edges was measured and recorded.

3.8.3 Test setup



3.9 OCCUPIED BANDWIDTH MEASUREMENT

3.9.1 Measurement procedure

The transmitter antenna output was connected to the spectrum analyzer through an attenuator. The resolution bandwidth shall be set to the range of 1% to 5% of the anticipated emission bandwidth, and a video bandwidth at least 3x the resolution bandwidth.
below the lower and above the upper frequency limits, the mean powers emitted are each equal to a specified percentage 0.5 %of the total mean power of a given emission.

3.9.2 TEST SETUP

3.10 ANTENNA REQUIREMENT

3.10.1 LIMITS OFFREQUENCY STABILITY

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 directional gain of the antenna exceeds 6 dBi.

3.10.2 ANTENNA ANTI-REPLACEMENT CONSTRUCTION

The antenna used for this product is External antenna and that no antenna other than that furnished by the responsible party shall be used with the device

3.10.3 ANTENNA GAIN

The maximum peak gain of the transmit antenna 2 is 2.75 dBi.

4 PHOTOGRAPHS OF TEST SETUP

Please refer to the attached file (Test Photos).

5 PHOTOGRAPHS OF THE EUT

Please refer to the attached file (External Photos report and Internal Photos).

------ End of the Report ------

Important

(1) The test report is invalid without the official stamp of CVC;

(2) Any part photocopies of the test report are forbidden without the written permission from CVC;

(3) The test report is invalid without the signatures of Approval and Reviewer;

(4) The test report is invalid if altered;

(5) Objections to the test report must be submitted to CVC within 15 days.

(6) Generally, commission test is responsible for the tested samples only.

(7) As for the test result "-" or "N" means "not applicable", "/" means "not test", "P" means "pass" and "F" means "fail"

The test data and test results given in this test report should only be used for purposes of scientific research, teaching and internal quality control when the CMA symbol is not presented.

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