



Test Report No.:
FCC2022-0064-RF4

RF Test Report

EUT : SAGA
MODEL : OV1
BRAND NAME : 
APPLICANT : OSOM Products Inc.
Classification Of Test : N/A

CVC Testing Technology Co., Ltd.



Applicant	Name: OSOM Products Inc. Address: 21701 Stevens Creek Blvd #2270, Cupertino, CA 95015, USA		
Manufacturer	Name: OSOM Products Inc. Address: 21701 Stevens Creek Blvd #2270, Cupertino, CA 95015, USA		
Equipment Under Test	Product Name: SAGA Model/Type: OV1 Brand Name:  Serial NO.: N/A Sample NO.:15-1		
Date of Receipt.	2022.09.13	Date of Testing	2022.09.13~2022.10.24
Test Specification		Test Result	
FCC Part 15, Subpart C, Section 15.247 Canada RSS-247 Issue 2 (2017-02) Canada RSS-Gen Issue 5 (2019-03)		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: 2022.10.24		
Tested by:  XuZhenFei Name Signature	Reviewed by:  LiuYongHai Name Signature	Approved by:  ChenHuaWen 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
FCC2022-0064-RF4	Original release	2022.10.24



1 SUMMARY OF TEST RESULTS

The EUT has been tested according to the following specifications:

APPLIED STANDARD: FCC Part 15, Subpart C, Canada RSS-247, Canada RSS-Gen			
TANDARD SECTION	TEST TYPE AND LIMIT	RESULT	REPORTSECTION
FCC 15.207 RSS-Gen 8.8	AC Power Conducted Emission	PASS	See setion 3.1
RSS-Gen 6.7	Occupied Bandwidth Measurement	PASS	Annex B of GJW2022-9328-RF4-A1
FCC 15.247(a)(1) RSS-2475.1(d)	Number of Hopping Frequency Used	PASS	Annex F of GJW2022-9328-RF4-A1
FCC 15.247(a)(1) RSS-2475.1(b)	Hopping Channel Separation	PASS	Annex D of GJW2022-9328-RF4-A1
FCC 15.247(a)(1) RSS-2475.1(d)	Dell Time of Each Channel	PASS	Annex E of GJW2022-9328-RF4-A1
FCC 15.247(a)(1) RSS-247 5.1(b)	20dB EMISSION BANDWIDTH	PASS	Annex A of GJW2022-9328-RF4-A1
FCC 15.247(b) RSS-2475.4(b)	Conducted Output Power	PASS	Annex C of GJW2022-9328-RF4-A1
FCC 15.247(d), 15.209,15.205 RSS-Gen8.10 Table 7 RSS-Gen 8.9 Table 5	Radiated Emissions	PASS	See setion 3.2
FCC 15.247(d) RSS-2475.5	Out of band Emission Measurement	PASS	Annex G&H of GJW2022-9328-RF4-A1
FCC 15.203 FCC 15.247(b)	Antenna Requirement	PASS	No antenna connector is used.



1.1 LIST OF TEST AND MEASUREMENT INSTRUMENTS

Test Equipment	Type/Mode	SERIAL NO.	Equipment No.	Manufacturer	Cal. Due
WIFI & Bluetooth Test System 1					/
Communication Shielded Room 1	4m*3m*3m	CRTDSWKS44301	VGDS-0699	CRT	2024/04/24
Spectrum Analyzer	FSV40	101580	DZ-000238-3	R&S	2023/06/05
Comprehensive Test Instrument	CMW270	100304	DZ-000240-1	R&S	2022/12/09
Analog Signal Generator	SMB100A	181858	DZ-000238-2	R&S	2023/06/05
Vector Signal Generator	SGT100A	111661	DZ-000238-1	R&S	2023/06/05
RF Radio Frequency Switch	JS0806-2	19H9080187		Tonscend	2023/06/06
Programmable DC Power Supply	E3644A	MY58036222	DZ-000178	KEYSIGHT	2023/04/21
Spectrum Analyzer	FSV40	101580	DZ-000238-3	R&S	2023/06/05
Radiation SpuriousTest System					/
3m Semi-Anechoic Chamber	FACT-4	ST08035	WKNA-0024	ETS	2024/12/12
Loop Antenna	FMZB1513	1513-170	EM-000384	SCHWARZBECK	2023-03-04
Spectrum Analyzer	N9010B	MY57470323	DZ-000174	KEYSIGHT	2023/03/02
EMI Test Receiver	N9038A-508	MY532290079	EM-000397	Agilent	2023/03/02
Broadband Antenna	VULB 9163	9163-530	EM-000342	SCHWARZBECK	2023/06/25
Waveguide Horn Antenna	HF906	360306/008	WKNA-0024-8	R&S	2023/03/04
Waveguide Horn Antenna	BBHA9170	00949	DZ-000209-2	SCHWARZBECK	2023/07/31
Preamplifier	BBV 9721	9721-050	DZ-000209-1	SCHWARZBECK	2023/06/05
5G Bandstop Filters	WRCJV12-4900-5100-5900-6100-50EE	1	DZ-000186	WI	2022/12/20
Comprehensive tester	CMW500	159000	DZ-000240-2	R&S	2022/12/20
Conducted emission					/
EMI Test Receiver	ESCI	100857	WKNB-0081	R&S	2022-12-08
EMI Test Receiver	ESR3	102394	VG DY-0705	R&S	2023-03-04
LISN	NSLK 8127	8127644	VG DY-0150	SCHWARZBECK	2023-09-04
LISN	NSLK 8128	8128-316	VG DY-0149	SCHWARZBECK	2023-09-04
LISN	NSLK 8129	8129-268	EM-000388	SCHWARZBECK	2023-03-03
Plus Limiter (＃1)	VTSD 9561 F-N	00515	VG DY-0808	SCHWARZBECK	2023-03-04
Plus Limiter (＃2)	VTSD 9561	9561-F017	VG DY-0152	SCHWARZBECK	2024-09-04
Impedance Stabilization Network	ISN T800	27095	WKNE-0195	TESEQ	2023-09-04
Impedance Stabilization Network	NTFM8158	8158-0092	VG DY-0356	SCHWARZBECK	2023-06-07
ImpedanceStabilizationNetwork	NTFM8131	#184	EM-000498	SCHWARZBECK	2023-06-07
Voltage Probe	TK9420	9420-499	VG DY-0128	SCHWARZBECK	2023-03-04
Power Divider	4901.17.B	22643830	DB-0016	HUBER+SUHNER	2023-09-01
Video Signal Generator	GV-798+	151064920001	VGDS-0215	PROMAX	2023-05-30
AudioSignalGenerator	GAG-810	EK871591	EM-000309	GW	2022-12-08
Shielding Room(＃1)	GP1A	001	WKNF-0001	LEINING	2024-08-08



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	FREQUENCY	UNCERTAINTY
1	Conducted Emissions	9kHz~30MHz	±2.66dB
2	Radiated Spurious Emissions	9KHz ~ 30MHz	±0.769dB
		30MHz ~ 1GMHz	±0.877dB
		1GHz ~ 18GHz	±0.777dB
		18GHz ~ 40GHz	±1.315dB

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

1.3 TEST LOCATION

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

Address: No.3,TiantaiyiRoad,KaitaiAvenue,ScienceCity,Guangzhou,China

Post Code: 510663 Tel: 0755-23763060-8805

Fax: 0755-23763060 E-mail: sz-kf@cvc.org.cn

<http://www.cvc.org.cn>

2 GENERAL INFORMATION

2.1 GENERAL PRODUCT INFORMATION

PRODUCT	SAGA
BRAND	
TEST MODEL	OV1
ADDITIONAL MODEL	N/A
FCC ID	2AW49200731A
IC ID	26394-200731A
POWER SUPPLY	DC 3.89 from Battery or USB host unit
MODULATION TYPE	GFSK, $\pi/4$ DQPSK, 8DPSK
OPERATING FREQUENCY	2402MHz~2480MHz
NUMBER OF CHANNEL	79
PEAK OUTPUT POWER	10.79dBm (Max. Measured)
ANTENNA TYPE (Remark 5)	PIFA Antenna, with -0.5dBi gain
HARDWARE REVISION	MP
SOFTWARE REVISION	SQ3A.220705.126
FIX FREQUENCY SOFTWARE	Qualcomm Radio Control Toolkit v4.0
I/O PORTS	Refer to user's manual
CABLE SUPPLIED	USB line, 1.2Meter, Shielded without ferrite
Note: - For more detailed features description, please refer to the manufacturer's specifications or the User's Manual. - For the test results, the EUT had been tested with all conditions. But only the worst case was shown in test report. - EUT photo refer to the report (Report NO.: FCC2022-0064-E). - Since the above data and/or information is provided by the client relevant results or conclusions of this report are only made for these data and/or information, CVC is not responsible for the authenticity, integrity and results of the data and information and/or the validity of the conclusion. - 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, $\pi/4$ 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		

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

For BT (GFSK, $\pi/4$ 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



2.3 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:

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	$\pi/4$ 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	$\pi/4$ 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 5V from USB host unit	LiuShiWei
RSE≥1G	24deg. C, 55%RH	DC 5V from USB host unit	LiuShiWei
PLC	24deg. C, 55%RH	DC 5V from USB host unit	LiuShiWei
APCM	25deg. C, 58%RH	DC 5V from USB host unit	LiuShiWei



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 C63.10-2020
Canada RSS-247 Issue 2 (2017-02)
Canada RSS-Gen Issue 5 (2019-03)

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.

During the tests.

Support Equipment							
NO	Description	Brand	Model No.	Serial Number	Supplied by		
1	Laptop	Lenovo	V14	PFNXB1628023	Lab		
Support Cable							
NO	Description	Quantity (Number)	Length (m)	Detachable (Yes/ No)	Shielded (Yes/ No)	Cores (Number)	Supplied by
1	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

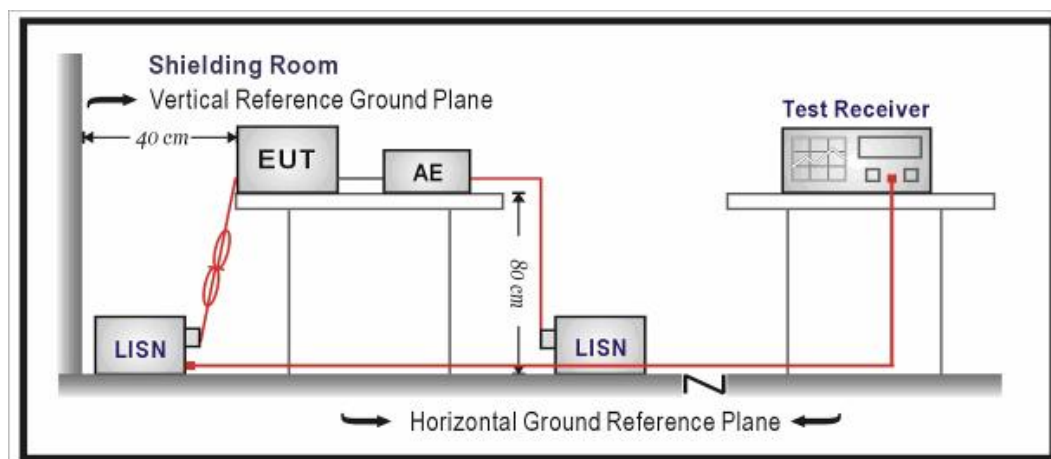
Frequency (MHz)	Conducted Limits(dBμV)	
	Quasi-peak	Average
0.15 - 0.5	66 to 56 *	56 to 46*
0.5 - 5	56	46
5 - 30	60	50

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.

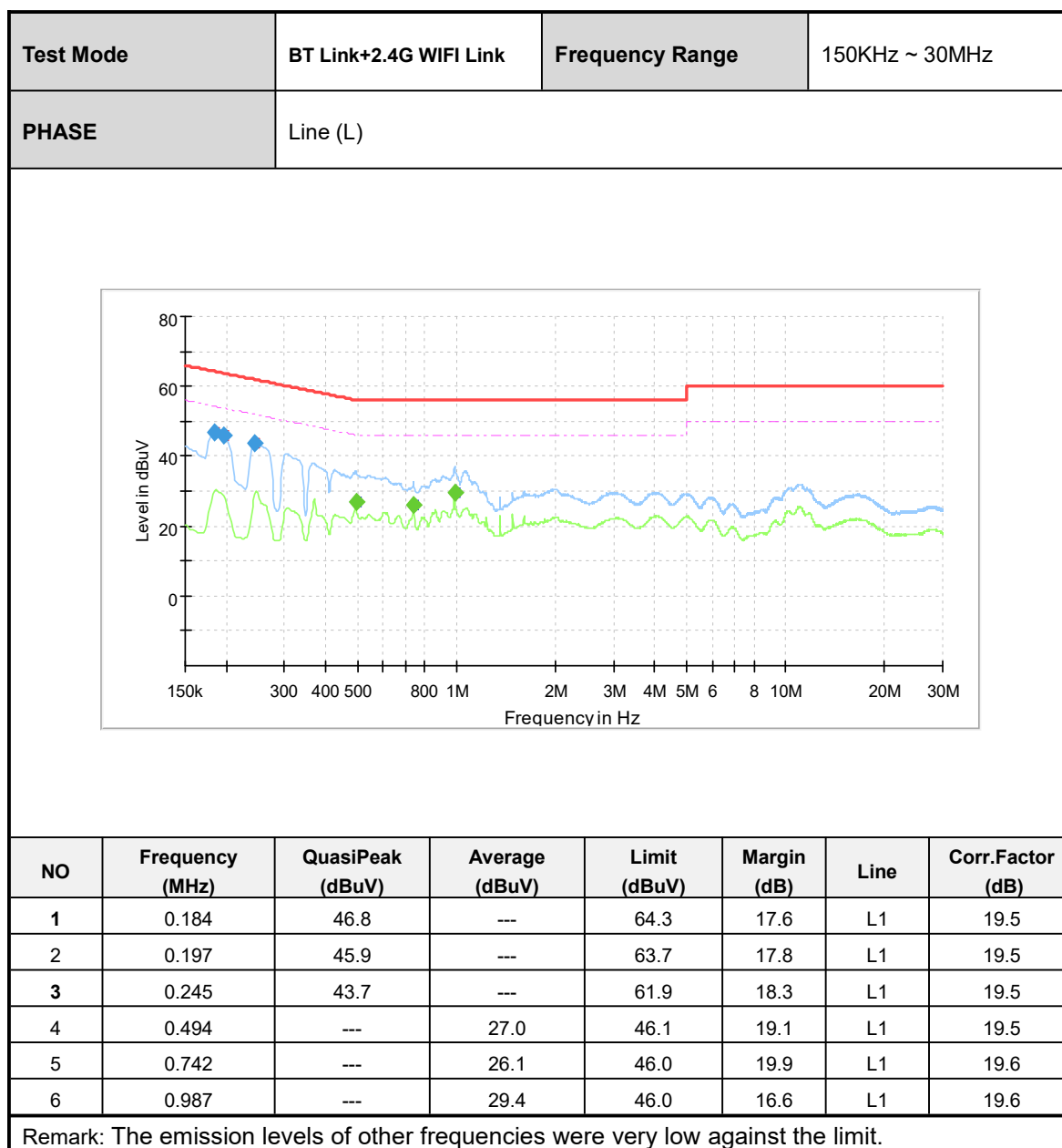
3.1.2 Measurement procedure

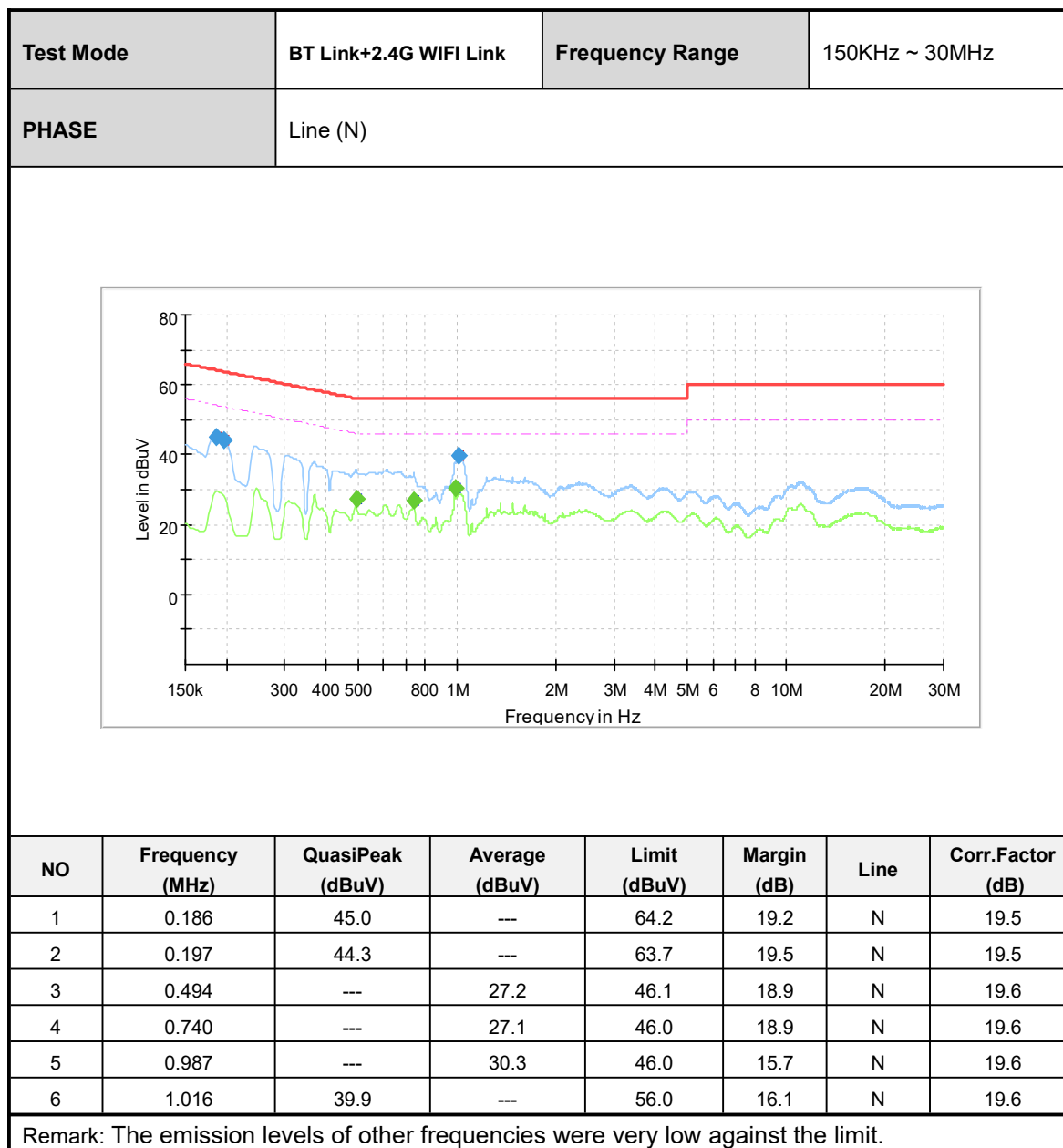
- The EUT was placed on a platform of nominal size, 1 m by 1.5 m, raised 80 cm above the conducting ground plane. The vertical conducting plane was located 40 cm to the rear of the EUT. All other surfaces of EUT were at least 80 cm from any other grounded conducting surface. The EUT and simulators are 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 be 1.5m above the ground,
- 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.
- 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





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

- 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.
- The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.
- 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.
- 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.
- The test-receiver system was set to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.
- 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.
- 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.

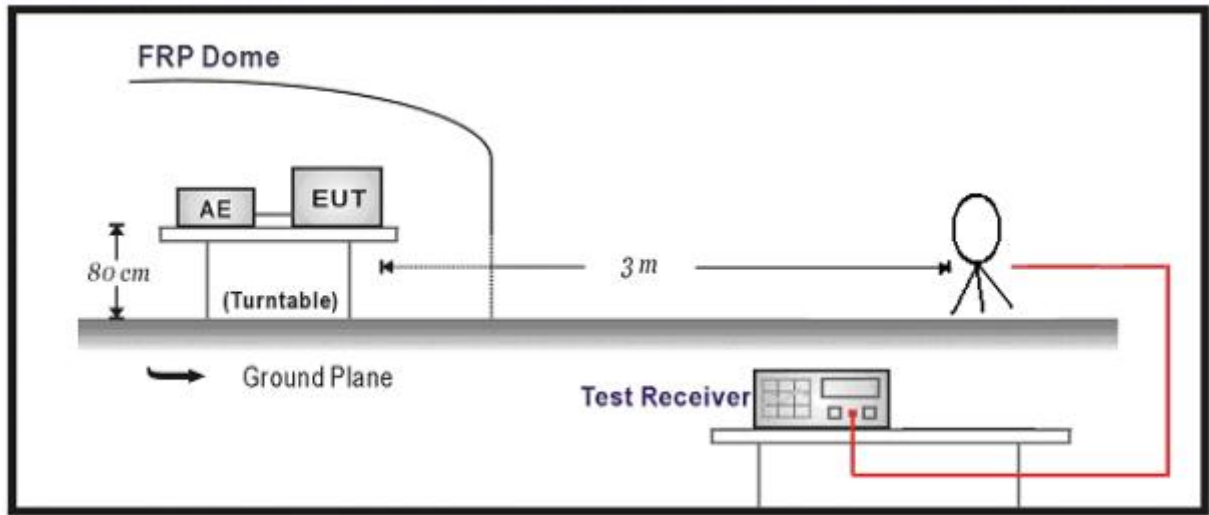


NOTE:

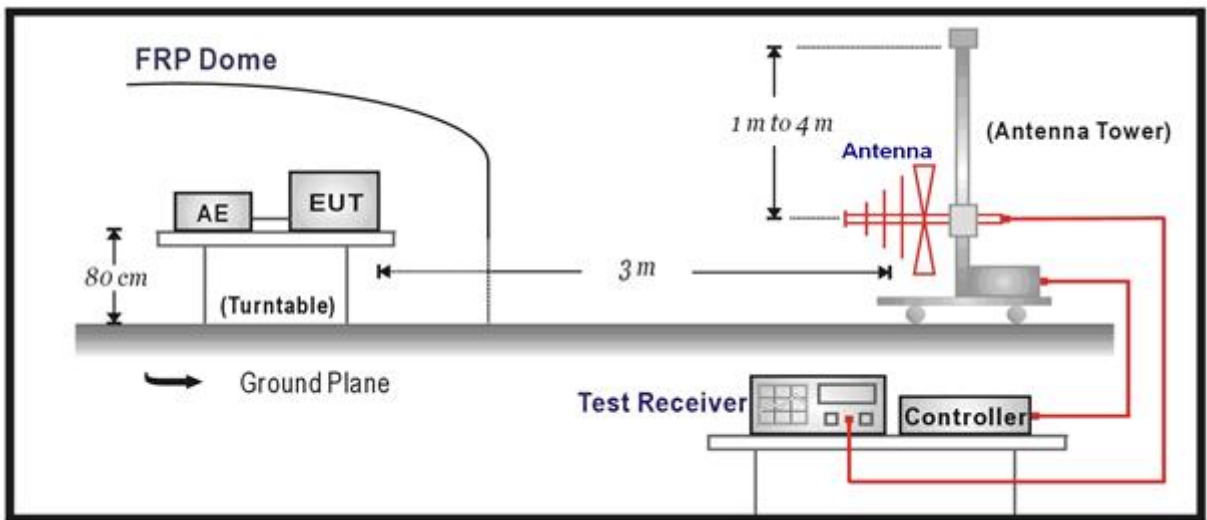
1. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 120kHz for Quasi-peak detection at frequency below 1GHz.
2. The resolution bandwidth of test receiver/spectrum analyzer is 1 MHz and video bandwidth is 3MHz for Peak detection at frequency above 1GHz.
3. The resolution bandwidth of test receiver/spectrum analyzer is 1MHz and the video bandwidth is $\geq 1/T$ (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

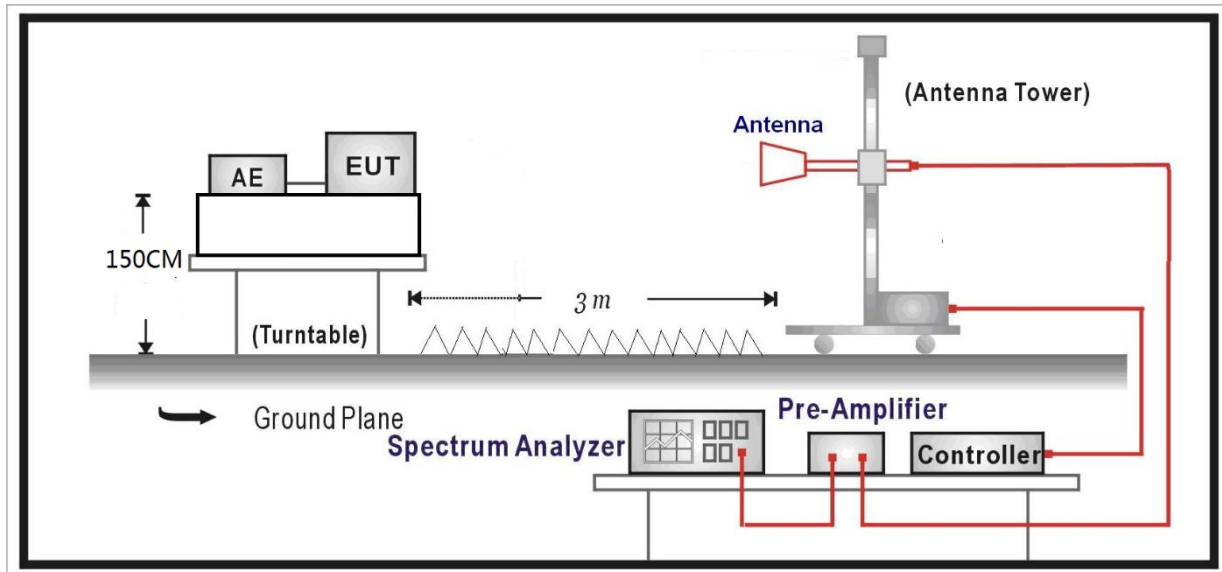
Below 30MHz Test Setup:



Below 1GHz Test Setup:

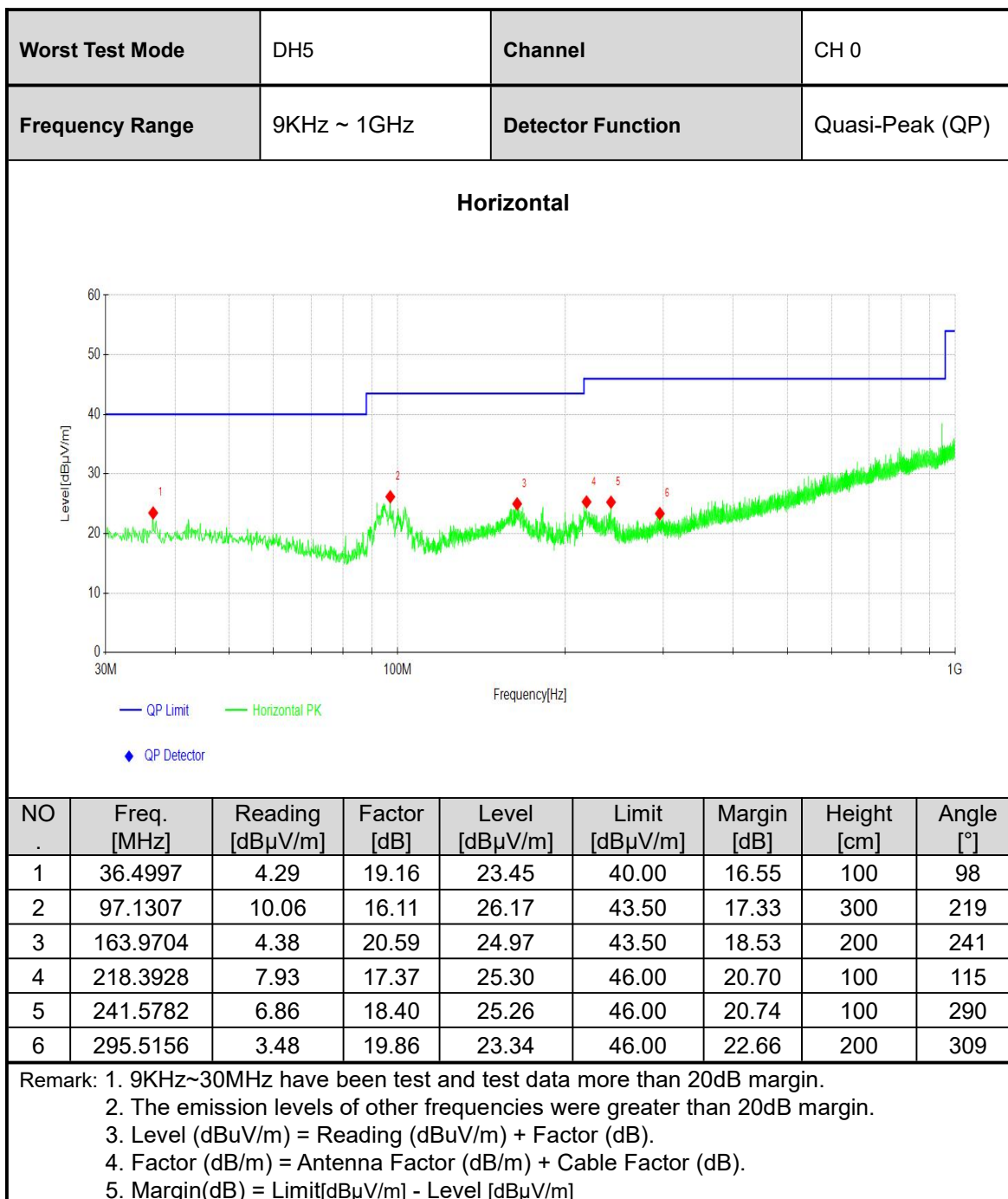


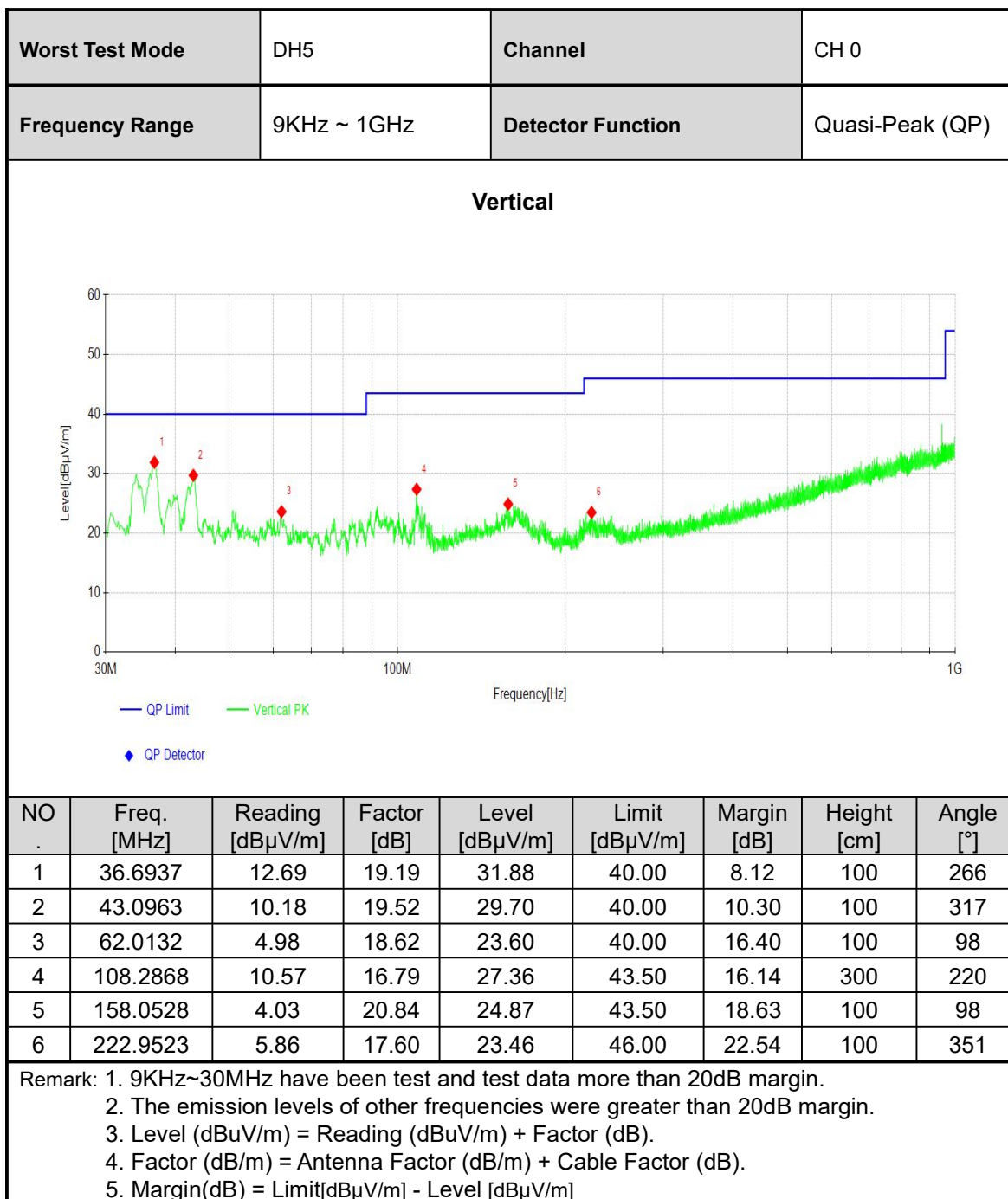
Above 1GHz Test Setup:



3.2.4 Test results

BELOW 1GHz WORST-CASE DATA:







ABOVE 1GHz DATA

DH5-CH 0

Channel		CH 0		Frequency		2402MHz			
Frequency Range		Above 1G		Detector Function		PK/AV			
Horizontal									
NO	Freq. [MHz]	Reading [dBμV/m]	Factor [dB]	Level [dBμV/m]	Limit [dBμV/m]	Margin [dB]	Height [cm]	Angle [°]	Remark
1	2390.0000	36.78	-0.15	36.63	54.00	17.37	271	188	AV
2	2390.0000	44.87	-0.15	44.72	74.00	29.28	104	2	PK
3	2401.8932	97.73	-0.03	97.70			257	354	AV
4	2402.1402	98.11	-0.03	98.08			306	357	PK
5	4804.0000	42.58	9.29	51.87	74.00	22.13	299	54	PK
6	4804.0000	34.72	9.29	44.01	54.00	9.99	246	46	AV
7	7206.0000	20.28	12.81	33.09	54.00	20.91	364	77	AV
8	7206.0000	28.03	12.81	40.84	74.00	33.16	231	301	PK
9	9608.0000	27.72	13.32	41.04	74.00	32.96	385	156	PK
10	9608.0000	19.77	13.32	33.09	54.00	20.91	136	267	AV
Vertical									
NO	Freq. [MHz]	Reading [dBμV/m]	Factor [dB]	Level [dBμV/m]	Limit [dBμV/m]	Margin [dB]	Height [cm]	Angle [°]	Remark
1	2390.0000	37.01	-0.15	36.86	54.00	17.14	311	305	AV
2	2390.0000	44.05	-0.15	43.90	74.00	30.10	221	92	PK
3	2401.9312	95.15	-0.03	95.12			280	92	AV
4	2402.1212	95.48	-0.03	95.45			125	92	PK
5	4804.0000	42.73	9.29	52.02	74.00	21.98	331	77	PK
6	4804.0000	34.63	9.29	43.92	54.00	10.08	197	123	AV
7	7206.0000	20.69	12.81	33.50	54.00	20.50	226	216	AV
8	7206.0000	28.85	12.81	41.66	74.00	32.34	144	216	PK
9	9608.0000	28.01	13.32	41.33	74.00	32.67	142	58	PK
10	9608.0000	19.46	13.32	32.78	54.00	21.22	385	58	AV
Remark: 1. The emission levels of other frequencies were greater than 20dB margin. 2. Level (dBuV/m) = Reading (dBuV/m) + Factor (dB). 3. Factor (dB/m) = Antenna Factor (dB/m) + Cable Factor (dB). 4. Margin(dB) = LimitdBuV/m] - Level [dBuV/m]									



DH5-CH 78

Channel		CH 78			Frequency		2480MHz		
Frequency Range		Above 1G			Detector Function		PK/AV		
Horizontal									
NO	Freq. [MHz]	Reading [dBμV/m]	Factor [dB]	Level [dBμV/m]	Limit [dBμV/m]	Margin [dB]	Height [cm]	Angle [°]	Remark
1	2479.8200	99.50	0.32	99.82			365	1	PK
2	2479.9530	99.19	0.32	99.51			275	360	AV
3	2483.5000	37.24	0.46	37.70	54.00	16.30	360	339	AV
4	2483.5000	46.53	0.46	46.99	74.00	27.01	192	145	PK
5	4960.0000	42.79	10.69	53.48	74.00	20.52	321	359	PK
6	4960.0000	34.39	10.69	45.08	54.00	8.92	152	258	AV
7	7440.0000	21.03	9.75	30.78	54.00	23.22	330	32	AV
8	7440.0000	29.78	9.75	39.53	74.00	34.47	230	32	PK
9	9920.0000	26.63	13.83	40.46	74.00	33.54	364	282	PK
10	9920.0000	19.16	13.83	32.99	54.00	21.01	174	90	AV
Vertical									
NO	Freq. [MHz]	Reading [dBμV/m]	Factor [dB]	Level [dBμV/m]	Limit [dBμV/m]	Margin [dB]	Height [cm]	Angle [°]	Remark
1	2479.8010	95.04	0.32	95.36			145	75	PK
2	2480.0290	94.57	0.32	94.89			310	61	AV
3	2483.5000	44.95	0.46	45.41	54.00	8.59	121	288	PK
4	2483.5000	36.81	0.46	37.27	54.00	16.73	220	235	AV
5	4960.0000	42.05	10.69	52.74	74.00	21.26	261	144	PK
6	4960.0000	34.61	10.69	45.30	54.00	8.70	123	285	AV
7	7440.0000	21.83	9.75	31.58	54.00	22.42	103	157	AV
8	7440.0000	29.90	9.75	39.65	74.00	34.35	237	152	PK
9	9920.0000	26.81	13.83	40.64	74.00	33.36	238	124	PK
10	9920.0000	19.23	13.83	33.06	54.00	20.94	241	78	AV
Remark: 1. The emission levels of other frequencies were greater than 20dB margin. 2. Level (dBuV/m) = Reading (dBuV/m) + Factor (dB). 3. Factor (dB/m) = Antenna Factor (dB/m) + Cable Factor (dB). 4. Margin(dB) = LimitdBuV/m] - Level [dBuV/m]									



2DH5-CH 0

Channel		CH 0			Frequency		2402MHz		
Frequency Range		Above 1G			Detector Function		PK/AV		
Horizontal									
NO	Freq. [MHz]	Reading [dBµV/m]	Factor [dB]	Level [dBµV/m]	Limit [dBµV/m]	Margin [dB]	Height [cm]	Angle [°]	Remark
1	2390.0000	36.55	-0.15	36.40	54.00	17.60	342	355	AV
2	2390.0000	44.67	-0.15	44.52	74.00	29.48	351	304	PK
3	2401.9122	91.72	-0.03	91.69			290	358	AV
4	2402.2162	93.77	-0.03	93.74			374	158	PK
5	4804.0000	34.78	9.29	44.07	54.00	9.93	348	76	AV
6	4804.0000	42.94	9.29	52.23	74.00	21.77	154	271	PK
7	7206.0000	28.23	12.81	41.04	74.00	32.96	359	106	PK
8	7206.0000	20.35	12.81	33.16	54.00	20.84	312	1	AV
9	9608.0000	19.87	13.32	33.19	54.00	20.81	142	300	AV
10	9608.0000	27.61	13.32	40.93	74.00	33.07	324	359	PK
Vertical									
NO	Freq. [MHz]	Reading [dBµV/m]	Factor [dB]	Level [dBµV/m]	Limit [dBµV/m]	Margin [dB]	Height [cm]	Angle [°]	Remark
1	2390.0000	45.02	-0.15	44.87	54.00	9.13	322	2	PK
2	2390.0000	36.43	-0.15	36.28	54.00	17.72	179	162	AV
3	2401.8932	91.86	-0.03	91.83			208	76	PK
4	2401.9502	89.50	-0.03	89.47			298	76	AV
5	4804.0000	42.48	9.29	51.77	74.00	22.23	335	6	PK
6	4804.0000	34.47	9.29	43.76	54.00	10.24	137	36	AV
7	7206.0000	20.57	12.81	33.38	54.00	20.62	300	124	AV
8	7206.0000	28.34	12.81	41.15	74.00	32.85	138	220	PK
9	9608.0000	27.17	13.32	40.49	74.00	33.51	297	16	PK
10	9608.0000	19.62	13.32	32.94	54.00	21.06	144	337	AV
Remark: 1. The emission levels of other frequencies were greater than 20dB margin. 2. Level (dBuV/m) = Reading (dBuV/m) + Factor (dB). 3. Factor (dB/m) = Antenna Factor (dB/m) + Cable Factor (dB). 4. Margin(dB) = Limit(dBuV/m) - Level (dBuV/m)									



2DH5-CH 78

Channel		CH 78			Frequency		2480MHz		
Frequency Range		Above 1G			Detector Function		PK/AV		
Horizontal									
NO	Freq. [MHz]	Reading [dBμV/m]	Factor [dB]	Level [dBμV/m]	Limit [dBμV/m]	Margin [dB]	Height [cm]	Angle [°]	Remark
1	2479.8010	96.84	0.32	97.16			139	166	PK
2	2480.0290	94.45	0.32	94.77			119	166	AV
3	2483.5000	36.63	0.46	37.09	54.00	16.91	137	306	AV
4	2483.5000	44.61	0.46	45.07	74.00	28.93	356	99	PK
5	4960.0000	42.76	10.69	53.45	74.00	20.55	277	349	PK
6	4960.0000	34.67	10.69	45.36	54.00	8.64	141	131	AV
7	7440.0000	21.11	9.75	30.86	54.00	23.14	101	256	AV
8	7440.0000	28.57	9.75	38.32	74.00	35.68	314	256	PK
9	9920.0000	27.23	13.83	41.06	74.00	32.94	322	52	PK
10	9920.0000	18.89	13.83	32.72	54.00	21.28	224	297	AV
Vertical									
NO	Freq. [MHz]	Reading [dBμV/m]	Factor [dB]	Level [dBμV/m]	Limit [dBμV/m]	Margin [dB]	Height [cm]	Angle [°]	Remark
1	2480.0480	91.56	0.32	91.88			178	121	AV
2	2480.1430	93.40	0.32	93.72			330	94	PK
3	2483.5000	36.99	0.46	37.45	54.00	16.55	161	342	AV
4	2483.5000	45.33	0.46	45.79	74.00	28.21	197	1	PK
5	4960.0000	42.97	10.69	53.66	74.00	20.34	316	185	PK
6	4960.0000	34.78	10.69	45.47	54.00	8.53	327	131	AV
7	7440.0000	21.26	9.75	31.01	54.00	22.99	295	291	AV
8	7440.0000	29.18	9.75	38.93	74.00	35.07	258	359	PK
9	9920.0000	26.99	13.83	40.82	74.00	33.18	157	237	PK
10	9920.0000	19.49	13.83	33.32	54.00	20.68	362	17	AV
Remark: 1. The emission levels of other frequencies were greater than 20dB margin. 2. Level (dBuV/m) = Reading (dBuV/m) + Factor (dB). 3. Factor (dB/m) = Antenna Factor (dB/m) + Cable Factor (dB). 4. Margin(dB) = LimitdBuV/m] - Level [dBuV/m]									



3DH5-CH 0

Channel		CH 0			Frequency		2402MHz		
Frequency Range		Above 1G			Detector Function		PK/AV		
Horizontal									
NO	Freq. [MHz]	Reading [dBµV/m]	Factor [dB]	Level [dBµV/m]	Limit [dBµV/m]	Margin [dB]	Height [cm]	Angle [°]	Remark
1	2390.0000	36.79	-0.15	36.64	54.00	17.36	231	3	AV
2	2390.0000	47.06	-0.15	46.91	74.00	27.09	372	3	PK
3	2401.9312	91.09	-0.03	91.06			375	179	AV
4	2402.0452	93.90	-0.03	93.87			170	179	PK
5	4804.0000	43.43	9.29	52.72	74.00	21.28	399	58	PK
6	4804.0000	34.70	9.29	43.99	54.00	10.01	157	25	AV
7	7206.0000	20.43	12.81	33.24	54.00	20.76	189	43	AV
8	7206.0000	28.83	12.81	41.64	74.00	32.36	218	23	PK
9	9608.0000	28.53	13.32	41.85	74.00	32.15	270	194	PK
10	9608.0000	19.39	13.32	32.71	54.00	21.29	239	294	AV
Vertical									
NO	Freq. [MHz]	Reading [dBµV/m]	Factor [dB]	Level [dBµV/m]	Limit [dBµV/m]	Margin [dB]	Height [cm]	Angle [°]	Remark
1	2390.0000	36.62	-0.15	36.47	54.00	17.53	212	335	AV
2	2390.0000	45.70	-0.15	45.55	74.00	28.45	378	348	PK
3	2402.0262	90.78	-0.03	90.75			304	74	PK
4	2402.0452	88.85	-0.03	88.82			343	61	AV
5	4804.0000	42.49	9.29	51.78	74.00	22.22	135	331	PK
6	4804.0000	34.83	9.29	44.12	54.00	9.88	359	356	AV
7	7206.0000	20.31	12.81	33.12	54.00	20.88	327	303	AV
8	7206.0000	27.97	12.81	40.78	74.00	33.22	172	303	PK
9	9608.0000	27.37	13.32	40.69	74.00	33.31	273	262	PK
10	9608.0000	19.33	13.32	32.65	54.00	21.35	266	16	AV
Remark: 1. The emission levels of other frequencies were greater than 20dB margin. 2. Level (dBuV/m) = Reading (dBuV/m) + Factor (dB). 3. Factor (dB/m) = Antenna Factor (dB/m) + Cable Factor (dB). 4. Margin(dB) = Limit[dBuV/m] - Level [dBuV/m]									

**3DH5-CH 39**

Channel		CH 39		Frequency		2441MHz			
Frequency Range		Above 1G		Detector Function		PK/AV			
Horizontal									
NO	Freq. [MHz]	Reading [dBμV/m]	Factor [dB]	Level [dBμV/m]	Limit [dBμV/m]	Margin [dB]	Height [cm]	Angle [°]	Remark
1	4882.0000	42.09	9.84	51.93	74.00	22.07	150	177	PK
2	4882.0000	35.14	9.84	44.98	54.00	9.02	221	177	AV
3	7321.5122	32.72	11.00	43.72	74.00	30.28	168	152	PK
4	7322.6823	25.02	10.98	36.00	54.00	18.00	159	186	AV
5	9764.0000	26.61	13.23	39.84	74.00	34.16	156	186	PK
6	9764.0000	18.69	13.23	31.92	54.00	22.08	188	107	AV
Vertical									
NO	Freq. [MHz]	Reading [dBμV/m]	Factor [dB]	Level [dBμV/m]	Limit [dBμV/m]	Margin [dB]	Height [cm]	Angle [°]	Remark
1	4882.0000	43.02	9.84	52.86	74.00	21.14	157	305	PK
2	4882.0000	34.41	9.84	44.25	54.00	9.75	187	305	AV
3	7313.3213	31.16	11.03	42.19	74.00	31.81	159	300	PK
4	7323.8524	22.26	10.96	33.22	54.00	20.78	159	172	AV
5	9764.0000	18.91	13.23	32.14	54.00	21.86	196	320	AV
6	9764.0000	27.02	13.23	40.25	74.00	33.75	178	236	PK
Remark: 1. The emission levels of other frequencies were greater than 20dB margin. 2. Level (dBuV/m) = Reading (dBuV/m) + Factor (dB). 3. Factor (dB/m) = Antenna Factor (dB/m) + Cable Factor (dB). 4. Margin(dB) = Limit[dBuV/m] - Level [dBuV/m]									



3DH5-CH 78

Channel		CH 78			Frequency		2480MHz		
Frequency Range		Above 1G			Detector Function		PK/AV		
Horizontal									
NO	Freq. [MHz]	Reading [dBμV/m]	Factor [dB]	Level [dBμV/m]	Limit [dBμV/m]	Margin [dB]	Height [cm]	Angle [°]	Remark
1	2479.9910	95.91	0.31	96.22			191	166	AV
2	2480.0860	97.09	0.32	97.41			261	166	PK
3	2483.5000	36.64	0.46	37.10	54.00	16.90	318	166	AV
4	2483.5000	45.81	0.46	46.27	74.00	27.73	319	166	PK
5	4960.0000	44.21	10.69	54.90	74.00	19.10	294	296	PK
6	4960.0000	34.49	10.69	45.18	54.00	8.82	285	56	AV
7	7440.0000	21.21	9.75	30.96	54.00	23.04	309	118	AV
8	7440.0000	29.78	9.75	39.53	74.00	34.47	320	148	PK
9	9920.0000	26.98	13.83	40.81	74.00	33.19	161	176	PK
10	9920.0000	19.19	13.83	33.02	54.00	20.98	225	272	AV
Vertical									
NO	Freq. [MHz]	Reading [dBμV/m]	Factor [dB]	Level [dBμV/m]	Limit [dBμV/m]	Margin [dB]	Height [cm]	Angle [°]	Remark
1	2479.8770	92.91	0.32	93.23			351	74	PK
2	2480.2190	91.11	0.32	91.43			126	60	AV
3	2483.5000	45.38	0.46	45.84	74.00	28.16	186	248	PK
4	2483.5000	37.72	0.46	38.18	54.00	15.82	207	315	AV
5	4960.0000	42.58	10.69	53.27	74.00	20.73	162	168	PK
6	4960.0000	34.71	10.69	45.40	54.00	8.60	158	164	AV
7	7440.0000	21.00	9.75	30.75	54.00	23.25	151	263	AV
8	7440.0000	28.52	9.75	38.27	74.00	35.73	259	34	PK
9	9920.0000	27.60	13.83	41.43	74.00	32.57	282	283	PK
10	9920.0000	19.61	13.83	33.44	54.00	20.56	311	71	AV
Remark: 1. The emission levels of other frequencies were greater than 20dB margin. 2. Level (dBuV/m) = Reading (dBuV/m) + Factor (dB). 3. Factor (dB/m) = Antenna Factor (dB/m) + Cable Factor (dB). 4. Margin(dB) = LimitdBuV/m] - Level [dBuV/m]									

3.3 NUMBER OF HOPPING FREQUENCY USED

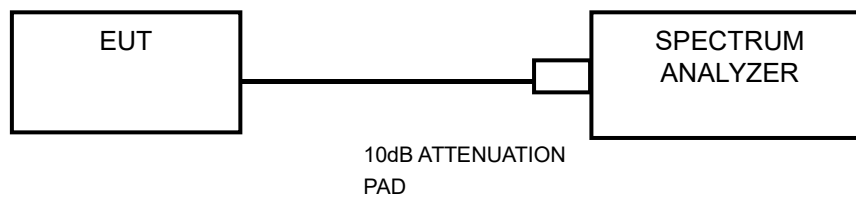
3.3.1 Limits

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

3.3.2 Measurement procedure

- Check the calibration of the measuring instrument (SA) using either an internal calibrator or a known signal from an external generator.
- 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.
- 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.
- Set the SA on View mode and then plot the result on SA screen.
- 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

- Check the calibration of the measuring instrument (SA) using either an internal calibrator or a known signal from an external generator.
- 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.
- 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.
- Measure the time duration of one transmission on the measured frequency. And then plot the result with time difference of this time duration.
- Repeat above procedures until all different time-slot modes have been completed.

3.4.3 Test setup



3.5 20dB EMISSION BANDWIDTH

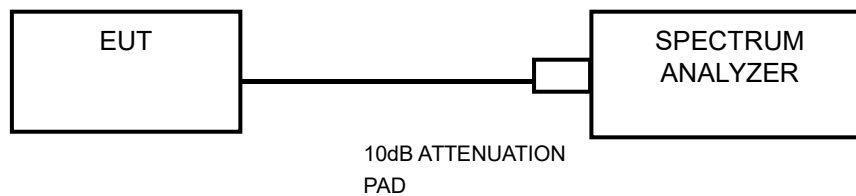
3.5.1 Limits

For frequency hopping system operating in the 2400-2483.5MHz, If the 20dB bandwidth of hopping channel is greater than 25kHz, two-thirds 20dB bandwidth of hopping channel shall 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

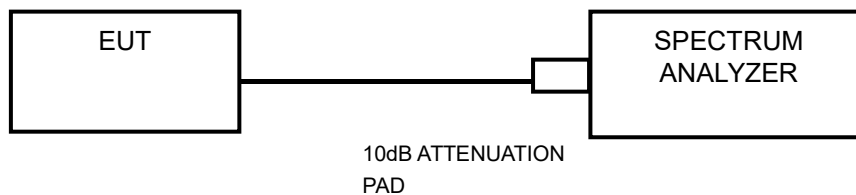
3.6.1 Limits

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

3.6.2 Measurement procedure

- Span: Wide enough to capture the peaks of two adjacent channels.
- 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.
- Video (or average) bandwidth (VBW) $\geq$ RBW.
- Sweep: Auto.
- Detector function: Peak.
- Trace: Max hold.
- 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.

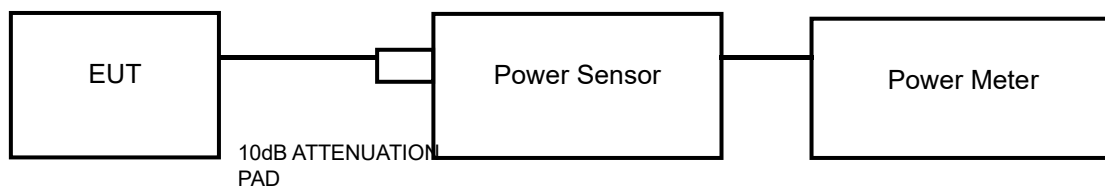
3.7.2 Limits(IC)

For FHSS operating in the band 2400-2483.5 MHz, the maximum peak conducted output power shall not exceed 1.0 W if the hopset uses 75 or more hopping channels; the maximum peak conducted output power shall not exceed 0.125 W if the hopset uses less than 75 hopping channels. The e.i.r.p. shall not exceed 4 W

3.7.3 Measurement procedure

- 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.
- An average power sensor was used on the output port of the EUT. A power meter was used to read the response of the average power sensor and set the detector to AVERAGE. Record the power level.

3.7.4 Test setup



3.8 OUT OF BAND EMISSION MEASUREMENT

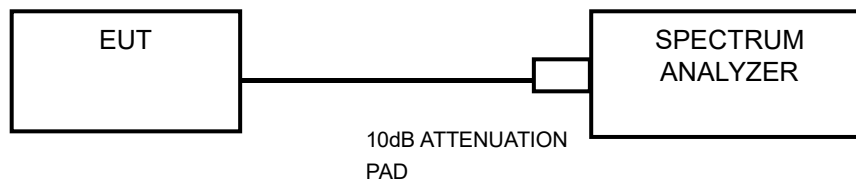
3.8.1 Limits

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





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).



Important

- (1) The test report is valid with the official seal of the laboratory and the signatures of Test engineer, Author and Reviewer simultaneously.
- (2) The test report is invalid if altered.
- (3) Any photocopies or part photocopies in the test report are forbidden without the written permission from the laboratory.
- (4) Objections to the test report must be submitted to the laboratory within 15 days.
- (5) Generally, commission test is responsible for the tested samples only.
- (6) Any photocopies or part photocopies of the test report are forbidden without the written permission from CVC;

Address of the laboratory:

CVC Testing Technology Co., Ltd.

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Post Code: 510663 Tel: 020-32293888

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