TEST REPORT

Application No.:	HKEM2008000837AT
Applicant:	Vtech Telecommunications Ltd
Address of Applicant:	23/F, Tai Ping Industrial Centre, Block 1, 57 Ting Kok Road, Tai Po, Hong Kong
Equipment Under Test (EUT):	
EUT Name:	Pan and Tilt Monitor
Model No.:	RM5754HD PU; RM5754-2HD PU; RM5754-aHD PU; RM5854HD PU; RM5854-aHD PU; VM813HD PU; VM813-1bHD PU; VM813-abHD PU; RM5764HD PU; RM5764-2HD PU; RM5764-aHD PU;RM5864HD PU; RM5864-aHD PU; VM906HD PU; VM906-1bHD PU; VM906-abHD PU
Additional Model:	Please refer to section 2 of this report which indicates which item was actually tested and which were electrically identical.
Standard(s):	CFR 47 FCC Part 15, Subpart C, 2019 RSS-247 Issue 2: May 2017 RSS-Gen: Issue 5 Amdt 2019
FCC ID:	EW780-1922-01
IC:	1135B-80192201
HVIN:	35-201270PUA
Date of Receipt:	2020-08-11
Date of Test:	2020-08-12 to 2020-08-18
Date of Issue:	2019-11-13 (for original report HKEM1910000102701) 2020-08-18 (for new report HKEM200800083702)
Test Result:	**Pass***

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

The CE mark as shown below can be used, under the responsibility of the manufacturer, after completion of an EU Declaration of Conformity and compliance with all relevant EU Directives.

Law Man Kit
EMC Manager

Revision Record				
Version	**Chapter**	**Date**	**Modifier**	**Remark**
01		*2019-11-13*		*Original*
02		*2020-08-18*		*C2PC Change*

Authorized for issue by:				
				
		Leo Xu /Project Engineer		Date: 2020-08-17
				
		Law Man Kit /Reviewer		Date: 2020-08-18

2 Test Summary

Radio Spectrum Matter Part				
Item	**Standard**	**Method**	**Requirement**	**Result**
Conducted Disturbance at AC Power Line(150kHz-30MHz)	CFR 47 FCCPart 15, Subpart C 15.207	ANSI C63.10: 2013 Section 6.2	CFR 47 FCCPart 15, Subpart C 15.207	Pass
Conducted Peak Output Power	CFR 47 FCCPart 15, Subpart C 15.247	ANSI C63.10: 2013 Section 11.9.1.2	CFR 47 FCCPart 15, Subpart C 15.247(b)(3)	Pass
Radiated Spurious Emissions	CFR 47 FCCPart 15, Subpart C 15.247	ANSI C63.10: 2013 Section 6.10.4, Section 11.11	CFR 47 FCCPart 15, Subpart C 15.247(d)	Pass
Radiated Emissions which fall in the restricted bands	CFR 47 FCCPart 15, Subpart C 15.247 & 15.209	ANSI C63.10: 2013 Section 6.10.5	CFR 47 FCCPart 15, Subpart C 15.209 & 15.247(d)	Pass
Conducted Emissions at AC Power Line (150kHz-30MHz)	RSS-Gen Issue 5: Amdt 2019	ANSI C63.10 (2013) Section 6.2	RSS-Gen Section 8.8	Pass
Conducted Peak Output Power	RSS-247 Issue 2, February 2017	ANSI C63.10 (2013) Section 11.9.1	RSS-247 Section 5.4(d)	Pass
Radiated Spurious Emissions	RSS-247 Issue 2, February 2017	ANSI C63.10 (2013) Section 11.11	RSS-247 Section 5.5	Pass
Radiated Emissions which fall in the restricted bands	RSS-Gen Issue 5: Amdt 2019	ANSI C63.10 (2013) Section 6.4&6.5&6.6	RSS-247 Section Section 3.3 & RSS-Gen Section 8.10	Pass

Declaration of EUT Family Grouping:
Item no.:

RM5754HD PU; RM5754-2HD PU; RM5754-aHD PU; RM5854HD PU; RM5854-aHD PU; VM813HD PU; VM813-1bHD PU; VM813-abHD PU; RM5764HD PU; RM5764-2HD PU; RM5764-aHD PU;RM5864HD PU; RM5864-aHD PU; VM906HD PU; VM906-1bHD PU; VM906-abHD PU

a=any alphanumeric character or blank is presenting number of baby unit.
b= any alphanumeric character or blank is presenting color option

According to the confirmation from the applicant, the above models are identical in all electrical aspects in relating to the circuit design, PCB layout, electrical components used, internal wiring and functions. The differences are only the model/item No, color and decorations.
Therefore only the model RM5764HD PU was tested in this report.

Note: According to the cover letter for C2PC (Class II permissive changes) from the applicant, the change are as bleow based on previous test reports HKEM1910000102701 issued on 2019-11-13.

Change is listed as below:

1. Remove Ten Pao adaptor S005CAU0500100;
2. Add one alternative battery Tianmao BP1763;

   Remark: original battery with 2 types below:

   Battery 1 model: SP605062 (model), 3.7V / 2300mAh

   Battery 2 model: 634169(model), 3.7V / 2000mAh
3. VTPL adaptor VT05EUS05100 add PTC (Positive Temperature Coefficient) component for protection.

According to the changes above, no impact on RF circuit and design. Hence, Conducted Peak Output Power and Radiated Emission were re-tested in this report, all other test result were referred to previos report HKEM1910000102701 issued on 2019-11-13.

3 Contents

4 General Information

4.1 Details of E.U.T.

Power supply:	AC 120 V, 60 Hz
	DC 3.7V (“rechargeable” battery x 1)
Adapter	Adaptor model: VT05EUS05100
	Input: AC 100 V – 240 V, 50/60 Hz
	Output: DC 5 V, 1 A
Battery	Battery 1 model: SP605062, 3.7V / 2300mAh
	Battery 2 model: 634169, 3.7V / 2000mAh
	Alternative Battery 3 model: BP1763, 3.7V / 2100mAh
Cable	181 cm unshielded 2-wire AC cable
Funtion	Monitoring
Test Voltage	AC120 V 60 Hz
Operation Frequency:	IEEE 802.11b/g/n(HT20): 2412MHz to 2462MHz
Channel Numbers:	IEEE 802.11b/g, IEEE 802.11n HT20: 11 Channels
Channel Separation:	5MHz
Type of Modulation:	IEEE for 802.11b: DSSS
	IEEE for 802.11g : OFDM
	IEEE for 802.11n(HT20)
Antenna Type:	Dipole
Antenna Gain:	1 dBi
Series No.	A1
Hardware Version:	V001
Software Version:	V0008
Frequency List	

Channel list for 802.11b/g/n(HT20)

Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)
1	2412	5	2432	9	2452
2	2417	6	2437	10	2457
3	2422	7	2442	11	2462
4	2427	8	2447		
Remark: Test frequencies for 20MHz bandwidth are the lowest channel: 1 channel(2412MHz), middle channel: 6 channel (2437 MHz) and highest channel: 11 channel (2462 MHz).					

4.2 Description of Support Units

The EUT has been tested with corresponding accessories as below:

Supplied by client

Description	Manufacturer	Model No.	SN/Certificate NO
UART Test board	N/A	MX3232	N/A
Test Software	MicroRidge System	Version 3.0.0.108	N/A

Supplied by SGS:

Description	Manufacturer	Model No.	SN/Certificate NO
NoteBook (EMC2)	Dell	P75F	N/A

4.3 Measurement Uncertainty (95% confidence level, k=2)

No.	Item	Measurement Uncertainty
1	Radio Frequency	± 7.25 x 10^{-8}
2	Duty cycle	± 0.37%
3	Occupied Bandwidth	± 3%
4	Conduction emission	± 3.0dB (150kHz to 30MHz)
5	RF conducted power	± 0.75dB
6	RF power density	± 2.84dB
7	Conducted Spurious emissions	± 0.75dB
8	RF Radiated power	± 4.5dB (Below 1GHz)
		± 4.8dB (Above 1GHz)
9	Radiated Spurious emission test	± 4.5dB (Below 1GHz)
		± 4.8dB (Above 1GHz)
10	Temperature test	± 1℃
11	Humidity test	± 3%
12	Supply voltages	± 1.5%
13	Time	± 3%

Remark:

The U_{lab} (lab Uncertainty) is less than U_{cispr} (CISPR Uncertainty), so the test results

- compliance is deemed to occur if no measured disturbance level exceeds the disturbance limit;
- non-compliance is deemed to occur if any measured disturbance level exceeds the disturbance limit.

According to decision rule based on Clause 4.2 of CISPR 16-4-2, the EUT complied with the standards specified above.

4.4 Test Location

All tests were performed at:

SGS Hong Kong Limited

Unit 2 and 3, G/F, Block A, Po Lung Centre,

11 Wang Chiu Road, Kowloon Bay, Kowloon, Hong Kong

Tel: +852 2305 2570 Fax: +852 2756 4480

No tests were sub-contracted.

4.5 Test Facility

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

- **HOKLAS (Lab Code: 009)**

SGS HONG KONGLimited has been accepted by HKAS Executive, on the recommendation of the Accreditation Advisory Board, as a HOKLAS Accredited Laboratory, this laboratory meets the requirements of ISO/IEC 17025:2017 an it has been accredited for performing specific test as listed in the scope of accreditation within the test category of Electrical and Electronic Products.

- **IAS Accreditation (Lab Code: TL-187)**

SGS HONG KONGLimited has met the requirements of AC89, IAS Accreditation Criteria for Testing Laboratories, and has demonstrated compliance with ISO/IEC Standard 17025:2017, General requirements for the competence of testing and calibration laboratories. This organization is accredited to provide the services specified in the scope of accreditation maintained on the IAS website (www.iasonline.org).

The report must not be used by the client to claim product certification, approval, or endorsement by IAS, NIST, or any agency of the Federal Government.

- **FCC Recognized Accredited Test Firm(CAB Registration No.: 514599)**

SGS HONG KONG Limited has been accredited and fully described in a report filed with the (FCC) Federal Communications Commission. The acceptance letter from the FCC is maintained in our files. Designation Number: HK0015, Test Firm Registration Number: 514599.

- **Industry Canada (Site Registration No.: 26103; CAB Identifier No.: HK0015)**

SGS HONG KONG Limited has been recognized by Department of Innovation, Science and Economic Development (ISED) Canada as a wireless testing laboratory. The acceptance letter from the ISED is maintained in our files. CAB Identifier No: HK0015, Site Registration Number: 26103.

4.6 Deviation from Standards

None

4.7 Abnormalities from Standard Conditions

None

5 Equipment List

Conducted Emissions at Mains Terminals (150kHz-30MHz)					
Equipment	Manufacturer	Model No	Inventory No	Cal Date	Cal Due Date
EMI Test Receiver 9kHz to 3.6GHz	Rohde & Schwarz	ESR3 / 102326	E231	2019/9/2	2020/9/1
Signal Generator	Rohde & Schwarz	SMT03	E177	2020/5/11	2021/5/10
Artificial Mains Network (LISN)	Schwarzbeck	NSLK 8127 / 8127312	TE10	2020/5/11	2021/5/10
Impulse Limiter	Rohde & Schwarz	ESH-3-Z2 / 357881052	TE36	2020/5/11	2021/5/10
EMC32 Test Software	R&S	Version 10	N/A	--	--

Radiated Spurious Emissions (30MHz-1GHz)					
Equipment	**Manufacturer**	**Model No**	**Inventory No**	**Cal Date**	**Cal Due Date**
3m Semi-Anechoic Chamber	ChamPro	N/A	E229	2020/8/9	2021/8/8
Coaxial Cable	SGS	N/A	E167	2020/7/20	2021/7/19
EMI Test Receiver 9kHz to 3.6GHz	Rohde & Schwarz	ESR3 / 102326	E231	2019/9/2	2020/9/1
TRILOG Super Broadb. Test Antenna, (25) 30-1000 (2	Schwarzbeck	VULB 9168	E264	2018/10/20	2020/10/19
Boresight Mast Controller	ChamPro	AM-BS-4500-E	E237	--	--
Turntable with Controller	ChamPro	EM1000	E238	--	--
EMC32 Test Software	R&S	Version 10	N/A	--	--

Radiated Spurious Emissions (above 1GHz)					
Equipment	**Manufacturer**	**Model No**	**Inventory No**	**Cal Date**	**Cal Due Date**
3m Semi-Anechoic Chamber	ChamPro	N/A	E229	2020/8/9	2021/8/8
Coaxial Cable	SGS	N/A	E167	2020/7/20	2021/7/19

EMI Test Receiver 9kHz to 3.6GHz	Rohde & Schwarz	ESR3 / 102326	E231	2019/9/2	2020/9/1
Signal and Spectrum Analyzer 2Hz - 26.5GHz	Rohde & Schwarz	FSW26	E296	2019/10/29	2020/10/28
Spectrum Analyzer 9kHz - 30GHz	Rohde & Schwarz	FSP30	E204	2020/5/11	2021/5/10
Horn Antenna 1 - 18GHz	Schwarzbeck	BBHA9120D	E211	2020/1/29	2022/1/29
Horn Antenna 15 - 40GHz	Schwarzbeck	BBHA9170	E212	2017/10/17	2020/10/16
Preamplifier 33dB, 1 - 18GHz	Schwarzbeck	BBV9718	E214	2020/4/14	2021/4/12
Preamplifier 33dB, 18 - 26.5GHz	Schwarzbeck	BBV9719	E215	2019/4/24	2021/4/23
Broadband Coaxial Preamplifier typ. 30 dB, 18-40 G	Schwarzbeck	BBV 9721	E266	2019/8/22	2020/8/21
Highpass Filter 3.5-26.5GHz	Wainwright	WHNX3.5/26.5G-6SS	E205	2019/4/24	2021/4/23
Band Reject Filter 2.4-2.5GHz	Wainwright	WRCJV 2400/2500-2100	E206	2019/4/24	2021/4/23
RF cable SMA to SMA 10000mm	HUBER+SUHNER	SF104-26.5/2*11SMA 45	E207-1	2019/9/26	2020/9/25
Boresight Mast Controller	ChamPro	AM-BS-4500-E	E237	--	--
Turntable with Controller	ChamPro	EM1000	E238	--	--
EMC32 Test Software	R&S	Version 10	N/A	--	--

General used equipment					
Equipment	**Manufacturer**	**Model No**	**Inventory No**	**Cal Date**	**Cal Due Date**
Digital temperature & humidity data logger	SATO	SK-L200TH II	E232	2019/10/28	2020/10/27

Electronic Digital Thermometer with Hygrometer	nil	2074/2075	E159	2019/10/28	2020/10/27
Barometer with digital thermometer	SATO	7612-00	E218	2020/04/23	2021/04/22
Conditional Chamber	Zhong Zhi Testing Instruments	CZ-E-608D	E216	2019/08/22	2020/08/21

6 Radio Spectrum Matter Test Results

6.1 Conducted Disturbance at AC Power Line(150kHz-30MHz)

Test Requirement FCC Part 15 Subpart C Section 15.207
RSS-Gen Section 8.8

Test Method: ANSI C63.10 Section 6.2

Limit:

Frequency of emission(MHz)	Conducted limit (dBμV)	
	Quasi-peak	Average
0.15-0.5	66 to 56*	56 to 46*
0.5-5	56	46
5-30	60	50
*Decreases with the logarithm of the frequency.		

6.1.1 E.U.T. Operation

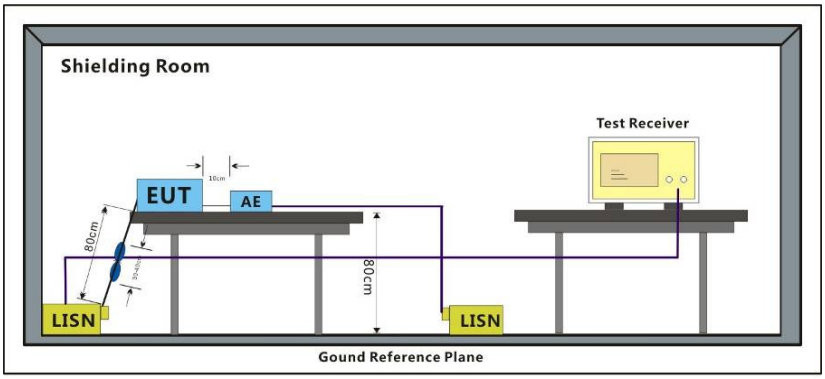
Operating Environment:

Temperature: 25.0 °C Humidity: 55 % RH :

Test mode: 1:(2.4g wifi)TX_Keep the EUT transmitted the continuous modulation test signal at the specific channel(s).

The worst case for final test: 1:(2.4g wifi)TX_Keep the EUT transmitted the continuous modulation test signal at the specific channel(s).

6.1.2 Test Setup Diagram



6.1.3 Measurement Data

1) The mains terminal disturbance voltage test was conducted in a shielded room.

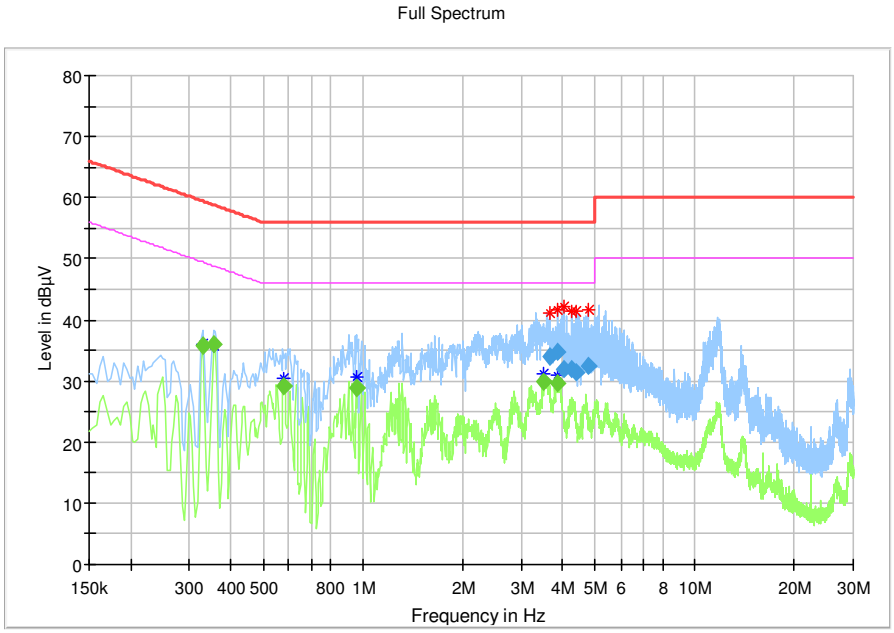
2) The EUT was connected to AC power source through a LISN 1 (Line Impedance Stabilization Network) which provides a 50ohm/50μH + 5ohm linear impedance. The power cables of all other units of the EUT were connected to a second LISN 2, which was bonded to the ground reference plane in the same way as the LISN 1 for the unit being measured. A multiple socket outlet strip was used to connect multiple power cables to a single LISN provided the rating of the LISN was not exceeded.

3) The tabletop EUT was placed upon a non-metallic table 0.8m above the ground reference plane. And for floor-standing arrangement, the EUT was placed on the horizontal ground reference plane,

4) The test was performed with a vertical ground reference plane. The rear of the EUT shall be 0.4 m from the vertical ground reference plane. The vertical ground reference plane was bonded to the horizontal ground reference plane. The LISN 1 was placed 0.8 m from the boundary of the unit under test and bonded to a ground reference plane for LISNs mounted on top of the ground reference plane. This distance was between the closest points of the LISN 1 and the EUT. All other units of the EUT and associated equipment was at least 0.8 m from the LISN 2.

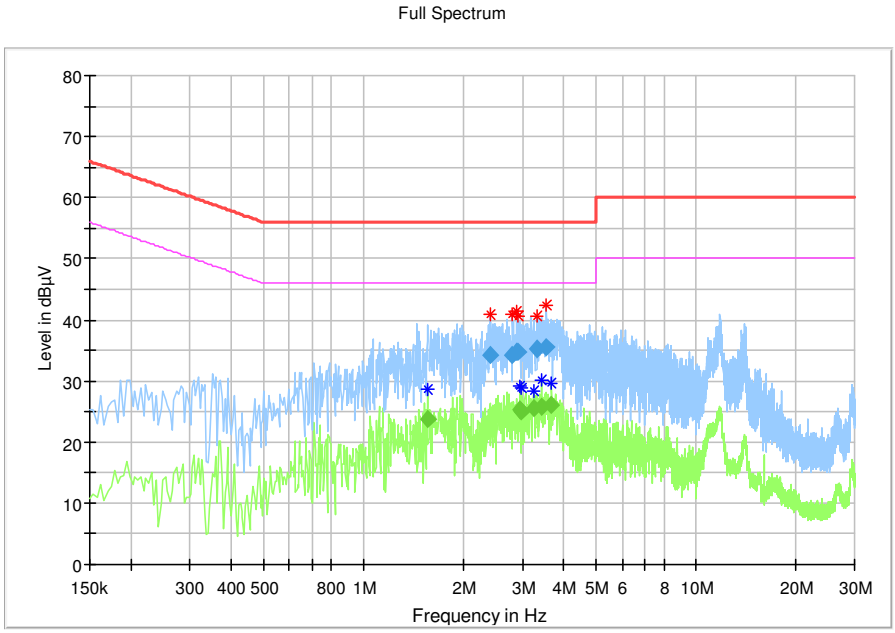
5) In order to find the maximum emission, the relative positions of equipment and all of the interface cables must be changed according to ANSI C63.10 on conducted measurement.

Line:Live Line



Frequency (MHz)	QuasiPeak (dBµV)	Average (dBµV)	Limit (dBµV)	Margin (dB)	Corr. (dB)	Result
0.330000	---	35.8	49.5	13.7	10.1	Pass
0.354000	---	36.0	48.9	12.9	10.1	Pass
0.578000	---	29.1	46.0	16.9	10.1	Pass
0.958000	---	29.0	46.0	17.0	10.1	Pass
3.514000	---	29.9	46.0	16.1	10.2	Pass
3.662000	33.9	---	56.0	22.1	10.3	Pass
3.870000	34.8	---	56.0	21.2	10.3	Pass
3.870000	---	29.5	46.0	16.5	10.3	Pass
4.046000	31.9	---	56.0	24.1	10.3	Pass
4.246000	31.9	---	56.0	24.1	10.3	Pass
4.406000	31.4	---	56.0	24.6	10.3	Pass
4.798000	32.4	---	56.0	23.6	10.3	Pass

Line:Neutral Line



Frequency (MHz)	QuasiPeak (dBµV)	Average (dBµV)	Limit (dBµV)	Margin (dB)	Corr. (dB)	Result
1.558000	---	23.8	46.0	22.2	10.4	Pass
2.390000	34.2	---	56.0	21.8	10.4	Pass
2.806000	34.3	---	56.0	21.7	10.5	Pass
2.882000	34.7	---	56.0	21.3	10.5	Pass
2.910000	34.8	---	56.0	21.2	10.5	Pass
2.938000	---	25.2	46.0	20.8	10.5	Pass
2.978000	---	25.0	46.0	21.0	10.5	Pass
3.234000	---	25.6	46.0	20.4	10.5	Pass
3.330000	35.2	---	56.0	20.8	10.5	Pass
3.426000	---	25.8	46.0	20.2	10.5	Pass
3.558000	35.5	---	56.0	20.5	10.5	Pass
3.678000	---	26.1	46.0	19.9	10.5	Pass

6.2 Conducted RF Output Power

Test Requirement FCC Part 15 Subpart C Section 15.247(b)(3)
RSS-247 Section 5.4(d)
Test Method: ANSI C63.10 Section 11.9.1
Limit:

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

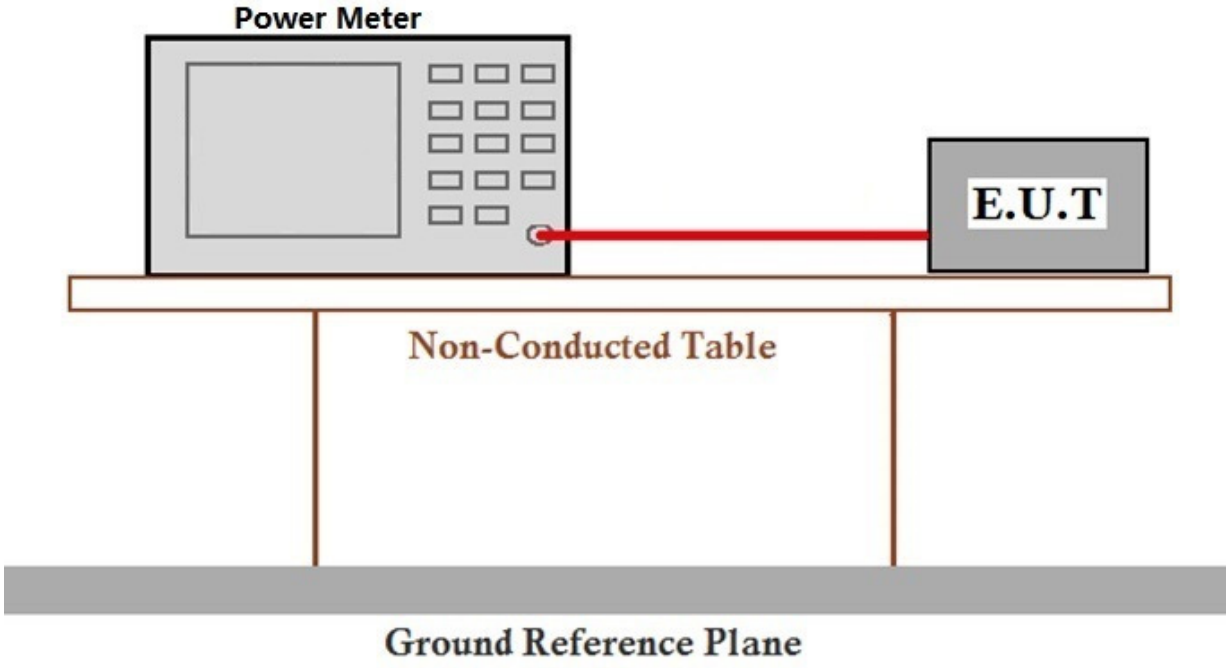
6.2.1 E.U.T. Operation

Operating Environment:

Temperature:	25.0 °C	Humidity:	56 % RH	:

Test mode	1:(2.4g wifi)TX_Keep the EUT transmitted the continuous modulation test signal at the specific channel(s).
The worst case for final test:	1:(2.4g wifi)TX_Keep the EUT transmitted the continuous modulation test signal at the specific channel(s). Through Pre-scan, find the worst case is 802.11b, 802.11g and 802.11n at MCS0, MCS0, MCS0 respectively.

6.2.2 Test Setup Diagram



6.2.3 Measurement Data

The detailed test data see: section 9 Appendix

6.3 Radiated Emissions which fall in the restricted bands

Test Requirement 47 CFR Part 15, Subpart C 15.209 & 15.247(d), Section 3.3 & RSS-Gen Section 8.9

Test Method: ANSI C63.10 (2013) Section 6.10.5

Limit:

Table 5 – General field strength limits at frequencies above 30 MHz

Frequency (MHz)	Field strength (μ V/m at 3 m)
30 – 88	100
88 – 216	150
216 – 960	200
Above 960	500

Table 6 – General field strength limits at frequencies below 30 MHz

Frequency	Magnetic field strength (H-Field) (μ A/m)	Measurement distance (m)
9 - 490 kHz 1	6.37/F (F in kHz)	300
490 - 1705 kHz	63.7/F (F in kHz)	30
1.705 - 30 MHz	0.08	30

Note 1: The emission limits for the ranges 9-90 kHz and 110-490 kHz are based on measurements employing a linear average detector.

6.3.1 E.U.T. Operation

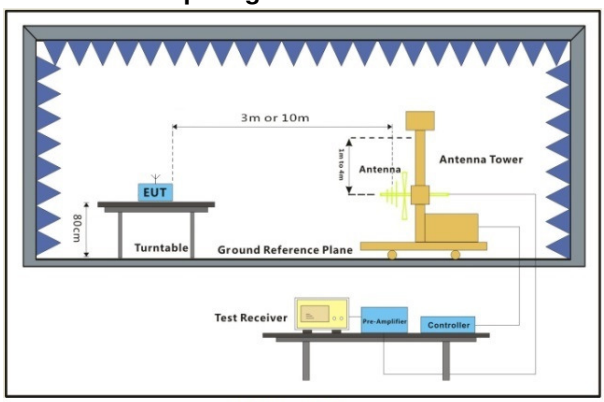
Operating Environment:

Temperature: 23.1 °C Humidity: 51.4 % RH :

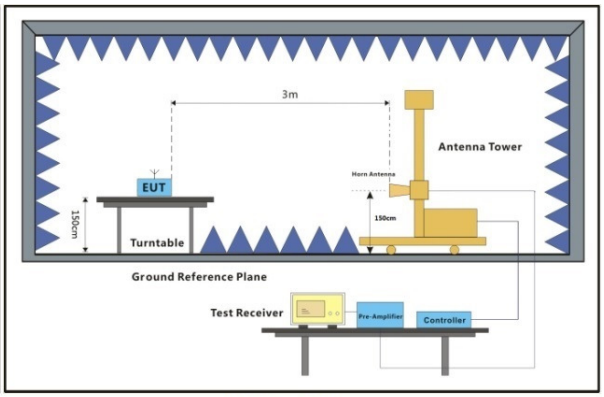
Test mode a:TX mode_Keep the EUT in continuously transmitting mode with all modulation types. All data rates for each modulation type have been tested and found the data rate @ 1Mbps is the worst case of IEEE 802.11b; data rate @ 6Mbps is the worst case of IEEE 802.11g; data rate @ 6.5Mbps is the worst case of IEEE 802.11n(HT20).

Only the data of worst case is recorded in the report.

6.3.2 Test Setup Diagram



30MHz-1GHz



Above 1GHz

6.3.3 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 1: Level= Read Level+ Cable Loss+ Antenna Factor- Preamp Factor

Remark 2: For frequencies above 1GHz, the field strength limits are based on average limits. However, 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. For the emissions whose peak level is lower than the average limit, only the peak measurement is shown in the report.

Mode: 802.11b

Frequency (MHz)	Antenna Polarization	Emission Level (dBµV/m)		Limit (dBµV/m)		Remark
		Peak	Average	Peak	Average	
2390.000	V	63.2	50.1	74.0	54.0	Pass
2483.500	V	61.6	48.9	74.0	54.0	Pass

Mode: 802.11g

Frequency (MHz)	Antenna Polarization	Emission Level (dBµV/m)		Limit (dBµV/m)		Remark
		Peak	Average	Peak	Average	
2390.000	V	60.9	43.2	74.0	54.0	Pass
2483.500	V	60.7	47.8	74.0	54.0	Pass

Mode: 802.11n20

Frequency (MHz)	Antenna Polarization	Emission Level (dBµV/m)		Limit (dBµV/m)		Remark
		Peak	Average	Peak	Average	
2390.000	V	63.5	49.8	74.0	54.0	Pass
2483.500	V	59.6	50.6	74.0	54.0	Pass

6.4 Radiated Spurious Emissions

Test Requirement Section 3.3 & RSS-Gen Section 8.9
Test Method: ANSI C63.10 (2013) Section 6.4&6.5&6.6
Limit:

Table 5 – General field strength limits at frequencies above 30 MHz

Frequency (MHz)	Field strength (μ V/m at 3 m)
30 – 88	100
88 – 216	150
216 – 960	200
Above 960	500

Table 6 – General field strength limits at frequencies below 30 MHz

Frequency	Magnetic field strength (H-Field) (μ A/m)	Measurement distance (m)
9 - 490 kHz 1	6.37/F (F in kHz)	300
490 - 1705 kHz	63.7/F (F in kHz)	30
1.705 - 30 MHz	0.08	30

Note 1: The emission limits for the ranges 9-90 kHz and 110-490 kHz are based on measurements employing a linear average detector.

6.4.1 E.U.T. Operation

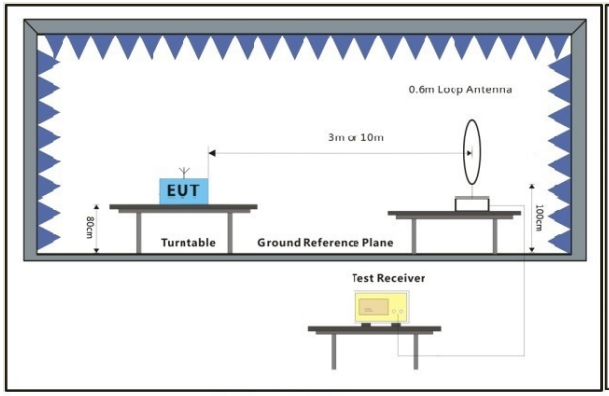
Operating Environment:

Temperature: 22.3 °C Humidity: 52.3 % RH :

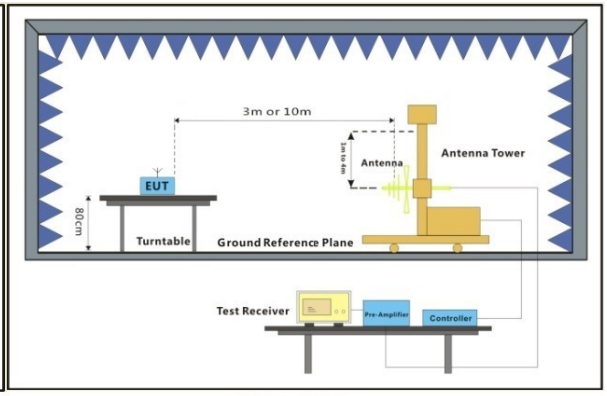
Test mode a:TX mode_Keep the EUT in continuously transmitting mode with all modulation types. All data rates for each modulation type have been tested and found the data rate @ 1Mbps is the worst case of IEEE 802.11b; data rate @ 6Mbps is the worst case of IEEE 802.11g; data rate @ 6.5Mbps is the worst case of IEEE 802.11n(HT20).

Only the data of worst case is recorded in the report.

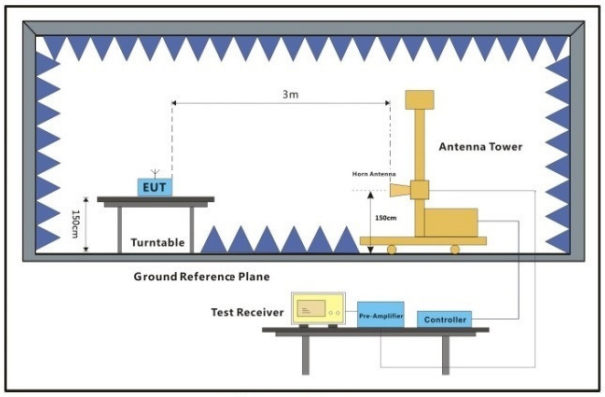
6.4.2 Test Setup Diagram



Below 30MHz



30MHz-1GHz



Above 1GHz

6.4.3 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:

1) For emission below 1GHz, through pre-scan found the worst case is the lowest channel. Only the worst case is recorded in the report.

2) The field strength is calculated by adding the Antenna Factor, Cable Factor & Preamplifier. The basic equation with a sample calculation is as follows:

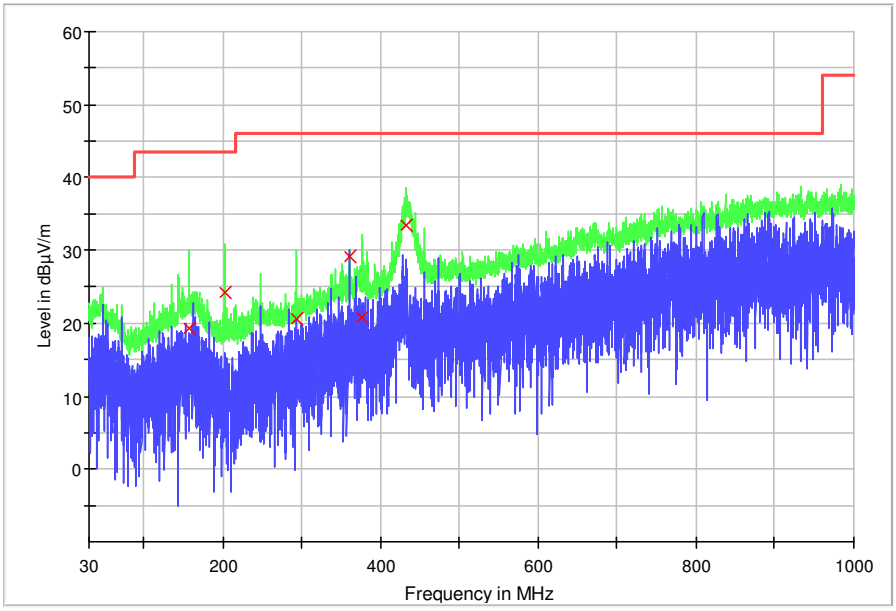
Final Test Level =Receiver Reading + Antenna Factor + Cable Factor – Preamplifier Factor

3) Scan from 9kHz to 25GHz, the disturbance above 18GHz and below 30MHz was very low. The points marked on above plots are the highest emissions could be found when testing, so only above points had been displayed. The amplitude of spurious emissions from the radiator which are attenuated more than 20dB below the limit need not be reported.

4) For frequencies above 1GHz, the field strength limits are based on average limits. However, 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. For the emissions whose peak level is lower than the average limit, only the peak measurement is shown in the report.

Radiated emission below 1GHz

Horizontal (worse plots was shown as below)

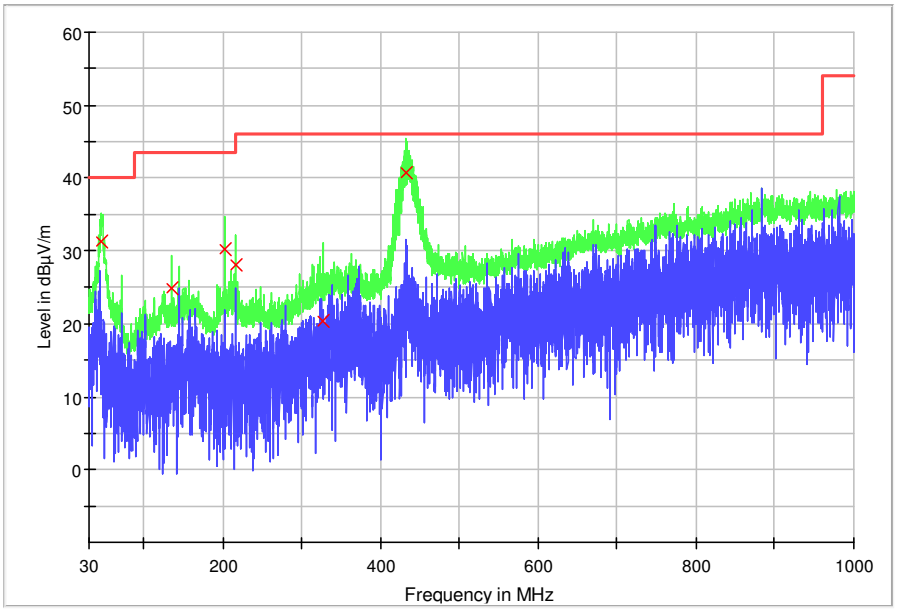


Frequency (MHz)	QuasiPeak (dBµV/m)	Pol.	Corr. (dB/m)	Margin (dB)	Limit (dBµV/m)	Result
157.405000	19.2	H	14.7	24.3	43.5	Pass
202.450000	24.3	H	10.4	19.2	43.5	Pass
292.442500	20.7	H	13.8	25.3	46.0	Pass
360.010000	29.2	H	15.8	16.8	46.0	Pass
376.780000	20.7	H	16.2	25.3	46.0	Pass
432.160000	33.5	H	17.2	12.5	46.0	Pass

Remark:

1. All readings are Quasi-Peak values.
2. Correction Factor = Antenna Factor + Cable Loss.
3. Pol. = antenna polarization

Vertical (worse plots was shown as below)



Frequency (MHz)	QuasiPeak (dBµV/m)	Pol.	Corr. (dB/m)	Margin (dB)	Limit (dBµV/m)	Result
45.280000	31.4	V	14.5	8.6	40.0	Pass
134.980000	24.8	V	13.1	18.7	43.5	Pass
202.450000	30.2	V	10.4	13.3	43.5	Pass
216.002500	28.0	V	10.5	18.0	46.0	Pass
327.640000	20.5	V	15.3	25.5	46.0	Pass
432.842500	40.7	V	17.2	5.3	46.0	Pass

Remark:

1. All readings are Quasi-Peak values.
2. Correction Factor = Antenna Factor + Cable Loss.
3. Pol. = antenna polarization

Above 1GHz

801.11b

Channel:Low

Frequency (MHz)	Antenna Polarization	Emission Level (dBμV/m)		Limit (dBμV/m)		Remark
		Peak	Average	Peak	Average	
1386.631	H	36.1	/	74.0	54.0	Pass
1995.789	H	36.9	/	74.0	54.0	Pass
4055.214	V	45.5	/	74.0	54.0	Pass
7320.604	H	55.5	41.3	74.0	54.0	Pass
8326.530	H	59.5	45.2	74.0	54.0	Pass
13806.771	H	65.6	52.8	74.0	54.0	Pass

Channel:Middle

Frequency (MHz)	Antenna Polarization	Emission Level (dBμV/m)		Limit (dBμV/m)		Remark
		Peak	Average	Peak	Average	
1262.125	H	35.6	/	74.0	54.0	Pass
1928.875	H	36.9	/	74.0	54.0	Pass
3103.375	H	43.6	/	74.0	54.0	Pass
5094.000	H	48.7	/	74.0	54.0	Pass
7391.000	V	56.1	/	74.0	54.0	Pass
12443.000	H	61.8	50.1	74.0	54.0	Pass

Channel: High

Frequency (MHz)	Antenna Polarization	Emission Level (dBμV/m)		Limit (dBμV/m)		Remark
		Peak	Average	Peak	Average	
1637.260	H	34.8	/	74.0	54.0	Pass
3752.464	H	35.6	/	74.0	54.0	Pass
4846.550	V	44.9	/	74.0	54.0	Pass
6021.537	H	43.7	/	74.0	54.0	Pass
9218.441	H	60.4	45.1	74.0	54.0	Pass
11410.663	H	62.9	51.8	74.0	54.0	Pass

Above 1GHz

801.11g

Channel:Low

Frequency (MHz)	Antenna Polarization	Emission Level (dBμV/m)		Limit (dBμV/m)		Remark
		Peak	Average	Peak	Average	
1379.812	H	35.8	/	74.0	54.0	Pass
2296.531	H	37.8	/	74.0	54.0	Pass
3207.829	V	45.7	/	74.0	54.0	Pass
5385.160	H	50.3	/	74.0	54.0	Pass
8360.153	H	62.1	47.5	74.0	54.0	Pass
13881.558	H	64.9	52.3	74.0	54.0	Pass

Channel:Middle

Frequency (MHz)	Antenna Polarization	Emission Level (dBμV/m)		Limit (dBμV/m)		Remark
		Peak	Average	Peak	Average	
1655.451	H	36.3	/	74.0	54.0	Pass
2216.664	H	40.8	/	74.0	54.0	Pass
4220.879	V	47.6	/	74.0	54.0	Pass
5113.139	H	53.9	/	74.0	54.0	Pass
8829.098	H	59.9	45.1	74.0	54.0	Pass
13755.217	H	66.3	51.8	74.0	54.0	Pass

Channel: High

Frequency (MHz)	Antenna Polarization	Emission Level (dBμV/m)		Limit (dBμV/m)		Remark
		Peak	Average	Peak	Average	
1581.250	H	37.5	/	74.0	54.0	Pass
1929.625	H	41.7	/	74.0	54.0	Pass
4374.500	V	47.5	/	74.0	54.0	Pass
6933.000	H	53.0	/	74.0	54.0	Pass
8849.500	H	60.5	46.9	74.0	54.0	Pass
13387.000	H	65.6	49.5	74.0	54.0	Pass

Above 1GHz

801.11n

Channel:Low

Frequency (MHz)	Antenna Polarization	Emission Level (dBµV/m)		Limit (dBµV/m)		Remark
		Peak	Average	Peak	Average	
1581.625	H	33.4	/	74.0	54.0	Pass
1931.125	H	34.8	/	74.0	54.0	Pass
3588.250	V	44.4	/	74.0	54.0	Pass
5153.500	H	47.1	/	74.0	54.0	Pass
8841.500	H	60.3	47.6	74.0	54.0	Pass
13290.500	H	62.3	48.9	74.0	54.0	Pass

Channel:Middle

Frequency (MHz)	Antenna Polarization	Emission Level (dBµV/m)		Limit (dBµV/m)		Remark
		Peak	Average	Peak	Average	
1361.217	H	28.6	/	74.0	54.0	Pass
2120.884	H	30.8	/	74.0	54.0	Pass
3204.949	V	43.8	/	74.0	54.0	Pass
5405.667	H	47.7	/	74.0	54.0	Pass
8340.511	H	59.5	49.1	74.0	54.0	Pass
13263.241	H	64.4	50.8	74.0	54.0	Pass

Channel: High

Frequency (MHz)	Antenna Polarization	Emission Level (dBµV/m)		Limit (dBµV/m)		Remark
		Peak	Average	Peak	Average	
1612.266	H	38.6	/	74.0	54.0	Pass
2012.711	H	43.0	/	74.0	54.0	Pass
4486.188	V	48.6	/	74.0	54.0	Pass
7121.449	H	54.3	/	74.0	54.0	Pass
9067.925	H	61.3	48.1	74.0	54.0	Pass
13887.245	H	66.4	51.8	74.0	54.0	Pass

7 Photographs

Remark: Photos refer to Appendix: External Photo, Internal Photo, Setup Photo of HKEM2008000837AT

8 Appendix

8.1 RF output power

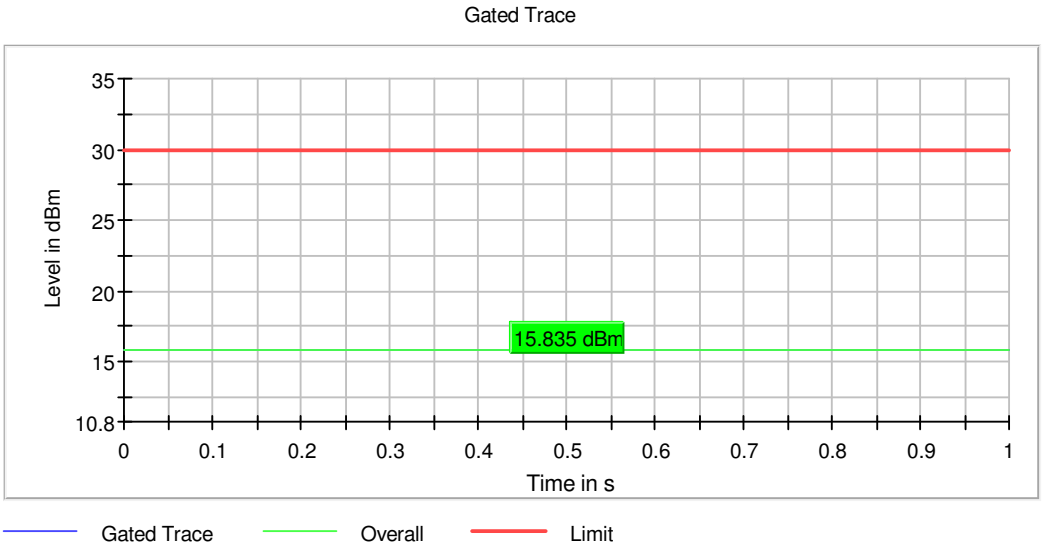
Operation Mode	DUT Frequency (MHz)	Measured Conducted Power (dBm)	e.i.r.p (dBm)	Limit Conducted Power (dBm)	Limit Max e.i.r.p (dBm)	Result
802.11b	2412.000000	14.0	15.0	30.0	36.0	PASS
802.11b	2437.000000	14.1	15.1	30.0	36.0	PASS
802.11b	2462.000000	15.8	16.8	30.0	36.0	PASS
802.11g	2412.000000	12.9	13.9	30.0	36.0	PASS
802.11g	2437.000000	14.1	15.1	30.0	36.0	PASS
802.11g	2472.000000	13.4	14.4	30.0	36.0	PASS
802.11n20	2412.000000	13.0	14.0	30.0	36.0	PASS
802.11n20	2437.000000	13.7	14.7	30.0	36.0	PASS
802.11n20	2462.000000	12.8	13.8	30.0	36.0	PASS

Remark: Antenna gain: 1dB

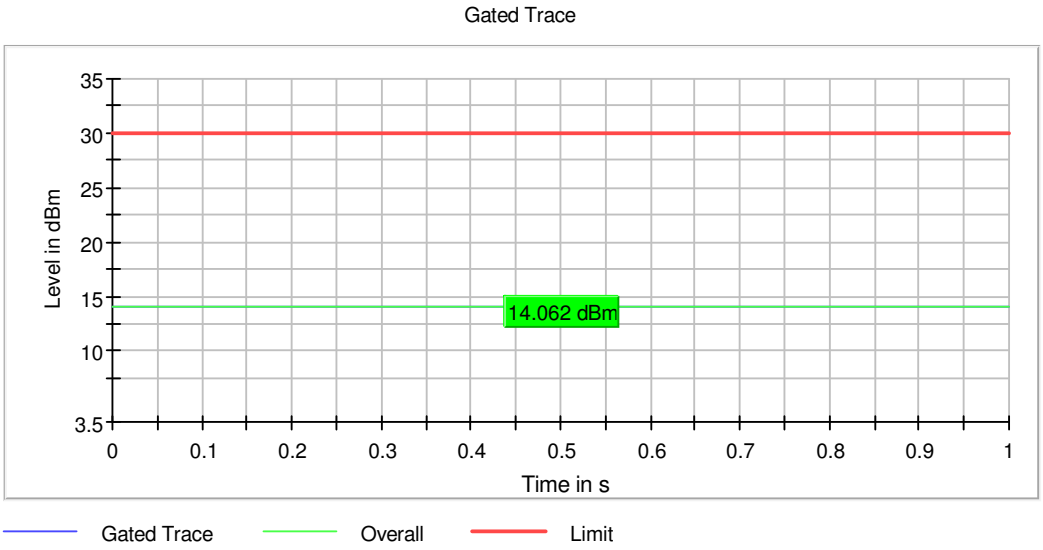
Remark: Cable loss 0.8dB was considered and set in system configuration.

Test Plot: (only worse case plot was shown as below)

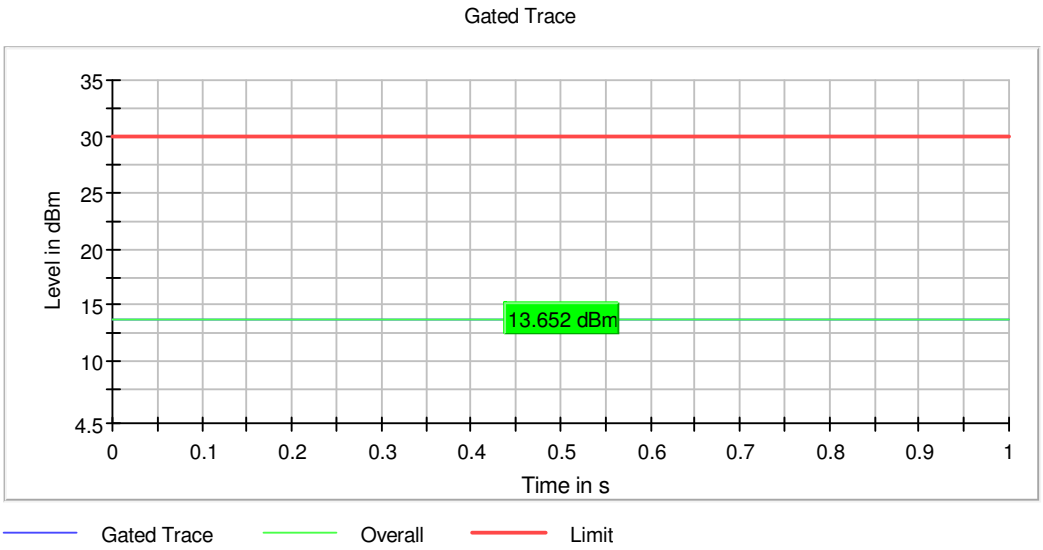
802.11b:



802.11g:



802.11n20:



- End of Report -