



# TEST REPORT

## FCC PART 15 SUBPART C 15.247

**Test report  
On Behalf of  
General Electrical Touch Co., Limited  
For  
ALL IN ONE**

**Model No.: GEO-215R9B250C4000-I-MWVM-PG030-AT,  
GEO-215R9B250C4000-I-MWVM-PG030-C-1.4,  
GEO-215thermal-C-1.6,  
GEO-215thermal-C-1.6-NL,  
GEO-215R9B250C4000-I-MWVM-PG030-AT-MT-CA  
FCC ID: 2AXMIXIANZONEGET**

**Prepared for : General Electrical Touch Co., Limited**

**Rm.1902, Easey Comm. Bldg., 253-261 Hennessy Road, Wanchai, HongKong,  
China**

**Prepared By : Shenzhen HUAK Testing Technology Co., Ltd.  
1F, B2 Building, Junfeng Zhongcheng Zhizao Innovation Park, Fuhai Street,  
Bao'an District, Shenzhen City, China**

**Date of Test: Sep. 22, 2020 ~Sep. 29, 2020**

**Date of Report: Sep. 29, 2020**

**Report Number: HK2009162594-1E**

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**Add: 1/F., Building B2, Junfeng Zhongcheng Zhizao Innovation Park, Heping Community, Fuhai Street, Bao'an District, Shenzhen, Guangdong, China**



## TEST RESULT CERTIFICATION

**Applicant's name** ..... : General Electrical Touch Co., Limited

**Address** ..... : Rm.1902,Easey Comm.Bldg.,253-261 Hennessy Road, Wanchai, HongKong, China

**Manufacture's Name** ..... : General Electrical Touch Co., Limited

**Address** ..... : Rm.1902,Easey Comm.Bldg.,253-261 Hennessy Road, Wanchai, HongKong, China

**Product description**

**Trade Mark:** N/A

**Product name** ..... : ALL IN ONE

GEO-215R9B250C4000-I-MWVM-PG030-AT,  
GEO-215R9B250C4000-I-MWVM-PG030-C-1.4,

**Model and/or type reference** ..... : GEO-215thermal-C-1.6,  
GEO-215thermal-C-1.6-NL,  
GEO-215R9B250C4000-I-MWVM-PG030-AT-MT-CA

**Standards** ..... : **47 CFR FCC Part 15 Subpart C 15.247**

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**Date of Test** ..... :

**Date (s) of performance of tests** ..... : Sep. 22, 2020 ~Sep. 29, 2020

**Date of Issue** ..... : Sep. 29, 2020

**Test Result** ..... : **Pass**

Prepared by:

Project Engineer

Reviewed by:

Project Supervisor

Approved by:

Technical Director



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**\*\* Modified History \*\***

Revison	Description	Issued Data	Remark
Revision 1.0	Initial Test Report Release	Sep. 29, 2020	Jason Zhou

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## 1. SUMMARY

### 1.1. TEST STANDARDS

The tests were performed according to following standards:

**FCC Rules Part 15.247:** Frequency Hopping, Direct Spread Spectrum and Hybrid Systems that are in operation within the bands of 902-928 MHz, 2400-2483.5 MHz, and 5725-5850 MHz

**ANSI C63.10:2013** : American National Standard for Testing Unlicensed Wireless Devices

### 1.2. Test Description

FCC PART 15.247		
FCC Part 15.207	AC Power Conducted Emission	PASS
FCC Part 15.215	20dB Bandwidth& 99% Bandwidth	PASS
FCC Part 15.247(d)	Spurious RF Conducted Emission	PASS
FCC Part 15.247(b)	Maximum Peak Output Power	PASS
FCC Part 15.247 (a) (1)	Pseudorandom Frequency Hopping Sequence	PASS
FCC Part 15.247(a)(1)(iii)	Number of hopping frequency& Time of Occupancy	PASS
FCC Part 15.247(a)(1)	Frequency Separation	PASS
FCC Part 15.205/15.209	Radiated Emissions	PASS
FCC Part 15.247(d)	Band Edge Compliance of RF Emission	PASS

**Test Facility****1.3.1 Address of the test laboratory**

Shenzhen HUAK Testing Technology Co., Ltd.

Add.:1F, B2 Building, Junfeng Zhongcheng Zhizao Innovation Park, Heping Community, Fuhai Street, Bao'an District, Shenzhen, China

There is one 3m semi-anechoic chamber and two line conducted labs for final test. The Test Sites meet the requirements in documents ANSI C63.10 and CISPR 32/EN 55032 requirements.

**1.3.2 Laboratory accreditation**

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

**IC Registration No.: 21210**

The 3m alternate test site of Shenzhen HUAK Testing Technology Co., Ltd. EMC Laboratory has been registered by Certification and Engineer Bureau of Industry Canada for the performance of with Registration No.: 21210 on May 24, 2016.

**1.3. Statement of the measurement uncertainty**

The data and results referenced in this document are true and accurate. The reader is cautioned that there may be errors within the calibration limits of the equipment and facilities. The measurement uncertainty was calculated for all measurements listed in this test report acc. to CISPR 16 - 4 "Specification for radio disturbance and immunity measuring apparatus and methods – Part 4: Uncertainty in EMC Measurements" and is documented in the Shenzhen HUAK Testing Technology Co., Ltd. quality system acc. to DIN EN ISO/IEC 17025. Furthermore, component and process variability of devices similar to that tested may result in additional deviation. The manufacturer has the sole responsibility of continued compliance of the device.

Hereafter the best measurement capability for HUAK laboratory is reported:

Test	Measurement Uncertainty	Notes
Transmitter power conducted	±0.37dB	(1)
Transmitter power Radiated	±3.35dB	(1)
Conducted spurious emission 9KHz-40 GHz	±2.20 dB	(1)
Occupied Bandwidth	±3.68%	(1)
Radiated Emission 30~1000MHz	±3.90dB	(1)
Radiated Emission Above 1GHz	±4.28dB	(1)
Conducted Disturbance 0.15~30MHz	±2.71dB	(1)

(1) This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k=2.



## 2. GENERAL INFORMATION

### 2.1. Environmental conditions

During the measurement the environmental conditions were within the listed ranges:

Normal Temperature:	25°C
Relative Humidity:	55 %
Air Pressure:	101 kPa

### 2.2. General Description of EUT

Product Name:	ALL IN ONE
Model/Type reference:	GEO-215R9B250C4000-I-MWVM-PG030-AT
Serial Model:	GEO-215R9B250C4000-I-MWVM-PG030-C-1.4, GEO-215thermal-C-1.6, GEO-215thermal-C-1.6-NL, GEO-215R9B250C4000-I-MWVM-PG030-AT-MT-CA
Model Difference:	All model's the function, software and electric circuit are the same, only model named different. Test sample model: GEO-215R9B250C4000-I-MWVM-PG030-AT
Power supply:	110-240Vac, 0.32-0.146A, 50/60Hz
Version:	Supported EDR
Modulation:	GFSK, $\pi/4$ DQPSK, 8DPSK
Operation frequency:	2402MHz~2480MHz
Channel number:	79CH
Channel separation:	1MHz
Antenna type:	External Antenna
Antenna gain:	2dBi
Hardware Version:	V2.0
Software Version:	V2.0

Note: For more details, refer to the user's manual of the EUT.



### 2.3. Description of Test Modes and Test Frequency

The Applicant provides communication tools software to control the EUT for staying in continuous transmitting and receiving mode for testing.

There are 79 channels provided to the EUT and Channel 00/39/78 was selected for testing.

#### Operation Frequency :

Channel	Frequency (MHz)
00	2402
01	2403
:	:
38	2440
39	2441
40	2442
:	:
77	2479
78	2480

Note: The line display in grey were the channel selected for testing



Preliminary tests were performed in each mode and packet length of BT, and found worst case as bellow, finally test were conducted at those mode and recorded in this report.

Test Items	Worst case
Conducted Emissions	DH5 High channel
Radiated Emissions and Band Edge	DH5 Low channel
Maximum Conducted Output Power	DH5/2DH5/3DH5
20dB Bandwidth&99% Bandwidth	DH5/2DH5/3DH5
Frequency Separation	DH5/2DH5/3DH5 Middle channel
Number of hopping frequency	DH5/2DH5/3DH5
Time of Occupancy (Dwell Time)	DH1/DH3/DH5 Middle channel 2DH1/2DH3/2DH5 Middle channel 3DH1/3DH3/3DH5 Middle channel
Out-of-band Emissions	DH5/2DH5/3DH5

## 2.4. Equipments Used during the Test

Item	Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Cal. Interval
1.	L.I.S.N. Artificial Mains Network	R&S	ENV216	HKE-002	Dec. 26, 2019	1 Year
2.	Receiver	R&S	ESCI 7	HKE-010	Dec. 26, 2019	1 Year
3.	RF automatic control unit	Tonscend	JS0806-2	HKE-060	Dec. 26, 2019	1 Year
4.	Spectrum analyzer	R&S	FSP40	HKE-025	Dec. 26, 2019	1 Year
5.	Spectrum analyzer	Agilent	N9020A	HKE-048	Dec. 26, 2019	1 Year
6.	Preamplifier	Schwarzbeck	BBV 9743	HKE-006	Dec. 26, 2019	1 Year
7.	EMI Test Receiver	Rohde & Schwarz	ESCI 7	HKE-010	Dec. 26, 2019	1 Year
8.	Bilog Broadband Antenna	Schwarzbeck	VULB9163	HKE-012	Dec. 26, 2019	1 Year
9.	Loop Antenna	Schwarzbeck	FMZB 1519 B	HKE-014	Dec. 26, 2019	1 Year
10.	Horn Antenna	Schwarzbeck	9120D	HKE-013	Dec. 26, 2019	1 Year
11.	Pre-amplifier	EMCI	EMC051845 SE	HKE-015	Dec. 26, 2019	1 Year
12.	Pre-amplifier	Agilent	83051A	HKE-016	Dec. 26, 2019	1 Year
13.	EMI Test Software EZ-EMC	Tonscend	JS1120-B Version	HKE-083	Dec. 26, 2019	N/A
14.	Power Sensor	Agilent	E9300A	HKE-086	Dec. 26, 2019	1 Year
15.	Spectrum analyzer	Agilent	N9020A	HKE-048	Dec. 26, 2019	1 Year
16.	Signal generator	Agilent	N5182A	HKE-029	Dec. 26, 2019	1 Year
17.	Signal Generator	Agilent	83630A	HKE-028	Dec. 26, 2019	1 Year
18.	Shielded room	Shiel Hong	4*3*3	HKE-039	Dec. 26, 2019	1 Year
19.	Power meter	Agilent	E4419B	HKE-085	Dec. 26, 2019	1 Year
20.	High gain antenna	Schwarzbeck	LB-180400 KF	HKE-054	Dec. 26, 2019	1 Year

The calibration interval was one year

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## 2.5. Related Submittal(s) / Grant (s)

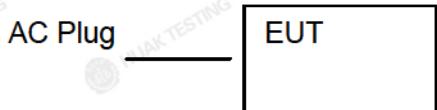
This submittal(s) (test report) is intended to comply with Section 15.247 of the FCC Part 15, Subpart C Rules.

## 2.6. Modifications

No modifications were implemented to meet testing criteria.

## 2.7. DESCRIPTION OF TEST SETUP

Operation of EUT during testing:



The sample was placed (0.8m below 1GHz, 1.5m above 1GHz) above the ground plane of 3m chamber. Measurements in both horizontal and vertical polarities were performed. 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, rotating the turntable, varying antenna height from 1m to 4m in both horizontal and vertical polarizations. The emissions worst-case are shown in Test Results of the following pages. The worst case is X position



### 3. TEST CONDITIONS AND RESULTS

#### 3.1. Conducted Emissions Test

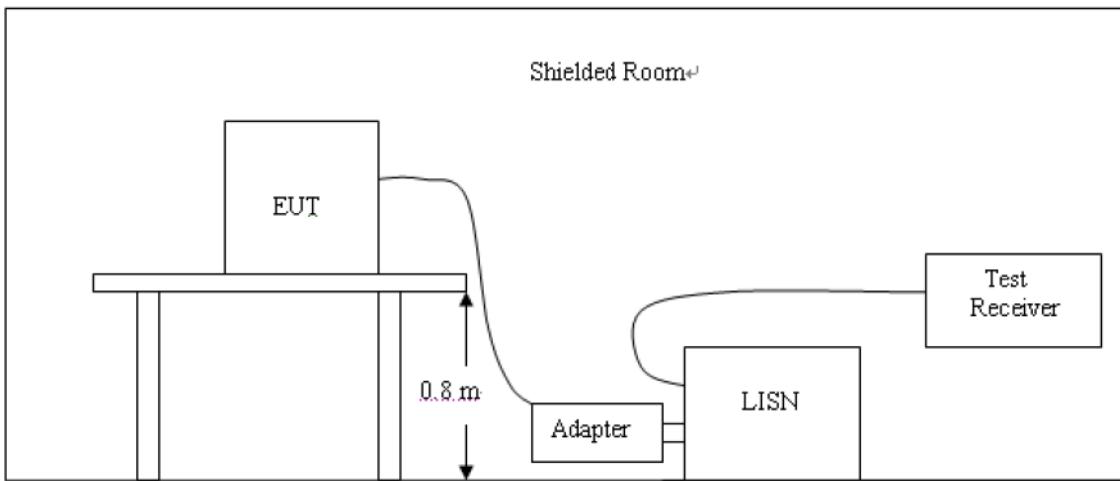
##### LIMIT

According to FCC CFR Title 47 Part 15 Subpart C Section 15.207 and RSS Gen 8.8, AC Power Line Conducted Emissions Limits for Licence-Exempt Radio Apparatus as below:

Frequency range (MHz)	Limit (dBuV)	
	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.

##### TEST CONFIGURATION



##### TEST PROCEDURE

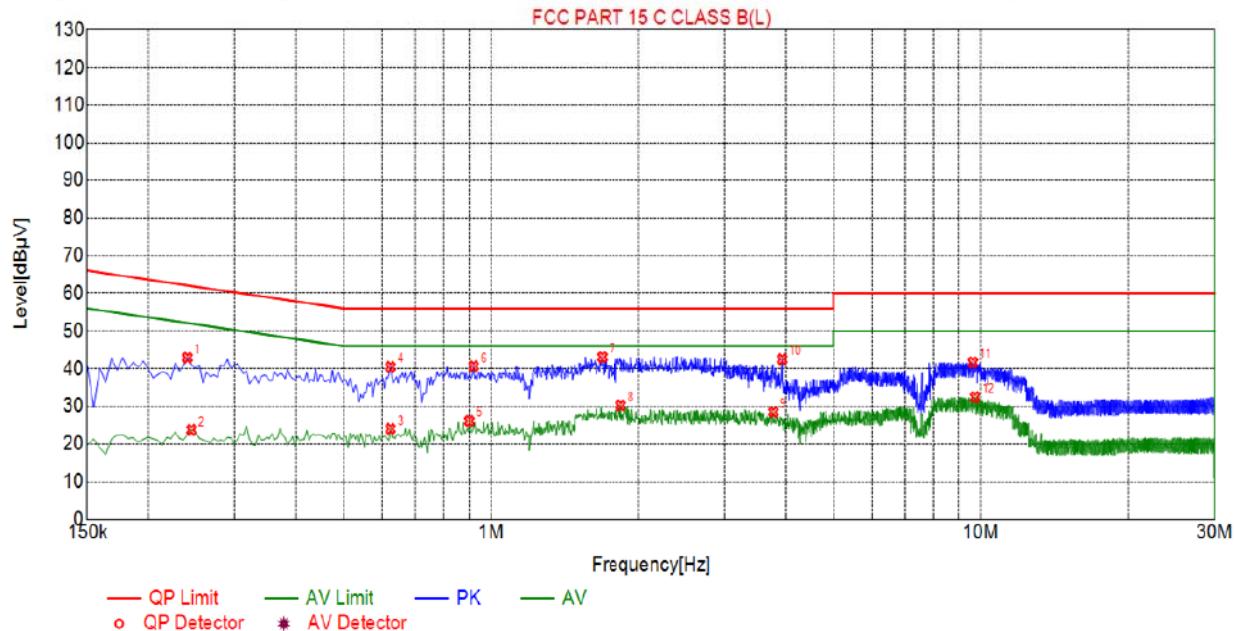
1. The equipment was set up as per the test configuration to simulate typical actual usage per the user's manual. The EUT is a tabletop system; a wooden table with a height of 0.8 meters is used and is placed on the ground plane as per ANSI C63.10:2013.
2. Support equipment, if needed, was placed as per ANSI C63.10:2013
3. All I/O cables were positioned to simulate typical actual usage as per ANSI C63.10:2013.
4. The adapter received AC120V/60Hz power through a Line Impedance Stabilization Network (LISN) which supplied power source and was grounded to the ground plane.
5. All support equipments received AC power from a second LISN, if any.
6. The EUT test program was started. Emissions were measured on each current carrying line of the EUT using a spectrum Analyzer / Receiver connected to the LISN powering the EUT. The LISN has two monitoring points: Line 1 (Hot Side) and Line 2 (Neutral Side). Two scans were taken: one with Line 1 connected to Analyzer / Receiver and Line 2 connected to a 50 ohm load; the second scan had Line 1 connected to a 50 ohm load and Line 2 connected to the Analyzer / Receiver.
7. Analyzer / Receiver scanned from 150 KHz to 30MHz for emissions in each of the test modes.
8. During the above scans, the emissions were maximized by cable manipulation.

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**TEST RESULTS**

Remark: All modes of GFSK, Pi/4 DQPSK, and 8DPSK were test at Low, Middle, and High channel; only the worst result of GFSK High Channel was reported as below:

Test Specification: Line

**Suspected List**

NO.	Freq. [MHz]	Level [dBμV]	Factor [dB]	Limit [dBμV]	Margin [dB]	Reading [dBμV]	Detector	Type
1	0.2400	42.93	20.03	62.10	19.17	22.90	PK	L
2	0.2445	23.78	20.03	51.94	28.16	3.75	AV	L
3	0.6225	24.04	20.05	46.00	21.96	3.99	AV	L
4	0.6225	40.47	20.05	56.00	15.53	20.42	PK	L
5	0.9015	26.12	20.06	46.00	19.88	6.06	AV	L
6	0.9195	40.67	20.06	56.00	15.33	20.61	PK	L
7	1.6845	43.08	20.13	56.00	12.92	22.95	PK	L
8	1.8420	30.26	20.14	46.00	15.74	10.12	AV	L
9	3.7725	28.47	20.25	46.00	17.53	8.22	AV	L
10	3.9345	42.50	20.25	56.00	13.50	22.25	PK	L
11	9.6315	41.64	20.08	60.00	18.36	21.56	PK	L
12	9.7260	32.44	20.08	50.00	17.56	12.36	AV	L

Remark: Margin = Limit – Level

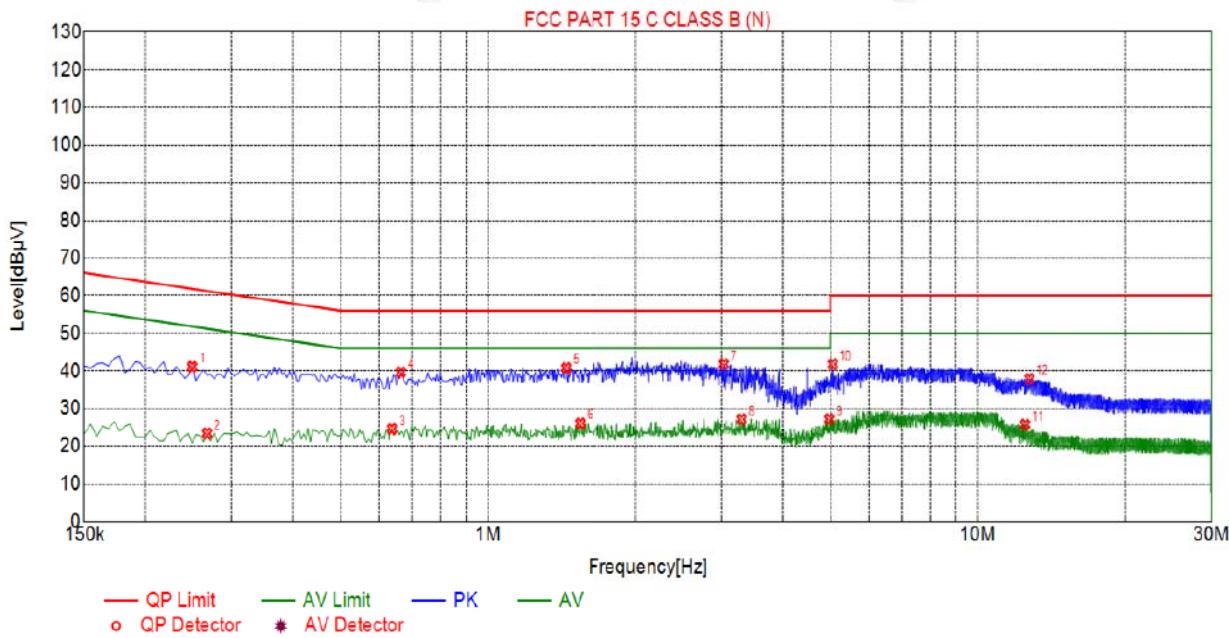
Correction factor = Cable loss + LISN insertion loss

Level=Test receiver reading + correction factor

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Test Specification: Neutral



### Suspected List

NO.	Freq. [MHz]	Level [dB $\mu$ V]	Factor [dB]	Limit [dB $\mu$ V]	Margin [dB]	Reading [dB $\mu$ V]	Detector	Type
1	0.2490	41.12	20.04	61.79	20.67	21.08	PK	N
2	0.2670	23.42	20.03	51.21	27.79	3.39	AV	N
3	0.6360	24.63	20.05	46.00	21.37	4.58	AV	N
4	0.6630	39.64	20.05	56.00	16.36	19.59	PK	N
5	1.4415	40.77	20.10	56.00	15.23	20.67	PK	N
6	1.5405	26.08	20.11	46.00	19.92	5.97	AV	N
7	3.0345	41.82	20.22	56.00	14.18	21.60	PK	N
8	3.2955	27.16	20.24	46.00	18.84	6.92	AV	N
9	4.9830	27.20	20.26	46.00	18.80	6.94	AV	N
10	5.0595	41.78	20.26	60.00	18.22	21.52	PK	N
11	12.4800	25.77	19.98	50.00	24.23	5.79	AV	N
12	12.7365	37.91	19.97	60.00	22.09	17.94	PK	N

Remark: Margin = Limit – Level

Correction factor = Cable loss + LISN insertion loss

Level=Test receiver reading + correction factor

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### 3.2. Radiated Emissions and Band Edge

#### Limit

For intentional device, according to § 15.209(a), the general requirement of field strength of radiated emission out of authorized band shall not exceed the following table at a 3 meters measurement distance.

In addition, radiated emissions which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emission limits specified in §15.209(a)

Except when the requirements applicable to a given device state otherwise, emissions from licence-exempt transmitters shall comply with the field strength limits shown in table below. Additionally, the level of any transmitter emission shall not exceed the level of the transmitter's fundamental emission

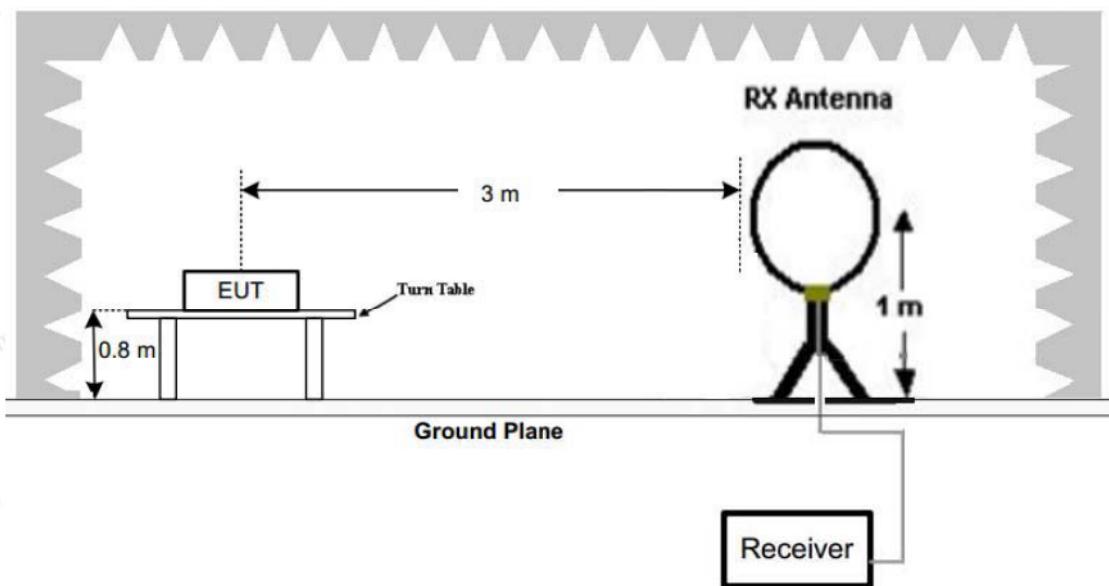
Unwanted emissions that fall into restricted bands shall comply with the limits specified in RSS-Gen; and Unwanted emissions that do not fall within the restricted frequency bands shall comply either with the limits specified in the applicable RSS or with those specified in this RSS-Gen.

Radiated emission limits

Frequency (MHz)	Distance (Meters)	Radiated (dB $\mu$ V/m)	Radiated ( $\mu$ V/m)
0.009-0.49	3	20log(2400/F(KHz))+40log(300/3)	2400/F(KHz)
0.49-1.705	3	20log(24000/F(KHz))+ 40log(30/3)	24000/F(KHz)
1.705-30	3	20log(30)+ 40log(30/3)	30
30-88	3	40.0	100
88-216	3	43.5	150
216-960	3	46.0	200
Above 960	3	54.0	500

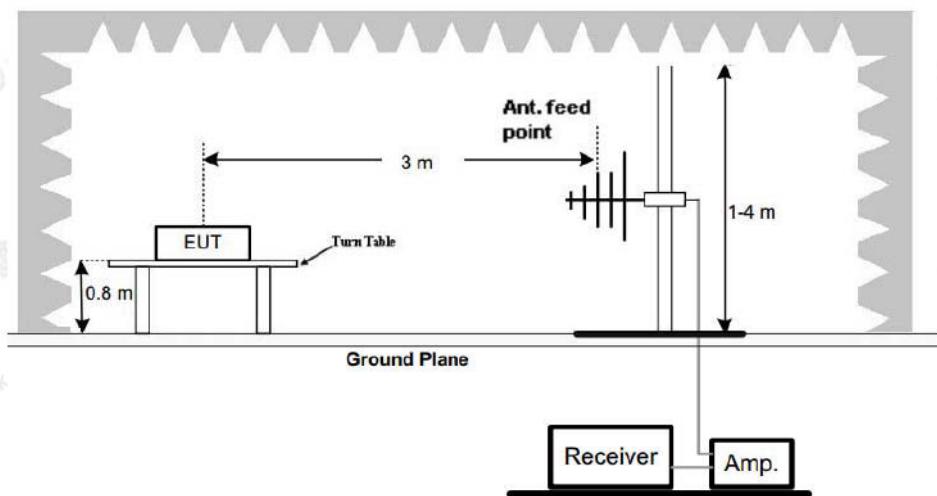
#### TEST CONFIGURATION

##### (A) Radiated Emission Test Set-Up, Frequency Below 30MHz

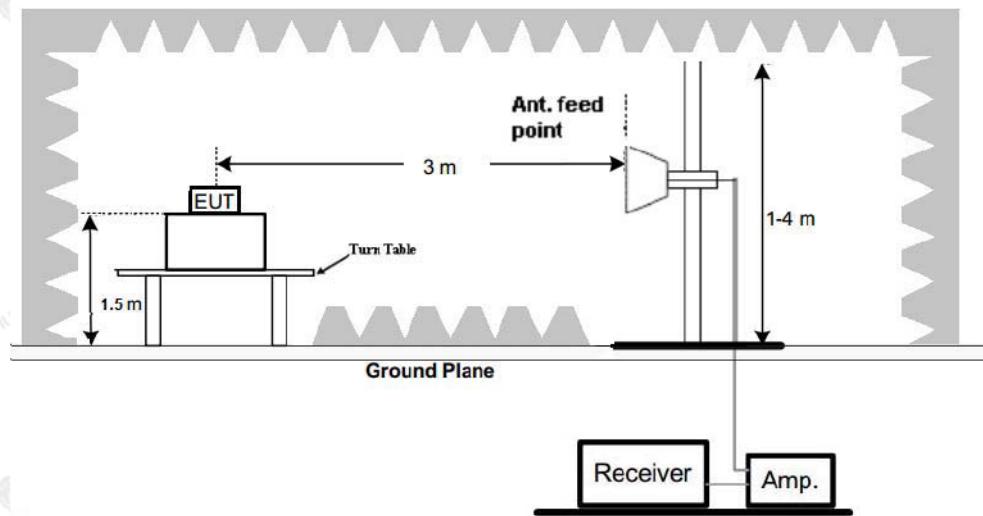




## (B) Radiated Emission Test Set-Up, Frequency below 1000MHz



## (C) Radiated Emission Test Set-Up, Frequency above 1000MHz

**Test Procedure**

1. The EUT was placed on turn table which is 0.8m above ground plane for below 1GHz test, and on a low permittivity and low loss tangent turn table which is 1.5m above ground plane for above 1GHz test.
2. Maximum procedure was performed by raising the receiving antenna from 1m to 4m and rotating the turn table from 0°C to 360°C to acquire the highest emissions from EUT
3. And also, each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical.
4. Repeat above procedures until all frequency measurements have been completed.

**TEST RESULTS****Remark:**

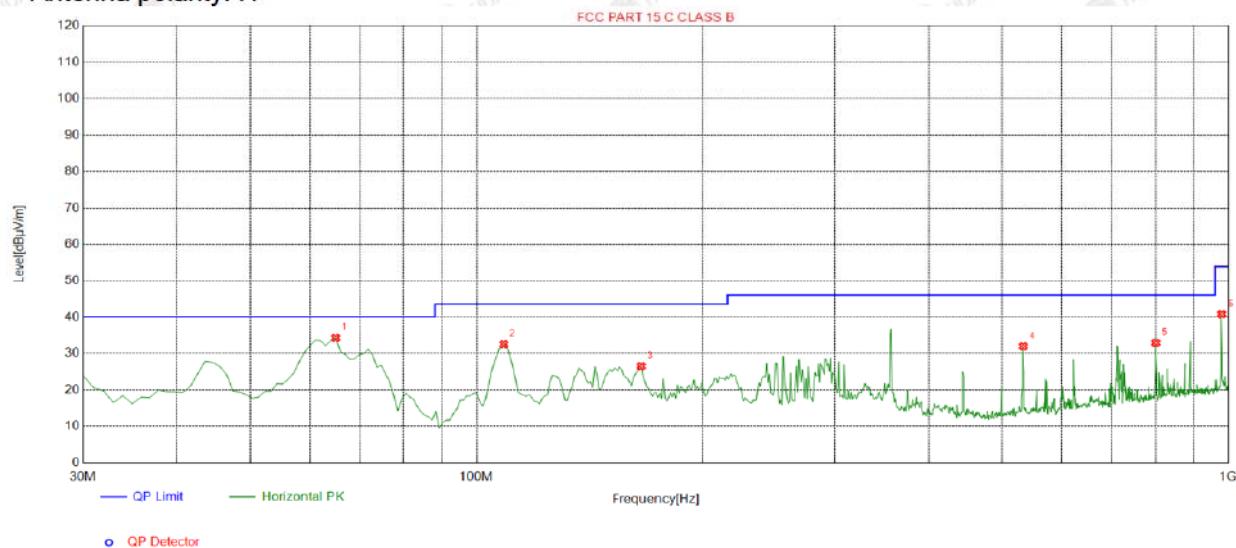
1. Radiated Emission measured at GFSK,  $\pi/4$  DQPSK and 8DPSK mode from 9 KHz to 10th harmonic of fundamental and recorded worst case at GFSK DH5 mode.
2. There is no emission found except system noise floor in 9 KHz to 30MHz and not recorded in this report.
3. For below 1GHz testing recorded worst at GFSK DH5 low channel.

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## Below 1GHz Test Results:

Antenna polarity: H

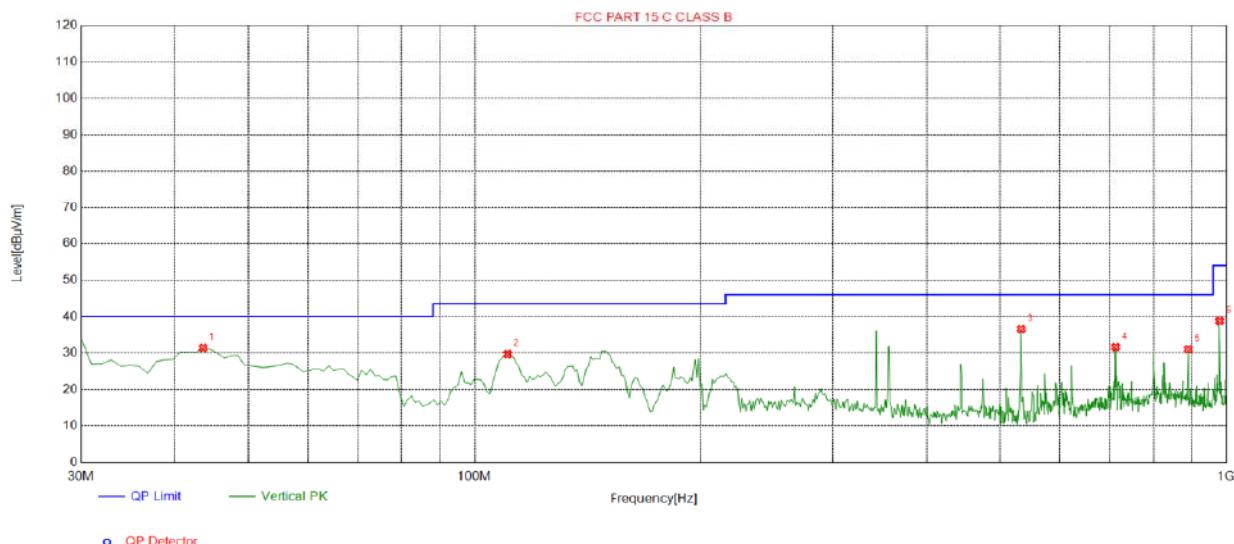


Suspected List									
NO.	Freq. [MHz]	Factor [dB]	Reading [dB $\mu$ V/m]	Level [dB $\mu$ V/m]	Limit [dB $\mu$ V/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	64.9550	-16.40	50.66	34.26	40.00	5.74	100	348	Horizontal
2	108.6486	-15.43	47.94	32.51	43.50	10.99	100	20	Horizontal
3	165.9359	-17.67	44.17	26.50	43.50	17.00	100	132	Horizontal
4	533.9339	-7.35	39.29	31.94	46.00	14.06	100	84	Horizontal
5	800.9510	-3.10	35.98	32.88	46.00	13.12	100	254	Horizontal
6	979.6096	-1.26	42.02	40.76	54.00	13.24	100	313	Horizontal

Remark: Factor = Cable loss + Antenna factor – Preamplifier; Level = Reading + Factor; Margin = Limit – Level



Antenna polarity: V



Suspected List									
NO.	Freq. [MHz]	Factor [dB]	Reading [dB $\mu$ V/m]	Level [dB $\mu$ V/m]	Limit [dB $\mu$ V/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	43.5936	-13.90	45.29	31.39	40.00	8.61	100	15	Vertical
2	110.5906	-15.53	45.24	29.71	43.50	13.79	100	315	Vertical
3	533.9339	-7.35	43.96	36.61	46.00	9.39	100	206	Vertical
4	712.5926	-4.84	36.45	31.61	46.00	14.39	100	196	Vertical
5	890.2803	-1.88	32.92	31.04	46.00	14.96	100	22	Vertical
6	979.6096	-1.26	40.06	38.80	54.00	15.20	100	325	Vertical

Remark: Factor = Cable loss + Antenna factor – Preamplifier; Level = Reading + Factor; Margin = Limit – Level

### Harmonics and Spurious Emissions

#### Frequency Range (9 kHz-30MHz)

Frequency (MHz)	Level@3m (dB $\mu$ V/m)	Limit@3m (dB $\mu$ V/m)
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Note:1. Emission Level=Reading+ Cable loss+ Antenna factor-Amp factor

2. The emission levels are 20 dB below the limit value, which are not reported. It is deemed to comply with the requirement

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