FCC Test Report (NFC)

Report No.:	RF180403E03-1
FCC ID:	2AAP4-GYGPRO1M
Test Model:	GYGPRO1-M
Series Model:	GYGL2-M
Received Date:	Apr. 10, 2018
Test Date:	Apr. 14 to July 10, 2018
Issued Date:	July 27, 2018
Applicant:	Game Your Game, Inc.
Address:	653 Bryant St., San Francisco, CA 94107
Issued By:	Bureau Veritas Consumer Products Services (H.K.) Ltd., Taoyuan Branch Hsin Chu Laboratory
Lab Address:	E-2, No.1, Li Hsin 1st Road, Hsinchu Science Park, Hsinchu City 300, Taiwan R.O.C.
Test Location:	E-2, No.1, Li Hsin 1st Road, Hsinchu Science Park, Hsinchu City 300, Taiwan R.O.C.
FCC Registration / Designation Number:	723255 / TW2022

Testing Laboratory
2022

Table of Contents

Release Control Record

Issue No.	Description	Date Issued
RF180403E03-1	Original release.	July 27, 2018

1 Certificate of Conformity

Product:	Digital golf tracking system
Brand:	Game Golf
Test Model:	GYGPRO1-M
Series Model:	GYGL2-M
Sample Status:	R&D SAMPLE
Applicant:	Game Your Game, Inc.
Test Date:	Apr. 14 to July 10, 2018
Standards:	47 CFR FCC Part 15, Subpart C (Section 15.225) 47 CFR FCC Part 15, Subpart C (Section 15.215) ANSI C63.10:2013

The above equipment has been tested by **Bureau Veritas Consumer Products Services (H.K.) Ltd., Taoyuan Branch**, and found compliance with the requirement of the above standards. The test record, data evaluation & Equipment Under Test (EUT) configurations represented herein are true and accurate accounts of the measurements of the sample's EMC characteristics under the conditions specified in this report.

Prepared by : Mary Ko , **Date:** July 27, 2018

Mary Ko / Specialist

Approved by : , **Date:** July 27, 2018

May Chen / Manager

2 Summary of Test Results

47 CFR FCC Part 15, Subpart C (SECTION 15.225, 15.215)			
FCC Clause	Test Item	Result	Remarks
15.207	Conducted emission test	PASS	Meet the requirement of limit. Minimum passing margin is -9.76dB at 0.19297MHz.
15.225 (a)	The field strength of any emissions within the band 13.553-13.567 MHz	PASS	Meet the requirement of limit. Minimum passing margin is -77.05dB at 13.560MHz.
15.225 (b)	The field strength of any emissions within the bands 13.410-13.553 MHz and 13.567-13.710 MHz	PASS	Meet the requirement of limit.
15.225 (c)	The field strength of any emissions within the bands 13.110-13.410 MHz and 13.710-14.010 MHz	PASS	Meet the requirement of limit.
15.225 (d)	The field strength of any emissions appearing outside of the 13.110-14.010 MHz band	PASS	Meet the requirement of limit. Minimum passing margin is -6.1dB at 45.52MHz.
15.225 (e)	The frequency tolerance	PASS	Meet the requirement of limit.
15.215 (c)	20dB Bandwidth	PASS	Meet the requirement of limit.
15.203	Antenna Requirement	PASS	No antenna connector is used.

2.1 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:

Measurement	Frequency	Expanded Uncertainty (k=2) (±)
Conducted Emissions at mains ports	150kHz ~ 30MHz	1.84 dB
Radiated Emissions up to 1 GHz	30MHz ~ 1GHz	5.33 dB
Radiated Emissions above 1 GHz	1GHz ~ 6GHz	5.10 dB
	6GHz ~ 18GHz	4.85 dB
	18GHz ~ 40GHz	5.24 dB

2.2 Modification Record

There were no modifications required for compliance.

3 General Information

3.1 General Description of EUT (NFC)

Product	Digital golf tracking system
Brand	Game Golf
Test Model	GYGPRO1-M
Series Model	GYGL2-M
Status of EUT	R&D SAMPLE
Power Supply Rating	DC 3.7V from battery DC 5V from USB interface
Modulation Type	ASK
Operating Frequency	13.56MHz
Number of Channel	1
Antenna Type	Refer to Note
Antenna Connector	Refer to Note
Accessory Device	GYGPRO1-T
Data Cable Supplied	Micro USB cable x 1 (Shielded)

Note:

1. There are BT-LE, NFC and GPS technology used for the EUT.
2. The EUT has two model names, which are identical to each other in all aspects except for the following:

Brand	Model	Product name	Different
Game Golf	GYGPRO1-M	Digital golf tracking system	For marketing request
	GYGL2-M		

From the above models, model: **GYGPRO1-M** was selected as representative model for the test and its data was recorded in this report.

3. The EUT could be supplied with a rechargeable battery as the following table:

Brand Name	Model No.	Spec.
Yata Energy	YATA803232	3.7Vdc, 700mAh

4. The antennas provided to the EUT, please refer to the following table:

Bluetooth			
Antenna Net Gain (dBi)	Frequency Range	Antenna Type	Connecter Type
5.3	2.4~2.4835GHz	inverted-F	NA
GPS			
Antenna Net Gain (dBi)	Frequency Range	Antenna Type	Connecter Type
1	1500~2000MHz	inverted-F	NA
NFC			
Frequency Range	Antenna Type	Connecter Type	
13~14MHz	Mag Loop Antenna Integral	NA	

5. The EUT was pre-tested under following test modes:

Pre-test Mode	Power
Mode A	**Power from USB interface (Adapter)**
Mode B	Power from battery

From the above modes, the worst radiated emission was found in **Mode A**. Therefore only the test data of the modes were recorded in this report.

6. The above EUT information is declared by manufacturer and for more detailed features description, please refer to the manufacturer's specifications or user's manual.

3.2 Description of Test Modes

One channel was provided to this EUT:

Channel	FREQ. (MHz)
1	13.56

3.2.1 Test Mode Applicability and Tested Channel Detail

EUT Configure Mode	Applicable to				Description
	RE	PLC	FS	EB	
1	√	√	√	√	Power from Adapter
2	-	√	-	-	Power from Laptop

Where **RE:** Radiated Emission **PLC:** Power Line Conducted Emission
FS: Frequency Stability **EB:** 20dB Bandwidth measurement

NOTE: 1. "-"means no effect.
2. The EUT had been pre-tested on the positioned of each 3 axis. The worst case was found when positioned on **X-plane**.

Radiated Emission Test:

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

Available Channel	Tested Channel	Modulation Type
1	1	ASK

Power Line Conducted Emission Test:

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

Available Channel	Tested Channel	Modulation Type
1	1	ASK

Frequency Stability:

☒ 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, data rates and antenna ports (if EUT with antenna diversity architecture).
☒ Following channel(s) was (were) selected for the final test as listed below.

Available Channel	Tested Channel	Modulation Type
1	1	ASK

20dB Bandwidth:

☒ 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, data rates and antenna ports (if EUT with antenna diversity architecture).

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

Available Channel	Tested Channel	Modulation Type
1	1	ASK

TEST CONDITION:

APPLICABLE TO	ENVIRONMENTAL CONDITIONS	INPUT POWER	TESTED BY
RE	23deg. C, 67%RH 22deg. C, 66%RH	120Vac, 60Hz (system)	Andy Ho
PLC	25deg. C, 75%RH	120Vac, 60Hz (system)	Andy Ho
FS	25deg. C, 60%RH	3.7Vdc	Jyunchun Lin
EB	24deg. C, 62%RH	3.7Vdc	Anderson Chen

3.3 Description of Support Units

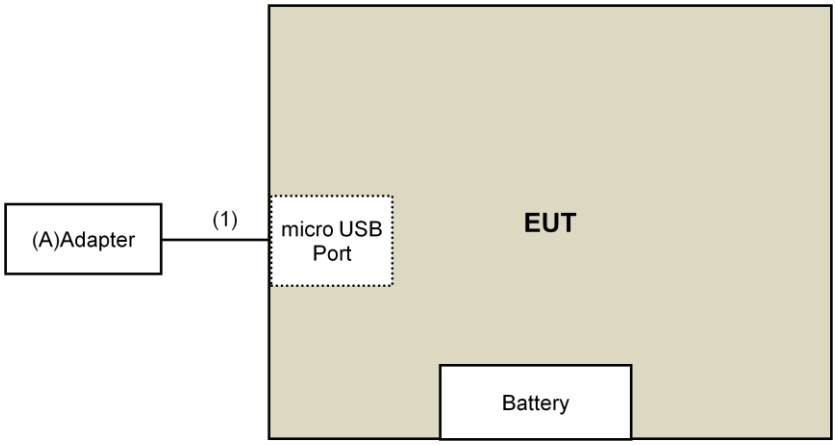
The EUT has been tested as an independent unit together with other necessary accessories or support units. The following support units or accessories were used to form a representative test configuration during the tests.

ID	Product	Brand	Model No.	Serial No.	FCC ID	Remarks
A.	USB Adapter	ASUS	EXA1205UA	NA	NA	Provided by Lab
B.	Laptop	DELL	E6420	B92T3R1	FCC DoC	Provided by Lab

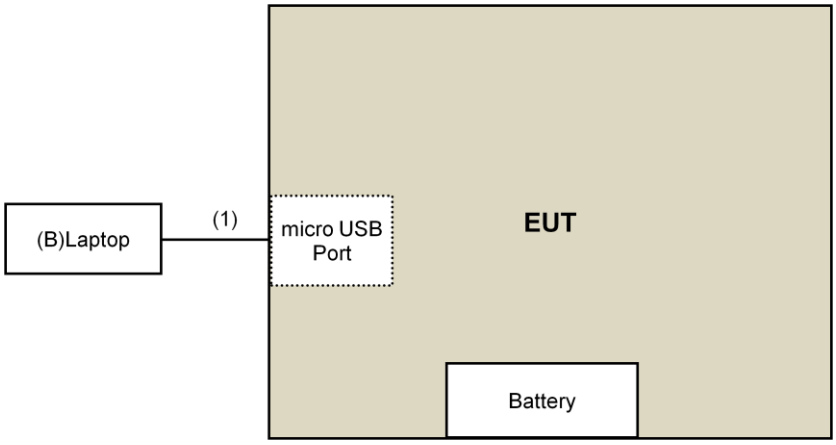
ID	Descriptions	Qty.	Length (m)	Shielding (Yes/No)	Cores (Qty.)	Remarks
1.	USB Cable	1	0.3	Yes	0	Supplied by client

3.3.1 Configuration of System under Test

Adapter mode:



Laptop mode:



3.4 General Description of Applied Standards

The EUT is a RF Product. According to the specifications of the manufacturer, it must comply with the requirements of the following standards:

FCC Part 15, Subpart C (15.225)

FCC Part 15, Subpart C (15.215)
ANSI C63.10-2013

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

4 Test Types and Results

4.1 Radiated Emission Measurement

4.1.1 Limits of Radiated Emission Measurement

(a) The field strength of any emissions within the band 13.553-13.567 MHz shall not exceed 15,848 microvolts/meter at 30 meters.

(b) Within the bands 13.410-13.553 MHz and 13.567-13.710 MHz, the field strength of any emissions shall not exceed 334 microvolts/meter at 30 meters.

(c) Within the bands 13.110-13.410 MHz and 13.710-14.010 MHz the field strength of any emissions shall not exceed 106 microvolts/meter at 30 meters.

(d) The field strength of any emissions appearing outside of the 13.110-14.010 MHz band shall not exceed the general radiated emission limits in §15.209 as below table:

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.
2. Emission level (dBuV/m) = 20 log Emission level (uV/m).
3. 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.

4.1.2 Test Instruments

For other test:

DESCRIPTION & MANUFACTURER	MODEL NO.	SERIAL NO.	CALIBRATED DATE	CALIBRATED UNTIL
Test Receiver Keysight	N9038A	MY54450088	July 05, 2018	July 04, 2019
Pre-Amplifier EMCI	EMC001340	980142	Feb. 09, 2018	Feb. 08, 2019
Loop Antenna(*) Electro-Metrics	EM-6879	264	Dec. 16, 2016	Dec. 15, 2018
RF Cable	NA	LOOPCAB-001 LOOPCAB-002	Jan. 15, 2018	Jan. 14, 2019
Pre-Amplifier Mini-Circuits	ZFL-1000VH2B	AMP-ZFL-01	Nov. 09, 2017	Nov. 08, 2018
Trilog Broadband Antenna SCHWARZBECK	VULB 9168	9168-406	Nov. 29, 2017	Nov. 28, 2018
RF Cable	8D	966-4-1 966-4-2 966-4-3	Mar. 21, 2018	Mar. 20, 2019
Fixed attenuator Mini-Circuits	UNAT-5+	PAD-3m-4-01	Oct. 03, 2017	Oct. 02, 2018
Software	ADT_Radiated_V8.7.08	NA	NA	NA
Boresight Antenna Tower & Turn Table Max-Full	MF-7802BS	MF780208530	NA	NA

Note:

1. The calibration interval of the above test instruments is 12 months and the calibrations are traceable to NML/ROC and NIST/USA.
2. *The calibration interval of the above test instruments is 24 months and the calibrations are traceable to NML/ROC and NIST/USA.
3. The test was performed in 966 Chamber No. 4.
4. The CANADA Site Registration No. is 20331-2
5. Loop antenna was used for all emissions below 30 MHz.
6. Tested Date: July 10, 2018

For output power test:

DESCRIPTION & MANUFACTURER	MODEL NO.	SERIAL NO.	CALIBRATED DATE	CALIBRATED UNTIL
Power meter Anritsu	ML2495A	1014008	May 11, 2017	May 10, 2018
Power sensor Anritsu	MA2411B	0917122	May 11, 2017	May 10, 2018
DC Power Supply Topward	6603D	795558	NA	NA
Temperature & Humidity Chamber Giant Force	GTH-150-40-SP-AR	MAA0812-008	Jan. 10, 2018	Jan. 09, 2019
True RMS Clamp Meter FLUKE	325	31130711WS	May 29, 2017	May 28, 2018

Note:

1. The calibration interval of the above test instruments is 12 months and the calibrations are traceable to NML/ROC and NIST/USA.
2. The test was performed in 966 Chamber No. 4.
3. The CANADA Site Registration No. is 20331-2
4. Tested Date: Apr. 20, 2018

4.1.3 Test Procedures

For Radiated emission below 30MHz

a. The EUT was placed on the top of a rotating table 0.8 meters above the ground at a 3 meter chamber room. 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. Parallel, perpendicular, and ground-parallel orientations of the antenna are set to make the measurement.

d. For each suspected emission, the EUT was arranged to its worst case 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 Quasi-Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.

NOTE:

1. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 9kHz at frequency below 30MHz.

For Radiated emission above 30MHz

a. The EUT was placed on the top of a rotating table 0.8 meters (for 30MHz ~ 1GHz) above the ground at 3 meter chamber room for test. 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. The height of antenna 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 quasi-peak detect function and specified bandwidth with maximum hold mode when the test frequency is below 1 GHz.

Note:

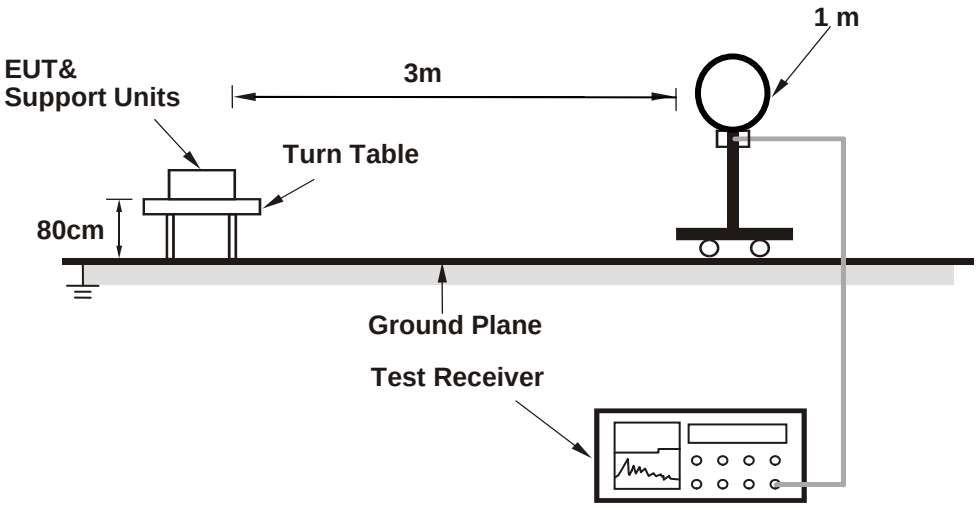
1. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 120kHz for Quasi-peak detection (QP) at frequency below 1GHz.
2. All modes of operation were investigated and the worst-case emissions are reported.

4.1.4 Deviation from Test Standard

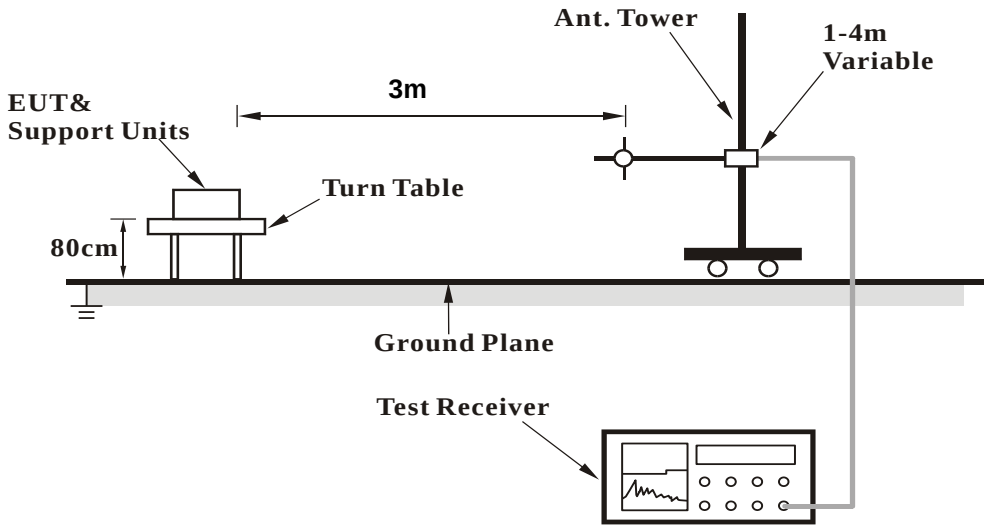
No deviation.

4.1.5 Test Setup

For Radiated emission below 30MHz



For Radiated emission 30MHz to 1GHz



For the actual test configuration, please refer to the attached file (Test Setup Photo).

4.1.6 EUT Operating Conditions

a. Placed the EUT on the testing table.

b. Set the EUT under transmission condition continuously at specific channel frequency.

4.1.7 Test Results

Type A

Frequency Range	13.110 ~ 14.010MHz	Detector Function	Quasi-Peak

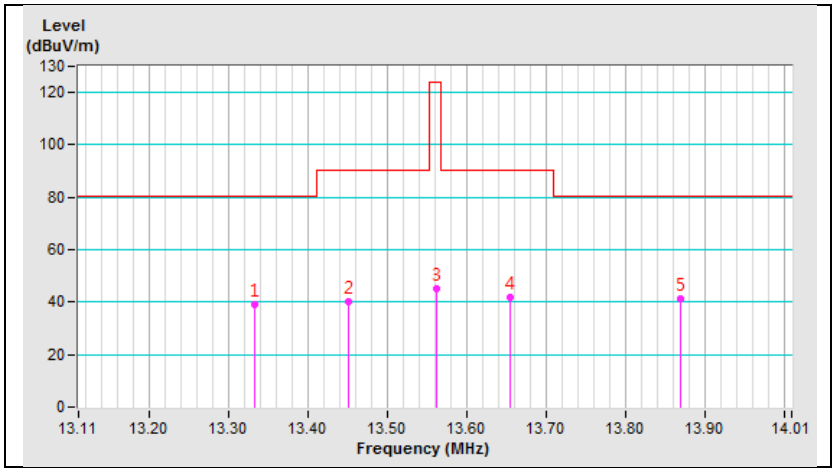
Antenna Polarity & Test Distance: Ground Parallel at 3m								
No.	Freq. (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	13.333	38.95 QP	80.50	-41.55	1.00	154	42.40	-3.45
2	13.450	40.35 QP	90.47	-50.12	1.00	302	43.82	-3.47
3	13.560*	44.90 QP	124.00	-79.10	1.00	19	48.38	-3.48
4	13.654	41.81 QP	90.47	-48.66	1.00	115	45.31	-3.50
5	13.869	41.19 QP	80.50	-39.31	1.00	256	44.72	-3.53

REMARKS:
1. Emission level(dBuV/m)=Raw Value(dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor (dB/m) + Cable Factor (dB) – Pre-Amplifier Factor(dB)
3. The other emission levels were very low against the limit.
4. Margin value = Emission level – Limit value.
5. Above limits have been translated by the formula
6. " * ": Fundamental frequency.

The measured field strength was extrapolated to distance 30 meters, using the formula that the limit of field strength varies as the inverse distance square (40dB per decade of distance)

Example:

13.56MHz = 15848uV/m 30m
= 84dBuV/m 30m
= $84+20\log(30/3)^2$ 3m
= 124dBuV/m



Frequency Range	13.110 ~ 14.010MHz	Detector Function	Quasi-Peak

Antenna Polarity & Test Distance: Perpendicylar at 3m								
No.	Freq. (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	13.392	30.04 QP	80.50	-50.46	1.00	137	33.50	-3.46
2	13.480	28.82 QP	90.47	-61.65	1.00	241	32.29	-3.47
3	**13.560***	**46.95 QP**	**124.00**	**-77.05**	**1.00**	**256**	**50.43**	**-3.48**
4	13.642	31.51 QP	90.47	-58.96	1.00	119	35.01	-3.50
5	13.781	30.23 QP	80.50	-50.27	1.00	245	33.75	-3.52

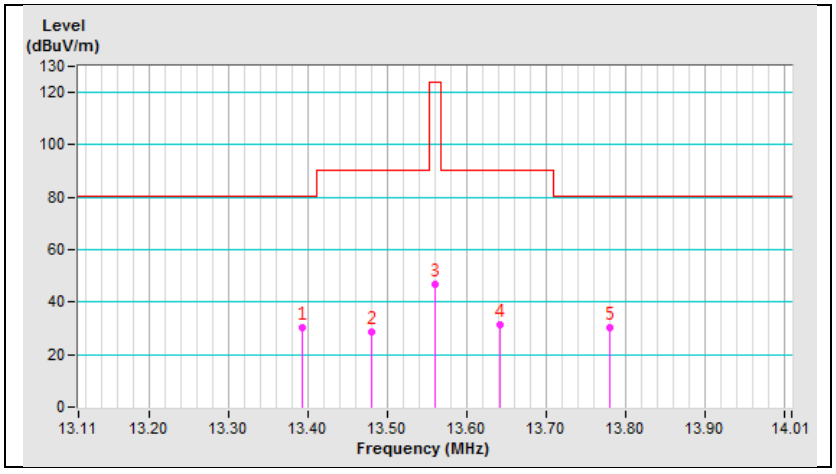
REMARKS:

1. Emission level(dBuV/m)=Raw Value(dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor (dB/m) + Cable Factor (dB) – Pre-Amplifier Factor(dB)
3. The other emission levels were very low against the limit.
4. Margin value = Emission level – Limit value.
5. Above limits have been translated by the formula
6. " * ": Fundamental frequency.

The measured field strength was extrapolated to distance 30 meters, using the formula that the limit of field strength varies as the inverse distance square (40dB per decade of distance)

Example:

13.56MHz = 15848uV/m 30m
= 84dBuV/m 30m
= $84+20\log(30/3)^2$ 3m
= 124dBuV/m



Frequency Range	13.110 ~ 14.010MHz	Detector Function	Quasi-Peak

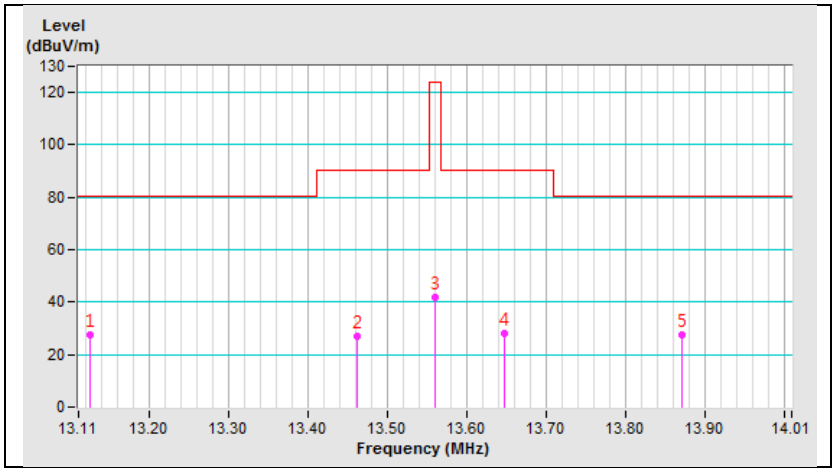
Antenna Polarity & Test Distance: Parallel at 3m								
No.	Freq. (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	13.124	27.33 QP	80.50	-53.17	1.00	224	30.75	-3.42
2	13.461	27.17 QP	90.47	-63.30	1.00	302	30.64	-3.47
3	13.560*	41.78 QP	124.00	-82.22	1.00	117	45.26	-3.48
4	13.648	28.21 QP	90.47	-62.26	1.00	249	31.71	-3.50
5	13.872	27.29 QP	80.50	-53.21	1.00	265	30.82	-3.53

REMARKS:
1. Emission level(dBuV/m)=Raw Value(dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor (dB/m) + Cable Factor (dB) – Pre-Amplifier Factor(dB)
3. The other emission levels were very low against the limit.
4. Margin value = Emission level – Limit value.
5. Above limits have been translated by the formula
6. " * ": Fundamental frequency.

The measured field strength was extrapolated to distance 30 meters, using the formula that the limit of field strength varies as the inverse distance square (40dB per decade of distance)

Example:

13.56MHz = 15848uV/m 30m
= 84dBuV/m 30m
= $84+20\log(30/3)^2$ 3m
= 124dBuV/m

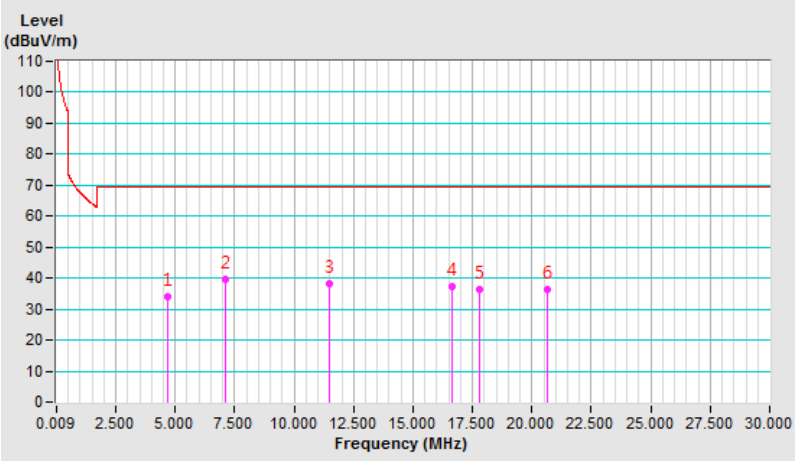


Frequency Range	Below 30MHz	Detector Function	Quasi-Peak

Antenna Polarity & Test Distance: Ground Parallel at 3m								
No.	Freq. (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	4.658	34.08 QP	69.50	-35.42	1.00	117	37.16	-3.08
2	7.087	39.76 QP	69.50	-29.74	1.00	204	42.80	-3.04
3	11.466	38.36 QP	69.50	-31.14	1.00	265	41.53	-3.17
4	16.624	37.29 QP	69.50	-32.21	1.00	264	41.23	-3.94
5	17.794	36.49 QP	69.50	-33.01	1.00	265	40.60	-4.11
6	20.643	36.57 QP	69.50	-32.93	1.00	102	40.85	-4.28

REMARKS:

1. Emission Level(dBuV/m) = Raw Value(dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor (dB)
3. The other emission levels were very low against the limit.
4. Margin value = Emission Level – Limit value

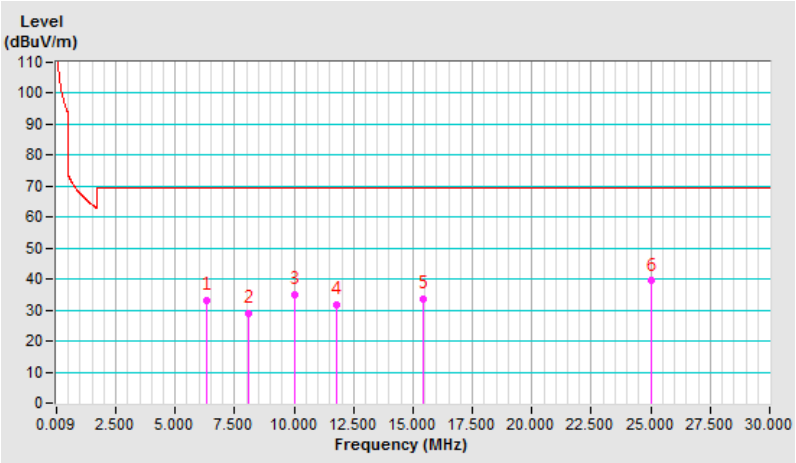


Frequency Range	Below 30MHz	Detector Function	Quasi-Peak

Antenna Polarity & Test Distance: Perpendicylar at 3m								
No.	Freq. (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	6.337	33.18 QP	69.50	-36.32	1.00	314	36.23	-3.05
2	8.107	29.13 QP	69.50	-40.37	1.00	218	32.14	-3.01
3	10.056	34.98 QP	69.50	-34.52	1.00	159	37.94	-2.96
4	11.765	31.72 QP	69.50	-37.78	1.00	342	34.93	-3.21
5	15.424	33.68 QP	69.50	-35.82	1.00	262	37.44	-3.76
6	24.992	39.46 QP	69.50	-30.04	1.00	114	42.81	-3.35

REMARKS:

1. Emission Level(dBuV/m) = Raw Value(dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor (dB)
3. The other emission levels were very low against the limit.
4. Margin value = Emission Level – Limit value

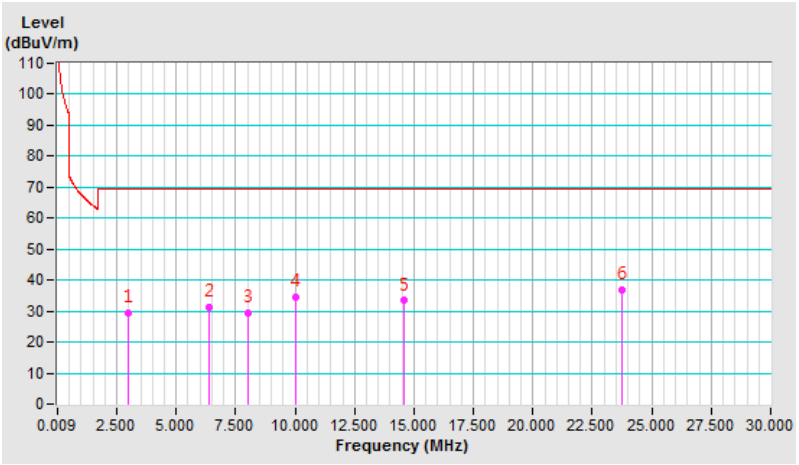


Frequency Range	Below 30MHz	Detector Function	Quasi-Peak

Antenna Polarity & Test Distance: Parallel at 3m								
No.	Freq. (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	3.008	29.49 QP	69.50	-40.01	1.00	105	32.54	-3.05
2	6.367	31.44 QP	69.50	-38.06	1.00	92	34.49	-3.05
3	8.047	29.49 QP	69.50	-40.01	1.00	117	32.50	-3.01
4	9.996	34.49 QP	69.50	-35.01	1.00	305	37.44	-2.95
5	14.555	33.40 QP	69.50	-36.10	1.00	249	37.03	-3.63
6	23.732	37.00 QP	69.50	-32.50	1.00	312	40.62	-3.62

REMARKS:

1. Emission Level(dBuV/m) = Raw Value(dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB)
   – Pre-Amplifier Factor (dB)
3. The other emission levels were very low against the limit.
4. Margin value = Emission Level – Limit value



Frequency Range	30MHz ~ 1000MHz	Detector Function	Quasi-Peak

Antenna Polarity & Test Distance: Horizontal At 3 M								
NO.	**FREQ. (MHz)**	**EMISSION LEVEL (dBuV/m)**	**LIMIT (dBuV/m)**	**MARGIN (dB)**	**ANTENNA HEIGHT (m)**	**TABLE ANGLE (Degree)**	**RAW VALUE (dBuV)**	**CORRECTION FACTOR (dB/m)**
1	38.73	26.5 QP	40.0	-13.5	2.50 H	313	34.9	-8.4
2	139.61	24.3 QP	43.5	-19.2	2.00 H	249	32.5	-8.2
3	271.53	24.4 QP	46.0	-21.6	2.00 H	138	32.3	-7.9
4	345.25	25.0 QP	46.0	-21.0	1.50 H	279	30.9	-5.9
5	474.26	32.1 QP	46.0	-13.9	1.50 H	360	34.4	-2.3
6	767.20	34.2 QP	46.0	-11.8	1.00 H	305	30.8	3.4
Antenna Polarity & Test Distance: Vertical At 3 M								
NO.	**FREQ. (MHz)**	**EMISSION LEVEL (dBuV/m)**	**LIMIT (dBuV/m)**	**MARGIN (dB)**	**ANTENNA HEIGHT (m)**	**TABLE ANGLE (Degree)**	**RAW VALUE (dBuV)**	**CORRECTION FACTOR (dB/m)**
1	**45.52**	**33.9 QP**	**40.0**	**-6.1**	**1.00 V**	**243**	**41.8**	**-7.9**
2	92.08	22.2 QP	43.5	-21.3	1.00 V	156	35.9	-13.7
3	159.98	23.6 QP	43.5	-19.9	1.00 V	261	31.3	-7.7
4	474.26	31.5 QP	46.0	-14.5	1.00 V	115	33.8	-2.3
5	688.63	32.1 QP	46.0	-13.9	2.00 V	312	30.2	1.9
6	783.69	34.3 QP	46.0	-11.7	1.50 V	174	30.6	3.7

REMARKS:

1. Emission Level(dBuV/m) = Raw Value(dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB)
3. The other emission levels were very low against the limit.
4. Margin value = Emission Level – Limit value

4.2 Conducted Emission Measurement

4.2.1 Limits of Conducted Emission Measurement

Frequency (MHz)	Conducted Limit (dBuV)	
	Quasi-peak	Average
0.15 - 0.5	66 - 56	56 - 46
0.50 - 5.0	56	46
5.0 - 30.0	60	50

Note: 1. The lower limit shall apply at the transition frequencies.
2. The limit decreases in line with the logarithm of the frequency in the range of 0.15 to 0.50MHz.
3. All emanations from a class A/B digital device or system, including any network of conductors and apparatus connected thereto, shall not exceed the level of field strengths specified above.

4.2.2 Test Instruments

DESCRIPTION & MANUFACTURER	MODEL NO.	SERIAL NO.	CALIBRATED DATE	CALIBRATED UNTIL
Test Receiver R&S	ESCS 30	847124/029	Nov. 01, 2017	Oct. 31, 2018
Line-Impedance Stabilization Network (for EUT) R&S	ESH3-Z5	848773/004	Nov. 15, 2017	Nov. 14, 2018
Line-Impedance Stabilization Network (for Peripheral) R&S	ENV216	100072	June 03, 2017	June 02, 2018
50 ohms Terminator	N/A	EMC-02	Sep. 22, 2017	Sep. 21, 2018
RF Cable	5D-FB	COCCAB-001	Sep. 29, 2017	Sep. 28, 2018
Fixed attenuator EMEC	STI02-2200-10	003	Mar. 16, 2018	Mar. 15, 2019
Software BVADT	BVADT_Cond_ V7.3.7.4	NA	NA	NA

Note:
1. The calibration interval of the above test instruments are 12 months and the calibrations are traceable to NML/ROC and NIST/USA.
2. The test was performed in Conduction 1.
3. Tested Date: Apr. 14, 2018

4.2.3 Test Procedures

a. The EUT was placed 0.4 meters from the conducting wall of the shielded room with EUT being connected to the power mains through a line impedance stabilization network (LISN). Other support units were connected to the power mains through another LISN. The two LISNs provide 50 ohm/ 50uH of coupling impedance for the measuring instrument.

b. Both lines of the power mains connected to the EUT were checked for maximum conducted interference.

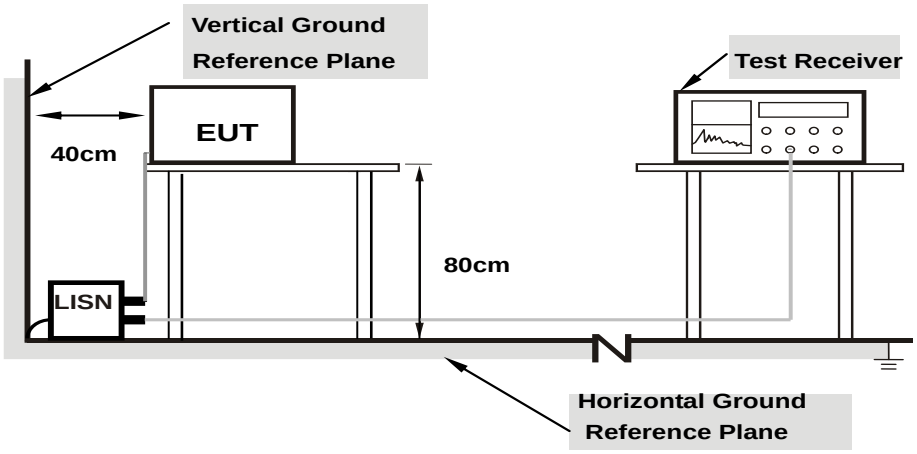
c. The frequency range from 150kHz to 30MHz was searched. Emission levels under (Limit - 20dB) was not recorded.

NOTE: The resolution bandwidth and video bandwidth of test receiver is 9kHz for quasi-peak detection (QP) and average detection (AV) at frequency 0.15MHz-30MHz.

4.2.4 Deviation from Test Standard

No deviation.

4.2.5 Test Setup



Note: 1.Support units were connected to second LISN.
2.Both of LISNs (AMN) are 80 cm from EUT and at least 80 from other units and other metal planes

For the actual test configuration, please refer to the attached file (Test Setup Photo).

4.2.6 EUT Operating Conditions

Same as 4.1.6.

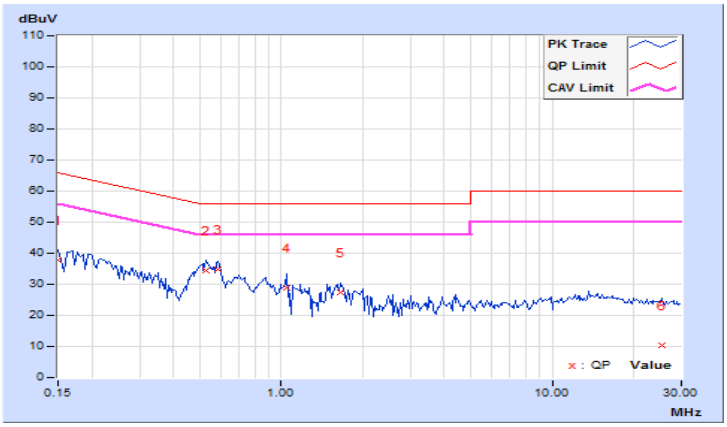
4.2.7 Test Results (Mode 1)

Phase	Line (L)	Detector Function	Quasi-Peak (QP) / Average (AV)

No	Freq.	Corr. Factor	Reading Value [dB (uV)]		Emission Level [dB (uV)]		Limit [dB (uV)]		Margin (dB)	
	[MHz]	(dB)	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.
1	0.15000	10.05	27.64	14.33	37.69	24.38	66.00	56.00	-28.31	-31.62
2	0.52500	10.13	24.34	12.04	34.47	22.17	56.00	46.00	-21.53	-23.83
3	0.58750	10.14	24.72	11.90	34.86	22.04	56.00	46.00	-21.14	-23.96
4	1.04297	10.17	18.90	7.19	29.07	17.36	56.00	46.00	-26.93	-28.64
5	1.66406	10.20	17.25	5.58	27.45	15.78	56.00	46.00	-28.55	-30.22
6	25.58594	11.49	-1.15	-7.27	10.34	4.22	60.00	50.00	-49.66	-45.78

Remarks:

1. Q.P. and AV. are abbreviations of quasi-peak and average individually.
2. The emission levels of other frequencies were very low against the limit.
3. Margin value = Emission level – Limit value
4. Correction factor = Insertion loss + Cable loss
5. Emission Level = Correction Factor + Reading Value

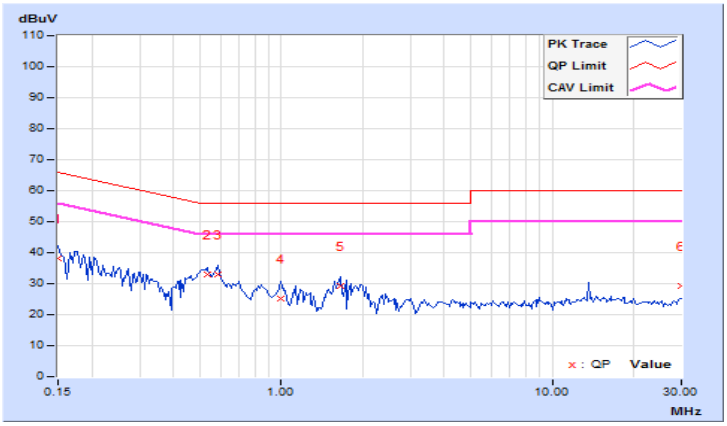


Phase	Neutral (N)	Detector Function	Quasi-Peak (QP) / Average (AV)

No	Freq.	Corr. Factor	Reading Value [dB (uV)]		Emission Level [dB (uV)]		Limit [dB (uV)]		Margin (dB)	
	[MHz]	(dB)	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.
1	0.15000	9.95	28.09	13.46	38.04	23.41	66.00	56.00	-27.96	-32.59
2	0.53281	10.02	22.94	15.56	32.96	25.58	56.00	46.00	-23.04	-20.42
3	0.58750	10.03	23.08	14.19	33.11	24.22	56.00	46.00	-22.89	-21.78
4	0.99766	10.04	15.08	7.30	25.12	17.34	56.00	46.00	-30.88	-28.66
5	1.64844	10.08	19.02	10.53	29.10	20.61	56.00	46.00	-26.90	-25.39
6	29.90234	11.32	17.85	12.04	29.17	23.36	60.00	50.00	-30.83	-26.64

Remarks:

1. Q.P. and AV. are abbreviations of quasi-peak and average individually.
2. The emission levels of other frequencies were very low against the limit.
3. Margin value = Emission level – Limit value
4. Correction factor = Insertion loss + Cable loss
5. Emission Level = Correction Factor + Reading Value



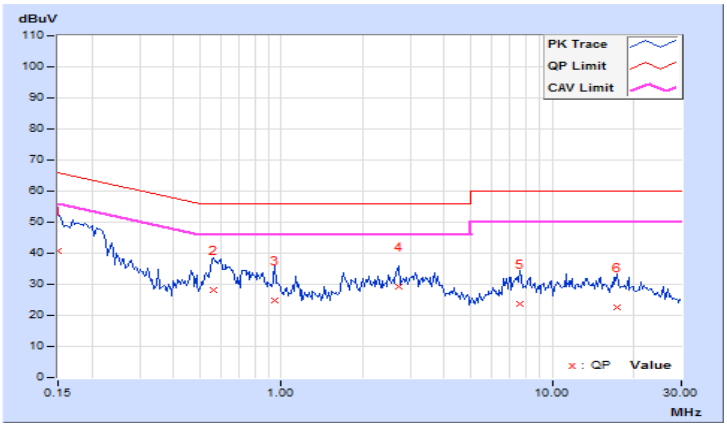
4.2.8 Test Results (Mode 2)

Phase	Line (L)	Detector Function	Quasi-Peak (QP) / Average (AV)

No	Freq.	Corr. Factor	Reading Value [dB (uV)]		Emission Level [dB (uV)]		Limit [dB (uV)]		Margin (dB)	
	[MHz]	(dB)	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.
1	0.15000	10.03	30.89	18.69	40.92	28.72	66.00	56.00	-25.08	-27.28
2	0.56016	10.12	17.89	7.21	28.01	17.33	56.00	46.00	-27.99	-28.67
3	0.95078	10.15	14.50	6.21	24.65	16.36	56.00	46.00	-31.35	-29.64
4	2.70703	10.22	19.01	10.62	29.23	20.84	56.00	46.00	-26.77	-25.16
5	7.64453	10.43	13.10	7.78	23.53	18.21	60.00	50.00	-36.47	-31.79
6	17.41406	10.96	11.57	6.27	22.53	17.23	60.00	50.00	-37.47	-32.77

Remarks:

1. Q.P. and AV. are abbreviations of quasi-peak and average individually.
2. The emission levels of other frequencies were very low against the limit.
3. Margin value = Emission level – Limit value
4. Correction factor = Insertion loss + Cable loss
5. Emission Level = Correction Factor + Reading Value

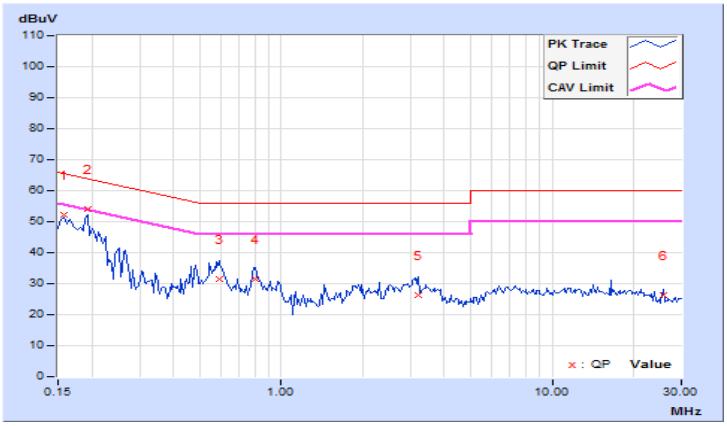


Phase	Neutral (N)	Detector Function	Quasi-Peak (QP) / Average (AV)

No	Freq.	Corr. Factor	Reading Value [dB (uV)]		Emission Level [dB (uV)]		Limit [dB (uV)]		Margin (dB)	
	[MHz]	(dB)	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.
1	0.15781	9.95	42.22	29.90	52.17	39.85	65.58	55.58	-13.41	-15.73
2	**0.19297**	**9.96**	**44.19**	**19.37**	**54.15**	**29.33**	**63.91**	**53.91**	**-9.76**	**-24.58**
3	0.59141	10.01	21.53	12.00	31.54	22.01	56.00	46.00	-24.46	-23.99
4	0.79844	10.02	21.37	6.19	31.39	16.21	56.00	46.00	-24.61	-29.79
5	3.20313	10.11	16.32	10.53	26.43	20.64	56.00	46.00	-29.57	-25.36
6	25.87109	10.93	15.47	14.65	26.40	25.58	60.00	50.00	-33.60	-24.42

Remarks:

1. Q.P. and AV. are abbreviations of quasi-peak and average individually.
2. The emission levels of other frequencies were very low against the limit.
3. Margin value = Emission level – Limit value
4. Correction factor = Insertion loss + Cable loss
5. Emission Level = Correction Factor + Reading Value

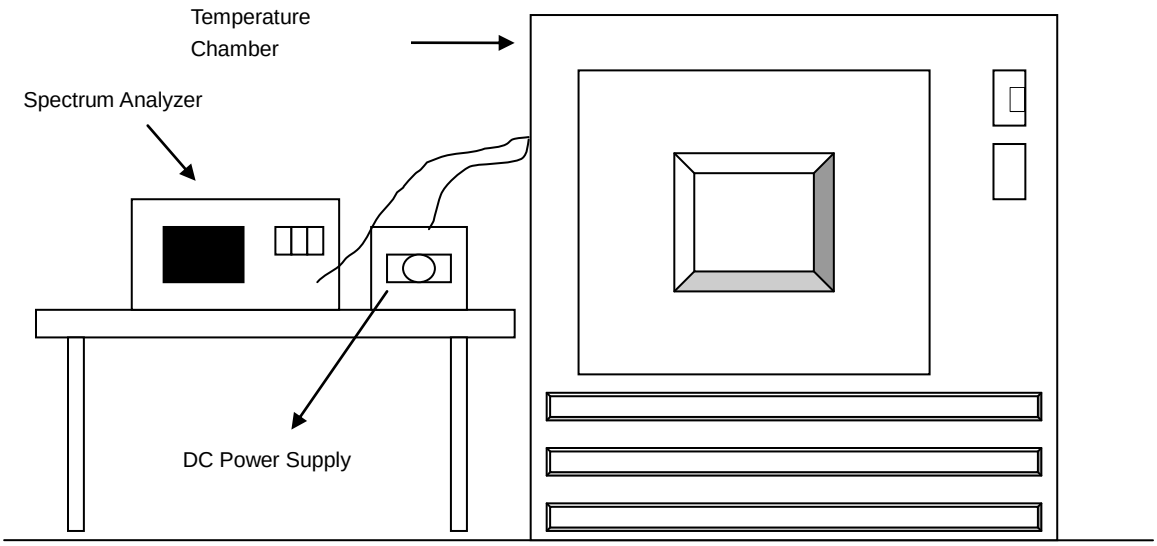


4.3 Frequency Stability

4.3.1 Limits of Frequency Stability Measurement

The frequency tolerance of the carrier signal shall be maintained within +/- 0.01% of the operating frequency over a temperature variation of –20 degrees to 50 degrees C at normal supply voltage, and for a variation in the primary supply voltage from 85% to 115% of the rated supply voltage at a temperature of 20 degrees C.

4.3.2 Test Setup



4.3.3 Test Instruments

Refer to section 4.1.2 to get information of above instrument.

4.3.4 Test Procedure

a. The EUT was placed inside the environmental test chamber and powered by nominal DC voltage.

b. Turned the EUT on and coupled its output to a spectrum analyzer.

c. Turned the EUT off and set the chamber to the highest temperature specified.

d. Allowed sufficient time (approximately 30 min) for the temperature of the chamber to stabilize then turned the EUT on and measured the operating frequency after 2, 5, and 10 minutes.

e. Repeated step 2 and 3 with the temperature chamber set to the lowest temperature.

f. The test chamber was allowed to stabilize at +20 degree C for a minimum of 30 minutes. The supply voltage was then adjusted on the EUT from 85% to 115% and the frequency record.

4.3.5 Deviation from Test Standard

No deviation.

4.3.6 EUT Operating Conditions

Same as Item 4.1.6.

4.3.7 Test Result

Frequemcy Stability Versus Temp.									
TEMP. (℃)	Power Supply (Vdc)	0 Minute		2 Minutes		5 Minutes		10 Minutes	
		Measured Frequency	Frequency Drift	Measured Frequency	Frequency Drift	Measured Frequency	Frequency Drift	Measured Frequency	Frequency Drift
		(MHz)	%	(MHz)	%	(MHz)	%	(MHz)	%
50	3.7	13.55999	-0.00007	13.55997	-0.00022	13.55997	-0.00022	13.55998	-0.00015
40	3.7	13.56	0.00000	13.56	0.00000	13.56001	0.00007	13.56001	0.00007
30	3.7	13.56005	0.00037	13.56006	0.00044	13.56006	0.00044	13.56004	0.00029
20	3.7	13.56007	0.00052	13.56005	0.00037	13.56005	0.00037	13.56005	0.00037
10	3.7	13.56002	0.00015	13.56002	0.00015	13.56002	0.00015	13.56003	0.00022
0	3.7	13.55998	-0.00015	13.55996	-0.00029	13.55996	-0.00029	13.55997	-0.00022
-10	3.7	13.56002	0.00015	13.56002	0.00015	13.56003	0.00022	13.56001	0.00007
-20	3.7	13.56002	0.00015	13.56	0.00000	13.56002	0.00015	13.56001	0.00007

Frequemcy Stability Versus Voltage									
TEMP. (℃)	Power Supply (Vdc)	0 Minute		2 Minutes		5 Minutes		10 Minutes	
		Measured Frequency	Frequency Drift	Measured Frequency	Frequency Drift	Measured Frequency	Frequency Drift	Measured Frequency	Frequency Drift
		(MHz)	%	(MHz)	%	(MHz)	%	(MHz)	%
20	4.255	13.56007	0.00052	13.56005	0.00037	13.56005	0.00037	13.56005	0.00037
	3.7	13.56007	0.00052	13.56005	0.00037	13.56005	0.00037	13.56005	0.00037
	3.145	13.56007	0.00052	13.56005	0.00037	13.56005	0.00037	13.56005	0.00037

4.4 20dB bandwidth

4.4.1 Limits of 20dB bandwidth Measurement

The 20dB bandwidth shall be specified in operating frequency band.

4.4.2 Test Setup

Same as Item 4.1.5.

4.4.3 Test Instruments

Refer to section 4.1.2 to get information of above instrument.

4.4.4 Test Procedures

The bandwidth of the fundamental frequency was measured by spectrum analyzer with 1kHz RBW and 3kHz VBW. The 20dB bandwidth is defined as the total spectrum the power of which is higher than peak power minus 20dB.

4.4.5 Deviation from Test Standard

No deviation.

4.4.6 EUT Operating Conditions

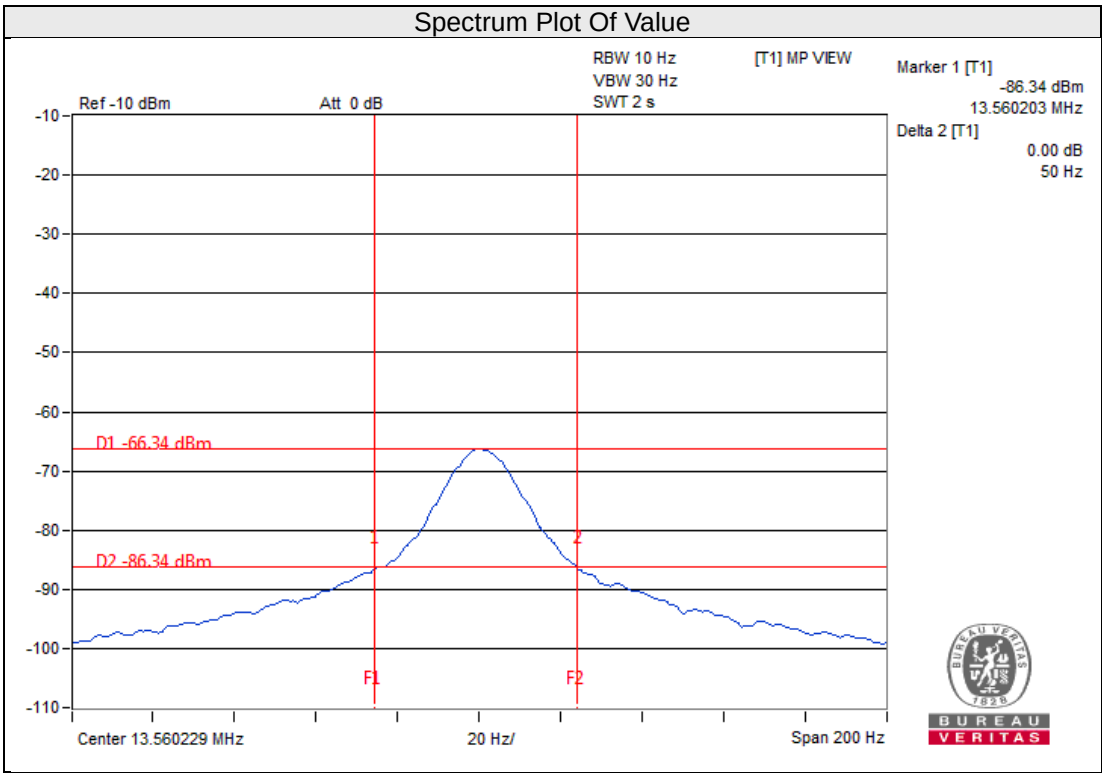
Same as Item 4.1.6.

4.4.7 Test Results

Type A

20dBc point (Low)	20dBc point (High)	Operating frequency band (MHz)	Pass/Fail
13.560203	13.560253	13.11 – 14.01	PASS

Spectrum Plot Of Value



5 Pictures of Test Arrangements

Please refer to the attached file (Test Setup Photo).

Appendix – Information on the Testing Laboratories

We, Bureau Veritas Consumer Products Services (H.K.) Ltd., Taoyuan Branch, were founded in 1988 to provide our best service in EMC, Radio, Telecom and Safety consultation. Our laboratories are FCC recognized accredited test firms and accredited according to ISO/IEC 17025.

If you have any comments, please feel free to contact us at the following:

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Web Site: www.bureauveritas-adt.com

The address and road map of all our labs can be found in our web site also.

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