

FCC Test Report

Report No.: RF190327C16A

FCC ID: MSQG731G

Test Model: G731G

Series Model: G731GT, PX731, GL731GT, G731GU, G731GV, G731GW, GL731GU, GL731GV, GL731GW, G731, GL731G, G731G_N, G731GU_N, G731GV_N, G731GW_N (Refer to section 3.1 for more detail)

Received Date: Apr. 24, 2019

Test Date: Apr. 29 ~ Apr. 30, 2019

Issued Date: May 13, 2019

Applicant: ASUSTeK COMPUTER INC.

Address: 4F, No. 150, LI-TE Rd., PEITOU, TAIPEI 112, TAIWAN

Issued By: Bureau Veritas Consumer Products Services (H.K.) Ltd., Taoyuan Branch

Lab Address: No. 47-2, 14th Ling, Chia Pau Vil., Lin Kou Dist., New Taipei City, Taiwan, R.O.C.

Test Location: No. 19, Hwa Ya 2nd Rd., Wen Hwa Vil., Kwei Shan Dist., Taoyuan City 33383, TAIWAN (R.O.C.)

FCC Registration / Designation Number: 788550 / TW0003



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Release Control Record

Issue No.	Description	Date Issued
RF190327C16A	Original release.	May 13, 2019

1 Certificate of Conformity

Product: Notebook PC

Brand: ASUS

Test Model: G731G

Series Model: G731GT, PX731, GL731GT, G731GU, G731GV, G731GW, GL731GU, GL731GV, GL731GW, G731, GL731G, G731G_N, G731GU_N, G731GV_N, G731GW_N
(Refer to section 3.1 for more detail)

Sample Status: Identical Prototype

Applicant: ASUSTeK COMPUTER INC.

Test Date: Apr. 29 ~ Apr. 30, 2019

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 RF characteristics under the conditions specified in this report.

Prepared by :  , **Date:** May 13, 2019
Polly Chien / Specialist

Approved by :  , **Date:** May 13, 2019
Bruce Chen / Project Engineer

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 -13.11dB at 0.22434MHz
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 -75.8dB at 13.56MHz.
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 -1.8dB at 193.68MHz.
15.225 (e)	The frequency tolerance	Pass	Meet the requirement of limit.
15.215 (c)	20dB Bandwidth	Pass	Meet the requirement of limit.

Note: Determining compliance based on the results of the compliance measurement, not taking into account measurement instrumentation uncertainty.

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) (\pm)
Conducted Emissions at mains ports	150kHz ~ 30MHz	2.94 dB
Radiated Emissions up to 1 GHz	9kHz ~ 30MHz	3.04 dB
	30MHz ~ 200MHz	3.63 dB
	200MHz ~ 1000MHz	3.64 dB

2.2 Modification Record

There were no modifications required for compliance.

3 General Information

3.1 General Description of EUT

Product	Notebook PC
Brand	ASUS
Test Model	G731G
Series Model	G731GT, PX731, GL731GT, G731GU, G731GV, G731GW, GL731GU, GL731GV, GL731GW, G731, GL731G, G731G_N, G731GU_N, G731GV_N, G731GW_N
Model Difference	Refer to Note
Sample Status	Identical Prototype
Nominal Voltage	15.4 Vdc (Battery) 20 Vdc (Adapter)
Modulation Type	ASK
Operating Frequency	13.56MHz
Data Rate	26.69 kbit/s
NFC type	Type V
Field Strength	48.2dBuV/m
Antenna Type	PCB antenna
Antenna Connector	NA
Accessory Device	Battery, Adapter
Cable Supplied	NA

Note:

1. All models are listed as below.

Brand	Model	Function	Difference
ASUS	G731G (Main Model)	WLAN + BT or WLAN + BT + NFC	All models are electrically identical, different model names are for marketing purpose.
	G731GT (Series Model)		
	PX731 (Series Model)		
	GL731GT (Series Model)		
	G731GU (Series Model)		
	G731GV (Series Model)		
	G731GW (Series Model)		
	GL731GU (Series Model)		
	GL731GV (Series Model)		
	GL731GW (Series Model)		
	G731 (Series Model)		
	GL731G (Series Model)		
	G731G_N (Series Model)		
	G731GU_N (Series Model)		
G731GV_N (Series Model)			
G731GW_N (Series Model)			

2. The EUT is powered by the following battery.

Battery	
Brand	ASUS
Manufacturer	DP
Model	C41N1731-2
Rating	15.4Vdc/66WH
Capacity	4335mAh(Typical) / 4210mAh (Rated)

3. The EUT is powered by the following adapter.

Adapter 280W	
Brand	ASUS
Manufacturer	DELTA
Model	ADP-280BB B
Input Power	100-240Vac, 3.2A
Output Power	20 Vdc , 14 A
Power Cord	AC: 1.8m non-shielded power cord DC: 1.2m shielded power cord with 2 cores

4. 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

1 channel is provided to this EUT

Channel	Freq. (MHz)
1	13.56

3.2.1 Test Mode Applicability and Tested Channel Data

EUT Configure Mode	Applicable to				Description
	RE	PLC	FS	EB	
-	√	√	√	√	-

Where RE: Radiated Emission
FS: Frequency Stability

PLC: Power Line Conducted Emission
EB: 20dB Bandwidth measurement

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.

EUT Configure Mode	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.

EUT Configure Mode	Available Channel	Tested Channel	Modulation Type
-	1	1	ASK

Frequency Stability:

- 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.

EUT Configure Mode	Available Channel	Tested Channel	Modulation Type
-	1	1	ASK

20dB Bandwidth:

- 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.

EUT Configure Mode	Available Channel	Tested Channel	Modulation Type
-	1	1	ASK

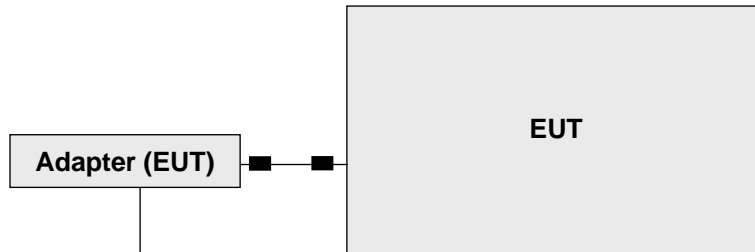
Test Condition:

Applicable to	Environmental Conditions	Input Power	Tested by
RE	23 deg. C, 67% RH	120Vac, 60Hz	Adair Peng
PLC	23 deg. C, 67% RH	120Vac, 60Hz	Adair Peng
FS	23 deg. C, 67% RH	120Vac, 60Hz	Adair Peng
BW	23 deg. C, 67% RH	120Vac, 60Hz	Adair Peng

3.3 Description of Support Units

The EUT has been tested as an independent unit together with other necessary accessories or support units.

3.3.1 Configuration of System under Test



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

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

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.

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.

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.

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

Description & Manufacturer	Model No.	Serial No.	Cal. Date	Cal. Due
Test Receiver ROHDE & SCHWARZ	ESIB7	100187	May 29, 2018	May 28, 2019
BILOG Antenna SCHWARZBECK	VULB9168	9168-171	Nov. 22, 2018	Nov. 21, 2019
HORN Antenna SCHWARZBECK	9120D	209	Nov. 25, 2018	Nov. 24, 2019
HORN Antenna SCHWARZBECK	BBHA 9170	BBHA9170241	Nov. 25, 2018	Nov. 24, 2019
HORN Antenna SCHWARZBECK	BBHA 9170	BBHA9170241	Nov. 25, 2018	Nov. 24, 2019
Loop Antenna TESEQ	HLA 6121	45745	Jun. 14, 2018	Jun. 13, 2019
Preamplifier Agilent (Below 1GHz)	8447D	2944A10738	Aug. 21, 2018	Aug. 20, 2019
Preamplifier Agilent (Above 1GHz)	8449B	3008A02465	Mar. 27, 2019	Mar. 26, 2020
RF signal cable HUBER+SUHNER	SUCOFLEX 104	Cable-CH3-03 (223653/4)	Aug. 21, 2018	Aug. 20, 2019
RF signal cable HUBER+SUHNER& EMCI	SUCOFLEX 104&EMC104-SM- SM-8000	Cable-CH3-03 (309224+170907)	Aug. 21, 2018	Aug. 20, 2019
Software BV ADT	ADT_Radiated_ V7.6.15.9.5	NA	NA	NA
Antenna Tower inn-co GmbH	MA 4000	013303	NA	NA
Antenna Tower Controller BV ADT	AT100	AT93021702	NA	NA
Turn Table BV ADT	TT100	TT93021702	NA	NA
Turn Table Controller BV ADT	SC100	SC93021702	NA	NA
Boresight Antenna Fixture	FBA-01	FBA-SIP01	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 test was performed in HwaYa Chamber 3.

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) / 1.5 meters (for above 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.
- f. The test-receiver system was set to peak and average detect function and specified bandwidth with maximum hold mode when the test frequency is above 1 GHz. If the peak reading value also meets average limit, measurement with the average detector is unnecessary.

Note:

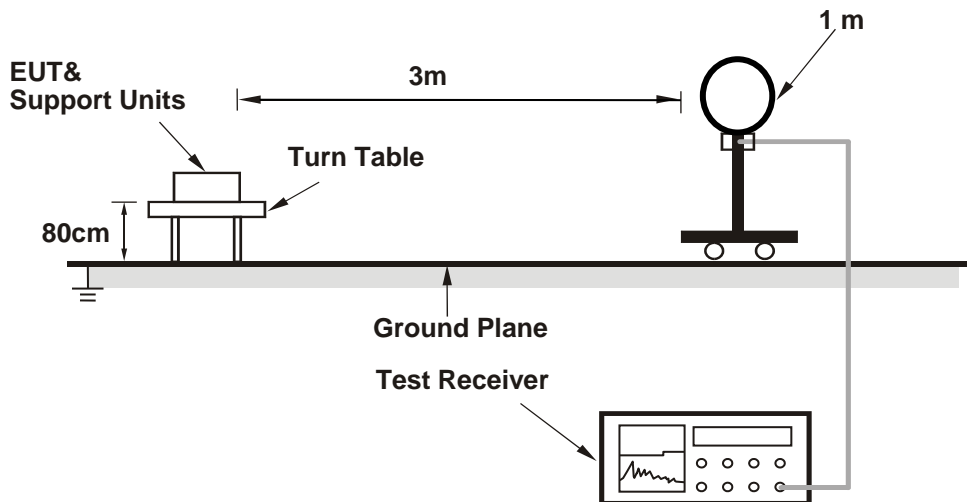
1. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 120kHz for Quasi-peak detection (QP) at frequency below 1GHz.
2. The resolution bandwidth of test receiver/spectrum analyzer is 1 MHz and the video bandwidth is 3 MHz for Peak detection (PK) at frequency above 1GHz.
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 $\geq 98\%$) for Average detection (AV) at frequency above 1GHz.
4. All modes of operation were investigated and the worst-case emissions are reported.

4.1.4 Deviation from Test Standard

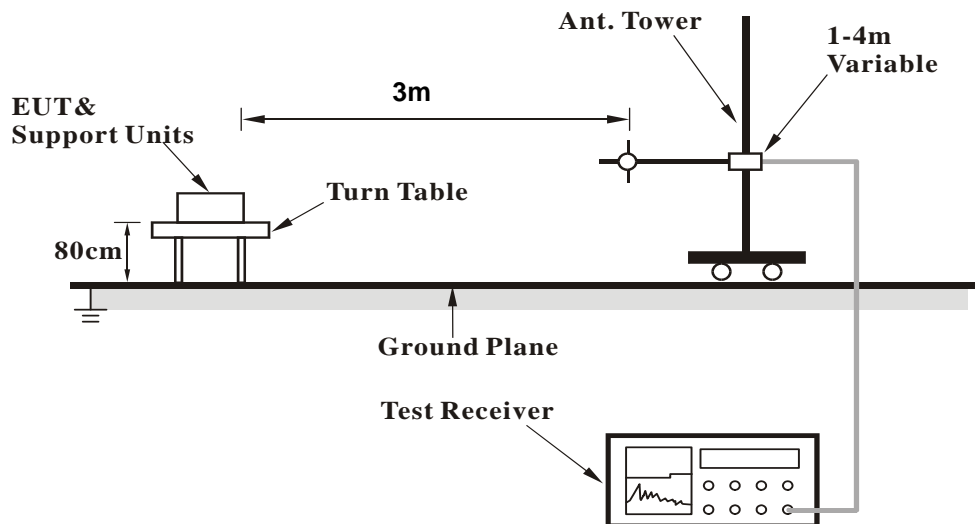
No deviation.

4.1.5 Test Set Up

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

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

4.1.7 Test Results

EUT Test Condition		Measurement Detail	
Channel	Channel 1	Frequency Range	13.553 ~ 13.567MHz
Input Power	120Vac, 60Hz	Detector Function	Quasi-Peak
Environmental Conditions	23 deg. C, 67% RH	Tested By	Adair Peng

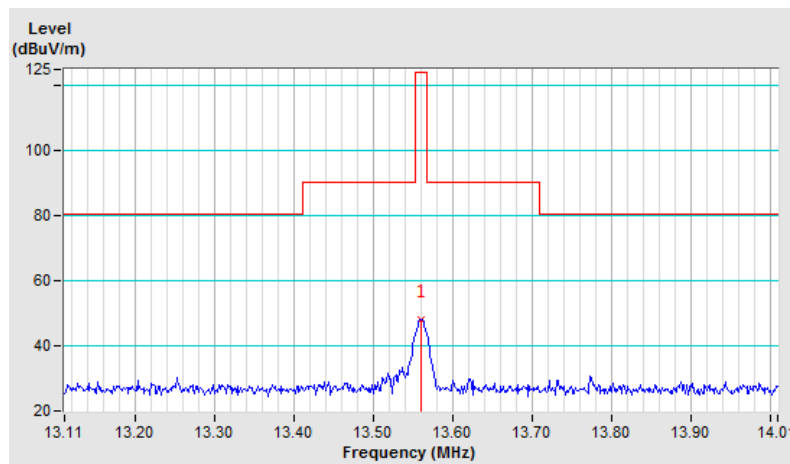
Antenna Polarity & Test Distance: Loop Antenna Open At 3m								
No.	Freq. (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	*13.56	48.2 QP	124.0 QP	-75.8	1.00	169	26.4	21.8

- 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)
 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

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:

$$\begin{aligned}
 13.56\text{MHz} &= 15848\text{uV/m} && 30\text{m} \\
 &= 84\text{dBuV/m} && 30\text{m} \\
 &= 84+20\log(30/3)^2 && 3\text{m} \\
 &= 124\text{dBuV/m}
 \end{aligned}$$



EUT Test Condition		Measurement Detail	
Channel	Channel 1	Frequency Range	13.553 ~ 13.567MHz
Input Power	120Vac, 60Hz	Detector Function	Quasi-Peak
Environmental Conditions	23 deg. C, 67% RH	Tested By	Adair Peng

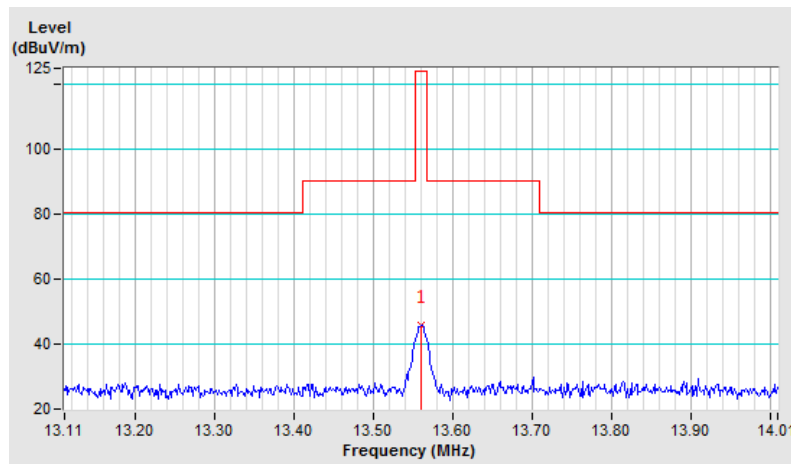
Antenna Polarity & Test Distance: Loop Antenna Close At 3m								
No.	Freq. (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	*13.56	45.9 QP	124.0 QP	-78.1	1.00	293	24.1	21.8

- 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)
 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

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:

$$\begin{aligned}
 13.56\text{MHz} &= 15848\mu\text{V/m} && 30\text{m} \\
 &= 84\text{dBuV/m} && 30\text{m} \\
 &= 84+20\log(30/3)^2 && 3\text{m} \\
 &= 124\text{dBuV/m}
 \end{aligned}$$



EUT Test Condition		Measurement Detail	
Channel	Channel 1	Frequency Range	13.553 ~ 13.567MHz
Input Power	120Vac, 60Hz	Detector Function	Quasi-Peak
Environmental Conditions	23 deg. C, 67% RH	Tested By	Adair Peng

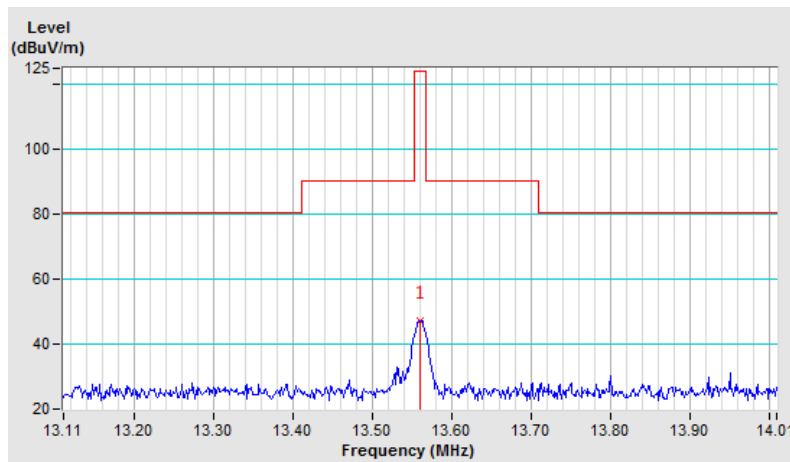
Antenna Polarity & Test Distance: Loop Antenna Ground Parallel At 3m								
No.	Freq. (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	*13.56	47.3 QP	124.0 QP	-76.7	1.00	139	25.5	21.8

- 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)
 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

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:

$$\begin{aligned}
 13.56\text{MHz} &= 15848\text{uV/m} && 30\text{m} \\
 &= 84\text{dBuV/m} && 30\text{m} \\
 &= 84+20\log(30/3)^2 && 3\text{m} \\
 &= 124\text{dBuV/m}
 \end{aligned}$$

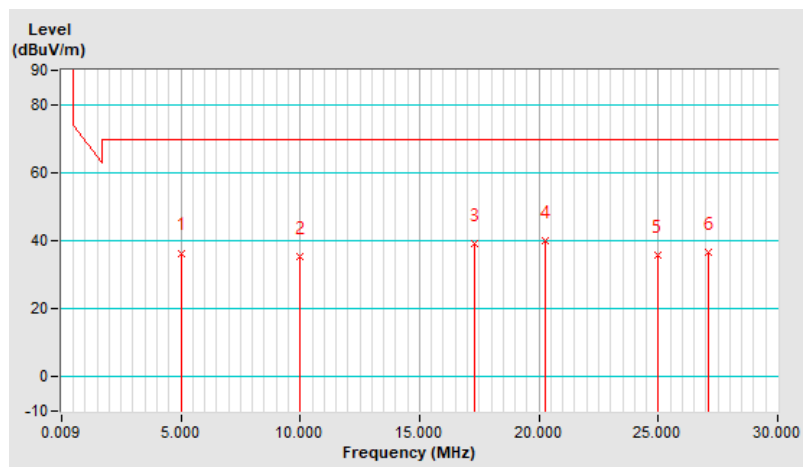


EUT Test Condition		Measurement Detail	
Channel	Channel 1	Frequency Range	Below 30MHz
Input Power	120Vac, 60Hz	Detector Function	Quasi-Peak
Environmental Conditions	23 deg. C, 67% RH	Tested By	Adair Peng

Antenna Polarity & Test Distance: Loop Antenna Open 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	5.01	36.4 QP	69.5 QP	-33.1	1.00	233	15.9	20.5
2	9.96	35.2 QP	69.5 QP	-34.3	1.00	17	13.4	21.8
3	17.31	39.3 QP	69.5 QP	-30.2	1.00	10	17.5	21.8
4	20.29	39.9 QP	69.5 QP	-29.6	1.00	35	18.0	21.9
5	24.95	35.7 QP	69.5 QP	-33.8	1.00	157	13.7	22.0
6	27.12	36.6 QP	69.5 QP	-32.9	1.00	149	14.5	22.1

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)
3. The other emission levels were very low against the limit.
4. Margin value = Emission Level – Limit value

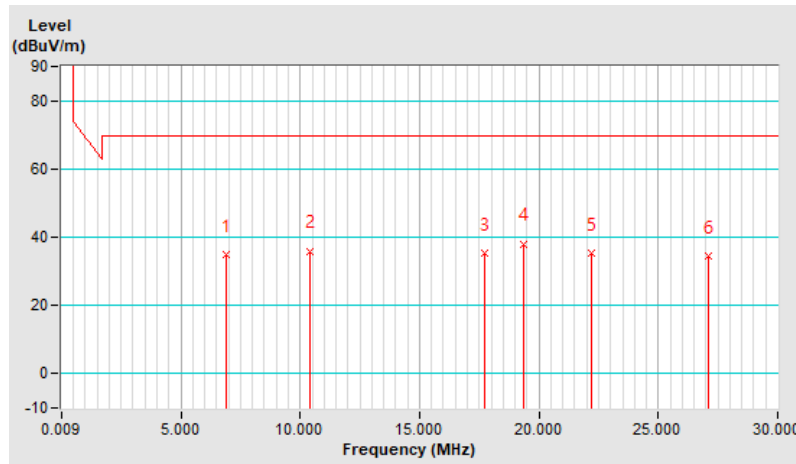


EUT Test Condition		Measurement Detail	
Channel	Channel 1	Frequency Range	Below 30MHz
Input Power	120Vac, 60Hz	Detector Function	Quasi-Peak
Environmental Conditions	23 deg. C, 67% RH	Tested By	Adair Peng

Antenna Polarity & Test Distance: Loop Antenna Close 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	6.93	35.1 QP	69.5 QP	-34.4	1.00	58	14.1	21.0
2	10.39	36.0 QP	69.5 QP	-33.5	1.00	31	14.2	21.8
3	17.74	35.2 QP	69.5 QP	-34.3	1.00	196	13.4	21.8
4	19.38	38.1 QP	69.5 QP	-31.4	1.00	1	16.3	21.8
5	22.21	35.4 QP	69.5 QP	-34.1	1.00	339	13.5	21.9
6	27.12	34.3 QP	69.5 QP	-35.2	1.00	185	12.2	22.1

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)
3. The other emission levels were very low against the limit.
4. Margin value = Emission Level – Limit value

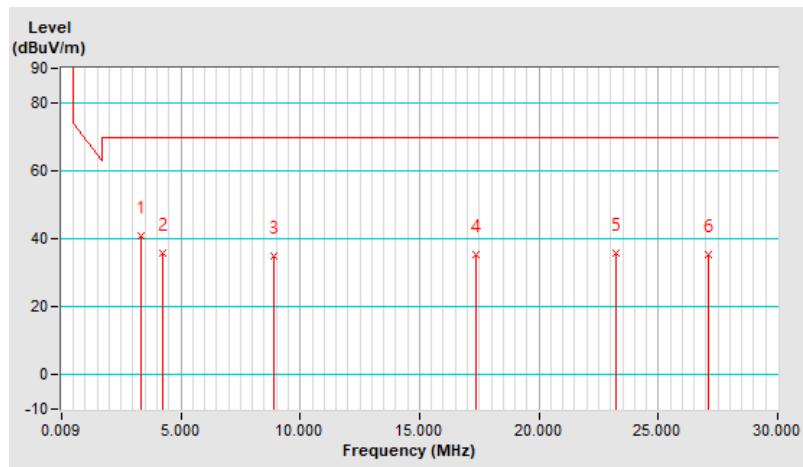


EUT Test Condition		Measurement Detail	
Channel	Channel 1	Frequency Range	Below 30MHz
Input Power	120Vac, 60Hz	Detector Function	Quasi-Peak
Environmental Conditions	23 deg. C, 67% RH	Tested By	Adair Peng

Antenna Polarity & Test Distance: Loop Antenna Ground Paralle 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	3.33	40.8 QP	69.5 QP	-28.7	1.00	86	21.1	19.7
2	4.24	35.6 QP	69.5 QP	-33.9	1.00	259	15.5	20.1
3	8.90	35.0 QP	69.5 QP	-34.5	1.00	30	13.5	21.5
4	17.36	35.5 QP	69.5 QP	-34.0	1.00	231	13.7	21.8
5	23.22	35.9 QP	69.5 QP	-33.6	1.00	109	13.9	22.0
6	27.12	35.5 QP	69.5 QP	-34.0	1.00	175	13.4	22.1

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)
3. The other emission levels were very low against the limit.
4. Margin value = Emission Level – Limit value

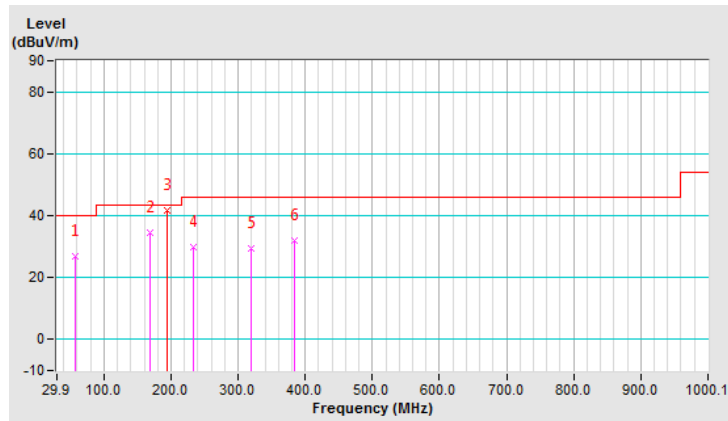


EUT Test Condition		Measurement Detail	
Channel	Channel 1	Frequency Range	Below 1000MHz
Input Power	120Vac, 60Hz	Detector Function	Quasi-Peak
Environmental Conditions	23 deg. C, 67% RH	Tested By	Adair Peng

Antenna Polarity & Test Distance: Horizontal 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	57.12	26.9 QP	40.0	-13.1	1.99 H	72	37.0	-10.1
2	167.94	34.3 QP	43.5	-9.2	1.51 H	218	43.6	-9.3
3	193.68	41.7 QP	43.5	-1.8	1.50 H	240	52.9	-11.2
4	234.05	29.8 QP	46.0	-16.2	1.00 H	277	39.9	-10.1
5	319.60	29.4 QP	46.0	-16.6	1.00 H	173	36.3	-6.9
6	383.76	32.1 QP	46.0	-13.9	1.99 H	302	37.9	-5.8

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

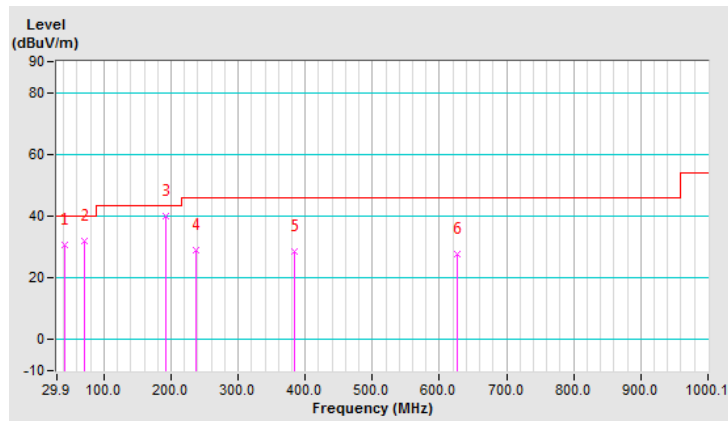


EUT Test Condition		Measurement Detail	
Channel	Channel 1	Frequency Range	Below 1000MHz
Input Power	120Vac, 60Hz	Detector Function	Quasi-Peak
Environmental Conditions	23 deg. C, 67% RH	Tested By	Adair Peng

Antenna Polarity & Test Distance: Vertical 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	41.57	30.7 QP	40.0	-9.3	1.49 V	16	40.8	-10.1
2	70.73	32.1 QP	40.0	-7.9	1.49 V	0	44.1	-12.0
3	193.22	40.1 QP	43.5	-3.4	1.49 V	14	51.3	-11.2
4	237.94	29.0 QP	46.0	-17.0	1.49 V	322	38.8	-9.8
5	383.76	28.4 QP	46.0	-17.6	1.49 V	346	34.2	-5.8
6	626.80	27.7 QP	46.0	-18.3	1.99 V	267	28.4	-0.7

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.

4.2.2 Test Instruments

Description & Manufacturer	Model No.	Serial No.	Cal. Date	Cal. Due
Test Receiver ROHDE & SCHWARZ	ESCS 30	100288	Jan. 03, 2019	Jan. 02, 2020
RF signal cable Woken	5D-FB	Cable-cond1-01	Sep. 05, 2018	Sep. 04, 2019
LISN ROHDE & SCHWARZ (EUT)	ENV216	101826	Feb. 21, 2019	Feb. 20, 2020
LISN ROHDE & SCHWARZ (Peripheral)	ESH3-Z5	100311	Aug. 19, 2018	Aug. 18, 2019
Software ADT	BV ADT_Cond_ V7.3.7.4	NA	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 test was performed in HwaYa Shielded Room 1.

3. The VCCI Site Registration No. is C-12040.

4.2.3 Test Procedures

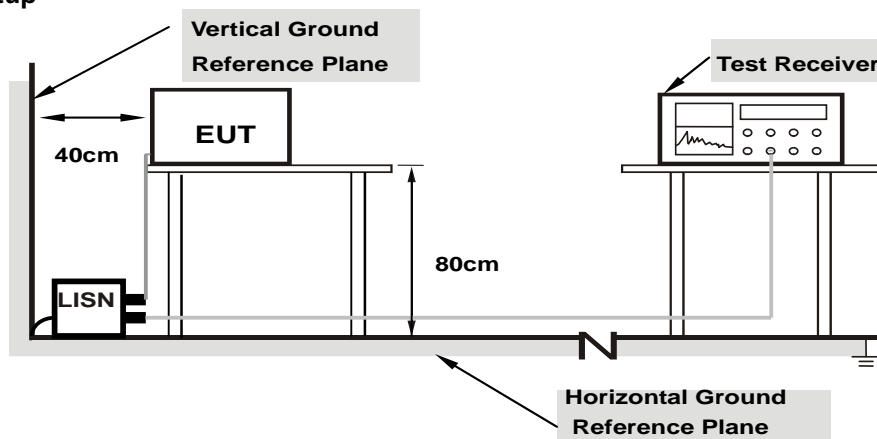
- The EUT was placed 0.4 meters from the conducting wall of the shielded room with EUT being connected to the power mains through a line impedance stabilization network (LISN). Other support units were connected to the power mains through another LISN. The two LISNs provide 50 ohm/ 50uH of coupling impedance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

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.

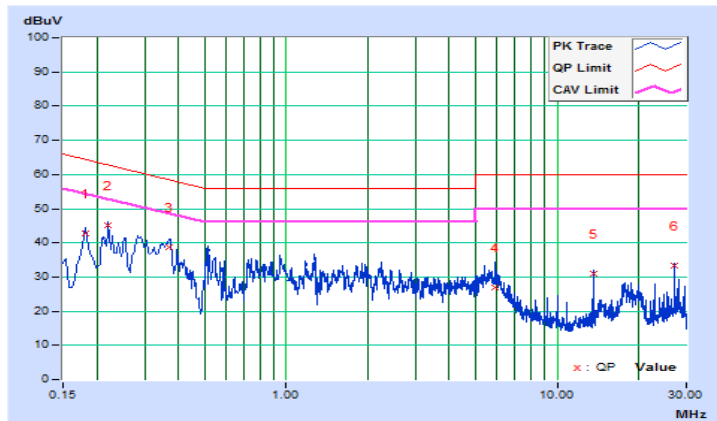
4.2.7 Test Results

Phase	Line (L)	Detector Function	Quasi-Peak (QP) / Average (AV)
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No	Freq. [MHz]	Corr. Factor (dB)	Reading Value [dB (uV)]		Emission Level [dB (uV)]		Limit [dB (uV)]		Margin (dB)	
			Q.P.	AV.	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.
			1	0.18122	9.68	33.06	26.20	42.74	35.88	64.43
2	0.22038	9.68	35.59	27.94	45.27	37.62	62.80	52.80	-17.53	-15.18
3	0.36913	9.68	28.88	18.93	38.56	28.61	58.52	48.52	-19.96	-19.91
4	5.89379	9.79	17.12	10.73	26.91	20.52	60.00	50.00	-33.09	-29.48
5	13.56130	9.89	20.96	20.81	30.85	30.70	60.00	50.00	-29.15	-19.30
6	27.12118	9.94	23.27	23.13	33.21	33.07	60.00	50.00	-26.79	-16.93

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.

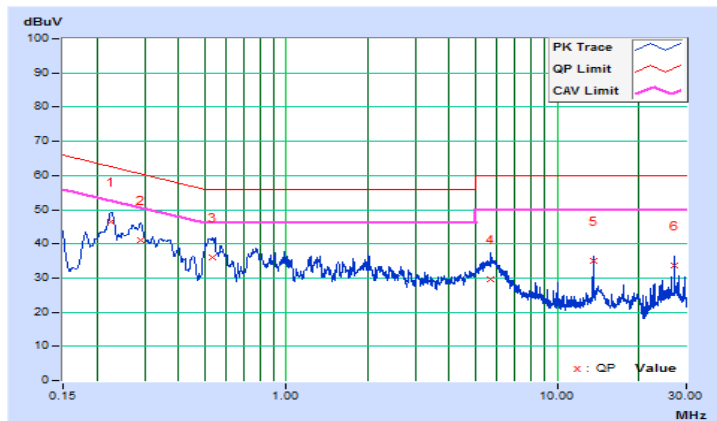


Phase	Neutral (N)	Detector Function	Quasi-Peak (QP) / Average (AV)
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No	Freq. [MHz]	Corr. Factor (dB)	Reading Value [dB (uV)]		Emission Level [dB (uV)]		Limit [dB (uV)]		Margin (dB)	
			Q.P.	AV.	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.
			1	0.22434	9.66	36.77	29.89	46.43	39.55	62.66
2	0.29043	9.66	31.25	22.95	40.91	32.61	60.51	50.51	-19.60	-17.90
3	0.53240	9.65	26.45	15.24	36.10	24.89	56.00	46.00	-19.90	-21.11
4	5.71393	9.76	19.96	13.73	29.72	23.49	60.00	50.00	-30.28	-26.51
5	13.56130	9.91	25.16	24.89	35.07	34.80	60.00	50.00	-24.93	-15.20
6	27.12118	10.03	23.64	23.48	33.67	33.51	60.00	50.00	-26.33	-16.49

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.

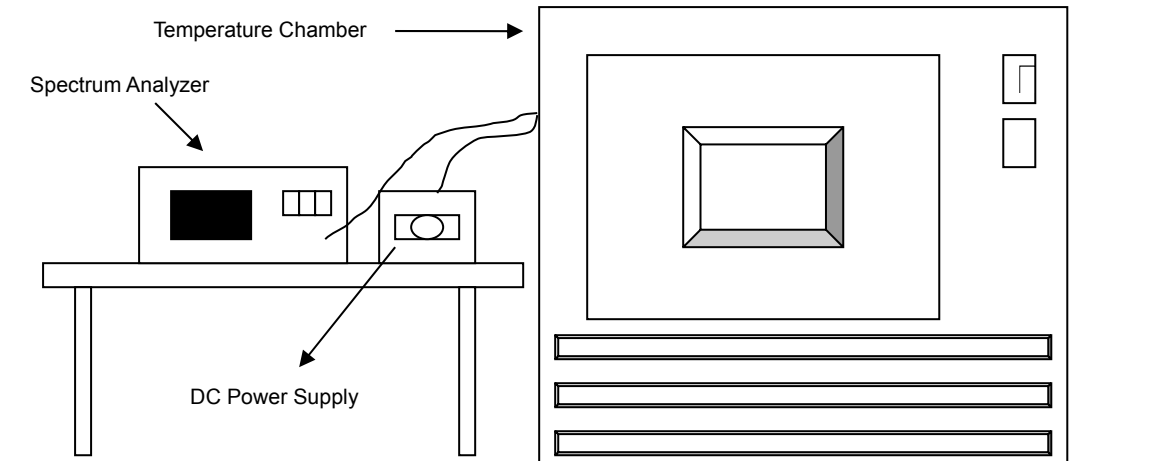


4.3 Frequency Stability

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

Description & Manufacturer	Model No.	Serial No.	Cal. Date	Cal. Due
Spectrum Analyzer ROHDE & SCHWARZ	FSP40	100039	Jun. 11, 2018	Jun. 10, 2019
WIT Standard Temperature And Humidity Chamber	TH-4S-C	W981030	Jun. 04, 2018	Jun. 03, 2019
Digital Multimeter Fluke	87-III	70360742	Jun. 29, 2018	Jun. 28, 2019
DC Power Supply Topward	6306A	727263	NA	NA

4.3.4 Test Procedure

- The EUT was placed inside the environmental test chamber and powered by nominal DC voltage.
- Turned the EUT on and coupled its output to a spectrum analyzer.
- Turned the EUT off and set the chamber to the highest temperature specified.
- 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.
- Repeated step d with the temperature chamber sets to each desired temperature.
- 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

Frequency Stability Versus Temp.									
TEMP. (°C)	Power Supply (Vdc)	0 Minute		2 Minute		5 Minute		10 Minute	
		Measured Frequency	Frequency Drift	Measured Frequency	Frequency Drift	Measured Frequency	Frequency Drift	Measured Frequency	Frequency Drift
		(MHz)	%	(MHz)	%	(MHz)	%	(MHz)	%
50	20	13.55996	-0.00029	13.55996	-0.00029	13.55997	-0.00022	13.55996	-0.00029
40	20	13.55999	-0.00007	13.55999	-0.00007	13.55999	-0.00007	13.55999	-0.00007
30	20	13.56007	0.00052	13.56007	0.00052	13.56007	0.00052	13.56007	0.00052
20	20	13.55996	-0.00029	13.55995	-0.00037	13.55996	-0.00029	13.55996	-0.00029
10	20	13.56001	0.00007	13.56001	0.00007	13.56	0.00000	13.56001	0.00007
0	20	13.55998	-0.00015	13.55997	-0.00022	13.55996	-0.00029	13.55997	-0.00022
-10	20	13.56007	0.00052	13.56006	0.00044	13.56006	0.00044	13.56006	0.00044
-20	20	13.56002	0.00015	13.56002	0.00015	13.56002	0.00015	13.56002	0.00015

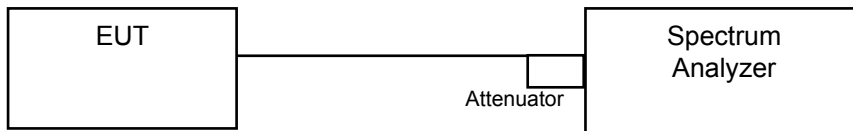
Frequency Stability Versus Voltage									
TEMP. (°C)	Power Supply (Vdc)	0 Minute		2 Minute		5 Minute		10 Minute	
		Measured Frequency	Frequency Drift	Measured Frequency	Frequency Drift	Measured Frequency	Frequency Drift	Measured Frequency	Frequency Drift
		(MHz)	%	(MHz)	%	(MHz)	%	(MHz)	%
20	23	13.55996	-0.00029	13.55995	-0.00037	13.55996	-0.00029	13.55996	-0.00029
	20	13.55996	-0.00029	13.55995	-0.00037	13.55996	-0.00029	13.55996	-0.00029
	17	13.55996	-0.00029	13.55995	-0.00037	13.55996	-0.00029	13.55996	-0.00029

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



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

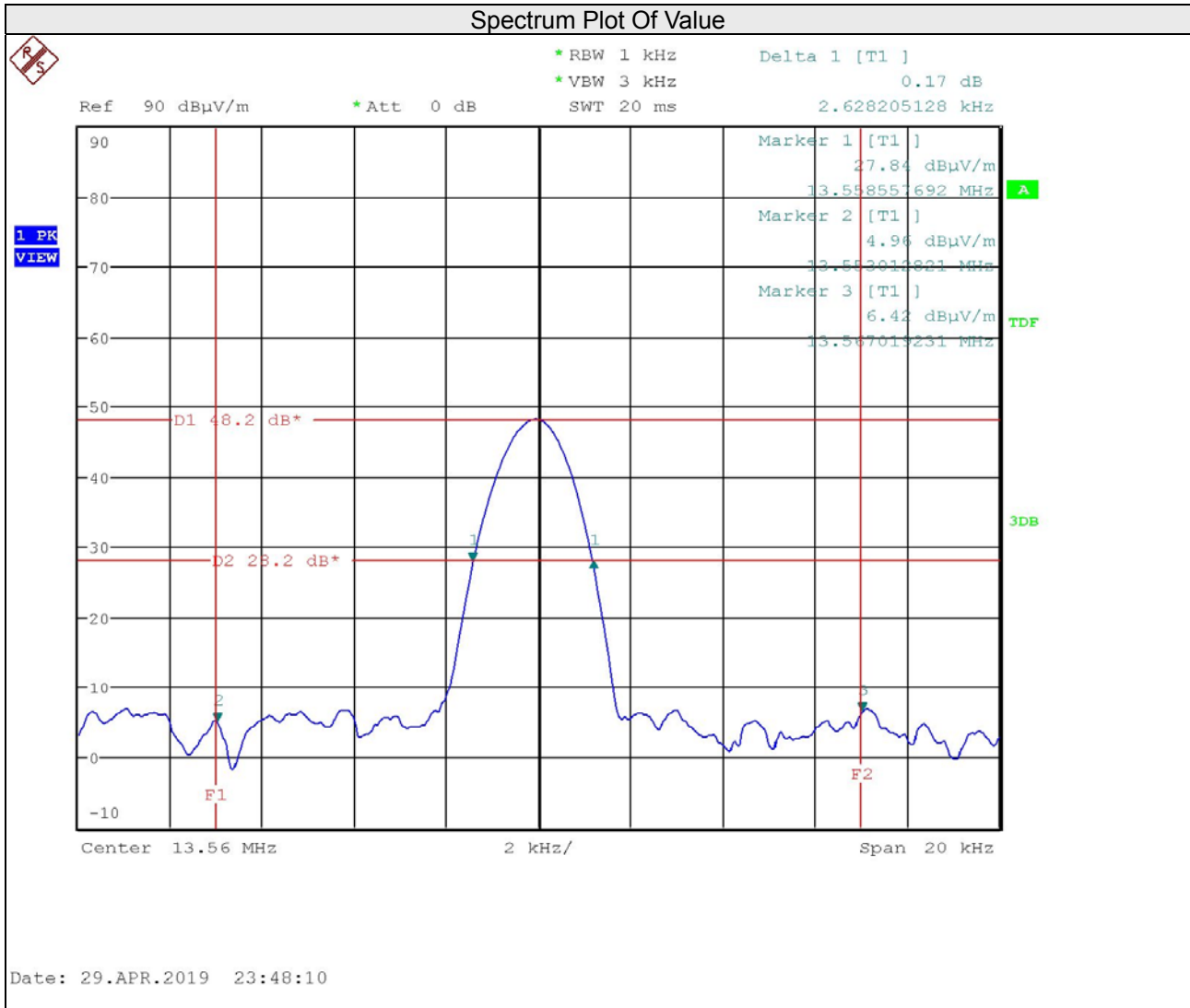
No deviation.

4.4.6 EUT Operating Conditions

Same as Item 4.1.6.

4.4.7 Test Results

20dBc point (Low)	20dBc point (High)	Operating frequency band (MHz)	Pass / Fail
13.558557692	13.561185897	13.553~13.567	Pass



5 Pictures of Test Arrangements

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

Appendix – Information of 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 and approved 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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