

FCC Test Report

Report No.: RF190320C04-5

FCC ID: HV4DTHW1321

Test Model: DTH-W1321

Series Model: DTH-W1321*****, DTHW1321***** (* may be alphanumeric/symbol or blank for marketing purpose) (refer to item 3.1 for more details)

Received Date: Mar. 20, 2019

Test Date: Apr. 22, 2019

Issued Date: Apr. 30, 2019

Applicant: Wacom Co., Ltd.

Address: 2-510-1, Toyonodai, Kazo-Shi, Saitama, 349-1148 Japan

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

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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
RF190320C04-5	Original release	Apr. 30, 2019

1 Certificate of Conformity

Product: Graphics Tablet Computer

Brand: Wacom

Test Model: DTH-W1321

Series Model: DTH-W1321*****, DTHW1321***** (* may be alphanumeric/symbol or blank for marketing purpose) (refer to item 3.1 for more details)

Sample Status: Production Unit

Applicant: Wacom Co., Ltd.

Test Date: Apr. 22, 2019

Standards: 47 CFR FCC Part 15, Subpart C (Section 15.209)
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 : Celine Chou , **Date:** Apr. 30, 2019
Celine Chou / Senior Specialist

Approved by : Bruce Chen , **Date:** Apr. 30, 2019
Bruce Chen / Project Engineer

2 Summary of Test Results

47 CFR FCC Part 15, Subpart C (Section 15.209)

FCC Clause	Test Item	Result	Remarks
15.207	AC Power Conducted Emission	Pass	Meet the requirement of limit. Minimum passing margin is -12.90dB at 0.18128MHz.
15.209	Radiated Emission Test	Pass	Meet the requirement of limit. Minimum passing margin is -11.3dB at 652.072MHz.

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	3.59 dB
	200MHz ~ 1000MHz	3.60 dB

2.2 Modification Record

There were no modifications required for compliance.

3 General Information

3.1 General Description of EUT

Product	Graphics Tablet Computer
Brand	Wacom
Test Model	DTH-W1321
Series Model:	DTH-W1321*****, DTHW1321*****
Power Supply rating	Refer to note
Sample Status	Engineering sample
Working voltage range	20 Vdc (adapter) 0.9-1.8Vdc (battery for touch pen)
Modulation Type	FSK
Operating Frequency	667 kHz
Antenna Type	Loop antenna
Field Strength	56.7dBuV/m
Accessory Device	Refer to Note
Cable Supplied	Refer to Note

Note:

1. The following models are provided to this EUT.

Brand	Model	Description
Wacom	DTH-W1321	Main test
	DTH-W1321*****	* may be alphanumeric/symbol or blank for marketing purpose
	DTHW1321*****	

2. The EUT contains following accessory devices.

Product	Brand	Model	Description
Adapter	WACOM	ADP-100PB B	I/P: 100-240 Vac, 50-60 Hz, 1.5 A O/P: 5 Vdc, 3 A or 20 Vdc, 5 A 1.8m / 1 core
WLAN / BT Module	Intel	9260NGW	--
GPS Module	U-Blox	EVA-8M	--

3. The 667kHz Wireless Digitizer function is transmitting from the Graphics Tablet Computer.

3.2 Description of Test Modes

1 channel is provided to this EUT

Channel	Freq. (kHz)
1	667

3.2.1 Test Mode Applicability and Tested Channel Detail

Eut Configure Mode	Applicable to		Description
	RE<1G	PLC	
-	√	√	-

Where **RE<1G**: Radiated Emission below 1GHz **PLC**: Power Line Conducted Emission

Note: The antenna had been pre-tested on the positioned of each 3 axis. The worst cases were found when positioned on **Z-plane**.

Radiated Emission Test (Below 1GHz):

- ☒ 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
-	1	1

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
-	1	1

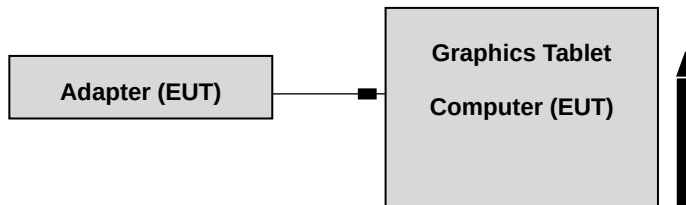
Test Condition:

Applicable To	Environmental Conditions	Input Power (System)	Tested by
RE<1G	23 deg. C, 67% RH	120Vac, 60Hz	Adair Peng
PLC	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 (15.209)

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 and Bandedge Measurement

4.1.1 Limits of Radiated Emission and Bandedge Measurement

For Frequency below 30MHz

Frequency (MHz)	Field Strength (dBuV/m)		Measurement Distance (meters)
	uV/m	dBuV/m	
0.009 – 0.490	2400 / F (kHz)	48.52-13.80	300
0.490 – 1.705	24000 / F (kHz)	33.80-22.97	30
1.705 – 30.0	30	29.54	30

For Frequency between 30-1000MHz

Frequency (MHz)	Class A (at 10m)		Class B (at 3m)	
	uV/m	dBuV/m	uV/m	dBuV/m
30-88	90	39.1	100	40.0
88-216	150	43.5	150	43.5
216-960	210	46.4	200	46.0
Above 960	300	49.5	500	54.0

4.1.2 Test Instruments

Description & Manufacturer	Model No.	Serial No.	Cal. Date	Cal. Due
Test Receiver KEYSIGHT	N9038A	MY55420137	Apr. 15, 2019	Apr. 14, 2020
Spectrum Analyzer ROHDE & SCHWARZ	FSP40	100269	May 29, 2018	May 28, 2019
BILOG Antenna SCHWARZBECK	VULB9168	9168-160	Nov. 21, 2018	Nov. 20, 2019
HORN Antenna SCHWARZBECK	BBHA 9120 D	9120D-1169	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	2944A10638	Aug. 08, 2018	Aug. 07, 2019
Preamplifier Agilent (Above 1GHz)	8449B	3008A02367	Feb. 19, 2019	Feb. 18, 2020
RF signal cable HUBER+SUHNER&EMCI	SUCOFLEX 104 & EMC104-SM-SM80 00	CABLE-CH9-02 (248780+171006)	Jan. 19, 2019	Jan. 18, 2020
RF signal cable HUBER+SUHNER	SUCOFLEX 104	CABLE-CH9-(250795/4)	Aug. 08, 2018	Aug. 07, 2019
RF signal cable Woken	8D-FB	Cable-CH9-01	Jul. 31, 2018	Jul. 30, 2019
Software BV ADT	ADT_Radiated_ V7.6.15.9.5	NA	NA	NA
Antenna Tower EMCO	2070/2080	512.835.4684	NA	NA
Turn Table EMCO	2087-2.03	NA	NA	NA
Antenna Tower & Turn BV ADT	AT100	AT93021705	NA	NA
Turn Table BV ADT	TT100	TT93021705	NA	NA
Turn Table Controller BV ADT	SC100	SC93021705	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 9.

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.
- a. The test-receiver system was set to Quasi-Peak Detect Function and Specified Bandwidth with Maximum Hold Mode, except for the frequency bands 9–90 kHz, 110–490 kHz bands were set to average detector.

Note:

1. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 9kHz at frequency 150k~ 30MHz.
2. The resolution bandwidth and video bandwidth of test receiver analyzer is 200Hz at frequency below 150kHz.

For Radiated emission above 30MHz

- a. The EUT was placed on the top of a rotating table 0.8 meters (for below 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:

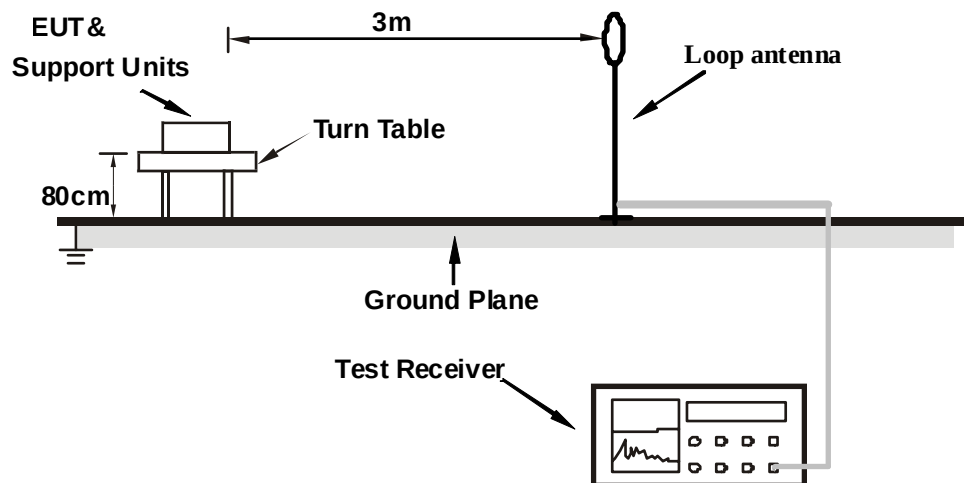
1. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 120kHz for Quasi-peak detection (QP) at frequency below 1GHz.
2. The resolution bandwidth of test receiver/spectrum analyzer is 1 MHz and the video bandwidth is 3 MHz for Peak detection (PK) at frequency above 1GHz.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

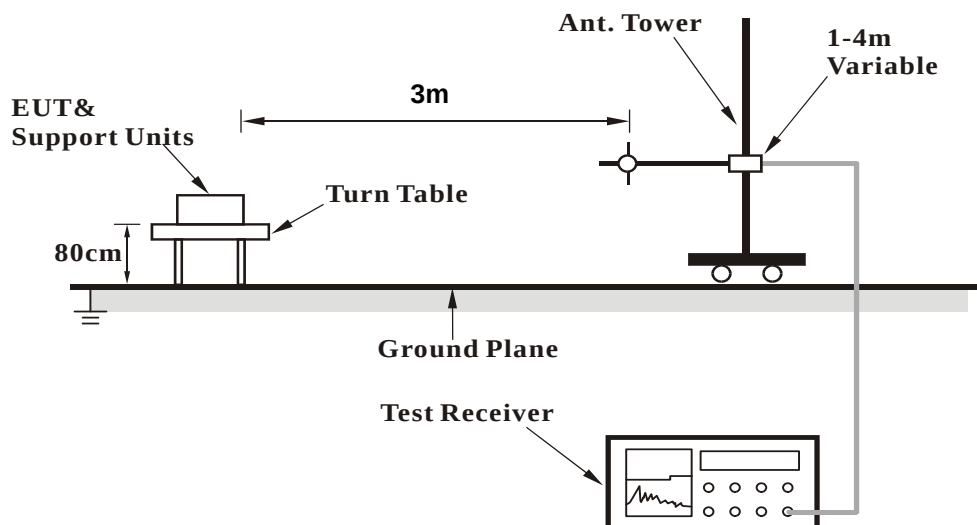
No deviation.

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

- The EUT touched on the screen of computer.

4.1.7 Test Results

Below 30MHz Data:

Channel	TX Channel 1	Detector Function	Quasi-Peak (QP)
Frequency Range	9 kHz ~ 30 MHz		

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	*0.667	56.7 QP	71.1	-14.4	1.00	350	36.5	20.2
2	1.980	42.3 QP	69.5	-27.2	1.00	289	22.5	19.8
3	2.941	38.9 QP	69.5	-30.6	1.00	43	19.4	19.5
4	9.718	36.6 QP	69.5	-32.9	1.00	143	14.9	21.7
5	15.725	36.2 QP	69.5	-33.3	1.00	139	14.4	21.8
6	18.369	37.7 QP	69.5	-31.8	1.00	290	15.9	21.8
7	25.098	37.7 QP	69.5	-31.8	1.00	244	15.7	22.0
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	*0.667	52.8 QP	71.1	-18.3	1.00	45	32.6	20.2
2	1.980	41.3 QP	69.5	-28.2	1.00	4	21.5	19.8
3	3.229	37.5 QP	69.5	-32.0	1.00	177	17.9	19.6
4	8.708	35.8 QP	69.5	-33.7	1.00	4	14.3	21.5
5	15.149	37.3 QP	69.5	-32.2	1.00	96	15.5	21.8
6	19.955	35.0 QP	69.5	-34.5	1.00	14	13.2	21.8
7	25.098	38.4 QP	69.5	-31.1	1.00	191	16.4	22.0
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	*0.667	51.1 QP	71.1	-20.0	1.00	253	30.9	20.2
2	2.941	40.1 QP	69.5	-29.4	1.00	173	20.6	19.5
3	7.555	35.9 QP	69.5	-33.6	1.00	291	14.7	21.2
4	12.217	38.2 QP	69.5	-31.3	1.00	187	16.4	21.8
5	18.417	37.8 QP	69.5	-31.7	1.00	249	16.0	21.8
6	20.532	44.0 QP	69.5	-25.5	1.00	90	22.1	21.9
7	25.098	42.2 QP	69.5	-27.3	1.00	12	20.2	22.0

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. “ * “: Fundamental frequency.
6. Loop antenna was used for all radiated emission below 30MHz.
7. Limit @3m=Limit@300m+40log(300 / 3)=Limit@300m+80
8. Limit @3m=Limit@30m+40log(30 / 3)=Limit@30m+40

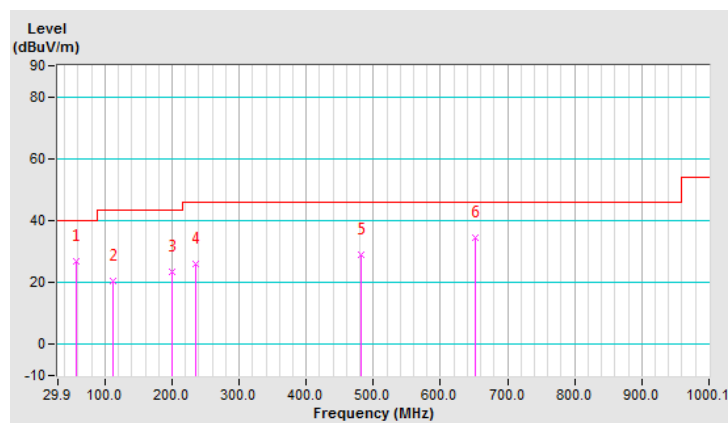
Below 1GHz Data:

Channel	TX Channel 1	Detector Function	Quasi-Peak (QP)
Frequency Range	30MHz ~ 1GHz		

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	57.120	26.7 QP	40.0	-13.3	1.99 H	194	36.8	-10.1
2	111.560	20.6 QP	43.5	-22.9	1.50 H	77	33.0	-12.4
3	200.997	23.6 QP	43.5	-19.9	1.50 H	15	34.7	-11.1
4	235.995	26.1 QP	46.0	-19.9	1.00 H	220	36.0	-9.9
5	480.975	29.0 QP	46.0	-17.0	1.50 H	15	33.0	-4.0
6	652.072	34.7 QP	46.0	-11.3	1.00 H	18	35.2	-0.5

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

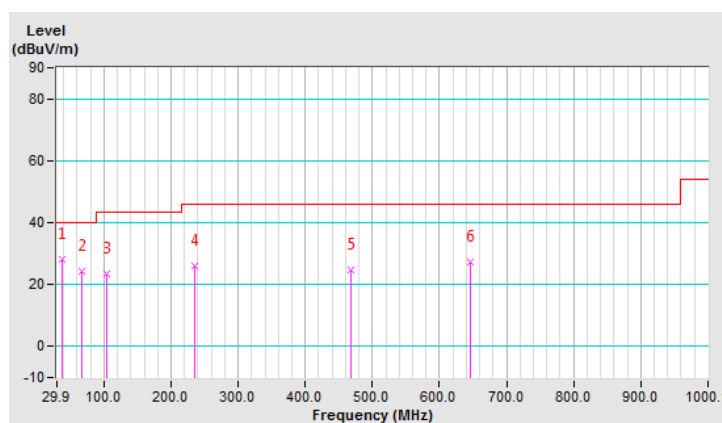


Channel	TX Channel 1	Detector Function	Quasi-Peak (QP)
Frequency Range	30MHz ~ 1GHz		

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	37.677	28.3 QP	40.0	-11.7	1.00 V	153	39.0	-10.7
2	66.841	24.5 QP	40.0	-15.5	2.00 V	0	35.6	-11.1
3	103.783	23.4 QP	43.5	-20.1	2.00 V	153	36.5	-13.1
4	235.995	25.9 QP	46.0	-20.1	2.00 V	276	35.8	-9.9
5	467.365	24.6 QP	46.0	-21.4	2.00 V	50	28.7	-4.1
6	646.239	27.4 QP	46.0	-18.6	1.51 V	75	27.9	-0.5

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	ESCI	100613	Dec. 10, 2018	Dec. 09, 2019
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

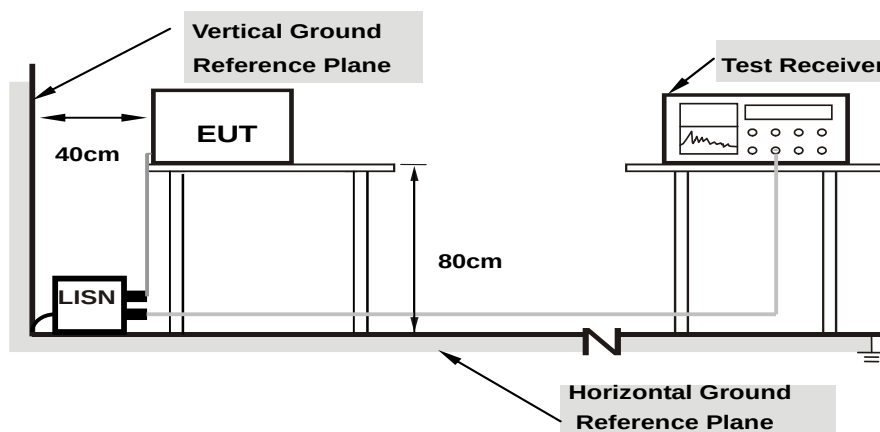
- The EUT was placed 0.4 meters from the conducting wall of the shielded room with EUT being connected to the power mains through a line impedance stabilization network (LISN). Other support units were connected to the power mains through another LISN. The two LISNs provide 50 ohm/ 50uH of coupling impedance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

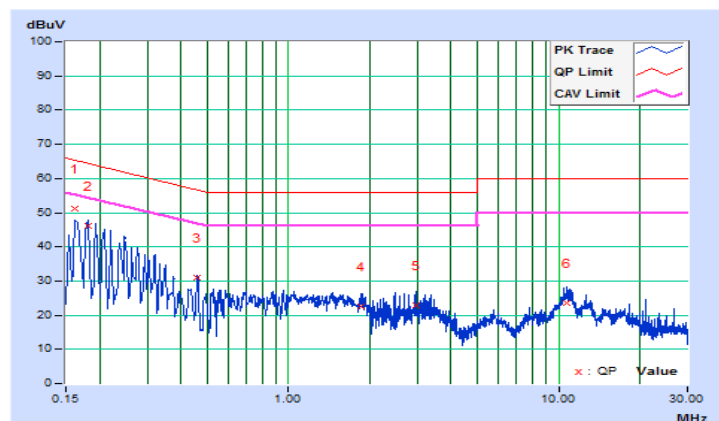
4.2.7 Test Results

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

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	0.16181	9.69	41.49	24.34	51.18	34.03	65.37	55.37	-14.19	-21.34
2	0.18122	9.68	36.32	21.86	46.00	31.54	64.43	54.43	-18.43	-22.89
3	0.45937	9.68	21.14	13.20	30.82	22.88	56.70	46.70	-25.88	-23.82
4	1.84694	9.70	12.79	4.70	22.49	14.40	56.00	46.00	-33.51	-31.60
5	2.95347	9.72	13.27	3.44	22.99	13.16	56.00	46.00	-33.01	-32.84
6	10.74219	9.88	13.84	7.24	23.72	17.12	60.00	50.00	-36.28	-32.88

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.

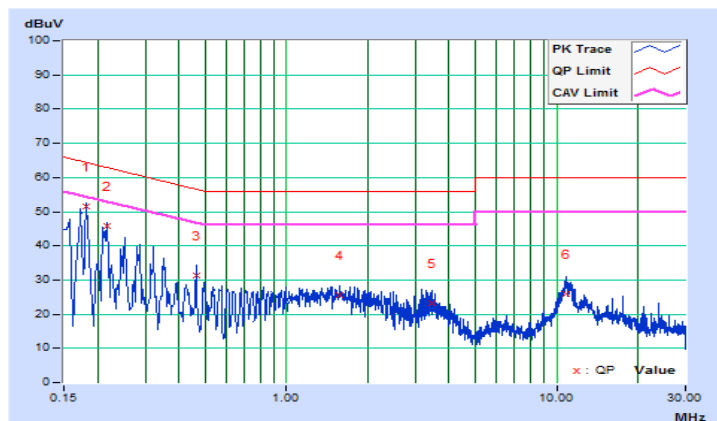


Phase	Neutral (N)	Detector Function	Quasi-Peak (QP) / Average (AV)
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No	Freq. [MHz]	Corr. Factor (dB)	Reading Value [dB (uV)]		Emission Level [dB (uV)]		Limit [dB (uV)]		Margin (dB)	
			Q.P.	AV.	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.
1	0.18128	9.66	41.87	27.62	51.53	37.28	64.43	54.43	-12.90	-17.15
2	0.21647	9.66	36.07	22.88	45.73	32.54	62.95	52.95	-17.22	-20.41
3	0.46280	9.65	21.80	11.50	31.45	21.15	56.64	46.64	-25.19	-25.49
4	1.57715	9.66	16.01	7.07	25.67	16.73	56.00	46.00	-30.33	-29.27
5	3.45395	9.71	13.60	2.36	23.31	12.07	56.00	46.00	-32.69	-33.93
6	10.88295	9.86	16.10	6.50	25.96	16.36	60.00	50.00	-34.04	-33.64

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.



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.

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

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