FCC Test Report

Report No.:	RFBCKS-WTW-P21123558-6
FCC ID:	2AAAS-CP06
Test Model:	CP06
Received Date:	Dec. 28, 2021
Test Date:	Jan. 11 ~ Jan. 19, 2022
Issued Date:	Feb. 14, 2022
Applicant:	Vivint. Inc.
Address:	4931 N. 300 W. Provo, UT 84604 USA
Issued By:	Bureau Veritas Consumer Products Services (H.K.) Ltd., Taoyuan Branch Lin Kou Laboratories
Lab Address:	No. 47-2, 14th Ling, Chia Pau Vil., Lin Kou Dist., New Taipei City, Taiwan
Test Location (1):	No. 19, Hwa Ya 2nd Rd., Wen Hwa Vil., Kwei Shan Dist., Taoyuan City 33383, TAIWAN
FCC Registration / Designation Number:	788550 / TW0003
Test Location (2):	No. 70, Wenming Rd., Guishan Dist., Taoyuan City 333, Taiwan (R.O.C.)
FCC Registration / Designation Number:	281270 / TW0032

Table of Contents

Release Control Record

Issue No.	Description	Date Issued
RFBCKS-WTW-P21123558-6	Original release	Feb. 14, 2022

1 Certificate of Conformity

Product:	Vivint Smart Hub Lite
Brand:	Vivint, Inc.
Test Model:	CP06
Sample Status:	Engineering sample
Applicant:	Vivint. Inc.
Test Date:	Jan. 11 ~ Jan. 19, 2022
Standards:	47 CFR FCC Part 15, Subpart C (Section 15.249) 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:** Feb. 14, 2022

Celine Chou / Senior Specialist

Approved by : Jeremy Lin , **Date:** Feb. 14, 2022

Jeremy Lin / Project Engineer

2 Summary of Test Results

47 CFR FCC Part 15, Subpart C (Section 15.249)			
FCC Clause	Test Item	Result	Remarks
15.207	AC Power Conducted Emission	Pass	Meet the requirement of limit. Minimum passing margin is -16.36dB at 0.43000MHz.
15.215	Channel Bandwidth	Pass	Meet the requirement of limit.
15.209 15.249 15.249 (d)	Radiated Emission Test Band Edge Measurement Limit: 50dB less than the peak value of fundamental frequency or meet radiated emission limit in section 15.209	Pass	Meet the requirement of limit. Minimum passing margin is -1.03dB at 908.42MHz.

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) (±)
Conducted Emissions at mains ports	150kHz ~ 30MHz	2.79 dB
Radiated Emissions up to 1 GHz	9kHz ~ 30MHz	3.00 dB
	30MHz ~ 200MHz	2.91 dB
	200MHz ~1000MHz	2.92 dB
Radiated Emissions above 1 GHz	1GHz ~ 18GHz	1.76 dB
	18GHz ~ 40GHz	1.77 dB

2.2 Modification Record

There were no modifications required for compliance.

3 General Information

3.1 General Description of EUT

Product	Vivint Smart Hub Lite
Brand	Vivint, Inc.
Test Model	CP06
Sample Status	Engineering sample
Power Supply Rating	12Vdc from adapter 4.2Vdc from battery
Modulation Type	FSK
Operating Frequency	908.40MHz, 908.42MHz, 916.00MHz
Transfer Rate	40kbps for 908.40MHz 9.6kbps for 908.42MHz 100kbps for 916.00MHz
Number of Channel	3
Field Strength	92.97dBuV/m (3m)
Antenna Type	Dipole antenna with 0.30dBi gain
Antenna Connector	ipex(MHF)
Accessory Device	Adapter, Battery
Cable Supplied	NA

Note:

1. The EUT consumes power from the following Adapter & Battery.

Adapter 1	
Brand	ZB-Power
Model	ZB-H120020A-88
Input Power	100-240Vac, 50/60Hz, 0.6A
Output Power	12Vdc, 2.0A
Power Line	1.5m power cable without core attached on adapter

Adapter 2	
Brand	Honor
Model	ADS-24FUD-12 12024EPCU
Input Power	100-240Vac, 50/60Hz, 0.6A
Output Power	12Vdc, 2.0A
Power Line	1.51m power cable without core attached on adapter

* After pre-tested, adapter 1 was chosen for final test and presented in the test report.

Battery	
Brand	EVE
Model	HB1021
Rating	4.2Vdc, 22.32Wh

2. The EUT contains certified WWAN module which FCC ID: 2AAAS-CC06.

3. WLAN 2.4GHz & 5GHz technology cannot transmit at same time.
4. Simultaneously transmission condition.

Condition	Technology
1	BLE + WWAN + Z-wave + DECT
2	WLAN 2.4G + BLE + Z-wave + DECT
3	WLAN 5G + BLE + Z-wave + DECT
Note: The emission of the simultaneous operation has been evaluated and no non-compliance was found.	

3.2 Description of Test Modes

3 channels are provided to this EUT:

Channel	Freq. (MHz)
0	908.40
1	908.42
2	916.00

3.2.1 Test Mode Applicability and Tested Channel Detail

EUT Configure Mode	Applicable To				Description
	RE≥1G	RE<1G	PLC	BW	
-	√	√	√	√	-

Where **RE≥1G:** Radiated Emission above 1GHz & Bandedge Measurement **RE<1G:** Radiated Emission below 1GHz
PLC: Power Line Conducted Emission **BW:** Channel Bandwidth

Note:
1. The EUT had been pre-tested on the positioned of each 3 axis. The worst case was found when positioned on **X-plane**.
2. Radiated emission test (below 1GHz) and power line conducted emission test items chosen the worst maximum power.

Radiated Emission Test (Above 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	Operating Frequency	Modulation Type
-	0	908.40MHz	FSK
-	1	908.42MHz	FSK
-	2	916.00MHz	FSK

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	Operating Frequency	Modulation Type
-	1	908.42MHz	FSK

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	Operating Frequency	Modulation Type
-	1	908.42MHz	FSK

Channel Bandwidth 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	Operating Frequency	Modulation Type
-	0	908.40MHz	FSK
-	1	908.42MHz	FSK
-	2	916.00MHz	FSK

Test Condition:

Applicable To	Environmental Conditions	Input Power	Tested By
RE≥1G	23 deg. C, 66% RH	120Vac, 60Hz	Randy Wu
RE<1G	22 deg. C, 65% RH	120Vac, 60Hz	Wade Huang
PLC	25 deg. C, 75% RH	120Vac, 60Hz	Randy Wu
BW	25 deg. C, 60% RH	120Vac, 60Hz	Ivan Tseng

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.

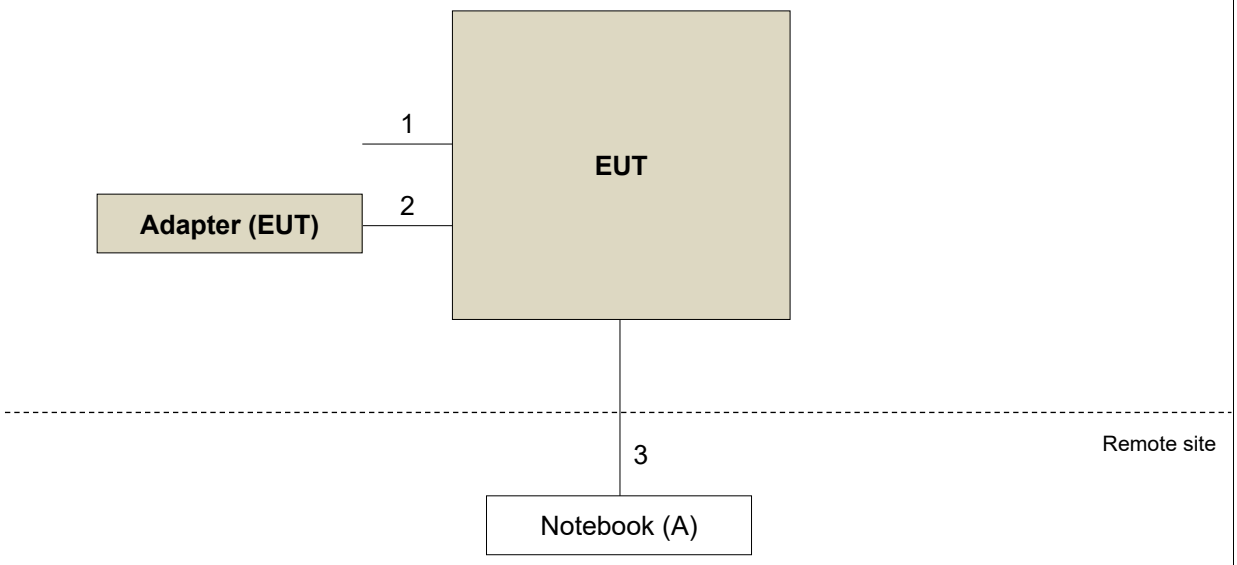
ID	Product	Brand	Model No.	Serial No.	FCC ID	Remarks
A.	Notebook	DELL	E5420	76WNBT1	FCC DoC Approved	-

Note:

1. All power cords of the above support units are non-shielded (1.8m).
2. Item A acted as a communication partner to transfer data.

ID	Cable Descriptions	Qty.	Length (m)	Shielding (Yes/No)	Cores (Qty.)	Remarks
1.	Micro USB Cable	1	1.0	Y	0	-
2.	Power Cable	1	1.5	N	0	Attached on adapter
3.	LAN Cable	1	10	N	0	RJ45, Cat5e

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 (15.249)

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

The field strength of emissions from intentional radiators operated within these frequency bands shall comply with the following:

Fundamental Frequency	Field Strength of Fundamental (millivolts/meter)	Field Strength of Harmonics (microvolts/meter)
902 ~ 928 MHz	50	500
2400 ~ 2483.5 MHz	50	500
5725 ~ 5875 MHz	50	500
24 ~ 24.25 GHz	250	2500

Emissions radiated outside of the specified frequency bands, except for harmonics, shall be attenuated by at least 50 dB below the level of the fundamental or to the general radiated emission limits as below table, whichever is the lesser attenuation

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 KEYSIGHT	N9038B	MY60180018	Feb. 01, 2021	Jan. 31, 2022
Spectrum Analyzer KEYSIGHT	N9020B	MY60110462	Dec. 21, 2021	Dec. 20, 2022
BILOG Antenna SCHWARZBECK	VULB9168	9168-995	Oct. 28, 2021	Oct. 27, 2022
HORN Antenna RF SPIN	DRH18-E	210104A18E	Nov. 14, 2021	Nov. 13, 2022
HORN Antenna SCHWARZBECK	BBHA 9170	9170-995	Nov. 14, 2021	Nov. 13, 2022
Loop Antenna TESEQ	HLA 6121	45745	Jul. 21, 2021	Jul. 20, 2022
Preamplifier EMCI	EMC330N	980783	Jan. 19, 2021	Jan. 18, 2022
			Jan. 17, 2022	Jan. 16, 2023
Preamplifier EMCI	EMC118A45SE	980810	Dec. 30, 2021	Dec. 29, 2022
Preamplifier EMCI	EMC184045SE	980787	Jan. 18, 2021	Jan. 17, 2022
			Jan. 17, 2022	Jan. 16, 2023
RF signal cable EMCI	EMC104-SM-SM-(9000+3000+2000+1000) EMCCFD400-NM-NM-(9000+3000+500+500)	201230+201242+201238+210101 201252+201250+201247+201245	Jan. 18, 2021	Jan. 17, 2022
			Jan. 17, 2022	Jan. 16, 2023
RF signal cable EMCI	EMC104-SM-SM-(9000+3000+2000+1000)	201230+201242+201238+210101	Jan. 18, 2021	Jan. 17, 2022
			Jan. 17, 2022	Jan. 16, 2023
RF signal cable EMCI	EMC101G-KM-KM-(5000+3000+2000)	201259+201256+201253	Jan. 18, 2021	Jan. 17, 2022
			Jan. 17, 2022	Jan. 16, 2023
Software BV CPS	ADT_Radiated_V7.6.15.9.5	NA	NA	NA
Turn Table Max-Full	MFT-151SS-0.5T	NA	NA	NA
Turn Table Controller Max-Full	MF-7802BS	MF780208675	NA	NA
Antenna Tower KaiTuo	NA	NA	NA	NA
Antenna Tower Controller KaiTuo	KT-2000	NA	NA	NA
Peak Power Analyzer KEYSIGHT	8990B	MY51000538	May 12, 2021	May 11, 2022
Wideband Power Sensor KEYSIGHT	N1923A	MY58190002	May 05, 2021	May 04, 2022

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 WM Chamber 7.

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:

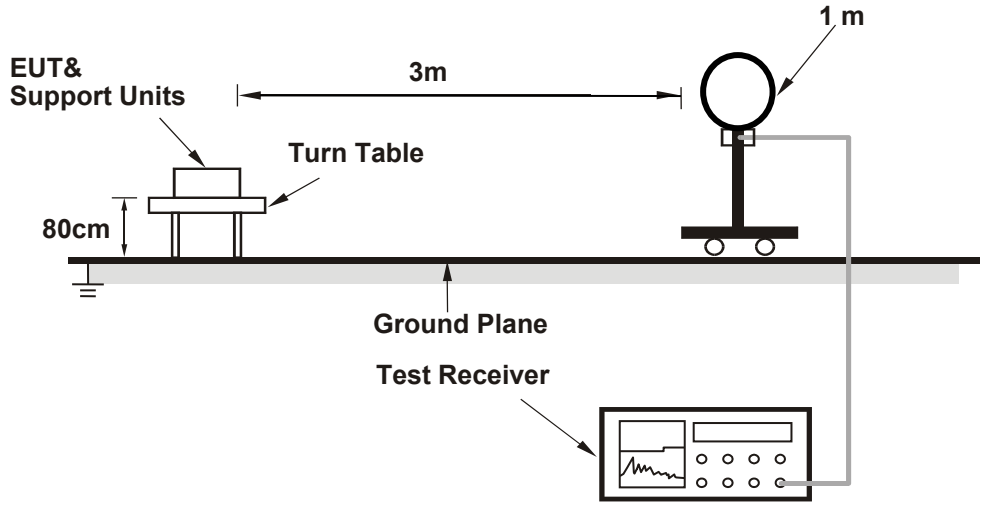
1. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 120kHz for Quasi-peak detection (QP) at frequency below 1GHz.
2. The resolution bandwidth of test receiver/spectrum analyzer is 1 MHz and the video bandwidth is 3 MHz for Peak detection (PK) at frequency above 1GHz.
3. The resolution bandwidth of test receiver/spectrum analyzer is 1 MHz and the video bandwidth is ≥ 1/T (Duty cycle < 98%) or 10 Hz (Duty cycle ≥ 98%) for Peak detection 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

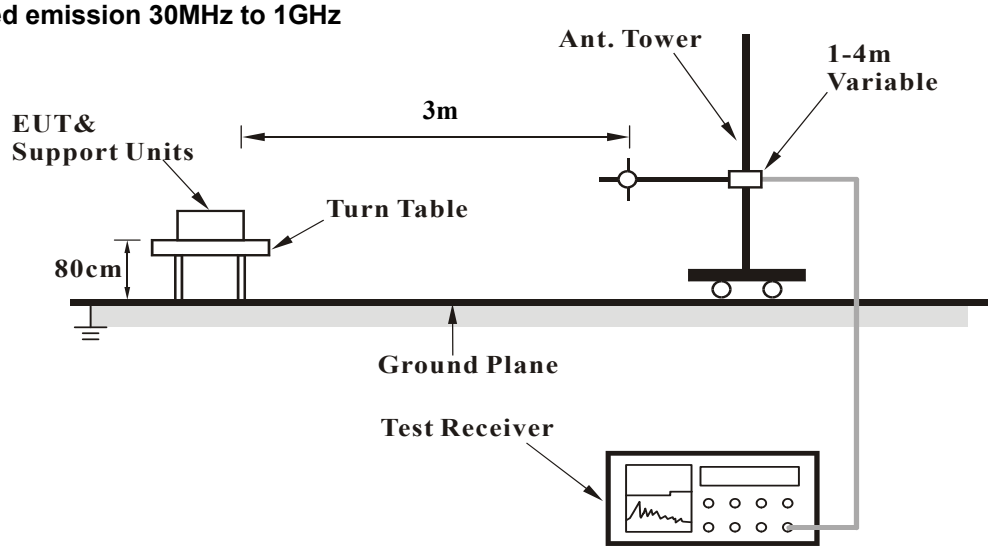
No deviation.

4.1.5 Test Set Up

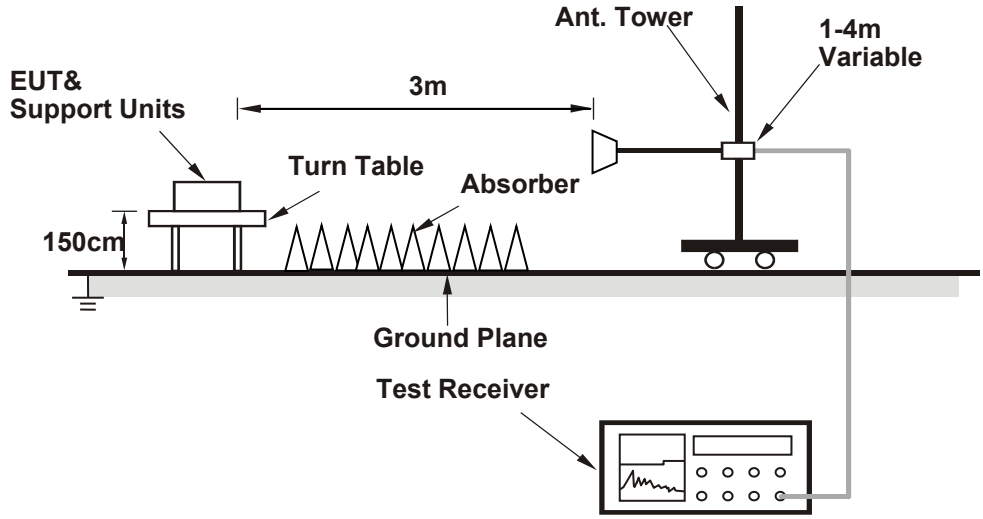
For Radiated emission below 30MHz



For Radiated emission 30MHz to 1GHz



For Radiated emission above 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. Prepared a notebook to act as a communication partner and placed it outside of testing area.
c. The communication partner connected with EUT via a RJ45 cable and ran a test program (provided by manufacturer) to enable EUT under transmission condition continuously at specific channel frequency.
d. The communication partner sent data to EUT by command.

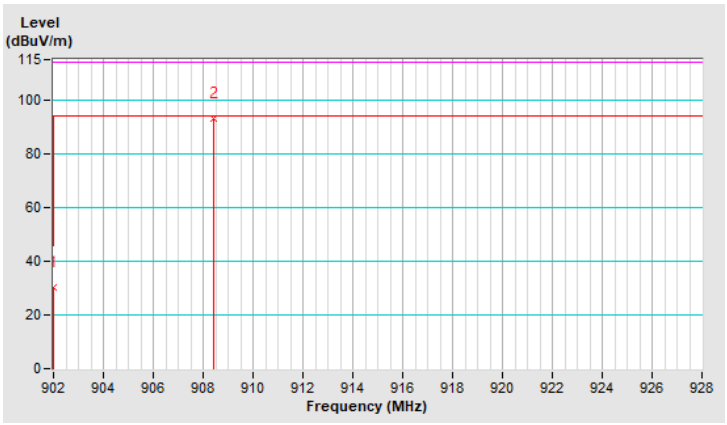
4.1.7 Test Results

RF Mode	TX Z-wave	Channel	CH 0：908.40 MHz
Frequency Range	902MHz ~ 928MHz	Detector Function	Quasi-Peak (QP)

Antenna Polarity & Test Distance : Horizontal at 3 m								
No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	902.00	30.11 QP	46.00	-15.89	1.56 H	349	5.50	24.61
2	*908.40	92.94 QP	94.00	-1.06	1.56 H	349	68.07	24.87

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. Margin value = Emission Level – Limit value.
4. The other emission levels were very low against the limit.
5. " * ": Fundamental frequency.

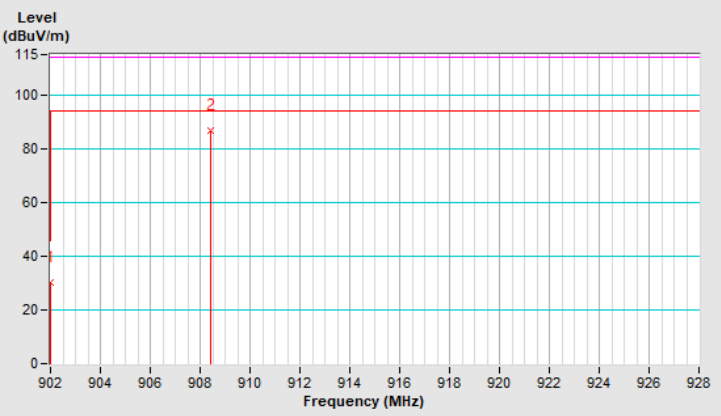


RF Mode	TX Z-wave	Channel	CH 0：908.40 MHz
Frequency Range	902MHz ~ 928MHz	Detector Function	Quasi-Peak (QP)

Antenna Polarity & Test Distance : Vertical at 3 m								
No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	902.00	30.08 QP	46.00	-15.92	1.00 V	183	5.47	24.61
2	*908.40	86.89 QP	94.00	-7.11	1.00 V	183	62.02	24.87

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. Margin value = Emission Level – Limit value.
4. The other emission levels were very low against the limit.
5. " * ": Fundamental frequency.

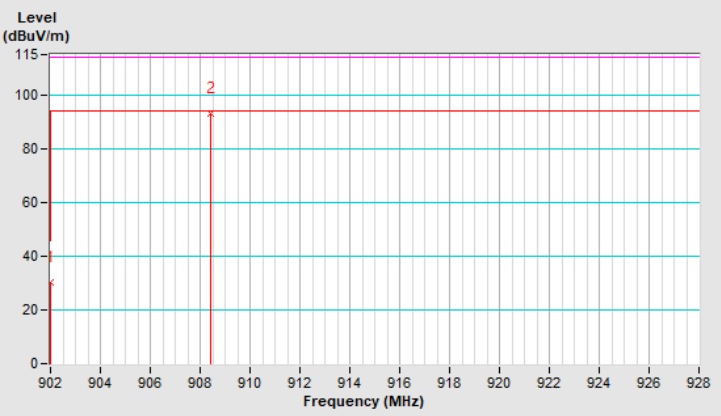


RF Mode	TX Z-wave	Channel	CH 1：908.42 MHz
Frequency Range	902MHz ~ 928MHz	Detector Function	Quasi-Peak (QP)

Antenna Polarity & Test Distance : Horizontal at 3 m								
No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	902.00	30.09 QP	46.00	-15.91	1.53 H	354	5.48	24.61
2	***908.42**	**92.97 QP**	**94.00**	**-1.03**	**1.53 H**	**354**	**68.10**	**24.87**

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. Margin value = Emission Level – Limit value.
4. The other emission levels were very low against the limit.
5. " * ": Fundamental frequency.

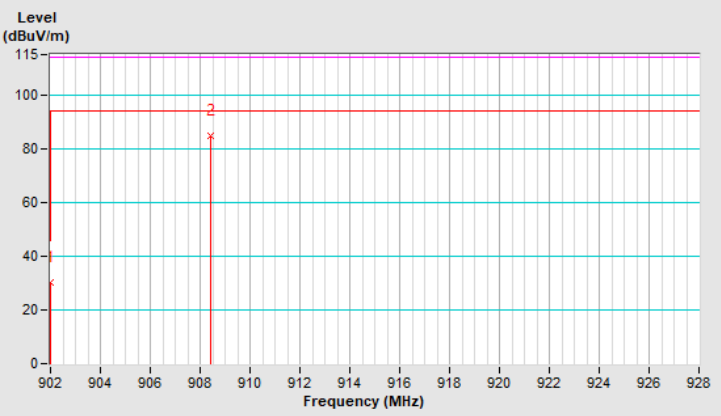


RF Mode	TX Z-wave	Channel	CH 1：908.42 MHz
Frequency Range	902MHz ~ 928MHz	Detector Function	Quasi-Peak (QP)

Antenna Polarity & Test Distance : Vertical at 3 m								
No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	902.00	30.00 QP	46.00	-16.00	1.04 V	184	5.39	24.61
2	*908.42	84.64 QP	94.00	-9.36	1.04 V	184	59.77	24.87

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. Margin value = Emission Level – Limit value.
4. The other emission levels were very low against the limit.
5. " * ": Fundamental frequency.

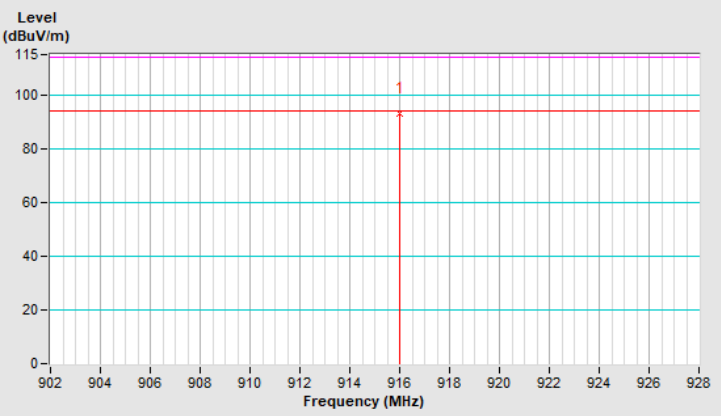


RF Mode	TX Z-wave	Channel	CH 2：916.00 MHz
Frequency Range	902MHz ~ 928MHz	Detector Function	Quasi-Peak (QP)

Antenna Polarity & Test Distance : Horizontal at 3 m								
No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	*916.00	92.95 QP	94.00	-1.05	1.60 H	353	67.97	24.98

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. Margin value = Emission Level – Limit value.
4. The other emission levels were very low against the limit.
5. " * ": Fundamental frequency.

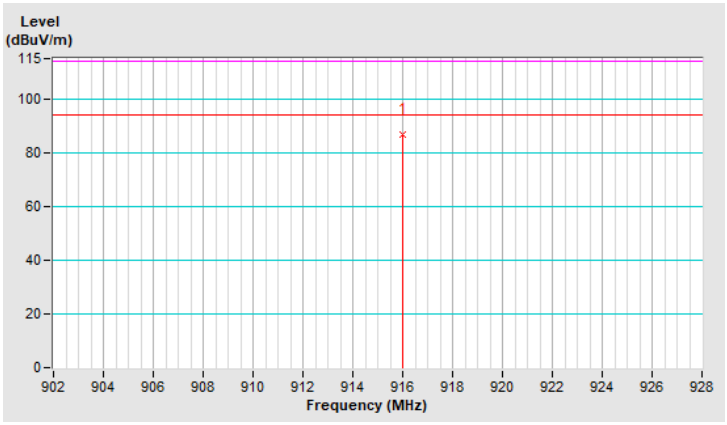


RF Mode	TX Z-wave	Channel	CH 2：916.00 MHz
Frequency Range	902MHz ~ 928MHz	Detector Function	Quasi-Peak (QP)

Antenna Polarity & Test Distance : Vertical at 3 m								
No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	*916.00	86.59 QP	94.00	-7.41	1.00 V	188	61.61	24.98

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. Margin value = Emission Level – Limit value.
4. The other emission levels were very low against the limit.
5. " * ": Fundamental frequency.



Above 1GHz Data

RF Mode	TX Z-wave	Channel	CH 0：908.40 MHz
Frequency Range	1GHz ~ 10GHz	Detector Function	Peak (PK) Average (AV)

Antenna Polarity & Test Distance : Horizontal at 3 m								
No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	1816.80	37.98 PK	74.00	-36.02	1.56 H	197	44.65	-6.67
2	1816.80	24.97 AV	54.00	-29.03	1.56 H	197	31.64	-6.67
3	2725.20	42.32 PK	74.00	-31.68	2.10 H	254	45.86	-3.54
4	2725.20	28.97 AV	54.00	-25.03	2.10 H	254	32.51	-3.54
Antenna Polarity & Test Distance : Vertical at 3 m								
No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	1816.80	37.17 PK	74.00	-36.83	1.74 V	103	43.84	-6.67
2	1816.80	24.83 AV	54.00	-29.17	1.74 V	103	31.50	-6.67
3	2725.20	41.91 PK	74.00	-32.09	1.47 V	168	45.45	-3.54
4	2725.20	28.92 AV	54.00	-25.08	1.47 V	168	32.46	-3.54

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

RF Mode	TX Z-wave	Channel	CH 1：908.42 MHz
Frequency Range	1GHz ~ 10GHz	Detector Function	Peak (PK) Average (AV)

Antenna Polarity & Test Distance : Horizontal at 3 m								
No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	1816.84	36.48 PK	74.00	-37.52	2.61 H	97	43.15	-6.67
2	1816.84	24.17 AV	54.00	-29.83	2.61 H	97	30.84	-6.67
3	2725.26	42.25 PK	74.00	-31.75	2.31 H	64	45.79	-3.54
4	2725.26	29.00 AV	54.00	-25.00	2.31 H	64	32.54	-3.54
Antenna Polarity & Test Distance : Vertical at 3 m								
No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	1816.84	37.24 PK	74.00	-36.76	1.94 V	111	43.91	-6.67
2	1816.84	24.17 AV	54.00	-29.83	1.94 V	111	30.84	-6.67
3	2725.26	41.67 PK	74.00	-32.33	1.96 V	25	45.21	-3.54
4	2725.26	29.13 AV	54.00	-24.87	1.96 V	25	32.67	-3.54

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

RF Mode	TX Z-wave	Channel	CH 2：916.00 MHz
Frequency Range	1GHz ~ 10GHz	Detector Function	Peak (PK) Average (AV)

Antenna Polarity & Test Distance : Horizontal at 3 m								
No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	1832.00	36.49 PK	74.00	-37.51	1.47 H	301	43.12	-6.63
2	1832.00	23.81 AV	54.00	-30.19	1.47 H	301	30.44	-6.63
3	2748.00	42.12 PK	74.00	-31.88	2.64 H	100	45.67	-3.55
4	2748.00	29.24 AV	54.00	-24.76	2.64 H	100	32.79	-3.55
Antenna Polarity & Test Distance : Vertical at 3 m								
No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	1832.00	37.31 PK	74.00	-36.69	2.55 V	191	43.94	-6.63
2	1832.00	25.01 AV	54.00	-28.99	2.55 V	191	31.64	-6.63
3	2748.00	42.46 PK	74.00	-31.54	1.80 V	332	46.01	-3.55
4	2748.00	29.61 AV	54.00	-24.39	1.80 V	332	33.16	-3.55

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

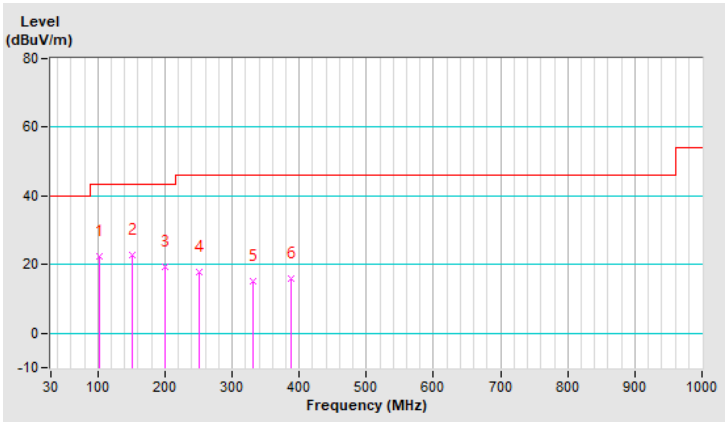
Below 1GHz worst-case data

RF Mode	TX Z-wave	Channel	CH 1：908.42 MHz
Frequency Range	30MHz ~ 1GHz	Detector Function	Quasi-Peak (QP)

Antenna Polarity & Test Distance : Horizontal at 3 m								
No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	101.78	22.43 QP	43.50	-21.07	1.99 H	266	44.94	-22.51
2	150.28	22.96 QP	43.50	-20.54	1.49 H	274	41.09	-18.13
3	199.75	19.28 QP	43.50	-24.22	1.01 H	101	41.20	-21.92
4	250.19	17.70 QP	46.00	-28.30	1.01 H	145	37.39	-19.69
5	331.67	15.36 QP	46.00	-30.64	1.01 H	286	32.42	-17.06
6	387.93	15.94 QP	46.00	-30.06	1.99 H	286	31.69	-15.75

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. Margin value = Emission Level – Limit value.
4. The other emission levels were very low against the limit of frequency range 30MHz~1000MHz.
5. The emission levels were very low against the limit of frequency range 9kHz~30MHz: the amplitude of spurious emissions attenuated more than 20 dB below the permissible value to be report.

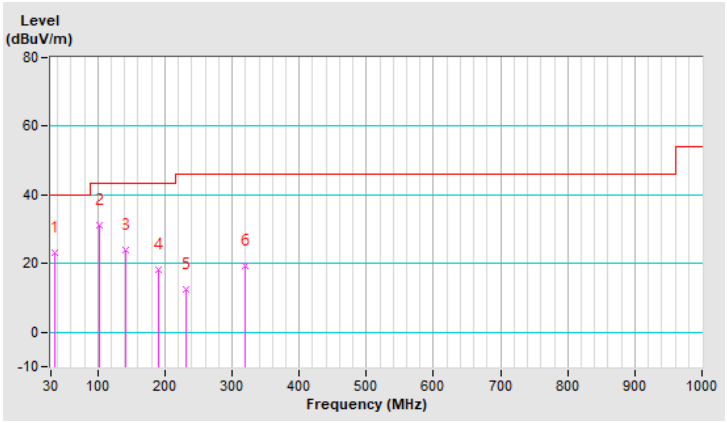


RF Mode	TX Z-wave	Channel	CH 1：908.42 MHz
Frequency Range	30MHz ~ 1GHz	Detector Function	Quasi-Peak (QP)

Antenna Polarity & Test Distance : Vertical at 3 m								
No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	35.82	23.21 QP	40.00	-16.79	2.00 V	1	42.42	-19.21
2	101.78	31.31 QP	43.50	-12.19	1.01 V	224	53.82	-22.51
3	141.55	23.95 QP	43.50	-19.55	1.01 V	220	42.45	-18.50
4	191.02	18.28 QP	43.50	-25.22	1.50 V	226	39.31	-21.03
5	230.79	12.67 QP	46.00	-33.33	1.50 V	351	33.53	-20.86
6	320.03	19.21 QP	46.00	-26.79	1.01 V	2	36.64	-17.43

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. Margin value = Emission Level – Limit value.
4. The other emission levels were very low against the limit of frequency range 30MHz~1000MHz.
5. The emission levels were very low against the limit of frequency range 9kHz~30MHz: the amplitude of spurious emissions attenuated more than 20 dB below the permissible value to be report.



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	ESR3	102783	Dec. 20, 2021	Dec. 19, 2022
RF signal cable (with 10dB PAD) Woken	5D-FB	Cable-cond2-01	Sep. 04, 2021	Sep. 03, 2022
LISN ROHDE & SCHWARZ (EUT)	ESH2-Z5	100100	Jan. 28, 2021	Jan. 27, 2022
LISN ROHDE & SCHWARZ (Peripheral)	ESH3-Z5	100312	Sep. 17, 2021	Sep. 16, 2022
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 2 (Conduction 2).
3. The VCCI Site Registration No. is C-12047.

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.

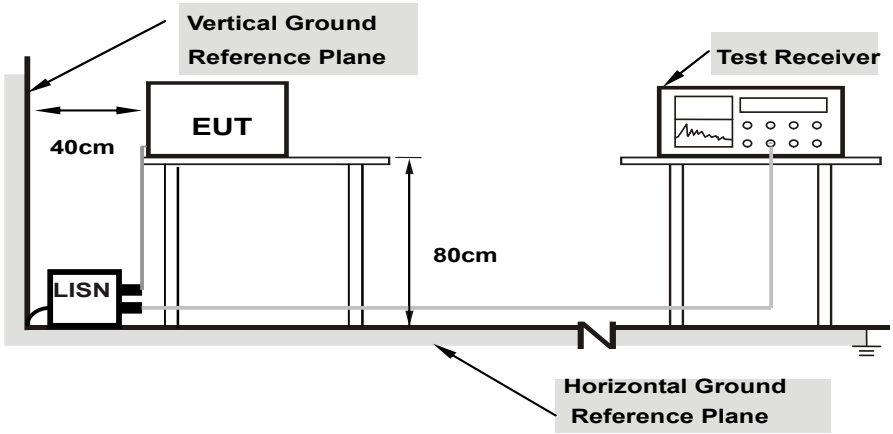
c. The frequency range from 150kHz to 30MHz was searched. Emission levels under (Limit - 20dB) was not recorded.

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.

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.

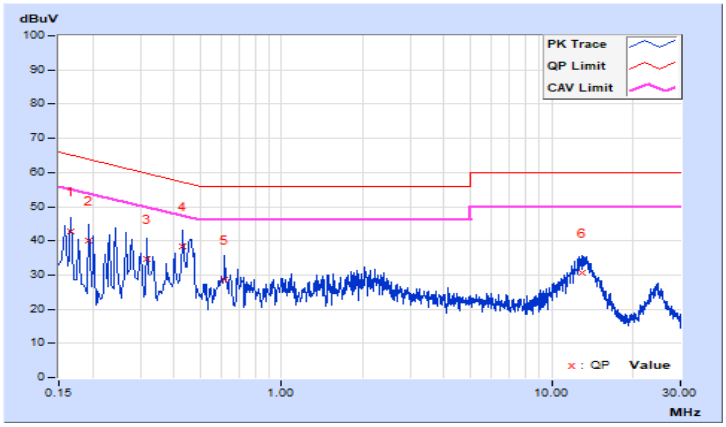
4.2.7 Test Results

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

No	Freq.	Corr. Factor	Reading Value		Emission Level		Limit		Margin	
			[dB (uV)]		[dB (uV)]		[dB (uV)]		(dB)	
	[MHz]	(dB)	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.
1	0.16535	10.13	32.47	16.55	42.60	26.68	65.19	55.19	-22.59	-28.51
2	0.19400	10.15	29.90	12.60	40.05	22.75	63.86	53.86	-23.81	-31.11
3	0.31800	10.19	24.34	11.56	34.53	21.75	59.76	49.76	-25.23	-28.01
4	0.43000	10.22	28.21	19.83	38.43	30.05	57.25	47.25	-18.82	-17.20
5	0.61400	10.24	18.49	11.32	28.73	21.56	56.00	46.00	-27.27	-24.44
6	13.04200	10.55	20.23	12.86	30.78	23.41	60.00	50.00	-29.22	-26.59

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.

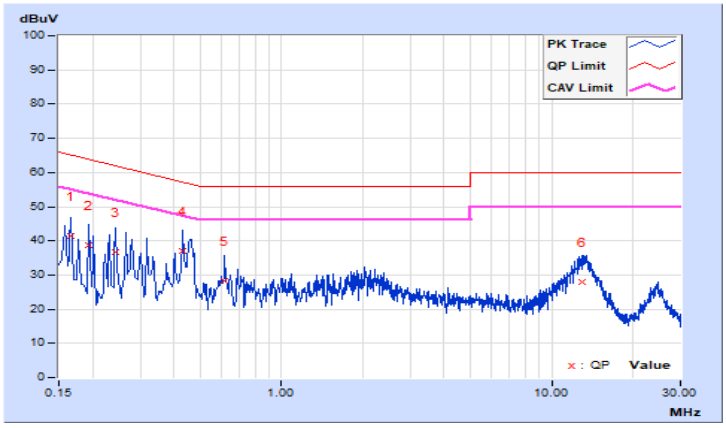


Phase	Neutral (N)	Detector Function	Quasi-Peak (QP) / Average (AV)

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	0.16600	10.15	31.36	18.47	41.51	28.62	65.16	55.16	-23.65	-26.54
2	0.19400	10.17	28.46	16.73	38.63	26.90	63.86	53.86	-25.23	-26.96
3	0.24200	10.18	26.36	17.24	36.54	27.42	62.03	52.03	-25.49	-24.61
4	**0.43000**	**10.24**	**26.77**	**20.65**	**37.01**	**30.89**	**57.25**	**47.25**	**-20.24**	**-16.36**
5	0.61400	10.26	18.04	11.79	28.30	22.05	56.00	46.00	-27.70	-23.95
6	13.04200	10.66	17.36	11.59	28.02	22.25	60.00	50.00	-31.98	-27.75

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.

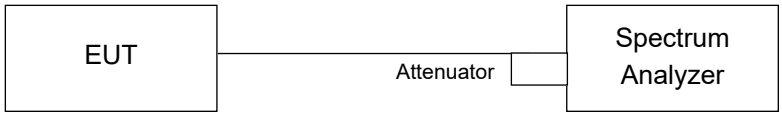


4.3 Channel Bandwidth

4.3.1 Limits of Channel Bandwidth Measurement

The channel bandwidth within the frequency band designated in the rule section under which the equipment is operated.

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. Check the calibration of the measuring instrument using either an internal calibrator or a known signal from an external generator.
b. Turn on the EUT and connect it to measurement instrument. Then set it to any one convenient frequency within its operating range. Set a reference level on the measuring instrument equal to the highest peak value.
c. Measure the frequency difference of two frequencies that were attenuated 20dB from the reference level. Record the frequency difference as the emission bandwidth.
d. Repeat above procedures until all frequencies measured were complete.

4.3.5 Deviation from Test Standard

No deviation.

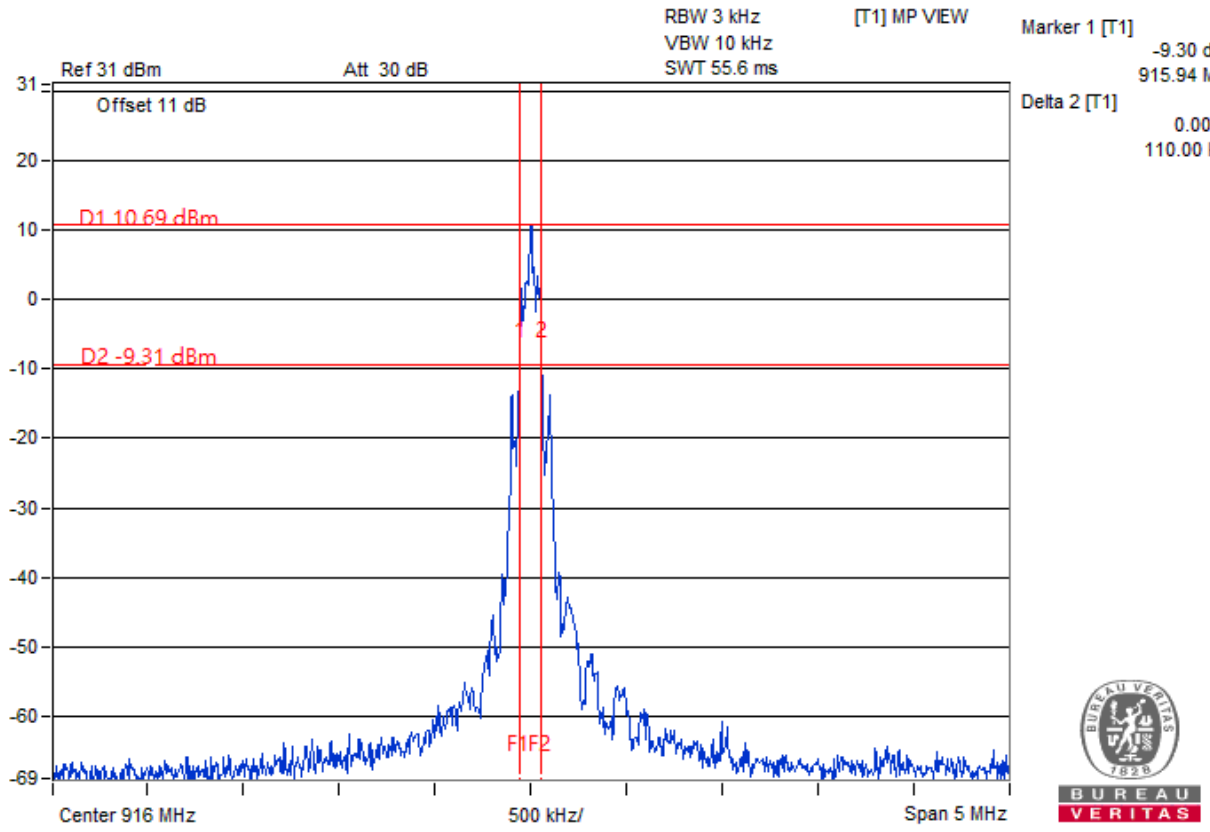
4.3.6 EUT Operating Condition

The software provided by client enabled the EUT to transmit and receive data at lowest, middle and highest channel frequencies individually.

4.3.7 Test Results

Channel	Frequency (MHz)	20dB Bandwidth (MHz)
0	908.40	0.090
1	908.42	0.100
2	916.00	0.110

Spectrum Plot of Worst 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 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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