

FCC Test Report

Report No.: RFBEOP-WTW-P22030407B-3

FCC ID: NKR-LS041

Test Model: S501R0-01

Received Date: 2024/8/29

Test Date: 2024/11/8 ~ 2024/11/12

Issued Date: 2024/12/9

Applicant: Wistron NeWeb Corporation

Address: 20 Park Avenue II, Hsinchu Science Park, Hsinchu 308, Taiwan, R.O.C.

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 / 788550 / TW0003
Designation Number:

Test Location (2): No. 70, Wenming Rd., Guishan Dist., Taoyuan City 333, Taiwan (R.O.C.)

FCC Registration / 281270 / TW0032
Designation Number:



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Release Control Record

Issue No.	Description	Date Issued
RFBEOP-WTW-P22030407B-3	Original release	2024/12/9

1 Certificate of Conformity

Product: home security gateway

Brand: ADT

Test Model: S501R0-01

Sample Status: Engineering sample

Applicant: Wistron NeWeb Corporation

Test Date: 2024/11/8 ~ 2024/11/12

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:** 2024/12/9
Celine Chou / Senior Specialist

Approved by : Jeremy Lin , **Date:** 2024/12/9
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 -12.75 dB at 0.41800 MHz.
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 -1.2 dB at 916.00 MHz.

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) (±)
26 dB Bandwidth	-	206.5 Hz
Conducted Emissions at mains ports	150kHz ~ 30MHz	2.90 dB
Radiated Emissions up to 1 GHz	9kHz ~ 30MHz	3.00 dB
	30MHz ~ 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	home security gateway
Brand	ADT
Test Model	S501R0-01
Sample Status	Engineering sample
Power Supply Rating	12 Vdc from adapter 3.65 Vdc from battery
Modulation Type	FSK
Operating Frequency	908.40 MHz, 908.42 MHz, 916.00 MHz
Transfer Rate	40 kbps for 908.40 MHz 9.6 kbps for 908.42 MHz 100 kbps for 916.00 MHz
Number of Channel	3
Field Strength	92.8 dBuV/m (3m)
Antenna Type	Refer to note
Antenna Connector	Refer to note
Accessory Device	Refer to note
Cable Supplied	Refer to note

Note:

1. The EUT uses following accessories.

Item	Brand	Model	Specification
Battery	TENEGRY	34262	Power Rating : Output: 3.65 Vdc, 2400 mAh
AC Adapter 1	ADT	1A101-1215-01	AC Input : 100-120 Vac, 500 mA, 50-60 Hz DC Output : 12 Vdc, 1.5 A DC Output Cable : 1.5 m cable without core attached on adapter
AC Adapter 2	ADT	ML18-S120150-A1	AC Input : 100-120 Vac, 500 mA, 50-60 Hz DC Output : 12 Vdc, 1.5 A DC Output Cable : 1.5 m cable without core attached on adapter

* Adapter 1 was chosen for final test and presented in the test report.

2. The EUT contains certified LTE module (Brand: Telit, Model: LE910C1-WW XD, FCC ID: R17LE910CXWWX).

3. Simultaneously transmission condition.

Condition	Technology
1	WLAN 2.4G + BLE + Z-wave + DECT + WWAN
2	WLAN 5G + BLE + Z-wave + DECT + WWAN

Note: The emission of the simultaneous operation has been evaluated and no non-compliance was found.

4. The antenna information is listed as below.

Antenna No.	Brand	Model	Antenna Gain (dBi)	Frequency Range	Antenna Type	Connector Type
Z-wave	WNC	LS04	3.04	908~916MHz	Dipole	ipex(MHF)

* Due to radiated measurements are made and the antenna gain is already accounted for this device, so provide an antenna datasheet and/or antenna measurement report is not required. The antenna dimensions and pictures (include antenna wire length if have) are stated in EUT photo exhibit.

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 \geq 1G	RE<1G	PLC	BW	
-	√	√	√	√	-

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

Note:

1. Radiated emission (below 1GHz) and power line conducted emission test items chosen the worst maximum power.
2. The EUT is designed to be positioned on the X-Plane only.

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	908.40 MHz	FSK
-	1	908.42 MHz	FSK
-	2	916.00 MHz	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
-	2	916.00 MHz	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
-	2	916.00 MHz	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.

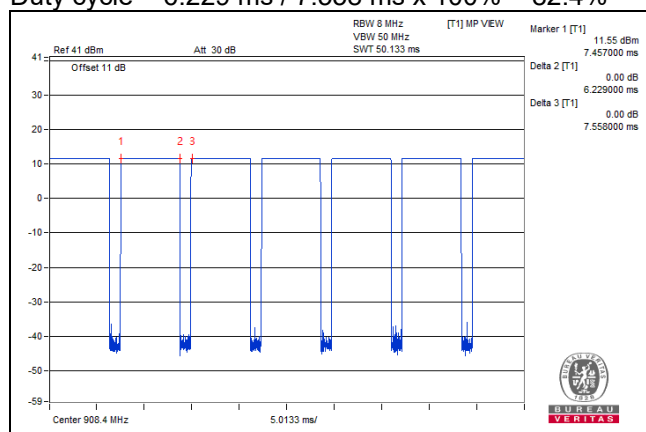
EUT Configure Mode	Available Channel	Operating Frequency	Modulation Type
-	0	908.40 MHz	FSK
-	1	908.42 MHz	FSK
-	2	916.00 MHz	FSK

Test Condition:

Applicable To	Environmental Conditions	Input Power	Tested By
RE \geq 1G	22 deg. C, 67% RH	120Vac, 60Hz	Charles Hsiao
RE $<$ 1G	22 deg. C, 67% RH 25 deg. C, 65% RH	120Vac, 60Hz	Charles Hsiao
PLC	25 deg. C, 75% RH	120Vac, 60Hz	Charles Hsiao
BW	25 deg. C, 60% RH	120Vac, 60Hz	Kevin Ko

3.3 Duty Cycle of Test Signal

Duty cycle = 6.229 ms / 7.558 ms x 100% = 82.4%

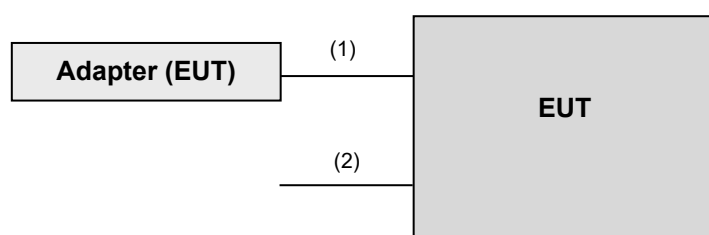


3.4 Description of Support Units

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	Cable Descriptions	Qty.	Length (m)	Shielding (Yes/No)	Cores (Qty.)	Remarks
1	DC Power Cable	1	1.5	No	0	Accessory of EUT
2	USB type C cable	1	0.2	Y	0	Provided by client

3.4.1 Configuration of System under Test



3.5 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	$2400/F(\text{kHz})$	300
0.490 ~ 1.705	$24000/F(\text{kHz})$	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

Unwanted Emissions below 1 GHz

Description & Manufacturer	Model No.	Serial No.	Cal. Date	Cal. Due
Antenna Tower KaiTuo	N/A	N/A	N/A	N/A
Antenna Tower Controller KaiTuo	KT-2000	N/A	N/A	N/A
Bi_Log Antenna Schwarzbeck	VULB 9168	9168-995	2024/10/9	2025/10/8
Loop Antenna TESEQ	HLA 6121	45745	2024/8/21	2025/8/20
MXE EMI Receiver Agilent	N9038A	MY52260177	2024/9/19	2025/9/18
Preamplifier EMCI	EMC330N	980783	2024/1/15	2025/1/14
	EMC001340	980201	2024/9/24	2025/9/23
PXA Signal Analyzer Keysight	N9030B	MY57140488	2024/3/6	2025/3/5
RF Coaxial Cable EMCI	EMCCFD400-NM-NM-500	201245	2024/1/15	2025/1/14
	EMCCFD400-NM-NM-3000	201250	2024/1/15	2025/1/14
	EMCCFD400-NM-NM-9000	201252(with PAD)	2024/1/15	2025/1/14
Software BV ADT	ADT_Radiated_ V7.6.15.9.5	N/A	N/A	N/A
Turn Table Max-Full	MFT-151SS-0.5T	N/A	N/A	N/A
Turn Table Controller Max-Full	MF-7802BS	MF780208675	N/A	N/A

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 - 966 chamber 7.
3. Tested Date: 2024/11/11

Unwanted Emissions above 1 GHz

Description & Manufacturer	Model No.	Serial No.	Cal. Date	Cal. Due
Antenna Tower KaiTuo	N/A	N/A	N/A	N/A
Antenna Tower Controller KaiTuo	KT-2000	N/A	N/A	N/A
Horn Antenna RFSPIN	DRH18-E	210104A18E	2023/11/12	2024/11/11
Horn Antenna Schwarzbeck	BBHA 9170	9170-1048	2023/11/12	2024/11/11
MXE EMI Receiver Agilent	N9038A	MY52260177	2024/9/19	2025/9/18
Preamplifier EMCI	EMC118A45SE	980810	2023/12/28	2024/12/27
	EMC184045SE	980787	2024/1/15	2025/1/14
PXA Signal Analyzer Keysight	N9030B	MY57140488	2024/3/6	2025/3/5
RF Coaxial Cable EMCI	EMC101G-KM-KM-2000	201254	2024/1/15	2025/1/14
	EMC101G-KM-KM-3000	201258	2024/1/15	2025/1/14
	EMC101G-KM-KM-5000	201261	2024/1/15	2025/1/14
	EMC104-SM-SM-1000	210101	2024/1/15	2025/1/14
	EMC104-SM-SM-3000	201242	2024/1/15	2025/1/14
	EMC104-SM-SM-9000	201230	2024/1/15	2025/1/14
Software BV ADT	ADT_Radiated_ V7.6.15.9.5	N/A	N/A	N/A
Turn Table Max-Full	MFT-151SS-0.5T	N/A	N/A	N/A
Turn Table Controller Max-Full	MF-7802BS	MF780208675	N/A	N/A

- 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 - 966 chamber 7.
3. Tested Date: 2024/11/9 ~ 2024/11/11

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:

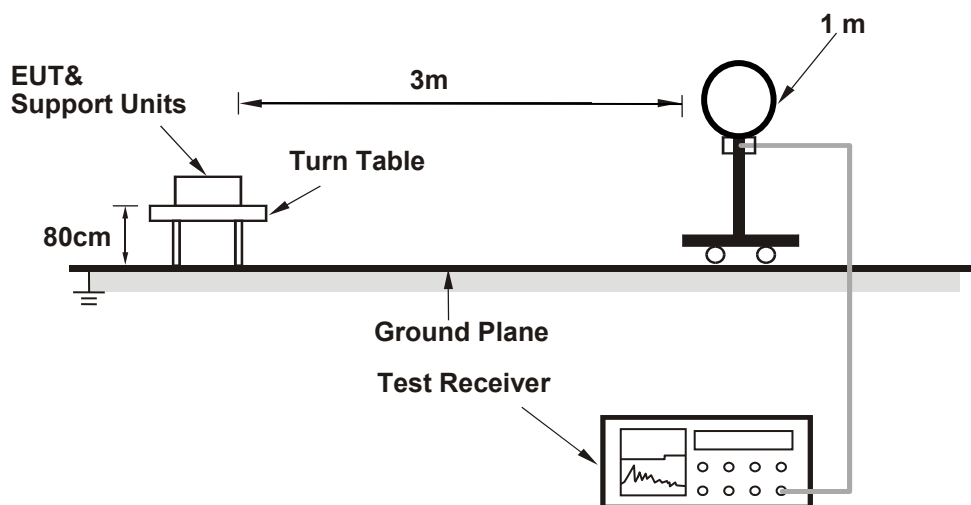
1. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 120kHz for Quasi-peak detection (QP) at frequency below 1GHz.
2. The resolution bandwidth of test receiver/spectrum analyzer is 1 MHz and the video bandwidth is 3 MHz for Peak detection (PK) at frequency above 1GHz.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

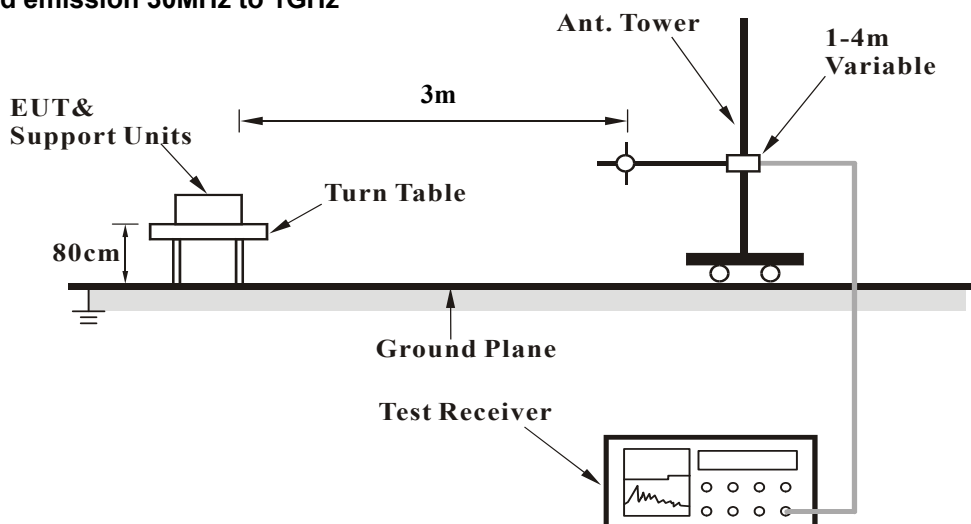
No deviation.

4.1.5 Test Set Up

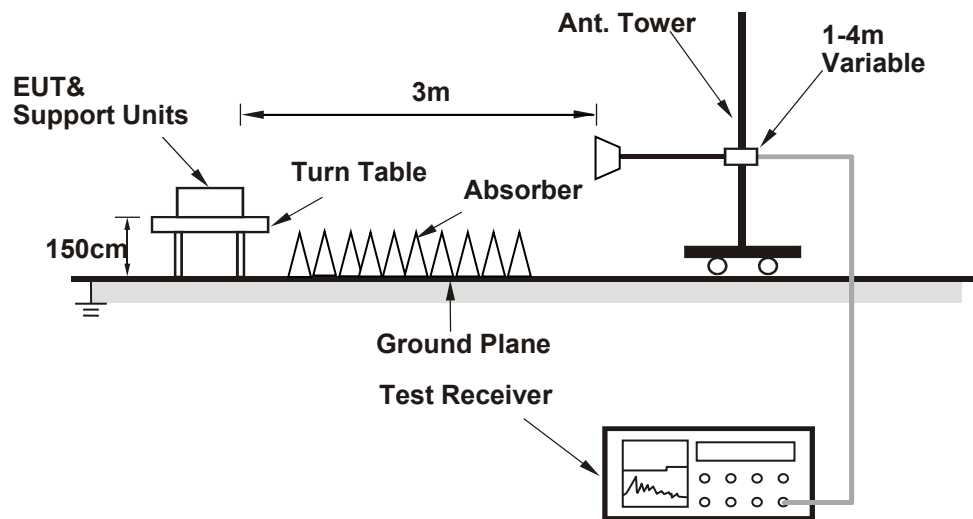
For Radiated emission below 30MHz



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

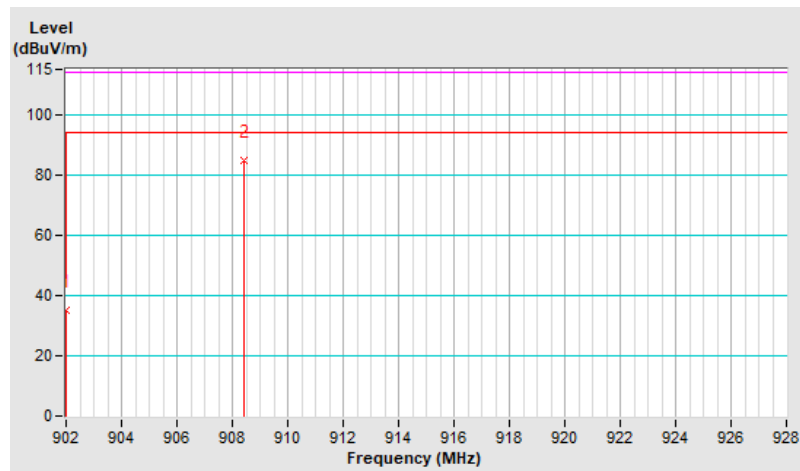
4.1.7 Test Results

RF Mode	Z-wave	Channel	CH 0 : 908.4 MHz
Frequency Range	902MHz ~ 928MHz	Detector Function & Bandwidth	(QP) RB = 120kHz
Input Power	120 Vac, 60 Hz	Environmental Conditions	22°C, 67% RH
Tested By	Charles Hsiao		

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	35.3 QP	46.0	-10.7	1.35 H	110	5.2	30.1
2	*908.40	85.0 QP	94.0	-9.0	1.35 H	110	54.7	30.3

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 902MHz ~ 928MHz.
5. " * ": Fundamental frequency.

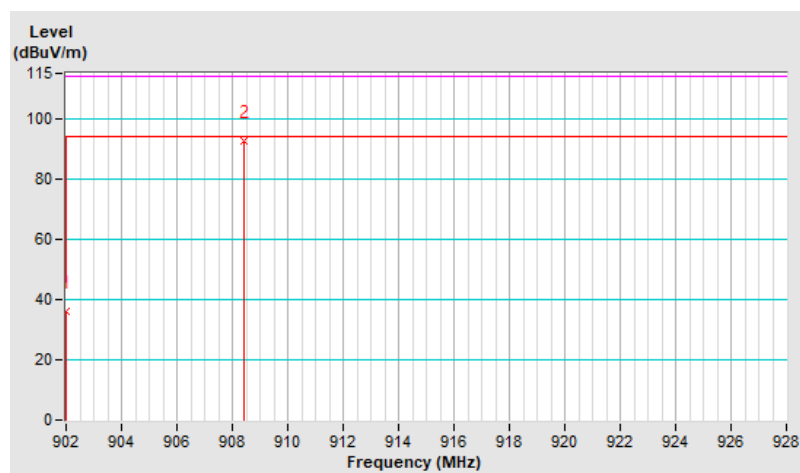


RF Mode	Z-wave	Channel	CH 0 : 908.4 MHz
Frequency Range	902MHz ~ 928MHz	Detector Function & Bandwidth	(QP) RB = 120kHz
Input Power	120 Vac, 60 Hz	Environmental Conditions	22°C, 67% RH
Tested By	Charles Hsiao		

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	35.9 QP	46.0	-10.1	1.10 V	177	5.8	30.1
2	*908.40	92.4 QP	94.0	-1.6	1.10 V	177	62.1	30.3

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 902MHz ~ 928MHz.
5. " * ": Fundamental frequency.

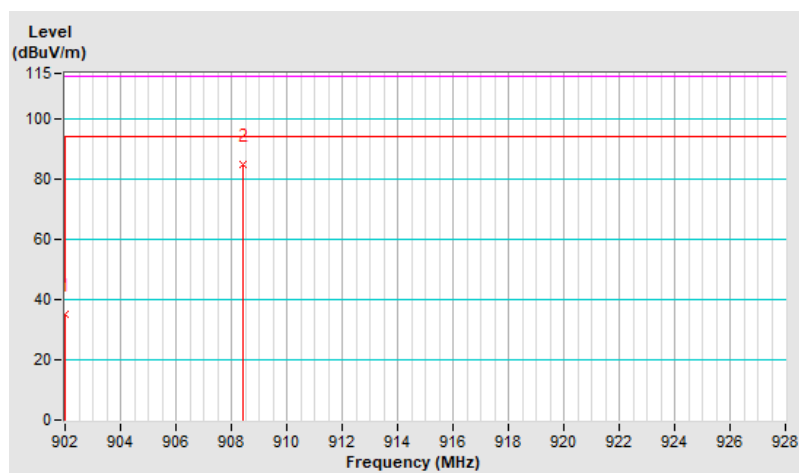


RF Mode	Z-wave	Channel	CH 1 : 908.42 MHz
Frequency Range	902MHz ~ 928MHz	Detector Function & Bandwidth	(QP) RB = 120kHz
Input Power	120 Vac, 60 Hz	Environmental Conditions	22°C, 67% RH
Tested By	Charles Hsiao		

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	35.2 QP	46.0	-10.8	1.33 H	110	5.1	30.1
2	*908.42	84.7 QP	94.0	-9.3	1.33 H	110	54.4	30.3

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 902MHz ~ 928MHz.
5. " * ": Fundamental frequency.

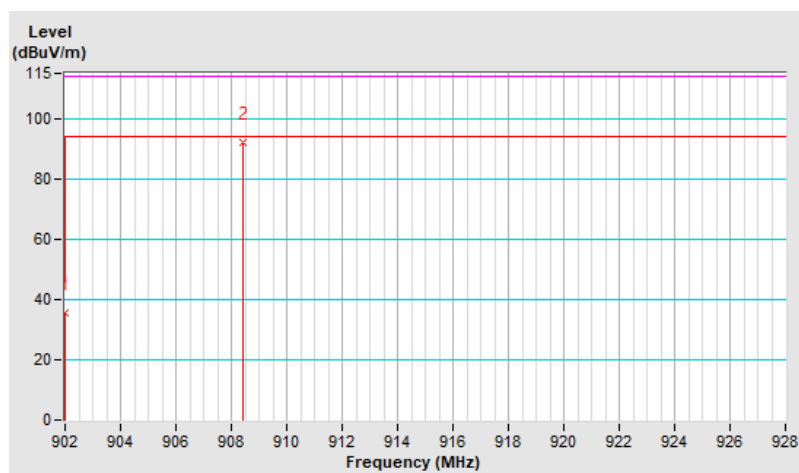


RF Mode	Z-wave	Channel	CH 1 : 908.42 MHz
Frequency Range	902MHz ~ 928MHz	Detector Function & Bandwidth	(QP) RB = 120kHz
Input Power	120 Vac, 60 Hz	Environmental Conditions	22°C, 67% RH
Tested By	Charles Hsiao		

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	35.8 QP	46.0	-10.2	1.01 V	177	5.7	30.1
2	*908.42	92.3 QP	94.0	-1.7	1.01 V	177	62.0	30.3

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 902MHz ~ 928MHz.
5. " * ": Fundamental frequency.

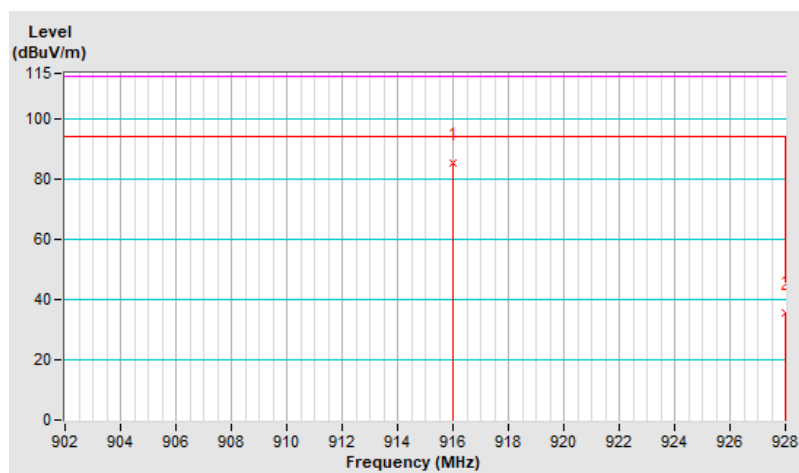


RF Mode	Z-wave	Channel	CH 2 : 916 MHz
Frequency Range	902MHz ~ 928MHz	Detector Function & Bandwidth	(QP) RB = 120kHz
Input Power	120 Vac, 60 Hz	Environmental Conditions	22°C, 67% RH
Tested By	Charles Hsiao		

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	85.2 QP	94.0	-8.8	1.40 H	115	54.7	30.5
2	928.00	35.5 QP	46.0	-10.5	1.40 H	115	4.8	30.7

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. Margin value = Emission Level – Limit value.
4. The other emission levels were very low against the limit of frequency range 902MHz ~ 928MHz.
5. " * ": Fundamental frequency.

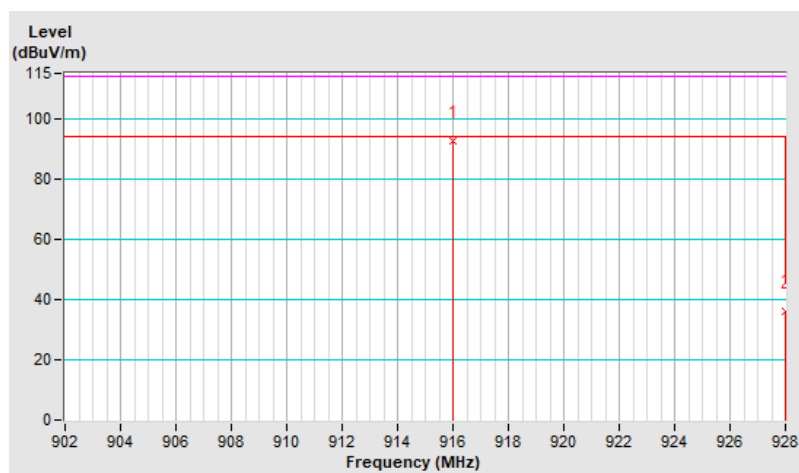


RF Mode	Z-wave	Channel	CH 2 : 916 MHz
Frequency Range	902MHz ~ 928MHz	Detector Function & Bandwidth	(QP) RB = 120kHz
Input Power	120 Vac, 60 Hz	Environmental Conditions	22°C, 67% RH
Tested By	Charles Hsiao		

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	92.8 QP	94.0	-1.2	1.10 V	175	62.3	30.5
2	928.00	36.0 QP	46.0	-10.0	1.10 V	175	5.3	30.7

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. Margin value = Emission Level – Limit value.
4. The other emission levels were very low against the limit of frequency range 902MHz ~ 928MHz.
5. " * ": Fundamental frequency.



Above 1GHz Data

RF Mode	Z-wave	Channel	CH 0 : 908.4 MHz
Frequency Range	1 GHz ~ 10 GHz	Detector Function & Bandwidth	(PK) RB = 1 MHz, VB = 3 MHz (AV) RB = 1 MHz, VB = 1 kHz
Input Power	120 Vac, 60 Hz	Environmental Conditions	22°C, 67% RH
Tested By	Charles Hsiao		

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	2725.20	36.7 PK	74.0	-37.3	2.35 H	310	36.2	0.5
2	2725.20	24.9 AV	54.0	-29.1	2.35 H	310	24.4	0.5
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	2725.20	38.0 PK	74.0	-36.0	1.64 V	255	37.5	0.5
2	2725.20	25.5 AV	54.0	-28.5	1.64 V	255	25.0	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. Margin value = Emission Level – Limit value.
4. The other emission levels were very low against the limit.

RF Mode	Z-wave	Channel	CH 1 : 908.42 MHz
Frequency Range	1 GHz ~ 10 GHz	Detector Function & Bandwidth	(PK) RB = 1 MHz, VB = 3 MHz (AV) RB = 1 MHz, VB = 1 kHz
Input Power	120 Vac, 60 Hz	Environmental Conditions	22°C, 67% RH
Tested By	Charles Hsiao		

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	2725.26	37.0 PK	74.0	-37.0	2.25 H	305	36.5	0.5
2	2725.26	25.0 AV	54.0	-29.0	2.25 H	305	24.5	0.5
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	2725.26	37.8 PK	74.0	-36.2	1.60 V	244	37.3	0.5
2	2725.26	25.3 AV	54.0	-28.7	1.60 V	244	24.8	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. Margin value = Emission Level – Limit value.
4. The other emission levels were very low against the limit.

RF Mode	Z-wave	Channel	CH 2 : 916 MHz
Frequency Range	1 GHz ~ 10 GHz	Detector Function & Bandwidth	(PK) RB = 1 MHz, VB = 3 MHz (AV) RB = 1 MHz, VB = 1 kHz
Input Power	120 Vac, 60 Hz	Environmental Conditions	22°C, 67% RH
Tested By	Charles Hsiao		

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	2748.00	37.0 PK	74.0	-37.0	2.22 H	315	36.3	0.7
2	2748.00	25.0 AV	54.0	-29.0	2.22 H	315	24.3	0.7
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	2748.00	38.0 PK	74.0	-36.0	1.67 V	235	37.3	0.7
2	2748.00	25.7 AV	54.0	-28.3	1.67 V	235	25.0	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. Margin value = Emission Level – Limit value.
4. The other emission levels were very low against the limit.

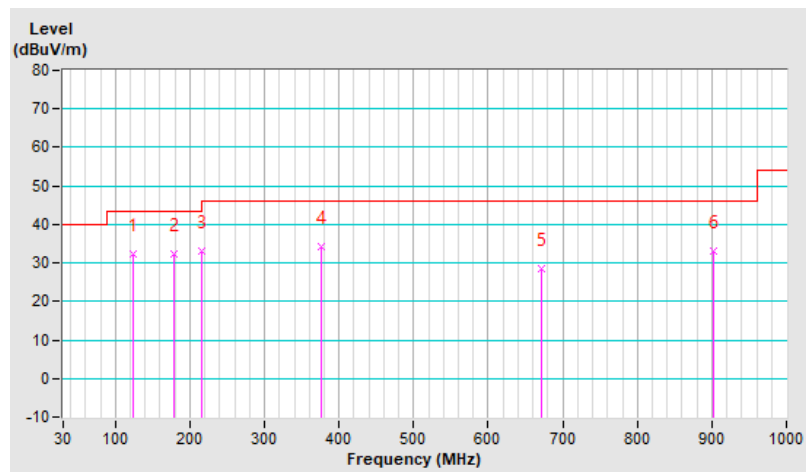
Below 1GHz worst-case data

RF Mode	Z-wave	Channel	CH 2 : 916 MHz
Frequency Range	30 MHz ~ 1 GHz	Detector Function & Bandwidth	(QP) RB = 120kHz
Input Power	120 Vac, 60 Hz	Environmental Conditions	25°C, 65% RH
Tested By	Charles Hsiao		

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	124.09	32.3 QP	43.5	-11.2	1.52 H	26	47.4	-15.1
2	179.38	32.2 QP	43.5	-11.3	1.78 H	111	46.9	-14.7
3	215.27	33.2 QP	43.5	-10.3	1.64 H	166	50.1	-16.9
4	376.29	34.3 QP	46.0	-11.7	1.05 H	311	45.1	-10.8
5	672.14	28.7 QP	46.0	-17.3	1.87 H	188	33.6	-4.9
6	902.03	33.1 QP	46.0	-12.9	1.64 H	233	34.9	-1.8

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. Margin value = Emission Level – Limit value.
4. The other emission levels were very low against the limit of frequency range 30 MHz ~ 1 GHz.
5. The frequency range 9 kHz ~ 30 MHz: all emissions are more than 20 dB below the limit, therefore do not be recorded in this report.

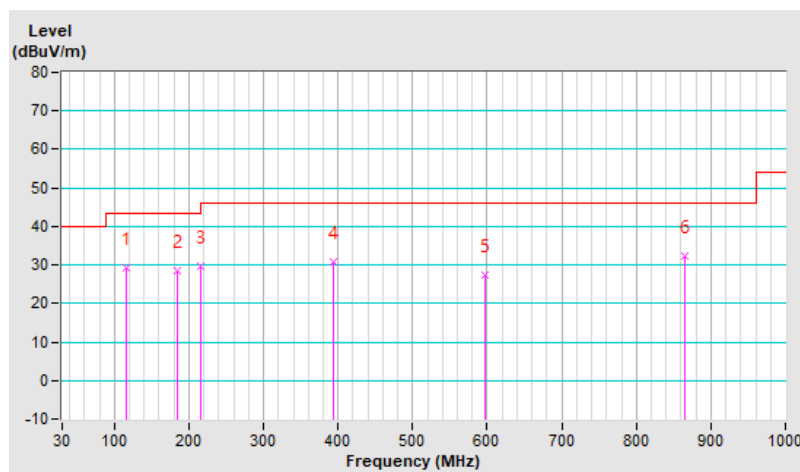


RF Mode	Z-wave	Channel	CH 2 : 916 MHz
Frequency Range	30 MHz ~ 1 GHz	Detector Function & Bandwidth	(QP) RB = 120kHz
Input Power	120 Vac, 60 Hz	Environmental Conditions	25°C, 65% RH
Tested By	Charles Hsiao		

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	115.36	29.3 QP	43.5	-14.2	1.57 V	285	45.2	-15.9
2	185.20	28.7 QP	43.5	-14.8	1.97 V	315	44.2	-15.5
3	215.27	29.8 QP	43.5	-13.7	1.15 V	12	46.7	-16.9
4	392.78	30.8 QP	46.0	-15.2	1.57 V	174	41.2	-10.4
5	596.48	27.2 QP	46.0	-18.8	1.96 V	322	33.3	-6.1
6	864.20	32.3 QP	46.0	-13.7	1.05 V	261	34.5	-2.2

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 30 MHz ~ 1 GHz.
5. The frequency range 9 kHz ~ 30 MHz: all emissions are more than 20 dB below the limit, therefore do not be recorded in this 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
50 ohm terminal resistance HUBER+SUHNER	E1-011315	13	2023/11/22	2024/11/21
50 ohm terminal resistance	E1-011279	04	2023/11/22	2024/11/21
	E1-011280	05	2023/11/22	2024/11/21
EMI Test Receiver R&S	ESCI	100613	2023/12/4	2024/12/3
Fixed Attenuator Mini-Circuits	HAT-10+	PAD-COND1-01	2024/1/6	2025/1/5
LISN R&S	ENV216	101826	2024/3/25	2025/3/24
	ESH3-Z5	100311	2024/9/5	2025/9/4
RF Coaxial Cable Woken	5D-FB	Cable-cond1-01	2024/1/6	2025/1/5
Software BVADT	BVADT_Cond_ V7.4.1.0	N/A	N/A	N/A
V-LISN Schwarzbeck	NNBL 8226-2	8226-142	2024/8/28	2025/8/27

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 HY - Conduction 1.

3. Tested Date: 2024/11/12

4.2.3 Test Procedures

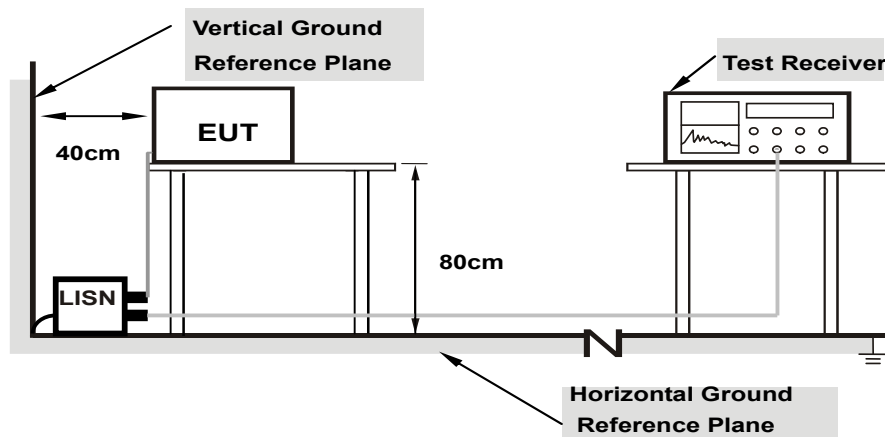
- The EUT was placed 0.4 meters from the conducting wall of the shielded room with EUT being connected to the power mains through a line impedance stabilization network (LISN). Other support units were connected to the power mains through another LISN. The two LISNs provide 50 ohm/ 50uH of coupling impedance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

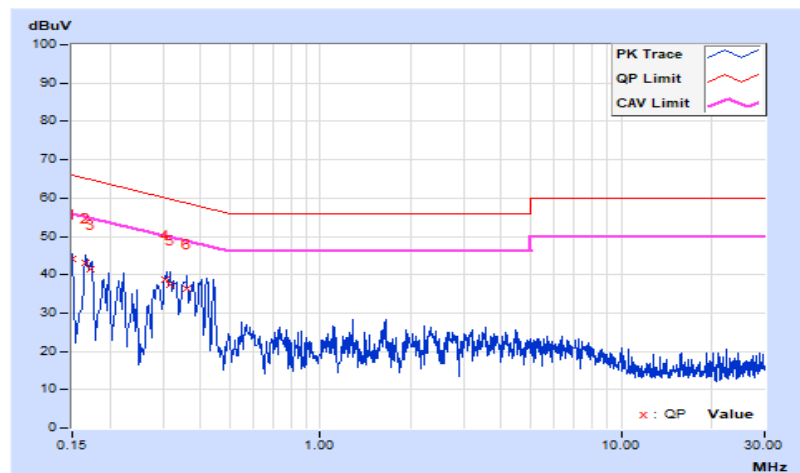
Worst-case data:

RF Mode	Z-wave	Channel	CH 2 : 916 MHz
Frequency Range	150 kHz ~ 30 MHz	Detector Function & Resolution Bandwidth	Quasi-Peak (QP) / Average (AV), 9 kHz
Input Power	120 Vac, 60 Hz	Environmental Conditions	25°C, 75% RH
Tested By	Charles Hsiao		

Phase Of Power : Line (L)										
No	Frequency (MHz)	Correction Factor (dB)	Reading Value (dBuV)		Emission Level (dBuV)		Limit (dBuV)		Margin (dB)	
			Q.P.	AV.	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.
1	0.15000	9.72	34.46	15.63	44.18	25.35	66.00	56.00	-21.82	-30.65
2	0.16535	9.72	33.31	16.54	43.03	26.26	65.19	55.19	-22.16	-28.93
3	0.17157	9.72	31.58	14.46	41.30	24.18	64.88	54.88	-23.58	-30.70
4	0.30390	9.78	28.93	20.08	38.71	29.86	60.14	50.14	-21.43	-20.28
5	0.31615	9.78	27.76	24.09	37.54	33.87	59.81	49.81	-22.27	-15.94
6	0.35971	9.81	26.67	21.39	36.48	31.20	58.74	48.74	-22.26	-17.54

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

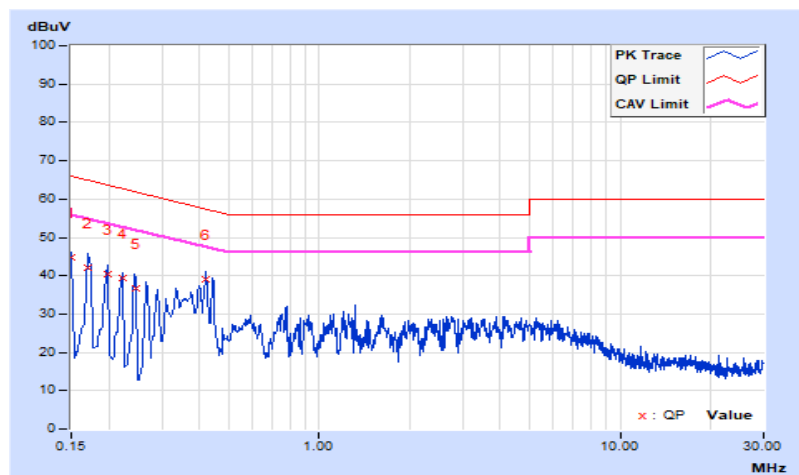


RF Mode	Z-wave	Channel	CH 2 : 916 MHz
Frequency Range	150 kHz ~ 30 MHz	Detector Function & Resolution Bandwidth	Quasi-Peak (QP) / Average (AV), 9 kHz
Input Power	120 Vac, 60 Hz	Environmental Conditions	23°C, 75% RH
Tested By	Charles Hsiao		

Phase Of Power : Neutral (N)										
No	Frequency (MHz)	Correction Factor (dB)	Reading Value (dBuV)		Emission Level (dBuV)		Limit (dBuV)		Margin (dB)	
			Q.P.	AV.	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.
1	0.15000	9.69	34.93	14.85	44.62	24.54	66.00	56.00	-21.38	-31.46
2	0.16932	9.70	32.42	13.06	42.12	22.76	64.99	54.99	-22.87	-32.23
3	0.19728	9.71	30.72	13.25	40.43	22.96	63.72	53.72	-23.29	-30.76
4	0.22152	9.73	29.68	11.41	39.41	21.14	62.76	52.76	-23.35	-31.62
5	0.24600	9.75	26.84	7.35	36.59	17.10	61.89	51.89	-25.30	-34.79
6	0.41800	9.87	29.15	24.87	39.02	34.74	57.49	47.49	-18.47	-12.75

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

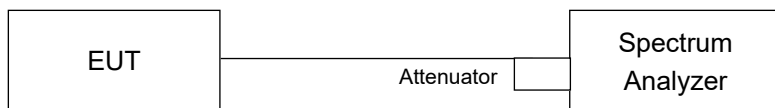


4.3 Channel Bandwidth

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

Description & Manufacturer	Model No.	Serial No.	Cal. Date	Cal. Due
Signal & Spectrum Analyzer R&S	FSV3044	101105	2024/2/27	2025/2/26
Software BV	ADT_RF Test Software V7.6.5.4	N/A	N/A	N/A

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 Oven room.
3. Tested Date: 2024/11/8

4.3.4 Test Procedure

- Check the calibration of the measuring instrument using either an internal calibrator or a known signal from an external generator.
- 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.
- Measure the frequency difference of two frequencies that were attenuated 20dB from the reference level. Record the frequency difference as the emission bandwidth.
- Repeat above procedures until all frequencies measured were complete.

4.3.5 Deviation from Test Standard

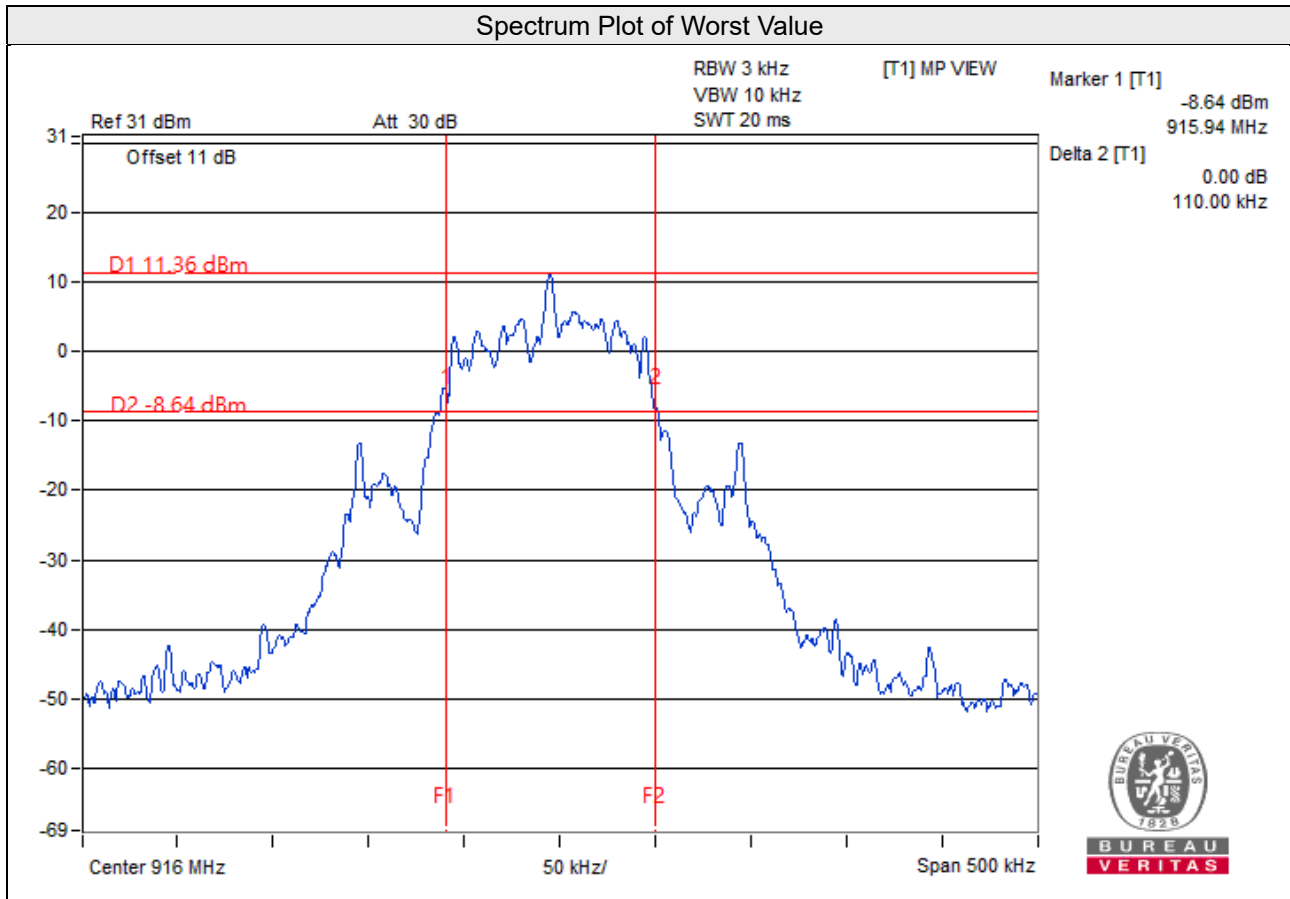
No deviation.

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	0.070
2	916.00	0.110



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:

Lin Kou EMC/RF Lab

Tel: 886-2-26052180

Fax: 886-2-26051924

Hsin Chu EMC/RF/Telecom Lab

Tel: 886-3-6668565

Fax: 886-3-6668323

Hwa Ya EMC/RF/Safety Lab

Tel: 886-3-3183232

Fax: 886-3-3270892

Email: service.adt@bureauveritas.com

Web Site: <http://ee.bureauveritas.com.tw>

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

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