TEST REPORT

CERTIFICATE OF CONFORMITY

Standard:	**47 CFR FCC Part 15, Subpart C (Section 15.249)**
Report No.:	RFBDKX-WTW-P23090081-1
FCC ID:	2ATIO5
Product:	Home IOT Gateway
Brand:	Level
Model No.:	H5
Series Model:	H2
Received Date:	2023/9/5
Test Date:	2023/9/13 ~ 2023/12/1
Issued Date:	2023/12/8
Applicant:	Level Home Inc.
Address:	935 Main Street, Redwood City, California 94063, United States of America
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:	No. 47-2, 14th Ling, Chia Pau Vil., Lin Kou Dist., New Taipei City, Taiwan
FCC Registration / Designation Number:	198487 / TW2021

Approved by: Jeremy Lin , **Date:** 2023/12/8

Jeremy Lin / Project Engineer

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Prepared by : Annie Chang / Senior Specialist

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Release Control Record

Issue No.	Description	Date Issued
RFBDKX-WTW-P23090081-1	Original release.	2023/12/8

1 Certificate

Product:	Home IOT Gateway
Brand:	Level
Test Model:	H5
Series Model:	H2
Sample Status:	Engineering sample
Applicant:	Level Home Inc.
Test Date:	2023/9/13 ~ 2023/12/1
Standard:	47 CFR FCC Part 15, Subpart C (Section 15.249)
Measurement procedure:	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.

2 Summary of Test Results

47 CFR FCC Part 15, Subpart C (Section 15.249)			
Standard / Clause	Test Item	Result	Remark
15.207	AC Power Conducted Emissions	Pass	Minimum passing margin is -1.98 dB at 0.49168 MHz
15.209 / 15.249(a) / 15.249(d)	Radiated Emissions below 1 GHz	Pass	Minimum passing margin is -1.7 dB at 916.00 MHz
15.209 / 15.249(a) / 15.249(d) / 15.249(e)	Radiated Emissions above 1 GHz	Pass	Minimum passing margin is -14.9 dB at 2748.00 MHz
15.215 (c)	20 dB Bandwidth	Pass	Meet the requirement of limit.
15.203	Antenna Requirement	Pass	No antenna connector is used.

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	Specification	Expanded Uncertainty (k=2) (±)
AC Power Conducted Emissions	9 kHz ~ 30 MHz	2.88 dB
20dB Bandwidth	-	960 Hz
Radiated Emissions below 1 GHz	9 kHz ~ 30 MHz	2.38 dB
	30 MHz ~ 1 GHz	5.7 dB
Radiated Emissions above 1 GHz	1 GHz ~ 6 GHz	4.83 dB
	6 GHz ~ 18 GHz	5.37 dB
	18 GHz ~ 40 GHz	5.24 dB

The other instruments specified are routine verified to remain within the calibrated levels, no measurement uncertainty is required to be calculated.

2.2 Supplementary Information

There is not any deviation from the test standards for the test method, and no modifications required for compliance.

3 General Information

3.1 General Description

Product	Home IOT Gateway
Brand	Level
Test Model	H5
Series Model	H2
Model Difference	Refer to Note as below
Status of EUT	Engineering sample
Power Supply Rating	3.6Vdc from battery or 5Vdc from Adapter
Modulation Type	2FSK (908.4 MHz) 2FSK (908.42 MHz) 2GFSK (916 MHz)
Transfer Rate	40kb/s (908.4 MHz) 9.6kb/s (908.42 MHz) 100kb/s (916 MHz)
Operating Frequency	908.4 MHz ~ 916 MHz
Number of Channel	3
Field Strength Of Fundamental	92.3 dBuV/m at 3 meters

Note:

1. All models are listed as below.

RF Radio List	Radio ID	Technology List	H5	H2
1	LTE	WWAN (LTE + WCDMA)	V	V
2	Z-Wave	Z-Wave	V	X
	Thread 900M	Thread 900M	V(Optional)	V
3	Thread	Thread	V(Optional)	V
	Zigbee	Zigbee	V	X
	BLE	BTLE	V	V
4	WiFi	WLAN(2.4G)	V	X
	BLE-SOM	BLE	V	V

2. There are WWAN, WLAN (2.4 GHz), Bluetooth LE, Zigbee, Thread, Z-Wave technology used for the EUT.
3. Simultaneously transmission condition.

Condition	Technology			
	Radio 1	Radio 2	Radio 3	Radio 4
1	WWAN	Z-Wave	Zigbee	BTLE
2	WWAN	Z-Wave	Thread	BTLE
3	WWAN	Z-Wave	BTLE	BTLE
4	WWAN	Thread 900M	Zigbee	BTLE
5	WWAN	Thread 900M	Thread	BTLE
6	WWAN	Thread 900M	BTLE	BTLE
7	-	Z-Wave	Zigbee	WLAN
8	-	Z-Wave	Thread	WLAN
9	-	Z-Wave	BTLE	WLAN
10	-	Thread 900M	Zigbee	WLAN
11	-	Thread 900M	Thread	WLAN
12	-	Thread 900M	BTLE	WLAN

4. The EUT uses following accessories.

Item	Brand	Model	Specification
AC Adapter	CUI INC	SWH15-5B-N	AC Input : 100-240Vac 50/60Hz 0.5A Max DC Output : 5.0Vdc 3.0A DC Output Cable : Non-shielded without core, 1.8m
LAN Cable	-	-	Non-shielded without core, 1.0m

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

3.2 Antenna Description of EUT

The antenna information is listed as below.

Antenna Type	Gain (dBi)	Connector Type
PIFA	-0.4	None

* Detail antenna specification please refer to antenna datasheet and/or antenna measurement report.

3.3 Channel List

3 channels are provided to this EUT:

Channel	Frequency (MHz)	Channel	Frequency (MHz)
0	908.4	2	916
1	908.42		

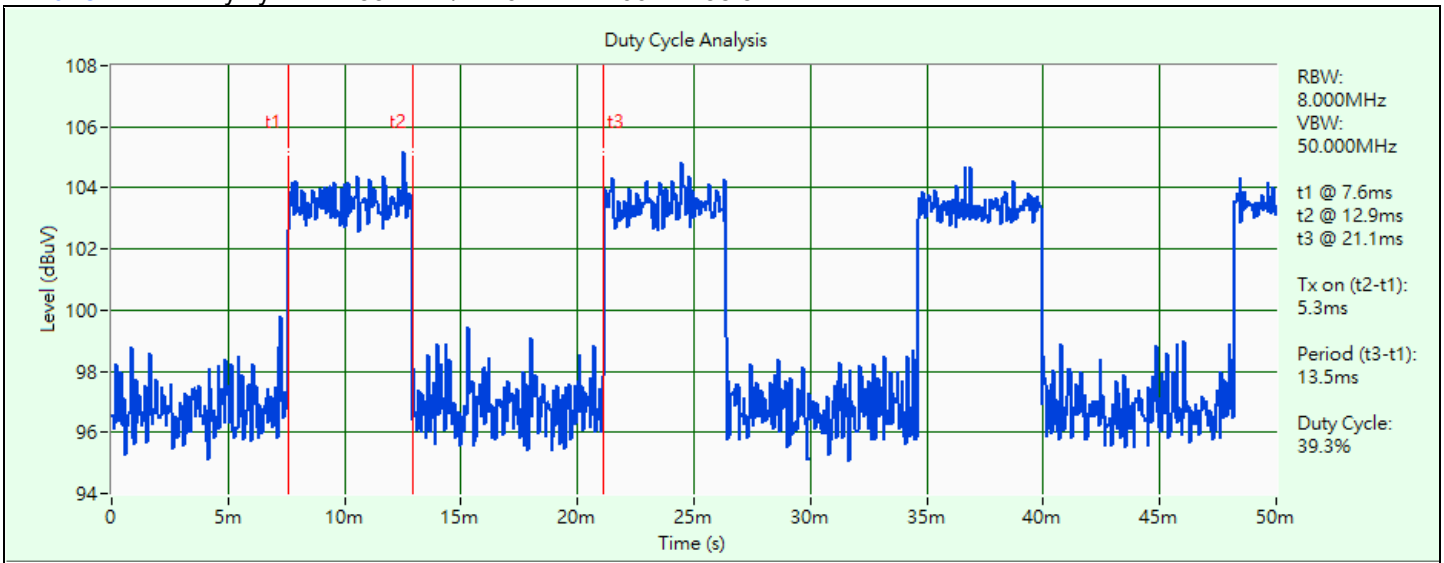
3.4 Test Mode Applicability and Tested Channel Detail

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

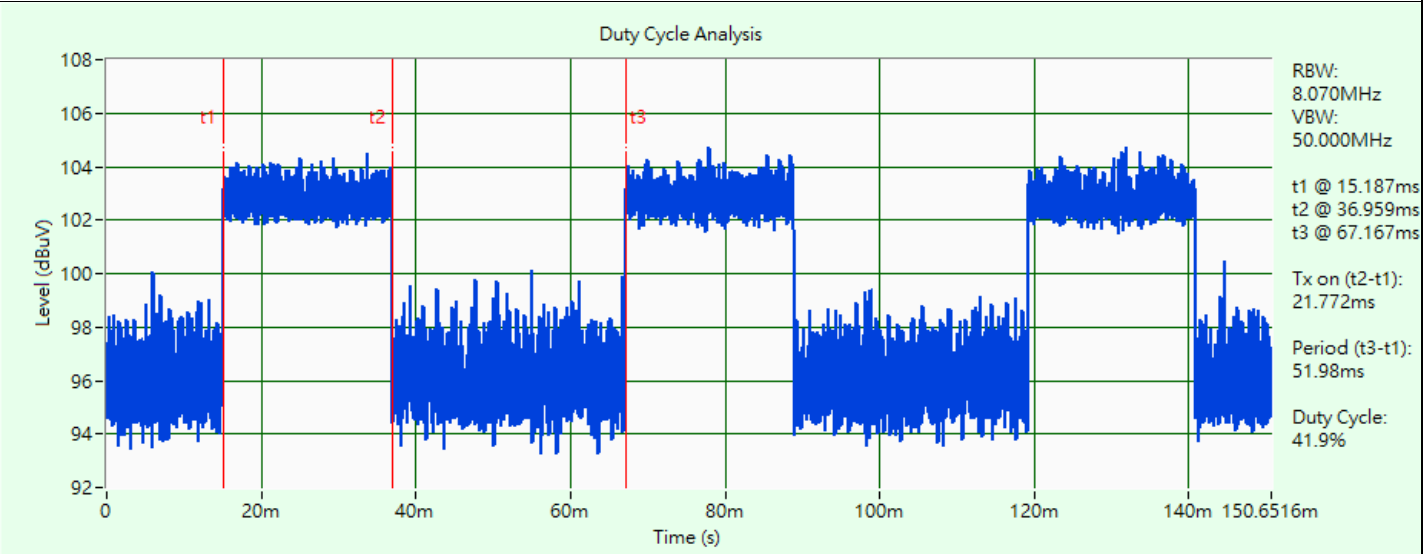
Test Item	Mode	Tested Channel	Modulation	Data Rate Parameter
20 dB Bandwidth	Z-Wave	0	2FSK	40kb/s
		1	2FSK	9.6kb/s
		2	2GFSK	100kb/s
AC Power Conducted Emissions	Z-Wave	0	2FSK	40kb/s
Radiated Emissions below 1 GHz	Z-Wave	0	2FSK	40kb/s
		1	2FSK	9.6kb/s
		2	2GFSK	100kb/s
Radiated Emissions above 1 GHz	Z-Wave	0	2FSK	40kb/s
		1	2FSK	9.6kb/s
		2	2GFSK	100kb/s
Note: Radio 2				

3.5 Duty Cycle of Test Signal

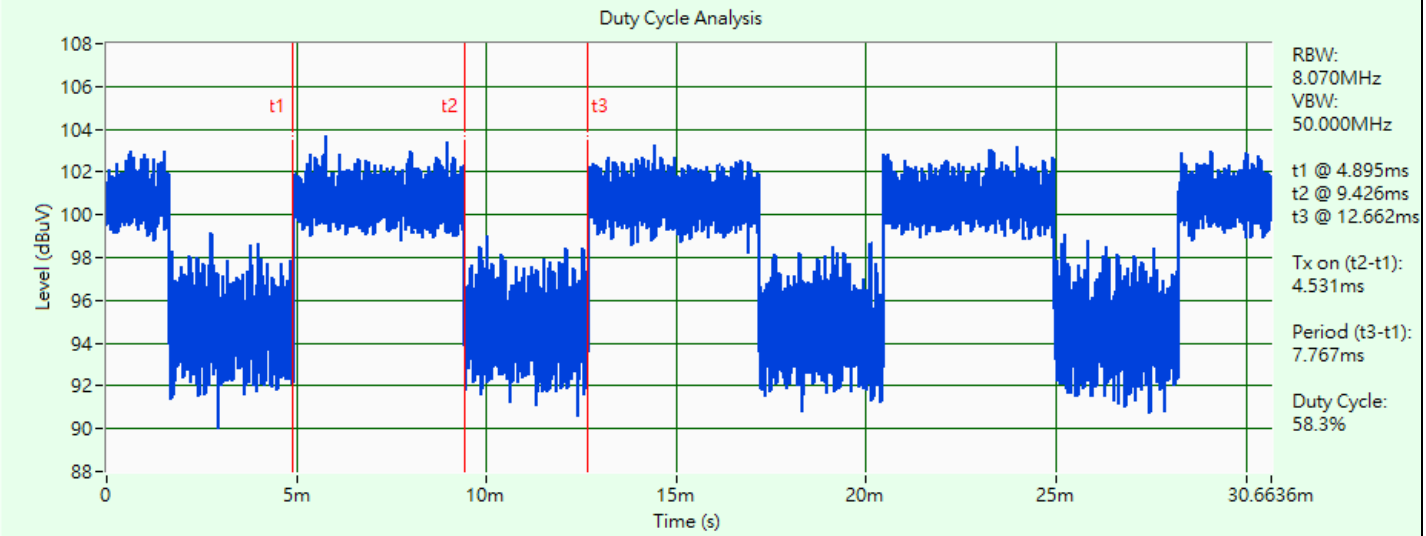
Z-Wave CH 0: Duty cycle = 5.3 ms / 13.5 ms x 100% = 39.3%
Z-Wave CH 1: Duty cycle = 21.772 ms / 51.98 ms x 100% = 41.9%
Z-Wave CH 2: Duty cycle = 4.531 ms / 7.767 ms x 100% = 58.3%



Z-Wave CH 0



Z-Wave CH 1

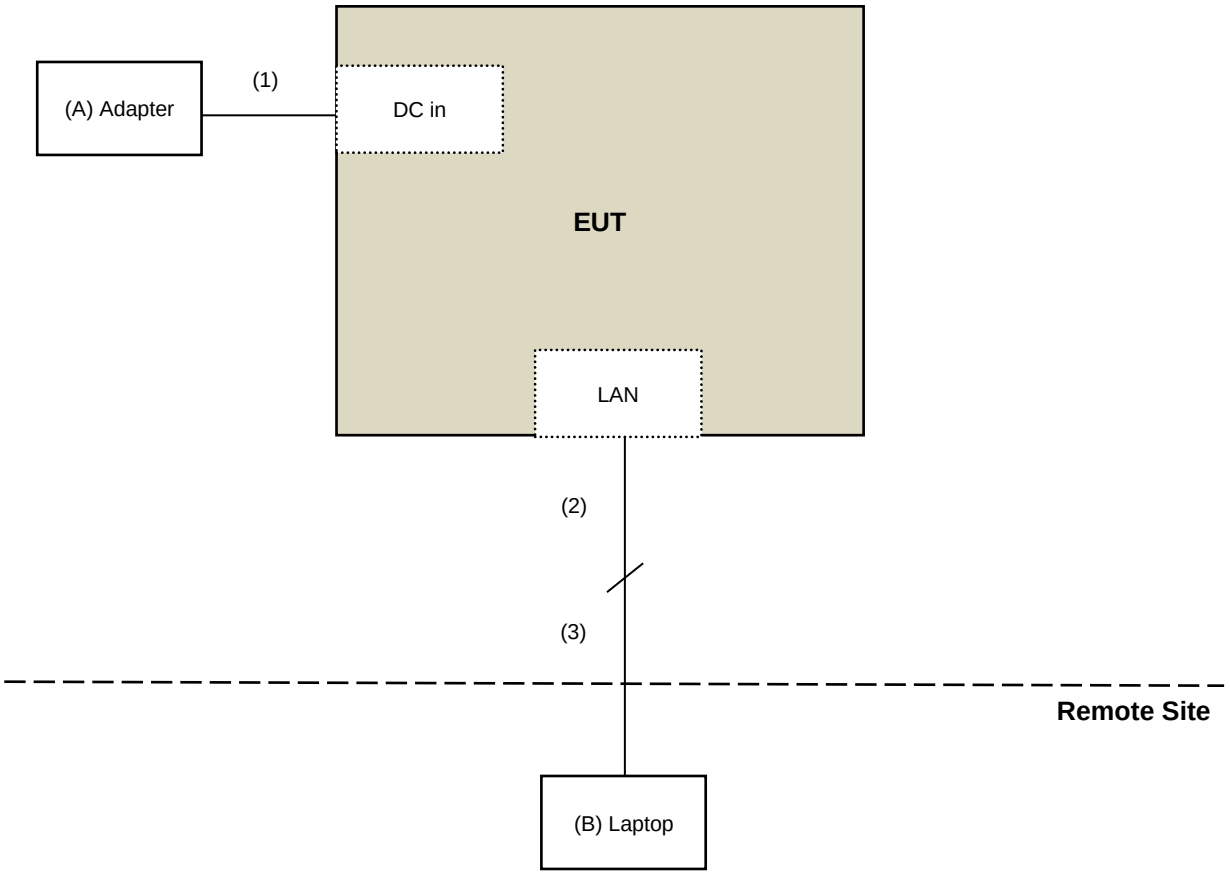


Z-Wave CH 2

3.6 Test Program Used and Operation Descriptions

Controlling software (teraterm v4.8) has been activated to set the EUT under transmission condition continuously at specific channel frequency.

3.7 Connection Diagram of EUT and Peripheral Devices



3.8 Configuration of Peripheral Devices and Cable Connections

ID	Product	Brand	Model No.	Serial No.	FCC ID	Remarks
A	Adapter	CUI INC	SWH15-5B-N	N/A	N/A	Supplied by applicant
B	Laptop	Lenovo	81A4	YD02TWDP	N/A	Provided by Lab

ID	Cable Descriptions	Qty.	Length (m)	Shielding (Yes/No)	Cores (Qty.)	Remarks
1	DC cable	1	1.8	N	0	Supplied by applicant
2	LAN cable	1	1	N	0	Supplied by applicant
3	LAN cable	1	10	N	0	Provided by Lab

4 Test Instruments

The calibration interval of the all test instruments are 12 months and the calibrations are traceable to NML/ROC and NIST/USA.

4.1 AC Power Conducted Emissions

Description Manufacturer	Model No.	Serial No.	Calibrated Date	Calibrated Until
50 ohm terminal resistance LYNICS	0900510	E1-01-305	2023/2/13	2024/2/12
		E1-011285	2022/9/19	2023/9/18
		E1-011286	2022/9/19	2023/9/18
EMI Test Receiver R&S	ESCS 30	100276	2023/4/20	2024/4/19
	ESR3	102412	2022/12/21	2023/12/20
Fixed Attenuator STI	STI02-2200-10	NO.4	2023/9/1	2024/8/31
High Voltage Probe Schwarzbeck	TK9420	00982	2022/12/14	2023/12/13
LISN R&S	ENV216	101197	2023/7/12	2024/7/11
LISN Schwarzbeck	NNLK 8121	8121-731	2023/6/9	2024/6/8
		8121-808	2023/5/2	2024/5/1
	NNLK 8129	8129229	2023/6/27	2024/6/26
	NSLK 8128	8128-244	2022/11/8	2023/11/7
RF Coaxial Cable PEWC	5D-FB	Cable-CO5-01	2023/1/19	2024/1/18
Software BVADT	Cond_V7.3.7.4	N/A	N/A	N/A

Notes:

1. The test was performed in Linkou Conduction 5.
2. Tested Date: 2023/9/13

4.2 Radiated Emissions below 1 GHz

Description Manufacturer	Model No.	Serial No.	Calibrated Date	Calibrated Until
Bi_Log Antenna Schwarzbeck	VULB 9168	137	2023/10/13	2024/10/12
Coupling / Decoupling Network Schwarzbeck	CDNE-M2	00097	2023/5/25	2024/5/24
	CDNE-M3	00091	2023/5/25	2024/5/24
Loop Antenna EMCI	LPA600	270	2023/9/4	2024/9/3
MXE EMI Receiver Agilent	N9038A	MY51210129	2023/3/24	2024/3/23
		MY51210137	2023/6/5	2024/6/4
Preamplifier EMCI	EMC001340	980269	2023/6/27	2024/6/26
Preamplifier HP	8447D	2432A03504	2023/2/16	2024/2/15
RF Coaxial Cable Pacific	8D-FB	Cable-CH6-02	2023/6/27	2024/6/26
Signal Analyzer R&S	FSV40	101544	2023/5/9	2024/5/8
Software BVADT	Radiated_V8.7.08	N/A	N/A	N/A
Tower ADT	AT100	0306	N/A	N/A
Turn Table ADT	TT100	0306	N/A	N/A

Notes:

1. The test was performed in Linkou 966 Chamber 6 (CH 6).
2. Tested Date: 2023/11/28

4.3 Radiated Emissions above 1 GHz

Description Manufacturer	Model No.	Serial No.	Calibrated Date	Calibrated Until
Band Pass Filter Micro-Tronics	BRM17690	005	2023/5/25	2024/5/24
Boresight antenna tower fixture BV	BAF-02	6	N/A	N/A
High Pass Filter Wainwright	WHK 3.1/18G-10SS	SN 8	2023/5/25	2024/5/24
Horn Antenna EMCO	3115	00028257	2023/11/12	2024/11/11
Horn Antenna ETS-Lindgren	3117-PA	00215857	2023/11/12	2024/11/11
Horn Antenna Schwarzbeck	BBHA 9170	212	2023/10/16	2024/10/15
		BBHA9170241	2023/10/16	2024/10/15
MXE EMI Receiver Agilent	N9038A	MY51210129	2023/3/24	2024/3/23
		MY51210137	2023/6/5	2024/6/4
Notch Filter Micro-Tronics	BRC50703-01	010	2023/5/25	2024/5/24
Preamplifier EMCI	EMC0126545	980076	2023/2/16	2024/2/15
	EMC184045B	980175	2023/9/2	2024/9/1
		980235	2023/2/16	2024/2/15
Preamplifier HP	8449B	3008A01201	2023/2/16	2024/2/15
RF Coaxial Cable EMCI	EMC102-KM-KM-1000	200310	2023/3/12	2024/3/11
	EMC104	190801	2023/9/13	2024/9/12
		190804	2023/9/13	2024/9/12
RF Coaxial Cable HUBER+SUHNER	SF-104	Cable-CH6-01	2023/9/13	2024/9/12
Signal Analyzer R&S	FSV40	101042	2023/9/5	2024/9/4
		101544	2023/5/9	2024/5/8
Software BVADT	Radiated_V7.7.1.1.1	N/A	N/A	N/A
Tower ADT	AT100	0306	N/A	N/A
Turn Table ADT	TT100	0306	N/A	N/A

Notes:

1. The test was performed in Linkou 966 Chamber 6 (CH 6).
2. Tested Date: 2023/11/28

4.4 20 dB Bandwidth

Description Manufacturer	Model No.	Serial No.	Calibrated Date	Calibrated Until
PXA Signal Analyzer Keysight	N9030A	MY54490260	2023/7/13	2024/7/12
Signal Analyzer R&S	FSV40	101042	2023/9/5	2024/9/4
		101544	2023/5/9	2024/5/8
Software	ADT_RF Test Software V6.6.5.4	N/A	N/A	N/A

Notes:

1. The test was performed in LK - Oven
2. Tested Date: 2023/12/1

5 Limits of Test Items

5.1 AC Power Conducted Emissions

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

Notes:

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 0.50 MHz.

5.2 Radiated Emissions below 1 GHz

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

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

Radiated emissions which fall in the restricted bands must comply with the radiated emission limits specified as below table.

Frequencies (MHz)	Field Strength (microvolts/meter)	Measurement Distance (meters)
0.009 ~ 0.490	2400/F(kHz)	300
0.490 ~ 1.705	24000/F(kHz)	30
1.705 ~ 30.0	30	30
30 ~ 88	100	3
88 ~ 216	150	3
216 ~ 960	200	3
Above 960	500	3

Notes:

1. The lower limit shall apply at the transition frequencies.
2. Emission level (dBuV/m) = 20 log Emission level (uV/m).

5.3 Radiated Emissions above 1 GHz

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

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)
Above 960	500	3

Notes:

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 1000 MHz, 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 20 dB under any condition of modulation.

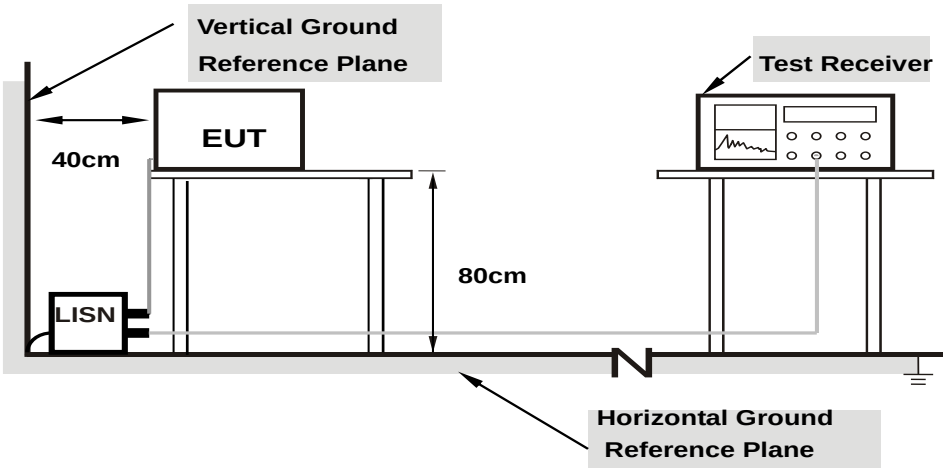
5.4 20 dB Bandwidth

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

6 Test Arrangements

6.1 AC Power Conducted Emissions

6.1.1 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).

6.1.2 Test Procedure

a. The EUT was placed on a 0.8 meter to the top of table and 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/ 50 uH of coupling impedance for the measuring instrument.

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

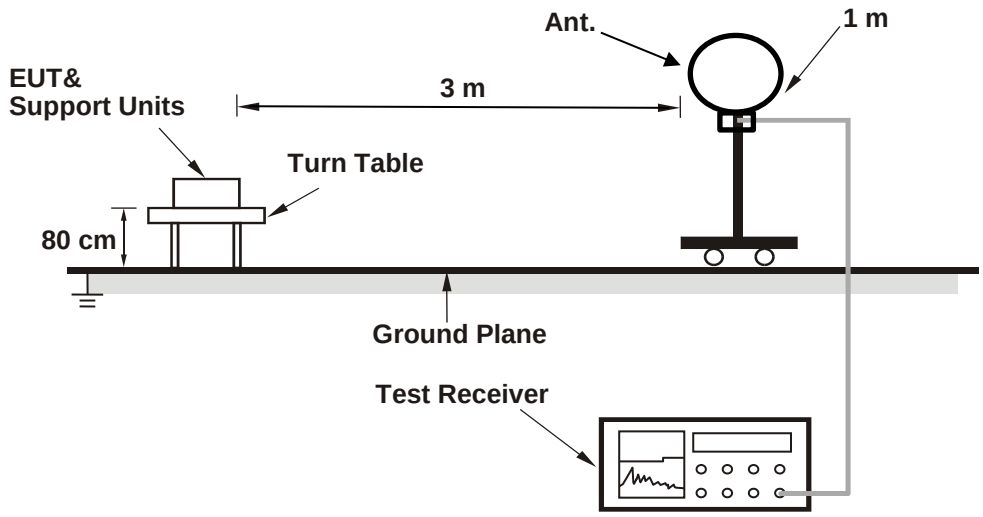
c. The frequency range from 150 kHz to 30 MHz was searched. Emission levels under (Limit – 20 dB) was not recorded.

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

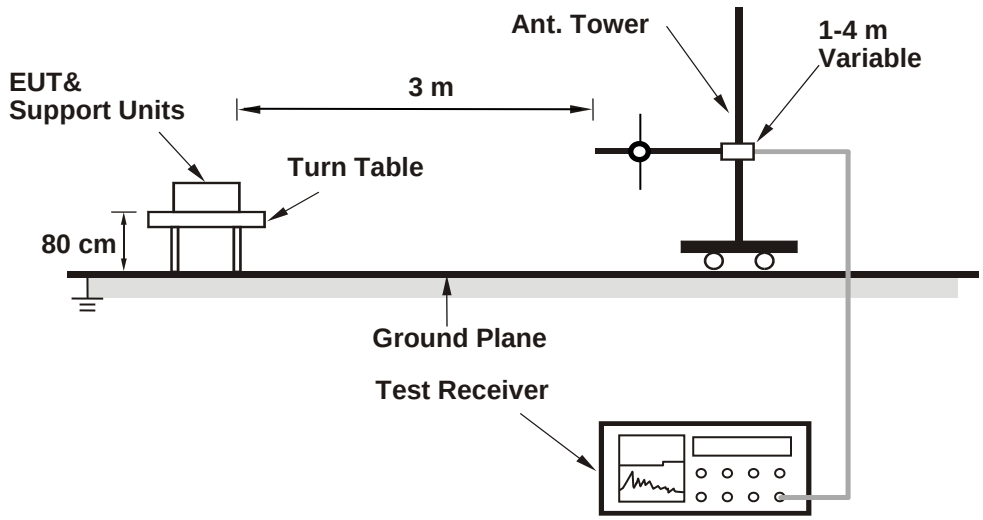
6.2 Radiated Emissions below 1 GHz

6.2.1 Test Setup

For Radiated emission below 30 MHz



For Radiated emission above 30 MHz



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

6.2.2 Test Procedure

For Radiated emission below 30 MHz

a. The EUT was placed on the top of a rotating table 0.8 meters 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. 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, except for the frequency band (9 kHz to 90 kHz and 110 kHz to 490 kHz) set to average detect function and peak detect function.

Notes:

1. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 200 Hz at frequency below 150 kHz.
2. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 9 kHz or 10 kHz at frequency (150 kHz to 30 MHz).
3. All modes of operation were investigated and the worst-case emissions are reported.

For Radiated emission above 30 MHz

a. The EUT was placed on the top of a rotating table 0.8 meters 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.

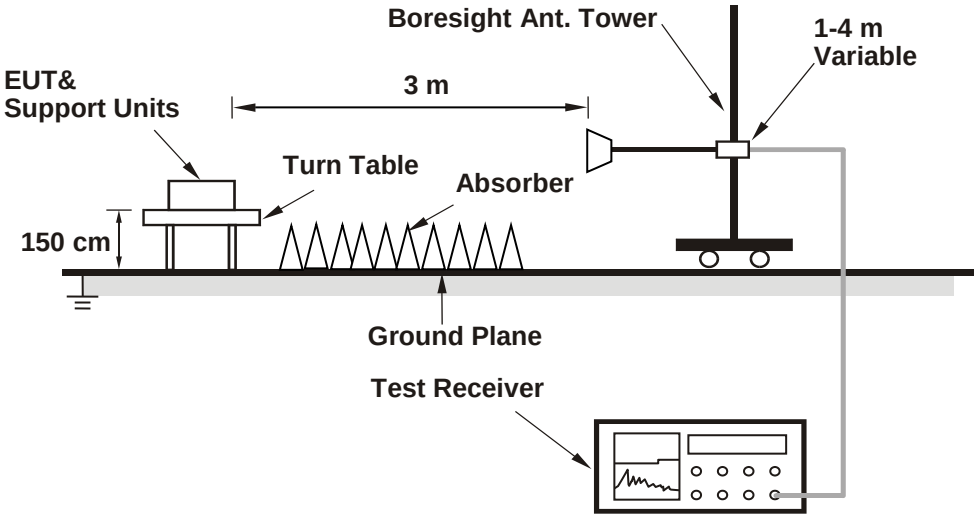
e. The test-receiver system was set to quasi-peak detect function and specified bandwidth with maximum hold mode when the test frequency is below 1 GHz.

Notes:

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

6.3 Radiated Emissions above 1 GHz

6.3.1 Test Setup



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

6.3.2 Test Procedure

a. The EUT was placed on the top of a rotating table 1.5 meters 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.

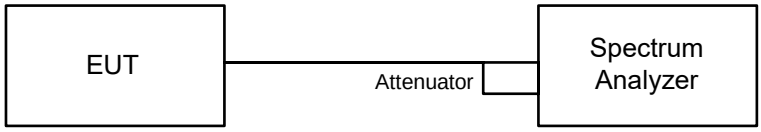
e. The test-receiver system was set to peak and average detects function and specified bandwidth with maximum hold mode when the test frequency is above 1 GHz. If the peak reading value also meets average limit, measurement with the average detector is unnecessary.

Notes:

1. The resolution bandwidth of test receiver/spectrum analyzer is 1 MHz and the video bandwidth is 3 MHz for Peak detection (PK) and Average detection (AV) at frequency above 1 GHz.
2. According to ANSI C63.10 section 6.6.4 and 4.1.4.2.2. For fundamental and harmonic signal measurement, according to ANSI C63.10 section 7.5, the average value = peak value + duty cycle correction factor. For duty cycle correction factor values, see the Test Signal Duty Cycle section in this report.
3. All modes of operation were investigated and the worst-case emissions are reported.

6.4 20 dB Bandwidth

6.4.1 Test Setup



6.4.2 Test Procedure

1) Set resolution bandwidth (RBW) = 1% to 5% of the OBW
2) Set the video bandwidth (VBW) ≥ 3 x RBW, Detector = Peak.
3) Trace mode = max hold.
4) Sweep = auto couple.
5) Measure the maximum width of the emission that is constrained by the frequencies associated with the two amplitude points (upper and lower) that are attenuated by 20 dB relative to the maximum level measured in the fundamental emission

7 Test Results of Test Item

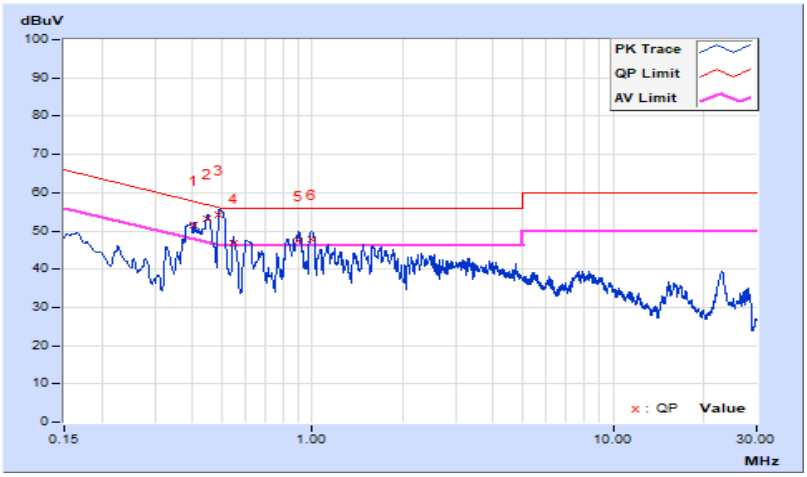
7.1 AC Power Conducted Emissions

RF Mode	Z-Wave	**Channel**	CH 0：908.4 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	Jed Wu		

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	0.40650	10.23	41.23	28.85	51.46	39.08	57.72	47.72	-6.26	-8.64
2	0.44700	10.24	42.93	33.94	53.17	44.18	56.93	46.93	-3.76	-2.75
3	**0.49168**	**10.25**	**43.91**	**30.29**	**54.16**	**40.54**	**56.14**	**46.14**	**-1.98**	**-5.60**
4	0.54600	10.26	36.52	24.79	46.78	35.05	56.00	46.00	-9.22	-10.95
5	0.90375	10.35	37.29	24.14	47.64	34.49	56.00	46.00	-8.36	-11.51
6	0.99506	10.37	37.36	17.69	47.73	28.06	56.00	46.00	-8.27	-17.94

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

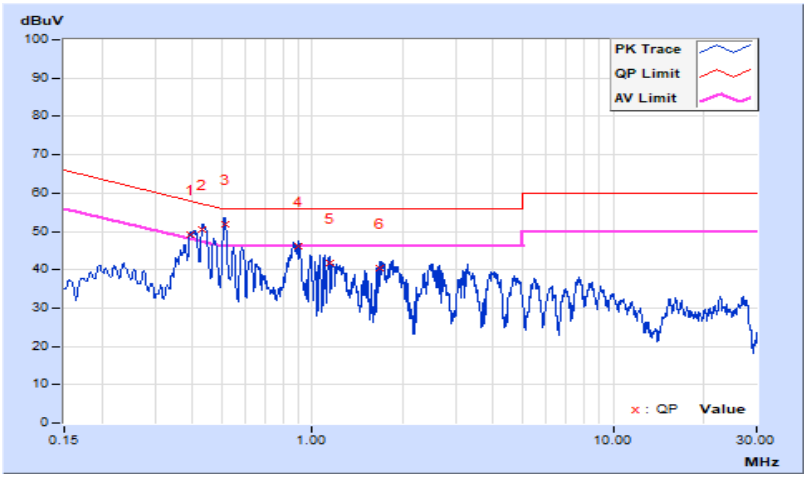


RF Mode	Z-Wave	**Channel**	CH 0：908.4 MHz
Frequency Range	150 kHz ~ 30 MHz	**Detector Function & Resolution Bandwidth**	Quasi-Peak (QP) / Average (AV), 9 kHz
Input Power	120 Vac, 60 Hz	**Environmental Conditions**	25°C, 75% RH
Tested By	Jed Wu		

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	0.39284	10.17	38.90	22.15	49.07	32.32	58.00	48.00	-8.93	-15.68
2	0.43316	10.17	40.47	21.91	50.64	32.08	57.19	47.19	-6.55	-15.11
3	0.51155	10.18	41.71	28.60	51.89	38.78	56.00	46.00	-4.11	-7.22
4	0.90375	10.24	35.83	19.03	46.07	29.27	56.00	46.00	-9.93	-16.73
5	1.14000	10.25	31.56	15.46	41.81	25.71	56.00	46.00	-14.19	-20.29
6	1.68225	10.26	30.27	15.30	40.53	25.56	56.00	46.00	-15.47	-20.44

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



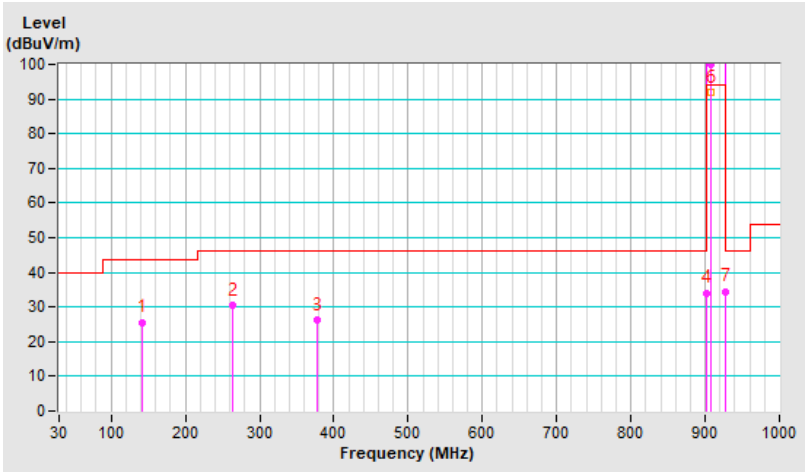
7.2 Radiated Emissions below 1 GHz

RF Mode	Z-Wave	**Channel**	CH 0：908.4 MHz
Frequency Range	30 MHz ~ 1 GHz	**Detector Function & Bandwidth**	QP: RB=120kHz, DET=Quasi-Peak PK: RB=1 MHz, VB=3 MHz, DET=Peak AV: RB=1 MHz, VB=3 MHz, DET=RMS
Input Power	120 Vac, 60 Hz	**Environmental Conditions**	25°C, 75% RH
Tested By	William Su		

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	142.52	25.4 QP	43.5	-18.1	1.15 H	140	34.2	-8.8
2	264.01	30.3 QP	46.0	-15.7	1.32 H	109	38.1	-7.8
3	377.11	26.1 QP	46.0	-19.9	1.19 H	360	30.7	-4.6
4	902.00	33.9 QP	46.0	-12.1	1.00 H	36	27.6	6.3
5	*908.40	99.9 PK	114.0	-14.1	1.00 H	36	93.2	6.7
6	*908.40	91.8 AV	94.0	-2.2	1.00 H	36	85.1	6.7
7	928.00	34.5 QP	46.0	-11.5	1.00 H	36	27.6	6.9

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.
6. " * ": Fundamental frequency.
7. The average value of fundamental and harmonic frequency is: Average = Peak value + 20 log(Duty cycle) Where the duty cycle correction factor is calculated from following formula:
   20 log(Duty cycle) = 20 log(5.3 ms / 13.5 ms) = -8.1 dB

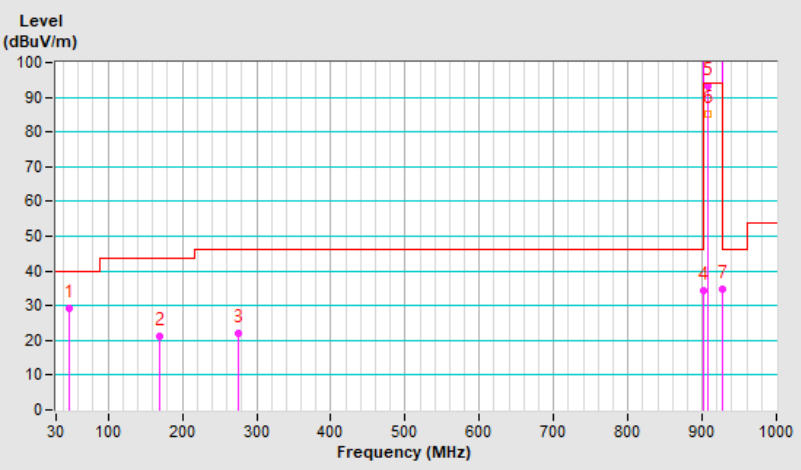


RF Mode	Z-Wave	Channel	CH 0：908.4 MHz
Frequency Range	30 MHz ~ 1 GHz	Detector Function & Bandwidth	QP: RB=120kHz, DET=Quasi-Peak PK: RB=1 MHz, VB=3 MHz, DET=Peak AV: RB=1 MHz, VB=3 MHz, DET=RMS
Input Power	120 Vac, 60 Hz	Environmental Conditions	25°C, 75% RH
Tested By	William Su		

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	48.43	29.4 QP	40.0	-10.6	1.12 V	18	38.4	-9.0
2	168.86	21.1 QP	43.5	-22.4	1.24 V	85	29.7	-8.6
3	275.56	22.1 QP	46.0	-23.9	1.32 V	192	29.2	-7.1
4	902.00	34.4 QP	46.0	-11.6	2.07 V	161	28.1	6.3
5	*908.40	93.2 PK	114.0	-20.8	2.07 V	161	86.5	6.7
6	*908.40	85.1 AV	94.0	-8.9	2.07 V	161	78.4	6.7
7	928.00	34.8 QP	46.0	-11.2	2.07 V	161	27.9	6.9

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.
6. " * ": Fundamental frequency.
7. The average value of fundamental and harmonic frequency is: Average = Peak value + 20 log(Duty cycle) Where the duty cycle correction factor is calculated from following formula:
   20 log(Duty cycle) = 20 log(5.3 ms / 13.5 ms) = -8.1 dB

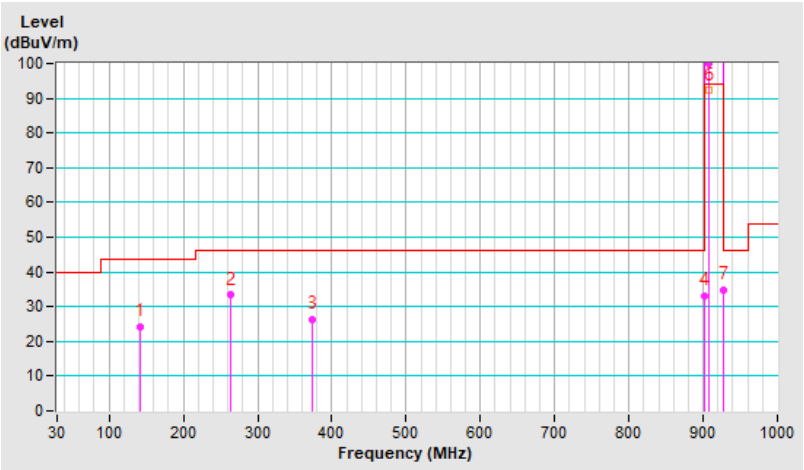


RF Mode	Z-Wave	Channel	CH 1：908.42 MHz
Frequency Range	30 MHz ~ 1 GHz	Detector Function & Bandwidth	QP: RB=120kHz, DET=Quasi-Peak PK: RB=1 MHz, VB=3 MHz, DET=Peak AV: RB=1 MHz, VB=3 MHz, DET=RMS
Input Power	120 Vac, 60 Hz	Environmental Conditions	25°C, 75% RH
Tested By	William Su		

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	141.74	24.1 QP	43.5	-19.4	1.12 H	134	33.1	-9.0
2	264.01	33.3 QP	46.0	-12.7	1.08 H	243	41.1	-7.8
3	373.77	26.2 QP	46.0	-19.8	1.31 H	34	30.9	-4.7
4	902.00	33.2 QP	46.0	-12.8	1.00 H	353	26.9	6.3
5	*908.42	99.8 PK	114.0	-14.2	1.00 H	353	93.1	6.7
6	*908.42	92.2 AV	94.0	-1.8	1.00 H	353	85.5	6.7
7	928.00	34.8 QP	46.0	-11.2	1.00 H	353	27.9	6.9

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.
6. " * ": Fundamental frequency.
7. The average value of fundamental and harmonic frequency is: Average = Peak value + 20 log(Duty cycle) Where the duty cycle correction factor is calculated from following formula:
   20 log(Duty cycle) = 20 log(21.772 ms / 51.98 ms) = -7.6 dB

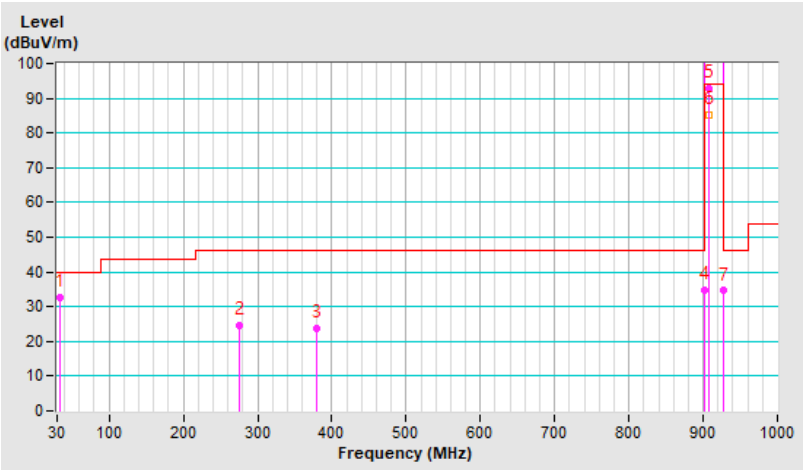


RF Mode	Z-Wave	Channel	CH 1：908.42 MHz
Frequency Range	30 MHz ~ 1 GHz	Detector Function & Bandwidth	QP: RB=120kHz, DET=Quasi-Peak PK: RB=1 MHz, VB=3 MHz, DET=Peak AV: RB=1 MHz, VB=3 MHz, DET=RMS
Input Power	120 Vac, 60 Hz	Environmental Conditions	25°C, 75% RH
Tested By	William Su		

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	34.66	32.6 QP	40.0	-7.4	1.24 V	118	43.0	-10.4
2	275.56	24.5 QP	46.0	-21.5	1.52 V	197	31.6	-7.1
3	378.96	23.8 QP	46.0	-22.2	1.13 V	192	28.4	-4.6
4	902.00	34.8 QP	46.0	-11.2	1.91 V	159	28.5	6.3
5	*908.42	92.7 PK	114.0	-21.3	1.91 V	159	86.0	6.7
6	*908.42	85.1 AV	94.0	-8.9	1.91 V	159	78.4	6.7
7	928.00	34.6 QP	46.0	-11.4	1.91 V	159	27.7	6.9

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.
6. " * ": Fundamental frequency.
7. The average value of fundamental and harmonic frequency is: Average = Peak value + 20 log(Duty cycle) Where the duty cycle correction factor is calculated from following formula:
   20 log(Duty cycle) = 20 log(21.772 ms / 51.98 ms) = -7.6 dB

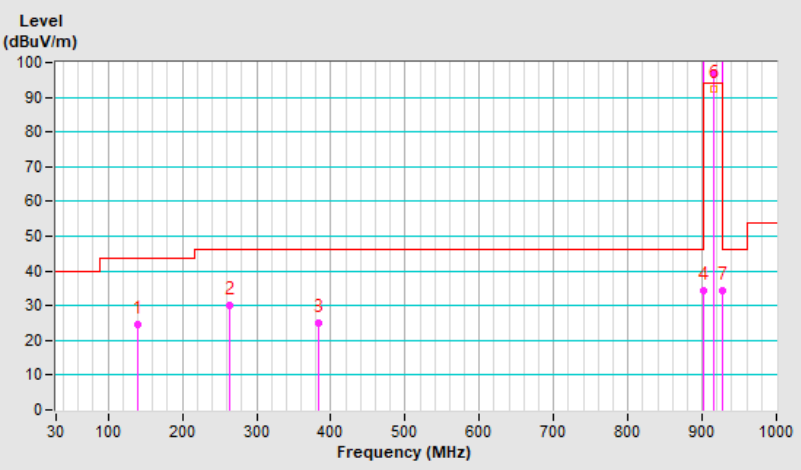


RF Mode	Z-Wave	Channel	CH 2：916 MHz
Frequency Range	30 MHz ~ 1 GHz	Detector Function & Bandwidth	QP: RB=120kHz, DET=Quasi-Peak PK: RB=1 MHz, VB=3 MHz, DET=Peak AV: RB=1 MHz, VB=3 MHz, DET=RMS
Input Power	120 Vac, 60 Hz	Environmental Conditions	25°C, 75% RH
Tested By	William Su		

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	140.87	24.6 QP	43.5	-18.9	1.16 H	163	33.7	-9.1
2	264.01	30.2 QP	46.0	-15.8	1.32 H	234	38.0	-7.8
3	383.27	24.9 QP	46.0	-21.1	1.51 H	35	29.5	-4.6
4	902.00	34.2 QP	46.0	-11.8	1.00 H	352	27.9	6.3
5	*916.00	97.0 PK	114.0	-17.0	1.00 H	352	90.1	6.9
6	***916.00**	**92.3 AV**	**94.0**	**-1.7**	**1.00 H**	**352**	**85.4**	**6.9**
7	928.00	34.2 QP	46.0	-11.8	1.00 H	352	27.3	6.9

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.
6. " * ": Fundamental frequency.
7. The average value of fundamental and harmonic frequency is: Average = Peak value + 20 log(Duty cycle) Where the duty cycle correction factor is calculated from following formula:
   20 log(Duty cycle) = 20 log(4.531 ms / 7.767 ms) = -4.7 dB

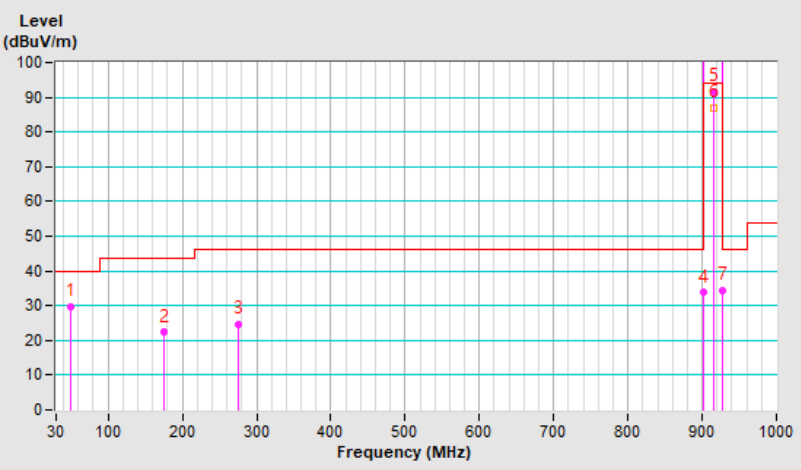


RF Mode	Z-Wave	Channel	CH 2：916 MHz
Frequency Range	30 MHz ~ 1 GHz	Detector Function & Bandwidth	QP: RB=120kHz, DET=Quasi-Peak PK: RB=1 MHz, VB=3 MHz, DET=Peak AV: RB=1 MHz, VB=3 MHz, DET=RMS
Input Power	120 Vac, 60 Hz	Environmental Conditions	25°C, 75% RH
Tested By	William Su		

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	48.67	29.7 QP	40.0	-10.3	1.15 V	12	38.7	-9.0
2	175.01	22.3 QP	43.5	-21.2	1.26 V	87	31.2	-8.9
3	275.70	24.6 QP	46.0	-21.4	1.08 V	192	31.7	-7.1
4	902.00	33.7 QP	46.0	-12.3	1.98 V	162	27.4	6.3
5	*916.00	91.5 PK	114.0	-22.5	1.98 V	162	84.6	6.9
6	*916.00	86.8 AV	94.0	-7.2	1.98 V	162	79.9	6.9
7	928.00	34.2 QP	46.0	-11.8	1.98 V	162	27.3	6.9

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.
6. " * ": Fundamental frequency.
7. The average value of fundamental and harmonic frequency is: Average = Peak value + 20 log(Duty cycle) Where the duty cycle correction factor is calculated from following formula:
   20 log(Duty cycle) = 20 log(4.531 ms / 7.767 ms) = -4.7 dB



7.3 Radiated Emissions above 1 GHz

RF Mode	Z-Wave	**Channel**	CH 0：908.4 MHz
Frequency Range	1 GHz ~ 25 GHz	**Detector Function & Bandwidth**	PK: RB=1 MHz, VB=3 MHz, DET=Peak AV: RB=1 MHz, VB=3 MHz, DET=RMS
Input Power	120 Vac, 60 Hz	**Environmental Conditions**	25°C, 75% RH
Tested By	William Su		

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	43.7 PK	74.0	-30.3	1.38 H	101	43.7	0.0
2	2725.20	35.6 AV	54.0	-18.4	1.38 H	101	35.6	0.0
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	42.6 PK	74.0	-31.4	1.58 V	116	42.6	0.0
2	2725.20	34.5 AV	54.0	-19.5	1.58 V	116	34.5	0.0

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. Margin value = Emission Level – Limit value
4. The other emission levels were very low against the limit.
5. The average value of fundamental and harmonic frequency is: Average = Peak value + 20 log(Duty cycle) Where the duty cycle correction factor is calculated from following formula:
   20 log(Duty cycle) = 20 log(5.3 ms / 13.5 ms) = -8.1 dB

RF Mode	Z-Wave	Channel	CH 1：908.42 MHz
Frequency Range	1 GHz ~ 25 GHz	Detector Function & Bandwidth	PK: RB=1 MHz, VB=3 MHz, DET=Peak AV: RB=1 MHz, VB=3 MHz, DET=RMS
Input Power	120 Vac, 60 Hz	Environmental Conditions	25°C, 75% RH
Tested By	William Su		

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	43.5 PK	74.0	-30.5	1.43 H	110	43.5	0.0
2	2725.26	35.9 AV	54.0	-18.1	1.43 H	110	35.9	0.0
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	42.3 PK	74.0	-31.7	1.54 V	123	42.3	0.0
2	2725.26	34.7 AV	54.0	-19.3	1.54 V	123	34.7	0.0

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. Margin value = Emission Level – Limit value
4. The other emission levels were very low against the limit.
5. The average value of fundamental and harmonic frequency is: Average = Peak value + 20 log(Duty cycle) Where the duty cycle correction factor is calculated from following formula:
   20 log(Duty cycle) = 20 log(21.772 ms / 51.98 ms) = -7.6 dB

RF Mode	Z-Wave	**Channel**	CH 2：916 MHz
Frequency Range	1 GHz ~ 25 GHz	**Detector Function & Bandwidth**	PK: RB=1 MHz, VB=3 MHz, DET=Peak AV: RB=1 MHz, VB=3 MHz, DET=RMS
Input Power	120 Vac, 60 Hz	**Environmental Conditions**	25°C, 75% RH
Tested By	William Su		

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	43.8 PK	74.0	-30.2	1.38 H	108	43.5	0.3
2	**2748.00**	**39.1 AV**	**54.0**	**-14.9**	**1.38 H**	**108**	**38.8**	**0.3**
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	42.5 PK	74.0	-31.5	1.53 V	111	42.2	0.3
2	2748.00	37.8 AV	54.0	-16.2	1.53 V	111	37.5	0.3

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.
5. The average value of fundamental and harmonic frequency is: Average = Peak value + 20 log(Duty cycle) Where the duty cycle correction factor is calculated from following formula:
   20 log(Duty cycle) = 20 log(4.531 ms / 7.767 ms) = -4.7 dB

7.4 20 dB Bandwidth

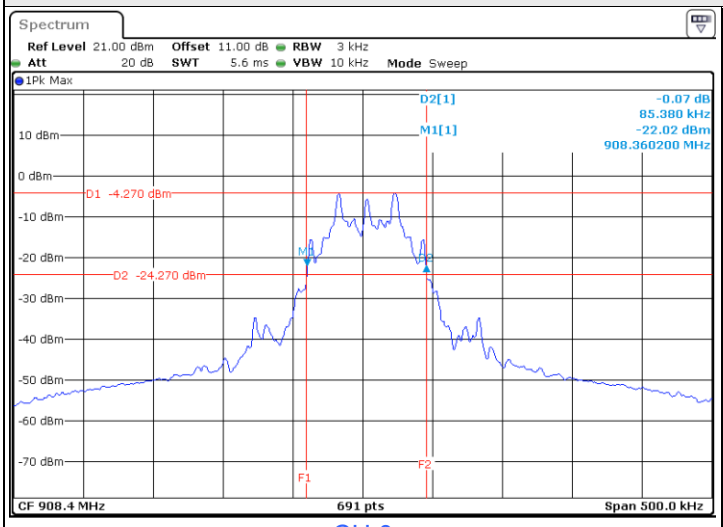
Input Power:	120 Vac, 60 Hz	Environmental Conditions:	25°C, 60% RH	Tested By:	Pirar Hsieh

Channel	Channel Frequency (MHz)	20 dB Bandwidth (MHz)	Measured Frequencies		Operating Frequency Band (MHz)	Test Result
			FL (MHz)	FH (MHz)		
0	908.4	0.08	908.36	908.44	902 ~ 928	Pass
1	908.42	0.06	908.39	908.45		Pass
2	916	0.11	915.94	916.05		Pass

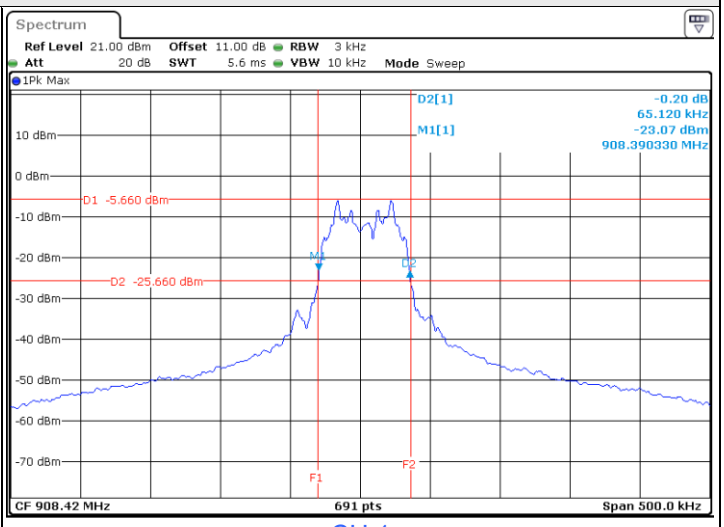
Notes:

1. FL is the lowest frequency of the 20 dB bandwidth of power envelope.
2. FH is the highest frequency of the 20 dB bandwidth of power envelope.

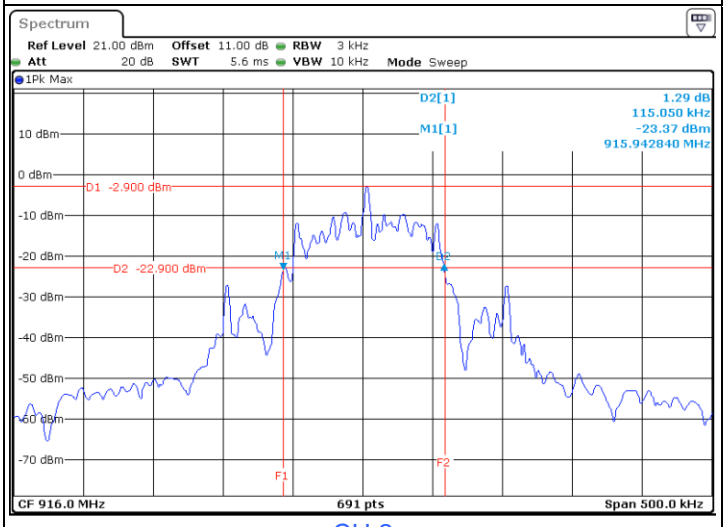
Spectrum Plot of Maximum Value



CH 0



CH 1



CH 2

8 Pictures of Test Arrangements

Please refer to the attached file (Test Setup Photo)

9 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 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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