## FCC 47 CFR PART 15 SUBPART C

## **TEST REPORT**

For

### Smart Home Gateway, Z-Wave Tool Box, Nexia Bridge, Smart Home Controller

Model:

NA301-ZWxxxxxxx (the 1st x should be "blank" or "-"; the rest x could be 0 to 9, A to Z, "blank" or "-", for marking purpose); BR200NX; ZWP-TBX; TGFX-HUB1; G150xxxxxxx (the 1st x should be ""blank"" or ""-""; the rest x could be 0 to 9, A to Z, ""blank" or ""-"", for marking purpose); VeraEdgexxxxxxx (the 1st x should be ""blank"" or ", for marking purpose); TRF-ZW2xxxxxx (the 1st x should be "blank" or "-"; the rest x could be 0 to 9, A to Z, "blank" or "-"; the rest x could be 0 to 9, A to Z, "blank" or "-"; the rest x could be 0 to 9, A to Z, "blank" or "-"; the rest x could be 0 to 9, A to Z, "blank" or "-"; the rest x could be 0 to 9, A to Z, "blank" or "-"; the rest x could be 0 to 9, A to Z, "blank" or "-"; the rest x could be 0 to 9, A to Z, "blank" or "-"; the rest x could be 0 to 9, A to Z, "blank" or "-"; the rest x could be 0 to 9, A to Z, "blank" or "-"; the rest x could be 0 to 9, A to Z, "blank" or "-"; the rest x could be 0 to 9, A to Z, "blank" or "-"; the rest x could be 0 to 9, A to Z, "blank" or "-"; the rest x could be 0 to 9, A to Z, "blank" or "-"; the rest x could be 0 to 9, A to Z, "blank" or "-"; the rest x could be 0 to 9, A to Z, "blank" or "-"; for marking purpose)

Trade Name: Sercomm; MiOS Limited; Accenture; Amdocs; Intamac; NorthQ; Vera Control, Ltd.; URC; Telguard; Zwaveproducts.com; NEXIA

Issued to

Sercomm Corporation 8F, No. 3-1, YuanQu St., NanKang, Taipei 115, Taiwan, R.O.C.

Issued by

Compliance Certification Services Inc. Wugu Laboratory No.11, Wugong 6th Rd., Wugu Dist., New Taipei City 24891, Taiwan. (R.O.C.) http://www.ccsrf.com service@ccsrf.com Issued Date: December 13, 2017



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### **Revision History**

Rev.	lssue Date	Revisions	Effect Page	Revised By
00	December 13, 2017	Initial Issue	ALL	Allison Chen
01	January 4, 2018	Rev. (01)	P.22, P.31	Allison Chen

Rev. (01)

1. Added field strength of fundamental frequency with AVG limit.

2. Modify setup photo below 1GHz.

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## 1. TEST RESULT CERTIFICATION

STAND	ARD	TEST RESULT			
	APPLICABLE ST	TANDARDS			
Date of Test:December 5 ~ December 12, 2017					
Trade Name:	Sercomm; MiOS Limited; Accenture; Amdocs; Intamac; NorthQ; Vera Control, Ltd.; URC; Telguard; Zwaveproducts.com; NEXIA				
Model Number:	NA301-ZWxxxxxxx (the 1st x should be "blank" or "-"; the rest x could be 0 to 9, A to Z, "blank" or "-", for marking purpose); BR200NX; ZWP-TBX; TGFX-HUB1; G150xxxxxxx (the 1st x should be ""blank"" or ""-""; the re x could be 0 to 9, A to Z, ""blank"" or ""-"", for marking purpose); VeraEdgexxxxxxx (the 1st x should be ""blank"" or ""-""; the rest x could be 0 to 9, A to Z, ""blank"" or ""-"", f marking purpose); TRF-ZW2xxxxxxx (the 1st x should be "blank" or "-"; the rest x could be 0 to 9, A to Z, "blank" or " for marking purpose)				
Equipment Under Test:	Smart Home Gateway; Z-Wave Tool Box; Nexia Bridge; Smart Home Controller				
Manufacturer:	Sercomm Corporati 8F, No. 3-1, YuanQ R.O.C.	ion ≀u St., NanKang, Taipei 115, Taiwan,			
Applicant:	Sercomm Corporation 8F, No. 3-1, YuanQu St., NanKang, Taipei 115, Taiwan, R.O.C.				

# We hereby certify that:

FCC 47 CFR Part 15 Subpart C

The above equipment was tested by Compliance Certification Services Inc. The test data, data evaluation, test procedures, and equipment configurations shown in this report were made in accordance with the procedures given in ANSI C63.10: 2013 and the energy emitted by the sample EUT tested as described in this report is in compliance with the requirements emission limits of FCC Rules Part 15.107, 15.109,15.207, 15.209 and 15.249.

No non-compliance noted

The test results of this report relate only to the tested sample EUT identified in this report.



Approved by:

Seen Clearing

Sam Chuang Manager Compliance Certification Services Inc.

Tested by:

Allison Chen

Allison Chen Assistant Compliance Certification Services Inc.

## 2. EUT DESCRIPTION

Product	Smart He Controlle	ome Gat er	eway; Z-	Wave To	ol Box;	Nexia Brido	ge; Smar	t Home
Model Number	NA301-Z be 0 to 9	NA301-ZWxxxxxxxx (the 1st x should be "blank" or "-"; the rest x could be 0 to 9, A to Z, "blank" or "-" , for marking purpose)						
Trade Name	Sercomr Control,	Sercomm; MiOS Limited; Accenture; Amdocs; Intamac; NorthQ; Vera Control, Ltd.; URC; Telguard; Zwaveproducts.com; NEXIA						
	<ol> <li>All the model numbers (list on this report) are identical, just for marketing purpose only except Brand.</li> <li>The means of "x" (The "x" in model name can be 0 to 9, A to Z, blank or "-", for marking purpose) on model number are identical, just for marketing purpose only.</li> <li>Client consigns only one model sample (Model number: NA301-ZW-US) to test. Therefore testing Lab. just guarantees the units, which have been tested.</li> </ol>							
Model Discrepancy		1	2	3	4	5	6	7
	Product	Nexia Bridge	Z-Wave Tool Box	Smart Home Gateway	Smart Hom Gateway	e Smart Home Controller	Smart Home Gateway	Smart Home Gateway
	Model Number	BR200NX	ZWP-TBX	NA301- ZWxxxxxxx	G150xxxxx	xxx VeraEdgexxxx xxxx	TGFX-HUB1	TRF- ZW2xxxxxxx x
	Trade Name Note : for N	NEXIA Aodel (the 1st	Zwaveprodu cts.com t x should be "	Sercomm blank" or "-"	MiOS Limit	ed Vera Control, Ltd. ould be 0 to 9, A t	Telguard	URC or "-", for
	marking pu	rpose)						
Received Date	Novemb	er 30, 20	)17					
Power Supply	Vdc from Power Adapter 1. APD / WA-12M12FU(V) I/P: 100-240VAC, 50/60HZ, 0.5A O/P: 12VDC, 1.0A 2. Sunny / SYS-1381-1212-W2 I/P: 100-240VAC, 50/60HZ, 0.5A O/P: 12VDC, 1.0A 3. Leader / MU12AR120100-A1 (VI) I/P: 100-240VAC, 50/60HZ, 0.3A O/P: 12VDC, 1.0A 4. APD / WA-12M12FU (VI) I/P: 100-240VAC, 50/60HZ, 0.5A							
RF Module Manufacturer	<b>BIGMA</b> DESIGNS MODEl SD3502A-CNE3							
<b>Operating Frequency</b>	916 MHz	2						
Modulation Technique	FSK							
Transfer Rate	9.6/40/10	00kbps						

RF Field Strength 99.52dBuV/m @peak			
Antenna Gain 0.56dBi			
Antenna Specification	PIFA Antenna		

#### Remark:

1. The sample selected for test was engineering sample that approximated to production product and was

provided by manufacturer.
2. This submittal(s) (test report) is intended for FCC ID: <u>P27NA301ZW</u> filing to comply with Section 15.207, 15.209, 15.249.

## 3. TEST METHODOLOGY

The tests documented in this report were performed in accordance with ANSI C63.10: 2013 and FCC Part 15.205, Part 15.207, Part 15.209

## 3.1 EUT CONFIGURATION

The EUT configuration for testing is installed on RF field strength measurement to meet the Commissions requirement and operating in a manner that intends to maximize its emission characteristics in a continuous normal application.

## 3.2 EUT EXERCISE

The EUT was operated in the engineering mode to fix the TX frequency that was for the purpose of the measurements.

According to its specifications, the EUT must comply with the requirements of the Section 15.107 and 15.109 under the FCC Rules Part 15 Subpart B and Section 15.207, 15.209,15.249 under the FCC Rules Part 15 Subpart C.

## 3.3 GENERAL TEST PROCEDURES

### **Conducted Emissions**

The EUT is placed on the turntable, which is 0.8 m above ground plane. According to the requirements in ANSI C63.10: 2013 Conducted emissions from the EUT measured in the frequency range between 0.15 MHz and 30MHz using CISPR Quasi-peak and average detector modes.

### **Radiated Emissions**

The EUT is placed on a turn table, which is 1.5 m above ground plane. The turntable shall rotate 360 degrees to determine the position of maximum emission level. EUT is set 3m away from the receiving antenna, which varied from 1m to 4m to find out the highest emission. And also, each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical. In order to find out the maximum emissions, exploratory radiated emission measurements were made according to the requirements in ANSI C63.10: 2013.

## 3.4 FCC PART 15.205 RESTRICTED BANDS OF OPERATIONS

(a) Except as shown in paragraph (d) of this section, only spurious emissions are permitted in any of the frequency bands listed below:

MHz	MHz	MHz	GHz
0.090 - 0.110	16.42 - 16.423	399.9 - 410	4.5 - 5.15
<sup>1</sup> 0.495 - 0.505	16.69475 - 16.69525	608 - 614	5.35 - 5.46
2.1735 - 2.1905	16.80425 - 16.80475	960 - 1240	7.25 - 7.75
4.125 - 4.128	25.5 - 25.67	1300 - 1427	8.025 - 8.5
4.17725 - 4.17775	37.5 - 38.25	1435 - 1626.5	9.0 - 9.2
4.20725 - 4.20775	73 - 74.6	1645.5 - 1646.5	9.3 - 9.5
6.215 - 6.218	74.8 - 75.2	1660 - 1710	10.6 - 12.7
6.26775 - 6.26825	108 - 121.94	1718.8 - 1722.2	13.25 - 13.4
6.31175 - 6.31225	123 - 138	2200 - 2300	14.47 - 14.5
8.291 - 8.294	149.9 - 150.05	2310 - 2390	15.35 - 16.2
8.362 - 8.366	156.52475 -	2483.5 - 2500	17.7 - 21.4
8.37625 - 8.38675	156.52525	2655 - 2900	22.01 - 23.12
8.41425 - 8.41475	156.7 - 156.9	3260 - 3267	23.6 - 24.0
12.29 - 12.293	162.0125 - 167.17	3332 - 3339	31.2 - 31.8
12.51975 - 12.52025	167.72 - 173.2	3345.8 - 3358	36.43 - 36.5
12.57675 - 12.57725	240 - 285	3600 - 4400	(2)
13.36 - 13.41	322 - 335.4		

 $^{1}$  Until February 1, 1999, this restricted band shall be 0.490-0.510 MHz.  $^{2}$  Above 38.6

(b) Except as provided in paragraphs (d) and (e), the field strength of emissions appearing within these frequency bands shall not exceed the limits shown in Section 15.209. At frequencies equal to or less than 1000 MHz, compliance with the limits in Section 15.209 shall be demonstrated using measurement instrumentation employing a CISPR quasi-peak detector. Above 1000 MHz, compliance with the emission limits in Section 15.209 shall be demonstrated based on the average value of the measured emissions. The provisions in Section 15.35 apply to these measurements.

## 3.5 DESCRIPTION OF TEST MODES

The EUT (model: NA301-ZW-US) comes with four types of power adapter (model: WA-12M12FU(V) / SYS-1381-1212-W2 / MU12AR120100-A1 (VI) / WA-12M12FU (VI)) for sale. After the preliminary test, the power adapter WA-12M12FU was found to emit the worst emissions and therefore had been tested under operating condition.

Software used to control the EUT for staying in continuous transmitting mode was programmed.

After verification, all tests were carried out with the worst case test modes as shown below except radiated spurious emission below 1GHz and power line conducted emissions below 30MHz, which worst case was in normal link mode.

## 4. INSTRUMENT CALIBRATION

## 4.1 MEASURING INSTRUMENT CALIBRATION

The measuring equipment, which was utilized in performing the tests documented herein, has been calibrated in accordance with the manufacturer's recommendations for utilizing calibration equipment, which is traceable to recognized national standards.

### 4.2 MEASUREMENT EQUIPMENT USED Equipment Used for Emissions Measurement

**Remark:** Each piece of equipment is scheduled for calibration once a year and Loop Antenna is scheduled for calibration once three years.

RF Conducted Test Site						
Name of Equipment	Manufacturer	Model	Serial Number	Cal. Date	Cal. Due	
Power Meter	Anritsu	ML2495A	1033009	04/11/2017	04/10/2018	
Power Sensor	Anritsu	MA2411B	917072	07/03/2017	07/02/2018	
Spectrum Analyzer	R&S	FSV 40	101073	10/02/2017	10/01/2018	
Thermostatic/Hrgrosatic Chamber	GWINSTEK	GTC-288MH-CC	TH160402	05/23/2017	05/22/2018	
Directional Coupler	Agilent	87301D	MY44350252	07/25/2017	07/24/2018	
SUCOFLEX Cable	HUBER SUHNER	SUCOFLEX 104PEA	25157	07/31/2017	07/30/2018	
Divider	Solvang Technology	2-18GHz 4Way	STI08-0015	07/26/2017	07/25/2018	

Wugu 966 Chamber A						
Name of Equipment Manufacturer Model Serial Number Cal. Date C						
Bilog Antenna	Sunol Sciences	JB3	A030105	06/20/2017	06/19/2018	
Pre-Amplifier	EMEC	EM330	060609	06/07/2017	06/06/2018	
Spectrum Analyzer	Agilent	E4446A	US42510252	11/27/2017	11/26/2018	
Antenna Tower	CCS	CC-A-1F	N/A	N.C.R	N.C.R	
Controller	CCS	CC-C-1F	N/A	N.C.R	N.C.R	
Turn Table	CCS	CC-T-1F	N/A	N.C.R	N.C.R	
Pre-Amplifier	HP	8449B	3008A00965	06/27/2017	06/26/2018	
Software	EZ-EMC (CCS-3A1RE)					

### Remark:

1. Each piece of equipment is scheduled for calibration once a year and Precision Dipole is scheduled for calibration once three years.

2. N.C.R. = No Calibration Request.

Conducted Emissions Test Site#B							
Name of Equipment	Manufacturer	Cal. Date	Cal. Due				
LISN	R&S	ENV216	101054	05/18/2017	05/17/2018		
LISN	SCHWARZBECK	NSLK 8127	8127-541	02/14/2017	02/13/2018		
EMI Test Receiver	R&S	ESCI	100064	05/17/2017	05/16/2018		
SUCOFLEX Cable	HUBER SUHNER	SUCOFLEX 104PEA	25157	07/31/2017	07/30/2018		
EMCI	CABLE	CFD300-NL	FERF	07/03/2017	07/02/2018		
Digital Thermo-Hygro Meter	WISEWIND	1110	D03	02/24/2017	07/23/2018		

#### Remark:

1. Each piece of equipment is scheduled for calibration once a year and Precision Dipole is scheduled for calibration once three years.

2. N.C.R. = No Calibration Request.

## 4.3 MEASUREMENT UNCERTAINTY

PARAMETER	UNCERTAINTY
Powerline Conducted Emission	+/- 1.2575
3M Semi Anechoic Chamber / 30M~200M	+/- 4.0138
3M Semi Anechoic Chamber / 200M~1000M	+/- 3.9483
3M Semi Anechoic Chamber / 1G~8G	+/- 2.5975
3M Semi Anechoic Chamber / 8G~18G	+/- 2.6112
3M Semi Anechoic Chamber / 18G~26G	+/- 2.7389
3M Semi Anechoic Chamber / 26G~40G	+/- 2.9683

**Remark**: This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k=2.

## 5. FACILITIES AND ACCREDITATIONS

## 5.1 FACILITIES

All measurement facilities used to collect the measurement data are located at

No.199, Chunghsen Road, Hsintien City, Taipei Hsien, Taiwan, R.O.C.
 Tel: 886-2-2217-0894 / Fax: 886-2-2217-1029

No.11, Wugong 6th Rd., Wugu Dist., New Taipei City 24891, Taiwan. (R.O.C.)
 Tel: 886-2-2299-9720 / Fax: 886-2-2298-4045

The sites are constructed in conformance with the requirements of ANSI C63.7, ANSI C63.10: 2013 and CISPR Publication 22.

### 5.2 EQUIPMENT

Radiated emissions are measured with one or more of the following types of linearly polarized antennas: tuned dipole, biconical, log periodic, bi-log, and/or ridged waveguide, horn. Spectrum analyzers with pre-selectors and quasi-peak detectors are used to perform radiated measurements.

Conducted emissions are measured with Line Impedance Stabilization Networks and EMI Test Receivers.

Calibrated wideband preamplifiers, coaxial cables, and coaxial attenuators are also used for making measurements.

All receiving equipment conforms to CISPR Publication 16-1, "Radio Interference Measuring Apparatus and Measurement Methods."

## 6. SETUP OF EQUIPMENT UNDER TEST

## 6.1 SETUP CONFIGURATION OF EUT

See test photographs attached in Appendix I for the actual connections between EUT and support equipment.

## 6.2 SUPPORT EQUIPMENT

I	No	Equipment	Brand	Model	Series No.	FCC ID	Data Cable	Power Cord
	1.	USB 2.0 Storage Media	SDCZ52-016G	N/A	D33724	SanDisk	N/A	N/A
	2.	NB(G)	IBM 1951	N/A	N/A	PD9LEN3945ABG	Unshielded, 20m	Unshielded, 1.8m



- 1. All the equipment/cables were placed in the worst-case configuration to maximize the emission during the test.
- 2. Grounding was established in accordance with the manufacturer's requirements and conditions for the intended use.

## 7. FCC PART 15.249 REQUIREMENTS

## 7.1 OCCUPIED BANDWIDTH(99%) AND 6DB BANDWIDTH

### TEST LIMIT

None; for reporting purposes only.

### Test Configuration



## **TEST PROCEDURE**

- 1. Place the EUT on the table and set it in the transmitting mode.
- 2. Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to the spectrum analyzer.
- 3. Set the spectrum analyzer as RBW=100kHz, VBW = 300kHz, Span = 1MHz, Sweep = auto.
- 4. Set the spectrum analyzer as OBW(99%) function
- 5. Mark the peak frequency and 6dB frequency.
- 6. Repeat until all the rest channels are investigated.

## TEST RESULTS

Frequency	99% Bandwidth	6dB Bandwidth
(MHz)	(MHz)	(MHz)
916.0	0.0846	0.2055

### Test Plot

#### 99% Bandwidth



#### 6dB Bandwidth



Date: 5.DEC.2017 10:49:26

## 7.2 SPURIOUS EMISSION

1. In the section 15.249(a):

Except as provided in paragraph (b) of this section, the field strength of emissions from intentional radiators operated within these frequency bands shall comply with the following:

Fundamental Frequency (MHz)	Field Strength of Fundamental Field Strength (mV/m)	Field Strength of Harmonics (µV/m)		
902-928 MHz	50	500		
2400 - 2483.5 MHz	50	500		
5725 - 5875 MHz	50	500		
24.0 - 24.25 GHz	250	2500		

2. Except as provided elsewhere in this Subpart, the emissions from an intentional radiator shall not exceed the field strength levels specified in the following table:

Frequency (MHz)	Field Strength (µV/m)	Measurement Distance (m)
30-88	100*	3
88-216	150*	3
216-960	200*	3
Above 960	500	3

**Remark:** Except as provided in paragraph (g), fundamental emissions from intentional radiators operating under this Section shall not be located in the frequency bands 54-72 MHz, 76-88 MHz, 174-216 MHz or 470-806 MHz. However, operation within these frequency bands is permitted under other sections of this Part, e.g., Sections 15.231 and 15.241.

3. In the above emission table, the tighter limit applies at the band edges.

Frequency (MHz)	Field Strength (μV/m at 3-meter)	Field Strength (dBµV/m at 3-meter)
30-88	100	40
88-216	150	43.5
216-960	200	46
Above 960	500	54

**Test Configuration** 

### 9kHz ~ 30MHz









### Above 1 GHz



## TEST PROCEDURE

- 1. The EUT is placed on a turntable, Above 1 GHz is 1.5m high and below 1 GHz is 0.8m high above ground plane.
- 2. The turntable shall be rotated for 360 degrees to determine the position of maximum emission level.
- 3. EUT is set 3m away from the receiving antenna, which is varied from 1m to 4m to find out the highest emissions.
- 4. Maximum procedure was performed on the six highest emissions to ensure EUT compliance.
- 5. And also, each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical.
- 6. Set the spectrum analyzer in the following setting as:

### Below 30MHz

RBW=10kHz / VBW=30kHz / Sweep=AUTO

### 30 ~ 1000MHz:

RBW=100kHz / VBW=300KHz / Sweep=AUTO

### Above 1GHz:

- a) PEAK: RBW=1MHz / VBW=3MHz / Sweep=AUTO
- b) AVERAGE: RBW=1MHz / VBW=300Hz / Sweep=AUTO
- 7. Repeat above procedures until the measurements for all frequencies are complete.

## TEST RESULTS

No non-compliance noted.

### **Duty Cycle**

🔆 Agilent					RΤ		
	0	an 10 dD				Mkr1	5.717 ms
Norm						-2.	
10							
dB/							
LaAv							
L gilly							
W1 S2							
\$3 F\$							
AA							
<b>£</b> (f):							
Flun							
Contor 916 000 M	<u> </u>					<u> </u>	
Res RW 1 MHz	ΠZ	VRW 1 MH	17		Sween	ຸ 10 ms (	ран е пд 601 nts)
105 DA 1 1112		VDA I HII	12		011006	10 110 (	001 p(3)
Duty Cycle (%)	TX ON (ms)	1/T(KHz)	VB\	N			
100%	1.0000	-	300	Hz			

Notes: Duty cycle = TXon/TXall

### Field strength of fundamental frequency



No.	Frequency	Reading	Correct	Result	Limit	Margin	Remark
	(MHz)	(dBuV)	Factor(dB/m)	(dBuV/m)	(dBuV/m)	(dB)	
1	915.9800	101.27	-1.75	99.52	114.00	-14.48	peak
2	915.9800	91.96	-1.75	90.21	94.00	-3.79	AVG

## TEST DATA

Below 1	GHZ						
Operation	Operation Mode:916 MHzTe		Test Date:		December 6, 2017		
Tempera	ature:	24°C		Tested by:	ed by: Kevin Kuo		
Humidit	:y:	33% RH		Polarity:		Ver.	
80.0	dBuV/m						
						Limit1:	-
						Margin:	_
-							
		J		5			
30	×			×		Б Х	_
	2 X	3 ¥					
		× I					
_							_
_							
-20							
30.0	00 127.00 22	4.00 321.00	418.00 515.	00 612.00	709.00 806.	00 100	10.00 MHz
Frequen	cy Reading	Factor	Result	Limit (dBuV/m)	Margin (dB)	Remark	Ant.Pol.
(1112)		(dB/m)					(11/4)
66.8600	50.98	-21.42	29.56	40.00	-10.44	peak	V
115.360	0 38.17	-15.82	22.35	43.52	-21.17	peak	V
286.080	0 32.53	-14.21	18.32	46.02	-27.70	peak	V
341.370	0 34.08	-13.17	20.91	46.02	-25.11	peak	V
579.990	0 37.47	-7.18	30.29	46.02	-15.73	peak	V
915.610	0 30.79	-1.75	29.04	46.02	-16.98	peak	V

- 1. No emission found between lowest internal used/generated frequency to 30MHz (9kHz~30MHz)
- 2. Radiated emissions measured in frequency range from 30 MHz to 1000MHz were made with an instrument using peak/quasi-peak detector mode.
- 3. Quasi-peak test would be performed if the peak result were greater than the quasi-peak limit or as required by the applicant.
- 4. Measurements above show only up to 6 maximum emissions noted, or would be lesser, with " N/A " remark, if no specific emissions from the EUT are recorded (ie: margin>20dB from the applicable limit) and considered that's already beyond the background noise floor.
- 5. Margin (dB) = Remark result (dBuV/m) Quasi-peak limit (dBuV/m).



- 1. No emission found between lowest internal used/generated frequency to 30MHz (9kHz~30MHz)
- 2. Radiated emissions measured in frequency range from 30 MHz to 1000MHz were made with an instrument using peak/quasi-peak detector mode.
- 3. Quasi-peak test would be performed if the peak result were greater than the quasi-peak limit or as required by the applicant.
- 4. Measurements above show only up to 6 maximum emissions noted, or would be lesser, with "N/A" remark, if no specific emissions from the EUT are recorded (ie: margin>20dB from the applicable limit) and considered that's already beyond the background noise floor.
- 5. Margin (dB) = Remark result (dBuV/m) Quasi-peak limit (dBuV/m).

#### Above 1 GHz Operation TX / 916MHz / 1G-10G Test Date: December 11, 2017 Mode: **Temperature:** 24°C Tested by: Kevin Kuo Humidity: 33 % RH Polarity: Ver. 110.0 dBuV/m Limit1: Limit2: 70 30.0 1000.000 1900.00 2800.00 3700.00 4600.00 5500.00 6400.00 7300.00 8200.00 10000.00 MHz Ant.Pol. Frequency Reading Correction Result Limit Margin No Remark (dBuV) (dBuV/m) (MHz) (dBuV/m) (dB/m) (dB) (H/V) V 1 2748.000 40.29 -2.14 38.15 74.00 -35.85 peak

- 1. Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.
- 2. Radiated emissions measured in frequency above 1000MHz were made with an instrument using peak/average detector mode.
- 3. Average test would be performed if the peak result were greater than the average limit .
- 4. Data of measurement within this frequency range shown "----" in the table above means the reading of emissions are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.
- 5. Measurements above show only up to 6 maximum emissions noted, or would be lesser, with "N/A" remark, if no specific emissions from the EUT are recorded (ie: margin>20dB from the applicable limit) and considered that's already beyond the background noise floor.
- 6. Margin (dB) = Remark result (dBuV/m) Average limit (dBuV/m).



Operation TX / 916MHz / 1G-10G Test Date: December 11, 2017 Mode: Temperature: 24°C Tested by: Kevin Kuo 33 % RH Humidity: **Polarity:** Hor. 110.0 dBuV/m Limit1: Limit2: 70 30.0 1000.000 1900.00 2800.00 3700.00 4600.00 5500.00 6400.00 7300.00 8200.00 10000.00 MHz Frequency Reading Correction Result Limit Margin Ant.Pol. No Remark (MHz) (dBuV) (dB/m) (dBuV/m) (dBuV/m) (dB) (H/V) 1 2748.000 43.45 -2.1441.31 74.00 -32.69 Н peak

- 1. Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.
- 2. Radiated emissions measured in frequency above 1000MHz were made with an instrument using peak/average detector mode.
- 3. Average test would be performed if the peak result were greater than the average limit .
- 4. Data of measurement within this frequency range shown "----" in the table above means the reading of emissions are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.
- 5. Measurements above show only up to 6 maximum emissions noted, or would be lesser, with "N/A" remark, if no specific emissions from the EUT are recorded (ie: margin>20dB from the applicable limit) and considered that's already beyond the background noise floor.
- 6. Margin (dB) = Remark result (dBuV/m) Average limit (dBuV/m).

## 7.3 POWERLINE CONDUCTED EMISSIONS

## <u>LIMIT</u>

According to §15.207(a), for an intentional radiator that is designed to be connected to the public utility (AC) power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies within the band 150 kHz to 30 MHz shall not exceed the limits in the following table, as measured using a 50  $\mu$ H/50 ohms line impedance stabilization network (LISN). Compliance with the provisions of this paragraph shall be based on the measurement of the radio frequency voltage between each power line and ground at the power terminal. The lower limit applies at the boundary between the frequency ranges.

Frequency Range	Limits (dBµV)			
	Quasi-peak	Average		
0.15 to 0.50	66 to 56*	56 to 46*		
0.50 to 5	56	46		
5 to 30	60	50		

\* Decreases with the logarithm of the frequency.

### Test Configuration

See test photographs attached in Appendix I for the actual connections between EUT and support equipment.

## TEST PROCEDURE

- 1. The EUT was placed on a table, which is 0.8m above ground plane.
- 2. Maximum procedure was performed on the six highest emissions to ensure EUT compliance.
- 3. Repeat above procedures until all frequency measured were complete.

## TEST RESULTS

The initial step in collecting conducted data is a spectrum analyzer peak scan of the measurement range. Significant peaks are then marked as shown on the following data page, and these signals are then quasi-peaked.

## TEST RESULTS

### <u>Test Data</u>

<b>Operation Mode:</b>	Normal Link	Test Date:	December 12, 2017
Temperature:	24°C	Tested by:	Eric Lee
Humidity:	50% RH		

Freq. (MHz)	QP Reading (dBuV)	AV Reading (dBuV)	Corr. factor (dB/m)	QP Result (dBuV/m )	AV Result (dBuV/m )	QP Limit (dBuV)	AV Limit (dBuV)	QP Margin (dB)	AV Margin (dB)	Note
0.1660	42.41	35.48	0.05	42.46	35.53	65.16	55.16	-22.70	-19.63	L1
0.3540	40.92	32.02	0.05	40.97	32.07	58.87	48.87	-17.90	-16.80	L1
0.4820	34.09	17.91	0.05	34.14	17.96	56.30	46.30	-22.16	-28.34	L1
0.8540	30.16	19.65	0.07	30.23	19.72	56.00	46.00	-25.77	-26.28	L1
1.2300	28.06	15.79	0.07	28.13	15.86	56.00	46.00	-27.87	-30.14	L1
4.7940	26.21	14.97	0.10	26.31	15.07	56.00	46.00	-29.69	-30.93	L1
0.1580	36.02	25.98	0.12	36.14	26.10	65.57	55.57	-29.43	-29.47	L2
0.2100	32.63	18.59	0.12	32.75	18.71	63.21	53.21	-30.46	-34.50	L2
0.3500	37.34	29.97	0.13	37.47	30.10	58.96	48.96	-21.49	-18.86	L2
0.4860	27.86	14.52	0.13	27.99	14.65	56.24	46.24	-28.25	-31.59	L2
4.7660	20.84	10.18	0.23	21.07	10.41	56.00	46.00	-34.93	-35.59	L2
11.9460	15.80	11.27	0.37	16.17	11.64	60.00	50.00	-43.83	-38.36	L2

- 1. Measuring frequencies from 0.15 MHz to 30MHz.
- 2. The emissions measured in frequency range from 0.15 MHz to 30MHz were made with an instrument using Quasi-peak detector and average detector.
- 3. The IF bandwidth of SPA between 0.15MHz to 30MHz was 10kHz; the IF bandwidth of Test Receiver between 0.15MHz to 30MHz was 9kHz;
- 4. L1 = Line One (Live Line) / L2 = Line Two (Neutral Line)

### Test Plots

### Conducted emissions (Line 1)



Conducted emissions (Line 2)

