



RF TEST REPORT

Product Name: NAUTIZ X2-V

Model Name: NAUTIZ X2-V

FCC ID: YY3-B1424222

Issued For : Handheld Group AB

Strandgatan 40, 531 60, Lidköping

Issued By : Shenzhen LGT Test Service Co., Ltd.

Room 205, Building 13, Zone B, Zhenxiong Industrial Park,
No.177, Renmin West Road, Jinsha, Kengzi Street,
Pingshan District, Shenzhen, Guangdong, China

Report Number: LGT23J048RF04

Sample Received Date: Oct. 25, 2023

Date of Test: Oct. 25, 2023 – Dec. 07, 2023

Date of Issue: Dec. 07, 2023

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TEST REPORT CERTIFICATION

Applicant: Handheld Group AB
Address: Strandgatan 40, 531 60, Lidköping
Manufacturer: Handheld Group AB
Address: Strandgatan 40, 531 60, Lidköping
Product Name: NAUTIZ X2-V
Trademark: Handheld
Model Name: NAUTIZ X2-V
Sample Status: Normal
Sample Number: LGT2310072

APPLICABLE STANDARDS	
STANDARD	TEST RESULTS
FCC Part 15.407, Subpart E ANSI C63.10-2013	PASS

Prepared by:

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Zane Shan
Engineer

Approved by:

Vita Li

Vita Li
Technical Director





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Revision History

Rev.	Issue Date	Contents
00	Dec. 07, 2023	Initial Issue



1. SUMMARY OF TEST RESULTS

Test procedures according to the technical standards:

Part 15.407, KDB 789033 D02 General U-NII Test Procedures New Rules v02r01

FCC Part 15.407		
FCC standard	Test Item	Results
15.207	AC Conducted Emission	PASS
15.407 (a) /15.407 (e)	26dB/6dB &99% Bandwidth	PASS
15.407(a)	Maximum Conducted Output Power	PASS
15.407(b)/15.205/15.209	Radiated Emission And (bandedge Emissions) Measurement	PASS
15.407(a)	Power Spectral Density	PASS
15.407(c)	Automatically Discontinue Transmission	PASS
15.203/15.204	Antenna Requirement	PASS

NOTE:

(1) 'N/A' denotes test is not applicable in this Test Report.

(2) All tests are according to ANSI C63.10-2013.



1.1 TEST FACTORY

Company Name:	Shenzhen LGT Test Service Co., Ltd.
Address:	Room 205, Building 13, Zone B, Zhenxiong Industrial Park, No.177, Renmin West Road, Jinsha, Kengzi Street, Pingshan District, Shenzhen, Guangdong, China
Registration number:	746540
Accreditation Certificate:	A2LA Certificate No.: 6727.01
	FCC Registration No.: 746540
	CAB ID: CN0136

1.2 MEASUREMENT UNCERTAINTY

The reported uncertainty of measurement $y \pm U$, where expanded uncertainty U is based on a standard uncertainty multiplied by a coverage factor of $k=2$, providing a level of confidence of approximately **95** %.

No.	Item	Uncertainty
1	RF output power, conducted	$\pm 0.68\text{dB}$
2	Unwanted Emissions, conducted	$\pm 2.988\text{dB}$
3	All emissions, radiated 9K-30MHz	$\pm 2.84\text{dB}$
4	All emissions, radiated 30M-1GHz	$\pm 4.39\text{dB}$
5	All emissions, radiated 1G-6GHz	$\pm 5.10\text{dB}$
6	All emissions, radiated >6G	$\pm 5.48\text{dB}$
7	Conducted Emission (9KHz-150KHz)	$\pm 2.79\text{dB}$
8	Conducted Emission (150KHz-30MHz)	$\pm 2.80\text{dB}$
9	Bandwidth	$\pm 10.40\text{KHz}$
10	PSD	$\pm 1.5734\text{dB}$

Note: The measurement uncertainty is not included in the test result.



2. GENERAL INFORMATION

2.1 GENERAL DESCRIPTION OF THE EUT

Product Name:	NAUTIZ X2-V																							
Trademark:	Handheld																							
Model Name:	NAUTIZ X2-V																							
Series Model:	N/A																							
Model Difference:	N/A																							
Product Description:	<table border="1"> <tr> <td rowspan="10">Operation Frequency:</td> <td>IEEE 802.11a/n(HT20)/ac(VHT20): 5.180GHz-5.240GHz</td> </tr> <tr> <td>IEEE 802.11n(HT40)/ac(VHT40): 5.190GHz-5.230GHz</td> </tr> <tr> <td>IEEE 802.11ac(VHT80): 5.210GHz</td> </tr> <tr> <td>IEEE 802.11a/n(HT20)/ac(VHT20): 5.260GHz-5.320GHz</td> </tr> <tr> <td>IEEE 802.11 n(HT40)/ac(VHT40): 5.270GHz-5.310GHz</td> </tr> <tr> <td>IEEE 802.11ac(VHT80): 5.290GHz</td> </tr> <tr> <td>IEEE 802.11a/n(HT20)/ac(VHT20): 5.500GHz-5.700GHz</td> </tr> <tr> <td>IEEE 802.11 n(HT40)/ac(VHT40): 5.510GHz-5.670GHz</td> </tr> <tr> <td>IEEE 802.11ac(VHT80): 5.530GHz-5.610GHz</td> </tr> <tr> <td>I IEEE 802.11a/n(HT20)/ac(VHT20): 5.745GHz-5.825GHz</td> </tr> <tr> <td>IEEE 802.11a/n(HT40)/ac(VHT40): 5.755GHz-5.795GHz</td> </tr> <tr> <td>IEEE 802.11ac(VHT80): 5.775GHz</td> </tr> <tr> <td rowspan="3">Modulation Type:</td> <td>802.11a(OFDM): BPSK, QPSK, 16-QAM, 64-QAM</td> </tr> <tr> <td>802.11n(OFDM): BPSK, QPSK, 16-QAM, 64-QAM</td> </tr> <tr> <td>802.11ac (OFDM): BPSK, QPSK, 16-QAM, 64-QAM, 256-QAM</td> </tr> <tr> <td>Antenna Designation:</td> <td>FPC</td> </tr> <tr> <td>Antenna Gain(dBi)</td> <td>2.95</td> </tr> <tr> <td colspan="2">More details of EUT technical specification, please refer to the User Manual.</td> </tr> </table>	Operation Frequency:	IEEE 802.11a/n(HT20)/ac(VHT20): 5.180GHz-5.240GHz	IEEE 802.11n(HT40)/ac(VHT40): 5.190GHz-5.230GHz	IEEE 802.11ac(VHT80): 5.210GHz	IEEE 802.11a/n(HT20)/ac(VHT20): 5.260GHz-5.320GHz	IEEE 802.11 n(HT40)/ac(VHT40): 5.270GHz-5.310GHz	IEEE 802.11ac(VHT80): 5.290GHz	IEEE 802.11a/n(HT20)/ac(VHT20): 5.500GHz-5.700GHz	IEEE 802.11 n(HT40)/ac(VHT40): 5.510GHz-5.670GHz	IEEE 802.11ac(VHT80): 5.530GHz-5.610GHz	I IEEE 802.11a/n(HT20)/ac(VHT20): 5.745GHz-5.825GHz	IEEE 802.11a/n(HT40)/ac(VHT40): 5.755GHz-5.795GHz	IEEE 802.11ac(VHT80): 5.775GHz	Modulation Type:	802.11a(OFDM): BPSK, QPSK, 16-QAM, 64-QAM	802.11n(OFDM): BPSK, QPSK, 16-QAM, 64-QAM	802.11ac (OFDM): BPSK, QPSK, 16-QAM, 64-QAM, 256-QAM	Antenna Designation:	FPC	Antenna Gain(dBi)	2.95	More details of EUT technical specification, please refer to the User Manual.	
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Antenna Designation:	FPC																							
Antenna Gain(dBi)	2.95																							
More details of EUT technical specification, please refer to the User Manual.																								
Test Channel:	Please refer to the Note 3.																							
Adapter:	Input: AC 100-240V, 50/60Hz 0.4A Output: DC 5V, 5A																							
Battery:	Capacity: 4000mAh Rated Voltage: 3.85V Maximum Charge Voltage: 4.4V																							
Hardware Version:	H159XO MMI V05																							
Software Version:	13.00.000_HHGWFO001A																							
Connecting I/O Port(s):	Please refer to the Note 1.																							



Note

1. For a more detailed features description, please refer to the manufacturer's specifications or the User Manual.
2. The antenna information refers to the manufacturer provide report, applicable only to the tested sample identified in the report. Due to the incorrect antenna information, a series of problems such as the accuracy of the test results will be borne by the customer.

Operation Frequency of channel			
5.180GHz-5.240GHz		5.260GHz-5.320GHz	
Channel	Frequency	Channel	Frequency
36	5180	52	5260
38	5190	54	5270
40	5200	56	5280
42	5210	58	5290
44	5220	60	5300
46	5230	62	5310
48	5240	64	5320
5.500GHz-5.720GHz		5.745GHz-5.825GHz	
Channel	Frequency	Channel	Frequency
100	5500	149	5745
102	5510	151	5755
104	5520	153	5765
108	5540	157	5785
110	5550	159	5795
112	5560	161	5805
116	5580	165	5825
118	5590		
120	5600		
124	5620		
126	5630		
128	5640		
132	5660		
134	5670		
136	5680		
140	5700		
142	5710		
144	5720		

Note:

In section 15.31(m), regards to the operating frequency range over 10 MHz, the Lowest frequency, the middle frequency, and the highest frequency of channel were selected to perform the test, and the selected channel see below:

Carrier Frequency Channel

Channel List for 802.11a/n/ac(20MHz)							
Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)
36	5180	52	5260	100	5500	149	5745
40	5200	60	5300	116	5580	157	5785
48	5240	64	5320	140	5700	165	5825



Channel List for 802.11n/ac(40MHz)							
Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)
38	5190	54	5270	102	5510	151	5755
46	5230	62	5310	110	5550	159	5795
134	5670						

Channel List for 802.11ac(80MHz)							
Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)
42	5210	58	5290	106	5530	155	5775
122	5610						



2.2 DESCRIPTION OF TEST MODES

To investigate the maximum EMI emission characteristics generated from EUT, the test system was pre-scanning tested based on the consideration of following EUT operation mode or test configuration mode which possibly have effect on EMI emission level. Each of these EUT operation mode(s) or test configuration mode(s) mentioned above was evaluated respectively.

Worst Mode	Description	Data Rate
Mode 1	TX IEEE 802.11a HT20 CH36&CH40&CH48	6 Mbps
Mode 2	TX IEEE 802.11a HT20 CH52&CH60&CH64	6 Mbps
Mode 3	TX IEEE 802.11a HT20 CH149&CH157&CH165	6 Mbps
Mode 4	TX IEEE 802.11n HT20 CH36&CH40&CH48	MCS 0
Mode 5	TX IEEE 802.11ac VHT20 CH36&CH40&CH48	NSS1 MCS0
Mode 6	TX IEEE 802.11n HT20 CH52&CH60&CH64	MCS 0
Mode 7	TX IEEE 802.11ac VHT20 CH52&CH60&CH64	NSS1 MCS0
Mode 8	TX IEEE 802.11n HT20 CH149&CH157&CH165	MCS 0
Mode 9	TX IEEE 802.11ac VHT20 CH149&CH157&CH165	NSS1 MCS0
Mode 10	TX IEEE 802.11n HT40 CH38&CH46	MCS 0
Mode 11	TX IEEE 802.11ac VHT40 CH38&CH46	NSS1 MCS0
Mode 12	TX IEEE 802.11n HT40 CH54 &CH62	MCS 0
Mode 13	TX IEEE 802.11ac VHT40 CH54 &CH62	NSS1 MCS0
Mode 14	TX IEEE 802.11n HT40 CH151&CH159	MCS 0
Mode 15	TX IEEE 802.11ac VHT40 CH151&CH159	NSS1 MCS0
Mode 16	TX IEEE 802.11ac VHT80 CH42	NSS1 MCS0
Mode 17	TX IEEE 802.11ac VHT80 CH58	NSS1 MCS0
Mode 18	TX IEEE 802.11ac VHT80 CH155	NSS1 MCS0

- Note: (1) The measurements are performed at the highest, middle, lowest available channels.
 (2) The measurements are performed at all Bit Rate of Transmitter, the worst data was reported.
 (3) We have been tested for all available U.S. voltage and frequencies (For 120V, 50/60Hz and 240V, 50/60Hz) for which the device is capable of operation.
 (4) The battery is fully-charged during the radiated and RF conducted test.
 (5) All 20M, 40M bandwidth modes have been tested, and the report only shows the worst mode data

AC Conducted Emission

Test Case	
AC Conducted Emission	Mode 19: TX Mode



2.3 TEST SOFTWARE AND POWER LEVEL

During testing channel & power controlling software provided by the customer was used to control the operating channel as well as the output power level.

Test software Version	Test program: 5G WIFI B1	
Engineering Mode	Mode Or Modulation type	Power setting
	a	17
	n20	17
	n40	17
	ac20	17
	ac40	17
	ac80	17
Test software Version	Test program: 5G WIFI B2	
Engineering Mode	Mode Or Modulation type	Power setting
	a	17
	n20	17
	n40	17
	ac20	17
	ac40	17
	ac80	17
Test software Version	Test program: 5G WIFI B3	
Engineering Mode	Mode Or Modulation type	Power setting
	a	17
	n20	17
	n40	17
	ac20	17
	ac40	17
	ac80	17
Test software Version	Test program: 5G WIFI B4	
Engineering Mode	Mode Or Modulation type	Power setting
	a	15
	n20	15
	n40	15
	ac20	15
	ac40	15
	ac80	15



2.4 DESCRIPTION OF NECESSARY ACCESSORIES AND 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.

Accessories Equipment

Description	Manufacturer	Model	S/N	Rating
Adapter	SHENZHNE FUJIA APPLIANCE CO., LTD	FJ- SW1260502000 UN	N/A	Input: 100-240V ~ 50/60Hz 0.4A Output: 5V, 2A
USB-A to USB-C Cable	N/A	N/A	N/A	0.8m, shielded, without ferrite core
Charging base	N/A	YD5PUSBA-A5	N/A	N/A

Auxiliary Equipment

Description	Manufacturer	Model	S/N	Rating

Note:

- (1) For detachable type I/O cable should be specified the length in cm in 『Length』 column.



2.5 EQUIPMENTS LIST FOR ALL TEST ITEMS

Conducted Emission					
Equipment	Manufacturer	Model No.	Serial No.	Cal. Date	Cal. Until
EMI Test Receiver	R&S	ESU8	100372	2023.04.13	2024.04.12
LISN	COM-POWER	LI-115	02032	2023.04.07	2024.04.06
LISN	SCHWARZBECK	NNLK 8122	00160	2023.04.07	2024.04.06
Transient Limiter	CYBERTEK	EM5010A	E225010004 9	2023.04.07	2024.04.06
Temperature & Humidity	KTJ	TA218B	N.A	2023.04.24	2024.04.23
Testing Software	EMC-I_V1.4.0.3_SKET				

Radiated Test equipment					
Equipment	Manufacturer	Model No.	Serial No.	Cal. Date	Cal. Until
EMI Test Receiver	R&S	ESU8	100372	2023.04.13	2024.04.12
Active loop Antenna	ETS	6502	00049544	2022.06.02	2025.06.01
Spectrum Analyzer	Keysight	N9010B	MY60242508	2023.04.10	2024.04.09
Bilog Antenna(30M-1G)	SCHWARZBECK	VULB 9168	2705	2022.06.05	2025.06.04
Horn Antenna(1-18G)	SCHWARZBECK	3115	10SL0060	2022.06.02	2025.06.01
Horn Antenna(18-40G)	A-INFO	LB-180400-KF	J211060273	2022.06.08	2025.06.07
Pre-amplifier(30M-1G)	EMtrace	RP01A	02019	2023.04.07	2024.04.06
Pre-amplifier(1-26.5G)	Agilent	8449B	3008A4722	2023.04.07	2024.04.06
Pre-amplifier(18-40G)	com-mw	LNPA_18-40- 01	18050003	2023.04.07	2024.04.06
Wireless Communications Test Set	R&S	CMW 500	137737	2023.04.13	2024.04.12
Temperature & Humidity	KTJ	TA218B	N.A	2023.04.24	2024.04.23
Testing Software	EMC-I_V1.4.0.3_SKET				

Conducted Test equipment					
Equipment	Manufacturer	Model No.	Serial No.	Cal. Date	Cal. Until
Signal Analyzer	Keysight	N9010B	MY60242508	2023.04.10	2024.04.09
Wireless Communications Test Set	R&S	CMW 500	137737	2023.04.13	2024.04.12
MXG Vector Signal Generator	Keysight	N5182B	MY59100717	2023.04.07	2024.04.06
Power Sensor	MW	MW100-RFCB	MW220324L G-33	2023.04.13	2024.04.12
Temperature & Humidity	KTJ	TA218B	N.A	2023.04.24	2024.04.23
Temperature & Humidity test chamber	AISRY	LX-1000L	171200018	2023.05.10	2024.05.09
Attenuator	eastsheep	90db	N.A	2023.04.10	2024.04.09
Testing Software	MTS8200_V2.0.0.0_MW				



3. EMC EMISSION TEST

3.1 CONDUCTED EMISSION MEASUREMENT

3.1.1 POWER LINE CONDUCTED EMISSION Limits (Frequency Range 150KHz-30MHz)

FREQUENCY (MHz)	Class B (dBuV)		Standard
	Quasi-peak	Average	
0.15 -0.5	66 - 56 *	56 - 46 *	CISPR
0.50 -5.0	56.00	46.00	CISPR
5.0 -30.0	60.00	50.00	CISPR

0.15 -0.5	66 - 56 *	56 - 46 *	FCC
0.50 -5.0	56.00	46.00	FCC
5.0 -30.0	60.00	50.00	FCC

Note:

- (1) The tighter limit applies at the band edges.
- (2) The limit of “ * ” marked band means the limitation decreases linearly with the logarithm of the frequency in the range.

The following table is the setting of the receiver

Receiver Parameters	Setting
Attenuation	10 dB
Start Frequency	0.15 MHz
Stop Frequency	30 MHz
IF Bandwidth	9 kHz

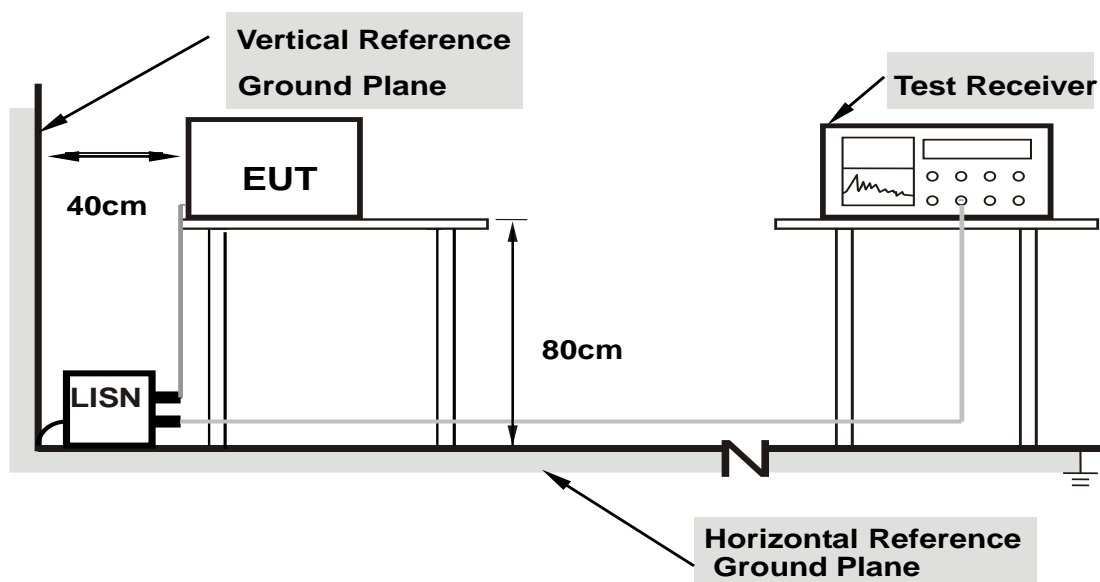
3.1.2 TEST PROCEDURE

- a. The EUT is 0.8 m from the horizontal ground plane and 0.4 m from the vertical ground plane with EUT being connected to the power mains through a line impedance stabilization network (LISN). All other support equipments are powered from additional LISN(s). The LISN provides 50 Ohm/ 50uH of coupling impedance for the measuring instrument.
- b. Interconnecting cables that hang closer than 40 cm to the ground plane shall be folded back and forth in the center forming a bundle 30 to 40 cm long.
- c. I/O cables that are not connected to a peripheral shall be bundled in the center. The end of the cable may be terminated, if required, using the correct terminating impedance. The overall length shall not exceed 1 m.
- d. LISN is at least 80 cm from the nearest part of EUT chassis.
- e. For the actual test configuration, please refer to the related Item –EUT Test Photos.

3.1.3 DEVIATION FROM TEST STANDARD

No deviation

3.1.4 TEST SETUP



Note: 1. Support units were connected to second LISN.

2. Both of LISNs (AMN) are 80 cm from EUT and at least 80 cm from other units and other metal planes support units.

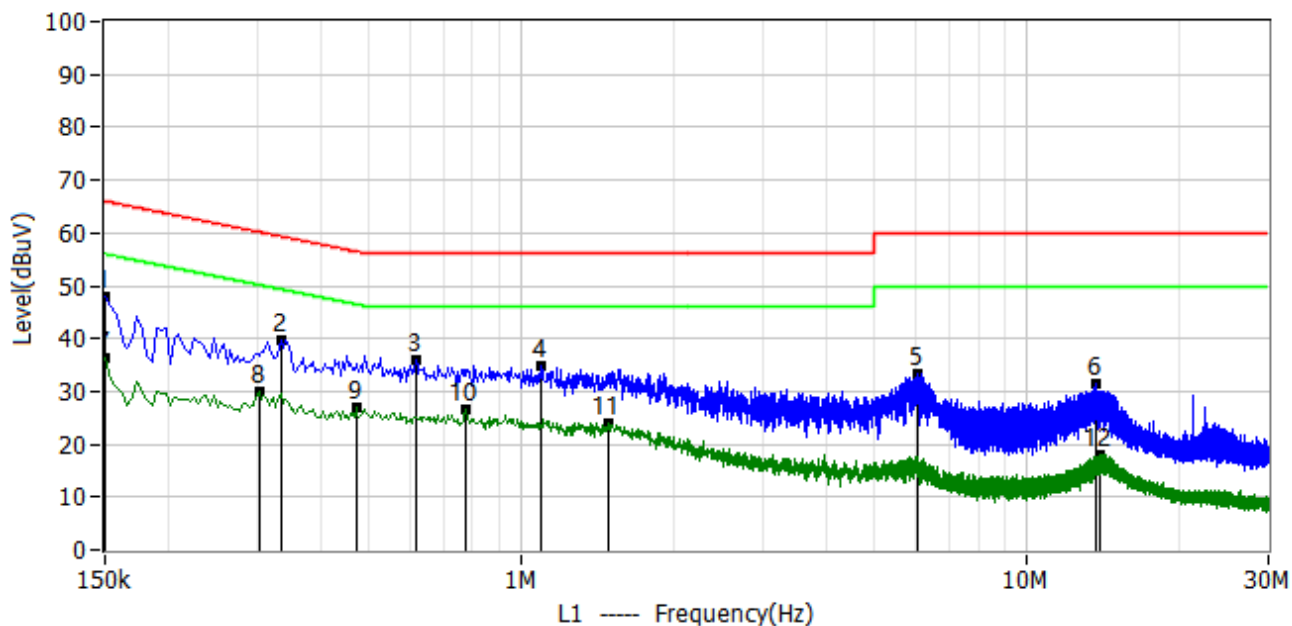
3.1.5 EUT OPERATING CONDITIONS

The EUT was configured for testing in a typical fashion (as a customer would normally use it). The EUT has been programmed to continuously transmit during test. This operating condition was tested and used to collect the included data.



3.1.6 TEST RESULTS

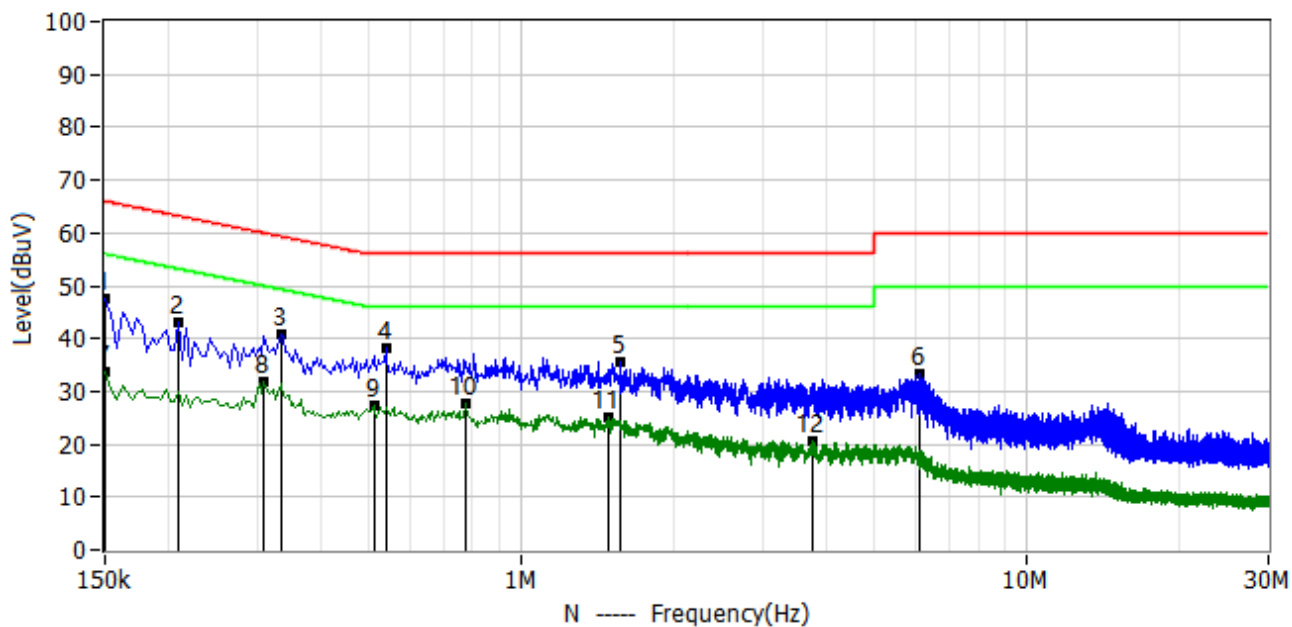
Project: LGT23J048	Test Engineer: LiuH
EUT: NAUTIZ X2-V	Temperature: 25.4°C
M/N: NAUTIZ X2-V	Humidity: 45%RH
Test Voltage: AC 120V/60Hz	Test Data: 2023-10-26
Test Mode: TX 802.11a 5180	
Note:	



No.	Frequency MHz	Reading dBuV	Factor dB	Level dBuV	Limit dBuV	Margin dB	Detector	Polar
1*	0.150	37.56	10.56	48.12	66.00	-17.88	QP	L1
2*	0.334	29.29	10.59	39.88	59.35	-19.47	QP	L1
3*	0.618	25.55	10.58	36.13	56.00	-19.87	QP	L1
4*	1.090	24.17	10.60	34.77	56.00	-21.23	QP	L1
5*	6.050	22.78	10.73	33.51	60.00	-26.49	QP	L1
6*	13.714	20.53	11.01	31.54	60.00	-28.46	QP	L1
7*	0.150	25.70	10.56	36.26	56.00	-19.74	AV	L1
8*	0.302	19.30	10.59	29.89	50.19	-20.30	AV	L1
9*	0.470	16.25	10.58	26.83	46.51	-19.68	AV	L1
10*	0.774	15.92	10.58	26.50	46.00	-19.50	AV	L1
11*	1.490	13.33	10.67	24.00	46.00	-22.00	AV	L1
12*	13.886	7.07	11.02	18.09	50.00	-31.91	AV	L1



Project: LGT23J048	Test Engineer: LiuH
EUT: NAUTIZ X2-V	Temperature: 25.4°C
M/N: NAUTIZ X2-V	Humidity: 45%RH
Test Voltage: AC 120V/60Hz	Test Data: 2023-10-26
Test Mode: TX 802.11a 5180	
Note:	



No.	Frequency MHz	Reading dBuV	Factor dB	Level dBuV	Limit dBuV	Margin dB	Detector	Polar
1*	0.150	36.92	10.56	47.48	66.00	-18.52	QP	N
2*	0.210	32.29	10.60	42.89	63.21	-20.32	QP	N
3*	0.334	30.18	10.59	40.77	59.35	-18.59	QP	N
4*	0.538	27.48	10.58	38.06	56.00	-17.94	QP	N
5*	1.570	25.05	10.68	35.73	56.00	-20.27	QP	N
6*	6.106	22.53	10.74	33.27	60.00	-26.73	QP	N
7*	0.150	22.99	10.56	33.55	56.00	-22.45	AV	N
8*	0.310	21.39	10.59	31.98	49.97	-17.99	AV	N
9*	0.510	16.68	10.58	27.26	46.00	-18.74	AV	N
10*	0.774	17.20	10.58	27.78	46.00	-18.22	AV	N
11*	1.486	14.55	10.67	25.22	46.00	-20.78	AV	N
12*	3.746	9.73	10.72	20.45	46.00	-25.55	AV	N



3.2 RADIATED EMISSION AND (BANDEGE) MEASUREMENT

3.2.1 RADIATED EMISSION LIMITS (Frequency Range 9kHz-1000MHz)

In case the emission fall within the restricted band specified on 15.407(b)7&15.205/209(a), then the limit in the table below has to be followed.

Frequencies (MHz)	Field Strength (micorvolts/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

LIMITS OF RADIATED EMISSION MEASUREMENT (Above 1000MHz)

FREQUENCY (MHz)	Class B (dBuV/m) (at 3M)	
	PEAK	AVERAGE
Above 1000	68.2	54

Notes:

- (1) The limit for radiated test was performed according to FCC PART 15E.
- (2) The tighter limit applies at the band edges.
- (3) Emission level (dBuV/m)=20log Emission level (uV/m).

LIMITS OF RESTRICTED FREQUENCY BANDS

FREQUENCY (MHz)	FREQUENCY (MHz)	FREQUENCY (MHz)	FREQUENCY (GHz)
0.090-0.110	16.42-16.423	399.9-410	4.5-5.15
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	156.52475-156.52525	2483.5-2500	17.7-21.4
8.37625-8.38675	156.7-156.9	2690-2900	22.01-23.12
8.41425-8.41475	162.0125-167.17	3260-3267	23.6-24.0
12.29-12.293	167.72-173.2	3332-3339	31.2-31.8
12.51975-12.52025	240-285	3345.8-3358	36.43-36.5
12.57675-12.57725	322-335.4	3600-4400	Above 38.6
13.36-13.41			

Note: In case the emission radiated emission above 1000MHz fall within the restricted band the restricted frequency bands, the peak limit is 74 dBuV/m.



LIMITS OF EMISSIONS OUTSIDE OF THE FREQUENCY BANDS

Undesirable emission limits. Except as shown in paragraph (b)(7) of this section, the maximum emissions outside of the frequency bands of operation shall be attenuated in accordance with the following limits:

- (1) For transmitters operating in the 5.15-5.25 GHz band: All emissions outside of the 5.15-5.35 GHz band shall not exceed an e.i.r.p. of -27 dBm/MHz.
- (2) For transmitters operating in the 5.25-5.35 GHz band: All emissions outside of the 5.15-5.35 GHz band shall not exceed an e.i.r.p. of -27 dBm/MHz.
- (3) For transmitters operating in the 5.47-5.725 GHz band: All emissions outside of the 5.47-5.725 GHz band shall not exceed an e.i.r.p. of -27 dBm/MHz.
- (4) For transmitters operating in the 5.725-5.85 GHz band:
 - (i) All emissions shall be limited to a level of -27 dBm/MHz at 75 MHz or more above or below the band edge increasing linearly to 10 dBm/MHz at 25 MHz above or below the band edge, and from 25 MHz above or below the band edge increasing linearly to a level of 15.6 dBm/MHz at 5 MHz above or below the band edge, and from 5 MHz above or below the band edge increasing linearly to a level of 27 dBm/MHz at the band edge.

Note: $\text{dBuV/m(at 3M)} = \text{EIRP(dBm)} + 95.2$.

Peak Limit = $-27\text{dBm/MHz} + 95.2 = 68.2$ dBuV/m.

Spectrum Parameter	Setting
Attenuation	Auto
Detector	Peak
Start Frequency	1000 MHz(Peak/AV)
Stop Frequency	10th carrier harmonic (Peak/AV)
RB / VB (emission in restricted band)	1 MHz / 1 MHz, AV=1 MHz /3 MHz

For Band edge

Spectrum Parameter	Setting
Detector	Peak
RB / VB (emission in restricted band)	1 MHz / 1 MHz, AV=1 MHz /3 MHz

Receiver Parameter	Setting
Attenuation	Auto
Start ~ Stop Frequency	9kHz~90kHz / RB 200Hz for PK & AV
Start ~ Stop Frequency	90kHz~110kHz / RB 200Hz for QP
Start ~ Stop Frequency	110kHz~490kHz / RB 200Hz for PK & AV
Start ~ Stop Frequency	490kHz~30MHz / RB 9kHz for QP
Start ~ Stop Frequency	30MHz~1000MHz / RB 120kHz for QP



3.2.2 TEST PROCEDURE

- The measuring distance at 3 m shall be used for measurements at frequency 0.009MHz up to 1GHz, and above 1GHz.
- The EUT was placed on the top of a rotating table 0.8 m (above 1GHz is 1.5 m) above the ground at a 3 m anechoic chamber test site. The table was rotated 360 degree to determine the position of the highest radiation.
- The height of the equipment shall be 0.8 m (above 1GHz is 1.5 m); the height of the test antenna shall vary between 1 m to 4 m. Horizontal and vertical polarization of the antenna are set to make the measurement.
- The initial step in collecting conducted emission data is a spectrum analyzer peak detector mode pre-scanning the measurement frequency range. Significant peaks are then marked and QuasiPeak detector mode will be re-measured.
- If the Peak Mode measured value is compliance with and lower than Quasi Peak Mode Limit, the EUT shall be deemed to meet QP Limits and no additional QP Mode measurement was performed.
- For the actual test configuration, please refer to the related Item –EUT Test Photos.

Note:

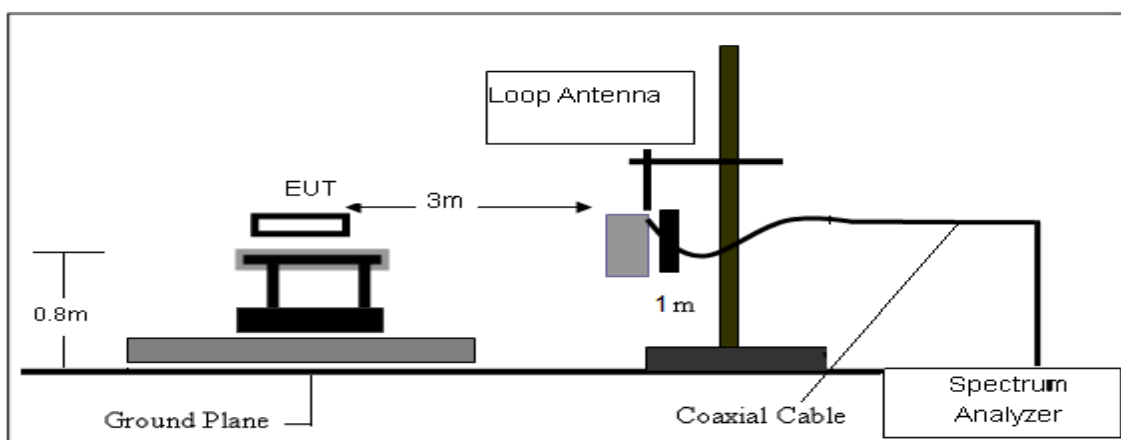
Both horizontal and vertical antenna polarities were tested and performed pretest to three orthogonal axis. The worst case emissions were reported.

3.2.2 DEVIATION FROM TEST STANDARD

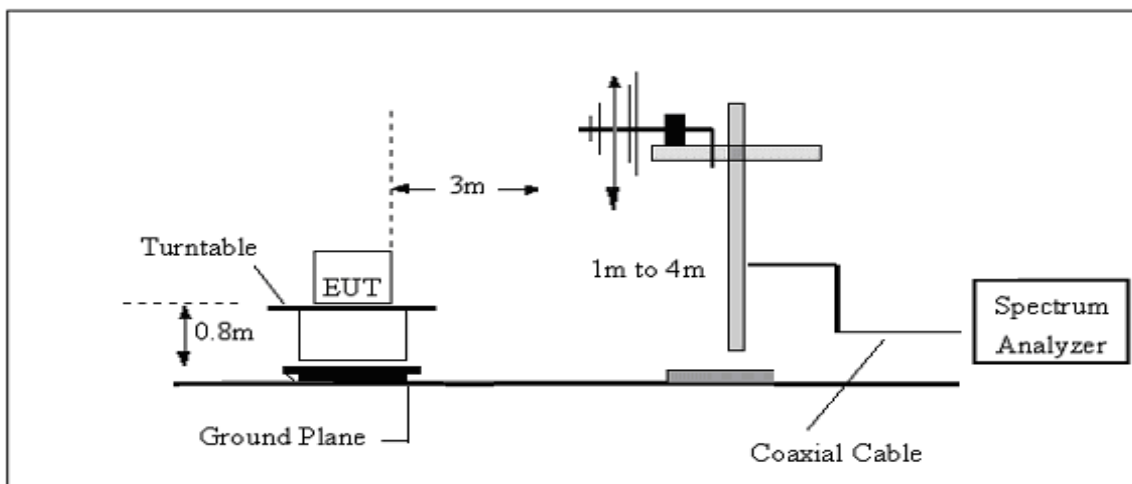
No deviation

3.2.3 TEST SETUP

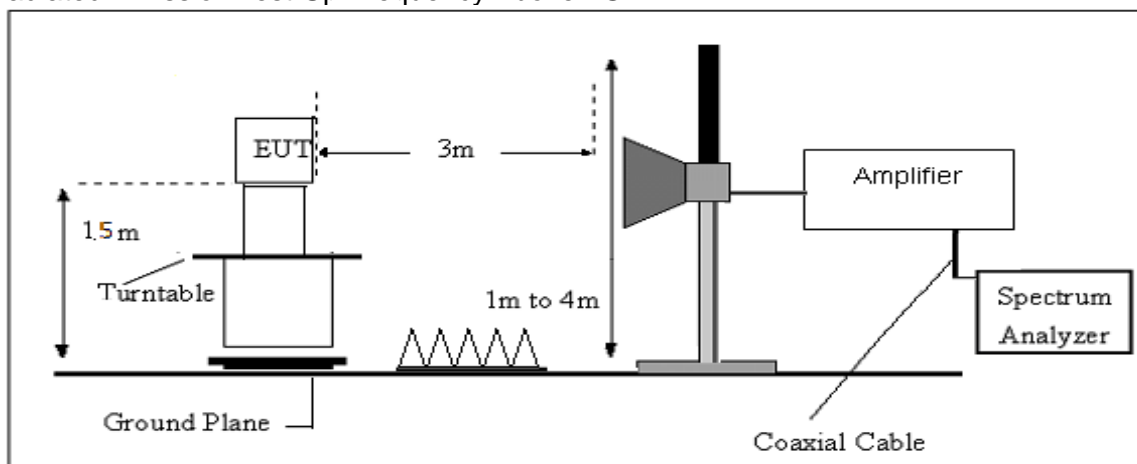
(A) Radiated Emission Test-Up Frequency Below 30MHz



(B) Radiated Emission Test-Up Frequency 30MHz~1GHz



(C) Radiated Emission Test-Up Frequency Above 1GHz





3.2.4 EUT OPERATING CONDITIONS

The EUT tested system was configured as the statements of 2.4 Unless otherwise a special operating condition is specified in the follows during the testing.

3.2.5 FIELD STRENGTH CALCULATION

The field strength is calculated by adding the Antenna Factor and Cable Factor and subtracting the Amplifier Gain and Duty Cycle Correction Factor (if any) from the measured reading. The basic equation with a sample calculation is as follows:

$$FS = RA + AF + CL - AG$$

Where

FS = Field Strength

CL = Cable Attenuation Factor (Cable Loss)

RA = Reading Amplitude

AG = Amplifier Gain

AF = Antenna Factor

For example

Frequency (MHz)	FS (dB μ V/m)	RA (dB μ V/m)	AF (dB)	CL (dB)	AG (dB)	Factor (dB)
300	40	58.1	12.2	1.6	31.9	-18.1

$$\text{Factor} = \text{AF} + \text{CL} - \text{AG}$$



3.2.6 TEST RESULTS

Results of Radiated Emissions (9 KHz~30MHz)

No.	Frequency	Reading dBuV	Factor dB/m	Level dBuV/m	Limit dBuV/m	Margin dB	Detector	Remark
1*	-	-	-	-	-	-	-	See Note

Note:

The emission from 9 kHz to 30MHz was pre-tested and found the result was 20dB lower than the limit, and the permissible value has no need to be reported.

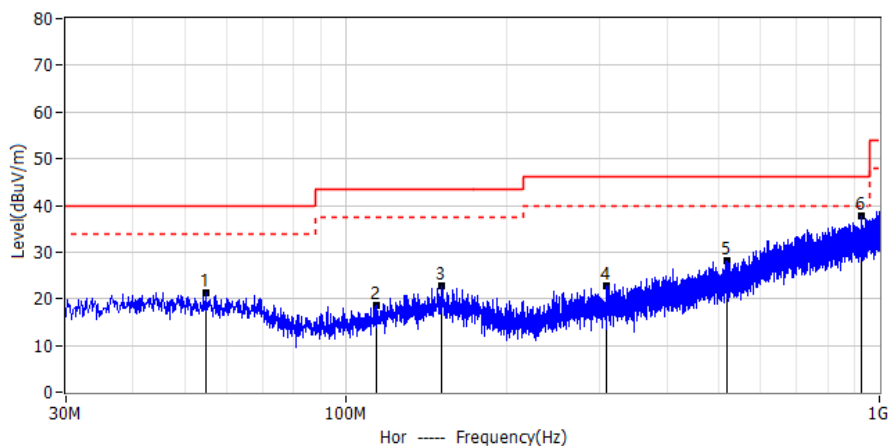
Distance extrapolation factor = $40 \log (\text{specific distance} / \text{test distance})$ (dB);

Limit line = specific limits (dBuV) + distance extrapolation factor.

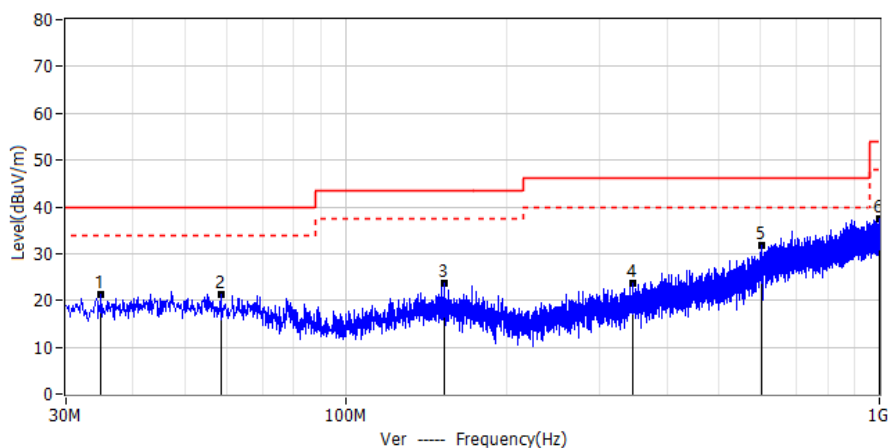


Results of Radiated Emissions (30MHz~1000MHz)

Project: LGT23J048	Test Engineer: Xiangdong Ma
EUT: NAUTIZ X2-V	Temperature: 28.2°C
M/N: NAUTIZ X2-V	Humidity: 61%RH
Test Voltage: Battery	Test Data: 2023-10-28
Test Mode: TX 802.11a 5180	
Note:	



No.	Frequency MHz	Reading dBuV	Factor dB/m	Level dBuV/m	Limit dBuV/m	Margin dB	Detector	Polar
1*	54.978	2.22	19.00	21.22	40.00	-18.78	PK	Hor
2*	114.026	1.45	17.13	18.58	43.50	-24.92	PK	Hor
3*	151.129	2.85	19.97	22.82	43.50	-20.68	PK	Hor
4*	307.905	2.66	20.16	22.82	46.00	-23.18	PK	Hor
5*	519.244	2.66	25.36	28.02	46.00	-17.98	PK	Hor
6*	923.249	4.33	33.37	37.70	46.00	-8.30	PK	Hor

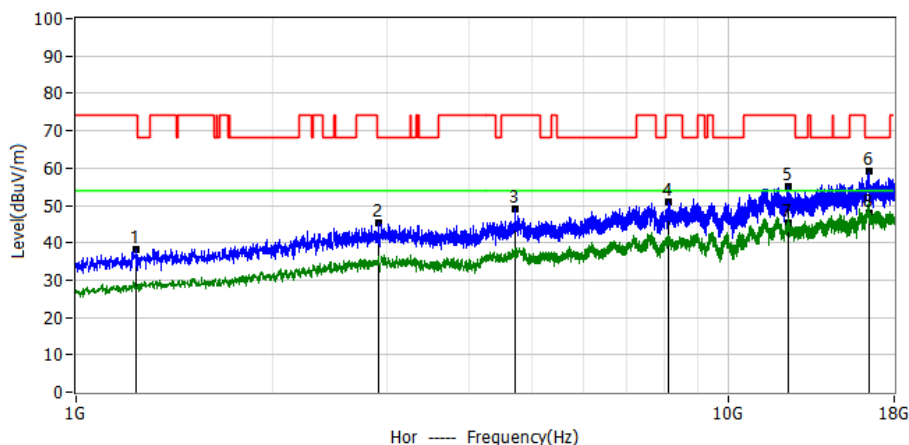


No.	Frequency MHz	Reading dBuV	Factor dB/m	Level dBuV/m	Limit dBuV/m	Margin dB	Detector	Polar
1*	34.850	2.62	18.53	21.15	40.00	-18.85	PK	Ver
2*	58.494	2.48	18.75	21.23	40.00	-18.77	PK	Ver
3*	153.554	3.74	19.94	23.68	43.50	-19.82	PK	Ver
4*	345.129	2.72	21.09	23.81	46.00	-22.19	PK	Ver
5*	600.360	4.07	27.73	31.80	46.00	-14.20	PK	Ver
6*	997.454	3.01	34.56	37.57	54.00	-16.43	PK	Ver

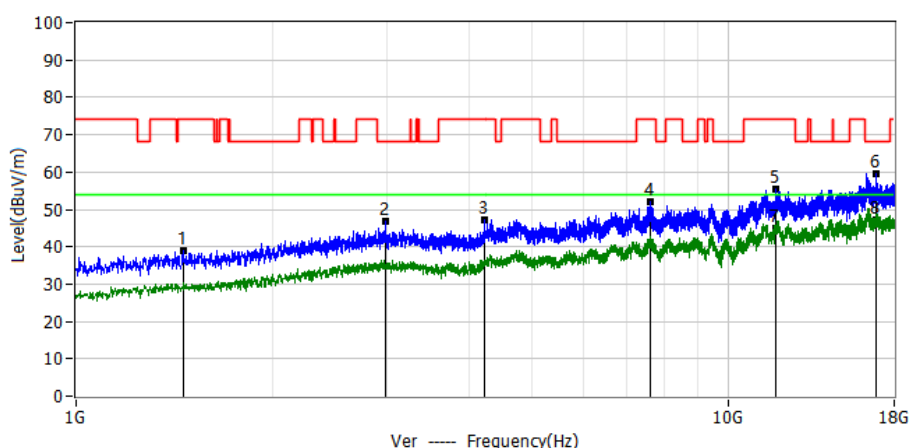


Results of Radiated Emissions (Above 1000MHz)

Project: LGT23J048	Test Engineer: Xiangdong Ma
EUT: NAUTIZ X2-V	Temperature: 28.2°C
M/N: NAUTIZ X2-V	Humidity: 61%RH
Test Voltage: Battery	Test Data: 2023-10-28
Test Mode: 802.11a 5180	
Note:	



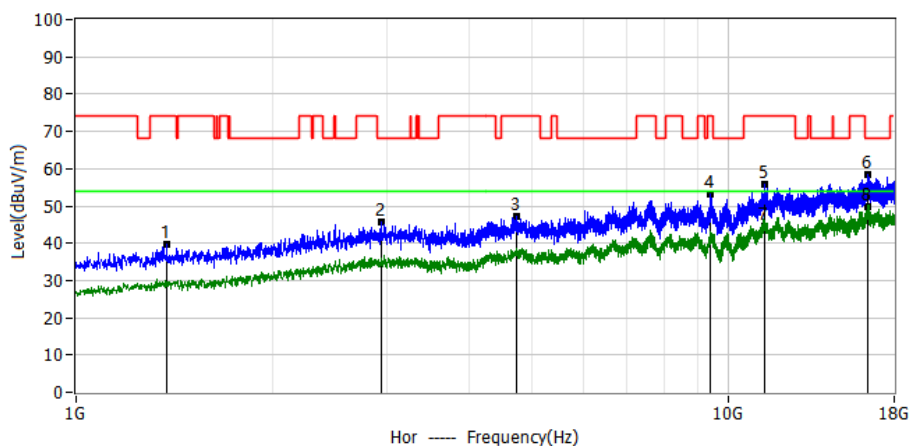
No.	Frequency MHz	Reading dBuV	Factor dB/m	Level dBuV/m	Limit dBuV/m	Margin dB	Detector	Polar
1*	1238.0000	61.03	-22.67	38.36	74.00	-35.60	PK	Hor
2*	2906.1000	54.17	-8.84	45.33	68.20	-22.90	PK	Hor
3*	4727.2000	54.95	-5.93	49.02	74.00	-25.00	PK	Hor
4*	8101.7000	54.52	-3.71	50.81	74.00	-23.20	PK	Hor
5*	12392.1000	52.61	2.30	54.91	74.00	-19.10	PK	Hor
6*	16453.0000	52.02	6.97	58.99	68.20	-9.20	PK	Hor
7*	12392.1000	42.90	2.30	45.20	54.00	-8.80	AV	Hor
8*	16453.0000	40.83	6.97	47.80	54.00	-6.20	AV	Hor



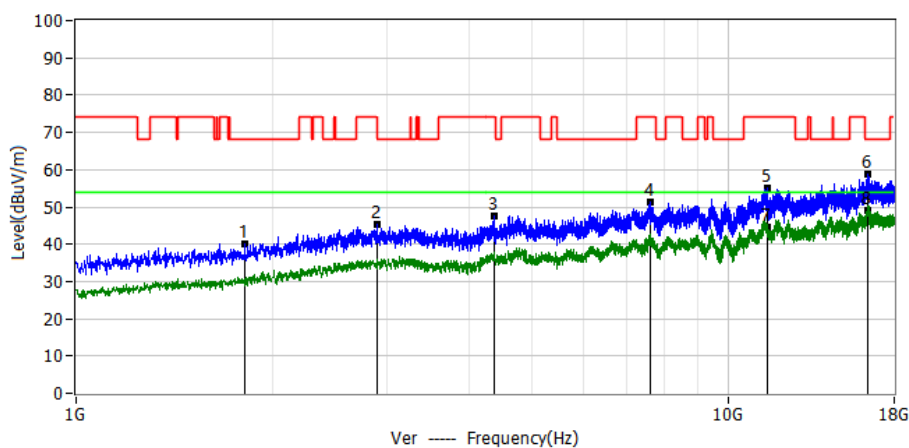
No.	Frequency MHz	Reading dBuV	Factor dB/m	Level dBuV/m	Limit dBuV/m	Margin dB	Detector	Polar
1*	1459.0000	60.02	-21.06	38.96	74.00	-35.00	PK	Ver
2*	2989.0000	55.05	-8.40	46.65	68.20	-21.60	PK	Ver
3*	4230.0000	54.18	-6.90	47.28	74.00	-26.70	PK	Ver
4*	7585.4000	56.17	-4.24	51.93	74.00	-22.10	PK	Ver
5*	11863.0000	53.20	2.14	55.34	74.00	-18.70	PK	Ver
6*	16888.6000	52.03	7.65	59.68	68.20	-8.50	PK	Ver
7*	11863.0000	42.86	2.14	45.00	54.00	-9.00	AV	Ver
8*	16888.6000	39.45	7.65	47.10	54.00	-6.90	AV	Ver



Project: LGT23J048	Test Engineer: Xiangdong Ma
EUT: NAUTIZ X2-V	Temperature: 28.2°C
M/N: NAUTIZ X2-V	Humidity: 61%RH
Test Voltage: Battery	Test Data: 2023-10-28
Test Mode: 802.11a 5200	
Note:	



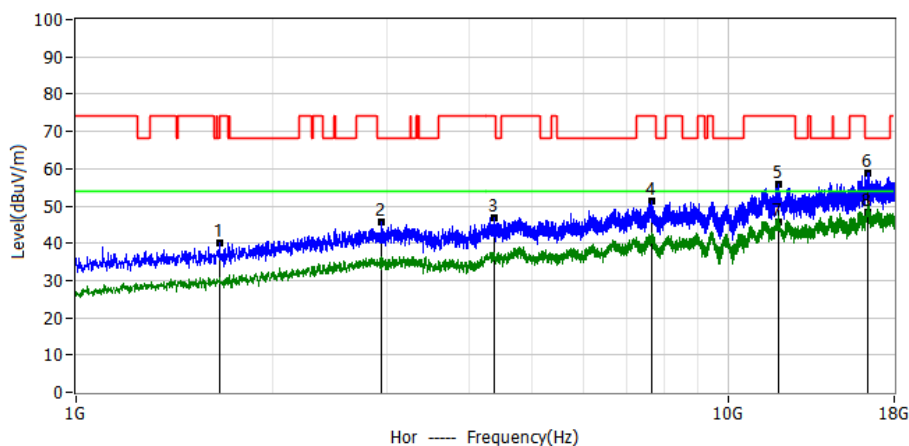
No.	Frequency MHz	Reading dBuV	Factor dB/m	Level dBuV/m	Limit dBuV/m	Margin dB	Detector	Polar
1*	1376.1000	61.19	-21.57	39.62	74.00	-34.40	PK	Hor
2*	2944.4000	54.23	-8.63	45.60	68.20	-22.60	PK	Hor
3*	4735.7000	53.15	-5.94	47.21	74.00	-26.80	PK	Hor
4*	9419.2000	54.17	-1.17	53.00	74.00	-21.00	PK	Hor
5*	11406.1000	53.80	1.87	55.67	74.00	-18.30	PK	Hor
6*	16372.2000	51.53	6.84	58.37	68.20	-9.80	PK	Hor
7*	11406.1000	42.73	1.87	44.60	54.00	-9.40	AV	Hor
8*	16372.2000	42.86	6.84	49.70	54.00	-4.30	AV	Hor



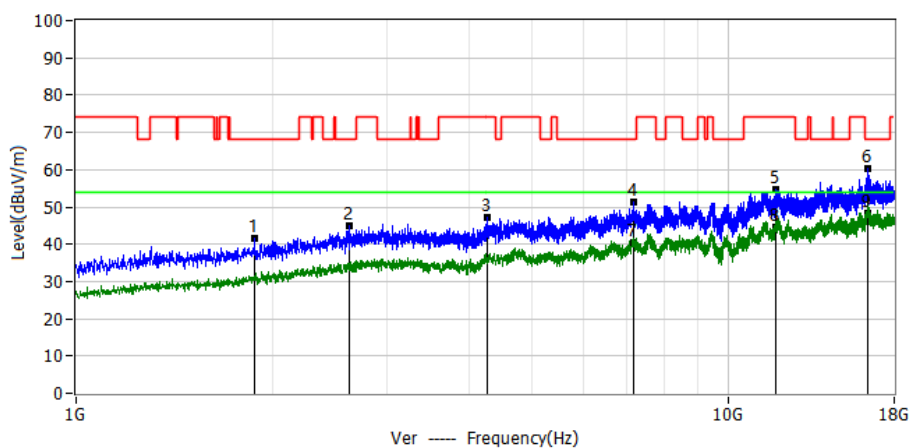
No.	Frequency MHz	Reading dBuV	Factor dB/m	Level dBuV/m	Limit dBuV/m	Margin dB	Detector	Polar
1*	1816.0000	58.30	-18.09	40.21	68.20	-28.00	PK	Ver
2*	2899.7000	54.09	-8.87	45.22	74.00	-28.80	PK	Ver
3*	4370.2000	53.89	-6.30	47.59	74.00	-26.40	PK	Ver
4*	7591.7000	55.40	-4.24	51.16	74.00	-22.80	PK	Ver
5*	11495.4000	53.24	1.92	55.16	74.00	-18.80	PK	Ver
6*	16363.7000	51.94	6.83	58.77	68.20	-9.40	PK	Ver
7*	11495.4000	42.68	1.92	44.60	54.00	-9.40	AV	Ver
8*	16363.7000	42.17	6.83	49.00	54.00	-5.00	AV	Ver



Project: LGT23J048	Test Engineer: Xiangdong Ma
EUT: NAUTIZ X2-V	Temperature: 28.2°C
M/N: NAUTIZ X2-V	Humidity: 61%RH
Test Voltage: Battery	Test Data: 2023-10-28
Test Mode: 802.11a 5240	
Note:	



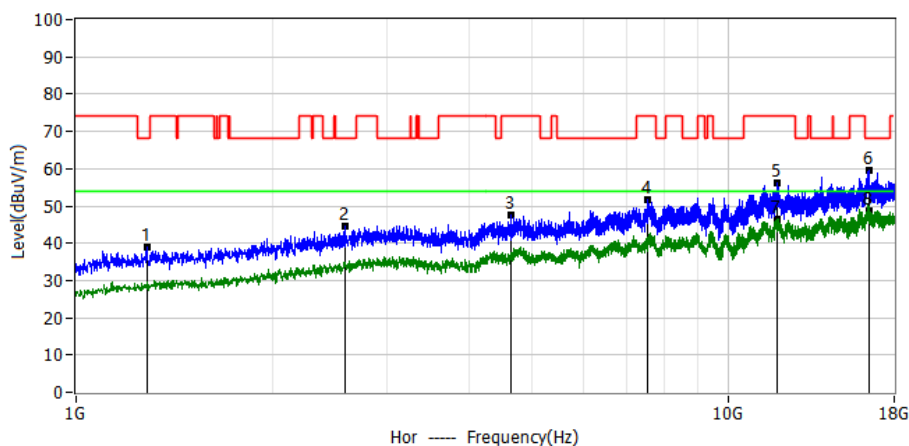
No.	Frequency MHz	Reading dBuV	Factor dB/m	Level dBuV/m	Limit dBuV/m	Margin dB	Detector	Polar
1*	1658.7000	59.81	-19.61	40.20	68.20	-28.00	PK	Hor
2*	2940.1000	54.22	-8.66	45.56	68.20	-22.60	PK	Hor
3*	4387.2000	52.95	-6.23	46.72	74.00	-27.30	PK	Hor
4*	7655.5000	55.49	-4.20	51.29	74.00	-22.70	PK	Hor
5*	11935.2000	53.61	2.18	55.79	74.00	-18.20	PK	Hor
6*	16361.6000	52.16	6.82	58.98	68.20	-9.20	PK	Hor
7*	11935.2000	43.52	2.18	45.70	54.00	-8.30	AV	Hor
8*	16361.6000	41.48	6.82	48.30	54.00	-5.70	AV	Hor



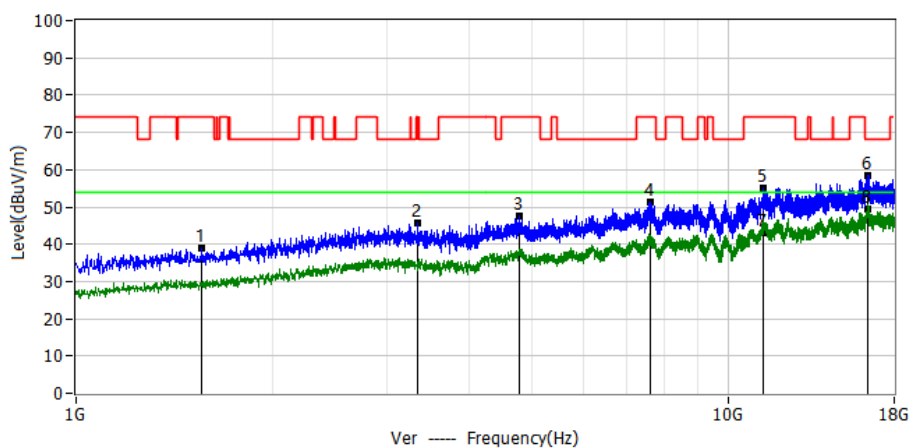
No.	Frequency MHz	Reading dBuV	Factor dB/m	Level dBuV/m	Limit dBuV/m	Margin dB	Detector	Polar
1*	1879.7000	58.90	-17.45	41.45	68.20	-26.80	PK	Ver
2*	2619.2000	55.13	-10.35	44.78	68.20	-23.40	PK	Ver
3*	4264.0000	53.81	-6.75	47.06	74.00	-26.90	PK	Ver
4*	7173.1000	56.61	-5.21	51.40	68.20	-16.80	PK	Ver
5*	11854.5000	52.43	2.13	54.56	74.00	-19.40	PK	Ver
6*	16387.1000	53.29	6.86	60.15	68.20	-8.10	PK	Ver
7*	7173.1000	45.61	-5.21	40.40	54.00	-13.60	AV	Ver
8*	11854.5000	42.57	2.13	44.70	54.00	-9.30	AV	Ver
9*	16387.1000	41.44	6.86	48.30	54.00	-5.70	AV	Ver



Project: LGT23J048	Test Engineer: Xiangdong Ma
EUT: NAUTIZ X2-V	Temperature: 28.2°C
M/N: NAUTIZ X2-V	Humidity: 61%RH
Test Voltage: Battery	Test Data: 2023-10-28
Test Mode: 802.11a 5260	
Note:	



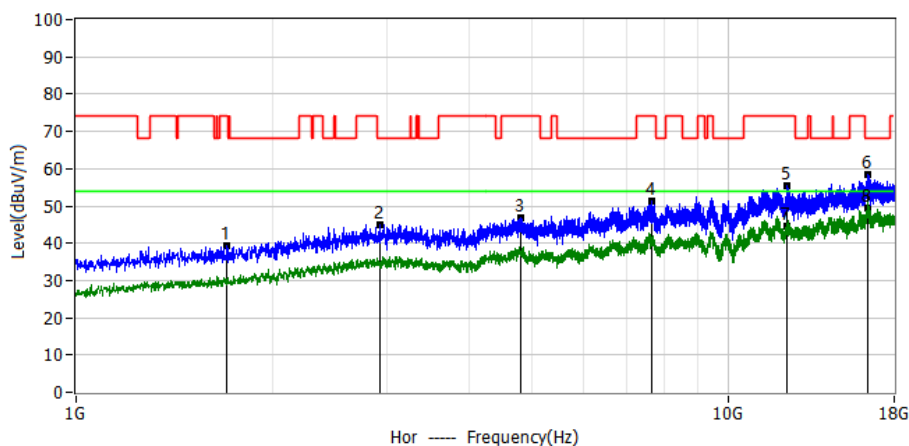
No.	Frequency MHz	Reading dBuV	Factor dB/m	Level dBuV/m	Limit dBuV/m	Margin dB	Detector	Polar
1*	1282.6000	61.17	-22.31	38.86	68.20	-29.30	PK	Hor
2*	2581.0000	55.25	-10.56	44.69	68.20	-23.50	PK	Hor
3*	4650.7000	53.56	-5.87	47.69	74.00	-26.30	PK	Hor
4*	7547.1000	55.86	-4.27	51.59	74.00	-22.40	PK	Hor
5*	11924.6000	53.92	2.18	56.10	74.00	-17.90	PK	Hor
6*	16459.4000	52.69	6.98	59.67	68.20	-8.50	PK	Hor
7*	11924.6000	44.32	2.18	46.50	54.00	-7.50	AV	Hor
8*	16459.4000	41.62	6.98	48.60	54.00	-5.40	AV	Hor



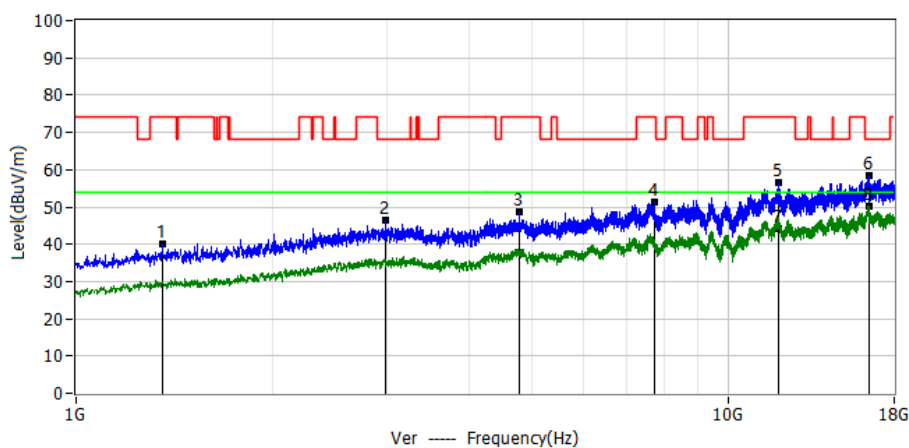
No.	Frequency MHz	Reading dBuV	Factor dB/m	Level dBuV/m	Limit dBuV/m	Margin dB	Detector	Polar
1*	1561.0000	59.42	-20.44	38.98	74.00	-35.00	PK	Ver
2*	3346.0000	54.26	-8.45	45.81	74.00	-28.20	PK	Ver
3*	4786.7000	53.72	-5.98	47.74	74.00	-26.30	PK	Ver
4*	7596.0000	55.37	-4.24	51.13	74.00	-22.90	PK	Ver
5*	11342.4000	53.38	1.83	55.21	74.00	-18.80	PK	Ver
6*	16380.7000	51.76	6.85	58.61	68.20	-9.60	PK	Ver
7*	11342.4000	41.17	1.83	43.00	54.00	-11.00	AV	Ver
8*	16380.7000	42.75	6.85	49.60	54.00	-4.40	AV	Ver



Project: LGT23J048	Test Engineer: Xiangdong Ma
EUT: NAUTIZ X2-V	Temperature: 28.2°C
M/N: NAUTIZ X2-V	Humidity: 61%RH
Test Voltage: Battery	Test Data: 2023-10-28
Test Mode: 802.11a 5300	
Note:	



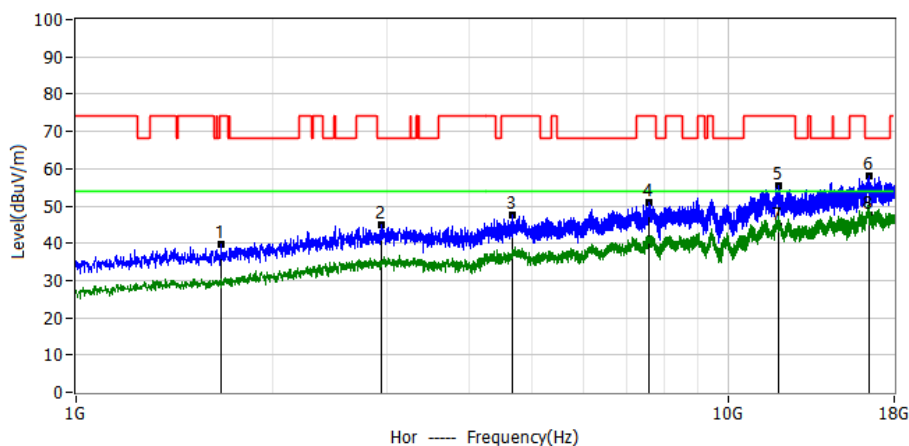
No.	Frequency MHz	Reading dBuV	Factor dB/m	Level dBuV/m	Limit dBuV/m	Margin dB	Detector	Polar
1*	1705.5000	58.35	-19.16	39.19	74.00	-34.80	PK	Hor
2*	2918.9000	53.89	-8.77	45.12	68.20	-23.10	PK	Hor
3*	4812.2000	52.72	-6.00	46.72	74.00	-27.30	PK	Hor
4*	7659.7000	55.43	-4.20	51.23	74.00	-22.80	PK	Hor
5*	12336.9000	52.96	2.29	55.25	74.00	-18.80	PK	Hor
6*	16385.0000	51.47	6.86	58.33	68.20	-9.90	PK	Hor
7*	12336.9000	42.41	2.29	44.70	54.00	-9.30	AV	Hor
8*	16385.0000	42.44	6.86	49.30	54.00	-4.70	AV	Hor



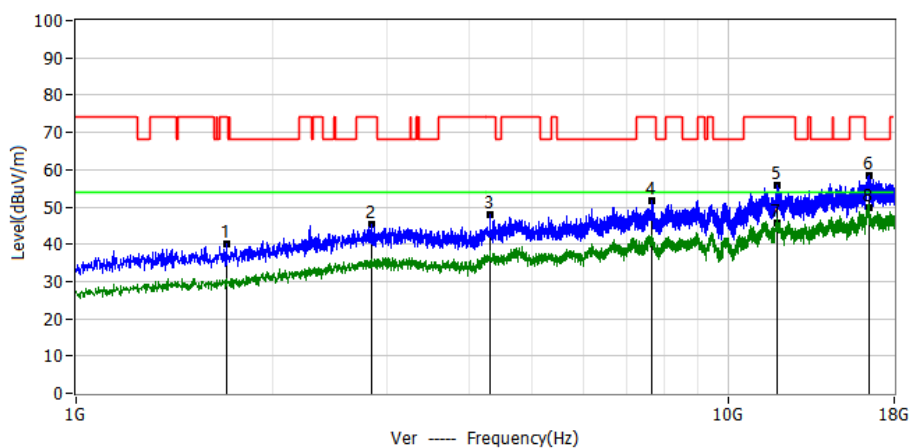
No.	Frequency MHz	Reading dBuV	Factor dB/m	Level dBuV/m	Limit dBuV/m	Margin dB	Detector	Polar
1*	1354.9000	61.80	-21.74	40.06	74.00	-33.90	PK	Ver
2*	2978.4000	54.81	-8.45	46.36	68.20	-21.80	PK	Ver
3*	4782.5000	54.79	-5.97	48.82	74.00	-25.20	PK	Ver
4*	7708.6000	55.49	-4.17	51.32	74.00	-22.70	PK	Ver
5*	11990.5000	54.33	2.21	56.54	74.00	-17.50	PK	Ver
6*	16467.9000	51.59	6.99	58.58	68.20	-9.60	PK	Ver
7*	11990.5000	41.89	2.21	44.10	54.00	-9.90	AV	Ver
8*	16467.9000	43.11	6.99	50.10	54.00	-3.90	AV	Ver



Project: LGT23J048	Test Engineer: Xiangdong Ma
EUT: NAUTIZ X2-V	Temperature: 28.2°C
M/N: NAUTIZ X2-V	Humidity: 61%RH
Test Voltage: Battery	Test Data: 2023-10-28
Test Mode: 802.11a 5320	
Note:	



No.	Frequency MHz	Reading dBuV	Factor dB/m	Level dBuV/m	Limit dBuV/m	Margin dB	Detector	Polar
1*	1665.1000	59.12	-19.55	39.57	74.00	-34.40	PK	Hor
2*	2938.0000	53.74	-8.67	45.07	68.20	-23.10	PK	Hor
3*	4667.7000	53.41	-5.88	47.53	74.00	-26.50	PK	Hor
4*	7579.0000	55.10	-4.25	50.85	74.00	-23.10	PK	Hor
5*	11952.2000	53.31	2.19	55.50	74.00	-18.50	PK	Hor
6*	16453.0000	51.15	6.97	58.12	68.20	-10.10	PK	Hor
7*	11952.2000	42.21	2.19	44.40	54.00	-9.60	AV	Hor
8*	16453.0000	40.63	6.97	47.60	54.00	-6.40	AV	Hor



No.	Frequency MHz	Reading dBuV	Factor dB/m	Level dBuV/m	Limit dBuV/m	Margin dB	Detector	Polar
1*	1701.2000	59.39	-19.20	40.19	74.00	-33.80	PK	Ver
2*	2836.0000	54.50	-9.21	45.29	74.00	-28.70	PK	Ver
3*	4319.2000	54.29	-6.52	47.77	74.00	-26.20	PK	Ver
4*	7659.7000	55.77	-4.20	51.57	74.00	-22.40	PK	Ver
5*	11922.5000	53.65	2.17	55.82	74.00	-18.20	PK	Ver
6*	16472.1000	51.48	7.00	58.48	68.20	-9.70	PK	Ver
7*	11922.5000	43.63	2.17	45.80	54.00	-8.20	AV	Ver
8*	16472.1000	42.70	7.00	49.70	54.00	-4.30	AV	Ver