

# **TEST REPORT**

Report No.:	BCTC2203199799E
Applicant:	Allterco Robotics
Product Name:	Shelly RGBW2
Model/Type Ref.:	SHRGBW-v2
Tested Date:	2022-03-23 to 2022-04-02
Issued Date:	2022-04-02
She I	enzhen
No.: BCTC/RF-EMC-005	Page: 1 of 73



## FCC ID:2ALAYSHRGBW-V2

Product Name:	Shelly RGBW2
Trademark:	N/A
Model/Type Ref.:	SHRGBW-v2
Prepared For:	Allterco Robotics
Address:	103 Cherni Vrah Blvd, Sofia 1407, Bulgaria
Manufacturer:	Allterco Robotics
Address:	103 Cherni Vrah Blvd, Sofia 1407, Bulgaria
Prepared By:	Shenzhen BCTC Testing Co., Ltd.
Address:	1-2/F., Building B, Pengzhou Industrial Park, No.158, Fuyuan 1st Road, Tangwei, Fuhai Subdistrict, Bao'an District, Shenzhen, Guangdong, China
Sample Received Date:	2022-03-23
Sample tested Date:	2022-03-23 to 2022-04-02
Issue Date:	2022-04-02
Report No.:	BCTC2203199799E
Test Standards:	FCC Part15.247 ANSI C63.10-2013
Test Results:	PASS
Remark:	This is WIFI-2.4GHz band radio test report.

Tested by:

Jeff.Fu/Project Handler

Approved by:

Zero Zhou/Reviewer

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## Table Of Content

Test R	Page Page	
1.	Version	5
2.	Test Summary	6
3.	Measurement Uncertainty	7
4.	Product Information And Test Setup	8
4.1	Product Information	8
4.2	Test Setup Configuration	8
4.3	Support Equipment	9
4.4	Channel List	9
4.5	Test Mode	
4.6	Table Of Parameters Of Text Software Setting	10
5.	Test Facility And Test Instrument Used	11
5.1	Test Facility	11
5.2	Test Instrument Used	
6.	Conducted Emissions	
6.1	Block Diagram Of Test Setup	
6.2	Limit	
6.3	Test Procedure	
6.4	EUT Operating Conditions	
6.5	Test Result	
7.	Radiated Emissions	
7.1	Block Diagram Of Test Setup	
7.2	Limit	
7.3	Test Procedure	
7.4	EUT Operating Conditions	· · · · · · · · · · · · · · · · · · ·
7.5	Test Result	
8.	Radiated Band Emission Measurement And Restricted Bands Of Opera	
8.1	Block Diagram Of Test Setup	
8.2		
8.3	Test Procedure	
8.4	EUT Operating Conditions	
8.5	Test Result	
9.	Power Spectral Density Test Block Diagram Of Test Setup Limit Test Procedure EUT Operating Conditions	
9.1		
9.2	Limit	
9.3	Test Procedure	
9.4 0.5	EUT Operating Conditions	
9.5	Test Result Bandwidth Test	3Z 20
10.	Block Diagram Of Tast Satur	პԾ აი
10.1		პშ იი
10.2		პბ აი
10.3 10.4		
10.5		



11. Peak Output Power Test	45
11.1 Block Diagram Of Test Setup	45
11.2 Limit	45
11.3 Test Procedure	45
11.4 EUT Operating Conditions	45
11.5 Test Result	46
12. 100 KHz Bandwidth Of Frequency Band Edge	47
12.1 Block Diagram Of Test Setup	47
12.2 Limit	47
12.3 Test Procedure	47
12.4 EUT Operating Conditions	47
12.5 Test Result	
13. Duty Cycle Of Test Signal	63
13.1 Standard Requirement	
13.2 Formula	63
13.3 Test Procedure	63
13.4 Test Result	63
14. Antenna Requirement	69
14.1 Limit	69
14.2 Test Result	69
15. EUT Photographs	70
16. EUT Test Setup Photographs	71

(Note: N/A Means Not Applicable)

Page: 4 of 73



#### 1. Version

Report No.	Issue Date	Description	Approved
BCTC2203199799E	2022-04-02	Original	Valid





### 2. Test Summary

The Product has been tested according to the following specifications:

No.	Test Parameter	Clause No	Results
1	Conducted Emission	15.207	PASS
2	6dB Bandwidth	15.247 (a)(2)	PASS
3	Peak Output Power	15.247 (b)	PASS
4	Radiated Spurious Emission	15.247 (d)	PASS
5	Power Spectral Density	15.247 (e)	PASS
6	Restricted Band of Operation	15.205	PASS
7	Band Edge (Out of Band Emissions)	15.247 (d)	PASS
8	Antenna Requirement	15.203	PASS





#### 3. Measurement Uncertainty

Where relevant, the following measurement uncertainty levels have been estimated for tests performed on the Product as specified in CISPR 16-4-2. This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k=2.

No.	Item	Uncertainty	
1	3m chamber Radiated spurious emission(9kHz-30MHz)	U=3.7dB	
2	3m chamber Radiated spurious emission(30MHz-1GHz)	U=4.3dB	
3	3m chamber Radiated spurious emission(1GHz-18GHz)	U=4.5dB	
4	3m chamber Radiated spurious emission(18GHz-40GHz)	U=3.34dB	
5	Conducted Emission(150kHz-30MHz)	U=3.20dB	
6	Conducted Adjacent channel power	U=1.38dB	
7	Conducted output power uncertainty Above 1G	U=1.576dB	
8	Conducted output power uncertainty below 1G	U=1.28dB	
9	humidity uncertainty U=5.3%		
10	Temperature uncertainty U=0.59°C		



#### 4. Product Information And Test Setup

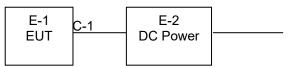
#### 4.1 Product Information

Model/Type Ref.:	SHRGBW-v2
Model differences:	N/A.
Operation Frequency:	802.11b/g/n20MHz:2412~2462 MHz
Bit Rate of Transmitter:	802.11b:11/5.5/2/1 Mbps 802.11g:54/48/36/24/18/12/9/6Mbps 802.11n Up to 150Mbps
Type of Modulation:	OFDM/DSSS
Number Of Channel:	802.11b/g/n20MHz:11 CH
Antenna installation:	Internal antenna
Antenna Gain:	0dBi
Ratings:	DC:12V/ 24V From DC Power

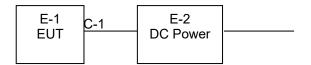
#### 4.2 Test Setup Configuration

See test photographs attached in *EUT TEST SETUP PHOTOGRAPHS* for the actual connections between Product and support equipment.

Conducted Emission:



Radiated Spurious Emission





#### 4.3 Support Equipment

No.	Device Type	Brand	Model	Series No.	Note
E-1	Shelly RGBW2	N/A	SHRGBW-v2	N/A	EUT
E-2	DC Power	N/A	BCTC002	N/A	Auxiliary

Item	Shielded Type	Ferrite Core	Length	Note
C-1	NO	NO	0.5M	DC cable unshielded

#### Notes:

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.

#### 4.4 Channel List

	Channel List for 802.11b/g/n(20)				
Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)
01	2412	02	2417	03	2422
04	2427	05	2432	06	2437
07	2442	08	2447	09	2452
10	2457	11	2462		



#### 4.5 Test Mode

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

Pretest Mode	Description	
Mode 1	802.11b CH1/ CH6/ CH11	
Mode 2	802.11g CH1/ CH6/ CH11	
Mode 3	802.11n20 CH1/ CH6/ CH11	
Mode 4	Link Mode(Conducted emission and Radiated emission)	

Radiated Emission				
Final Test Mode Description				
Mode 5 Link Mode(Conducted emission and Radiated emission)				

For Radiated Emission			
Final Test Mode	Description		
Mode 1	802.11b CH1/ CH6/ CH11		
Mode 2	802.11g CH1/ CH6/ CH11		
Mode 3	802.11n20 CH1/ CH6/ CH11		

Note:

(1) The measurements are performed at all Bit Rate of Transmitter, the worst data was reported.

#### 4.6 Table Of Parameters Of Text Software Setting

During testing channel & power controlling software provided by the customer was used to control the operating channel as well as the output power level. The RF output power selection is for the setting of RF output power expected by the customer and is going to be fixed on the firmware of the final end product power parameters

Test software Version		ESP_RF_test_tool_v2.5	
Frequency	2412 MHz	2437 MHz	2462 MHz
Parameters	DEF	DEF	DEF



#### 5. Test Facility And Test Instrument Used

#### 5.1 Test Facility

All measurement facilities used to collect the measurement data are located at Shenzhen BCTC Testing Co., Ltd. Address: 1-2/F., Building B, Pengzhou Industrial Park, No.158, Fuyuan 1st Road, Tangwei, Fuhai Subdistrict, Bao'an District, Shenzhen, Guangdong, China. The site and apparatus are constructed in conformance with the requirements of ANSI C63.4 and CISPR 16-1-1 other equivalent standards. FCC Test Firm Registration Number: 712850 IC Registered No.: 23583

#### 5.2 Test Instrument Used

Conducted Emissions Test								
Equipment	nt Manufacturer Model# Serial# Last Cal.							
Receiver	R&S	ESR3	102075	May 28, 2021	May 27, 2022			
LISN	R&S	ENV216	101375	May 28, 2021	May 27, 2022			
Software	Frad	EZ-EMC	EMC-CON 3A1	١	/			
Attenuator	\	10dB DC-6GHz	1650	May 28, 2021	May 27, 2022			

RF Conducted Test							
Equipment	Manufacturer	Model#	Serial#	Last Cal.	Next Cal.		
Power Metter	Keysight	E4419	/	May 28, 2021	May 27, 2022		
Power Sensor (AV)	Keysight	E9300A	/	May 28, 2021	May 27, 2022		
Signal Analyzer20kH z-26.5GHz	Keysight	N9020A	MY49100060	May 28, 2021	May 27, 2022		
Spectrum Analyzer9kHz- 40GHz	R&S	FSP40	I want the second s	May 28, 2021	May 27, 2022		

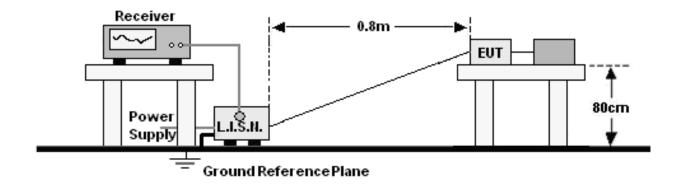


Radiated Emissions Test (966 Chamber)						
Equipment	Manufacturer	Model#	Serial#	Last Cal.	Next Cal.	
966 chamber	ChengYu	966 Room	966	Jun. 06. 2020	Jun. 05, 2023	
Receiver	R&S	ESR3	102075	May 28, 2021	May 27, 2022	
Receiver	R&S	ESRP	101154	May 28, 2021	May 27, 2022	
Amplifier	SKET	LAPA_01G18 G-45dB	١	May 28, 2021	May 27, 2022	
Amplifier	Schwarzbeck	BBV9744	9744-0037	May 28, 2021	May 27, 2022	
TRILOG Broadband Antenna	Schwarzbeck	VULB9163	942	Jun. 01, 2021	May 31, 2022	
Horn Antenna	Schwarzbeck	BBHA9120D	1541	Jun. 02, 2021	Jun. 01, 2022	
Horn Antenn(18GH z-40GHz)	Schwarzbeck	BBHA9170	00822	Jun. 15, 2021	Jun. 14, 2022	
Amplifier(18G Hz-40GHz)	MITEQ	TTA1840-35- HG	2034381	May 28, 2021	May 27, 2022	
Loop Antenna(9KHz -30MHz)	Schwarzbeck	FMZB1519B	00014	Jun. 02, 2021	Jun. 01, 2022	
RF cables1(9kHz- 30MHz)	Huber+Suhnar	9kHz-30MHz	B1702988-000 8	May 28, 2021	May 27, 2022	
RF cables2(30MH z-1GHz)	Huber+Suhnar	30MHz-1GHz	1486150	May 28, 2021	May 27, 2022	
RF cables3(1GHz -40GHz)	Huber+Suhnar	1GHz-40GHz	1607106	May 28, 2021	May 27, 2022	
Power Metter	Keysight	E4419	/	May 28, 2021	May 27, 2022	
Power Sensor (AV)	Keysight	E9300A	\	May 28, 2021	May 27, 2022	
Signal Analyzer20kH z-26.5GHz	Keysight	N9020A	MY49100060	May 28, 2021	May 27, 2022	
Spectrum Analyzer9kHz- 40GHz	R&S	FSP40	Levensen management	May 28, 2021	May 27, 2022	
Software	Frad	EZ-EMC	FA-03A2 RE	· · · · · · · · · · · · · · · · · · ·	$\overline{\lambda}$	



#### 6. Conducted Emissions

#### Block Diagram Of Test Setup 6.1



#### 6.2 Limit

FREQUENCY (MHz)	Limit (dBuV)		
	Quas-peak	Average	
0.15 -0.5	66 - 56 *	56 - 46 *	
0.50 -5.0	56.00	46.00	
5.0 -30.0	60.00	50.00	
Notes:		•	

1. \*Decreasing linearly with logarithm of frequency.

2. The lower limit shall apply at the transition frequencies.

#### 6.3 **Test Procedure**

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

a. The Product was placed on a nonconductive table 0.8 m above the horizontal ground reference plane, and 0.4 m from the vertical ground reference plane, and connected to the main through Line Impedance Stability Network (L.I.S.N).

b. The RBW of the receiver was set at 9 kHz in 150 kHz ~ 30MHz with Peak and AVG detector in Max Hold mode. Run the receiver's pre-scan to record the maximum disturbance generated from Product in all power lines in the full band.

c. For each frequency whose maximum record was higher or close to limit, measure its QP and AVG values and record.



#### 6.4 EUT Operating Conditions

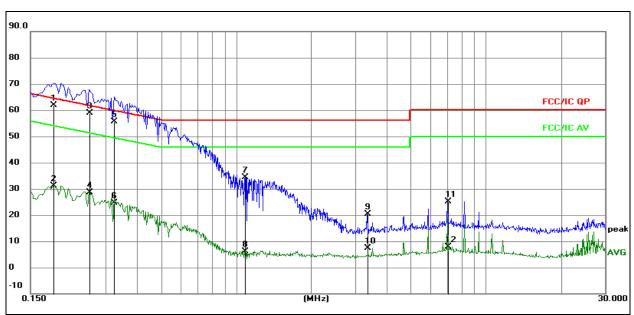
The EUT was configured for testing in a typical fashion (as a customer would normally use it). The EUT has been programmed to continuously transmit during test. This operating condition was tested and used to collect the included data.





#### 6.5 Test Result

Temperature:	<b>26</b> ℃	Relative Humidity:	54%
Pressure:	101kPa	Phase :	Line
Test Voltage :	AC 120V 60Hz	Test Mode:	Mode 4



#### Remark:

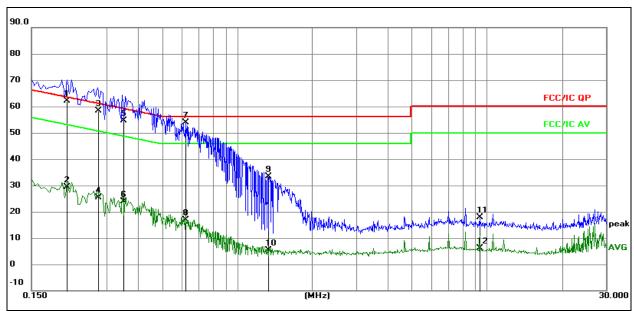
- 1. All readings are Quasi-Peak and Average values.
- 2. Factor = Insertion Loss + Cable Loss.
- 3. Measurement=Reading Level+ Correct Factor
- 4. Over=Measurement-Limit

No. MI	k. Freq.	Reading Level	Correct Factor	Measure- ment	Limit	Over	
	MHz		dB	dBuV	dBuV	dB	Detector
1 *	0.1860	42.21	19.60	61.81	64.21	-2.40	QP
2	0.1860	11.54	19.60	31.14	54.21	-23.07	AVG
3	0.2580	39.18	19.61	58.79	61.50	-2.71	QP
4	0.2580	9.13	19.61	28.74	51.50	-22.76	AVG
5	0.3250	35.98	19.61	55.59	59.58	-3.99	QP
6	0.3250	5.01	19.61	24.62	49.58	-24.96	AVG
7	1.0881	14.80	19.62	34.42	56.00	-21.58	QP
8	1.0881	-13.48	19.62	6.14	46.00	-39.86	AVG
9	3.3458	0.76	19.66	20.42	56.00	-35.58	QP
10	3.3458	-12.37	19.66	7.29	46.00	-38.71	AVG
11	7.0249	5.46	19.73	25.19	60.00	-34.81	QP
12	7.0249	-11.80	19.73	7.93	50.00	-42.07	AVG

No.: BCTC/RF-EMC-005



Temperature:	<b>26</b> ℃	Relative Humidity:	54%
Pressure:	101kPa	Phase :	Neutral
Test Voltage :	AC 120V 60Hz	Test Mode:	Mode 4



#### Remark:

All readings are Quasi-Peak and Average values.
 Factor = Insertion Loss + Cable Loss.

3. Measurement=Reading Level+ Correct Factor

4. Over=Measurement-Limit

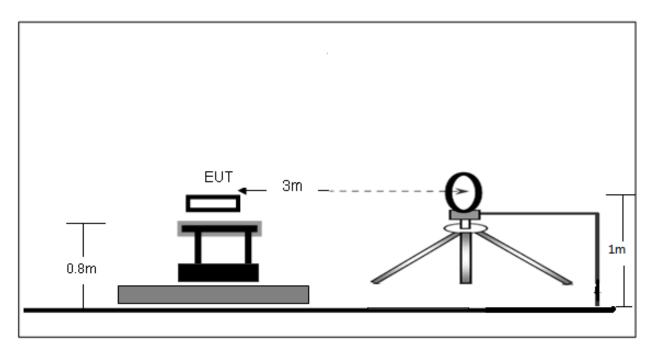
No. Mk.	Freq.	Reading Level	Correct Factor	Measure- ment	Limit	Over	
	MHz		dB	dBuV	dBuV	dB	Detector
1 *	0.2080	42.44	19.60	62.04	63.28	-1.24	QP
2	0.2080	9.82	19.60	29.42	53.28	-23.86	AVG
3	0.2760	38.67	19.61	58.28	60.94	-2.66	QP
4	0.2760	5.74	19.61	25.35	50.94	-25.59	AVG
5	0.3490	35.07	19.61	54.68	58.99	-4.31	QP
6	0.3490	4.24	19.61	23.85	48.99	-25.14	AVG
7	0.6225	34.17	19.61	53.78	56.00	-2.22	QP
8	0.6225	-2.64	19.61	16.97	46.00	-29.03	AVG
9	1.3245	13.66	19.62	33.28	56.00	-22.72	QP
10	1.3245	-14.24	19.62	5.38	46.00	-40.62	AVG
11	9.3930	-1.99	19.78	17.79	60.00	-42.21	QP
12	9.3930	-13.59	19.78	6.19	50.00	-43.81	AVG

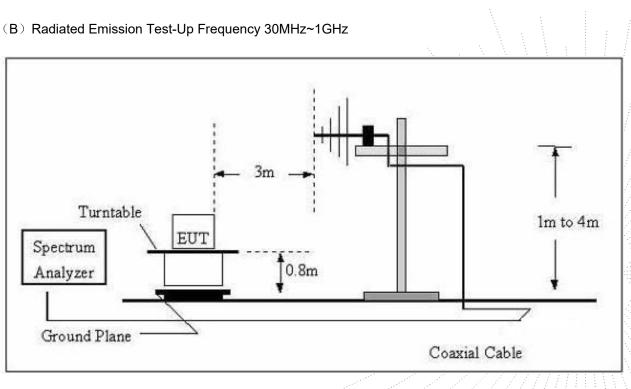


#### 7. Radiated Emissions

#### 7.1 Block Diagram Of Test Setup

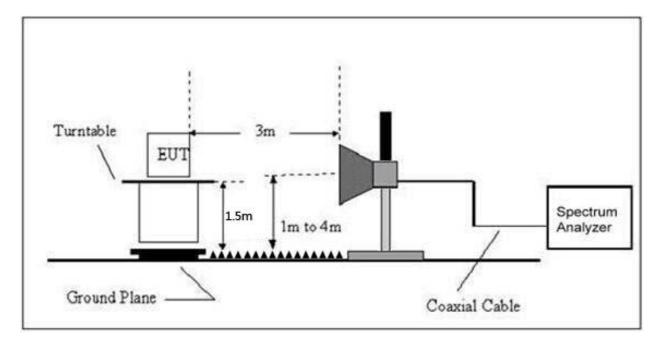
#### (A) Radiated Emission Test-Up Frequency Below 30MHz







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



#### 7.2 Limit

20dBc in any 100 kHz bandwidth outside the operating frequency band. In case the emission fall within the restricted band specified on 15.205(a), then the 15.209(a) limit in the table below has to be followed.

Frequency	Field Strength	Distance	Field Strength Limit at 3m Distance			
(MHz)	uV/m	(m)	uV/m	dBuV/m		
0.009 ~ 0.490	2400/F(kHz)	300	10000 * 2400/F(kHz)	20log <sup>(2400/F(kHz))</sup> + 80		
0.490 ~ 1.705	24000/F(kHz)	30	100 * 24000/F(kHz)	20log <sup>(24000/F(kHz))</sup> + 40		
1.705 ~ 30	30	30	100 * 30	20log <sup>(30)</sup> + 40		
30 ~ 88	100	3	100	20log <sup>(100)</sup>		
88 ~ 216	150	3	150	20log <sup>(150)</sup>		
216 ~ 960	200	3	200	20log <sup>(200)</sup>		
Above 960	500	3	500	20log <sup>(500)</sup>		



#### LIMITS OF RADIATED EMISSION MEASUREMENT (Above 1000MHz)

FREQUENCY	Limit (dBuV/m) (at 3M)		
(MHz)	PEAK	AVERAGE	
Above 1000	74	54	

Notes:

(1)The limit for radiated test was performed according to FCC PART 15C.

(2) The tighter limit applies at the band edges.

(3) Emission level (dBuV/m)=20log Emission level (uV/m).

FREQUENCY RANGE OF RADIATED MEASUREMENT (For unintentional radiators)

Highest frequency generated or Upper frequency of measurement used in the device or on which the device operates or tunes (MHz)	Range (MHz)
Below 1.705	30
1.705 – 108	1000
108 – 500	2000
500 – 1000	5000
Above 1000	5 <sup>th</sup> harmonic of the highest frequency or 40 GHz, whichever is lower

#### 7.3 Test Procedure

	- 「「「」」、「」」、「」、「」、「」、「」、「」、「」、「」、「」、「」、「」、
Receiver Parameter	Setting
Attenuation	Auto
9kHz~150kHz	RBW 200Hz for QP
150kHz~30MHz	RBW 9kHz for QP
30MHz~1000MHz	RBW 120kHz for QP

Spectrum Parameter	Setting
1-25GHz	RBW 1 MHz /VBW 1 MHz for Peak, RBW 1 MHz / VBW 10Hz for Average

Below 1GHz test procedure as below:

a. The EUT was placed on the top of a rotating table 0.8 meters above the ground at a 3 meter semi-anechoic chamber. 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 antenna height 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 (for the test frequency of below 30MHz, the antenna was tuned to heights 1 meter) 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 Detect Function and Specified Bandwidth with Maximum Hold Mode.

f. If the emission level of the EUT in peak mode was 10dB lower than the limit specified, then testing could be stopped and the peak values of the EUT would be reported. Otherwise the emissions that did not have 10dB margin would be re-tested one by one using peak, quasi-peak or average method as specified and then reported in a data sheet.

g. Different between above is the test site, change from Semi- Anechoic Chamber to fully Anechoic Chamber and change form table 0.8 metre to 1.5 metre( Above 18GHz the distance is 1 meter and table is 1.5 metre).

h. Test the EUT in the lowest channel ,the middle channel ,the Highest channel. Note:

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

Above 1GHz test procedure as below:

a. The EUT was placed on the top of a rotating table 1.5 meters above the ground at a 3 meter chamber. 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 antenna height 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 rota table was turned from 0 degrees to 360 degrees to find the maximum reading.

e. The test-receiver system was set to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.

f. If the emission level of the EUT in peak mode was 10dB lower than the limit specified, then testing could be stopped and the peak values of the EUT would be reported. Otherwise the emissions that did not have 10dB margin would be re-tested one by one using peak, quasi-peak or average method as specified and then reported in a data sheet.

g. Test the EUT in the lowest channel, the Highest channel. Note:

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

#### 7.4 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.



#### 7.5 Test Result

#### Below 30MHz

Temperature:	<b>26</b> ℃	Relative Humidity:	24%
Pressure:	101 kPa	Test Voltage :	DC 24V
Test Mode :	Mode 4	Polarization :	

Freq.	Reading	Limit	Margin	State
(MHz)	(dBuV/m)	(dBuV/m)	(dB)	P/F
				PASS
				PASS

Note:

The amplitude of spurious emissions which are attenuated by more than 20dB below the permissible value has no need to be reported. Distance extrapolation factor =40 log (specific distance/test distance)(dB); Limit line = specific limits(dBuv) + distance extrapolation factor.

No.: BCTC/RF-EMC-005

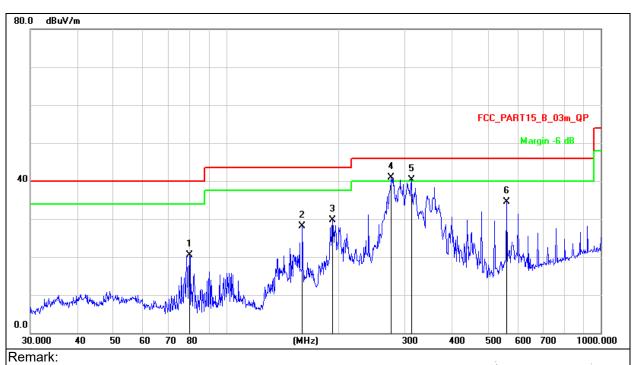
Page: 21 of 73

Edition: A.4



#### Between 30MHz – 1GHz

Temperature:	<b>26</b> ℃	Relative Humidity:	54%
Pressure:	101KPa	Phase :	Horizontal
Test Mode:	Mode 4	Remark:	N/A

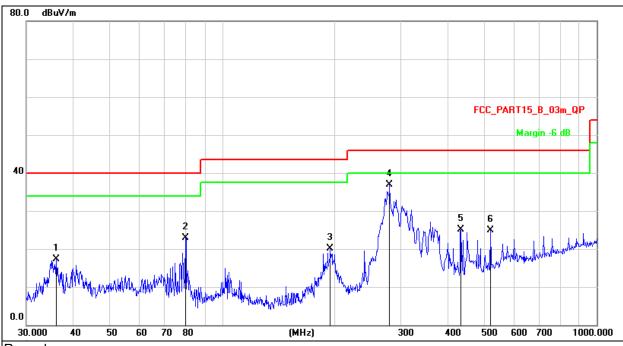


Factor = Antenna Factor + Cable Loss – Pre-amplifier.
 Measurement=Reading Level+ Correct Factor
 Over=Measurement-Limit

No.	Mk	. Freq.	Reading Level	Correct Factor	Measure- ment	Limit	Over	
		MHz	dBuV	dB	dBuV/m	dB/m	dB	Detector
1		79.8003	40.94	-20.37	20.57	40.00	-19.43	QP
2		159.7844	46.96	-18.87	28.09	43.50	-15.41	QP
3		192.4186	46.42	-16.79	29.63	43.50	-13.87	QP
4	*	276.1235	55.24	-14.34	40.90	46.00	-5.10	QP
5	İ	312.1794	53.57	-13.27	40.30	46.00	-5.70	QP
6		560.6928	41.92	-7.43	34.49	46.00	-11.51	QP



Temperature:	<b>26</b> ℃	Relative Humidity:	54%
Pressure:	101KPa	Phase :	Vertical
Test Mode:	Mode 4	Remark:	N/A



Remark:

1.Factor = Antenna Factor + Cable Loss – Pre-amplifier.

Measurement=Reading Level+ Correct Factor
 Over=Measurement-Limit

0,01	mousu						1	
No.	Mk.	Freq.	Reading Level	Correct Factor	Measure- ment	Limit	Over	
		MHz	dBuV	dB	dBuV/m	dB/m	dB	Detector
1		36.1272	33.52	-16.13	17.39	40.00	-22.61	QP
2		79.8003	43.35	-20.37	22.98	40.00	-17.02	QP
3	1	94.4534	36.76	-16.65	20.11	43.50	-23.39	QP
4	* 2	80.0237	51.08	-14.22	36.86	46.00	-9.14	QP
5	4	34.0651	35.49	-10.33	25.16	46.00	-20.84	QP
6	5	20.8882	33.24	-8.41	24.83	46.00	-21.17	QP



#### Between 1GHz – 25GHz **802.11b**

Polar	Frequency	Reading Level	Correct Factor	Measure- ment	Limits	Over	Detector
(H/V)	(MHz)	(dBuV/m)	(dB)	(dBuV/m)	(dBuV/ m)	(dB)	Туре
	•	Lo	ow channel:24	12MHz			•
V	4824.00	53.19	-0.43	52.76	74.00	-21.24	PK
V	4824.00	43.64	-0.43	43.21	54.00	-10.79	AV
V	7236.00	44.97	8.31	53.28	74.00	-20.72	PK
V	7236.00	34.50	8.31	42.81	54.00	-11.19	AV
Н	4824.00	49.64	-0.43	49.21	74.00	-24.79	PK
Н	4824.00	38.80	-0.43	38.37	54.00	-15.63	AV
Н	7236.00	42.81	8.31	51.12	74.00	-22.88	PK
Н	7236.00	35.18	8.31	43.49	54.00	-10.51	AV
		Mic	dle channel:2	437MHz			
V	4874.00	50.56	-0.38	50.18	74.00	-23.82	PK
V	4874.00	42.32	-0.38	41.94	54.00	-12.06	AV
V	7311.00	42.52	8.83	51.35	74.00	-22.65	PK
V	7311.00	34.30	8.83	43.13	54.00	-10.87	AV
Н	4874.00	48.41	-0.38	48.03	74.00	-25.97	PK
Н	4874.00	37.52	-0.38	37.14	54.00	-16.86	AV
Н	7311.00	41.51	8.83	50.34	74.00	-23.66	PK
Н	7311.00	32.95	8.83	41.78	54.00	-12.22	AV
		Hi	gh channel:24	l62MHz			
V	4924.00	52.85	-0.32	52.53	74.00	-21.47	PK
V	4924.00	41.89	-0.32	41.57	54.00	-12.43	AV
V	7386.00	43.99	9.35	53.34	74.00	-20.66	PK
V	7386.00	33.72	9.35	43.07	54.00	-10.93	AV
Н	4924.00	51.69	-0.32	51.37	74.00	-22.63	PK
Н	4924.00	40.94	-0.32	40.62	54.00	-13.38	AV
Н	7386.00	42.69	9.35	52.04	74.00	-21.96	РК
Н	7386.00	35.30	9.35	44.65	54.00	-9.35	AV

Remark:

1.Emission Level = Meter Reading + Factor,

Factor = Antenna Factor + Cable Loss – Pre-amplifier.

Over= Emission Level - Limit

2.If peak below the average limit, the average emission was no test.

In restricted bands of operation, The spurious emissions below the permissible value more than 20dB
 The amplitude of spurious emissions which are attenuated by more than 20dB below the permissible value has no need to be reported.

5.All the Modulation are test, the worst mode is 802.11b, the data recording in the report.



#### 802.11g

Polar	Frequency	Reading Level	Correct Factor	Measure- ment	Limits	Over	Detector
(H/V)	(MHz)	(dBuV/m)	(dB)	(dBuV/m)	(dBuV/ m)	(dB)	Туре
	•	Lo	ow channel:24	12MHz			•
V	4824.00	53.19	-0.43	52.76	74.00	-21.24	PK
V	4824.00	43.02	-0.43	42.59	54.00	-11.41	AV
V	7236.00	43.28	8.31	51.59	74.00	-22.41	PK
V	7236.00	32.87	8.31	41.18	54.00	-12.82	AV
Н	4824.00	50.07	-0.43	49.64	74.00	-24.36	PK
Н	4824.00	39.55	-0.43	39.12	54.00	-14.88	AV
Н	7236.00	42.27	8.31	50.58	74.00	-23.42	PK
Н	7236.00	34.19	8.31	42.50	54.00	-11.50	AV
		Mic	dle channel:2	437MHz			
V	4874.00	49.89	-0.38	49.51	74.00	-24.49	PK
V	4874.00	42.06	-0.38	41.68	54.00	-12.32	AV
V	7311.00	40.95	8.83	49.78	74.00	-24.22	PK
V	7311.00	31.31	8.83	40.14	54.00	-13.86	AV
Н	4874.00	47.12	-0.38	46.74	74.00	-27.26	PK
Н	4874.00	37.57	-0.38	37.19	54.00	-16.81	AV
Н	7311.00	38.01	8.83	46.84	74.00	-27.16	PK
Н	7311.00	30.99	8.83	39.82	54.00	-14.18	AV
		Hi	gh channel:24	l62MHz			
V	4924.00	52.18	-0.32	51.86	74.00	-22.14	PK
V	4924.00	41.89	-0.32	41.57	54.00	-12.43	AV
V	7386.00	43.43	9.35	52.78	74.00	-21.22	PK
V	7386.00	32.99	9.35	42.34	54.00	-11.66	AV
Н	4924.00	49.23	-0.32	48.91	74.00	-25.09	PK
Н	4924.00	39.84	-0.32	39.52	54.00	-14.48	AV
Н	7386.00	40.85	9.35	50.20	74.00	-23.80	PK
Н	7386.00	32.20	9.35	41.55	54.00	-12.45	AV

Remark:

1.Emission Level = Meter Reading + Factor,

Factor = Antenna Factor + Cable Loss - Pre-amplifier.

Over= Emission Level - Limit

2.If peak below the average limit, the average emission was no test.

In restricted bands of operation, The spurious emissions below the permissible value more than 20dB
 The amplitude of spurious emissions which are attenuated by more than 20dB below the permissible value has no need to be reported.

5.All the Modulation are test, the worst mode is 802.11b, the data recording in the report.



#### 802.11n20

Polar	Frequency	Reading Level	Correct Factor	Measure- ment	Limits	Over	Detector
(H/V)	(MHz)	(dBuV/m)	(dB)	(dBuV/m)	(dBuV/ m)	(dB)	Туре
		Lo	w channel:24	12MHz			
V	4824.00	54.08	-0.43	53.65	74.00	-20.35	PK
V	4824.00	45.82	-0.43	45.39	54.00	-8.61	AV
V	7236.00	44.25	8.31	52.56	74.00	-21.44	PK
V	7236.00	35.07	8.31	43.38	54.00	-10.62	AV
Н	4824.00	51.55	-0.43	51.12	74.00	-22.88	PK
Н	4824.00	41.13	-0.43	40.70	54.00	-13.30	AV
Н	7236.00	42.96	8.31	51.27	74.00	-22.73	PK
Н	7236.00	34.75	8.31	43.06	54.00	-10.94	AV
		Mic	dle channel:2	437MHz			
V	4874.00	52.72	-0.38	52.34	74.00	-21.66	PK
V	4874.00	46.39	-0.38	46.01	54.00	-7.99	AV
V	7311.00	44.11	8.83	52.94	74.00	-21.06	PK
V	7311.00	35.80	8.83	44.63	54.00	-9.37	AV
Н	4874.00	50.91	-0.38	50.53	74.00	-23.47	PK
Н	4874.00	40.57	-0.38	40.19	54.00	-13.81	AV
Н	7311.00	42.36	8.83	51.19	74.00	-22.81	PK
Н	7311.00	34.76	8.83	43.59	54.00	-10.41	AV
		Hi	gh channel:24	l62MHz			
V	4924.00	55.19	-0.32	54.87	74.00	-19.13	PK
V	4924.00	44.33	-0.32	44.01	54.00	-9.99	AV
V	7386.00	46.68	9.35	56.03	74.00	-17.97	PK
V	7386.00	36.81	9.35	46.16	54.00	-7.84	AV
Н	4924.00	53.75	-0.32	53.43	74.00	-20.57	PK
Н	4924.00	43.00	-0.32	42.68	54.00	-11.32	AV
Н	7386.00	44.29	9.35	53.64	74.00	-20.36	РК
Н	7386.00	36.77	9.35	46.12	54.00	-7.88	AV

Remark:

1.Emission Level = Meter Reading + Factor,

Factor = Antenna Factor + Cable Loss - Pre-amplifier.

Over= Emission Level - Limit

2.If peak below the average limit, the average emission was no test.

3. In restricted bands of operation, The spurious emissions below the permissible value more than 20dB4. The amplitude of spurious emissions which are attenuated by more than 20dB below the permissible value has no need to be reported.

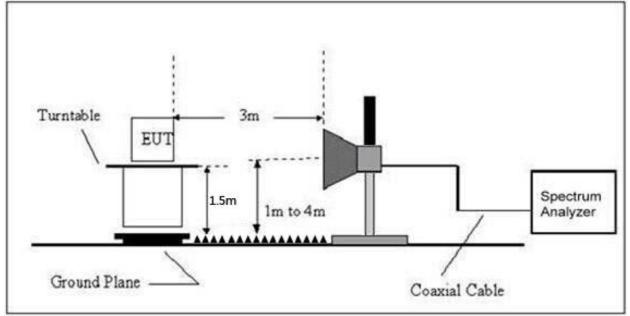
5.All the Modulation are test, the worst mode is 802.11b, the data recording in the report.



#### 8. Radiated Band Emission Measurement And Restricted Bands Of Operation

#### 8.1 Block Diagram Of Test Setup

#### Radiated Emission Test-Up Frequency Above 1GHz



#### 8.2 Limit

FCC Part15 C Section 15.209 and 15.205

(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	156.52475-156.52525	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	( <sup>2</sup> )
13.36-13.41			



#### LIMITS OF RADIATED EMISSION MEASUREMENT (Above 1000MHz)

FREQUENCY	Limit (dBuV/m) (at 3M)		
(MHz)	PEAK	AVERAGE	
Above 1000	74	54	

Notes:

(1)The limit for radiated test was performed according to FCC PART 15C.

(2)The tighter limit applies at the band edges.

(3)Emission level (dBuV/m)=20log Emission level (uV/m).

#### 8.3 Test Procedure

Receiver Parameter	Setting
Attenuation	Auto
Start Frequency	2300MHz
Stop Frequency	2520
RB / VB (emission in restricted band)	1 MHz / 1 MHz for Peak, 1 MHz / 10Hz for Average

Above 1GHz test procedure as below:

a. The EUT was placed on the top of a rotating table 1.5 meters above the ground at a 3 meter chamber.

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 antenna height 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 rota table was turned from 0 degrees to 360 degrees to find the maximum reading.

e. The test-receiver system was set to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.

f. If the emission level of the EUT in peak mode was 10dB lower than the limit specified, then testing could be stopped and the peak values of the EUT would be reported. Otherwise the emissions that did not have 10dB margin would be re-tested one by one using peak, quasi-peak or average method as specified and then reported in a data sheet.

g. Test the EUT in the lowest channel, the Highest channel.

Note:

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

#### 8.4 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.



#### 8.5 Test Result

	Polar (H/V)	Frequency (MHz)	Reading Level	Correct Factor	Measure- ment (dBuV/m)	Lim (dBu		Result	
	(11/1)	(1411 12)	(dBuV/m)	(dB)	РК	□PK	AV		
			Lov	w Channel 24	412MHz		I		
	Н	2390.00	53.22	-6.70	46.52	74.00	54.00	PASS	
	Н	2400.00	56.42	-6.71	49.71	74.00	54.00	PASS	
	V	2390.00	52.26	-6.70	45.56	74.00	54.00	PASS	
802.11b	V	2400.00	57.05	-6.71	50.34	74.00	54.00	PASS	
002.110	High Channel 2462MHz								
	Н	2483.50	56.38	-6.79	49.59	74.00	54.00	PASS	
	Н	2500.00	50.28	-6.81	43.47	74.00	54.00	PASS	
	V	2483.50	56.11	-6.79	49.32	74.00	54.00	PASS	
	V	2500.00	52.64	-6.81	45.83	74.00	54.00	PASS	
	Low Channel 2412MHz								
	Н	2390.00	53.08	-6.70	46.38	74.00	54.00	PASS	
	Н	2400.00	57.91	-6.71	51.20	74.00	54.00	PASS	
	V	2390.00	53.91	-6.70	47.21	74.00	54.00	PASS	
802.11g	V	2400.00	58.74	-6.71	52.03	74.00	54.00	PASS	
002.11g			Hig	h Channel 24	462MHz				
	Н	2483.50	56.66	-6.79	49.87	74.00	54.00	PASS	
	Н	2500.00	52.55	-6.81	45.74	74.00	54.00	PASS	
	V	2483.50	57.49	-6.79	50.70	74.00	54.00	PASS	
	V	2500.00	54.48	-6.81	47.67	74.00	54.00	PASS	

Remark:

1. Emission Level = Meter Reading + Factor,

Factor = Antenna Factor + Cable Loss – Pre-amplifier.

Over= Emission Level - Limit

2. If the PK measured levels comply with average limit, then the average level were deemed to comply with average limit.

3 In restricted bands of operation, The spurious emissions below the permissible value more than 20dB 4. The amplitude of spurious emissions which are attenuated by more than 20dB below the permissible value has no need to be reported.



	Polar (H/V)	Frequency (MHz)		Correct Factor (dB)	Measure- ment (dBuV/m)	Lim (dBu		Result
	(17, •)	(11112)	(dBuV/m)		РК	□PK	AV	
			Lov	w Channel 24	412MHz			
	Н	2390.00	53.86	-6.70	47.16	74.00	54.00	PASS
	Н	2400.00	57.72	-6.71	51.01	74.00	54.00	PASS
000.44	V	2390.00	54.19	-6.70	47.49	74.00	54.00	PASS
802.11	V	2400.00	58.54	-6.71	51.83	74.00	54.00	PASS
n20			Hig	h Channel 24	462MHz			
	Н	2483.50	57.72	-6.79	50.93	74.00	54.00	PASS
	Н	2500.00	50.96	-6.81	44.15	74.00	54.00	PASS
	V	2483.50	57.19	-6.79	50.40	74.00	54.00	PASS
	V	2500.00	52.56	-6.81	45.75	74.00	54.00	PASS

#### Remark:

1. Emission Level = Meter Reading + Factor,

Factor = Antenna Factor + Cable Loss – Pre-amplifier.

Over= Emission Level – Limit

2. If the PK measured levels comply with average limit, then the average level were deemed to comply with average limit.

3 In restricted bands of operation, The spurious emissions below the permissible value more than 20dB 4. The amplitude of spurious emissions which are attenuated by more than 20dB below the permissible value has no need to be reported.

Page: 30 of 73



#### 9. Power Spectral Density Test

#### 9.1 Block Diagram Of Test Setup



#### 9.2 Limit

FCC Part15 (15.247) , Subpart C						
Section	Frequency Range (MHz)	Result				
15.247	Power Spectral Density	8 dBm (in any 3KHz)	2400-2483.5	PASS		

LIMITS OF RADIATED EMISSION MEASUREMENT (Above 1000MHz)

#### 9.3 Test Procedure

1. Set analyzer center frequency to DTS channel center frequency.

- 2. Set the span to 1.5 times the DTS bandwidth.
- 3. Set the RBW to: 10 kHz
- 4. Set the VBW  $\geq$  3 x RBW.
- 5. Detector = peak.
- 6. Sweep time = auto couple.
- 7. Trace mode = max hold.
- 8. Allow trace to fully stabilize.
- 9. Use the peak marker function to determine the maximum amplitude level within the RBW.
- 10. If measured value exceeds limit, reduce RBW (no less than 3 kHz) and repeat.

#### 9.4 EUT Operating Conditions

The EUT tested system was configured as the statements of 4.6 Unless otherwise a special operating condition is specified in the follows during the testing. Note: Power Spectral Density(dBm)=Reading+Cable Loss



#### 9.5 Test Result

Temperature :	26°C	Relative Humidity :	54%
Pressure :	101kPa	Test Voltage :	DC 24V

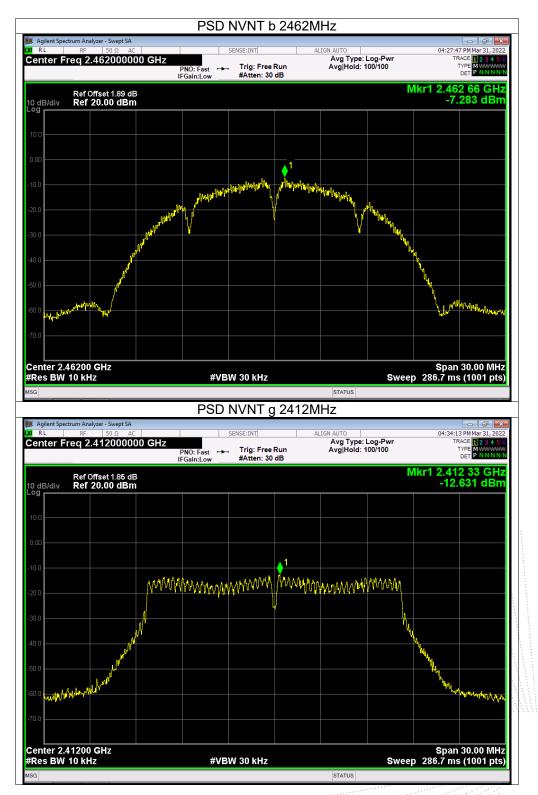
Mode	Frequency	Power Spectral Density(dBm/10kHz)	Power Spectral Density(dBm/3kHz)	Limit (dBm/3kHz )	Result
	2412 MHz	-7.67	-12.90	8	PASS
b	2437 MHz	-7.29	-12.52	8	PASS
	2462 MHz	-7.28	-12.51	8	PASS
	2412 MHz	-12.63	-17.86	8	PASS
g	2437 MHz	-12.4	-17.63	8	PASS
	2462 MHz	-12.27	-17.50	8	PASS
	2412 MHz	-14.24	-19.47	8	PASS
N 20	2437 MHz	-13.84	-19.07	8	PASS
	2462 MHz	-13.73	-18.96	8	PASS

Note: Correction Factor = 10log(3KHz/RBW in measurement)=-5.23 Power Spectral Density(dBm/3kHz)= Power Spectral Density(dBm/10kHz) + Correction Factor

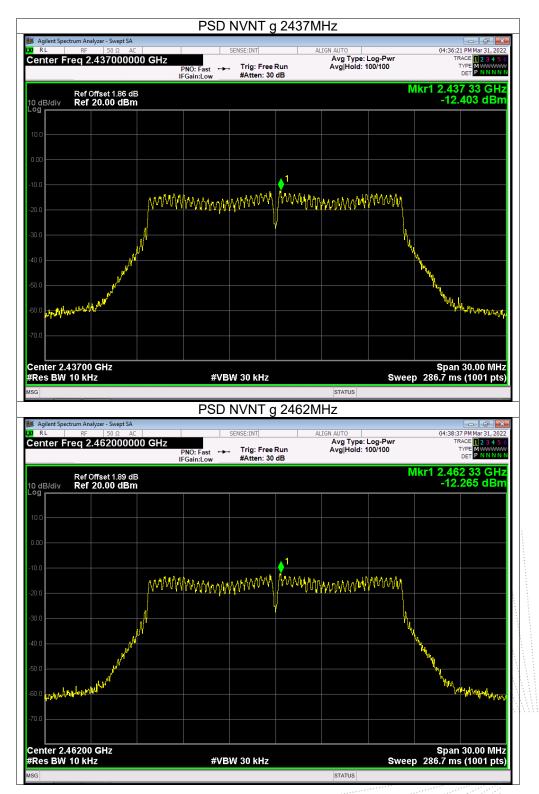




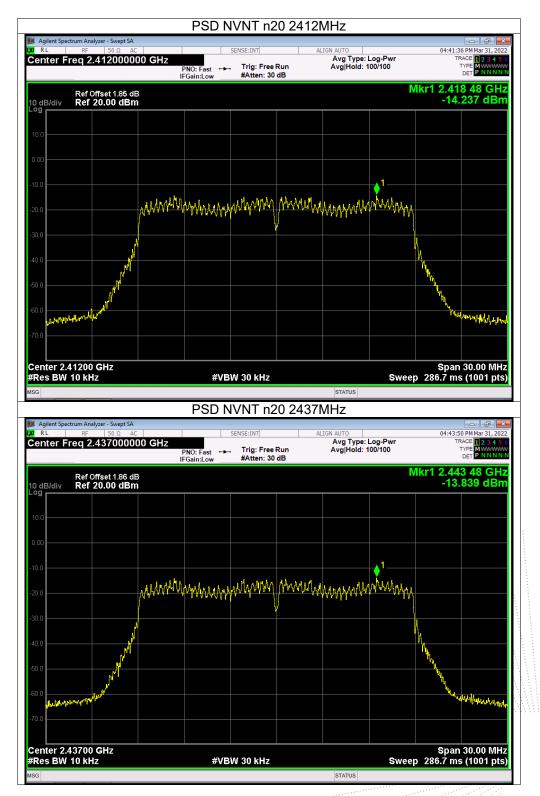




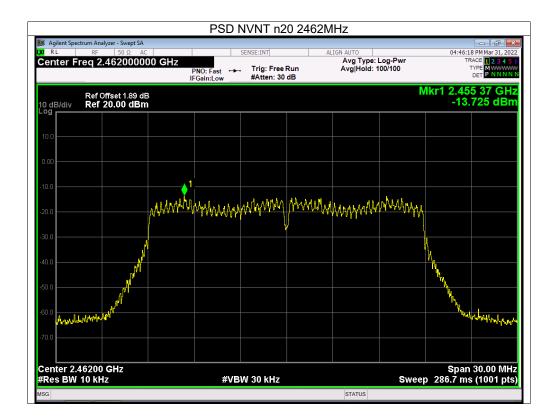














## 10. Bandwidth Test

#### 10.1 Block Diagram Of Test Setup



#### 10.2 Limit

	FCC Part15 (15.247) , Subpart C							
Section	Test Item	Limit	Frequency Range (MHz)	Result				
15.247(a)(2)	Bandwidth	>= 500KHz (6dB bandwidth)	2400-2483.5	PASS				

#### 10.3 Test Procedure

- 1. Set RBW = 100 kHz.
- 2. Set the video bandwidth (VBW)  $\ge$  3 x RBW.
- 3. Detector = Peak.
- 4. Trace mode = max hold.
- 5. Sweep = auto couple.
- 6. Allow the trace to stabilize.

7. Measure the maximum width of the emission that is constrained by the frequencies associated with the two outermost amplitude points (upper and lower frequencies) that are attenuated by 6 dB relative to the maximum level measured in the fundamental emission.

### 10.4 EUT Operating Conditions

The EUT tested system was configured as the statements of 4.6 Unless otherwise a special operating condition is specified in the follows during the testing. Note: Power Spectral Density(dBm)=Reading+Cable Loss



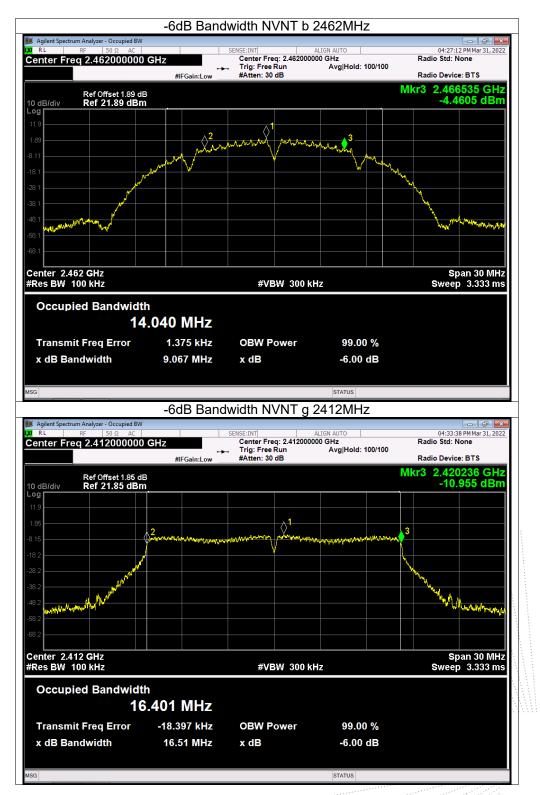
## 10.5 Test Result

Temperature :	<b>26°</b> C	Relative Humidity :	54%		
Pressure :	101kPa	Test Voltage :	DC 24V		
Mode	Frequency (MHz)	6dB bandwidth (MHz)	Limit (kHz)	Result	
	2412	9.064	500	Pass	
b	2437	9.09	500	Pass	
	2462	9.067	500	Pass	
	2412	16.508	500	Pass	
g	2437	16.453	500	Pass	
	2462	16.51	500	Pass	
	2412	17.591	500	Pass	
N 20	2437	17.585	500	Pass	
	2462	17.599	500	Pass	

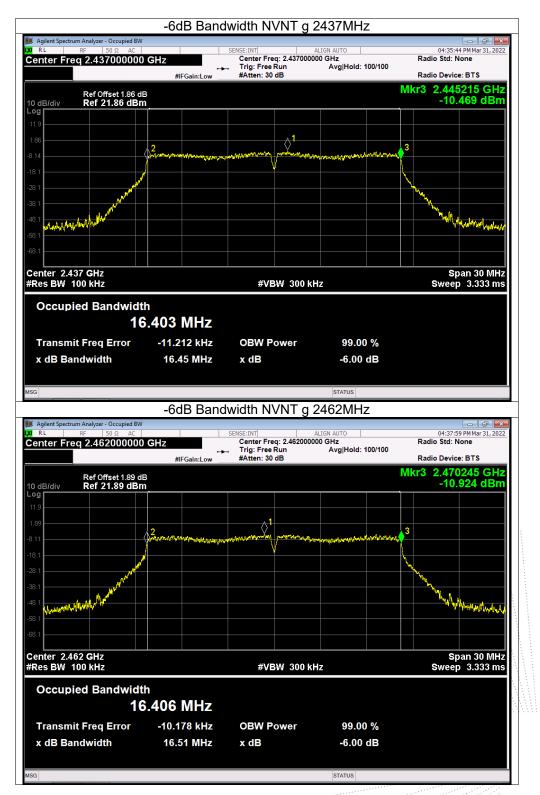




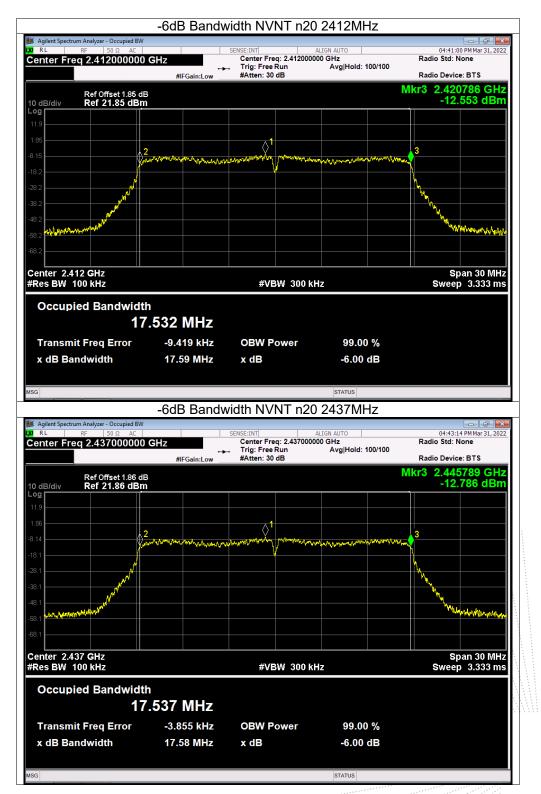




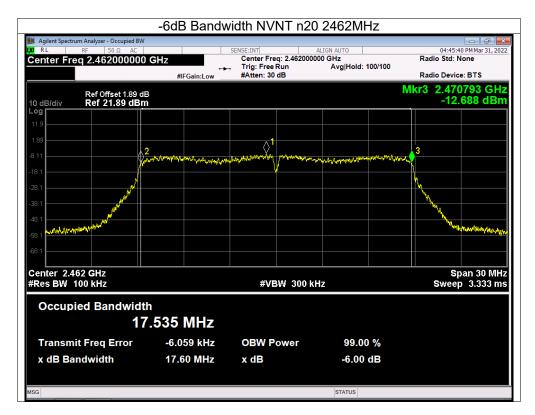












Page: 44 of 73



## 11. Peak Output Power Test

## 11.1 Block Diagram Of Test Setup



#### 11.2 Limit

		FCC Part15 (15.247)	, Subpart C	
Section	Test Item	Limit	Frequency Range (MHz)	Result
15.247(b)(3)	Peak Output Power	1 watt or 30dBm	2400-2483.5	PASS

#### 11.3 Test Procedure

a. The EUT was directly connected to the Power meter

## 11.4 EUT Operating Conditions

The EUT tested system was configured as the statements of 4.6 Unless otherwise a special operating condition is specified in the follows during the testing. Note: Power Spectral Density(dBm)=Reading+Cable Loss

Page: 45 of 73



## 11.5 Test Result

Temperature :	26°C	Relative Humidity :	54%
Pressure :	101kPa	Test Voltage :	DC 24V
	Frequency	<ul> <li>Maximum Conducted Outp Power(PK)</li> </ul>	LIMIT
	(MHz)	(dBm)	dBm
	2412	13.8	30
802.11b	2437	14.01	30
	2462	13.89	30
	2412	12.99	30
802.11g	2437	13.07	30
	2462	13.29	30
	2412	11.22	30
802.11n20	2437	11.44	30
	2462	11.68	30



### 12. 100 KHz Bandwidth Of Frequency Band Edge

#### 12.1 Block Diagram Of Test Setup



#### 12.2 Limit

In any 100 kHz bandwidth outside the frequency band in which the spread spectrum intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement.

#### 12.3 Test Procedure

Using the following spectrum analyzer setting:

- a) Set the RBW = 100KHz.
- b) Set the VBW = 300KHz.
- c) Sweep time = auto couple.
- d) Detector function = peak.
- e) Trace mode = max hold.
- f) Allow trace to fully stabilize..

### 12.4 EUT Operating Conditions

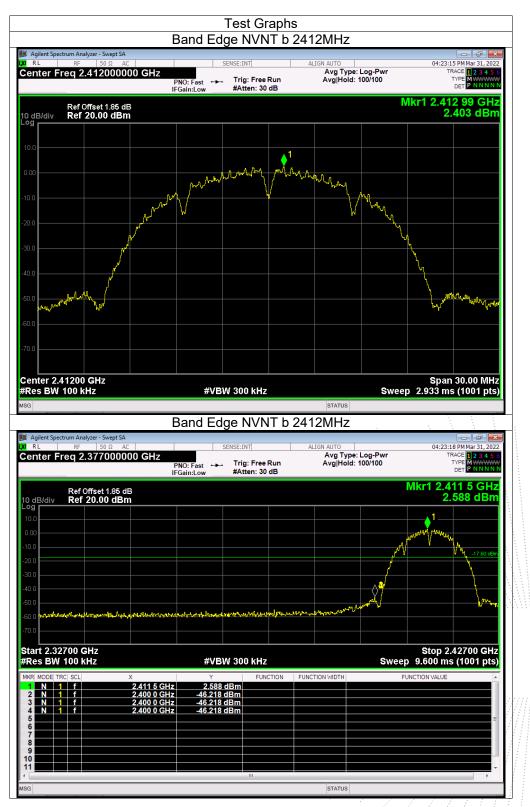
The EUT tested system was configured as the statements of 4.6 Unless otherwise a special operating condition is specified in the follows during the testing. Note: Power Spectral Density(dBm)=Reading+Cable Loss

Page: 47 of 73



## 12.5 Test Result

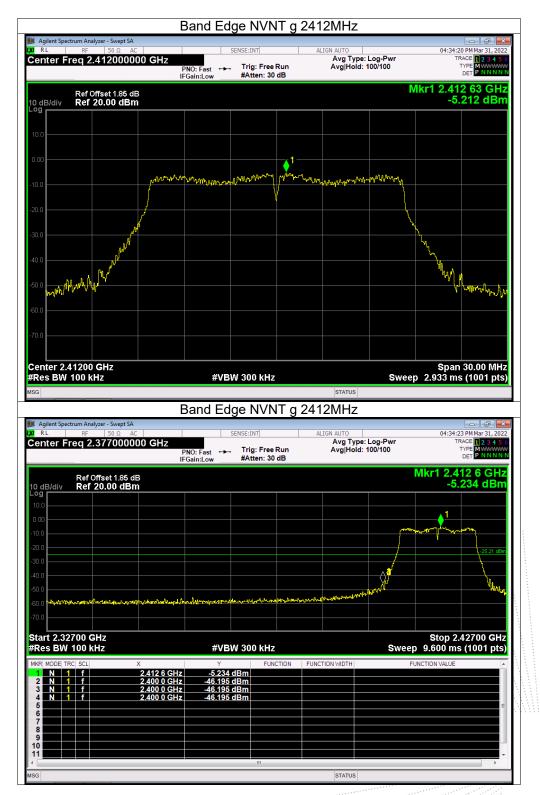
Temperature :	<b>26</b> ℃	Relative Humidity :	54%
Pressure :	101kPa	Test Voltage :	DC 24V



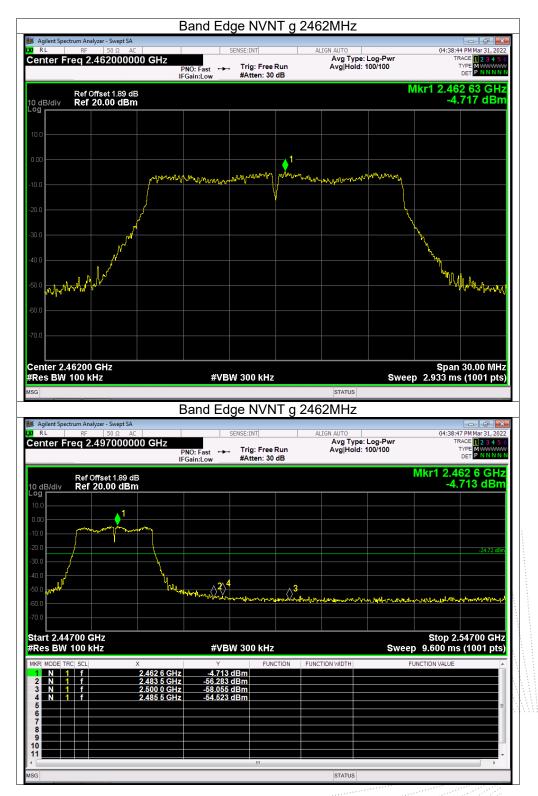




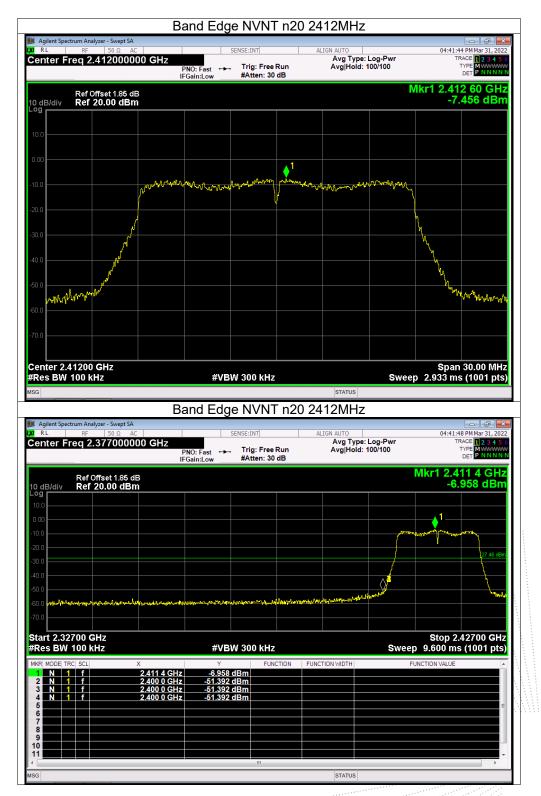




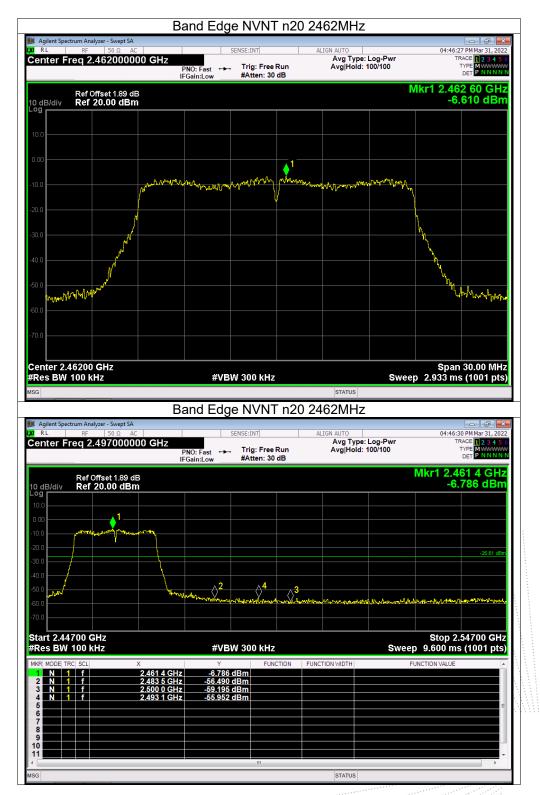




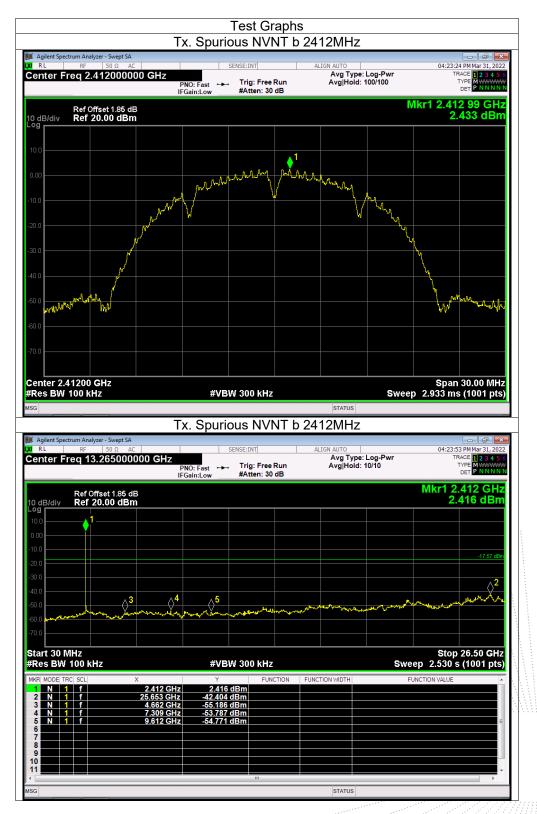




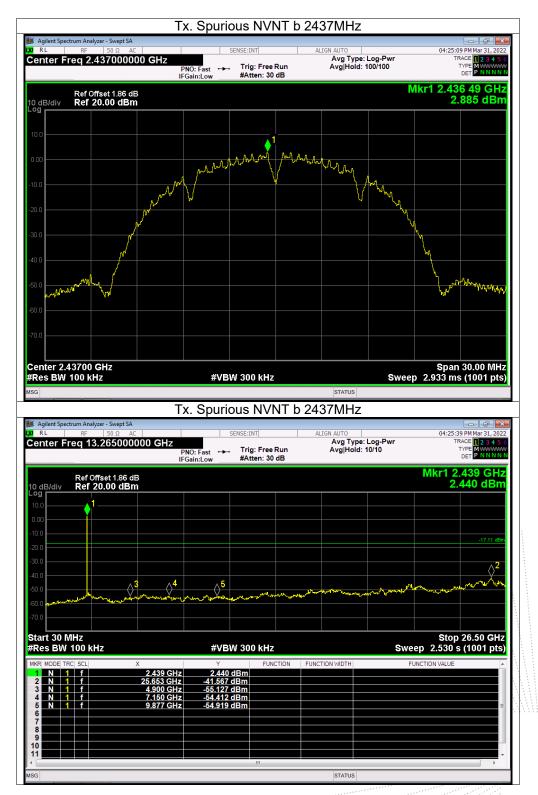




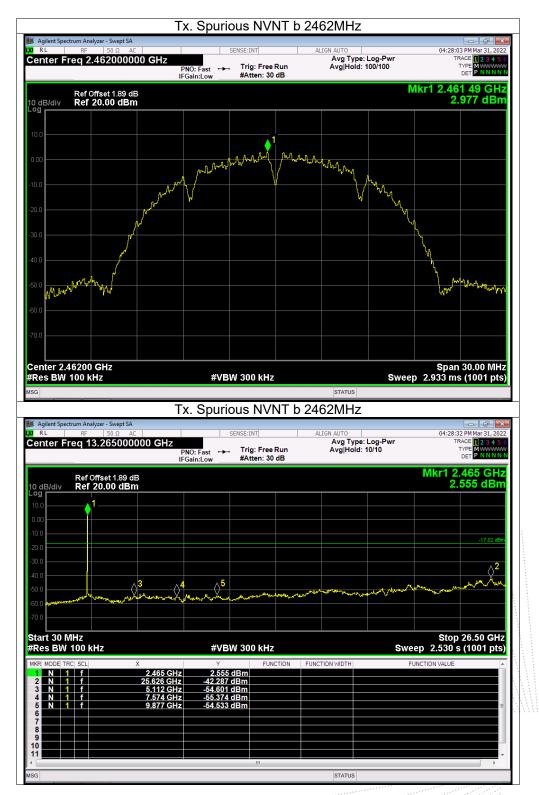




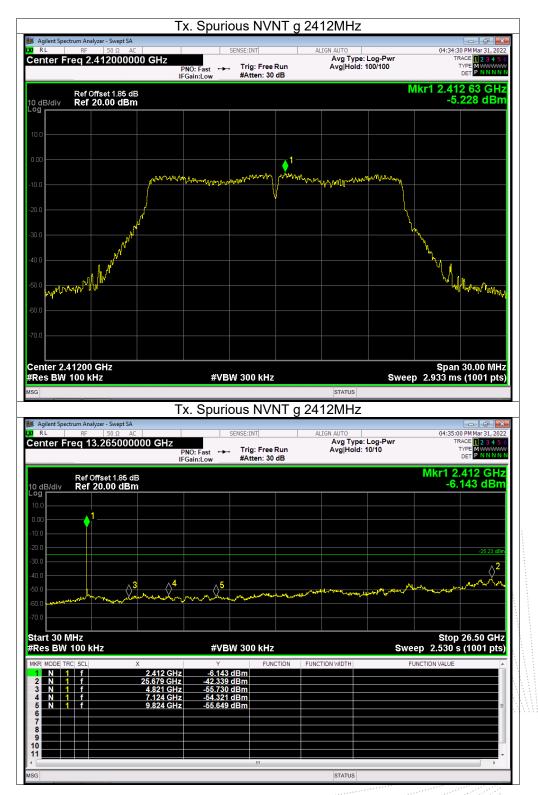




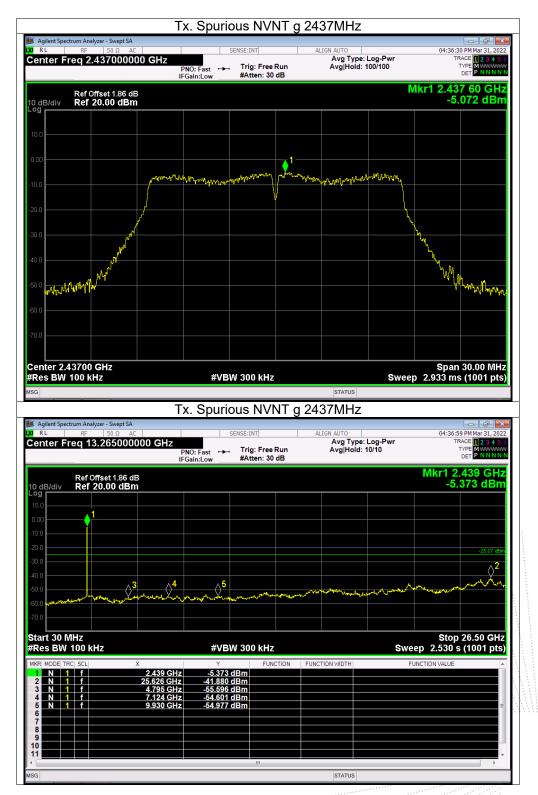




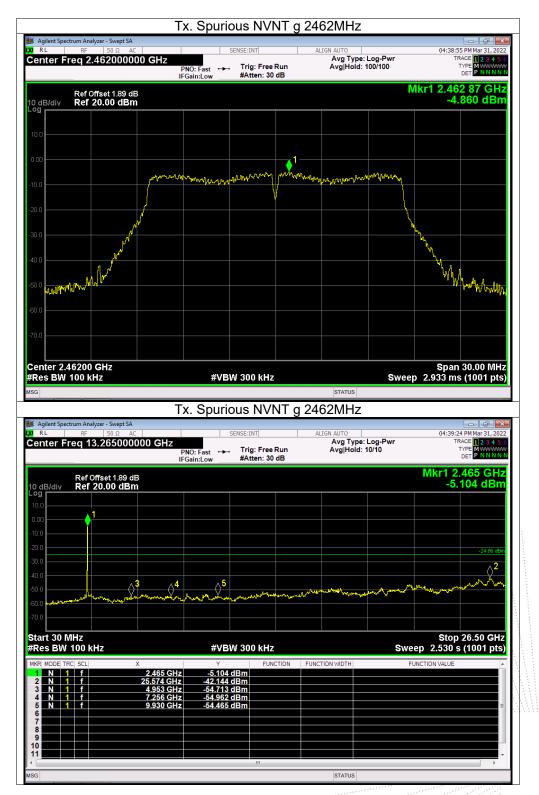




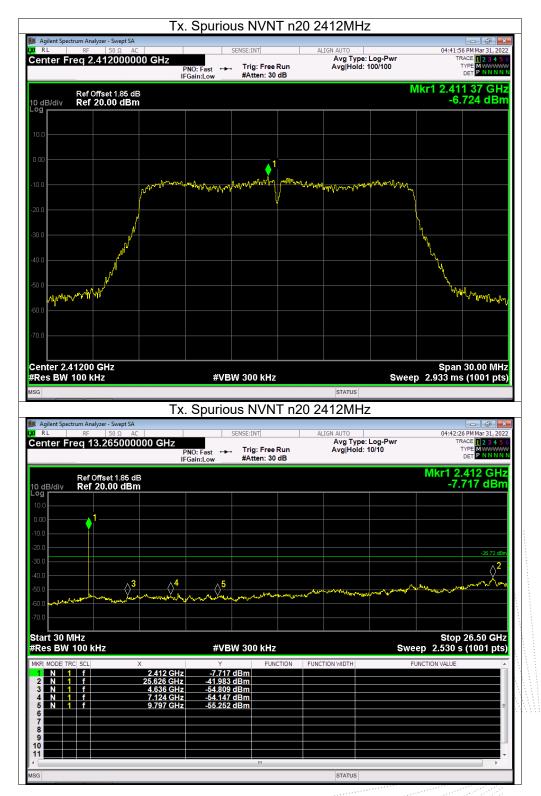




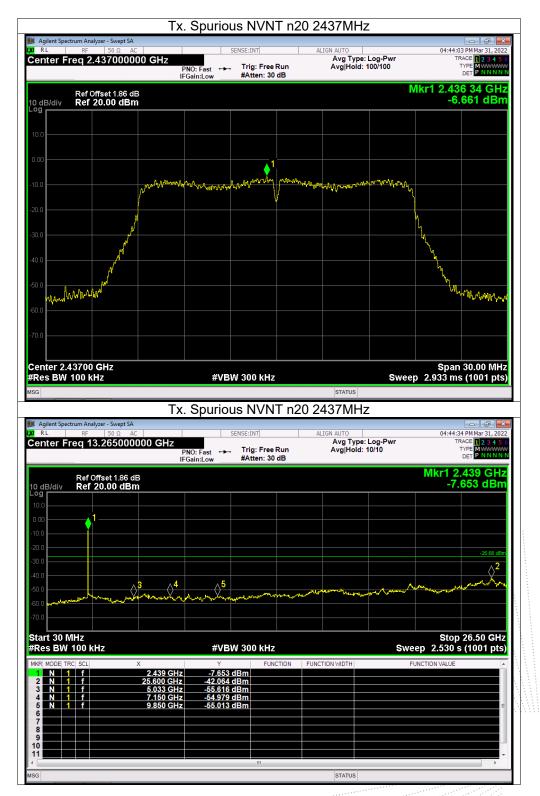




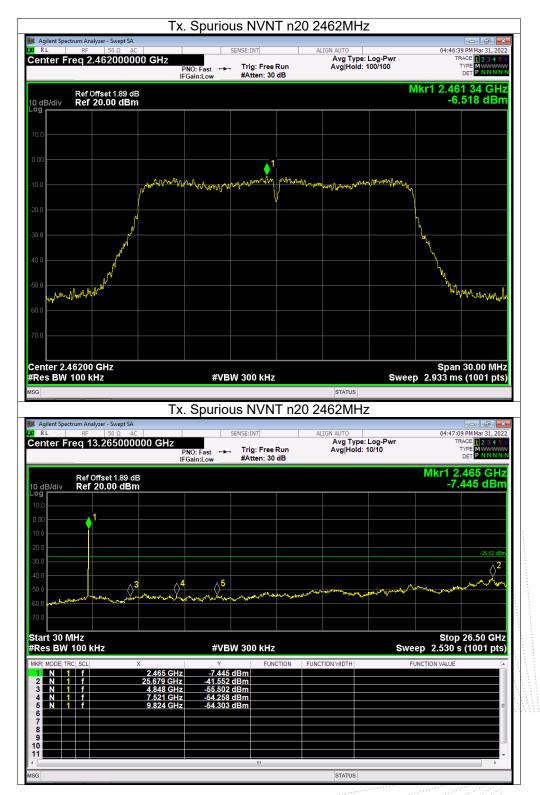














## 13. Duty Cycle Of Test Signal

#### 13.1 Standard Requirement

Pre-analysis Check: While conducting average power measurement, duty cycle of each mode shall be checked to ensure its duty cycle in order to compensate for the loss due to insufficient ratio of duty cycle. All duty cycle is pre-scanned, and result as obtained below shows only the most representative ones where duty cycle is conducted as the given transmission with given virtual operation that expresses the percentage.

13.2 Formula

Duty Cycle = Ton / (Ton+Toff)

#### 13.3 Test Procedure

1.Set span = Zero

- 2. RBW = 8MHz
- 3. VBW = 8MHz,
- 4. Detector = Peak

### 13.4 Test Result

Condition	Mode	Frequency (MHz)	Duty Cycle (%)	Correction Factor (dB)	1/T (kHz)
NVNT	b	2412	100	0	0
NVNT	b	2437	100	0	0
NVNT	b	2462	100	0	0
NVNT	g	2412	100	0	0
NVNT	g	2437	100	0	0
NVNT	g	2462	100	0	0
NVNT	n20	2412	100	0	0
NVNT	n20	2437	100	0	0
NVNT	n20	2462	100	0	0



	Ω AC	SEN	SE:INT	ALIGN AUTO		04:22:	22 PM Mar 31, 2022
nter Freq 2.412	P		Trig: Free Run #Atten: 30 dB	Avg Type:	Log-Pwr	Т	RACE 1 2 3 4 5 6 TYPE WWWWWW DET P N N N N N
Ref Offset	1.85 dB					Mkr1	50.00 ms 5.32 dBm
dB/div Ref 20.0						·	
0							
•							
0							
nter 2.412000000	) GHz						Span 0 Hz
s BW 8 MHz			8.0 MHz				(10001 pts)
MODE TRC SCL	× 50.00 ms	Y 15.32 dB	FUNCTION m	FUNCTION WIDTH	F	UNCTION VALUE	
							Ξ
			III	STATIS			
		)utv Cvcle		STATUS 2437MHz			
	wept SA		e NVNT b	2437MHz			
RL RF 50	wept SA	SEN:	e NVNT b SE:INT Trig: Free Run		: Log-Pwr		22 PM Mar 31, 2022
nter Freq 2.412	wept SA D Ω AC 0 0000000 GHz PP IFC	SEN:	e NVNT b	2437MHz	: Log-Pwr	т	22 PM Mar 31, 2022 RACE 1 2 3 4 5 6 TYPE WWWWWWW DET PNNNNN
RL RF 50 nter Freq 2.412 Ref Offset dB/div Ref 20.0	wept SA 0 Ω AC     0000000 GHz Pr IFC 1.85 dB	SEN: NO: Fast ↔	E NVNT b SE:INT Trig: Free Run #Atten: 30 dB	2437MHz	: Log-Pwr	T Mkr1	22 PM Mar 31, 2022
Agilent Spectrum Analyzer - S RL RF SC nter Freq 2.412 Ref Offset	wept SA 0 Ω AC 000000 GHz PP IFC 1.85 dB	SEN: NO: Fast ↔	e NVNT b SE:INT Trig: Free Run	2437MHz	Log-Pwr	T Mkr1	22 PM Mar 31, 2022 RACE 1 2 3 4 5 6 TYPE WWWWWW DET P N N N N 50.00 ms
RL RF 50 nter Freq 2.412 Ref Offset dB/div Ref 20.0	wept SA 0 Ω AC 000000 GHz PP IFC 1.85 dB	SEN: NO: Fast ↔	E NVNT b SE:INT Trig: Free Run #Atten: 30 dB	2437MHz	Log-Pwr	T Mkr1	22 PM Mar 31, 2022 RACE 1 2 3 4 5 6 TYPE WWWWWW DET P N N N N 50.00 ms
RL RF 50 nter Freq 2.412 Ref Offset dB/div Ref 20.00	wept SA 0 Ω AC 000000 GHz PP IFC 1.85 dB	SEN: NO: Fast ↔	E NVNT b SE:INT Trig: Free Run #Atten: 30 dB	2437MHz	Log-Pwr	T Mkr1	22 PM Mar 31, 2022 RACE 1 2 3 4 5 6 TYPE WWWWWW DET P N N N N 50.00 ms
RE RE SC Ref Offset B/div Ref 20.00	wept SA 0 Ω AC 000000 GHz PP IFC 1.85 dB	SEN: NO: Fast ↔	E NVNT b SE:INT Trig: Free Run #Atten: 30 dB	2437MHz	Log-Pwr	T Mkr1	22 PM Mar 31, 2022 RACE 1 2 3 4 5 6 TYPE WWWWWW DET P N N N N 50.00 ms
RE RE SC Ref Offset B/div Ref 20.00	wept SA 0 Ω AC 000000 GHz PP IFC 1.85 dB	SEN: NO: Fast ↔	E NVNT b SE:INT Trig: Free Run #Atten: 30 dB	2437MHz	Log-Pwr	T Mkr1	22 PM Mar 31, 2022 RACE 1 2 3 4 5 6 TYPE WWWWWW DET P N N N N 50.00 ms
Agilent Spectrum Analyzer - S RL RF 50 nter Freq 2.412 Ref Offset dB/div Ref 20.00	wept SA 0 Ω AC 000000 GHz PP IFC 1.85 dB	SEN: NO: Fast ↔	E NVNT b SE:INT Trig: Free Run #Atten: 30 dB	2437MHz	Log-Pwr	T Mkr1	22 PM Mar 31, 2022 RACE 1 2 3 4 5 6 TYPE WWWWWW DET P N N N N 50.00 ms
RL RF SC nter Freq 2.412 Ref Offset dB/div Ref 20.00 0 0 0 0 0 0 0 0 0 0 0 0	wept SA 0 Ω AC 000000 GHz PP IFC 1.85 dB	SEN: NO: Fast ↔	E NVNT b SE:INT Trig: Free Run #Atten: 30 dB	2437MHz	Log-Pwr	T Mkr1	22 PM Mar 31, 2022 RACE 1 2 3 4 5 6 TYPE WWWWWW DET P N N N N 50.00 ms
Ref Offset B/div Ref 20.00	wept SA 2.2 AC 000000 GHz PP IFC 1.85 dB 0 dBm	NO: Fast +-	e NVNT b se:INT Trig: Free Run #Atten: 30 dB	2437MHz		Mkr1 1	22 PMWar 31, 2022 RACE    2 3 4 5 6 TYPE    2 3 4 5 6 TYPE    3 4 5 6 50.00 ms 5.32 dBm 5.32 dBm
Ref Offset Bi/div Ref 2.412	wept SA 2.2 AC 000000 GHz PP IFC 1.85 dB 0 dBm	NO: Fast +-	E NVNT b SE:INT Trig: Free Run #Atten: 30 dB	2437MHz	Sweep	Mkr1 1	22 PMArr 31, 2022 RACE [] 2:3 4:5 6 TYPE WARNING DET P NINNNN 50.00 ms 5.32 dBm
Ref Offset	wept SA 2.2 AC 1.85 dB 0 dBm 0 dBm 0 dBm 0 dBm 0 dBm 0 dBm	NO: Fast +-	E NVNT b SE:INT Trig: Free Run #Atten: 30 dB	2437MHz	Sweep	Mkr1 1	22 PMWar 31, 2022 RACE    2 3 4 5 6 TYPE    2 3 4 5 6 TYPE    3 4 5 6 50.00 ms 5.32 dBm 5.32 dBm
Ref Offset Ref Offset B/div Ref 20.00 Ref 20.0	wept SA           02 AC           0100000 GHz           Priso           010000 GHz           010000 GHz           010000 GHz           010000 GHz           010000 GHz	NO: Fast  Sain:Low	E NVNT b SE:INT Trig: Free Run #Atten: 30 dB	2437MHz	Sweep	Mkr1 1	22 PMWar 31, 2022 RACE    2 3 4 5 6 TYPE    2 3 4 5 6 TYPE    3 4 5 6 50.00 ms 5.32 dBm 5.32 dBm
Ref Offset Ref Offset B/div Ref 20.00 Ref 20.0	weet SA           02 AC           0100000 GHz           Price           010000 GHz           010000 GHz           010000 GHz           010000 GHz           010000 GHz	NO: Fast  Sain:Low	E NVNT b SE:INT Trig: Free Run #Atten: 30 dB	2437MHz	Sweep	Mkr1 1	22 PMWar 31, 2022 RACE    2 3 4 5 6 TYPE    2 3 4 5 6 TYPE    3 4 5 6 50.00 ms 5.32 dBm 5.32 dBm



nter Freq 2.4620	Ω AC 1000000 GHz PNO: I IFGain:	ust .	nt g: Free Run ten: 30 dB	ALIGN AUTO Avg Type	: Log-Pwr	TF	51 PM Mar 31, 2022 RACE 1 2 3 4 5 6 TYPE WWWWWW DET P N N N N N
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enter 2.462000000	GH7						Span 0 Hz
s BW 8 MHz		#VBW 8.0					(10001 pts)
N 1 t	× 50.00 ms	۲ 16.61 dBm	FUNCTION	FUNCTION WIDTH	F	UNCTION VALUE	
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			ш	STATUS			•
				514105			
	Dut	v Cvcle N	n TNVI	2412MHz			
	vept SA			2412MHz			
RL RF 50 9	Pept SA Ω AC 00000 GHz	SENSE:1	NT	2412MHz ALIGN AUTO Avg Type	: Log-Pwr	TF	I3 PM Mar 31, 2022 RACE 1 2 3 4 5 6
RL RF 50 9	Pept SA Ω AC 00000 GHz	SENSE:I		ALIGN AUTO	: Log-Pwr	TF	L3 PM Mar 31, 2022 RACE 1 2 3 4 5 6 TYPE WWWWWW DET PNNNNN
RL RF 50 9 nter Freq 2.4120 Ref Offset 1 dB/div Ref 20.00	xept SA Ω AC        000000 GHz  FGain:  .85 dB	SENSE:I	NT g: Free Run	ALIGN AUTO	: Log-Pwr	Tr Mkr1	I3 PM Mar 31, 2022 RACE 1 2 3 4 5 6
RL RF 50 f Inter Freq 2.4120 Ref Offset 1 dB/div Ref 20.00	xept SA Ω AC        000000 GHz  FGain:  .85 dB	ast ++- Trig Low #At	nt g: Free Run ten: 30 dB	ALIGN AUTO Avg Type		Tr Mkr1 1(	13 PMMar 31, 2022 RACE 1 2 3 4 5 6 TYPE P N N N N N 50.00 ms 0.74 dBm
RL RF 50 : nter Freq 2.4120 Ref Offset 1 dB/div Ref 20.00	eert SA Ω AC DE D00000 GHz PNO: f IFGain: IS5 dB dBm	ast ++- Trig Low #At	nt g: Free Run ten: 30 dB	ALIGN AUTO Avg Type		Tr Mkr1 1(	13 PMMar 31, 2022 RACE 1 2 3 4 5 6 TYPE P N N N N N 50.00 ms 0.74 dBm
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RL         RF         50 /           nter Freq 2.4120         Ref Offset 1           dB/div         Ref 20.00         8           0         0         0         0         0           0 </td <td>eert SA Ω AC DE D00000 GHz PNO: f IFGain: IS5 dB dBm</td> <td>ast ++- Trig Low #At</td> <td>nt g: Free Run ten: 30 dB</td> <td>ALIGN AUTO Avg Type</td> <td></td> <td>Tr Mkr1 1(</td> <td>13 PMMar 31, 2022 RACE 1 2 3 4 5 6 TYPE P N N N N N 50.00 ms 0.74 dBm</td>	eert SA Ω AC DE D00000 GHz PNO: f IFGain: IS5 dB dBm	ast ++- Trig Low #At	nt g: Free Run ten: 30 dB	ALIGN AUTO Avg Type		Tr Mkr1 1(	13 PMMar 31, 2022 RACE 1 2 3 4 5 6 TYPE P N N N N N 50.00 ms 0.74 dBm
RL         RF         50 4           nter Freq 2.4120         Ref Offset 1         Ref Offset 2           dB/div         Ref 20.00	eert SA Ω AC DE D00000 GHz PNO: f IFGain: IS5 dB dBm	ast ++- Trig Low #At	nt g: Free Run ten: 30 dB	ALIGN AUTO Avg Type		Tr Mkr1 1(	13 PMMar 31, 2022 RACE 1 2 3 4 5 6 TYPE P N N N N N 50.00 ms 0.74 dBm
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RL         RF         50.2           Inter Freq 2.4120         Ref Offset 1         Ref 20.00           Ref Offset 1         Ref 20.00         Ref 20.00           Ref 0         Ref 20.00         Ref 20.00           Ref 1         Ref 20.00         Ref 20.00	AC DIANA CARACTERISTICS A CONTRACT OF CON	SENSE: ast $\rightarrow \rightarrow$ Trig Low #At #At #At #At #At #At #At #At	g: Free Run ten: 30 dB	ALIGN AUTO Avg Type	Sweep	Tr Mkr1 10 100.0 ms	13 PM APT 31, 2022 RAGE 12 34 5 6 50.00 ms 0.74 dBm 4.1111 4.1111 50.00 ms 0.74 dBm 4.1111 50.00 ms 0.74 dBm 4.1111 50.00 ms 0.74 dBm 4.1111 50.00 ms 0.74 dBm 4.1111 50.00 ms 0.74 dBm 4.1111 50.00 ms 0.74 dBm 50.00 ms 0.74 dBm 10.00 ms 0.75 dBm 10.00 ms 0.75 dBm 10.00 ms 10.00 ms 10.0
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enter 2.437000000 GHz es BW 8 MHz		#VBW 8.0	MHz		Sweep	100.0 ms	Span 0 Hz (10001 pts)
R MODE TRC SCL	× 50.00 ms	۲ 11.27 dBm	FUNCTION	FUNCTION WIDTH	FL	JNCTION VALUE	<u>^</u>
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RL RF 50 Ω AC	00 GHz	sense:I		2462MHz	Log-Pwr	TF	
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RL RF 50 2 AC enter Freq 2.4620000 Ref Offset 1.89 dl dB/div Ref 20.00 dBn	OO GHz PNO: F IFGain: B n	sense:⊡ ast ↔ Trig Low #At	nt g: Free Run ten: 30 dB	ALIGN AUTO AVIG Type:		۳ Mkr1 12	33 PMMar 31, 2022 RACE 1 2 3 4 5 6 TYPE WANNAN DET P N N N N N 50.00 ms 2.66 dBm
RL RF 50 0 AC enter Freq 2.4620000 Ref Offset 1.89 di dB/div Ref 20.00 dBn	OO GHz PNO: F IFGain: B n	sense:⊡ ast ↔ Trig Low #At	nt g: Free Run ten: 30 dB	ALIGN AUTO AVIG Type:		۳ Mkr1 12	33 PMMar 31, 2022 RACE 1 2 3 4 5 6 TYPE WANNAN DET P N N N N N 50.00 ms 2.66 dBm
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RL RF 500 AC	OO GHz PNO: F IFGain: B n	sense:⊡ ast ↔ Trig Low #At	nt g: Free Run ten: 30 dB	ALIGN AUTO AVIG Type:		۳ Mkr1 12	33 PMMar 31, 2022 RACE 1 2 3 4 5 6 TYPE WANNAN DET P N N N N N 50.00 ms 2.66 dBm
RL         R5         50.0         Acc           enter Freq 2.4620000         Ref Offset 1.89 dl         Ref 20.00 dBn         Ref 20.00 dBn           dB/div         Ref 20.00 dBn         Ref 20.00 dBn         Ref 20.00 dBn         Ref 20.00 dBn           0         0         0         0         0         0         0         0           0 </td <td>OO GHz PNO: F IFGain: B n</td> <td>sense:⊡ ast ↔ Trig Low #At</td> <td>nt g: Free Run ten: 30 dB</td> <td>ALIGN AUTO AVIG Type:</td> <td></td> <td>۳ Mkr1 12</td> <td>33 PMMar 31, 2022 RACE 1 2 3 4 5 6 TYPE WANNAN DET P N N N N N 50.00 ms 2.66 dBm</td>	OO GHz PNO: F IFGain: B n	sense:⊡ ast ↔ Trig Low #At	nt g: Free Run ten: 30 dB	ALIGN AUTO AVIG Type:		۳ Mkr1 12	33 PMMar 31, 2022 RACE 1 2 3 4 5 6 TYPE WANNAN DET P N N N N N 50.00 ms 2.66 dBm
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1							-
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	Dut	v Cycle N	V/NT n2(				
Agilent Spectrum Analyzer - Sw		y Cycle N	VNT n2	0 2437MHz			
RL RF 50	vept SA Ω AC			D 2437MHz		TF	4 PM Mar 31, 2022
RL RF 50	vept SA Ω AC     D00000 GHz PNO	SENSE:I		0 2437MHz		TF	
enter Freq 2.4370	vept SA Ω AC     DOOOOOO GHz PNO IFGai	SENSE:I	NT g: Free Run	D 2437MHz		TF Mkr1	4 PMMar 31, 2022 RACE 1 2 3 4 5 6 TYPE PNNNN DET PNNNNN
RL RF 50 enter Freq 2.4370 Ref Offset 1	vept SA Ω AC DO0000 GHz PNO IFGai 1.86 dB	SENSE:I	nt g: Free Run tten: 30 dB	D 2437MHz		TF Mkr1	4 PM Mar 31, 2022 RACE 1 2 3 4 5 6 TYPE WWWWWW DET P NNNN
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RL         PF         50           enter Freq 2.4370         Ref Offset 1         0           dB/div         Ref 20.00         0           0         0         0           0 <td>wept SA         PRO           Q. AC         PNO           D000000 GHz         PNO           PNO         IFGai           1.86 dB         PNO           0.010000 GHz         PNO           0.010000 GHz         PNO           0.010000 GHz         PNO           0.01000 GHz         PNO           0.01000 GHz         PNO           0.01000 GHz         PNO           0.0100 GHz         PNO</td> <td>SENSE: Fast →→ Tri r:Low #At</td> <td>g: Free Run ten: 30 dB</td> <td>D 2437MHz</td> <td>Log-Pwr</td> <td>TF Mkr1 10 100.0 ms</td> <td>4 PM Mar 31, 2022 Made II 2 3 4 5 6 Made II 2 3 4 5 6 Mar 2 4 5 6 DET P NINN N 50.00 ms 50.43 dBm Mar 2 4 6 6 6 7 10 1</td>	wept SA         PRO           Q. AC         PNO           D000000 GHz         PNO           PNO         IFGai           1.86 dB         PNO           0.010000 GHz         PNO           0.010000 GHz         PNO           0.010000 GHz         PNO           0.01000 GHz         PNO           0.01000 GHz         PNO           0.01000 GHz         PNO           0.0100 GHz         PNO	SENSE: Fast →→ Tri r:Low #At	g: Free Run ten: 30 dB	D 2437MHz	Log-Pwr	TF Mkr1 10 100.0 ms	4 PM Mar 31, 2022 Made II 2 3 4 5 6 Made II 2 3 4 5 6 Mar 2 4 5 6 DET P NINN N 50.00 ms 50.43 dBm Mar 2 4 6 6 6 7 10 1
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RL         PF         50           enter Freq 2.4370         Ref Offset 1         GE           Ref Offset 1         GE         GE           O dE/div         Ref 20.00         GE         GE           O dE         GE         GE         GE           G dE         GE         GE         GE           G dE         GE         GE         GE           G dE         GE         GE         GE	vept SA Q AC OUNDOO GHZ PNO IFGal I.86 dB dBm Vertex of the second	SENSE: Fast →→ Tri #A1	g: Free Run ten: 30 dB	D 2437MHz	Log-Pwr	TF Mkr1 10 100.0 ms	4 PMMB13, 2022 MGE 1 2 3 4 5 6 DET P NNNN 50.00 ms .43 dBm .43 dBm
RL         PF         50           enter Freq 2.4370         Ref Offset 1         0           0 dB/div         Ref 20.00         0           0 dB/div	vept SA Q AC OUNDOO GHZ PNO IFGal I.86 dB dBm Vertex of the second	SENSE: Fast →→ Tri #A1	g: Free Run ten: 30 dB	D 2437MHz	Log-Pwr	TF Mkr1 10 100.0 ms	4 PMMB13, 2022 MGE 1 2 3 4 5 6 DET P NNNN 50.00 ms .43 dBm .43 dBm



	trum Analyzer - Swept SA	-	- i		0 2462MHz			- 6
RL Center Fi	RF 50 Ω AC req 2.46200000	0 GHz PNO: IFGain		:INT rig: Free Run Atten: 30 dB	ALIGN AUTO Avg Typ	e: Log-Pwr	TR	8 PM Mar 31, 202 RACE 1 2 3 4 5 TYPE WWWWWW DET P N N N N
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## 14. Antenna Requirement

#### 14.1 Limit

15.203 requirement: For intentional device, according to 15.203: an intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device.

### 14.2 Test Result

The EUT antenna is Internal antenna, The antenna gain is 0 dBi, fulfill the requirement of this section.

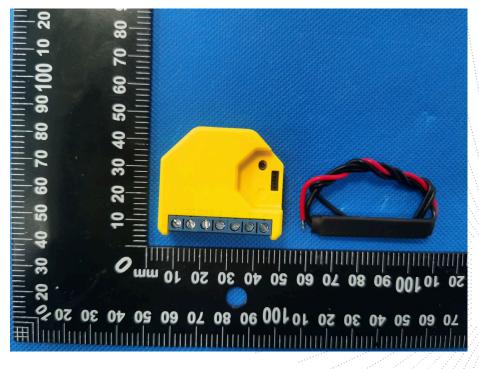


### 15. EUT Photographs

## EUT Photo 1



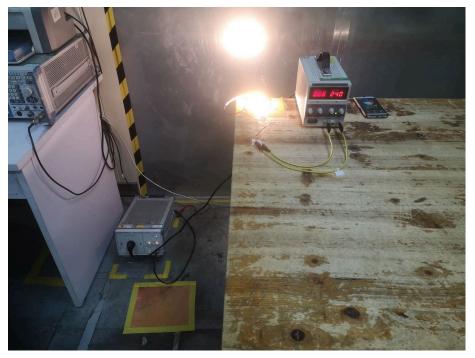
EUT Photo 2



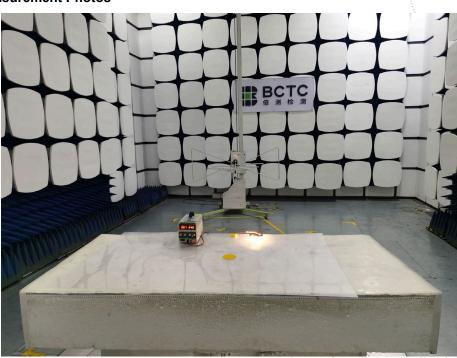


## 16. EUT Test Setup Photographs

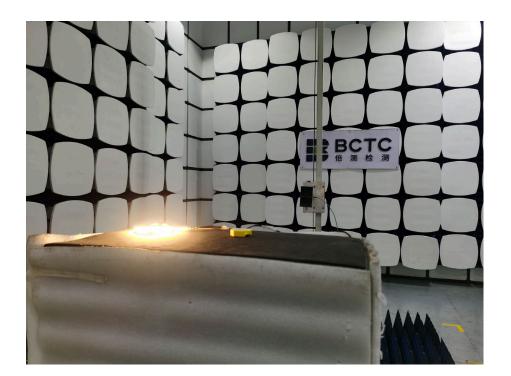
## **Conducted Measurement Photo**



#### **Radiated Measurement Photos**









# **STATEMENT**

1. The equipment lists are traceable to the national reference standards.

2. The test report can not be partially copied unless prior written approval is issued from our lab.

3. The test report is invalid without stamp of laboratory.

4. The test report is invalid without signature of person(s) testing and authorizing.

5. The test process and test result is only related to the Unit Under Test.

6.The quality system of our laboratory is in accordance with ISO/IEC17025.

7.If there is any objection to report, the client should inform issuing laboratory within 15 days from the date of receiving test report.

Address:

1-2/F., Building B, Pengzhou Industrial Park, No.158, Fuyuan 1st Road, Tangwei, Fuhai Subdistrict, Bao'an District, Shenzhen, Guangdong, China

TEL: 400-788-9558

P.C.: 518103

FAX: 0755-33229357

Website: http://www.chnbctc.com

E-Mail: bctc@bctc-lab.com.cn

#### **\*\*\*\*\*\* END \*\*\*\*\***

No.: BCTC/RF-EMC-005

Page: 73 of 73