

### FCC PART 15 SUBPART C ISED RSS-247 ISSUE 2

### **CERTIFICATION TEST REPORT**

For

#### WIFI+BLE Module

#### MODEL NUMBER: GRJW05-J8

#### FCC ID: 2ADAP-GRJW05J8 IC: 12478A-GRJW05J8

#### **REPORT NUMBER: 4790401446.2**

### ISSUE DATE: 16 June 2022

Prepared for

GREE Electric Appliances,Inc.of Zhuhai West Jinji Rd, Qianshan, Zhuhai, Guangdong, China 519070

Prepared by

UL Verification Services (Guangzhou) Co., Ltd, Song Shan Lake Branch Room 101, Building 10, Innovation Technology Park, Song Shan Lake Hi tech Development Zone, Dongguan, 523808, China Tel: +86 769 33817100 Fax: +86 769 33244054 Website: www.ul.com



#### **Revision History**

Rev.	Issue Date	Revisions	Revised By
	16/06/2022	Initial Issue	



Summary of Test Results					
Clause	Test Items	FCC/IC Rules	Test Results		
1	6 dB Bandwidth and 99% Bandwidth	FCC Part 15.247 (a) (2) RSS-247 Clause 5.2 (a) RSS-Gen Clause 6.7	Pass		
2	Conducted Output Power	FCC Part 15.247 (b) (3) RSS-247 Clause 5.4 (d)	Pass		
3	Power Spectral Density	FCC Part 15.247 (e) RSS-247 Clause 5.2 (b)	Pass		
4	Conducted Bandedge and Spurious Emission	FCC Part 15.247 (d) RSS-247 Clause 5.5	Pass		
5	Radiated Bandedge and Spurious Emission	FCC Part 15.247 (d) FCC Part 15.209 FCC Part 15.205 RSS-247 Clause 5.5 RSS-GEN Clause 8.9	Pass		
6	Conducted Emission Test For AC Power Port	FCC Part 15.207 RSS-GEN Clause 8.8	Pass		
7	Antenna Requirement	FCC Part 15.203 RSS-GEN Clause 6.8	Pass		
Remark: 1) The measurement result for the sample received is <pass> according to &lt; CFR 47 FCC PART 15 SUBPART C, when <accuracy method=""> decision rule is applied.</accuracy></pass>					

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# **1. ATTESTATION OF TEST RESULTS**

Applicant Information	
Company Name:	GREE Electric Appliances, Inc. of Zhuhai
Address:	West Jinji Rd, Qianshan, Zhuhai, Guangdong, China 519070
Manufacturer Information	
Company Name:	Same As the Applicant
Address:	Same As the Applicant

#### **EUT Description**

EUT Name:	WIFI+BLE Module
Brand Name:	N/A
Model:	GRJW05-J8
Sample Status:	Normal
Model:	22060602003-4
Sample Received Date:	07 June 2022
Date of Tested:	07 June 2022 ~ 16 June 2022

APPLICABLE STANDARDS				
STANDARD	TEST RESULTS			
FCC Part 15 Subpart C	PASS			
ISED RSS-247 Issue 2	PASS			
ISED RSS-GEN Issue 5	PASS			

Prepared By:

Chris Chen **Engineer Project Associate** Approved By:

Aephenbus

Stephen Guo Laboratory Manager

Checked By: Shennellen

Shawn Wen Laboratory Leader



# 2. TEST METHODOLOGY

The tests documented in this report were performed in accordance with 558074 D01 15.247 Meas Guidance v05r02, 414788 D01 Radiated Test Site v01r01, FCC CFR 47 Part 2, FCC CFR 47 Part 15, ANSI C63.10-2013, ISED RSS-247 Issue 2 and ISED RSS-GEN Issue 5.

# 3. FACILITIES AND ACCREDITATION

	A2LA (Certificate No.: 4338.01)
	Shenzhen STS Test Services Co., Ltd.
	has been assessed and proved to be in compliance with A2LA.
	CNAS (Registration No.: L7649)
Accreditation	Shenzhen STS Test Services Co., Ltd.
Certificate	has been assessed and proved to be in compliance with CNAS.
	IC(Company No.: 12108A)
	Shenzhen STS Test Services Co., Ltd.
	has been registered and fully described in a report filed with
	Industry Canada. The Company Number is 12108A.

Note: All tests measurement facilities use to collect the measurement data are located at A 1/F, Building B, Zhuoke Science Park, No.190 Chongqing Road, HepingShequ, Fuyong Sub-District, Bao'an District, Shenzhen, Guang Dong, China

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# 4. CALIBRATION AND UNCERTAINTY

### 4.1. MEASURING INSTRUMENT CALIBRATION

The measuring equipment utilized to perform the tests documented in this report has been calibrated in accordance with the manufacturer's recommendations, and is traceable to recognized national standards.

## 4.2. MEASUREMENT UNCERTAINTY

The reported uncertainty of measurement  $\mathbf{y} \pm \mathbf{U}$ , where expended uncertainty  $\mathbf{U}$  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	±0.87dB
2	Unwanted Emissions, conducted	±2.895dB
3	All emissions, radiated 9K-30MHz	±3.80dB
4	All emissions, radiated 30M-1GHz	±4.09dB
5	All emissions, radiated 1G-6GHz	±4.92dB
6	All emissions, radiated>6G	±5.49dB
7	Conducted Emission (9KHz-30MHz)	±2.73dB

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# 5. EQUIPMENT UNDER TEST

# 5.1. DESCRIPTION OF EUT

EUT Name	WIFI+BLE Module		
EUT Description	WIFI+BLE Module		
Model	GRJW05-J8		
PMN	WIFI+BLE Module		
HVIN	GRJW05-J8		
FVIN	N/A		
Serial number	N/A		
	Operation Frequency	2402 MHz ~ 2480 MHz	
Product Description (Bluetooth)	Modulation Type	GFSK	
	Data Rate	1Mbps	
Power Parameter	Input: DC 3.3V		
Bluetooth Version	5.0		
Bluetooth Configuration	LE		
Hardware Version	N/A		
Software Version	N/A		

# 5.2. MAXIMUM OUTPUT POWER

Frequency Range (MHz)	Number of Transmit Chains (NTX)	Bluetooth Mode	Frequency (MHz)	Channel Number	Max average Conducted Power (dBm)
2400-2483.5	1	BLE	2402-2480	0-39[40]	-5.16

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# 5.3. CHANNEL LIST

Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)
00	2402	11	2424	22	2446	33	2468
01	2404	12	2426	23	2448	34	2470
02	2406	13	2428	24	2450	35	2472
03	2408	14	2430	25	2452	36	2474
04	2410	15	2432	26	2454	37	2476
05	2412	16	2434	27	2456	38	2478
06	2414	17	2436	28	2458	39	2480
07	2416	18	2438	29	2460		
08	2418	19	2440	30	2462		
09	2420	20	2442	31	2464		
10	2422	21	2444	32	2466		

### 5.4. TEST CHANNEL CONFIGURATION

Test Mode	Test Channel	Frequency
GFSK	CH 00, CH 19, CH 39	2402MHz, 2440MHz, 2480MHz

## 5.5. THE WORSE CASE POWER SETTING PARAMETER

The Worse Case Power Setting Parameter under 2400 ~ 2483.5MHz Band					
Modulation Type	Transmit Antenna Test Channel				
Modulation Type	Number	CH 00	CH 19	CH 39	
GFSK	1	6	6	6	

# 5.6. DESCRIPTION OF AVAILABLE ANTENNAS

Ant.	Frequency (MHz)	Antenna Type	Antenna Gain (dBi)
1	2402-2480	PCB antenna	1 (Provided by applicant)

Test Mode	Transmit and Receive Mode	Description
GFSK	⊠1TX, 1RX	Chain 1 can be used as transmitting/receiving antenna.

# 5.7. WORST-CASE CONFIGURATIONS

Bluetooth Mode	Modulation Technology	Modulation Type	Data Rate (Mbps)
BLE	DTS	GFSK	1Mbit/s

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# 5.8. DESCRIPTION OF TEST SETUP

#### SUPPORT EQUIPMENT

Item	Equipment	Brand Name	Model Name	P/N
1	Notebook Adapter	LENOVO	ADLX45DLC3A	N/A
2	Notebook	LENOVO	Think Pad E470	N/A

#### I/O CABLES

Cable No	Port	Connector Type	Cable Type	Cable Length(cm)	Remarks
1	USB Cable	N/A	N/A	150cm	N/A

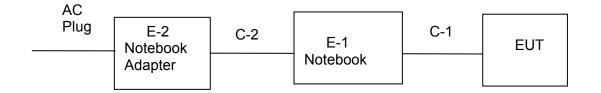
#### ACCESSORY

Item	Accessory	Brand Name	Model Name	Description
1	N/A	N/A	N/A	N/A

#### TEST SETUP

The EUT can work in engineering mode with software EspRFTestTool\_v2.8\_Manual through a Laptop.

#### SETUP DIAGRAM FOR TESTS



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# 6. MEASURING INSTRUMENT AND SOFTWARE USED

#### Radiation Test equipment

Kind of Equipment	Manufacturer	Type No.	Serial No.	Last calibration	Calibrated until
Test Receiver	R&S	ESCI	101427	2021.09.30	2022.09.29
Signal Analyzer	R&S	FSV 40-N	101823	2021.09.30	2022.09.29
Active loop Antenna	ZHINAN	ZN30900C	16035	2021.04.11	2023.04.10
Bilog Antenna	TESEQ	CBL6111D	34678	2020.10.12	2022.10.11
Horn Antenna	SCHWARZBECK	BBHA 9120D	02014	2021.10.11	2023.10.10
SHF-EHF Horn Antenna (18G- 40GHz)	A-INFO	LB-180400-KF	J211020657	2020.10.12	2022.10.11
Pre-Amplifier (0.1M- 3GHz)	EM	EM330	060665	2021.10.08	2022.10.07
Pre-Amplifier (1G- 18GHz)	SKET	LNPA-01018G-45	SK2018080901	2021.09.30	2022.09.29
Pre-Amplifier (18G- 40GHz)	SKET	LNPA-1840-50	SK2018101801	2021.09.28	2022.09.27
Temperature & Humidity	HH660	Mieo	N/A	2021.10.09	2022.10.08
Turn table	EM	SC100_1	60531	N/A	N/A
Antenna mast	EM	SC100	N/A	N/A	N/A
Band Reject Filter (2.4G-2.5GHz)	COM-MW	ZBSF-2400-2500	N/A	2021.09.30	2022.09.29
Test SW	FARAD	EZ-EMC(Ver.STSLAB-03A1 RE)			

#### Conduction Test equipment

Kind of Equipment	Manufacturer	Type No.	Serial No.	Last calibration	Calibrated until
Test Receiver	R&S	ESCI	101427	2021.09.30	2022.09.29
LISN	R&S	ENV216	101242	2021.09.30	2022.09.29
LISN	EMCO	3810/2NM	23625	2021.09.30	2022.09.29
Test SW	FARAD	E	Z-EMC(Ver.STS	LAB-03A1 RE)	



#### **RF** Connected Test

Kind of Equipment	Manufacturer	Type No.	Serial No.	Last calibration	Calibrated until
		MY55520005	2021.09.30	2022.09.29	
Power Sensor	Kovoisht	U2021XA –	MY55520006	2021.09.30	2022.09.29
Power Sensor	Keysight		MY56120038	2021.09.30	2022.09.29
			MY56280002	2021.09.30	2022.09.29
Signal Analyzer	Agilent	N9020A	MY51110105	2022.03.01	2023.02.28
Temperature & Humidity	HH660	Mieo	N/A	2021.10.09	2022.10.08
Test SW	FARAD	E	Z-EMC(Ver.STS	LAB-03A1 RE)	



# 7. MEASUREMENT METHODS

No.	Test Item	KDB Name	Section
1	6 dB Bandwidth and 99% Bandwidth	558074 D01 15.247 Meas Guidance v05r02	8.2
2	Peak Output Power	558074 D01 15.247 Meas Guidance v05r02	8.1.3
3	Power Spectral Density	558074 D01 15.247 Meas Guidance v05r02	8.4
4	Out-of-band emissions in non-restricted bands	558074 D01 15.247 Meas Guidance v05r02	8.5
5	Out-of-band emissions in restricted bands	558074 D01 15.247 Meas Guidance v05r02	8.6
6	Band-edge	558074 D01 15.247 Meas Guidance v05r02	8.7
7	Conducted Emission Test For AC Power Port	ANSI C63.10-2013	6.2

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# 8. ANTENNA PORT TEST RESULTS

## 8.1. ON TIME AND DUTY CYCLE

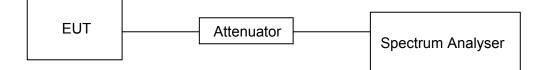
#### LIMITS

None; for reporting purposes only

#### PROCEDURE

KDB 558074 Zero-Span Spectrum Analyzer Method

#### TEST SETUP



#### **TEST ENVIRONMENT**

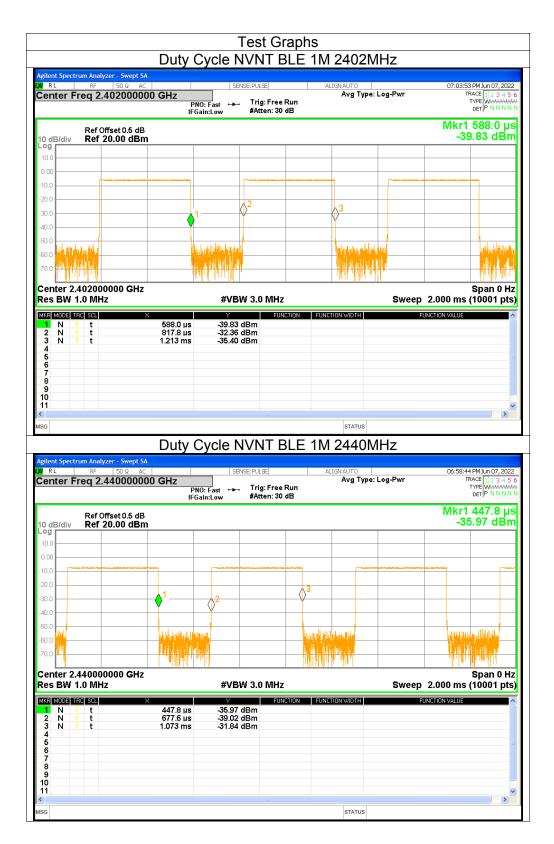
Temperature	25.5°C	Relative Humidity	37%
Atmosphere Pressure	101kPa	Test Voltage	DC 3.3V

#### <u>RESULTS</u>

Condition	Mode	Frequency (MHz)	Duty Cycle (%)	Correction Factor (dB)	1/T (kHz)
NVNT	BLE 1M	2402	69.88	-1.46	2.53
NVNT	BLE 1M	2440	69.88	-1.46	2.53
NVNT	BLE 1M	2480	69.88	-1.46	2.53

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		er - Swept SA							
enter	<sub>R</sub> , Freq 2.4	50 Ω AC 8000000	0 GHz PNC	): Fast +++	NSE:PULSE Trig: Free Run #Atten: 30 dB	ALIGNAUTO Avg Ty	pe: Log-Pwr		40 PM Jun 07, 2022 TRACE 1 2 3 4 5 6 TYPE WWWWWW DET P N N N N
) dB/div		set 0.5 dB 0.00 dBm						Mkr -3	1 97.80 µs 3.42 dBm
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1 N	TRC SCL	×	97.80 µs	¥ -33.42		FUNCTION WIDTH		UNCTION VALUE	^
2 N 3 N	1 t 1 t		327.6 µs 722.8 µs	-38.94 -29.84					
4									
6 7									
7 8 9									
0									
1									~

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### 8.2. 6 dB BANDWIDTH & 99% BANDWIDTH

#### **LIMITS**

FCC Part15 (15.247) Subpart C RSS-247 ISSUE 2							
Section	Test Item	Limit	Frequency Range (MHz)				
FCC 15.247(a)(2) RSS-247 5.2 (a)	6dB Bandwidth	>= 500KHz	2400-2483.5				
RSS-Gen Clause 6.7	99% Bandwidth	For reporting purposes only.	2400-2483.5				

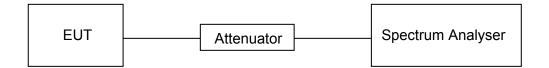
#### TEST PROCEDURE

Connect the UUT to the spectrum analyser and use the following settings:

Center Frequency	The centre frequency of the channel under test
Detector	Peak
	For 6 dB Bandwidth :100K For 99% Bandwidth :1% to 5% of the occupied bandwidth
IV BW	For 6dB Bandwidth : ≥3 × RBW For 99% Bandwidth : approximately 3×RBW
Trace	Max hold
Sweep	Auto couple

Allow the trace to stabilize and 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 and 99% relative to the maximum level measured in the fundamental emission.

#### TEST SETUP



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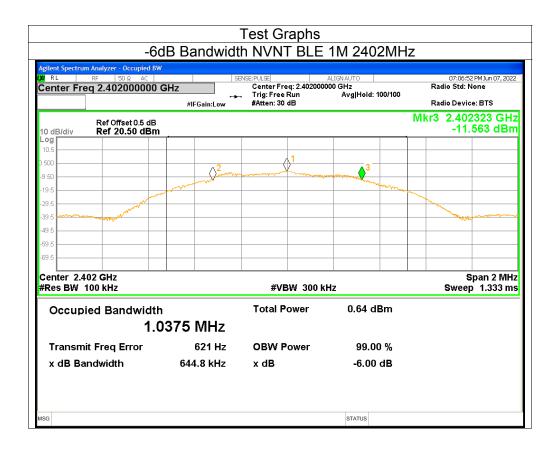


#### TEST ENVIRONMENT

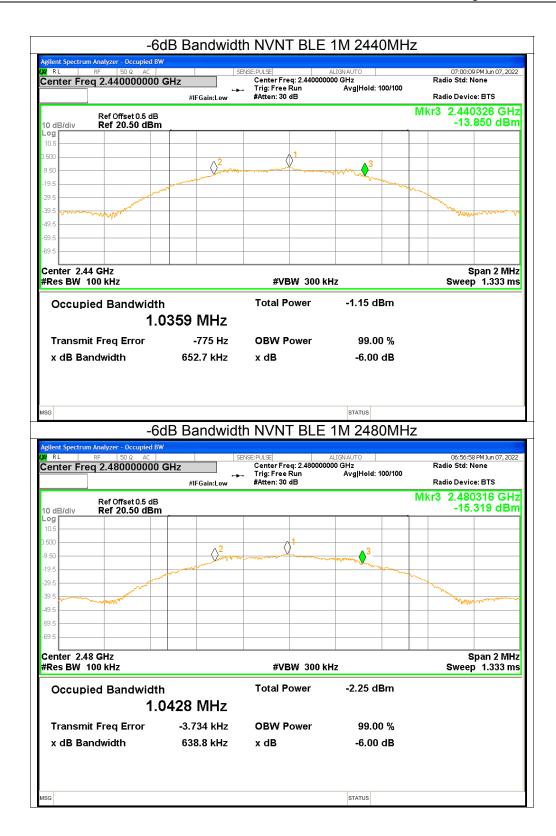
Temperature	25.5°C	Relative Humidity	37%
Atmosphere Pressure	101kPa	Test Voltage	DC 3.3V

#### **RESULTS**

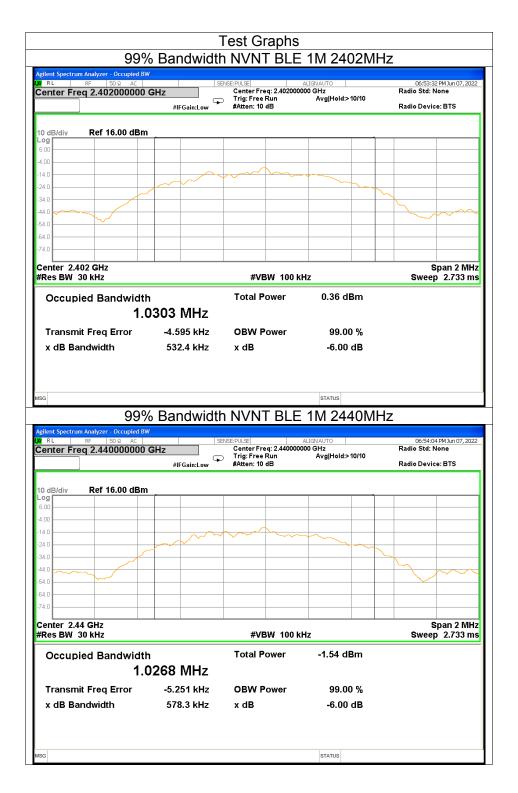
Condition	Mode	Frequency (MHz)	-6 dB Bandwidth (KHz)	-6 dB Bandwidth (MHz)	99% bandwidth (KHz)	Limit (MHz)	Verdict
NVNT	BLE 1M	2402	645.000	0.645	1030.300	>=0.5	Pass
NVNT	BLE 1M	2440	653.000	0.653	1026.800	>=0.5	Pass
NVNT	BLE 1M	2480	639.000	0.639	1029.100	>=0.5	Pass



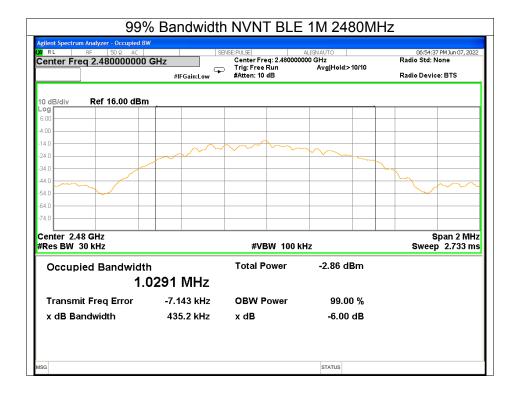
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## 8.3. CONDUCTED OUTPUT POWER

#### **LIMITS**

FCC Part15 (15.247) , Subpart C IC RSS-247 ISSUE 2							
Section	Test Item	Limit	Frequency Range (MHz)				
FCC 15.247(b)(3) RSS-247 5.4 (d)	Conducted Output Power	1 watt or 30dBm	2400-2483.5				
RSS-247	EIRP	4W	2400-2483.5				

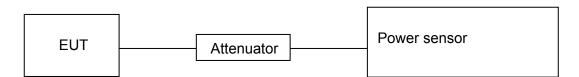
#### TEST PROCEDURE

Place the EUT on the table and set it in the transmitting mode.

Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to the Power sensor.

Measure peak power each channel.

#### TEST SETUP



#### **TEST ENVIRONMENT**

Temperature	25.5°C	Relative Humidity	37%
Atmosphere Pressure	101kPa	Test Voltage	DC 3.3V

#### **RESULTS**

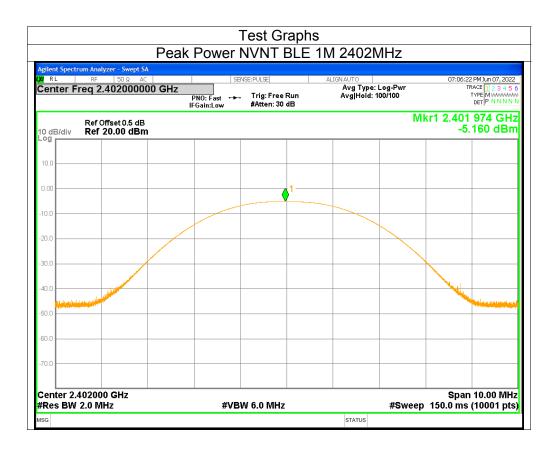
Condition	Mode	Frequency (MHz)	Conducted Power (dBm)	Limit (dBm)	Verdict
NVNT	BLE 1M	2402	-5.16	<=30	Pass
NVNT	BLE 1M	2440	-6.93	<=30	Pass
NVNT	BLE 1M	2480	-7.76	<=30	Pass

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EIRP							
Test Channel	Frequency	Peak Conducted Output Power	Antenna Gain	EIRP Power	LIMIT		
	(MHz)	(dBm)	(dBi)	(dBm)	dBm		
CH0	2402	-5.16	1.00	-4.16	36.02		
CH19	2440	-6.93	1.00	-5.93	36.02		
CH39	2480	-7.76	1.00	-6.76	36.02		

Note: The power sensor has no duty cycle display. The measured AVG power is Burst power. The software has considered the factor of the duty cycle correction factor, so it is unnecessary to add it again.



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gilent Spec	trum Analyzer - Swept SA						
RL	RF 50 Ω AC		SENSE:PULSE	ALIGNAUTO	_		39 PM Jun 07, 2022
enter I	Freq 2.440000000 GH;	Z PNO: Fast + IFGain:Low	➡ Trig: Free Run #Atten: 30 dB	Avg Type: L Avg Hold: 10	.og-Pwr 10/100		TRACE 1 2 3 4 5 TYPE MWWWWW DET P N N N N
0 dB/div	Ref Offset 0.5 dB Ref 20.00 dBm				М	kr1 2.43 -6	9 963 GH: 6.925 dBn
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0.00			1				
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enter 2	.440000 GHz					Snal	n 10.00 MH:
SG	Pa	ak Powe		status	#Sweep		
gilent Spec	trum Analyzer - Swept SA	ak Powe	r NVNT BLE	1M 2480N		06:56:	28 PM Jun 07, 2022
gilent Spec			SENSE:PULSE		1Hz ₀g-Pwr	06:56:	TRACE 1 2 3 4 5
gilent Spec RL Center I	<b>trum Analyzer - Swept SA</b> RF 50 Ω AC	Z PNO: Fast	SENSE:PULSE	1M 2480N ALIGNAUTO Avg Type: L	0g-Pwr 0/100	kr1 2.47	
gilent Spec RL Center I	trum Analyzer - Swept SA RF   50 Ω AC   Freq 2.480000000 GH; Ref Offset 0.5 dB	Z PNO: Fast	SENSE:PULSE	1M 2480N ALIGNAUTO Avg Type: L	0g-Pwr 0/100	kr1 2.47	
gilent Spec RL Center I O dB/div	trum Analyzer - Swept SA RF   50 Ω AC   Freq 2.480000000 GH; Ref Offset 0.5 dB	Z PNO: Fast	SENSE:PULSE	1M 2480N ALIGNAUTO Avg Type: L	0g-Pwr 0/100	kr1 2.47	
gilent Spec RL Center I O dB/div O dB/div	trum Analyzer - Swept SA RF   50 Ω AC   Freq 2.480000000 GH; Ref Offset 0.5 dB	Z PNO: Fast	SENSE:PULSE	1M 2480N ALIGNAUTO Avg Type: L	0g-Pwr 0/100	kr1 2.47	
gilent Spec RL Center I O dB/div O dB/div	trum Analyzer - Swept SA RF   50 Ω AC   Freq 2.480000000 GH; Ref Offset 0.5 dB	Z PNO: Fast	SENSE:PULSE	1M 2480N ALIGNAUTO Avg Type: L	0g-Pwr 0/100	kr1 2.47	
gilent Spec RL Center I 0 dB/div 9 10.0	trum Analyzer - Swept SA RF   50 Ω AC   Freq 2.480000000 GH; Ref Offset 0.5 dB	Z PNO: Fast	SENSE:PULSE	1M 2480N ALIGNAUTO Avg Type: L	0g-Pwr 0/100	kr1 2.47	
glent Spec RL Center I 10.0	trum Analyzer - Swept SA RF   50 Ω AC   Freq 2.480000000 GH; Ref Offset 0.5 dB	Z PNO: Fast	SENSE:PULSE	1M 2480N ALIGNAUTO Avg Type: L	0g-Pwr 0/100	kr1 2.47	
glent Spec RL Center I 10.0	trum Analyzer - Swept SA RF   50 Ω AC   Freq 2.480000000 GH; Ref Offset 0.5 dB	Z PNO: Fast	SENSE:PULSE	1M 2480N ALIGNAUTO Avg Type: L	0g-Pwr 0/100	kr1 2.47	
gilent Spec           RL           center I           0 dB/div           0	trum Analyzer - Swept SA RF   50 Ω AC   Freq 2.480000000 GH; Ref Offset 0.5 dB	Z PNO: Fast	SENSE:PULSE	1M 2480N ALIGNAUTO Avg Type: L	0g-Pwr 0/100	kr1 2.47	
gilent Spec           RL           center I           0 dB/div           0	trum Analyzer - Swept SA RF   50 Ω AC   Freq 2.480000000 GH; Ref Offset 0.5 dB	Z PNO: Fast	SENSE:PULSE	1M 2480N ALIGNAUTO Avg Type: L	0g-Pwr 0/100	kr1 2.47	
gilent Spec           RL           center I           0	trum Analyzer - Swept SA RF 50 Ω AC Freq 2.480000000 GH; Ref Offset 0.5 dB Ref 20.00 dBm	Z PNO: Fast	SENSE:PULSE	1M 2480N ALIGNAUTO Avg Type: L	0g-Pwr 0/100	kr1 2.47	
gilent Spec           RL           center I           0 dB/div           0 0	trum Analyzer - Swept SA RF   50 Ω AC   Freq 2.480000000 GH; Ref Offset 0.5 dB	Z PNO: Fast	SENSE:PULSE	1M 2480N ALIGNAUTO Avg Type: L	0g-Pwr 0/100	kr1 2.47	28 PMJun 07, 2022 TRACE 1 2 3 4 5 TYPE MWWWWW DET P NNNN 9 978 GH2 7.763 dBm
0 dB/div 0 dB/div 0 dB/div 0 dB/div 0 dD 0 dD 0 dV 0	trum Analyzer - Swept SA RF 50 Ω AC Freq 2.480000000 GH; Ref Offset 0.5 dB Ref 20.00 dBm	Z PNO: Fast	SENSE:PULSE	1M 2480N ALIGNAUTO Avg Type: L	0g-Pwr 0/100	kr1 2.47	
	trum Analyzer - Swept SA RF 50 Ω AC Freq 2.480000000 GH; Ref Offset 0.5 dB Ref 20.00 dBm	Z PNO: Fast	SENSE:PULSE	1M 2480N ALIGNAUTO Avg Type: L	0g-Pwr 0/100	kr1 2.47	
glent Spec d RL Center I 0 dB/div 0 g 10.0 0.00 10.0 0.00 10.0 0.00 10.0 0.00 10.0 0.00 10.0 0.00 10.0 0.00 10.0 0 0 0	trum Analyzer - Swept SA RF 50 Ω AC Freq 2.480000000 GH; Ref Offset 0.5 dB Ref 20.00 dBm	Z PNO: Fast	SENSE:PULSE	1M 2480N ALIGNAUTO Avg Type: L	0g-Pwr 0/100	kr1 2.47	
glent Spec           RL           Center I           10.0           10.0           20.0           40.0           40.0	trum Analyzer - Swept SA RF 50 Ω AC Freq 2.480000000 GH; Ref Offset 0.5 dB Ref 20.00 dBm	Z PNO: Fast	SENSE:PULSE	1M 2480N ALIGNAUTO Avg Type: L	0g-Pwr 0/100	kr1 2.47	
gilent Spec           RL           CodB/div           O           O         O	trum Analyzer - Swept SA RF 50 & AC Freq 2.480000000 GH: Ref Offset 0.5 dB Ref 20.00 dBm	Z PNO: Fast	SENSE:PULSE	1M 2480N ALIGNAUTO Avg Type: L	0g-Pwr 0/100	kr1 2.479	9978 GH: 763 dBn
gilent Spec           RL           CodB/div           0         0           0	trum Analyzer - Swept SA RF 50 Ω AC Freq 2.480000000 GH; Ref Offset 0.5 dB Ref 20.00 dBm	Z PNO: Fast IFGain:Low	SENSE:PULSE	1M 2480N ALIGNAUTO Avg Type: L	og Pwr 10/100 M	kr1 2.47: -7	



### 8.4. POWER SPECTRAL DENSITY

#### **LIMITS**

FCC Part15 (15.247) , Subpart C IC RSS-247 ISSUE 2						
Section	Test Item	Limit	Frequency Range (MHz)			
FCC §15.247 (e) RSS-247 5.2 (b)	Power Spectral Density	8 dBm in any 3 kHz band	2400-2483.5			

#### TEST PROCEDURE

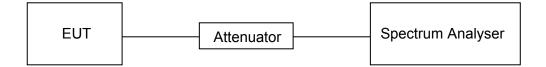
Connect the UUT to the spectrum analyser and use the following settings:

Center Frequency	The centre frequency of the channel under test
Detector	Peak
RBW	$3 \text{ kHz} \le \text{RBW} \le 100 \text{ kHz}$
VBW	≥3 × RBW
Span	1.5 x DTS bandwidth
Trace	Max hold
Sweep time	Auto couple.

Allow trace to fully stabilize and use the peak marker function to determine the maximum amplitude level within the RBW.

If measured value exceeds limit, reduce RBW (no less than 3 kHz) and repeat.

#### TEST SETUP



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#### **TEST ENVIRONMENT**

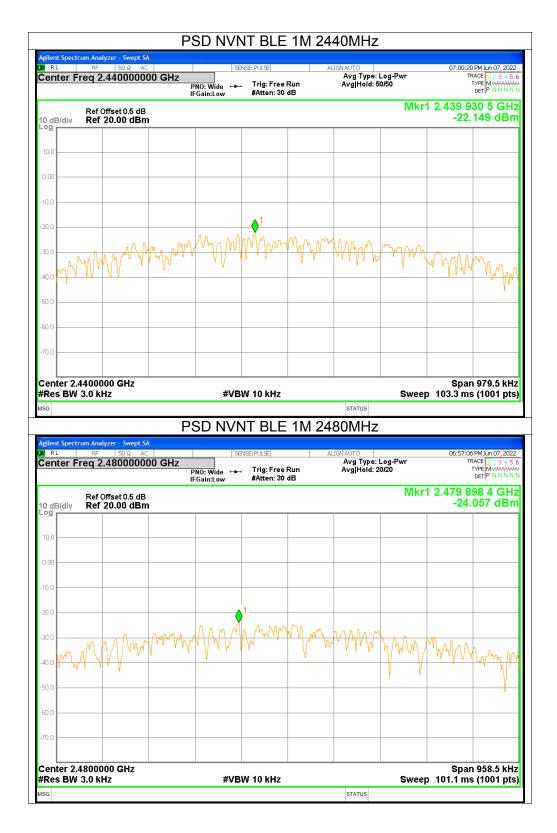
Temperature	25.5°C	Relative Humidity	37%
Atmosphere Pressure	101kPa	Test Voltage	DC 3.3V

#### **RESULTS**

Condition	Mode	Frequency (MHz)	Conducted PSD (dBm/3kHz)	Limit (dBm/3kHz)	Verdict
NVNT	BLE 1M	2402	-20.63	<=8	Pass
NVNT	BLE 1M	2440	-22.15	<=8	Pass
NVNT	BLE 1M	2480	-24.06	<=8	Pass









### 8.5. CONDUCTED BANDEDGE AND SPURIOUS EMISSIONS

#### **LIMITS**

		15.247) , Subpart C -247 ISSUE 2
Section	Test Item	Limit
FCC §15.247 (d) RSS-247 5.5	Conducted Bandedge and Spurious Emissions	In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated 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, provided the transmitter demonstrates compliance with the peak conducted power limits.

#### TEST PROCEDURE

Connect the UUT to the spectrum analyser and use the following settings:

Center Frequency	The centre frequency of the channel under test
Detector	Peak
RBW	100K
VBW	≥3 × RBW
Span	1.5 x DTS bandwidth
Trace	Max hold
Sweep time	Auto couple.

Use the peak marker function to determine the maximum PSD level.

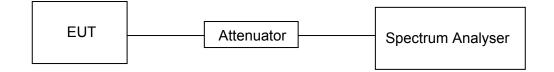
Span	Set the center frequency and span to encompass frequency range to be measured
Detector	Peak
RBW	100K
VBW	≥3 × RBW
measurement points	≥span/RBW
Trace	Max hold
Sweep time	Auto couple.

Use the peak marker function to determine the maximum amplitude level.

#### TEST SETUP

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#### **TEST ENVIRONMENT**

Temperature	25.5°C	Relative Humidity	37%
Atmosphere Pressure	101kPa	Test Voltage	DC 3.3V

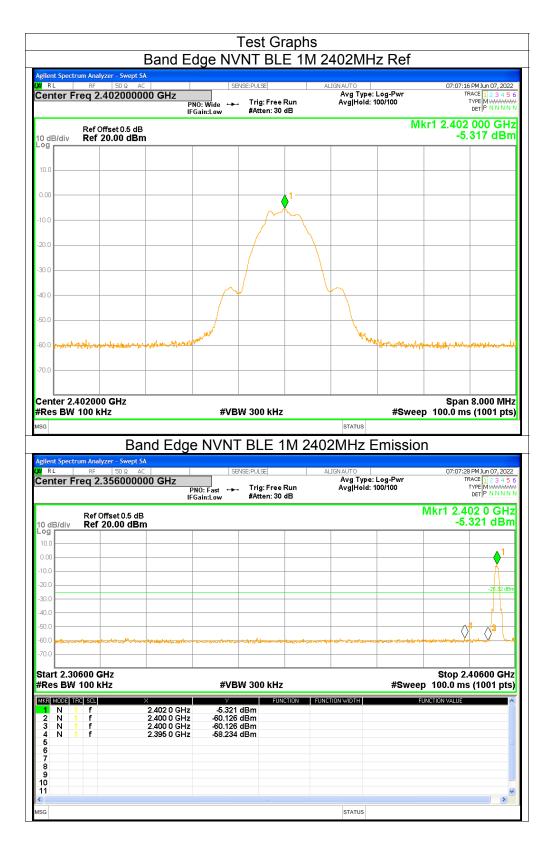
#### **RESULTS**

## **Band Edge**

Condition	Mode	Frequency (MHz)	Max Value (dBc)	Limit (dBc)	Verdict
NVNT	BLE 1M	2402	-52.91	<=-20	Pass
NVNT	BLE 1M	2480	-49.49	<=-20	Pass

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gilent Spect	rum Analyzer - Swept SA RF 50 Ω AC		SEN	NSE:PULSE	A	IGNAUTO		06:57	21 PM Jun 07, 2022
	Freq 2.480000000	) GHz	): Wide ↔→ ain:Low		n	Avg Type: Avg Hold: 1	Log-Pwr 00/100	00.37	TRACE 1 2 3 4 5 TYPE MWWWW DET P N N N N
0 dB/div	Ref Offset 0.5 dB Ref 20.00 dBm						М		'9 992 GH: 8.581 dBm
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SG	100 kHz	d Edge		W 300 KHZ BLE 1N	/1 2480	status )MHz B		ep 100.0 r	
SG gilent Spect Ø R L	100 KHz Ban	) GHz		BLE 1N	AL	IGNAUTO Avg Type:	Emissio	ep 100.0 r on	35 PM Jun 07, 2022 TRACE 12 3 4 5
SG I <mark>gilent Spect</mark> Ø R L	100 kHz Ban rum Analyzer - Swept SA RF   50 Ω AC   Freq 2.526000000	) GHz	NVNT	BLE 1N	AL	DMHz E	Emissio	ep 100.0 r DN 06:57	1001 pts 35 PM Jun 07, 2022 TRACE 1 2 3 4 5 TYPE MWWWWW DET P N N N
sg gilent Spect a RL Center F	100 kHz Ban rum Analyzer - Swept SA RF 50 Ω AC	) GHz	NVNT	BLE 1N	AL	IGNAUTO Avg Type:	Emissio	ep 100.0 r DN 06:57 Mkr1 2.	135 PM Jun 07, 2022 TRACE 12 3 4 5 TYPE MWWWW DET P NNNN 480 0 GHz
agilent Spect RL Center F 10 dB/div 10.0	100 kHz Ban ۲۰۰۰ Analyzer - Swept SA ۲۰۰۰ ۲۰۰۹ ۲۰۰۵ ۲۰۰۹ ۲۰۰۹ ۲۰۰۹ ۲۰۰۹ ۲۰۰۹ ۲۰۰۹ ۲۰۰۹ ۲۰۰۹	) GHz	NVNT	BLE 1N	AL	IGNAUTO Avg Type:	Emissio	ep 100.0 r DN 06:57 Mkr1 2.	135 PM Jun 07, 2022 TRACE 12 3 4 5 TYPE MWWWW DET P NNNN 480 0 GHz
sglent Spect glent Spect RL Center F	100 kHz Ban ۲۰۰۰ Analyzer - Swept SA ۲۰۰۰ ۲۰۰۹ ۲۰۰۵ ۲۰۰۹ ۲۰۰۹ ۲۰۰۹ ۲۰۰۹ ۲۰۰۹ ۲۰۰۹ ۲۰۰۹ ۲۰۰۹	) GHz	NVNT	BLE 1N	AL	IGNAUTO Avg Type:	Emissio	ep 100.0 r DN 06:57 Mkr1 2.	1001 pts 135 PM Jun 07, 2022 TRACE 12345 TYPE MWWWW DET P NNNN 480 0 GHz
sglent Spect glent Spect RL Center F	100 kHz Ban ۲۰۰۰ Analyzer - Swept SA ۲۰۰۰ ۲۰۰۹ ۲۰۰۵ ۲۰۰۹ ۲۰۰۹ ۲۰۰۹ ۲۰۰۹ ۲۰۰۹ ۲۰۰۹ ۲۰۰۹ ۲۰۰۹	) GHz	NVNT	BLE 1N	AL	IGNAUTO Avg Type:	Emissio	ep 100.0 r DN 06:57 Mkr1 2.	ns (1001 pts 35 PM Jm 07, 2022 TRACE 1 2 3 4 5 TYPE MWWWW DET P NN NI 480 0 GHz 8,559 dBm
org         org <td>100 kHz Ban ۲۰۰۰ Analyzer - Swept SA ۲۰۰۰ ۲۰۰۹ ۲۰۰۵ ۲۰۰۹ ۲۰۰۹ ۲۰۰۹ ۲۰۰۹ ۲۰۰۹ ۲۰۰۹ ۲۰۰۹ ۲۰۰۹</td> <td>) GHz</td> <td>NVNT</td> <td>BLE 1N</td> <td>AL</td> <td>IGNAUTO Avg Type:</td> <td>Emissio</td> <td>ep 100.0 r DN 06:57 Mkr1 2.</td> <td>an 8.000 MHz ns (1001 pts :35 PMJun 07, 2022 TRACE 12 3 45 I 2 3 45 PMJun 07, 2022 TRACE 12 3 45 PMJun 07 PMJun 07</td>	100 kHz Ban ۲۰۰۰ Analyzer - Swept SA ۲۰۰۰ ۲۰۰۹ ۲۰۰۵ ۲۰۰۹ ۲۰۰۹ ۲۰۰۹ ۲۰۰۹ ۲۰۰۹ ۲۰۰۹ ۲۰۰۹ ۲۰۰۹	) GHz	NVNT	BLE 1N	AL	IGNAUTO Avg Type:	Emissio	ep 100.0 r DN 06:57 Mkr1 2.	an 8.000 MHz ns (1001 pts :35 PMJun 07, 2022 TRACE 12 3 45 I 2 3 45 PMJun 07, 2022 TRACE 12 3 45 PMJun 07 PMJun 07
Image: segment spect           grad RL           Q           RL           Center F           10 dB/div           -00           -01           -02           -03           -04           -05           -02           -03           -04           -05           -05           -00           -00           -00           -00           -00           -00           -00	100 kHz Ban rum Analyzer - Swept SA RF 50 Ω AC Treq 2.5260000000 Ref 0ffset 0.5 dB Ref 20.00 dBm	) GHz PN IFG	NVNT	BLE 1N	AL	IGNAUTO Avg Type:	Emissio	ep 100.0 r DN 06:57 Mkr1 2.	ns (1001 pts 35 PM Jm 07, 2022 TRACE 1 2 3 4 5 TYPE MWWWW DET P NN NI 480 0 GHz 8,559 dBm
org         org           10         dB/div           00         00           00         00           00         00           00         00           00         00           00         00           00         00           000         00 <tr< td=""><td>100 kHz Ban ۲۰۰۰ Analyzer - Swept SA ۲۰۰۰ ۲۰۰۹ ۲۰۰۵ ۲۰۰۹ ۲۰۰۹ ۲۰۰۹ ۲۰۰۹ ۲۰۰۹ ۲۰۰۹ ۲۰۰۹ ۲۰۰۹</td><td>) GHz</td><td>NVNT</td><td>BLE 1N</td><td>AL</td><td>IGNAUTO Avg Type:</td><td>Emissio</td><td>ep 100.0 r DN 06:57 Mkr1 2.</td><td>ns (1001 pts 35 PM Jm 07, 2022 TRACE 1 2 3 4 5 TYPE MWWWW DET P NN NI 480 0 GHz 8,559 dBm</td></tr<>	100 kHz Ban ۲۰۰۰ Analyzer - Swept SA ۲۰۰۰ ۲۰۰۹ ۲۰۰۵ ۲۰۰۹ ۲۰۰۹ ۲۰۰۹ ۲۰۰۹ ۲۰۰۹ ۲۰۰۹ ۲۰۰۹ ۲۰۰۹	) GHz	NVNT	BLE 1N	AL	IGNAUTO Avg Type:	Emissio	ep 100.0 r DN 06:57 Mkr1 2.	ns (1001 pts 35 PM Jm 07, 2022 TRACE 1 2 3 4 5 TYPE MWWWW DET P NN NI 480 0 GHz 8,559 dBm
org         org           0         dB/div           0         0           0	100 kHz Ban rum Analyzer - Swept SA RF 50 Ω AC Treq 2.5260000000 Ref 0ffset 0.5 dB Ref 20.00 dBm	) GHz PN IFG	NVNT	BLE 1N	AL	IGNAUTO Avg Type:	Emissio	ep 100.0 r DN 06:57 Mkr1 2.	ns (1001 pts 35 PM Jm 07, 2022 TRACE 1 2 3 4 5 TYPE MWWWW DET P NN NI 480 0 GHz 8,559 dBm
sg sglent Spect Center F Conter F 10 dB/div - og 10.0 - og - og	100 kHz Ban rum Analyzer - Swept SA Ref 0ffset 0.5 dB Ref 20.00 dBm	) GHz PN IFG	NVNT	BLE 1N	AL	IGNAUTO Avg Type:	Log-Pwr 00/100	ep 100.0 r on 06:57 Mkr1 2. -{ -{ 	ns (1001 pts ::35 PM Jun 07, 2022 TRACE 12: 3: 4: 5: TYPE MWWDET P N N N N 480 0 GHz 8.559 dBm -28:58 dBm -28:58 dBm 2.57600 GHz ns (1001 pts)
Image: second	100 kHz Ban rum Analyzer - Swept SA RF S0 2 AC req 2.526000000 Ref Offset 0.5 dB Ref 20.00 dBm	O GHZ PN IFG	NVNT 0: Fast ↔ ain:Low #VB1	BLE 1N	AL	IGN AUTO Avg Type: Avg Hold: 1	Log-Pwr 00/100	ep 100.0 r	ns (1001 pts ::35 PM Jun 07, 2022 TRACE 12: 3: 4: 5: TYPE MWWDET P N N N N 480 0 GHz 8.559 dBm -28:58 dBm -28:58 dBm 2.57600 GHz ns (1001 pts)
sg glent Spect Center F Center F 10 dB/div -99 10.0 0.00 10.0 1	100 kHz Ban rum Analyzer - Swept SA Ref 25 Ω AC req 2.526000000 Ref Offset 0.5 dB Ref 20.00 dBm 1 2 2 2 4 4 4 4 5 6 6 6 7 6 6 6 7 6 6 7 7 6 7 7 7 7 7 7 7 7 7 7 7 7 7	2.480 0 GHz 2.480 0 GHz 4.483 6 GHz 4.83 6 GHz	NVNT 0: Fast →→ aln:Low #VB 4	BLE 1N	n	IGN AUTO Avg Type: Avg Hold: 1	Log-Pwr 00/100	ep 100.0 r on 06:57 Mkr1 2. -{ -{ 	ns (1001 pts ::35 PM Jun 07, 2022 TRACE 12: 3: 4: 5: TYPE MWWDET P N N N N 480 0 GHz 8.559 dBm -28:58 dBm -28:58 dBm 2.57600 GHz ns (1001 pts)
Image: second	100 kHz Ban rum Analyzer - Swept SA Ref 25 Ω AC req 2.526000000 Ref Offset 0.5 dB Ref 20.00 dBm 1 2 2 2 4 4 4 4 5 6 6 6 7 6 6 6 7 6 6 7 7 6 7 7 7 7 7 7 7 7 7 7 7 7 7	C.480 0 GHz	NVNT 0.Fast →→ ain:Low #VB1 × 9.559 59.734	BLE 1N	n	IGN AUTO Avg Type: Avg Hold: 1	Log-Pwr 00/100	ep 100.0 r on 06:57 Mkr1 2. -{ -{ 	ns (1001 pts ::35 PM Jun 07, 2022 TRACE 12: 3: 4: 5: TYPE MWWDET P N N N N 480 0 GHz 8.559 dBm -28:58 dBm -28:58 dBm 2.57600 GHz ns (1001 pts)
Image: second	100 kHz Ban rum Analyzer - Swept SA Ref 25 Ω AC req 2.526000000 Ref Offset 0.5 dB Ref 20.00 dBm 1 2 2 2 4 4 4 4 5 6 6 6 7 6 6 6 7 6 6 7 7 6 7 7 7 7 7 7 7 7 7 7 7 7 7	2.480 0 GHz 2.480 0 GHz 4.483 6 GHz 4.83 6 GHz	NVNT 0: Fast →→ aln:Low #VB 4	BLE 1N	n	IGN AUTO Avg Type: Avg Hold: 1	Log-Pwr 00/100	ep 100.0 r on 06:57 Mkr1 2. -{ -{ 	ns (1001 pts ::35 PM Jun 07, 2022 TRACE 12: 3: 4: 5: TYPE MWWDET P N N N N 480 0 GHz 8.559 dBm -28:58 dBm -28:58 dBm 2.57600 GHz ns (1001 pts)
Image: sign of the system           Image: sign of the system <td>100 kHz Ban rum Analyzer - Swept SA Ref 25 Ω AC req 2.526000000 Ref Offset 0.5 dB Ref 20.00 dBm 1 2 2 2 4 4 4 4 5 6 6 6 7 6 6 6 7 6 6 7 7 6 7 7 7 7 7 7 7 7 7 7 7 7 7</td> <td>2.480 0 GHz 2.480 0 GHz 4.483 6 GHz 4.83 6 GHz</td> <td>NVNT 0: Fast →→ aln:Low #VB 4</td> <td>BLE 1N</td> <td>n</td> <td>IGN AUTO Avg Type: Avg Hold: 1</td> <td>Log-Pwr 00/100</td> <td>ep 100.0 r on 06:57 Mkr1 2. -{ -{ </td> <td>ns (1001 pts 35 PM Jun 07, 2022 TRACE 12.3 4 5 TYPE M NNN 0 ET P NNNN 480 0 GHz 8.559 dBm -28.58 dBm -28.58 dBm 2.57600 GHz ns (1001 pts</td>	100 kHz Ban rum Analyzer - Swept SA Ref 25 Ω AC req 2.526000000 Ref Offset 0.5 dB Ref 20.00 dBm 1 2 2 2 4 4 4 4 5 6 6 6 7 6 6 6 7 6 6 7 7 6 7 7 7 7 7 7 7 7 7 7 7 7 7	2.480 0 GHz 2.480 0 GHz 4.483 6 GHz 4.83 6 GHz	NVNT 0: Fast →→ aln:Low #VB 4	BLE 1N	n	IGN AUTO Avg Type: Avg Hold: 1	Log-Pwr 00/100	ep 100.0 r on 06:57 Mkr1 2. -{ -{ 	ns (1001 pts 35 PM Jun 07, 2022 TRACE 12.3 4 5 TYPE M NNN 0 ET P NNNN 480 0 GHz 8.559 dBm -28.58 dBm -28.58 dBm 2.57600 GHz ns (1001 pts



# **Conducted RF Spurious Emission**

Condition	Mode	Frequency (MHz)	Max Value (dBc)	Limit (dBc)	Verdict
NVNT	BLE 1M	2402	-50.78	<=-20	Pass
NVNT	BLE 1M	2440	-49.22	<=-20	Pass
NVNT	BLE 1M	2480	-47.76	<=-20	Pass

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<mark>ilent Spectrum Analyzer - Swe</mark> RL RF 50 Ω	pt SA		ISE:PULSE	M 2402MH		07:07:44 PM Jun 07, 2022
enter Freq 2.40200	0000 GHz	PNO: Wide ↔ FGain:Low	Trig: Free Run #Atten: 20 dB	ALIGNAOTO Avg Type: Avg Hold: 1		TRACE 1 2 3 4 5 TYPE MWAWAM DET P N N N N
Ref Offset 0.5 dB/div Ref 10.50 d					Mkr1	2.401 994 0 GH -5.394 dBn
pg						
500			1			
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enter 2.4020000 GHz Res BW 100 kHz	:	#VB\	V 300 kHz		#Sweep	
	:	#VB\	¥ 300 kHz	STATUS	#Sweep	
Res BW 100 kHz				status 2402MHz	•	100.0 ms (1001 pts
Res BW 100 kHz	x. Spuriou	us NVN <sup>-</sup>		2402MHz	Emissior	100.0 ms (1001 pts ר ח 07:07:55 PMJun 07, 2022
Res BW 100 kHz	x. Spuriou		TBLE 1M	2402MHz	Emissior	100.0 ms (1001 pts ) 07:07:55 PM Jun 07, 2022 TRACE   1 2 3 4 5 TYPE   1 2 3 4 5
Res BW 100 kHz G (ilent Spectrum Analyzer - Swe RL RF 50 Q enter Freq 13.2650	x. Spuriou pt sa AC 000000 GHz	us NVN	T BLE 1M	2402MHz	Emissior	100.0 ms (1001 pts 07:07:55 PMJun 07,2022 TRACE [1:23 4 5 TYPE [M WHOM DET P: NN NN 1kr1 2.402 6 GH:
Res BW 100 kHz G Itent Spectrum Analyzer - Swe RL RF 50 ຊ	x. Spuriou		TBLE 1M	2402MHz	Emissior	100.0 ms (1001 pts 07:07:55 PMJun 07,2022 TRACE [] 23 4 5 TYPE [MWMM DET P.N.N.N 1kr1 2.402 6 GH2
Res BW 100 kHz G T: Silent Spectrum Analyzer - Swe RL RF 50 2 enter Freq 13.26500 C dB/div Ref Offset 0.5 C dB/div Ref 10.50 d Sou	x. Spuriou		TBLE 1M	2402MHz	Emissior	100.0 ms (1001 pts 07:07:55 PMJun 07,2022 TRACE [1:23 4 5 TYPE [M WHOM DET P: NN NN 1kr1 2.402 6 GH:
Res BW 100 kHz G T Solution Spectrum Analyzer - Swe RL RF 50 2 enter Freq 13.26500 Ref Offset 0.5 0 dB/div Ref 10.50 d	x. Spuriou		TBLE 1M	2402MHz	Emissior	100.0 ms (1001 pts 07:07:55 PMJun 07,2022 TRACE [] = 3 4 5 TYPE[MWHWH DET P.N.N.N 1kr1 2.402 6 GH: -13.366 dBn
Res BW 100 kHz G T: Silent Spectrum Analyzer - Swe RL RF 50 Ω enter Freq 13.26500 C dB/div Ref 0ffset 0.5 C dB/div Ref 10.50 d S00 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	x. Spuriou		TBLE 1M	2402MHz	Emissior	100.0 ms (1001 pts 07:07:55 PMJun 07,2022 TRACE [] - 24 - 5 TYPE [M WANNA DET [P NN NN 1kr1 2.402 6 GH2 -13.366 dBm
Res BW 100 kHz G T: Silent Spectrum Analyzer - Swe RL RF 50 2 enter Freq 13.26500 C dB/div Ref 0ffset 0.5 0 G 95 9.5 9.5 9.5	x. Spuriou		TBLE 1M	2402MHz	Emissior	100.0 ms (1001 pts 07:07:55 PMJun 07,2022 TRACE [] - 24 - 5 TYPE [M WANNA DET [P NN NN 1kr1 2.402 6 GH2 -13.366 dBm
Res BW 100 kHz G T: Silent Spectrum Analyzer - Swe RL RF 50 2 enter Freq 13.26500 C dB/div Ref 0ffset 0.5 of State of the set of the s	x. Spuriou		T BLE 1M	ALIGNAUTO Avg Type: Avg Hold: 1	Emission Log-Pwr 10/10	100.0 ms (1001 pts 07:07:55 PMJun 07, 2022 TRACE [1::2:3 4 5 TYPE [MWWWWW DET[P NIN]N 1kr1 2.402 6 GH2 -13.366 dBm -25.39 db
Res BW 100 kHz           g	x. Spuriou		T BLE 1M	ALIGNAUTO Avg Type: Avg Hold: 1	Emission Log-Pwr 10/10	100.0 ms (1001 pts 07:07:55 PMJun 07, 2022 TRACE [1::2:3 4 5 TYPE [MWWWWW DET[P NIN]N 1kr1 2.402 6 GH2 -13.366 dBm -25.39 db
Res BW 100 kHz           g	x. Spuriou		T BLE 1M	ALIGNAUTO Avg Type: Avg Hold: 1	Emission Log-Pwr 10/10	100.0 ms (1001 pts 07:07:55 PMJun 07, 2022 TRACE [1::2:3 4 5 TYPE [MWWWWW DET[P NIN]N 1kr1 2.402 6 GH2 -13.366 dBm -25.39 db
Res BW 100 kHz  G  G  (lent Spectrum Analyzer - 50 2  enter Freq 13.2650  C  C  C  C  C  C  C  C  C  C  C  C  C	x. Spuriou		TBLE 1M	ALIGNAUTO Avg Type: Avg Hold: 1	Emission Log-Pwr 10/10	100.0 ms (1001 pts 07:07:55 PM Jun 07, 2022 TRACE [1: 2: 4: 5 TYPE [M YANGA DET   P. N.N.N.N 1kr1 2:402 6 GHz -13.366 dBm -25.39 dP -25.39 dP -25.39 dP -25.39 dP -25.39 dP
Res BW 100 kHz           G           G           Ident Spectrum Analyzer - Swe           Ref Offset 0.5           enter Freq 13.26500           OdB/div           Ref Offset 0.5           OdB/div           Ref 0ffset 0.5           9           9.5           10           9.5           10           10           10           10           10           10           10           10           11           12           13           14           150      1	x. Spuriou	US NVN	T BLE 1M	ALIGNAUTO Avg Type: Avg Hold: 1	Emission	07:07:55 PM bm 07, 2022 IRACE 12:3 4 5 TYPE M WWWWW DET P NNNN 1kr1 2.402 6 GH2 -13.366 dBrr -25.39 dBr
Res BW 100 kHz           G           T:           g           RL         Rf           RL         Rf           RL         Rf           S0 2           enter Freq 13.2650           0 dB/div           Ref Offset 0.5           0 dB/div           Ref 0ffset 0.5           9.6           9.7           9.7	X. Spuriou	US NVN PNO: Fast FGain:Low 5 4 4 4 4 4 4 4 4 4 4 4 4 4	T BLE 1M	2402MHz	Emission	100.0 ms (1001 pts 07:07:55 PMJun 07,2022 TRACE [] 23.4 5 TYPE [] NNNN 1kr1 2.402 6 GH2 -13.366 dBm -25.39 dP -25.39 dP -25.30 dP -25.50 GH2 -25.50 GH2
Res BW 100 kHz           G           T:           g           RL         Rf           RL         Rf           RL         Rf           S0 2           enter Freq 13.2650           0 dB/div           Ref Offset 0.5           0 dB/div           Ref 0ffset 0.5           9.6           9.7           9.7	X. Spuriou	US NVN SEP PNO: Fast FGain:Low	T BLE 1M	2402MHz	Emission	100.0 ms (1001 pts 07:07:55 PMJun 07,2022 TRACE [1:2:3:4:5 TYPE [M:NNNN 1kr1 2:402 6 GHz -13.366 dBm -25:39 dP -25:39 dP -25:30 dP -25
Res BW 100 kHz           g	X. Spuriou	US NVN SEP PNO: Fast FGain:Low	T BLE 1M	2402MHz	Emission	100.0 ms (1001 pts 07:07:55 PMJun 07,2022 TRACE [1:2:3:45 TYPE [M:MNNN 1kr1 2:402 6 GH: -13.366 dBn -25:39 dP -25:39 dP -25:30 dP -25:
Res BW 100 kHz           G           T:           g           RL         Rf           RL         Rf           RL         Rf           S0 2           enter Freq 13.2650           0 dB/div           Ref Offset 0.5           0 dB/div           Ref 0ffset 0.5           9.6           9.7           9.7	X. Spuriou	US NVN SEP PNO: Fast FGain:Low	T BLE 1M	2402MHz	Emission	100.0 ms (1001 pts 07:07:55 PMJun 07,2022 TRACE [1:2:3:45 TYPE [M:MNNN 1kr1 2:402 6 GH: -13.366 dBn -25:39 dP -25:39 dP -25:30 dP -25:

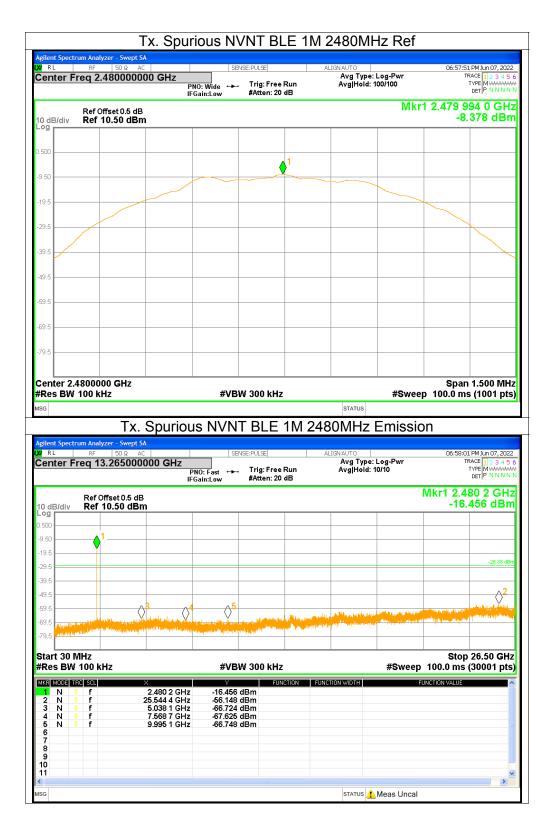
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ilent Spectrum Analyzer - 1 R L RF 50	DΩ AC	SEN	ISE:PULSE	ALIGN AUTO	a Dur		5 PM Jun 07, 2022 RACE 1 2 3 4 5
enter Freq 2.440	Р	NO: Wide ↔↔ Gain:Low	Trig: Free Run #Atten: 20 dB	Avg Type: Lo Avg Hold: 100	0/100	Į.	TYPE MWWWW DET P N N N N
Ref Offset dB/div Ref 10.50					Mkr		94 0 GH: .233 dBn
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	Tx. Spuriou	us NVN	Г BLE 1M	status 2440MHz E	missio	n	
i <mark>lent Spectrum Analyzer</mark> - 5 RL RF 50	Swept SA D Ω AC 5000000 GHz	SEN	ISE:PULSE	2440MHz E Alignauto Avg Type: Lo	og-Pwr	07:00:4	6 PM Jun 07, 2022 RACE 1 2 3 4 5 TYPE M WWWWW
ilent Spectrum Analyzer - RL RF Sc enter Freq 13.26	Swept SA 3 Ω AC     5000000 GHz      F			2440MHz E	9g-Pwr 10	07:00:4I T	RACE 1 2 3 4 5 TYPE MWWWW DET P NNNN
RL RF 50 RL RF 50 enter Freq 13.26 Ref Offset 0 dB/div Ref 10.5	Swept SA 3 Ω AC 5000000 GHz F IF 0.5 dB	SEN PNO: Fast ↔	ISE:PULSE	2440MHz E Alignauto Avg Type: Lo	9g-Pwr 10	07:00:40 ™ 7	
RL         RF         50           enter Freq 13.26         Sef Offset           Q dB/div         Ref Offset           29         1	Swept SA 3 Ω AC 5000000 GHz F IF 0.5 dB	SEN PNO: Fast ↔	ISE:PULSE	2440MHz E Alignauto Avg Type: Lo	9g-Pwr 10	07:00:40 ™ 7	
RL         RF         50           enter Freq 13.26         Ref Offset         8           0 dB/div         Ref 10.5         9         1           500         50         1         1	Swept SA 3 Ω AC 5000000 GHz F IF 0.5 dB	SEN PNO: Fast ↔	ISE:PULSE	2440MHz E Alignauto Avg Type: Lo	9g-Pwr 10	07:00:40 ™ 7	RACE 12 3 4 5 TYPE MWWWWW DET P NNNN 40 5 GH2 579 dBm
Ref         Offset           RL         RF         50           0 dB/div         Ref Offset         10.50           9.5         9.5         9.5	Swept SA 3 Ω AC 5000000 GHz F IF 0.5 dB	SEN PNO: Fast ↔	ISE:PULSE	2440MHz E Alignauto Avg Type: Lo	9g-Pwr 10	07:00:40 ™ 7	RACE 12 3 4 5 TYPE MWWWWW DET P NNNN 40 5 GH2 579 dBm
Ref         Offset           0 dB/div         Ref Offset           0 dB/div         Ref 10.50	Swept SA 3 Ω AC 5000000 GHz F IF 0.5 dB	SEN PNO: Fast ↔	ISE:PULSE	2440MHz E Alignauto Avg Type: Lo	9g-Pwr 10	07:00:40 ™ 7	RACE 12 3 4 5 TYPE MWWWWW DET P NNNN 40 5 GH2 579 dBm
Ref         Offset           0 dB/div         Ref         0.50           0.5         0.5         0.5           0.5         0.5         0.5           0.5         0.5         0.5	Swept SA 3 Ω AC 5000000 GHz F F 0.5 dB 0 dBm	Gain:Low	ISE:PULSE	2440MHz E	og-Pwr 10	07:00:41 T Mkr1 2.4 -12.	6 PM Jun 07, 2022 RACE 1 2 3 4 5 TYPE MWANAMA DET P N N N 40 5 GH2 579 dBm -27.23 dBm
Ref         Offset           0 dB/div         Ref         0.50           0.5         0.5         0.5           0.5         0.5         0.5           0.5         0.5         0.5	Swept SA 3 Ω AC 5000000 GHz F F 0.5 dB 0 dBm	Gain:Low	ISE:PULSE	2440MHz E	og-Pwr 10	07:00:41 T Mkr1 2.4 -12.	RACE 12 3 4 5 VPE [M VAN WAY DET P N N N N 40 5 GH2 579 dBm -27 23 dBm
ilent Spectrum Analyzer - St RL RF St enter Freq 13.26 D dB/div Ref Offset 0 dB/div Ref 10.50 9 5 9 5 9 5 9 5 9 5 9 5 9 5 9 5	Swept SA 3 Ω AC 5000000 GHz F F 0.5 dB 0 dBm	SEN Gain:Low	ISE:PULSE	2440MHz E	Pg-Pwr 10	07:00:4 T Mkr1 2.4 -12.	RACE   1 2 3 4 5 TYPE   MNNN DET   P NNNN 40 5 GH: 579 dBn -27 23 dBr -27 23 dBr
Ref Offset RL RF SC enter Freq 13.26 Ref Offset 0 dB/div Ref 10.50 0 dB/div Ref 1	Swept SA 2 2 AC 5000000 GHz F 0.5 dB 0 dBm 0	SEN Gain:Low	ISE:PULSE	2440MHz E	Pg-Pwr 10	07:00:44 T Mkr1 2.4 -12.	RACE 12 3 4 5 TYPE [MWNNN DET P NNNN 40 5 GH2 579 dBm -27 23 dBr
Ilent Spectrum Analyzer - State       RL     RF     State       enter Freq 13.26       Ref Offset       O dB/div     Ref 10.51       State     1       95     -       95     -       95     -       95     -       95     -       95     -       95     -       95     -       95     -       95     -       96     -       97     -       98     -       99     -       95     -       96     -       97     -       98     -       99     -       91     -       92     -       93     -       94     -       95     -       96     -       97     -       98     -       99     -       94     -       95     -       96     -       97     -       98     -       99     -       91     -       92     -       93     -	Swept SA 22 AC 5000000 GHz F 0.5 dB 0 dBm 0 dBm 2.440 5 GHz 25.592 1 GHz 4.964 0 GHz	SEN Sean:Low Source Search	V 300 KHz	2440MHz E	Pg-Pwr 10	07:00:4 T Mkr1 2.4 -12.	RACE   1 2 3 4 5 TYPE   MNNN DET   P NNNN 40 5 GH: 579 dBn -27 23 dBr -27 23 dBr
Sectrum Analyzer         Ref         SC           RL         RF         SC           enter Freq 13.26         Ref Offset         SC           0 dB/div         Ref 10.51         SC           95         1         1           96         1         5	Swept SA 3 2 AC 5000000 GHz F F 0.5 dB 0 dBm 0 dBm 4 2.440 5 GHz 2.5592 1 GHz	SEN PN0: Fast Gain:Low 5 5 #VBV #VBV 12.579 c -72.579 c -72.579 c	ISE:PULSE	2440MHz E	Pg-Pwr 10	07:00:4 T Mkr1 2.4 -12.	RACE   1 2 3 4 5 TYPE   MNNN DET   P NNNN 40 5 GH: 579 dBn -27 23 dBr -27 23 dBr
Ref         Offset         SC           Ref         Offset         SC           OdB/div         Ref         Offset           OdB/div         Ref         SC           SC         SC	Swept 5A 3 2 AC 5000000 GHz F 0.5 dB 0 dBm 0 dBm 2.440 5 GHz 2.592 1 GHz 4.964 0 GHz 7.490 1 GHz	SEN Gain:Low Sant → Gain:Low #VEV #VEV 12.579 c 5.6400 c 57.517 c 56.974 c	ISE:PULSE	2440MHz E	Pg-Pwr 10	07:00:4 T Mkr1 2.4 -12.	RACE   1 2 3 4 5 TYPE   MNNN DET   P NNNN 40 5 GH: 579 dBn -27 23 dBr -27 23 dBr
Sectrum Analyzer         Ref         SC           RL         RF         SC           enter Freq 13.26         Ref Offset         SC           0 dB/div         Ref 10.51         SC           95         1         1           96         1         5	Swept 5A 3 2 AC 5000000 GHz F 0.5 dB 0 dBm 0 dBm 2.440 5 GHz 2.592 1 GHz 4.964 0 GHz 7.490 1 GHz	SEN Gain:Low Sant → Gain:Low #VEV #VEV 12.579 c 5.6400 c 57.517 c 56.974 c	ISE:PULSE	2440MHz E	Pg-Pwr 10	07:00:4 T Mkr1 2.4 -12.	RACE   1 2 3 4 5 TYPE   MNNN DET   P NNNN 40 5 GH: 579 dBn -27 23 dBr -27 23 dBr

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# 9. RADIATED TEST RESULTS

#### LIMITS

Please refer to FCC §15.205 and §15.209

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#### Please refer to RSS-GEN Clause 8.9 (Transmitter)

Frequency (MHz)	Field Strength (microvolts/meter)	Measurement Distance (meters)
0.009~0.490	2400/F(KHz)	300
0.490~1.705	24000/F(KHz)	30
1.705~30.0	30	30
30~88	100	3
88~216	150	3
216~960	200	3
960~1000	500	3

Radiation Disturbance Test Limit for FCC (Class B)(9KHz-1GHz)

Note: 1) At frequencies at or above 30 MHz, measurements may be performed at a distance other than what is specified provided: measurements are not made in the near field except where it can be shown that near field measurements are appropriate due to the characteristics of the device; and it can be demonstrated that the signal levels needed to be measured at the distance employed can be detected by the measurement equipment. Measurements shall not be performed at a distance greater than 30 meters unless it can be further demonstrated that measurements at a distance of 30 meters or less are impractical. When performing measurements at a distance other than that specified, the results shall be extrapolated to the specified distance using an extrapolation factor of 20 dB/decade (inverse linear-distance for field strength measurements; inverse-linear-distance-squared for power density measurements).

(2) At frequencies below 30 MHz, measurements may be performed at a distance closer than that specified in the regulations; however, an attempt should be made to avoid making measurements in the near field. Pending the development of an appropriate measurement procedure for measurements performed below 30 MHz, when performing measurements at a closer distance than specified, the results shall be extrapolated to the specified distance by either making measurements at a minimum of two distances on at least one radial to determine the proper extrapolation factor or by using the square of an inverse linear distance extrapolation factor (40 dB/decade). This paragraph (f) shall not apply to Access BPL devices operating below 30 MHz.

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#### Radiation Disturbance Test Limit for RSS-Gen (9KHz-1GHz)

Frequencies (MHz)	Magnetic field strength (H- Field) (µA/m)	Measurement Distance (meters)					
		(IIIeleis)					
0.009~0.490	6.37/F(KHz)	300					
0.490~1.705	63.7/F(KHz)	30					
1.705~30.0	0.08	30					

Frequencies (MHz)	Field strength (µV/m at 3 m)
30~88	100
88~216	150
216~960	200
Above 960	500

Note 1: The emission limits for the ranges 9-90 kHz and 110-490 kHz are based on measurements employing a linear average detector.

#### Radiation Disturbance Test Limit for FCC (Above 1G)

Frequency (MHz)	dB(uV/m) (at 3 meters)		
	Peak	Average	
Above 1000	74	54	

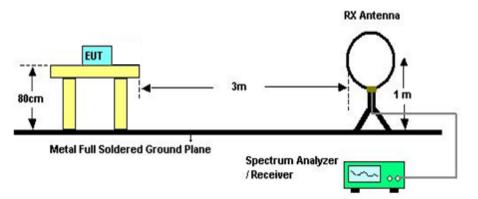
#### Restricted bands of operation

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			

Note: <sup>1</sup>Until February 1, 1999, this restricted band shall be 0.490-0.510 MHz. <sup>2</sup>Above 38.6c

## TEST SETUP AND PROCEDURE

Below 30MHz



The setting of the spectrum analyser

RBW	200Hz (From 9kHz to 0.15MHz)/ 9KHz (From 0.15MHz to 30MHz)
VBW	200Hz (From 9kHz to 0.15MHz)/ 9KHz (From 0.15MHz to 30MHz)
Sweep	Auto
Detector	Peak/QP/ Average
Trace	Max hold

1. The testing follows the guidelines in ANSI C63.10-2013

2. The EUT was arranged to its worst case and then turntable (from 0 degree to 360 degrees) to find the maximum reading. A pre-amp and a high pass filter are used for the test in order to get better signal level. Both horizontal and vertical polarizations of the antenna are set to make the measurement.

3. The EUT was placed on a turntable with 0.8 meter above ground.

4. The EUT was set 3 meters from the interference receiving antenna, which was mounted on the top of a variable height antenna tower.

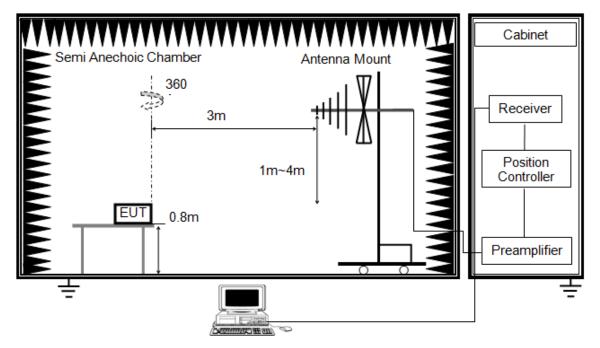
5. For measurement below 1GHz, the initial step in collecting conducted emission data is a spectrum analyzer peak detector mode pre-scanning the measurement frequency range. Significant peaks are then marked and then Quasi Peak detector mode re-measured. If the emission level of the EUT measured by the peak detector is 3 dB lower than the applicable limit, the peak emission level will be reported. Otherwise, the emission measurement will be repeated using the quasi-peak detector and reported.

6. For the actual test configuration, please refer to the related item in this test report (Photographs of the Test Configuration)

Note: Although these tests were performed other than open area test site, adequate comparison measurements were confirmed against 30m open are test site. Therefore sufficient tests were made to demonstrate that the alternative site produces results that correlate with the ones of tests made in an open field based on KDB 414788.



## Below 1G



The setting of the spectrum analyser

RBW	120K
VBW	300K
Sweep	Auto
Detector	Peak/QP
Trace	Max hold

1. The testing follows the guidelines in ANSI C63.10-2013.

2. The EUT was arranged to its worst case and then tune the antenna tower (from 1 m to 4 m) and turntable (from 0 degree to 360 degrees) to find the maximum reading. A pre-amp and a high pass filter are used for the test in order to get better signal level. Both horizontal and vertical polarizations of the antenna are set to make the measurement.

3. The EUT was placed on a turntable with 0.8 meter above ground.

4. The EUT was set 3 meters from the interference receiving antenna, which was mounted on the top of a variable height antenna tower.

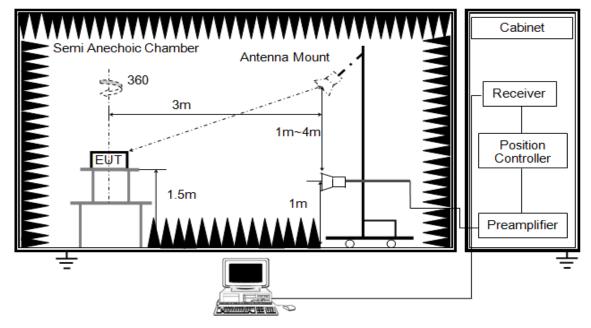
5. For measurement below 1GHz, the initial step in collecting conducted emission data is a spectrum analyzer peak detector mode pre-scanning the measurement frequency range. Significant peaks are then marked and then Quasi Peak detector mode re-measured. If the emission level of the EUT measured by the peak detector is 3 dB lower than the applicable limit, the peak emission level will be reported. Otherwise, the emission measurement will be repeated using the quasi-peak detector and reported.

6. For the actual test configuration, please refer to the related Item in this test report (Photographs of the Test Configuration)

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## ABOVE 1G



The setting of the spectrum analyser

RBW	1M
VBW	PEAK: 3M AVG: see note 6
Sweep	Auto
Detector	Peak
Trace	Max hold

1. The testing follows the guidelines in ANSI C63.10-2013.

2. The EUT was arranged to its worst case and then tune the antenna tower (from 1 m to 4 m) and turntable (from 0 degree to 360 degrees) to find the maximum reading. A pre-amp and a high pass filter are used for the test in order to get better signal level. Both horizontal and vertical polarizations of the antenna are set to make the measurement.

3. The EUT was placed on a turntable with 1.5m above ground.

4. The EUT was set 3 meters from the interference receiving antenna, which was mounted on the top of a variable height antenna tower.

5. For measurement above 1GHz, the emission measurement will be measured by the peak detector. This peak level, once corrected, must comply with the limit specified in Section 15.209.

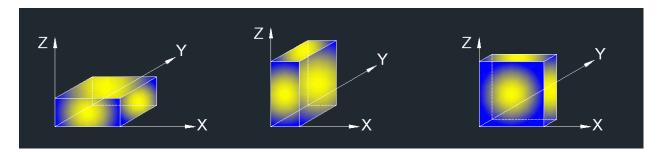
6. For peak measurements, the resolution bandwidth is set to 1 MHz, then the video bandwidth is set to 3 MHz with peak detector; For average measurements, the resolution bandwidth is set to 1 MHz, then the video bandwidth is set to 3KHz with peak detector.

7. For the actual test configuration, please refer to the related item in this test report (Photographs of the Test Configuration)

X axis, Y axis, Z axis positions:

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## **TEST ENVIRONMENT**

Temperature	23.1C	Relative Humidity	60%
Atmosphere Pressure	101kPa	Test Voltage	DC 3.3V

Note: Pre-test X-axis, Y-axis, and Z-axis positions, find the worst case in X-axis and record it in this report.

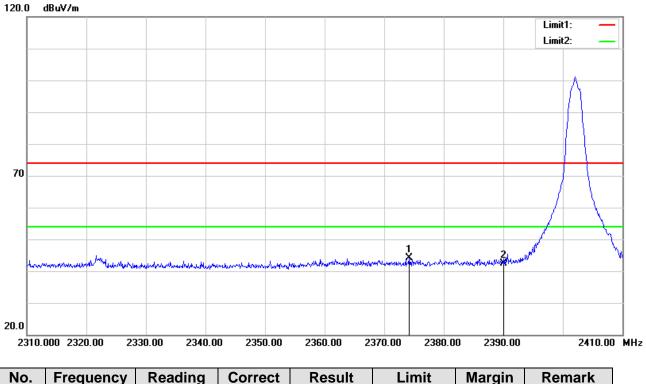
The results reported herein have been performed in accordance with the laboratory's terms of accreditation. This report shall not be reproduced except in full without the written approval of the Laboratory. The results in this report apply to the test sample(s) mentioned above at the time of the testing period only and are not to be used to indicate applicability to other similar products. This report does not imply that the product(s) has met the criteria for certification.



## 9.1. RESTRICTED BANDEDGE

GFSK



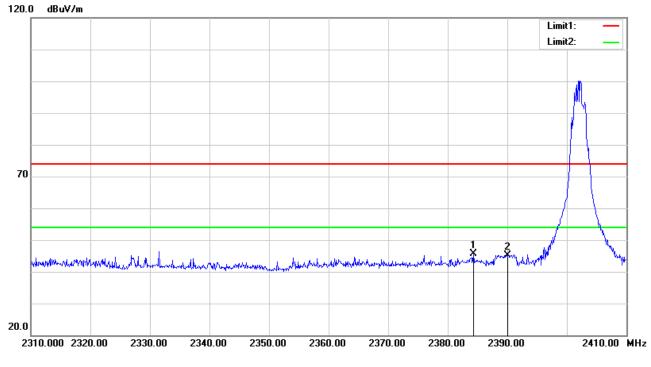


No.	Frequency	Reading	Correct	Result	Limit	Margin	Remark
	(MHz)	(dBuV/m)	dB/m	(dBuV/m)	(dBuV/m)	(dB)	
1	2374.200	39.99	4.10	44.09	74.00	-29.91	peak
2	2390.000	38.04	4.34	42.38	74.00	-31.62	peak

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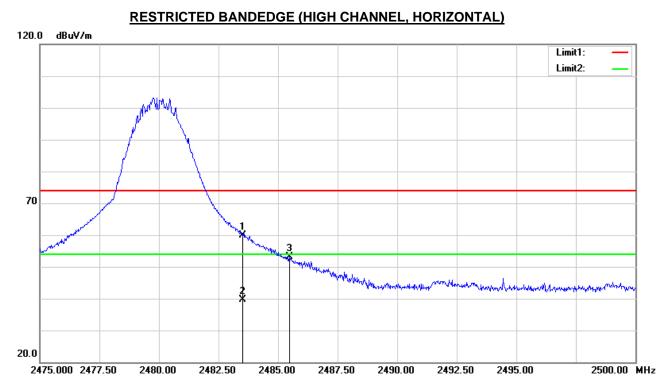
## **RESTRICTED BANDEDGE (LOW CHANNEL, VERTICAL)**



No.	Frequency	Reading	Correct	Result	Limit	Margin	Remark
	(MHz)	(dBuV/m)	dB/m	(dBuV/m)	(dBuV/m)	(dB)	
1	2384.300	41.27	4.26	45.53	74.00	-28.47	peak
2	2390.000	40.77	4.34	45.11	74.00	-28.89	peak

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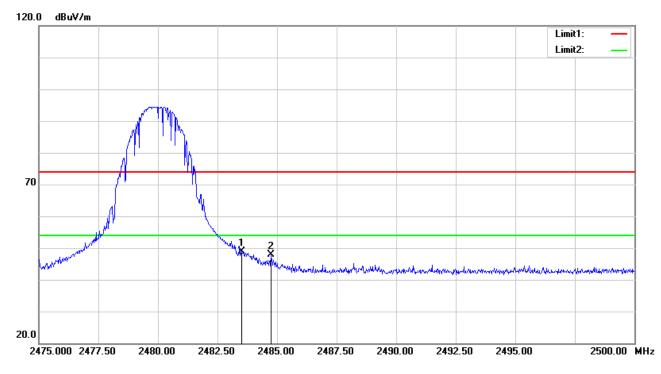


No.	Frequency	Reading	Correct	Result	Limit	Margin	Remark
	(MHz)	(dBuV/m)	dB/m	(dBuV/m)	(dBuV/m)	(dB)	
1	2483.500	55.31	4.60	59.91	74.00	-14.09	peak
2	2483.500	35.05	4.60	39.65	54.00	-14.35	AVG
3	2485.475	48.43	4.61	53.04	74.00	-20.96	peak

The results reported herein have been performed in accordance with the laboratory's terms of accreditation. This report shall not be reproduced except in full without the written approval of the Laboratory. The results in this report apply to the test sample(s) mentioned above at the time of the testing period only and are not to be used to indicate applicability to other similar products. This report does not imply that the product(s) has met the criteria for certification.



## **RESTRICTED BANDEDGE (HIGH CHANNEL, VERTICAL)**



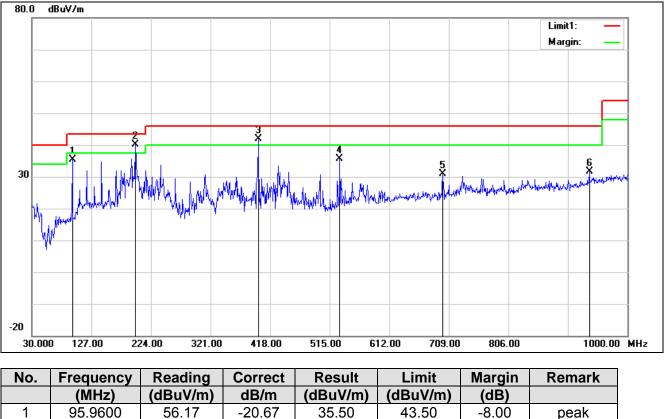
No.	Frequency	Reading	Correct	Result	Limit	Margin	Remark
	(MHz)	(dBuV/m)	dB/m	(dBuV/m)	(dBuV/m)	(dB)	
1	2483.500	44.22	4.60	48.82	74.00	-25.18	peak
2	2484.750	43.25	4.61	47.86	74.00	-26.14	peak

The results reported herein have been performed in accordance with the laboratory's terms of accreditation. This report shall not be reproduced except in full without the written approval of the Laboratory. The results in this report apply to the test sample(s) mentioned above at the time of the testing period only and are not to be used to indicate applicability to other similar products. This report does not imply that the product(s) has met the criteria for certification.



## 9.2. SPURIOUS EMISSIONS 30MHz-1GHz

Note: All the channels had been tested, but only the worst data recorded in the report.



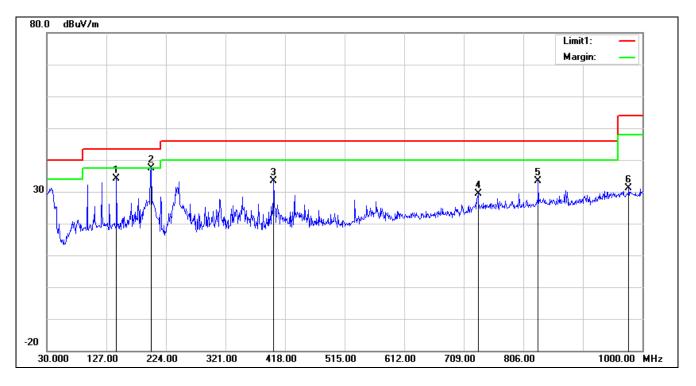
## HARMONICS AND SPURIOUS EMISSIONS (HORIZONTAL)

No.	Frequency	Reading	Correct	Result	Limit	Margin	Remark
	(MHz)	(dBuV/m)	dB/m	(dBuV/m)	(dBuV/m)	(dB)	
1	95.9600	56.17	-20.67	35.50	43.50	-8.00	peak
2	198.7800	61.33	-21.12	40.21	43.50	-3.29	peak
3	398.6000	53.17	-11.20	41.97	46.00	-4.03	peak
4	531.4900	43.08	-7.37	35.71	46.00	-10.29	peak
5	699.3000	35.17	-4.18	30.99	46.00	-15.01	peak
6	937.9200	30.48	1.20	31.68	46.00	-14.32	peak

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#### HARMONICS AND SPURIOUS EMISSIONS (VERTICAL)

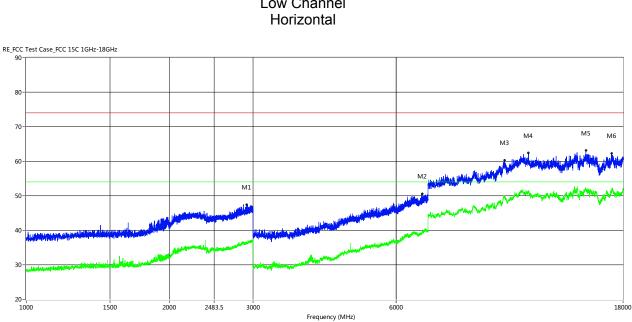


No.	Frequency	Reading	Correct	Result	Limit	Margin	Remark
	(MHz)	(dBuV/m)	dB/m	(dBuV/m)	(dBuV/m)	(dB)	
1	143.4900	52.31	-18.23	34.08	43.50	-9.42	peak
2	199.7500	58.44	-21.11	37.33	43.50	-6.17	peak
3	399.5700	44.66	-11.16	33.50	46.00	-12.50	peak
4	732.2800	31.78	-2.39	29.39	46.00	-16.61	peak
5	830.2500	34.20	-0.74	33.46	46.00	-12.54	peak
6	977.6900	28.64	2.52	31.16	54.00	-22.84	peak

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9.3.



## SPURIOUS EMISSIONS Above 1 GHz Low Channel

Frequency (MHz)	Peak Level (dBuV/m)	Average Level (dBuV/m)	Factor (dB)	PK Limit (dBuV/m)	AV Limit (dBuV/m)	Over Limit (dB)	ANT	Verdict
2909.500	47.50	36.32	5.66	74.0	54.0	-17.68	Horizontal	Pass
6808.000	50.55	39.34	0.01	74.0	54.0	-14.66	Horizontal	Pass
10140.500	60.31	49.84	7.15	74.0	54.0	-4.16	Horizontal	Pass
11391.750	62.44	51.22	9.73	74.0	54.0	-2.78	Horizontal	Pass
15032.750	63.15	51.66	10.37	74.0	54.0	-2.34	Horizontal	Pass
17034.750	62.26	51.11	10.01	74.0	54.0	-2.89	Horizontal	Pass

Remark:

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

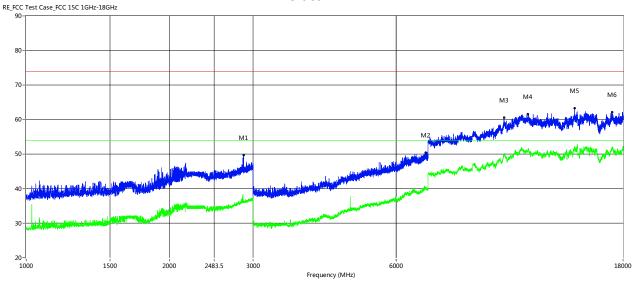
2. Margin = Limit - Emission Level

3. Tests were performed in three frequency range 1GHz~3GHz, 3GHz~13GHz, 13GHz~18GHz.

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Frequency (MHz)	Peak Level (dBuV/m)	Average Level (dBuV/m)	Factor (dB)	PK Limit (dBuV/m)	AV Limit (dBuV/m)	Over Limit (dB)	ANT	Verdic t
2865.000	49.73	36.44	5.61	74.0	54.0	-17.56	Vertical	Pass
6923.000	50.37	40.32	0.48	74.0	54.0	-13.68	Vertical	Pass
10124.000	60.58	49.76	7.16	74.0	54.0	-4.24	Vertical	Pass
11364.250	61.62	51.19	9.67	74.0	54.0	-2.81	Vertical	Pass
14240.750	63.31	51.99	11.28	74.0	54.0	-2.01	Vertical	Pass
17084.250	62.15	51.66	10.37	74.0	54.0	-2.34	Vertical	Pass

Remark:

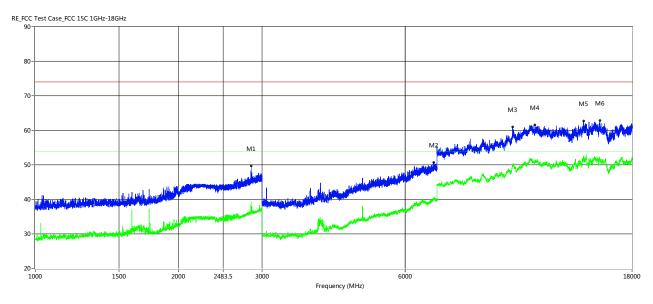
1. Factor = Antenna Factor + Cable Loss – Pre-amplifier + BRF Factor.

2. Margin = Limit - Emission Level

3. Tests were performed in three frequency range 1GHz~3GHz, 3GHz~13GHz, 13GHz~18GHz.

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#### Mid Channel Horizontal



Frequency (MHz)	Peak Level (dBuV/m)	Average Level (dBuV/m)	Factor (dB)	PK Limit (dBuV/m)	AV Limit (dBuV/m)	Over Limit (dB)	ANT	Verdict
2848.000	49.66	39.39	5.60	74.0	54.0	-14.61	Horizontal	Pass
6883.000	50.74	40.12	0.38	74.0	54.0	-13.88	Horizontal	Pass
10088.250	60.94	49.94	6.94	74.0	54.0	-4.06	Horizontal	Pass
11246.000	61.64	51.46	9.57	74.0	54.0	-2.54	Horizontal	Pass
14235.250	62.67	52.55	11.33	74.0	54.0	-1.45	Horizontal	Pass
15404.000	62.89	51.59	10.95	74.0	54.0	-2.41	Horizontal	Pass

Remark:

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

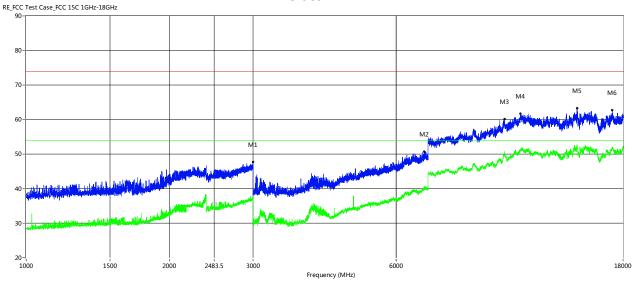
2. Margin = Limit - Emission Level

3. Tests were performed in three frequency range 1GHz~3GHz, 3GHz~13GHz, 13GHz~18GHz.

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Frequency (MHz)	Peak Level (dBuV/m)	Average Level (dBuV/m)	Factor (dB)	PK Limit (dBuV/m)	AV Limit (dBuV/m)	Over Limit (dB)	ANT	Verdic t
2998.000	47.68	37.16	6.10	74.0	54.0	-16.84	Vertical	Pass
6874.000	50.74	40.26	0.33	74.0	54.0	-13.74	Vertical	Pass
10146.000	60.19	50.24	7.15	74.0	54.0	-3.76	Vertical	Pass
10960.000	61.66	51.31	9.91	74.0	54.0	-2.69	Vertical	Pass
14403.000	63.23	52.38	11.39	74.0	54.0	-1.62	Vertical	Pass
17087.000	62.76	51.59	10.39	74.0	54.0	-2.41	Vertical	Pass

Remark:

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

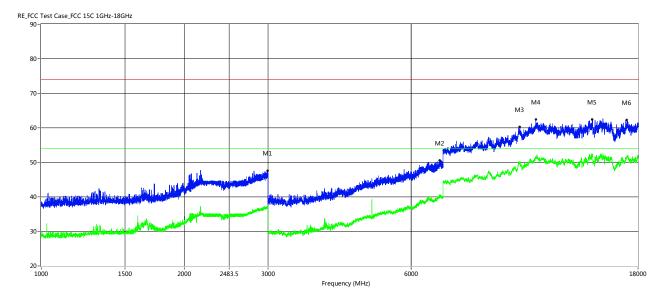
2. Margin = Limit - Emission Level

3. Tests were performed in three frequency range 1GHz~3GHz, 3GHz~13GHz, 13GHz~18GHz.

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# (UL)

## High Channel Horizontal



Frequency (MHz)	Peak Level (dBuV/m)	Average Level (dBuV/m)	Factor (dB)	PK Limit (dBuV/m)	AV Limit (dBuV/m)	Over Limit (dB)	ANT	Verdict
2993.000	47.56	36.90	6.08	74.0	54.0	-17.10	Horizontal	Pass
6893.000	50.61	40.30	0.43	74.0	54.0	-13.70	Horizontal	Pass
10157.000	60.29	49.81	7.14	74.0	54.0	-4.19	Horizontal	Pass
10971.000	62.37	51.52	10.00	74.0	54.0	-2.48	Horizontal	Pass
14414.000	62.46	52.22	11.26	74.0	54.0	-1.78	Horizontal	Pass
17056.750	62.33	51.82	10.17	74.0	54.0	-2.18	Horizontal	Pass

Remark:

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

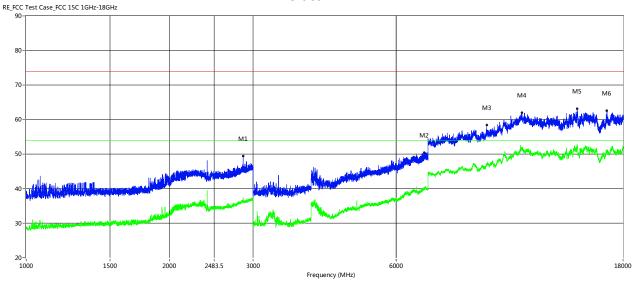
2. Margin = Limit - Emission Level

3. Tests were performed in three frequency range 1GHz~3GHz, 3GHz~13GHz, 13GHz~18GHz.

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Frequency (MHz)	Peak Level (dBuV/m)	Average Level (dBuV/m)	Factor (dB)	PK Limit (dBuV/m)	AV Limit (dBuV/m)	Over Limit (dB)	ANT	Verdic t
2860.000	49.44	37.44	5.61	74.0	54.0	-16.56	Vertical	Pass
6866.000	50.41	39.75	0.29	74.0	54.0	-14.25	Vertical	Pass
9304.500	58.47	46.70	5.38	74.0	54.0	-7.30	Vertical	Pass
11031.500	62.01	51.85	10.05	74.0	54.0	-2.15	Vertical	Pass
14414.000	63.20	52.29	11.26	74.0	54.0	-1.71	Vertical	Pass
16649.750	62.62	50.60	9.93	74.0	54.0	-3.40	Vertical	Pass

Remark:

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

2. Margin = Limit - Emission Level

3. Tests were performed in three frequency range 1GHz~3GHz, 3GHz~13GHz, 13GHz~18GHz.

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## 9.4. SPURIOUS EMISSIONS BELOW 30M

Freq.			Margin	State	Test Desult
(MHz)			(dB)	P/F	Test Result
					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.

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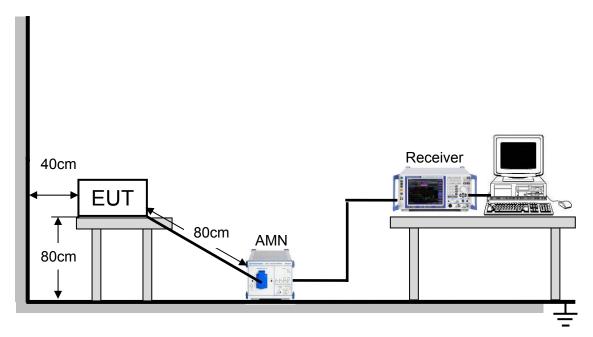
# **10. AC POWER LINE CONDUCTED EMISSIONS**

## LIMITS

Please refer to FCC §15.207 (a) and RSS-Gen Clause 8.8

FREQUENCY (MHz)	Quasi-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

## TEST SETUP AND PROCEDURE



The EUT is put on a table of non-conducting material that is 80cm high. The vertical conducting wall of shielding is located 40cm to the rear of the EUT. The power line of the EUT is connected to the AC mains through a Artificial Mains Network (A.M.N.). A EMI Measurement Receiver (R&S Test Receiver ESR3) is used to test the emissions from both sides of AC line. According to the requirements in Section 7 and 13 of ANSI C63.10-2013.Conducted emissions from the EUT measured in the frequency range between 0.15 MHz and 30MHz using CISPR Quasi-Peak and average detector mode. The bandwidth of EMI test receiver is set at 9kHz.

The arrangement of the equipment is installed to meet the standards and operating in a manner, which tends to maximize its emission characteristics in a normal application.

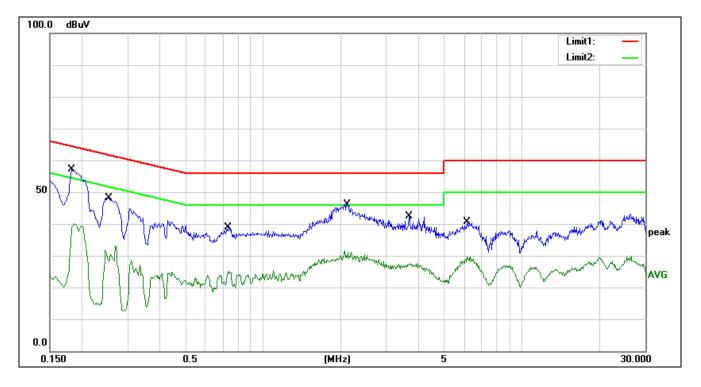
## TEST ENVIRONMENT

Temperature	25.4°C	Relative Humidity	51%
Atmosphere Pressure	101kPa	Test Voltage	DC 3.3V

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## TEST RESULTS



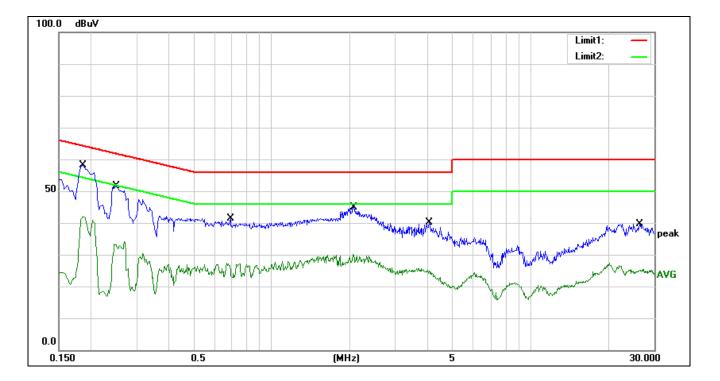
No.	Frequency	Reading	Correct	Result	Limit	Margin	Remark
	(MHz)	(dBuV)	dB	(dBuV)	(dBuV)	(dB)	
1	0.1820	36.66	20.36	57.02	64.39	-7.37	QP
2	0.1820	19.68	20.36	40.04	54.39	-14.35	AVG
3	0.2540	27.57	20.61	48.18	61.63	-13.45	QP
4	0.2540	12.43	20.61	33.04	51.63	-18.59	AVG
5	0.7340	18.62	20.36	38.98	56.00	-17.02	QP
6	0.7340	4.71	20.36	25.07	46.00	-20.93	AVG
7	2.1140	25.79	20.39	46.18	56.00	-9.82	QP
8	2.1140	11.27	20.39	31.66	46.00	-14.34	AVG
9	3.6700	21.80	20.49	42.29	56.00	-13.71	QP
10	3.6700	7.06	20.49	27.55	46.00	-18.45	AVG
11	6.1620	19.98	20.56	40.54	60.00	-19.46	QP
12	6.1620	9.01	20.56	29.57	50.00	-20.43	AVG

Note: 1. Result = Reading +Correct Factor.

- 2. If QP Result complies with AV limit, AV Result is deemed to comply with AV limit.
- 3. Test setup: RBW: 200 Hz (9 kHz-150 kHz), 9 kHz (150 kHz-30 MHz).
- 4. Step size: 80Hz (0.009MHz-0.15MHz), 4 kHz (0.15MHz-30MHz), Scan time: auto.



## LINE L RESULTS



No.	Frequency	Reading	Correct	Result	Limit	Margin	Remark
	(MHz)	(dBuV)	dB	(dBuV)	(dBuV)	(dB)	
1	0.1860	37.87	20.31	58.18	64.21	-6.03	QP
2	0.1860	21.84	20.31	42.15	54.21	-12.06	AVG
3	0.2500	31.06	20.53	51.59	61.76	-10.17	QP
4	0.2500	13.66	20.53	34.19	51.76	-17.57	AVG
5	0.6900	20.94	20.36	41.30	56.00	-14.70	QP
6	0.6900	6.98	20.36	27.34	46.00	-18.66	AVG
7	2.0660	24.62	20.30	44.92	56.00	-11.08	QP
8	2.0660	9.77	20.30	30.07	46.00	-15.93	AVG
9	4.0620	19.79	20.40	40.19	56.00	-15.81	QP
10	4.0620	5.23	20.40	25.63	46.00	-20.37	AVG
11	26.3700	17.04	22.69	39.73	60.00	-20.27	QP
12	26.3700	4.57	22.69	27.26	50.00	-22.74	AVG

Note: 1. Result = Reading +Correct Factor.

- 2. If QP Result complies with AV limit, AV Result is deemed to comply with AV limit.
- 3. Test setup: RBW: 200 Hz (9 kHz-150 kHz), 9 kHz (150 kHz-30 MHz).
- 4. Step size: 80Hz (0.009MHz-0.15MHz), 4 kHz (0.15MHz-30MHz), Scan time: auto.



## 11. ANTENNA REQUIREMENTS

## APPLICABLE REQUIREMENTS

## Please refer to FCC §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. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the provisions of this section. The manufacturer may design the unit so that a broken antenna can be replaced by the user, but the use of a standard antenna jack or electrical connector is prohibited.

## Please refer to FCC §15.247(b)(4)

The conducted output power limit specified in paragraph (b) of this section is based on the use of antennas with directional gains that do not exceed 6 dBi. Except as shown in paragraph (c) of this section, if transmitting antennas of directional gain greater than 6 dBi are used, the conducted output power from the intentional radiator shall be reduced below the stated values in paragraphs (b)(1), (b)(2), and (b)(3) of this section, as appropriate, by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

## ANTENNA CONNECTOR

EUT has an integral antenna without antenna connector.

## ANTENNA GAIN

The antenna gain of EUT is less than 6 dBi.

The results reported herein have been performed in accordance with the laboratory's terms of accreditation. This report shall not be reproduced except in full without the written approval of the Laboratory. The results in this report apply to the test sample(s) mentioned above at the time of the testing period only and are not to be used to indicate applicability to other similar products. This report does not imply that the product(s) has met the criteria for certification.



## **Test photos**

Note: See test photos in setup photo document for the actual connections between Product and support equipment.

# **END OF REPORT**