

# **FCC Test Report**

Report No.: AGC02862210507FE03

FCC ID : UU8-RCD109

**APPLICATION PURPOSE** : Original Equipment

**PRODUCT DESIGNATION**: Bluetooth CD Player with Lights - UNICORN

**BRAND NAME** : LEXIBOOK

MODEL NAME : RCD109UNI

APPLICANT : Lexibook America

**DATE OF ISSUE** : Aug. 05, 2021

**STANDARD(S)** : FCC Part 15.247

**REPORT VERSION**: V1.0

Attestation of Global Comptance (Shenzhen) Co., Ltd



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# REPORT REVISE RECORD

Report Version	Revise Time	Issued Date	Valid Version	Notes
V1.0	® /	Aug. 05, 2021	Valid	Initial Release

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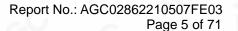
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# 1. VERIFICATION OF CONFORMITY

Applicant	Lexibook America	
Address	C/O NATXIS PRAMEX INTERNATIONAL -NORTH AMERICA 1251 avenue of the Americas 34th floor, New York 10020, New York, United States	
Manufacturer	Lexibook America	
Address C/O NATXIS PRAMEX INTERNATIONAL -NORTH AMERICA 1251 the Americas 34th floor, New York 10020, New York, United States		
Factory	Lexibook America	
Address C/O NATXIS PRAMEX INTERNATIONAL -NORTH AMERICA 1251 the Americas 34th floor, New York 10020, New York, United States		
Product Designation	Bluetooth CD Player with Lights - UNICORN	
Brand Name	LEXIBOOK	
Test Model	RCD109UNI	
Date of test	Jul. 13, 2021 to Aug. 05, 2021	
Deviation	No any deviation from the test method	
Condition of Test Sample	Normal	
Test Result	Pass	
Report Template	AGCRT-US-BR/RF	

# We hereby certify that:

The above equipment was tested by Attestation of Global Compliance (Shenzhen) Co., Ltd. The test data, data evaluation, test procedures, and equipment configurations shown in this report were made in accordance with the procedures given in ANSI C63.10 (2013) and the energy emitted by the sample EUT tested as described in this report is in compliance with radiated emission limits of FCC PART 15.247.

Prepared By	Eddy Lin	
CC C	Eddy Liu (Project Engineer)	Aug. 05, 2021
Reviewed By	Max Zhang	GC P
10°	Max Zhang (Reviewer)	Aug. 05, 2021
Approved By	Formerlies	
	Forrest Lei (Authorized Officer)	Aug. 05, 2021

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# 2. GENERAL INFORMATION

# 2.1. PRODUCT DESCRIPTION

The EUT is designed as "Bluetooth CD Player with Lights - UNICORN". It is designed by way of utilizing the GFSK and  $\pi$  /4-DQPSK technology to achieve the system operation.

A major technical description of EUT is described as following

g			
Operation Frequency	2.402 GHz to 2.480 GHz		
RF Output Power	2.609dBm (Max)		
Bluetooth Version	V5.0		
Modulation	BR ⊠GFSK, EDR ⊠π /4-DQPSK, □8DPSK BLE □GFSK 1Mbps □GFSK 2Mbps		
Number of channels	79		
Hardware Version	V1.0		
Software Version	V1.0		
Antenna Designation	PCB Antenna (Comply with requirements of the FCC part 15.203)		
Antenna Gain	0dBi		
Power Supply	DC 4.5V by battery or DC 9V by adapter		
Note: The EUT doesn't support 8DPSK and BLE.			

# 2.2. TABLE OF CARRIER FREQUENCYS

Frequency Band	Channel Number	Frequency
	0	2402 MHz
100	1	2403 MHz
	100 CC	
30 60	38	2440 MHz
2402~2480MHz	39	2441 MHz
	40	2442 MHz
100 ca	。 : · · · · ·	- GO : C
	77	2479 MHz
-6	78	2480 MHz

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#### 2.3. RECEIVER INPUT BANDWIDTH

The input bandwidth of the receiver is 1.3MHz, in every connection one Bluetooth device is the master and the other one is slave. The master determines the hopping sequence. The slave follows this sequence. Both devices shift between RX and TX time slot according to the clock of the master. Additionally, the type of connection (e.g. single of multi slot packet) is set up at the beginning of the connection. The master adapts its hopping frequency and its TX/RX timing according to the packet type of the connection. Also, the slave of the connection will use these settings. Repeating of a packet has no influence on the hopping sequence. The hopping sequence generated by the master of the connection will be followed in any case. That means, a repeated packet will not be send on the same frequency, it is send on the next frequency of the hopping sequence.

#### 2.4. EXAMPLE OF A HOPPING SEQUENCY IN DATA MODE

Example of a hopping sequence in data mode:

40, 21, 44, 23, 04, 15, 66, 56, 19, 78, 07, 28, 69, 55,

36, 45, 05, 13, 43, 74, 57, 35, 67, 76, 02, 34, 54, 63,

42, 11, 30, 06, 64, 25, 75, 48, 17, 33, 58, 01, 29, 14,

51, 72, 03, 31, 50, 61, 77, 18, 10, 47, 12, 68, 08, 49,

20, 00, 73, 09, 16, 60, 71, 41, 24, 53, 38, 26, 46, 37,

65, 32, 70, 52, 27, 59, 22, 62, 39

#### 2.5. EQUALLY AVERAGE USE OF FREQUENCIES AND BEHAVIOUR

The generation of the hopping sequence in connection mode depends essentially on two input values:

- 1. LAP/UAP of the master of the connection.
- 2. Internal master clock.

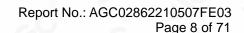
The LAP (lower address part) are the 24 LSB's of the 48 BD\_ADDRESS. The BD\_ADDRESS is an unambiguous number of every Bluetooth unit. The UAP (upper address part) are the 24MSB's of the 48BD\_ADDRESS

The internal clock of a Bluetooth unit is derived from a free running clock which is never adjusted and is never turned off. For behavior action with other units only offset is used. It has no relation to the time of the day. Its resolution is at least half the RX/TX slot length of 312.5us. The clock has a cycle of about one day(23h30). In most case it is implemented as 28 bits counter. For the deriving of the hopping sequence the entire. LAP (24 bits),4LSB's(4bits) (Input 1) and the 27MSB's of the clock (Input 2) are used. With this input values different mathematical procedures (permutations, additions, XOR-operations) are performed to generate the Sequence. This will be done at the beginning of every new transmission.

Regarding short transmissions the Bluetooth system has the following behavior:

The first connection between the two devices is established, a hopping sequence was generated. For Transmitting the wanted data the complete hopping sequence was not used. The connection ended.

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The second connection will be established. A new hopping sequence is generated. Due to the fact the Bluetooth clock has a different value, because the period between the two transmission is longer (and it Cannot be shorter) than the minimum resolution of the clock(312.5us). The hopping sequence will always differ from the first one.

# 2.6. RELATED SUBMITTAL(S) / GRANT (S)

This submittal(s) (test report) is intended for **FCC ID: UU8-RCD109** filing to comply with the FCC PART 15.247 requirements.

# 2.7. TEST METHODOLOGY

Both conducted and radiated testing was performed according to the procedures in ANSI C63.10 (2013). Radiated testing was performed at an antenna to EUT distance 3 meters.

#### 2.8. SPECIAL ACCESSORIES

Refer to section 5.2.

#### 2.9. EQUIPMENT MODIFICATIONS

Not available for this EUT intended for grant.

#### 2.10. ANTENNA REQUIREMENT

This intentional radiator is designed with a permanently attached antenna of an antenna to ensure that no antenna other than that furnished by the responsible party shall be used with the device.

For more information of the antenna, please refer to the APPENDIX B: PHOTOGRAPHS OF EUT.

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# 3. MEASUREMENT UNCERTAINTY

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

Item	Measurement Uncertainty
Uncertainty of Conducted Emission for AC Port	$U_c = \pm 3.1 \text{ dB}$
Uncertainty of Radiated Emission below 1GHz	$U_c = \pm 4.0 \text{ dB}$
Uncertainty of Radiated Emission above 1GHz	$U_c = \pm 4.8 \text{ dB}$
Uncertainty of total RF power, conducted	$U_c = \pm 0.8 \text{ dB}$
Uncertainty of RF power density, conducted	$U_c = \pm 2.6 \text{ dB}$
Uncertainty of spurious emissions, conducted	U <sub>c</sub> = ±2 %
Uncertainty of Occupied Channel Bandwidth	U <sub>c</sub> = ±2 %

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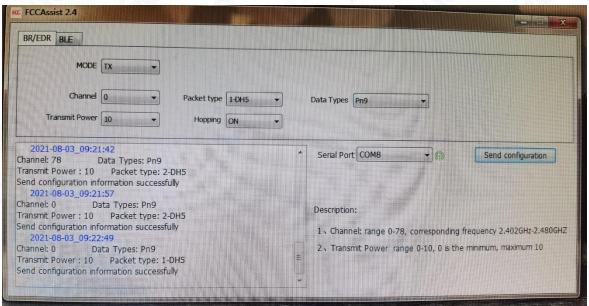
# 4. DESCRIPTION OF TEST MODES

NO.	TEST MODE DESCRIPTION		
1	Low channel GFSK		
2	Middle channel GFSK		
3	High channel GFSK		
4	Low channel π/4-DQPSK		
5	Middle channel π/4-DQPSK		
6	High channel π/4-DQPSK		
7	Hopping mode GFSK		
8	Hopping mode π/4-DQPSK		

#### Note:

- 1. Only the result of the worst case was recorded in the report, if no other cases.
- 2. For Radiated Emission, 3axis were chosen for testing for each applicable mode.
- 3. For Conducted Test method, a temporary antenna connector is provided by the manufacture.

# Software Setting



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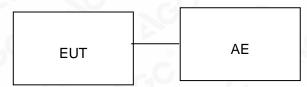
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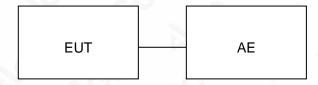
# 5. SYSTEM TEST CONFIGURATION

# **5.1. CONFIGURATION OF EUT SYSTEM**

Radiated Emission Configure:



# Conducted Emission Configure:



#### **5.2. EQUIPMENT USED IN TESTED SYSTEM**

Item	Equipment	Model No.	ID or Specification	Remark
1	Bluetooth CD Player with Lights - UNICORN	RCD109UNI	UU8-RCD109	EUT
2	Control Box	USB-TTL	N/A	AE

# **5.3. SUMMARY OF TEST RESULTS**

FCC RULES	DESCRIPTION OF TEST	RESULT
15.247 (b)(1)	Peak Output Power	Compliant
15.247 (a)(1)	20 dB Bandwidth	Compliant
15.247 (d)	Conducted Spurious Emission	Compliant
15.209	Radiated Emission	Compliant
15.247 (a)(1)(iii)	Number of Hopping Frequency	Compliant
15.247 (a)(1)(iii)	Time of Occupancy	Compliant
15.247 (a)(1)	Frequency Separation	Compliant
15.207	Conducted Emission	Compliant

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# 6. TEST FACILITY

Test Site Attestation of Global Compliance (Shenzhen) Co., Ltd	
Location  1-2/F, Building 19, Junfeng Industrial Park, Chongqing Road, Heping Communication Street, Bao'an District, Shenzhen, Guangdong, China	
Designation Number CN1259	
FCC Test Firm Registration Number	975832
A2LA Cert. No.	5054.02
Description	Attestation of Global Compliance (Shenzhen) Co., Ltd is accredited by A2LA

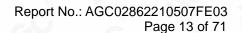
# TEST EQUIPMENT OF CONDUCTED EMISSION TEST

Equipment	Manufacturer	Model	S/N	Cal. Date	Cal. Due
TEST RECEIVER	R&S	ESPI	101206	May 11, 2021	May 10, 2022
LISN	R&S	ESH2-Z5	100086	Jun. 09, 2021	Jun. 08, 2022
Test software	R&S	ES-K1(Ver.V1.71)	N/A	N/A	N/A

# **TEST EQUIPMENT OF RADIATED EMISSION TEST**

Equipment	Manufacturer	Model	S/N	Cal. Date	Cal. Due
TEST RECEIVER	R&S	ESCI	10096	May 15,2021	May 14,2022
EXA Signal Analyzer	Aglient	N9010A	MY53470504	Dec. 07, 2020	Dec. 06, 2021
2.4GHz Filter	EM Electronics	2400-2500MHz	N/A	Mar. 23, 2020	Mar. 22, 2022
Attenuator	ZHINAN	E-002	N/A	Sep. 03, 2020	Sep. 02, 2022
Horn antenna	SCHWARZBECK	BBHA 9170	#768	Sep. 21, 2019	Sep. 20, 2021
Active loop antenna (9K-30MHz)	ZHINAN	ZN30900C	18051	May 22, 2020	May 21, 2022
Double-Ridged Waveguide Horn	ETS LINDGREN	3117	00034609	Apr. 23, 2021	Apr. 22, 2023
Broadband Preamplifier	ETS LINDGREN	3117PA	00225134	Sep. 03, 2020	Sep. 02, 2022
ANTENNA	SCHWARZBECK	VULB9168	494	Jan. 08, 2021	Jan. 07, 2023
Test software	Tonscend	JS32-RE (Ver.2.5)	N/A	N/A	N/A

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# 7. PEAK OUTPUT POWER

#### 7.1. MEASUREMENT PROCEDURE

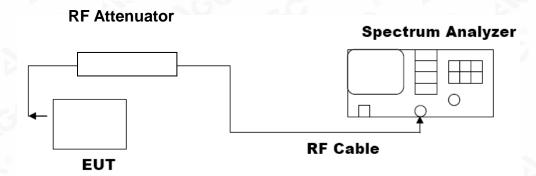
For peak power test:

- 1. Connect EUT RF output port to the Spectrum Analyzer through an RF attenuator
- 2. Span: Approximately five times the 20 dB bandwidth, centered on a hopping channel.
- 3. RBW > 20 dB bandwidth of the emission being measured.
- 4. VBW ≥RBW.
- 5. Sweep: Auto.
- 6. Detector function: Peak.
- 7. Trace: Max hold.

Allow trace to stabilize. Use the marker-to-peak function to set the marker to the peak of the emission. The indicated level is the peak output power, after any corrections for external attenuators and cables.

# 7.2. TEST SET-UP (BLOCK DIAGRAM OF CONFIGURATION)

#### **PEAK POWER TEST SETUP**



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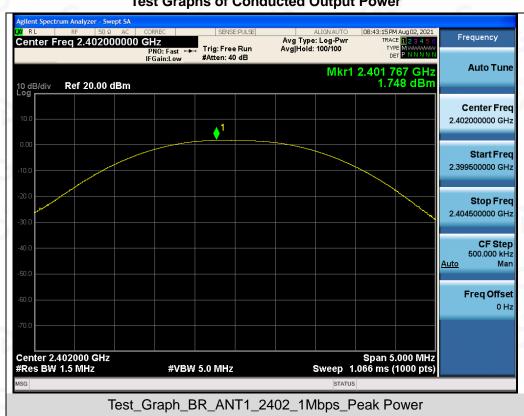
/Inspection he test results he test report.



# 7.3. LIMITS AND MEASUREMENT RESULT

Test Data of Conducted Output Power				
Test Mode	Test Channel (MHz)	Peak Power (dBm)	Limits (dBm)	Pass or Fail
a.C	2402	1.748	<b>≨</b> 21 ⊚	Pass
GFSK	2441	1.838	<b>≤21</b>	Pass
	2480	1.900	<b>≨</b> 21	Pass
©	2402	2.503	<b>≨21</b>	Pass
π /4-DQPSK	2441	2.598	≤21	Pass
	2480	2.609	<b>≨</b> 21	Pass

# **Test Graphs of Conducted Output Power**



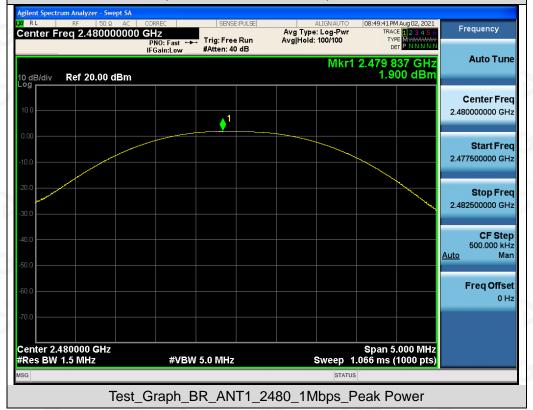
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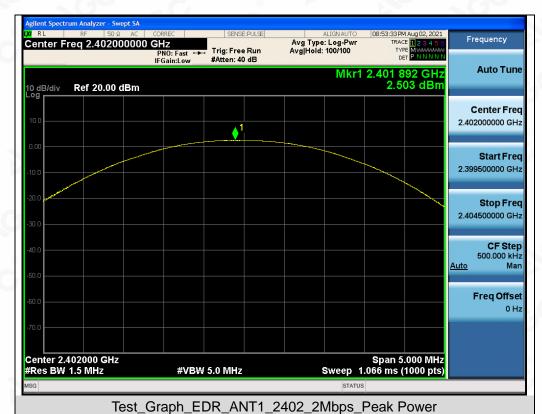


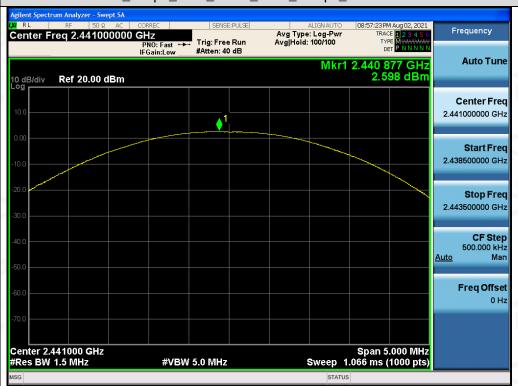
Test\_Graph\_BR\_ANT1\_2441\_1Mbps\_Peak Power



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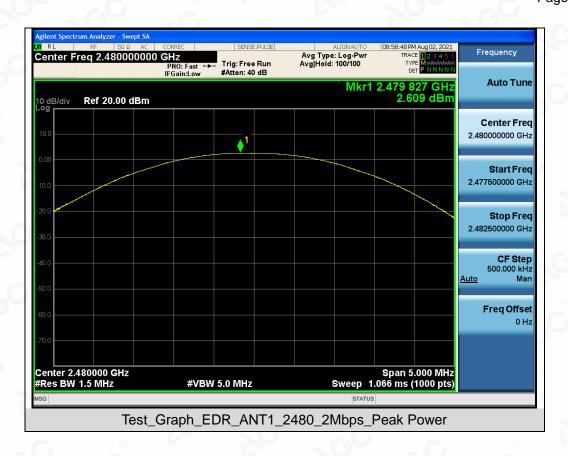


Test\_Graph\_EDR\_ANT1\_2441\_2Mbps\_Peak Power

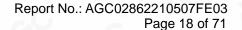
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g/Inspection
The test results
If the test report.





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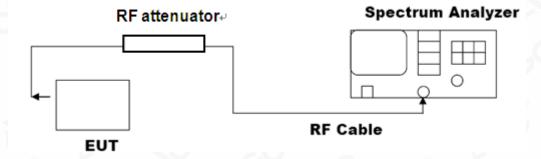


# 8. 20DB BANDWIDTH

#### **8.1. MEASUREMENT PROCEDURE**

- 1. Connect EUT RF output port to the Spectrum Analyzer through an RF attenuator
- 2, Set the EUT Work on the top, the middle and the bottom operation frequency individually.
- 3. Set Span = approximately 2 to 5 times the 20 dB bandwidth, centered on a hoping channel
  The nominal IF filter bandwidth (3 dB RBW) shall be in the range of 1% to 5% of the OBW and video
  bandwidth (VBW) shall be approximately three times RBW; Sweep = auto; Detector function = peak
- 4. Set SPA Trace 1 Max hold, then View.

# 8.2. TEST SET-UP (BLOCK DIAGRAM OF CONFIGURATION)



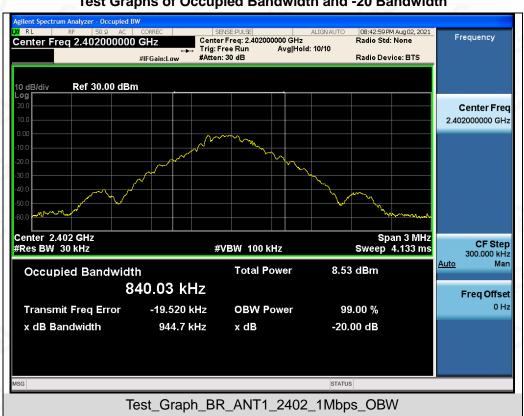
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# 8.3. LIMITS AND MEASUREMENT RESULTS

Test Data of Occupied Bandwidth and -20dB Bandwidth					
Test Mode	Test Channel (MHz)	99% Occupied Bandwidth (MHz)	-20dB Bandwidth (MHz)	Limits	Pass or Fail
-0	2402	0.840	0.945	N/A	Pass
GFSK	2441	0.842	0.948	N/A	Pass
	2480	0.841	0.947	N/A	Pass
· ·	2402	1.173	1.309	N/A	Pass
π /4-DQPSK	2441	1.175	1.307	N/A	Pass
	2480	1.176	1.310	N/A	Pass

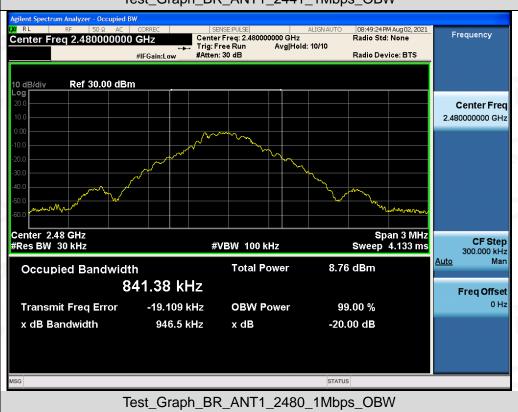
# Test Graphs of Occupied Bandwidth and -20 Bandwidth



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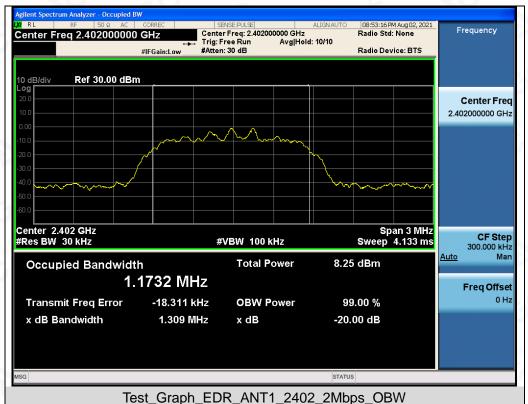


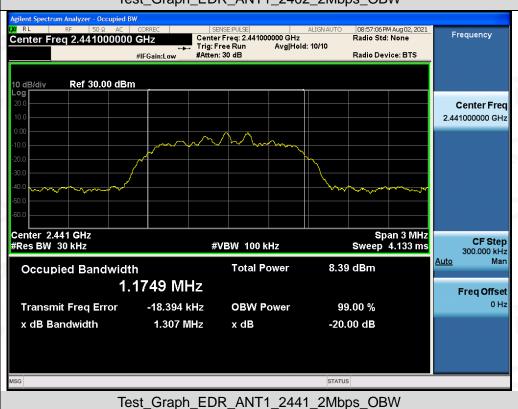




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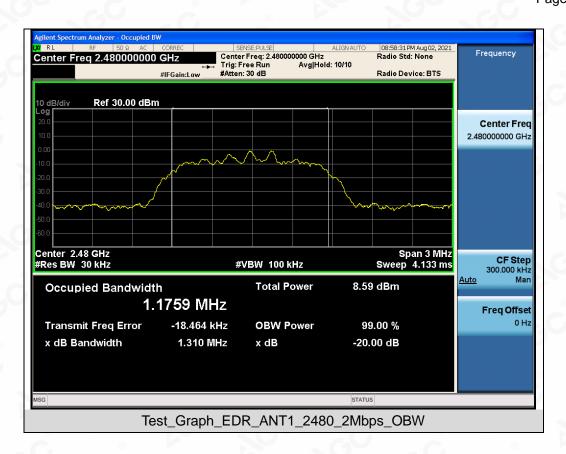






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# 9. CONDUCTED SPURIOUS EMISSION

# 9.1. MEASUREMENT PROCEDURE

- 1. Connect EUT RF output port to the Spectrum Analyzer through an RF attenuator
- 2. Set the EUT Work on the top, the Middle and the bottom operation frequency individually.
- 3. Set the Span = wide enough to capture the peak level of the in-band emission and all spurious emissions from the lowest frequency generated in the EUT up through the 10th harmonic.
  RBW = 100 kHz; VBW= 300 kHz; Sweep = auto; Detector function = peak.
- 4. Set SPA Trace 1 Max hold, then View.

# 9.2. TEST SET-UP (BLOCK DIAGRAM OF CONFIGURATION)

The same as described in section 8.2

# 9.3. MEASUREMENT EQUIPMENT USED

The same as described in section 6

#### 9.4. LIMITS AND MEASUREMENT RESULT

LIMITS AND MEASUREMENT RESULT				
Applicable Limite	Measurement Result			
Applicable Limits	Test Data	Criteria		
n any 100 kHz Bandwidth Outside the frequency band in which the spread spectrum ntentional radiator is operating, the radio frequency	At least -20dBc than the limit Specified on the BOTTOM Channel	PASS		
power that is produce by the intentional radiator shall be at least 20 dB below that in 100KHz bandwidth within the band that contains the highest level of the desired power.  In addition, radiation emissions which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emission limits specified in§15.209(a))	At least -20dBc than the limit Specified on the TOP Channel	PASS		

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#### Test Graphs of Spurious Emissions in Non-Restricted Frequency Bands





Test\_Graph\_BR\_ANT1\_2402\_1Mbps\_Lower Band Emissions

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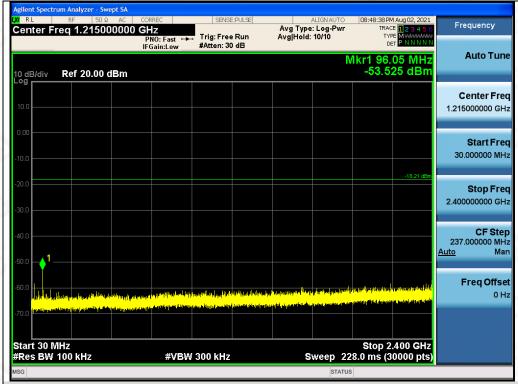


Test\_Graph\_BR\_ANT1\_2402\_1Mbps\_Higher Band Emissions

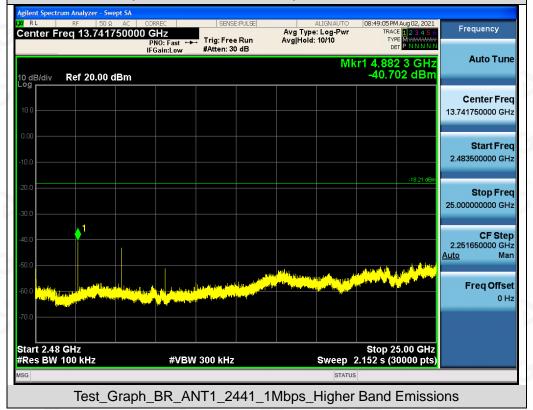


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Test\_Graph\_BR\_ANT1\_2441\_1Mbps\_Lower Band Emissions



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Frequency Avg Type: Log-Pw Avg|Hold: 10/10 Center Freq 1.215000000 GHz Trig: Free Run #Atten: 30 dB IFGain:Lov **Auto Tune** 53.776 dBm 10 dB/div Ref 20.00 dBm Center Frea 1.215000000 GHz 30.000000 MHz Stop Freq 2.400000000 GHz CF Step 237.000000 MHz Auto Freq Offset Start 30 MHz #Res BW 100 kHz Stop 2.400 GHz Sweep 228.0 ms (30000 pts) #VBW 300 kHz Test\_Graph\_BR\_ANT1\_2480\_1Mbps\_Lower Band Emissions

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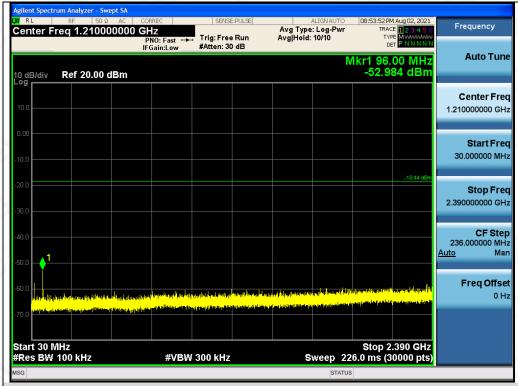


Test\_Graph\_BR\_ANT1\_2480\_1Mbps\_Higher Band Emissions



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Test\_Graph\_EDR\_ANT1\_2402\_2Mbps\_Lower Band Emissions

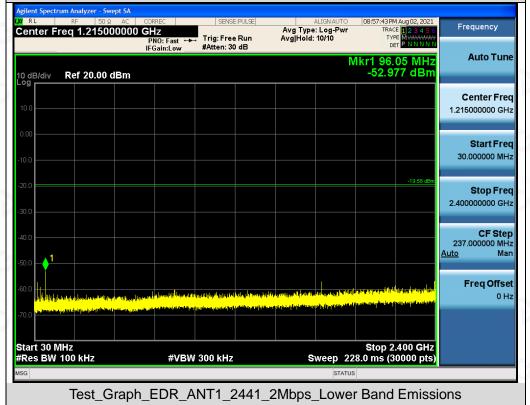


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Test\_Graph\_EDR\_ANT1\_2441\_2Mbps\_Reference Level



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Attestation of Global Compliance(Shenzhen)Co., Ltd

Tel: +86-755 2523 4088 E-mail: agc@agc-cert.com Web: http://cn.agc-cert.com/



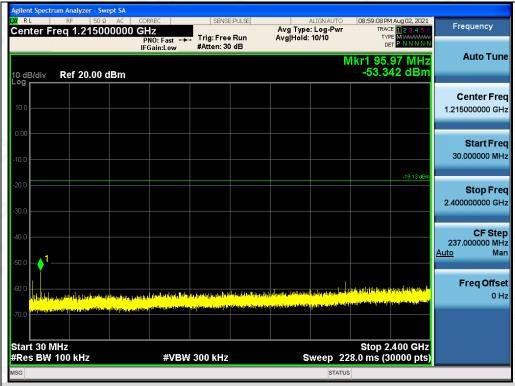


Test\_Graph\_EDR\_ANT1\_2441\_2Mbps\_Higher Band Emissions



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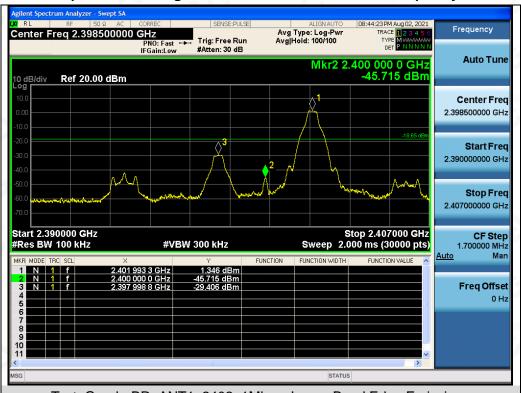
Test\_Graph\_EDR\_ANT1\_2480\_2Mbps\_Lower Band Emissions



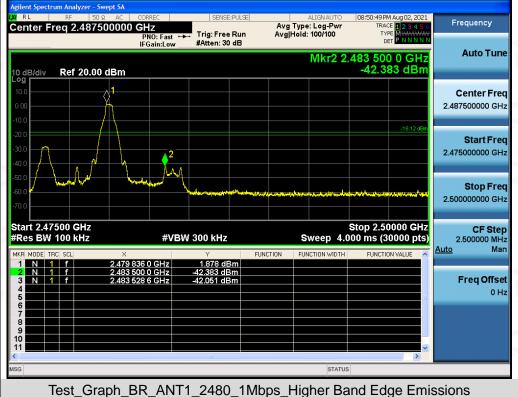
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# Test Graphs of Band Edge Emissions in Non-Restricted Frequency Bands



Test\_Graph\_BR\_ANT1\_2402\_1Mbps\_Lower Band Edge Emissions

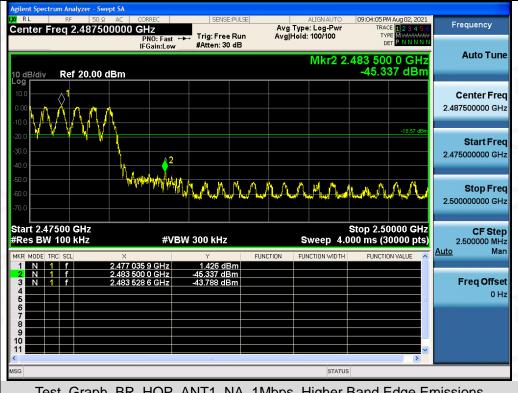


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Test\_Graph\_BR\_HOP\_ANT1\_NA\_1Mbps\_Lower Band Edge Emissions



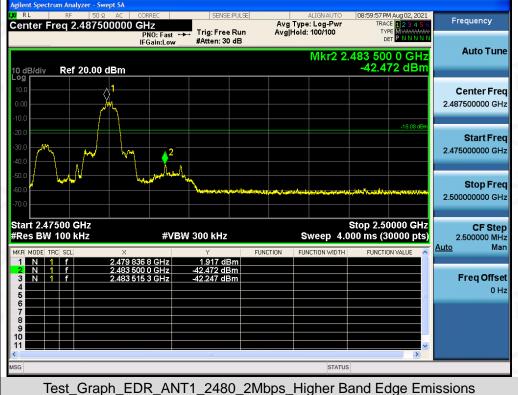
Test\_Graph\_BR\_HOP\_ANT1\_NA\_1Mbps\_Higher Band Edge Emissions

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Test\_Graph\_EDR\_ANT1\_2402\_2Mbps\_Lower Band Edge Emissions

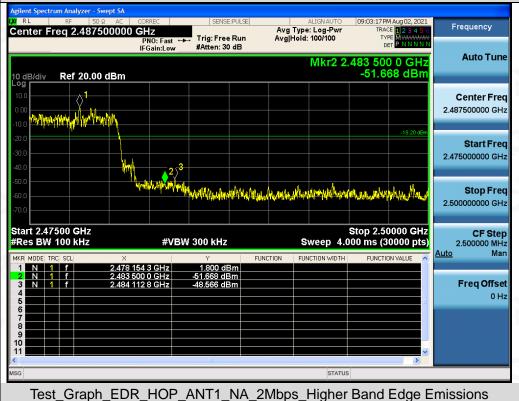


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Test\_Graph\_EDR\_HOP\_ANT1\_NA\_2Mbps\_Lower Band Edge Emissions



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#### 10. RADIATED EMISSION

#### 10.1. MEASUREMENT PROCEDURE

- 1. The EUT was placed on the top of the turntable 0.8 or 1.5 meter above ground. The phase center of the receiving antenna mounted on the top of a height-variable antenna tower was placed 3 meters far away from the turntable.
- 2. Power on the EUT and all the supporting units. The turntable was rotated by 360 degrees to determine the position of the highest radiation.
- 3. The height of the broadband receiving antenna was varied between one meter and four meters above ground to find the maximum emissions field strength of both horizontal and vertical polarization.
- 4. For each suspected emission, the antenna tower was scan (from 1 M to 4 M) and then the turntable was rotated (from 0 degree to 360 degrees) to find the maximum reading.
- Set the test-receiver system to Peak or CISPR quasi-peak Detect Function with specified bandwidth under Maximum Hold Mode.
- 6. For emissions above 1GHz, use 1MHz RBW and 3MHz VBW for peak reading. Place the measurement antenna away from each area of the EUT determined to be a source of emissions at the specified measurement distance, while keeping the measurement antenna aimed at the source of emissions at each frequency of significant emissions, with polarization oriented for maximum response. The measurement antenna may have to be higher or lower than the EUT, depending on the radiation pattern of the emission and staying aimed at the emission source for receiving the maximum signal. The final measurement antenna elevation shall be that which maximizes the emissions. The measurement antenna elevation for maximum emissions shall be restricted to a range of heights of from 1 m to 4 m above the ground or reference ground plane.
- 7. When the radiated emissions limits are expressed in terms of the average value of the emissions, and pulsed operation is employed, the measurement field strength shall be determined by averaging over one complete pulse train, including blanking intervals, as long as the pulse train does not exceed 0.1 seconds. As an alternative (provided the transmitter operates for longer than 0.1 seconds) or in cases where the pulse train exceeds 0.1 seconds, the measured field strength shall be determined from the average absolute voltage during a 0.1 second interval during which the field strength is at its maximum values.
- 8.If the emissions level of the EUT in peak mode was 3 dB lower than the average limit specified, then testing will be stopped and peak values of EUT will be reported, otherwise, the emissions which do not have 3 dB margin will be repeated one by one using the quasi-peak method for below 1GHz.
- 9. For testing above 1GHz, the emissions level of the EUT in peak mode was lower than average limit (that means the emissions level in peak mode also complies with the limit in average mode), then testing will be stopped and peak values of EUT will be reported, otherwise, the emissions will be measured in average mode again and reported.
- 10. In case the emission is lower than 30MHz, loop antenna has to be used for measurement and the recorded data should be QP measured by receiver. High Low scan is not required in this case.

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# The following table is the setting of spectrum analyzer and receiver.

	Spectrum Parameter	Setting
	Start ~Stop Frequency	9KHz~150KHz/RB 200Hz for QP
0	Start ~Stop Frequency	150KHz~30MHz/RB 9KHz for QP
	Start ~Stop Frequency	30MHz~1000MHz/RB 120KHz for QP
	Start ~Stop Frequency	1GHz~26.5GHz 1MHz/3MHz for Peak, 1MHz/3MHz for Average

Receiver Parameter	Setting
Start ~Stop Frequency	9KHz~150KHz/RB 200Hz for QP
Start ~Stop Frequency	150KHz~30MHz/RB 9KHz for QP
Start ~Stop Frequency	30MHz~1000MHz/RB 120KHz for QP

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