

FCC Test Report

Report No.: AGC10328210602FE03

FCC ID	
FCC ID	: 2AV7N-MSB2
APPLICATION PURPOSE	: Original Equipment
PRODUCT DESIGNATION	: Detachable Speaker
BRAND NAME	: Donner
MODEL NAME	: MSb2, MSb1
APPLICANT	: Guangzhou Rantion Technology Co., Ltd
DATE OF ISSUE	: Jul. 20, 2021
STANDARD(S)	: FCC Part 15.247
REPORT VERSION	: V1.0



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 Attestation of Global Compliance(Shenzhen)Co., Ltd

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REPORT REVISE RECORD

Report Version	Revise Time	Issued Date	Valid Version	Notes
V1.0	. /	Jul. 20, 2021	Valid	Initial Release

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1. VERIFICATION OF CONFORMITY

Applicant	Guangzhou Rantion Technology Co., Ltd	
Address	Building D, Kengkou digital base, No.9, Huaxi Road, Liwan District, Guangzhou, China	
Manufacturer	Guangzhou Rantion Technology Co., Ltd	
Address	Building D, Kengkou digital base, No.9, Huaxi Road, Liwan District, Guangzhou, China	
Factory	Shenzhen Fuxing Plastics and Products Co., Ltd	
Address	1st floor, Building 2, Bantian Shuidoukeng Xuming Industrial Park, Bantian, Shenzhen, China.	
Product Designation	Detachable Speaker	
Brand Name	Donner	
Test Model	MSb2	
Series Model	MSb1	
Declaration of Difference	All the same except for the model name.	
Date of test	Jun. 28, 2021 to Jul. 20, 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

Then Huony

Thea Huang Project Engineer

Jul. 20, 2021

Reviewed By

Max Zhan

Max Zhang Reviewer

Jul. 20, 2021

Approved By

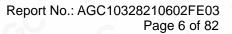
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Forrest Lei Authorized Officer

Jul. 20, 2021

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2. GENERAL INFORMATION

2.1. PRODUCT DESCRIPTION

The EUT is designed as "Detachable Speaker". It is designed by way of utilizing the GFSK, Pi/4 DQPSK and 8DPSK technology to achieve the system operation.

A major technical description of EUT is described as following

Operation Frequency	2.402 GHz to 2.480 GHz
RF Output Power	0.826dBm (Max)
Bluetooth Version	V5.0
Modulation	BR ⊠GFSK, EDR ⊠π /4-DQPSK, ⊠8DPSK BLE □GFSK 1Mbps □GFSK 2Mbps
Number of channels	79
Hardware Version	MSb1-MSb2-V1.2
Software Version	V03
Antenna Designation	PCB Antenna (Comply with requirements of the FCC part 15.203)
Antenna Gain	0dBi
Power Supply	DC 18V 3A by adapter
Note: The EUT doesn't supp	port BLE

2.2. TABLE OF CARRIER FREQUENCYS

Frequency Band	Channel Number	Frequency
	0	2402 MHz
	1	2403 MHz
	38	2440 MHz
2402~2480MHz	39	2441 MHz
O a	40	2442 MHz
	77	2479 MHz
	78	2480 MHz



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.



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: 2AV7N-MSB2** 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.

3. MEASUREMENT UNCERTAINTY

The reported uncertainty of measurement y \pm 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	$U_c = \pm 2 \%$	
Uncertainty of Occupied Channel Bandwidth	$U_c = \pm 2 \%$	



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	Low channel 8DPSK	
8	Middle channel 8DPSK	
9	High channel 8DPSK	
10	Hopping mode GFSK	
11	Hopping mode π/4-DQPSK	
12	Hopping mode 8DPSK	

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

COM Port		Connect Select	
C0M2	*	NonConnect_BT	Connect
Clos	se	* Notice If you want change test 1) Reboo (the Device) 2) Restart (the FrequencyTools so	
Generate and Send 1. Hopping Type	CMD	Mode Select in NonConnect	
01:79 Hopping	•	BT-TX D BT-RX	
2. Frequency			
2480	- MHz	TX Power	SEND
3. Package Type		0 dBm 👻	
2DH5	•		
Connect_BLE_Tester			
BLE Mode		Frequency (BLE Tester)	START

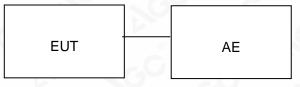
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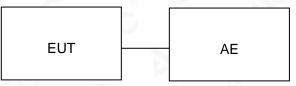
5. SYSTEM TEST CONFIGURATION

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	Detachable Speaker	MSb2	2AV7N-MSB2	EUT
2	Control Box	USB TO TTL	N/A	AE
3	Adapter	WTB65-1803000-T2	N/A	Accessory
4	DVD	SAMSUNG	N/A	AE
୍ର 5	TV			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



6. TEST FACILITY

Test Site	Attestation of Global Compliance (Shenzhen) Co., Ltd		
Location	1-2/F, Building 19, Junfeng Industrial Park, Chongqing Road, Heping Community, Fuhai 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



7. PEAK OUTPUT POWER

7.1. MEASUREMENT PROCEDURE

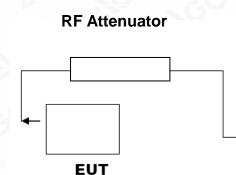
For peak power test:

- 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 \geq RBW.
- 5. Sweep: Auto.
- 6. Detector function: Peak.
- 7. Trace: Max hold.

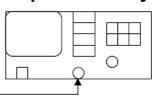
Allow trace to stabilize. Use the marker-to-peak function to set the marker to the peak of the emission. The indicated level is the peak output power, after any corrections for external attenuators and cables.

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

PEAK POWER TEST SETUP



Spectrum Analyzer



RF Cable

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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	
- 6	2402	0.826	≪21	Pass	
GFSK	2441	-2.086	⊴21	Pass	
	2480	-4.920	≪21	Pass	
π /4-DQPSK	2402	0.789	\$21	Pass	
	2441	-2.081	≪21	Pass	
	2480	-4.950	≪21	Pass	
8	2402	0.803	\$21	Pass	
8DPSK	2441	-2.015	\$21	Pass	
	2480	-4.898	⊴21	Pass	

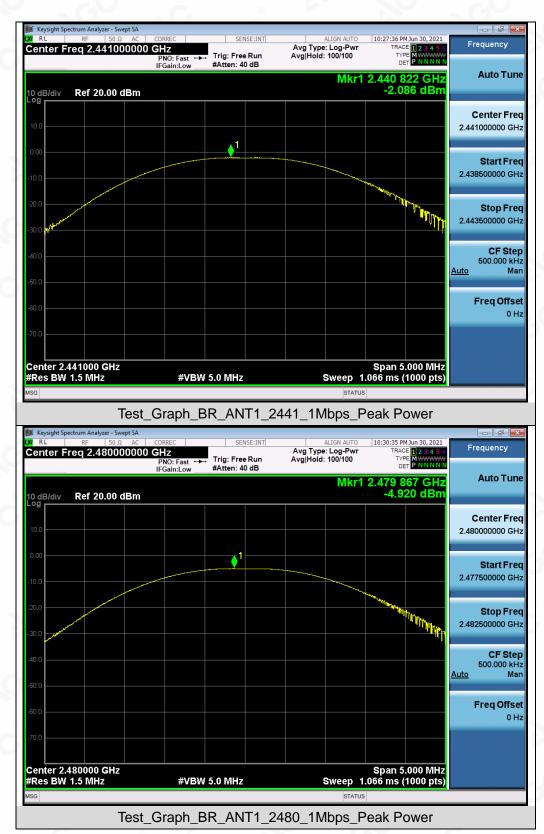
Test Graphs of Conducted Output Power



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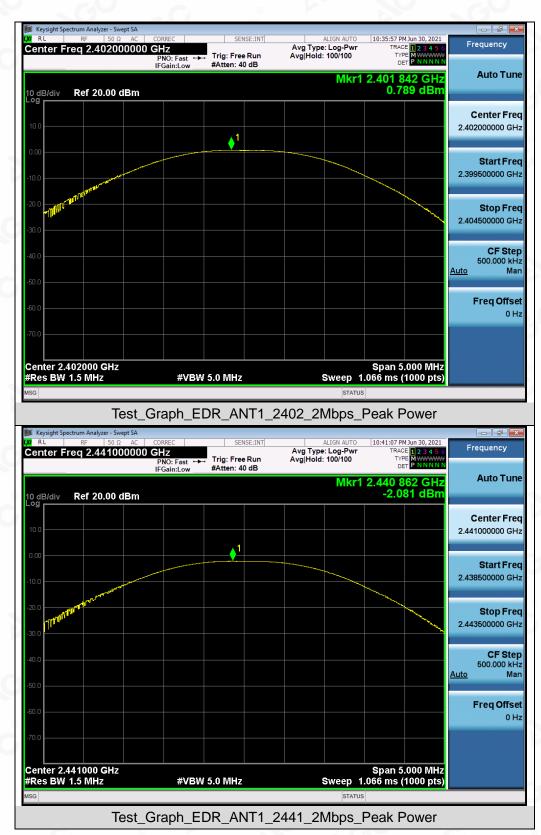
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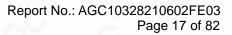




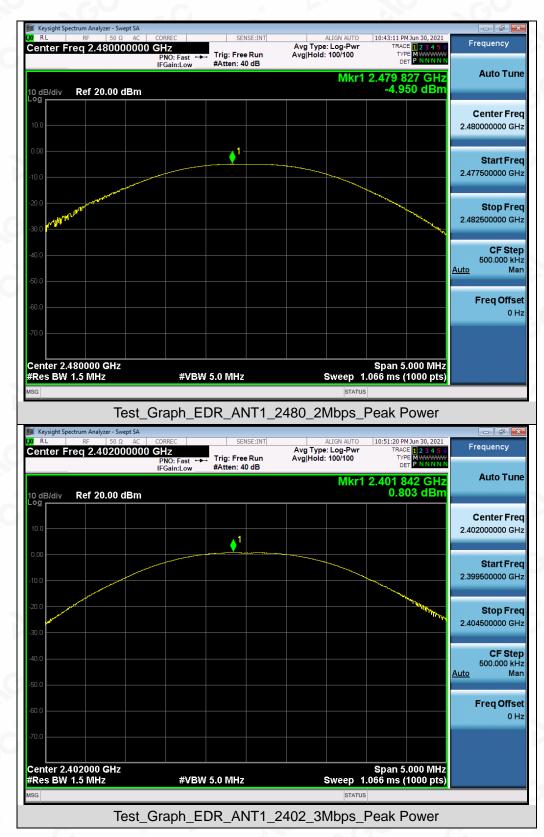
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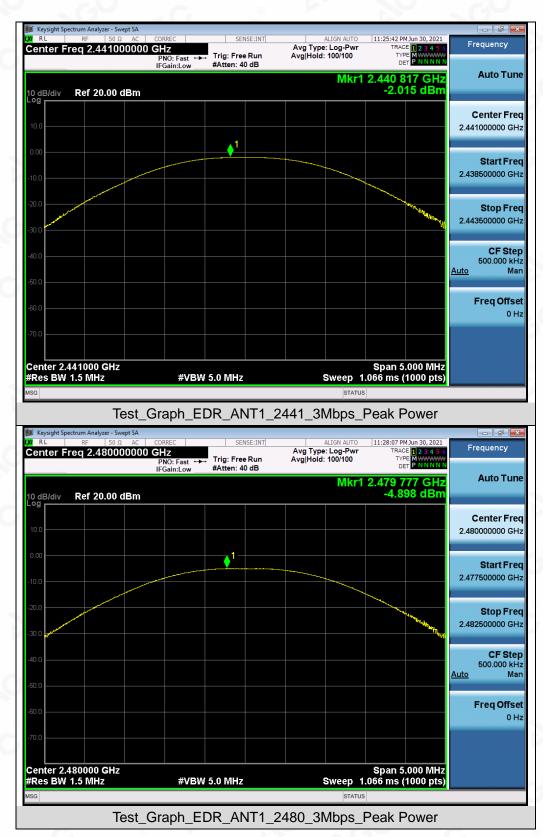






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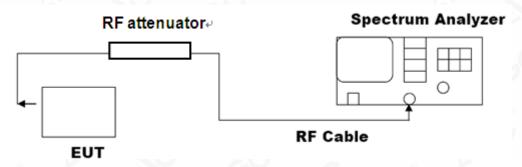


8. 20DB BANDWIDTH

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)

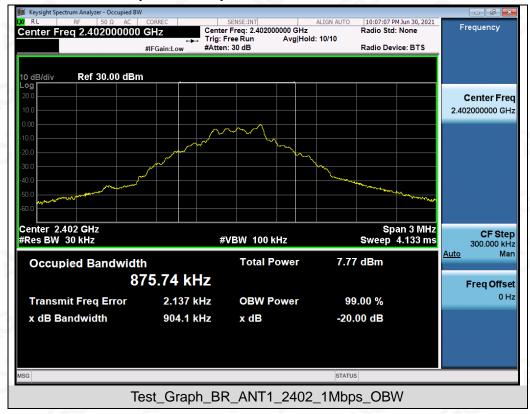




Test Data of Occupied Bandwidth and -20dB Bandwidth					
Test Mode	Test Channel (MHz)	99% Occupied Bandwidth (MHz)	-20dB Bandwidth (MHz)	Limits	Pass or Fail
-0	2402	0.876	0.904	N/A	Pass
GFSK	2441	0.877	0.904	N/A	Pass
	2480	0.876	0.903	N/A	Pass
π /4-DQPSK	2402	1.183	1.296	N/A	Pass
	2441	1.183	1.297	N/A	Pass
	2480	1.184	1.296	N/A	Pass
8DPSK	2402	1.174	1.278	N/A	Pass
	2441	1.175	1.272	N/A	Pass
	2480	1.176	1.279	N/A	Pass

8.3. LIMITS AND MEASUREMENT RESULTS

Test Graphs of Occupied Bandwidth and -20 Bandwidth



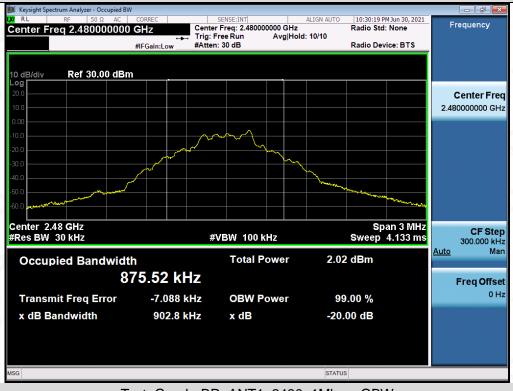
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Test_Graph_BR_ANT1_2441_1Mbps_OBW



Test_Graph_BR_ANT1_2480_1Mbps_OBW

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Test_Graph_EDR_ANT1_2402_2Mbps_OBW



Test_Graph_EDR_ANT1_2441_2Mbps_OBW

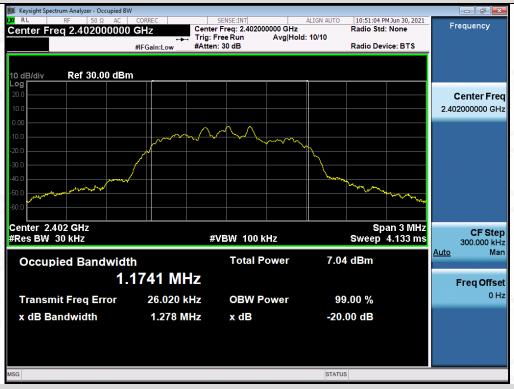
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Test_Graph_EDR_ANT1_2480_2Mbps_OBW



Test_Graph_EDR_ANT1_2402_3Mbps_OBW

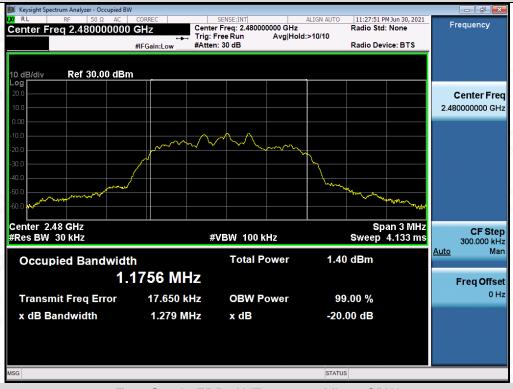
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Test_Graph_EDR_ANT1_2441_3Mbps_OBW



Test_Graph_EDR_ANT1_2480_3Mbps_OBW



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.
- 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				
Applieghte Limite	Measurement Result			
Applicable Limits	Test Data	Criteria		
In any 100 kHz Bandwidth Outside the frequency band in which the spread spectrum intentional 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		



Test Graphs of Spurious Emissions in Non-Restricted Frequency Bands

AGC

 W.R.L
 PF
 50.0
 AC CORREC
 SENSELINT
 ALLIGN AUTO
 114-05-22 PMJ and 30.2021
 Frequency

 Center Freq 1.210000000 GHz
 PMD: Frat
 Trig: Free Run
 Avg Type Log-Pwr
 Trig: Frequency
 Auto Tune

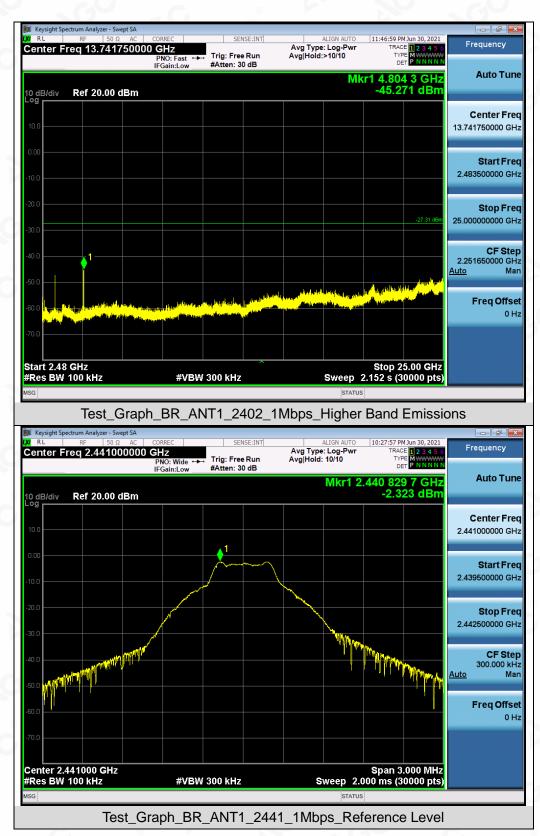
 10.0
 Bl/div
 Ref 20.00 dBm
 Start Freq
 Auto Tune
 Center Freq
 1.210000000 GHz
 Auto Tune

 10.0
 GB/div
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 Start Freq
 30.00000 GHz
 Start Freq
 30.000000 GHz

 10.0
 Gender
 Ge

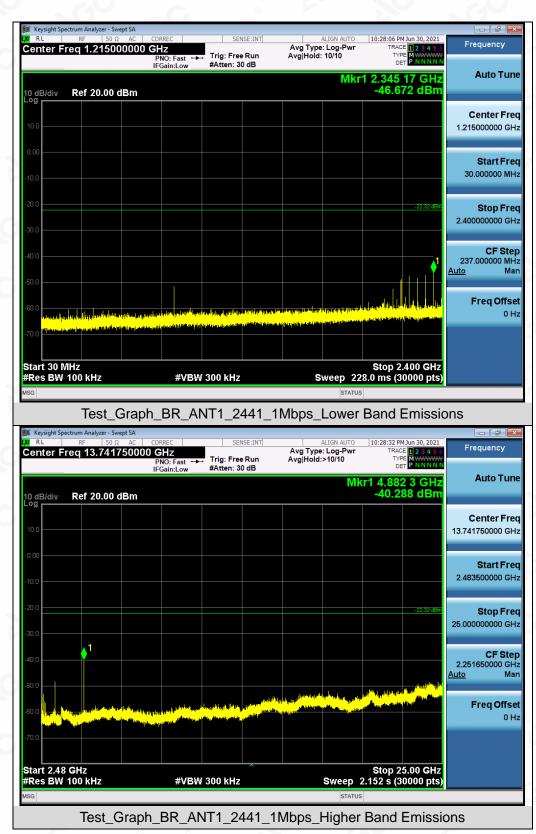
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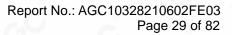




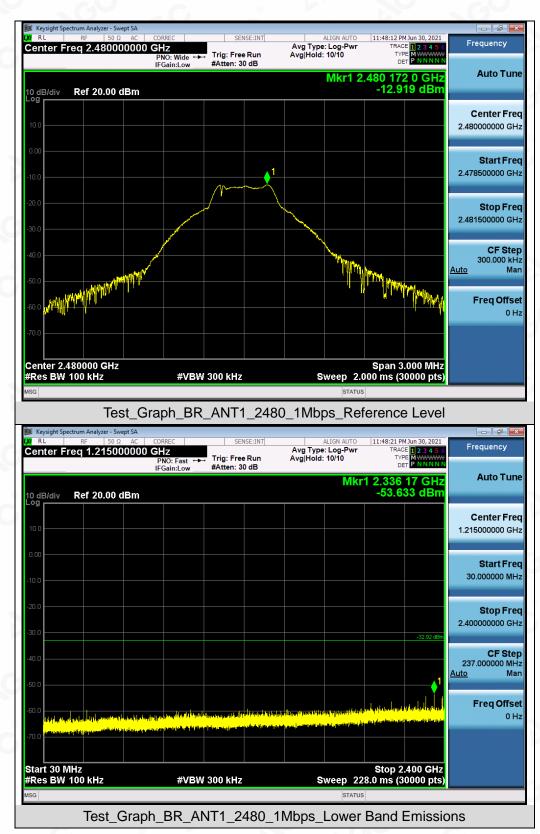
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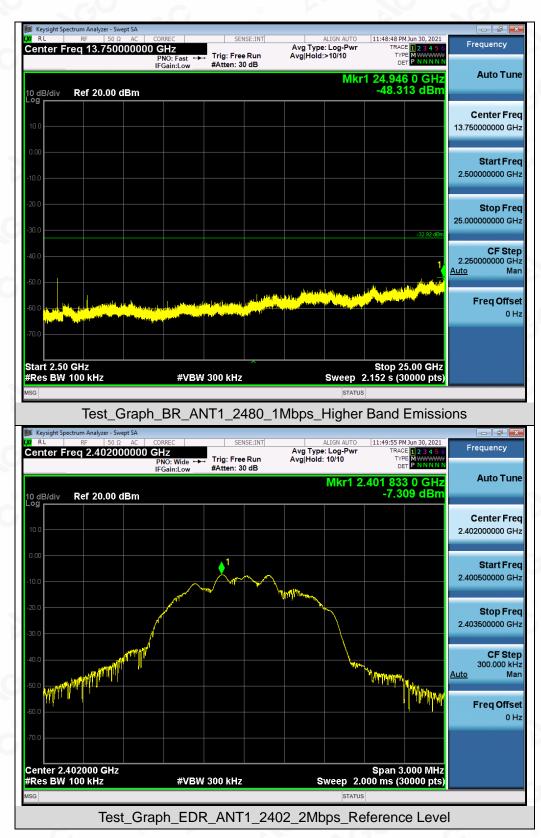






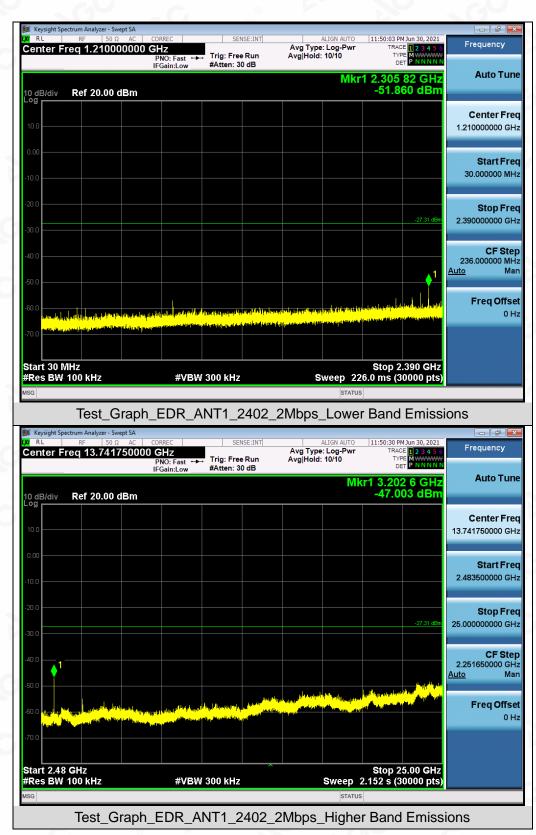
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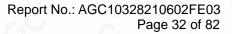




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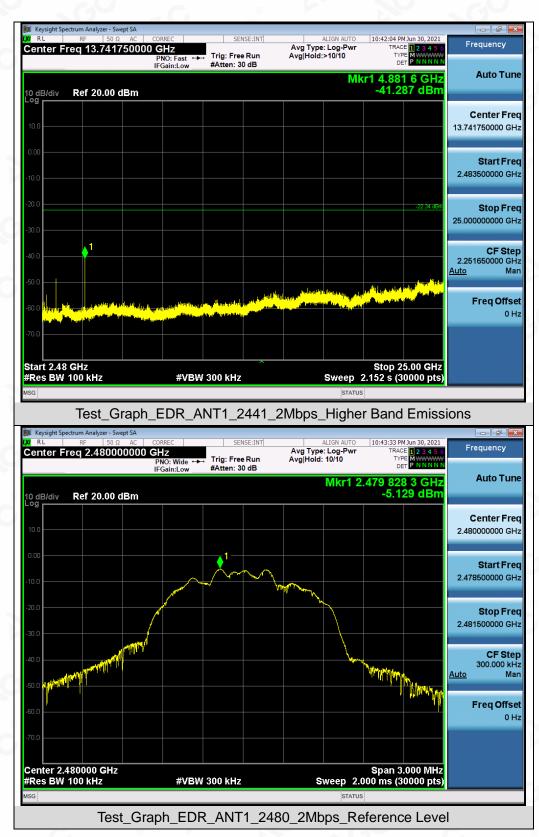






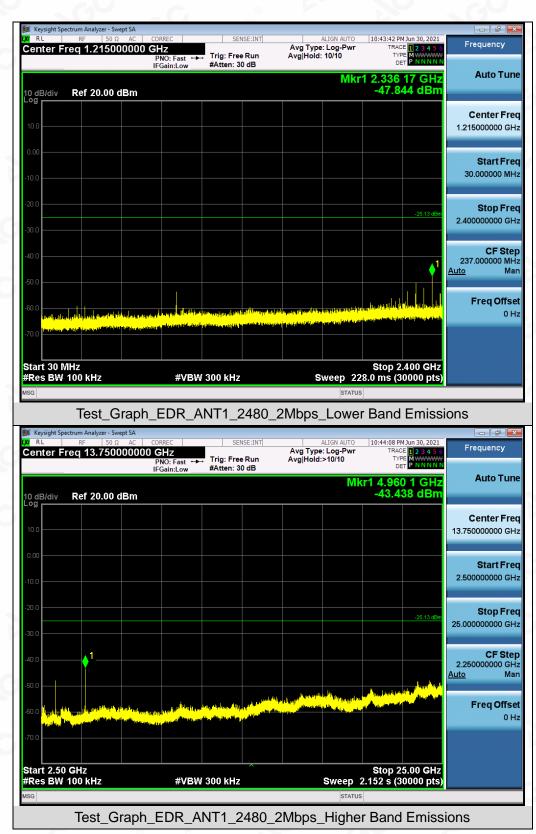
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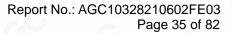




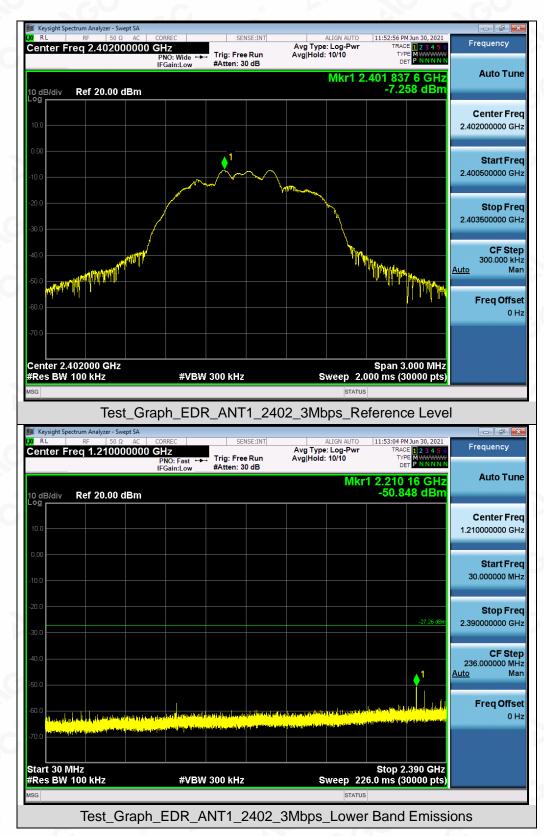
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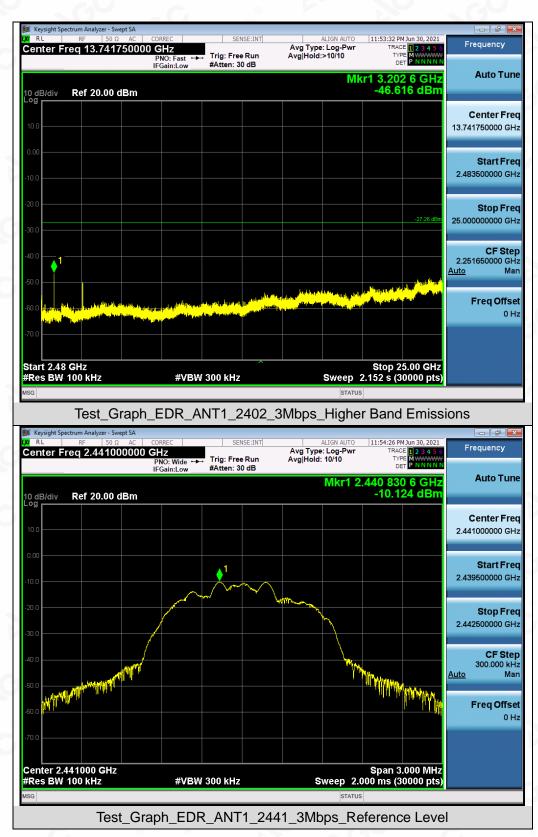






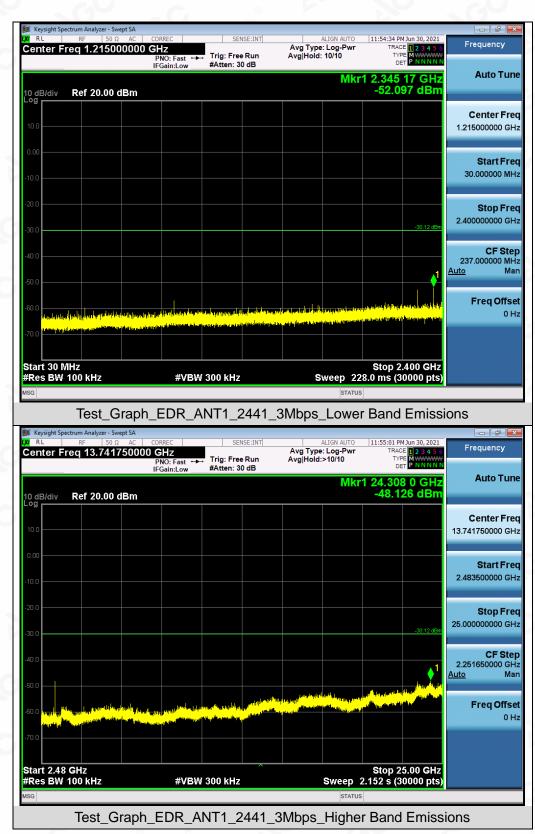
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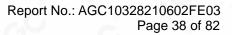




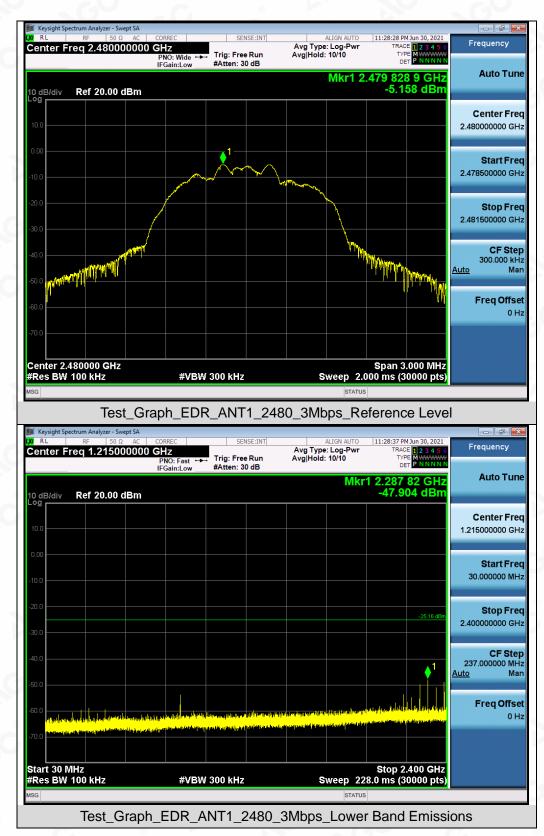
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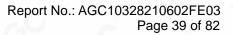




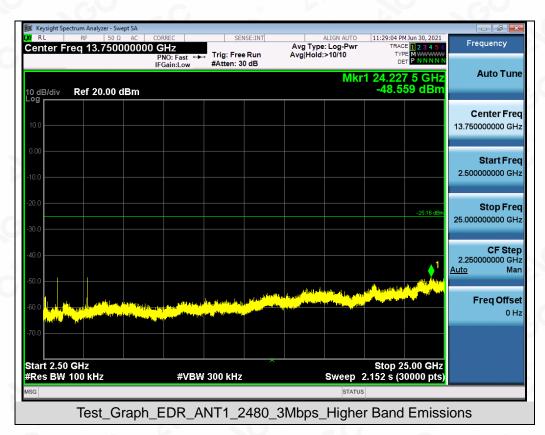










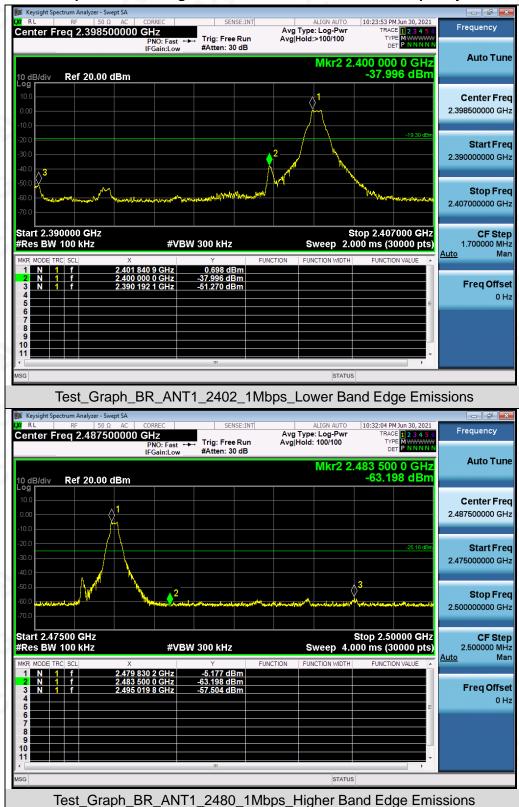


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Test Graphs of Band Edge Emissions in Non-Restricted Frequency Bands

AGC

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