

FCC Test Report

Report No.: AGC00803210702FE03

FCC ID	: 2AKHJ-HB206
APPLICATION PURPOSE	: Original Equipment
PRODUCT DESIGNATION	: Bluetooth Keyboard
BRAND NAME	: N/A
MODEL NAME	: HB206
APPLICANT	: Shenzhen Hangshi Technology Co., Ltd
DATE OF ISSUE	: Jul. 23, 2021
STANDARD(S)	: FCC Part 15.247
REPORT VERSION	: V1.0



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REPORT REVISE RECORD

Report Version	Revise Time	Issued Date	Valid Version	Notes
V1.0	. /	Jul. 23, 2021	Valid	Initial Release

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TABLE OF CONTENTS

1. VERIFICATION OF CONFORMITY	5
2. GENERAL INFORMATION	6
2.1. PRODUCT DESCRIPTION	6
2.2. TABLE OF CARRIER FREQUENCYS	
2.3. RECEIVER INPUT BANDWIDTH	7
2.4. EXAMPLE OF A HOPPING SEQUENCY IN DATA MODE	7
2.5. EQUALLY AVERAGE USE OF FREQUENCIES AND BEHAVIOUR	7
2.6. RELATED SUBMITTAL(S) / GRANT (S)	
2.7. TEST METHODOLOGY	
2.8. SPECIAL ACCESSORIES	
2.9. EQUIPMENT MODIFICATIONS	
2.10. ANTENNA REQUIREMENT	
3. MEASUREMENT UNCERTAINTY	9
4. DESCRIPTION OF TEST MODES	
5. SYSTEM TEST CONFIGURATION	11
5.1. CONFIGURATION OF EUT SYSTEM	11
5.2. EQUIPMENT USED IN TESTED SYSTEM	11
5.3. SUMMARY OF TEST RESULTS	11
6. TEST FACILITY	
7. PEAK OUTPUT POWER	
7.1. MEASUREMENT PROCEDURE	
7.2. TEST SET-UP (BLOCK DIAGRAM OF CONFIGURATION)	
7.3. LIMITS AND MEASUREMENT RESULT	
8. 20DB BANDWIDTH	
8.1. MEASUREMENT PROCEDURE	
8.2. TEST SET-UP (BLOCK DIAGRAM OF CONFIGURATION)	
8.3. LIMITS AND MEASUREMENT RESULTS	
9. CONDUCTED SPURIOUS EMISSION	
9.1. MEASUREMENT PROCEDURE	
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Report No.: AGC00803210702FE03 Page 4 of 58

9.2. TEST SET-UP (BLOCK DIAGRAM OF CONFIGURATION)	
9.3. MEASUREMENT EQUIPMENT USED	
9.4. LIMITS AND MEASUREMENT RESULT	
10. RADIATED EMISSION	
10.1. MEASUREMENT PROCEDURE	
10.2. TEST SETUP	
10.3. LIMITS AND MEASUREMENT RESULT	
10.4. TEST RESULT	
11. NUMBER OF HOPPING FREQUENCY	
11.1. MEASUREMENT PROCEDURE	
11.2. TEST SETUP (BLOCK DIAGRAM OF CONFIGURATION)	
11.3. MEASUREMENT EQUIPMENT USED	
11.4. LIMITS AND MEASUREMENT RESULT	40
12. TIME OF OCCUPANCY (DWELL TIME)	41
12.1. MEASUREMENT PROCEDURE	
12.2. TEST SETUP (BLOCK DIAGRAM OF CONFIGURATION)	
12.3. MEASUREMENT EQUIPMENT USED	
12.4. LIMITS AND MEASUREMENT RESULT	
13. FREQUENCY SEPARATION	
13.1. MEASUREMENT PROCEDURE	
13.2. TEST SETUP (BLOCK DIAGRAM OF CONFIGURATION)	
13.3. MEASUREMENT EQUIPMENT USED	
13.4. LIMITS AND MEASUREMENT RESULT	
14. LINE CONDUCTED EMISSION TEST	
14.1. LIMITS OF LINE CONDUCTED EMISSION TEST	
14.2. BLOCK DIAGRAM OF LINE CONDUCTED EMISSION TEST	
14.3. PRELIMINARY PROCEDURE OF LINE CONDUCTED EMISSION TEST	
14.4. FINAL PROCEDURE OF LINE CONDUCTED EMISSION TEST	
14.5. TEST RESULT OF LINE CONDUCTED EMISSION TEST	
APPENDIX A: PHOTOGRAPHS OF TEST SETUP	
APPENDIX B: PHOTOGRAPHS OF EUT	

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1. VERIFICATION OF CONFORMITY

Applicant	Shenzhen Hangshi Technology Co., Ltd	
Address	Hangshi Technology Park, Democracy West Industry Area, Shajing Town, Bao'an District, Shenzhen, China.	
Manufacturer	Shenzhen Hangshi Technology Co., Ltd	
Address	Hangshi Technology Park, Democracy West Industry Area, Shajing Town, Bao'an District, Shenzhen, China.	
Factory	Shenzhen Hangshi Technology Co., Ltd	
Address	Hangshi Technology Park, Democracy West Industry Area, Shajing Town, Bao'an District, Shenzhen, China.	
Product Designation	Bluetooth Keyboard	
Brand Name	N/A	
Test Model	HB206	
Date of test	Jul. 14, 2021 to Jul. 23, 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

well chang

Cool Cheng Project Engineer

Jul. 23, 2021

Max Zhank

Reviewed By

Max Zhang Reviewer

Jul. 23, 2021

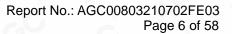
Approved By

Forrest Lei Authorized Officer

Jul. 23, 2021

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2. GENERAL INFORMATION

2.1. PRODUCT DESCRIPTION

The EUT is designed as "Bluetooth Keyboard". 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	-5.061dBm (Max)
Bluetooth Version	V5.1
Modulation	BR ⊠GFSK, EDR □π /4-DQPSK, □8DPSK BLE □GFSK 1Mbps □GFSK 2Mbps
Number of channels	79
Hardware Version	V1.3
Software Version	V1.0
Antenna Designation	PCB Antenna (Comply with requirements of the FCC part 15.203)
Antenna Gain	1.87dBi
Power Supply	DC 3.7V by battery or DC 5V by adapter

2.2. TABLE OF CARRIER FREQUENCYS

Frequency Band	Channel Number	Frequency
0	0	2402 MHz
	。 1	2403 MHz
0	38	2440 MHz
2402~2480MHz	39	2441 MHz
	40	2442 MHz
C C		
	77	2479 MHz
	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: 2AKHJ-HB206** 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 \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	$U_c = \pm 2 \%$	

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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	Hopping mode GFSK	

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

Log Window Modulation_Type = 0x4 (4, "PRBS9 Patter + Logical_Channel = 0x1 (1, "ACL Basic")		
<pre>BB_Racket_Type = 0.4 (15, "DB5 / 3-DB5 BB_Racket_Longth = 0.6153 (335, Firmware Tx_Power_Lowel = 0.00 (0, "0 dBm") 32:34.952 com8 co Tx_Test BC Command com68115200nfc Local Device ED_RDES = "9906081126BB" Ropping Mode = 0.00 (0, "79 channel") Modulation_Type = 0.44 (4, "PRESP Patter Logical_Channel = 0.41 (1, "ALL BEAIC") BB_Racket_Type = 0.47 (15, "DB5 / 3-DB5" BB_Racket_Length = 0.00 (0, "0 dBm") 32:34.962 com8 <c tx_test<br="">HCT Command Complete Event com88115200nfc (DE 0.01; 01 51 FC 00 event = 0.42 (4, "Command Complete") Num HCT Command Packets = 0.41 (1) Command_Opode = 0.47C51 (64593, "Tx_Test")</c></pre>	HCI Control: cond@UllS200.nc NII protocol active 0. Vendor-specific Commands 0 key) Nod UPRL & CTS Jow Renet 0. Main reset device with DTE strobe Nod UPRL & CTS Jow Renet 0. Main reset device with DTE strobe Nod UPRL & CTS Jow Renet 0. Main reset device with DTE strobe Nod UPRL & CTS Jow Renet 0. Main reset device with DTE strobe Nod UPRL & CTS Jow Renet 0. Main reset device with DTE strobe Nod UPRL & CTS Jow Renet 0. Main reset device with DTE strobe Nod UPRL & CTS Jow Renet 0. Main reset device with DTE strobe Nod UPRL & CTS Jow Renet 0. Main reset device with DTE strobe Nod UPRL & CTS Jow Renet 0. Main reset device with DTE strobe Nod Renet 1. Main Renet 1. Main reset 0. M	

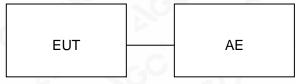
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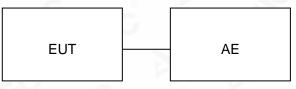
5. SYSTEM TEST CONFIGURATION

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 Keyboard	HB206	2AKHJ-HB206	EUT
2	Adapter	ZL-PCB0100020502000	DC5V	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 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 15, 2021	May 14, 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, 2022
Broadband Preamplifier	ETS LINDGREN	3117PA	00225134	Sep. 03, 2020	Sep. 02, 2022
ANTENNA	SCHWARZBECK	VULB9168	494	Jan. 08, 2021	Jan. 07, 2023
Test software	FARA	EZ-EMC (Ver RA-03A)	N/A	N/A	N/A

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7. PEAK OUTPUT POWER

7.1. MEASUREMENT PROCEDURE

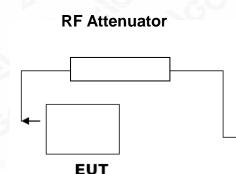
For peak power test:

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

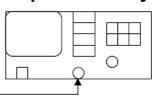
Allow trace to stabilize. Use the marker-to-peak function to set the marker to the peak of the emission. The indicated level is the peak output power, after any corrections for external attenuators and cables.

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			
-C	2402	-5.061	\$21	Pass			
GFSK	2441	-6.679	\$21	Pass			
	2480	-8.601	\$21	Pass			

Test Graphs of Conducted Output Power



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Report No.: AGC00803210702FE03 Page 15 of 58





Test_Graph_BR_ANT1_2441_1Mbps_Peak Power



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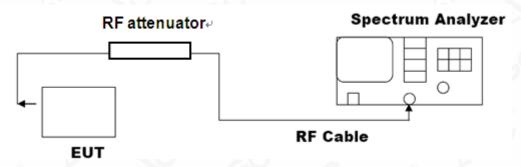


8. 20DB BANDWIDTH

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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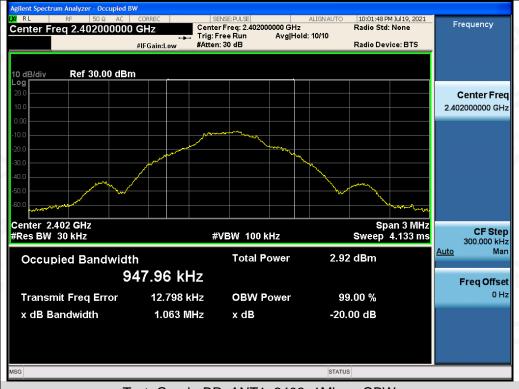
Web: http://cn.agc-cert.com/



8.3. LIMITS AND MEASUREMENT RESULTS

Test Data of Occupied Bandwidth and -20dB Bandwidth									
Test Mode	Limits	Pass or Fail							
-0	2402	0.948	1.063	N/A	Pass				
GFSK	2441	0.936	1.067	N/A	Pass				
	2480	0.937	1.057	N/A	Pass				

Test Graphs of Occupied Bandwidth and -20 Bandwidth



Test_Graph_BR_ANT1_2402_1Mbps_OBW

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Report No.: AGC00803210702FE03 Page 18 of 58



Test_Graph_BR_ANT1_2441_1Mbps_OBW



Test_Graph_BR_ANT1_2480_1Mbps_OBW

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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							
Angliaghta Limita	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					

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Man

Freq Offset 0 Hz

Auto

Stop 2.390 GHz

Sweep 226.0 ms (30000 pts)





Test Graphs of Spurious Emissions in Non-Restricted Frequency Bands

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Test_Graph_BR_ANT1_2402_1Mbps_Lower Band Emissions

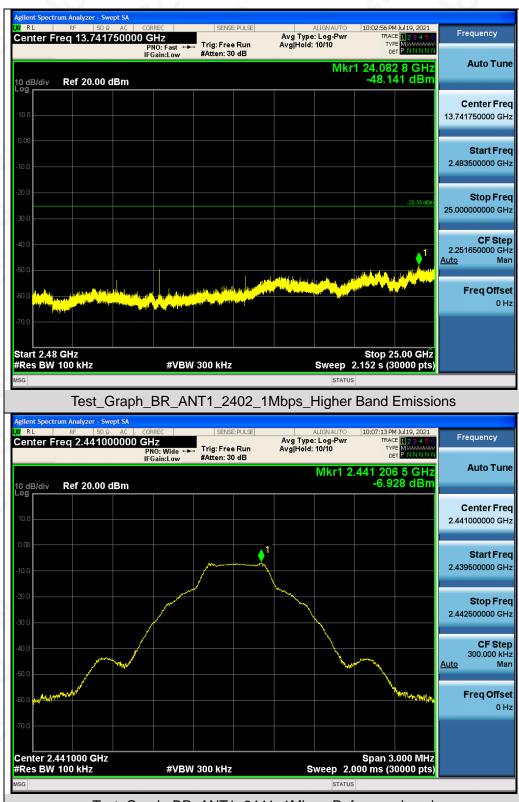
#VBW 300 kHz

Start 30 MHz

#Res BW 100 kHz

Report No.: AGC00803210702FE03 Page 21 of 58



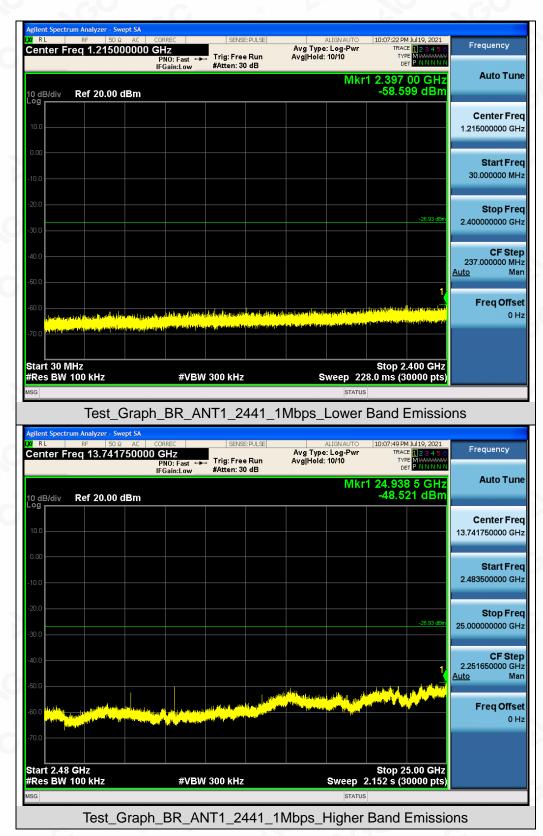


Test_Graph_BR_ANT1_2441_1Mbps_Reference Level

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Report No.: AGC00803210702FE03 Page 22 of 58

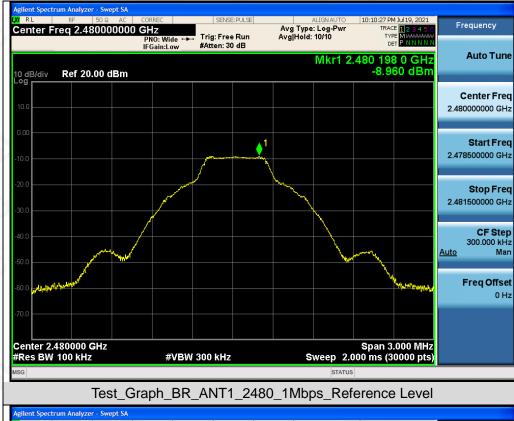




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Report No.: AGC00803210702FE03 Page 23 of 58



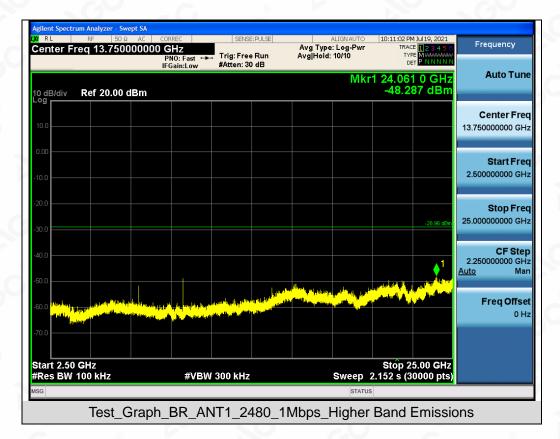




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Report No.: AGC00803210702FE03 Page 24 of 58





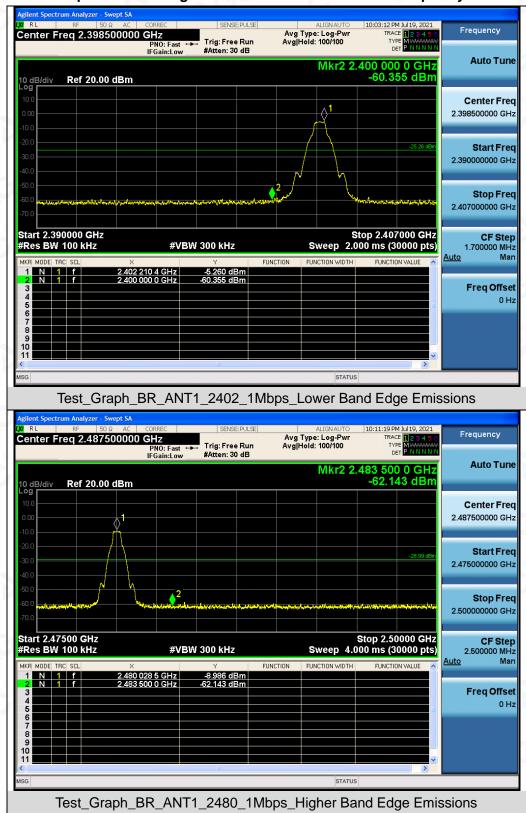
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 Tel: +86-755 2523 4088
 E-mail: agc@agc-cert.com



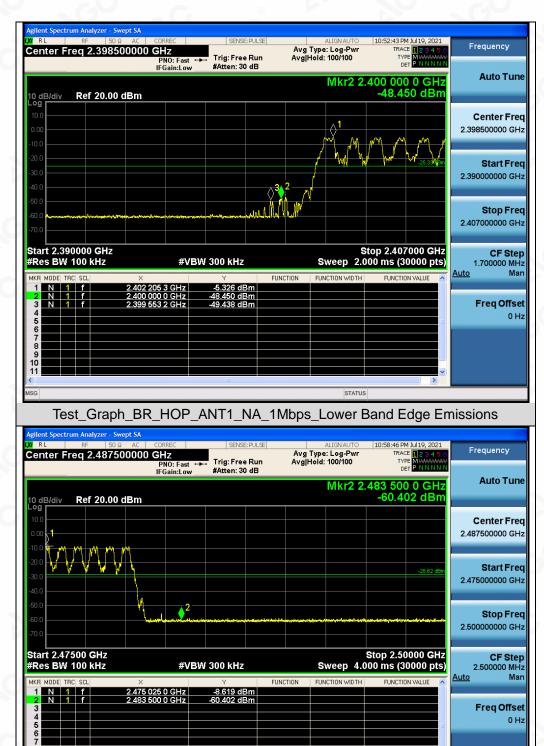


Test Graphs of Band Edge Emissions in Non-Restricted Frequency Bands

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Report No.: AGC00803210702FE03 Page 26 of 58





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Test_Graph_BR_HOP_ANT1_NA_1Mbps_Higher Band Edge Emissions

STATUS



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.
- 5. 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
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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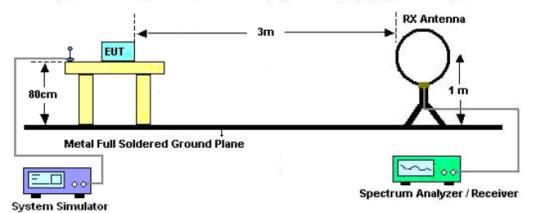
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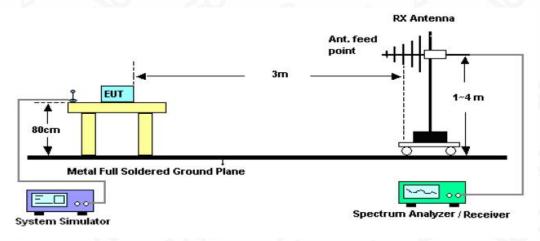


10.2. TEST SETUP

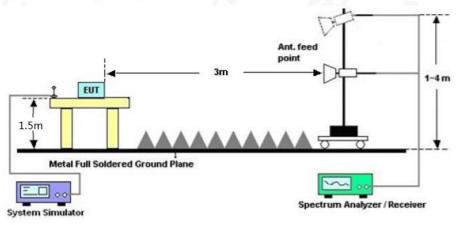
Radiated Emission Test-Setup Frequency Below 30MHz



RADIATED EMISSION TEST SETUP 30MHz-1000MHz



RADIATED EMISSION TEST SETUP ABOVE 1000MHz



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10.3. LIMITS AND MEASUREMENT RESULT

15.209 Limit in the below table has to be followed

Frequencies (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
Above 960	500	3

Note: All modes were tested for restricted band radiated emission, the test records reported below are the worst result compared to other modes.

10.4. TEST RESULT

Radiated emission below 30MHz

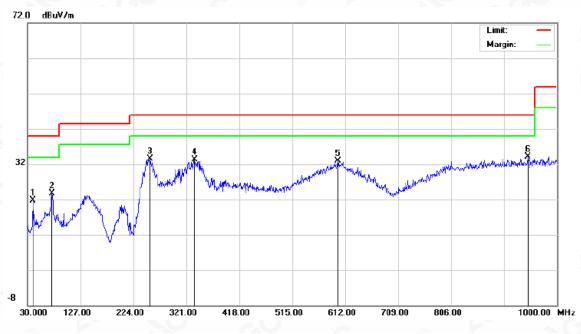
The amplitude of spurious emissions from 9kHz to 30MHz which are attenuated more than 20 dB below the permissible value need not be reported.

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Radiated emission from 30MHz to 1000MHz

EUT	Bluetooth Keyboard	Model Name	HB206
Temperature	25°C	Relative Humidity	55.4%
Pressure	960hPa	Test Voltage	Normal Voltage
Test Mode	Mode 1	Antenna	Horizontal



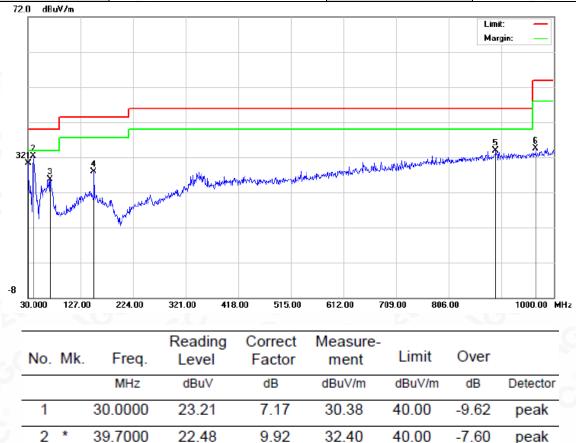
No.	Mk	. Freq.	Reading Level	Correct Factor	Measure- ment	Limit	Over	
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector
1		39.7000	11.81	9.92	21.73	40.00	-18.27	peak
2		74.6200	12.59	11.11	23.70	40.00	-16.30	peak
3		254.0700	15.05	18.41	33.46	46.00	-12.54	peak
4		335.5500	12.41	20.94	33.35	46.00	-12.65	peak
5		598.4200	6.08	26.84	32.92	46.00	-13.08	peak
6	*	945.6800	7.10	27.09	34.19	46.00	-11.81	peak

RESULT: PASS

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EUT	Bluetooth Keyboard	Model Name	HB206
Temperature	25°C	Relative Humidity	55.4%
Pressure	960hPa	Test Voltage	Normal Voltage
Test Mode	Mode 1	Antenna	Vertical



RESULT: PASS

3

4

5

6

70.7400

151.2500

892.3300

966.0500

Note: 1. Factor=Antenna Factor + Cable loss, Margin=Measurement-Limit.

13.82

12.81

7.25

7.17

2. All test modes had been pre-tested. The mode 1 is the worst case and recorded in the report.

11.95

15.08

26.60

27.27

25.77

27.89

33.85

34.44

40.00

43.50

46.00

54.00

-14.23

-15.61

-12.15

-19.56

peak

peak

peak

peak

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Radiated emission above 1GHz

EUT	Bluetooth Keyboard	Model Name	HB206
Temperature	25°C	Relative Humidity	55.4%
Pressure	960hPa	Test Voltage	Normal Voltage
Test Mode	Mode 1	Antenna	Horizontal

Frequency ©	Meter Reading	Factor	Emission Level	Limits	Margin	Value Type
(MHz)	(dBµV)	(dB)	(dBµV/m)	(dBµV/m)	(dB)	value Type
4804.000	46.29	0.08	46.37	74	-27.63	peak
4804.000	37.42	0.08	37.5	54	-16.5	AVG
7206.000	40.45	2.21	42.66	74	-31.34	peak
7206.000	31.27	2.21	33.48	54	-20.52	AVG
			0			
emark:			- 6	8		
$actor = \Delta nten$	na Factor + Cabl	eloss - Pre-	amplifier			

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

EUT	Bluetooth Keyboard	Model Name	HB206
Temperature	25°C	Relative Humidity	55.4%
Pressure	960hPa	Test Voltage	Normal Voltage
Test Mode	Mode 1	Antenna	Vertical

Frequency	Meter Reading	Factor	Emission Level	Limits	Margin	
(MHz)	(dBµV)	(dB)	(dBµV/m)	(dBµV/m)	(dB)	- Value Type
4804.000	45.16	0.08	45.24	74	-28.76	peak
4804.000	36.27	0.08	36.35	54	-17.65	AVG
7206.000	39.74	2.21	41.95	74	-32.05	peak
7206.000	29.43	2.21	31.64	54	-22.36	AVG
		-0-	0			
emark:						

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Report No.: AGC00803210702FE03 Page 34 of 58

EUT	Bluetooth Keyboard	Model Name	HB206
Temperature	25°C	Relative Humidity	55.4%
Pressure	960hPa	Test Voltage	Normal Voltage
Test Mode	Mode 2	Antenna	Horizontal

Frequency	Meter Reading	Factor	Emission Level	Limits	Margin	
(MHz)	(dBµV)	(dB)	(dBµV/m)	(dBµV/m)	(dB)	Value Type
4882.000	46.23	0.14	46.37	74	-27.63	peak
4882.000	37.51	0.14	37.65	54	-16.35	AVG
7323.000	41.03	2.36	43.39	74	-30.61	peak
7323.000	32.54	2.36	34.9	54	-19.1	AVG
-95	© /	6		200	©	8
emark:		0	0		No.	-C
actor = Anter	na Factor + Cab	le Loss – Pre-	amplifier.	(2)		

EUT	Bluetooth Keyboard	Model Name	HB206
Temperature	25°C	Relative Humidity	55.4%
Pressure	960hPa	Test Voltage	Normal Voltage
Test Mode	Mode 2	Antenna	Vertical

Frequency	Meter Reading	Factor	Emission Level	Limits	Margin	
(MHz)	(dBµV)	(dB)	(dBµV/m)	(dBµV/m)	(dB)	- Value Type
4882.000	46.59	0.14	46.73	74	-27.27	peak
4882.000	37.84	0.14	37.98	54	-16.02	AVG
7323.000	41.51	2.36	43.87	74	-30.13	peak
7323.000	32.88	2.36	35.24	54	-18.76	AVG
		8				
Remark:			6 C	0		N
actor = Anten	na Factor + Cable	Loss - Pre-	amplifier.	- 6	0	

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Report No.: AGC00803210702FE03 Page 35 of 58

EUT	Bluetooth Keyboard	Model Name	HB206
Temperature	25°C	Relative Humidity	55.4%
Pressure	960hPa	Test Voltage	Normal Voltage
Test Mode	Mode 3	Antenna	Horizontal

Frequency	Meter Reading	Factor	Emission Level	Limits	Margin	
(MHz)	(dBµV)	(dB)	(dBµV/m)	(dBµV/m)	(dB)	Value Type
4960.000	47.51	0.22	47.73	74	-26.27	peak
4960.000	38.62	0.22	38.84	54	-15.16	AVG
7440.000	42.72	2.64	45.36	74	-28.64	peak
7440.000	33.49	2.64	36.13	54	-17.87	AVG
C.	0				0	
G	- 6	8		2		8
emark:	0	0	0		0	
actor = Anter	na Factor + Cab	le Loss – Pre-	amplifier.	9		

EUT	Bluetooth Keyboard	Model Name	HB206
Temperature	25°C	Relative Humidity	55.4%
Pressure	960hPa	Test Voltage	Normal Voltage
Test Mode	Mode 3	Antenna	Vertical

Frequency	Meter Reading	Factor	Emission Level	Limits	Margin	Value Type
(MHz)	(dBµV)	(dB)	(dBµV/m)	(dBµV/m)	(dB)	value Type
4960.000	46.29	0.22	46.51	74	-27.49	peak
4960.000	37.57	0.22	37.79	54	-16.21	AVG
7440.000	40.26	2.64	42.9	74	-31.1	peak
7440.000	31.57	2.64	34.21	54	-19.79	AVG
		.0-	-C	0		
	(R)			<u> </u>	8	
emark:						
emark:	Page Factor I Cab		amplifier	, u	G	

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

RESULT: PASS

Note:

The amplitude of other spurious emissions from 1G to 25 GHz which are attenuated more than 20 dB below the permissible value need not be reported.

Factor = Antenna Factor + Cable loss - Amplifier gain, Over=Measure-Limit.

The "Factor" value can be calculated automatically by software of measurement system.

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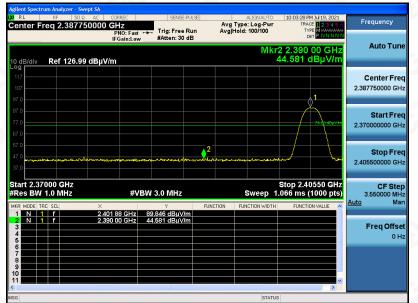


Report No.: AGC00803210702FE03 Page 36 of 58

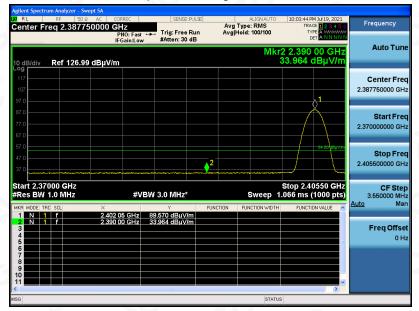
EUT	Bluetooth Keyboard	Model Name	HB206
Temperature	25°C	Relative Humidity	55.4%
Pressure	960hPa	Test Voltage	Normal Voltage
Test Mode	Mode 1	Antenna	Horizontal

Test result for band edge emission at restricted bands

Test Graph for Peak Measurement



Test Graph for Average Measurement



RESULT: PASS

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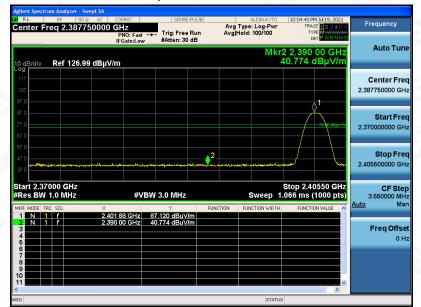
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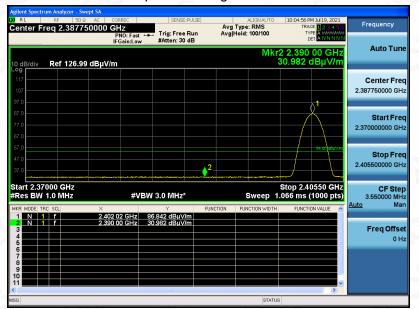
Report No.: AGC00803210702FE03 Page 37 of 58

EUT	Bluetooth Keyboard	Model Name	HB206
Temperature	25°C	Relative Humidity	55.4%
Pressure	960hPa	Test Voltage	Normal Voltage
Test Mode	Mode 1	Antenna	Vertical

Test Graph for Peak Measurement



Test Graph for Average Measurement



RESULT: PASS

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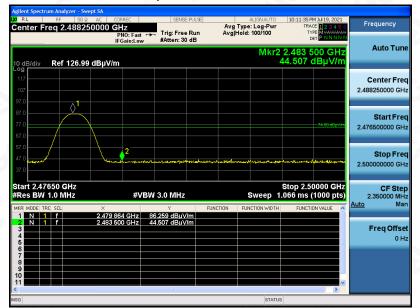
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Report No.: AGC00803210702FE03 Page 38 of 58

EUT	Bluetooth Keyboard	Model Name	HB206
Temperature	25°C	Relative Humidity	55.4%
Pressure	960hPa	Test Voltage	Normal Voltage
Test Mode	Mode 3	Antenna	Horizontal

Test Graph for Peak Measurement



Test Graph for Average Measurement



RESULT: PASS

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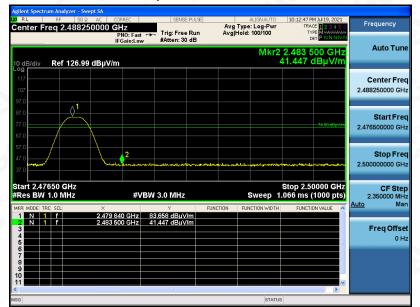
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Report No.: AGC00803210702FE03 Page 39 of 58

EUT	Bluetooth Keyboard	Model Name	HB206
Temperature	25°C	Relative Humidity	55.4%
Pressure	960hPa	Test Voltage	Normal Voltage
Test Mode	Mode 3	Antenna	Vertical

Test Graph for Peak Measurement



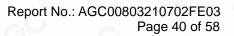
Test Graph for Average Measurement



RESULT: PASS

Note: The factor had been edited in the "Input Correction" of the Spectrum Analyzer.

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11. NUMBER OF HOPPING FREQUENCY

11.1. MEASUREMENT PROCEDURE

The EUT shall have its hopping function enabled. Use the following spectrum analyzer settings:

1. Span: The frequency band of operation. Depending on the number of channels the device supports, it may be necessary to divide the frequency range of operation across multiple spans, to allow the individual channels to be clearly seen.

2. RBW: To identify clearly the individual channels, set the RBW to less than 30% of the channel spacing or the 20 dB bandwidth, whichever is smaller.

3. VBW \geq RBW. Sweep: Auto. Detector function: Peak. Trace: Max hold.

4. Allow the trace to stabilize.

11.2. TEST SETUP (BLOCK DIAGRAM OF CONFIGURATION)

Same as described in section 8.2

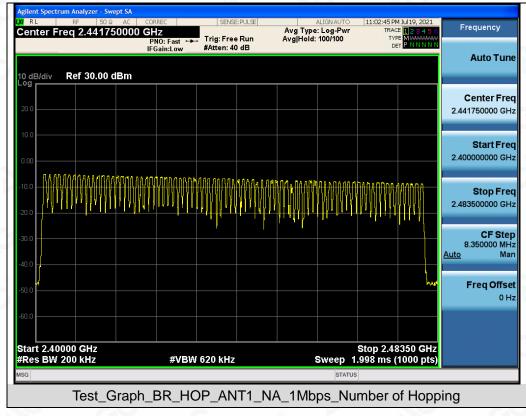
11.3. MEASUREMENT EQUIPMENT USED

The same as described in section 6

11.4. LIMITS AND MEASUREMENT RESULT

Test Data of Number of Hopping Frequency					
Test Mode	Limits	Pass or Fail			
GFSK Hopping	79	>=15	Pass		

Test Graphs of Number of Hopping Frequency



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12. TIME OF OCCUPANCY (DWELL TIME)

12.1. MEASUREMENT PROCEDURE

The EUT shall have its hopping function enabled. Use the following spectrum analyzer settings:

1. Span: Zero span, centered on a hopping channel.

2. RBW shall be \leq channel spacing and where possible RBW should be set >> 1 / T, where T is the expected dwell time per channel.

3. Sweep: As necessary to capture the entire dwell time per hopping channel; where possible use a video trigger and trigger delay so that the transmitted signal starts a little to the right of the start of the plot. The trigger level might need slight adjustment to prevent triggering when the system hops on an adjacent channel; a second plot might be needed with a longer sweep time to show two successive hops on a channel.

4. Detector function: Peak. Trace: Max hold.

5. Use the marker-delta function to determine the transmit time per hop.

6. Repeat the measurement using a longer sweep time to determine the number of hops over the period specified in the requirements. The sweep time shall be equal to, or less than, the period specified in the requirements. Determine the number of hops over the sweep time and calculate the total number of hops in the period specified in the requirements, using the following equation:

(Number of hops in the period specified in the requirements) = (number of hops on spectrum analyzer) \times (period specified in the requirements / analyzer sweep time)

7. The average time of occupancy is calculated from the transmit time per hop multiplied by the number of hops in the period specified in the requirements.

12.2. TEST SETUP (BLOCK DIAGRAM OF CONFIGURATION)

Same as described in section 8.2

12.3. MEASUREMENT EQUIPMENT USED

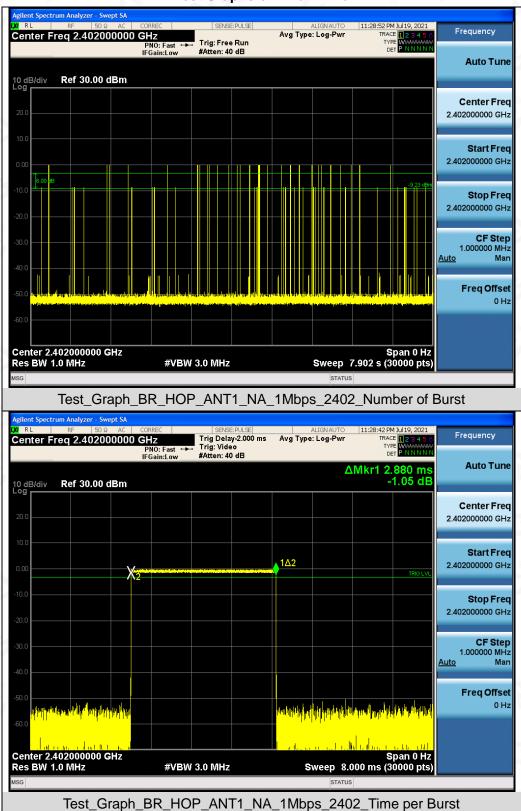
The same as described in section 6

12.4. LIMITS AND MEASUREMENT RESULT

Test Data of Dwell Time							
Channel	Time of Pulse for DH5 (ms)	Number of hops in the period specified in the requirements	Sweep Time (ms)	Limit (ms)	Pass or Fail		
2402	2.880	27.0*4	311.040	400	Pass		
2441	2.879	23.0*4	264.868	400	Pass		
2480	2.879	23.0*4	264.868	400	Pass		

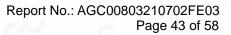
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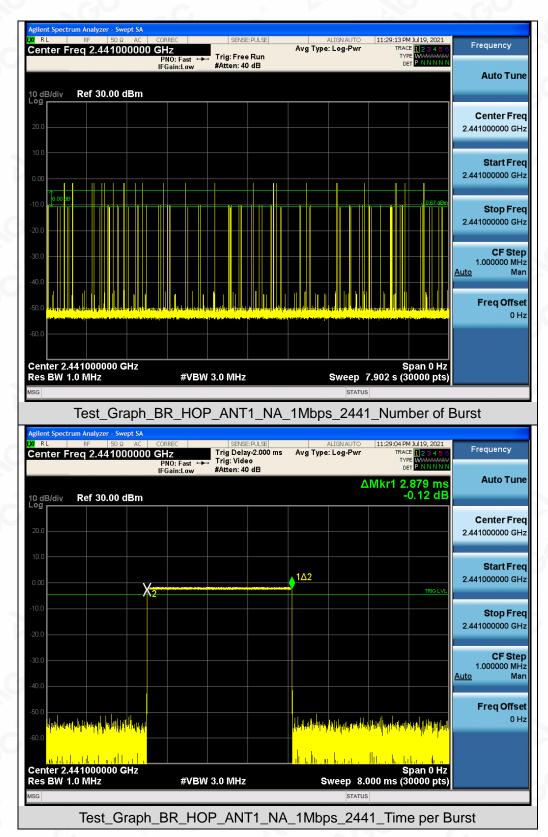


Test Graphs of Dwell Time

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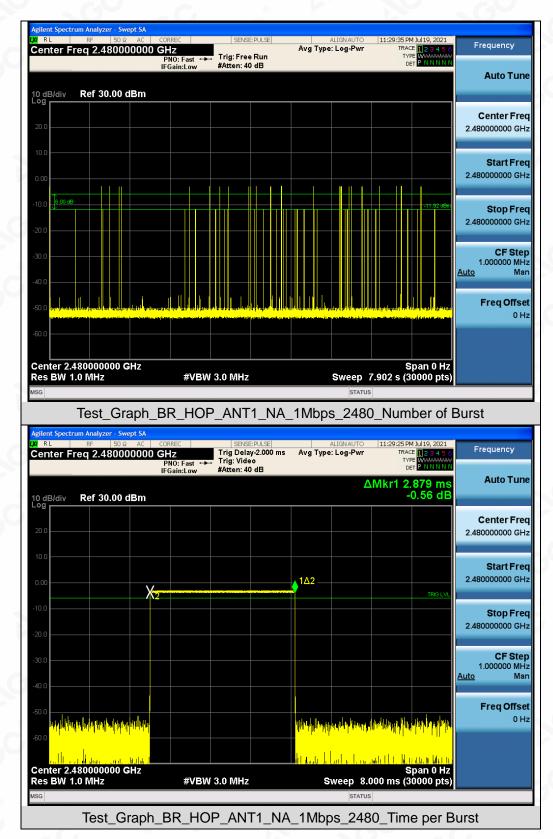




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Report No.: AGC00803210702FE03 Page 44 of 58





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13. FREQUENCY SEPARATION

13.1. MEASUREMENT PROCEDURE

The EUT shall have its hopping function enabled. Use the following spectrum analyzer settings:

1. Span: Wide enough to capture the peaks of two adjacent channels.

2. RBW: Start with the RBW set to approximately 30% of the channel spacing; adjust as necessary to best identify the center of each individual channel.

3. Video (or average) bandwidth (VBW) \geq RBW.

4. Sweep: Auto. e) Detector function: Peak. f) Trace: Max hold. g) Allow the trace to stabilize.

Use the marker-delta function to determine the separation between the peaks of the adjacent channels.

13.2. TEST SETUP (BLOCK DIAGRAM OF CONFIGURATION)

Same as described in section 6.2

13.3. MEASUREMENT EQUIPMENT USED

The same as described in section 6.3

13.4. LIMITS AND MEASUREMENT RESULT

Test Data of Frequency Separation					
Test Mode Channel Separation (MHz) Limits Pass					
GFSK Hopping	0.993	>= 2/3 -20dB BW	Pass		



Test Graphs of Number of Hopping Frequency

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14. LINE CONDUCTED EMISSION TEST

14.1. LIMITS OF LINE CONDUCTED EMISSION TEST

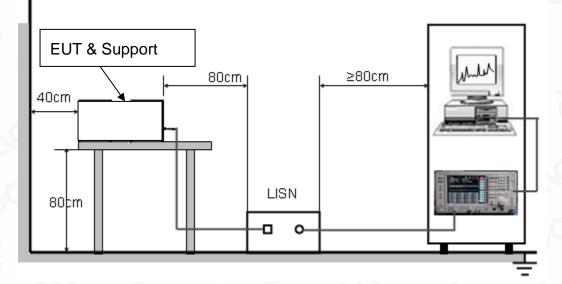
Francianau	Maximum RF Line Voltage				
Frequency	Q.P. (dBµV)	Average (dBµV)			
150kHz~500kHz	66-56	56-46			
500kHz~5MHz	56	46			
5MHz~30MHz	60	50			

Note:

1. The lower limit shall apply at the transition frequency.

2. The limit decreases linearly with the logarithm of the frequency in the range 0.15 MHz to 0.50 MHz.

14.2. BLOCK DIAGRAM OF LINE CONDUCTED EMISSION TEST



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14.3. PRELIMINARY PROCEDURE OF LINE CONDUCTED EMISSION TEST

- The equipment was set up as per the test configuration to simulate typical actual usage per the user's manual. When the EUT is a tabletop system, a wooden table with a height of 0.8 meters is used and is placed on the ground plane as per ANSI C63.10 (see Test Facility for the dimensions of the ground plane used). When the EUT is a floor-standing equipment, it is placed on the ground plane which has a 3-12 mm non-conductive covering to insulate the EUT from the ground plane.
- 2. Support equipment, if needed, was placed as per ANSI C63.10.
- 3. All I/O cables were positioned to simulate typical actual usage as per ANSI C63.10.
- 4. All support equipment received AC120V/60Hz power from a LISN, if any.
- 5. The EUT received DC 5V power from adapter which received AC120V/60Hz power from a LISN.
- 6. The test program was started. Emissions were measured on each current carrying line of the EUT using a spectrum Analyzer / Receiver connected to the LISN powering the EUT. The LISN has two monitoring points: Line 1 (Hot Side) and Line 2 (Neutral Side). Two scans were taken: one with Line 1 connected to Analyzer / Receiver and Line 2 connected to a 50 ohm load; the second scan had Line 1 connected to a 50 ohm load and Line 2 connected to the Analyzer / Receiver.
- 7. Analyzer / Receiver scanned from 150 kHz to 30MHz for emissions in each of the test modes.
- 8. During the above scans, the emissions were maximized by cable manipulation.
- 9. The test mode(s) were scanned during the preliminary test.

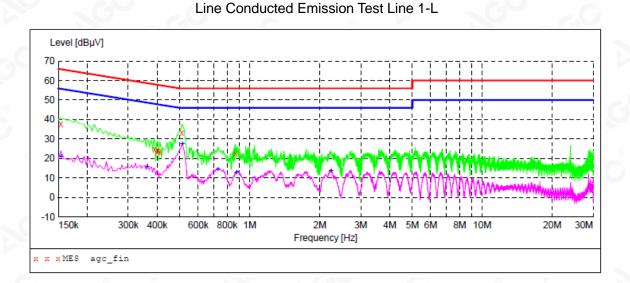
Then, the EUT configuration and cable configuration of the above highest emission level were recorded for reference of final testing.

14.4. FINAL PROCEDURE OF LINE CONDUCTED EMISSION TEST

- 1. EUT and support equipment was set up on the test bench as per step 2 of the preliminary test.
- A scan was taken on both power lines, Line 1 and Line 2, recording at least the six highest emissions. Emission frequency and amplitude were recorded into a computer in which correction factors were used to calculate the emission level and compare reading to the applicable limit. If EUT emission level was less – 2dB to the A.V. limit in Peak mode, then the emission signal was re-checked using Q.P and Average detector.
- 3. The test data of the worst case condition(s) was reported on the Summary Data page.

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14.5. TEST RESULT OF LINE CONDUCTED EMISSION TEST

MEASUREMENT RESULT: "agc_fin"

2021/7/14 16:37

Frequency MHz	Level dBµV	Transd dB	Limit dBµV	Margin dB	Detector	Line
0.154000 0.390000 0.402000 0.410000 0.510000 0.866000	37.60 24.80 24.00 23.40 33.10 22.50	6.9 5.7 5.7 5.7 5.4 5.4	66 58 58 58 56 56	28.2 33.3 33.8 34.2 22.9 33.5	QP QP QP QP	L1 L1 L1 L1 L1 L1

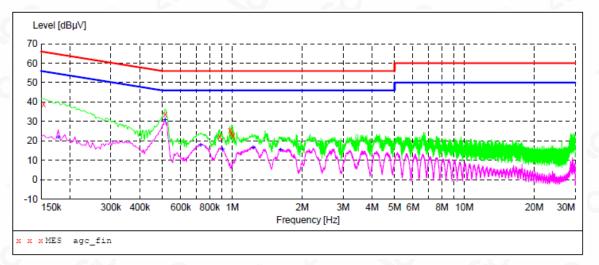
MEASUREMENT RESULT: "agc fin2"

2021/7/14 16	:35					
Frequency		Transd	Limit	-	Detector	Line
MHz	dBµV	dB	dBµV	dB		
0.154000		<u> </u>	5.0	24.0		- 1
0.154000	20.90	6.9	56	34.9	AV	ь1
0.362000	15.70	5.8	49	33.0	AV	ь1
0.514000	27.70	5.4	46	18.3	AV	ь1
0.730000	14.50	5.4	46	31.5	AV	ь1
0.878000	12.90	5.4	46	33.1	AV	ь1
2.234000	13.50	7.5	46	32.5	AV	г1

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Line Conducted Emission Test Line 2-N

MEASUREMENT RESULT: "agc_fin"

2021/7/14 16:32

21///14 10.	52					
Frequency	Level	Transd	Limit	Margin	Detector	Line
MHz	dBµV	dB	dBµV	dB		
0.154000	39.00	6.9	66	26.8	QP	N
0.514000	33.80	5.4	56	22.2	QP	N
0.882000	22.40	5.4	56	34.6	QP	N
0.978000	25.60	5.4	56	30.4	QP	N
0.994000	23.80	5.4	56	32.2	QP	N
1.006000	22.70	5.4	56	33.3	QP	N

MEASUREMENT RESULT: "agc fin2"

2021/7/14	16:29					
Frequen M	cy Level Hz dBµV	Transd dB	Limit dBµV	Margin dB	Detector	Line
0.1780	00 21.90	6.7	55	32.7	AV	N
0.5140	00 30.80	5.4	46	15.2	AV	N
0.7300	00 17.50	5.4	46	28.5	AV	N
0.9060	00 15.70	5.4	46	30.3	AV	N
1.2300	00 16.50	6.0	46	29.5	AV	N
1.6140	00 15.10	6.8	46	30.9	AV	Ν

RESULT: PASS

Note: All the test modes had been tested, the mode 1 was the worst case. Only the data of the worst case would be record in this test report.

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