

 Report No.:
 18220WC30232201
 FCC ID: 2BBY9-SI-2191
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## FCC Test Report

Applicant: Dongguan Suoai Electronics Co., LTDAddressNo.3, Huayu Street, Changlong: Village, Huangjiang Town, Dongguan<br/>City, Guangdong, China

Product Name : mechanical keyboard

Report Date : Nov. 16, 2023



#### Shenzhen Anbotek Compliance Laboratory Limited

Address:1/F.,Building D,Sogood Science and Technology Park, Sanwei Community, Hangcheng Street, Bao'an District, Shenzhen, Guangdong, China. Tel:(86)0755–26066440 Fax:(86)0755–26014772 Email:service@anbotek.com





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400-003-0500 www.anbotek.com.cn 

Hotline



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	TEST F	REPORT	
Applicant	: Dongguan Suoai Electr	onics Co., LTD	
Manufacturer	: Dongguan Suoai Electr	onics Co., LTD	
Product Name	: mechanical keyboard		
Test Model No.	K21 Andrea An		
Reference Model No.	: K81 Pro, K108, K81, H	i9, Hi8, Hi75, F21, A75, GK600FS	ek Anbotek
Trade Mark	: N/A stek And hotek		
Rating(s)	: Input: 5V 650mA (with	ם DC 3.7V, 600mAh battery inside	)Anbotek Anbot

Test Standard(s)

47 CFR Part 15.247

The device described above is tested by Shenzhen Anbotek Compliance Laboratory Limited to determine the maximum emission levels emanating from the device and the severe levels of the device can endure and its performance criterion. The measurement results are contained in this test report and Shenzhen Anbotek Compliance Laboratory Limited is assumed full of responsibility for the accuracy and completeness of these measurements. Also, this report shows that the EUT (Equipment Under Test) is technically compliant with above listed standard(s) requirements.

This report applies to above tested sample only and shall not be reproduced in part without written approval of Shenzhen Anbotek Compliance Laboratory Limited.

Date of Receipt: Date of Test:

Prepared By:

Nov. 02, 2023 Nov. 02 ~ 14, 2023

Nian Xiu Chen

(Nianxiu Chen)

Idward pan

Approved & Authorized Signer:

(Edward Pan)

Shenzhen Anbotek Compliance Laboratory Limited

Address:1/F.,Building D,Sogood Science and Technology Park, Sanwei Community, Hangcheng Street, Bao'an District, Shenzhen, Guangdong, China. Tel:(86)0755–26066440 Fax:(86)0755–26014772 Email:service@anbotek.com





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## **Revision History**

Report Vers	sion		Description			Issued	Date	
R00	botek Ant	otek	Original Issue.	Anbotek	Anbote.	Nov. 16,	2023	Anbote
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Anbc

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## 1. General Information

## 1.1. Client Information

Applicant	: Dongguan Suoai Electronics Co., LTD
Address	No.3, Huayu Street,Changlong Village,Huangjiang Town, Dongguan City,Guangdong, China
Manufacturer	: Dongguan Suoai Electronics Co., LTD
Address	No.3, Huayu Street,Changlong Village,Huangjiang Town, Dongguan City,Guangdong, China
Factory	: Dongguan Suoai Electronics Co., LTD
Address	No.3, Huayu Street,Changlong Village,Huangjiang Town, Dongguan City,Guangdong, China

## 1.2. Description of Device (EUT)

Product Name	:	mechanical keyboard
Test Model No.	:	K21 K hotek Anbolek Anbolek Anbolek Anbolek
Reference Model No.	:	K81 Pro, K108, K81, Hi9, Hi8, Hi75, F21, A75, GK600FS (Note: All samples are the same except the model number and appearance color, so we prepare "K21" for test only.)
Trade Mark	:	N/A Anborek Andrek Anborek Anborek Anborek Anbor
Test Power Supply	:	AC 120V, 60Hz for Adapter/ DC 3.7V Battery inside
Test Sample No.	:	1-2-1(Normal Sample), 1-2-2(Engineering Sample)
Adapter	:	N/Aotek Anbotek Anbotek Anbotek Anbotek
RF Specification		
Operation Frequency	:	2402MHz to 2480MHz
Number of Channel	:	79 And tek Anbotek Anbotek Anbotek Anbotek Anbotek
Modulation Type	:	GFSK, π/4 DQPSK
Antenna Type	:	PCB Antenna
Antenna Gain(Peak)	:	0 dBiorek Anborek Anborek Anborek Anborek Anborek
		ation are provided by customer. eatures description, please refer to the manufacturer's specifications or the

## 1.3. Auxiliary Equipment Used During Test

	Title	Manufacturer	Model No.	Serial No.
.e	Xiaomi 33W adapter	Xiaomi	MDY-11-EX	SA62212LA04358J

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#### 1.4. Operation channel list

Operation Band:

Operation E	und o	M N	~0 <sup>1</sup> 0	All	×0 <sup>~</sup>		N. N.
Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)
0 Anbote	2402	20 00	2422	40	e <sup>k</sup> 2442,00 <sup>16</sup>	60	2462
rek 1 Anb	2403	21 nt	o <sup>nex</sup> 2423 pr <sup>b0</sup>	41	2443	61 And	2463
hotek2	2404	22	2424	42	2444	62	2464
314	2405	23	2425	Anborda	2445	63	2465
4 otek	2406	Anna 24 tok	2426	44	2446	64	2466
5 botek	2407	25	2427	45	2447	65 more	2467
× 6	2408	26	2428 NO	46 Anbo	2448	ret 66 prof	2468
, 7	60 <sup>10</sup> 2409 M <sup>0</sup>	27	2429	o <sup>tek</sup> 47 An	2449	bote <sup>4</sup> 67	2469
8	2410	28	2430	48	2450	68	2470
And 9 tek	2411	29	2431	49	2451	69	2471
Anna 10	2412	30	2432	50 <sup>oten</sup>	2452	70 potek	2472
11	2413	31 <sup>nbore</sup>	2433	K 51 <sub>Anbot</sub>	2453	ek 71 Anbo	2473 <sup>000</sup>
12 Anbc	2414	tek 32 And	2434	otek 52 Ant	2454	otet 72	2474 M
13	2415	10 <sup>010</sup> 33	2435	53	2455	73	2475
nb <sup>ot</sup> 14	2416	34	2436	54	2456	74	2476
M15	2417	35	2437	55	2457	75 otek	2477
16	2418	36 0010	2438	56 note	2458	76	2478
17Anbor	2419	e <sup>k</sup> 37 <sub>Anb</sub> o	2439	stek 57 Anb	2459 Mar	77 T	ote <sup>k</sup> 2479 ph
otek 18 Ant	2420	pote <sup>k</sup> 38 pt	2440	58	2460	78	2480
nb <sup>otek</sup> 19	2421	39	2441	59	2461	Aupon	abo <u>t</u> ek

## 1.5. Description of Test Modes

Pretest Modes	Descriptions		
tek Andro TM1 Androkek	Keep the EUT in continuously transmitting mode (non-hopping) with GFSK modulation.		
hotek TM2 Anboten	Keep the EUT in continuously transmitting mode (non-hopping) with $\pi/4$ DQPSK modulation.		
TM3	Keep the EUT in continuously transmitting mode (hopping) with GFSK modulation,.		
Anbotek TM4 <sup>nbotek</sup>	Keep the EUT in continuously transmitting mode (hopping) with $\pi/4$ DQPSK modulation.		

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## 1.6. Measurement Uncertainty

Parameter	Uncertainty
Conducted emissions (AMN 150kHz~30MHz)	3.4dB And
Occupied Bandwidth	925Hz
Conducted Output Power	0.76dB
Conducted Spurious Emission	1.24dB
Radiated spurious emissions (above 1GHz)	1G-6GHz: 4.78dB; 6G-18GHz: 4.88dB 18G-40GHz: 5.68dB
Radiated emissions (Below 30MHz)	3.53dB
Radiated spurious emissions (30MHz~1GHz)	Horizontal: 3.92dB; Vertical: 4.52dB
The measurement uncertainty and decision risk of This uncertainty represents an expanded uncertainty confidence level using a coverage factor of k=2.	

## 1.7. Test Summary

Test Items	Test Modes	Status
Antenna requirement	over Anboy tek	botek P Ar
Conducted Emission at AC power line	Mode1,2	Anbot P
Occupied Bandwidth	Mode1,2	AntPrek
Maximum Conducted Output Power	Mode1,2	Photek
Channel Separation	Mode3,4	ek PAnbot
Number of Hopping Frequencies	Mode3,4	botek P Ant
Dwell Time	Mode3,4	9 <sup>97000</sup>
Emissions in non-restricted frequency bands	Mode1,2,3,4	Bek
Band edge emissions (Radiated)	Mode1,2	Photek
Emissions in frequency bands (below 1GHz)	Mode1,2	K P nbote
Emissions in frequency bands (above 1GHz)	Mode1,2	otek P Ant
Note: P: Pass N: N/A, not applicable	botek Anbotek An	Anbotek

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#### 1.8. Description of Test Facility

The test facility is recognized, certified, or accredited by the following organizations:

#### FCC-Registration No.:184111

Shenzhen Anbotek Compliance Laboratory Limited, EMC Laboratory has been registered and fully described in a report filed with the (FCC) Federal Communications Commission. The acceptance letter from the FCC is maintained in our files. Registration No. 184111.

#### ISED-Registration No.: 8058A

Shenzhen Anbotek Compliance Laboratory Limited, EMC Laboratory has been registered and fully described in a report filed with the (ISED) Innovation, Science and Economic Development Canada. The acceptance letter from the ISED is maintained in our files. Registration 8058A.

#### Test Location

Shenzhen Anbotek Compliance Laboratory Limited. 1/F, Building D, Sogood Science and Technology Park, Sanwei community, Hangcheng Street, Bao'an District, Shenzhen, Guangdong, China.

#### 1.9. Disclaimer

- 1. The test report is invalid if not marked with the signatures of the persons responsible for preparing and approving the test report.
- 2. The test report is invalid if there is any evidence and/or falsification.
- 3. The results documented in this report apply only to the tested sample, under the conditions and modes of operation as described herein.
- 4. This document may not be altered or revised in any way unless done so by Anbotek and all revisions are duly noted in the revisions section.
  - 5. Content of the test report, in part or in full, cannot be used for publicity and/or promotional purposes without prior written approval from the laboratory.
  - 6. The authenticity of the information provided by the customer is the responsibility of the customer and the laboratory is not responsible for its authenticity.

The laboratory is only responsible for the data released by the laboratory, except for the part provided by the applicant.

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#### 1.10. Test Equipment List

Conducted Emission at AC power line

200	·	note. Dur	.0	4	Pr. V	100
Item	Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Cal.Due Date
<u>к</u> 1	L.I.S.N. Artificial Mains Network	Rohde & Schwarz	ENV216	100055	2023-10-12	2024-10-11
otek 2	Three Phase V- type Artificial Power Network	CYBERTEK	EM5040DT	E215040D T001	2023-07-05	2024-07-04
3	EMI Test Receiver	Rohde & Schwarz	ESCI	100627	2023-10-12	2024-10-11
4	Software Name EZ-EMC	Farad Technology	ANB-03A	N/A Anbo	rek /Anborek	Anbo, ek Anborek
	tothe short	p.c.	der MP		with the	

Occupied Bandwidth Maximum Conducted Output Power Channel Separation Number of Hopping Frequencies Dwell Time Emissions in non-restricted frequency bands

Item	Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Cal.Due Date
1	DC Power Supply	IVYTECH	IV3605	1804D360 510	2023-10-20	2024-10-19
2	Spectrum Analyzer	Rohde & Schwarz	FSV40-N	101792	2023-05-26	2024-05-25
3 3	MXA Spectrum Analysis	KEYSIGHT	N9020A	MY505318 23	2023-02-23	2024-02-22
And 4	Oscilloscope	Tektronix	MDO3012	C020298	2023-10-12	2024-10-11
5	MXG RF Vector Signal Generator	Agilent	N5182A	MY474206 47	2023-02-23	2024-10-22

	edge emissions (Ra sions in frequency ba		Anbotek	Anboten	Anbotek	Anbotek Anb
Item	Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Cal.Due Date
Anbo	EMI Test Receiver	Rohde & Schwarz	ESR26	101481	2023-10-12	2024-10-11
2	EMI Preamplifier	SKET Electronic	LNPA- 0118G-45	SKET-PA- 002	2023-10-12	2024-10-11
3	Double Ridged Horn Antenna	SCHWARZBECK	BBHA 9120D	02555	2022-10-16	2025-10-15
o <sup>xe</sup> 4	EMI Test Software EZ-EMC	SHURPLE	N/A	N/A	Anboren A	Nobotek A
nb5 <sup>tek</sup>	Horn Antenna	Annoore <sup>A</sup> A-INFO	LB-180400- KF	J21106062 8	2023-10-12	2024-10-11
16 <sup>1001</sup>	Spectrum Analyzer	Rohde & Schwarz	FSV40-N	101792	2023-05-26	2024-05-25
7 00	Amplifier	Talent Microwave	TLLA18G40 G-50-30	23022802	2023-05-25	2024-05-24

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Emis	sions in frequency ba	ands (below 1GHz)	Anboro	Annebotek	Anbotek	Anburgtek
Item	Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Cal.Due Date
1	EMI Test Receiver	Rohde & Schwarz	ESR26	101481	2023-10-12	2024-10-11
2	Pre-amplifier	SONOMA	oote <sup>k</sup> 310N Anb	186860	2023-10-12	2024-10-11
, e 3	Bilog Broadband Antenna	Schwarzbeck	VULB9163	345	2022-10-23	2025-10-22
nb4ek	EMI Test Software EZ-EMC	SHURPLE	N/A	N/A	Anboten	And
<u>.</u>	en poor	And the borek	Aupo.	An. stek	upoter.	P.O.P.

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## 2. Antenna requirement

	Refer to 47 CFR Part 15.203, an intentional radiator shall be designed to
	ensure that no antenna other than that furnished by the responsible party
Test Requirement:	shall be used with the device. The use of a permanently attached antenna or
Anbotek Anbot	of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the provisions of this section.
	Test Requirement:

#### 2.1. Conclusion

The antenna is a **PCB Antenna** which permanently attached, and the best case gain of the antenna is **0dBi** . It complies with the standard requirement.

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## 3. Conducted Emission at AC power line

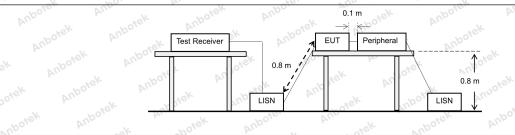
Test Requirement:	Refer to 47 CFR 15.207(a), Except section, for an intentional radiator to public utility (AC) power line, the radiated back onto the AC power line on an band 150 kHz to 30 MHz, shall not measured using a 50 µH/50 ohms (LISN).	hat is designed to be con adio frequency voltage tha y frequency or frequencie exceed the limits in the fo	nected to the it is conducted s, within the pllowing table, as	
abotek Anbo	Frequency of emission (MHz)	Conducted limit (dBµV)		
All aboten	And k botek Anbor	Quasi-peak	Average	
Anbor Arr	0.15-0.5	66 to 56*	56 to 46*	
Test Limit:	0.5-5 det moore Anne	56 hotek M	46	
Ant .ek .both	5-30	60	50 ten And	
Anbore An	*Decreases with the logarithm of th	ne frequency.	pri botek Anbo	
Test Method:	ANSI C63.10-2013 section 6.2	botek Anboten	And stek	
Procedure:	Refer to ANSI C63.10-2013 section line conducted emissions from unli			

## 3.1. EUT Operation

#### Operating Environment:

Anbo	1: TX-GFSK (Non-Hopping): Keep the EUT in continuously transmitting mode (non-
Test mode:	hopping) with GFSK modulation. 2: TX-π/4-DQPSK (Non-Hopping): Keep the EUT in continuously transmitting mode
hotek Anbor	(non-hopping) with $\pi/4$ DQPSK modulation.

#### 3.2. Test Setup



#### Shenzhen Anbotek Compliance Laboratory Limited

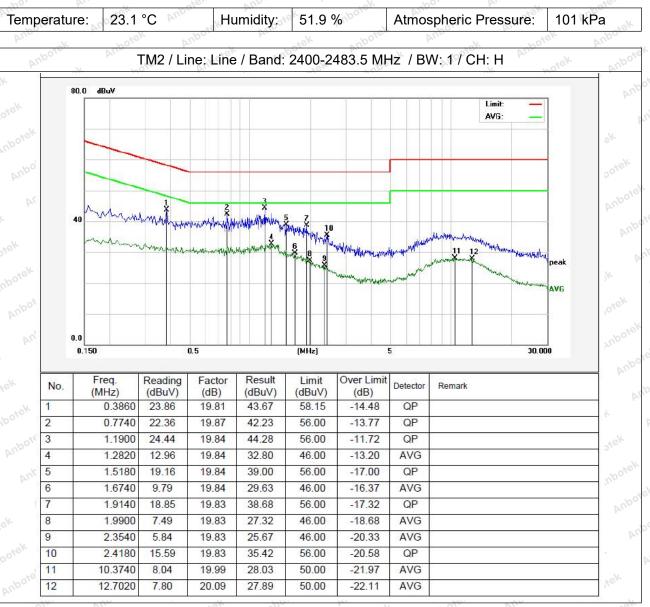
Address:1/F.,Building D,Sogood Science and Technology Park, Sanwei Community, Hangcheng Street, Bao'an District, Shenzhen, Guangdong, China. Tel:(86)0755–26066440 Fax:(86)0755–26014772 Email:service@anbotek.com





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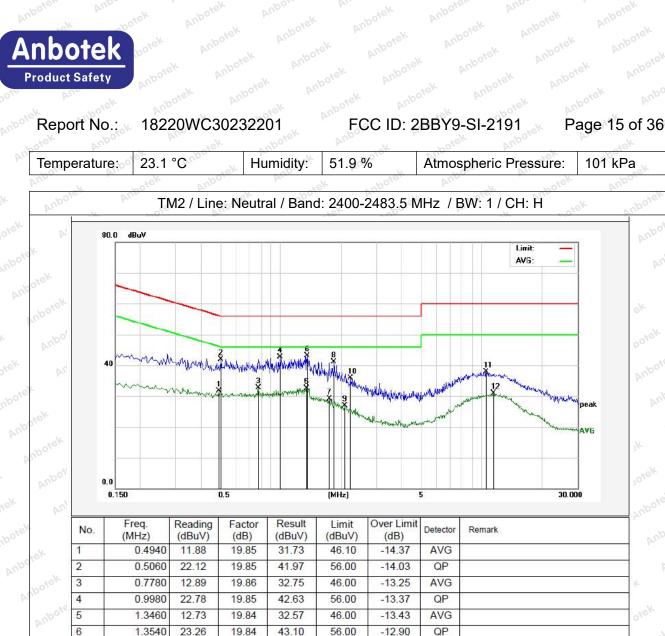
#### 3.3. Test Data



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29.08

41.03

26.93

35.83

37.91

30.87

46.00

56.00

46.00

56.00

60.00

50.00

-16.92

-14.97

-19.07

-20.17

-22.09

-19.13

AVG

QP

AVG

QP

QP

AVG

19.84

19.83

19.83

19.83

20.01

20.03

Note:Only record the worst data in the report.

9.24

21.20

7.10

16.00

17.90

10.84

1.7500

1.8420

2.0820

2.2340

10.5500

11.4580

7

8

9

10 11

12

#### Shenzhen Anbotek Compliance Laboratory Limited

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## 4. Occupied Bandwidth

Test Requirement:	47 CFR 15.215(c)
Test Limit:	Refer to 47 CFR 15.215(c), intentional radiators operating under the alternative provisions to the general emission limits, as contained in §§ 15.217 through 15.257 and in subpart E of this part, must be designed to ensure that the 20 dB bandwidth of the emission, or whatever bandwidth may otherwise be specified in the specific rule section under which the equipment operates, is contained within the frequency band designated in the rule section under which the equipment is operated.
Test Method:	ANSI C63.10-2013, section 7.8.7, For occupied bandwidth measurements, use the procedure in 6.9.2.
Anbotek Anbotek Anbote	<ul> <li>a) The spectrum analyzer center frequency is set to the nominal EUT channel center frequency. The span range for the EMI receiver or spectrum analyzer shall be between two times and five times the OBW.</li> <li>b) The nominal IF filter bandwidth (3 dB RBW) shall be in the range of 1% to</li> </ul>
nbotek Anbotek Anbotek Anbotek	5% of the OBW and video bandwidth (VBW) shall be approximately three times RBW, unless otherwise specified by the applicable requirement. c) Set the reference level of the instrument as required, keeping the signal from exceeding the maximum input mixer level for linear operation. In general, the peak of the spectral envelope shall be more than [10 log
Anbotek Anbote Anbotek Anbote	<ul> <li>(OBW/RBW)] below the reference level. Specific guidance is given in</li> <li>4.1.5.2.</li> <li>d) Steps a) through c) might require iteration to adjust within the specified</li> </ul>
hotek Anbotek Anbotek	tolerances. e) The dynamic range of the instrument at the selected RBW shall be more than 10 dB below the target "-xx dB down" requirement; that is, if the requirement calls for measuring the -20 dB OBW, the instrument noise floor at the selected RBW shall be at least 30 dB below the
Procedure:	reference value. f) Set detection mode to peak and trace mode to max hold. g) Determine the reference value: Set the EUT to transmit an unmodulated carrier or modulated signal, as applicable. Allow the trace to stabilize. Set the
potek Anbotek A Anbotek Anbotek	<ul> <li>spectrum analyzer marker to the highest level of the displayed trace (this is the reference value).</li> <li>h) Determine the "-xx dB down amplitude" using [(reference value) - xx].</li> <li>Alternatively, this calculation may be made by using the marker-delta function of the instrument.</li> </ul>
	<ul> <li>function of the instrument.</li> <li>i) If the reference value is determined by an unmodulated carrier, then turn the EUT modulation ON, and either clear the existing trace or start a new trace on the spectrum analyzer and allow the new trace to stabilize.</li> <li>Otherwise, the trace from step g) shall be used for step j).</li> </ul>
ootek Anbotek Ar Anbotek Anbotek	<ul> <li>j) Place two markers, one at the lowest frequency and the other at the highest frequency of the envelope of the spectral display, such that each marker is at or slightly below the "-xx dB down amplitude" determined in step h). If a marker is below this "-xx dB down amplitude" value, then it shall be</li> </ul>
Anbotek Anbotek Anbotek Anbotek K Anbotek Anbot	as close as possible to this value. The occupied bandwidth is the frequency difference between the two markers. Alternatively, set a marker at the lowest frequency of the envelope of the spectral display, such that the marker is at or slightly below the "-xx dB down amplitude" determined in step h). Reset
tek abotek An	the marker-delta function and move the marker to the other side of the

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# Report No.: 18220WC30232201 FCC ID: 2BBY9-SI-2191 Page 17 of 36 emission until the delta marker amplitude is at the same level as the reference marker amplitude. The marker-delta frequency reading at this point is the specified emission bandwidth. Page 17 of 36

k) The occupied bandwidth shall be reported by providing plot(s) of the measuring instrument display; the plot axes and the scale units per division shall be clearly labeled. Tabular data may be reported in addition to the plot(s).

## 4.1. EUT Operation

Operating Envir	ronment:	Anbor	Annotek	Anboren	Anburgtek	nbotek
Test mode:	1: TX-GFSK (Non- hopping) with GFS 2: TX-π/4-DQPSK (non-hopping) with	SK modulatio (Non-Hoppi	on. ing): Keep the		stek subot	And

## 4.2. Test Setup

nbotek		EUT		Spectrum Analyze	er		Anbotek
Anbotek	Anbotek	k mbotek	Anbote.	An	Anbotek	Anbotek	Anboic

## 4.3. Test Data

· · · · · · · · · · · · · · · · · · ·		DAY.		An a start and a start	
Temperature:	26.3 °C	Humidity:	51 %	Atmospheric Pressure:	101 kPa
20	10 A	V.	1.07	D//	

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## 5. Maximum Conducted Output Power

Test Requirement:	47 CFR 15.247(b)(1)
Test Limit: ek	Refer to 47 CFR 15.247(b)(1), For frequency hopping systems operating in the 2400-2483.5 MHz band employing at least 75 non-overlapping hopping channels, and all frequency hopping systems in the 5725-5850 MHz band: 1 watt. For all other frequency hopping systems in the 2400-2483.5 MHz band:
otek Anboten An	0.125 watts.
Test Method:	ANSI C63.10-2013, section 7.8.5
Anbotek Anbotek	This is an RF-conducted test to evaluate maximum peak output power. Use a direct connection between the antenna port of the unlicensed wireless device and the spectrum analyzer, through suitable attenuation. The hopping
Anbotek Anbot	<ul> <li>a) Use the following spectrum analyzer settings:</li> </ul>
otek Anboten An	<ol> <li>Span: Approximately five times the 20 dB bandwidth, centered on a hopping channel.</li> <li>RBW &gt; 20 dB bandwidth of the emission being measured.</li> </ol>
nbotek Anbotek	<ul> <li>3) VBW &gt;= RBW.</li> <li>4) Sweep: Auto.</li> </ul>
Procedure:	<ul><li>5) Detector function: Peak.</li><li>6) Trace: Max hold.</li><li>b) Allow trace to stabilize.</li></ul>
	c) Use the marker-to-peak function to set the marker to the peak of the emission.
	d) The indicated level is the peak output power, after any corrections for external attenuators and cables.
	<ul> <li>e) A plot of the test results and setup description shall be included in the test report.</li> <li>NOTE—A peak responding power meter may be used, where the power</li> </ul>
	meter and sensor system video bandwidth is greater than the occupied bandwidth of the unlicensed wireless device, rather than a spectrum
An botek Anb	d <sup>e</sup> analyzer. <sup>20</sup> Anboret Anboret Anboret Anboret Anboret

## 5.1. EUT Operation

Operating Env	vironment:	Ann	Anboten	Anbo	.xek	abotek	Anboro
Test mode:	1: TX-GFSK (No hopping) with GF 2: TX-π/4-DQPS (non-hopping) wi	SK modulation	n. ng): Keep th	e EUT ir	aboten		K notel

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#### 5.2. Test Setup

2			EUT	Spec	ctrum Analyzer	PL		Anbotek	
orely or	Anbatek	Anbotc	A	Anboter	And	Anbotek	Anbotek	Anbo.	

#### 5.3. Test Data

Temperature:	26.3 °C	Humidity:	51 %	Atmospheric Pressure:	101 kPa
- AV	.V. 100.	lev.	_26.	No. No.	~O.

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## 6. Channel Separation

Test Requirement:	47 CFR 15.247(a)(1)
Test Limit:	Refer to 47 CFR 15.247(a)(1), Frequency hopping systems shall have hopping channel carrier frequencies separated by a minimum of 25 kHz or the 20 dB bandwidth of the hopping channel, whichever is greater. Alternatively, frequency hopping systems operating in the 2400-2483.5 MHz band may have hopping channel carrier frequencies that are separated by 25 kHz or two-thirds of the 20 dB bandwidth of the hopping channel, whichever is greater, provided the systems operate with an output power no greater than 125 mW.
Test Method:	ANSI C63.10-2013, section 7.8.2
Anbotek Anbotek Dtek Anbotek Anbotek Anbotek Anbotek	<ul> <li>The EUT shall have its hopping function enabled. Use the following spectrum analyzer settings:</li> <li>a) Span: Wide enough to capture the peaks of two adjacent channels.</li> <li>b) 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.</li> <li>c) Video (or average) bandwidth (VBW) ≥ RBW.</li> </ul>
Procedure:	d) Sweep: Auto.
Anbotek Anbotel	<ul><li>e) Detector function: Peak.</li><li>f) Trace: Max hold.</li><li>g) Allow the trace to stabilize.</li></ul>
nbotek Anbotek Anbotek Anbotek Anbotek Anbotek Anbotek	Use the marker-delta function to determine the separation between the peaks of the adjacent channels. Compliance of an EUT with the appropriate regulatory limit shall be determined. A plot of the data shall be included in the test report.

## 6.1. EUT Operation

Operating Envi	ronment:	Anbe	nbotek	Anbore	Der.	hotek	Anboten	Anos
Test mode:	with GFSI 4: TX-π/4	SK (Hopping): I K modulation,. -DQPSK (Hopp with π/4 DQPS	oing): Keep	the EUT ir	hotek		Pu. (	otek on

## 6.2. Test Setup

Anbotek	Anbotek	EUT	Spectro	um Analyzer	N.		Anbore
ak Anbore,	And Andotek	Anbo.	p	Anbote.	Ann	And	Anb

## 6.3. Test Data

Temperature:	26.3 °C	Humidity:	51 % motor	Atmospheric Pi	ressure:	101 kPa
~0 <sup>7</sup> 0	the second se	70, 75	P	~0 <sup>1</sup> ~	DU.	7.9 4

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## 7. Number of Hopping Frequencies

Test Requirement:	47 CFR 15.247(a)(1)(iii)
Test Limit:	Refer to 47 CFR 15.247(a)(1)(iii), Fequency hopping systems in the 2400- 2483.5 MHz band shall use at least 15 channels. The average time of occupancy on any channel shall not be greater than 0.4 seconds within a period of 0.4 seconds multiplied by the number of hopping channels employed. Frequency hopping systems may avoid or suppress transmissions on a particular hopping frequency provided that a minimum of 15 channels are used.
Test Method:	ANSI C63.10-2013, section 7.8.3
Procedure:	<ul> <li>The EUT shall have its hopping function enabled. Use the following spectrum analyzer settings:</li> <li>a) 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.</li> <li>b) 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.</li> <li>c) VBW ≥ RBW.</li> <li>d) Sweep: Auto.</li> <li>e) Detector function: Peak.</li> </ul>
tek Anbotek Anb hootek Anbotek A Anbotek Anbotek A	<ul> <li>f) Trace: Max hold.</li> <li>g) Allow the trace to stabilize.</li> <li>It might prove necessary to break the span up into subranges to show clearly all of the hopping frequencies. Compliance of an EUT with the appropriate regulatory limit shall be determined for the number of hopping channels. A plot of the data shall be included in the test report.</li> </ul>

## 7.1. EUT Operation

Operating Envir	onment:	Ant	nbotek	Anbo	h. botek	Anbor
Test mode:	3: TX-GFSK (Hopping with GFSK modulatio 4: TX- $\pi$ /4-DQPSK (H (hopping) with $\pi$ /4 DC	n,. opping): Keep the	EUT in con	ek abott	Anbor	

## 7.2. Test Setup

		Anbo.	EUT	6.07	Spectrum A	nalvzer			Anbote
eK.					Opeotrain	indiy201			Ant
otek	Anbote	Ann	otek pr	botek Ar	100. N		Anbore	Ant	

## 7.3. Test Data

Temp	erature:	26.3 °C	Humidity:	51 %	A vete	Atmospheric Press	ure:	101 kPa	F
10 m	NL.	1001	011.	*05	100	r	1001	DI.	

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## FCC ID: 2BBY9-SI-2191

## 8. Dwell Time

And the set	Antonio Anto botek Ando k nek Moore
Test Requirement:	47 CFR 15.247(a)(1)(iii)
Test Limit:	Refer to 47 CFR 15.247(a)(1)(iii), Fequency hopping systems in the 2400-2483.5 MHz band shall use at least 15 channels. The average time of occupancy on any channel shall not be greater than 0.4 seconds within a period of 0.4 seconds multiplied by the number of hopping channels employed. Frequency hopping systems may avoid or suppress transmissions on a particular hopping frequency provided that a minimum of 15 channels are used.
Test Method:	ANSI C63.10-2013, section 7.8.4
Procedure: Amborek	The EUT shall have its hopping function enabled. Use the following spectrum analyzer settings: a) Span: Zero span, centered on a hopping channel. b) RBW shall be <= channel spacing and where possible RBW should be set >> 1 / T, where T is the expected dwell time per channel. c) 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. d) Detector function: Peak. e) Trace: Max hold. Use the marker-delta function to determine the transmit time per hop. If this value varies with different modes of operation (data rate, modulation format, number of hopping channels, etc.), then repeat this test for each variation in transmit time. 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, using the following equation: (Number of hops in the period specified in the requirements) = (number of hops in the period specified in the requirements) = (number of hops in the period specified in the requirements / analyzer sweep time) 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. If the number of hops in a specific time varies with different modes of operation (data rate, modulation format, number of hops in a specific time varies with different modes of operation (data rate, modulation format, number of hops in the period specified in the requirements. If the number of hops in the period specified in the requirements. If the number of hops in a specific time varies with different modes of operatio
poter Anboy A.	The measured transmit time and time between hops shall be consistent with the values described in the operational description for the EUT.

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Anbo

#### 8.1. EUT Operation

Test mode:	4: TX-π/4-DQP (hopping) with t		JT in continuc	ously transmit	ting mode
8.2. Test Se	etup		Anbotek		

#### 8.2. Test Setup

EUT	Spectrum Analy	zer
-100°-	V oter	Anv.

Anbo

#### 8.3. Test Data

012	DUN		xet I	nobo.		hold Put	1	
Tempera	ature:	26.3 °C		Humidity:	51 %	Atmospheric Pressure:	101 kPa	

Anbote

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## 9. Emissions in non-restricted frequency bands

Test Requirement:	47 CFR 15.247(d), 15.209, 15.205
Test Limit: Anborek Anborek Test Limit: Anborek Anborek Anborek Anborek Anborek	Refer to 47 CFR 15.247(d), In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under paragraph (b)(3) of this section, the attenuation required under this paragraph shall be 30 dB instead of 20 dB. Attenuation below the general limits specified in § 15.209(a) is not required.
Test Method:	ANSI C63.10-2013 section 7.8.8
Procedure:	Conducted spurious emissions shall be measured for the transmit frequency, per 5.5 and 5.6, and at the maximum transmit powers. Connect the primary antenna port through an attenuator to the spectrum analyzer input; in the results, account for all losses between the unlicensed wireless device output and the spectrum analyzer. The instrument shall span 30 MHz to 10 times the operating frequency in GHz, with a resolution bandwidth of 100 kHz, video bandwidth of 300 kHz, and a coupled sweep time with a peak detector. The band 30 MHz to the highest frequency may be split into smaller spans, as long as the entire spectrum is covered.

## 9.1. EUT Operation

Operating Envi	ronment: Anton Antone Another Another Another Another Another Another
Test mode:	<ol> <li>TX-GFSK (Non-Hopping): Keep the EUT in continuously transmitting mode (non-hopping) with GFSK modulation.</li> <li>TX-π/4-DQPSK (Non-Hopping): Keep the EUT in continuously transmitting mode (non-hopping) with π/4 DQPSK modulation.</li> <li>TX-GFSK (Hopping): Keep the EUT in continuously transmitting mode (hopping) with GFSK modulation,.</li> <li>TX-π/4-DQPSK (Hopping): Keep the EUT in continuously transmitting mode (hopping) with GFSK modulation,.</li> </ol>

#### 9.2. Test Setup

o <sup>te</sup>		nbot	UT	Spectrum A	nalyzer	Anbotek Anbo
n!	9.3. Test Dat	aotek Anborek	An- Anbotek	Anbotek	Anbotek Anbotek Anbotek	Anbotek Ar
[	Temperature:	26.3 °C	Humidity:	51 % Moore	Atmospheric Pressure	: 101 kPa

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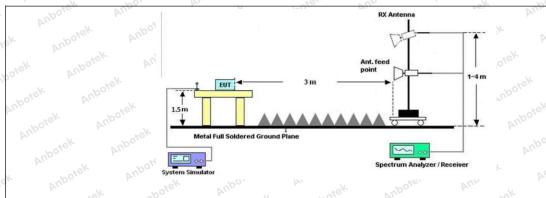
## 10. Band edge emissions (Radiated)

Test Requirement:	restricted bands, as defined	In addition, radiated emissions d in § 15.205(a), must also comp ecified in § 15.209(a)(see § 15.2	ly with the wo					
k Anbotek Anbot	Frequency (MHz)	Field strength (microvolts/meter)	Measurement distance (meters)					
h. stek	0.009-0.490	2400/F(kHz)	300 000					
aboten Anbo	0.490-1.705	24000/F(kHz)	30 Lotek					
arek anboten	1.705-30.0	30° pri dek abo	30 400					
Anbo. K. M. otek	30-88	100 **	3 et noore					
aboten Anbe	88-216	150 ** Notes N	3					
Arr. stek anbote	216-960	200 **	3 boten And					
Anbo. A.	Above 960	500 hotek Antoo	3 dek no					
Test Limit: ** Except as provided in paragraph (g), fundamental emissions from intentional radiators operating under this section shall not be located in the frequency bands 54-72 MHz, 76-88 MHz, 174-216 MHz or 470-806 MHz. However, operation within these frequency bands is permitted under other sections of this part, e.g., §§ 15.231 and 15.241. In the emission table above, the tighter limit applies at the band edges. The emission limits shown in the above table are based on measurements employing a CISPR quasi-peak detector except for the frequency bands 9– 90 kHz, 110–490 kHz and above 1000 MHz. Radiated emission limits in these three bands are based on measurements employing an average detector.								
Test Method:	ANSI C63.10-2013 section	6.10						
Procedure:	ANSI C63.10-2013 section	6.10.5.2	otek Anboten					

## 10.1. EUT Operation

Operating Envir	ronment:	Anbo.	A. botek	Anbote.	Anthotek	Anbotek	Aupo
Test mode:	hopping) with 2: TX-π/4-D0	h GFSK mo QPSK (Non-	dulation.	ep the EUT	tinuously trans in continuously	And	. No.

## 10.2. Test Setup



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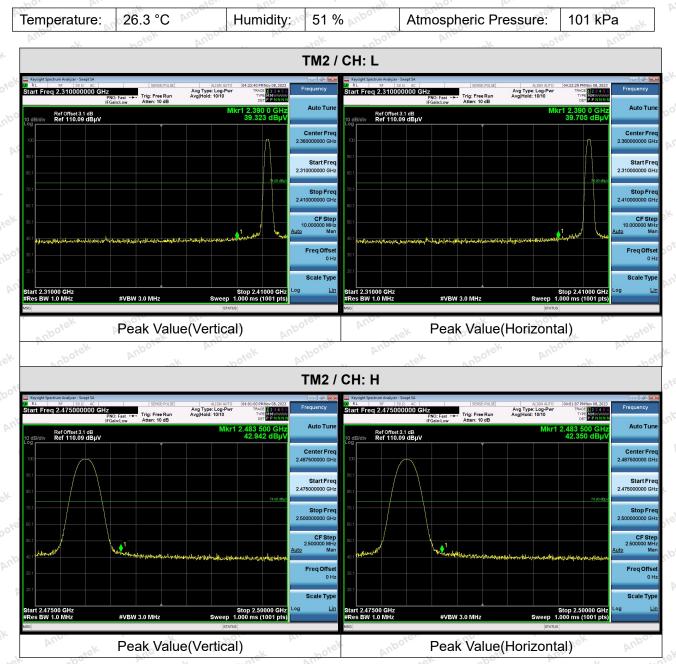
Address:1/F.,Building D,Sogood Science and Technology Park, Sanwei Community, Hangcheng Street, Bao'an District, Shenzhen, Guangdong, China. Tel:(86)0755–26066440 Fax:(86)0755–26014772 Email:service@anbotek.com



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## 10.3. Test Data



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Average: Average Peak Value Limit Test Mode DCCF Value Polarization Verdict (dBuV/m) (dBuV/m) (dBuV/m) 39.323 -2.23 54.00 37.090 Vertical Pass TM2 / CH: L 39.705 -2.23 37.472 54.00 Horizontal Pass 42.942 -2.23 40.709 54.00 Vertical Pass TM2 / CH: H 42.350 -2.23 Horizontal Pass 40.117 54.00

#### Remark:

- 1. During the test, pre-scan all modes, the report only record the worse case mode.
- 2. DCCF=20log(Duty Cycle)
- 3. Average Value=Peak Value+DCCF

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## 11. Emissions in frequency bands (below 1GHz)

Test Requirement:	restricted bands, as defined	, In addition, radiated emissions d in § 15.205(a), must also comp ecified in § 15.209(a)(see § 15.2	ly with the wo					
Anbotek Anbotek Anbon	Frequency (MHz)	Field strength (microvolts/meter)	Measurement distance (meters)					
h h he	0.009-0.490	2400/F(kHz)	300 000					
aboten Ande	0.490-1.705	24000/F(kHz)	30					
atek anboten	1.705-30.0	30° pri stek noo	30 400					
	30-88	100 **	3 rek notore					
aboten Anbe	88-216	150 **	3					
Ar. stek unbote	216-960	200 **	3 bote And					
Andor	Above 960	500 boten Anbo	3 dek anb					
Test Limit: ** Except as provided in paragraph (g), fundamental emissions from intentional radiators operating under this section shall not be located in the frequency bands 54-72 MHz, 76-88 MHz, 174-216 MHz or 470-806 MHz. However, operation within these frequency bands is permitted under other sections of this part, e.g., §§ 15.231 and 15.241. In the emission table above, the tighter limit applies at the band edges. The emission limits shown in the above table are based on measurements employing a CISPR quasi-peak detector except for the frequency bands 9– 90 kHz, 110–490 kHz and above 1000 MHz. Radiated emission limits in these three bands are based on measurements employing an average detector.								
Test Method:	ANSI C63.10-2013 section	6.6.4						
Procedure:	ANSI C63.10-2013 section	6.6.4 And	otek Anboten					
procedurer Anbore		And Ant Ant	or Am					

## 11.1. EUT Operation

Operating Envi	ronment:	Anbo.	p. botek	Anbore.	Antotek	Anbotek	Aupo
Test mode:	hopping) with 2: TX-π/4-DC	n GFSK moo QPSK (Non-I	lulation.	p the EUT i	inuously transı n continuously	Ant	. No.

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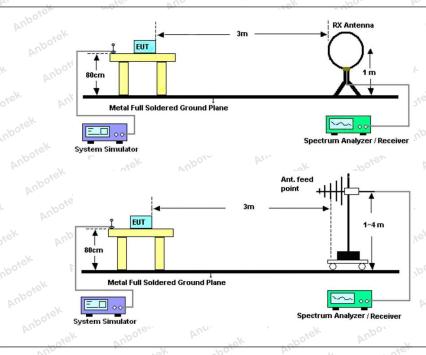
Address:1/F.,Building D,Sogood Science and Technology Park, Sanwei Community, Hangcheng Street, Bao'an District, Shenzhen, Guangdong, China. Tel:(86)0755–26066440 Fax:(86)0755–26014772 Email:service@anbotek.com





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## 11.2. Test Setup



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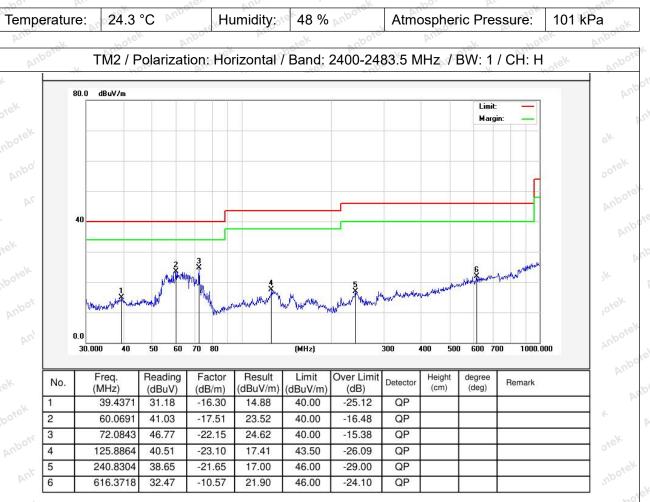
Address:1/F.,Building D,Sogood Science and Technology Park, Sanwei Community, Hangcheng Street, Bao'an District, Shenzhen, Guangdong, China. Tel:(86)0755–26066440 Fax:(86)0755–26014772 Email:service@anbotek.com



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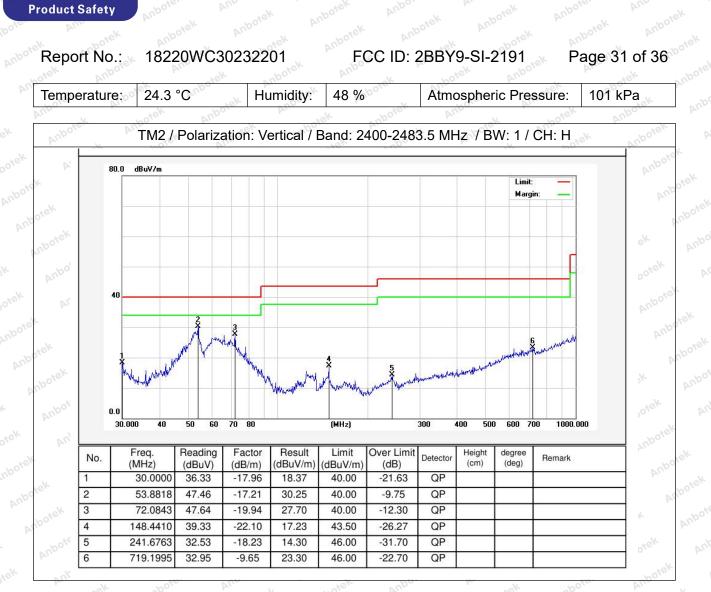
#### 11.3. Test Data



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Note:Only record the worst data in the report.

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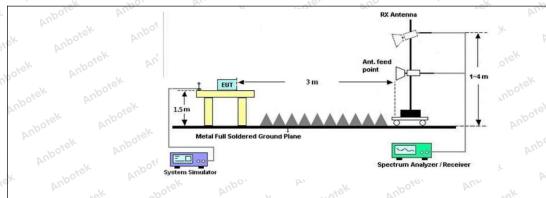
## 12. Emissions in frequency bands (above 1GHz)

priver Anboren	In addition, radiated emissi	ons which fall in the restricted ba	ands, as defined					
Test Requirement:	in § 15.205(a), must also co in § 15.209(a)(see § 15.205	omply with the radiated emission	ı limits specified					
K Anbotek Anbot	Frequency (MHz)	Field strength (microvolts/meter)	Measurement distance (meters)					
o. protek	0.009-0.490	2400/F(kHz)	300 000					
nboten Anbo	0.490-1.705	24000/F(kHz)	30 otek					
a otek anbote	1.705-30.0	30° http://www.atek	30 An					
Anbo K hotek	30-88	100 **	3 ek Anbore					
Anboten Anu	88-216	150 **	3 rel					
k hotek Anbore	216-960	200 **	3 bote And					
- Anor K	Above 960	500 Anborek Anbor	3 wotek phot					
Test Limit: ore hopered	** Except as provided in paragraph (g), fundamental emissions from intentional radiators operating under this section shall not be located in the frequency bands 54-72 MHz, 76-88 MHz, 174-216 MHz or 470-806 MHz. However, operation within these frequency bands is permitted under other sections of this part, e.g., §§ 15.231 and 15.241. In the emission table above, the tighter limit applies at the band edges. The emission limits shown in the above table are based on measurements employing a CISPR quasi-peak detector except for the frequency bands 9– 90 kHz, 110–490 kHz and above 1000 MHz. Radiated emission limits in these three bands are based on measurements employing an average detector.							
Test Method:	ANSI C63.10-2013 section	6.6.4	ak Anbore					
Procedure:	ANSI C63.10-2013 section	6.6.4 otek Anbor An	otek Anboten					
hoto Ant	tek nbo	r white An	N95					

## 12.1. EUT Operation

6	Operating Envir	onment:	Anbo.	A. botek	Anbore.	And	Anbotek	Anbo
2 2	Test mode:	hopping) with 2: TX-π/4-D0	n GFSK mo QPSK (Non	dulation.	ep the EUT ir	inuously transr n continuously	Anu	N

## 12.2. Test Setup



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#### 12.3. Test Data

Temperature:	24.3 °C	Humidity:	48 %	Atmospheric Pressure:	101 kPa
20r	de Her	0. N.	No. No.	NGP .	ek soo.

		-	TM2 / CH: L					
Peak value:								
Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Over Limit (dB)	polarization		
4804.00	28.62	15.27	43.89	74.00	-30.11	Vertical		
7206.00	29.53	18.09	47.62	74.00	-26.38	Vertical		
9608.00	30.85	23.76	54.61	74.00	-19.39	Vertical		
12010.00	Anbotet * Ar	in sek	botek Anb	74.00	otek Anbote	Vertical		
14412.00	anbo*ek	Anbo	notek p	74.00	atek ant	Vertical		
4804.00	28.87	15.27	44.14	74.00	-29.86	Horizontal		
7206.00	30.24	18.09	48.33	74.00	-25.67	Horizontal		
9608.00	28.86	23.76	52.62	74.00	-21.38	Horizontal		
12010.00	potek * Anbo	ak ho	rek Anbote	74.00	L nbotek	Horizontal		
14412.00	botek* An	poto Ann	atek anbo	74.00 <sup>100</sup>	alt bote	Horizontal		

#### Average value:

Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Over Limit (dB)	polarization
4804.00	18.00	15.27	33.27	54.00	-20.73	Vertical
7206.00	18.56	18.09	36.65	54.00	-17.35	Vertical
9608.00	19.87	23.76	43.63	54.00	-10.37	Vertical
12010.00	notet.	Anboten An		o <sup>ve</sup> 54.00 p <sup>000</sup>	-ye - >e	Vertical o
14412.00	And *	nbotek	Anbo, Ar	54.00	bote. And	Vertical
4804.00	17.22	15.27	32.49	54.00	-21.51	Horizontal
7206.00	19.30	18.09	37.39	54.00	-16.61	Horizontal
9608.00	18.17 pore	23.76	41.93	54.00	-12.07	Horizontal
12010.00	tek *	otek Anbor	ak not	54.00	Ann	Horizontal
14412.00	August August	botek Ant	ore And	54.00 NO	ek Anbo.	Horizontal
		Clark Contraction of the Clark Contraction of	10.		N	10 011

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J. Hotline of 400-003-0500 www.anbotek.com.cn



		1	ГМ2 / СН: М			
Peak value:						
Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Over Limit (dB)	polarization
4882.00	28.64	15.42	44.06	74.00	-29.94 ·····	Vertical
7323.00	29.38	18.02	47.40	74.00	-26.60	Vertical
9764.00	29.86	23.80	53.66	74.00	-20.34	Vertical
12205.00	ek * spotek	Anbor	Anotek	74.00	And	Vertical
14646.00	* ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~	tek Anbore	Ann	74.00	Anbo	Vertical
4882.00	28.57	15.42	43.99	74.00	-30.01	Horizontal
7323.00	30.23	18.02	48.25	74.00	-25.75	Horizontal
9764.00	28.56	23.80	52.36	74.00	-21.64	Horizontal
12205.00	* votek	Anboten	Ant	74.00	NUPOL PL.	Horizontal
14646.00	Alt atek	nbotek	Anbo	74.00	Anboro	Horizontal
Average value:						
Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Over Limit (dB)	polarization
4882.00	17.73	15.42	33.15	54.00	-20.85	Vertical
7323.00	18.66	18.02	36.68	54.00	-17.32	Vertical
9764.00	19.73	23.80	43.53	54.00	-10.47	Vertical
12205.00	k Anbore	An	Anboter	54.00	-botek	Vertical
14646.00	otek * Anbot	Anbe	ek abotek	54.00	All	Vertical
4882.00	17.13	o <sup>tek</sup> 15.42 Moo	32.55	54.00	-21.45	Horizontal
7323.00	18.86	18.02	36.88	54.00	-17.12	Horizontal
9764.00	18.68	23.80	42.48	54.00	ote -11.52 prof	Horizontal
12205.00	anbotek	And	abotek	54.00	in otek	Horizontal
0	100 A		D.V.	1. C.N.	/	V

#### Shenzhen Anbotek Compliance Laboratory Limited

14646.00

Address:1/F.,Building D,Sogood Science and Technology Park, Sanwei Community, Hangcheng Street, Bao'an District, Shenzhen, Guangdong, China. Tel:(86)0755–26066440 Fax:(86)0755–26014772 Email:service@anbotek.com

\*

Anb

Anbe

Hotline 400–003–0500 www.anbotek.com.cn

54.00



Horizontal

		-	ГМ2 / СН: Н			
Peak value:						
Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Over Limit (dB)	polarization
4960.00	28.91	15.58	44.49	74.00	otex-29.51 100	Vertical
7440.00	29.39	17.93	47.32	74.00	-26.68	Vertical
9920.00	30.41	23.83	54.24	74.00	-19.76	Vertical
12400.00	At wotek	Anbotet	Ano	74.00	Anbor	Vertical
14880.00	* And	ek nbotel	Anboi	74.00	Anboten	Vertical
4960.00	28.64	15.58	44.22	74.00	-29.78	Horizontal
7440.00	30.26	17.93	48.19	74.00	-25.81	Horizontal
9920.00	29.24	23.83	53.07	74.00	-20.93	Horizontal
12400.00	And *	obotek	Anbor	74.00	inboter Ant	Horizontal
14880.00	Pixou.	priotek	Anboten	74.00	abotek	Horizontal
Average value:					-	
Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Over Limit (dB)	polarization
4960.00	18.85	15.58	34.43	54.00	-19.57	Vertical
7440.00	19.67	17.93	37.60	54.00	-16.40 M	Vertical
9920.00	20.28	23.83	44.11	54.00	-9.89	Vertical
12400.00	* * obotek	Anbo	hotek	54.00	And	Vertical
14880.00	* *	AN ANDORE	Annatok	54.00	Anbo	Vertical
4960.00	18.57	15.58 NO	34.15	54.00	-19.85	Horizontal
7440.00	20.23	17.93	o <sup>tel</sup> 38.16	54.00	-15.84	Horizontal
9920.00	18.58	23.83	42.41	54.00 And	-11.59	Horizontal
10100.00	* . ek	borer	Ann	54.00	100. 101.	Horizontal
12400.00	boro	PIL	Anboten	0-04.00	Yo.	Tionzontai

#### Remark:

- 1. Result =Reading + Factor
- 2. "\*" means the test results were attenuated more than 20dB below the permissible limits, so the results don't record in the report.
- 3. Only the worst case is recorded in the report.

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## **APPENDIX I -- TEST SETUP PHOTOGRAPH**

Please refer to separated files Appendix I -- Test Setup Photograph\_RF

## APPENDIX II -- EXTERNAL PHOTOGRAPH

Please refer to separated files Appendix II -- External Photograph

## **APPENDIX III -- INTERNAL PHOTOGRAPH**

Please refer to separated files Appendix III -- Internal Photograph

----- End of Report ----

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