

# **TEST REPORT**

APPLICANT	: SamKnows Limited
PRODUCT NAME	: SamKnows Whitebox 8.0+
MODEL NAME	: SK-WB8+
BRAND NAME	: SamKnows
FCC ID	: 2AGPP-SKWB8V4
STANDARD(S)	: 47 CFR Part 15 Subpart C
RECEIPT DATE	: 2020-11-11
TEST DATE	: 2020-11-29 to 2020-12-29
ISSUE DATE	: 2022-06-13

Edited by:

Pong Mi

Peng Mi (Rapporteur)

Approved by: -Shen Junsheng (Supervisor)

**NOTE:** This document is issued by Shenzhen Morlab Communications Technology Co., Ltd., the test report shall not be reproduced except in full without prior written permission of the company. The test results apply only to the particular sample(s) tested and to the specific tests carried out which is available on request for validation and information confirmed at our website.



Shenzhen Morlab Communications Technology Co., Ltd. FL1-3, Building A, FeiYang Science Park, No.8 LongChang Road, Block67, BaoAn District, ShenZhen , GuangDong Province, P. R. China

 Tel: 86-755-36698555
 Fax: 86-755-36698525

 Http://www.morlab.cn
 E-mail: service@morlab.cn





# DIRECTORY

1. Technical Information 3
1.1. Applicant and Manufacturer Information 3
1.2. Equipment Under Test (EUT) Description 3
1.3. Modulation Type and Data Rate of EUT 5
1.4. The Channel Number and Frequency 6
1.5. Test Standards and Results 7
1.6. Environmental Conditions 8
2. 47 CFR Part 15C Requirements ······ 9
2.1. Antenna Requirement ······ 9
2.2. Duty Cycle of Test Signal ······10
2.3. Maximum Peak and Average Conducted Output Power14
2.4. Bandwidth······18
2.5. Conducted Spurious Emissions and Band Edge27
2.6. Power Spectral Density 40
2.7. Conducted Emission57
2.8. Restricted Frequency Bands ······61
2.9. Radiated Emission ······74
Annex A Test Uncertainty90
Annex B Testing Laboratory Information91

Change History							
Version	Version Date Reason for change						
1.0	2022-06-13	First edition					





# **1. Technical Information**

Note: Provide by applicant.

# **1.1. Applicant and Manufacturer Information**

Applicant:	SamKnows Limited
Applicant Address:	94 New Bond Street, London W1S 1SJ, United Kingdom
Manufacturer:	Taicang T & W Electronics Co., Ltd
Manufacturor Addross:	No. 89, Jiangnan Road, Loudong Street, Taicang, Jiangsu
Manufacturer Address.	Province 215412, P. R. China

# **1.2. Equipment Under Test (EUT) Description**

Product Name:	SamKnows Whitebox 8.0+			
Sample No.:	4#			
Hardware Version:	3			
Software Version:	20160115			
Modulation Technology:	DSSS, OFDM			
Modulation Type:	Refer to section1.3			
Operating Frequency Bange:	802.11b/g/ n (HT2	20): 2412MHz–2472MHz		
Operating Frequency Range.	802.11n (HT40): 2422MHz–2462MHz			
Antenna Type:	External Antenna			
Antenna Gain:	ANT 0: 5.00dBi; ANT 1: 5.00dBi			
Directional Gain:	8.01dBi <sub>Note 3</sub>			
	AC Adapter			
	Brand Name:	N/A		
	Model No.:	S24B72-120A200-0K		
Accessory Information:	Serial No.:	(N/A, marked #1 by test site)		
	Rated Output:	12V2A		
	Rated Input:	100-240V~50/60Hz, 0.8A		
	Manufacturer:	Shenzhen Gongjin Electronics Co., Ltd.		



**Note 1:** This test report is variant from the original report (Report No.: SZ20110143W01, FCC ID: 2AGPP-SKWB8V3), based on the similarity between before, o a second Wi-Fi(2.4G) chip needs to be added. The Wi-Fi(2.4G) chip is Pin-to-Pin and the supplier is the same to the before. New Wi-Fi(2.4G) chip's basic function is the same with old chip and no any change in radio parameters has occurred. Except for the above differences, their electrical circuit design, layout, components used and internal wiring are identical. The changes do not affect the results in this report.

**Note 2:** We use the dedicated software to control the EUT continuous transmission.

**Note 3:** The EUT has two antennas, only 802.11n modulation mode supports a MIMO function.

**Note 4:** According to KDB 662911 D01, the directional gain =  $G_{ANT}$  + 10log( $N_{ANT}$ ) dBi, where  $G_{ANT}$  is the maximum antenna gain in dBi,  $N_{ANT}$  is the number of outputs.

**Note 5:** For conducted test item Conducted Output Power and Power Spectral Density of each modulation mode, we recorded the test result of two antennas separately, for other conducted test items both of the two antennas were tested separately, we only recorded the worst test result (ANT 0) in this report.

**Note 6:** Radiation test items for all modulation operate at 2Tx mode during the test, only the worst test result(ANT0) was recorded in this report.

**Note 7:** For a more detailed description, please refer to Specification or User's Manual supplied by the applicant and/or manufacturer.





# **1.3. Modulation Type and Data Rate of EUT**

Modulation technology	Modulation Type	Data Rate (Mbps) Note1
	DBPSK	1
DSSS (802.11b)	DQPSK	2
	ССК	5.5/ 11
	BPSK	6 / 9
	QPSK	12 / 18
OFDIVI (802.11g)	16QAM	24 / 36
	64QAM	48 / 54
	BPSK	6.5
OFDM	QPSK	13/19.5
(802.11n (HT20))	16QAM	26/39
	64QAM	52/58.5/65
	BPSK	13.5
OFDM	QPSK	27/40.5
(802.11n (HT40))	16QAM	54/81/108
	64QAM	121.5/135

**Note1:** The worst-case mode (bold face) in all data rates has been determined during the pre-scan, only the test data of the worst-case were recorded in this report.





# 1.4. The Channel Number and Frequency

Test Mode	Channel	Frequency (MHz)	Channel	Frequency (MHz)
	1	2412	8	2447
	2	2417	9	2452
802.11b/g/ n	3	2422	10	2457
	4	2427	11	2462
(1120)	5	2432	12	2467
	6	2437	13	2472
	7	2442		
Test Mode	Channel	Frequency (MHz)	Channel	Frequency (MHz)
	3	2422	8	2447
	4	2427	9	2452
802.11n (HT40)	5	2432	10	2457
	6	2437	11	2462
	7	2442		

Note 1: The black bold channels were selected for test.





# 1.5. Test Standards and Results

The objective of the report is to perform testing according to 47 CFR Part 15 Subpart C for the EUT FCC ID Certification:

No	Identity	Document Title
1	47 CFR Part 15	Radio Frequency Devices

Test detailed items/section required by FCC rules and results are as below:

No.	Section	Description	Test Date Test Engineer		Result	Method Determination /Remark		
1	15.203	Antenna Requirement	N/A	N/A	PASS <sub>Note1</sub>	No deviation		
2	N/A	Duty Cycle of Test Signal	Dec 26, 2020	Ouyang Feng	PASS <sub>Note1</sub>	No deviation		
3	15.247(b)	Maximum Peak and Average Conducted Output Power	Dec 29, 2020	Ouyang Feng	PASS <sub>Note1</sub>	No deviation		
4	15.247(a)	Bandwidth	Dec 26, 2020	Ouyang Feng	PASS <sub>Note1</sub>	No deviation		
5	15.247(d)	Conducted Spurious Emission and Band Edge	Dec 24, 2020	Ouyang Feng	PASS <sub>Note1</sub>	No deviation		
6	15.247(e)	Power Spectral Density	Dec 24, 2020	Ouyang Feng	PASS <sub>Note1</sub>	No deviation		
7	15.207	Conducted Emission	Nov 29, 2020	Huang Zhiye	PASS <sub>Note1</sub>	No deviation		
8	15.247(d)	Restricted Frequency Bands	Dec 20, 2020	Gao Jianrou	PASS <sub>Note1</sub>	No deviation		
9	15.209, 15.247(d)	Radiated Emission	Nov 30&Dec 04&14, 2020	Gao Jianrou	PASS <sub>Note1</sub>	No deviation		
Note SZ22	<b>Note 1:</b> The test results of these test items in this report refer to the test report (Report No.: SZ22110143W01).							

Note 2: The tests were performed according to the method of measurements prescribed in



Fax: 86-755-36698525 E-mail: service@morlab.cn



ANSIC63.10-2013, KDB558074 D01 v05r02.

**Note 3:** The path loss during the RF test is calibrated to correct the results by the offset setting in the test equipments. The ref offset 12dB contains two parts that cable loss 2dB and Attenuator 10dB.

**Note 4:** Additions to, deviation, or exclusions from the method shall be judged in the "method determination" column of add, deviate or exclude from the specific method shall be explained in the "Remark" of the above table.

**Note 5:** When the test result is a critical value, we will use the measurement uncertainty give the judgment result based on the 95% confidence intervals.

# 1.6. Environmental Conditions

During the measurement, the environmental conditions were within the listed ranges:

Temperature (°C):	15-35
Relative Humidity (%):	30-60
Atmospheric Pressure (kPa):	86-106





# 2.47 CFR Part 15C Requirements

# 2.1. Antenna Requirement

# 2.1.1. Applicable Standard

According to FCC 15.203, an intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the provisions of this section.

# 2.1.2. Test Result: Compliant

The EUT has a permanently and irreplaceable attached antenna. Please refer to the EUT internal photos.





# 2.2. Duty Cycle of Test Signal

# 2.2.1. Requirement

Preferably, all measurements of maximum conducted (average) output power will be performed with the EUT transmitting continuously (i.e., with a duty cycle of greater than or equal to 98%). When continuous operation cannot be realized, then the use of sweep triggering/signal gating techniques can be used to ensure that measurements are made only during transmissions at the maximum power control level. Such sweep triggering/signal gating techniques will require knowledge of the minimum transmission duration (T) over which the transmitter is on and is transmitting at its maximum power control level for the tested mode of operation. Sweep triggering/signal gating techniques can be set such that it does not exceed T at any time that data are being acquired (i.e., no transmitter OFF-time is to be considered).

When continuous transmission cannot be achieved and sweep triggering/signal gating cannot be implemented, alternative procedures are provided that can be used to measure the average power; however, they will require an additional measurement of the transmitter duty cycle (D). Within this subclause, the duty cycle refers to the fraction of time over which the transmitter is ON and is transmitting at its maximum power control level. The duty cycle is considered to be constant if variations are less than ±2%; otherwise, the duty cycle is considered to be nonconstant.

# 2.2.2. Test Description

# Test Setup:



ANSI C63.10 2013 Clause 11.6 was used in order to prove compliance.





# 2.2.3. Test Result

# A. Test Verdict:

Tost Modo	Duty Cycle (%)	Duty Factor
	(D)	(10*lg[1/D])
802.11b	87.80	0.57
802.11g	87.80	0.57
802.11n (HT20)	86.54	0.63
802.11n (HT40)	76.55	1.16

#### **B. Test Plot:**



(Channel 1, 802.11b)



Fax: 86-755-36698525

E-mail: service@morlab.cn



11.0	RF 50 Q DC		SENSE	INT	ALIGN AUTO	05:30:02 AM	Dec 27, 2020	and the second second
/erage/H	old Number 1	00		Avg	ype: Log-Pwr	TRACE	123456	Meas Setup
		PNO: Fast IFGain:Low	Atten: 40 d	B		DET	PNNNN	
	Pof Offeat 125 dB				Δ	Mkr3 1.	640 ms	Avg/Hold Null
dB/div	Ref 35.00 dBm					0	.01 dB	
	ne many frida	menter of	1	3∆1 	a producer and a second	ma parte	whentstephen	Avg Typ Log-Pwr (Video)
00								Auto
00			_					
0								Limits
0 84		4W	-	M.	w.	114		
5.Q								N dB Poin
10								-3.01 c
								-
enter 2.41	2000000 GHz	VB			Sugar 1	Sp 00 mg (1	an 0 Hz	PhNoise O
S DW 6	201	VD.	W 0.0 WINZ	FLUCTION	Sweep n	0.00 ms (1	oor prs)	Auto Ma
I N 1	t X	3.640 ms	24.74 dBn	PONCTION	FUNCTION WIDTH	FUNCTION	VALUE	
	t (Δ)	1.440 ms (	Δ) -0.75 dE	3				ADC Dithe
		1.040 11.5 [	0,010					Auto Ma
6								Mo
								1 of
							-	1 of

# (Channel 1, 802.11g)



# (Channel 1, 802.11n (HT20))

MORLAB



PNO: Fast IFGain:Low	Atten: 40 dB	n Avg	Type: Log-Pwr	TRACE 1 2 3 4 5 TYPE W	Ava/Hold Nun	
12.5 dB ) dBm				∆Mkr3 870.0 µs -0.43 dB	100	
uan produceration	n ghuemie	<sup>2Δ1</sup> 3Δ1	monen je	pusetimulionae discu	Avg Typ Log-Pwr (Video) <u>Auto</u> Ma	
new	www.	ntu			Limits	
					N dB Point -3.01 d On <u>C</u>	
GHz VBI	W 8.0 MHz	FUNCTION	Sweep 5	Span 0 Hz .000 ms (1001 pts)	PhNoise O Fast Tuning Auto Ma	
2.150 ms 660.0 μs (ג 870.0 μs (ג	11.79 dBm Δ) 5.58 dB Δ) -0.43 dB				ADC Dithe Medium Auto Ma	
					Mor 1 of	
	GHz VB1	IFGain:Low         Atten: 40 dB           2.5 dB dBm	IFGain:Low         Atten: 40 dB           2.5 dB dBm         2.01 341           LW         maximum (phratering from (phrater	IFGain:Low Atten: 40 dB       2.5 dB       dBm       Lyn matematication (hatten attended)       matematication (hattended)       Atten: 40 dB       Lyn matematication (hattended)       hatten: 40 dB       Lyn matematication (hattended)       hatten: 40 dB       Lyn matematication (hattended)       hatten: 40 dB       Lyn matematication (hattended)       hattended)       GHz       VBW 8.0 MHz       Sweep 5       X     Y       FUNCTION WOTH       Atten: 40 dB       Sweep 5       X     Y       FUNCTION WOTH       Atten: 40 dB       Sweep 5       X     Y       FUNCTION WOTH       Atten: 40 dB       Atten: 40 dB <td colspan<="" td=""><td>IFGain:Low         Atten: 40 dB         ΔMIkr3 870.0 μs           2.5 dB         -0.43 dB         -0.43 dB           Lun         -0.43 dB         -0.43 dB</td></td>	<td>IFGain:Low         Atten: 40 dB         ΔMIkr3 870.0 μs           2.5 dB         -0.43 dB         -0.43 dB           Lun         -0.43 dB         -0.43 dB</td>	IFGain:Low         Atten: 40 dB         ΔMIkr3 870.0 μs           2.5 dB         -0.43 dB         -0.43 dB           Lun         -0.43 dB         -0.43 dB

(Channel 3, 802.11n (HT40))



Shenzhen Morlab Communications Technology Co., Ltd. FL1-3, Building A, FeiYang Science Park, No.8 LongChang Road, Block67, BaoAn District, ShenZhen , GuangDong Province, P. R. China

Tel: 86-755-36698555 Fax: 86-755-36698525 Http://www.morlab.cn E-mail: service@morlab.cn

Page 13 of 93





# 2.3. Maximum Peak and Average Conducted Output Power

# 2.3.1. Requirement

According to FCC section 15.247(b)(3), For systems using digital modulation in the 902-928 MHz, 2400-2483.5 MHz, and 5725-5850 MHz bands: The maximum peak conducted output power of the intentional radiator shall not exceed1 Watt.

# 2.3.2. Test Description

The measured output power was calculated by the reading of the USB Wideband Power Sensor and calibration.

#### Test Setup:



The EUT (Equipment under the test) which is coupled to the USB Wideband Power Sensor; the RF load attached to the EUT antenna terminal is 500hm; the path loss as the factor is calibrated to correct the reading.





# 2.3.3. Test Result

# Maximum Peak Conducted Output Power

#### 802.11b Mode

Channel Frequency		Measured	Limit					
	ANT 0		ANT 1		(dBm)		Verdict	
	(IVITZ)	dBm	W	dBm	W	dBm	W	
1	2412	22.99	0.199	21.23	0.133			PASS
7	2442	22.47	0.177	20.25	0.106	30	1	PASS
13	2472	22.54	0.179	19.18	0.083			PASS

# 802.11g Mode

Channel Frequency		Measured	Limit					
	ANT 0		ANT 1		(dBm)		Verdict	
	(101112)	dBm	W	dBm	W	dBm	W	
1	2412	25.57	0.361	25.00	0.316			PASS
7	2442	25.57	0.361	24.75	0.299	30	1	PASS
13	2472	25.25	0.335	24.39	0.275			PASS

# 802.11n (HT20) Mode

Channel Frequency		Measur	ed Peak	Total	Total	Lin	sit	
		Power	(dBm)	Power	Power	LIIIII		Verdict
	(IVI⊓∠)	ANT 0	ANT 1	(dBm)	(W)	dBm	W	
1	2412	25.30	24.50	27.93	0.621			PASS
7	2442	25.39	24.51	27.98	0.628	27.99	0.63	PASS
13	2472	25.14	24.22	27.72	0.591			PASS
<b>Note:</b> Directional gain = 5.00dBi +10log(2) = 8.01dBi>6dBi, so the power limit shall be reduced								
to 30-(8.01-6)=27.99dBm.								

# 802.11n (HT40) Mode

Frequency		Measured Peak		Total	Total	Lin	ait	
Channel		Power (dBm)		Power	Power			Verdict
	(IVITZ)	ANT 0	ANT 1	(dBm)	(W)	dBm	W	
3	2422	24.30	23.59	26.97	0.498			PASS
7	2442	24.46	23.37	26.96	0.497	27.99	0.63	PASS
11	2462	24.38	23.23	26.86	0.485			PASS
Note: Dir	ectional gain	= 5.00dBi +	10log(2) = 8.	01dBi>6dBi	, so the powe	r limit sh	all be r	educed
to 30-(8.01-6)=27.99dBm.								



Fax: 86-755-36698525



# Maximum Average Conducted Output Power

# 802.11b Mode

		Average Power								
Frequency	Meas	sured	Duty	Du	ity Factor	r Calcula	ted	Lin	nit	Verdic
(MHz)	ANT0	ANT1	Eactor	AN	IT0	AN	IT1			t
	dBm	dBm	Facior	dBm	W	dBm	W	dBm	W	
2412	20.06	17.97		20.63	0.116	18.54	0.071			PASS
2442	19.33	16.82	0.57	19.90	0.098	17.39	0.055	30	1	PASS
2472	19.28	15.85		19.85	0.097	16.42	0.044			PASS

# 802.11g Mode

	Average Power									
Frequency	Meas	sured	Duty	Du	ty Factor	<sup>-</sup> Calcula	ted	Limit		Verdic
(MHz)	ANT0	ANT1	Easter	AN	IT0	AN	IT1			t
	dBm	dBm	Facior	dBm	W	dBm	W	dBm	W	
2412	19.08	17.21		19.65	0.092	17.78	0.060			PASS
2442	18.45	16.34	0.57	19.02	0.080	16.91	0.049	30	1	PASS
2472	18.68	15.38		19.25	0.084	15.95	0.039			PASS

#### 802.11n (HT20) Mode

			Avera	ge Power				
Frequency	Meas	Measured		n Duty Eactor	Lin	nit	Vordict	
(MHz)	ANT0	ANT1	Eactor		T Duty Factor			veruici
	dBm	dBm	Facior	dBm	W	dBm	W	
2412	18.48	16.77		21.34	0.136			PASS
2442	18.36	15.55	0.63	20.83	0.121	27.99	0.63	PASS
2472	18.47	14.77		20.64	0.116			PASS
Note: Direct	ional gain	= 5.00dB	i +10log(2	2) = 8.01dBi>6dE	Bi, so the powe	r limit sha	II be re	duced to
30-(8.01-6)=	27.99dBm	۱.						





# 802.11n (HT40) Mode

			Avera	ige Power				
Frequency	Meas	ured	Duti	Total Dowar with	- Duty Footor	Limit		Vordiot
(MHz)	ANT0	ANT1	Easter		Iotal Power with Duty Factor			verdict
	dBm	dBm	Гасіог	dBm	W	dBm	W	
2412	17.66	16.17		21.14	0.130			PASS
2442	17.58	15.21	1.16	20.72	0.118	27.99	0.63	PASS
2462	17.48	15.09		20.61	0.115			PASS
Note: Direct	Note: Directional gain = 5.00dBi +10log(2) = 8.01dBi>6dBi, so the power limit shall be reduced to							
30-(8.01-6)=	6)=27.99dBm							



Shenzhen Morlab Communications Technology Co., Ltd. FL1-3, Building A, FeiYang Science Park, No.8 LongChang Road, Block67, BaoAn District, ShenZhen , GuangDong Province, P. R. China

Tel: 86-755-36698555 Fax: 86 Http://www.morlab.cn E-mail:

Fax: 86-755-36698525

E-mail: service@morlab.cn



# 2.4.1. Requirement

According to FCC section 15.247(a) (2), Systems using digital modulation techniques may operate in the 902 - 928 MHz, 2400 - 2483.5 MHz, and 5725 - 5850 MHz bands. The minimum 6 dB bandwidth shall be at least 500 kHz.

# 2.4.2. Test Description

#### Test Setup:



The EUT is coupled to the Spectrum Analyzer; the RF load attached to the EUT antenna terminal is 500hm; the path loss as the factor is calibrated to correct the reading.

Make the measurement with the spectrum analyzer's resolution bandwidth (RBW) = 100 kHz. In order to make an accurate measurement, set the span greater than RBW.

#### 2.4.3. Test Procedure

KDB 558074 Section 8.2 was used in order to prove compliance.





# 2.4.4. Test Result

#### 802.11b Mode

#### A. Test Verdict:

Channel	Frequency (MHz)	6 dB Bandwidth (MHz)	Limits(kHz)	Result
1	2412	9.554	≥500	PASS
7	2442	9.108	≥500	PASS
13	2472	9.566	≥500	PASS

#### **B. Test Plot:**



(Channel 1, 802.11b)



Shenzhen Morlab Communications Technology Co., Ltd. FL1-3, Building A, FeiYang Science Park, No.8 LongChang Road, Block67, BaoAn District, ShenZhen , GuangDong Province, P. R. China Tel: 86-755-36698555 Http://www.morlab.cn E-mail: service@morlab.cn

Fax: 86-755-36698525





#### (Channel 7, 802.11b)



#### (Channel 13, 802.11b)



Shenzhen Morlab Communications Technology Co., Ltd. FL1-3, Building A, FeiYang Science Park, No.8 LongChang Road, Block67, BaoAn District, ShenZhen , GuangDong Province, P. R. China Tel: 86-755-36698555 Http://www.morlab.cn Fax: 86-755-36698525 E-mail: service@morlab.cn



# 802.11g Mode

#### A. Test Verdict:

Channel	Frequency (MHz)	6 dB Bandwidth (MHz)	Limits(kHz)	Result
1	2412	15.10	≥500	PASS
7	2442	15.34	≥500	PASS
13	2472	15.79	≥500	PASS

# **B. Test Plot:**



# (Channel 1, 802.11g)







#### (Channel 7, 802.11g)



#### (Channel 13, 802.11g)



Shenzhen Morlab Communications Technology Co., Ltd. FL1-3, Building A, FeiYang Science Park, No.8 LongChang Road, Block67, BaoAn District, ShenZhen , GuangDong Province, P. R. China Tel: 86-755-36698555 Http://www.morlab.cn Fax: 86-755-36698525

E-mail: service@morlab.cn



# 802.11n (HT20) Mode

#### A. Test Verdict:

Channel	Frequency (MHz)	6 dB Bandwidth (MHz)	Limits(kHz)	Result
1	2412	15.12	≥500	PASS
7	2442	14.08	≥500	PASS
13	2472	15.94	≥500	PASS

# **B. Test Plot:**



(Channel 1, 802.11n (HT20))







# (Channel 7, 802.11n (HT20))



#### (Channel 13, 802.11n (HT20))



Shenzhen Morlab Communications Technology Co., Ltd. FL1-3, Building A, FeiYang Science Park, No.8 LongChang Road, Block67, BaoAn District, ShenZhen , GuangDong Province, P. R. China Tel: 86-755-36698555 Http://www.morlab.cn Fax: 86-755-36698525 E-mail: service@morlab.cn



# 802.11n (HT40) Mode

# A. Test Verdict:

Channel	Frequency (MHz)	6 dB Bandwidth (MHz)	Limits(kHz)	Result
3	2422	35.19	≥500	PASS
7	2442	35.19	≥500	PASS
11	2462	35.17	≥500	PASS

#### **B. Test Plot:**

RF 50Ω AC Span 60.000 MHz	Cente Trig: F	Sense Pulse Source OFF Align AUTO Center Freq: 2.422000000 GHz Frig: Free Run Avg Hold>10/10		ALIGNAUTO	04:17:07 P Radio Std	MDec 06, 2019 : None	M	leas Setup	
	#IFGain:Low #Atter	#Atten: 18 dB F				vice: BTS	Av	g/Hold Num	
10 dB/div Ref 20.00 dBn	1						<u>On</u>	Of	
10.0								Avg Mode	
100	Ster tradesense broken tradiseduselos	my prospheniked	Antoniala	shahahatan			Exp	Repea	
20.0		Y							
10 0 WILLIAM AND WILLIAM					which have	anonahan			
40.0									
66.0								OBWPowe	
0.07								99.00 %	
Center 2.422 GHz #Res BW 100 kHz	#	VBW 300 H	Hz		Spa Sweep	n 60 MHz 7.467 ms			
Occupied Bandwidt	h	Total P	ower	19.6	6 dBm				
35	5.836 MHz							x de	
Transmit Freq Error	33.797 kHz	OBW P	ower	99	0.00 %			-6.00 dE	
x dB Bandwidth	35.19 MHz	x dB		-6.	00 dB		-		
								More	
								101	
5G <sup>1</sup>				STATUS	9		-		

(Channel 3, 802.11n (HT40))





enter Freq 2.442000000	GHz Ce #IFGain:Low #At	SENSE: FULSE  SOURCE OFF   nter Freq: 2.442000000 GH g: Free Run Avg He tten: 18 dB	ALIGNAUTO	Radio Sto	MDec 06, 2019 I: None vice: BTS	M Av	Meas Setup Avg/Hold Num		
dB/div Ref 20.00 dBr	div Ref 20.00 dBm								
9 00 10 10	wayter town had been been been been been been been bee	rdrom junishteherherherherten	ala mahashashas			Exp	Avg Mode Exp Repeat		
10 wywadanamana				whether whether	phinana data				
10 20						- 10	<b>OBW Powe</b> 99.00 %		
enter 2.442 GHz Res BW 100 kHz		#VBW 300 kHz		Spa Sweep	an 60 MHz 7.467 ms				
Occupied Bandwidt	<sup>h</sup> 5.868 MHz	Total Power	19.1	3 dBm			x dE		
Transmit Freq Error	53.417 kHz	OBW Power	9	9.00 %			-6.00 dB		
x dB Bandwidth	35.19 MHz	x dB	-6	00 dB			Mon 1 of 3		
14 C			<ta11< td=""><td>e</td><td>_</td><td>-</td><td>_</td></ta11<>	e	_	-	_		

# (Channel 7, 802.11n (HT40))



#### (Channel 11, 802.11n (HT40))



Shenzhen Morlab Communications Technology Co., Ltd. FL1-3, Building A, FeiYang Science Park, No.8 LongChang Road, Block67, BaoAn District, ShenZhen , GuangDong Province, P. R. China Tel: 86-755-36698555 Http://www.morlab.cn Fax: 86-755-36698525 E-mail: service@morlab.cn





# 2.5. Conducted Spurious Emissions and Band Edge

# 2.5.1. Requirement

According to FCC section 15.247(c), in any 100kHz 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 20dB below that in the 100kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement.

# 2.5.2. Test Description

# Test Setup:



The EUT is coupled to the Spectrum Analyzer; the RF load attached to the EUT antenna terminal is 500hm; the path loss as the factor is calibrated to correct the reading.

Make the measurement with the spectrum analyzer's resolution bandwidth (RBW) = 100 kHz. In order to make an accurate measurement, set the span greater than RBW.

# 2.5.3. Test Procedure

KDB 558074 Section 8.5 and 8.7 was used in order to prove compliance.





# 2.5.4. Test Result

# 802.11b Mode

#### A. Test Verdict:

		Measured Max. Out	Limi	t (dBm)	
Channel	Frequency (MHz)	of Band Emission	Carrier	Calculated	Verdict
		(dBm)	Level	-20dBc Limit	
1	2412	-38.63	10.15	-9.85	PASS
7	2442	-39.08	9.74	-10.26	PASS
13	2472	-37.44	8.00	-12.00	PASS

#### **B. Test Plot:**



(30MHz to 25GHz, Channel 1, 802.11b)



Shenzhen Morlab Communications Technology Co., Ltd. FL1-3, Building A, FeiYang Science Park, No.8 LongChang Road, Block67, BaoAn District, ShenZhen , GuangDong Province, P. R. China Tel: 86-755-36698555 Fax: Http://www.morlab.cn E-m

Fax: 86-755-36698525

E-mail: service@morlab.cn







(Band Edge, Channel 1, 802.11b)



(30MHz to 25GHz, Channel 7, 802.11b)



Shenzhen Morlab Communications Technology Co., Ltd. FL1-3, Building A, FeiYang Science Park, No.8 LongChang Road, Block67, BaoAn District, ShenZhen , GuangDong Province, P. R. China





Peak Search Next Peak	TRACE 21 A TYPE MUMANAN	ALIGNAUTO e: Log-Pwr >10/10	Avg Ty Avg Ho	ree Run	T.	GHz	000000	595486	2 24.	ker
Next Peak	DET P NANNN	Mke		24 dB	A	Gain:Low	IF		_	_
	-37.400 dBm	-37.400 dBr				2 dB dBm				
Next Pk Rigi								1	0	
Next Pk Le										
Marker Del	~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~		يەلىمەمىمەمىم مەر	-	-			-	أسمين	-
Marker Del Mkr→C	Stop 25.00 GHz 2.387 s (10001 pts)	Sweep 2	يە <del>م</del> ەمەمىيىلىر م	Hz	W 30	#VB		kHz	0 MHz W 100	t 30 s BV
Marker Del Mkr→C	Stop 25.00 GHz .387 s (10001 pts) FUNCTION VALUE	Sweep 2	UNCTION 1	Hz dBm	W 30	#VB	× 2,465	kHz	OMHZ W 100 TRC SC 1 f	t 30 s BV MODE
Marker Del Mkr→C Mkr→Ref L	Stop 25.00 GHz 2.387 s (10001 pts) FUNCTION VALUE	Sweep 2	UNCTION	Hz dBm dBm	W 30	#VB 9 6 GHz 5 5 GHz	× 2.469 24.595	kHz	0 MHz W 100 TRC SCI 1 f 1 f	t 30 s BV MODE N

(30MHz to 25GHz, Channel 13, 802.11b)



(Band Edge, Channel 13, 802.11b)



Shenzhen Morlab Communications Technology Co., Ltd. FL1-3, Building A, FeiYang Science Park, No.8 LongChang Road, Block67, BaoAn District, ShenZhen , GuangDong Province, P. R. China



# 802.11g Mode

#### A. Test Verdict:

		Measured Max. Out	Limi	t (dBm)	
Channel	Frequency (MHz)	of Band Emission	Carrier	Calculated	Verdict
		(dBm)	Level	-20dBc Limit	
1	2412	-38.53	6.01	-13.99	PASS
7	2442	-39.83	5.12	-14.88	PASS
13	2472	-38.04	6.46	-13.54	PASS

# **B. Test Plot:**



(30MHz to 25GHz, Channel 1, 802.11g)



Shenzhen Morlab Communications Technology Co., Ltd. FL1-3, Building A, FeiYang Science Park, No.8 LongChang Road, Block67, BaoAn District, ShenZhen , GuangDong Province, P. R. China Tel: 86-755-36698555 Fax: 86-755-36698525 Http://www.morlab.cn E-mail: service@morlab.cn







(Band Edge, Channel 1, 802.11g)



(30MHz to 25GHz, Channel 7, 802.11g)



Shenzhen Morlab Communications Technology Co., Ltd. FL1-3, Building A, FeiYang Science Park, No.8 LongChang Road, Block67, BaoAn District, ShenZhen , GuangDong Province, P. R. China







(30MHz to 25GHz, Channel 13, 802.11g)



(Band Edge, Channel 13, 802.11g)



Shenzhen Morlab Communications Technology Co., Ltd. FL1-3, Building A, FeiYang Science Park, No.8 LongChang Road, Block67, BaoAn District, ShenZhen , GuangDong Province, P. R. China Fax: 86-755-36698525



# 802.11n (HT20) Mode

#### A. Test Verdict:

		Measured Max. Out	Limi	t (dBm)	
Channel	Frequency (MHz)	of Band Emission	Carrier	Calculated	Verdict
		(dBm)	Level	-20dBc Limit	
1	2412	-38.55	5.97	-14.03	PASS
7	2442	-37.49	7.32	-12.68	PASS
13	2472	-38.21	6.21	-13.79	PASS

# **B. Test Plot:**



(30MHz to 25GHz, Channel 1, 802.11n (HT20))



Shenzhen Morlab Communications Technology Co., Ltd. FL1-3, Building A, FeiYang Science Park, No.8 LongChang Road, Block67, BaoAn District, ShenZhen , GuangDong Province, P. R. China Tel: 86-755-36698555 Fax: 86-755-36698525 Http://www.morlab.cn E-mail: service@morlab.cn







# (Band Edge, Channel 1, 802.11n (HT20))



(30MHz to 25GHz, Channel 7, 802.11n (HT20))







Next Peak	TRACE 2 4 F	/pe: Log-Pwr Id:>10/10	Avg Avg	Free Run 24 dB	Trig: Fre Atten: 24	SHZ NO: Fast G Gain:Low	000000 ( P IF	861368	er 2 2	rke
	3.861 4 GHz -38.207 dBm	Mkr2					2 dB dBm	ef Offset 1: ef 25.00	liv	B/d
Next Pk Righ								> <sup>1</sup>		0 0 0
Next Pk Le	¢2									
Marker Delt	·····		ser.			***********	-	and the party	فلمانعن	
Mkr→C	Stop 25.00 GHz 37 s (10001 pts)	Sweep 2.3		Hz	N 300 kHz	#VBV		) kHz	30 MH BW 10	rt 3 es E
	FUNCTION VALUE	FUNCTION WIDTH	FUNCTION	9 dBm 7 dBm	6.209 d -38.207 d	6 GHz 4 GHz	× 2.464 23.861			MOC N N
Mkr-Ref L										
Mor										

(30MHz to 25GHz, Channel 13, 802.11n (HT20))



(Band Edge, Channel 13, 802.11n (HT20))



Shenzhen Morlab Communications Technology Co., Ltd. FL1-3, Building A, FeiYang Science Park, No.8 LongChang Road, Block67, BaoAn District, ShenZhen , GuangDong Province, P. R. China


## 802.11n (HT40) Mode

#### A. Test Verdict:

		Measured Max. Out	Limi		
Channel	Frequency (MHz)	of Band Emission	Carrier	Calculated	Verdict
		(dBm)	Level	-20dBc Limit	
3	2422	-38.40	5.91	-14.09	PASS
7	2442	-37.31	5.61	-14.39	PASS
11	2462	-37.31	5.61	-14.39	PASS

### **B. Test Plot:**



(30MHz to 25GHz, Channel 3, 802.11n (HT40))



Shenzhen Morlab Communications Technology Co., Ltd. FL1-3, Building A, FeiYang Science Park, No.8 LongChang Road, Block67, BaoAn District, ShenZhen , GuangDong Province, P. R. China







## (Band Edge, Channel 3, 802.11n (HT40))



(30MHz to 25GHz, Channel 7, 802.11n (HT40))







	TRACE 2244 TYPE MUMANANAN DET PIN INNININ	pe: Log-Pwr d:>10/10	Avg T Avg H	Trig: Free Run Atten: 24 dB	PNO: Fast	392500000	23.813	ker 2
Next Pea	23.813 9 GHz -37.309 dBm	Mkr2				fset 12 dB 5.00 dBm	Ref Offs Ref 25	3/div
Next Pk Righ							01	
Next Pk Le	¢2							
MarkerDelt	~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~		~~~~			~~~~~	يسابع	_
	the second s		~	100	#\/B\		AHz 100 kHz	t 30 N s BW
Mkr→C	Stop 25.00 GHz 387 s (10001 pts)	Sweep 2.3		300 kHz	#VDV	2		
Mkr→C	Stop 25.00 GHz 387 s (10001 pts) FUNCTION VALUE	Sweep 2.	FUNCTION	300 kHz 5.611 dBm	439 6 GHz	2 × 2	RC SCL	N 1
Mkr→C Mkr→RefL1	Stop 25.00 GHz 387 s (10001 pts) FUNCTION VALUE	Sweep 2.	FUNCTION	300 kHz 5.611 dBm 37.309 dBm	#VBV 439 6 GHz 813 9 GHz	2 23	RC SEL	N 1 N 1

(30MHz to 25GHz, Channel 11, 802.11n (HT40))



(Band Edge, Channel 11, 802.11n (HT40))



Shenzhen Morlab Communications Technology Co., Ltd. FL1-3, Building A, FeiYang Science Park, No.8 LongChang Road, Block67, BaoAn District, ShenZhen , GuangDong Province, P. R. China



# 2.6. Power Spectral Density

### 2.6.1. Requirement

For digitally modulated systems, the power spectral density conducted from the intentional radiator to the antenna shall not be greater than 8dBm in any 3 kHz band during any time interval of continuous transmission. This power spectral density shall be determined in accordance with the provisions of paragraph (b) of this section. The same method of determining the conducted output power shall be used to determine the power spectral density.

#### 2.6.2. Test Description

#### Test Setup:



The EUT is coupled to the Spectrum Analyzer; the RF load attached to the EUT antenna terminal is 500hm; the path loss as the factor is calibrated to correct the reading.

#### 2.6.3. Test Procedure

KDB 558074 Section 8.4 was used in order to prove compliance.





#### 2.6.4. Test Result

## 802.11b Mode

#### A. Test Verdict:

Channel	Frequency	Measured PSI	Limit	Verdict		
•	(MHz)	ANT 0	ANT 1	(dBm/3kHz)		
1	2412	-4.34	-4.09	8	PASS	
7	2442	-5.53	-5.18	8	PASS	
13	2472	-5.97	-5.97	8	PASS	

#### **B. Test Plot:**



(Channel 1, 802.11b, ANT0)



Shenzhen Morlab Communications Technology Co., Ltd. FL1-3, Building A, FeiYang Science Park, No.8 LongChang Road, Block67, BaoAn District, ShenZhen , GuangDong Province, P. R. China Tel: 86-755-36698555 Fax: 86-755-36698525 Http://www.morlab.cn

E-mail: service@morlab.cn







#### (Channel 7, 802.11b, ANT0)



#### (Channel 13, 802.11b, ANT0)

**MORLAB** 

Shenzhen Morlab Communications Technology Co., Ltd. FL1-3, Building A, FeiYang Science Park, No.8 LongChang Road, Block67, BaoAn District, ShenZhen , GuangDong Province, P. R. China Tel: 86-755-36698555 Fax: 86-755-36698525 Http://www.morlab.cn

E-mail: service@morlab.cn







#### (Channel 1, 802.11b, ANT1)



#### (Channel 7, 802.11b, ANT1)

**MORLAB** 

Shenzhen Morlab Communications Technology Co., Ltd. FL1-3, Building A, FeiYang Science Park, No.8 LongChang Road, Block67, BaoAn District, ShenZhen , GuangDong Province, P. R. China







(Channel 13, 802.11b, ANT1)



Shenzhen Morlab Communications Technology Co., Ltd. FL1-3, Building A, FeiYang Science Park, No.8 LongChang Road, Block67, BaoAn District, ShenZhen , GuangDong Province, P. R. China



## 802.11g Mode

#### A. Test Verdict:

Channel	Frequency	Measured PSI	D (dBm/3kHz)	Limit	Verdict	
	(MHz)	ANT 0	ANT 1	(dBm/3kHz)		
1	2412	-6.45	-5.65	8	PASS	
7	2442	-7.02	-8.19	8	PASS	
13	2472	-7.73	-7.73 -6.25		PASS	

### **B. Test Plot:**



(Channel 1, 802.11g, ANT0)



Shenzhen Morlab Communications Technology Co., Ltd. FL1-3, Building A, FeiYang Science Park, No.8 LongChang Road, Block67, BaoAn District, ShenZhen , GuangDong Province, P. R. China Tel: 86-755-36698555 Fa

Fax: 86-755-36698525 E-mail: service@morlab.cn

Http://www.morlab.cn







### (Channel 7, 802.11g, ANT0)



#### (Channel 13, 802.11g, ANT0)

**MORLAB** 

Shenzhen Morlab Communications Technology Co., Ltd. FL1-3, Building A, FeiYang Science Park, No.8 LongChang Road, Block67, BaoAn District, ShenZhen , GuangDong Province, P. R. China

Tel: 86-755-36698555 Http://www.morlab.cn E-mail: service@morlab.cn

Fax: 86-755-36698525







### (Channel 1, 802.11g, ANT1)



#### (Channel 7, 802.11g, ANT1)

**MORLAB** 

Shenzhen Morlab Communications Technology Co., Ltd. FL1-3, Building A, FeiYang Science Park, No.8 LongChang Road, Block67, BaoAn District, ShenZhen , GuangDong Province, P. R. China







(Channel 13, 802.11g, ANT1)





## 802.11n (HT20) Mode

#### A. Test Verdict:

Channel	Frequency	Measured PSD (dBm/3kHz)		Total PSD	Limit	Verdict	
•••••	(MHz)	ANT 0	ANT 1	(dBm/3kHz)	(dBm/3kHz)	Voluiot	
1	2412	-7.13	-6.37	-3.72	5.99	PASS	
7	2442	-7.07	-5.60	-3.26	5.99	PASS	
13	2472	-8.51 -7.98		-5.23	5.99	PASS	
13	2472	-8.51 -7.98		-5.23	5.99	PASS	

**Note:** Directional gain = 5.00dBi +10log(2) = 8.01dBi>6dBi, so the power density limit shall be reduced to 8-(8.01-6)=5.99dBm.

### B. Test Plot:



(Channel 1, 802.11n (HT20), ANT0)



Shenzhen Morlab Communications Technology Co., Ltd. FL1-3, Building A, FeiYang Science Park, No.8 LongChang Road, Block67, BaoAn District, ShenZhen , GuangDong Province, P. R. China Tel: 86-755-36698555 Fa Http://www.morlab.cn E-

Fax: 86-755-36698525

morlab.cn E-mail: service@morlab.cn





# (Channel 7, 802.11n (HT20), ANT0)



#### (Channel 13, 802.11n (HT20), ANT0)

**MORLAB** 

Shenzhen Morlab Communications Technology Co., Ltd. FL1-3, Building A, FeiYang Science Park, No.8 LongChang Road, Block67, BaoAn District, ShenZhen , GuangDong Province, P. R. China

Tel: 86-755-36698555 Http://www.morlab.cn E-mail: service@morlab.cn

Fax: 86-755-36698525

Page 50 of 93







## (Channel 1, 802.11n (HT20), ANT1)



#### (Channel 7, 802.11n (HT20), ANT1)

**MORLAB** 

Shenzhen Morlab Communications Technology Co., Ltd. FL1-3, Building A, FeiYang Science Park, No.8 LongChang Road, Block67, BaoAn District, ShenZhen , GuangDong Province, P. R. China







(Channel 13, 802.11n (HT20), ANT1)



Shenzhen Morlab Communications Technology Co., Ltd. FL1-3, Building A, FeiYang Science Park, No.8 LongChang Road, Block67, BaoAn District, ShenZhen , GuangDong Province, P. R. China



### 802.11n (HT40) Mode

#### A. Test Verdict:

Channel	Frequency	Measured PSD (dBm/3kHz)		Total PSD	Limit	Verdict	
Chainer	(MHz)	ANT 0	ANT 1	(dBm/3kHz)	(dBm/3kHz)	Veralot	
3	2422	-8.81	-9.08	-5.93	5.99	PASS	
7	2442	-9.28	-9.14	-6.20	5.99	PASS	
11	2462	-10.63	-10.14	-7.37	5.99	PASS	

**Note:** Directional gain = 5.00dBi +10log(2) = 8.01dBi>6dBi, so the power density limit shall be reduced to 8-(8.01-6)=5.99dBm.

### B. Test Plot:



(Channel 3, 802.11n (HT40), ANT0)



Shenzhen Morlab Communications Technology Co., Ltd. FL1-3, Building A, FeiYang Science Park, No.8 LongChang Road, Block67, BaoAn District, ShenZhen , GuangDong Province, P. R. China Tel: 86-755-36698555

Fax: 86-755-36698525

Http://www.morlab.cn

E-mail: service@morlab.cn







## (Channel 7, 802.11n (HT40), ANT0)



#### (Channel 11, 802.11n (HT40), ANT0)

**MORLAB** 

Shenzhen Morlab Communications Technology Co., Ltd. FL1-3, Building A, FeiYang Science Park, No.8 LongChang Road, Block67, BaoAn District, ShenZhen , GuangDong Province, P. R. China







## (Channel 3, 802.11n (HT40), ANT1)



(Channel 7, 802.11n (HT40), ANT1)

**MORLAB** 

Shenzhen Morlab Communications Technology Co., Ltd. FL1-3, Building A, FeiYang Science Park, No.8 LongChang Road, Block67, BaoAn District, ShenZhen , GuangDong Province, P. R. China



enter Freq 2.46200000	O GHz PNO: Fast	Trig: Free Run Atten: 18 dB	Avg Type: Log-Pwr Avg Hold>10/10	TRACE 2 4 5 TYPE MUMANNAN DET PININININ	Frequency
Ref Offset 12 dB dB/div Ref 20.00 dBm	I Gantew		Mk	r1 2.465 78 GHz -10.140 dBm	Auto Tune
2					Center Free 2.462000000 GH
00 10	และเหตุสารณ์เป็นเป็น	alihilation studiedlak	Statilitation of a sta		Start Free 2.432000000 GH
	ludittalli, ludenterer,	la Lan Anti, Abi failti	And All Million States and All Million States and	<u>k</u>	Stop Free 2.492000000 GH
no whele when the state of the				A Contraction of the second se	CF Step 6.000000 MH <u>Auto</u> Ma
0.0					Freq Offse 0 Hi
enter 2.46200 GHz Res BW 3.0 kHz	#VBW	l0 kHz	Sweep	Span 60.00 MHz 6.326 s (1001 pts)	

(Channel 11, 802.11n (HT40), ANT1)



Shenzhen Morlab Communications Technology Co., Ltd. FL1-3, Building A, FeiYang Science Park, No.8 LongChang Road, Block67, BaoAn District, ShenZhen , GuangDong Province, P. R. China



# 2.7. Conducted Emission

## 2.7.1. Requirement

According to FCC section 15.207, for an intentional radiator that is designed to be connected to the public utility (AC) power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency within the band 150kHz to 30MHz shall not exceed the limits in the following table, as measured using a  $50\mu$ H/ $50\Omega$  line impedance stabilization network (LISN).

Fraguanay Panga (MHz)	Conducted Limit (dBµV)				
	Quai-peak	Average			
0.15 - 0.50	66 to 56	56 to 46			
0.50 - 5	56	46			
5 - 30	60	50			

NOTE:

(a) The lower limit shall apply at the band edges.

(b) The limit decreases linearly with the logarithm of the frequency in the range 0.15 - 0.50MHz.

### 2.7.2. Test Description

#### Test Setup:



The Table-top EUT was placed upon a non-metallic table 0.8m above the horizontal metal reference ground plane. EUT was connected to LISN and LISN was connected to reference Ground Plane. EUT was 80cm from LISN. The set-up and test methods were according to ANSI C63.10 2013.

MORLAB



## 2.7.3. Test Result

The maximum conducted interference is searched using Peak (PK), if the emission levels more than the AV and QP limits, and that have narrow margins from the AV and QP limits will be re-measured with AV and QP detectors. Tests for both L phase and N phase lines of the power mains connected to the EUT are performed. Set RBW=9kHz, VBW=30kHz. Refer to recorded points and plots below.

Note: Both of the test voltage AC 120V/60Hz and AC 230V/50Hz were considered and tested respectively, only the results of the worst case AC 120V/60Hz were recorded in this report.

### A. Test Setup:

Test Mode: EUT+ ADAPTER + WIFI TX Test Voltage: AC 120V/60Hz The measurement results are obtained as below:  $E [dB\mu V] = U_R + L_{Cable loss} [dB] + A_{Factor}$ U<sub>R</sub>: Receiver Reading AFactor: Voltage division factor of LISN





#### **B. Test Plot:**



## (L Phase)

No.	Fre. Emiss		Emission Level (dBµV)		dBµV)	Power-line	Verdict
	(MHz)	Quai-peak	Average	Quai-peak	Quai-peak Average		
1	0.2308	44.38	34.42	62.42	52.42		PASS
2	0.2714	43.99	36.96	61.08	51.08		PASS
3	0.3705	48.60	45.12	58.49	48.49	Lino	PASS
4	0.3976	39.35	33.55	57.90	47.90	LITE	PASS
5	0.7579	36.57	30.85	56.00	46.00		PASS
6	1.2750	34.98	26.28	56.00	46.00		PASS







(N	Phase)
----	--------

No.	Fre.	Emission Level (dBµV)		Limit (	dBµV)	Power-line	Verdict
	(MHz)	Quai-peak	Average	Quai-peak	Average		
1	0.2672	45.19	34.29	61.20	51.20		PASS
2	0.3433	41.74	36.14	59.12	49.12		PASS
3	0.3657	45.61	42.04	58.60	48.60	Noutral	PASS
4	0.5459	36.47	24.82	56.00	46.00	neutrai	PASS
5	0.8474	35.29	25.44	56.00	46.00		PASS
6	1.2433	35.20	25.81	56.00	46.00		PASS



Fax: 86-755-36698525



# 2.8. Restricted Frequency Bands

## 2.8.1. Requirement

According to FCC section 15.247(d), in any 100kHz 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 20dB below that in the 100kHz bandwidth within the band that contains the highest level of the desired power, In addition, radiated 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).

## 2.8.2. Test Description

### **Test Setup**



The EUT is located in a 3m Semi-Anechoic Chamber; the antenna factors, cable loss and so on of the site as factors are calculated to correct the reading.

For the Test Antenna:

Test Antenna is 3m away from the EUT. Test Antenna height is varied from 1m to 4m above the ground to determine the maximum value of the field strength.





## 2.8.3. Test Procedure

KDB 558074 Section 8.6 and 8.7 was used in order to prove compliance.

## 2.8.4. Test Result

The lowest and highest channels are tested to verify Restricted Frequency Bands.

The measurement results are obtained as below:

 $E [dB\mu V/m] = U_R + A_T + A_{Factor} [dB]; A_T = L_{Cable loss} [dB] - G_{preamp} [dB]$ 

A<sub>T</sub>: Total correction Factor except Antenna

U<sub>R</sub>: Receiver Reading

G<sub>preamp</sub>: Preamplifier Gain

AFactor: Antenna Factor at 3m

Note: Restricted Frequency Bands were performed when antenna was at vertical and horizontal polarity, and only the worse test condition (vertical) was recorded in this test report.

### 802.11b Mode

#### A. Test Verdict:

	Frequency	Detector	Receiver Reading	A <sub>T</sub>	A <sub>Factor</sub>	Max. Emission	Limit	Verdict
Channel	(MHz)	PK/ AV	U <sub>R</sub> (dBµV)	(dB)	(dB@3m)	E (dBµV/m)	(dBµV/m)	Verdiot
1	2385.46	PK	27.11	6.74	27.20	61.05	74	PASS
1	2388.26	AV	14.59	6.74	27.20	48.53	54	PASS
13	2484.65	PK	25.86	6.74	27.20	59.80	74	PASS
13	2483.50	AV	15.11	6.74	27.20	49.05	54	PASS



#### **B. Test Plot:**

- 6 <u>- 4</u>					trum Analyzer - Swept SA	eysight Spectri
Marker	TRACE 1 2 3 4 5 0	Type: Voltage	SENSE:INT	0 GHz	2.385456000000	rker 1 2
Select Marker	DET PPNNNN	Hold:>100/100	Atten: 10 dB	PNO: Fast 😱 IFGain:Low	PREAMP	Р
1	2.385 46 GHz 27.109 dBµV	Mkr			Ref 86.99 dBµV	B/div
Norma						α
Deli	and the second sec	1				
Fixed						9 9 1
o	op 2.41200 GHz 0 ms (1001 pts)	Sweep 1.	) MHz	#VBW	000 GHz SISPR) 1 MHz	s BW (CI
Properties	E		109 dBµV 402 dBµV	385 46 GHz 390 00 GHz	f 2.38 f 2.39	N 1 N 1
Moi 1 of						
		STATUS	Hr.			

(PEAK, Channel 1, 802.11b)



(AVERAGE, Channel 1, 802.11b)

MORLAB

Shenzhen Morlab Communications Technology Co., Ltd. FL1-3, Building A, FeiYang Science Park, No.8 LongChang Road, Block67, BaoAn District, ShenZhen , GuangDong Province, P. R. China Tel: 86-755-36698555

Fax: 86-755-36698525 E-mail: service@morlab.cn



PREAMP	IFGain:Low βμV	#Atten: 10 dB		Mkr2	2.484 646 GH 25.860 dBµ	Select Marker 2 2
Ndiv Ref 86.99 dE	ЗµV				25.860 dBµ	/
						Norma
Uniter a		TIMAN				Delt
						Fixed
2.46200 GHz W (CISPR) 1 MHz	#VB	W 3.0 MHz		Sweep 1	Stop 2.50000 GH .000 ms (1001 pts	z 5)
DDE TRC SCL	x 2.483 500 GHz	24.848 dBµV	FUNCTION	FUNCTION WIDTH	FUNCTION VALUE	
	2.484 646 GHZ	25.860 dBµV				Properties
						Mor
						1 of

## (PEAK, Channel 13, 802.11b)



## (AVERAGE, Channel 13, 802.11b)

**MORLAB** 

Shenzhen Morlab Communications Technology Co., Ltd. FL1-3, Building A, FeiYang Science Park, No.8 LongChang Road, Block67, BaoAn District, ShenZhen , GuangDong Province, P. R. China Tel: 86-755-36698555 Http://www.morlab.cn E-mail: service@morlab.cn

Fax: 86-755-36698525



# 802.11g Mode

### A. Test Verdict:

Channel	Frequency	Detector	Receiver Reading	A <sub>T</sub>	A <sub>Factor</sub>	Max. Emission	Limit	Vordict
Channel	(MHz)	PK/ AV	U <sub>R</sub> (dBµV)	(dB)	(dB@3m)	E (dBµV/m)	(dBµV/m)	veruici
1	2388.26	PK	26.44	6.74	27.20	60.38	74	PASS
1	2390.00	AV	14.74	6.74	27.20	48.68	54	PASS
13	2487.72	PK	26.35	6.74	27.20	60.29	74	PASS
13	2483.50	AV	15.74	6.74	27.20	49.68	54	PASS

### **B. Test Plot:**

Marker	01:11:06 PM Dec 20, 2020	ALIGN OFF	E:INT	SENS		DC DC	RESEL 50	RF PRE	
Select Marke	TRACE 1 2 3 4 5 6 TYPE MA	g Type: Voltage  Hold:>100/100	Run dB	Trig: Free #Atten: 10	PNO: Fast IFGain:Low	000000	888256 EAMP	1 2.3	ker 1
Geneermane	1 2.388 26 GHz 26.437 dBµV	Mkr1				9 dBµV	ef 86.99	Re	3/div
Norm									
De	12								
Fixe			And 19, 19 19 19			daning things	1-4748-144,444		
	Stop 2.41200 GHz 000 ms (1001 pts)	Sweep 1.		3.0 MHz	#VBW	ИНz	OGHZ PR)1N	30000 (CISP	t 2.3 BW
Propertie	FUNCTION VALUE	FUNCTION WIDTH	FUNCT	<u>ү</u> 26.437 dBµ 25.736 dBµ	8 26 GHz 0 00 GHz	× 2.388 2.390		TRC SCL 1 f 1 f	N N
Mo									
10									

(PEAK, Channel 1, 802.11g)





Keysight Spectrum Analy	zer - Swept SA					0 6 -0
rker 1 2.3884	180000000 GHz PNO: Fast	Trig: Free Run	#Avg	g Type: Voltage  Hold:>100/100	01:11:38 PM Dec 20, 2020 TRACE 1 2 3 4 5 0 TYPE MA WANNE	Marker
PREAMP	IFGain:Low	#Atten: 10 dB		Mkr	1 2.388 48 GHz	Select Marker
dB/div Ref 8	6.99 dBµV				14.661 dBµV	
0						Norma
o						
0						Delt
0				••••••••••••••••••••••••••••••••••••••	12	
95						Fixed
art 2.30000 GH s BW (CISPR)	lz 1 MHz #VE	W 3.0 MHz		Sweep 1	Stop 2.41200 GHz 55.9 ms (1001 pts)	0
R MODE TRC SCL	X 2 299 49 CH-	Y 44 664 dDwV	FUNCTION	FUNCTION WIDTH	FUNCTION VALUE	
N 1 f	2.388 48 GH2 2.390 00 GHz	14.739 dBµV				Properties
					5	
						Moi 1 of
		TT.			1	

## (AVERAGE, Channel 1, 802.11g)



### (PEAK, Channel 13, 802.11g)

**MORLAB** 

Shenzhen Morlab Communications Technology Co., Ltd. FL1-3, Building A, FeiYang Science Park, No.8 LongChang Road, Block67, BaoAn District, ShenZhen , GuangDong Province, P. R. China Tel: 86-755-36698555 E-mail: service@morlab.cn Http://www.morlab.cn

Fax: 86-755-36698525



0.6	01-00-14 010 0 20 2020	A NUCH OT	crairi and	1	1 1	zer - Swept SA	trum Analyzer	ight Spe
Marker	TRACE 1 2 3 4 5 0 TYPE MA WHILE	Type: Voltage Hold:>100/100	Free Run	ist 😱	00 GHz	10000000	2.48381	er 2
Select Marker	DET APNNNN		en: 10 dB	w	IFGain:Low		PREAMP	_
2	2.483 810 GHZ 15.594 dBµV	MKP2			v	6.99 dBµV	Ref 86.9	div
Norma								
24100								
Delt					~		_	1
			2 A2	_				]
Fixed								
_	Stop 2 50000 GHz					7	200 GH7	246
0	.27 ms (1001 pts)	Sweep 56	1Hz	VBW 3	#VE	1 MHz	ISPR) 1	3W (0
-	FUNCTION VALUE	FUNCTION WIDTH	FUNCT	z <b>1</b>	x 483 500 GHz	× 2.48	SCL f	
Properties			4 dBµV	z 1	483 810 GHz	2.48	1	N 1
	E							
Mor 1 of								
	-							
		STATUS		_				-

(AVERAGE, Channel 13, 802.11g)



Shenzhen Morlab Communications Technology Co., Ltd. FL1-3, Building A, FeiYang Science Park, No.8 LongChang Road, Block67, BaoAn District, ShenZhen , GuangDong Province, P. R. China



## 802.11n (HT20) Mode

### A. Test Verdict:

Channel	Frequency	Detector	Receiver Reading	A <sub>T</sub> (dB)	A <sub>Factor</sub>	Max. Emission E	Limit	Verdict
	(1011 12)	PK/ AV	(dBµV)	(UD)		∟ (dBµV/m)		
1	2380.30	PK	26.01	6.74	27.20	59.95	74	PASS
1	2386.13	AV	14.60	6.74	27.20	48.54	54	PASS
13	2483.77	PK	27.82	6.74	27.20	61.76	74	PASS
13	2483.50	AV	16.10	6.74	27.20	50.04	54	PASS

## **B. Test Plot:**

<u> </u>	2M Dec 20, 2020	01:13:21 4	A ALIGN OFF	ri 1	SENSE-TH		- Swept SA	F PRESEL	sight Spec
Marker	CE 1 2 3 4 5 0 PE NA WINN	TRA	Type: Voltage old:>100/100	#Avg Avg	Trig: Free Run	GHZ PNO: Fast	4000000	2.38030	ter 1
Select Marker	DET	1			#Atten: 10 dB	IFGain:Low		PREAMP	_
1	30 GHZ	2.380	MKF				99 dBµV	Ref 86	div
Norm									
0.000									
Det	1								
Dei		$\rangle^2$	↓ <sup>1</sup>	and the second					
-									
Fixed									
	1200 GHz	Stop 2.4						00 GH2	2,300
0	(1001 pts)	000 ms	Sweep 1.		3.0 MHz	#VBI	MHz	ISPR)	BW (C
	ION VALUE	FUNCT	FUNCTION WIDTH	FUNCTION	26.006 dBµV	30 30 GHz	× 2.38	SCL	N 1
Properties					(5.1/1 dBµV	0 00 GHZ	2.39		N 1
Mor									
1 of									
		-			it.				

(PEAK, Channel 1, 802.11n (HT20))





Marker	01:12:57 PM Dec 20, 2020	ALIGN OFF	ti i	SENSE:IN		zer - Swept SA 50 Ω DC	RF PRESEL	Keysight S RL
Select Marker	TYPE MA WANNA DET A P N N N N	Hold:>100/100	Avg	Trig: Free Run #Atten: 10 dB	PNO: Fast	2800000	PREAMP	arker
1	1 2.386 13 GHz 14.599 dBµV	Mkr1				6.99 dBµV	Ref 86.	) dB/div
Norm								7.0 7.0
Delt								7.0
Fixed	2	∳ <sup>1</sup> ◊						7.0
C	Stop 2.41200 GHz 55.9 ms (1001 pts)	Sweep 16	FUNCTION	3.0 MHz	#VBW	z 1 MHz ×	0000 GHz (CISPR) 1	tart 2.3 es BW
Properties				14,599 dBµV 14,517 dBµV	86 13 GHz 90 00 GHz	2.3		1 N 2 N 3 4
Mo 1 of								7
		871.TH		10				

## (AVERAGE, Channel 1, 802.11n (HT20))



(PEAK, Channel 13, 802.11n (HT20))



Fax: 86-755-36698525



CONTRACTOR OF THE OWNER	1:16:48 PM Dec 20, 2020	A ALIGN OFF	a	SENSE:IN		O DC	PRESEL 50	RE
Marker	TRACE 123450 TYPE MAWAMAN	Type: Voltage Hold:>100/100	n #	Trig: Free Run	GHz PNO: Fast 😱	000000	4840380	er 2 2.
Select Marker	DET		_	#Atten: 10 dB	IFGain:Low		REAMP	P
2	484 038 GHZ 15.661 dBµV	MKr2 2				9 dBµV	Ref 86.99	div
Norm								
2447.54								
Del								$\bigcap$
_			¢12					
Fixed								
	op 2.50000 GHz	Sweep 56			#\/B\M /	11-2	0 GHz	2.4620
	FUNCTION VALUE	Sweep Jo.	ELINCTIO	5.0 WIH2	#VOVV	4H2	SPR) I IV	DE TRC
	PONCHONVACO	PORCHON HIDTH	Polychio	16.099 dBµV	500 GHz	2.483	f	
Properties								
	5							
Mo								
1 01								

(AVERAGE, Channel 13, 802.11n (HT20))



Shenzhen Morlab Communications Technology Co., Ltd. FL1-3, Building A, FeiYang Science Park, No.8 LongChang Road, Block67, BaoAn District, ShenZhen , GuangDong Province, P. R. China



## 802.11n (HT40) Mode

## A. Test Verdict:

Channel	Frequency	Detector	Receiver Reading	A <sub>T</sub>	A <sub>Factor</sub>	Max. Emission	Limit	Verdict
		PK/ AV	ο <sub>R</sub> (dBμV)	(ub)	(db@3iii)	∟ (dBµV/m)	(ασμν/π)	
3	2390.00	PK	27.77	6.74	27.20	61.71	74	PASS
3	2389.15	AV	15.07	6.74	27.20	49.01	54	PASS
11	2483.50	PK	25.75	6.74	27.20	59.69	74	PASS
11	2483.50	AV	15.86	6.74	27.20	49.80	54	PASS

#### **B. Test Plot:**

	01-2210 010 01-20 2020		-	C. crackan	-	zer - Swept SA	rum Analyzei	Spectr	eysight
Marker	TRACE 1 2 3 4 5 0 TYPE MA WWWW	Type: Voltage Hold:>100/100	#Avg Avg	Trig: Free Run	GHz	60000000	2.37616	12	rker
Select Marker	DET PPNNNN			#Atten: 10 dB	IFGain:Low		PREAMP	F	_
1	1 2.376 16 GHz 27.363 dBµV	Mkr				6.99 dBµV	Ref 86.	v	dB/di
Norm									a
Delt	22 / m	<u>_1</u>							0 0 0
Fixed			an a	(	under som er teler sta	******			0
c	Stop 2.41200 GHz .000 ms (1001 pts)	Sweep 1.		3.0 MHz	#VBW	z 1 MHz	00 GHz ISPR) 1	300 / (Cl	art 2. s BW
	FUNCTION VALUE	FUNCTION WIDTH:	FUNCTION	27.363 dBuV	76 16 GHz	× 2.37	SCL	TRC 1	MODE
Properties				27.769 dBµV	90 00 GHz	2.39			N
Mo									
10	-								
				11.					

(PEAK, Channel 3, 802.11n (HT40))





Marker	01:23:51 PM Dec 20, 2020 TRACE 2 3 4 5 0 TYPE MANNIN DET A P N N N N	ALIGN OFF Type: Voltage Hold:>100/100	#Av	SENSE:IN Trig: Free Run #Atten: 10 dB	GHz PNO: Fast	EL 50 0 DC 9152000000	RL REPRESE rker 1 2.389
Select Marker	Mkr1 2.389 15 GHz Δ dB/div Ref 86.99 dBμV 15.072 dBμV						
Norm							0 0 0
Del							0
Fixed							0 19
o	Iz Stop 2.41200 GHz 1 MHz #VBW 3.0 MHz Sweep 165.9 ms (1001 pts) x Y FUNCTION FUNCTION VIDTH FUNCTION VALUE -						art 2.30000 G s BW (CISPR
Properties				15.072 dBµV 14.931 dBµV	89 15 GHz 90 00 GHz	2.3	N 1 f
Mo 1 of							
		STATUS		T			

## (AVERAGE, Channel 3, 802.11n (HT40))



(PEAK, Channel 11, 802.11n (HT40))



Fax: 86-755-36698525


Markar	01:18:12 PM Dec 20, 2020	ALIGN OFF		SENSE:IN		L 50 12 DC	RF PRESEL	
Marker	TYPE MA WANNY	Type: Voltage Hold:>100/100	#A Av	Trig: Free Run	PNO: Fast	380000000	2.4843	ker 2
Select Marke	484 380 GHz	Mkr2 2	#Atten: 10 dB Mkr2		IFGain:Low	þ	PREAMP	-
	15.351 dBµV					36.99 dBµV	Ref 86	3/div
Norm								
Del								$\frown$
_			<b>∂</b> <sup>1</sup> ∂ <sup>2</sup>					
Fixed								
	top 2.50000 GHz	Sween 56		3.0 MHz	#\/B\\((	Hz	200 GH	2.46
	FUNCTION VALUE	FUNCTION WIDTH	FUNCTION	y	# 4 10 44	X	C SCL	IODE TR
				15.857 dBµV 15.351 dBµV	3 500 GHz 4 380 GHz	2.483 2.484	1 1	N 1 N 1
Properties	E	و و و و و و و و و و و و و و و و و و و						
Mc								
10								
				TT.				

(AVERAGE, Channel 11, 802.11n (HT40))



Shenzhen Morlab Communications Technology Co., Ltd. FL1-3, Building A, FeiYang Science Park, No.8 LongChang Road, Block67, BaoAn District, ShenZhen , GuangDong Province, P. R. China

Tel: 86-755-36698555 Fax: 86-755-36698525 Http://www.morlab.cn E-mail: service@morlab.cn



## 2.9. Radiated Emission

## 2.9.1. Requirement

According to FCC section 15.247(d), radiated emission outside the frequency band attenuation below the general limits specified in FCC section 15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in FCC section 15.205(a), must also comply with the radiated emission limits specified in FCC section 15.209(a).

According to FCC section 15.209 (a), except as provided elsewhere in this subpart, the emissions from an intentional radiator shall not exceed the field strength levels specified in the following table:

Frequency (MHz)	Field Strength (µV/m)	Measurement Distance (m)
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

**Note1:** For above 1000MHz, the emission limit in this paragraph is based on measurement instrumentation employing an average detector, measurement using instrumentation with a peak detector function, corresponding to 20dB above the maximum permitted average limit. **Note2:** For above 1000MHz, limit field strength of harmonics: 54dBuV/m@3m (AV) and 74dBuV/m@3m (PK). In addition, radiated emissions which fall in the restricted bands, as defined in Section 15.205(a), also should comply with the radiated emission limits specified in Section 15.209(a)(above table).





## 2.9.2. Test Description

## **Test Setup:**

1) For radiated emissions from 9kHz to 30MHz



2) For radiated emissions from 30MHz to1GHz





Shenzhen Morlab Communications Technology Co., Ltd. FL1-3, Building A, FeiYang Science Park, No.8 LongChang Road, Block67, BaoAn District, ShenZhen , GuangDong Province, P. R. China



3) For radiated emissions above 1GHz



The EUT is placed on a non-conducting table 80 cm above the ground plane for measurement below 1GHz; 1.5 m above the ground plane for measurement above 1GHz.The antenna to EUT distance is 3meters. The EUT is configured in accordance with ANSI C63.10. The EUT is set to transmit in a continuous mode.

For measurements below 30MHz, the emission limits shown in the above table are based on measurements employing a CISPR quasi-peak detector except for the frequency bands 9kHz-90 kHz, 110kHz-490 kHz. Radiated emission limits in these two bands are based on measurements employing an average detector.

For measurements below 1GHz the resolution bandwidth is set to 100kHz for peak detection measurements or 120kHz for quasi-peak detection measurements. Peak detection is used unless otherwise noted as quasi-peak.

For measurements above 1GHz the resolution bandwidth is set to 1MHz, the video band width is set to 3MHz for peak measurements and as applicable for average measurements.

The frequency range of interest is monitored at a fixed antenna height and EUT azimuth. The EUT is rotated through 360 degrees to maximize emissions received. The antenna is scanned from 1 to 4 meters above the ground plane to further maximize the emission. Measurements are made with the antenna polarized in both the vertical and the horizontal positions.





### 2.9.3. Test Result

According to ANSI C63.10, because of peak detection will yield amplitudes equal to or greater than amplitudes measured with the quasi-peak (or average) detector, the measurement data from a spectrum analyzer peak detector will represent the worst-case results, if the peak measured value complies with the quasi-peak (or average) limit, it is unnecessary to perform an quasi-peak measurement (or average).

The measurement results are obtained as below:

 $E [dB\mu V/m] = U_R + A_T + A_{Factor} [dB]; A_T = L_{Cable loss} [dB] - G_{preamp} [dB]$ 

A<sub>T</sub>: Total correction Factor except Antenna

U<sub>R</sub>: Receiver Reading

G<sub>preamp</sub>: Preamplifier Gain

A<sub>Factor</sub>: Antenna Factor at 3m

During the test, the total correction Factor  $A_T$  and  $A_{Factor}$  were built in test software.

**Note1:** All radiated emission tests were performed in X, Y, Z axis direction. And only the worst axis test condition was recorded in this test report.

**Note2:** For the frequency, which started from 9kHz to 30MHz, was pre-scanned and the result which was 20dB lower than the limit was not recorded.

**Note3:** For the frequency, which started from 18GHz to 40GHz, was pre-scanned and the result which was 20dB lower than the limit was not recorded.





#### 802.11b Mode

Plot for Channel 1



(Antenna Horizontal, 30MHz to 18GHz)



(Antenna Vertical, 30MHz to 18GHz)



Shenzhen Morlab Communications Technology Co., Ltd. FL1-3, Building A, FeiYang Science Park, No.8 LongChang Road, Block67, BaoAn District, ShenZhen , GuangDong Province, P. R. China Tel: 86-755-36698555

Fax: 86-755-36698525

Http://www.morlab.cn





#### Plot for Channel 7



(Antenna Horizontal, 30MHz to 18GHz)



(Antenna Vertical, 30MHz to 18GHz)



Shenzhen Morlab Communications Technology Co., Ltd. FL1-3, Building A, FeiYang Science Park, No.8 LongChang Road, Block67, BaoAn District, ShenZhen , GuangDong Province, P. R. China Tel: 86-755-36698555

Fax: 86-755-36698525

Http://www.morlab.cn



#### Plot for Channel 13



(Antenna Horizontal, 30MHz to 18GHz)



(Antenna Vertical, 30MHz to 18GHz)



Shenzhen Morlab Communications Technology Co., Ltd. FL1-3, Building A, FeiYang Science Park, No.8 LongChang Road, Block67, BaoAn District, ShenZhen , GuangDong Province, P. R. China Tel: 86-755-36698555

Fax: 86-755-36698525 E-mail: service@morlab.cn

Http://www.morlab.cn



## 802.11g Mode





(Antenna Horizontal, 30MHz to 18GHz)



(Antenna Vertical, 30MHz to 18GHz)



Shenzhen Morlab Communications Technology Co., Ltd. FL1-3, Building A, FeiYang Science Park, No.8 LongChang Road, Block67, BaoAn District, ShenZhen , GuangDong Province, P. R. China Tel: 86-755-36698555

Fax: 86-755-36698525

Http://www.morlab.cn



#### Plot for Channel 7



(Antenna Horizontal, 30MHz to 18GHz)



(Antenna Vertical, 30MHz to 18GHz)



Shenzhen Morlab Communications Technology Co., Ltd. FL1-3, Building A, FeiYang Science Park, No.8 LongChang Road, Block67, BaoAn District, ShenZhen , GuangDong Province, P. R. China Tel: 86-755-36698555

Fax: 86-755-36698525

Http://www.morlab.cn



#### Plot for Channel 13



(Antenna Horizontal, 30MHz to 18GHz)



(Antenna Vertical, 30MHz to 18GHz)



Shenzhen Morlab Communications Technology Co., Ltd. FL1-3, Building A, FeiYang Science Park, No.8 LongChang Road, Block67, BaoAn District, ShenZhen , GuangDong Province, P. R. China Tel: 86-755-36698555

Fax: 86-755-36698525

Http://www.morlab.cn



## 802.11n (HT20) Mode

## Plot for Channel 1



(Antenna Horizontal, 30MHz to 18GHz)



(Antenna Vertical, 30MHz to 18GHz)



Shenzhen Morlab Communications Technology Co., Ltd. FL1-3, Building A, FeiYang Science Park, No.8 LongChang Road, Block67, BaoAn District, ShenZhen , GuangDong Province, P. R. China Tel: 86-755-36698555

Fax: 86-755-36698525

Http://www.morlab.cn



#### Plot for Channel 7



(Antenna Horizontal, 30MHz to 18GHz)



(Antenna Vertical, 30MHz to 18GHz)



Shenzhen Morlab Communications Technology Co., Ltd. FL1-3, Building A, FeiYang Science Park, No.8 LongChang Road, Block67, BaoAn District, ShenZhen , GuangDong Province, P. R. China Tel: 86-755-36698555

Fax: 86-755-36698525

Http://www.morlab.cn





#### Plot for Channel 13



(Antenna Horizontal, 30MHz to 18GHz)



(Antenna Vertical, 30MHz to 18GHz)



Shenzhen Morlab Communications Technology Co., Ltd. FL1-3, Building A, FeiYang Science Park, No.8 LongChang Road, Block67, BaoAn District, ShenZhen , GuangDong Province, P. R. China Tel: 86-755-36698555

Fax: 86-755-36698525

Http://www.morlab.cn



## 802.11n (HT40) Mode

#### Plot for Channel 3



(Antenna Horizontal, 30MHz to 18GHz)



(Antenna Vertical, 30MHz to 18GHz)



Shenzhen Morlab Communications Technology Co., Ltd. FL1-3, Building A, FeiYang Science Park, No.8 LongChang Road, Block67, BaoAn District, ShenZhen , GuangDong Province, P. R. China Tel: 86-755-36698555 Http://www.morlab.cn Fax: 86-755-36698525



#### Plot for Channel 7



(Antenna Horizontal, 30MHz to 18GHz)



(Antenna Vertical, 30MHz to 18GHz)



Shenzhen Morlab Communications Technology Co., Ltd. FL1-3, Building A, FeiYang Science Park, No.8 LongChang Road, Block67, BaoAn District, ShenZhen , GuangDong Province, P. R. China Tel: 86-755-36698555

Fax: 86-755-36698525

Http://www.morlab.cn



#### Plot for Channel 11



(Antenna Horizontal, 30MHz to 18GHz)



(Antenna Vertical, 30MHz to 18GHz)



Shenzhen Morlab Communications Technology Co., Ltd. FL1-3, Building A, FeiYang Science Park, No.8 LongChang Road, Block67, BaoAn District, ShenZhen , GuangDong Province, P. R. China Tel: 86-755-36698555

Fax: 86-755-36698525

Http://www.morlab.cn



# **Annex A Test Uncertainty**

Where relevant, the following measurement uncertainty levels have been estimated for test performed on the EUT as specified in CISPR 16-1-2:

Test Items	Uncertainty
Peak Output Power	±2.22dB
Power Spectral Density	±2.22dB
Bandwidth	±5%
Conducted Spurious Emission	±2.77dB
Restricted Frequency Bands	±5%
Radiated Emission	±2.95dB
Conducted Emission	±2.44dB

This uncertainty represent an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k=2.



Shenzhen Morlab Communications Technology Co., Ltd. FL1-3, Building A, FeiYang Science Park, No.8 LongChang Road, Block67, BaoAn District, ShenZhen , GuangDong Province, P. R. China



# **Annex B Testing Laboratory Information**

## 1. Identification of the Responsible Testing Laboratory

Laboratory Name:	Shenzhen Morlab Communications Technology Co., Ltd.		
	FL.3, Building A, FeiYang Science Park, No.8 LongChang		
Laboratory Address:	Road, Block 67, BaoAn District, ShenZhen, GuangDong		
	Province, P. R. China		
Telephone:	+86 755 36698555		
Facsimile:	+86 755 36698525		

## 2. Identification of the Responsible Testing Location

Name:	Shenzhen Morlab Communications Technology Co., Ltd.				
	FL.3, Building A, FeiYang Science Park, No.8 LongChang				
Address:	Road, Block 67, BaoAn District, ShenZhen, GuangDong				
	Province, P. R. China				

#### 3. Facilities and Accreditations

All measurement facilities used to collect the measurement data are located at FL.3, Building A, FeiYang Science Park, Block 67, BaoAn District, Shenzhen, 518101 P. R. China. The test site is constructed in conformance with the requirements of ANSI C63.10-2013 and CISPR Publication 22; the FCC designation number is CN1192, the test firm registration number is 226174.





## 4. Test Equipments Utilized

#### **4.1 Conducted Test Equipments**

Equipment Name	Serial No.	Туре	Manufacturer	Cal. Date	Due Date
Attenuator 1	(N/A.)	10dB	Resent	N/A	N/A
EXA Signal	MXE2470020		Acilont	2020 04 01	2021 02 21
Analyzer	MY53470836	N9010A	Aglient	2020.04.01	2021.03.31
USB Wideband	MV54210011		Agilopt	2020 04 01	2024 02 24
Power Sensor	WIY54210011	02021XA	Aglient	2020.04.01	2021.03.31
RF Cable	0004		Maylah	N1/A	N1/A
(30MHz-26GHz)	CB01	REUT	worlad	N/A	N/A
Coaxial Cable	CB02	RF02	Morlab	N/A	N/A
SMA Connector	CN01	RF03	HUBER-SUHNER	N/A	N/A
Computer	T430i	Think Pad	Lenovo	N/A	N/A

## **4.2 Conducted Emission Test Equipments**

Equipment Name	Serial No.	Туре	Manufacturer	Cal. Date	Due Date
Receiver	MY56400093	N9038A	KEYSIGHT	2020.03.26	2021.03.25
LISN	812744	NSLK 8127	Schwarzbeck	2020.03.26	2021.03.25
Pulse Limiter (10dB)	VTSD 9561 F-B #206	VTSD 9561-F	Schwarzbeck	2020.07.24	2021.07.23
Coaxial Cable(BNC) (30MHz-26GHz)	CB01	EMC01	Morlab	N/A	N/A
Adapter	J5164200005	AK933JH	OPPO	N/A	N/A

## 4.3 List of Software Used

Description	Manufacturer	Software Version
Test system	Townsend	V2.6
Power Panel	Agilent	V3.8
MORLAB EMCR V1.2	MORLAB	V1.0
TS+ -[JS32-CE]	Tonscend	V2.5.0.0





## 4.4 Radiated Test Equipments

Equipment Name	Serial No.	Туре	Manufacturer	Cal. Date	Due Date
Receiver	MY54130016	N9038A	Agilent	2020.07.21	2021.07.20
Test Antenna - Bi-Log	9163-519	VULB 9163	Schwarzbeck	2019.05.24	2022.05.23
Test Antenna - Loop	1519-022	FMZB1519	Schwarzbeck	2019.02.14	2022.02.13
Test Antenna – Horn	01774	BBHA 9120D	Schwarzbeck	2019.07.26	2022.07.25
Test Antenna – Horn	BBHA9170 #774	BBHA9170	Schwarzbeck	2019.07.26	2022.07.25
Coaxial Cable (N male) (9KHz-30MHz)	CB04	EMC04	Morlab	N/A	N/A
Coaxial Cable (N male) (30MHz-26GHz)	CB02	EMC02	Morlab	N/A	N/A
Coaxial Cable (N male) (30MHz-26GHz)	CB03	EMC03	Morlab	N/A	N/A
Coaxial Cable (N male) (30MHz-40GHz)	CB05	EMC05	Morlab	N/A	N/A
1-18GHz pre-Amplifier	61171/61172	S020180L32 03	Tonscend	2020.07.21	2021.07.20
18-26.5GHz pre-Amplifier	46732	S10M100L38 02	Tonscend	2020.07.21	2021.07.20
26-40GHz pre-Amplifier	56774	S40M400L40 02	Tonscend	2020.07.21	2021.07.20
Notch Filter	N/A	WRCG-2400- 2483.5-60SS	Wainwright	2020.07.21	2021.07.20
Anechoic Chamber	N/A	9m*6m*6m	CRT	2020.01.06	2023.01.05

\_\_\_\_\_ END OF REPORT \_\_\_\_



Fax: 86-755-36698525