



# **TEST REPORT**

- APPLICANT : General Procurement, Inc
- PRODUCT NAME : 10.1INCH WIFI TABLET
- MODEL NAME : HT1004X16
- BRAND NAME : HYUNDAI
- **FCC ID** : 2AIOHHT1004X16
- STANDARD(S) : 47 CFR Part 15 Subpart C
- **TEST DATE** : 2018-10-16 to 2018-10-25
- **ISSUE DATE** : 2018-11-02

Tested by:

Zhou zi jiang

Zhou Zijiang (Test Engineer)

Approved by:

Peng Huarui (Supervisor)

**NOTE:** This document is issued by MORLAB, 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





# DIRECTORY

1. Technical Information	4
1.1. Applicant and Manufacturer Information	4
1.2. Equipment Under Test (EUT) Description	4
1.3. Test Standards and Results	6
1.4. Environmental Conditions	6
2. 47 CFR Part 15C Requirements	7
2.1. Antenna requirement ·····	7
2.2. Duty Cycle Of Test Signal	7
2.3. Peak Output Power ·······1	1
2.4. Bandwidth ·······1	4
2.5. Conducted Spurious Emissions and Band Edge2	3
2.6. Power spectral density (PSD)	6
2.7. Conducted Emission 4	5
2.8. Restricted Frequency Bands4	9
2.9. Radiated Emission6	1
Annex A Test Uncertainty7	7
Annex B Testing Laboratory Information7	8





Change History					
Issue	Date	Reason for change			
1.0	2018-11-02	First edition			



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



# **1.** Technical Information

Note: Provide by applicant.

# **1.1. Applicant and Manufacturer Information**

Applicant:	General Procurement, Inc
Applicant Address:	800 E Dyer Road , Santa Ana, California 92705, United States
Manufacturer:	XIAMEN CANDOUR CO.,LTD.
Manufacturer Address:	19/F,C&D International Building, No.1699 Huandao East Road,
	Xiamen, China

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

Product Name:	10.1INCH WIFI TABLET				
Serial No:	(N/A, marked #1 by test site)				
Hardware Version:	TH863_V2.0				
Software Version:	Android Go				
Modulation Type:	DSSS, OFDM				
Operating Frequency Pange	802.11b/g/ n(HT20): 2.412GHz	- 2.462GHz			
Operating Frequency Kange.	* 802.11 n(HT40): 2.422GHz - 2.452GHz				
Channel Number	802.11b/g/ n(HT20): 11				
	802.11 n(HT40): 7				
Antenna Type:	FPC Antenna				
Antenna Gain:	-4.5 dBi				
	Battery				
	Brand Name:	YB			
	Model No.:	2865118/3.7V			
Accessory Information:	Serial No.:	(N/A, marked #1 by test site)			
	Capacity:	5000mAh			
	Rated Voltage: 3.7V				
	Charge Limit:	4.2V			





Accessory Information:	AC Adapter				
	Brand Name:	HYUNDAI			
	Model No.:	JML-0500200Z-LW			
	Serial No.:	(N/A, marked #1 by test site)			
	Rated Input:	~ 100-240V, 50/60Hz,0.2A			
	Rated Output:	=5V, 2.0A			

**Note1:** The EUT is operating at 2.4GHz ISM; it supports 802.11b, 802.11g, 802.11n and they are all tested in this report.

For 802.11b/g/n(HT20) (2.4GHz band), the frequencies allocated is F (MHz) =2412+5\*(n-1) (1<=n<=11). The lowest, middle, highest channel numbers of the EUT used and tested in this report are separately 1 (2412MHz), 6 (2437MHz) and 11 (2462MHz).

For 802.11 n(HT40), the frequencies allocated is F (MHz) = $2412+5^{*}(n-1)$  (3<=n<=9). The lowest, middle, highest channel numbers of the EUT used and tested in this report are separately 3 (2422MHz), 6 (2437MHz) and 9 (2452MHz).

**Note 2:** The EUT connected to the serial port of the computer with a serial communication cable, we use the dedicated software to control the EUT continuous transmission.

**Note 3:** For a more detailed description, please refer to Specification or User's Manual supplied by the applicant and/or manufacturer.





# 1.3. 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	1 47 CFR Part 15 (10-1-15 Edition)		Radio Frequency Devices					
Test d	etailed items	/section required by FCC rule	es and	d results are as l	below:			
No.	Section	Description		Test Date	Test Engineer	Result		
1	15.203	Antenna Requirement		N/A	N/A	PASS		
2	N/A	Duty Cycle Of Test Signal		Oct 19, 2018	Zhou Zijiang	PASS		
3	15.247(b)	Peak Output Power		Oct 19, 2018	Zhou Zijiang	PASS		
4	15.247(a)	Bandwidth		Oct 23, 2018	Zhou Zijiang	PASS		
5	15.247(d)	Conducted Spurious Emission and Band Edge		Oct 23, 2018	Zhou Zijiang	PASS		
6	15.247(e)	Power spectral density (PS	D)	Oct 23, 2018	Zhou Zijiang	PASS		
7	15.207	Conducted Emission		Oct 16, 2018	Wang Dalong	PASS		
8	15.247(d)	Restricted Frequency Band	S	Oct 25, 2018	Wang Dalong	PASS		
0	15.209,			Oct 25, 2019				
9   15.247(d)   Radiated Emission   Oct 25, 2018   Wang Dalong   PASS								
Note	Note: The tests of Conducted Emission and Radiated Emission were performed according to							
the n	nethod of me	asurements prescribed in AN	ISI Ce	63.10 2013 and	KDB558074 D01 v	v05.		

# **1.4. 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. 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  $\pm 2\%$ ; otherwise, the duty cycle is considered to be nonconstant.



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



### 2.2.2. Test Description

#### A. Test Set:



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

#### B. Equipments List:

Please refer ANNEX B(4).

#### 2.2.3. Test Result

#### A. Test Verdict:

Test Mode	Duty Cycle (%) (D)	Duty Factor (10*lg[1/D])
802.11b	100.00	0.00
802.11g	97.89	0.09
802.11n(HT20)	97.01	0.13
802.11n(HT40)	95.59	0.20





#### **B. Test Plots**

Spectrum Analyzer - Swept SA 42 PM Oct 19, 2018 TRACE 1 2 3 4 5 6 TYPE WWWWWW DET P N N N N Peak Search Marker 1 56.6000 ms Avg Type: Log-Pwr PNO: Fast +++ Trig: Free Run IFGain:Low Atten: 40 dB Next Peak Mkr1 56.60 ms 22.94 dBm Ref Offset 11.5 dB Ref 40.00 dBm 10 dB/div og <u>î</u>1 Next Pk Right Next Pk Left Marker Delta Center 2.412000000 GHz Res BW 8 MHz Span 0 Hz Sweep 100.0 ms (1001 pts) #VBW 8.0 MHz Mkr→CF FUNCTION FUNCTION WIDTH FUNCTION 22.94 dBm 56.60 ms 2 Mkr→RefLv 6789 More 10 11 1 of 2 STATUS





(Channel 1, 2412MHz, 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



Agilent Spectrum Analyzer - Swept SA					
μ RF 50 Ω AC   Marker 3 Δ 1 33500 ms		SENSE:INT	ALIGNAUTO	12:29:39 PM Oct 19, 2018 TRACE 1 2 3 4 5 6	Properties
	PNO: Fast +++ Trig: IFGain:Low Atter	Free Run n: 40 dB	- <b>3</b> - <b>3 3</b>	TYPE WWWWWWW DET P N N N N N	Select Marker
Ref Offset 11.5 dB 10 dB/div Ref 40.00 dBm			Δ	Mkr3 1.335 ms -0.12 dB	3
30.0 20.0 24341/2 Princeton Anthony Conference on Although The	an a	3∆1 <sup>Malakan</sup> adan malan satu satu satu satu satu satu satu satu	the page of the sector	epphinenlappingengen de	Relative To
-10.0					X Axis Scale Time▶ Auto Man
-30.0 -40.0 -50.0					Marker Trace [Trace1, Auto Init]
Center 2.412000000 GHz Res BW 8 MHz	#VBW 8.0 N	IHz	Sweep 5	Span 0 Hz .000 ms (1001 pts)	Lines On <u>Off</u>
MKR MODE TRC SCL ×   1 N 1 t   2 Δ1 1 t (Δ)   3 Δ1 1 t (Δ)   4 5 5 5 5   6 7 8 9 9 9   10 2 11 1 1 1	Y Y   930.0 μs 19.9   1.300 ms (Δ) -0   1.335 ms (Δ) -0	FUNCTION 8 dBm 178 dB 172 dB	FUNCTION WIDTH	FUNCTION VALUE	
MSG			STATUS		

#### (Channel 1, 2412MHz, 802.11 n(HT20))



#### (Channel 3, 2422MHz, 802.11 n(HT40))

**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



# 2.3. Peak 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.

# A. 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.

# B. Equipments List:

Please refer ANNEX B(4).





### 2.3.3. Test Result

#### 2.3.3.1 802.11b Test Mode

		Measured Output Peak Power		Limit		Vordict
Channel	Frequency (MHZ)	dBm	W	dBm	W	veruici
1	2412	19.77	0.095			PASS
6	2437	18.88	0.077	30	1	PASS
11	2462	18.84	0.077			PASS

Channel	Frequency (MHz)	Measured Output Average Power		Limi	t	Verdict
		dBm	W	dBm	W	
1	2412	17.23	0.053			PASS
6	2437	13.28	0.021	30	1	PASS
11	2462	16.34	0.043			PASS

# 2.3.3.2 802.11g Test mode

Channel	hannel Frequency (MHz) Measured Output Peak Power		Limit		Vordict	
Channel	Frequency (MHZ)	dBm	W	dBm	W	veruici
1	2412	20.24	0.106			PASS
6	2437	19.77	0.095	30	1	PASS
11	2462	19.38	0.087			PASS

Channel	Frequency (MHz)	Measured Output Average Power		Limit		Verdict
		dBm	W	dBm	W	
1	2412	10.67	0.012			PASS
6	2437	10.27	0.011	30	1	PASS
11	2462	9.79	0.010			PASS





Channel	Fraguanay (MHz)	Measured C	Measured Output Peak Power		t	Vardiat
Channel		dBm	W	dBm W		verdict
1	2412	19.88	0.097			PASS
6	2437	19.40	0.087	30	1	PASS
11	2462	18.64	0.073			PASS

#### 2.3.3.3 802.11n(HT20) Test mode

Channel	Frequency (MHz)	Measured	Output Average Power	Limi	t	Verdict
		dBm	W	dBm	W	
1	2412	9.72	0.009			PASS
6	2437	9.19	0.008	30	1	PASS
11	2462	8.66	0.007			PASS

# 2.3.3.4 802.11n(HT40) Test mode

Channel		Measured C	output Peak Power	Limi	t	Vardiat	
Channel		dBm	W	dBm W		Verdict	
3	2422	20.01	0.100			PASS	
6	2437	19.60	0.091	30	1	PASS	
9	2452	19.28	0.085			PASS	

Channel	Frequency (MHz)	Measured Output Average Power		Limit		Verdict
		dBm	W	dBm	W	
3	2422	9.39	0.009			PASS
6	2437	9.18	0.008	30	1	PASS
9	2452	8.89	0.008			PASS





### 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

#### A. Test Set:



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.

KDB 558074 Section 8.1 Option 1 was used in order to prove compliance.

#### B. Equipments List:

Please refer ANNEX B(4).





#### 2.4.3. Test Result

#### 2.4.3.1 802.11b Test mode

#### A. Test Verdict:

Channel	Frequency (MHz)	6 dB Bandwidth (MHz)	Limits(kHz)	Result
1	2412	8.548	≥500	PASS
6	2437	8.549	≥500	PASS
11	2462	9.006	≥500	PASS

#### B. Test Plots



(Channel 1, 2412MHz, 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





#### (Channel 6, 2437 MHz, 802.11b)



#### (Channel 11, 2462MHz, 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 Http://www.morlab.cn

E-mail: service@morlab.cn



#### 2.4.3.2 802.11g Test mode

#### A. Test Verdict:

Channel	Frequency (MHz)	6 dB Bandwidth (MHz)	Limits (kHz)	Result
1	2412	16.38	≥500	PASS
6	2437	16.36	≥500	PASS
11	2462	16.36	≥500	PASS

#### B. Test Plots:



(Channel 1, 2412MHz, 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







### (Channel 6, 2437MHz, 802.11g)



#### (Channel 11, 2462MHz, 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



#### 2.4.3.3 802.11n(HT20) Test mode

#### A. Test Verdict:

Channel	Frequency (MHz)	6 dB Bandwidth (MHz)	Limits (kHz)	Result
1	2412	17.56	≥500	PASS
6	2437	17.57	≥500	PASS
11	2462	17.56	≥500	PASS

#### B. Test Plots:



(Channel 1, 2412MHz, 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







#### (Channel 6, 2437MHz, 802.11n(HT20))



#### (Channel 11, 2462MHz, 802.11n(HT20))

**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

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



#### 2.4.3.4 802.11n(HT40) Test mode

#### A. Test Verdict:

Channel	Frequency (MHz)	6 dB Bandwidth (MHz)	Limits (kHz)	Result
3	2422	35.46	≥500	PASS
6	2437	35.93	≥500	PASS
9	2452	35.43	≥500	PASS

#### B. Test Plots:



(Channel 3, 2422Mz, 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







(	Channel 6	2437MHz	802 11n	(HT40))
l	Charmer 0,	2437 1011 12,	002.111	11140))



#### (Channel 9, 2452MHz, 802.11n(HT40))

**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



# 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

#### A. Test Set:



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.

KDB 558074 Section 11.0 was used in order to prove compliance.

#### B. Equipments List:

Please refer ANNEX B(4).





#### 2.5.3. Test Result

#### 2.5.3.1 802.11b Test 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	-42.85	4.64	-15.36	PASS	
6	2437	-42.83	4.58	-15.42	PASS	
11	2462	-42.49	4.80	-15.20	PASS	

#### B. Test Plots:

**Note:** The power of the Module transmitting frequency should be ignored.



(Channel = 1, 30MHz to 25GHz)



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 = 1)



#### (Channel = 6, 30MHz to 25GHz)

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





Agilent Spectr	um Analyzer - Sv	wept SA					
<mark>W</mark> orker 2	RF 50 9		SENSE:	PULSE SOURCE OFF	ALIGNAUTO	10:24:58 AM Oct 23, 2018	Peak Search
Marker Z	23.801440	PNO: F IFGain:	ast 🕞 Trig: Free Low Atten: 20	Run Avg dB	Hold:>10/10		
10 dB/div	Ref Offset 1 Ref 20.00	1.5 dB dBm			М	kr2 23.801 GHz -42.494 dBm	Next Peak
10.0 0.00 -10.0	<sup>1</sup>						Next Pk Right
-20.0 -30.0 -40.0						2	Next Pk Left
-50.0 -60.0 -70.0	and a second second		artigethere <sup>ant</sup> ion <sup>th</sup> ion <sup>th</sup> iontic <sup>t</sup> ic	and the second			Marker Delta
Start 30 M #Res BW	/IHz 100 kHz		#VBW 300 kHz		Sweep	Stop 25.00 GHz 2.386 s (4001 pts)	Mkr→CF
MKR MODE TF	RC SCL	× 2.465.CI	Y 17 4 799 dB	FUNCTION	FUNCTION WIDTH	FUNCTION VALUE	
2 N 1 3 4 5	ŕ	23.801 GI	Iz -42.494 dB	m			Mkr→RefLvl
7 8 9 10							More 1 of 2
<						>	
MSG					STATUS	5	

(Channel = 11, 30MHz to 25GHz)



(Band Edge, Channel = 11)

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



#### 2.5.3.2 802.11g Test mode

#### A. Test Verdict:

		Measured Max. Out	Limit (dBm)		
Channel	Frequency (MHz)	of Band Emission	Carrier	Calculated	Verdict
		(dBm)	Level	-20dBc Limit	
1	2412	-43.74	-3.18	-23.18	PASS
6	2437	-41.83	-1.33	-21.33	PASS
11	2462	-41.44	-3.64	-23.64	PASS

#### B. Test Plots:

**Note:** The power of the Module transmitting frequency should be ignored.



(Channel = 1, 30MHz to 25GHz)







# (Band Edge, Channel = 1)



#### (Channel = 6, 30MHz to 25GHz)

**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



Agilent Spectrum Ana	Ilyzer - Swept SA		SENSE:PU	JLSE SOURCE OFF	ALIGNAUTO	10:20:22 AM Oct 23, 2	018	
Marker 2 23.8	51380000000 G	Hz NO: Fast	Trig: Free R	Avg un Avg	Type: Log-Pwr  Hold:>10/10	TRACE 1 2 3 4 TYPE M	56	Peak Search
	IFO	Gain:Low	Atten: 20 dE	3	54			Next Peak
,10 dB/div Ref	Offset 11.5 dB 20.00 dBm				IVI	-41.436 dE	m	
10.0								
0.00								Next Pk Right
-10.0								
-20.0								Next Pk Left
-40.0						ļ •	2	
-50.0			L bat m	Marria Marria	بالتجيين والمستحد والمستحد والمستحد	www.www	~	
-60.0	a dina pangangkan kana kana kana kana kana kana	*****						Marker Delta
-70.0								
Start 30 MHz #Res BW 100 I	kHz	#VBV	V 300 kHz		Sweep	Stop 25.00 G 2.386 s (4001 p	Hz ts)	Mkr→CF
MKR MODE TRC SCL	× 2.43	5 CH-	Y 2.636.dBm	FUNCTION	FUNCTION WIDTH	FUNCTION VALUE		
2 N 1 f	23.85	1 GHz	-41.436 dBm					
4								Mkr→RefLvl
6 7								
8								More
10							~	1 of 2
MSG			III		STATU	3		

(Channel = 11, 30MHz to 25GHz)



(Band Edge, Channel = 11)

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



#### 2.5.3.3 802.11n(HT20) Test mode

#### A. Test Verdict:

		Measured Max. Out	Limit (dBm)		
Channel	Frequency (MHz)	of Band Emission	Carrier	Calculated	Verdict
		(dBm)	Level	-20dBc Limit	
1	2412	-42.18	-4.42	-24.42	PASS
6	2437	-43.07	-5.28	-25.28	PASS
11	2462	-45.02	-5.12	-25.12	PASS

#### B. Test Plots:

**Note:** The power of the Module transmitting frequency should be ignored.



(Channel = 1, 30MHz to 25GHz)



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 = 1)



#### (Channel = 6, 30MHz to 25GHz)

**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 = 11, 30MHz to 25GHz)



(Band Edge, Channel = 11)

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



#### 2.5.3.4 802.11n(HT40) Test mode

#### A. Test Verdict:

		Measured Max. Out	Limit (dBm)		
Channel	Frequency (MHz)	of Band Emission	Carrier	Calculated	Verdict
		(dBm)	Level	-20dBc Limit	
3	2422	-43.91	-4.05	-24.05	PASS
6	2437	-43.15	-5.14	-25.14	PASS
9	2452	-42.63	-5.54	25.54	PASS

#### B. Test Plots:

**Note:** The power of the Module transmitting frequency should be ignored.



(Channel = 3, 30MHz to 25GHz)



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)



#### (Channel = 6, 30MHz to 25GHz)

**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



Agilent Spectrum Analyzer - Swept SA	SENSE:PULSE SOU	RCE OFF ALIGN AUTO	10:40:01 AM Oct 23, 2018	
Marker 2 23.857622500000 GH	Z Trig: Free Run	Avg Type: Log-Pwr Avg Hold:>10/10	TRACE 1 2 3 4 5 6 TYPE M	Peak Search
IFGair	n:LowAtten: 20 dB	м		Next Peak
Ref Offset 11.5 dB 10 dB/div Ref 20.00 dBm		IVI	-42.634 dBm	
10.0				
0.00				Next Pk Right
-10.0				
-20.0				Nevt Pk Left
-30.0			2 <sup>2</sup>	Next FR Left
-50.0		and and a second se	mann	
-60.0	فيسقم يجمعه بستج والمستج والمتحد والمحي المحيو المحي المحيو المح			Marker Delta
-70.0				
Start 30 MHz	· · · · · · · · · · · · · · · · · · ·	<u>_</u>	Stop 25.00 GHz	
#Res BW 100 KHz	#VBW 300 KHz	Sweep	2.386 s (4001 pts)	Mkr→CF
1 N 1 f 2.446 G	Hz -5.543 dBm	CTION FONCTION WIDTH	FUNCTION VALUE	
2 N 1 F 23.858 G	HZ -42.634 dBm			Mkr→RefLvl
4 5				
9				More
			×	1012
MSG		STATU	S	

#### (Channel = 9, 30MHz to 25GHz)



#### (Band Edge, Channel = 9)

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



# 2.6. Power spectral density (PSD)

### 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

### A. Test procedure

The measured power spectral density was calculated by the reading of the spectrum analyzer and calibration. Following is the test procedure for PSD test:

- a) Set analyzer center frequency to channel center frequency.
- b) Set the span to 1.5 times DTS
- c) Set the RBW to 3 kHz
- d) Set the VBW to 10 kHz
- e) Detector = peak.
- f) Sweep time = auto couple.
- g) Trace mode = max hold.
- h) Allow trace to fully stabilize.
- i) Use the peak marker function to determine the maximum amplitude level within the RBW.

#### B. Test Set:



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.

KDB 558074 Section 10.2 was used in order to prove compliance.

#### C. Equipments List:

Please refer ANNEX B(4).



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


### 2.6.3. Test Result

#### 2.6.3.1 802.11b Test mode

#### A. Test Verdict:

	Spect	ral power density (dBm/3kHz)		
Channel	Frequency	Measured PSD (dBm/3kHz)	Limit	Verdict
onannor	(MHz)		(dBm/3kHz)	Voraiot
1	2412	-8.45	8	PASS
6	2437	-8.09	8	PASS
11	2462	-9.25	8	PASS

#### B. Test Plots:



(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





#### (Channel = 6, 802.11b)



(Channel = 11, 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 Http://www.morlab.cn E-mail: service@morlab.cn



## 2.6.3.2 802.11g Test mode

#### A. Test Verdict:

	S	pectral power density (dBm/3kHz)		
Channel	Frequency (MHz)	Measured PSD (dBm/3kHz)	Limit (dBm/3kHz)	Verdict
1	2412	-14.20	8	PASS
6	2437	-14.57	8	PASS
11	2462	-14.58	8	PASS

## B. Test Plots:



(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





#### (Channel = 6, 802.11g)



(Channel = 11, 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 Http://www.morlab.cn



## 2.6.3.3 802.11n(HT20) Test mode

#### A. Test Verdict:

	S	pectral power density (dBm/3kHz)		
Channel	Frequency	Macourod BSD (dBm/2kHz)	Limit	Vardiat
Channel	(MHz)	Measured FSD (UBIN/SKHZ)	(dBm/3kHz)	verdict
1	2412	-14.37	8	PASS
6	2437	-15.25	8	PASS
11	2462	-14.65	8	PASS

#### B. Test Plots:



(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





(Channel = 6, 802.11n(HT20))



(Channel = 11, 802.11n(HT20))





## 2.6.3.4 802.11n(HT40) Test mode

#### A. Test Verdict:

	Spec	ctral power density (dBm/3kHz)		
Channel	Frequency	Macourod DSD (dBm/2kHz)	Limit	Vardiat
Channel	(MHz)	Measured FSD (dBIII/SKHZ)	(dBm/3kHz)	verdict
3	2422	-17.99	8	PASS
6	2437	-18.98	8	PASS
9	2452	-19.22	8	PASS

#### B. Test Plots:



(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





(Channel = 6, 802.11n(HT40))



(Channel = 9, 802.11n(HT40))







# 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).

Frequency range	Conducted	Limit (dBµV)
(MHz)	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

## A. 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



## B. Equipments List:

Please refer ANNEX B(4).

## 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. 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:

The EUT configuration of the emission tests is Adaptor + EUT + Link. **Note:** The test voltage is AC 120V/60Hz.







(L Phase)

NO.	Fre.	Emission L	.evel (dBµV)	Limit (	dBµV)	Power-line	Verdict
	(MHz)	Quai-peak	Average	Quai-peak	Average		
1	0.1544	50.15	33.31	65.76	55.76		PASS
2	0.1951	43.91	29.38	63.82	53.82		PASS
3	0.2806	33.02	23.46	60.80	50.80	Lino	PASS
4	0.4968	43.11	34.80	56.05	46.05	LINE	PASS
5	0.5727	42.03	33.24	56.00	46.00		PASS
6	9.1153	39.62	24.47	60.00	50.00		PASS









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

NO.	Fre.	Emission L	.evel (dBµV)	Limit (	dBµV)	Power-line	Verdict	
	(MHz)	Quai-peak	Average	Quai-peak	Average			
1	0.1544	52.25	36.49	65.76	55.76		PASS	
2	0.1949	46.66	32.91	63.83	53.83		PASS	
3	0.4969	44.85	37.60	56.05	46.05	Noutrol	PASS	
4	0.5771	42.46	36.56	56.00	46.00	neutrai	PASS	
5	1.1140	38.17	30.76	56.00	46.00		PASS	
6	9.9242	40.23	24.82	60.00	50.00		PASS	







# 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

#### A. 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.

KDB 558074 Section 12.1 was used in order to prove compliance.





# **B.** Equipments List:

Please refer ANNEX B(4).

## 2.8.3. Test Result

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

The measurement results are obtained as below: E  $[dB\mu V/m] = U_R + A_T + A_{Factor} [dB]; A_T = L_{Cable loss} [dB] - G_{preamp} [dB]$   $A_T$ : Total correction Factor except Antenna  $U_R$ : Receiver Reading  $G_{preamp}$ : Preamplifier Gain  $A_{Factor}$ : 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.

## 2.7.3.1 802.11b Test mode

#### A. Test Verdict:

Channel	Frequency	Detector	Receiver Reading	A <sub>T</sub>	A <sub>Factor</sub>	Max. Emission	Limit	Verdict
	(MHz)	PK/ AV	U <sub>R</sub> (dBuV)	(dB)	(dB@3m)	E (dBµV/m)	(dBµV/m)	
1	2386.61	PK	51.82	-29.67	32.56	54.71	74	PASS
1	2386.16	AV	42.14	-29.67	32.56	45.03	54	PASS
11	2486.73	PK	53.69	-29.67	32.56	56.58	74	PASS
11	2487.68	AV	42.09	-29.67	32.56	44.98	54	PASS





### B. Test Plots:

📕 Keysight Spectrum Analyzer - Swept S/ ALIGN OFF Avg Type: Voltage Avg|Hold:>100/100 07:32:09 AM Oct 25, 2018 TRACE 12345 TYPE MWWWW DET P P N N N D Marker Marker 1 2.386608000000 GHz Trig: Free Run Atten: 10 dB PNO: Fast IFGain:Low Select Marker Mkr1 2.386 61 GHz 51.816 dBµV Ref 106.99 dBµV l0 dB/div Normal 2 1 Delta **Fixed** Start 2.30000 GHz #Res BW (CISPR) 1 MHz Stop 2.41200 GHz Sweep 1.000 ms (1001 pts) #VBW 3.0 MHz Off FUNCTION EUI 2.386 61 GHz 2.390 00 GHz 51.816 dBµV 51.334 dBµV N **Properties**► More 1 of 2

(Channel = 1 PEAK, 802.11b)



(Channel = 1 AVG, 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





RL RF PRESEL 50 Ω DC arker 2 2.486732000000	GHz PNO: Fast	SENSE:INT	ALIGN OFF Avg Type: Voltage Avg Hold:>100/100	07:52:21 AM Oct 25, 2018 TRACE 1 2 3 4 5 6 TYPE M WWWW DET P P N N N N	Marker
dB/div Ref 106.99 dBµV	II Guilleow		Mkr2	2.486 732 GHz 53.691 dBµV	Select Marke
<b>g</b> 7.0					Norn
		1	2		De
.0					Fixe
art 2.46200 GHz tes BW (CISPR) 1 MHz	#VBW 3	3.0 MHz	Sweep 1	Stop 2.50000 GHz .000 ms (1001 pts)	
R MODE TRC SCL X N 1 f 2.483 N 1 f 2.486 A 1 f 2.486	500 GHz 5 732 GHz 5	Υ FUN 10.708 dBμV 13.691 dBμV	ICTION FUNCTION WIDTH	FUNCTION VALUE	Propertie
					M

(Channel = 11 PEAK, 802.11b)



(Channel = 11 AVG, 802.11b)





# 2.7.3.2 802.11g Test mode

#### A. Test Verdict:

Channel	Frequency         Detector         Receiver Reading         A <sub>T</sub> A <sub>Factor</sub> Max.		Limit	Vordiot				
Channel	(MHz)	PK/ AV	U <sub>R</sub> (dBuV)	(dB)	(dB@3m)	E (dBµV/m)	(dBµV/m)	verdici
1	2390.00	PK	63.95	-29.67	32.56	66.84	74	PASS
1	2390.00	AV	48.72	-29.67	32.56	51.61	54	PASS
11	2483.96	PK	63.63	-29.67	32.56	66.52	74	PASS
11	2483.50	AV	49.04	-29.67	32.56	51.93	54	PASS

#### B. Test Plots:



(Channel = 1 PEAK, 802.11g)





									pt SA	lyzer - Swe	rum Ana	ht Spect	Keysig
Marker	E 1 2 3 4 5 6	07:36:02 A	: Voltage	Avg Typ	NT	SENSE:		GHz	DC 0000 C	L 50 Ω 84800	2.388	r 1 2	rke
Select Marke		DE	>100/100	Avg Hold	n	10 dB	Atten	PNO: Fast ⊂ FGain:Low					
	85 GHz 5 dBµV	1 2.388 46.76	Mkr						dBµV	106.99	Ref '	liv	dB/c
Norm													
													.0
_													
De		12											
Eixo													
FIXE													Π
c	200 GHz 1001 pts)	Stop 2.41 12.84 s (	Sweep				/ 10 Hz	#VB	Hz	Hz R)1M	00 G CISPI	2.300 3W (0	art : les l
	ON VALUE	FUNCTION	CTION WIDTH	N FL	FUNC	15.14	Y		Х		SCL	DE TRC	R MOI
						iBμV iBμV	46.765	00 GHz	2.388		f	1	N
Propertie													
	=												
Mo													
1 0													
	-												

(Channel = 1 AVG, 802.11g)



(Channel = 11 PEAK, 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 Fax: 86-755-36698525 Http://www.morlab.cn E-mail: service@morlab.cn





								Swept SA	trum Analyzer -	ysight Spec	🎽 Key
Marker	E 1 2 3 4 5 6	07:49:57 Al TRAC	ALIGN OFF	Avg		SEI	GHz	0Ω DC	F PRESEL 50 2.483844	ker 2	r <sub>RL</sub> Mark
Select Marker		DE	510.2100/100	~vgi	dB	Atten: 10	IFGain:Low				
2	44 GHz 6 dBµV	2.483 8 48.60	Mkr2					99 dBµV	Ref 106.	B/div	10 dE
Norma											- <b>og</b> 97.0
Norma											87.0
											67.0
Delta				2						<u> </u>	57.0
											47.0 37.0
Fixed										<u> </u>	27.0
											17.0
Of	000 GHz 1001 pts)	Stop 2.50 4.357 s (	Sweep			V 10 Hz	#VB	MHz	200 GHz CISPR) 1	t 2.462 s BW (	Stari #Res
	IN VALUE	FUNCTION	FUNCTION WIDTH	ICTION	FU	Y		х	SCL	MODE TRO	MKR N
_					μν μV	49.042 dB 48.606 dB	844 GHz	2.483	f	N 1 N 1	1 2 3
Properties	=										4 5
											6 7
More 1 of 2											9 10
						III					11 <b>_</b>

(Channel = 11 AVG, 802.11g)

## 2.7.3.3 802.11n(HT20) Test mode

#### A. Test Verdict:

Channel	Frequency	Detector	Receiver Reading	A <sub>T</sub>	A <sub>Factor</sub>	Max. Emission	Limit	Verdict
		PK/ AV	(dBuV)	(UD)	(00@311)	∟ (dBµV/m)	(ασμν/π)	
1	2390.00	PK	65.24	-29.67	32.56	68.13	74	PASS
1	2390.00	AV	46.17	-29.67	32.56	49.06	54	PASS
11	2483.88	PK	63.91	-29.67	32.56	66.80	74	PASS
11	2483.50	AV	46.92	-29.67	32.56	49.81	54	PASS





#### **B. Test Plots:**



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



(Channel = 1 AVG, 802.11n(HT20))

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 

 Http://www.morlab.cn
 E-mail:
 servior





SENSE:INT ALIGN OFF 07:47:33 AM Oct 25, 20	B Marker
Trig: Free Run Avg/Hold:>100/100 TYPE Www. Atten: 10 dB DET	Select Marker
Mkr2 2.483 882 GF 63.906 dBµ	2
	Norm
	Norm
	De
	Fixe
Stop 2.50000 G N 3.0 MHz Sweep 1.000 ms (1001 pt	) c
Y FUNCTION FUNCTION WIDTH FUNCTION VALUE	
63.906 dBµV	Properties
	-
	Mo
	1 0

(Channel = 11 PEAK, 802.11n(HT20))



(Channel = 11 AVG, 802.11n(HT20))





## 2.7.3.4 802.11n(HT40) Test mode

#### A. Test Verdict:

Channel	Frequency	Detector	Receiver Reading	A <sub>T</sub> (dB)	A <sub>Factor</sub>	Max. Emission F	Limit	Verdict	
		PK/ AV	(dBuV)	(UD)		∟ (dBµV/m)	(dbµ v/m)		
3	2386.05	PK	63.93	-29.67	32.56	66.82	74	PASS	
3	2390.00	AV	48.16	-29.67	32.56	51.05	54	PASS	
9	2485.86	PK	64.33	-29.67	32.56	67.22	74	PASS	
9	2483.50	AV	49.04	-29.67	32.56	51.93	54	PASS	

#### B. Test Plots:



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







									Swept SA	nalyzer - Sv	trum A	ight Spec	Keysi
Marker	Oct 25, 2018	07:41:56 AM TRAC	ALIGN OFF	Avg T	E:INT	SEN		0 GHz	Ω DC 000000	SEL 50 S	F PRES	er 1 3	≀L rk
Select Marke		TYP DE	>100/100	Avg Ho	Run IB	rig: Free Atten: 10	Fast 🖵	PNO IFGai	000000	00-700			
Select Marke	85 GHz 5 dBµV	1 2.388	Mkr					v	9 dBu\	106.9	Ref	ldiv	dB
													׀ ֘
Norm													]
	$\square$												
													╞┝
De	/	12											oŀ
		Y											₀┣
											_		╞
Fixed													╞
													ᆘ
	200 GHz	Stop 2.41					I			GHz	100 0	2.300	rt
C	1001 pts)	12.84 s (1	Sweep			Hz	#VBW '		MHz	PR) 1 I	CISF	BW (	es
	N VALUE	FUNCTIO	CTION WIDTH	TION	FUN	Y 085 dBi	Hz /	388 85 (	X 2 3		SCL		M
					v	.155 dB	Hz 4	390 00 (	2.3		f	N 1	
Properties													
	=												
Mo													
1 0													

# (Channel = 3 AVG, 802.11n(HT40))



#### (Channel = 9 PEAK, 802.11n(HT40))

**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





RL RF PRESEL	- Swept SA 50 Ω DC		SENS	E:INT		ALIGN OFF	07:45:14 A	M Oct 25, 2018	
arker 2 2.48384	4000000 GH:	Z D: Fast 🕞	Trig: Free F	Run	Avg 1 Avg H	ype: Voltage old:>100/100	TRAC TYP	E 1 2 3 4 5 6 E M WWWW	Marker
) dB/div Ref 106	IFGa .99 dBµV	in:Low	Atten: 10 c	38		Mkr2	2.483 8 48.86	44 GHz 1 dBµV	Select Marke
7.0 7.0									Norn
7.0									De
7.0				\$ <sup>2</sup>					
7.0									Fixe
art 2.46200 GHz tes BW (CISPR)	1 MHz	, #VBW	√ 10 Hz			Sweep	Stop 2.50 4.357 s (	0000 GHz 1001 pts)	
R MODE TRC SCL	× 2.483 500	GHz	۲ 49.036 dBµ	FUNC	TION	FUNCTION WIDTH	FUNCTION	ON VALUE	
2 N 1 f	2.483 844	GHz	48.861 dBµ	v					Propertie
									М

(Channel = 9 AVG, 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



# 2.9. 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

Note:

- 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.
- 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

#### A. 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 RF absorbing material used on the reference ground plane and on the turntable have a maximum height (thickness) of 30 cm (12 in) and have a minimum-rated attenuation of 20 dB at all frequencies from 1 GHz to 18 GHz. Test site have a minimum area of the ground plane covered with RF absorbing material as specified in Figure 6 of ANSI C63.4: 2014.

The test site semi-anechoic chamber has met the requirement of NSA tolerance 4dB according to the standards: ANSI C63.10 (2013). For radiated emissions below or equal to 1GHz, The EUT was set-up on insulator 80cm above the Ground Plane, For radiated emissions above 1GHz, The EUT was set-up on insulator 150cm above the Ground Plane. The set-up and test methods were according to ANSI C63.10

For the radiated emission test above 1GHz:

Place the measurement antenna away from each area of the EUT determined to be a source of emissions at the specified measurement distance, while keeping the measurement antenna aimed at the source of emissions at each frequency of significant emissions, with polarization oriented for maximum response. The measurement antenna may have to be higher or lower than the EUT, depending on the radiation pattern of the emission and staying aimed at the emission source for receiving the maximum signal. The final measurement antenna elevation shall be that which maximizes the emissions. The measurement antenna elevation for maximum emissions shall be restricted to a range of heights of from 1 m to 4 m above the ground or reference ground plane.

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



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



For the Test Antenna:

(a) In the frequency range of 9kHz to 30MHz, magnetic field is measured with Loop Test Antenna. The Test Antenna is positioned with its plane vertical at 1m distance from the EUT. The center of the Loop Test Antenna is 1m above the ground. During the measurement the Loop Test Antenna rotates about its vertical axis for maximum response at each azimuth about the EUT.

(b) In the frequency range above 30MHz, Bi-Log Test Antenna (30MHz to 1GHz) and Horn Test Antenna (above 1GHz) are used. Place the test antenna at 3m away from area of the EUT, while keeping the test antenna aimed at the source of emissions at each frequency of significant emissions, with polarization oriented for maximum response. The test antenna may have to be higher or lower than the EUT, depending on the radiation pattern of the emission and staying aimed at the emission source for receiving the maximum signal. The final test antenna elevation shall be that which maximizes the emissions. The test antenna elevation for maximum emissions shall be restricted to a range of heights of from 1 m to 4 m above the ground or reference ground plane. The emission levels at both horizontal and vertical polarizations should be tested.

# A. Equipments List:

Please refere ANNEX B(4).

## 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 limit, it is unnecessary to perform an quasi-peak measurement.

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 9 kHz 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 25GHz to 40GHz, was pre-scanned and the result which was 20dB lower than the limit was not recorded.





#### 2.9.3.1 802.11b Test mode

### Plots for Channel = 1



(Antenna Horizontal, 30MHz to 25GHz)



(Antenna Vertical, 30MHz to 25GHz)



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 F Http://www.morlab.cn E



Plot for Channel = 6



(Antenna Horizontal, 30MHz to 25GHz)



(Antenna Vertical, 30MHz to 25GHz)



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



## Plot for Channel = 11



(Antenna Horizontal, 30MHz to 25GHz)



(Antenna Vertical, 30MHz to 25GHz)



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-



#### 2.9.3.2 802.11g Test mode

#### Plots for Channel = 1



(Antenna Horizontal, 30MHz to 25GHz)



(Antenna Vertical, 30MHz to 25GHz)



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:





#### Plot for Channel = 6



(Antenna Horizontal, 30MHz to 25GHz)



(Antenna Vertical, 30MHz to 25GHz)



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



(Antenna Horizontal, 30MHz to 25GHz)



(Antenna Vertical, 30MHz to 25GHz)

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

MORLAB

Tel: 86-755-36698555 Fax: 8 Http://www.morlab.cn E-mai





2.9.3.3 802.11n(HT20) Test mode

## Plots for Channel = 1



(Antenna Horizontal, 30MHz to 25GHz)



(Antenna Vertical, 30MHz to 25GHz)



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: 8 Http://www.morlab.cn E-mai





#### Plot for Channel = 6



(Antenna Horizontal, 30MHz to 25GHz)



(Antenna Vertical, 30MHz to 25GHz)



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: 8 Http://www.morlab.cn E-mai
### REPORT No.: SZ18100035W02



(Antenna Horizontal, 30MHz to 25GHz)



(Antenna Vertical, 30MHz to 25GHz)

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 E-mail: service@morlab.cn







#### 2.9.3.4 802.11n(HT40) Test mode

#### Plots for Channel = 3



(Antenna Horizontal, 30MHz to 25GHz)



(Antenna Vertical, 30MHz to 25GHz)



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



## REPORT No.: SZ18100035W02

Plots for Channel = 6



(Antenna Horizontal, 30MHz to 25GHz)



(Antenna Vertical, 30MHz to 25GHz)



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 E-mail: service@morlab.cn

#### REPORT No.: SZ18100035W02



(Antenna Horizontal, 30MHz to 25GHz)



(Antenna Vertical, 30MHz to 25GHz)

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





Plots for Channel = 9



# **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 (PSD)	±2.22dB
Bandwidth	±5%
Conducted Spurious Emission	±2.77 dB
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

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

#### 2. Identification of the Responsible Testing Location

Name:	Shenzhen Morlab Communications Technology Co., Ltd.
	Morlab Laboratory
Address:	FL.3, Building A, FeiYang Science Park, No.8 LongChang
	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	Cal. Due
Power Splitter	NW521	1506A	Weinschel	2018.04.17	2019.04.16
Attenuator 1	(N/A.)	10dB	Resnet	2018.04.17	2019.04.16
Attenuator 2	(N/A.)	3dB	Resnet	2018.04.17	2019.04.16
EXA Signal Analzver	MY53470836	N9010A	Agilent	2017.12.03	2018.12.02
USB Wideband Power Sensor	MY54210011	U2021XA	Agilent	2018.04.17	2019.04.16
RF cable (30MHz-26GHz)	CB01	RF01	Morlab	N/A	N/A
Coaxial cable	CB02	RF02	Morlab	N/A	N/A
SMA connector	CN01	RF03	HUBER-SUHNER	N/A	N/A

## 4.2 Conducted Emission Test Equipments

Equipment Name	Serial No.	Туре	Manufacturer	Cal. Date	Cal. Due
Receiver	MY56400093	N9038A	KEYSIGHT	2018.05.08	2019.05.07
LISN	812744	NSLK 8127	Schwarzbeck	2018.05.08	2019.05.07
Pulse Limiter (20dB)	9391	VTSD 9561-D	Schwarzbeck	2018.05.08	2019.05.07
Coaxial cable(BNC) (30MHz-26GHz)	CB01	EMC01	Morlab	N/A	N/A

## 4.3Auxiliary Test Equipment

Equipment Name	Model No.	Brand Name	Manufacturer	Cal.Date	Cal.Due Date
Computer	T430i	Think Pad	Lenovo	N/A	N/A

#### 4.4 List of Software Used

Description	Manufacturer	Software Version	
Test system	Tonscend	V2.6	
Power Panel	Agilent	V3.8	
MORLAB EMCR V1.2	MORLAB	V 1.0	





### 4.5 Radiated Test Equipments

Equipment Name	Serial No.	Туре	Manufacturer	Cal. Date	Cal. Due
Receiver	MY54130016	N9038A	Agilent	2018.08.04	2019.08.03
Test Antenna - Bi-Log	9163-519	VULB 9163	Schwarzbeck	2018.05.18	2019.05.17
Test Antenna - Loop	1519-022	FMZB1519	Schwarzbeck	2018.03.03	2019.03.02
Test Antenna – Horn	01774	BBHA 9120D	Schwarzbeck	2018.08.06	2019.08.05
Test Antenna – Horn	BBHA9170 #774	BBHA9170	Schwarzbeck	2018.08.02	2019.08.01
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
1-18GHz pre-Amplifier	MA02	TS-PR18	Rohde& Schwarz	2018.05.08	2019.05.07
18-26.5GHz pre-Amplifier	MA03	TS-PR18	Rohde& Schwarz	2018.05.08	2019.05.07
Anechoic Chamber	N/A	9m*6m*6m	CRT	2017.11.19	2020.11.18

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

\_



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