

# **TEST REPORT**

APPLICANT	: Bullitt Group
PRODUCT NAME	: 4G Mobile Phone
MODEL NAME	: S22 Flip
BRAND NAME	: CAT
FCC ID	: ZL5S22F
STANDARD(S)	: 47 CFR Part 15 Subpart C
RECEIPT DATE	: 2021-02-08
TEST DATE	: 2021-03-23 to 2021-04-07
ISSUE DATE	: 2021-05-27

Edited by:

Pong Mi Peng Mi (Rapporteur)

Approved by:

Peng Huarui (Supervisor)

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# DIRECTORY

Change History					
Version	Version Date Reason for change				
1.0 2021-05-27		First edition			





# **1. Technical Information**

Note: Provide by applicant.

# 1.1. Applicant and Manufacturer Information

Applicant:	Bullitt Group	
Applicant Address:	One Valpy, Valpy Street, Reading RG1 1AR, United Kingdom	
Manufacturer:	Bullitt Group	
Manufacturer Address:	One Valpy, Valpy Street, Reading RG1 1AR, United Kingdom	

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

Product Name:	4G Mobile Phone		
Serial No:	(N/A, marked #1 by	/ test site)	
Hardware Version:	Q2805_V2.0		
Software Version:	LTE_S02113.11_N	_S22Flip	
Modulation Technology:	DSSS, OFDM		
Modulation Type:	Refer to section1.3		
Operating Frequency Range:	802.11b/g/ n (HT20): 2412MHz–2462MHz 802.11n (HT40): 2422MHz–2452MHz		
Antenna Type:	PIFA Antenna		
Antenna Gain:	0.18dBi		
	Battery		
	Brand Name:	N/A	
	Model No.:	BTE-2000	
Accessory Information:	Serial No.:	(N/A, marked #1 by test site)	
Accessory mormation.	Capacity:	2000mAh	
	Rated Voltage:	3.80V	
	Charge Limit:	4.35V	
	Manufacturer:	Phenix New Energy(Hui Zhou)Co.,Ltd.	





	AC Adapter		
	Brand Name:	N/A	
	Model No.:	TPA-46050200UU	
Accessory Information:	Serial No.:	(N/A, marked #1 by test site)	
	Rated Output:	5.0V==2000mA	
	Rated Input:	100-240V~50/60Hz, 0.3A	
	Manufacturer:	Shenzhen Tianyin Electronics Co.,Ltd.	

Note 1: We use the dedicated software to control the EUT continuous transmission.

**Note 2:** 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	<b>6</b> / 9
	QPSK	12 / 18
OFDM (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
000 44 h / m	3	2422	10	2457
802.11b/g/ n	4	2427	11	2462
(HT20)	5	2432		
	6	2437		
	7	2442		
Test Mode	Channel	Frequency (MHz)	Channel	Frequency (MHz)
	3	2422	8	2447
802.11n (HT40)	4	2427	9	2452
	5	2432		
	6	2437		
	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	No deviation
2	N/A	Duty Cycle of Test Signal	Mar 24, 2021	Liu Bo	PASS	No deviation
3	15.247(b)	Maximum Peak and Average Conducted Output Power	Mar 24, 2021	Liu Bo	PASS	No deviation
4	15.247(a)	Bandwidth	Mar 24, 2021	Liu Bo	PASS	No deviation
5	15.247(d)	Conducted Spurious Emission and Band Edge	Mar 24, 2021	Liu Bo	PASS	No deviation
6	15.247(e)	Power Spectral Density	Mar 24, 2021	Liu Bo	PASS	No deviation
7	15.207	Conducted Emission	Apr 03, 2021	Huang Zhiye	PASS	No deviation
8	15.247(d)	Restricted Frequency Bands	Apr 07, 2021	Gao Jianrou	PASS	No deviation
9	15.209, 15.247(d)	Radiated Emission	Apr 06&07, 2021	Gao Jianrou	PASS	No deviation
	Note 1: The tests were performed according to the method of measurements prescribed in					
	ANSIC63.10-2013, KDB558074 D01 v05r02. <b>Note 2:</b> The path loss during the RF test is calibrated to correct the results by the offset setting					





in the test equipments. The ref offset 11.5dB contains two parts that cable loss 1.5dB and Attenuator 10dB.

**Note 3:** 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 4:** When the test result is a critical value, we will use the measurement uncertainty give the judgment result based on the 95% risk level.

# **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

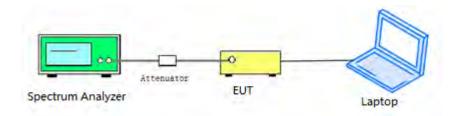
# 2.2.1. Requirement

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.



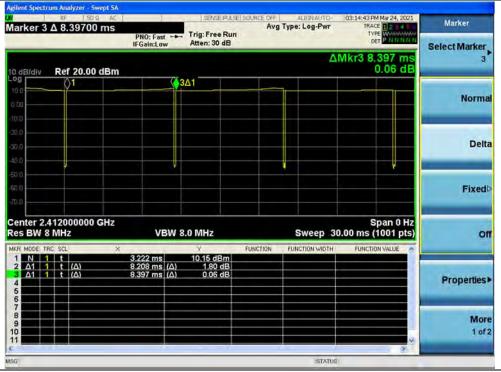


# 2.2.3. Test Result

### A. Test Verdict:

Test Mode	Duty Cycle (%) (D)	Duty Factor (10*lg[1/D])
802.11b	97.75	0.10
802.11g	87.22	0.59
802.11n (HT20)	86.44	0.63
802.11n (HT40)	75.99	1.19

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



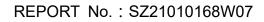
(Channel 1, 802.11b)



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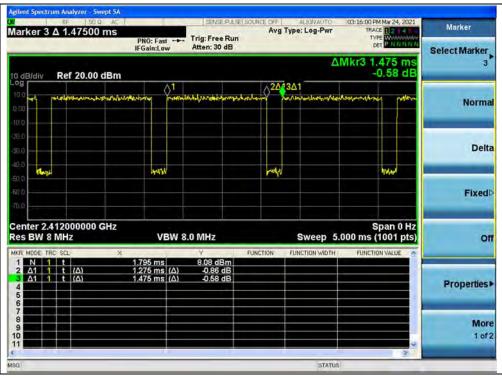
Http://www.morlab.cn





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Mkr⊸RefLv							B	7.48 dB -0.33 d 0.56 d	(Δ) (Δ)	190 ms 365 ms 565 ms	1.3			t t	V 1 1 1 1 1	۵
More 1 of 2																

# (Channel 1, 802.11g)

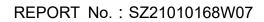


#### (Channel 1, 802.11n (HT20))

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Marker		TYPE	LIGNAUTO			ENSE: PULSE	Trig: F	0: Fast +		37.000	8F 3 Δ 8	ker 3
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Del												
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(Channel 3, 802.11n (HT40))



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# 2.3. Maximum Peak and Average Conducted Output Power

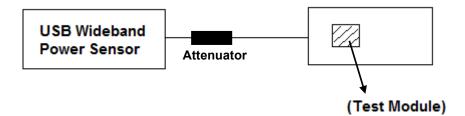
# 2.3.1. Requirement

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	Fraguanay (MHz)	Measured C	utput Peak Power	Limi	t	Verdict
Channel	Frequency (MHz)	dBm	W	dBm	W	verdict
1	2412	20.77	0.119			PASS
6	2437	20.24	0.106	30	1	PASS
11	2462	21.35	0.136			PASS

#### 802.11g Mode

Channel	Frequency (MHz)	Measured C	output Peak Power	Limi	t	Verdict
Channel	Frequency (IVITZ)	dBm	W	dBm	W	verdict
1	2412	22.91	0.195			PASS
6	2437	23.48	0.223	30	1	PASS
11	2462	23.78	0.239			PASS

#### 802.11n (HT20) Mode

Channel		Measured C	utput Peak Power	Limi	t	Vardiat
Channel	Frequency (MHz)	dBm	W	dBm	W	Verdict
1	2412	23.07	0.203			PASS
6	2437	23.56	0.227	30	1	PASS
11	2462	23.64	0.231			PASS

#### 802.11n (HT40) Mode

Channel	Frequency (MHz)	Measured C	utput Peak Power	Limi	t	Verdict
Channel	Frequency (MHz)	dBm	W	dBm	W	verdict
3	2422	23.21	0.209			PASS
6	2437	23.46	0.222	30	1	PASS
9	2452	23.61	0.230			PASS





# Maximum Average Conducted Output Power

# 802.11b Mode

	Fraguanay		Averag	le Power		Lin	nit	
Channel	Frequency (MHz)	Measured	Duty	Duty Factor	<sup>r</sup> Calculated		IIIL	Verdict
	(INITZ)	dBm	Factor	dBm	W	dBm	W	
1	2412	18.34		18.44	0.070			PASS
6	2437	17.38	0.10	17.48	0.056	30	1	PASS
11	2462	18.83		18.93	0.078			PASS

# 802.11g Mode

	Fraguanay		Averag	je Power		Lin	mit	
Channel	Frequency (MHz)	Measured	Duty	Duty Factor	ty Factor Calculated		m	Verdict
	(INITZ)	dBm	Factor	dBm	W	dBm	W	
1	2412	17.06		17.65	0.058			PASS
6	2437	17.45	0.59	18.04	0.064	30	1	PASS
11	2462	17.55		18.14	0.065			PASS

# 802.11n (HT20) Mode

	Fraguanay		Averag	je Power		Lie	mit		
Channel	Frequency (MHz)	Measured	Duty	uty Duty Factor Calculated		Limit		Verdict	
		dBm	Factor	dBm	W	dBm	W		
1	2412	17.10		17.73	0.059			PASS	
6	2437	17.41	0.63	18.04	0.064	30	1	PASS	
11	2462	17.55		18.18	0.066			PASS	

#### 802.11n (HT40) Mode

	Fraguanay		Averag	le Power		Lir	nit	
Channel	Frequency (MHz)	Measured	easured Duty Duty Factor Calcula		<sup>r</sup> Calculated	Limit		Verdict
	(INITZ)	dBm	Factor	dBm	W	dBm	W	
3	2422	18.10		19.29	0.085			PASS
6	2437	17.60	1.19	18.79	0.076	30	1	PASS
9	2452	17.74		18.93	0.078			PASS



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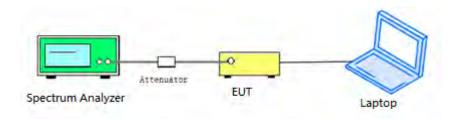


# 2.4.1. Requirement

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.



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### 2.4.4. Test Result

#### 802.11b Mode

#### A. Test Verdict:

Channel	Frequency (MHz)	6 dB Bandwidth (MHz)	Limits(kHz)	Result
1	2412	9.048	≥500	PASS
6	2437	8.086	≥500	PASS
11	2462	8.541	≥500	PASS

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

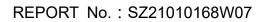


(Channel 1, 802.11b)



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#### (Channel 6, 802.11b)



#### (Channel 11, 802.11b)

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# 802.11g Mode

# A. Test Verdict:

Channel	Frequency (MHz)	6 dB Bandwidth (MHz)	Limits(kHz)	Result
1	2412	16.32	≥500	PASS
6	2437	16.35	≥500	PASS
11	2462	16.33	≥500	PASS

### B. Test Plot:

Center Freq 2.412000000	GHz Cente	ENSE:FULSE SOURCE OFF In Freq: 2.412000000 GH Free Run Avg H 1: 20 dB	ALIGNAUTO 2 old:>10/10	03:17:57 PM Mar 24, 2021 Radio Std: None Radio Device: BTS	Frequency
o dB/div Ref 15.00 dBm					
5.00	mburbarbarbar	in partmanteers	hurny		Center Free 2.412000000 GH
so so				mathamilianter	
50 50					
enter 2.412 GHz Res BW 100 kHz	#	VBW 300 kHz		Span 30 MHz Sweep 3.733 ms	CF Step 3.000000 MH
Occupied Bandwidt	n 7.525 MHz			6 dBm	Auto Mar Freq Offse
Transmit Freq Error x dB Bandwidth	-2.276 kHz 16.32 MHz	OBW Power x dB		9.00 % .00 dB	OH
3			STATU	ŝ	

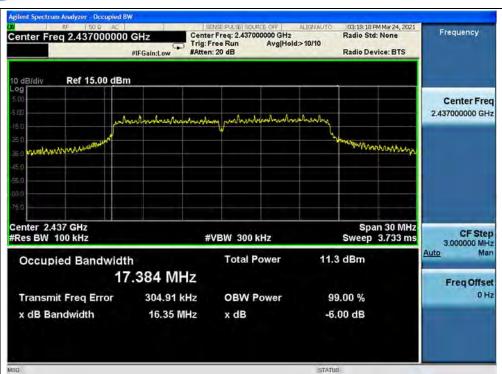
# (Channel 1, 802.11g)



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#### (Channel 6, 802.11g)



#### (Channel 11, 802.11g)

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# 802.11n (HT20) Mode

# A. Test Verdict:

Channel	Frequency (MHz)	6 dB Bandwidth (MHz)	Limits(kHz)	Result
1	2412	16.55	≥500	PASS
6	2437	17.56	≥500	PASS
11	2462	17.58	≥500	PASS

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

enter Freq 2.412000000	Cente	EVSEIFULSE SOURCE OFF er Freq: 2.412000000 GHz Free Run Avg Hol n: 20 dB	ALIGNAUTO d:>10/10	03:20:46 PM Mar 24, 2021 Radio Std: None Radio Device: BTS	Frequency
o dB/div Ref 15.00 dBr	n				
.03	Lahenbertrack	m water allow when the	Mulmin		Center Fred 2.412000000 GH
50 50 WmWhanky America 50				anterna anternation and	
5.0 5.0 5.0					
enter 2.412 GHz Res BW 100 kHz	#	VBW 300 kHz		Span 30 MHz Sweep 3.733 ms	CF Ste 3.000000 MH
Occupied Bandwid	<sup>th</sup> 8.058 MHz	Total Power	11.4	dBm	Auto Ma Freq Offse
Transmit Freq Error x dB Bandwidth	-36.032 kHz 16.55 MHz	OBW Power x dB		.00 % 00 dB	OH
G			STATUS		

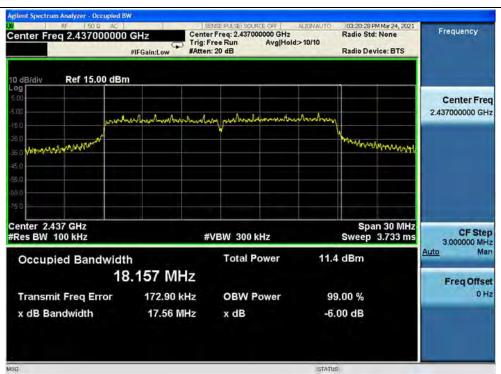
(Channel 1, 802.11n (HT20))



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# (Channel 6, 802.11n (HT20))



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

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# 802.11n (HT40) Mode

# A. Test Verdict:

Channel	Frequency (MHz)	6 dB Bandwidth (MHz)	Limits(kHz)	Result
3	2422	35.43	≥500	PASS
6	2437	35.70	≥500	PASS
9	2452	35.05	≥500	PASS

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

Center Freq 2.422000000	GHz Centor	ENSE:PULSE SOURCE OFF Freq: 2.422000000 GH Free Run Avg H n: 20 dB	2 old:>10/10	Radio Dev		Recall State
Bof 40.00 dBr	in Galicow	n. 20 ab		Radio De	vice. B13	From File
0 dB/div Ref 10.00 dBr	n ucharhadhaanaakarharphaelussaada	m posistaaladustaatus	ndaturatur			Edit Register Names
aa				Wishillowlog	hidunatumengi	Register 1 Last: 2/21/2019 10:03:15 AM
3.0 9.0						Register 2 (empty)
enter 2.422 GHz Res BW 100 kHz	#	VBW 300 kHz			n 60 MHz 7.467 ms	Register 3 (empty)
Occupied Bandwidt	<sup>h</sup> 6.774 MHz	Total Power	11.4	l dBm		Register 4
Transmit Freq Error x dB Bandwidth	-161.12 kHz 35.43 MHz	OBW Power x dB		9.00 % 00 dB		(empty)
						More 1 of 3
sg J File <2422.state> recalled			STATU	5		

# (Channel 3, 802.11n (HT40))







# (Channel 6, 802.11n (HT40))



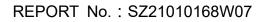
#### (Channel 9, 802.11n (HT40))

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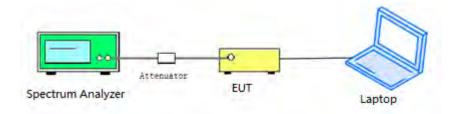
# 2.5. Conducted Spurious Emissions and Band Edge

# 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		
Channel	Frequency (MHz)	of Band Emission	Carrier	Calculated	Verdict
		(dBm)	Level	-20dBc Limit	
1	2412	-37.47	6.43	-13.57	PASS
6	2437	-38.25	7.77	-12.23	PASS
11	2462	-36.15	7.92	-12.08	PASS

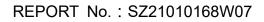
#### **B. Test Plot:**



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



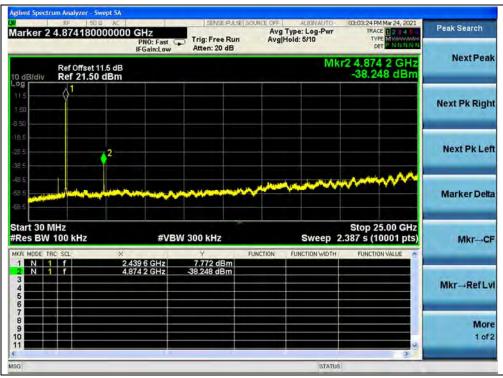
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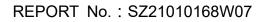
(Band Edge, Channel 1, 802.11b)



(30MHz to 25GHz, Channel 6, 802.11b)



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Peak Search		TYPE	LIGNAUTO : Log-Pwr 1/10			1	IZ NO: Fast G		4.924120	rker 2
Next Peak	Ref Offset 11.5 dB         Mkr2 4.924 1 GHz           3/div         Ref 21.50 dBm         -36.146 dBm								B/div	
Next Pk Righ									¢1	5 
Next Pk Let								2		5
Marker Delt	~~~~	<b>A</b> lineada	,	يندر <del>ا</del> حتو أجر	ww	به جو او	-	-	and disade the second	
Mkr→C	5.00 GHz 0001 pts)		Sweep 2.			300 kHz	#VBW		Hz 100 kHz	nt 30 M es BW
Mkr→RefLv	N VALUE	FUNCTION	CTION WIDTH	TION FUN	m	Y 7.917 dB .36.146 dB	1 GHz 1 GHz		f	MODE TR

(30MHz to 25GHz, Channel 11, 802.11b)



(Band Edge, Channel 11, 802.11b)



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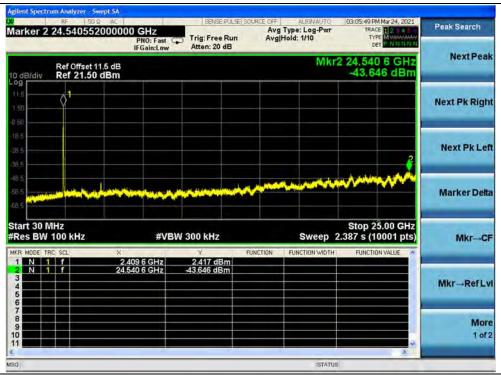


# 802.11g Mode

#### A. Test Verdict:

		Measured Max. Out	Limi		
Channel	Frequency (MHz)	of Band Emission	Carrier	Calculated	Verdict
		(dBm)	Level	-20dBc Limit	
1	2412	-43.65	2.42	-17.58	PASS
6	2437	-42.59	1.58	-18.42	PASS
11	2462	-42.54	3.06	-16.94	PASS

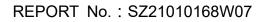
### **B. Test Plot:**



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



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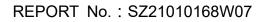
(Band Edge, Channel 1, 802.11g)



(30MHz to 25GHz, Channel 6, 802.11g)



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	5:07 PM Mar 24, 2021 TRACE 2 4 5 TYPE MWAAAAAA DET PINTENININ	Log-Pwr T		SENSE: PULSE  S Trig: Free Run Atten: 20 dB	GHz PNO: Fast 😱 FGain:Low	8000000	24.48561	rker 2
Next Peak	485 6 GHz 2.537 dBm			Ref Offset 11.5 dB B/div Ref 21.50 dBm				
Next Pk Righ							0 <sup>1</sup>	δ σ σ
Next Pk Le	2							5 5 5
Marker Del		whenthe		www.	-	humona		5
Mkr→C		Sweep 2.387 s		800 kHz	#VBW		100 kHz	
	UNCTION VALUE	CTION WIDTH FUNC	ECTION F	3.057 dBm 42.537 dBm	4 6 GHz 5 6 GHz		17	MDDE TR
Mkr→RefL								

### (30MHz to 25GHz, Channel 11, 802.11g)



(Band Edge, Channel 11, 802.11g)

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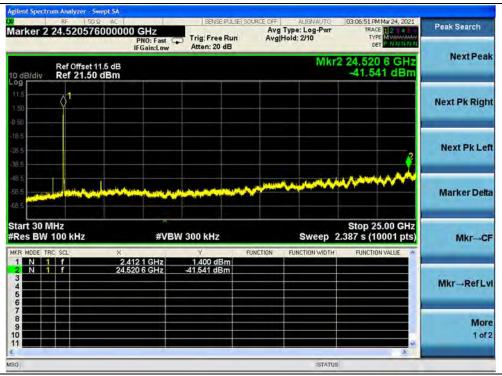


# 802.11n (HT20) Mode

#### A. Test Verdict:

		Measured Max. Out	Limi		
Channel	Frequency (MHz)	of Band Emission	Carrier	Calculated	Verdict
		(dBm)	Level	-20dBc Limit	
1	2412	-41.54	1.40	-18.60	PASS
6	2437	-43.03	1.80	-18.20	PASS
11	2462	-43.19	6.83	-13.17	PASS

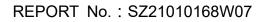
### **B. Test Plot:**



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



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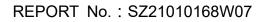
# (Band Edge, Channel 1, 802.11n (HT20))



(30MHz to 25GHz, Channel 6, 802.11n (HT20))



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	03:07:34 PM Mar 24, 2021 TRACE 22:4 8 TYPE M MANAAAAA DET P.N. 12 DI N M	ALIGNAUTO Type: Log-Pwr Hold: 1/10	Avg	SENSE:PULSE Trig: Free Run Atten: 20 dB	GHZ NO: Fast Gain:Low			2 24.	ker
Next Peak	Ref Offset 11.5 dB Mkr2 24.520 6 GHz Ref 21.50 dBm -43.191 dBm							3/div	
Next Pk Rigi							1	0	
Next Pk Le	2								
Marker Del	And the second s	-	in an			hanna	te the training	ألعويه	
Mkr→C	Stop 25.00 GHz 387 s (10001 pts)	Sweep 2.3		300 kHz	#VBW		kHz	MHz V 100	
	FUNCTION VALUE	FUNCTION WIDTH	FUNCTION	6.825 dBm	6 GHz			TRC SC	N
				43.191 dBm	6 GHz	24.520		1 f	N
Mkr→RefL									

(30MHz to 25GHz, Channel 11, 802.11n (HT20))



(Band Edge, Channel 11, 802.11n (HT20))

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# 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	-42.22	0.82	-19.18	PASS
6	2437	-42.94	-0.02	-20.02	PASS
9	2452	-43.47	1.10	-18.90	PASS

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



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



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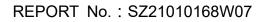
Marker	14.5	03:08:36 PM Mar 24, 2 TRACE	Type: Log-Pwr Hold:>100/100		Trig: Free Run Atten: 20 dB	GHZ PNO: Fast G	150 9 AC	er 2 2.3971
Select Marker 2	GHz Bm	2.397 12 G	Mkr		Atten: 20 dB	IFGain:Low	set 11.5 dB 1.50 dBm	
Norma		ų,	لم بدلاللايارولال	1 ډيريدا ماندلار	,			
Delta	hipping	annel her most alle			Hanna Hanna	m		
Fixed						md	an an an an Alban Inan	entres minimente
or	Span 120.0 MHz Sweep 11.53 ms (1001 pts)				ter 2.40000 GHz s BW 100 kHz #VBW 300 kHz			
Properties		FUNCTION VALUE	FORCION WIDTH	FUNCTION	5,506 dBm -14.757 dBm	3 32 GHz 7 12 GHz	2.41	N 1 F N 1 F
More 1 of 2								

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



(30MHz to 25GHz, Channel 6, 802.11n (HT40))







	03:10:35 PM Mar 24, 2021 TRACE 2 4 8 TYPE MUMAAAAAA DET P.N. (2014)	ALIGNAUTO Type: Log-Pwr Hold: 2/10		Trig: Free Run Atten: 20 dB	OOOO GHz PNO: Fast IFGain:Low	5405520	
Next Pea	24.540 6 GHz -43.466 dBm	Mkr2				ef Offset 11. ef 21.50 d	
Next Pk Righ						) <sup>1</sup>	
Next Pk Le	2						
Marker Del	Norman Mar	-	N. A. S. W.		****************	and the second	(internetional
Mkr→C	Stop 25.00 GHz 387 s (10001 pts)			300 kHz	#VBW	) kHz	30 MI BW 1
Mkr→RefL	FUNCTION VALUE	FUNCTION WIDTH	FUNCTION	1.098 dBm 43.466 dBm	X 2.447 1 GHz 24.540 6 GHz		DDE TRC N 1 N 1
							_

(30MHz to 25GHz, Channel 9, 802.11n (HT40))



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

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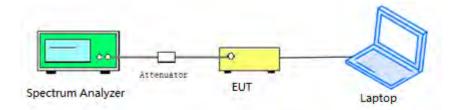
# 2.6. Power Spectral Density

#### 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.



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# 2.6.4. Test Result

#### 802.11b Mode

#### A. Test Verdict:

	Spect	ral power density (dBm/3kHz)		
Channel	Frequency (MHz)	Measured PSD (dBm/3kHz)	Limit (dBm/3kHz)	Verdict
1	2412	-5.22	8	PASS
6	2437	-5.18	8	PASS
11	2462	-3.87	8	PASS

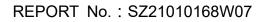
#### **B. Test Plot:**



(Channel 1, 802.11b)



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(Channel 6, 802.11b)



(Channel 11, 802.11b)

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# 802.11g Mode

#### A. Test Verdict:

	S	pectral power density (dBm/3kHz)		
Channel	Frequency (MHz)	Measured PSD (dBm/3kHz)	Limit (dBm/3kHz)	Verdict
1	2412	-9.15	8	PASS
6	2437	-9.15	8	PASS
11	2462	-7.44	8	PASS

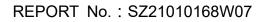
#### **B. Test Plot:**



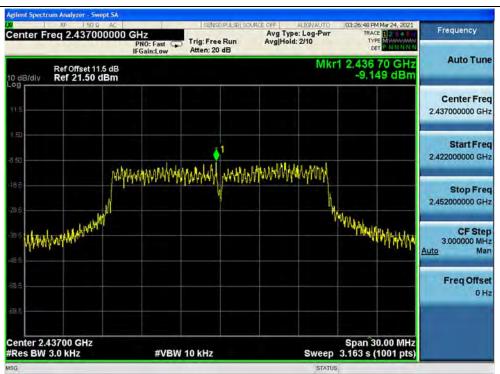
(Channel 1, 802.11g)



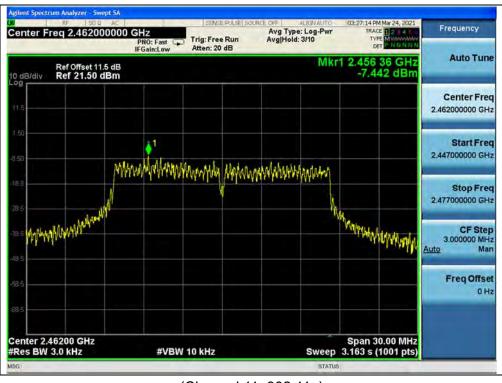
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(Channel 6, 802.11g)



(Channel 11, 802.11g)

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# 802.11n (HT20) Mode

#### A. Test Verdict:

	S	pectral power density (dBm/3kHz)		
Channel	Frequency	Macourod DSD (dPm/2kHz)	Limit	Verdict
Channel	(MHz)	Measured PSD (dBm/3kHz)	(dBm/3kHz)	verdict
1	2412	-9.39	8	PASS
6	2437	-8.74	8	PASS
11	2462	-8.96	8	PASS

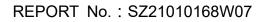
#### **B. Test Plot:**



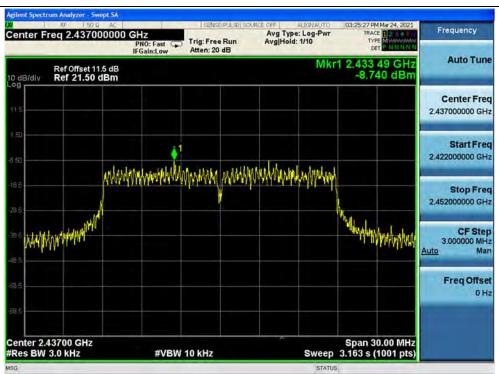
(Channel 1, 802.11n (HT20))



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(Channel 6, 802.11n (HT20))



(Channel 11, 802.11n (HT20))

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# 802.11n (HT40) Mode

#### A. Test Verdict:

	Spec	ctral power density (dBm/3kHz)		
Channel	Frequency (MHz)	Measured PSD (dBm/3kHz)	Limit (dBm/3kHz)	Verdict
3	2422	-10.81	8	PASS
6	2437	-11.79	8	PASS
9	2452	-12.28	8	PASS

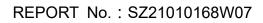
#### **B. Test Plot:**



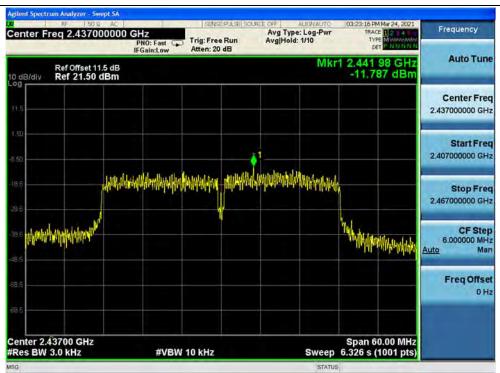
(Channel 3, 802.11n (HT40))



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(Channel 6, 802.11n (HT40))



(Channel 9, 802.11n (HT40))

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# 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).

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

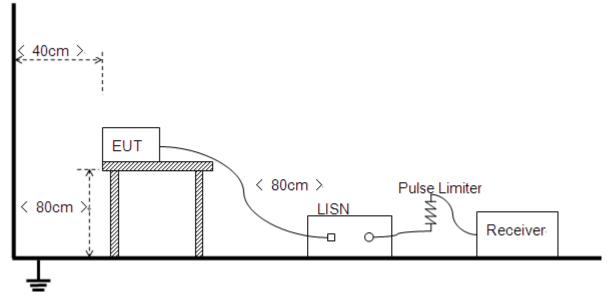
NOTE:

(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

#### 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.

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#### 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.

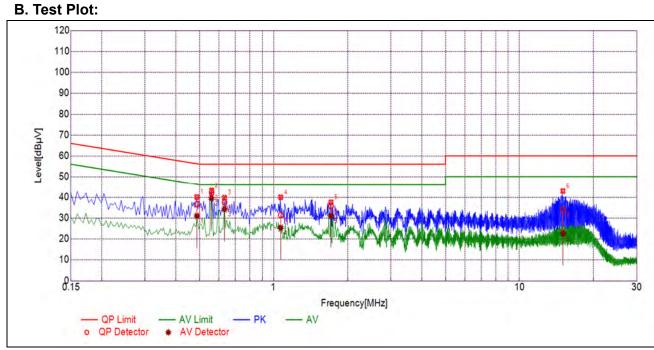
Note: Both of the test voltage AC 120V/60Hz and AC 230V/50Hz were considered and tested respectively, only the results of the worst case AC 120V/60Hz were recorded in this report.

#### 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





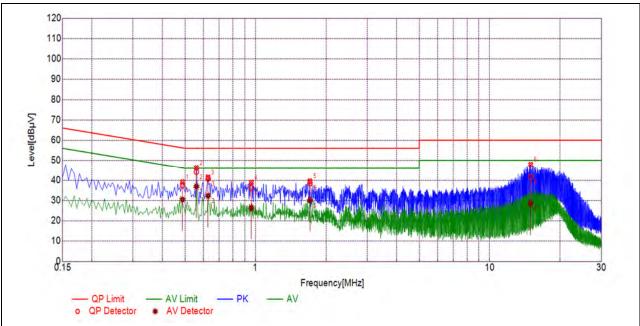


## (L Phase)

No.	Fre.	Emission L	evel (dBµV)	Limit (	dBµV)	Power-line Verdict	
	(MHz)	Quai-peak	Average	Quai-peak	Average		
1	0.4878	36.62	56.21	56.21	46.21		PASS
2	0.5594	42.27	56.00	56.00	46.00		PASS
3	0.6314	37.53	56.00	56.00	46.00	Line	PASS
4	1.0684	31.39	56.00	56.00	46.00	LITE	PASS
5	1.7108	35.71	56.00	56.00	46.00		PASS
6	15.0297	34.04	60.00	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	0.4872	37.35	30.45	56.22	46.22		PASS	
2	0.5592	44.14	36.90	56.00	46.00		PASS	
3	0.6274	40.75	32.30	56.00	46.00	Noutral	PASS	
4	0.9601	36.22	26.39	56.00	46.00	Neutral	PASS	
5	1.7085	38.61	30.03	56.00	46.00		PASS	
6	14.9524	41.78	28.44	60.00	50.00		PASS	



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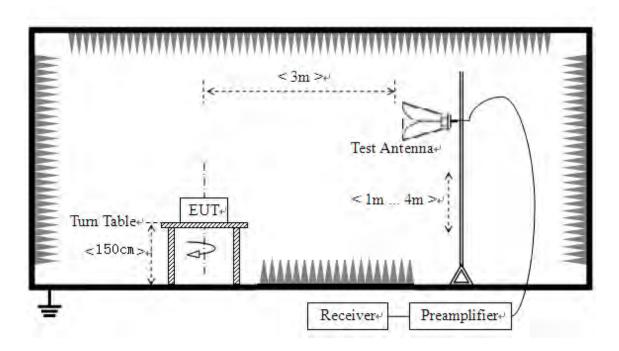
# 2.8. Restricted Frequency Bands

#### 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:

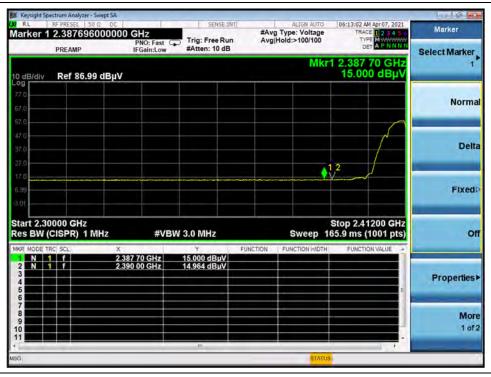
	Frequency	Detector	Receiver Reading	A <sub>T</sub>	A <sub>Factor</sub>	Max. Emission	Limit	Verdict
Channel	(MHz)	PK/ AV	U <sub>R</sub> (dBµV)	(dB)	(dB@3m)	E (dBµV/m)	(dBµV/m)	Vertiliet
1	2387.93	PK	27.24	6.74	27.20	61.18	74	PASS
1	2387.70	AV	15.00	6.74	27.20	48.94	54	PASS
11	2489.47	PK	26.96	6.74	27.20	60.90	74	PASS
11	2487.54	AV	15.68	6.74	27.20	49.62	54	PASS



# **B. Test Plot:**

RL	RF PRESEL 50		SENSE:INT	ALIGN AUTO	06:12:33 AM Apr 07, 2021	Marker
arker 1	2.3879200 PREAMP	000000 GHz PNO: Fast IFGain:Low	Trig: Free Run #Atten: 10 dB	Avg Type: Voltage Avg Hold:>100/100	TRACE 123450 TYPE MWWWWW DET P P NN NN	
0 dB/div	Ref 86.99	dBµV		Mkr	1 2.387 92 GHz 27.237 dBµV	Select Marker 1 Norm: Delt Fixed
og 7 0 57 0						Norm
7 0 7 0 17 0 17 0					12	Deli
7 0 99 01						Fixed
	0000 GHz CISPR) 1 M	IHz #VE	3W 3.0 MHz	Sweep 1	Stop 2.41200 GHz .000 ms (1001 pts)	o
1 N 2 N 3 4	f	2.387 92 GHz 2.390 00 GHz	27.237 dBµV 25.212 dBµV	ACTOR PERCHARMENT	FORCHORVALDE	Properties
6 7 8 9 0						Mor 1 of
			Inc			

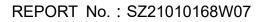
(PEAK, Channel 1, 802.11b)



(AVERAGE, Channel 1, 802.11b)



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Marker	06:25:33 AM Apr 07, 2021 TRACE 1 2 3 4 5 0 TYPE NUMBER	ALIGN AUTO Type: Voltage	Ave	SENSE:11		4000000	PRESEL	
Select Marke	DET PENNNN	Hold:>100/100	Avg	Trig: Free Run #Atten: 10 dB	PNO: Fast		REAMP	F
	2.489 474 GHz 26.963 dBµV	Mkr2				9 dBµV	Ref 86.	v
Norm								
Del		¢ <sup>2</sup>	1					
Fixed	المتكن والتين وكان والتين وكان وكان							
c	Stop 2.50000 GHz 000 ms (1001 pts)	Sweep 1.	FUNCTION	3.0 MHz	#VBW	MHz	00 GHz SPR) 1	
Properties	POWENDWVALDE	PONCHON MIDIN	PONCHON	25.351 dBµV 26.963 dBµV	500 GHz 474 GHz	2,483	1	1
-								

(PEAK, Channel 11, 802.11b)



(AVERAGE, Channel 11, 802.11b)

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# 802.11g Mode

#### A. Test Verdict:

Channel	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)	verdict
1	2368.32	PK	27.75	6.74	27.20	61.69	74	PASS
1	2390.00	AV	15.07	6.74	27.20	49.01	54	PASS
11	2487.00	PK	26.75	6.74	27.20	60.69	74	PASS
11	2485.71	AV	15.37	6.74	27.20	49.31	54	PASS

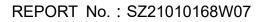
#### **B. Test Plot:**

	RF PRESEL 50 2.368320 PREAMP	0000000 GHz PNO: Fas IFGain:Lo	at 😱 Trig: Fr			ALIGN AUTO e: Voltage :>100/100	06:37:59 AM Ap TRACE TYPE N DET		Marker Select Marker
dBídiv	Ref 86.9	9 dBµV				Mkr	1 2.368 32 27.749	GHz dBµV	1
7.0									Norm
0	Acurterunt	an a la ana de al ser a la consecto	Dumbarriantur		• <sup>1</sup>		3. Sugar mater		Del
1 D 99 01									Fixed
es BW (	1000 GHz CISPR) 1 N		VBW 3.0 MH			-	Stop 2.4120 .000 ms (100	01 pts)	c
R MODE TR	f	× 2.368 32 GHz 2.390 00 GHz		BuV	CTION FUI	NCTION WIDTH	FUNCTION V	ALUE	Properties
									Mo 1 of
1			- tm					-	

(PEAK, Channel 1, 802.11g)



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TRACE 1 2 34 5 4	Type: Voltage	#Av		GHz				ker
DET A P N N N N	Hold:>100/100	Avg	Trig: Free Run #Atten: 10 dB	PNO: Fast C				
	Mkr				dBµV	f 86.99	R	3/div
16.58 s (1001 pts)	Sweep		3.0 MHz	#VBW	IHz	PR) 1 N	(CIS	BW
FUNCTION VALUE	FUNCTION WIDTH	FUNCTION					1	N N
=								
	12.389 15 GHz 14.862 dBµV	g Type: Voltage  Hold:>100/100 Mkr1 2.389 15 GHz 14.862 dBµV 1 Stop 2.41200 GHz Sweep 16.58 s (1001 pts)	#Avg Type: Voltage Avg Hold:>100/100 Mkr1 2.389 15 GHz 14.862 dBµV 1 1 Stop 2.41200 GHz Sweep 16.58 s (1001 pts)	Trig: Free Run #Atten: 10 dB         Avg Hold:>100/100         The Attention of the Attentio of the A	GHz PN0: Fast IFGain:Low         Trig: Free Run #Atten: 10 dB         #Avg Type: Voltage Avg Hold:>100/100         TRACE I2.383 THE POINT DET         TRACE I2.383 POINT DET           Mkr1 2.389 15 GHz 14.862 dBµV         Mkr1 2.389 15 GHz 14.862 dBµV           #VBW 3.0 MHz         Stop 2.41200 GHz Sweep 16.58 s (1001 pts)           Y         FUNCTION         FUNCTION WDTH         FUNCTION VALUE	D00000 GHz PN0: Fast IFGain:Low         Trig: Free Run #Atten: 10 dB         #Avg Type: Voltage Avg/Hold:>100/100         TRACE [2:34:357 TYPE HAWNWY DEF ALMANNA Def ALMANNA TYPE HAWNWY DEF ALMANNA Def ALMAN	389152000000 GHz         Trig: Free Run #Atten: 10 dB         #Avg Type: Voltage Avg Hold:>100/100         Trice ID: 34 3 to Avg Hold:>100/100           IFGain:Low         Trig: Free Run #Atten: 10 dB         #Avg Type: Voltage Avg Hold:>100/100         Trice ID: 34 3 to Avg Hold:>100/100           Mkr1 2.389 15 GHz 14.862 dBµV           O GHz PR) 1 MHz         Stop 2.41200 GHz Sweep 16.58 s (1001 pts)           CL         X           Y         FUNCTION WIDTH         FUNCTION VALUE	1 2.389152000000 GHz         PNO: Fast         Trig: Free Run         #Avg Type: Voltage         True         True         #AvgHold:>100/100         True         True         #AvgHold:>100/100         True

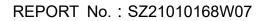
# (AVERAGE, Channel 1, 802.11g)



#### (PEAK, Channel 11, 802.11g)

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									um Analyzer -	
Marker	8 AM Apr 07, 2021 RACE 1 2 3 4 5 0 TYPE N WARKANN DET A P N N N N	TR	ALIGN AUTO ype: Voltage Id:>100/100		in	SENSE: Trig: Free Ru	PNO: Fast	Ω DC	PRESEL 50	
Select Marker	712 GHz	2.485	Mkr2		3	#Atten: 10 di	IFGain:Low		REAMP	-
	366 dBµV	15.3						θdBμV	Ref 86.9	Bidiv
Norm										
		-								
Del										
			_	¢ <sup>2</sup>	_\ <b>\</b> '			~		
Fixed										
C	.50000 GHz s (1001 pts)	Stop 2. 6.27 ms	Sweep 5			3.0 MHz	#VBW :	ЛНz	00 GHz SPR) 1 M	
-	CTION VALUE	FUNC	UNCTION WIDTH	TION	FUNC	Y		х		ODE TR
Properties						15.288 dBµV 15.366 dBµV		2,483 2,485	-	N 1 N 1
	-									
Mo										
10	-					Im				
		2	STATUS	_	_					

(AVERAGE, Channel 11, 802.11g)



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# 802.11 n (HT20) Mode

#### A. Test Verdict:

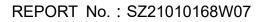
Channel	Frequency	Detector	Receiver Reading	A <sub>T</sub>	A <sub>Factor</sub>	Max. Emission E	Limit	Verdict
	(MHz)	PK/ AV	U <sub>R</sub> (dBµV)	(dB)	(dB@3m)	⊏ (dBµV/m)	(dBµV/m)	
1	2390.00	PK	31.38	6.74	27.20	65.32	74	PASS
1	2390.00	AV	15.43	6.74	27.20	49.37	54	PASS
11	2485.26	PK	26.09	6.74	27.20	60.03	74	PASS
11	2483.50	AV	15.22	6.74	27.20	49.16	54	PASS

#### B. Test Plot:



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







	07:06:25 AM Apr 07, 2021	ALIGN AUTO	π	SENSE:IN		zer - Swept SA	RF PRESEL	RL RL
Marker	TRACE 1 2 3 4 5 0 TYPE MWHANNY DET A P N N N N	Type: Voltage Hold:>100/100		Trig: Free Run #Atten: 10 dB	PNO: Fast	96000000	2.38769	arker '
Select Marker	1 2.387 70 GHz 14.667 dBµV	Mkr		within it do	IFGam.Low	6.99 dBµV		dB/div
Norm								9 0
Deli								0
Fixed	2							0 29 71
0	Stop 2.41200 GHz 16.58 s (1001 pts)	Sweep	Pulction	3.0 MHz	#VBW	1 MHz	0000 GHz CISPR) 1	s BW
Properties	FUNCTION VALUE	FUNCTION WIDTH	FUNCTION	Υ 14.667 dBμV 15.425 dBμV	37 70 GHz 90 00 GHz			N N
Moi 1 of								
	1.1	STATUS		tre .				

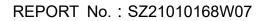
# (AVERAGE, Channel 1, 802.11n (HT20))



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

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	1:33 AM Apr 07, 2021	10	ALIGN AUTO	T	SENSE:1	T		PRESEL 5	
Marker			g Type: Voltage Hold:>100/100	-	Trig: Free Ru	PNO: Fast		.483850	
Select Marker				_	#Atten: 10 dB	IFGain:Low	_	PREAMP	_
2	83 850 GHz 4.900 dBµV	2 2.4	MKF2				dBµV	Ref 86.9	Bídiv
Norm									
		-							
- 74							-		
Del									-
				A2					
Fixed						and the second s			
1 IACO		_							_
	2.50000 GHz	Cto						00 GHz	+ 2 46
0	ms (1001 pts)	56.2	Sweep 5		3.0 MHz	#VBW	IHz	SPR) 11	
	UNCTION VALUE	н	FUNCTION WIDTH	FUNCT	¥.		х		MODE TR
					15.215 dBµV 14.900 dBµV		2.483	1	N 1 N 1
Properties									
Mo									
1 of									
	-				tre:				
		us	STATU						

(AVERAGE, Channel 11, 802.11n (HT20))



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# 802.11n (HT40) 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> (dBµV)	(dB)	(dB@3m)	E (dBµV/m)	(dBµV/m)	
3	2389.26	PK	26.94	6.74	27.20	60.88	74	PASS
3	2389.49	AV	15.28	6.74	27.20	49.22	54	PASS
9	2483.50	PK	14.70	6.74	27.20	48.64	74	PASS
9	2389.26	AV	26.94	6.74	27.20	60.88	54	PASS

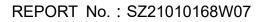
#### **B. Test Plot:**

	PRESEL 50 0 DC 2.38926400000 PREAMP	00 GHz PNO: Fast G IFGain:Low	Trig: Free Run #Atten: 10 dB	ALIGN AUTO Avg Type: Voltage Avg[Hold:>100/100	07:22:04 AM Apr 07, 2021 TRACE 2 3 4 5 6 TYPE MUNICIPAL OF P N N N N	Marker Select Marker
) dB/div	Ref 86.99 dBµ	/		Mkr	1 2.389 26 GHz 26.936 dBµV	1
7 0 7 0 7 0						Norm
7.0 7.0 7.0 7.0					Linne	Del
7 D 99 01						Fixed
es BW (	000 GHz CISPR) 1 MHz		V 3.0 MHz	Sweep 1	Stop 2.41200 GHz .000 ms (1001 pts)	o
KR MODE TR 1 N 1 2 N 1 3 A 1 4 A 1 5 A 1 5 A 1 6 A 1 7 A	1 2	389 26 GHz 390 00 GHz	Υ FU 26.936 dBμV 26.773 dBμV	NCTION FUNCTION WIDTH	FUNCTION VALUE	Properties
						Mo 1 of
0 1			10	STATU		1

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



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Marker	07:22:34 AM Apr 07, 2021	ALIGN AUTO		SENSE:IN		L 50 Q DC		RL
Select Marker	TYPE APNNNN	g Type: Voltage Hold:>100/100		Trig: Free Run #Atten: 10 dB	GHZ PNO: Fast	488000000	PREAMP	arker
Selectividi Kei	1 2.389 49 GHz 15.280 dBµV	Mkr1				86.99 dBµV		dB/di
Norm								9 0 0
Del								
Fixed								
C	Stop 2.41200 GHz 65.9 ms (1001 pts)	Sweep 16	FUNCTION	3.0 MHz	#VBW		2.30000 GH	s BV
Properties				15.280 dBµV 15.021 dBµV				NN
<b>Mo</b> 1 of								
								_

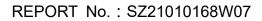
# (AVERAGE, Channel 3, 802.11n (HT40))



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

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	07:35:25 AM Apr 07, 2021	ALIGN AUTO	NT	SENSE:1		50 Q DC	RE PRESEL	L
Marker	TRACE 123450 TYPE NUMBER	Type: Voltage Hold:>100/100	n	Trig: Free Ru	PNO: Fast	30467568	2.48403	
Select Marker	2.484 03 GHz	Mkr2	8	#Atten: 10 dB	IFGain:Low		PREAMP	-
	14.532 dBµV					6.99 dBµV	Ref 86.	Bidiv
Norm								
Del						~		$\int$
Fixed		¢ <sup>2</sup>						
0	top 2.50000 GHz 9.5 ms (1001 pts)	S Sweep 10		3.0 MHz	#VBW :		011 GHz ISPR) 1	
_	FUNCTION VALUE	FUNCTION WIDTH	FUNCT		83 50 GHz	× 2.48	SCL	MODE TI
Properties				14.532 dBµV	84 03 GHz	2.48	1	N
Mo								ة يكم ي يكم و يكم
1 of								
	1.4	STATUS		tre .				

(AVERAGE, Channel 9, 802.11n (HT40))



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# 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).

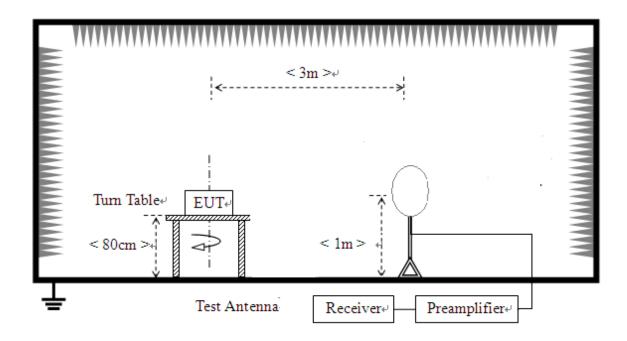




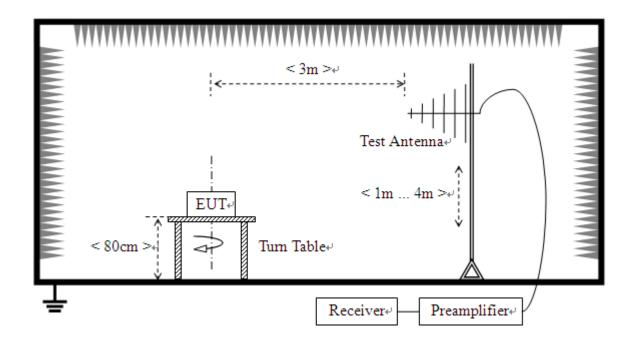
# 2.9.2. Test Description

#### **Test Setup:**

1) For radiated emissions from 9kHz to 30MHz



2) For radiated emissions from 30MHz to1GHz

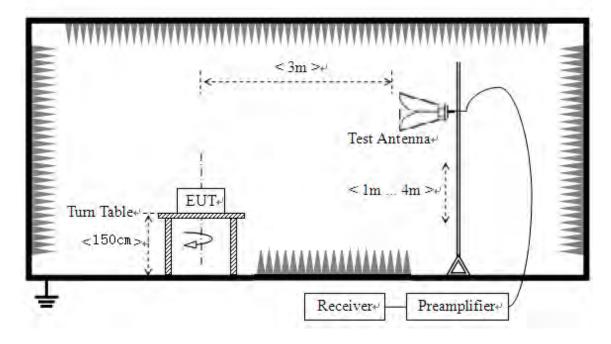




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3) For radiated emissions above 1GHz



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.

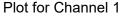
**Note2:** For the frequency, which started from 9kHz to 30MHz, was pre-scanned and the result which was 20dB lower than the limit was not recorded.

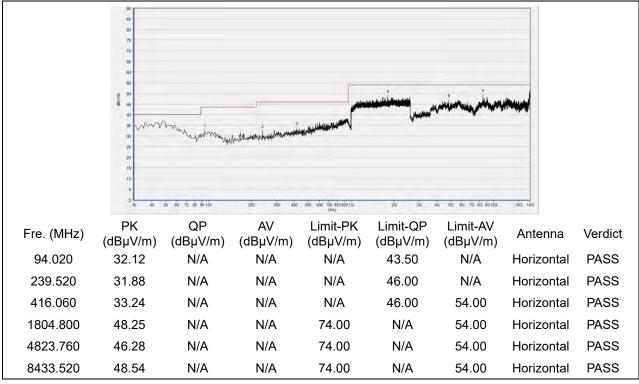
**Note3:** For the frequency, which started from 18GHz to 40GHz, was pre-scanned and the result which was 20dB lower than the limit was not recorded.



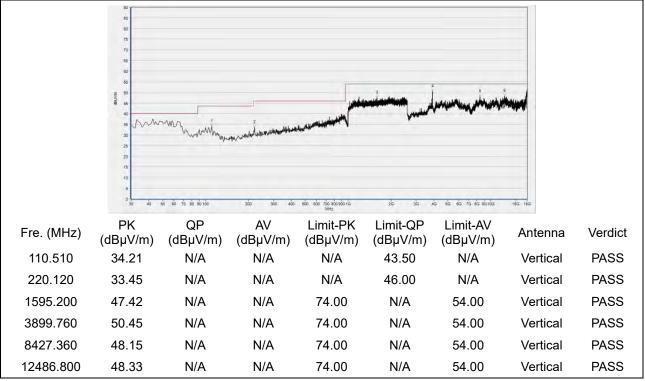


#### 802.11b Mode





(Antenna Horizontal, 30MHz to 18GHz)



(Antenna Vertical, 30MHz to 18GHz)



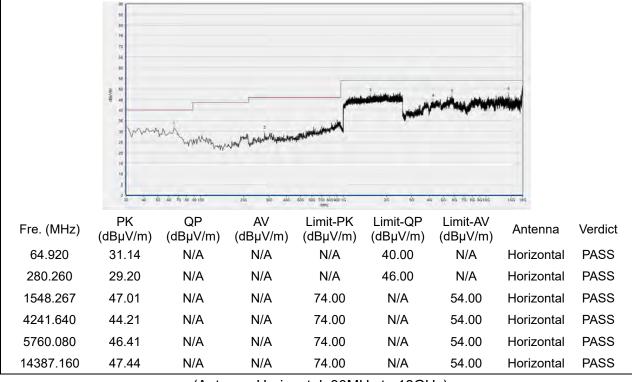
SHENZHEN MORLAB COMMUNICATIONS TECHNOLOGY Co., Ltd. FL1-3, Building A, FeiYang Science Park, No.8 LongChang Road, Block67, BaoAn District, ShenZhen , GuangDong Province, P. R. China Tel: 86-755-36698555

Fax: 86-755-36698525

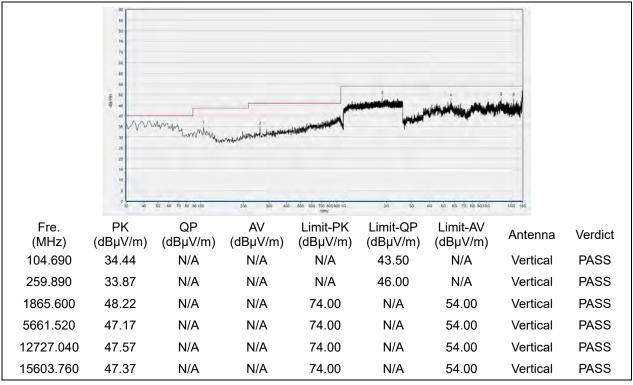
Http://www.morlab.cn



#### Plot for Channel 6



(Antenna Horizontal, 30MHz to 18GHz)



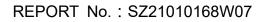
(Antenna Vertical, 30MHz to 18GHz)



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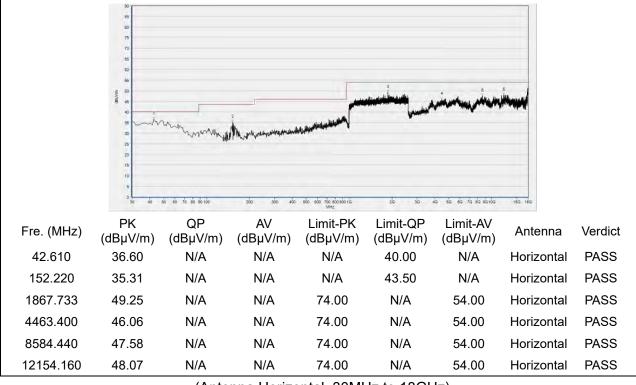
Fax: 86-755-36698525

Http://www.morlab.cn

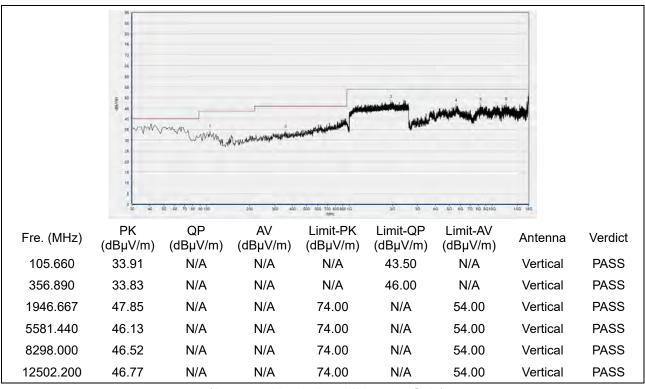




#### Plot for Channel 11



(Antenna Horizontal, 30MHz to 18GHz)



(Antenna Vertical, 30MHz to 18GHz)



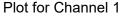
SHENZHEN MORLAB COMMUNICATIONS TECHNOLOGY Co., Ltd. FL1-3, Building A, FeiYang Science Park, No.8 LongChang Road, Block67, BaoAn District, ShenZhen , GuangDong Province, P. R. China Tel: 86-755-36698555

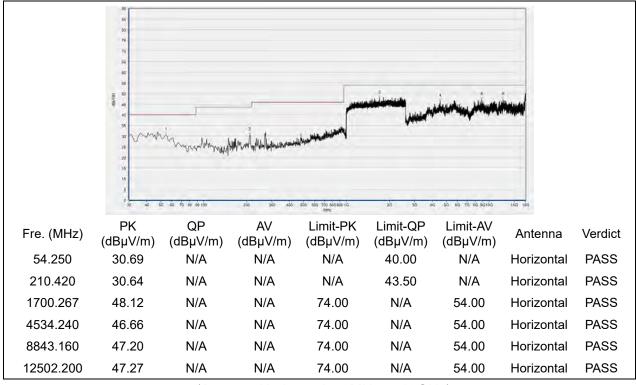
Fax: 86-755-36698525

Http://www.morlab.cn

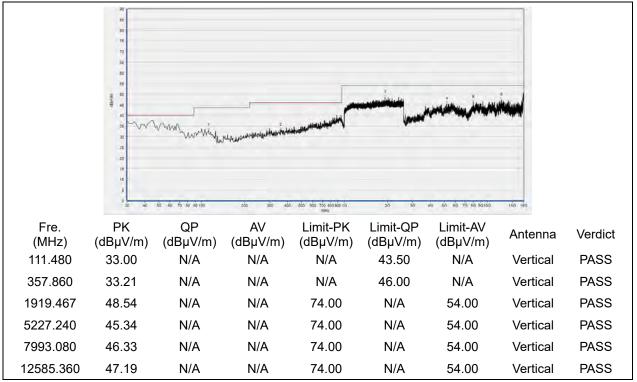


# 802.11g Mode





(Antenna Horizontal, 30MHz to 18GHz)



(Antenna Vertical, 30MHz to 18GHz)



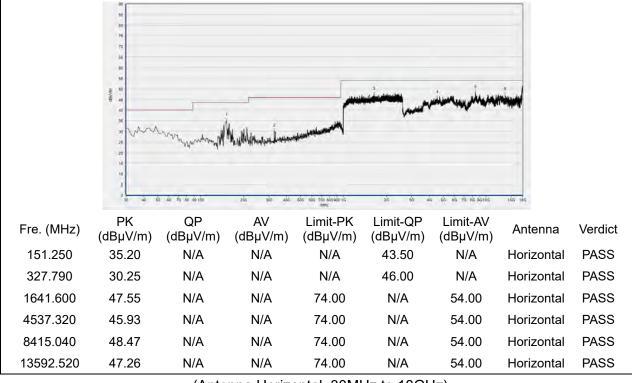
SHENZHEN MORLAB COMMUNICATIONS TECHNOLOGY Co., Ltd. FL1-3, Building A, FeiYang Science Park, No.8 LongChang Road, Block67, BaoAn District, ShenZhen , GuangDong Province, P. R. China Tel: 86-755-36698555

Fax: 86-755-36698525

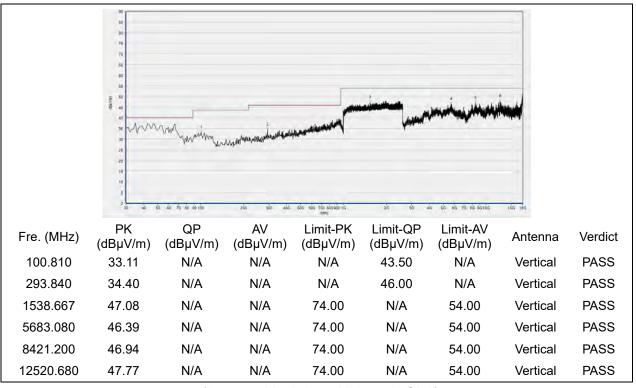
Http://www.morlab.cn



#### Plot for Channel 6



(Antenna Horizontal, 30MHz to 18GHz)



(Antenna Vertical, 30MHz to 18GHz)



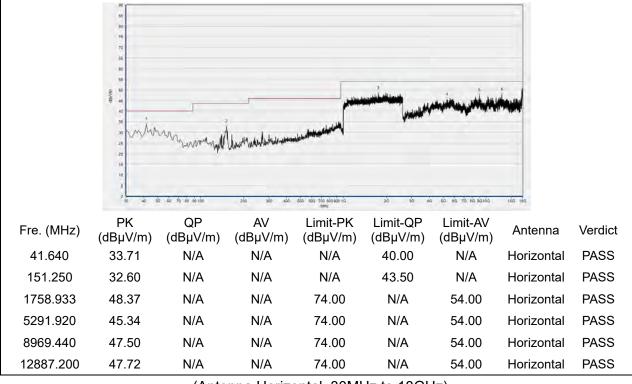
SHENZHEN MORLAB COMMUNICATIONS TECHNOLOGY Co., Ltd. FL1-3, Building A, FeiYang Science Park, No.8 LongChang Road, Block67, BaoAn District, ShenZhen , GuangDong Province, P. R. China Tel: 86-755-36698555

Fax: 86-755-36698525

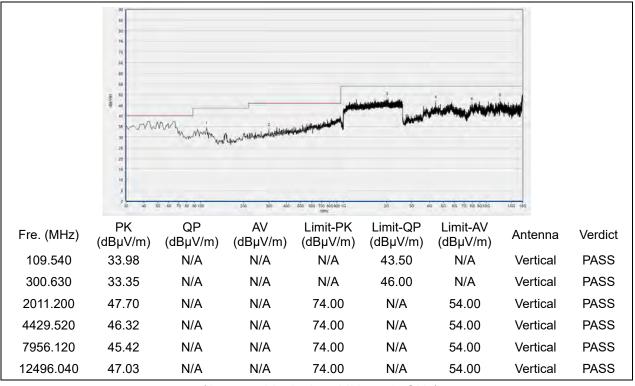
Http://www.morlab.cn



#### Plot for Channel 11



(Antenna Horizontal, 30MHz to 18GHz)



(Antenna Vertical, 30MHz to 18GHz)



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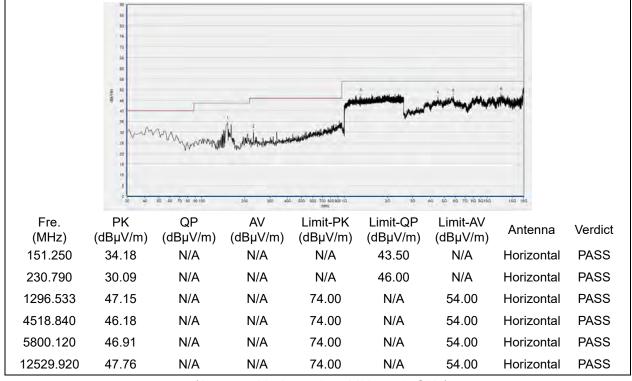
Fax: 86-755-36698525

Http://www.morlab.cn

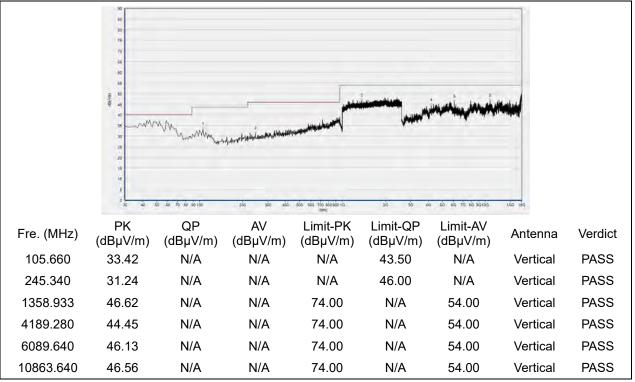


#### 802.11n (HT20) Mode

#### Plot for Channel 1



(Antenna Horizontal, 30MHz to 18GHz)



(Antenna Vertical, 30MHz to 18GHz)



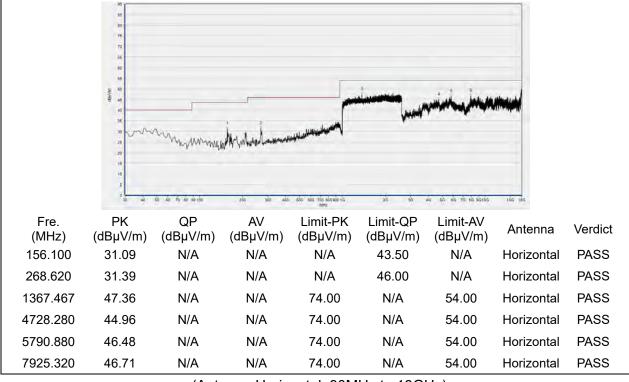
SHENZHEN MORLAB COMMUNICATIONS TECHNOLOGY Co., Ltd. FL1-3, Building A, FeiYang Science Park, No.8 LongChang Road, Block67, BaoAn District, ShenZhen , GuangDong Province, P. R. China Tel: 86-755-36698555

Fax: 86-755-36698525

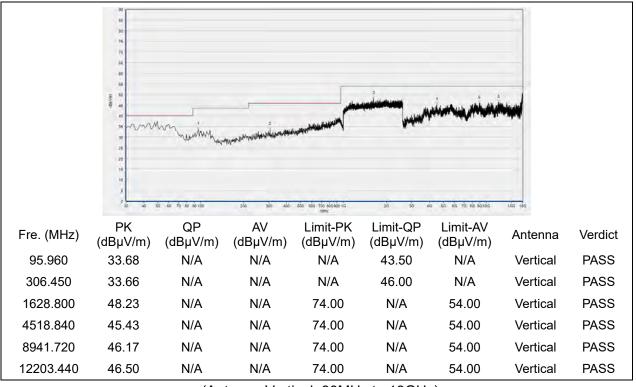
Http://www.morlab.cn



#### Plot for Channel 6



(Antenna Horizontal, 30MHz to 18GHz)



(Antenna Vertical, 30MHz to 18GHz)



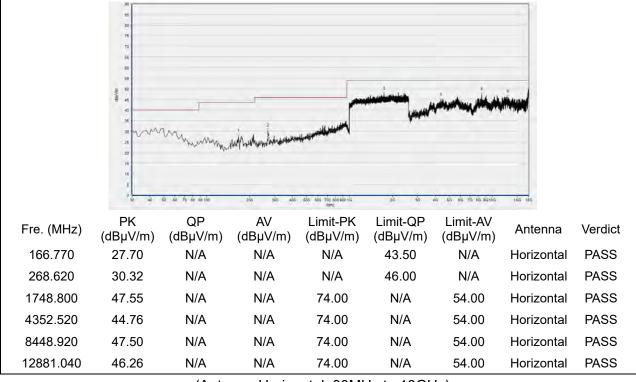
SHENZHEN MORLAB COMMUNICATIONS TECHNOLOGY Co., Ltd. FL1-3, Building A, FeiYang Science Park, No.8 LongChang Road, Block67, BaoAn District, ShenZhen , GuangDong Province, P. R. China Tel: 86-755-36698555

Fax: 86-755-36698525

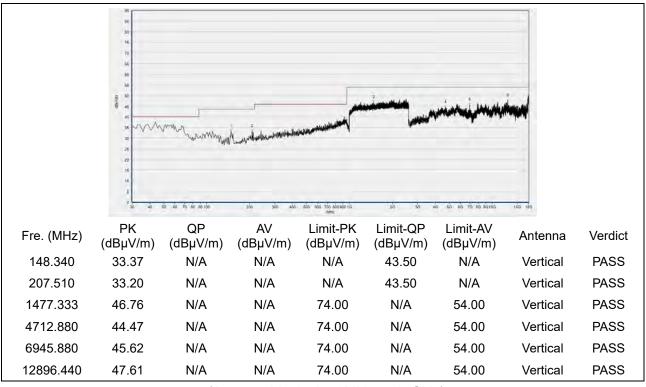
Http://www.morlab.cn



#### Plot for Channel 11



(Antenna Horizontal, 30MHz to 18GHz)



(Antenna Vertical, 30MHz to 18GHz)



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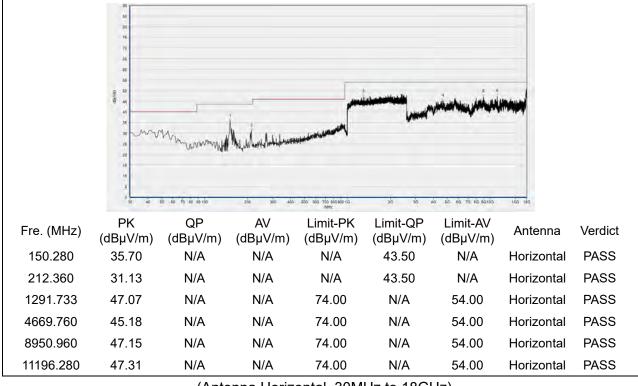
Fax: 86-755-36698525

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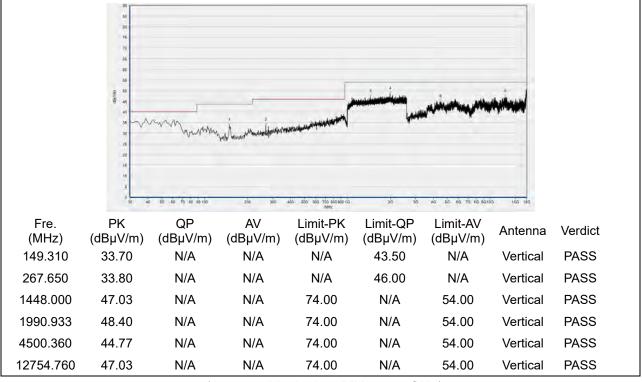


# 802.11n (HT40) Mode

#### Plot for Channel 3



(Antenna Horizontal, 30MHz to 18GHz)



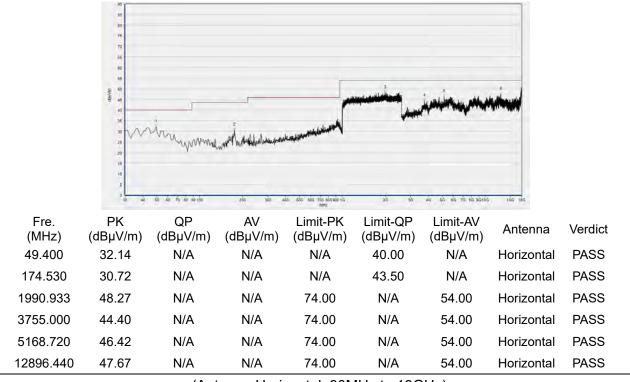
(Antenna Vertical, 30MHz to 18GHz)



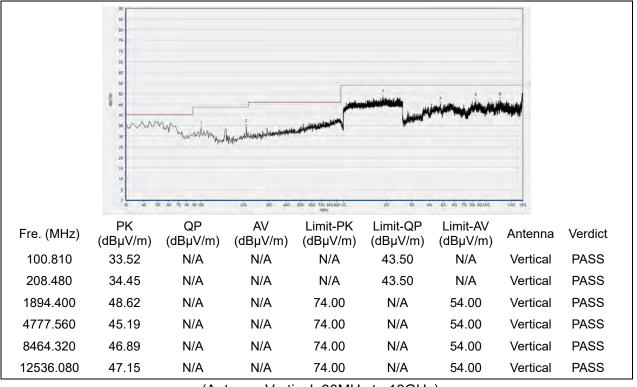
SHENZHEN MORLAB COMMUNICATIONS TECHNOLOGY Co., Ltd. FL1-3, Building A, FeiYang Science Park, No.8 LongChang Road, Block67, BaoAn District, ShenZhen , GuangDong Province, P. R. China Tel: 86-755-36698555 Http://www.morlab.cn Fax: 86-755-36698525 E-mail: service@morlab.cn



#### Plot for Channel 6



(Antenna Horizontal, 30MHz to 18GHz)



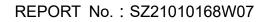
(Antenna Vertical, 30MHz to 18GHz)



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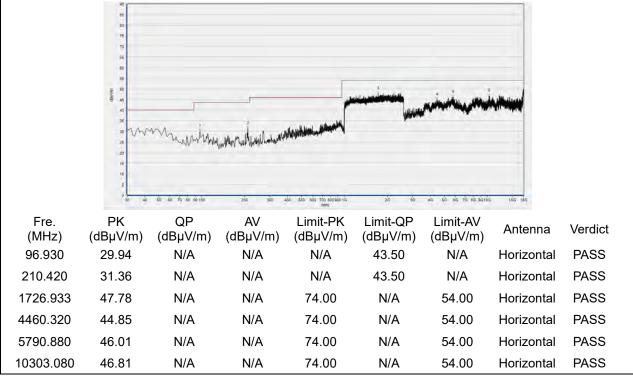
Fax: 86-755-36698525

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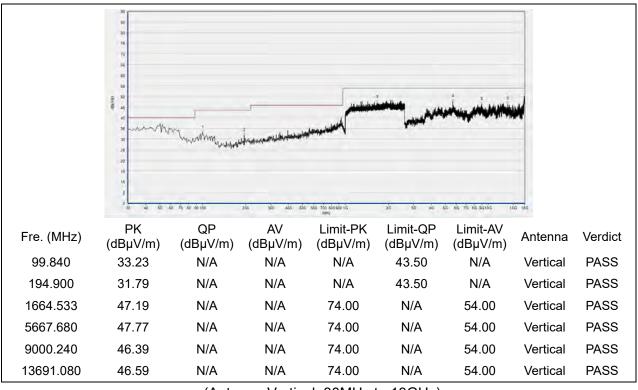




#### Plot for Channel 9



(Antenna Horizontal, 30MHz to 18GHz)



(Antenna Vertical, 30MHz to 18GHz)



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

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# **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



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# **Annex B Testing Laboratory Information**

#### 1. Identification of the Responsible Testing Laboratory

	Morlab Laboratory of Shenzhen Morlab Communications		
Laboratory Name:	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:	Morlab Laboratory of Shenzhen Morlab Communications Technology Co., Ltd.		
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	Due Date
Attenuator 1	(N/A.)	10dB	Resent	N/A	N/A
EXA Signal	MY53470836	N9010A	Agilent	2021.03.25	2022.03.24
Analyzer					
USB Wideband	MY54210011	U2021XA	Agilent	2021.03.25	2022.03.24
Power Sensor					
RF Cable	CB01	RF01	Morlab	N/A	N/A
(30MHz-26GHz)					
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	2021.03.09	2022.03.08
	040744	NSLK	Schwarzbeck	2021.03.09	2022.03.08
LISN	812744	8127			
Pulse Limiter	VTSD 9561	VTSD	Sobworzbook	2020.07.24	2021.07.23
(10dB)	F-B #206	9561-F	Schwarzbeck	2020.07.24	2021.07.23
Coaxial					
Cable(BNC)	CB01	EMC01	Morlab	N/A	N/A
(30MHz-26GHz)					

#### 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 \_\_\_\_

