

TEST REPORT

- : ShenZhen Gospell Smarthome Electronic Co., Ltd. APPLICANT
- PRODUCT NAME : HD WiFi Camera
- **MODEL NAME** : T5886HAA; T5886F
- BRAND NAME : N/A
- FCC ID : TW5T5886HAA
- STANDARD(S) : 47 CFR Part 15 Subpart C
- **TEST DATE** : 2017-11-08 to 2017-11-20
- **ISSUE DATE** : 2017-11-27

Tested by:

Le Jung Zour

Li Jingzong (Test Engineer)

Approved by:

Andy Yeh (Technical Director)

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Change History						
Issue	Issue Date Reason for change					
1.0	2017-11-27	First edition				



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1. Technical Information

Note: Provide by applicant.

1.1. Applicant and Manufacturer Information

Applicant:	ShenZhen Gospell Smarthome Electronic Co., Ltd.				
Applicant Address:	5Floor/Block 2, Vision (SZ) Park, Hi-Tech Industrial Park,				
	Shenzhen, China				
Manufacturer:	Manufacturer: ShenZhen Gospell Smarthome Electronic Co., Ltd.				
Manufacturer Address:	East of 01st-04st Floor, Block A,No.1 Industrial park,				
	Fenghuanggang, South of No.1 Baotian Road, Xixiang street,				
	Bao'an District, Shenzhen City, Guangdong Province				
	518126,P.R.China				

1.2. Equipment Under Test (EUT) Description

Product Name:	HD WiFi Camera
Serial No:	(N/A, marked #1 by test site)
Hardware Version:	T5886HAA_M03
Software Version:	E_900.T5886HAA.010.323
Modulation Type:	DSSS, OFDM
Operating Frequency Benger	802.11b/g/n-20MHz: 2.412GHz - 2.462GHz
Operating Frequency Range:	802.11n-40MHz: 2.422GHz - 2.452GHz
Channel Number:	802.11b/g/n-20MHz: 11
	802.11n-40MHz: 7
Modulation Type:	DSSS, OFDM
Antenna Type:	Dipole Antenna
Antenna Gain:	1.0dBi

Note 1: 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-20MHz (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 802.11n-40MHz, 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: According to the designer, they declare that the models(T5886HAA /T5886F) are the same in hardware, software and WiFi IC. Only the model name is different.

Note 3: 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 4: 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 (Bluetooth, 2.4GHz ISM band radiators) for the EUT FCC ID Certification:

No	Identity	Document Title
1	47 CFR Part 15 (10-1-15 Edition)	Radio Frequency Devices

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

No.	Section	Description	Test Date	Test Engineer	Result
1	15.203	Antenna Requirement	N/A	N/A	PASS
2	15.247(b)	Peak Output Power	Nov 08, 2017	Li Jingzong	PASS
3	15.247(a)	Bandwidth	Nov 08, 2017	Li Jingzong	PASS
4	15.247(d)	Conducted Spurious Emission and Band Edge	Nov 08, 2017	Li Jingzong	PASS
5	15.247(d)	Restricted Frequency Bands	Nov 20, 2017	Wu Zhognwen	PASS
6	15.207	Conducted Emission	Nov 15, 2017	Wu Zhognwen	PASS
7	15.209, 15.247(d)	Radiated Emission	Nov 20, 2017	Wu Zhognwen	PASS
8	15.247(e)	Power spectral density (PSD)	Nov 08, 2017	Li Jingzong	PASS

Note: The tests of Conducted Emission and Radiated Emission were performed according to the method of measurements prescribed in ANSI C63.10 2013 and KDB558074 D01 v04 (04/05/2017).

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. Peak Output Power

2.2.1. 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.

2.2.2. 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, all test result in power meter.

B. Equipments List:

Please reference ANNEX A(1.5).

2.2.3. Test Result

The lowest, middle and highest channels are selected to perform testing to verify the conducted RF output peak power of the Module.

2.2.3.1 802.11b Test Mode

Channel		Measured Output Peak Power		Limit		Verdict
Channel	Frequency (MHz)	dBm	W	dBm	W	verdict
1	2412	19.53	0.08974			PASS
6	2437	18.34	0.06823	30	1	PASS
11	2462	18.53	0.07129			PASS

Channel	Frequency (MHz)	Measured Output Average Power				Verdict
		dBm	W	dBm	W	
1	2412	17.61	0.05768			PASS
6	2437	16.37	0.04335	30	1	PASS
11	2462	16.57	0.04539			PASS

2.2.3.2 802.11g Test mode

Channel		Measured Output Peak Power		Limit		Verdict
Channel	Frequency (MHz)	dBm	W	dBm	W	verdict
1	2412	23.09	0.20370			PASS
6	2437	23.08	0.20324	30	1	PASS
11	2462	22.54	0.17947			PASS

Channel	Frequency (MHz)	Measured Output Average Power				t	Verdict
		dBm	W	dBm	W		
1	2412	17.35	0.05433			PASS	
6	2437	17.93	0.06209	30	1	PASS	
11	2462	17.76	0.05970			PASS	



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2.2.3.3 802.11n-20MHz Test mode

Channel		Measured Output Peak Power		Limit		Verdict
Channel	Frequency (MHz)	dBm	W	dBm	W	Veruici
1	2412	23.35	0.21627			PASS
6	2437	23.15	0.20654	30	1	PASS
11	2462	22.77	0.18923			PASS

Channel	Frequency (MHz)	Measured Output Average Power		Limit		Verdict
		dBm	W	dBm	W	
1	2412	17.72	0.05916			PASS
6	2437	17.87	0.06124	30	1	PASS
11	2462	17.79	0.06012			PASS

2.2.3.4 802.11n-40MHz Test mode

Channel		Measured Output Peak Power		Limit		Vardiat
Channel	Frequency (MHz)	dBm	W	dBm	W	Verdict
3	2422	23.18	0.20797			PASS
6	2437	23.13	0.20559	30	1	PASS
9	2452	22.92	0.19588			PASS

Channel	Frequency (MHz)		Measured Output Average Power		Limit	
		dBm	W	dBm	W	
3	2422	17.16	0.05200			PASS
6	2437	17.50	0.05623	30	1	PASS
9	2452	17.33	0.05408			PASS



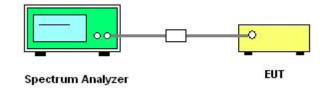


2.3.1. Requirement

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.

2.3.2. 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 reference ANNEX A(1.5).

2.3.3. Test Result

The lowest, middle and highest channels are selected to perform testing to record the 6 dB bandwidth of the Module.





2.3.3.1 802.11b Test mode

A. Test Verdict:

Channel	Frequency (MHz)	6 dB Bandwidth (MHz)	Limits(kHz)	Result
1	2412	10.09	≥500	PASS
6	2437	10.09	≥500	PASS
11	2462	10.09	≥500	PASS

B. Test Plots



(Channel 1: 2412MHz @ 802.11b)



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(Channel 11: 2462MHz @ 802.11b)



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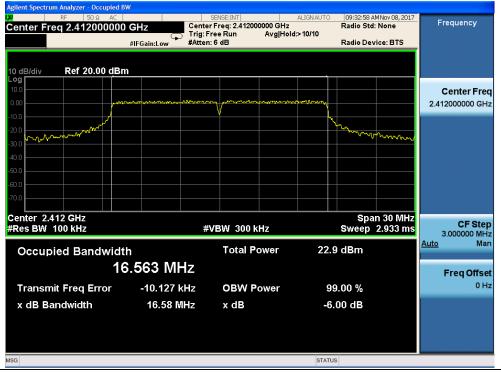


2.3.3.2 802.11g Test mode

A. Test Verdict:

Channel	Frequency (MHz)	6 dB Bandwidth (MHz)	Limits (kHz)	Result
1	2412	16.58	≥500	PASS
6	2437	16.53	≥500	PASS
11	2462	16.55	≥500	PASS

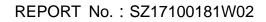
B. Test Plots:



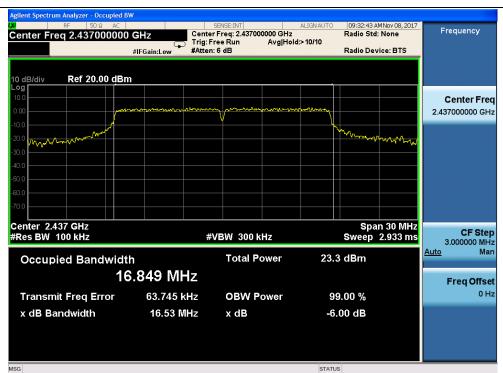
(Channel 1: 2412MHz @ 802.11g)



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(Channel 6: 2437MHz @ 802.11g)



(Channel 11: 2462MHz @ 802.11g)

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2.3.3.3 802.11n-20 Test mode

A. Test Verdict:

Channel	Frequency (MHz)	6 dB Bandwidth (MHz)	Limits (kHz)	Result
1	2412	17.83	≥500	PASS
6	2437	17.85	≥500	PASS
11	2462	17.84	≥500	PASS

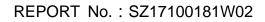
B. Test Plots:

Agilent Spectrum Analyzer - Occupie					
🕅 RF 50 Q AC Span 30.000 MHz		SENSE:INT Center Freq: 2.41200		09:30:59 AMNov 08, 2017 Radio Std: None	Span
	#IFGain:Low	Trig: Free Run #Atten: 6 dB	Avg Hold:>10/10	Radio Device: BTS	Onen
	an ouncon				Span 30.000 MHz
10 dB/div Ref 20.00 d	Bm				00.000 11112
Log 10.0					
0.00	An-manananana	anna far a lan a lan an a lan an a	- MAr warder and the street		
-10.0		<u> </u>			
-20.0				mar no	
-20.0 <u>10000000000000000000000000000000000</u>					Full Span
-40.0					
-50.0					
-60.0					
-70.0					
Center 2.412 GHz				Span 30 MHz	
#Res BW 100 kHz		#VBW 300 k	Hz	Sweep 2.933 ms	Last Span
Occupied Bandwi	dth	Total P	ower 22.	5 dBm	
	17.757 M⊦				
		12			
Transmit Freq Error	-4.166 k	Hz OBW P	ower 9	9.00 %	
x dB Bandwidth	17.83 M	Hz xdB	-6	.00 dB	
MSG			STATU	JS	

(Channel 1: 2412MHz @ 802.11n-20)



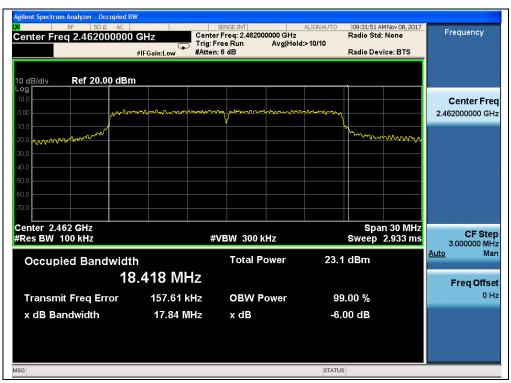
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enter Freq 2.437000000		SENSE:INT nter Freq: 2.437000000 g: Free Run Av ten: 6 dB	ALIGN AUTO GHz g Hold:>10/10	09:31:22 AM Radio Std: Radio Devi		Frequency
dB/div Ref 20.00 dBm	1					
00	and and and and and and an	and nonononon	~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~	ų		Center Fr 2.437000000 G
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enter 2.437 GHz Res BW 100 kHz		#VBW 300 kHz			n 30 MHz 2.933 ms	CF St 3.000000 M
Occupied Bandwidtl 17	^h ′.882 MHz	Total Powe	er 22.	9 dBm	4	Auto M Freg Offs
Transmit Freq Error	17.526 kHz	OBW Powe	er 9	9.00 %		. 0
x dB Bandwidth	17.85 MHz	x dB	-6	.00 dB		

(Channel 6: 2437MHz @ 802.11n-20)



(Channel 11: 2462MHz @ 802.11n-20)

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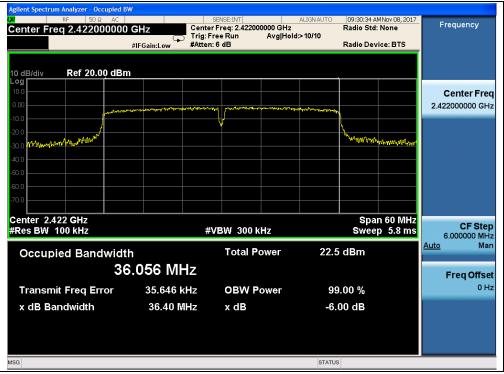


2.3.3.4 802.11n-40 Test mode

A. Test Verdict:

Channel	Frequency (MHz)	6 dB Bandwidth (MHz)	Limits (kHz)	Result
3	2422	36.40	≥500	PASS
6	2437	36.39	≥500	PASS
9	2452	36.39	≥500	PASS

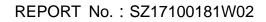
B. Test Plots:



(Channel 3: 2422Mz @ 802.11n-40)



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(Channel 6 [.]	2437MHz	@	802.11n-40)	
١.	Unamer 0.	270710112	9	002.111 +0)	

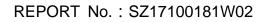


(Channel 9: 2452MHz @ 802.11n-40)

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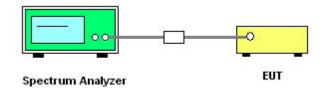
2.4. Conducted Spurious Emissions and Band Edge

2.4.1. 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.

2.4.2. 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 11.0 was used in order to prove compliance.

B. Equipments List:

Please reference ANNEX A(1.5).

2.4.3. Test Result

The measurement frequency range is from 30MHz to the 10th harmonic of the fundamental frequency. The lowest, middle and highest channels are tested to verify the spurious emissions.





2.4.3.1 802.11b Test mode

A. Test Verdict:

	Fraguanay	Measured Max.	Limit		
Channel	Frequency	Out of Band	Carrier	Calculated	Verdict
	(MHz)	Emission (dBm)	Level	-20dBc Limit	
1	2412	-49.18	4.52	-15.48	PASS
6	2437	-49.63	3.42	-16.58	PASS
11	2462	-48.85	4.01	-15.99	PASS

B. Test Plots:

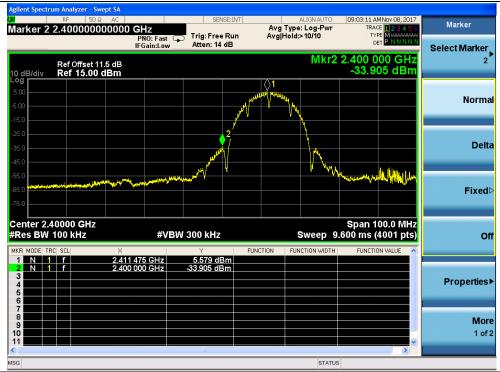
Note: the power of the Module transmitting frequency should be ignored.



(Channel = 1, 30MHz to 25GHz)







(Band Edge @ Channel = 1)



(Channel = 6, 30MHz to 25GHz)

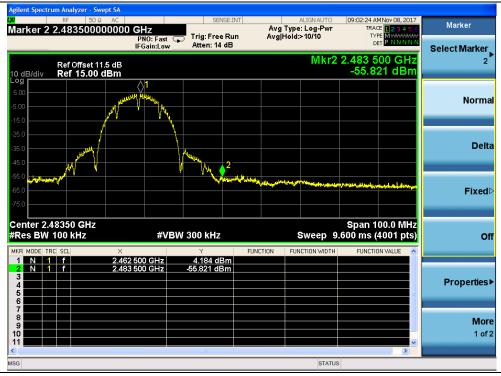
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Agilent Spectrum Analyzer - Swept SA				
04 RF 50 Ω AC Marker 2 24.007442500000 GHz PN0: Fa	st C Trig: Free Run	ALIGNAUTO Avg Type: Log-Pwr Avg Hold:>10/10	09:06:22 AMNov 08, 2017 TRACE 1 2 3 4 5 6 TYPE MWWWW	Peak Search
IFGain:L			DET P N N N N N	Next Peak
Ref Offset 11.5 dB 10 dB/div Ref 15.00 dBm		M	kr2 24.007 GHz -48.854 dBm	NextFeak
5.00 -5.00 -15.0				Next Pk Right
-25.0 			2	Next Pk Left
-55.0 -65.0 -75.0	and the second	يندون والمركز المركز	munt	Marker Delta
	VBW 300 kHz	-	Stop 25.00 GHz 2.386 s (4001 pts)	Mkr→CF
MKR MODE TRC SCL X 1 N 1 f 2.465 GH 2 N 1 f 24.007 GH 3 1 f 24.007 GH 4 5 6 6	z 4.008 dBm	CTION FUNCTION WIDTH	FUNCTION VALUE	Mkr→RefLvl
7 8 9 10			~	More 1 of 2
MSG		STATUS		

(Channel = 11, 30MHz to 25GHz)



(Band Edge @ Channel = 11)

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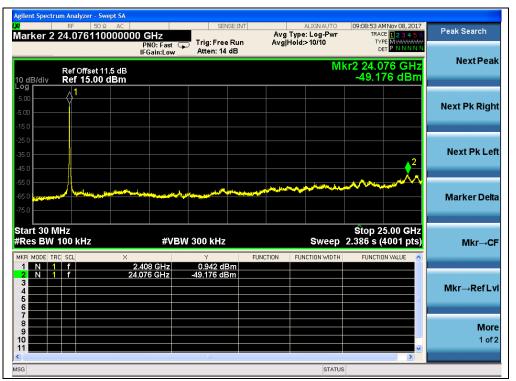
2.4.3.2 802.11g Test mode

A. Test Verdict:

	Eregueney Measured Max.		Limi		
Channel	Frequency	Out of Band	Carrier	Calculated	Verdict
	(MHz)	Emission (dBm)	Level	-20dBc Limit	
1	2412	-49.18	0.94	-19.06	PASS
6	2437	-49.12	0.60	-19.40	PASS
11	2462	-48.73	0.68	-19.32	PASS

B. Test Plots:

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



(Channel = 1, 30MHz to 25GHz)





Agilent Spectrum Analyzer - Swept SA				
Marker 2 2.400000000000	GHz	ALIGN AUTO Avg Type: Log-Pwr	09:09:36 AMNov 08, 2017 TRACE 1 2 3 4 5 6	Marker
	PNO: Fast Trig: Free Run IFGain:Low Atten: 14 dB	Avg Hold:>10/10	TYPE MWWWWW DET PNNNN	Select Marker
Ref Offset 11.5 dB 10 dB/div Ref 15.00 dBm		Mkr2	2.400 000 GHz -24.877 dBm	2
5.00				Normal
-15.0 -25.0 -35.0 -45.0	2/2 	hand hard here here here here here here here he	her water the provide the second	Delta
-45.0 -65.0 -75.0 -75.0				Fixed⊳
Center 2.40000 GHz #Res BW 100 kHz	#VBW 300 kHz	Sweep 9	Span 100.0 MHz .600 ms (4001 pts)	Off
1 N 1 f 2.414 2 N 1 f 2.400 3 4 5 6	225 GHz 1.576 dBm 000 GHz -24.877 dBm			Properties►
7 8 9 10 11			~	More 1 of 2
MSG		STATUS		

(Band Edge @ Channel = 1)



(Channel = 6, 30MHz to 25GHz)

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Agilent Spectrum Analyzer - Swept SA				
Marker 2 24.650420000000 (P	NO: Fast 🕟 Trig: Free Run	ALIGN AUTO Avg Type: Log-Pwr Avg Hold:>10/10	09:07:08 AMNov 08, 2017 TRACE 1 2 3 4 5 6 TYPE M WWWWW DET P N N N N N	Peak Search
Ref Offset 11.5 dB	Gain:Low Atten: 14 dB	М	kr2 24.650 GHz -48.729 dBm	Next Peak
5.00 1 5.00				Next Pk Right
-25.0 -35.0 -45.0				Next Pk Left
-55.0 -66.0 -75.0	And the state of t	alantan alan ang kang kang kang kang kang kang kan		Marker Delta
Start 30 MHz #Res BW 100 kHz	#VBW 300 kHz	Sweep	Stop 25.00 GHz 2.386 s (4001 pts)	Mkr→CF
2 N 1 f 24.65 3 4 5 5 6	58 GHz 0.684 dBm 50 GHz -48.729 dBm			Mkr→RefLvl
7 8 9 10 11			>	More 1 of 2
MSG		STATUS	3	

(Channel = 11, 30MHz to 25GHz)



(Band Edge @ Channel = 11)

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2.4.3.3 802.11n -20MHz Test mode

A. Test Verdict:

	Fraguanay	Measured Max.	Limit (dBm)		
Channel	Frequency	Out of Band	Carrier	Calculated	Verdict
	(MHz)	Emission (dBm)	Level	-20dBc Limit	
1	2412	-48.80	1.58	-18.42	PASS
6	2437	-48.02	2.18	-17.82	PASS
11	2462	-48.58	1.59	-18.41	PASS

B. Test Plots:

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



(Channel = 1, 30MHz to 25GHz)



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Agilent Spectrum Analyzer - Swept SA				
Marker 2 2.400000000000 G	SENSE:INT	ALIGN AUTO Avg Type: Log-Pwr	09:11:23 AMNov 08, 2017 TRACE 1 2 3 4 5 6	Marker
Р	NO: Fast Trig: Free Run Gain:Low Atten: 14 dB	Avg Hold>10/10	DET P N N N N	Select Marker
Ref Offset 11.5 dB 10 dB/div Ref 15.00 dBm		Mkr2	2.400 000 GHz -25.352 dBm	2
5.00 -5.00 -15.00				Normal
-25.0 -35.0 -45.0	and shink the second		dilayonan ang sata ang sa da an	Delta
-55.0 				Fixed⊳
Center 2.40000 GHz #Res BW 100 kHz	#VBW 300 kHz	-	Span 100.0 MHz .600 ms (4001 pts)	Off
MKR MODE TRC SCL X 1 N 1 f 2.409 10 2 N 1 f 2.409 00 3 - - - 4 - - - 6 - - -		FUNCTION FUNCTION WIDTH	FUNCTION VALUE	Properties►
7 8 9 10 11			~	More 1 of 2
MSG		STATUS		

(Band Edge @ Channel = 1)



(Channel = 6, 30MHz to 25GHz)

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Agilent Spectrum Analyzer - Swept SA				
	ast 😱 Trig: Free Run	ALIGN AUTO Avg Type: Log-Pwr Avg Hold:>10/10	09:14:56 AMNov 08, 2017 TRACE 123456 TYPE MWWWWW DET P N N N N N	Peak Search
Ref Offset 11.5 dB	Low Atten: 14 dB	М	kr2 24.682 GHz -48.583 dBm	Next Peak
5.00 -5.00 -15.0				Next Pk Right
-25.0			}	Next Pk Left
-55.0 -65.0 -75.0	مويسودور المستحط بالمم ^ر المراجع المرواني واليونانورون	ين و الاو الم ^ر المراجع المراجع و المراجع المراجع و المراجع و المراجع و المراجع و المراجع و المراجع و المراجع و المراجع و المراجع و ال		Marker Delta
Start 30 MHz #Res BW 100 kHz MKR MODEL TRC SCL N 1 I 1		Sweep	Stop 25.00 GHz 2.386 s (4001 pts) FUNCTION VALUE	Mkr→CF
2 N 1 f 24.682 GI 3 - - - - 4 - - - - 5 - - - - 6 - - - - -				Mkr→RefLvl
7 8 9 10 11			×	More 1 of 2
MSG		STATUS		

(Channel = 11, 30MHz to 25GHz)



(Band Edge @ Channel = 11)

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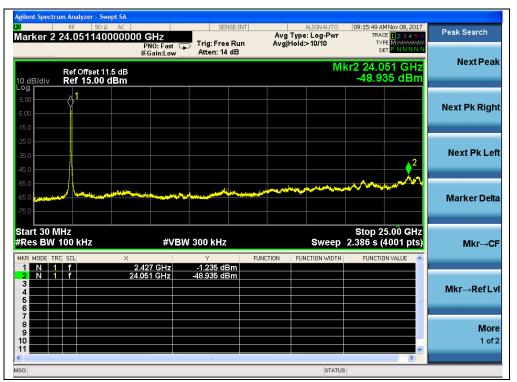
2.4.3.4 802.11n -40MHz Test mode

A. Test Verdict:

	Fraguanay	Measured Max.	Limit (dBm)		
Channel	Frequency	Out of Band	Carrier	Calculated	Verdict
	(MHz)	Emission (dBm)	Level	-20dBc Limit	
3	2422	-48.94	-1.24	-21.24	PASS
6	2437	-49.64	-1.65	-21.65	PASS
9	2452	-49.21	-0.97	-20.97	PASS

B. Test Plots:

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



(Channel = 3, 30MHz to 25GHz)





Agilent Spectrum Analyzer - Swept SA				
Marker 2 2.400000000000 GHz	SENSE:INT	ALIGNAUTO Avg Type: Log-Pwr	09:20:40 AMNov 08, 2017 TRACE 1 2 3 4 5 6	Marker
PNO: Fast IFGain:Lon		Avg Hold:>10/10	TYPE MWWWWW DET PNNNNN	Select Marker
Ref Offset 11.5 dB 10 dB/div Ref 10.00 dBm		Mkr2	2.400 000 GHz -25.906 dBm	2
-10.0		and the second s	and the state of the	Normal
-20.0	2/	V		
-30.0	hursday have been been the of the		White Washington	
-40.0				Delta
-50.0				
-60.0				
-70.0				Fixed⊳
-80.0				
Center 2.40000 GHz			Span 100.0 MHz	
#Res BW 100 kHz #\	'BW 300 kHz	Sweep 9	.600 ms (4001 pts)	Off
MKR MODE TRC SCL X 1 N 1 f 2.417 875 GHz	-0.434 dBm	FUNCTION FUNCTION WIDTH	FUNCTION VALUE	
2 N 1 f 2.400 000 GHz	-25.906 dBm			
				Properties►
6			=	
7 8 11 11 11 11 11 11 11 11 11 11 11 11 11				More
9				1 of 2
			~	
MSG		STATU		

(Band Edge @ Channel = 3)



(Channel = 6, 30MHz to 25GHz)

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Agilent Spectrum Analyzer - Swept SA ΙΧΙ RF 50 Ω AC	SENSE:IN		09:17:35 AM Nov 08, 2017	Peak Search
	CHZ PNO: Fast FGain: Low Atten: 14 dB	Avg Type: Log-Pwr n Avg Hold>10/10	TRACE 123456 TYPE MWWWWW DET PINNNNN	T built obuildin
Ref Offset 11.5 dB 10 dB/div Ref 15.00 dBm		М	kr2 24.613 GHz -49.211 dBm	NextPeak
5.00 1 -5.00				Next Pk Right
-25.0 -35.0 -45.0				Next Pk Left
-55.0 -65.0 -75.0	along the second design of the second sec	Site and Proper Providence in the second state of the second state		Marker Delta
Start 30 MHz #Res BW 100 kHz	#VBW 300 kHz	Sweep	Stop 25.00 GHz 2.386 s (4001 pts)	Mkr→CF
2 N 1 f 24.6 3 -	-58 GHz -0.971 dBm 13 GHz -49.211 dBm			Mkr→RefLvl
7 8 9 10 11			>	More 1 of 2
MSG		STATU	S	

(Channel = 9, 30MHz to 25GHz)



(Band Edge @ Channel = 9)

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2.5. Power spectral density (PSD)

2.5.1. 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.

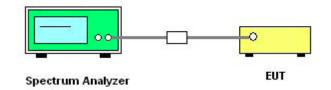
2.5.2. Test Description

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 30MHz
- c) Set the RBW to 3 kHz
- d) Set the VBW to 10KHz
- 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 reference ANNEX A(1.5).





2.5.3. Test Result

2.5.3.1 802.11b Test mode

A. Test Verdict:

Spectral power density (dBm/3kHz)					
Channel	Frequency	Measured PSD	Limit	\/e ndiet	
Channel	(MHz)	(dBm/3kHz)	(dBm/3kHz)	Verdict	
1	2412	-15.60	8	PASS	
6	2437	-16.21	8	PASS	
11	2462	-16.11	8	PASS	
Measurement uncertainty: ±1.3dB					

B. Test Plots:



(Channel = 1 @ 802.11b)







(Channel = 6 @ 802.11b)



(Channel = 11 @ 802.11b)

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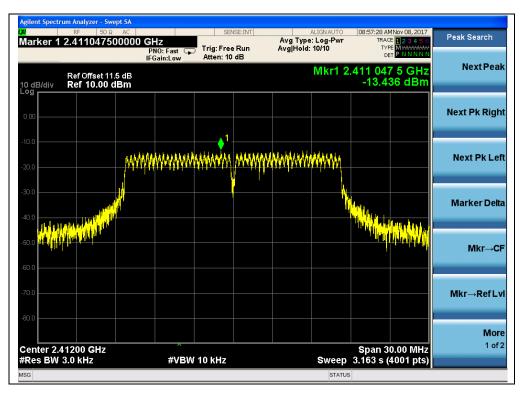


2.5.3.2 802.11g Test mode

A. Test Verdict:

Spectral power density (dBm/3kHz)					
Channel	Frequency	Measured PSD	Limit	Verdict	
Channel	(MHz)	(dBm/3kHz)	(dBm/3kHz)	voraiot	
1	2412	-13.44	8	PASS	
6	2437	-13.06	8	PASS	
11	2462	-13.23	8	PASS	
Measurement uncertainty: ±1.3dB					

B. Test Plots:

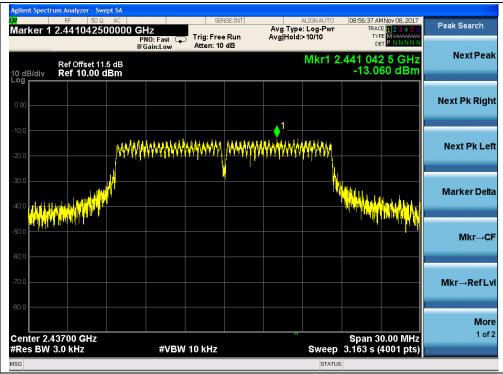


(Channel = 1 @ 802.11g)

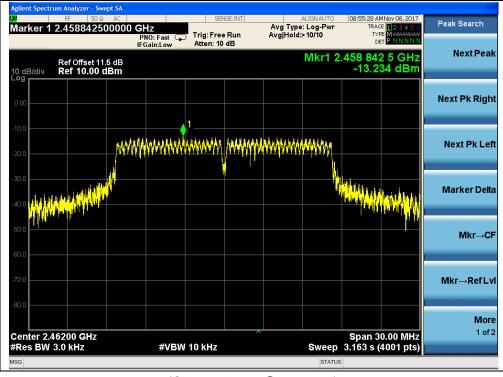


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(Channel = 6 @ 802.11g)



(Channel = 11 @ 802.11g)

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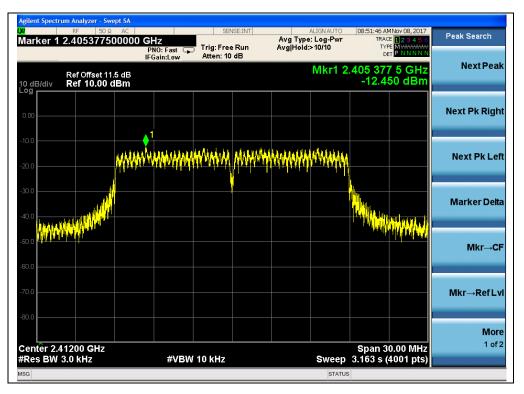


2.5.3.3 802.11n-20MHz Test mode

A. Test Verdict:

Spectral power density (dBm/3kHz)					
Channel	Frequency	Measured PSD	Limit	Verdict	
Channel	(MHz)	(dBm/3kHz)	(dBm/3kHz)	verdici	
1	2412	-12.45	8	PASS	
6	2437	-12.48	8	PASS	
11 2462 -12.58 8 PASS					
Measurement uncertainty: ±1.3dB					

B. Test Plots:



(Channel = 1 @ 802.11n-20MHz)



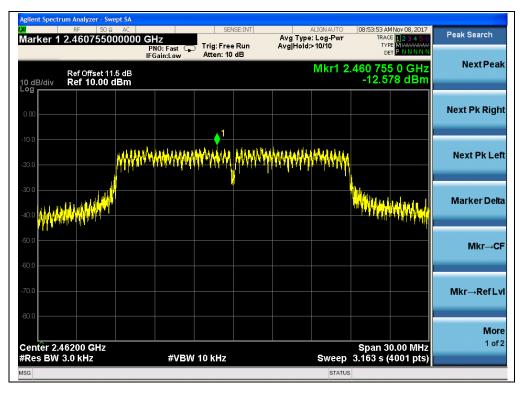
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(Channel = 6 @ 802.11n-20MHz)



(Channel = 11 @ 802.11n-20MHz)

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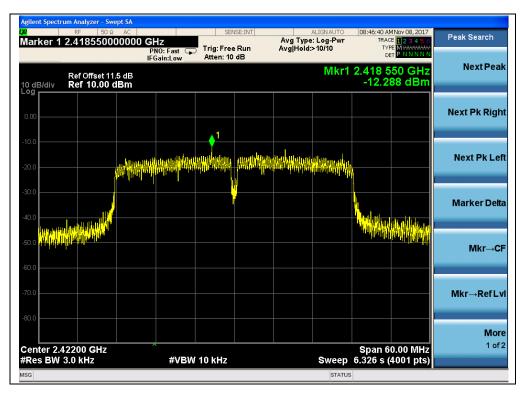


2.5.3.4 802.11n-40MHz Test mode

A. Test Verdict:

	Spectral power density (dBm/3kHz)									
Channel	Frequency	Measured PSD	Limit	Verdict						
Channel	(MHz)	(dBm/3kHz)	(dBm/3kHz)	verdici						
3 2422 -12.29 8 PASS										
6	2437	8	PASS							
9 2452 -12.73 8 PASS										
Measureme	Measurement uncertainty: ±1.3dB									

B. Test Plots:



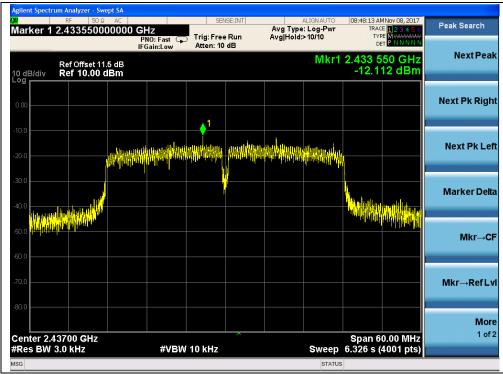
(Channel = 3 @ 802.11n-40MHz)



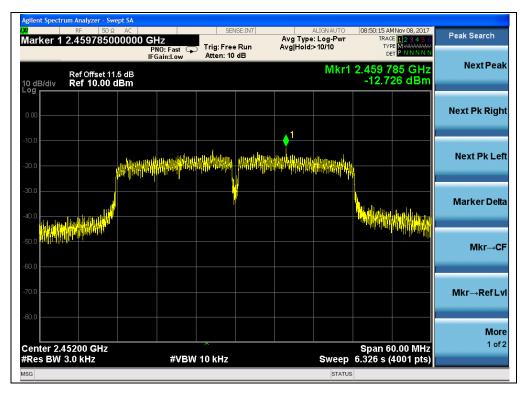
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REPORT No. : SZ17100181W02



(Channel = 6 @ 802.11n-40MHz)



(Channel = 9 @ 802.11n-40MHz)

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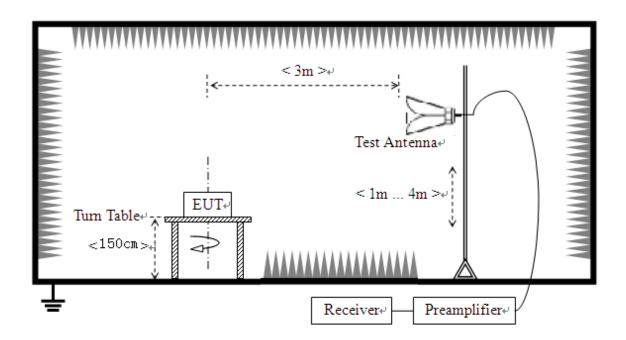
2.6. Restricted Frequency Bands

2.6.1. 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).

2.6.2. 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.



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REPORT No. : SZ17100181W02

B. Equipments List:

Please reference ANNEX A(1.5).

2.6.3. 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.

2.6.3.1 802.11b Test mode

The lowest and highest channels are tested to verify the band edge emissions.

A. Test Verdict:

Channel	Frequency	Detector	Receiver Reading	A _T	A _{Factor}	Max. Emission	Limit	Verdict
Chamiler	(MHz)	PK/ AV	U _R (dBuV)	(dB)	(dB@3m)	E (dBµV/m)	(dBµV/m)	voraiot
1	2382.77	PK	46.17	-33.63	32.56	45.1	74	Pass
1	2387.81	AV	33.94	-33.63	32.56	32.87	54	Pass
11	2488.68	PK	48.60	-33.18	32.5	47.92	74	Pass
11	2386.70	AV	33.97	-33.18	32.5	33.29	54	Pass



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B. Test Plots:

Aug Type: Voltage Avg|Hold:>100/100 05:57:20 AM Nov 20, 2017 TRACE 123456 TYPE M Trace/Detector Marker 1 2.382768000000 GHz Trig: Free Run Atten: 10 dB PNO: Fast 😱 IFGain:Low Select Trace Mkr1 2.382 77 GHz 46.167 dBµV Ref 105.00 dBµV 10 dB/div Log Detector Peak Auto Man Preset \wedge^2 ՝՝ Detectors **Clear Trace** Start 2.30000 GHz Res BW (CISPR) 1 MHz Stop 2.41200 GHz Sweep 1.000 ms (1001 pts) #VBW 3.0 MHz **Clear All Traces** 2.382 77 GHz 2.390 00 GHz 46.167 dBµV 46.838 dBµV f f Preset All Traces More 2 of 3

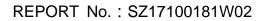
(Plot A1: Channel = 1 PEAK @ 802.11b)



(Plot A2: Channel = 1 AVG @ 802.11b)



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Keysight Spectrum Analyzer - Swept S	A							
RL RF PRESEL 50 Ω D arker 2 2.488676000	C	→ Trig: Free F Atten: 10 d	Run		ALIGN OFF e: Voltage :>100/100	TRAC	M Nov 20, 2017 DE 1 2 3 4 5 6 PE M WWWWW ET P P N N N N	Marker Select Marker
dB/div Ref 105.00 dl	BμV				Mkr2		76 GHz 4 dBμV	
9 5.0								Norn
5.0	Martin Martin		1		2			De
5.0		wellen to Wiener Man	handura	k-s-untrh-many-y	- Anarty Units	rhan flan turburan turb fla	uaraalhda daabhar	
								Fixe
art 2.46200 GHz s BW (CISPR) 1 MHz	#VB	W 3.0 MHz Y	FUNC		Sweep 1	.000 ms (0000 GHz 1001 pts)	
	2.483 500 GHz 2.488 676 GHz	45.148 dBµ\ 48.604 dBµ\					E	Propertie
								M (

(Plot B1: Channel = 11 PEAK @ 802.11b)



(Plot B2: Channel = 11 AVG @ 802.11b)



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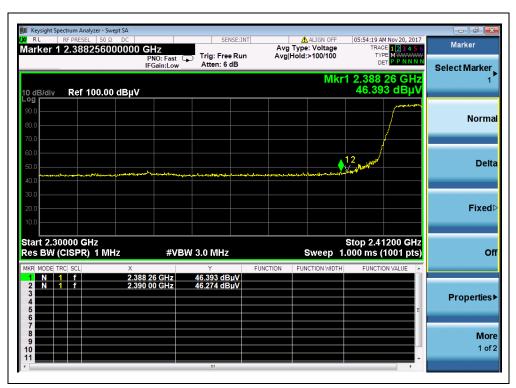
2.6.3.2 802.11g Test mode

The lowest and highest channels are tested to verify the band edge emissions.

A. Test Verdict:

Channel	Frequency	Detector	Receiver Reading	A _T	A _{Factor}	Max. Emission	Limit	Vordiat
Channel	(MHz)	PK/ AV	U _R (dBuV)	(dB)	(dB@3m)	E (dBµV/m)	(dBµV/m)	Verdict
1	2388.26	PK	46.39	-33.63	32.56	45.32	74	Pass
1	2331.92	AV	35.36	-33.63	32.56	34.29	54	Pass
11	2483.85	PK	50.88	-33.18	32.5	50.20	74	Pass
11	2483.93	AV	33.28	-33.18	32.5	32.60	54	Pass

B. Test Plots:

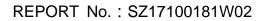


(Plot C1: Channel = 1 PEAK @ 802.11g)



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							ght Spectrum Anal	
Marker	05:54:57 AM Nov 20, 2017 TRACE 1 2 3 4 5 6 TYPE M	ALIGN OFF Type: Voltage Hold: 2/100	Av	SENSE:	GHz PNO: Fast	50 Ω DC 920000000		^{r RL} Narko
Select Marker	1 2.331 92 GHz 35.364 dBµV	Mkr		Atten: 6 dB	IFGain:Low	00.00 dBµV	div Ref 1	10 dB/
Norma								90.0
Delta	2				<u> </u>			70.0 - 60.0 - 50.0 -
Fixed					<u></u>			40.0
 Of	Stop 2.41200 GHz 12.84 s (1001 pts)	Sweep		/ 10 Hz	#VB		2.30000 GH 3W (CISPR)	
	FUNCTION VALUE	FUNCTION WIDTH	FUNCTION	۲ 35.364 dBµV	1 92 GHz		DDE TRC SCL	1
Properties	E			33.090 dBµV	0 00 GHz	2.390	1 f	2 N 3 4 5 6
Mor 1 of:								7 8 9
				m				11

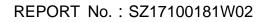
(Plot C2: Channel = 1 AVG @ 802.11g)



(Plot D1: Channel = 11 PEAK @ 802.11g)

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										Analyzer - Sv		
Marker	Nov 20, 2017 1 2 3 4 5 6 M	TRACE	ALIGN OFF			SENSE	-			ESEL 50 \$		^{RL} arker
Select Marker		DE	1: 7/100	Avg Ho		ig: Free R tten: 10 d		PNO: Fast IFGain:Low				
2	26 GHz I dBµV	2.483 9 33.28	Mkr2						0 dBµV	f 105.00	Re	dB/div
Norm												
									_	~		
Delt												
					2							
Fixed												
	000 GHz	Stop 2.50								GH7	46200	art 2.4
0	001 pts)	4.357 s (1	Sweep			Hz	VBW 10	#V	Hz	PR) 1 M		
	N VALUE	FUNCTIO	NCTION WIDTH	TION F	FUNC	Ƴ 367 dBu\		500 GHz	× 2.483		TRC SC	R MODE
Properties						281 dBµ\		926 GHz			1 f	N
Мо												
1 of	-											

(Plot D2: Channel = 11 AVG @ 802.11g)

2.6.3.3 802.11n-20MHz Test mode

The lowest and highest channels are tested to verify the band edge emissions.

A. Test Verdict:

Channel	Frequency (MHz)	Detector	Receiver Reading U _R	A _T (dB)	A _{Factor} (dB@3m)	Max. Emission E	Limit (dBµV/m)	Verdict
	(10112)	PK/ AV	(dBuV)	(UD)	(ub@Sill)	∟ (dBµV/m)	(ασμν/ιιι)	
1	2389.15	PK	46.99	-33.63	32.56	45.92	74	Pass
1	2332.14	AV	35.78	-33.63	32.56	34.71	54	Pass
11	2484.80	PK	51.59	-33.18	32.5	50.91	74	Pass
11	2484.15	AV	34.04	-33.18	32.5	33.36	54	Pass



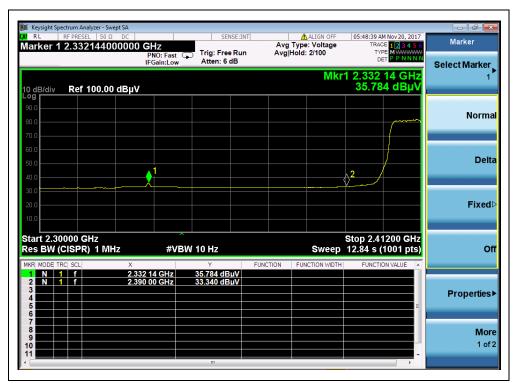
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B. Test Plots:

n Analyzer - Swept SA 🚺 Keysight Sp ALIGN OFF Avg Type: Voltage Avg|Hold:>100/100 05:47:49 AM Nov 20, 2017 TRACE 123456 TYPE MW Marker Marker 1 2.389152000000 GHz Trig: Free Run Atten: 6 dB PNO: Fast C DET Select Marker Mkr1 2.389 15 GHz 46.991 dBµV Ref 100.00 dBµV 10 dB/div Log Normal it sharpe Delta **Fixed** Start 2.30000 GHz Res BW (CISPR) 1 MHz Stop 2.41200 GHz 1.000 ms (1001 pts) #VBW 3.0 MHz Sweep Off FUNCTION FUNCTIO 2.389 15 GHz 2.390 00 GHz 46.991 dBµV 45.725 dBµV **Properties**► More 1 of 2

(Plot E1: Channel = 1 PEAK @ 802.11n-20)



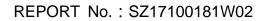
(Plot E2: Channel = 1 AVG @ 802.11n-20)

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Keysight Spectrum Analyzer -					
RL RFPRESEL 50 arker 2 2.484800		SENSE:INT	ALIGN Avg Type: Volt	age TRACE 1 2 3 4 5 6	Marker
	PNO: Fast IFGain:Low		Avg Hold:>100/	DET P P N N N	Select Marker
dB/div Ref 105.0	00 dBµV		Μ	kr2 2.484 800 GHz 51.595 dBµV	
9 9 5.0 5.0					Norm
5.0	and a second sec	melliphanterproduction	1 2 Munimum		De
5.0					Fixe
art 2.46200 GHz es BW (CISPR) 1 N	ЛHz #V	BW 3.0 MHz	Swee	Stop 2.50000 GHz p 1.000 ms (1001 pts)	
R MODE TRC SCL 1 N 1 f 2 N 1 f	× 2.483 500 GHz 2.484 800 GHz	Y 48.723 dBµV 51.595 dBµV	FUNCTION FUNCTION	VIDTH FUNCTION VALUE	
				E	Propertie
7 					M 0
1					10

(Plot F1: Channel = 11 PEAK @ 802.11n-20)



(Plot F2: Channel = 11 AVG @ 802.11n-20)

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2.6.3.4 802.11n-40MHz Test mode

The lowest and highest channels are tested to verify the band edge emissions.

A. Test Verdict:

Channel	Frequency	Detector	Receiver Reading	A _T	A _{Factor}	Max. Emission E	Limit	Verdict
	(MHz)	PK/ AV	U _R (dBuV)	(dB)	(dB@3m)	⊏ (dBµV/m)	(dBµV/m)	
3	2388.93	PK	49.10	-33.63	32.56	48.03	74	Pass
3	2388.82	AV	33.64	-33.63	32.56	32.57	54	Pass
9	2488.07	PK	53.81	-33.18	32.5	53.13	74	Pass
9	2484.50	AV	34.82	-33.18	32.5	34.14	54	Pass

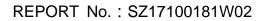
B. Test Plots:



(Plot E1: Channel = 3 PEAK @ 802.11n-40)



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							rum Analyzer - S	
Marker	05:45:28 AM Nov 20, 2017 TRACE 123456 TYPE M	ALIGN OFF Type: Voltage Hold: 2/100		SENSE	PNO: Fast C	6000000	PRESEL 50	
Select Marker	^{ретрернини} 1 2.388 82 GHz 33.637 dBµV	Mkr		Atten: 6 dB	IFGain:Low		Ref 100.0	B/div
Norma								
Delta								
Fixed								
Of	Stop 2.41200 GHz 12.84 s (1001 pts)	Sweep		10 Hz	#VB	۷Hz	00 GHz SPR) 1 N	
	FUNCTION VALUE	FUNCTION WIDTH	FUNCTI	Y 33.637 dBµV 33.766 dBµV	8 82 GHz 0 00 GHz	× 2.388 2.390	SCL f	MODE TRC N 1 N 1
Properties	E							
Mon 1 of:								
				m				

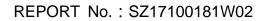
(Plot E2: Channel = 3 AVG @ 802.11n-40)



(Plot F1: Channel = 9 PEAK @ 802.11n-40)

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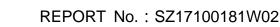


Keysight Spectrum Analyzer - Swept SA RL RF PRESEL 50 Ω DC		SENS	TNT	ALIGN OFF	05:39:41 AM I	Joy 20, 2017	
arker 2 2.484496000000				Avg Type: Voltage	TRACE	123456 MWWWW	Marker
	PNO: Fast G	Atten: 6 dE			DET	PPNNNN	Select Marker
dB/div Ref 100.00 dBµV				Mkr	2 2.484 49 34.821		2
9 							Norm
0.0							
0.0							Del
).0			¹ ²	<u></u>			
).0							Fixed
art 2.46200 ĜHz es BW (CISPR) 1 MHz	#VBV	V 10 Hz		Sweep	Stop 2.500 4.357 s (1	000 GHz 001 pts)	c
R MODE TRC SCL X		Y	FUNCTIO	N FUNCTION WIDT	H FUNCTION	VALUE	
N 1 f 2.483 N 1 f 2.484	500 GHz 496 GHz	34.337 dBµ 34.821 dBµ					Properties
						=	
							Mo
							1 0

(Plot F2: Channel = 9 AVG @ 802.11n-40)



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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 50μ H/ 50Ω 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		

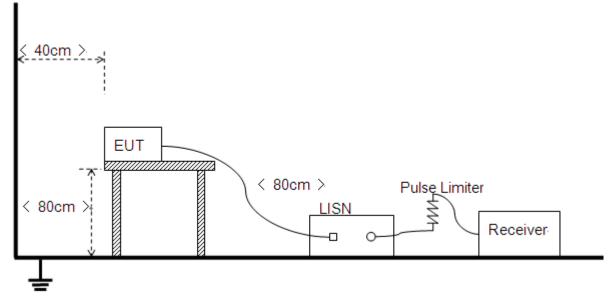
NOTE:

(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.

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B. Equipments List:

Please reference ANNEX A(1.5).

2.7.3. Test Result

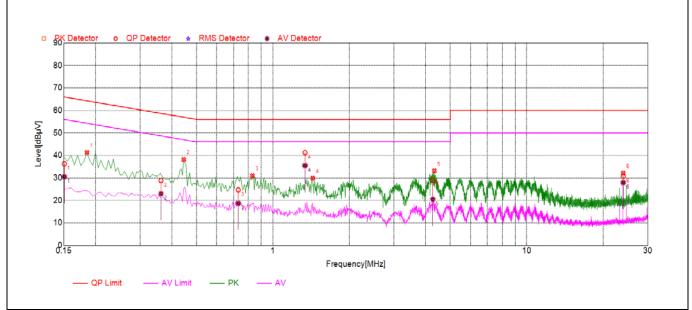
The maximum conducted interference is searched using Peak (PK), if the emission levels more than the AV and QP limits, and that have narrow margins from the AV and QP limits will be re-measured with AV and QP detectors. Tests for both L phase and N phase lines of the power mains connected to the EUT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

A. Test setup:

The EUT configuration of the emission tests is EUT + Link.

Note: The test voltage is AC 120V/60Hz.

B. Test Plots:



(Plot A: L Phase)

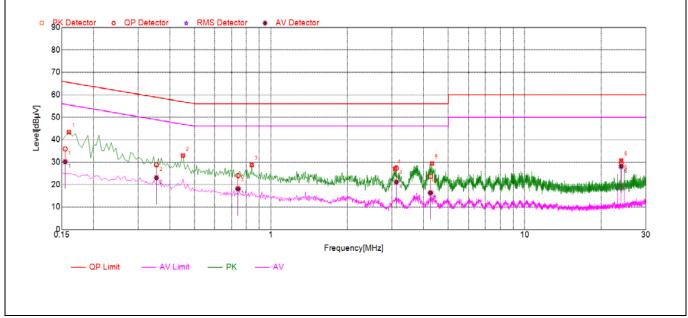
NO.	Fre.			Limit (dBµV)		Power-line	Verdict
	(MHz)	Quai-peak	Average	Quai-peak	Average		
1	0.1506	36.27	30.49	65.97	55.97		PASS
2	0.3622	28.81	22.98	58.68	48.68]	PASS
3	0.73	24.66	18.75	56.00	46.00	Line	PASS
4	1.338	41.22	35.49	56.00	46.00	Line	PASS
5	4.2648	28.96	20.49	56.00	46.00		PASS
6	24.0006	30.74	27.91	60.00	50.00		PASS



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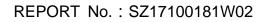




(Plot B: N Phase)

NO.	Fre.			Limit (dBµV)		Power-line	Verdict
	(MHz)	Quai-peak	Average	Quai-peak	Average		
1	0.1546	35.89	30.13	65.75	55.75		PASS
2	0.3538	28.82	22.99	58.87	48.87		PASS
3	0.7418	24.01	18.12	56.00	46.00	Line	PASS
4	3.12	27.34	21.15	56.00	46.00	LINE	PASS
5	4.254	23.68	16.34	56.00	46.00		PASS
6	24.0004	29.74	28.09	60.00	50.00		PASS







2.8. Radiated Emission

2.8.1. 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)



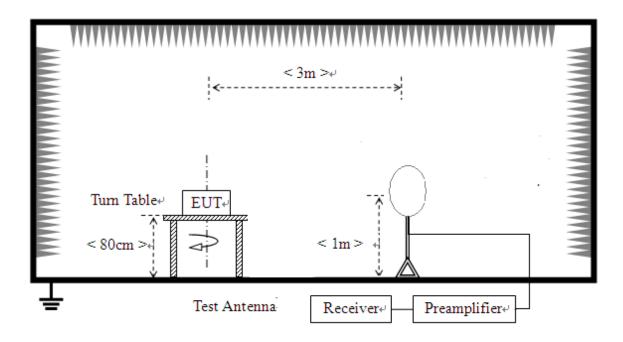


REPORT No. : SZ17100181W02

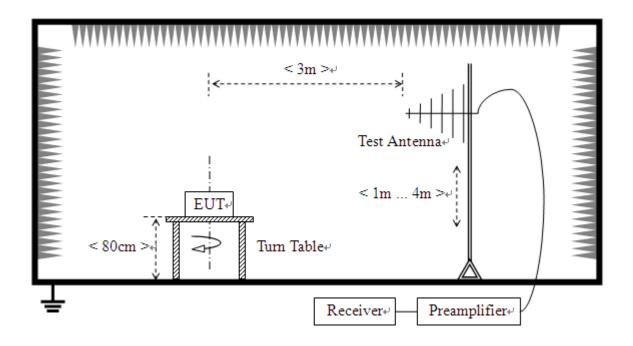
2.8.2. Test Description

A. Test Setup:

1) For radiated emissions from 9kHz to 30MHz



2) For radiated emissions from 30MHz to1GHz

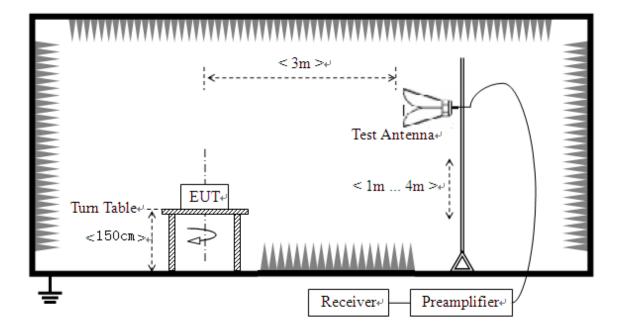




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3) For radiated emissions above 1GHz



The 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



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the site as factors are calculated to correct the reading

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 reference ANNEX A(1.5).

2.8.3. 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_T: Total correction Factor except Antenna

U_R: Receiver Reading

G_{preamp}: Preamplifier Gain

A_{Factor}: Antenna Factor at 3m

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

The low frequency, which started from 9KHz to 30MHz, was pre-scanned and the result which was 20dB lower than the limit line per 15.31(o) was not reported.

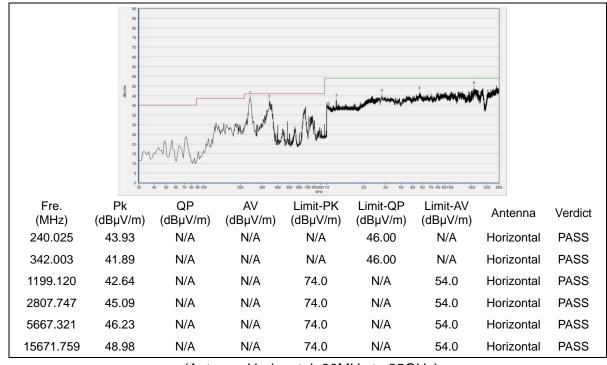




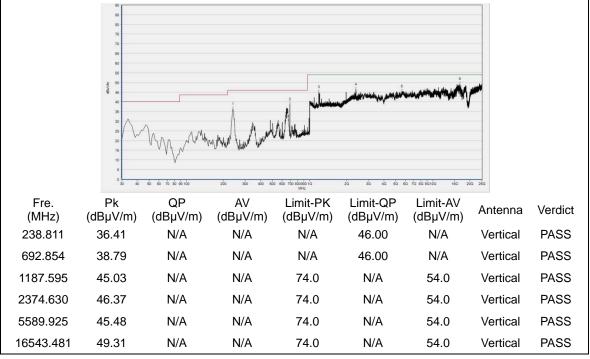
2.8.3.1 802.11b Test mode

A. Test Plots for the Whole Measurement Frequency Range:

Plots for Channel = 1



(Antenna Horizontal, 30MHz to 25GHz)

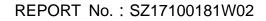


(Antenna Vertical, 30MHz to 25GHz)

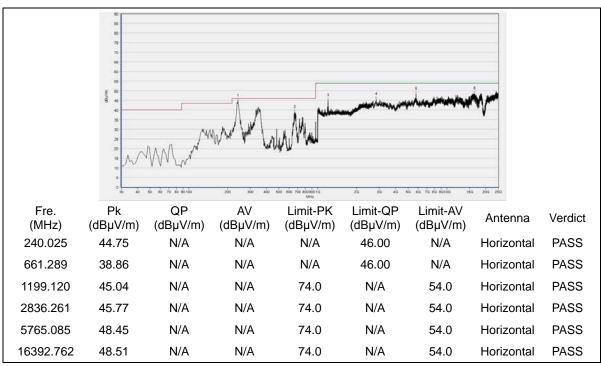


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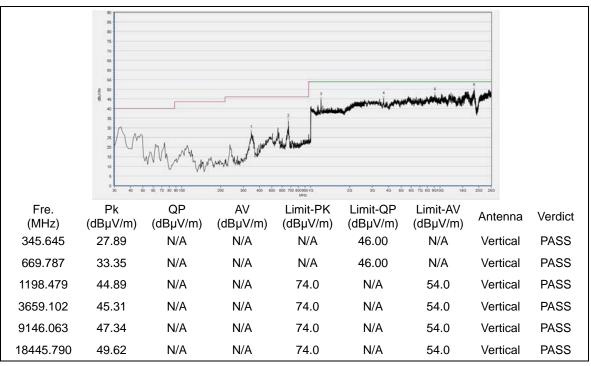
Fax: 86-755-36698525 E-mail: service@morlab.cn





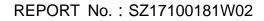


(Antenna Horizontal, 30MHz to 25GHz)



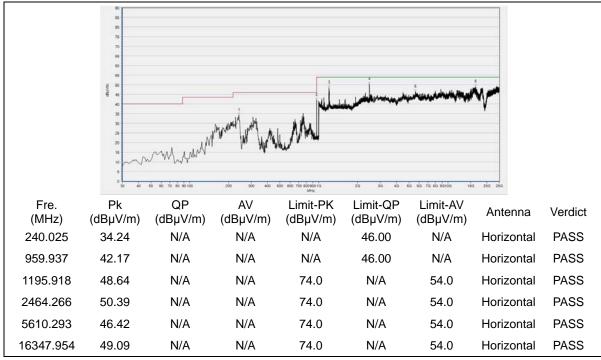
(Antenna Vertical, 30MHz to 25GHz)



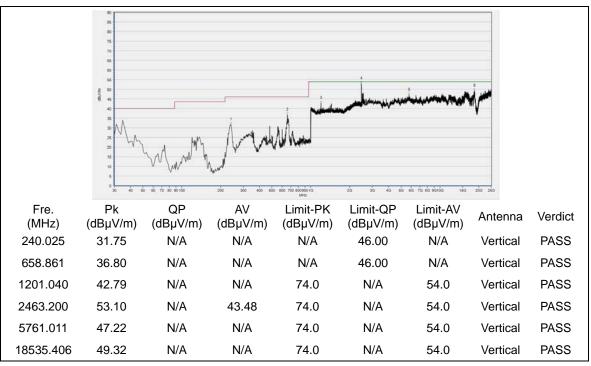




Plot for Channel = 11



(Antenna Horizontal, 30MHz to 25GHz)



(Antenna Vertical, 30MHz to 25GHz)

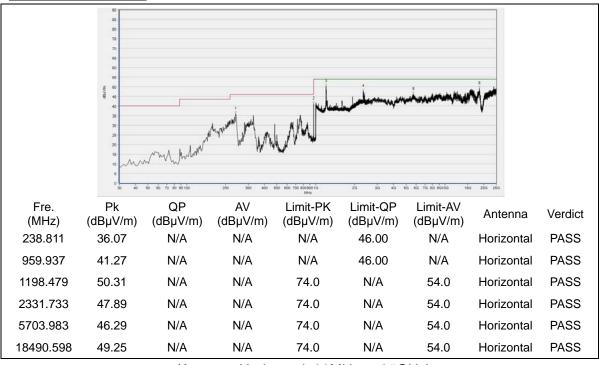
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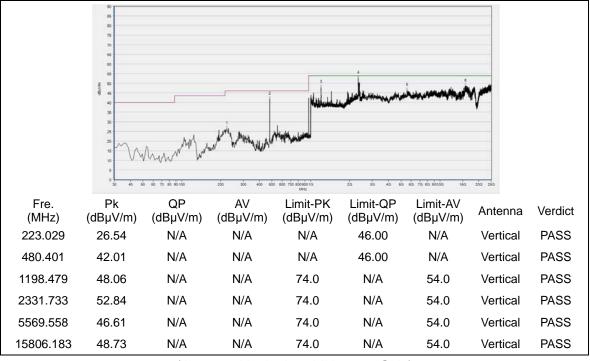
2.8.3.2 802.11g Test mode

B. Test Plots for the Whole Measurement Frequency Range:

Plots for Channel = 1



(Antenna Horizontal, 30MHz to 25GHz)

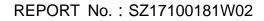


(Antenna Vertical, 30MHz to 25GHz)

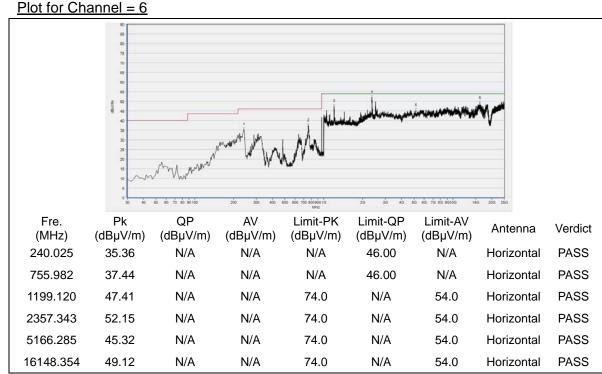


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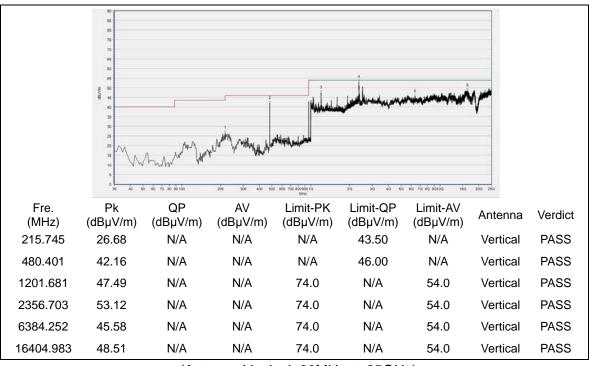
Fax: 86-755-36698525 E-mail: service@morlab.cn







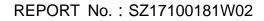
(Antenna Horizontal, 30MHz to 25GHz)



(Antenna Vertical, 30MHz to 25GHz)

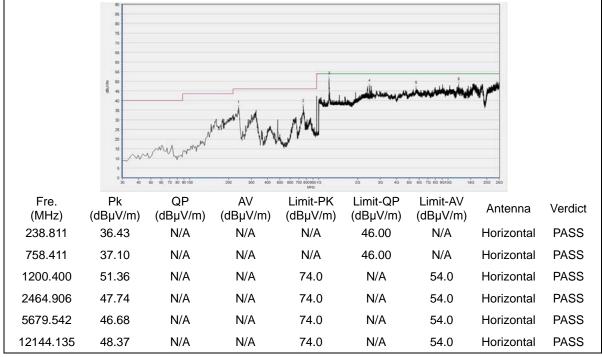


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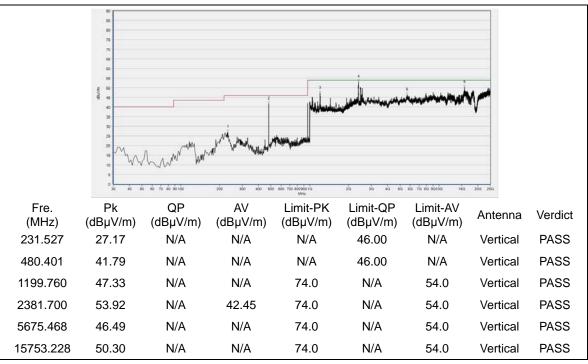




Plot for Channel = 11



(Antenna Horizontal, 30MHz to 25GHz)



(Antenna Vertical, 30MHz to 25GHz)

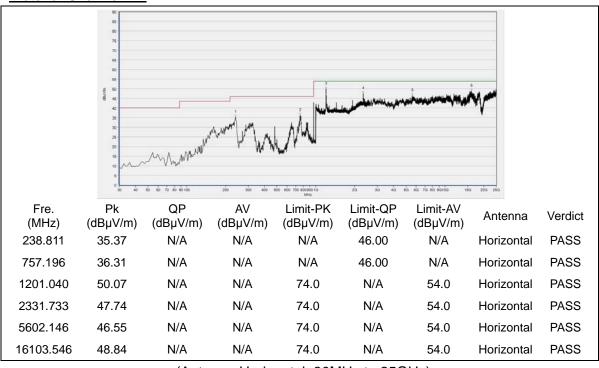




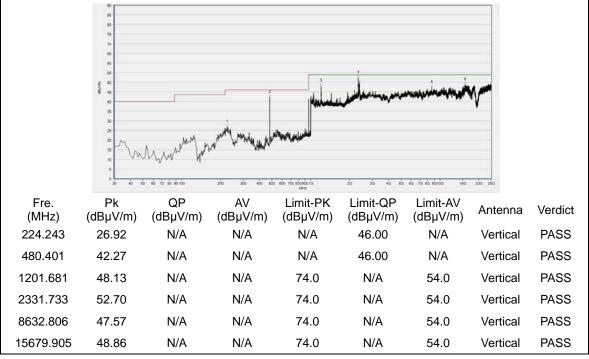
2.8.3.3 802.11n-20MHz Test mode

C. Test Plots for the Whole Measurement Frequency Range:

Plots for Channel = 1



(Antenna Horizontal, 30MHz to 25GHz)



(Antenna Vertical, 30MHz to 25GHz)

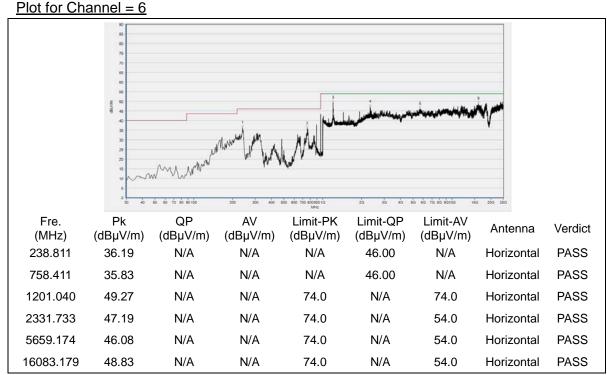


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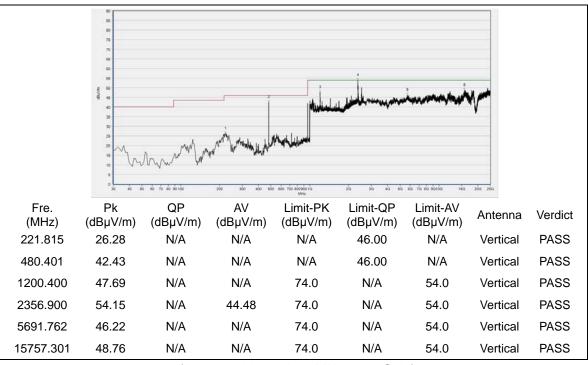
Fax: 86-755-36698525 E-mail: service@morlab.cn







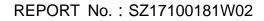
(Antenna Horizontal, 30MHz to 25GHz)



(Antenna Vertical, 30MHz to 25GHz)

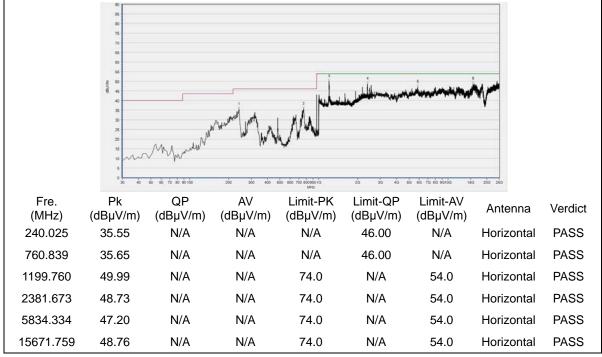


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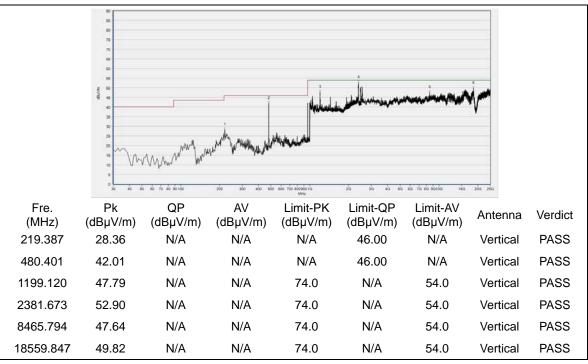




Plot for Channel = 11



(Antenna Horizontal, 30MHz to 25GHz)



(Antenna Vertical, 30MHz to 25GHz)

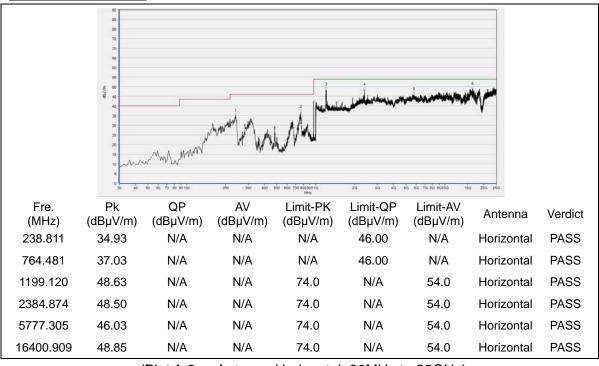




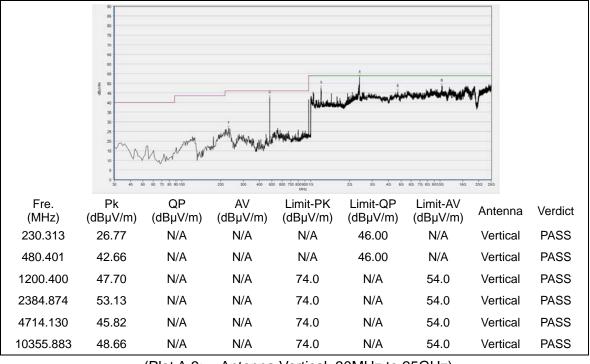
2.8.3.4 802.11n-40MHz Test mode

D. Test Plots for the Whole Measurement Frequency Range:

Plots for Channel = 3



(Plot A.2: Antenna Horizontal, 30MHz to 25GHz)



(Plot A.3: Antenna Vertical, 30MHz to 25GHz)

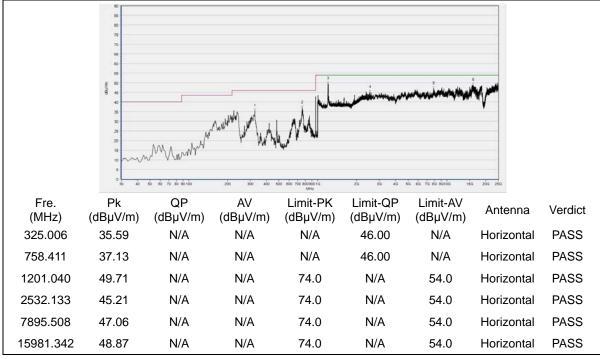


SHENZHEN MORLAB COMMUNICATIONS TECHNOLOGY Co., Ltd. FL1-3, Building A, FeiYang Science Park, No.8 LongChang Road, Block67, BaoAn District, ShenZhen , GuangDong Province, P. R. China Tel: 86-755-36698555 Http://www.morlab.cn Fax: 86-755-36698525 E-mail: service@morlab.cn

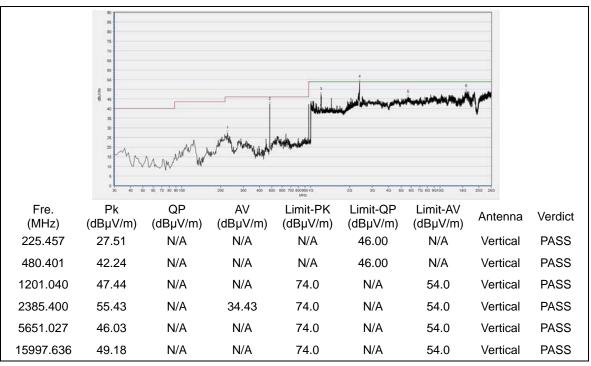


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Plots for Channel = 6

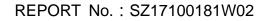


(Plot B.2: Antenna Horizontal, 30MHz to 25GHz)



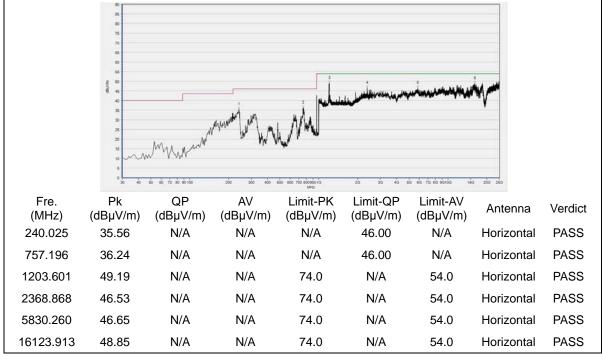
(Plot B.3: Antenna Vertical, 30MHz to 25GHz)



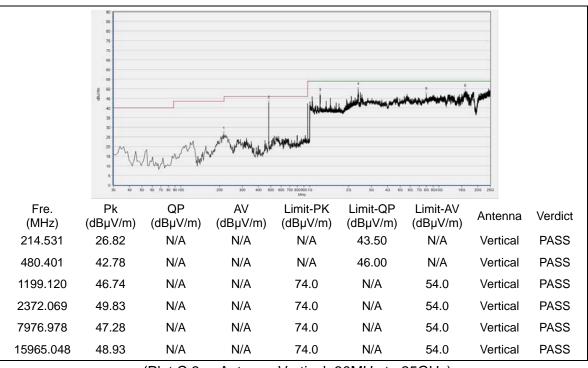




Plots for Channel = 9



(Plot C.2: Antenna Horizontal, 30MHz to 25GHz)



(Plot C.3: Antenna Vertical, 30MHz to 25GHz)





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



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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. Cu Fang				
Manager:	Mr. Su Feng				
Telephone:	+86 755 36698555				
Facsimile:	+86 755 36698525				

2. Identification of the Responsible Testing Location

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

3. Facilities and Accreditations

Shenzhen Morlab Communications Technology Co., Ltd. Morlab Laboratory is a testing organization accredited by China National Accreditation Service for Conformity Assessment (CNAS) according to ISO/IEC 17025. The accreditation certificate number is L3572.

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.





4. Test Equipments Utilized

4.1 Conducted Test Equipments

Equipment Name	Serial No.	Туре	Manufacturer	Cal. Date	Cal. Due
Spectrum Analyzer	MY45101810	E4407B	Agilent	2017.05.24	2018.05.23
Power Splitter	NW521	1506A	Weinschel	2017.05.24	2018.05.23
Attenuator 1	(N/A.)	10dB	Resnet	2017.05.24	2018.05.23
Attenuator 2	(N/A.)	3dB	Resnet	2017.05.24	2018.05.23
EXA Signal Analzyer	MY53470836	N9010A	Agilent	2016.12.07	2017.12.06
USB Wideband Power Sensor	MY54210011	U2021XA	Agilent	2017.05.24	2018.05.23
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	US44210471	E7405A	Agilent	2017.05.17	2018.05.16
LISN	812744	NSLK 8127	Schwarzbeck	2017.05.17	2018.05.16
Service Supplier	100448	CMU200	R&S	2017.05.17	2018.05.16
Pulse Limiter	9391	VTSD	Schwarzbeck	2017.05.17	2018.05.16
(20dB)		9561-D	Schwarzbeck	2017.05.17	2018.05.10
Coaxial cable(BNC)	CB01	EMC01	Morlab	N/A	N/A
(30MHz-26GHz)			IVIOTIAD		

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 Radiated Test Equipments

Equipment Name	Serial No.	Туре	Manufacturer	Cal. Date	Cal.Due Date
System Simulator	GB45360846	8960-E5515C	Agilent	2017.05.17	2018.05.16
Receiver	MY54130016	N9038A	Agilent	2017.05.17	2018.05.16
Test Antenna - Bi-Log	N/A	VULB9163	Schwarzbeck	2016.12.09	2017.12.08
Test Antenna - Horn	9170C-531	BBHA9170	Schwarzbeck	2017.03.30	2018.03.29
Test Antenna - Loop	1519-022	FMZB1519	Schwarzbeck	2017.03.30	2018.03.29
Test Antenna - Horn	1774	BBHA 9120D	Schwarzbeck	2017.09.13	2018.09.12
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	2017.05.17	2018.05.16
18-26.5GHz pre-Amplifier	MA03	TS-PR18	Rohde& Schwarz	2017.05.17	2018.05.16
Climate Chamber	2004012	HL4003T	Yinhe	2017.01.11	2018.01.10
Vibration Table	N/A	ACT2000-S01 5L	CMI-COM	2017.01.11	2018.01.10
Anechoic Chamber	N/A	9m*6m*6m	Changning	2017.01.11	2018.01.10

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