SGS-CSTC Standards Technical Services
(Shanghai) Co., Ltd.

588 West Jindu Road,Songjiang District,Shanghai,China
Telephone: +86 (0) 21 6191 5666
Fax: +86 (0) 21 6191 5678
ee.shanghai@sgs.com

2 Cover Page

FCC DFS TEST REPORT

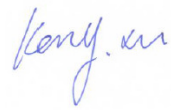
Application No.:	SHEM1412003180RF
Applicant:	Shanghai Xunzhao Communication Technology Co., Ltd
FCC ID:	2ADY6WC18R2211
Equipment Under Test (EUT): **NOTE:** The following sample(s) was/were submitted and identified by the client as	
Product Name:	WiFi Modular
Model No.(EUT):	WC18R2211
Standards:	FCC PART 15 Subpart E: 2014 KDB 905462 D02 KDB 905462 D03
Date of Receipt:	December 11, 2014
Date of Test:	December 23, 2014 to May 17, 2015
Date of Issue:	May 26, 2015
Test Result:	**Pass***

*In the configuration tested, the EUT detailed in this report complied with the standards specified above.

Parlam Zhan
E&E Section Manager
SGS-CSTC (Shanghai) Co., Ltd.

3 Version

Revision Record				
Version	**Chapter**	**Date**	**Modifier**	**Remark**
00	/	May 26, 2015	/	Original

Authorized for issue by:				
Engineer		Eddy Zong **Print Name**		
Clerk		Susie Liu **Print Name**		
Reviewer		Keny Xu **Print Name**		

4 Test Summary

Test Item	Test Requirement	Test method	Result
Dynamic Frequency Selection	15.407 (h)(2)	KDB 905462 D02 KDB 905462 D03	PASS

5 Contents

6 General Information

6.1 Client Information

Applicant:	Shanghai Xunzhao Communication Technology Co., Ltd
Address of Applicant:	1759 Jinshajiang road putuo district of Shanghai
Manufacturer:	Shanghai Xunzhao Communication Technology Co., Ltd
Address of Manufacturer:	1759 Jinshajiang road putuo district of Shanghai
Factory:	Shanghai Xunzhao Communication Technology Co., Ltd
Address of Factory:	1759 Jinshajiang road putuo district of Shanghai

6.2 General Description of E.U.T.

Product Description:	802.11 a/b/g/n/ac 2T/2R Dual Band USB Module
Brand Name:	EBD
Power Supply:	DC 5V from USB Interface

6.3 Technical Specifications

Operation Frequency:	802.11a/n(HT20)/ac(VHT20):U-NII 1:5180-5240MHz, U-NII 2A:5260-5320MHz, U-NII-2C:5500-5720MHz, U-NII-3:5745-5825MHz 802.11n(HT40)/ac(VHT40): U-NII 1:5190-5230MHz, U-NII 2A:5270-5310MHz, U-NII 2C:5500-5720MHz, U-NII 3:5755-5795MHz 802.11ac(VHT80): U-NII 1:5210 MHz, U-NII 2A:5290 MHz, U-NII 2C:5530-5690MHz, U-NII 3:5775 MHz
Modulation Technique:	OFDM(256QAM, 64QAM, 16QAM, QPSK, BPSK) Remark: 256QAM for 802.11 ac only
Data Rate:	802.11a: 6/9/12/18/24/36/48/54Mbps 802.11n(HT20)/n(HT40): MCS0-7 up to 300Mbps 802.11ac(VHT20)/ac(VHT40)/ac(VHT80): MCS0-7 up to 866.3Mbps
DFS mode	Client without radar detection
Support TPC:	☒Yes ☐No
Antenna Type	Monopole Antenna 2*2 MIMO without 802.11 beam forming function 2.4G and 5G technology cannot transmit at the same time.
Antenna Gain	3dBi
Number of Channel:	802.11 a/n(HT20)/ac(HT20): 25 Channel: 36,40,44,48,52,56,60,64,100,104, 108,112,116,120,124,128,132,136,140,144,149, 153, 157,161,165 802.11 n(HT40)/ac(HT40): 12 Channel: 38,46,54,62,102,110,118,126, 134, 142, 151,159 802.11 ac(HT80): 6 Channel 42,58,106,122,138,155

6.4 Test Location

All tests were performed at:

SGS-CSTC Standards Technical Services (Shanghai) Co., Ltd.

No.588 West Jindu Road, Songjiang District, Shanghai, China.201612.

Tel: +86 21 6191 5666

Fax: +86 21 6191 5678

6.5 Test Facility

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

- **CNAS (No. CNAS L0599)**

  CNAS has accredited SGS-CSTC Standards Technical Services (Shanghai) Co., Ltd. to ISO/IEC 17025:2005 General Requirements for the Competence of Testing and Calibration Laboratories (CNAS-CL01 Accreditation Criteria for the Competence of Testing and Calibration Laboratories) for the competence in the field of testing. Date of expiry: 2017-07-14.

- **FCC – Registration No.: 402683**

  SGS-CSTC Standards Technical Services (Shanghai) Co., Ltd. has been registered and fully described in a report filed with the Federal Communications Commission (FCC). The acceptance letter from the FCC is maintained in our files. Registration No.: 402683, Expiry Date: 2017-09-16.

- **Industry Canada (IC) – IC Assigned Code: 8617A**

  The 3m Semi-anechoic chamber of SGS-CSTC Standards Technical Services (Shanghai) Co., Ltd. has been registered by Certification and Engineering Bureau of Industry Canada for radio equipment testing with Registration No.: 8617A-1. Expiry Date: 2017-06-18.

- **VCCI (Member No.: 3061)**

  The 3m Semi-anechoic chamber and Shielded Room of SGS-CSTC Standards Technical Services (Shanghai) Co., Ltd. has been registered in accordance with the Regulations for Voluntary Control Measures with Registration No.: R-3868 and C-4336 respectively. Date of Registration: 2012-05-29. Date of Expiry: 2017-11-16.

6.6 Measurement Uncertainty

No.	Parameter	Measurement Uncertainty
1	Radio Frequency	< $\pm 1 \times 10^{-5}$
2	Total RF power, conducted	< ±1.5 dB
3	RF power density, conducted	< ±3 dB
4	Spurious emissions, conducted	< ±3 dB
5	All emissions, radiated	< ±6 dB (30MHz – 1GHz) < ±6 dB (above 1GHz)
6	Temperature	< ±1°C
7	Humidity	< ±5 %
8	DC and low frequency voltages	< ±3 %

7 Dynamic Frequency Selection

7.1 Applicability of DFS requirements

Table 1: Applicability of DFS Requirements Prior to Use of a Channel

Requirement	Operational Mode		
	☐Master	☐Client Without Radar Detection	☒Client With Radar Detection
Non-Occupancy Period	Yes	Not required	Yes
DFS Detection Threshold	Yes	Not required	Yes
Channel Availability Check Time	Yes	Not required	Not required
U-NII Detection Bandwidth	Yes	Not required	Yes

Table 2: Applicability of DFS requirements during normal operation

Requirement	Operational Mode	
	☐Master Device or Client with Radar Detection	☒Client Without Radar Detection
DFS Detection Threshold	Yes	Not required
Channel Closing Transmission Time	Yes	Yes
Channel Move Time	Yes	Yes
U-NII Detection Bandwidth	Yes	Not required

Additional requirements for devices with multiple bandwidth modes	☐Master Device or Client with Radar Detection	☒Client Without Radar Detection
U-NII Detection Bandwidth and Statistical Performance Check	All BW modes must be tested	Not required
Channel Move Time and Channel Closing Transmission Time	Test using widest BW mode available	Test using the widest BW mode available for the link
All other tests	Any single BW mode	Not required
Note: Frequencies selected for statistical performance check (Section 7.8.4) should include several frequencies within the radar detection bandwidth and frequencies near the edge of the radar detection bandwidth. For 802.11 devices it is suggested to select frequencies in each of the bonded 20 MHz channels and the channel center frequency.		

7.2 Limit

7.2.1 DFS Detection Thresholds

Table 3: DFS Detection Thresholds for Master Devices and Client Devices With Radar Detection

Maximum Transmit Power	Value (See Notes 1, 2, and 3)
EIRP ≥ 200 milliwatt	-64 dBm
EIRP < 200 milliwatt and power spectral density < 10 dBm/MHz	-62 dBm
EIRP < 200 milliwatt that do not meet the power spectral density requirement	-64 dBm
Note 1: This is the level at the input of the receiver assuming a 0 dBi receive antenna. Note 2: Throughout these test procedures an additional 1 dB has been added to the amplitude of the test transmission waveforms to account for variations in measurement equipment. This will ensure that the test signal is at or above the detection threshold level to trigger a DFS response. Note3: EIRP is based on the highest antenna gain. For MIMO devices refer to KDB Publication 662911 D01.	

7.2.2 DFS Response Requirements

Table 4: DFS Response Requirement Values

Parameter	Value
Non-occupancy period	Minimum 30 minutes
Channel Availability Check Time	60 seconds
Channel Move Time	10 seconds See Note 1.
Channel Closing Transmission Time	200 milliseconds + an aggregate of 60 milliseconds over remaining 10 second period. See Notes 1 and 2.
U-NII Detection Bandwidth	Minimum 100% of the U-NII 99% transmission power bandwidth. See Note 3.
Note 1: *Channel Move Time* and the *Channel Closing Transmission Time* should be performed with Radar Type 0. The measurement timing begins at the end of the Radar Type 0 burst. Note 2: The *Channel Closing Transmission Time* is comprised of 200 milliseconds starting at the beginning of the *Channel Move Time* plus any additional intermittent control signals required facilitating a *Channel* move (an aggregate of 60 milliseconds) during the remainder of the 10 second period. The aggregate duration of control signals will not count quiet periods in between transmissions. Note 3: During the *U-NII Detection Bandwidth* detection test, radar type 0 should be used. For each frequency step the minimum percentage of detection is 90 percent. Measurements are performed with no data traffic.	

7.3 Parameters of radar test Waveforms

This section provides the parameters for required test waveforms, minimum percentage of successful detections, and the minimum number of trials that must be used for determining DFS conformance. Step intervals of 0.1 microsecond for Pulse Width, 1 microsecond for PRI, 1 MHz for chirp width and 1 for the number of pulses will be utilized for the random determination of specific test waveforms.

Table 5 Short Pulse Radar Test Waveforms

Radar Type	Pulse Width (μsec)	PRI (μsec)	Number of Pulses	Minimum Percentage of Successful Detection	Minimum Number of Trials
0	1	1428	18	See Note 1	See Note 1
1	1	Test A	$\text{Roundup}\left\{\left(\frac{1}{360}\right)\cdot\left(\frac{19\cdot 10^6}{\text{PRI}_{\mu\text{sec}}}\right)\right\}$	60%	30
		Test B			
2	1-5	150-230	23-29	60%	30
3	6-10	200-500	16-18	60%	30
4	11-20	200-500	12-16	60%	30
Aggregate (Radar Types 1-4)				80%	120

Note 1: Short Pulse Radar Type 0 should be used for the detection bandwidth test, channel move time, and channel closing time tests.
Test A: 15 unique PRI values randomly selected from the list of 23 PRI values in Table 5a
Test B: 15 unique PRI values randomly selected within the range of 518-3066 μsec, with a minimum increment of 1 μsec, excluding PRI values selected in Test A

A minimum of 30 unique waveforms are required for each of the Short Pulse Radar Types 2 through 4. If more than 30 waveforms are used for Short Pulse Radar Types 2 through 4, then each additional waveform must also be unique and not repeated from the previous waveforms. If more than 30 waveforms are used for Short Pulse Radar Type 1, then each additional waveform is generated with Test B and must also be unique and not repeated from the previous waveforms in Tests A or B.

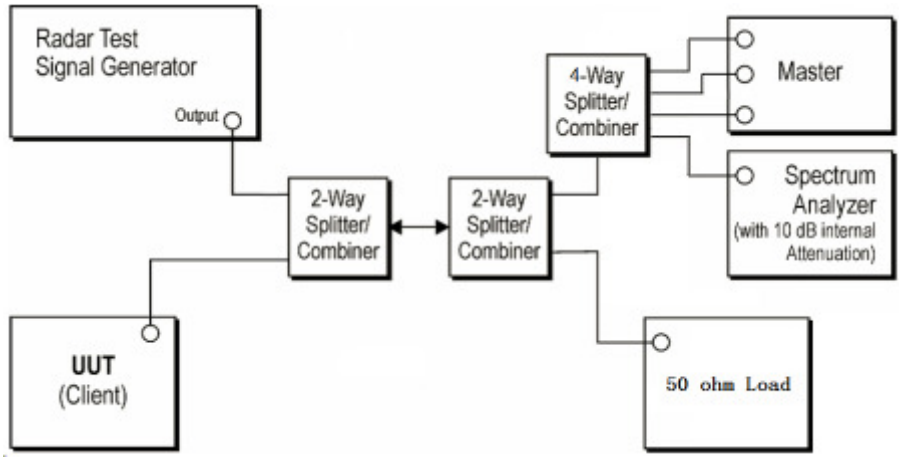
Test aggregate is average of the percentage of successful detections of short pulse radar types 1-4

7.4 Calibration of Radar Waveform

7.4.1 Radar Waveform Calibration Procedure

1) A 50 ohm load is connected in place of the spectrum analyzer, and the spectrum analyzer is connected to place of the master
2) The interference Radar Detection Threshold Level is -62dBm + 0dBi +1dB = -61dBm that had been taken into account the output power range and antenna gain.
3) The following equipment setup was used to calibrate the conducted radar waveform. A vector signal generator was utilized to establish the test signal level for radar type 0. During this process there were no transmissions by either the master or client device. The spectrum analyzer was switched to the zero spans (time domain) at the frequency of the radar waveform generator. Peak detection was used. The spectrum analyzer resolution bandwidth (RBW) and video bandwidth (VBW) were set to 3 MHz. The spectrum analyzer had offset -1.0dB to compensate RF cable loss 1.0dB.
4) The vector signal generator amplitude was set so that the power level measured at the spectrum analyzer was - -62dBm + 0dBi +1dB = -61dBm. Capture the spectrum analyzer plots on short pulse radar waveform.

7.4.2 Conducted Calibration Setup

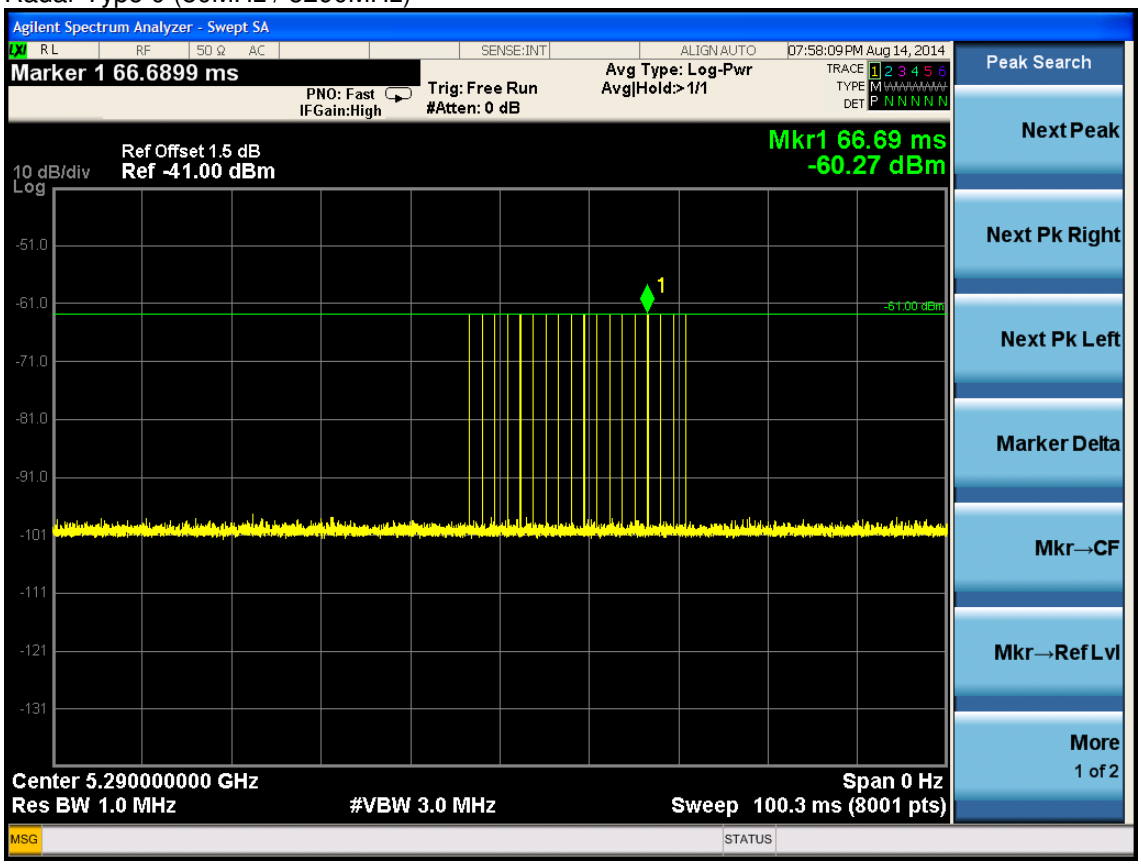


7.4.3 Calibration Deviation

There is no deviation with the original standard.

7.4.4 Radar Waveform Calibration Result

Radar Type 0 (80MHz / 5290MHz)



7.5 Test Procedure

1) The radar pulse generator is setup to provide a pulse at frequency that the master and client are operating. A type 0 radar pulse with a 1us pulse width and a 1428us PRI is used for the testing.

2) The vector signal generator is adjusted to provide the radar burst (18 pulses) at the level of approximately -61dBm at the antenna port of the master device.

3) A trigger is provided from the pulse generator to the DFS monitoring system in order to capture the traffic and the occurrence of the radar pulse.

4) EUT will associate with the master at channel. The file “iperf.exe” specified by the FCC is streamed from the PC 2 through the master and the client device to the PC 1 and played in full motion video using Media Player Classic Ver. 6.4.8.6 in order to properly load the network for the entire period of the test.

5) When radar burst with a level equal to the DFS Detection Threshold +1dB is generated on the operating channel of the U-NII device. At time T0 the radar waveform generator sends a burst of pulse of the radar waveform at Detection Threshold +1dB.

6) Observe the transmissions of the EUT at the end of the radar Burst on the Operating Channel. Measure and record the transmissions from the UUT during the observation time (Channel Move Time). One 15 seconds plot is reported for the Short Pulse Radar Type 0. The plot for the Short Pulse Radar Types start at the end of the radar burst. The Channel Move Time will be calculated based on the zoom in 600ms plot of the Short Pulse Radar Type.

7) Measurement of the aggregate duration of the Channel Closed Transmission Time method. With the spectrum analyzer set to zero span tuned to the center frequency of the EUT operating channel at the radar simulated frequency, peak detection, and max hold, the dwell time per bin is given by: Dwell (0.3ms) =S (12000ms) / B (4000); where Dwell is the dwell time per spectrum analyzer sampling bin, S is sweep time and B is the number of spectrum analyzer sampling bins. An upper bound of the aggregate duration of the intermittent control signals of Channel Closing Transmission Time is calculated by: C (ms)= N X Dwell (0.3ms); where C is the Closing Time, N is the number of spectrum analyzer sampling bins (intermittent control signals) showing a U-NII transmission and Dwell is the dwell time per bin.

8) Measurement the EUT for more than 30 minutes following the channel move time to verify that no transmission or beacons occur on this channel.

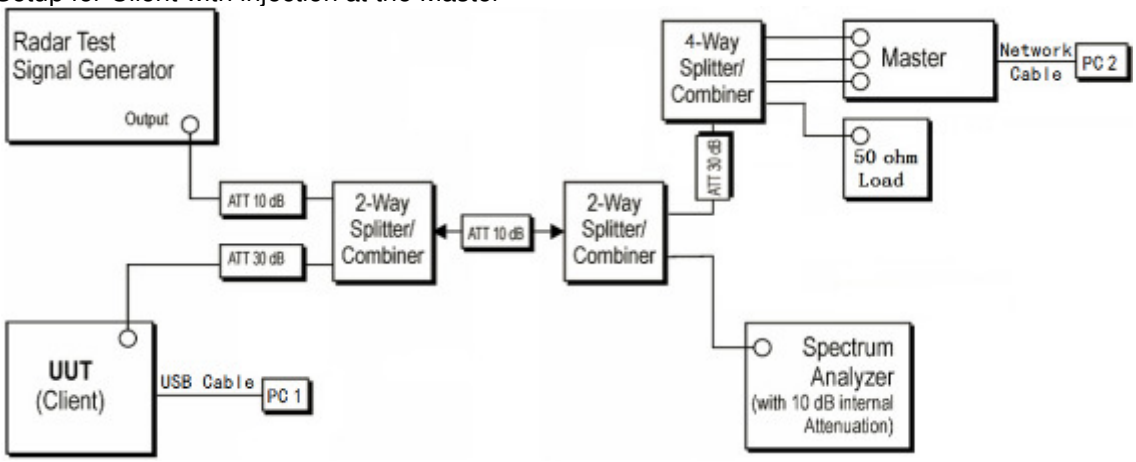
7.6 Test Equipment

Instrument	Manufacturer	Type No.	Serial No	Cal. Date
EXA Signal Analyzer	Agilent Technologies	N9010A	MY54200636	2015/10/10
ESG vector signal generator	Agilent Technologies	E4483C	MY42082326	2015/10/10
Power Splitter (5 ports)	Mini-Circuits	ZN4PD1-63-S+	S F495861428	N/A
Power Splitter (3 ports)	Mini-Circuits	ZFSC-2-10G	S F767300626	N/A
Power Splitter (3 ports)	Mini-Circuits	ZFSC-2-10G	S F767300626	N/A
10dB Attenuator	Narda Micro-Pad	4778-10	8202	N/A
10dB Attenuator	Narda Micro-Pad	4778-10	99899	N/A
30dB Attenuator	MidWest	ATT-0263-30-SMA-02	N/A	N/A
30dB Attenuator	MidWest	ATT-0263-30-SMA-02	N/A	N/A
Wireless Router	Buffalo	WZR-1750DHP	N/A	N/A
PC 1	Lenovo	ThinkPad L430	99-4CACA	N/A
PC 2	Lenovo	ThinkPad X100e	2876A65	N/A
RF Cable (Qty: 9)	Mini-Circuits	N/A	DFS-1~9	N/A

Software	Manufacturer	Function
DFS Radar Profiles	Agilent	Radar Signal Generation Software
ISMonitor9	Agilent	DFS Test Software

7.7 Test Setup

☒Setup for Client with injection at the Master



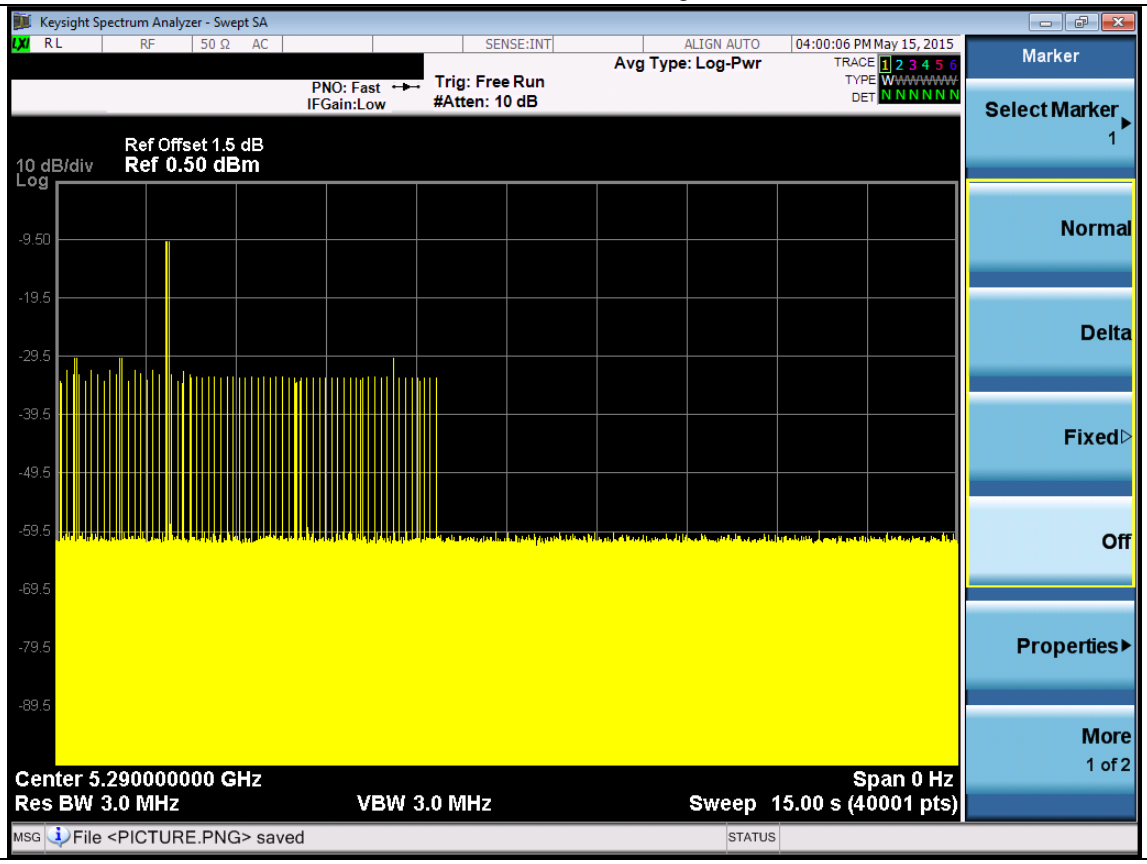
7.8 Test Result

Test Data:

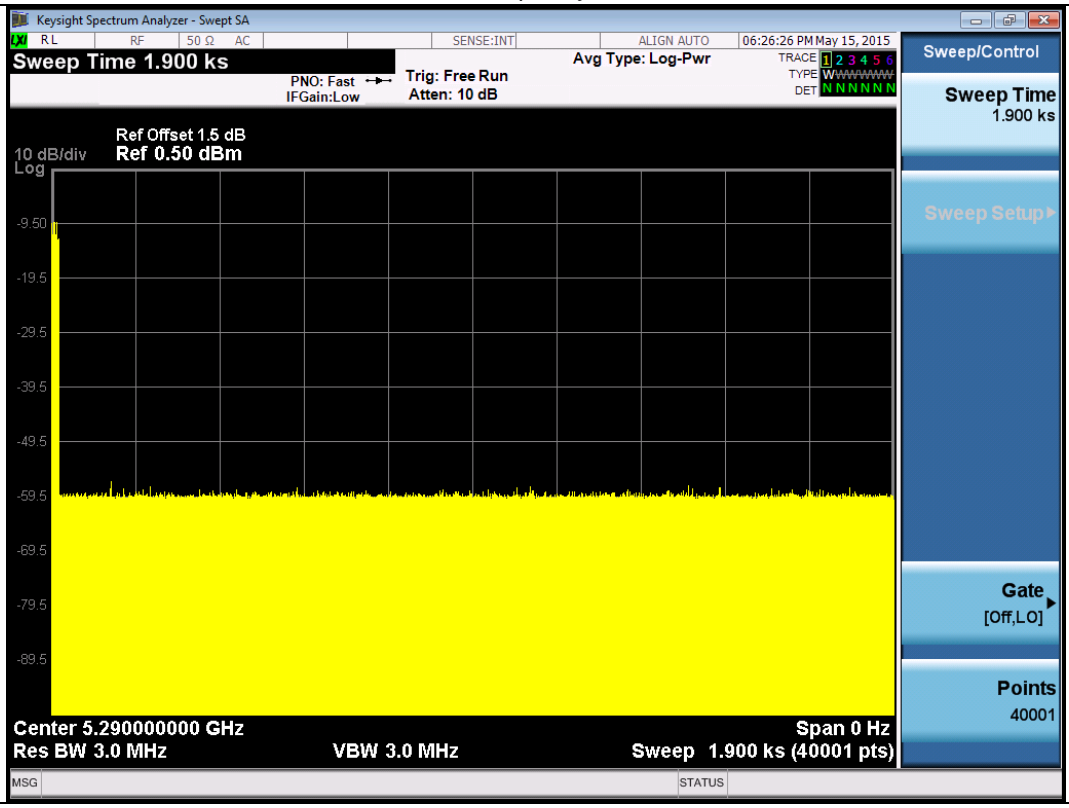
BW/Channel	Test Item	Test Result	Limit	Results
80MHz/5290MHz	Channel Move Time	4.51s	＜10 s	Pass
	Channel Closing Transmission Time	0.226s	＜1s	Pass
	Non-Occupancy Period	≥30	≥30minutes	Pass

Test plots as follows:

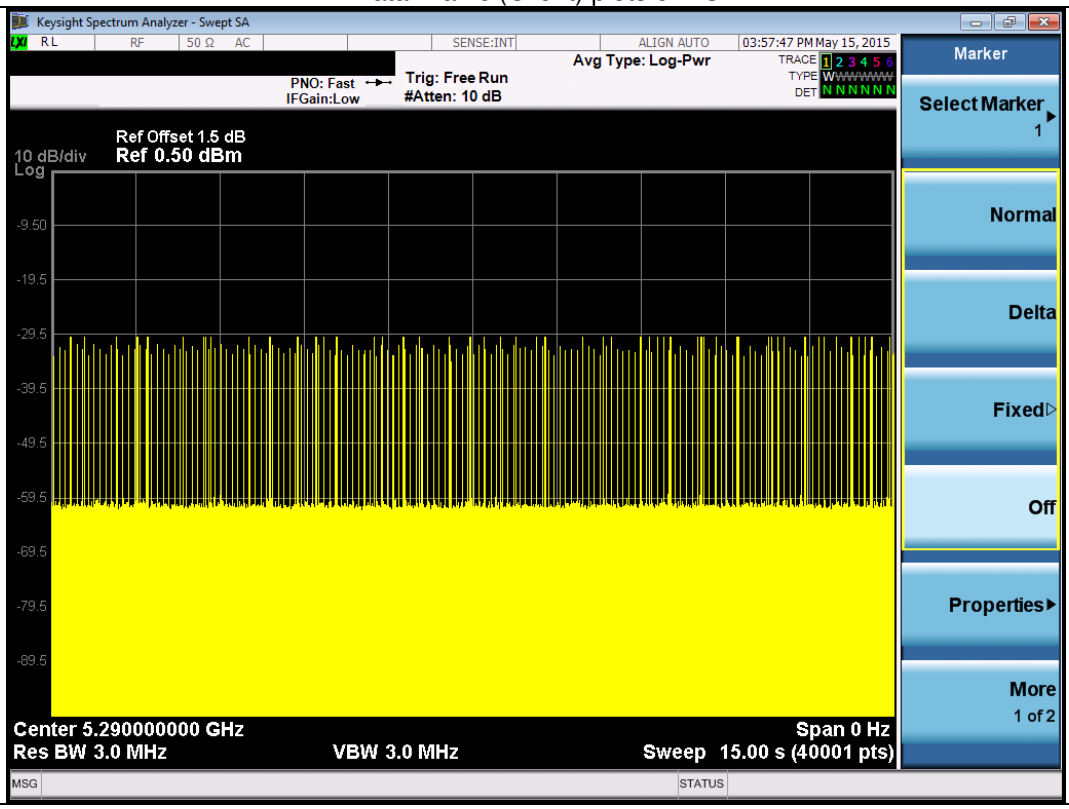
Channel Move Time & Channel Closing Transmission Time



Non-Occupancy Period



Data Traffic (Client) plots of EUT



8 Test Setup Photographs

Refer to the < WC18R2211 _Test Setup photos-FCC>.

9 EUT Constructional Details

Refer to the < WC18R2211 _External Photos-FCC > & < WC18R2211 _Internal Photos-FCC>.

--End of the Report--