MEASUREMENT REPORT
FCC PART 15.407 WLAN 802.11a/n/ac

FCC ID:	TK4WLE600VX
APPLICANT:	Compex Systems Pte Ltd

Application Type:	Certification
Product:	802.11ac Dual Band Module
Model No.:	WLE600VX
Brand Name:	COMPEX
FCC Classification:	Unlicensed National Information Infrastructure (UNII)
FCC Rule Part(s):	Part 15.407
Test Procedure(s):	ANSI C63.10-2013, KDB 789033 D02 UNII Test Procedures v01, KDB 662911 D01v02r01, KDB 644545 D03v01
Test Date:	Mar. 16 ~ Jun. 17, 2015

Reviewed By : Robin Wu
(Robin Wu)

Approved By : Marlin Chen
(Marlin Chen)

ACCREDITED
TESTING LABORATORY
CERTIFICATE #3628.01

The test results relate only to the samples tested.
This equipment has been shown to be capable of compliance with the applicable technical standards as indicated in the measurement report and was tested in accordance with the measurement procedures specified in KDB 789033 D02v01. Test results reported herein relate only to the item(s) tested.
The test report shall not be reproduced except in full without the written approval of MRT Technology (Suzhou) Co., Ltd.

Revision History

Report No.	Version	Description	Issue Date
1503RSU02902	Rev. 01	Initial report	06-17-2015
1503RSU02902	Rev. 02	Add some test descriptions	06-25-2015

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§2.1033 General Information

Applicant:	Compex Systems Pte Ltd
Applicant Address:	135, Joo Seng Road, #08-01 Singapore 368363
Manufacturer:	Compex Systems Pte Ltd
Manufacturer Address:	135, Joo Seng Road, #08-01 Singapore 368363
Test Site:	MRT Technology (Suzhou) Co., Ltd
Test Site Address:	D8 Building, Youxin Industrial Park, No.2 Tian'edang Rd., Wuzhong Economic Development Zone, Suzhou, China
MRT FCC Registration No.:	809388
FCC Rule Part(s):	Part 15.407
Model No.:	WLE600VX
FCC ID:	TK4WLE600VX
Test Device Serial No.:	N/A ☐ Production ☒ Pre-Production ☐ Engineering
FCC Classification:	Unlicensed National Information Infrastructure (UNII)

Test Facility / Accreditations

Measurements were performed at MRT Laboratory located in Tian'edang Rd., Suzhou, China.

- **MRT facility is a FCC registered (MRT Reg. No. 809388) test facility with the site description report on file and has met all the requirements specified in Section 2.948 of the FCC Rules.**
- **MRT facility is an IC registered (MRT Reg. No. 11384A-1) test laboratory with the site description on file at Industry Canada.**
- **MRT facility is a VCCI registered (R-4179, G-814, C-4664, T-2206) test laboratory with the site description on file at VCCI Council.**
- **MRT Lab is accredited to ISO 17025 by the American Association for Laboratory Accreditation (A2LA) under the American Association for Laboratory Accreditation Program (A2LA Cert. No. 3628.01) in EMC, Telecommunications and Radio testing for FCC, Industry Canada, EU and TELEC Rules.**

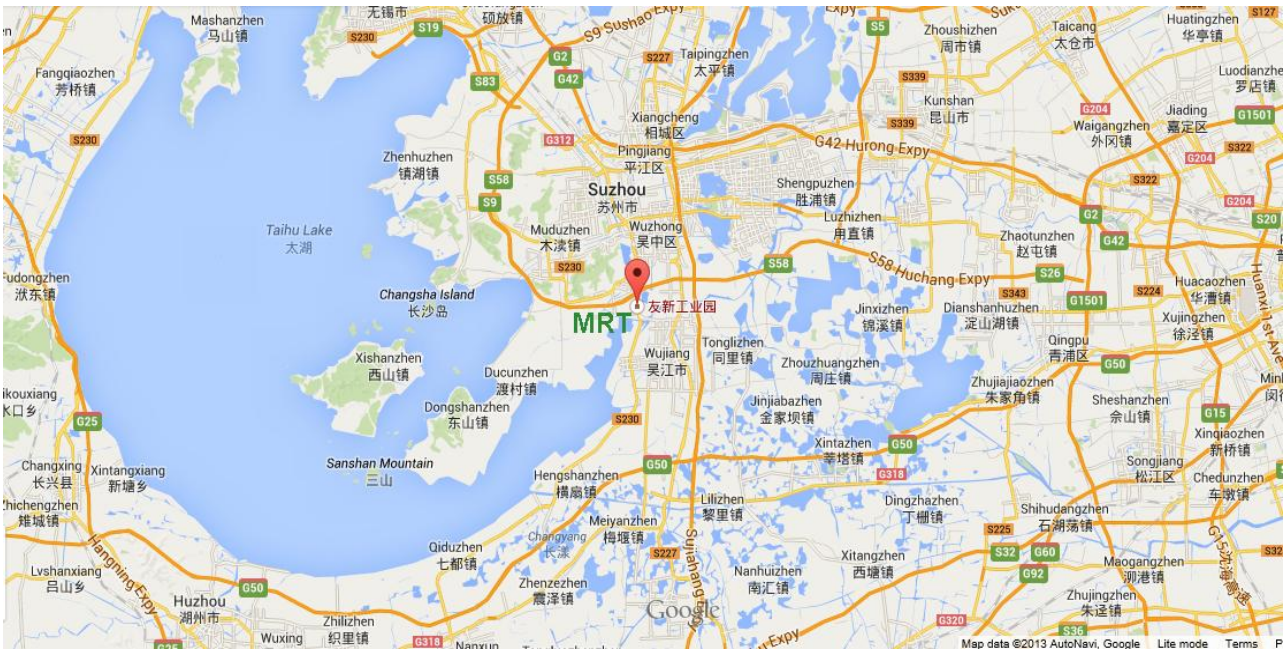
1. INTRODUCTION

1.1. Scope

Measurement and determination of electromagnetic emissions (EMC) of radio frequency devices including intentional and/or unintentional radiators for compliance with the technical rules and regulations of the Federal Communications Commission and the Industry Canada Certification and Engineering Bureau.

1.2. MRT Test Location

The map below shows the location of the MRT LABORATORY, its proximity to the Taihu Lake. These measurement tests were conducted at the MRT Technology (Suzhou) Co., Ltd. Facility located at D8 Building, Youxin Industrial Park, No.2 Tian'edang Rd., Wuzhong Economic Development Zone, Suzhou, China. The detailed description of the measurement facility was found to be in compliance with the requirements of § 2.948 according to ANSI C63.4-2009 on September 30, 2013.



2. PRODUCT INFORMATION

2.1. Equipment Description

Product Name	802.11ac Dual Band Module
Model No.	WLE600VX
Frequency Range	For 802.11a/n-HT20: 5180~5320MHz, 5500~5700MHz, 5745~5825MHz For 802.11ac-VHT20: 5180~5320MHz, 5500~5720MHz, 5745~5825MHz For 802.11n-HT40: 5190~5310MHz, 5510~5670MHz, 5755~5795MHz For 802.11ac-VHT40: 5190~5310MHz, 5510~5710MHz, 5755~5795MHz For 802.11ac-VHT80: 5210MHz, 5290MHz, 5530MHz, 5610MHz, 5690MHz, 5775MHz
Maximum Output Power	802.11a: 21.71dBm 802.11n-HT20: 24.09dBm 802.11n-HT40: 22.93dBm 802.11ac-VHT20: 24.63dBm 802.11ac-VHT40: 22.87dBm 802.11ac-VHT80: 22.41dBm
Type of Modulation	802.11a/n/ac: OFDM

2.2. Applicable Standards

According to the specifications of the manufacturer, the EUT must comply with the requirements of the following standards:

- FCC Part 15 Subpart E §15.407
- FCC KDB Publication No. 789033 D02 UNII Test Procedures v01
- ANSI C63.10-2013

Note:

1. All the test items were verified and recorded according to the standards and without any deviation during the test.
2. FCC permits the use of the 1.5 meter table as an alternative in ANSI C63.10-2013 through inquiry tracking number 198796.
3. This EUT has also been tested and complied with the requirements of FCC Part 15, Subpart B recorded in a separate report.

2.3. Operation Frequency / Channel list

802.11a/n-HT20

Channel	Frequency	Channel	Frequency	Channel	Frequency
36	5180 MHz	40	5200 MHz	44	5220 MHz
48	5240 MHz	52	5260 MHz	56	5280 MHz
60	5300 MHz	64	5320 MHz	100	5500 MHz
104	5520 MHz	108	5540 MHz	112	5560 MHz
116	5580 MHz	120	5600 MHz	124	5620 MHz
128	5640 MHz	132	5660 MHz	136	5680 MHz
140	5700 MHz	149	5745 MHz	153	5765 MHz
157	5785 MHz	161	5805 MHz	165	5825 MHz

802.11ac-VHT20

Channel	Frequency	Channel	Frequency	Channel	Frequency
36	5180 MHz	40	5200 MHz	44	5220 MHz
48	5240 MHz	52	5260 MHz	56	5280 MHz
60	5300 MHz	64	5320 MHz	100	5500 MHz
104	5520 MHz	108	5540 MHz	112	5560 MHz
116	5580 MHz	120	5600 MHz	124	5620 MHz
128	5640 MHz	132	5660 MHz	136	5680 MHz
140	5700 MHz	144	5720 MHz	149	5745 MHz
153	5765 MHz	157	5785 MHz	161	5805 MHz
165	5825 MHz	--	--	--	--

802.11n-HT40

Channel	Frequency	Channel	Frequency	Channel	Frequency
38	5190 MHz	46	5230 MHz	54	5270 MHz
62	5310 MHz	102	5510 MHz	110	5550 MHz
118	5590 MHz	126	5630 MHz	134	5670 MHz
151	5755 MHz	159	5795 MHz	--	--

802.11ac-VHT40

Channel	Frequency	Channel	Frequency	Channel	Frequency
38	5190 MHz	46	5230 MHz	54	5270 MHz
62	5310 MHz	102	5510 MHz	110	5550 MHz
118	5590 MHz	126	5630 MHz	134	5670 MHz
142	5710 MHz	151	5755 MHz	159	5795 MHz

802.11ac-VHT80

Channel	Frequency	Channel	Frequency	Channel	Frequency
42	5210 MHz	58	5290 MHz	106	5530 MHz
122	5610 MHz	138	5690 MHz	155	5775 MHz

2.4. Description of Available Antennas

Antenna Type	Manufacturer	Tx Paths	Max Directional Gain (dBi)
Panel Antenna 1#	Compex Systems Pte Ltd	2	2.4GHz: 11.0
Panel Antenna 2#	Kenbotong Communication LTD	2	2.4GHz: 10.0 5GHz: 10.0
Panel Antenna 3#	Smart Ant Inc	2	2.4GHz: 7.0 5GHz: 7.0
Panel Antenna 4#	TAOGLAS Inc	2	2.4GHz: 4.5 5GHz: 6.7
Panel Antenna 5#	Compex Systems Pte Ltd	2	2.4GHz: 5.0 5GHz: 5.0
Panel Antenna 6#	Compex Systems Pte Ltd	2	2.4GHz: 5.0 5GHz: 5.0
Dipole Antenna 1#	Kunshan Wavelink Electronic Co., Ltd.	2	2.4GHz: 2.0 5GHz: 2.0

Note 1: The device didn't support transmit beam-forming mode and Cyclic Delay Diversity (CDD) mode, and the transmit signals are correlated, so no add array gain to the band power and band PSD.

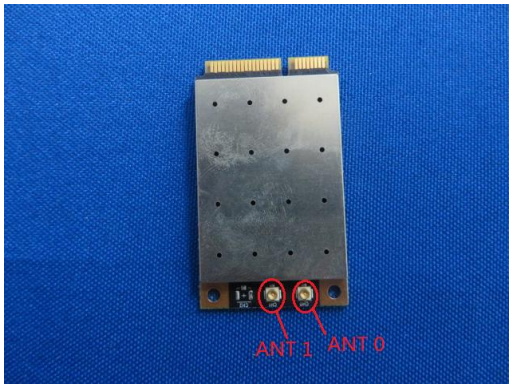
Note 2: 5.725~5.850GHz bands use the max antenna gain 10dBi, 5.15~5.35GHz and 5.470~5.725GHz bands use the max antenna gain 7dBi which are declared by the applicant.

Note 3: We selected the panel antenna 2# & 3# and dipole antenna 1# for all radiated emission testing.

2.5. Description of Antenna RF Port

--	2.4/5GHz Antenna RF Port	
	2.4/5GHz	2.4/5GHz
Software Control Port	Ant 0	Ant 1

Antenna RF Port Plot



2.6. Test Mode

Test Mode	Mode 1: Transmit by 802.11a
	Mode 2: Transmit by 802.11n-HT20
	Mode 3: Transmit by 802.11n-HT40
	Mode 4: Transmit by 802.11ac-VHT20
	Mode 5: Transmit by 802.11ac-VHT40
	Mode 6: Transmit by 802.11ac-VHT80

2.7. Test Software

The test utility software used during testing were “ART2-GUI Version: 2.3” and “CART Version: 4.9”.

Final Power Parameter Value of the test software.

Test Mode	Test Frequency	Power Parameter Value		
		Ant 0	Ant 1	Ant 0 + 1
Dipole Antenna 1#				
802.11a	5180	18.0	18.0	Not Support
	5220	20.0	19.0	
	5240	20.0	19.5	
	5260	20.0	20.0	
	5300	20.0	20.0	
	5320	18.5	18.5	
	5500	20.0	20.0	
	5600	20.0	20.0	
	5700	19.0	20.0	
	5745	16.5	20.0	
	5785	20.0	20.0	
	5825	20.0	20.0	
802.11n-HT20	5180	18.0	17.5	17.0
	5220	20.0	20.0	17.0
	5240	20.0	20.0	16.5
	5260	20.0	20.0	18.5
	5300	20.0	20.0	18.5
	5320	18.5	18.5	18.5
	5500	20.0	20.0	19.0
	5600	20.0	20.0	20.0
	5700	18.0	20.0	18.5
	5745	16.5	17.5	18.5
	5785	20.0	20.0	20.0
	5825	19.5	20.0	20.0
802.11n-HT40	5190	15.5	16.5	15.0
	5230	20.0	20.0	18.0
	5270	20.0	20.0	20.0
	5310	15.5	16.5	14.5
	5510	19.5	20.0	18.0
	5590	20.0	20.0	20.0

	5670	20.0	20.0	20.0
	5755	16.5	18.0	16.0
	5795	20.0	20.0	20.0
802.11ac-VHT20	5180	18.0	18.5	17.0
	5220	20.0	19.5	17.0
	5240	20.0	20.0	16.5
	5260	20.0	20.0	19.0
	5300	20.0	20.0	20.0
	5320	18.5	18.5	17.0
	5500	20.0	20.0	18.0
	5600	20.0	20.0	20.0
	5700	18.0	20.0	17.0
	5720	20.0	20.0	20.0
	5745	16.5	17.5	18.0
	5785	20.0	20.0	20.0
	5825	19.5	20.0	20.0
802.11ac-VHT40	5190	15.0	16.0	14.0
	5230	20.0	20.0	18.0
	5270	20.0	20.0	20.0
	5310	15.0	16.0	14.0
	5510	20.0	19.5	17.0
	5590	20.0	20.0	20.0
	5670	20.0	20.0	20.0
	5710	20.0	20.0	20.0
	5755	16.5	17.5	16.0
	5795	20.0	20.0	20.0
802.11ac-VHT80	5210	15.0	15.0	13.5
	5290	15.0	15.5	13.5
	5530	15.5	15.0	18.0
	5610	20.0	20.0	20.0
	5690	20.0	20.0	20.0
	5775	14.0	18.0	12.0

Test Mode	Test Frequency	Power Parameter Value		
		Ant 0	Ant 1	Ant 0 + 1
Panel Antenna 1#				
802.11a	5180	18.0	18.5	Not Support
	5220	20.0	20.0	
	5240	20.0	20.0	
	5260	20.0	20.0	
	5300	20.0	20.0	
	5320	18.5	17.5	
	5500	20.0	20.0	
	5600	20.0	20.0	
	5700	16.5	16.5	
	5745	15.5	14.5	
	5785	19.0	20.0	
	5825	18.5	19.5	
802.11n-HT20	5180	18.0	18.0	15.5
	5220	20.0	20.0	18.0
	5240	20.0	20.0	20.0
	5260	20.0	20.0	18.0
	5300	20.0	20.0	18.0
	5320	17.0	17.5	16.0
	5500	17.0	20.0	20.0
	5600	20.0	20.0	19.0
	5700	16.5	15.5	14.5
	5745	16.0	14.5	15.0
	5785	20.0	20.0	14.0
	5825	19.0	17.5	18.5
802.11n-HT40	5190	14.0	14.5	13.5
	5230	20.0	20.0	17.0
	5270	20.0	20.0	14.0
	5310	14.5	14.0	13.0
	5510	15.5	17.0	12.0
	5590	20.0	20.0	20.0
	5670	20.0	18.5	18.0
	5755	16.0	14.0	14.0
	5795	20.0	19.0	19.0
802.11ac-	5180	18.0	18.0	16.5

VHT20	5220	19.5	19.5	20.0
	5240	20.0	20.0	20.0
	5260	20.0	20.0	19.0
	5300	20.0	20.0	20.0
	5320	18.0	17.5	16.5
	5500	20.0	20.0	17.0
	5600	20.0	20.0	20.0
	5700	17.0	18.0	14.5
	5720	20.0	20.0	20.0
	5745	16.0	17.0	14.5
	5785	20.0	20.0	14.5
	5825	19.0	18.5	18.5
802.11ac-VHT40	5190	14.0	14.5	13.5
	5230	18.0	19.0	17.0
	5270	20.0	20.0	20.0
	5310	14.0	14.0	13.0
	5510	15.5	18.5	12.5
	5590	20.0	20.0	20.0
	5670	20.0	19.5	18.5
	5710	20.0	20.0	20.0
	5755	15.5	15.0	14.0
	5795	20.0	20.0	19.0
802.11ac-VHT80	5210	13.0	14.0	12.0
	5290	13.0	13.5	11.0
	5530	13.0	14.5	12.0
	5610	20.0	20.0	19.0
	5690	20.0	20.0	19.0
	5775	12.5	13.0	9.5

Note: We use the max power parameter value to test during the process of the Occupied Bandwidth & Output Power & TPC & Power Density testing.

2.8. Device Capabilities

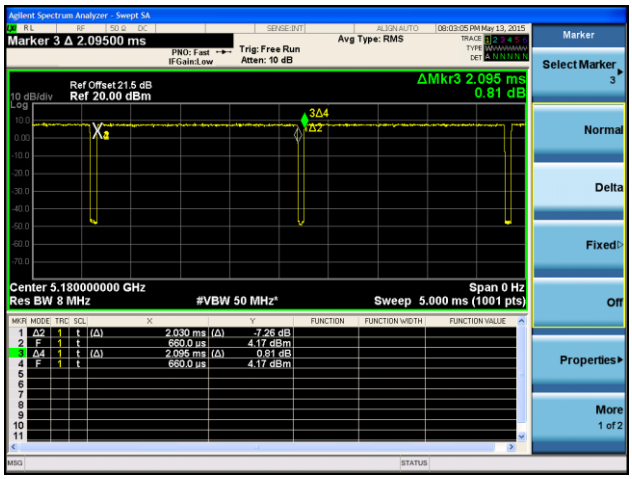
This device contains the following capabilities:

2.4GHz WLAN (DTS) and 5GHz WLAN (UNII).

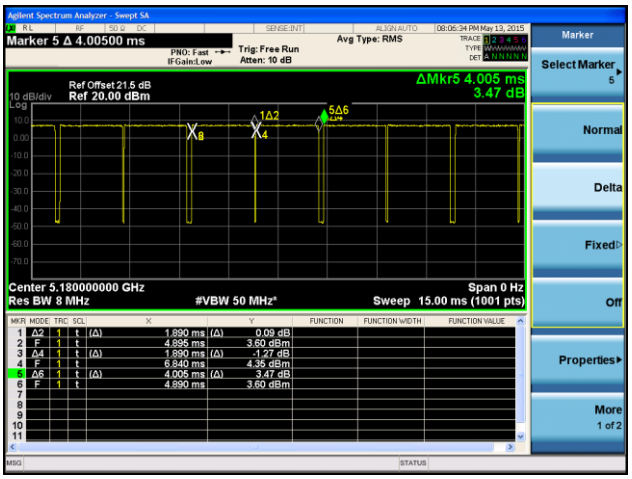
Note: 5GHz (NII) operation is possible in 20MHz, 40MHz and 80MHz channel bandwidths. The maximum achievable duty cycles for all modes were determined based on measurements performed on a spectrum analyzer in zero-span mode with RBW = 8MHz, VBW = 50MHz, and detector = average per the guidance of Section B)2)b) of KDB 789033 D02v01. The RBW and VBW were both greater than 50/T, where T is the minimum transmission duration, and the number of sweep points across T was greater than 100. The duty cycles are as follows:

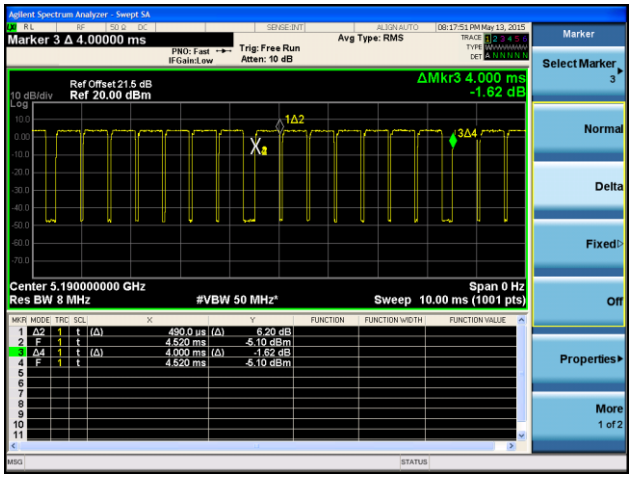
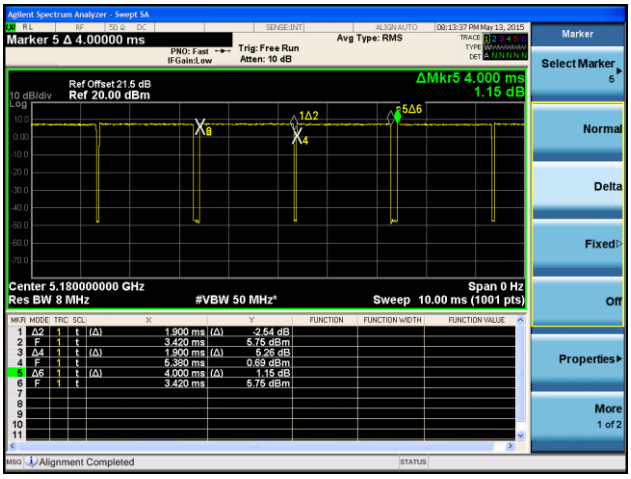
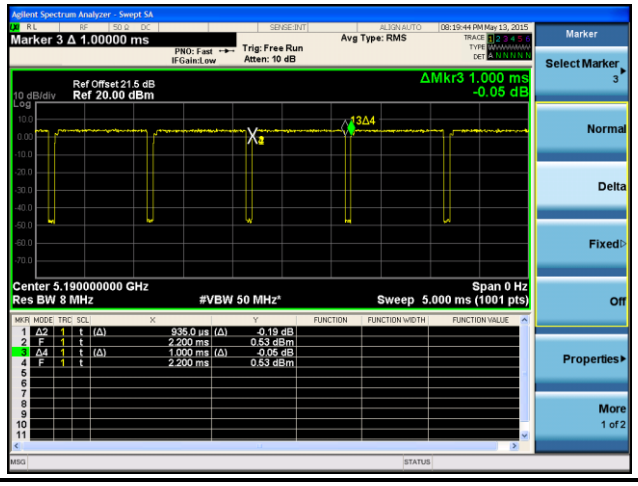
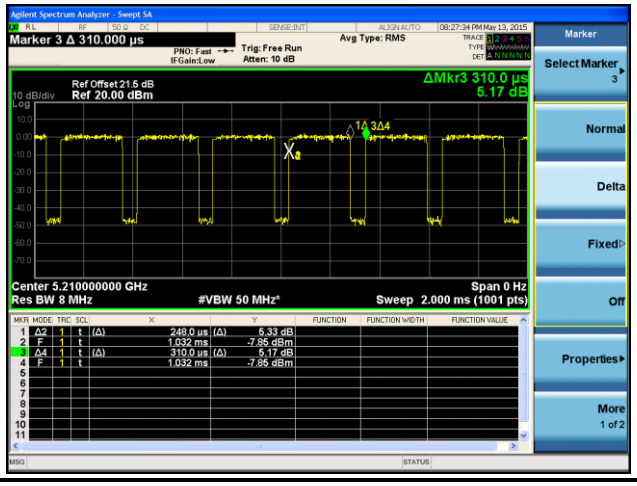
Test Mode	Duty Cycle	Transmission Duration (T) (ms)
802.11a	96.9%	2.03
802.11n-HT20	94.4%	3.78
802.11n-HT40	85.8%	3.43
802.11ac-VHT20	95.0%	3.80
802.11ac-VHT40	93.5%	0.94
802.11ac-VHT80	80.0%	0.25

802.11a – Duty Cycle



802.11n-HT20 – Duty Cycle



802.11n-HT40 – Duty Cycle	802.11ac-VHT20 – Duty Cycle
	
802.11ac-VHT40 – Duty Cycle	802.11ac-VHT80 – Duty Cycle
	

Note: Due to hardware limitations of the EUT, continuous transmission (at least 98 percent duty cycle) can't be achieved which was declared by the applicant.

2.9. Test Configuration

The **802.11ac Dual Band Module FCC ID: TK4WLE600VX** was tested per the guidance of KDB 789033 D02v01. ANSI C63.10-2013 was used to reference the appropriate EUT setup for radiated spurious emissions testing and AC line conducted testing.

2.10. EMI Suppression Device(s)/Modifications

No EMI suppression device(s) were added and/or no modifications were made during testing.

2.11. Labeling Requirements

Per 2.1074 & 15.19; Docket 95-19

The label shall be permanently affixed at a conspicuous location on the device; instruction manual or pamphlet supplied to the user and be readily visible to the purchaser at the time of purchase. However, when the device is so small wherein placement of the label with specified statement is not practical, only the trade name and FCC ID must be displayed on the device per Section 15.19(a)(5). Please see attachment for FCC ID label and label location.

3. DESCRIPTION OF TEST

3.1. Evaluation Procedure

The measurement procedures described in the American National Standard for Testing Unlicensed Wireless Devices (ANSI C63.10-2013), and the guidance provided in KDB 789033 D02v01 were used in the measurement of the **802.11ac Dual Band Module FCC ID: TK4WLE600VX.**

Deviation from measurement procedure…….....None

3.2. AC Line Conducted Emissions

The line-conducted facility is located inside an 8'x4'x4' shielded enclosure. A 1m x 2m wooden table 80cm high is placed 40cm away from the vertical wall and 80cm away from the sidewall of the shielded room. Two 10kHz-30MHz, 50Ω/50uH Line-Impedance Stabilization Networks (LISNs) are bonded to the shielded room floor. Power to the LISNs is filtered by external high-current high-insertion loss power line filters. These filters attenuate ambient signal noise from entering the measurement lines. These filters are also bonded to the shielded enclosure.

The EUT is powered from one LISN and the support equipment is powered from the second LISN. All interconnecting cables more than 1 meter were shortened to a 1 meter length by non-inductive bundling (serpentine fashion) and draped over the back edge of the test table. All cables were at least 40cm above the horizontal reference ground-plane. Power cables for support equipment were routed down to the second LISN while ensuring that that cables were not draped over the second LISN.

Sufficient time for the EUT, support equipment, and test equipment was allowed in order for them to warm up to their normal operating condition. The RF output of the LISN was connected to the receiver and exploratory measurements were made to determine the frequencies producing the maximum emission from the EUT. The receiver was scanned from 150kHz to 30MHz. The detector function was set to peak mode for exploratory measurements while the bandwidth of the analyzer was set to 9kHz. The EUT, support equipment, and interconnecting cables were arranged and manipulated to maximize each emission. Each emission was also maximized by varying: power lines, the mode of operation or data exchange speed, or support equipment whichever determined the worst-case emission. Once the worst case emissions have been identified, the one EUT cable configuration/arrangement and mode of operation that produced these emissions are used for final measurements on the same test site. The analyzer is set to CISPR quasi-peak and average detectors with a 9kHz resolution bandwidth for final measurements.

An extension cord was used to connect to a single LISN which powered by EUT. The extension cord was calibrated with LISN, the impedance and insertion loss are compliance with the requirements as stated in ANSI C63.10-2013.

Line conducted emissions test results are shown in Section 7.10.

3.3. Radiated Emissions

The radiated test facilities consisted of an indoor 3 meter semi-anechoic chamber used for final measurements and exploratory measurements, when necessary. The measurement area is contained within the semi-anechoic chamber which is shielded from any ambient interference. For measurements above 1GHz absorbers are arranged on the floor between the turn table and the antenna mast in such a way so as to maximize the reduction of reflections. For measurements below 1GHz, the absorbers are removed. A MF Model 210SS turntable is used for radiated measurement. It is a continuously rotatable, remote controlled, metallic turntable and 2 meters (6.56 ft.) in diameter. The turn table is flush with the raised floor of the chamber in order to maintain its function as a ground plane. An 80cm high PVC support structure is placed on top of the turntable.

For all measurements, the spectrum was scanned through all EUT azimuths and from 1 to 4 meter receive antenna height using a broadband antenna from 30MHz up to the upper frequency shown in 15.33(b)(1) depending on the highest frequency generated or used in the device or on which the device operates or tunes. For frequencies above 1GHz, linearly polarized double ridge horn antennas were used. For frequencies below 30MHz, a calibrated loop antenna was used. When exploratory measurements were necessary, they were performed at 1 meter test distance inside the semi-anechoic chamber using broadband antennas, broadband amplifiers, and spectrum analyzers to determine the frequencies and modes producing the maximum emissions. Sufficient time for the EUT, support equipment, and test equipment was allowed in order for them to warm up to their normal operating condition. The test set-up for frequencies below 1GHz was placed on top of the 0.8 meter high, 1 x 1.5 meter table; and test set-up for frequencies 1-40GHz was placed on top of the 1.5 meter high, 1 x 1.5 meter table. The EUT, support equipment, and interconnecting cables were arranged and manipulated to maximize each emission. Appropriate precaution was taken to ensure that all emissions from the EUT were maximized and investigated. The system configuration, clock speed, mode of operation or video resolution, if applicable, turntable azimuth, and receive antenna height was noted for each frequency found.

Final measurements were made in the semi-anechoic chamber using calibrated, linearly polarized broadband and horn antennas. The test setup was configured to the setup that produced the worst case emissions. The spectrum analyzer was set to investigate all frequencies required for testing to compare the highest radiated disturbances with respect to the specified limits. The turntable containing the EUT was rotated through 360 degrees and the height of the receive antenna was varied 1 to 4 meters and stopped at the azimuth and height producing the maximum emission. Each emission was maximized by changing the orientation of the EUT through three orthogonal planes and changing the polarity of the receive antenna, whichever produced the worst-case emissions. According to 3dB Beam-Width of horn antenna, the horn antenna should be always directed to the EUT when rising height.

4. ANTENNA REQUIREMENTS

Excerpt from §15.203 of the FCC Rules/Regulations:

"An intentional radiator antenna shall be designed to ensure that no antenna other than that furnished by the responsible party can 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."

- The antenna of the **802.11ac Dual Band Module** uses a unique connector.

Antenna Type	Antenna Connector Type
Panel Antenna 1#	IPEX connector
Panel Antenna 2#	Inverted connector
Panel Antenna 3#	Inverted connector
Panel Antenna 4#	IPEX connector
Panel Antenna 5#	IPEX connector
Panel Antenna 6#	IPEX connector
Dipole Antenna 1#	IPEX connector

Conclusion:

The **802.11ac Dual Band Module FCC ID: TK4WLE600VX** unit complies with the requirement of §15.203.

5. TEST EQUIPMENT CALIBRATION DATE

Conducted Emissions

Instrument	Manufacturer	Type No.	Asset No.	Cali. Interval	Cali. Due Date
EMI Test Receiver	R&S	ESR7	MRTSUE06001	1 year	2015/11/07
Two-Line V-Network	R&S	ENV216	MRTSUE06002	1 year	2015/11/07
Two-Line V-Network	R&S	ENV216	MRTSUE06003	1 year	2015/11/07
Temperature/ Meter Humidity	Anymetre	TH101B	MRTSUE06045	1 year	2015/11/14

Radiated Emission

Instrument	Manufacturer	Type No.	Asset No.	Cali. Interval	Cali. Due Date
Spectrum Analyzer	Agilent	E4447A	MRTSUE06028	1 year	2015/10/09
EMI Test Receiver	R&S	ESR7	MRTSUE06001	1 year	2015/11/07
Preamplifier	Schwarzbeck	AP18G40	MRTSUE06121	1 year	2016/04/15
Preamplifier	Agilent	83017A	MRTSUE06019	1 year	2015/12/13
Loop Antenna	Schwarzbeck	FMZB1519	MRTSUE06025	1 year	2015/11/08
TRILOG Antenna	Schwarzbeck	VULB9162	MRTSUE06022	1 year	2015/11/08
Broad-Band Horn Antenna	Schwarzbeck	BBHA9120D	MRTSUE06023	1 year	2015/11/08
Broadband Horn Antenna	Schwarzbeck	BBHA9170	MRTSUE06024	1 year	2016/01/05
Temperature/Humidity Meter	Anymetre	TH101B	MRTSUE06048	1 year	2015/11/14

Conducted Test Equipment

Instrument	Manufacturer	Type No.	Asset No.	Cali. Interval	Cali. Due Date
Spectrum Analyzer	Agilent	N9020A	MRTSUE06106	1 year	2016/04/23
USB Wideband Power Sensor	Boonton	55006	MRTSUE06109	1 year	2015/10/15
Temperature/Humidity Meter	Anymetre	TH101B	MRTSUE06046	1 year	2015/11/14

Software	Version	Function
e3	V8.3.5	EMI Test Software

6. MEASUREMENT UNCERTAINTY

Where relevant, the following test uncertainty levels have been estimated for tests performed on the EUT as specified in CISPR 16-4-2. This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k = 2.

AC Conducted Emission Measurement
Measuring Uncertainty for a Level of Confidence of 95% (U=2Uc(y)): 150kHz~30MHz: 3.46dB
Radiated Emission Measurement
Measuring Uncertainty for a Level of Confidence of 95% (U=2Uc(y)): 9kHz ~ 1GHz: 4.18dB 1GHz ~ 40GHz: 4.76dB

7. TEST RESULT

7.1. Summary

Company Name: **Compex Systems Pte Ltd**

FCC ID: **TK4WLE600VX**

FCC Classification: **Unlicensed National Information Infrastructure (UNII)**

Data Rate(s) Tested: **6Mbps ~ 54Mbps (a);**
6.5/7.2Mbps ~ 130/144.4Mbps (n-HT20MHz BW);
13.5/15Mbps ~ 270/300Mbps (n-HT40MHz BW);
6.5/7.2Mbps ~ 156/173.4Mbps (ac-VHT20MHz BW);
13.5/15Mbps ~ 360/400Mbps (ac-VHT40MHz BW);
29.3/32.5Mbps ~ 780/866.6Mbps (ac-VHT80MHz BW)

FCC Part Section(s)	Test Description	Test Limit	Test Condition	Test Result	Reference
15.407(a)	26dB Bandwidth	N/A	Conducted	Pass	Section 7.2
15.407(e)	6dB Bandwidth	≥ 500kHz		Pass	Section 7.3
15.407(a)(1)(ii), (2), (3)	Maximum Conducted Output Power	≤ 24 dBm U-NII-1 ≤ 24 dBm U-NII-2A ≤ 24 dBm U-NII-2C ≤ 30 dBm U-NII-3		Pass	Section 7.4
15.407(h)(1)	Transmit Power Control	≤ 24 dBm		Pass	Section 7.5
15.407(a)(1)(ii), (2), (3), (5)	Peak Power Spectral Density	≤ 11 dBm/MHz U-NII-1 ≤ 11 dBm/MHz U-NII-2A ≤ 11 dBm/MHz U-NII-2C ≤ 30 dBm/500kHz U-NII-3		Pass	Section 7.6
15.407(g)	Frequency Stability	N/A		Pass	Section 7.7
15.407(b)(1), (2), (3), (4)	Undesirable Emissions	≤ -27dBm/MHz EIRP ≤ -17dBm/MHz EIRP	Radiated	Pass	Section 7.8 & 7.9
15.205, 15.209 15.407(b)(5), (6), (7)	General Field Strength Limits (Restricted Bands and Radiated Emission Limits)	Emissions in restricted bands must meet the radiated limits detailed in 15.209		Pass	
15.207	AC Conducted Emissions 150kHz - 30MHz	< FCC 15.207 limits	Line Conducted	Pass	Section 7.10

Notes:

1) All channels, modes, and modulations/data rates were investigated among all UNII bands. For radiated emission test, every axis (X, Y, Z) was also verified. The test results shown in the following sections represent the worst case emissions.
2) The analyzer plots shown in this section were all taken with a correction table loaded into the analyzer. The correction table was used to account for the losses of the cables and attenuators used as part of the system to connect the EUT to the analyzer at all frequencies of interest.
3) All antenna port conducted emissions testing was performed on a test bench with the antenna port of the EUT connected to the spectrum analyzer through calibrated cables and attenuators.

7.2. 26dB Bandwidth Measurement

7.2.1. Test Limit

N/A

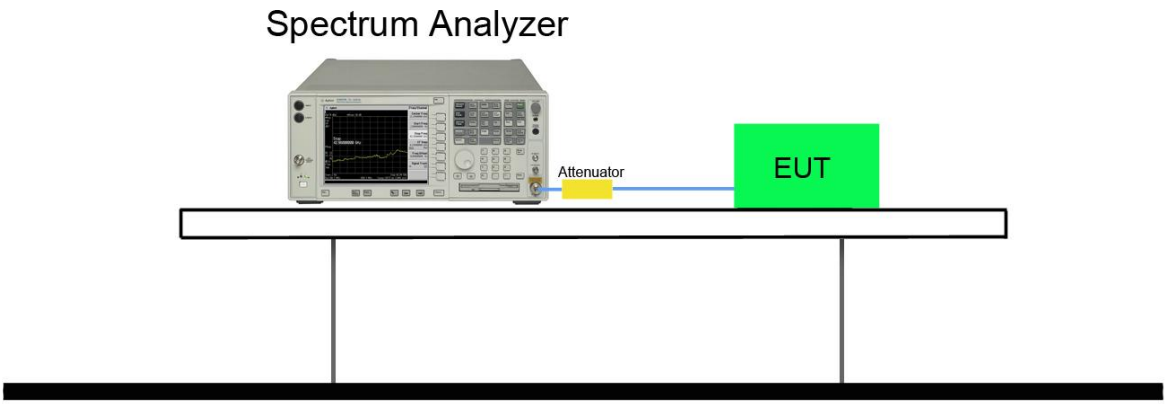
7.2.2. Test Procedure used

KDB 789033 D02v01 – Section C.1

7.2.3. Test Setting

1. The analyzers' automatic bandwidth measurement capability was used to perform the 26dB bandwidth measurement. The "X" dB bandwidth parameter was set to X = 26. The automatic bandwidth measurement function also has the capability of simultaneously measuring the 99% occupied bandwidth. The bandwidth measurement was not influenced by any intermediated power nulls in the fundamental emission.
2. RBW = approximately 1% of the emission bandwidth.
3. VBW ≥ 3 × RBW.
4. Detector = Peak.
5. Trace mode = max hold.

7.2.4. Test Setup



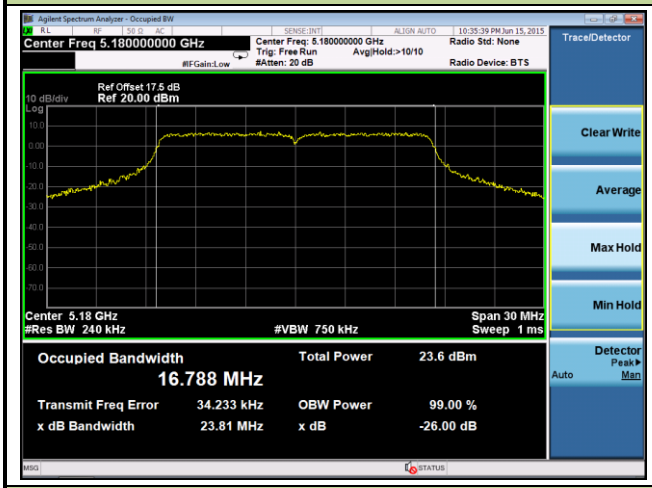
7.2.5. Test Result

Test Mode	Data Rate (Mbps)	Channel No.	Frequency (MHz)	26dB Bandwidth (MHz)	99% Bandwidth (MHz)	Result
802.11a	6	36	5180	23.81	16.79	Pass
802.11a	6	44	5220	25.33	16.83	Pass
802.11a	6	48	5240	26.51	16.81	Pass
802.11a	6	52	5260	25.47	16.82	Pass
802.11a	6	60	5300	25.66	16.81	Pass
802.11a	6	64	5320	24.07	16.79	Pass
802.11a	6	100	5500	22.55	16.75	Pass
802.11a	6	120	5600	22.99	16.71	Pass
802.11a	6	140	5700	23.82	16.72	Pass
802.11a	6	149	5745	23.27	16.76	Pass
802.11a	6	157	5785	25.82	16.87	Pass
802.11a	6	165	5825	25.03	16.80	Pass
802.11n-HT20	13	36	5180	25.58	17.92	Pass
802.11n-HT20	13	44	5220	25.70	17.91	Pass
802.11n-HT20	13	48	5240	24.42	17.89	Pass
802.11n-HT20	13	52	5260	24.51	17.90	Pass
802.11n-HT20	13	60	5300	24.45	17.90	Pass
802.11n-HT20	13	64	5320	24.92	17.91	Pass
802.11n-HT20	13	100	5500	23.80	17.84	Pass
802.11n-HT20	13	120	5600	23.81	17.84	Pass
802.11n-HT20	13	140	5700	23.95	17.87	Pass
802.11n-HT20	13	149	5745	23.65	17.87	Pass
802.11n-HT20	13	157	5785	23.77	17.85	Pass
802.11n-HT20	13	165	5825	23.49	17.87	Pass
802.11n-HT40	27	38	5190	45.25	36.52	Pass
802.11n-HT40	27	46	5230	47.82	36.51	Pass
802.11n-HT40	27	54	5270	47.89	36.53	Pass
802.11n-HT40	27	62	5310	47.72	36.55	Pass
802.11n-HT40	27	102	5510	45.10	36.53	Pass
802.11n-HT40	27	118	5590	45.68	36.55	Pass
802.11n-HT40	27	134	5670	45.11	36.49	Pass
802.11n-HT40	27	151	5755	45.47	36.47	Pass
802.11n-HT40	27	159	5795	46.78	36.52	Pass

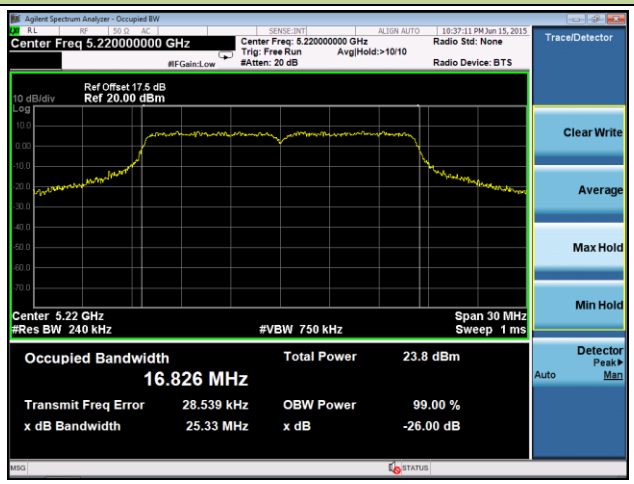
802.11ac-VHT20	13	36	5180	24.12	17.87	Pass
802.11ac-VHT20	13	44	5220	25.14	17.91	Pass
802.11ac-VHT20	13	48	5240	25.54	17.92	Pass
802.11ac-VHT20	13	52	5260	24.38	17.92	Pass
802.11ac-VHT20	13	60	5300	25.20	17.91	Pass
802.11ac-VHT20	13	64	5320	25.11	17.93	Pass
802.11ac-VHT20	13	100	5500	25.51	17.93	Pass
802.11ac-VHT20	13	120	5600	23.75	17.84	Pass
802.11ac-VHT20	13	140	5700	23.71	17.83	Pass
802.11ac-VHT20	13	144	5720	23.54	17.86	Pass
802.11ac-VHT20	13	149	5745	23.42	17.84	Pass
802.11ac-VHT20	13	157	5785	23.42	17.82	Pass
802.11ac-VHT20	13	165	5825	23.32	17.85	Pass
802.11ac-VHT40	27	38	5190	46.61	36.59	Pass
802.11ac-VHT40	27	46	5230	46.30	36.56	Pass
802.11ac-VHT40	27	54	5270	47.03	36.59	Pass
802.11ac-VHT40	27	62	5310	45.53	36.56	Pass
802.11ac-VHT40	27	102	5510	47.50	36.65	Pass
802.11ac-VHT40	27	118	5590	46.76	36.62	Pass
802.11ac-VHT40	27	134	5670	45.88	36.59	Pass
802.11ac-VHT40	27	142	5710	45.61	36.55	Pass
802.11ac-VHT40	27	151	5755	44.87	36.53	Pass
802.11ac-VHT40	27	159	5795	46.01	36.54	Pass
802.11ac-VHT80	58.6	42	5210	88.73	76.21	Pass
802.11ac-VHT80	58.6	58	5290	90.55	76.25	Pass
802.11ac-VHT80	58.6	106	5530	87.88	76.29	Pass
802.11ac-VHT80	58.6	122	5610	99.72	76.30	Pass
802.11ac-VHT80	58.6	138	5690	87.67	76.56	Pass
802.11ac-VHT80	58.6	155	5775	87.67	76.22	Pass
Note: 26dB Bandwidth is measured at ant 1 port.						

802.11a 26dB Bandwidth & 99% Bandwidth

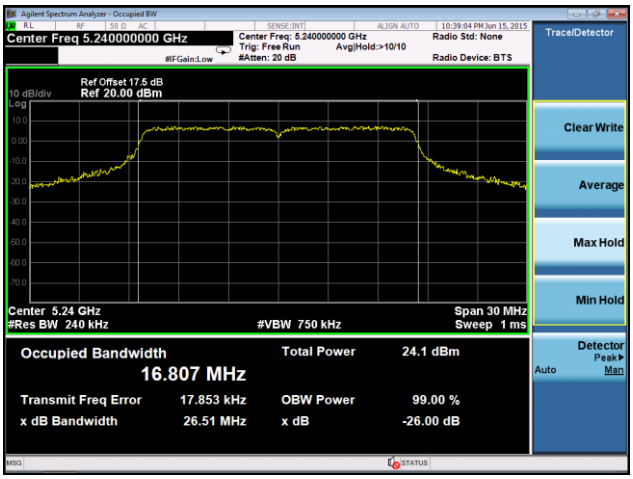
Channel 36 (5180MHz)



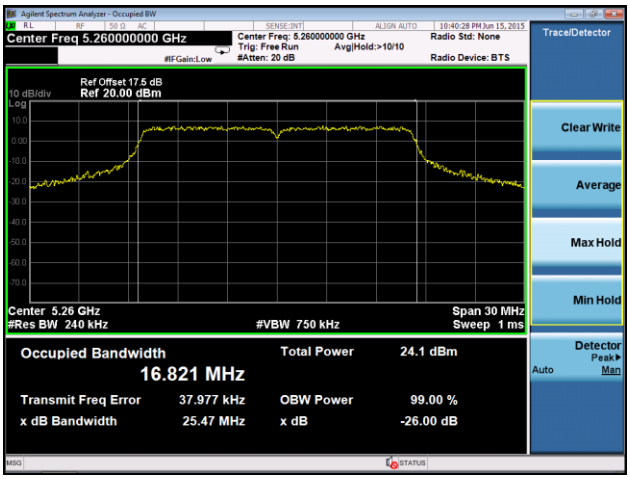
Channel 44 (5220MHz)



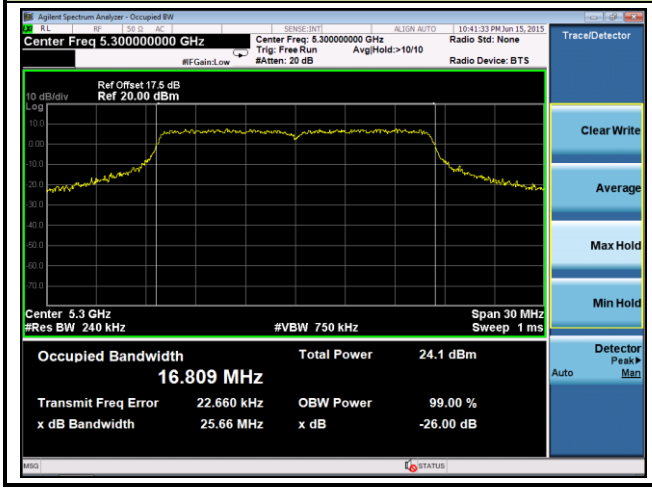
Channel 48 (5240MHz)



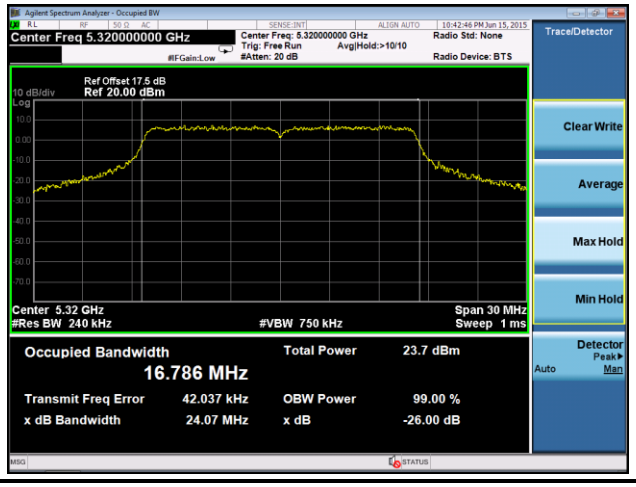
Channel 52 (5260MHz)



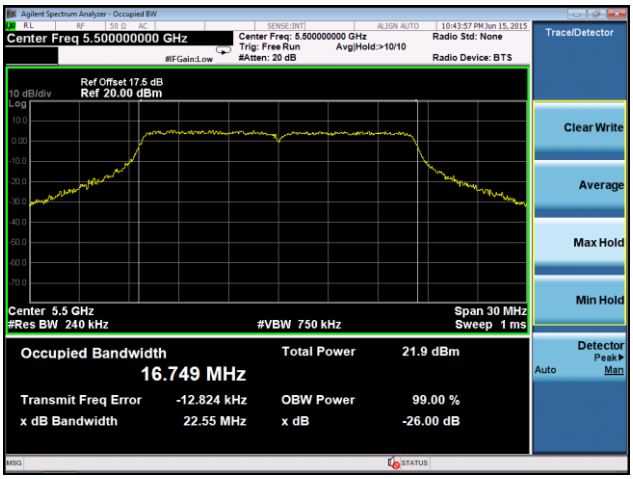
Channel 60 (5300MHz)



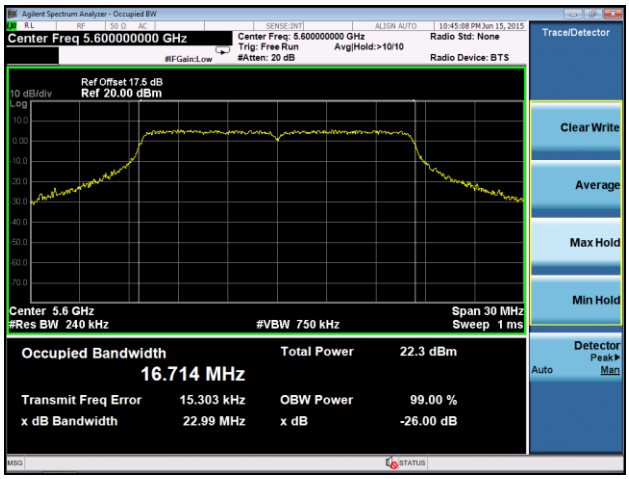
Channel 64 (5320MHz)



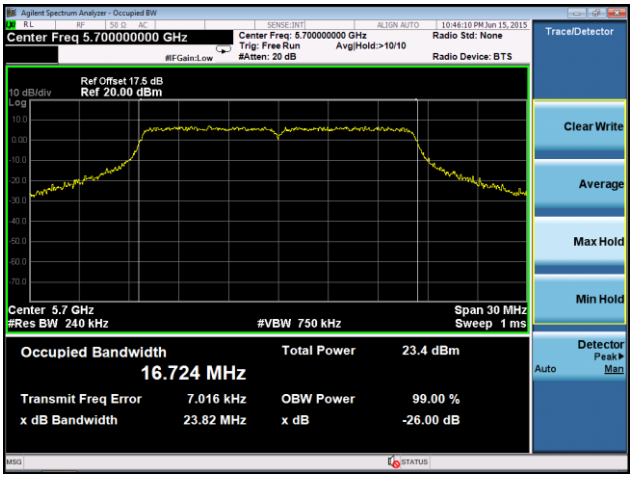
Channel 100 (5500MHz)



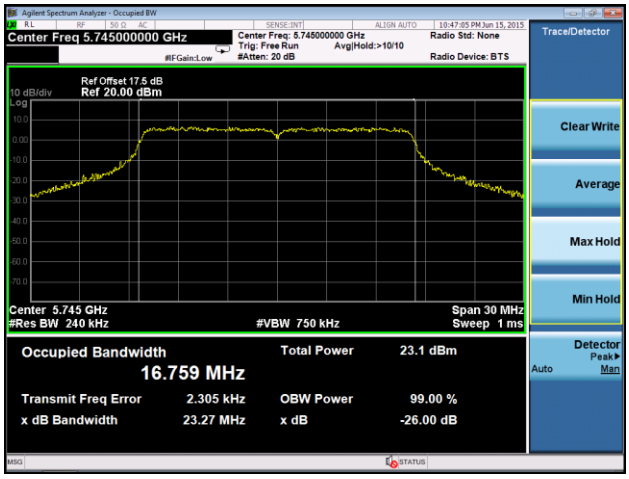
Channel 120 (5600MHz)



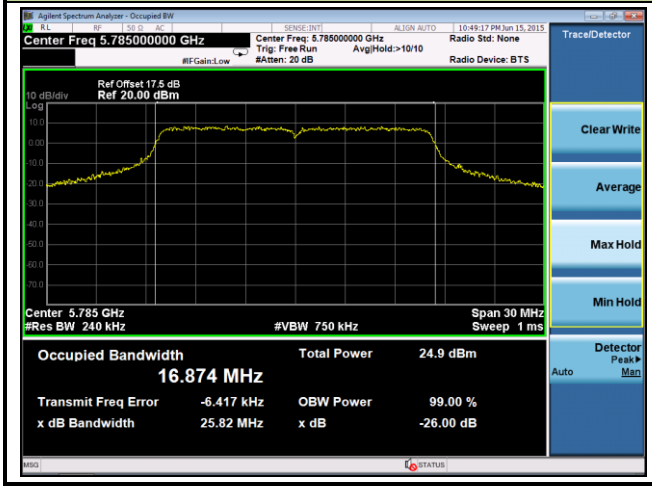
Channel 140 (5700MHz)



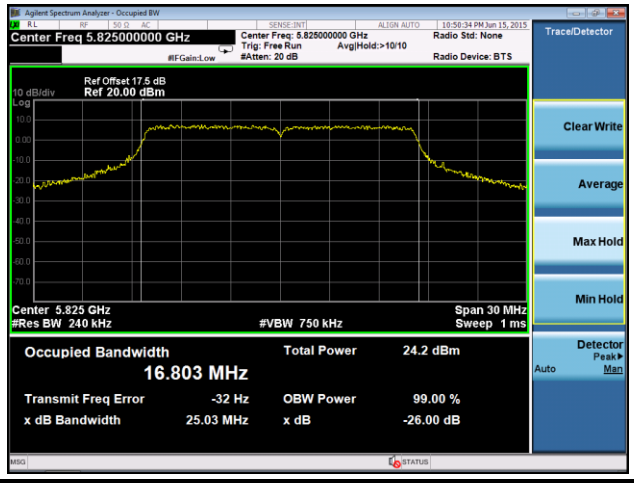
Channel 149 (5745MHz)



Channel 157 (5785MHz)

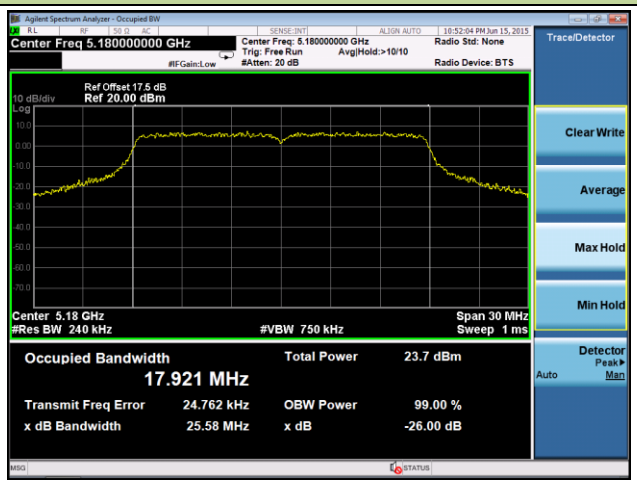


Channel 165 (5825MHz)

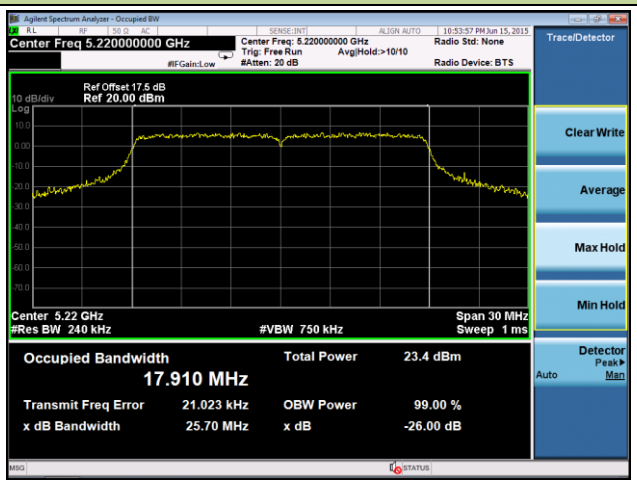


802.11n-HT20 26dB Bandwidth & 99% Bandwidth

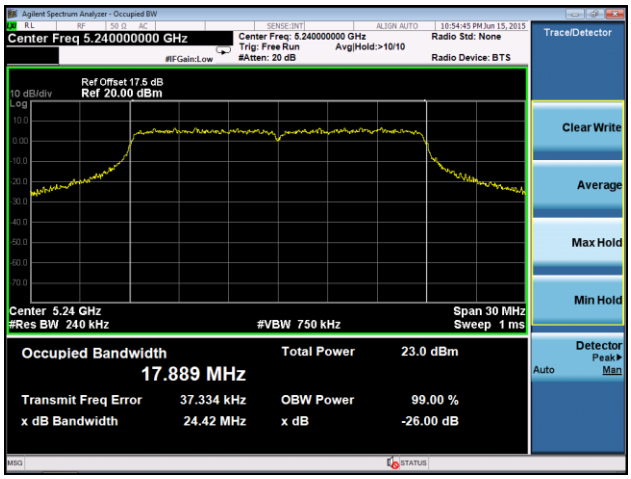
Channel 36 (5180MHz)



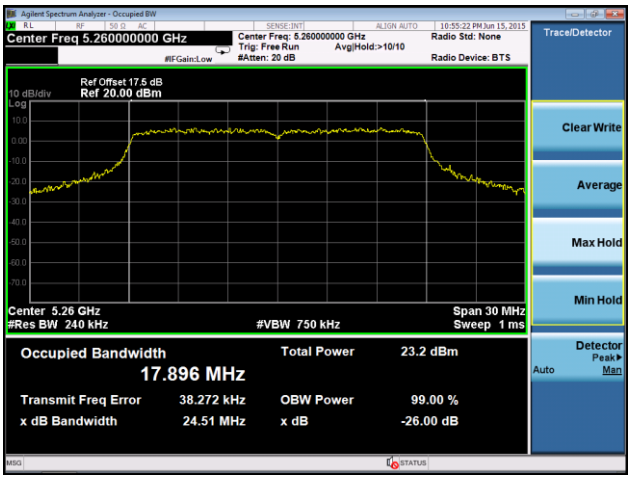
Channel 44 (5220MHz)



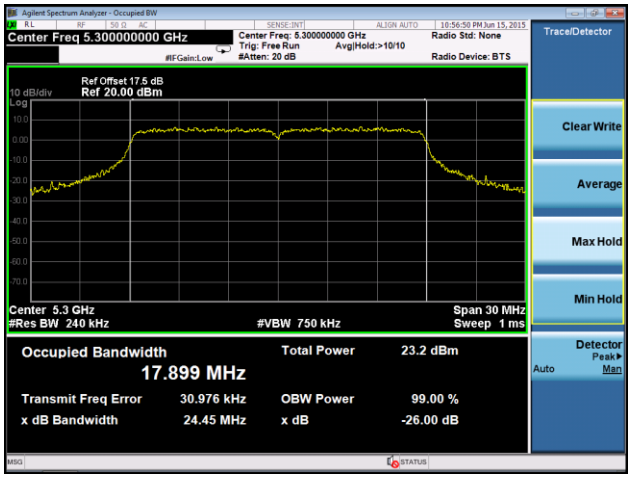
Channel 48 (5240MHz)



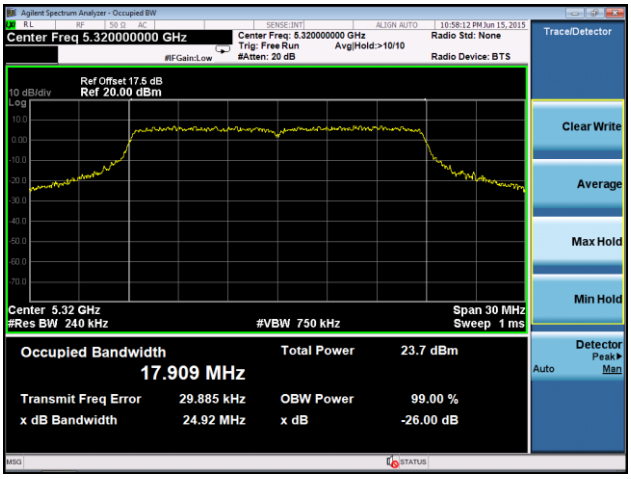
Channel 52 (5260MHz)



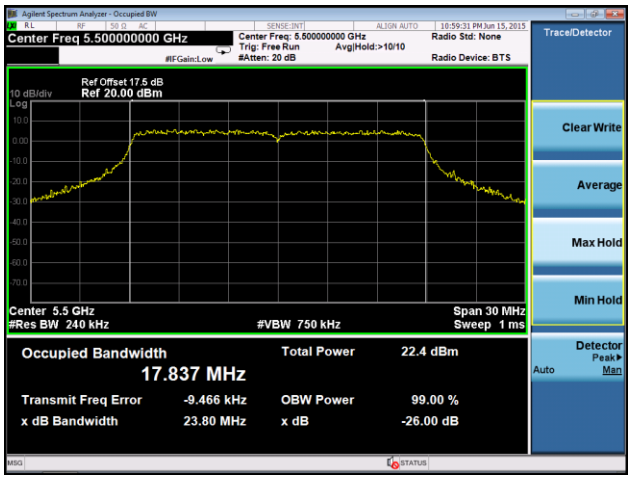
Channel 60 (5300MHz)



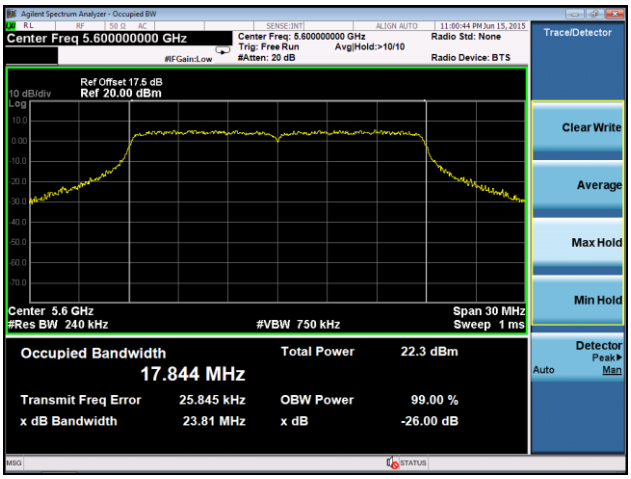
Channel 64 (5320MHz)



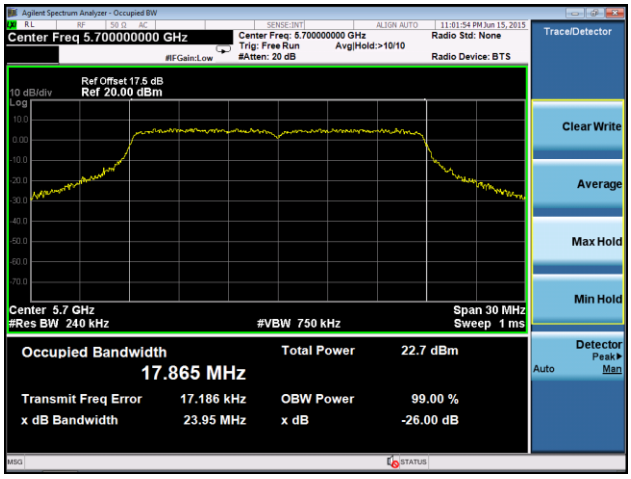
Channel 100 (5500MHz)



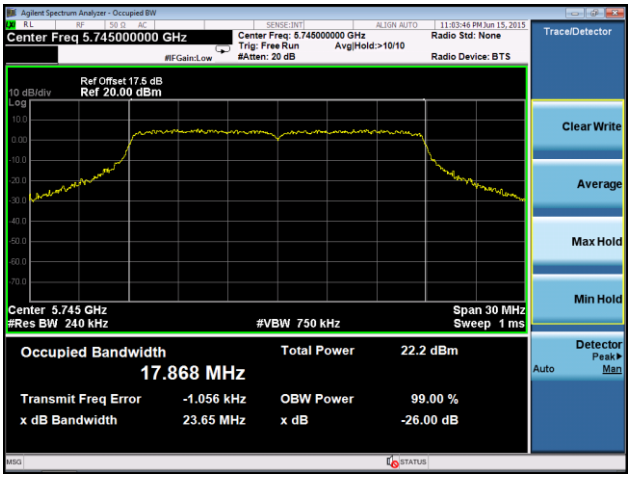
Channel 120 (5600MHz)



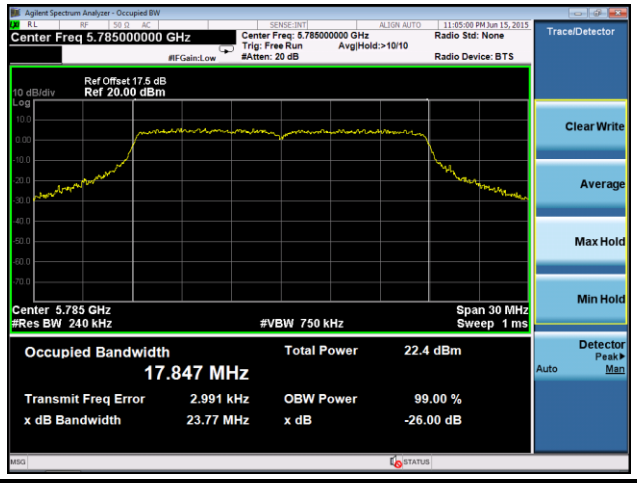
Channel 140 (5700MHz)



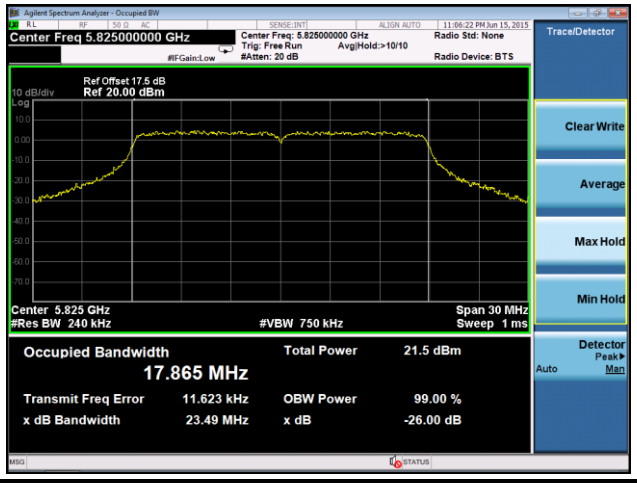
Channel 149 (5745MHz)



Channel 157 (5785MHz)

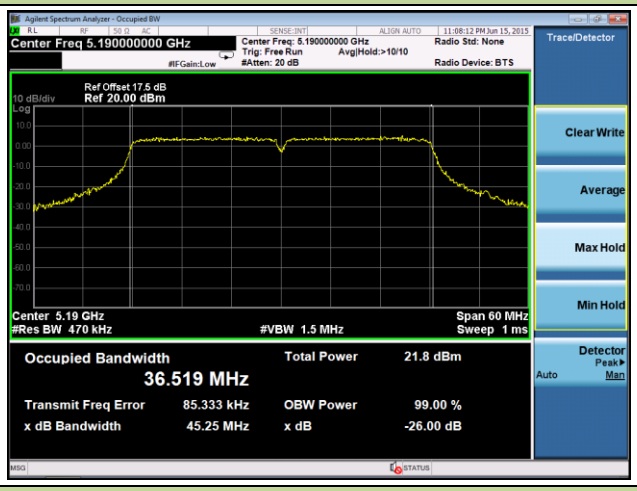


Channel 165 (5825MHz)

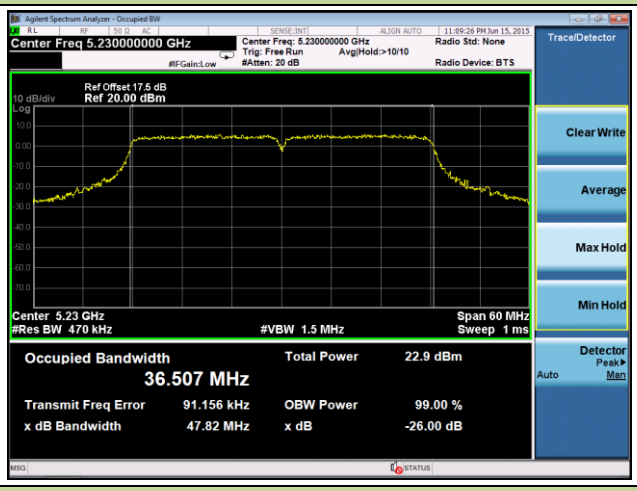


802.11n-HT40 26dB Bandwidth & 99% Bandwidth

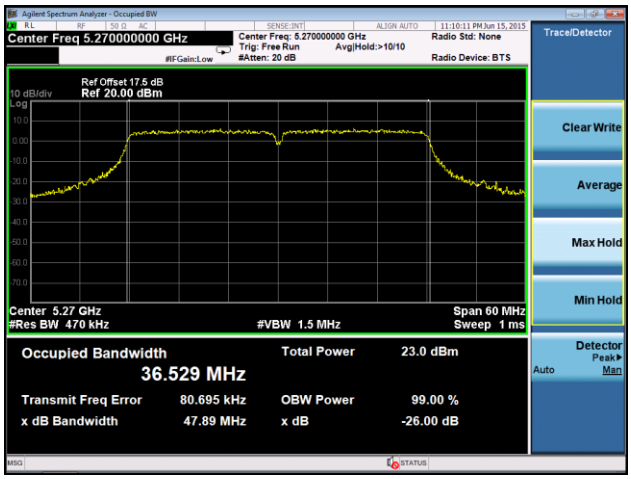
Channel 38 (5190MHz)



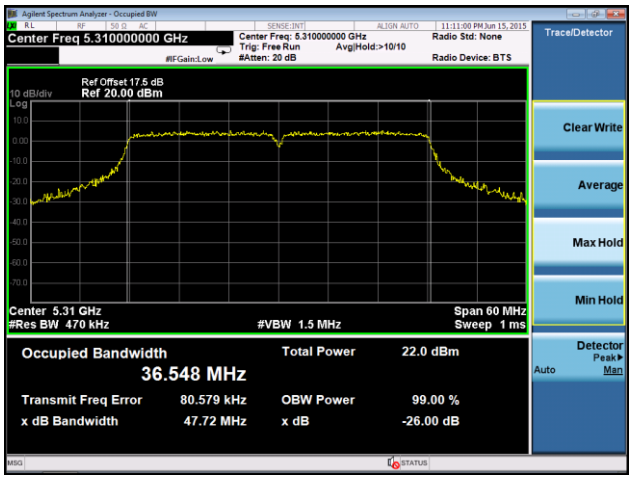
Channel 46 (5230MHz)



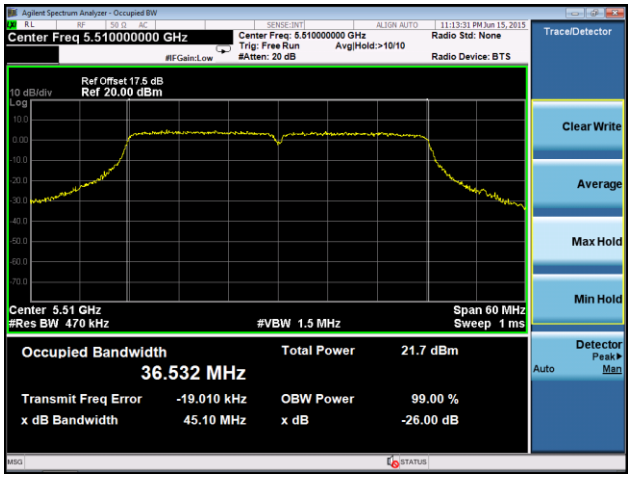
Channel 54 (5270MHz)



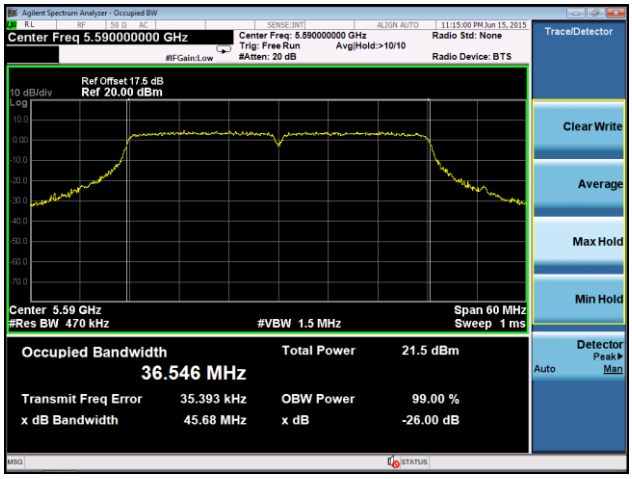
Channel 62 (5310MHz)

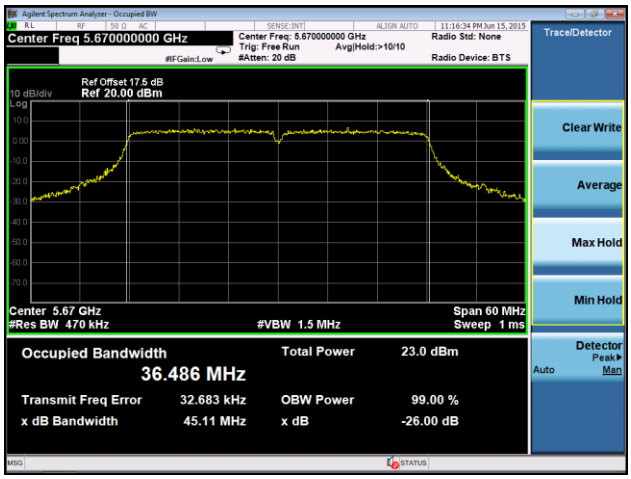
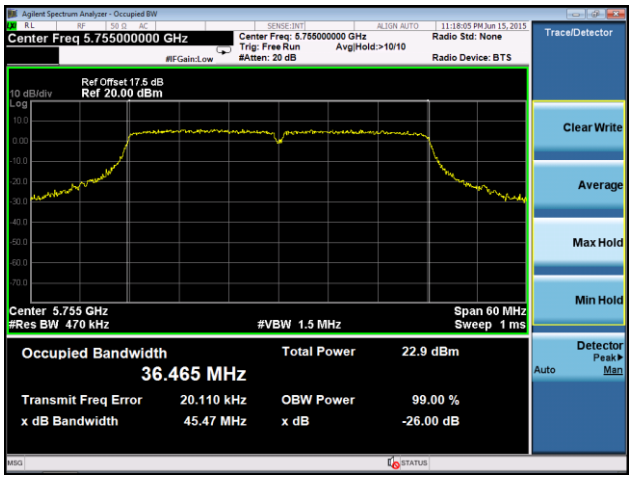
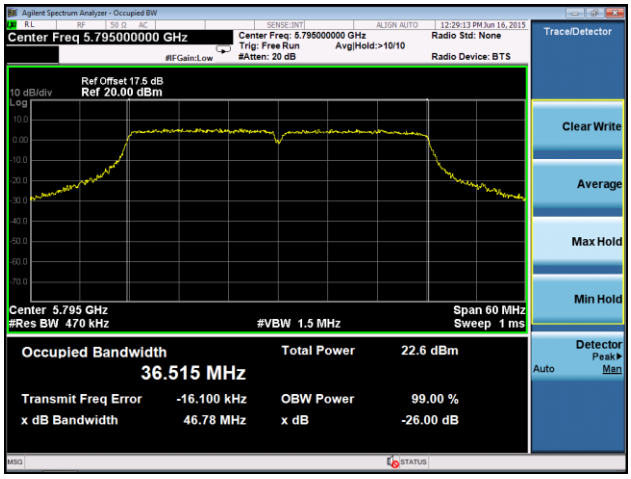


Channel 102 (5510MHz)



Channel 118 (5590MHz)



Channel 134 (5670MHz)	Channel 151 (5755MHz)
	
Channel 159 (5795MHz)