



中认信通
CHINA CERTIFICATION ICT CO., LTD (DONGGUAN)

JAPAN MIC

TEST REPORT

Applicant: Visteon Electronics Germany GmbH

Address: Amalienbadstrasse, 41a Karlsruhe Baden-Wurttemberg - Germany

Product Name: Driver Display Unit

Model Number: DDU-ADV, DDU-MID, DDU-BSC

Standard(s): Radio Law of Japan item 78 of Article 2 paragraph 1

Test Method: Test method temporarily determined by TACOYAKI

The above device has been tested and found compliant with the requirement of the relative standards by China Certification ICT Co., Ltd (Dongguan)

Report Number: CR231165359-07C

Date Of Issue: 2024/1/18

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Test Facility

The Test site used by China Certification ICT Co., Ltd (Dongguan) to collect test data is located on the No. 113, Pingkang Road, Dalang Town, Dongguan, Guangdong, China.

Declarations

China Certification ICT Co., Ltd (Dongguan) is not responsible for the authenticity of any test data provided by the applicant. Data included from the applicant that may affect test results are marked with a triangle symbol “▲”. Customer model name, addresses, names, trademarks etc. are not considered data.

Unless otherwise stated the results shown in this test report refer only to the sample(s) tested.

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DOCUMENT REVISION HISTORY

Revision Number	Report Number	Description of Revision	Date of Revision
1.0	CR231165359-07C	Original Report	2023/1/18

1. GENERAL INFORMATION

1.1 Product Description for Equipment under Test (EUT)

EUT Name:	Driver Display Unit
EUT Model:	DDU-ADV
Multiple Models:	DDU-MID, DDU-BSC
Frequency Range:	802.11a/n ht20/ac vht20: 5180-5240MHz 802.11n ht40/ac vht40: 5190/5230MHz 802.11ac vht80: 5210MHz
Data Rate[▲]:	802.11a: 24/36/48/54 Mbps 802.11n-ht20: MCS3 to MCS7 802.11n-ht40: MCS2 to MCS7 802.11ac-vht20: MCS3 to MCS8 802.11ac-vht40: MCS2 to MCS9 802.11ac-vht80: MCS0 to MCS9
Nominal RF Output Power (Conducted):	802.11a: 0.5mW/MHz; 802.11n ht20: 0.5mW/MHz; 802.11n ht40: 0.4mW/MHz; 802.11ac vht80: 0.2mW/MHz
Number of TX Chain(s):	1
Number of RX Chain(s):	1
Antenna Gain (dBi)[▲]:	0
Modulation Type:	OFDM
Emission Type:	D1D, G1D
Rated Input Voltage:	DC 28V from Vehicle Battery
Serial Number:	2CX5-1
EUT Received Date:	2023/11/7
EUT Received Status:	Good
Note:	The multiple models are electrically identical with the test model. Please refer to the declaration letter for more detail, which was provided by manufacturer.

Operation Frequency Detail:

Channel	Frequency (MHz)	Channel	Frequency (MHz)
36	5180	44	5220
38	5190	46	5230
40	5200	48	5240
42	5210	/	/

The system support 802.11a/n ht20/n ht40/ac vht20/ac vht40/ac vht80, the 802.11ac vht20/vht40 were reduced since the identical parameters with 802.11n ht20 and ht40.

For 802.11a/n ht20, Channel 36, 40 and 48 were tested.

For 802.11n ht40, Channel 38, 46 were tested.

For 802.11ac vht80, Channel 42 was tested.

Accessory Information:

Accessory Description	Manufacturer	Model	Parameters
/	/	/	/

1.2 Description of Test Configuration

1.2.1 EUT Operation Condition

EUT Operation Mode:	The system was configured for testing in Engineering Mode, which was provided by the manufacturer.		
Equipment Modifications:	No		
EUT Exercise Software:	QRCT4.exe		
The engineering mode was provided by manufacturer. The maximum power was configured as below, that was provided by the manufacturer▲:			
Test Modes	Lowest	Middle	Highest
802.11 a	Auto	Auto	Auto
802.11n ht20	Auto	Auto	Auto
802.11n ht40	Auto	Auto	Auto
802.11ac vht80	Auto	Auto	Auto

1.2.2 Power Supply Voltage Fluctuation Test

Voltage Fluctuation Test	Normal Voltage	Low Voltage -10% of Normal Voltage	High Voltage +10% of Normal Voltage
Power Supply Voltage (Vdc)	28	25.2	30.8
Measured Voltage for the RF circuit (Vdc)	3.304	3.302	3.305
Voltage Variation (%)	/	-0.06	0.03

Note:

1. Voltage Variation (%) = (Measured Voltage at High or Low Voltage - Measured Voltage at Normal Voltage) / Measured Voltage at Normal Voltage *100

2. The Voltage for the Radio Part fluctuation is verified at the power input PIN of the RF circuit.

Due to the power management chip (PMIC Model: PMM8155AU) equipped with the EUT, theoretically, when the EUT input power supply voltage changes is varied by $\pm 10\%$, the voltage impact on the RF circuit of the EUT will be minimal or even negligible. From the Voltage Fluctuation Test data in the table above, it can be seen that the change of the measured voltage at the radio part of the EUT is below $\pm 1\%$, when input voltage from external power supply to the EUT is varied by $\pm 10\%$, thus the RF test is tested at **Normal Voltage (NV)** only.

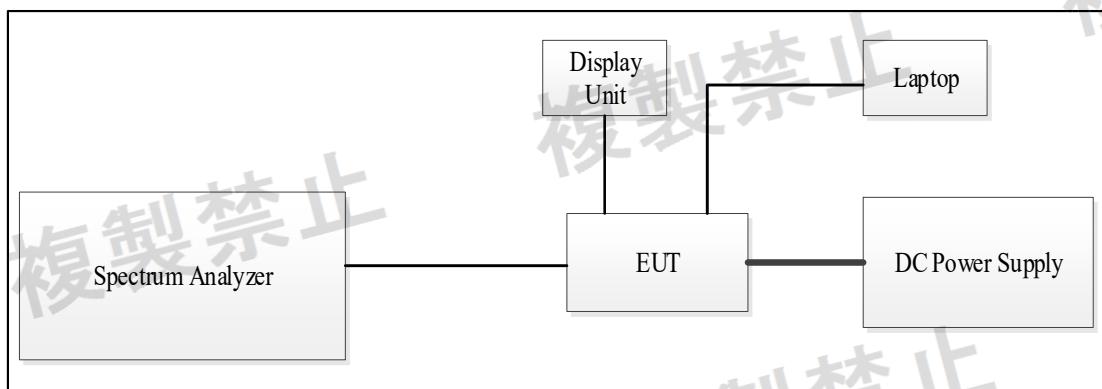
1.2.3 Support Equipment List and Details

Manufacturer	Description	Model	Serial Number
ZHAOXIN	DC Power Supply	RXN-6010D	21R6010D0912386
Unknown	Display	Unknown	Unknown
Lenovo	Laptop	T460S	60PDTEK7
Weinschel	Power Splitter	1515	RA914

1.2.4 Support Cable List and Details

Cable Description	Shielding Type	Ferrite Core	Length (m)	From Port	To
Main Harness	no	no	2.0	DC Power Supply	EUT/ Display
GSML Cable	no	no	2.0	EUT	Display
QFIL USB Cable	no	no	2.0	EUT	Laptop
Coaxial Cable	no	no	1	EUT	Spectrum Analyzer

1.2.5 Block Diagram of Test Setup



1.3 Measurement Uncertainty

Otherwise required by the applicant or Product Regulations, Decision Rule in this report did not consider the uncertainty. The extended uncertainty given in this report is obtained by combining the standard uncertainty times the coverage factor K with the 95% confidence interval.

Parameter	Measurement Uncertainty
Frequency Error	±0,5 ppm
Occupied bandwidth and spreading bandwidth	±5 %
RF output power, conducted	±0.61dB
Unwanted Emissions (TX&RX), conducted	±2.47 dB
Temperature	±1°C
Humidity	±5%
DC and low frequency voltages	±0.4%
Duty Cycle	1%

2. SUMMARY OF TEST RESULTS

Article 2, Paragraph 1, Item 78	
Description Of Test	Result
Frequency Tolerance	Compliant
Output Power and Output Power Tolerance	Compliant
Occupied Bandwidth	Compliant
Unwanted Emission Strength	Compliant
Adjacent Channel Emitted Power	Compliant
Secondary Radiated Emission Strength	Compliant
Transmission Data Rate	Compliant
Transmission Burst Length	Compliant
Radio Interference Prevention Capability	Compliant
Carrier Sense Capability	Compliant
Construction Protection Confirmation	Compliant

3. REQUIREMENTS AND TEST PROCEDURES

3.1 Frequency Tolerance

3.1.1 Limit

Within $\pm 20\text{ppm}$.

3.1.2 Test Procedure

Set the EUT to the measurement frequency without modulation.

Setting of SA is following as: Sweep time: Auto / Sweep Mode: Continuous sweep / Detect mode:

Positive peak / Trace mode: Max hold.

Record the peak spot frequency.

If the EUT can't set at un-modulation mode, measure the 10dBc center frequency.

3.2 Output Power and Output Power Tolerance

3.2.1 Limit

Item	Band	Limits
Antenna Power	W52	20M System: $\leq 2\text{mW/MHz}$ 40M System: $\leq 1\text{mW/MHz}$ 80M System: $\leq 0.5\text{mW/MHz}$
E.I.R.P.	W52	20M System: $\leq 2\text{mW/MHz}$ 40M System: $\leq 1\text{mW/MHz}$ 80M System: $\leq 0.5\text{mW/MHz}$
Antenna Power Tolerance	W52	$\leq +20\%$, -80%

3.2.2 Test Procedure

Step 1:

Connect the UUT to the spectrum analyser and use the following settings:

- Centre Frequency: The centre frequency of the channel under test.
- Resolution BW: 1 MHz.
- Video BW: 1 MHz.
- Span: Wide enough to cover the complete power envelope of the signal of the UUT.
- Detector: Peak.
- Trace Mode: Max Hold.

Step 2:

When the trace is complete, find the peak value of the power envelope and record the frequency.

Step 3:

Make the following changes to the settings of the spectrum analyser:

- Centre Frequency: Equal to the frequency recorded in step 2.
- Span: 3 MHz.
- Resolution BW: 1 MHz.
- Video BW: 1 MHz.
- Sweep time: 1 minute.
- Detector: Average (see note).
- Trace Mode: Max Hold.

NOTE: The detector mode "Average" is often referred to as "RMS Average" or "Sample" but do not use Video Average.

Step 4:

When the trace is complete, capture the trace, for example using the "View" option on the spectrum analyser.

Find the peak value of the trace and place the analyser marker on this peak. This level is recorded as the highest mean power (spectral power density) D in a 1 MHz band.

Alternatively, where a spectrum analyser is equipped with a facility to measure spectral power density, this facility may be used to display the spectral power density D in dBm/MHz.

Step 5:

The maximum e.i.r.p. spectral density is calculated from the above measured power density (D), the observed duty cycle x, and the applicable antenna assembly gain "G" in dBi, according to the formula below. If more than one antenna assembly is intended for this power setting, the gain of the antenna assembly with the highest gain shall be used.

- $PD = D + G + 10 \log(1/x);$
- PD shall be recorded in the test report.

3.3 Occupied Bandwidth

3.3.1 Limit

Item	Limits
Occupied Bandwidth:	W52 : ≤ 20MHz (20MHz Mode OFDM) ≤ 40MHz (40MHz Mode OFDM) ≤ 80MHz (80MHz Mode OFDM)

3.3.2 Test Procedure

1. Setting of SA is following as: RB: 300 kHz / VB: 300 kHz / SPAN: 2*Nominal Bandwidth/
Sweep time: Auto / Sweep Mode: Continuous sweep / Detect mode: Positive peak / Trace
mode: Max hold
2. EUT have transmitted the maximum modulation signal and fixed channelize. SA set to 99% of
occupied bandwidth to measure occupied bandwidth.

3.4 Unwanted Emission Strength

3.4.1 Limit

Spurious Emission:

20MHz system	40MHz system	80MHz system
5,142 MHz or less : 0.5 μ W/MHz	5,141.6 MHz or less : 0.5 μ W/MHz	5,123.2 MHz or less : 0.5 μ W/MHz
5,142 - 5,150 MHz : 3 μ W/MHz	5,141.6 - 5,150 MHz : 3 μ W/MHz	5,123.2 - 5,150 MHz : 3 μ W/MHz
5,250 - 5,250.2 MHz : $0.2 \times 10^{1-(8/3)(f-9.75)}$ mW/MHz		
5,250.2 - 5,251 MHz : $0.2 \times 10^{1-(f-9)}$ mW/MHz	5,250 - 5,251 MHz : $0.2 \times 10^{-(f-20)+\log(1/2)}$ mW/MHz	5,250 - 5,251 MHz : $0.2 \times 10^{-(f-40)+\log(1/4)}$ mW/MHz
5,251 - 5,260 MHz : $0.2 \times 10^{-1-(8/90)(f-11)}$ mW/MHz	5,251 - 5,270 MHz : $0.2 \times 10^{-(8/190)(f-21)-1+\log(1/2)}$ mW/MHz	5,251 - 5,290 MHz : $0.2 \times 10^{-(8/390)(f-41)-1+\log(1/4)}$ mW/MHz
5,260 - 5,266.7 MHz : $0.2 \times 10^{-1.8-(6/50)(f-20)}$ mW/MHz	5,270 - 5,278.4 MHz : $0.2 \times 10^{-(3/50)(f-40)-1.8+\log(1/2)}$ mW/MHz	5,290 - 5,296.7 MHz : $0.2 \times 10^{-(3/100)(f-80)-1.8+\log(1/4)}$ mW/MHz
5,266.7 - 5,365 MHz : 0.5 μ W/MHz	5,278.4 - 5,400 MHz : 0.5 μ W/MHz	5,296.7 - 5,480 MHz : 0.5 μ W/MHz
*5,365 MHz or more : 0.5 μ W/MHz	*5,400 MHz or more : 0.5 μ W/MHz	*5,480 MHz or more : 0.5 μ W/MHz
f = MHz, Difference from 5240 (MHz)	f = MHz, Difference from 5230 (MHz)	f = MHz, Difference from 5210 (MHz)

3.4.2 Test Procedure

❖ Conditions of Application Equipment (EUT)

- The modulation state shall be “continuous transmitting mode” by spread spectrum.

3.5 Adjacent Channel Power

3.5.1 Limit

Bandwidth System	Limits
20MHz System	$\geq 25\text{dB}$ ($f_c \pm 20\text{MHz}$)
	$\geq 40\text{dB}$ ($f_c \pm 40\text{MHz}$)
40MHz System	$\geq 25\text{dB}$ ($f_c \pm 40\text{MHz}$)
	$\geq 40\text{dB}$ ($f_c \pm 80\text{MHz}$)
80MHz System	$\geq 25\text{dB}$ ($f_c \pm 80\text{MHz}$)

3.5.2 Test Procedure

1. EUT have transmitted the maximum modulation signal and fixed channelize.
2. Setting of SA is following as: RB: 300 kHz / VB: 300 kHz / Sweep time: Auto / Sweep Mode: Continuous sweep / Detect mode: Sample / Trace mode: Max hold
3. SA set the Channel Power Function and Channel Bandwidth: 20MHz and Center Frequency: The center frequency of testing for EUT (Such as 5180MHz). Then SA automatically calculate the channel power of EUT and A is representative of this channel power
4. SA set the Channel Power Function and Channel Bandwidth: 20MHz and Center Frequency: The center frequency of testing for EUT (Such as 5180MHz) $\pm 20\text{MHz}$. Then SA automatically subtract the first adjacent channel power of EUT from channel power, the value must more than 25dB.
5. SA set the Channel Power Function and Channel Bandwidth: 20MHz and Center Frequency: The center frequency of testing for EUT (Such as 5180MHz) $\pm 40\text{MHz}$. Then SA automatically subtract the second adjacent channel power of EUT form channel power, the value must more than 40dB.

3.6 Secondary Radiated Emission Strength

3.6.1 Limit

4nW or below (Frequency range: 30MHz – 1GHz); 20n W or below (frequency range: 1GHz – 26GHz).

3.6.2 Test Procedure

- ❖ Conditions of Application Equipment (EUT)
 - The modulation state shall be “continuous receiving mode”.
- ❖ Spectrum Analyzer Conditions
 - Start Frequency: Start Frequency of frequency range to measure (30MHz or 1GHz)
 - Stop Frequency: Stop Frequency of frequency range to measure (1GHz or 26GHz)
 - Span: AUTO (Measurement Range)
 - RBW: 100 kHz, VBW: 100 kHz for Frequency < 1 GHz
 - RBW: 1MHz, VBW: 1MHz for Frequency > 1 GHz
 - Sweep time: AUTO or more
 - Log scale: 10dB/Div, Data points: 501points (400 points or more)
 - Detection: Positive Peak
 - Reference Level: Enough level for maximum dynamic range

3.7 Transmission Burst Length

3.7.1 Limit

Item	Limit
Transmission Burst Length	$\leq 8 \text{ ms}$

3.7.2 Test Procedure

- ❖ 1. The transmitter output (antenna port) was connected to the spectrum analyzer
- ❖ 2. Set RBW of spectrum analyzer to 10MHz and VBW to 10MHz.
- ❖ 3. Use a video trigger with the trigger level set to enable triggering only on full pulses.
- ❖ 4. Sweep Time is more than once pulse time.
- ❖ 5. Set the center frequency on any frequency would be measure and set the frequency span to zero span.
- ❖ 6. Measure the maximum time duration of one single pulse.

3.8 Transmission Data Rate

3.8.1 Limit

Bandwidth System	Limits
20MHz System	20Mbps or more
40MHz System	40Mbps or more
80MHz System	80Mbps or more

3.8.2 Result

Result: Compliant, please see the below table

Data Rate[▲]:	802.11a: 24/36/48/54 Mbps 802.11n-ht20: MCS3 to MCS7 802.11n-ht40: MCS2 to MCS7 802.11ac-vht20: MCS3 to MCS8 802.11ac-vht40: MCS2 to MCS9 802.11ac-vht80: MCS0 to MCS9
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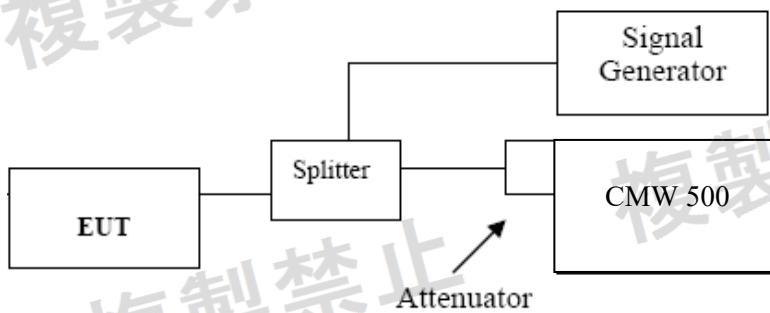
3.9 Radio Interference Prevention Capability

3.9.1 Limit

The EUT shall have the interference prevention capability to transmit or to receive the identification automatically, so that sender and receiver shall exclude other equipment.

3.9.2 Test Procedure

❖ Measurement System Diagram



- ❖ 1. In the case that the EUT has the function of automatically transmitting the identification code: a. Transmit the predetermined identification codes form EUT. b. Check the transmitted identification codes with the demodulator.
- ❖ 2. In the case of receiving the identification code: a. Transmit the predetermined identification codes form the counterpart. b. Check if communication is normal. c. Transmit the signals other than predetermined ID codes form the counterpart. d. check if the EUT stops the transmission, or if it displays that identification codes are different from the predetermined ones.

3.9.3 Measurement Result

Result: Compliant.

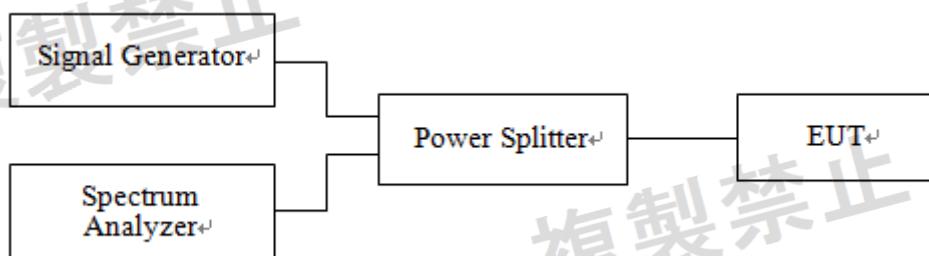
3.10 Carrier Sense Capability

3.10.1 Limit

EUT stop RF transmission signal after carrier inject to EUT

3.10.2 Test Procedure

- ❖ Measurement System Diagram



- ❖ Conditions of Application Equipment (EUT)

- The EUT state shall be “normal mode link with wireless router”.

- ❖ Test Procedure

1. SG adjusted the frequency as same as the EUT transmitted signal and emitted the absence of modulation from SG and power level is

$$P_{CS} = \frac{G \lambda^2}{480 \pi^2} \times E^2$$

2. turn off the RF signal of the SG.
3. EUT have transmitted the maximum modulation signal and fixed channelize.
4. Setting of SA: RBW/VBW=1MHz/1MHz, Span=50MHz, Sweep time=auto, Sweep mode=continuous, Detect mode=positive peak
5. SG RF signal on.
6. EUT shall be stop the transmitted any signal and SG RF signal off, the EUT will be continuous transmitted signal.

3.10.3 Measurement Result

Result: Compliant.

3.11 Construction Protection Confirmation

3.11.1 Limit

The high-frequency section and modulation section of the radio equipment except for the antenna system shall not be capable of being opened easily.

3.11.2 Confirmation Method

The RF and Modulation components are covered by a metal shell with special screws, which is not easy to open. Please refer the EUT photo.

4. TEST DATA AND RESULTS

4.1 Test Environmental Conditions & Test Equipment List and Details

Test Date:	2023/10/22~2024/1/18		
Tester:	Claire Liu, Ling Ling Li		
Environmental Conditions:			
Temperature: (°C)	26.9-27.5	Relative Humidity: (%)	55-60
ATM Pressure: (kPa)	101.1-101.3		

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date	Calibration Agency	Calibration Method Note
R&S	Spectrum Analyzer	FSU26	200256	2023/03/31	2024/03/30	BACL	C
UNI-T	Multimeter	UT39A+	C210582554	2023/09/28	2024/09/27	BACL	C
R&S	Wideband Radio Communication Tester	CMW500	143458	2023/03/31	2024/03/30	BACL	C
Agilent	MXG Vector Signal Generator	N5182B	MY51350144	2023/03/31	2024/03/30	BACL	C

* Statement of Traceability: China Certification ICT Co., Ltd (Dongguan) attests that all calibrations have been performed, traceable to National Primary Standards and International System of Units (SI).

Note:

- A. Calibration conducted by the National Institute of Information and Communications Technology (NICT) (hereinafter referred to as "NICT") or a designated calibration agency under Article 102-18 paragraph (1).
- B. Correction conducted pursuant to the provisions of Article 135 or Article 144 of the Measurement Law (Law No. 51 of 1992).
- C. Calibration conducted in foreign countries, which shall be equivalent to the calibration conducted by the NICT or a designated calibration agency under Article 102-18 paragraph (1).
- D. Calibration conducted by using measuring instruments and other equipment which shall have been given any of calibration, etc. listed above from a) to c)

4.2 Frequency Tolerance

Test Result: Compliant

Test Mode: Carrier transmitting mode

Test Condition	Frequency Band	Channel	Test Frequency (MHz)	Measured Frequency (MHz)	Result (ppm)	Limit (ppm)
NV	W52	Low	5180	5179.9964	-0.69	± 20
			5190	5189.9964	-0.69	
		Middle	5200	5199.9964	-0.69	
			5210	5209.9962	-0.73	
		High	5230	5229.9962	-0.73	
			5240	5239.9960	-0.76	

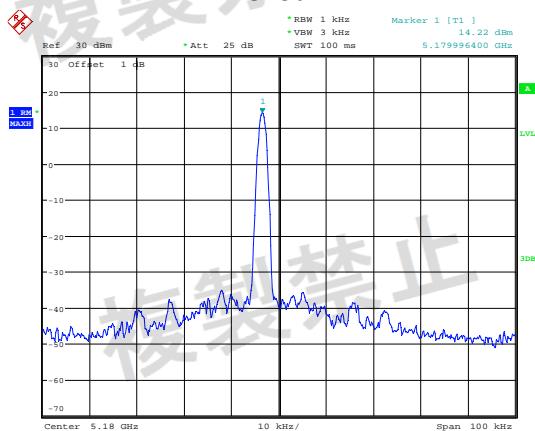
Note:

$$\text{Result} = (\text{Measured Frequency} - \text{Test Frequency}) / \text{Test Frequency} * 10^6$$

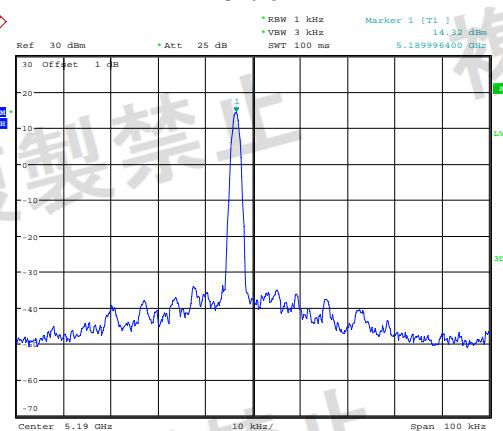
Please refer to the plots for normal voltage test:

W52:

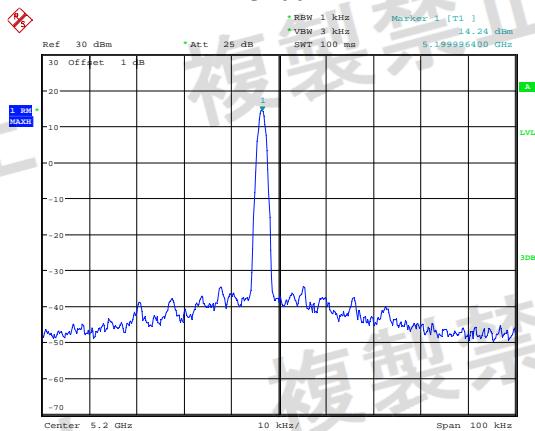
5180MHz



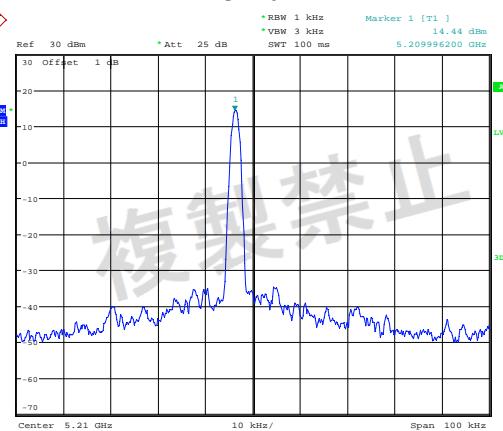
5190MHz



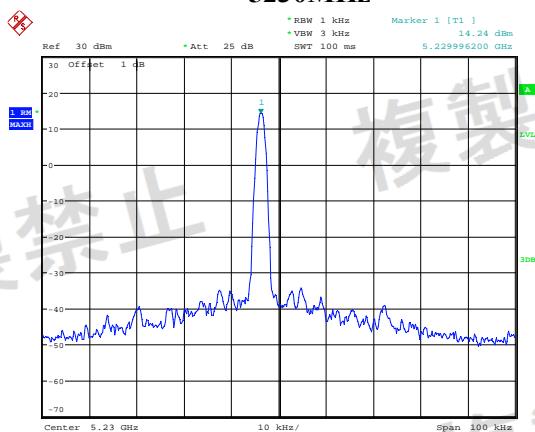
5200MHz



5210MHz



5230MHz



5240MHz



4.3 Output Power and Output Power Tolerance

Test Result: Compliant

Test Mode: Transmitting

Duty Cycle and Declared Power:

Mode	Ton (ms)	Ton+Toff (ms)	Duty Cycle (%)
802.11a	2.066	2.149	96.14
802.11n ht20	1.951	2.085	93.57
802.11n ht40	0.959	1.028	93.29
802.11ac vht80	0.469	0.585	80.17

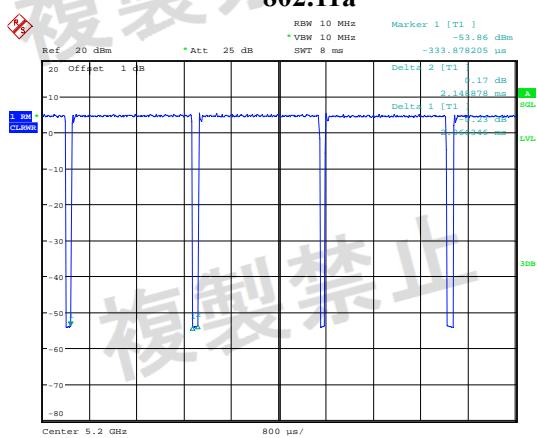
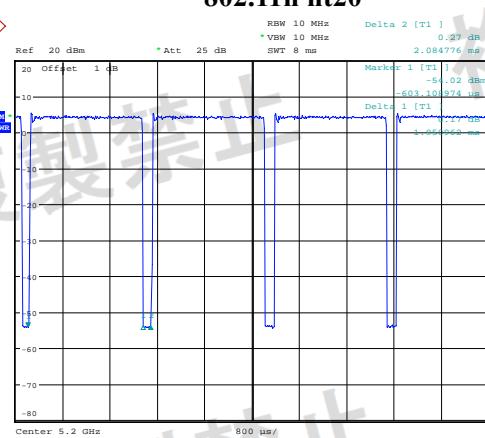
Mode	Antenna Gain (dBi)	Declared Power (mW/MHz)
802.11a	0	0.5
802.11n ht20		0.5
802.11n ht40		0.4
802.11ac vht80		0.2

Antenna Output Power

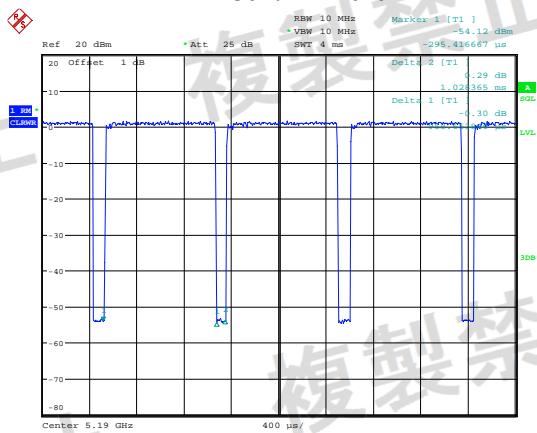
Test Voltage	Mode	Channel	Conducted Power (dBm/MHz)	Antenna Output Power (mW/MHz)		Antenna Output Tolerance (%)		EIRP (mW/MHz)	
				Result	Limit	Result	Limit	Result	Limit
NV	802.11a	Low	-4.40	0.378	≤ 2	-24.40	-80~ +20	0.38	≤ 2
		Middle	-3.79	0.435	≤ 2	-13.00		0.44	≤ 2
		High	-4.02	0.412	≤ 2	-17.60		0.41	≤ 2
	802.11n ht20	Low	-4.80	0.354	≤ 2	-29.20	-80~ +20	0.35	≤ 2
		Middle	-4.23	0.404	≤ 2	-19.20		0.40	≤ 2
		High	-4.45	0.384	≤ 2	-23.20		0.38	≤ 2
	802.11n ht40	Low	-7.54	0.189	≤ 1	-52.75	-80~ +20	0.19	≤ 1
		High	-6.71	0.229	≤ 1	-42.75		0.23	≤ 1
	802.11ac vht80	Middle	-11.86	0.081	≤ 0.5	-59.50		0.08	≤ 0.5

Note:

1. Antenna Output Power = Conducted power (mW/MHz) / Duty Cycle;
2. Antenna Output Power Tolerance = (Antenna Output power - Declared Power)/Declared Power*100%
3. The device without TPC function.

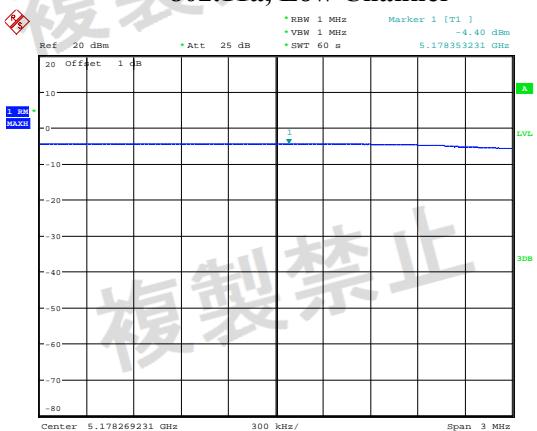
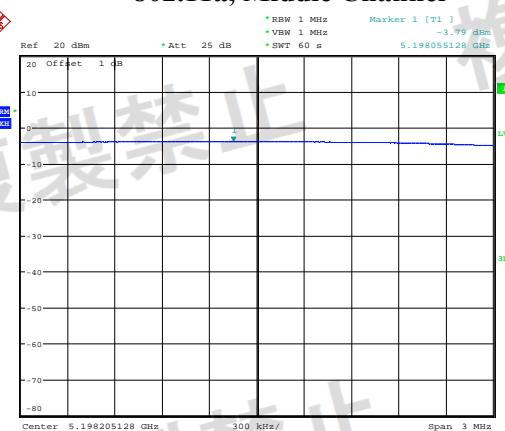
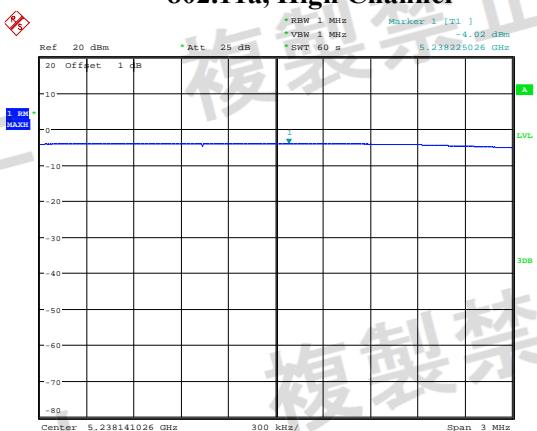
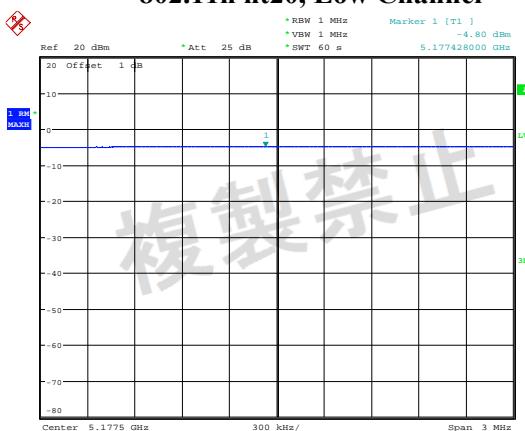
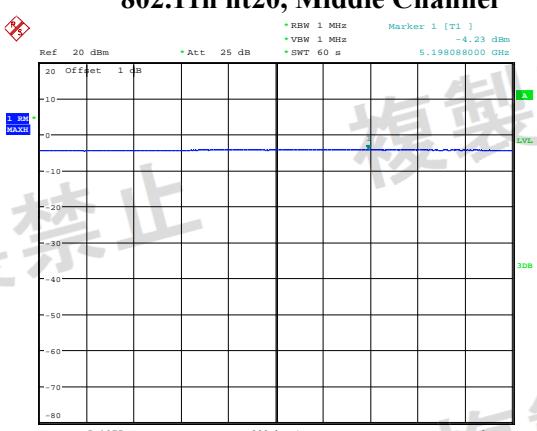
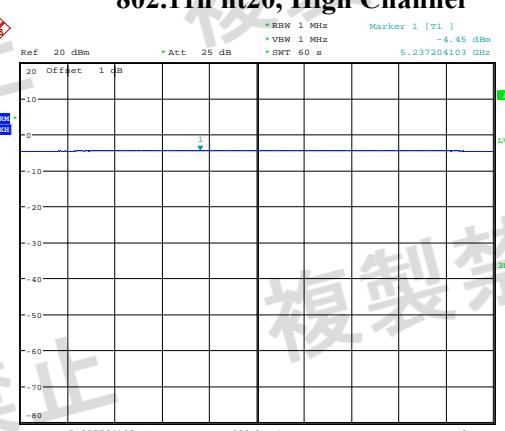
Duty Cycle:**802.11a****802.11n ht20**

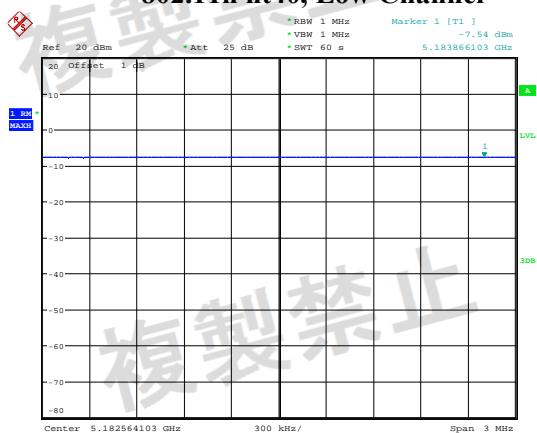
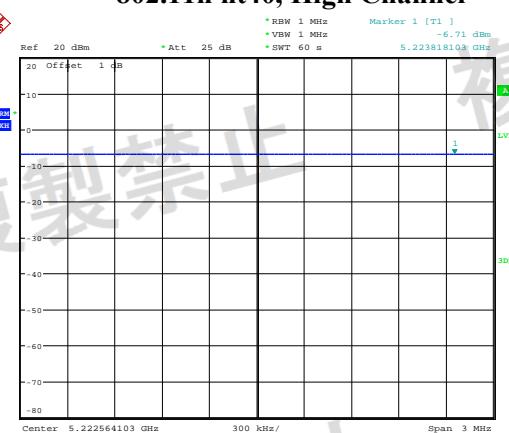
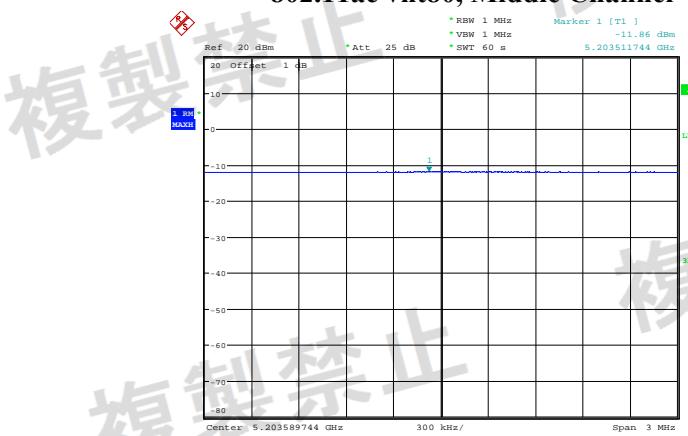
ProjectNo.:CR231165359-RF Tester:Claire Liu
Date: 22.NOV.2023 10:12:47

802.11n ht40**802.11ac vht80**

ProjectNo.:CR231165359-RF Tester:Claire Liu
Date: 22.NOV.2023 10:07:03

ProjectNo.:CR231165359-RF Tester:Claire Liu
Date: 22.NOV.2023 09:51:23

Antenna Power:**802.11a, Low Channel****802.11a, Middle Channel****802.11a, High Channel****802.11n ht20, Low Channel****802.11n ht20, Middle Channel****802.11n ht20, High Channel**

802.11n ht40, Low Channel**802.11n ht40, High Channel****802.11ac vht80, Middle Channel**

4.4 Occupied Bandwidth

Test Result: Compliant

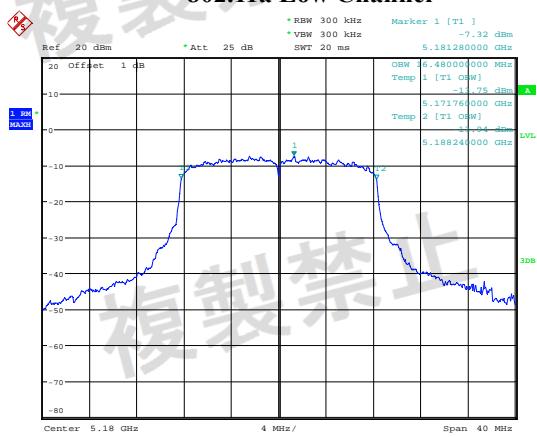
Test Mode: Transmitting

Test Voltage	Frequency Band	Occupied bandwidth (MHz)				
		Mode	Low Channel	Middle Channel	High Channel	Limit
NV	W52	802.11a	16.48	16.48	16.40	≤ 20
		802.11n ht20	17.60	17.60	17.52	≤ 20
		802.11n ht40	35.84	/	36.00	≤ 40
		802.11ac vht80	/	74.88	/	≤ 80

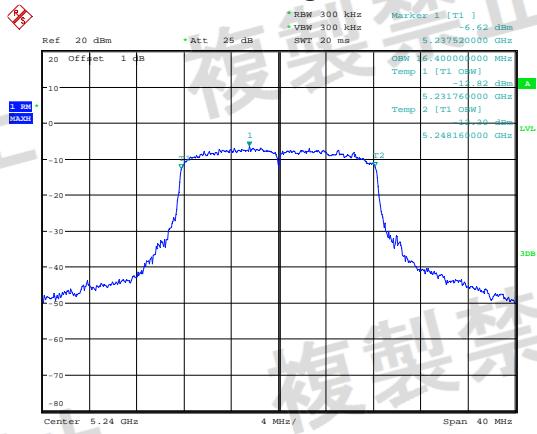
Please refer to the below plots for normal voltage test:

Occupied bandwidth:

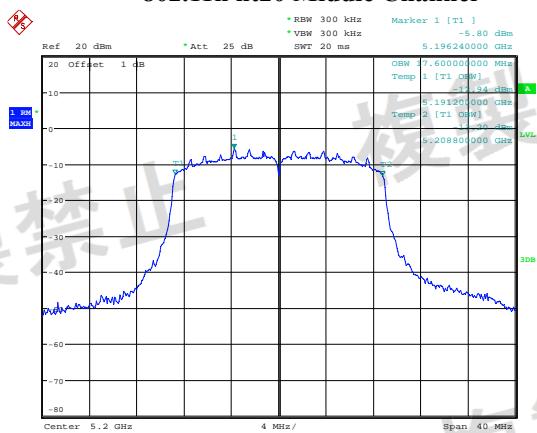
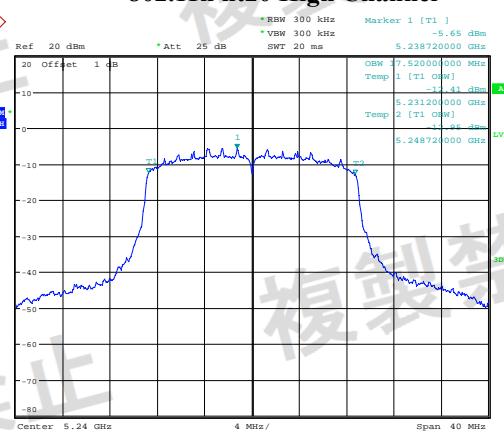
W52:

802.11a Low Channel**802.11a Middle Channel**

ProjectNo.:CR231165359-RF Tester:Claire Liu
Date: 22.NOV.2023 09:30:26

802.11a High Channel**802.11n ht20 Low Channel**

ProjectNo.:CR231165359-RF Tester:Claire Liu
Date: 22.NOV.2023 09:32:56

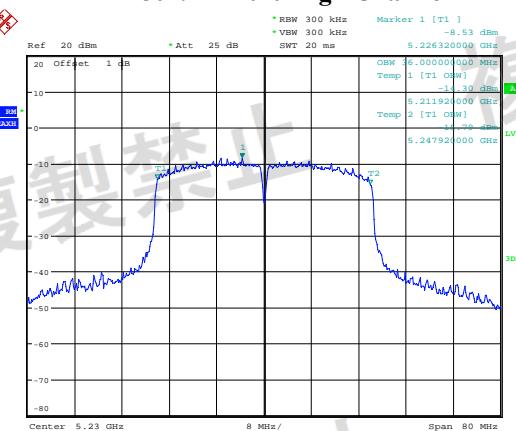
802.11n ht20 Middle Channel**802.11n ht20 High Channel**

ProjectNo.:CR231165359-RF Tester:Claire Liu
Date: 22.NOV.2023 09:42:43

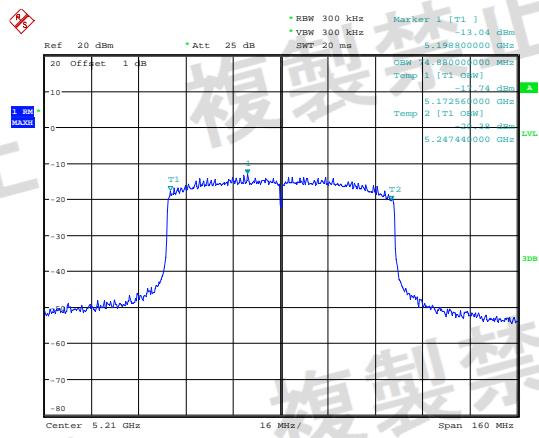
ProjectNo.:CR231165359-RF Tester:Claire Liu
Date: 22.NOV.2023 09:41:38

802.11n ht40 Low Channel

ProjectNo.:CR231165359-RF Tester:Claire Liu
Date: 22.NOV.2023 09:45:08

802.11n ht40 High Channel

ProjectNo.:CR231165359-RF Tester:Claire Liu
Date: 22.NOV.2023 09:46:01

802.11ac vht80 Middle Channel

ProjectNo.:CR231165359-RF Tester:Claire Liu
Date: 22.NOV.2023 09:47:44

4.5 Transmitter Spurious Emission Strength and Unwanted Emission Intensity

Test Result: Compliant; Test Mode: Transmitting

The test data refers to below tables:

802.11a						
Test Condition	Channel	Test Band (RBW)	Reading		Limit (dBm/MHz)	Limit (μ W/MHz)
			Frequency (MHz)	Amplitude (dBm/MHz)		
NV	Low	30MHz~5142MHz (1MHz)	2433.18	-43.46	-33.01	0.50
		5142MHz~5150MHz (1MHz)	5148.91	-51.08	-25.23	3.00
		5250MHz~5250.2MHz (1MHz)	5250.19	-59.68	-8.83	130.93
		5250.2MHz~5251MHz (1MHz)	5251.00	-60.16	-16.98	20.05
		5251MHz~5260MHz (1MHz)	5251.00	-60.12	-16.99	20.00
		5260MHz~5266.7MHz (1MHz)	5266.64	-59.75	-32.95	0.51
		5266.7MHz~5365MHz (1MHz)	5334.60	-59.71	-33.01	0.50
		5365MHz~26000MHz (1MHz)	24926.98	-55.92	-33.01	0.50
NV	Middle	30MHz~5142MHz (1MHz)	2423.04	-40.01	-33.01	0.50
		5142MHz~5150MHz (1MHz)	5149.13	-56.09	-25.23	3.00
		5250MHz~5250.2MHz (1MHz)	5250.18	-57.27	-8.56	139.22
		5250.2MHz~5251MHz (1MHz)	5250.98	-57.94	-16.78	20.99
		5251MHz~5260MHz (1MHz)	5259.68	-58.74	-24.71	3.38
		5260MHz~5266.7MHz (1MHz)	5266.54	-59.39	-32.84	0.52
		5266.7MHz~5365MHz (1MHz)	5267.80	-59.37	-34.35	0.37
		5365MHz~26000MHz (1MHz)	24926.98	-55.85	-33.01	0.50
NV	High	30MHz~5142MHz (1MHz)	2423.04	-39.99	-33.01	0.50
		5142MHz~5150MHz (1MHz)	5144.15	-58.99	-25.23	3.00
		5250MHz~5250.2MHz (1MHz)	5250.20	-27.55	-8.96	126.97
		5250.2MHz~5251MHz (1MHz)	5250.98	-32.09	-16.81	20.85
		5251MHz~5260MHz (1MHz)	5251.06	-32.59	-17.04	19.76
		5260MHz~5266.7MHz (1MHz)	5266.37	-48.99	-32.63	0.55
		5266.7MHz~5365MHz (1MHz)	5268.28	-50.44	-33.01	0.50
		5365MHz~26000MHz (1MHz)	24844.44	-56.03	-33.01	0.50

802.11n ht20

Test Condition	Channel	Test Band (RBW)	Reading		Limit (dBm/MHz)	Limit (μ W/MHz)
			Frequency (MHz)	Amplitude (dBm/MHz)		
NV	Low	30MHz~5142MHz (1MHz)	2423.04	-42.21	-33.01	0.50
		5142MHz~5150MHz (1MHz)	5149.58	-49.59	-25.23	3.00
		5250MHz~5250.2MHz (1MHz)	5250.20	-60.08	-8.99	126.19
		5250.2MHz~5251MHz (1MHz)	5250.98	-59.65	-16.75	21.14
		5251MHz~5260MHz (1MHz)	5259.90	-60.09	-24.90	3.24
		5260MHz~5266.7MHz (1MHz)	5266.70	-60.34	-33.03	0.50
		5266.7MHz~5365MHz (1MHz)	5312.07	-59.82	-33.01	0.50
		5365MHz~26000MHz (1MHz)	24885.71	-56.24	-33.01	0.50
	Middle	30MHz~5142MHz (1MHz)	2534.58	-45.27	-33.01	0.50
		5142MHz~5150MHz (1MHz)	5147.86	-56.19	-25.23	3.00
		5250MHz~5250.2MHz (1MHz)	5250.19	-56.93	-8.67	135.84
		5250.2MHz~5251MHz (1MHz)	5250.97	-57.20	-16.71	21.33
		5251MHz~5260MHz (1MHz)	5259.32	-58.60	-24.39	3.64
		5260MHz~5266.7MHz (1MHz)	5266.59	-59.21	-32.90	0.51
		5266.7MHz~5365MHz (1MHz)	5270.64	-59.32	-33.01	0.50
		5365MHz~26000MHz (1MHz)	24887.60	-56.10	-33.01	0.50
	High	30MHz~5142MHz (1MHz)	2423.04	-44.80	-33.01	0.50
		5142MHz~5150MHz (1MHz)	5144.77	-58.72	-25.23	3.00
		5250MHz~5250.2MHz (1MHz)	5250.20	-25.65	-8.99	126.19
		5250.2MHz~5251MHz (1MHz)	5251.00	-32.42	-16.99	20.00
		5251MHz~5260MHz (1MHz)	5251.14	-33.32	-17.12	19.42
		5260MHz~5266.7MHz (1MHz)	5266.05	-49.34	-32.24	0.60
		5266.7MHz~5365MHz (1MHz)	5266.86	-51.25	-33.01	0.50
		5365MHz~26000MHz (1MHz)	24885.74	-55.92	-33.01	0.50

802.11n ht40

Test Condition	Channel	Test Band (RBW)	Reading		Limit (dBm/MHz)	Limit (μ W/MHz)
			Frequency (MHz)	Amplitude (dBm/MHz)		
NV	Low	30MHz~5141.6MHz (1MHz)	2423.04	-37.95	-33.01	0.50
		5141.6MHz~5150MHz (1MHz)	5149.84	-46.09	-25.23	3.00
		5250MHz~5251MHz (1MHz)	5250.99	-55.72	-19.94	10.14
		5251MHz~5270MHz (1MHz)	5268.81	-57.03	-27.50	1.78
		5270MHz~5278.4MHz (1MHz)	5277.84	-58.27	-32.70	0.54
		5278.4MHz~5400MHz (1MHz)	5289.31	-57.45	-33.01	0.50
		5400MHz~26000MHz (1MHz)	24887.60	-56.10	-33.01	0.50
	High	30MHz~5141.6MHz (1MHz)	2423.04	-37.90	-33.01	0.50
		5141.6MHz~5150MHz (1MHz)	5147.43	-54.80	-25.23	3.00
		5250MHz~5251MHz (1MHz)	5251.00	-34.23	-19.97	10.07
		5251MHz~5270MHz (1MHz)	5262.36	-39.08	-24.78	3.33
		5270MHz~5278.4MHz (1MHz)	5272.98	-46.82	-29.79	1.05
		5278.4MHz~5400MHz (1MHz)	5278.40	-52.15	-33.01	0.50
		5400MHz~26000MHz (1MHz)	24887.60	-56.03	-33.01	0.50

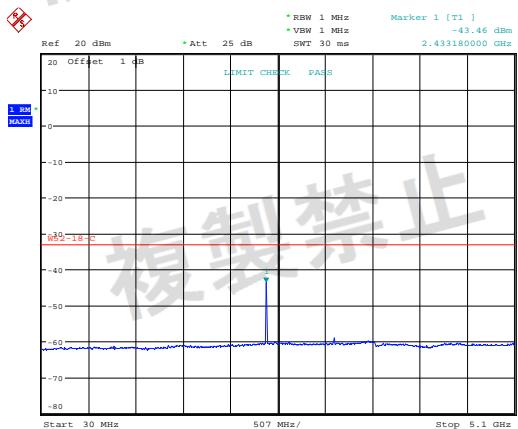
802.11ac vht80

Test Condition	Channel	Test Band (RBW)	Reading		Limit (dBm/MHz)	Limit (μ W/MHz)
			Frequency (MHz)	Amplitude (dBm/MHz)		
NV	Middle	30MHz~5123.2MHz (1MHz)	2423.04	-37.89	-33.01	0.5
		5123.2MHz~5150MHz (1MHz)	5149.18	-40.20	-25.23	3.0
		5250MHz~5251MHz (1MHz)	5250.99	-38.70	-22.91	5.1
		5251MHz~5290MHz (1MHz)	5251.00	-39.28	-23.01	5.0
		5290MHz~5296.7MHz (1MHz)	5295.55	-51.42	-2.55	555.7
		5296.7MHz~5480MHz (1MHz)	5297.88	-52.49	-33.01	0.5
		5480MHz~26000MHz (1MHz)	24891.92	-55.92	-33.01	0.5

Please refer to the plots for normal voltage test:

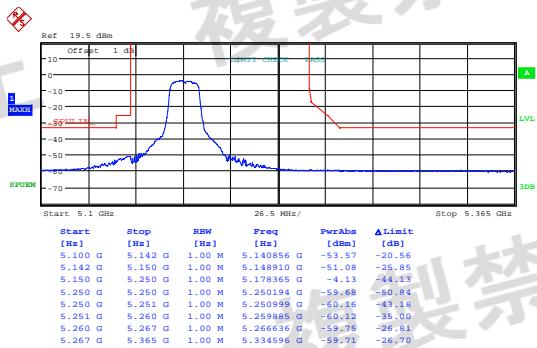
Note: Antenna gain is 0 dBi, so the result shall add 0dB and compliant the limit. All test performed at low, normal and high voltage, please refer to the following plots for normal voltage test:

802.11a Low Channel -1



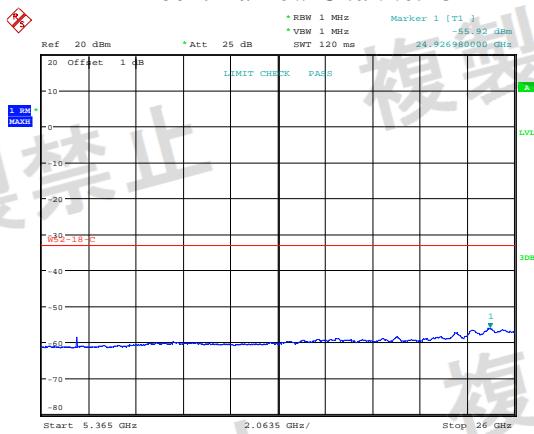
ProjectNo.:CR231165359-RF Tester:Claire Liu
Date: 22.NOV.2023 14:00:13

802.11a Low Channel -2



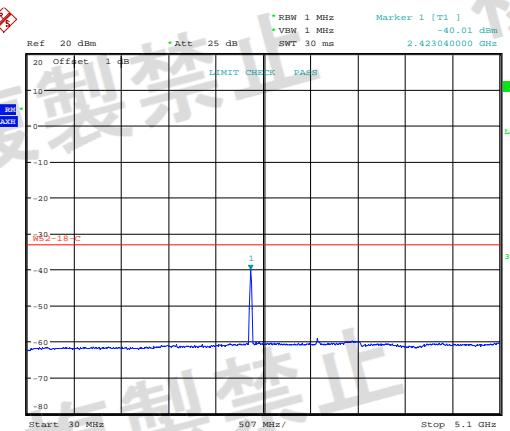
ProjectNo.:CR231165359-RF Tester:LingLing Li
Date: 17.JAN.2024 11:14:25

802.11a Low Channel -3



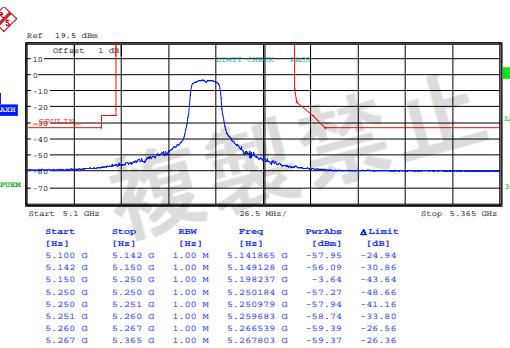
ProjectNo.:CR231165359-RF Tester:Claire Liu
Date: 22.NOV.2023 14:17:08

802.11a Middle Channel -1



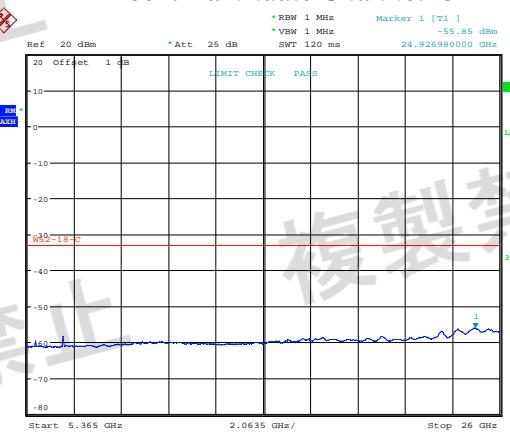
ProjectNo.:CR231165359-RF Tester:Claire Liu
Date: 22.NOV.2023 14:24:53

802.11a Middle Channel -2

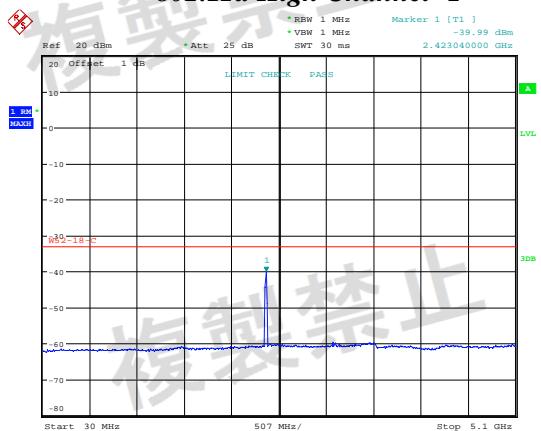


ProjectNo.:CR231165359-RF Tester:LingLing Li
Date: 17.JAN.2024 11:16:54

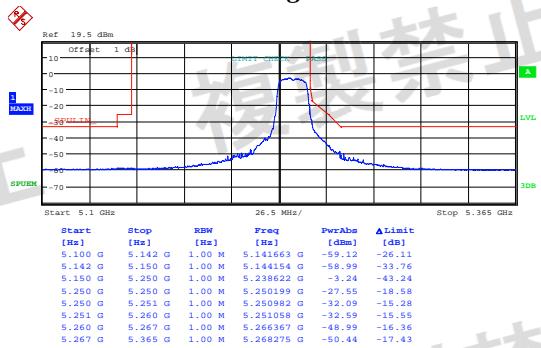
802.11a Middle Channel -3



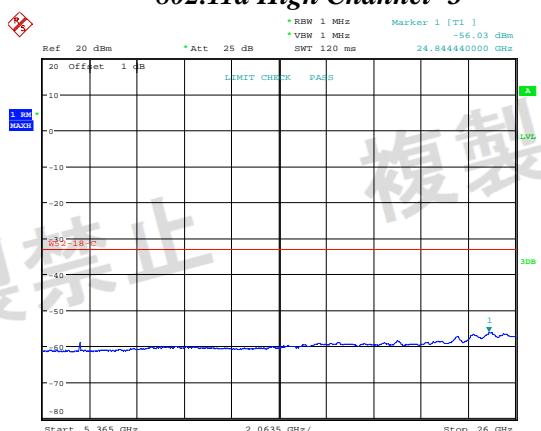
ProjectNo.:CR231165359-RF Tester:Claire Liu
Date: 22.NOV.2023 14:23:08

802.11a High Channel -1

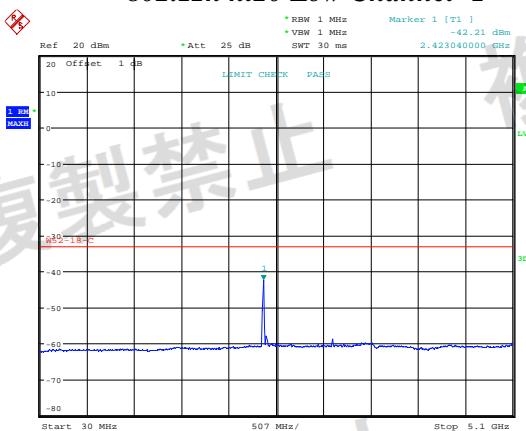
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Date: 22.NOV.2023 14:25:33

802.11a High Channel -2

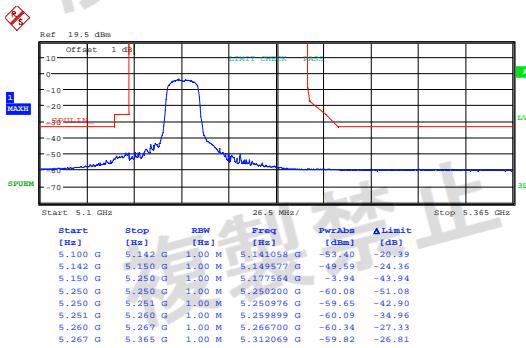
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Date: 17.JAN.2024 11:22:36

802.11a High Channel -3

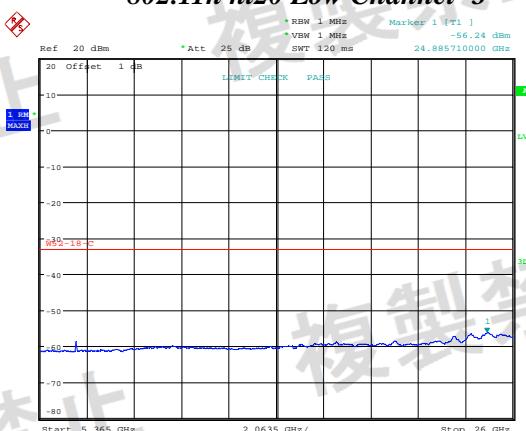
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Date: 22.NOV.2023 14:27:47

802.11n ht20 Low Channel -1

ProjectNo.:CR231165359-RF Tester:Claire Liu
Date: 22.NOV.2023 15:18:39

802.11n ht20 Low Channel -2

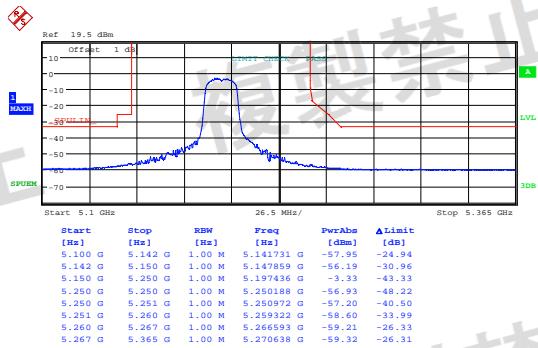
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Date: 17.JAN.2024 11:25:46

802.11n ht20 Low Channel -3

ProjectNo.:CR231165359-RF Tester:Claire Liu
Date: 22.NOV.2023 15:17:07

802.11n ht20 Middle Channel -1

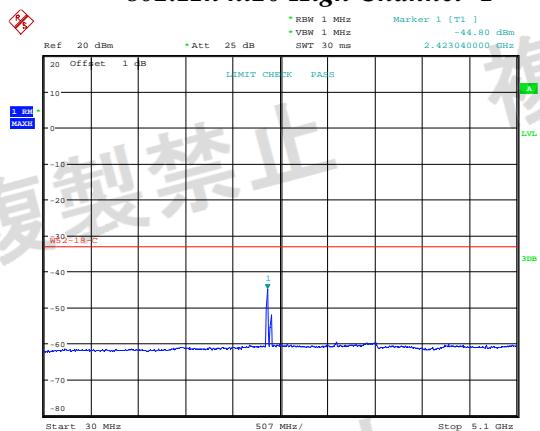
ProjectNo.:CR231165359-RF Tester:Claire Liu
Date: 22.NOV.2023 15:15:34

802.11n ht20 Middle Channel -2

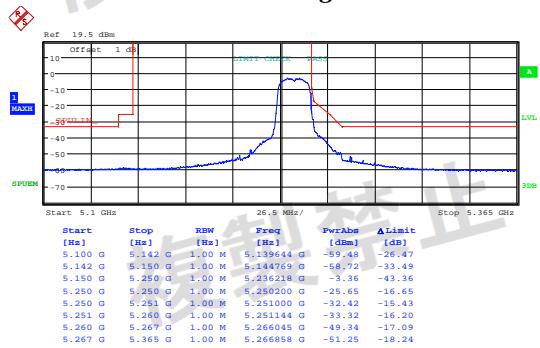
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Date: 17.JAN.2024 11:27:23

802.11n ht20 Middle Channel -3

ProjectNo.:CR231165359-RF Tester:Claire Liu
Date: 22.NOV.2023 15:16:39

802.11n ht20 High Channel -1

ProjectNo.:CR231165359-RF Tester:Claire Liu
Date: 22.NOV.2023 14:57:27

802.11n ht20 High Channel -2

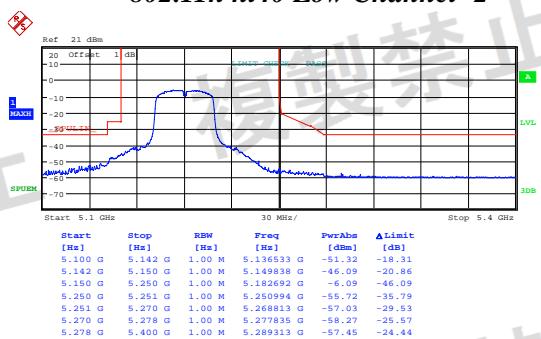
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Date: 17.JAN.2024 11:27:42

802.11n ht20 High Channel -3

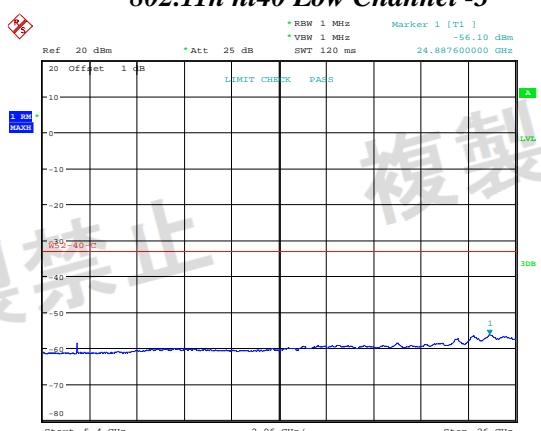
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Date: 22.NOV.2023 14:47:49

802.11n ht40 Low Channel -1

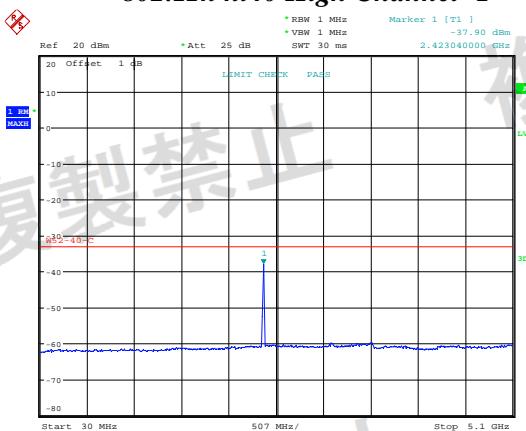
ProjectNo.:CR231165359-RF Tester:Claire Liu
Date: 22.NOV.2023 15:21:07

802.11n ht40 Low Channel -2

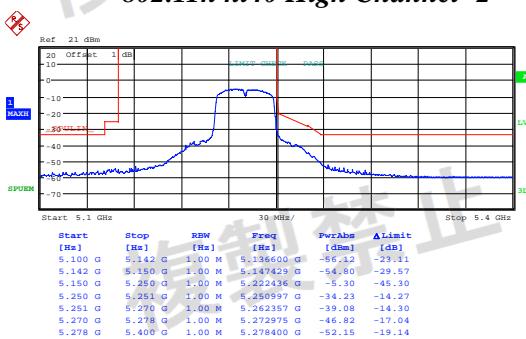
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Date: 18.JAN.2024 10:03:36

802.11n ht40 Low Channel -3

ProjectNo.:CR231165359-RF Tester:Claire Liu
Date: 22.NOV.2023 15:23:23

802.11n ht40 High Channel -1

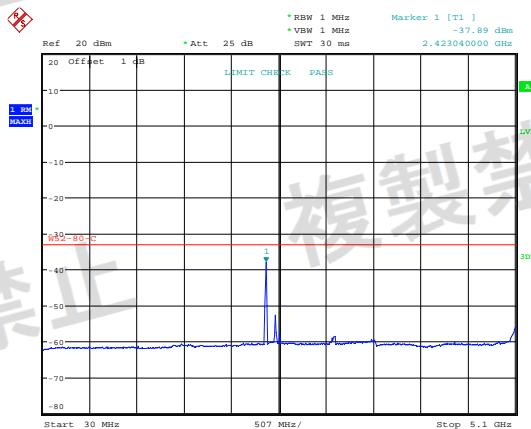
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Date: 22.NOV.2023 15:25:33

802.11n ht40 High Channel -2

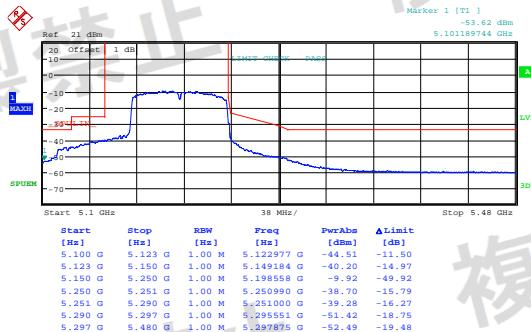
ProjectNo.:CR231165359-RF Tester:LingLing Li
Date: 18.JAN.2024 10:03:00

802.11n ht40 High Channel -3

ProjectNo.:CR231165359-RF Tester:Claire Liu
Date: 22.NOV.2023 15:24:24

802.11ac vht80 Middle Channel -1

ProjectNo.:CR231165359-RF Tester:Claire Liu
Date: 22.NOV.2023 15:27:20

802.11ac vht80 Middle Channel -2

ProjectNo.:CR231165359-RF Tester:LingLing Li
Date: 18.JAN.2024 09:51:15

802.11ac vht80 Middle Channel -3

ProjectNo.:CR231165359-RF Tester:Claire Liu
Date: 22.NOV.2023 15:29:11

4.6 Adjacent Channel Power

Test Result: Compliant, please see the below tables and plots

Test Voltage	Frequency Band	Mode	Frequency offset (MHz)	Result (dBc)			Limit (dBc)
				Low Channel	Middle Channel	High Channel	
NV	W52	802.11 a	-20	39.64	40.07	37.93	≥ 25
			+20	36.80	37.63	36.97	≥ 25
			-40	48.93	49.79	45.19	≥ 40
			+40	48.62	50.52	49.78	≥ 40
		802.11n ht20	-20	40.28	40.11	37.88	≥ 25
			+20	38.58	37.90	37.13	≥ 25
			-40	49.38	49.62	43.66	≥ 40
			+40	50.15	50.59	49.86	≥ 40
		802.11n ht40	-40	35.70	/	33.16	≥ 25
			+40	35.22	/	34.27	≥ 25
			-80	49.00	/	49.17	≥ 40
			+80	50.14	/	50.19	≥ 40
		802.11ac vht80	-80	/	33.82	/	≥ 25
			+80	/	35.51	/	≥ 25

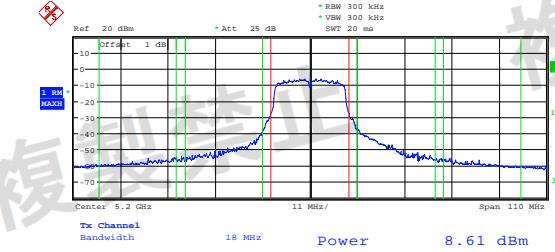
Please refer to the below plots for normal voltage test.

Test Plots for W52 Band:

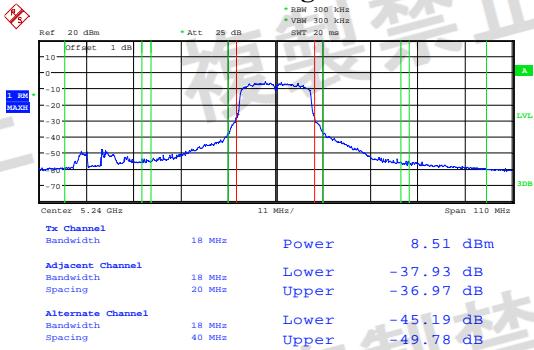
802.11a Low Channel



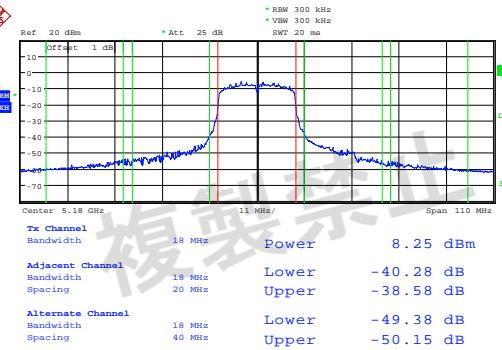
802.11a Middle Channel



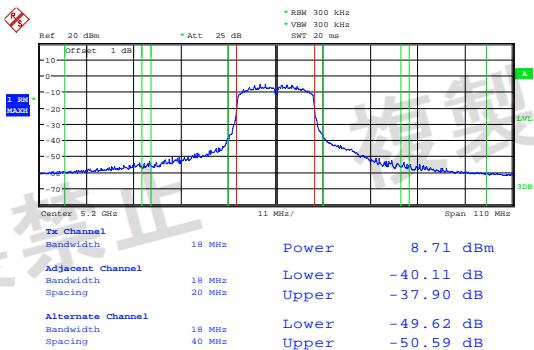
802.11a High Channel



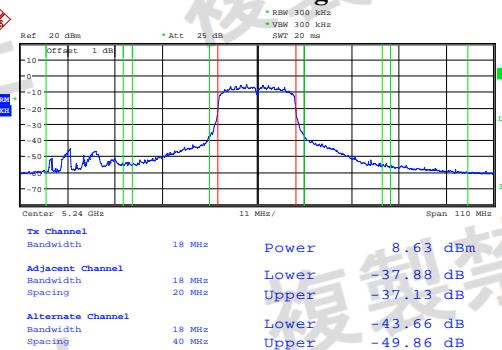
802.11n ht20 Low Channel



802.11n ht20 Middle Channel

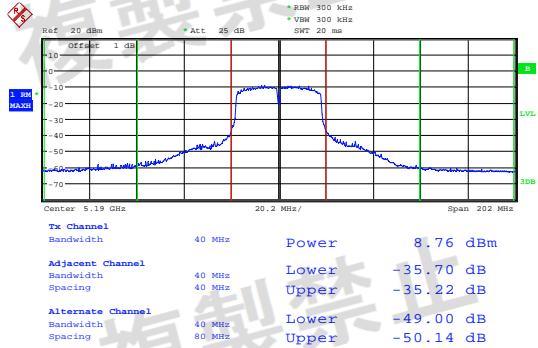
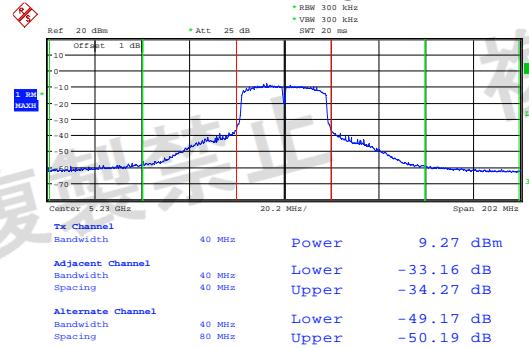


802.11n ht20 High Channel



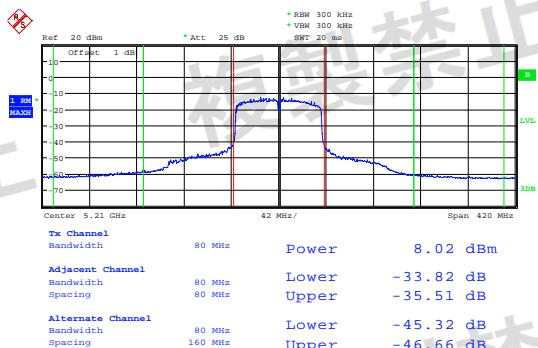
ProjectNo.:CR231165359-RF Tester:Claire Liu
Date: 22.NOV.2023 11:48:46

ProjectNo.:CR231165359-RF Tester:Claire Liu
Date: 22.NOV.2023 11:54:28

802.11n ht40 Low Channel**802.11n ht40 High Channel**

ProjectNo.:CR231165359-RF Tester:Claire Liu
Date: 22.NOV.2023 10:28:58

ProjectNo.:CR231165359-RF Tester:Claire Liu
Date: 22.NOV.2023 10:30:06

802.11ac vht80 Middle Channel

ProjectNo.:CR231165359-RF Tester:Claire Liu
Date: 22.NOV.2023 10:01:01

4.7 Receiver Secondary Radiated Emission Strength

Test Result: Compliant; Test Mode: Receiving

802.11a:

Test Condition	Channel	Test Band (RBW)	Reading		Limit (dBm)	Limit (nW)
			Frequency (MHz)	Amplitude (dBm)		
NV	Low Channel	Band I (100kHz)	914.640	-94.96	-54	4
		Band II (1MHz)	2402.244	-76.49	-47	20
	Middle Channel	Band I (100kHz)	679.900	-95.51	-54	4
		Band II (1MHz)	24878.205	-82.07	-47	20
	High Channel	Band I (100kHz)	930.160	-95.33	-54	4
		Band II (1MHz)	24958.333	-82.20	-47	20

802.11n ht20:

Test Condition	Channel	Test Band (RBW)	Reading		Limit (dBm)	Limit (nW)
			Frequency (MHz)	Amplitude (dBm)		
NV	Low Channel	Band I (100kHz)	679.900	-94.39	-54	4
		Band II (1MHz)	24918.269	-82.04	-47	20
	Middle Channel	Band I (100kHz)	468.440	-94.51	-54	4
		Band II (1MHz)	2402.244	-78.03	-47	20
	High Channel	Band I (100kHz)	452.920	-95.10	-54	4
		Band II (1MHz)	24878.205	-81.94	-47	20

802.11n ht40:

Test Condition	Channel	Test Band (RBW)	Reading		Limit (dBm)	Limit (nW)
			Frequency (MHz)	Amplitude (dBm)		
NV	Low Channel	Band I (100kHz)	821.520	-95.02	-54	4
		Band II (1MHz)	24918.269	-82.26	-47	20
	High Channel	Band I (100kHz)	743.920	-95.00	-54	4
		Band II (1MHz)	2402.244	-77.89	-47	20

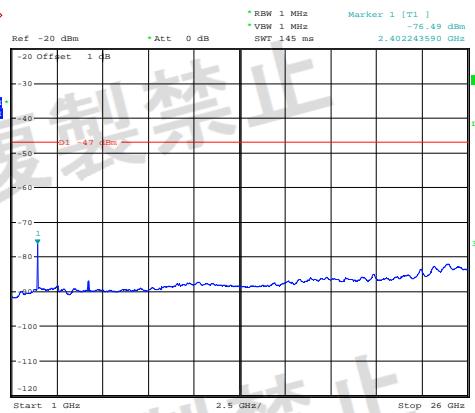
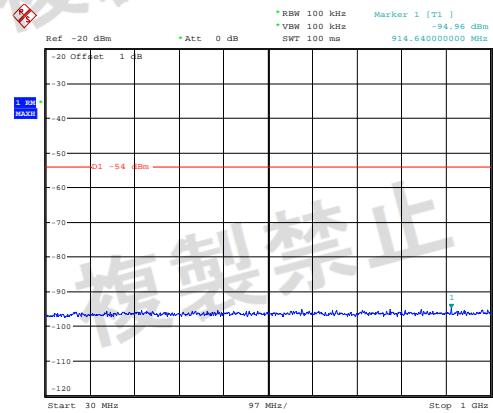
802.11ac vht80:

Test Condition	Channel	Test Band (RBW)	Reading		Limit (dBm)	Limit (nW)
			Frequency (MHz)	Amplitude (dBm)		
NV	Middle Channel	Band I (100kHz)	939.860	-95.15	-54	4
		Band II (1MHz)	24878.205	-82.02	-47	20

Please refer to the plots for normal voltage test:

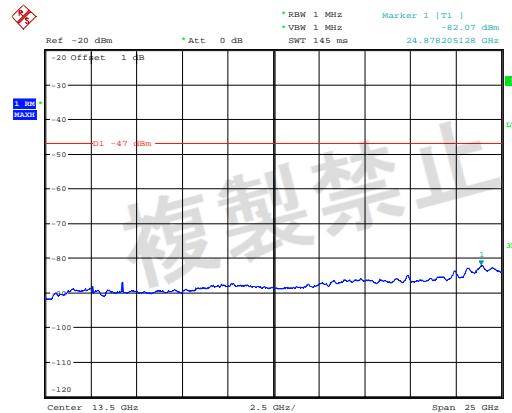
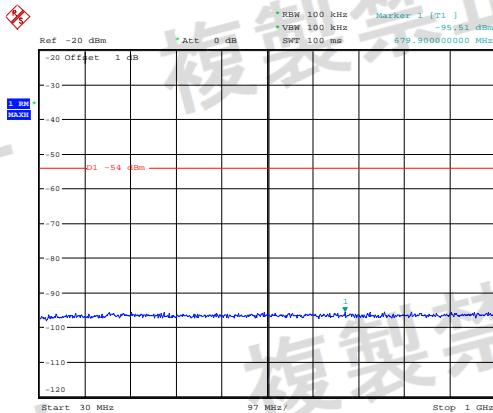
Note: Antenna gain is 0 dB_i, so the result shall add 0 dB and compliant the limit. All test performed at low, normal and high voltage, please refer to the following plots for normal voltage test:

802.11a Low Channel



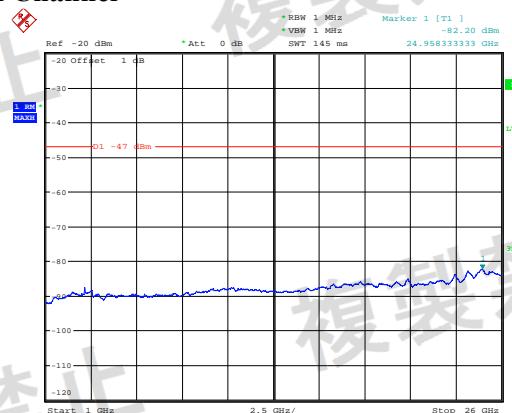
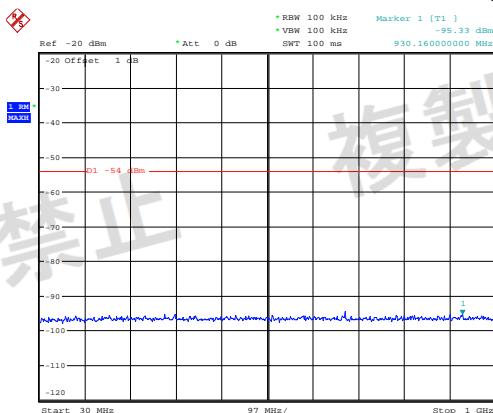
ProjectNo.:CR231165359-RF Tester:Claire Liu
Date: 22.NOV.2023 16:04:16

802.11a Middle Channel



ProjectNo.:CR231165359-RF Tester:Claire Liu
Date: 22.NOV.2023 16:06:06

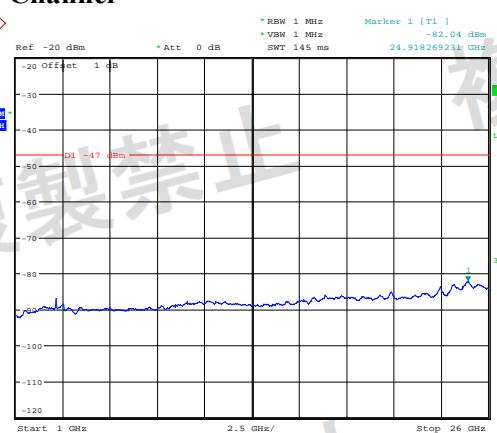
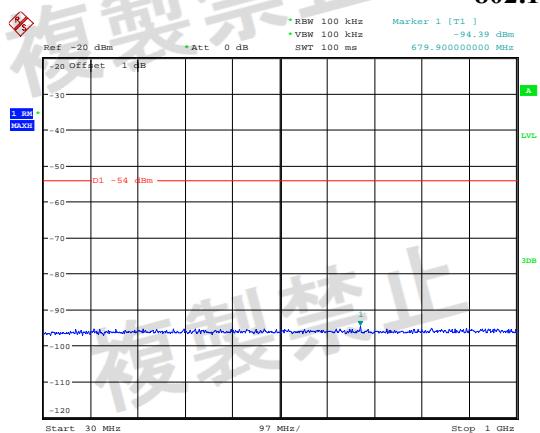
802.11a High Channel



ProjectNo.:CR231165359-RF Tester:Claire Liu
Date: 22.NOV.2023 16:07:53

ProjectNo.:CR231165359-RF Tester:Claire Liu
Date: 22.NOV.2023 16:07:30

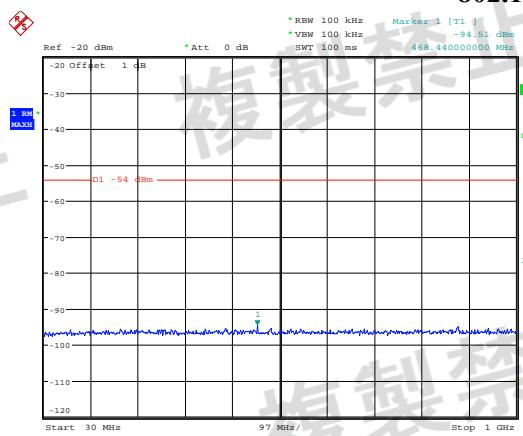
802.11n ht20 Low Channel



ProjectNo.:CR231165359-RF Tester:Claire Liu
Date: 22.NOV.2023 16:08:40

ProjectNo.:CR231165359-RF Tester:Claire Liu
Date: 22.NOV.2023 16:09:04

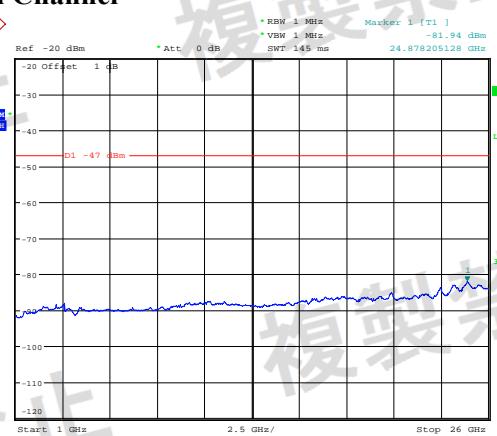
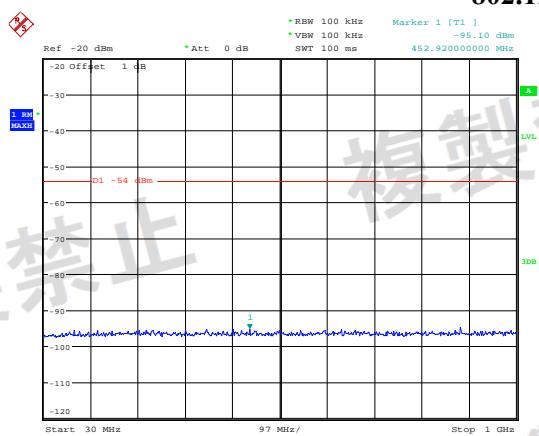
802.11n ht20 Middle Channel



ProjectNo.:CR231165359-RF Tester:Claire Liu
Date: 22.NOV.2023 16:09:49

ProjectNo.:CR231165359-RF Tester:Claire Liu
Date: 22.NOV.2023 16:09:29

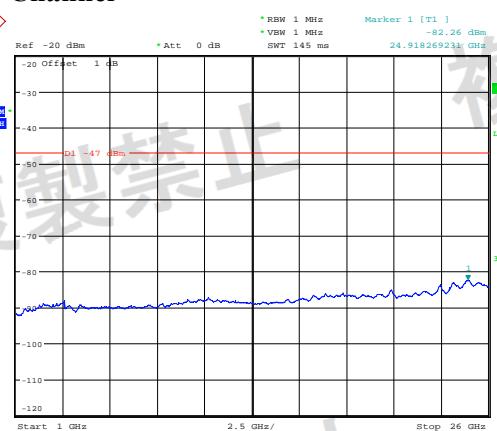
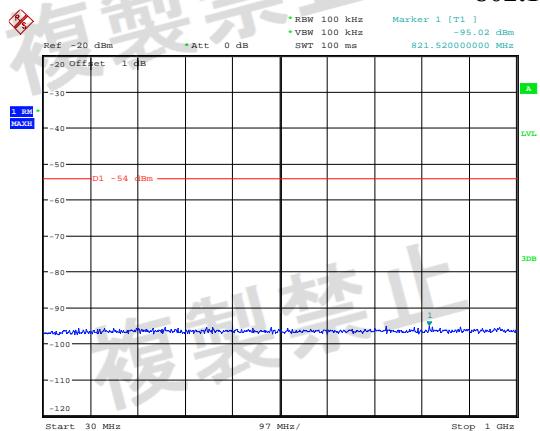
802.11n ht20 High Channel



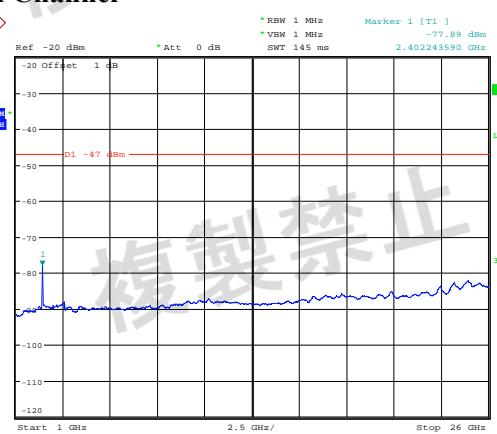
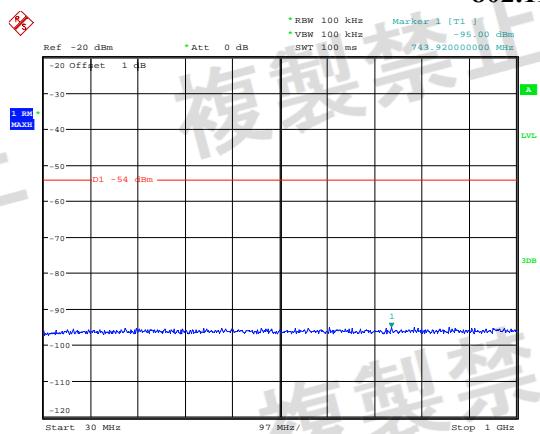
ProjectNo.:CR231165359-RF Tester:Claire Liu
Date: 22.NOV.2023 16:10:30

ProjectNo.:CR231165359-RF Tester:Claire Liu
Date: 22.NOV.2023 16:10:51

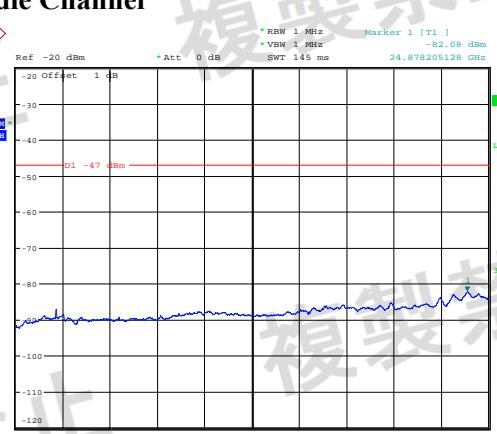
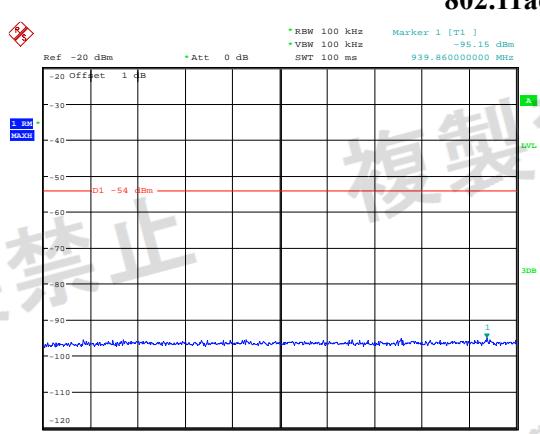
802.11n ht40 Low Channel



802.11n ht40 High Channel



802.11ac vht80 Middle Channel

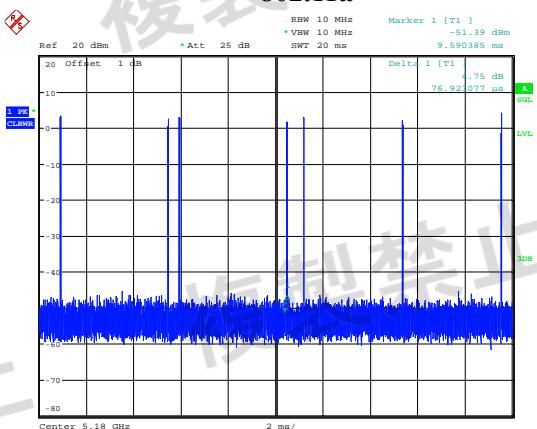


4.8 Transmission Burst Length

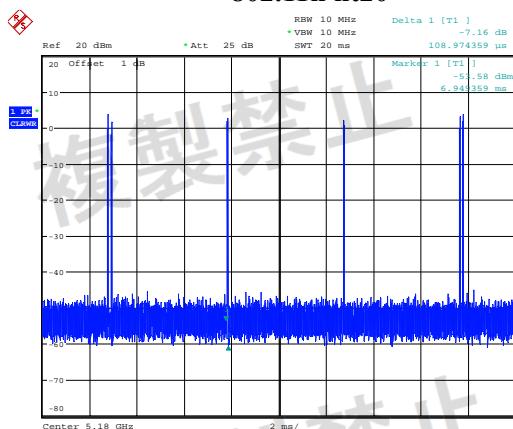
Test Result: Compliant

Test Mode	Test Frequency (MHz)	Transmission Burst Length (ms)	Limit (ms)	Result
802.11a	5180	0.048	≤ 8	Pass
802.11n ht20	5180	0.048	≤ 8	Pass
802.11n ht40	5190	0.048	≤ 8	Pass
802.11ac vht80	5210	0.048	≤ 8	Pass

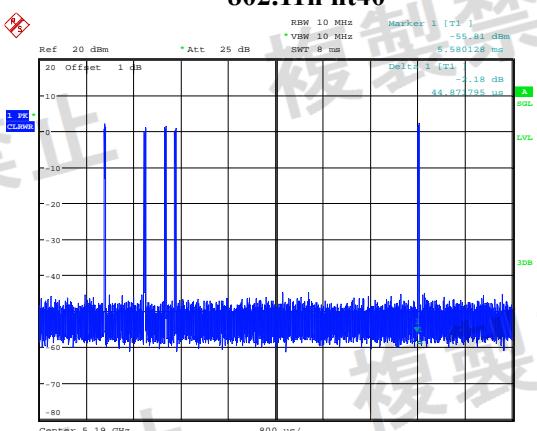
802.11a



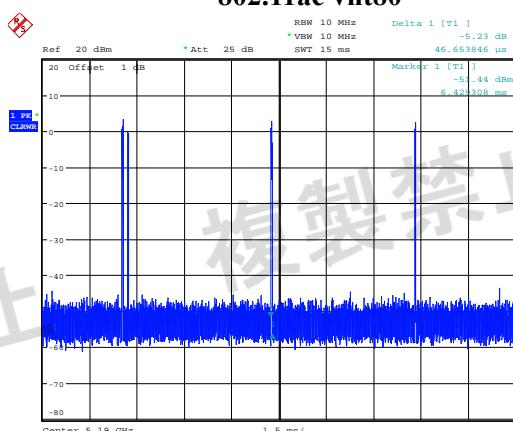
802.11n ht20



802.11n ht40



802.11ac vht80



5. EUT PHOTOGRAPHS

Please refer to the attachment CR231165359-EXP EUT EXTERNAL PHOTOGRAPHS and CR231165359-INP EUT INTERNAL PHOTOGRAPHS

6. TEST SETUP PHOTOGRAPHS

Please refer to the attachment CR231165359-07C-TSP TEST SETUP PHOTOGRAPHS.

***** END OF REPORT *****

TEST SETUP PHOTOGRAPHS

Test Setup photo

