

TEST REPORT

Reference No...... : WTS18S04109771-2W
Applicant..... : Winstars Technology Limited
Address..... : Block 4, TaiSong Industrial Park, DaLang Street, LongHua Town,
Bao'an district,Shenzhen, China
Manufacturer : Winstars Technology Limited
Address..... : Block 4, TaiSong Industrial Park, DaLang Street, LongHua Town,
Bao'an district,Shenzhen, China
Factory : SHENZHEN SINOBY ELECTRONICS CO., LTD.
Address..... : 1/F-5/F, No.5, Taisong Industrial Park, Dalang Community, Dalang
Office Longhua District, Shenzhen, Guangdong, China
Product Name..... : Wireless AC1200 Router
Model No...... : WS-WN535G3R, WL-WN535G3R, halo1, halo3, halo5, halo7
Brand Name..... : N/A
Standards..... : Article 2 Section 1 No.19-3
Date of Receipt sample : 2018-04-28
Date of Test : 2018-04-28 to 2018-06-01
Date of Issue..... : 2018-06-01
Test Result..... : **Pass**

Remarks:

The results shown in this test report refer only to the sample(s) tested, this test report cannot be reproduced, except in full, without prior written permission of the company.

The report would be invalid without specific stamp of test institute and the signatures of compiler and approver.

Prepared By:

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2 Laboratories Introduction

Waltek Services (Shenzhen) Co., Ltd is a professional third-party testing and certification laboratory with multi-year product testing and certification experience, established strictly in accordance with ISO/IEC 17025 requirements, and accredited by ILAC (International Laboratory Accreditation Cooperation) member. A2LA (American Association for Laboratory Accreditation) of USA, Meanwhile, Waltek has got recognition as registration and accreditation laboratory from EMSD (Electrical and Mechanical Services Department), and American Energy star, FCC(The Federal Communications Commission), CEC(California energy efficiency), IC(Industry Canada). It's the strategic partner and data recognition laboratory of international authoritative organizations, such as Intertek(ETL-SEMKO), TÜV Rheinland, TÜV SÜD, etc.



Waltek Services (Shenzhen) Co., Ltd is one of the largest and the most comprehensive third party testing laboratory in China. Our test capability covered four large fields: safety test. ElectroMagnetic Compatibility(EMC), and energy performance, wireless radio. As a professional, comprehensive, justice international test organization, we still keep the scientific and rigorous work attitude to help each client satisfy the international standards and assist their product enter into globe market smoothly.

2.1 Test Facility

A. Accreditations for Conformity Assessment (International)

Country/Region	Accreditation Body	Scope	Note
USA	A2LA (Certificate No.: 4243.01)	FCC ID \ DOC \ VOC	1
Canada		IC ID \ VOC	2
Japan		MIC-T \ MIC-R	-
Europe		EMCD \ RED	-
Taiwan		NCC	-
Hong Kong		OFCA	-
Australia		RCM	-
India	International Services	WPC	-
Thailand		NTC	-
Singapore		IDA	-
Note:			
1. FCC Designation No.: CN1201. Test Firm Registration No.: 523476.			
2. IC Canada Registration No.: 7760A			

B.TCBs and Notify Bodies Recognized Testing Laboratory.

Recognized Testing Laboratory of ...	Notify body number
TUV Rheinland	Optional.
Intertek	
TUV SUD	
SGS	
Phoenix Testlab GmbH	0700
Element Materials Technology Warwick Ltd	0891
Timco Engineering, Inc.	1177
Eurofins Product Service GmbH	0681

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4 Report Revision History

Test report No.	Date of Receipt sample	Date of Test	Date of Issue	Purpose	Comment	Approved
WTS18S04109 771-2W	2018-04-28	2018-04-28 to 2018-06-01	2018-06-01	original	-	Valid

5 General Information

5.1 General Description of E.U.T

Product Name:	Wireless AC1200 Router
Model No.:	WS-WN535G3R, WL-WN535G3R, halo1, halo3, halo5, halo7
Model difference description:	Only the model names are different.
Type of Modulation:	IEEE for 802.11a: OFDM(BPSK/QPSK/16QAM/64QAM) IEEE for 802.11n : OFDM(BPSK/QPSK/16QAM/64QAM) IEEE for 802.11ac : OFDM (BPSK/QPSK/16QAM/64QAM/256QAM)
Frequency Range:	IEEE 802.11a/n(HT20/40)/ac(VHT20/40/80): 5150MHz to 5250MHz
Antenna Gain:	ANT3, ANT4: 2.53dBi
Antenna installation:	Integrated Antenna
Hardware Version:	WS-WN535G3-B-V1.2
Software Version:	M35G3R.V5030.180402

5.2 Details of E.U.T

Ratings:	Input: DC 5V 2A
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5.3 Channel List

Channel No.	Frequency (MHz)	Channel No.	Frequency (MHz)	Channel No.	Frequency (MHz)	Channel No.	Frequency (MHz)
36	5180	38	5190	40	5200	42	5210
44	5220	46	5230	48	5240	-	-

5.4 General condition

Ambient Condition: 25.5 °C 58 %RH

5.4.1 Environmental condition of test site

A power supply with the rated voltage and also the rated voltage +10% shall be used. However when it was confirmed that input voltage variation at the radio unit (except power supply section) in the radio equipment to be tested is less than +1% against a variation of +10% at the input voltage from the external power supply to the radio equipment, the test may be done for the rated voltage only and when the radio equipment was designed so as to be operated in a specified voltage variation limit within +10%, and which is indicated in the installation specification with the upper and the lower limits, the test shall be done for the rated voltage and the specified upper and lower limits of voltage.

Test Voltage	Input voltage of EUT	Input voltage of RF module	Tolerances
Rated voltage-10%	AC 90V	DC 3.3V	0%
Rated voltage	AC 100V	DC 3.3V	/
Rated voltage+10%	AC 110V	DC 3.3V	0%
Rated voltage-10% for DC	DC 4.5V	DC 3.3V	0%
Rated voltage for DC	DC 5V	DC 3.3V	/
Rated voltage+10% for DC	DC 5.5V	DC 3.3V	0%
<p>Remark:</p> <p>The EUT was pretested three voltages, rated power-10%,rated power and rated power+10%,and all the voltages just the same. so the following test are conducted at rated voltage only.</p> <p>The regulator voltage IC is MT7620A</p> <p>Only the worst case(Rated voltage+10% ANT3) were record in the report.The max.data transfer rate identical for all models.</p>			

5.4.2 Test Mode

All test mode(s) and condition(s) mentioned were considered and evaluated respectively by performing full tests, only the worst data ANT3 were recorded and reported.

Test mode	Low channel	Middle channel	High channel
Transmitting(802.11a/n/ac)	5180MHz	5200MHz	5240MHz
Transmitting(802.11n/ac)	5190MHz	-	5230MHz
Transmitting(802.11ac)	5210MHz	-	-
Receiving(802.11a/n/ac)	5180MHz	5200MHz	5240MHz
Receiving(802.11n/ac)	5190MHz	-	5230MHz
Transmitting(802.11ac)	5210MHz	-	-

5.5 Construction of Test Equipment Calibration

All the test equipments used are valid and calibrated by GUANG ZHOU GRG METROLOGY & TEST CO., LTD. address is No.163, Pingyun Rd. West of Huangpu Ave, Tianhe District, Guangzhou, Guangdong, China.

5.6 Test Equipment

Item	Equipment	Manufacturer	Model No.	Serial No.	Last Calibration Date	Calibration Due Date
1	EXA Signal Analyzer	Malaysia Keysight	N9010A	MY50520207	2018-04-27	2019-04-26
2	Spectrum Analyzer	R&S	FSL6	100959	2017-09-11	2018-09-10
3	DC power supply	Agilent	E3640A	MY40006693	2018-04-17	2019-04-16
4	Temperature & Humidity Chamber	Agilent	TH-1P-B	WIT-05121302	2017-10-14	2018-10-13
5	Temperature/ Humidity Meter	Agilent	ZC1-2	TR7-TH	2018-05-26	2019-05-25
6.	EXG Analog Signal Generator	Keysight	N5171B	MY53050845503	2017-09-11	2018-09-10

6 Test Summary

Test Item	Result
Transmitting equipment	
Antenna Power	PASS
Tolerances for Antenna Power	PASS
Frequency Tolerance	PASS
Equivalent Isotropic Radiated Power	PASS
Transmission Rate	PASS
Transmission Burst Length	PASS
Unwanted Emissions Strength	PASS
Adjacent Channel Emitted Power	PASS
Out-band Leakage Power	PASS
Occupied Frequency Bandwidth	PASS
Receiving equipment	
Secondary Radiated Emissions	PASS
Controlling equipment	
Interference prevention function	PASS
Carrier Sensing Function	PASS
N/A is an abbreviation for Not Applicable.	

7 Measurements of Transmitting Equipment

7.1 Antenna Power and Antenna Power Tolerances

7.1.1 Test Requirement

Article 2-1.

7.1.2 Limit

Antenna power of those using OFDM etc modulation scheme, the average power in the bandwidth of 1MHz is not more than 10 mW for HT20 and 5mW for HT40.

7.1.3 Test Result

ANT1:

Modulation	Channel	Antenna Power (dBm/MHz)	Test Result for Antenna Power (mW/MHz)	Antenna power Limit ((10mW/MHz)	Declared Antenna Power (mW/MHz)	Tolerance(%)
802.11a	Low	1.41	1.38	10	1.38	0.00
	Middle	1.31	1.35	10	1.38	-0.02
	High	1.41	1.38	10	1.38	-0.00
802.11n-HT20	Low	1.36	1.37	10	1.39	-0.02
	Middle	1.27	1.34	10	1.39	-0.04
	High	1.44	1.39	10	1.39	0.00
802.11ac-VHT20	Low	1.15	1.30	10	1.33	-0.02
	Middle	1.19	1.31	10	1.33	-0.02
	High	1.25	1.33	10	1.33	0.00
802.11n-HT40	Low	-3.68	0.43	5	0.43	0.00
	High	-3.77	0.42	5	0.42	0.00
802.11ac-VHT40	Low	-3.88	0.41	5	0.41	0.00
	High	-3.90	0.41	5	0.41	0.00
802.11ac-VHT80	Low	-5.96	0.25	2.5	0.25	0.00

ANT2:

Modulation	Channel	Antenna Power (dBm/MHz)	Test Result for Antenna Power (mW/MHz)	Antenna power Limit ((10mW/MHz)	Declared Antenna Power (mW/MHz)	Tolerance(%)
802.11a	Low	1.36	1.37	10	1.39	-0.02
	Middle	1.42	1.39	10	1.39	0.00
	High	1.34	1.36	10	1.39	-0.02
802.11n-HT20	Low	1.23	1.33	10	1.37	-0.03
	Middle	1.36	1.37	10	1.37	0.00
	High	1.32	1.36	10	1.37	-0.01
802.11ac-VHT20	Low	1.44	1.39	10	1.44	-0.03
	Middle	1.36	1.37	10	1.44	-0.05
	High	1.58	1.44	10	1.44	0.00
802.11n-HT40	Low	-3.67	0.43	5	0.43	0.00
	High	-3.82	0.42	5	0.43	-0.03
802.11ac-VHT40	Low	-3.70	0.43	5	0.43	0.00
	High	-3.82	0.41	5	0.41	0.00
802.11ac-VHT80	Low	-6.02	0.25	2.5	0.25	0.00

ANT1+ANT2:

Modulation	Channel	Test Result for Antenna Power (mW/MHz)	Antenna power Limit ((10mW/MHz)	Declared Antenna Power (mW/MHz)	Tolerance(%)
802.11a	Low	2.75	10	2.75	0.00
	Middle	2.74	10	2.75	-0.00
	High	2.74	10	2.75	-0.00
802.11n-HT20	Low	2.70	10	2.75	-0.02
	Middle	2.71	10	2.75	-0.01
	High	2.75	10	2.75	0.00
802.11ac-VHT20	Low	2.69	10	2.77	-0.03
	Middle	2.68	10	2.77	-0.03
	High	2.77	10	2.77	0.00
802.11n-HT40	Low	0.86	5	0.86	0.00
	High	0.84	5	0.86	-2.33
802.11ac-VHT40	Low	0.84	5	0.84	0.00
	High	0.82	5	0.84	-2.38
802.11ac-VHT80	Low	0.50	2.5	0.50	0.00

7.2 Frequency Tolerance

7.2.1 Test Requirement

Article 2-1.

7.2.2 Limit

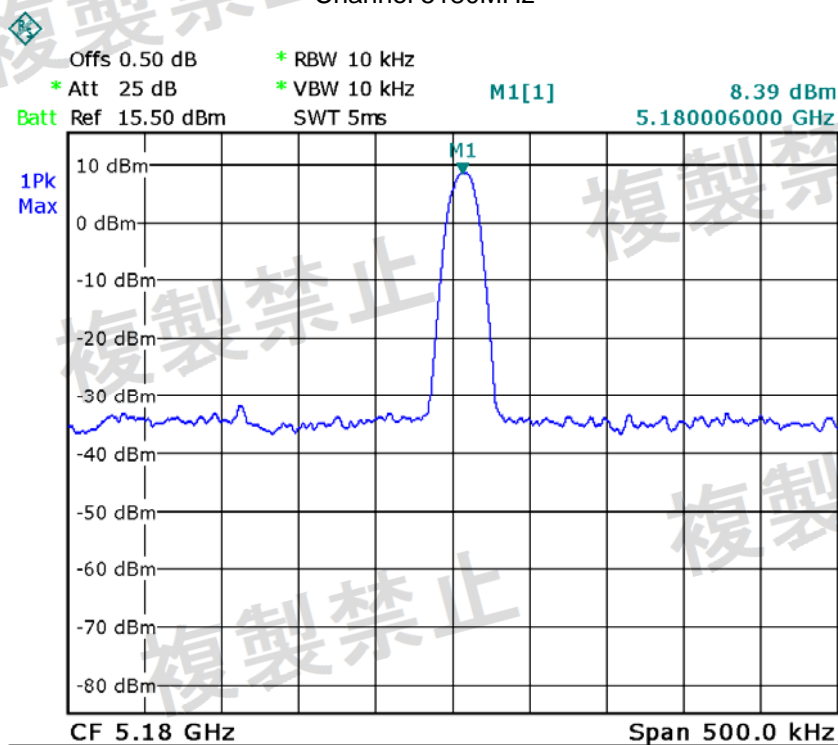
According to Article 2-1, the Tolerance of frequency: $\pm 20 \times 10^{-6}$.

7.2.3 Test Result

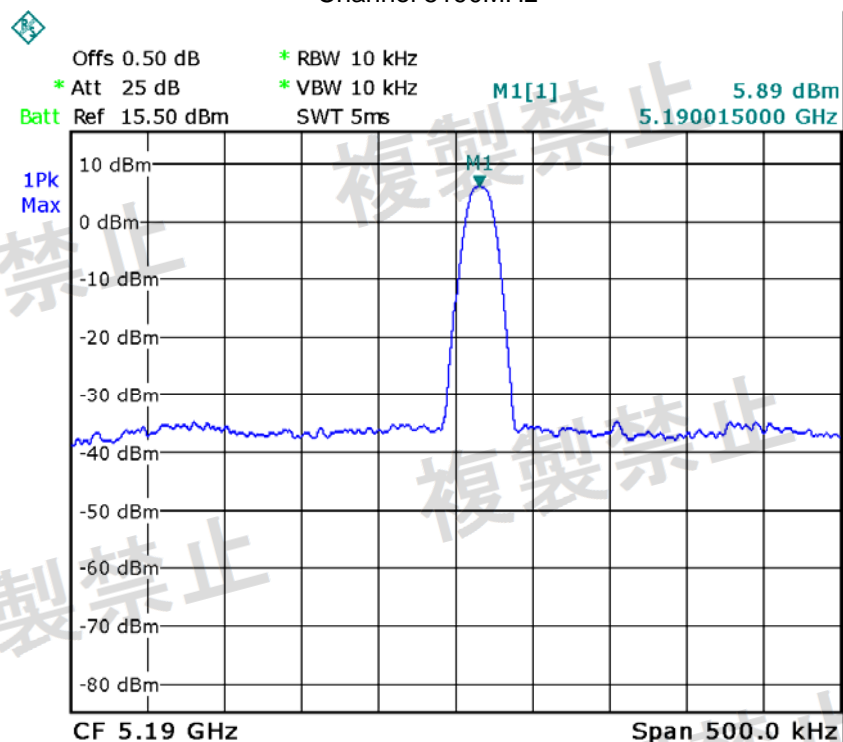
Frequency (MHz)	Result (MHz)	Tolerance (kHz)	Tolerance (ppm)	Limit
5180	5180.006	6	1.16	± 20
5190	5190.015	15	2.89	± 20
5200	5200.013	13	2.50	± 20
5210	5209.995	-5	-0.96	± 20
5230	5230.009	9	1.72	± 20
5240	5240.021	21	4.01	± 20

Test Plots

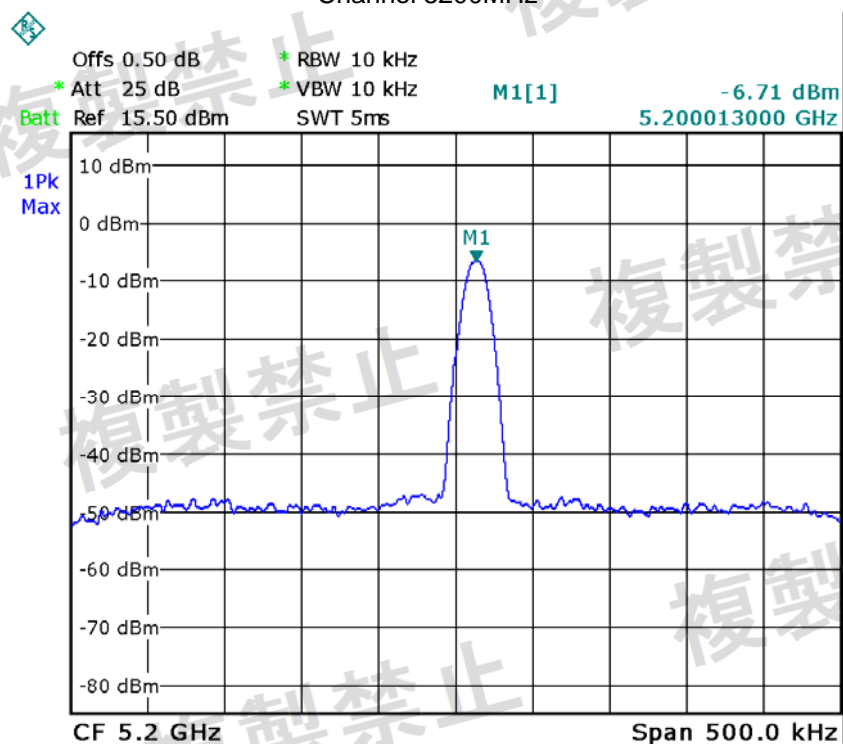
Channel 5180MHz



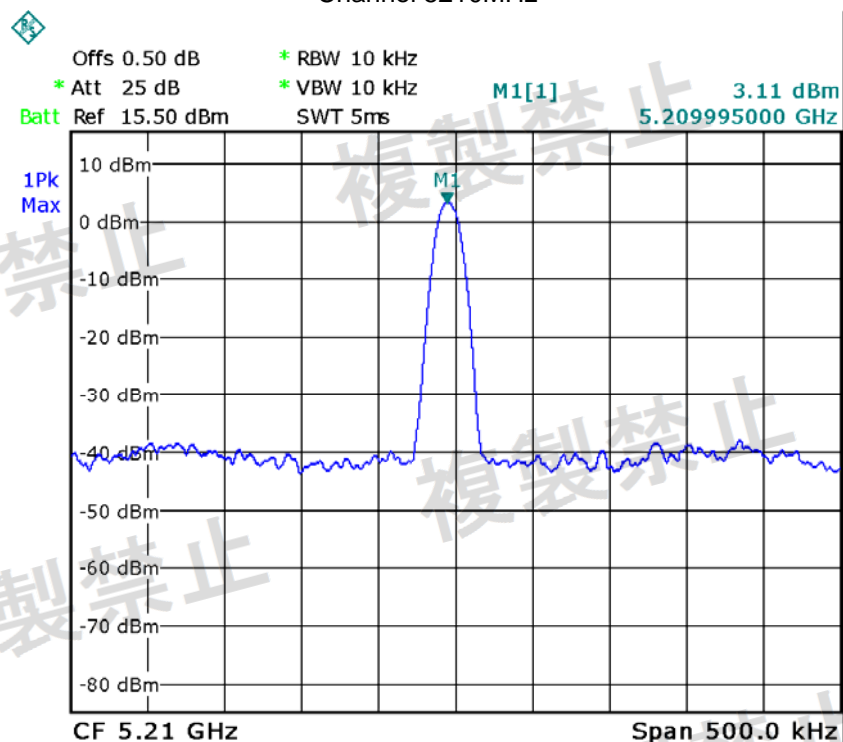
Channel 5190MHz



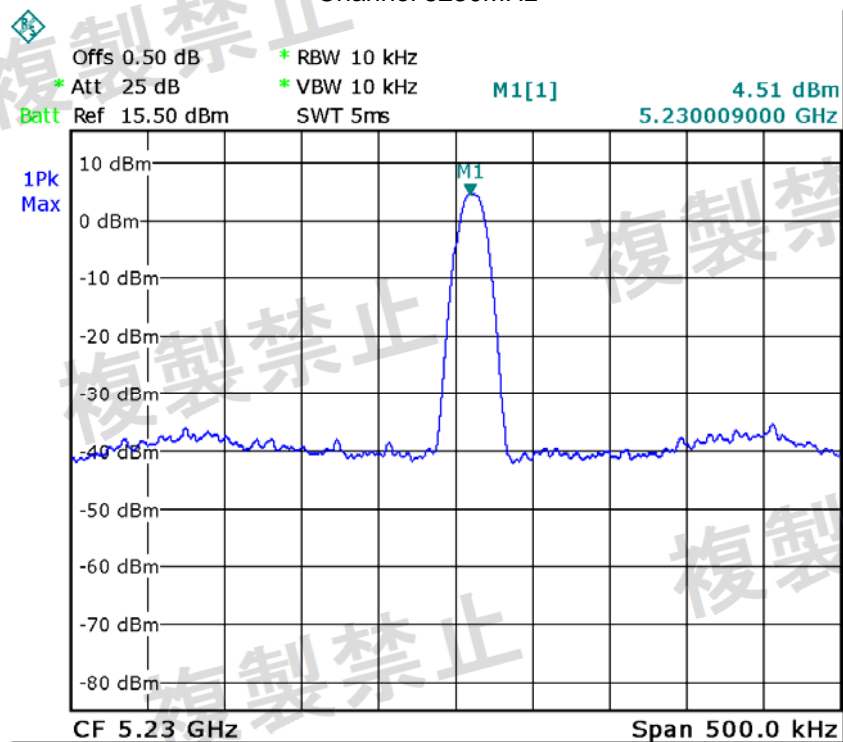
Channel 5200MHz

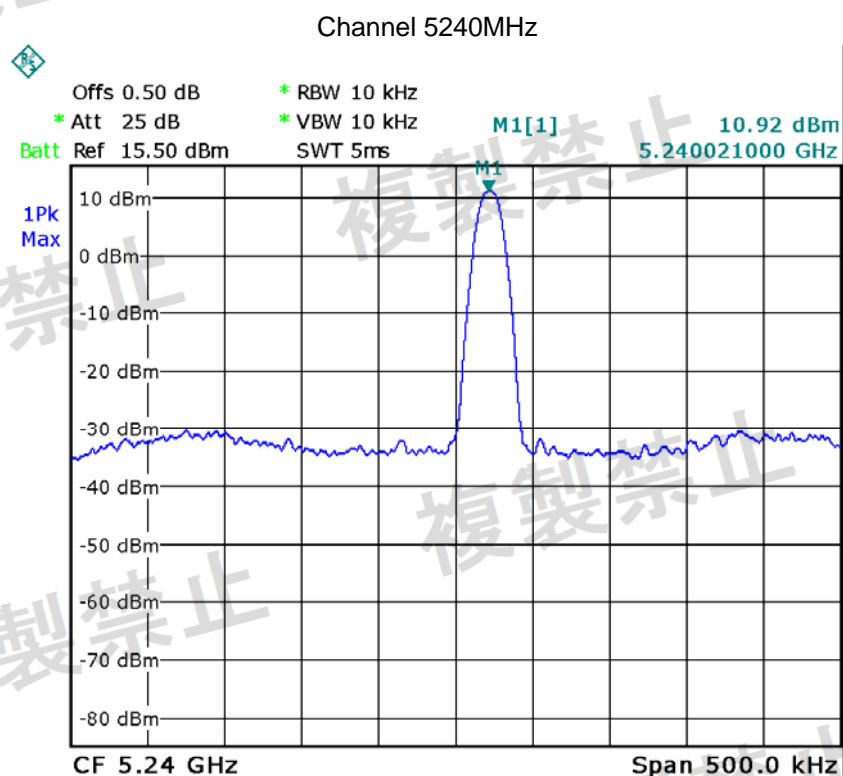


Channel 5210MHz



Channel 5230MHz





7.3 Equivalent Isotropic Radiated Power

7.3.1 Test Requirement

Article 2-1.

7.3.2 Limit

According to Article 2-1, It equivalent isotropic radiated power in the bandwidth of 1MHz are as follows. However, there is a transitional measure.

a, Use radio waves in the frequency of 5,180 MHz ; 5,200 MHz; 5,220MHz or 5,240MHz, the isotropic radiated power should be 10mW or less for HT20 and 5mW or less for HT40;

7.3.3 Test Result

802.11a

Frequency	Receiver Reading	Turn table Angle	RX Antenna		Substituted			Absolute Level		
			Height	Polar	SG Level	Cable	Antenna Gain		Limit	Margin
(MHz)	(dBμV)	Degree	(m)	(H/V)	(dBm)	(dB)	(dB)	(dBm)	(dBm)	(dB)
Low channel 5180MHz										
5180	93.96	345	1.21	H	-1.30	2.81	12.80	8.69	10	-1.31
5180	93.87	99	1.53	V	-1.39	2.81	12.80	8.60	10	-1.40
Middle channel 5200MHz										
5200	93.52	349	1.45	H	-1.74	2.81	12.80	8.25	10	-1.75
5200	93.41	85	1.51	V	-1.85	2.81	12.80	8.14	10	-1.86
High Channel 5240MHz										
5240	93.87	63	1.89	H	-1.39	2.81	12.80	8.60	10	-1.40
5240	93.86	301	1.54	V	-1.40	2.81	12.80	8.59	10	-1.41

802.11n-HT20

Frequency	Receiver Reading	Turn table Angle	RX Antenna		Substituted			Absolute Level		
			Height	Polar	SG Level	Cable	Antenna Gain		Limit	Margin
(MHz)	(dBμV)	Degree	(m)	(H/V)	(dBm)	(dB)	(dB)	(dBm)	(dBm)	(dB)
Low channel 5180MHz										
5180	94.01	26	1.35	H	-1.25	2.81	12.80	8.74	10	-1.26
5180	93.99	197	1.22	V	-1.27	2.81	12.80	8.72	10	-1.28
Middle channel 5200MHz										
5200	93.41	303	1.97	H	-1.85	2.81	12.80	8.14	10	-1.86
5200	93.40	310	1.18	V	-1.86	2.81	12.80	8.13	10	-1.87
High Channel 5240MHz										
5240	93.98	261	1.99	H	-1.28	2.81	12.80	8.71	10	-1.29
5240	93.84	187	1.67	V	-1.42	2.81	12.80	8.57	10	-1.43

802.11ac-VHT20

Frequency	Receiver Reading	Turn table Angle	RX Antenna		Substituted			Absolute Level		
			Height	Polar	SG Level	Cable	Antenna Gain		Limit	Margin
(MHz)	(dBμV)	Degree	(m)	(H/V)	(dBm)	(dB)	(dB)	(dBm)	(dBm)	(dB)
Low channel 5180MHz										
5180	92.93	215	1.74	H	-2.33	2.81	12.80	7.66	10	-2.34
5180	92.96	58	1.46	V	-2.30	2.81	12.80	7.69	10	-2.31
Middle channel 5200MHz										
5200	92.45	3	1.34	H	-2.81	2.81	12.80	7.18	10	-2.82
5200	92.40	313	1.59	V	-2.86	2.81	12.80	7.13	10	-2.87
High Channel 5240MHz										
5240	92.33	303	1.34	H	-2.93	2.81	12.80	7.06	10	-2.94
5240	92.33	291	1.51	V	-2.93	2.81	12.80	7.06	10	-2.94

802.11n-HT40

Frequency	Receiver Reading	Turn table Angle	RX Antenna		Substituted			Absolute Level	Limit	Margin
			Height	Polar	SG Level	Cable	Antenna Gain			
(MHz)	(dBμV)	Degree	(m)	(H/V)	(dBm)	(dB)	(dB)	(dBm)	(dBm)	(dB)
Low channel 5190MHz										
5190	89.19	6	1.49	H	-6.07	2.83	12.90	4.00	5	-1.00
5190	89.10	273	1.59	V	-6.16	2.83	12.90	3.91	5	-1.09
Middle channel 5230MHz										
5230	89.29	68	1.95	H	-5.97	2.83	12.90	4.10	5	-0.90
5230	89.25	114	1.46	V	-6.01	2.83	12.90	4.06	5	-0.94

802.11ac-VHT40

Frequency	Receiver Reading	Turn table Angle	RX Antenna		Substituted			Absolute Level	Limit	Margin
			Height	Polar	SG Level	Cable	Antenna Gain			
(MHz)	(dBμV)	Degree	(m)	(H/V)	(dBm)	(dB)	(dB)	(dBm)	(dBm)	(dB)
Low channel 5190MHz										
5190	88.76	35	1.73	H	-6.50	2.83	12.90	3.57	5	-1.43
5190	88.76	259	1.36	V	-6.50	2.83	12.90	3.57	5	-1.43
Middle channel 5230MHz										
5230	89.63	337	1.52	H	-5.63	2.83	12.90	4.44	5	-0.56
5230	89.54	288	1.87	V	-5.72	2.83	12.90	4.35	5	-0.65

802.11ac-VHT80

Frequency	Receiver Reading	Turn table Angle	RX Antenna		Substituted			Absolute Level	Limit	Margin
			Height	Polar	SG Level	Cable	Antenna Gain			
(MHz)	(dBμV)	Degree	(m)	(H/V)	(dBm)	(dB)	(dB)	(dBm)	(dBm)	(dB)
Low channel 5210MHz										
5210	85.45	143	1.16	H	-9.81	2.83	12.90	0.26	2.5	-2.24
5210	85.59	155	1.01	V	-9.67	2.83	12.90	0.40	2.5	-2.10

7.4 Occupied Frequency Bandwidth

7.4.1 Test Requirement

Article 2-1.

7.4.2 Limit

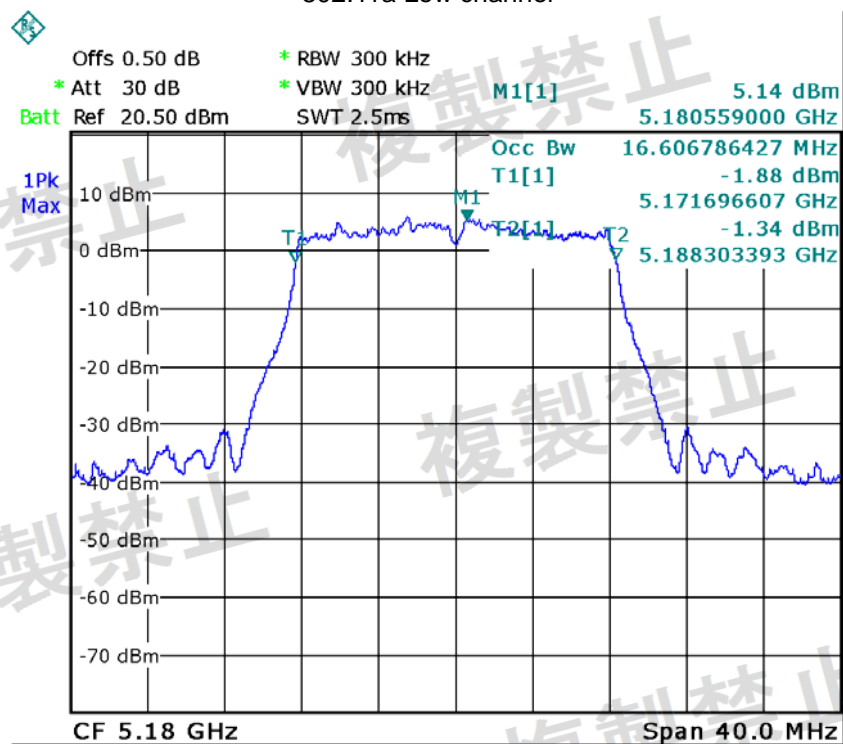
According to Article 2-1, permissible value for occupied bandwidth shall be HT20 mode of OCW should be 19MHz or less, for HT40 mode of OCW should be 38MHz or less.

7.4.3 Test Result

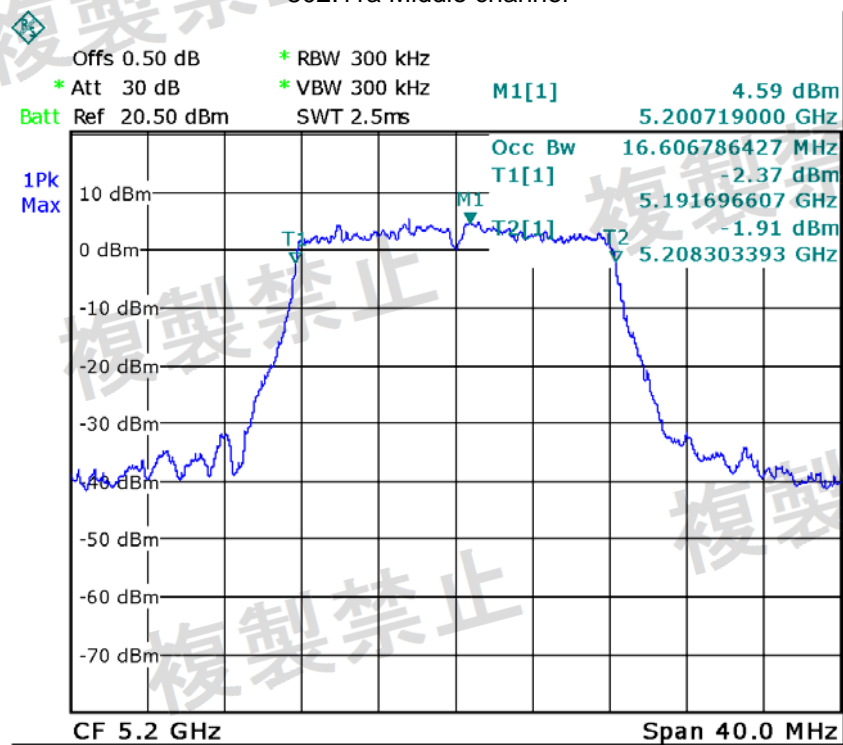
Modulation	Channel	Occupied Frequency Bandwidth (MHz)	Limit (MHz)
802.11a	Low	16.607	< 19
	Middle	16.607	< 19
	High	16.527	< 19
802.11n-HT20	Low	17.565	< 19
	Middle	17.565	< 19
	High	17.565	< 19
802.11ac-VHT20	Low	17.565	< 19
	Middle	17.565	< 19
	High	17.485	< 19
802.11n-HT40	Low	36.088	< 38
	High	36.886	< 38
802.11ac-VHT40	Low	37.643	< 38
	High	36.886	< 38
802.11ac-VHT80	Low	77.605	< 78

Test Plots

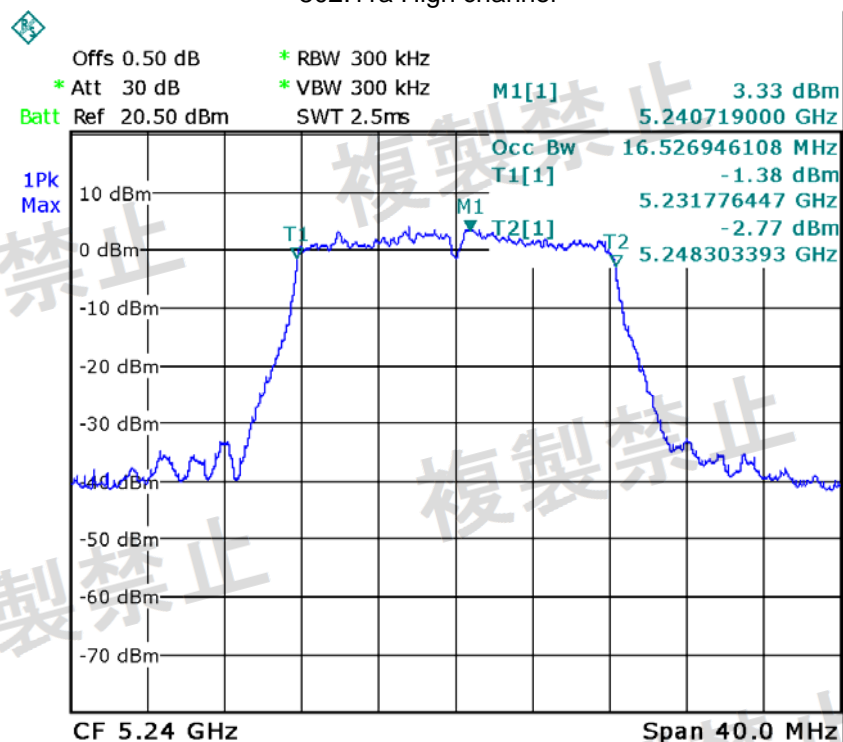
802.11a Low channel



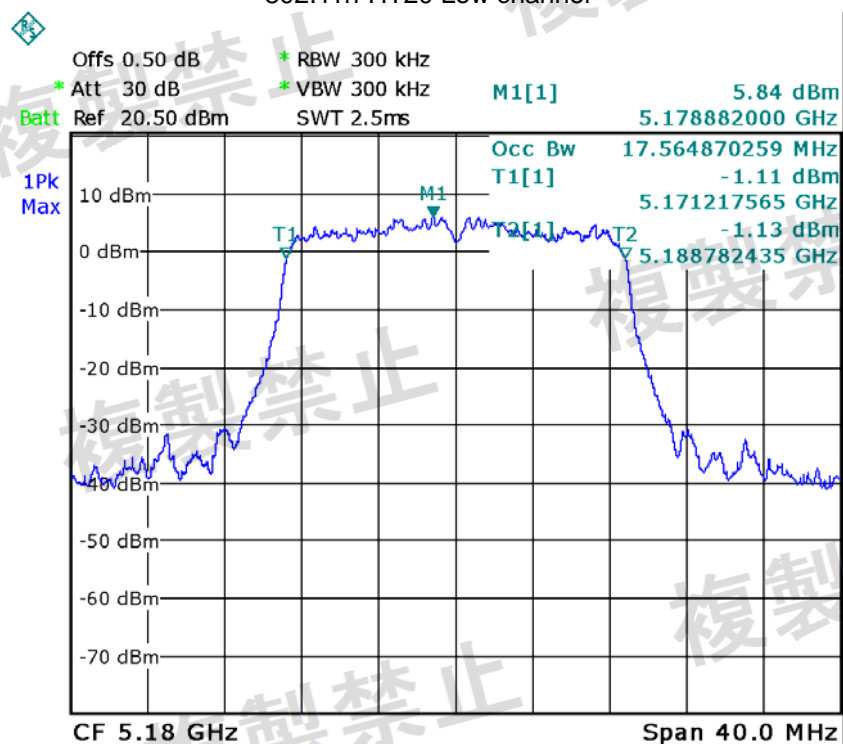
802.11a Middle channel



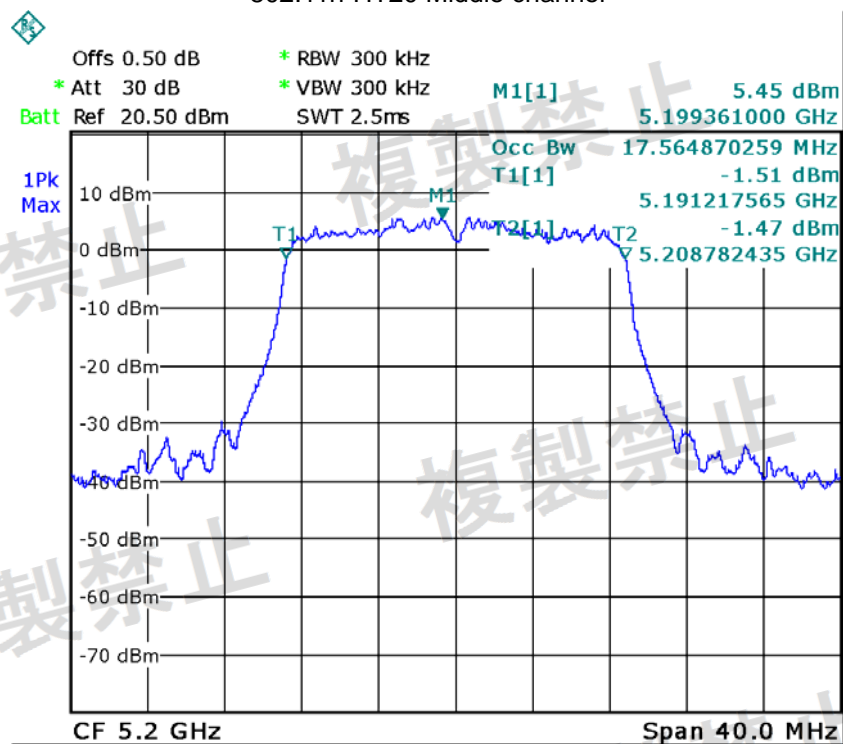
802.11a High channel



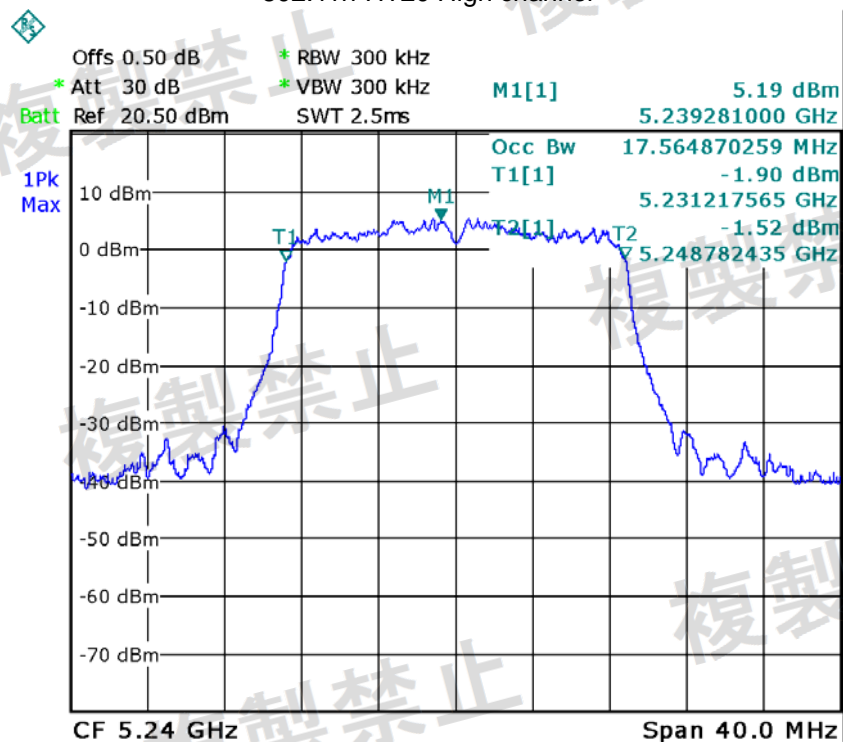
802.11n-HT20 Low channel



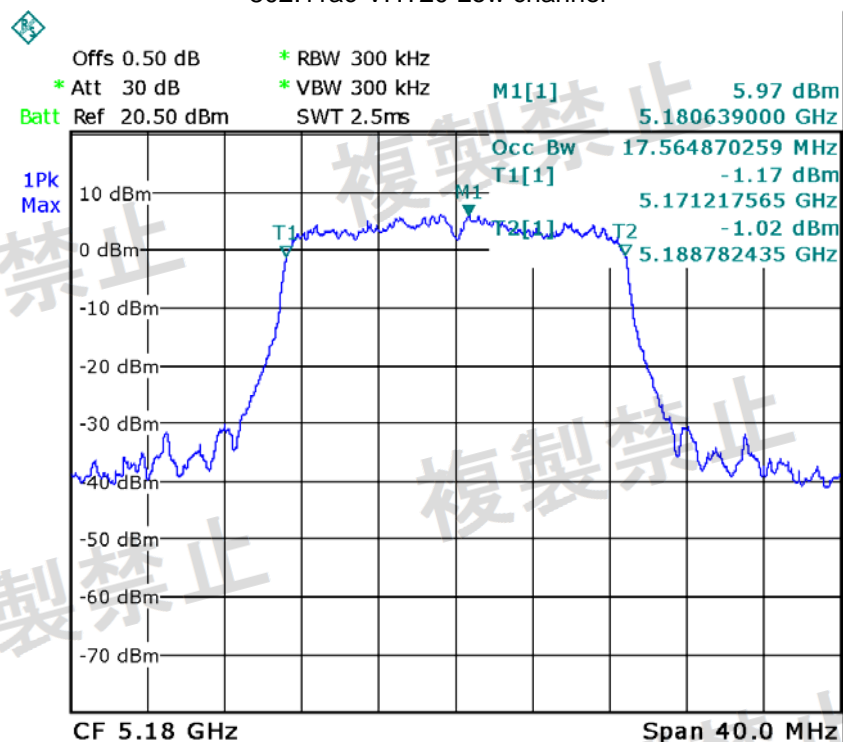
802.11n-HT20 Middle channel



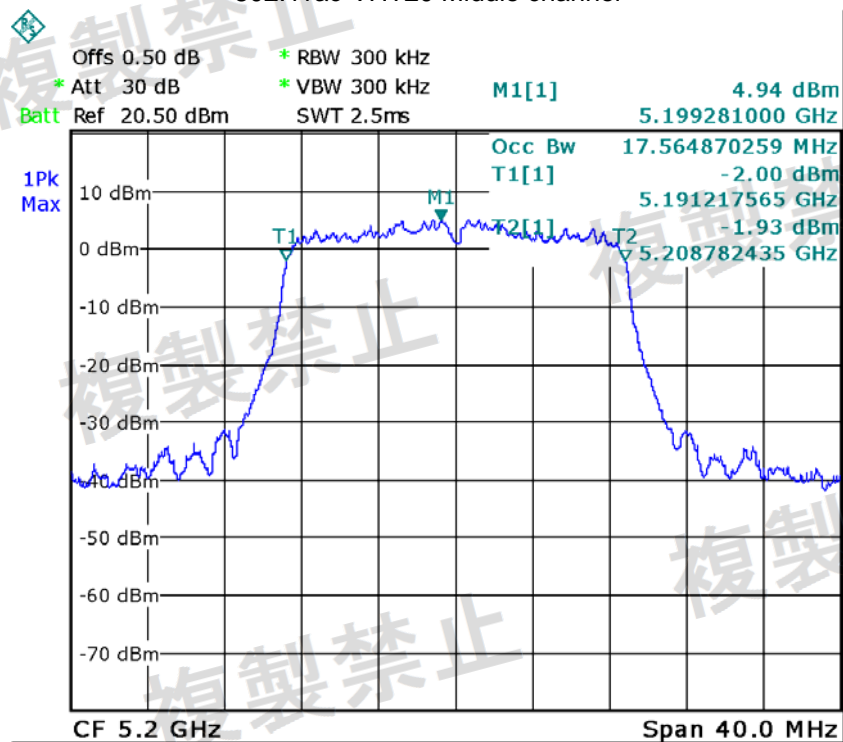
802.11n-HT20 High channel



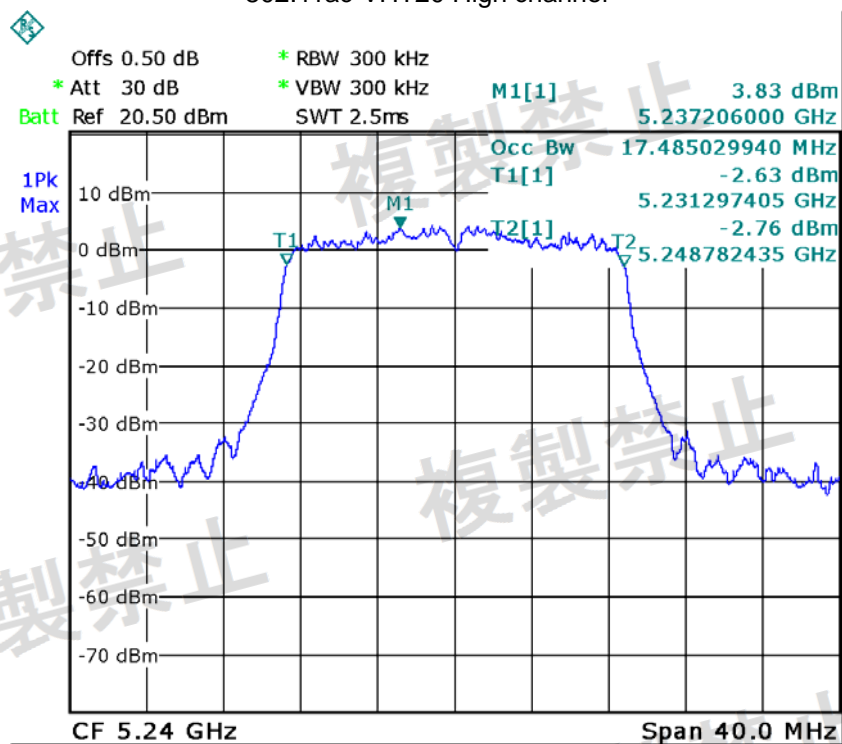
802.11ac-VHT20 Low channel



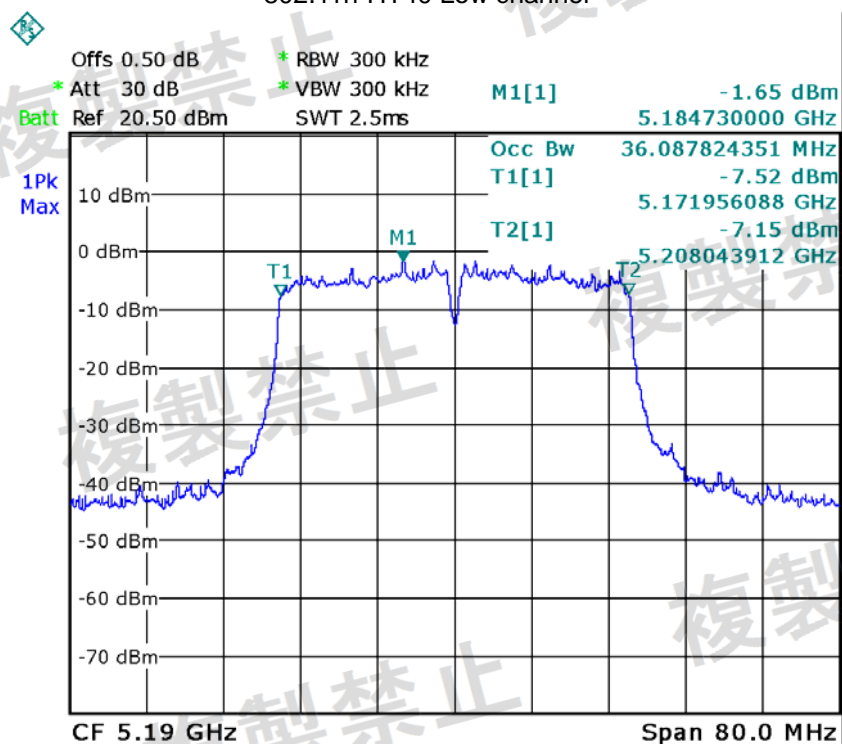
802.11ac-VHT20 Middle channel



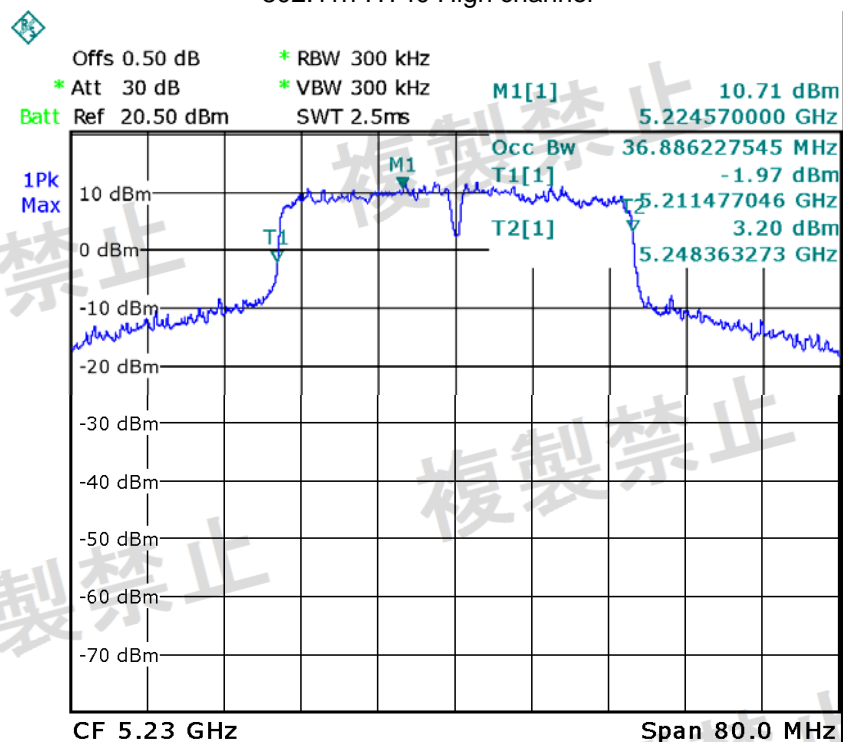
802.11ac-VHT20 High channel



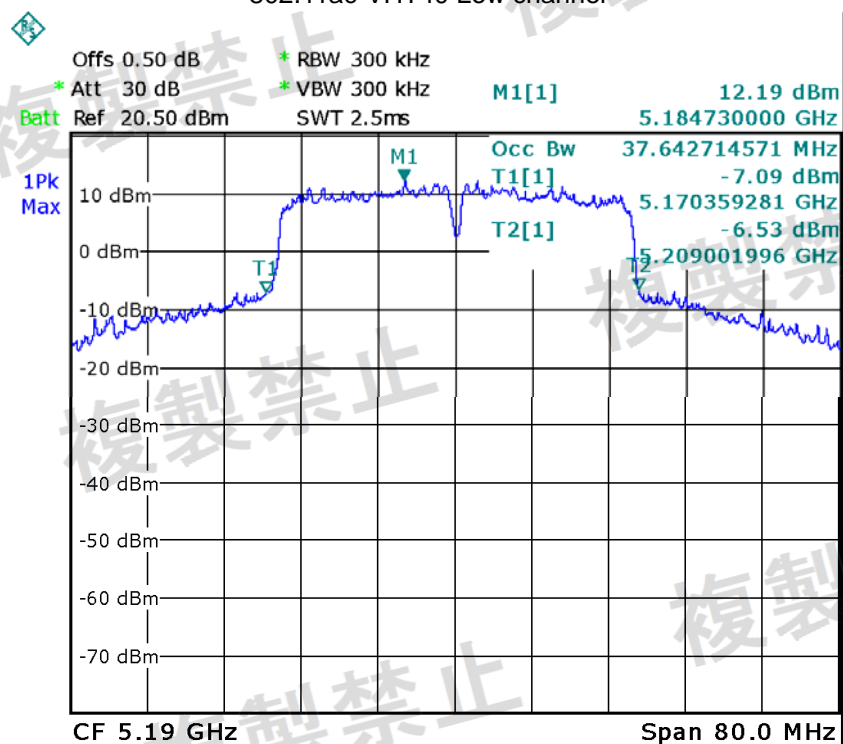
802.11n-HT40 Low channel



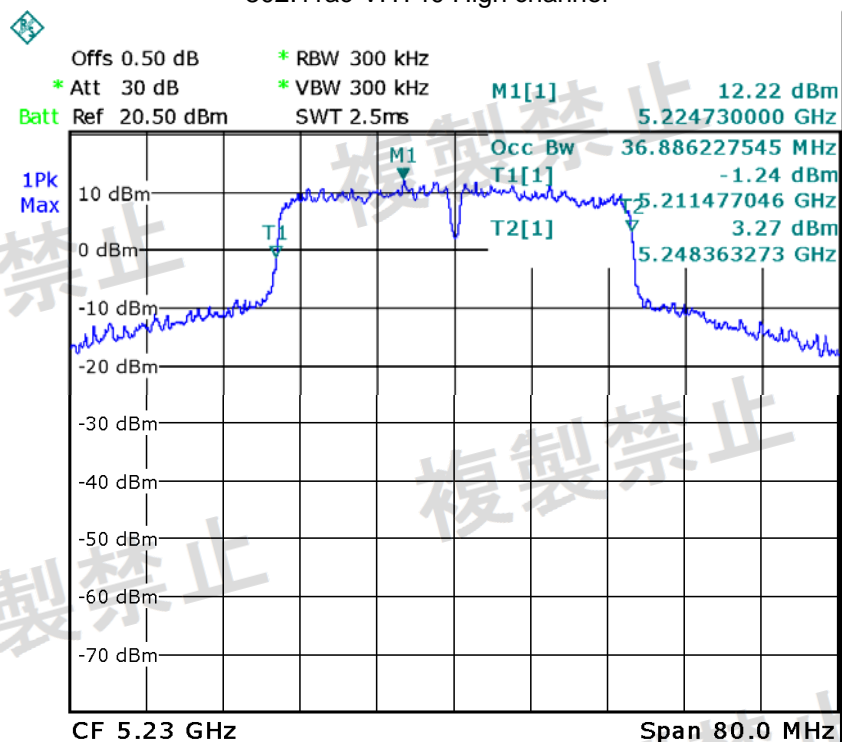
802.11n-HT40 High channel



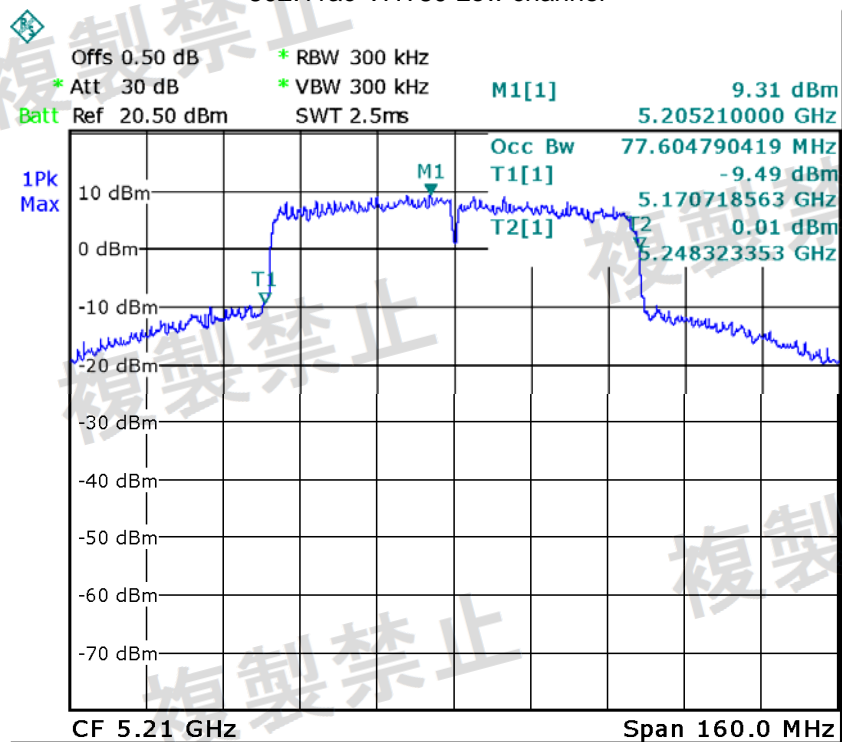
802.11ac-VHT40 Low channel



802.11ac-VHT40 High channel



802.11ac-VHT80 Low channel



7.5 Transmission Rate

7.5.1 Test Requirement

Article 2-1.

7.5.2 Limit

According to Article 2-1, transmission speed is 10Mbit / s or higher. However, radio equipment shall be capable of transmitting signals at 20 Mbit / s or faster for HT20 and 40 Mbit / s for HT40.

7.5.3 Result

Modulation	Transmission rate(Mbps)
802.11a	54
802.11n	160
802.11ac	433.3

7.6 Transmission Burst Length

7.6.1 Test Requirement

Article 2-1.

7.6.2 Limit

According to Article 2-1, transmission burst length is 4ms or less.

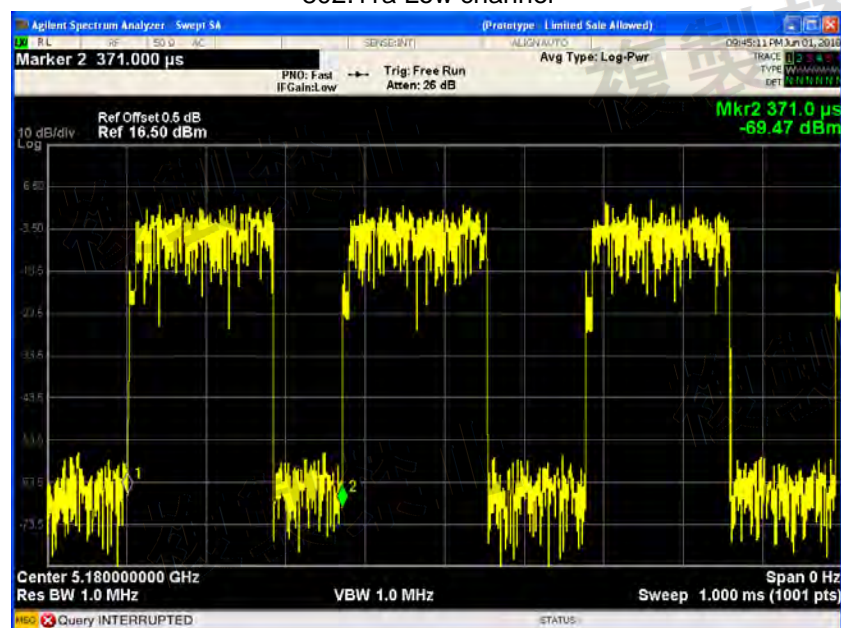
7.6.3 Result

Modulation	Measurement Burst Length(ms)	Limit(ms)
802.11a	0.371	4
802.11n-HT20	0.644	4
802.11ac-VHT20	0.702	4
802.11n-HT40	0.336	4
802.11ac-VHT40	0.277	4
802.11ac-VHT80	0.337	4

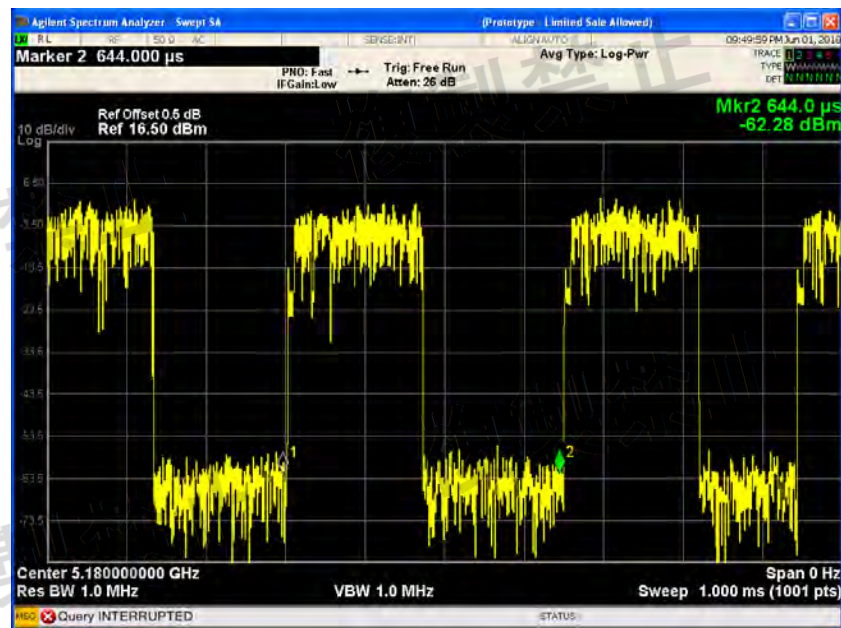
Note: The result only show the worst channel each mode.

Test Plots

802.11a Low channel



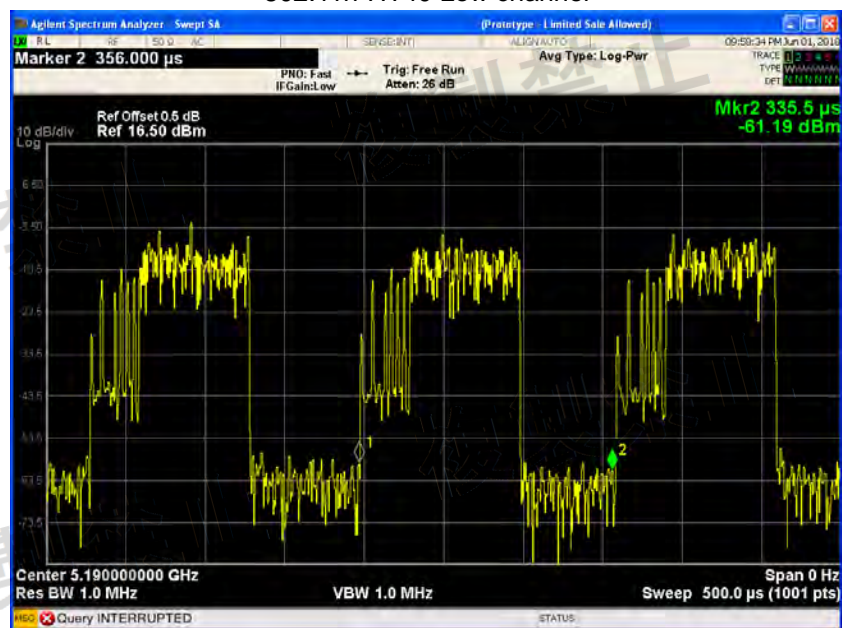
802.11n-HT20 Low channel



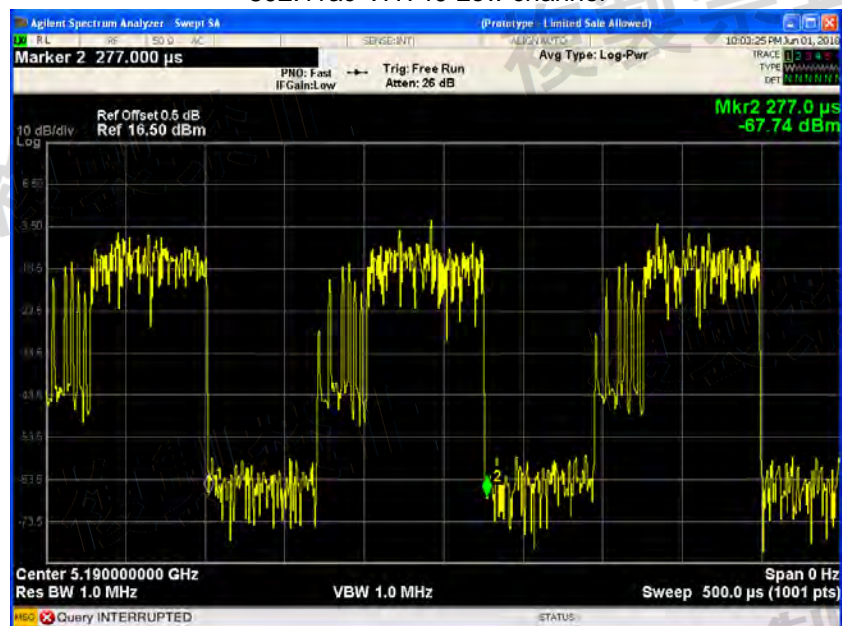
802.11ac-VHT20 Low channel



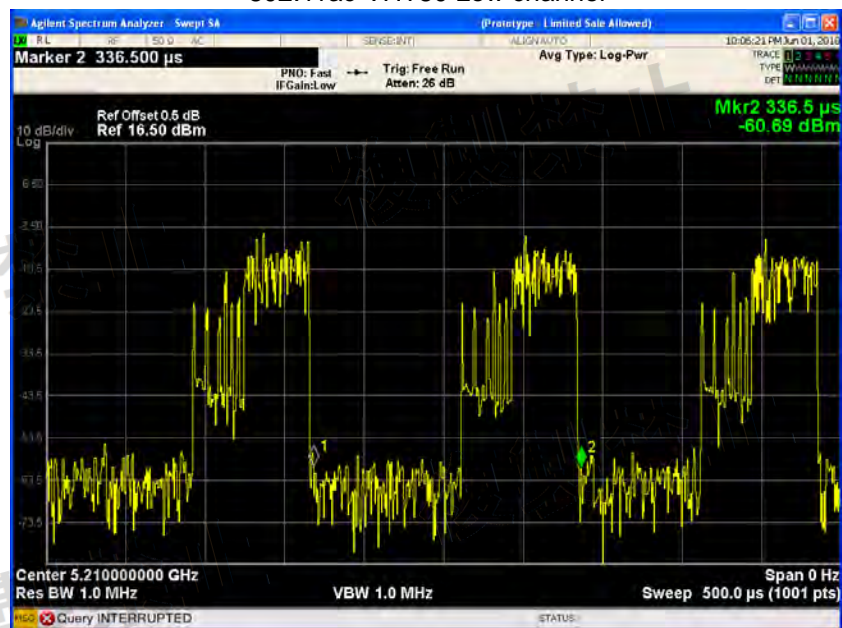
802.11n-HT40 Low channel



802.11ac-VHT40 Low channel



802.11ac-VHT80 Low channel



7.7 Unwanted Emissions Strength

7.7.1 Test Requirement

Article 2-1.

7.7.2 Limit

According to Article 2-1, unwanted emission intensity of tolerance (tolerance defined by the average power of the unwanted emission for each frequency supplied to the feeder at the time of modulation) is as follows.

Frequency	Permissible value of the unwanted emission intensity
For HT20 mode, That less than 5,140MHz and more than 5,360MHz	The average power in the bandwidth of any 1MHz 2.5μW or less
For HT40 mode, That less than 5,100MHz and more than 5,400MHz	The average power in the bandwidth of any 1MHz 2.5μW or less

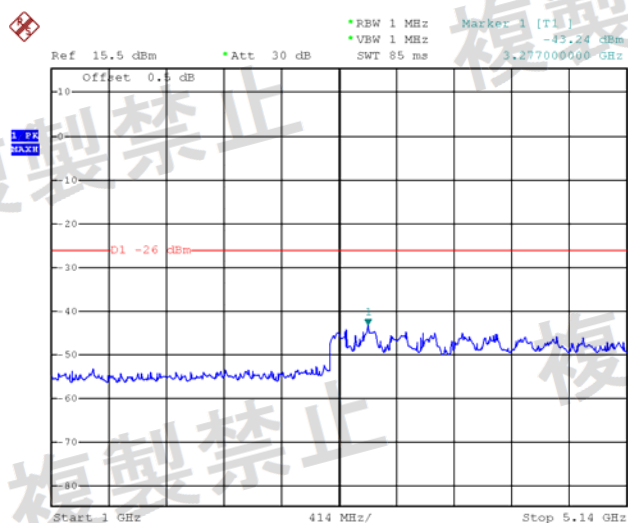
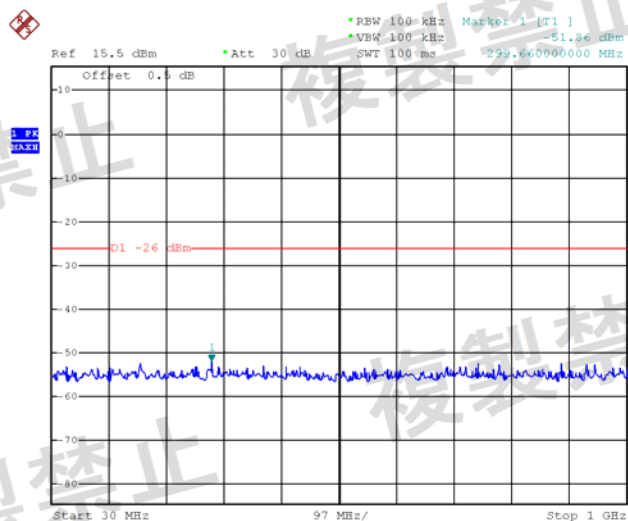
7.7.3 Test Result

Modulation	Channel	Test Mode	Test Result
802.11a	Low	Transmitting	PASS
	Middle	Transmitting	PASS
	High	Transmitting	PASS
802.11n-HT20	Low	Transmitting	PASS
	Middle	Transmitting	PASS
	High	Transmitting	PASS
802.11ac-VHT20	Low	Transmitting	PASS
	Middle	Transmitting	PASS
	High	Transmitting	PASS
802.11n-HT40	Low	Transmitting	PASS
	High	Transmitting	PASS
802.11ac-VHT40	Low	Transmitting	PASS
	High	Transmitting	PASS
802.11ac-VHT80	Low	Transmitting	PASS

Test Plots

802.11a Low Channel

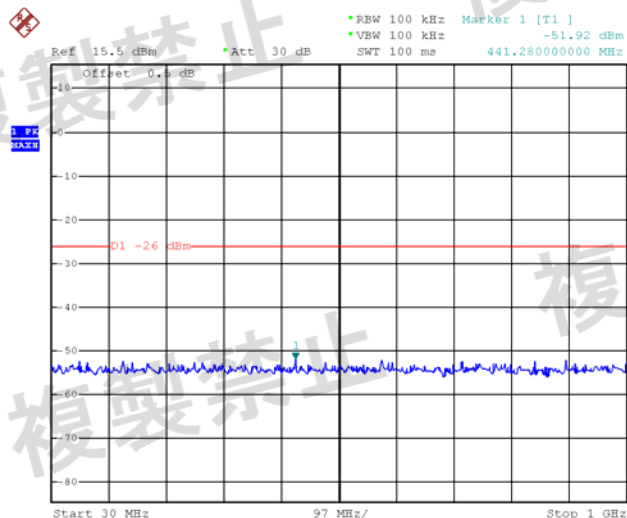
0.03-5.14GHz

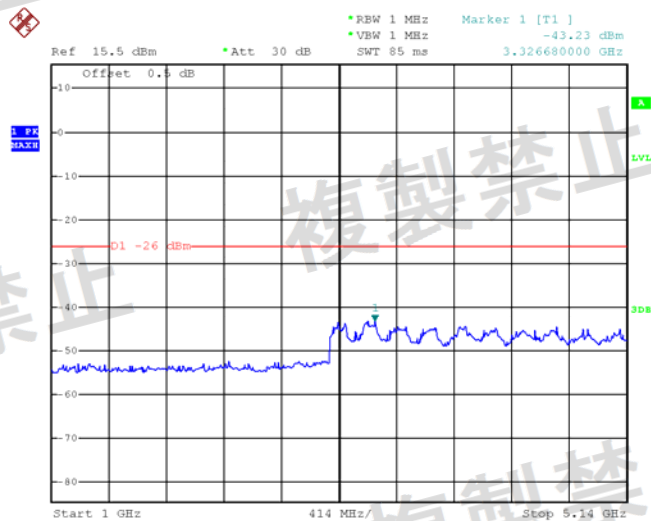


802.11a Low Channel 5.36-26GHz



802.11a Middle Channel 0.03-5.14GHz

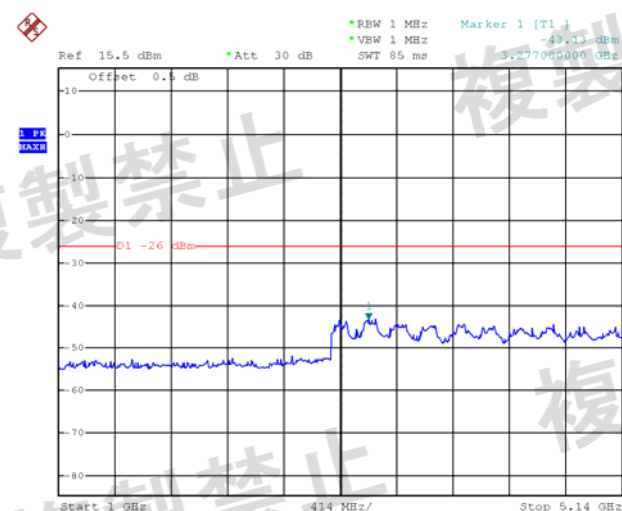
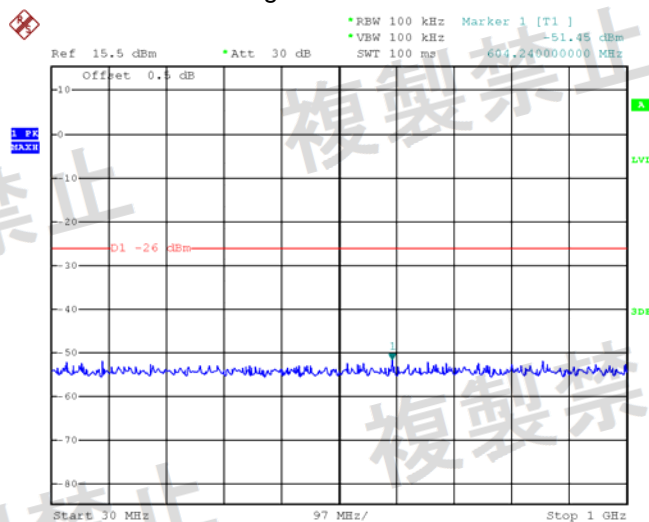




802.11a Middle Channel 5.36-26GHz

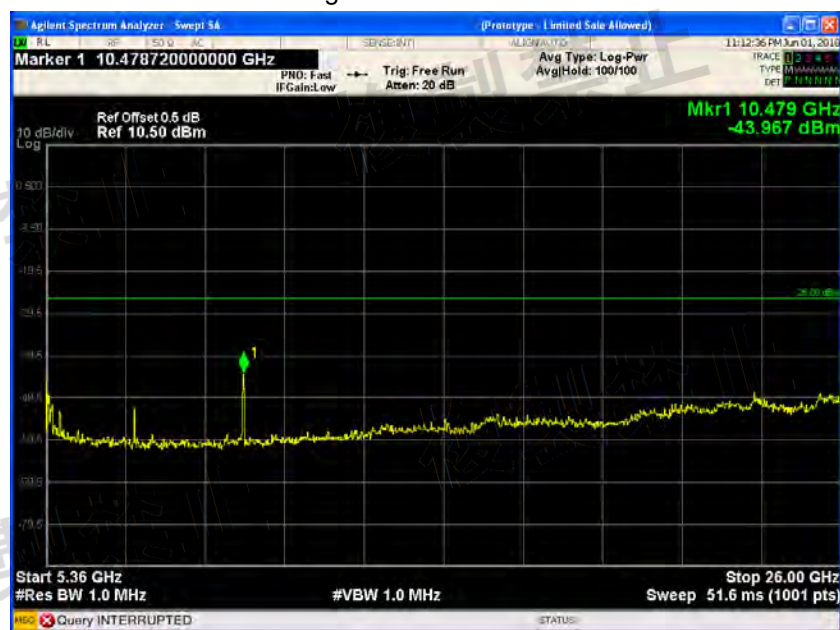


802.11a High Channel 0.03-5.14GHz



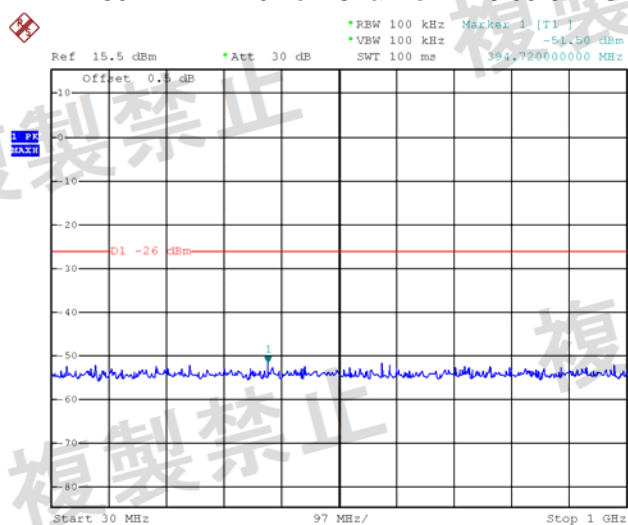
802.11a High Channel

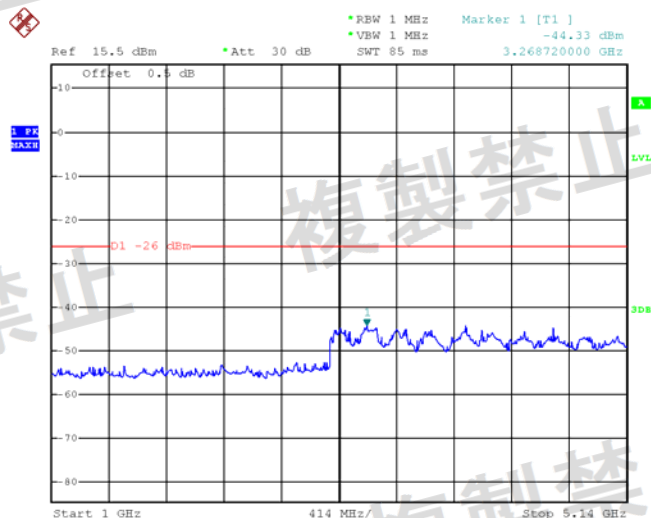
5.36-26GHz



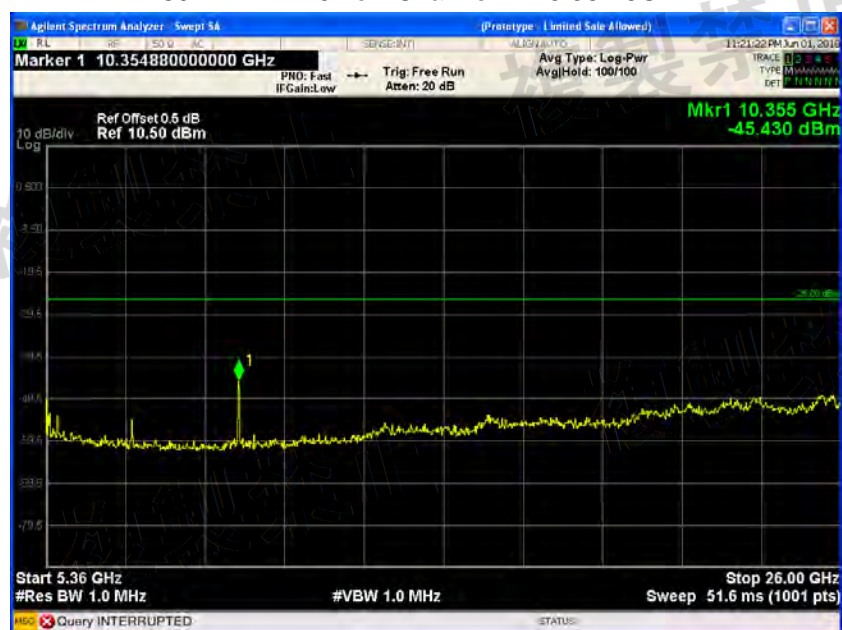
802.11n-HT20 Low Channel

0.03-5.14GHz

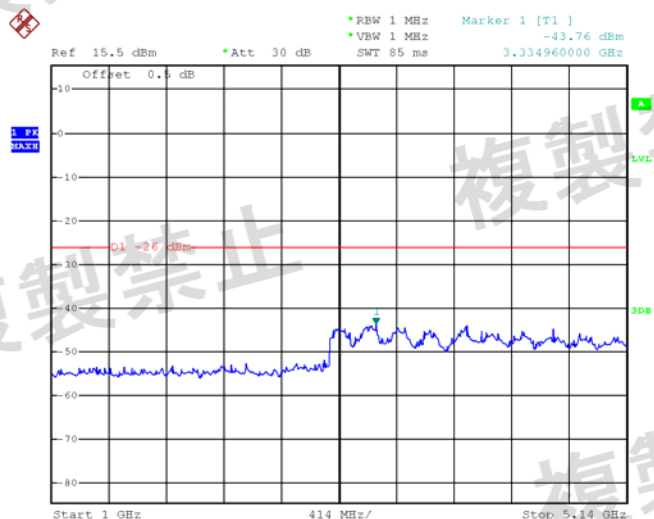
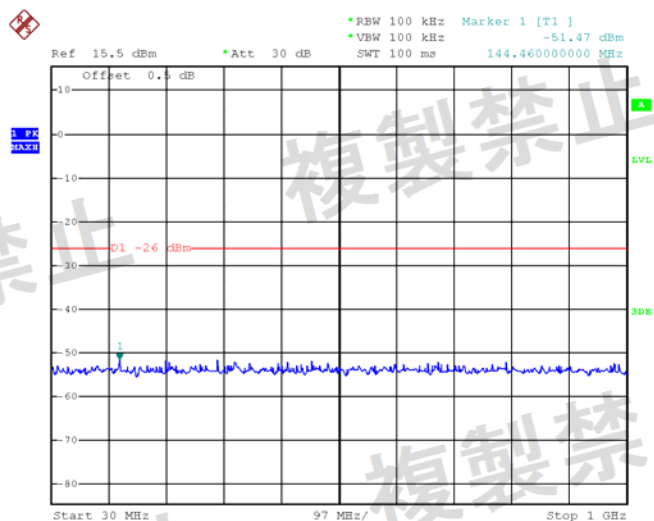




802.11n-HT20 Low Channel 5.36-26GHz



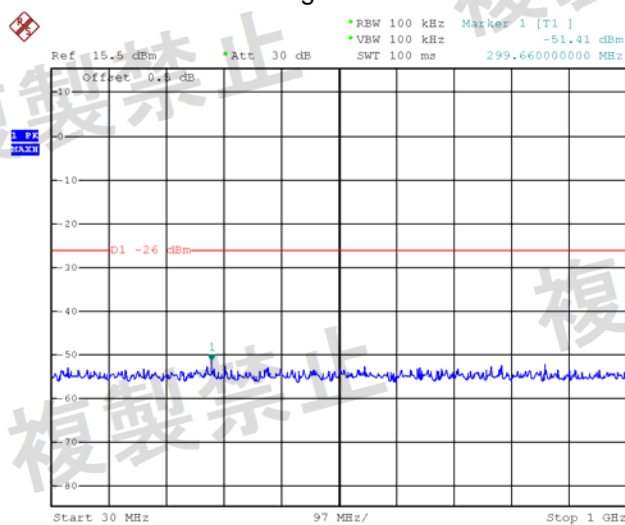
802.11n-HT20 Middle Channel 0.03-5.14GHz

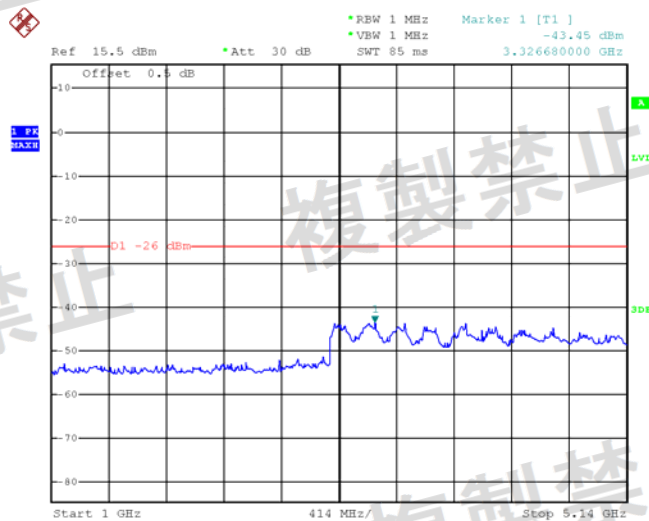


802.11n-HT20 Middle Channel 5.36-26GHz



802.11n-HT20 High Channel 0.03-5.14GHz



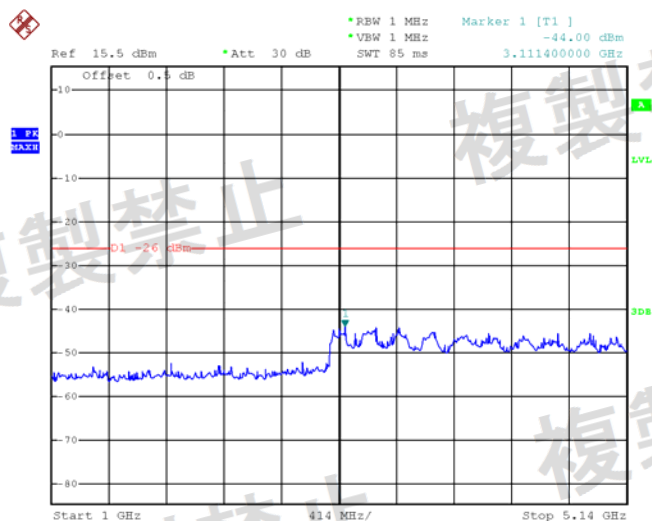
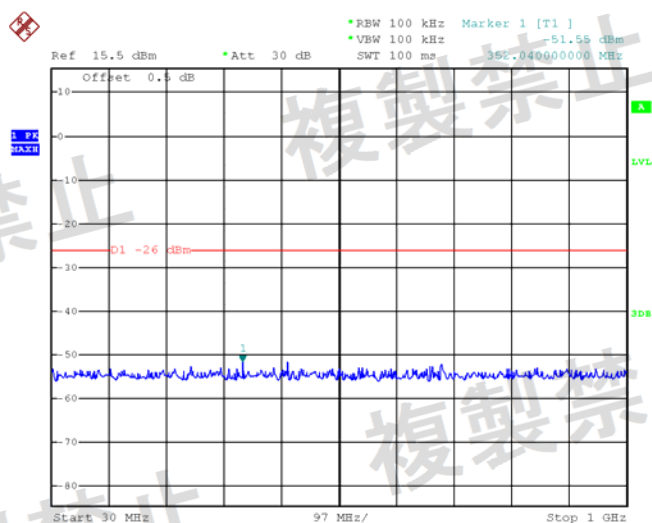


802.11n-HT20 High Channel

5.36-26GHz



802.11ac-VHT20 Low Channel 0.03-5.14GHz



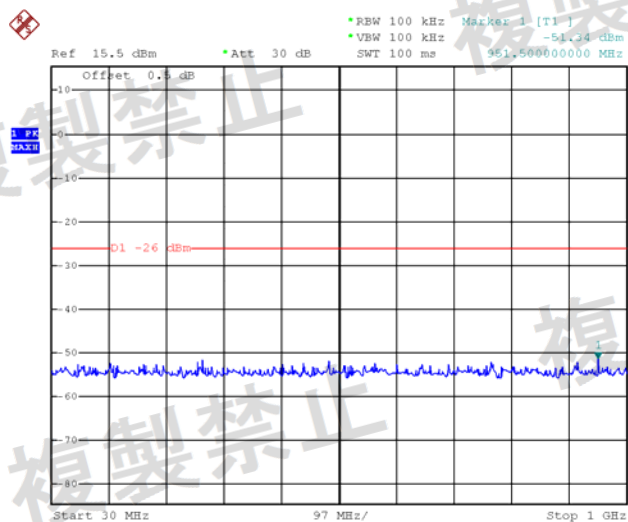
802.11ac-VHT20 Low Channel

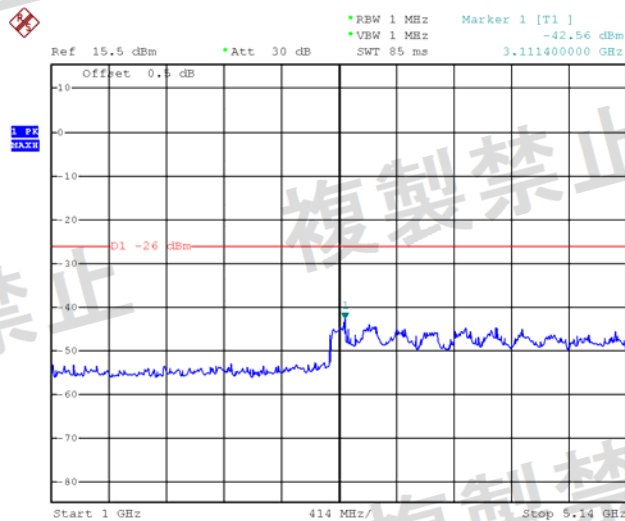
5.36-26GHz



802.11ac-VHT20 Middle Channel

0.03-5.14GHz

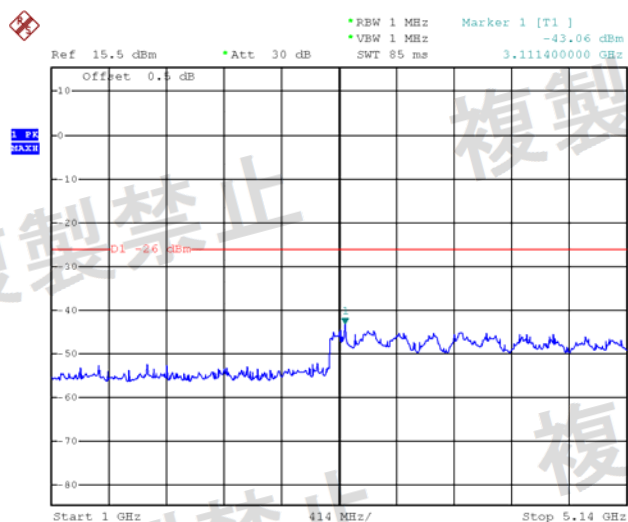
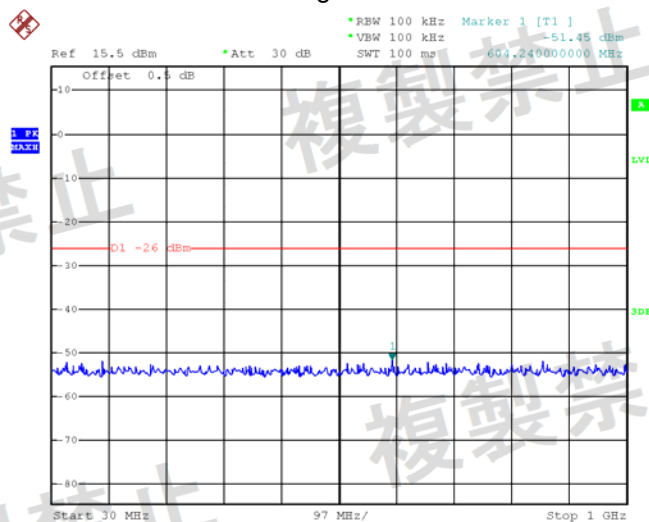




802.11ac-VHT20 Middle Channel 5.36-26GHz



802.11ac-VHT20 High Channel 0.03-5.14GHz



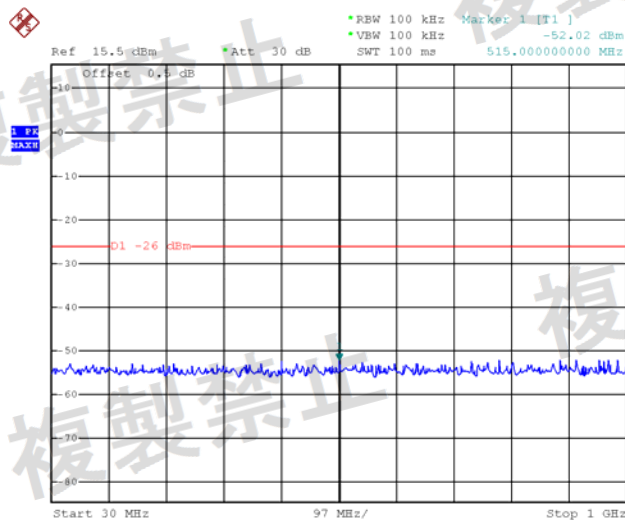
802.11ac-VHT20 High Channel

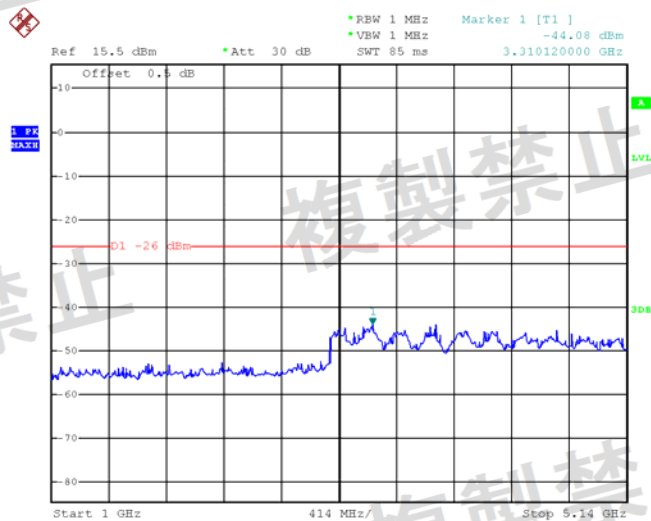
5.36-26GHz



802.11n-HT40 Low Channel

0.03-5.1GHz

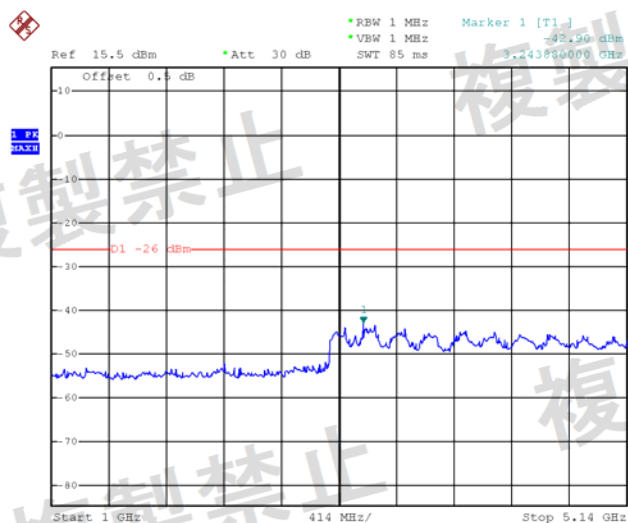
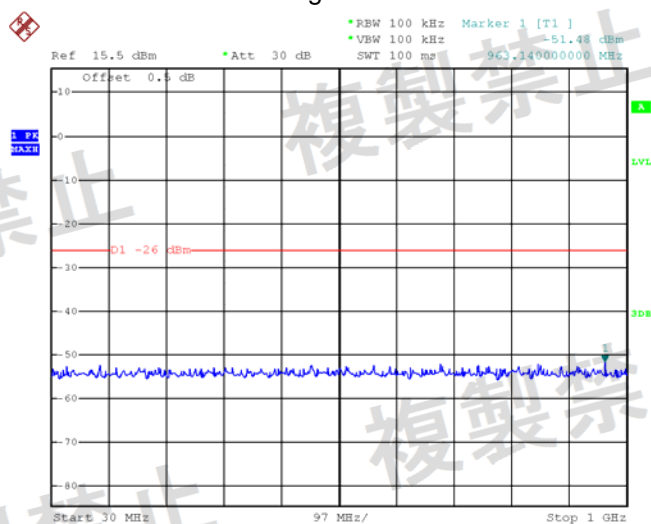




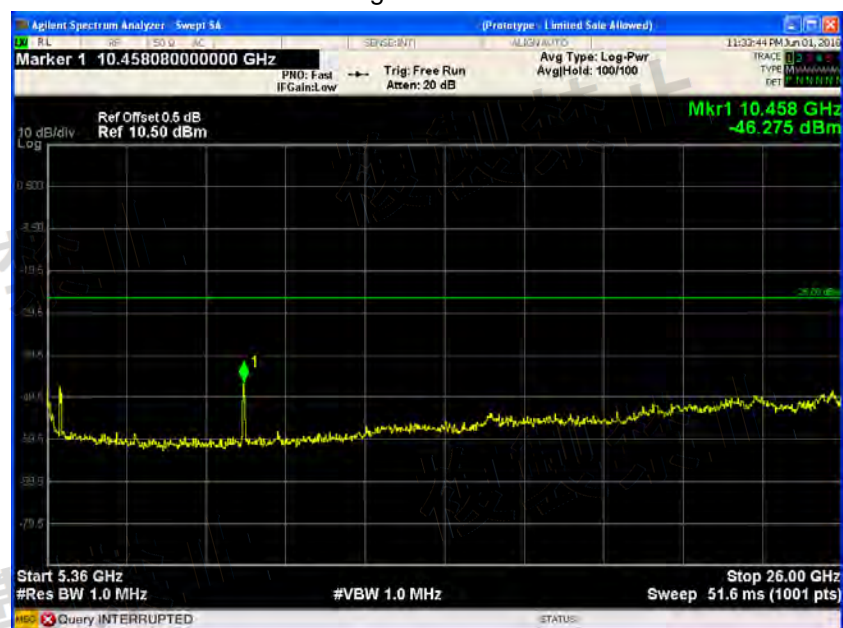
802.11n-HT40 Low Channel 5.4-26GHz



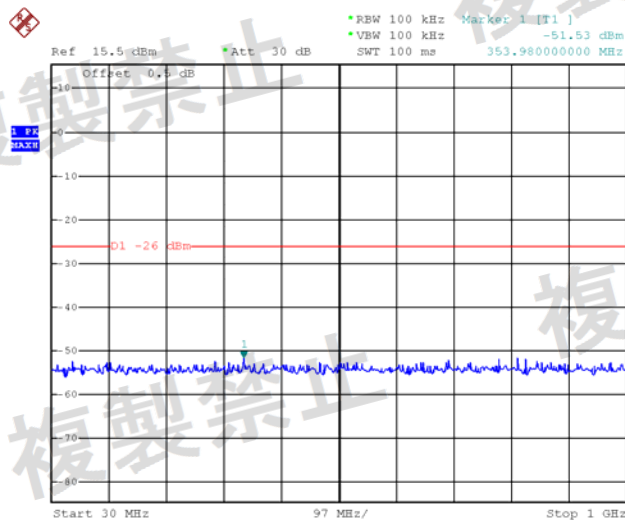
802.11n-HT40 High Channel 0.03-5.1GHz

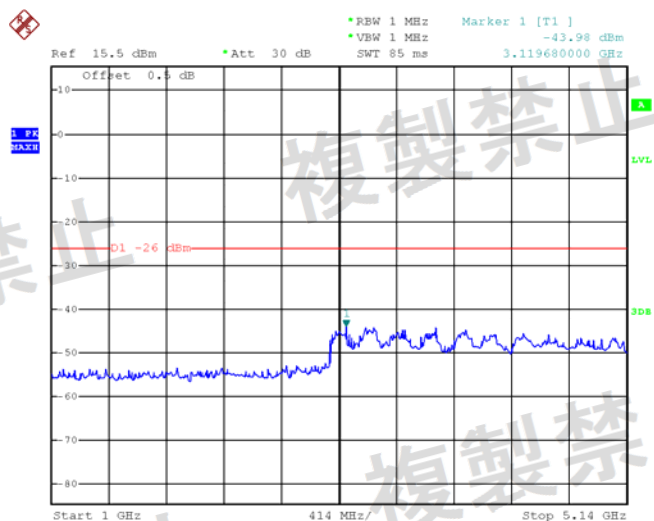


802.11n-HT40 High Channel 5.4-26GHz



802.11ac-VHT40 Low Channel 0.03-5.1GHz



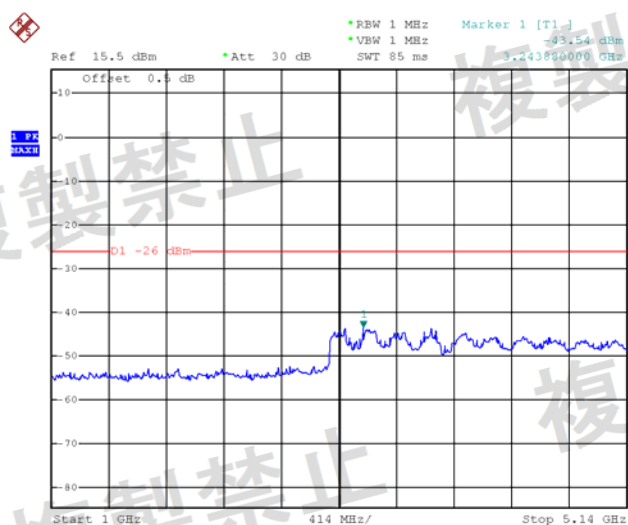
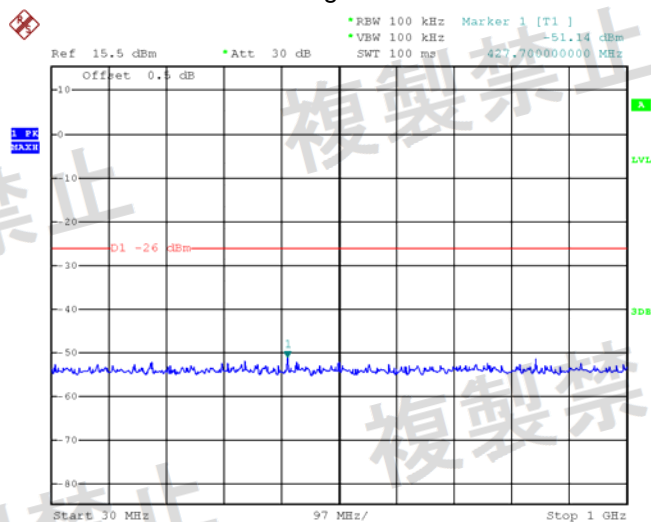


802.11ac-VHT40 Low Channel

5.4-26GHz



802.11ac-VHT40 High Channel 0.03-5.1GHz



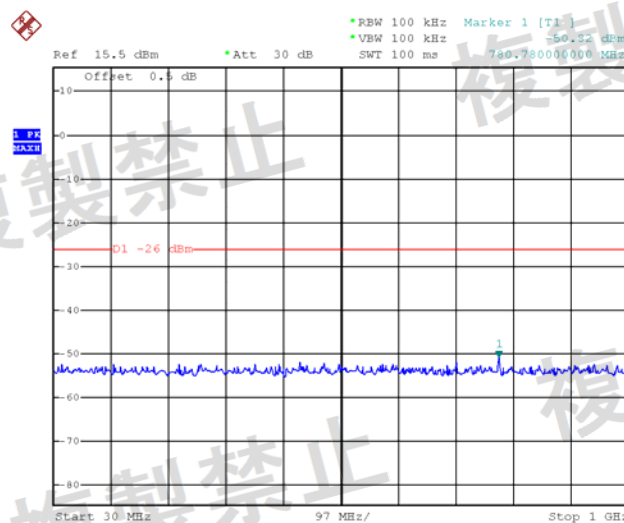
802.11ac-VHT40 High Channel

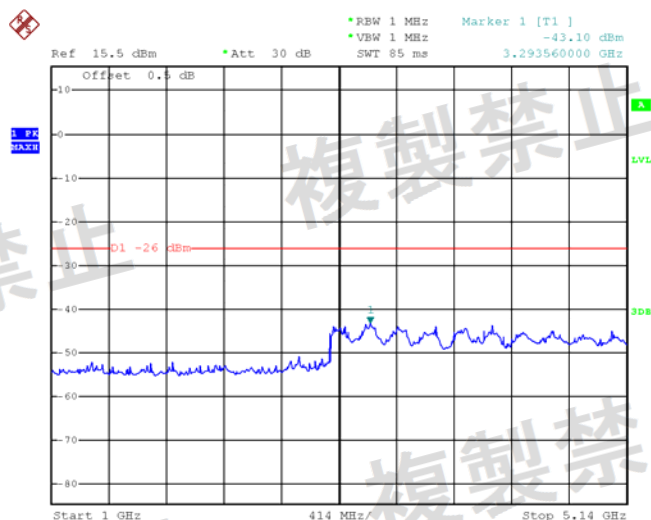
5.4-26GHz



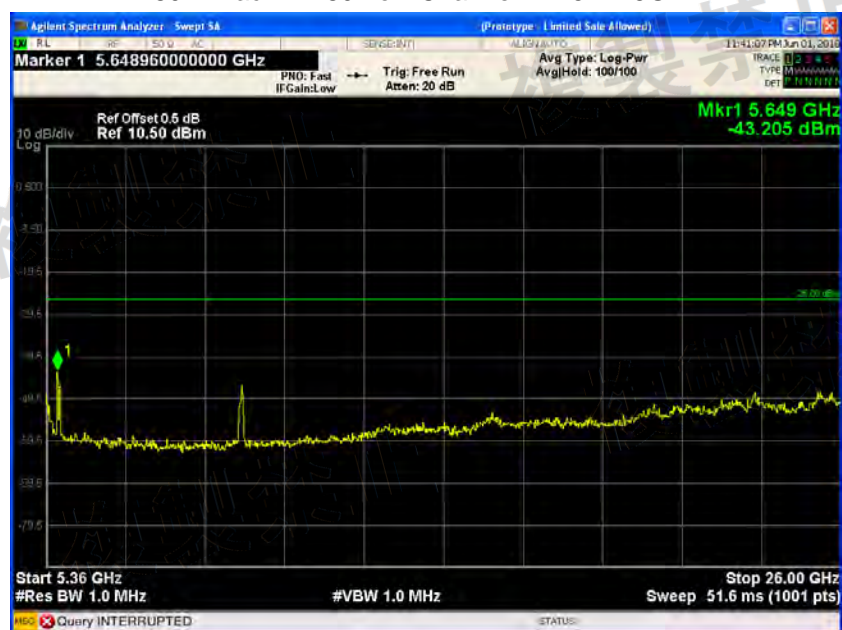
802.11ac-VHT80 Low Channel

0.03-5.1GHz





802.11ac-VHT80 Low Channel 5.4-26GHz



7.8 Adjacent Channel Emitted Power

7.8.1 Test Requirement

Article 2-1

7.8.2 Limit

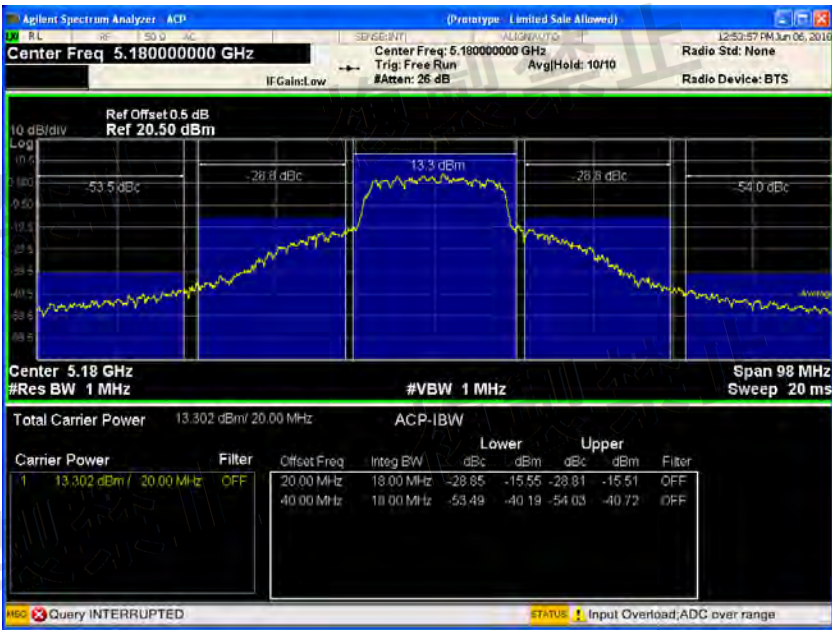
According to Article 2-1, for HT20, the average power radiated from the carrier frequency in a band of ± 9 MHz frequency apart 20MHz and 40MHz is a low value, respectively 25dB and 40dB higher than that of the carrier wave. for HT40, the average power radiated from the carrier frequency in a band of ± 9 MHz frequency apart 40MHz and 80MHz is a low value, respectively 25dB and 40dB higher than that of the carrier wave.

7.8.3 Test Result

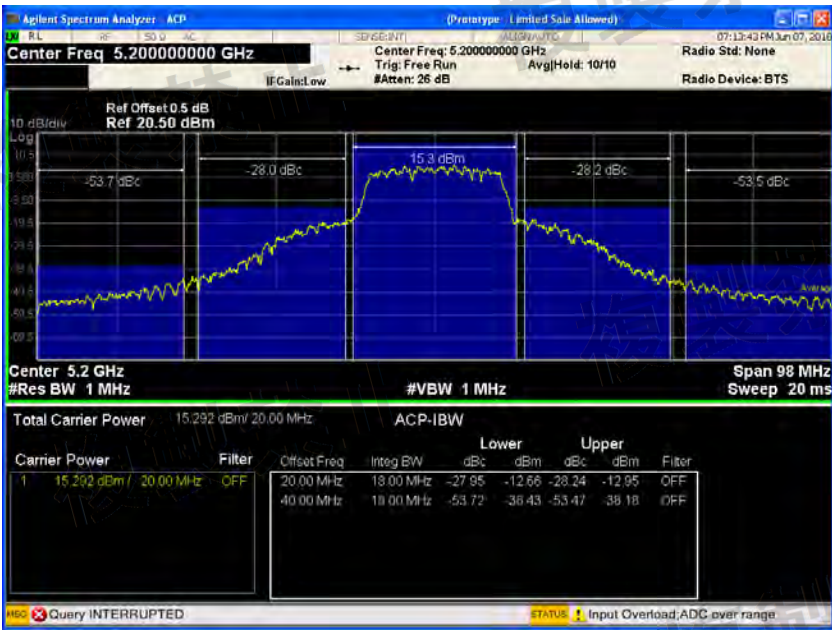
Modulation	Channel	Test Mode	Test Result
802.11a	Low	Transmitting	PASS
	Middle	Transmitting	PASS
	High	Transmitting	PASS
802.11n-HT20	Low	Transmitting	PASS
	Middle	Transmitting	PASS
	High	Transmitting	PASS
802.11ac-VHT20	Low	Transmitting	PASS
	Middle	Transmitting	PASS
	High	Transmitting	PASS
802.11n-HT40	Low	Transmitting	PASS
	High	Transmitting	PASS
802.11ac-VHT40	Low	Transmitting	PASS
	High	Transmitting	PASS
802.11ac-VHT80	Low	Transmitting	PASS

Test Plots

802.11a Low Channel



802.11a Middle Channel



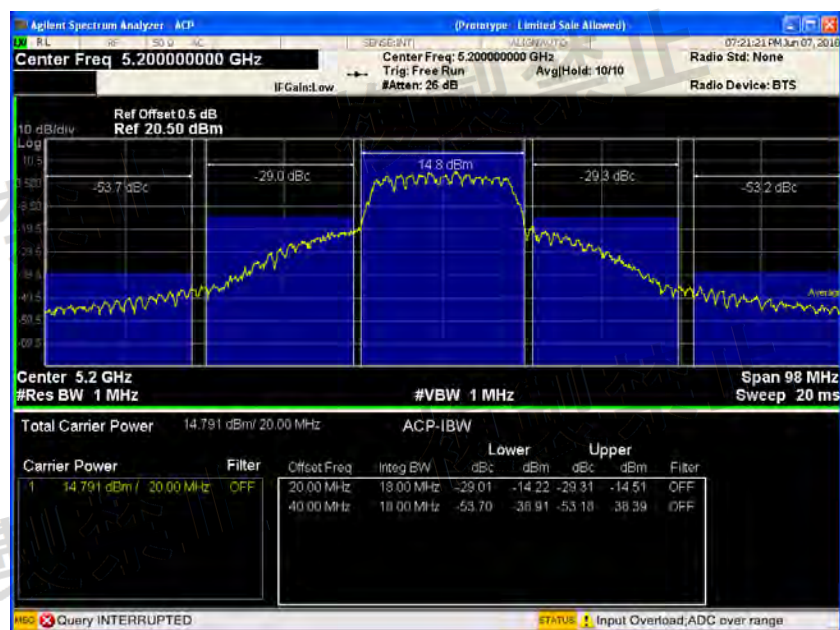
802.11a High Channel



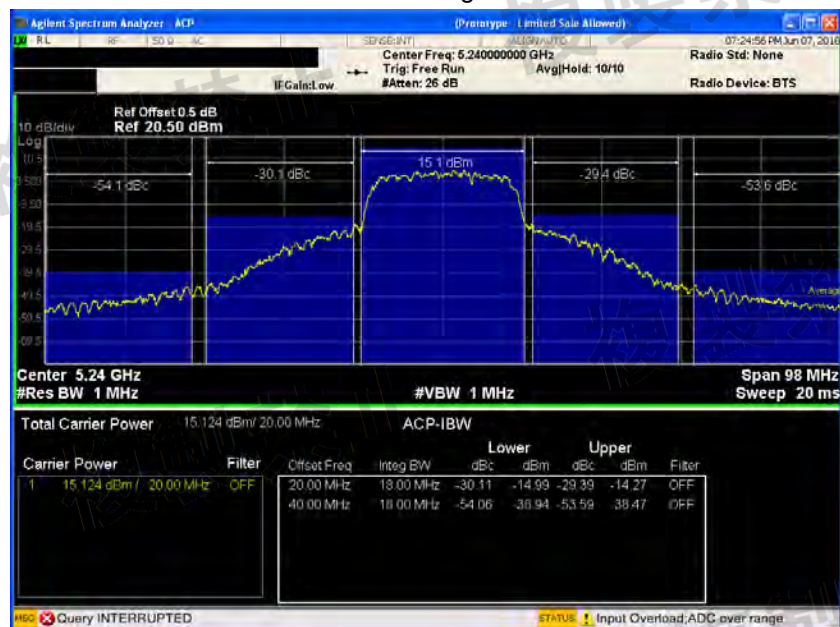
802.11n-HT20 Low Channel



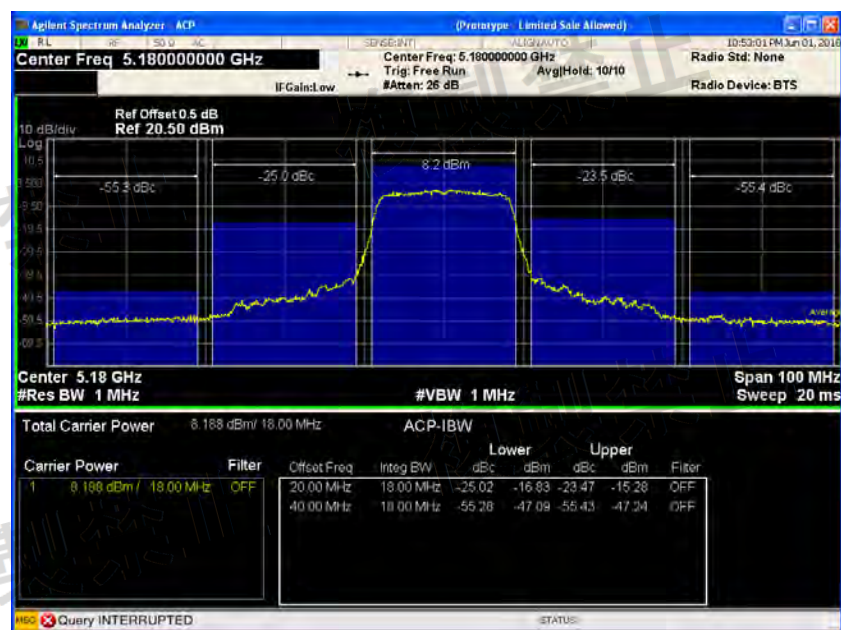
802.11n-HT20 Middle Channel



802.11n-HT20 High Channel



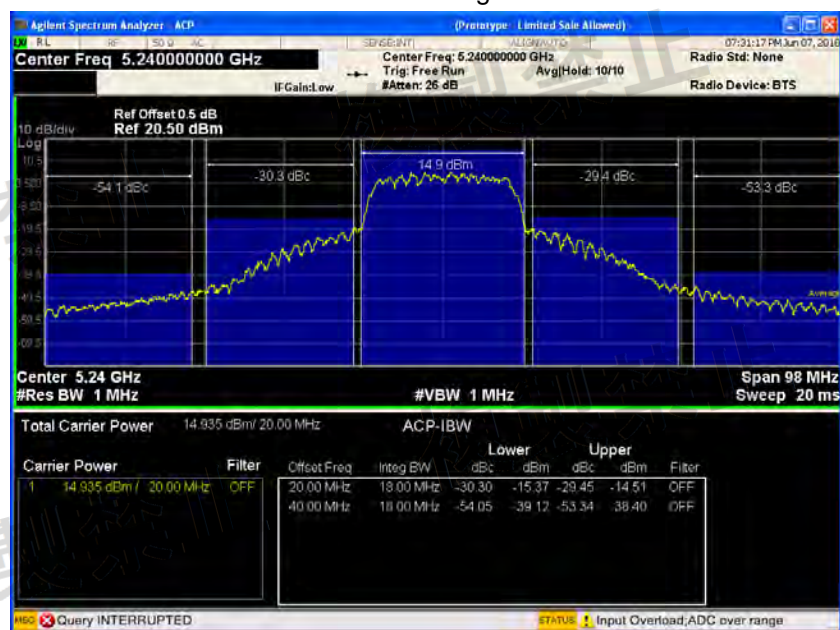
802.11ac-VHT20 Low Channel



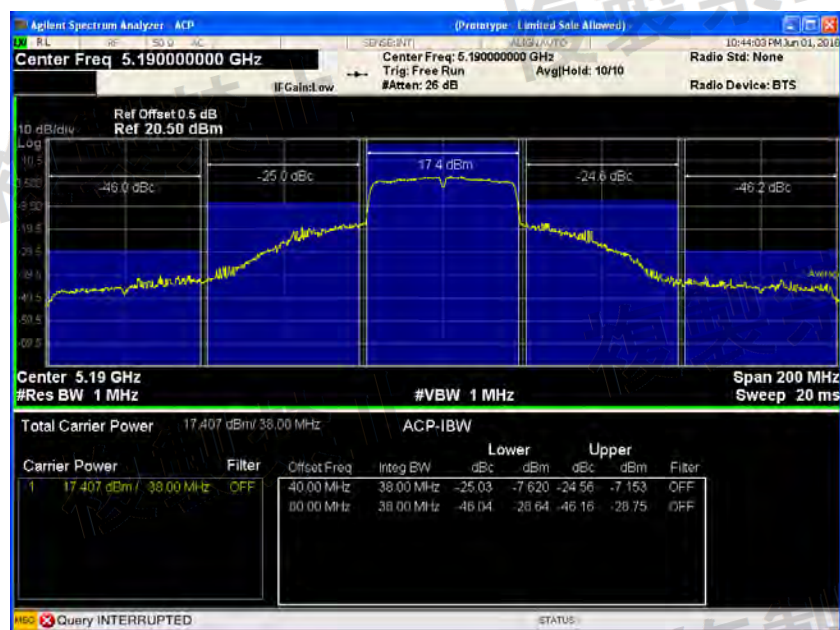
802.11ac-VHT20 Middle Channel



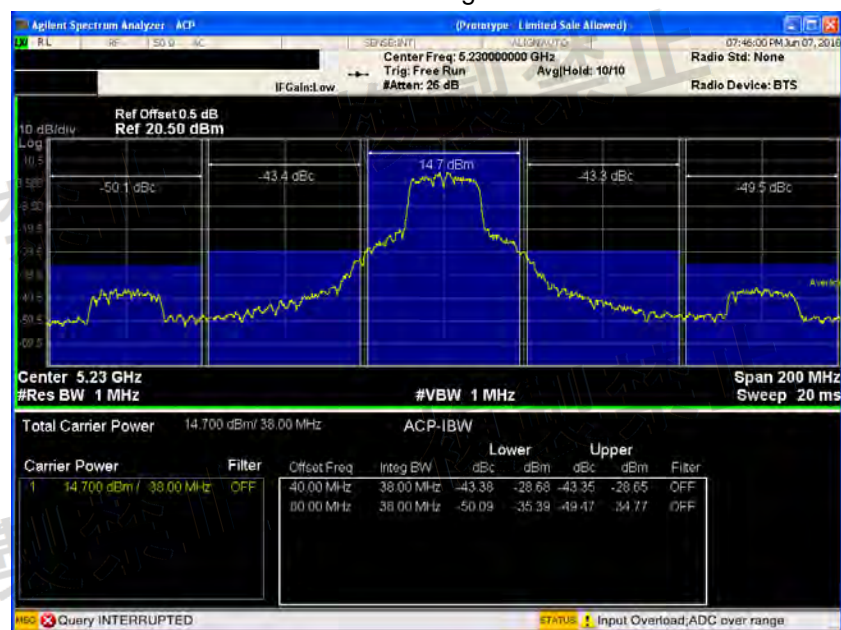
802.11ac-VHT20 High Channel



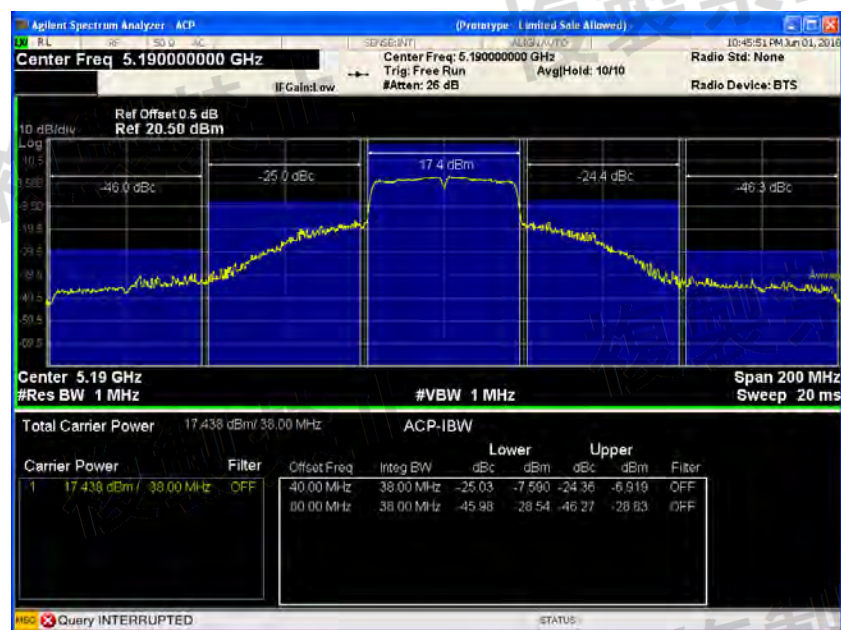
802.11n-HT40 Low Channel



802.11n-HT40 High Channel



802.11ac-VHT40 Low Channel



802.11n-VHT40 High Channel



802.11ac-VHT80 Low Channel



7.9 Out-band Leakage Power

7.9.1 Test Requirement

Article 2-1.

7.9.2 Limit

The limit refer to Article 2-1.Follow as:

HT 20:

$$5140\text{MHz} \leq f_o \leq 5142\text{MHz}; 2.5\text{uW/MHz}$$

$$5142\text{MHz} < f_o \leq 5150\text{MHz}; 15\text{uW/MHz}$$

$$5250\text{MHz} \leq f_o < 5251\text{MHz};$$

$$10^{1-(f-9)} \text{ mW/MHz}$$

$$5251\text{MHz} \leq f_o < 5260\text{MHz};$$

$$10^{-1-(8/90)(f-11)} \text{ mW/MHz}$$

$$5260\text{MHz} \leq f_o < 5266.7\text{MHz};$$

$$10^{-1.8-(6/50)(f-20)} \text{ mW/MHz}$$

$$f = f_o - (5240\text{MHz})$$

$$5266.7\text{MHz} \leq f_o \leq 5360\text{MHz}; 2.5\text{uW/MHz}$$

HT 40:

$$5100\text{MHz} \leq f_o \leq 5142\text{MHz}; 2.5\text{uW/MHz}$$

$$5142\text{MHz} < f_o \leq 5150\text{MHz}; 15\text{uW/MHz}$$

$$5250\text{MHz} \leq f_o < 5251\text{MHz};$$

$$10^{-(f-20)+\log(1/2)} \text{ mW/MHz}$$

$$5251\text{MHz} \leq f_o < 5270\text{MHz};$$

$$10^{-(8/190)(f-21)-1+\log(1/2)} \text{ mW/MHz}$$

$$5270\text{MHz} \leq f_o < 5275.8\text{MHz};$$

$$10^{-(17/200)(f-40)-1.8+\log(1/2)} \text{ mW/MHz}$$

$$f = f_o - (5230\text{MHz})$$

$$5275.8\text{MHz} \leq f_o \leq 5400\text{MHz}; 2.5\text{uW/MHz}$$

HT 80:30MHz~5020MHz: $\leq 2.5\mu\text{W}/\text{MHz}$;5020MHz~5123.2MHz: $\leq 2.5\mu\text{W}/\text{MHz}$;5123.2MHz~5150MHz: $\leq 15\mu\text{W}/\text{MHz}$;

5250MHz~5251MHz:

 $10^{-(f-40)+\log(1/4)} \text{ mW}/\text{MHz}$

5251MHz~5290MHz:

 $10^{-(8/390)(f-41)-1+\log(1/4)} \text{ mW}/\text{MHz}$

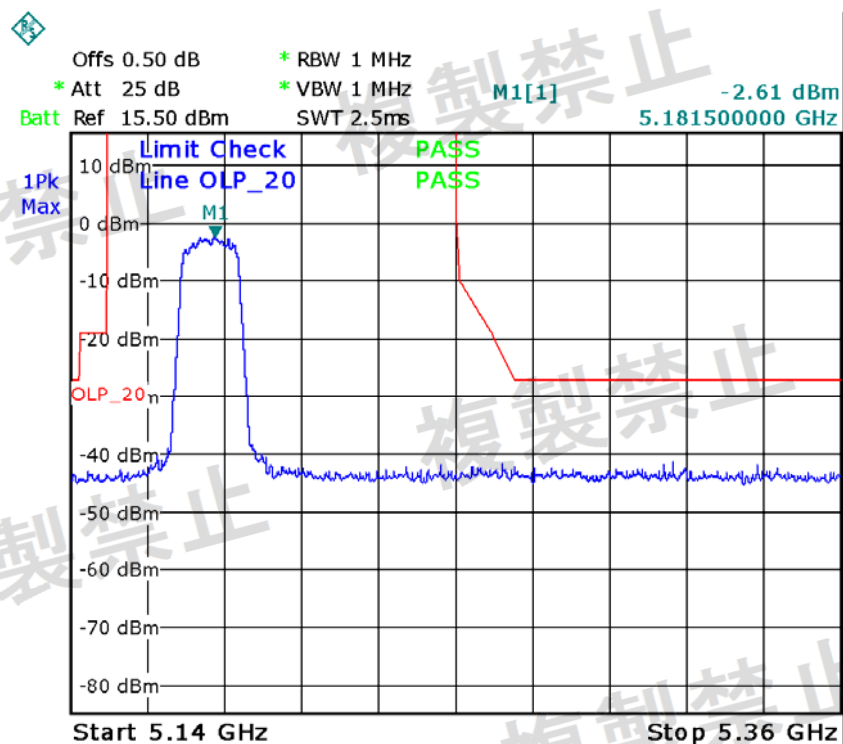
5290MHz~5296.7MHz:

 $10^{-(3/100)(f-80)-1.8+\log(1/4)} \text{ mW}/\text{MHz}$ 5296.7MHz~5480MHz: $\leq 2.5\mu\text{W}/\text{MHz}$ 5480MHz~26500MHz: $\leq 2.5\mu\text{W}/\text{MHz}$ **7.9.3 Test Result**

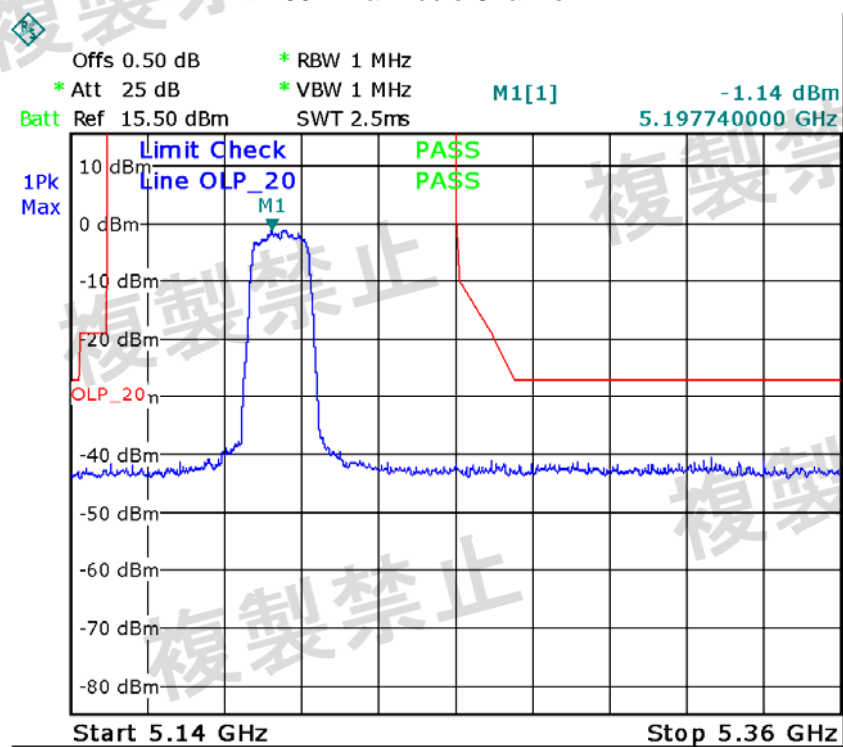
Modulation	Channel	Test Mode	Test Result
802.11a	Low	Transmitting	PASS
	Middle	Transmitting	PASS
	High	Transmitting	PASS
802.11n-HT20	Low	Transmitting	PASS
	Middle	Transmitting	PASS
	High	Transmitting	PASS
802.11ac-VHT20	Low	Transmitting	PASS
	Middle	Transmitting	PASS
	High	Transmitting	PASS
802.11n-HT40	Low	Transmitting	PASS
	High	Transmitting	PASS
802.11ac-VHT40	Low	Transmitting	PASS
	High	Transmitting	PASS
802.11ac-VHT80	Low	Transmitting	PASS

Test Plots

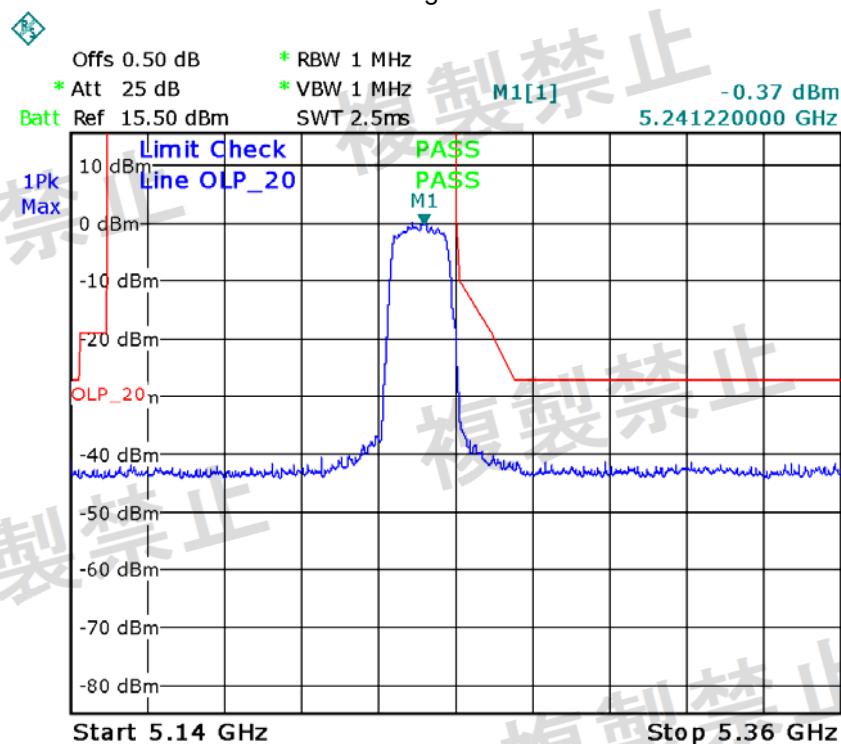
802.11a Low Channel



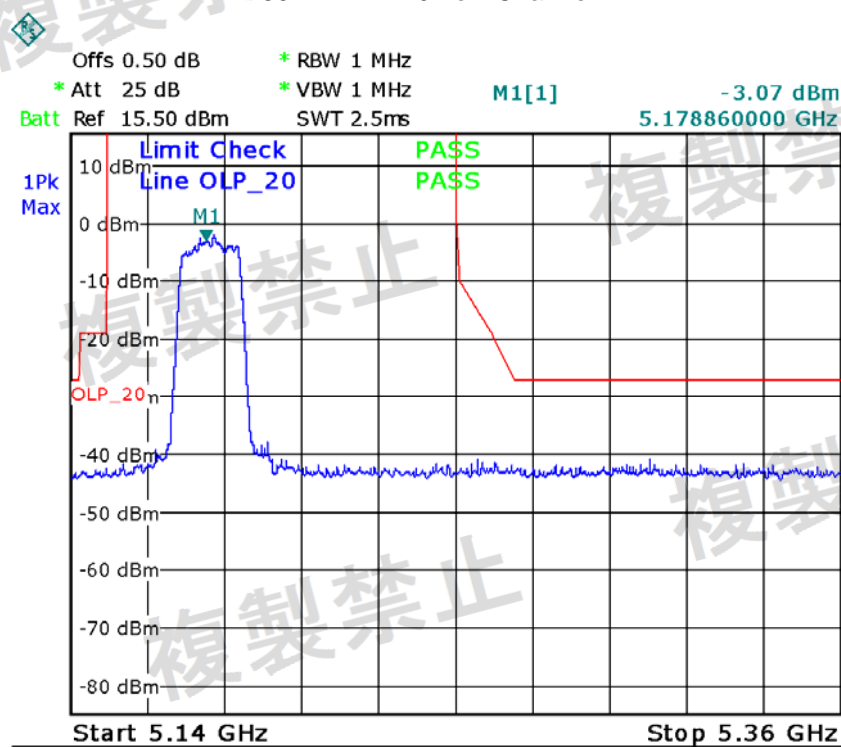
802.11a Middle Channel



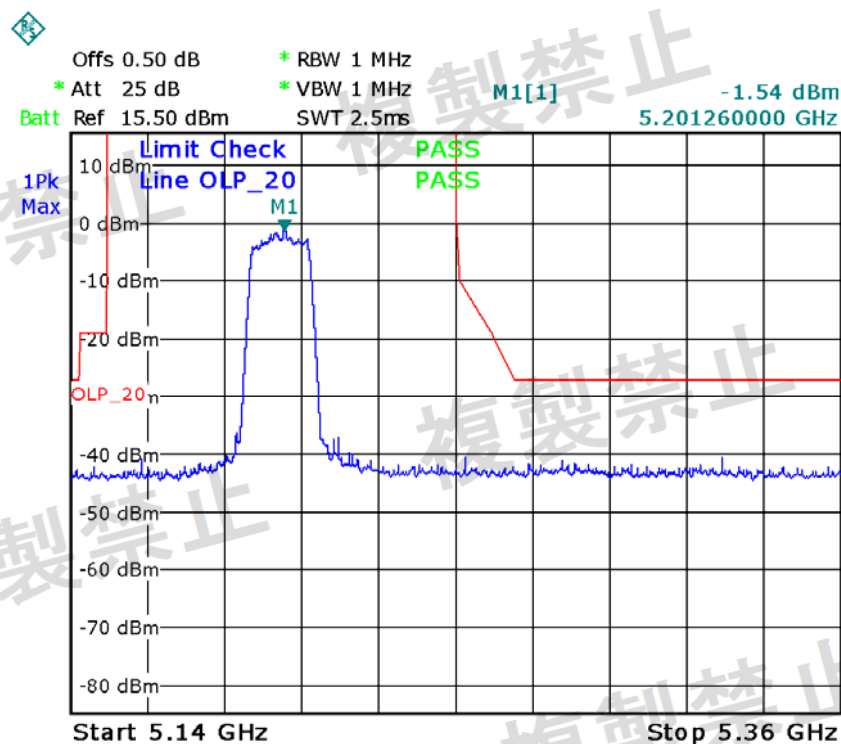
802.11a High Channel



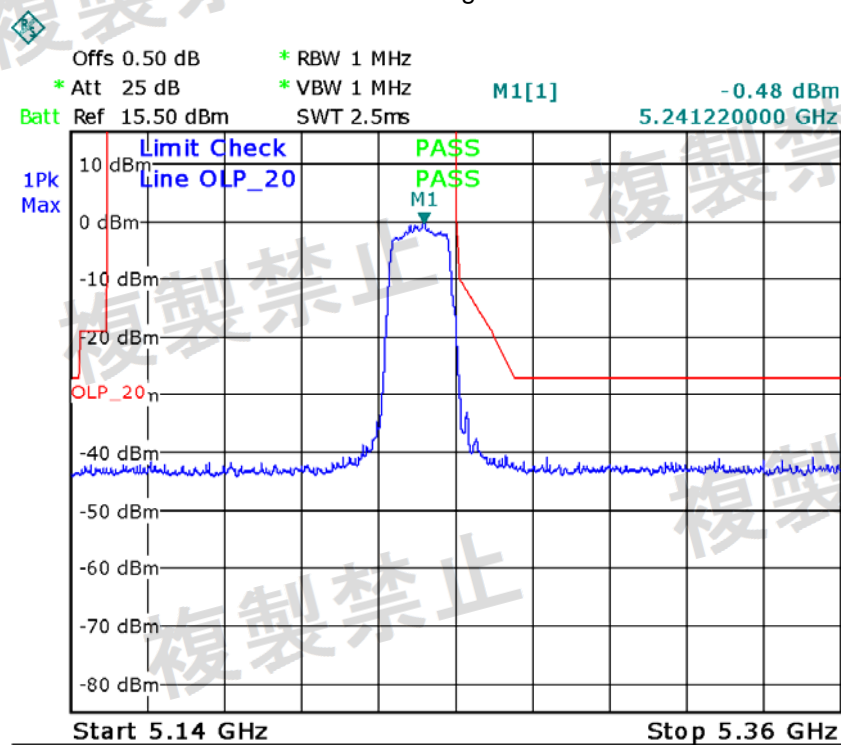
802.11n-HT20 Low Channel



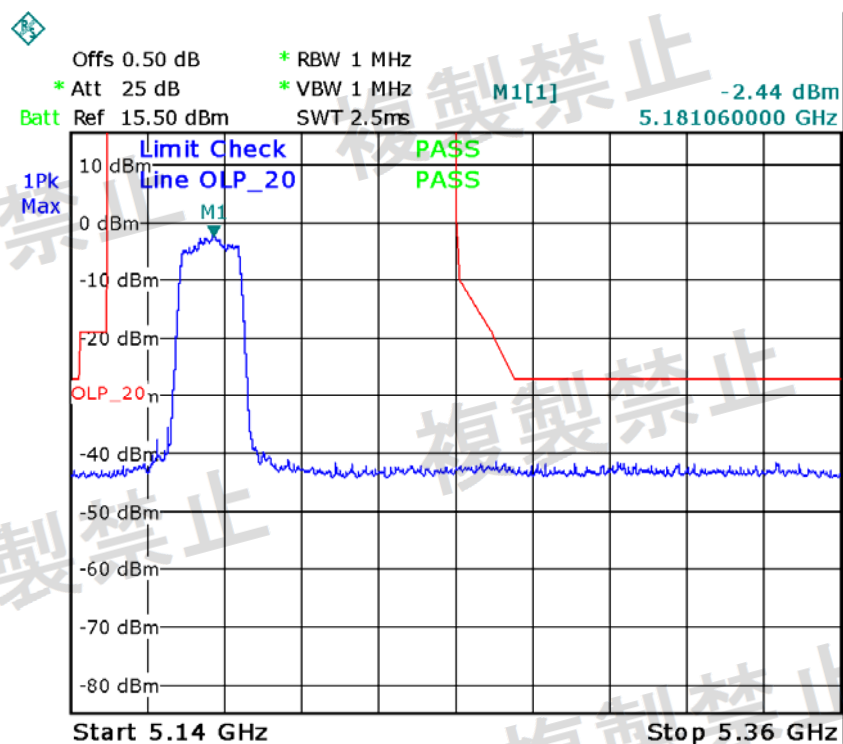
802.11n-HT20 Middle Channel



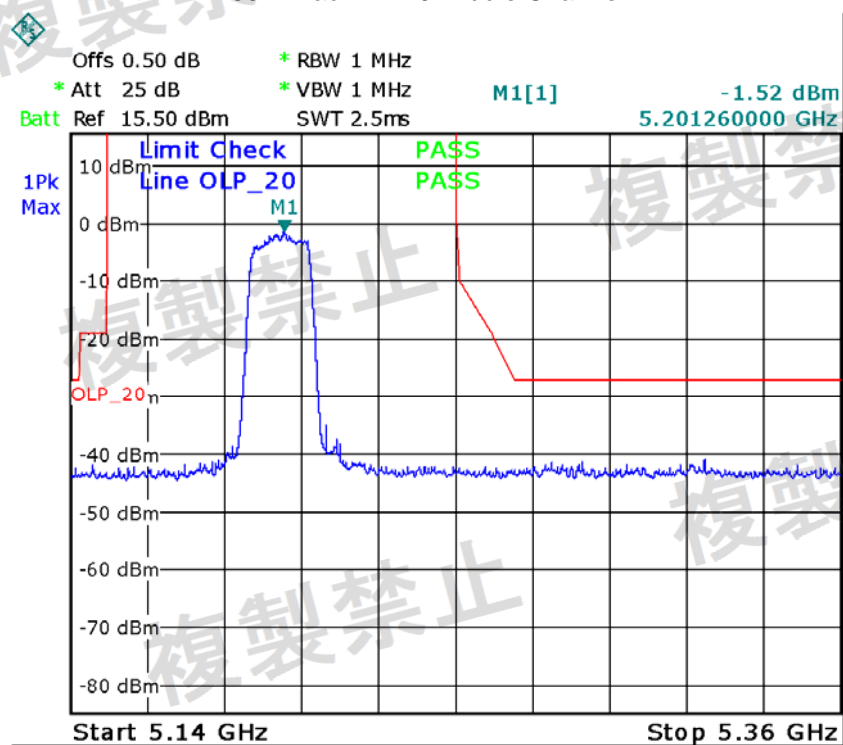
802.11n-HT20 High Channel



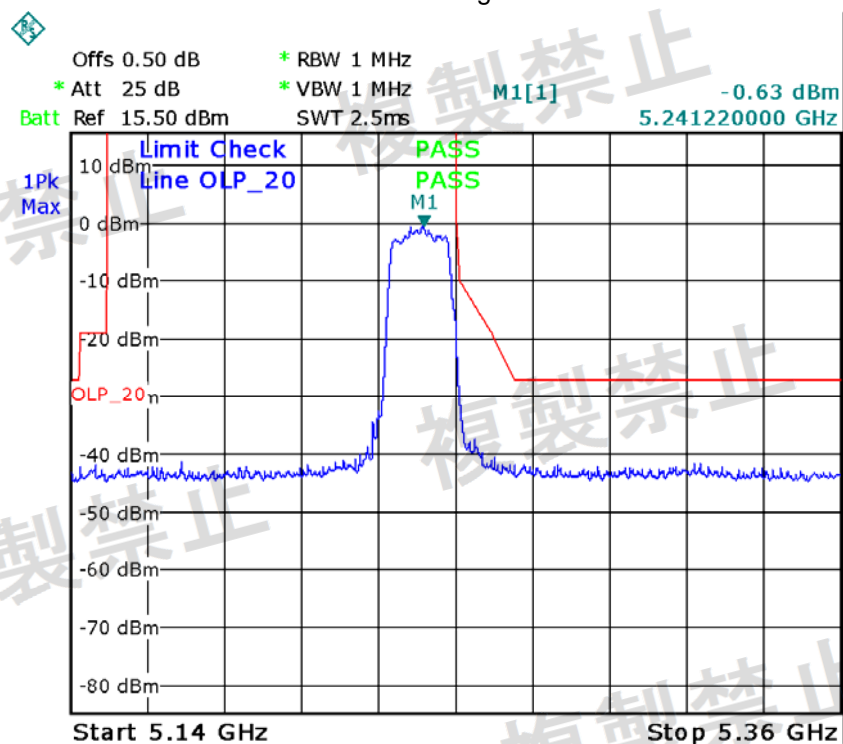
802.11ac-VHT20 Low Channel



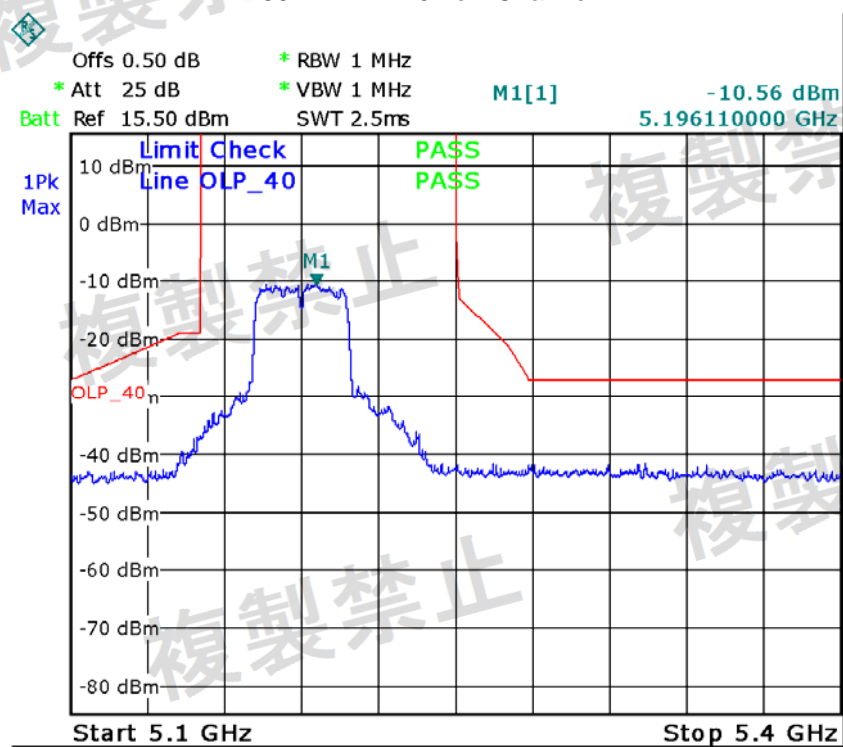
802.11ac-VHT20 Middle Channel



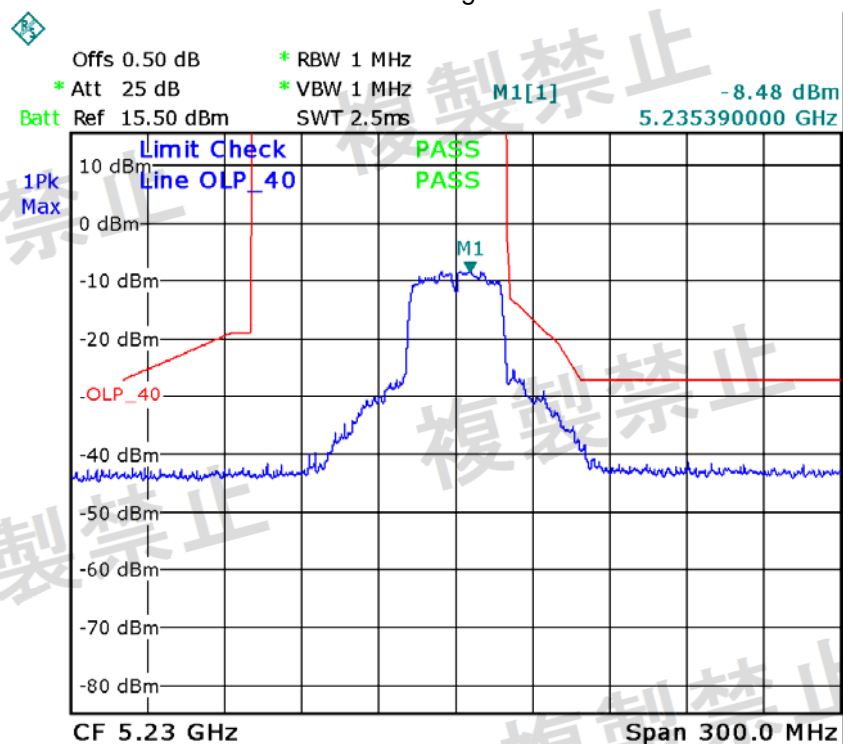
802.11ac-VHT20 High Channel



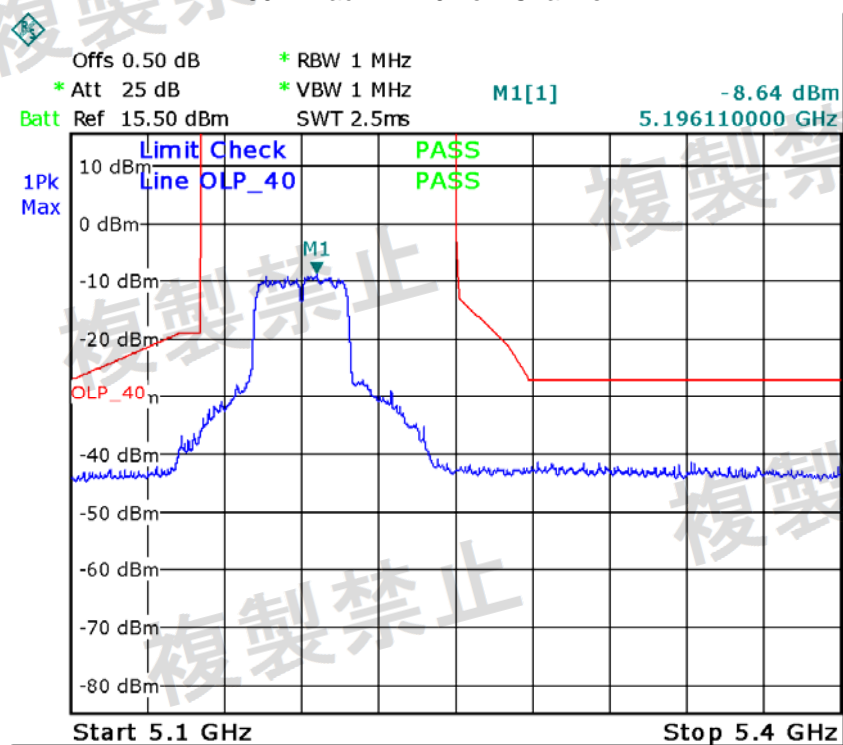
802.11n-HT40 Low Channel



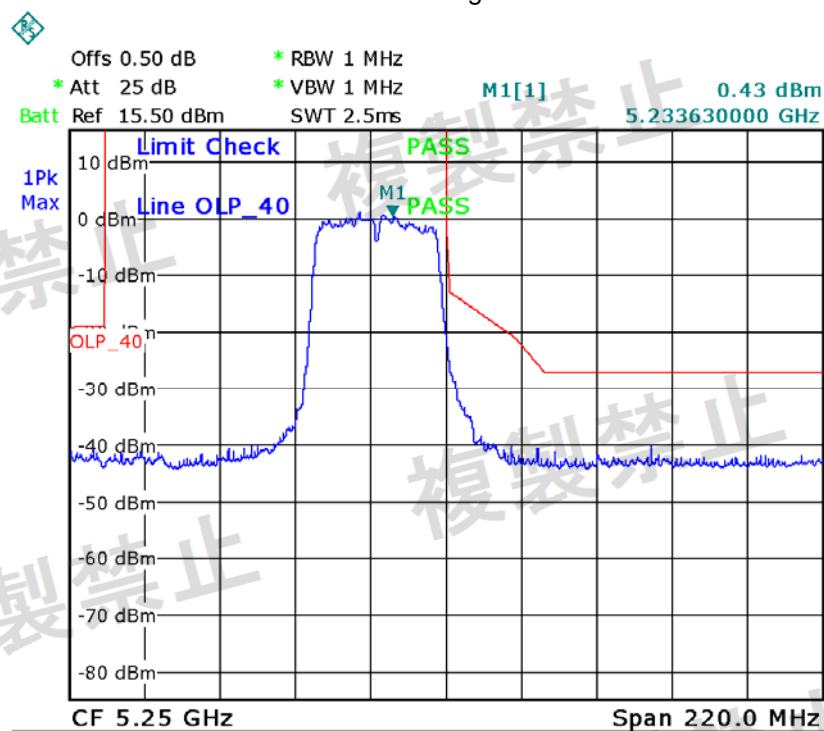
802.11n-HT40 High Channel



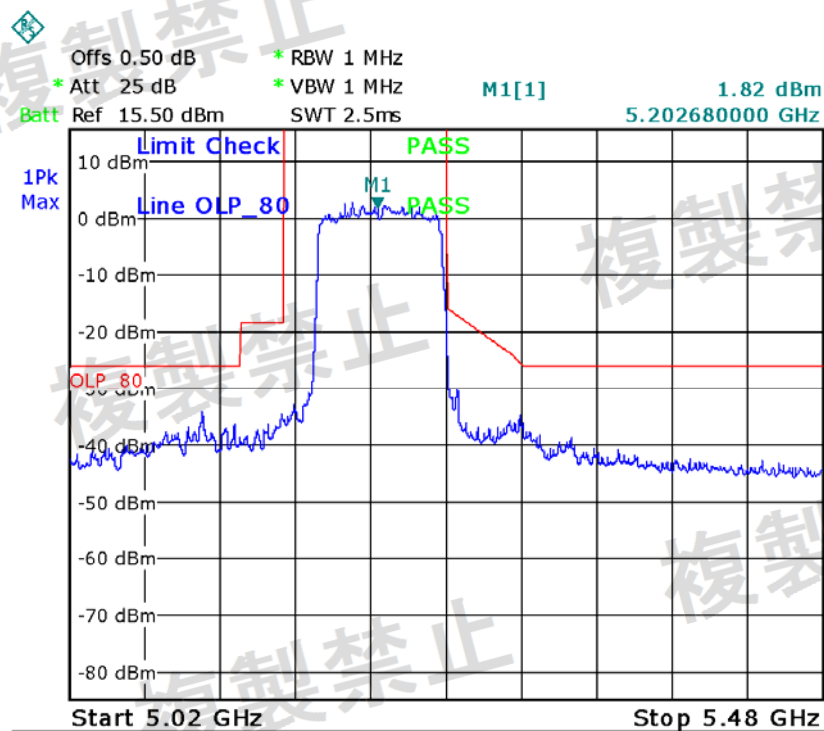
802.11ac-VHT40 Low Channel



802.11ac-VHT40 High Channel



802.11ac-VHT80 Low Channel



8 Measurements of Receiving Equipment

8.1 Secondary Radiated Emissions

8.1.1 Test Requirement

Article 2-1.

8.1.2 Limit

According to Article 2-1., the limit as follow:

below 1GHz:4nW or less;.

above 1GHz:20nW or less.

8.1.3 Test Result

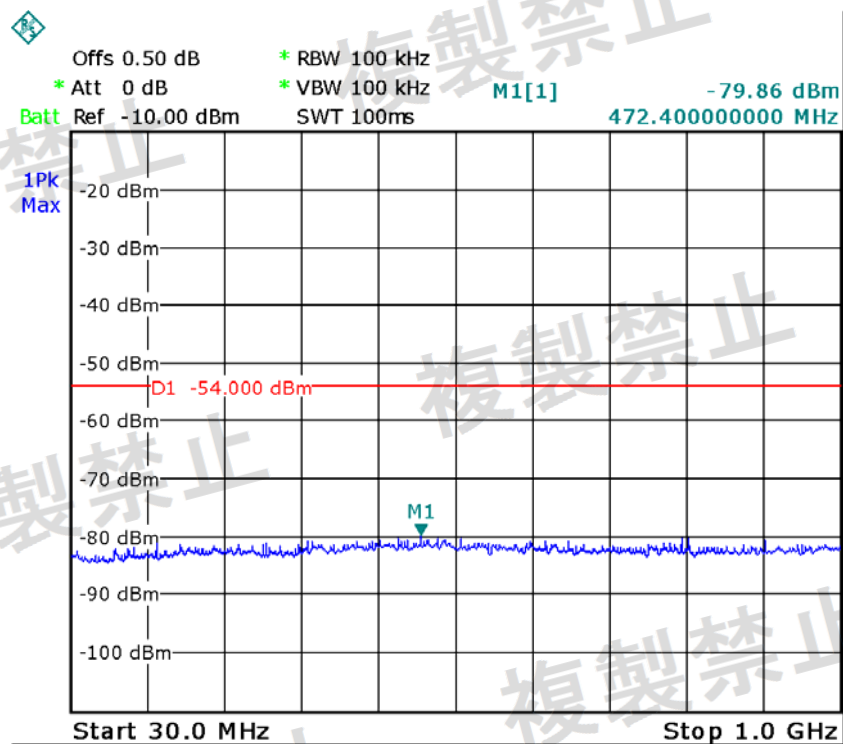
Modulation	Channel	Test Mode	Test Result
802.11a	Low	Receiving	PASS
	Middle	Receiving	PASS
	High	Receiving	PASS
802.11n-HT20	Low	Receiving	PASS
	Middle	Receiving	PASS
	High	Receiving	PASS
802.11ac-VHT20	Low	Receiving	PASS
	Middle	Receiving	PASS
	High	Receiving	PASS
802.11n-HT40	Low	Receiving	PASS
	High	Receiving	PASS
802.11ac-VHT40	Low	Receiving	PASS
	High	Receiving	PASS
802.11ac-VHT80	Low	Receiving	PASS

Note: The result only show the worst mode.

802.11ac

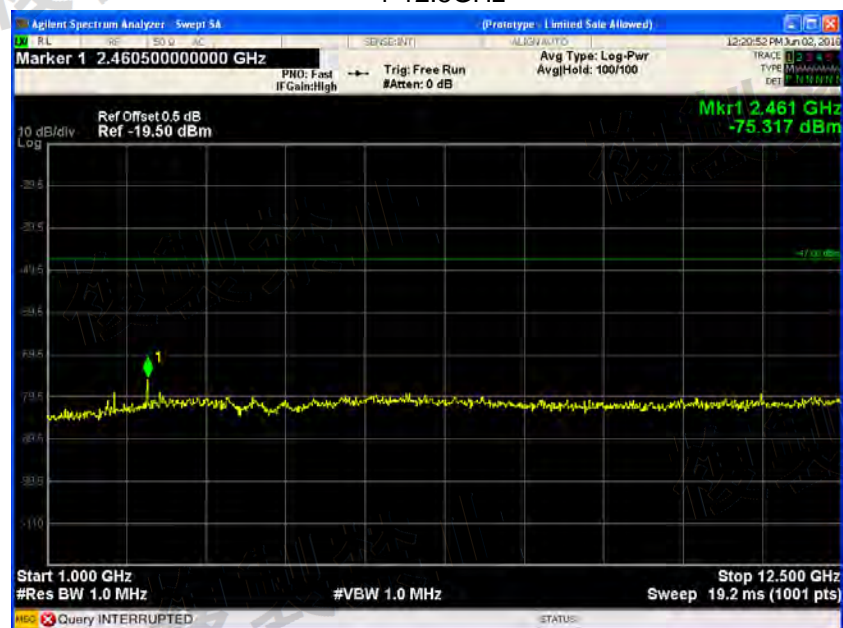
Low Channel

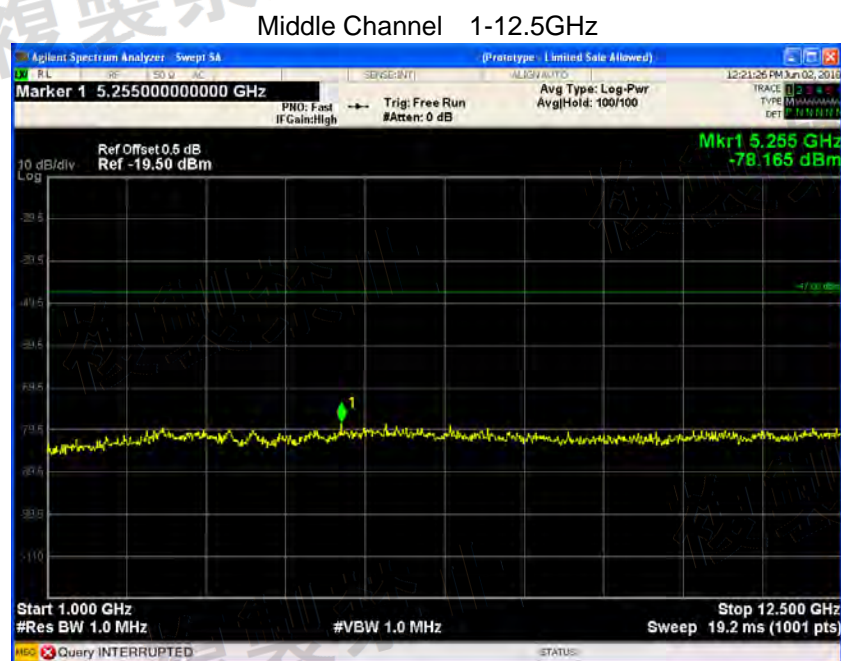
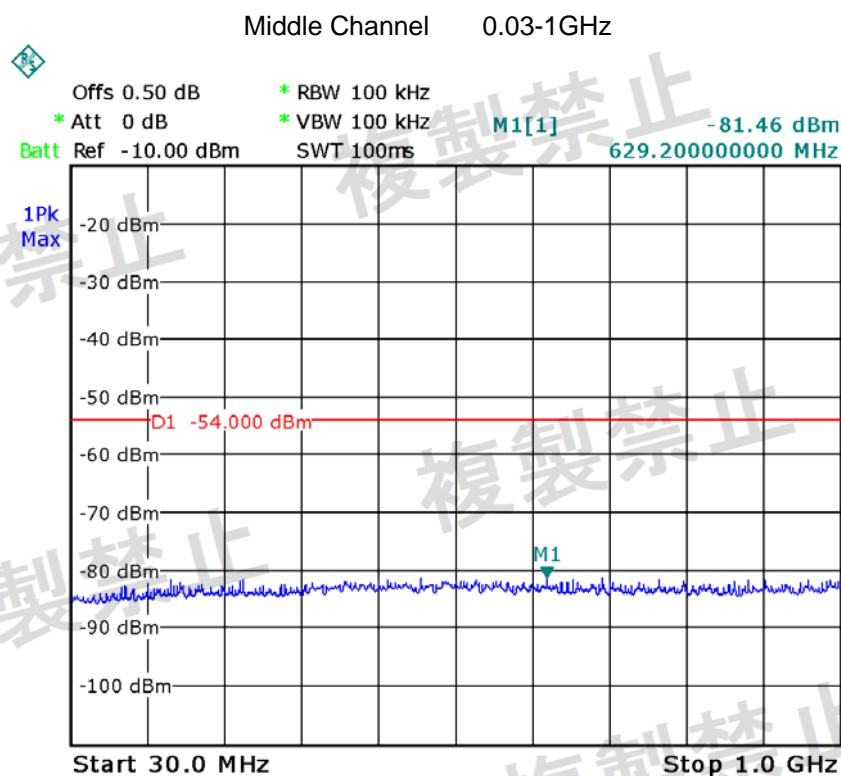
0.03-1GHz

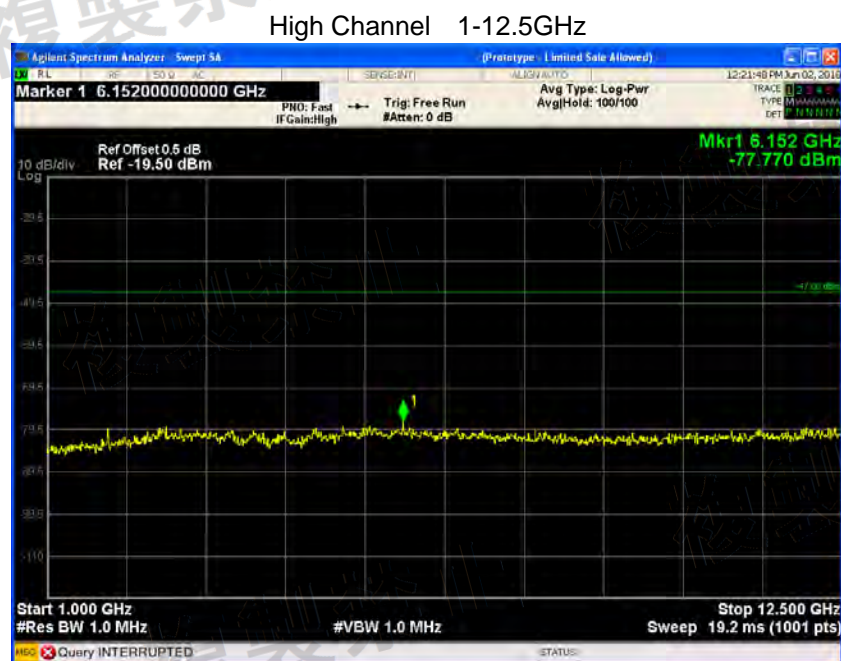
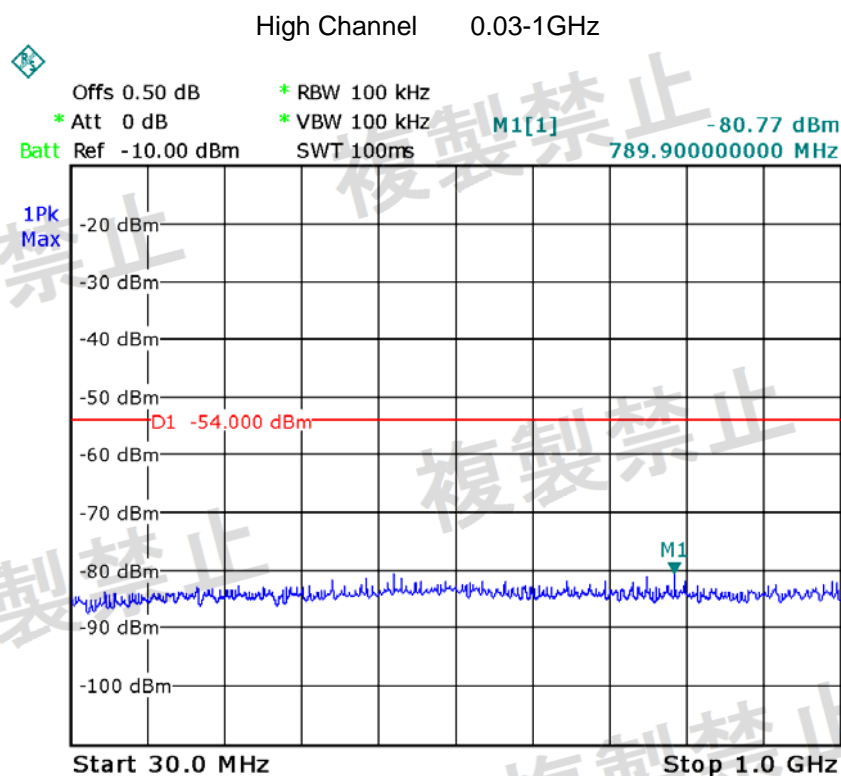


Low Channel

1-12.5GHz







9 Measurements of Controlling Equipment

9.1 Interference prevention function

9.1.1 Test Requirement

Article 2-1.

9.1.2 Conditions etc. of test equipment

- (1) The demodulator shall be able to demodulate the transmitting signal from the radio equipment and display contents of the identification code.
- (2) The opposite equipment shall be able to transmit the identification code as same as the transmitting signal from the radio equipment

9.1.3 Test Procedure

- (1) The radio equipment with automatic transmitting function of identification code A. Transmit the assigned identification code from the radio equipment. B. Confirm the identification code received by the demodulator.
- (2) The radio equipment with automatic receiving function of identification code A. Transmit the assigned identification code from the opposite equipment.

9.1.4 Test Result

Item	Modulation	Test mode	Results
Identification code	802.11a	transmitting	PASS
Identification code	802.11n-HT20	transmitting	PASS
Identification code	802.11ac-VHT20	transmitting	PASS
Identification code	802.11n-HT40	transmitting	PASS
Identification code	802.11ac-VHT40	transmitting	PASS
Identification code	802.11ac-VHT80	transmitting	PASS

9.2 Carrier Sensing Function

9.2.1 Test Requirement

Article 2-1.

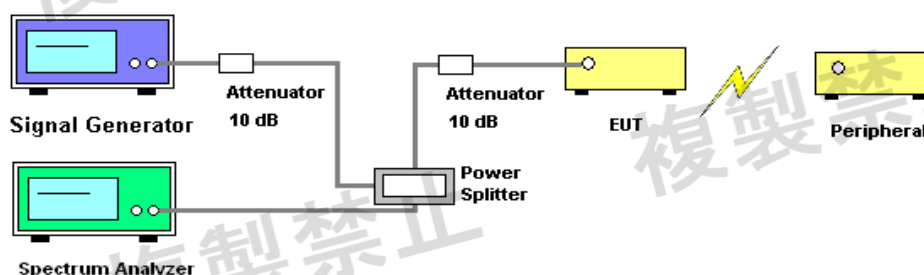
Item	Limits
Carrier Sense	Good – EUT stop RF transmission signal after carrier inject to EUT. (On $22.79 + Gr - 20 \cdot \log(f)$ [dBm] (Gr: dBi; f: MHz) or 100mV/m)

9.2.2 Conditions etc. of test equipment

Please refer to section 6 of equipments list in this report. The following table is the setting of spectrum analyzer and receiver.

Spectrum Parameter	Setting
Attenuation	Auto
RB / VB	1 MHz
Span	0 MHz
Sweep	Continuous
Detector	Peak
Trigger mode	Video

9.2.3 Test Setup Layout



9.2.4 Test Procedure

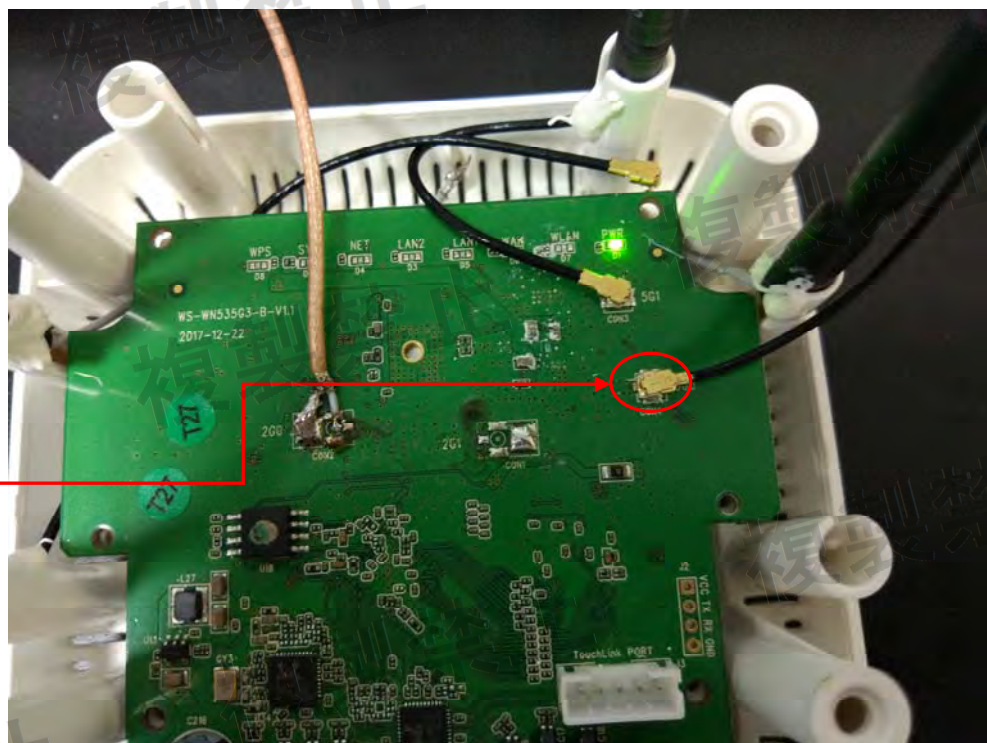
- (1) SSG adjusted the frequency as same as the EUT transmitted signal and emitted the absence of modulation from SSG and power level is $(On 22.79 + Gr - 20 \cdot \log(f) \text{ [dBm]})$ (Gr: dBi; f: MHz). Then turn off the RF signal of SSG.
- (2) EUT have transmitted the maximum modulation signal and fixed channelize.
- (3) Setting of SA is following as: RB: 1MHz / VB: 1MHz / SPAN: 0MHz / AT: 10dB / Ref: 0dBm / Sweep time: Auto / Sweep Mode: Continuous sweep / Detect mode: Positive peak.
- (4) SSG RF Signal On.
- (5) EUT shall be stop the transmitted any signal and SSG RF Signal Off. Then EUT will be continuous transmitted signal.

9.2.5 Test Result

Good.

Note: The register value-R30 which control the carrier sense level is 11 00 00 00.

10 Test Setup Photos



11 Photographs - Constructional Details

Refer to Annex WTS18S04109771W-Photos.

=====End of Report=====