

**JAPAN MIC  
TEST REPORT**  
For

**AtomTechJapan Co.,Ltd.**

#422 Sukaimena-yokohama 2-11-2 Takashima Nishi-ku kanagawa-ken

**Model: AC1**

<b>This Report Concerns:</b> <input checked="" type="checkbox"/> Original Report		<b>Equipment Type:</b> ATOM Cam	
<b>Report Number:</b>		RBJ200103050-07	
<b>Report Date:</b>		2020-01-12	
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## GENERAL INFORMATION

### Product Description for Equipment Under Test (EUT)

<b>EUT Name:</b>	ATOM Cam
<b>EUT Model:</b>	AC1
<b>Modulation Type:</b>	DSSS, OFDM
<b>Emission Type:</b>	G1D, D1D
<b>Frequency Range:</b>	802.11b/g/n ht20: 2412-2472MHz 802.11n ht40: 2422-2462MHz
<b>Output Power:</b>	802.11b:5mW/MHz, 802.11g/ n ht20:1mW/MHz, 802.11n ht40:1mW/MHz
<b>Antenna Gain:</b>	2.0dBi
<b>Rated Input Voltage:</b>	DC 5V from adapter
<b>Adapter Information</b>	<b>Model:</b> KA06E-0501000JP
	<b>Input:</b> 100-240V~50/60Hz 0.25A
	<b>Output Power:</b> 5V-1000mA
	<b>Serial Number:</b> RBJ200103050-RF-S1
	<b>EUT Received Date:</b> 2001.01.08
	<b>EUT Received Status:</b> Good

### Objective

The objective of the manufacturer is to demonstrate compliance with Radio Law of Japan item 19 of Article 2 Paragraph 1.

### Test Methodology

All measurements contained in this report were conducted with technical regulations of the Radio Law of Japan.

### Measurement Uncertainty

Parameter	Measurement Uncertainty
Frequency error	$\pm 0.082 \times 10^{-6}$
Occupied bandwidth	$\pm 5 \%$
Unwanted emission strength	$\pm 2.47\text{dB}$
Antenna output power	$\pm 0.61\text{dB}$
Temperature	$\pm 1^\circ\text{C}$
Humidity	$\pm 5\%$
Duty Cycle	0.01
DC and low frequency voltages	$\pm 0.4\%$

*Note: 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.*

## Declarations

BACL 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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This report may contain data that are not covered by the accreditation scope and shall be marked with an asterisk “★”.

## EUT TEST CONFIGURATION

### Description of Test Configuration

The system was configured for testing in engineering mode which was selected by manufacturer.

For 2.4G band, 13 channels are provided to testing:

Channel	Frequency (MHz)	Channel	Frequency (MHz)
1	2412	8	2447
2	2417	9	2452
3	2422	10	2457
4	2427	11	2462
5	2432	12	2467
6	2437	13	2472
7	2442	/	/

For 802.11b/g/n ht20 modes channel 1, 7 and 13 were tested;

For 802.11n ht40 modes channel 3, 7 and 11 were tested.

The extreme voltage test conditions which were declared by the manufacturer and the normal conditions are as below:

NV: Normal Voltage 100V<sub>AC</sub>

LV: Low Voltage 90V<sub>AC</sub>

HV: High Voltage 110V<sub>AC</sub>

The power deviation of the adapter output is less than 1% when extreme voltage supplied to the adapter, therefore the test only performed at normal condition.

Condition	Input (V/AC)	Output (V/DC)
NV	100	5.00
LV	90	5.00
HV	110	5.00



## EUT Exercise Software

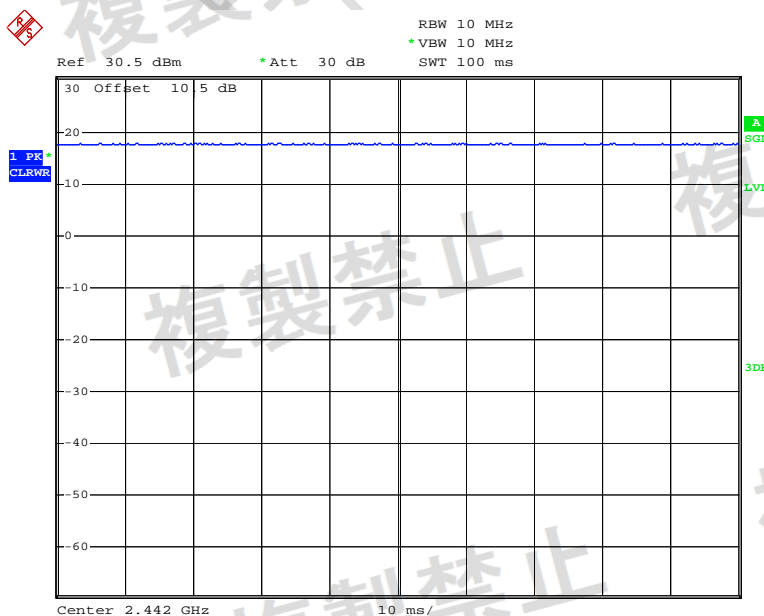
Software "ipop" was used during test, which was provided by manufacturer, the maximum power was configured as below:

Mode	Channel	Frequency (MHz)	Data rate	Power level Setting
802.11 b	Low	2412	1Mbps	36
	Middle	2442	1Mbps	36
	High	2472	1Mbps	36
802.11 g	Low	2412	6Mbps	42
	Middle	2442	6Mbps	42
	High	2472	6Mbps	42
802.11n ht20	Low	2412	MCS0	42
	Middle	2442	MCS0	42
	High	2472	MCS0	42
802.11n ht40	Low	2422	MCS0	40
	Middle	2442	MCS0	40
	High	2462	MCS0	40

Duty cycle:

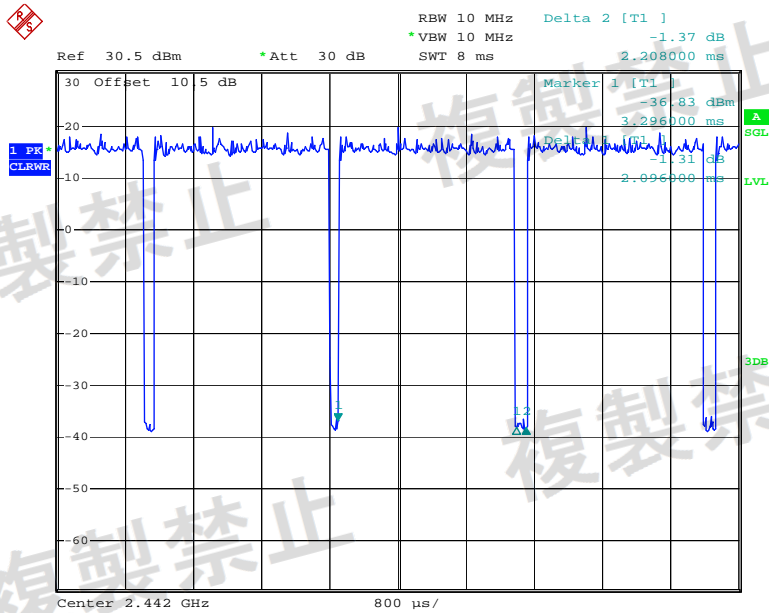
Mode	T <sub>on</sub> (ms)	T <sub>on+off</sub> (ms)	Duty Cycle (%)
802.11 b	100	100	100
802.11 g	2.096	2.208	94.9
802.11n ht20	1.968	2.064	95.3
802.11n ht40	0.96	1.048	91.6

### 802.11b



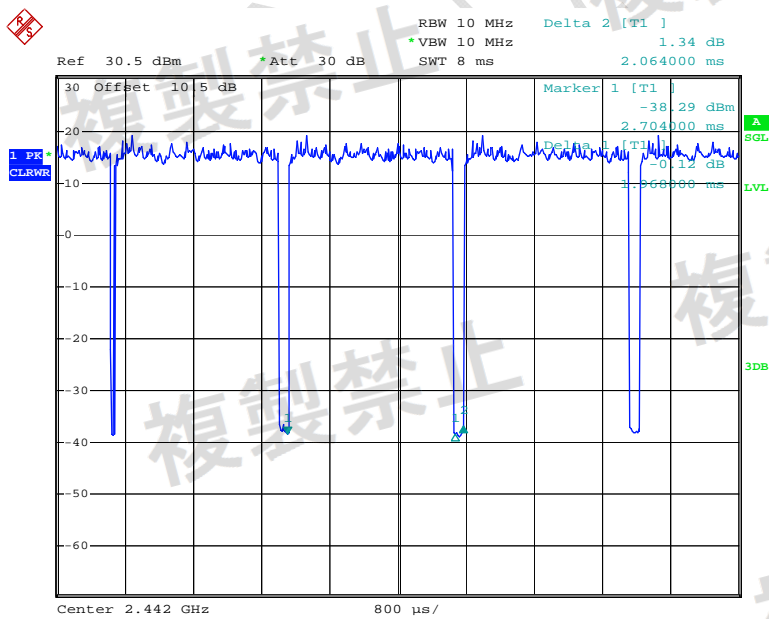
Date: 9.JAN.2020 18:07:59

### 802.11 g



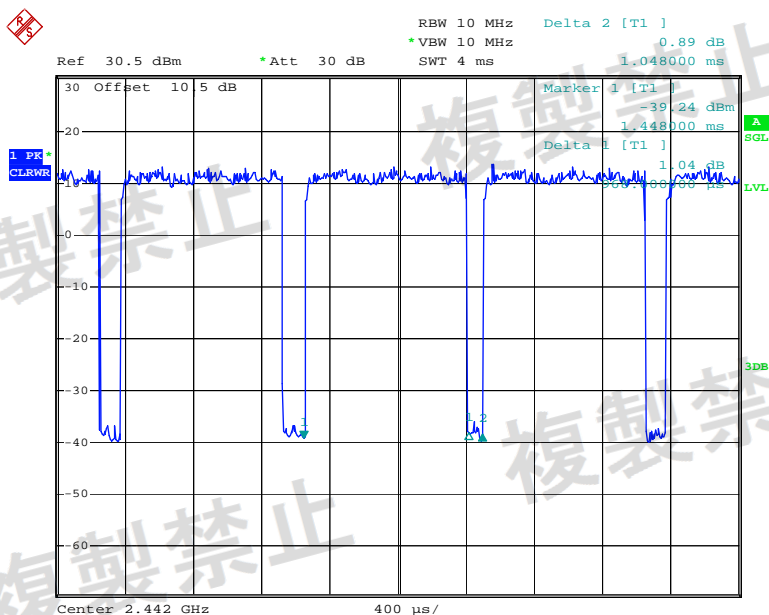
Date: 9.JAN.2020 18:11:05

### 802.11n ht20



Date: 9.JAN.2020 18:13:43

# 802.11n ht40

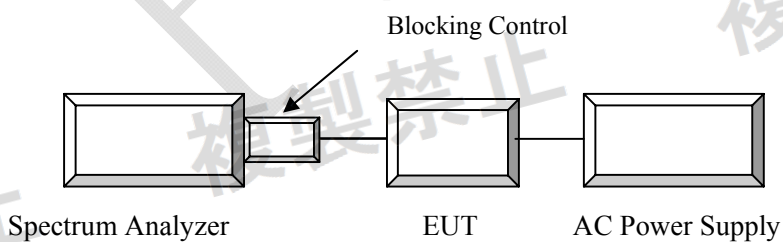


Date: 9.JAN.2020 18:15:48

## Support Equipment List and Details

Manufacturer	Description	Model	Serial Number
Gaoxin	AC Power Supply	GX-MZ-100	120 42315

## Configuration of Test Setup





**Test Equipment List and Details**

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
R&S	Spectrum Analyzer	FSP 38	100478	2019-05-09	2020-05-09
Unknown	Coaxial Cable	C-SJ00-0010	C0010/03	Each time	N/A
E-Microwave	Blocking Control	EMDCB-00036	OE01203218	Each time	N/A
E-Microwave	Coaxial Attenuators	EMCA10-5RN-6	OE01203239	Each time	N/A
Agilent	USB Wideband Power Sensor	U2021XA	MY54080014	2019-05-09	2020-05-09
UNI-T	Multimeter	UT39A	M130199938	2019-07-24	2020-07-24
R&S	Wideband Radio Communication Tester	CMW500	147473	2019-08-03	2020-08-03
Agilent	MXG Vector Signal Generator	N5182B	MY51350142	2019-07-19	2020-07-19

\* **Statement of Traceability:** Bay Area Compliance Laboratories Corp. (Dongguan) attests that all calibrations have been performed, traceable to National Primary Standards and International System of Units (SI).

**Test Environmental Conditions**

<b>Temperature:</b>	25 °C
<b>Relative Humidity:</b>	43%
<b>ATM Pressure:</b>	101.9kPa
<b>Tester:</b>	Severn Zhu
<b>Test Date:</b>	2020.01.09

**SUMMARY OF TEST RESULTS**

MIC Notice No.88 Appendix No.43 Article 2, Paragraph 1, Item 19 Rules Section	Description of Test	Result
3	Frequency Error	Compliance
4	Occupied Bandwidth and Spreading Bandwidth	Compliance
5	Transmitter Spurious Emission and Unwanted Emission Intensity	Compliance
6	Antenna Output Power and Output Power Tolerance	Compliance
7	Receiver Spurious Emission and Unwanted Emission Intensity	Compliance
8	Transmission Antenna Gain	Not Applicable
9	Transmission Radiation Angle Width	Not Applicable
10	Carrier sense capability	Compliance
11	Frequency Hopping Dwell Time	Not Applicable*
12	Interference Prevention Function	Compliance
Note 1	Construction Protection Confirmation	Compliance

Note:

Not Applicable: Please refer to 'Note 3' of Antenna Output Power and Output Power Tolerance section.

Not Applicable\*: Testing is only required for FHSS system devices.

**FREQUENCY ERROR****Limit**

50ppm or below

**Test Procedure**

Set the EUT to the measurement frequency without modulation.

Setting of SA is following as: RB: 1 kHz / VB: 10 kHz / 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.

**Test Data****Test Result:** Compliance*Test Mode: Transmitting*

Mode	Test Frequency (MHz)	Measured Frequency (MHz)		F <sub>C</sub>	Result (ppm)	Limit (ppm)
		F <sub>L</sub>	F <sub>H</sub>	MHz		
802.11 b	2412	2406.9600	2417.1200	2412.0400	16.58	<50
	2442	2436.8000	2447.1200	2441.9600	16.38	
	2472	2467.0400	2476.9600	2472.0000	0.00	
802.11 g	2412	2403.6800	2420.3200	2412.0000	0.00	<50
	2442	2433.6800	2450.3200	2442.0000	0.00	
	2472	2463.6800	2480.3200	2472.0000	0.00	
802.11n ht20	2412	2403.0400	2420.9600	2412.0000	0.00	<50
	2442	2433.0400	2450.9600	2442.0000	0.00	
	2472	2463.0400	2480.9600	2472.0000	0.00	
802.11n ht40	2422	2403.7600	2440.4000	2422.0800	33.03	<50
	2442	2423.6000	2460.4000	2442.0000	0.00	
	2462	2443.7600	2480.4000	2462.0800	32.49	

Note:

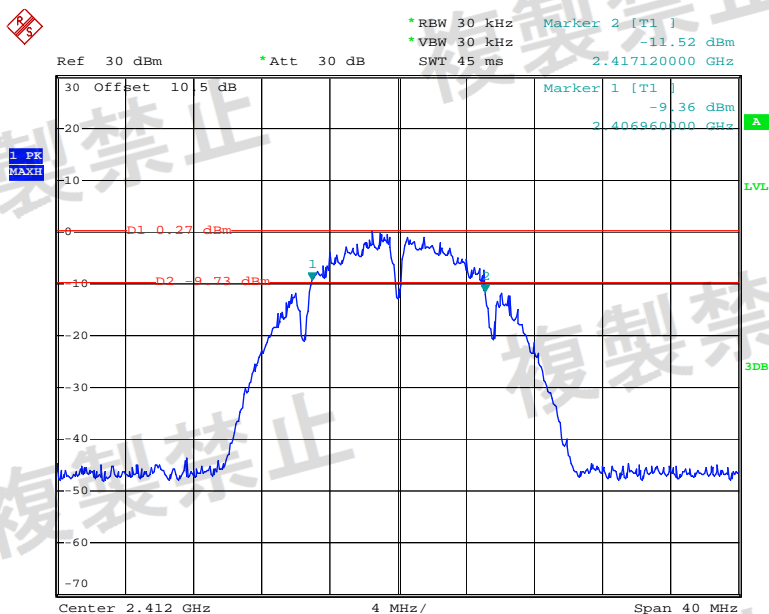
$$F_C = (F_L + F_H) / 2$$

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

Please refer to the following plots for normal voltage:

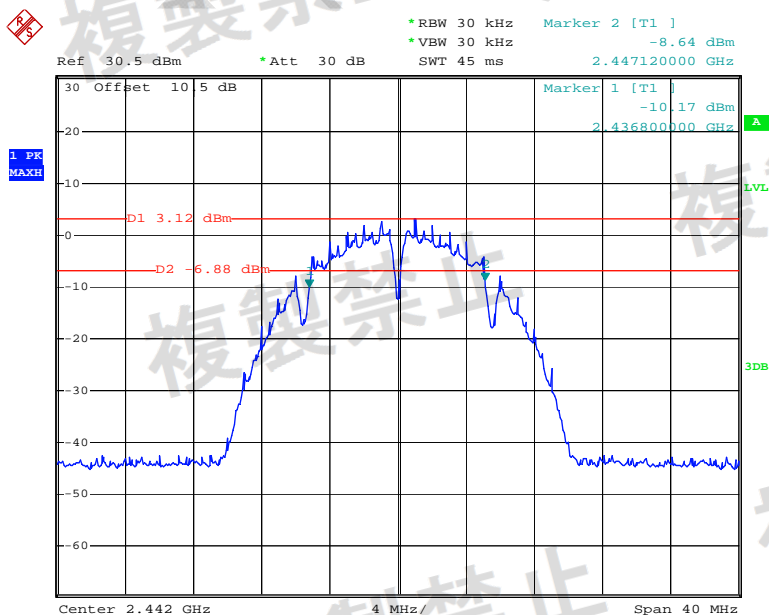
802.11b:

Test Frequency:2412MHz



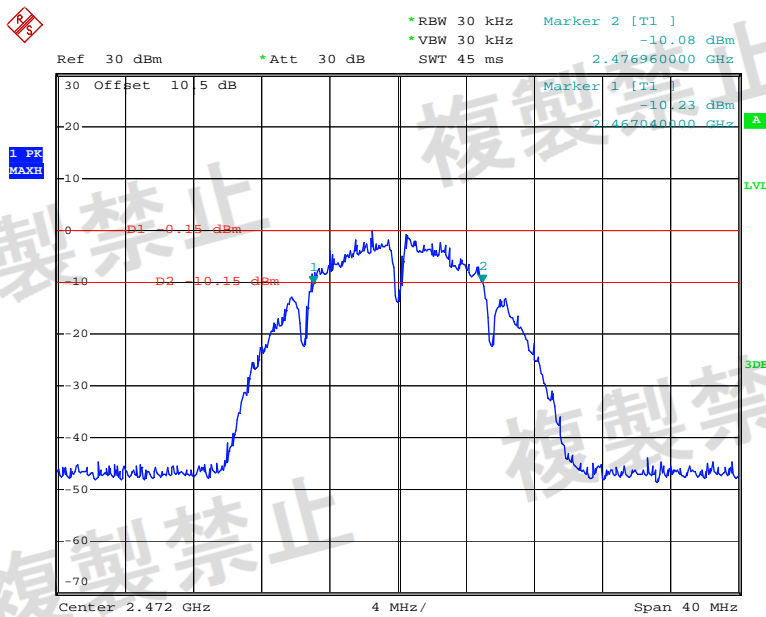
Date: 9.JAN.2020 16:29:30

Test Frequency:2442MHz



Date: 14.JAN.2020 15:58:43

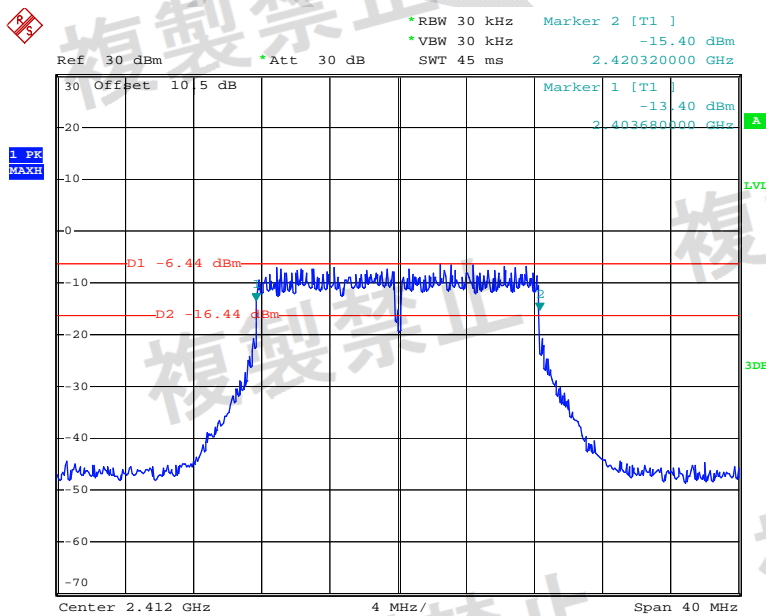
Test Frequency:2472 MHz



Date: 9.JAN.2020 16:35:47

802.11g:

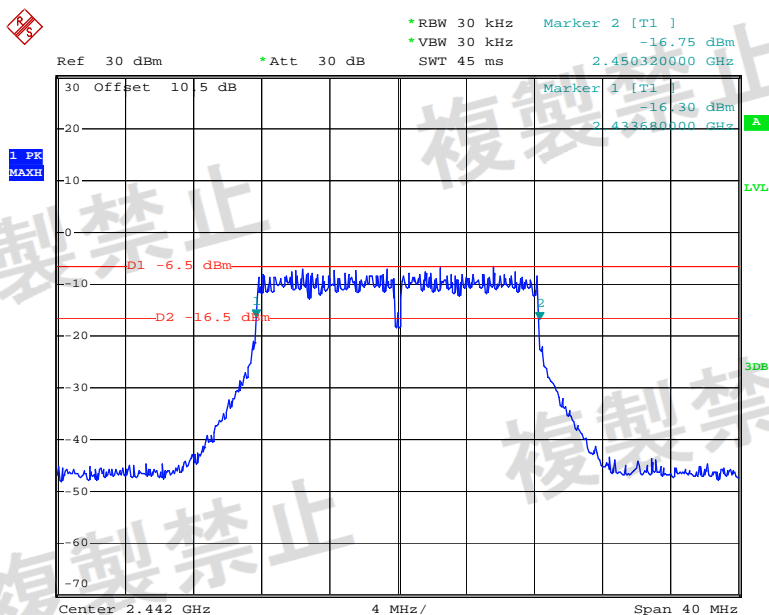
Test Frequency:2412MHz



Date: 9.JAN.2020 16:44:40

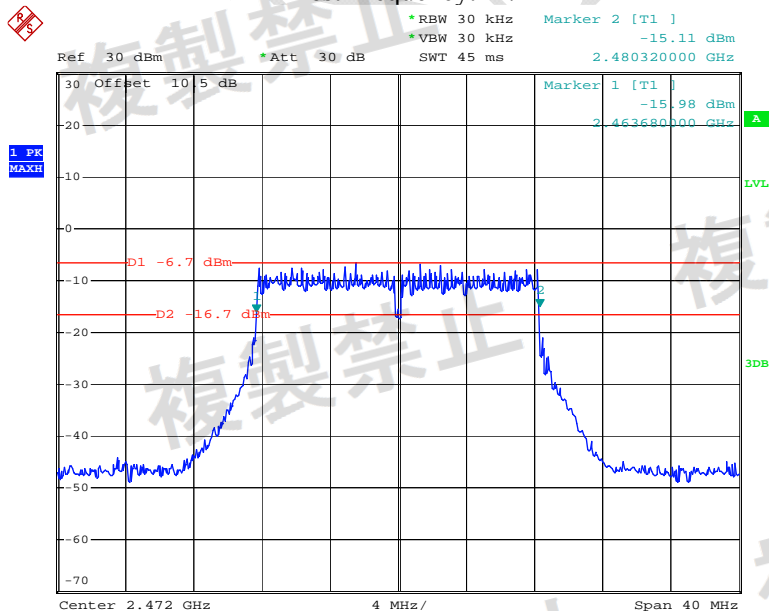


Test Frequency:2442MHz



Date: 9.JAN.2020 16:41:58

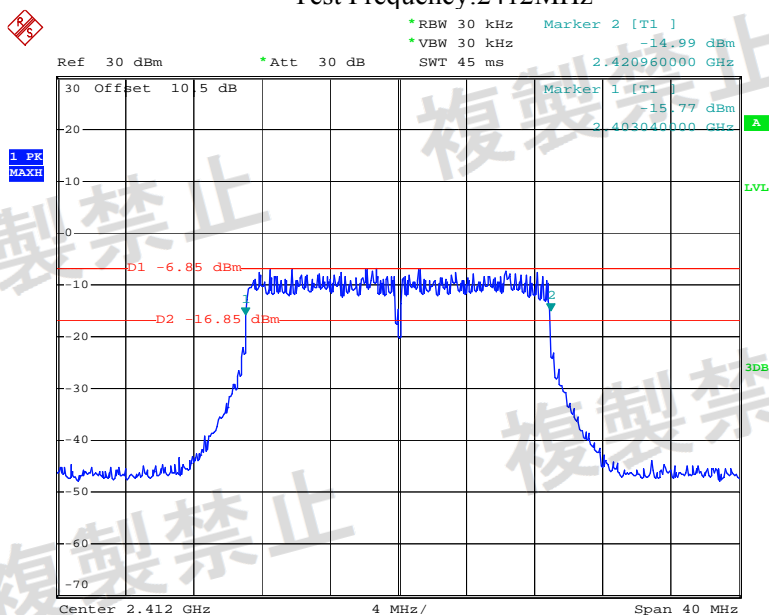
Test Frequency:2472MHz



Date: 9.JAN.2020 16:39:44

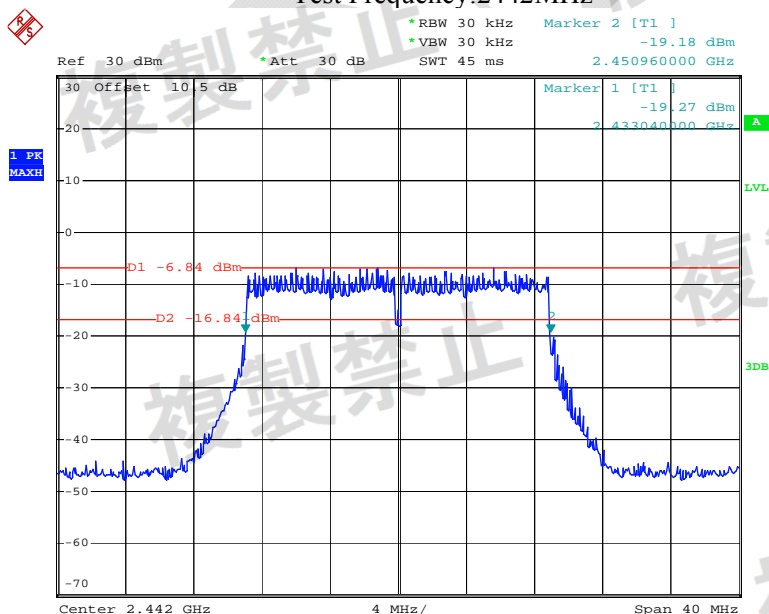
802.11n ht20:

Test Frequency:2412MHz



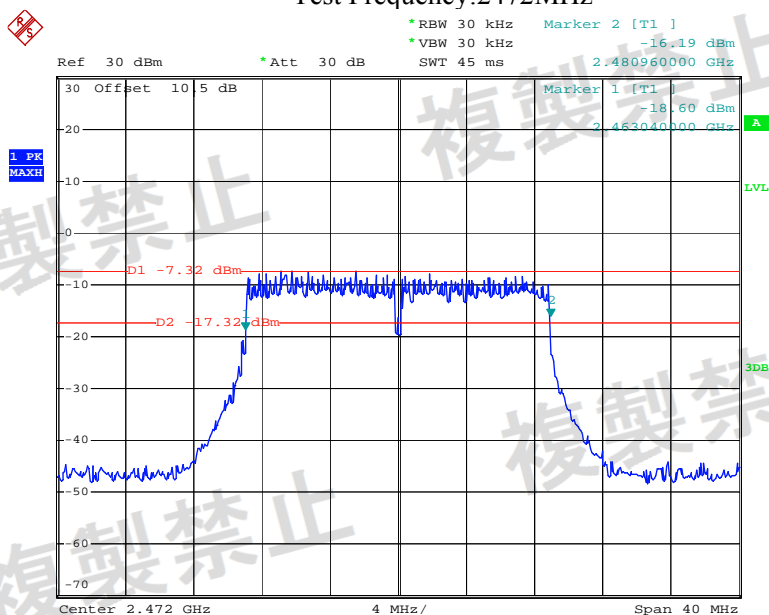
Date: 9.JAN.2020 16:47:08

Test Frequency:2442MHz



Date: 9.JAN.2020 16:50:17

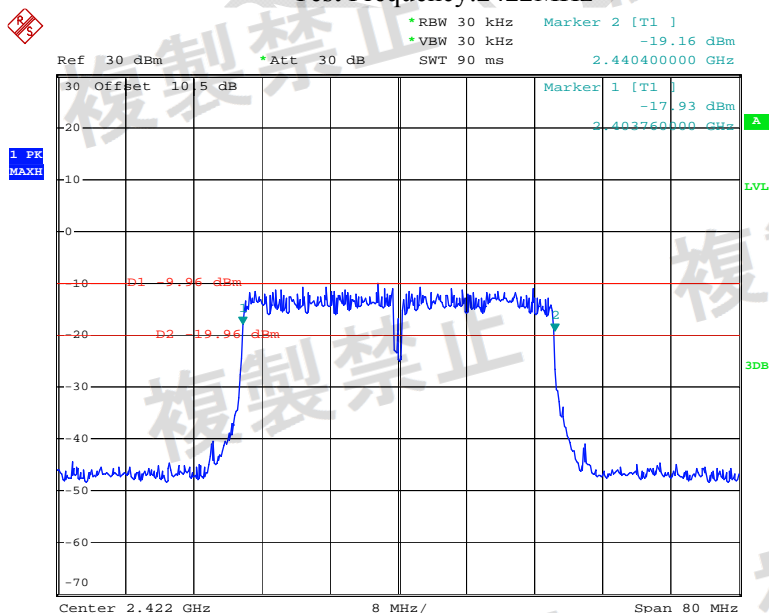
Test Frequency:2472MHz



Date: 9.JAN.2020 16:52:25

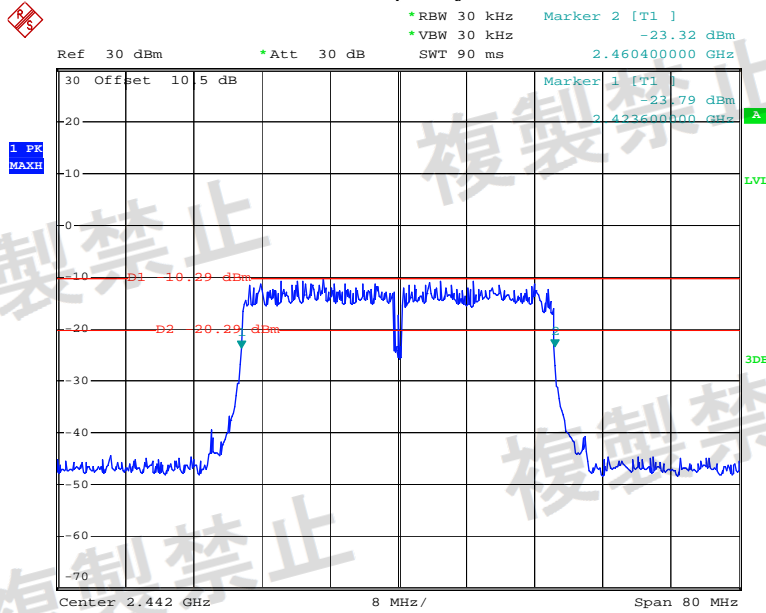
802.11n ht40

Test Frequency:2422MHz



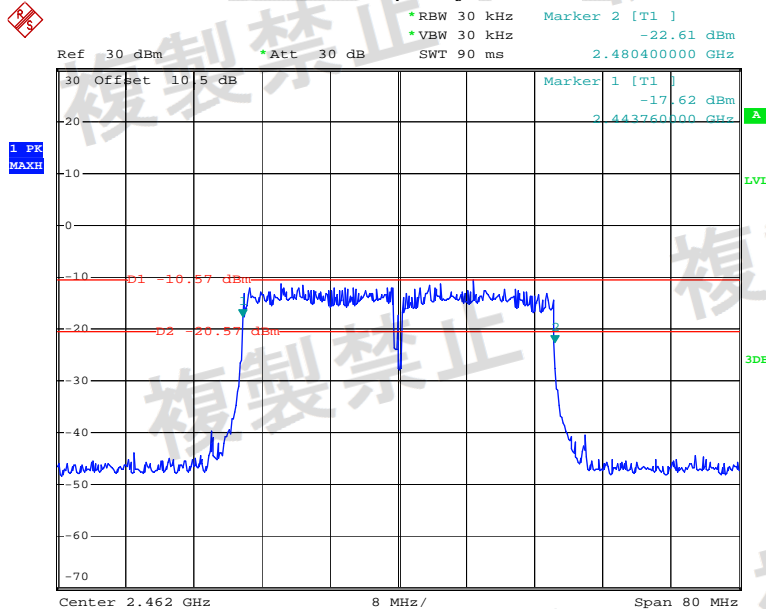
Date: 9.JAN.2020 17:00:34

Test Frequency: 2442 MHz



Date: 9.JAN.2020 16:57:48

Test Frequency: 2462 MHz



Date: 9.JAN.2020 16:55:17

**OCCUPIED BANDWIDTH AND SPREADING BANDWIDTH****Limit**

- Occupied bandwidth: FH $\leq$ 83.5 MHz; DS $\leq$ 26 MHz; OFDM $\leq$ 38 MHz, Others $\leq$ 26 MHz
- Spread Bandwidth: $\geq$  500 kHz(FH,DS), Spread factor $\geq$  5.

**Test Procedure**

1. Setting of SA is following as: RB: 300 kHz / VB: 300 kHz / 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. EUT have transmitted the maximum modulation signal and fixed channelize. SA set to 90% of occupied bandwidth to measure spread bandwidth.
4. Spread Factor=Spread Bandwidth/modulation rate. The modulation rate: MR=1.375 for 802.11b, 1.5 for 802.11g/n ht20, 3 for 802.11n ht40.

**Test Data****Test Result:** Compliance*Test Mode: Transmitting*

802.11b Mode:

Frequency	2412 MHz	2442 MHz	2472 MHz	Limit
Occupied Bandwidth (MHz)	13.44	13.36	13.44	$\leq$ 26MHz
Spread Bandwidth (MHz)	8.80	8.88	8.88	$\geq$ 0.5MHz
Spread Factor	6.4	6.46	6.46	$>$ 5

802.11g Mode:

Frequency	2412 MHz	2442 MHz	2472 MHz	Limit
Occupied Bandwidth (MHz)	16.8	16.88	16.8	$\leq$ 26MHz

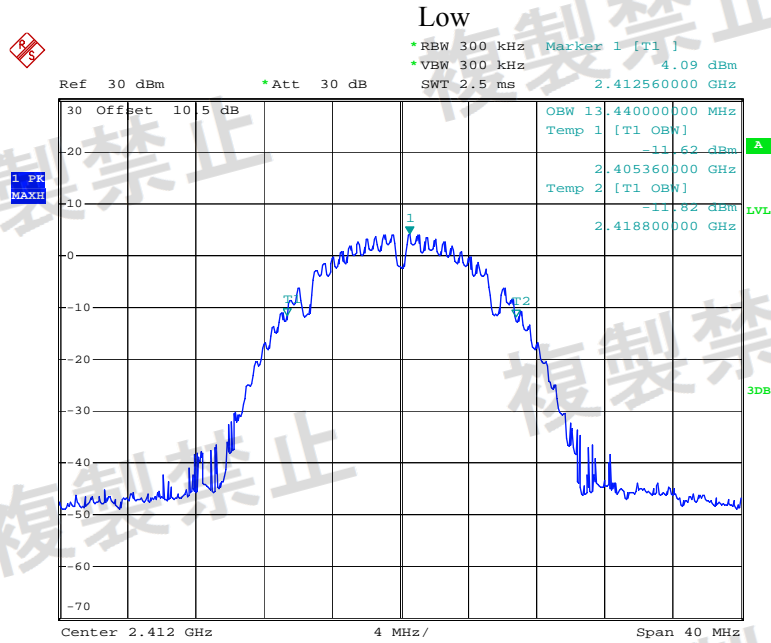
802.11n ht20 Mode:

Frequency	2412 MHz	2442 MHz	2472 MHz	Limit
Occupied Bandwidth (MHz)	17.84	17.84	17.84	$\leq$ 26MHz

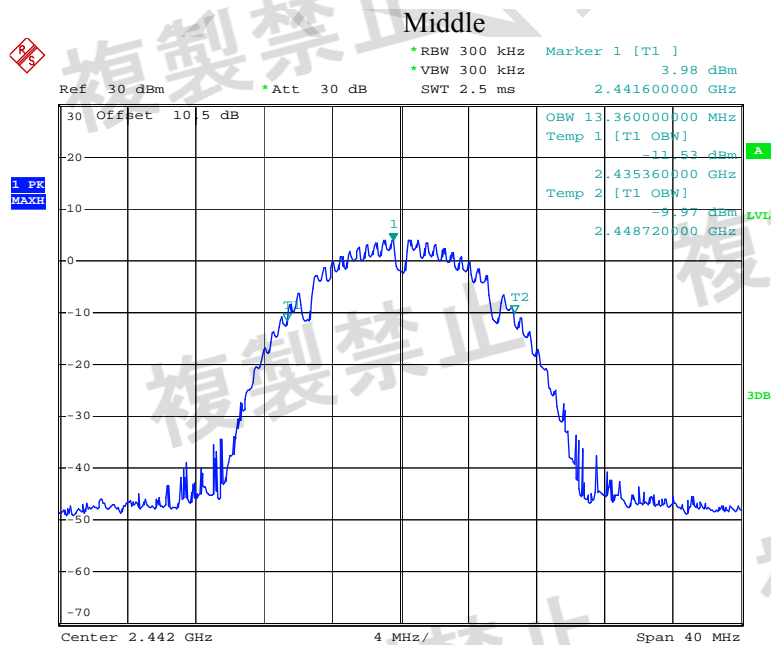
802.11n ht40 Mode:

Frequency	2422 MHz	2442 MHz	2462 MHz	Limit
Occupied Bandwidth (MHz)	36.16	36.32	36.16	$\leq$ 38MHz

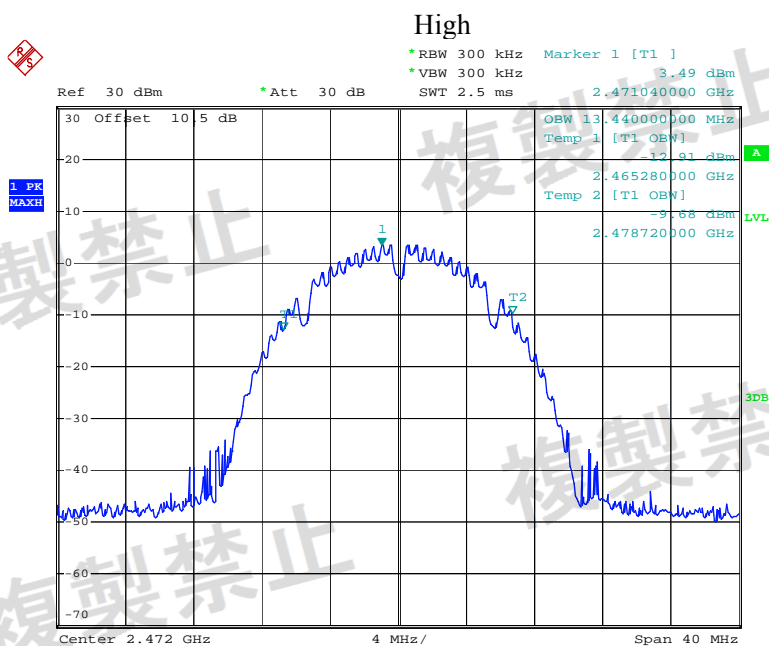


**Occupied Bandwidth:****802.11b Mode:**

Date: 9.JAN.2020 16:30:55

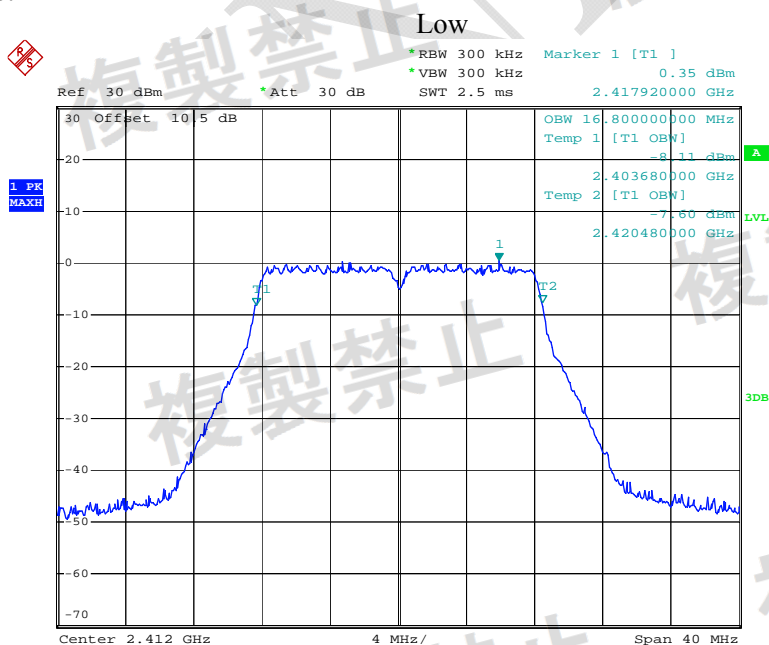


Date: 9.JAN.2020 16:34:16



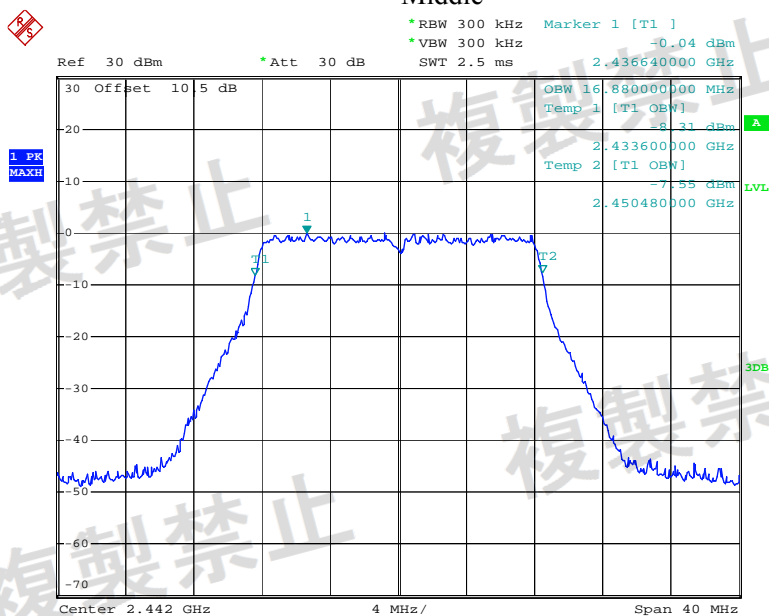
Date: 9.JAN.2020 16:37:12

**802.11 g Mode:**



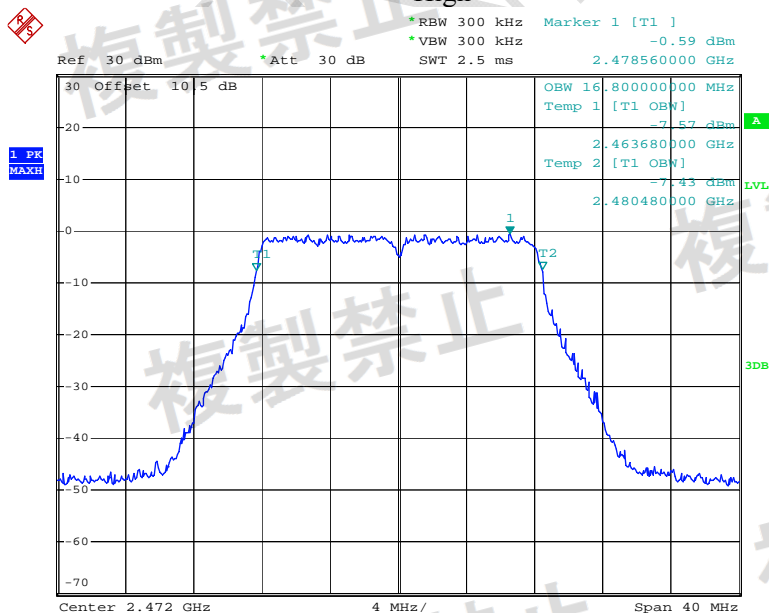
Date: 9.JAN.2020 16:45:55

### Middle



Date: 9.JAN.2020 16:43:23

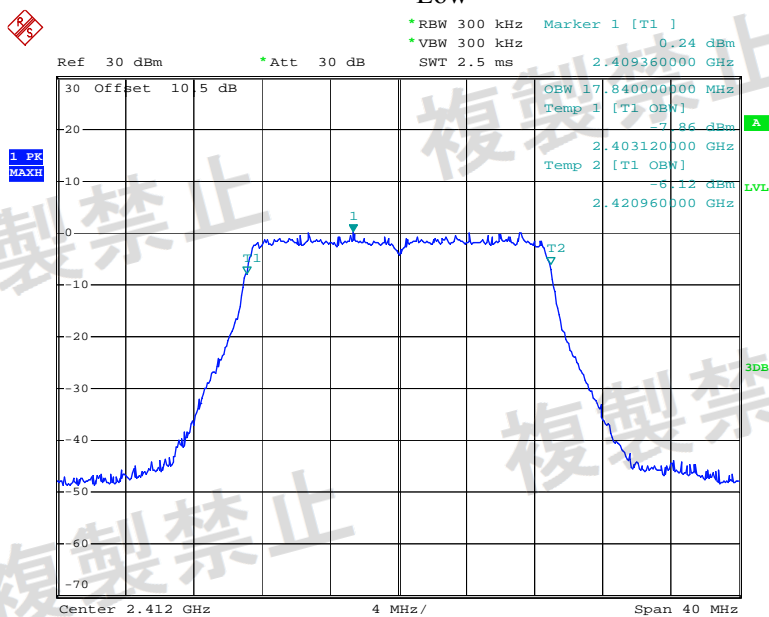
### High



Date: 9.JAN.2020 16:41:02

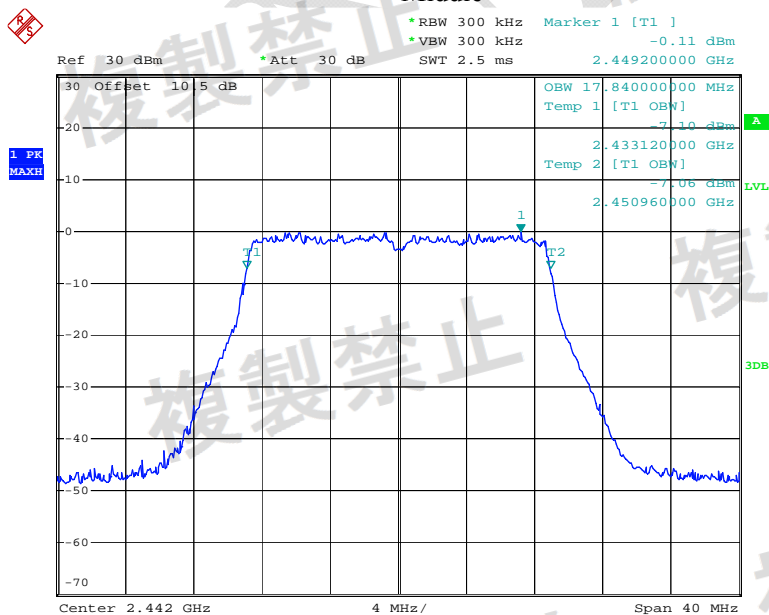
## 802.11n ht20 Mode:

## Low

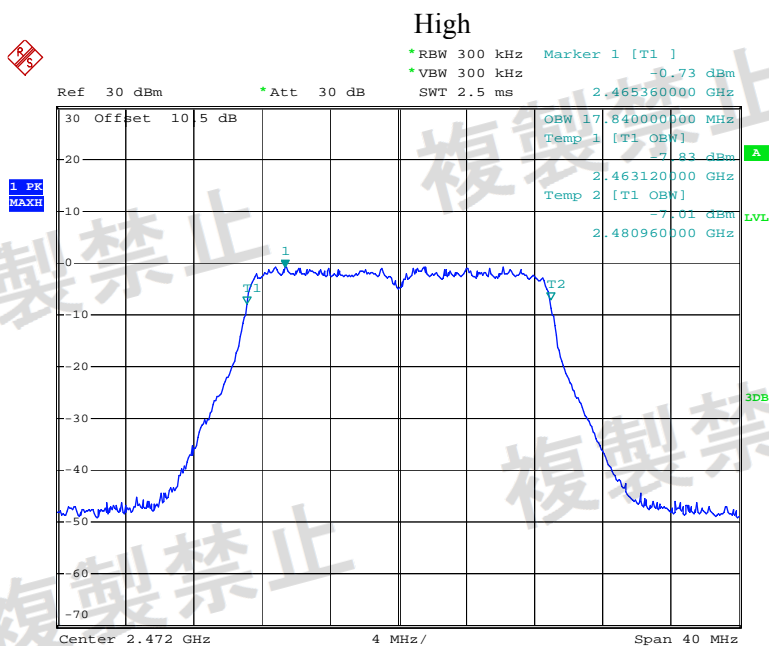


Date: 9.JAN.2020 16:48:23

## Middle

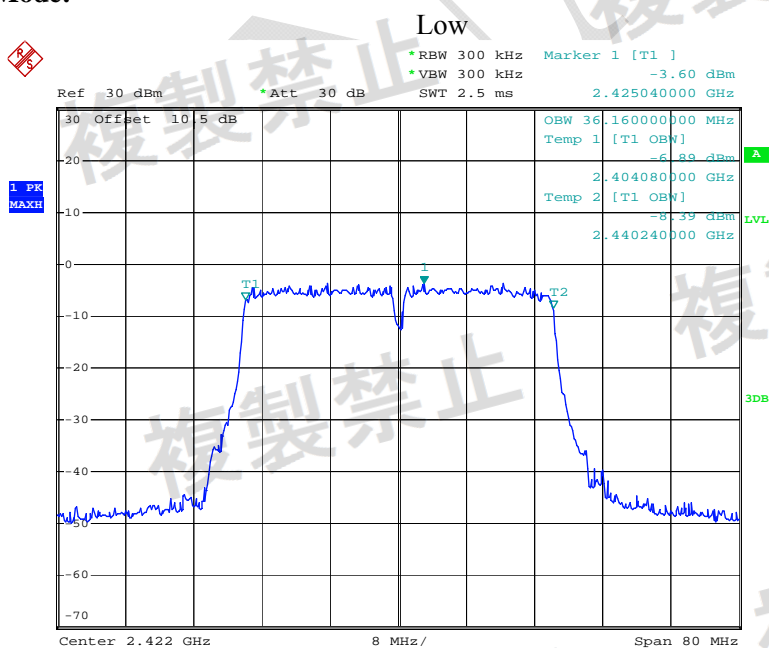


Date: 9.JAN.2020 16:51:36



Date: 9.JAN.2020 16:53:47

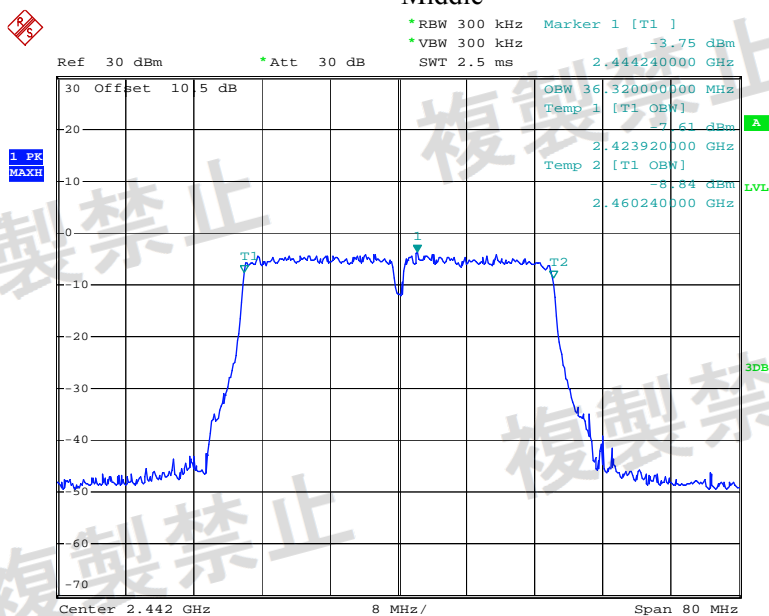
**802.11n ht40 Mode:**



Date: 9.JAN.2020 17:01:55

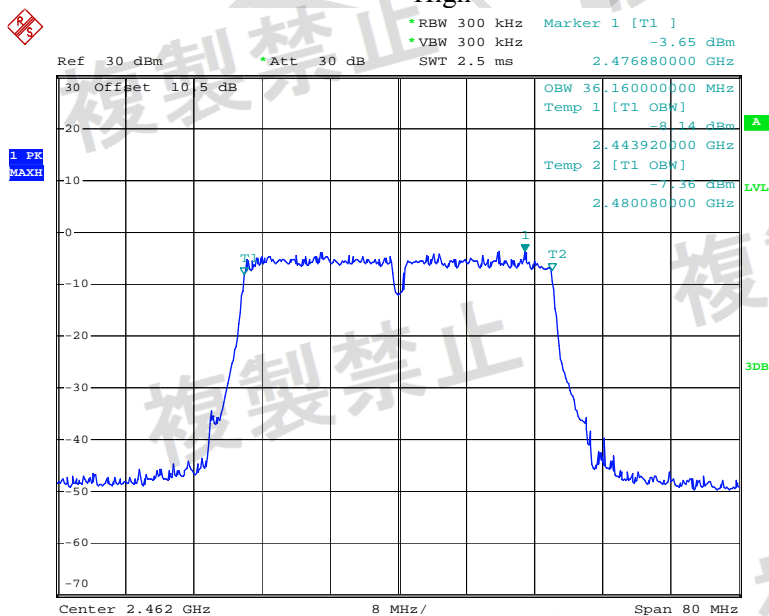


### Middle



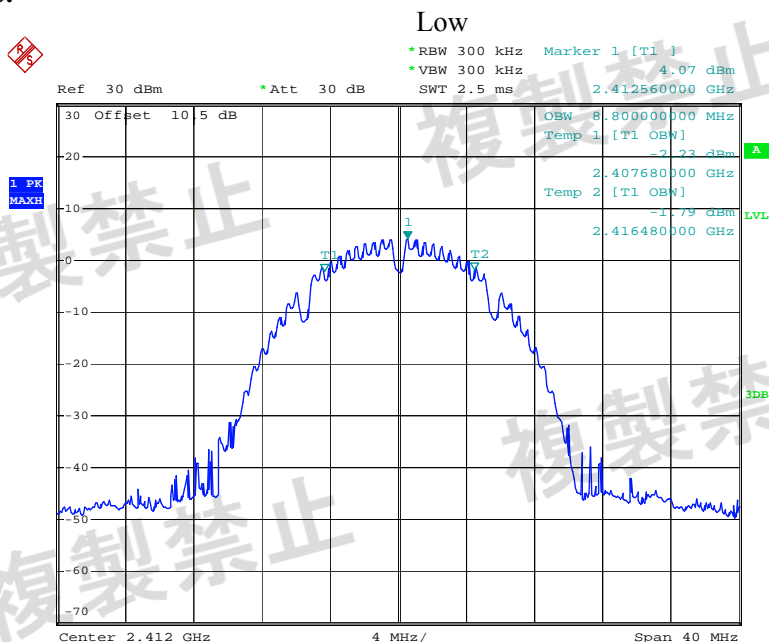
Date: 9.JAN.2020 16:59:13

### High

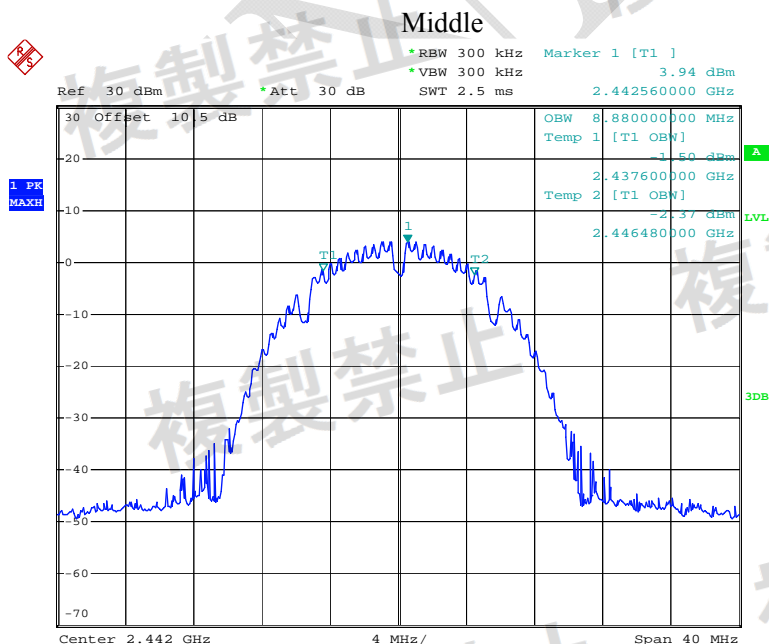


Date: 9.JAN.2020 16:56:46

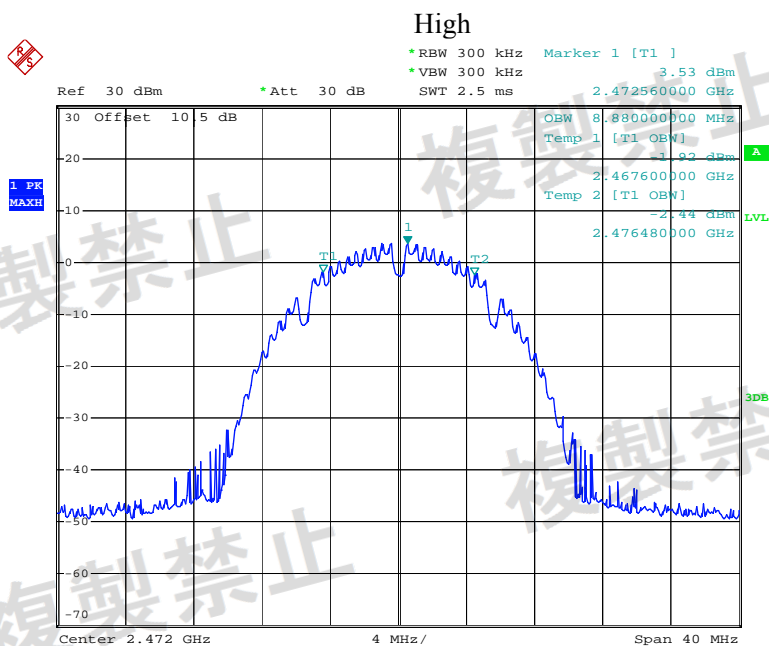
**Spread Bandwidth:**  
**802.11 b mode:**



Date: 9.JAN.2020 16:31:04



Date: 9.JAN.2020 16:34:24



Date: 9.JAN.2020 16:37:21

## TRANSMITTER SPURIOUS EMISSION STRENGTH AND UNWANTED EMISSION INTENSITY

### Limit

- $f < 1000 \text{ MHz}$ :  $\leq 0.25 \mu\text{W}/100\text{kHz}$
- $1000 \text{ MHz} < f < 2387 \text{ MHz}$ ,  $f > 2496.5 \text{ MHz}$ :  $\leq 2.5 \mu\text{W}/\text{MHz}$
- $2387 \text{ MHz} \leq f \leq 2400 \text{ MHz}$ ;  $2483.5 \text{ MHz} < f \leq 2496.5 \text{ MHz}$ :  $\leq 25 \mu\text{W}/\text{MHz}$

### Test Procedure

#### ❖ Conditions of Application Equipment (EUT)

- The modulation state shall be in continuously transmitting mode.

#### ❖ Spectrum Analyzer Conditions

- Setting of SA start 30MHz and stop frequency 1000MHz, RB:100kHz/VB:100kHz, Sweep time: Auto. Sweep mode: continuous sweep .Detect mode: Positive peak/Trace mode: max hold. Then to mark peak. reading value + cable loss shall be less than  $0.25 \mu\text{W}/100\text{kHz}$ .
- Setting of SA start 1000MHz and stop frequency 2387MHz, RB:1MHz/VB:1MHz, Sweep time: Auto. Sweep mode: continuous sweep .Detect mode: Positive peak/Trace mode: max hold. Then to mark peak. reading value + cable loss shall be less than  $2.5 \mu\text{W}/\text{MHz}$ .
- Setting of SA start 2387MHz and stop frequency 2400MHz, RB:1MHz/VB:1MHz, Sweep time: Auto. Sweep mode: continuous sweep .Detect mode: Positive peak/Trace mode: max hold. Then to mark peak. reading value + cable loss shall be less than  $25 \mu\text{W}/\text{MHz}$ .
- Setting of SA start 2483.5MHz and stop frequency 2496.5MHz, RB:1MHz/VB:1MHz, Sweep time: Auto. Sweep mode: continuous sweep .Detect mode: Positive peak/Trace mode: max hold. Then to mark peak. reading value + cable loss shall be less than  $25 \mu\text{W}/\text{MHz}$ .
- Setting of SA start 2496.5MHz and stop frequency 12500MHz, RB:1MHz/VB:1MHz, Sweep time: Auto. Sweep mode: continuous sweep .Detect mode: Positive peak/Trace mode: max hold. Then to mark peak. reading value + cable loss shall be less than  $2.5 \mu\text{W}/\text{MHz}$ .

### Test Data

*Test Mode: Transmitting,*

**Test Result:** Compliance

Modes	Frequency Band	Low Channel	Middle Channel	High Channel	Limit
802.11b	Band I (dBm/100kHz)	-52.97	-53.28	-53.02	-36dBm/100kHz (0.25 $\mu$ W/100kHz)
	Band II (dBm/MHz)	-43.54	-42.81	-42.93	-26dBm/MHz (2.5 $\mu$ W/MHz)
	Band III (dBm/MHz)	-28.31	-42.24	-42.23	-16dBm/MHz (25 $\mu$ W/MHz)
	Band IV (dBm/MHz)	-41.40	-42.23	-27.59	-16dBm/MHz (25 $\mu$ W/MHz)
	Band V (dBm/MHz)	-29.74	-31.04	-30.92	-26dBm/MHz (2.5 $\mu$ W/MHz)
802.11g	Band I (dBm/100kHz)	-53.59	-52.81	-53.42	-36dBm/100kHz (0.25 $\mu$ W/100kHz)
	Band II (dBm/MHz)	-43.42	-43.63	-43.16	-26dBm/MHz (2.5 $\mu$ W/MHz)
	Band III (dBm/MHz)	-25.20	-42.71	-42.30	-16dBm/MHz (25 $\mu$ W/MHz)
	Band IV (dBm/MHz)	-42.04	-41.87	-19.85	-16dBm/MHz (25 $\mu$ W/MHz)
	Band V (dBm/MHz)	-31.58	-31.31	-31.42	-26dBm/MHz (2.5 $\mu$ W/MHz)
802.11n ht20	Band I (dBm/100kHz)	-53.51	-52.82	-52.60	-36dBm/100kHz (0.25 $\mu$ W/100kHz)
	Band II (dBm/MHz)	-43.39	-42.94	-43.20	-26dBm/MHz (2.5 $\mu$ W/MHz)
	Band III (dBm/MHz)	-23.42	-41.80	-41.45	-16dBm/MHz (25 $\mu$ W/MHz)
	Band IV (dBm/MHz)	-41.25	-42.80	-21.34	-16dBm/MHz (25 $\mu$ W/MHz)
	Band V (dBm/MHz)	-31.66	-31.75	-31.78	-26dBm/MHz (2.5 $\mu$ W/MHz)
802.11n ht40	Band I (dBm/100kHz)	-52.99	-53.61	-53.05	-36dBm/100kHz (0.25 $\mu$ W/100kHz)
	Band II (dBm/MHz)	-42.77	-43.22	-40.49	-26dBm/MHz (2.5 $\mu$ W/MHz)
	Band III (dBm/MHz)	-26.62	-41.83	-42.25	-16dBm/MHz (25 $\mu$ W/MHz)
	Band IV (dBm/MHz)	-42.52	-42.14	-22.19	-16dBm/MHz (25 $\mu$ W/MHz)
	Band V (dBm/MHz)	-32.35	-31.58	-31.04	-26dBm/MHz (2.5 $\mu$ W/MHz)

Note:

Band I: 30MHz~1000MHz

Band II: 1000MHz~2387MHz

Band III: 2387MHz~2400MHz

Band IV: 2483.5MHz~2496.5MHz

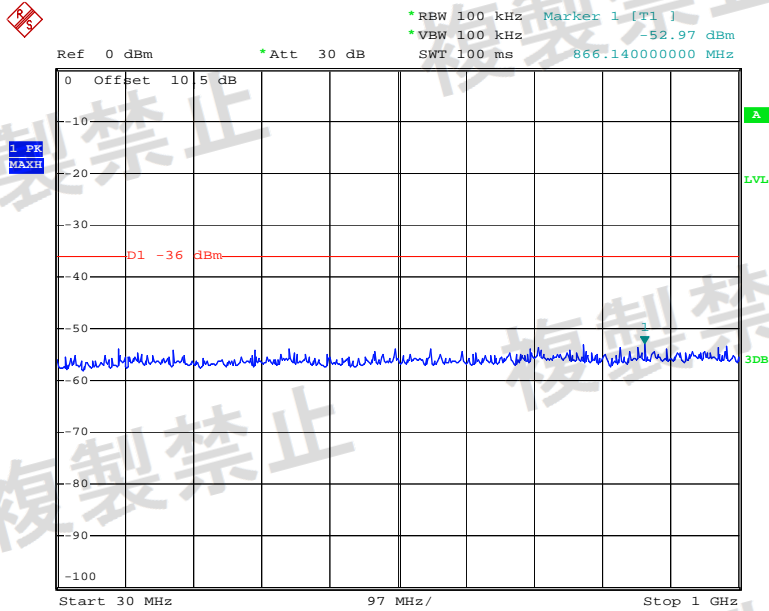
Band V: 2496.5MHz~12500MHz



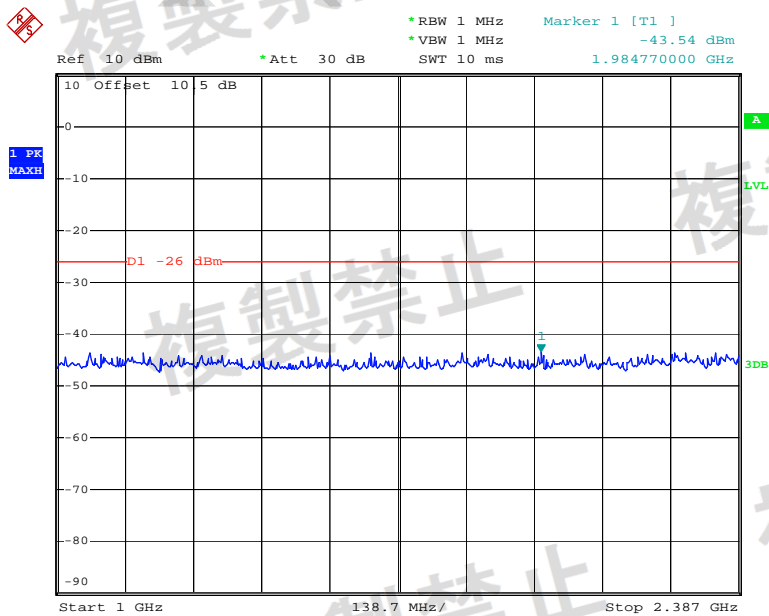
Please refer to the following plots for normal voltage:

802.11 b:

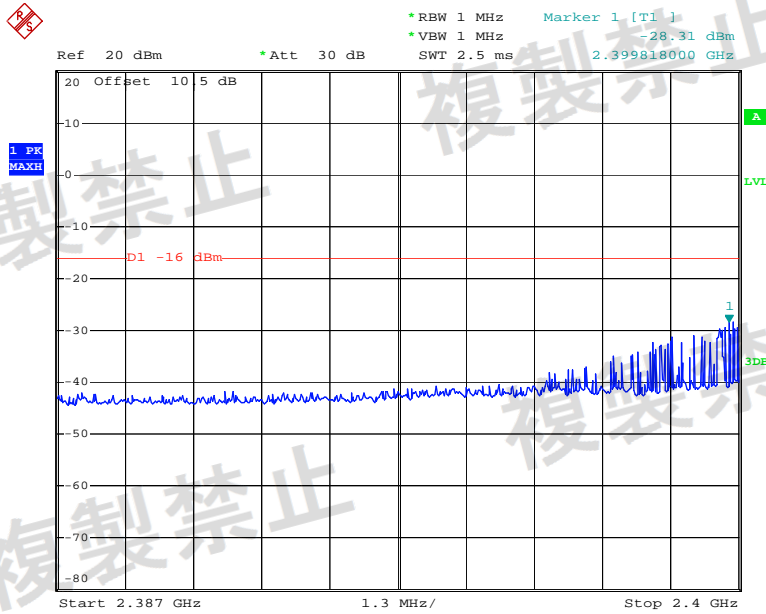
*Low Channel*



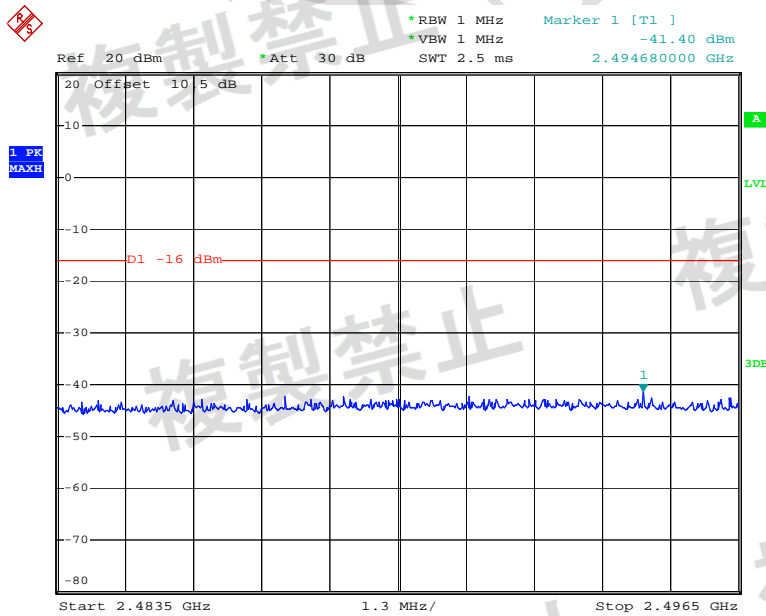
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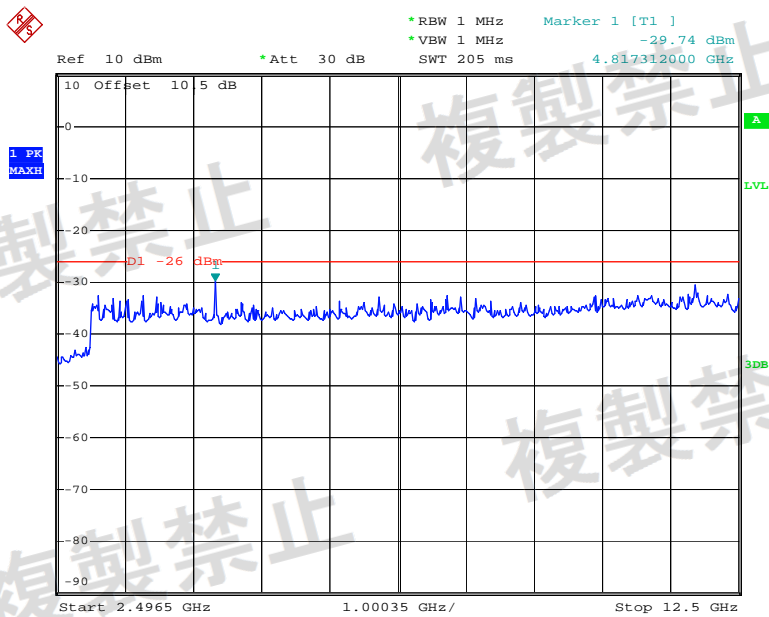
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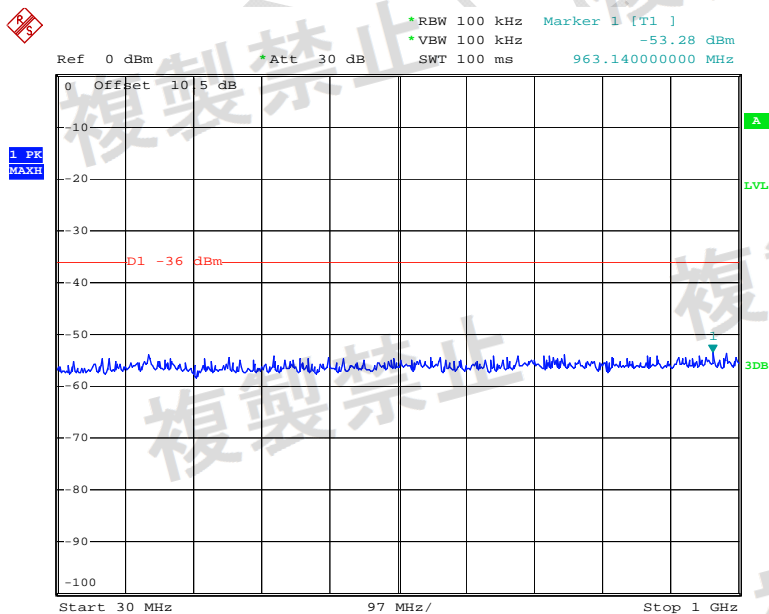


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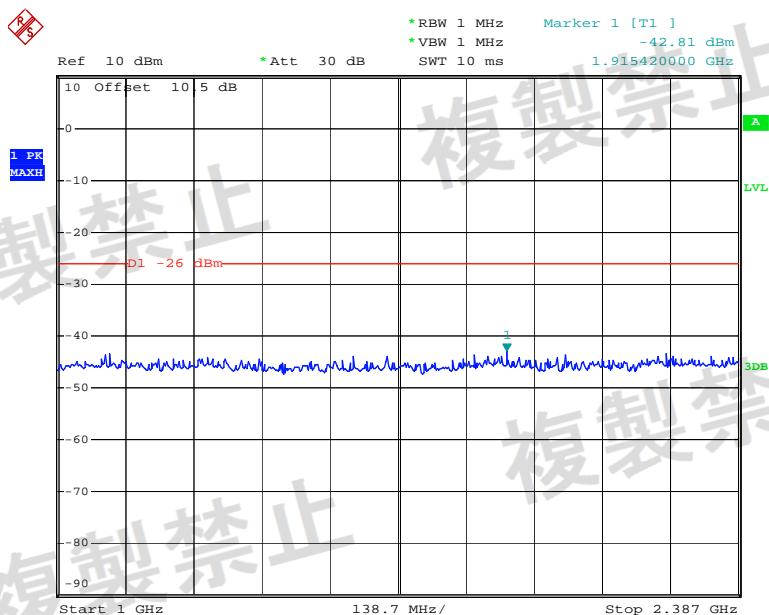


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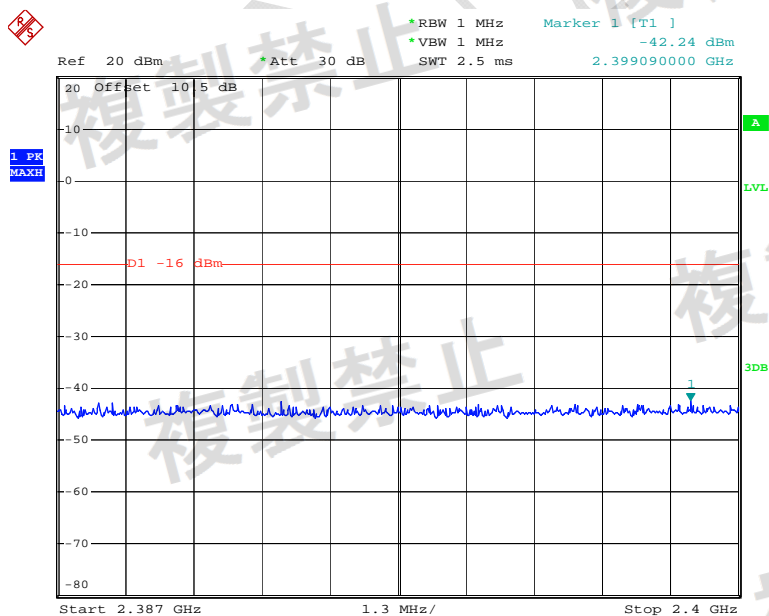
### Middle Channel



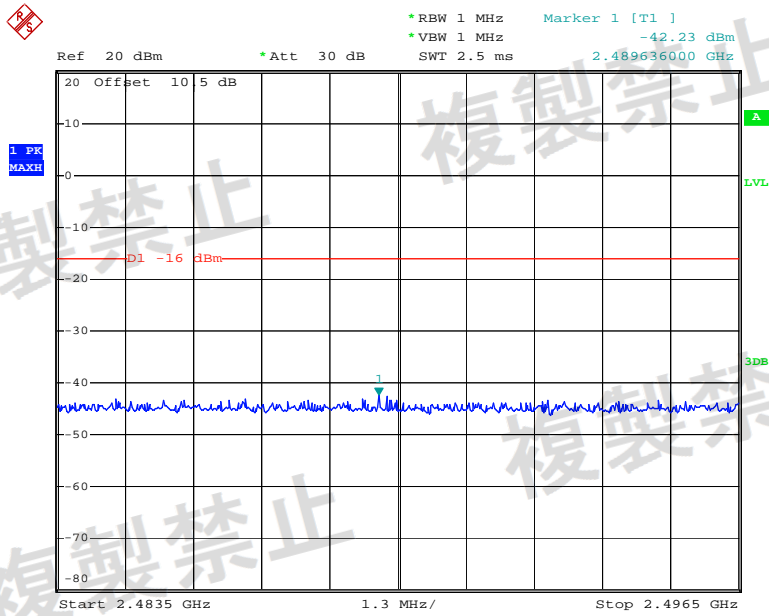
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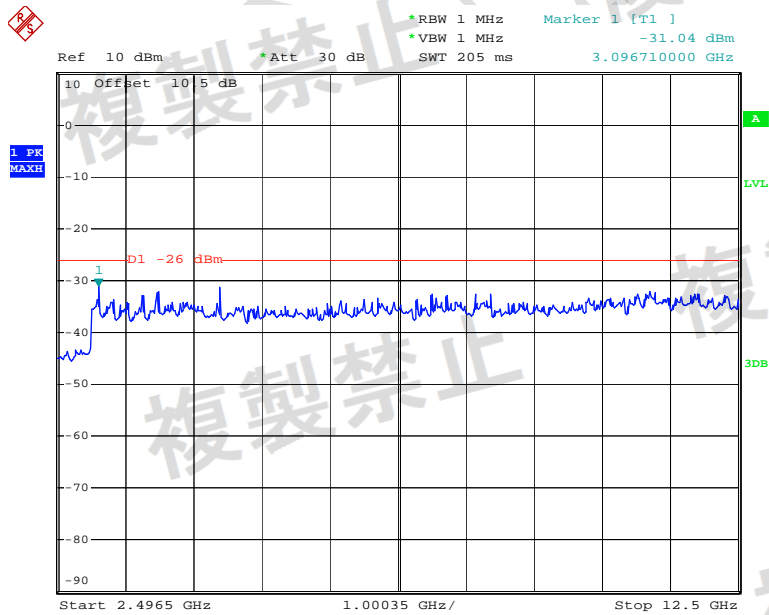
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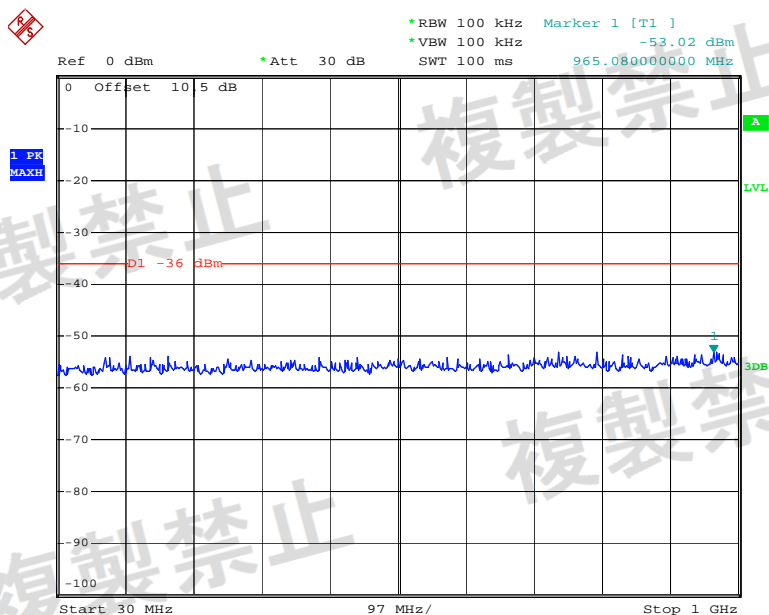


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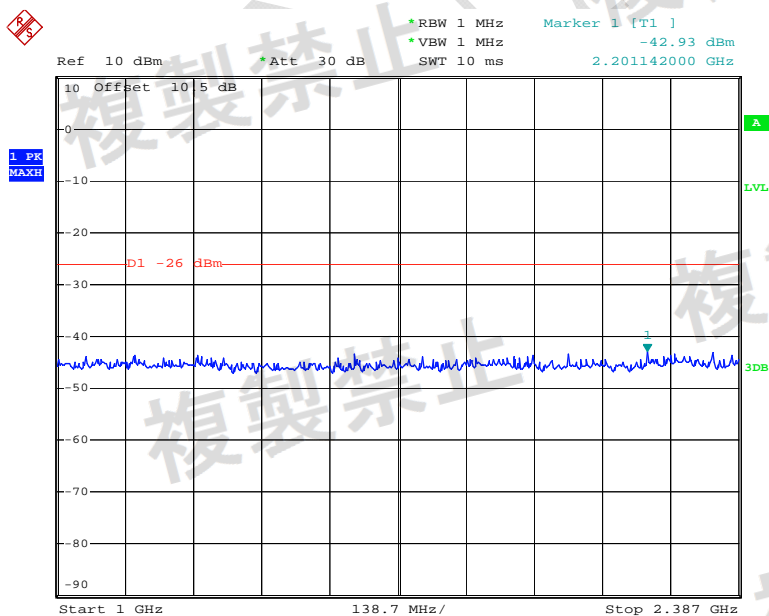


Date: 9.JAN.2020 16:33:59

### High Channel

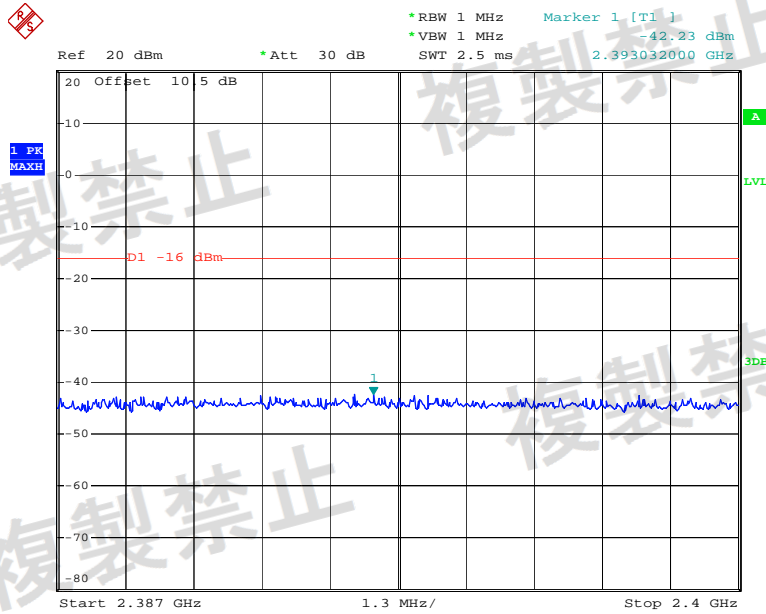


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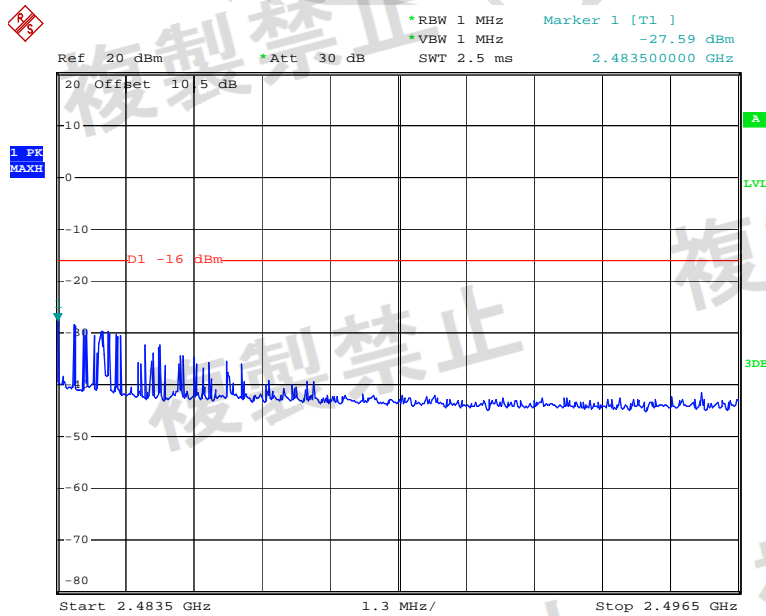


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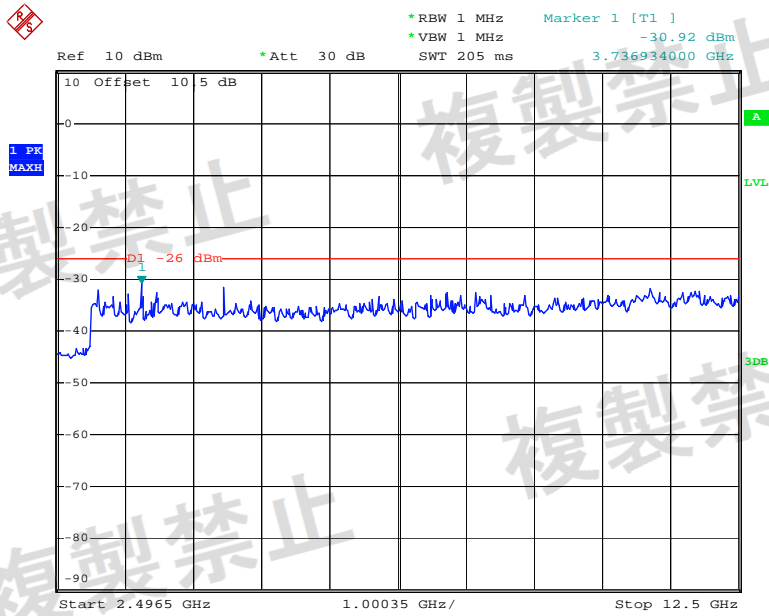




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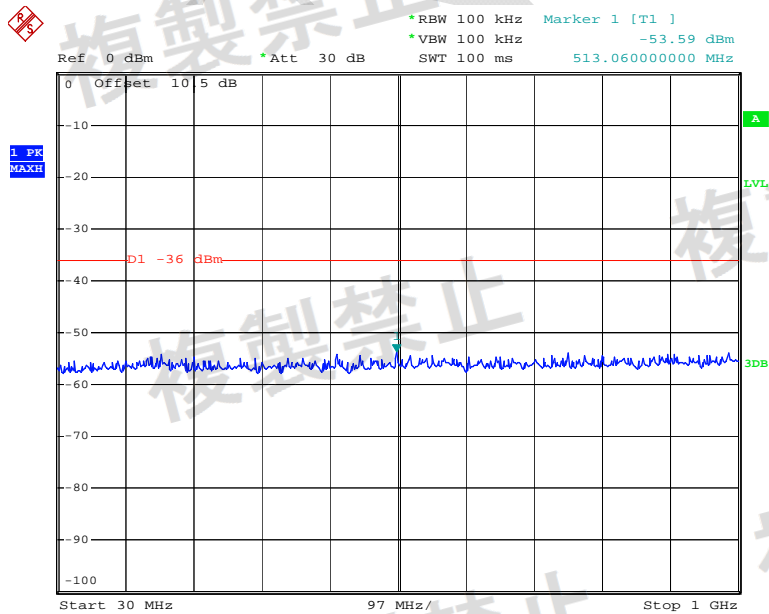
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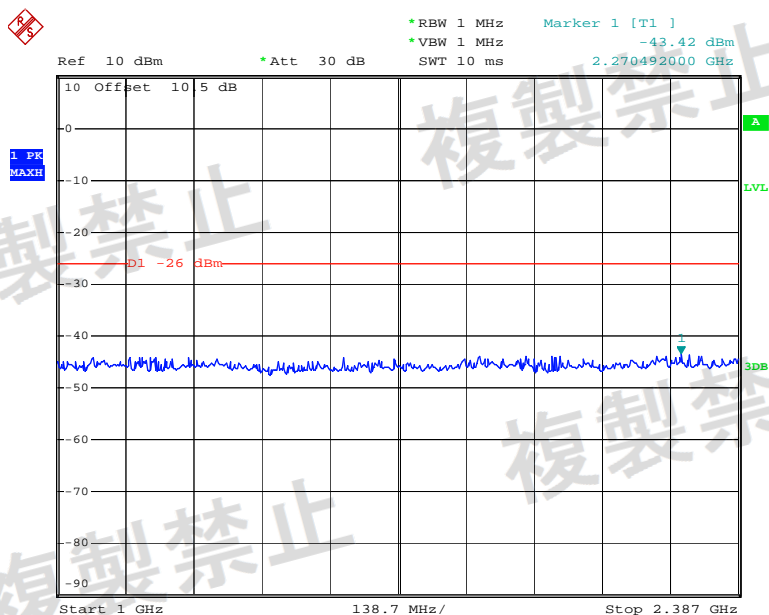
Date: 9.JAN.2020 16:36:59

802.11 g:

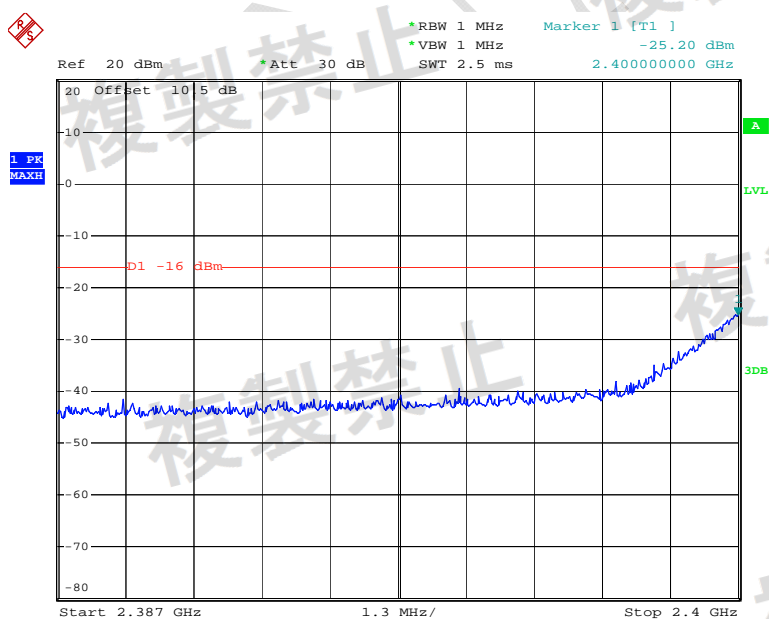
### Low Channel



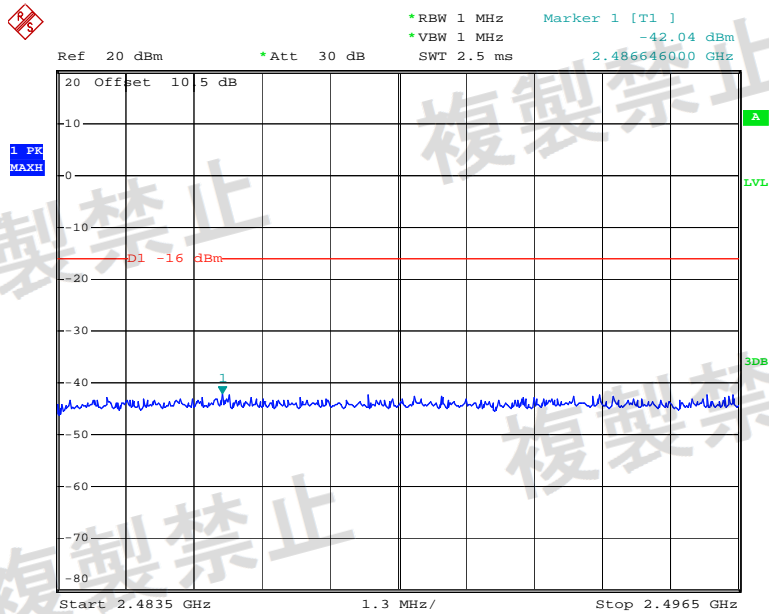
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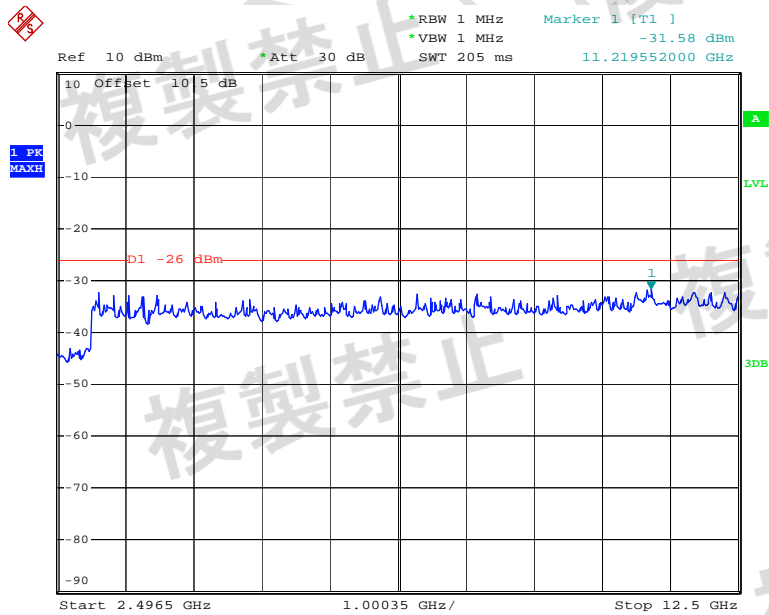
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Date: 9.JAN.2020 16:45:18

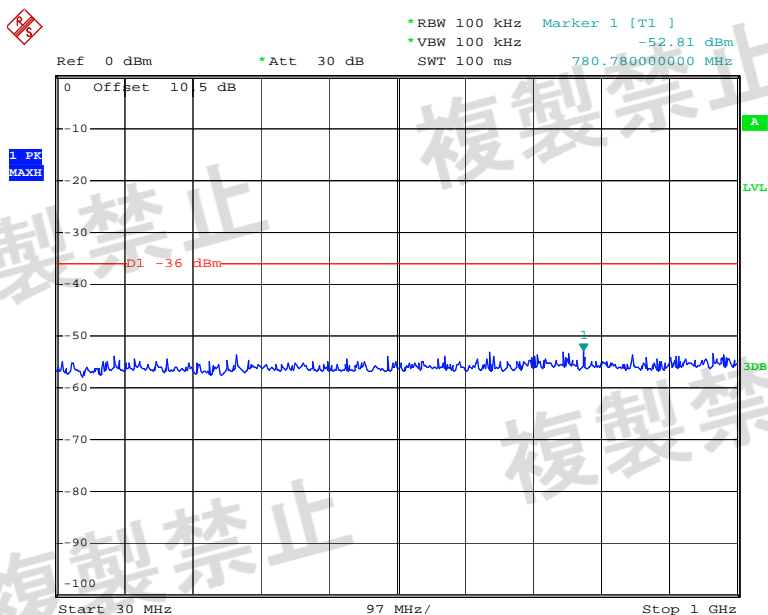


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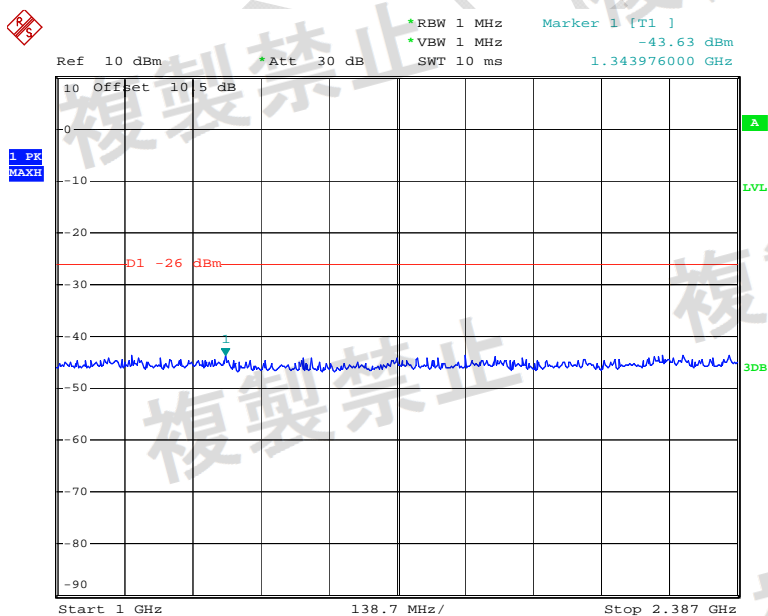


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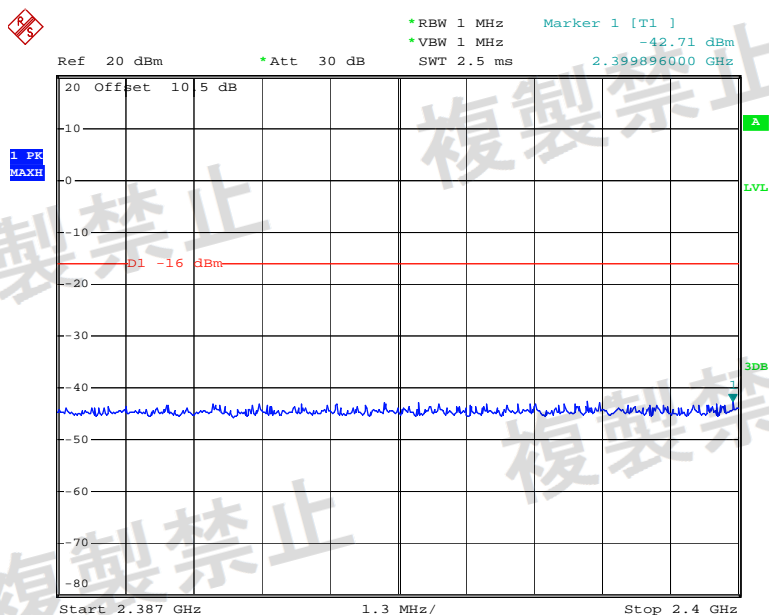
### Middle Channel



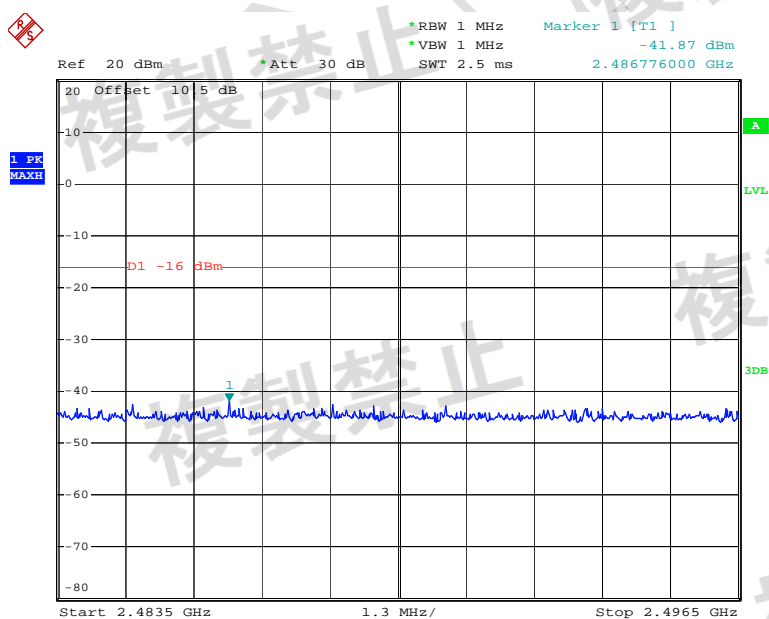
Date: 9.JAN.2020 16:42:14



Date: 9.JAN.2020 16:42:30

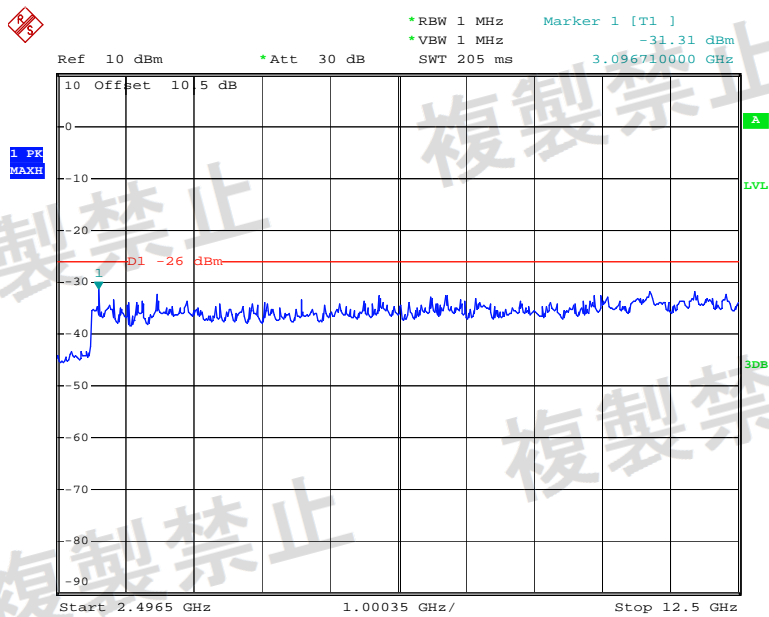


Date: 9.JAN.2020 16:42:43



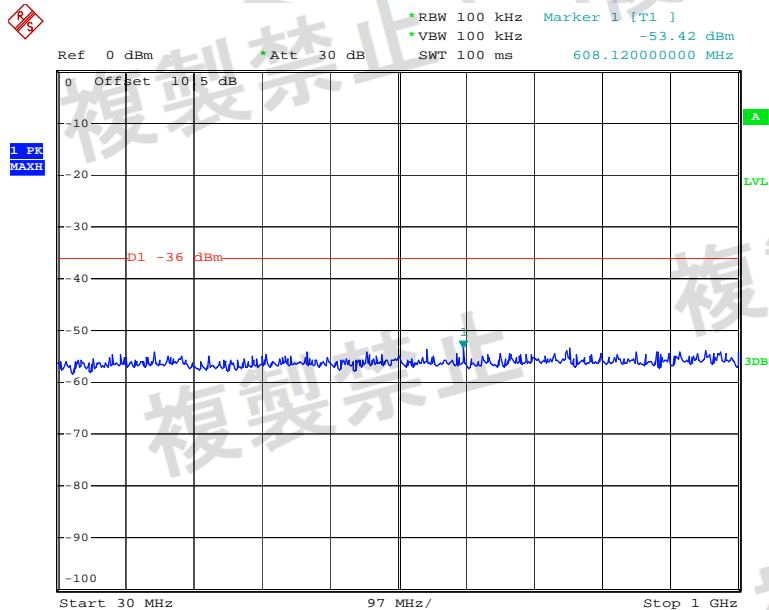
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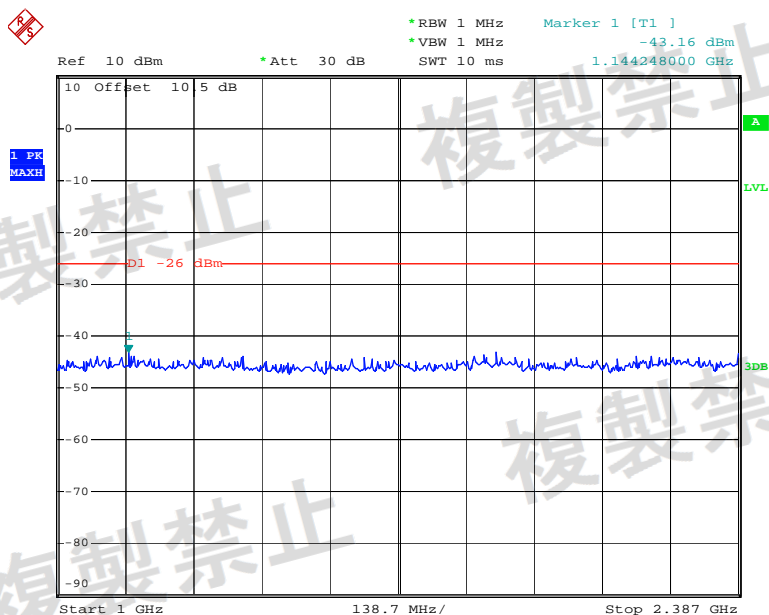


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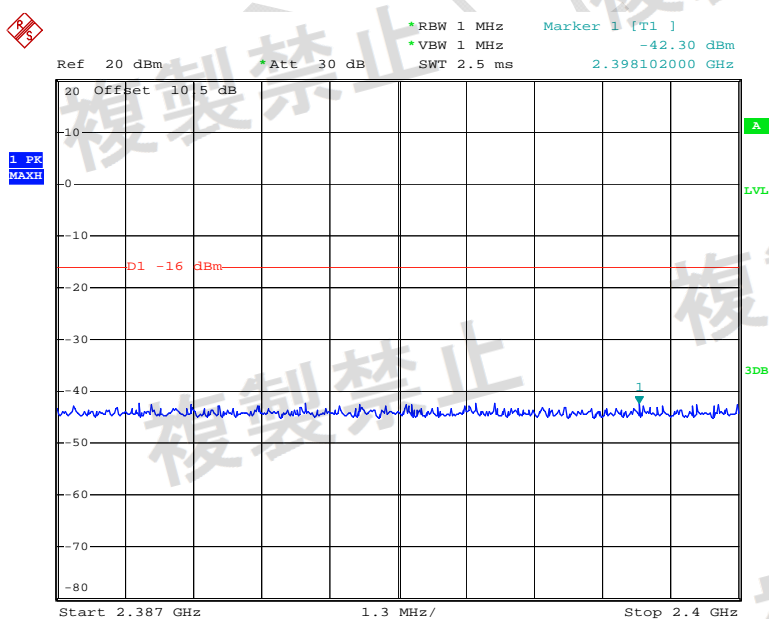
### High Channel



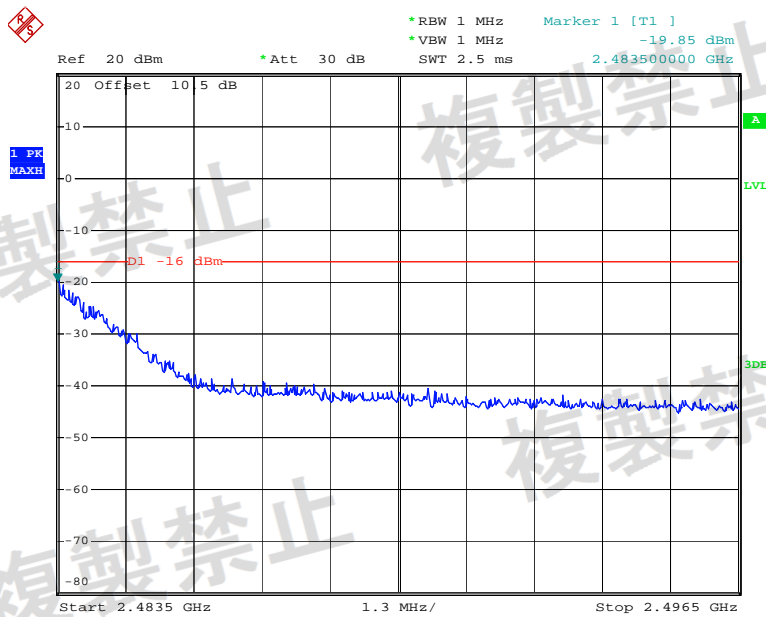
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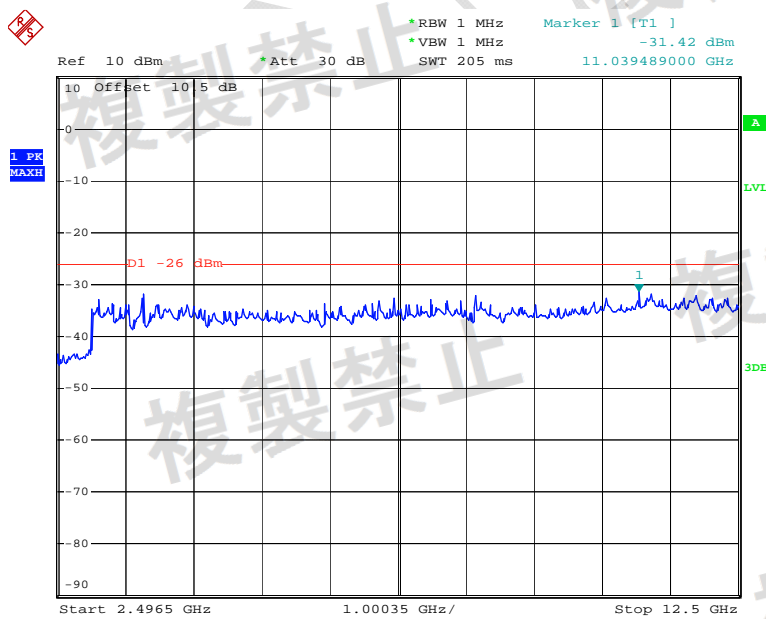
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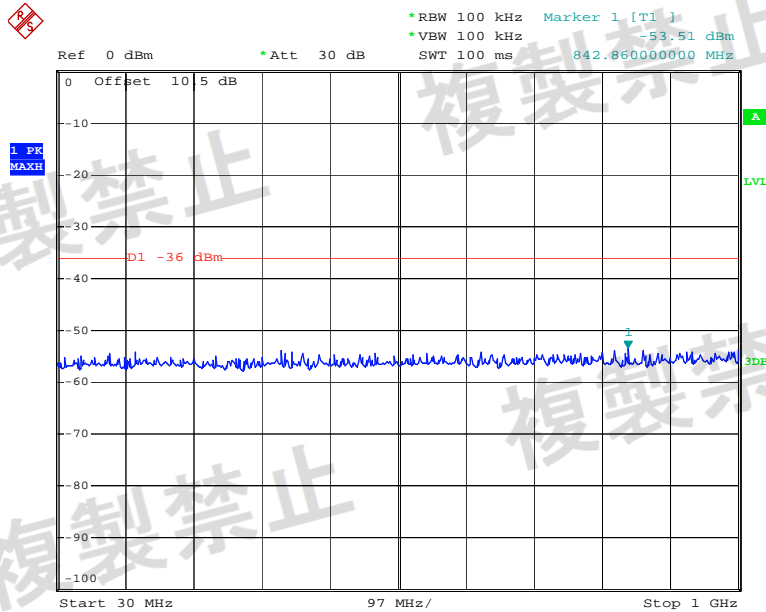
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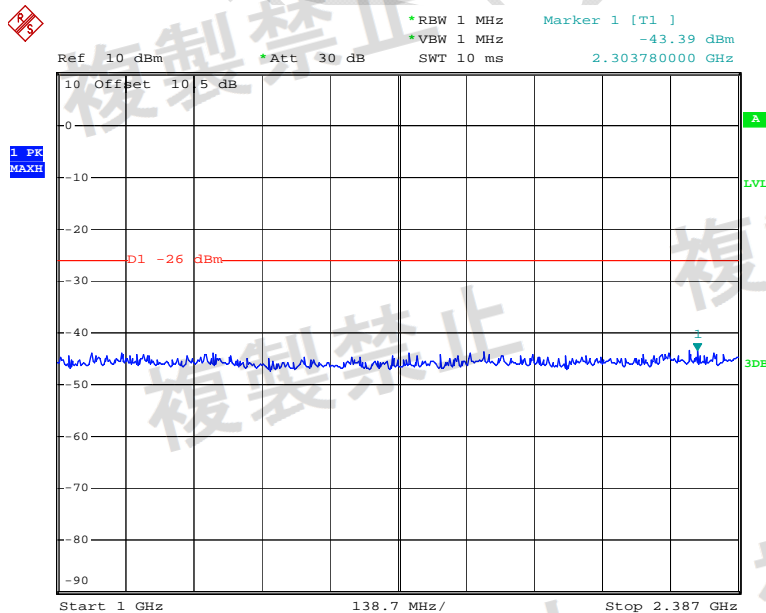
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802.11n ht20:

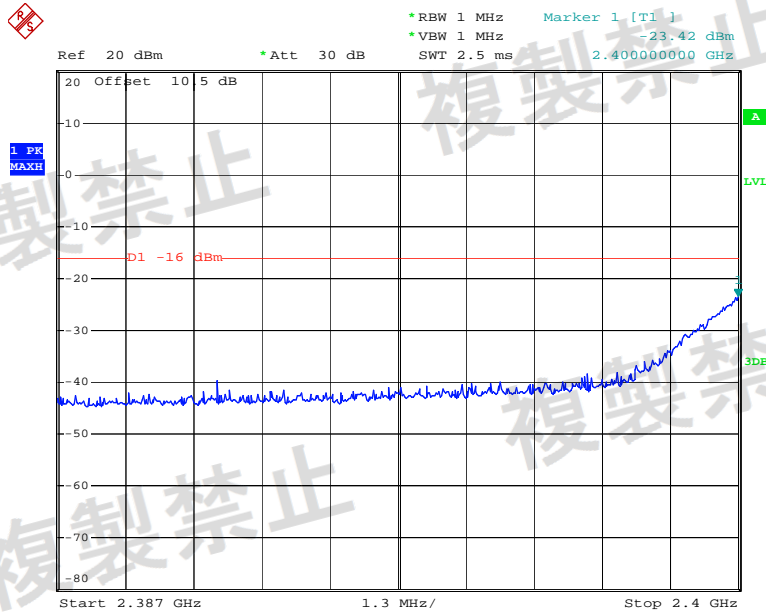
Low Channel



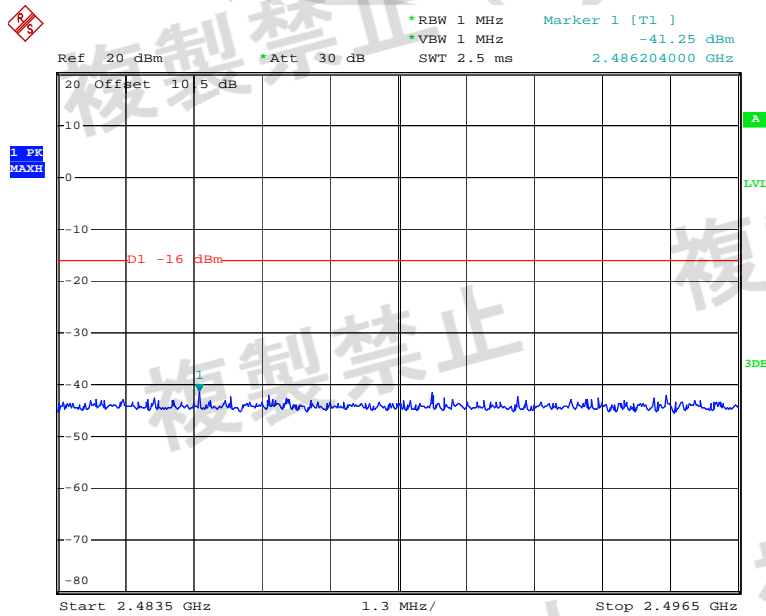
Date: 9.JAN.2020 16:47:20



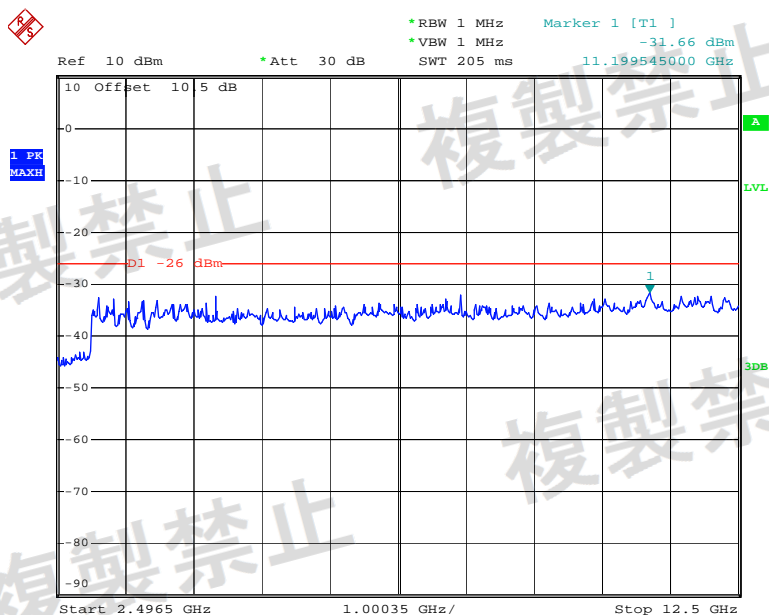
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Date: 9.JAN.2020 16:47:45

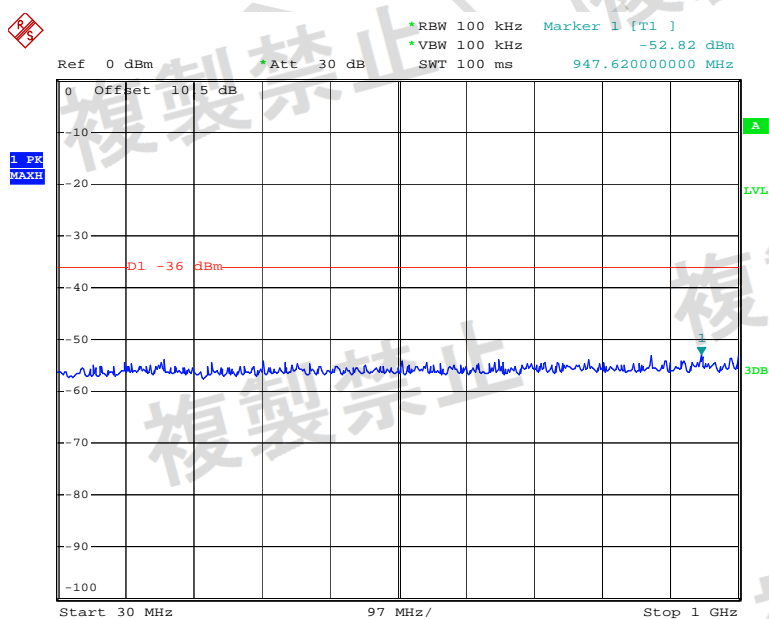


Date: 9.JAN.2020 16:47:57



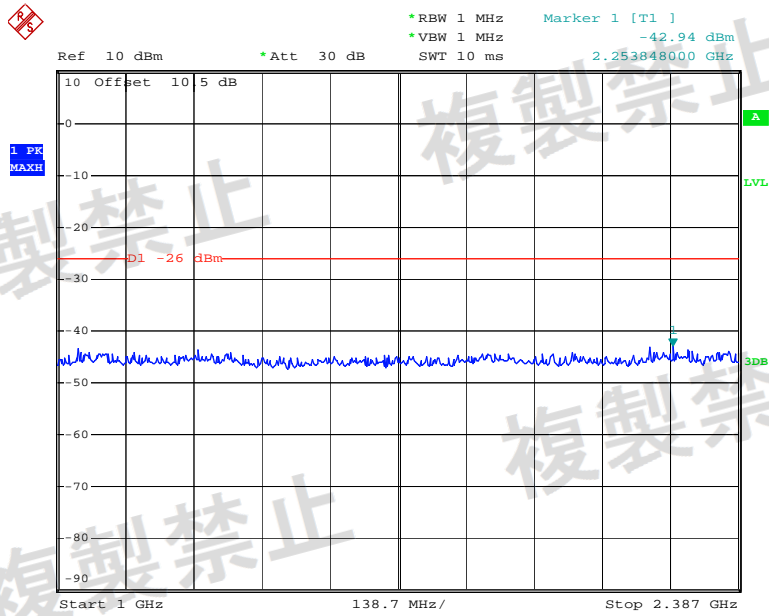
Date: 9.JAN.2020 16:48:10

### Middle Channel

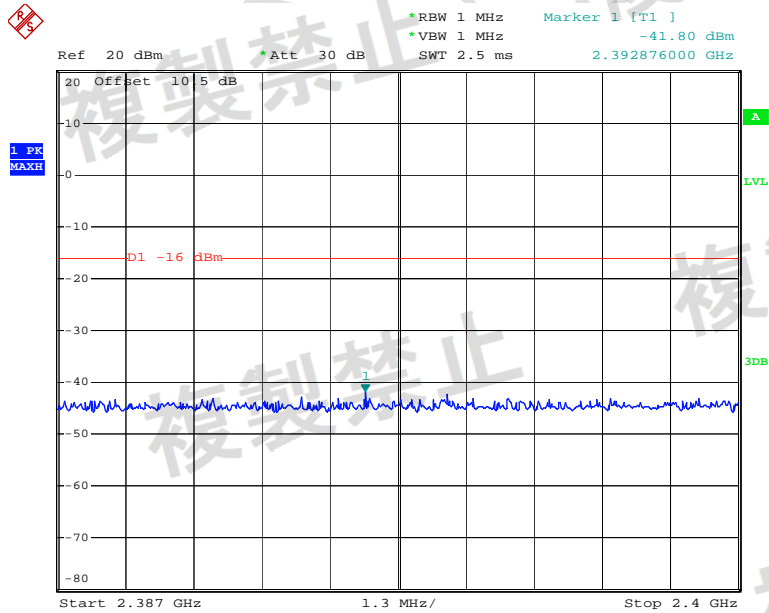


Date: 9.JAN.2020 16:50:33

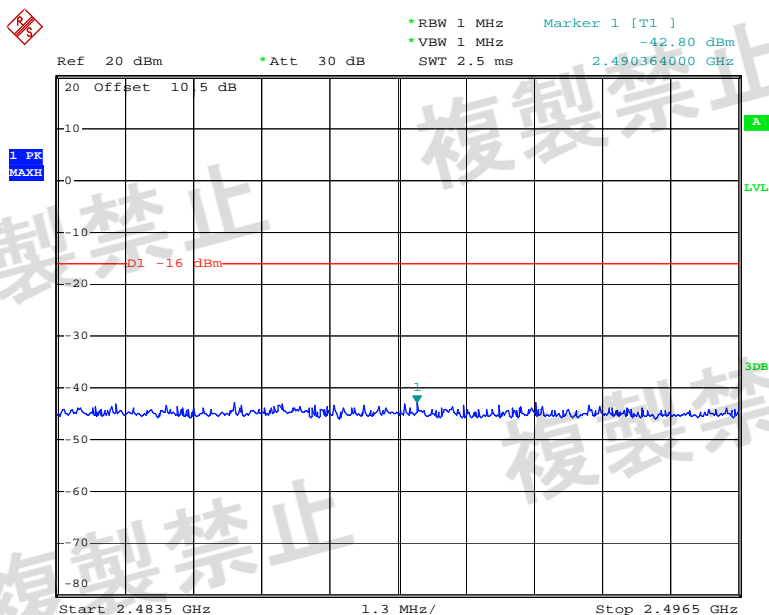




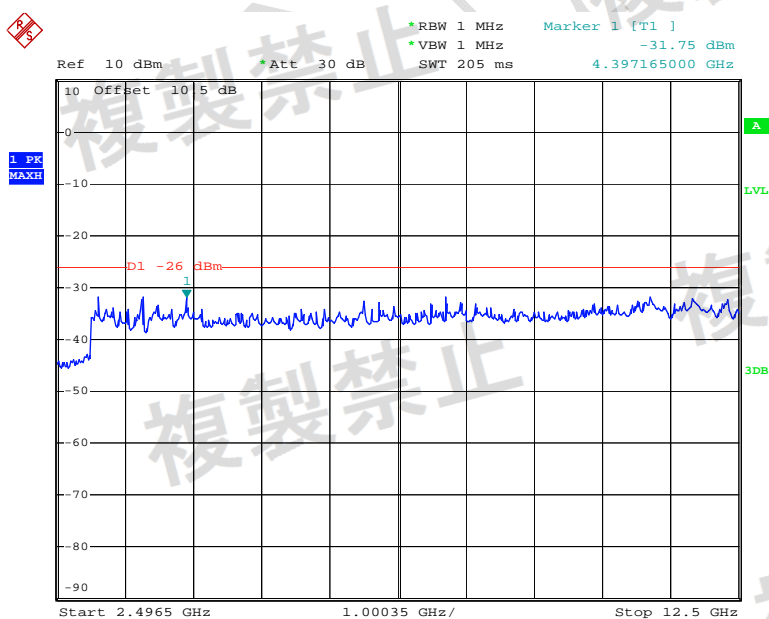
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Date: 9.JAN.2020 16:50:58

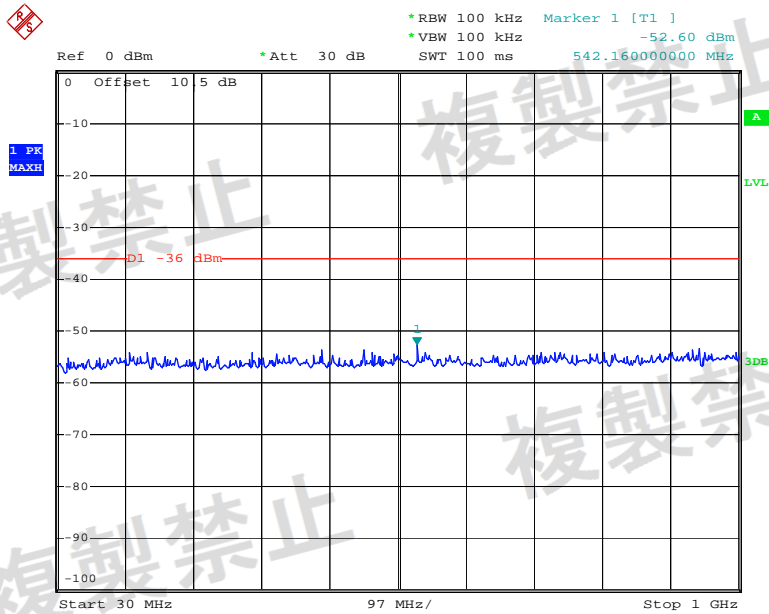


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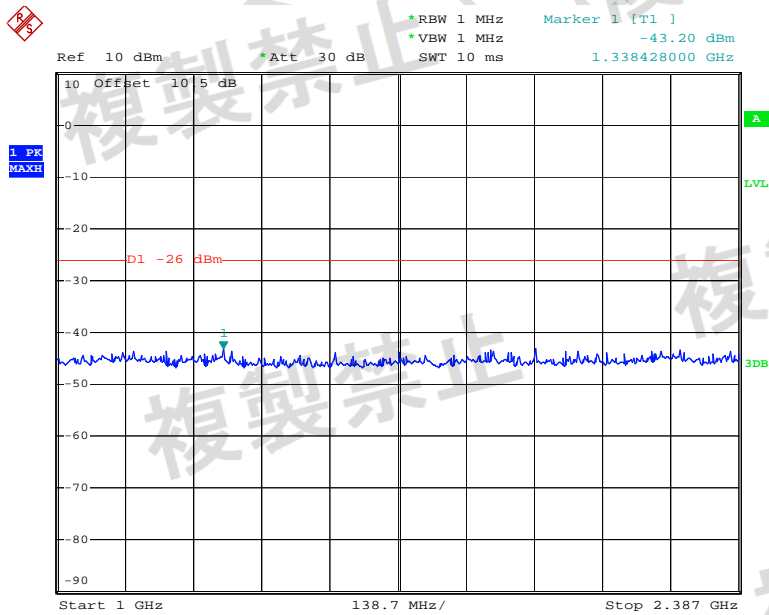


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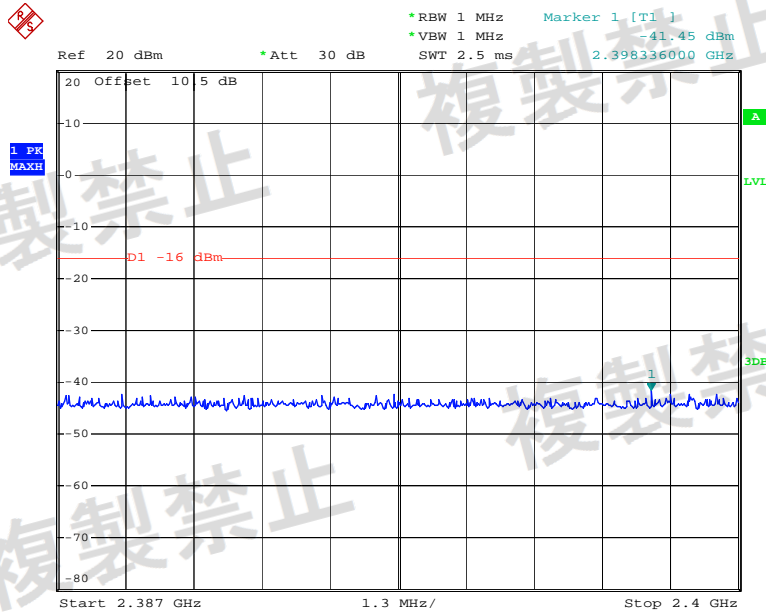
# High Channel



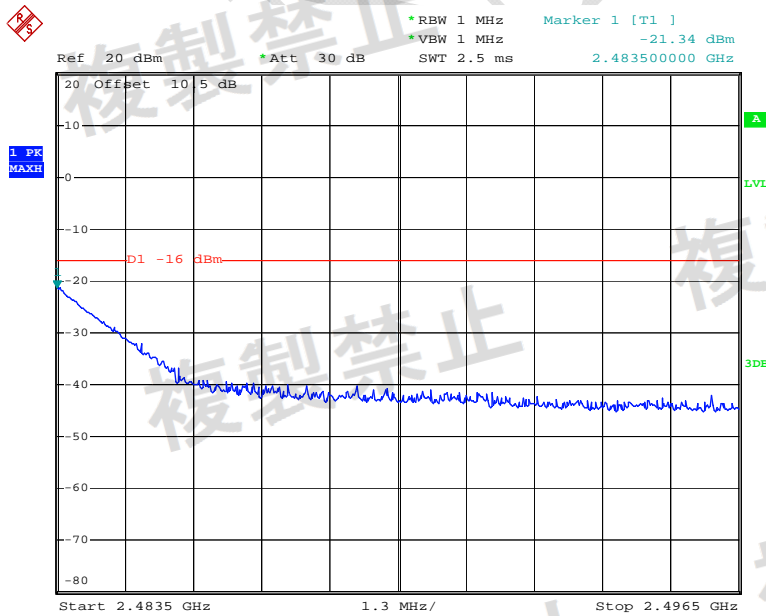
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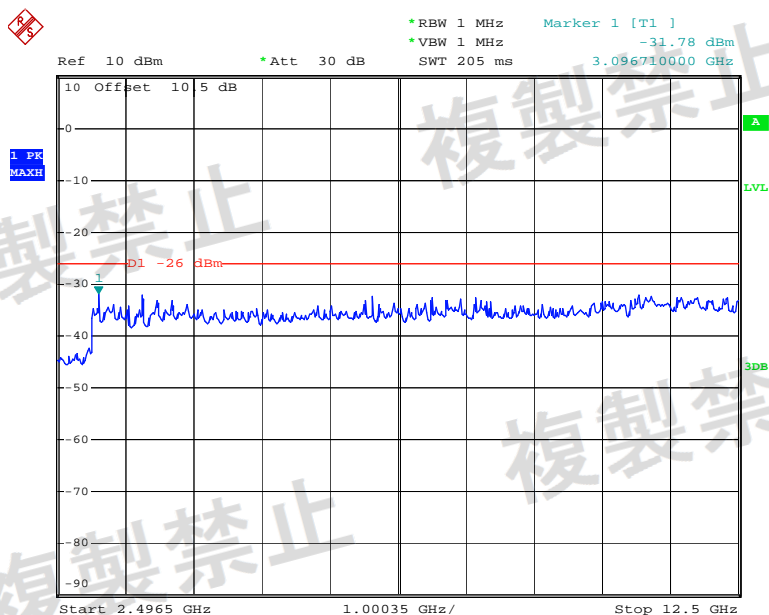
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Date: 9.JAN.2020 16:53:09



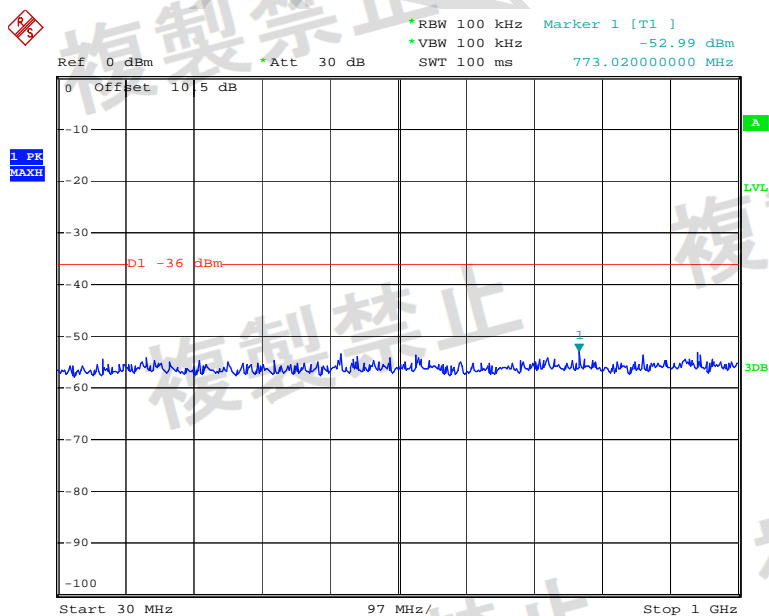
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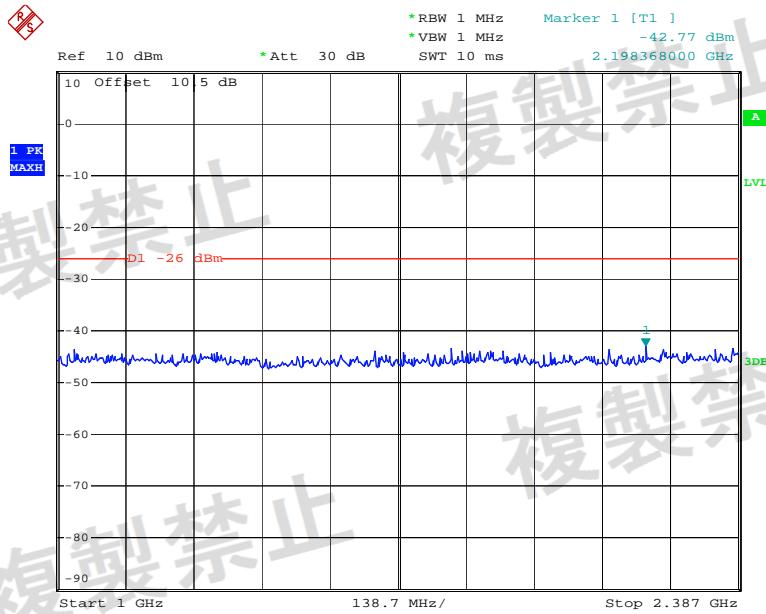
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802.11n ht40

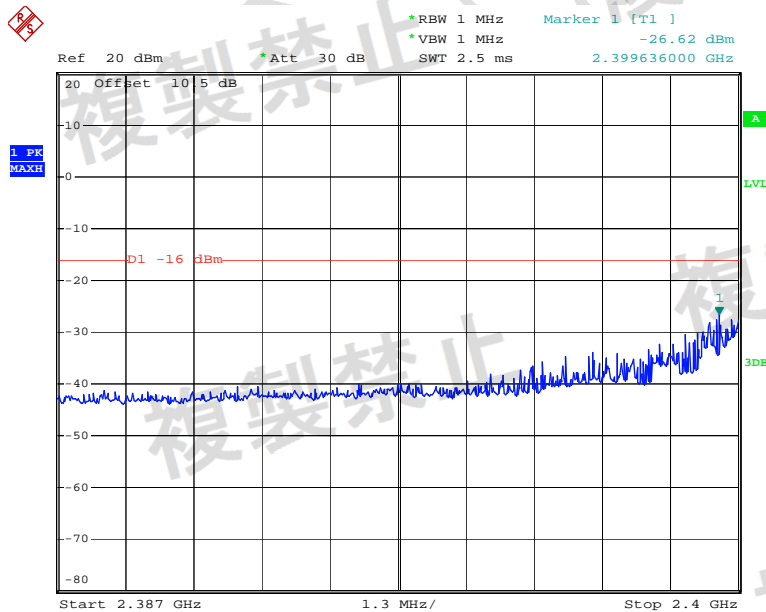
### Low Channel



Date: 9.JAN.2020 17:00:46

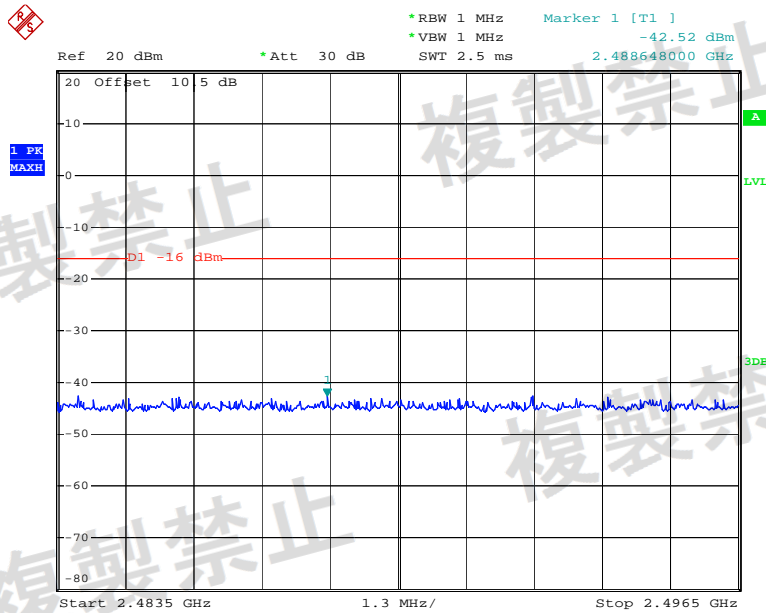


Date: 9.JAN.2020 17:00:59

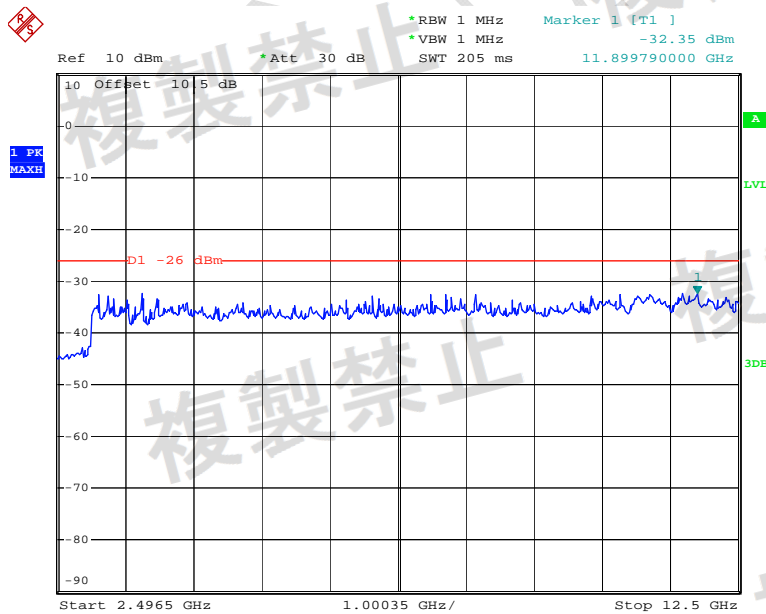


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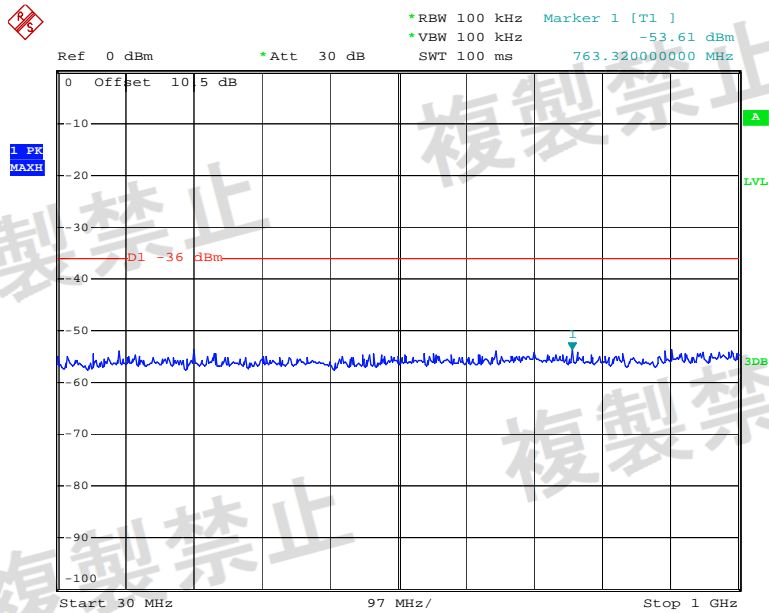


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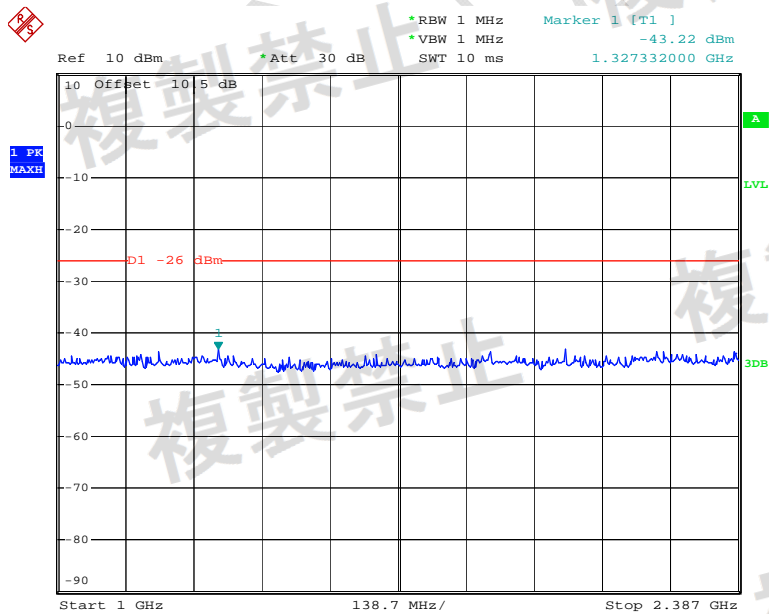


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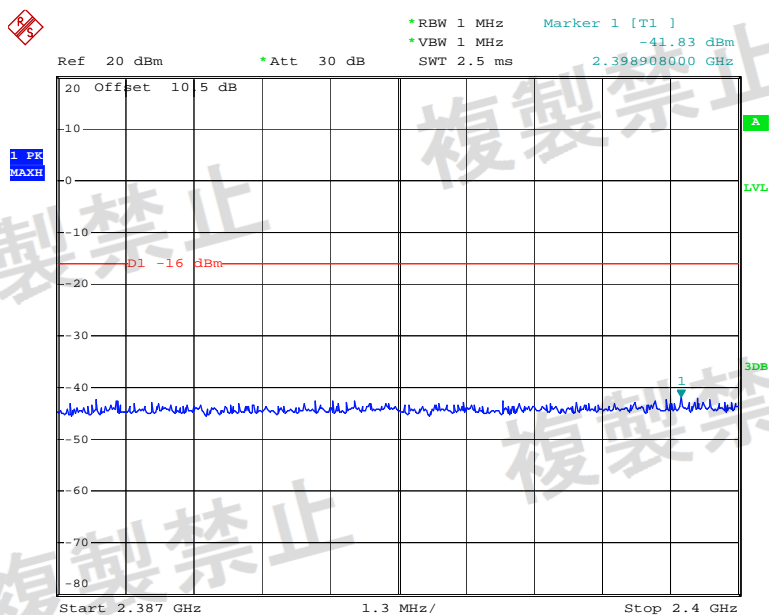
### Middle Channel



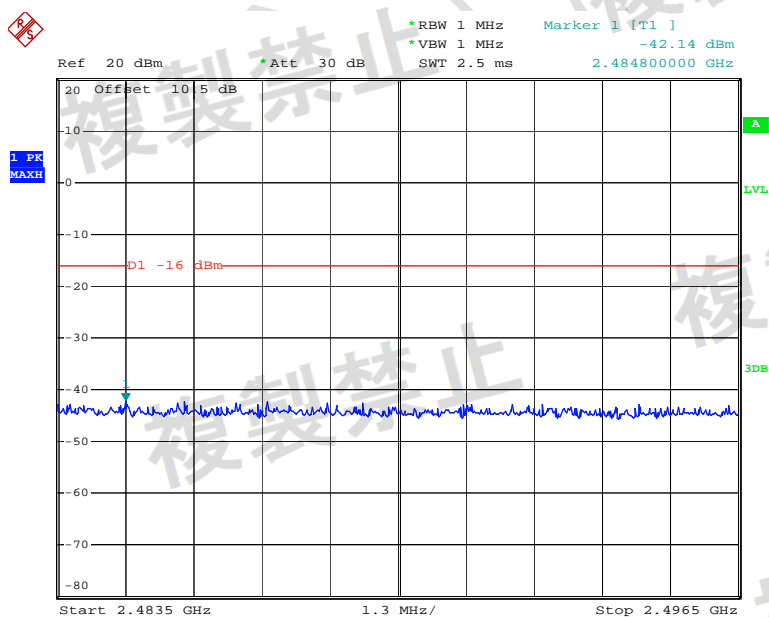
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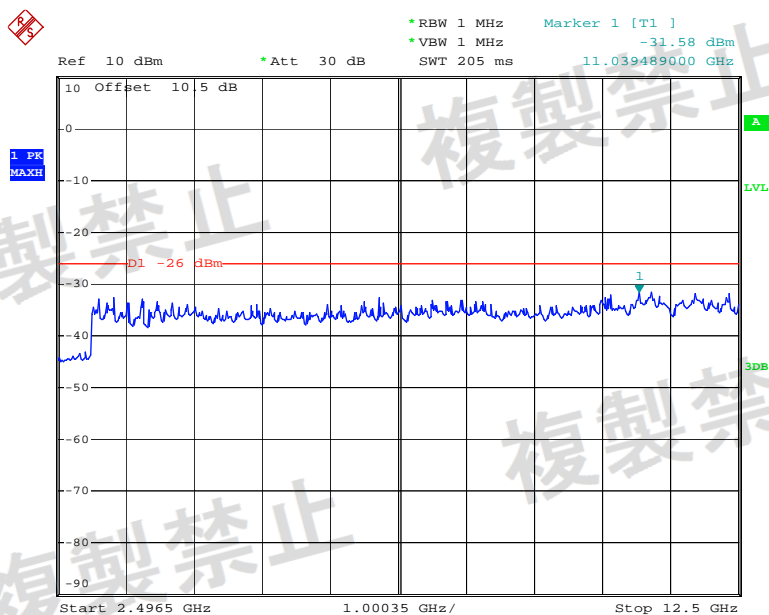
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Date: 9.JAN.2020 16:58:29

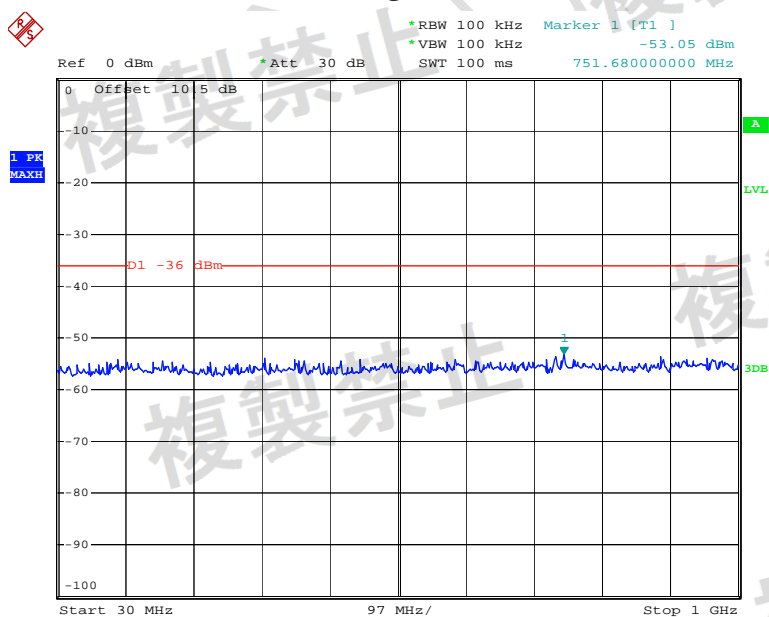


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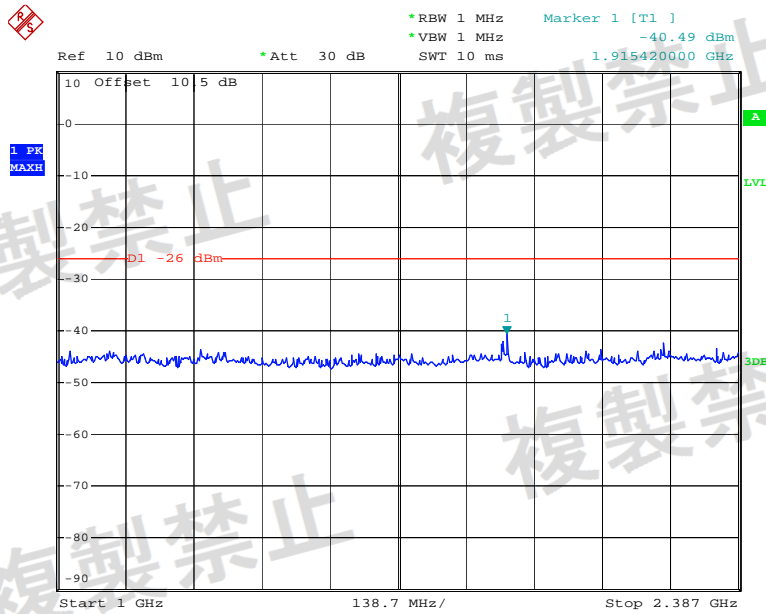


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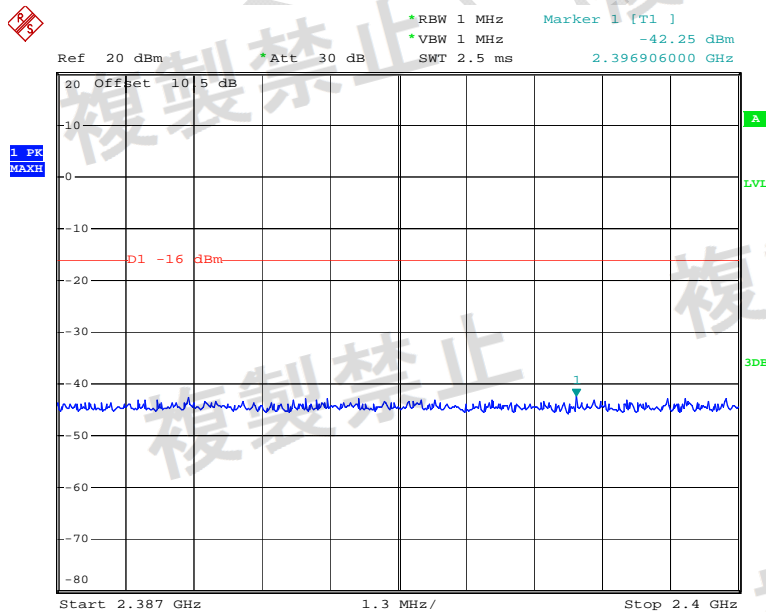
### High Channel



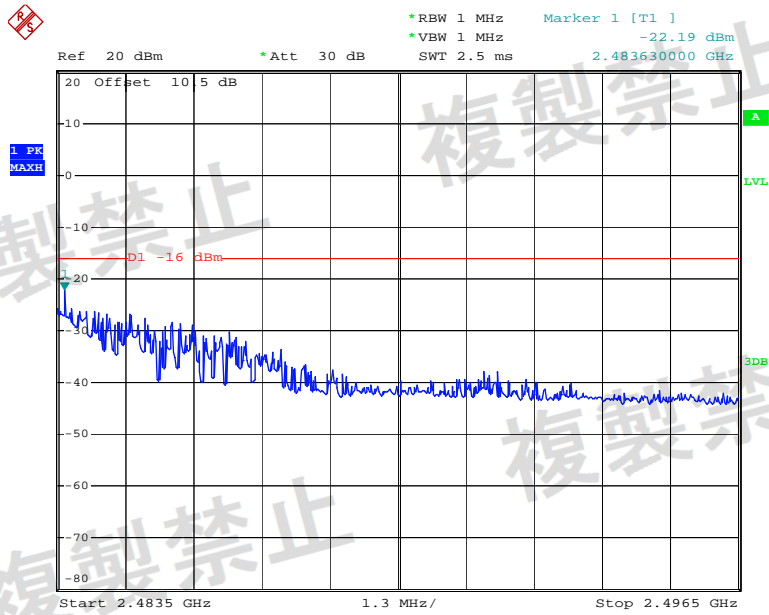
Date: 9.JAN.2020 16:55:33



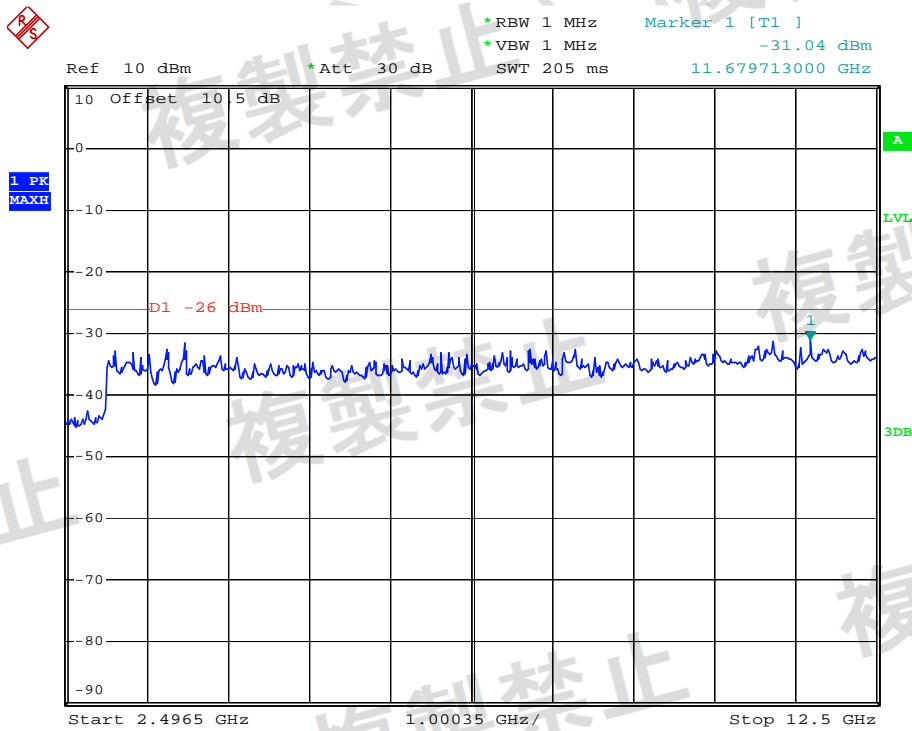
Date: 9.JAN.2020 16:55:46



Date: 9.JAN.2020 16:55:58



Date: 9.JAN.2020 16:56:17





## ANTENNA OUTPUT POWER, ANTENNA POWER TOLERANCE AND TRANSMISSION ANTENNA GAIN

### Limit

- $\leq 3 \text{ mW /MHz}$  (FHSS from 2400-2483.5 MHz)
- $\leq 10 \text{ mW/MHz}$  (OFDM/DSSS for bandwidth  $\leq 26 \text{ MHz}$ )
- $\leq 5 \text{ mW/MHz}$  (OFDM for bandwidth  $\leq 38 \text{ MHz}$ )
- $\leq 10 \text{ mW}$  (others)

The Output Power Tolerance must be within +20%, -80%.

E.i.r.p:

- $\leq 12.14 \text{ dBm/MHz}$  (OFDM, DS for 2400-2483.5 MHz)

Note: E.I.R.P will not be applied to the transmission antenna which has a gain of 2.14dBi or less.

### Test Procedure

For OFDM, DSSS UUT:

Step 1:

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

- Centre Frequency: The centre frequency of the channel under test.
- RBW: 1 MHz.
- VBW: 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.
- RBW: 1 MHz.
- VBW: 1 MHz.
- Detector: Average (see note).
- Trace Mode: Max Hold.

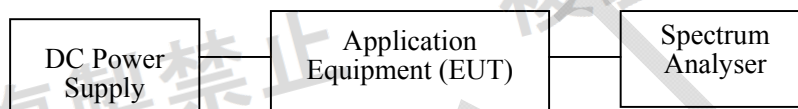
When the trace is complete, capture the trace, for example using the "View" option on the spectrum analyser. For Find the peak value of the trace and place the analyser marker on this peak. This level is recorded as D.

D shall be recorded in the test report.

The maximum PD, which is e.i.r.p. PSD (spectral density power) or power, is calculated from the above measured value D, 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.

$$PD = D + G$$

### Test Setup Block diagram



### Test Data

**Test Result:** Compliance

*Test Mode: Transmitting*

Modes	Channel	Conducted power (dBm)	Duty Cycle (%)	Antenna output power (mW/MHz)		Antenna output tolerance (%)		EIRP (dBm/MHz)	
				Result	Limit	Result	Limit	Result	Limit
802.11b	Low	6.32	100	4.285	10	-14.29	-80%~ +20%	8.32	12.14
	Middle	6.29	100	4.256		-14.88		8.29	
	High	5.8	100	3.802		-23.96		7.80	
802.11g	Low	0.09	94.9	0.969		-3.11		1.86	
	Middle	0.1	94.9	0.971		-2.89		1.87	
	High	-0.38	94.9	0.869		-13.05		1.39	
802.11n ht20	Low	-0.2	95.3	0.910		-8.99		1.59	
	Middle	-0.22	95.3	0.906		-9.41		1.57	
	High	-0.73	95.3	0.806		-19.44		1.06	
802.11n ht40	Low	-4.12	91.6	0.355	5	-64.53		-2.50	9.14
	Middle	-4.12	91.6	0.355		-64.53		-2.50	
	High	-4.56	91.6	0.321		-67.95		-2.94	

Note 1: The antenna gain is 2dBi.

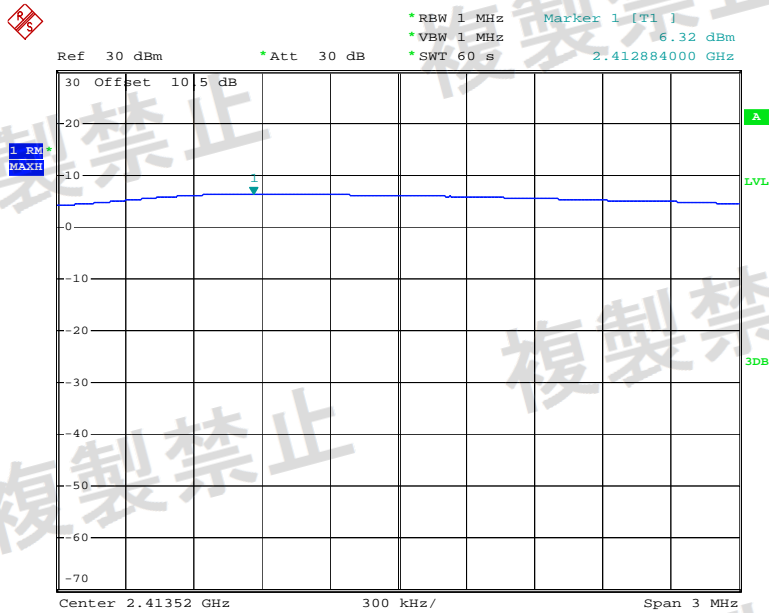
Note 2: The nominal output power is 5mW/MHz for 802.11b, 1mW/MHz for 802.11g, 1mW/MHz for 802.11n ht20, 1mW/MHz for 802.11n ht40.

Note 3: Transmission Antenna Gain and Transmission Radiation Angle Width are not required since EIRP less than 12.14dBm/MHz for 20MHz modes and 9.14 dBm for 40MHz mode .

Please refer to the plots below for normal voltage.

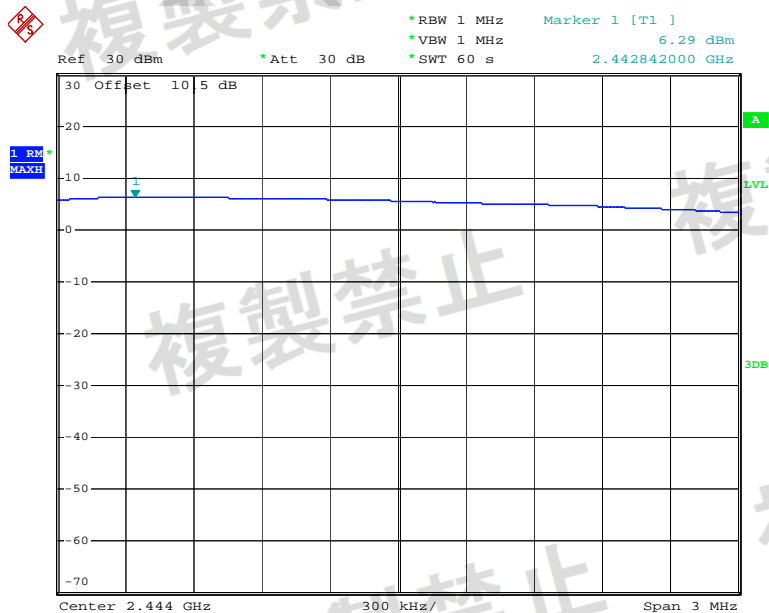
802.11b Mode:

Test Frequency:2412MHz



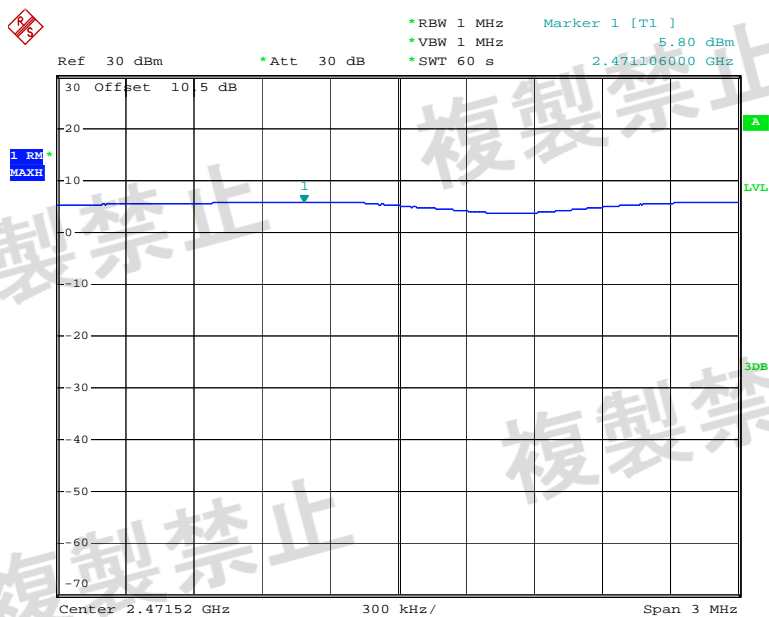
Date: 9.JAN.2020 18:55:15

Test Frequency:2442MHz



Date: 9.JAN.2020 18:57:35

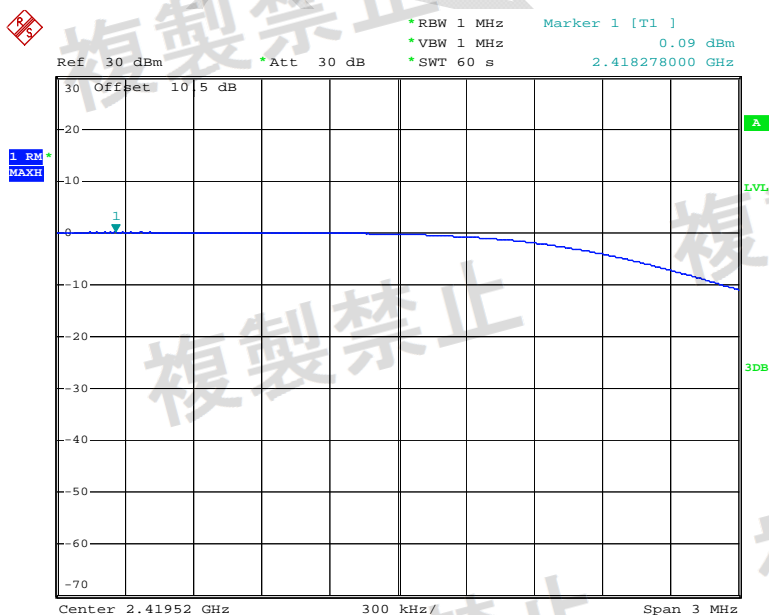
Test Frequency:2472MHz



Date: 9.JAN.2020 19:00:14

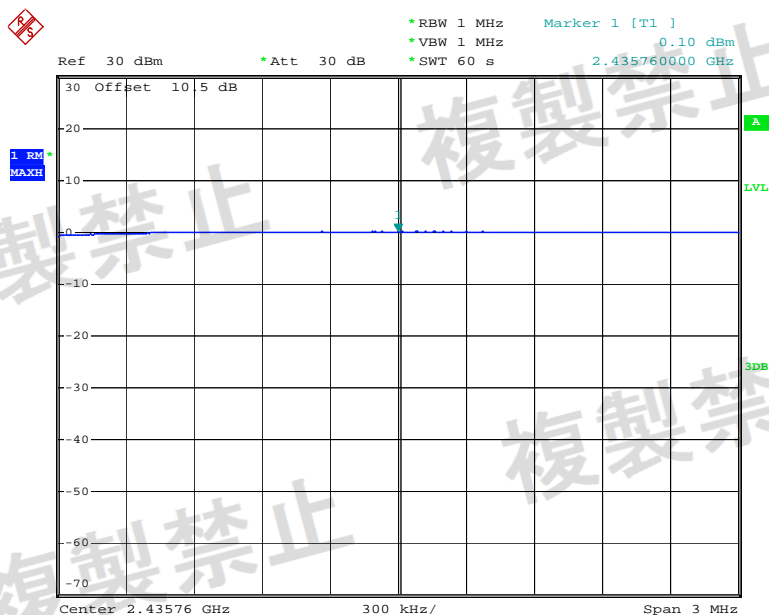
802.11g Mode:

Test Frequency:2412MHz



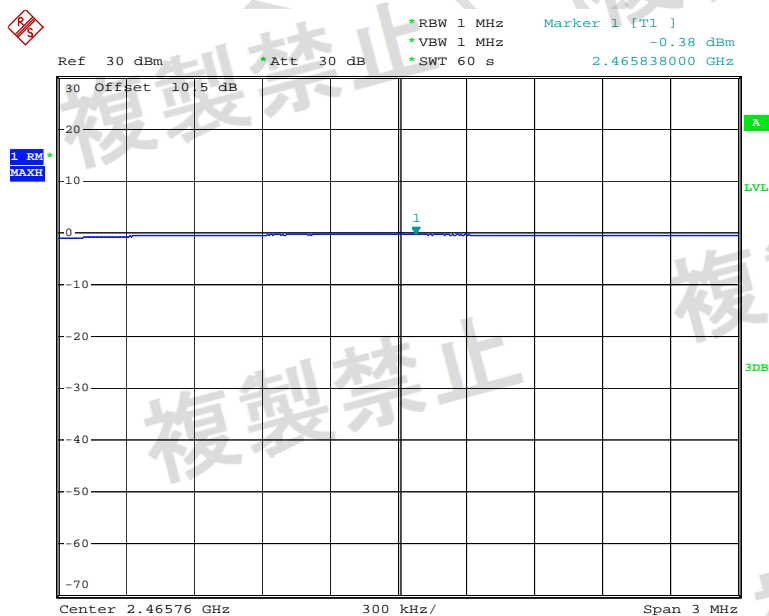
Date: 9.JAN.2020 18:52:23

Test Frequency:2442MHz



Date: 9.JAN.2020 18:49:11

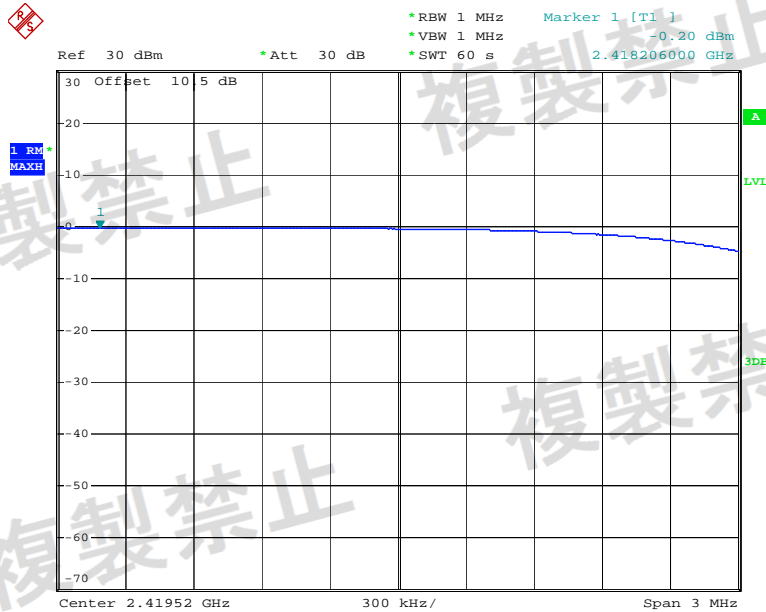
Test Frequency:2472MHz



Date: 9.JAN.2020 18:46:47

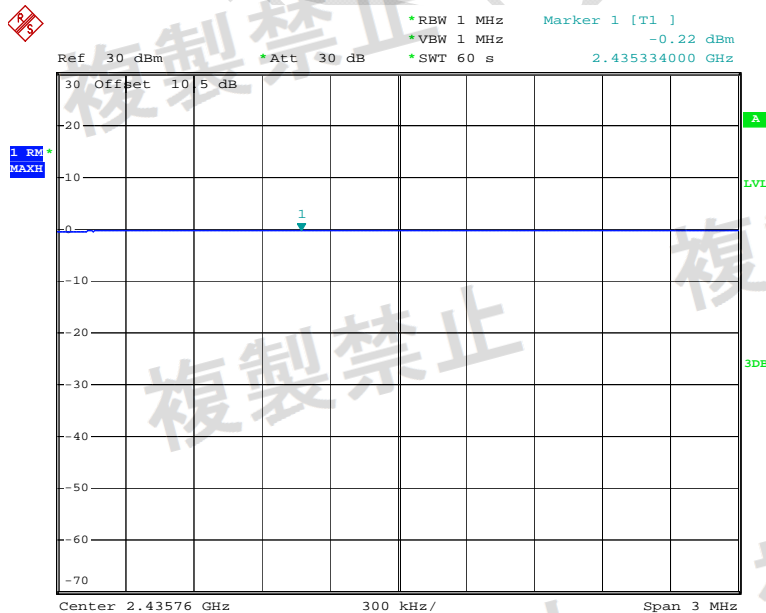
802.11n ht20 Mode

Test Frequency:2412MHz



Date: 9.JAN.2020 18:42:03

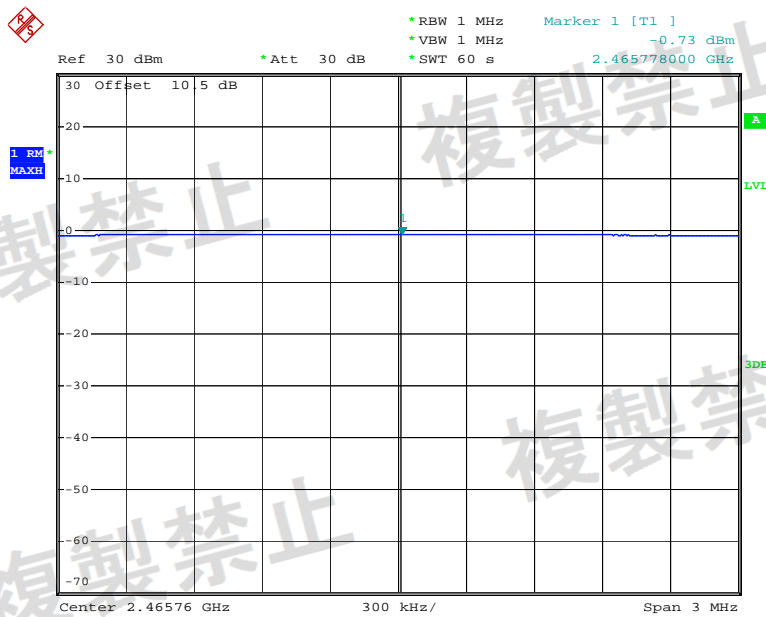
Test Frequency:2442MHz



Date: 9.JAN.2020 18:39:27



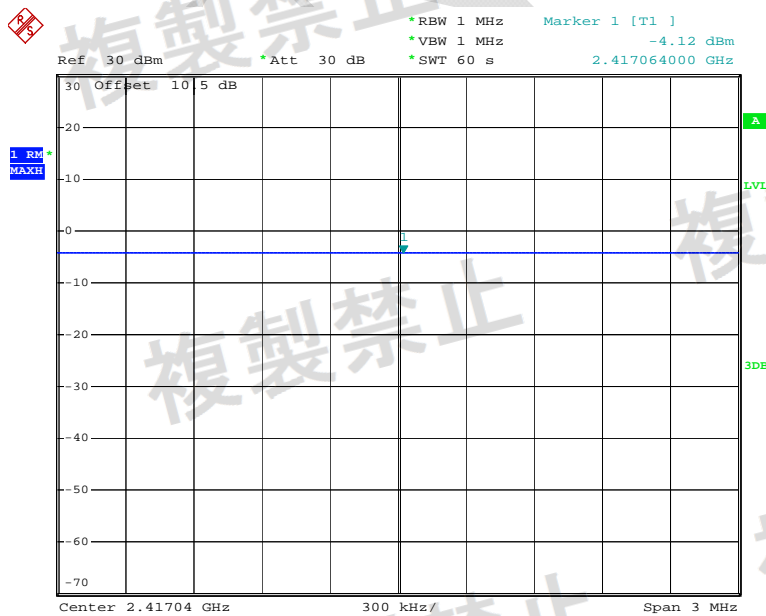
Test Frequency:2472MHz



Date: 9.JAN.2020 18:44:35

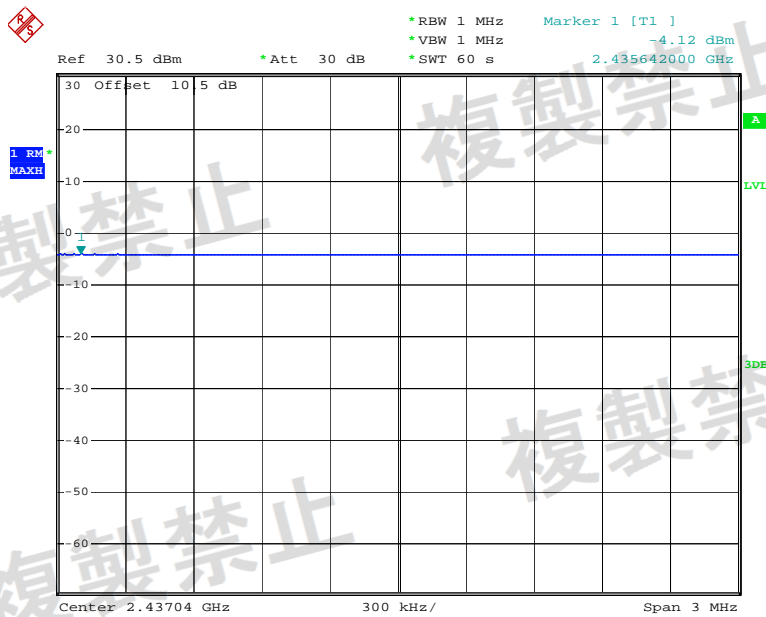
802.11n ht40 Mode:

Test Frequency:2422MHz



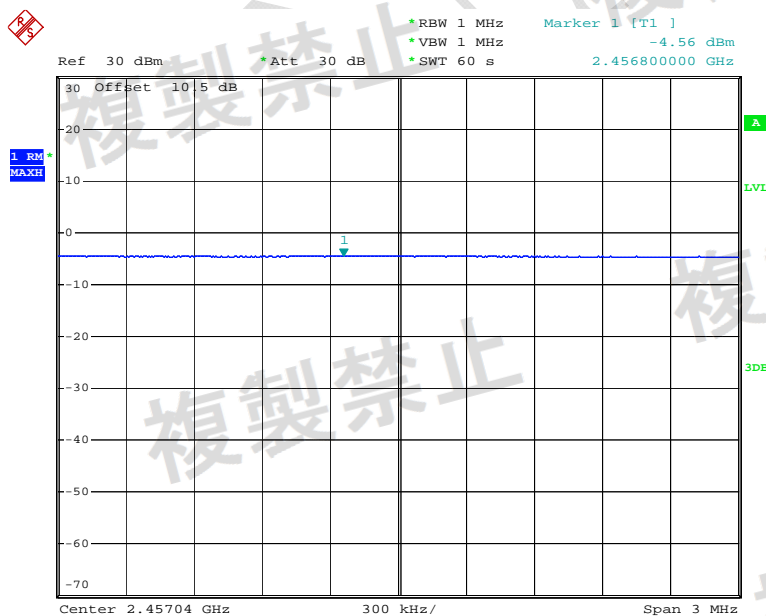
Date: 9.JAN.2020 18:30:06

Test Frequency:2442MHz



Date: 9.JAN.2020 18:21:06

Test Frequency:2462MHz



Date: 9.JAN.2020 18:26:20

## RECEIVER SPURIOUS EMISSION AND UNWANTED EMISSION INTENSITY

### Limit

- $\leq 4 \text{ nW}$  ( $30 \text{ MHz} \leq f \leq 1000 \text{ MHz}$ )
- $\leq 20 \text{ nW}$  ( $1 \text{ GHz} \leq f \leq 12.75 \text{ GHz}$ )

### 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 12.75GHz)
- 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
- Sweep mode: Auto Sweep
- Detection: Positive Peak
- Reference Level: Enough level for maximum dynamic range

### Test Data

**Test Result:** Compliance

*Test Mode: Receiving*

Test modes	Frequency Band	Low Channel	Middle Channel	High Channel	Limit
802.11b	Band VI (dBm)	-73.07	-80.82	-80.51	-54dBm (4nW)
	Band VII (dBm)	-60.40	-61.43	-62.02	-47dBm (20nW)
802.11g	Band VI (dBm)	-79.91	-80.21	-80.86	-54dBm (4nW)
	Band VII (dBm)	-61.5	-60.07	-62.29	-47dBm (20nW)
802.11n ht20	Band VI (dBm)	-82.48	-79.06	-75.87	-54dBm (4nW)
	Band VII (dBm)	-61.69	-61.7	-62.01	-47dBm (20nW)
802.11n ht40	Band VI (dBm)	-80.38	-76.21	-80.67	-54dBm (4nW)
	Band VII (dBm)	-61.32	-61.83	-60.98	-47dBm (20nW)

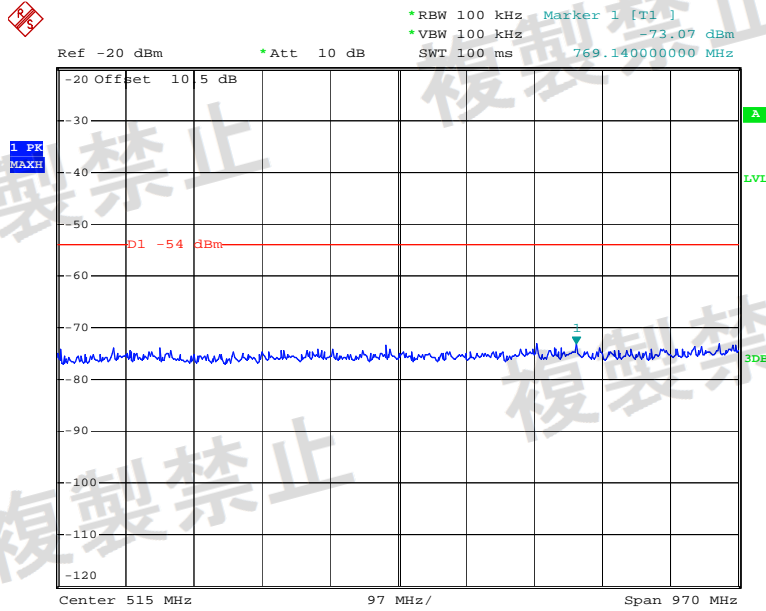
Note: Band VI: 30MHz~1000MHz

Band VII: 1000MHz~12750MHz

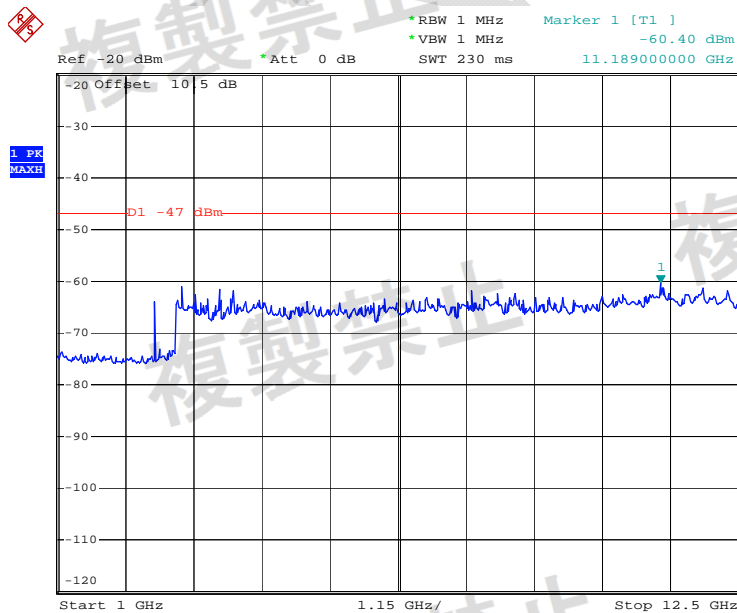
Please refer to the plots below for normal voltage.

802.11b mode

Test Frequency: 2412MHz

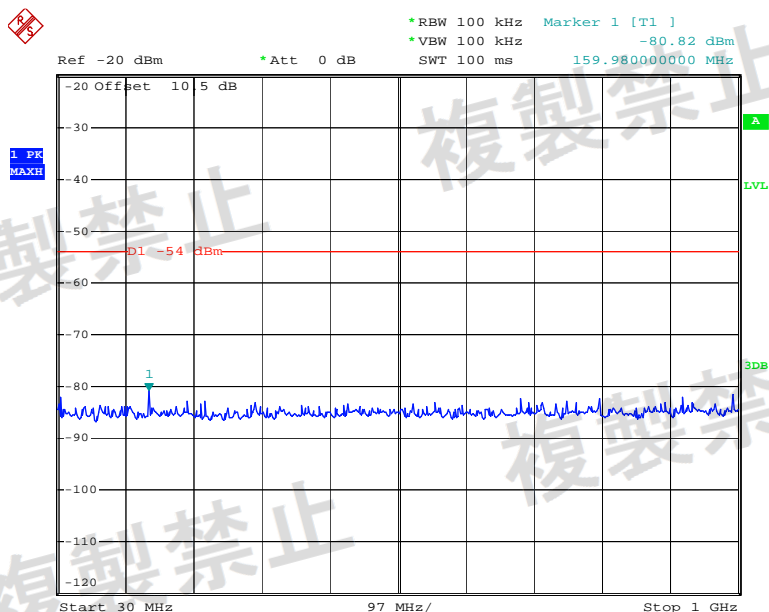


Date: 9.JAN.2020 17:06:17

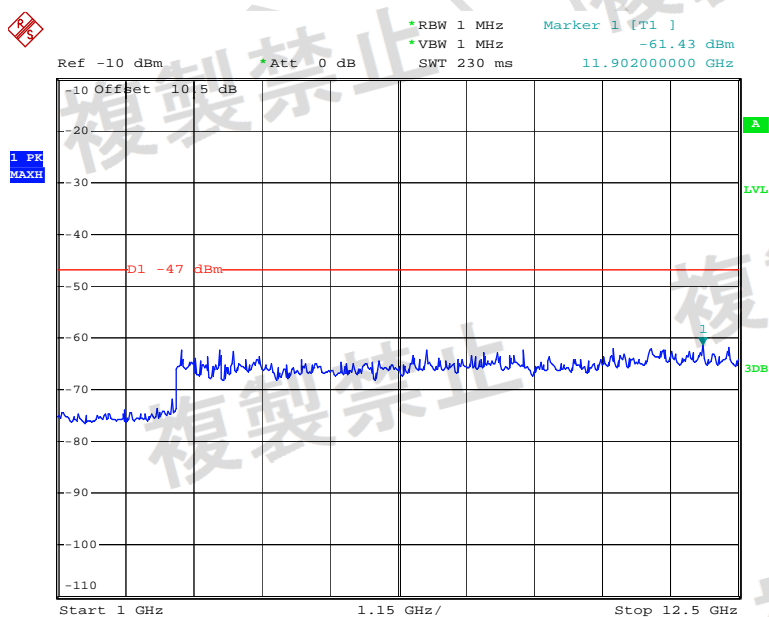


Date: 9.JAN.2020 17:08:23

Test Frequency: 2442MHz

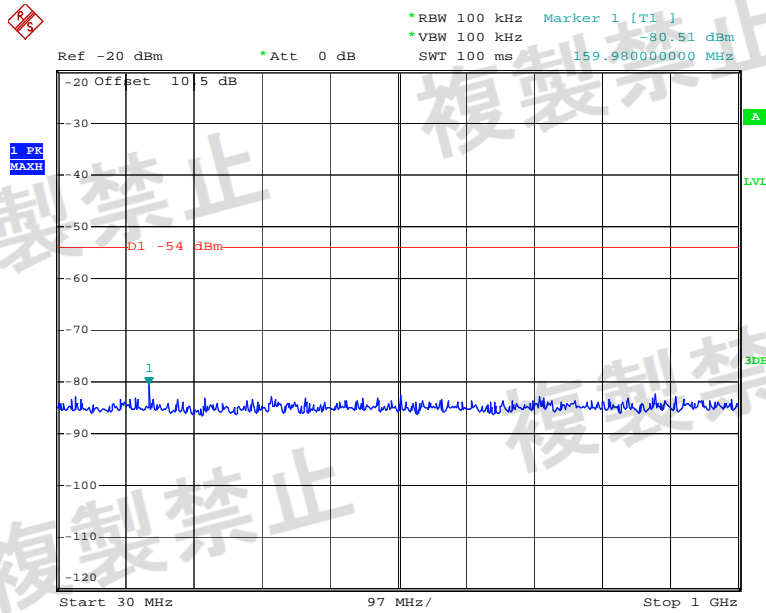


Date: 9.JAN.2020 17:08:42

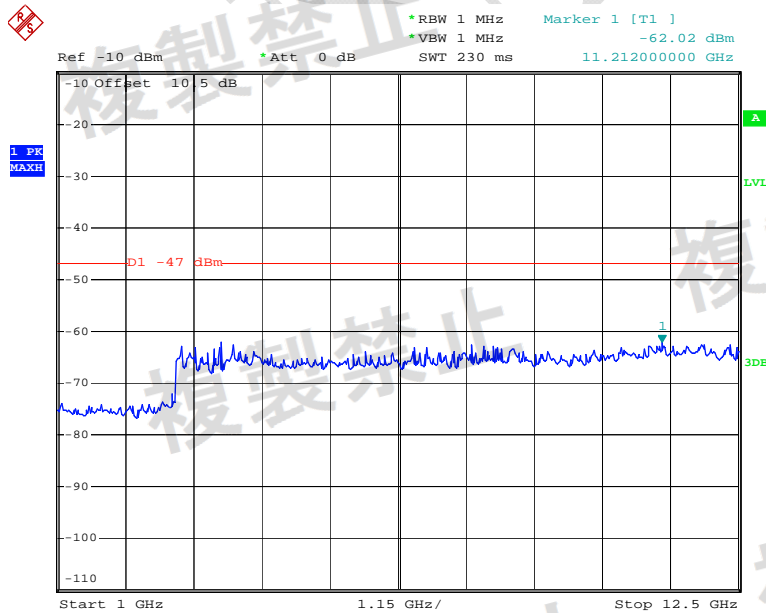


Date: 9.JAN.2020 17:08:54

Test Frequency: 2472MHz



Date: 9.JAN.2020 17:09:14

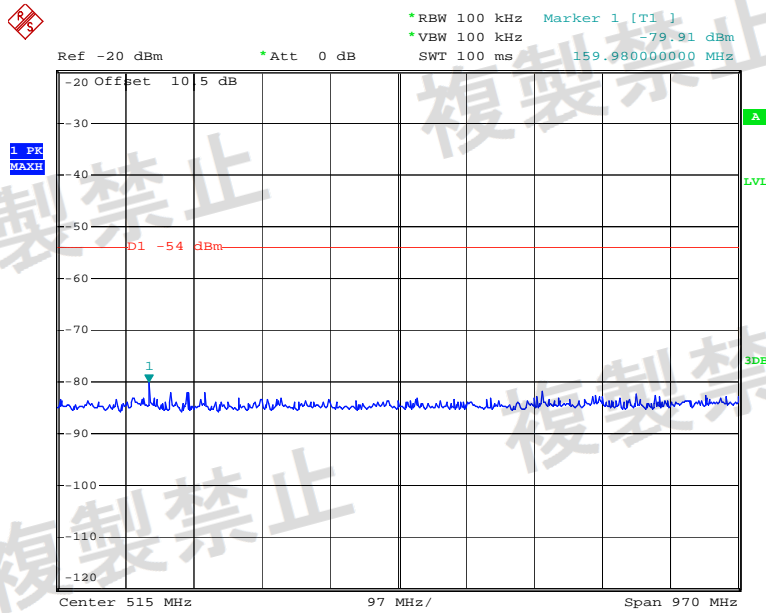


Date: 9.JAN.2020 17:09:27

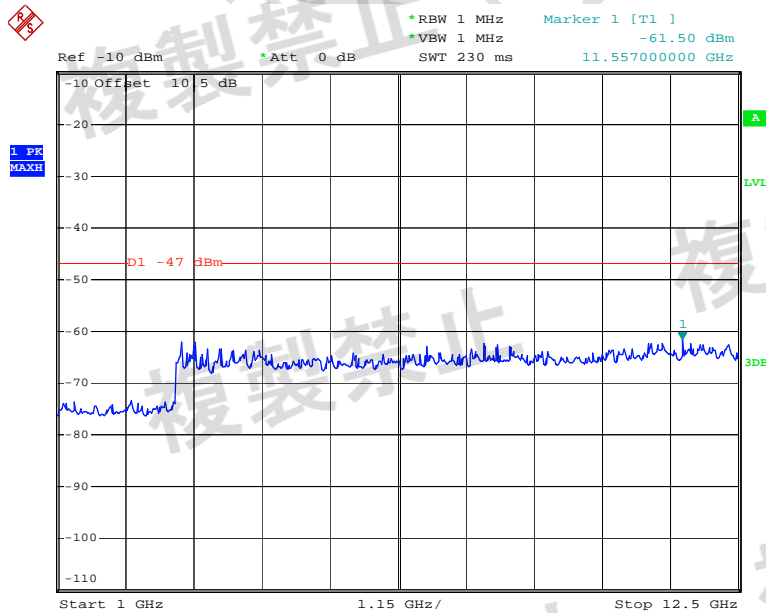


802.11g mode

Test Frequency: 2412MHz

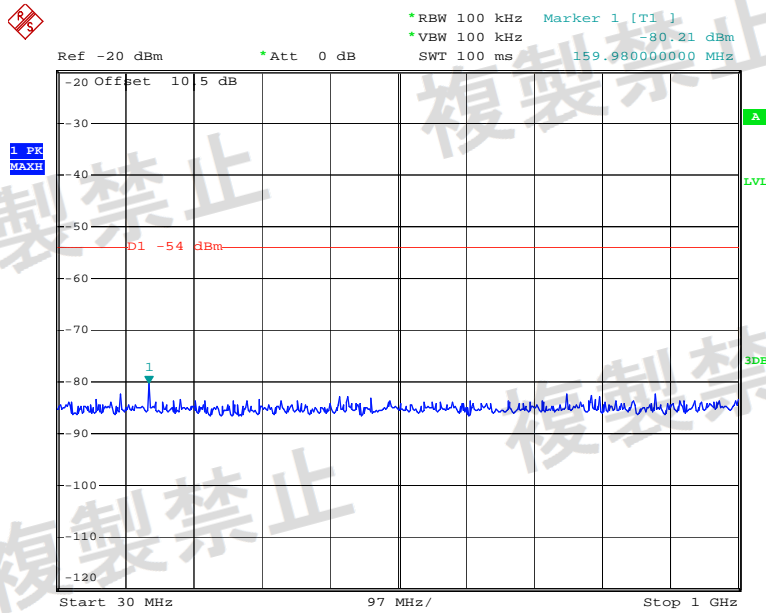


Date: 9.JAN.2020 17:54:26

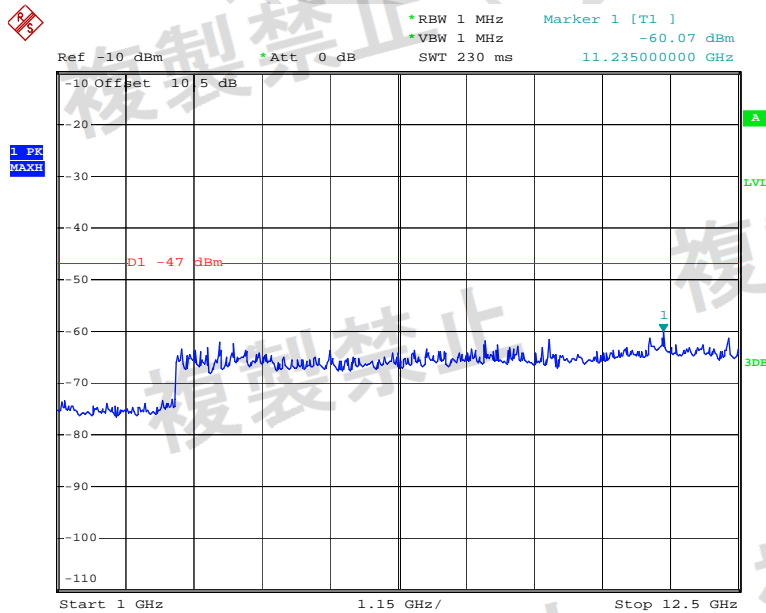


Date: 9.JAN.2020 17:54:39

Test Frequency: 2442MHz

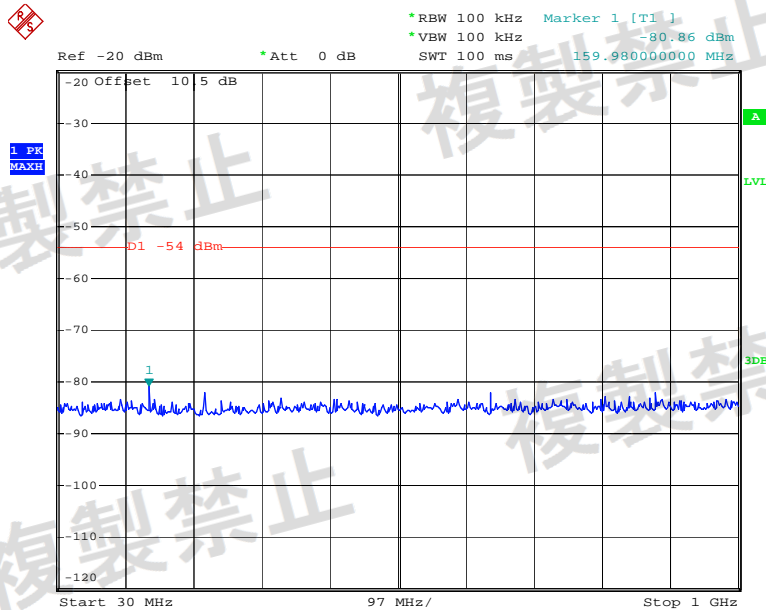


Date: 9.JAN.2020 17:11:27

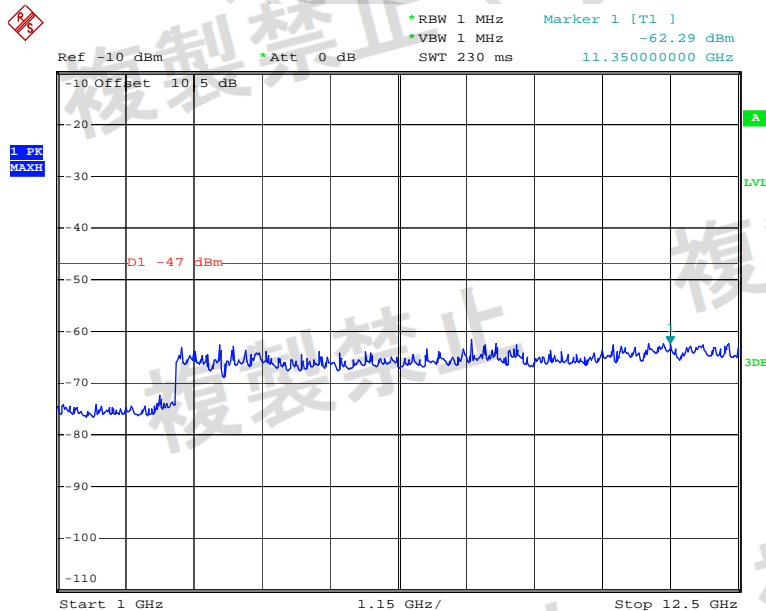


Date: 9.JAN.2020 17:11:40

Test Frequency: 2472MHz



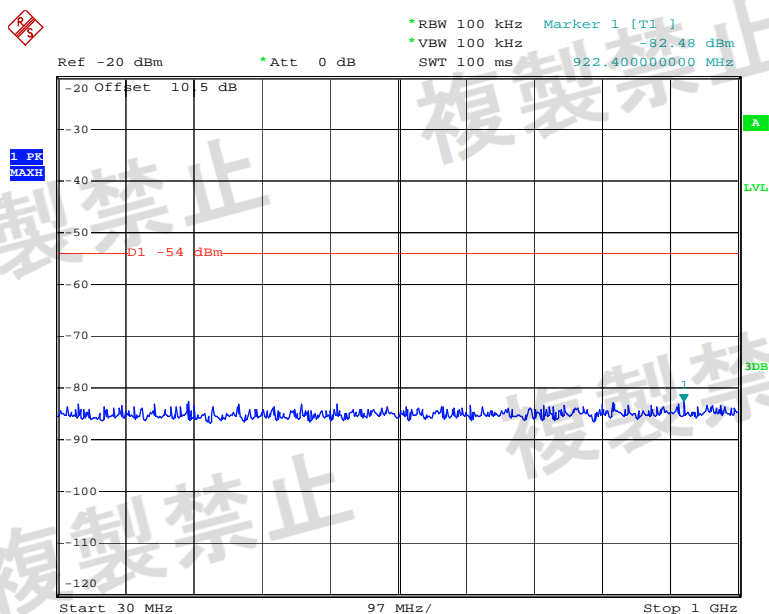
Date: 9.JAN.2020 17:09:52



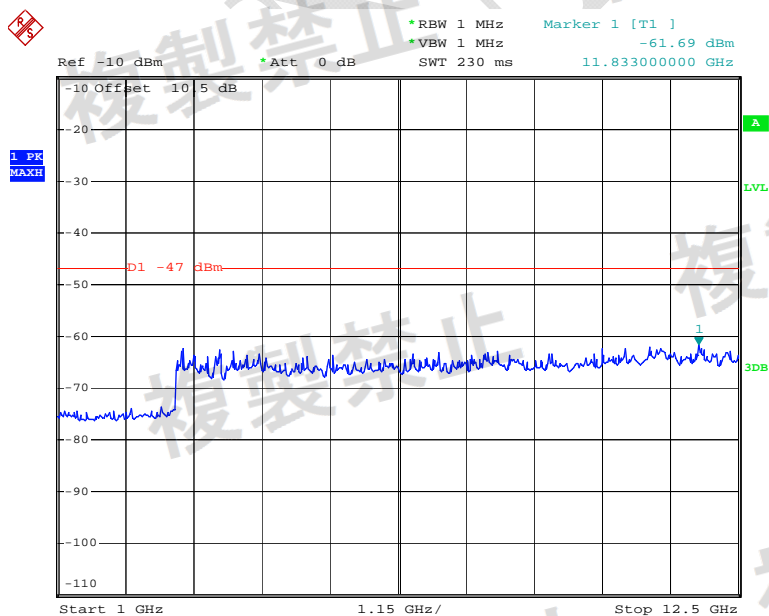
Date: 9.JAN.2020 17:10:05

## 802.11n ht20 mode

Test Frequency: 2412MHz

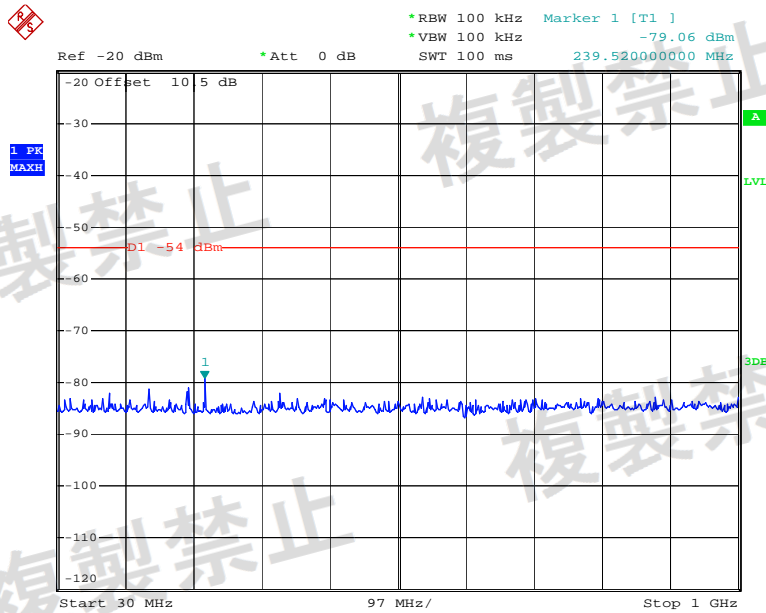


Date: 9.JAN.2020 17:55:07

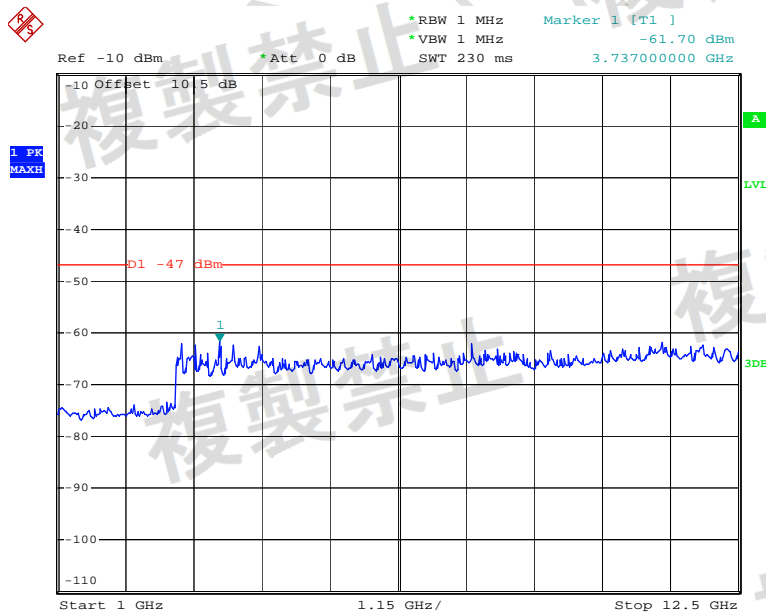


Date: 9.JAN.2020 17:55:20

Test Frequency: 2442MHz

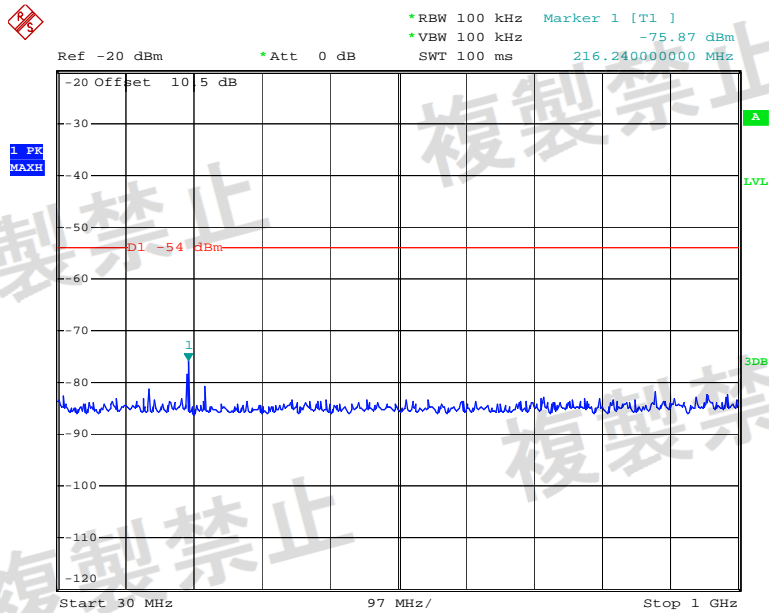


Date: 9.JAN.2020 17:55:49

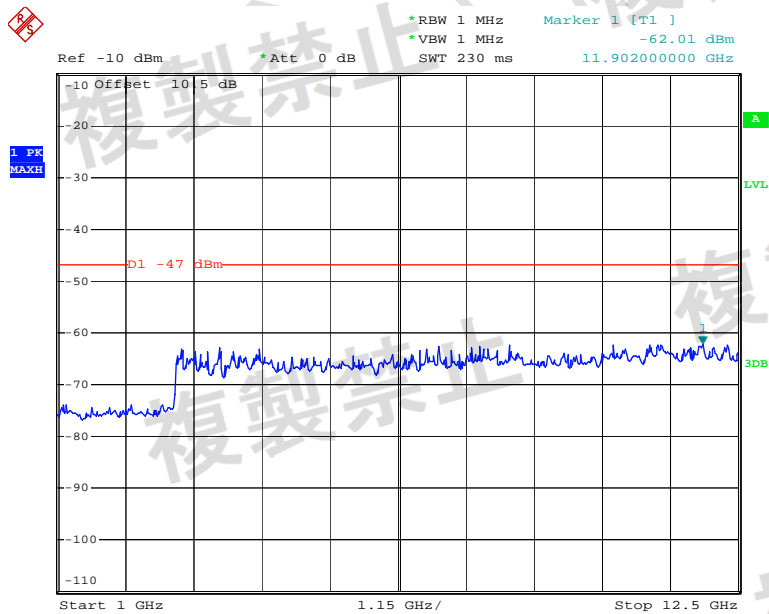


Date: 9.JAN.2020 17:56:02

Test Frequency: 2472MHz



Date: 9.JAN.2020 17:56:30

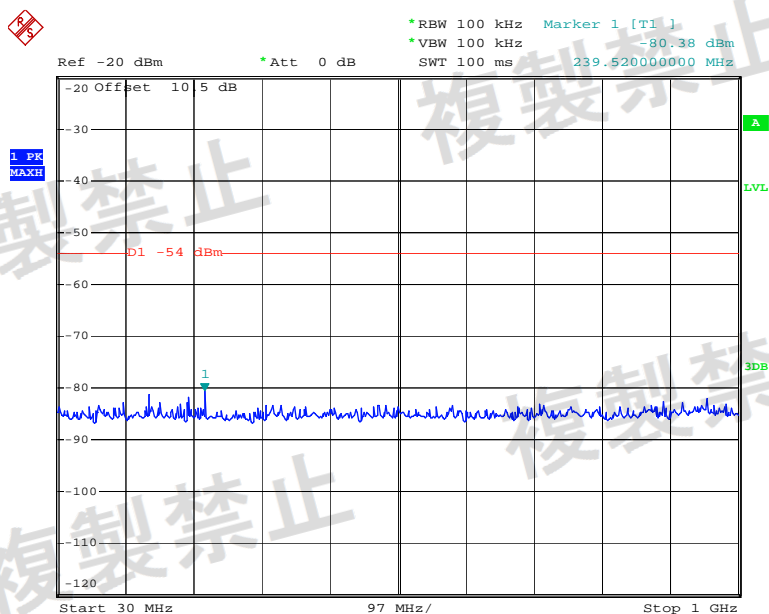


Date: 9.JAN.2020 17:56:43

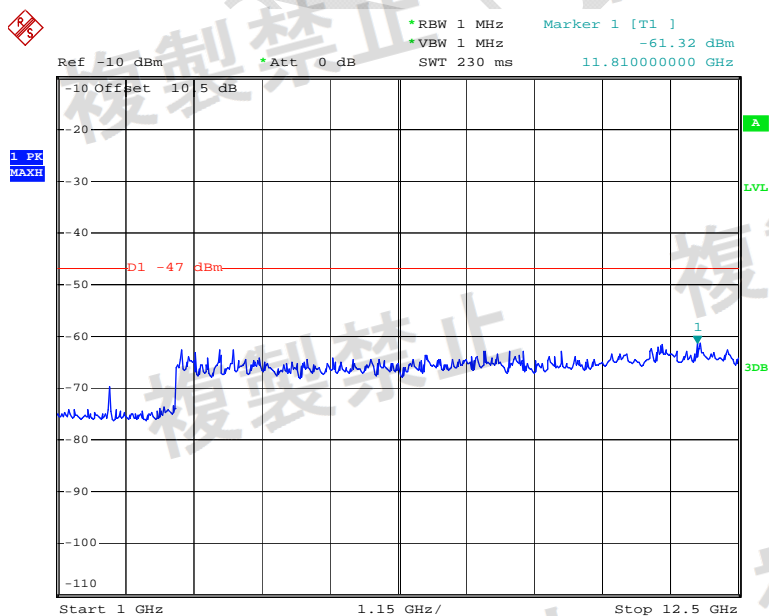


802.11n ht40 mode:

Test Frequency: 2422MHz

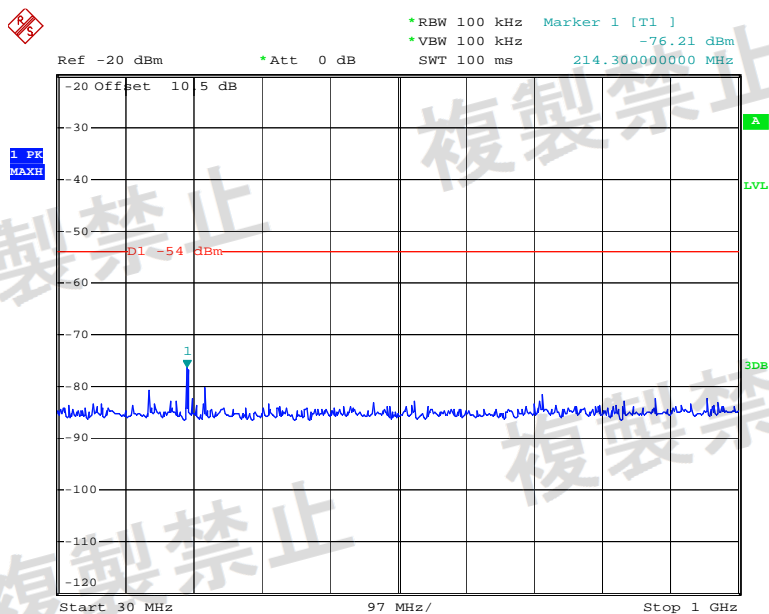


Date: 9.JAN.2020 18:00:00

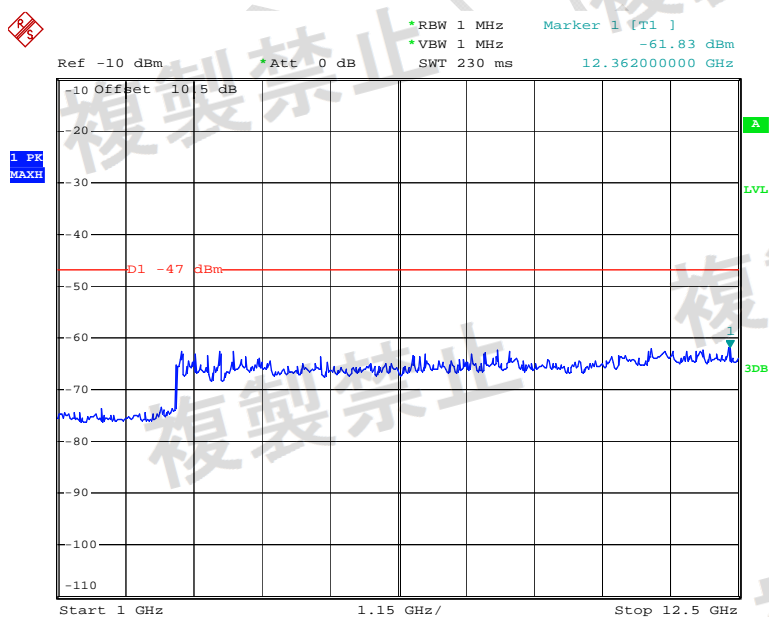


Date: 9.JAN.2020 18:00:12

Test Frequency: 2442MHz

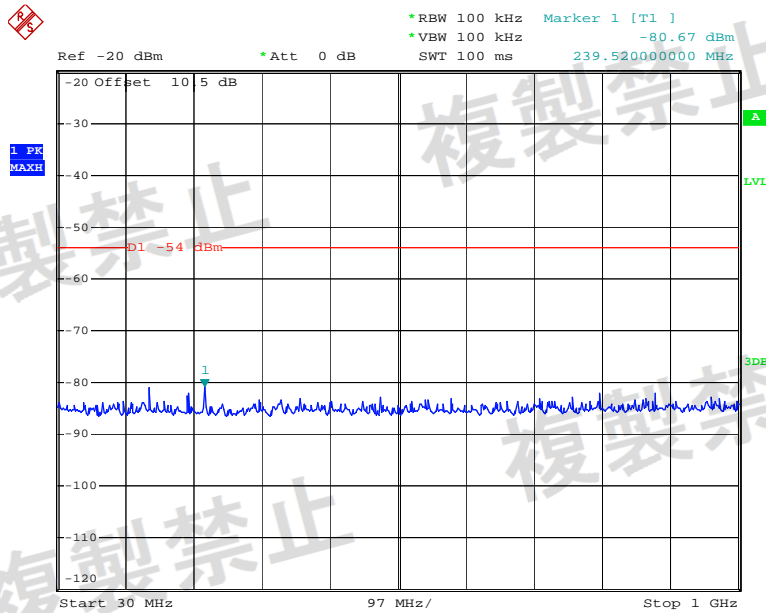


Date: 9.JAN.2020 17:59:30

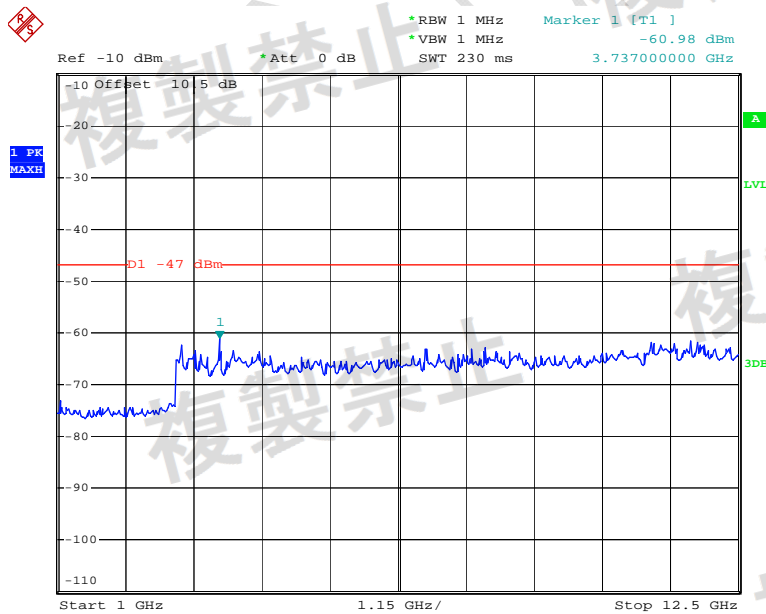


Date: 9.JAN.2020 17:59:43

Test Frequency: 2462MHz



Date: 9.JAN.2020 17:58:36



Date: 9.JAN.2020 17:58:49

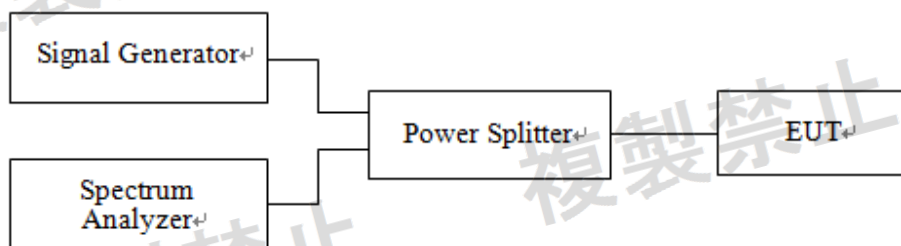
## CARRIER SENSE CAPABILITY

### Limit

EUT stop RF transmission signal after carrier inject to EUT

### 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  $(-22.79 + G - 20 \cdot \log(f) \text{ dBm})$  (G is the antenna gain, f is the test frequency).
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.

### Measurement Result

**Test Result:** Compliance

## **INTERFERENCE PREVENTION FUNCTION**

### **Requirement**

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.

### **Test Procedure**

In the case that the EUT has the function of automatically transmitting the identification code:

1. Transmit the predetermined identification codes from EUT
2. Check the transmitted identification codes with the demodulator.

In the case of receiving the identification codes:

1. Transmit the predetermined identification codes from the counterpart.
2. Check if communication is normal
3. Transmit the signal other than predetermined ID codes from the counterpart.
4. Check if the EUT stops the transmission, or if it displays that identification codes are different from the predetermined ones.

### **Measurement Result**

**Test Result:** Good

## **CONSTRUCTION PROTECTION CONFIRMATION**

### **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.

### **Confirmation Method**

The house of EUT was locked by Screws, can't be opened easily. Please refer the EUT photo.

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