

1. TEST RESULT REPORT

Applicant (4SEILS)**HYEONJOON, RYU****Test Laboratory: ESTECH CO., LTD****Tested Engineer;**signature
Jun Yeop, Lee**Approval person;**signature
Keum Bum, Lee

Equipment Type	VIVA-AP
Model Name	AP100
Serial Number	-
Number of Tested Equipment	1
Date of Testing	2024-01-17 ~ 2024-01-18
Place of Testing	ESTECH CO., LTD. Suite 1015, World Venture Center II, 123 Gasan Digital 2-ro, Geumcheon-gu, Seoul, 08505, Korea
Test Result	PASS (Refer to attachment)

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Phone: +82-2-867-3201, Fax: +82-2-867-3204

2. TEST INFORMATION

- | | |
|--|---|
| 1 Classification of Specified Radio Equipment | Article 2 Paragraph 1 of Item 19 |
| 2 Test Method | Ministry of Internal Affairs and Communications
MIC Notification. No. 88, Annex 43 |
| 3 Supply Voltage | DC 5.0 V, DC 36 ~ 57 V POE |
| 4 Size (W x D x H) | 200 x 200 x 39.5 (mm) |
| 5 RF Specification Frequency range | GFSK : 2402 - 2480 MHz |
| 6 RF Channels | GFSK : 40 channels (2MHz interval) |
| 7 Modulation method & Data rate | GFSK & 1Mbps |
| 8 Measurement Equipment | <u>Refer to Item 4</u> |
| 9 Type of Emissions, Frequency and Declaration Output Power to be tested | <u>Refer to Test Results</u> |
| 10 Special note | <p>Tested at one antenna terminal with the highest antenna power supply using the same module.</p> <p>There is a constant voltage circuit, so it is tested at DC 5 V out of two voltages: DC 5 V and DC 48 V POE.</p> |

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2.1 TEST RESULTS DATA FOR JAPANESE CERTIFICATION (GFSK High Voltage)

Environment of Test Room	Temperature	23.2 °C
	Humidity	48 %

Peak Antenna Gain	4.13	dBi
Declaration Output Power	2.5	mW
Declaration Output Power	3.98	dBm
E.I.R.P	8.11	dBm
Input Power Voltage	5.5	VDC

Tested Circuit Insertion Loss	1	dB
Burst	ON TIME	-Not applicable- sec
	OFF TIME	-Not applicable- sec
	Ratio	-Not applicable- %
Packet Type (Mode)	-Not applicable-	mode

Frequency equal to the transmission rate of the modulation signal

N/A

Test Category ; 2.4GHz Band Wideband Direct Sequence Spread Spectrum Communication System

Comprehensive operation test

"When the input voltage to receiver RF circuit varies below $\pm 1\%$, as the input voltage from the external power supply to the receiver varies $\pm 10\%$ (excluding power supply)."

2.4.1. TEST Results

Measurement Frequency		MHz	2402	2440	2480	Result	NOTES
Channel Number		Ch.	0	19	39	----	
Reading Frequency		MHz	2401.9886	2439.9882	2479.9882	----	
Frequency Tolerance		ppm	-4.74604	-4.83607	-4.75806	PASS	
Occupied Bandwidth		MHz	1.0343	1.0828	1.0735	PASS	
Spread Bandwidth		MHz	0.6761318	0.7087733	0.7094394	PASS	
RF Output Power		mW	0.673	0.634	0.556	PASS	
RF Output Power Tolerance		%	-73.08	-74.65	-77.76	PASS	
Real Total Output Power		dBm	-1.72	-1.98	-2.55	----	<Reference>
Unwanted Emission Strength	Under 2387MHz	μW/MHz	0.010460	0.004980	0.007050	PASS	
		MHz	2359.09	2248.01	2287.72	----	
	2387-2400MHz	μW/MHz	0.164850	0.010100	0.00060785	PASS	
		MHz	2399.9921	2396.5734	2395.6212	----	
	2483.5-2496.5MHz	μW/MHz	0.00046419	0.007220	0.002860	PASS	
		MHz	2487.3630	2483.5349	2483.7508	----	
	2496.5 - 12.5GHz	μW/MHz	0.001870	0.002390	0.005450	PASS	
		MHz	2594.2	2503.8	2522.1	----	
Secondarily Emitted Radio Wave Strength (RX Spurious)	Under 1GHz	nW	0.102490	0.098510	0.132980	PASS	
		MHz	149.61	192	192.24	----	
	1 - 12.5GHz	nW	0.337750	0.355880	0.362240	PASS	
		MHz	7701.2	8154.7	7559.4	----	
Interference Prevention Function		----	good			PASS	

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2.2 TEST RESULTS DATA FOR JAPANESE CERTIFICATION (GFSK Rated Voltage)

Environment of Test Room	Temperature	23.2 °C
	Humidity	48 %

Peak Antenna Gain	4.13	dBi
Declaration Output Power	2.5	mW
Declaration Output Power	3.98	dBm
E.I.R.P	8.11	dBm
Input Power Voltage	5.0	VDC

Tested Circuit Insertion Loss	1	dB
Burst	ON TIME	-Not applicable- sec
	OFF TIME	-Not applicable- sec
	Ratio	-Not applicable- %
Packet Type (Mode)	-Not applicable-	mode

Frequency equal to the transmission rate
of the modulation signal

N/A

Test Category ; 2.4GHz Band Wideband Direct Sequence Spread Spectrum Communication System

Comprehensive operation test

"When the input voltage to receiver RF circuit varies below $\pm 1\%$,
as the input voltage from the external power supply to the receiver varies $\pm 10\%$ (excluding power supply)."

2.4.2. TEST Results

Measurement Frequency			MHz	2402	2440	2480	Result	NOTES
Channel Number			Ch.	0	19	39	----	
Reading Frequency			MHz	2401.9887	2439.9882	2479.9882	----	
Frequency Tolerance			ppm	-4.70441	-4.83607	-4.75806	PASS	
Occupied Bandwidth			MHz	1.0585	1.0976	1.1148	PASS	
Spread Bandwidth			MHz	0.6395082	0.7313956	0.6971356	PASS	
RF Output Power			mW	0.675	0.646	0.562	PASS	
RF Output Power Tolerance			%	-73.02	-74.17	-77.51	PASS	
Real Total Output Power			dBm	-1.71	-1.90	-2.50	----	<Reference>
Unwanted Emission Strength	Under 2387MHz	$\mu\text{W}/\text{MHz}$	0.009400	0.004840	0.006020	PASS		
		MHz	2359.95	2375.78	2287.72	----		
	2387-2400MHz	$\mu\text{W}/\text{MHz}$	0.175950	0.010220	0.00050699	PASS		
		MHz	2399.9984	2396.3449	2397.5828	----		
	2483.5-2496.5MHz	$\mu\text{W}/\text{MHz}$	0.496940	0.007250	0.003040	PASS		
		MHz	2486.3346	2483.5175	2483.5127	----		
	2496.5 - 12.5GHz	$\mu\text{W}/\text{MHz}$	0.001860	0.002560	0.005440	PASS		
		MHz	2594.2	2503.8	2522.1	----		
Secondarily Emitted Radio Wave Strength (RX Spurious)	Under 1GHz	nW	0.100320	0.109900	0.106930	PASS		
		MHz	192	191.77	191.65	----		
	1 - 12.5GHz	nW	0.323820	0.368380	0.390390	PASS		
		MHz	7667.5	7510.3	2166.7	----		
Interference Prevention Function			----	good			PASS	

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2.3 TEST RESULTS DATA FOR JAPANESE CERTIFICATION (GFSK Low Voltage)

Environment of Test Room	Temperature	23.2 °C
	Humidity	48 %

Peak Antenna Gain	4.13	dBi
Declaration Output Power	2.5	mW
Declaration Output Power	3.98	dBm
E.I.R.P	8.11	dBm
Input Power Voltage	4.5	VDC

Tested Circuit Insertion Loss	1	dB
Burst	ON TIME	-Not applicable- sec
	OFF TIME	-Not applicable- sec
	Ratio	-Not applicable- %
Packet Type (Mode)	-Not applicable-	mode

Frequency equal to the transmission rate of the modulation signal

N/A

Test Category ; 2.4GHz Band Wideband Direct Sequence Spread Spectrum Communication System

Comprehensive operation test

"When the input voltage to receiver RF circuit varies below $\pm 1\%$, as the input voltage from the external power supply to the receiver varies $\pm 10\%$ (excluding power supply)."

2.4.3. TEST Results

Measurement Frequency		MHz	2402	2440	2480	Result	NOTES
Channel Number		Ch.	0	19	39	----	
Reading Frequency		MHz	2401.9887	2439.9882	2479.9881	----	
Frequency Tolerance		ppm	-4.70441	-4.83607	-4.79839	PASS	
Occupied Bandwidth		MHz	1.0812	1.1015	1.0806	PASS	
Spread Bandwidth		MHz	0.6991322	0.6784402	0.6839645	PASS	
RF Output Power		mW	0.668	0.652	0.564	PASS	
RF Output Power Tolerance		%	-73.27	-73.93	-77.45	PASS	
Real Total Output Power		dBm	-1.75	-1.86	-2.49	----	<Reference>
Unwanted Emission Strength	Under 2387MHz	μW/MHz	0.009870	0.004840	0.004830	PASS	
		MHz	2359.38	2376.07	2288.01	----	
	2387-2400MHz	μW/MHz	0.183150	0.010680	0.541000	PASS	
		MHz	2400	2396.8972	2395.326	----	
	2483.5-2496.5MHz	μW/MHz	0.460890	0.007130	0.002410	PASS	
		MHz	2486.5964	2483.5	2483.865	----	
	2496.5 - 12.5GHz	μW/MHz	0.001420	0.002880	0.005860	PASS	
		MHz	2594.2	2503.8	2523.4	----	
Secondarily Emitted Radio Wave Strength (RX Spurious)	Under 1GHz	nW	0.137370	0.130590	0.142400	PASS	
		MHz	191.88	191.53	191.77	----	
	1 - 12.5GHz	nW	0.361490	0.321660	0.465160	PASS	
		MHz	7739.1	7581.9	2166.7	----	
Interference Prevention Function		----	good			PASS	

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Use	Instrument	Manufacture
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禁製

Use of measurement equipment is valid for
equipment

by the National Institute of Information and

Calibration
a) : Calibration
a designa

- Technology(NICT) or
Measurement Law

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CO., LTD.
Seoul, 08505, Korea

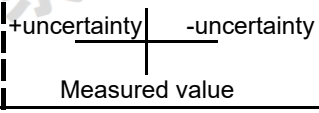
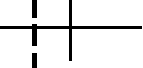

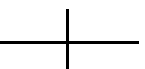
4. About Uncertainty of Measured Value

*In this test, the influence of an error or uncertainty may be done according to the following factors.

- Bias of a measurement equipment, Change by aging, Attrition, Noise
- Skill and capability of an inspector
- Environment (Temperature, Humidity)
- Dispersion in a EUT (Equipment Under Test)
- Uncertainty of calibration of a measurement equipment

Therefore, Synthetic uncertainty is calculated using "k=2" of coverage factor, and about 95% of confidence level shall be obtained.

In consideration of the above, it judged as follows.

JUDGE	Measured value and Standard limit value	
PASS	Case1 <u>Standard limit value</u>  <p>*Even if it takes uncertainty into consideration, a standard limit value is fulfilled.</p>	
	Case2  <p>*Although measured value is in a standard limit value, a limit value won't be fulfilled if uncertainty is taken into consideration.</p>	
FAIL	Case3  <p>*Although measured value exceeds a standard limit value, a limit value will be fulfilled if uncertainty is taken into consideration.</p>	
	Case4  <p>*Even if it takes uncertainty into consideration, a standard limit value isn't fulfilled.</p>	

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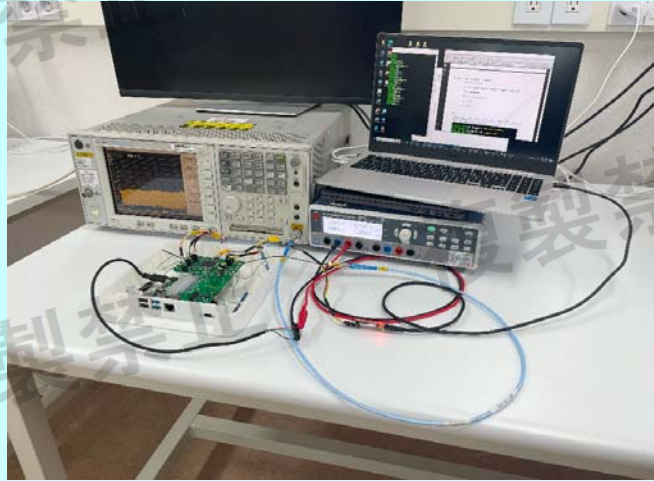
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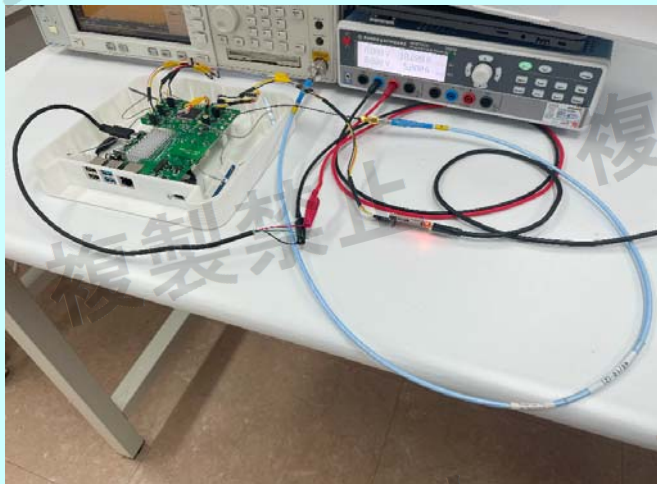
5. PHOTOGRAPHS

5 Test Conditions Photographs

Test Circuit Photo



Conducted Measurement Photo



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6. Antenna List Table

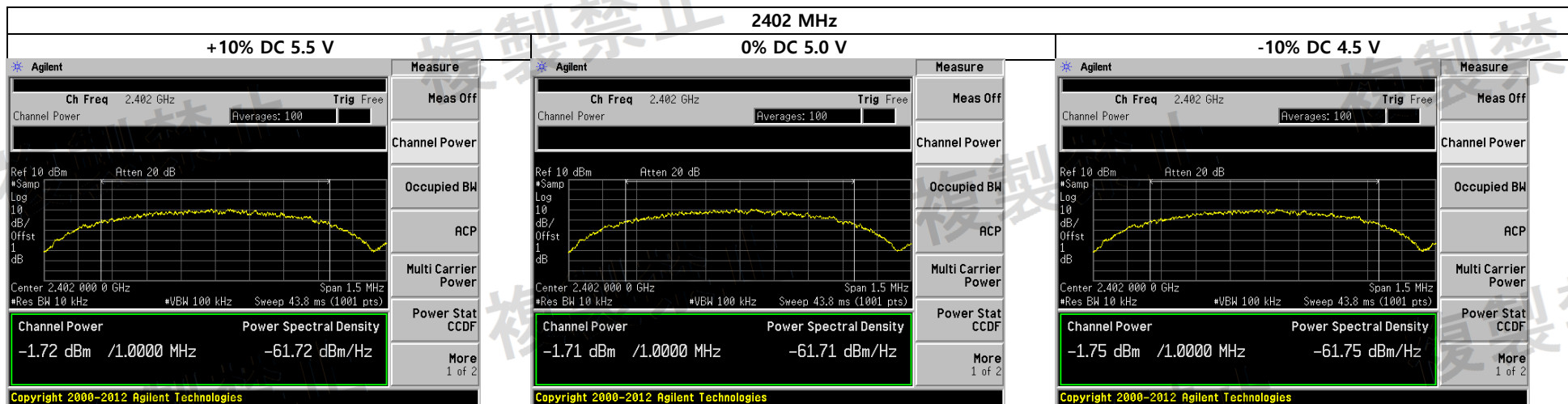
			MAX VALUE ;		4.1300 dBi		
ANTENNA			Gain Specification				NOTES (Cable or Others)
No	Type	Model Name	Max Gain (dBi)	Polarization (H or V)	Attenuation (dB)	Net Gain (dBi)	
1	PCB	AA107	4.13	Horizontal	0	4.130	
2			0	Horizontal	0	0.000	
3			0	Horizontal	0	0.000	
4			0	Horizontal	0	0.000	
5			0	Horizontal	0	0.000	
6			0	Horizontal	0	0.000	
7			0	Horizontal	0	0.000	
8			0	Horizontal	0	0.000	
9			0	Horizontal	0	0.000	
10			0	Horizontal	0	0.000	
11			0	Horizontal	0	0.000	
12			0	Horizontal	0	0.000	
13			0	Horizontal	0	0.000	
14			0	Horizontal	0	0.000	
15			0	Horizontal	0	0.000	
16			0	Horizontal	0	0.000	
17			0	Horizontal	0	0.000	
18			0	Horizontal	0	0.000	
19			0	Horizontal	0	0.000	
20			0	Horizontal	0	0.000	
21			0	Horizontal	0	0.000	
22			0	Horizontal	0	0.000	
23			0	Horizontal	0	0.000	
24			0	Horizontal	0	0.000	
25			0	Horizontal	0	0.000	
26			0	Horizontal	0	0.000	
27			0	Horizontal	0	0.000	
28			0	Horizontal	0	0.000	
29			0	Horizontal	0	0.000	
30			0	Horizontal	0	0.000	
31			0	Horizontal	0	0.000	
32			0	Horizontal	0	0.000	
33			0	Horizontal	0	0.000	
34			0	Horizontal	0	0.000	
35			0	Horizontal	0	0.000	
36			0	Horizontal	0	0.000	
37			0	Horizontal	0	0.000	
38			0	Horizontal	0	0.000	
39			0	Horizontal	0	0.000	
40			0	Horizontal	0	0.000	
41			0	Horizontal	0	0.000	
42			0	Horizontal	0	0.000	

If the equipment has more than two transmission chains (such like MIMO), the antenna combination should be considered not to exceed the limit of total EIRP.

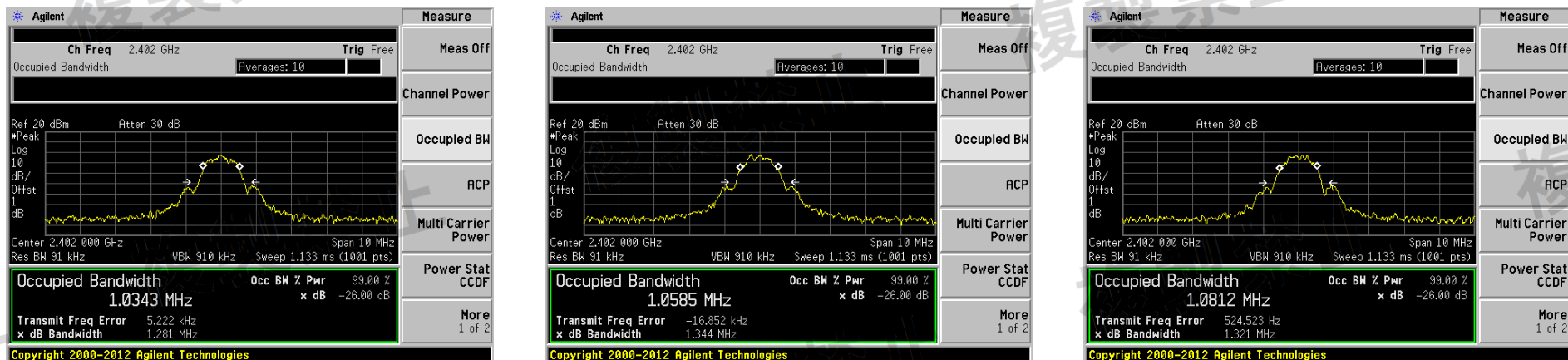
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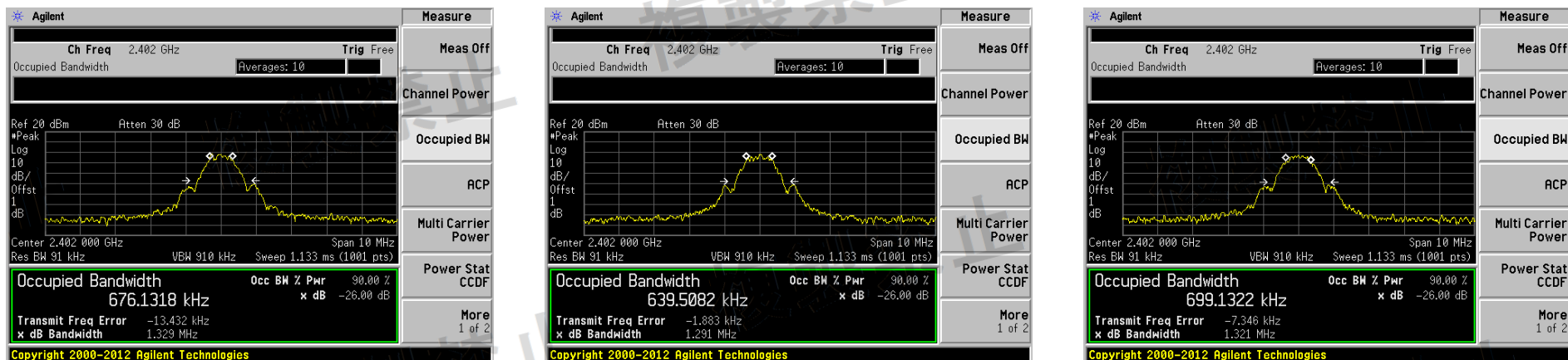
Real Total
Output
Power



Occupied
Bandwidth

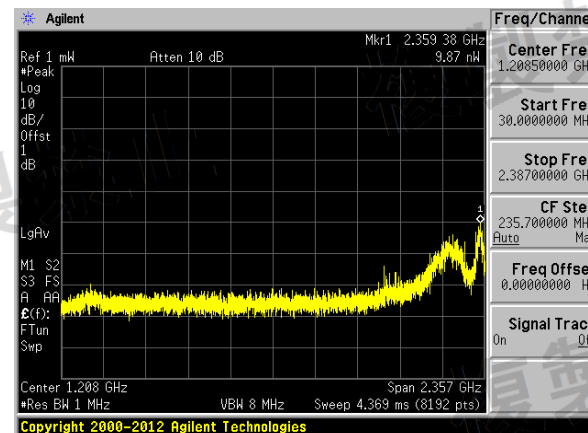
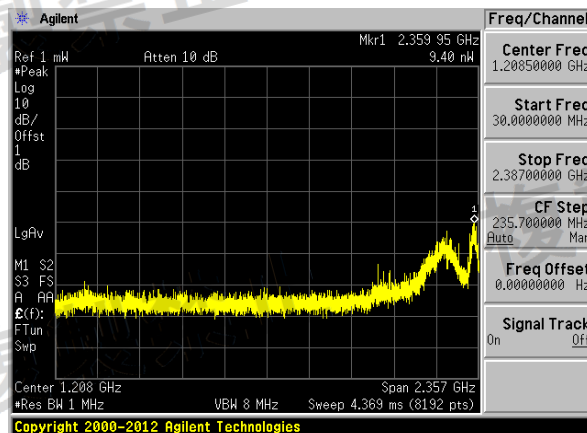
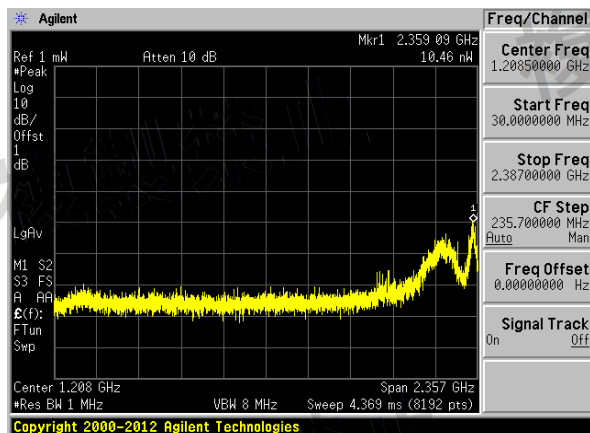


Spread
Bandwidth



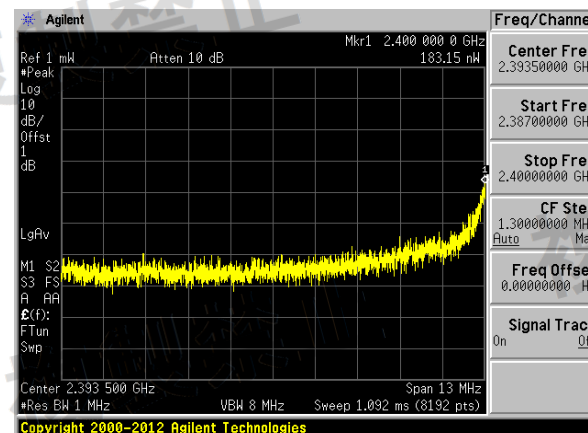
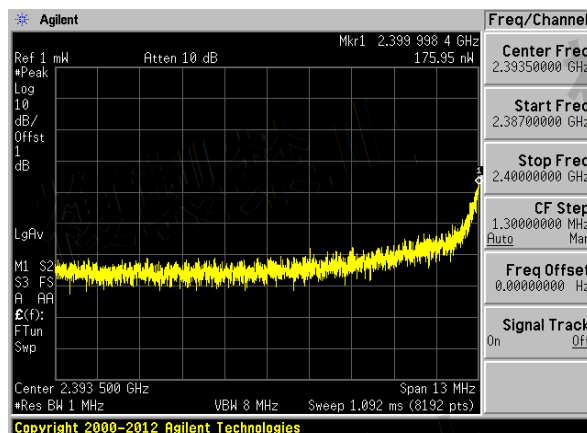
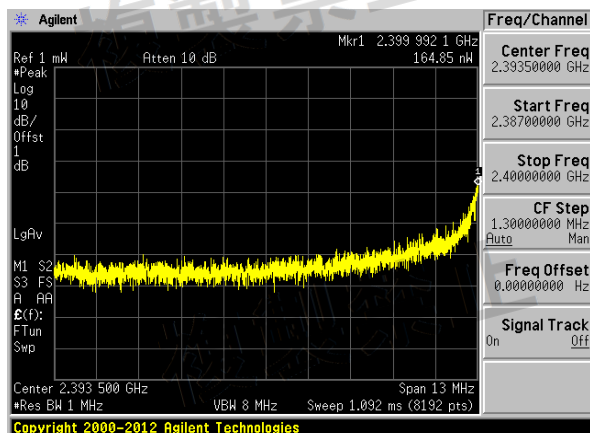
Unwanted
Emission
Strength

Under
2387MHz



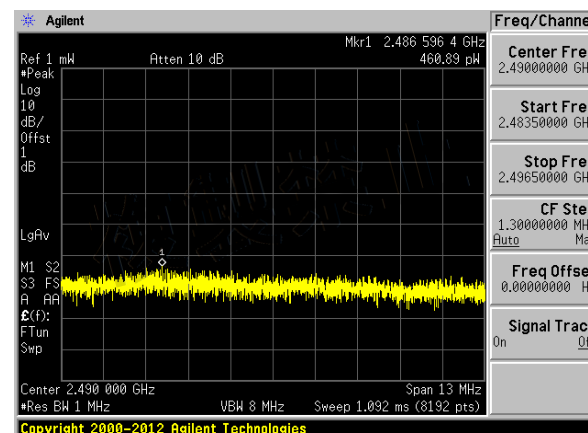
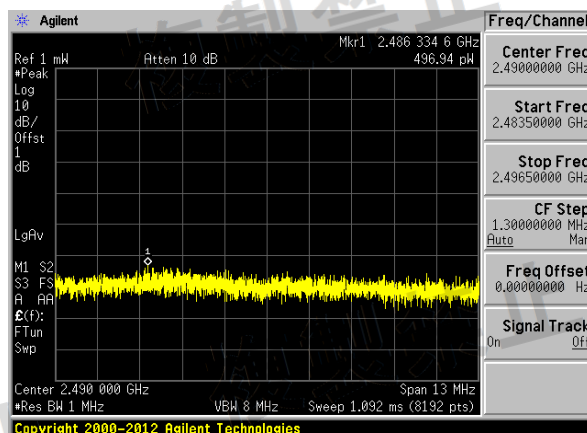
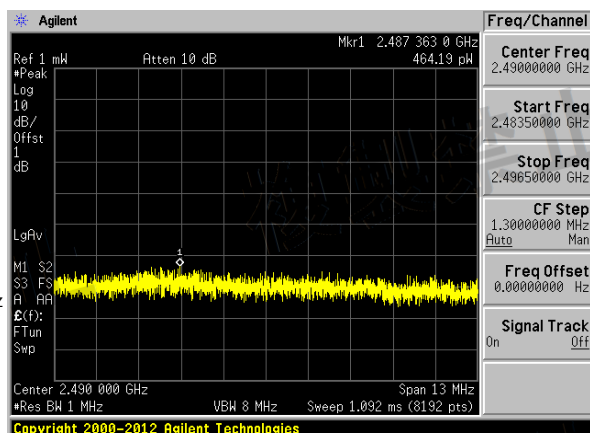
Unwanted
Emission
Strength

2387-
2400MHz



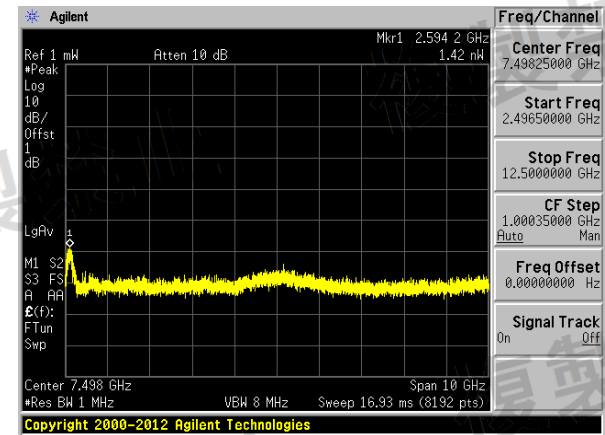
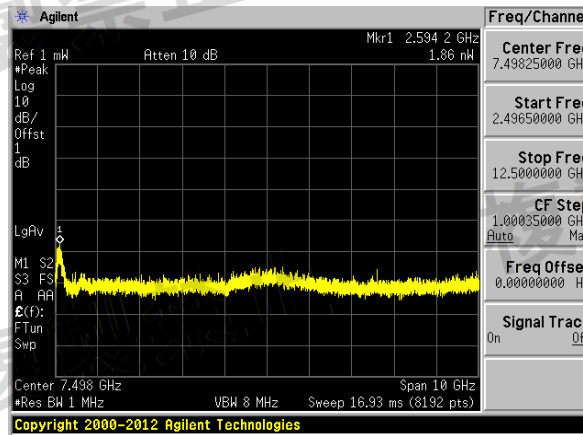
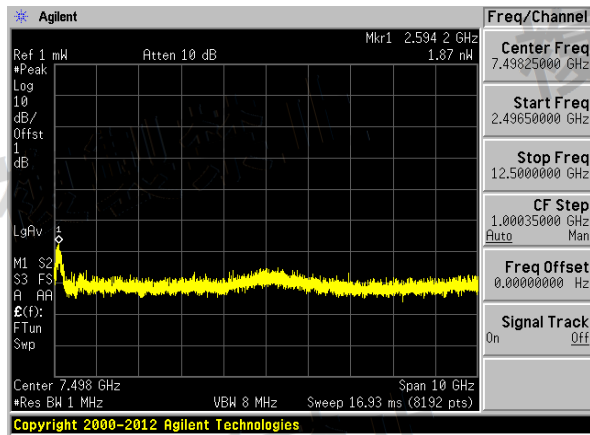
Unwanted
Emission
Strength

2483.5-
2496.5MHz



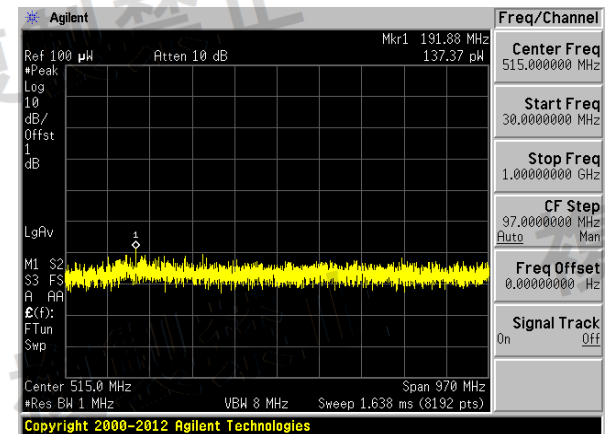
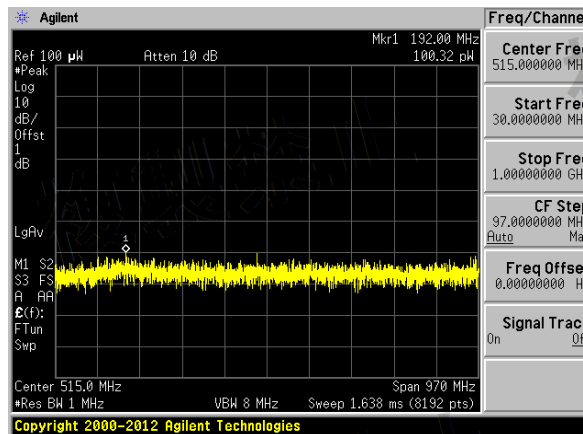
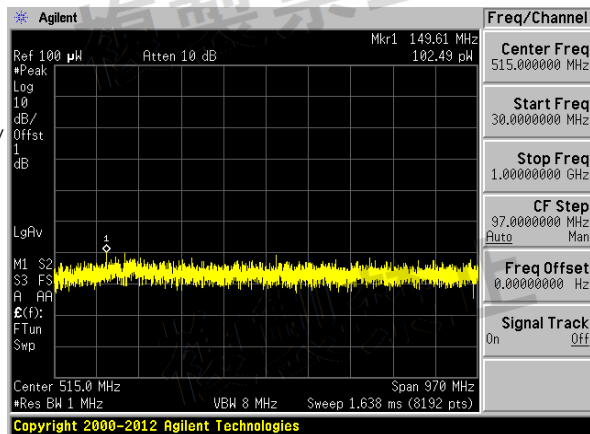
Unwanted
Emission
Strength

2496.5 -
12.5GHz



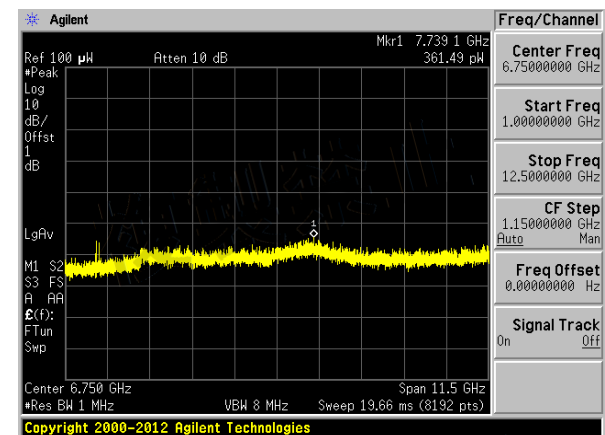
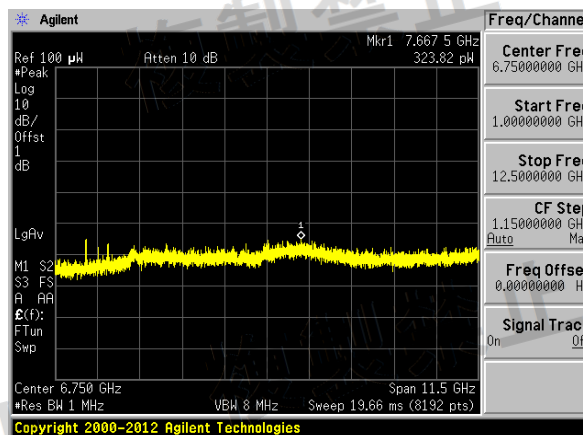
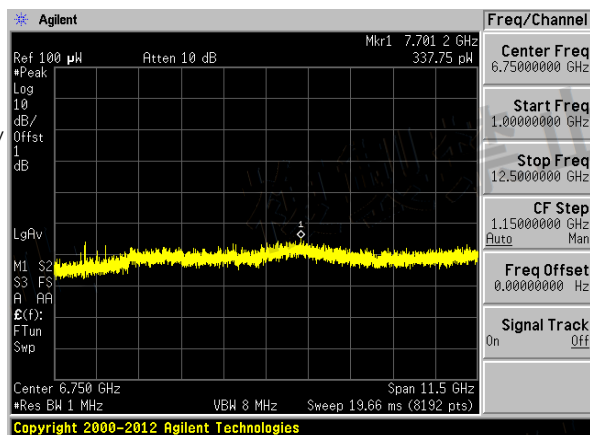
Secondarily
Emitted
Radio
Wave
Strength

Under
1GHz

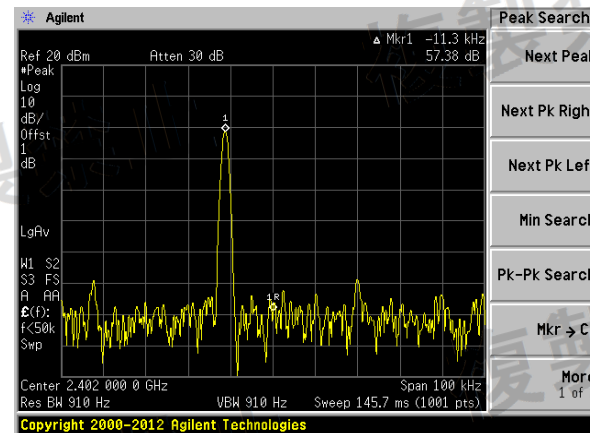
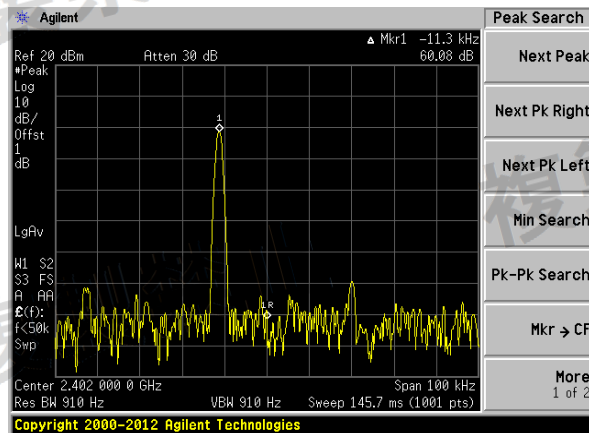
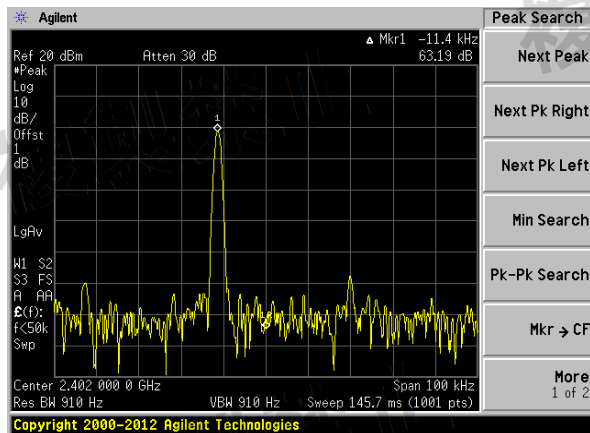


Secondarily
Emitted
Radio
Wave
Strength

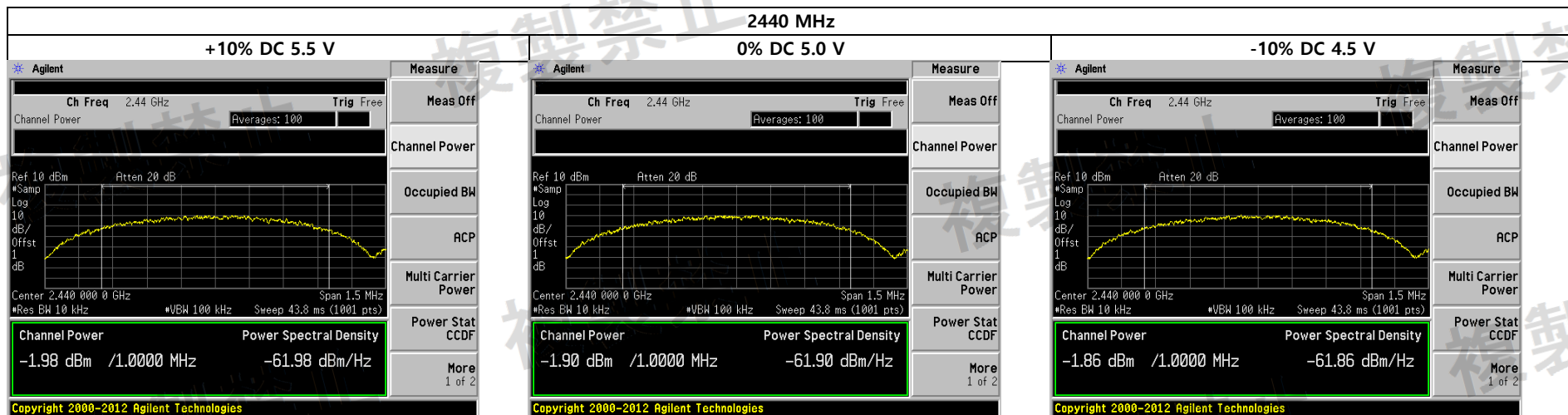
1 -
12.5GHz



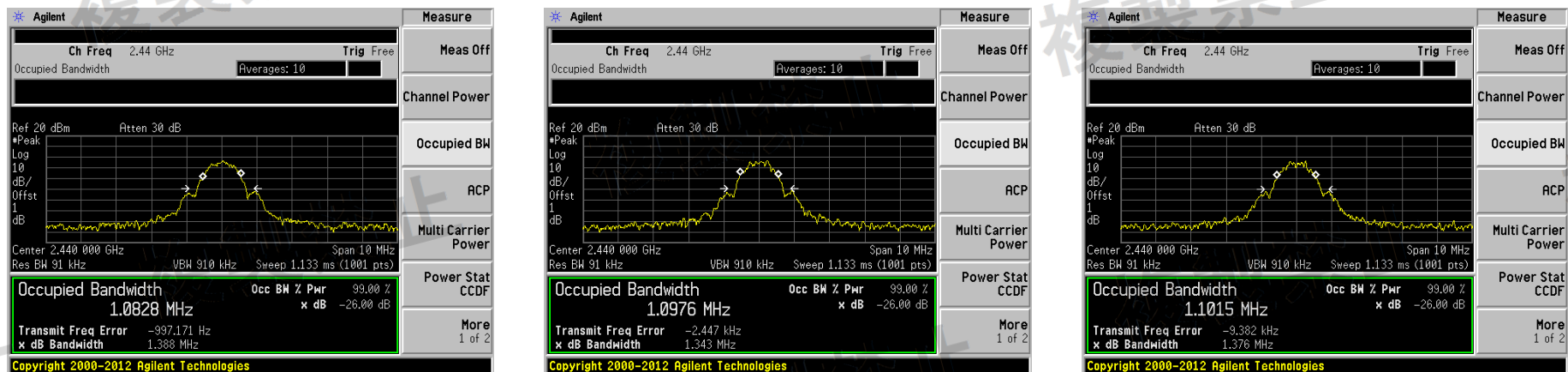
Reading
Frequency



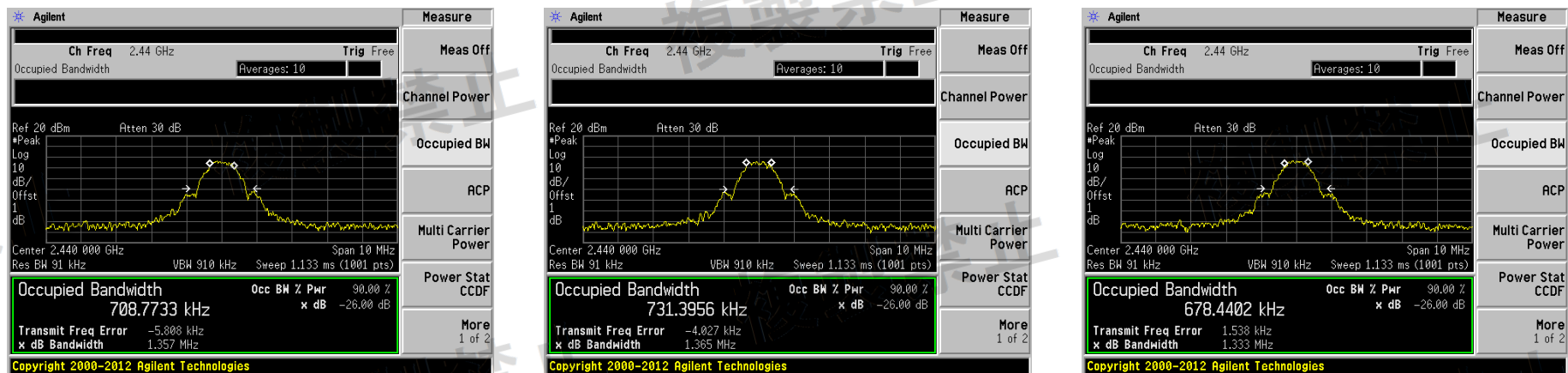
Real Total Output Power



Occupied Bandwidth

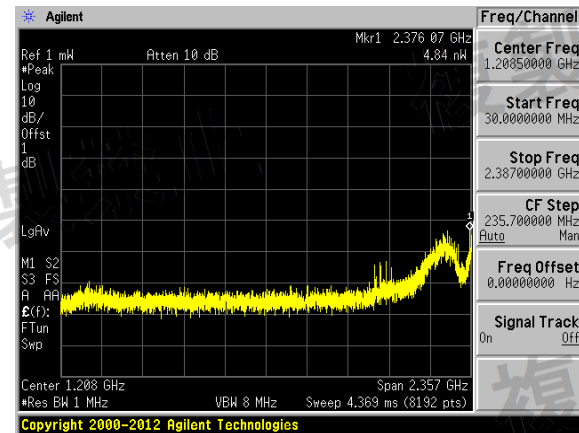
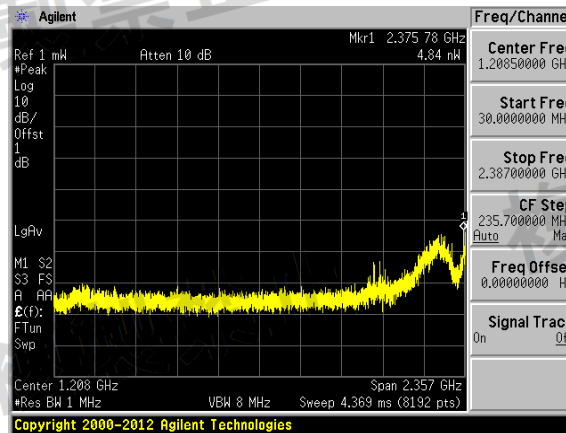
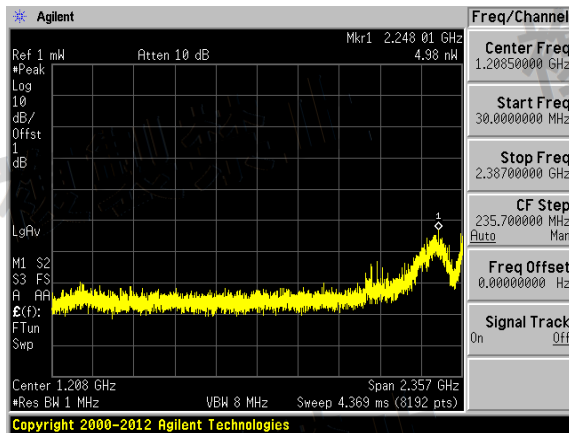


Spread Bandwidth



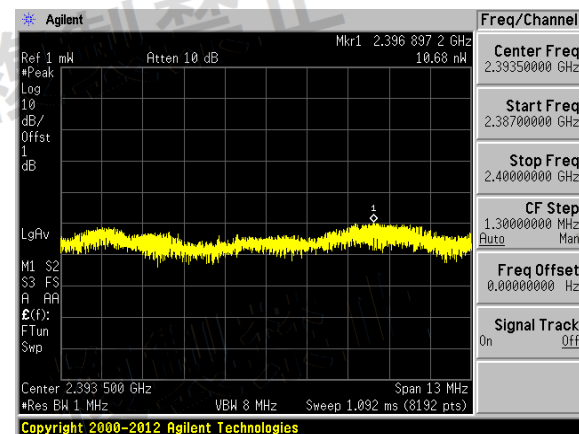
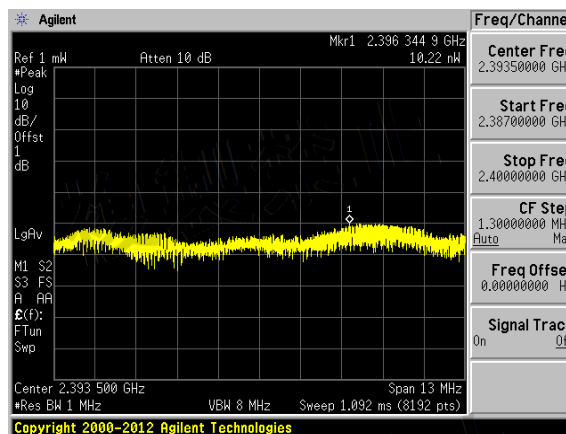
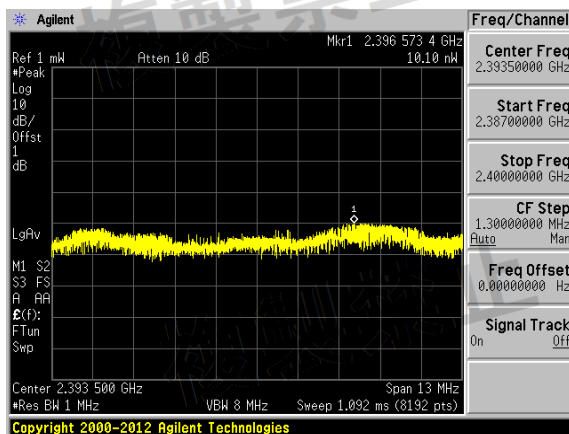
Unwanted
Emission
Strength

Under
2387MHz



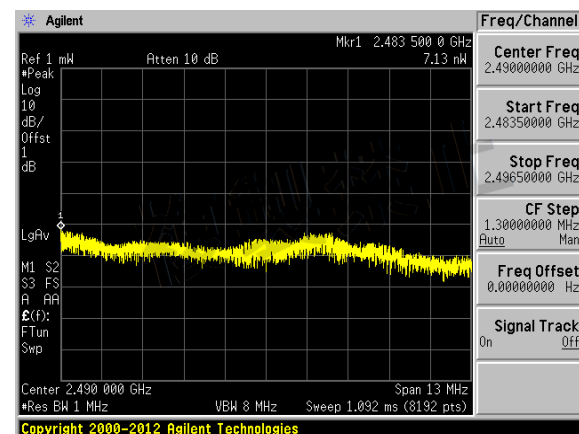
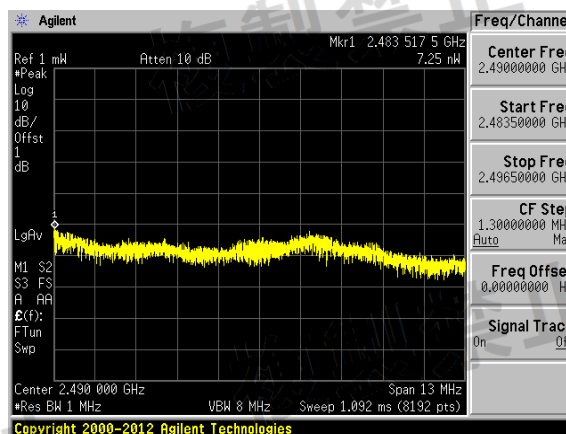
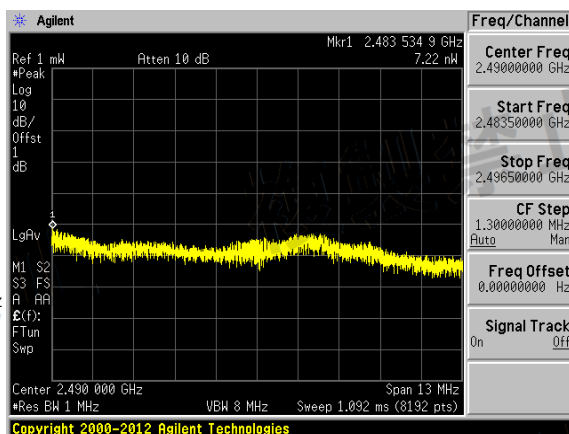
Unwanted
Emission
Strength

2387-
2400MHz

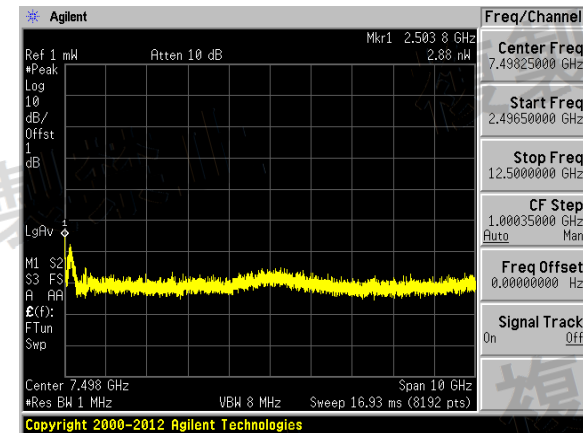
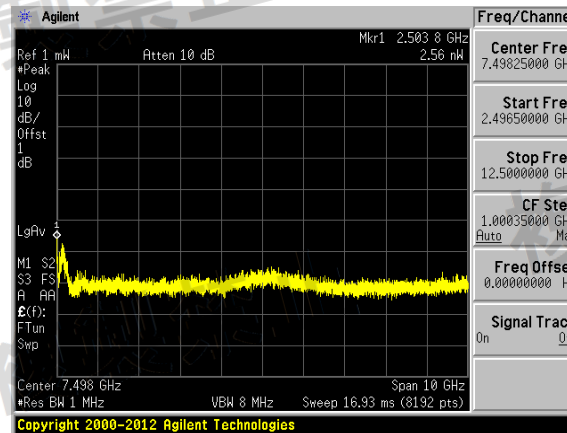
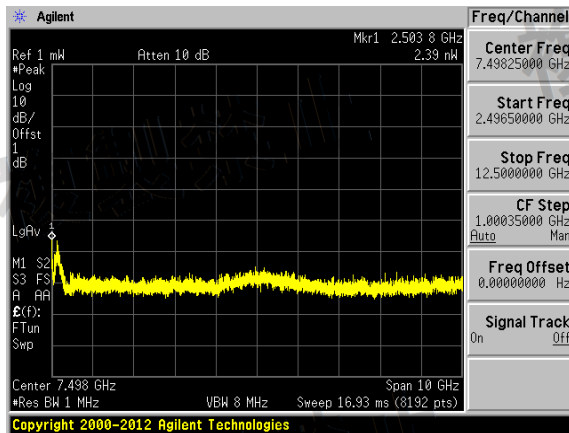


Unwanted
Emission
Strength

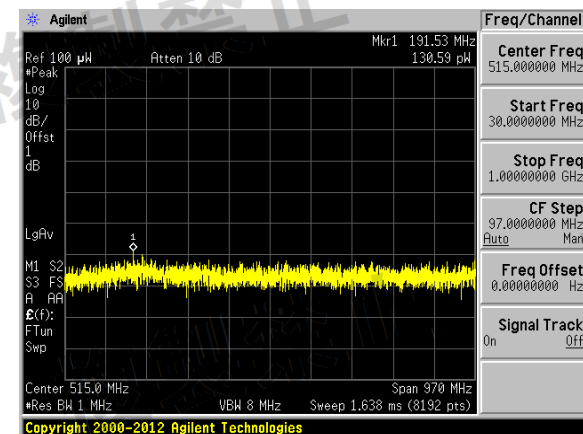
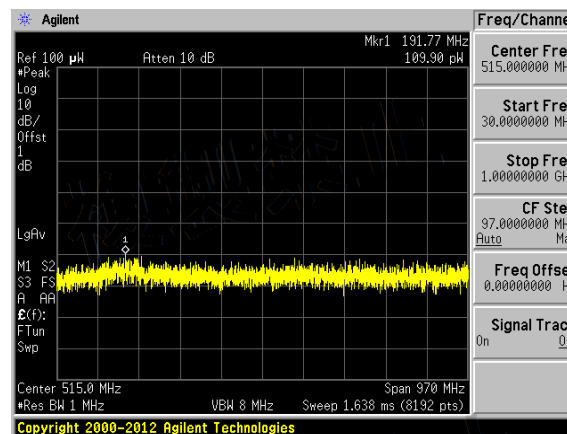
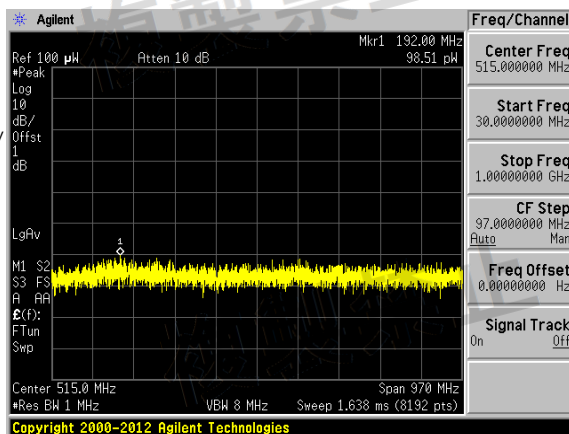
2483.5-
2496.5MHz



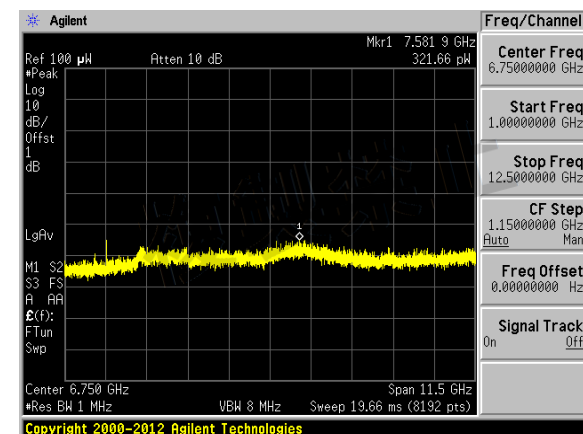
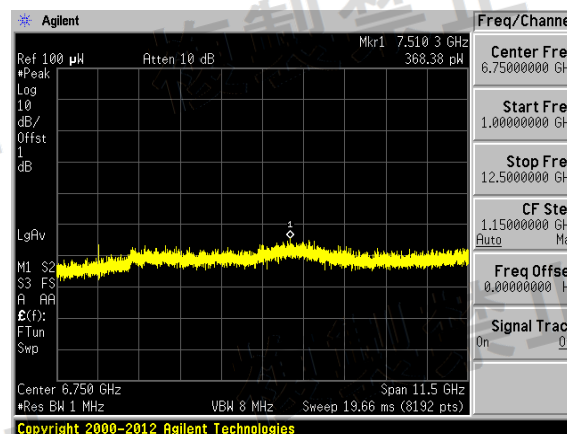
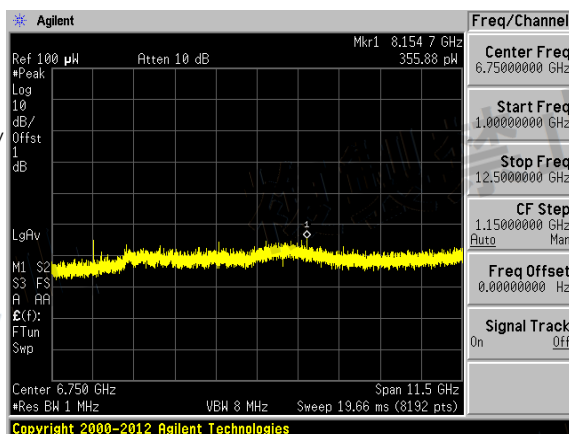
Unwanted
Emission
Strength
2496.5 -
12.5GHz



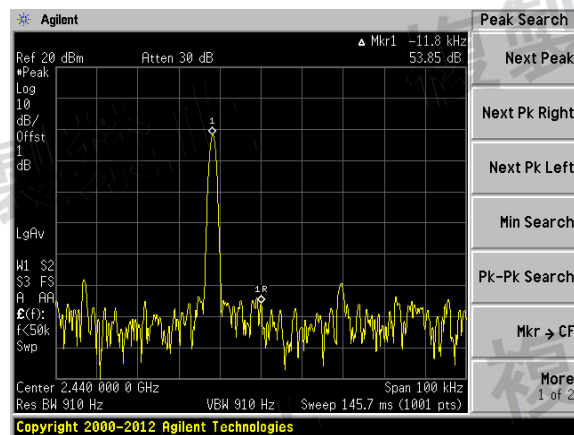
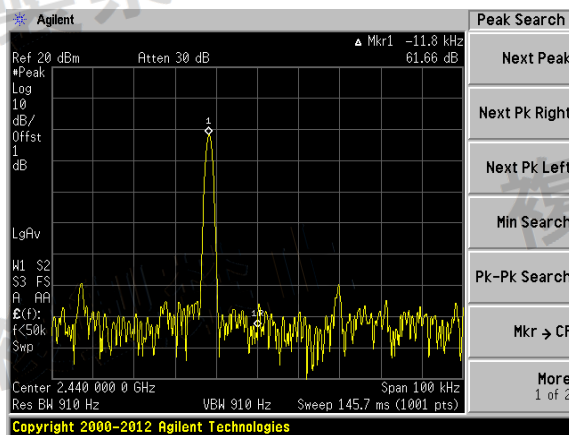
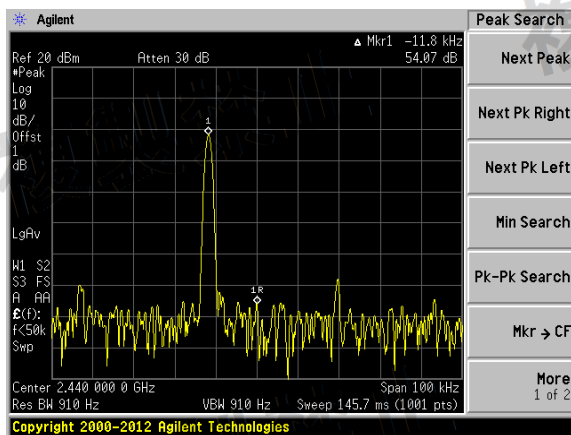
Secondarily
Emitted
Radio
Wave
Strength
Under
1GHz



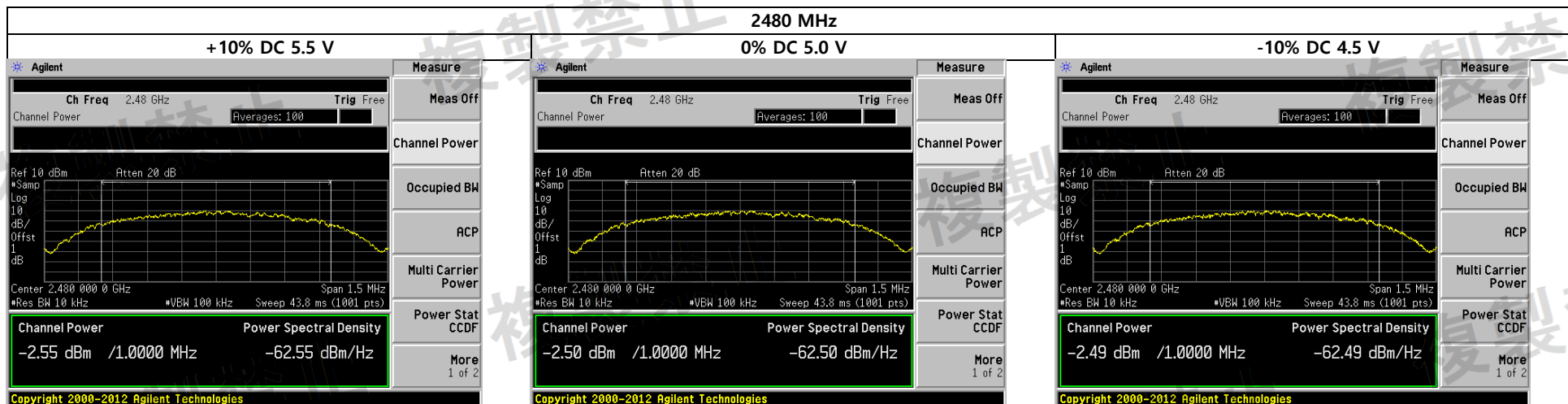
Secondarily
Emitted
Radio
Wave
Strength
1 -
12.5GHz



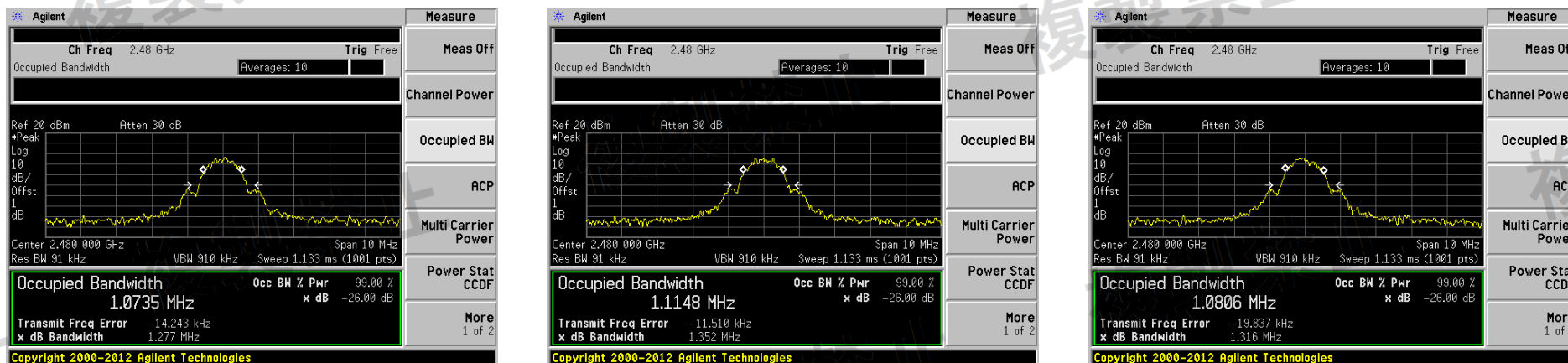
Reading
Frequency



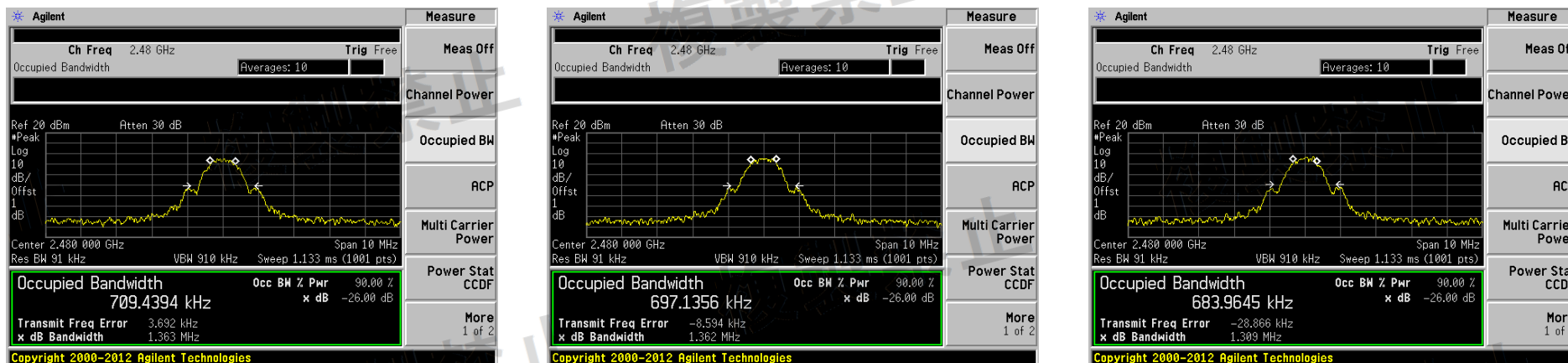
Real Total
Output
Power



Occupied
Bandwidth

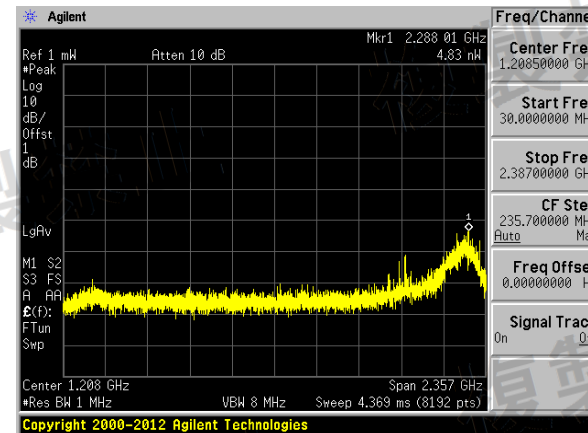
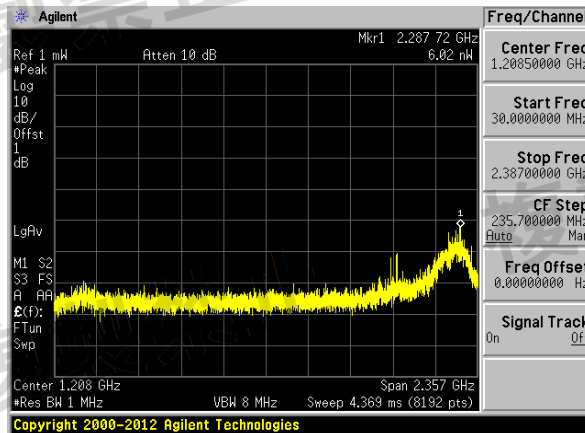
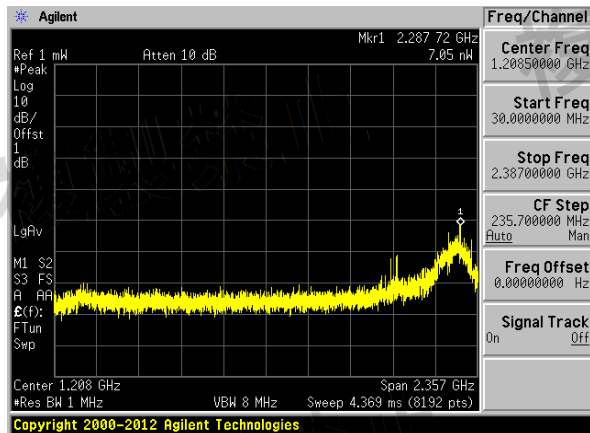


Spread
Bandwidth



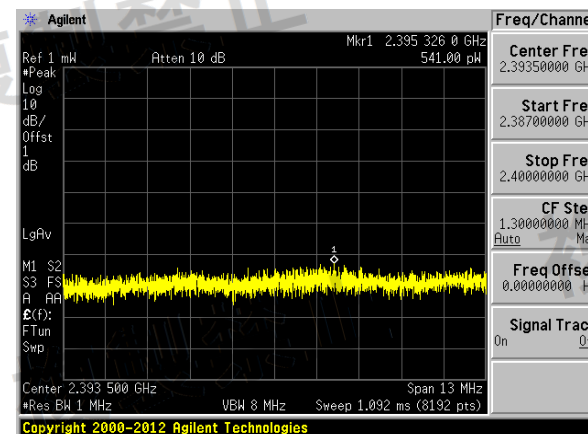
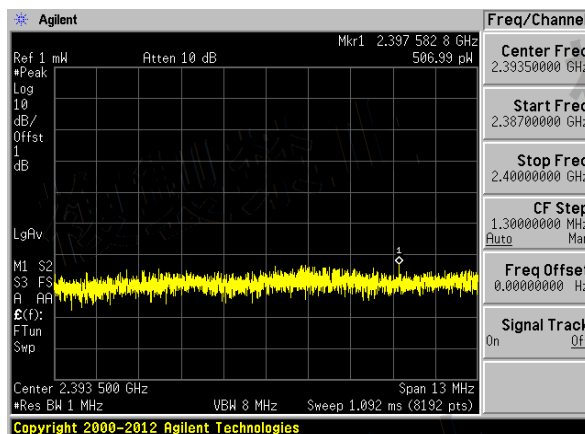
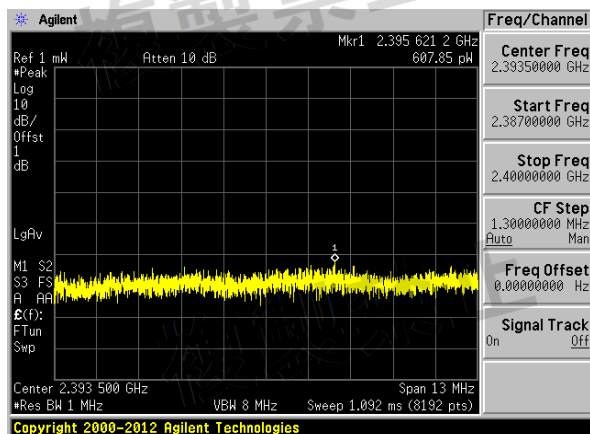
Unwanted
Emission
Strength

Under
2387MHz



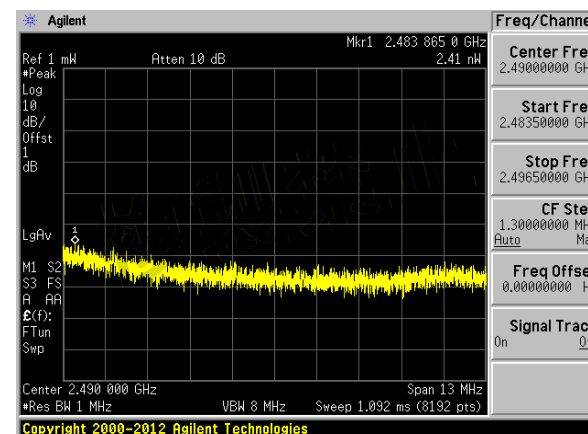
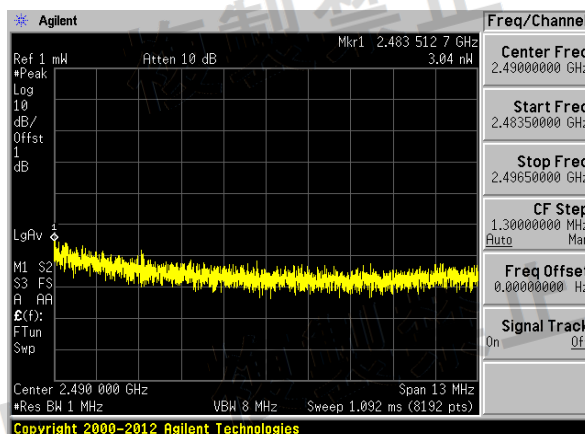
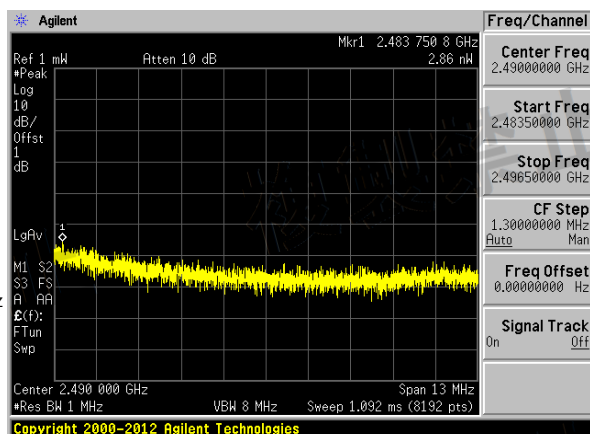
Unwanted
Emission
Strength

2387-
2400MHz



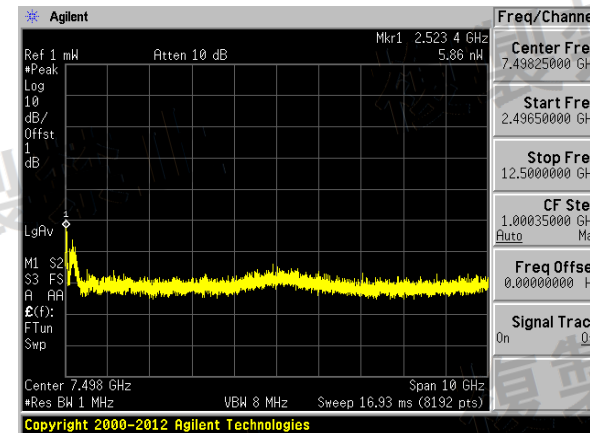
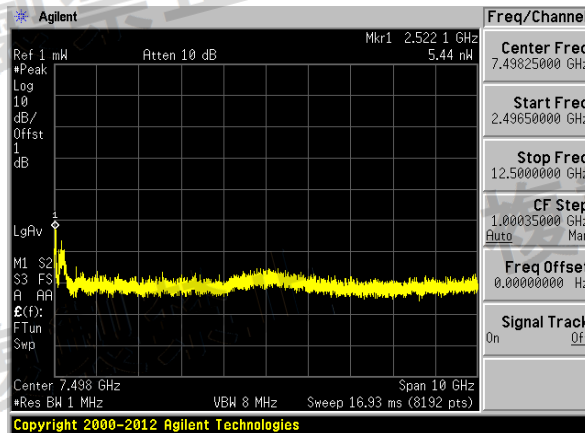
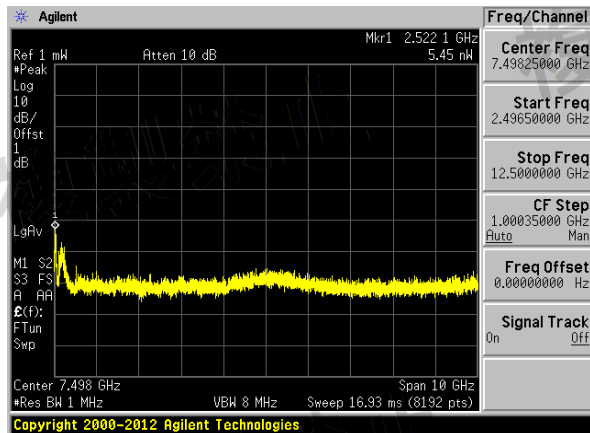
Unwanted
Emission
Strength

2483.5-
2496.5MHz



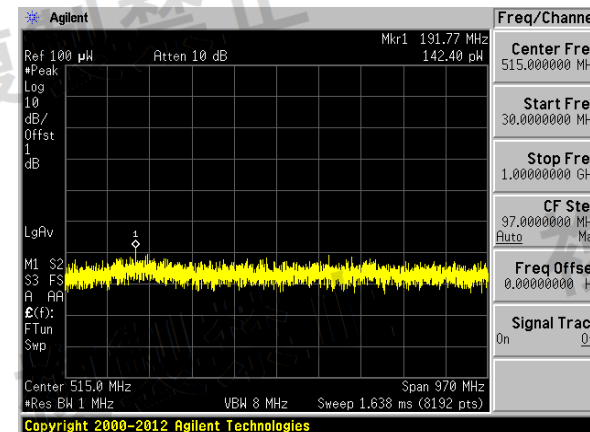
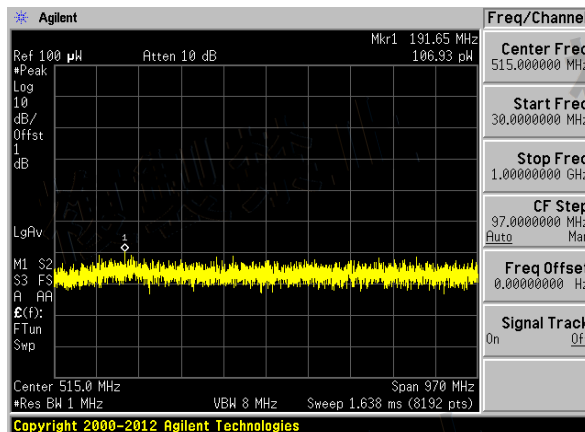
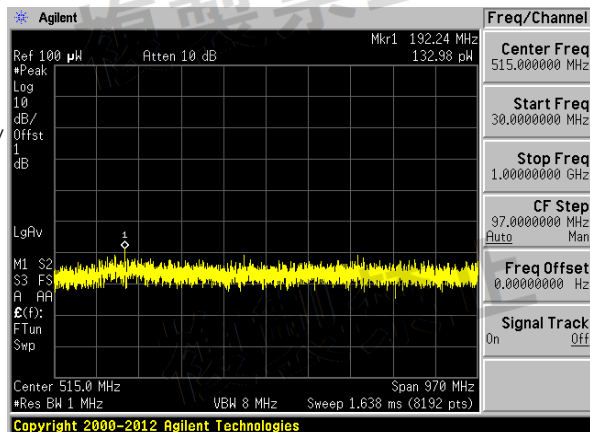
Unwanted
Emission
Strength

2496.5 -
12.5GHz



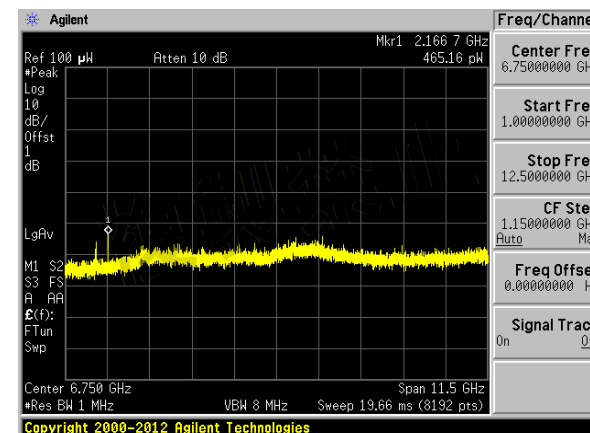
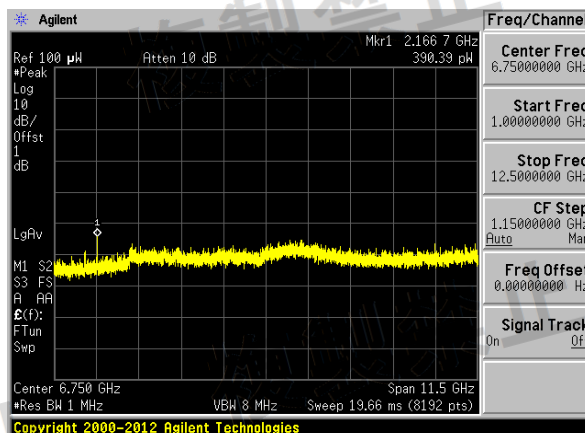
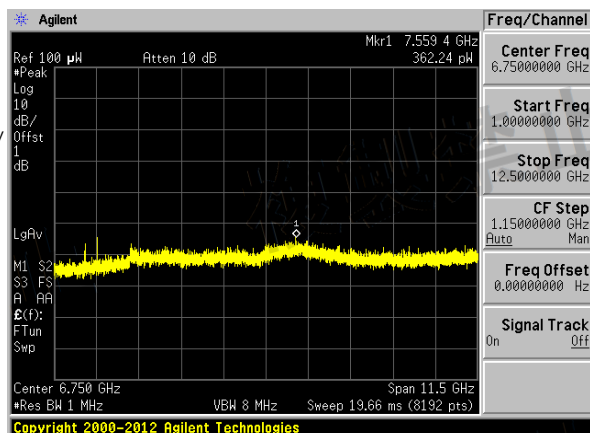
Secondarily
Emitted
Radio
Wave
Strength

Under
1GHz



Secondarily
Emitted
Radio
Wave
Strength

1 -
12.5GHz



Reading
Frequency

