FCC/IC- TEST REPORT

Report Number	:	**68.920.15.046.01**	Date of Issue:	September 8, 2015

Model	:	**MGOVS015, SDV5301, SDV2301, SDV6301, SDV8301, MG015**
Product Type	:	Action Camera
Applicant	:	OMG ELECTRONIC LIMITED
Address	:	7Floor, Huarong Building, Mintian Road, Futian District, Shenzhen, China
Production Facility	:	OMG ELECTRONIC LIMITED
Address	:	Lefushan Industrial Park, Youganpu Village Fenggang Town, Dongguan, China

Test Result	:	■ **Positive** ☐ **Negative**
Total pages including Appendices	:	44

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2 Details about the Test Laboratory

Details about the Test Laboratory
Test Site 1

Company name:	TÜV SÜD Certification and Testing (China) Co., Ltd. Shenzhen Branch Building 12&13, Zhiheng Wisdomland Business Park, Nantou Checkpoint Road 2, Nanshan District, Shenzhen City, 518052, P. R. China
FCC Registration Number:	502708
Telephone:	86 755 8828 6998
Fax:	86 755 828 5299

Test Site 2

Company name:	Global United Technology Services Co., Ltd. 2nd Floor, Block No.2, Laodong Industrial Zone, Xixiang Road, Baoan District, Shenzhen, China 518102
FCC Registration Number:	600491
Telephone:	86 755 2779 8480
Fax:	86 755 2779 8960

Remark: All test items were performed at Site 2.

3 Description of the Equipment under Test

Description of the Equipment Under Test

Product:	Action Camera
Model no.:	MGOVS015, SDV5301, SDV2301, SDV6301, SDV8301, MG015
FCC ID:	2AAAO-MG015
Options and accessories:	NIL
Rating:	3.7VDC Supplied by Li-ion rechargeable battery 5.0VDC Charged by the USB port
RF Transmission Frequency:	2412-2462MHz for 802.11b/g/n-HT20 2422-2452MHz for 802.11n-HT40
No. of Operated Channel:	11
Modulation:	OFDM, DSSS
Duty Cycle:	100%
Antenna Type:	PCB Antenna
Antenna Gain:	2.3dBi
Description of the EUT:	The Equipment Under Test (EUT) is a Digital Video Camera with WIFI function operating at 2.4GHz.

Remark: All models have same appearance, PCB and frequency range, just have different model name for marketing requirement.

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4 Summary of Test Standards

Test Standards	
FCC Part 15 Subpart C 10-1-2014 Edition	PART 15 - RADIO FREQUENCY DEVICES Subpart C - Intentional Radiators

All the test methods were according to KDB558074 D01 DTS Meas Guidance v03r03 and ANSI C63.10 (2014).

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5 Summary of Test Results

Technical Requirements						
FCC Part 15 Subpart C						
Test Condition		Pages	Test Site	Test Result		
				Pass	Fail	N/A
§15.207	Conducted emission AC power port	10	Site 2	☒	☐	☐
§15.247 (b) (1)	Conducted peak output power	13	Site 2	☒	☐	☐
§15.247(a)(1)	20dB bandwidth	---	---	☐	☐	☒
§15.247(a)(1)	Carrier frequency separation	---	---	☐	☐	☒
§15.247(a)(1)(iii)	Number of hopping frequencies	---	---	☐	☐	☒
§15.247(a)(1)(iii)	Dwell Time	---	---	☐	☐	☒
§15.247(a)(2)	6dB bandwidth and 99% Occupied Bandwidth	14	Site 2	☒	☐	☐
§15.247(e)	Power spectral density	21	Site 2	☒	☐	☐
§15.247(d)	Spurious RF conducted emissions	22	Site 2	☒	☐	☐
§15.247(d)	Band edge	35	Site 2	☒	☐	☐
§15.247(d) & §15.209	Spurious radiated emissions for transmitter	40	Site 2	☒	☐	☐
§15.203	Antenna requirement	See note 1		☒	☐	☐

Remark 1: N/A – Not Applicable.
Note 1: The EUT uses an integral antenna, which gain is 2.3dBi. According to §15.203 and RSSGEN 8.3, it is considered sufficiently to comply with the provisions of this section.

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6 General Remarks

Remarks

This submittal(s) (test report) is intended for FCC ID: 2AAAO-MG015 complies with Section 15.207, 15.209, 15.247 of the FCC Part 15, Subpart C Rules.

SUMMARY:

All tests according to the regulations cited on page 5 were

■ - Performed

☐ - **Not** Performed

The Equipment under Test

■ - **Fulfills** the general approval requirements.

☐ - **Does not** fulfill the general approval requirements.

Sample Received Date: August 19, 2015

Testing Start Date: August 19, 2015

Testing End Date: September 6, 2015

- TÜV SÜD Certification and Testing (China) Co., Ltd. Shenzhen Branch -

Reviewed by:

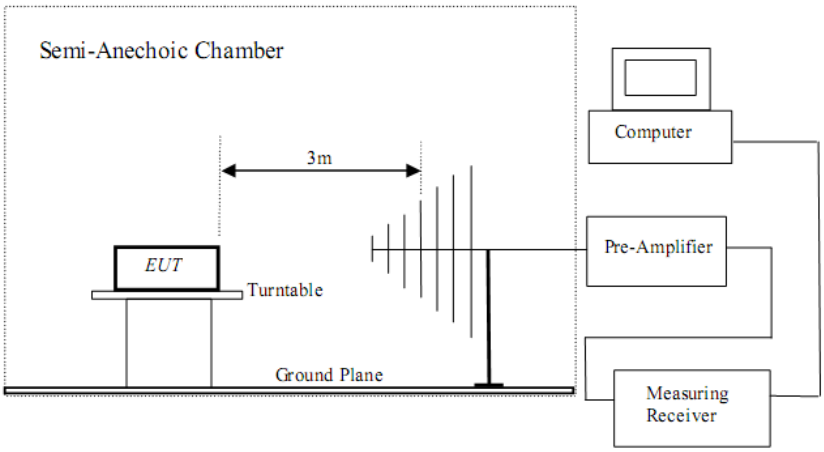
John Zhi
EMC Project Manager

Prepared by:

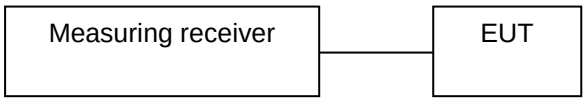
Alan Xiong
EMC Project Engineer

7 Test Setups

7.1 Radiated test setups



7.2 Conducted RF test setups



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8 Systems test configuration

Auxiliary Equipment Used during Test:

DESCRIPTION	MANUFACTURER	MODEL NO.(SHIELD)	S/N(LENGTH)
---	---	---	---

The system was configured to non-hopping mode.
Non-hopping mode: The system was configured to operate at a signal channel transmitting. The test software allows the configuration and operation at the worst-case duty and the highest transmit power

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9 Technical Requirement

9.1 Conducted Emission

Test Method

1. The EUT was placed on a table, which is 0.8m above ground plane
2. The power line of the EUT is connected to the AC mains through a Artificial Mains Network (A.M.N.).
3. Maximum procedure was performed to ensure EUT compliance
4. A EMI test receiver is used to test the emissions from both sides of AC line

Limit

According to §15.207, conducted emissions limit as below:

Frequency MHz	QP Limit dBµV	AV Limit dBµV
0.150-0.500	66-56*	56-46*
0.500-5	56	46
5-30	60	50

Decreasing linearly with logarithm of the frequency

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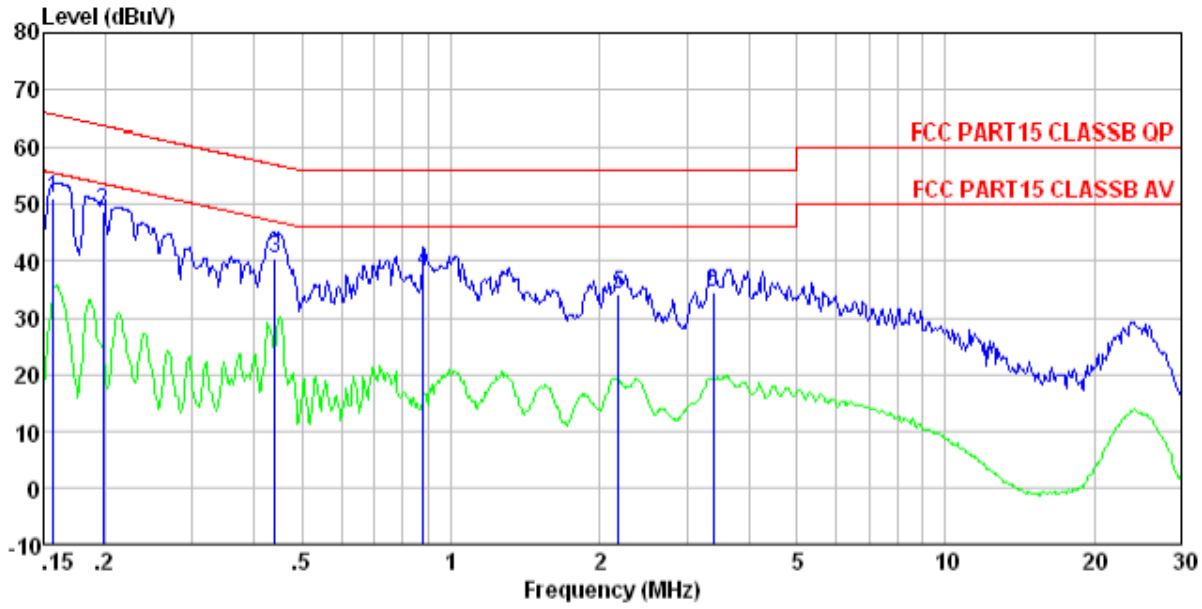
Product Type	:	Action Camera
M/N	:	MGOVS015
Operating Condition	:	Transmitting
Test Specification	:	Line
Comment	:	AC 120V/60Hz



	Freq	Read Level	LISN Factor	Cable Loss	Level	Limit Line	Over Limit	Remark
	MHz	dBuV	dB	dB	dBuV	dBuV	dB	
1	0.157	50.97	0.15	0.12	51.24	65.60	-14.36	QP
2	0.198	48.65	0.14	0.13	48.92	63.71	-14.79	QP
3	0.440	40.17	0.12	0.11	40.40	57.07	-16.67	QP
4	0.880	37.98	0.14	0.13	38.25	56.00	-17.75	QP
5	2.178	33.84	0.12	0.15	34.11	56.00	-21.89	QP
6	3.399	34.16	0.18	0.15	34.49	56.00	-21.51	QP

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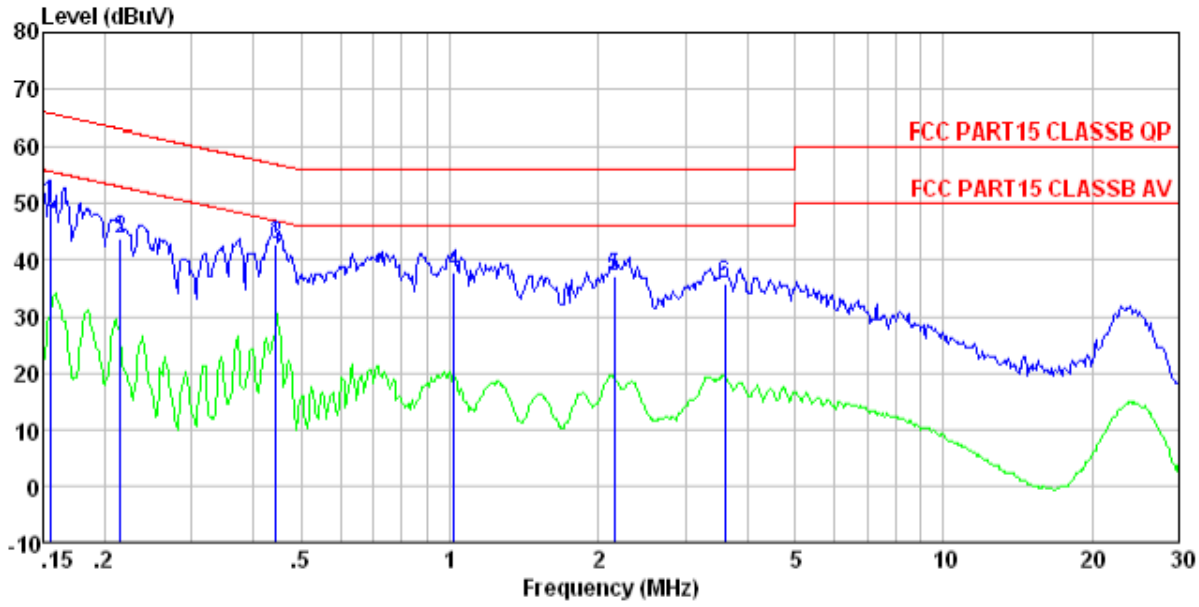
Product Type	:	Action Camera
M/N	:	MGOVS015
Operating Condition	:	Transmitting
Test Specification	:	Neutral
Comment	:	AC 120V/60Hz



	Freq	Read Level	LISN Factor	Cable Loss	Level	Limit Line	Over Limit	Remark
	MHz	dBuV	dB	dB	dBuV	dBuV	dB	
1	0.155	49.87	0.07	0.12	50.06	65.74	-15.68	QP
2	0.215	43.59	0.06	0.13	43.78	63.01	-19.23	QP
3	0.444	42.66	0.06	0.11	42.83	56.98	-14.15	QP
4	1.021	37.68	0.07	0.13	37.88	56.00	-18.12	QP
5	2.155	36.95	0.09	0.15	37.19	56.00	-18.81	QP
6	3.603	35.67	0.14	0.15	35.96	56.00	-20.04	QP

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9.2 Conducted peak output power

Test Method

1. Use the following spectrum analyzer settings:
   RBW > the 6 dB bandwidth of the emission being measured, VBW≥3RBW, Span≥3RBW
   Sweep = auto, Detector function = peak, Trace = max hold.
2. Add a correction factor to the display.
3. Use a power meter to measure the conducted peak output power.

Limits

According to §15.247 (b) (1), conducted peak output power limit as below:

Frequency Range MHz	Limit W	Limit dBm
2400-2483.5	≤1	≤30

Test result as below table

802.11B

Frequency MHz	Conducted Peak Output Power dBm	Result
Low channel 2412MHz	8.37	Pass
Middle channel 2437MHz	8.12	Pass
High channel 2462MHz	8.46	Pass

802.11G

Frequency MHz	Conducted Peak Output Power dBm	Result
Low channel 2412MHz	7.80	Pass
Middle channel 2437MHz	8.03	Pass
High channel 2462MHz	8.13	Pass

802.11N20

Frequency MHz	Conducted Peak Output Power dBm	Result
Low channel 2412MHz	7.84	Pass
Middle channel 2437MHz	7.43	Pass
High channel 2462MHz	7.99	Pass

802.11N40

Frequency MHz	Conducted Peak Output Power dBm	Result
Low channel 2442MHz	7.37	Pass
Middle channel 2437MHz	7.85	Pass
High channel 2452MHz	7.37	Pass

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9.3 6dB bandwidth and 99% Occupied Bandwidth

Test Method

1. Use the following spectrum analyzer settings:
   RBW=100K, VBW≥3RBW, Sweep = auto, Detector function = peak, Trace = max hold
2. Use the automatic bandwidth measurement capability of an instrument, may be employed using the X dB bandwidth mode with X set to 6 dB, care shall be taken so that the bandwidth measurement is not influenced by any intermediate power nulls in the fundamental emission that might be ≥ 6 dB.
3. Allow the trace to stabilize, record the X dB Bandwidth value.

Limit

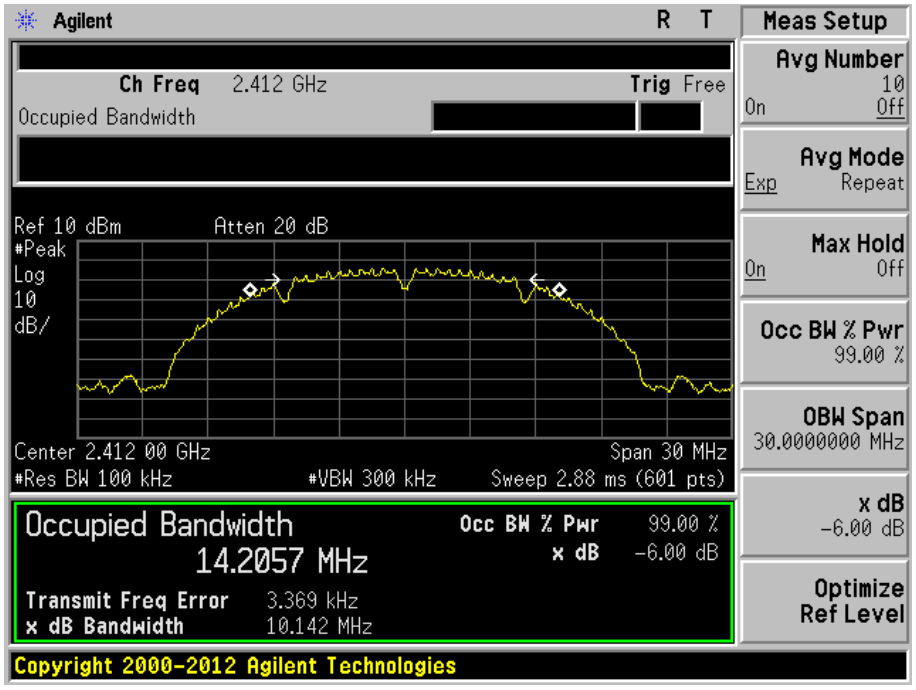
Limit [kHz]
≥500

Test result

802.11B

Frequency MHz	6dB bandwidth MHz	99% occupied bandwidth MHz	Result
Low channel 2412MHz	10.142	14.2057	Pass
Middle channel 2437MHz	10.013	14.1952	Pass
High channel 2462MHz	10.121	14.1611	Pass

2412MHz



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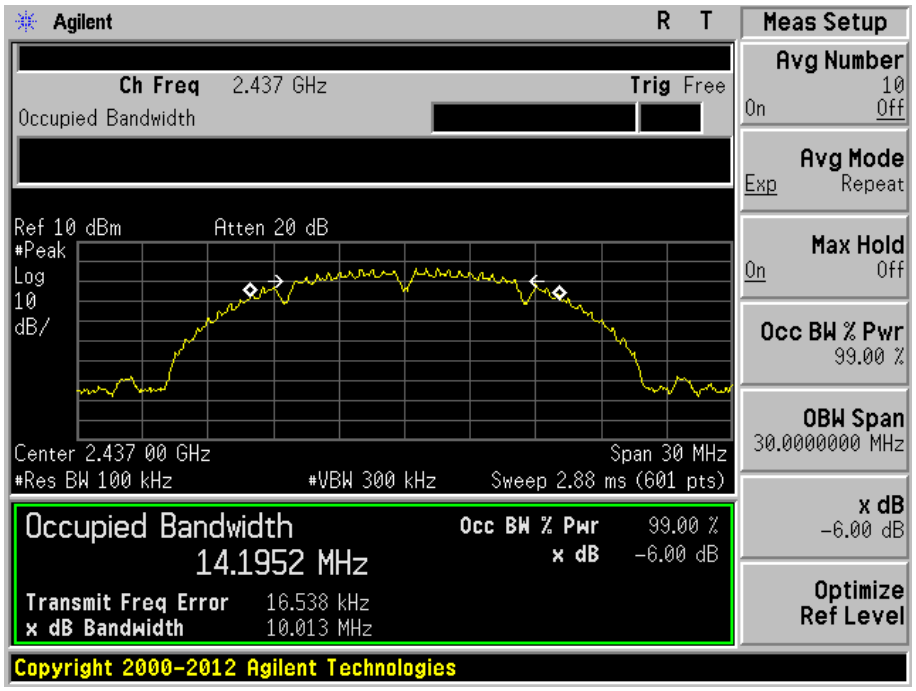
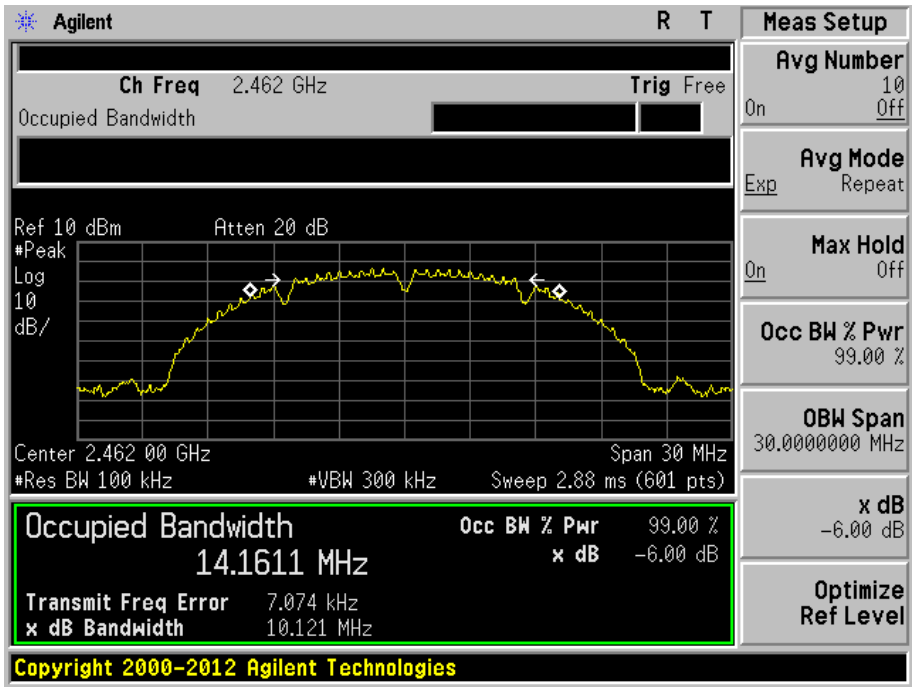
2437MHz



2462MHz



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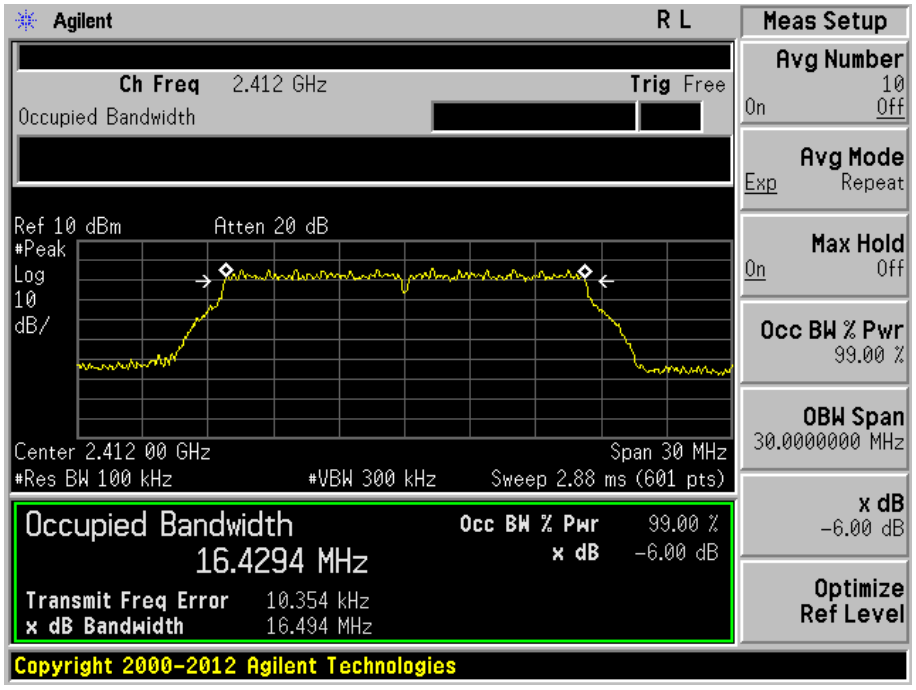
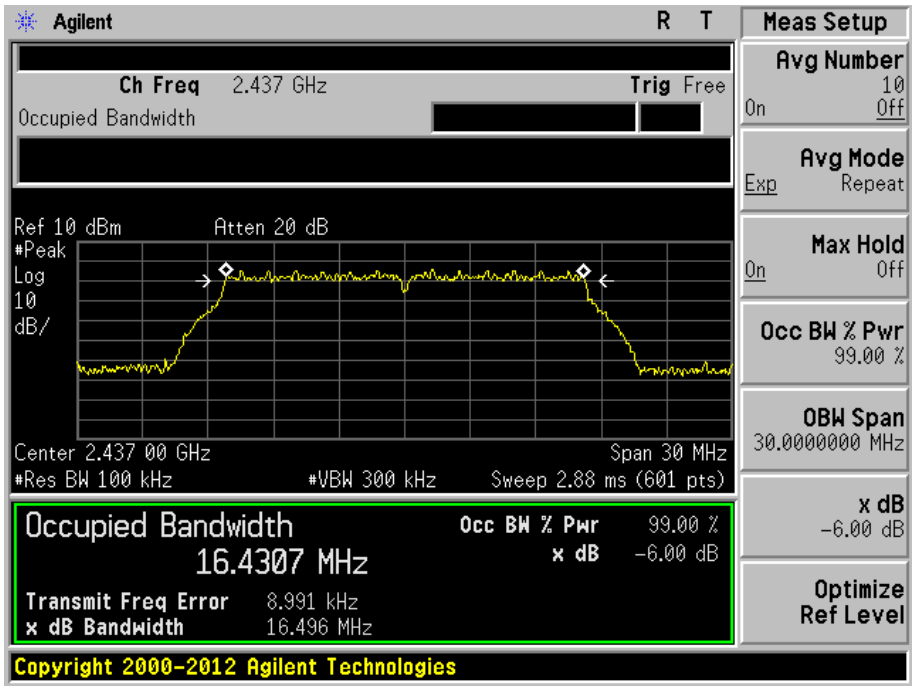
802.11G

Frequency MHz	6dB bandwidth MHz	99% occupied bandwidth MHz	Result
Low channel 2412MHz	16.494	16.4294	Pass
Middle channel 2437MHz	16.496	16.4307	Pass
High channel 2462MHz	16.509	16.4254	Pass

2412MHz



2437MHz



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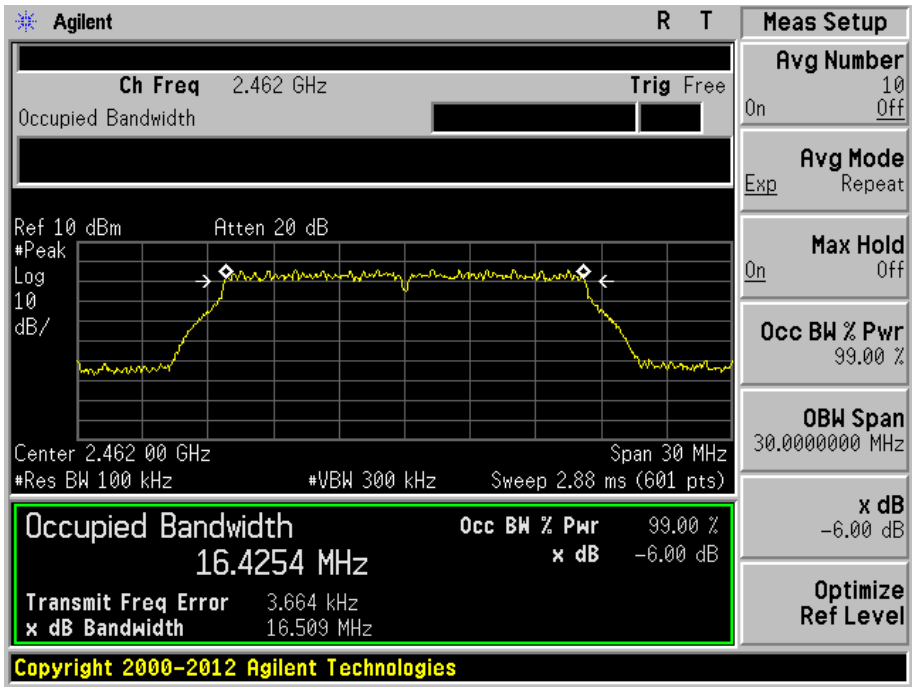
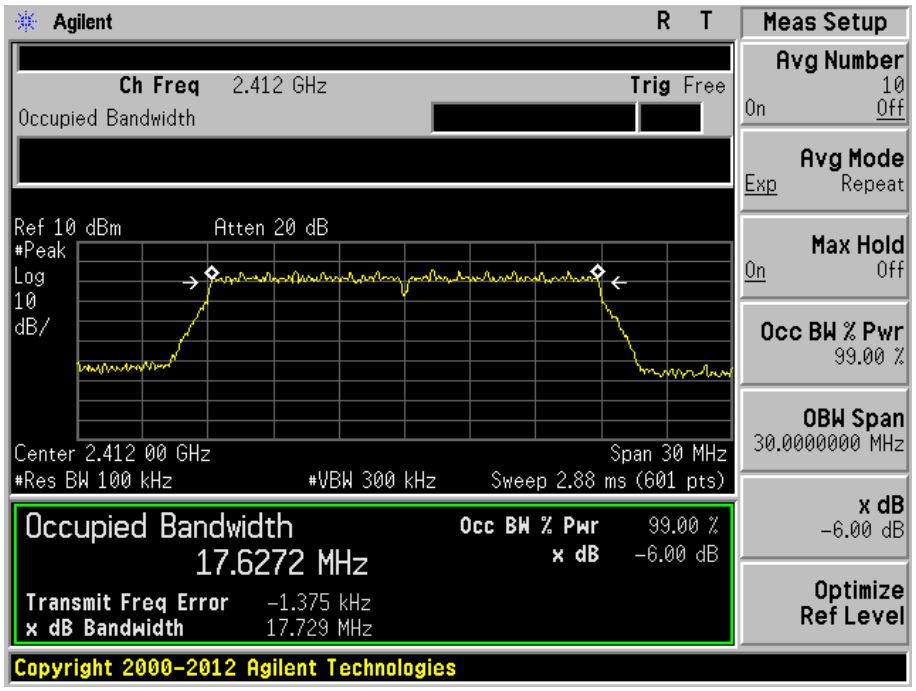
2462MHz



802.11N20

Frequency MHz	6dB bandwidth MHz	99% occupied bandwidth MHz	Result
Low channel 2412MHz	17.729	17.6272	Pass
Middle channel 2437MHz	17.759	17.6284	Pass
High channel 2462MHz	17.729	17.6191	Pass

2412MHz



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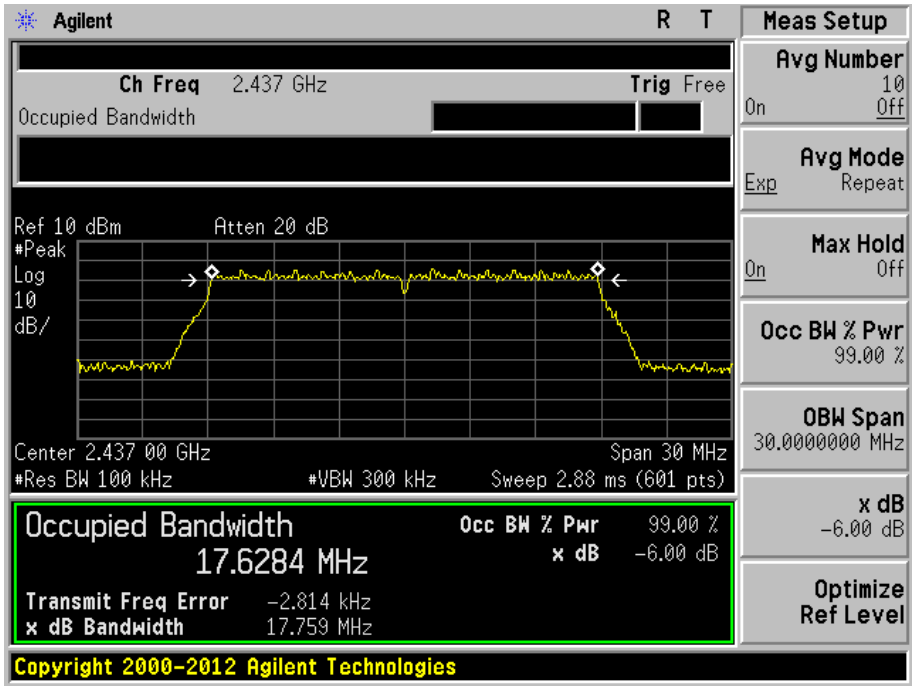
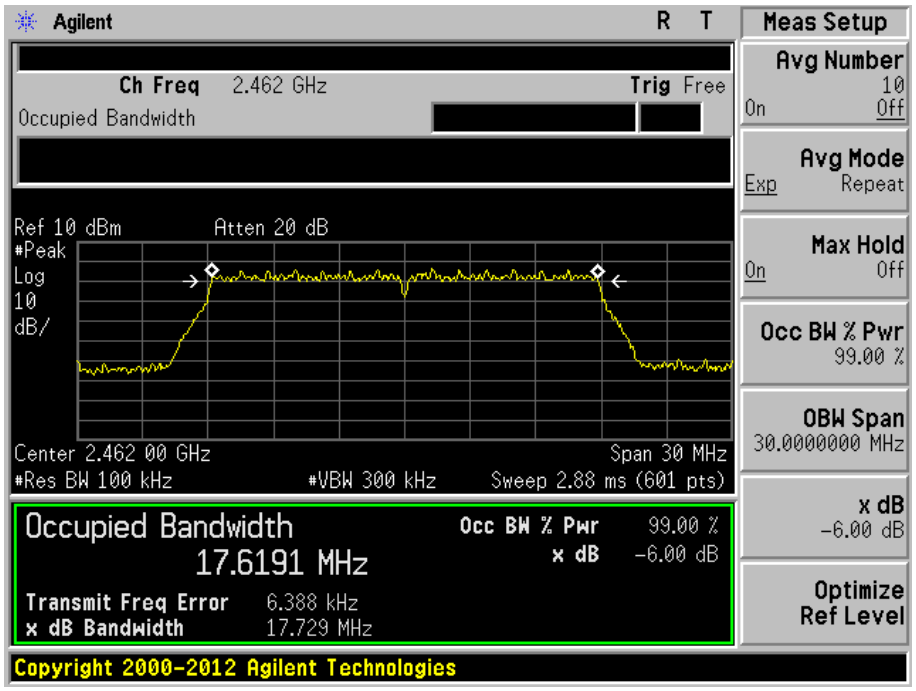
2437MHz



2462MHz



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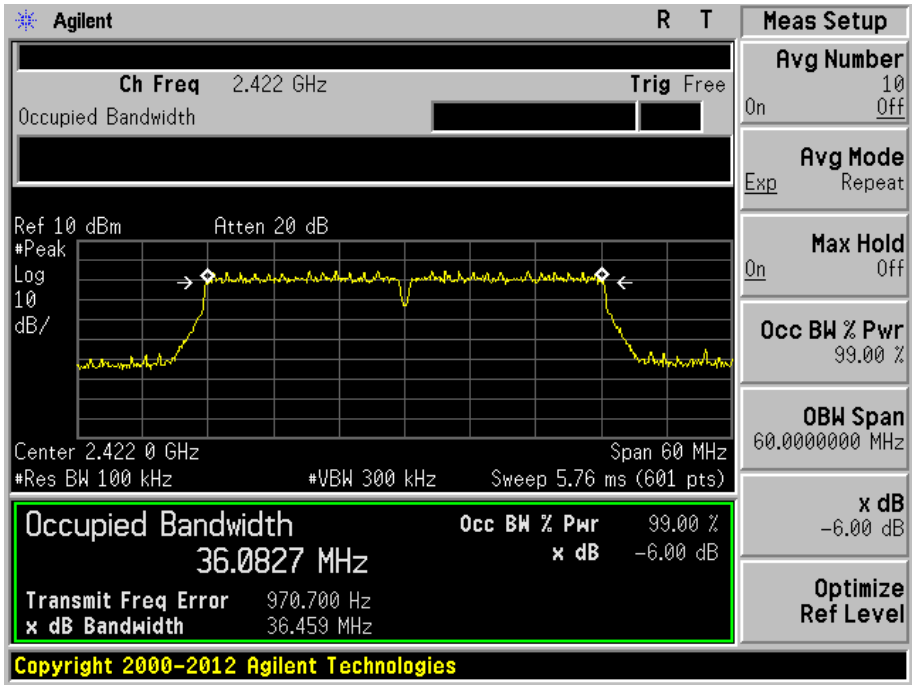
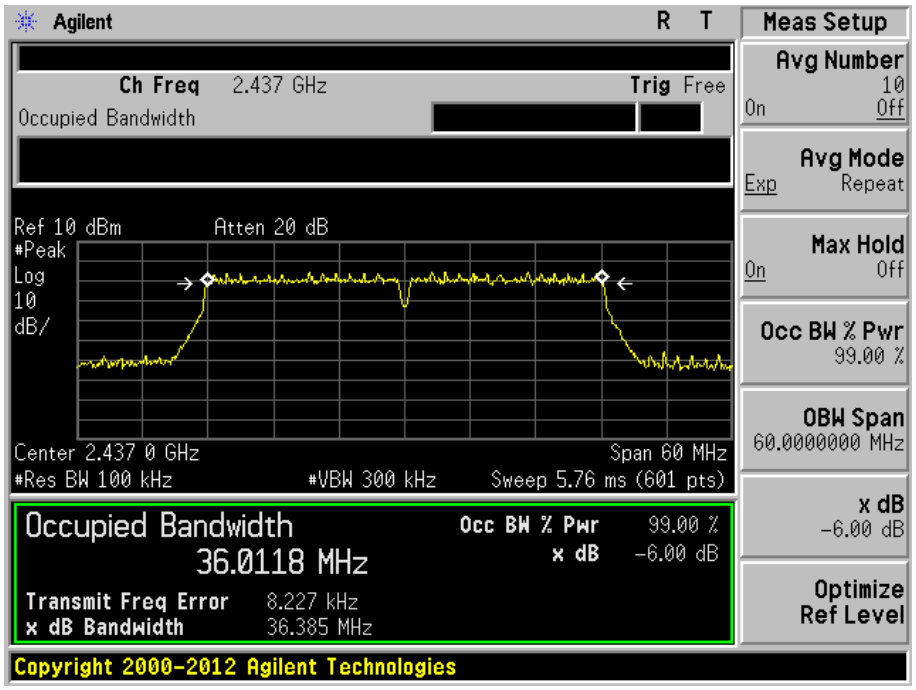
802.11N40

Frequency MHz	6dB bandwidth MHz	99% occupied bandwidth MHz	Result
Low channel 2422MHz	36.459	36.0827	Pass
Middle channel 2437MHz	36.385	36.0118	Pass
High channel 2452MHz	36.420	36.0045	Pass

2422MHz



2437MHz



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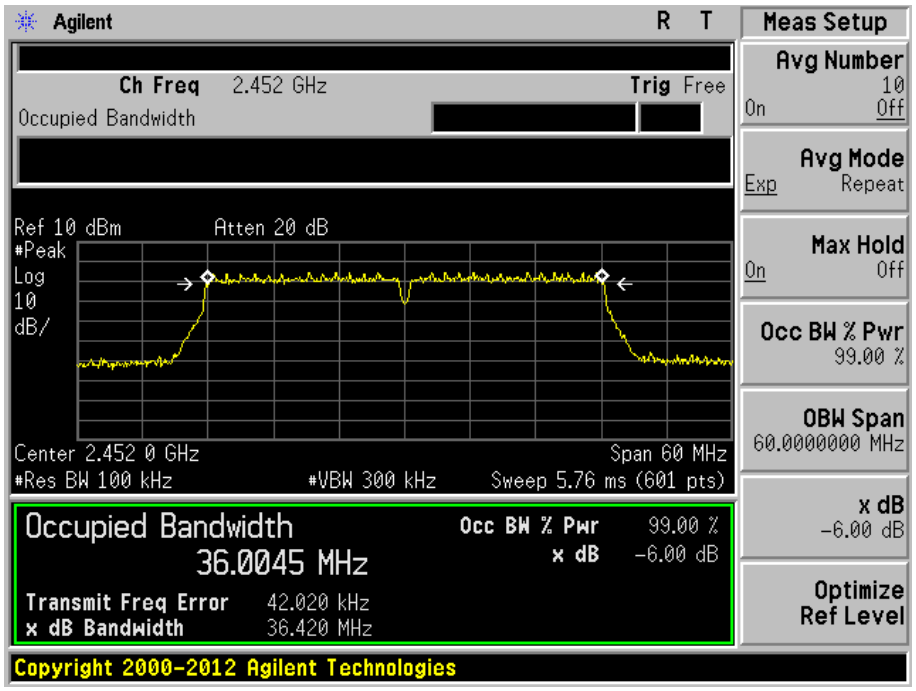
2462MHz



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9.4 Power spectral density

Test Method

This procedure shall be used if maximum peak conducted output power was used to demonstrate compliance:

1. Set analyzer center frequency to DTS channel center frequency. RBW=3kHz,VBW≥3RBW,Span=1.5 times DTS bandwidth, Detector=Peak, Sweep=auto, Trace= max hold.
2. Allow trace to fully stabilize, use the peak marker function to determine the maximum amplitude level within the RBW.
3. Repeat above procedures until other frequencies measured were completed.

Limit

Limit [dBm]
≤8

Test result

802.11 B

Frequency	Power spectral density	Result
MHz	**dBm**	
Low channel 2412MHz	-3.74	Pass
Middle channel 2437MHz	-3.76	Pass
High channel 2462MHz	-4.04	Pass

802.11 G

Frequency	Power spectral density	Result
MHz	**dBm**	
Low channel 2412MHz	-4.34	Pass
Middle channel 2437MHz	-4.06	Pass
High channel 2462MHz	-3.87	Pass

802.11 N20

Frequency	Power spectral density	Result
MHz	**dBm**	
Low channel 2412MHz	-4.64	Pass
Middle channel 2437MHz	-4.28	Pass
High channel 2462MHz	-3.85	Pass

802.11 N40

Frequency	Power spectral density	Result
MHz	**dBm**	
Low channel 2422MHz	-5.69	Pass
Middle channel 2437MHz	-5.76	Pass
High channel 2452MHz	-5.46	Pass

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9.5 Spurious RF conducted emissions

Test Method

1. Establish a reference level by using the following procedure:
   a. Set RBW=100 kHz. VBW≥3RBW. Detector =peak, Sweep time = auto couple, Trace mode = max hold.
   b. Allow trace to fully stabilize, use the peak marker function to determine the maximum PSD level.
2. Use the maximum PSD level to establish the reference level.
   a. Set the center frequency and span to encompass frequency range to be measured.
   b. Use the peak marker function to determine the maximum amplitude level. Ensure that the amplitude of all unwanted emissions outside of the authorized frequency band (excluding restricted frequency bands) are attenuated by at least the minimum requirements, report the three highest emissions relative to the limit.
3. Repeat above procedures until other frequencies measured were completed.

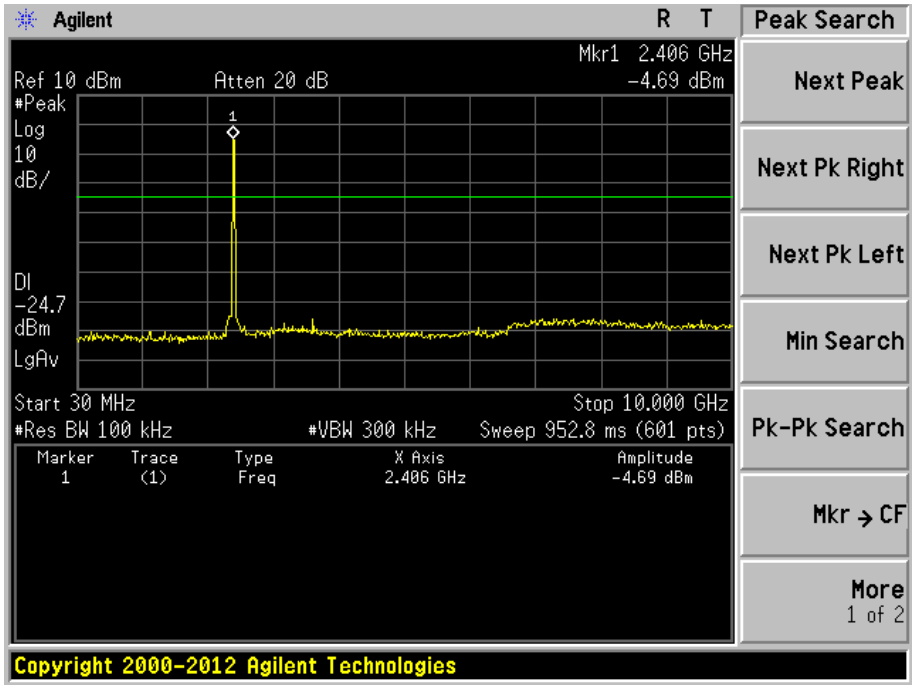
Limit

Frequency Range MHz	Limit (dBc)
30-25000	-20

Spurious RF conducted emissions

802.11 B

2412MHz



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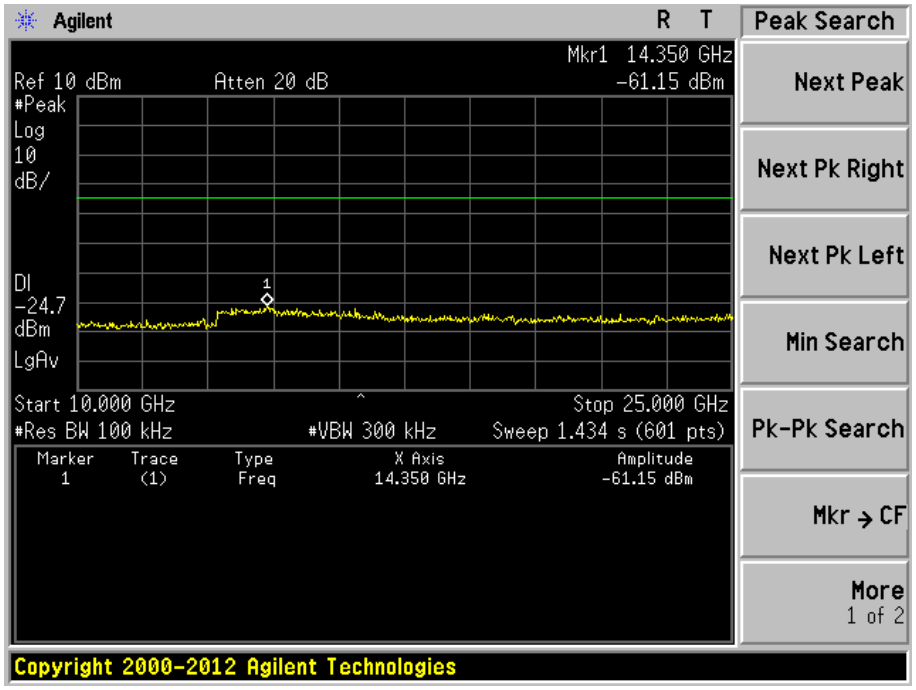
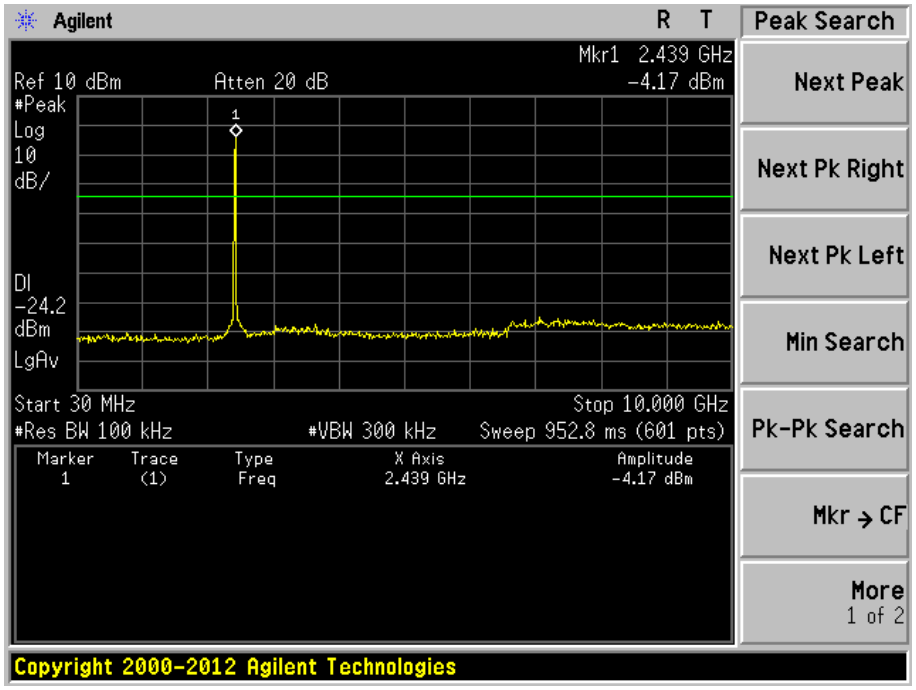


2437MHz



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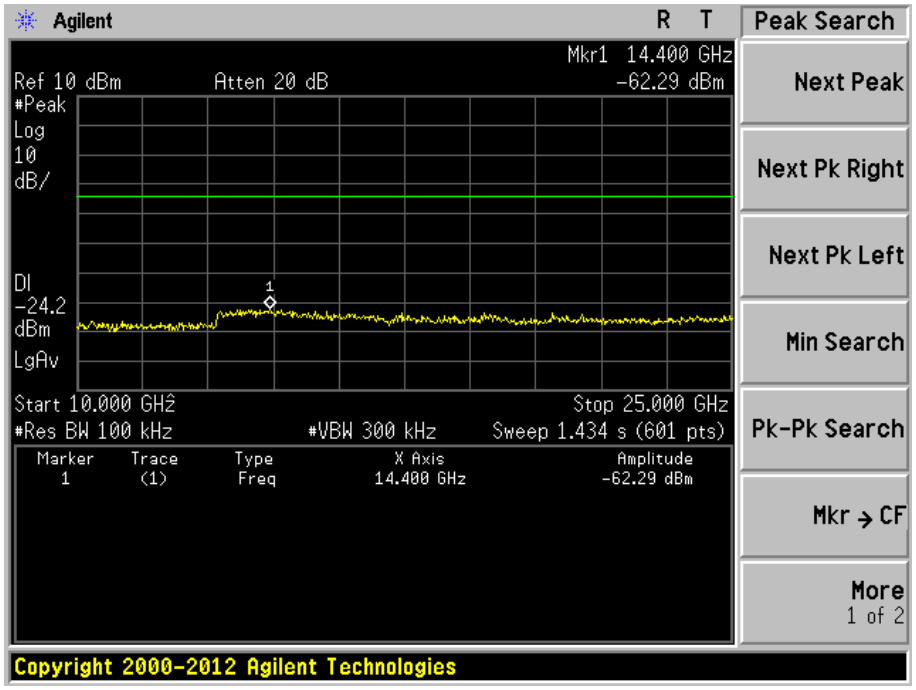
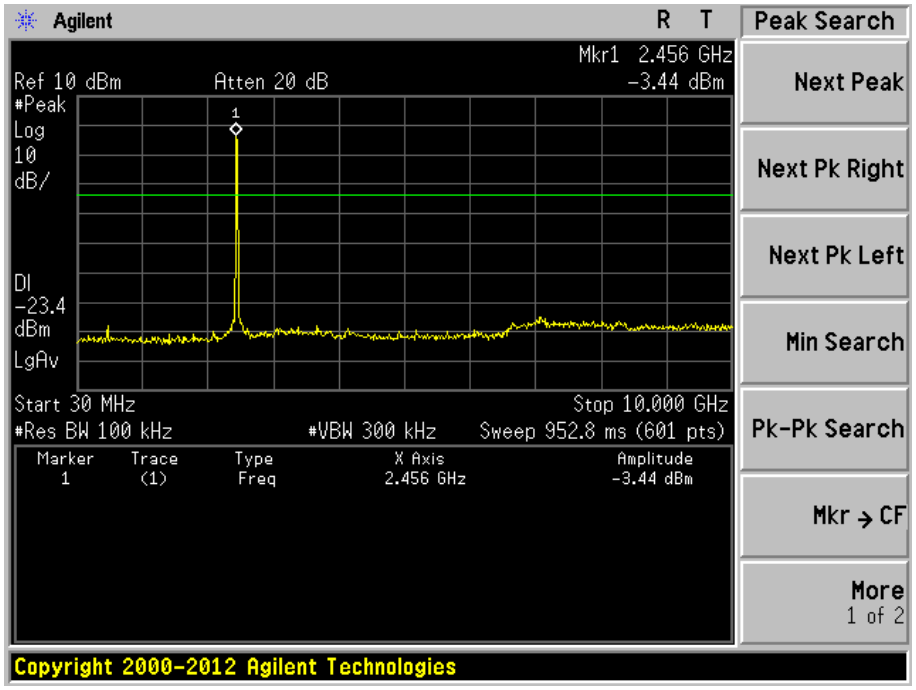


2462MHz



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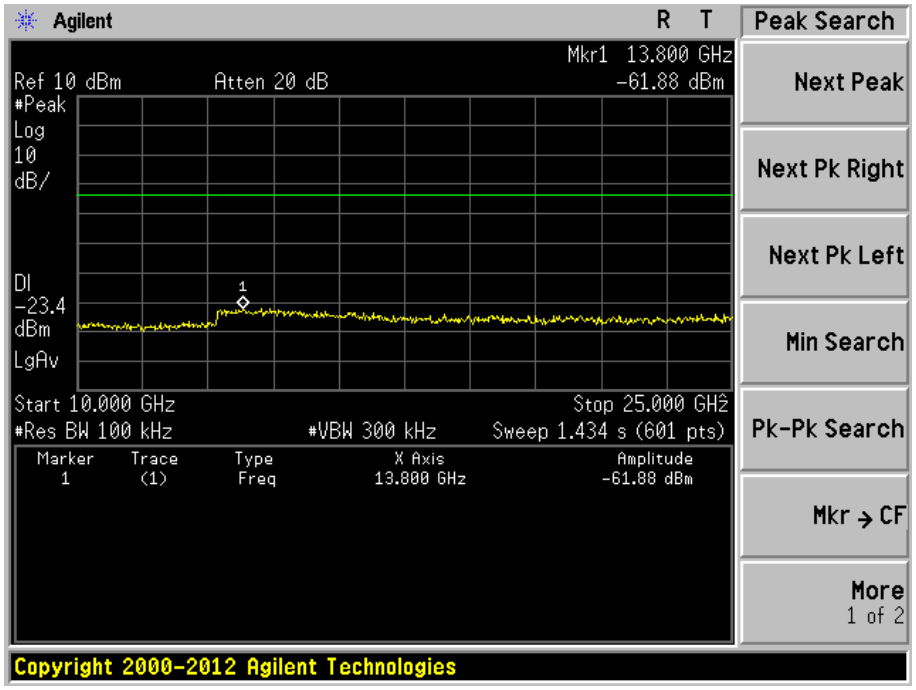
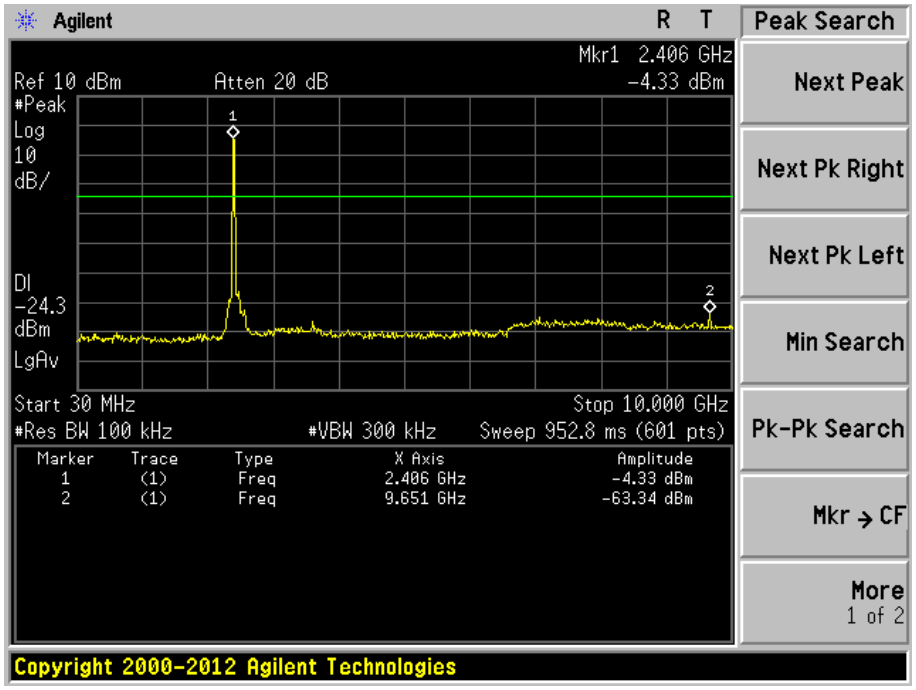


802.11 G

2412MHz



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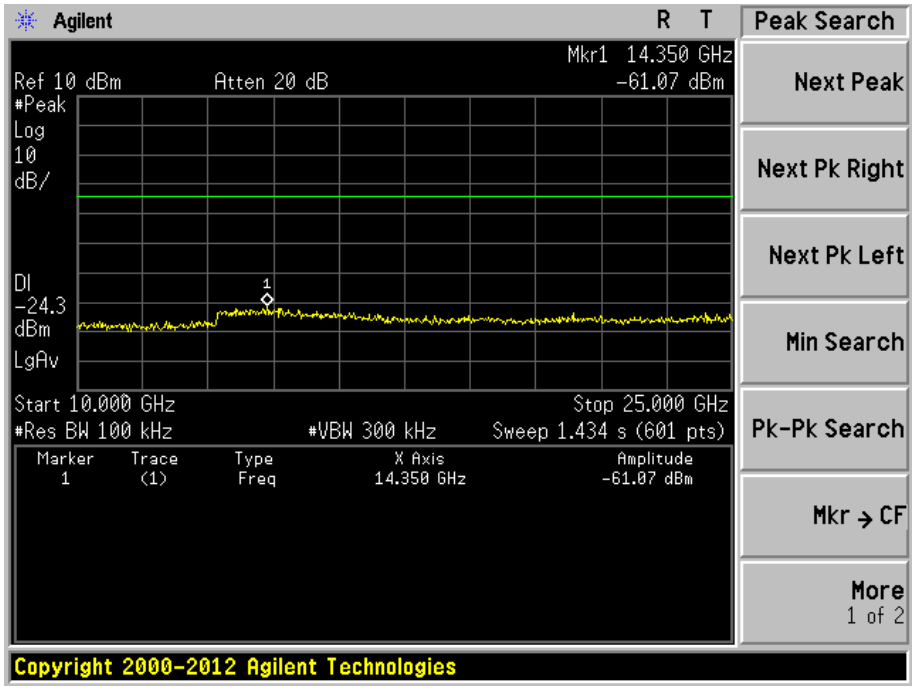
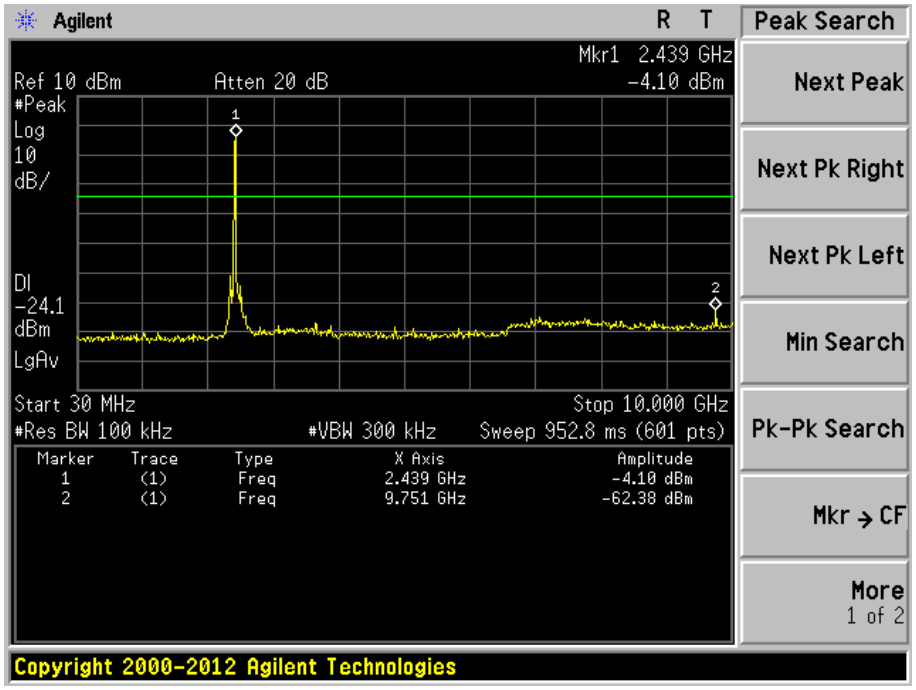


2437MHz



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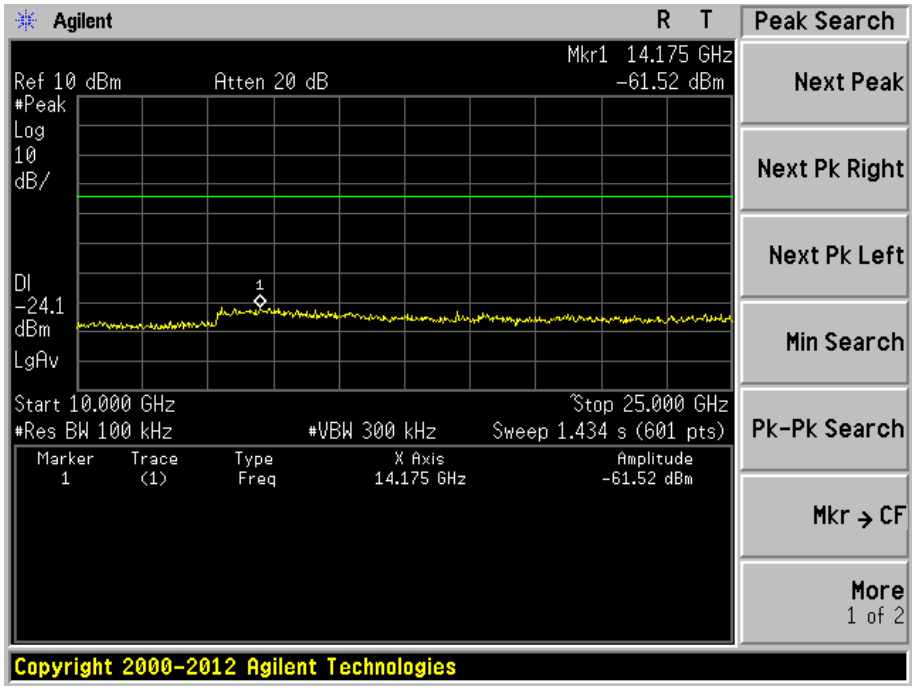
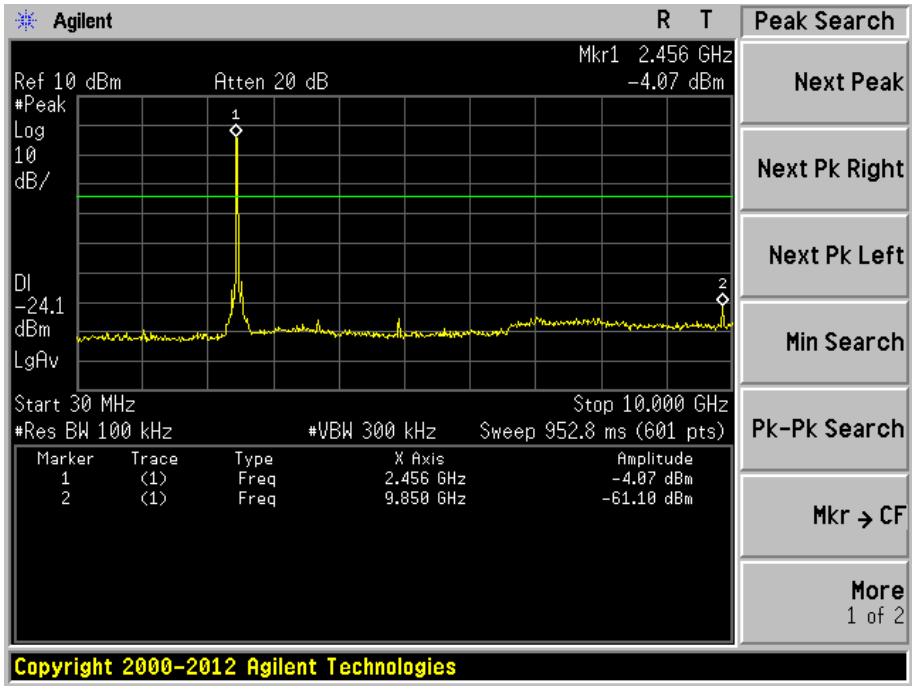


2462MHz



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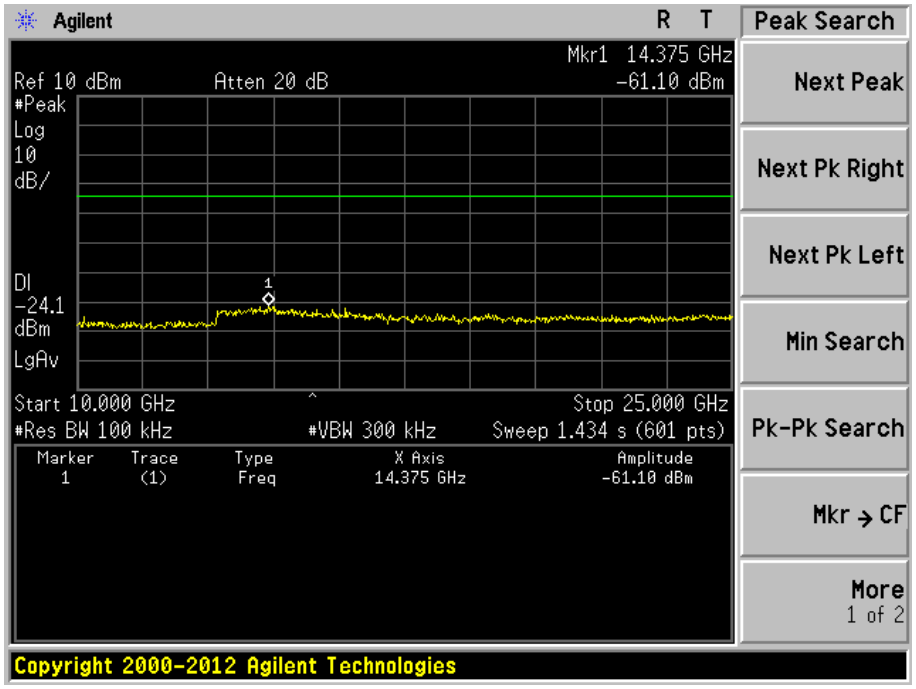
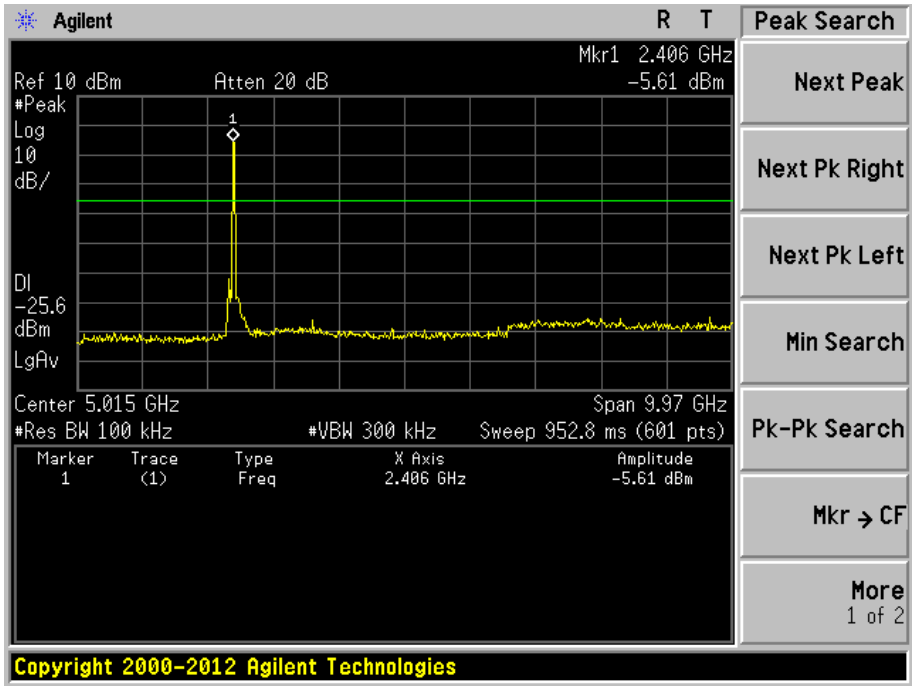


802.11 N20

2412MHz



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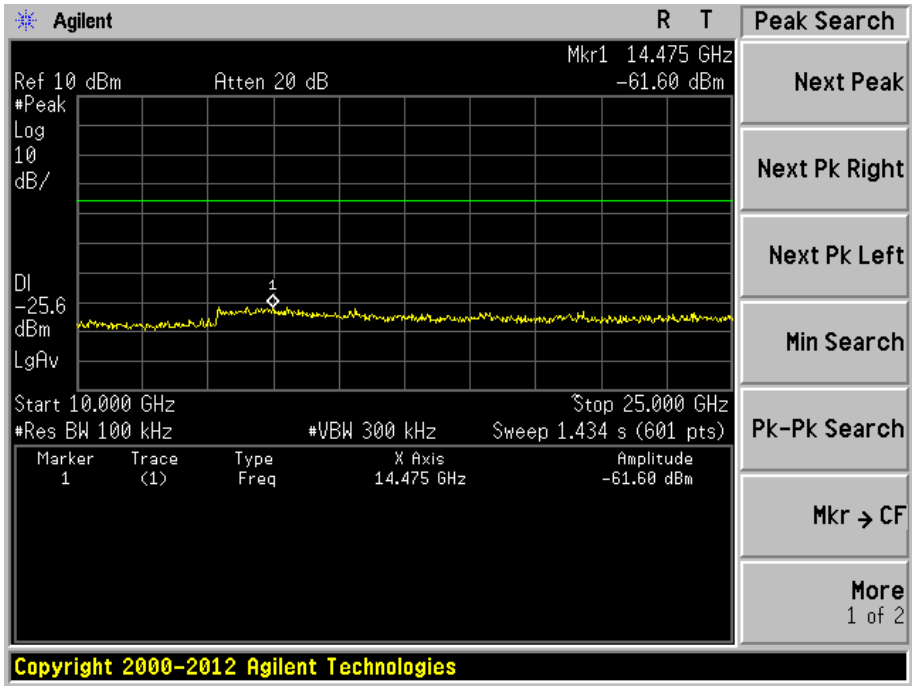
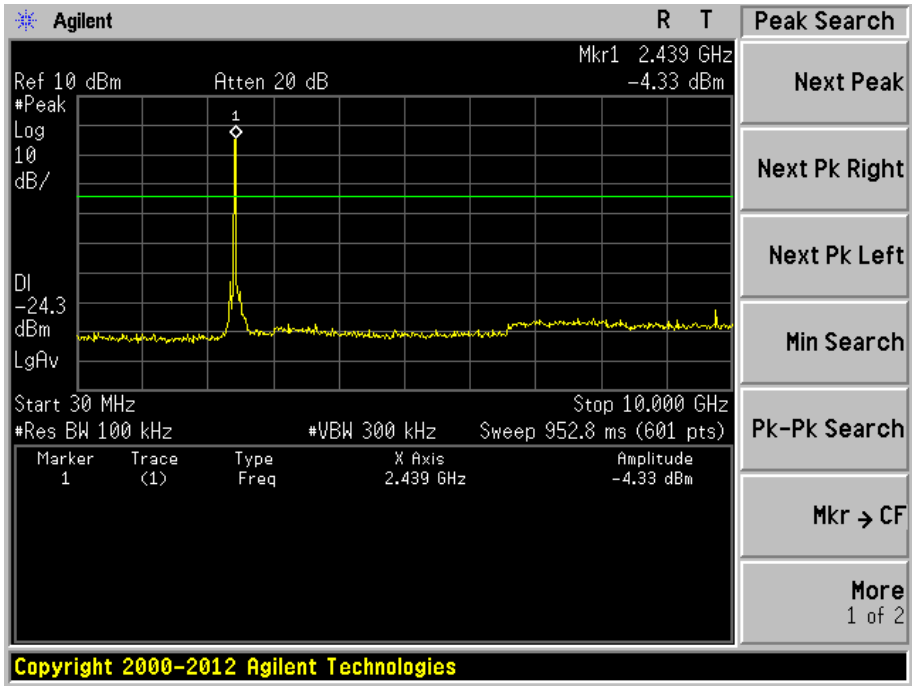


2437MHz



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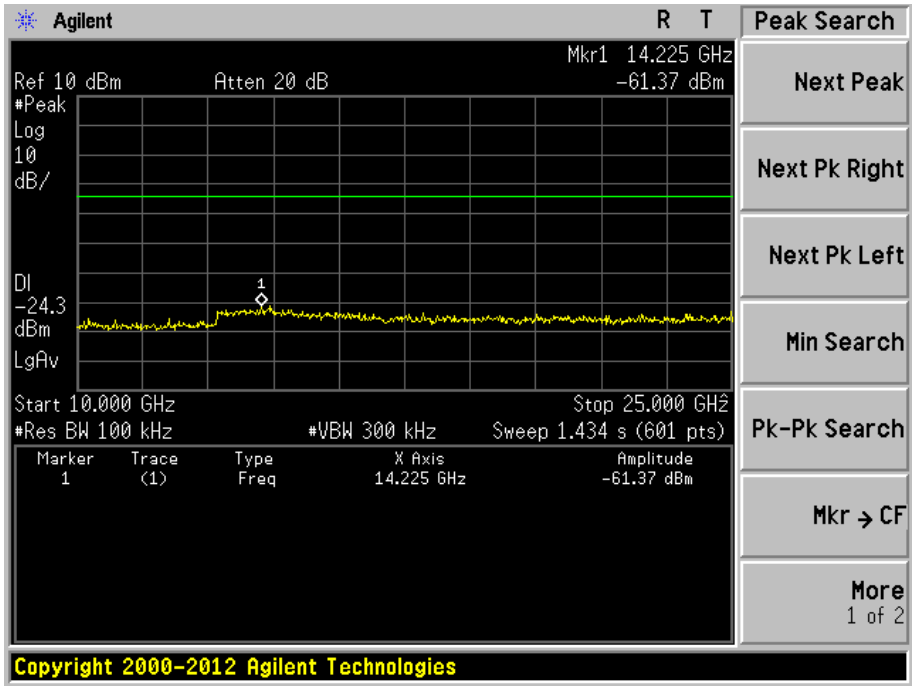
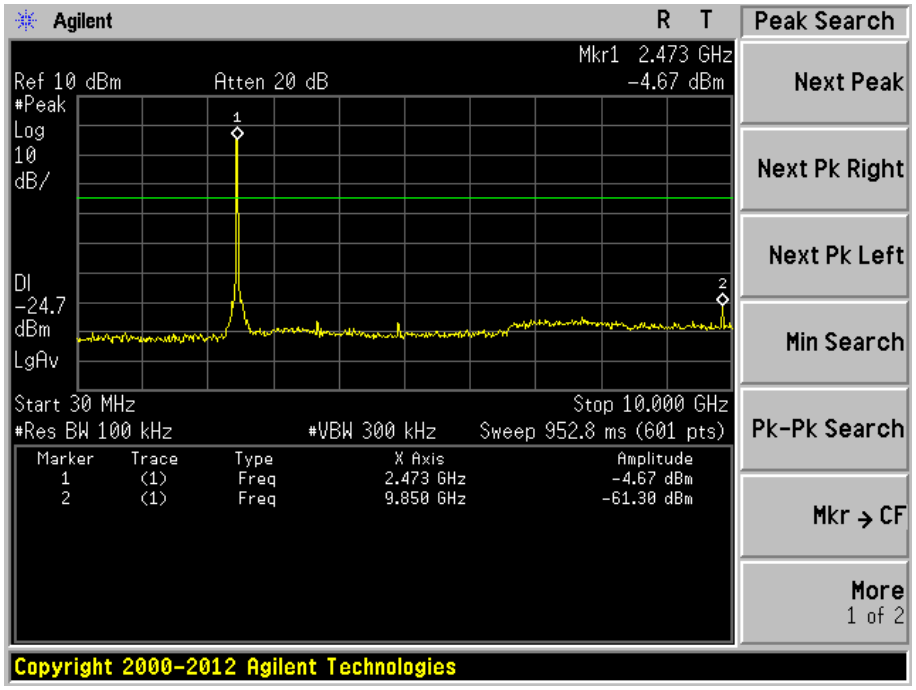


2462MHz



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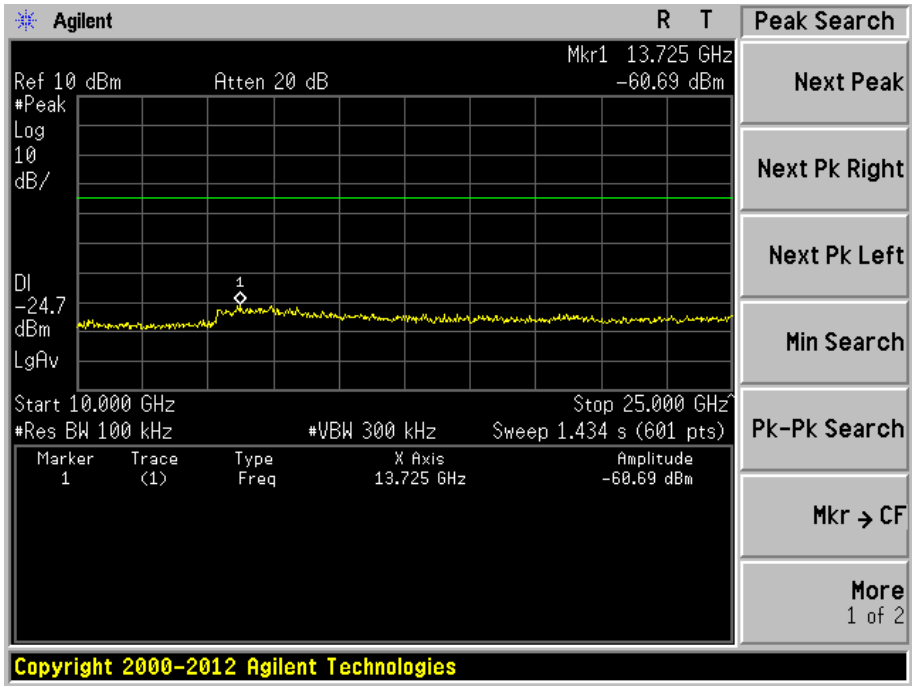
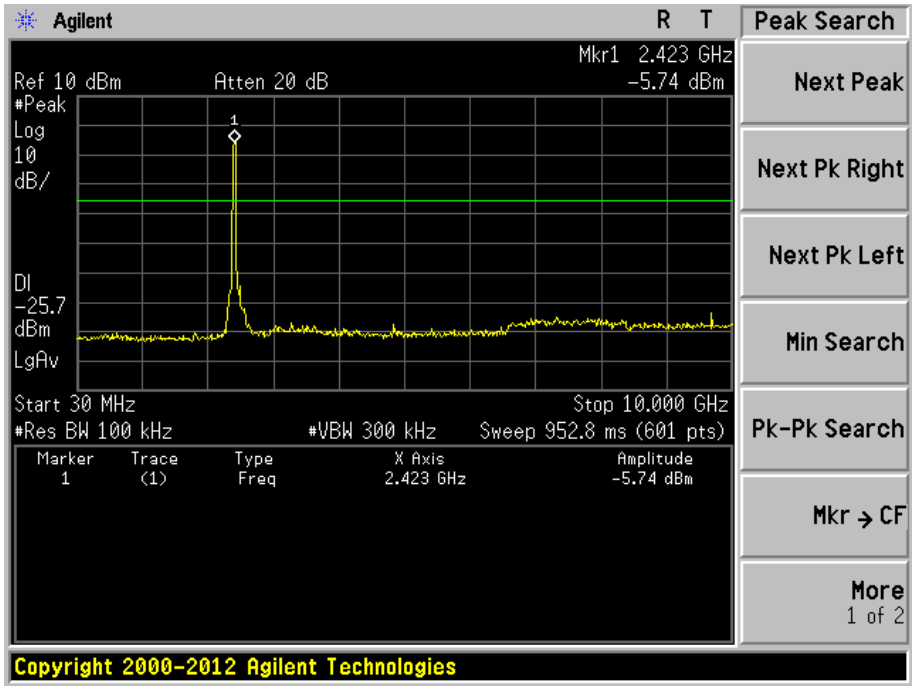


802.11 N40

2422MHz



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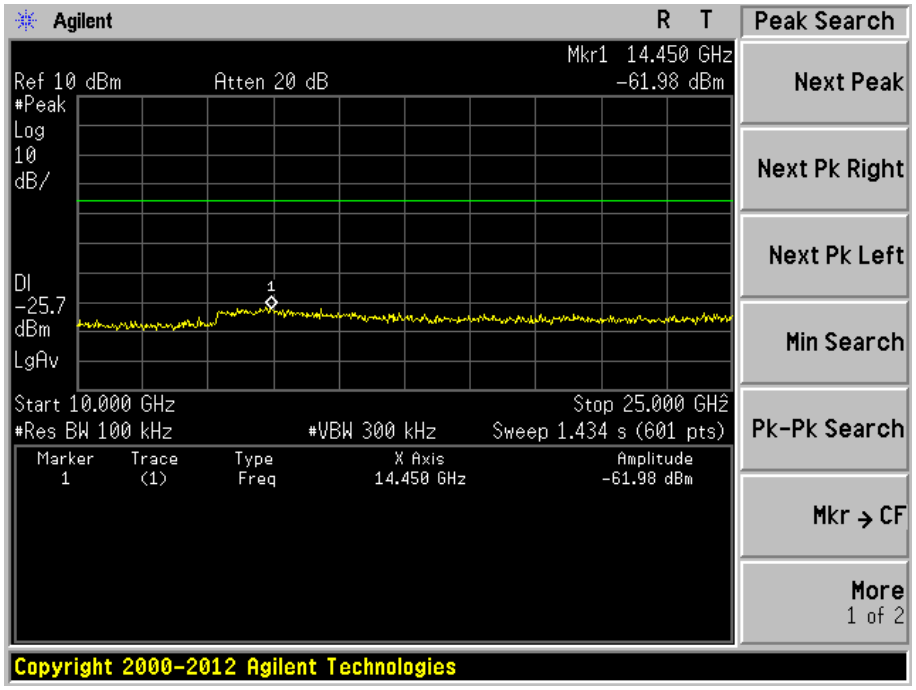
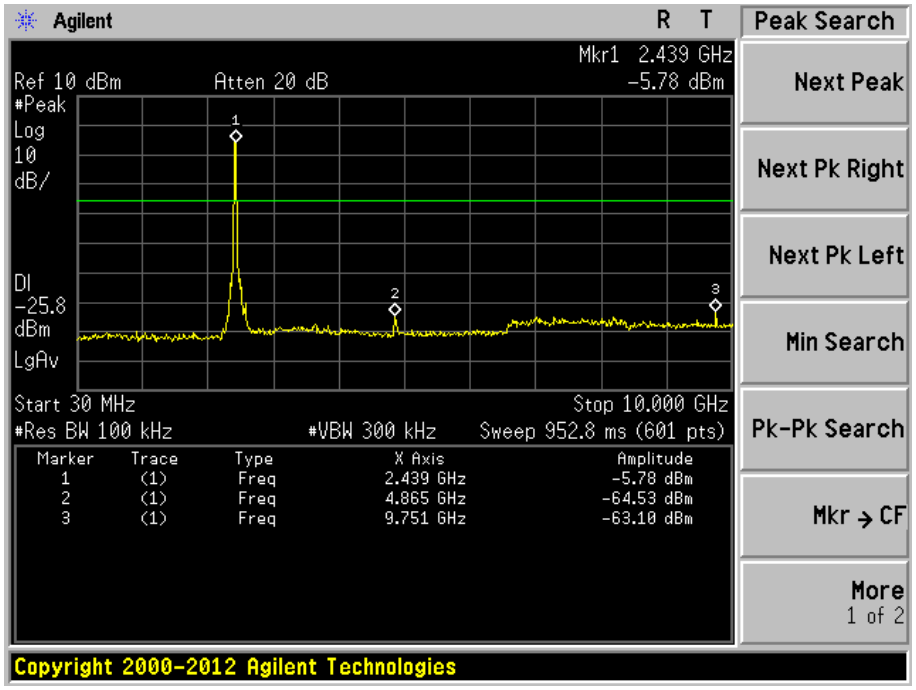


2437MHz



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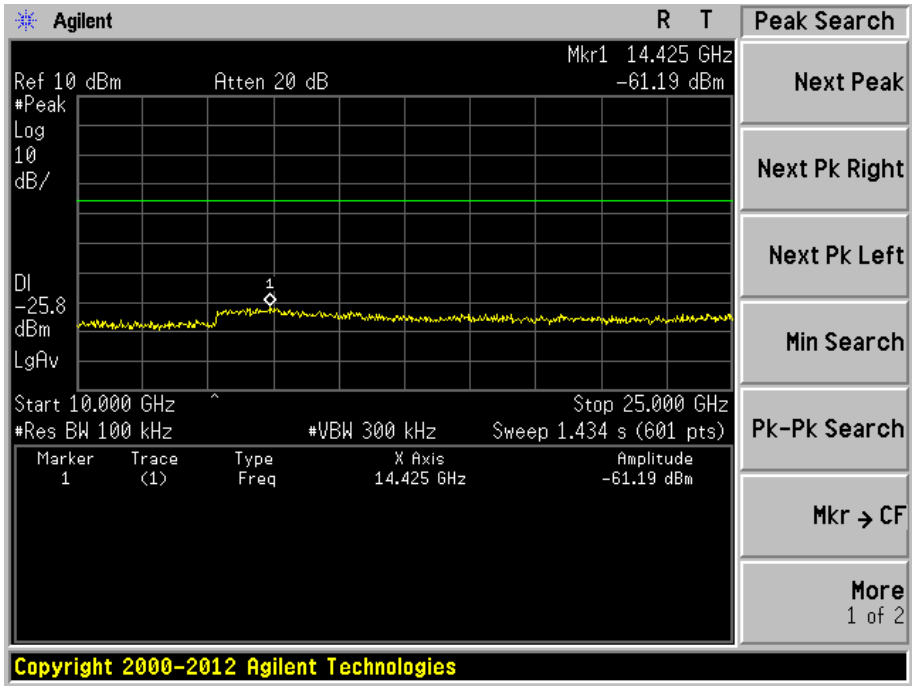
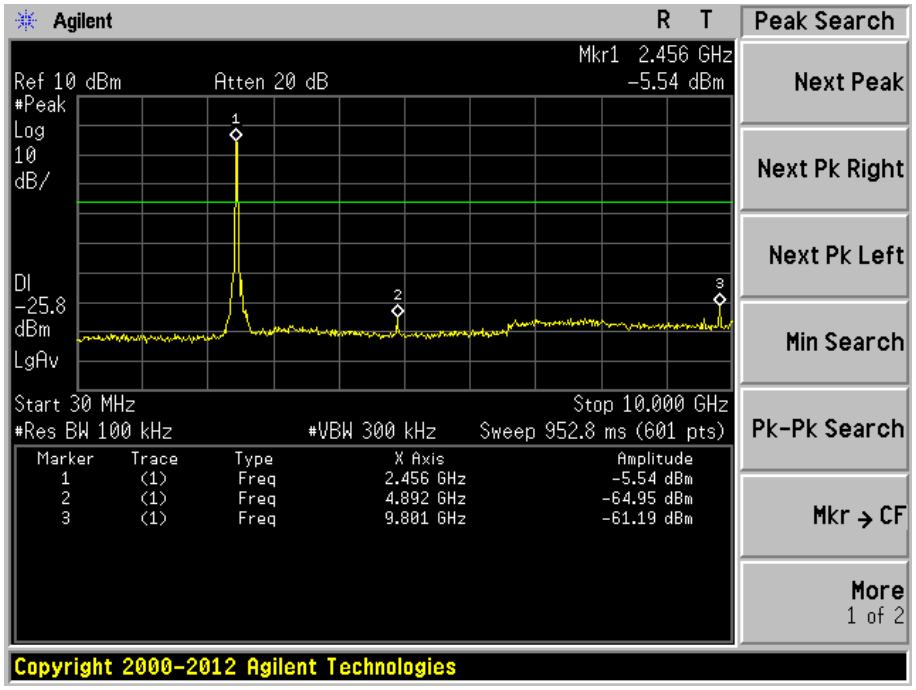


2452MHz



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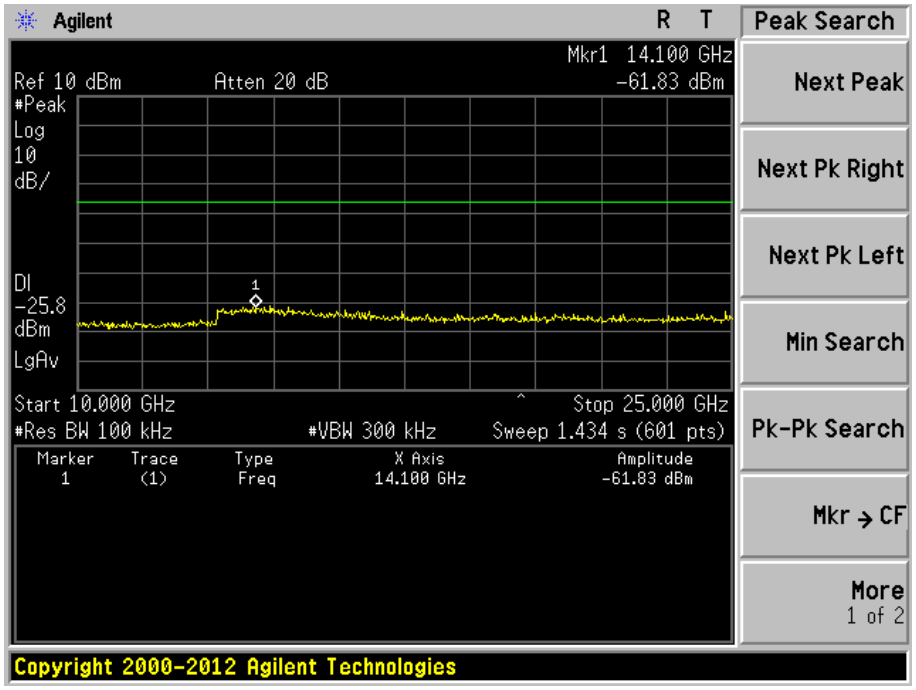

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9.6 Band edge

Test Method

1 Use the following spectrum analyzer settings:
Span = wide enough to capture the peak level of the in-band emission and all spurious
RBW = 100 kHz, VBW≥RBW, Sweep = auto, Detector function = peak, Trace = max hold.
2 Allow the trace to stabilize, use the peak and delta measurement to record the result.
3 The level displayed must comply with the limit specified in this Section.

Limit

Frequency Range MHz	Limit (dBc)
30-25000	-20

Test result

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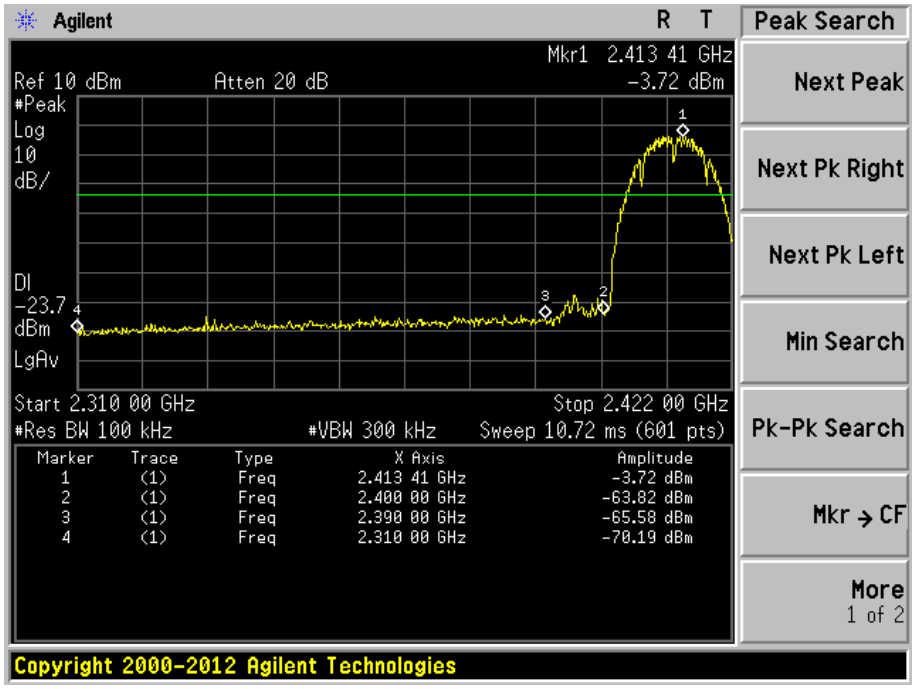
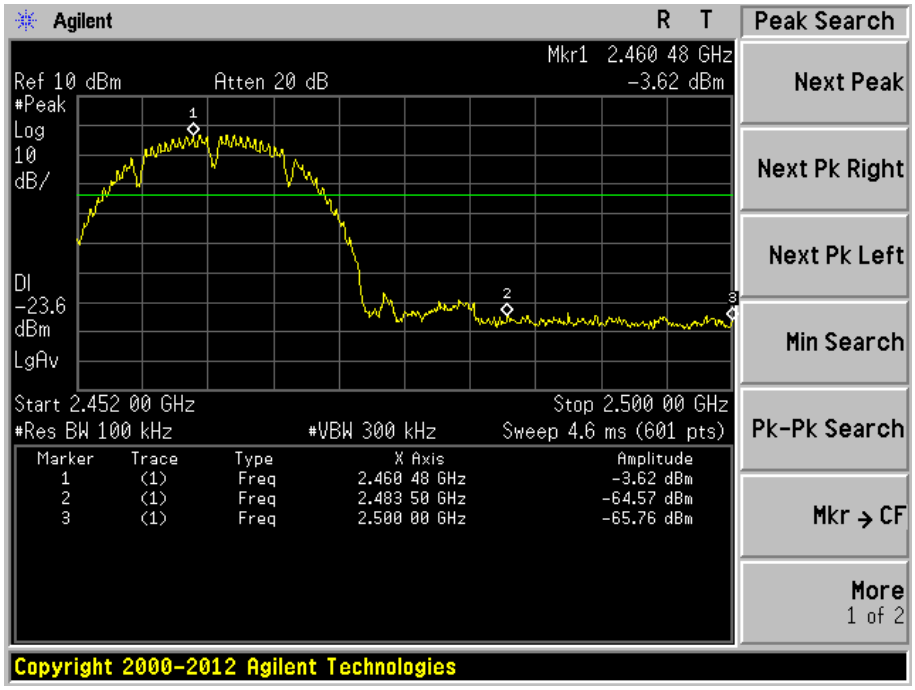
802.11 B





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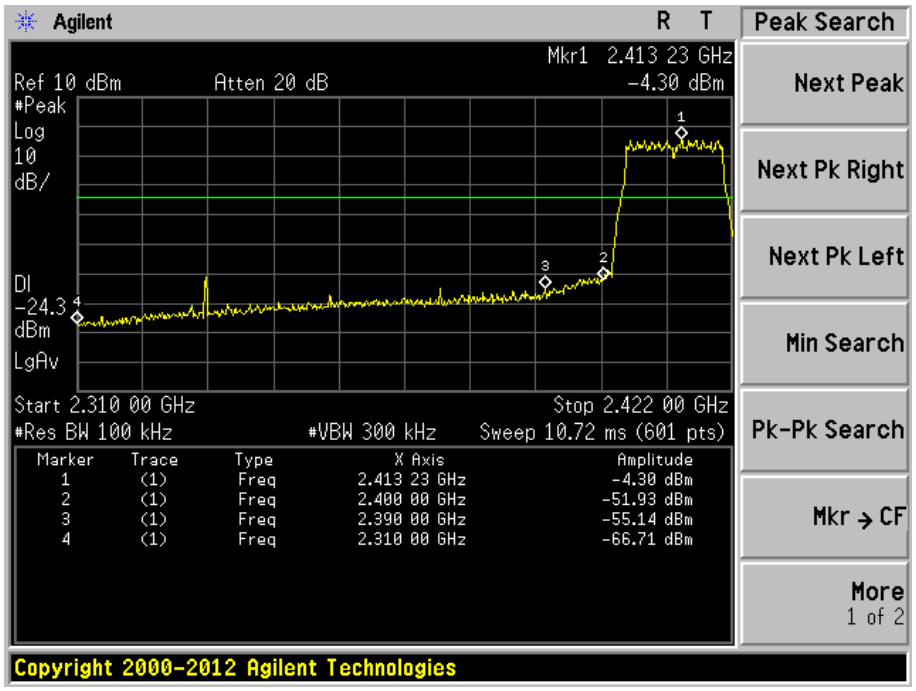
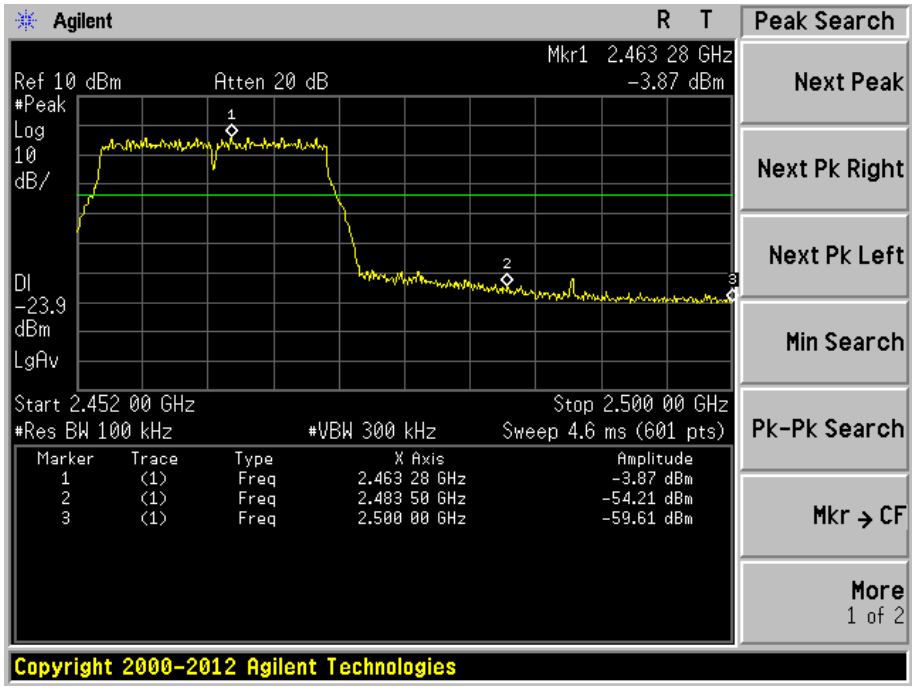
802.11 G





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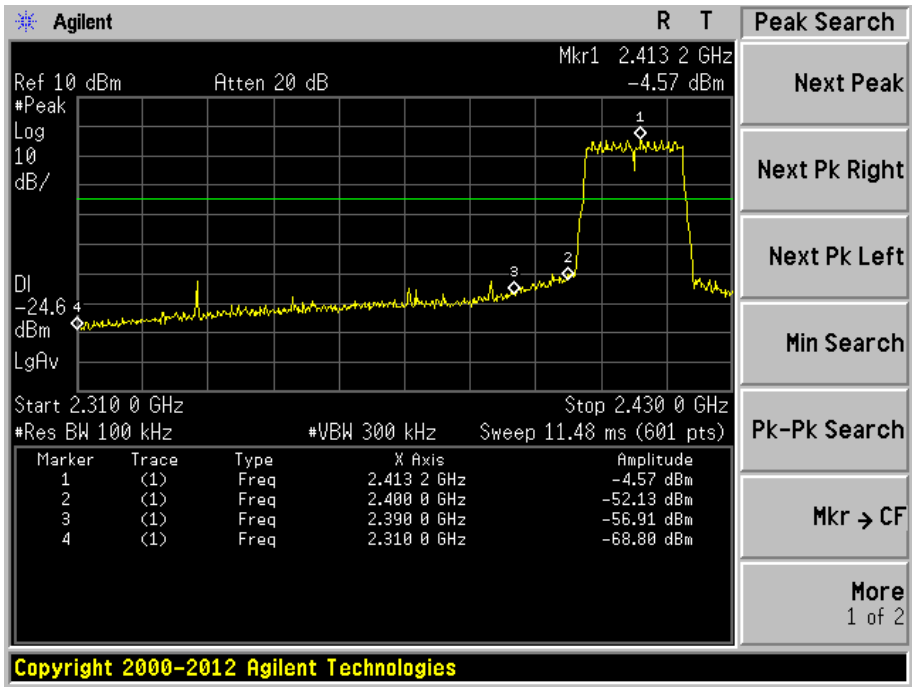
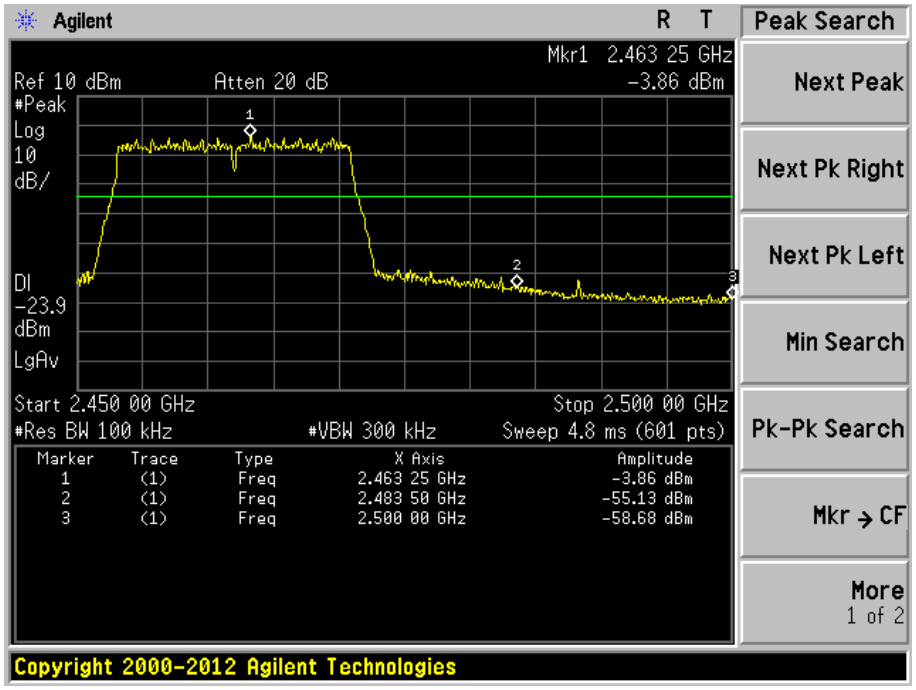
802.11 N20





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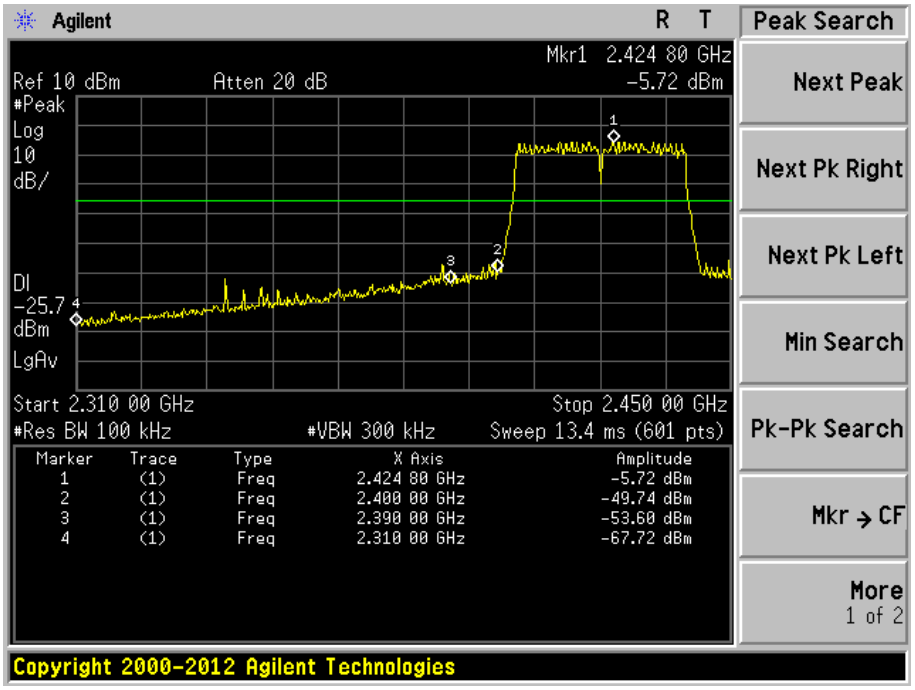
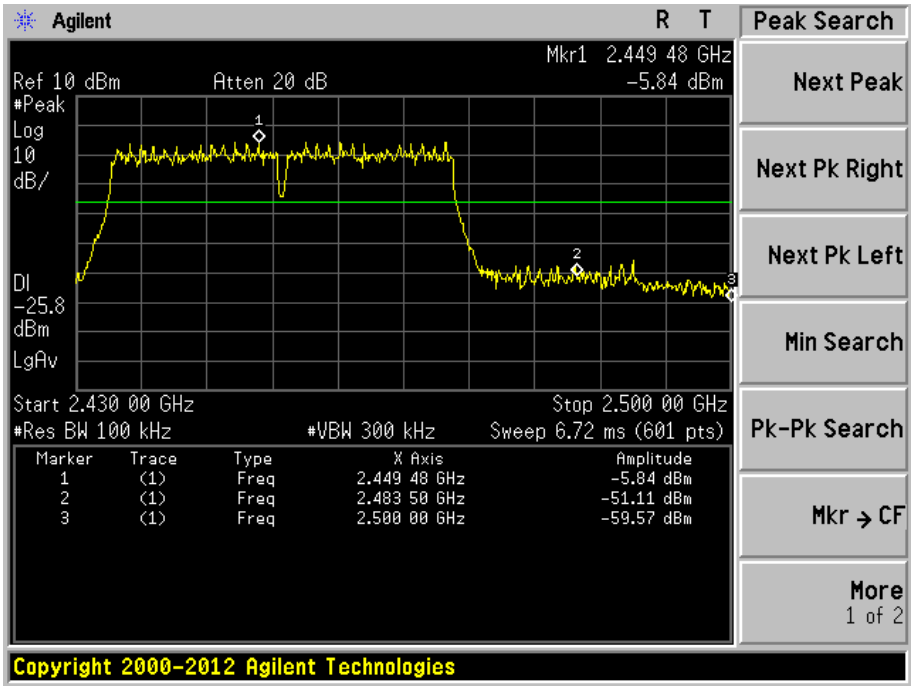
802.11 N40





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9.7 Spurious radiated emissions for transmitter

Test Method

1. The EUT is placed on a turntable, which is 0.8m above ground plane.
2. EUT is set 3m away from the receiving antenna, which is varied from 1m to 4m to find out the highest emissions.
3. Use the following spectrum analyzer settings:
   Span = wide enough to fully capture the emission being measured, RBW = 1 MHz for f ≥ 1GHz, 100 kHz for f < 1 GHz, VBW ≥ RBW, Sweep = auto, Detector function = peak, Trace = max hold
4. Follow the guidelines in ANSI C63.4-1992 with respect to maximizing the emission by rotating the EUT, adjusting the measurement antenna height and polarization, etc.
   The peak reading of the emission, after being corrected by the antenna factor, cable loss, pre-amp gain, etc., is the peak field strength, submit this data. Each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical.
5. Set the VBW to 10 Hz, while maintaining all of the other instrument settings. This peak level, once corrected, must comply with the limit specified in Section 15.209. If the duty cycle per channel of the hopping signal is less than 100 ms, then the reading obtained with the 10 Hz VBW may be further adjusted by a “duty cycle correction factor”, derived from 20log(duty cycle/100 ms), in an effort to demonstrate compliance with the 15.209 limit. Submit this data.

Limit

According to part 15.247(d), the radio emission outside the operating frequency band shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power. Radiated emissions which fall in the restricted bands, as defined in section15.205, must comply with the radiated emission limits specified in section 15.209.

Frequency MHz	Field Strength uV/m	Field Strength dBµV/m	Detector
30-88	100	40	QP
88-216	150	43.5	QP
216-960	200	46	QP
960-1000	500	54	QP
Above 1000	500	54	AV
Above 1000	5000	74	PK

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Spurious radiated emissions for transmitter

According to C63.10, if the peak (or quasi-peak) measured value complies with the average limit, it is unnecessary to perform an average measurement, so AV emission value did not show in below table if the peak value complies with average limit.

Transmitting spurious emission test result as below:

802.11 B

2412MHz

Frequency MHz	Emission Level dBuV/m	Polarization	Limit dBµV/m	Detector	Margin dBµV/m	Result
173.205	35.60	Horizontal	43.5	QP	-7.90	Pass
222.950	39.18	Horizontal	46.0	QP	-6.82	Pass
372.005	39.46	Horizontal	46.0	QP	-6.54	Pass
420.580	37.70	Horizontal	46.0	QP	-8.30	Pass
173.205	29.22	Vertical	43.5	QP	-14.28	Pass
222.950	34.77	Vertical	46.0	QP	-11.23	Pass
372.005	35.30	Vertical	46.0	QP	-10.70	Pass
420.580	36.09	Vertical	46.0	QP	-9.91	Pass
*2310	46.91	Horizontal	74	PK	-27.09	Pass
*2310	46.73	Vertical	74	PK	-27.27	Pass
*2390	45.71	Horizontal	74	PK	-28.29	Pass
*2390	45.94	Vertical	74	PK	-28.06	Pass
*4824	40.14	Horizontal	74	PK	-33.86	Pass
*4824	40.34	Vertical	74	PK	-33.66	Pass
7236	44.39	Horizontal	74	PK	-29.61	Pass
7236	44.54	Vertical	74	PK	-29.46	Pass

2437MHz

Frequency MHz	Emission Level dBuV/m	Polarization	Limit dBµV/m	Detector	Margin dBµV/m	Result
*4874	40.50	Horizontal	74	PK	-33.50	Pass
*4874	39.10	Vertical	74	PK	-34.90	Pass
*7311	44.38	Horizontal	74	PK	-29.62	Pass
*7311	44.14	Vertical	74	PK	-29.86	Pass

2462MHz

Frequency MHz	Emission Level dBuV/m	Polarization	Limit dBµV/m	Detector	Margin dBµV/m	Result
*2483.5	44.14	Horizontal	74	PK	-29.86	Pass
*2483.5	44.30	Vertical	74	PK	-29.70	Pass
*2500	44.15	Horizontal	74	PK	-29.85	Pass
*2500	44.19	Vertical	74	PK	-29.81	Pass
*4924	39.94	Horizontal	74	PK	-34.06	Pass
*4924	39.65	Vertical	74	PK	-34.35	Pass
*7386	44.17	Horizontal	74	PK	-29.83	Pass
*7386	44.31	Vertical	74	PK	-29.69	Pass

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Remark:

(1) AV Emission Level= PK Emission Level+20log (dutycycle)
(2) We test all modes and worse case recorded in the report.
(3) "*" means the emission(s) appear within the restrict bands shall follow the requirement of section 15.205.

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10 Test Equipment List

List of Test Instruments

	DESCRIPTION	MANUFACTURER	MODEL NO.	SERIAL NO.	CAL. DUE DATE
CE	Shielding Room	ZhongYu Electron	7.0(L)x3.0(W)x3.0(H)	GTS264	Sep. 06 2015
	EMI Test Receiver	Rohde & Schwarz	ESCS30	GTS223	June 29 2016
	10dB Pulse Limita	Rohde & Schwarz	N/A	GTS224	June 29 2016
	Coaxial Switch	ANRITSU CORP	MP59B	GTS225	June 29 2016
	LISN	SCHWARZBECK MESS-ELEKTRONIK	NSLK 8127	GTS226	June 29 2016
	Coaxial Cable	GTS	N/A	GTS227	June 29 2016
	EMI Test Software	AUDIX	E3	N/A	N/A
C	Spectrum Analyzer	Agilent	E4440A	GTS533	Dec. 3 2015
RE	3m Semi- Anechoic Chamber	ZhongYu Electron	9.2(L)*6.2(W)* 6.4(H)	GTS250	Mar. 26 2016
	Control Room	ZhongYu Electron	6.2(L)*2.5(W)* 2.4(H)	GTS251	N/A
	Spectrum Analyzer	Agilent	E4440A	GTS533	Dec. 3 2015
	EMI Test Receiver	Rohde & Schwarz	ESU26	GTS203	June 29 2016
	BiConiLog Antenna	SCHWARZBECK MESS-ELEKTRONIK	VULB9163	GTS214	June 29 2016
	Double -ridged waveguide horn	SCHWARZBECK MESS-ELEKTRONIK	9120D-829	GTS208	June 25 2016
	Horn Antenna	ETS-LINDGREN	3160	GTS217	Mar. 26 2016
	EMI Test Software	AUDIX	E3	N/A	N/A
	Coaxial Cable	GTS	N/A	GTS213	Mar. 27 2016
	Coaxial Cable	GTS	N/A	GTS211	Mar. 27 2016
	Coaxial cable	GTS	N/A	GTS210	Mar. 27 2016
	Coaxial Cable	GTS	N/A	GTS212	Mar. 27 2016
	Amplifier(100kHz-3GHz)	HP	8347A	GTS204	June 29 2016
	Amplifier(2GHz-20GHz)	HP	8349B	GTS206	June 29 2016
	Amplifier (18-26GHz)	Rohde & Schwarz	AFS33-18002 650-30-8P-44	GTS218	June 25 2016
	Band filter	Amindeon	82346	GTS219	Mar. 27 2016
	Power Meter	Anritsu	ML2495A	GTS540	June 29 2016
	Power Sensor	Anritsu	MA2411B	GTS541	June 29 2016

C - Conducted RF tests

- Conducted peak output power
- 6dB bandwidth and 99% Occupied Bandwidth
- Power spectral density*
- Spurious RF conducted emissions
- Band edge

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11 System Measurement Uncertainty

For a 95% confidence level, the measurement expanded uncertainties for defined systems, in accordance with the recommendations of ISO 17025 were:

System Measurement Uncertainty

Test Item	Frequency Range	Measurement Uncertainty	Notes
Radiated Emission	9kHz ~ 30MHz	± 4.34dB	(1)
Radiated Emission	30MHz ~ 1000MHz	± 4.24dB	(1)
Radiated Emission	1GHz ~ 26.5GHz	± 4.68dB	(1)
AC Power Line Conducted Emission	0.15MHz ~ 30MHz	± 3.45dB	(1)
Note (1): The measurement uncertainty is for coverage factor of k=2 and a level of confidence of 95%.			

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