



Test report No. : 4788166493A-US-R1-V0
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Issued date : 2017/11/02
FCC ID : A43-WISP5

RADIO TEST REPORT

Applicant : Portwell, Inc.
Model No. : WiSP
FCC ID : A43-WISP5
Test regulation : FCC 47 CFR Part 15 Subpart C (Section 15.247)
Test Result : Complied

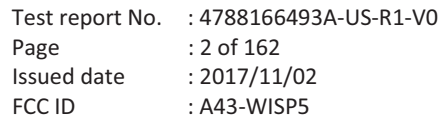
Date of test: 2017/10/2~2017/11/02
Sample received Date: 2017/9/29
Representative test engineer: *Wayne Chen*
Bull Chen
Approved by:



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Original Test Report No.: 4788166493A-US-R1-V0

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1. Attestation of Test Results

Applicant

Company Name: Portwell, Inc.
Address: No. 242, Bo-Ai St., Shu-Lin Dist., New Taipei City 238, Taiwan
Model Name WiSP

Manufacturer

Company Name: Portwell, Inc.
Address: No. 242, Bo-Ai St., Shu-Lin Dist., New Taipei City 238, Taiwan
Model Name WiSP

APPLICABLE STANDARDS	
STANDARD	Test Results
FCC 47 CFR PART 15 Subpart C (Section 15.247)	PASS

1. This test report shall not be reproduced in full or partial, without the written approval of UL Taiwan, Inc.
2. The results in this report apply only to the sample tested.
3. This sample tested is in compliance with the above regulation.
4. The test results in this report are traceable to the national or international standards.

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2. Test Methodology

The tests documented in this report were performed in accordance with FCC CFR 47 Part 2, FCC CFR 47 Part 15.247, KDB558074 D01 v04, KDB662911 D01v02r01 and ANSI C63.10-2013.

3. Facilities and Accreditation

Test Location	UL Verification Services Taiwan Co., Ltd
Address	Building B & E, No.372-7, Sec. 4, Zhongxing Rd., Zhudong Township, Hsinchu County 310, Taiwan (R.O.C.)
Accreditation Certificate	UL Verification Services Inc. is accredited by TAF, Laboratory Code 3398. The full scope of accreditation can be viewed at http://www.taftw.org.tw/wSite/sp?xdUrl=/wSite/taf/lalab.jsp&mp=1

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4. Measurement Uncertainty

The following uncertainties have been calculated to provide a confidence level of 95 % using a coverage factor k=2.

Test Item	Measurement Frequency Range	K	U(dB)
Conducted disturbance at mains terminals ports	0.15MHz ~ 30MHz	2	2.6
RF Conducted	9 kHz - 40GHz	2	0.94
Radiated disturbance below 30MHz	9 kHz - 30 MHz	2	2.4
Radiated disturbance below 1 GHz	30MHz ~ 1GHz	2	5.5
Radiated disturbance above 1GHz	1GHz ~ 40GHz	2	5.0

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5. Equipment under Test

5.1. Description of EUT

Product	Wireless Service Platform
Model Name	WiSP
Power Supply	1. EUT power Rating : 100-240V 2. Internal Battery Rating:11.1V, 2500mAh / 28Wh
Operating Frequency	802.11b/g/n HT20 : 2412~2462 MHz 802.11n HT40 : 2422~2452 MHz
Number of channels	802.11b/g/n HT20 : 11Channels 802.11n HT40: 7 Channels

Modulaton	Chain 0	Chain 1
802.11b	V	X
802.11g	V	X
802.11n HT20	V	V
802.11n HT40	V	V

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Modulaton	Channel	Frequency(MHz)	Power Setting
802.11b	1	2412	0C
	6	2437	0C
	11	2462	0C
802.11g	1	2412	0C
	6	2437	0D
	11	2462	0E

Modulaton	Channel	Frequency(MHz)	Power Setting	
			Chain 0	Chain 1
802.11n HT20	1	2412	0A	0A
	6	2437	0A	0A
	11	2462	0A	0A
802.11n HT40	3	2422	0A	0A
	6	2437	0A	0A
	9	2452	0A	0A

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5.2. Test Condition

Test Item	Test Site No.	Environmental Condition	Input Power
Antenna Port Conducted Measuremaent	SR4	26°C / 66%RH	120Vac / 60Hz
Radiated Spurious Emission	966-2	25°C / 60%RH	120Vac / 60Hz
AC power Line Conducted Emission	SR1	26°C / 66%RH	120Vac / 60Hz

5.3. Description Of Available Antennas

Frequecny Band (GHz)	Brand Name	Model Name	Antenna Type	Antenna Gain(dBi)	
				Chain 0	Chain 1
2.4	Aristotle	RFA-25-L2M2	Dipole Antenna	2	2

5.4. Software And Firmware

The software installed in the EUT during testing was “Ralink QA test program Version 17”.

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5.5. Operating Mode and Worst Case of EUT

For below 1G radiated emission and AC power line conducted emission were performed with the EUT set to transmit at the channel with highest output power as worst-case.

The fundamental of the EUT was investigated in three orthogonal axes X/Y/Z, it was determined that X axis was worst-case . Therefore, all final radiated testing was performed with the EUT in X axis.

Worst-case data rates as provided by the client were:

802.11b mode: 1 Mbps

802.11g mode: 6 Mbps

802.11n HT20 mode: MCS0

802.11n HT40 mode: MCS0

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6. Test Equipment

Test Equipment List					
Equipment	Manufacturer	Model No.	Serial No.	Cal. Date	Cal. Interval
Radiated Spurious Emission					
Spectrum Analyzer	Keysight	N9010A	MY56070821	Nov. 21, 2016	1 year
Loop Antenna	ETS lindgren	6502	00213440	Dec. 13, 2016	1 year
Trilog-Broadband Antenna	Schwarzbeck	VULB9168	VULB9168-733	Jan. 17, 2017	1 year
Horn Antenna (1G~18GHz)	Schwarzbeck	BBHA 9120D	BBHA 9120D-01686	Jan. 12, 2017	1 year
Horn Antenna(18-40GHz)	Schwarzbeck	BBHA9170	BBHA9170#759	Jan.12, 2017	1 year
Preamplifier (30-1000MHz)	EMCI	RMC330E	980405	Jan. 25, 2017	1 year
Preamplifier (1-18GHz)	EMCI	EMC051835BE	908044	Jan. 25, 2017	1 year
Preamplifier (18-40GHz)	EMCI	EMC184045SE	980407	Apr. 18, 2017	1 year
RF Cable (9K~18G)	emci	EMC106-NM-NM-7000	170102	July 10, 2017	1 year
RF Cable (9K~18G)	emci	EMC106-NM-SM-2500	170219	July 10, 2017	1 year
RF Cable (9K~18G)	emci	EMC106-NM-NM-4000	170221	July 10, 2017	1 year
RF Cable (18G~40G)	Rosnol	K1K50-UP0264-K1K50-2500	170214-1	July 10, 2017	1 year
RF Cable (18G~40G)	Rosnol	K1K50-UP0264-K1K50-3500	170214-2	July 10, 2017	1 year
RF Cable (18G~40G)	Rosnol	K1K50-UP0264-K1K50-2500	170214-3	July 10, 2017	1 year
Antenna Port Conducted Measurement					
Spectrum Analyzer	Keysight	N9010A	MY56070834	Nov. 21, 2016	1 year
Power meter	Anrisu	MA2411B	1531202	Dec. 13, 2016	1 year
Power sensor	Anrisu	ML2495A	1645002	Dec. 13, 2016	1 year
Signal Generator	Keysight	N5182B	MY56200244	Dec. 19, 2016	1 year

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AC power Line Conducted Emission					
EMI Test Receiver	Rohde & Schwarz	ESR7	101753	Nov. 4, 2016	1 year
Two-Line V-Network	Rohde & Schwarz	ENV216	102136	Nov. 16, 2016	1 year
Four-Line V-Network	Rohde & Schwarz	ENV432	101298	Dec. 7, 2016	1 year
RF Cable-CON	Huber+Suhner	RG214/U	FCC-BCICF-4_RF	Mar. 23, 2017	1 year

UL Software

Software	Test Item	Version
EMC-RI	Radiated measurement	1.0.0.0
Keysight.TestSystem	Conducted measurement	1.0.0.0
EZ_EMC	AC power Line Conducted Emission	1.1.4.2

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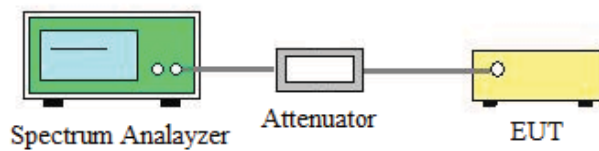
7. Test Result

7.1. Duty Cycle

Requirements

N/A

Test Setup



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Test Data

Mode	Channel	Frequency (MHz)	On time(ms)	Period(ms)	Duty cycle	Duty Cycle factor
802.11b Chain0	6	2437	1	1	100%	0.000
802.11g Chain0	6	2437	1	1	100%	0.000
802.11n HT20 Chain0	6	2437	1	1	100%	0.000
802.11n HT20 Chain1	6	2437	1	1	100%	0.000
802.11n HT40 Chain0	6	2437	1	1	100%	0.000
802.11n HT40 Chain1	6	2437	1	1	100%	0.000

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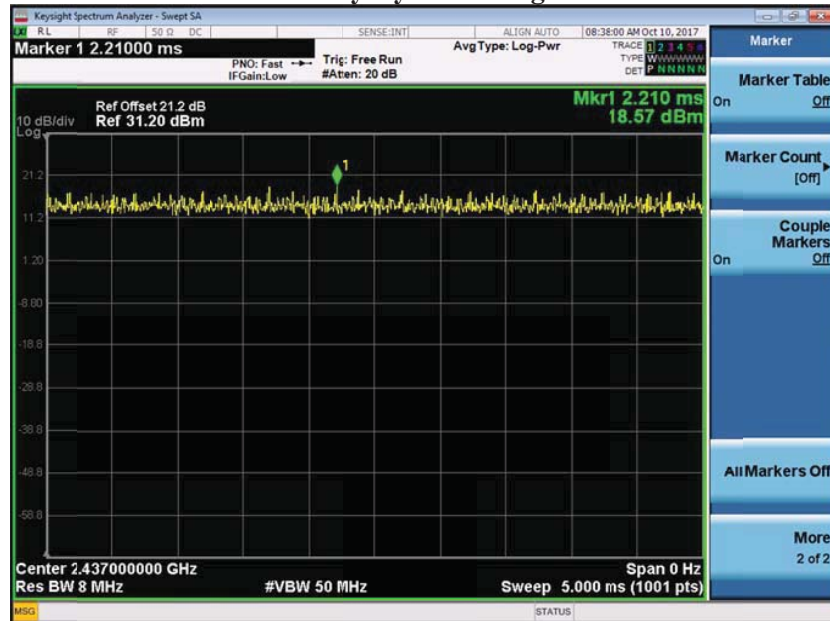


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Duty Cycle 802.11b



Duty Cycle 802.11g



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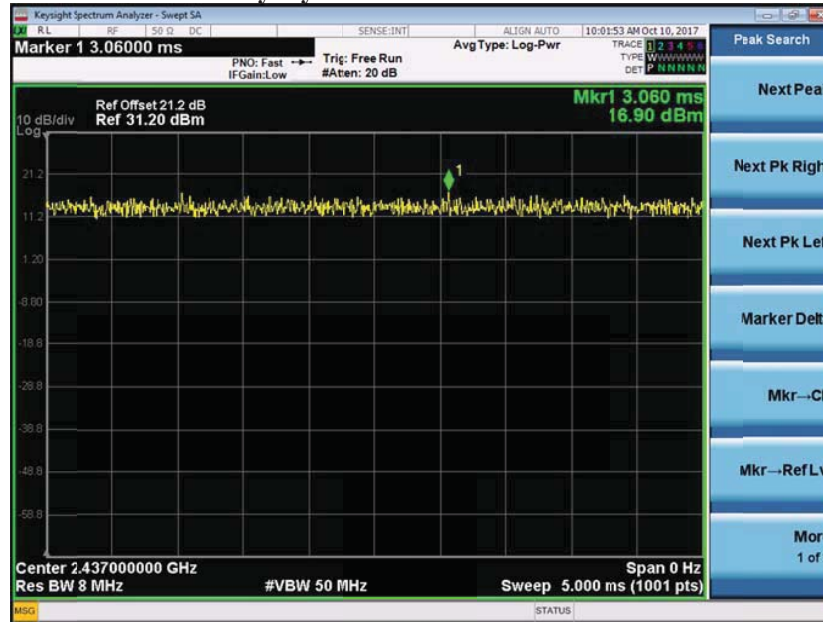
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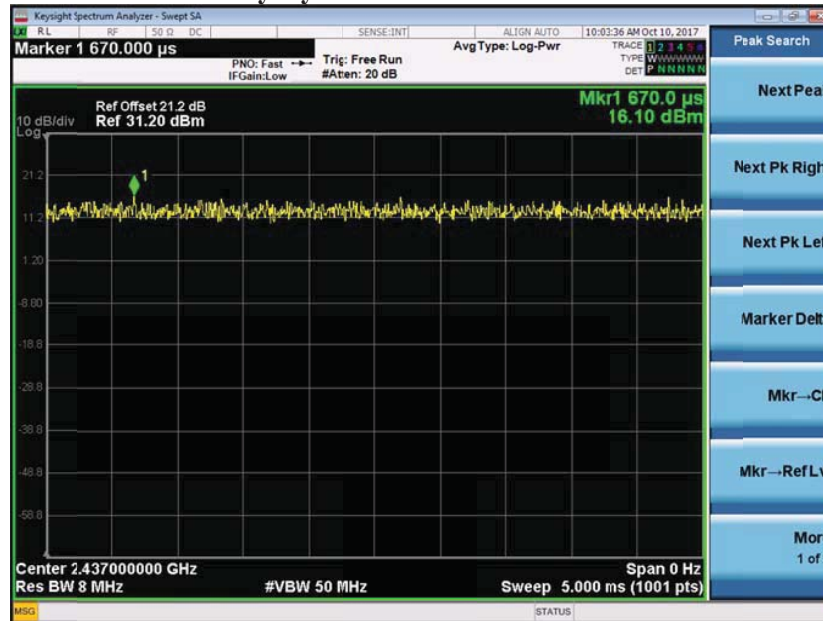


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Duty Cycle 802.11n HT20 Chain 0



Duty Cycle 802.11n HT20 Chain 1



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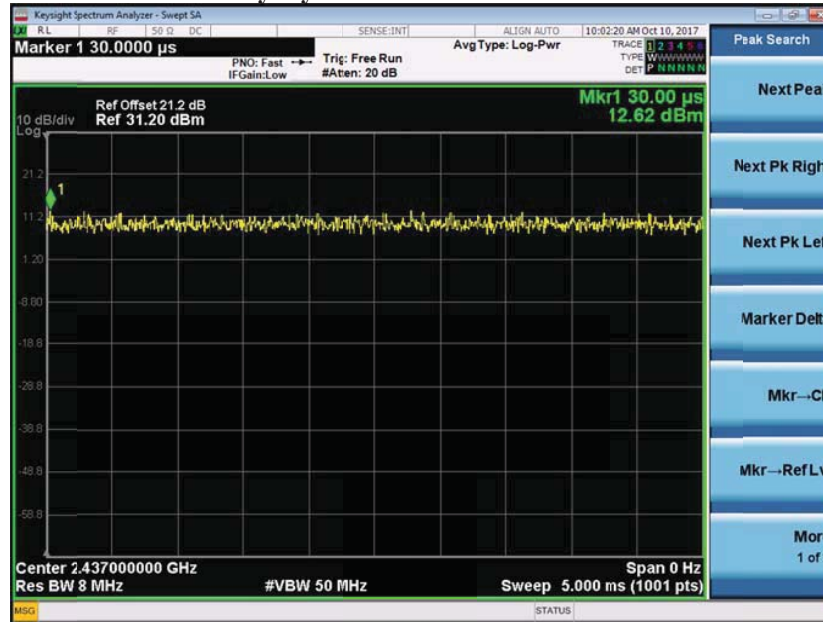
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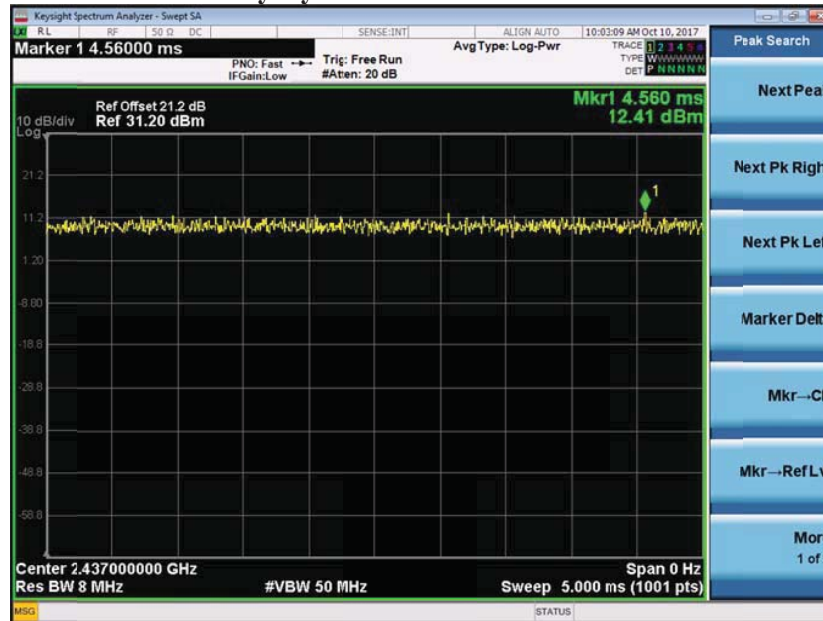


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Duty Cycle 802.11n HT40 Chain 0



Duty Cycle 802.11n HT40 Chain 1



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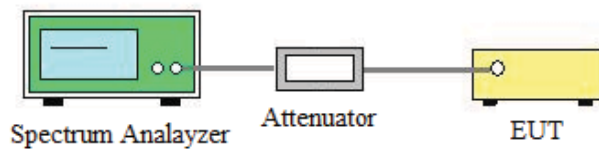
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7.2. 6 dB Bandwidth

Requirements

The minimum 6 dB bandwidth shall be at least 500 kHz.

Test Setup



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Test Data

Mode	Channel	Frequency (MHz)	6dB Bandwidth (MHz)	Limit (MHz)	Pass/Fail
802.11b (chain0)	1	2412	12.06	≥ 0.5	Pass
	6	2437	12.03	≥ 0.5	Pass
	11	2462	12.06	≥ 0.5	Pass
802.11g (chain0)	1	2412	16.3	≥ 0.5	Pass
	6	2437	16.32	≥ 0.5	Pass
	11	2462	16.3	≥ 0.5	Pass

Mode	Channel	Frequency (MHz)	6dB Bandwidth (MHz)		Limit (MHz)	Pass/Fail
			chain0	chain1		
802.11n HT20	1	2412	16.93	16.89	≥ 0.5	Pass
	6	2437	16.92	16.92	≥ 0.5	Pass
	11	2462	17.01	16.92	≥ 0.5	Pass
802.11n HT40	3	2422	35.34	35.34	≥ 0.5	Pass
	6	2437	35.63	35.35	≥ 0.5	Pass
	9	2452	35.66	35.35	≥ 0.5	Pass

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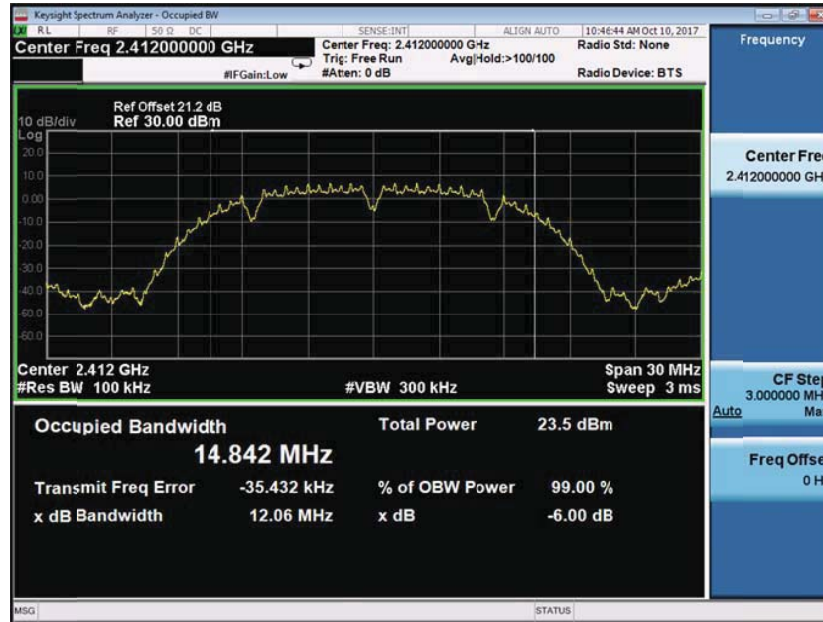
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6dB Bandwidth 802.11b Ch 1 2412MHz



6dB Bandwidth 802.11b Ch 6 2437MHz



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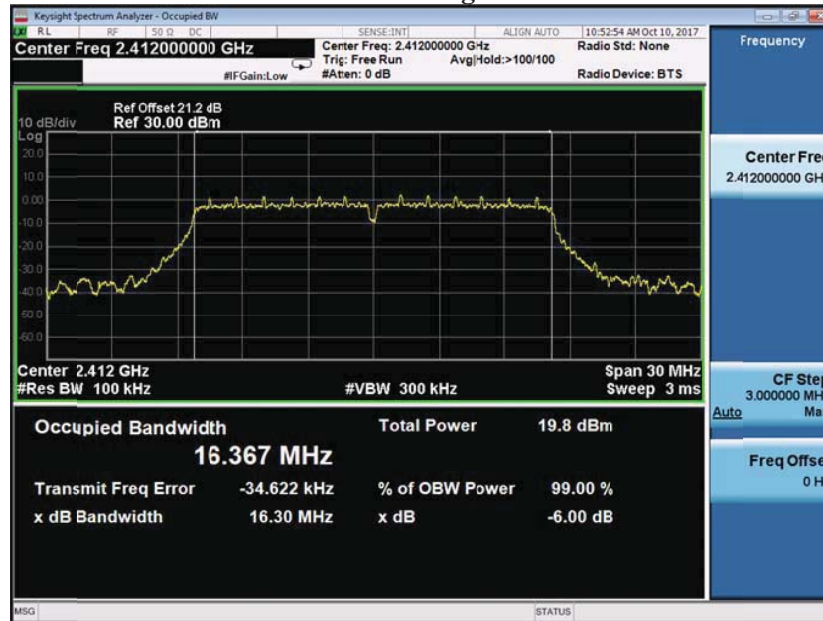


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6dB Bandwidth 802.11b Ch 11 2462MHz



6dB Bandwidth 802.11g Ch 1 2412MHz



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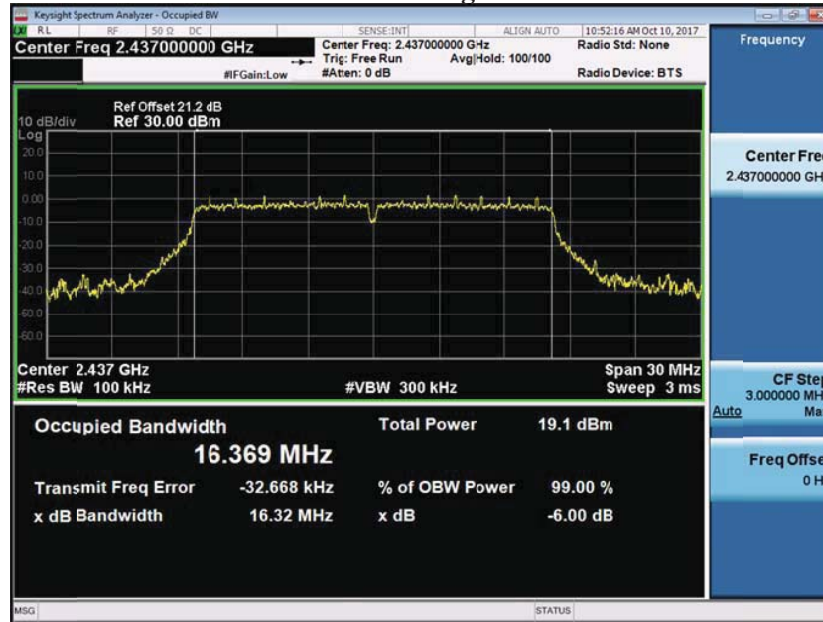
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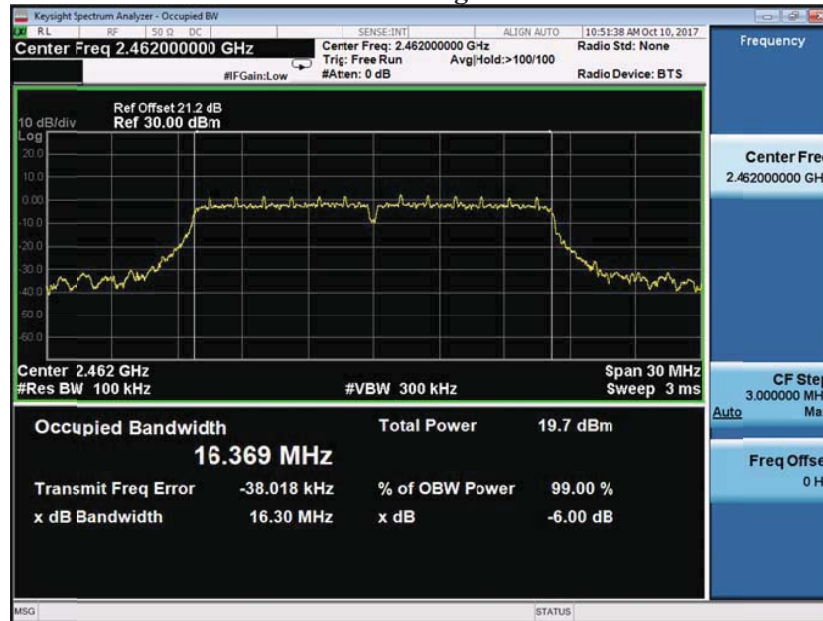


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6dB Bandwidth 802.11g Ch 6 2437MHz



6dB Bandwidth 802.11g Ch 11 2462MHz



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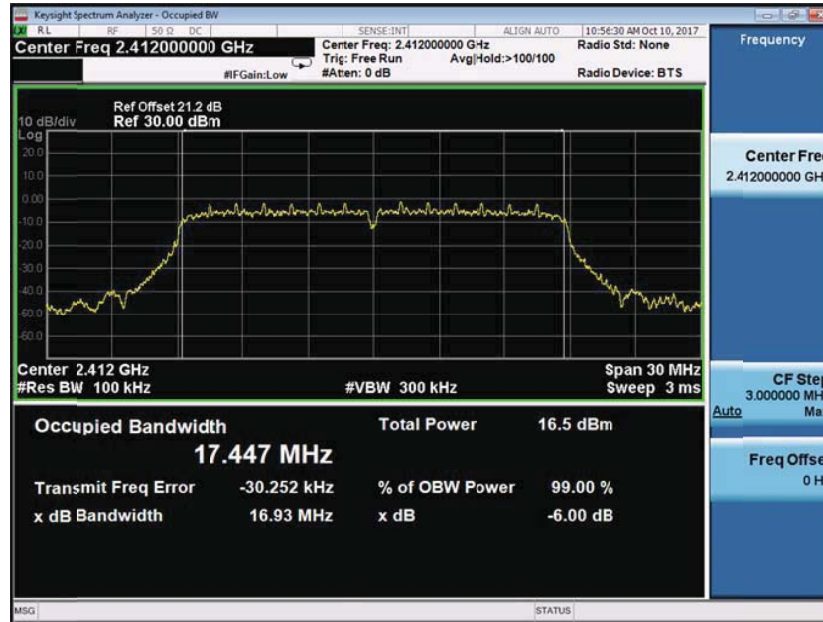
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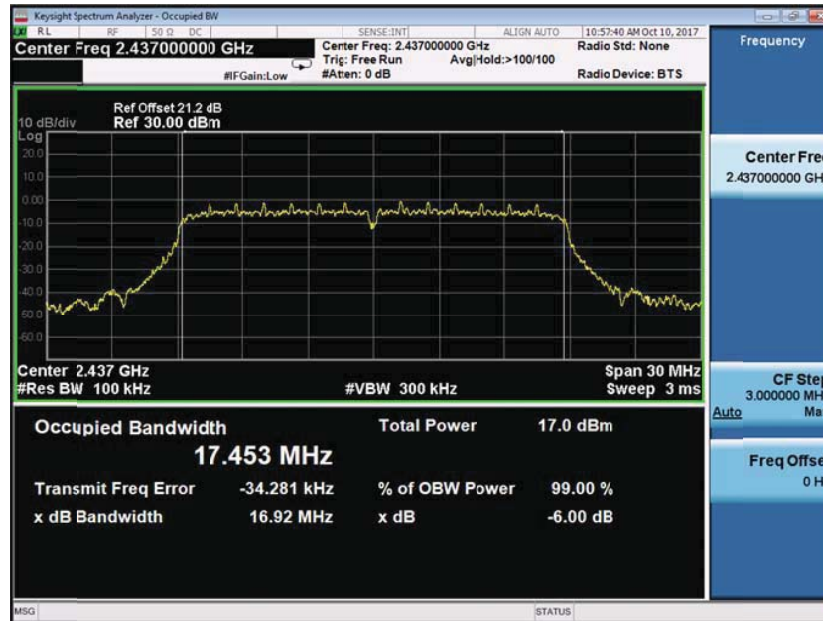


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6dB Bandwidth 802.11n HT20 Chain 0 Ch 1 2412MHz



6dB Bandwidth 802.11n HT20 Chain 0 Ch 6 2437MHz



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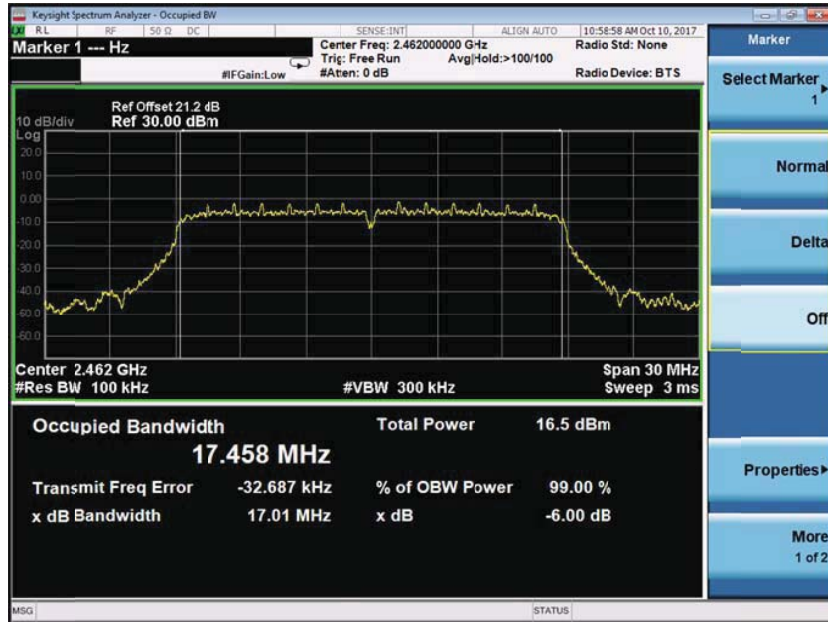
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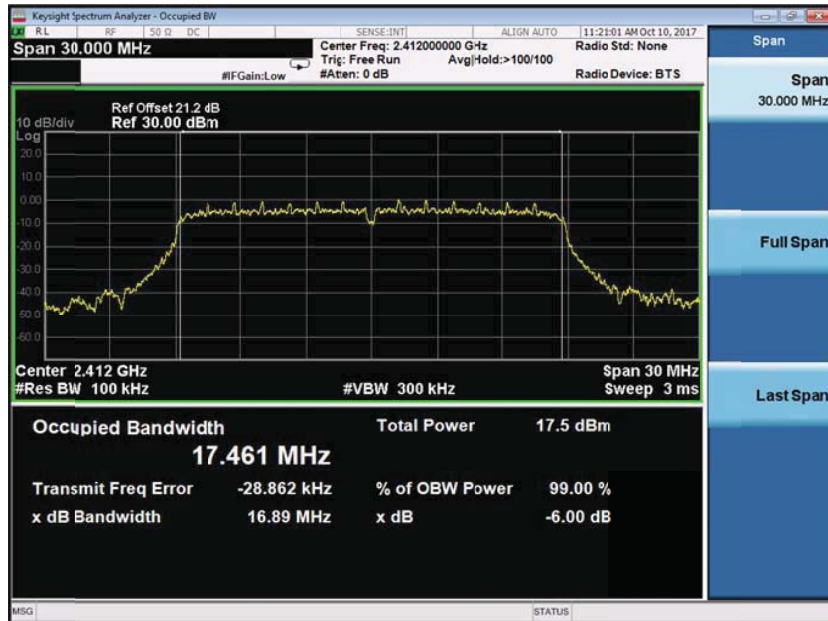


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6dB Bandwidth 802.11n HT20 Chain 1 Ch 1 2412MHz



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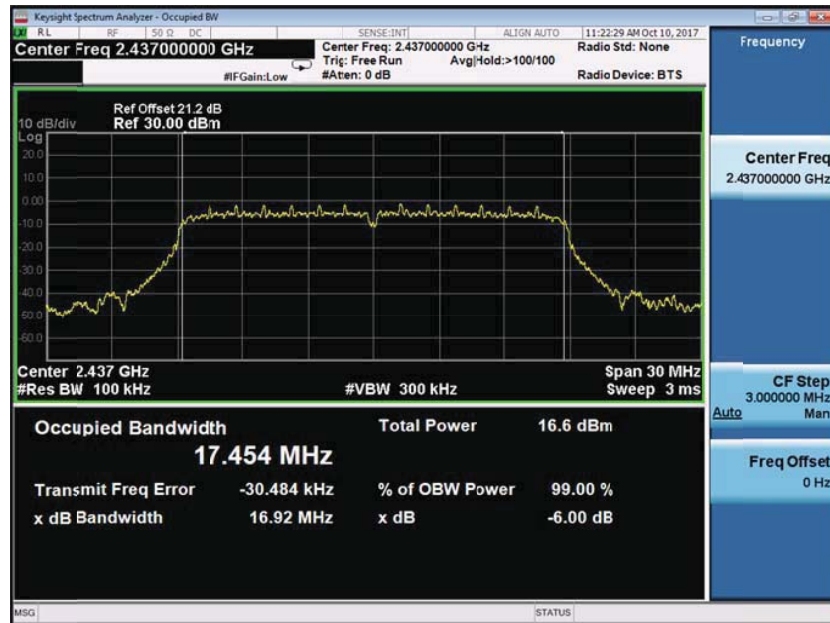
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Facsimile (FAX) :+886-2-7737-3610

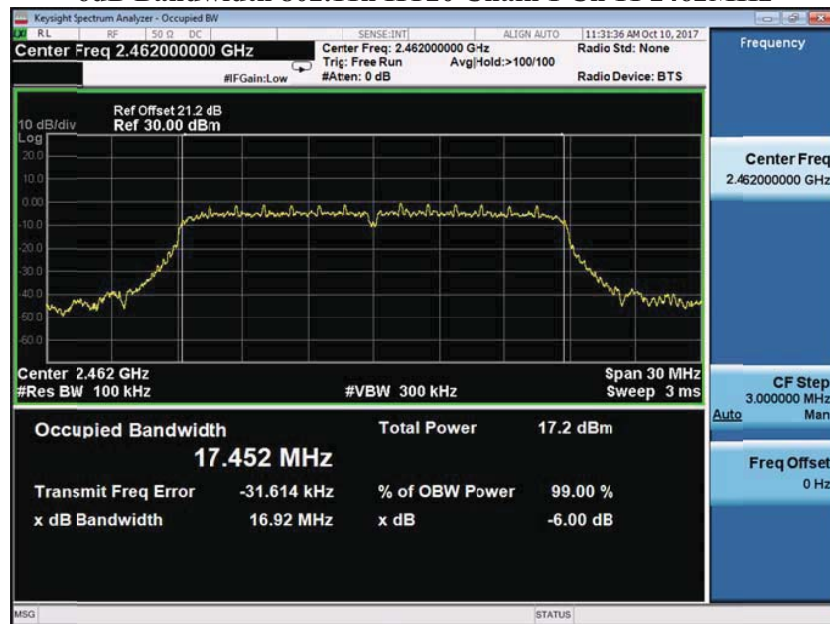


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6dB Bandwidth 802.11n HT20 Chain 1 Ch 6 2437MHz



6dB Bandwidth 802.11n HT20 Chain 1 Ch 11 2462MHz



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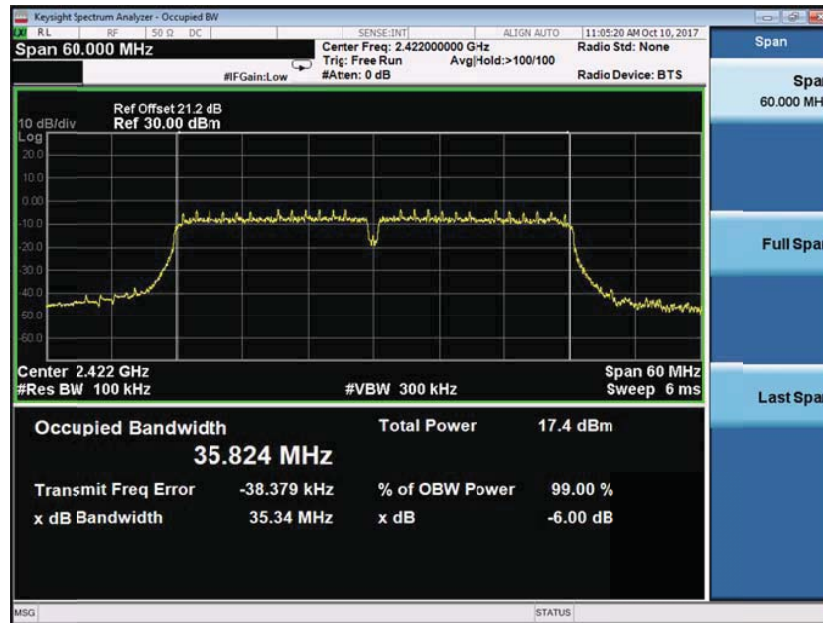
Telephone :+886-2-7737-3000

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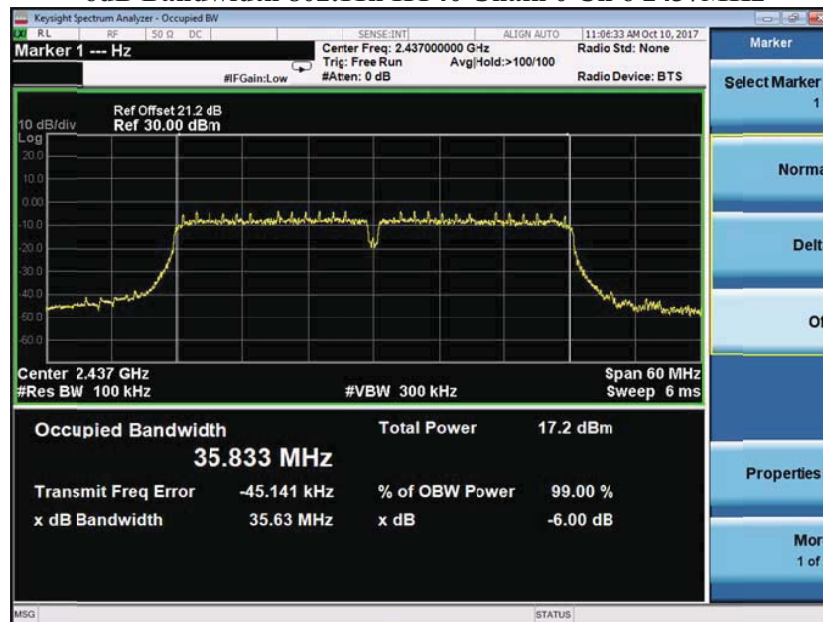


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6dB Bandwidth 802.11n HT40 Chain 0 Ch 3 2422MHz



6dB Bandwidth 802.11n HT40 Chain 0 Ch 6 2437MHz



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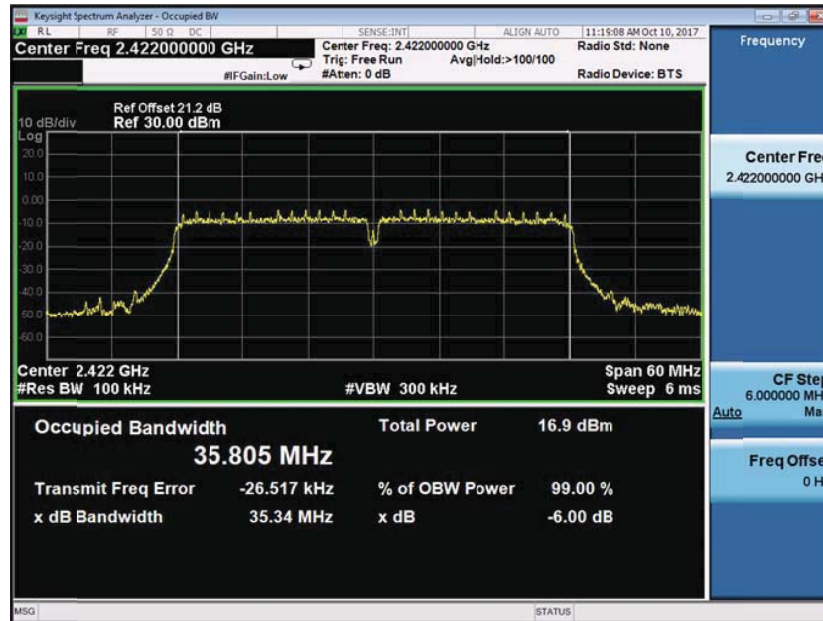


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6dB Bandwidth 802.11n HT40 Chain 0 Ch 9 2452MHz



6dB Bandwidth 802.11n HT40 Chain 1 Ch 3 2422MHz



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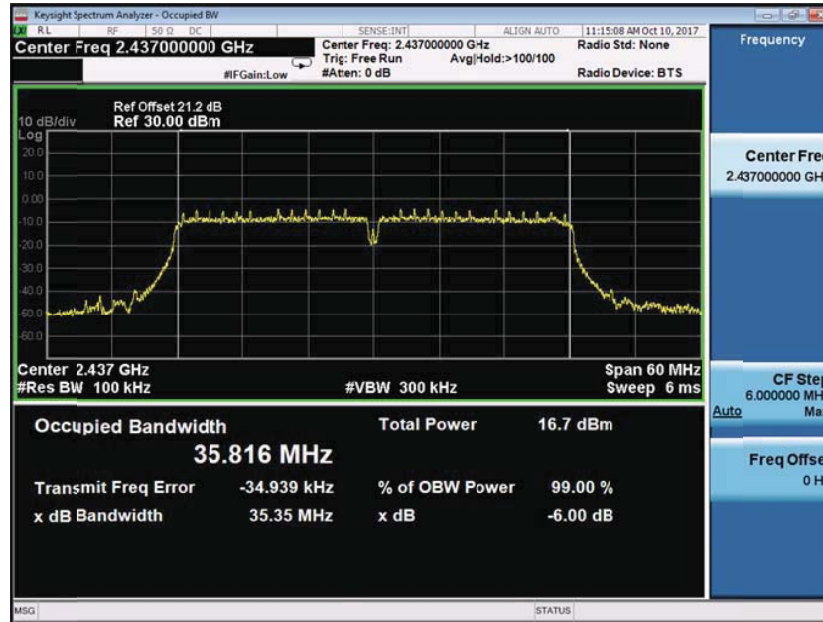
Telephone :+886-2-7737-3000

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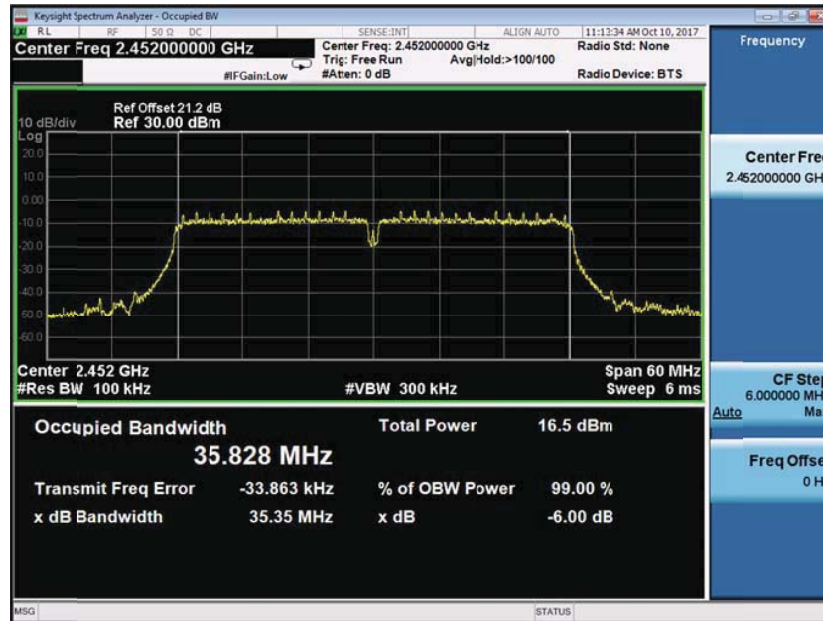


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6dB Bandwidth 802.11n HT40 Chain 1 Ch 6 2437MHz



6dB Bandwidth 802.11n HT40 Chain 1 Ch 9 2452MHz



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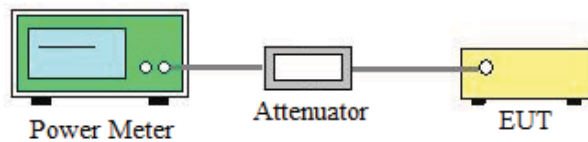
Test report No. : 4788166493A-US-R1-V0
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7.3. Maximum conducted output power

Requirements

For systems using digital modulation in the 2400-2483.5 MHz bands: 1 Watt.

Test Setup



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Test Data

Mode	Channel	Frequency (MHz)	Output Power (PK) (dBm)	Total Power (PK) (dBm)	Limit (dBm)	Margin (dB)
11b(chain0)	1	2412	18.99	18.99	30	-11.01
	6	2437	18.68	18.68	30	-11.32
	11	2462	18.15	18.15	30	-11.85
11g(chain0)	1	2412	22.05	22.05	30	-7.95
	6	2437	22.2	22.20	30	-7.80
	11	2462	22.26	22.26	30	-7.74

Mode	Channel	Frequency (MHz)	Output Power (dBm)		Total Power	Limit (dBm)	Margin (dB)
			Chain 0	Chain 1	0+1(dBm)		
			PK	PK	PK		
11n (20M)	1	2412	19.87	19.72	22.81	30	-7.19
	6	2437	19.48	19.97	22.74	30	-7.26
	11	2462	19.57	19.35	22.47	30	-7.53
11n (40M)	3	2422	20.02	20.06	23.05	30	-6.95
	6	2437	19.68	19.62	22.66	30	-7.34
	9	2452	19.61	19.68	22.66	30	-7.34

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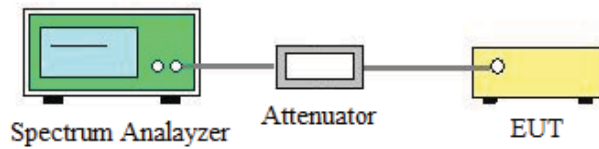
Test report No. : 4788166493A-US-R1-V0
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7.4. Power Spectral Density

Requirements

For digitally modulated systems, the power spectral density conducted from the intentional radiator to the antenna shall not be greater than 8 dBm in any 3 kHz band during any time interval of continuous transmission.

Test Setup



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Test Data

Mode	Channel	Frequency (MHz)	Total PSD (dBm/3kHz)	Limit (dBm)	Margin (dB)
11b (chain0)	1	2412	-13.617	8	-21.617
	6	2437	-14.094	8	-22.094
	11	2462	-14.52	8	-22.520
11g (chain0)	1	2412	-13.508	8	-21.508
	6	2437	-13.849	8	-21.849
	11	2462	-14.684	8	-22.684

Mode	Channel	Frequency (MHz)	PSD (dBm/3kHz)		Total PSD dBm/3kHz	Limit (dBm)	Margin (dB)
			chain0	chain1			
11n (HT20)	1	2412	-16.267	-15.708	-12.968	8	-20.968
	6	2437	-15.065	-15.977	-12.487	8	-20.487
	11	2462	-17.087	-16.076	-13.542	8	-21.542
11n (HT40)	3	2422	-19.22	-16.77	-14.814	8	-22.814
	6	2437	-18.738	-17.111	-14.838	8	-22.838
	9	2452	-19.547	-16.972	-15.061	8	-23.061

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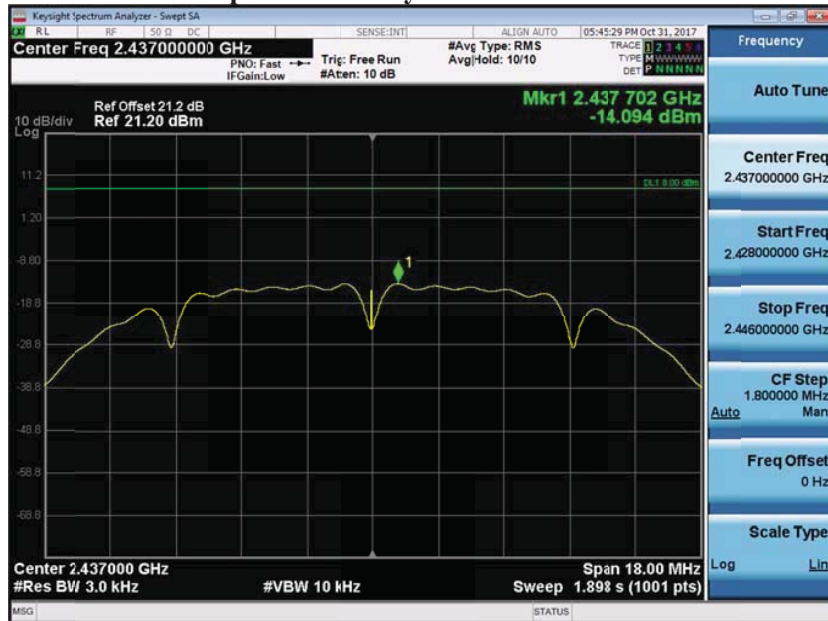


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Power Spectral Density 802.11b Ch 1 2412MHz



Power Spectral Density 802.11b Ch 6 2437MHz



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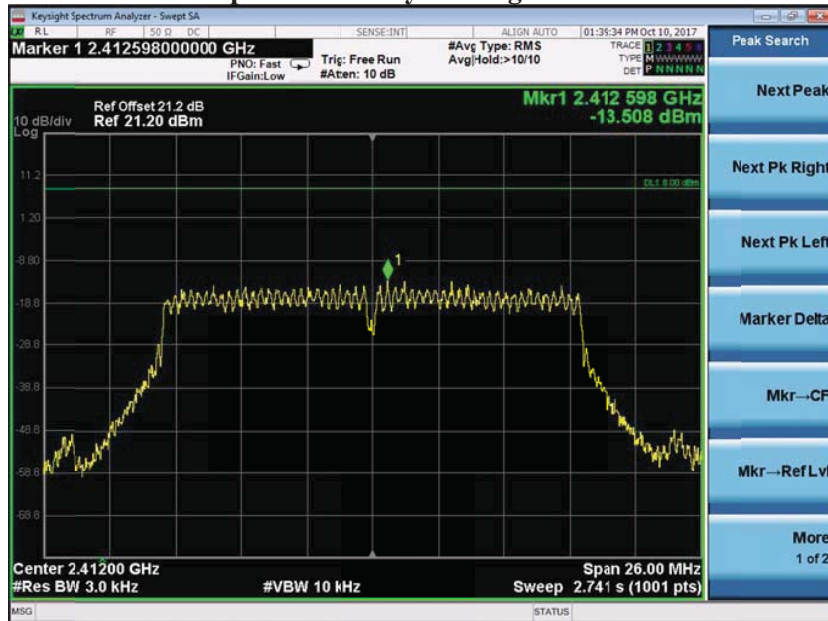


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Power Spectral Density 802.11b Ch 11 2462MHz



Power Spectral Density 802.11g Ch 1 2412MHz



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Power Spectral Density 802.11g Ch 6 2437MHz



Power Spectral Density 802.11g Ch 11 2462MHz



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Power Spectral Density 802.11n HT20 Chain 0 Ch 1 2412MHz



Power Spectral Density 802.11n HT20 Chain 0 Ch 6 2437MHz



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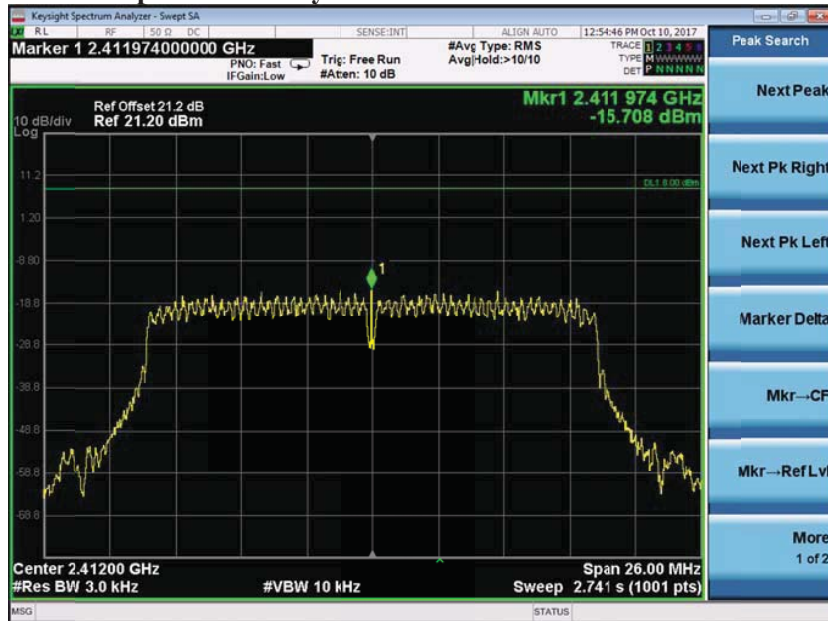


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Power Spectral Density 802.11n HT20 Chain 0 Ch 11 2462MHz



Power Spectral Density 802.11n HT20 Chain 1 Ch 1 2412MHz



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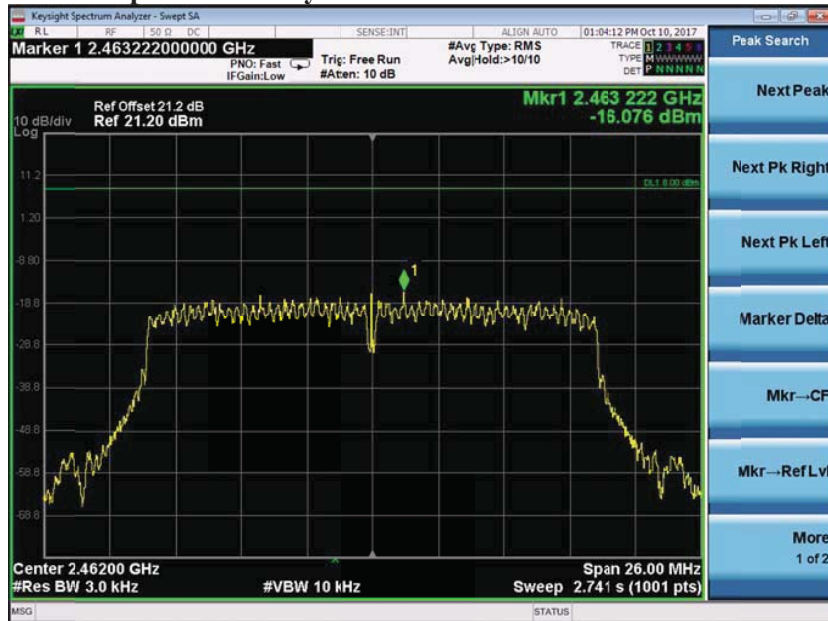


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Power Spectral Density 802.11n HT20 Chain 1 Ch 6 2437MHz



Power Spectral Density 802.11n HT20 Chain 1 Ch 11 2462MHz



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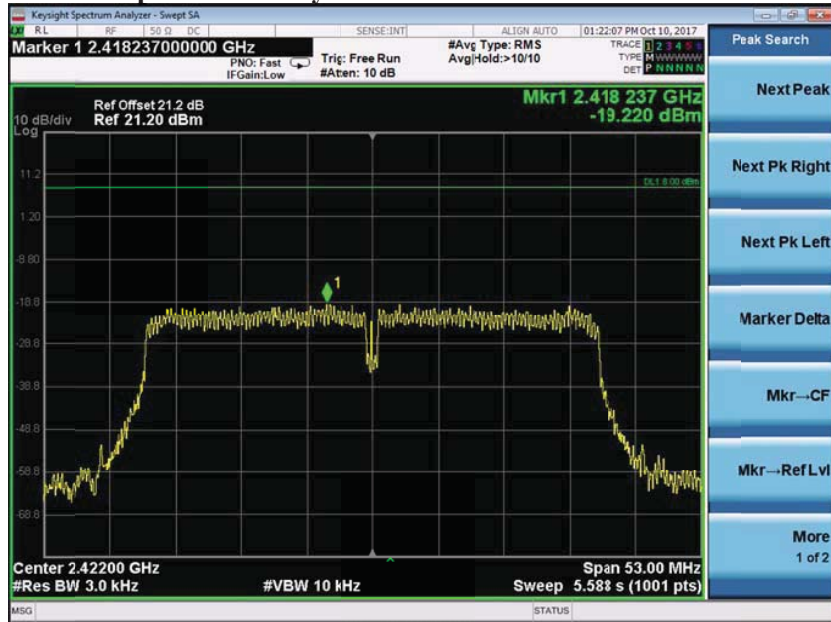
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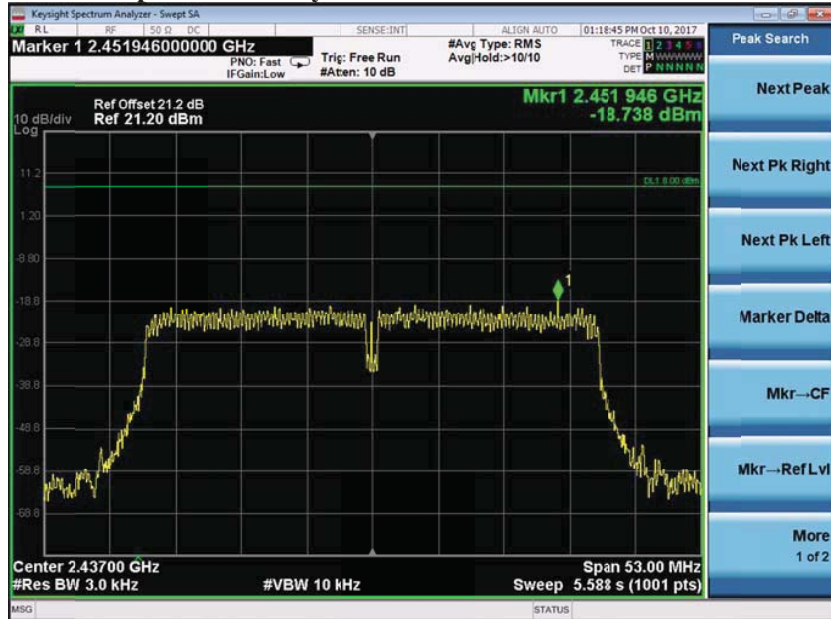


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FCC ID : A43-WISP5

Power Spectral Density 802.11n HT40 Chain 0 Ch 3 2422MHz



Power Spectral Density 802.11n HT40 Chain 0 Ch 6 2437MHz



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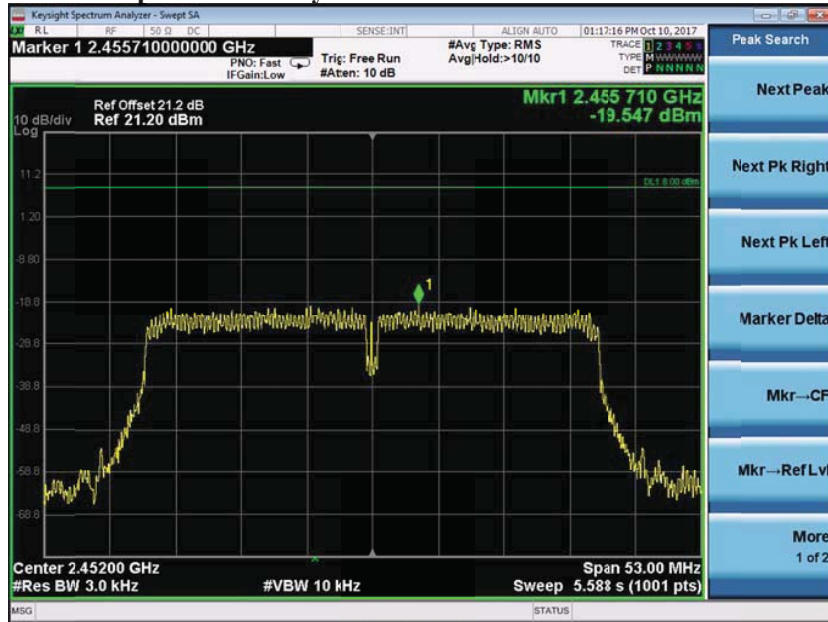
Telephone :+886-2-7737-3000

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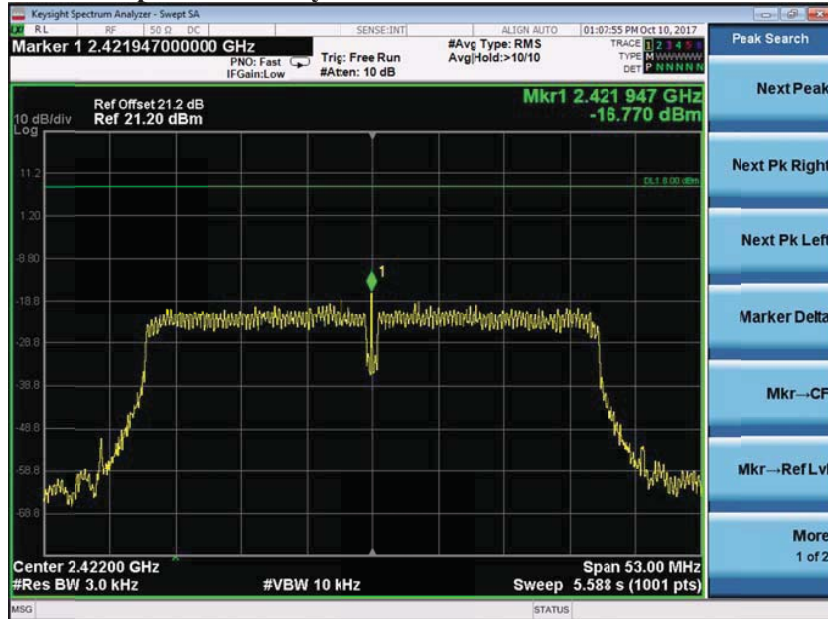


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Issued date : 2017/11/02
FCC ID : A43-WISP5

Power Spectral Density 802.11n HT40 Chain 0 Ch 9 2452MHz



Power Spectral Density 802.11n HT40 Chain 1 Ch 3 2422MHz



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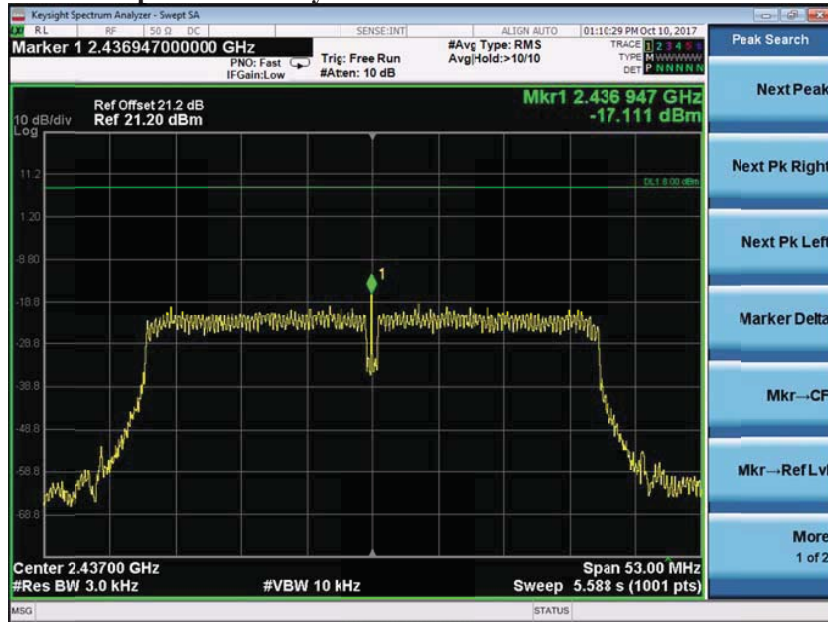
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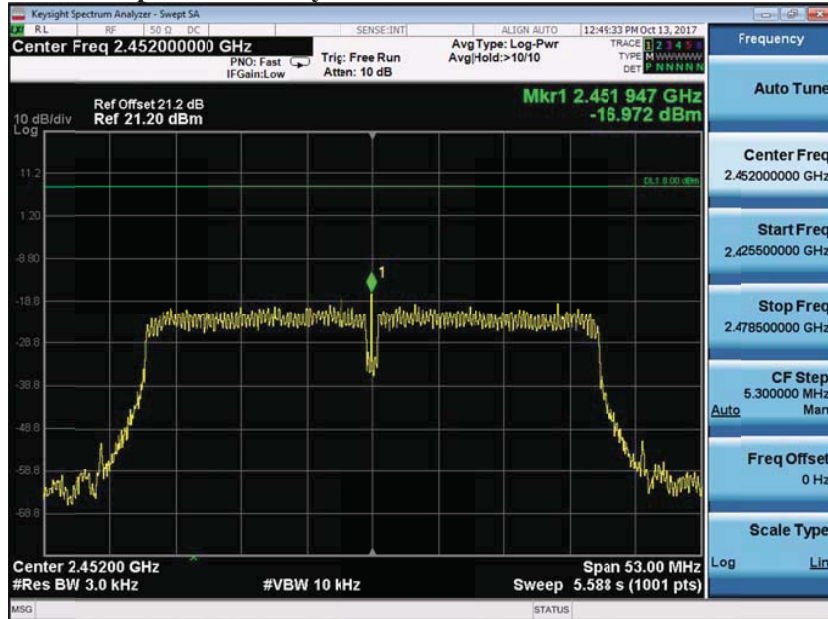


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Power Spectral Density 802.11n HT40 Chain 1 Ch 6 2437MHz



Power Spectral Density 802.11n HT40 Chain 1 Ch 9 2452MHz



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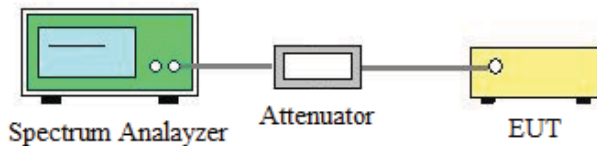


7.5. Out of Band Emission

Requirements

In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator 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, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under paragraph (b)(3) of this section, the attenuation required under this paragraph shall be 30 dB instead of 20 dB. Attenuation below the general limits specified in §15.209(a) is not required.

Test Setup



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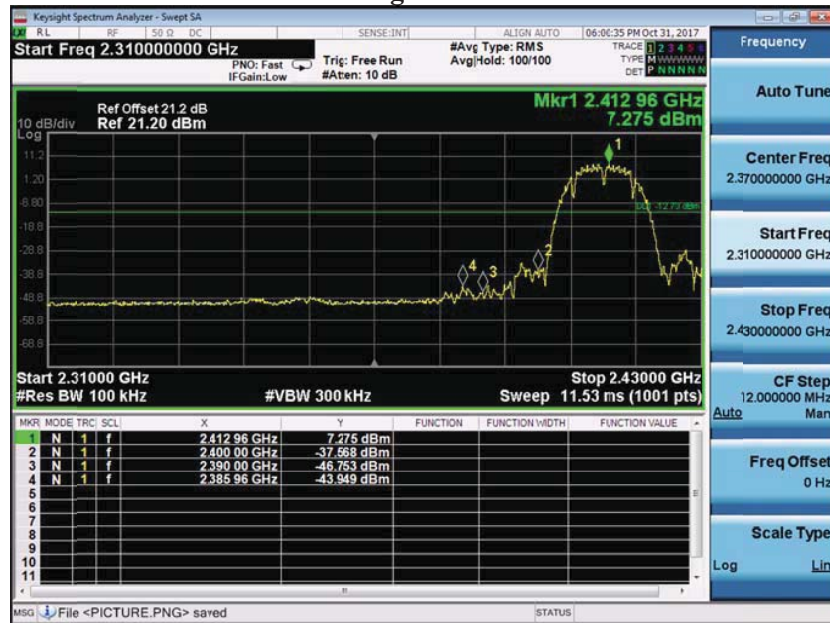
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Test Data

Authorized Band Edge 802.11b Ch 1 2412MHz



Reference 802.11b Ch 6 2437MHz



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Authorized Band Edge 802.11b Ch 11 2462MHz



Authorized Band Edge 802.11g Ch 1 2412MHz



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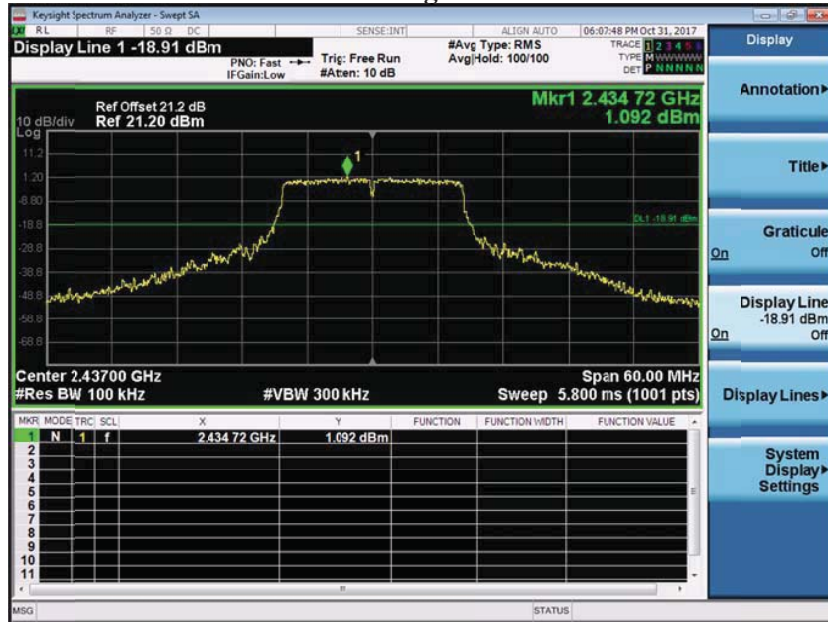
Telephone :+886-2-7737-3000

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Reference 802.11g Ch 6 2437MHz



Authorized Band Edge 802.11g Ch 11 2462MHz



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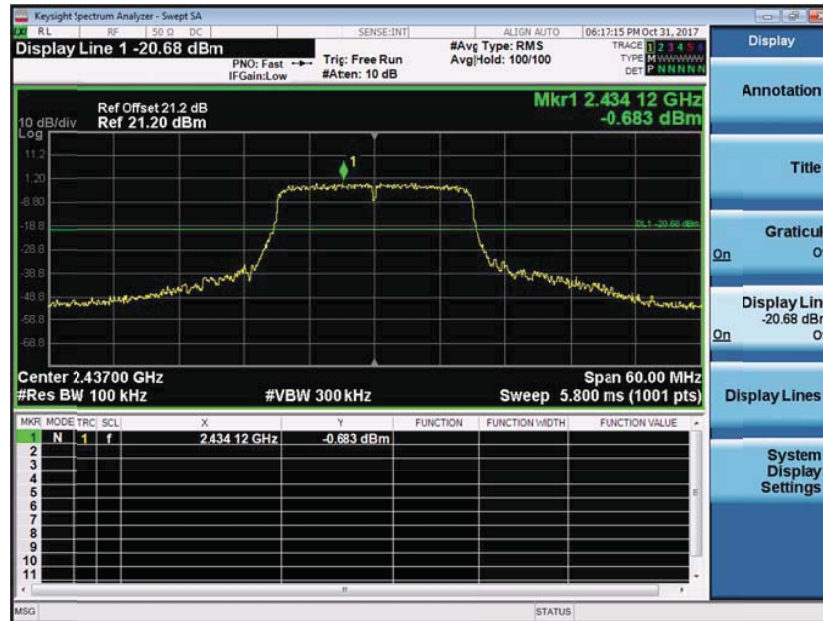


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Authorized Band Edge 802.11n HT20 Chain 0 Ch 1 2412MHz



Reference 802.11n HT20 Chain 0 Ch 6 2437MHz



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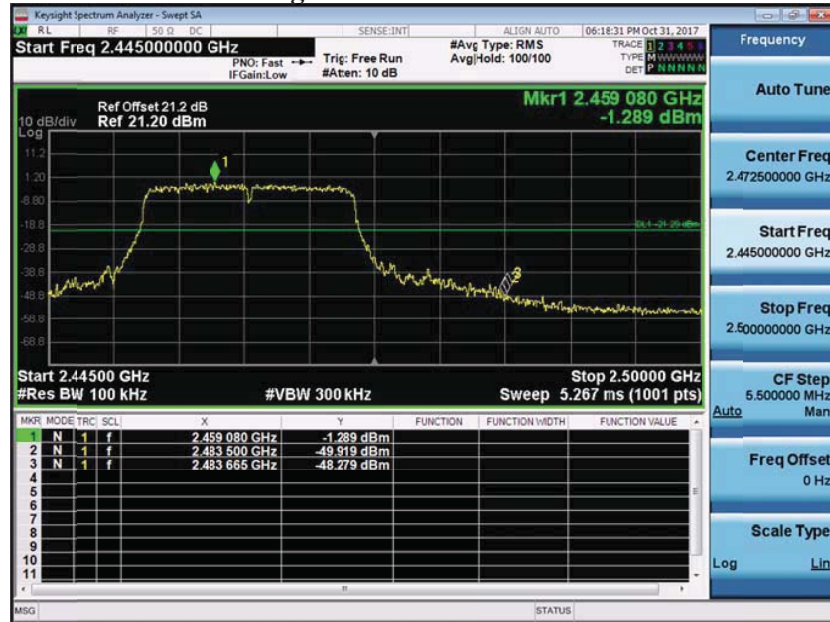
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Authorized Band Edge 802.11n HT20 Chain 1 Ch 1 2412MHz



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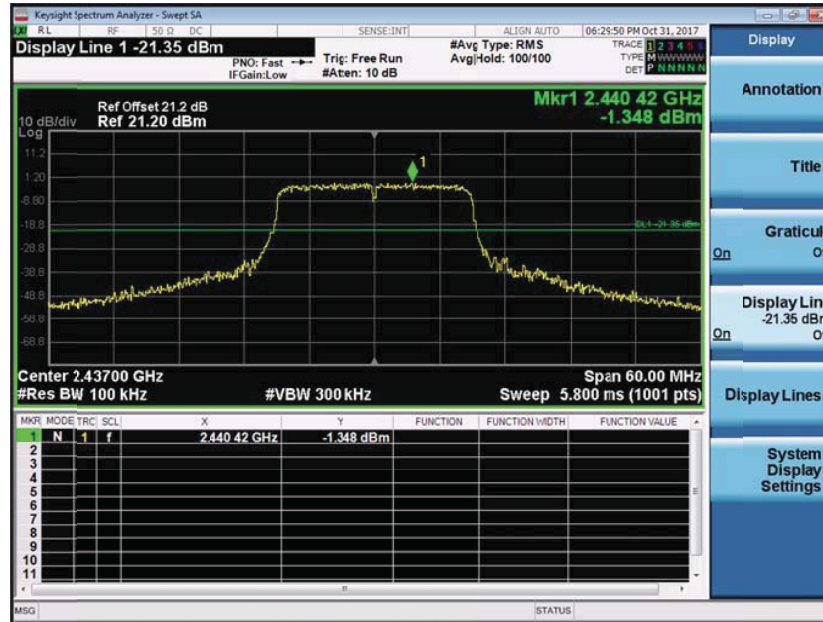
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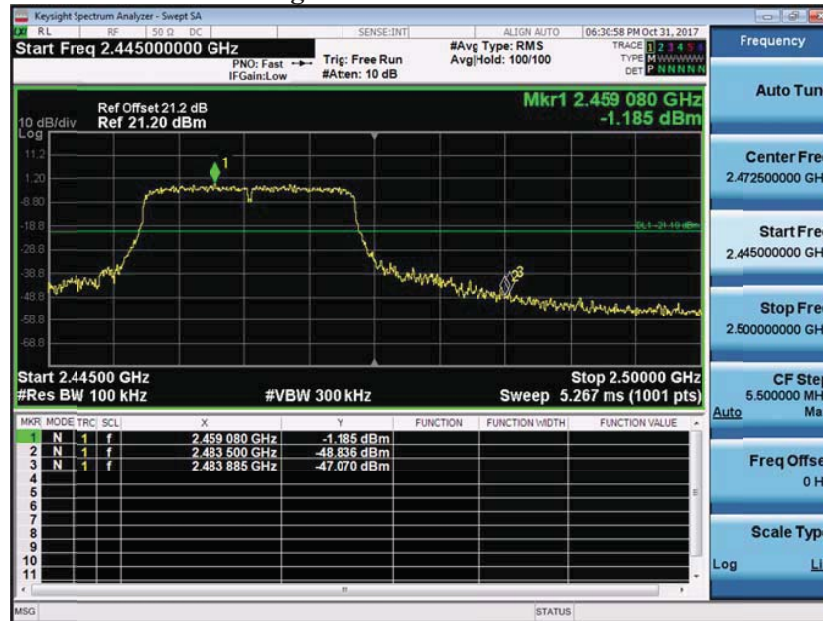


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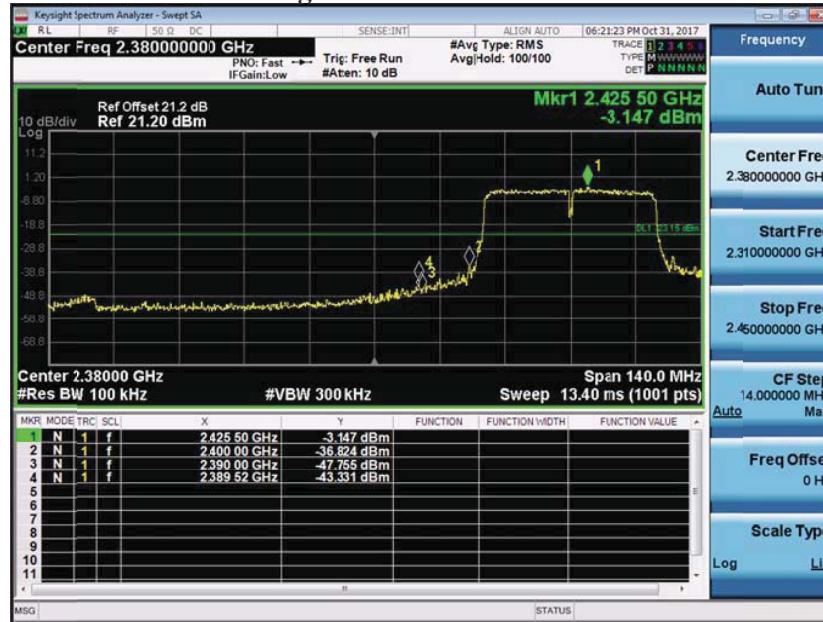
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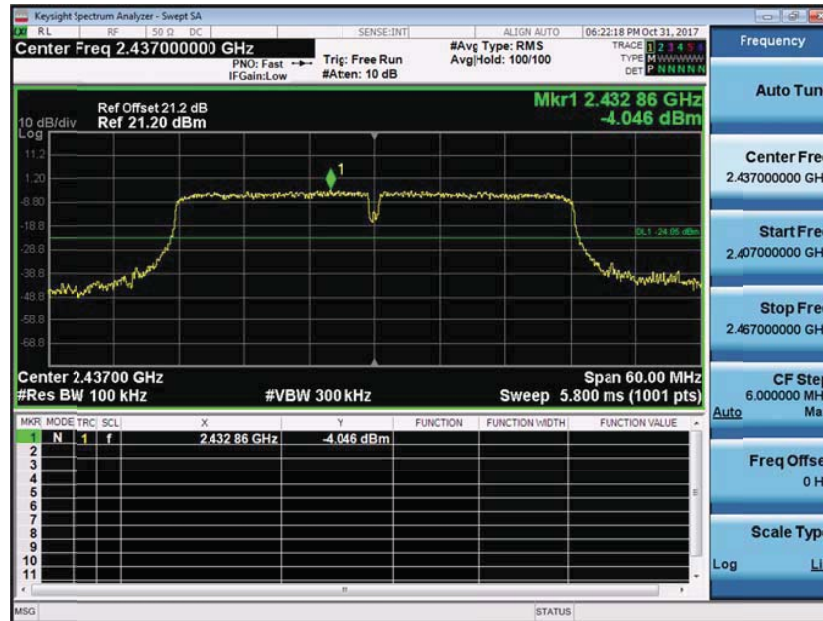


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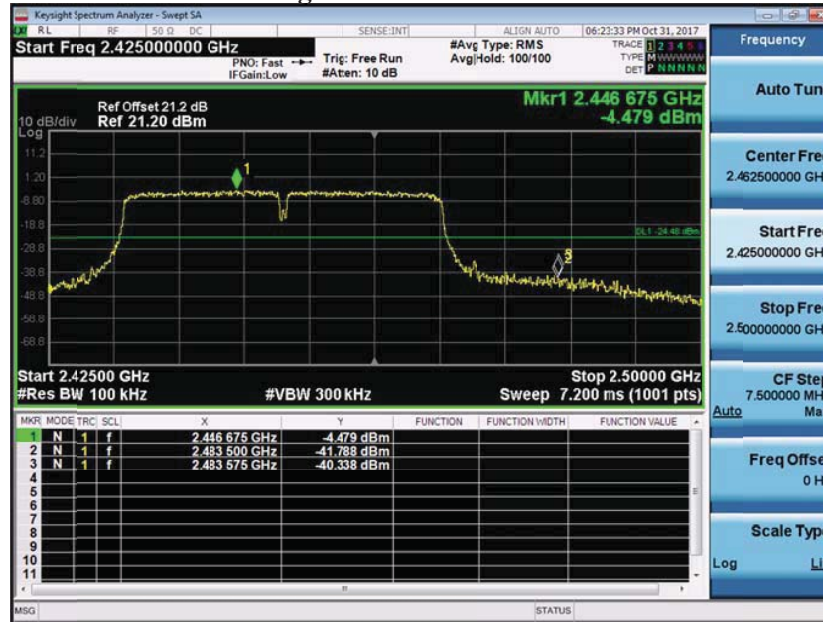
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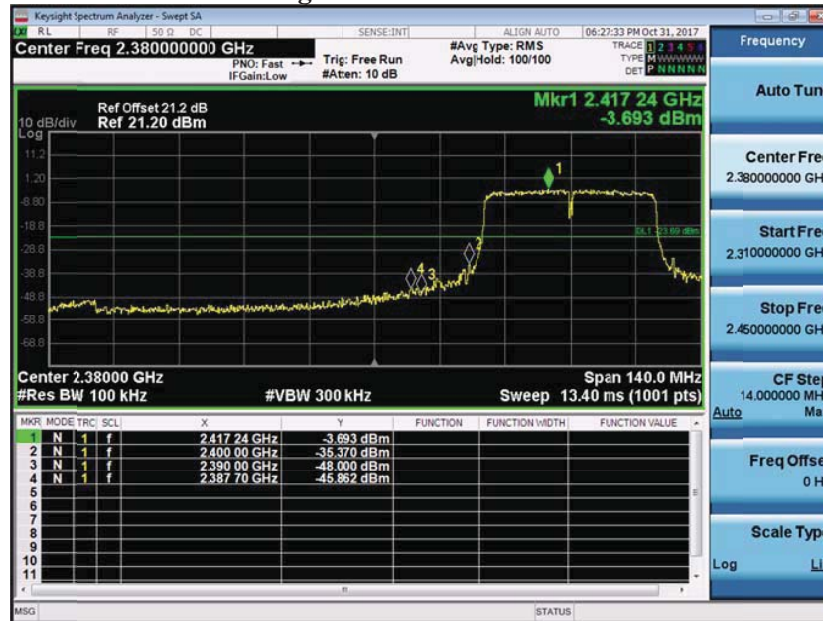


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Authorized Band Edge 802.11n HT40 Chain 0 Ch 9 2452MHz



Authorized Band Edge 802.11n HT40 Chain 1 Ch 3 2422MHz



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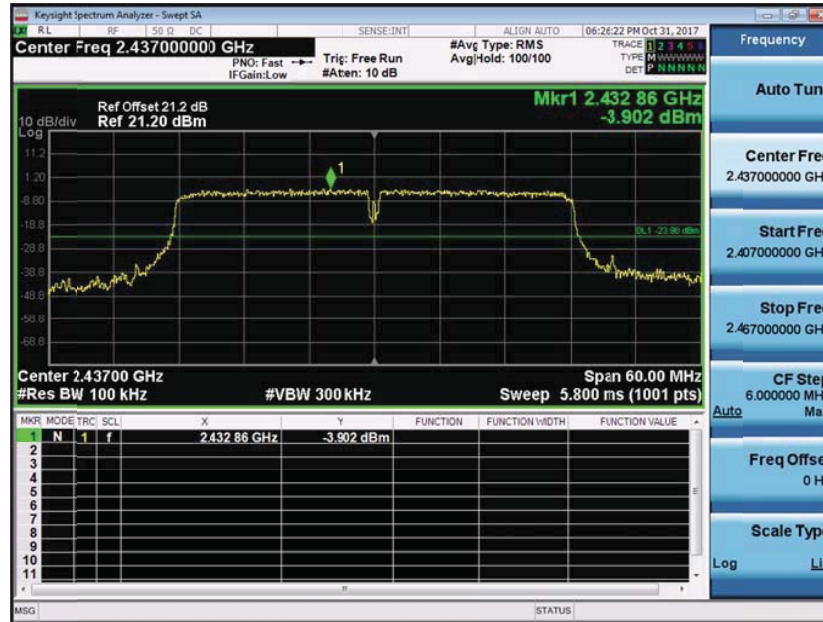
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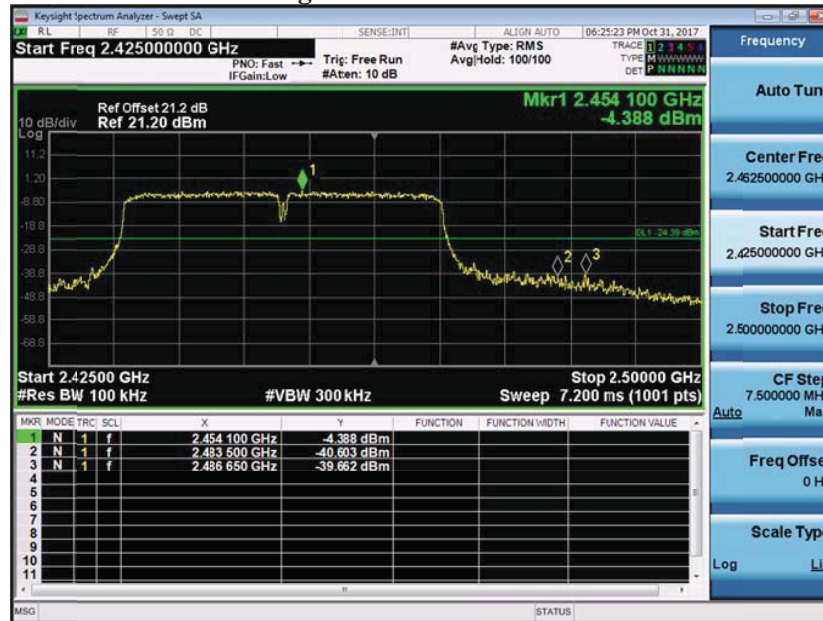


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Authorized Band Edge 802.11n HT40 Chain 1 Ch 9 2452MHz



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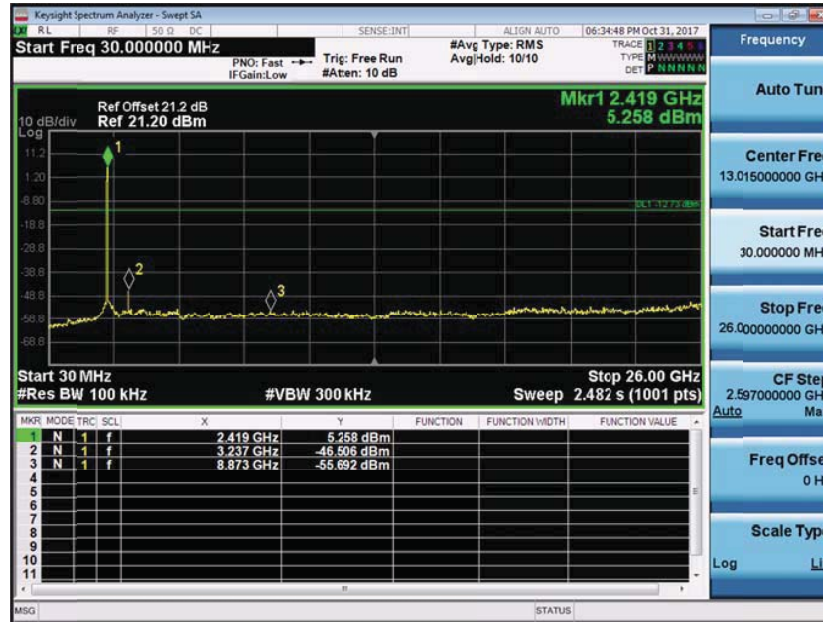
Telephone :+886-2-7737-3000

Facsimile (FAX) :+886-2-7737-3610

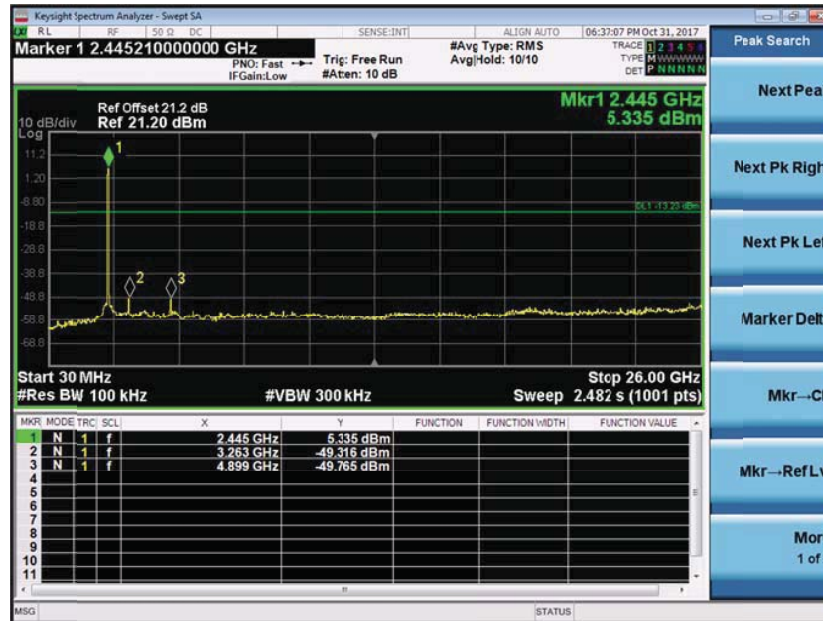


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Out of Band Emission 802.11b Ch 1 2412MHz



Out of Band Emission 802.11b Ch 6 2437MHz



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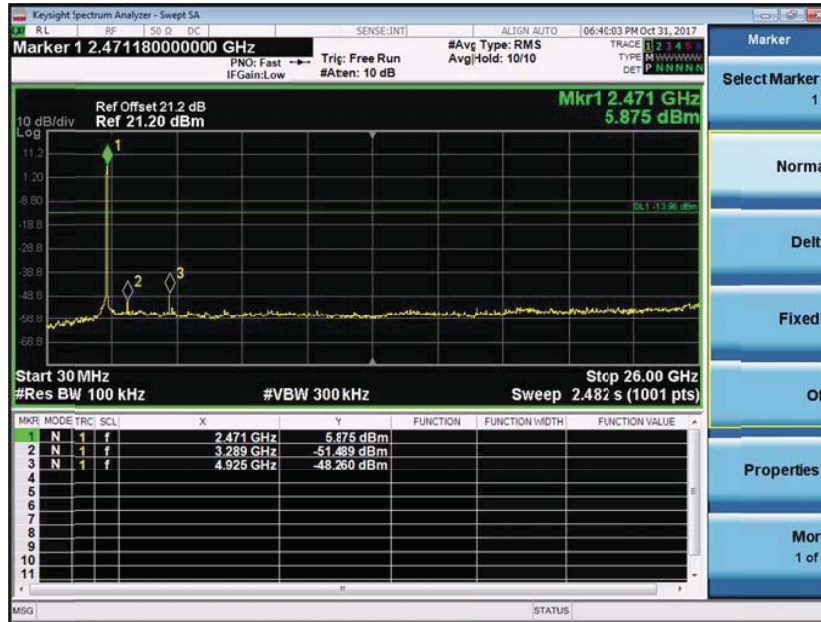
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Facsimile (FAX) :+886-2-7737-3610

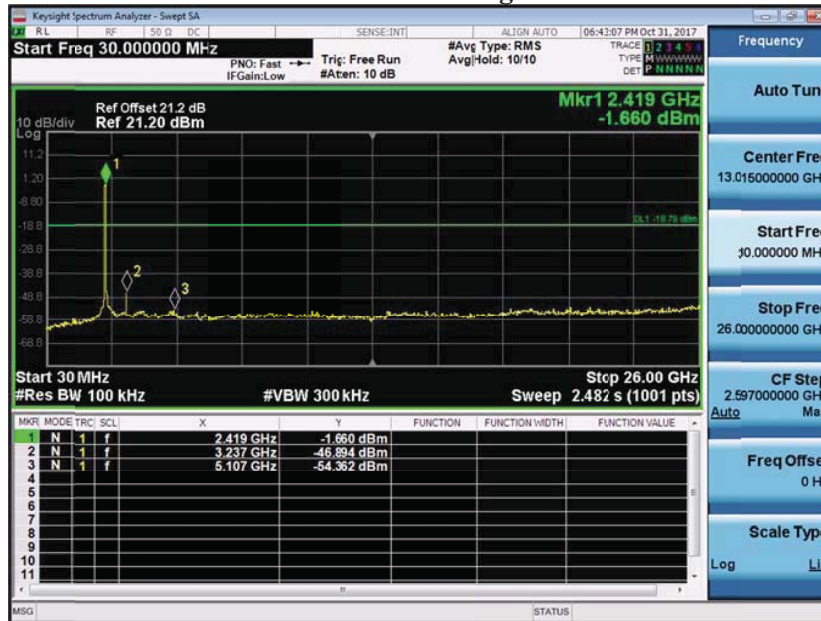


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Out of Band Emission 802.11b Ch 11 2462MHz



Out of Band Emission 802.11g Ch 1 2412MHz



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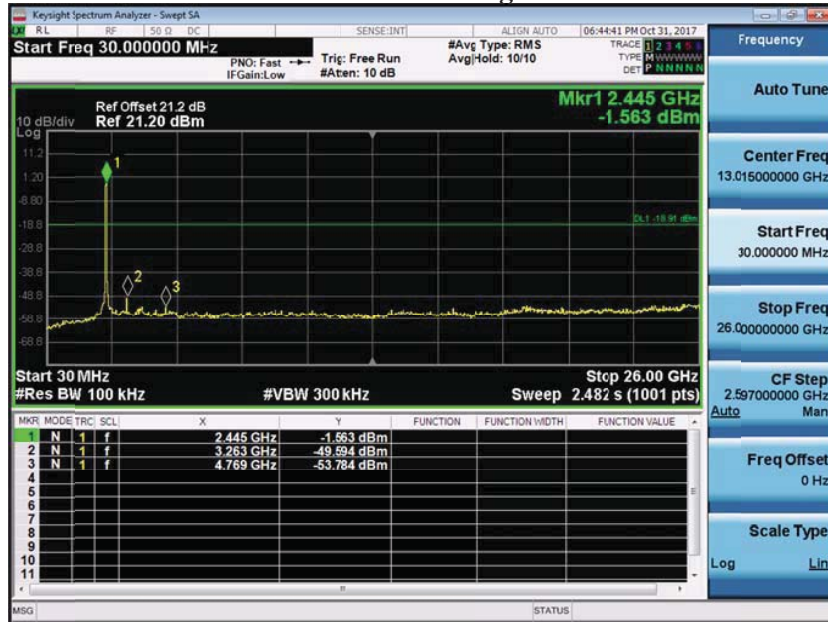
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Facsimile (FAX) :+886-2-7737-3610

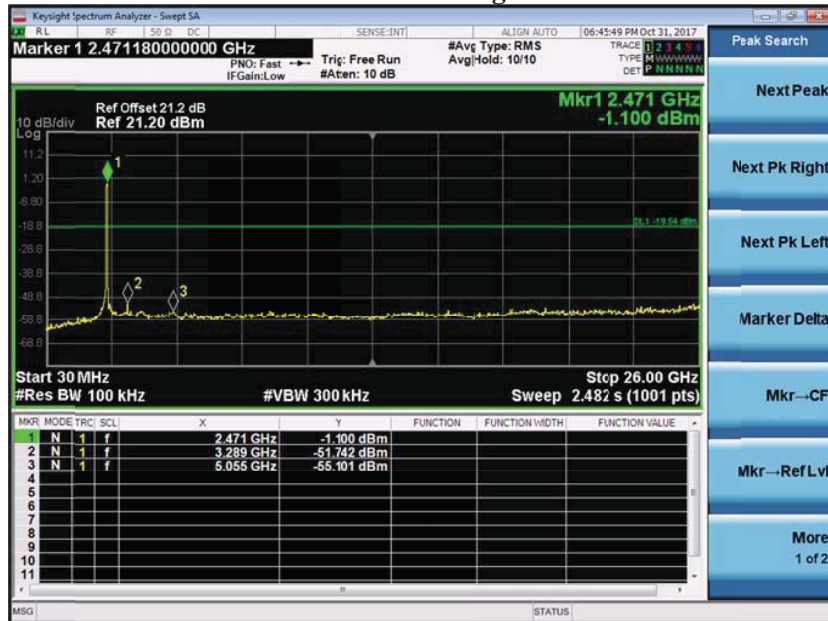


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Out of Band Emission 802.11g Ch 6 2437MHz



Out of Band Emission 802.11g Ch 11 2462MHz



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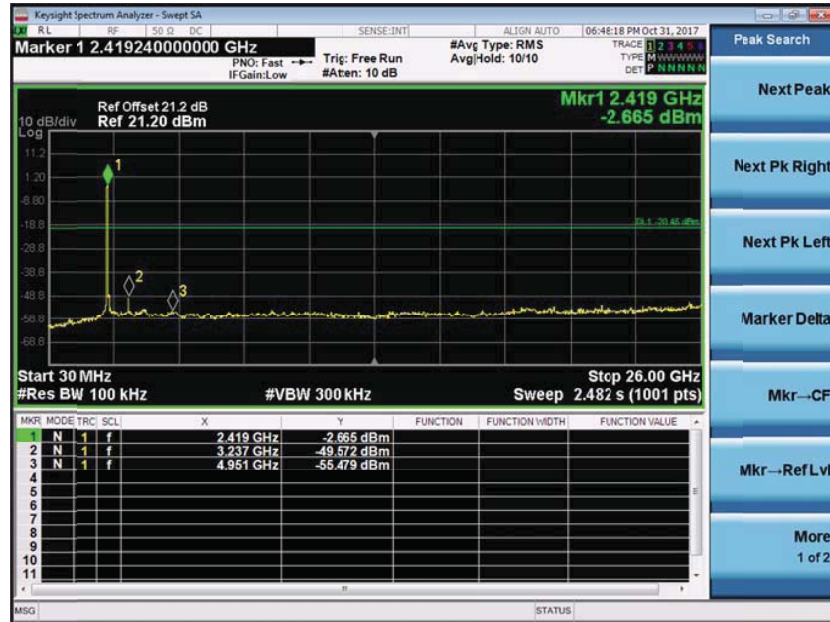
Telephone :+886-2-7737-3000

Facsimile (FAX) :+886-2-7737-3610

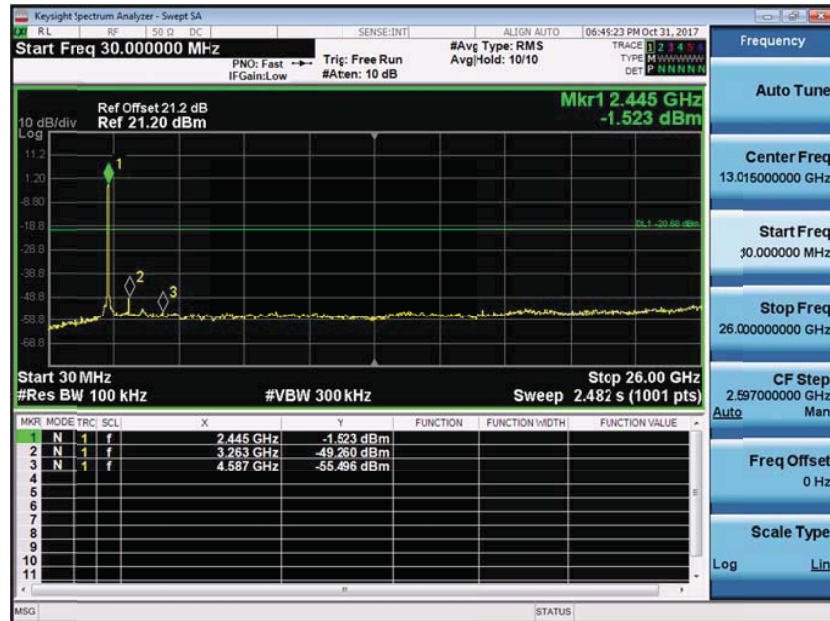


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Out of Band Emission 802.11n HT20 Chain 0 Ch 1 2412MHz



Out of Band Emission 802.11n HT20 Chain 0 Ch 6 2437MHz



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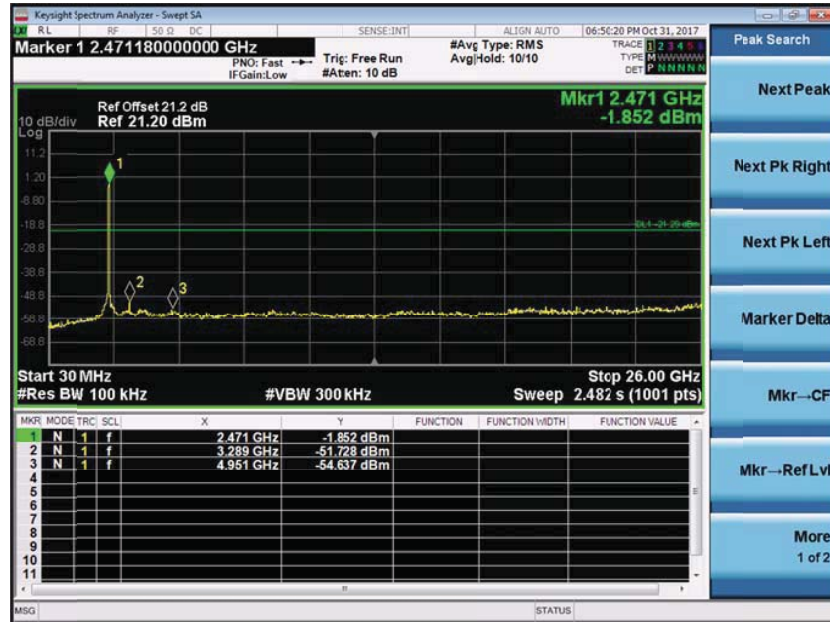
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Facsimile (FAX) :+886-2-7737-3610

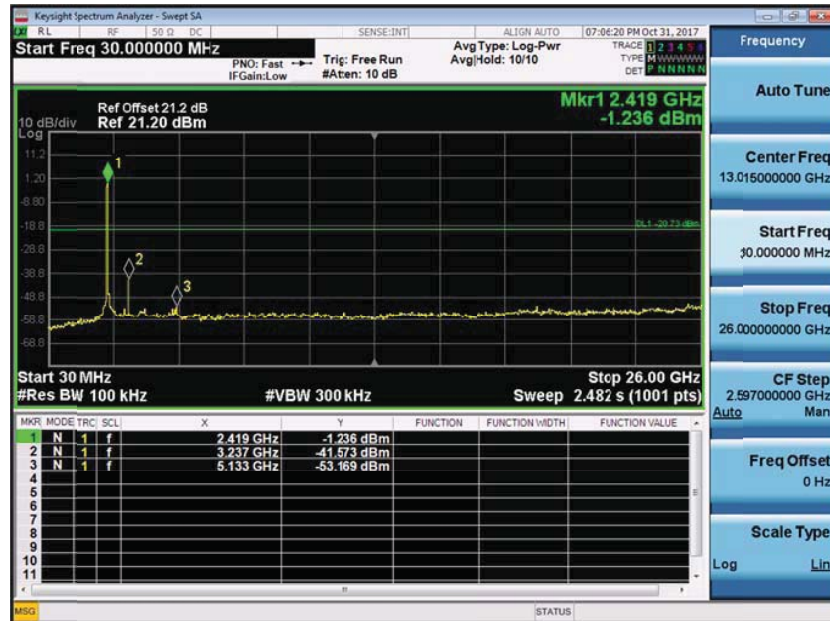


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Out of Band Emission 802.11n HT20 Chain 0 Ch 11 2462MHz



Out of Band Emission 802.11n HT20 Chain 1 Ch 1 2412MHz



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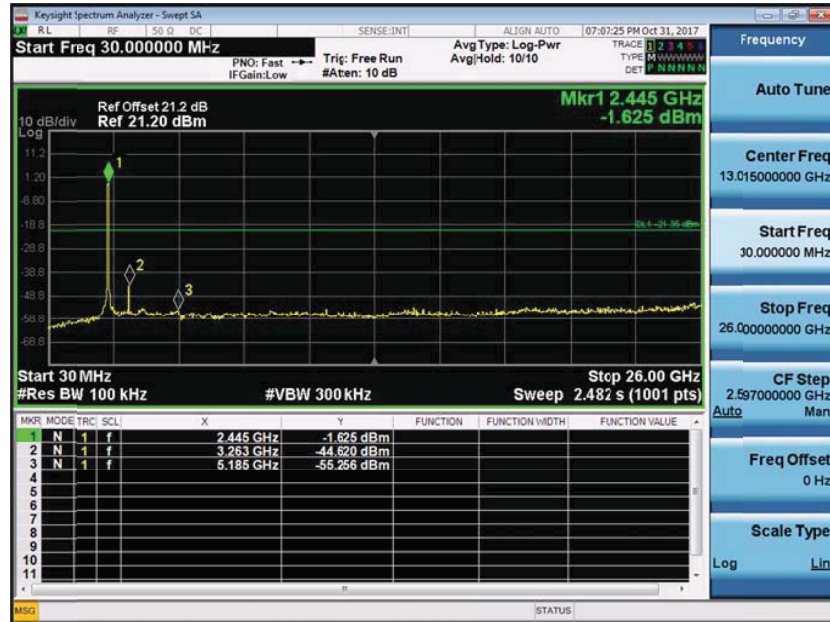
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Telephone :+886-2-7737-3000
Facsimile (FAX) :+886-2-7737-3610

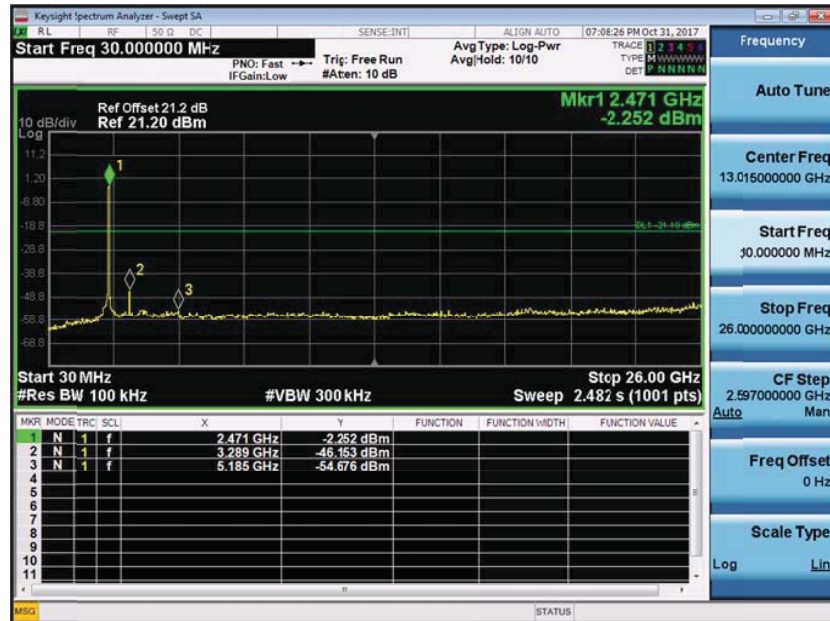


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Out of Band Emission 802.11n HT20 Chain 1 Ch 6 2437MHz



Out of Band Emission 802.11n HT20 Chain 1 Ch 11 2462MHz



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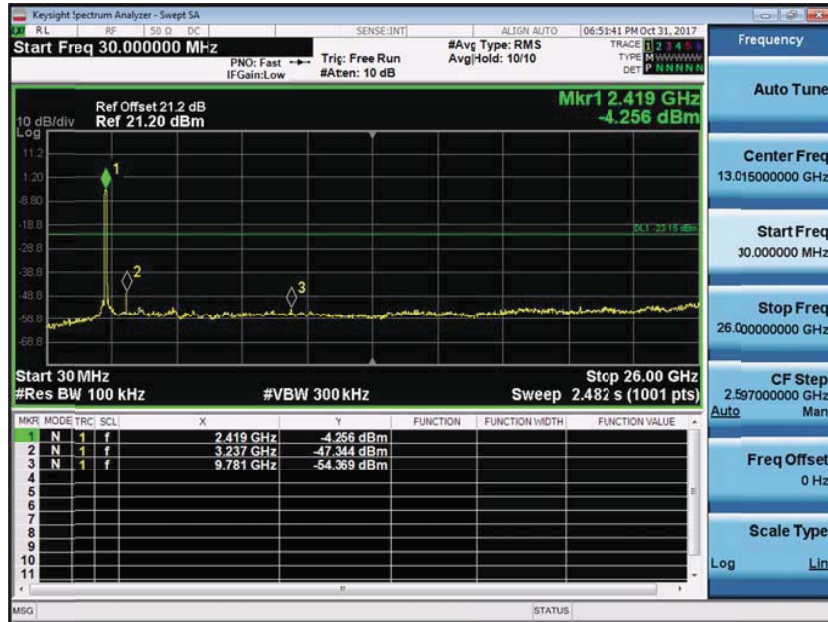
Telephone :+886-2-7737-3000

Facsimile (FAX) :+886-2-7737-3610

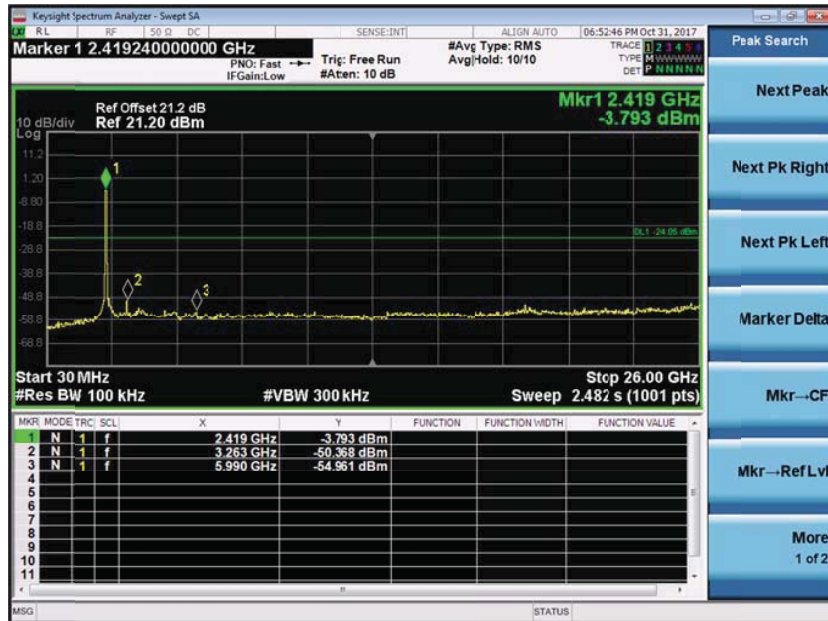


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Out of Band Emission 802.11n HT40 Chain 0 Ch 3 2422MHz



Out of Band Emission 802.11n HT40 Chain 0 Ch 6 2437MHz



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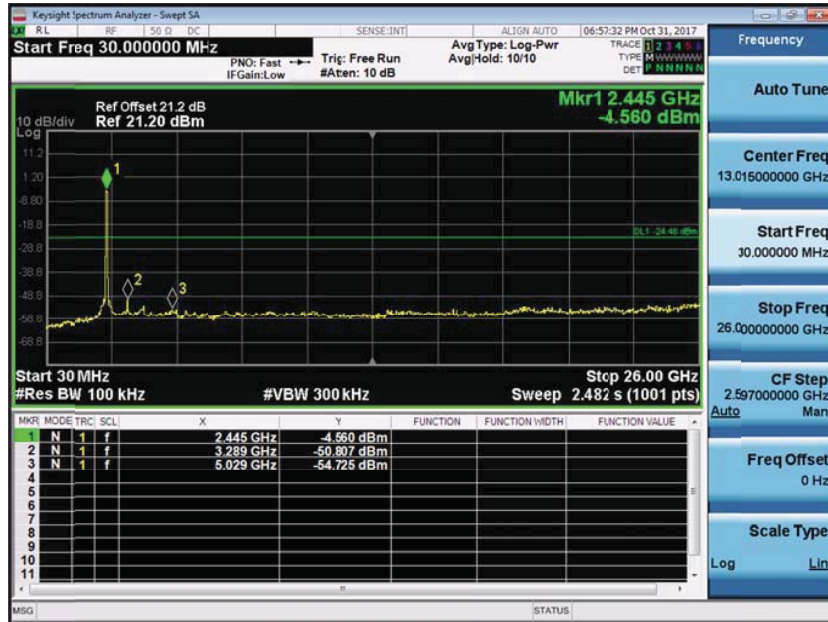
Telephone :+886-2-7737-3000

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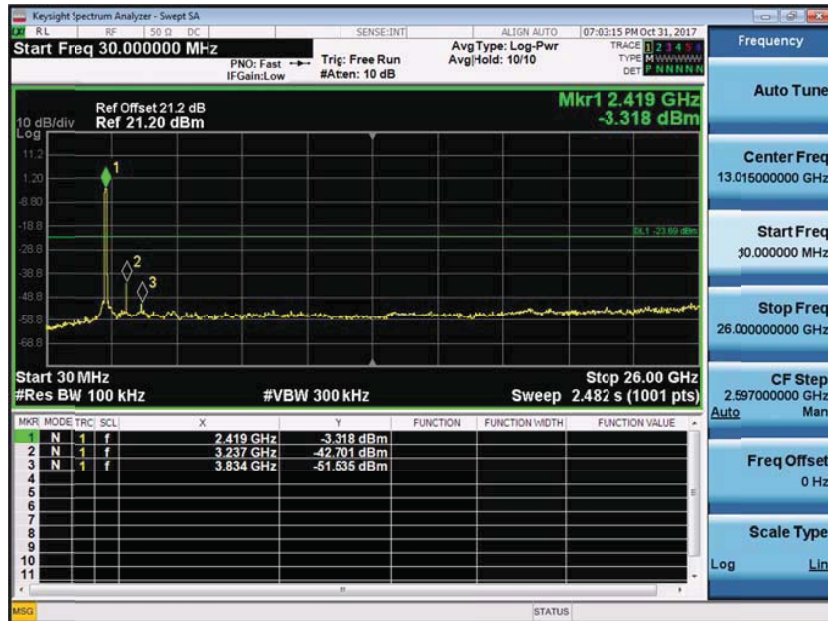


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Out of Band Emission 802.11n HT40 Chain 0 Ch 9 2452MHz



Out of Band Emission 802.11n HT40 Chain 1 Ch 3 2422MHz



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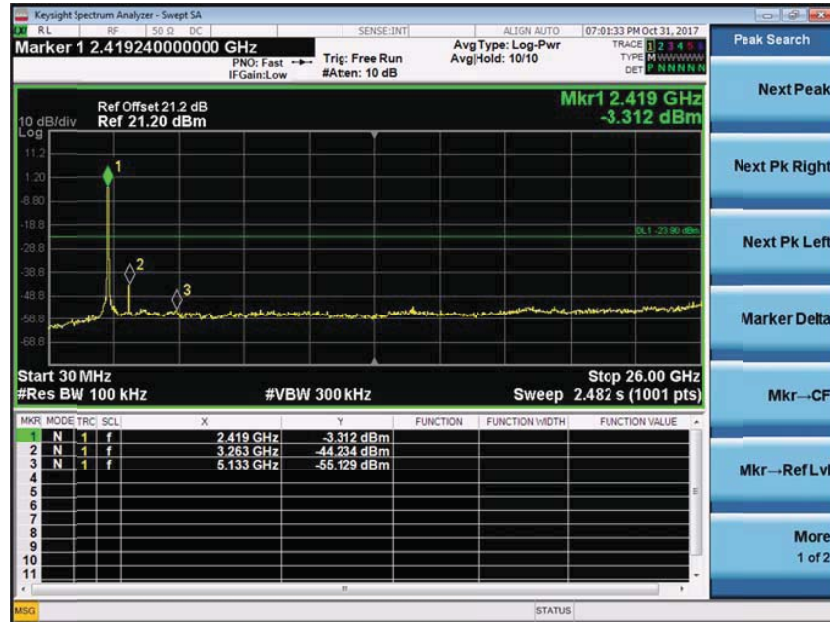
Telephone :+886-2-7737-3000

Facsimile (FAX) :+886-2-7737-3610

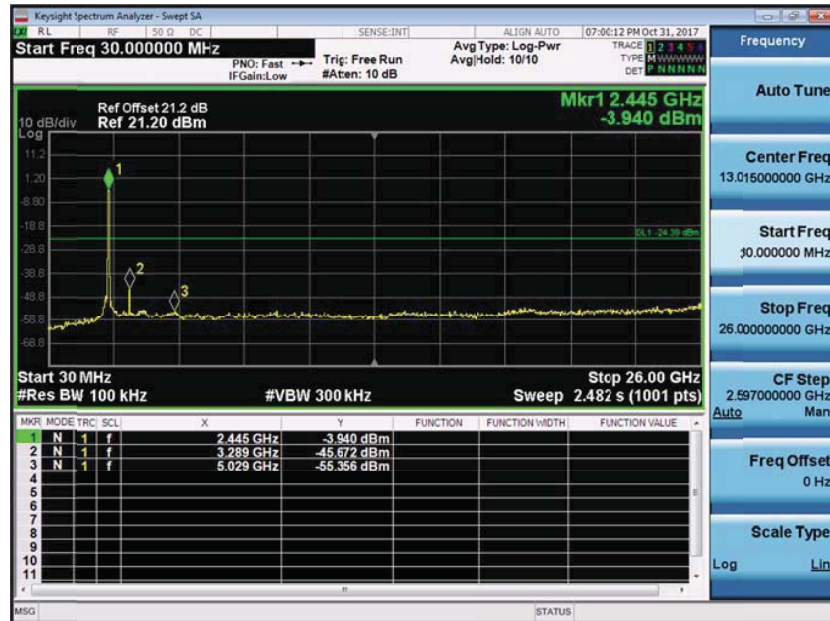


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Out of Band Emission 802.11n HT40 Chain 1 Ch 6 2437MHz



Out of Band Emission 802.11n HT40 Chain 1 Ch 9 2452MHz



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