

FCC Test Report

Report No.: AGC08045240801FR01

FCC ID : 2AKL2N44WET

APPLICATION PURPOSE : Original Equipment

PRODUCT DESIGNATION : Network Video Recorder

BRAND NAME : N/A

MODEL NAME : N44WET, N44WEF, N44WEE, N44WEV, N44WER,
N44WES, N44WEP, N48WED, N48WEE, N48WEF, L7134,
L7174, L7154, L7164, L8004, L8014, L8024, L5064,
L5074, L5514, L5524, L5534

APPLICANT : Shenzhen Kean Digital Co., Ltd.

DATE OF ISSUE : Sep. 18, 2024

STANDARD(S) : FCC Part 15 Subpart C §15.247

REPORT VERSION : V1.0



Attestation of Global Compliance (Shenzhen) Co., Ltd

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Attestation of Global Compliance(Shenzhen)Co., Ltd
Attestation of Global Compliance(Shenzhen)Std & Tech Co., Ltd
Tel: +86-755 2523 4088 E-mail: agc@agccert.com Web: <http://www.agccert.com/>



Report Revise Record

Report Version	Revise Time	Issued Date	Valid Version	Notes
V1.0	/	Sep. 18, 2024	Valid	Initial Release

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Attestation of Global Compliance(Shenzhen)Std & Tech Co., Ltd
Tel: +86-755 2523 4088 E-mail: agc@agccert.com Web: <http://www.agccert.com/>

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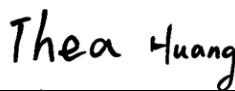

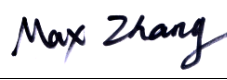
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1. General Information

Applicant	Shenzhen Kean Digital Co., Ltd.
Address	Room 1001, Rujun Building, No. 105, Zhongxing Road, Ma'antang Community, Bantian Street, Longgang District, Shenzhen, 518129 China
Manufacturer	Shenzhen Kean Digital Co., Ltd.
Address	Room 1001, Rujun Building, No. 105, Zhongxing Road, Ma'antang Community, Bantian Street, Longgang District, Shenzhen, 518129 China
Factory	Shenzhen Zhongan Xunshi Technology Co., Ltd
Address	3rd Floor, Building D, No. 3, Pingxi 7th Road, Nanping Science and Technology Industrial Park, Zhuhai China
Product Designation	Network Video Recorder
Brand Name	N/A
Test Model	N44WET
Series Model(s)	N44WEF, N44WEE, N44WEV, N44WER, N44WES, N44WEP, N48WED, N48WEE, N48WEF, L7134, L7174, L7154, L7164, L8004, L8014, L8024, L5064, L5074, L5514, L5524, L5534
Difference Description	All the same except for the model name and color.
Date of receipt of test item	Aug. 15, 2024
Date of Test	Aug. 15, 2024 to Sep. 18, 2024
Deviation from Standard	No any deviation from the test method
Condition of Test Sample	Normal
Test Result	Pass
Test Report Form No	AGCER-FCC-2.4GWLAN-V1

Note: The test results of this report relate only to the tested sample identified in this report

Prepared By		
	Thea Huang (Project Engineer)	Sep. 18, 2024
Reviewed By		
	Calvin Liu (Reviewer)	Sep. 18, 2024
Approved By		
	Max Zhang (Authorized Officer)	Sep. 18, 2024

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2. Product Information

2.1 Product Technical Description

Equipment Type	WLAN 2.4G
Frequency Band	2400MHz ~ 2483.5MHz
Operation Frequency	2412MHz ~ 2462MHz
Output Power (Average)	2.4G WIFI (Module: RTL8192FC): IEEE 802.11b:11.90dBm; IEEE 802.11g:6.74dBm; IEEE 802.11n(HT20):6.68dBm; IEEE 802.11n(HT40):6.99dBm 2.4G WIFI (Module: ATBM6012B): IEEE 802.11b:12.95dBm; IEEE 802.11g:11.95dBm; IEEE 802.11n(HT20):11.93dBm;
Output Power (Peak)	2.4G WIFI (Module: RTL8192FC): IEEE 802.11b:14.72dBm; IEEE 802.11g:14.59dBm; IEEE 802.11n(HT20):14.55dBm; IEEE 802.11n(HT40):15.00dBm 2.4G WIFI (Module: ATBM6012B): IEEE 802.11b:15.70dBm; IEEE 802.11g:19.97dBm; IEEE 802.11n(HT20):19.96dBm;
Modulation	802.11b:(DQPSK, DBPSK, CCK) DSSS 802.11g/n:(64-QAM,16-QAM, QPSK, BPSK) OFDM
Data Rate	802.11b:1/2/5.5/11Mbps 802.11g: 6/9/12/18/24/36/48/54Mbps 802.11n: up to 300Mbps
Number of channels	11
Hardware Version	V3.2.2.4
Software Version	V111
Antenna Designation	Copper Tube Antenna
Antenna Gain	2.29dBi
Power Supply	DC 5V by adapter

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2.2 Table of Carrier Frequency

For 2412-2462MHz:

2.4G WIFI (Module: RTL8192FC):

11 channels are provided for 802.11b/g/n(HT20):

Channel	Frequency	Channel	Frequency	Channel	Frequency
01	2412 MHz	02	2417 MHz	03	2422 MHz
04	2427 MHz	05	2432 MHz	06	2437 MHz
07	2442 MHz	08	2447 MHz	09	2452 MHz
10	2457 MHz	11	2462 MHz		

7 channels are provided for 802.11n(HT40):

Channel	Frequency	Channel	Frequency	Channel	Frequency
01	--	02	--	03	2422 MHz
04	2427 MHz	05	2432 MHz	06	2437 MHz
07	2442 MHz	08	2447 MHz	09	2452 MHz
10	--	11	--		

2.4G WIFI (Module: ATBM6012B):

11 channels are provided for 802.11b/g/n(HT20):

Channel	Frequency	Channel	Frequency	Channel	Frequency
01	2412 MHz	02	2417 MHz	03	2422 MHz
04	2427 MHz	05	2432 MHz	06	2437 MHz
07	2442 MHz	08	2447 MHz	09	2452 MHz
10	2457 MHz	11	2462 MHz		

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2.3 IEEE 802.11n Modulation Scheme

MCS Index	N _{ss}	Modulation	R	N _{BPSC}	N _{CBPS}		N _{DBPS}		Data Rate(Mbps)	
									800nsGI	
					20MHz	40MHz	20MHz	40MHz	20MHz	40MHz
0	1	BPSK	1/2	1	52	108	26	54	6.5	13.5
1	1	QPSK	1/2	2	104	216	52	108	13.0	27.0
2	1	QPSK	3/4	2	104	216	78	162	19.5	40.5
3	1	16-QAM	1/2	4	208	432	104	216	26.0	54.0
4	1	16-QAM	3/4	4	208	432	156	324	39.0	81.0
5	1	64-QAM	2/3	6	312	648	208	432	52.0	108.0
6	1	64-QAM	3/4	6	312	648	234	489	58.5	121.5
7	1	64-QAM	5/6	6	312	648	260	540	65.0	135.0

Symbol	Explanation
NSS	Number of spatial streams
R	Code rate
NBPSC	Number of coded bits per single carrier
NCBPS	Number of coded bits per symbol
NDBPS	Number of data bits per symbol
GI	Guard interval

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2.4 Related Submittal(S) / Grant (S)

This submittal(s) (test report) is intended for FCC ID: **2AKL2N44WET**, filing to comply with Part 2, Part 15 of the Federal Communication Commission rules.

2.5 Test Methodology

The tests were performed according to following standards:

No.	Identity	Document Title
1	FCC 47 CFR Part 2	Frequency allocations and radio treaty matters; general rules and regulations
2	FCC 47 CFR Part 15	Radio Frequency Devices
3	ANSI C63.10-2013	American National Standard for Testing Unlicensed Wireless Devices
4	KDB 662911	KDB 662911 D01 Multiple Transmitter Output v02r01 Emissions Testing of Transmitters with Multiple Outputs in the Same Band (e.g., MIMO, Smart Antenna, etc)

2.6 Special Accessories

Refer to section 4.4.

2.7 Equipment Modifications

Not available for this EUT intended for grant.

2.8 Antenna Requirement

Standard Requirement
<p>15.203 requirement: An intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator, the manufacturer may design the unit so that a broken antenna can be replaced by the user, but the use of a standard antenna jack or electrical connector is prohibited.</p> <p>15.247(b) (4) requirement: The conducted output power limit specified in paragraph (b) of this section is based on the use of antennas with directional gains that do not exceed 6 dBi. Except as shown in paragraph (c) of this section, if transmitting antennas of directional gain greater than 6 dBi are used, the conducted output power from the intentional radiator shall be reduced below the stated values in paragraphs (b)(1), (b)(2), and (b)(3) of this section, as appropriate, by the amount in dB that the directional gain of the antenna exceeds 6 dBi</p> <p>EUT Antenna: The non-detachable antenna inside the device cannot be replaced by the user at will. The gain of the antenna is 2.29dBi.</p>

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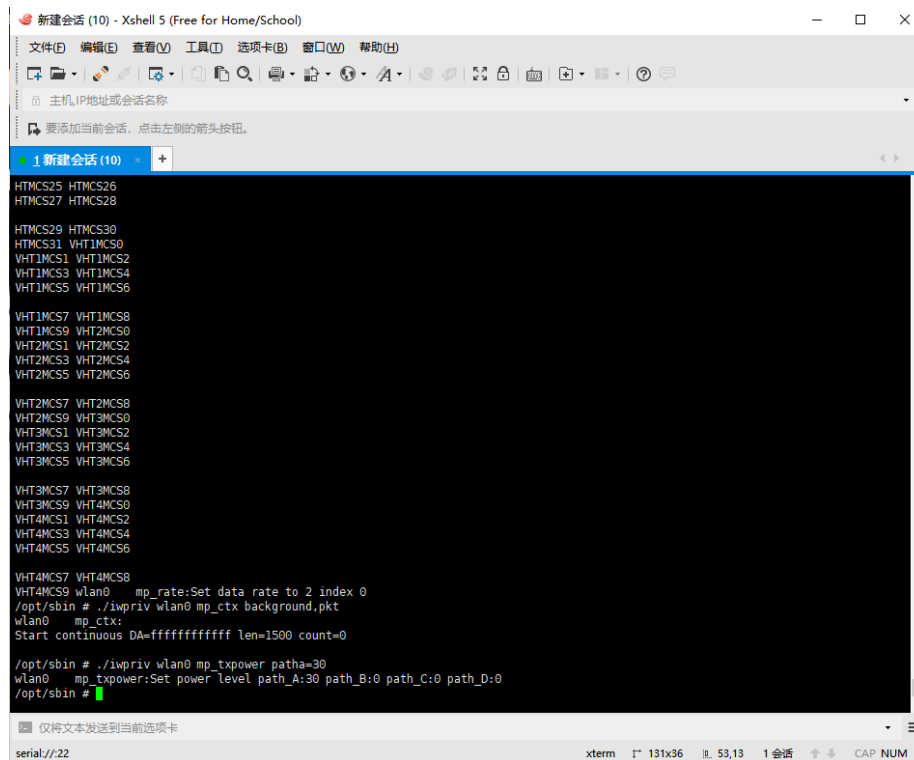
2.9 Description of Test Software

For IEEE 802.11 mode:

2.4G WIFI (Module: RTL8192FC):

The test utility software used during testing was “Xshell 5 (Free for Home School)”.

Software Setting Diagram



```

新建会话 (10) - Xshell 5 (Free for Home/School)
文件(F) 编辑(E) 查看(V) 工具(T) 选项卡(B) 窗口(W) 帮助(H)
主机, IP地址或会话名称
要添加当前会话, 点击左侧的箭头按钮。
1 新建会话 (10)
HTMCS25 HTMCS26
HTMCS27 HTMCS28
HTMCS29 HTMCS30
HTMCS31 VHT1MCS0
VHT1MCS1 VHT1MCS2
VHT1MCS3 VHT1MCS4
VHT1MCS5 VHT1MCS6
VHT1MCS7 VHT1MCS8
VHT1MCS9 VHT2MCS0
VHT2MCS1 VHT2MCS2
VHT2MCS3 VHT2MCS4
VHT2MCS5 VHT2MCS6
VHT2MCS7 VHT2MCS8
VHT2MCS9 VHT3MCS0
VHT3MCS1 VHT3MCS2
VHT3MCS3 VHT3MCS4
VHT3MCS5 VHT3MCS6
VHT3MCS7 VHT3MCS8
VHT3MCS9 VHT4MCS0
VHT4MCS1 VHT4MCS2
VHT4MCS3 VHT4MCS4
VHT4MCS5 VHT4MCS6
VHT4MCS7 VHT4MCS8
VHT4MCS9 wlan0 mp_rate:Set data rate to 2 index 0
/opt/sbin # ./iwpriv wlan0 mp_ctx background.pkt
wlan0 mp_ctx:
Start continuous DA=ffffffff len=1500 count=0
/opt/sbin # ./iwpriv wlan0 mp_txpower patha=30
wlan0 mp_txpower:Set power level path_A:30 path_B:0 path_C:0 path_D:0
/opt/sbin #
仅将文本发送到当前选项卡
serial://:22 xterm 1" 131x36 53,13 1会话 设置 CAP NUM
  
```

Test Mode	Channel	Power Index
802.11b	L/M/H	Patha=30
802.11g	L/M/H	Patha=30
802.11n-HT20	L/M/H	Patha=30
802.11n-HT40	L/M/H	Patha=30

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2.4G WIFI (Module: ATBM6012B):

The test utility software used during testing was “Xshell 5 (Free for Home School)”.

Software Setting Diagram

```

新建会话 (12) - Xshell 5 (Free for Home/School)
文件(F) 编辑(E) 查看(V) 工具(T) 选项卡(B) 窗口(W) 帮助(H)
主机: IP地址或会话名称
要添加当前会话, 点击左侧的箭头按钮。

1 新建会话 (12)
2024-09-13 09:31:30.730 | 865:1026 | INFO | IOTDev | Bye, IOTDaemon !!
2024-09-13 09:31:30.730 | 865:1026 | INFO | IOTDev | IOTDaemon is Dead:Connection refused(111)
client [865] disconnected, module:vdec
[MDrv_MMU_RemoveClientId] not support , chipId = 2
client [865] disconnected, module:venc
[MDrv_MMU_RemoveClientId] not support , chipId = 2
[MDrv_MMU_RemoveClientId] not support , chipId = 2
[MDrv_MMU_RemoveClientId] not support , chipId = 2
[MDrv_MMU_RemoveClientId] not support , chipId = 2
[MDrv_MMU_RemoveClientId] not support , chipId = 2
[MDrv_MMU_RemoveClientId] not support , chipId = 2
[MDrv_MMU_RemoveClientId] not support , chipId = 2
[MDrv_MMU_RemoveClientId] not support , chipId = 2
[MDrv_MMU_RemoveClientId] not support , chipId = 2
client [865] disconnected, module:panel
client [865] disconnected, module:disp
[MDrv_MMU_RemoveClientId] not support , chipId = 2
[MDrv_MMU_RemoveClientId] not support , chipId = 2
[MDrv_MMU_RemoveClientId] not support , chipId = 2
[MDrv_MMU_RemoveClientId] not support , chipId = 2
[MDrv_MMU_RemoveClientId] not support , chipId = 2
[MDrv_MMU_RemoveClientId] not support , chipId = 2
[MDrv_MMU_RemoveClientId] not support , chipId = 2
client [865] disconnected, module:ao
client [865] disconnected, module:ai
client [865] disconnected, module:sys
press 'q' to exit the program:
qroute: SIOADDRRT: File exists
Welcome to Milinux.
/ # ifconfig wlan1 down
[atbm_log]:wlan1:free authen bss ++
[atbm_log]:wlan1:free authen bss ++
/ # ifconfig wlan1 up
/ # cd /opt/sbin
/opt/sbin # [ _juan_error_reset_ap_update_rxtx][19522] ap sort reset count = 0
/opt/sbin # cd /opt/sbin
/opt/sbin # ./atbm_iwpriv wlan1 fwcmd set_rate_txpower_mode,-6
/opt/sbin # ./atbm_iwpriv wlan1 start_tx 1,1,500,0,0
[atbm_log]:etf_channel = 1 etf_channel_type 0
/opt/sbin #
  
```

Test Mode	Channel	Power Index
802.11b	L/M/H	-6
802.11g	L/M/H	-6
802.11n-HT20	L/M/H	-6

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3. Test Environment

3.1 Address of The Test Laboratory

Laboratory: Attestation of Global Compliance (Shenzhen) Co., Ltd.

Address: 1-2/F, Building 19, Junfeng Industrial Park, Chongqing Road, Heping Community, Fuhai Street, Bao'an District, Shenzhen, Guangdong, China

3.2 Test Facility

The test facility is recognized, certified, or accredited by the following organizations:

CNAS-Lab Code: L5488

Attestation of Global Compliance (Shenzhen) Co., Ltd. has been assessed and proved to follow CNAS-CL01 Accreditation Criteria for Testing and Calibration Laboratories (identical to ISO/IEC17025: 2017 General Requirements for the Competence of Testing and Calibration Laboratories).

A2LA-Lab Cert. No.: 5054.02

Attestation of Global Compliance (Shenzhen) Co., Ltd. EMC Laboratory has been accredited by A2LA for technical competence in the field of electrical testing, and proved to follow ISO/IEC 17025: 2017 General Requirements for the Competence of Testing and Calibration Laboratories and any additional program requirements in the identified field of testing.

FCC-Registration No.: 975832

Attestation of Global Compliance (Shenzhen) Co., Ltd. EMC Laboratory has been registered and fully described in a report filed with the FCC (Federal Communications Commission). The acceptance letter from the FCC is maintained in our files with Registration 975832.

IC-Registration No.: 24842 (CAB identifier: CN0063)

Attestation of Global Compliance (Shenzhen) Co., Ltd. EMC Laboratory has been registered and fully described in a report filed with the Certification and Engineering Bureau of Industry Canada. The acceptance letter from the IC is maintained in our files with Registration 24842.

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3.3 Environmental Conditions

	Normal Conditions
Temperature range (°C)	15 - 35
Relative humidity range	20 % - 75 %
Pressure range (kPa)	86 - 106

3.4 Measurement Uncertainty

The reported uncertainty of measurement $y \pm U$, where expanded uncertainty U is based on a standard uncertainty multiplied by a coverage factor of $k=2$, providing a level of confidence of approximately 95%.

Item	Measurement Uncertainty
Uncertainty of Conducted Emission for AC Port	$U_c = \pm 2.9 \text{ dB}$
Uncertainty of Radiated Emission below 1GHz	$U_c = \pm 3.9 \text{ dB}$
Uncertainty of Radiated Emission above 1GHz	$U_c = \pm 4.9 \text{ dB}$
Uncertainty of total RF power, conducted	$U_c = \pm 0.8 \text{ dB}$
Uncertainty of RF power density, conducted	$U_c = \pm 2.6 \text{ dB}$
Uncertainty of spurious emissions, conducted	$U_c = \pm 2 \%$
Uncertainty of Occupied Channel Bandwidth	$U_c = \pm 2 \%$

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3.5 List of Equipment Used

● RF Conducted Test System							
Used	Equipment No.	Test Equipment	Manufacturer	Model No.	Serial No.	Last Cal. Date (YY-MM-DD)	Next Cal. Date (YY-MM-DD)
<input checked="" type="checkbox"/>	AGC-ER-E036	Spectrum Analyzer	Agilent	N9020A	MY49100060	2024-05-24	2025-05-23
<input checked="" type="checkbox"/>	AGC-ER-E062	Power Sensor	Agilent	U2021XA	MY54110007	2024-02-01	2025-01-31
<input checked="" type="checkbox"/>	AGC-ER-E063	Power Sensor	Agilent	U2021XA	MY54110009	2024-02-01	2025-01-31
<input checked="" type="checkbox"/>	AGC-ER-A001	6dB Attenuator	Eeatsheep	LM-XX-6-5W	N/A	2023-09-21	2025-09-20
<input checked="" type="checkbox"/>	AGC-ER-E083	Signal Generator	Agilent	E4421B	US39340815	2024-05-23	2025-05-22
<input checked="" type="checkbox"/>	N/A	RF Connection Cable	N/A	1#	N/A	Each time	N/A
<input checked="" type="checkbox"/>	N/A	RF Connection Cable	N/A	2#	N/A	Each time	N/A

● Radiated Spurious Emission							
Used	Equipment No.	Test Equipment	Manufacturer	Model No.	Serial No.	Last Cal. Date (YY-MM-DD)	Next Cal. Date (YY-MM-DD)
<input type="checkbox"/>	AGC-EM-E046	EMI Test Receiver	R&S	ESCI	10096	2024-02-01	2025-01-31
<input checked="" type="checkbox"/>	AGC-EM-E116	EMI Test Receiver	R&S	ESCI	100034	2024-05-24	2025-05-23
<input checked="" type="checkbox"/>	AGC-EM-E061	Spectrum Analyzer	Agilent	N9010A	MY53470504	2024-05-28	2025-05-27
<input checked="" type="checkbox"/>	AGC-EM-E086	Loop Antenna	ZHINAN	ZN30900C	18051	2024-03-05	2026-03-04
<input checked="" type="checkbox"/>	AGC-EM-E001	Wideband Antenna	SCHWARZBECK	VULB9168	D69250	2023-05-11	2025-05-10
<input checked="" type="checkbox"/>	AGC-EM-E029	Broadband Ridged Horn Antenna	ETS	3117	00034609	2024-03-31	2025-03-30
<input checked="" type="checkbox"/>	AGC-EM-E082	Horn Antenna	SCHWARZBECK	BBHA 9170	#768	2023-09-24	2025-09-23
<input checked="" type="checkbox"/>	AGC-EM-E146	Pre-amplifier	ETS	3117-PA	00246148	2024-07-24	2026-07-23
<input checked="" type="checkbox"/>	AGC-EM-A119	2.4G Filter	SongYi	N/A	N/A	2024-05-23	2025-05-22
<input checked="" type="checkbox"/>	AGC-EM-A138	6dB Attenuator	Eeatsheep	LM-XX-6-5W	N/A	2023-06-09	2025-06-08
<input type="checkbox"/>	AGC-EM-A139	6dB Attenuator	Eeatsheep	LM-XX-6-5W	N/A	2023-06-09	2025-06-08

● AC Power Line Conducted Emission							
Used	Equipment No.	Test Equipment	Manufacturer	Model No.	Serial No.	Last Cal. Date (YY-MM-DD)	Next Cal. Date (YY-MM-DD)
<input checked="" type="checkbox"/>	AGC-EM-E045	EMI Test Receiver	R&S	ESPI	101206	2024-05-28	2025-05-27
<input checked="" type="checkbox"/>	AGC-EM-A130	6dB Attenuator	Eeatsheep	LM-XX-6-5W	DC-6GZ	2023-06-09	2025-06-08
<input checked="" type="checkbox"/>	AGC-EM-E023	AMN	R&S	100086	ESH2-Z5	2024-05-28	2025-05-27

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● Test Software					
Used	Equipment No.	Test Equipment	Manufacturer	Model No.	Version Information
<input checked="" type="checkbox"/>	AGC-EM-S001	CE Test System	R&S	ES-K1	V1.71
<input checked="" type="checkbox"/>	AGC-EM-S003	RE Test System	FARA	EZ-EMC	VRA-03A
<input checked="" type="checkbox"/>	AGC-ER-S012	BT/WIFI Test System	Tonscend	JS1120-2	2.6
<input checked="" type="checkbox"/>	AGC-EM-S011	RSE Test System	Tonscend	TS+-Ver2.1(JS36-RSE)	4.0.0.0

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4. System Test Configuration

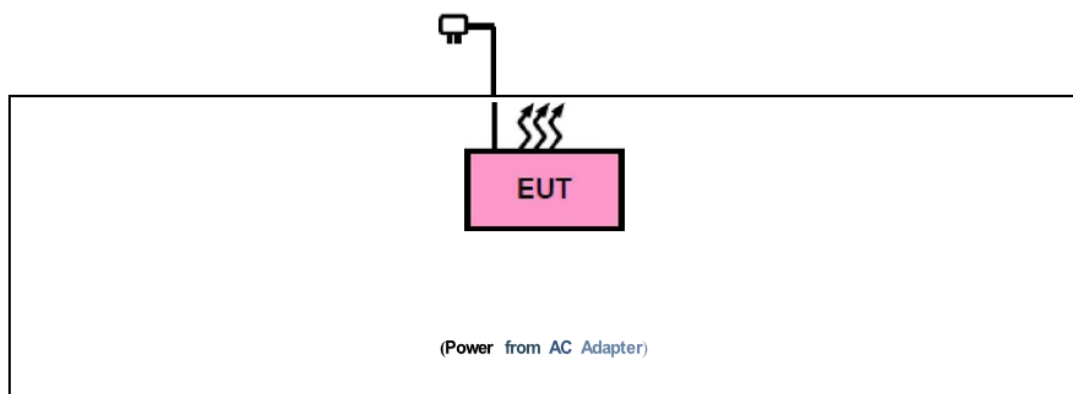
4.1 EUT Configuration

The EUT configuration for testing is installed on RF field strength measurement to meet the Commission's requirement and operating in a manner which intends to maximize its emission characteristics in a continuous normal application.

4.2 EUT Exercise

The Transmitter was operated in the normal operating mode. The TX frequency was fixed which was for the purpose of the measurements.

4.3 Configuration of Tested System



4.4 Equipment Used in Tested System

The following peripheral devices and interface cables were connected during the measurement:

☒ Test Accessories Come From The Laboratory

No.	Equipment	Manufacturer	Model No.	Specification Information	Cable
1	Control Box	--	USB-TTL	--	--

☒ Test Accessories Come From The Manufacturer

No.	Equipment	Manufacturer	Model No.	Specification Information	Cable
1	Adapter	SHENZHEN FUSHIGANG TECHNOLOGY CO.,LTD.	AS1201A-0502000U SL	Input:100-240V~ 50/60Hz 0.35A MAX Output:5.0V 2000mA	1.5m unshielded

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4.5 Summary of Test Results

Item	FCC Rules	Description of Test	Result
1	§15.203&15.247(b)(4)	Antenna Equipment	Pass
2	§15.247 (b)(1)	RF Output Power	Pass
3	§15.247 (a)(1)	6 dB Bandwidth	Pass
4	§15.247 (e)	Power Spectral Density	Pass
5	§15.247 (d)	Conducted Band Edge and Out-of-Band Emissions	Pass
6	§15.247 (d)&15.209	Radiated Spurious Emission	Pass
7	§15.207	AC Power Line Conducted Emission	Pass

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5. Description of Test Modes

2.4G WIFI (Module: RTL8192FC):

Summary table of Test Cases	
Test Item	Data Rate / Modulation
	2.4G WLAN – 802.11b/g/n/ax (DSSS/OFDM/OFDMA)
Radiated & Conducted Test Cases	Mode 1: 802.11b_TX CH01_2412 MHz_1 Mbps Mode 2: 802.11b_TX CH06_2437 MHz_1 Mbps Mode 3: 802.11b_TX CH11_2462 MHz_1 Mbps Mode 4: 802.11g_TX CH01_2412 MHz_6 Mbps Mode 5: 802.11g_TX CH06_2437 MHz_6 Mbps Mode 6: 802.11g_TX CH11_2462 MHz_6 Mbps Mode 7: 802.11n-HT20_TX CH01_2412 MHz_MCS0 Mbps Mode 8: 802.11n-HT20_TX CH06_2437 MHz_MCS0 Mbps Mode 9: 802.11n-HT20_TX CH11_2462 MHz_MCS0 Mbps Mode 10: 802.11n-HT40_TX CH03_2422 MHz_MCS0 Mbps Mode 11: 802.11n-HT40_TX CH06_2437 MHz_MCS0 Mbps Mode 12: 802.11n-HT40_TX CH09_2452 MHz_MCS0 Mbps
AC Conducted Emission	Mode 1: 2.4G WLAN Link (adapter connected)

Note:

- For Radiated Emission, 3axis were chosen for testing for each applicable mode.
- For Conducted Test method, a temporary antenna connector is provided by the manufacture.

2.4G WIFI (Module: ATBM6012B):

Summary table of Test Cases	
Test Item	Data Rate / Modulation
	2.4G WLAN – 802.11b/g/n/ax (DSSS/OFDM/OFDMA)
Radiated & Conducted Test Cases	Mode 1: 802.11b_TX CH01_2412 MHz_1 Mbps Mode 2: 802.11b_TX CH06_2437 MHz_1 Mbps Mode 3: 802.11b_TX CH11_2462 MHz_1 Mbps Mode 4: 802.11g_TX CH01_2412 MHz_6 Mbps Mode 5: 802.11g_TX CH06_2437 MHz_6 Mbps Mode 6: 802.11g_TX CH11_2462 MHz_6 Mbps Mode 7: 802.11n-HT20_TX CH01_2412 MHz_MCS0 Mbps Mode 8: 802.11n-HT20_TX CH06_2437 MHz_MCS0 Mbps Mode 9: 802.11n-HT20_TX CH11_2462 MHz_MCS0 Mbps
AC Conducted Emission	Mode 1: 2.4G WLAN Link (adapter connected)

Note:

- For Radiated Emission, 3axis were chosen for testing for each applicable mode.
- For Conducted Test method, a temporary antenna connector is provided by the manufacture.

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6. Duty Cycle Measurement

2.4GHz WLAN (DTS) operation is possible in 20MHz, and 40MHz channel bandwidths. The maximum achievable duty cycles for all modes were determined based on measurements performed on a spectrum analyzer in zero-span mode with RBW = 8MHz, VBW = 50MHz, and detector = Average. The RBW and VBW were both greater than 50/T, where T is the minimum transmission duration, and the number of sweep points across T was greater than 100. The duty cycles are as follows:

2.4G WIFI (Module: RTL8192FC):

Operating mode	Data rates (Mbps)	Duty Cycle (%)	Duty Cycle Factor (dB)
IEEE 802.11b	1	98.80	0.052
IEEE 802.11g	6	98.33	0.073
IEEE 802.11n-HT20	MCS0	97.76	0.098
IEEE 802.11n-HT40	MCS0	80.21	0.958

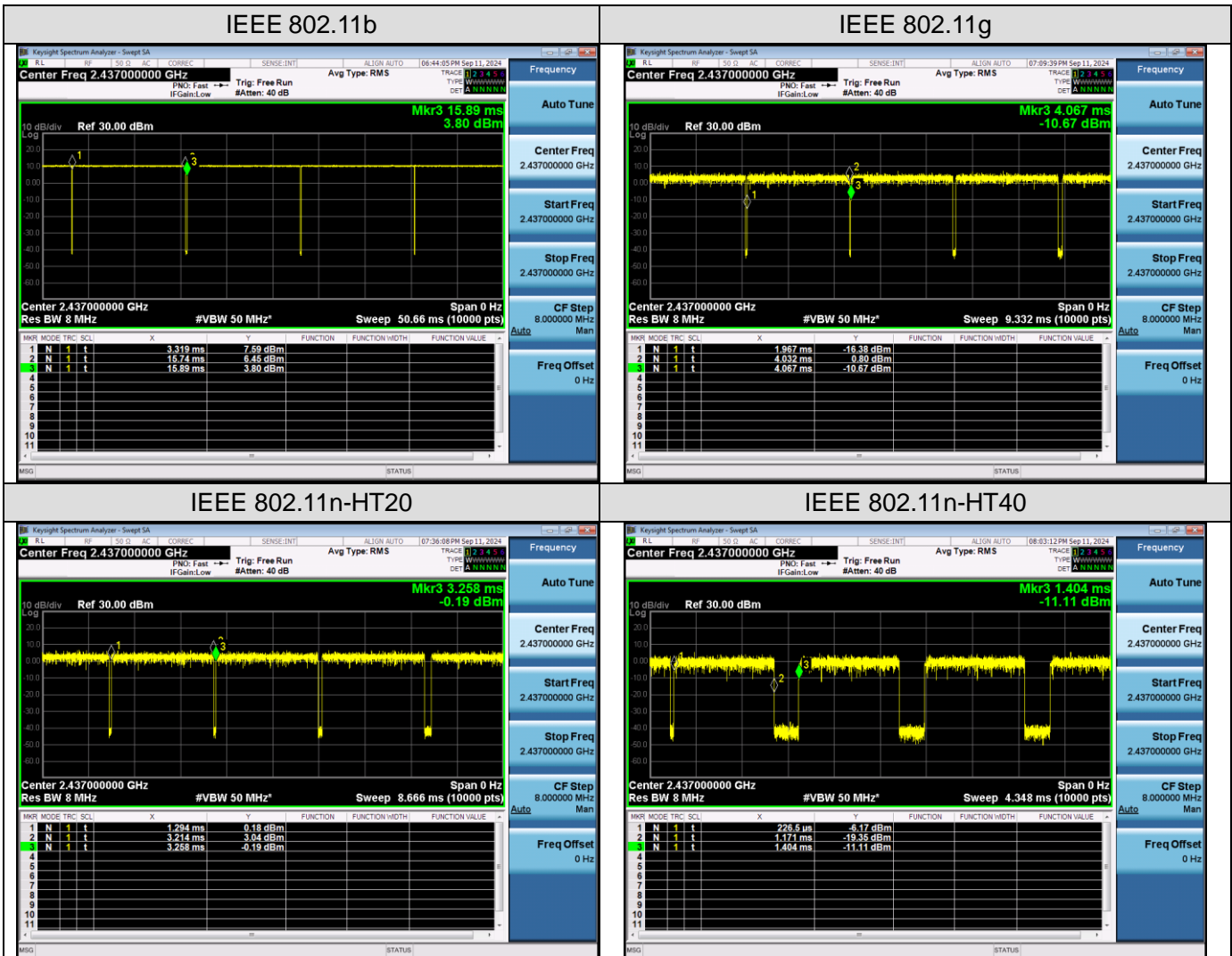
Remark:

1. Duty Cycle factor = $10 * \log (1/ \text{Duty cycle})$
2. The duty cycle of each frequency band mode reflects the determination requirements of the Middle channel measurement value.

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The test plots as follows:



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2.4GHz WLAN (DTS) operation is possible in 20MHz channel bandwidths. The maximum achievable duty cycles for all modes were determined based on measurements performed on a spectrum analyzer in zero-span mode with RBW = 8MHz, VBW = 50MHz, and detector = Average. The RBW and VBW were both greater than $50/T$, where T is the minimum transmission duration, and the number of sweep points across T was greater than 100. The duty cycles are as follows:

2.4G WIFI (Module: ATBM6012B):

Operating mode	Data rates (Mbps)	Duty Cycle (%)	Duty Cycle Factor (dB)
IEEE 802.11b	1	97.60	0.106
IEEE 802.11g	6	91.59	0.382
IEEE 802.11n-HT20	MCS0	94.36	0.252

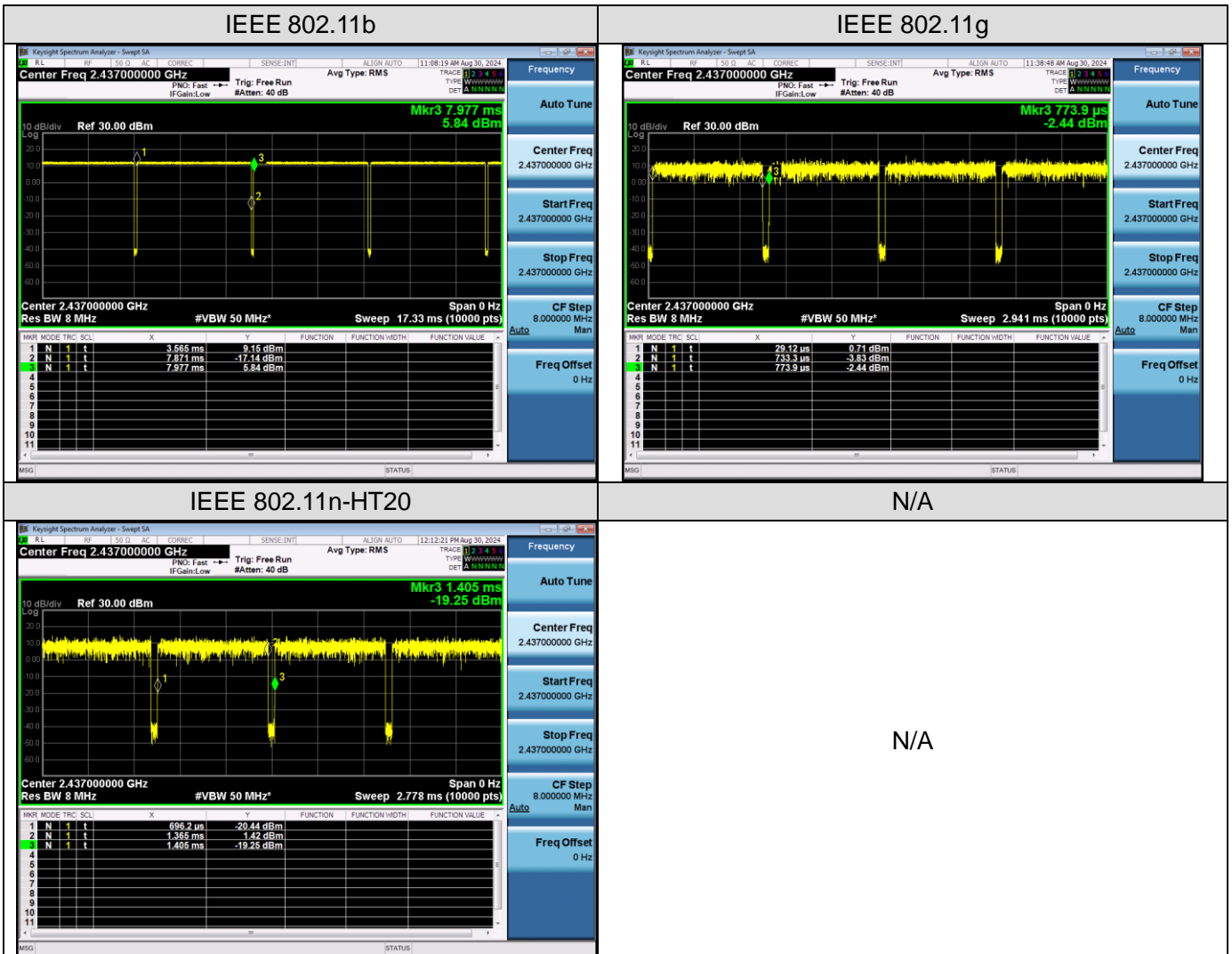
Remark:

- Duty Cycle factor = $10 * \log (1/ \text{Duty cycle})$
- The duty cycle of each frequency band mode reflects the determination requirements of the Middle channel measurement value.

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The test plots as follows:



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7. RF Output Power Measurement

7.1 Provisions Applicable

For DTSs employing digital modulation techniques operating in the bands 2400-2483.5 MHz, the maximum peak conducted output power shall not exceed 1 W.

7.2 Measurement Procedure

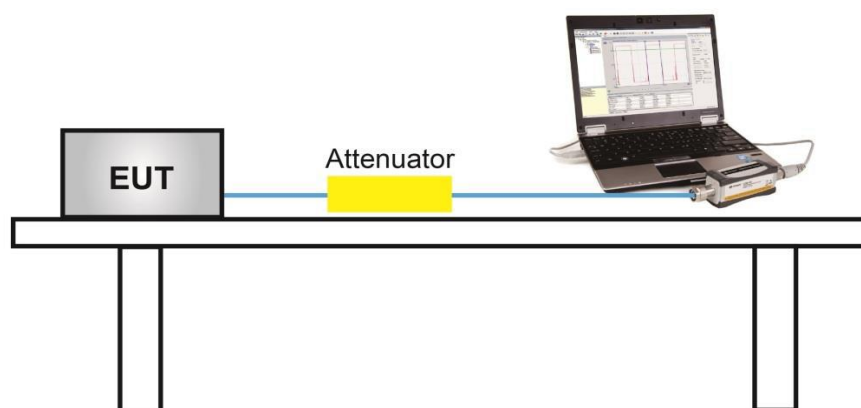
☒ Method PM is Measurement using an RF Peak power meter. The procedure for this method is as follows:

1. The testing follows the ANSI C63.10 Section 11.9.1.3
2. The maximum peak conducted output power may be measured using a broadband peak RF power meter. The power meter shall have a video bandwidth that is greater than or equal to the DTS bandwidth and shall use a fast-responding diode detector.

☒ Method PM is Measurement using an RF average power meter. The procedure for this method is as follows:

1. The testing follows the ANSI C63.10 Section 11.9.2.3
2. Measurements may be performed using a wideband RF power meter with a thermocouple detector or equivalent if all of the following conditions are satisfied:
3. The EUT is configured to transmit continuously, or to transmit with a constant duty cycle.
4. At all times when the EUT is transmitting, it shall be transmitting at its maximum power control level.
5. The integration period of the power meter exceeds the repetition period of the transmitted signal by at least a factor of five.
6. Determine according to the duty cycle of the equipment: when it is less than 98%, follow the steps below.
7. Measure the average power of the transmitter. This measurement is an average over both the ON and OFF periods of the transmitter.
8. Adjust the measurement in dBm by adding $[10 \log (1 / D)]$, where D is the duty cycle {e.g., $[10 \log (1 / 0.25)]$, if the duty cycle is 25%}.
9. Record the test results in the report.

7.3 Measurement Setup (Block Diagram of Configuration)



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7.4 Measurement Result

Test Data of Conducted Output Power-2.4G WIFI (Module: RTL8192FC)					
Test Mode	Test Frequency (MHz)	Average Power (dBm)	Peak Power (dBm)	Limits (dBm)	Pass or Fail
802.11b	2412	11.90	14.72	≤30	Pass
	2437	11.28	14.16	≤30	Pass
	2462	10.40	13.21	≤30	Pass
802.11g	2412	6.74	14.59	≤30	Pass
	2437	6.21	14.25	≤30	Pass
	2462	5.58	13.46	≤30	Pass
802.11n20	2412	6.68	14.55	≤30	Pass
	2437	6.22	14.26	≤30	Pass
	2462	5.59	13.41	≤30	Pass
802.11n40	2422	6.89	15.00	≤30	Pass
	2437	6.99	14.79	≤30	Pass
	2452	5.88	14.20	≤30	Pass

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Test Data of Conducted Output Power-2.4G WIFI (Module: ATBM6012B)					
Test Mode	Test Frequency (MHz)	Average Power (dBm)	Peak Power (dBm)	Limits (dBm)	Pass or Fail
802.11b	2412	12.40	15.11	≤30	Pass
	2437	12.84	15.52	≤30	Pass
	2462	12.95	15.70	≤30	Pass
802.11g	2412	11.62	19.62	≤30	Pass
	2437	11.87	19.83	≤30	Pass
	2462	11.95	19.97	≤30	Pass
802.11n20	2412	11.40	19.48	≤30	Pass
	2437	11.81	19.83	≤30	Pass
	2462	11.93	19.96	≤30	Pass

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8. 6dB Bandwidth Measurement

8.1 Provisions Applicable

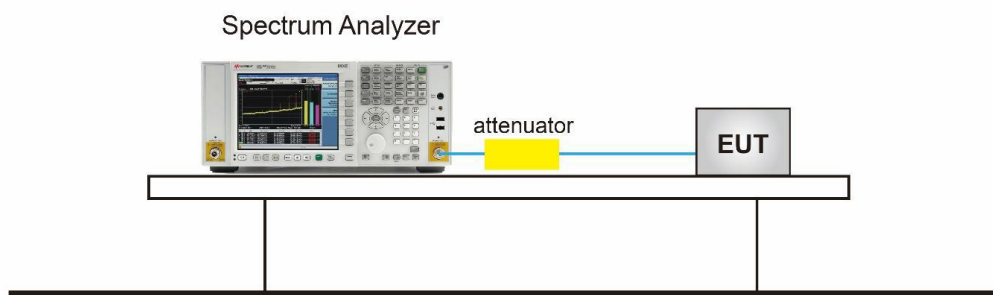
The minimum 6dB bandwidth shall be 500 kHz.

8.2 Measurement Procedure

The testing follows the ANSI C63.10 Section 6.9.3 (OBW) and 11.8.1 (6dB BW).

1. The RF output of EUT was connected to the spectrum analyzer by RF cable and attenuator. The path loss was compensated to the results for each measurement.
2. Set to the maximum power setting and enable the EUT transmit continuously.
3. For 6dB Bandwidth Measurement, the spectrum analyzer's resolution bandwidth (RBW) = 100 kHz. Set the Video bandwidth (VBW) = 300 kHz. In order to make an accurate measurement.
4. For 99% Bandwidth Measurement, the spectrum analyzer's resolution bandwidth (RBW) is set 1-5% of the OBW and set the Video bandwidth (VBW) $\geq 3 * \text{RBW}$.
5. Detector = peak
6. Trace mode = max hold.
7. Sweep = auto couple.
8. Allow the trace to stabilize.
9. Measure and record the results in the test report.

8.3 Measurement Setup (Block Diagram of Configuration)



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8.4 Measurement Result

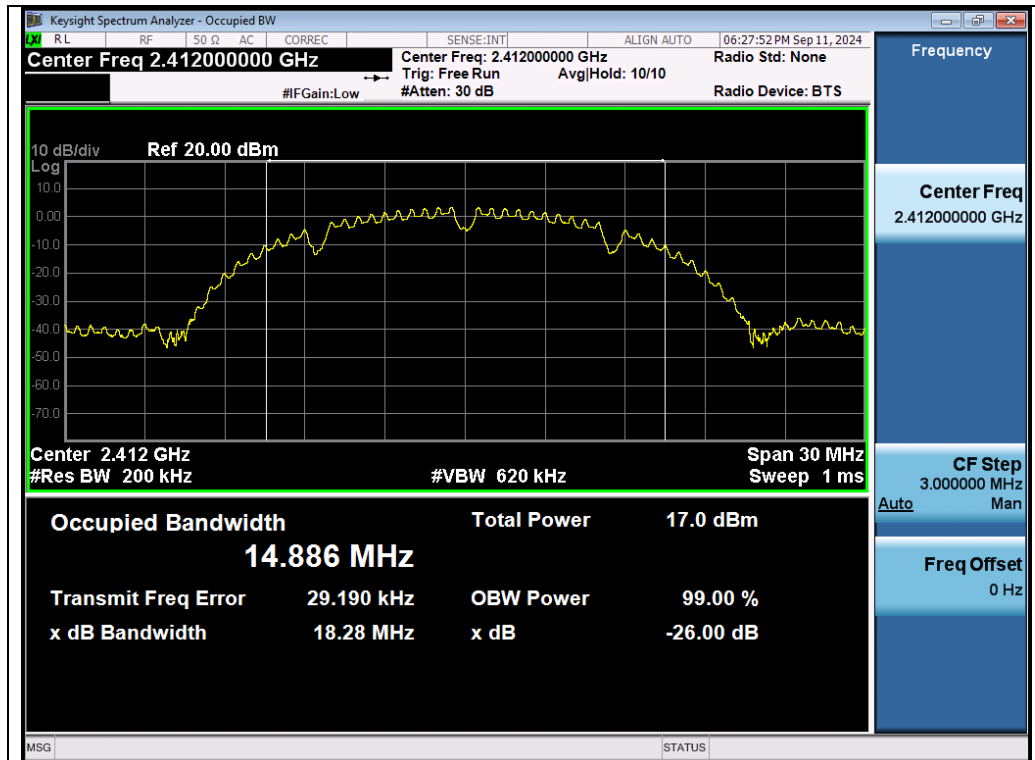
Test Data of Occupied Bandwidth and DTS Bandwidth-2.4G WIFI (Module: RTL8192FC)					
Test Mode	Test Frequency (MHz)	99% Occupied Bandwidth (MHz)	DTS Bandwidth (MHz)	DTS Bandwidth Limits (MHz)	Pass or Fail
802.11b	2412	14.886	10.031	≥0.5	Pass
	2437	14.841	10.053	≥0.5	Pass
	2462	14.826	10.040	≥0.5	Pass
802.11g	2412	16.539	16.360	≥0.5	Pass
	2437	16.534	16.351	≥0.5	Pass
	2462	16.610	16.349	≥0.5	Pass
802.11n20	2412	17.641	17.533	≥0.5	Pass
	2437	17.705	17.539	≥0.5	Pass
	2462	17.697	17.318	≥0.5	Pass
802.11n40	2422	35.839	35.464	≥0.5	Pass
	2437	35.788	35.691	≥0.5	Pass
	2452	35.814	35.683	≥0.5	Pass

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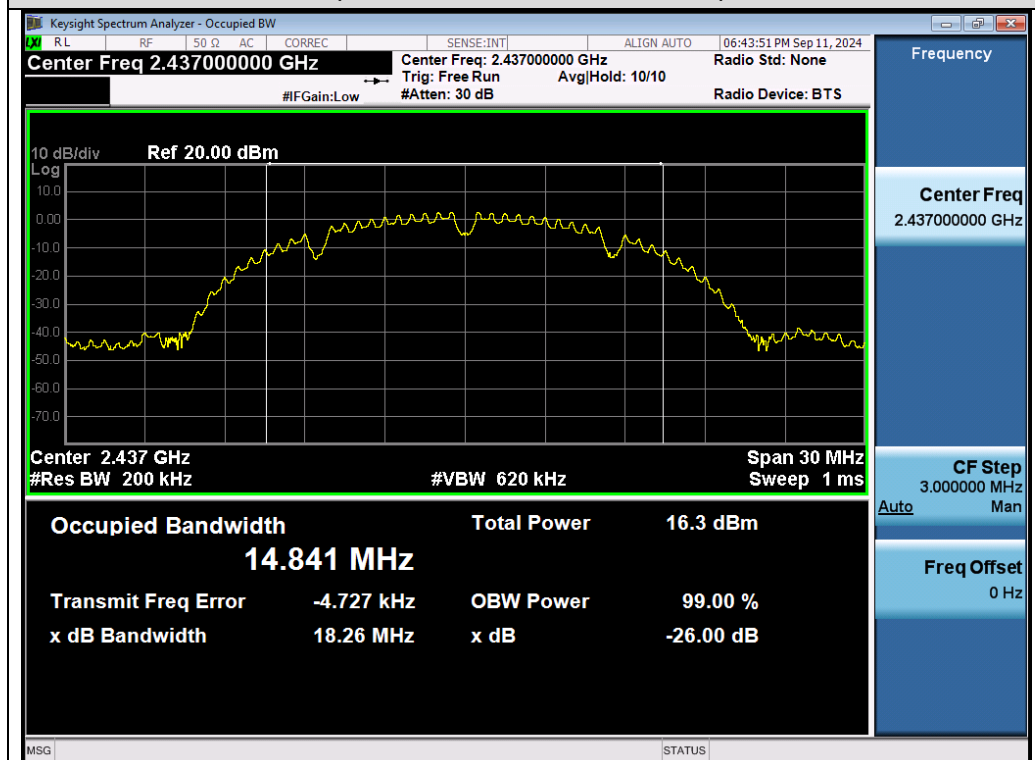
Test Data of Occupied Bandwidth and DTS Bandwidth-2.4G WIFI (Module: ATBM6012B)					
Test Mode	Test Frequency (MHz)	99% Occupied Bandwidth (MHz)	DTS Bandwidth (MHz)	DTS Bandwidth Limits (MHz)	Pass or Fail
802.11b	2412	13.074	10.061	≥0.5	Pass
	2437	13.079	10.063	≥0.5	Pass
	2462	13.104	10.062	≥0.5	Pass
802.11g	2412	16.558	16.402	≥0.5	Pass
	2437	16.551	16.396	≥0.5	Pass
	2462	16.561	16.397	≥0.5	Pass
802.11n20	2412	17.524	17.530	≥0.5	Pass
	2437	17.519	17.536	≥0.5	Pass
	2462	17.506	17.532	≥0.5	Pass

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Test Graphs of Occupied Bandwidth-2.4G WIFI (Module: RTL8192FC)

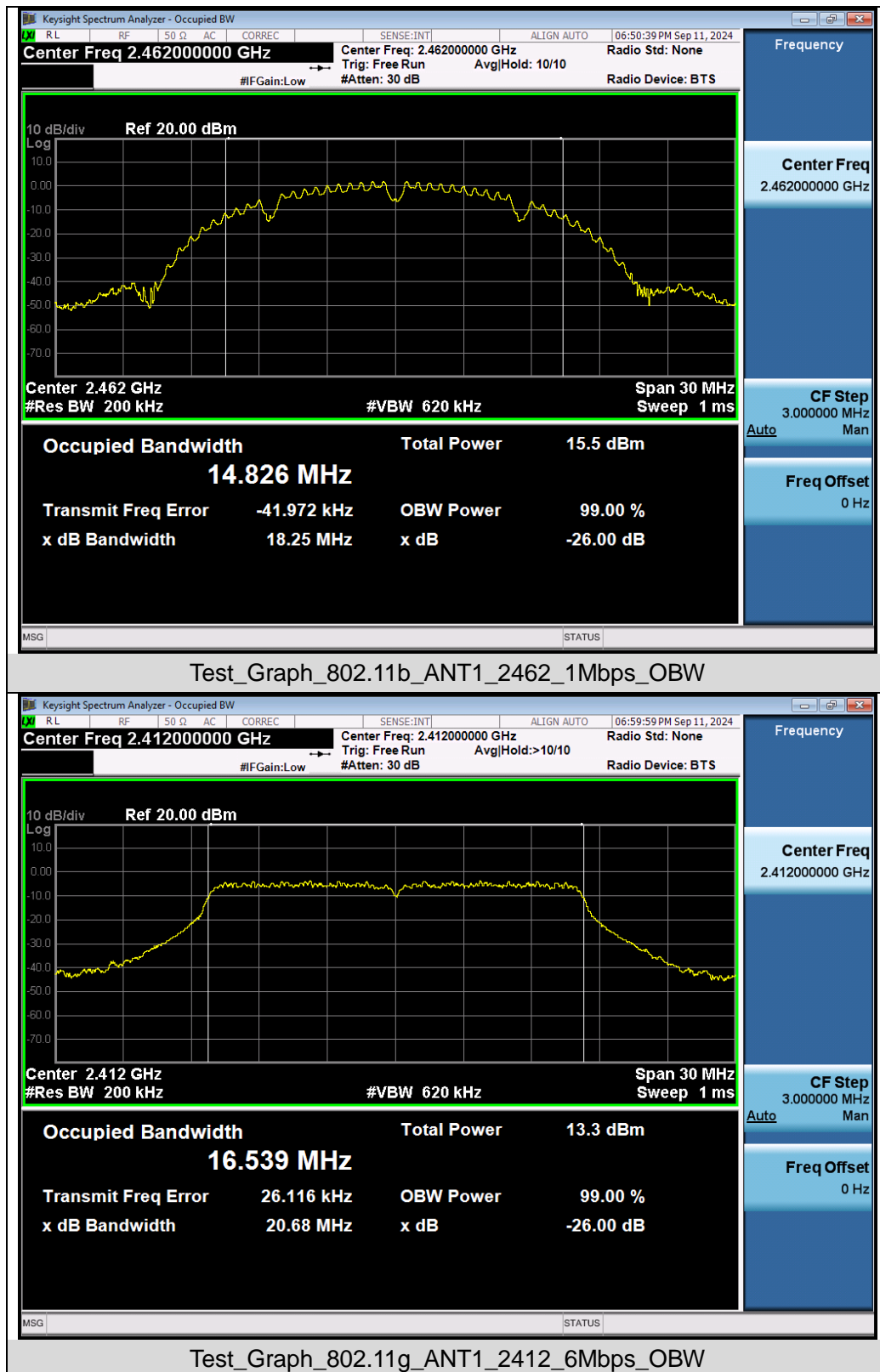


Test_Graph_802.11b_ANT1_2412_1Mbps_OBW

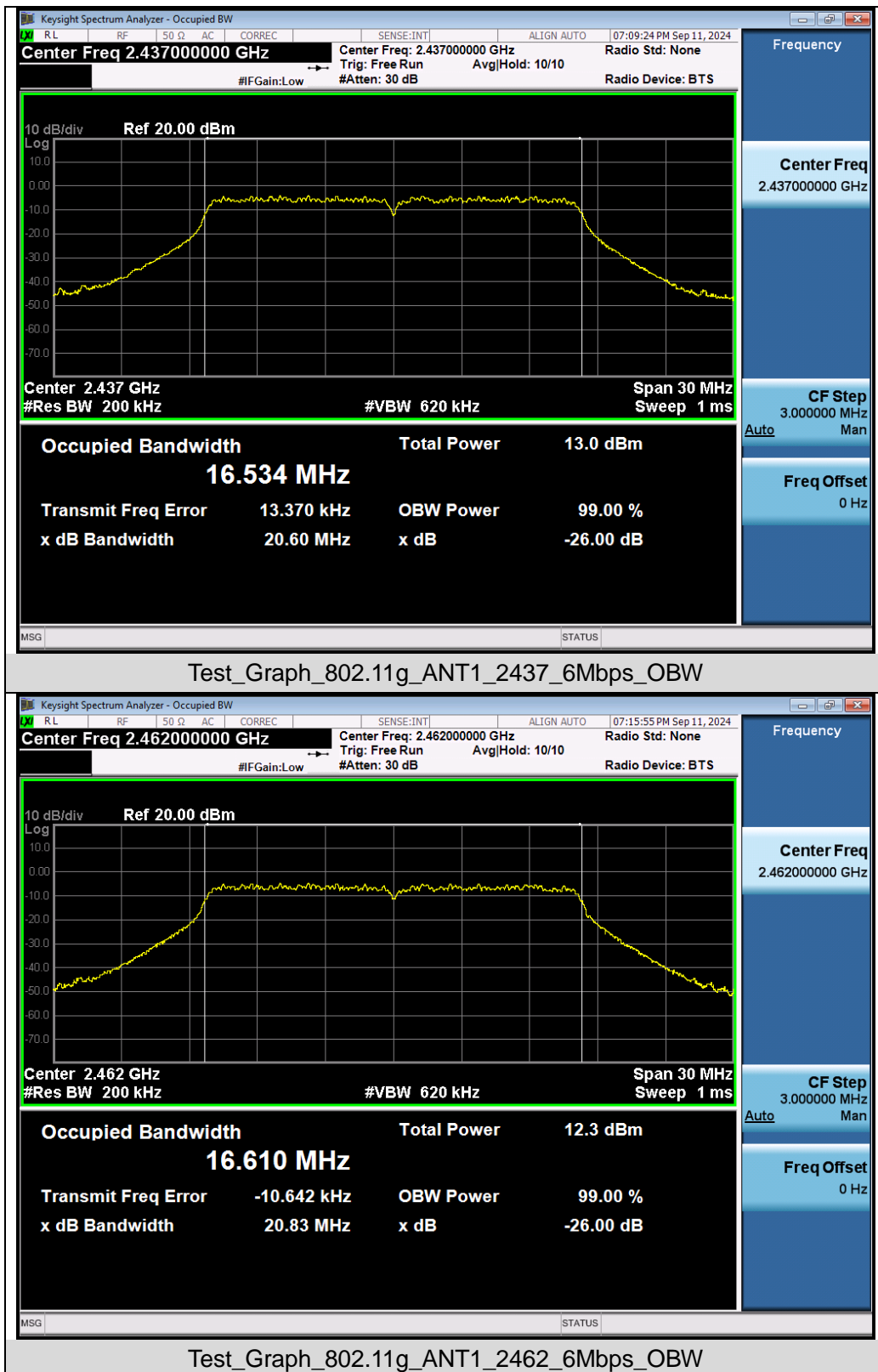


Test_Graph_802.11b_ANT1_2437_1Mbps_OBW

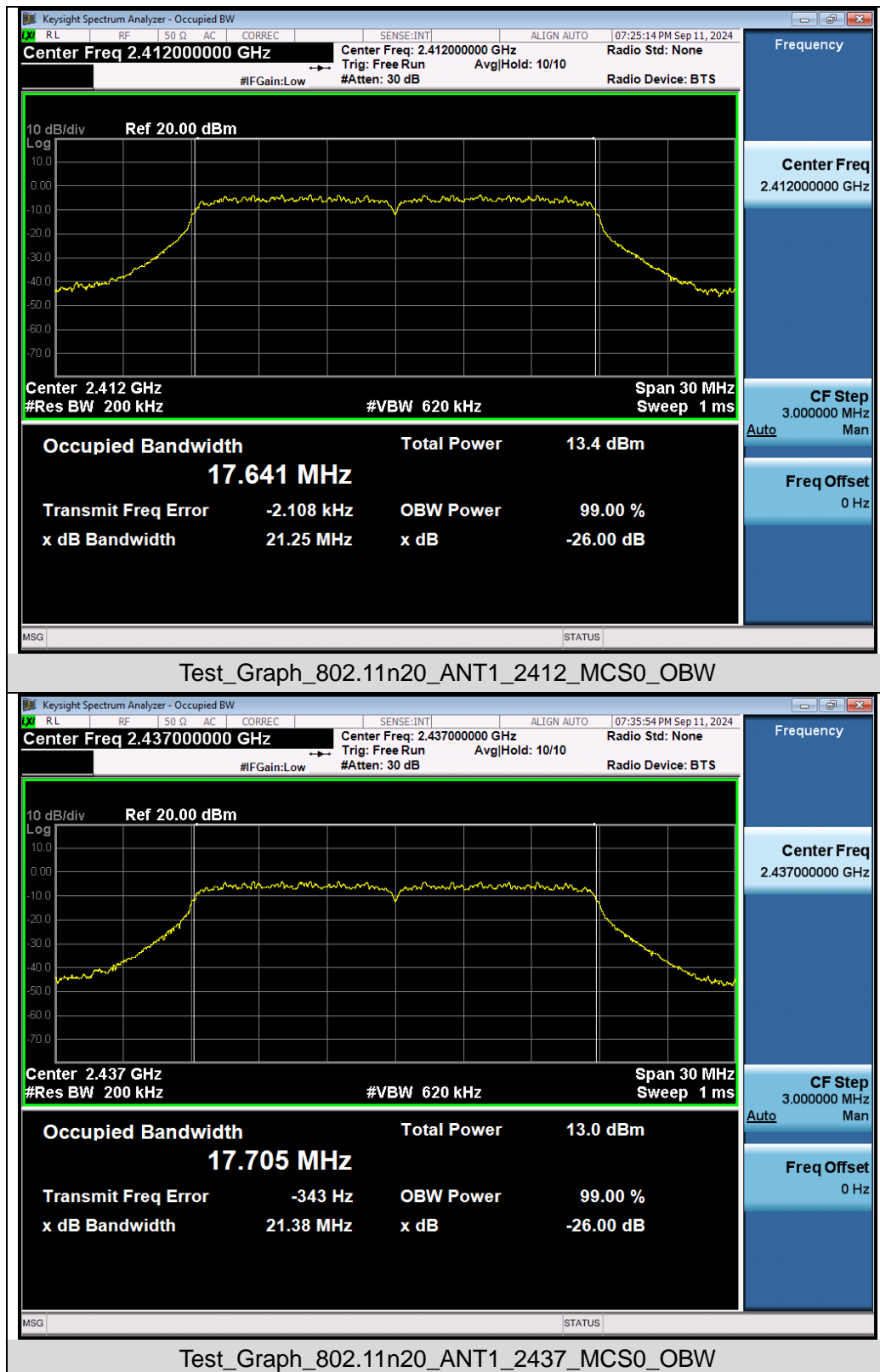
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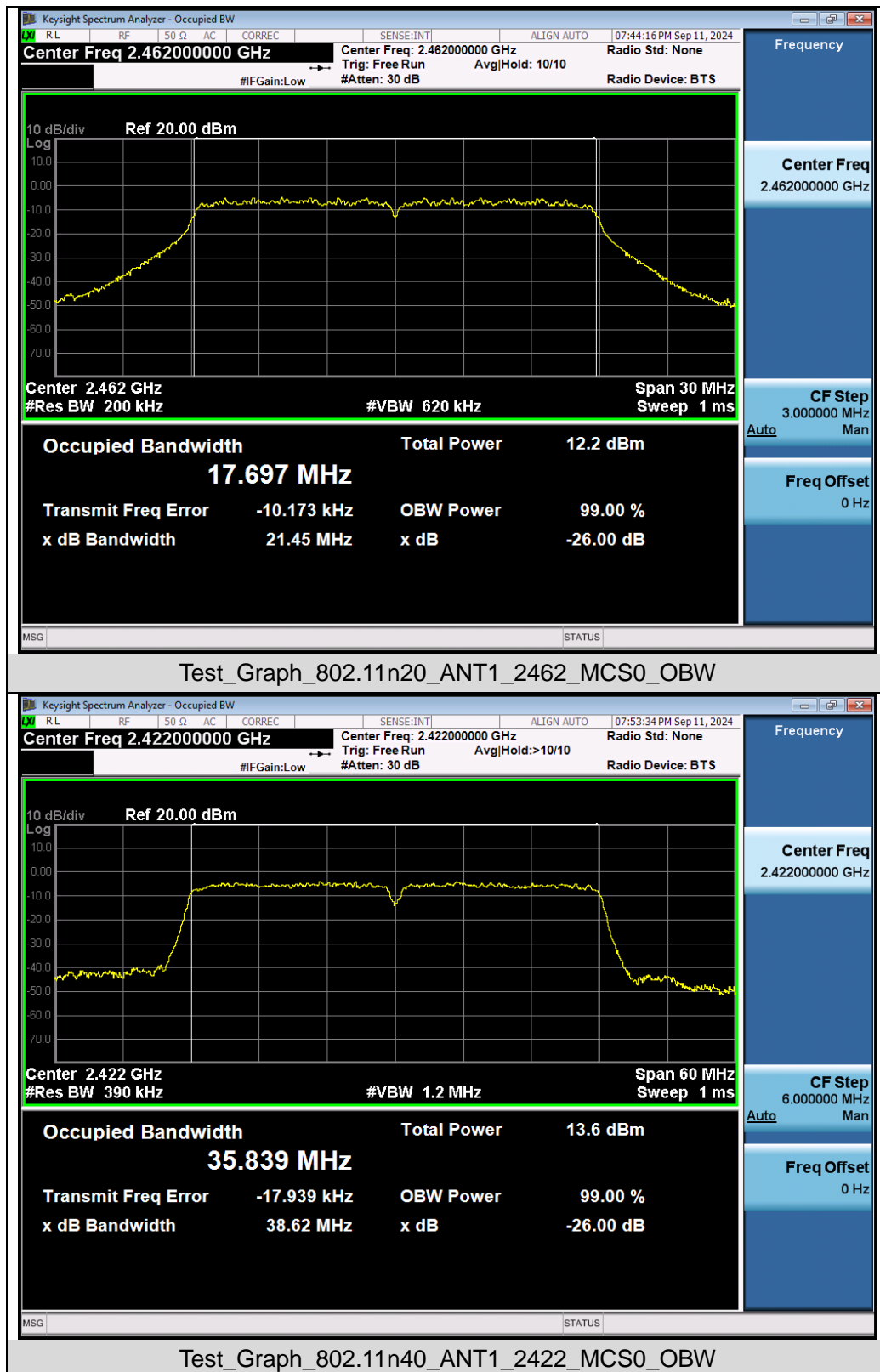
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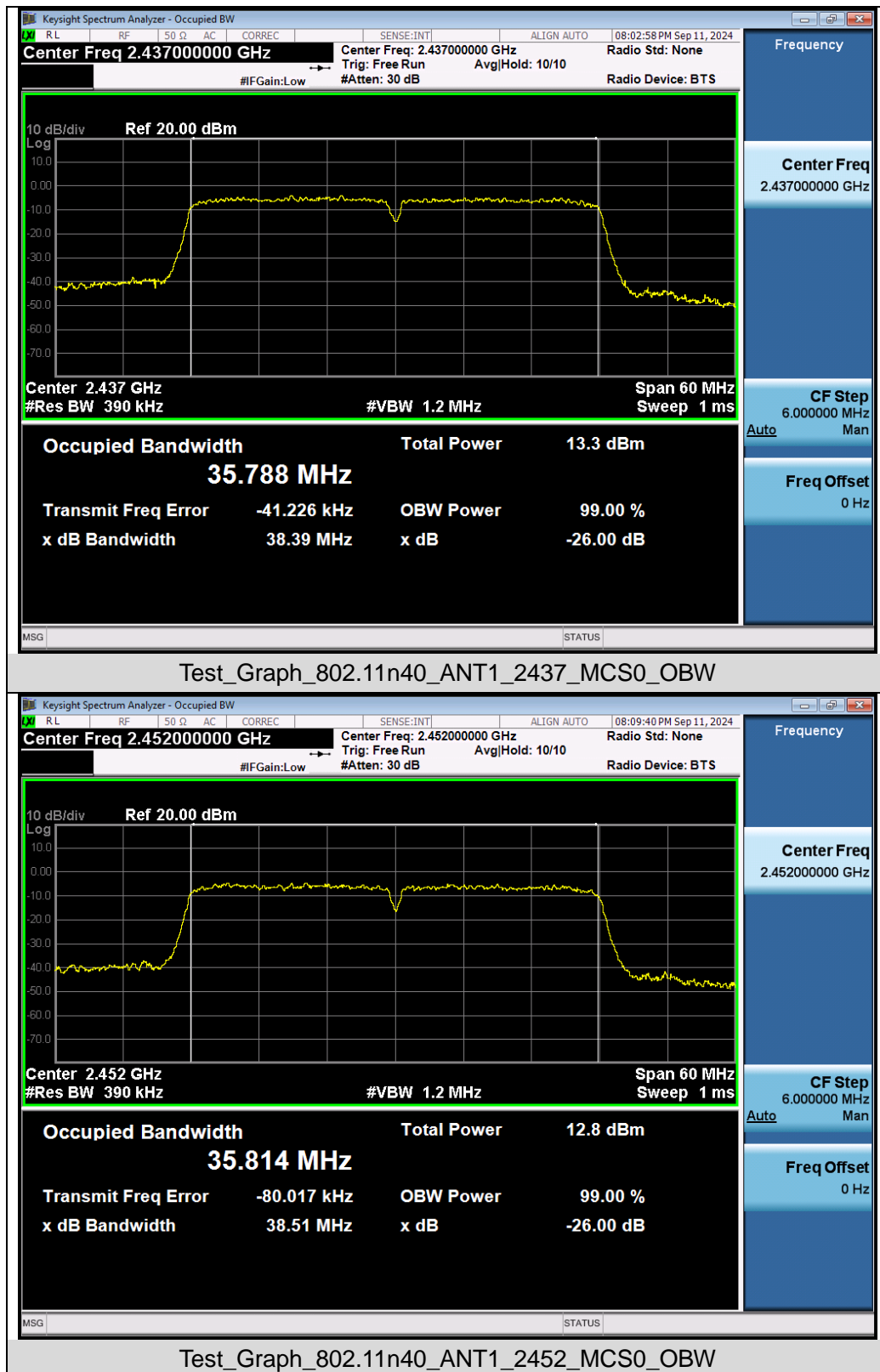
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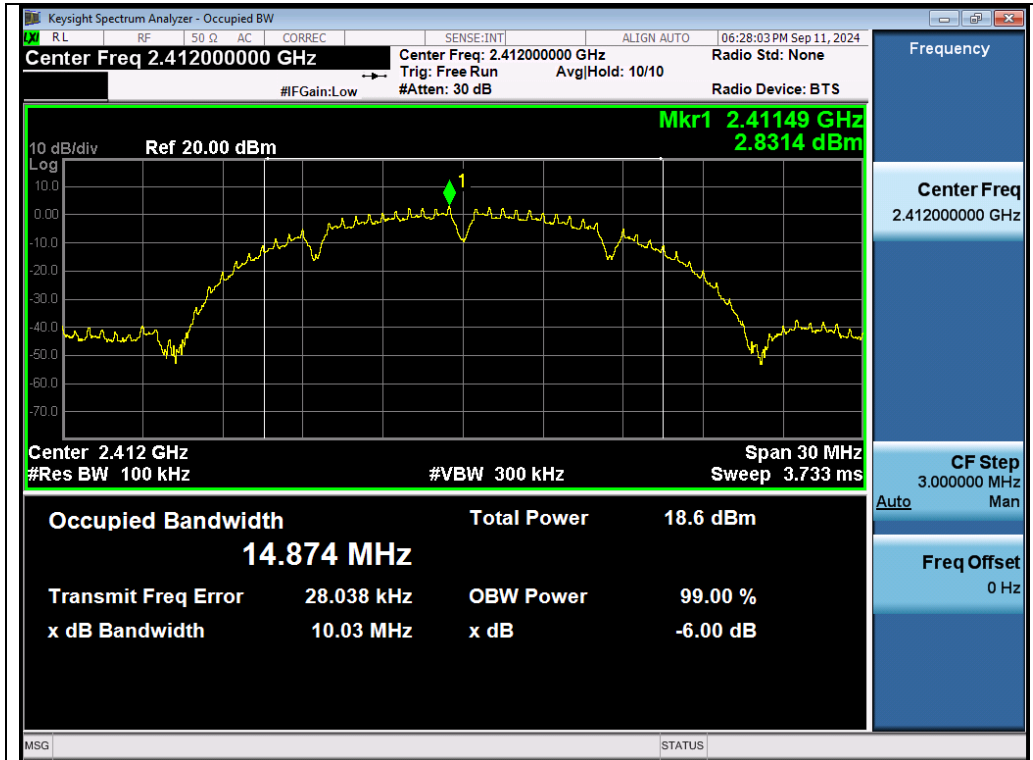


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Test Graphs of DTS Bandwidth-2.4G WIFI (Module: RTL8192FC)

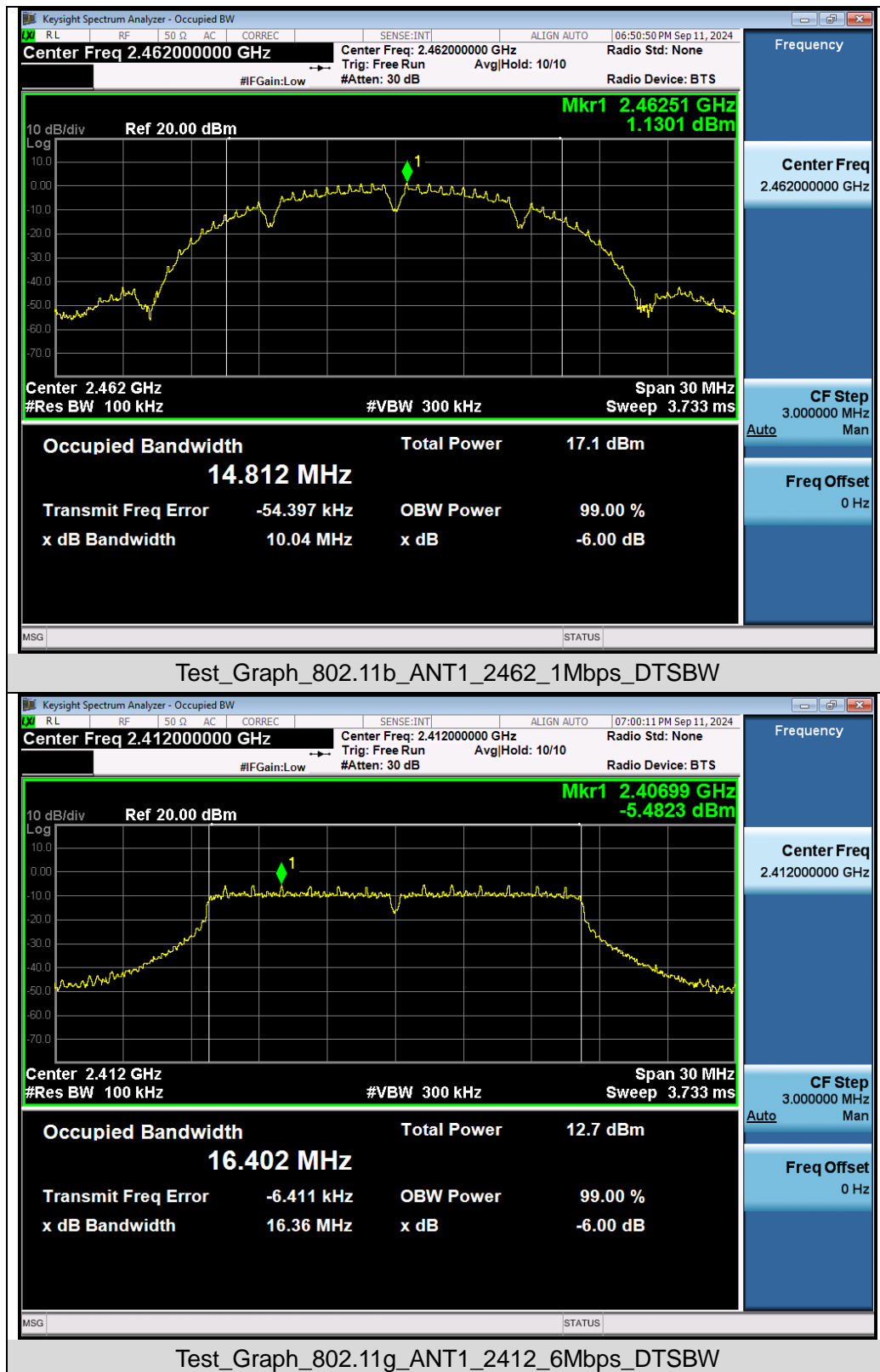


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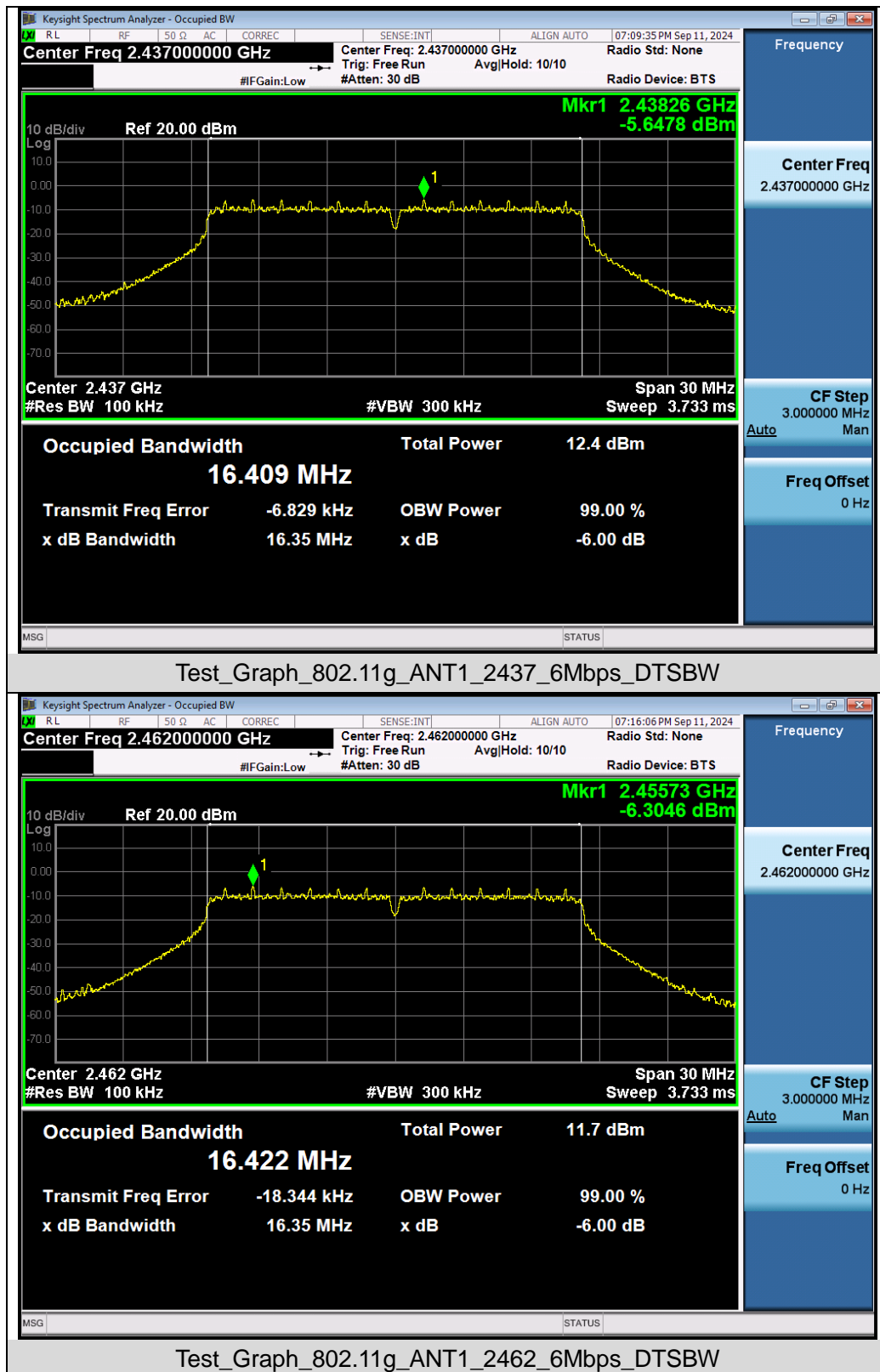


Test_Graph_802.11b_ANT1_2437_1Mbps_DTBSW

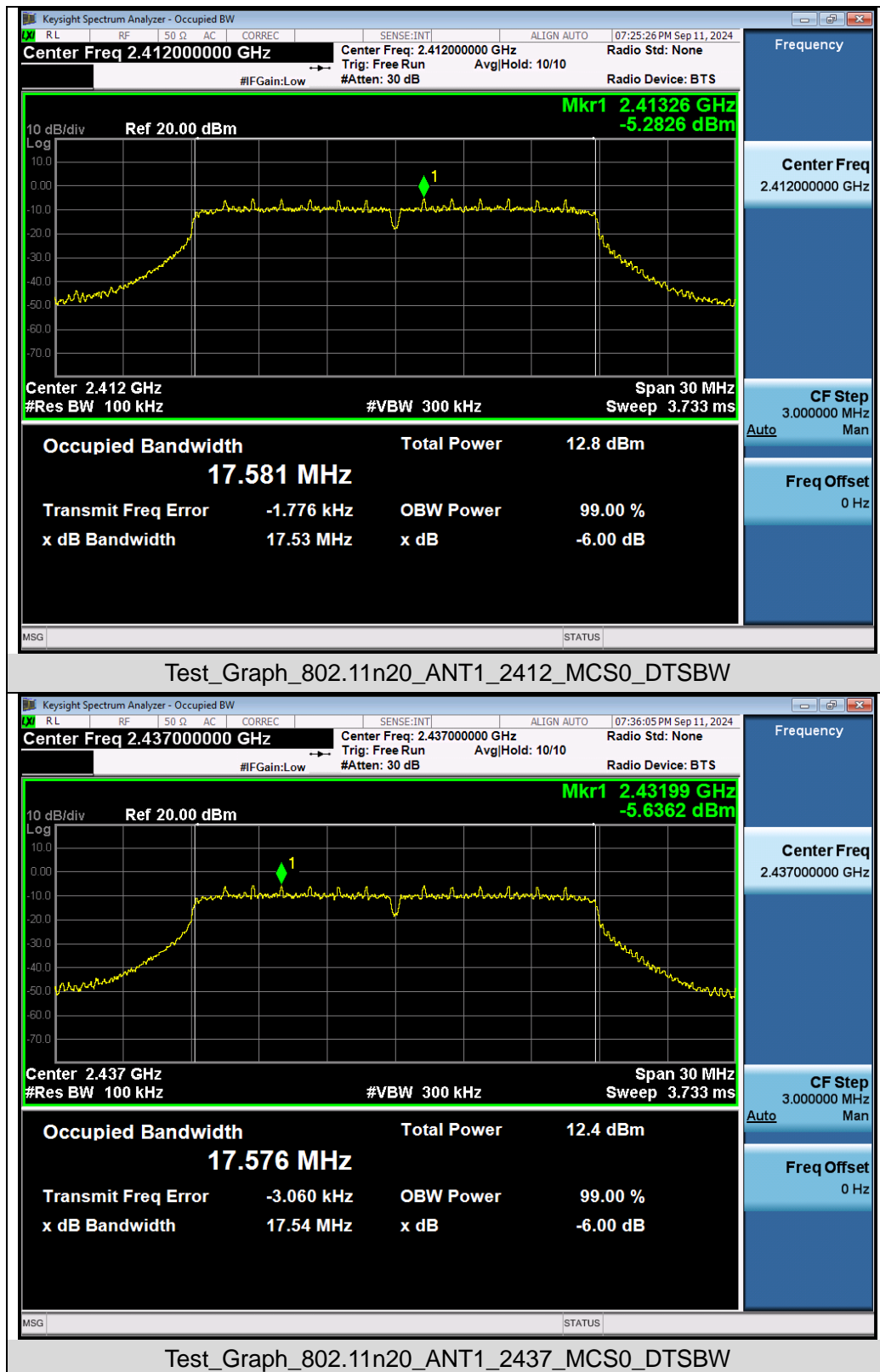
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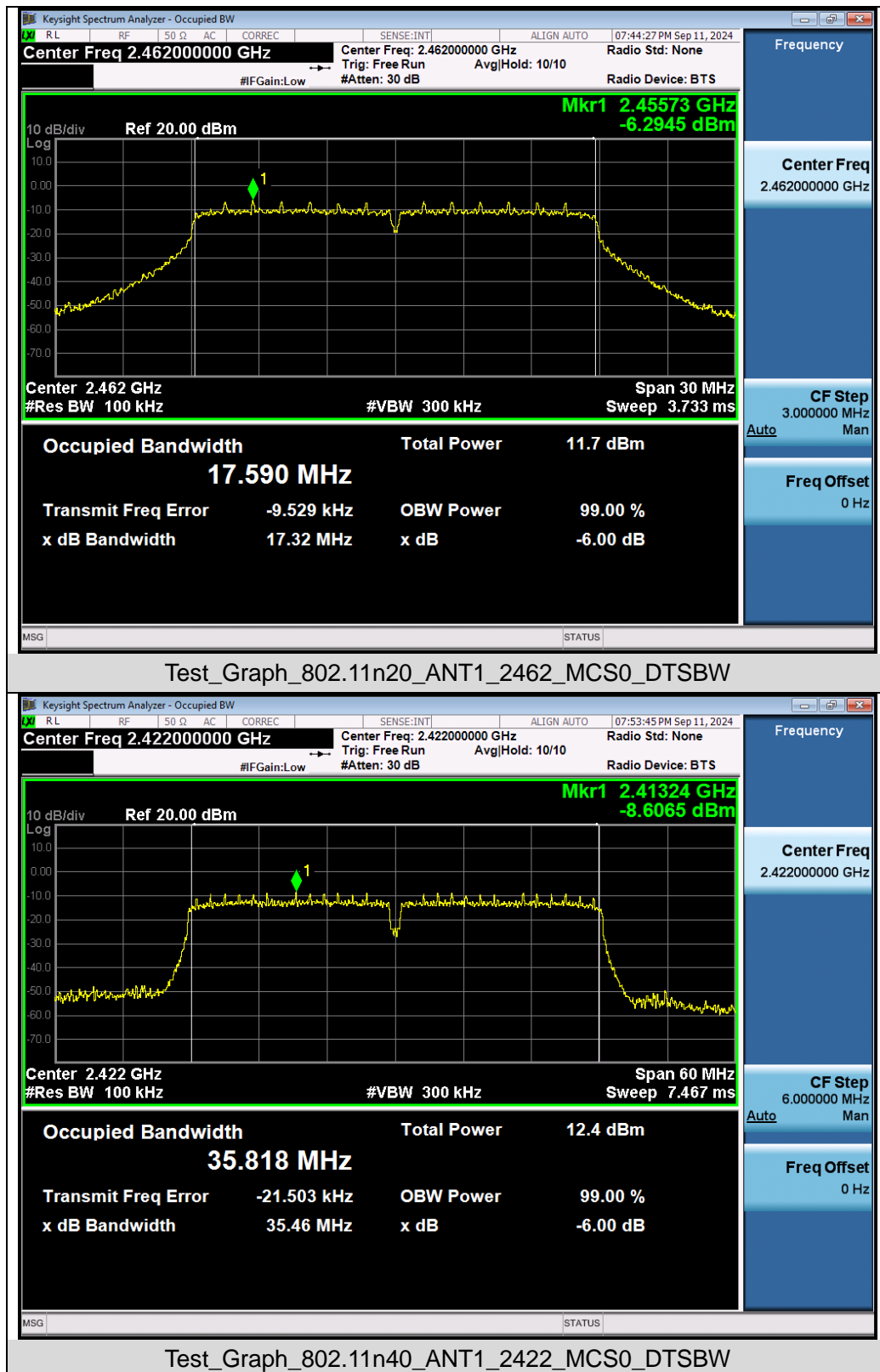
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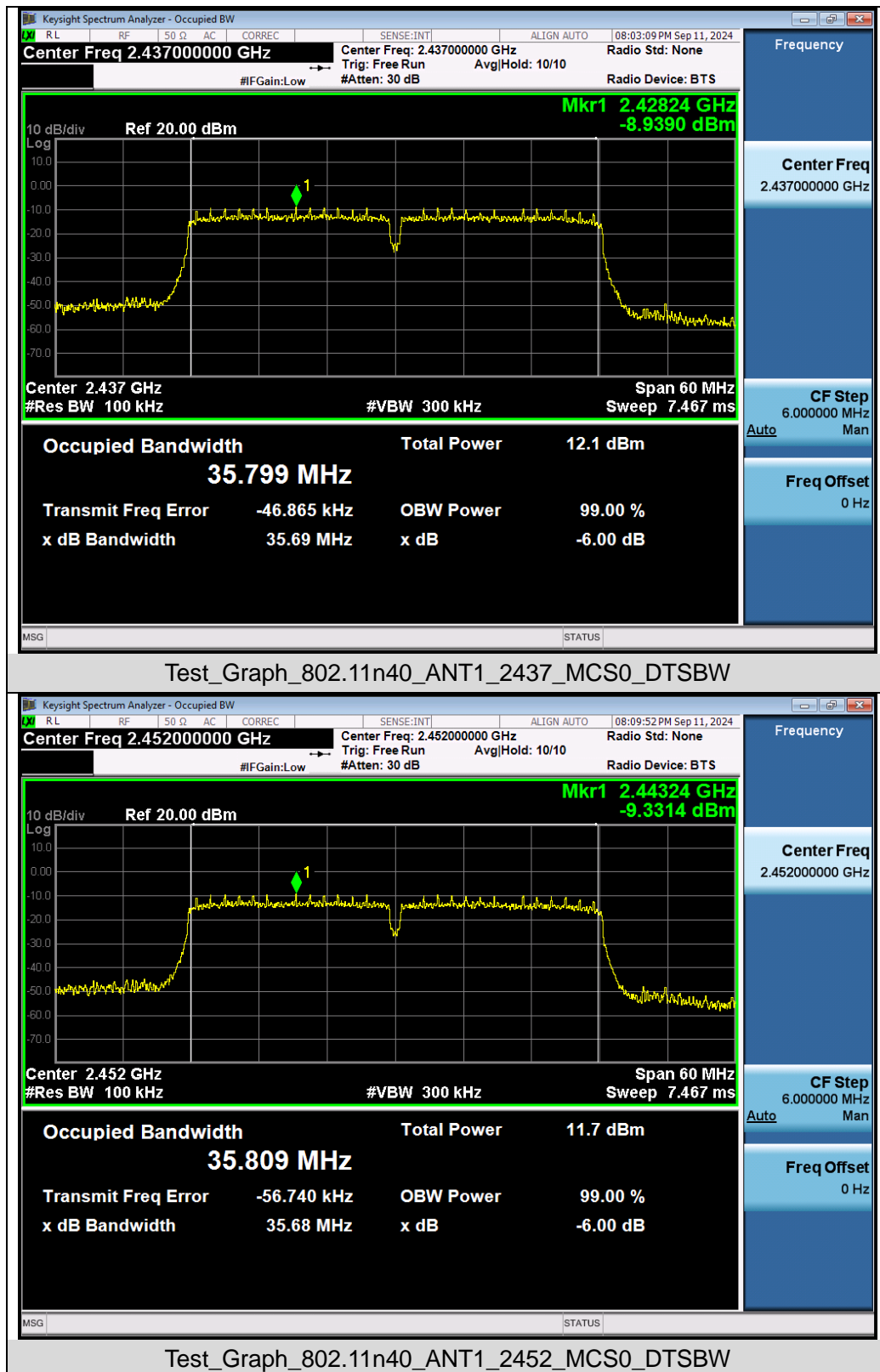
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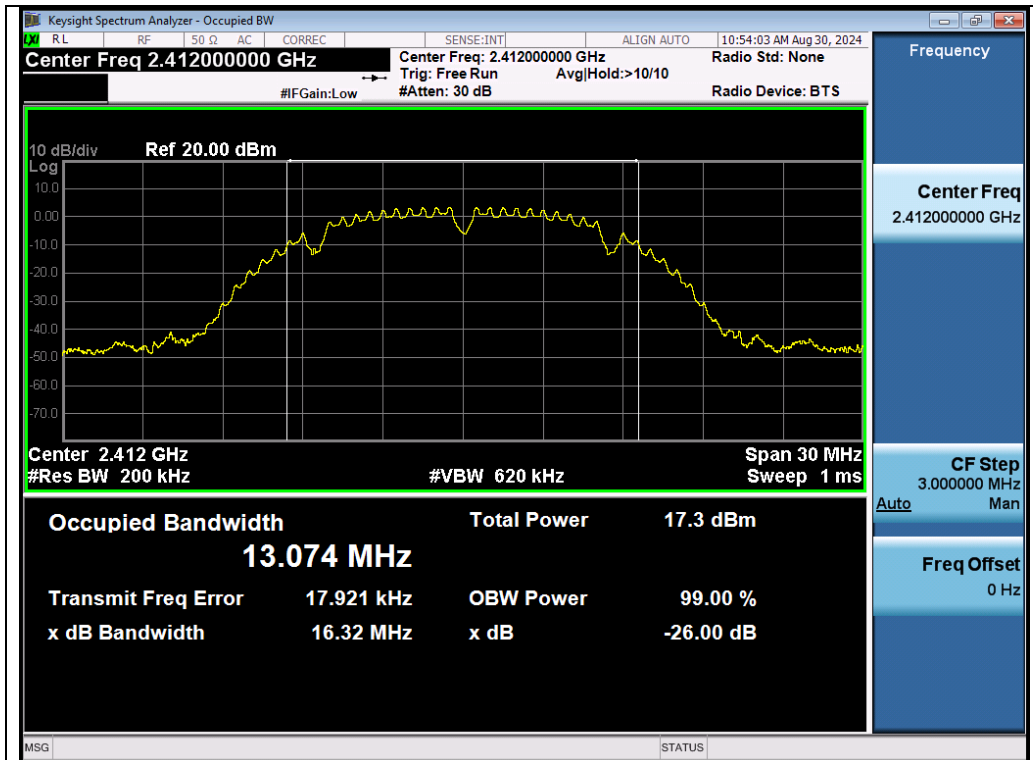


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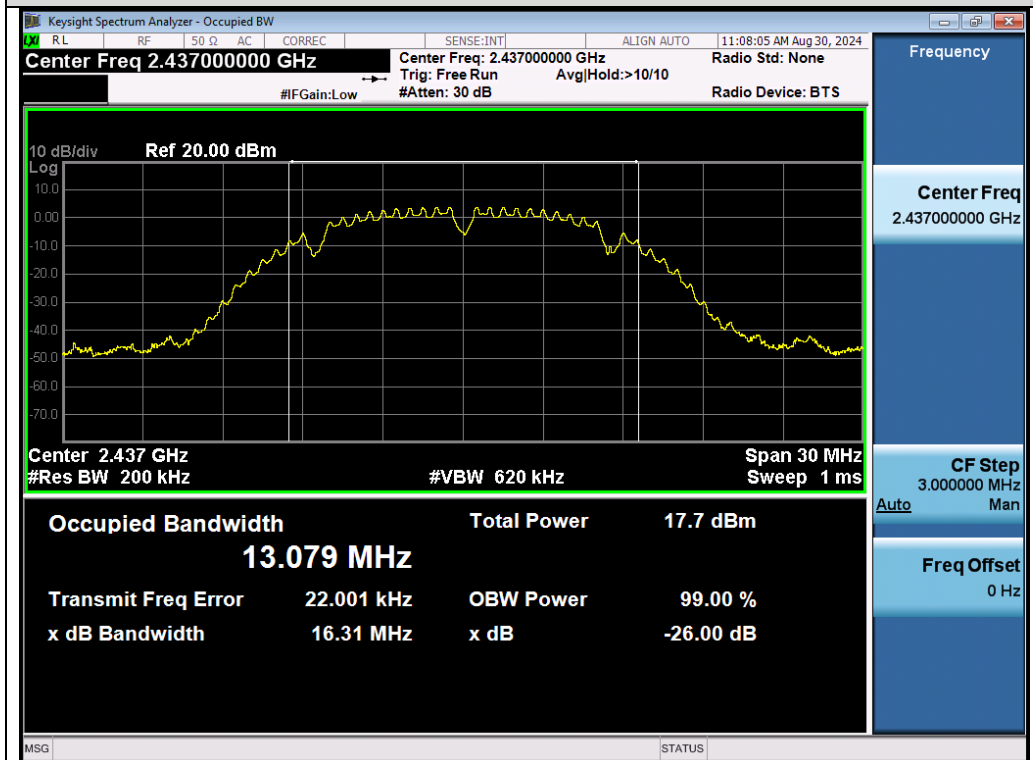


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Test Graphs of Occupied Bandwidth-2.4G WIFI (Module: ATBM6012B)

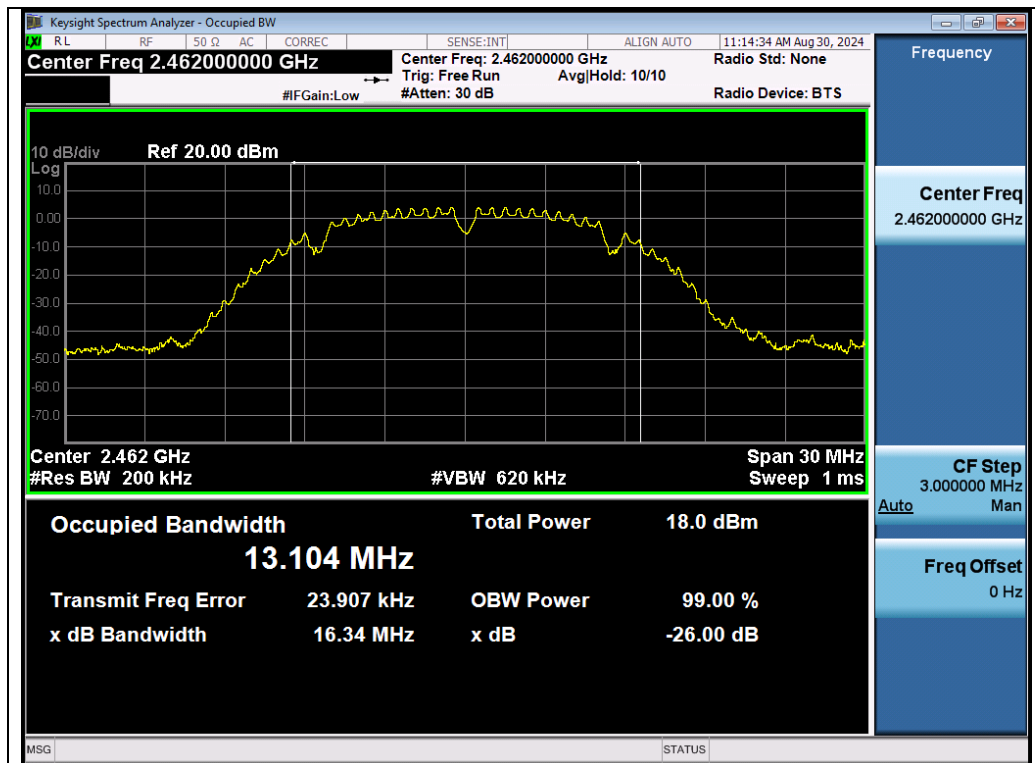


Test_Graph_802.11b_ANT2_2412_1Mbps_OBW

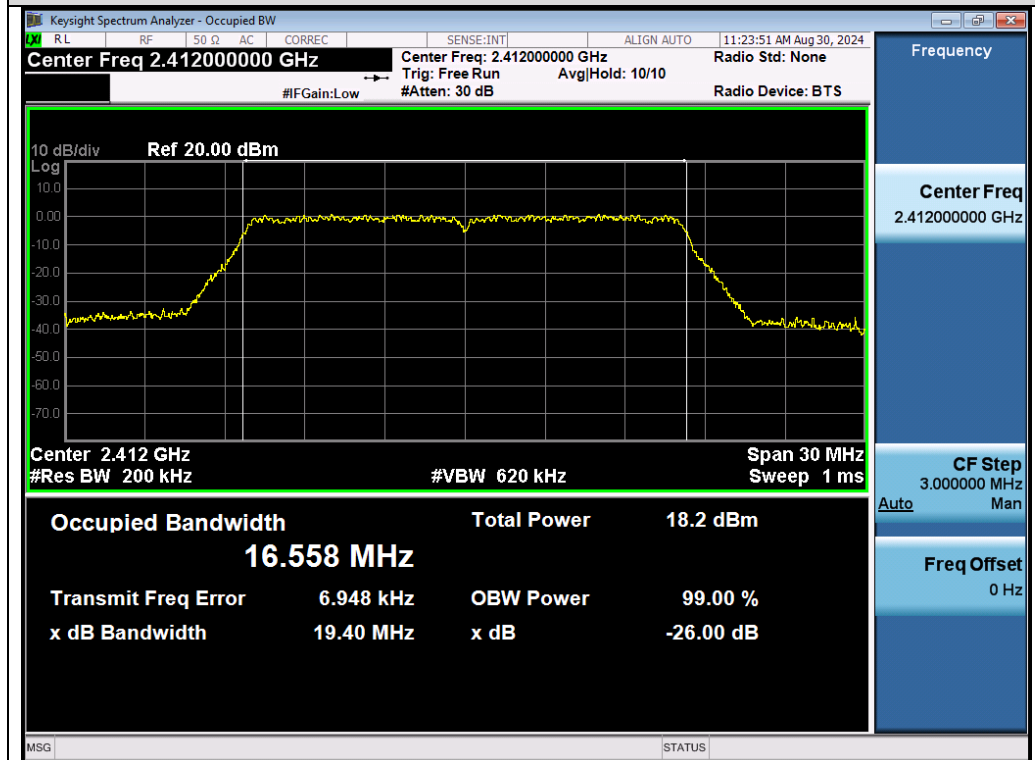


Test_Graph_802.11b_ANT2_2437_1Mbps_OBW

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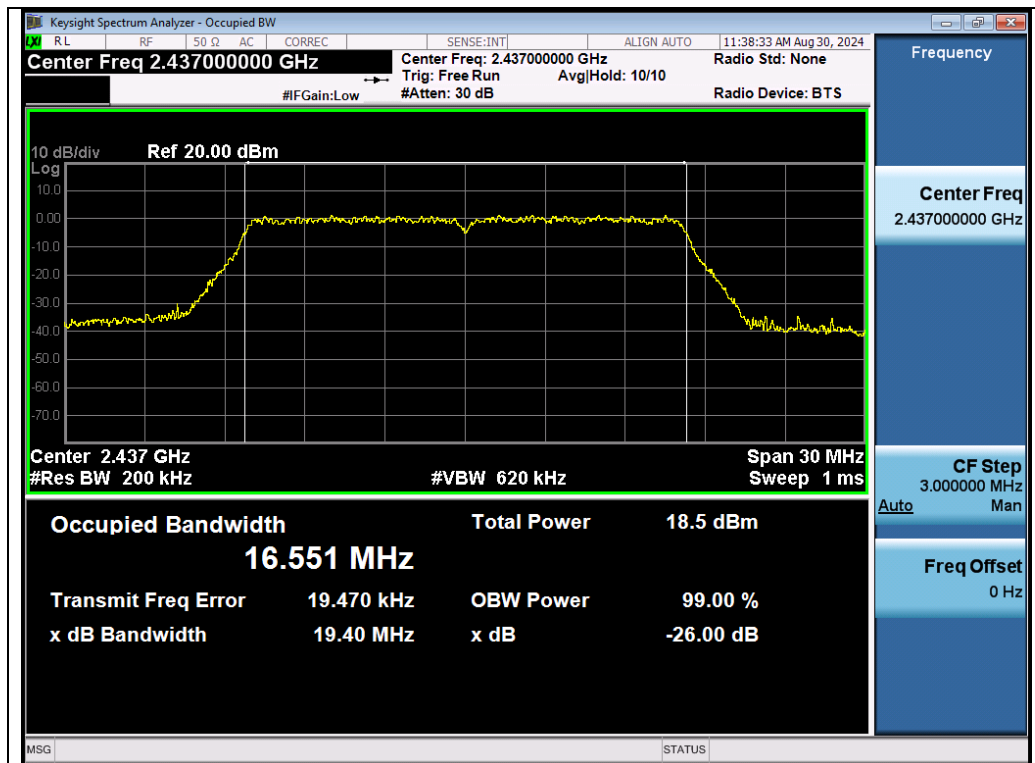


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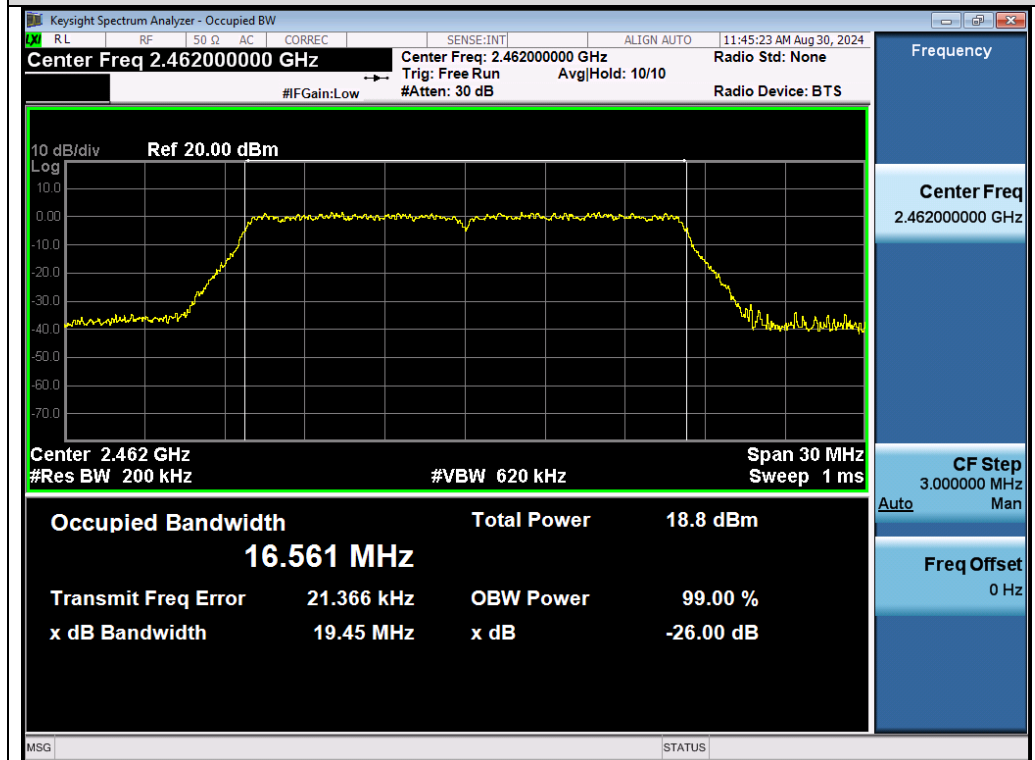


Test_Graph_802.11g_ANT2_2412_6Mbps_OBW

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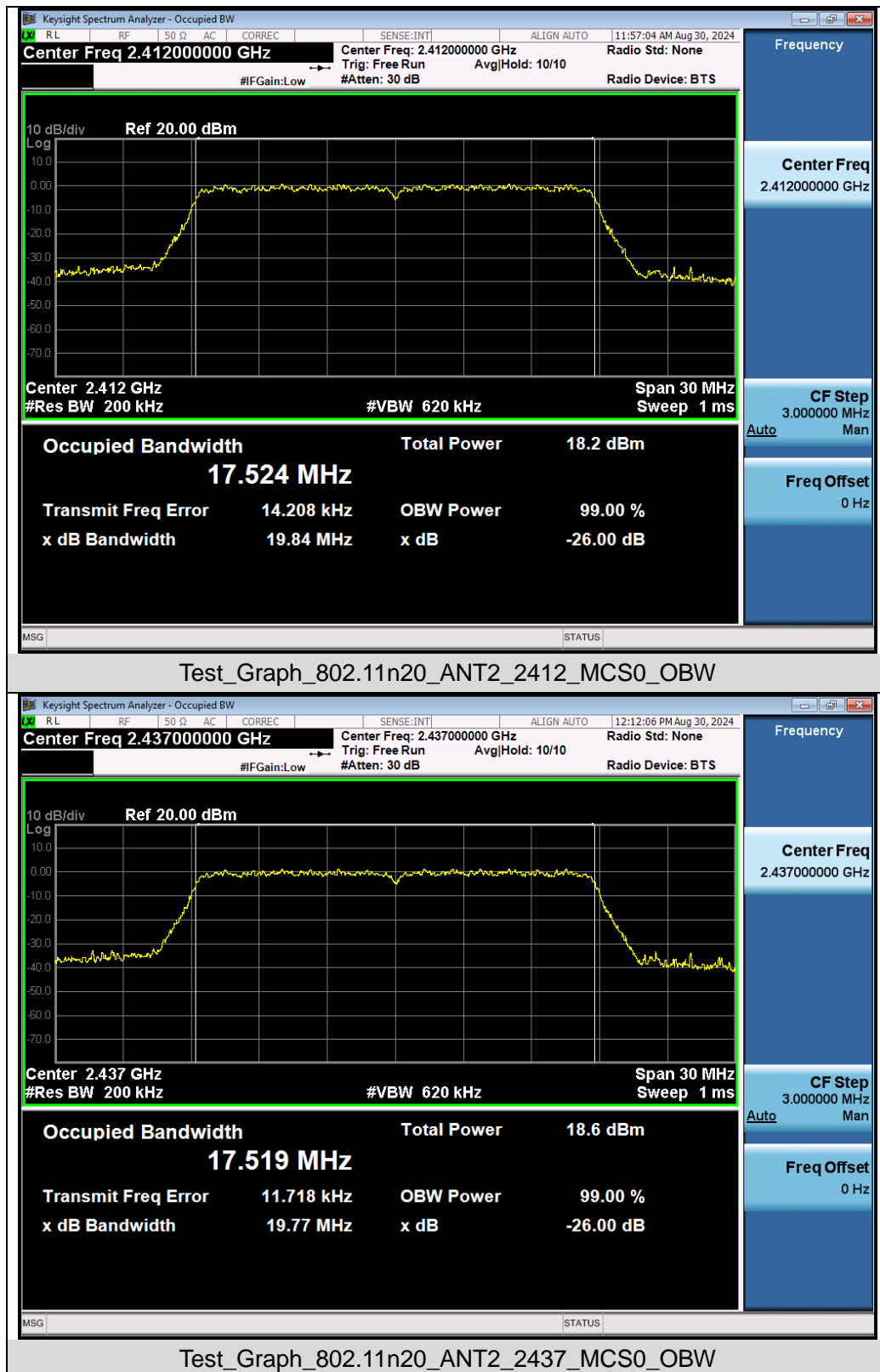


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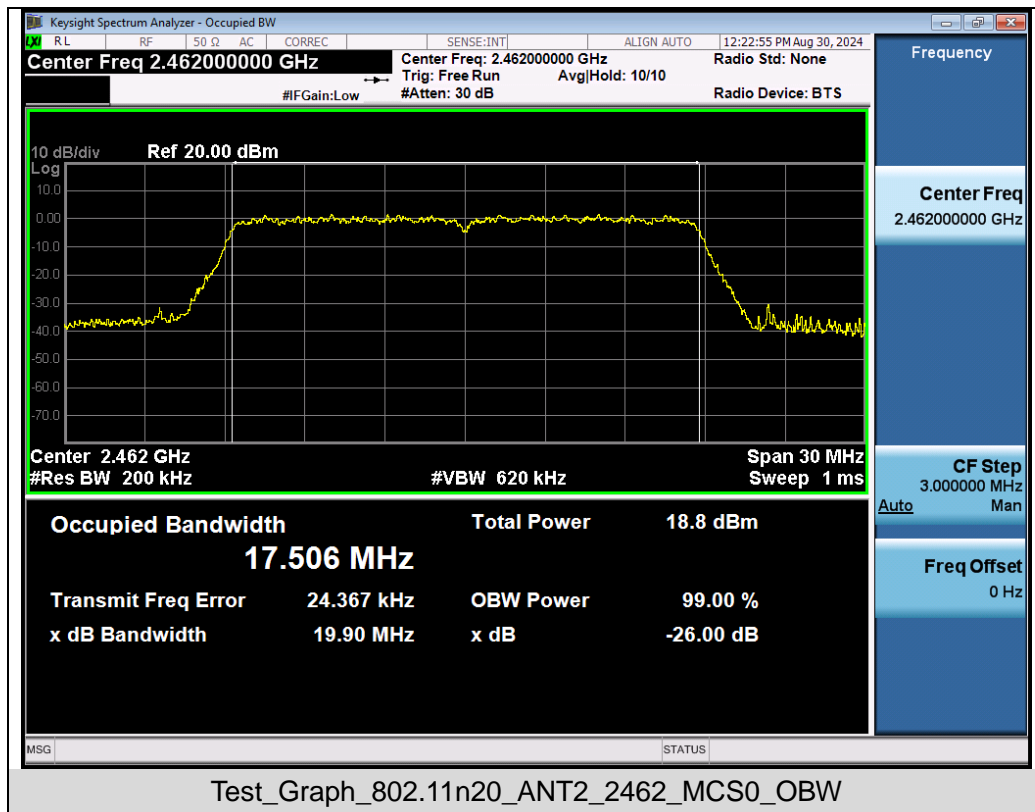


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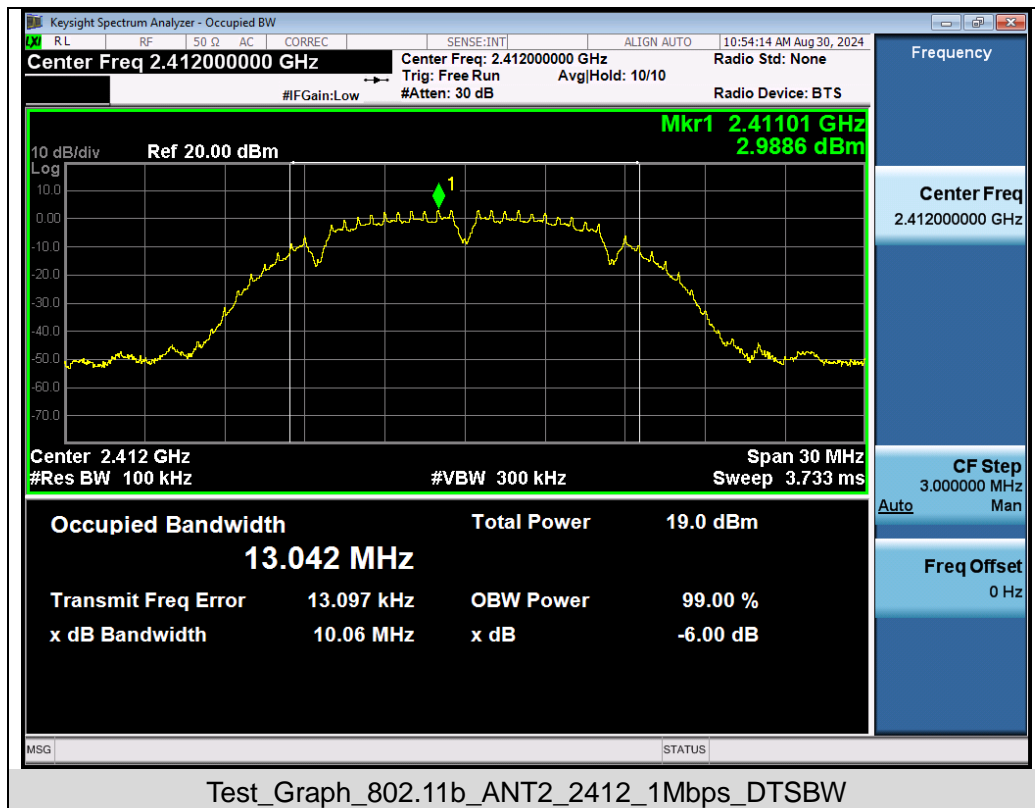
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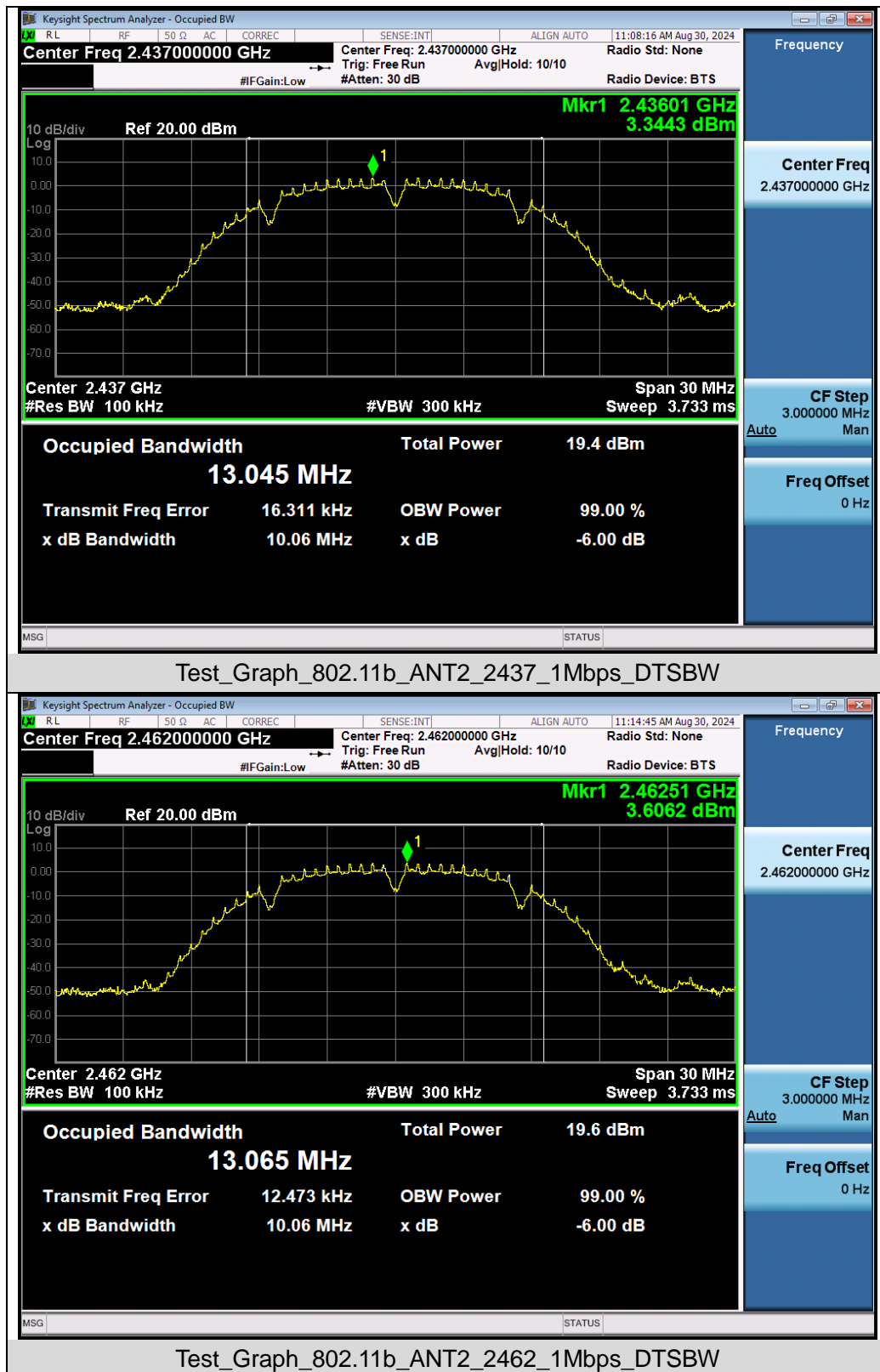
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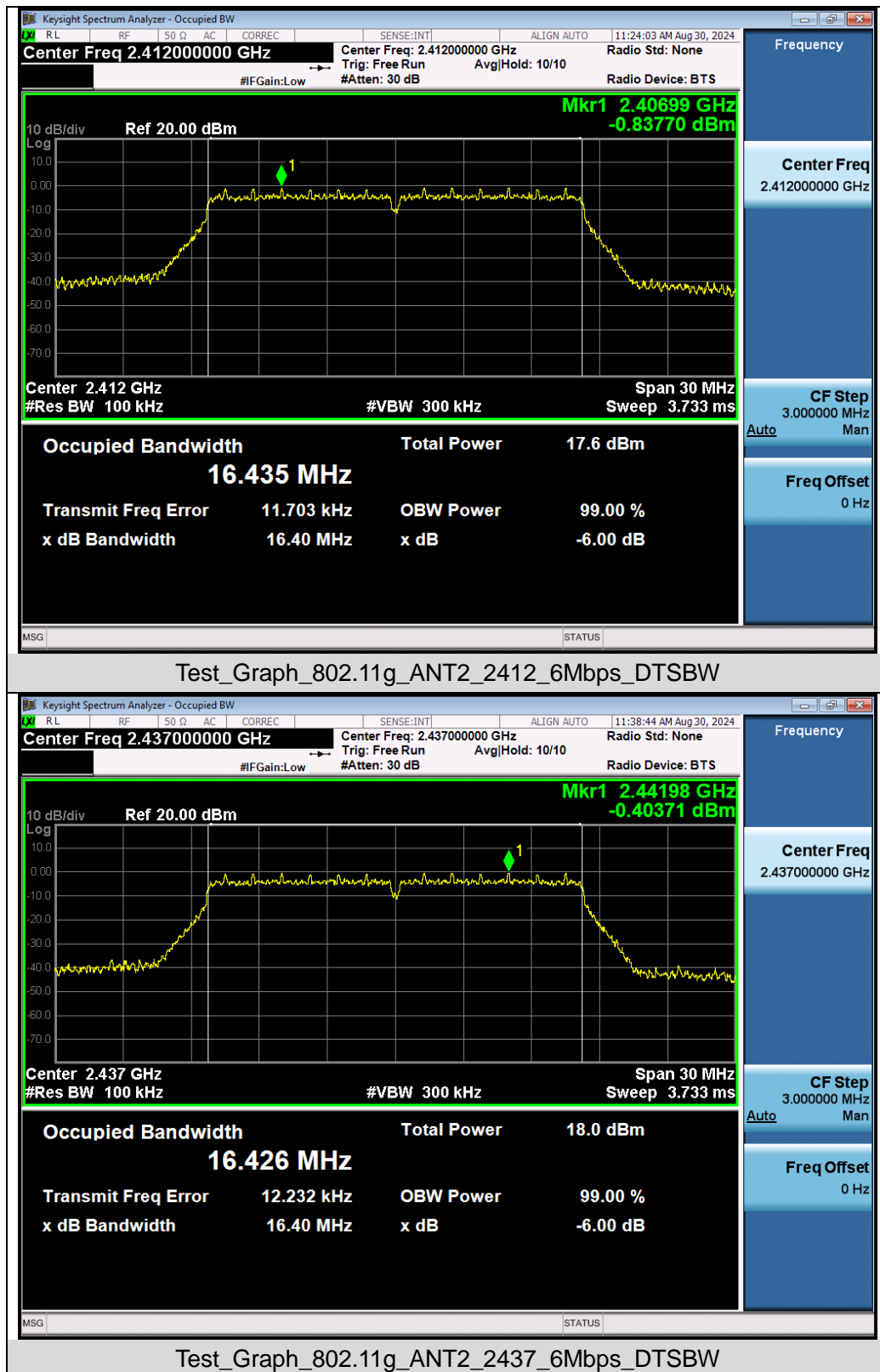
Test Graphs of DTS Bandwidth-2.4G WIFI (Module: ATBM6012B)



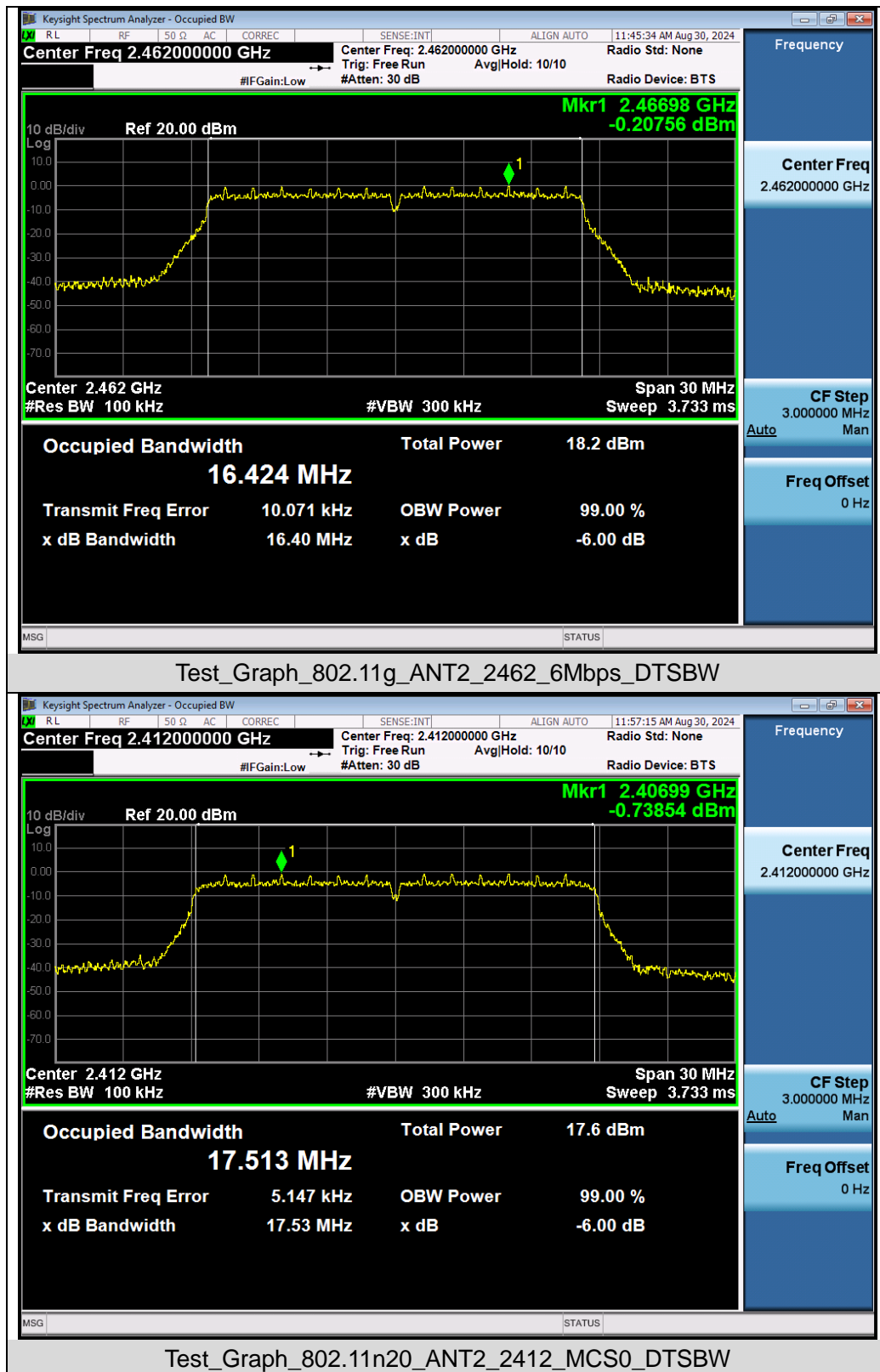
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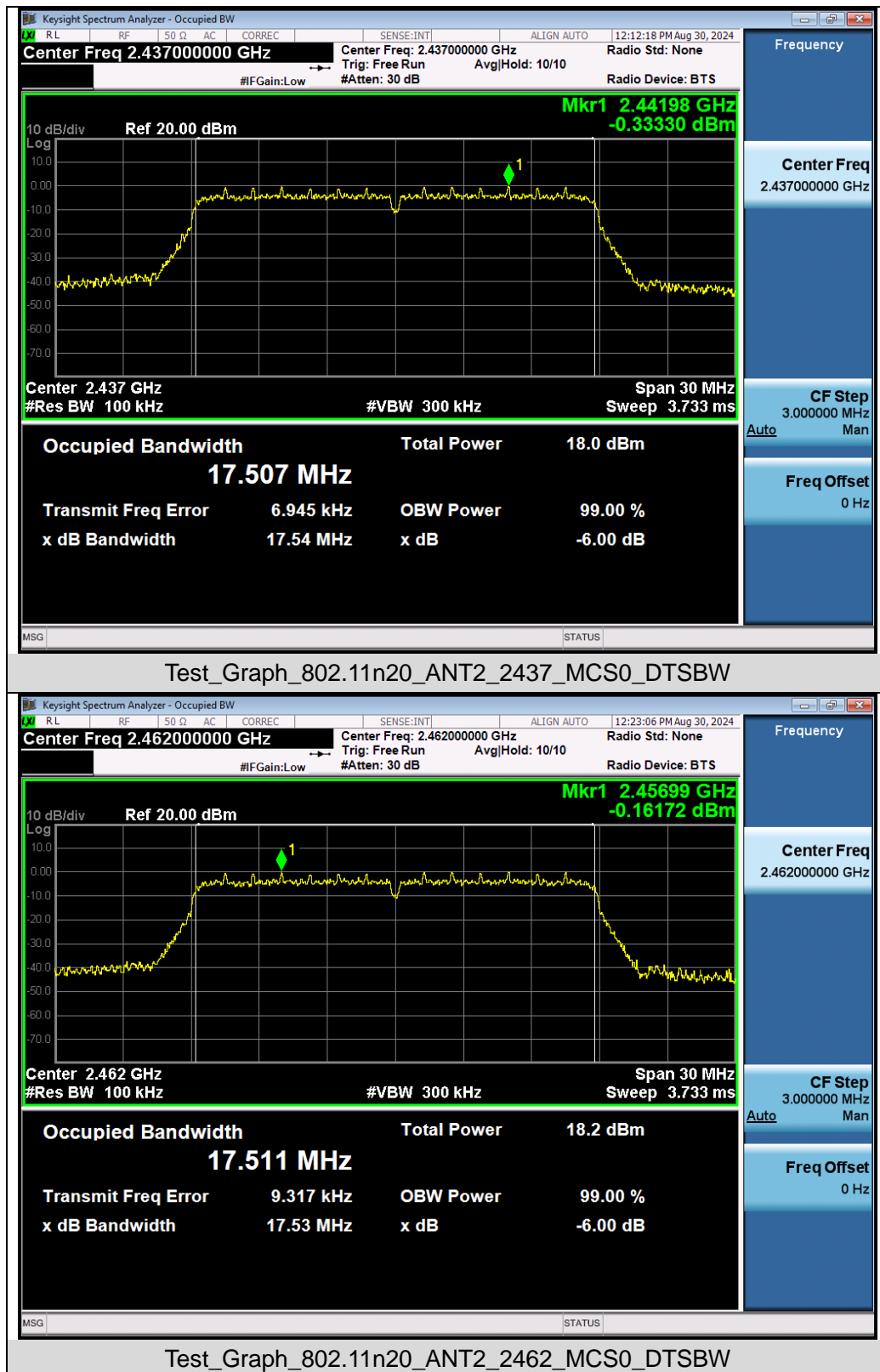
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9. Power Spectral Density Measurement

9.1 Provisions Applicable

The transmitter power spectral density conducted from the transmitter to the antenna shall not be greater than 8 dBm in any 3 kHz band during any time interval of continuous transmission.

9.2 Measurement Procedure

☒ For Peak power spectral density test:

1. The testing follows the ANSI C63.10 Section 11.10.2 Method PKPSD.
2. Connect EUT RF output port to the Spectrum Analyzer through an RF attenuator
3. Set the RBW = 20 kHz.
4. Set the VBW $\geq [3 \times \text{RBW}]$.
5. Set the Span $\geq [1.5 \times \text{DTS bandwidth}]$.
6. Sweep time=Auto couple.
7. Detector function=Peak.
8. Trace Mode=Max hold.
9. When the measurement bandwidth of Maximum PSD is specified in 3 kHz, add a constant factor $10 \cdot \log(3\text{kHz}/20\text{kHz}) = -8.23 \text{ dB}$ to the measured result.
10. Allow trace to stabilize. Use the marker-to-peak function to set the marker to the peak of the emission.
11. The indicated level is the peak output power, after any corrections for external attenuators and cables.

☐ For Average power spectral density test:

1. The testing follows the ANSI C63.10 Section 11.10.5 Method AVPSD.
2. Connect EUT RF output port to the Spectrum Analyzer through an RF attenuator.
3. Set Span to at least 1.5 times the OBW.
4. Set RBW to: $3 \text{ kHz} \leq \text{RBW} \leq 100 \text{ kHz}$.
5. Set $\text{VBW} \geq [3 \times \text{RBW}]$.
6. Sweep Time=Auto couple.
7. Detector function=RMS (i.e., power averaging).
8. Trace average at least 100 traces in power averaging (rms) mode.
9. When the measurement bandwidth of Maximum PSD is specified in 3 kHz, add a constant factor $10 \cdot \log(3\text{kHz}/20\text{kHz}) = -8.23 \text{ dB}$ to the measured result.
10. Determine according to the duty cycle of the equipment: when it is less than 98%, follow the steps below.
11. Add $[10 \log (1 / D)]$, where D is the duty cycle, to the measured power to compute the average power during the actual transmission times (because the measurement represents an average over both the ON and OFF times of the transmission). For example, add $[10 \log (1/0.25)] = 6 \text{ dB}$ if the duty cycle is 25%.
12. Record the test results in the report.

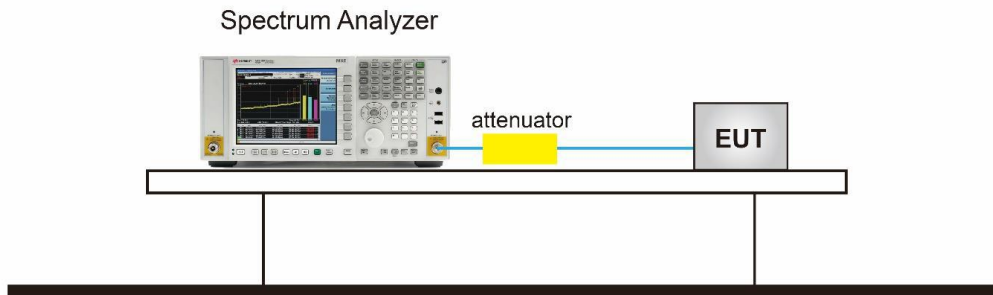
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Attestation of Global Compliance(Shenzhen)Co., Ltd

Attestation of Global Compliance(Shenzhen)Std & Tech Co., Ltd

Tel: +86-755 2523 4088 E-mail: agc@agccert.com Web: <http://www.agccert.com/>

9.3 Measurement Setup (Block Diagram of Configuration)



9.4 Measurement Result

Test Data of Conducted Output Power Spectral Density-2.4G WIFI (Module: RTL8192FC)					
Test Mode	Test Frequency (MHz)	Power Spectral density (dBm/20kHz)	Power Spectral density (dBm/3kHz)	Limit (dBm/3kHz)	Pass or Fail
802.11b	2412	-2.042	-10.281	≤8	Pass
	2437	-2.598	-10.837	≤8	Pass
	2462	-4.214	-12.453	≤8	Pass
802.11g	2412	-9.744	-17.983	≤8	Pass
	2437	-10.888	-19.127	≤8	Pass
	2462	-11.001	-19.24	≤8	Pass
802.11n20	2412	-10.502	-18.741	≤8	Pass
	2437	-10.916	-19.155	≤8	Pass
	2462	-11.154	-19.393	≤8	Pass
802.11n40	2422	-13.154	-21.393	≤8	Pass
	2437	-12.308	-20.547	≤8	Pass
	2452	-14.212	-22.451	≤8	Pass

Note: Power density(dBm/3kHz) = Power density(dBm/20kHz) – 10*log(20/3).

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Test Data of Conducted Output Power Spectral Density-2.4G WIFI (Module: ATBM6012B)					
Test Mode	Test Frequency (MHz)	Power Spectral density (dBm/20kHz)	Power Spectral density (dBm/3kHz)	Limit (dBm/3kHz)	Pass or Fail
802.11b	2412	2.448	-5.791	≤8	Pass
	2437	1.336	-6.903	≤8	Pass
	2462	3.787	-4.452	≤8	Pass
802.11g	2412	-5.452	-13.691	≤8	Pass
	2437	-5.078	-13.317	≤8	Pass
	2462	-4.779	-13.018	≤8	Pass
802.11n20	2412	-5.807	-14.046	≤8	Pass
	2437	-4.892	-13.131	≤8	Pass
	2462	-5.364	-13.603	≤8	Pass

Note: Power density(dBm/3kHz) = Power density(dBm/20kHz) – 10*log(20/3).

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Test Graphs of Conducted Output Power Spectral Density-2.4G WIFI (Module: RTL8192FC)

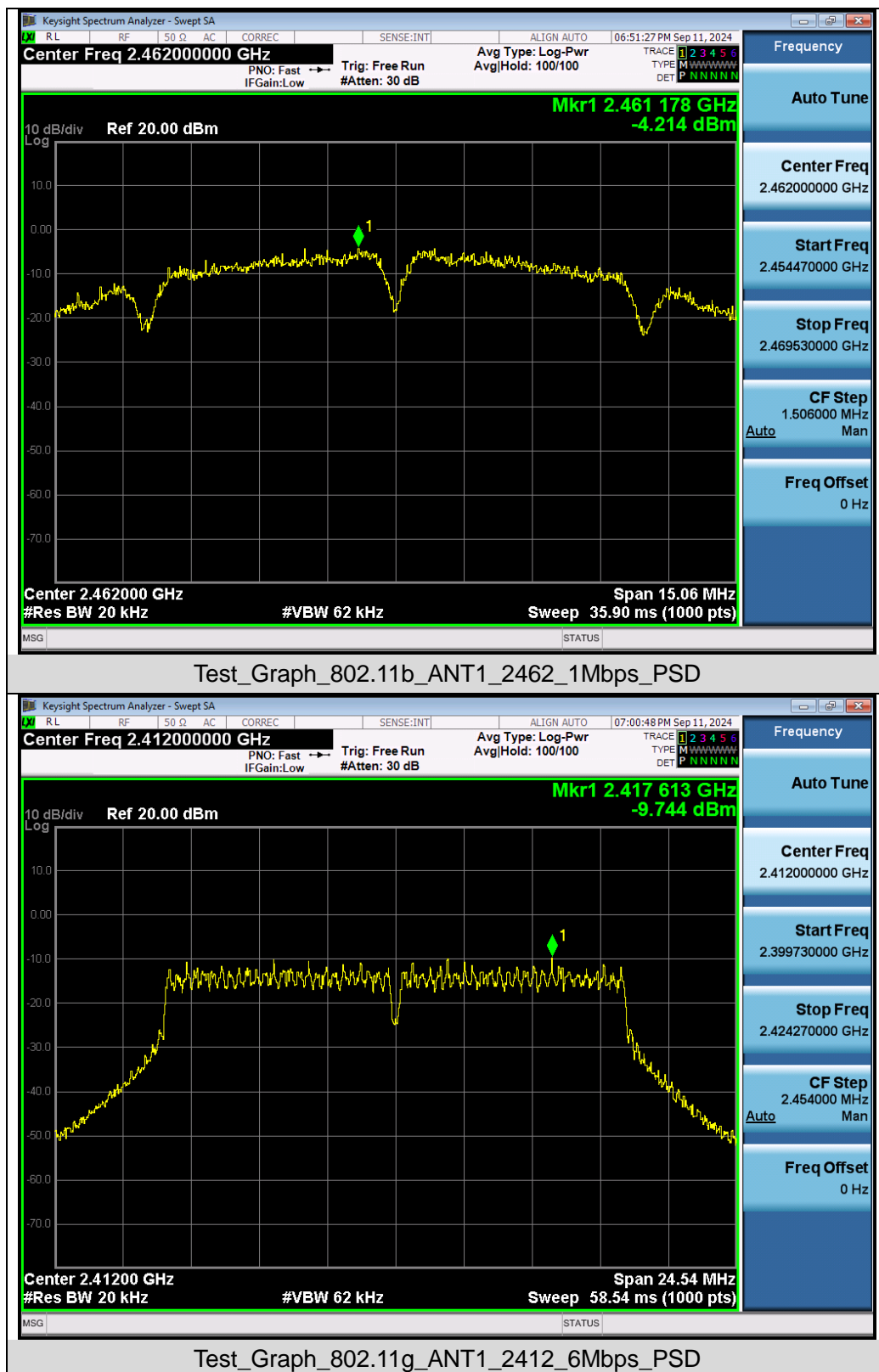


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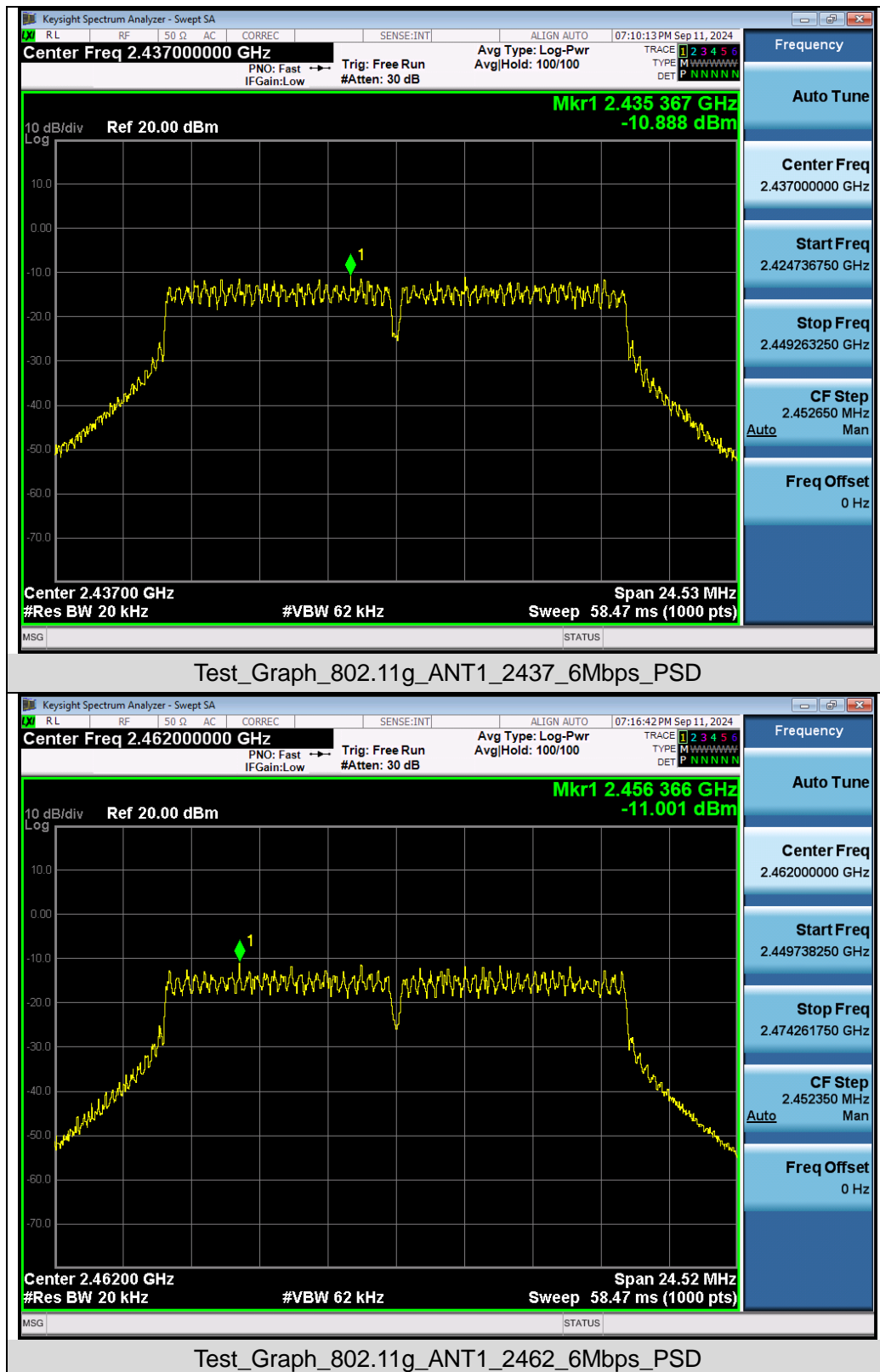


Test_Graph_802.11b_ANT1_2437_1Mbps_PSD

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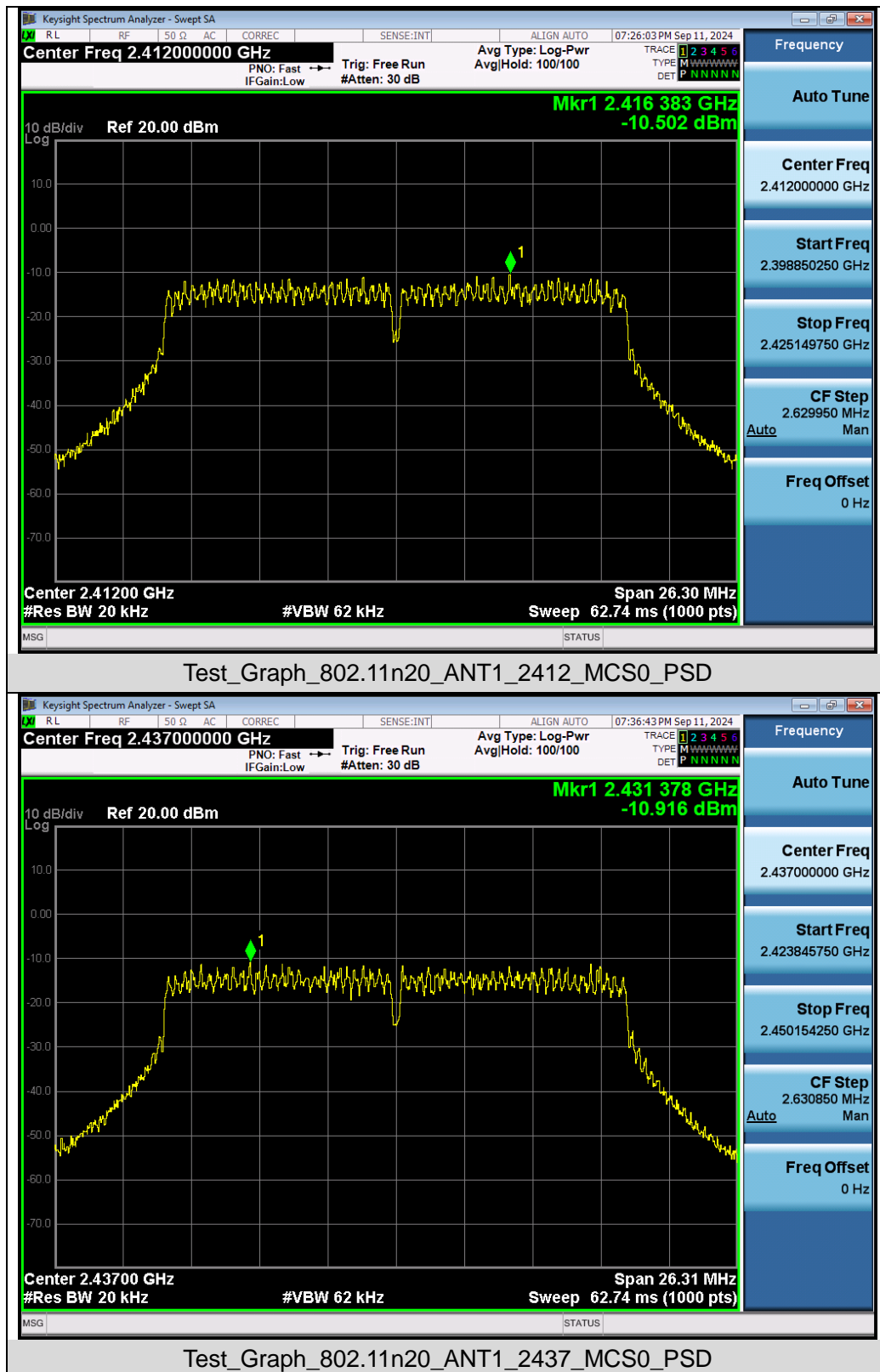


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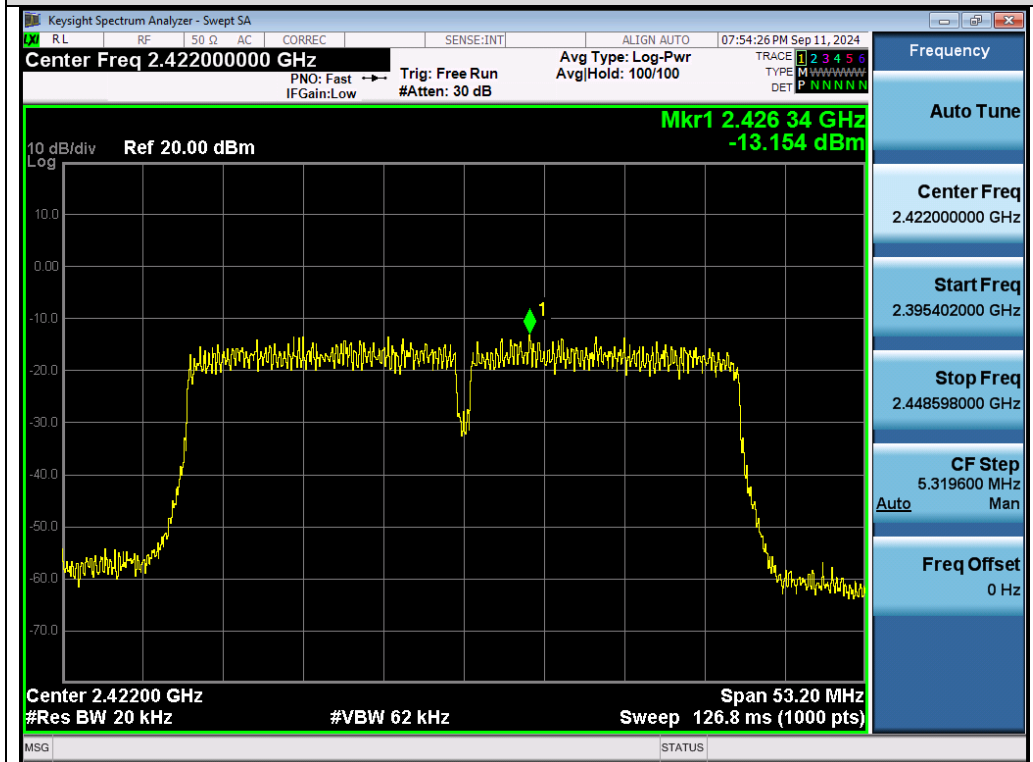
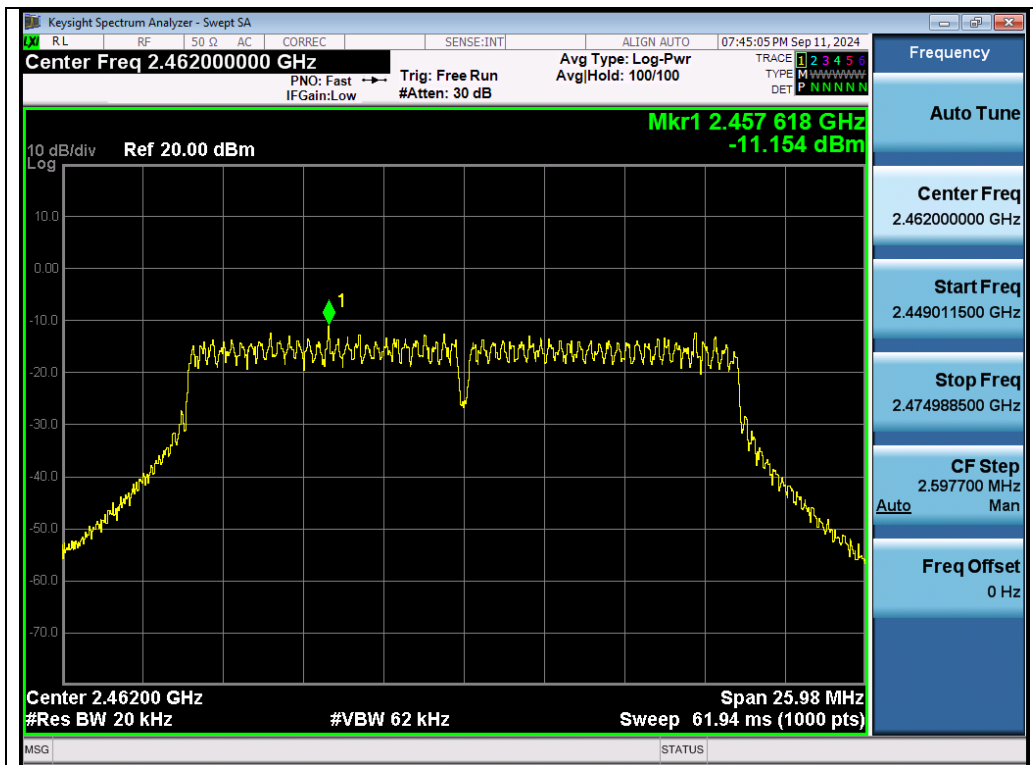


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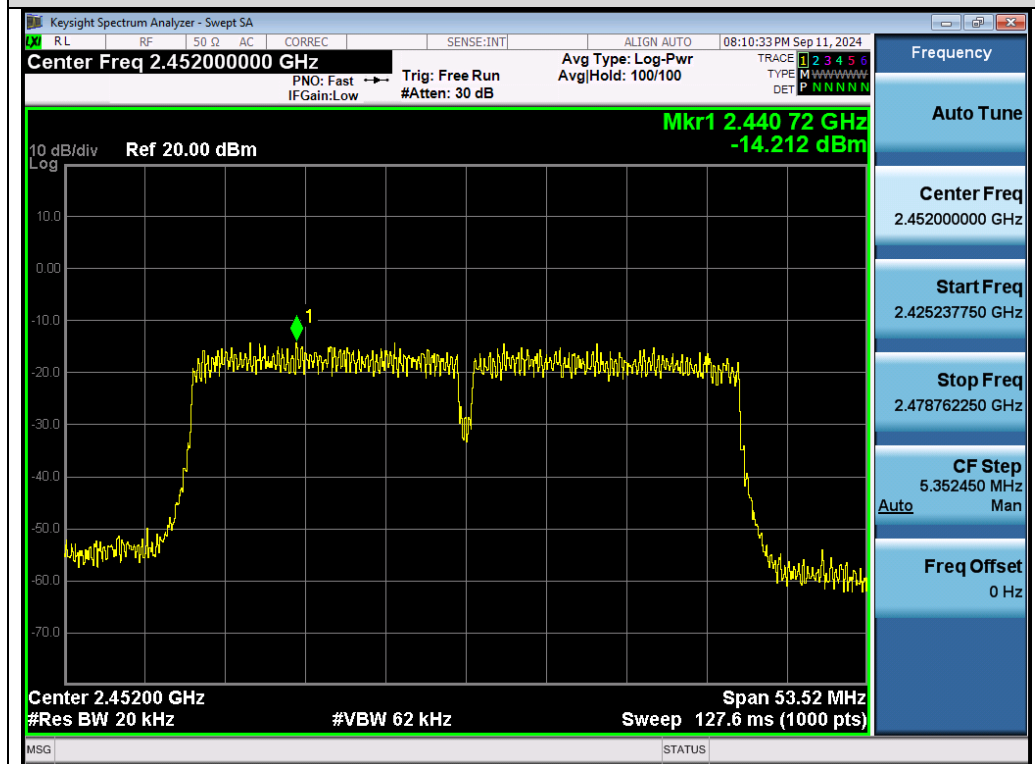
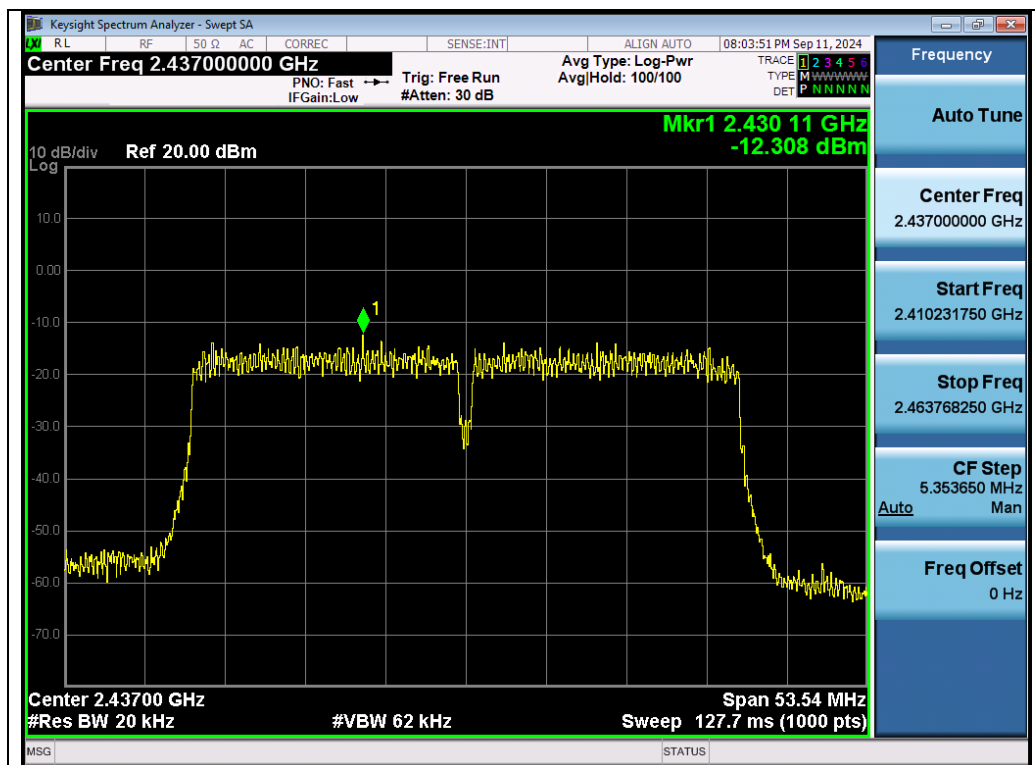
Attestation of Global Compliance(Shenzhen)Co., Ltd
Attestation of Global Compliance(Shenzhen)Std & Tech Co., Ltd
Tel: +86-755 2523 4088 E-mail: agc@agccert.com Web: http://www.agccert.com/



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Test Graphs of Conducted Output Power Spectral Density-2.4G WIFI (Module: ATBM6012B)



Test_Graph_802.11b_ANT2_2412_1Mbps_PSD

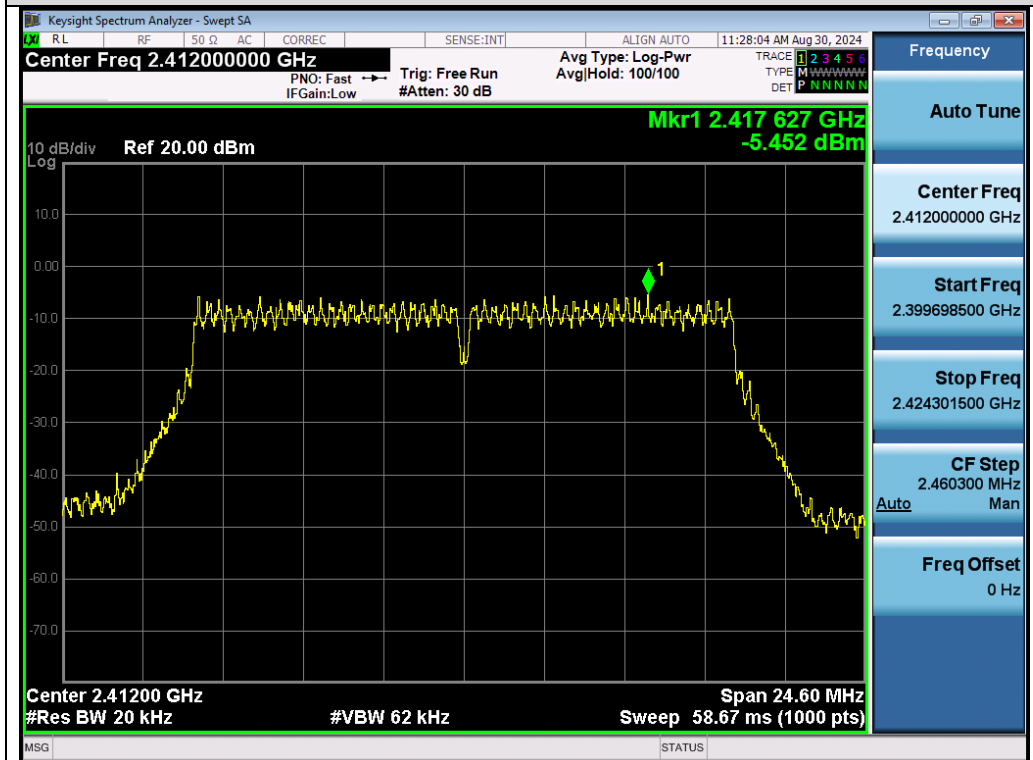


Test_Graph_802.11b_ANT2_2437_1Mbps_PSD

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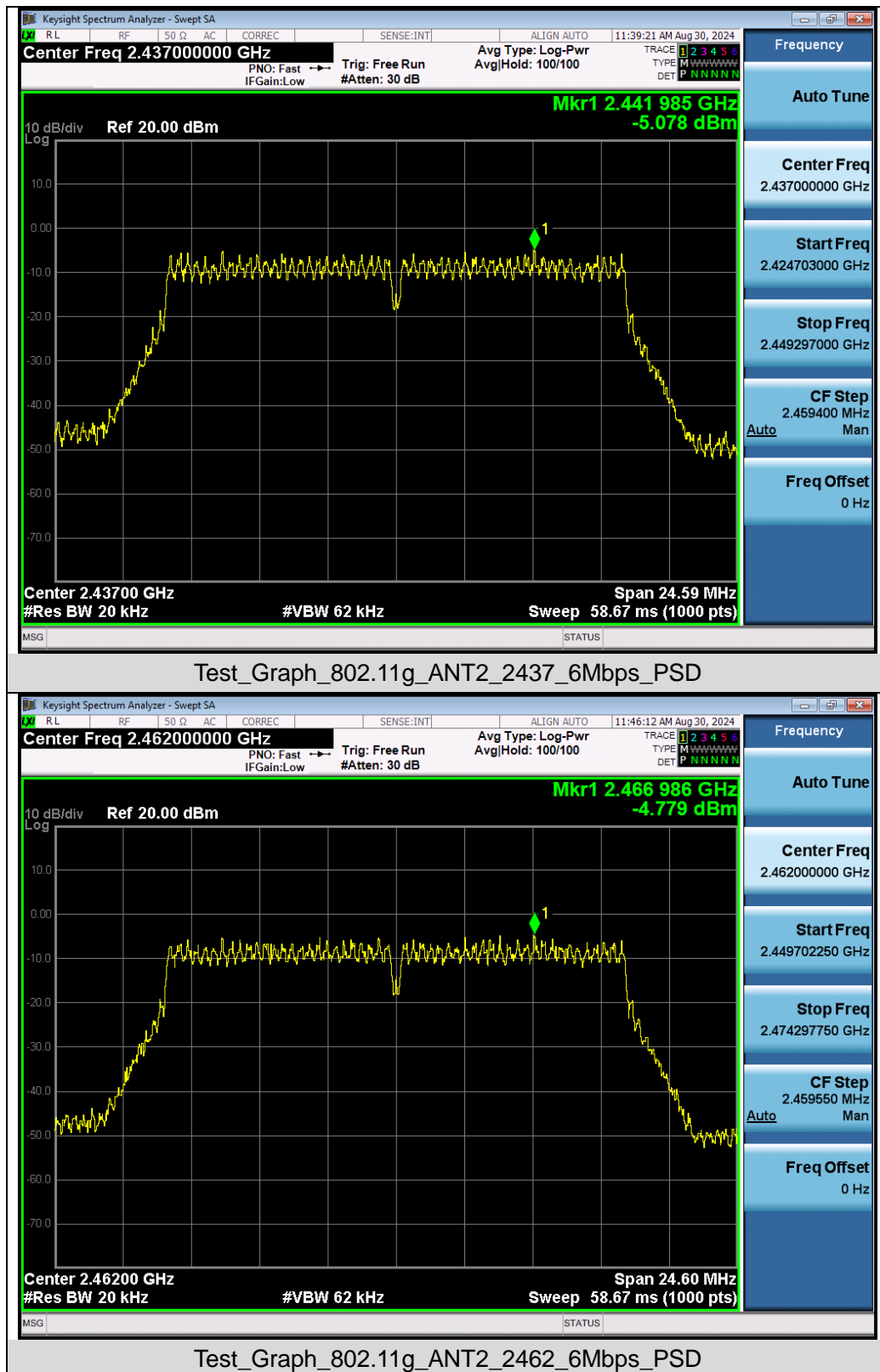


Test_Graph_802.11b_ANT2_2462_1Mbps_PSD



Test_Graph_802.11g_ANT2_2412_6Mbps_PSD

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