MOTOROLA SOLUTIONS

CERTIFICATE 2518.08

MS ISO/IEC 17025
TESTING
SAMM NO. 0825

MOTOROLA PENANG ADV. COMM. LABORATORY

Motorola Solutions Malaysia Sdn. Bhd.
Plot 2A Medan Bayan Lepas,
Mukim 12, S.W.D. 11900 Bayan Lepas,
Penang, Malaysia.

FCC / ISED TEST REPORT

Report Revision : **Rev.A**

Date/s Tested	:	11-Aug-2020 - 26-Aug-2020
Report Issue Date	:	11-Sep-2020
Manufacturer/Location	:	Motorola Solutions Malaysia Sdn Bhd Plot 2A, Medan Bayan Lepas, Mukim 12 SWD, 11900, Bayan Lepas, Penang, Malaysia
Requestor	:	SIEW KHENG TAN
Product Type	:	Hand-held
Product Version (PMN)	:	MSLB-MKZ900
Model Number (HVIN)	:	AAH90ZDU9RH1AN (PMUE5674A)
Frequency Band	:	2.412-2.462 GHz
Max RF Output Power	:	802.11b - 56.23 mWatts 802.11g - 56.23 mWatts 802.11n(HT20) - 56.23 mWatts 802.11n(HT40) - 56.23 mWatts
Applicant Name	:	Motorola Solutions Inc
Applicant Address		8000 West Sunrise Boulevard, Fort Lauderdale, Florida 33322
FCC Registrations	:	461337
ISED Registrations	:	MY0001
Firmware Version (FVIN)	:	I02.20.02.0032 (BP), D00.00.39 (AP)

The equipment was tested accordance to the requirement listed below:

(2.4GHz Wifi) **47CFR Part 15C** **ISED RSS 247 Issue 2**	**PASS**

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Prepared By:

GAN BOON TEONG
Test Personnel

Approved Signatory:

VINCENT FOONG CHUEN KIT
Deputy Technical Manager

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REVISION HISTORY

Revision History	Description	Date	Originator
Rev. A	Initial Report	**10-Sep-2020**	**Gan Boon Teong**

1.0. General Information

EUT Description:

Technologies	2.4GHz Wi-Fi
TX Frequency range	2412MHz – 2462MHz
Modulation Type	DSSS, OFDM
Connector type	PROGRAMMING, TEST & ALIGNMENT CABLE
Antenna type	BT/WIFI ANTENNA

1.1. Channel number and frequency information:

There are two bandwidth systems.
For 20MHz Bandwidth systems (802.11b, 802.11g, 802.11n), use channel 1 ~ channel 11
For 40MHz Bandwidth systems (802.11n), use channel 3 ~ channel 9

Channel	Frequency	Channel	Frequency
1	2412	7	2442
2	2417	8	2447
3	2422	9	2452
4	2427	10	2457
5	2432	11	2462
6	2437		

The EUT contains following accessory devices and data cable:

Item	Brand	Model or P/N
BATTERY PACK,BATTERY PACK,IMPRES GEN2, LIION,IP68, 2900T, TIA4950	MOTOROLA	PMNN4804A
UHF STUBBY ANTENNA (400-527MHZ), 90MM, FERRULE	MOTOROLA	AN000348A01
CABLE,MACKENZIE PROG,TEST&ALIGN CABLE W/ TTR	MOTOROLA	PMKN4229A

General Description of Applied Standards

The EUT is a RF Product. According to the specifications of the manufacturer, the EUT is to comply with the requirements of the following standards:

FCC 47 CFR Part 15 Subpart C
KDB 558074 D01 15.247 Meas Guidance v05
ANSI C63.10-2013

Deviation from standard

Not applicable as no deviation from standard test method

Modifications to EUT

For RF conducted measurements a pigtail was soldered out of the board while for radiated measurements there were no modifications to the device

2.0. Summary of Test Results

FCC Clause	IC Clause	Test Item	Result	Remark	Serial number tested	Tested by
15.247 (a)(2)	RSS-247 5.2(a)	DTS & 99% Channel Bandwidth	Pass	Highest 99% OCB: 802.11b: 13.836 MHz(13M8G1D) 802.11g: 16.748 MHz(16M7D1D) 802.11n(HT20): 17.866 MHz(17M9D1D) 802.11n(HT40): 36.241 MHz(36M2D1D)	734TWP0317	Gan
15.247 (b)(3)	RSS-247 5.4(d)	Conducted RF Output Power (Average)	Pass	Highest output power: 802.11b: 16.957 dBm (49.62 mW) 802.11g: 16.971 dBm(49.79 mW) 802.11n(HT20): 16.798 dBm(47.84 mW) 802.11n(HT40): 17.054 dBm(50.75 mW)	734TWP0317	Gan
15.247(e)	RSS-247 5.2(b)	Maximum Power Spectral Density	Pass	Meet the limit requirement.	734TWP0317	Gan
15.247(d)	RSS-247 5.5	Conducted Spurious Emissions	Pass	Worst case emission: 802.11b: -37.90 dBm 802.11g: -38.33 dBm 802.11n(HT20): -38.24 dBm 802.11n(HT40): -39.02 dBm	734TWP0317	Gan
15.247 (d)	RSS-247 5.5	Band edge Conducted Spurious Emission	Pass	Worst case emission: 802.11b: -41.64 dBm 802.11g: -24.78 dBm 802.11n(HT20): -24.22 dBm 802.11n(HT40): -33.22 dBm	734TWP0317	Gan
15.205, 15.209, 15.247 (d)	RSS-247 5.5	Radiated Emission within Restricted Bands	Pass	Worst case emission: 802.11b: No spur detect (Noise Floor) 802.11g: No spur detect (Noise Floor) 802.11n(HT20): No spur detect (Noise Floor) 802.11n(HT40): No spur detect (Noise Floor)	734TWP0311	Nazrin &Qawiman &Fendi
15.207	RSS-Gen 8.8	AC Power Line Conducted Emission	Pass	NA	734TWP0311	Azil & Iskandar
15.203		Antenna requirement	NA	Internal antenna is not accessible to the enduser	NA	

NA → Not Available

3.0. Measurement Uncertainty

Measurement	Frequency	Expended Uncertainty (k=1.96) (±dB)
AC Power Line Conducted Spurious Emission	150KHz ~ 30MHz	3.43
Radiated Emissions up to 1 GHz	30MHz ~ 200MHz	5.01
	200MHz ~ 1000MHz	5.01
Radiated Emissions above 1 GHz	1GHz ~ 18GHz	5.01
	18GHz ~ 25GHz	5.01
Conducted Spurious Emissions	9kHz ~ 12.75GHz	2.82

4.0. Equipment List

Bluetooth ATE # 1 (SW Version: Ate Main_3.1.10_R2)

Description	Model	Serial Number	Calibration Date	Calibration Due Date
SPECTRUM ANALYZER	FSEK30	838495/014	19-Oct-19	19-Oct-20
CHAMBER	SH-641	92002639	9-Dec-19	9-Dec-20
POWER	6652A	3541A02565	26-Jun-20	26-Jun-21
SPECTRUM ANALYZER	E4440A	MY48250517	1-Nov-19	1-Nov-20
N to N RF Cable # 1	SF126/11N/11N	NA	NA	NA

Radiated Emission Station (SW Version: EMC FCC RE v1.6.2)

Description	Model	Serial Number	Calibration Date	Calibration Due Date
DRG HORN FREQ.	SAS-571	720	21-Mar-19	21-Mar-21
DRG HORN FREQ.	SAS-571	1143	14-Feb-19	14-Feb-21
POWER SUPPLY	6032A	2615A01178	21-MAY-20	21-MAY-21
SIGNAL GENERATOR	SMB 100A	181117	8-Nov-18	8-Nov-21
EMI TEST RECEIVER	ESW44	101750	24-Jul-19	24-Sep-20
EMI TEST RECEIVER	ESIB26	100017	19-Jul-19	19-Sep-20
5m Semi-anechoic Chamber	S800-HX	J2308	Not Required	Not Required
BILOG ANTENNA	CBL6112B	2964	23-Apr-19	23-Apr-21
BILOG ANTENNA	CBL6112B	2950	8-Jul-19	8-Jul-21
DATA LOGGER	SDL500	A.016776	4-Jun-20	4-Jun-21
SYSTEM CONTROLLER	SC104V	050806-1	Not Required	Not Required
TURNTABLE FLUSH MOUNT 2M	FM2011	NA	Not Required	Not Required
ANTENNA POSITIONING TOWER	TLT2	NA	Not Required	Not Required
BROAD-BAND HORN ANTENNA	BBHA9170	BBHA9170255	27-Jan-20	27-Jan-21
18 - 40GHz PREAMPLIFIER	Miteq Hi Gain Sucoflex	001	Not Required	Not Required
PREAMPLIFIER	PAM-0118	269	24-May-19	24-May-22
LOOP ANTENNA	6502	00208416	5-Sep-19	5-Sep-20

AC Power Line Conducted Spurious Emission(SW Version: EMC 32 Ver. 10.60.10)

Description	Model #	Serial Number	Calibration Date	Calibration Due Date
TEMPERATURE & HUMIDITY LOGGER	TM320	16344143	20-May-20	20-May-21
V-NETWORK 2-LINE	ENV216V	101039	20-Jul-19	20-Sep-20
EMI TEST RECEIVER	ESIB26	827769/009	25-Jul-19	25-Sep-20
PROGRAMMABLE AC SOURCE	61604	ABR000000926	10-July-2020	10-July-2021

5.0. Test Mode Applicability and Test Channel Detail

The device employs MIMO technology. Below are the possible configurations.

WLAN Configurations		Mode					
		SISO		Spatial Diversity Multiplexing (MIMO)		Cyclic Delay Diversity (MIMO)	
	Antenna	Primary	Secondary	Primary	Secondary	Primary	Secondary
2.4GHz	802.11b	√	x	x	x	x	x
	802.11g	√	x	x	x	x	x
	802.11n (HT20)	√	x	x	x	x	x
	802.11n (HT40)	√	x	x	x	x	x

√ = Support;
x = NOT Support

Note: This Device supports simultaneous transmission operation, which allows for two SISO or two MIMO channels to operate independent of one another in the 2.4GHz band on each antenna. 802.11n mode is capable of transmitting simultaneously on two antennas using Cyclic Delay Diversity and Spatial Diversity Multiplexing (2x2 MIMO).
The following tables show the worst case configurations determined during testing. The data for these configurations is contained in this test report.

Radiated Emission Test (Above 1GHz)

☒Pre-Scan has been conducted to determine the worst-case mode from all possible combinations between available modulations, data rates and antenna ports (if EUT with antenna diversity architecture).

☒Following channel(s) was (were) selected for the final test as listed below.

EUT Configure Mode	Modulation	Available Channel	Tested Channel	Modulation Technology	Data Modulation Type	Date Rate (Mbps)	Mode	Environmental Conditions
Test Mode	802.11b	1 to 11	1,6,11	DSSS	DBPSK	1	SISO	23.5°C, 70.3%RH
Test Mode	802.11g	1 to 11	1,6,11	OFDM	BPSK	6	SISO	23.5°C, 70.3%RH
Test Mode	802.11n (HT20)	1 to 11	1,6,11	OFDM	BPSK	6.5	SISO CDD (MIMO)	23.5°C, 70.3%RH
Test Mode	802.11n (HT40)	3 to 9	3,6,9	OFDM	BPSK	13.5	SISO CDD (MIMO)	23.5°C, 70.3%RH

Radiated Emission Test (Below 1GHz)

☒Pre-Scan has been conducted to determine the worst-case mode from all possible combinations between available modulations, data rates and antenna ports (if EUT with antenna diversity architecture).

☒Following channel(s) was (were) selected for the final test as listed below.

EUT Configure Mode	Modulation	Available Channel	Tested Channel	Modulation Technology	Data Modulation Type	Date Rate (Mbps)	Mode	Environmental Conditions
Test Mode	802.11b	1 to 11	1,6,11	DSSS	DBPSK	1	SISO	23.5°C, 70.3%RH
Test Mode	802.11g	1 to 11	1,6,11	OFDM	BPSK	6	SISO	23.5°C, 70.3%RH
Test Mode	802.11n (HT20)	1 to 11	1,6,11	OFDM	BPSK	6.5	SISO CDD (MIMO)	23.5°C, 70.3%RH
Test Mode	802.11n (HT40)	3 to 9	3,6,9	OFDM	BPSK	13.5	SISO CDD (MIMO)	23.5°C, 70.3%RH

Power Line Conducted Emission Test

☒Pre-Scan has been conducted to determine the worst-case mode from all possible combinations between available modulations, data rates and antenna ports (if EUT with antenna diversity architecture).

☒Following channel(s) was (were) selected for the final test as listed below.

EUT Configure Mode	Modulation	Available Channel	Tested Channel	Modulation Technology	Data Modulation Type	Date Rate (Mbps)	Environmental Conditions
Application Mode	802.11bgn mixed	1 to 11	AUTO	DSSS, OFDM	AUTO	AUTO	21.5°C, 63.8%RH

Antenna Port Conducted Measurement:

☒This item includes all test value of each mode, but only includes spectrum plot of worst value of each mode.

☒Pre-Scan has been conducted to determine the worst-case mode from all possible combinations between available modulations, data rates and antenna ports (if EUT with antenna diversity architecture).

☒Following channel(s) was (were) selected for the final test as listed below.

EUT Configure Mode	Modulation	Available Channel	Tested Channel	Modulation Technology	Data Modulation Type	Data Rate (Mbps)	Mode	Environmental Conditions
Test Mode	802.11b	1 to 11	1,6,11	DSSS	DBPSK	1	SISO	25.0°C, 50%RH
Test Mode	802.11g	1 to 11	1,6,11	OFDM	BPSK	6	SISO	25.0°C, 50%RH
Test Mode	802.11n (HT20)	1 to 11	1,6,11	OFDM	BPSK	6.5	SISO CDD (MIMO)	25.0°C, 50%RH
Test Mode	802.11n (HT40)	1 to 11	3,6,9	OFDM	BPSK	13.5	SISO CDD (MIMO)	25.0°C, 50%RH

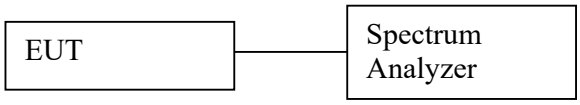
Duty Cycle of Test Signal

802.11b, 802.11g and 802.11n(HT20) : Duty cycle of test signal is ≥98%.
802.11n(HT20) : Duty cycle of test signal is ≥94%.
(Refer to Clause 6.3 for duty cycle test signal)

6.0. Transmitter Test Parameters

6.1. 6dB Channel Bandwidth

6.1.1. **Test Setup**



a) Check and ensure the spectrum analyzer well calibrate.
b) Turn on the DUT and set DUT to transmit maximum power.
c) Connect DUT's antenna terminal to spectrum analyzer with a low loss cable.
d) Setting of Spectrum analyzer :
    a. RBW = 100 kHz
    b. VBW = 300 kHz
    c. Detector mode = Peak
    d. Trace = Max hold
    e. Sweep = auto
e) Measure the freq different of two frequencies that were attenuated 6dB from peak of the emission & record the frequency difference as the emission bandwidth.
f) Measure every antenna port by repeat the step above for MIMO measurement.

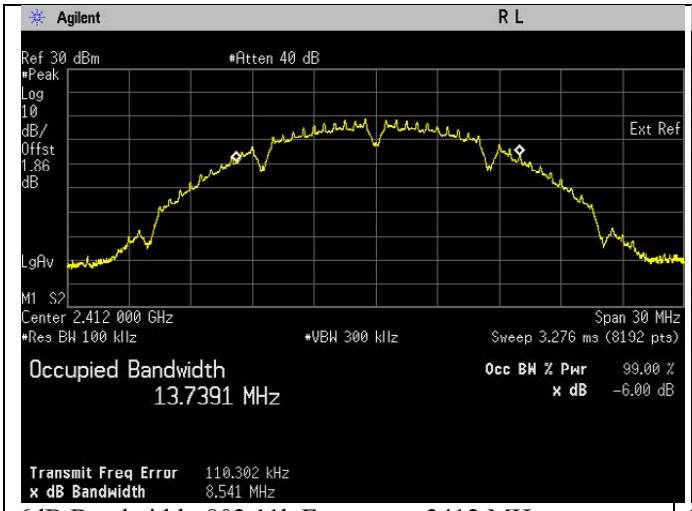
6.1.2. **Test Limits:**

Normal Condition (25 º C)
≥500 kHz

6.1.3. **Test Data:**

802.11 b

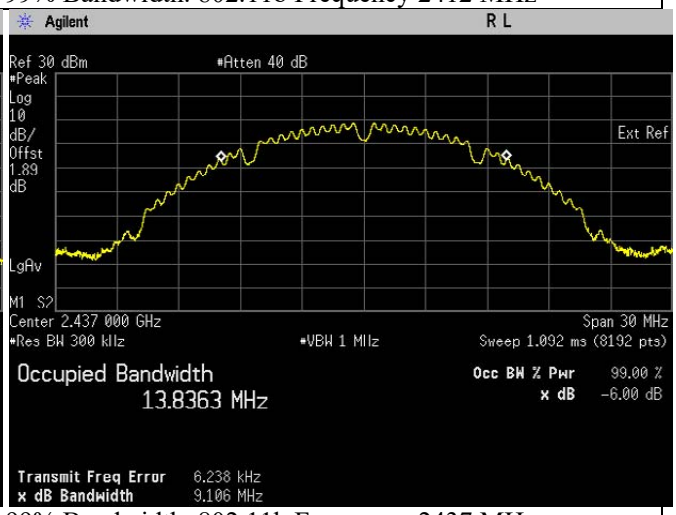
Test Conditions				Test Frequency	Results		
Standard	Modulation Type	Modulation Technology	Data Rate (mbps)	Tx (MHz)	6dB Bandwidth (MHz)	99% Bandwidth (MHz)	Status
802.11b	DSSS	DBPSK	1	2412	8.541	13.771	Pass
802.11b	DSSS	DBPSK	1	2437	8.550	13.836	Pass
802.11b	DSSS	DBPSK	1	2462	9.025	13.832	Pass



6dB Bandwidth. 802.11b Frequency 2412 MHz

99% Bandwidth. 802.11b Frequency 2412 MHz

6dB Bandwidth. 802.11b Frequency 2437 MHz

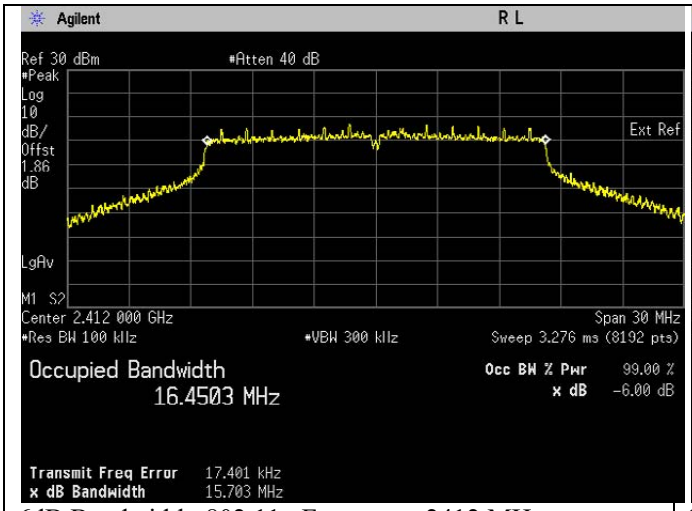


99% Bandwidth. 802.11b Frequency 2437 MHz

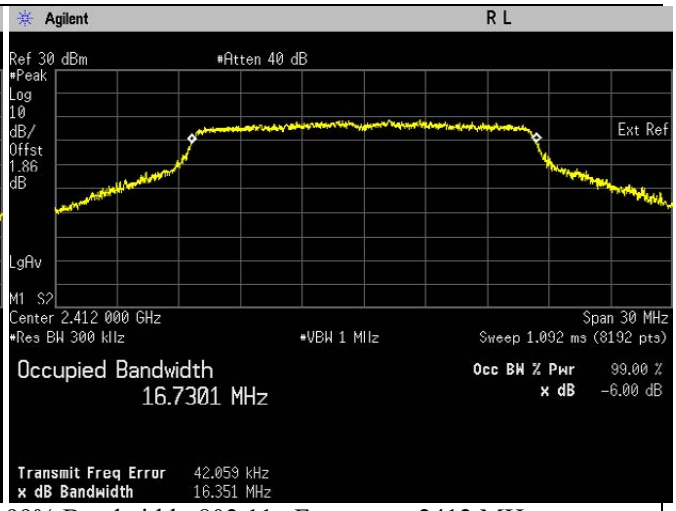
	
6dB Bandwidth. 802.11b Frequency 2462 MHz	99% Bandwidth. 802.11b Frequency 2462 MHz

802.11 g

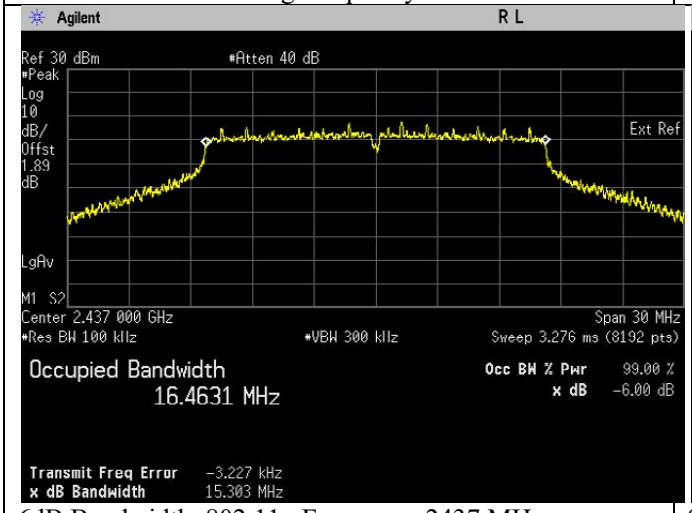
Test Conditions				Test Frequency	Results		
Standard	Modulation Type	Modulation Technology	Data Rate (mbps)	Tx (MHz)	6dB Bandwidth (MHz)	99% Bandwidth (MHz)	Status
802.11g	OFDM	BPSK	6	2412	15.703	16.730	Pass
802.11g	OFDM	BPSK	6	2437	15.303	16.748	Pass
802.11g	OFDM	BPSK	6	2462	15.681	16.730	Pass



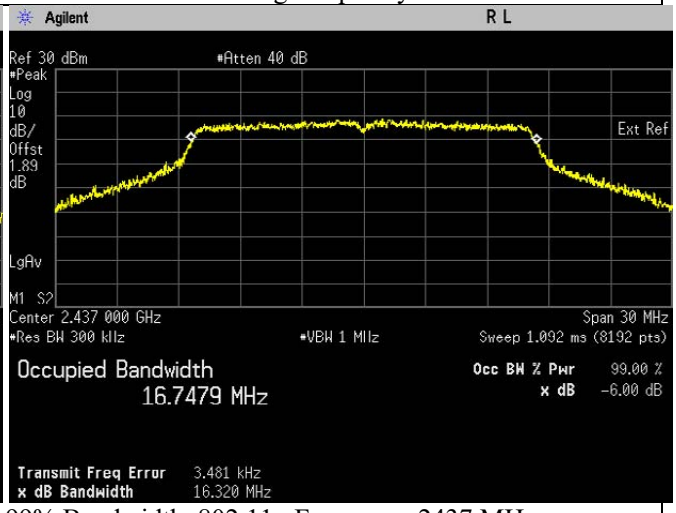
6dB Bandwidth. 802.11g Frequency 2412 MHz



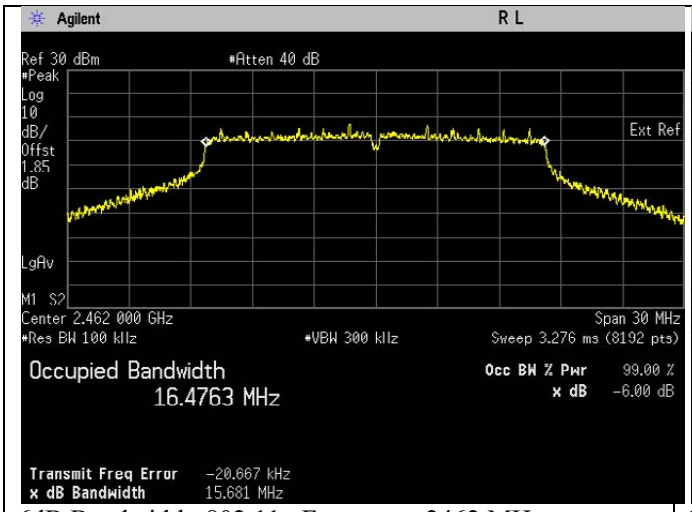
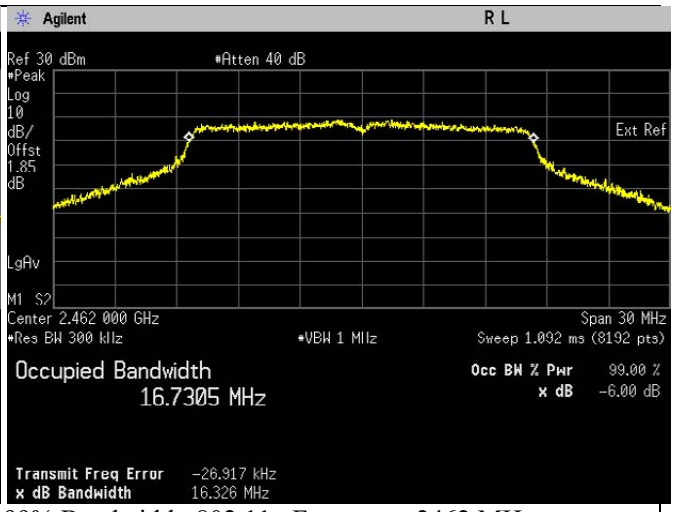
99% Bandwidth. 802.11g Frequency 2412 MHz



6dB Bandwidth. 802.11g Frequency 2437 MHz

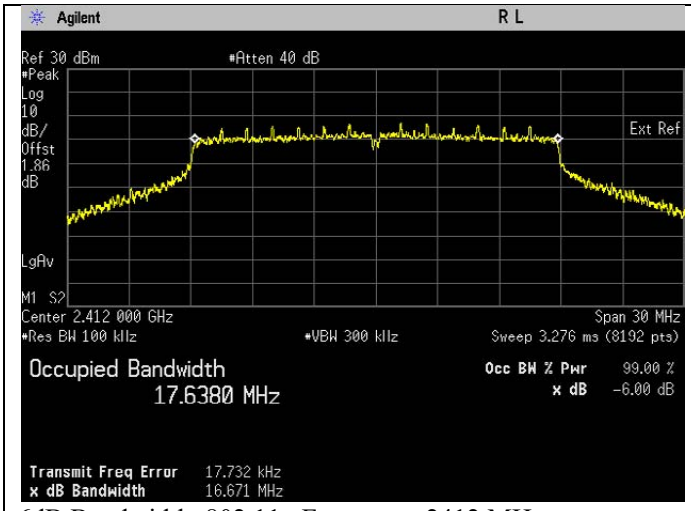


99% Bandwidth. 802.11g Frequency 2437 MHz

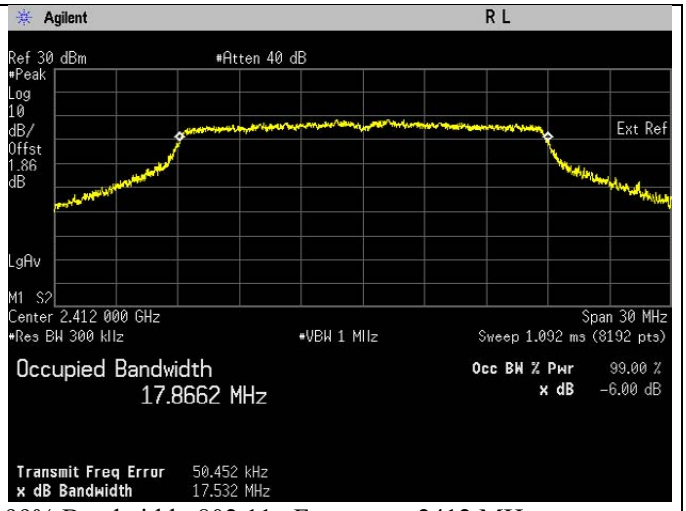
	
6dB Bandwidth. 802.11g Frequency 2462 MHz	99% Bandwidth. 802.11g Frequency 2462 MHz

802.11n (HT20)

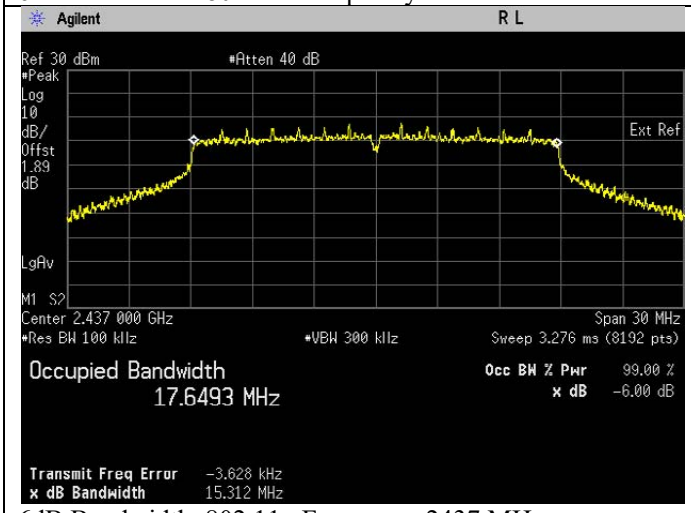
Test Conditions				Test Frequency	Results		
Standard	Modulation Type	Modulation Technology	Data Rate (mbps)	Tx (MHz)	6dB Bandwidth (MHz)	99% Bandwidth (MHz)	Status
802.11n	OFDM	BPSK	6.5	2412	16.671	17.866	Pass
802.11n	OFDM	BPSK	6.5	2437	15.312	17.864	Pass
802.11n	OFDM	BPSK	6.5	2462	16.271	17.840	Pass



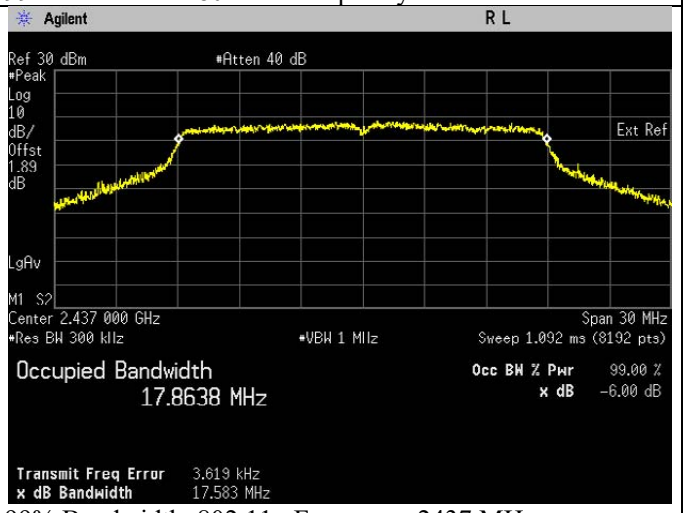
6dB Bandwidth. 802.11n Frequency 2412 MHz



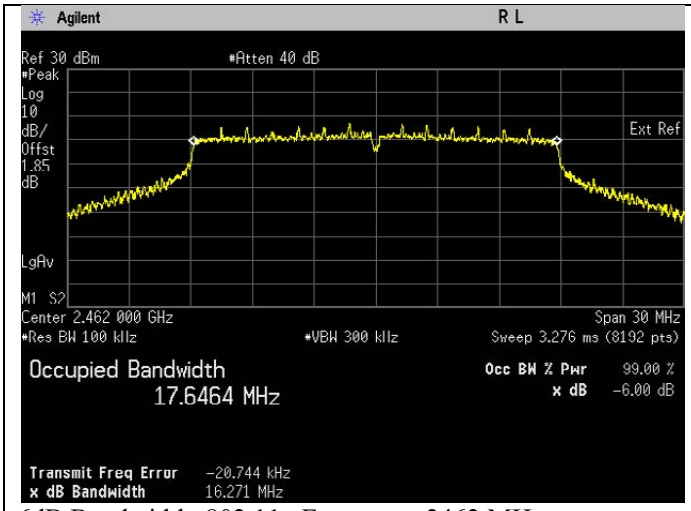
99% Bandwidth. 802.11n Frequency 2412 MHz



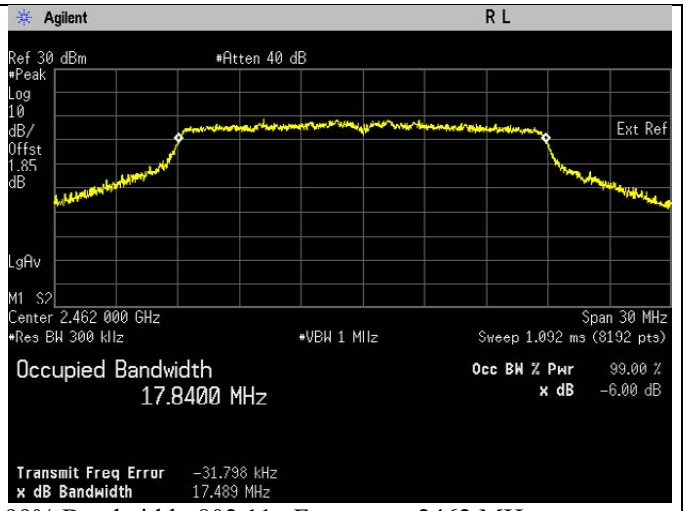
6dB Bandwidth. 802.11n Frequency 2437 MHz



99% Bandwidth. 802.11n Frequency 2437 MHz



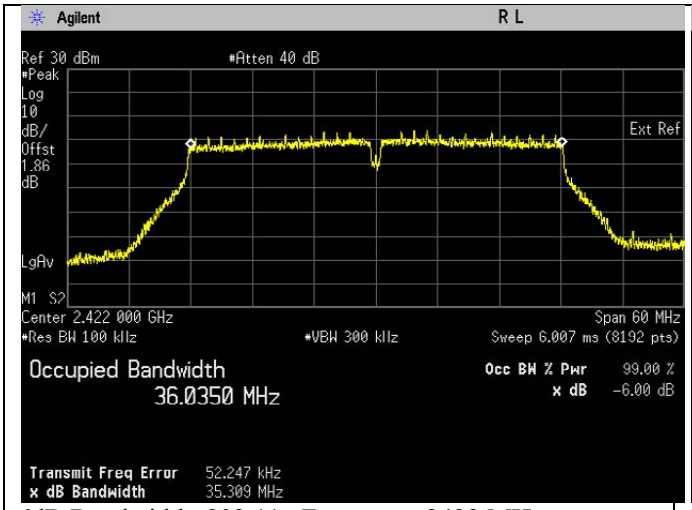
6dB Bandwidth. 802.11n Frequency 2462 MHz



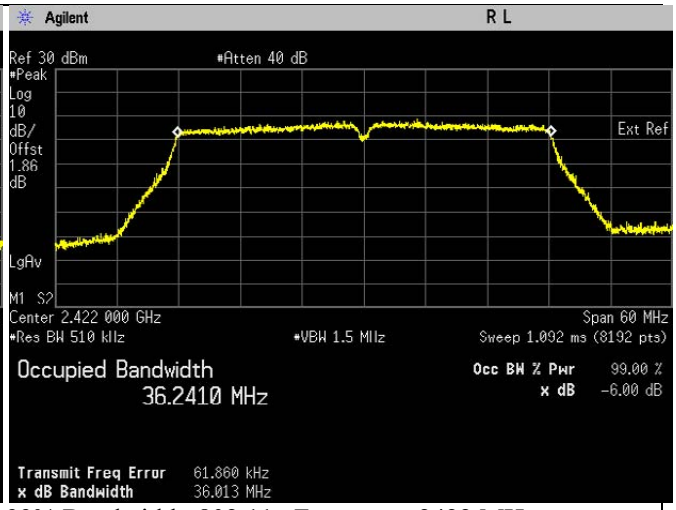
99% Bandwidth. 802.11n Frequency 2462 MHz

802.11n (HT40)

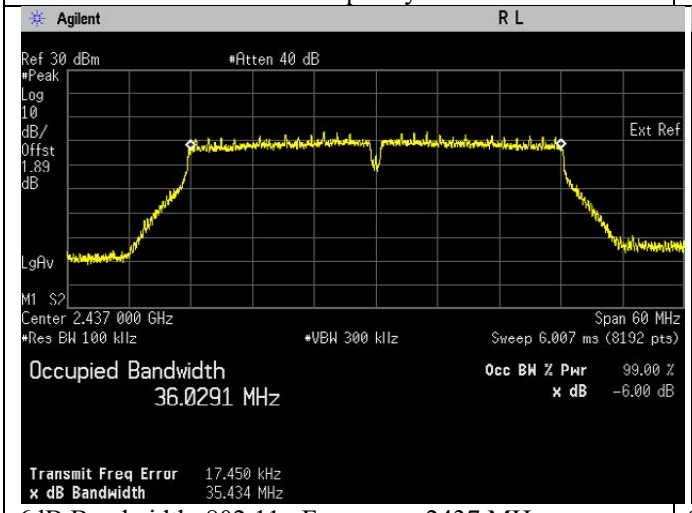
Test Conditions				Test Frequency	Results		
Standard	Modulation Type	Modulation Technology	Data Rate (mbps)	Tx (MHz)	6dB Bandwidth (MHz)	99% Bandwidth (MHz)	Status
802.11n	OFDM	BPSK	13.5	2422	35.309	36.241	Pass
802.11n	OFDM	BPSK	13.5	2437	35.434	36.211	Pass
802.11n	OFDM	BPSK	13.5	2452	35.444	36.241	Pass



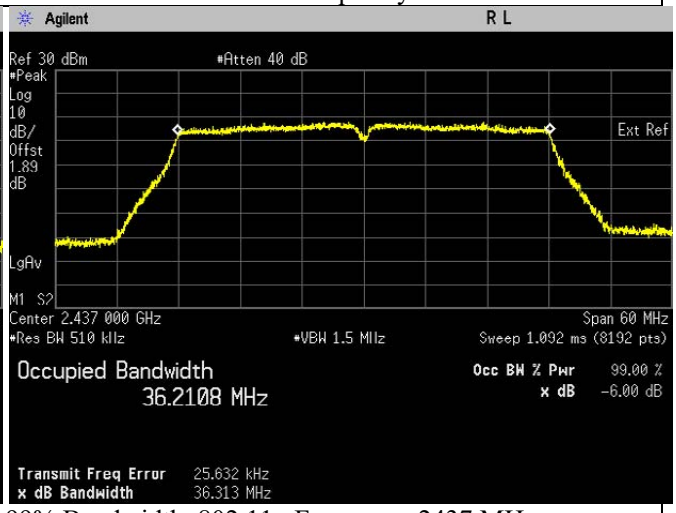
6dB Bandwidth. 802.11n Frequency 2422 MHz



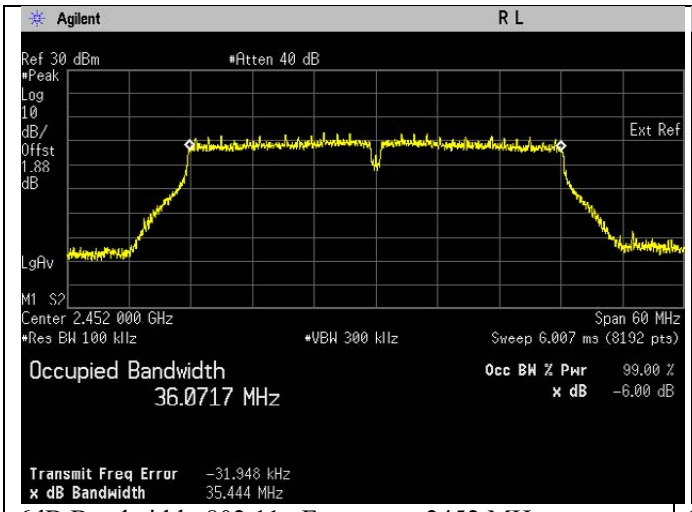
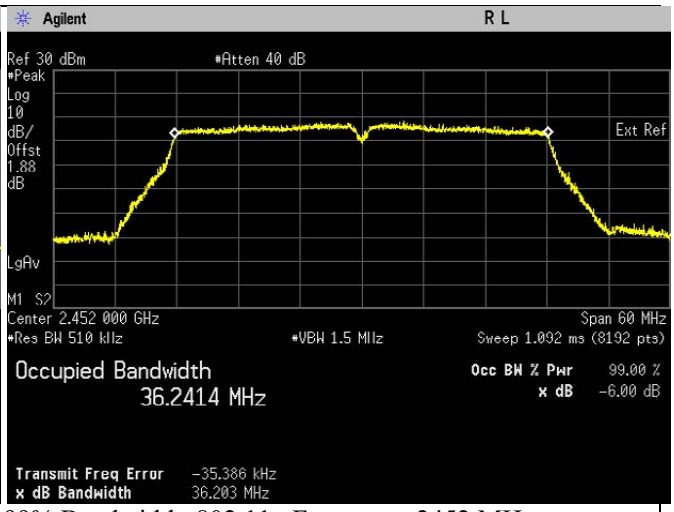
99% Bandwidth. 802.11n Frequency 2422 MHz



6dB Bandwidth. 802.11n Frequency 2437 MHz

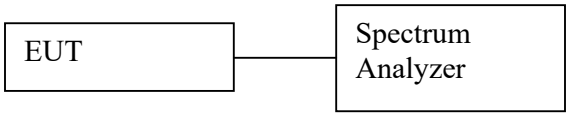


99% Bandwidth. 802.11n Frequency 2437 MHz

	
6dB Bandwidth. 802.11n Frequency 2452 MHz	99% Bandwidth. 802.11n Frequency 2452 MHz

6.2. Conducted RF Output Power

6.2.1. **Test Setup**



Average

a) Check and ensure the spectrum analyzer well calibrate.
b) Turn on the DUT and set DUT to transmit maximum power.
c) Measure the duty cycle of transmitter output signal.
d) Setting of Spectrum analyzer :
    a. Set the RBW = 300 kHz.
    b. Set the VBW ≥ [3 × RBW].
    c. Set the span ≥ [1.5 × OBW bandwidth].
    d. Detector = average.
    e. Sweep time = auto couple.
    f. Trace mode = free run.
    g. Allow trace to fully stabilize.
e) Add in duty cycle correction into final test result.
f) Duty cycle correction is calculated as below:
    10 log (1/x)
g) Measure every antenna port by repeat the step above for MIMO measurement.

6.2.2. **Test Limits:**

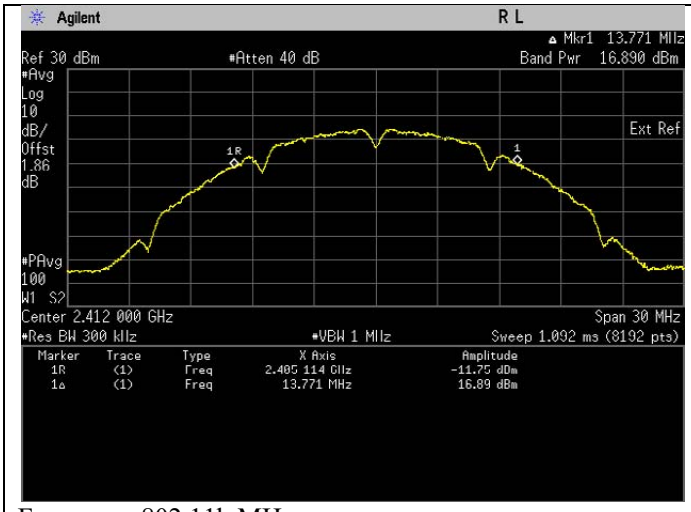
Normal Condition (25 º C)
≤1 Watt(30 dBm)

6.2.3. **Test Data:**

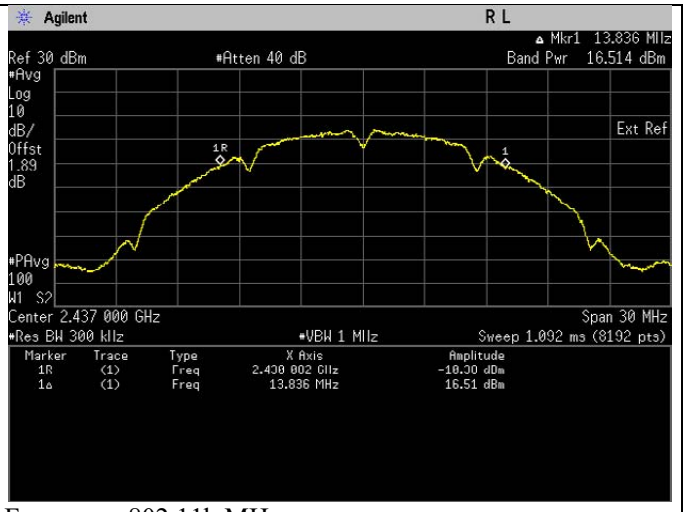
802.11b

Output Power = Band Power + Duty Cycle Factor
= Band Power + 0.067dBm

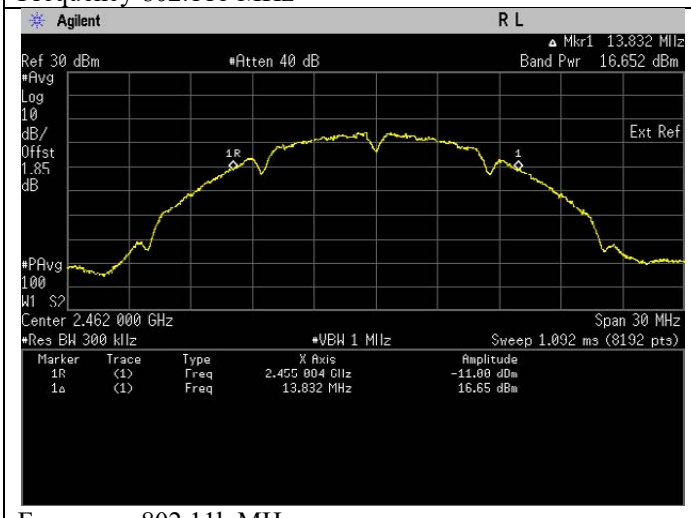
Test Conditions				Test Frequency	Results	
Standard	Modulation Type	Modulation Technology	Data Rate (mbps)	Tx (MHz)	Output Power (dBm)	Status
802.11b	DSSS	DBPSK	1	2412	16.957	Pass
802.11b	DSSS	DBPSK	1	2437	16.581	Pass
802.11b	DSSS	DBPSK	1	2462	16.719	Pass



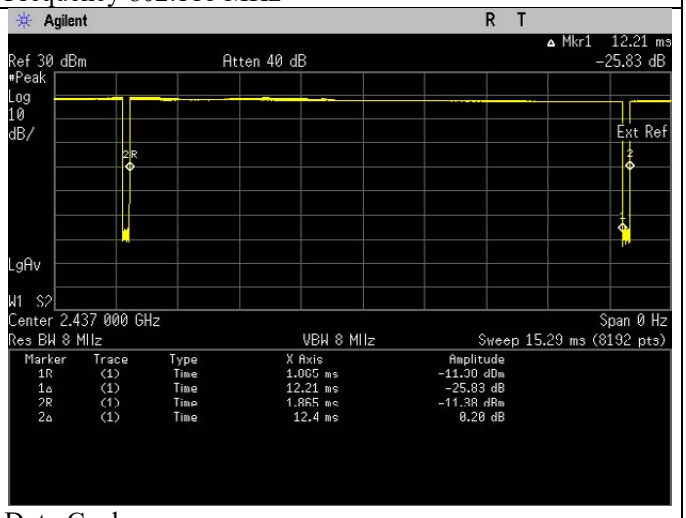
Frequency 802.11b MHz



Frequency 802.11b MHz



Frequency 802.11b MHz

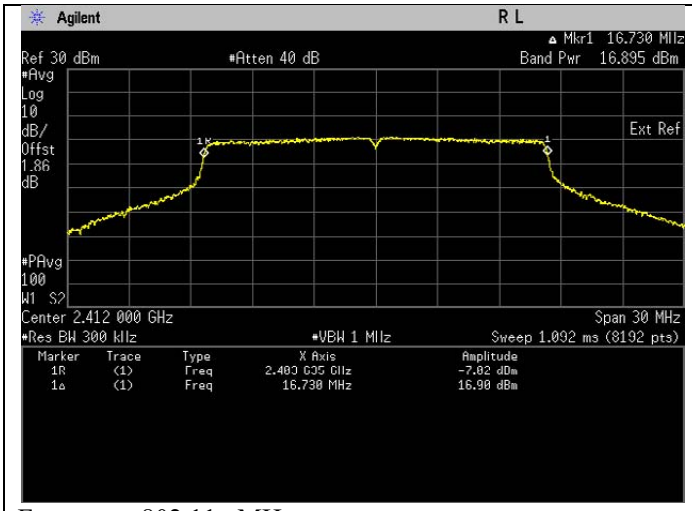


Duty Cycle

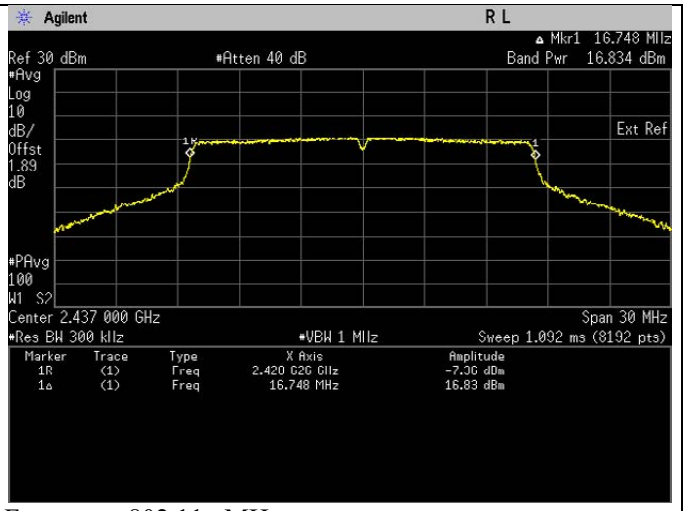
802.11g

Output Power = Band Power + Duty Cycle Factor
= Band Power + 0.076dBm

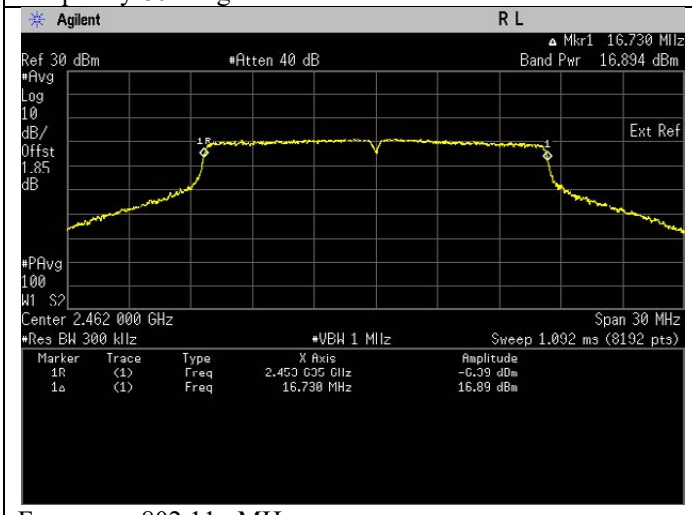
Test Conditions				Test Frequency	Results	
Standard	Modulation Type	Modulation Technology	Data Rate (mbps)	Tx (MHz)	Output Power (dBm)	Status
802.11g	OFDM	BPSK	6	2412	16.971	Pass
802.11g	OFDM	BPSK	6	2437	16.910	Pass
802.11g	OFDM	BPSK	6	2462	16.970	Pass



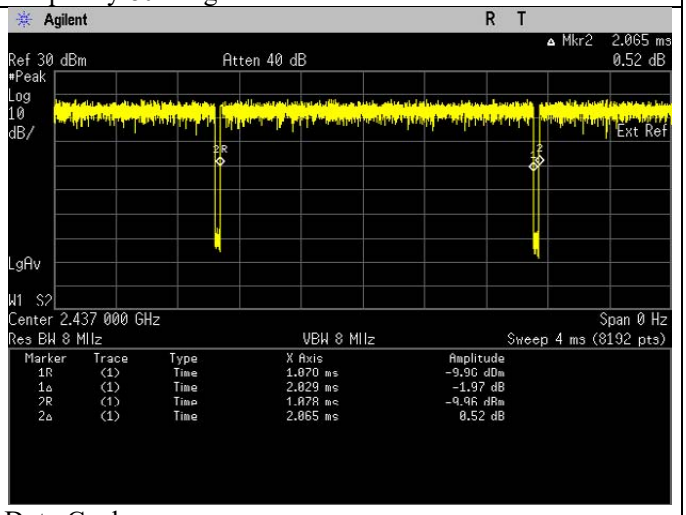
Frequency 802.11g MHz



Frequency 802.11g MHz



Frequency 802.11g MHz

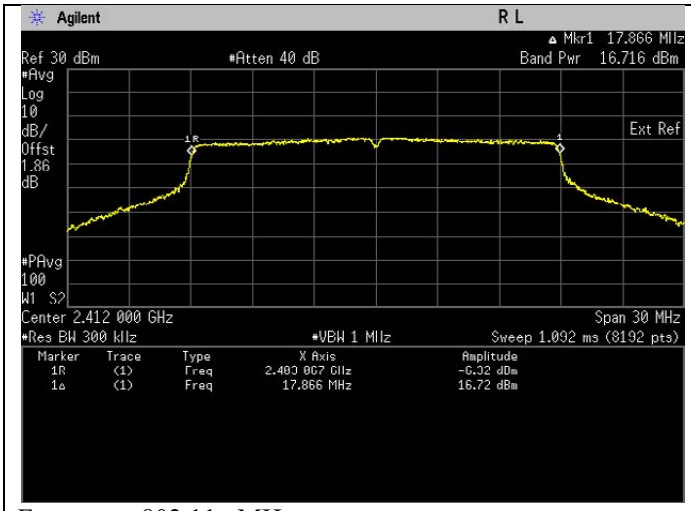


Duty Cycle

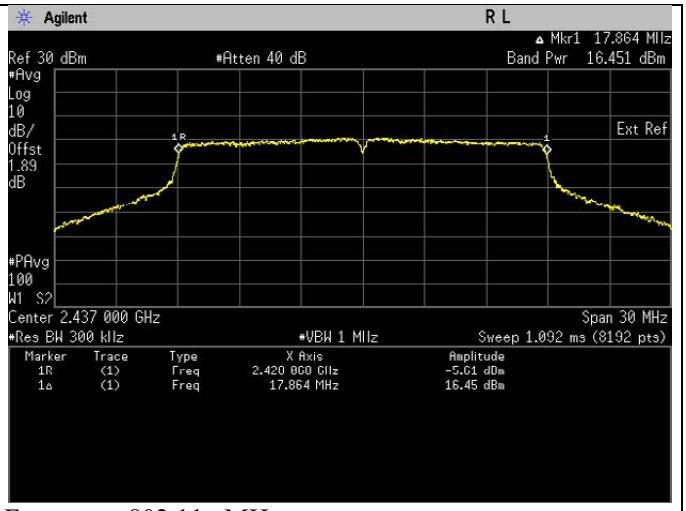
802.11n (HT20)

Output Power = Band Power + Duty Cycle Factor
= Band Power + 0.082dBm

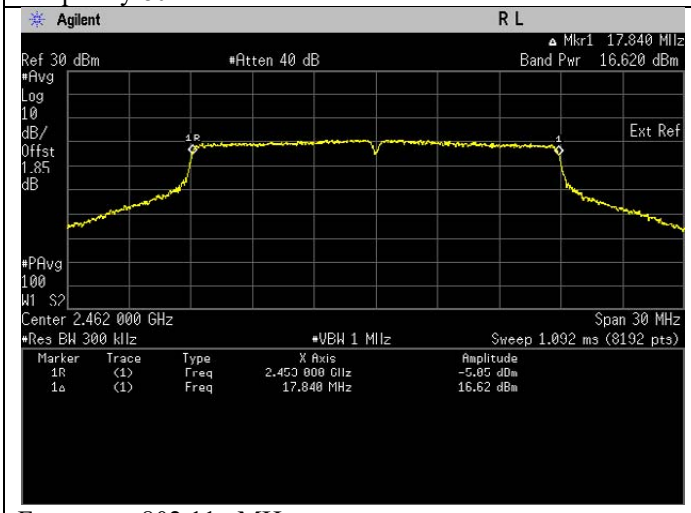
Test Conditions				Test Frequency	Results	
Standard	Modulation Type	Modulation Technology	Data Rate (mbps)	Tx (MHz)	Output Power (dBm)	Status
802.11n	OFDM	BPSK	6.5	2412	16.798	Pass
802.11n	OFDM	BPSK	6.5	2437	16.533	Pass
802.11n	OFDM	BPSK	6.5	2462	16.702	Pass



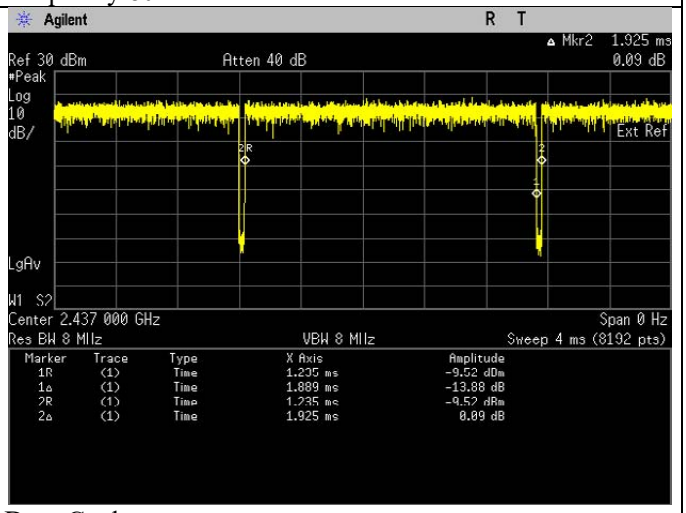
Frequency 802.11n MHz



Frequency 802.11n MHz



Frequency 802.11n MHz

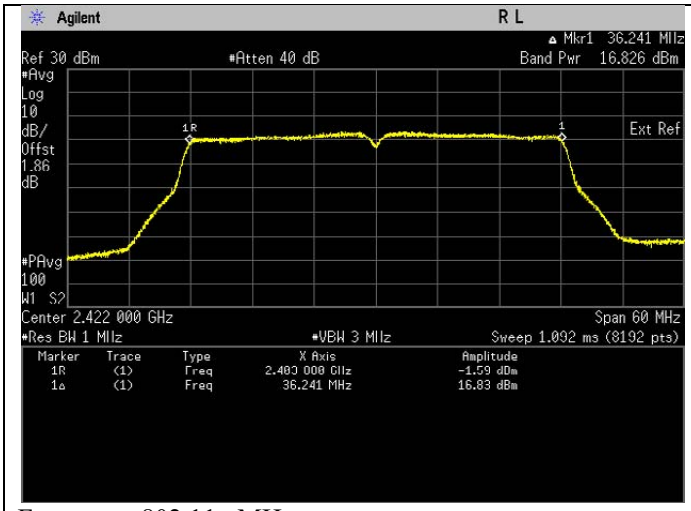


Duty Cycle

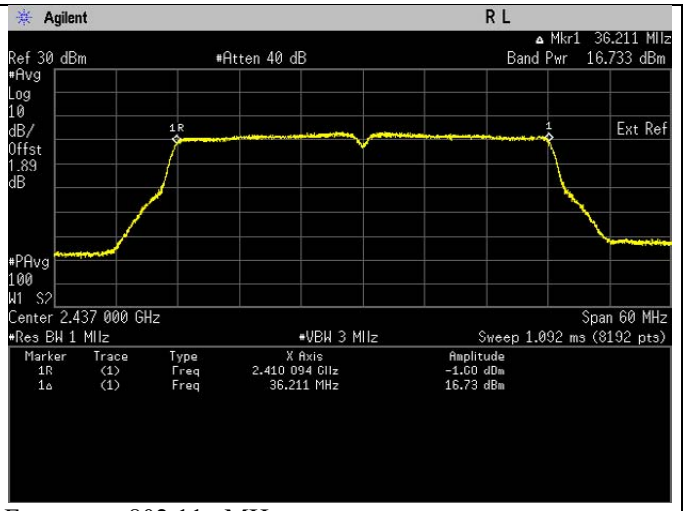
802.11n (HT40)

Output Power = Band Power + Duty Cycle Factor
= Band Power + 0.0228dBm

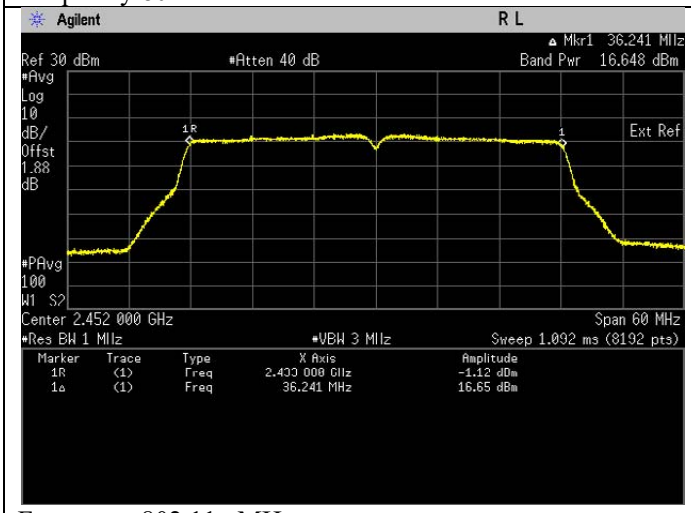
Test Conditions				Test Frequency	Results	
Standard	Modulation Type	Modulation Technology	Data Rate (mbps)	Tx (MHz)	Output Power (dBm)	Status
802.11n	OFDM	BPSK	13.5	2422	17.054	Pass
802.11n	OFDM	BPSK	13.5	2437	16.961	Pass
802.11n	OFDM	BPSK	13.5	2452	16.876	Pass



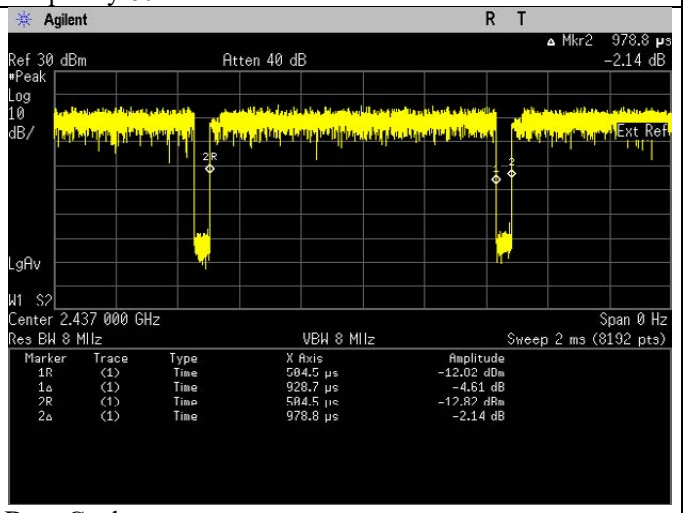
Frequency 802.11n MHz



Frequency 802.11n MHz



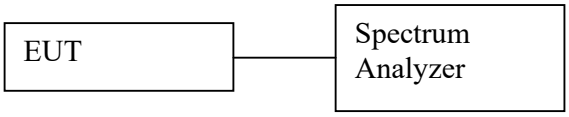
Frequency 802.11n MHz



Duty Cycle

6.3.Duty Cycle of the test signal

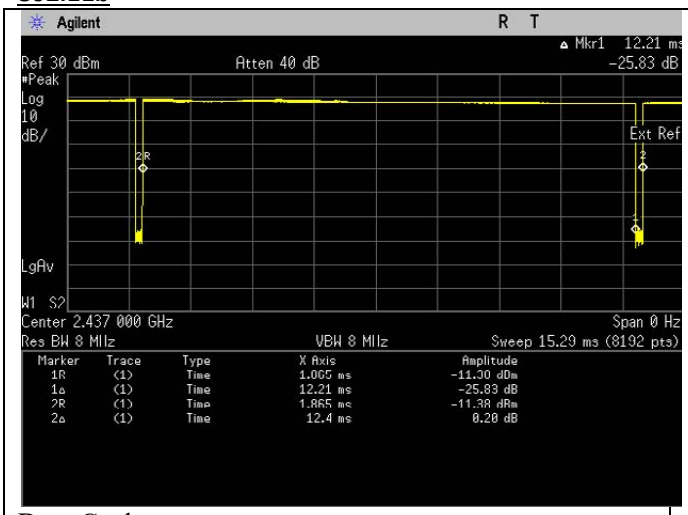
6.3.1. Test Setup



1) Check and ensure the spectrum analyzer well calibrate.
2) Turn on the DUT and set DUT to transmit maximum power.
3) Connect DUT's antenna terminal to spectrum analyzer with a low loss cable.
4) Setting of Spectrum analyzer :
    a. Set the RBW = 10 MHz or the highest RBW available on spectrum analyzer.
    b. Set the VBW ≥ RBW.
    c. Set the span ≥ [1.5 × DTS bandwidth].
    d. Detector = Peak.
    e. Sweep time = 10ms or others that allow to measure accurate duty cycle.
    f. Trace mode = max hold.
    g. Allow trace to fully stabilize.
5) Record the duty cycle as X and save the plot.
6) Measure every antenna port by repeat the step above for MIMO measurement.

6.3.2. **Test Data**

802.11b

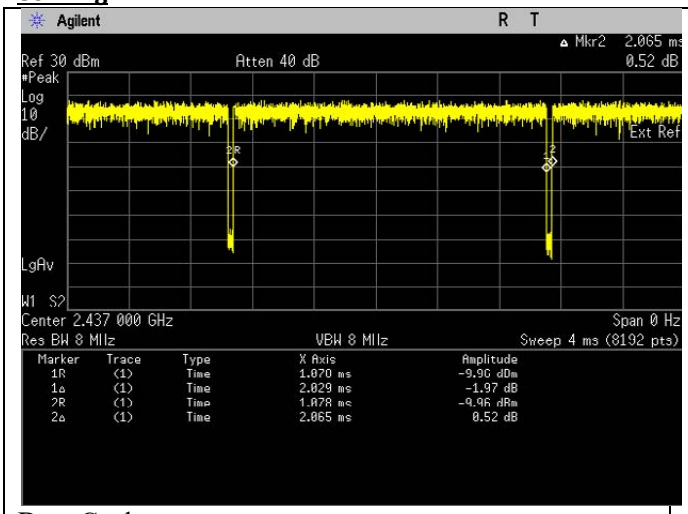


Duty Cycle

On time (ms)	12.21
On + Off Time (ms)	12.4
Duty cycle	0.9847
Duty Cycle factor	0.067

*Duty cycle = On time/ On +off time
*Duty Cycle factor = 10*log(1/Duty Cycle)

802.11g

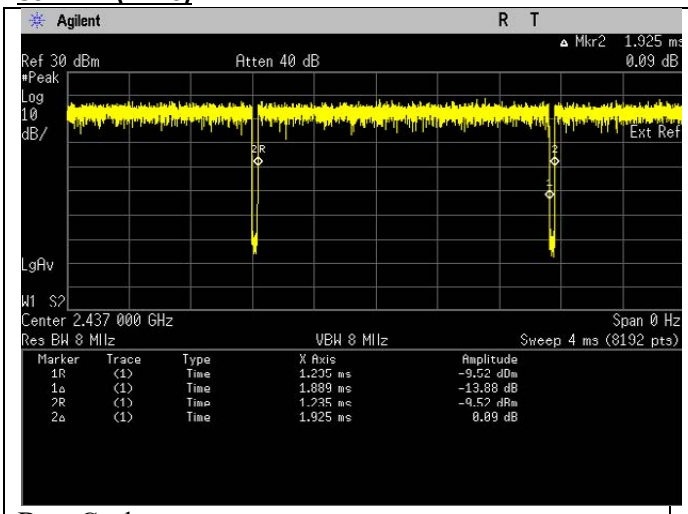


Duty Cycle

On time (ms)	2.029
On + Off Time (ms)	2.065
Duty cycle	0.9826
Duty Cycle factor	0.076

*Duty cycle = On time/ On +off time
*Duty Cycle factor = 10*log(1/Duty Cycle)

802.11n (HT20)

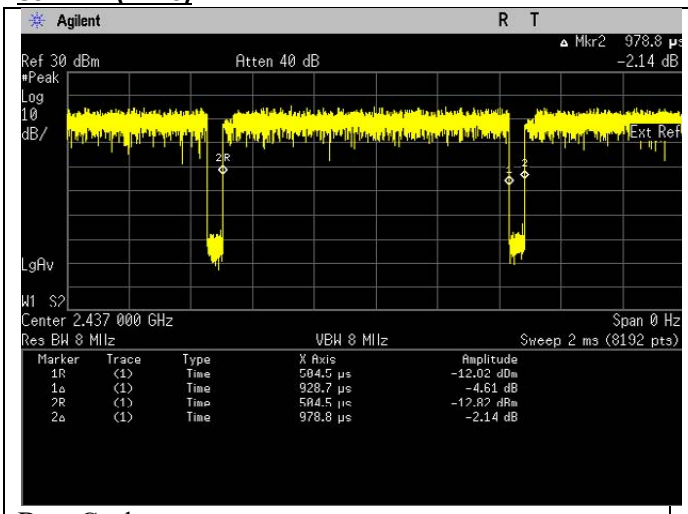


Duty Cycle

On time (ms)	1.889
On + Off Time (ms)	1.925
Duty cycle	0.9813
Duty Cycle factor	0.082

*Duty cycle = On time/ On +off time
*Duty Cycle factor = 10*log(1/Duty Cycle)

802.11n (HT40)



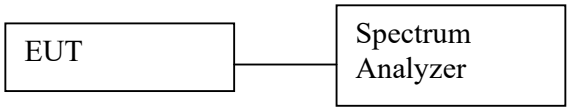
Duty Cycle

On time (ms)	0.9287
On + Off Time (ms)	0.9788
Duty cycle	0.9488
Duty Cycle factor	0.228

*Duty cycle = On time/ On +off time
*Duty Cycle factor = 10*log(1/Duty Cycle)

6.4. Maximum Peak Power Spectral Density

6.4.1. Test Setup



Maximum Peak

a) Check and ensure the spectrum analyzer well calibrate.
b) Turn on the DUT and set DUT to transmit maximum power.
c) Connect DUT's antenna terminal to spectrum analyzer with a low loss cable.
d) Setting of Spectrum analyzer :
    a. Set analyzer center frequency to DTS channel center frequency.
    b. Set the span to 1.5 times the DTS bandwidth.
    c. Set the RBW to 3 kHz ≤ RBW ≤ 100 kHz.
    d. Set the VBW ≥ [3 × RBW].
    e. Detector = peak.
    f. Sweep time = auto couple.
    g. Trace mode = max hold.
    h. Allow trace to fully stabilize.
    i. Use the peak marker function to determine the maximum amplitude level within the RBW.
    j. If measured value exceeds requirement, then reduce RBW (but no less than 3 kHz) and repeat.
e) Measure every antenna port by repeat the step above for MIMO measurement.

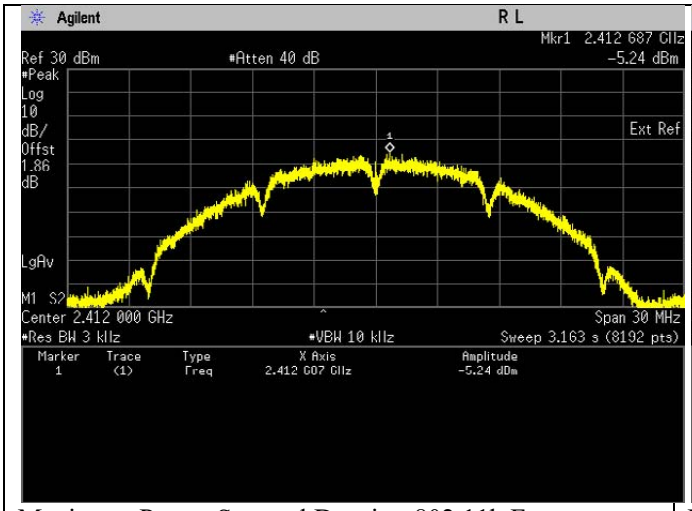
6.4.2. Test Limits

Normal Condition (25 º C)
≤ 8 dBm/3kHz

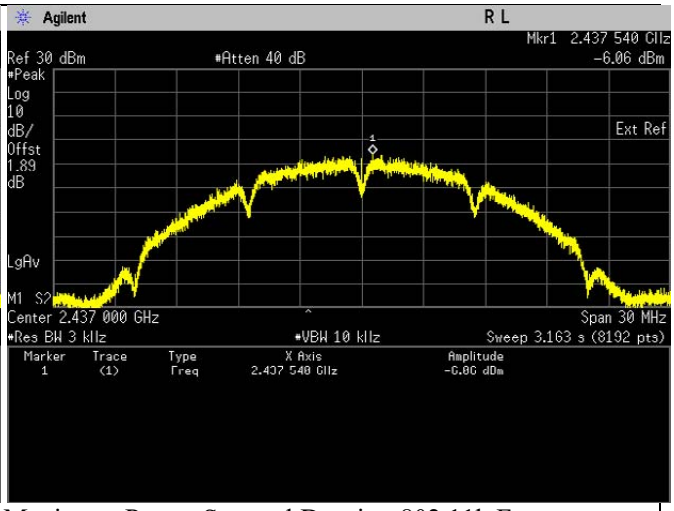
6.4.3. **Test Result**

802.11b

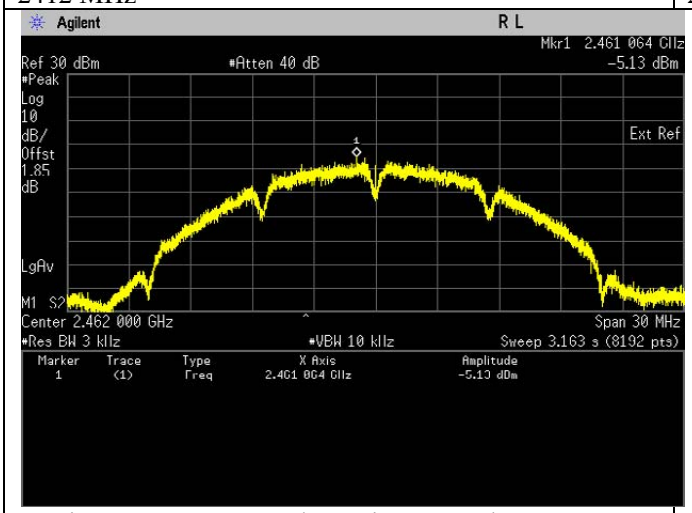
Test Conditions				Test Frequency	Results	
Standard	Modulation Type	Modulation Technology	Data Rate (mbps)	Tx (MHz)	Power (dBm/3kHz)	Status
802.11b	DSSS	DBPSK	1	2412	-5.24	Pass
802.11b	DSSS	DBPSK	1	2437	-6.06	Pass
802.11b	DSSS	DBPSK	1	2462	-5.13	Pass



Maximum Power Spectral Density. 802.11b Frequency 2412 MHz



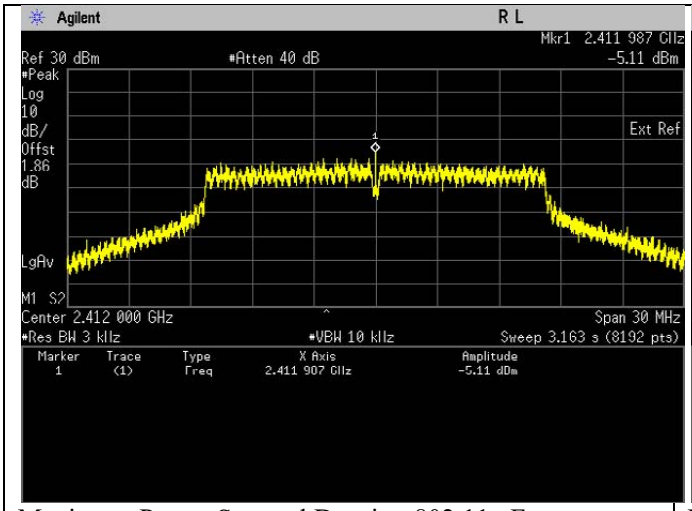
Maximum Power Spectral Density. 802.11b Frequency 2437 MHz



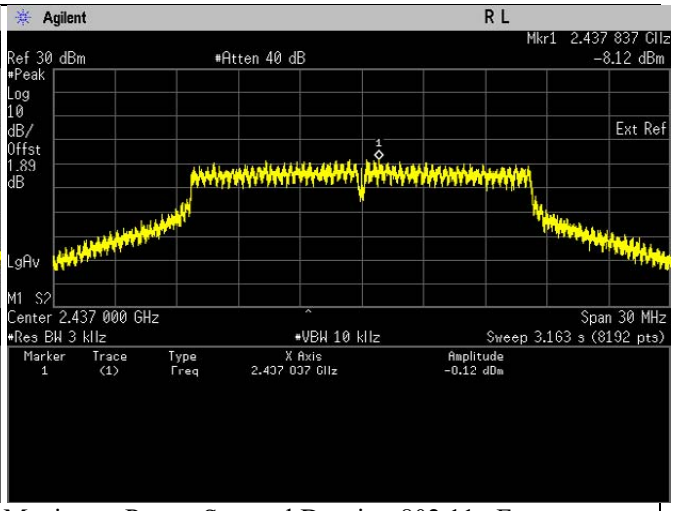
Maximum Power Spectral Density. 802.11b Frequency 2462 MHz

802.11g

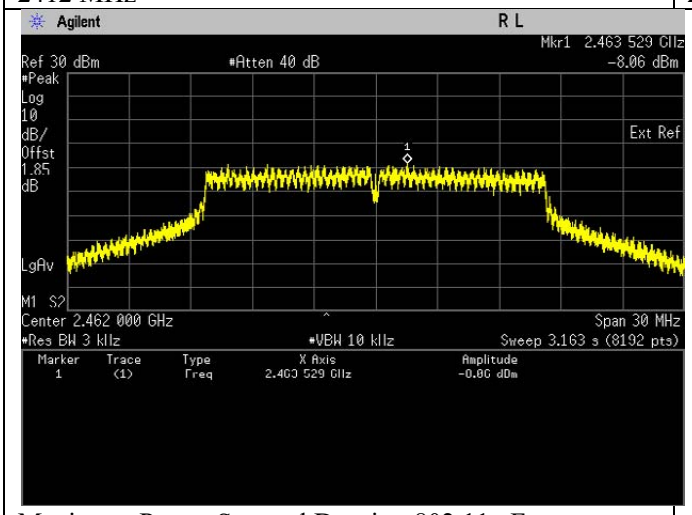
Test Conditions				Test Frequency	Results	
Standard	Modulation Type	Modulation Technology	Data Rate (mbps)	Tx (MHz)	Power (dBm/3kHz)	Status
802.11g	OFDM	BPSK	6	2412	-5.11	Pass
802.11g	OFDM	BPSK	6	2437	-8.12	Pass
802.11g	OFDM	BPSK	6	2462	-8.06	Pass



Maximum Power Spectral Density. 802.11g Frequency 2412 MHz



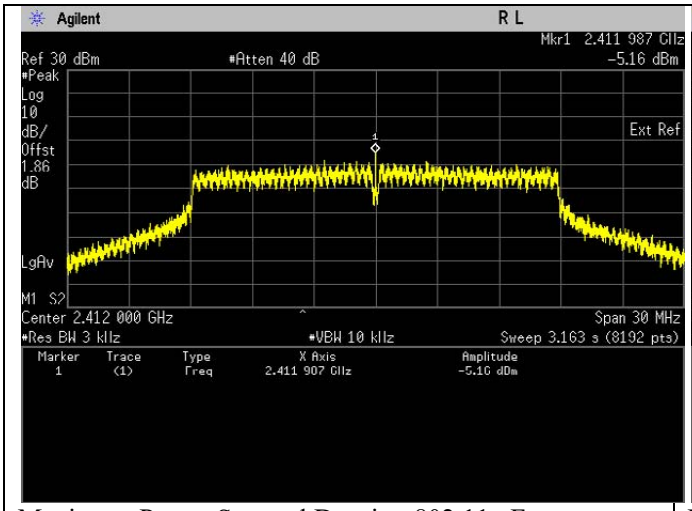
Maximum Power Spectral Density. 802.11g Frequency 2437 MHz



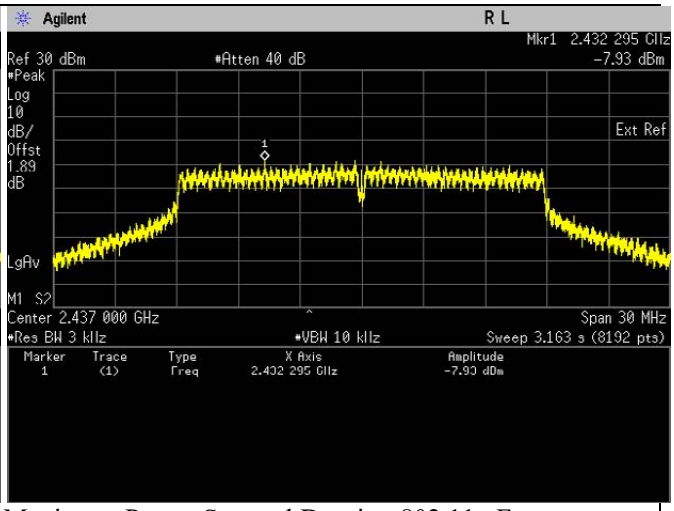
Maximum Power Spectral Density. 802.11g Frequency 2462 MHz

802.11n (HT20)

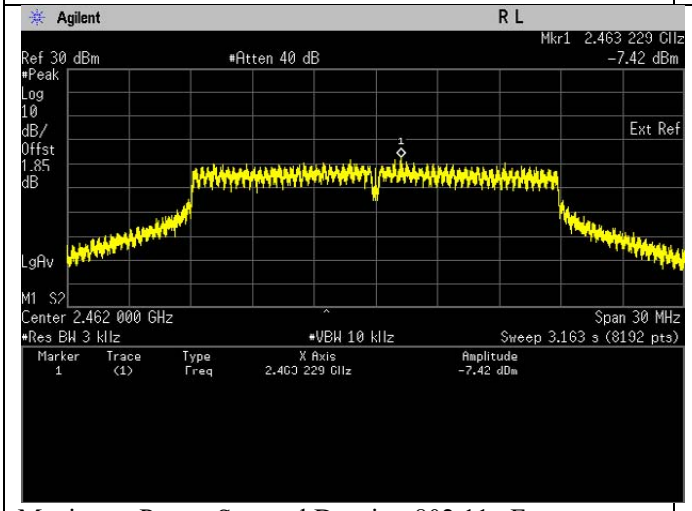
Test Conditions				Test Frequency	Results	
Standard	Modulation Type	Modulation Technology	Data Rate (mbps)	Tx (MHz)	Power (dBm/3kHz)	Status
802.11n	OFDM	BPSK	6.5	2412	-5.16	Pass
802.11n	OFDM	BPSK	6.5	2437	-7.93	Pass
802.11n	OFDM	BPSK	6.5	2462	-7.42	Pass



Maximum Power Spectral Density. 802.11n Frequency 2412 MHz



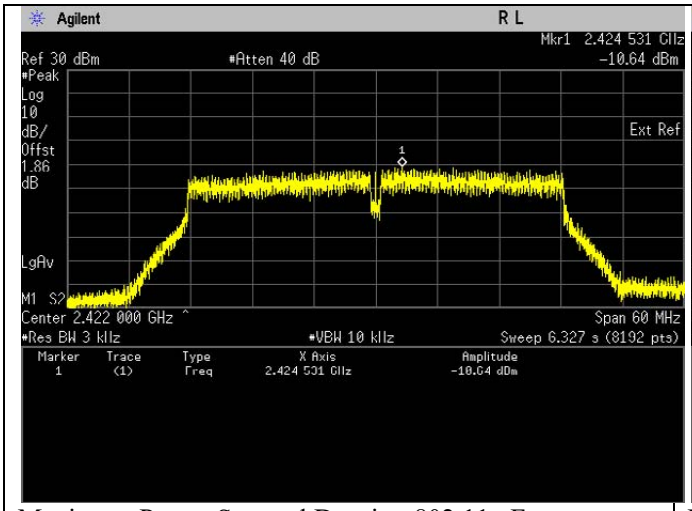
Maximum Power Spectral Density. 802.11n Frequency 2437 MHz



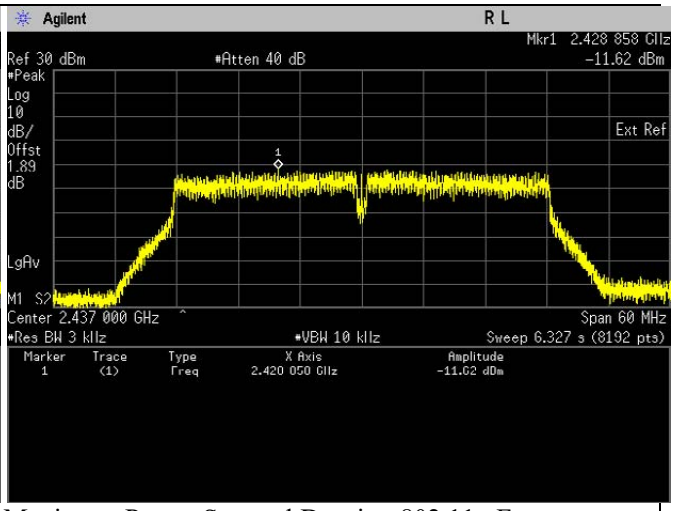
Maximum Power Spectral Density. 802.11n Frequency 2462 MHz

802.11n (HT40)

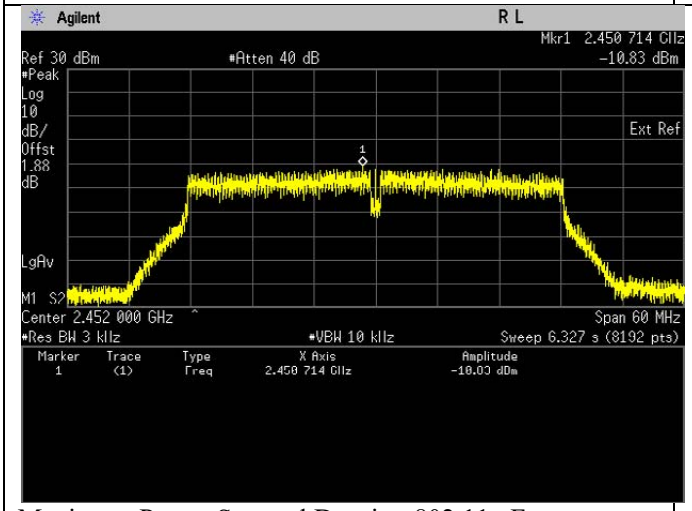
Test Conditions				Test Frequency	Results	
Standard	Modulation Type	Modulation Technology	Data Rate (mbps)	Tx (MHz)	Power (dBm/3kHz)	Status
802.11n	OFDM	BPSK	13.5	2422	-10.64	Pass
802.11n	OFDM	BPSK	13.5	2437	-11.62	Pass
802.11n	OFDM	BPSK	13.5	2452	-10.83	Pass



Maximum Power Spectral Density. 802.11n Frequency 2422 MHz



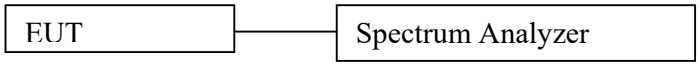
Maximum Power Spectral Density. 802.11n Frequency 2437 MHz



Maximum Power Spectral Density. 802.11n Frequency 2452 MHz

6.5. Conducted Spurious Emission

6.5.1. Test Setup



a) Check and ensure the spectrum analyzer well calibrate.
b) Turn on the DUT and set DUT to transmit maximum power.
c) Connect DUT's antenna terminal to spectrum analyzer with a low loss cable.
d) Setting of Spectrum analyzer :
    a. RBW = 100 kHz
    b. VBW = 300 kHz
    c. Detector mode = Peak
    d. Trace = Max Hold
    e. Sweep = auto
e) Use the peak marker function to measure highest emission and scan up to 10th harmonic.
f) Measure every antenna port by repeat the step above for MIMO measurement.

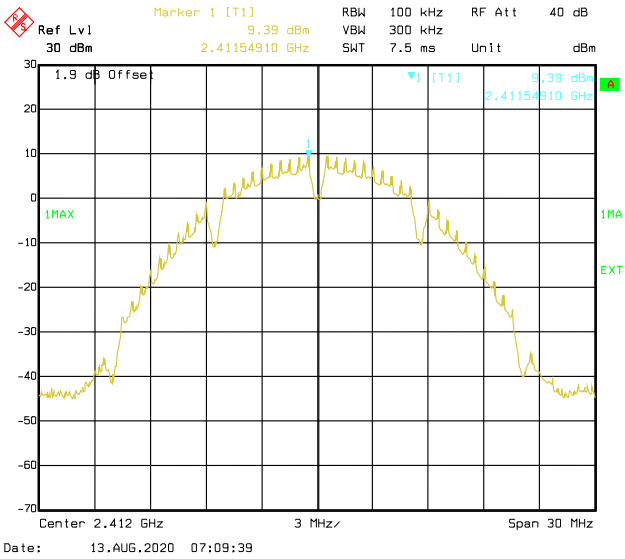
6.5.2. Test Limits:

Normal Condition (25 ° C)
Shall be at least 30 dB below peak (max) power.

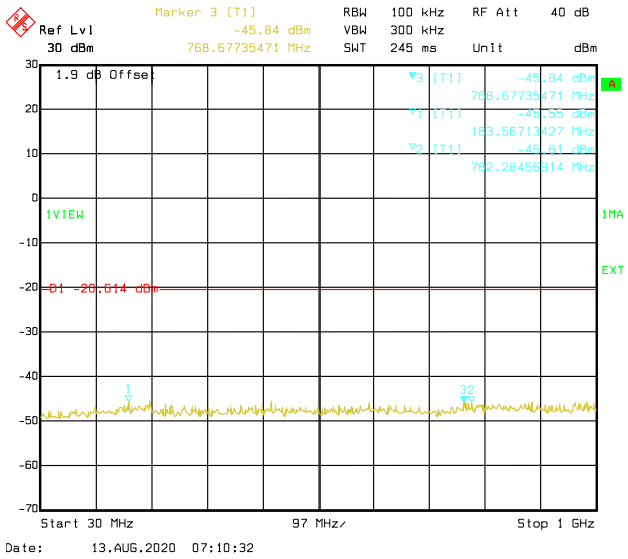
6.5.3. Test Result

802.11b

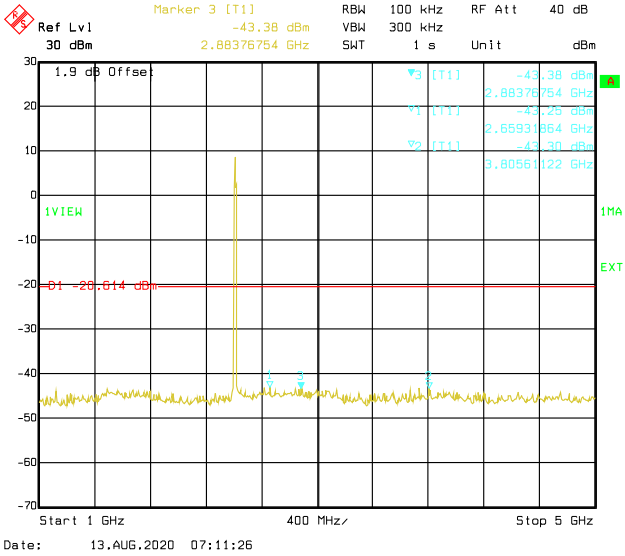
Test Conditions				Test Frequency	Results		
Standard	Modulation Type	Modulation Technology	Data Rate (mbps)	Tx (MHz)	Spurs (MHz)	Level (dBm)	Status
802.11b	DSSS	DBPSK	1	2412	14188.38	-38.01	Pass
					6723.45	-39.29	Pass
					15671.34	-39.70	Pass
802.11b	DSSS	DBPSK	1	2437	14188.38	-37.90	Pass
					6683.37	-39.55	Pass
					6983.97	-39.60	Pass
802.11b	DSSS	DBPSK	1	2462	14198.40	-39.04	Pass
					6983.97	-40.27	Pass
					6733.47	-40.30	Pass



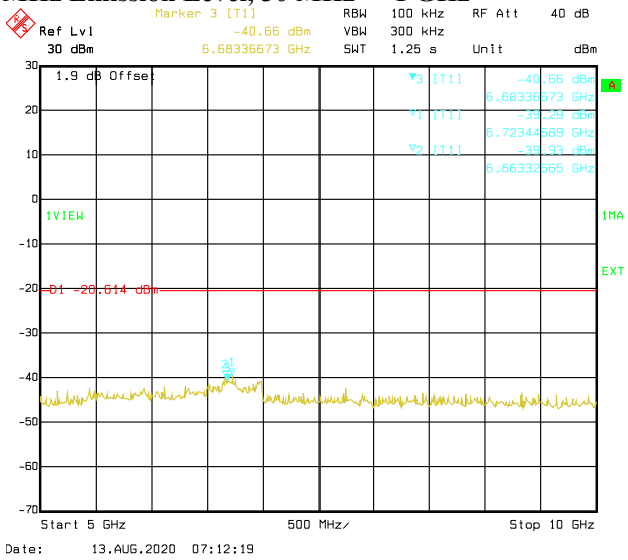
Conducted Emissions. 802.11b, Frequency 2412 MHz Reference Level



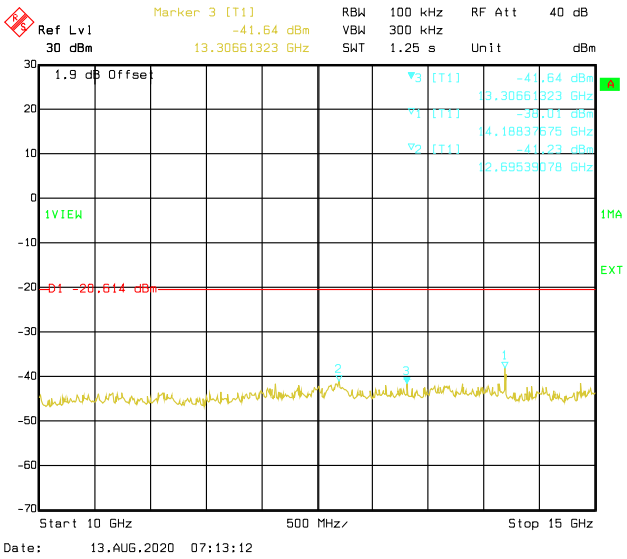
Conducted Emissions. 802.11b, Frequency 2412 MHz Emission Level, 30 MHz -> 1 GHz



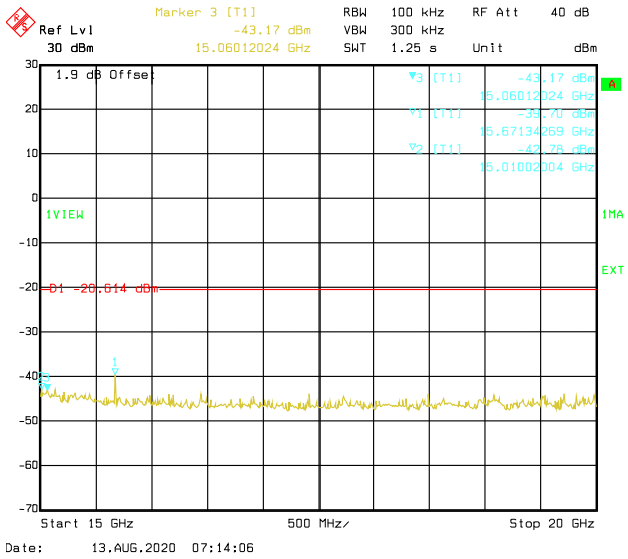
Conducted Emissions. 802.11b, Frequency 2412 MHz Emission Level, 1 GHz -> 5 GHz



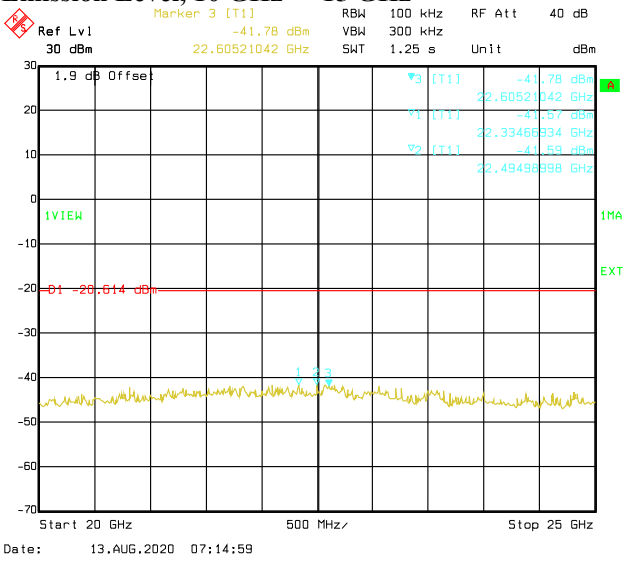
Conducted Emissions. 802.11b, Frequency 2412 MHz Emission Level, 5 GHz -> 10 GHz



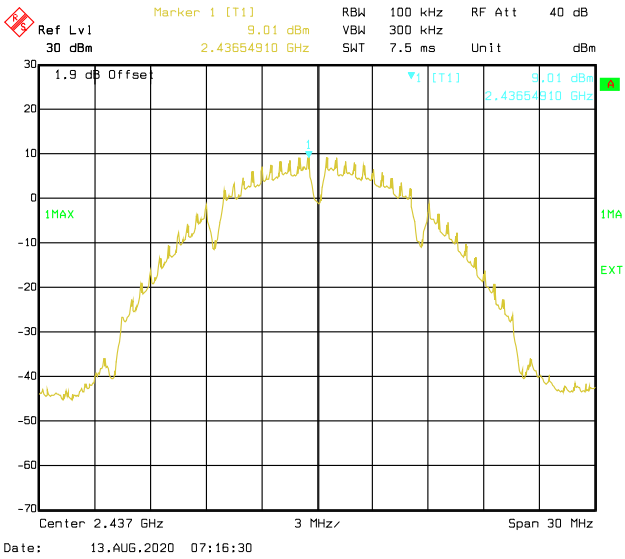
Conducted Emissions. 802.11b, Frequency 2412 Emission Level, 10 GHz -> 15 GHz



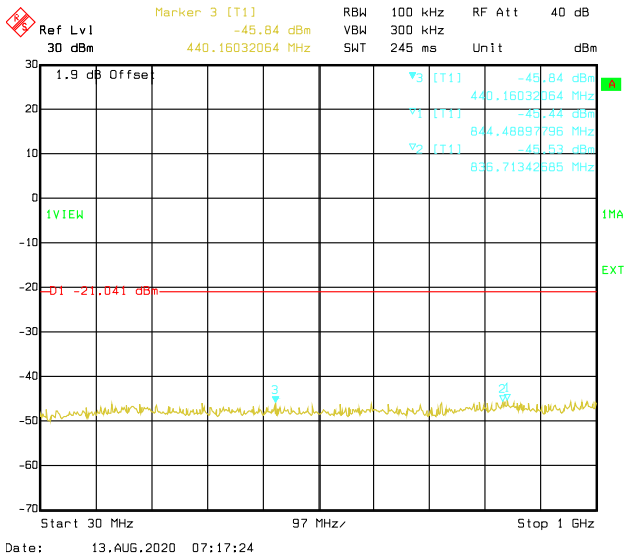
Conducted Emissions. 802.11b, Frequency 2412 MHz Emission Level, 15 GHz -> 20 GHz



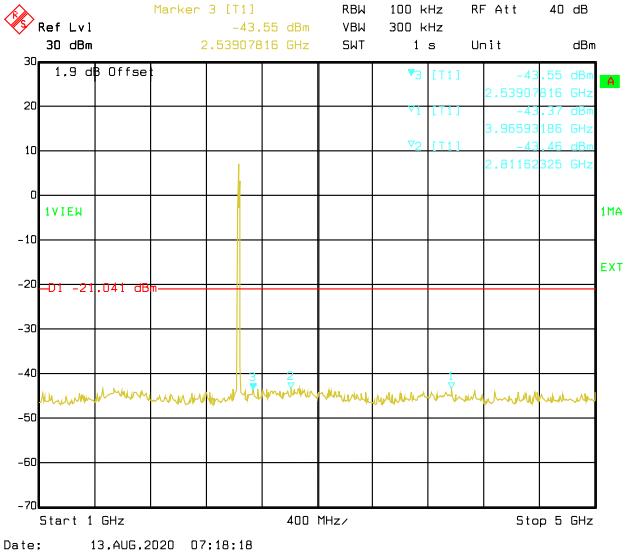
Conducted Emissions. 802.11b, Frequency 2412 MHz Emission Level, 20 GHz -> 25 GHz



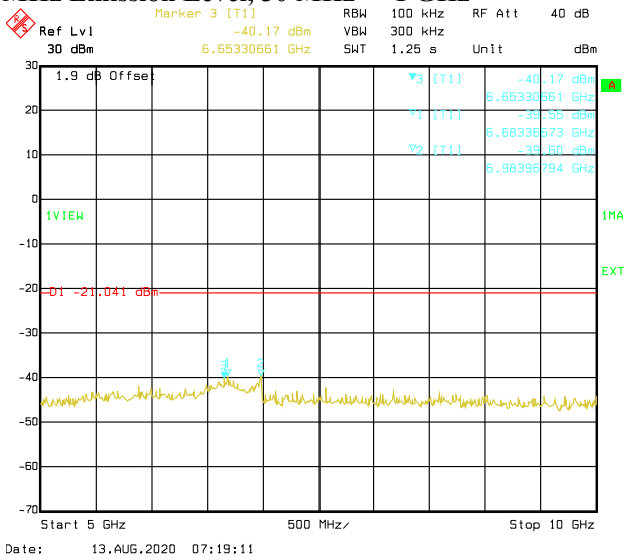
Conducted Emissions. 802.11b, Frequency 2437 MHz Reference Level



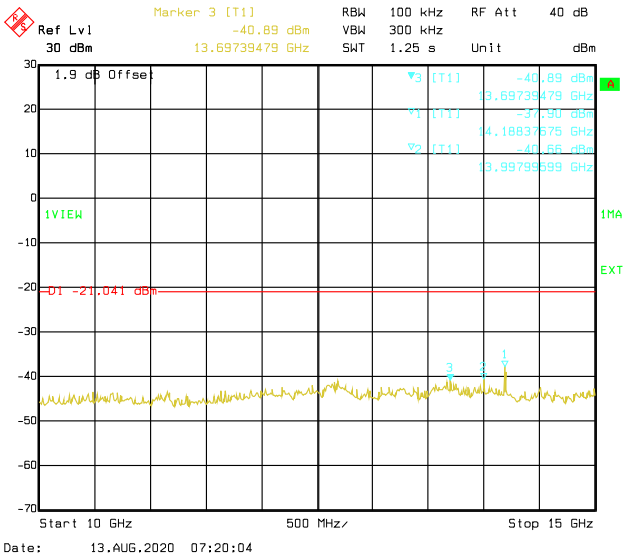
Conducted Emissions. 802.11b, Frequency 2437 MHz Emission Level, 30 MHz -> 1 GHz



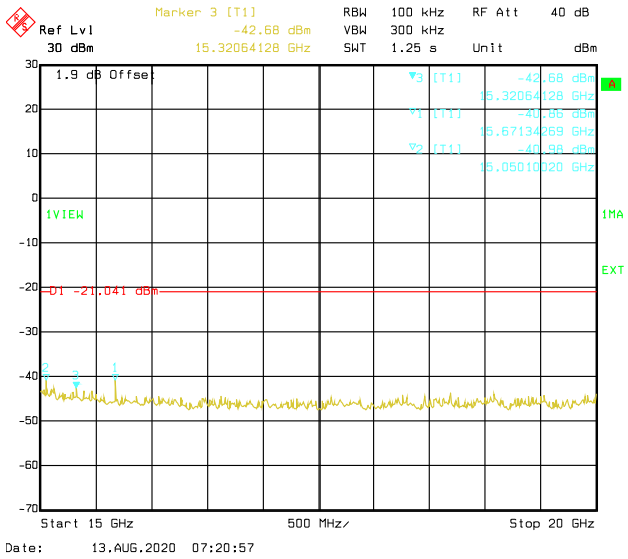
Conducted Emissions. 802.11b, Frequency 2437 MHz Emission Level, 1 GHz -> 5 GHz



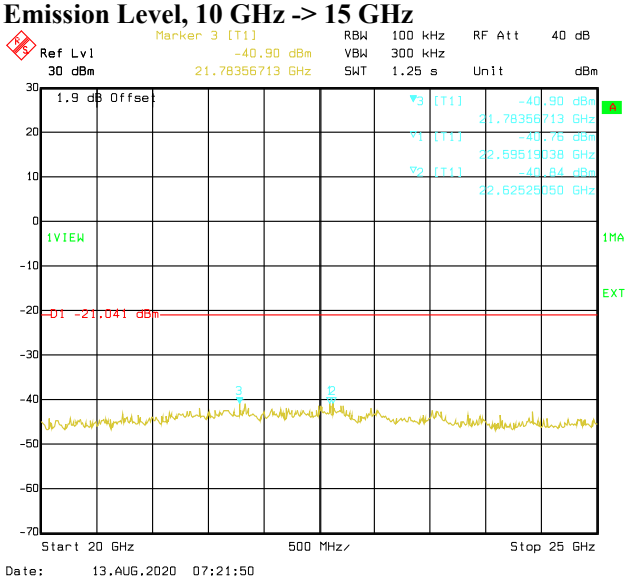
Conducted Emissions. 802.11b, Frequency 2437 MHz Emission Level, 5 GHz -> 10 GHz



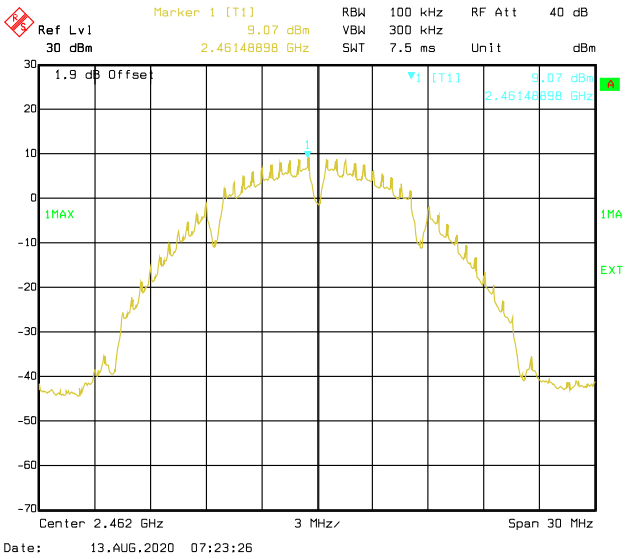
Conducted Emissions. 802.11b, Frequency 2437 Emission Level, 10 GHz -> 15 GHz



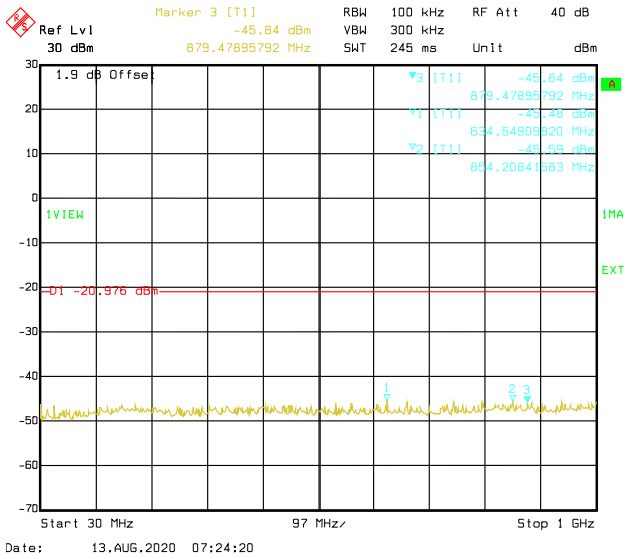
Conducted Emissions. 802.11b, Frequency 2437 MHz Emission Level, 15 GHz -> 20 GHz



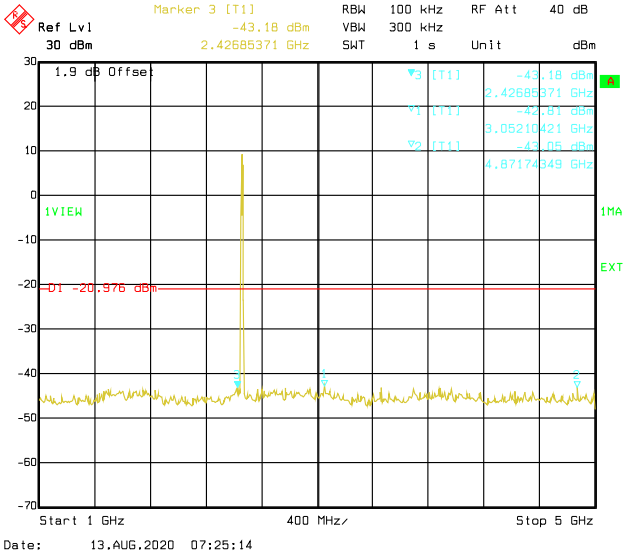
Conducted Emissions. 802.11b, Frequency 2437 MHz Emission Level, 20 GHz -> 25 GHz



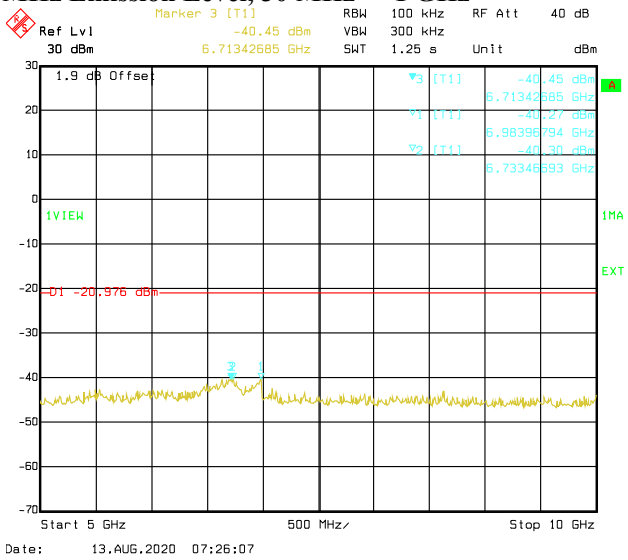
Conducted Emissions. 802.11b, Frequency 2462 MHz Reference Level



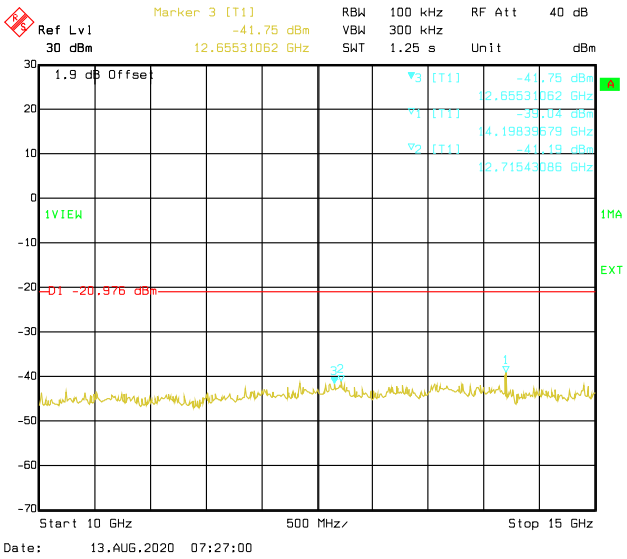
Conducted Emissions. 802.11b, Frequency 2462 MHz Emission Level, 30 MHz -> 1 GHz



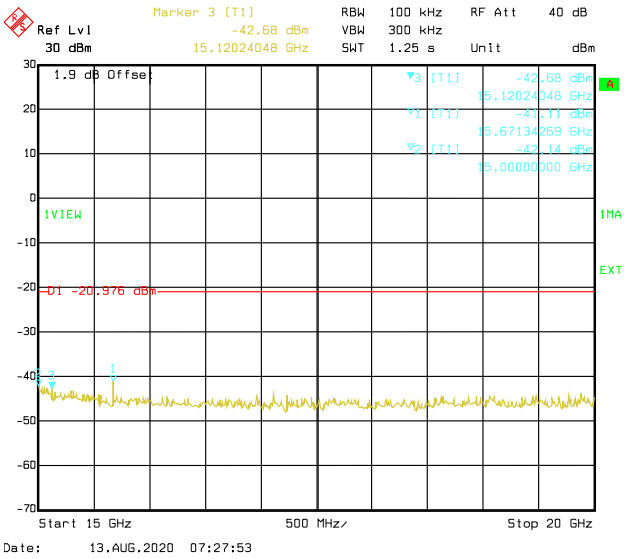
Conducted Emissions. 802.11b, Frequency 2462 MHz Emission Level, 1 GHz -> 5 GHz



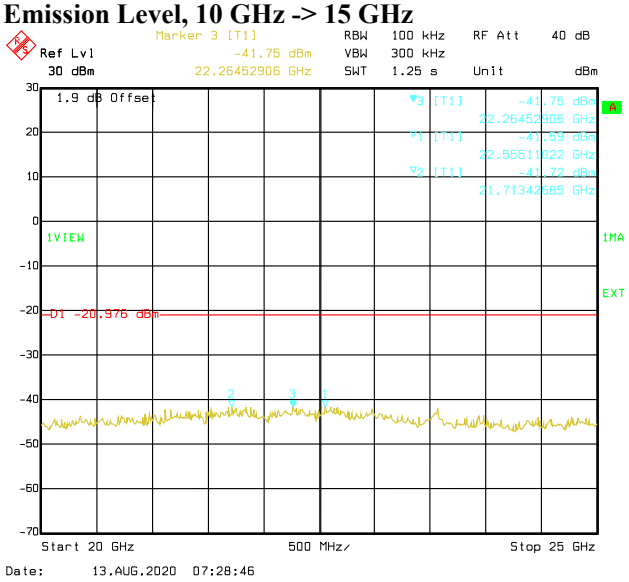
Conducted Emissions. 802.11b, Frequency 2462 MHz Emission Level, 5 GHz -> 10 GHz



Conducted Emissions. 802.11b, Frequency 2462 Emission Level, 10 GHz -> 15 GHz



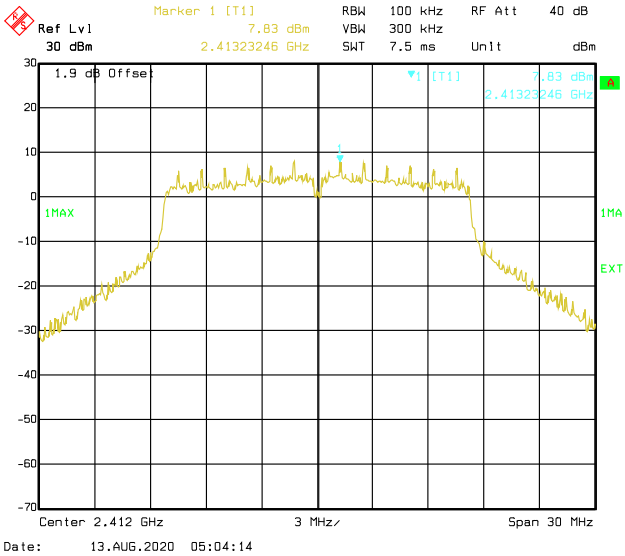
Conducted Emissions. 802.11b, Frequency 2462 MHz Emission Level, 15 GHz -> 20 GHz



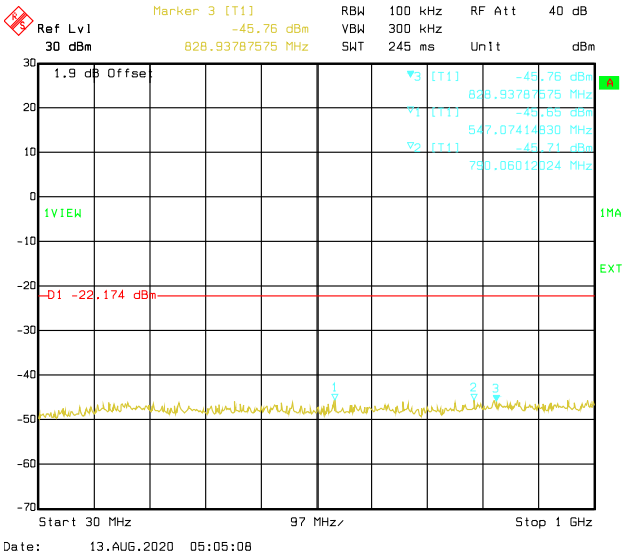
Conducted Emissions. 802.11b, Frequency 2462 MHz Emission Level, 20 GHz -> 25 GHz

802.11g

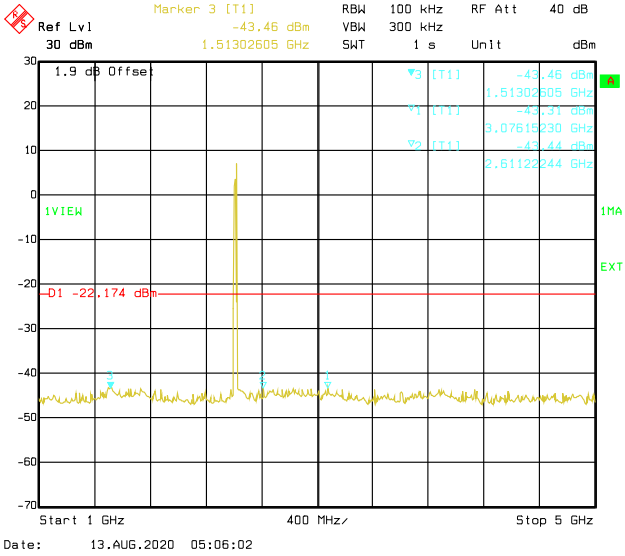
Test Conditions				Test Frequency	Results		
Standard	Modulation Type	Modulation Technology	Data Rate (mbps)	Tx (MHz)	Spurs (MHz)	Level (dBm)	Status
802.11g	OFDM	BPSK	6	2412	14188.38	-38.86	Pass
					15671.34	-40.22	Pass
					6923.85	-40.42	Pass
802.11g	OFDM	BPSK	6	2437	14188.38	-38.92	Pass
					6713.43	-40.00	Pass
					6673.35	-40.16	Pass
802.11g	OFDM	BPSK	6	2462	14188.38	-38.33	Pass
					6993.99	-39.76	Pass
					15671.34	-40.26	Pass



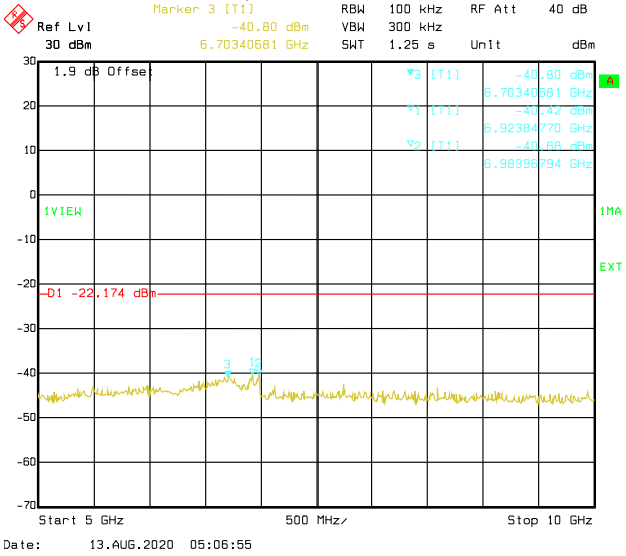
Conducted Emissions. 802.11g, Frequency 2412 MHz Reference Level



Conducted Emissions. 802.11g, Frequency 2412 MHz Emission Level, 30 MHz -> 1 GHz

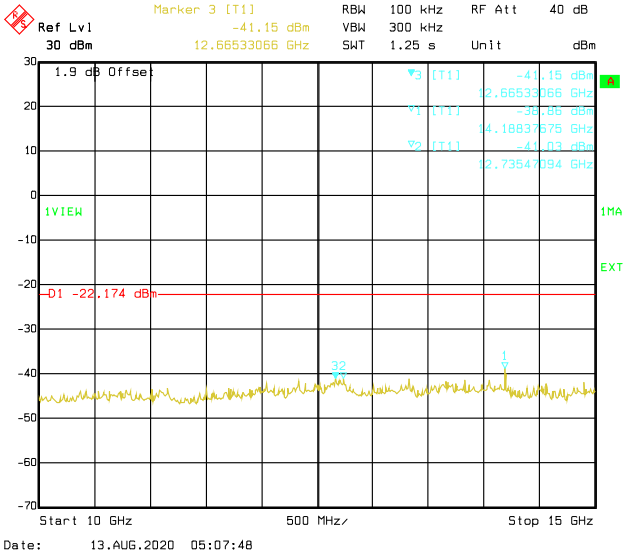


Conducted Emissions. 802.11g, Frequency 2412 MHz Reference Level

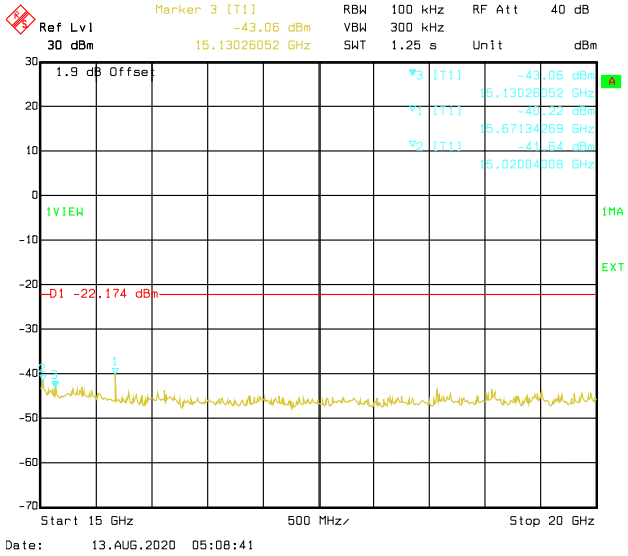


Conducted Emissions. 802.11g, Frequency 2412 MHz Emission Level, 30 MHz -> 1 GHz

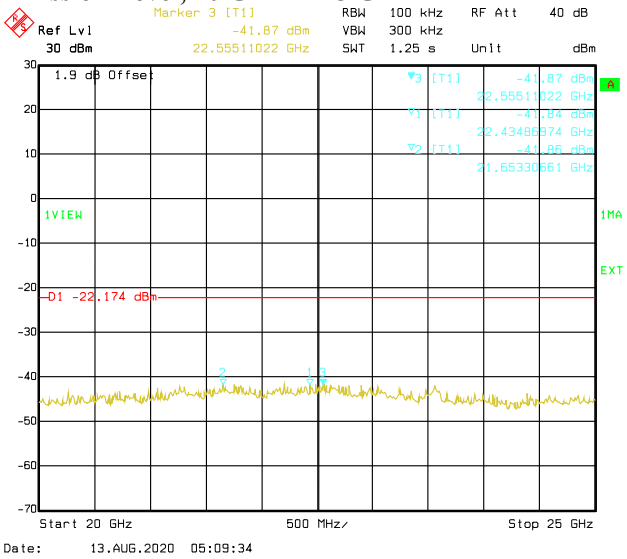
Conducted Emissions. 802.11g, Frequency 2412 MHz Emission Level, 1 GHz -> 5 GHz



Conducted Emissions. 802.11g, Frequency 2412 MHz Emission Level, 5 GHz -> 10 GHz

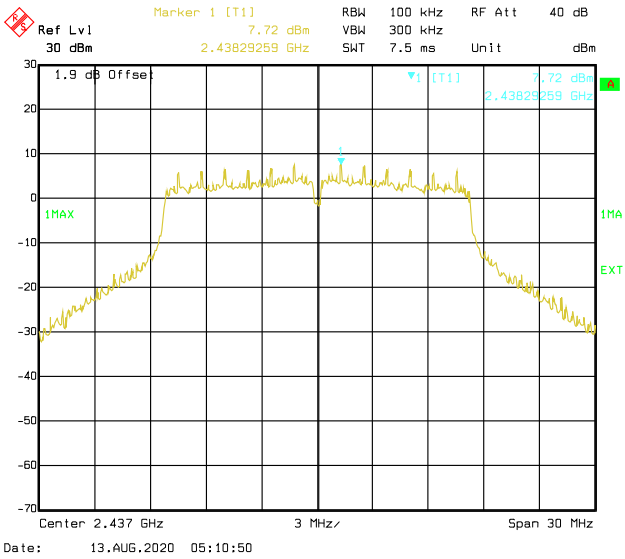


Conducted Emissions. 802.11g, Frequency 2412 Emission Level, 10 GHz -> 15 GHz

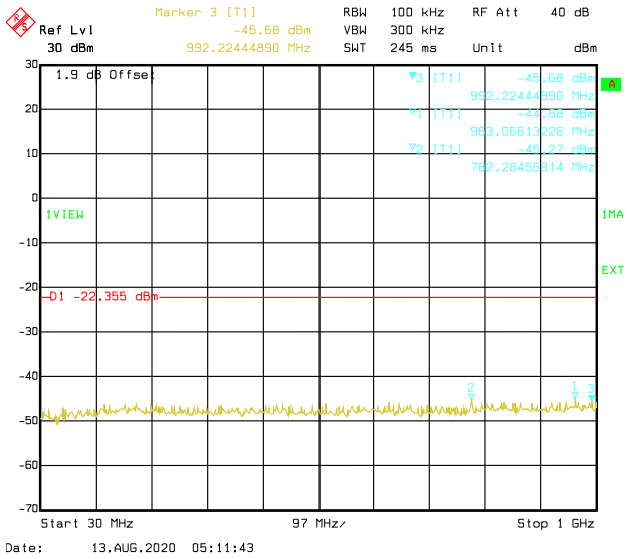


Conducted Emissions. 802.11g, Frequency 2412 MHz Emission Level, 20 GHz -> 25 GHz

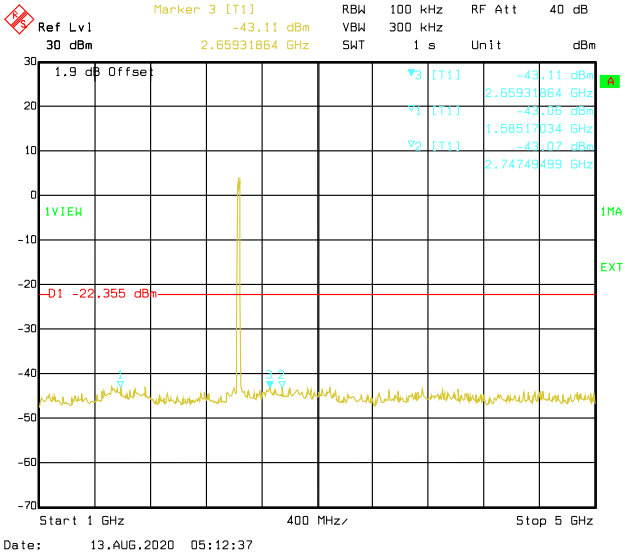
Conducted Emissions. 802.11g, Frequency 2412 MHz Emission Level, 15 GHz -> 20 GHz



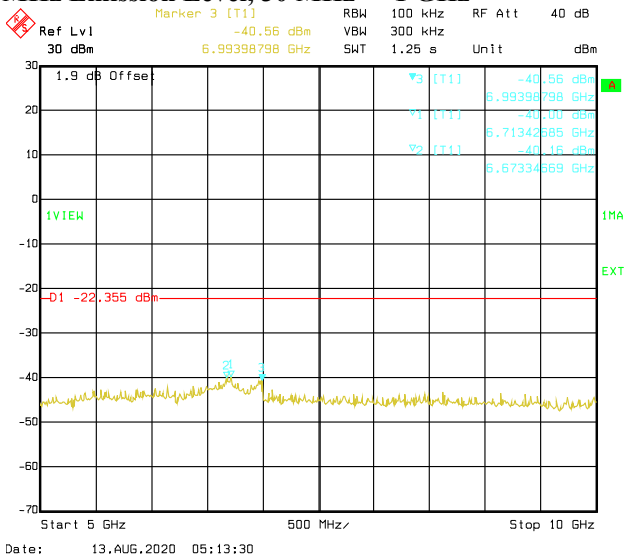
Conducted Emissions. 802.11g, Frequency 2437 MHz Reference Level



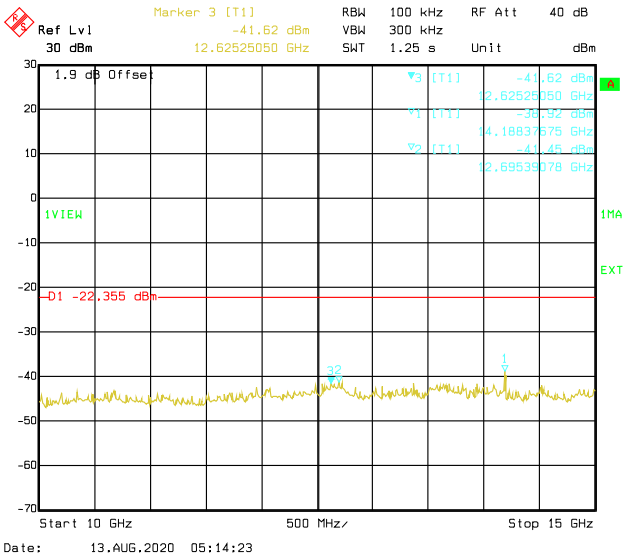
Conducted Emissions. 802.11g, Frequency 2437 MHz Emission Level, 30 MHz -> 1 GHz



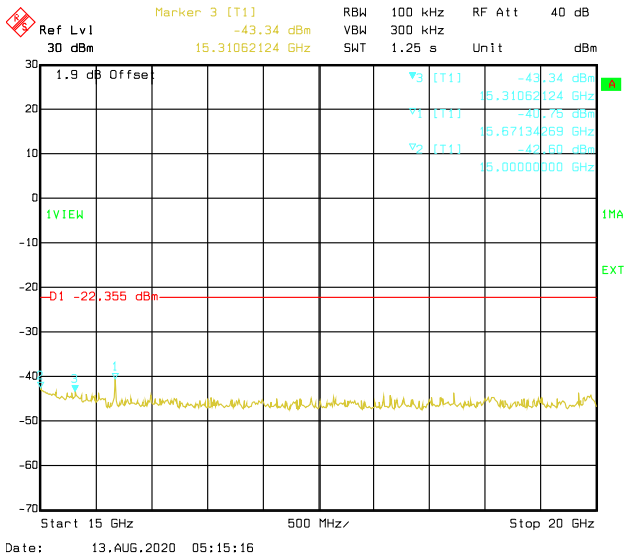
Conducted Emissions. 802.11g, Frequency 2437 MHz Emission Level, 1 GHz -> 5 GHz



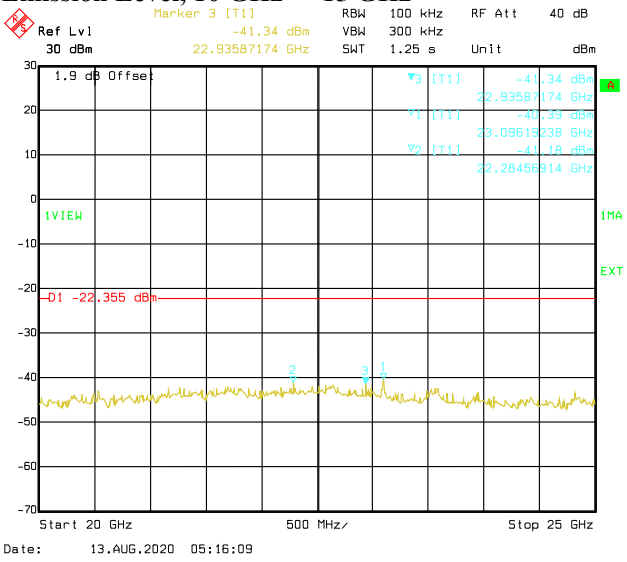
Conducted Emissions. 802.11g, Frequency 2437 MHz Emission Level, 5 GHz -> 10 GHz



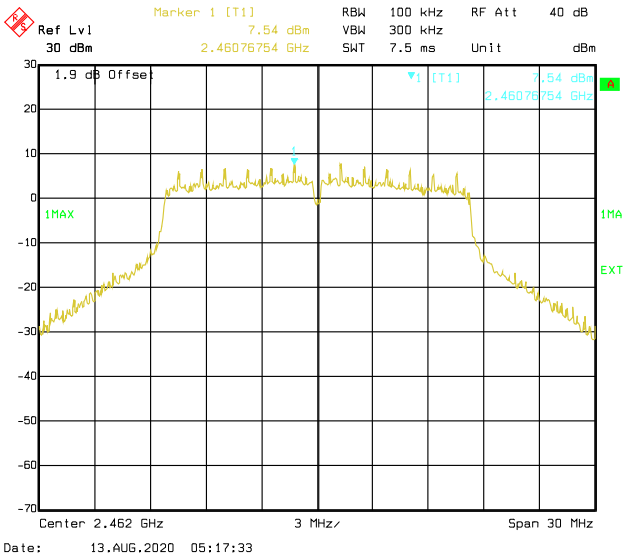
Conducted Emissions. 802.11g, Frequency 2437 Emission Level, 10 GHz -> 15 GHz



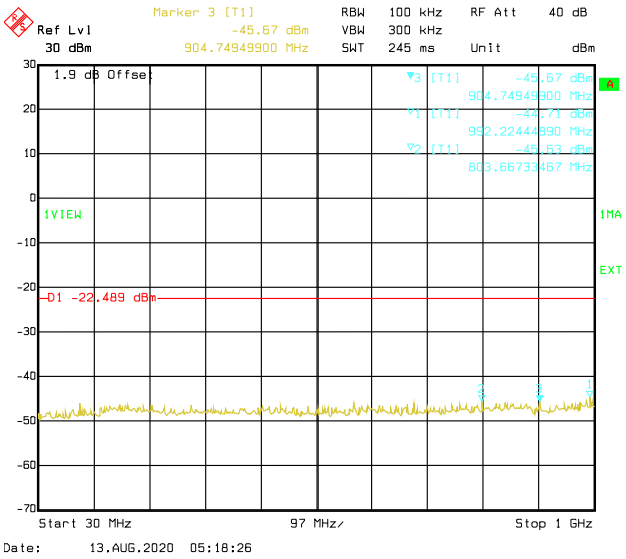
Conducted Emissions. 802.11g, Frequency 2437 MHz Emission Level, 15 GHz -> 20 GHz



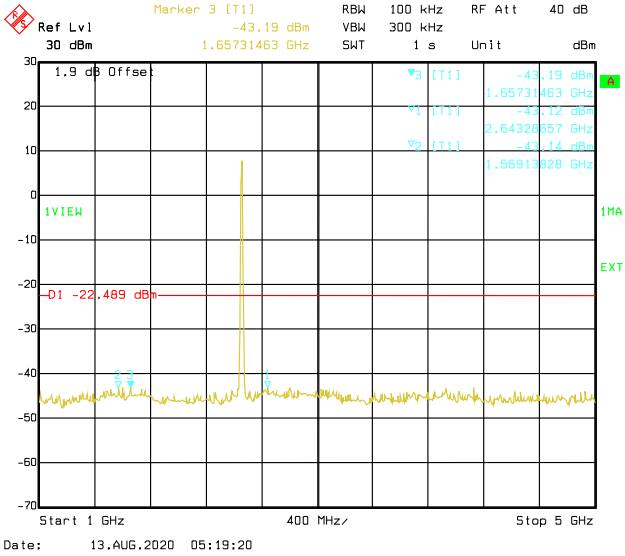
Conducted Emissions. 802.11g, Frequency 2437 MHz Emission Level, 20 GHz -> 25 GHz



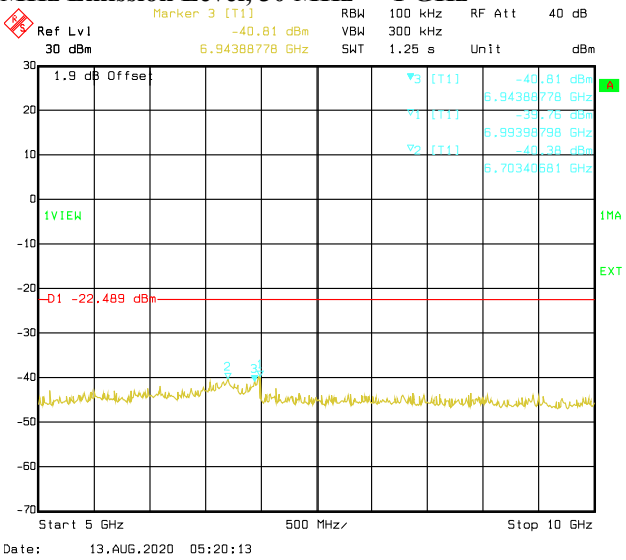
Conducted Emissions. 802.11g, Frequency 2462 MHz Reference Level



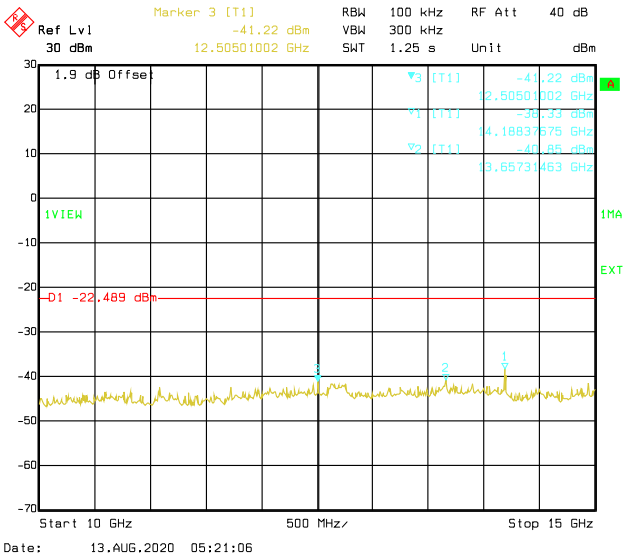
Conducted Emissions. 802.11g, Frequency 2462 MHz Emission Level, 30 MHz -> 1 GHz



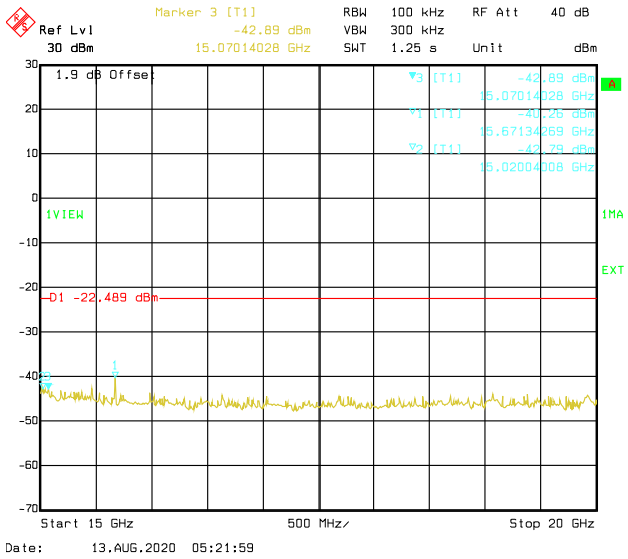
Conducted Emissions. 802.11g, Frequency 2462 MHz Emission Level, 1 GHz -> 5 GHz



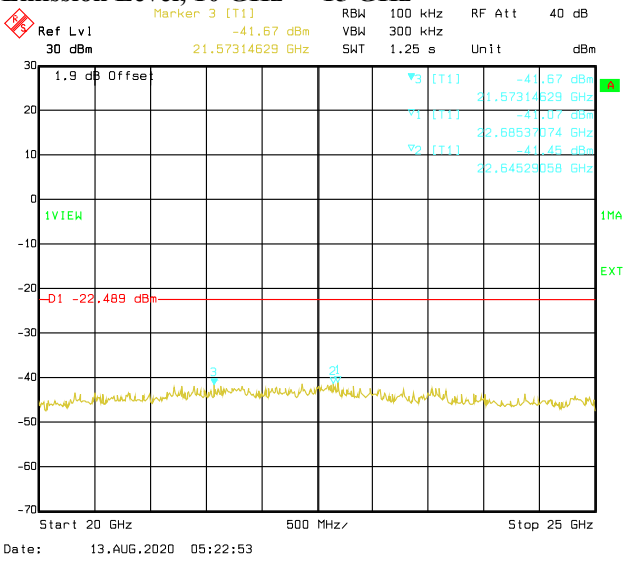
Conducted Emissions. 802.11g, Frequency 2462 MHz Emission Level, 5 GHz -> 10 GHz



Conducted Emissions. 802.11g, Frequency 2462 Emission Level, 10 GHz -> 15 GHz



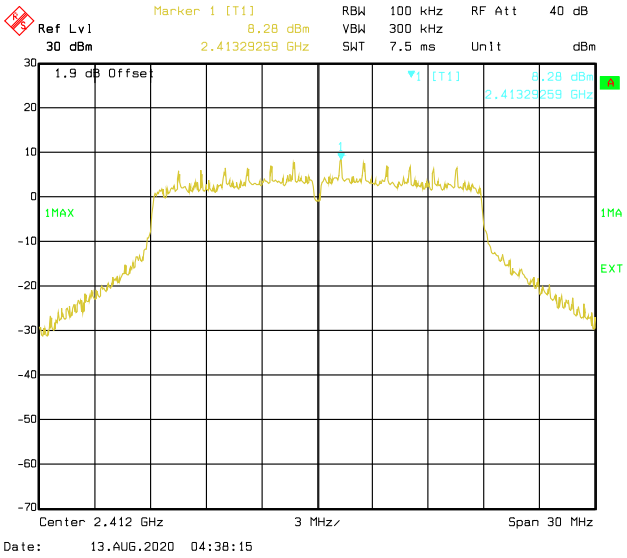
Conducted Emissions. 802.11g, Frequency 2462 MHz Emission Level, 15 GHz -> 20 GHz



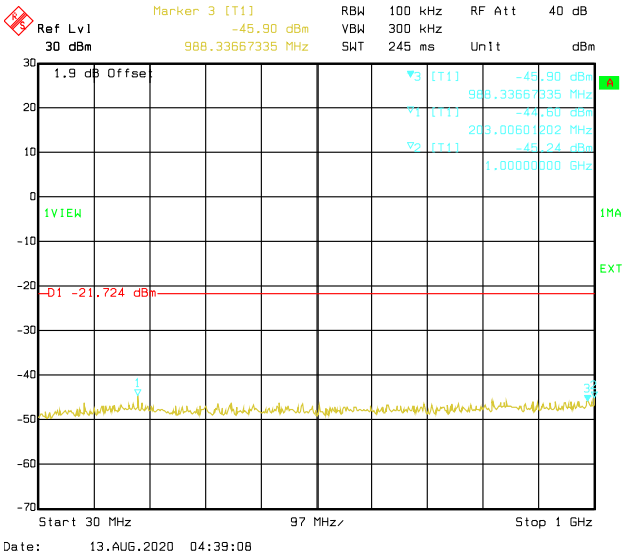
Conducted Emissions. 802.11g, Frequency 2462 MHz Emission Level, 20 GHz -> 25 GHz

802.11n (HT20)

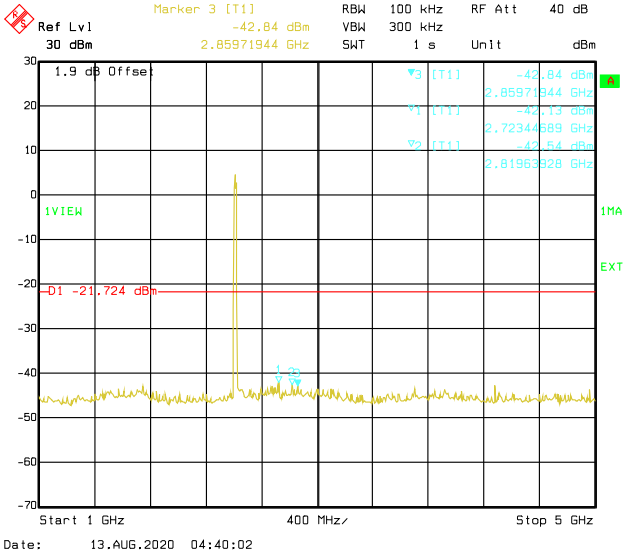
Test Conditions				Test Frequency	Results		
Standard	Modulation Type	Modulation Technology	Data Rate (mbps)	Tx (MHz)	Spurs (MHz)	Level (dBm)	Status
802.11n	OFDM	BPSK	6.5	2412	14188.38	-38.83	Pass
					6993.99	-39.13	Pass
					6673.35	-39.58	Pass
802.11n	OFDM	BPSK	6.5	2437	6693.39	-38.24	Pass
					14188.38	-39.08	Pass
					6993.99	-39.35	Pass
802.11n	OFDM	BPSK	6.5	2462	14188.38	-39.10	Pass
					6673.35	-40.20	Pass
					6653.31	-40.46	Pass



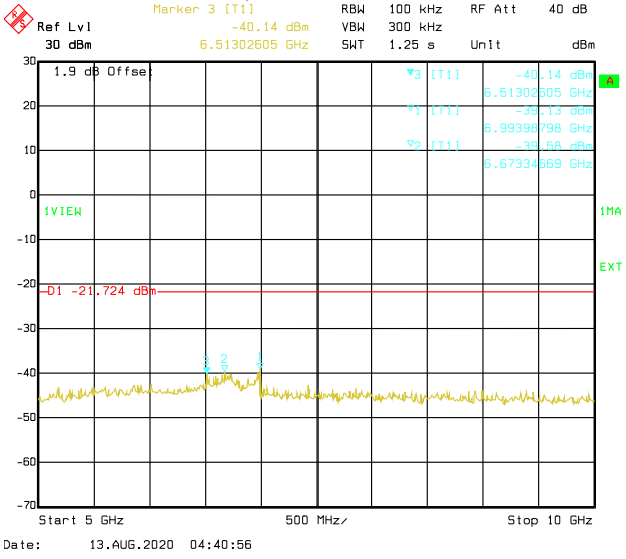
Conducted Emissions. 802.11n, Frequency 2412 MHz Reference Level



Conducted Emissions. 802.11n, Frequency 2412 MHz Emission Level, 30 MHz -> 1 GHz

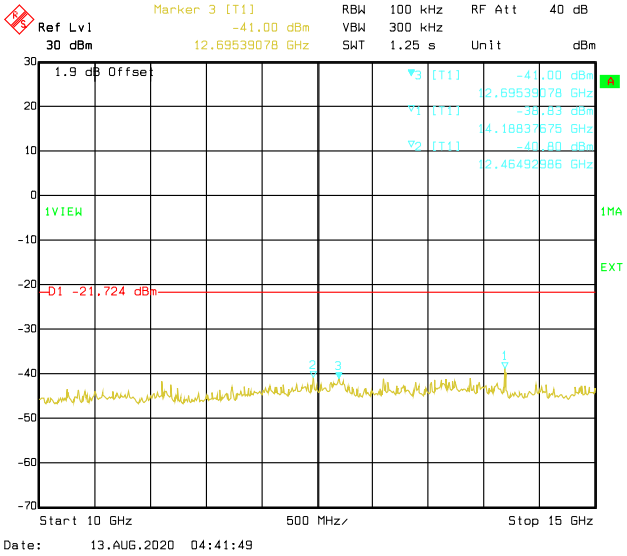


Conducted Emissions. 802.11n, Frequency 2412 MHz Reference Level

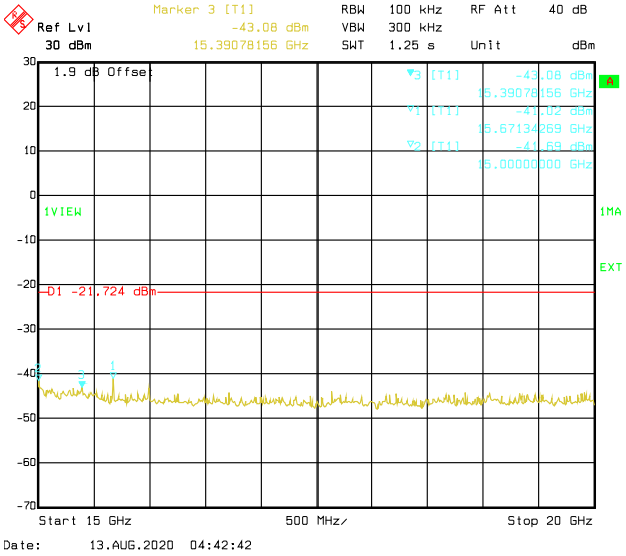


Conducted Emissions. 802.11n, Frequency 2412 MHz Emission Level, 30 MHz -> 1 GHz

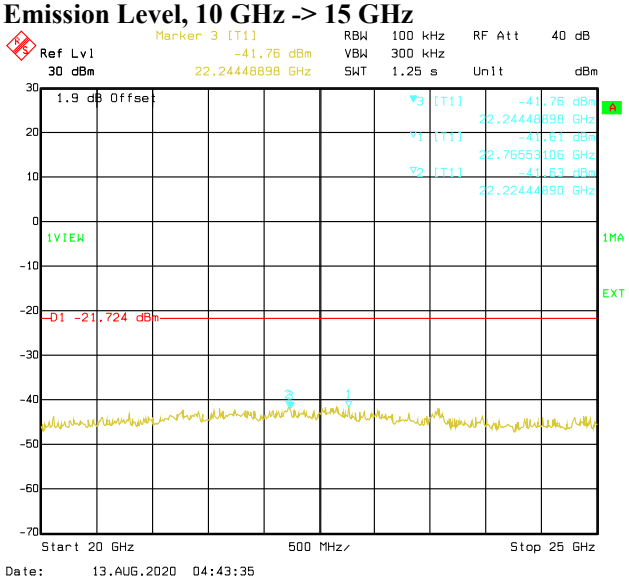
Conducted Emissions. 802.11n, Frequency 2412 MHz Emission Level, 1 GHz -> 5 GHz



Conducted Emissions. 802.11n, Frequency 2412 MHz Emission Level, 5 GHz -> 10 GHz

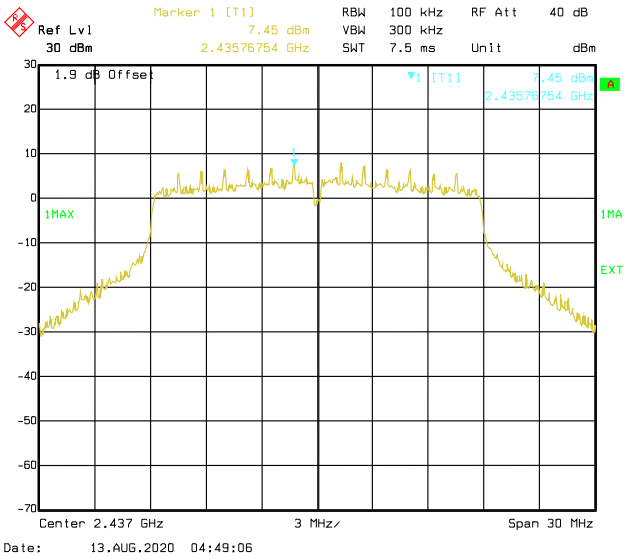


Conducted Emissions. 802.11n, Frequency 2412 Emission Level, 10 GHz -> 15 GHz

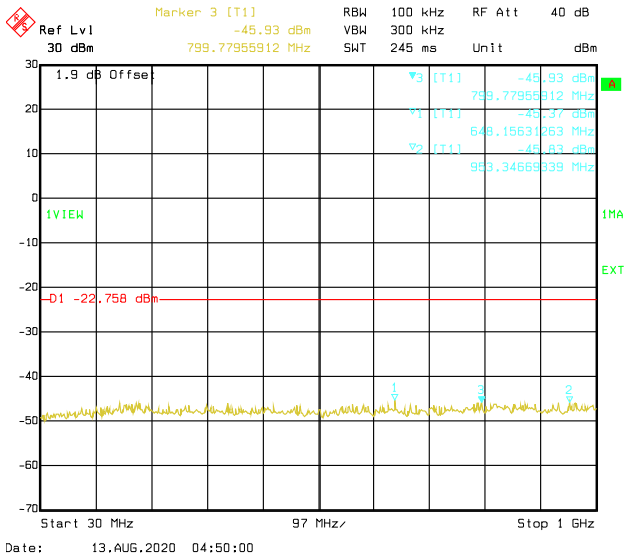


Conducted Emissions. 802.11n, Frequency 2412 MHz Emission Level, 15 GHz -> 20 GHz

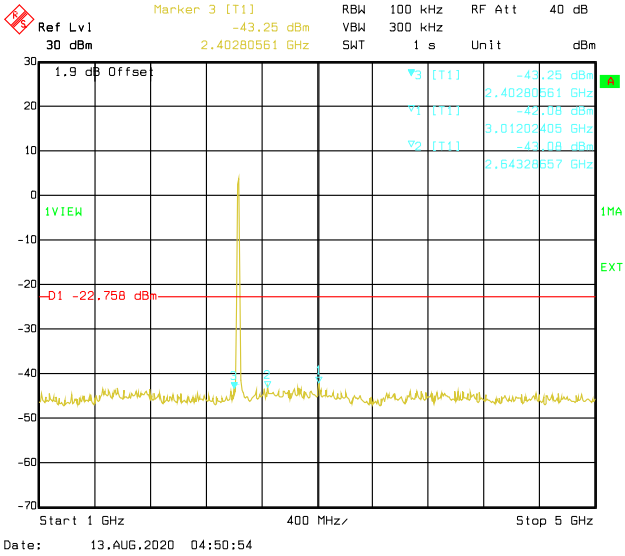
Conducted Emissions. 802.11n, Frequency 2412 MHz Emission Level, 20 GHz -> 25 GHz



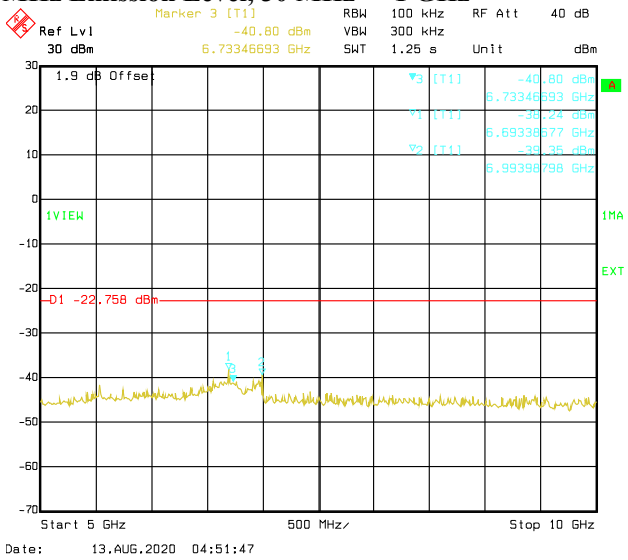
Conducted Emissions. 802.11n, Frequency 2437 MHz Reference Level



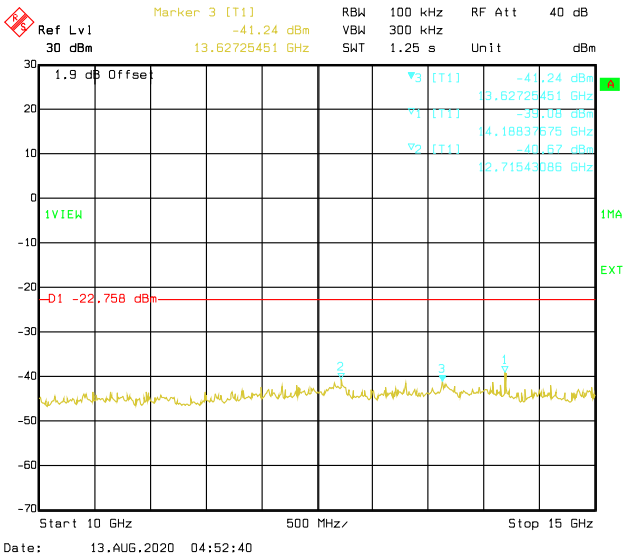
Conducted Emissions. 802.11n, Frequency 2437 MHz Emission Level, 30 MHz -> 1 GHz



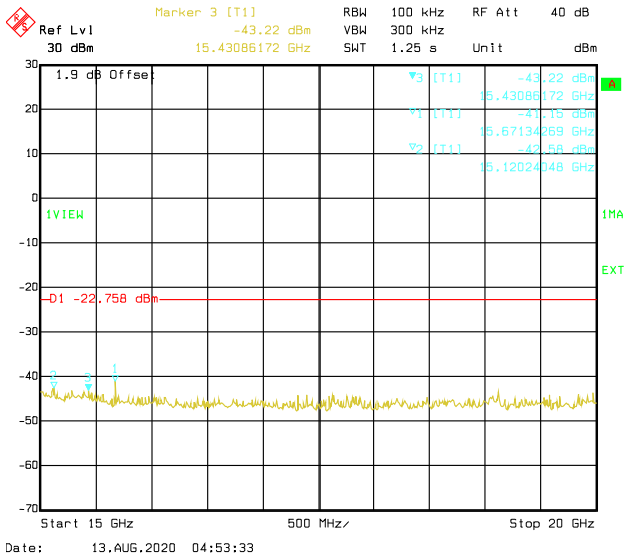
Conducted Emissions. 802.11n, Frequency 2437 MHz Emission Level, 1 GHz -> 5 GHz



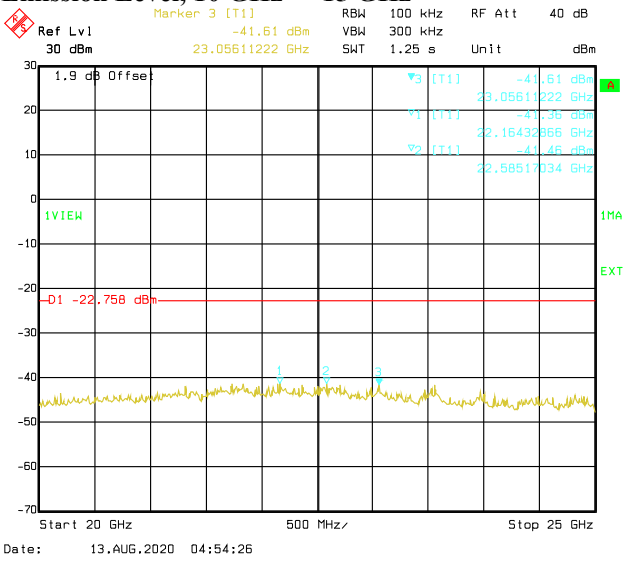
Conducted Emissions. 802.11n, Frequency 2437 MHz Emission Level, 5 GHz -> 10 GHz



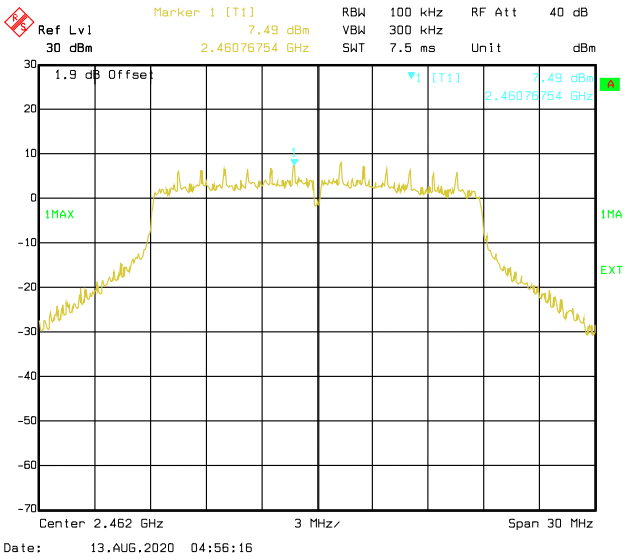
Conducted Emissions. 802.11n, Frequency 2437 Emission Level, 10 GHz -> 15 GHz



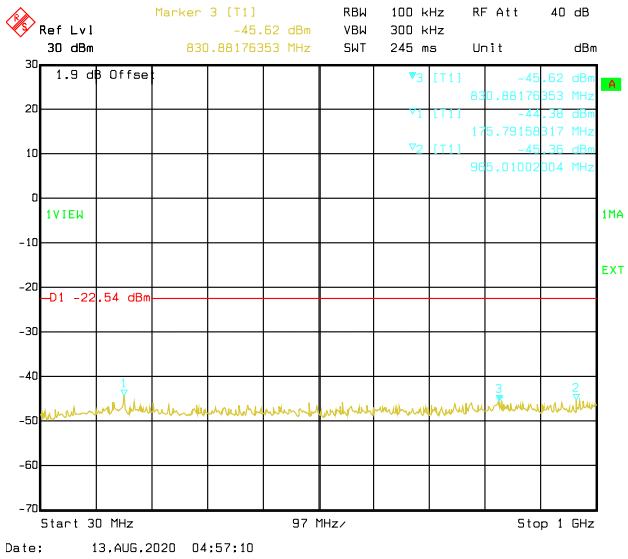
Conducted Emissions. 802.11n, Frequency 2437 MHz Emission Level, 15 GHz -> 20 GHz



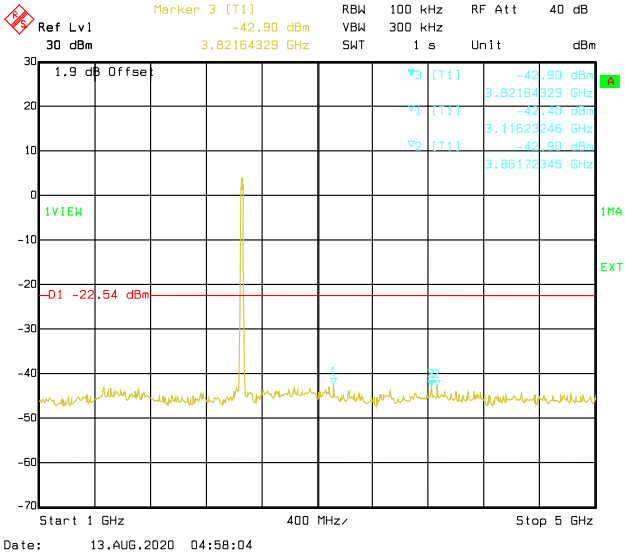
Conducted Emissions. 802.11n, Frequency 2437 MHz Emission Level, 20 GHz -> 25 GHz



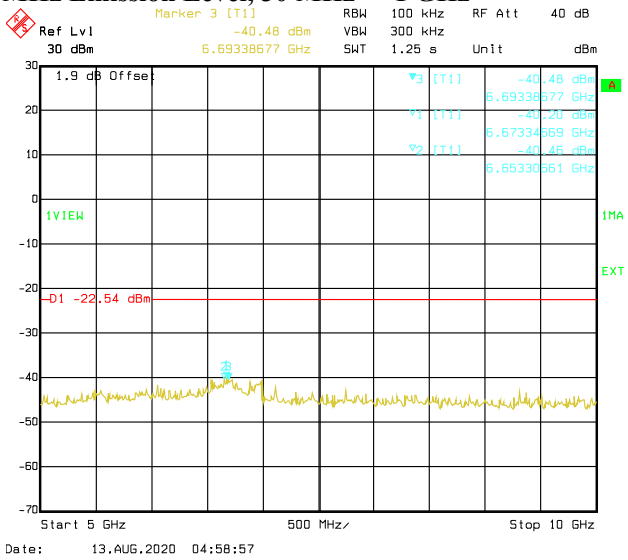
Conducted Emissions. 802.11n, Frequency 2462 MHz Reference Level



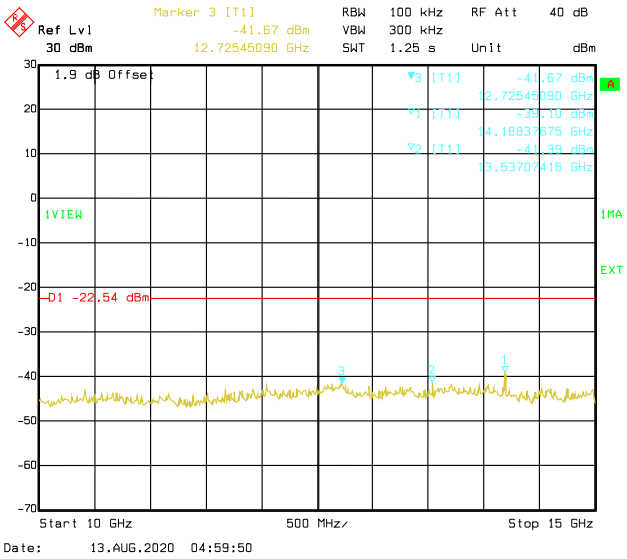
Conducted Emissions. 802.11n, Frequency 2462 MHz Emission Level, 30 MHz -> 1 GHz



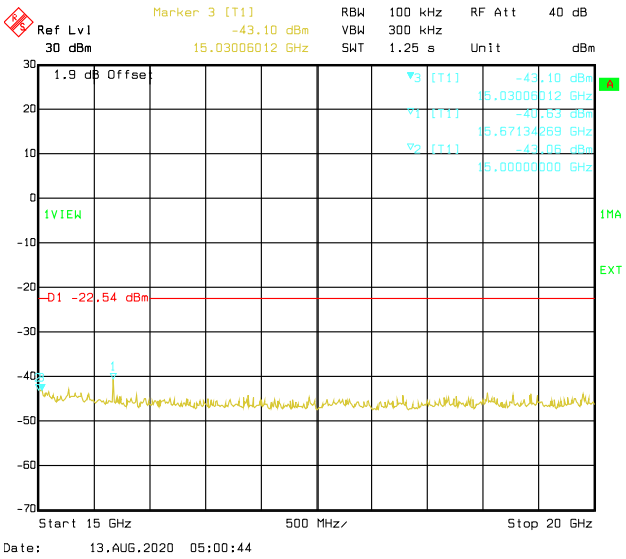
Conducted Emissions. 802.11n, Frequency 2462 MHz Emission Level, 1 GHz -> 5 GHz



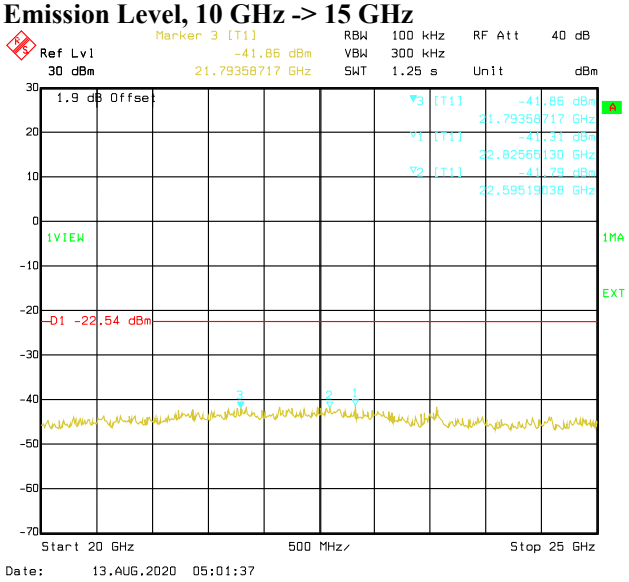
Conducted Emissions. 802.11n, Frequency 2462 MHz Emission Level, 5 GHz -> 10 GHz



Conducted Emissions. 802.11n, Frequency 2462 Emission Level, 10 GHz -> 15 GHz



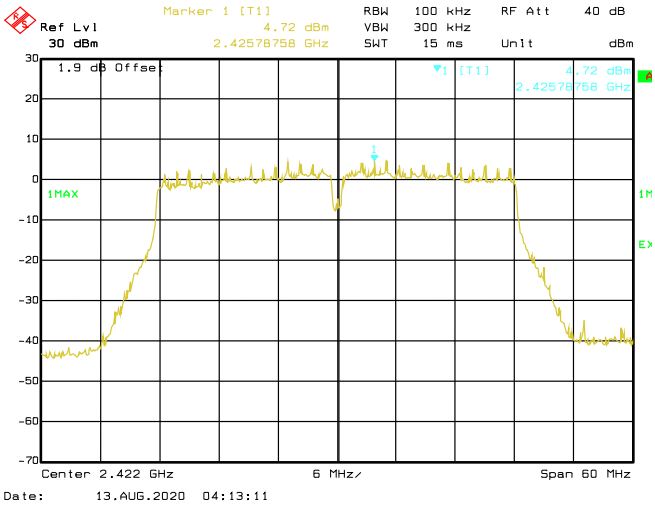
Conducted Emissions. 802.11n, Frequency 2462 MHz Emission Level, 15 GHz -> 20 GHz



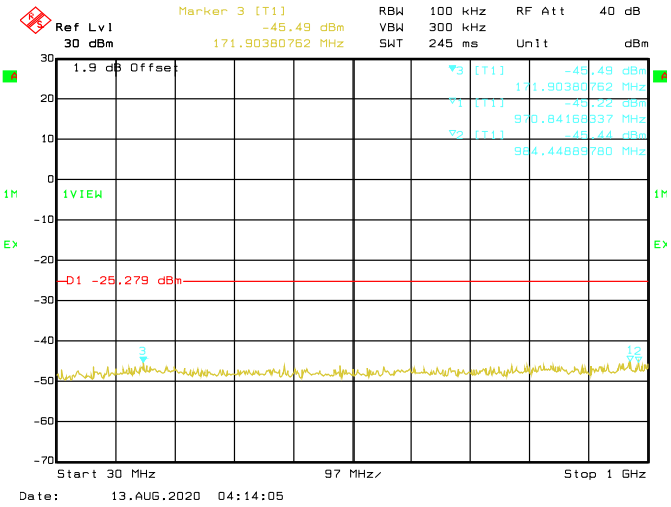
Conducted Emissions. 802.11n, Frequency 2462 MHz Emission Level, 20 GHz -> 25 GHz

802.11n (HT40)

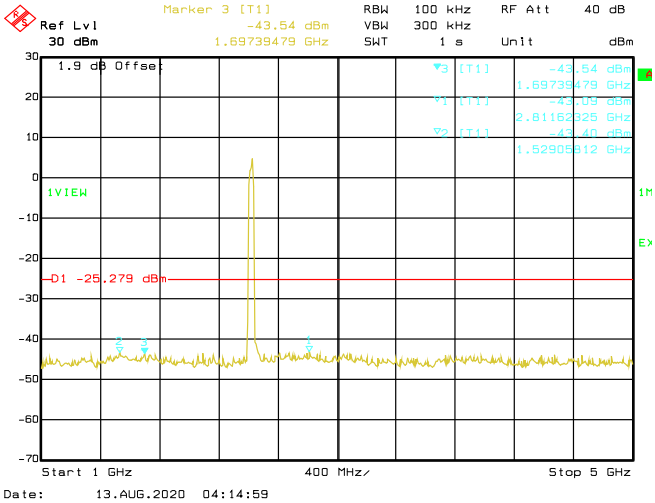
Test Conditions				Test Frequency	Results		
Standard	Modulation Type	Modulation Technology	Data Rate (mbps)	Tx (MHz)	Spurs (MHz)	Level (dBm)	Status
802.11n	OFDM	BPSK	13.5	2412	14198.40	-39.09	Pass
					6713.43	-39.60	Pass
					6983.97	-39.87	Pass
802.11n	OFDM	BPSK	13.5	2437	6753.51	-39.02	Pass
					6723.45	-39.35	Pass
					14188.38	-39.82	Pass
802.11n	OFDM	BPSK	13.5	2462	14188.38	-39.41	Pass
					6743.49	-40.49	Pass
					6703.41	-40.77	Pass



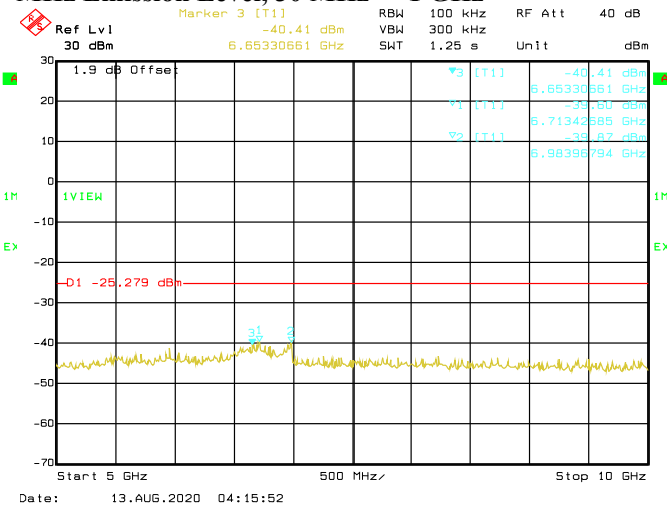
Conducted Emissions. 802.11n, Frequency 2422 MHz Reference Level



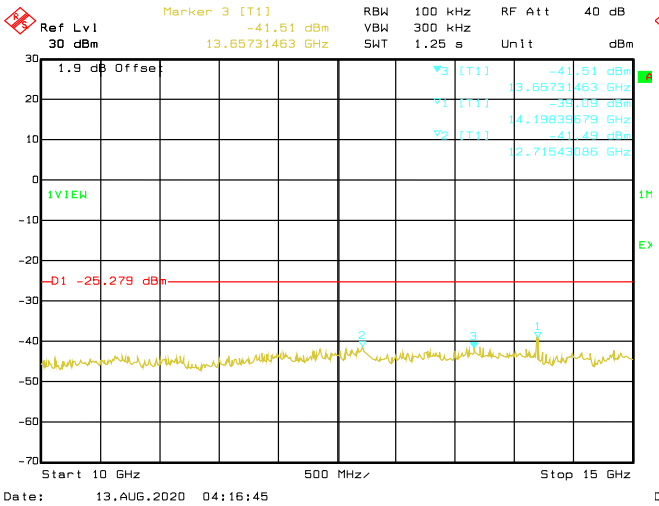
Conducted Emissions. 802.11n, Frequency 2422 MHz Emission Level, 30 MHz -> 1 GHz



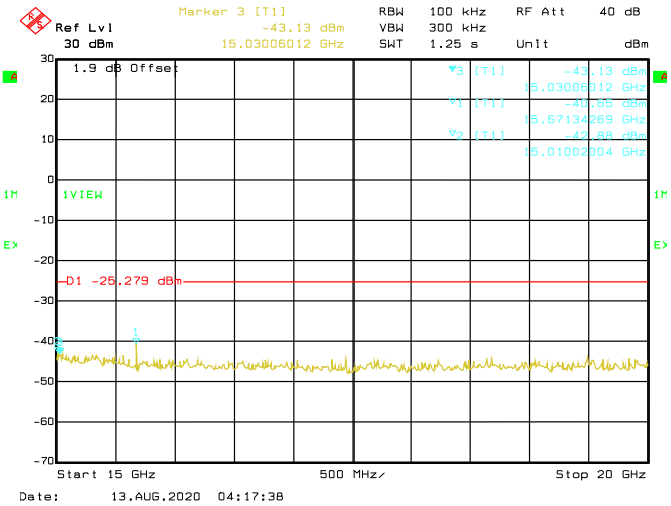
Conducted Emissions. 802.11n, Frequency 2422 MHz Emission Level, 1 GHz -> 5 GHz



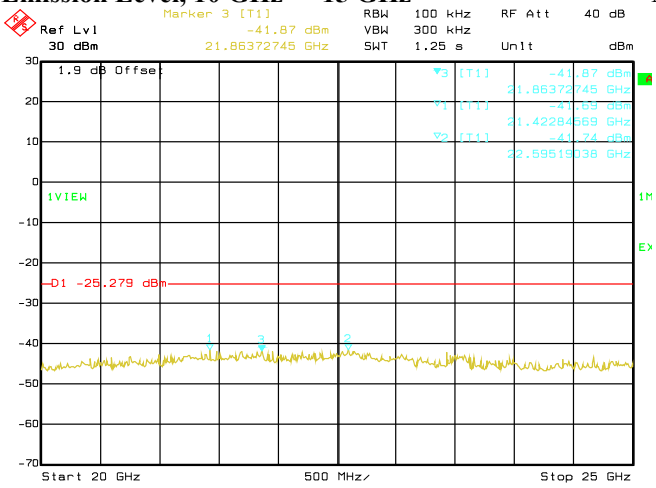
Conducted Emissions. 802.11n, Frequency 2422 MHz Emission Level, 5 GHz -> 10 GHz



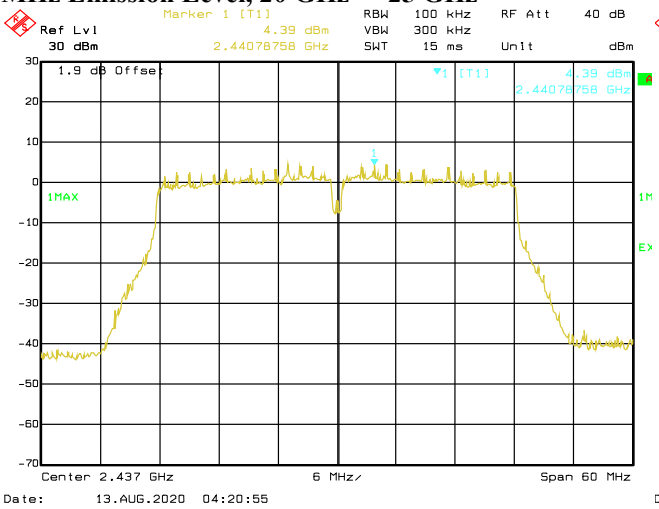
Conducted Emissions. 802.11n, Frequency 2422 Emission Level, 10 GHz -> 15 GHz



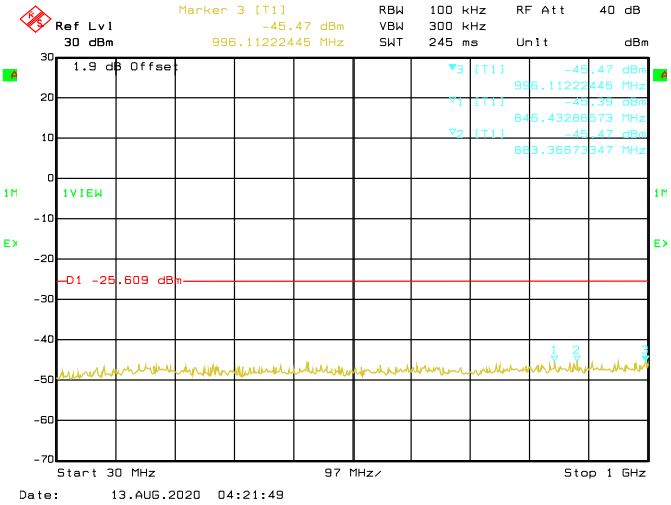
Conducted Emissions. 802.11n, Frequency 2422 MHz Emission Level, 15 GHz -> 20 GHz



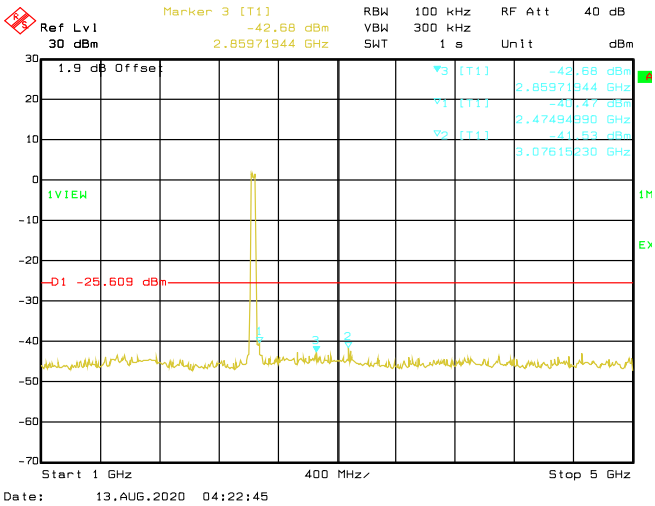
Conducted Emissions. 802.11n, Frequency 2422 MHz Emission Level, 20 GHz -> 25 GHz



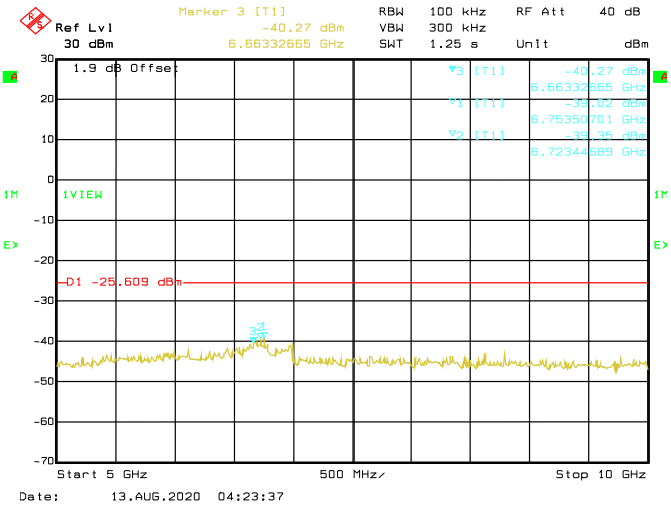
Conducted Emissions. 802.11n, Frequency 2437 MHz Reference Level



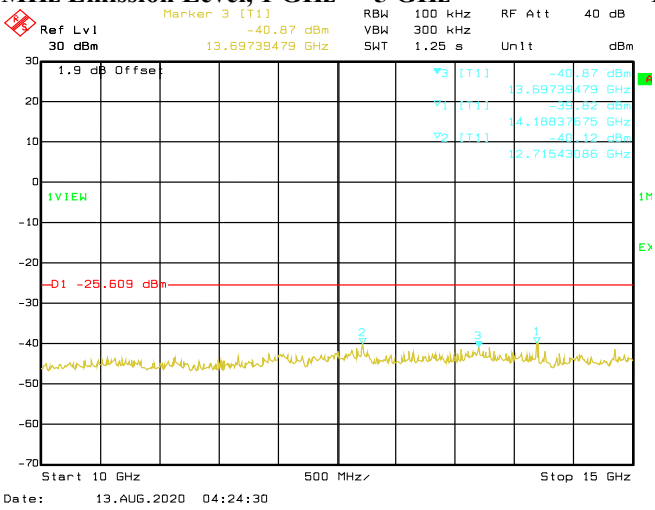
Conducted Emissions. 802.11n, Frequency 2437 MHz Emission Level, 30 MHz -> 1 GHz



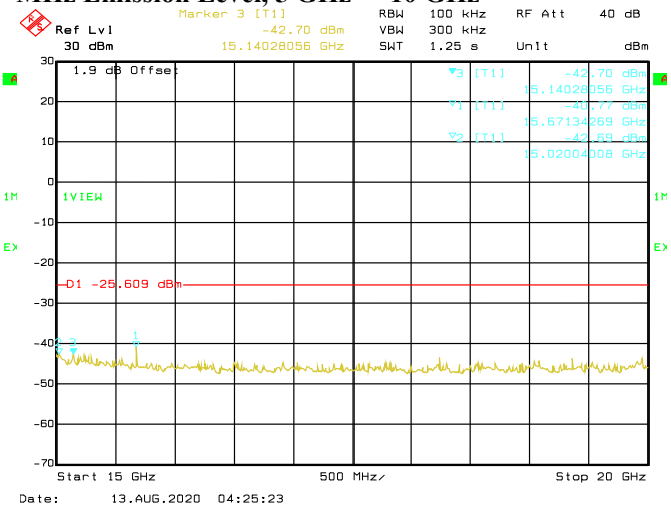
Conducted Emissions. 802.11n, Frequency 2437 MHz Emission Level, 1 GHz -> 5 GHz



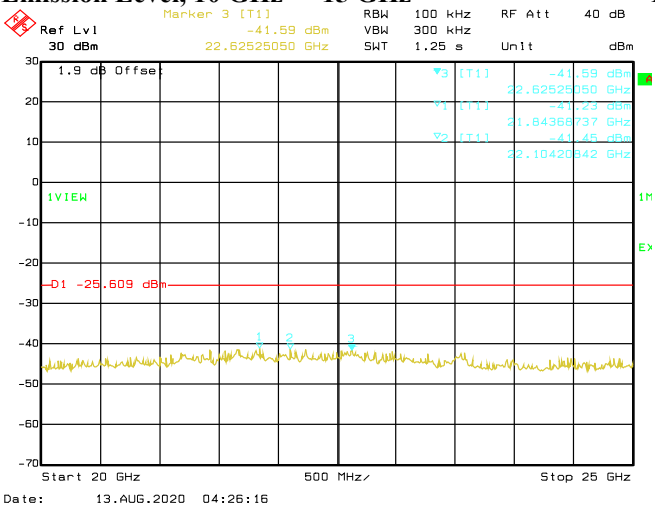
Conducted Emissions. 802.11n, Frequency 2437 MHz Emission Level, 5 GHz -> 10 GHz



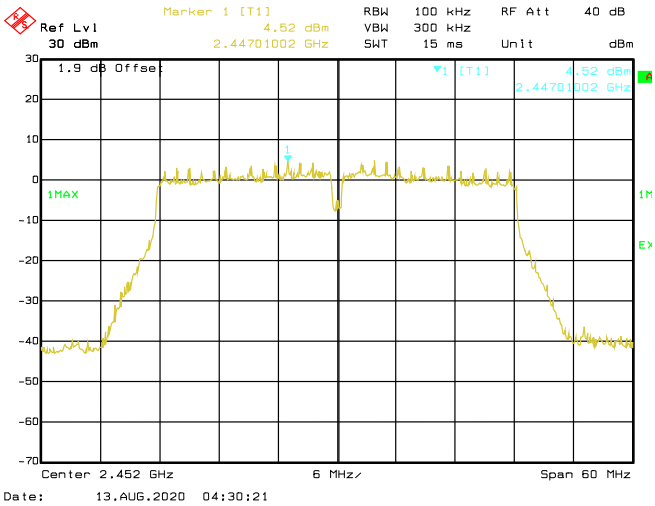
Conducted Emissions. 802.11n, Frequency 2437 Emission Level, 10 GHz -> 15 GHz



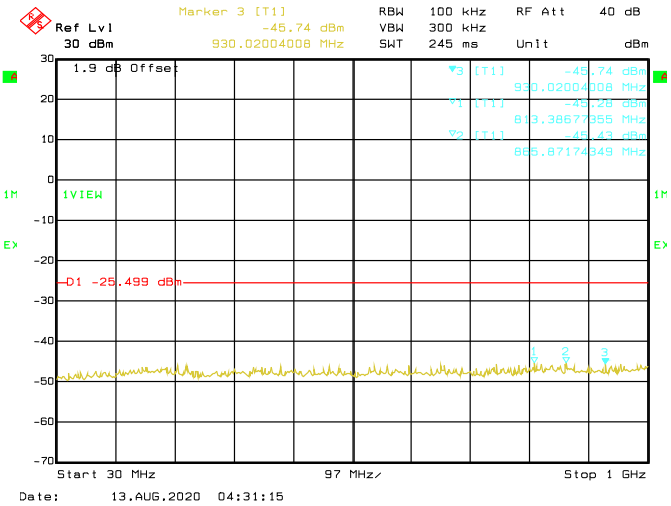
Conducted Emissions. 802.11n, Frequency 2437 MHz Emission Level, 15 GHz -> 20 GHz



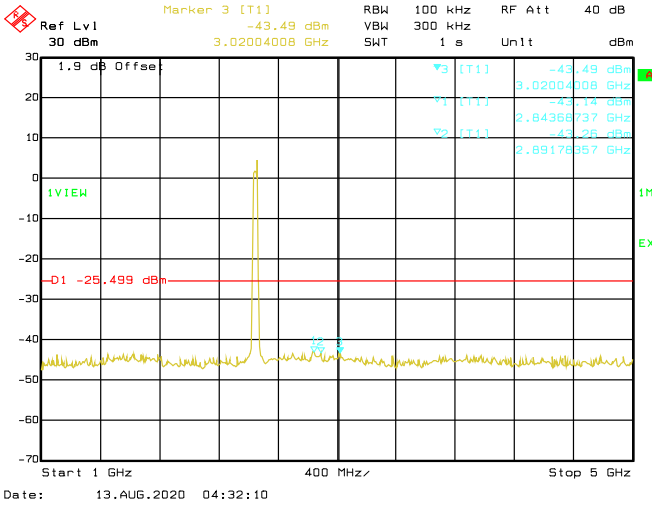
Conducted Emissions. 802.11n, Frequency 2437 MHz Emission Level, 20 GHz -> 25 GHz



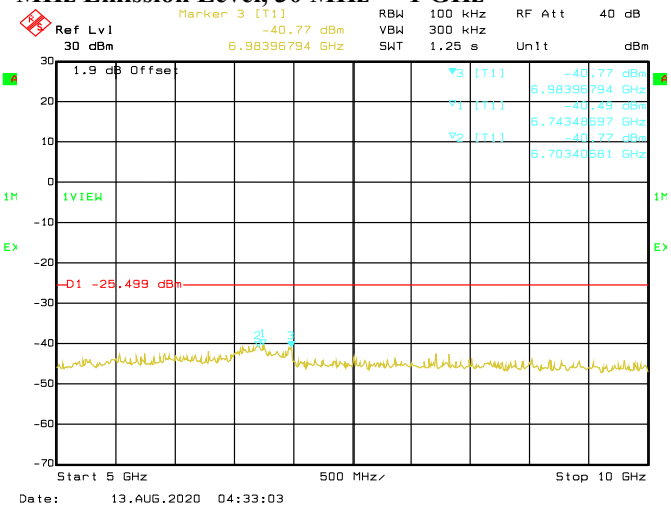
Conducted Emissions. 802.11n, Frequency 2452 MHz Reference Level



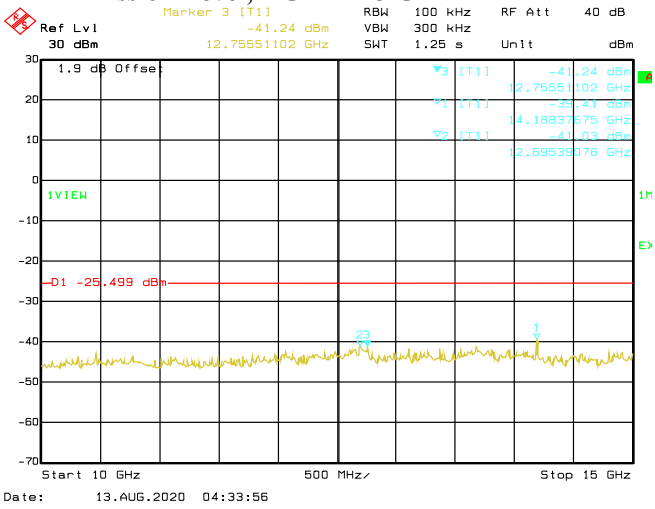
Conducted Emissions. 802.11n, Frequency 2452 MHz Emission Level, 30 MHz -> 1 GHz



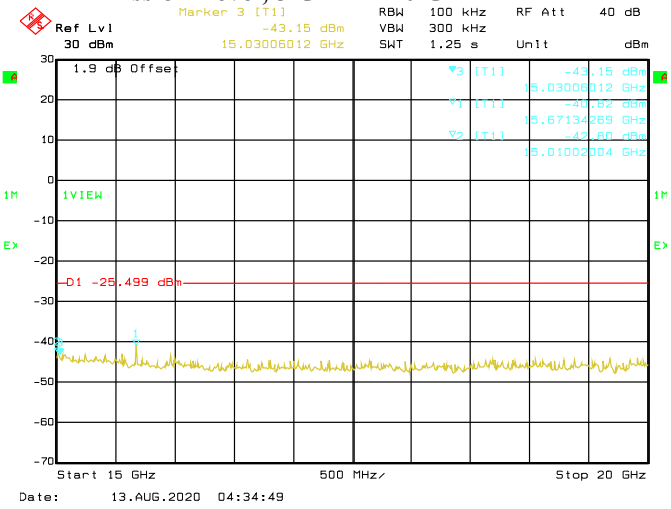
Conducted Emissions. 802.11n, Frequency 2452 MHz Emission Level, 1 GHz -> 5 GHz



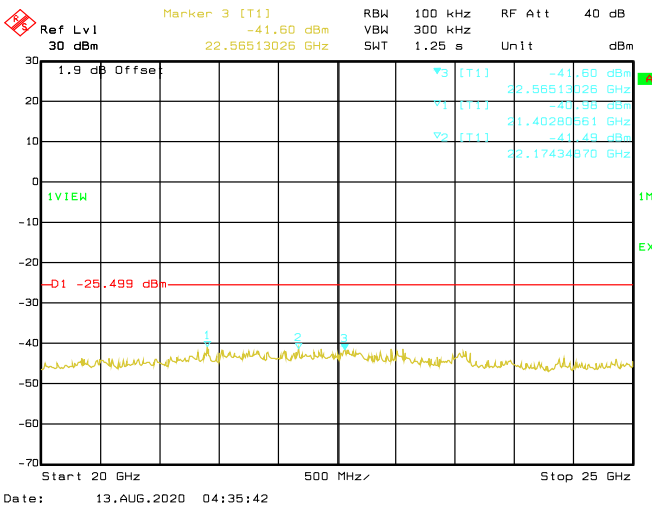
Conducted Emissions. 802.11n, Frequency 2452 MHz Emission Level, 5 GHz -> 10 GHz



Conducted Emissions. 802.11n, Frequency 2452 Emission Level, 10 GHz -> 15 GHz



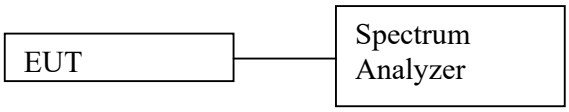
Conducted Emissions. 802.11n, Frequency 2452 MHz Emission Level, 15 GHz -> 20 GHz



Conducted Emissions. 802.11n, Frequency 2452 MHz Emission Level, 20 GHz -> 25 GHz

6.6. Band edge Conducted Spurious Emission

6.6.1. Test Setup



a) Check and ensure the spectrum analyzer well calibrate.
b) Turn on the DUT and set DUT to transmit maximum power.
c) Connect DUT's antenna terminal to spectrum analyzer with a low loss cable.
d) Setting of Spectrum analyzer :
    a. RBW = 100 kHz
    b. VBW = 300 kHz
    c. Detector mode = Peak
    d. Trace = Max Hold
    e. Sweep = auto
e) Use the peak marker function to measure highest emission.
f) Measure every antenna port by repeat the step above for MIMO measurement.

6.6.2. Test Limits:

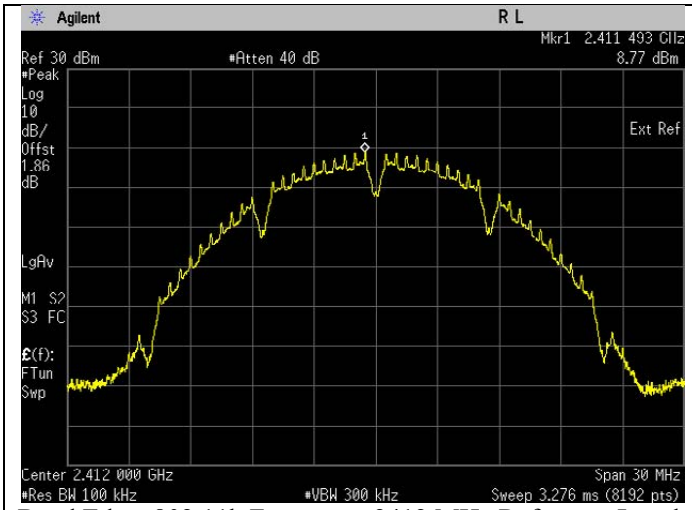
Normal Condition (25 º C)
Shall be at least 30 dB below peak (max) power.

6.6.3. **Test Result**

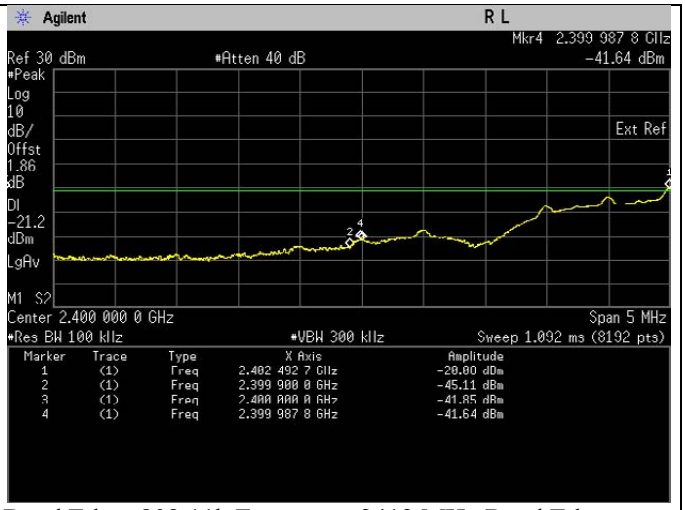
802.11b

Antenna 1:

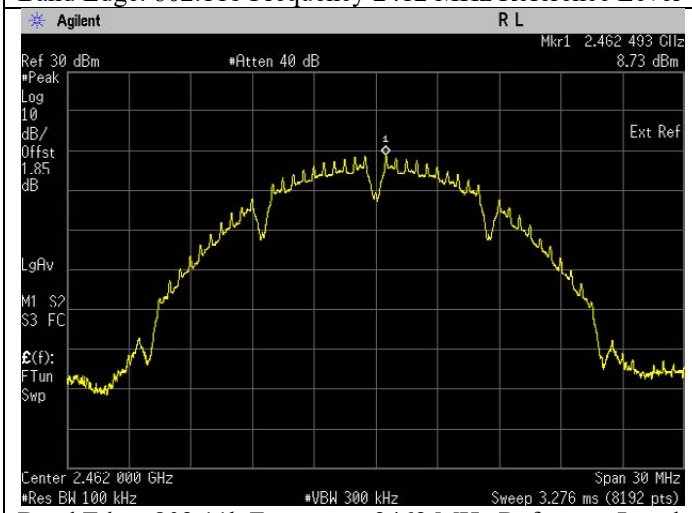
Test Conditions				Test Frequency	Results		
Standard	Modulation Type	Modulation Technology	Data Rate (mbps)	Tx (MHz)	Frequencies (MHz)	Power (dBm)	Status
802.11b	DSSS	DBPSK	1	2412	2399.99	-41.64	Pass
802.11b	DSSS	DBPSK	1	2462	2483.57	-48.89	Pass



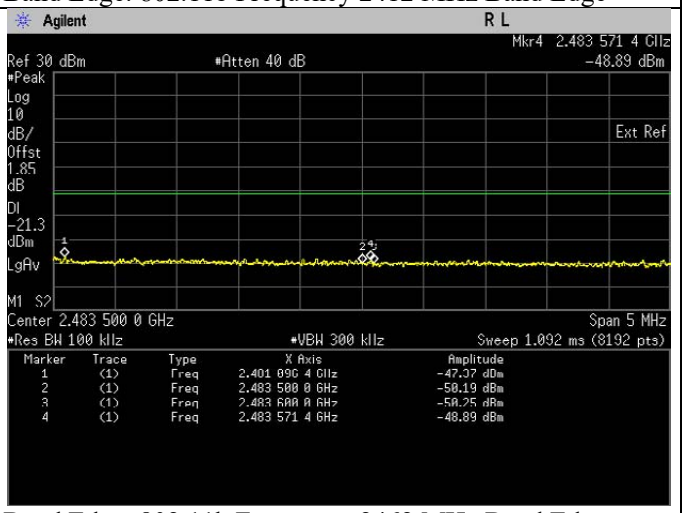
Band Edge. 802.11b Frequency 2412 MHz Reference Level



Band Edge. 802.11b Frequency 2412 MHz Band Edge



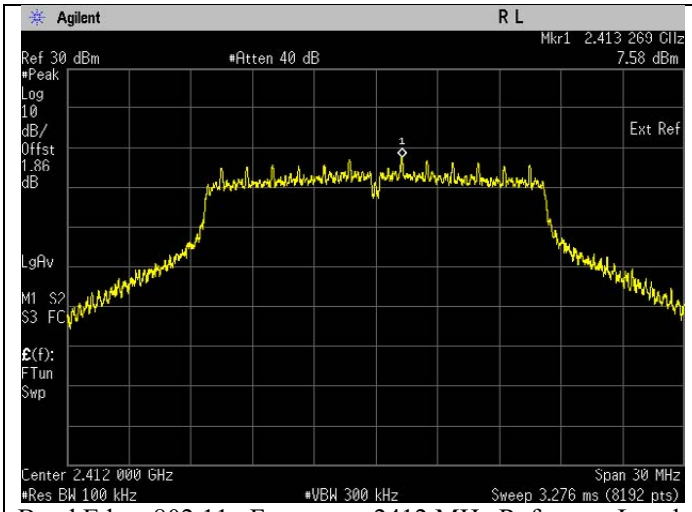
Band Edge. 802.11b Frequency 2462 MHz Reference Level



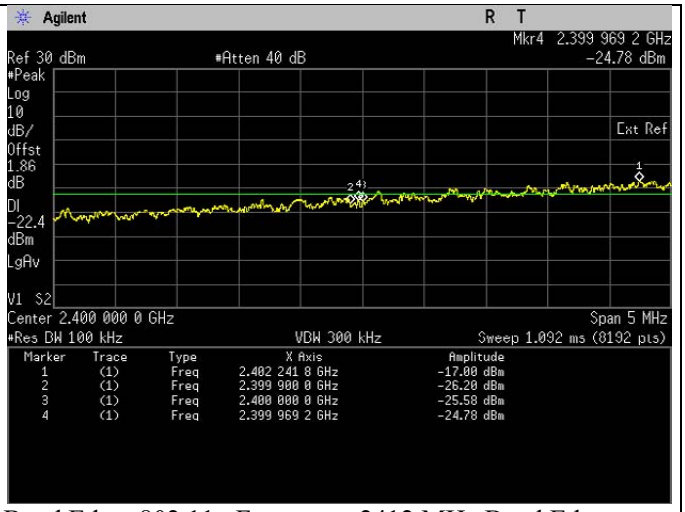
Band Edge. 802.11b Frequency 2462 MHz Band Edge

802.11g

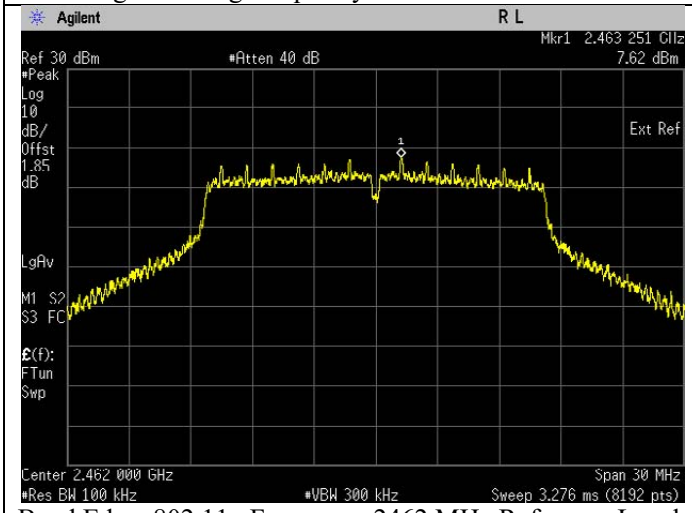
Test Conditions				Test Frequency	Results		
Standard	Modulation Type	Modulation Technology	Data Rate (mbps)	Tx (MHz)	Frequencies (MHz)	Power (dBm)	Status
802.11g	OFDM	BPSK	6	2412	2400.00	-24.78	Pass
802.11g	OFDM	BPSK	6	2462	2483.54	-45.15	Pass



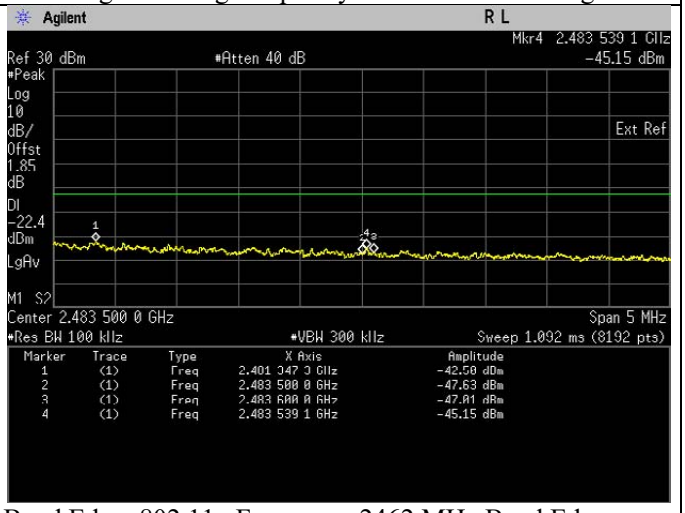
Band Edge. 802.11g Frequency 2412 MHz Reference Level



Band Edge. 802.11g Frequency 2412 MHz Band Edge



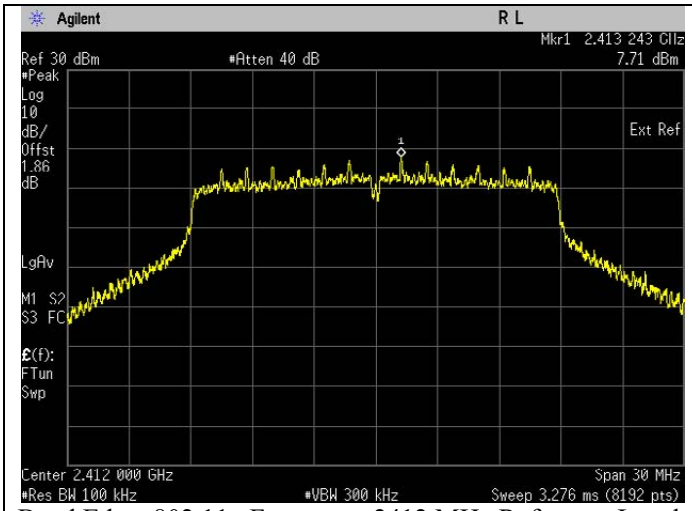
Band Edge. 802.11g Frequency 2462 MHz Reference Level



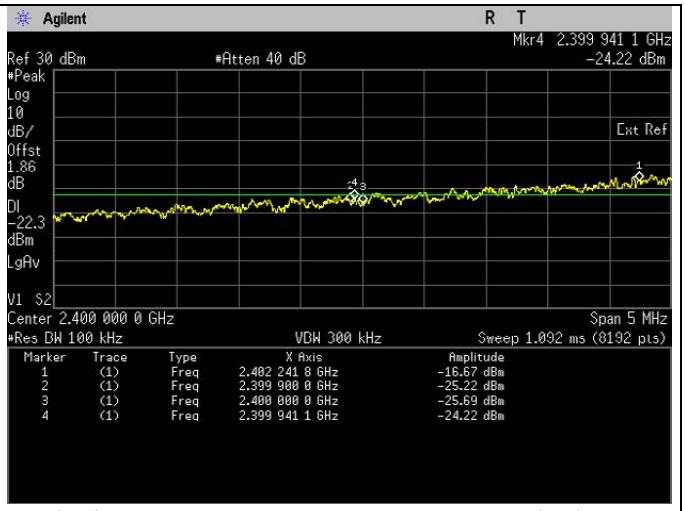
Band Edge. 802.11g Frequency 2462 MHz Band Edge

802.11n (HT20)

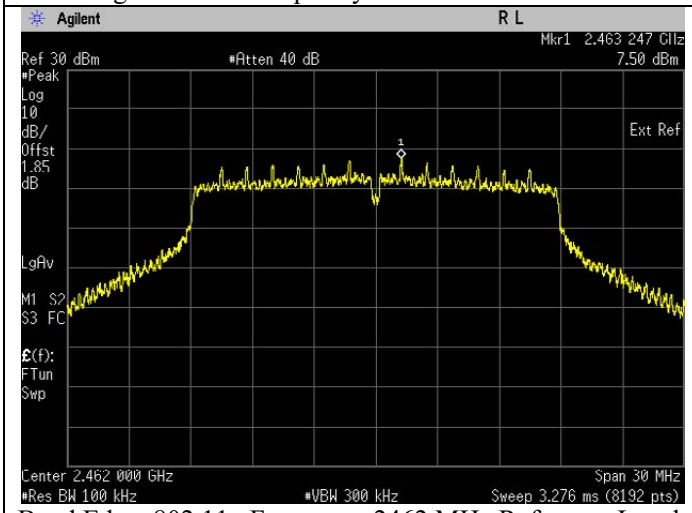
Test Conditions				Test Frequency	Results		
Standard	Modulation Type	Modulation Technology	Data Rate (mbps)	Tx (MHz)	Frequencies (MHz)	Power (dBm)	Status
802.11n	OFDM	BPSK	6.5	2412	2399.98	-24.22	Pass
802.11n	OFDM	BPSK	6.5	2462	2483.58	-44.10	Pass



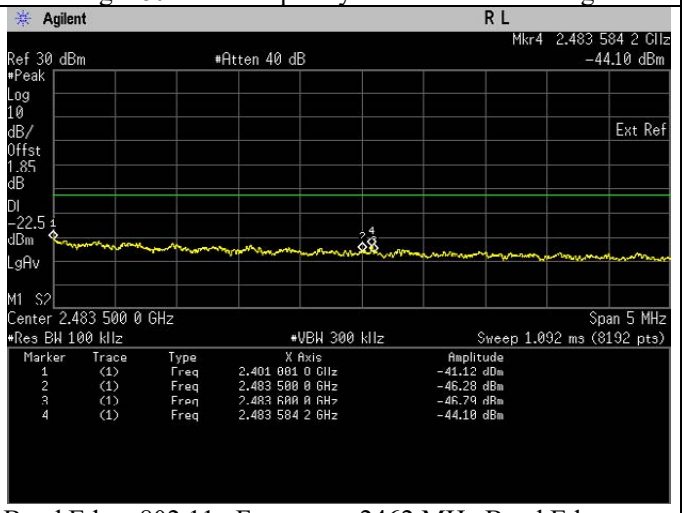
Band Edge. 802.11n Frequency 2412 MHz Reference Level



Band Edge. 802.11n Frequency 2412 MHz Band Edge



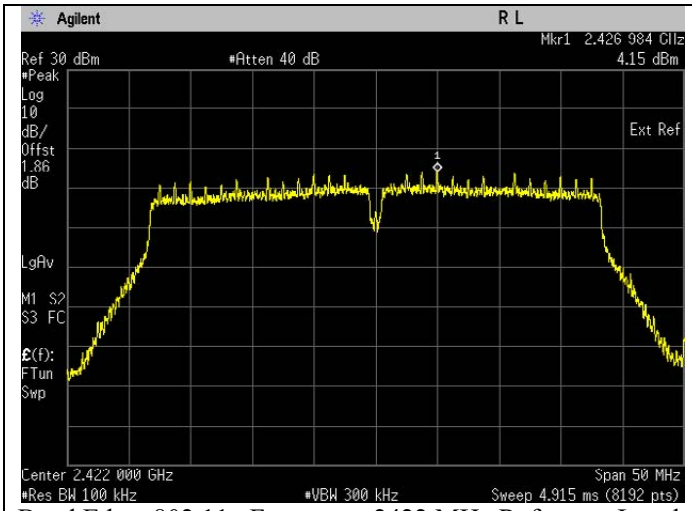
Band Edge. 802.11n Frequency 2462 MHz Reference Level



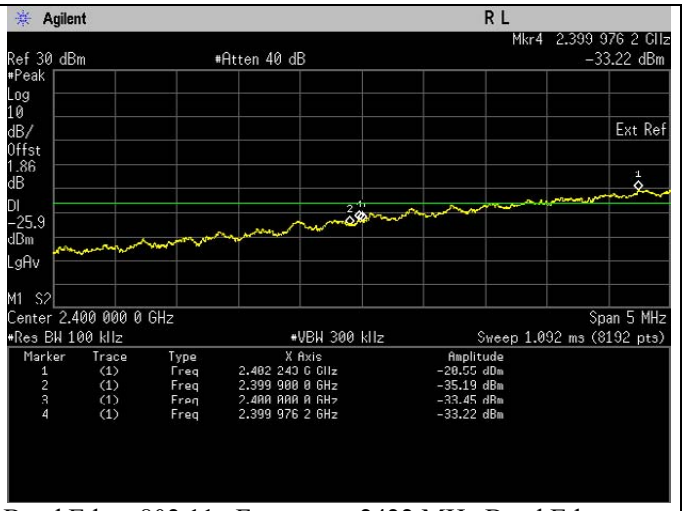
Band Edge. 802.11n Frequency 2462 MHz Band Edge

802.11n (HT40)

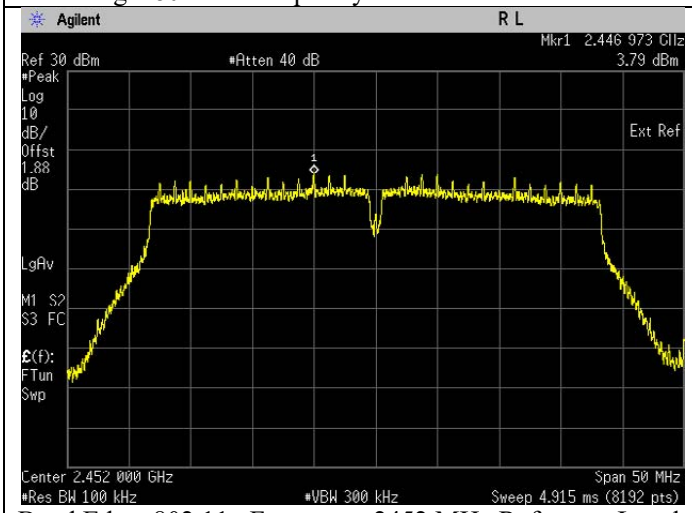
Test Conditions				Test Frequency	Results		
Standard	Modulation Type	Modulation Technology	Data Rate (mbps)	Tx (MHz)	Frequencies (MHz)	Power (dBm)	Status
802.11n	OFDM	BPSK	13.5	2422	2399.98	-33.22	Pass
802.11n	OFDM	BPSK	13.5	2452	2483.52	-42.79	Pass



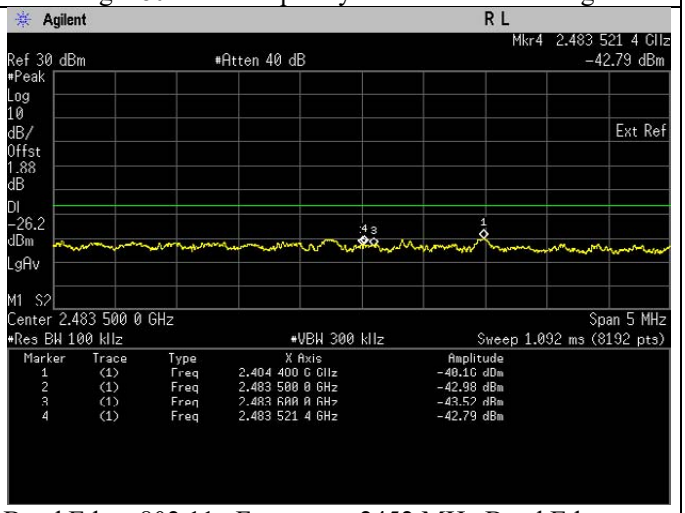
Band Edge. 802.11n Frequency 2422 MHz Reference Level



Band Edge. 802.11n Frequency 2422 MHz Band Edge



Band Edge. 802.11n Frequency 2452 MHz Reference Level



Band Edge. 802.11n Frequency 2452 MHz Band Edge

6.7. Radiated Emission within restricted Bands