MOTOROLA SOLUTIONS

MS ISO/IEC 17025
TESTING
SAMM No. 0825

MOTOROLA PENANG ADV. COMM. LABORATORY

Motorola Solutions Malaysia Sdn. Bhd.
Innoplex 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	:	09-Jan-2019 - 22-Jan-2019
Report Issue Date	:	23-Jan-2019
Manufacturer/Location	:	Motorola Solutions – Schaumburg
Requestor	:	HOPKINS, SEAN
Product Type	:	Hand-held
Product Version (PMN)	:	P1B
Model Number (HVIN)	:	H55TGT9PW8AN
Frequency Band	:	2.412-2.462 GHz
Max RF Output Power	:	802.11b - 200 mWatts 802.11g - 45,158 mWatts 802.11n (HT20) - 45,158 mWatts 802.11n (HT40) - 126,158,79 mWatts
Applicant Name	:	Motorola Solutions, Inc
Applicant Address	:	8000 West Sunrise Boulevard, Fort Lauderdale, Florida 33322
FCC Registrations	:	461337
ISED Registrations	:	109AK
Firmware Version (FVIN)	:	D00.00.31

The equipment was tested accordance to the requirement listed below:

(2.4GHz Wifi) **FCC 47 CFR Part 15 Subpart C** **ISED RSS 247 Issue 2,** **February 2017**	**PASS**

Prepared By:

Gan Boon Teong
Test Personnel

Approved By:

Vincent Foong
Responsible Engineer

Table of Contents

REVISION HISTORY

Revision History	Description	Date	Originator
Rev. A	Initial Report	**23-Jan-2019**	**Gan Boon Teong**

1.0. General Information

EUT Description:

Technologies	2.4GHz Wi-Fi
TX Frequency range	2412MHz – 2462MHz
Modulation Type	DSSS, OFDM
Antenna type	Stamped metal

Note:

1. The EUT contains following accessory devices and data cable.

Item	Brand	Model or P/N
Hi-Cap Battery, IMPRES GEN2, LIION, IP68, 5650T	Motorola Solutions	NNTN9089A
Single Unit Charger (SUC), IMPRES 2, 3A, 115VAC, US/NA + PWR SUPPLY WALL CUBE,AC,DC 110VAC FIXED BLADE US 14.5V/2.5A L6 BARREL	Motorola Solutions	NNTN9199A (Charger Base) + PS000040A01 (power supply)
Multi-unit Charger (MUC), IMPRES G2, 6-DISP, BASE with INSERTS + US Line Cord	Motorola Solutions	NNTN9115A (Charger Base) + 3087791G01 (Linecord)
MICRO USB Programming cable	Motorola Solutions	CB000262A01

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		

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.

2.0. Summary of Test Results

FCC Clause	ISED Clause	Test Item	Result	Remark	Serial Number Tested
15.247 (a)(2)	RSS-247 5.2(a)	DTS & 99% Channel Bandwidth	Pass	Highest 99% OCB: 802.11b: 12.862 MHz(12M9G1D) 802.11g: 16.706 MHz(16M7D1D) 802.11n: 17.862 MHz(17M9D1D) 802.11n40: 36.195 MHz(36M2D1D)	437P1B0032
15.247 (b)(3)	RSS-247 5.4(d)	Conducted RF Output Power (Average)	Pass	Highest output power: 802.11b: 22.152 dBm 802.11g: 21.241 dBm 802.11n20: 20.966 dBm 802.11n40: 21.436 dBm	437P1B0032
15.247(e)	RSS-247 5.2(b)	Maximum Power Spectral Density	Pass	Meet the limit requirement.	437P1B0032
15.247(d)	RSS-247 5.5	Conducted Spurious Emissions	Pass	Worst case emission: 802.11b: -38.98 dBm 802.11g: -39.18 dBm 802.11n20: -39.39 dBm 802.11n40: -39.08 dBm	437P1B0032
15.247 (d)	RSS-247 5.5	Band edge Conducted Spurious Emission	Pass	Worst case emission: 802.11b: -42.64 dBm 802.11g: -26.28 dBm 802.11n20: -25.00 dBm 802.11n40: -30.66 dBm	437P1B0032
15.205, 15.209, 15.247 (d)	RSS-247 5.5	Radiated Emission within Restricted Bands	NA	Not Performed.	Not Performed.
15.207	RSS-Gen 8.8	AC Power Line Conducted Emission	Pass	Meet the limit requirement.	437P1B0039
15.203	-	Antenna requirement	NA	No antenna connector is used.	437P1B0032 437P1B0039

Note: NA → Not Applicable

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

4.0. Equipment List

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

Description	Model	Serial Number	Calibration Date	Calibration Due Date
POWER SUPPLY (0-20V / 0-25A)	6652A	MY40001437	17-Aug-17	17-Aug-19
SPECTRUM ANALYZER	FSEK30	838495/014	11-Jul-18	11-Jul-19
SPECTRUM ANALYZER	E4445A	MY46181513	24-Dec-17	24-Dec-19

Conducted Emission Test

Description	Model	Serial Number	Calibration Date	Calibration Due Date
TEMPERATURE & HUMIDITY LOGGER	TM320	12249289	27-Apr-18	27-Apr-19
V-NETWORK 2-LINE	ENV216V	101039	10-Jul-18	10-Jul-19
EMI TEST RECEIVER	ESCI	100225	9-Jul-18	9-Jul-19
PROGRAMMABLE AC SOURCE	61604	ABR000000926	27-Jun-18	27-Jun-19
Test Software	EMC32			
Version	Ver. 8.53.0			

5.0. Test Mode Applicability and Test Channel Detail

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	QPSK	1	SISO	22.9°C, 61%RH
Test Mode	802.11g	1 to 11	1,6,11	OFDM	BPSK	6	SISO	22.9°C, 61%RH
Test Mode	802.11n (HT20)	1 to 11	1,6,11	OFDM	BPSK	6.5	SISO	22.9°C, 61%RH
Test Mode	802.11n (HT40)	3 to 9	3,6,9	OFDM	BPSK	13.5	SISO	22.9°C, 61%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	QPSK	1	SISO	22.9°C, 61%RH
Test Mode	802.11g	1 to 11	1,6,11	OFDM	BPSK	6	SISO	22.9°C, 61%RH
Test Mode	802.11n (HT20)	1 to 11	1,6,11	OFDM	BPSK	6.5	SISO	22.9°C, 61%RH
Test Mode	802.11n (HT40)	3 to 9	3,6,9	OFDM	BPSK	13.5	SISO	22.9°C, 61%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	23.7°C, 73%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	QPSK	1	SISO	22.9°C, 61%RH
Test Mode	802.11g	1 to 11	1,6,11	OFDM	BPSK	6	SISO	22.9°C, 61%RH
Test Mode	802.11n (HT20)	1 to 11	1,6,11	OFDM	BPSK	6.5	SISO	22.9°C, 61%RH
Test Mode	802.11n (HT40)	1 to 11	3,6,9	OFDM	BPSK	13.5	SISO	22.9°C, 61%RH

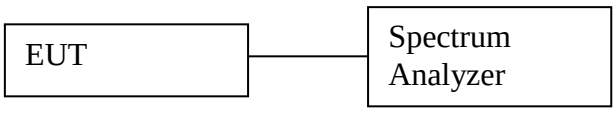
Duty Cycle of Test Signal

802.11b: Duty cycle of test signal is ≥98%. (Refer to Clause 6.3 for duty cycle test signal)
802.11g and 802.11n (HT20 & HT40): Duty cycle of test signal is ≤98%. (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.

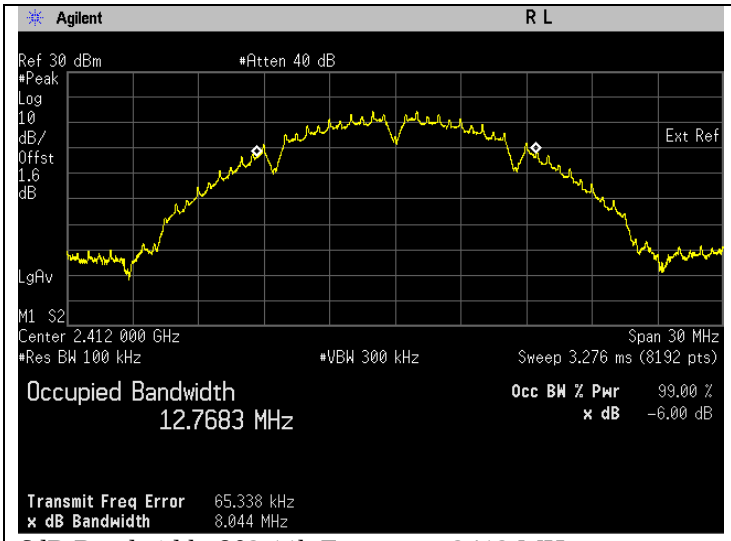
6.1.2. Test Limits:

Normal Condition (25 ° C)
≥500 kHz

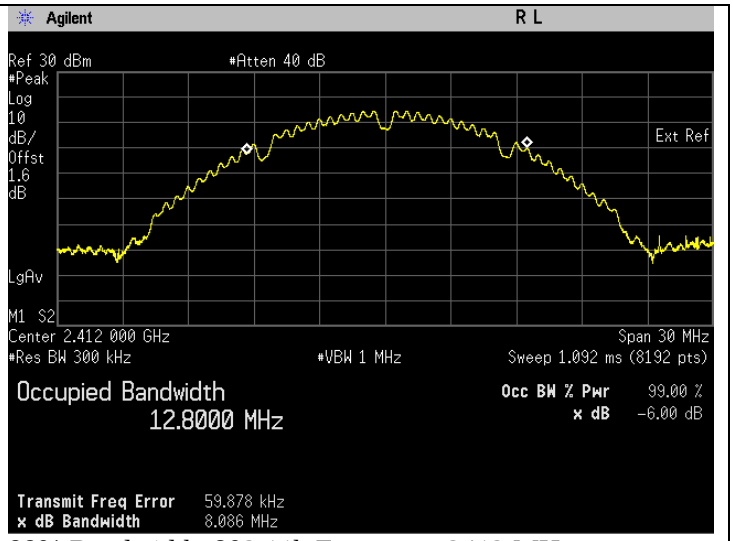
6.1.3. Test Data:

802.11 b

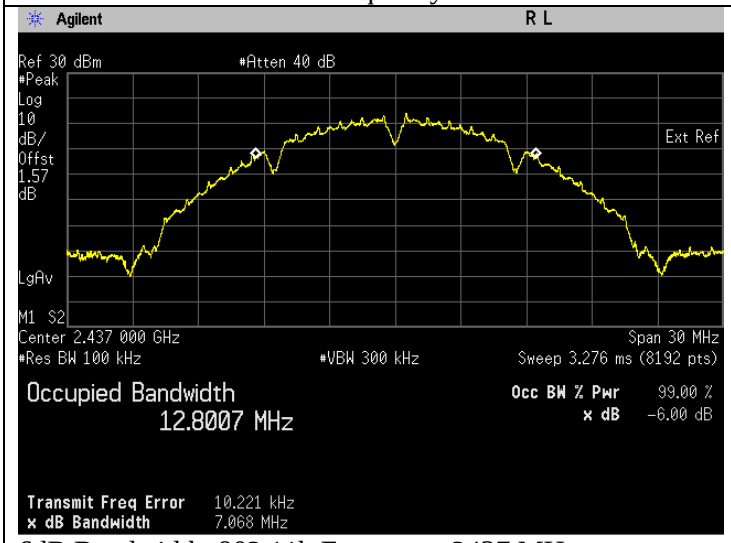
Test Conditions				Test Frequency	Results		
Standard	Modulation Type	Modulation Technology	Data Rate (mbps)	Tx (MHz)	6dB Bandwidth (MHz)	99% Bandwidth (MHz)	Status
802.11b	DSSS	QPSK	1	2412	8.044	12.800	Pass
802.11b	DSSS	QPSK	1	2437	7.068	12.846	Pass
802.11b	DSSS	QPSK	1	2462	8.009	12.862	Pass



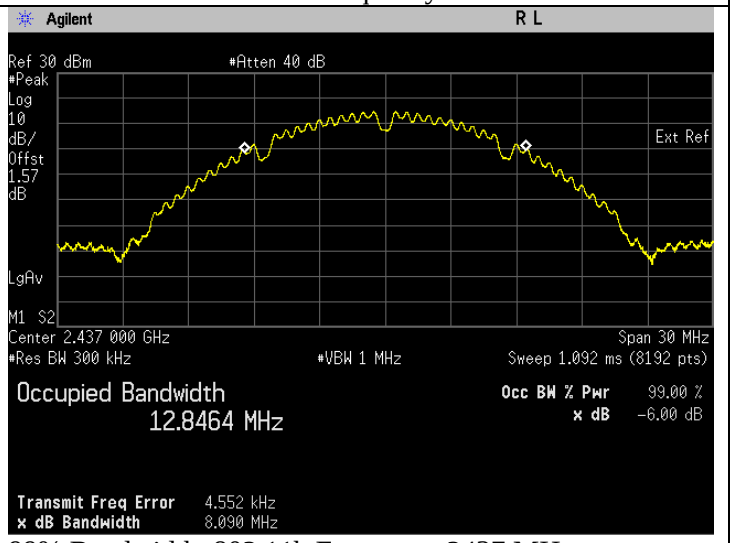
6dB Bandwidth. 802.11b Frequency 2412 MHz



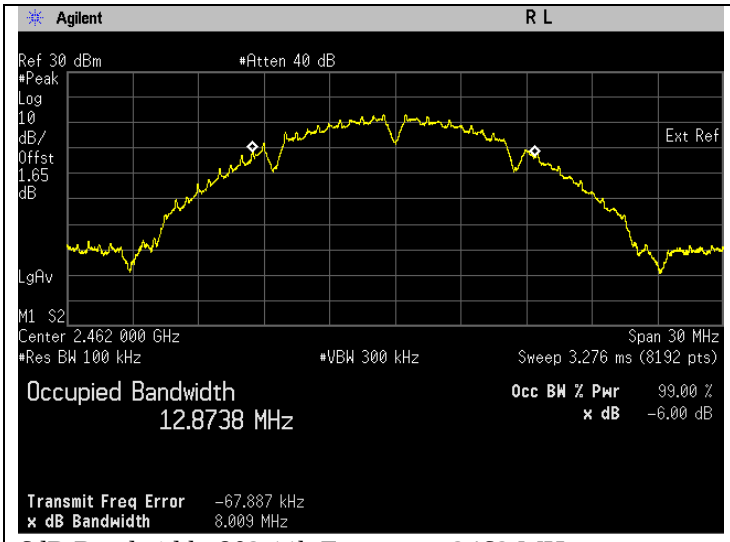
99% Bandwidth. 802.11b Frequency 2412 MHz



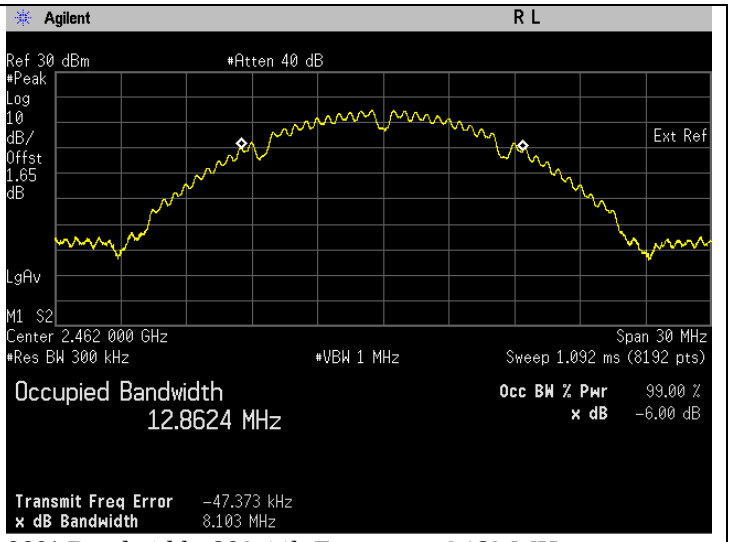
6dB Bandwidth. 802.11b Frequency 2437 MHz



99% Bandwidth. 802.11b Frequency 2437 MHz



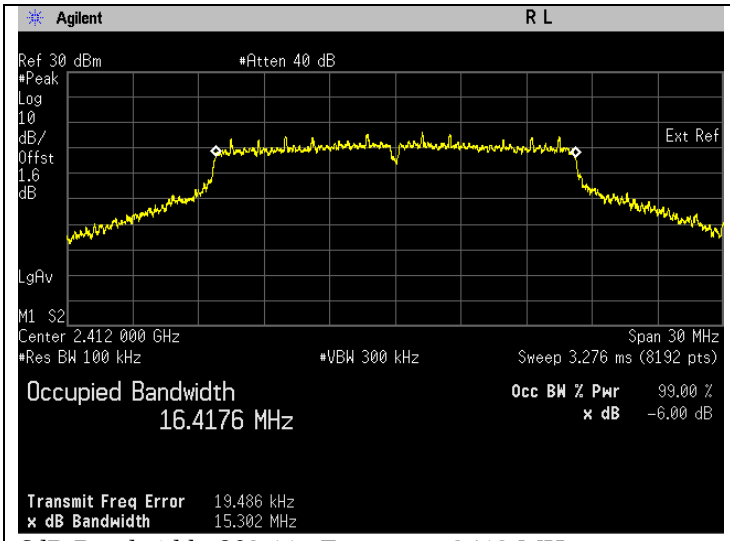
6dB Bandwidth. 802.11b Frequency 2462 MHz



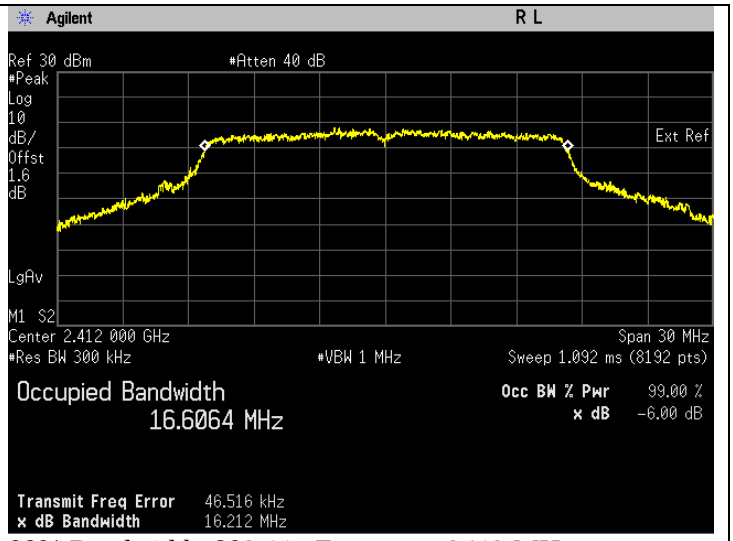
99% Bandwidth. 802.11b Frequency 2462 MHz

802.11 g

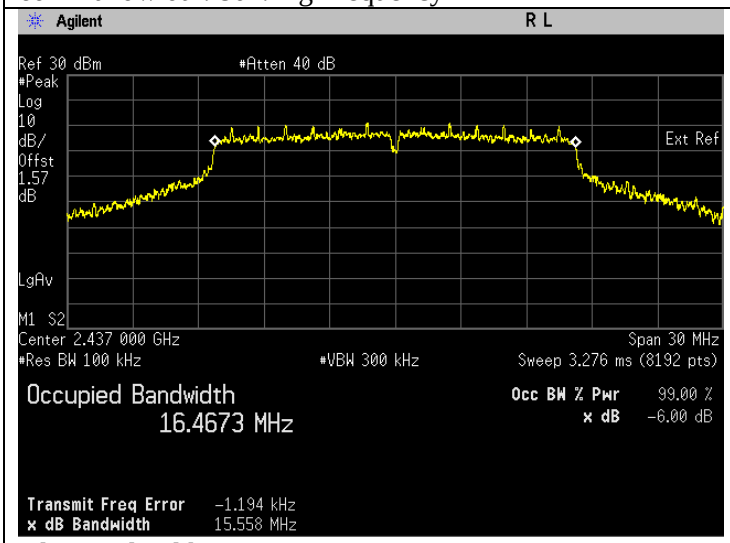
Test Conditions				Test Frequency	Results		
Standard	Modulation Type	Modulation Technology	Data Rate (mbps)	Tx (MHz)	6dB Bandwidth (MHz)	99% Bandwidth (MHz)	Status
802.11g	OFDM	BPSK	6	2412	15.302	16.606	Pass
802.11g	OFDM	BPSK	6	2437	15.558	16.685	Pass
802.11g	OFDM	BPSK	6	2462	15.089	16.706	Pass



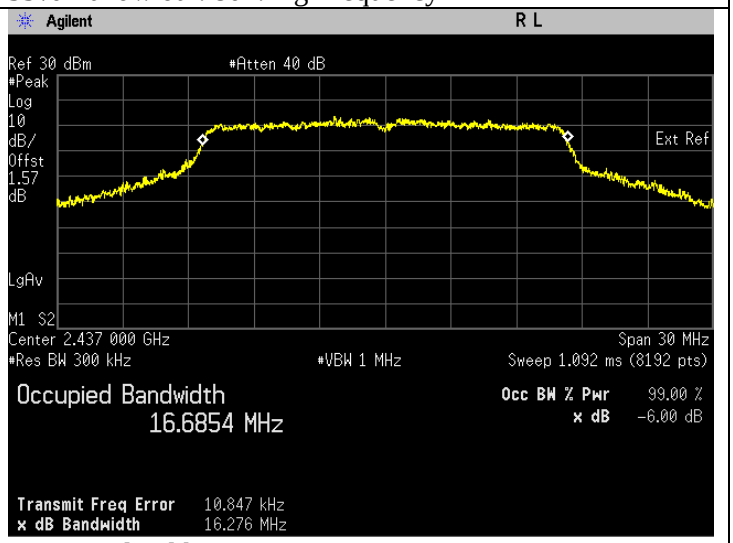
6dB Bandwidth. 802.11g Frequency 2412 MHz



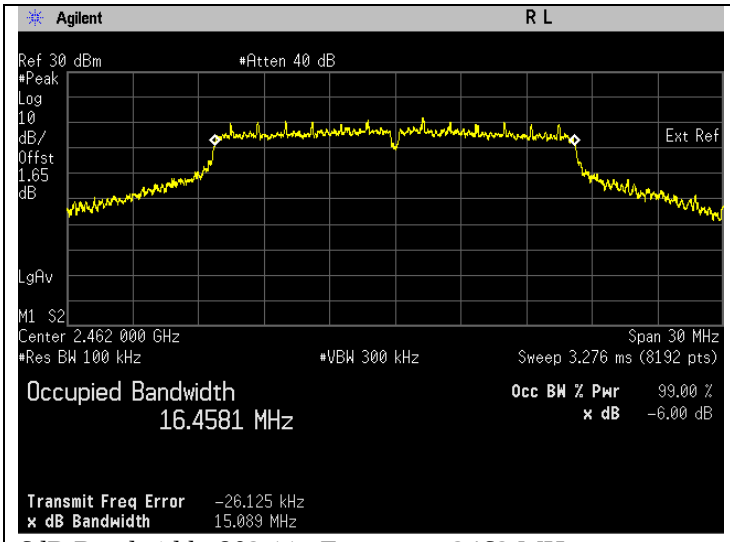
99% Bandwidth. 802.11g Frequency 2412 MHz



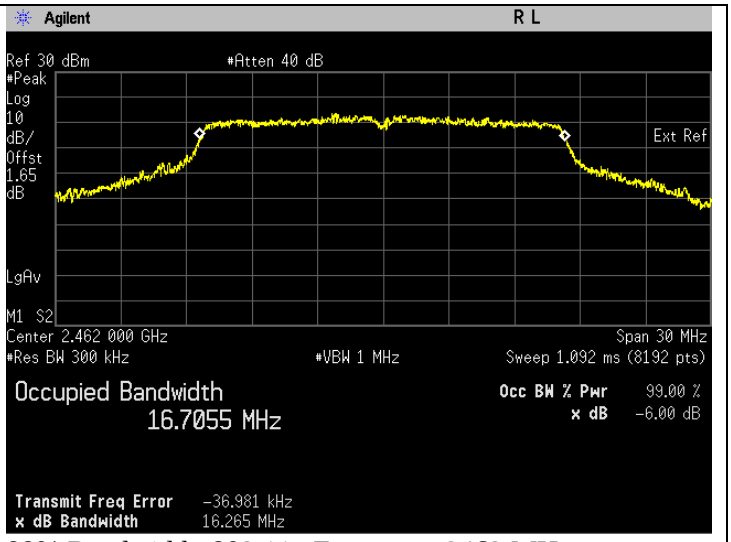
6dB Bandwidth. 802.11g Frequency 2437 MHz



99% Bandwidth. 802.11g Frequency 2437 MHz



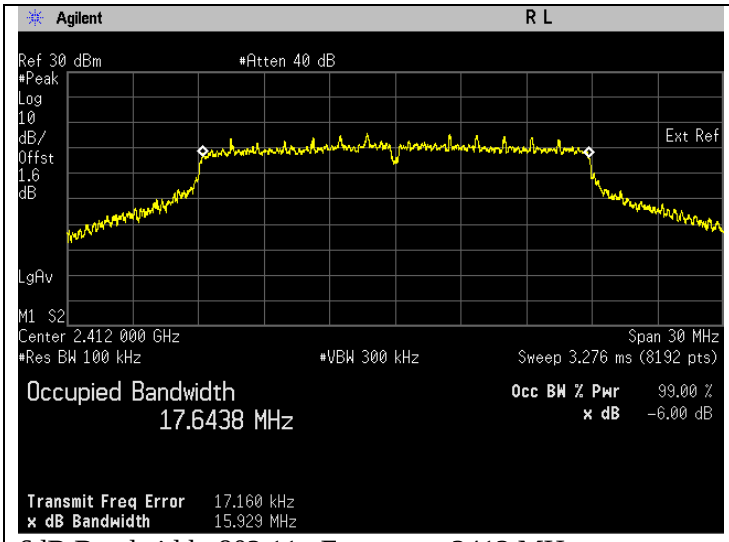
6dB Bandwidth. 802.11g Frequency 2462 MHz



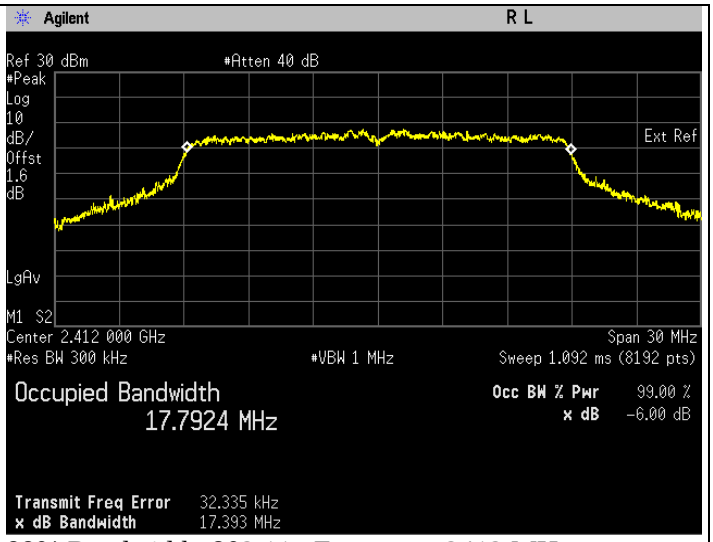
99% Bandwidth. 802.11g Frequency 2462 MHz

802.11n (HT20)

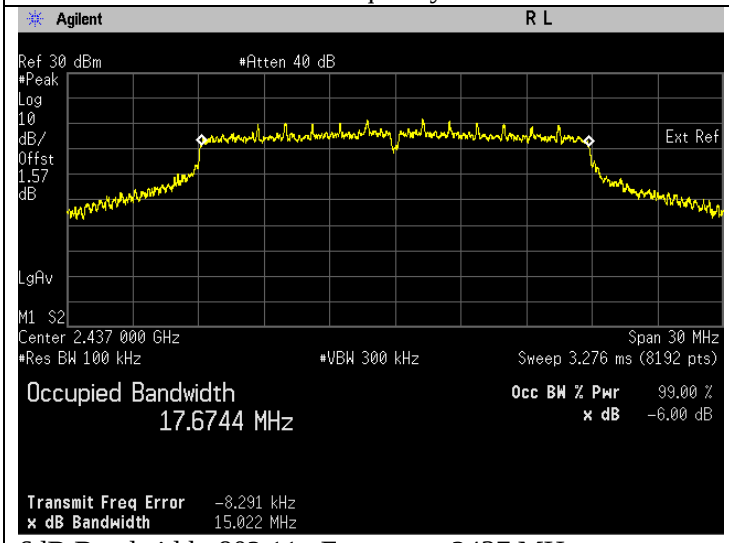
Test Conditions				Test Frequency	Results		
Standard	Modulation Type	Modulation Technology	Data Rate (mbps)	Tx (MHz)	6dB Bandwidth (MHz)	99% Bandwidth (MHz)	Status
802.11n	OFDM	DBPSK	6.5	2412	15.929	17.792	Pass
802.11n	OFDM	DBPSK	6.5	2437	15.022	17.862	Pass
802.11n	OFDM	DBPSK	6.5	2462	15.966	17.857	Pass



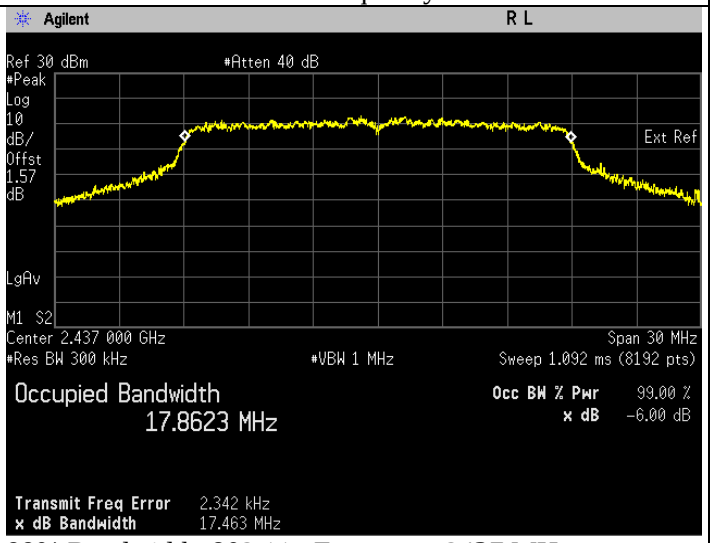
6dB Bandwidth. 802.11n Frequency 2412 MHz



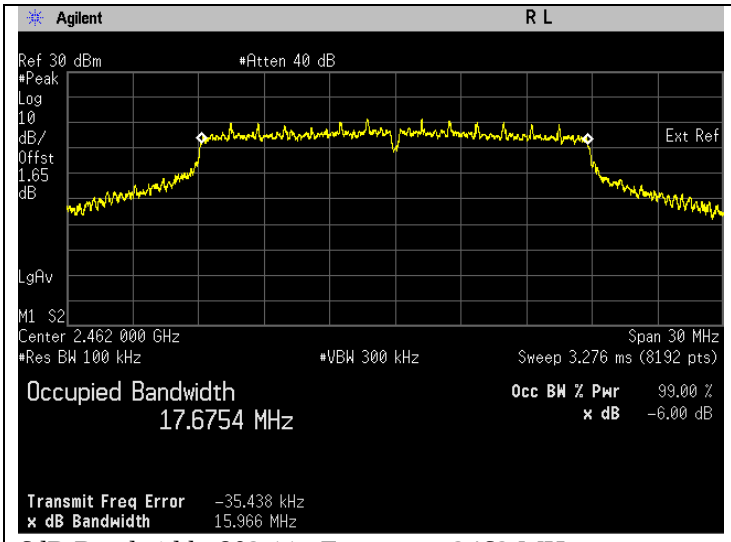
99% Bandwidth. 802.11n Frequency 2412 MHz



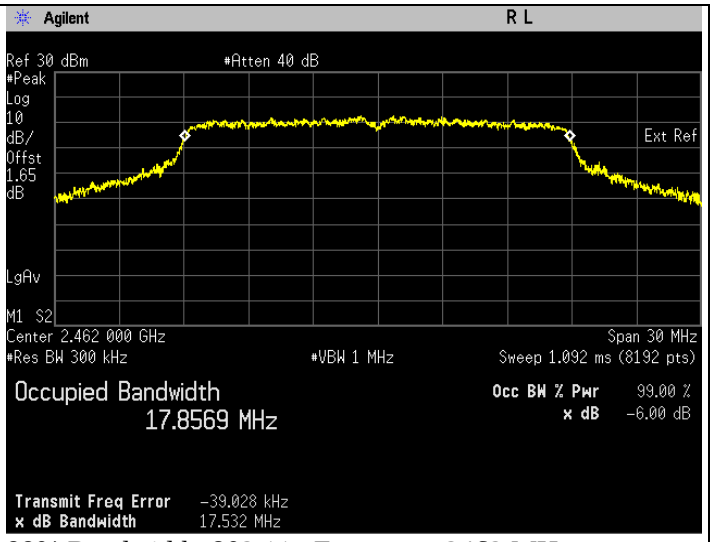
6dB Bandwidth. 802.11n Frequency 2437 MHz



99% Bandwidth. 802.11n Frequency 2437 MHz



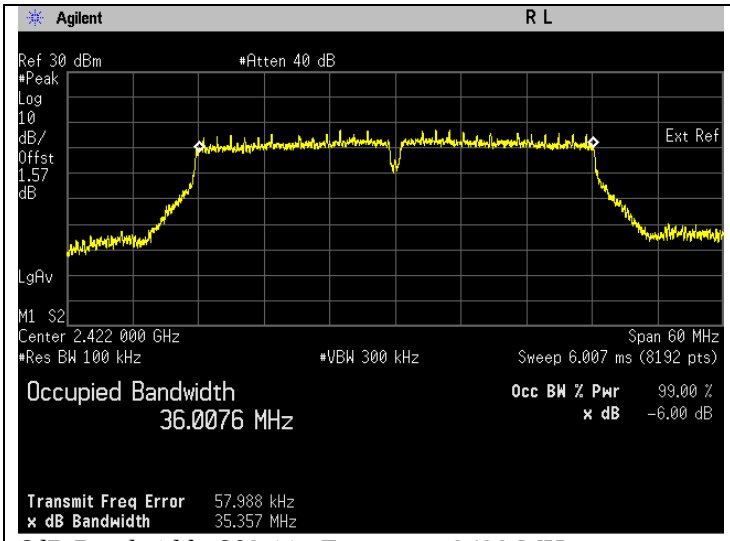
6dB Bandwidth. 802.11n Frequency 2462 MHz



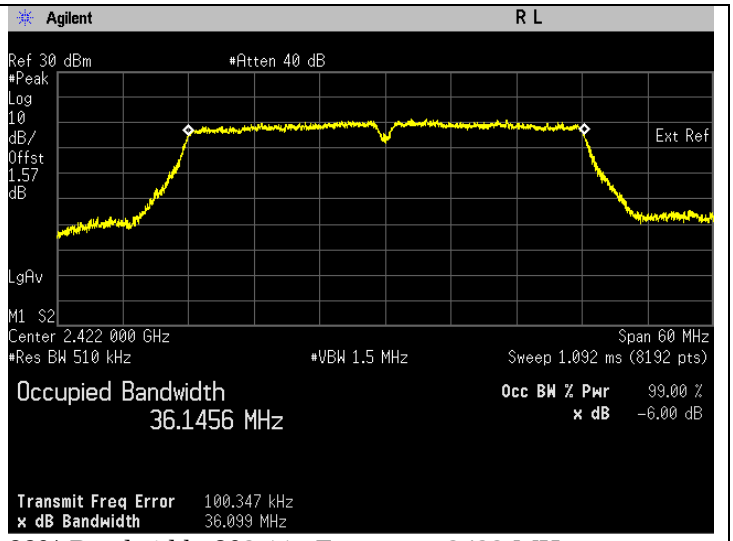
99% Bandwidth. 802.11n Frequency 2462 MHz

802.11n (HT40)

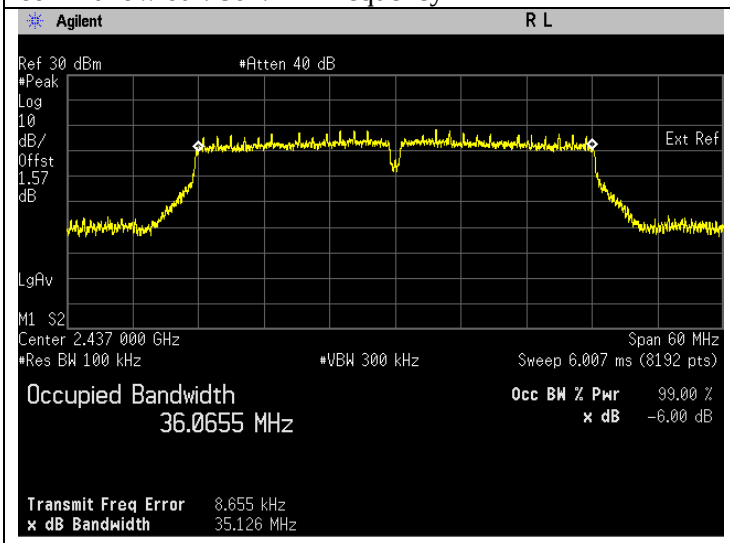
Test Conditions				Test Frequency	Results		
Standard	Modulation Type	Modulation Technology	Data Rate (mbps)	Tx (MHz)	6dB Bandwidth (MHz)	99% Bandwidth (MHz)	Status
802.11n	OFDM	DBPSK	13.5	2422	35.357	36.146	Pass
802.11n	OFDM	DBPSK	13.5	2437	35.126	36.187	Pass
802.11n	OFDM	DBPSK	13.5	2452	35.677	36.195	Pass



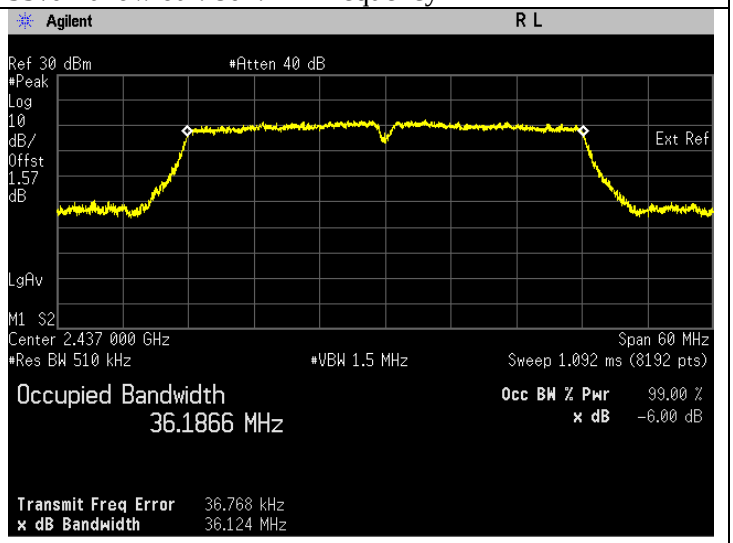
6dB Bandwidth. 802.11n Frequency 2422 MHz



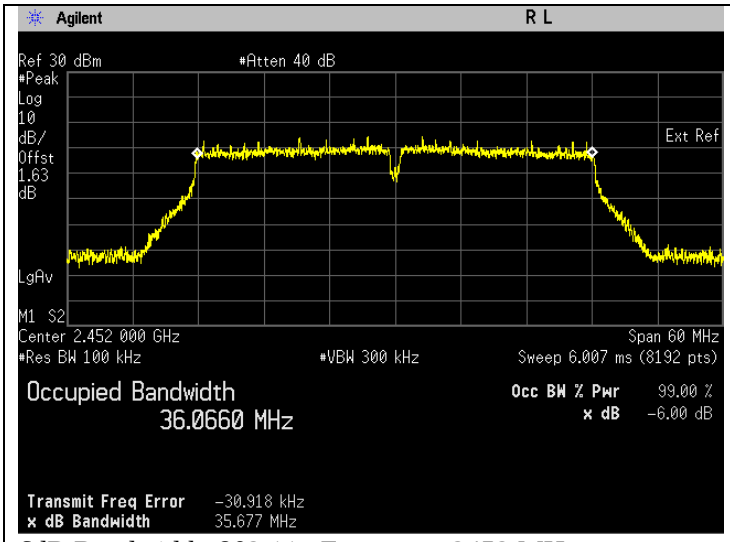
99% Bandwidth. 802.11n Frequency 2422 MHz



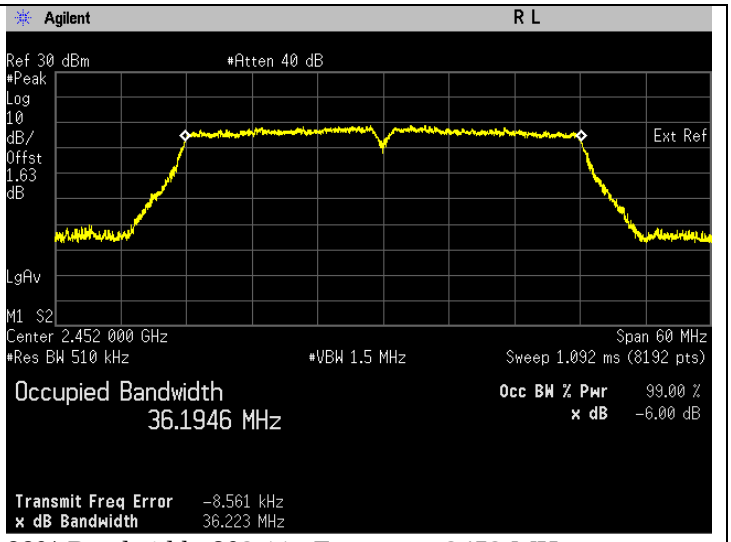
6dB Bandwidth. 802.11n Frequency 2437 MHz



99% Bandwidth. 802.11n Frequency 2437 MHz



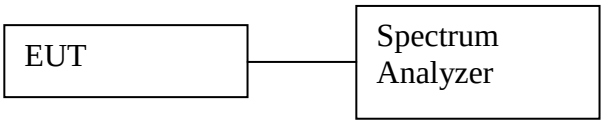
6dB Bandwidth. 802.11n Frequency 2452 MHz



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)

6.2.2. Test Limits:

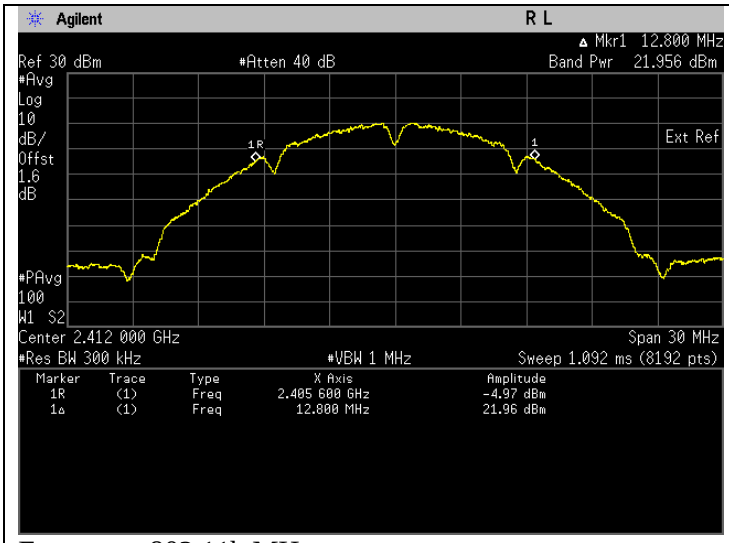
Normal Condition (25 ° C)
≤1 Watt(30 dBm)

6.2.3. Test Data:

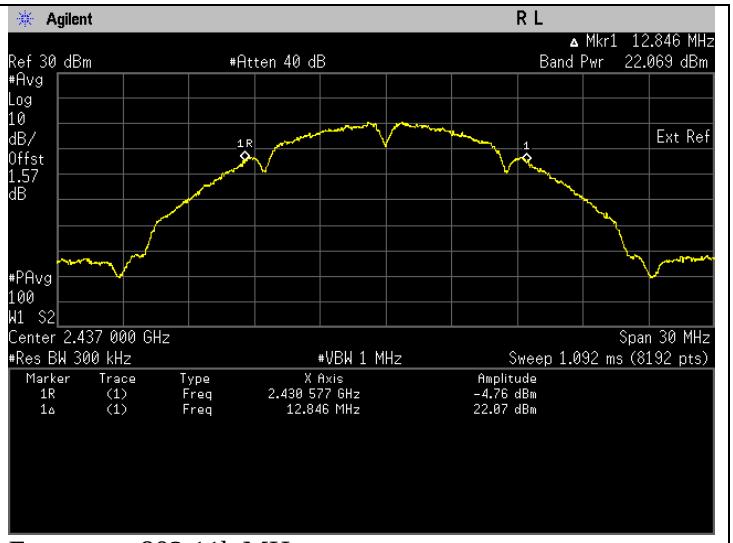
802.11b

Output power = band power +duty cycle factor
Duty cycle factor =0.035dBm

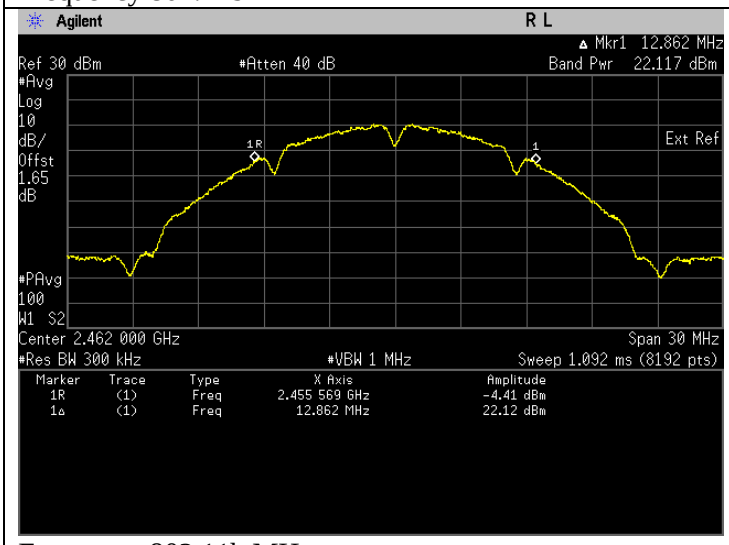
Test Conditions				Test Frequency	Results	
Standard	Modulation Type	Modulation Technology	Data Rate (mbps)	Tx (MHz)	Output Power (dBm)	Status
802.11b	DSSS	QPSK	1	2412	21.991	Pass
802.11b	DSSS	QPSK	1	2437	22.104	Pass
802.11b	DSSS	QPSK	1	2462	22.152	Pass



Frequency 802.11b MHz



Frequency 802.11b MHz

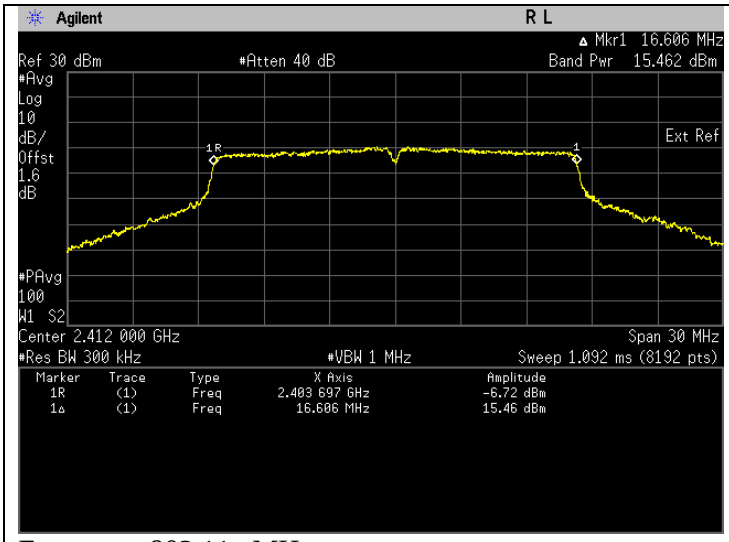


Frequency 802.11b MHz

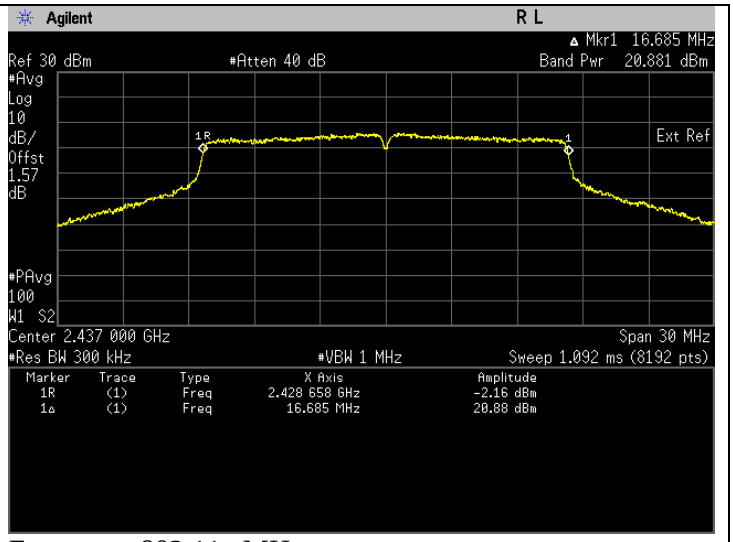
802.11g

Output power = band power +duty cycle factor
Duty cycle factor =0.227dBm

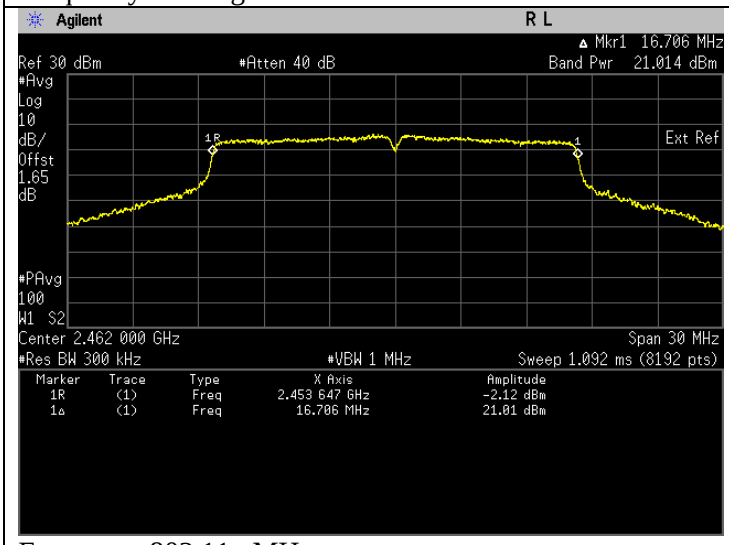
Test Conditions				Test Frequency	Results	
Standard	Modulation Type	Modulation Technology	Data Rate (mbps)	Tx (MHz)	Output Power (dBm)	Status
802.11g	OFDM	BPSK	6	2412	15.689	Pass
802.11g	OFDM	BPSK	6	2437	21.108	Pass
802.11g	OFDM	BPSK	6	2462	21.241	Pass



Frequency 802.11g MHz



Frequency 802.11g MHz

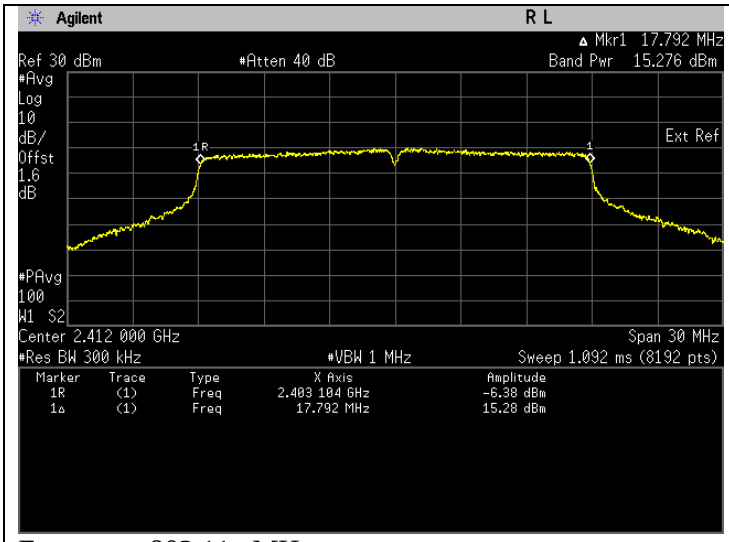


Frequency 802.11g MHz

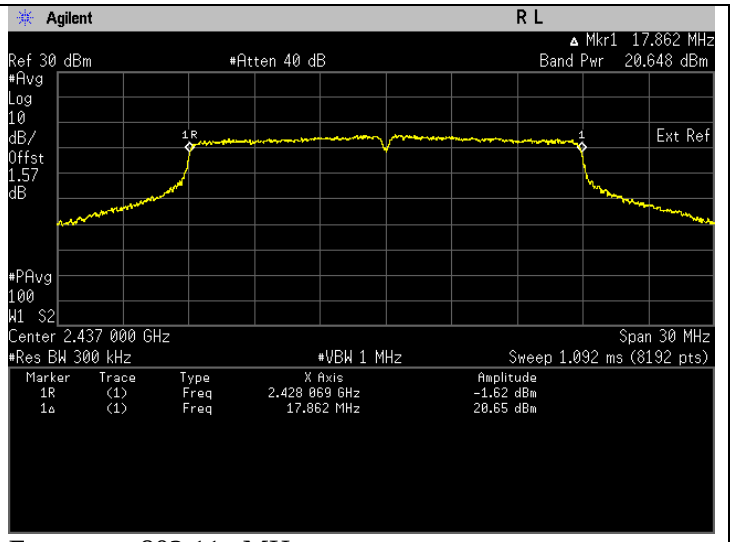
802.11n (HT20)

Output power = band power +duty cycle factor
Duty cycle factor =0.252dBm

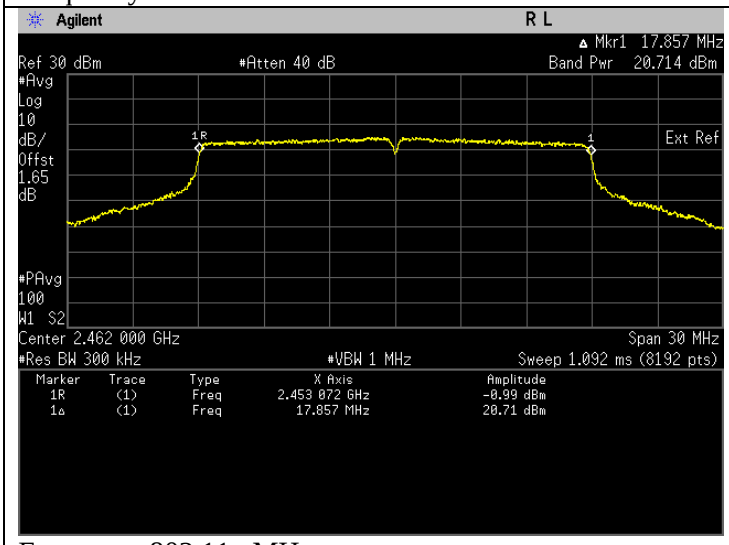
Test Conditions				Test Frequency	Results	
Standard	Modulation Type	Modulation Technology	Data Rate (mbps)	Tx (MHz)	Output Power (dBm)	Status
802.11n	OFDM	DBPSK	6.5	2412	15.528	Pass
802.11n	OFDM	DBPSK	6.5	2437	20.900	Pass
802.11n	OFDM	DBPSK	6.5	2462	20.966	Pass



Frequency 802.11n MHz



Frequency 802.11n MHz

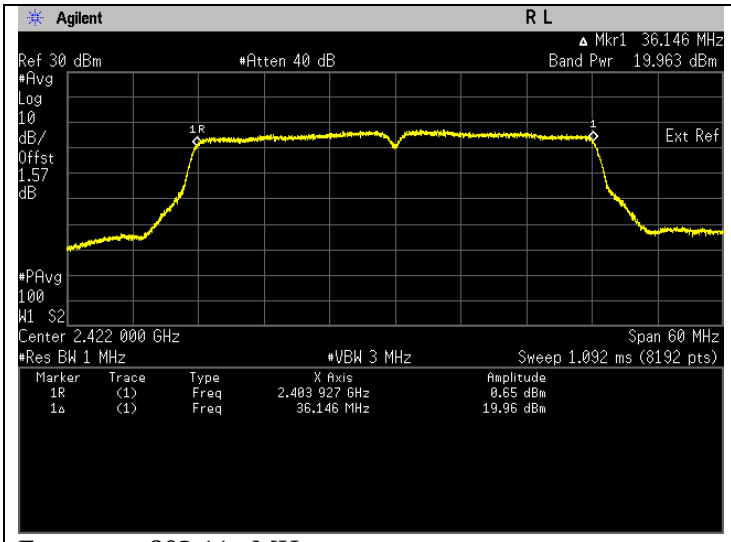


Frequency 802.11n MHz

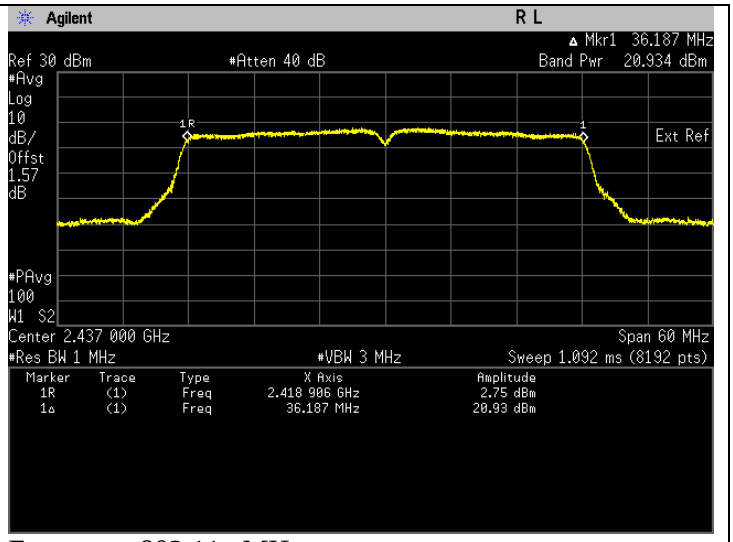
802.11n (HT40)

Output power = band power +duty cycle factor
Duty cycle factor =0.502dBm

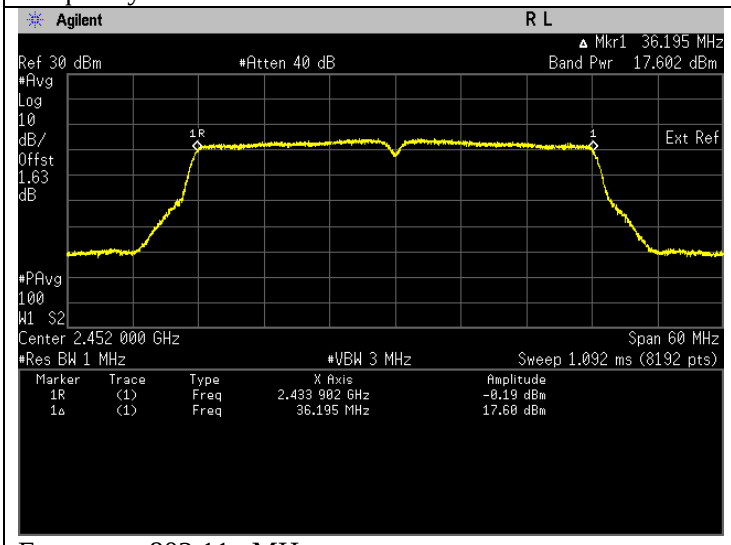
Test Conditions				Test Frequency	Results	
Standard	Modulation Type	Modulation Technology	Data Rate (mbps)	Tx (MHz)	Output Power (dBm)	Status
802.11n	OFDM	DBPSK	13.5	2422	20.465	Pass
802.11n	OFDM	DBPSK	13.5	2437	21.436	Pass
802.11n	OFDM	DBPSK	13.5	2452	18.104	Pass



Frequency 802.11n MHz



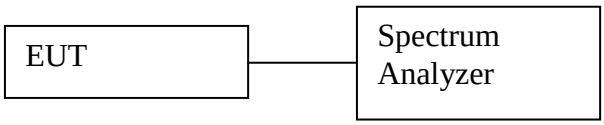
Frequency 802.11n MHz



Frequency 802.11n MHz

6.3. Duty Cycle of the test signal

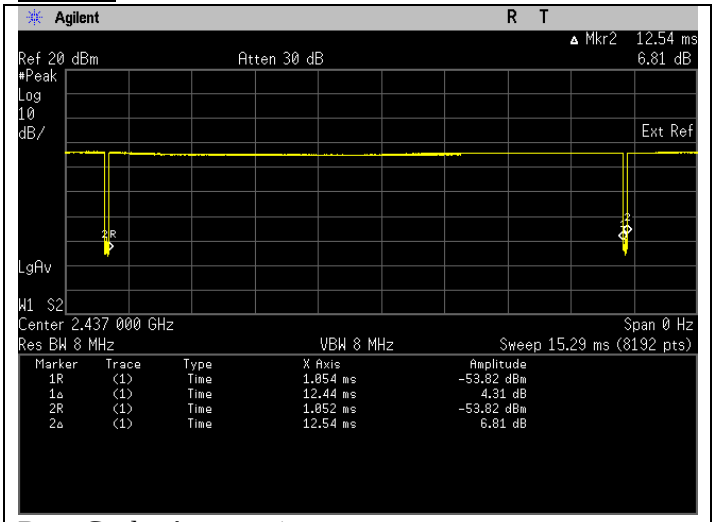
6.3.1. Test Setup



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.

6.3.2. Test Data

802.11b

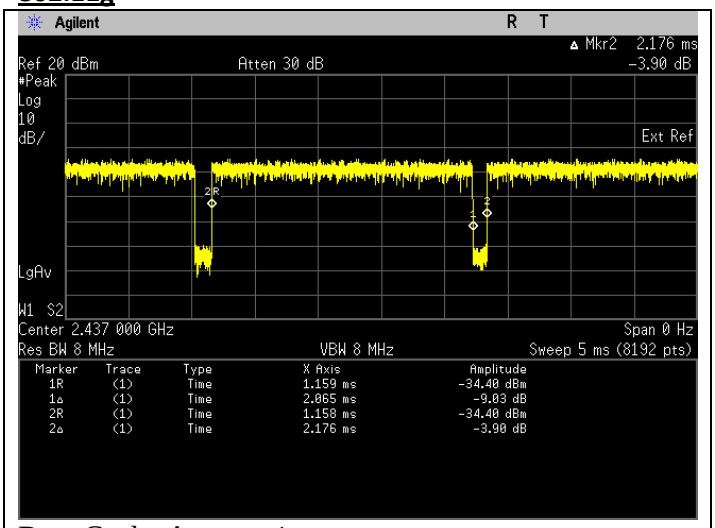


Duty Cycle, Antenna 1

On time (ms)	12.44
On + Off Time (ms)	12.54
Duty cycle	0.9920
Duty Cycle factor	0.035

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

802.11g

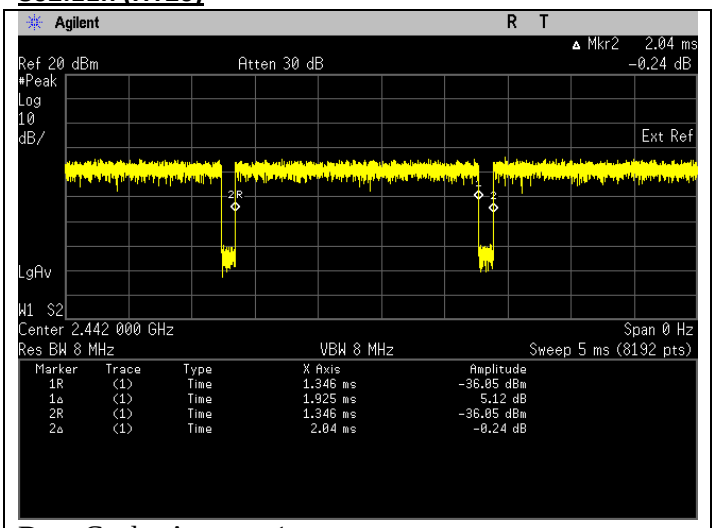


Duty Cycle, Antenna 1

On time (ms)	2.065
On + Off Time (ms)	2.176
Duty cycle	0.9490
Duty Cycle factor	0.227

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

802.11n (HT20)

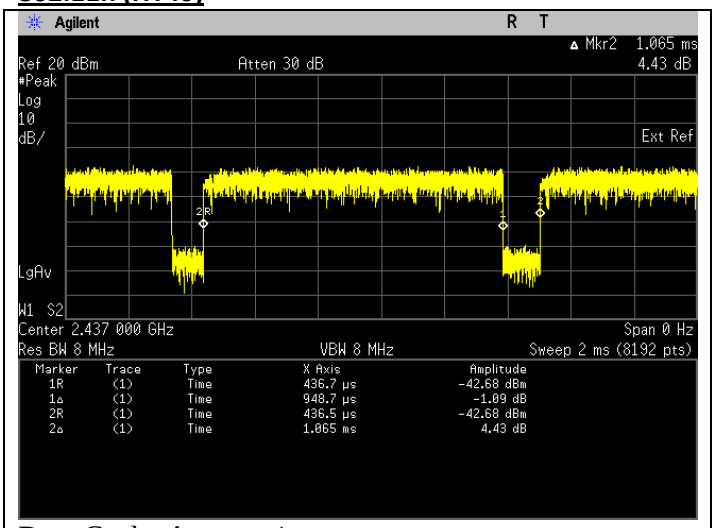


Duty Cycle, Antenna 1

On time (ms)	1.9245
On + Off Time (ms)	2.04
Duty cycle	0.9436
Duty Cycle factor	0.252

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

802.11n (HT40)



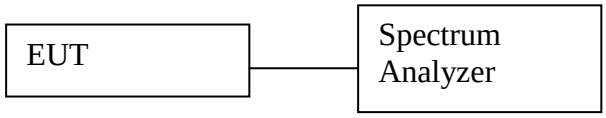
Duty Cycle, Antenna 1

On time (ms)	0.9487
On + Off Time (ms)	1.065
Duty cycle	0.8908
Duty Cycle factor	0.502

*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.

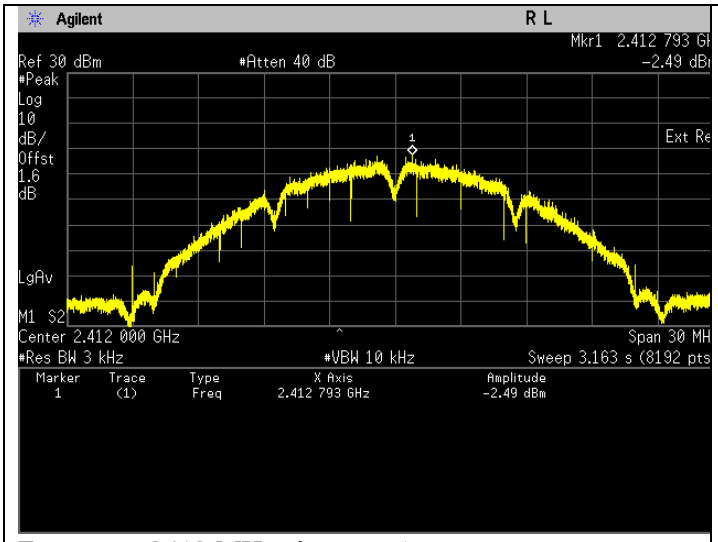
6.4.2. Test Limits

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

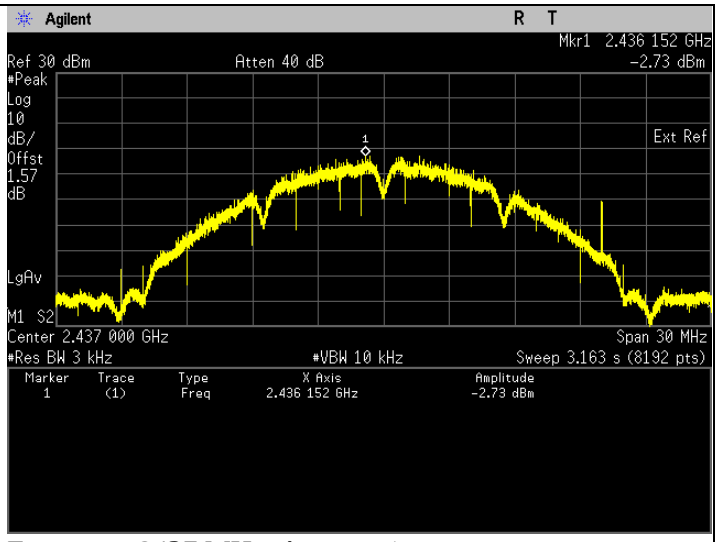
6.4.3. Test Result

802.11b

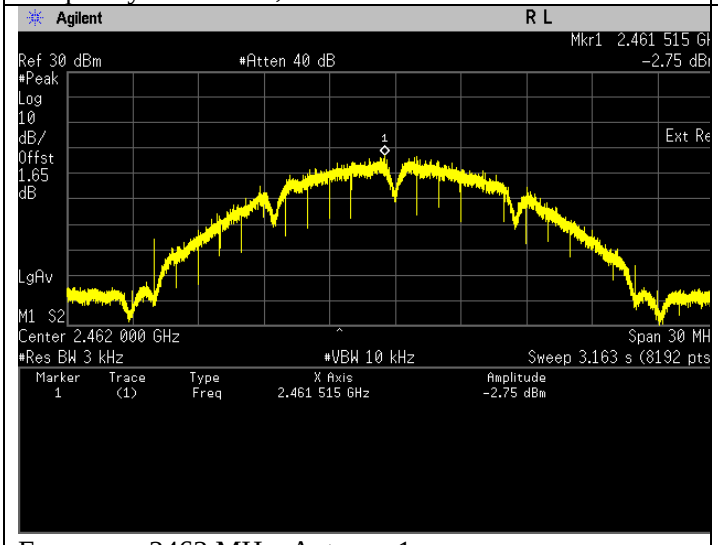
Test Conditions				Test Frequency	Results	
Standard	Modulation Type	Modulation Technology	Data Rate (mbps)	Tx (MHz)	Power (dBm/3kHz)	Status
802.11b	DSSS	QPSK	1	2412	-2.49	Pass
802.11b	DSSS	QPSK	1	2437	-2.37	Pass
802.11b	DSSS	QPSK	1	2462	-2.75	Pass



Frequency 2412 MHz, Antenna 1



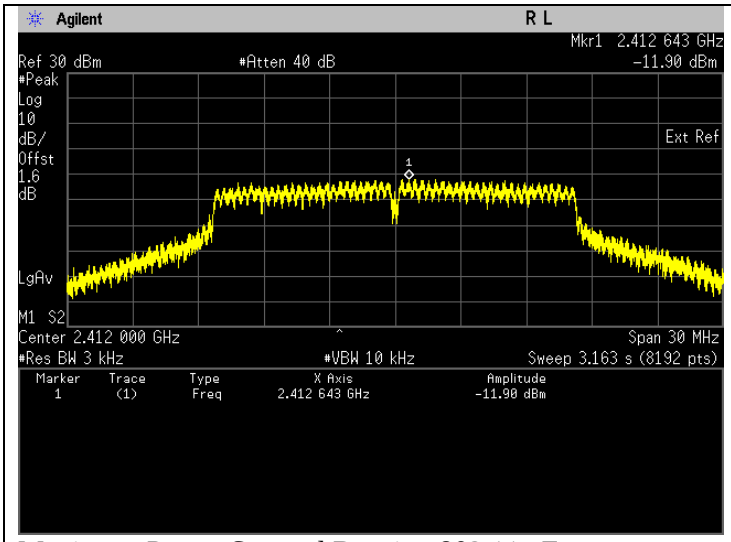
Frequency 2437 MHz, Antenna 1



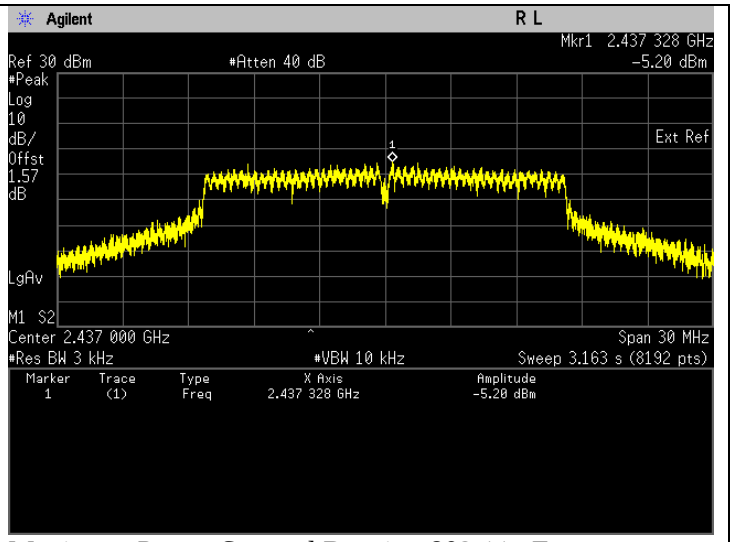
Frequency 2462 MHz, Antenna 1

802.11g

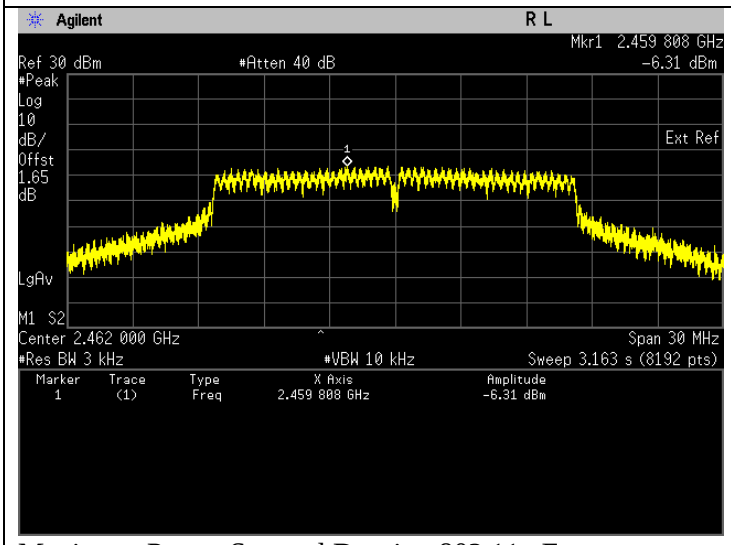
Test Conditions				Test Frequency	Results	
Standard	Modulation Type	Modulation Technology	Data Rate (mbps)	Tx (MHz)	Power (dBm/3kHz)	Status
802.11g	OFDM	BPSK	6	2412	-11.90	Pass
802.11g	OFDM	BPSK	6	2437	-5.20	Pass
802.11g	OFDM	BPSK	6	2462	-6.31	Pass



Maximum Power Spectral Density. 802.11g Frequency 2412 MHz



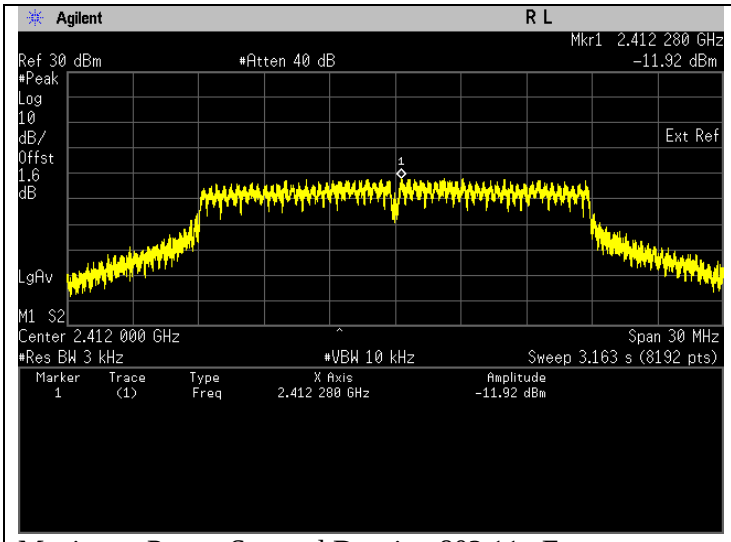
Maximum Power Spectral Density. 802.11g Frequency 2437 MHz



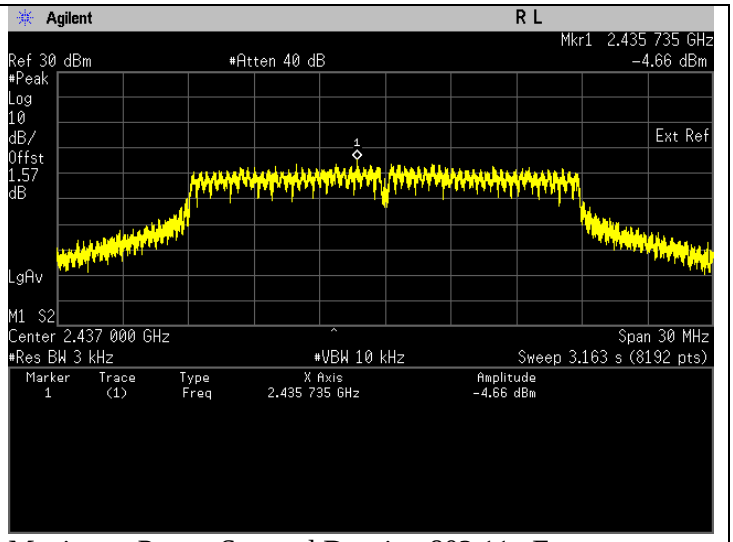
Maximum Power Spectral Density. 802.11g Frequency 2462 MHz

802.11n (HT20)

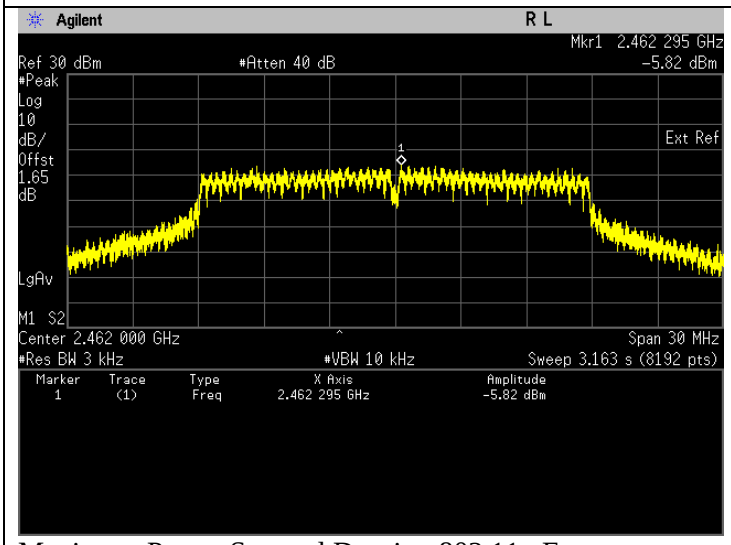
Test Conditions				Test Frequency	Results	
Standard	Modulation Type	Modulation Technology	Data Rate (mbps)	Tx (MHz)	Power (dBm/3kHz)	Status
802.11n	OFDM	DBPSK	6.5	2412	-11.92	Pass
802.11n	OFDM	DBPSK	6.5	2437	-4.66	Pass
802.11n	OFDM	DBPSK	6.5	2462	-5.82	Pass



Maximum Power Spectral Density. 802.11n Frequency 2412 MHz



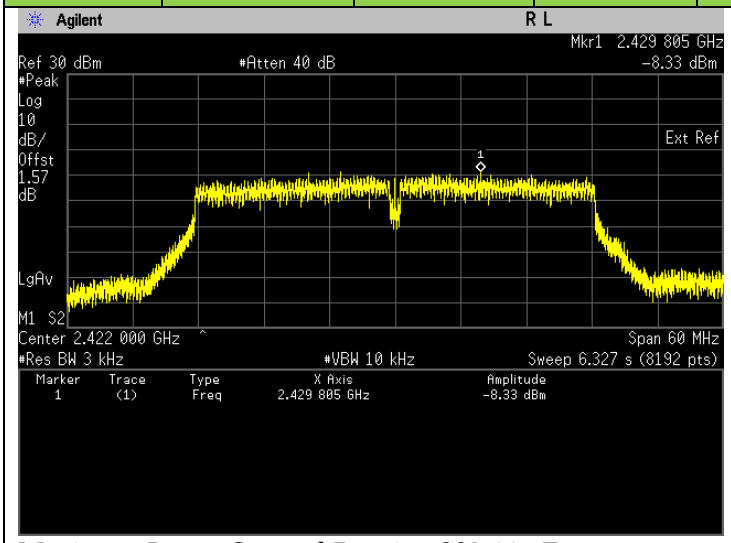
Maximum Power Spectral Density. 802.11n Frequency 2437 MHz



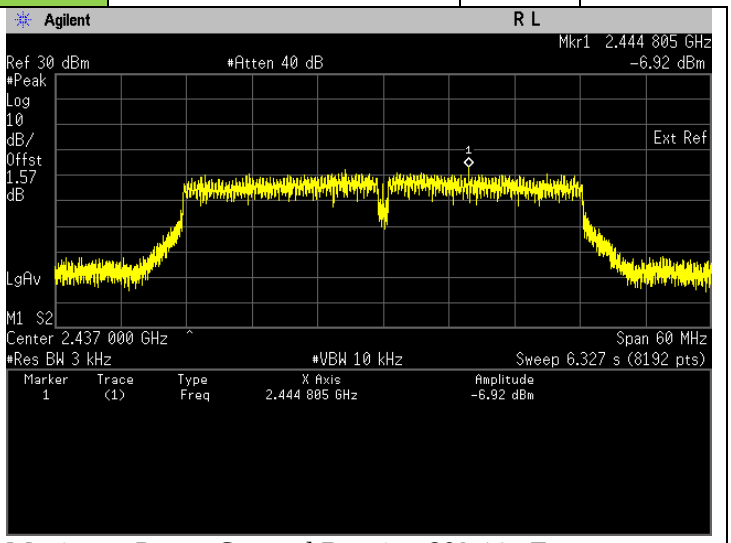
Maximum Power Spectral Density. 802.11n Frequency 2462 MHz

802.11n (HT40)

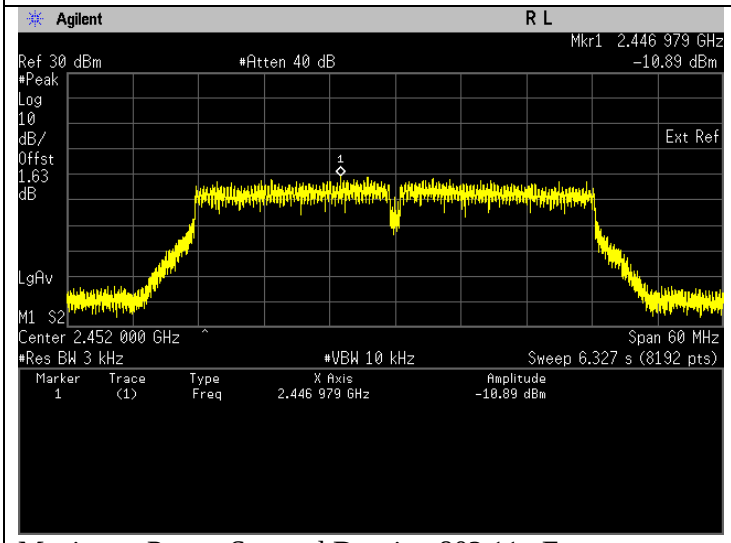
Test Conditions				Test Frequency	Results	
Standard	Modulation Type	Modulation Technology	Data Rate (mbps)	Tx (MHz)	Power (dBm/3kHz)	Status
802.11n	OFDM	DBPSK	13.5	2422	-8.33	Pass
802.11n	OFDM	DBPSK	13.5	2437	-6.92	Pass
802.11n	OFDM	DBPSK	13.5	2452	-10.88	Pass



Maximum Power Spectral Density. 802.11n Frequency 2422 MHz



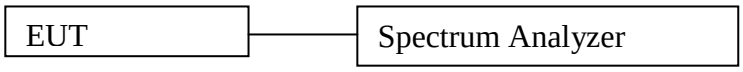
Maximum Power Spectral Density. 802.11n Frequency 2437 MHz



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 10^{th} harmonic.

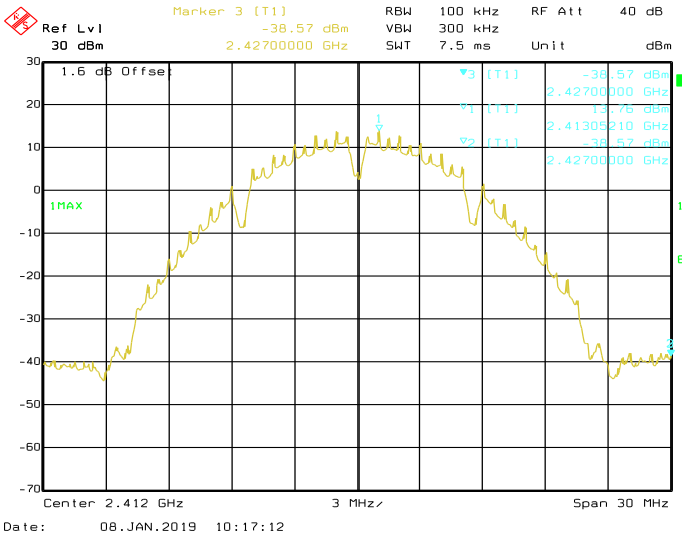
6.5.2. Test Limits:

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

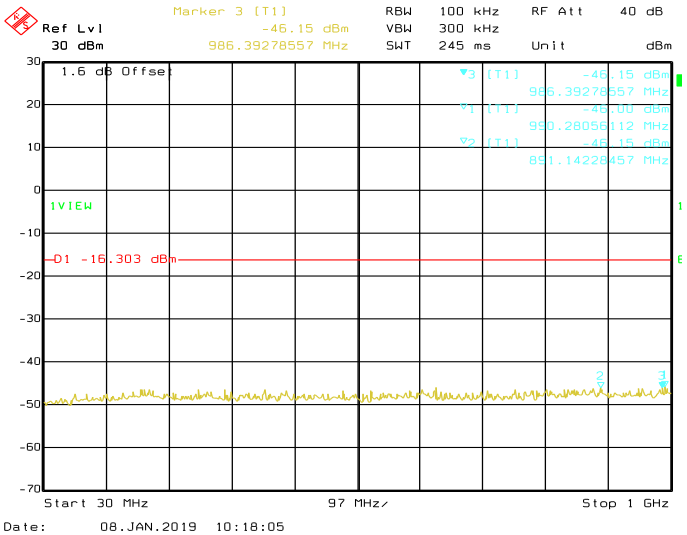
6.5.3. Test Result

802.11b

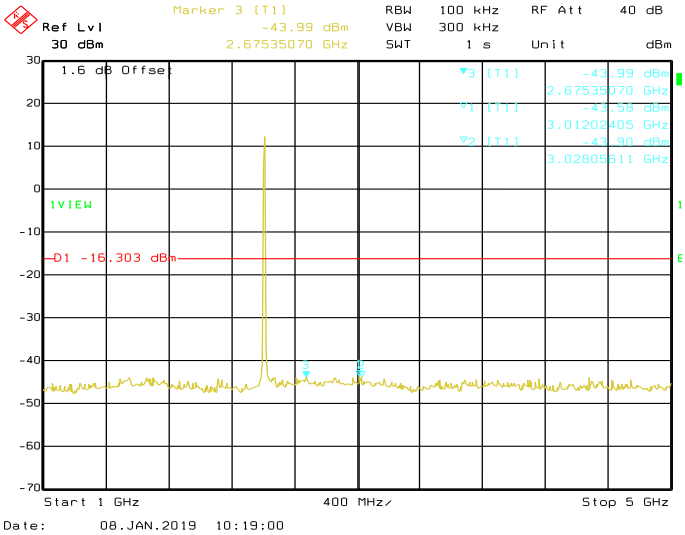
Test Conditions				Test Frequency	Results		
Standard	Modulation Type	Modulation Technology	Data Rate (mbps)	Tx (MHz)	Spurs (MHz)	Level (dBm)	Status
802.11b	DSSS	BPSK	1	2412	14188.38	-39.47	Pass
					6973.95	-39.64	Pass
					15671.34	-40.70	Pass
802.11b	DSSS	BPSK	1	2437	14188.38	-40.06	Pass
					6713.43	-40.76	Pass
					6993.99	-40.77	Pass
802.11b	DSSS	BPSK	1	2462	14188.38	-38.98	Pass
					6983.97	-40.96	Pass
					6643.29	-41.08	Pass



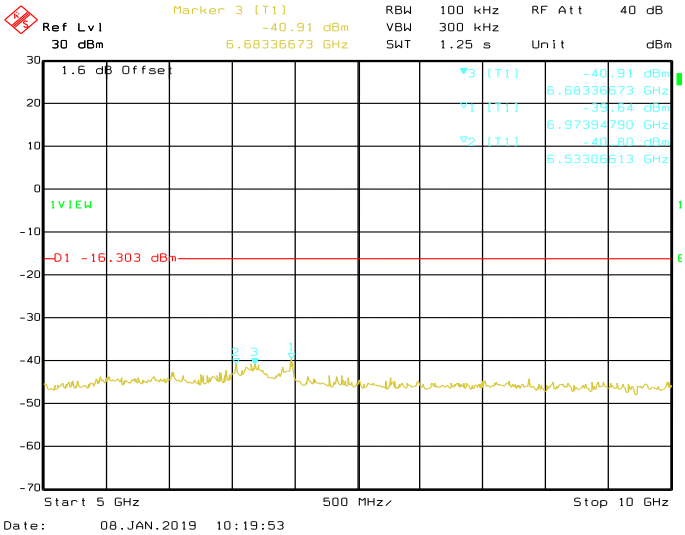
Conducted Emissions. 802.11b, Frequency 2412 MHz Reference Level



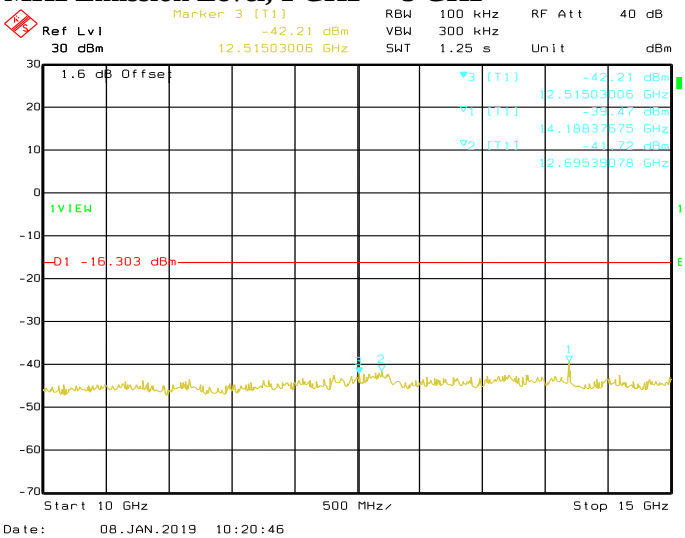
Conducted Emissions. 802.11b, Frequency 2412 MHz Emission Level, 30 MHz -> 1 GHz



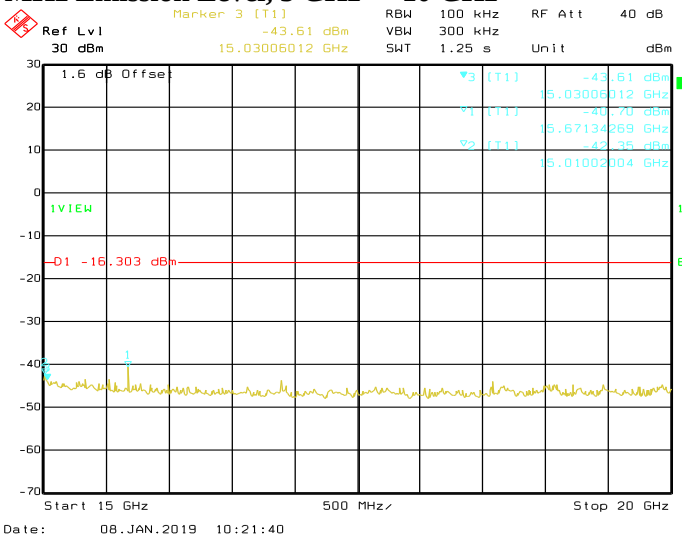
Conducted Emissions. 802.11b, Frequency 2412 MHz Emission Level, 1 GHz -> 5 GHz



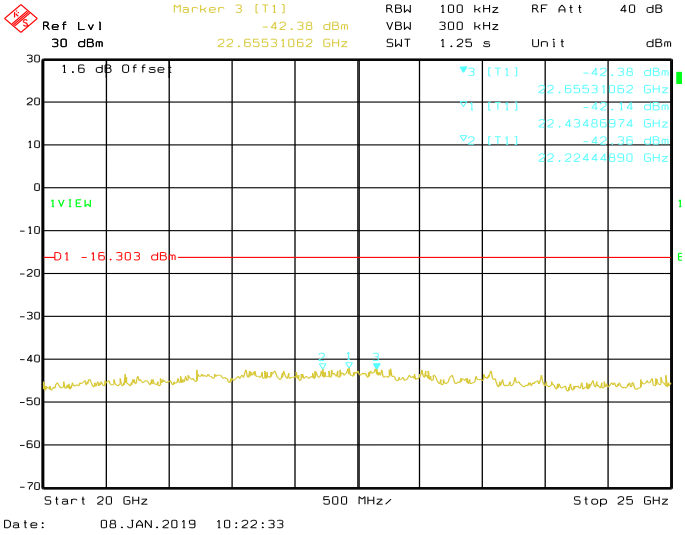
Conducted Emissions. 802.11b, Frequency 2412 MHz Emission Level, 5 GHz -> 10 GHz



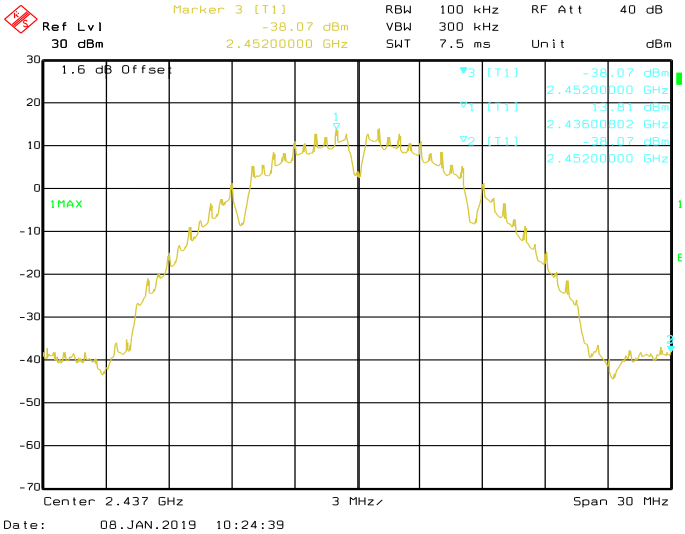
Conducted Emissions. 802.11b, Frequency 2412 Emission Level, 10 GHz -> 15 GHz



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

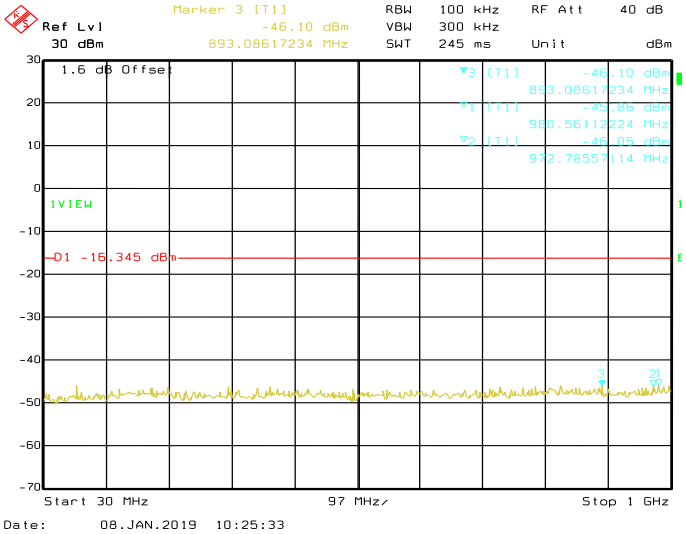


Conducted Emissions. 802.11b, Frequency 2412 MHz Emission Level, 20 GHz -> 25 GHz



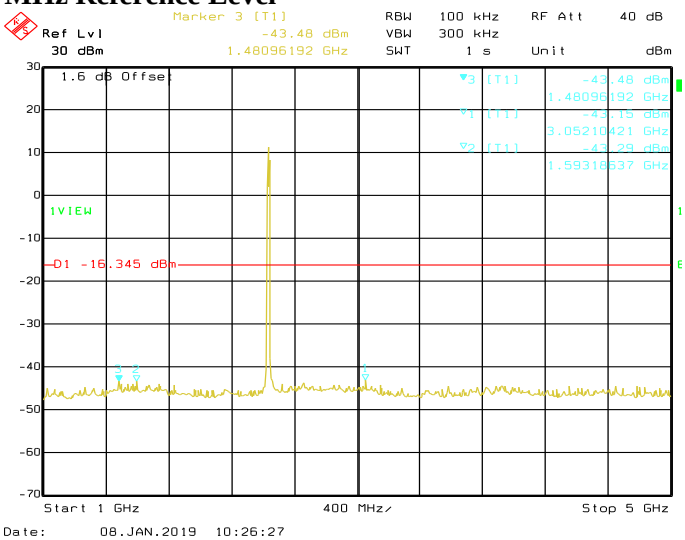
Date: 08.JAN.2019 10:24:39

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



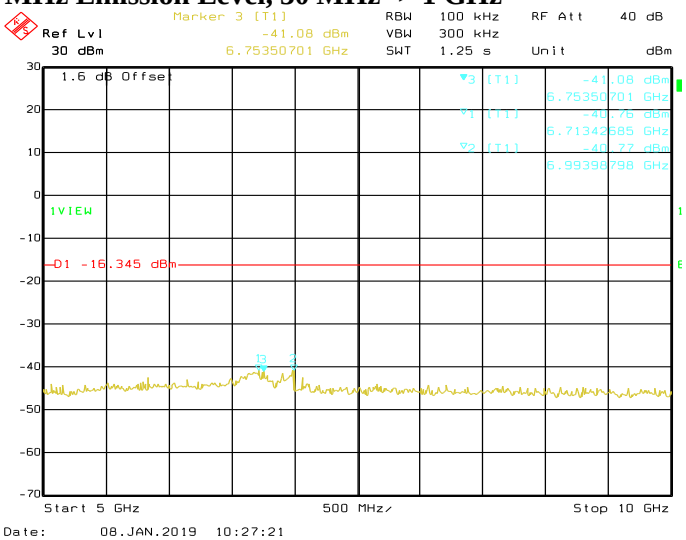
Date: 08.JAN.2019 10:25:33

Conducted Emissions. 802.11b, Frequency 2437 MHz Reference Level



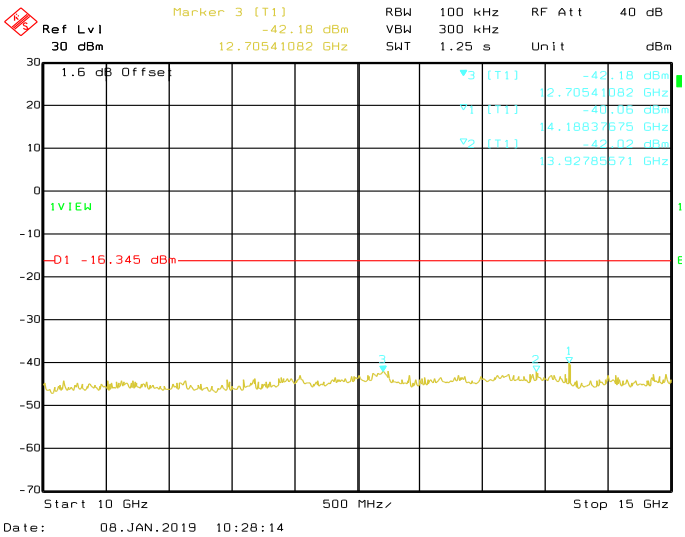
Date: 08.JAN.2019 10:26:27

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

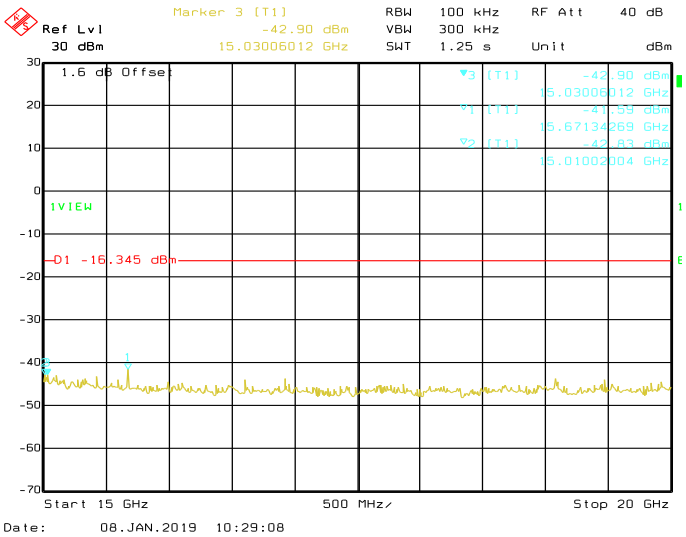


Date: 08.JAN.2019 10:27:21

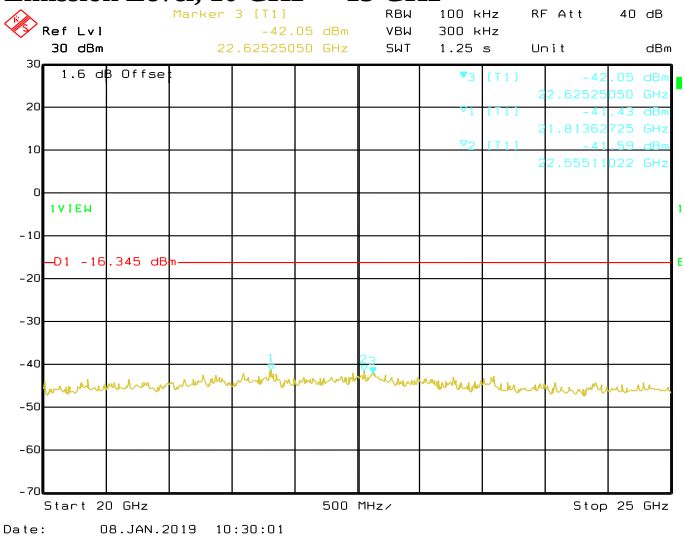
Conducted Emissions. 802.11b, Frequency 2437 MHz Emission Level, 5 GHz -> 10 GHz



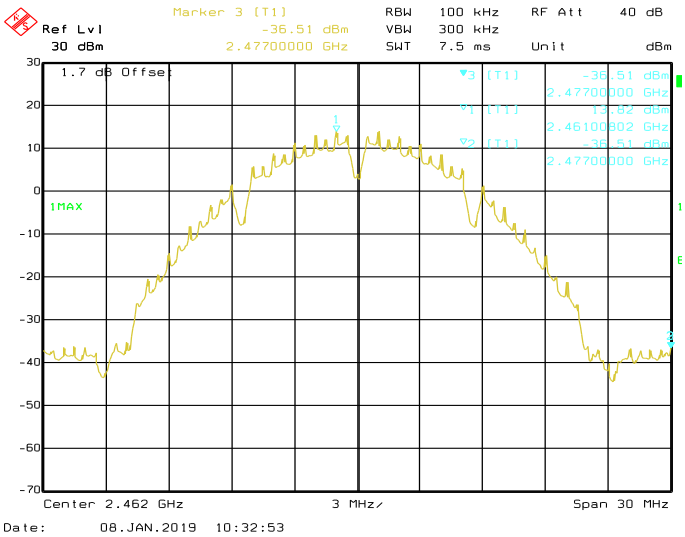
Conducted Emissions. 802.11b, Frequency 2437 Emission Level, 10 GHz -> 15 GHz



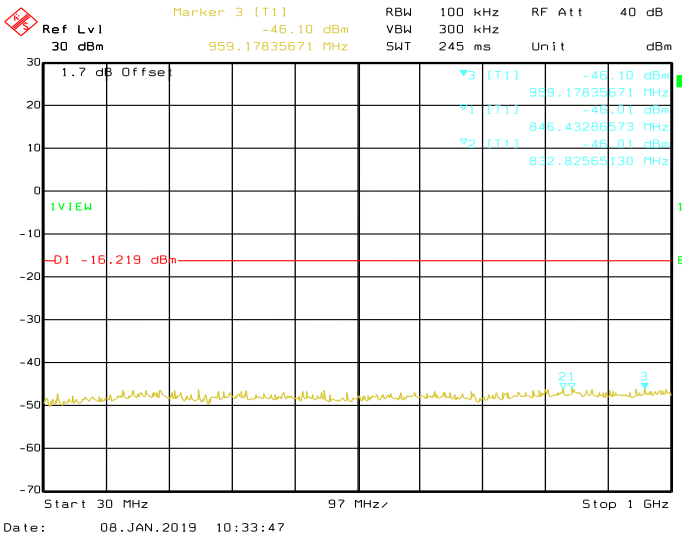
Conducted Emissions. 802.11b, Frequency 2437 MHz Emission Level, 15 GHz -> 20 GHz



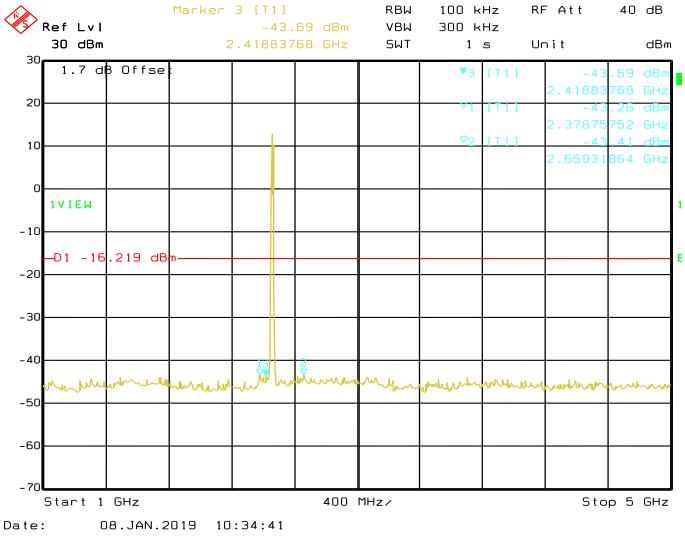
Conducted Emissions. 802.11b, Frequency 2437 MHz Emission Level, 20 GHz -> 25 GHz



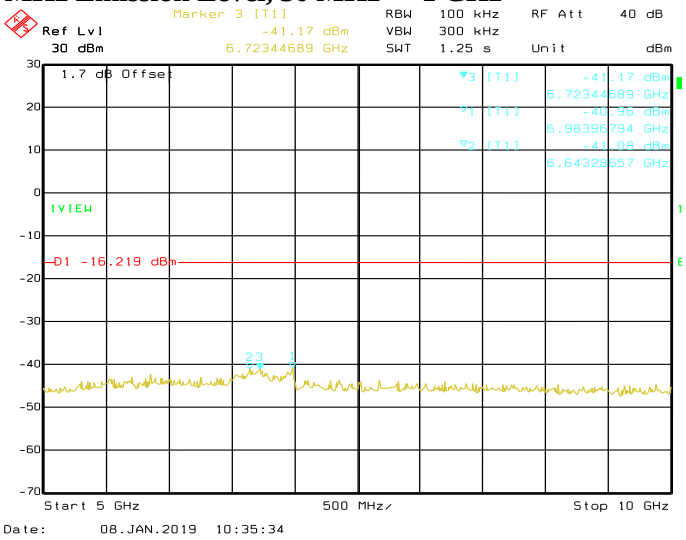
Conducted Emissions. 802.11b, Frequency 2462 MHz Reference Level



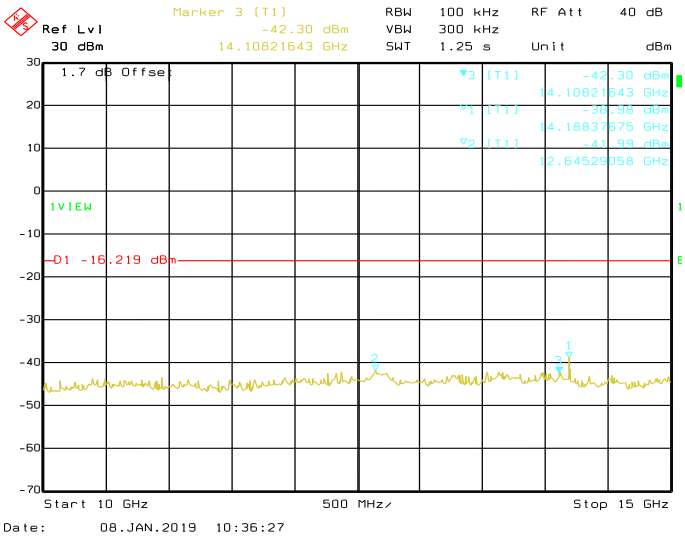
Conducted Emissions. 802.11b, Frequency 2462 MHz Emission Level, 30 MHz -> 1 GHz



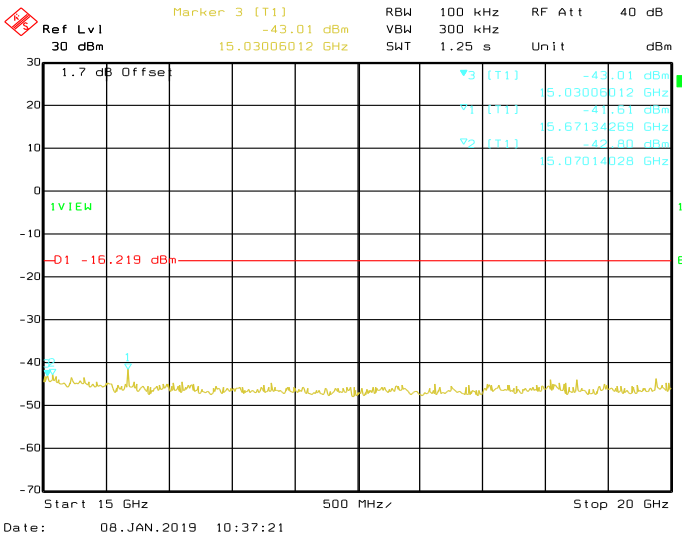
Conducted Emissions. 802.11b, Frequency 2462 MHz Emission Level, 1 GHz -> 5 GHz



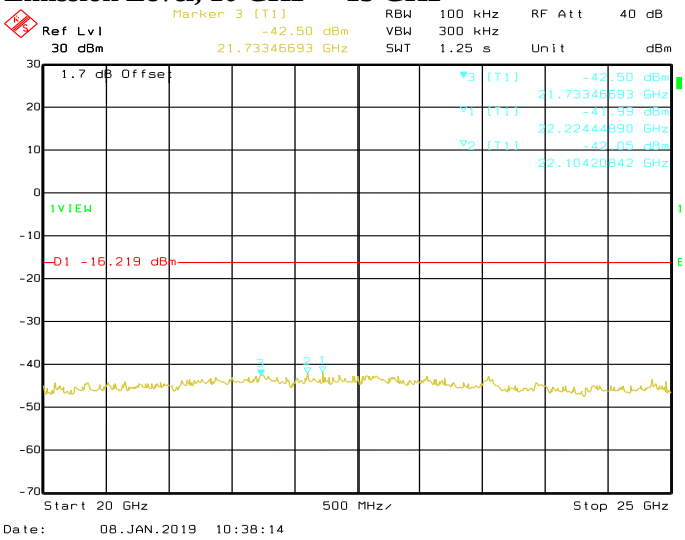
Conducted Emissions. 802.11b, Frequency 2462 MHz Emission Level, 5 GHz -> 10 GHz



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



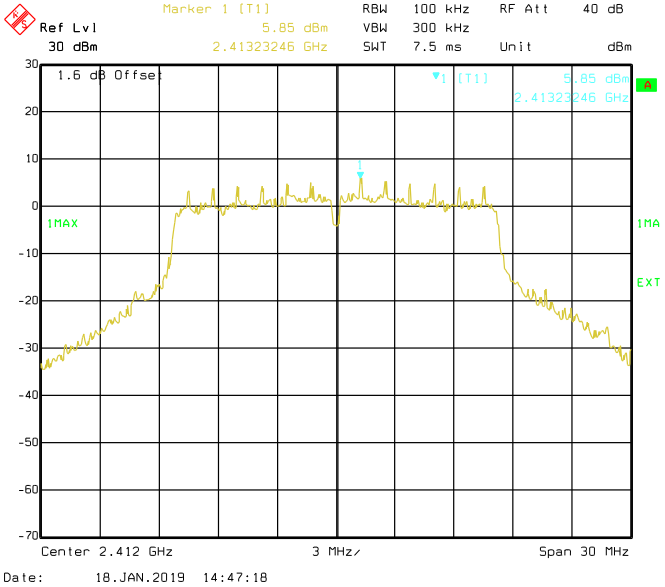
Conducted Emissions. 802.11b, Frequency 2462 MHz Emission Level, 15 GHz -> 20 GHz



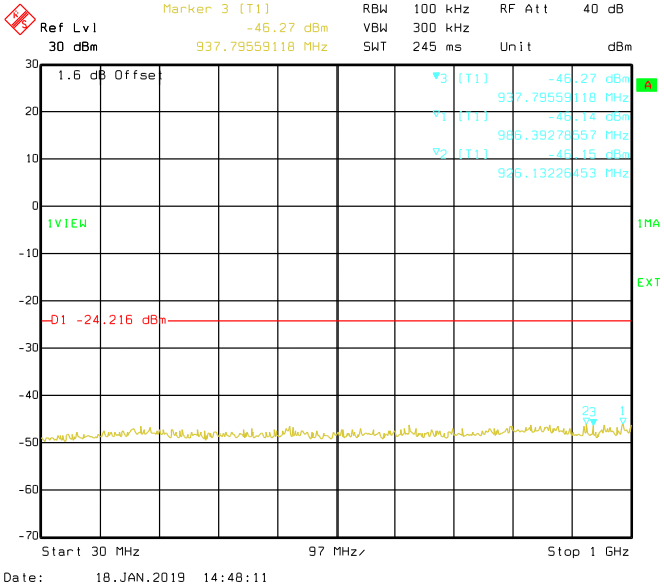
Conducted Emissions. 802.11b, Frequency 2462 MHz Emission Level, 20 GHz -> 25 GHz

802.11g

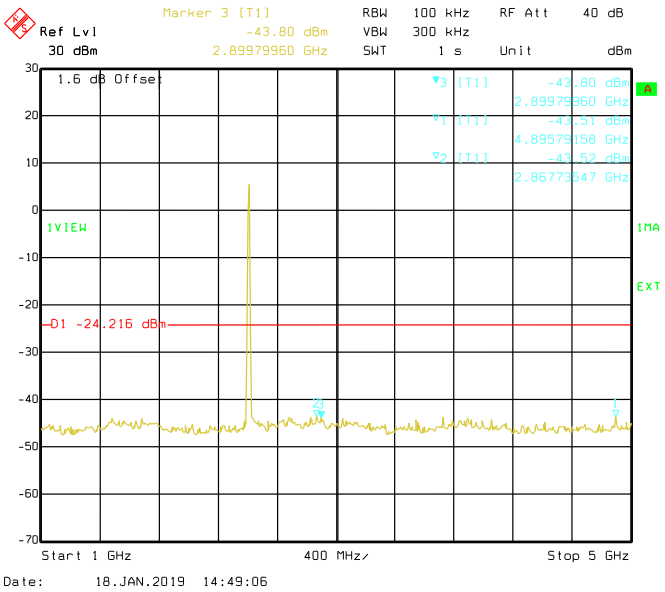
Test Conditions				Test Frequency	Results		
Standard	Modulation Type	Modulation Technology	Data Rate (mbps)	Tx (MHz)	Spurs (MHz)	Level (dBm)	Status
802.11g	OFDM	BPSK	6	2412	14188.38	-39.61	Pass
					6673.35	-40.96	Pass
					6603.21	-40.98	Pass
802.11g	OFDM	BPSK	6	2437	14188.38	-39.18	Pass
					6723.45	-40.70	Pass
					6703.41	-40.95	Pass
802.11g	OFDM	BPSK	6	2462	14188.38	-39.42	Pass
					6643.29	-40.31	Pass
					6703.41	-40.48	Pass



Conducted Emissions. 802.11g, Frequency 2412 MHz Reference Level

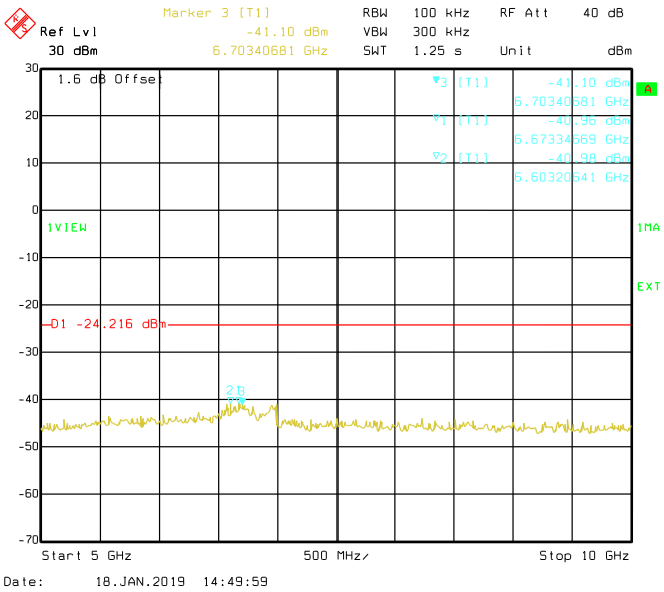


Conducted Emissions. 802.11g, Frequency 2412 MHz Emission Level, 30 MHz -> 1 GHz



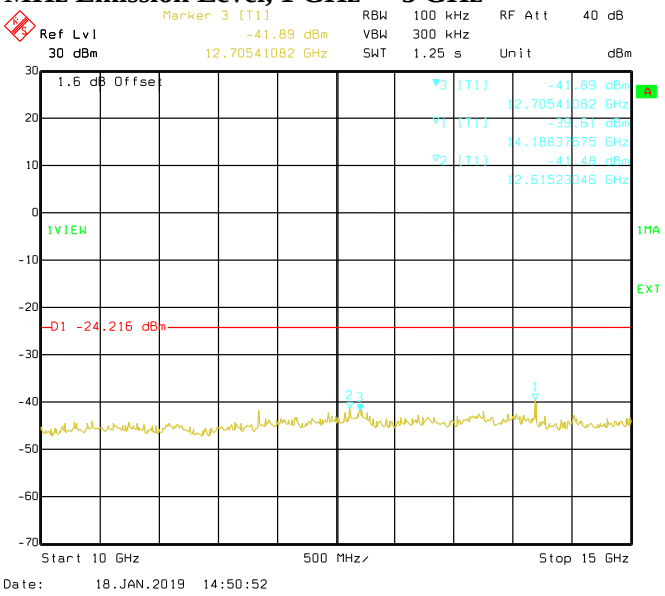
Date: 18.JAN.2019 14:49:06

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



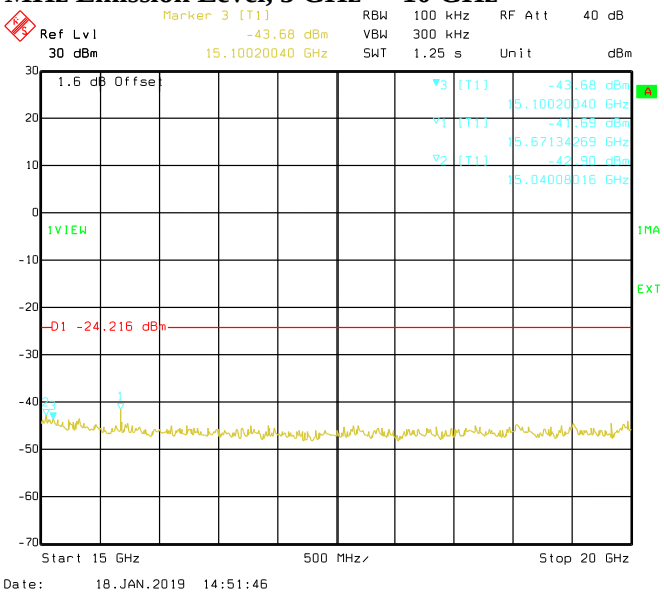
Date: 18.JAN.2019 14:49:59

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



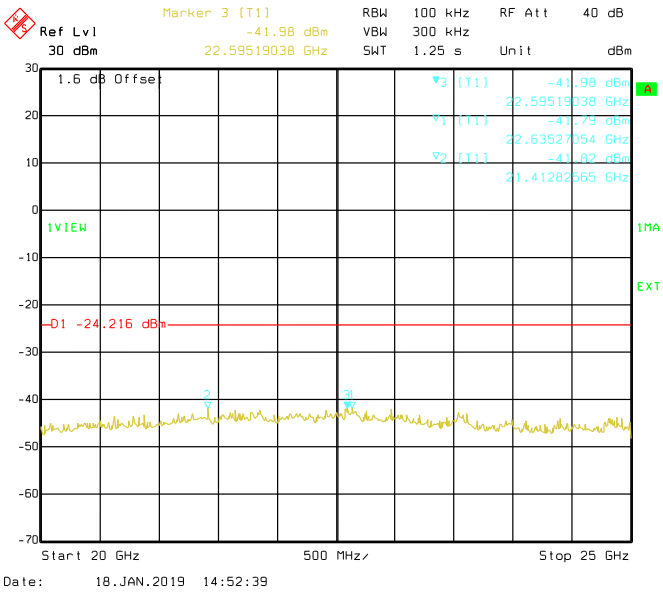
Date: 18.JAN.2019 14:50:52

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

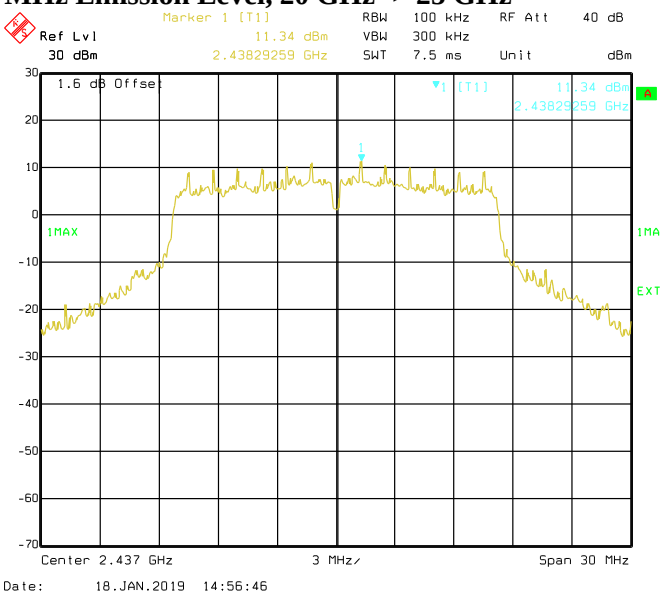


Date: 18.JAN.2019 14:51:46

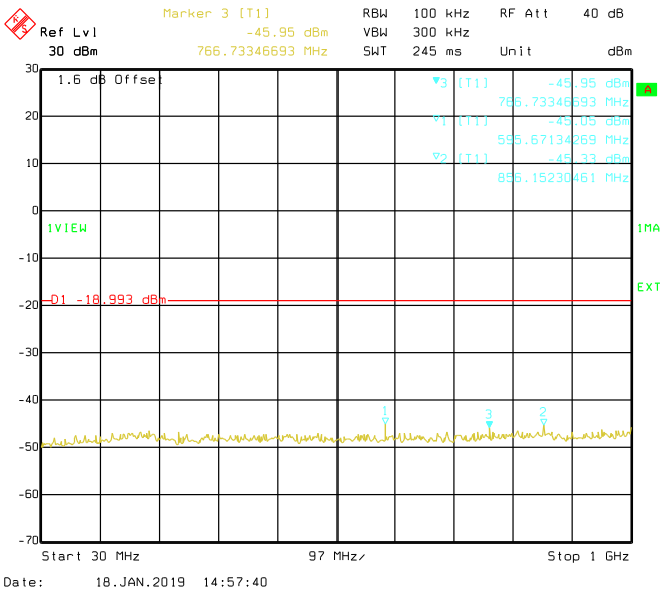
Conducted Emissions. 802.11g, Frequency 2412 MHz Emission Level, 15 GHz -> 20 GHz



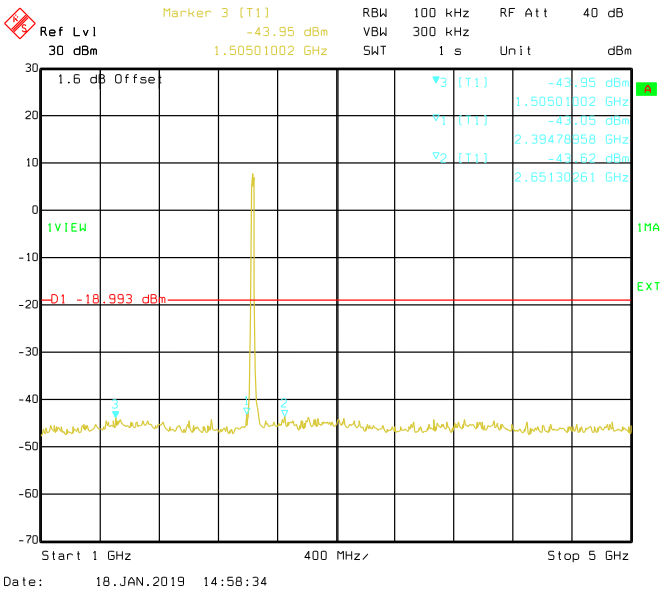
Conducted Emissions. 802.11g, Frequency 2412 MHz Emission Level, 20 GHz -> 25 GHz



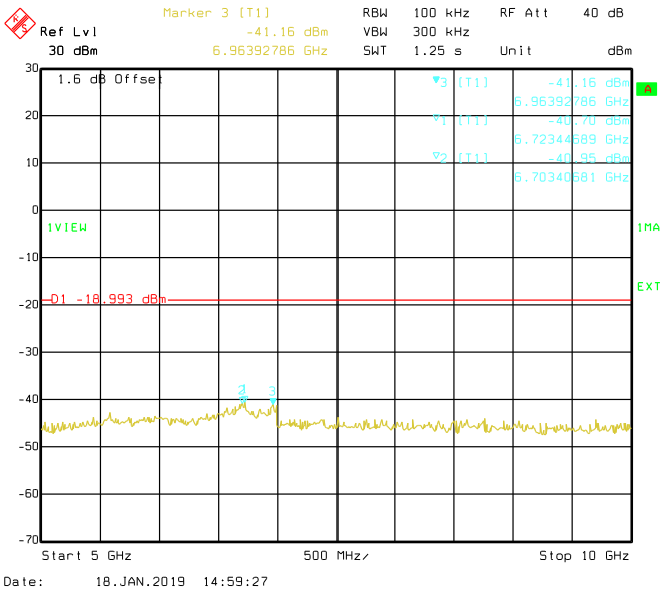
Conducted Emissions. 802.11g, Frequency 2437 MHz Reference Level



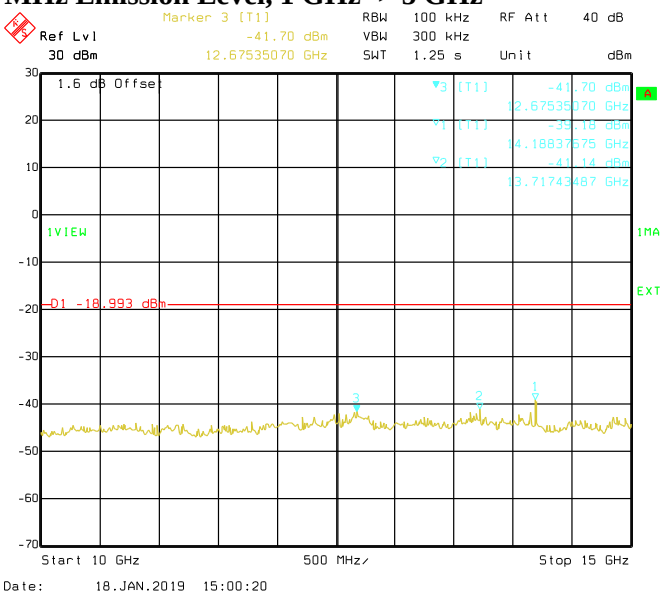
Conducted Emissions. 802.11g, Frequency 2437 MHz Emission Level, 30 MHz -> 1 GHz



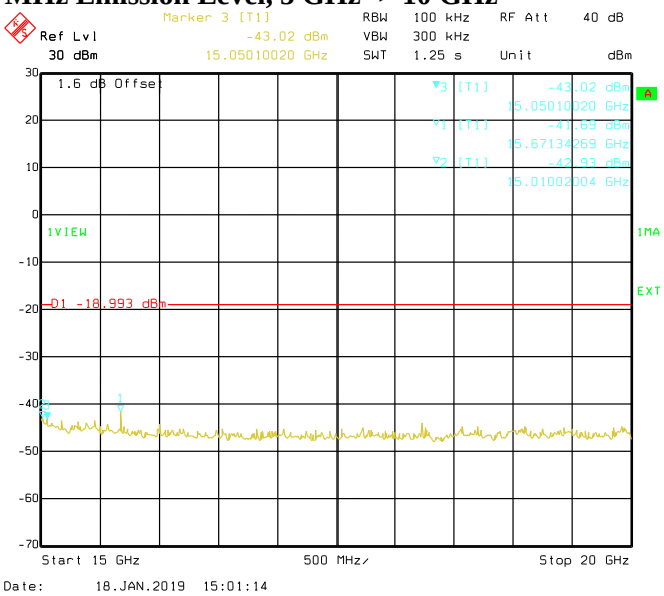
Conducted Emissions. 802.11g, Frequency 2437 MHz Emission Level, 1 GHz -> 5 GHz



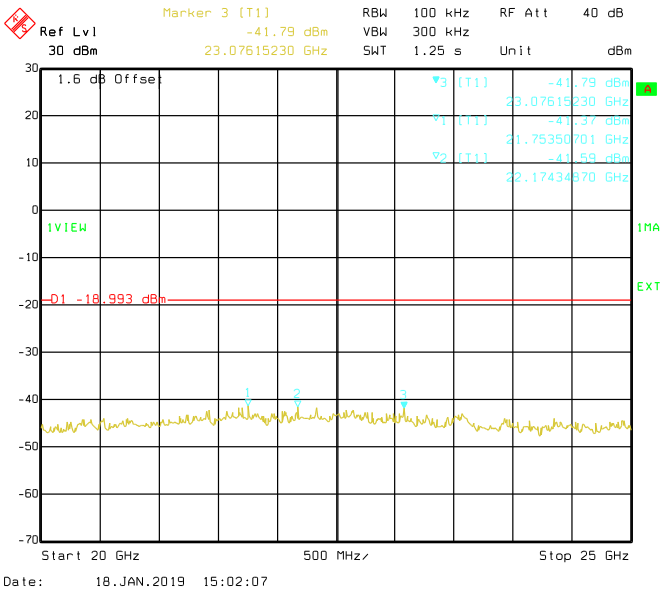
Conducted Emissions. 802.11g, Frequency 2437 MHz Emission Level, 5 GHz -> 10 GHz



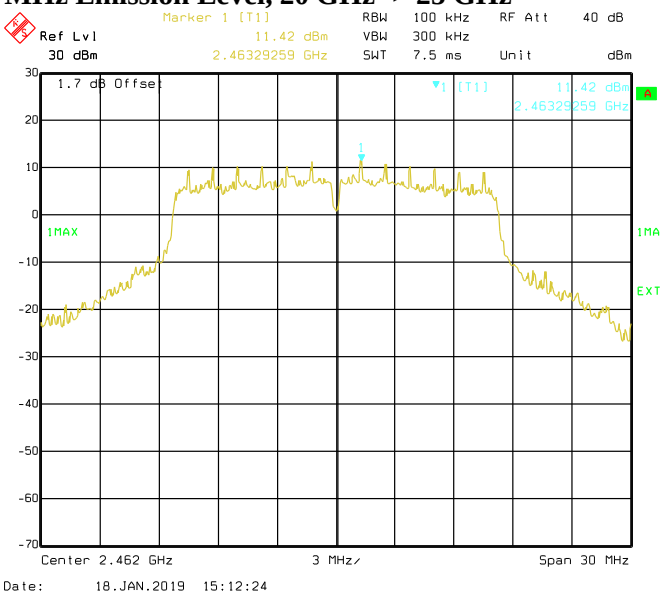
Conducted Emissions. 802.11g, Frequency 2437 Emission Level, 10 GHz -> 15 GHz



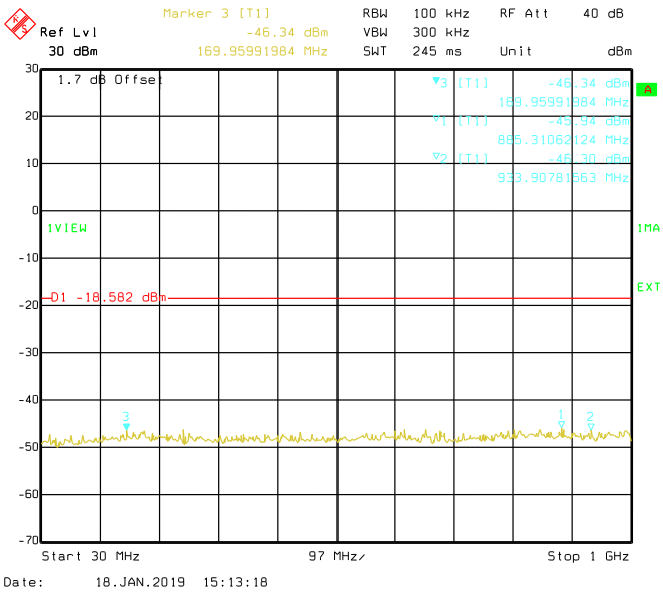
Conducted Emissions. 802.11g, Frequency 2437 MHz Emission Level, 15 GHz -> 20 GHz



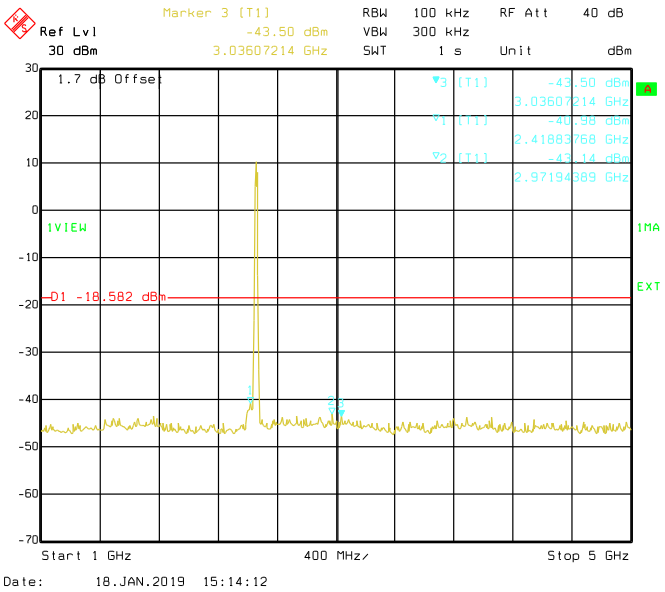
Conducted Emissions. 802.11g, Frequency 2437 MHz Emission Level, 20 GHz -> 25 GHz



Conducted Emissions. 802.11g, Frequency 2462 MHz Reference Level

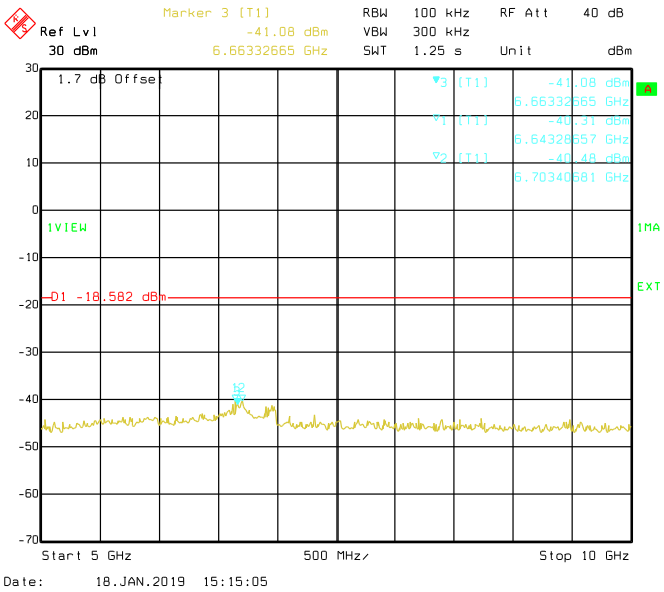


Conducted Emissions. 802.11g, Frequency 2462 MHz Emission Level, 30 MHz -> 1 GHz



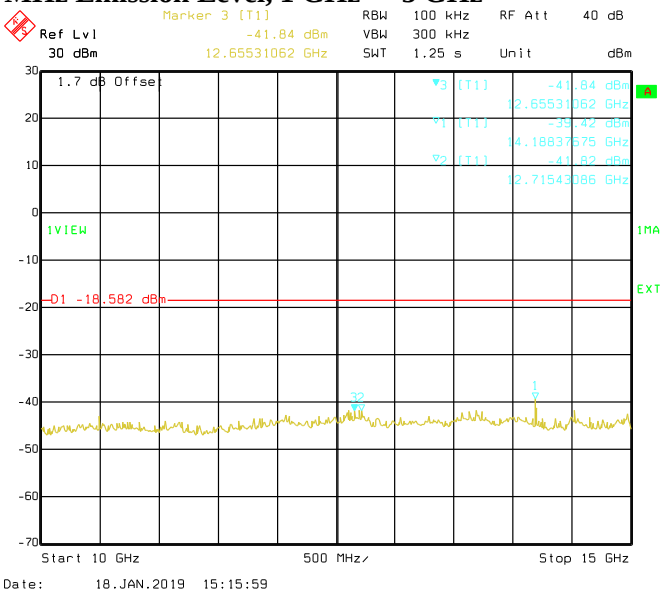
Date: 18.JAN.2019 15:14:12

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



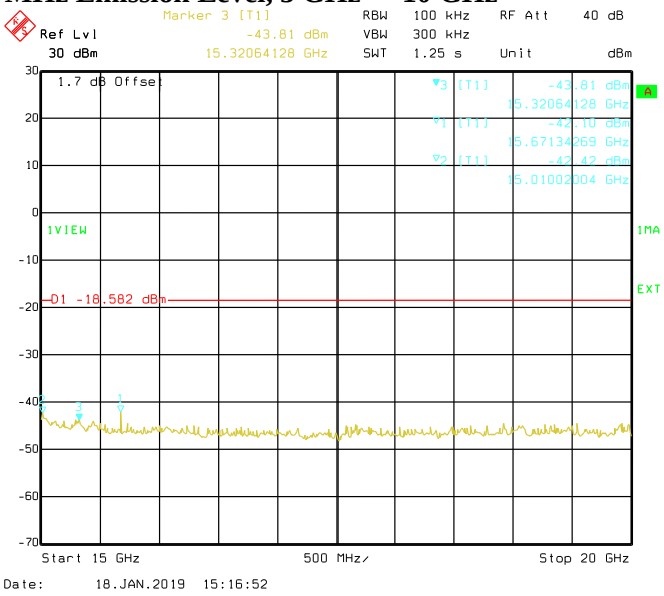
Date: 18.JAN.2019 15:15:05

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



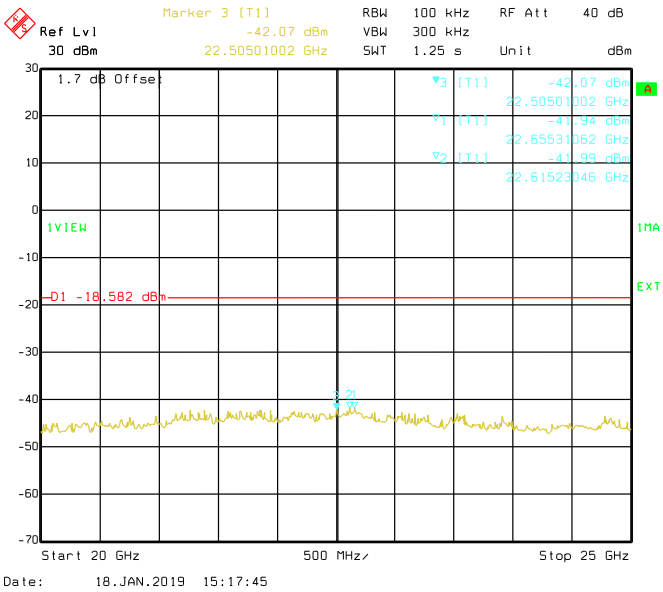
Date: 18.JAN.2019 15:15:59

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



Date: 18.JAN.2019 15:16:52

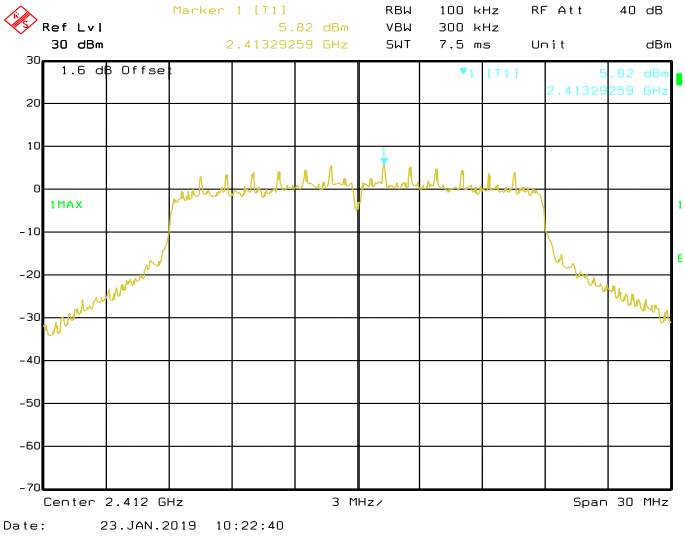
Conducted Emissions. 802.11g, Frequency 2462 MHz Emission Level, 15 GHz -> 20 GHz



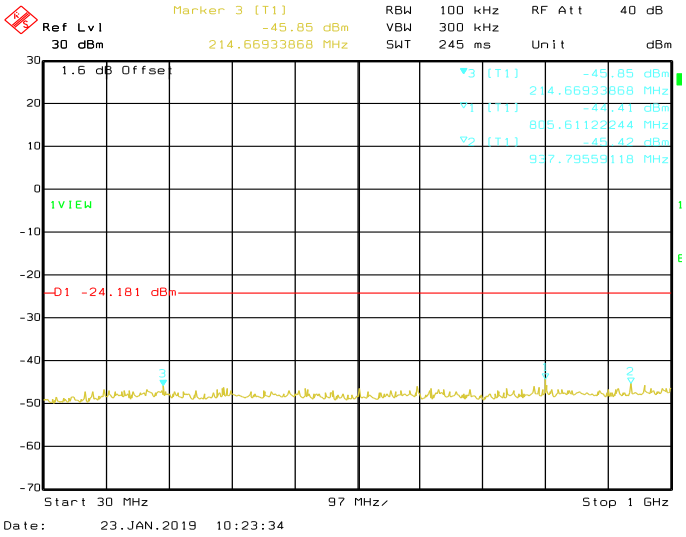
Conducted Emissions. 802.11g, Frequency 2462 MHz Emission Level, 20 GHz -> 25 GHz

802.11n (HT20)

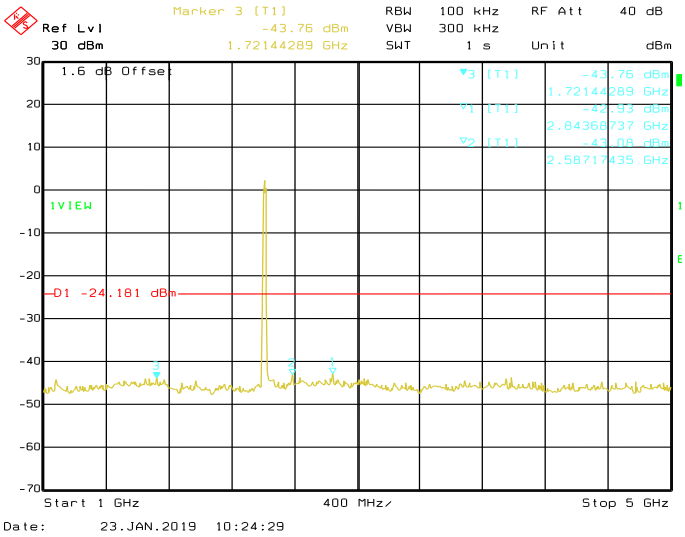
Test Conditions				Test Frequency	Results		
Standard	Modulation Type	Modulation Technology	Data Rate (mbps)	Tx (MHz)	Spurs (MHz)	Level (dBm)	Status
802.11n	OFDM	DBPSK	6.5	2412	14188.38	-39.96	Pass
					6693.39	-40.87	Pass
					6933.87	-41.09	Pass
802.11n	OFDM	DBPSK	6.5	2437	14188.38	-39.39	Pass
					13617.23	-39.57	Pass
					6733.47	-40.52	Pass
802.11n	OFDM	DBPSK	6.5	2462	6973.95	-40.01	Pass
					6663.33	-40.26	Pass
					14188.38	-40.33	Pass



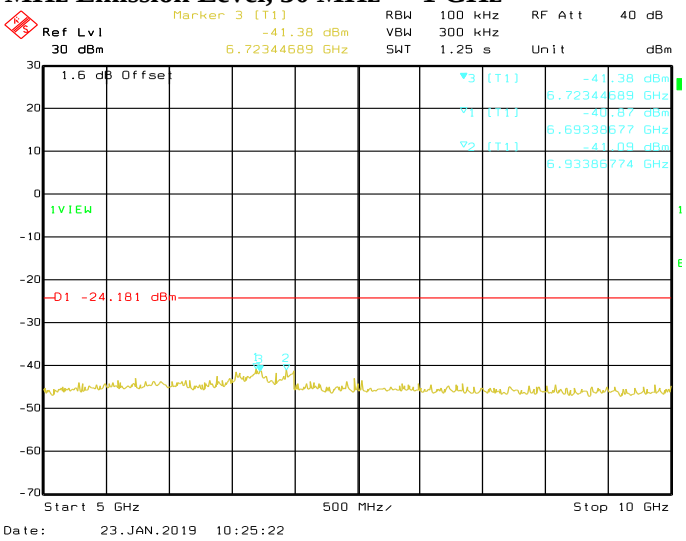
Conducted Emissions. 802.11n, Frequency 2412 MHz Reference Level



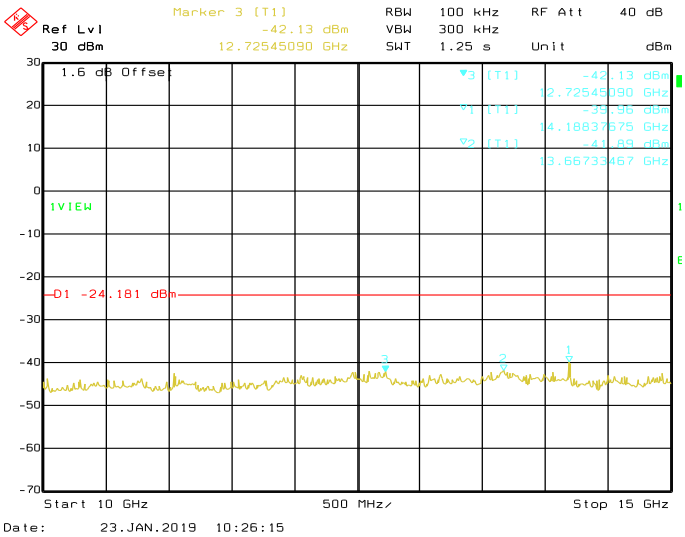
Conducted Emissions. 802.11n, Frequency 2412 MHz Emission Level, 30 MHz -> 1 GHz



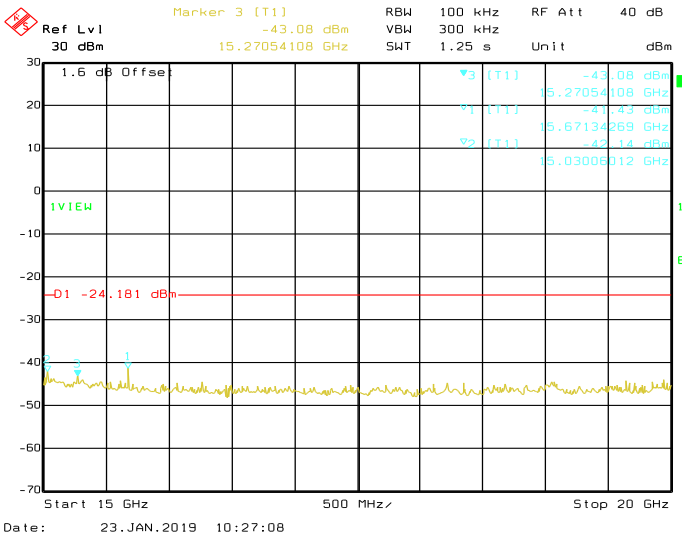
Conducted Emissions. 802.11n, Frequency 2412 MHz Emission Level, 1 GHz -> 5 GHz



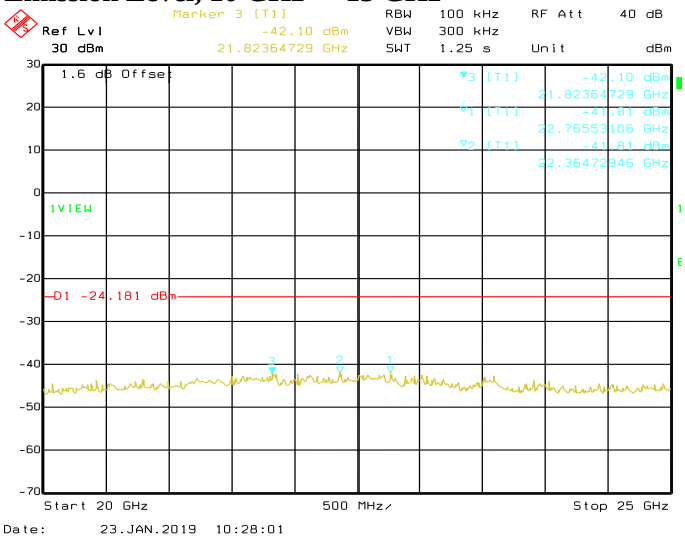
Conducted Emissions. 802.11n, Frequency 2412 MHz Emission Level, 5 GHz -> 10 GHz



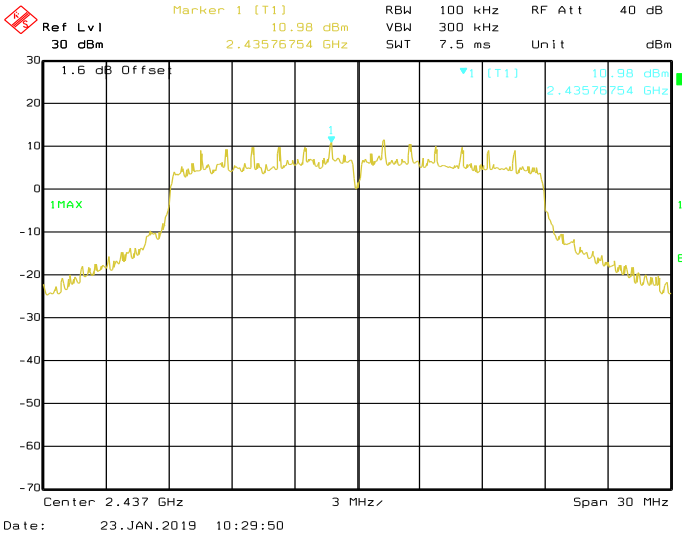
Conducted Emissions. 802.11n, Frequency 2412 Emission Level, 10 GHz -> 15 GHz



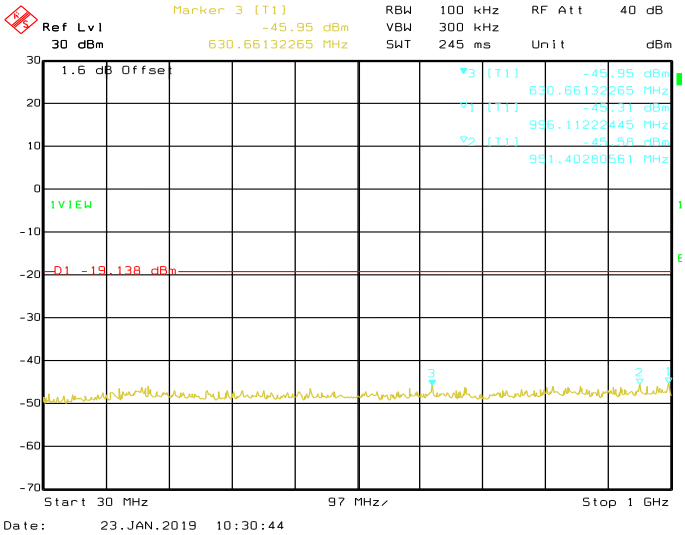
Conducted Emissions. 802.11n, Frequency 2412 MHz Emission Level, 15 GHz -> 20 GHz



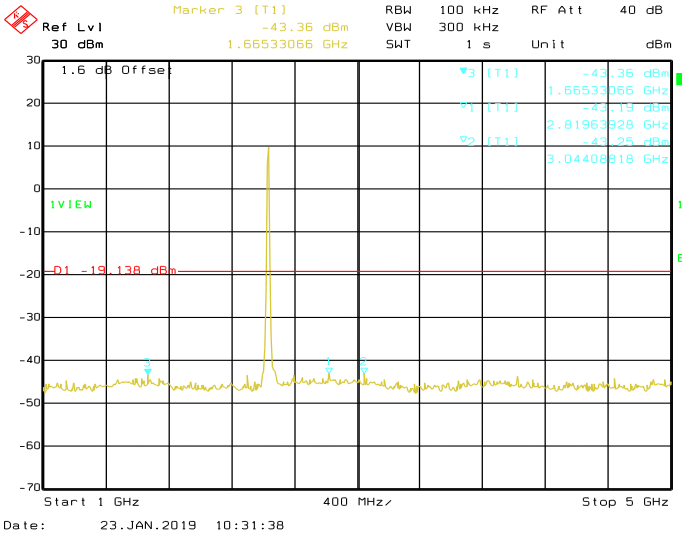
Conducted Emissions. 802.11n, Frequency 2412 MHz Emission Level, 20 GHz -> 25 GHz



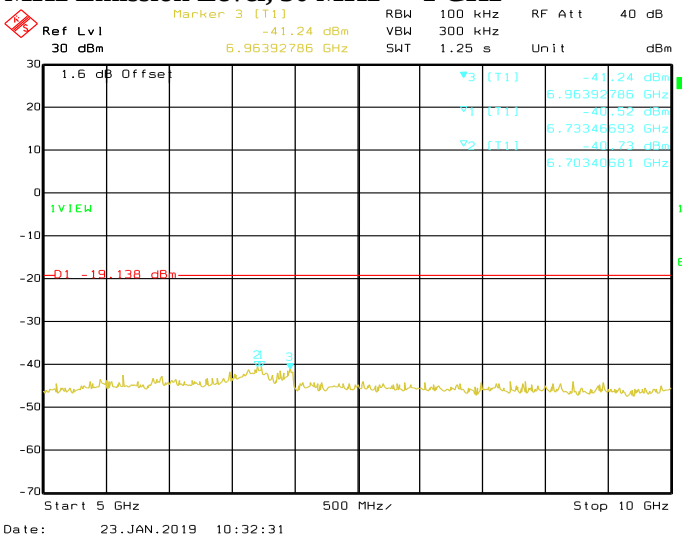
Conducted Emissions. 802.11n, Frequency 2437 MHz Reference Level



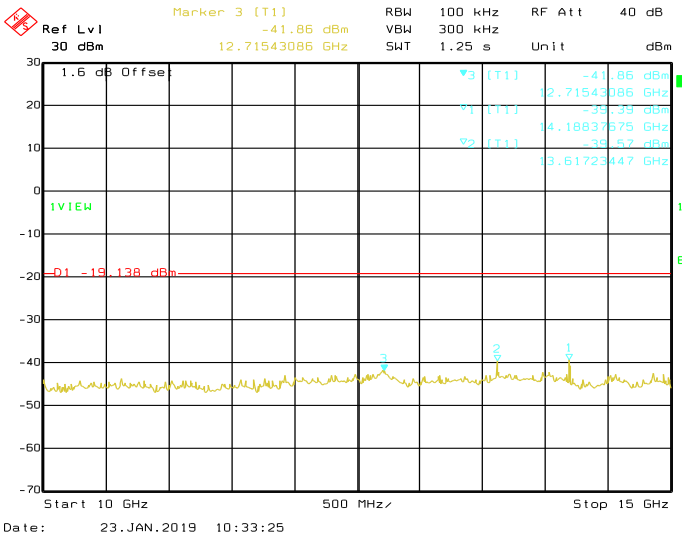
Conducted Emissions. 802.11n, Frequency 2437 MHz Emission Level, 30 MHz -> 1 GHz



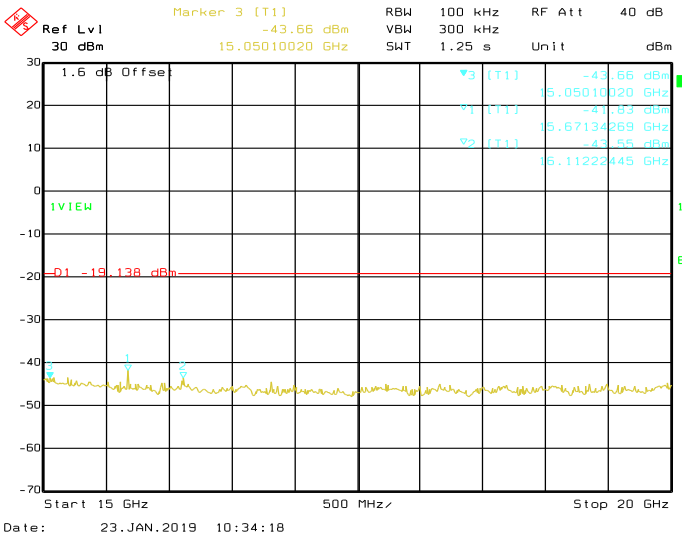
Conducted Emissions. 802.11n, Frequency 2437 MHz Emission Level, 1 GHz -> 5 GHz



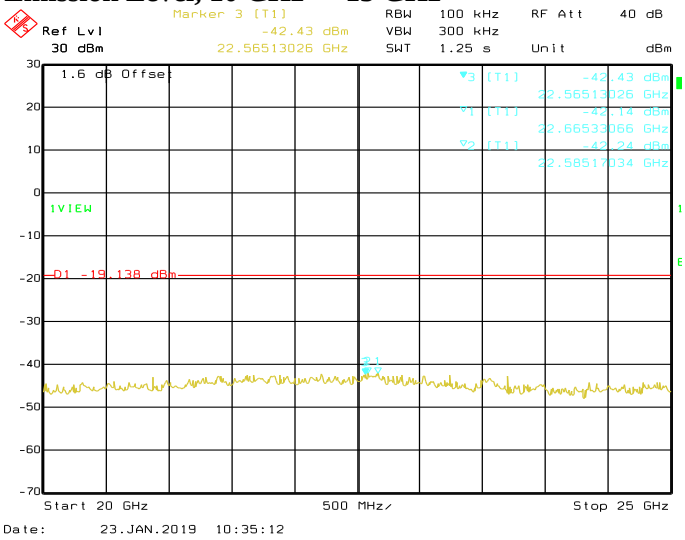
Conducted Emissions. 802.11n, Frequency 2437 MHz Emission Level, 5 GHz -> 10 GHz



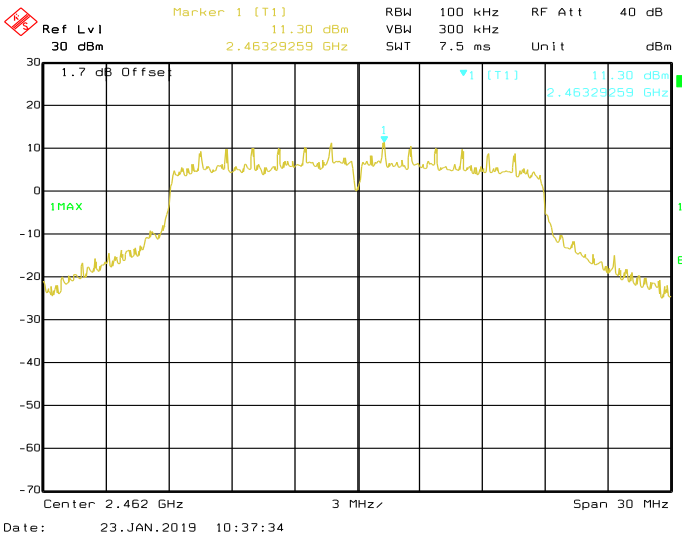
Conducted Emissions. 802.11n, Frequency 2437 Emission Level, 10 GHz -> 15 GHz



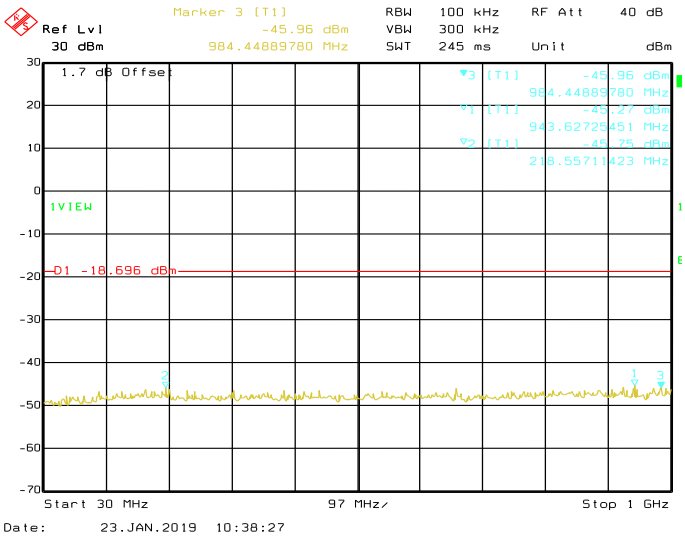
Conducted Emissions. 802.11n, Frequency 2437 MHz Emission Level, 15 GHz -> 20 GHz



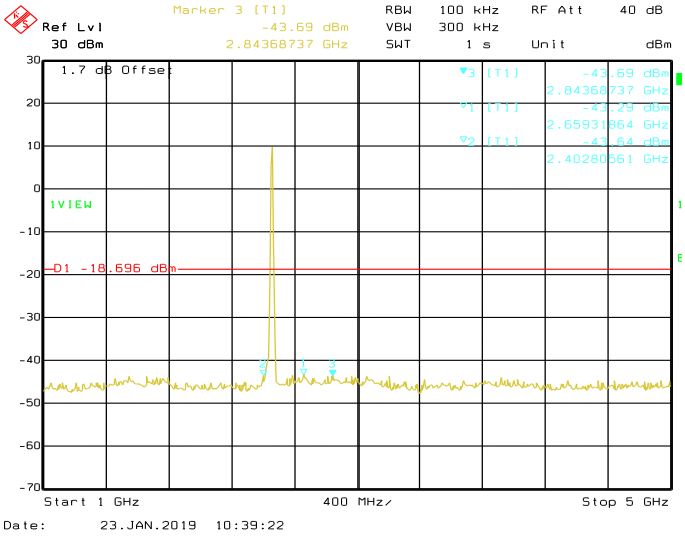
Conducted Emissions. 802.11n, Frequency 2437 MHz Emission Level, 20 GHz -> 25 GHz



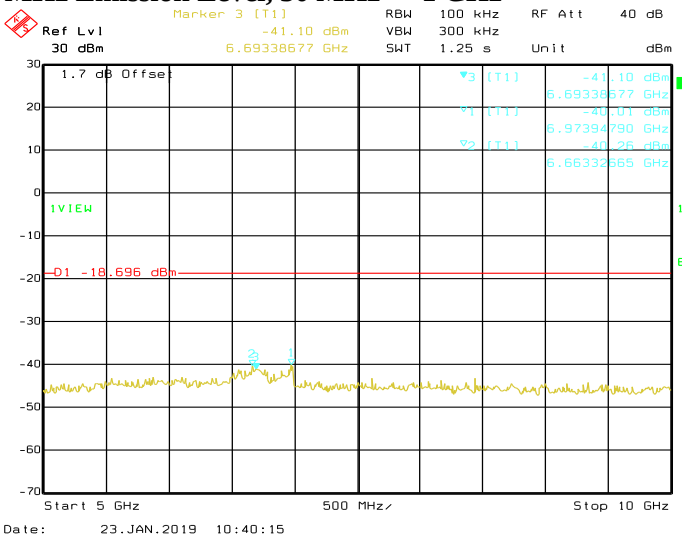
Conducted Emissions. 802.11n, Frequency 2462 MHz Reference Level



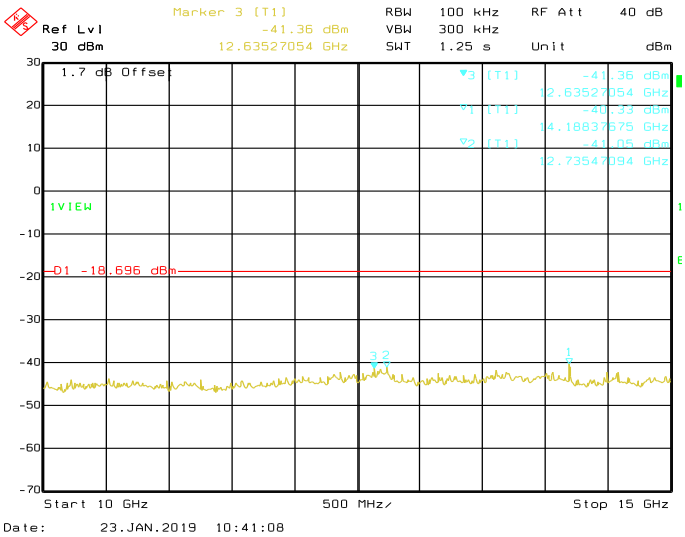
Conducted Emissions. 802.11n, Frequency 2462 MHz Emission Level, 30 MHz -> 1 GHz



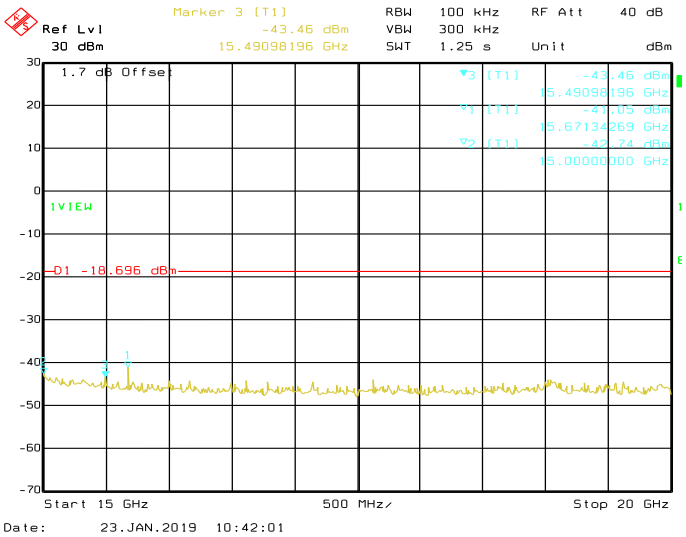
Conducted Emissions. 802.11n, Frequency 2462 MHz Emission Level, 1 GHz -> 5 GHz



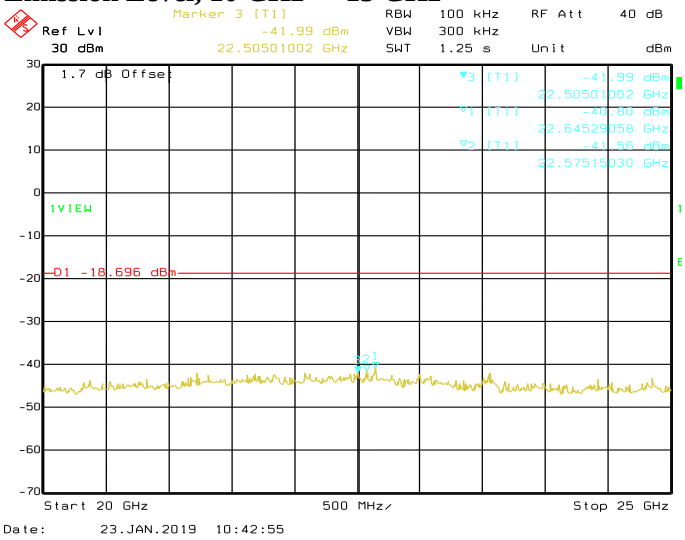
Conducted Emissions. 802.11n, Frequency 2462 MHz Emission Level, 5 GHz -> 10 GHz



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



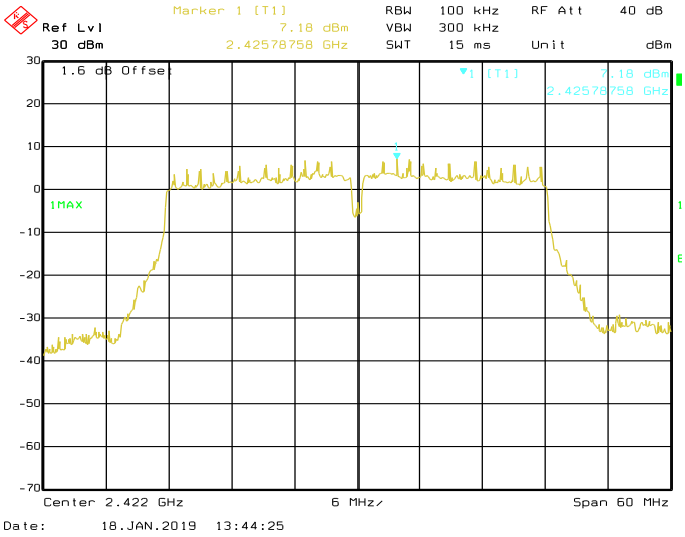
Conducted Emissions. 802.11n, Frequency 2462 MHz Emission Level, 15 GHz -> 20 GHz



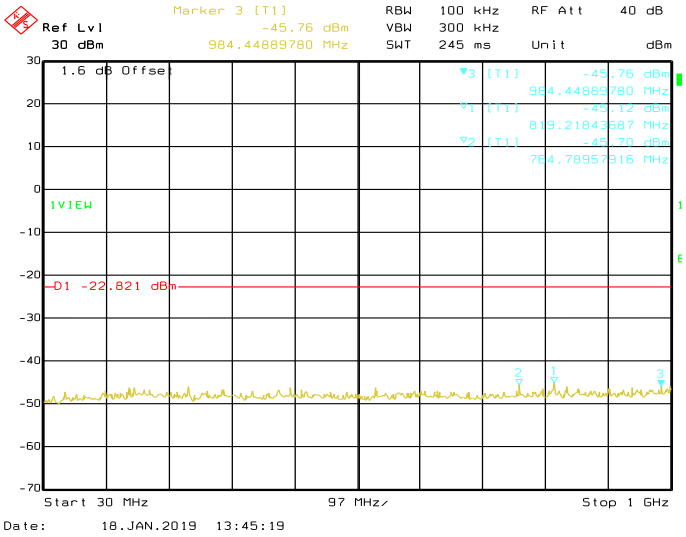
Conducted Emissions. 802.11n, Frequency 2462 MHz Emission Level, 20 GHz -> 25 GHz

802.11n (HT40)

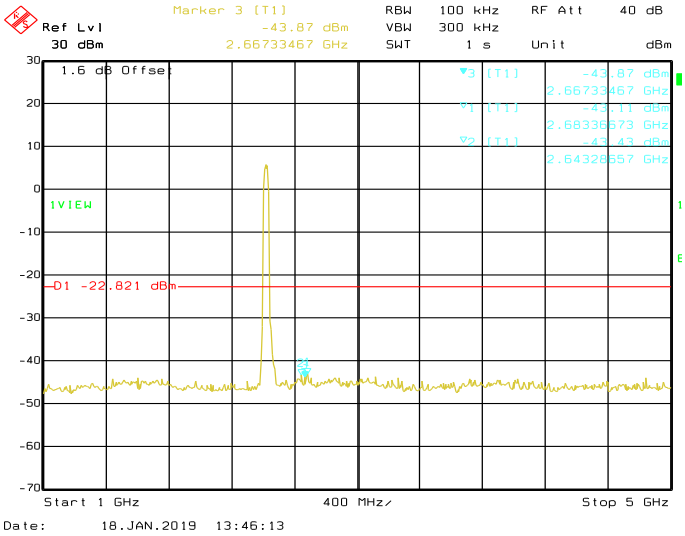
Test Conditions				Test Frequency	Results		
Standard	Modulation Type	Modulation Technology	Data Rate (mbps)	Tx (MHz)	Spurs (MHz)	Level (dBm)	Status
802.11n	OFDM	DBPSK	13.5	2422	14188.38	-39.99	Pass
					6693.39	-40.70	Pass
					13697.39	-40.89	Pass
802.11n	OFDM	DBPSK	13.5	2437	14198.40	-39.62	Pass
					6983.97	-40.03	Pass
					12735.47	-40.72	Pass
802.11n	OFDM	DBPSK	13.5	2452	14188.38	-39.08	Pass
					15671.34	-41.19	Pass
					6983.97	-41.22	Pass



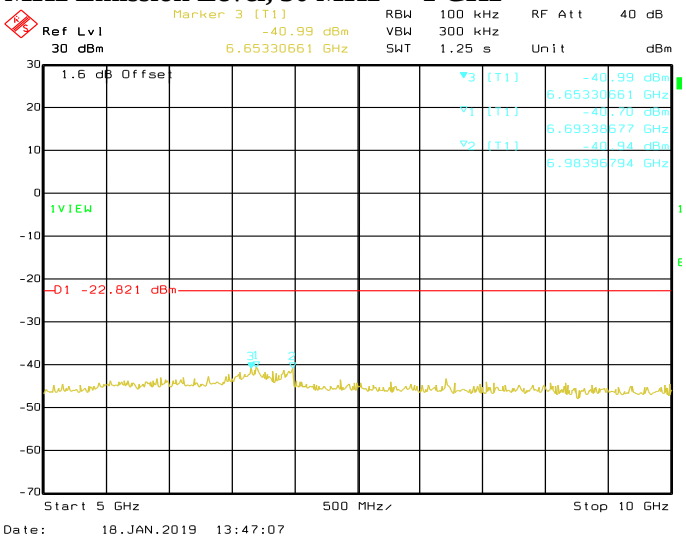
Conducted Emissions. 802.11n, Frequency 2422 MHz Reference Level



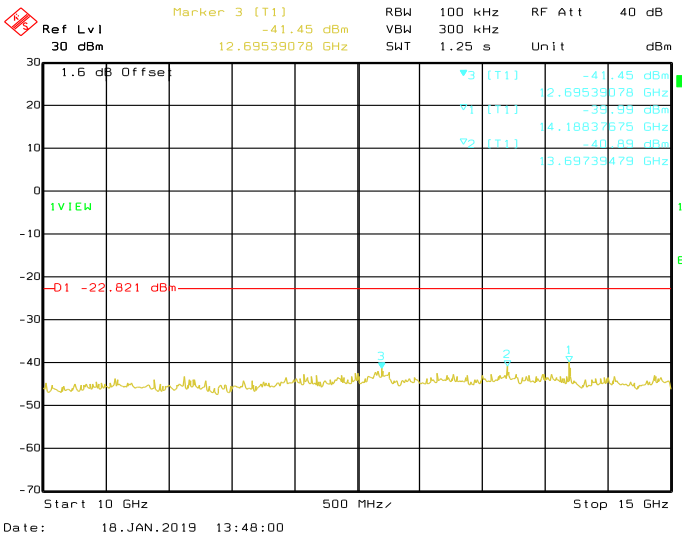
Conducted Emissions. 802.11n, Frequency 2422 MHz Emission Level, 30 MHz -> 1 GHz



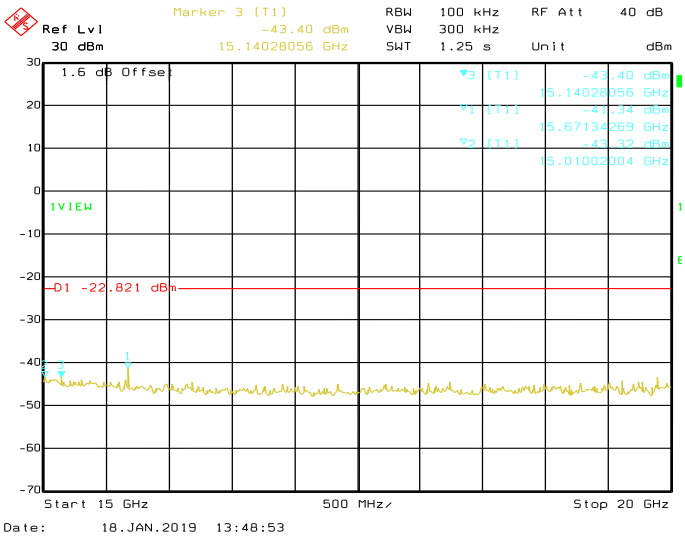
Conducted Emissions. 802.11n, Frequency 2422 MHz Emission Level, 1 GHz -> 5 GHz



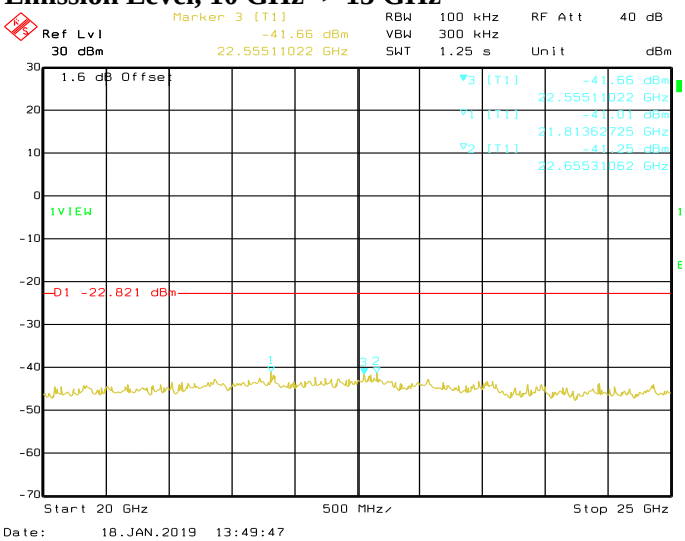
Conducted Emissions. 802.11n, Frequency 2422 MHz Emission Level, 5 GHz -> 10 GHz



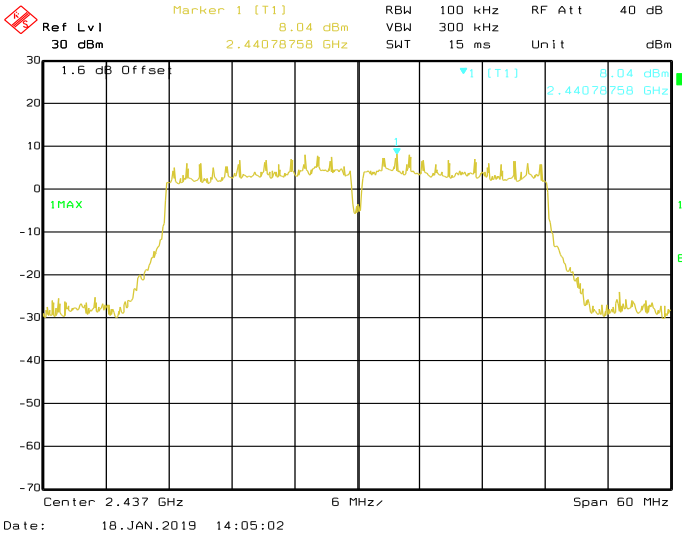
Conducted Emissions. 802.11n, Frequency 2422 Emission Level, 10 GHz -> 15 GHz



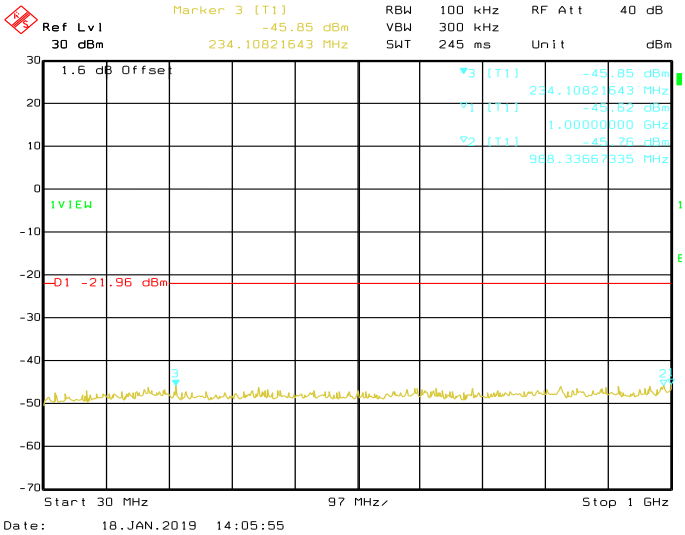
Conducted Emissions. 802.11n, Frequency 2422 MHz Emission Level, 15 GHz -> 20 GHz



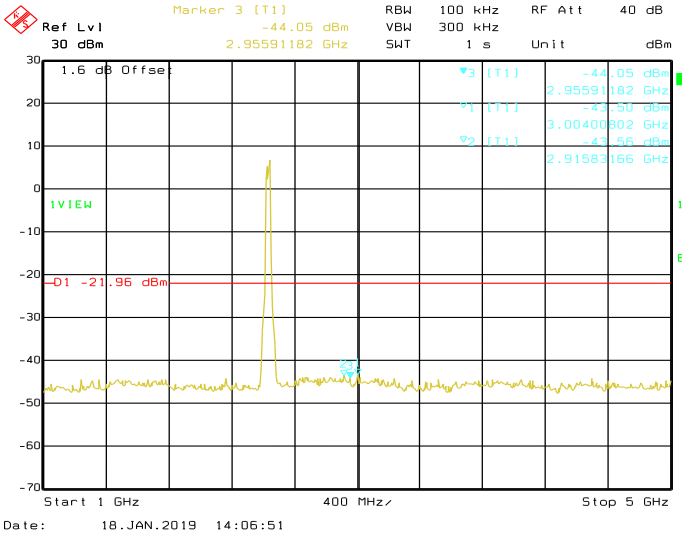
Conducted Emissions. 802.11n, Frequency 2422 MHz Emission Level, 20 GHz -> 25 GHz



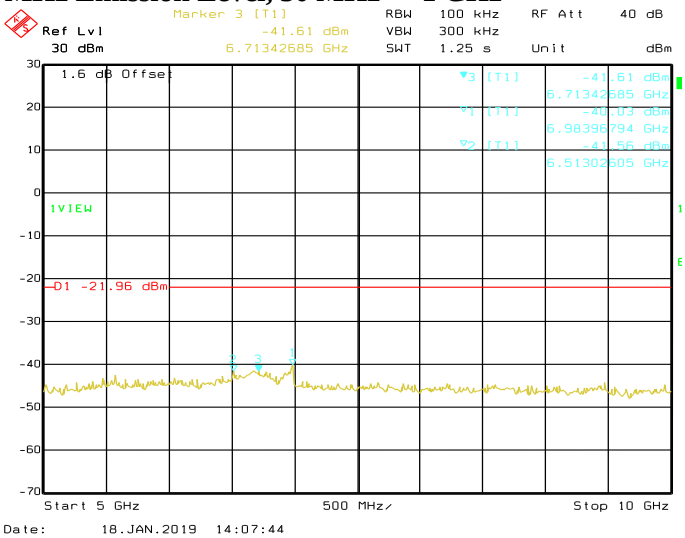
Conducted Emissions. 802.11n, Frequency 2437 MHz Reference Level



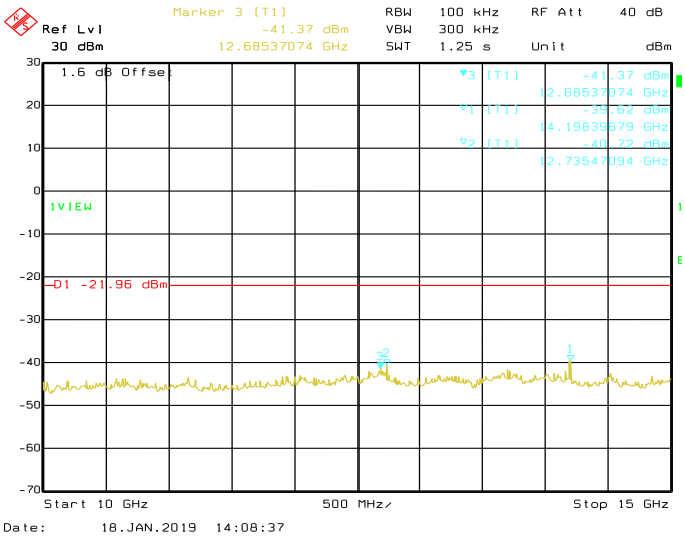
Conducted Emissions. 802.11n, Frequency 2437 MHz Emission Level, 30 MHz -> 1 GHz



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

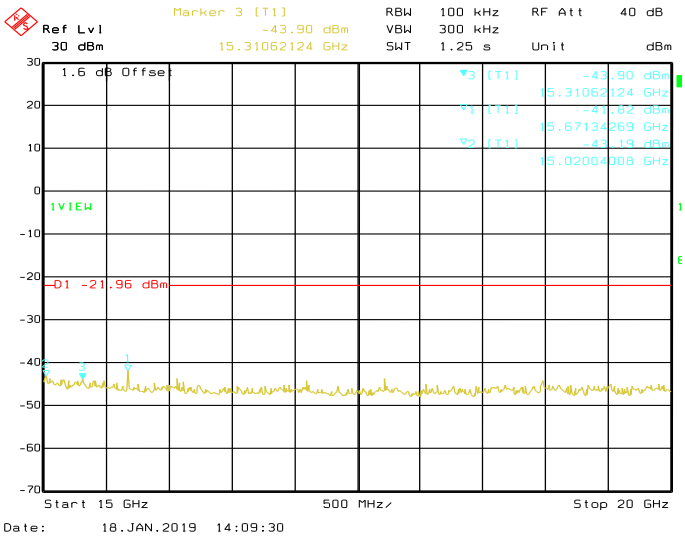


Conducted Emissions. 802.11n, Frequency 2437 MHz Emission Level, 5 GHz -> 10 GHz



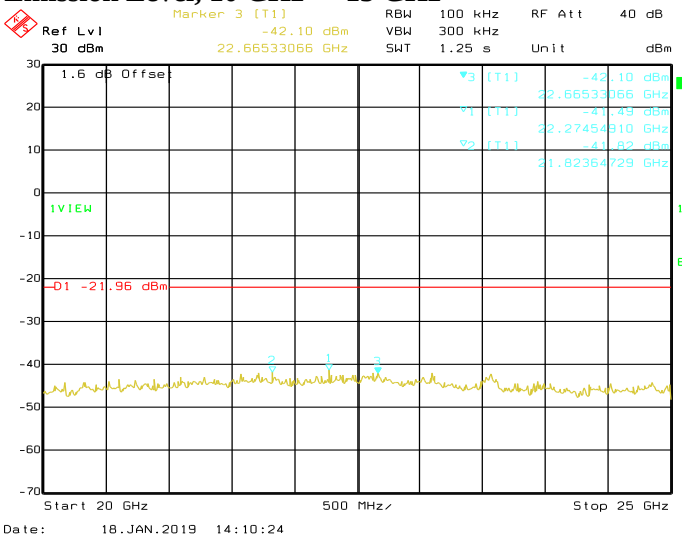
Date: 18.JAN.2019 14:08:37

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



Date: 18.JAN.2019 14:09:30

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



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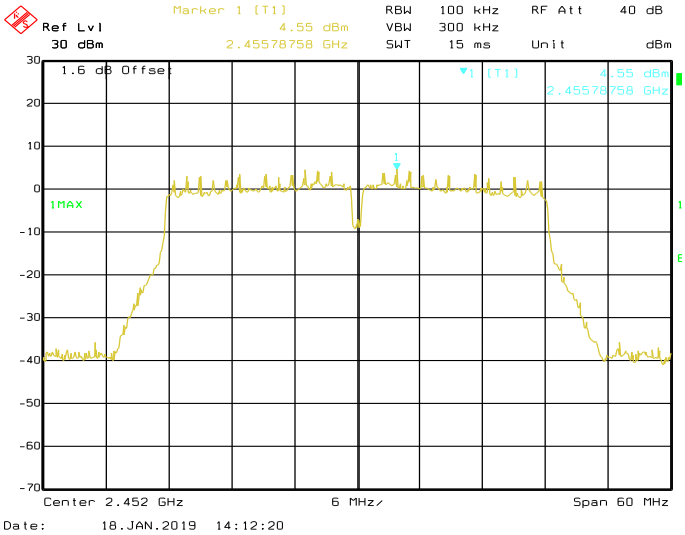
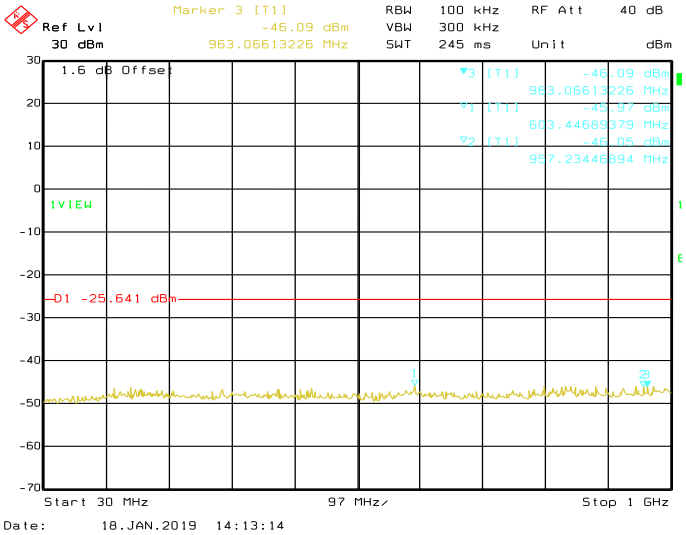
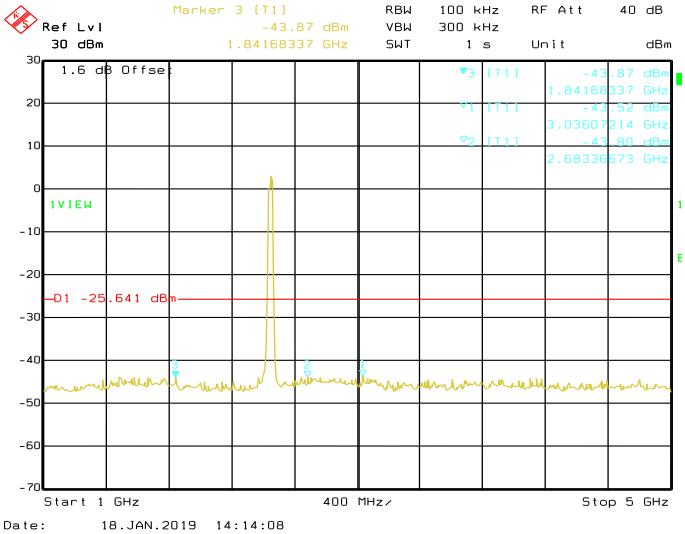
Conducted Emissions. 802.11n, Frequency 2437 MHz Emission Level, 20 GHz -> 25 GHz



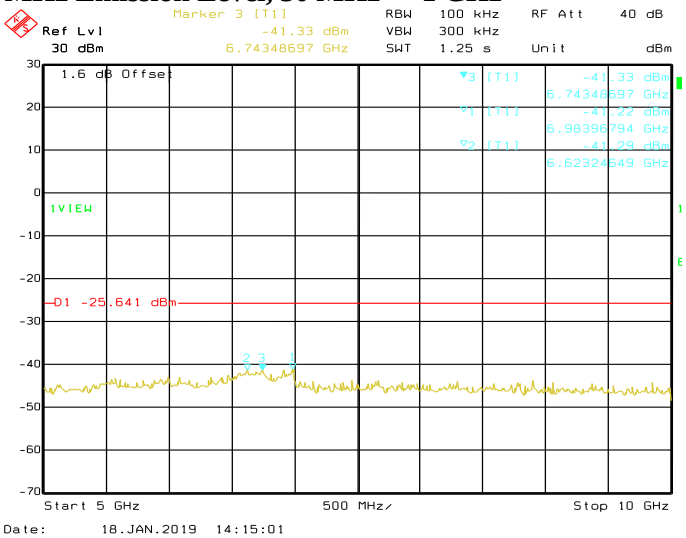
Conducted Emissions. 802.11n, Frequency 2452 MHz Reference Level



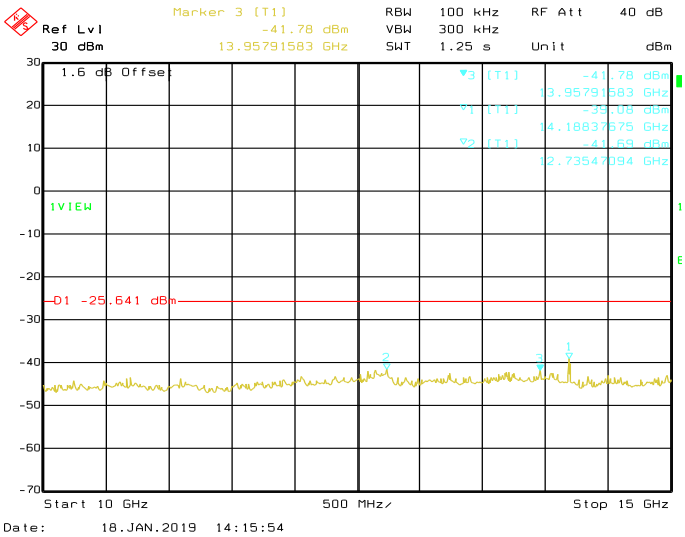
Conducted Emissions. 802.11n, Frequency 2452 MHz Emission Level, 30 MHz -> 1 GHz



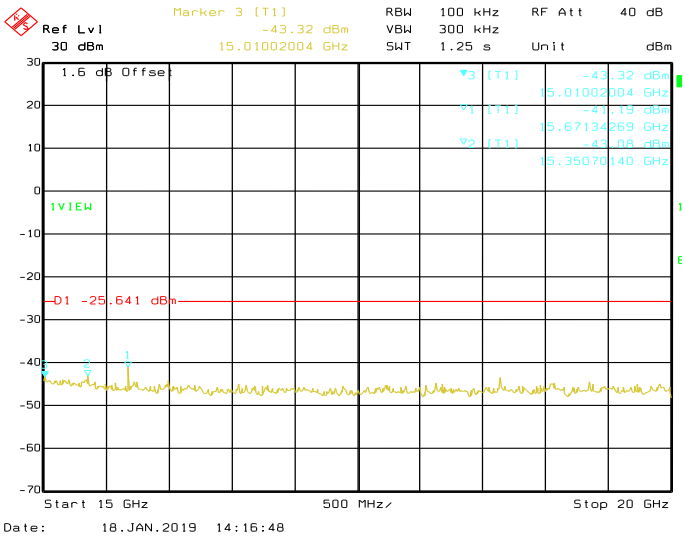
Conducted Emissions. 802.11n, Frequency 2452 MHz Emission Level, 1 GHz -> 5 GHz



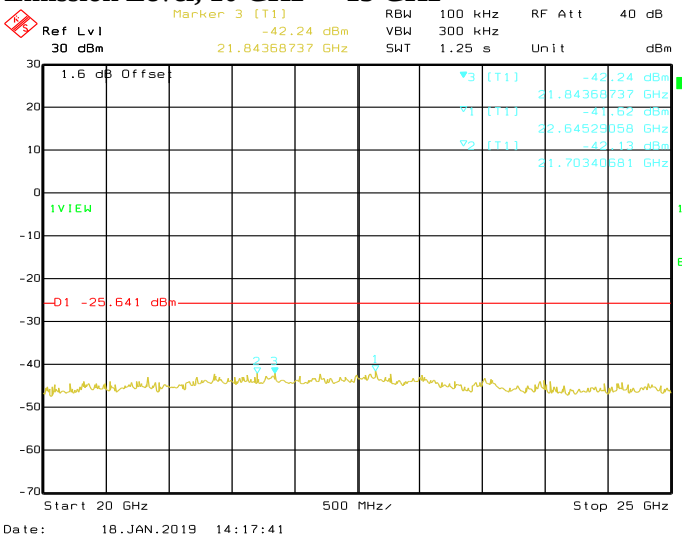
Conducted Emissions. 802.11n, Frequency 2452 MHz Emission Level, 5 GHz -> 10 GHz



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



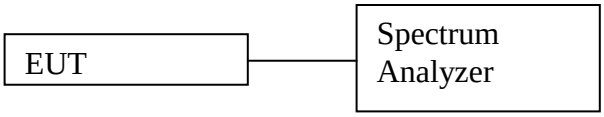
Conducted Emissions. 802.11n, Frequency 2452 MHz Emission Level, 15 GHz -> 20 GHz



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.

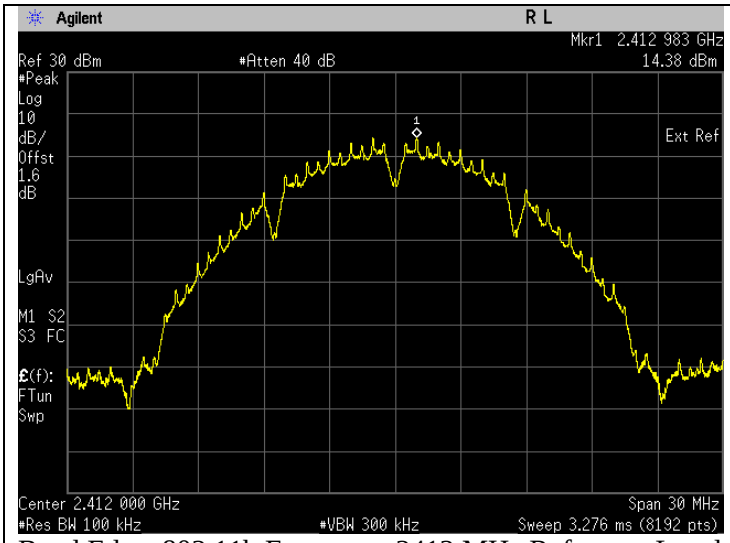
6.6.2. Test Limits:

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

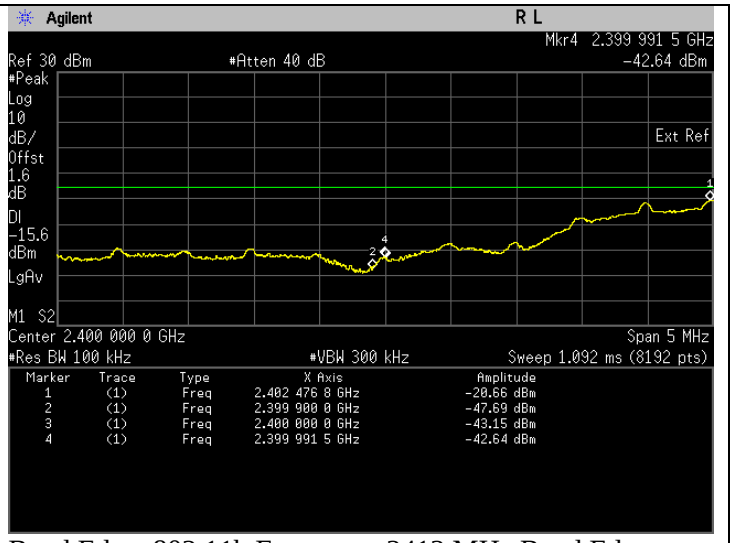
6.6.3. Test Result

802.11b

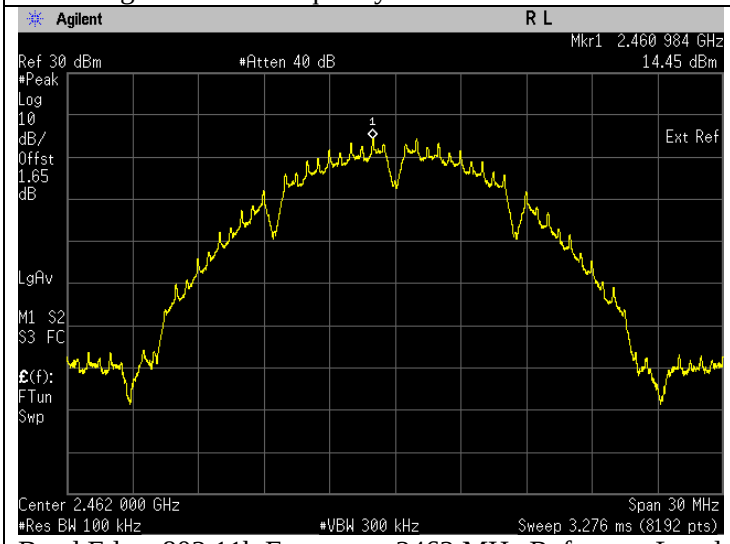
Test Conditions				Test Frequency	Results		
Standard	Modulation Type	Modulation Technology	Data Rate (mbps)	Tx (MHz)	Frequencies (MHz)	Power (dBm)	Status
802.11b	DSSS	BPSK	1	2412	2399.99	-42.64	Pass
802.11b	DSSS	BPSK	1	2462	2483.50	-47.87	Pass



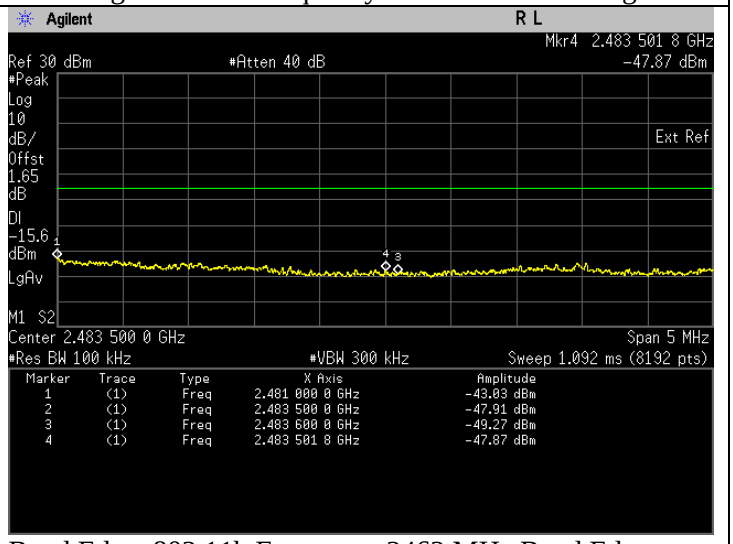
Band Edge. 802.11b Frequency 2412 MHz Reference Level



Band Edge. 802.11b Frequency 2412 MHz Band Edge



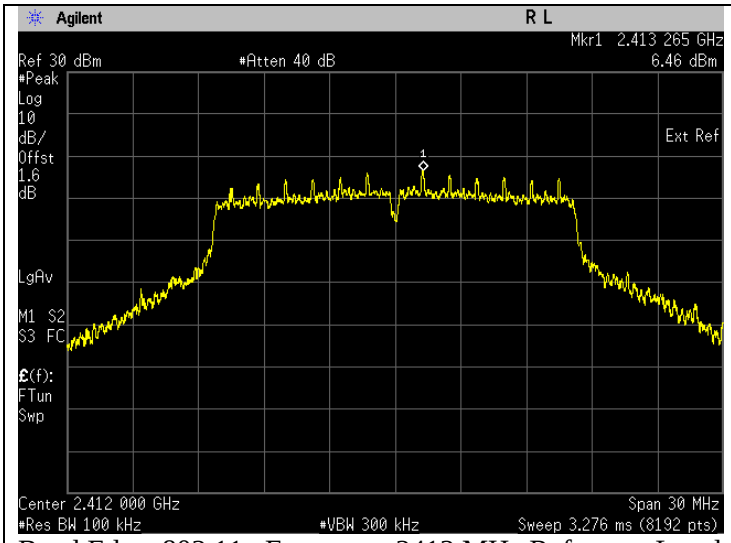
Band Edge. 802.11b Frequency 2462 MHz Reference Level



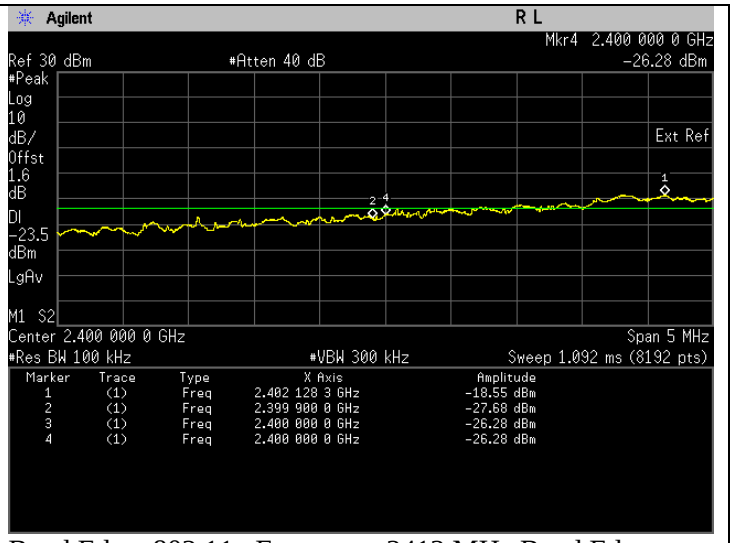
Band Edge. 802.11b Frequency 2462 MHz Band Edge

802.11g

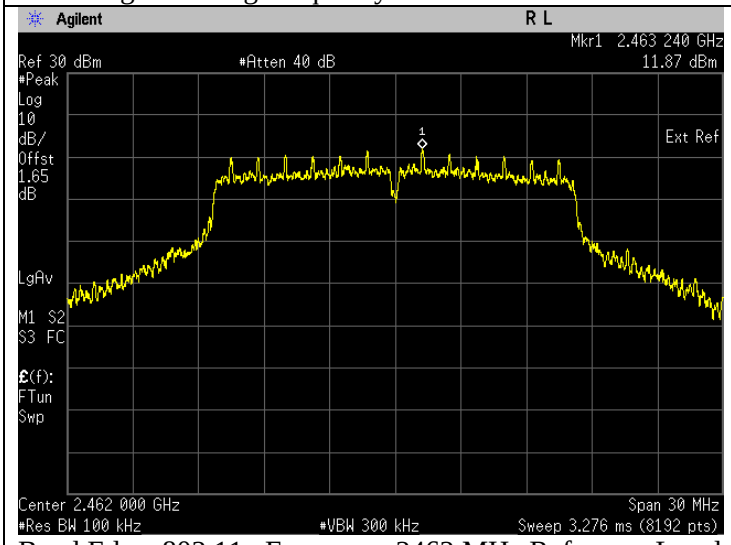
Test Conditions				Test Frequency	Results		
Standard	Modulation Type	Modulation Technology	Data Rate (mbps)	Tx (MHz)	Frequencies (MHz)	Power (dBm)	Status
802.11g	OFDM	DBPSK	6	2412	2399.99	-26.28	Pass
802.11g	OFDM	DBPSK	6	2462	2483.50	-38.76	Pass



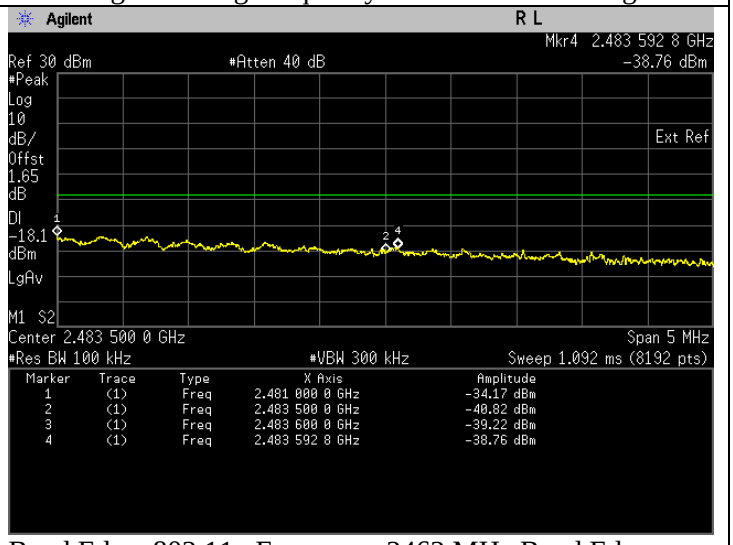
Band Edge. 802.11g Frequency 2412 MHz Reference Level



Band Edge. 802.11g Frequency 2412 MHz Band Edge



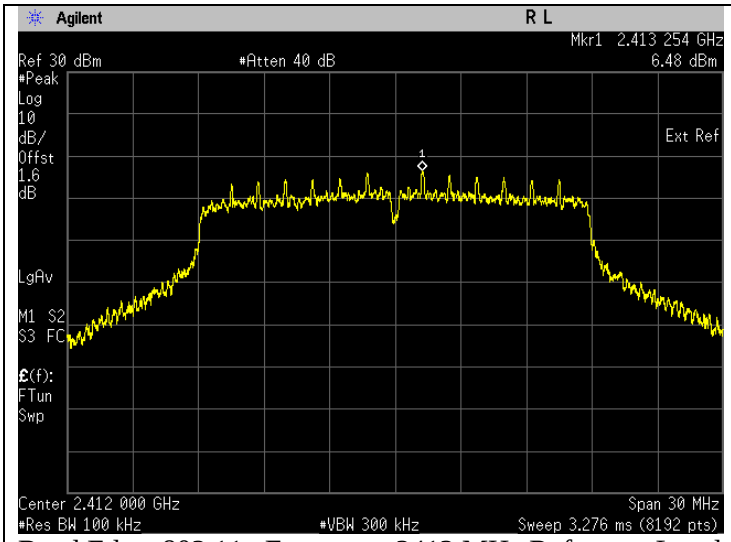
Band Edge. 802.11g Frequency 2462 MHz Reference Level



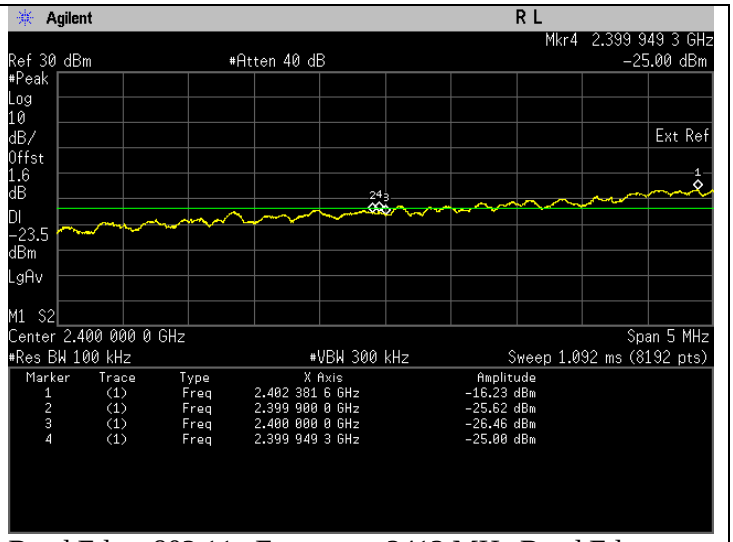
Band Edge. 802.11g Frequency 2462 MHz Band Edge

802.11n (HT20)

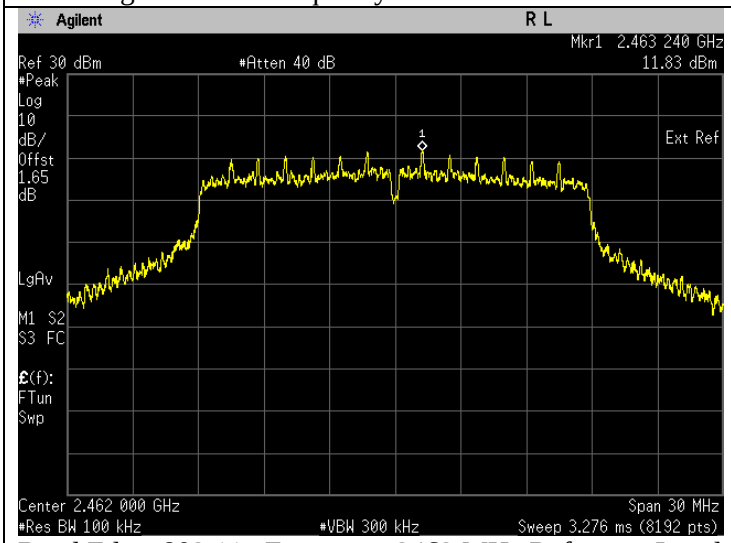
Test Conditions				Test Frequency	Results		
Standard	Modulation Type	Modulation Technology	Data Rate (mbps)	Tx (MHz)	Frequencies (MHz)	Power (dBm)	Status
802.11n	OFDM	DBPSK	6.5	2412	2399.96	-25.00	Pass
802.11n	OFDM	DBPSK	6.5	2462	2483.60	-37.95	Pass



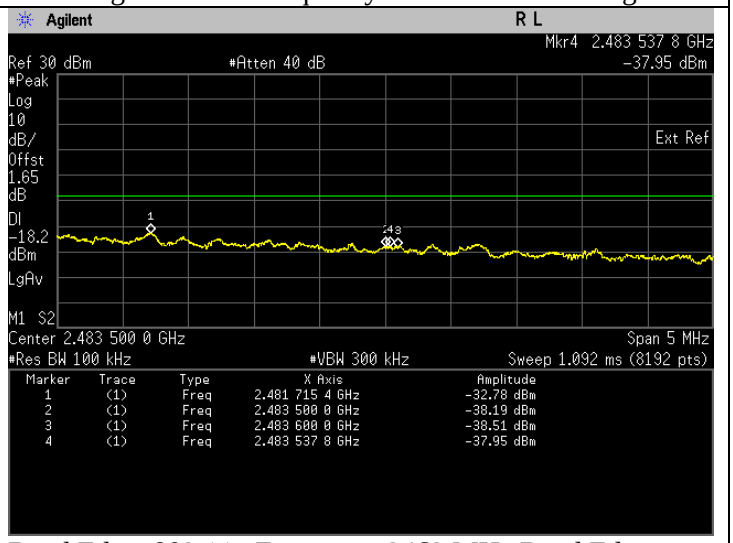
Band Edge. 802.11n Frequency 2412 MHz Reference Level



Band Edge. 802.11n Frequency 2412 MHz Band Edge



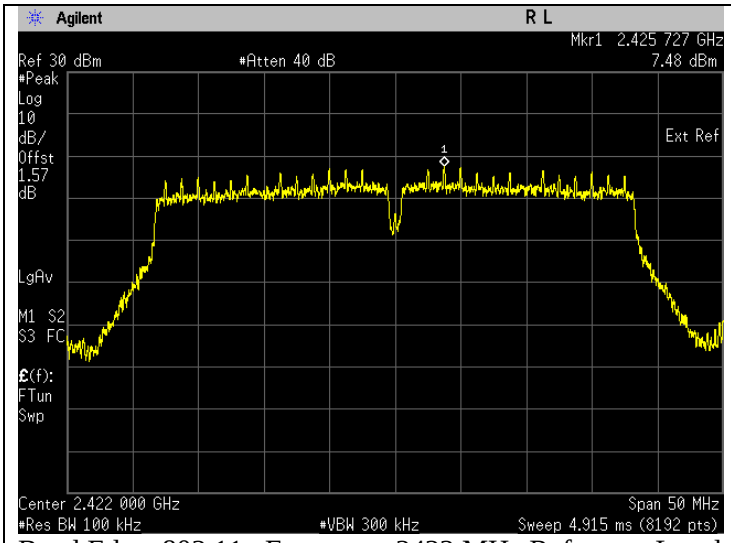
Band Edge. 802.11n Frequency 2462 MHz Reference Level



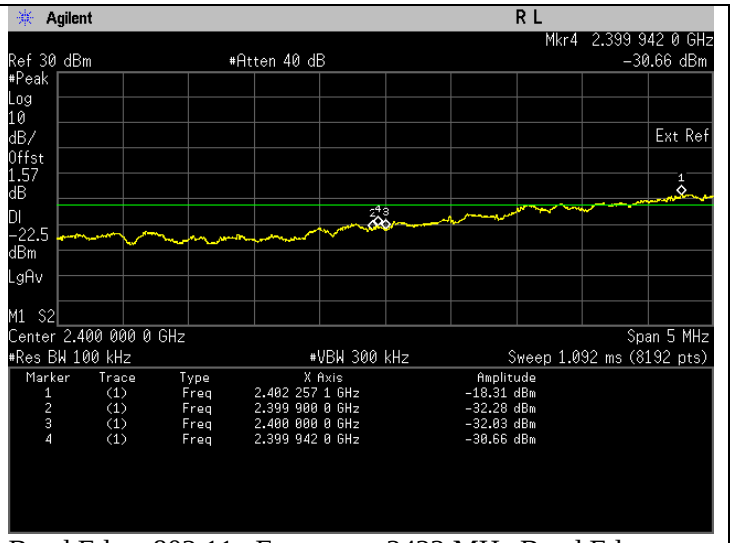
Band Edge. 802.11n Frequency 2462 MHz Band Edge

802.11n (HT40)

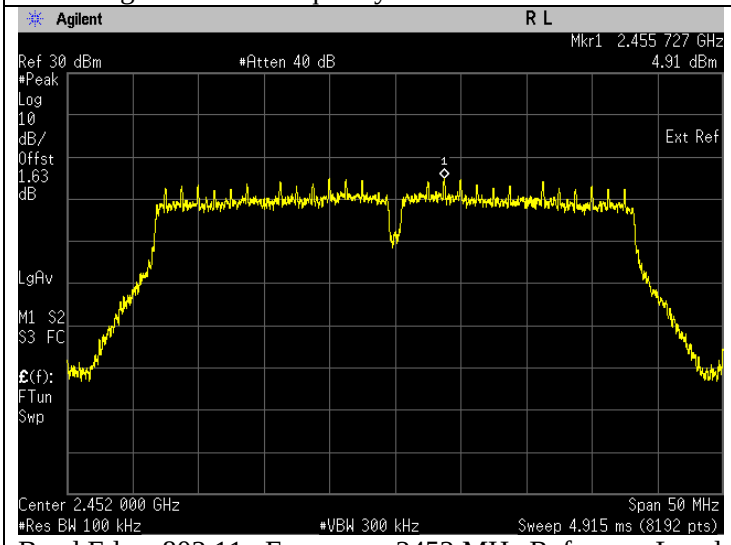
Test Conditions				Test Frequency	Results		
Standard	Modulation Type	Modulation Technology	Data Rate (mbps)	Tx (MHz)	Frequencies (MHz)	Power (dBm)	Status
802.11n	OFDM	DBPSK	13.5	2422	2399.94	-30.66	Pass
802.11n	OFDM	DBPSK	13.5	2452	2483.60	-39.87	Pass



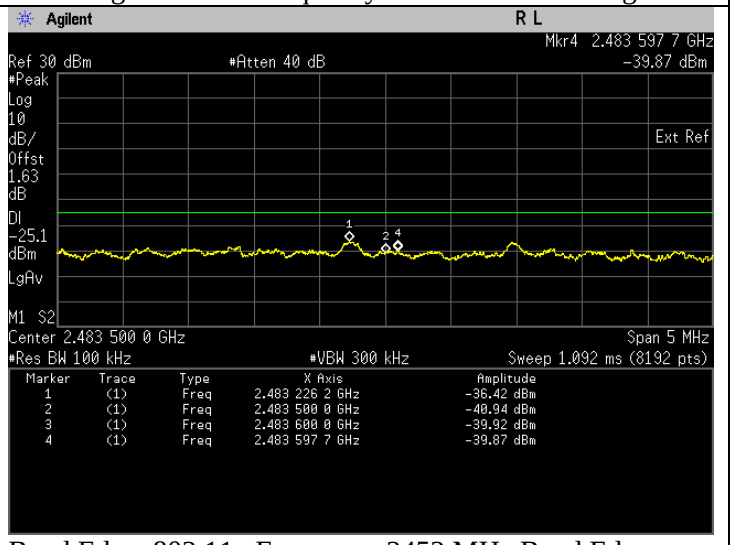
Band Edge. 802.11n Frequency 2422 MHz Reference Level



Band Edge. 802.11n Frequency 2422 MHz Band Edge



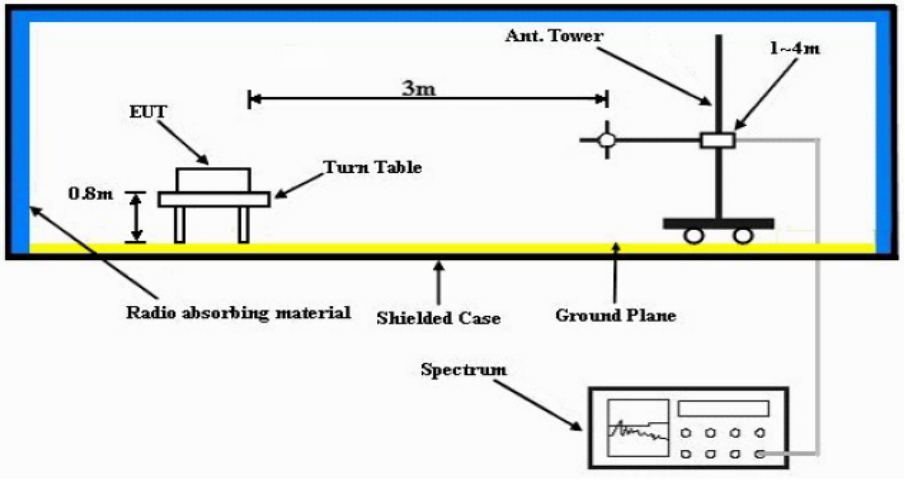
Band Edge. 802.11n Frequency 2452 MHz Reference Level



Band Edge. 802.11n Frequency 2452 MHz Band Edge

6.7. Radiated Emission within restricted Bands

6.7.1. Test Setup



a. The EUT is placed on the top of a rotating table 0.8m above the ground (<1GHz) and 1.5m above the ground (>1GHz) at a 3m semi-anechoic chamber. The table is rotated 360 degrees to determine the position of the highest radiation.
b. The EUT is set 3m away from the interference-receiving antenna, which is mounted on the top of a variable-height antenna tower.
c. The antenna is Bilog/Horn antenna depend on which frequency range uses, and its height is varied from one meter to four meters above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are set to make the measurement.
d. For each suspected emission, the EUT is arranged to its worst case and then the antenna is tuned to heights from 1m to 4m and the rotatable table is turned from 0 degrees to 360 degrees to find the maximum reading.
e. The test-receiver system is set to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.
f. If the emission level of the EUT in peak mode is fall within the range of 10dB from the limit specified, the emissions would be re-tested one by one using peak, quasi-peak or average method as specified and then reported in a data sheet. Otherwise, the testing could be stopped and the peak values of the EUT would be reported.

NOTE:

a. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 120 kHz for Quasi-peak detection at frequency below 1GHz.
b. The resolution bandwidth of test receiver/spectrum analyzer is 1 MHz and video bandwidth is 3 MHz for Peak detection at frequency above 1 GHz.
c. All modes of operation were investigated and the worst-case emissions are reported.

6.7.2. Test Limits:

Radiated emissions which fall in the restricted bands must comply with the radiated emission limits specified as below table. Other emissions shall be at least 20dB below the highest level of the desired power.

Frequency (MHz)	Field strength (microvolts/meter)	Measurement distance (meters)
0.009-0.490	2400/F(kHz)	300
0.490-1.705	24000/F(kHz)	30
1.705-30.0	30	30
30-88	100**	3
88-216	150**	3
216-960	200**	3
Above 960	500	3

NOTE:

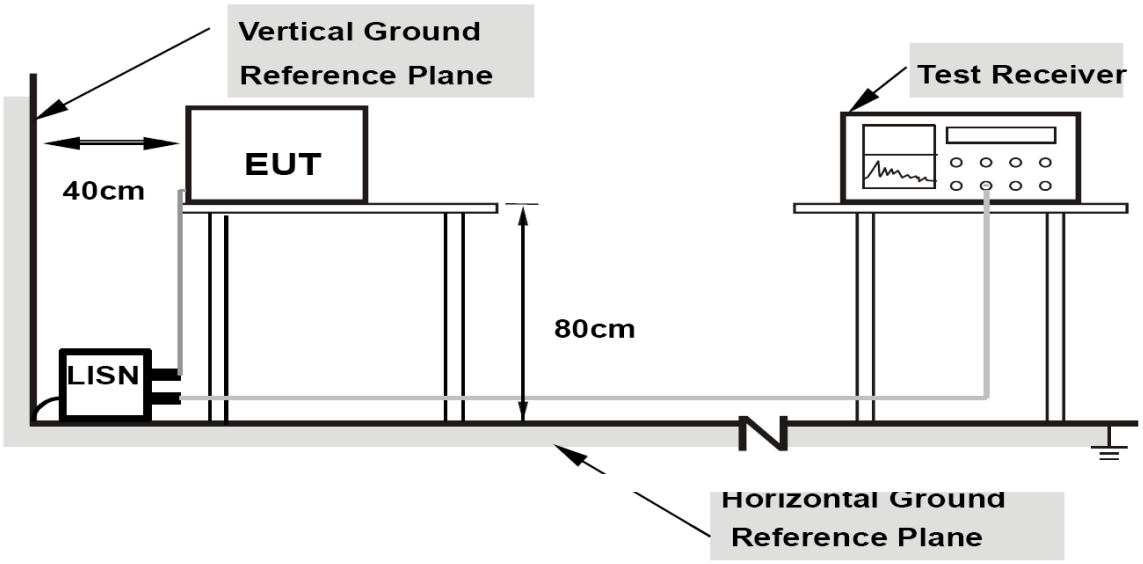
a. The lower limit shall apply at the transition frequencies.
b. Emission level (dBuV/m) = 20 log Emission level (uV/m).
c. For frequencies above 1000 MHz, the field strength limits are based on average detector, however, the peak field strength of any emission shall not exceed the maximum permitted average limits, specified above by more than 20dB under any condition of modulation.

6.7.3. Test Data:

Not Performed.

6.8. AC Powerline Conducted Emission

6.8.1. Test Setup



1) Tests were conducted for both Receive and Transmit Mode of the EUT.
2) The EUT was placed 0.4 meters from the conducting wall of the shielded room with EUT being connected to the power mains through a line impedance stabilization network (LISN). Other support units were connected to the power mains through another LISN. The two LISNs provide 50 ohm/50uH of coupling impedance for the measuring instrument.
3) Both lines of the power mains connected to the EUT were checked for maximum conducted interference.
4) The frequency range from 150 kHz to 30MHz was measured.

6.8.2. Test Limits:

For AC Power Line Conducted Test Limit can be Class A or B depends on product classification.

Limits for conducted disturbance at the mains ports of class A ITE

Frequency range MHz	Limits dB(µV)	
	Quasi-peak	Average
0,15 to 0,50	79	66
0,50 to 30	73	60
NOTE The lower limit shall apply at the transition frequency.		

Table 1: Limits for Conducted Disturbance at the Mains Ports of Class A ITE.

Limits for conducted disturbance at the mains ports of class B ITE

Frequency range MHz	Limits dB(µV)	
	Quasi-peak	Average
0,15 to 0,50	66 to 56	56 to 46
0,50 to 5	56	46
5 to 30	60	50
NOTE 1 The lower limit shall apply at the transition frequencies. NOTE 2 The limit decreases linearly with the logarithm of the frequency in the range 0,15 MHz to 0,50 MHz.		

Table 2: Limits for Conducted Disturbance at the Mains Ports of Class B ITE

6.8.3. Test Result

EMI Auto Test Template: Voltage with 2-Line-LISN

Hardware Setup:	Voltage with 2-Line-LISN
Measurement Type:	2 Line LISN
Frequency Range:	150 kHz - 30 MHz
Graphics Level Range:	0 dBµV - 80 dBµV

Preview Measurements:

Scan Test Template:	Voltage with 2-Line-LISN pre

Data Reduction:

Limit Line #1:	FCC Part 15 Class B Voltage on Mains QP
Limit Line #2:	FCC Part 15 Class B Voltage on Mains AV
Peak Search:	6 dB , Maximum Results: 20
Subrange Maxima:	10 Subranges , Maxima per Subrange: 1
Acceptance Offset:	-20 dB
Maximum Number of Results:	20

Maximization Measurements:

Template for Single Meas.:	Voltage with 2-Line-LISN max

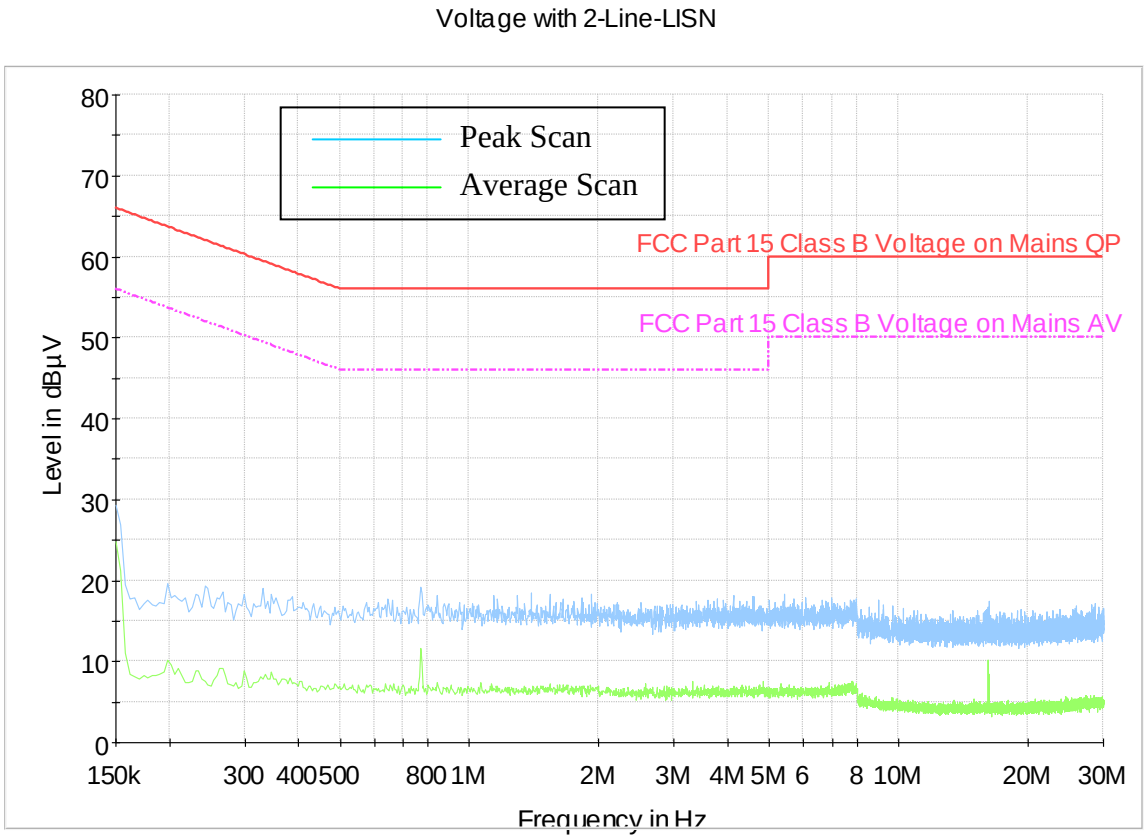
Final Measurements:

Template for Single Meas.:	Voltage with 2-Line-LISN fin

Subrange	Step Size	Detectors	IF BW	Meas. Time	Preamp
150 kHz - 30 MHz	4.5 kHz	QPK; CAV	9 kHz	1 s	0 dB

Receiver: [ESCI 3]

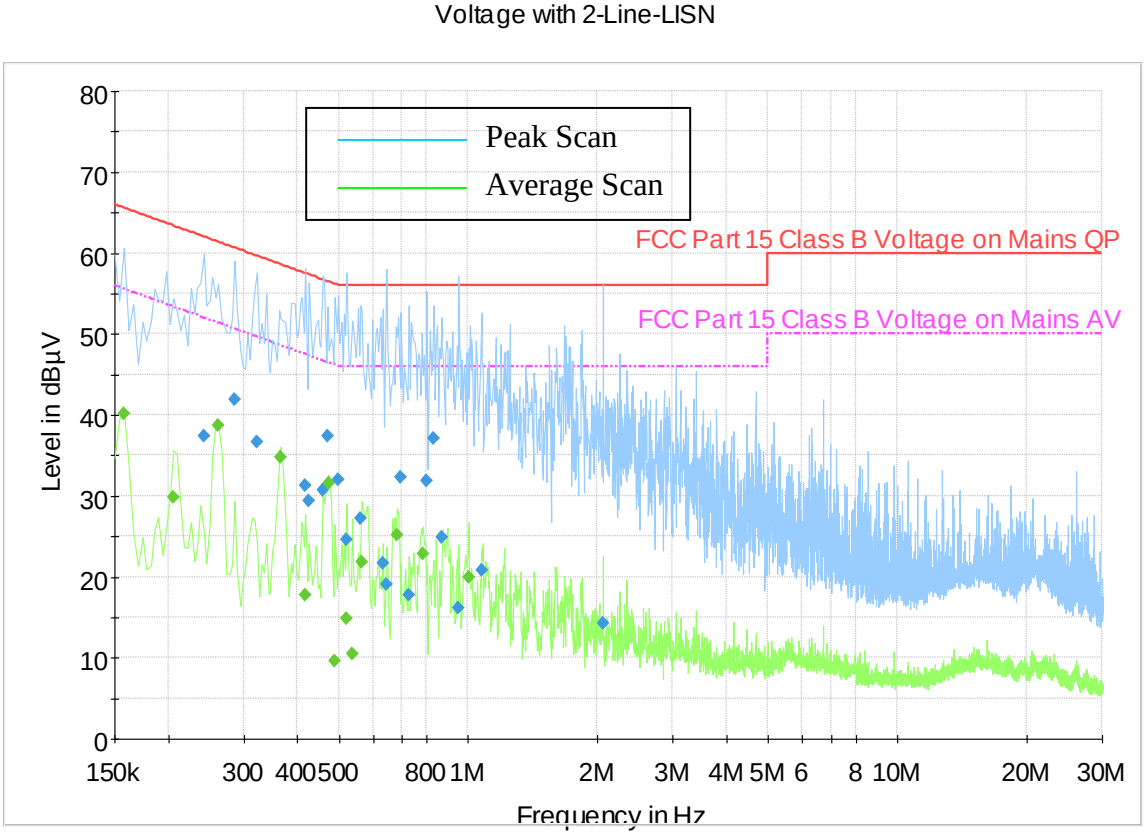
1) Ambient Noise



120VAC, 60Hz

SUC

1) Charger Alone



Quasipeak Measurement

Frequency (MHz)	QuasiPeak (dBµV)	Meas. Time (ms)	Bandwidth (kHz)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)	Comment
0.242000	37.4	1000.0	9.000	On	L1	9.8	24.6	62.0	PASS
0.286000	41.9	1000.0	9.000	On	L1	9.8	18.7	60.6	PASS
0.322000	36.6	1000.0	9.000	On	L1	9.8	23.0	59.7	PASS
0.418000	31.2	1000.0	9.000	On	N	9.9	26.3	57.5	PASS
0.426000	29.4	1000.0	9.000	On	N	9.9	27.9	57.3	PASS
0.458000	30.7	1000.0	9.000	On	L1	10.0	26.0	56.7	PASS
0.470000	37.4	1000.0	9.000	On	N	10.0	19.1	56.5	PASS
0.498000	32.1	1000.0	9.000	On	N	10.0	24.0	56.0	PASS
0.522000	24.6	1000.0	9.000	On	L1	10.0	31.4	56.0	PASS
0.562000	27.3	1000.0	9.000	On	N	9.9	28.8	56.0	PASS
0.634000	21.6	1000.0	9.000	On	N	9.9	34.4	56.0	PASS
0.646000	19.1	1000.0	9.000	On	L1	9.9	36.9	56.0	PASS
0.698000	32.3	1000.0	9.000	On	L1	9.9	23.7	56.0	PASS
0.726000	17.8	1000.0	9.000	On	L1	9.9	38.2	56.0	PASS
0.802000	31.8	1000.0	9.000	On	L1	9.9	24.2	56.0	PASS
0.830000	37.1	1000.0	9.000	On	L1	9.9	18.9	56.0	PASS
0.866000	24.8	1000.0	9.000	On	L1	9.8	31.2	56.0	PASS
0.950000	16.2	1000.0	9.000	On	N	9.9	39.8	56.0	PASS
1.074000	20.9	1000.0	9.000	On	N	9.9	35.1	56.0	PASS
2.062000	14.3	1000.0	9.000	On	N	9.8	41.7	56.0	PASS

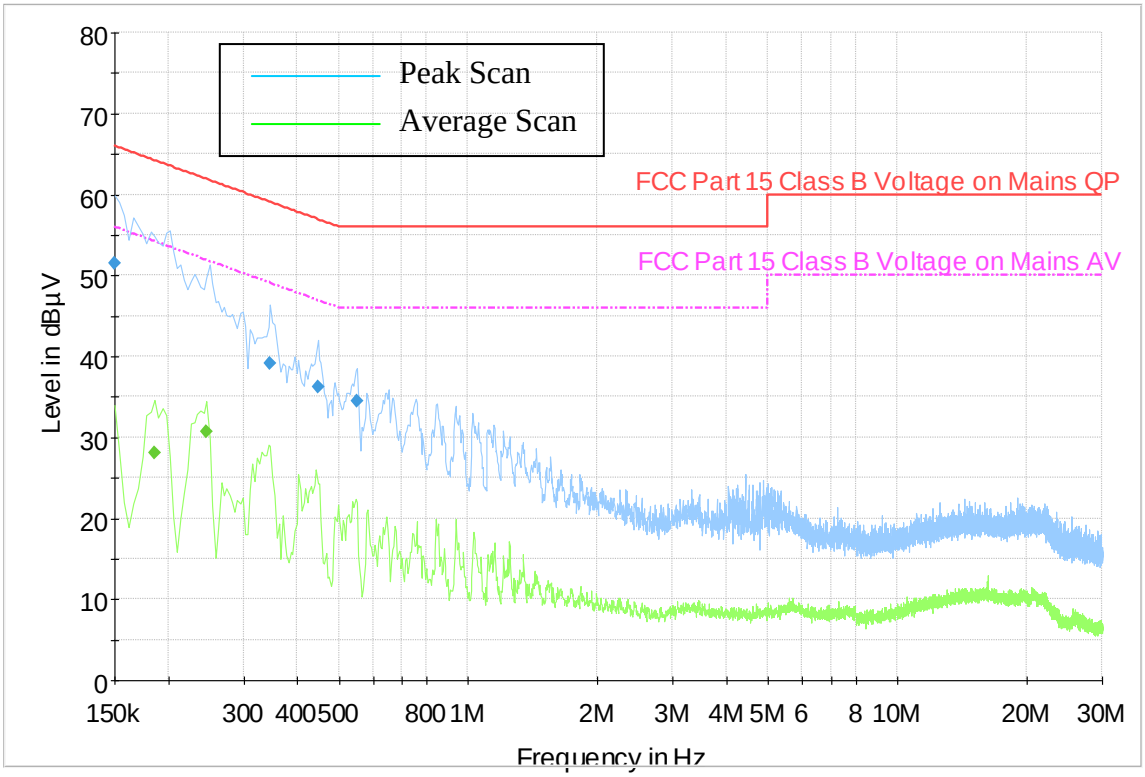
Average Measurement

Frequency (MHz)	CAverage (dBµV)	Meas. Time (ms)	Bandwidth (kHz)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)	Comment
0.158000	40.2	1000.0	9.000	On	N	10.0	15.4	55.6	PASS
0.206000	29.9	1000.0	9.000	On	N	9.9	23.5	53.4	PASS
0.262000	38.7	1000.0	9.000	On	N	9.8	12.7	51.4	PASS
0.366000	34.7	1000.0	9.000	On	N	9.9	13.9	48.6	PASS
0.418000	17.7	1000.0	9.000	On	N	9.9	29.8	47.5	PASS
0.474000	31.5	1000.0	9.000	On	N	10.0	14.9	46.4	PASS
0.490000	9.6	1000.0	9.000	On	N	10.0	36.5	46.2	PASS
0.522000	14.9	1000.0	9.000	On	N	10.0	31.1	46.0	PASS
0.538000	10.5	1000.0	9.000	On	N	10.0	35.5	46.0	PASS
0.566000	21.8	1000.0	9.000	On	N	9.9	24.2	46.0	PASS
0.682000	25.2	1000.0	9.000	On	N	9.8	20.8	46.0	PASS
0.786000	22.8	1000.0	9.000	On	N	9.8	23.2	46.0	PASS
1.002000	19.9	1000.0	9.000	On	L1	9.8	26.1	46.0	PASS

*** Expanded Uncertainty (U) = +/- 3.43 dB**

2) Charger with Radio Off

Voltage with 2-Line-LISN



Quasipeak Measurement

Frequency (MHz)	QuasiPeak (dBµV)	Meas. Time (ms)	Bandwidth (kHz)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)	Comment
0.150000	51.5	1000.0	9.000	On	N	10.0	14.5	66.0	PASS
0.346000	39.1	1000.0	9.000	On	L1	9.9	19.9	59.1	PASS
0.446000	36.2	1000.0	9.000	On	N	10.0	20.8	56.9	PASS
0.550000	34.5	1000.0	9.000	On	N	9.9	21.5	56.0	PASS

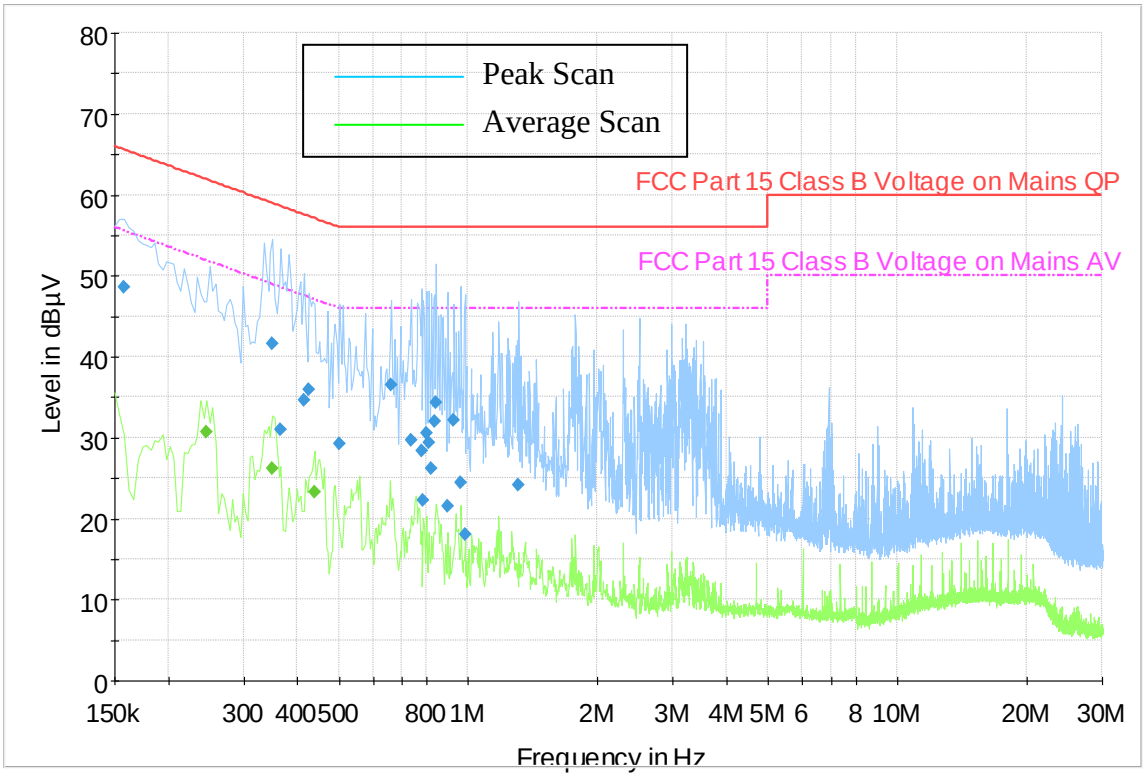
Average Measurement

Frequency (MHz)	CAverage (dBµV)	Meas. Time (ms)	Bandwidth (kHz)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)	Comment
0.186000	28.1	1000.0	9.000	On	N	9.9	26.1	54.2	PASS
0.246000	30.7	1000.0	9.000	On	L1	9.8	21.2	51.9	PASS

*** Expanded Uncertainty (U) = +/- 3.43 dB**

3) Charger with Radio Standby Mode

Voltage with 2-Line-LISN



Quasipeak Measurement

Frequency (MHz)	QuasiPeak (dBµV)	Meas. Time (ms)	Bandwidth (kHz)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)	Comment
0.158000	48.6	1000.0	9.000	On	L1	9.9	16.9	65.6	PASS
0.350000	41.6	1000.0	9.000	On	N	9.9	17.3	59.0	PASS
0.366000	31.0	1000.0	9.000	On	N	9.9	27.6	58.6	PASS
0.414000	34.7	1000.0	9.000	On	L1	9.9	22.9	57.6	PASS
0.426000	36.0	1000.0	9.000	On	N	9.9	21.4	57.3	PASS
0.502000	29.3	1000.0	9.000	On	L1	10.0	26.7	56.0	PASS
0.662000	36.5	1000.0	9.000	On	N	9.8	19.5	56.0	PASS
0.738000	29.7	1000.0	9.000	On	N	9.8	26.3	56.0	PASS
0.778000	28.4	1000.0	9.000	On	N	9.8	27.6	56.0	PASS
0.786000	22.3	1000.0	9.000	On	L1	9.9	33.7	56.0	PASS
0.798000	30.6	1000.0	9.000	On	N	9.8	25.4	56.0	PASS
0.810000	29.3	1000.0	9.000	On	N	9.8	26.7	56.0	PASS
0.822000	26.2	1000.0	9.000	On	N	9.8	29.8	56.0	PASS
0.834000	32.0	1000.0	9.000	On	L1	9.9	24.0	56.0	PASS
0.842000	34.4	1000.0	9.000	On	L1	9.8	21.6	56.0	PASS
0.898000	21.5	1000.0	9.000	On	N	9.9	34.5	56.0	PASS
0.926000	32.2	1000.0	9.000	On	N	9.9	23.8	56.0	PASS
0.962000	24.4	1000.0	9.000	On	L1	9.8	31.6	56.0	PASS
0.982000	18.0	1000.0	9.000	On	N	9.9	38.0	56.0	PASS
1.310000	24.1	1000.0	9.000	On	N	9.9	31.9	56.0	PASS

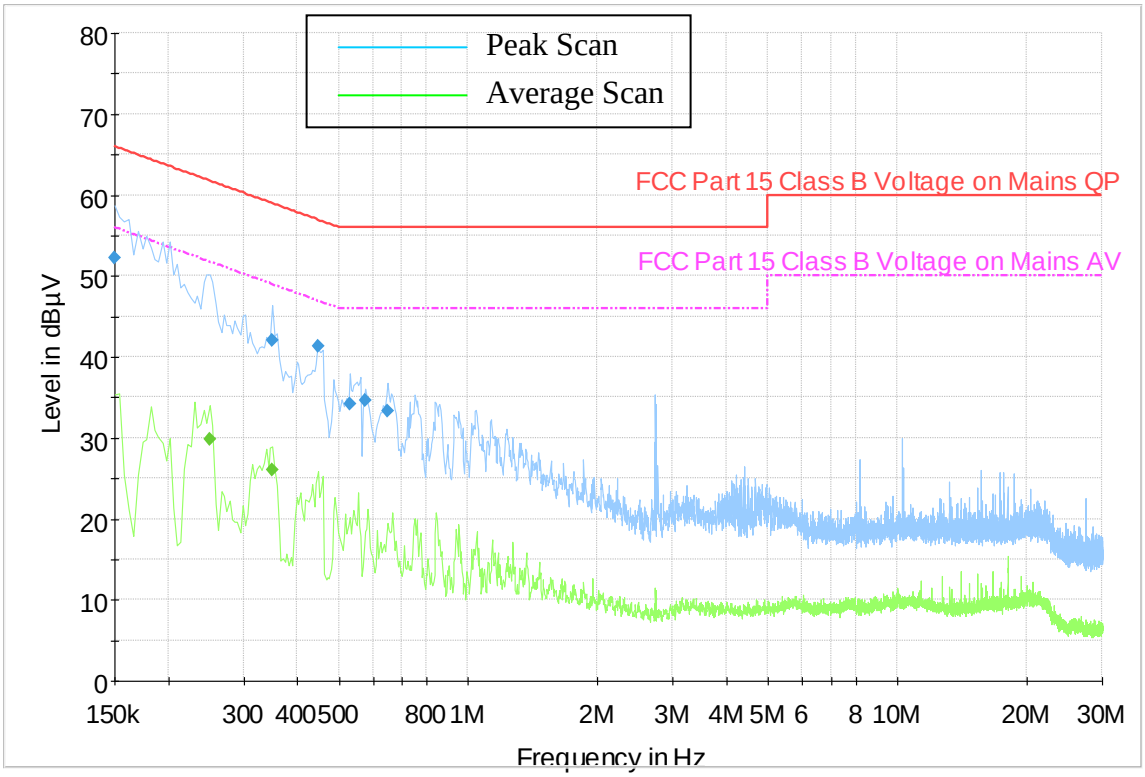
Average Measurement

Frequency (MHz)	CAverage (dBµV)	Meas. Time (ms)	Bandwidth (kHz)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)	Comment
0.246000	30.7	1000.0	9.000	On	N	9.9	21.1	51.9	PASS
0.350000	26.2	1000.0	9.000	On	N	9.9	22.8	49.0	PASS
0.438000	23.2	1000.0	9.000	On	L1	9.9	23.9	47.1	PASS

*** Expanded Uncertainty (U) = +/- 3.43dB**

4) Charger with Radio in WLAN 2.4GHz TX Mode.

Voltage with 2-Line-LISN



Quasipeak Measurement

Frequency (MHz)	QuasiPeak (dBµV)	Meas. Time (ms)	Bandwidth (kHz)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)	Comment
0.150000	52.2	1000.0	9.000	On	N	10.0	13.8	66.0	PASS
0.350000	42.1	1000.0	9.000	On	L1	9.9	16.9	59.0	PASS
0.446000	41.3	1000.0	9.000	On	L1	10.0	15.6	56.9	PASS
0.530000	34.1	1000.0	9.000	On	L1	10.0	21.9	56.0	PASS
0.574000	34.6	1000.0	9.000	On	N	9.9	21.4	56.0	PASS
0.650000	33.3	1000.0	9.000	On	N	9.8	22.7	56.0	PASS

Average Measurement

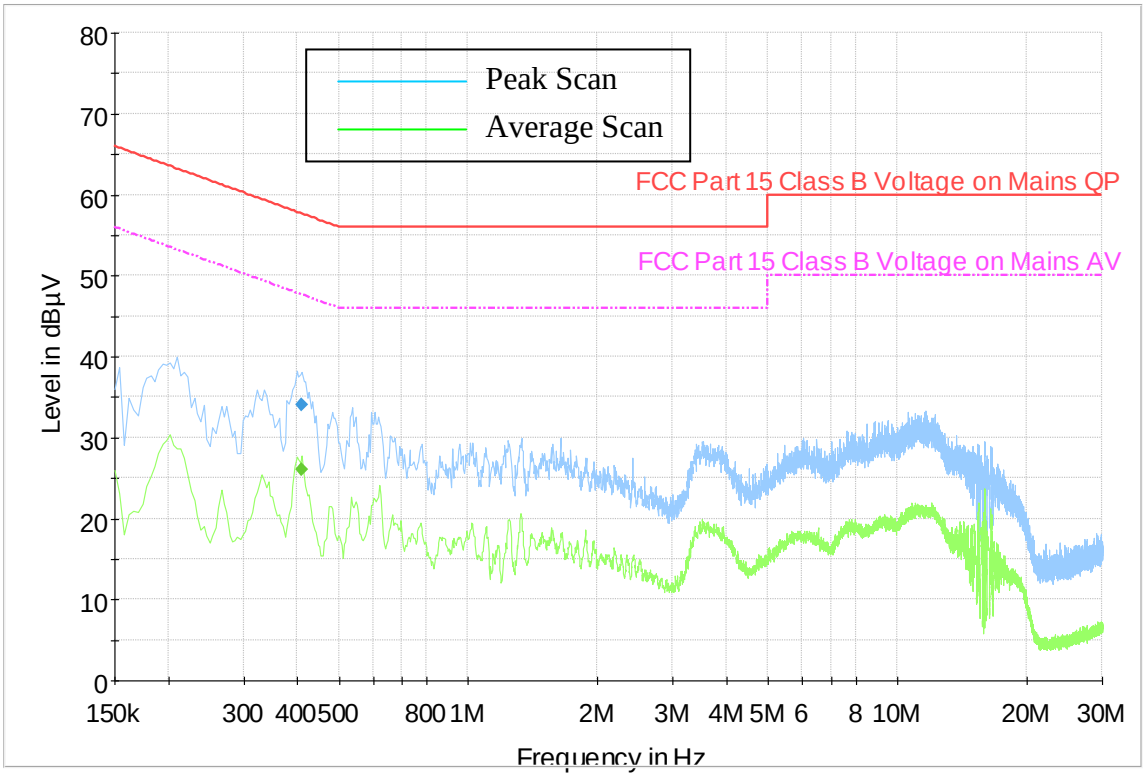
Frequency (MHz)	CAverage (dBµV)	Meas. Time (ms)	Bandwidth (kHz)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)	Comment
0.250000	29.8	1000.0	9.000	On	L1	9.8	22.0	51.8	PASS
0.350000	26.1	1000.0	9.000	On	N	9.9	22.9	49.0	PASS

*** Expanded Uncertainty (U) = +/- 3.43 dB**

MUC

1) Charger Alone

Voltage with 2-Line-LISN



Quasipeak Measurement

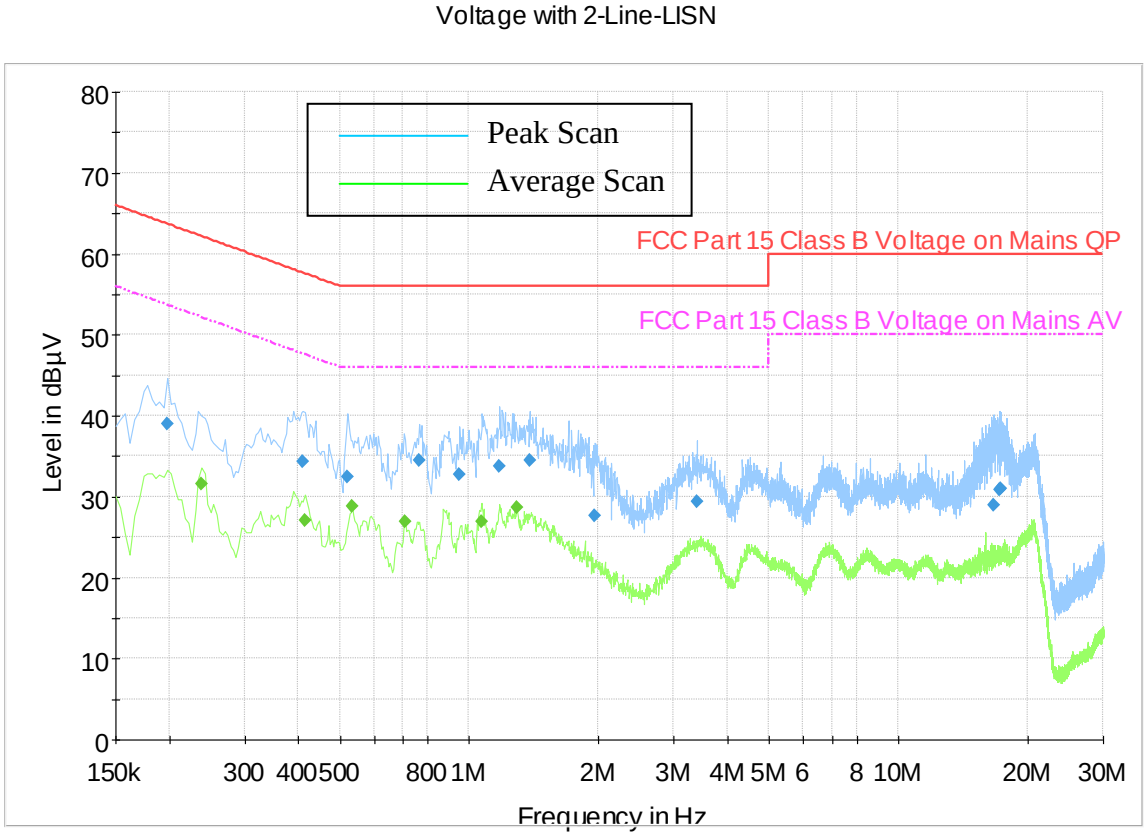
Frequency (MHz)	QuasiPeak (dBµV)	Meas. Time (ms)	Bandwidth (kHz)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)	Comment
0.410000	34.0	1000.0	9.000	On	L1	9.9	23.6	57.6	PASS

Average Measurement

Frequency (MHz)	CAverage (dBµV)	Meas. Time (ms)	Bandwidth (kHz)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)	Comment
0.410000	26.0	1000.0	9.000	On	N	9.9	21.7	47.6	PASS

*** Expanded Uncertainty (U) = +/- 3.43 dB**

2) Charger with Radio Off



Quasipeak Measurement

Frequency (MHz)	QuasiPeak (dBµV)	Meas. Time (ms)	Bandwidth (kHz)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)	Comment
0.198000	38.9	1000.0	9.000	On	L1	9.9	24.7	63.7	PASS
0.410000	34.4	1000.0	9.000	On	N	9.9	23.3	57.6	PASS
0.522000	32.4	1000.0	9.000	On	N	10.0	23.6	56.0	PASS
0.766000	34.4	1000.0	9.000	On	L1	9.9	21.6	56.0	PASS
0.950000	32.7	1000.0	9.000	On	L1	9.8	23.3	56.0	PASS
1.178000	33.7	1000.0	9.000	On	L1	9.8	22.3	56.0	PASS
1.382000	34.5	1000.0	9.000	On	L1	9.8	21.5	56.0	PASS
1.966000	27.6	1000.0	9.000	On	N	9.8	28.4	56.0	PASS
3.398000	29.3	1000.0	9.000	On	L1	9.7	26.7	56.0	PASS
16.634000	28.9	1000.0	9.000	On	N	9.8	31.1	60.0	PASS
17.246000	30.9	1000.0	9.000	On	N	9.8	29.1	60.0	PASS
17.350000	31.0	1000.0	9.000	On	N	9.8	29.0	60.0	PASS

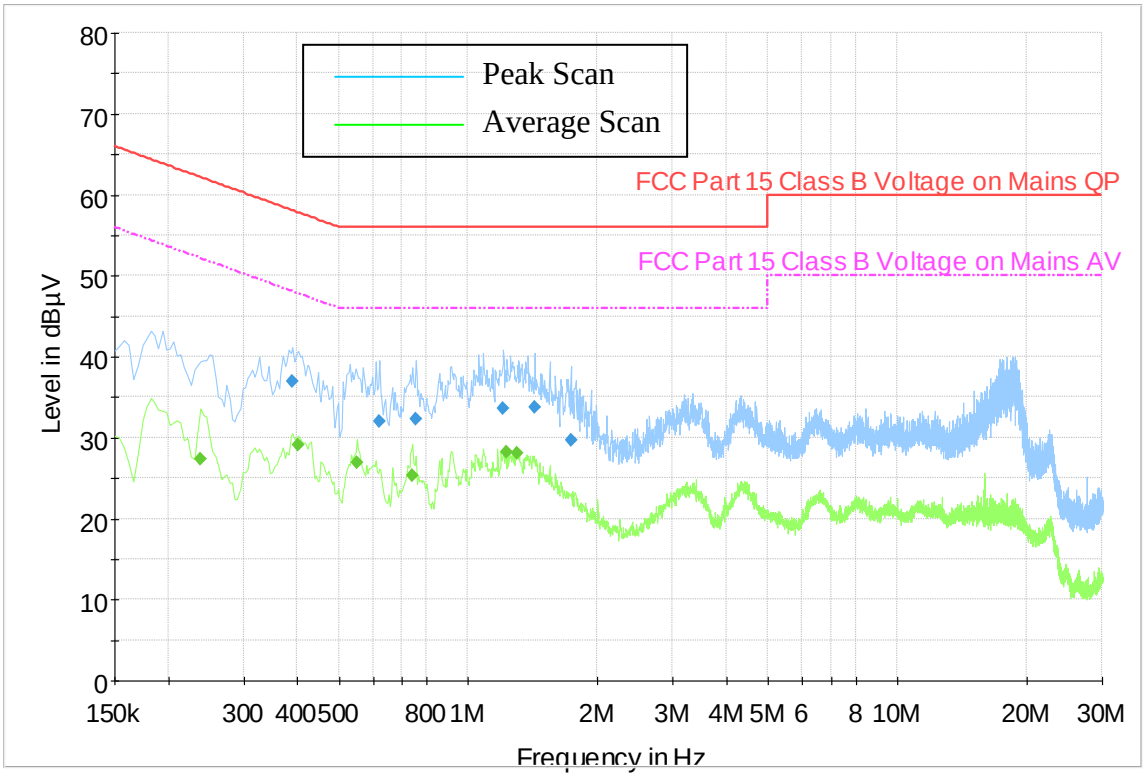
Average Measurement

Frequency (MHz)	CAverage (dBµV)	Meas. Time (ms)	Bandwidth (kHz)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)	Comment
0.238000	31.6	1000.0	9.000	On	N	9.9	20.6	52.2	PASS
0.414000	27.0	1000.0	9.000	On	N	9.9	20.5	47.6	PASS
0.534000	28.8	1000.0	9.000	On	L1	10.0	17.2	46.0	PASS
0.710000	26.8	1000.0	9.000	On	L1	9.9	19.2	46.0	PASS
1.066000	27.0	1000.0	9.000	On	L1	9.8	19.0	46.0	PASS
1.290000	28.7	1000.0	9.000	On	L1	9.8	17.3	46.0	PASS

*** Expanded Uncertainty (U) = +/- 3.43 dB**

3) Charger with Radio Standby Mode

Voltage with 2-Line-LISN



Quasipeak Measurement

Frequency (MHz)	QuasiPeak (dBµV)	Meas. Time (ms)	Bandwidth (kHz)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)	Comment
0.390000	37.0	1000.0	9.000	On	L1	9.9	21.0	58.1	PASS
0.622000	31.9	1000.0	9.000	On	L1	9.9	24.1	56.0	PASS
0.754000	32.3	1000.0	9.000	On	L1	9.9	23.7	56.0	PASS
1.206000	33.5	1000.0	9.000	On	N	9.9	22.5	56.0	PASS
1.430000	33.7	1000.0	9.000	On	L1	9.8	22.3	56.0	PASS
1.734000	29.7	1000.0	9.000	On	L1	9.7	26.3	56.0	PASS

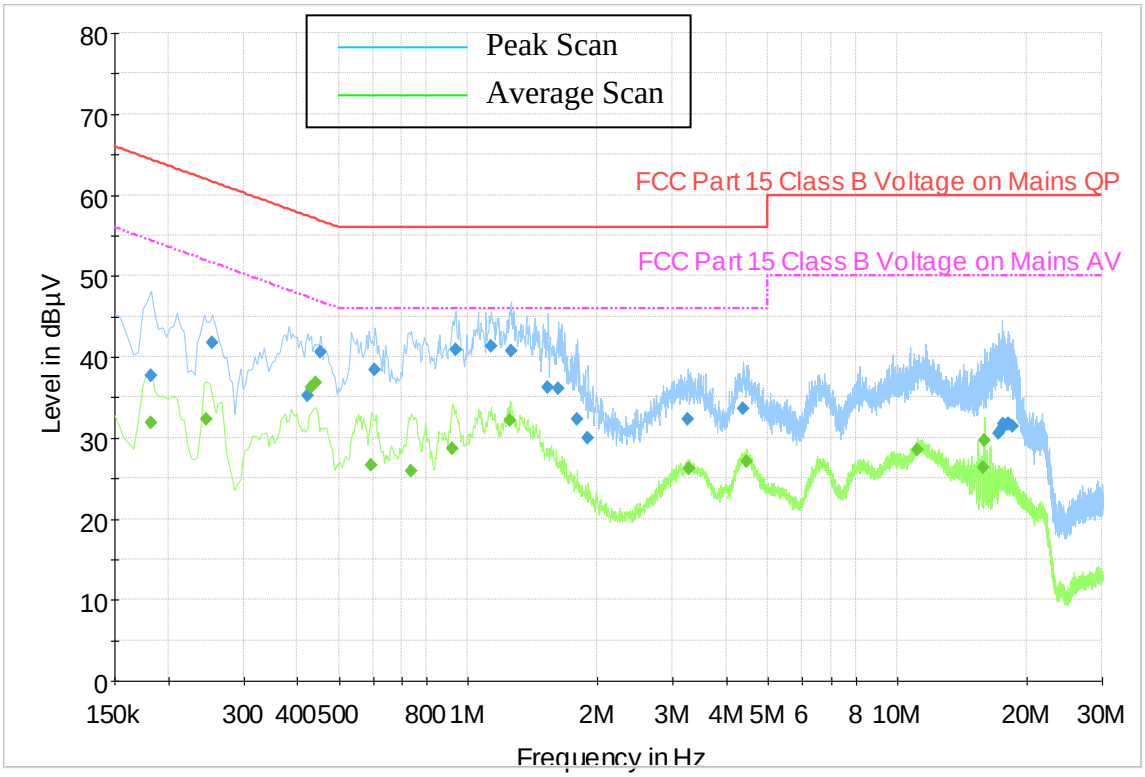
Average Measurement

Frequency (MHz)	CAverage (dBµV)	Meas. Time (ms)	Bandwidth (kHz)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)	Comment
0.238000	27.3	1000.0	9.000	On	N	9.9	24.8	52.2	PASS
0.402000	29.1	1000.0	9.000	On	L1	9.9	18.7	47.8	PASS
0.550000	26.9	1000.0	9.000	On	L1	10.0	19.1	46.0	PASS
0.742000	25.3	1000.0	9.000	On	L1	9.9	20.7	46.0	PASS
1.230000	28.3	1000.0	9.000	On	L1	9.8	17.7	46.0	PASS
1.302000	28.1	1000.0	9.000	On	L1	9.8	17.9	46.0	PASS

*** Expanded Uncertainty (U) = +/- 3.43dB**

4) Charger with Radio in WLAN 2.4GHz TX Mode.

Voltage with 2-Line-LISN



Quasipeak Measurement

Frequency (MHz)	QuasiPeak (dBµV)	Meas. Time (ms)	Bandwidth (kHz)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)	Comment
0.182000	37.7	1000.0	9.000	On	L1	9.9	26.7	64.4	PASS
0.254000	41.8	1000.0	9.000	On	L1	9.8	19.8	61.6	PASS
0.422000	35.1	1000.0	9.000	On	N	9.9	22.3	57.4	PASS
0.454000	40.6	1000.0	9.000	On	L1	10.0	16.2	56.8	PASS
0.606000	38.5	1000.0	9.000	On	N	9.9	17.5	56.0	PASS
0.934000	40.9	1000.0	9.000	On	N	9.9	15.1	56.0	PASS
1.130000	41.4	1000.0	9.000	On	N	9.9	14.6	56.0	PASS
1.258000	40.8	1000.0	9.000	On	L1	9.8	15.2	56.0	PASS
1.534000	36.2	1000.0	9.000	On	N	9.8	19.8	56.0	PASS
1.618000	36.1	1000.0	9.000	On	N	9.8	19.9	56.0	PASS
1.798000	32.4	1000.0	9.000	On	N	9.8	23.6	56.0	PASS
1.902000	29.9	1000.0	9.000	On	N	9.8	26.1	56.0	PASS
3.254000	32.2	1000.0	9.000	On	N	9.7	23.8	56.0	PASS
4.382000	33.6	1000.0	9.000	On	N	9.7	22.4	56.0	PASS
17.258000	30.6	1000.0	9.000	On	N	9.8	29.4	60.0	PASS
17.510000	31.1	1000.0	9.000	On	N	9.8	28.9	60.0	PASS
17.682000	31.7	1000.0	9.000	On	N	9.8	28.3	60.0	PASS
18.054000	31.8	1000.0	9.000	On	N	9.8	28.2	60.0	PASS
18.170000	31.7	1000.0	9.000	On	N	9.8	28.3	60.0	PASS
18.586000	31.4	1000.0	9.000	On	N	9.8	28.6	60.0	PASS

Average Measurement

Frequency (MHz)	CAverage (dBµV)	Meas. Time (ms)	Bandwidth (kHz)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)	Comment
0.182000	31.9	1000.0	9.000	On	L1	9.9	22.5	54.4	PASS
0.246000	32.3	1000.0	9.000	On	L1	9.8	19.6	51.9	PASS
0.430000	36.2	1000.0	9.000	On	L1	9.9	11.0	47.3	PASS
0.442000	36.8	1000.0	9.000	On	L1	10.0	10.2	47.0	PASS
0.594000	26.7	1000.0	9.000	On	L1	9.9	19.3	46.0	PASS
0.738000	25.9	1000.0	9.000	On	L1	9.9	20.1	46.0	PASS
0.918000	28.7	1000.0	9.000	On	N	9.9	17.3	46.0	PASS
1.254000	32.2	1000.0	9.000	On	N	9.9	13.8	46.0	PASS
3.274000	26.1	1000.0	9.000	On	L1	9.7	19.9	46.0	PASS
4.446000	27.0	1000.0	9.000	On	N	9.7	19.0	46.0	PASS
11.130000	28.5	1000.0	9.000	On	N	9.8	21.5	50.0	PASS
15.846000	26.3	1000.0	9.000	On	L1	9.8	23.7	50.0	PASS
15.930000	29.6	1000.0	9.000	On	N	9.8	20.4	50.0	PASS

*** Expanded Uncertainty (U) = +/- 3.43 dB**

--End of Test Report--