Nemko Korea CO., Ltd.

300-2, Osan-Ri, Mohyeon-Myeon, Cheoin-Gu, Yongin-Si, Gyeonggi-Do, KOREA
TEL:+82 31 330 1700 FAX:+82 31 330 1701

FCC and IC EVALUATION REPORT FOR CERTIFICATION

Applicant :

Samsung Electronics Co., Ltd.
416, Maetan-3Dong, Yeongtong-Gu,
Suwon-Si, Gyeonggi-Do, Korea.
(Post code : 443-742)
Attn. : Mr. Jaywoo. Lee

Dates of Issue : April 21, 2011
Test Report No. : NK-11-R-071
Test Site : Nemko Korea Co., Ltd.

FCC ID	**A3LDNURS1**
IC ID	**649E-DNURS1**
Brand Name	**SAMSUNG**
Contact Person	**Samsung Electronics Co., Ltd.** **416, Maetan-3Dong, Yeongtong-Gu,** **Suwon-Si, Gyeonggi-Do, Korea, 442-742.** **Mr. Jaywoo. Lee** **Telephone No. : +82-31-277-2569**

Applied Standard: FCC 47 CFR Part 15C and IC RSS-210
Classification: FCC part 15 Spread Spectrum Transmitter
EUT Type: Wi-Fi Module

The device bearing the brand name and model specified above has been shown to comply with the applicable technical standards as indicated in the measurement report and was tested in accordance with the measurement procedures specified in ANSI C63.4-2003. The client should not use it to claim product endorsement by TAF or any government agencies. The test results in the report only apply to the tested sample.

I attest to the accuracy of data and all measurements reported herein were performed by me or were made under my supervision and are correct to the best of my knowledge and belief. I assume full responsibility for the completeness of these measurements and vouch for the qualifications of all persons taking them.

Apr 21, 2011
Tested By : Jin-ha, Ko
Engineer

Apr. 21. 2011
Reviewed By : CS. Choi
Manager & Chief Engineer

TABLE OF CONTENTS

1. SCOPE

Measurement and determination of electromagnetic emissions (EME) of radio frequency devices including intentional and/or unintentional radiators for compliance with the technical rules and regulations of the Federal Communications Commission under FCC part 15 and IC RSS-210.

Responsible Party :	Samsung Electronics Co., Ltd.
Contact Person :	Mr. Jaywoo. Lee
Manufacturer :	Samsung Electronics Co., Ltd. 416 Maetan-3Dong, Yeongtong-Gu, Suwon-Si, Gyeonggi-Do, 443-742 KOREA

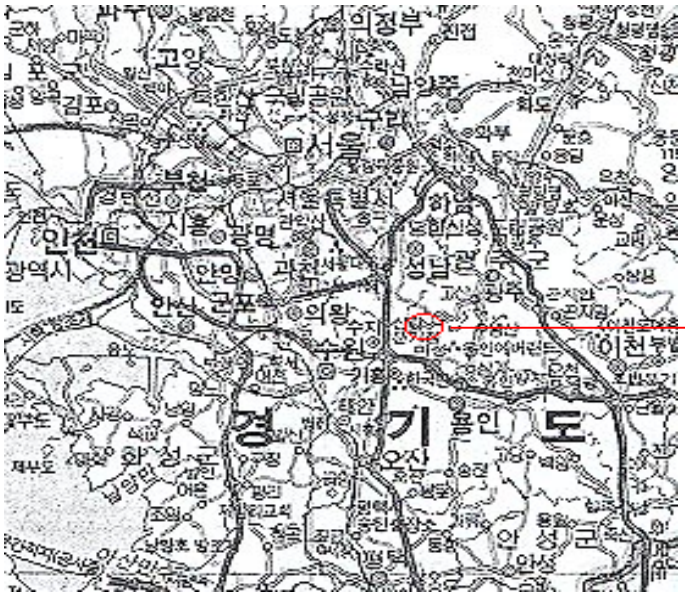
- FCC ID: A3LDNURS1
- Model: DNUR-S1
- Brand Name: SAMSUNG
- EUT Type: Wi-Fi Module
- Classification: FCC part 15 Spread Spectrum Transmitter
- Applied Standard: FCC 47 CFR Part 15 subpart C and IC RSS-210
- Test Procedure(s): ANSI C63.4 (2003)
- Dates of Test: Mar. 19, 2011 ~ Apr. 5, 2011
- Place of Tests: Nemko Korea Co., Ltd.

2. INTRODUCTION

2.1 Test facility

The measurement procedure described in American National Standard for Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz (ANSI C63.4-2003) was used in determining radiated and conducted emissions emanating from **Samsung Electronics Co., Ltd.**
FCC ID : A3LDNURS1 and **IC ID : 649E-DNURS1**

These measurement tests were conducted at ***Nemko Korea Co., Ltd. EMC Laboratory***.
The site address is 300-2, Osan-Ri, Mohyeon-Myeon, Cheoin-Gu, Yongin-Si, Gyeonggi-Do, KOREA.
The area of Nemko Korea Corporation Ltd. EMC Test Site is located in a mountain area at 80 kilo-meters (48 miles) southeast and Incheon International Airport (Incheon Airport), 30 kilometers (18miles) south-southeast from central Seoul.
It is located in the valley surrounded by mountains in all directions where ambient radio signal conditions are quiet and a favorable area to measure the radio frequency interference on open field test site for the computing and ISM devices manufactures.
The detailed description of the measurement facility was found to be in compliance with the requirements of § 2.948 according to ANSI C63.4 2003.



Nemko Korea Co., Ltd.
EMC Lab.
300-2, Osan-Ri, Mohyeon-Myeon, Cheoin-Gu, Yongin-Si, Gyeonggi-Do, KOREA 449-852
Tel)+82-31-330-1700

Fig. 1. The map above shows the Seoul in Korea vicinity area.
The map also shows Nemko Korea Corporation Ltd. EMC Lab. and Incheon Airport.

2.2 Accreditation and listing

Accreditation type		Accreditation number
FC	FCC part 15/18 Filing site	Registration No. 97992
	CAB Accreditation for DOC	Designation No. KR0026
KOLAS	KOLAS Accredited Lab. (Korea Laboratory Accreditation Scheme)	Registration No. 155
Industry Canada	Canada IC Registered site	Site No. 2040E-1
VCCI	VCCI registration site(RE/CE/Telecom CE)	Member No. 2118
IECEE CB SCHEME	EMC CBTL	-
방송통신위원회	KCC(RRL)Designated Lab.	Registration No. KR0026
	SASO registered Lab and Certification Body	Registration No. 2008-15

3. TEST CONDITIONS & EUT INFORMATION

3.1 Operation During Test

The EUT was tested at the lowest channel, middle channel and the highest channel with the maximum RF power and all test data recorded in the report.
During the test, the EUT was connected to Laptop PC and then the test program was executed to operate EUT continuously.

The EUT is programmed with the following setting during the testing:

Test frequency		2412 MHz	2437 MHz	2462 MHz
802.11b	Programed Level	16	16	16
	Data rate (Mbps)	1	1	1
802.11g	Programed Level	1E	1D	1D
	Data rate (Mbps)	54	54	54
802.11n(HT20)	Programed Level	1E	1E	1E
	Data rate (Mbps)	MCS7	MCS7	MCS7

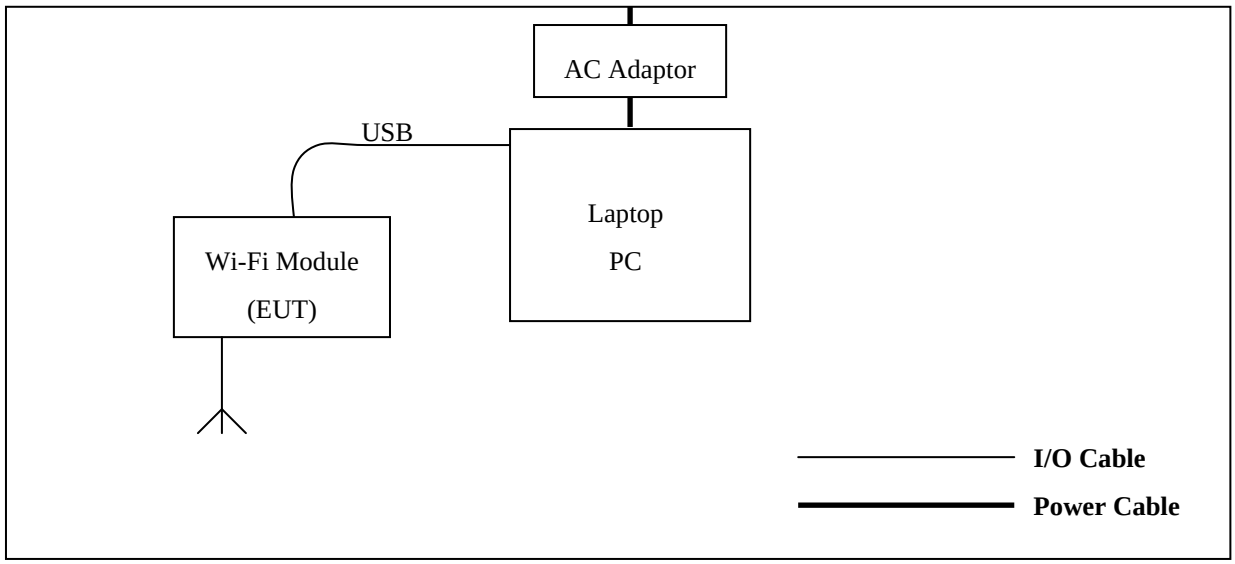
Table of test modes

Test Items	Mode	Data rate (Mbps)
Conducted Emissions	802.11b	1
Radiated Emissions	802.11b	1
6 dB Bandwidth	802.11b	1
	802.11g	54
	802.11n(HT20)	MCS7
Peak Output Power	802.11b	1
	802.11g	54
	802.11n(HT20)	MCS7
Power Spectral Density	802.11b	1
	802.11g	54
	802.11n(HT20)	MCS7
Conducted Spurious Emission, Radiated Spurious Emission, Bandedge Emission	802.11b	1
	802.11g	54
	802.11n(HT20)	MCS7

3.2 Support Equipment

Wi-Fi Module (EUT)	Samsung Electronics Co., Ltd. Model : DNUR-S1	S/N: N/A
Laptop PC	Samsung Electronics Co., Ltd. Model : NT-R70	FCC DOC S/N: BD0093CQ100230F
AC Adaptor	LITEON Electronics(Dongguang) Co.Ltd Model : AD-9019S 1.8 m shielded power cable	FCC DOC S/N: N/A

3.3 Setup Drawing



3.4 EUT Information

The EUT is the **Samsung Wi-Fi Module FCC ID: A3LDNURS1, IC ID: 649E-DNURS1.**

Specifications:

EUT Type	Wi-Fi Module
Model Name	DNUR-S1
Brand Name	SAMSUNG
Frequency of Operation	2412 MHz to 2462 MHz
Peak Power Output (Conducted)	802.11b : 20.67 dBm 802.11g : 26.69 dBm 802.11n(HT20) : 26.45 dBm
Channels	802.11b,g,n(HT20) : 11 CH
TX Antenna Gain	1.02 dBi
Spreading	DSSS, OFDM
Modulations	BPSK, QPSK, 16QAM, 64QAM
Temperature Range	- 20 ℃ ~ + 55 ℃
Voltage	5.0 VDC
Dimension(W x H x D)	20 mm x 56 mm x 3 mm
Weight	3 g
Remarks	-

4. SUMMARY OF TEST RESULTS

The EUT has been tested according to the following specification:

Name of Test	FCC Paragraph No.	IC Paragraph No.	Result	Remark
Conducted Emission	15.207	RSS-GEN 7.2.4	Complies	
Radiated Emission	15.205 15.209	RSS-GEN 7.2.2	Complies	
6 dB Bandwidth	15.247(a)(2)	RSS-210 A8.2	Complies	
Peak Power Output	15.247(b)(3)	RSS-210 A8.4	Complies	
Power Spectral Density	15.247(e)	RSS-210 A8.2	Complies	
Conducted Spurious Emission	15.247(d)	RSS-210 A8.5	Complies	
Radiated Spurious Emission	15.247(d)	RSS-210 A8.5	Complies	
Maximum Permissible Exposure	1.1307(b)	RSS-102	Complies	

5. RECOMMENDATION/CONCLUSION

The data collected shows that the **Samsung Wi-Fi Module FCC ID: A3LDNURS1, IC ID: 649E-DNURS1** is in compliance with Part 15 Subpart C 15.247 of the FCC Rules.

6. ANTENNA REQUIREMENTS

§15.203 of the FCC Rules part 15 Subpart C

: An intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the provisions of this section.

The antenna of the **Samsung Wi-Fi Module FCC ID: A3LDNURS1, IC ID: 649E-DNURS1** is **Permanently attached** and there are no provisions for connection to an external antenna. It complies with the requirement of §15.203.

7. DESCRIPTION OF TESTS

7.1 Conducted Emissions

The Line conducted emission test facility is located inside a 4 x 7 x 2.5 meter shielded enclosure.
It is manufactured by EM engineering. The shielding effectiveness of the shielded room is in accordance with MIL-STD-285 or NSA 65-6.
A 1 m x 1.5 m wooden table 0.8 m height is placed 0.4 m away from the vertical wall and 1.5 m away from the side of wall of the shielded room Rohde & Schwarz (ESH3-Z5) and Kyoritsu (KNW-407) of the 50 ohm/50 uH Line Impedance Stabilization Network(LISN) are bonded to the shielded room.
The EUT is powered from the Rohde & Schwarz LISN and the support equipment is powered from the Kyoritsu (KNW-407). Power to the LISNs are filtered by high-current high insertion loss Power line filters. The purpose of filter is to attenuate ambient signal interference and this filter is also bonded to shielded enclosure. All electrical cables are shielded by tinned copper zipper tubing with inner diameter of 1 / 2 ".
If DC power device, power will be derived from the source power supply it normally will be powered from and this supply lines will be connected to the LISNs, All interconnecting cables more than 1 meter were shortened by non inductive bundling (serpentine fashion) to a 1 meter length.
Sufficient time for EUT, support equipment, and test equipment was allowed in order for them to warm up to their normal operating condition. The RF output of the LISN was connected to the spectrum analyzer to determine the frequency producing the maximum EME from the EUT.
The spectrum was scanned from 150 kHz to 30 MHz with 200 ms sweep time.
The frequency producing the maximum level was re-examined using the EMI test receiver. (Rohde & Schwarz ESCS30).
The detector functions were set to CISPR quasi-peak mode & average mode.
The bandwidth of receiver was set to 9 kHz. The EUT, support equipment, and interconnecting cables were arranged and manipulated to maximize each EME emission.
Each emission was maximized by; switching power lines; varying the mode of operation or resolution; clock or data exchange speed; scrolling H pattern to the EUT and of support equipment, and powering the monitor from the floor mounted outlet box and computer aux AC outlet, if applicable; which ever determined the worst case emission.
Each EME reported was calibrated using the R & S signal generator.

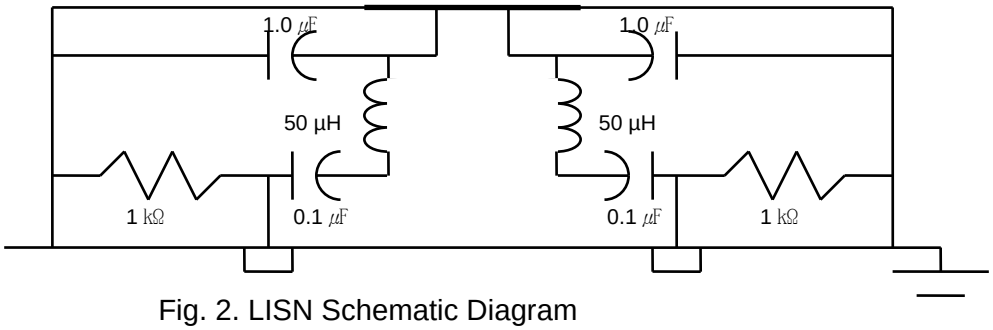


Fig. 2. LISN Schematic Diagram

7.2 Radiated Emissions

Preliminary measurement were made indoors at 3 meter using broad band antennas, broadband amplifier, and spectrum analyzer to determine the frequency producing the maximum EME. Appropriate precaution was taken to ensure that all EME from the EUT were maximized and investigated. The Technology configuration, clock speed, mode of operation or video resolution, turntable azimuth with respect to the antenna was note for each frequency found. The spectrum was scanned from 9 kHz to 30 MHz using Loop Antenne(EMCO, 6502) and 30 to 1000 MHz using Bi-conical log Antenna(ARA, LPB-2520/A). Above 1 GHz, Horn antenna (Scwarzbeck BBHA 9120D: upto 18 GHz , BBHA9170 : up to 40 GHz) was used. Final Measurements were made outdoors at 3 or 10 m test range using Loop Antenna(EMCO, 6502) and Logbicon Super Antenna (Schwarzbeck, VULB9168) or Double Ridged Broadband Horn antenna.(Scwarzbeck BBHA 9120D: up to 18 GHz , BBHA9170 : up to 40 GHz).
The test equipment was placed on a wooden table. Sufficient time for the EUT, support equipment, and test equipment was allowed in order for them to warm up to their normal operating condition.
Each frequency found during pre-scan measurements was reexamined and investigated using EMI test receiver.(ESCS30 & FSP40) The detector function was set to CISPR peak mode or quasi-peak mode or average mode and the band-width of the receiver was set to 120 kHz or 1MHz depending on the frequency or type of signal. The half wave dipole antenna was tuned to the frequency found during preliminary radiated measurements. The EUT support equipment and interconnecting cables were re configured to the setup producing the maximum emission for the frequency and were placed on top of a 0.8 m high non- metallic 1.0 X 1.5 meter table. The EUT, support equipment and interconnecting cables were re-arranged and manipulated to maximize each EME emission. The turn table containing the Technology was rotated; the antenna height was varied 1 to 4meter and stopped at the azimuth or height producing the maximum emission Each emission was maximized by : switching power lines; varying the mode of operation or resolution; clock or data exchange speed; scrolling H pattern to the EUT and of support equipment, and powering the monitor from the floor mounted outlet box and computer aux AC outlet, if applicable; which ever determined the worst case emission.
Each EME reported was calibrated using the R/S signal generator.

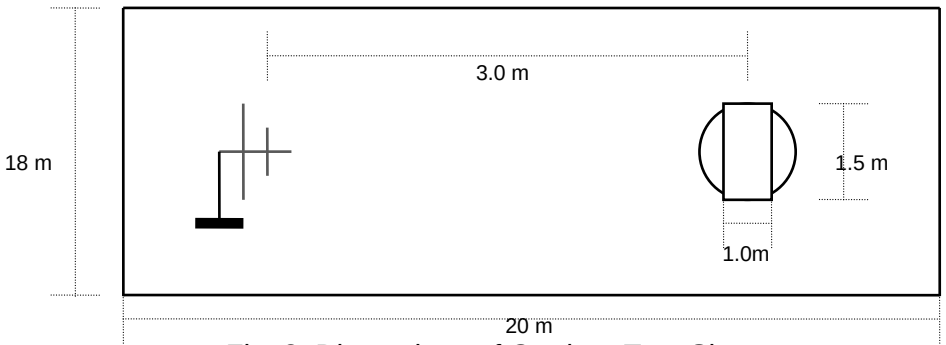
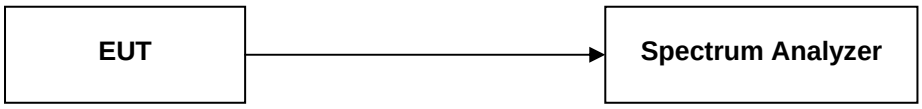


Fig. 3. Dimensions of Outdoor Test Site

7.3 6 dB Bandwidth

Test Setup

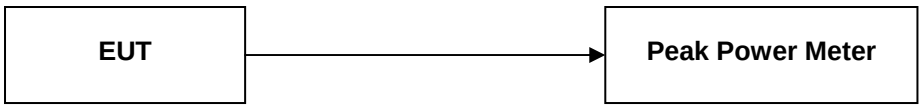


Test Procedure

The transmitter is set to the Low, Middle, High channels is connected to the spectrum analyzer. The RBW and VBW of spectrum analyzer are set to 100 kHz.
The sweep time is coupled.
The spectrum analyzer is set for peak detected and Max hold scan mode.

7.4 Maximum Peak Output Power

Test Setup

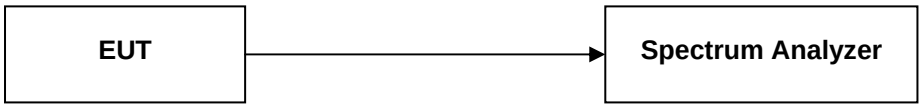


Test Procedure

The transmitter is set to the Low, Middle, High channels is connected to the Peak Power Meter.

7.5 Peak Power Spectral Density

Test Setup

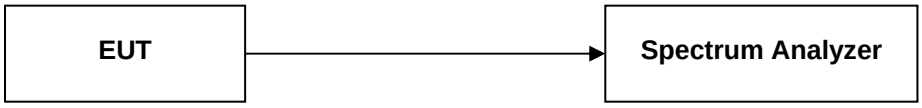


Test Procedure

The transmitter is connected to the Spectrum analyzer.
The maximum level in a 3 kHz bandwidth is measured with the spectrum analyzer.
The RBW of spectrum analyzer is set to 3 kHz and VBW is set to 3 kHz.
The sweep time is set to Span/3 kHz and video averaging is turned off.
The PPSD is the highest level found across the emission in any 3 kHz band.

7.6 Conducted Spurious Emissions

Test Setup



Test Procedure

The transmitter is connected to the spectrum analyzer.
The RBW of spectrum analyzer is set to 1 MHz and VBW is set to the 1 MHz.
Measurements are made over the 30 MHz to 25 GHz range with the transmitter set to the Lowest, Middle and highest channels.

8. TEST DATA

8.1 Conducted Emissions

FCC §15.207, RSS-Gen 7.2.4

Frequency	Level(dBμV)		*)Factor	**) Line	Limit(dBμV)		Margin(dB)	
(MHz)	Q-Peak	Average	(dB)		Q-Peak	Average	Q-Peak	Average
0.15	54.2	32.8	0.2	N	66.0	56.0	11.8	23.2
0.21	49.7	40.7	0.2	N	63.2	53.2	13.5	12.5
0.28	42.0	33.4	0.2	N	60.8	50.8	18.8	17.4
0.35	36.4	30.1	0.2	N	59.0	49.0	22.6	18.9
0.49	31.1	28.9	0.2	L	56.2	46.2	25.1	17.3
28.19	38.7	34.7	1.6	N	60.0	50.0	21.3	15.3

Line Conducted Emissions Tabulated Data

NOTES:

1. Measurements using CISPR quasi-peak mode & average mode.
2. All modes of operation were investigated and the worst -case emission were reported. See attached Plots.
3. *) Factor = LISN + Cable Loss
4. **) LINE : L =Line , N = Neutral
5. The limit is on the FCC Part section 15.207(a).

PLOTS OF EMISSIONS

- ***Conducted Emission at the Mains port (Line)***

NEMKO KOREA (NK-11-R-071) 28 Mar 2011 17:45

Conducted Emissions

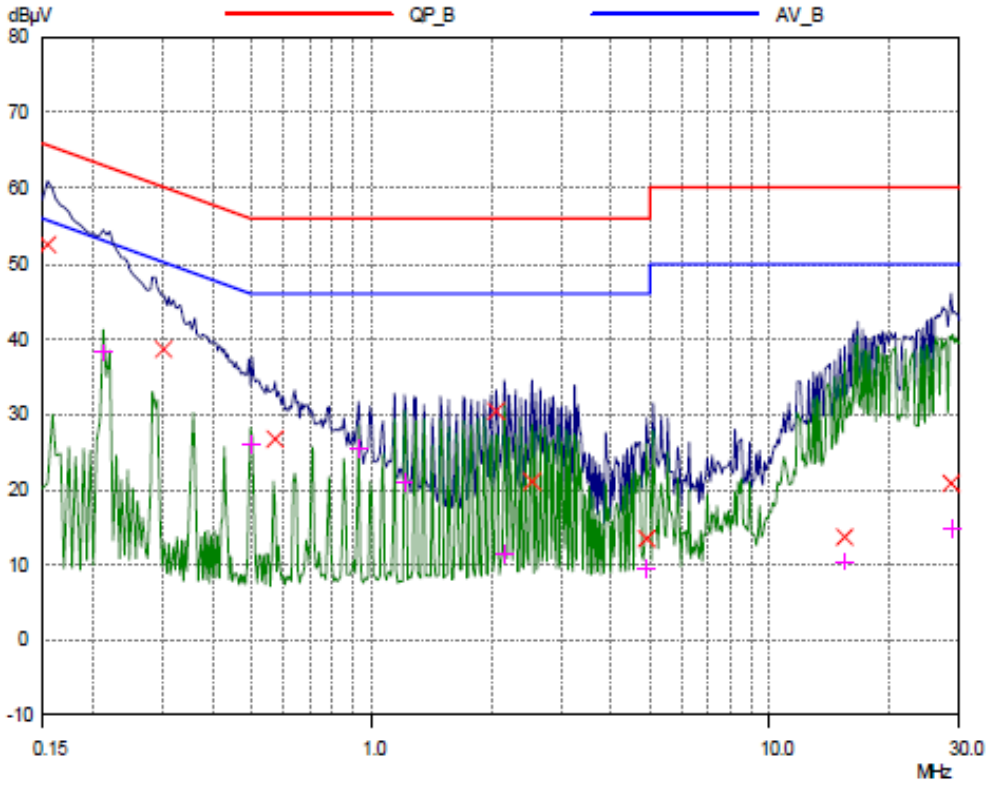
EUT:	EUT
Manuf:	Samsung Electronics Co., Ltd.
Op Cond:	a.c. 120 V / 60 Hz (Wi-Fi Traffic Mode)
Operator:	Jin-Ha, Ko
Test Spec:	FCC Part 15 Subpart C
Comment:	MODEL : DNUR-S1
	LINE : LINE-PE
Result File:	r071l.dat : DNUR-S1

Scan Settings (1 Range)

Frequencies			Receiver Settings					
Start	Stop	Step	IF BW	Detector	M-Time	Atten	Preamp	OpRge
150kHz	30MHz	3.9063kHz	9kHz	PK+AV	20msec	20 dB	OFF	60dB

Transducer	No.	Start	Stop	Name
	1	150kHz	30MHz	ESH3_NEUT

Final Measurement:		
	Detectors:	X QP / + AV
	Meas Time:	1sec
	Subranges:	8
	Acc Margin:	60 dB



PLOTS OF EMISSIONS

- ***Conducted Emission at the Mains port (Neutral)***

NEMKO KOREA (NK-11-R-071) 28 Mar 2011 17:34

Conducted Emissions

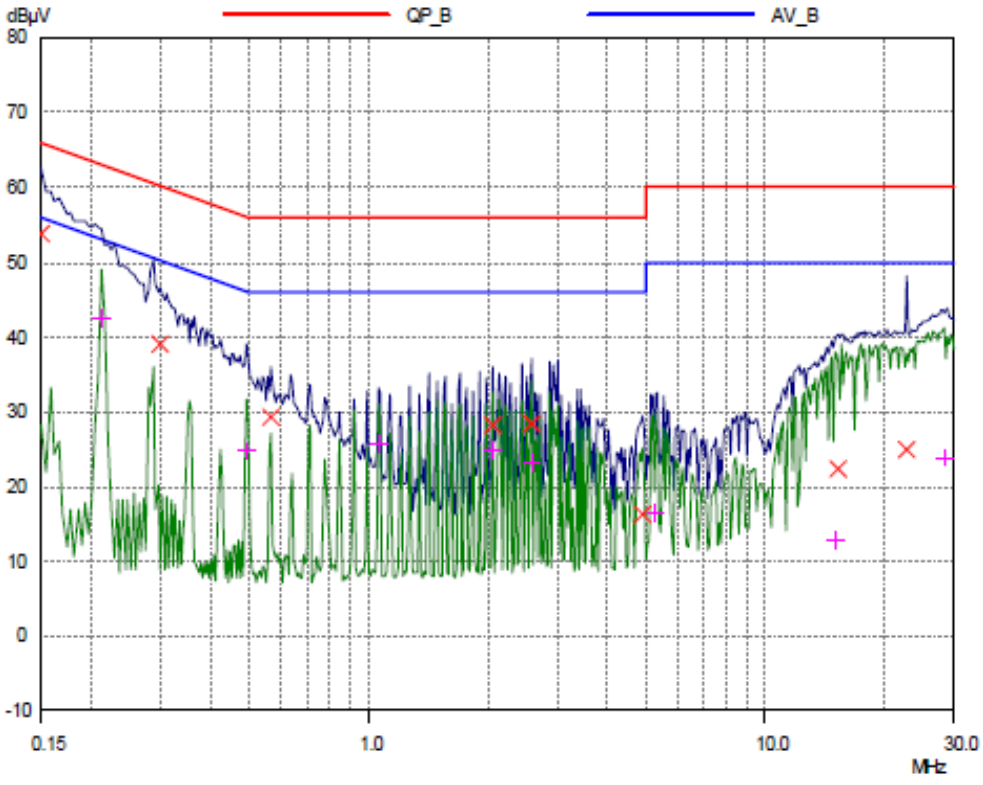
EUT:	EUT
Manuf:	Samsung Electronics Co., Ltd.
Op Cond:	a.c. 120 V / 60 Hz (Wi-Fi Traffic Mode)
Operator:	Jin-Ha, Ko
Test Spec:	FCC Part 15 Subpart C
Comment:	MODEL : DNUR-S1
	LINE : NEUTRAL-PE
Result File:	r071n.dat : DNUR-S1

Scan Settings (1 Range)

Frequencies			Receiver Settings					
Start	Stop	Step	IF BW	Detector	M-Time	Atten	Preamp	OpRge
150kHz	30MHz	3.9063kHz	9kHz	PK+AV	20msec	20 dB	OFF	60dB

Transducer	No.	Start	Stop	Name
	1	150kHz	30MHz	ESH3_NEUT

Final Measurement:		
	Detectors:	X QP / + AV
	Meas Time:	1sec
	Subranges:	8
	Acc Margin:	60 dB

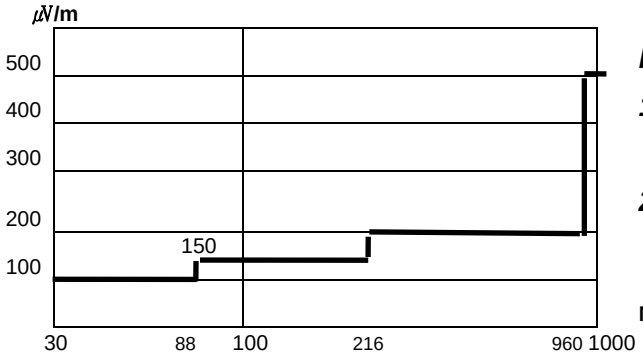


8.2 Radiated Emissions

FCC §15.209, RSS-210 A8.5

Frequency (MHz)	Reading (dBμV/m)	Pol* (H/V)	Antenna Heights (cm)	Turntable Angles (°)	AF+CL+Amp (dB)**	Result (dBμV/m)	Limit (dBμV/m)	Margin (dB)
178.41	51.2	V	100	308	-16.7	34.5	43.5	9.0
209.82	49.0	H	221	326	-15.4	33.6	43.5	9.9
216.93	49.9	H	200	337	-15.4	34.5	46.0	11.5
230.89	54.1	H	100	343	-15.4	38.7	46.0	7.3
461.99	45.2	H	100	297	-11.3	33.9	46.0	12.1
959.99	38.2	V	114	357	-2.0	36.2	46.0	9.8

Radiated Measurements at 3 meters (X-Axis)



NOTES:

1. All modes were measured and the worst-case emission was reported.

2 The radiated limits are shown on Figure 4.

Above 1 GHz the limit is 500 μV/m.

Fig. 4. Limits at 3 meters

8.3 6 dB Modulated Bandwidth

FCC §15.247(a)(2), RSS-210 A8.2

Test Mode : Set to Lowest channel, Middle channel and Highest channel

Result:

802.11b mode

Channel	Frequency(MHz)	Result(MHz)	Limit(MHz)
Low	2412	12.135	0.5
Middle	2437	12.141	0.5
High	2462	12.143	0.5

802.11g mode

Channel	Frequency(MHz)	Result(MHz)	Limit(MHz)
Low	2412	16.523	0.5
Middle	2437	16.520	0.5
High	2462	16.523	0.5

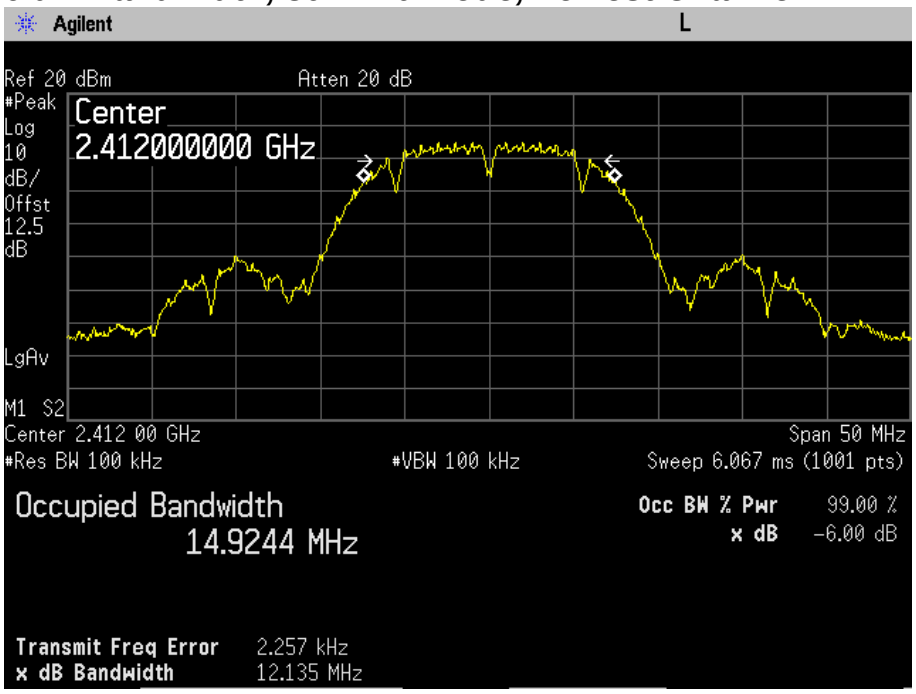
802.11n(HT20) mode

Channel	Frequency(MHz)	Result(MHz)	Limit(MHz)
Low	2412	17.736	0.5
Middle	2437	17.734	0.5
High	2462	17.729	0.5

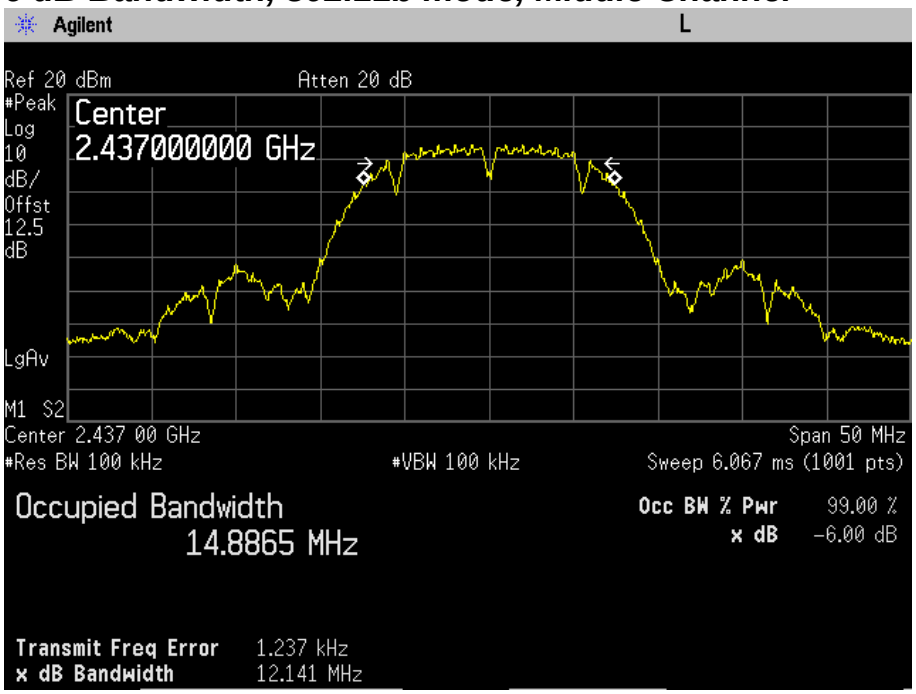
PLOTS OF EMISSIONS

802.11b mode

6 dB Bandwidth, 802.11b mode, Lowest Channel

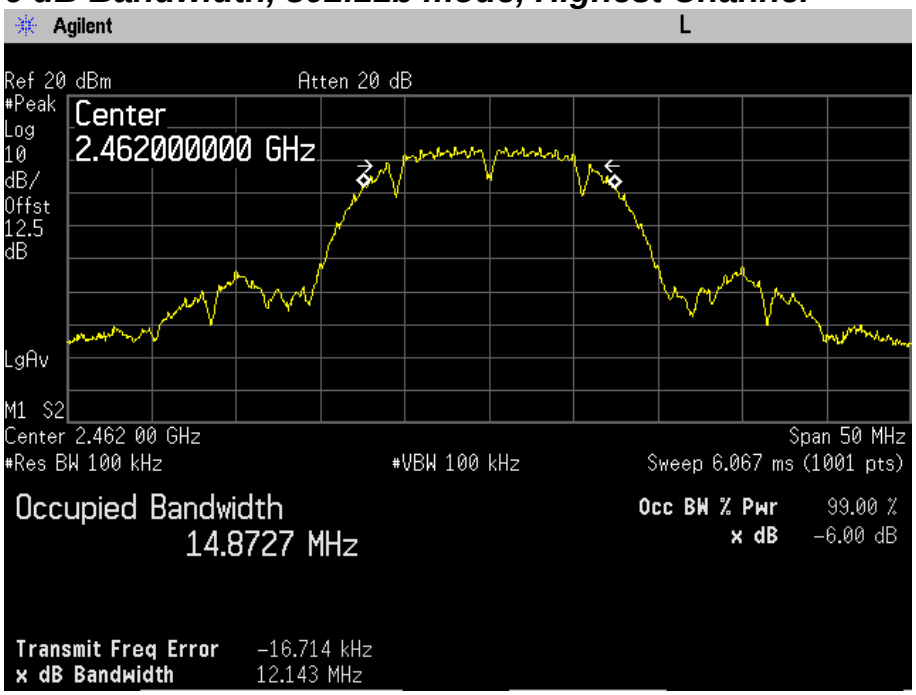


6 dB Bandwidth, 802.11b mode, Middle Channel



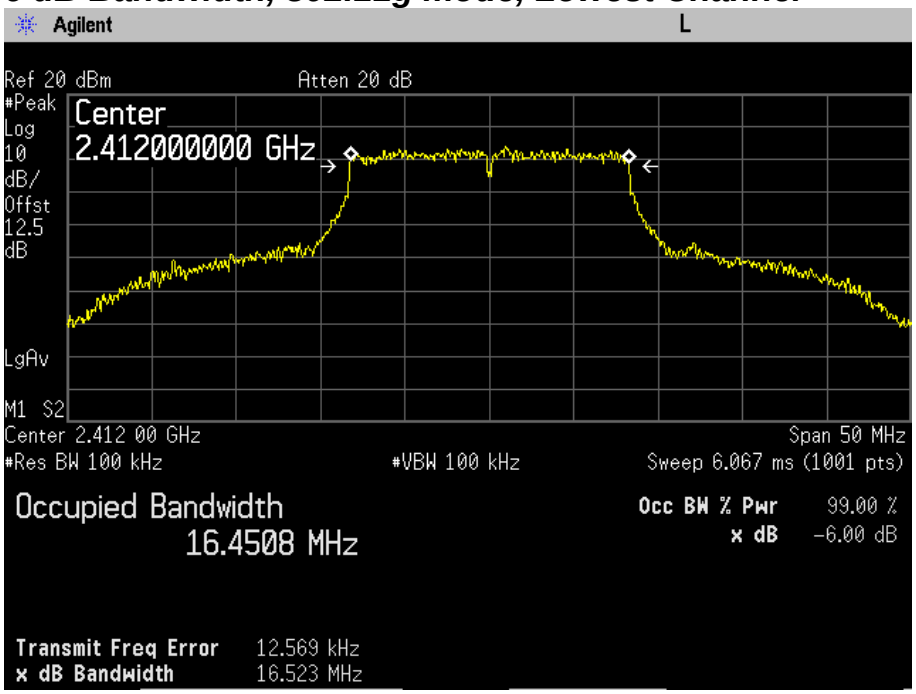
PLOTS OF EMISSIONS

6 dB Bandwidth, 802.11b mode, Highest Channel



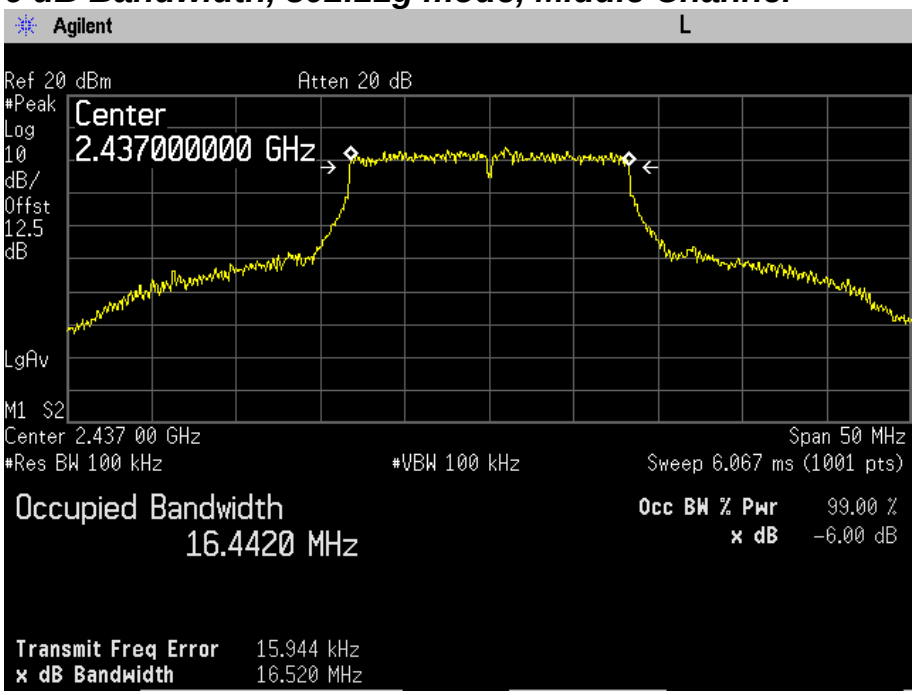
802.11g mode

6 dB Bandwidth, 802.11g mode, Lowest Channel

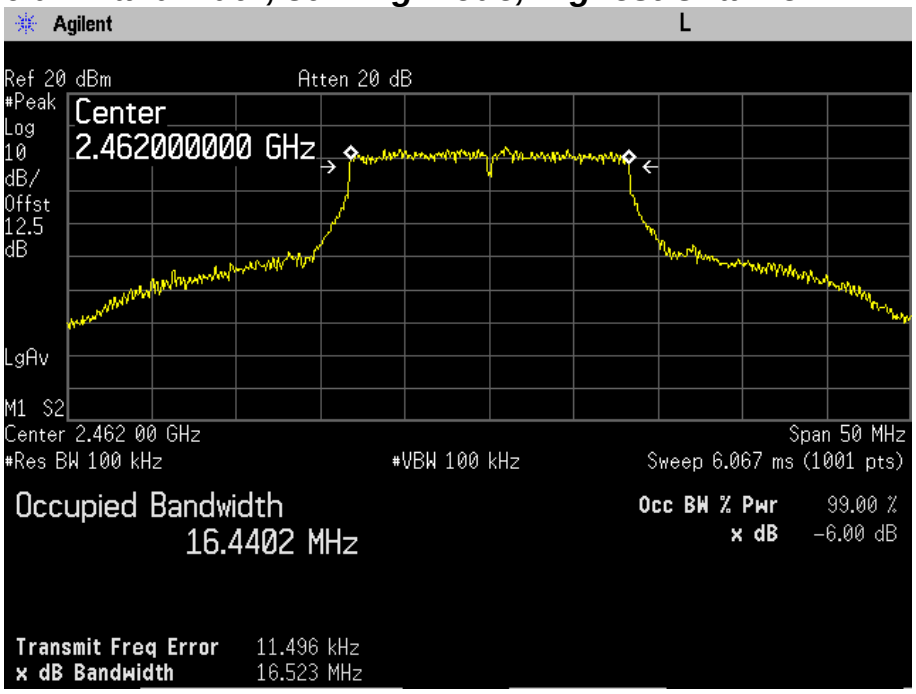


PLOTS OF EMISSIONS

6 dB Bandwidth, 802.11g mode, Middle Channel



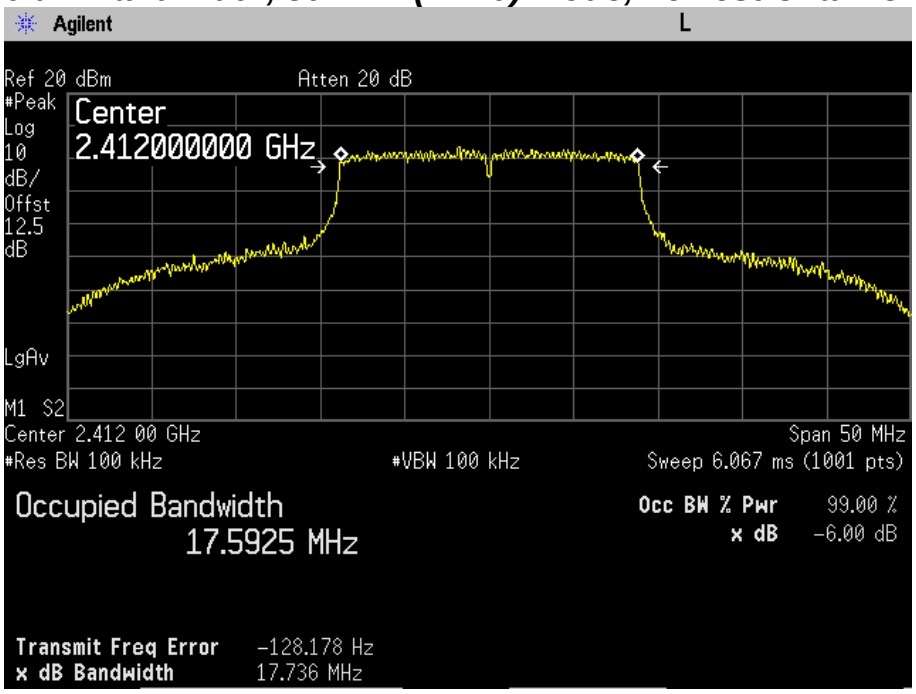
6 dB Bandwidth, 802.11g mode, Highest Channel



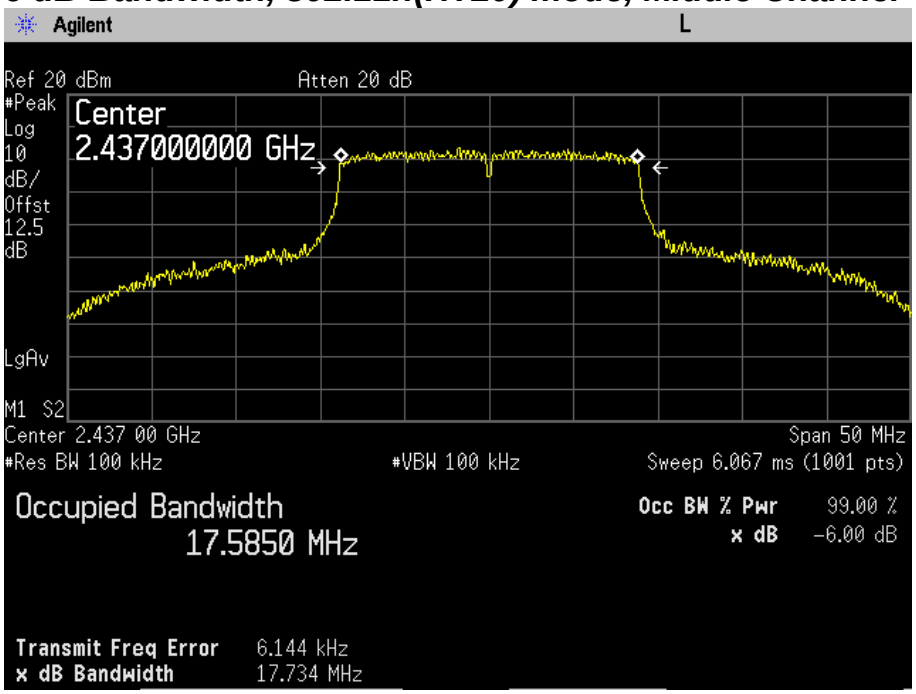
PLOTS OF EMISSIONS

802.11n(HT20) mode

6 dB Bandwidth, 802.11n(HT20) mode, Lowest Channel

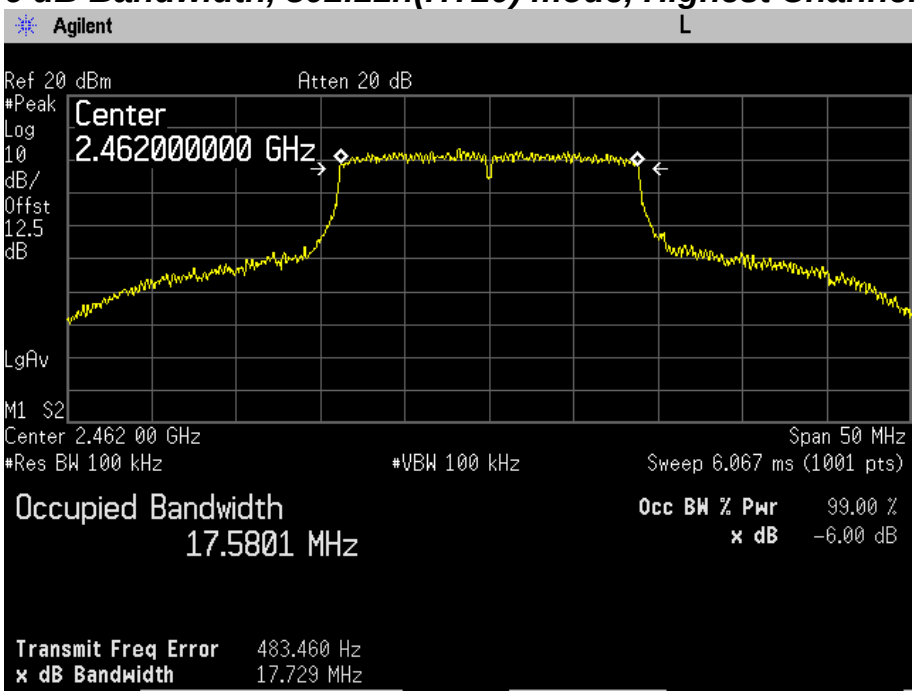


6 dB Bandwidth, 802.11n(HT20) mode, Middle Channel



PLOTS OF EMISSIONS

6 dB Bandwidth, 802.11n(HT20) mode, Highest Channel



8.4 Peak Power Output

FCC §15.247(b)(3), RSS-210 A8.4

Test Mode : Set to Lowest channel, Middle channel and Highest channel

Result:

802.11b mode

Channel	Frequency(MHz)	Peak Power(dBm)	Limit(dBm)
Low	2412	20.62	30
Middle	2437	20.67	30
High	2462	20.40	30

802.11g mode

Channel	Frequency(MHz)	Peak Power(dBm)	Limit(dBm)
Low	2412	26.65	30
Middle	2437	26.57	30
High	2462	26.69	30

802.11n(HT20) mode

Channel	Frequency(MHz)	Peak Power(dBm)	Limit(dBm)
Low	2412	26.64	30
Middle	2437	26.45	30
High	2462	26.45	30

8.5 Power Spectral Density

FCC §15.247(e), RSS-210 A8.2

Test Mode : Set to Lowest channel, Middle channel and Highest channel

Result:

802.11b mode

Channel	Frequency(MHz)	PPSD(dBm)	Limit(dBm)
Low	2412	-13.41	8
Middle	2437	-13.42	8
High	2462	-13.88	8

802.11g mode

Channel	Frequency(MHz)	PPSD(dBm)	Limit(dBm)
Low	2412	-10.45	8
Middle	2437	-10.70	8
High	2462	-11.02	8

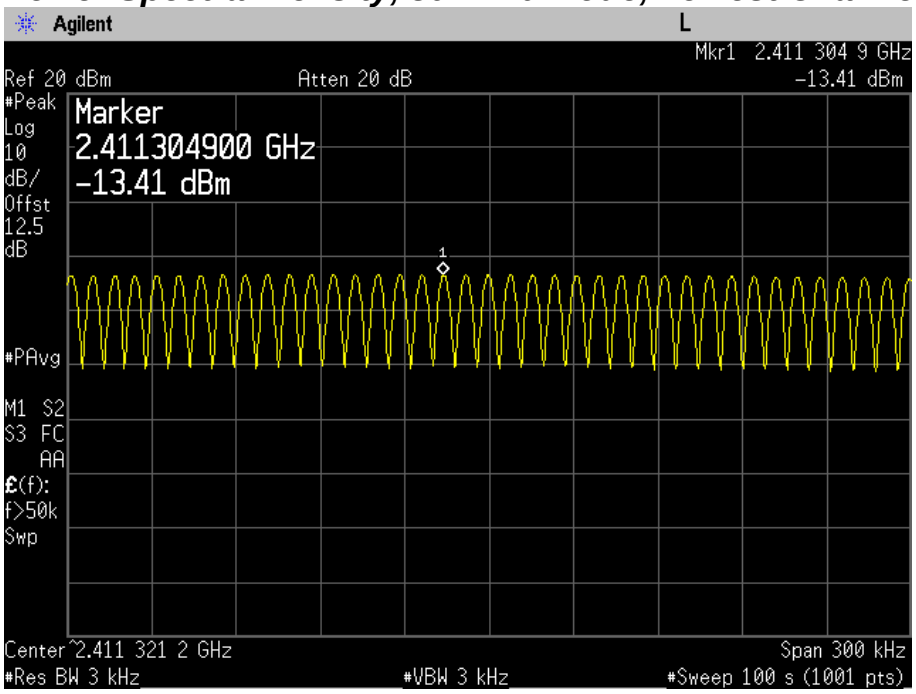
802.11n(HT20) mode

Channel	Frequency(MHz)	PPSD(dBm)	Limit(dBm)
Low	2412	-10.33	8
Middle	2437	-10.30	8
High	2462	-10.53	8

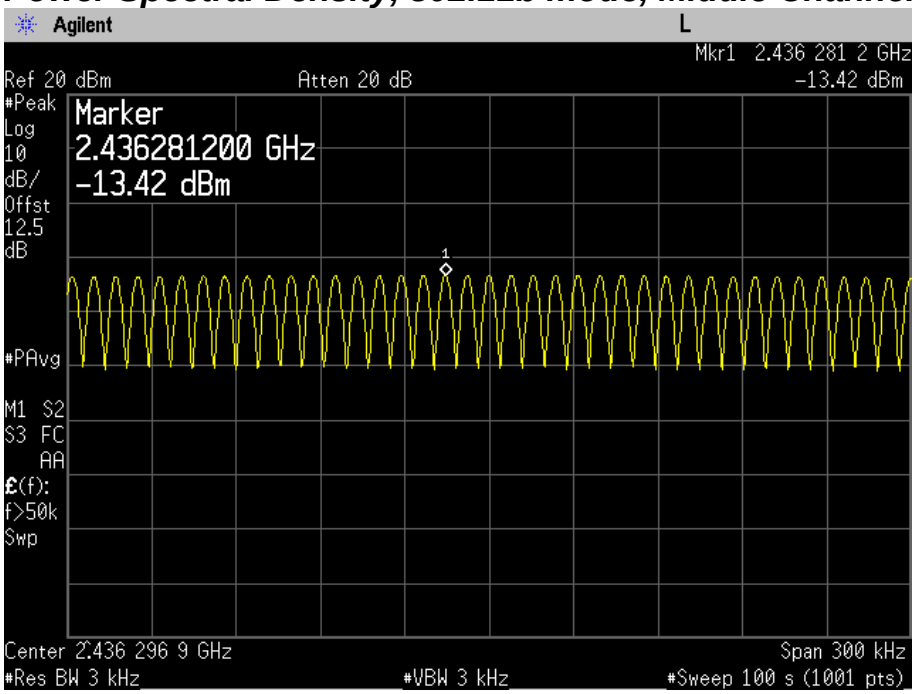
PLOTS OF EMISSIONS

802.11b mode

Power Spectral Density, 802.11b mode, Lowest Channel

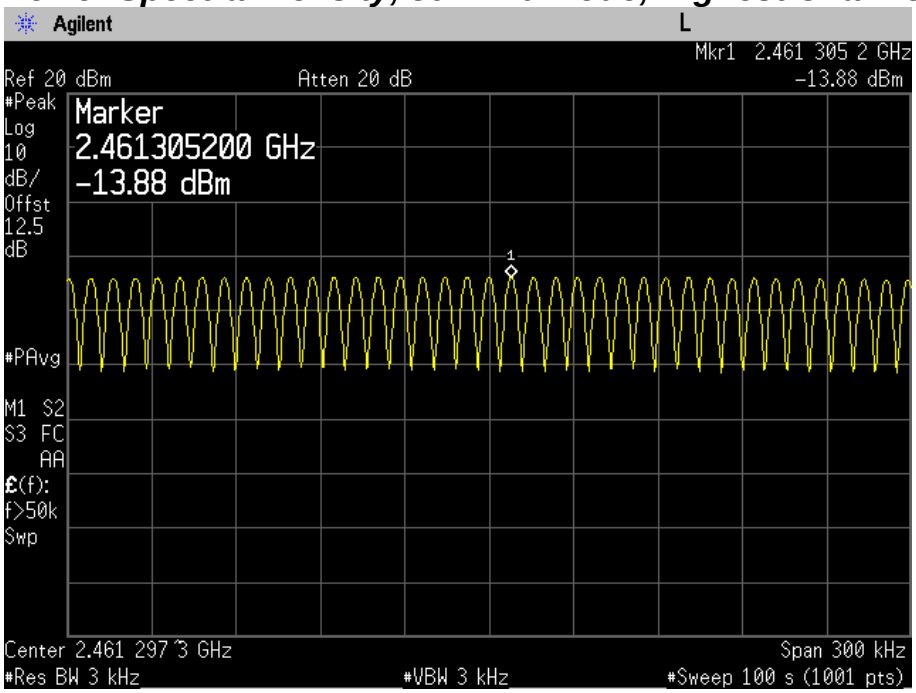


Power Spectral Density, 802.11b mode, Middle Channel



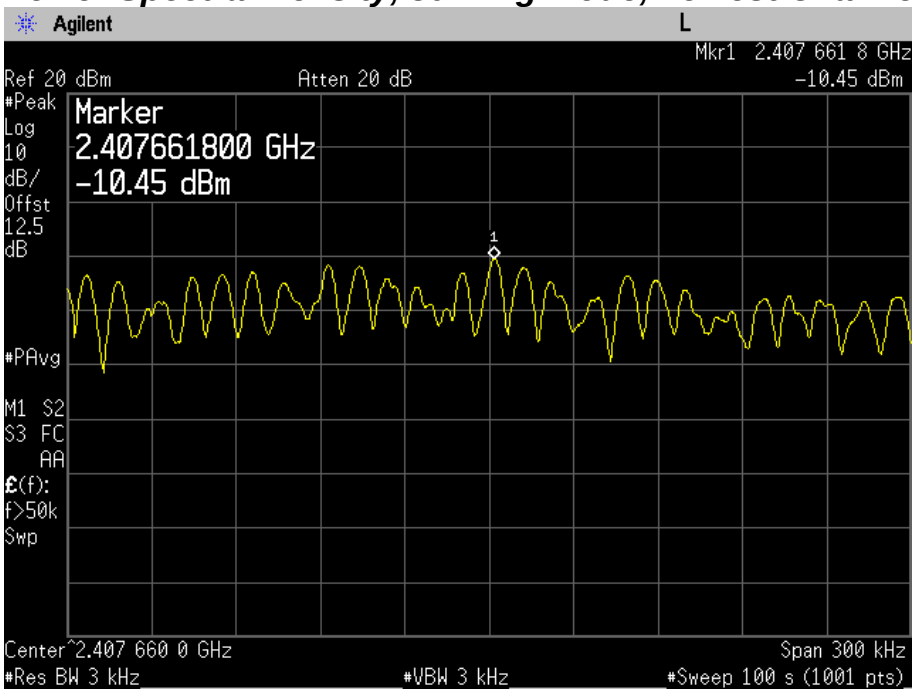
PLOTS OF EMISSIONS

Power Spectral Density, 802.11b mode, Highest Channel



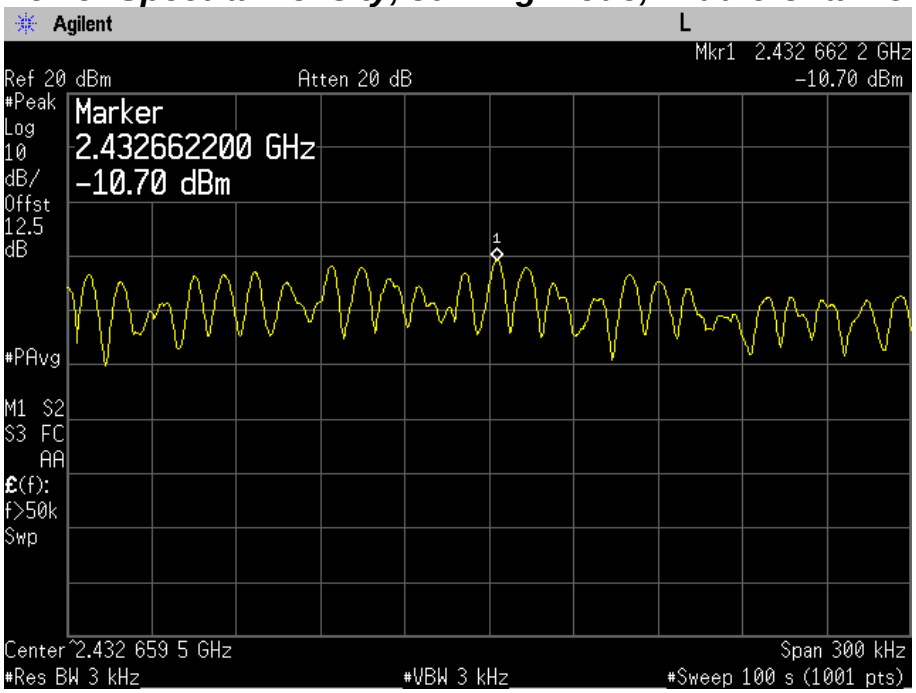
802.11g mode

Power Spectral Density, 802.11g mode, Lowest Channel

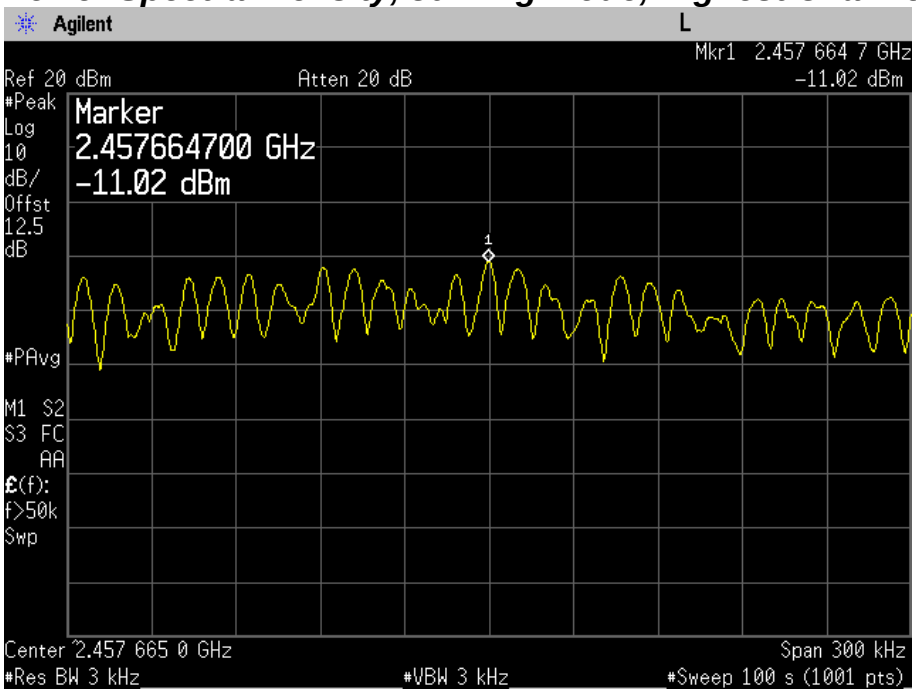


PLOTS OF EMISSIONS

Power Spectral Density, 802.11g mode, Middle Channel



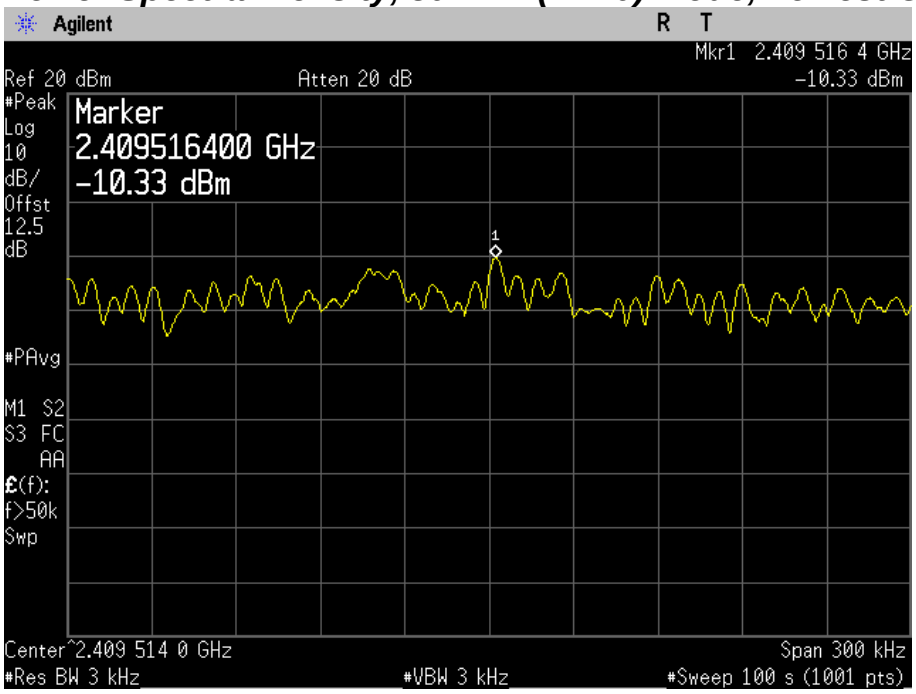
Power Spectral Density, 802.11g mode, Highest Channel



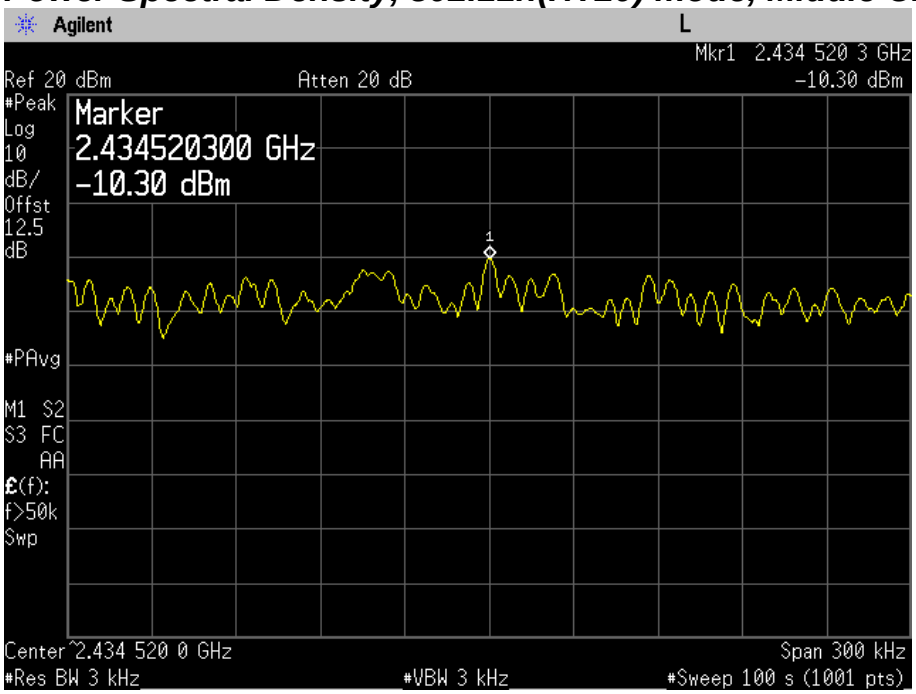
PLOTS OF EMISSIONS

802.11n(HT20) mode

Power Spectral Density, 802.11n(HT20) mode, Lowest Channel

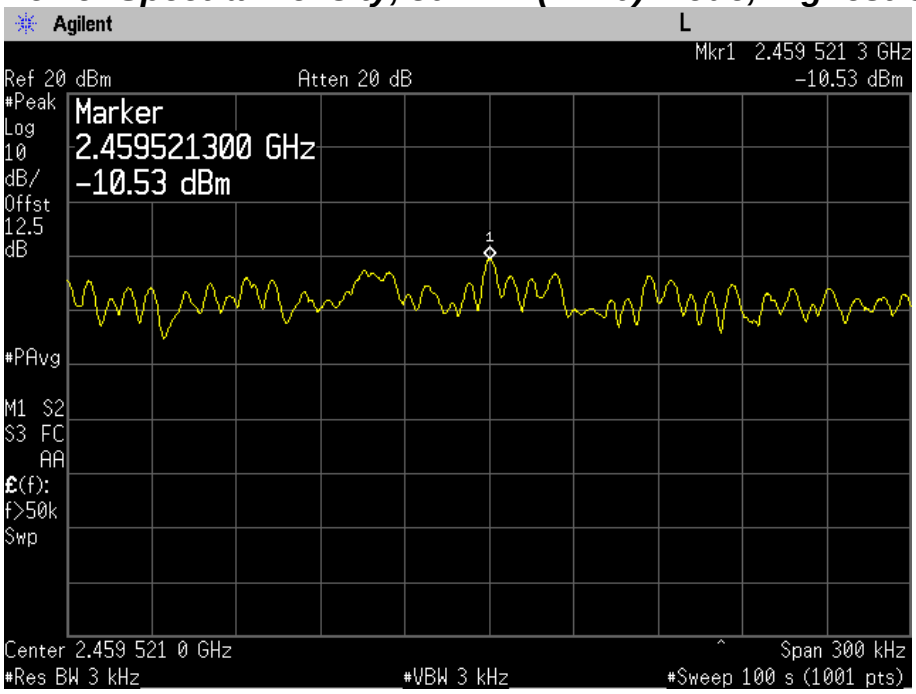


Power Spectral Density, 802.11n(HT20) mode, Middle Channel



PLOTS OF EMISSIONS

Power Spectral Density, 802.11n(HT20) mode, Highest Channel



8.6 Conducted Spurious Emissions

FCC §15.247(d), RSS-210 A8.5

Test Mode : Set to Lowest channel, Middle channel and Highest channel

Result:

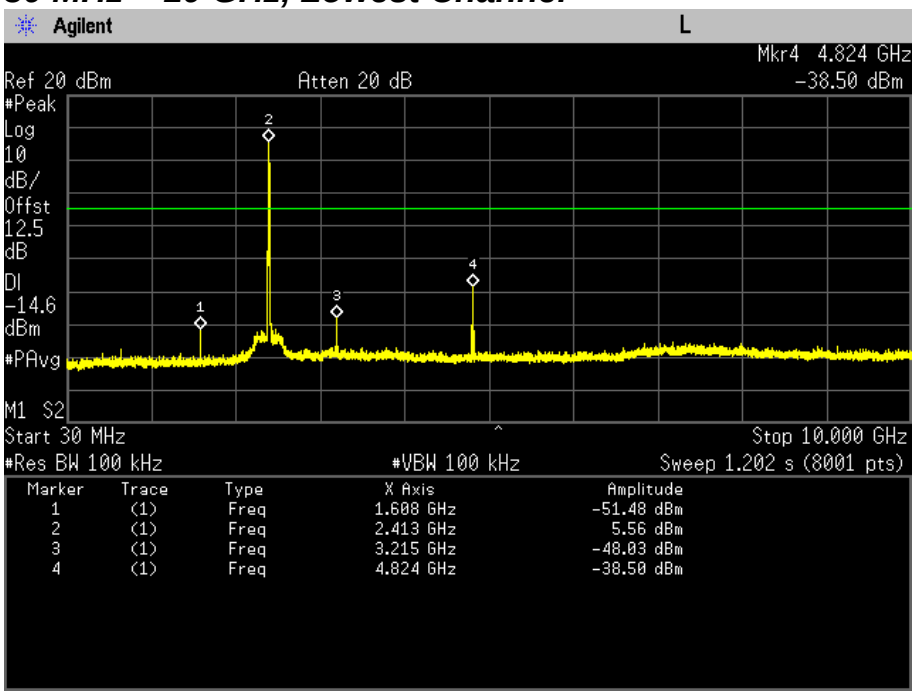
802.11b/g/n(HT20) mode

Channel	Frequency(MHz)	Result(dBc)	Limit(dBc)
Low	2412	More than 20 dBc	20
Middle	2437	More than 20 dBc	20
High	2462	More than 20 dBc	20

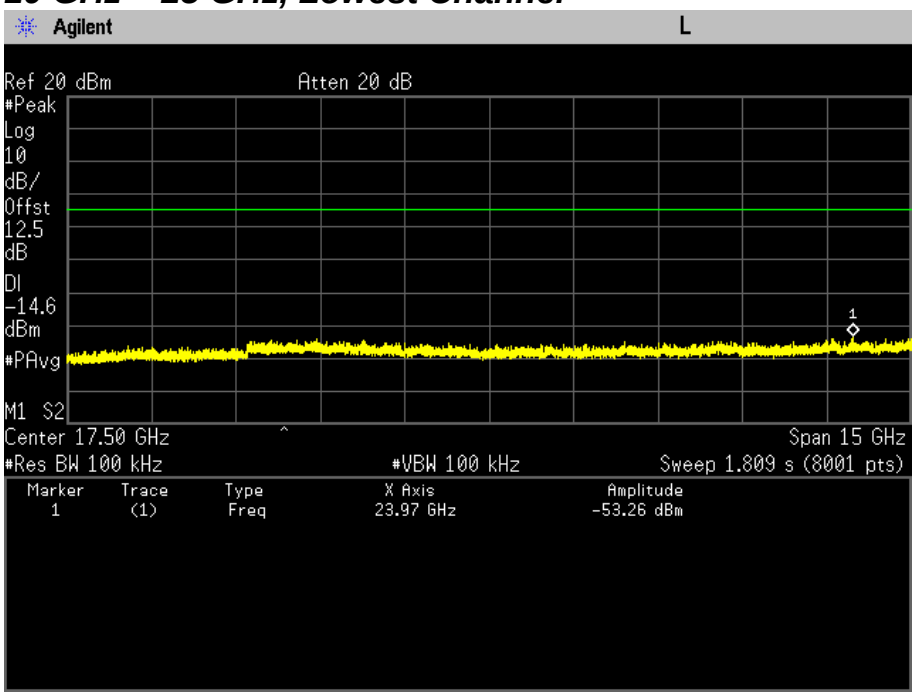
PLOT OF TEST DATA

802.11b mode

Conducted Spurious Emissions, 802.11b mode, 30 MHz ~ 10 GHz, Lowest Channel

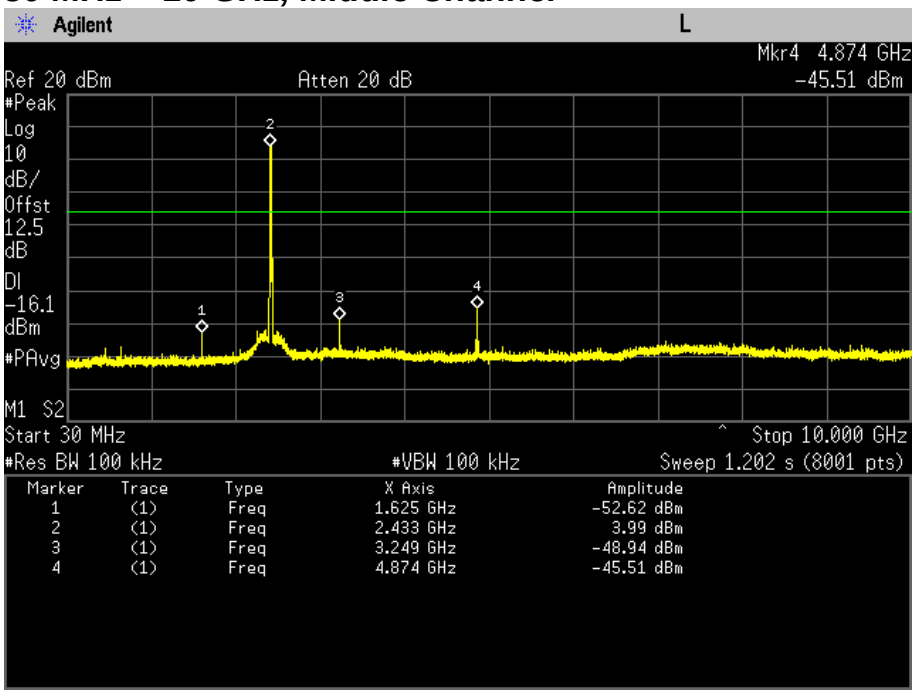


Conducted Spurious Emissions, 802.11b mode, 10 GHz ~ 25 GHz, Lowest Channel

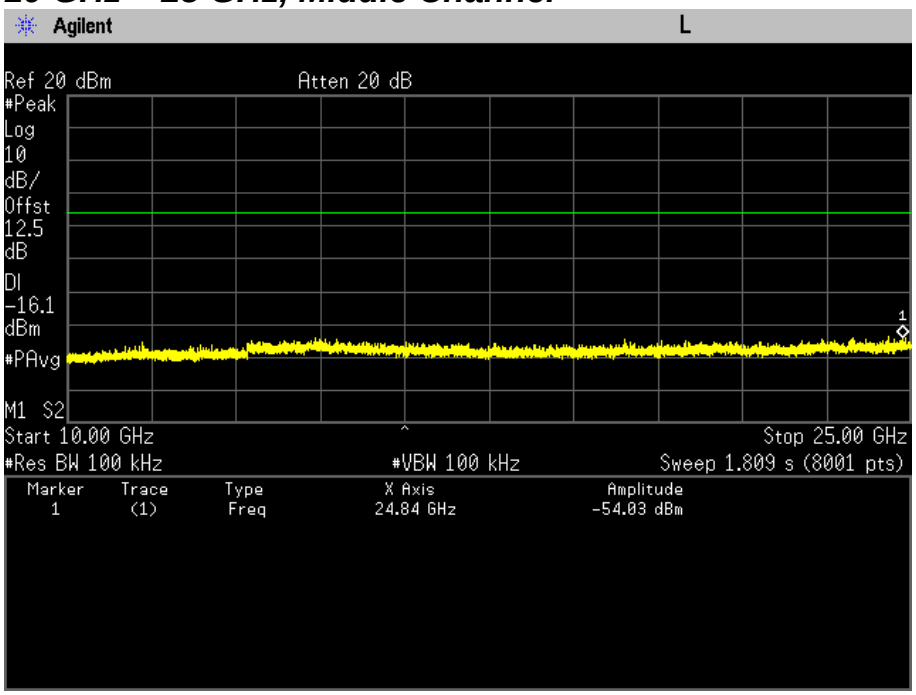


PLOT OF TEST DATA

Conducted Spurious Emissions, 802.11b mode, 30 MHz ~ 10 GHz, Middle Channel

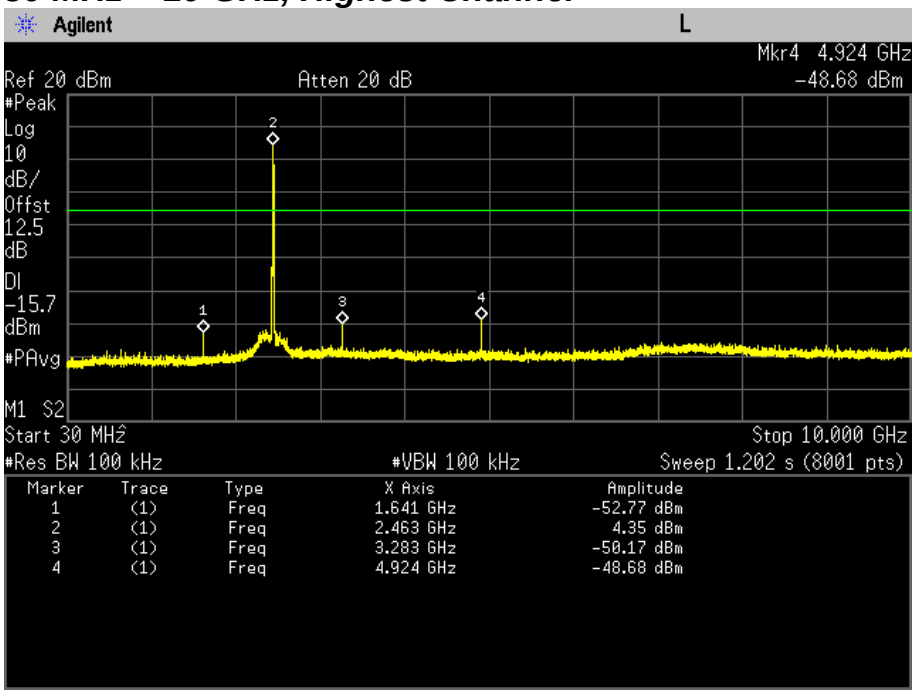


Conducted Spurious Emissions, 802.11b mode, 10 GHz ~ 25 GHz, Middle Channel

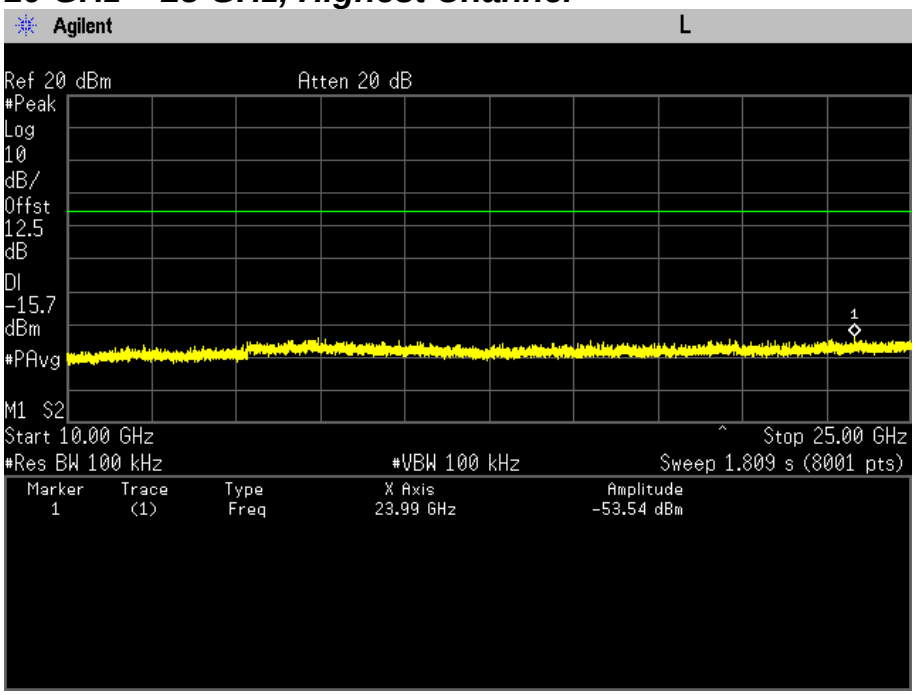


PLOT OF TEST DATA

Conducted Spurious Emissions, 802.11b mode, 30 MHz ~ 10 GHz, Highest Channel



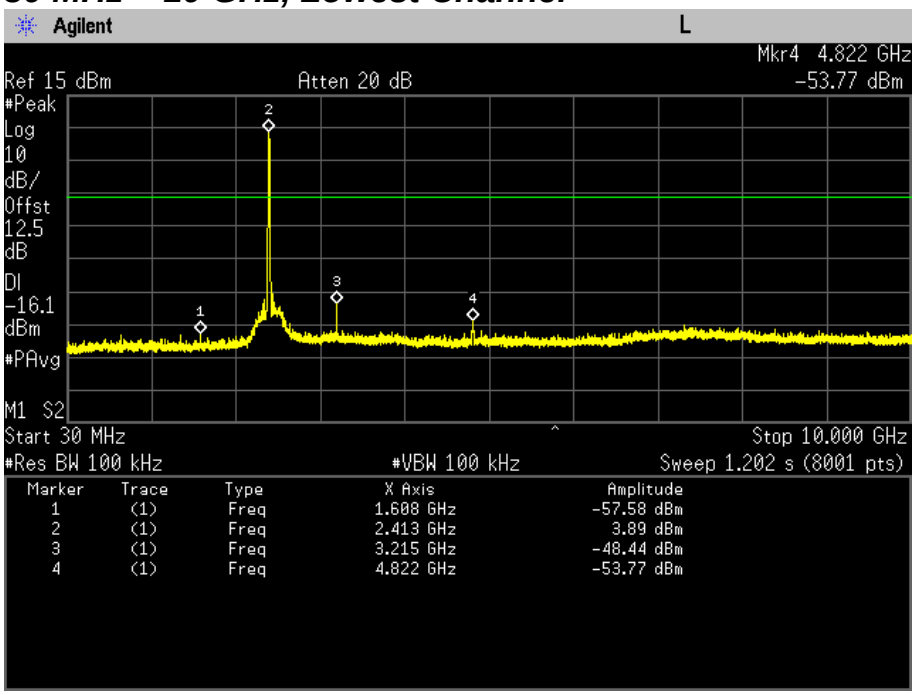
Conducted Spurious Emissions, 802.11b mode, 10 GHz ~ 25 GHz, Highest Channel



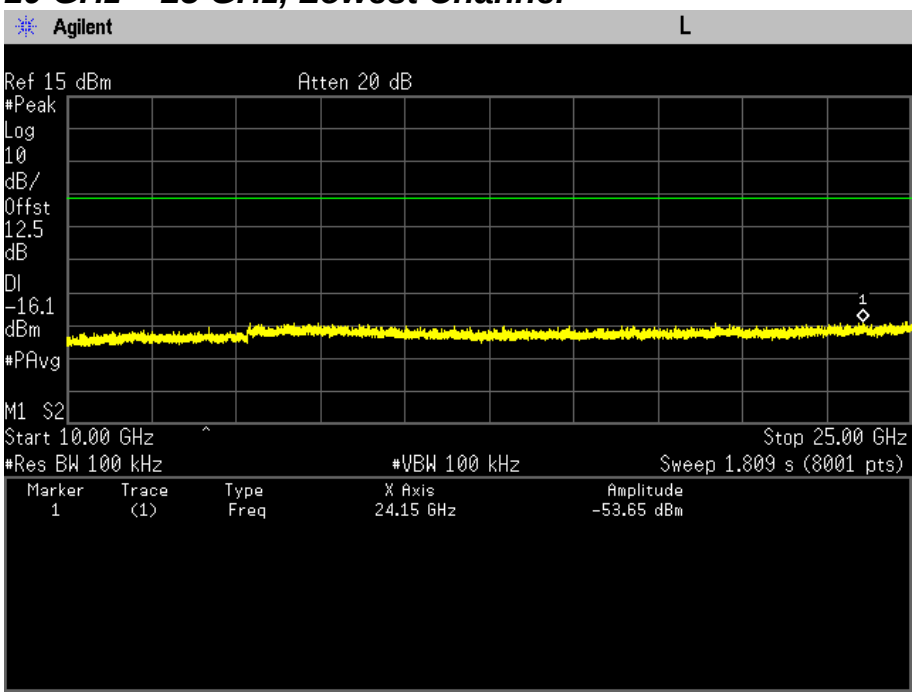
PLOT OF TEST DATA

802.11g mode

Conducted Spurious Emissions, 802.11g mode, 30 MHz ~ 10 GHz, Lowest Channel

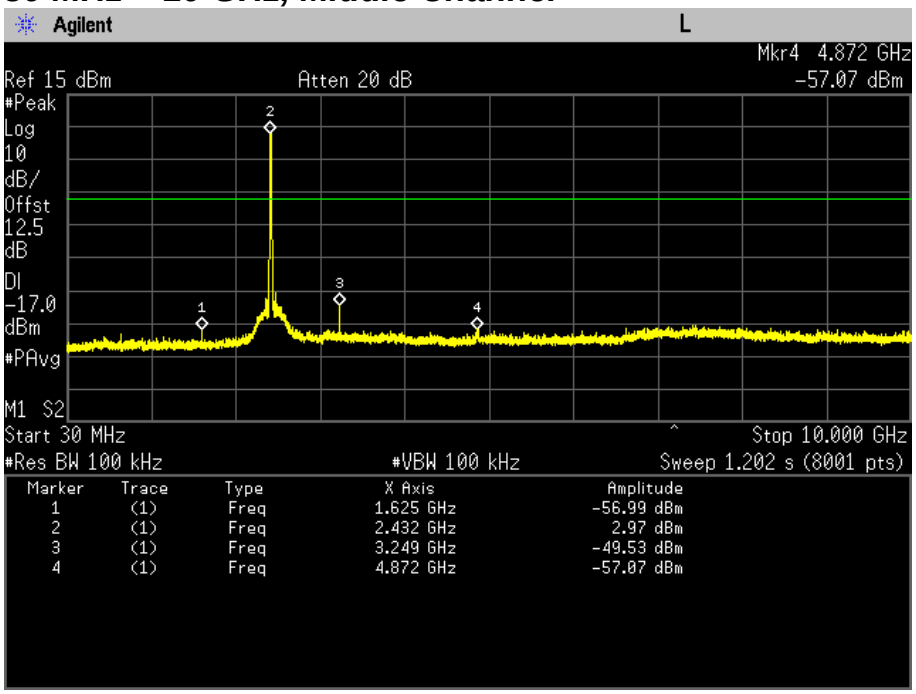


Conducted Spurious Emissions, 802.11g mode, 10 GHz ~ 25 GHz, Lowest Channel

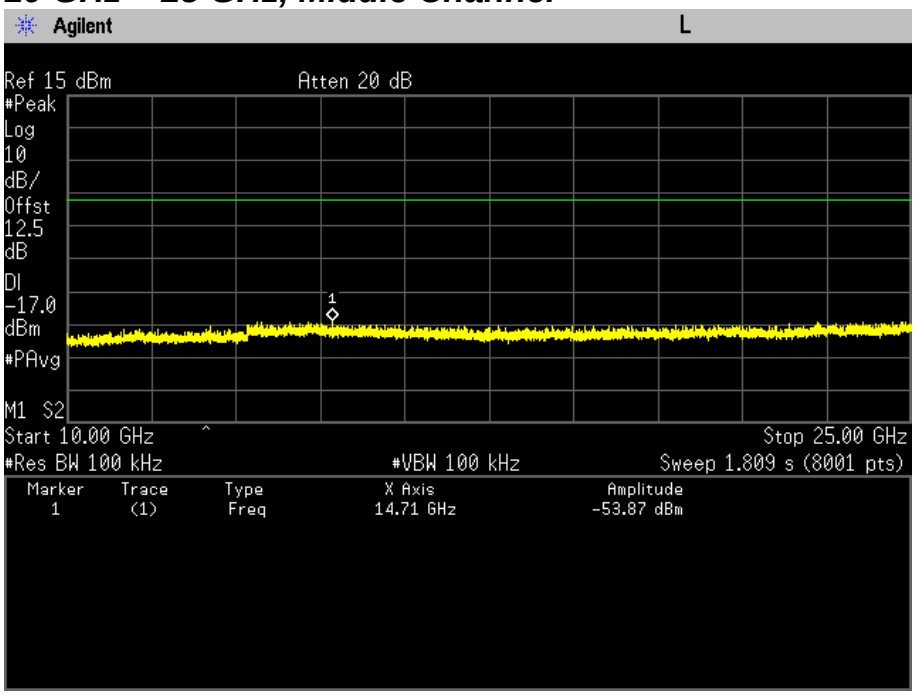


PLOT OF TEST DATA

Conducted Spurious Emissions, 802.11g mode, 30 MHz ~ 10 GHz, Middle Channel

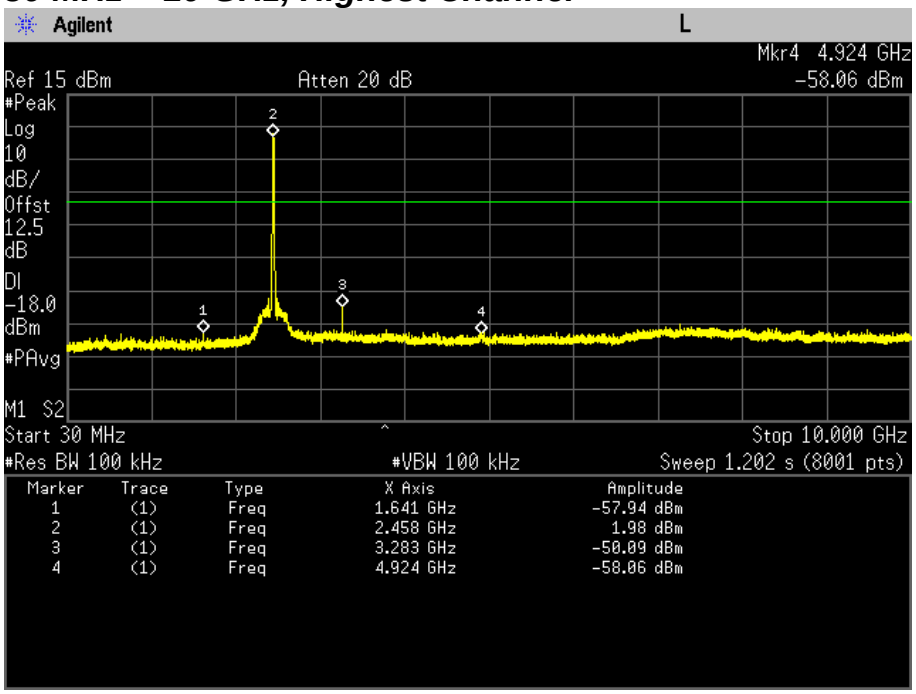


Conducted Spurious Emissions, 802.11g mode, 10 GHz ~ 25 GHz, Middle Channel

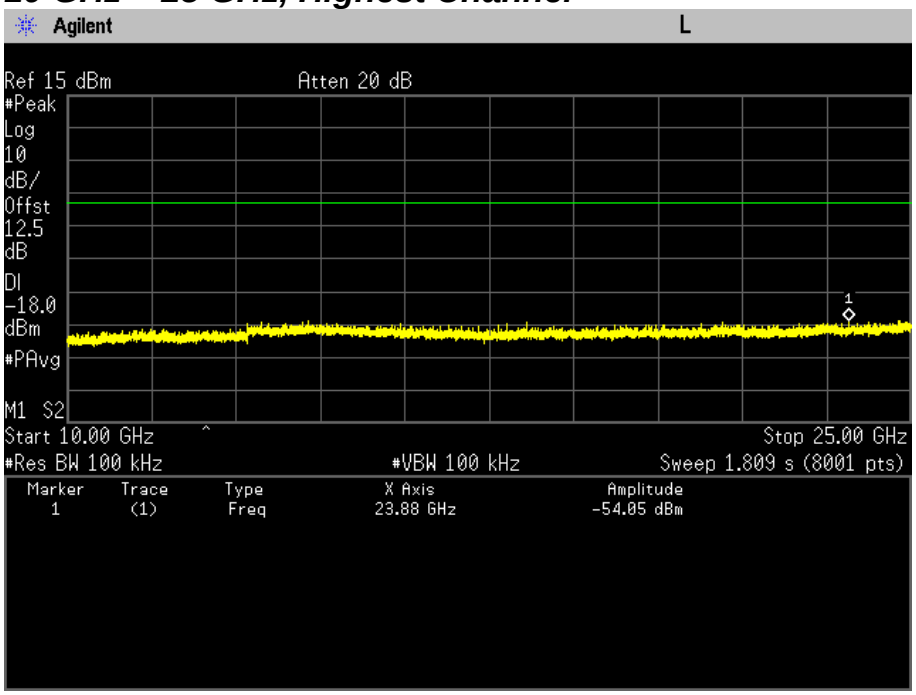


PLOT OF TEST DATA

Conducted Spurious Emissions, 802.11g mode, 30 MHz ~ 10 GHz, Highest Channel



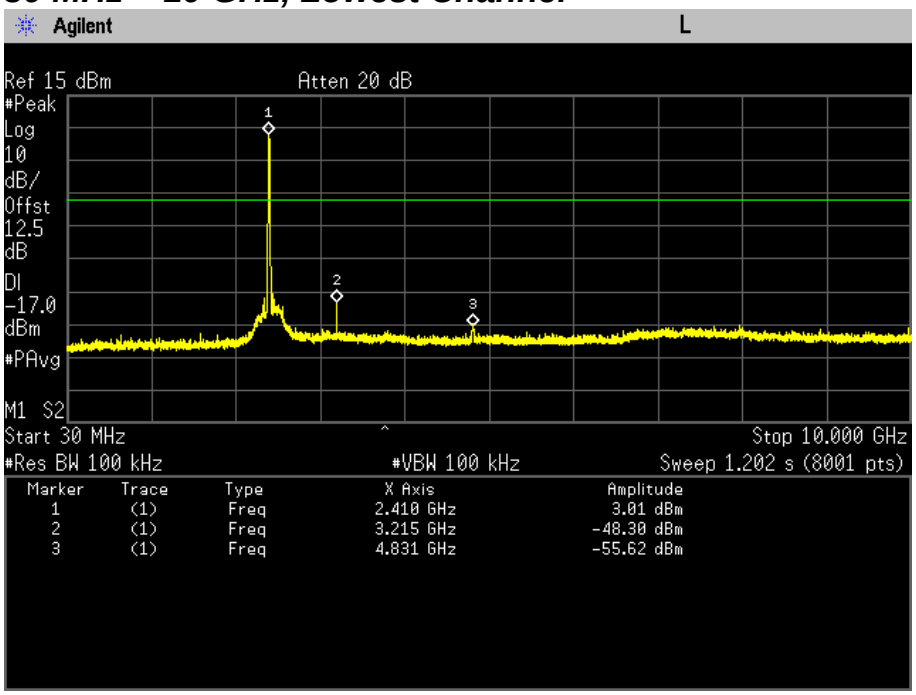
Conducted Spurious Emissions, 802.11g mode, 10 GHz ~ 25 GHz, Highest Channel



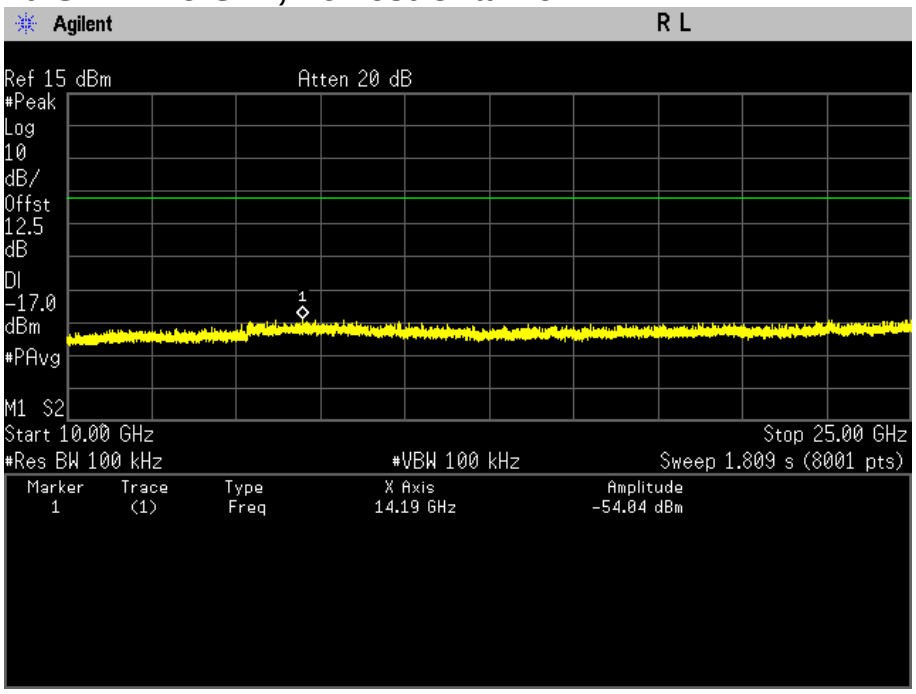
PLOT OF TEST DATA

802.11n(HT20) mode

Conducted Spurious Emissions, 802.11n(HT20) mode, 30 MHz ~ 10 GHz, Lowest Channel

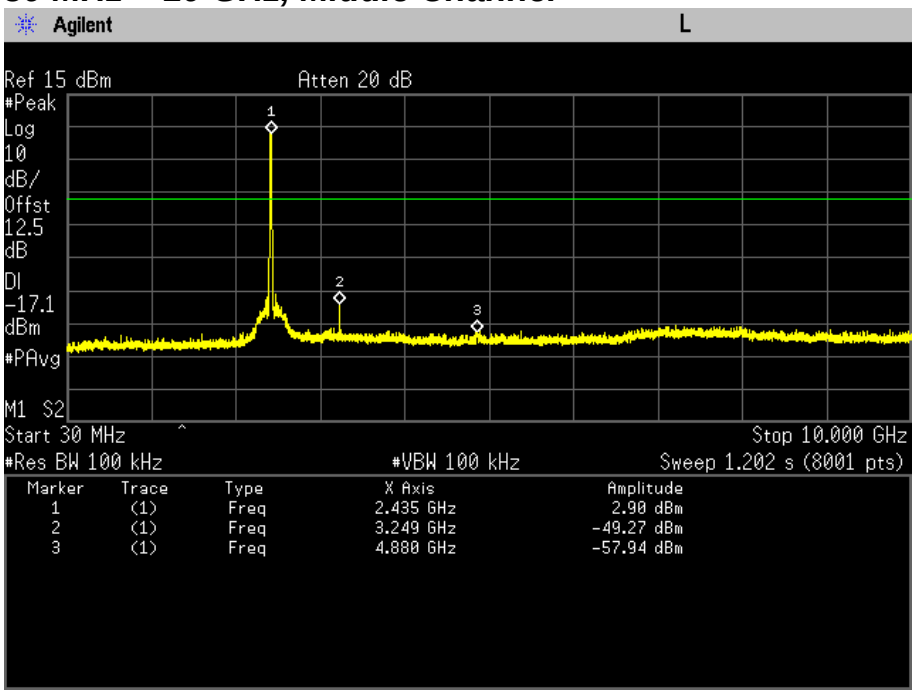


Conducted Spurious Emissions, 802.11n(HT20) mode, 10 GHz ~ 25 GHz, Lowest Channel

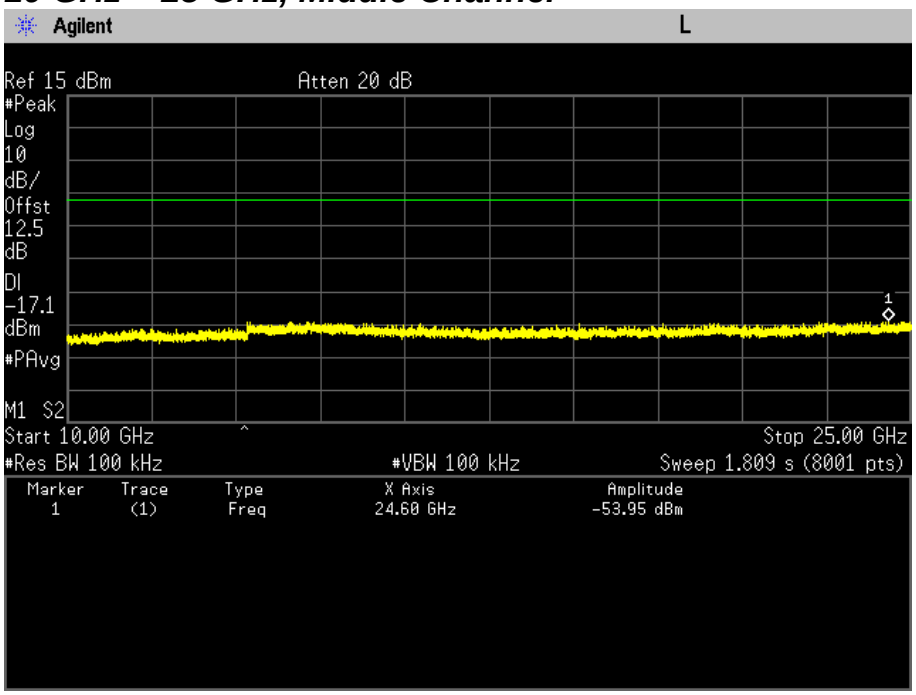


PLOT OF TEST DATA

Conducted Spurious Emissions, 802.11n(HT20) mode, 30 MHz ~ 10 GHz, Middle Channel

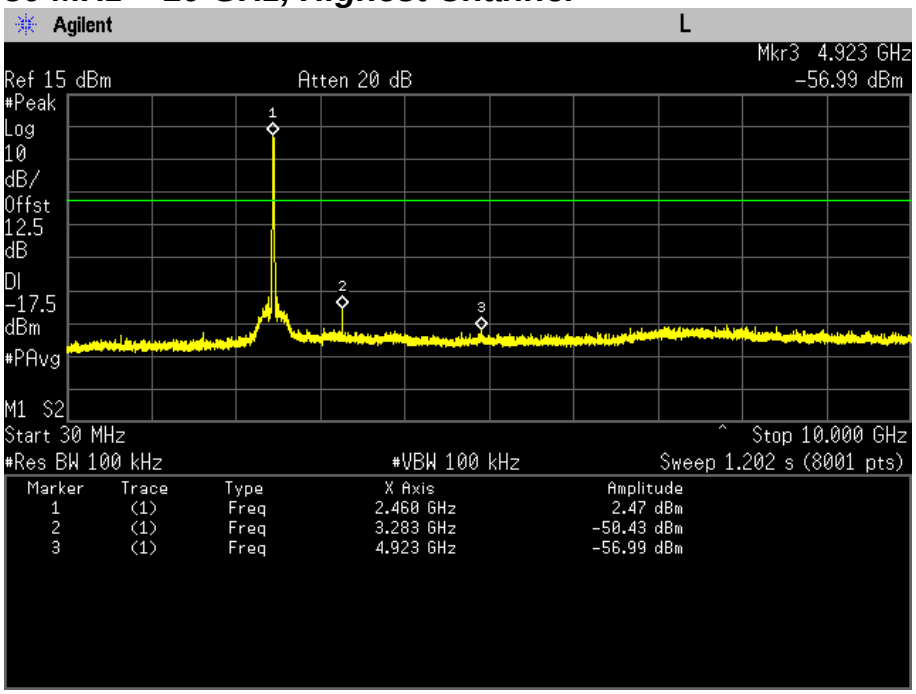


Conducted Spurious Emissions, 802.11n(HT20) mode, 10 GHz ~ 25 GHz, Middle Channel

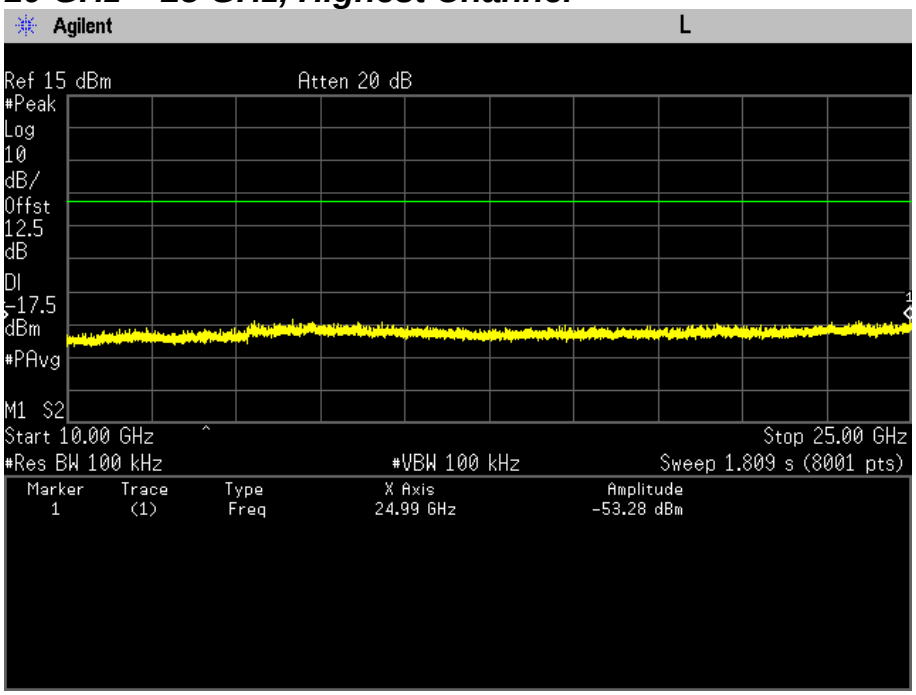


PLOT OF TEST DATA

Conducted Spurious Emissions, 802.11n(HT20) mode, 30 MHz ~ 10 GHz, Highest Channel



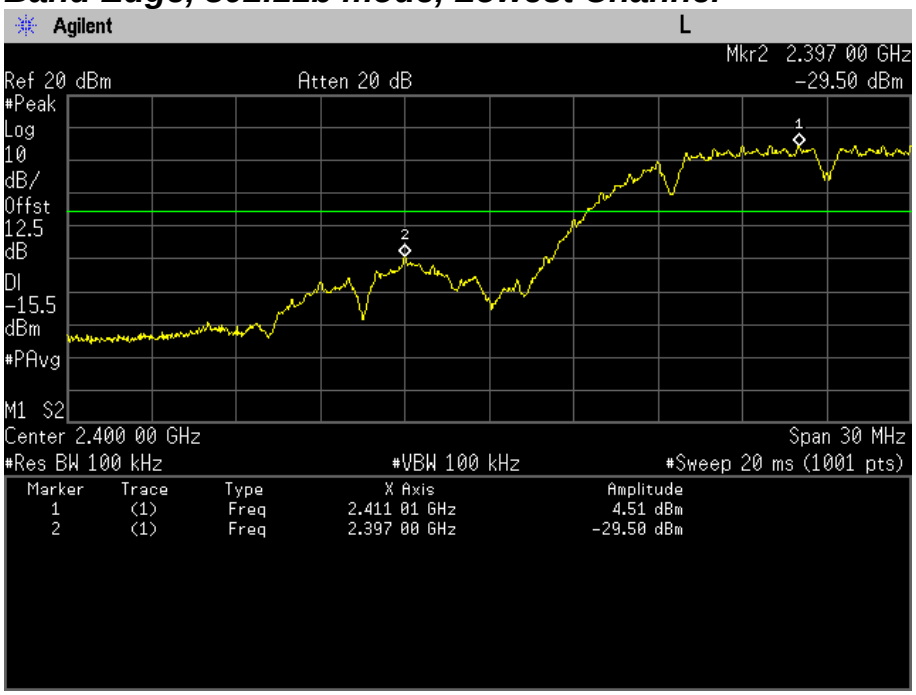
Conducted Spurious Emissions, 802.11n(HT20) mode, 10 GHz ~ 25 GHz, Highest Channel



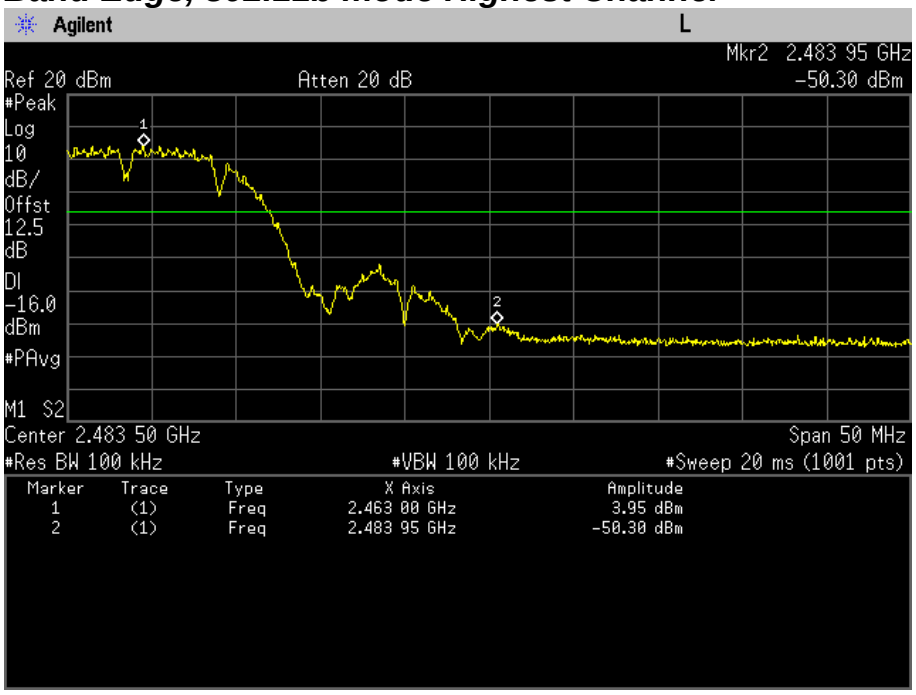
PLOT OF TEST DATA

802.11b mode

Band Edge, 802.11b mode, Lowest Channel



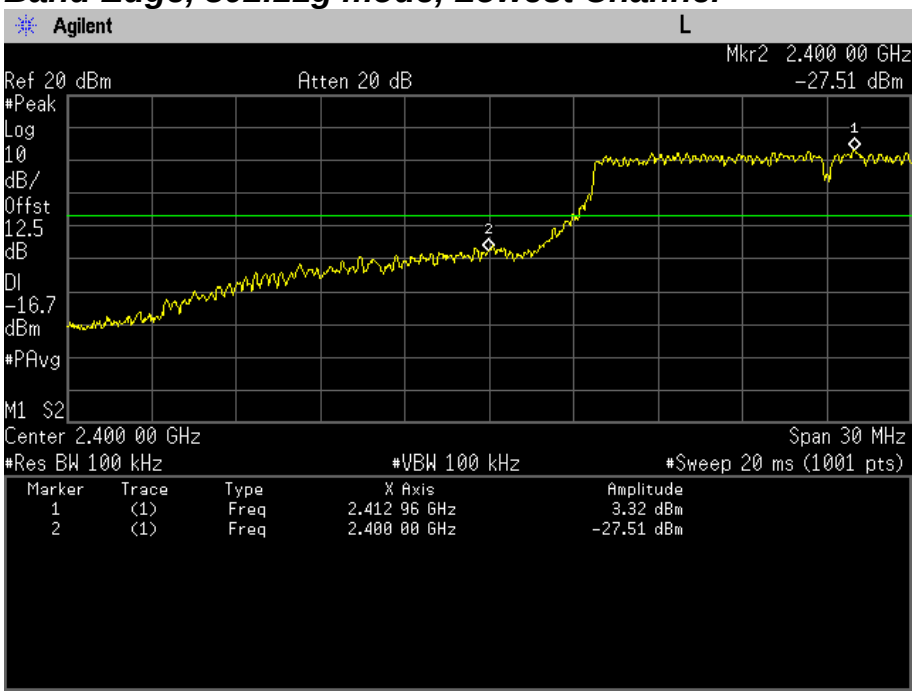
Band Edge, 802.11b mode Highest Channel



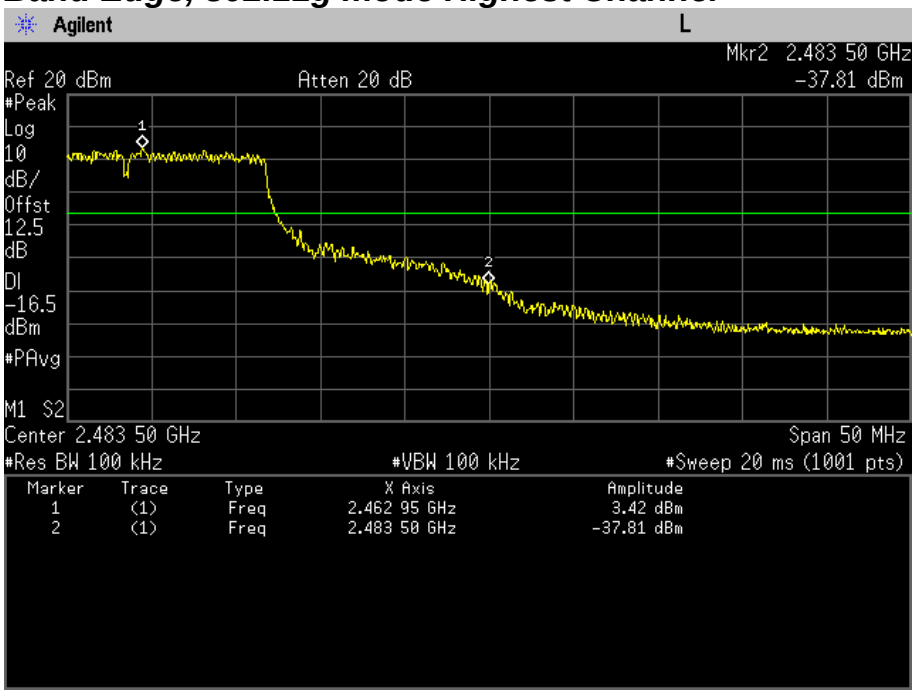
PLOT OF TEST DATA

802.11g mode

Band Edge, 802.11g mode, Lowest Channel



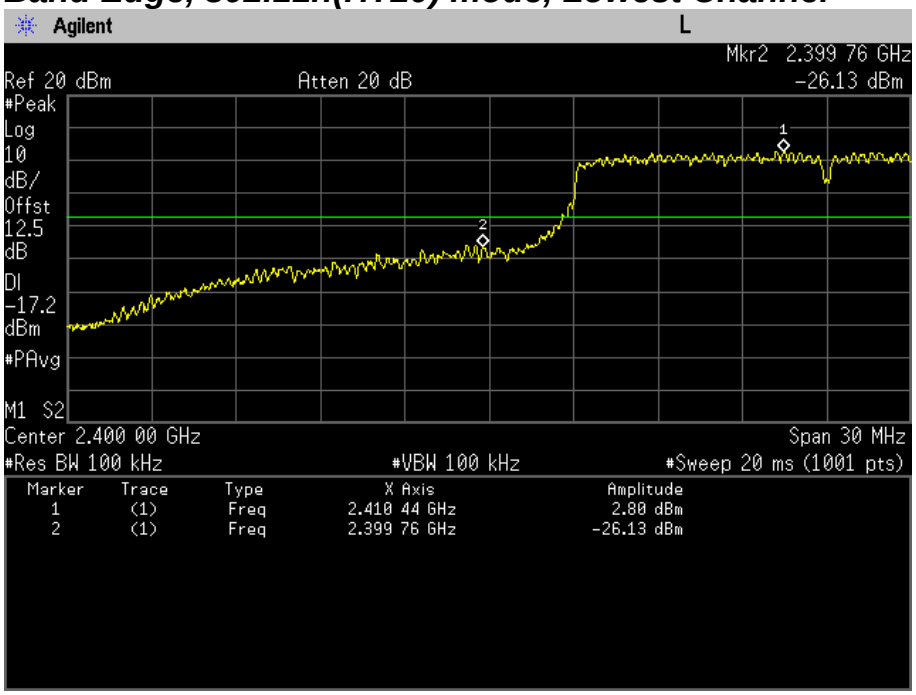
Band Edge, 802.11g mode Highest Channel



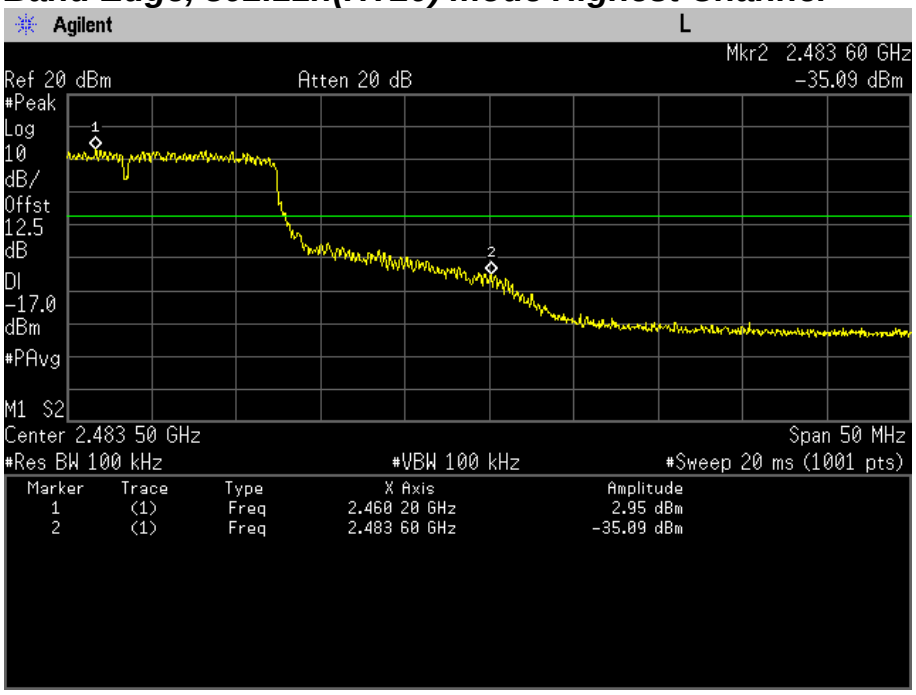
PLOT OF TEST DATA

802.11n(HT20) mode

Band Edge, 802.11n(HT20) mode, Lowest Channel



Band Edge, 802.11n(HT20) mode Highest Channel



8.7 Radiated Spurious Emissions

FCC §15.247(d), RSS-210 A8.5

Test Mode : Set to Lowest channel, Middle channel and Highest channel

Result:

802.11b mode

Lowest Channel

Frequency (MHz)	Reading (dBμV)	Pol* (H/V)	Detector	AF+CL+Amp (dB)**	Result (dBμV/m)	Limit (dBμV/m)	Margin (dB)
1497.50	48.4	V	PK	-4.6	43.8	74.0	30.2
1497.50	35.5	V	AV	-4.6	30.9	54.0	23.1
2248.00	48.4	V	PK	-2.4	46.0	74.0	28.0
2248.00	36.2	V	AV	-2.4	33.8	54.0	20.2
4824.00	44.8	V	PK	8.3	53.1	74.0	20.9
4824.00	40.9	V	AV	8.3	49.2	54.0	4.8

Middle Channel

Frequency (MHz)	Reading (dBμV)	Pol* (H/V)	Detector	AF+CL+Amp (dB)**	Result (dBμV/m)	Limit (dBμV/m)	Margin (dB)
1595.00	47.6	V	PK	-4.3	43.3	74.0	30.7
1595.00	35.5	V	AV	-4.3	31.2	54.0	22.8
1664.50	57.0	V	PK	-4.1	52.9	74.0	21.1
1664.50	40.0	V	AV	-4.1	35.9	54.0	18.1
4874.00	46.1	V	PK	8.4	54.5	74.0	19.5
4874.00	42.4	V	AV	8.4	50.8	54.0	3.2

Highest Channel

Frequency (MHz)	Reading (dBμV)	Pol* (H/V)	Detector	AF+CL+Amp (dB)**	Result (dBμV/m)	Limit (dBμV/m)	Margin (dB)
1497.50	46.5	V	PK	-4.6	41.9	74.0	32.1
1497.50	34.6	V	AV	-4.6	30.0	54.0	24.0
2246.50	49.6	V	PK	-2.4	47.2	74.0	26.8
2246.50	36.9	V	AV	-2.4	34.5	54.0	19.5
4924.00	44.4	V	PK	8.6	53.0	74.0	21.0
4924.00	39.6	V	AV	8.6	48.2	54.0	5.8

802.11g mode

Lowest Channel

Frequency (MHz)	Reading (dBμV)	Pol* (H/V)	Detector	AF+CL+Amp (dB)**	Result (dBμV/m)	Limit (dBμV/m)	Margin (dB)
1497.00	48.0	V	PK	-4.6	43.4	74.0	30.6
1497.00	35.6	V	AV	-4.6	31.0	54.0	23.0
1594.00	47.2	V	PK	-4.3	42.9	74.0	31.1
1594.00	34.8	V	AV	-4.3	30.5	54.0	23.5
4824.00	43.8	V	PK	8.3	52.1	74.0	21.9
4824.00	33.0	V	AV	8.3	41.3	54.0	12.7

TEST DATA

Middle Channel

Frequency (MHz)	Reading (dBμV)	Pol* (H/V)	Detector	AF+CL+Amp (dB)**	Result (dBμV/m)	Limit (dBμV/m)	Margin (dB)
1496.50	47.4	V	PK	-4.6	42.8	74.0	31.2
1496.50	35.6	V	AV	-4.6	31.0	54.0	23.0
1594.00	46.9	V	PK	-4.3	42.6	74.0	31.4
1594.00	34.7	V	AV	-4.3	30.4	54.0	23.6
4874.00	44.2	V	PK	8.4	52.6	74.0	21.4
4874.00	32.4	V	AV	8.4	40.8	54.0	13.2

Highest Channel

Frequency (MHz)	Reading (dBμV)	Pol* (H/V)	Detector	AF+CL+Amp (dB)**	Result (dBμV/m)	Limit (dBμV/m)	Margin (dB)
1496.50	48.7	V	PK	-4.6	44.1	74.0	29.9
1496.50	36.5	V	AV	-4.6	31.9	54.0	22.1
1594.00	48.5	V	PK	-4.3	44.2	74.0	29.8
1594.00	36.5	V	AV	-4.3	32.2	54.0	21.8
4924.00	48.4	V	PK	8.6	57.0	74.0	17.0
4924.00	34.0	V	AV	8.6	42.6	54.0	11.4

802.11n(HT20) mode

Lowest Channel

Frequency (MHz)	Reading (dBμV)	Pol* (H/V)	Detector	AF+CL+Amp (dB)**	Result (dBμV/m)	Limit (dBμV/m)	Margin (dB)
1497.50	47.9	V	PK	-4.6	43.3	74.0	30.7
1497.50	36.0	V	AV	-4.6	31.4	54.0	22.6
1594.00	46.9	V	PK	-4.3	42.6	74.0	31.4
1594.00	34.7	V	AV	-4.3	30.4	54.0	23.6
4824.00	44.0	V	PK	8.3	52.3	74.0	21.7
4824.00	33.6	V	AV	8.3	41.9	54.0	12.1

Middle Channel

Frequency (MHz)	Reading (dBμV)	Pol* (H/V)	Detector	AF+CL+Amp (dB)**	Result (dBμV/m)	Limit (dBμV/m)	Margin (dB)
1496.50	47.9	V	PK	-4.6	43.3	74.0	30.7
1496.50	35.6	V	AV	-4.6	31.0	54.0	23.0
1595.50	46.7	V	PK	-4.3	42.4	74.0	31.6
1595.50	34.6	V	AV	-4.3	30.3	54.0	23.7
4874.00	43.6	V	PK	8.4	52.0	74.0	22.0
4874.00	32.1	V	AV	8.4	40.5	54.0	13.5

TEST DATA

Highest Channel

Frequency (MHz)	Reading (dBμV)	Pol* (H/V)	Detector	AF+CL+Amp (dB)**	Result (dBμV/m)	Limit (dBμV/m)	Margin (dB)
1496.50	47.9	V	PK	-4.6	43.3	74.0	30.7
1496.50	35.6	V	AV	-4.6	31.0	54.0	23.0
1595.50	46.7	V	PK	-4.3	42.4	74.0	31.6
1595.50	34.6	V	AV	-4.3	30.3	54.0	23.7
4874.00	43.6	V	PK	8.4	52.0	74.0	22.0
4874.00	32.1	V	AV	8.4	40.5	54.0	13.5

Note:

1. *Pol. H = Horizontal V = Vertical

2. **AF + CL + Amp. = Antenna Factor + Cable Loss + Amplifier.

3. Other spurious are 20 dB below than Fundamental.

4. The radiated emissions testing were made by rotating EUT through three orthogonal axes and rotating the receive antenna with horizontal, Vertical polarization.
The worst date was recorded.

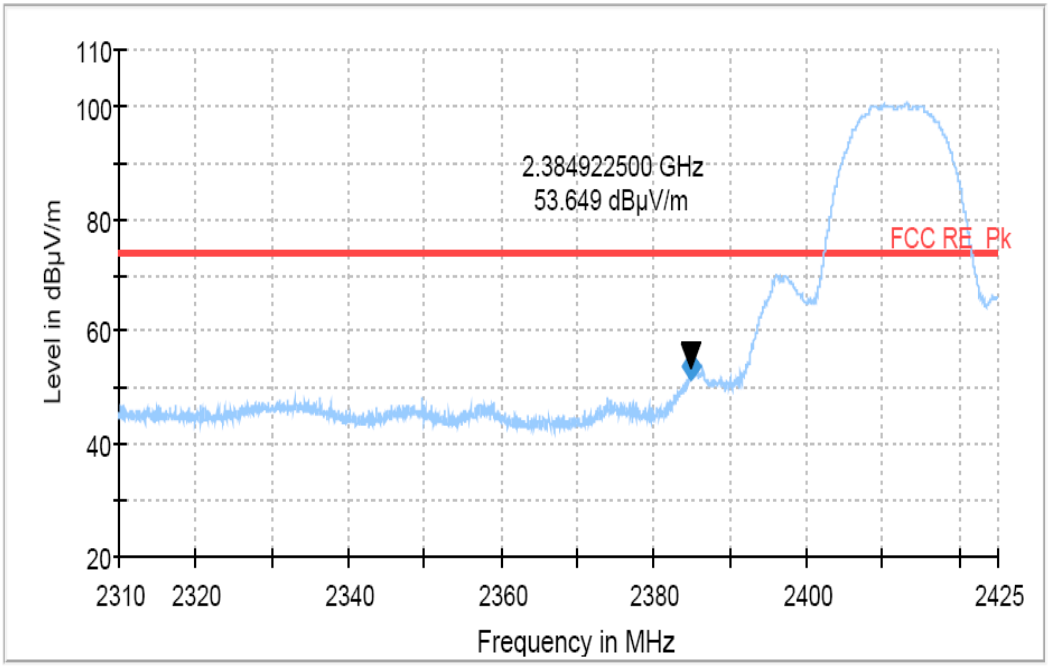
5. For measurements the resolution bandwidth is set to 1 MHz, and then the video bandwidth is set to 1 MHz for peak measurements and 10 Hz for average measurements.

6. The spectrum is measured from 9 kHz to 10th harmonic and the worst-case emissions are reported. No significant emissions were found beyond the fifth harmonic for this device.

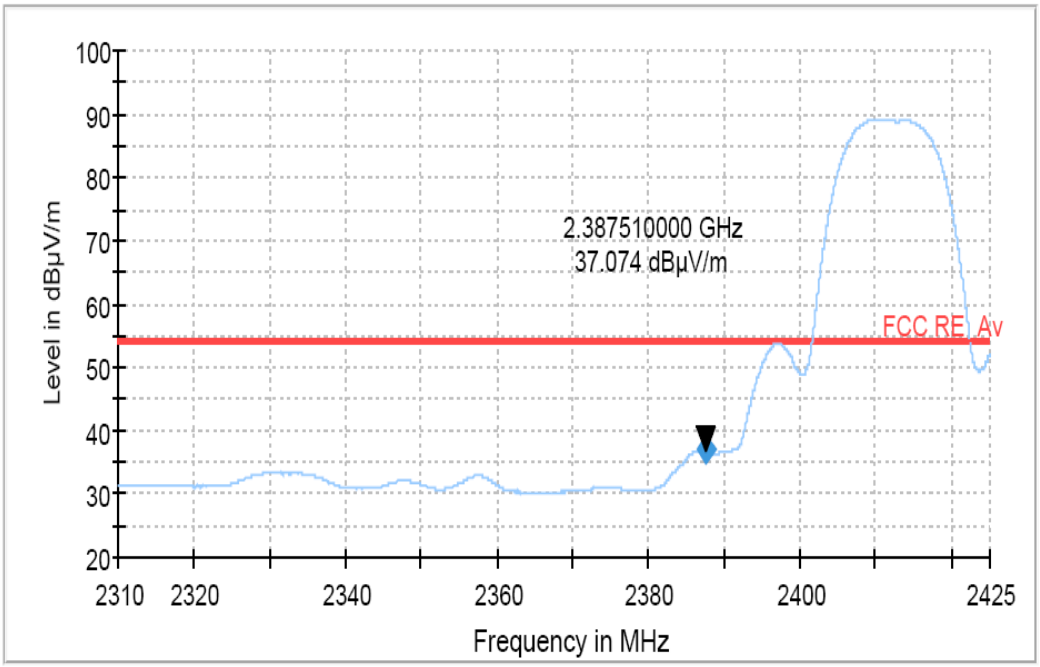
PLOT OF TEST DATA

802.11b mode

Restricted Band Spurious Emissions, 802.11b, Lowest channel Peak

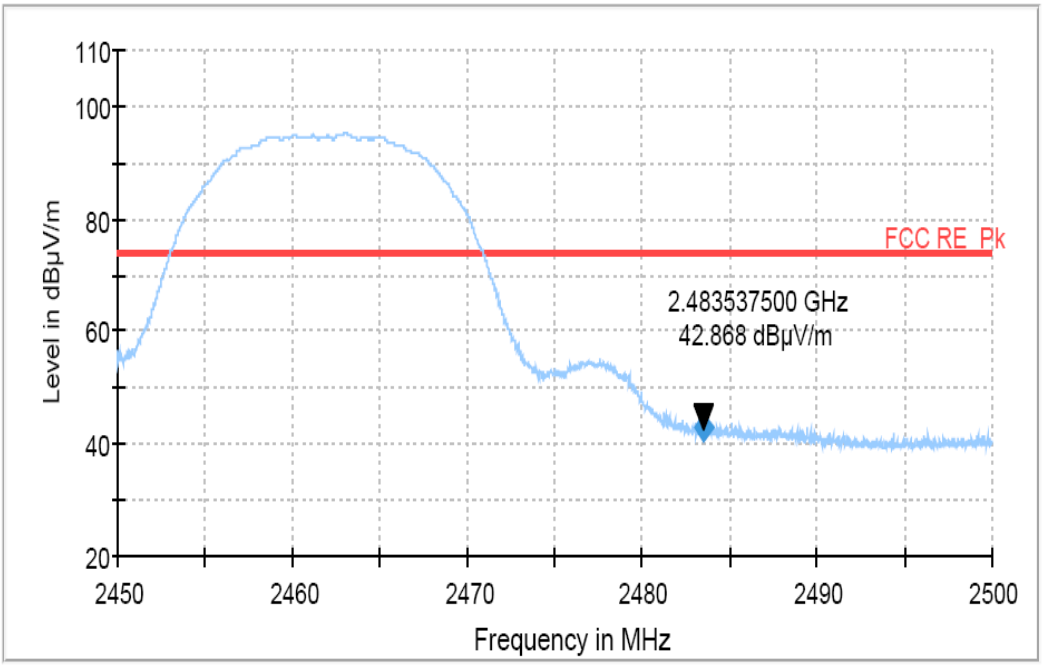


Restricted Band Spurious Emissions, 802.11b, Lowest channel Average

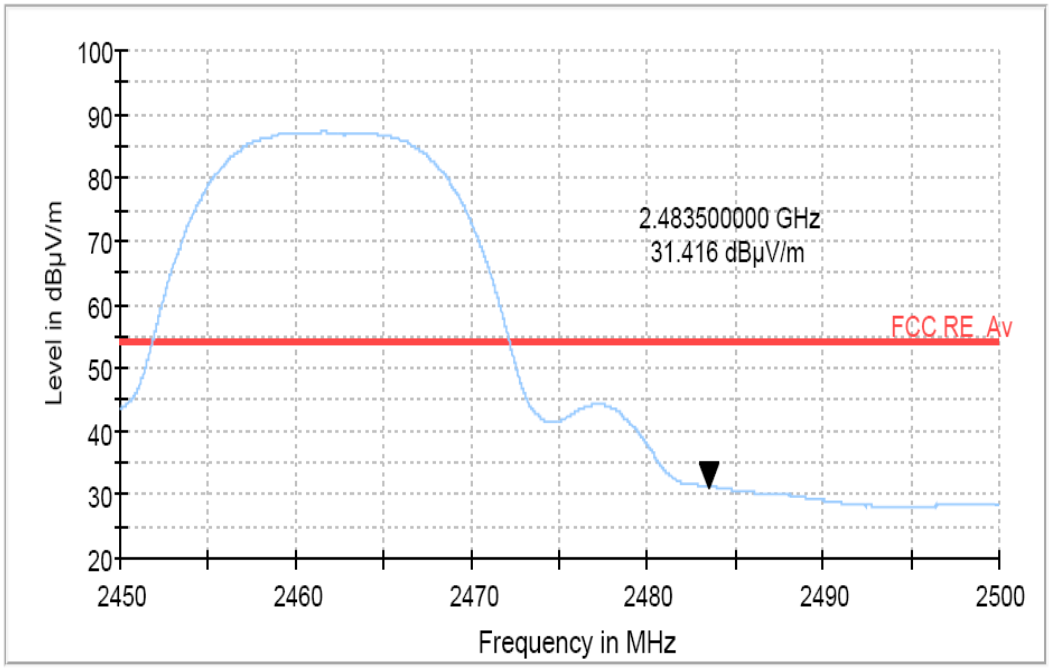


PLOT OF TEST DATA

Restricted Band Spurious Emissions, 802.11b, Highest channel Peak



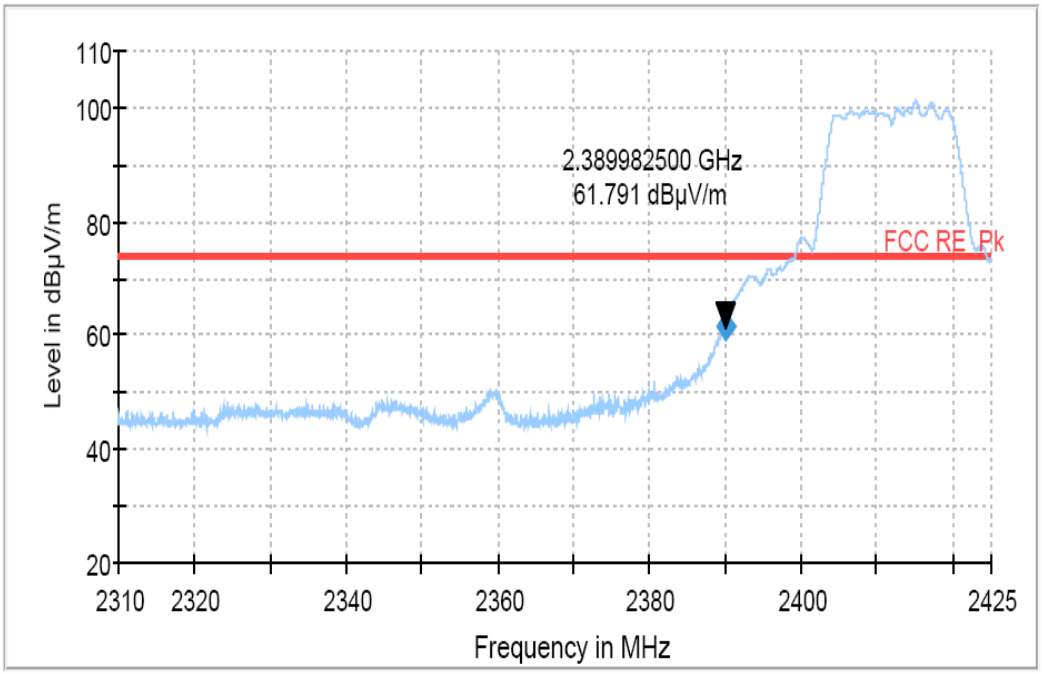
Restricted Band Spurious Emissions, 802.11b, Highest channel Average



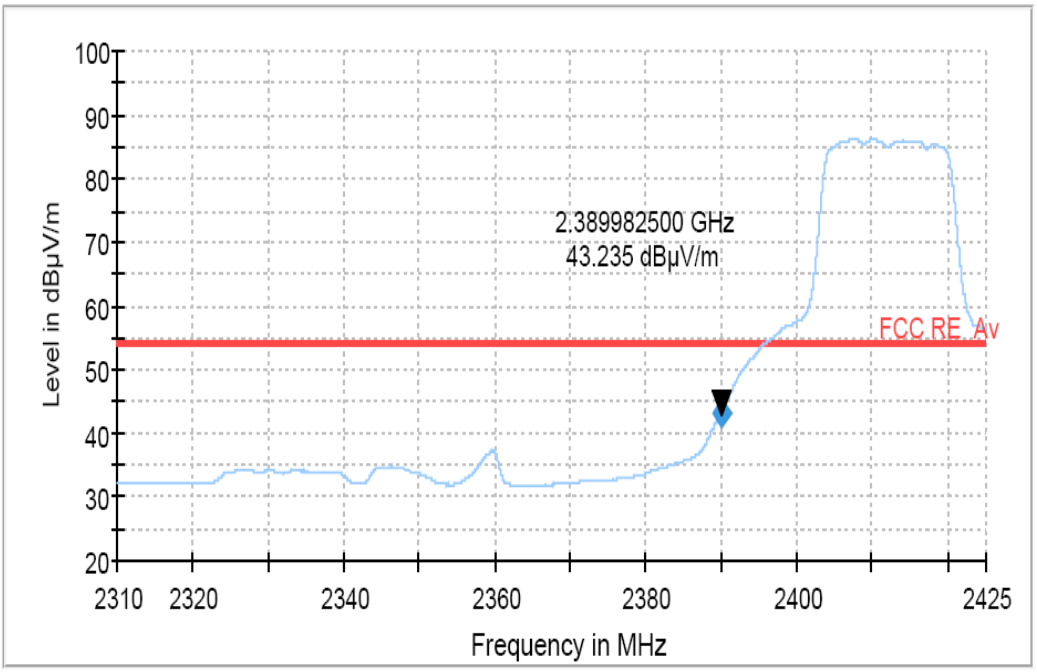
PLOT OF TEST DATA

802.11g mode

Restricted Band Spurious Emissions, 802.11g, Lowest channel Peak

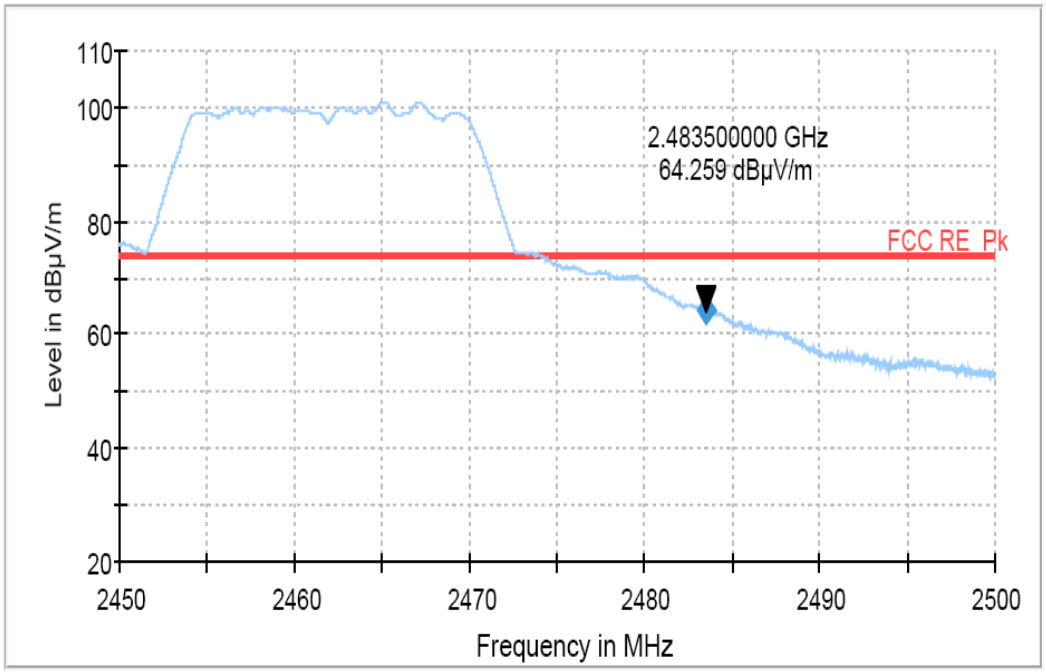


Restricted Band Spurious Emissions, 802.11g, Lowest channel Average

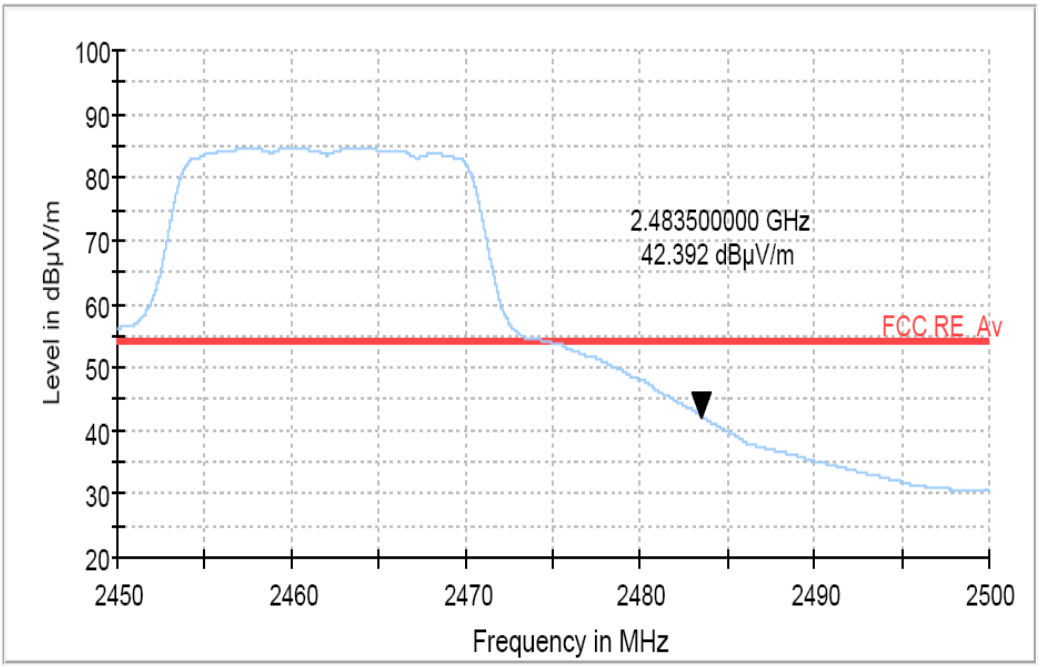


PLOT OF TEST DATA

Restricted Band Spurious Emissions, 802.11g, Highest channel Peak



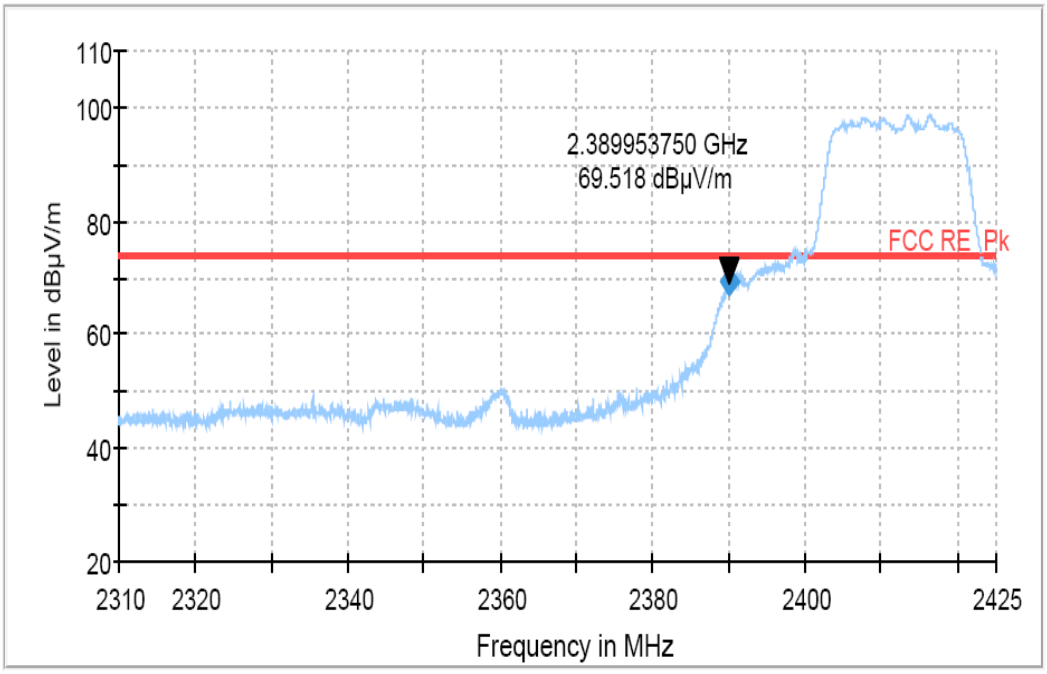
Restricted Band Spurious Emissions, 802.11g, Highest channel Average



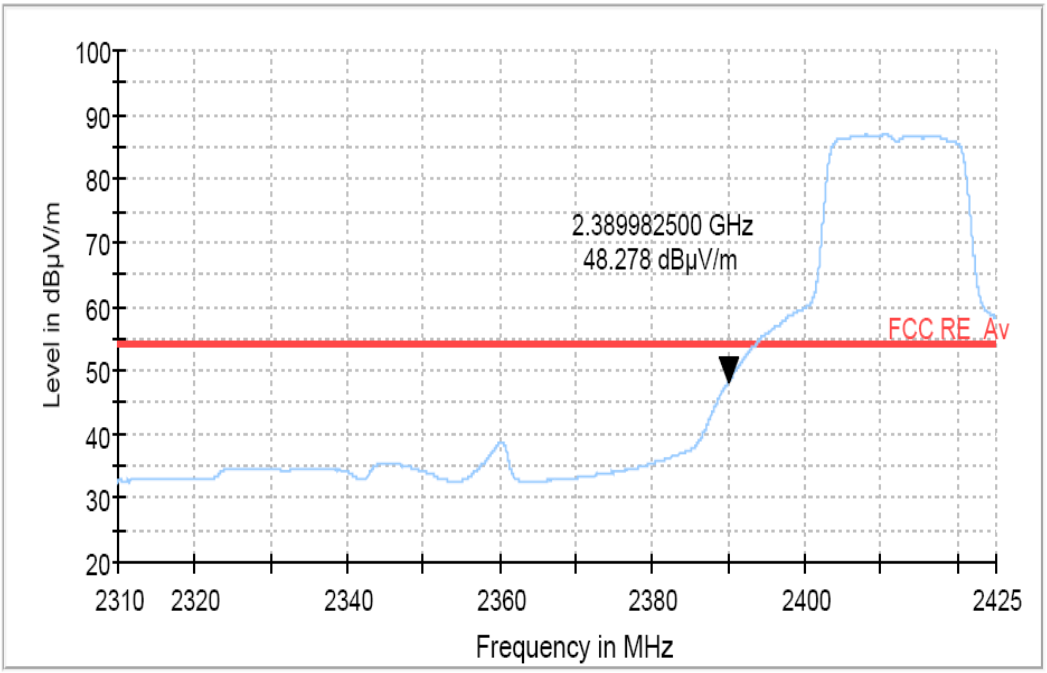
PLOT OF TEST DATA

802.11n(HT20) mode

Restricted Band Spurious Emissions, 802.11n(HT20), Lowest channel Peak

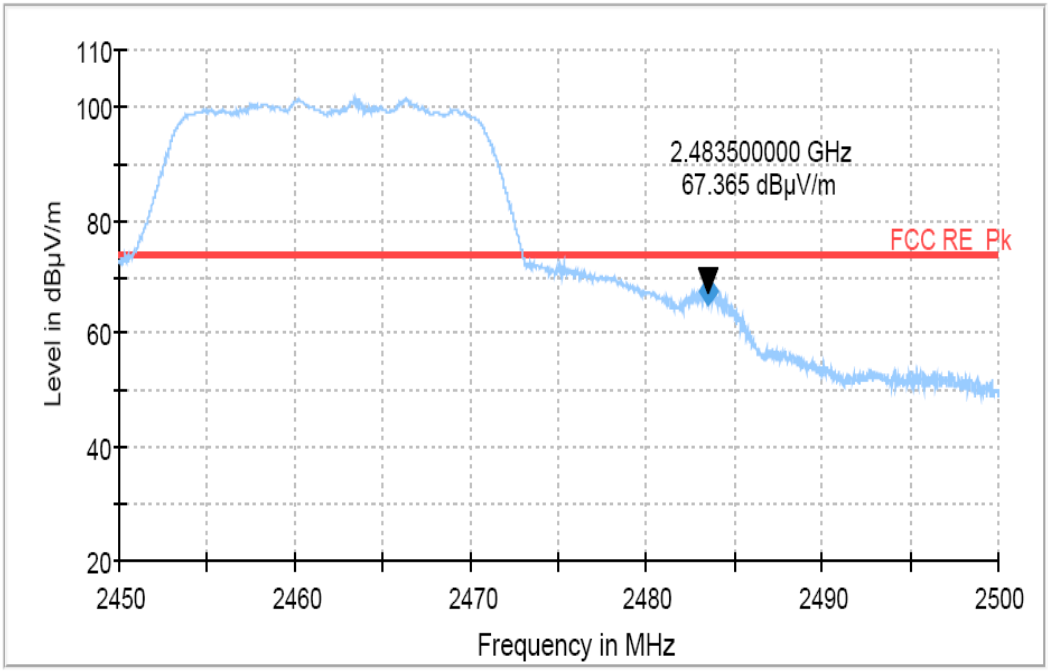


Restricted Band Spurious Emissions, 802.11n(HT20), Lowest channel Average

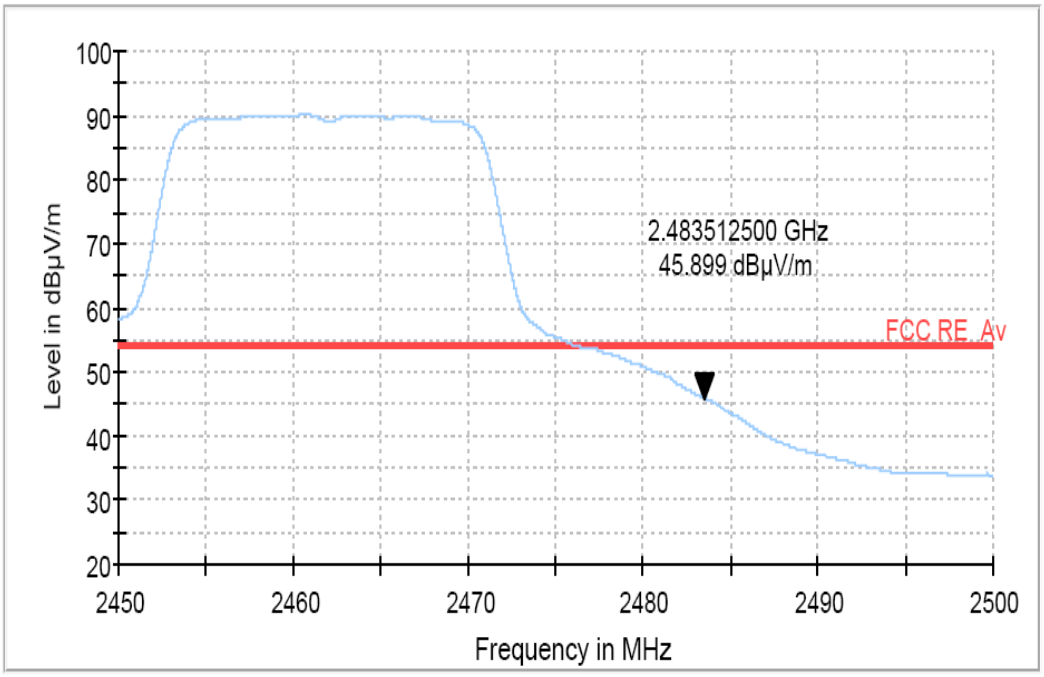


PLOT OF TEST DATA

Restricted Band Spurious Emissions, 802.11n(HT20), Highest channel Peak



Restricted Band Spurious Emissions, 802.11n(HT20), Highest channel Average



Note: For the radiated emission field strength measurements at the bandedges, the resolution bandwidth was set to 1 MHz then the video bandwidth was set to 1 MHz for peak measurements and 10 Hz for average measurements. Peak detector was used.

9. MAXIMUM PERMISSIBLE EXPOSURE

RF Exposure Limit

According to FCC 1.1310: The criteria listed in the following table shall be used to evaluate the Environmental of human exposure to radio frequency (RF) radiation as specified in 1.1307(b)

Limits for Maximum Permissible Exposure (MPE)

Frequency Range(MHz)	Electric Field Strength(V/m)	Magnetic Field Strength(A/m)	Power Density (mW/cm^2)	Averaging Time (Minutes)
(A) Limits for occupational / Contral Exposure				
30 - 300	61.4	0.163	1	6
300 - 1500	…	…	F/300	6
1500 - 100000	…	…	5	6
(B) Limits for General Population / Uncontrolled Exposure				
30 - 300	27.5	0.073	0.2	30
300 - 1500	…	…	F/1500	30
1500 - 100000	…	…	1	30

F = Frequency (MHz)

Fries formula

Fries transmission formula : $Pd = (Pout * G) / (4 * \pi * r^2)$

$r = \sqrt{((Pout * G) / 4 * \pi * Pd)}$

Where

Pd = Power density in mW/cm^2

Pout = Output power to antenna in mW

G = Gain of antenna in linear scale

$\pi = 3.1416$

r = Distance between observation point center of the radiator in cm

Pd is the limit of MPE, **1 mW/cm^2**. If we know the Maximum Gain of the antenna and the total power input to the antenna, through the calculation, we will know the Maximum distance r where the MPE limit is reached and Power density at prediction frequency.

TEST DATA

Test Result :

The maximum tx antenna gain is **1.02 dBi or 1.26(Numeric).**
Maximum peak output power including the 2 dB production tolerance: 28.69 dBm

Maximum peak output power at antenna input terminal:	28.69	(dBm)
Maximum peak output power at antenna input terminal:	739.61	(mW)
Antenna gain(typical):	1.02	(dBi)
Maximum antenna gain:	1.26	(numeric)
Prediction distance:	20	(cm)
Prediction frequency:	2437	(MHz)
MPE limit for uncontrolled exposure at prediction frequency:	1	(mW/cm^2)

Maximum allowable antenna gain:	8.32	(dBi)
Minimum Distance:	8.63	(cm)

Power density at prediction frequency : ***0.186093*** ***(mW/cm^2)***

Test result: PASS

10. ACCURACY OF MEASUREMENT

The Measurement Uncertainties stated were calculated in accordance with the requirements of measurement uncertainty contained in CISPR 16-4-2 with the confidence level of 95%

1. Conducted Uncertainty Calculation

Source of Uncertainty	Xi	Uncertainty of Xi		Coverage factor k	u(Xi) (dB)	Ci	Ci u(Xi) (dB)
		Value (dB)	Probability Distribution				
Receiver reading	RI	± 0.1	normal 1	1.000	0.1	1	0.1
Attenuation AMN-Receiver	LC	± 0.08	normal 2	2.000	0.04	1	0.04
AMN Voltage division factor	LAMN	± 0.8	normal 2	2.000	0.4	1	0.4
Sine wave voltage	dVSW	± 2.00	normal 2	2.000	1.00	1	1.00
Pulse amplitude response	dVPA	± 1.50	rectangular	1.732	0.87	1	0.87
Pulse repetition rate response	dVPR	± 1.50	rectangular	1.732	0.87	1	0.87
Noise floor proximity	dVNF	± 0.00	-	-	0.00	1	0.00
AMN Impedance	dZ	± 1.80	triangular	2.449	0.73	1	0.73
ⓐ Mismatch	M	+ 0.70	U-Shaped	1.414	0.49	1	0.49
ⓑ Mismatch	M	- 0.80	U-Shaped	1.414	- 0.56	1	- 0.56
Measurement System Repeatability	RS	0.05	normal 1	1.000	0.05	1	0.05
Remark	ⓐ: AMN-Receiver Mismatch : + ⓑ: AMN-Receiver Mismatch : -						
Combined Standard Uncertainty	Normal			± 1.88			
Expended Uncertainty U	Normal (k = 2)			± 3.76			

2. Radiation Uncertainty Calculation

Source of Uncertainty	*Xi*	Uncertainty of *Xi*		Coverage factor *k*	*u(Xi)* (dB)	*Ci*	*Ci u(Xi)* (dB)
		Value (dB)	Probability Distribution				
Receiver reading	***RI***	± 0.10	normal 1	1.000	0.10	1	0.10
Sine wave voltage	***dVsw***	± 2.00	normal 2	2.000	1.00	1	1.00
Pulse amplitude response	***dVpa***	± 1.50	rectangular	1.732	0.87	1	0.87
Pulse repetition rate response	***dVpr***	± 1.50	rectangular	1.732	0.87	1	0.87
Noise floor proximity	***dVnf***	± 0.50	normal 2	2.000	0.25	1	0.25
Antenna Factor Calibration	***AF***	± 1.50	normal 2	2.000	0.75	1	0.75
Attenuation Antenna-receiver	***CL***	± 0.52	normal 2	2.000	0.26	1	0.26
Antenna Directivity	***AD***	± 1.00	rectangular	1.732	0.58	1	0.58
Antenna Factor Height Dependence	***AH***	± 0.50	rectangular	1.732	0.29	1	0.29
Antenna Phase Centre Variation	***AP***	± 0.30	rectangular	1.732	0.17	1	0.17
Antenna Factor Frequency Interpolation	***AI***	± 0.30	rectangular	1.732	0.17	1	0.17
Site Imperfections	***SI***	± 4.00	triangular	2.449	1.63	1	1.63
Measurement Distance Variation	***DV***	± 0.10	rectangular	1.732	0.06	1	0.06
Antenna Balance	***Dbal***	± 0.90	rectangular	1.732	0.52	1	0.52
Cross Polarisation	***DCross***	± 0.90	rectangular	1.732	0.52	1	0.52
ⓐ Mismatch	***M***	+ 0.25	U-Shaped	1.414	0.18	1	0.18
ⓑ Mismatch	***M***	- 0.26	U-Shaped	1.414	- 0.18	1	- 0.18
ⓒ Mismatch	***M***	+ 0.98	U-Shaped	1.414	0.69	1	0.69
ⓓ Mismatch	***M***	- 1.11	U-Shaped	1.414	- 0.79	1	- 0.79
Measurement System Repeatability	***RS***	0.09	normal 1	1.000	0.09	1	0.09
Remark	ⓐ: Biconical Antenna-receiver Mismatch : + (< 200 MHz) ⓑ: Biconical Antenna-receiver Mismatch : - (< 200 MHz) ⓒ: Log Periodic Antenna-receiver Mismatch : + (≧ 200 MHz) ⓓ: Log Periodic Antenna-receiver Mismatch : - (≧ 200 MHz)						
Combined Standard Uncertainty	Normal			± 2.63 (< 200 MHz) ± 2.74 (≧200 MHz)			
Expended Uncertainty U	Normal (*k* = 2)			± 5.26 (< 200 MHz) ± 5.48 (≧200 MHz)			