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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 : December 22, 2009****Test Report No. : NK09R203****Test Site : Nemko Korea Co., Ltd.****FCC ID****IC ID****Brand Name****Contact Person****A3LSWA5000
649E-SWA5000****SAMSUNG****Samsung Electronics Co., Ltd.
416, Maetan-3Dog, Yeongtong-Gu,
Suwon-Si, Gyeonggi-Do, Korea, 442-742.
Mr. Jaywoo. Lee
Telephone No. : +82-10-5691-9410**

Applied Standard: FCC 47 CFR Part 15 and IC RSS-210

Classification: FCC part 15 Digital modulation Transmitter

EUT Type: Audio transceiver 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.

**Tested By : Minchul Shin
Engineer****Reviewed By : H.H. Kim
Manager & Chief Engineer**

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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: A3LSWA5000
- IC ID: 649E-SWA5000
- Model: SWA-5000
- Brand Name: SAMSUNG
- EUT Type: Audio transceiver module
- Classification: FCC part 15 Digital modulation Transmitter
- Applied Standard: FCC 47 CFR Part 15 subpart C and IC RSS-210
- Test Procedure(s): ANSI C63.4 (2003)
- Dates of Test: Dec. 5, 2009 ~ Dec. 18, 2009
- Place of Tests: Nemko Korea Co., Ltd.

2. INTRODUCTION

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 9kHz to 40GHz (ANSI C63.4-2003) was used in determining radiated and conducted emissions emanating from **Samsung Electronics Co., Ltd.**

FCC ID : **A3LSWA5000** and IC ID : **649E-SWA5000**

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.

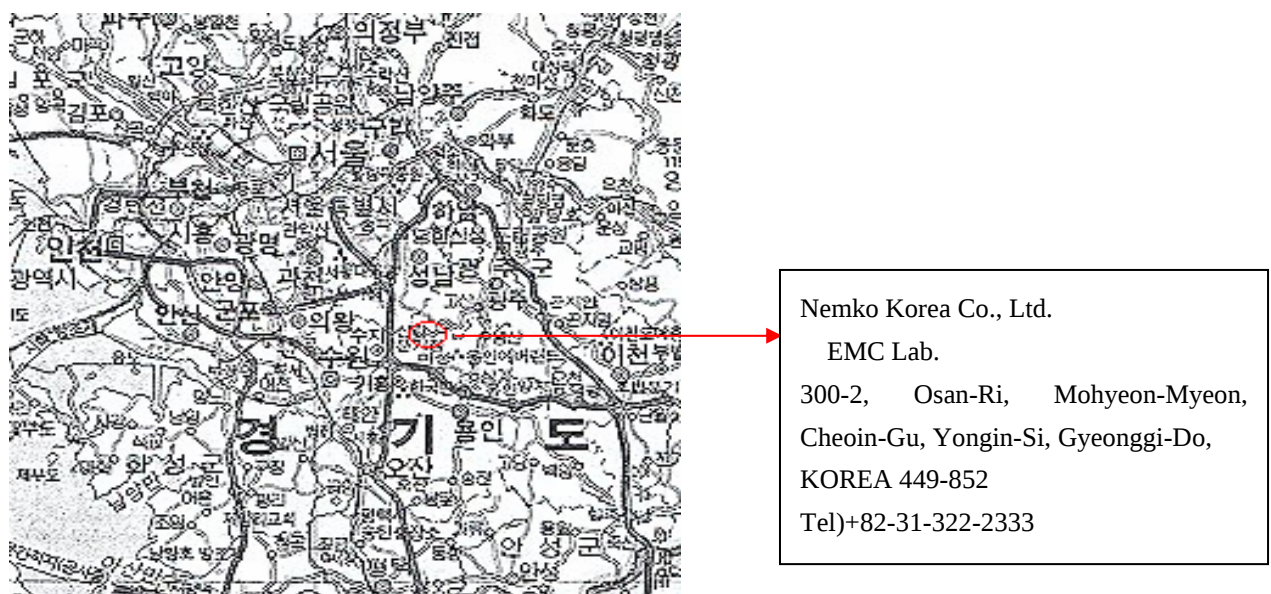


Fig. 1. The map above shows the Seoul in Korea vicinity area.
The map also shows Nemko Korea Corporation Ltd. EMC Lab. and Incheon Airport.

3. TEST CONDITIONS & EUT INFORMATION

3.1 Operation During Test

The EUT was controlled and monitored by testing jig which manufacturer supported.
The EUT have two antennas which are not working simultaneously. All tests were performed the worst case antenna path at the Lowest, Middle, Highest channel.

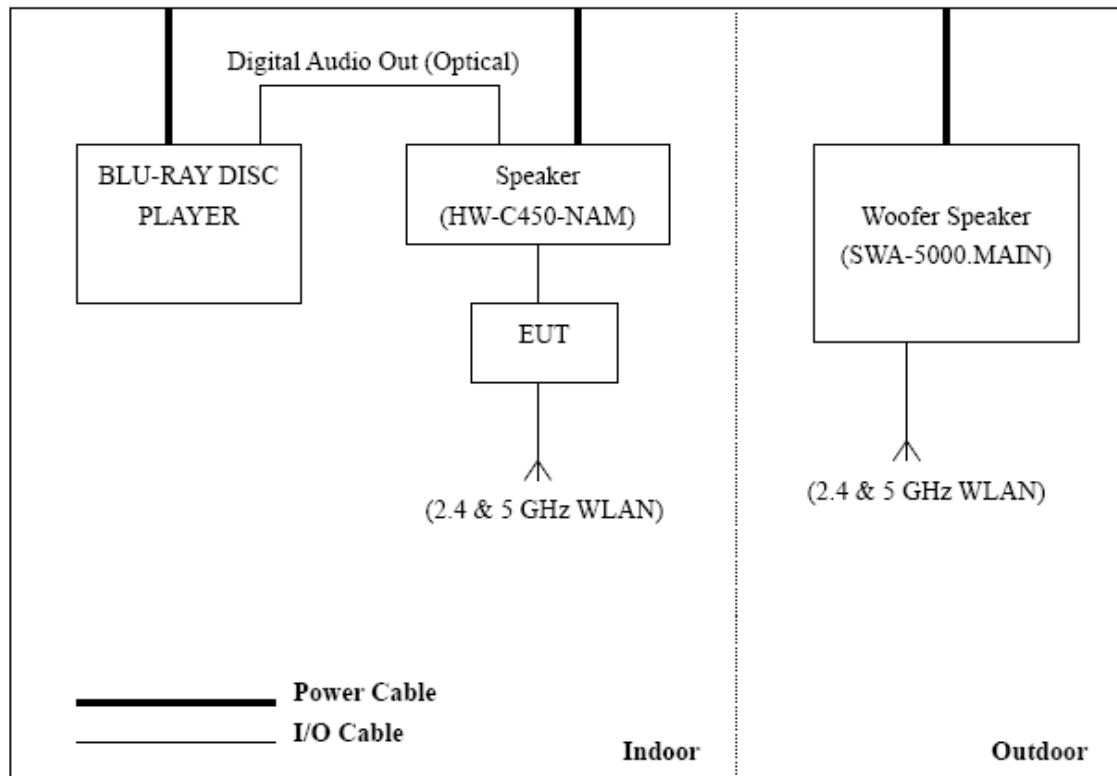
Power setting level

Frequency Band	2412 ~ 2464 MHz	5736 ~ 5814 MHz
Power Level	4	4

3.2 Support Equipment

Audio transceiver module (EUT)	Samsung Electronics Co., Ltd. FCC ID: A3LSWA5000	S/N: N/A
Speaker (HW-C450-NAM)	Samsung Electronics Co., Ltd. Model : HW-C450 0.1 m unshielded module cable	S/N: PV373091113047N
BLU-RAY DISC PLAYER	Samsung Electronics Co., Ltd. Model : BD-P3600 1.5 m unshielded optical cable	S/N: ZATE6V1SA17856L
Woofer Speaker (SWA-5000. MAIN)	Samsung Electronics Co., Ltd. Model: N/A	S/N: PV4480910280038K

3.3 Setup Drawing



3.4 EUT Information

The EUT is the **Samsung Audio transceiver module FCC ID: A3LSWA5000, IC ID: 649E-SWA5000.**

Specifications:

Category:	Audio transceiver module
Model Name:	SWA-5000
Brand Name:	SAMSUNG
Frequency of Operation	2412 MHz to 2464 MHz 5736 MHz to 5814 MHz
Power Output (Conducted)	2 GHz : 17.64 dBm 5 GHz : 11.91 dBm
Channels	2 GHz : 3 ch 5 GHz : 3 ch
Antenna Gain	2 GHz : 0.70 dBi 5 GHz : 1.47 dBi
Modulations	QPSK
Temperature Range	-10 °C ~ +55 °C
Voltage	5.0 Vdc
Dimensions (W x H x D)	25 mm x 60 mm X 3 mm
Weight	6 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	15.107 15.207	RSS-GEN	Complies	
Radiated Emission	15.109 15.205 15.209	RSS-210 Clause 2.6, RSS-GEN Clause 6	Complies	
6 dB Bandwidth	15.247(a)(2)	RSS-210 A8.2 (a)	Complies	
Peak Power Output	15.247(b)(3)	RSS-210 Issue 7 Clause A8.4	Complies	
Power Spectral Density	15.247(e)	RSS-210 Clause A8.2	Complies	
Conducted Spurious Emission	15.247(d)	IC RSS-210 A8.5	Complies	
Radiated Spurious Emission	15.247(d)	RSS-210 Clause 2.6, RSS-GEN Clause 6	Complies	
Maximum Permissible Exposure	1.1307(b)	RSS-102	Complies	

5. RECOMMENDATION/CONCLUSION

The data collected shows that the **Samsung Audio transceiver module FCC ID: A3LSWA5000, IC ID: 649E-SWA5000** 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 Audio transceiver module FCC ID: A3LSWA5000, IC ID: 649E-SWA5000** 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 1m X 1.5m wooden table 0.8m height is placed 0.4m away from the vertical wall and 1.5m away from the side of wall of the shielded room Rohde & Schwarz (ESH3-Z5) and Kyoritsu (KNW-407) of the 50ohm/50uH 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 LISN. Power to the LISN s 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 msec sweep time.

The frequency producing the maximum level was re-examined using the EMI test receiver. (Rohde & Schwarz ESCS30).

The detector function were set to CISPR quasi-peak mode & average mode.

The bandwidth of receiver was set to 9KHz. 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.

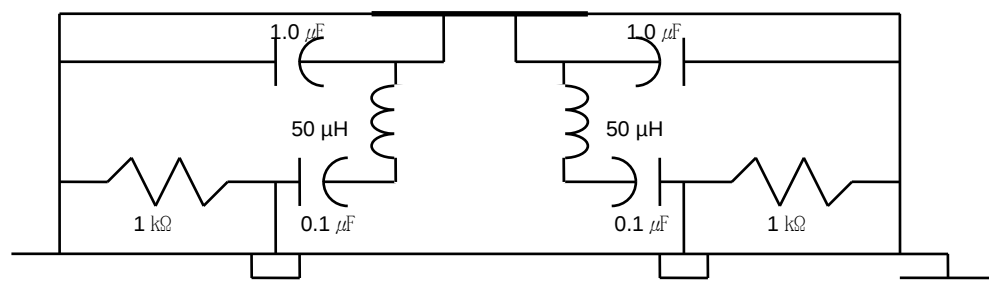


Fig. 2. LISN Schematic Diagram

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 (Schwarzbeck BBHA 9120D: upto 18 GHz , BBHA9170 : upto 40 GHz) was used. Final Measurements were made outdoors at 3 or 10 m test range using Loop Antenne(EMCO, 6502) and Logbicon Super Antenna (Schwarzbeck, VULB9166) or Horn antenna.(Schwarzbeck BBHA 9120D: upto 18 GHz , BBHA9170 : upto 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) 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.

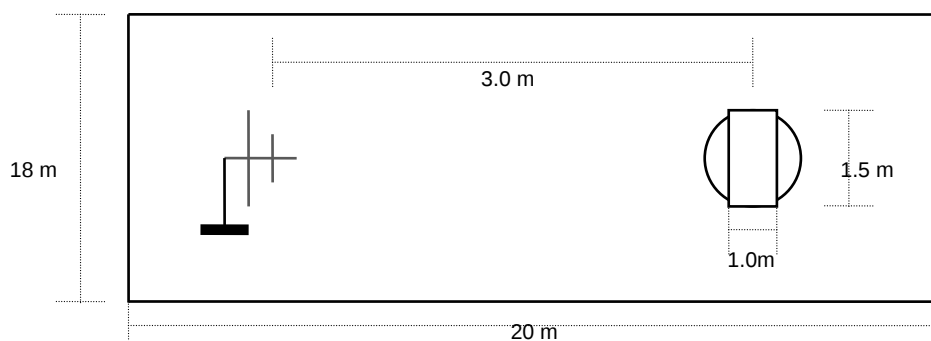
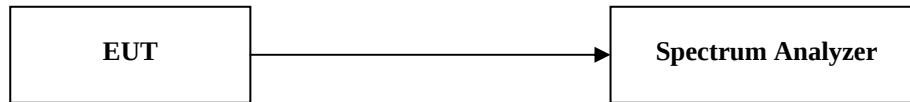


Fig. 3. Dimensions of Outdoor Test Site

7.3 6 dB Bandwidth

Test Setup



Test Procedure

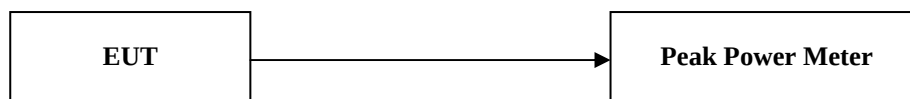
The transmitter is set to the Low, Middle, High channels is connected to the spectrum analyzer. The RBW and VBW of spectrum analyzer are set to 100 kHz.

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

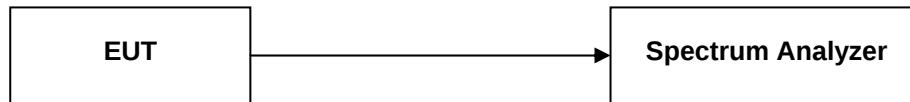


Test Procedure

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.

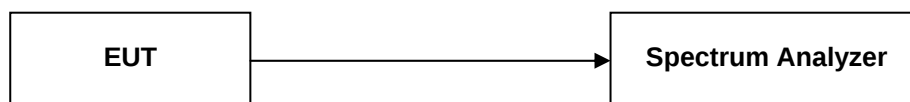
The RBW of spectrum analyzer is set to 3 kHz and VBW is set to 3 kHz.

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 40 GHz range with the transmitter set to the Lowest, Middle and highest channels.

8. TEST DATA

8.1 Conducted Emissions

FCC §15.207. 15.107

2 GHz WLAN Traffic mode

Frequency (MHz)	Level(dB μ V)		Factor (dB)	Line	Limit(dB μ V)		Margin(dB)	
	Q-Peak	Average			Q-Peak	Average	Q-Peak	Average
0.15	43.1	19.8	0.2	N	66.0	56.0	22.9	36.2
0.19	55.0	38.7	0.2	N	64.0	54.0	9.0	15.3
0.26	40.7	30.0	0.2	N	61.4	51.4	20.7	21.4
0.34	36.4	27.4	0.2	L	59.2	49.2	22.8	21.8
0.47	41.4	33.3	0.1	N	56.5	46.5	15.1	13.2
24.71	45.9	38.7	2.0	L	60.0	50.0	14.1	11.3

Line Conducted Emissions Tabulated Data

5 GHz WLAN Traffic mode

Frequency (MHz)	Level(dB μ V)		Factor (dB)	Line	Limit(dB μ V)		Margin(dB)	
	Q-Peak	Average			Q-Peak	Average	Q-Peak	Average
0.15	42.2	19.9	0.2	N	66.0	56.0	23.8	36.1
0.19	53.5	38.1	0.2	N	64.0	54.0	10.5	15.9
0.26	39.8	30.0	0.2	L	61.4	51.4	21.6	21.4
0.34	36.2	27.2	0.2	L	59.2	49.2	23.0	22.0
0.47	41.1	32.8	0.1	L	56.5	46.5	15.4	13.7
25.92	46.7	38.7	2.1	L	60.0	50.0	13.3	11.3

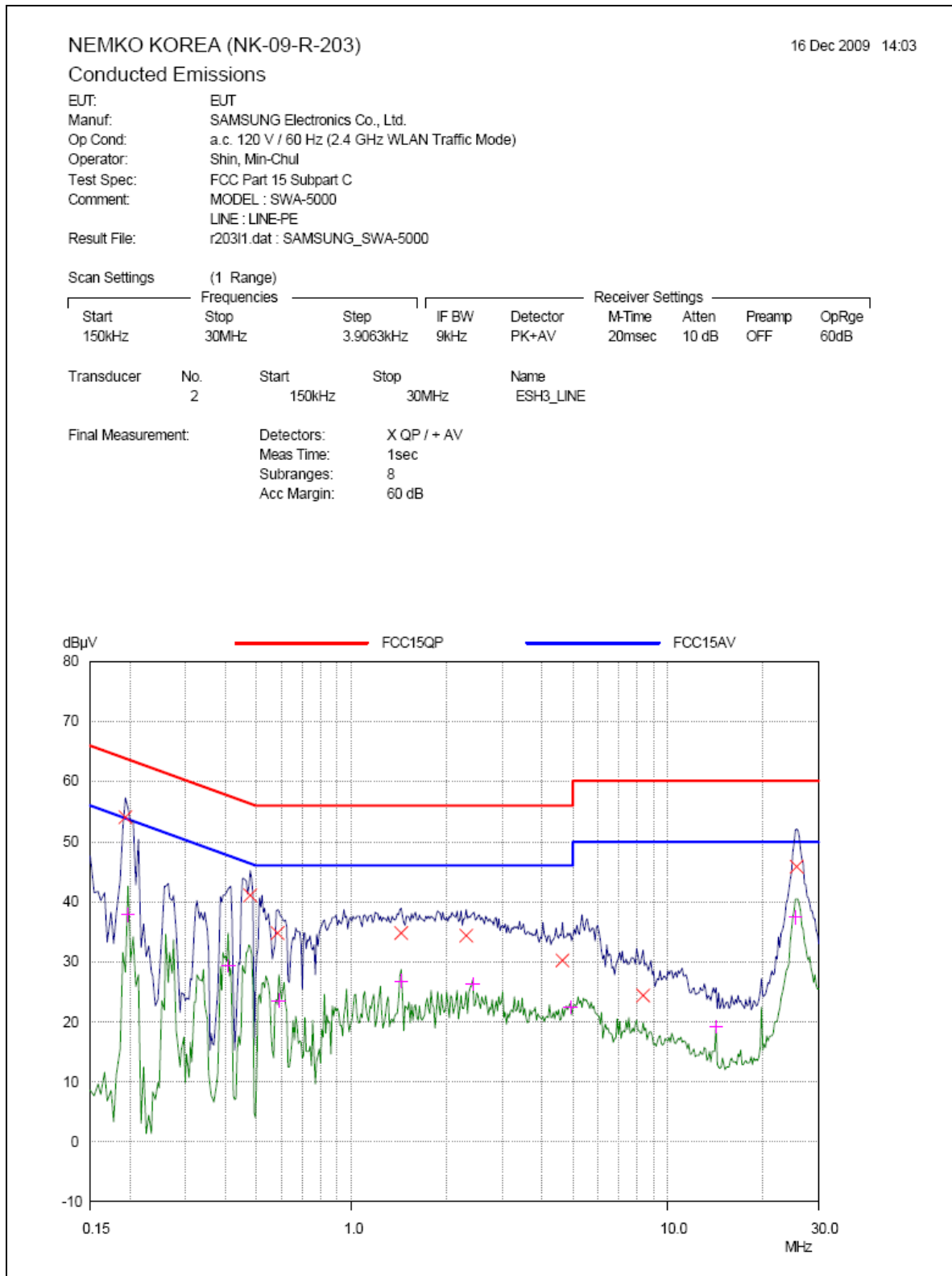
Line Conducted Emissions Tabulated Data

NOTES:

1. Measurements using CISPR quasi-peak mode & average mode.
2. All modes of operation were investigated and the worst -case emission are 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), 15.107(a).

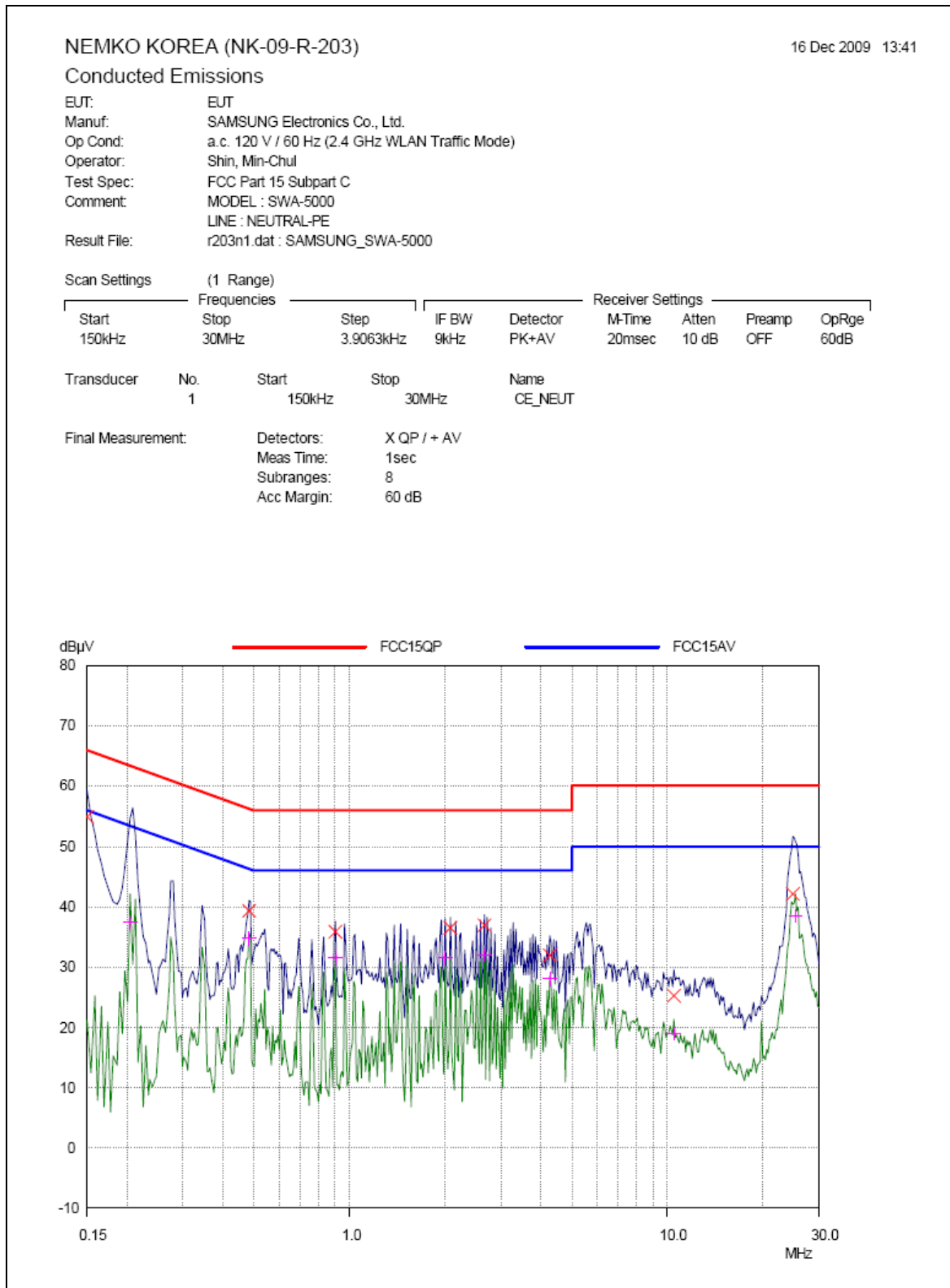
PLOTS OF EMISSIONS

Conducted Emission at the Mains port (2.4 GHz WLAN Traffic mode, Line)



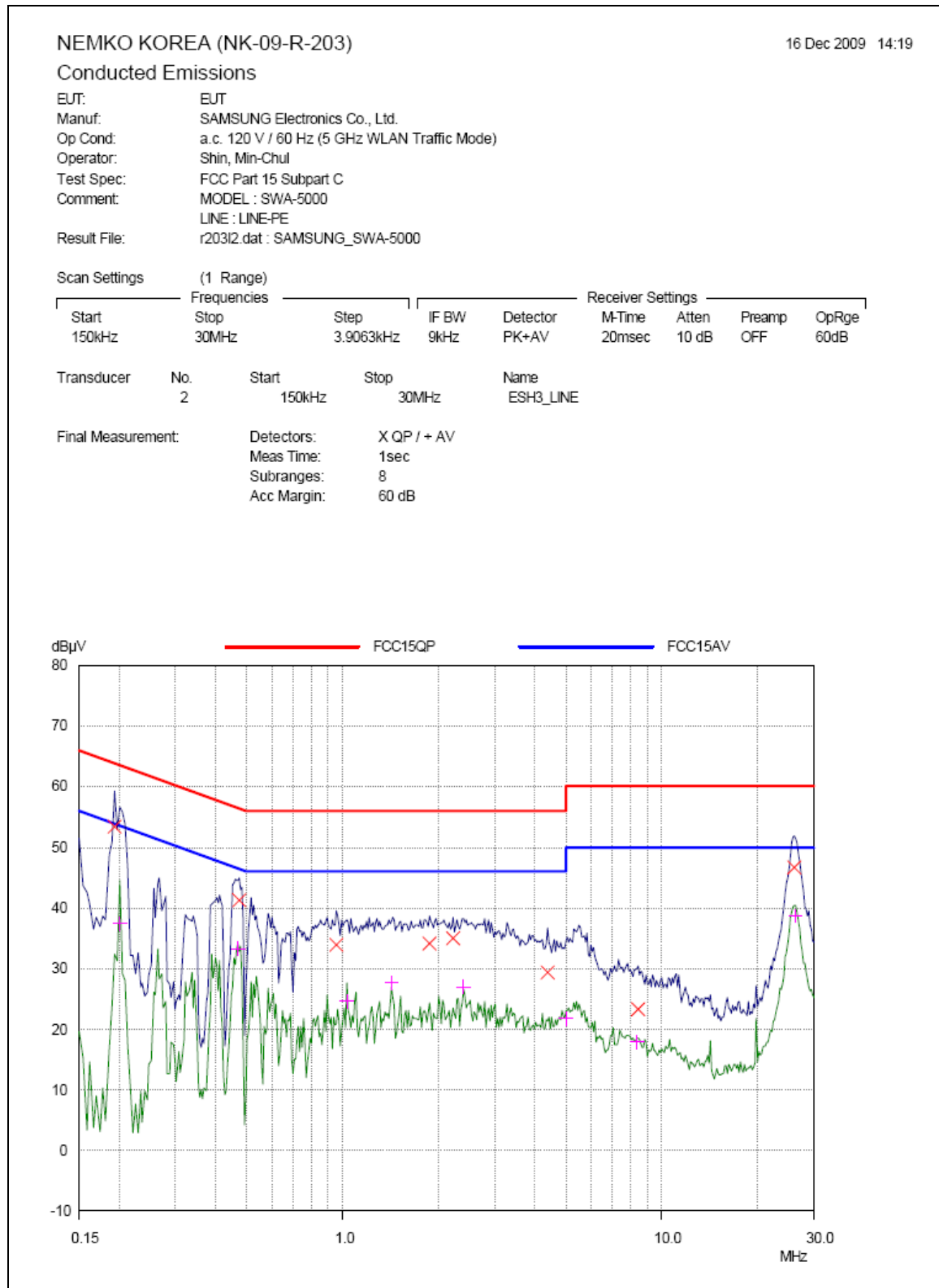
PLOTS OF EMISSIONS

Conducted Emission at the Mains port (2.4 GHz WLAN Traffic mode, Neutral)



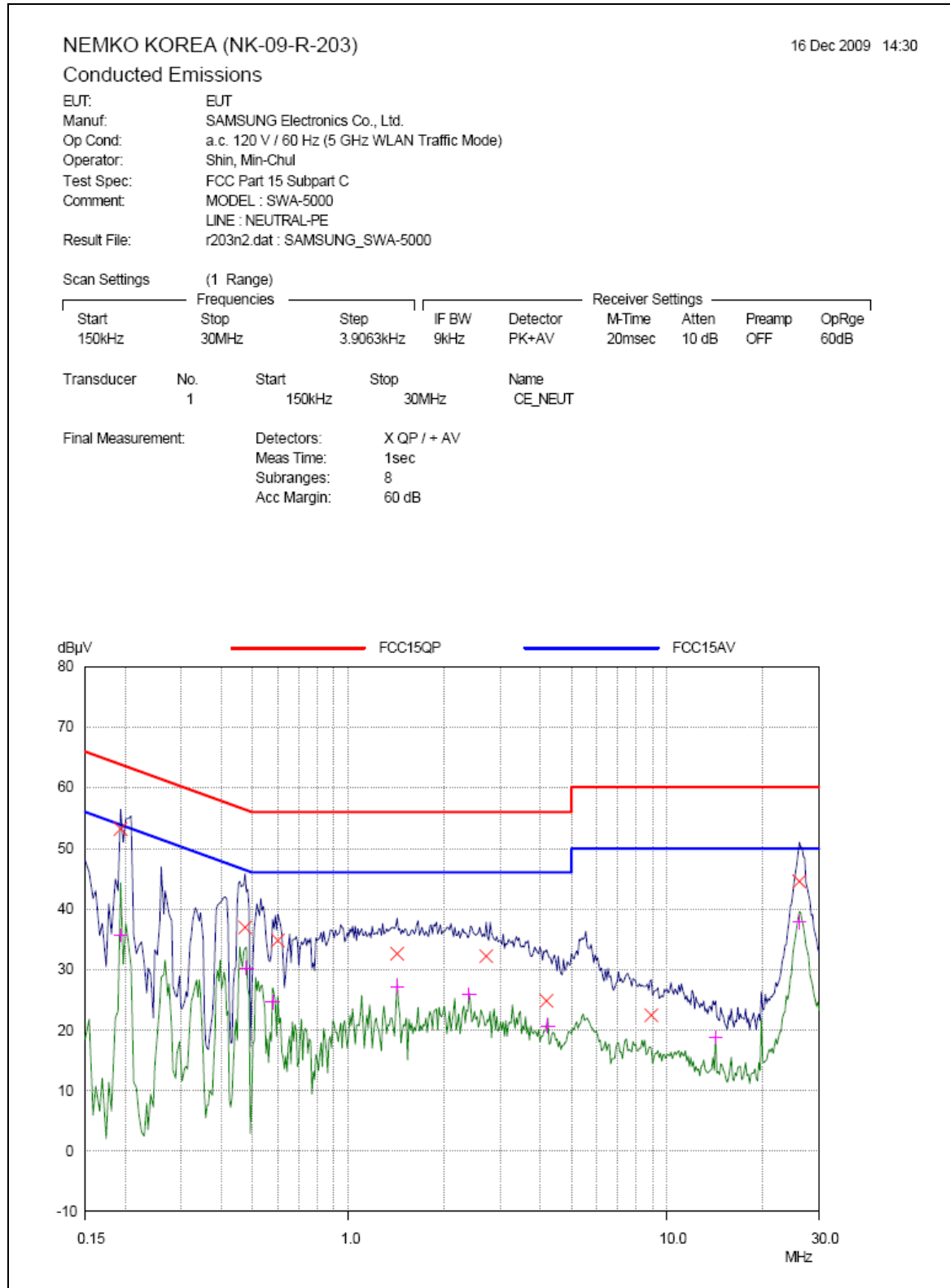
PLOTS OF EMISSIONS

Conducted Emission at the Mains port (5 GHz WLAN Traffic mode, Line)



PLOTS OF EMISSIONS

Conducted Emission at the Mains port (5 GHz WLAN Traffic mode, Neutral)



TEST DATA

8.2 Radiated Emissions

FCC §15.209, 15. 205, 15.109, IC RSS-210 Clause 2.6, IC RSS-GEN Clause 6

2 GHz WLAN Traffic mode

Frequency (MHz)	Reading (dB μ V/m)	Pol* (H/V)	Antenna Heights (cm)	AF+CL+Amp (dB)**	Result (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)
31.82	52.0	V	100	-18.0	34.0	40.0	6.0
32.29	51.7	V	100	-18.0	33.7	40.0	6.3
193.58	46.3	H	190	-16.2	30.1	43.5	13.4
600.01	42.8	V	100	-6.5	36.3	46.0	9.7
700.01	41.5	V	100	-5.1	36.4	46.0	9.6
800.02	39.7	V	100	-3.4	36.3	46.0	9.7

Radiated Measurements at 3meters

5 GHz WLAN Traffic mode

Frequency (MHz)	Reading (dB μ V/m)	Pol* (H/V)	Antenna Heights (cm)	AF+CL+Amp (dB)**	Result (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)
31.78	52.5	V	100	-18.0	34.5	40.0	5.5
32.13	53.0	V	110	-18.0	35.0	40.0	5.0
193.59	47.2	H	201	-16.2	31.0	43.5	12.5
600.01	42.7	V	100	-6.5	36.2	46.0	9.8
700.01	41.8	V	100	-5.1	36.7	46.0	9.3
800.02	39.5	V	100	-3.4	36.1	46.0	9.9

Radiated Measurements at 3meters

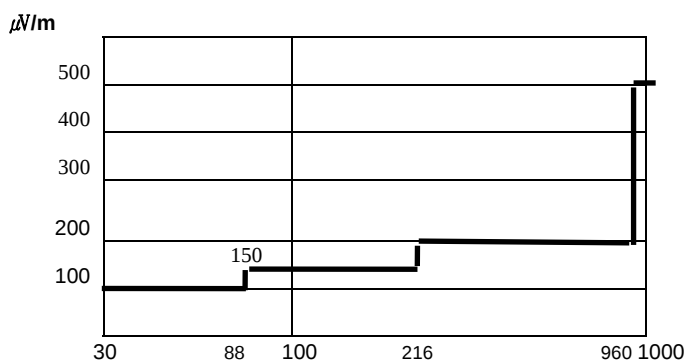


Fig. 4. Limits at 3 meters

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 μ V/m.

NOTES:

1. **Pol. H =Horizontal, V=Vertical*
2. ***AF+CL+Amp. = Antenna Factor + Cable Loss + Amplifier.*
3. *Measurements using CISPR quasi-peak mode.*
4. *The radiated emissions testing were made by rotating through three orthogonal axes.
The worst date was recorded.*
5. *The limit is on the FCC Part section 15.109(a), 15.209(a).*

TEST DATA

8.3 6 dB Modulated Bandwidth

FCC §15.247(a), IC RSS-210 A8.2(a)

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

Result:

2 GHz mode

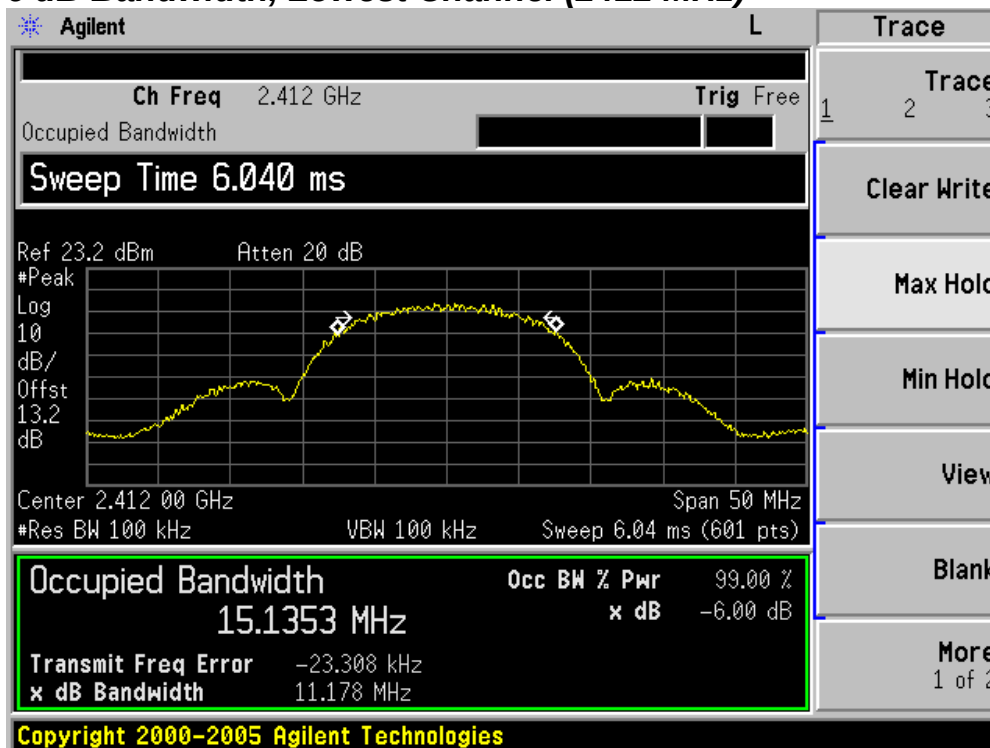
Channel	Frequency(MHz)	Result(kHz)	Limit(kHz)	Margin(kHz)
Low	2412	11178	500	10678
Middle	2438	11173	500	10673
High	2464	11175	500	10675

5 GHz mode

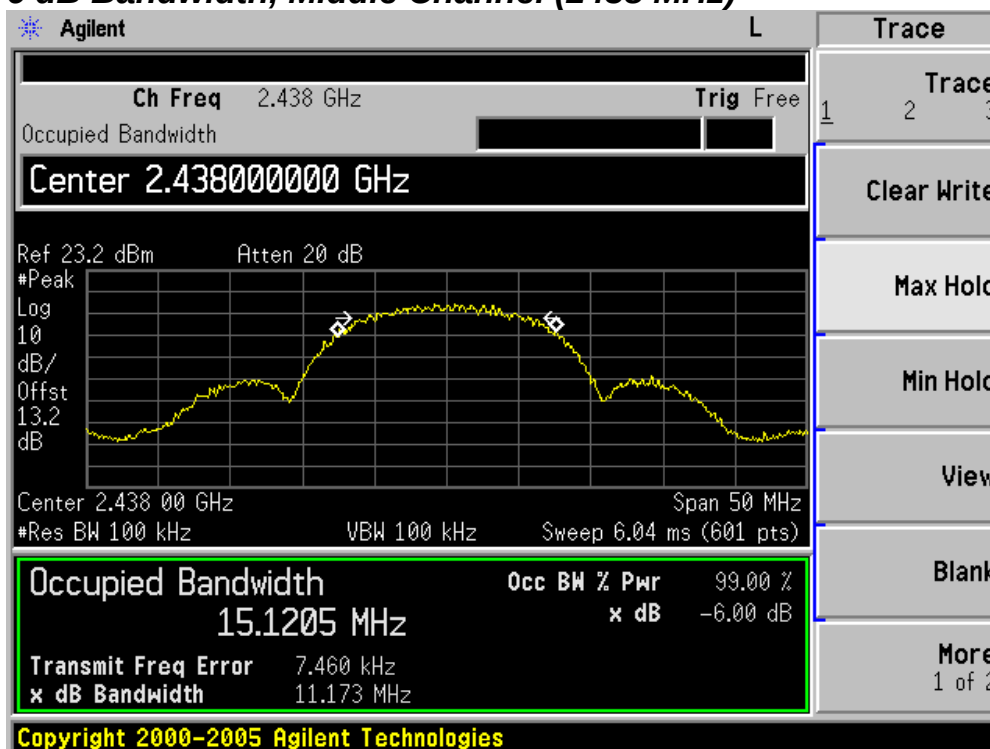
Channel	Frequency(MHz)	Result(kHz)	Limit(kHz)	Margin(kHz)
Low	5736	11221	500	10721
Middle	5762	11148	500	10648
High	5814	11134	500	10634

PLOTS OF EMISSIONS

6 dB Bandwidth, Lowest Channel (2412 MHz)

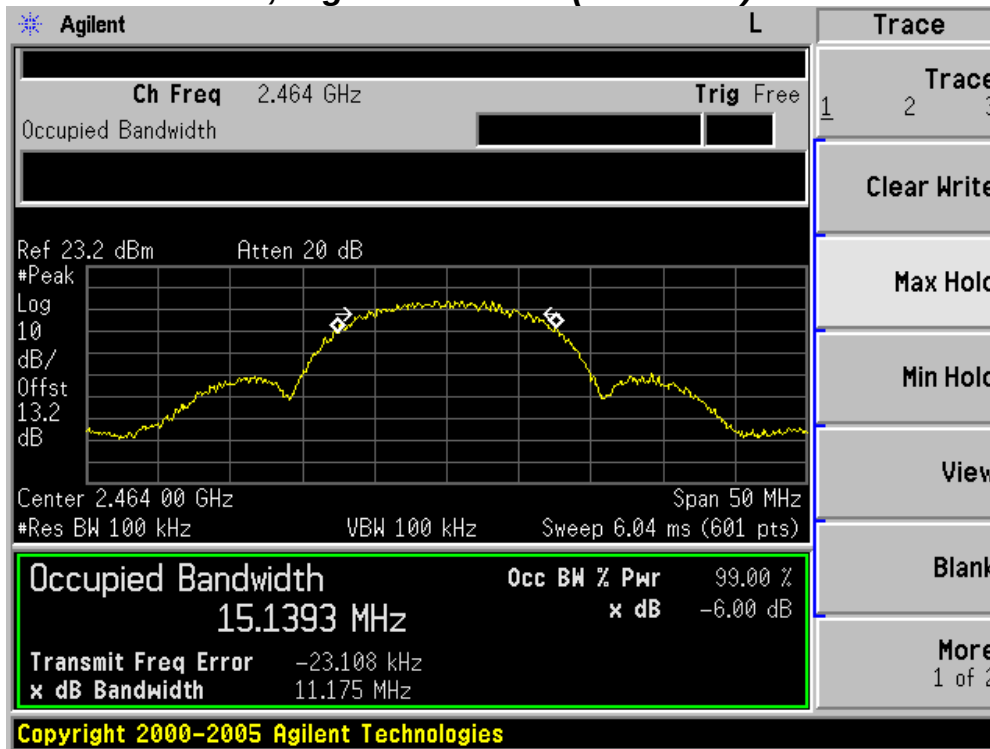


6 dB Bandwidth, Middle Channel (2438 MHz)

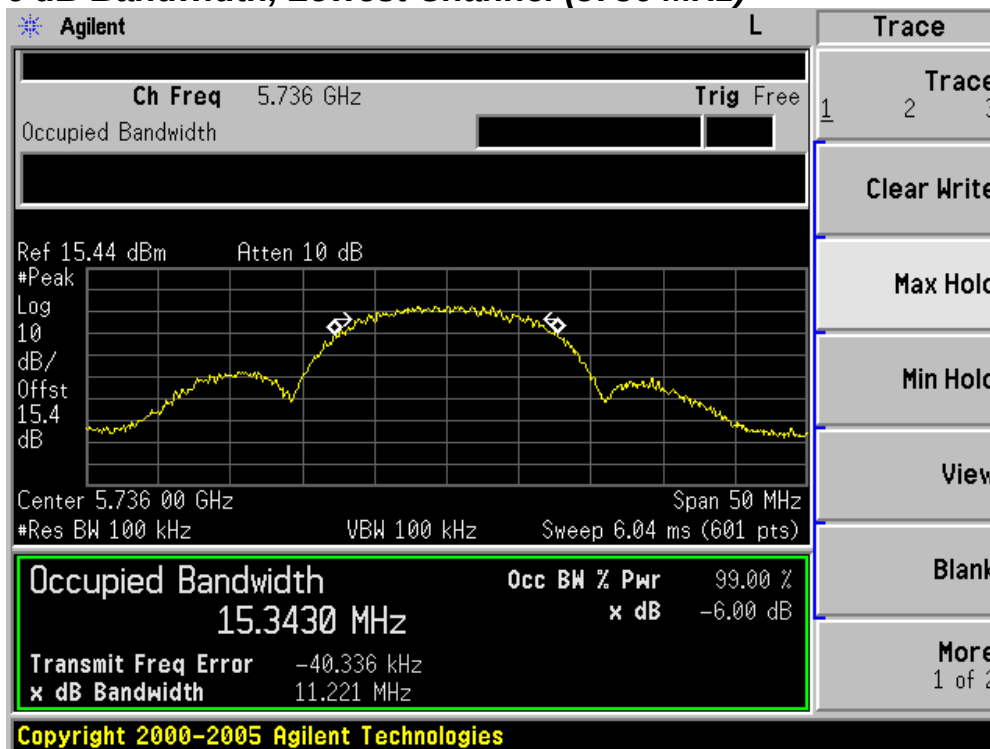


PLOTS OF EMISSIONS

6 dB Bandwidth, Highest Channel (2464 MHz)

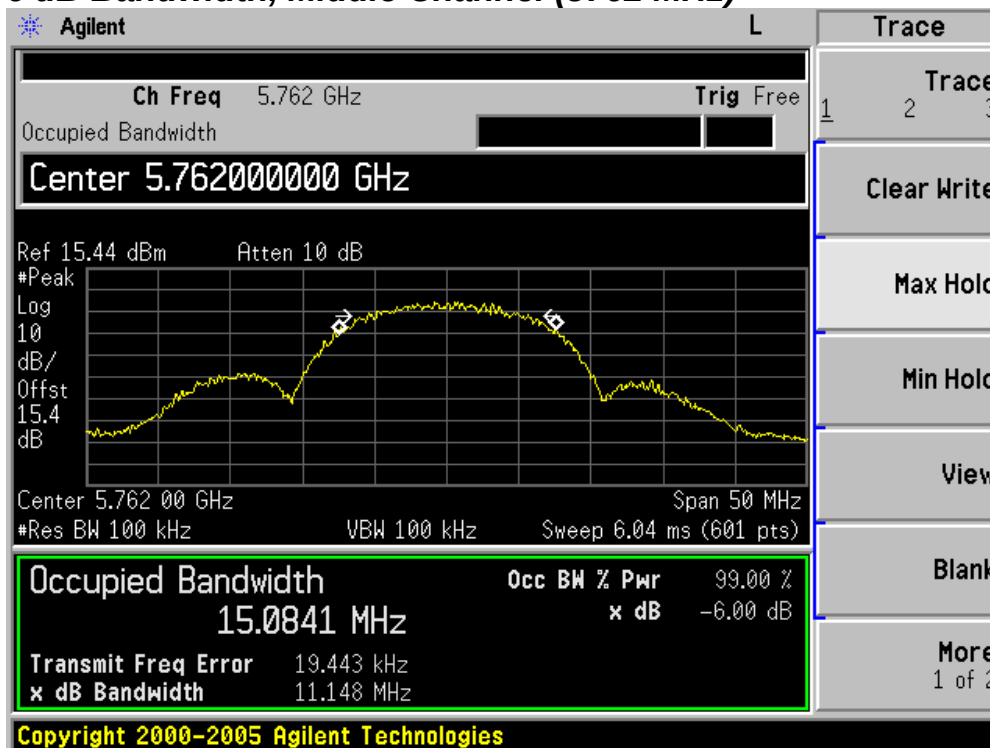


6 dB Bandwidth, Lowest Channel (5736 MHz)

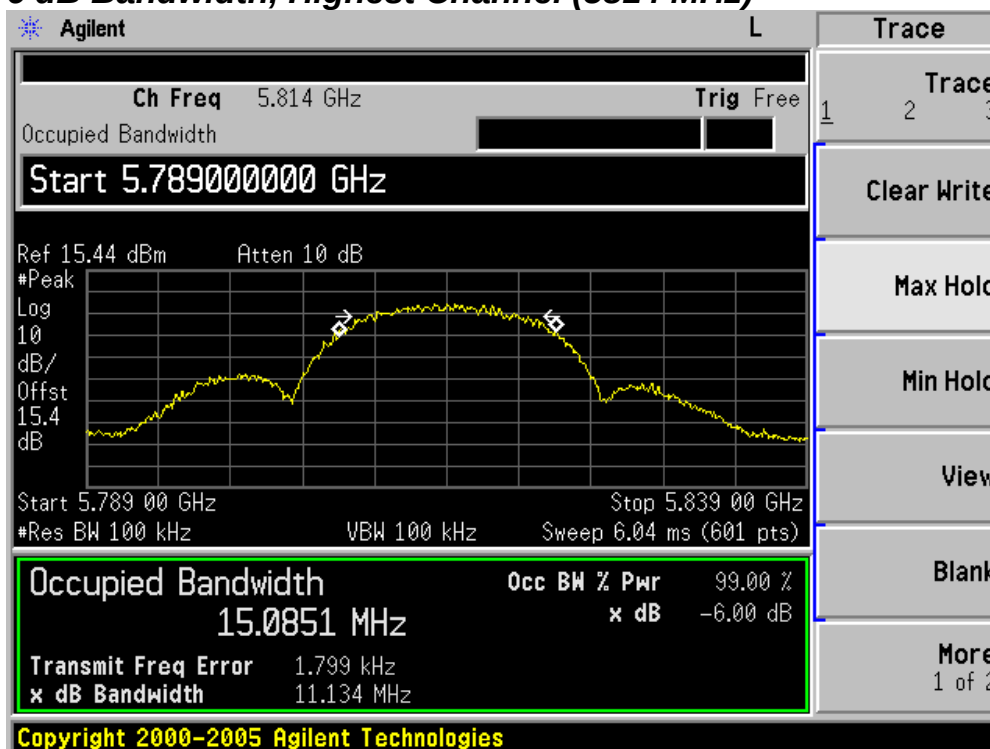


PLOTS OF EMISSIONS

6 dB Bandwidth, Middle Channel (5762 MHz)



6 dB Bandwidth, Highest Channel (5814 MHz)



TEST DATA

8.4 Peak Power Output

FCC §15.247(b), IC RSS-210 Issue 7 Clause A8.4

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

Result:

2 GHz mode

Channel	Frequency (MHz)	Conducted Power (dBm)	Limit (dBm)	Margin (dB)
Low	2412	17.28	30.00	12.72
Middle	2438	17.58	30.00	12.42
High	2464	17.64	30.00	12.36

5 GHz mode

Channel	Frequency (MHz)	Conducted Power (dBm)	Limit (dBm)	Margin (dB)
Low	5736	11.91	30.00	18.09
Middle	5762	10.11	30.00	19.89
High	5814	11.33	30.00	18.67

TEST DATA

8.5 Power Spectral Density

FCC §15.247(e), IC RSS-210 Issue 7 Clause A8.2

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

Result:

2 GHz mode

Channel	Frequency(MHz)	Result(dBm)	Limit(dBm)	Margin(dB)
Low	2412	-8.07	8	16.07
Middle	2438	-5.48	8	13.48
High	2464	-6.38	8	14.38

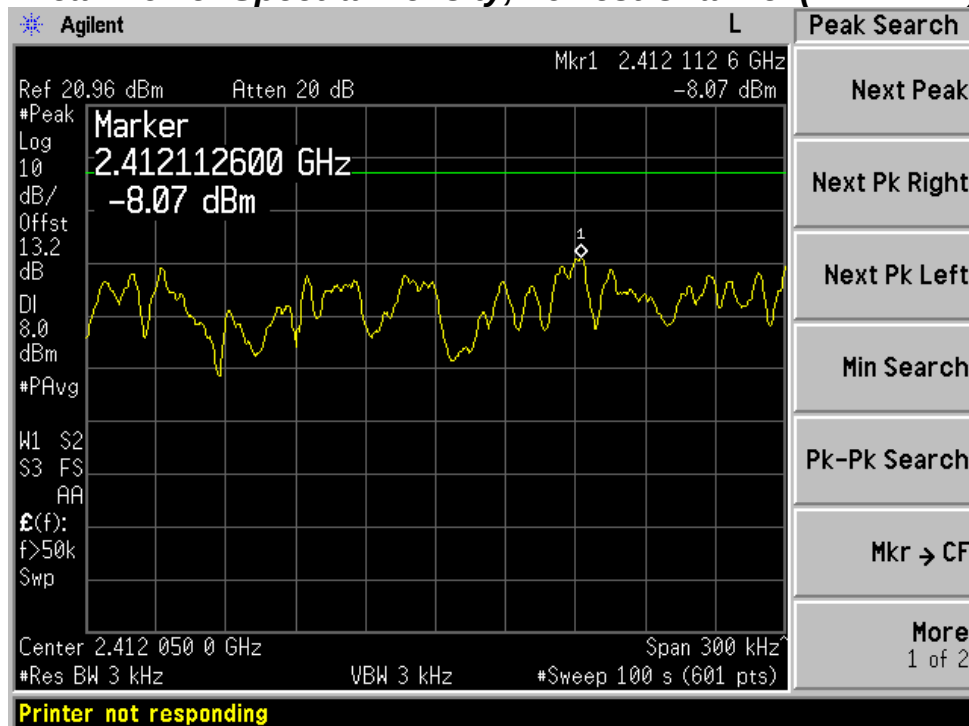
5 GHz mode

Channel	Frequency(MHz)	Result(dBm)	Limit(dBm)	Margin(dB)
Low	5736	-14.31	8	22.31
Middle	5762	-13.34	8	21.34
High	5814	-13.84	8	21.84

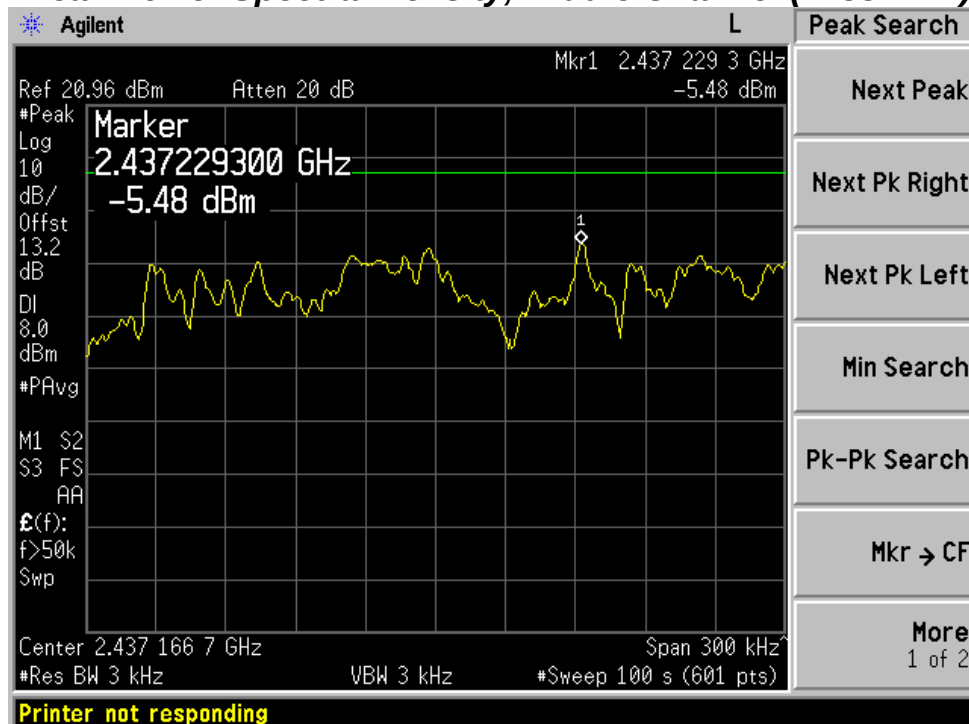
PLOT OF TEST DATA

2 GHz mode

Peak Power Spectral Density, Lowest Channel (2412 MHz)

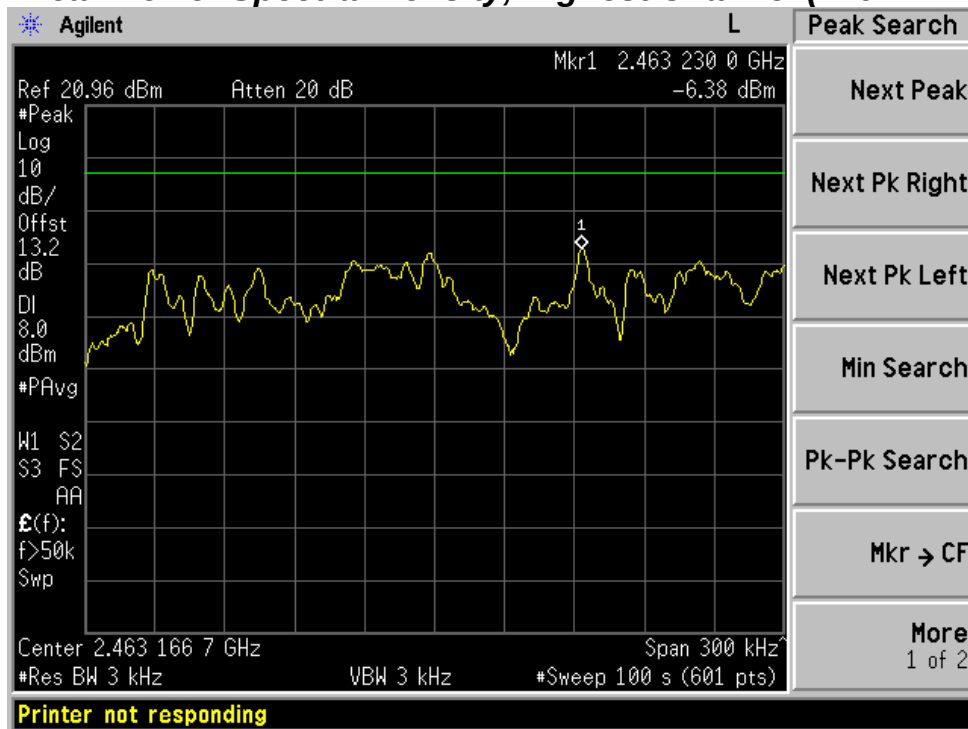


Peak Power Spectral Density, Middle Channel (2438 MHz)



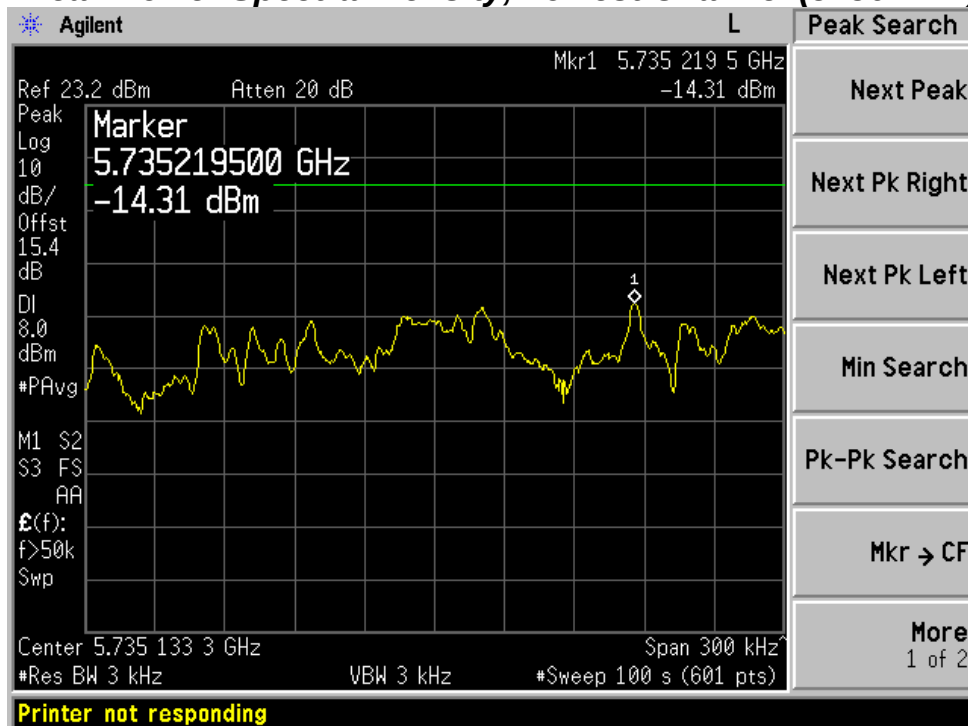
PLOT OF TEST DATA

Peak Power Spectral Density, Highest Channel (2464 MHz)



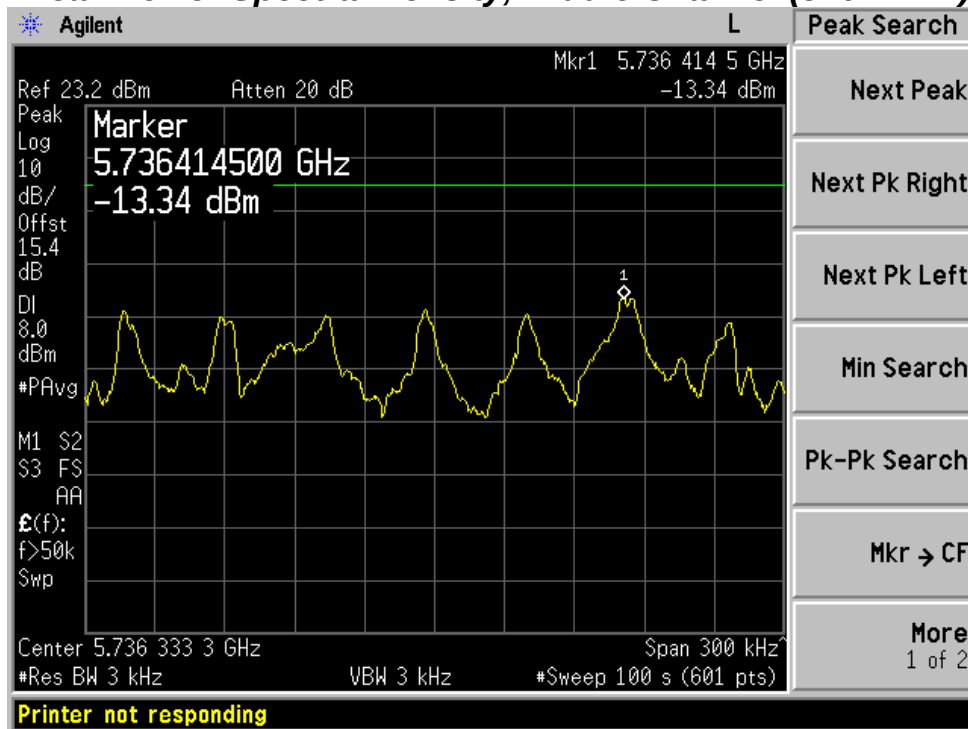
5 GHZ mode

Peak Power Spectral Density, Lowest Channel (5736 MHz)

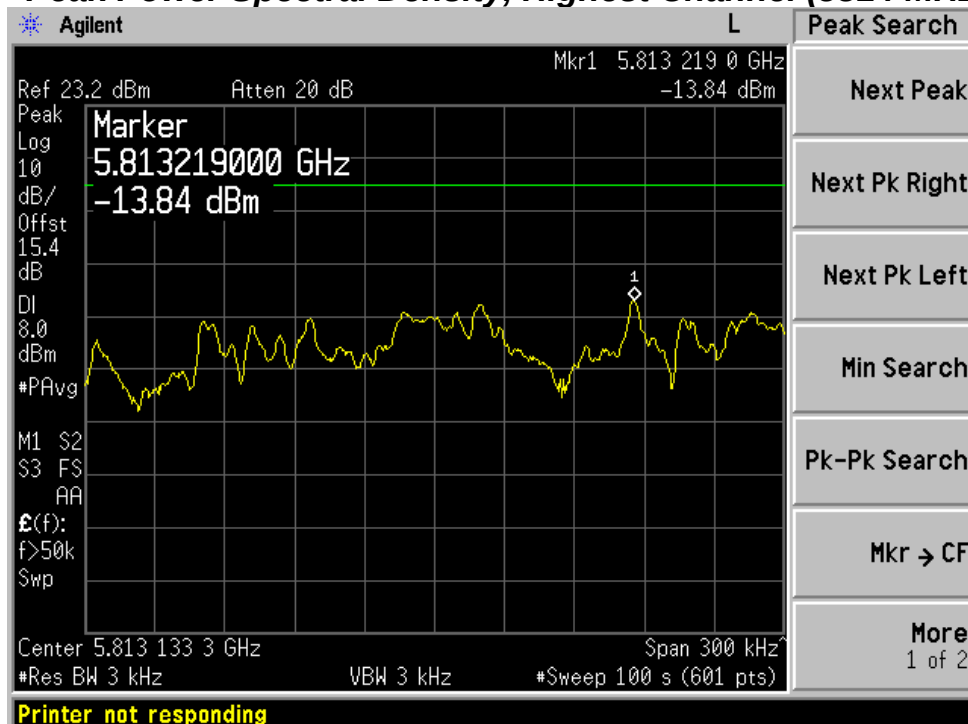


PLOT OF TEST DATA

Peak Power Spectral Density, Middle Channel (5762 MHz)



Peak Power Spectral Density, Highest Channel (5814 MHz)



TEST DATA

8.6 Conducted Spurious Emissions

FCC §15.247(d), IC RSS-210 A8.5

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

Result:

2 GHz mode

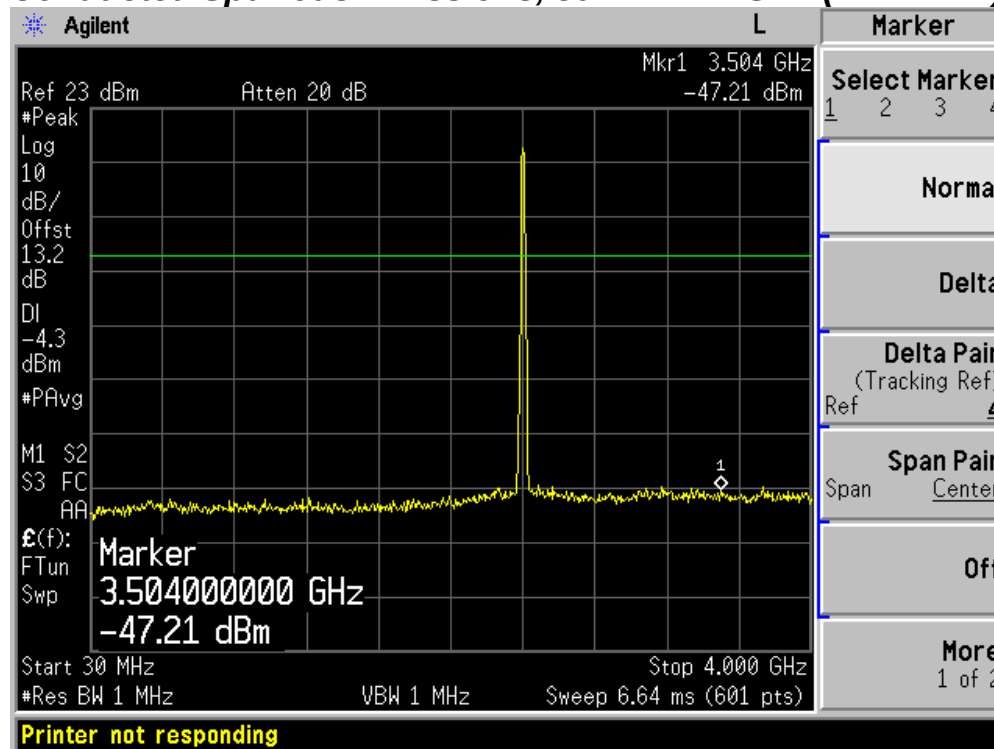
Channel	Frequency(MHz)	Result(dBc)	Limit(dBc)
Low	2412	More than 20 dBc	20
Middle	2438	More than 20 dBc	20
High	2464	More than 20 dBc	20

5 GHz mode

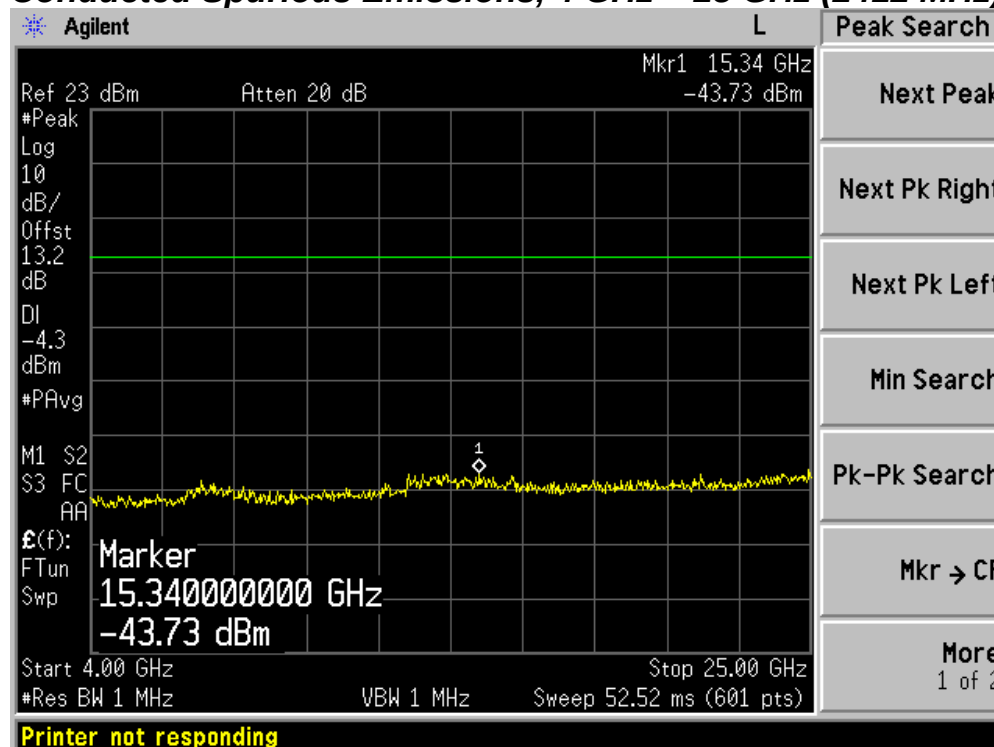
Channel	Frequency(MHz)	Result(dBc)	Limit(dBc)
Low	5736	More than 20 dBc	20
Middle	5762	More than 20 dBc	20
High	5814	More than 20 dBc	20

PLOT OF TEST DATA

Conducted Spurious Emissions, 30 MHz ~ 4 GHz (2412 MHz)

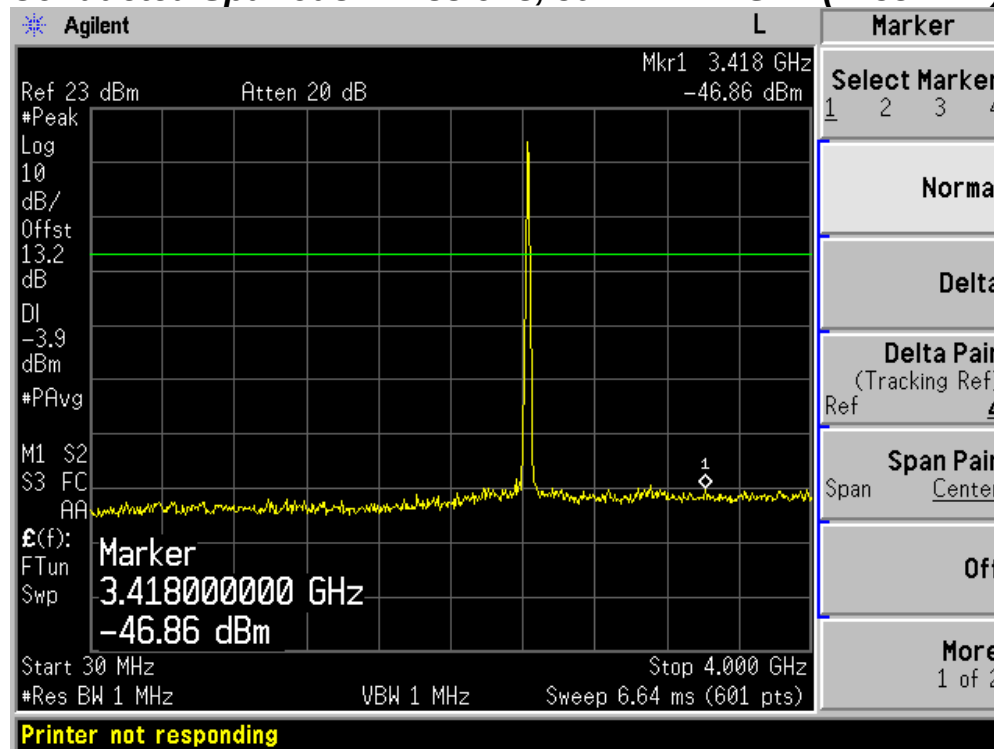


Conducted Spurious Emissions, 4 GHz ~ 25 GHz (2412 MHz)

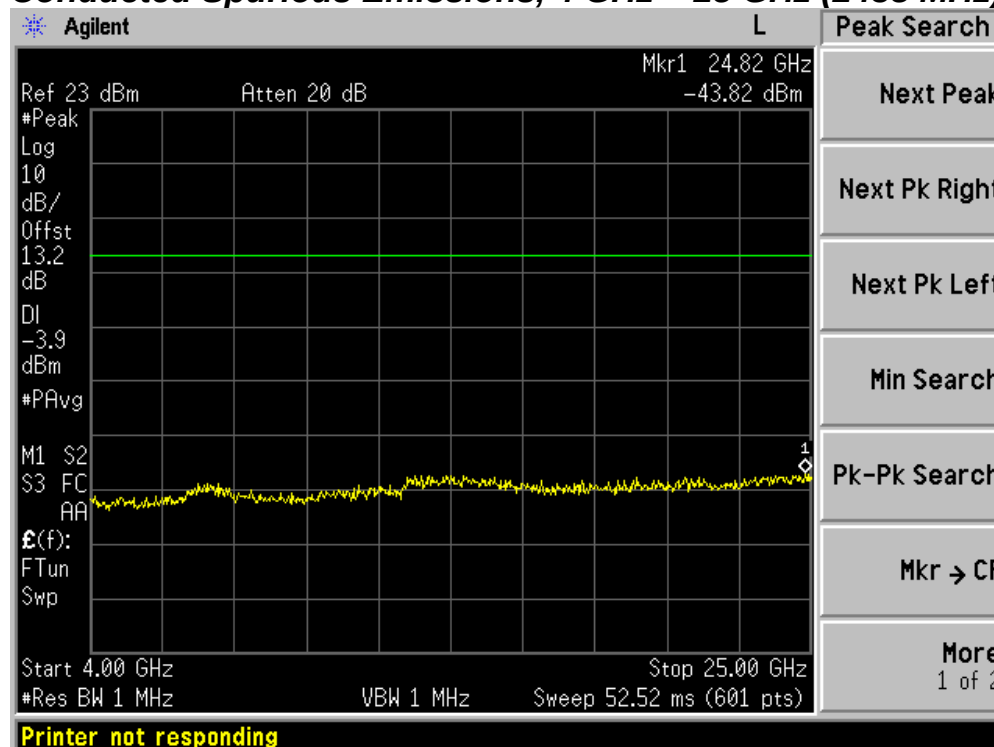


PLOT OF TEST DATA

Conducted Spurious Emissions, 30 MHz ~ 4 GHz (2438 MHz)

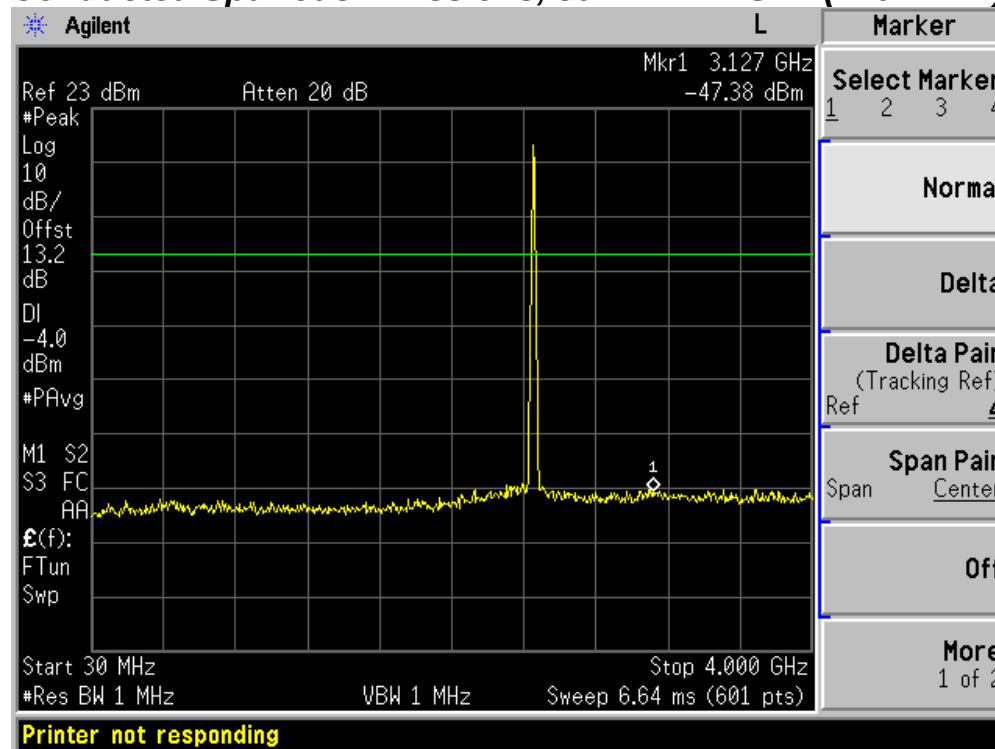


Conducted Spurious Emissions, 4 GHz ~ 25 GHz (2438 MHz)

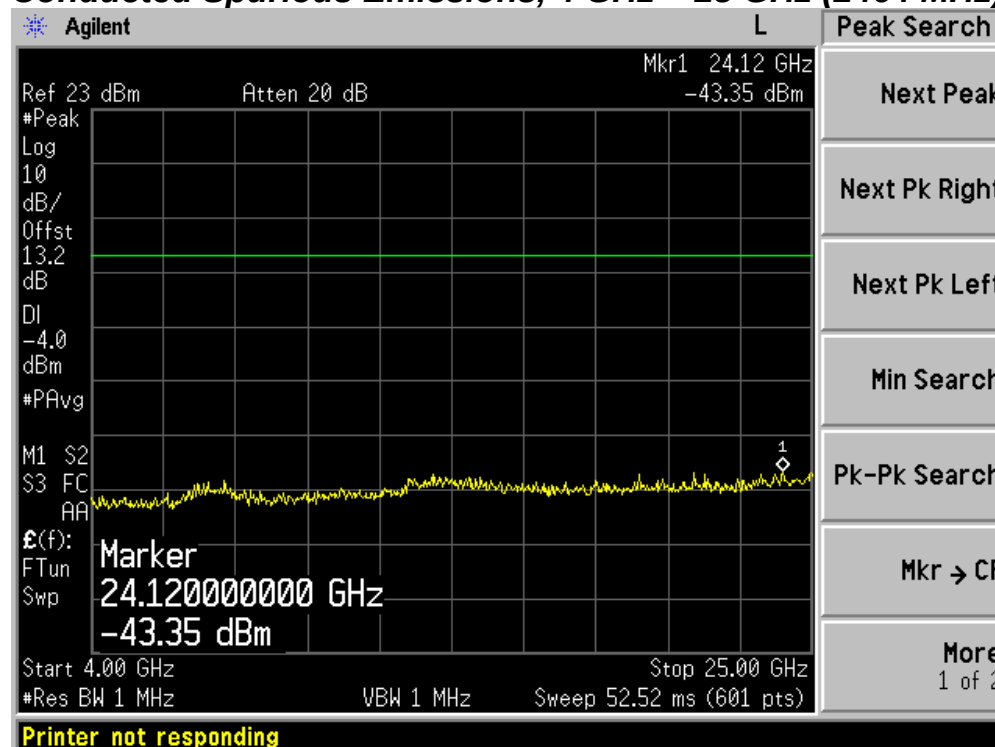


PLOT OF TEST DATA

Conducted Spurious Emissions, 30 MHz ~ 4 GHz (2464 MHz)

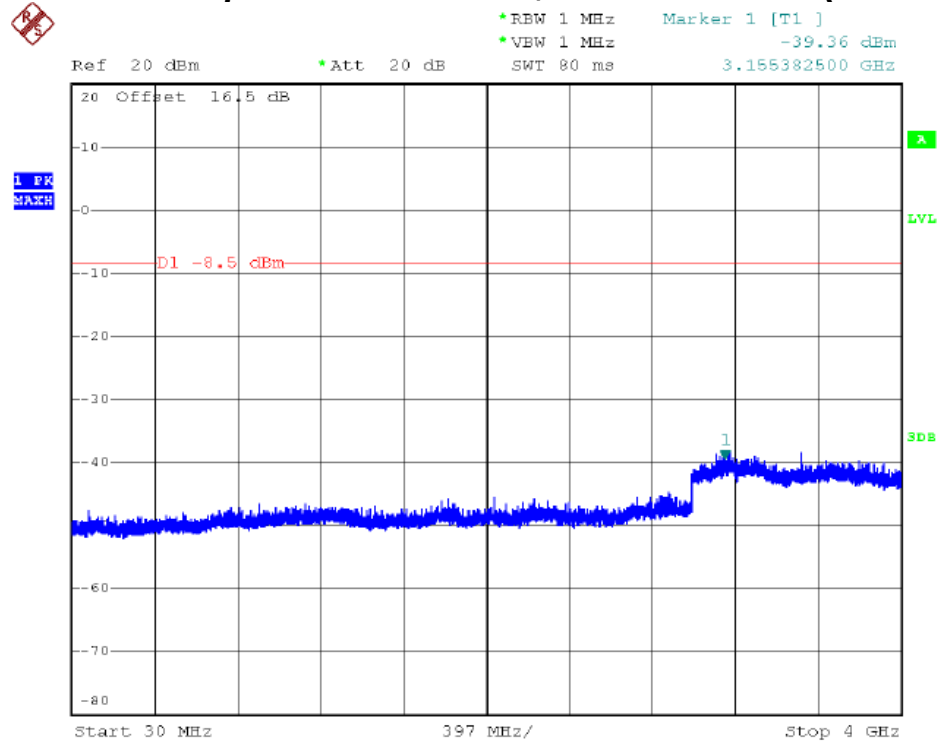


Conducted Spurious Emissions, 4 GHz ~ 25 GHz (2464 MHz)

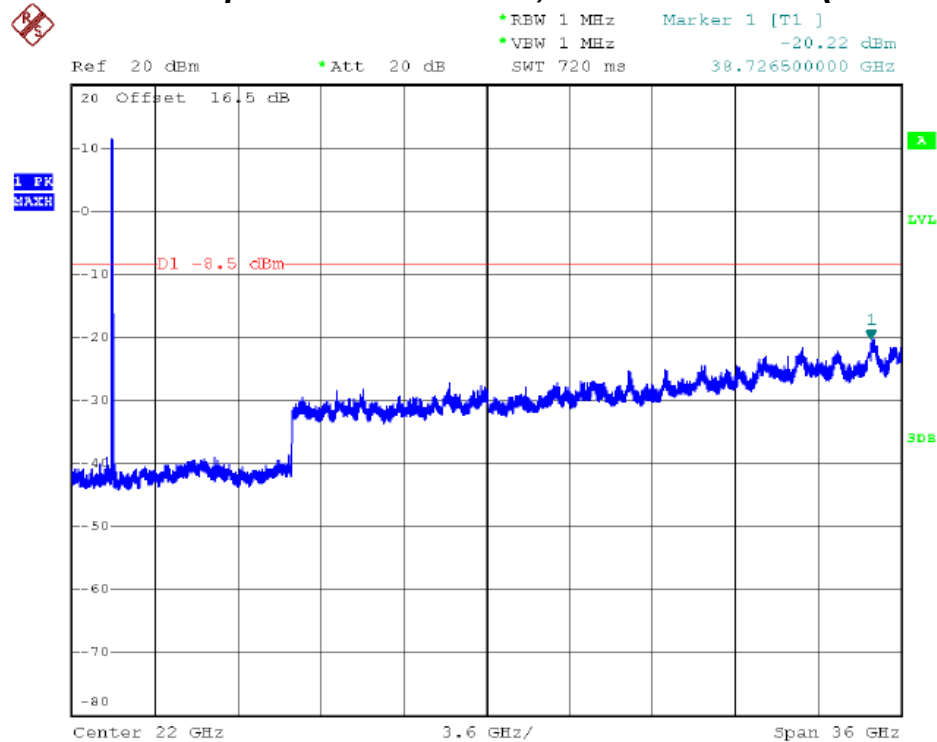


PLOT OF TEST DATA

Conducted Spurious Emissions, 30 MHz ~ 4 GHz (5736 MHz)

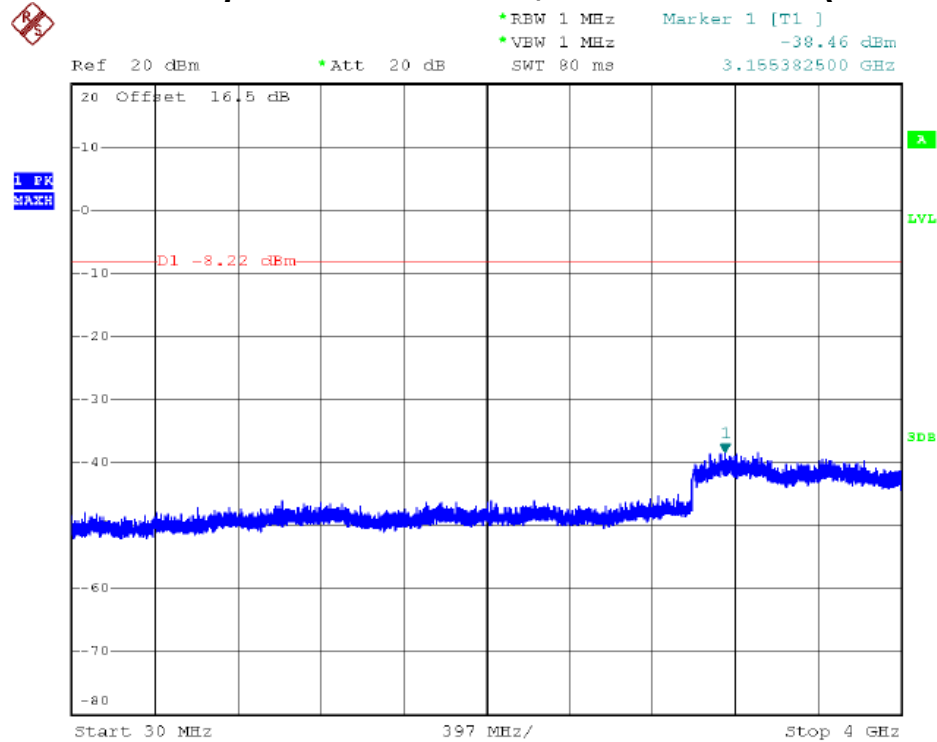


Conducted Spurious Emissions, 4 GHz ~ 40 GHz (5736 MHz)

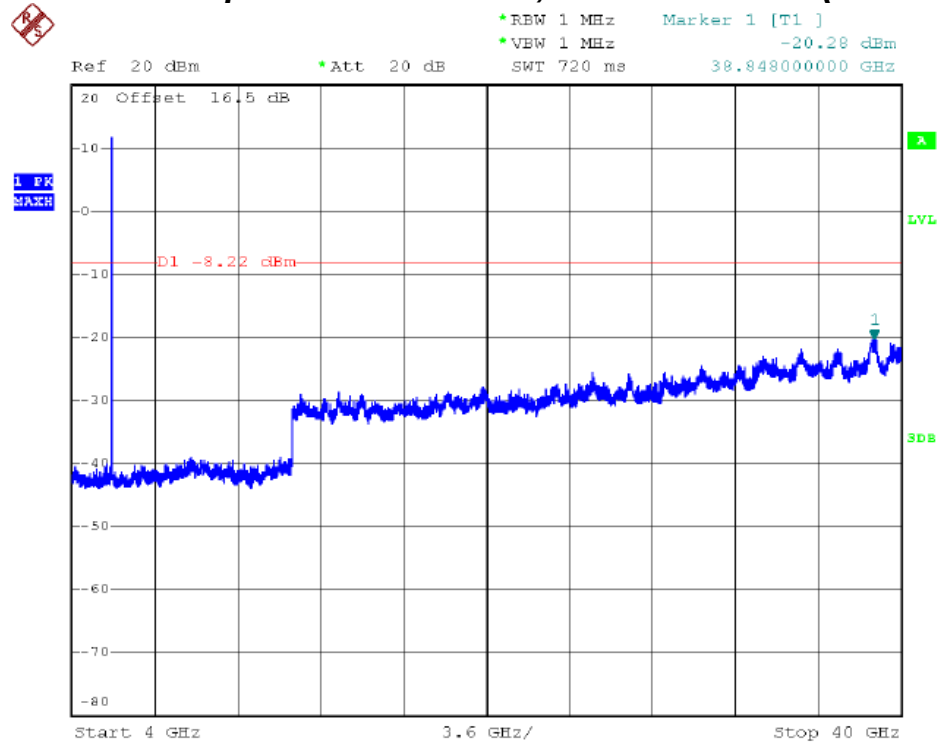


PLOT OF TEST DATA

Conducted Spurious Emissions, 30 MHz ~ 4 GHz (5762 MHz)

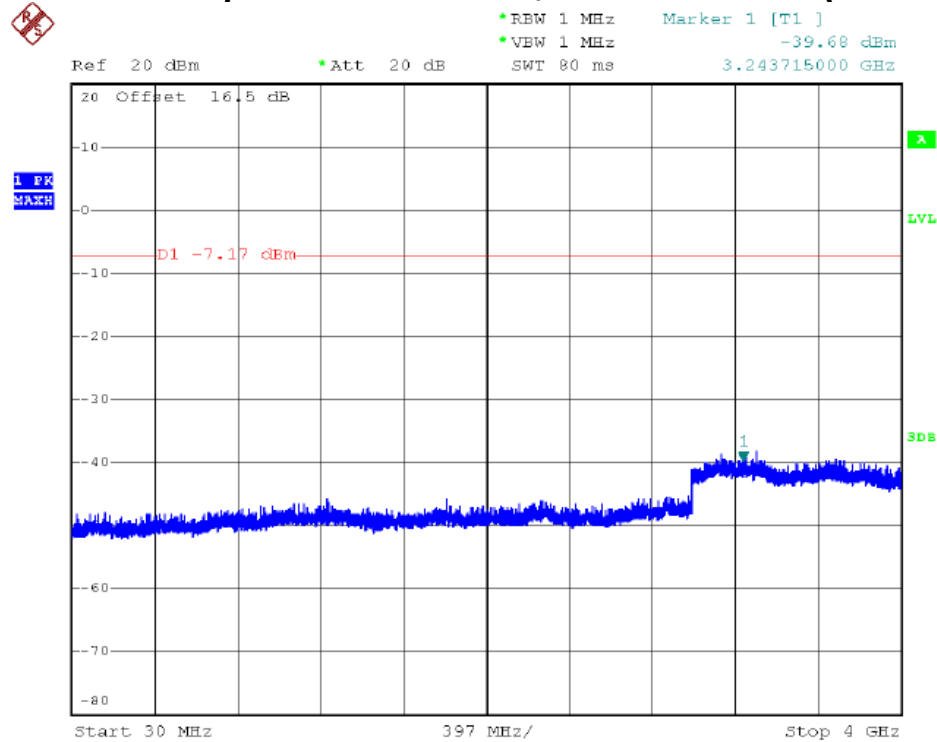


Conducted Spurious Emissions, 4 GHz ~ 40 GHz (5762 MHz)

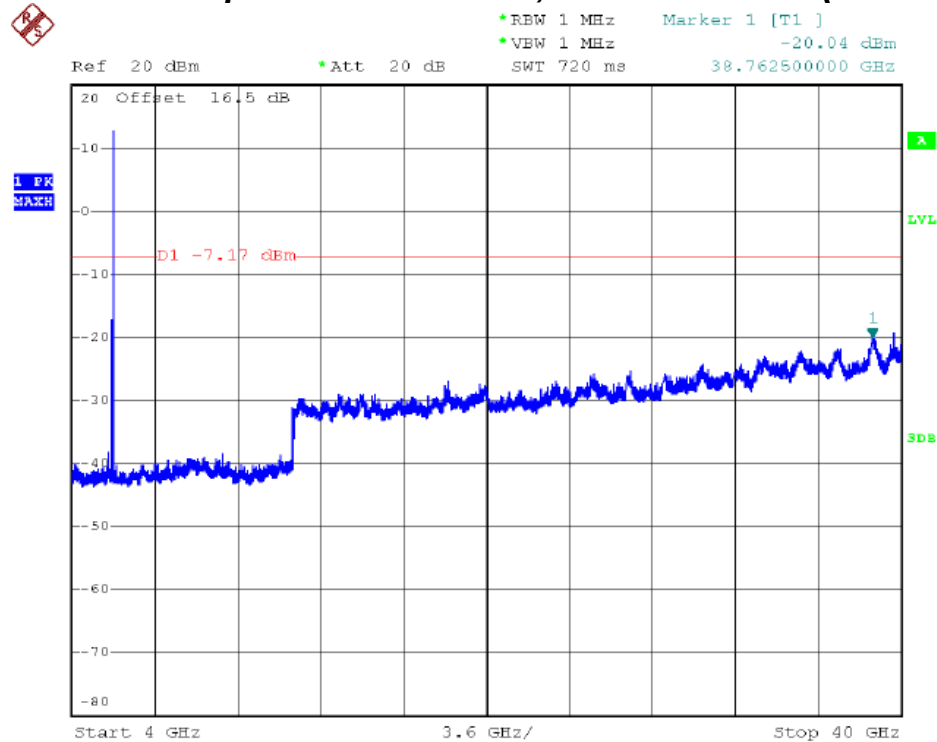


PLOT OF TEST DATA

Conducted Spurious Emissions, 30 MHz ~ 4 GHz (5814 MHz)

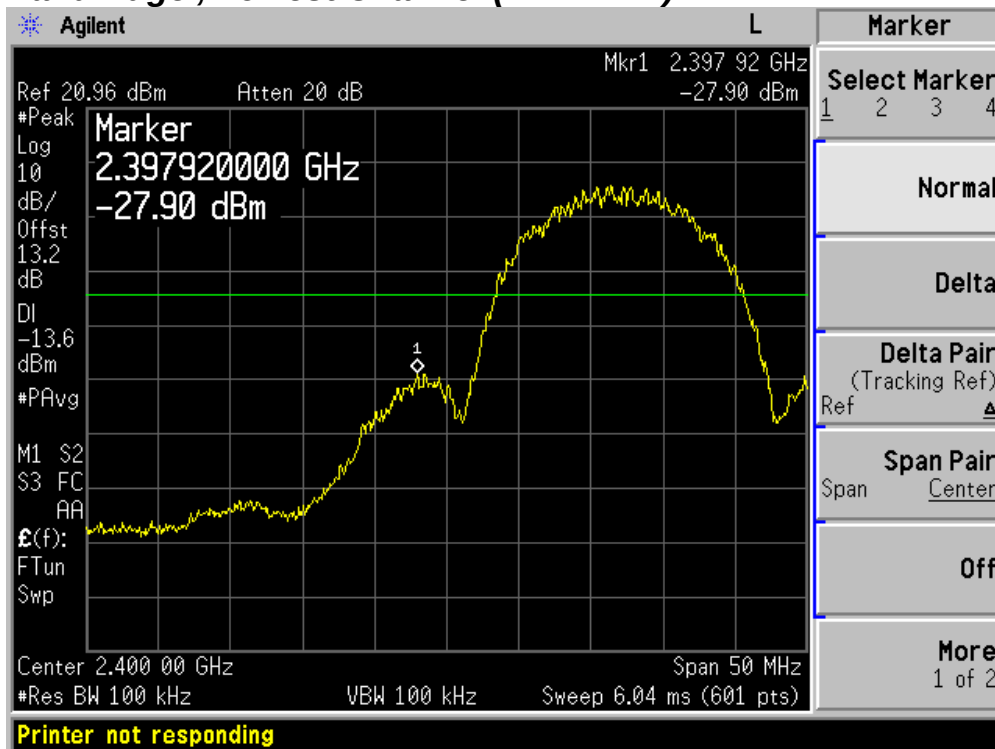


Conducted Spurious Emissions, 4 GHz ~ 40 GHz (5814 MHz)

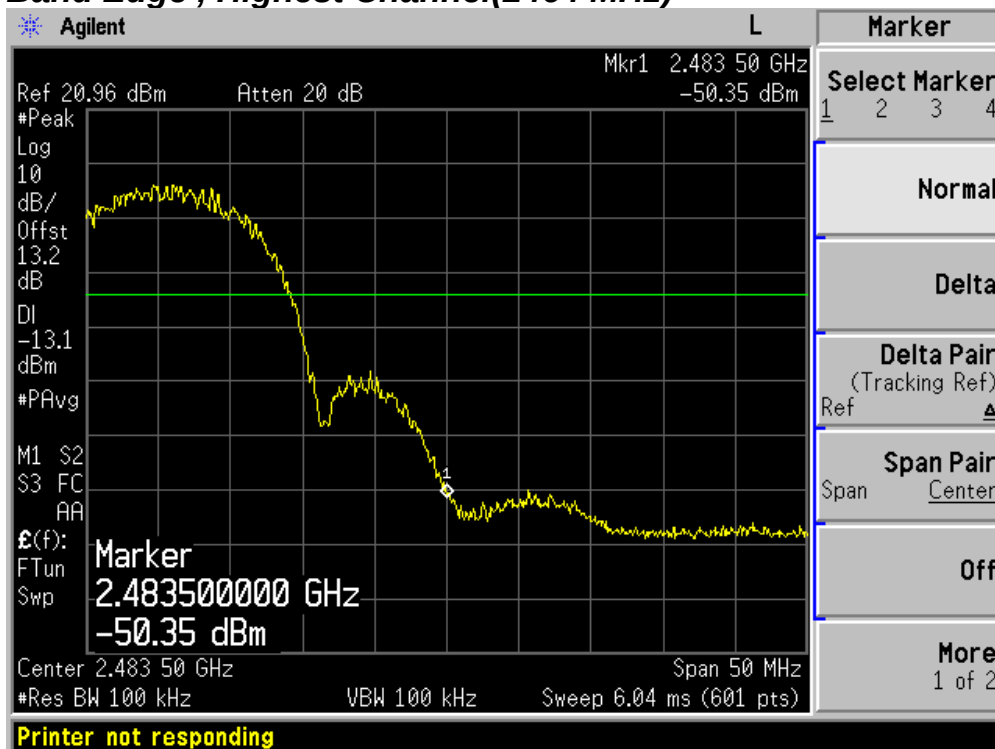


PLOT OF TEST DATA

Band Edge , Lowest Channel (2412 MHz)

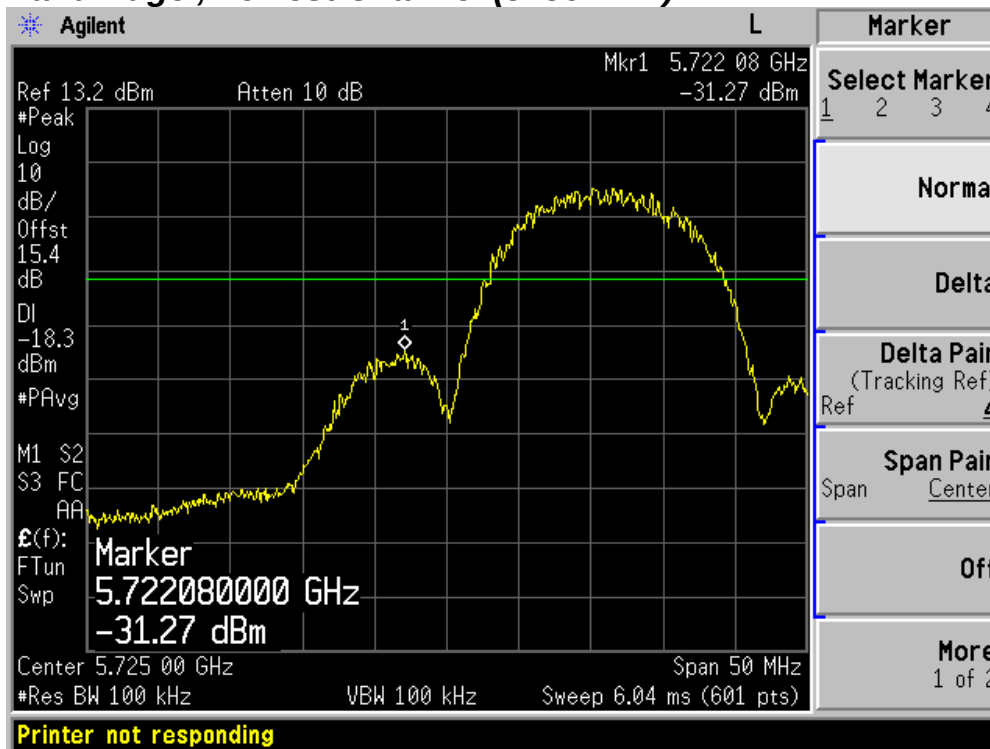


Band Edge , Highest Channel(2464 MHz)

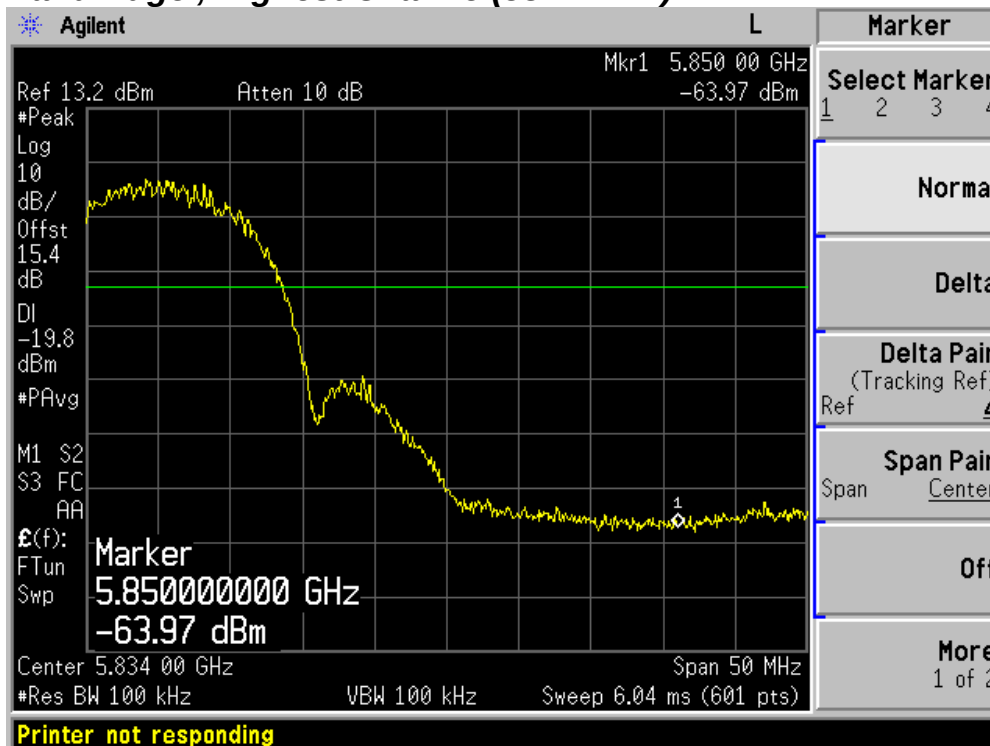


PLOT OF TEST DATA

Band Edge , Lowest Channel (5736 MHz)



Band Edge , Highest Channel(5814 MHz)



TEST DATA

8.7 Radiated Spurious Emissions

FCC §15.247(d), IC RSS-210 Clause 2.6, IC RSS-GEN Clause 6

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

Result:

2 GHz mode

Lowest Channel

Frequency (M Hz)	Reading (dB μ V)	Pol* (H/V)	mode	AF+CL+Amp (dB)**	Result (dB μ V/m)	Lim it (dB μ V/m)	Margin (dB)
4824	40.1	H	peak	8.70	48.8	54.0	5.2
4824	41.2	V	peak	8.70	49.9	54.0	4.1

Middle Channel

Frequency (M Hz)	Reading (dB μ V)	Pol* (H/V)	mode	AF+CL+Amp (dB)**	Result (dB μ V/m)	Lim it (dB μ V/m)	Margin (dB)
4876	39.8	H	peak	8.90	48.7	54.0	5.3
4876	39.2	V	peak	8.90	48.1	54.0	5.9

Highest Channel

Frequency (M Hz)	Reading (dB μ V)	Pol* (H/V)	mode	AF+CL+Amp (dB)**	Result (dB μ V/m)	Lim it (dB μ V/m)	Margin (dB)
4928	40.0	H	peak	8.90	48.9	54.0	5.1
4928	38.8	V	peak	8.90	47.7	54.0	6.3

TEST DATA

5 GHz mode

Lowest Channel

Frequency (MHz)	Reading (dB μ V)	Pol* (H/V)	mode	AF+CL+Amp (dB)**	Result (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)
11472	44.00	H	peak	22.60	66.60	74.0	7.40
11472	28.50	H	average	22.60	51.10	54.0	2.90
11472	43.80	V	peak	22.60	66.40	74.0	7.60
11472	28.10	V	average	22.60	50.70	54.0	3.30
17207	36.22	H	peak	19.64	55.86	74.0	18.14
17207	23.44	H	average	19.64	43.08	54.0	10.92

Middle Channel

Frequency (MHz)	Reading (dB μ V)	Pol* (H/V)	mode	AF+CL+Amp (dB)**	Result (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)
11524	42.65	H	peak	23.90	66.55	74.0	7.45
11524	27.40	H	average	23.90	51.30	54.0	2.70
11524	42.72	V	peak	23.90	66.62	74.0	7.38
11524	27.00	V	average	23.90	50.90	54.0	3.10
17287	36.66	H	peak	19.76	56.42	74.0	17.58
17287	23.19	H	average	19.76	42.95	54.0	11.05

TEST DATA

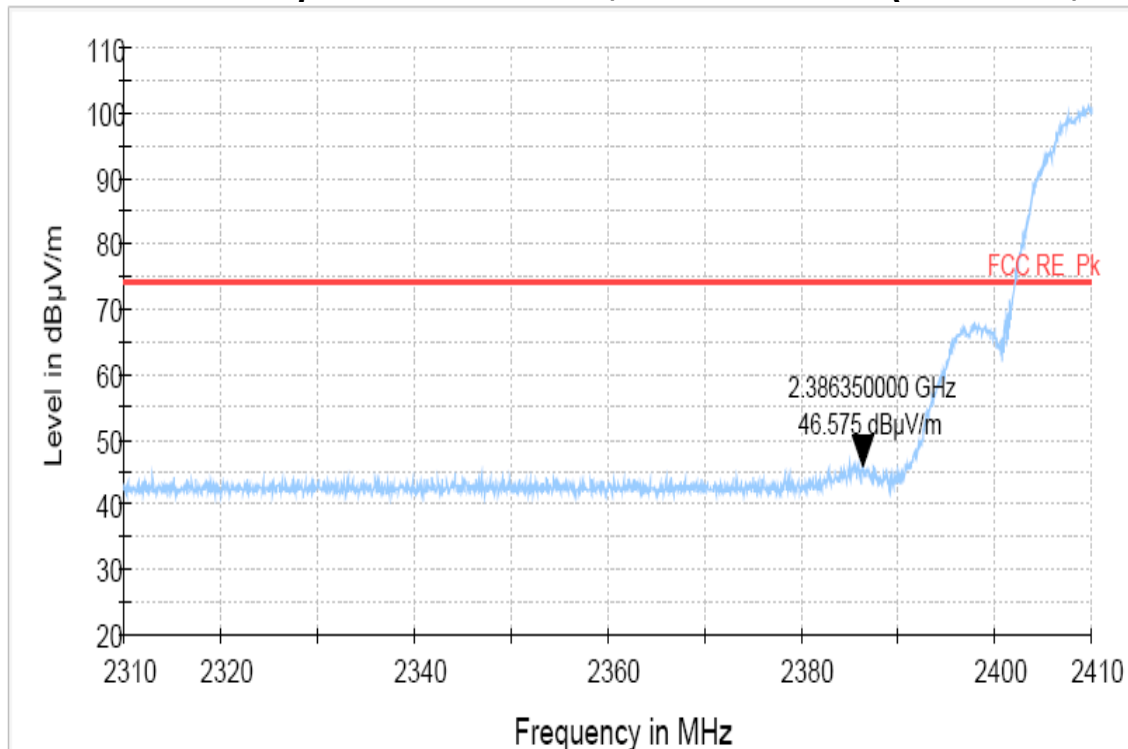
Highest Channel

Frequency (MHz)	Reading (dB μ V)	Pol* (H/V)	mode	AF+CL+Amp (dB)**	Result (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)
11628	42.68	H	peak	23.90	66.58	74.0	7.42
11628	28.00	H	average	23.90	51.90	54.0	2.10
11628	42.60	V	peak	23.90	66.50	74.0	7.50
11628	27.30	V	average	23.90	51.20	54.0	2.80
17443	38.29	H	peak	19.99	58.28	74.0	15.72
17443	23.22	H	average	19.99	43.21	54.0	10.79

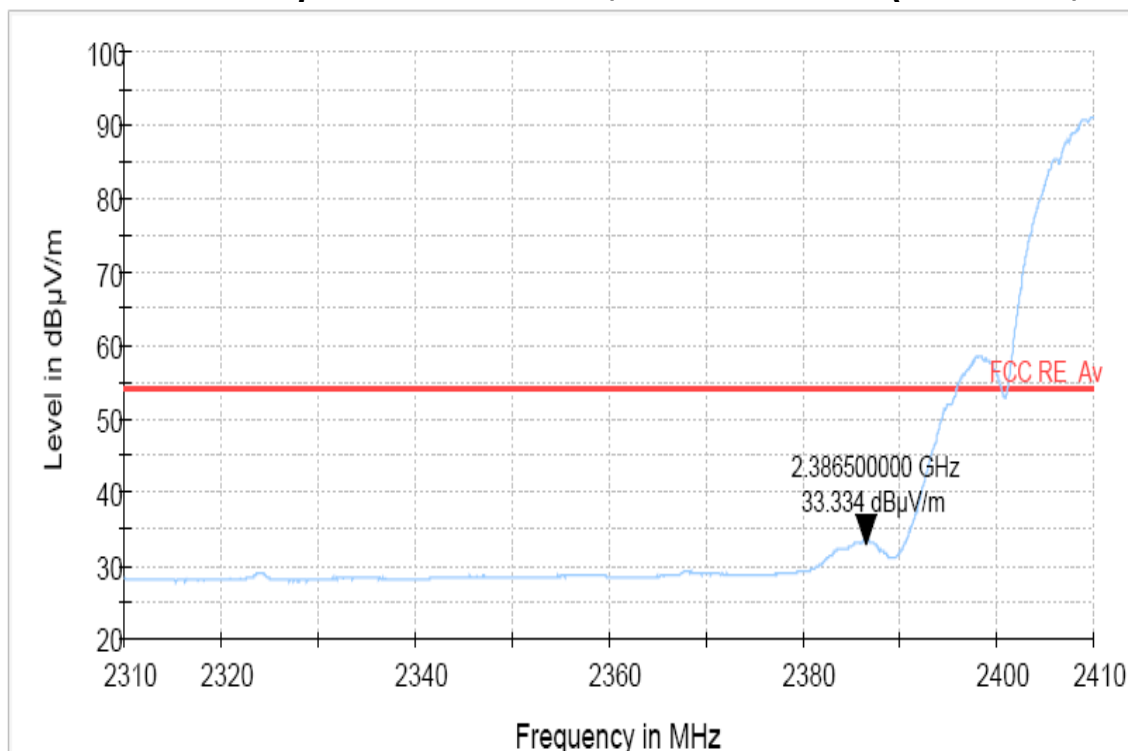
- *Pol.** H =Horizontal V=Vertical
- **AF+CL+Amp.** = Antenna Factor + Cable Loss + Amplifier.
- Other spurious are under 20 dB below Fundamental.
- The radiated emissions testing were made by rotating through three orthogonal axes.
The worst date was recorded.
- For measurements the resolution bandwidth is set to 1 MHz, and then the video bandwidth is set to 1 MHz for peak measurements and 10 Hz for average measurements.
- 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

Restricted Band Spurious Emissions, Lowest channel(Horizontal, Peak)

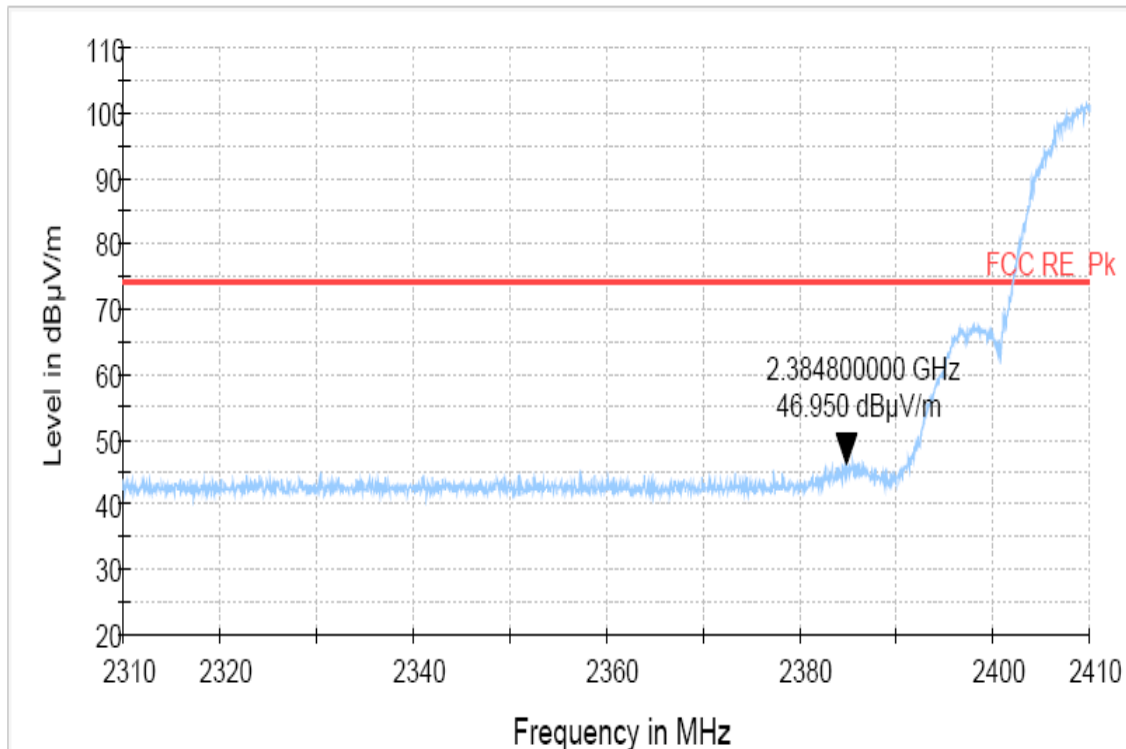


Restricted Band Spurious Emissions, Lowest channel(Horizontal, Average)

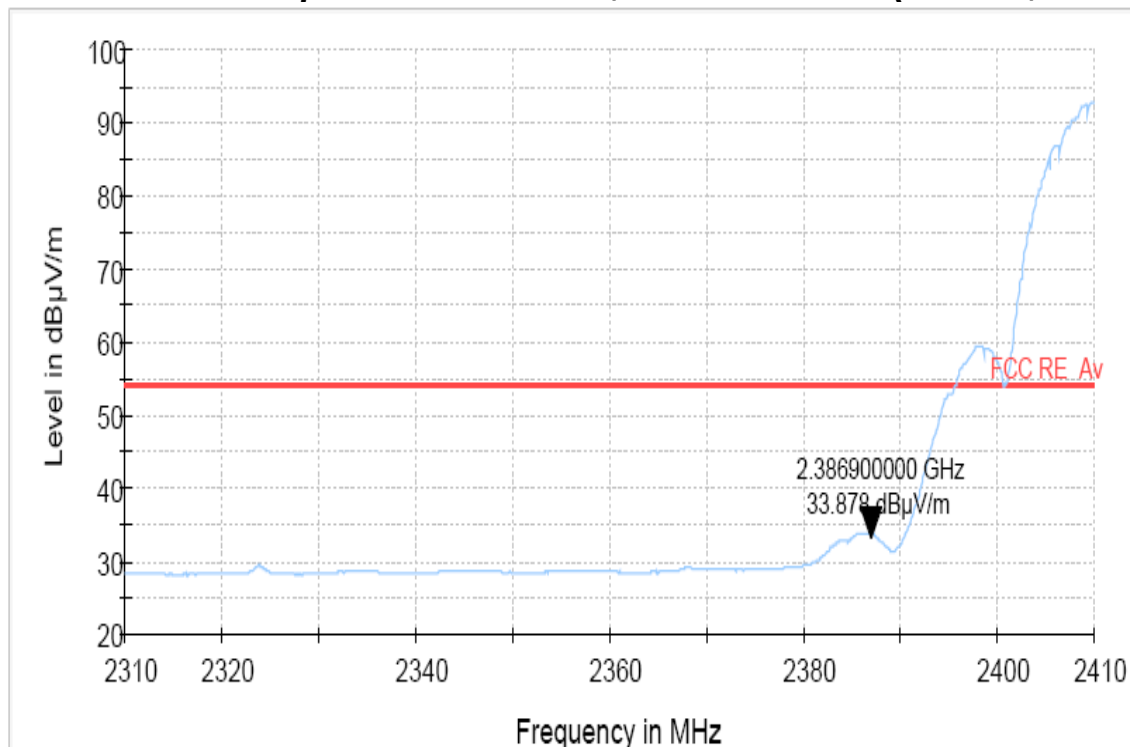


PLOT OF TEST DATA

Restricted Band Spurious Emissions, Lowest channel(Vertical, Peak)

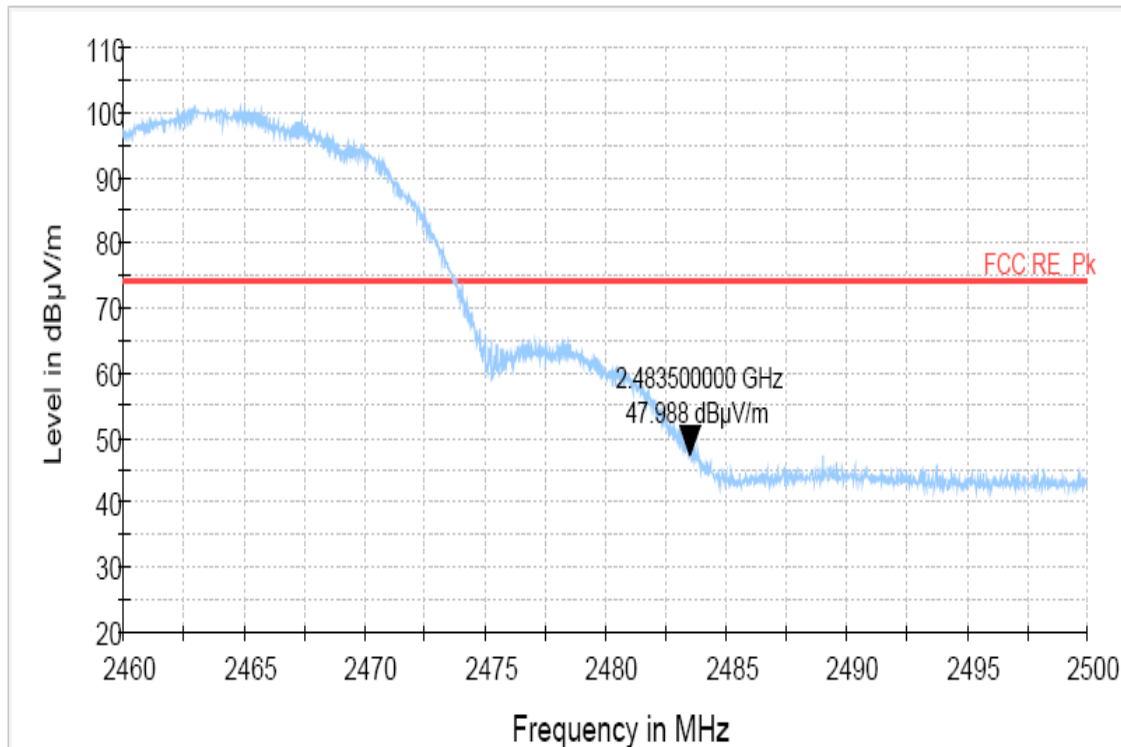


Restricted Band Spurious Emissions, Lowest channel(Vertical, Average)

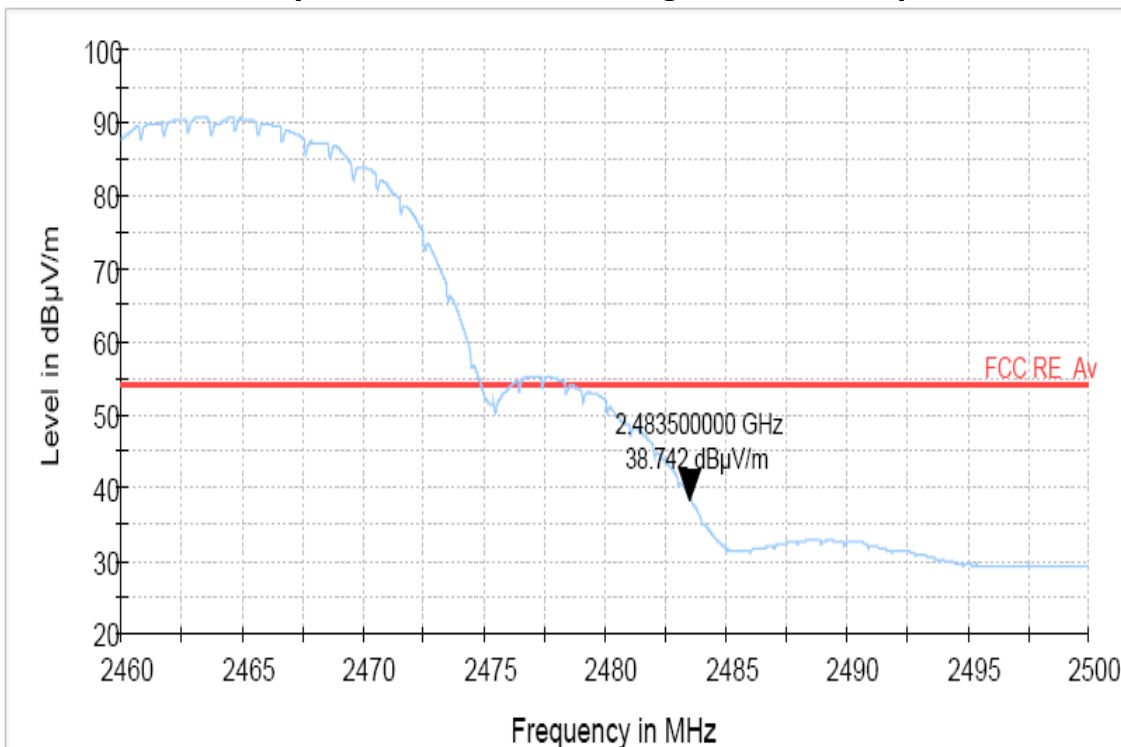


PLOT OF TEST DATA

Restricted Band Spurious Emissions, Highest channel(Horizontal, Peak)

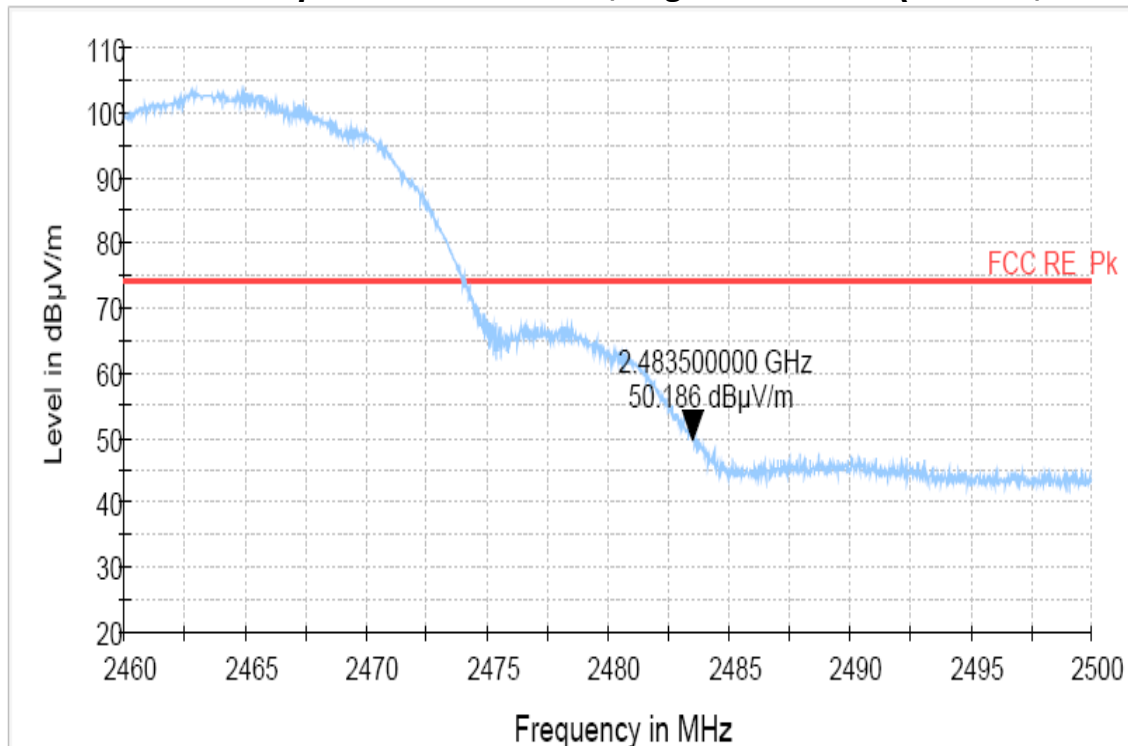


Restricted Band Spurious Emissions, Highest channel(Horizontal, Average)

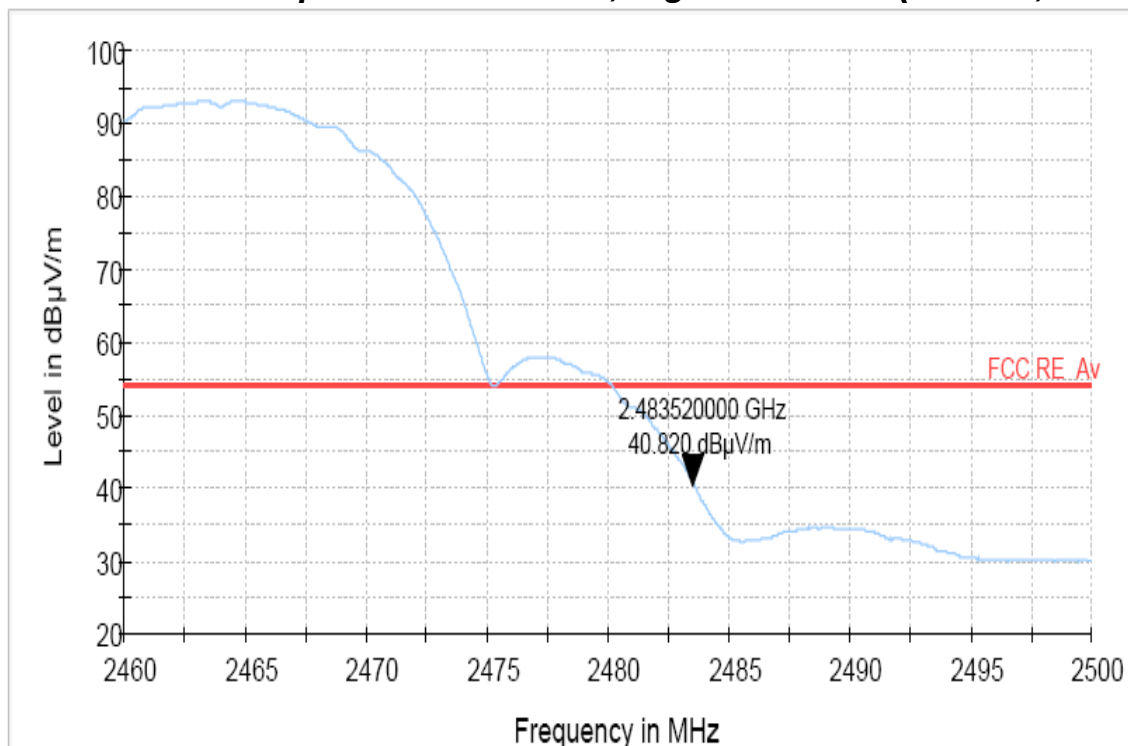


PLOT OF TEST DATA

Restricted Band Spurious Emissions, Highest channel(Vertical, Peak)



Restricted Band Spurious Emissions, Highest channel(Vertical, Average)



TEST DATA

8.8 Receiver Spurious Emissions

IC RSS-GEN Clause 6

Frequency (MHz)	Reading (dB μ V/m)	Pol* (H/V)	Antenna Heights (cm)	AF+CL+Amp (dB)**	Result (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)
31.78	51.9	V	100	-18.0	33.9	40.0	6.1
32.13	52.8	V	110	-18.0	34.8	40.0	5.2
193.59	47.5	H	201	-16.2	31.3	43.5	12.2
600.01	42.1	V	100	-6.5	35.6	46.0	10.4
700.01	40.5	V	100	-5.1	35.4	46.0	10.6
800.02	40.1	V	100	-3.4	36.7	46.0	9.3

Radiated Measurements at 3meters

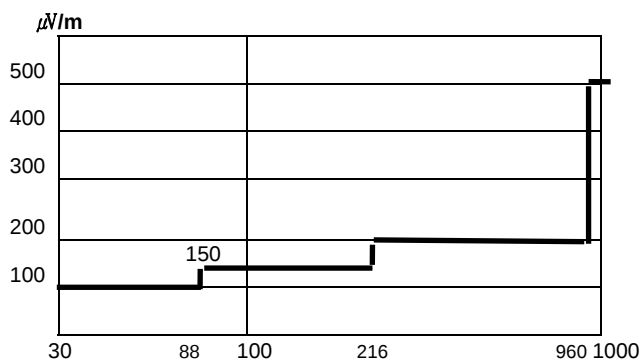


Fig. 5. Limits at 3 meters

NOTES:

1. All modes were measured and the worst-case emission was reported.
- 2 The radiated limits are shown on Figure 5.
- Above 1GHz the limit is 500 μ V/m.

MHz

NOTES:

1. *Pol. H =Horizontal, V=Vertical
2. **AF+CL+Amp. = Antenna Factor + Cable Loss + Amplifier.
3. Measurements using CISPR quasi-peak mode.
4. The radiated emissions testing were made by rotating through three orthogonal axes.
The worst date was recorded.
5. The limit is on the IC RSS GEN Clause 6.

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 : $P_d = (P_{out} * G) / (4 * \pi * r^2)$

$$r = \sqrt{((P_{out} * G) / 4 * \pi * P_d)}$$

Where

P_d = Power density in mW/cm²

P_{out} = Output power to antenna in mW

G = Gain of antenna in linear scale

π = 3.1416

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

P_d is the limit of MPE, 1 mW/cm². 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 antenna gain is **0.7 dBi for 2 GHz and 1.47 dBi for 5 GHz.**

2 GHz mode

Maximum peak output power at antenna input terminal:	17.64 (dBm)
Maximum peak output power at antenna input terminal:	58.08 (mW)
Antenna gain(typical):	0.70 (dBi)
Maximum antenna gain:	1.17 (numeric)
Prediction distance:	20 (cm)
Prediction frequency:	2438 (MHz)
MPE limit for uncontrolled exposure at prediction frequency:	1 (mW/cm ²)
Maximum allowable antenna gain:	19.37 (dBi)
Maximum Distance:	2.33 (cm)

Power density at prediction frequency : 0.013575 (mW/cm²)

Test result: PASS

5 GHz mode

Maximum peak output power at antenna input terminal:	11.91 (dBm)
Maximum peak output power at antenna input terminal:	15.52 (mW)
Antenna gain(typical):	1.47 (dBi)
Maximum antenna gain:	1.40 (numeric)
Prediction distance:	20 (cm)
Prediction frequency:	5762 (MHz)
MPE limit for uncontrolled exposure at prediction frequency:	1 (mW/cm ²)
Maximum allowable antenna gain:	25.10 (dBi)
Maximum Distance:	1.32 (cm)

Power density at prediction frequency : 0.004332 (mW/cm²)

Test result: PASS

10. ACCURACY OF MEASUREMENT

The Measurement Uncertainties stated were calculated in accordance with the requirements of NIST Technical Note 1297 with the confidence level of 95%

1. Radiation Uncertainty Calculation

Contribution	Probability Distribution	Uncertainty(+/-dB)
Antenna Factor	Normal (k=2)	± 0.5
Cable Loss	Normal (k=2)	± 0.04
Receiver Specification	Rectangular	± 2.0
Antenna directivity	Rectangular	± 1.0
Antenna Factor variation with Height		
Antenna Phase Center Variation		
Antenna Factor Frequency Interpolation		
Measurement Distance Variation		
Site Imperfections	Rectangular	± 2.0
Mismatch:Receiver VRC $r_i=0.3$ Antenna VRC $r_R=0.1(B_i)0.4(L_p)$ Uncertainty Limits $20\log(1+/-r_i r_R)$	U-Shaped	$+ 0.25 / - 0.26$
System Repeatibility	Std.deviation	± 0.05
Repeatability of EUT	-	-
Combined Standard Uncertainty	Normal	± 1.77
Expended Uncertainty U	Normal (k=2)	± 3.5

2. Conducted Uncertainty Calculation

Contribution	Probability Distribution	Uncertainty(+/-dB)
Receiver Specification	Normal (k=2)	± 2.0
LISN coupling spec.	Normal (k=2)	± 0.4
Cable and input attenuator cal.	Rectangular	± 0.4
Mismatch:Receiver VRC $r_i=0.3$ LISN vrc $r_g=0.1$ Uncertainty Limits $20\log(1+/-r_i r_R)$	U-Shaped	± 0.26
System Repeatibility	Std.deviation	± 0.68
Repeatability of EUT	-	-
Combined Standard Uncertainty	Normal	± 1.18
Expended Uncertainty U	Normal (k=2)	± 2.4

11. TEST EQUIPMENT

No.	Instrument	Manufacturer	Model	Serial No.	Calibration Date	Calibration Interval
1	*Test Receiver	R & S	ESCS 30	833364/020	Mar. 28 2009	1 year
2	*Test Receiver	R & S	ESCS 30	100302	Nov. 11 2009	1 year
3	*Amplifier	HP	8447F	2805A03427	Jul. 20 2009	1 year
4	*Amplifier	Sonoma Instrument	310N	291916	Jul. 22 2009	1 year
5	*Pre Amplifier	HP	8449B	3008A00107	Feb. 12 2009	1 year
6	*Pre Amplifier	HP	8447F	2805A03406	Apr. 09 2009	1 year
7	*Pre Amplifier	Agilent	83051A	3950M00201	Jun. 15 2009	1 year
8	*Spectrum Analyzer	Agilent	E4440A	MY44303257	Jul. 20 2009	1 year
9	*Spectrum Analyzer	Agilent	E4440A	MY44022567	Sep. 04 2009	1 year
10	*Spectrum Analyzer	R & S	FSP40	100361	Sep. 04 2009	1 year
11	*Loop Antenna	EMCO	6502	8911-2436	Jan. 11 2009	2 year
12	*Spectrum Analyzer	R & S	FSP40	100361	Sep. 04 2009	1 year
13	*Powr Meter	R & S	NRVS	835360/002	Feb. 12 2009	1 years
14	*Peak Power Sensor	R & S	NRV-Z32	836019/028	Nov. 11 2009	1 years
15	*Biconical Log Antenna	ARA	LPB-2520/A	1209	Dec. 08 2008	2 years
16	*Horn Antenna	SCHWARZBECK	BBHA9120D	9120D-508	Dec.11 2008	2 years
17	*Horn Antenna	SCHWARZBECK	BBHA9170	9170223	Jun. 16 2008	2 years
18	*Trilog-Broadband Antenna	SCHWARZBECK	VULB 9168	9168-257	Apr. 21 2008	2 years
19	Signal Generater	R & S	SMP02	833286/003	Jul. 20 2009	1 year
20	*LISN	R & S	ESH3-Z5	833874/006	Nov. 11 2009	1 year
21	*LISN	R & S	ESH2-Z5	100227	Feb. 13 2009	1 year
22	*Position Controller	DAEIL EMC	N/A	N/A	N/A	N/A
23	*Turn Table	DAEIL EMC	N/A	N/A	N/A	N/A
24	*Antenna Mast	DAEIL EMC	N/A	N/A	N/A	N/A
25	*Anechoic Chamber	EM Eng.	N/A	N/A	N/A	N/A
26	*Shielded Room	EM Eng.	N/A	N/A	N/A	N/A
27	*Position Controller	Seo-Young EMC	N/A	N/A	N/A	N/A
28	*Turn Table	Seo-Young EMC	N/A	N/A	N/A	N/A
29	*Antenna Mast	Seo-Young EMC	N/A	N/A	N/A	N/A
30	*Anechoic Chamber	Seo-Young EMC	N/A	N/A	N/A	N/A
31	*Shielded Room	Seo-Young EMC	N/A	N/A	N/A	N/A

*) Test equipment used during the test