

Nemko Korea CO., Ltd.

300-2, Osan-Ri, Mohyeon-Myeon, Cheoin-Gu, Yongin-Si, Gyeonggi-Do, KOREA

TEL:+82 31 330 1700

FAX:+82 31 322 2332

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 : January 5, 2012
Test Report No. : NK-11-R-298
Test Site : Nemko Korea Co., Ltd.

FCC ID
IC ID

A3LWISP40A
649E-WISP40A

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 15 Subpart C §15.247 and
IC RSS-210 Annex 8

Classification: Digital modulation Transmitter
EUT Type: Wireless 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.


Jan. 5, 2012
Tested By : Jinha Ko
Engineer


Jan. 05, 2012
Reviewed By : H.H. Kim
Manager & Chief Engineer

Samsung Electronics Co., Ltd.

Page 1 of 58

FCC ID : A3LWISP0A/ IC ID : 649E-WISP40A

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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: A3LWISP40A
- IC ID: 649E-WISP40A
- Model: WISP-40A
- Brand Name: SAMSUNG
- EUT Type: Wireless Audio Transceiver Module
- Classification: Digital modulation Transmitter
- Applied Standard: FCC 47 CFR Part 15 subpart C part 15.247
and IC RSS-210 Annex 8
- Test Procedure(s): ANSI C63.4-2003 and FCC procedure dated March 23, 2005
entitled "Measurements of Digital Transmission Systems
Operating Under Section 15.247"
- Dates of Test: November 29, 2011 ~ December 12, 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 9kHz to 40GHz (ANSI C63.4-2003) was used in determining radiated and conducted emissions emanating from **Samsung Electronics Co., Ltd.**

FCC ID : **A3LWISP40A** and IC ID : **649E-WISP40A**

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
Fax)+82-31-322-2332

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

3. TEST CONDITIONS & EUT INFORMATION

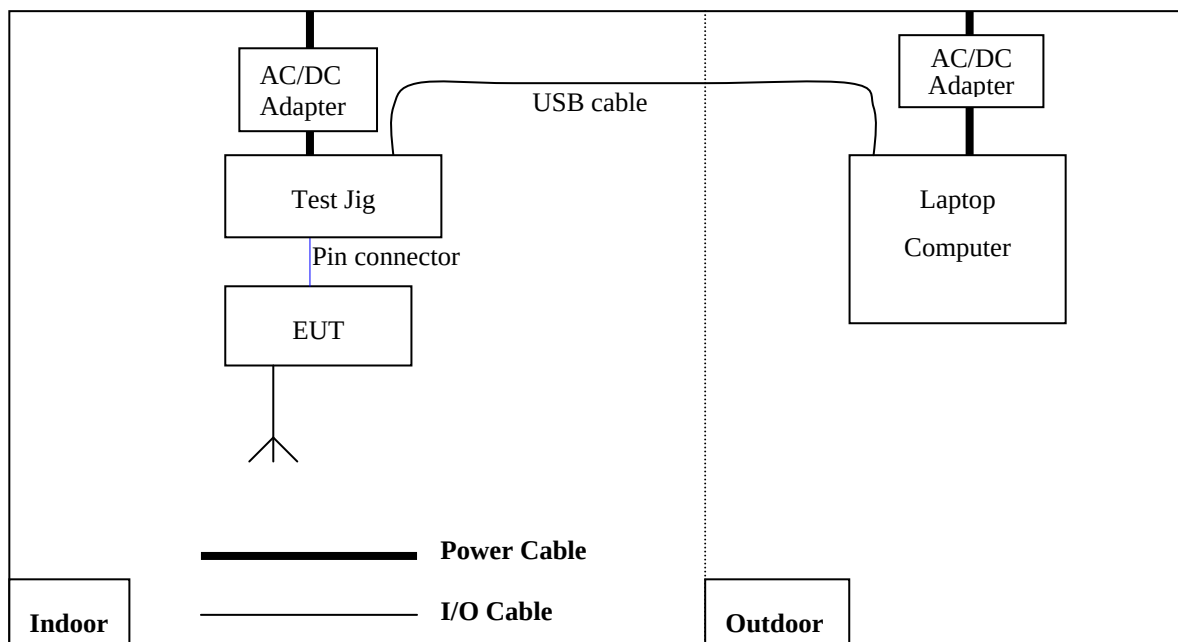
3.1 Operation During Test

The EUT was controlled and monitored by testing jig which manufacturer supported.
The EUT have two antennas which are not working simultaneously. All tests were performed at two antenna paths then, the worst case was recorded.

3.2 Support Equipment

EUT	Samsung Electronics Co., Ltd. FCC ID: A3LWISP40A	S/N: N/A
Laptop Computer	HP Model : HSTNN-Q61C 1.5 m shielded USB cable	FCC DOC S/N : CNF0489WDT
AC/DC Adapter for Laptop	LITE-ON TECHNOLOGY Model : Series PPP009L-E 1.0 m unshielded power cable	FCC DOC S/N : WBGST0A3UZOFQ6
AC/DC Adapter for Test Jig	Kuantech (Shenzhen) Co.,Ltd. Model : KSAC0500200W1KO 1.0 m unshielded power cable	FCC DOC S/N : N/A

3.3 Setup Drawing



3.4 EUT Information

The EUT is the **Samsung Wireless Audio Transceiver Module FCC ID: A3LWISP40A, IC ID: 649E-WISP40A.**

Specifications:

Category	Wireless Audio Transceiver Module
Model Name	WISP-40A
Brand Name	SAMSUNG
Frequency of Operation	2405.35 MHz ~ 2477.35 MHz
Power Output (Conducted)	4.88 dBm
Channels	37 ch
Antenna Gain (peak)	1.97 dBi
Modulations	π /4-DQPSK
Temperature Range	0 °C ~ +40 °C
Voltage	5.0 Vdc
Dimensions (W x H x D)	26 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	15.207	RSS-GEN 7.2.4	Complies	
Radiated Emission	15.209	RSS-210 A8.5	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 Wireless Audio Transceiver Module FCC ID: A3LWISP40A, IC ID: 649E-WISP40A** 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 Wireless Audio Transceiver Module FCC ID: A3LWISP40A, IC ID: 649E-WISP40A** 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 (ESH2-Z5) 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 (ESH3-Z5) and the support equipment is powered from the Rohde & Schwarz LISN (ESH2-Z5). 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 msec 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; whichever determined the worst case emission.

Each EME reported was calibrated using the R&S signal generator.

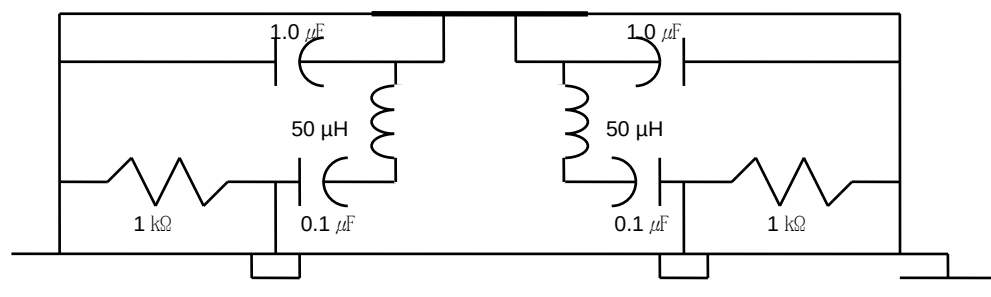


Fig. 2. LISN Schematic Diagram

7.2 Radiated Emissions

Preliminary measurements 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: up to 18 GHz, Q-par Angus QSH20S20 : 18 to 26.5 GHz, QSH22K20: up to 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, VULB9168) or Horn antenna.(Scwarzbeck BBHA 9120D: up to 18 GHz , Q-par Angus QSH20S20 : 18 to 26.5 GHz, QSH22K20: 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 1 MHz 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 4 meter 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; whichever determined the worst case emission.

Each EME reported was calibrated using the R/S signal generator.

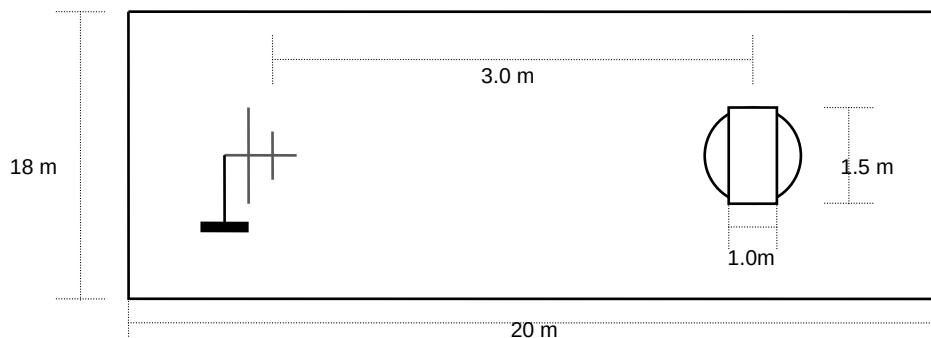
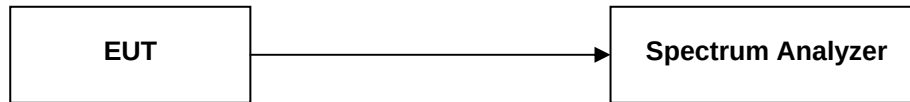


Fig. 3. Dimensions of Outdoor Test Site

7.3 6 dB Bandwidth

Test Setup

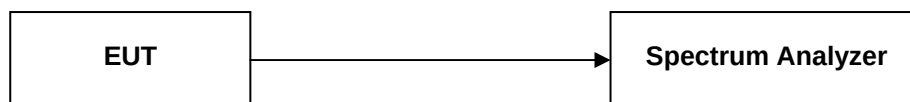


Test Procedure

The 6 dB bandwidth was measured with the EUT set to low, medium, and high transmit frequencies. The measurement was made using a direct connection between the RF output of the EUT and a spectrum analyzer. The RBW and VBW of spectrum analyzer were set to 100 kHz. The sweep time was coupled. The spectrum analyzer was set to peak detected and Max hold scan mode.

7.4 Maximum Peak Output Power

Test Setup

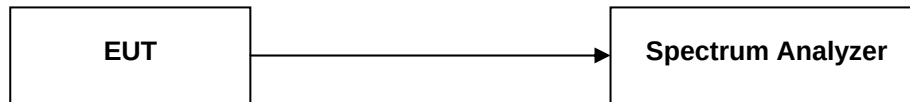


Test Procedure

The Peak output Power was measured with the EUT set to low, medium, and high transmit frequencies. The measurement was made using a direct connection between the RF output of the EUT and a spectrum analyzer. The RBW and VBW of spectrum analyzer were set to 3 MHz. The spectrum analyzer was set to peak detected and Max hold scan mode.

7.5 Peak Power Spectral Density

Test Setup



Test Procedure

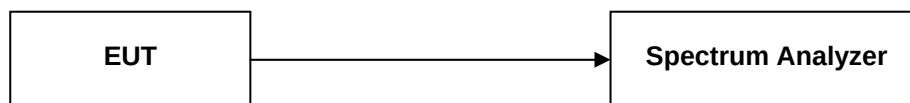
The Peak Power Spectral Density was measured with the EUT set to low, medium, and high transmit frequencies. The measurement was made using a direct connection between the RF output of the EUT and a spectrum analyzer. The RBW and VBW of spectrum analyzer were set to 3 kHz. The spectrum analyzer was set to peak detected and Max hold scan mode.

The sweep time was set to Span/3 kHz and video averaging was turned off.

The PPSD was the highest level found across the emission in any 3 kHz band.

7.6 Conducted Spurious Emissions

Test Setup



Test Procedure

The Peak Power Spectral Density was measured with the EUT set to low, medium, and high transmit frequencies. The measurement was made using a direct connection between the RF output of the EUT and a spectrum analyzer. The RBW of spectrum analyzer was set to 100 kHz and VBW was set to the 300 kHz.

The spectrum analyzer was set to peak detected and Max hold scan mode.

8. TEST DATA

8.1 Conducted Emissions

FCC §15.207, RSS-Gen

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	39.7	29.1	0.2	L	66.0	56.0	26.3	26.9
0.17	36.2	26.1	0.2	L	65.0	55.0	28.8	28.9
0.47	32.4	27.0	0.2	N	56.5	46.5	24.1	19.5
2.58	30.1	22.9	0.2	L	56.0	46.0	25.9	23.1
9.21	32.4	27.9	0.6	L	60.0	50.0	27.6	22.1
24.57	24.2	22.6	1.7	L	60.0	50.0	35.8	27.4

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).

PLOTS OF EMISSIONS

Conducted Emission at the Mains port (Line)

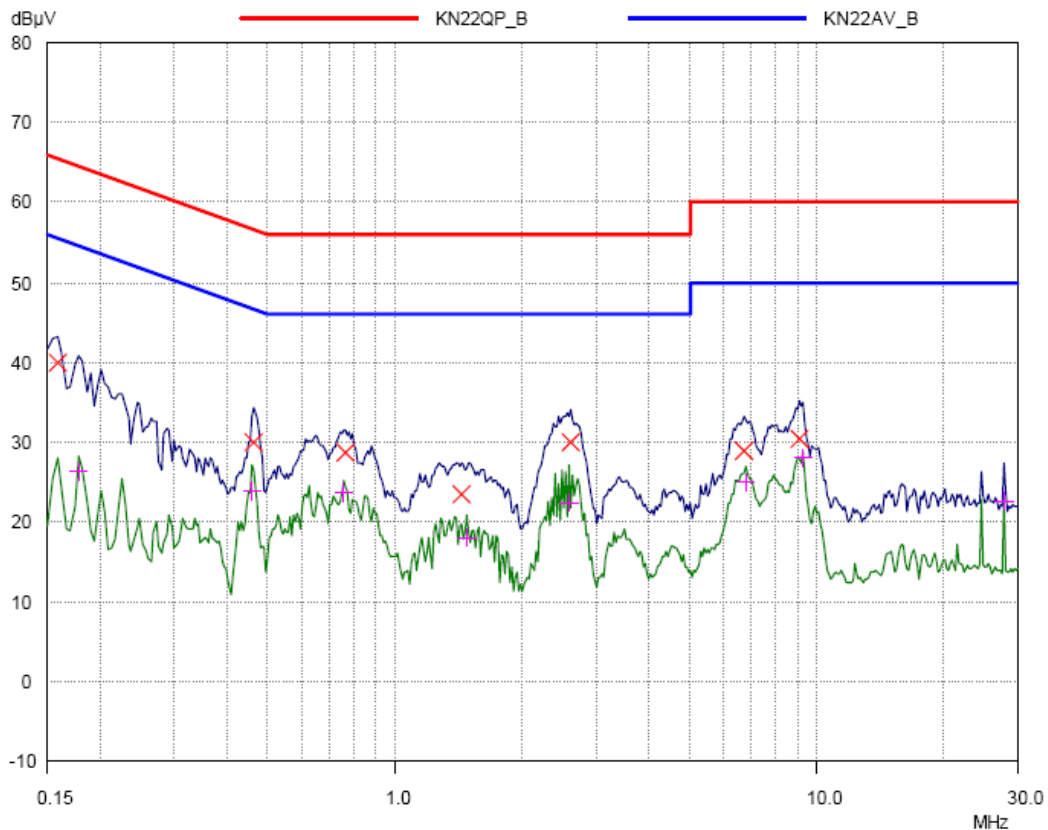
NEMKO KOREA (NK-11-R-298)

07 Dec 2011 20:11

Conducted Emissions

EUT: Wireless Audio Transceiver Module
 Manuf: Samsung Electronics
 Op Cond: a.c. 120 V, 60 Hz (TX mode)
 Operator: Jinha. KO
 Test Spec: FCC Part 15.207
 Comment: MODEL : WISP-40A
 LINE : L1

Scan Settings		(1 Range)			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_Z5_Line					
Final Measurement:		Detectors:	X QP / + AV						
		Meas Time:	1sec						
		Subranges:	8						
		Acc Margin:	30 dB						



PLOTS OF EMISSIONS

Conducted Emission at the Mains port (Neutral)

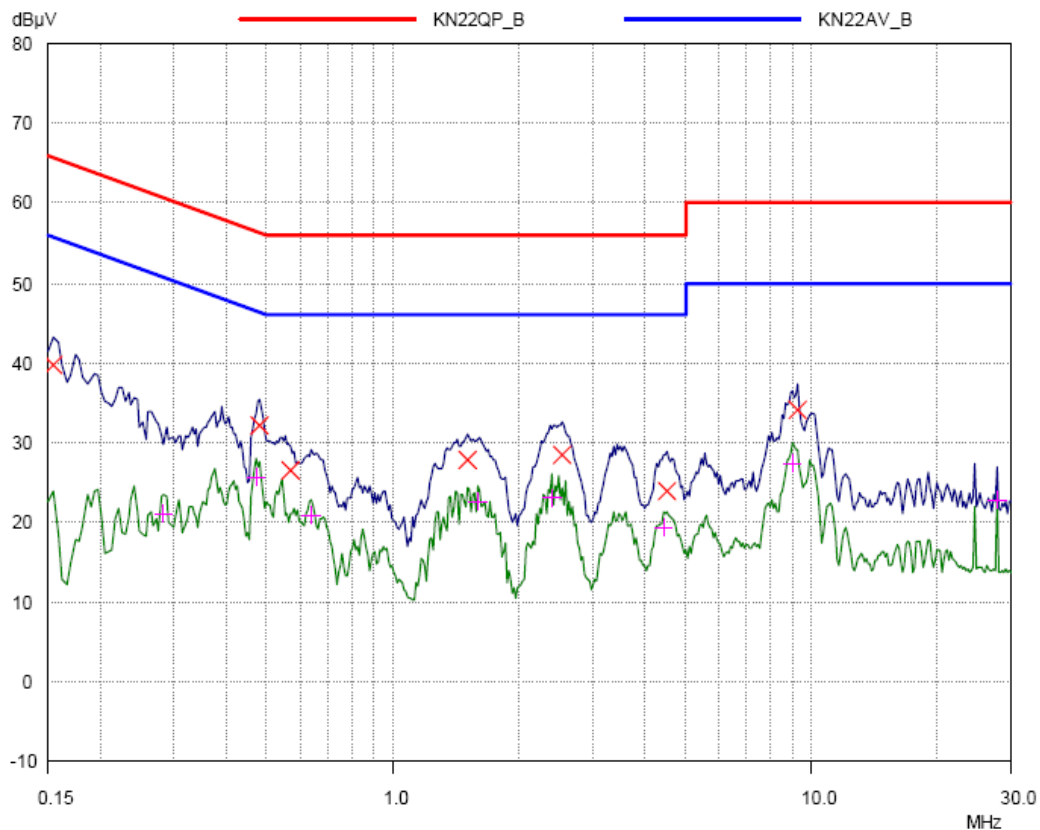
NEMKO KOREA (NK-11-R-298)

07 Dec 2011 20:00

Conducted Emissions

EUT: Wireless Audio Transceiver Module
Manuf: Samsung Electronics
Op Cond: a.c. 120 V, 60 Hz (TX mode)
Operator: Jinha. KO
Test Spec: FCC Part 15.207
Comment: MODEL : WISP-40A
LINE : Neutral

Scan Settings		(1 Range)			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_Z5_Neutral					
Final Measurement:		Detectors:	X QP / + AV						
		Meas Time:	1sec						
		Subranges:	8						
		Acc Margin:	30 dB						



TEST DATA

8.2 Radiated Emissions

FCC §15.209, RSS-210 A8.5

Frequency (MHz)	Reading (dB μ V/m)	Pol* (H/V)	Antenna Heights (cm)	Tumtable Angles (°)	AF+CL+Amp (dB)**	Result (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)
40.54	49.1	V	101	320	-17.0	32.1	40.0	7.9
159.74	46.1	V	114	244	-15.5	30.6	43.5	12.9
552.95	49.3	H	195	137	-8.9	40.4	46.0	5.6
638.97	49.3	H	162	145	-6.5	42.8	46.0	3.2
688.12	48.4	H	167	142	-6.5	41.9	46.0	4.1
712.70	43.3	H	161	144	-5.1	38.2	46.0	7.8

Radiated Measurements at 3meters

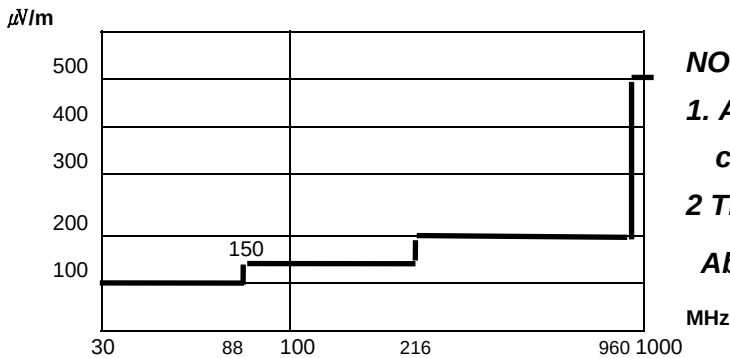


Fig. 4. Limits at 3 meters

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:

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

TEST DATA

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:

Ant A

Channel	Frequency(MHz)	Result(kHz)	Limit(kHz)	Margin(kHz)
Low	2405.35	1638	500	1138
Middle	2437.35	1636	500	1136
High	2477.35	1632	500	1132

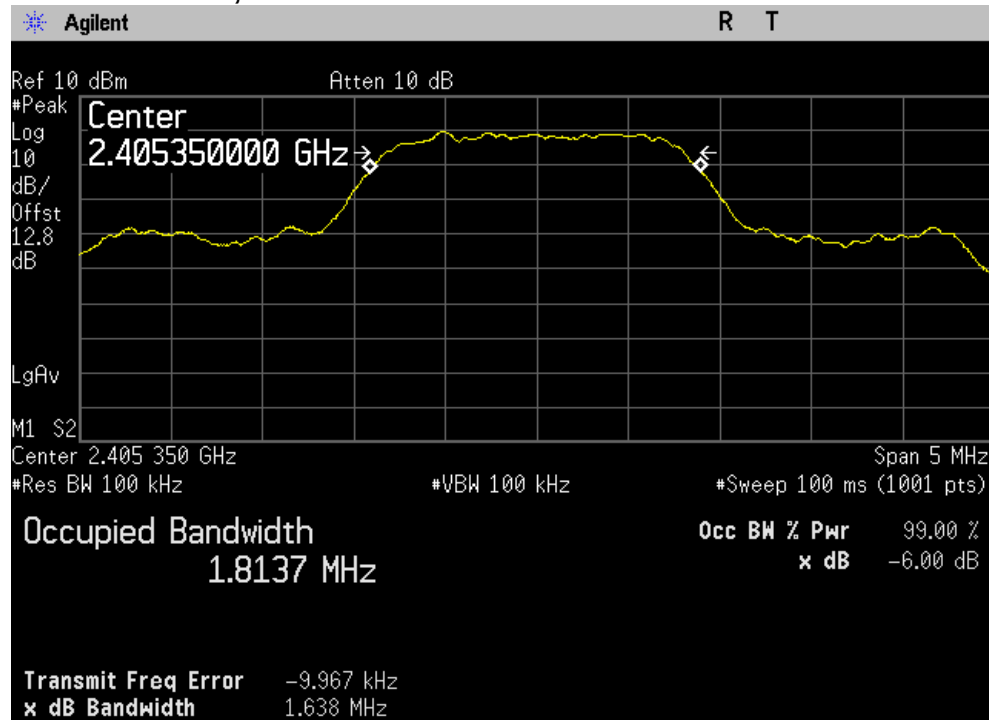
Ant B

Channel	Frequency(MHz)	Result(kHz)	Limit(kHz)	Margin(kHz)
Low	2405.35	1631	500	1131
Middle	2437.35	1635	500	1135
High	2477.35	1636	500	1136

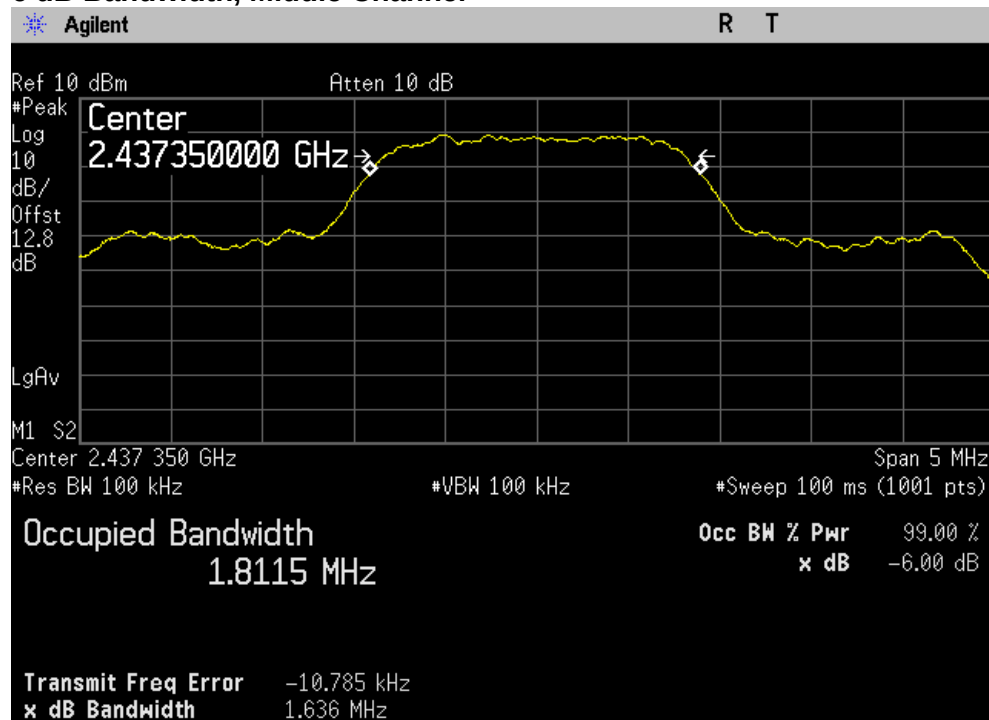
PLOTS OF EMISSIONS

Ant A

6 dB Bandwidth, Lowest Channel

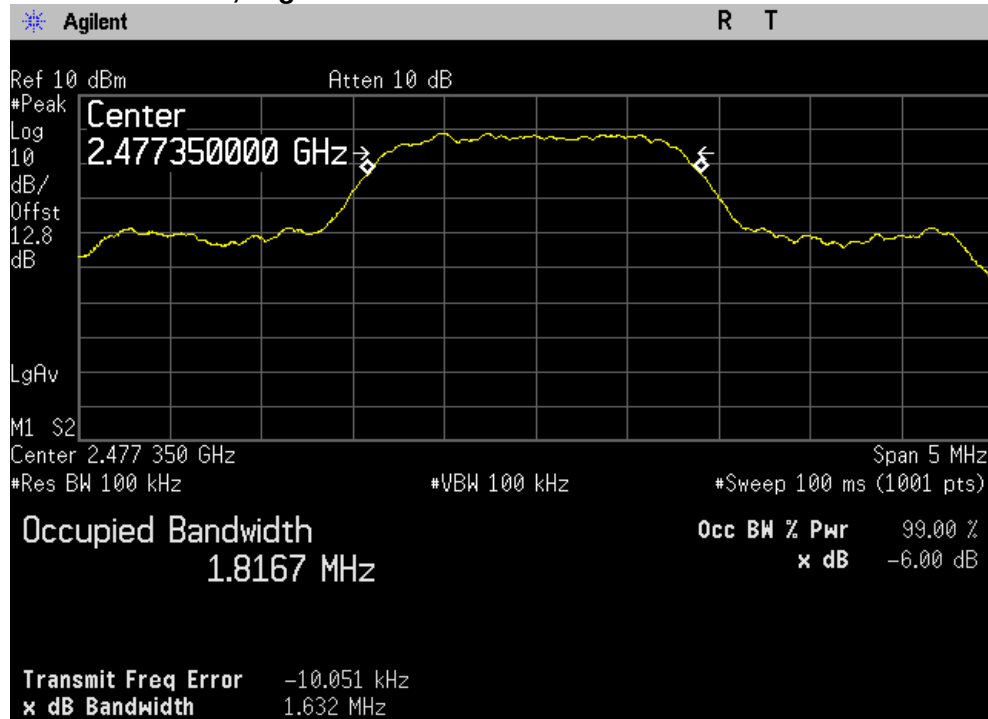


6 dB Bandwidth, Middle Channel



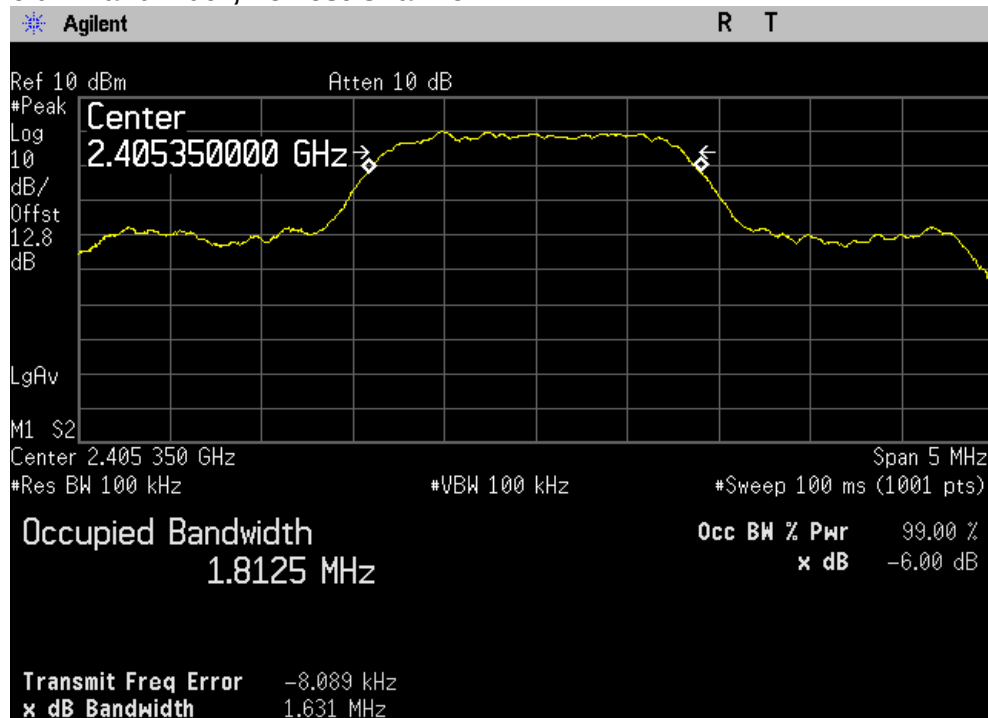
PLOTS OF EMISSIONS

6 dB Bandwidth, Highest Channel



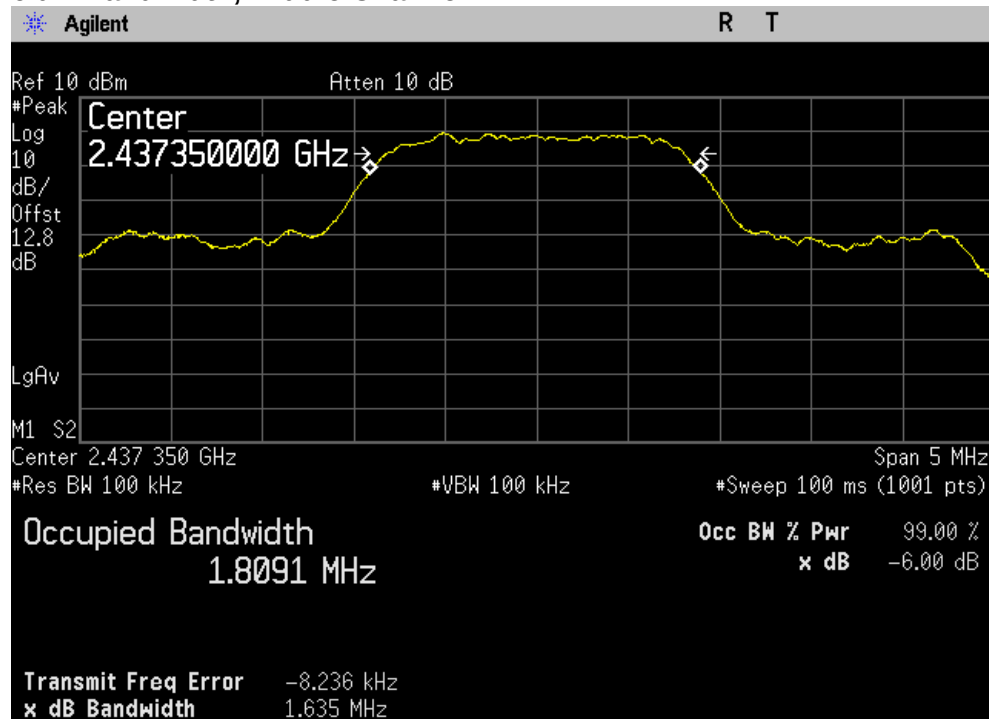
Ant B

6 dB Bandwidth, Lowest Channel

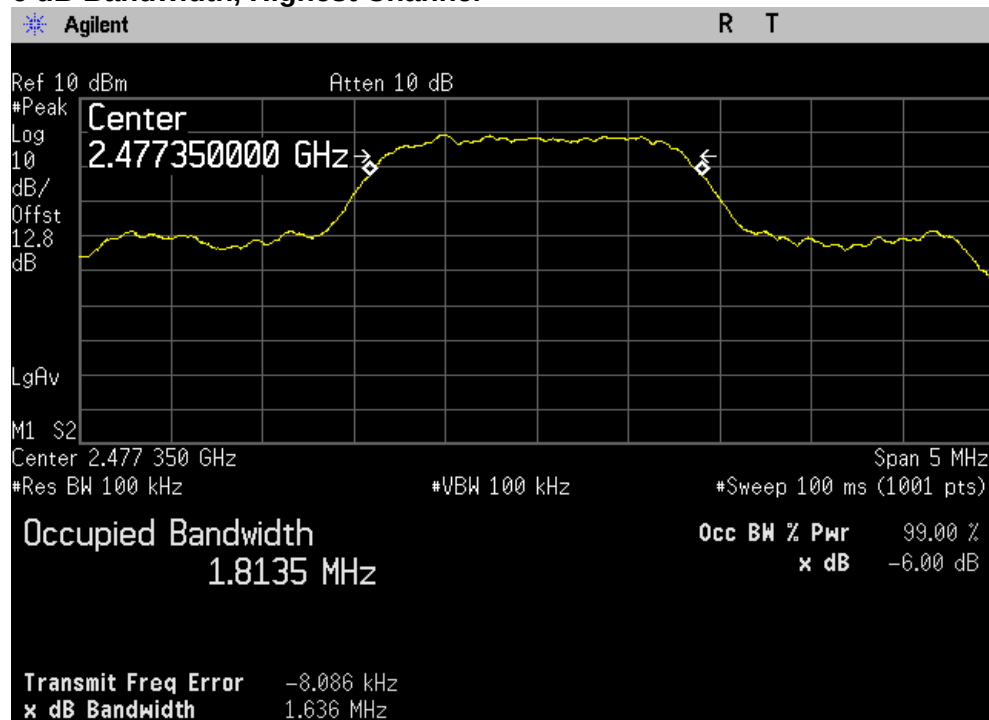


PLOTS OF EMISSIONS

6 dB Bandwidth, Middle Channel



6 dB Bandwidth, Highest Channel



TEST DATA

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:

Ant A

Channel	Frequency (MHz)	Peak Power (dBm)	Limit (dBm)	Margin (dB)
Low	2405.35	4.48	30.00	25.52
Middle	2437.35	4.29	30.00	25.71
High	2477.35	3.80	30.00	26.20

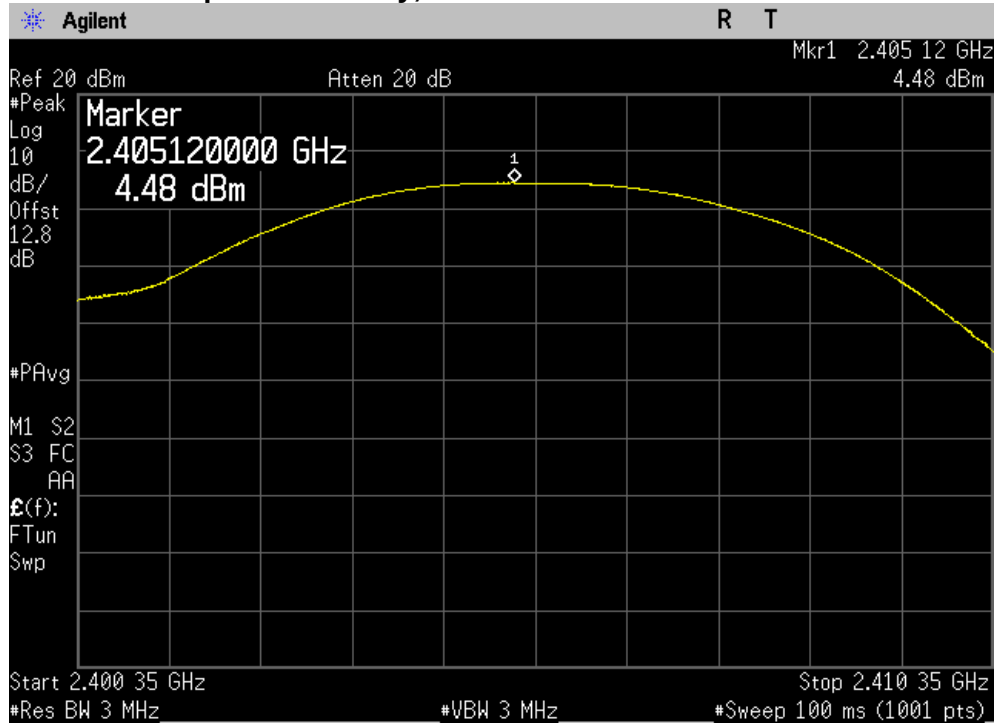
Ant B

Channel	Frequency (MHz)	Peak Power (dBm)	Limit (dBm)	Margin (dB)
Low	2405.35	4.88	30.00	25.12
Middle	2437.35	4.45	30.00	25.55
High	2477.35	4.15	30.00	25.85

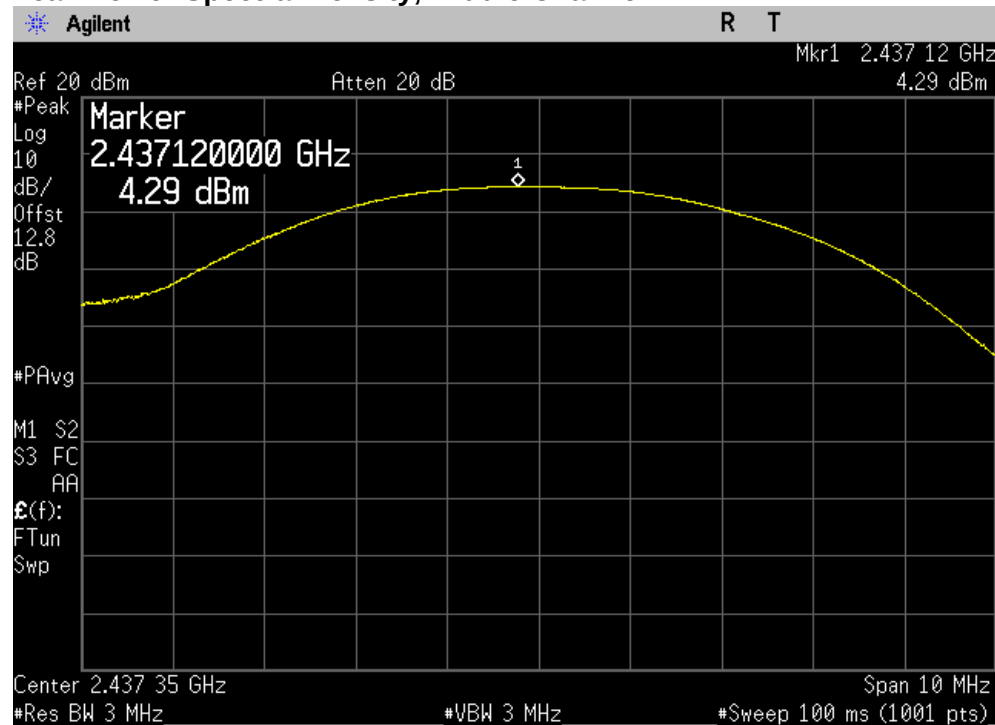
PLOT OF TEST DATA

Ant A

Peak Power Spectral Density, Lowest Channel

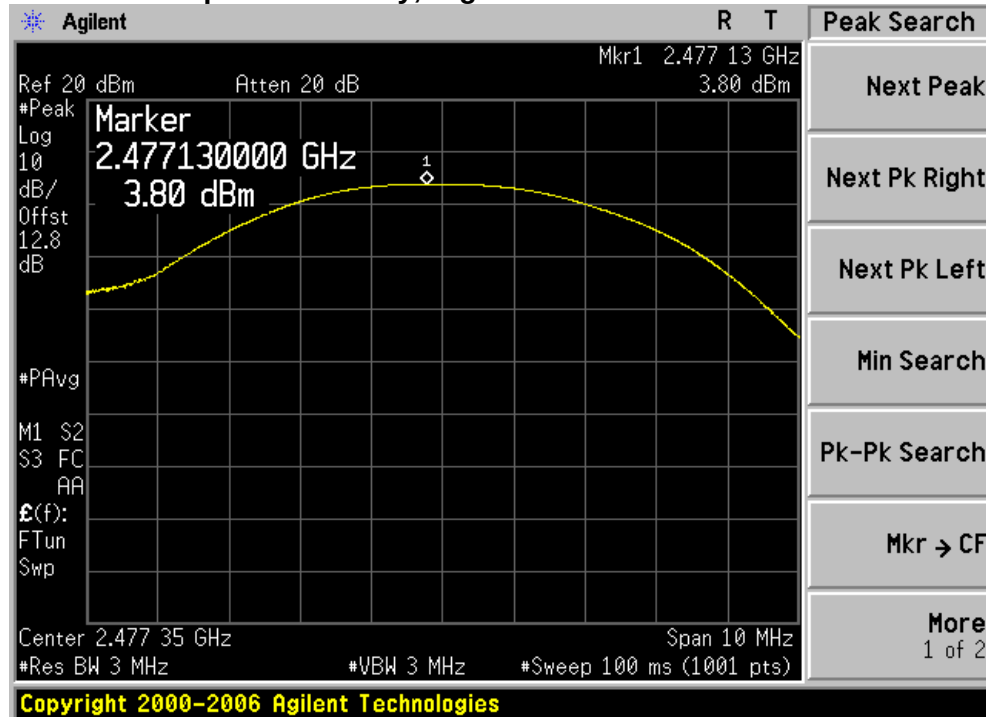


Peak Power Spectral Density, Middle Channel



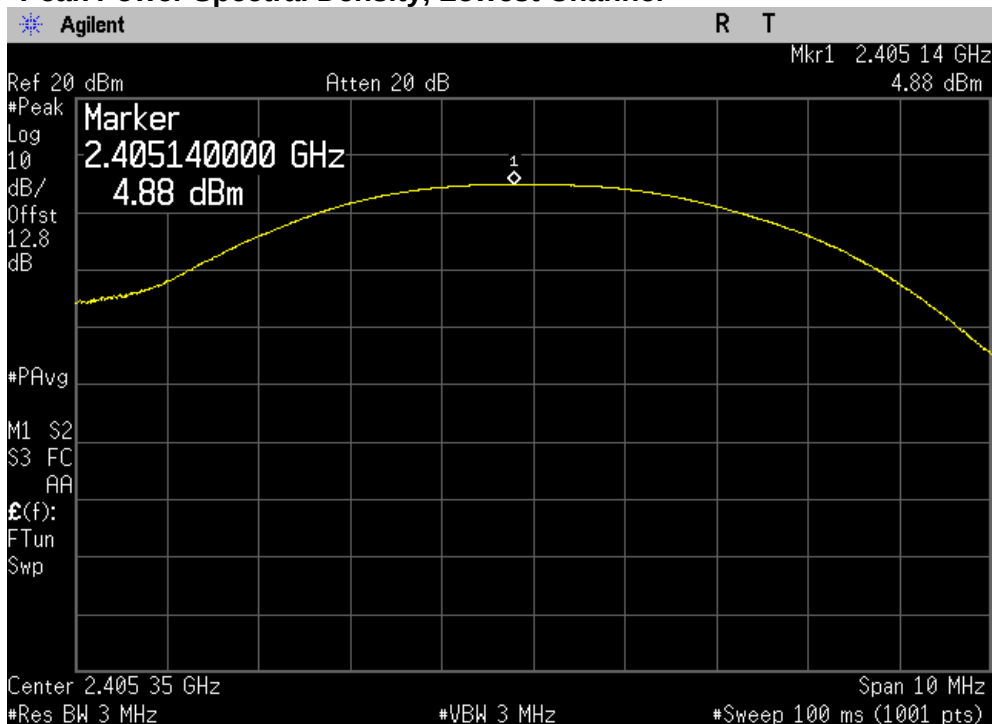
PLOT OF TEST DATA

Peak Power Spectral Density, Highest Channel



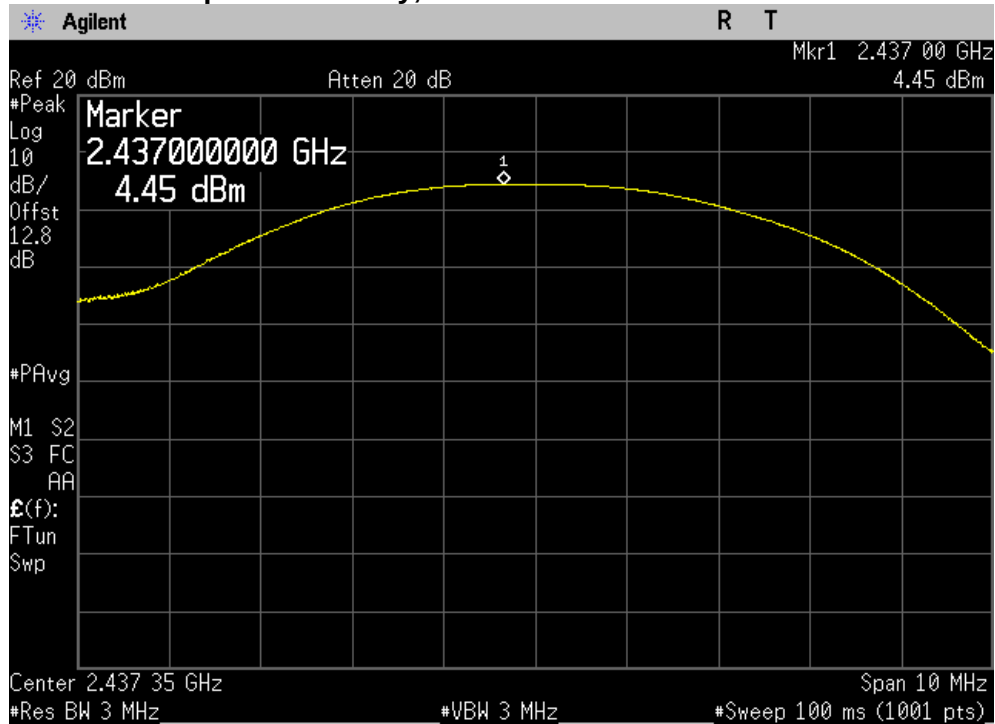
Ant B

Peak Power Spectral Density, Lowest Channel

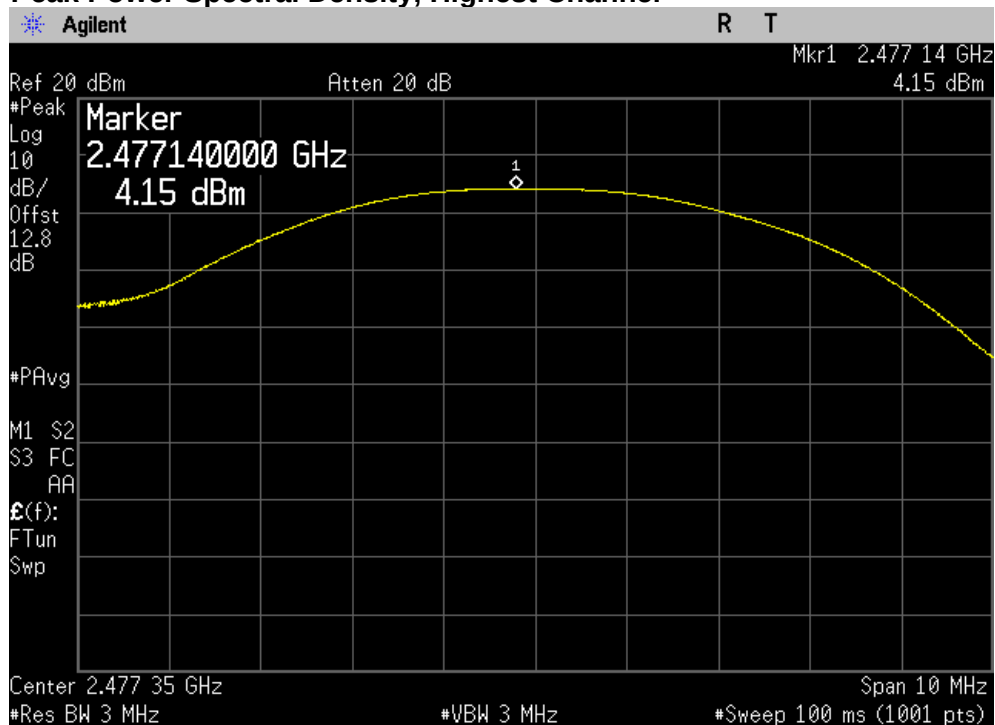


PLOT OF TEST DATA

Peak Power Spectral Density, Middle Channel



Peak Power Spectral Density, Highest Channel



TEST DATA

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:

Ant A

Channel	Frequency(MHz)	Result(dBm)	Limit(dBm)	Margin(dB)
Low	2405.35	-13.80	8	21.80
Middle	2437.35	-14.04	8	22.04
High	2477.35	-14.43	8	22.43

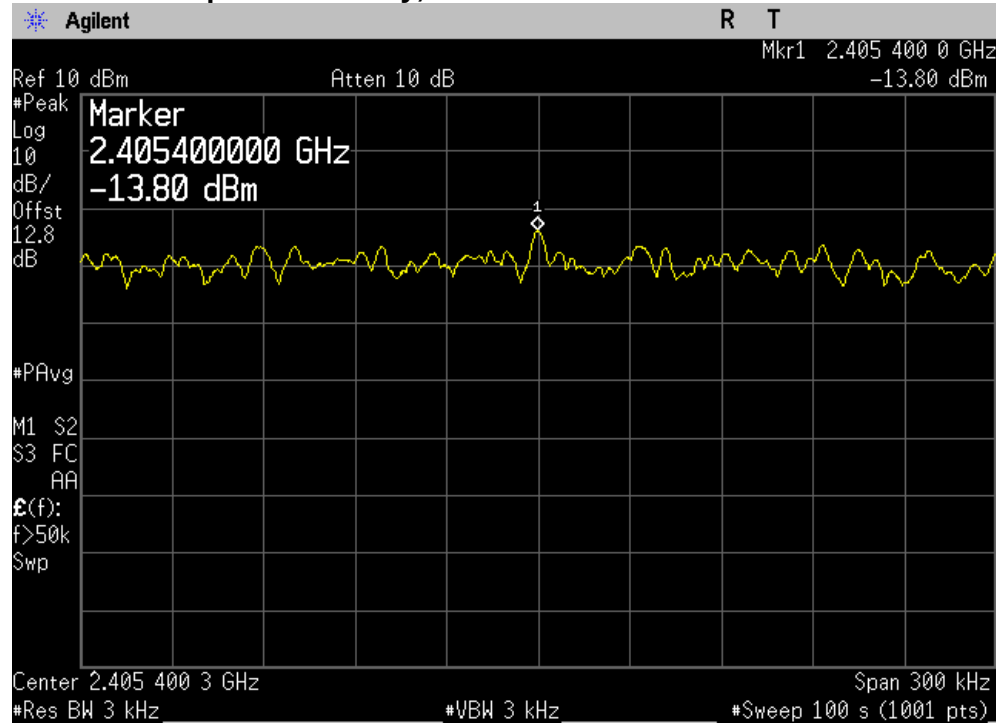
Ant B

Channel	Frequency(MHz)	Result(dBm)	Limit(dBm)	Margin(dB)
Low	2405.35	-13.35	8	21.35
Middle	2437.35	-13.81	8	21.81
High	2477.35	-14.09	8	22.09

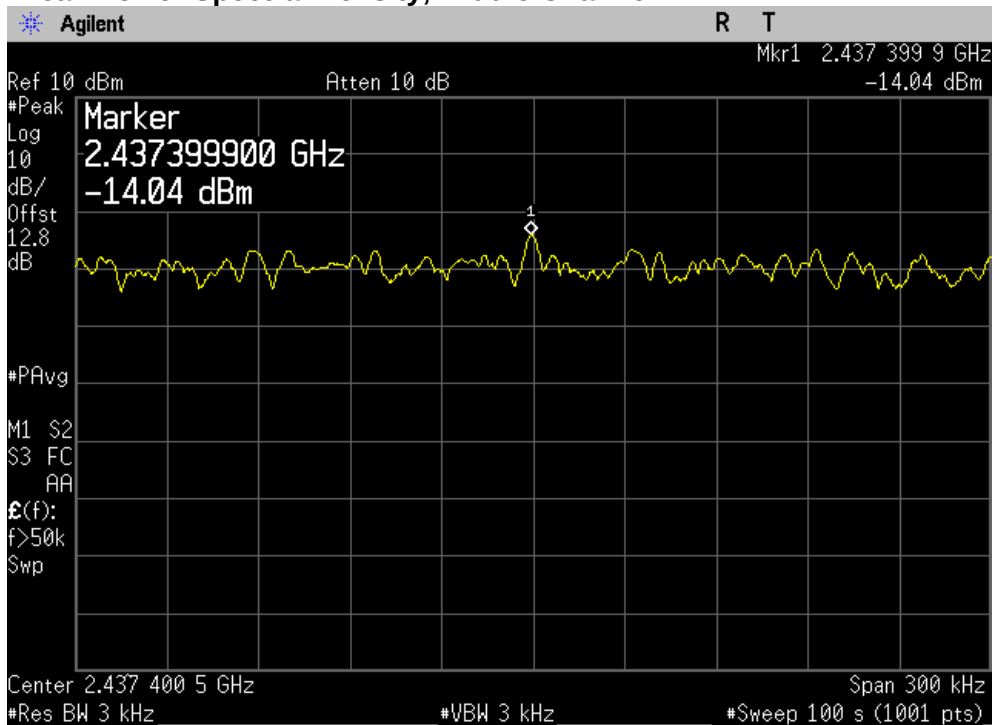
PLOT OF TEST DATA

Ant A

Peak Power Spectral Density, Lowest Channel

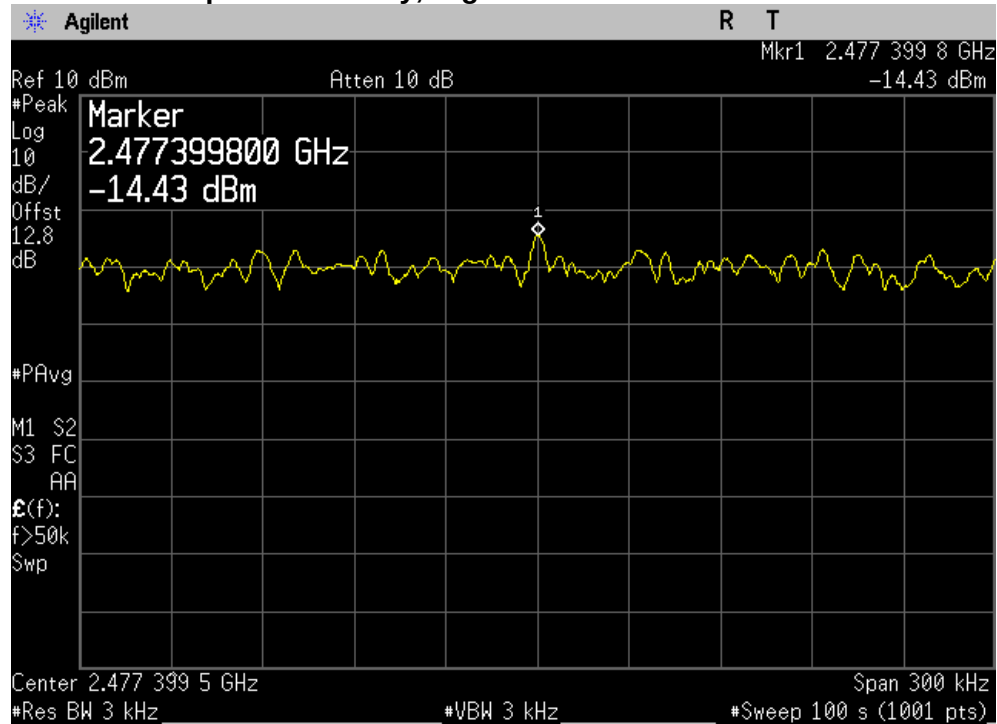


Peak Power Spectral Density, Middle Channel



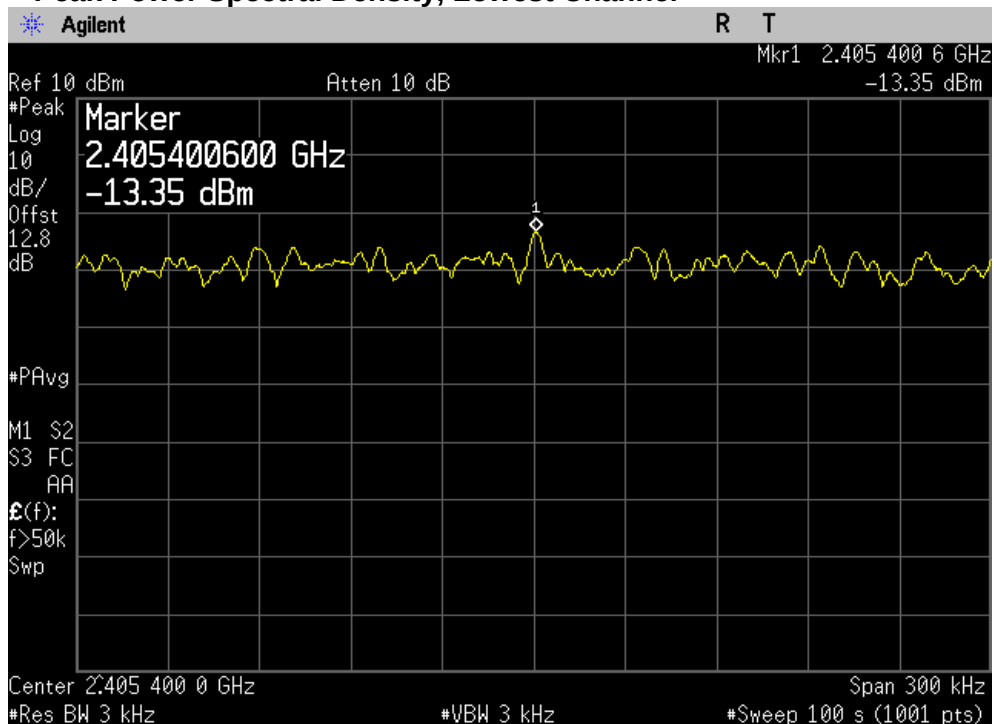
PLOT OF TEST DATA

Peak Power Spectral Density, Highest Channel



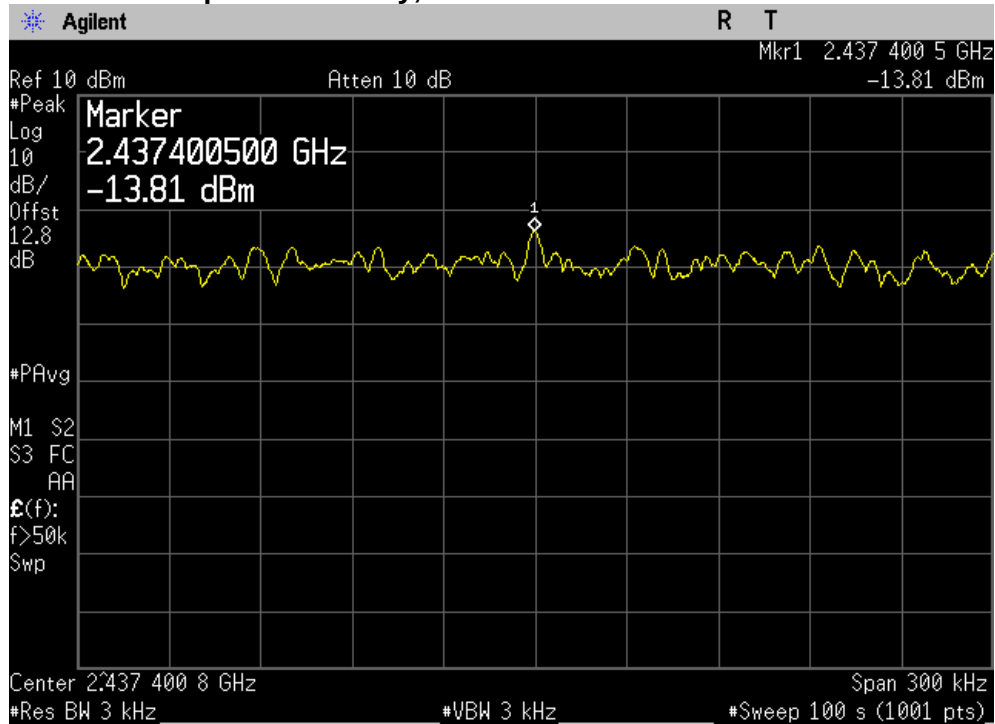
Ant B

Peak Power Spectral Density, Lowest Channel

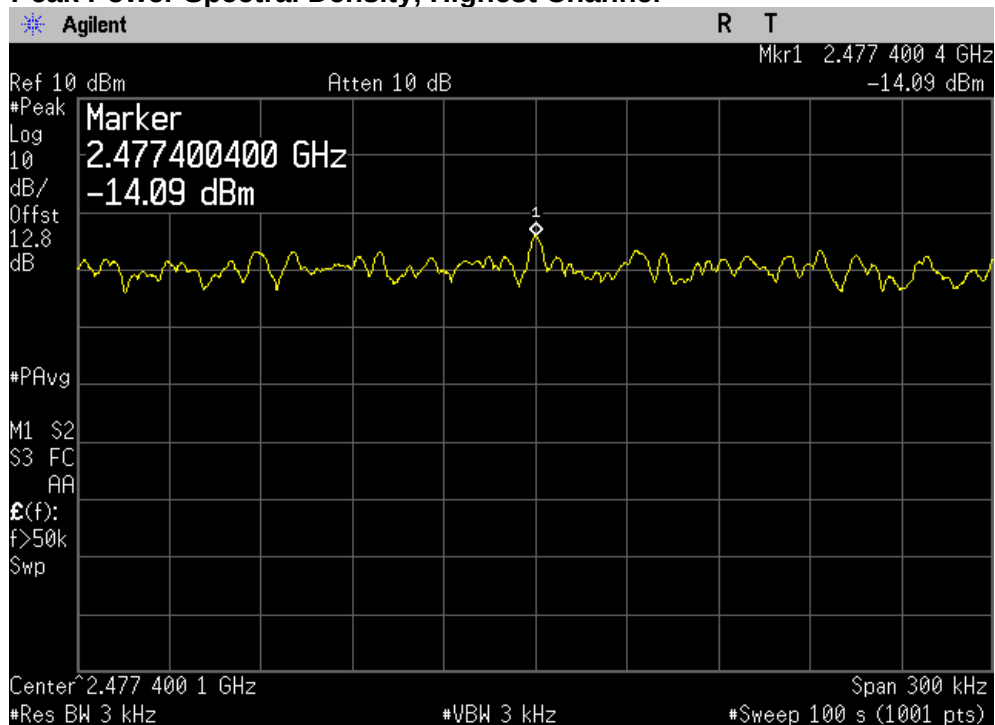


PLOT OF TEST DATA

Peak Power Spectral Density, Middle Channel



Peak Power Spectral Density, Highest Channel



TEST DATA

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:

Ant A

Channel	Frequency(MHz)	Result(dBc)	Limit(dBc)
Low	2405.35	More than 20 dBc	20
Middle	2437.35	More than 20 dBc	20
High	2477.35	More than 20 dBc	20

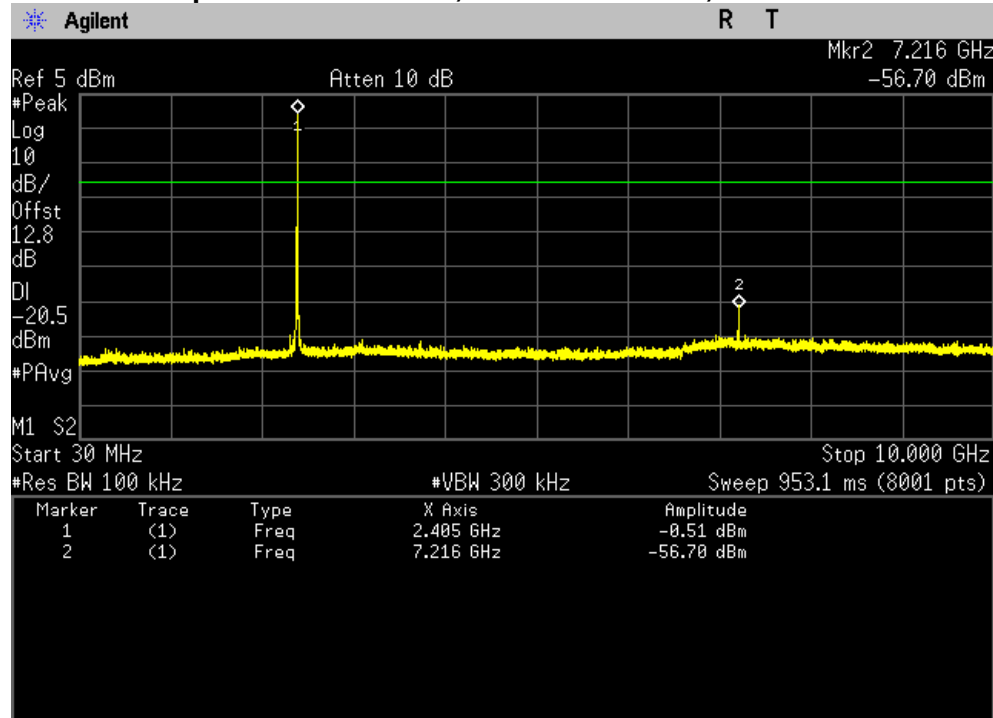
Ant B

Channel	Frequency(MHz)	Result(dBc)	Limit(dBc)
Low	2405.35	More than 20 dBc	20
Middle	2437.35	More than 20 dBc	20
High	2477.35	More than 20 dBc	20

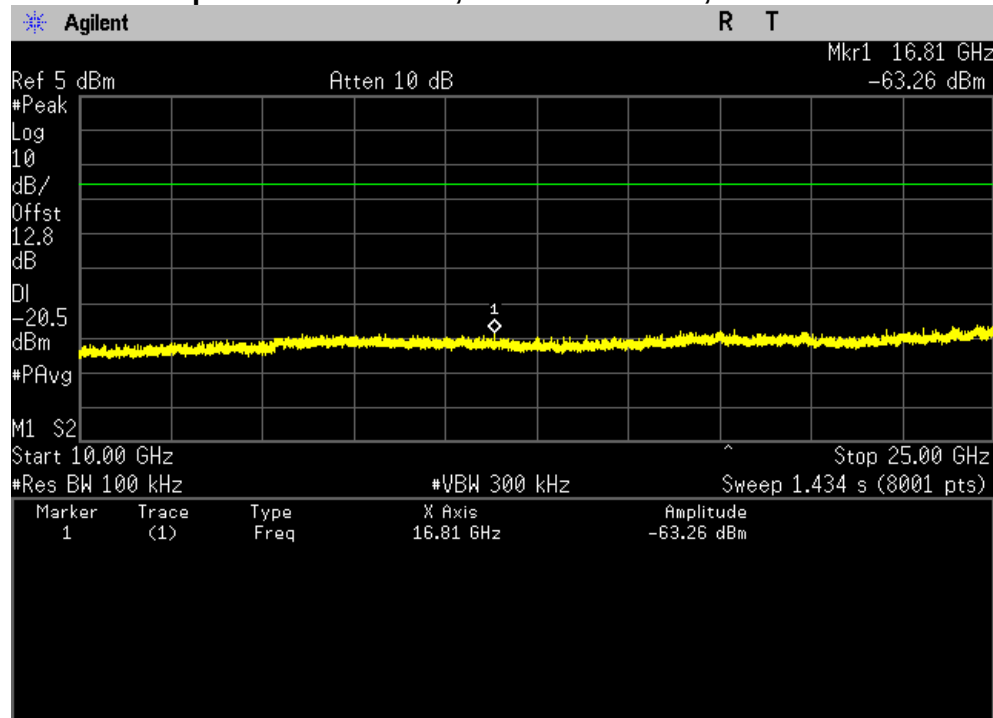
PLOT OF TEST DATA

Ant A

Conducted Spurious Emissions, 30 MHz ~ 10 GHz, Lowest Channel

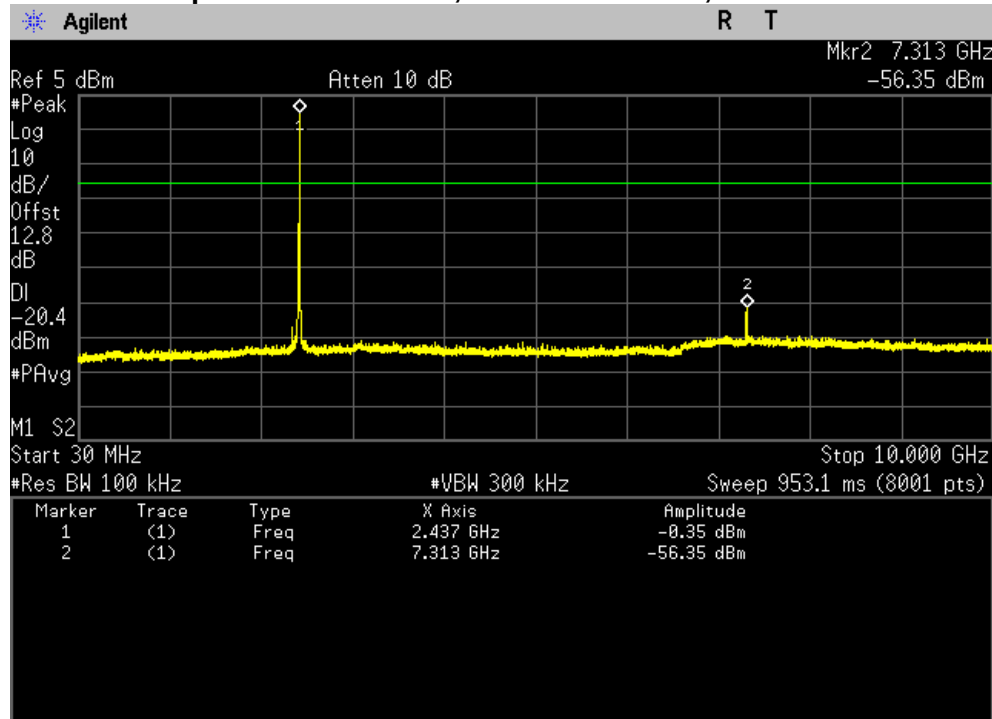


Conducted Spurious Emissions, 10 GHz ~ 25 GHz, Lowest Channel

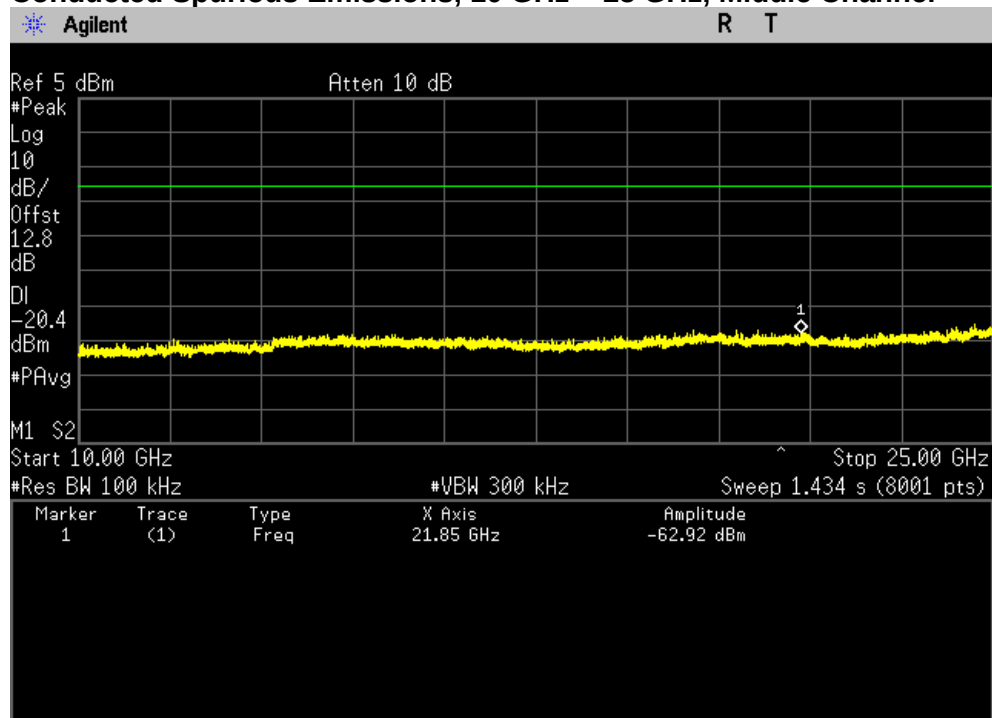


PLOT OF TEST DATA

Conducted Spurious Emissions, 30 MHz ~ 10 GHz, Middle Channel

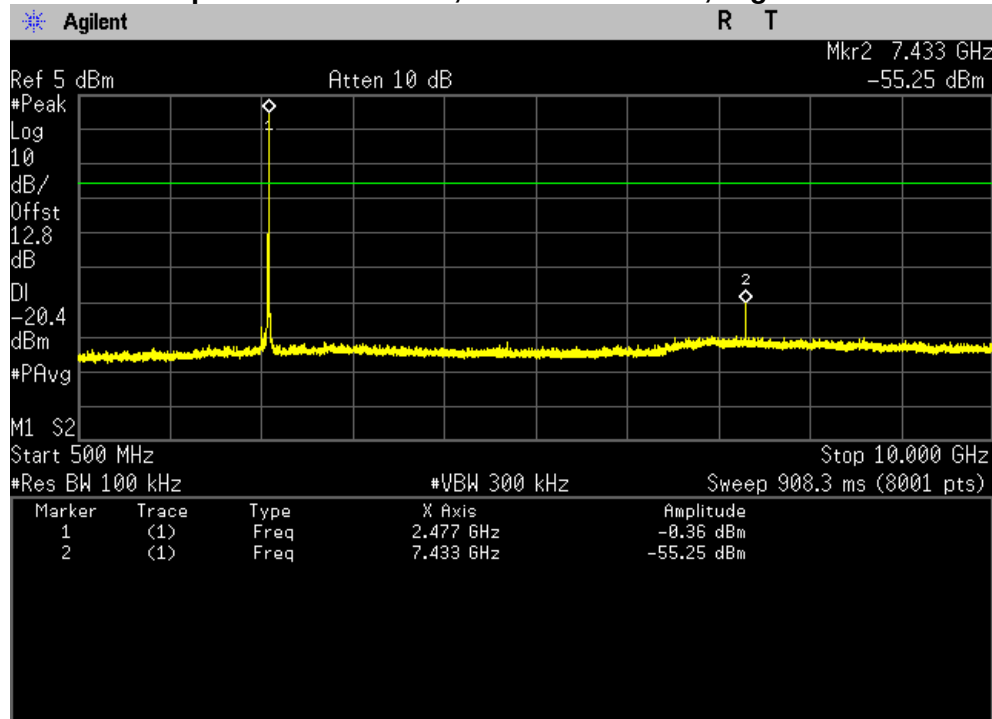


Conducted Spurious Emissions, 10 GHz ~ 25 GHz, Middle Channel

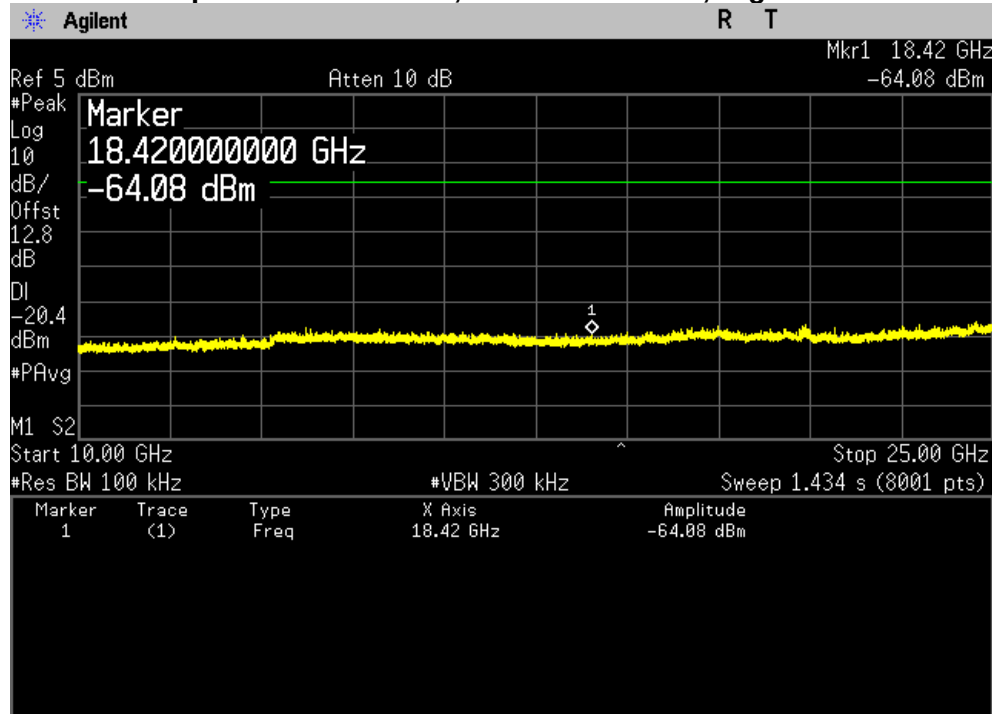


PLOT OF TEST DATA

Conducted Spurious Emissions, 30 MHz ~ 10 GHz, Highest Channel



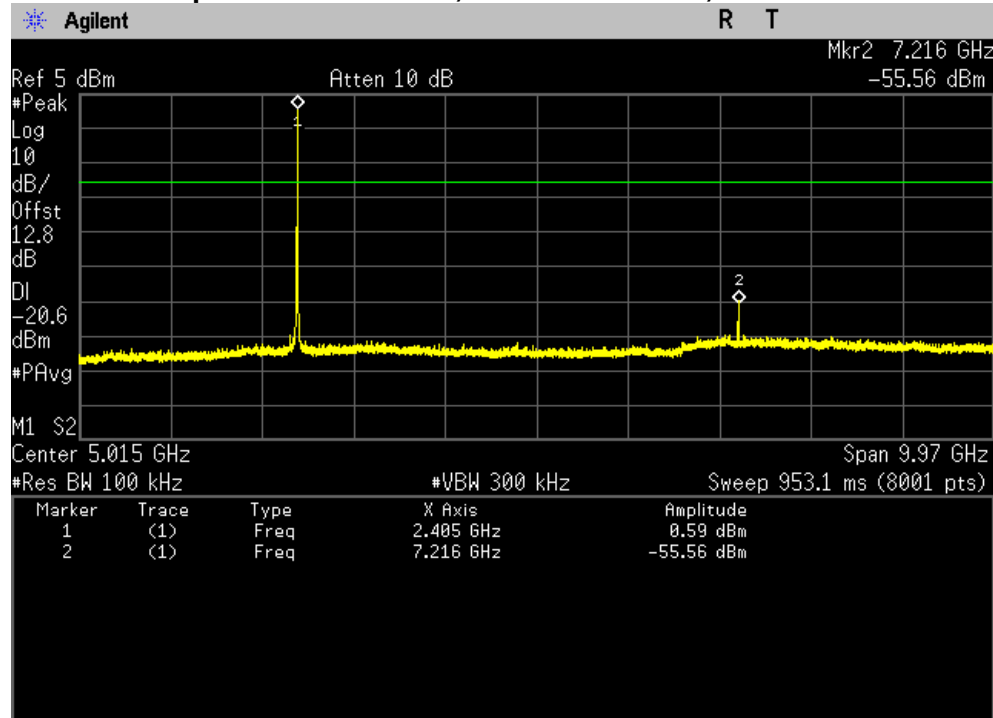
Conducted Spurious Emissions, 10 GHz ~ 25 GHz, Highest Channel



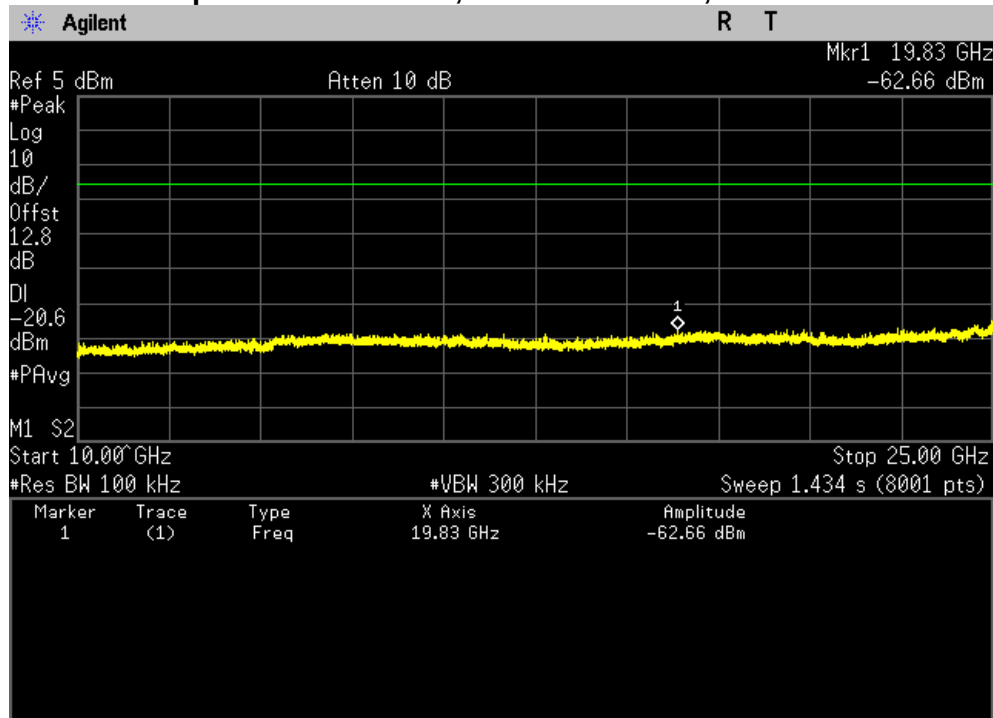
PLOT OF TEST DATA

Ant B

Conducted Spurious Emissions, 30 MHz ~ 10 GHz, Lowest Channel

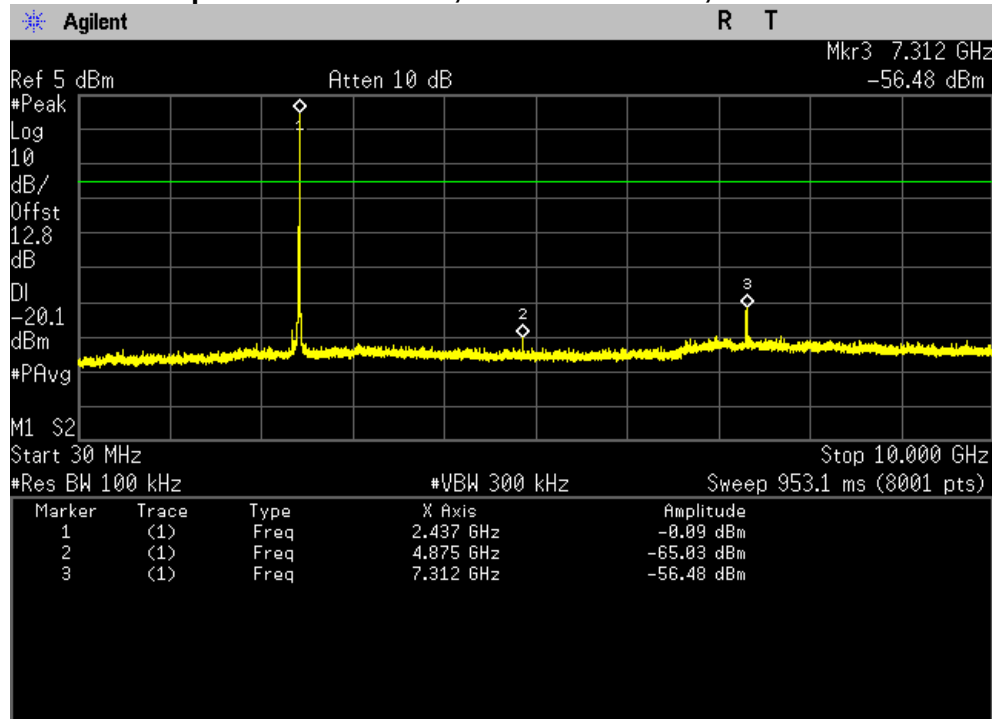


Conducted Spurious Emissions, 10 GHz ~ 25 GHz, Lowest Channel

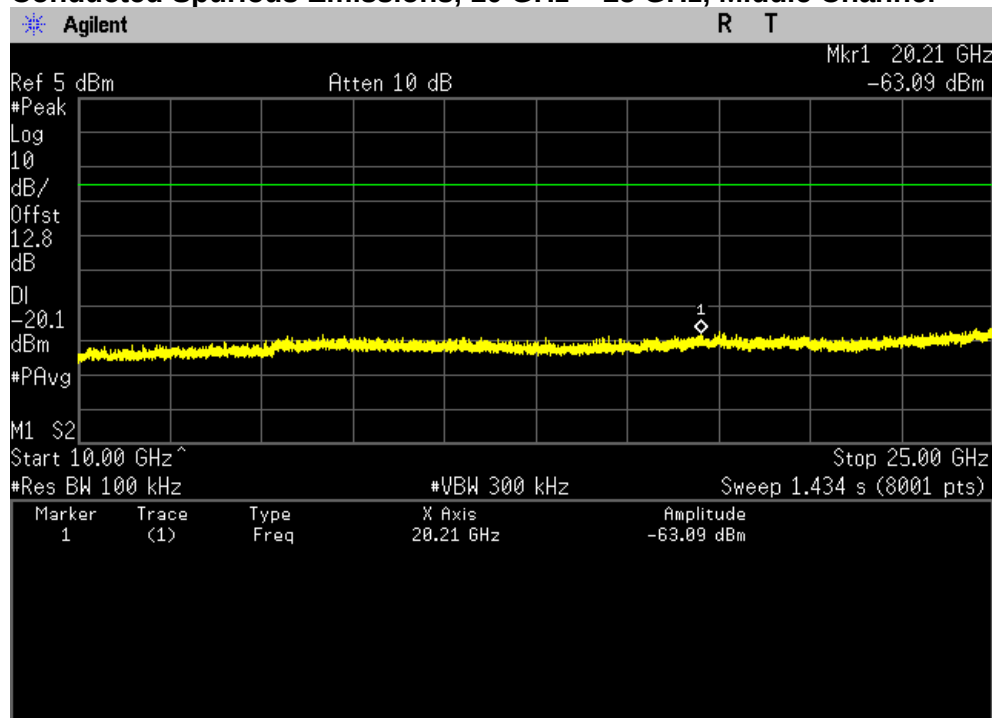


PLOT OF TEST DATA

Conducted Spurious Emissions, 30 MHz ~ 10 GHz, Middle Channel

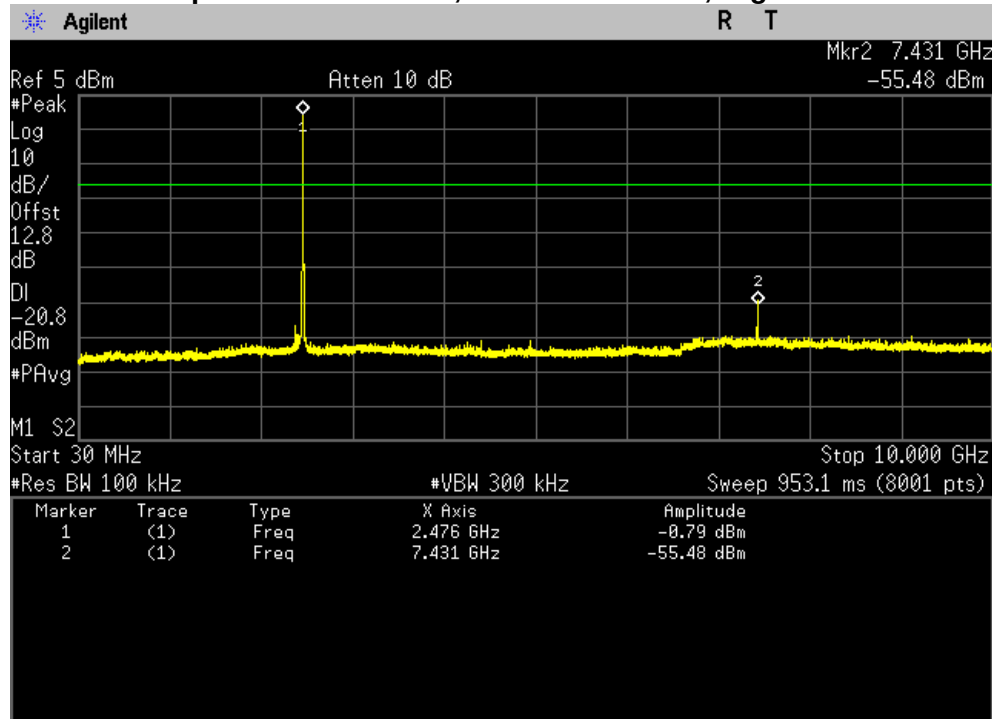


Conducted Spurious Emissions, 10 GHz ~ 25 GHz, Middle Channel

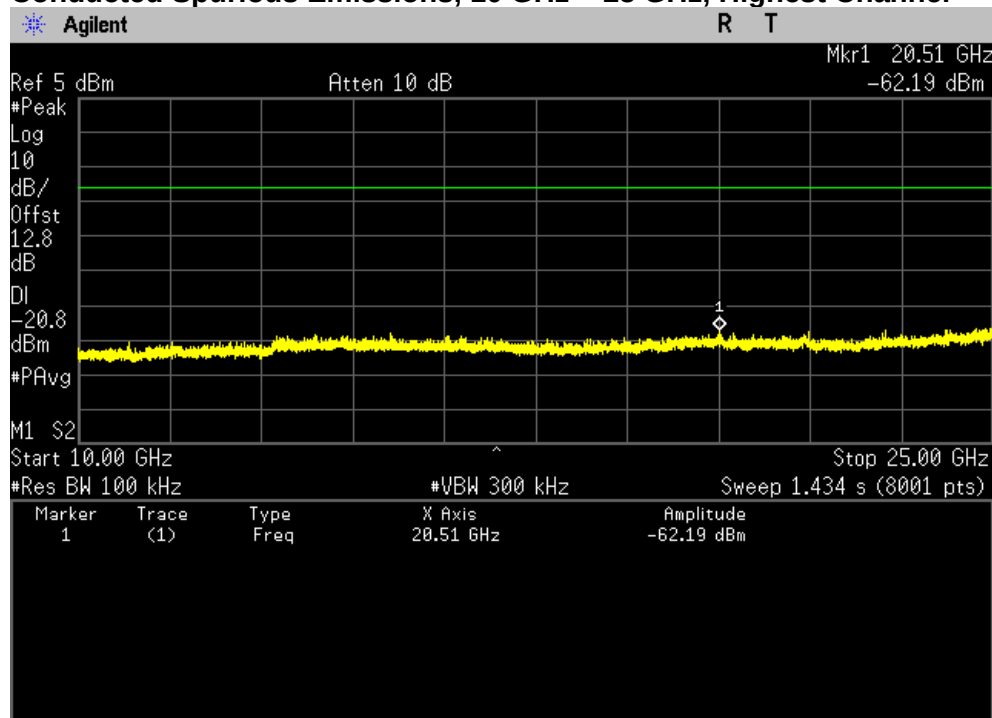


PLOT OF TEST DATA

Conducted Spurious Emissions, 30 MHz ~ 10 GHz, Highest Channel



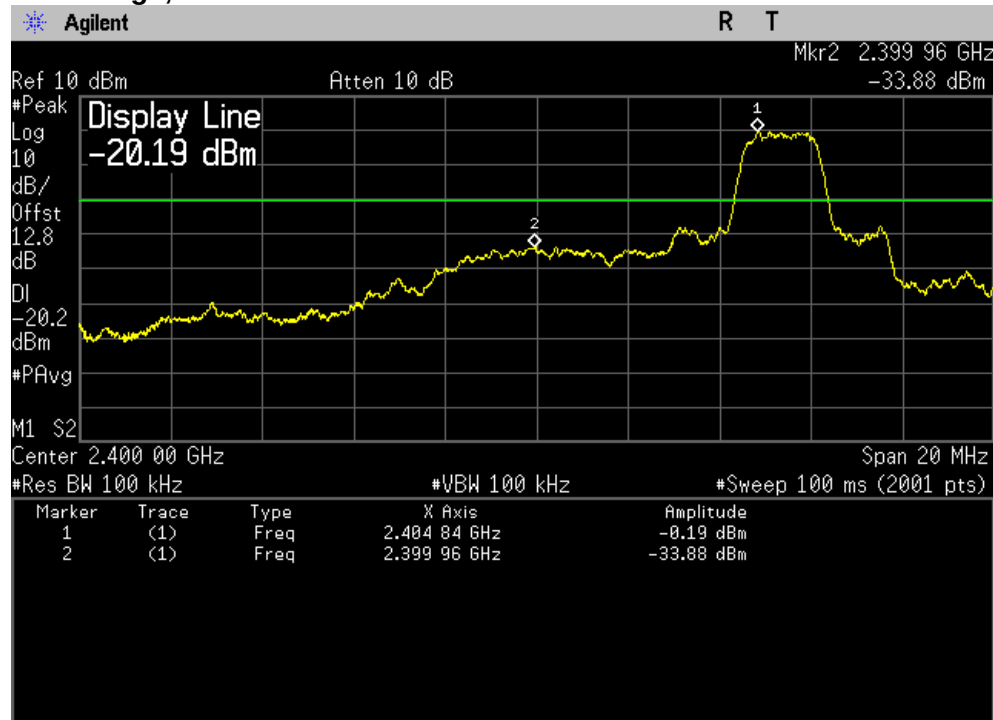
Conducted Spurious Emissions, 10 GHz ~ 25 GHz, Highest Channel



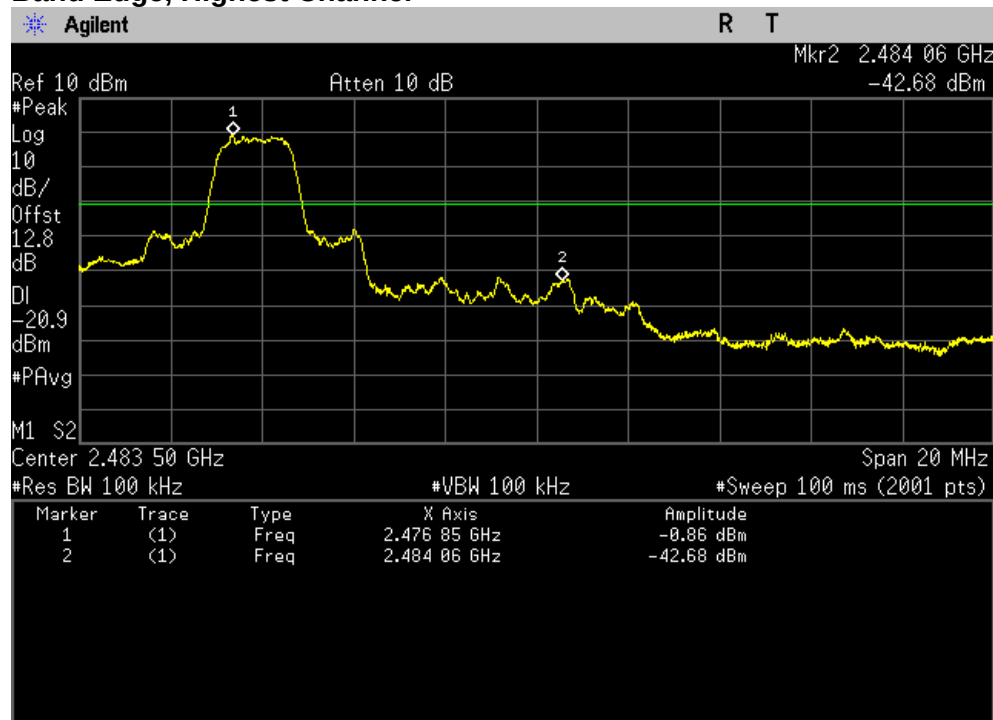
PLOT OF TEST DATA

Ant A

Band Edge, Lowest Channel



Band Edge, Highest Channel



PLOT OF TEST DATA

Ant B

Band Edge, Lowest Channel



Band Edge, Highest Channel



TEST DATA

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:

Ant A

Lowest Channel

Frequency (G H z)	Reading (d B μ V)	Pol* (H/V)	m o d e	A F+ C L+ A m p (d B)**	R e s u l t (d B μ V /m)	L i m i t (d B μ V /m)	M a r g i n (d B)
1.441	45.3	H	peak	-4.7	40.6	74.0	33.4
1.441	34.9	H	average	-4.7	30.2	54.0	23.8
1.498	47.9	V	peak	-4.6	43.3	74.0	30.7
1.498	36.4	V	average	-4.6	31.8	54.0	22.2
1.596	46.1	V	peak	-4.3	41.8	74.0	32.2
1.596	34.9	V	average	-4.3	30.6	54.0	23.4
2.246	47.2	V	peak	-2.4	44.8	74.0	29.2
2.246	35.3	V	average	-2.4	32.9	54.0	21.1
4.811	40.9	V	peak	9.2	50.1	74.0	23.9
4.811	32.1	V	average	9.2	41.3	54.0	12.7

TEST DATA

Middle Channel

Frequency (G Hz)	Reading (dB μ N)	Pol* (H/V)	m o d e	AF+ CL+ Am p (dB)**	Result (dB μ N /m)	Lim it (dB μ N /m)	Marg in (dB)
1.328	46.9	H	peak	-5.0	41.9	74.0	32.1
1.328	34.8	H	average	-5.0	29.8	54.0	24.2
1.497	47.2	H	peak	-4.6	42.6	74.0	31.4
1.497	36.0	H	average	-4.6	31.4	54.0	22.6
1.595	46.5	V	peak	-4.3	42.2	74.0	31.8
1.595	34.7	V	average	-4.3	30.4	54.0	23.6
2.246	46.6	V	peak	-2.4	44.2	74.0	29.8
2.246	34.7	V	average	-2.4	32.3	54.0	21.7
4.875	41.8	V	peak	9.5	51.3	74.0	22.7
4.875	32.3	V	average	9.5	41.8	54.0	12.2

Highest Channel

Frequency (G Hz)	Reading (dB μ N)	Pol* (H/V)	m o d e	AF+ CL+ Am p (dB)**	Result (dB μ N /m)	Lim it (dB μ N /m)	Marg in (dB)
1.497	47.0	H	peak	-4.6	42.4	74.0	31.6
1.497	36.0	H	average	-4.6	31.4	54.0	22.6
1.594	46.8	V	peak	-4.3	42.5	74.0	31.5
1.594	34.7	V	average	-4.3	30.4	54.0	23.6
2.245	46.9	V	peak	-2.4	44.5	74.0	29.5
2.245	34.8	V	average	-2.4	32.4	54.0	21.6
4.955	40.4	V	peak	9.6	50.0	74.0	24.0
4.955	32.8	V	average	9.6	42.4	54.0	11.6
7.432	40.5	V	peak	16.3	56.8	74.0	17.2
7.432	29.6	V	average	16.3	45.9	54.0	8.1

TEST DATA

Ant B

Lowest Channel

Frequency (G Hz)	Reading (dB μ V)	Pol* (H/V)	m mode	AF+CL+ Amp (dB)**	Result (dB μ V/m)	Lim it (dB μ V/m)	Margin (dB)
1.329	45.2	H	peak	-5.0	40.2	74.0	33.8
1.329	34.9	H	average	-5.0	29.9	54.0	24.1
1.440	45.7	H	peak	-4.7	41.0	74.0	33.0
1.440	34.6	H	average	-4.7	29.9	54.0	24.1
1.497	46.9	H	peak	-4.6	42.3	74.0	31.7
1.497	35.8	H	average	-4.6	31.2	54.0	22.8
2.245	47.4	V	peak	-2.4	45.0	74.0	29.0
2.245	35.1	V	average	-2.4	32.7	54.0	21.3
4.811	39.9	V	peak	9.2	49.1	74.0	24.9
4.811	31.6	V	average	9.2	40.8	54.0	13.2

Middle Channel

Frequency (G Hz)	Reading (dB μ V)	Pol* (H/V)	m mode	AF+CL+ Amp (dB)**	Result (dB μ V/m)	Lim it (dB μ V/m)	Margin (dB)
1.331	45.4	H	peak	-5.0	40.4	74.0	33.6
1.331	34.8	H	average	-5.0	29.8	54.0	24.2
1.498	46.8	H	peak	-4.6	42.2	74.0	31.8
1.498	36.1	H	average	-4.6	31.5	54.0	22.5
1.594	46.3	V	peak	-4.3	42.0	74.0	32.0
1.594	34.7	V	average	-4.3	30.4	54.0	23.6
2.243	47.1	V	peak	-2.5	44.6	74.0	29.4
2.243	35.1	V	average	-2.5	32.6	54.0	21.4
4.875	41.1	V	peak	9.5	50.6	74.0	23.4
4.875	31.5	V	average	9.5	41.0	54.0	13.0

TEST DATA

Highest Channel

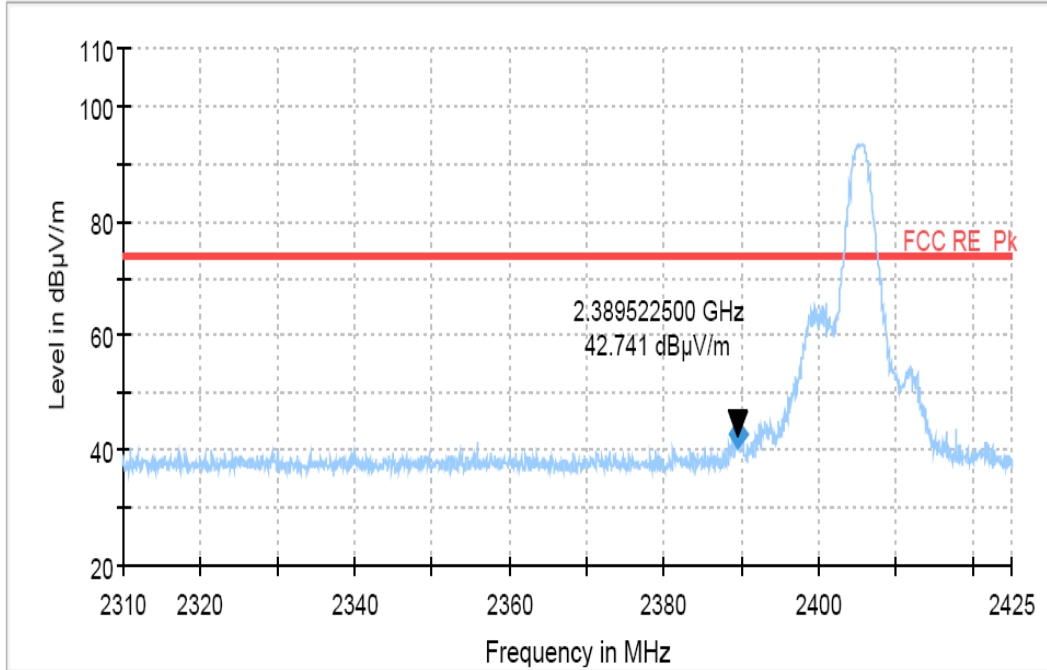
Frequency (G Hz)	Reading (dB μ N)	Pol* (H/V)	m o d e	A F+ C L+ A m p (dB)**	Result (dB μ N /m)	Lim it (dB μ N /m)	Marg in (dB)
1.497	47.6	H	peak	-4.6	43.0	74.0	31.0
1.497	36.0	H	average	-4.6	31.4	54.0	22.6
1.594	46.4	V	peak	-4.3	42.1	74.0	31.9
1.594	34.6	V	average	-4.3	30.3	54.0	23.7
2.244	47.3	V	peak	-2.5	44.8	74.0	29.2
2.244	35.2	V	average	-2.5	32.7	54.0	21.3
4.955	39.4	V	peak	9.6	49.0	74.0	25.0
4.955	31.8	V	average	9.6	41.4	54.0	12.6
7.432	40.4	H	peak	16.3	56.7	74.0	17.3
7.432	29.1	H	average	16.3	45.4	54.0	8.6

Note:

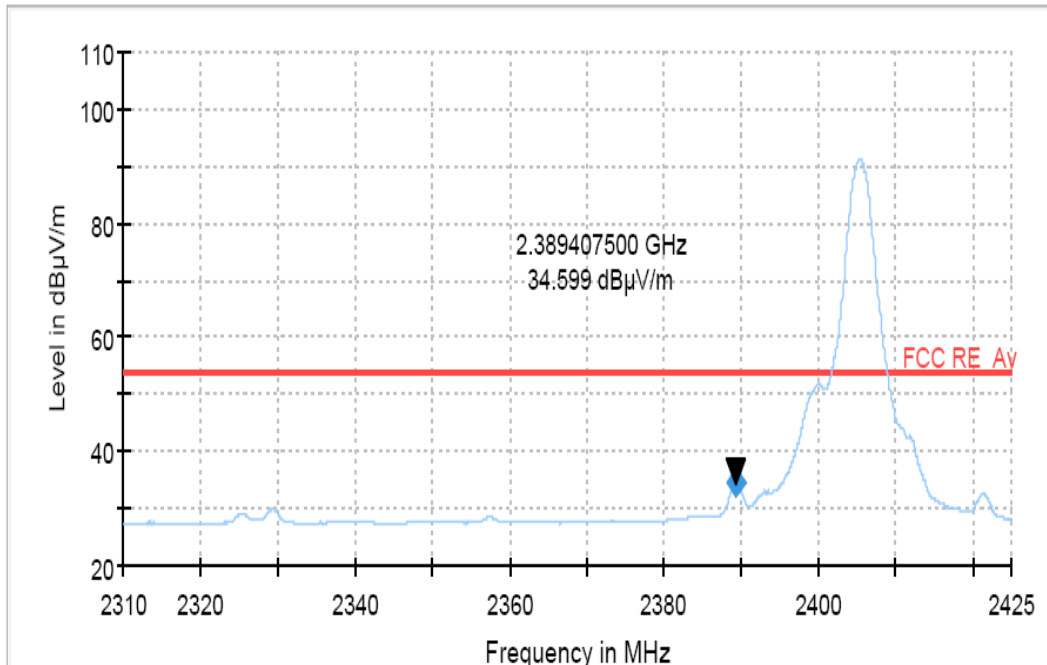
- *Pol.** H = Horizontal V = Vertical
- **AF + CL + Amp.** = Antenna Factor + Cable Loss + Amplifier.
- Other spurious** are under 20 dB below Fundamental.
- The radiated emissions testing were made by rotating through three orthogonal axes.
The worst date was recorded.
- For measurements the resolution 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 Peak (Ant A)

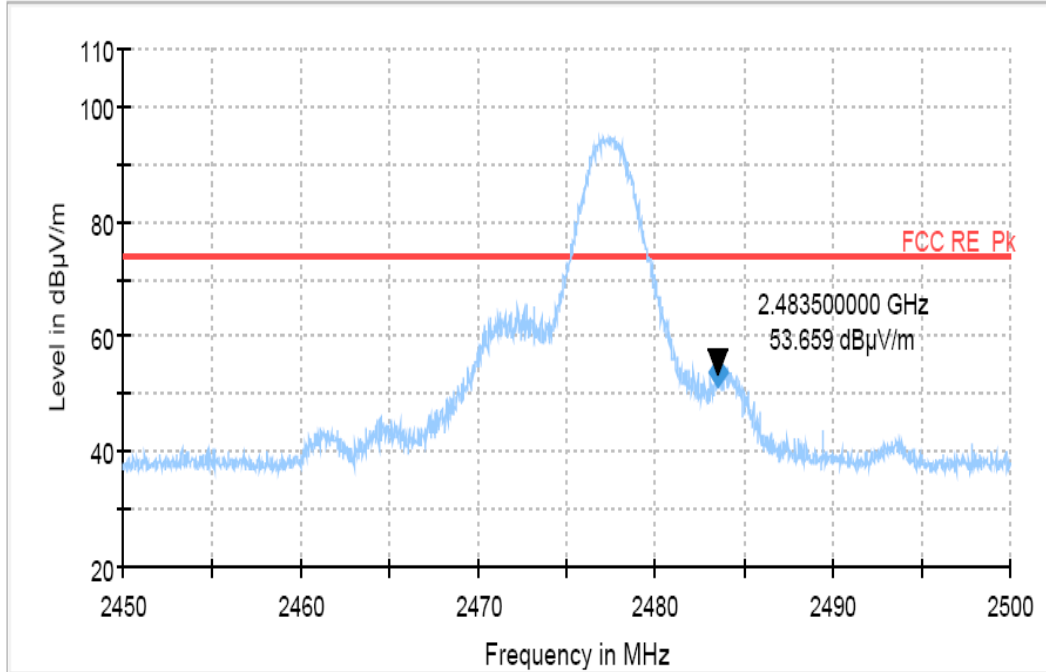


Restricted Band Spurious Emissions, Lowest channel Average (Ant A)

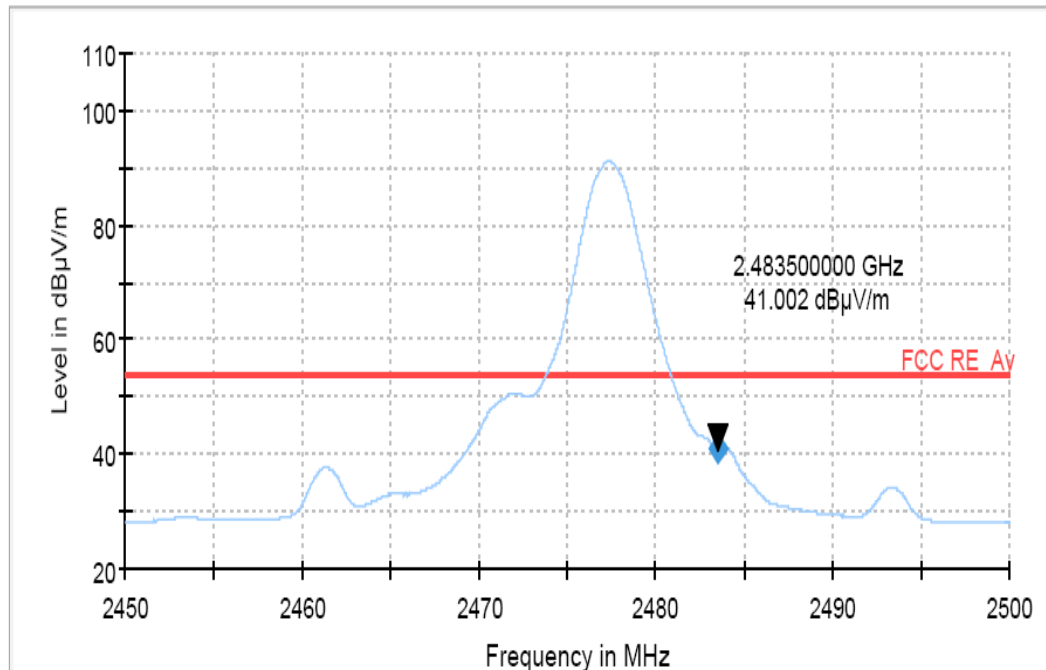


PLOT OF TEST DATA

Restricted Band Spurious Emissions, Highest channel Peak (Ant A)

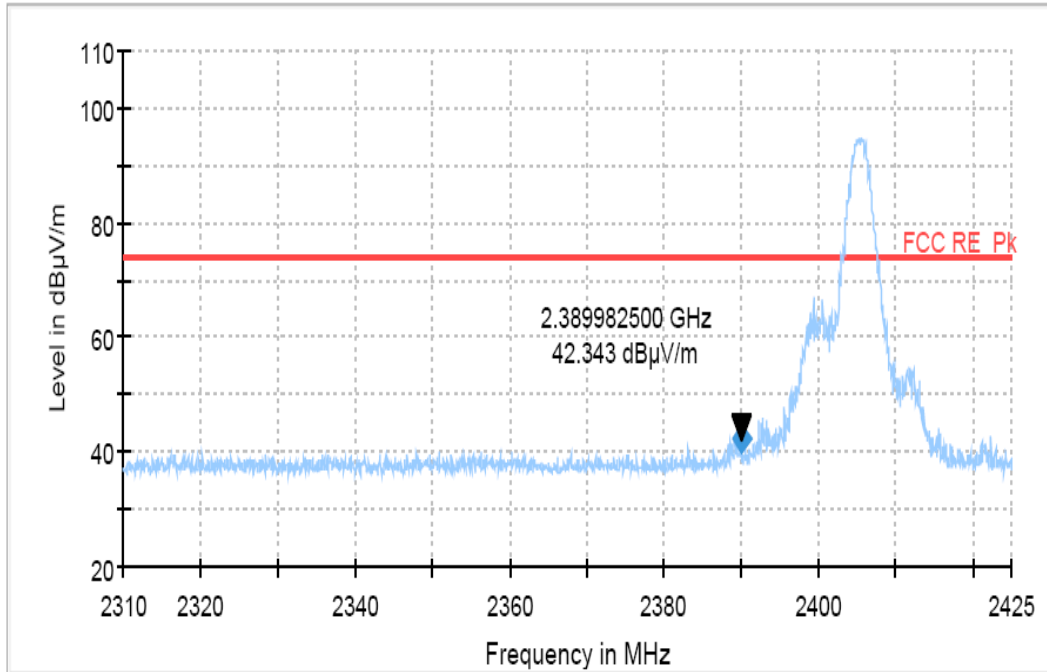


Restricted Band Spurious Emissions, Highest channel Average (Ant A)

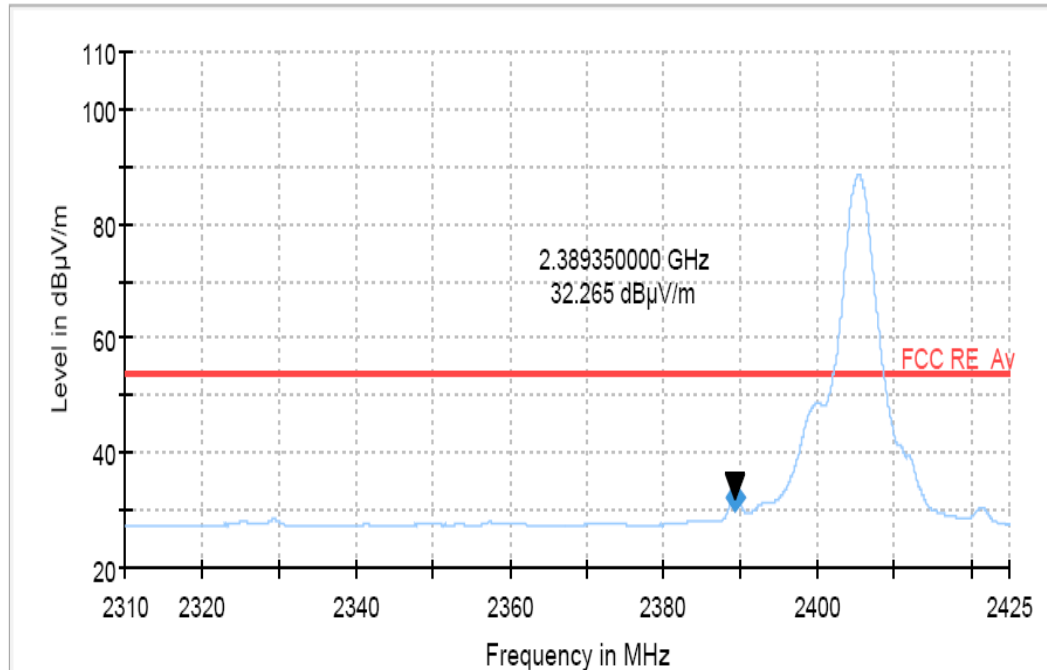


PLOT OF TEST DATA

Restricted Band Spurious Emissions, Lowest channel Peak (Ant B)

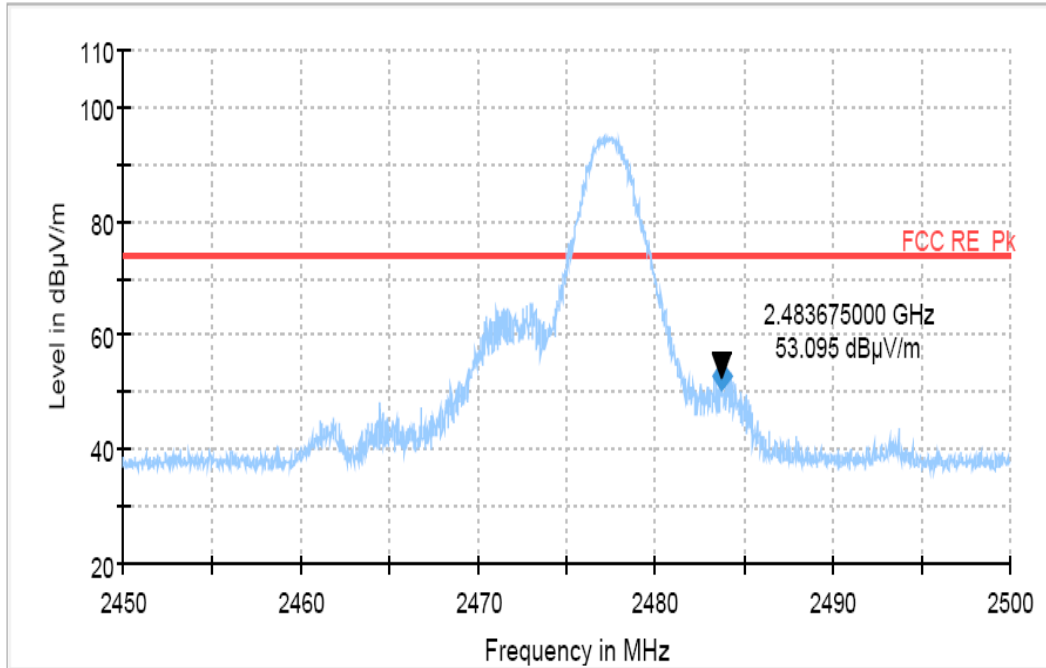


Restricted Band Spurious Emissions, Lowest channel Average (Ant B)

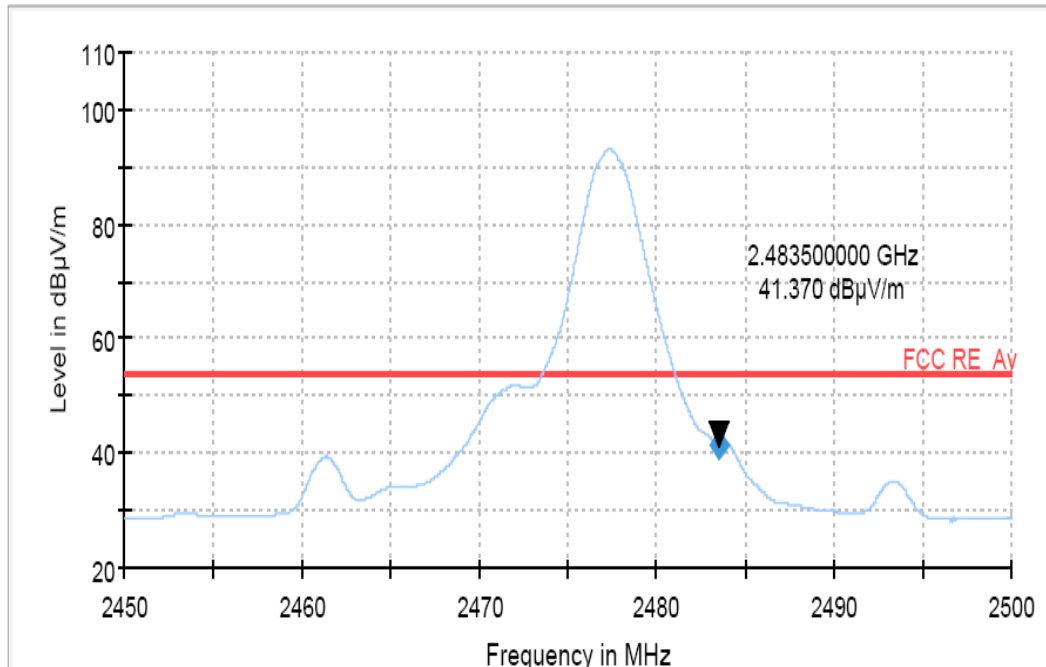


PLOT OF TEST DATA

Restricted Band Spurious Emissions, Highest channel Peak (Ant B)



Restricted Band Spurious Emissions, Highest channel Average (Ant B)



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

9. 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	X_i	Uncertainty of X_i		Coverage factor k	$u(X_i)$ (dB)	C_i	$C_i u(X_i)$ (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	X_i	Uncertainty of X_i		Coverage factor k	$u(X_i)$ (dB)	C_i	$C_i u(X_i)$ (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 : + ($\geq$ 200 MHz) Ⓓ: Log Periodic Antenna-receiver Mismatch : - ($\geq$ 200 MHz)						
Combined Standard Uncertainty	Normal			± 2.63 (< 200 MHz) ± 2.74 ($\geq$ 200 MHz)			
Expanded Uncertainty U	Normal ($k = 2$)			± 5.26 (< 200 MHz) ± 5.48 ($\geq$ 200 MHz)			

10. TEST EQUIPMENT

No.	Instrument	Manufacturer	Model	Serial No.	Calibration Date	Calibration Interval
1	*Test Receiver	R & S	ESCS 30	833364/020	Jan. 14 2011	1 year
2	Test Receiver	R & S	ESCS 30	100302	Oct. 12 2011	1 year
3	*Amplifier	HP	8447F	2805A03427	Jul. 19 2011	1 year
4	*Amplifier	Sonoma Instrument	310N	291916	Jul. 19 2011	1 year
5	*Amplifier	R & S	SCU26	10011	Jun. 01 2011	1 year
6	*Pre Amplifier	HP	8449B	3008A00107	Jan. 13 2011	1 year
7	*Pre Amplifier	HP	8447F	2805A03351	Oct. 06 2011	1 year
8	*Spectrum Analyzer	Agilent	E4440A	MY44303257	Jul. 19 2011	1 year
9	*Spectrum Analyzer	Agilent	E4440A	MY44022567	Apr. 05 2011	1 year
10	*Spectrum Analyzer	R & S	FSP40	100361	Jul. 19 2011	1 year
11	*Loop Antenna	EMCO	6502	8911-2436	Jan. 19 2010	2 year
12	Wideband Power Sensor	R & S	NRP-Z81	100634	May. 03 2011	1 year
13	Peak Power Sensor	R & S	NRV-Z32	836019/028	Oct. 25 2011	1 year
14	*Biconical Log Antenna	ARA	LPB-2520/A	1180	Apr. 14 2010	2 year
15	*Horn Antenna	SCHWARZBECK	BBHA9120D	9120D-508	Dec. 24 2010	2 year
16	Horn Antenna	SCHWARZBECK	BBHA9120D	9120D-474	Jul. 14 2010	2 year
17	*Horn Antenna	Q-par Angus	QSH20S20	8179	Apr. 12 2010	2 year
18	*Trilog-Broadband Antenna	SCHWARZBECK	VULB 9168	9168-257	Apr. 14 2010	2 year
19	*LISN	R & S	ESH3-Z5	833874/006	Oct. 12 2011	1 year
20	*LISN	R & S	ESH2-Z5	100227	Apr. 06 2011	1 year
21	*Position Controller	DAEIL EMC	N/A	N/A	N/A	N/A
22	*Turn Table	DAEIL EMC	N/A	N/A	N/A	N/A
23	*Antenna Mast	DAEIL EMC	N/A	N/A	N/A	N/A
24	*Anechoic Chamber	EM Eng.	N/A	N/A	N/A	N/A
25	*Shielded Room	EM Eng.	N/A	N/A	N/A	N/A
26	*Position Controller	Seo-Young EMC	N/A	N/A	N/A	N/A
27	*Turn Table	Seo-Young EMC	N/A	N/A	N/A	N/A
28	*Antenna Mast	Seo-Young EMC	N/A	N/A	N/A	N/A
29	*Anechoic Chamber	Seo-Young EMC	N/A	N/A	N/A	N/A
30	*Shielded Room	Seo-Young EMC	N/A	N/A	N/A	N/A

*) Test equipment used during the test