Nemko Korea CO., Ltd.

300-2, Osan-Ri, Mohyun-Myun, Yongin-City, Kyungki-Do, KOREA
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FCC EVALUATION REPORT FOR CLASS II PERMISSIVE CHANGE

Applicant :

Samsung Electronics Co., Ltd.
Suwon P.O.Box 105, 416,Maetan3-dong, Paldal-gu
Suwon-si,Kyunggi-do, Korea, (Post code : 442-742)
Attn. : Mr. Gihoon Lee

Dates of Issue : November 10, 2004
Test Report No. : NK2ER204
Test Site : Nemko Korea Co., Ltd.
EMC site, Korea

FCC ID	***A3LWIP5000M***
Brand Name	***SAMSUNG***
CONTACT PERSON	**Samsung Electronics Co., Ltd.** **Suwon P.O.Box 105,416, Maetan3-dong, Paldal-gu,** **Suwon-shi,Kyunggi-do, Korea , 442-742.** **Mr. Gihoon Lee** **Telephone No. : +82 31 279 4391**

Applied Standard:	FCC 47 CFR Part 15, Subpart C : 2001
Classification :	FCC Class B Device
EUT Type:	WLAN Phone

The device bearing the brand name and FCC ID 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 C63.4-2001.

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 : Seob Lee

Reviewed By : H.H. Kim
Manager & Chief Engineer

TABLE OF CONTENTS

SCOPE	**3**
INTRODUCTION (Site Description)	**4**
TEST CONDITIONS & EUT INFORMATION	**5**
SUMMARY OF TEST RESULTS	**7**
RECOMMANDATION / CONCLUSION	**7**
SAMPLE CALCULATION	**7**
DESCRIPTION OF TEST	**8**
TEST DATA(Conducted Emissions)	**12**
PLOT OF EMISSION	**13**
TEST DATA (Radiated Emissions)	**15**
TEST DATA(Modulated Bandwidth)	**16**
PLOT OF TEST DATA	**17**
TEST DATA(Peak Power Output)	**19**
TEST DATA(Conducted & Radiated Spurious Emission)	**20**
PLOT OF TEST DATA	**21**
TEST DATA(Peak Power Spectral Density)	**42**
PLOT OF TEST DATA	**43**
ACCURACY OF MEASUREMENT	**45**
TEST EQUIPMENT	**46**
APPENDIX A - LABELLING REQUIREMENTS	**47**
APPENDIX B - BLOCK DIAGRAM	**48**
APPENDIX C - PHOTOGRAPHS OF TEST SET-UP	**49**
APPENDIX D - EUT PHOTOGRAPHS	**51**
APPENDIX E - USER'S MANUAL	**64**
APPENDIX F - SCHEMATIC DIAGRAM	**65**
APPENDIX G - PART LIST	**66**
APPENDIX H - OPERATING DESCRIPTION	**67**

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.

Responsible Party* :	Samsung Electronics Co., Ltd.
Contact Person :	Mr. Gihoon Lee
Manufacturer :	B·M Telecom 195-4 B/L Ochang Science Industry Complex, Ochang-Myeon, Chungwon-Gun, Chungcheongbuk-Do, Korea

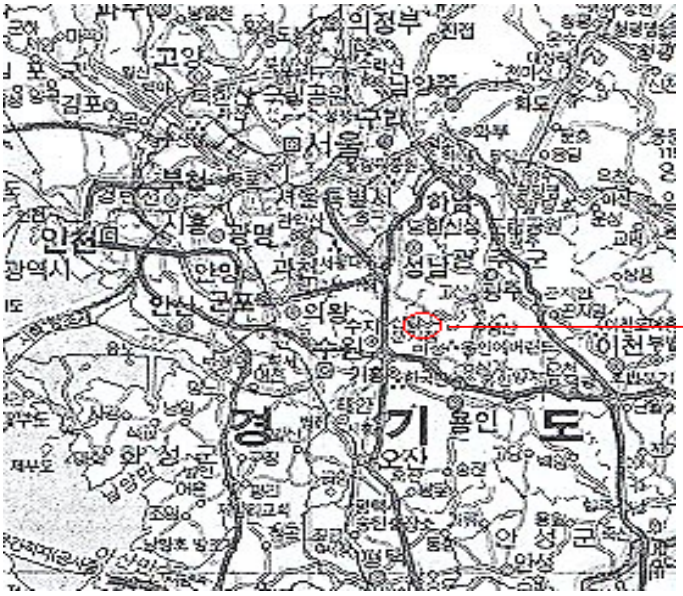
- FCC ID: A3LWIP5000M
- Model: WIP-5000M
- Brand Name: SAMSUNG
- EUT Type: WLAN Phone

- Classification: FCC Class B
- Applied Standard: FCC 47 CFR Part 15 , Subpart C
- Test Procedure(s): ANSI C63.4 (2001)
- Dates of Test: October 22, 2004 to Novemer 10, 2004
- Place of Tests: Nemko Korea Co., Ltd. EMC Site
- Test Report No.: NK2ER204

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 C63.4-2001) was used in determining radiated and conducted emissions emanating from **Samsung Electronics Co., Ltd.**
FCC ID : **A3LWIP5000M**

These measurement tests were conducted at ***Nemko Korea Co., Ltd. EMC Laboratory*** .
The site address is 300-2, Osan-Ri, Mohyun-Myun, Yongin-City, Kyungki-Do, KOREA
The area of Nemko Korea Corporation LTD. EMC Test Site is located in a mountain area at 80 kilometers (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 on June 06, 2001.



Nemko Korea Co., Ltd.
EMC Lab.
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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.

TEST CONDITIONS & EUT INFORMATION

Operating During Test

Sending and receiving a voice data from a WLAN Phone with WLAN card via Radio link to the WBS24. The EUT was tested at the communication mode and charging mode with being connected to the phone of a keyphone system according to the manutacturer's specifications.

Support Equipment

Product	Manufacturer and model name	S/N	Remark
WLAN Phone	Samsung Electronics Co.,Ltd. Model: WIP-5000M	S/N: N/A	EUT
Desktop charger	Samsung Electronics Co.,Ltd. Model: WDC5000 2.0m unshielded AC power cable	S/N: N/A	
WBS24(Basic)	Samsung Electronics Co.,Ltd. Model: WBS24(Basic) 1.8m unshielded DC power cable 2.0m UTP twisted pair cable	S/N: N/A	
AC Adapter	Dee Van Electronics Co.,Ltd. Model: DSA-0101F-05KA1 1.8m unshielded DC power cable	S/N: N/A	
Corded Phone	Samsung Electronics Co.,Ltd. Model: SP-F212 1.8m unshielded modular jack cable	S/N: N/A	
Keyphone System	Samsung Electronics Co.,Ltd. Model: DCS-408 1.8m unshielded AC Power cable	S/N: N/A	

EUT Information

Clock:	44MHz(Y1), 10MHz(X1)
Chipset:	U17(ISL3871K), U34(AM39LV010B), U23(EM128L16B) U16(ISL3984), U18(ISL3684), U19(ISL3084) U32(AUDACITY_T2U), U15(M29W160DT) U22(EXD128), U1(TWLL1103)
RF frequency	2412 ~ 2462GHz
RF output power	Maximum of 13dBm
Transmission Protocols	DSSS(Direct Sequence Spread Spectrum)
Voice Codec	G711/G729A/G723.1
Size	125(width)x45(length)x24(height)mm
Weight	About95g
Battery	3.8V Li-Ion/800mA

SUMMARY OF TEST RESULTS

The EUT has been tested according to the following specification:

Name of Test	Paragraph No.	Result	Remark
Power line Conducted Emission	15.207	Complies	
Radiated Emission(Spurious)	15.209	Complies	
Modulated Bandwidth (6dB Bandwidth)	15.247(a)(2)	Complies	
Peak Power Output	15.247(b)	Complies	
Conducted Spurious Emission	15.247(c)	Complies	
Radiated Spurious Emission	15.247(c)	Complies	
Power Spectral Density	15.247(d)	Complies	

RECOMMENDATION/CONCLUSION

The data collected shows that the **Samsung Electronics Co., Ltd.**
FCC ID : **A3LWIP5000M**
The highest emission observed was at **2500.0MHz** for radiated emissions with a margin of **5.6 dB.**

SAMPLE CALCULATION

$$\text{dB}\mu N = 20 \log_{10} (\mu N/\text{m})$$

$$\mu N = 10^{(\text{dB}\mu N/20)}$$

EX. 1.

@57.7 MHz Class B limit = 100 μN/m = 40.0 dB μN/m

Reading = 19.1 dB μN(calibrated level)
Antenna factor + Cable Loss = 10.12 dB
Total = 29.22 dB μN/m
Margin = 40.0 - 29.22 = 10.78
10.78 dB below the limit

DESCRIPTION OF TESTS

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 1mX 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 LISN and Kyoritsu KNW-407 50ohm/50uH line impedance stabilization network 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 150KHz to 30MHz with 200msec sweep time.
The frequency producing the maximum level was re-examined using the EMI test receiver. (Rohde & Schwarz, ESCS30).
The detector function was set to CISPR quasi-peak mode and 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.

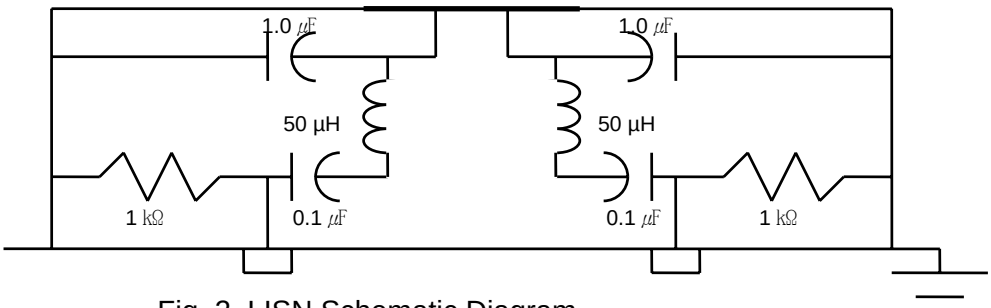


Fig. 2. LISN Schematic Diagram

DESCRIPTION OF TEST

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 30 to 1000MHz using Biconical log Antenna(ARA, LPB-2520/A). Above 1GHz, Horn antenna (Scwarzbeck BBHA 9120D:upto 18GHz) was used.

Final Measurements were made outdoors at 3 or 10m test range using Logbicon Super Antenna(Schwarzbeck, VULB9166) or Horn antenna.(Scwarzbeck BBHA 9120D)

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 quasi-peak mode or Average mode and the bandwidth of the receiver was set to 120KHz 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 0.8m high non- metallic 1.0X 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.

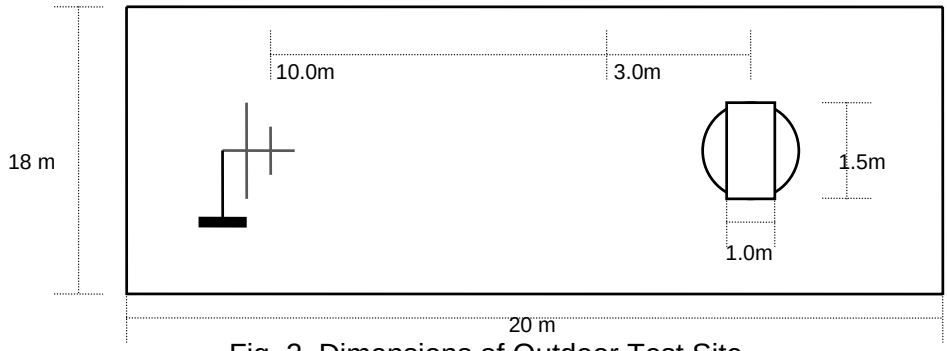
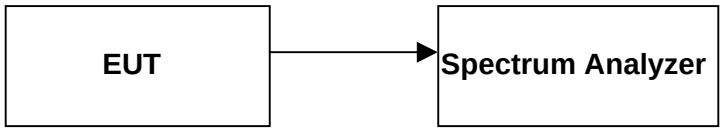


Fig. 2. Dimensions of Outdoor Test Site

DESCRIPTION OF TEST

Modulated Bandwidth (6dB Bandwidth)

Test Setup

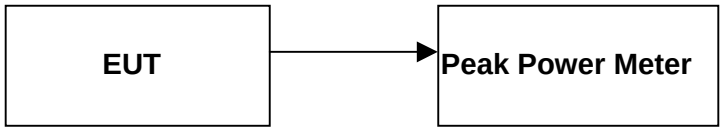


Test Procedure

The transmitter output is connected to the spectrum analyzer.
The RBW of spectrum analyzer is set to 100KHz and VBW is set to the 100KHz.
The sweep time is coupled.

Peak Power Output

Test Setup



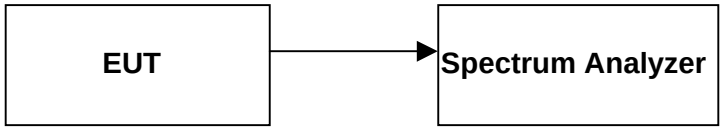
Test Procedure

The transmitter output is connected to the peak power meter.

DESCRIPTION OF TEST

Conducted Spurious Emission

Test Setup

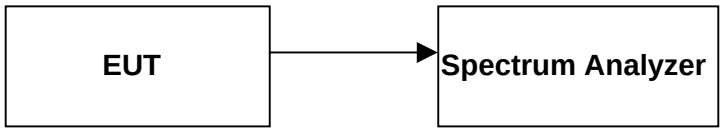


Test Procedure

The transmitter output is connected to the spectrum analyzer.
The RBW of spectrum analyzer is set to 100KHz and VBW is set to the 300KHz.
Measurements are made over the 30MHz to 26.5GHz range with the transmitter set to the lowest, middle, and highest channels within the 2.4GHz band.

Peak Power Spectral Density

Test Setup



Test Procedure

The transmitter output is connected to the spectrum analyzer.
The maximum level in a 3KHz bandwidth is measured with the spectrum analyzer.
The RBW of spectrum analyzer is set to 3KHz and VBW is set to 10KHz.
The sweep time is set to Span/3KHz and video averaging is turned off.
The PPSD is the highest level found across the emission in any 3KHz band.

TEST DATA

Conducted Emissions-15.207

FCC ID : A3LWIP5000M
Test Mode : set to each channel.

Frequency	Level(dBμV)		Line	Limit(dBμV)		Margin(dB)	
(MHz)	Q-Peak	Average		Q-Peak	Average	Q-Peak	Average
0.41	46.6	34.7	L	57.6	47.6	11.0	12.9
0.43	49.8	34.5	N	57.3	47.3	7.5	12.8
0.51	44.0	33.1	L	55.8	45.8	11.8	12.7
0.88	41.3	29.2	N	51.3	41.3	10.0	12.1
1.24	41.1	26.2	N	48.5	38.5	7.4	12.3
1.66	41.2	27.7	N	46.0	36.0	4.8	8.3

Table 1. 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.The limit for Class B device is on the FCC Part section 15.107(a).
4.Line L = Line Line N = Neutral

Tested by ***Seob Lee***

PLOTS OF EMISSIONS

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

NEMKO KOREA

28 Oct 2004 09:56

Conducted Emissions

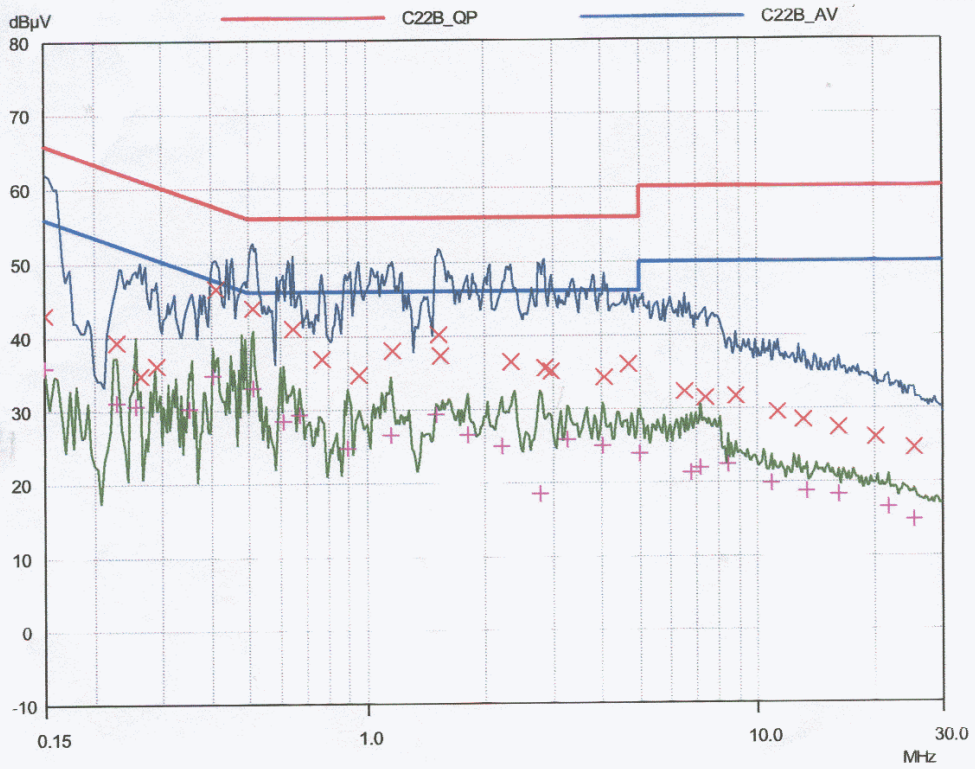
EUT:	WIP Adaptor
Manuf:	Samsung Electronics Co., Ltd.
Op Cond:	Communication Link
Operator:	
Test Spec:	CISPR 22 Class B
Comment:	MODEL : WIP-5000M
	LINE : LINE-PE
Result File:	e816l1.dat : WIP-5000M

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	10 dB	OFF	60dB

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

Final Measurement:		
	Detectors:	X QP / + AV
	Meas Time:	1sec
	Subranges:	25
	Acc Margin:	60 dB



PLOTS OF EMISSIONS

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

NEMKO KOREA

28 Oct 2004 10:08

Conducted Emissions

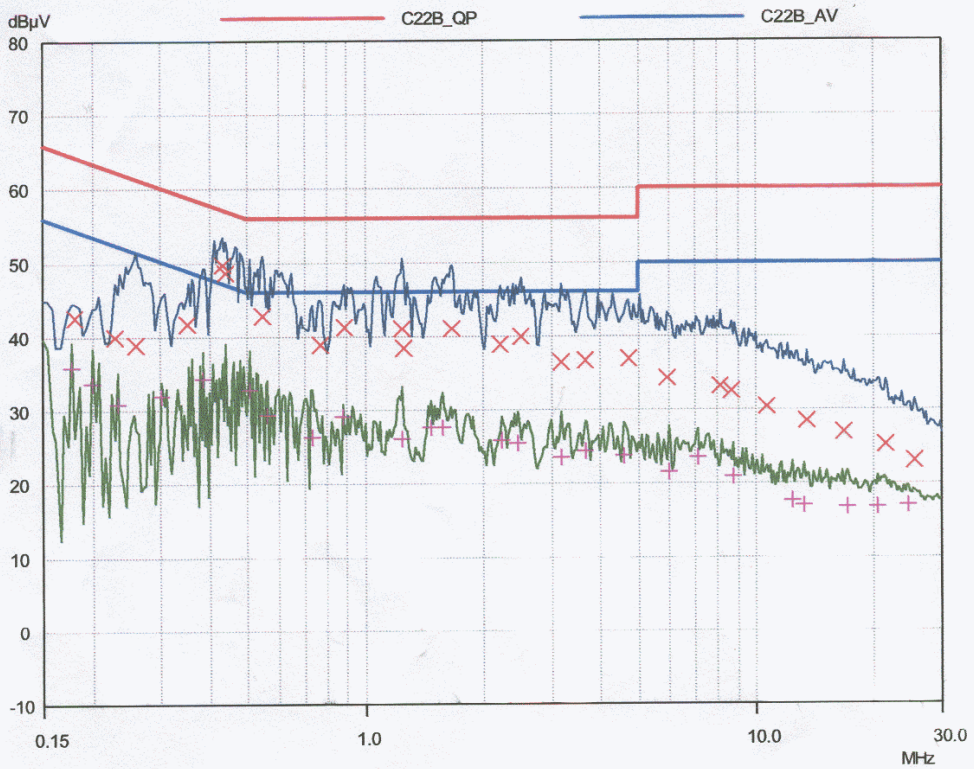
EUT:	WIP Adaptor
Manuf:	Samsung Electronics Co., Ltd.
Op Cond:	Communication Link
Operator:	
Test Spec:	CISPR 22 Class B
Comment:	MODEL : WIP-5000M
	LINE : NEUTRAL-PE
Result File:	e816n1.dat : WIP-5000M

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	10 dB	OFF	60dB

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

Final Measurement:		
	Detectors:	X QP / + AV
	Meas Time:	1sec
	Subranges:	25
	Acc Margin:	60 dB



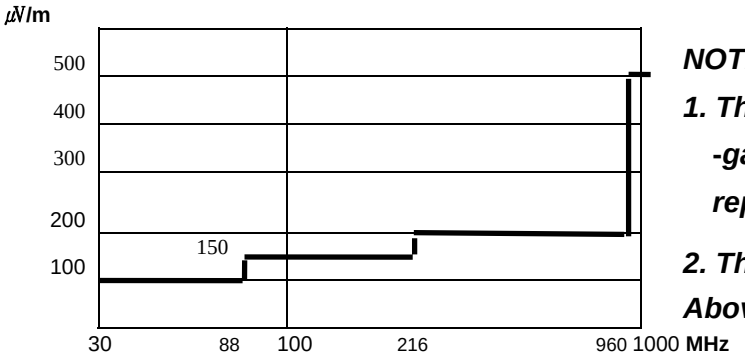
TEST DATA

Radiated Emissions(general requirements)-15.209

FCC ID : A3LWIP5000M
Test Mode :

Frequency (MHz)	Reading (dBμV)	Pol* (H/V)	AF+CL+Amp (dB)**	Result (dBμV/m)	Limit (dBμV/m)	Margin (dB)
33.00	50.2	V	-22.4	27.8	40.0	12.2
40.60	51.7	V	-21.1	30.6	40.0	9.4
41.95	49.0	V	-21.2	27.8	40.0	12.2
48.00	45.1	V	-21.4	23.7	40.0	16.3
157.55	34.9	V	-12.8	22.1	43.5	21.4
160.00	36.5	V	-12.8	23.7	43.5	19.8
2370.00[1)]	48.1	H	0.0	48.1	54.0	5.9
2500.00[1)]	46.0	H	0.8	46.8	54.0	7.2
2380.00[2)]	45.9	H	0.0	45.9	54.0	8.1
2500.00[2)]	47.6	H	0.8	48.4	54.0	5.6

Table 1. Radiated Measurements at 3meters



NOTES:

1. Three orthogonal directions were investi -gated and the worst-case emissions were reported.

2. The radiated limits are shown on Figure 3. Above 1GHz the limit is 500 μV/m.

Fig. 3. Limits at 3 meters

NOTES:

*1. *Pol. H =Horizontal V=Vertical*

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

3. 1) : Radiated emissions which fall in the restricted bands at ch 1(2412MHz)

4. 2) : Radiated emissions which fall in the restricted bands at ch 11(2462MHz)

5. Up to the 10th harmonics were investigated according to §15.33 and the worst –case is reported.

Tested by ***Seob Lee***

TEST DATA

Modulated Bandwidth (6dB Bandwidth)-15.247(a)(2)

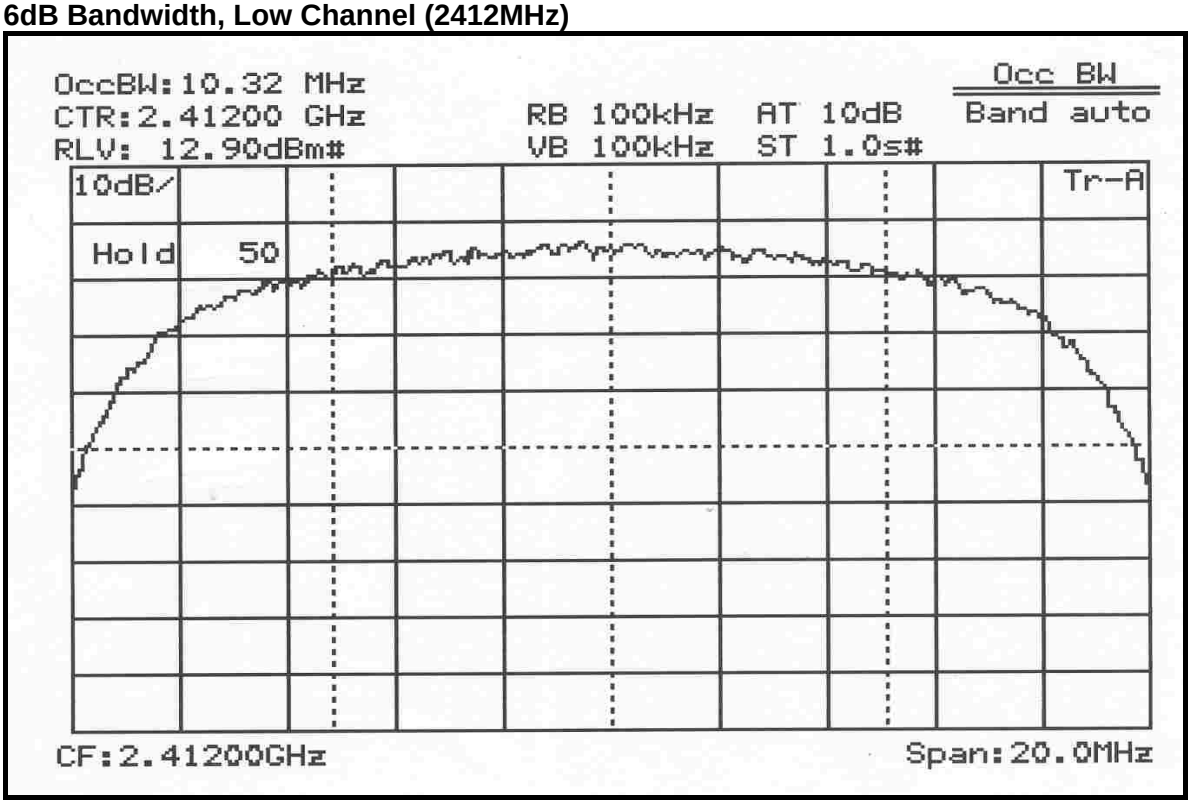
FCC ID : A3LWIP5000M
Test Mode : set to Lowest channel and Middle channel and Highest channel

Channel	Frequency (MHz)	Result (KHz)	Limit (KHz)	Margin (KHz)
1	2412	10320	500	9820
6	2437	10320	500	9820
11	2462	10320	500	9820

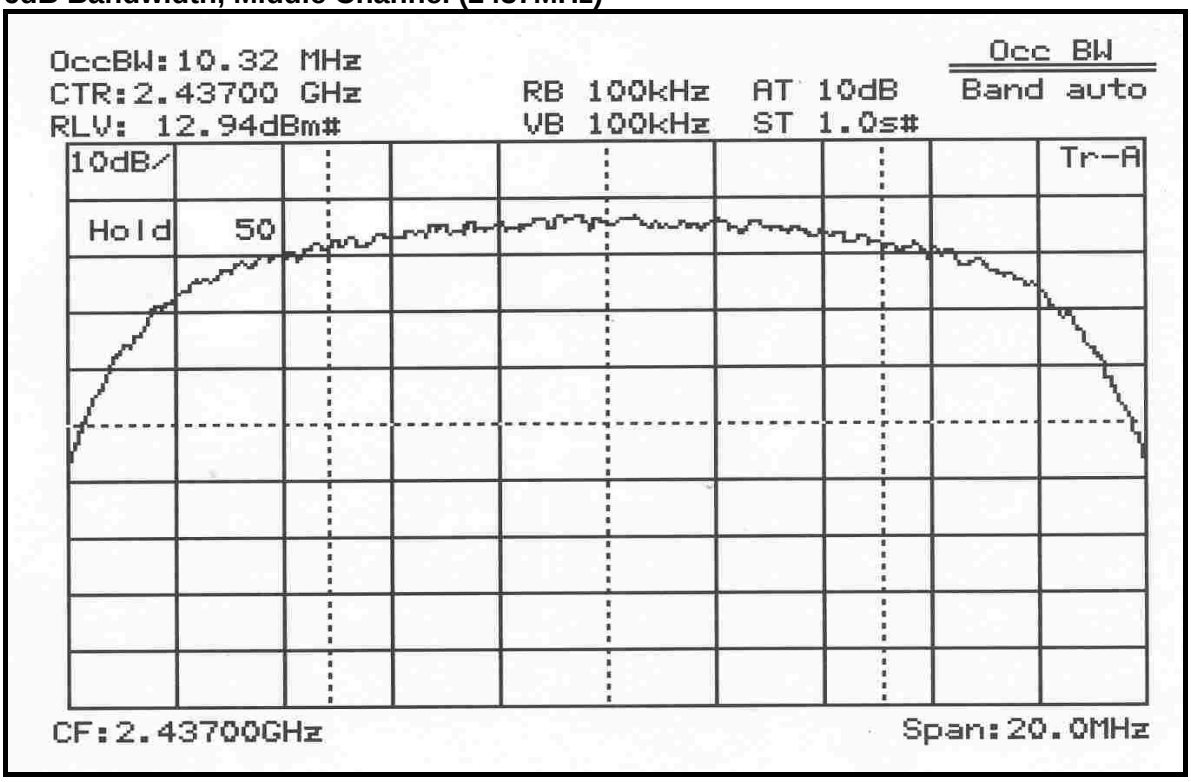
Tested by ***Seob Lee***

PLOT OF TEST DATA

6dB Bandwidth, Low Channel (2412MHz)

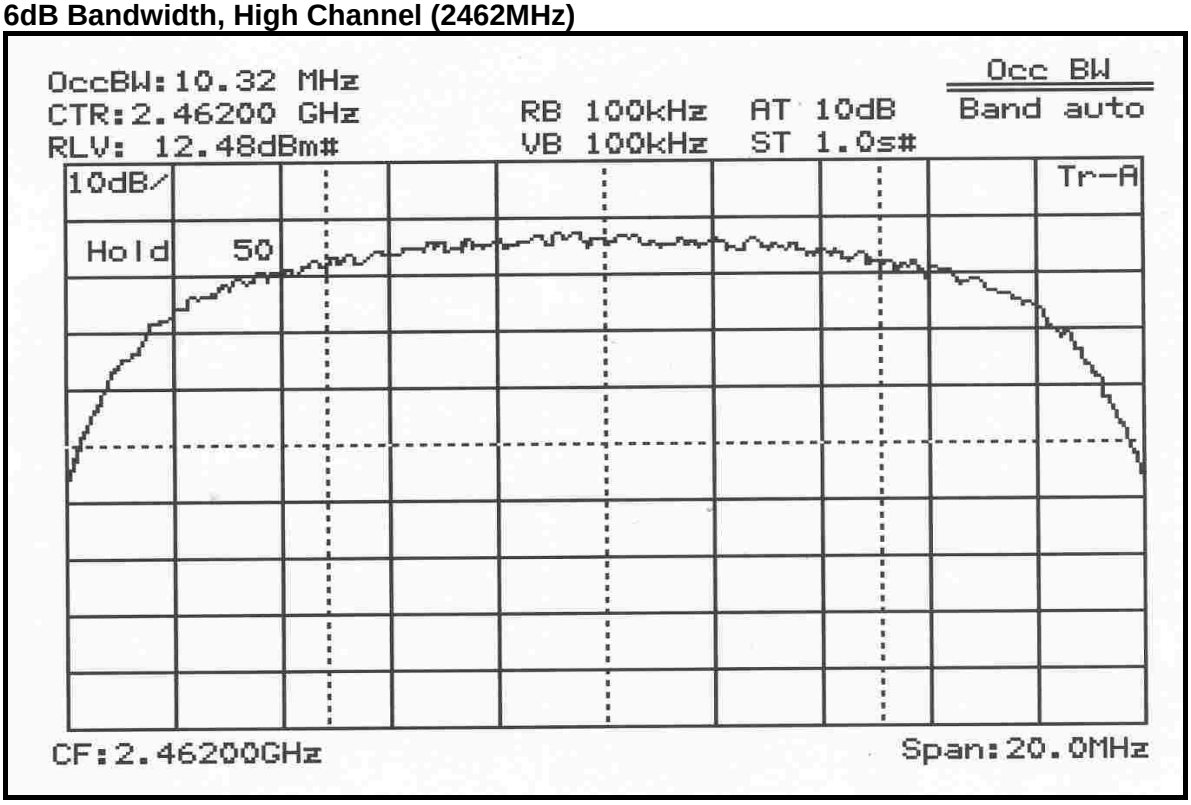


6dB Bandwidth, Middle Channel (2437MHz)



PLOT OF TEST DATA

6dB Bandwidth, High Channel (2462MHz)



TEST DATA

Peak Power Output-15.247(b)

FCC ID : A3LWIP5000M
Test Mode : set to Lowest channel and Middle channel and Highest channel

Channel	Frequency (MHz)	Result (dBm)	Limit (dBm)	Margin (dBm)
1	2412	10.13	30	-19.87
6	2437	11.05	30	-18.95
11	2462	10.94	30	-19.06

Tested by ***Seob Lee***

TEST DATA

Conducted Spurious Emission-15.247(c)

FCC ID : A3LWIP5000M
Test Mode : set to Lowest channel and Middle channel and Highest channel

Channel	Frequency (MHz)	Result (dBc)	Limit (dBc)	Margin (dB)
1	2412	More than 40dBc	20	
6	2437	More than 40dBc	20	
11	2462	More than 40dBc	20	

Radiated Spurious Emission-15.247(c)

FCC ID : A3LWIP5000M
Test Mode : set to Lowest channel, Middle channel and Highest channel

***)The result of WIP-5000 was under 20dB below fundamental.**

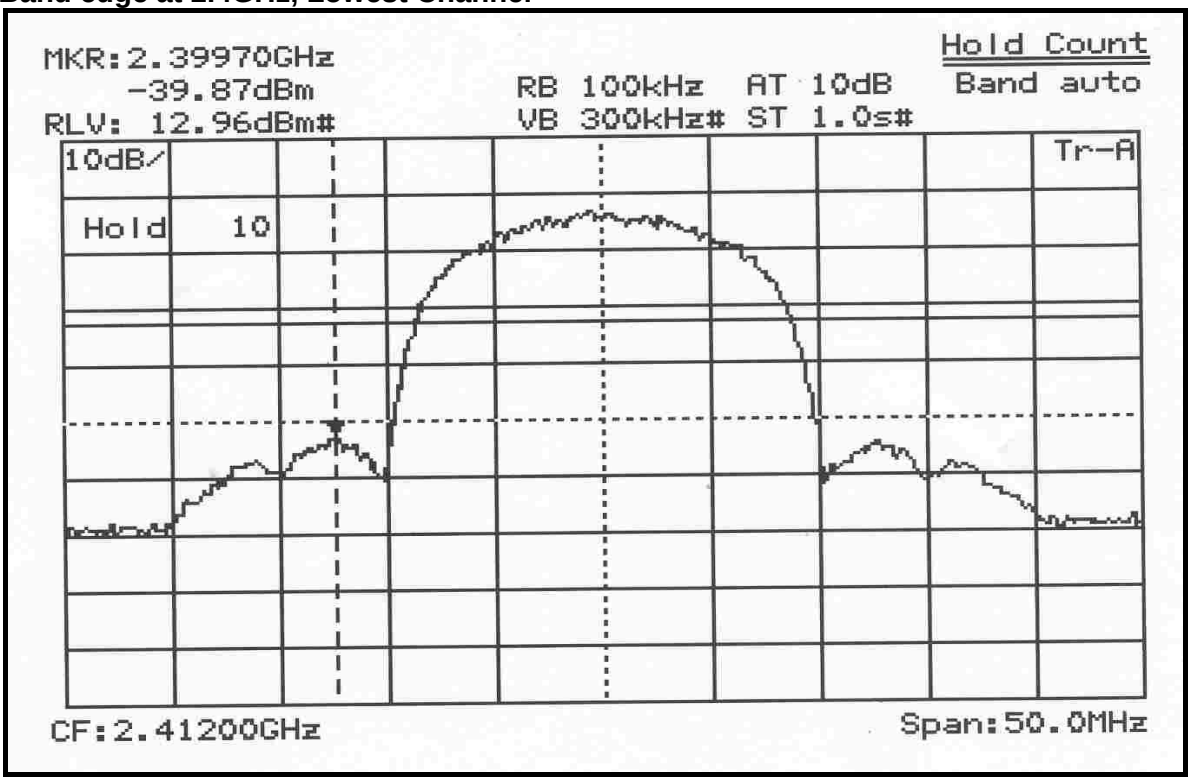
Channel	Frequency (MHz)	Pol (H/V)	*)Result (dBuV)	Fundamental (dBuV/m)	Margin (dB)
1	2412	H	Under 20dB below fundamental	99.3	
1	2412	V	Under 20dB below fundamental	94.9	
6	2437	H	Under 20dB below fundamental	99.6	
6	2437	V	Under 20dB below fundamental	92.8	
11	2462	H	Under 20dB below fundamental	100.0	
11	2462	V	Under 20dB below fundamental	93.1	

Note: Three orthogonal directions were investigated and the worst case results were reported.

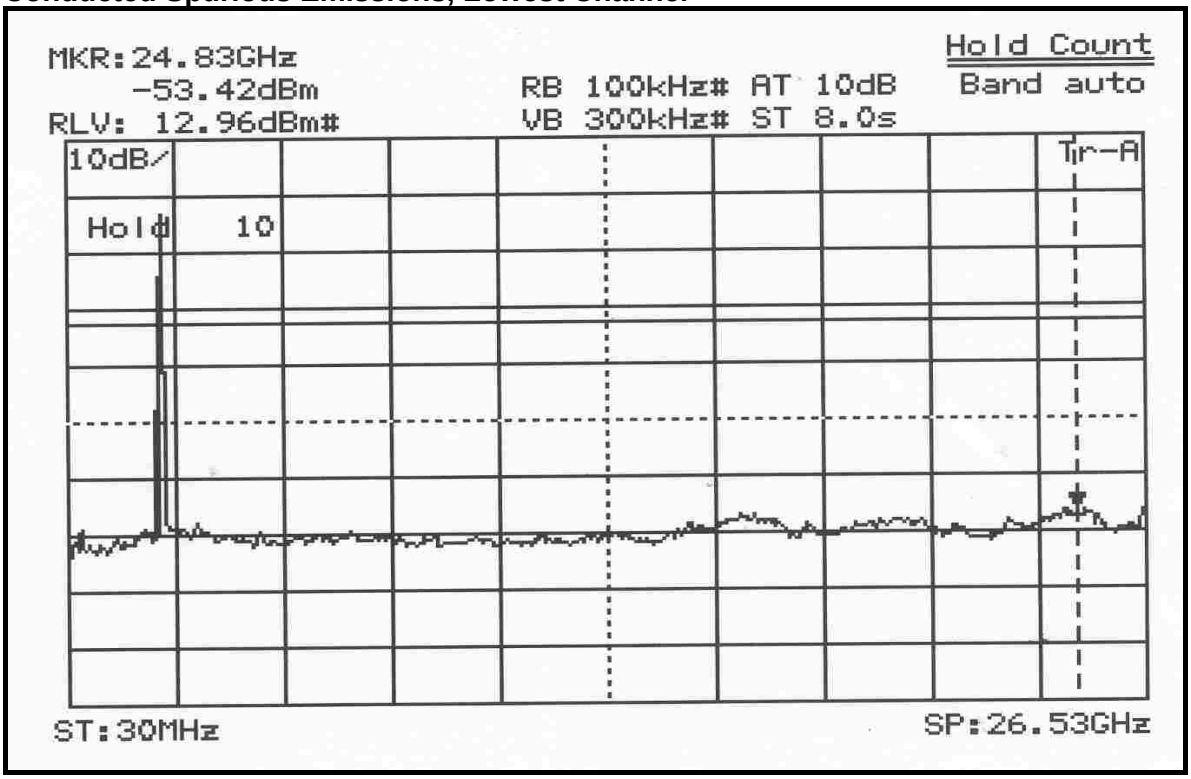
Tested by ***Seob Lee***

PLOT OF TEST DATA

Band edge at 2.4GHz, Lowest Channel

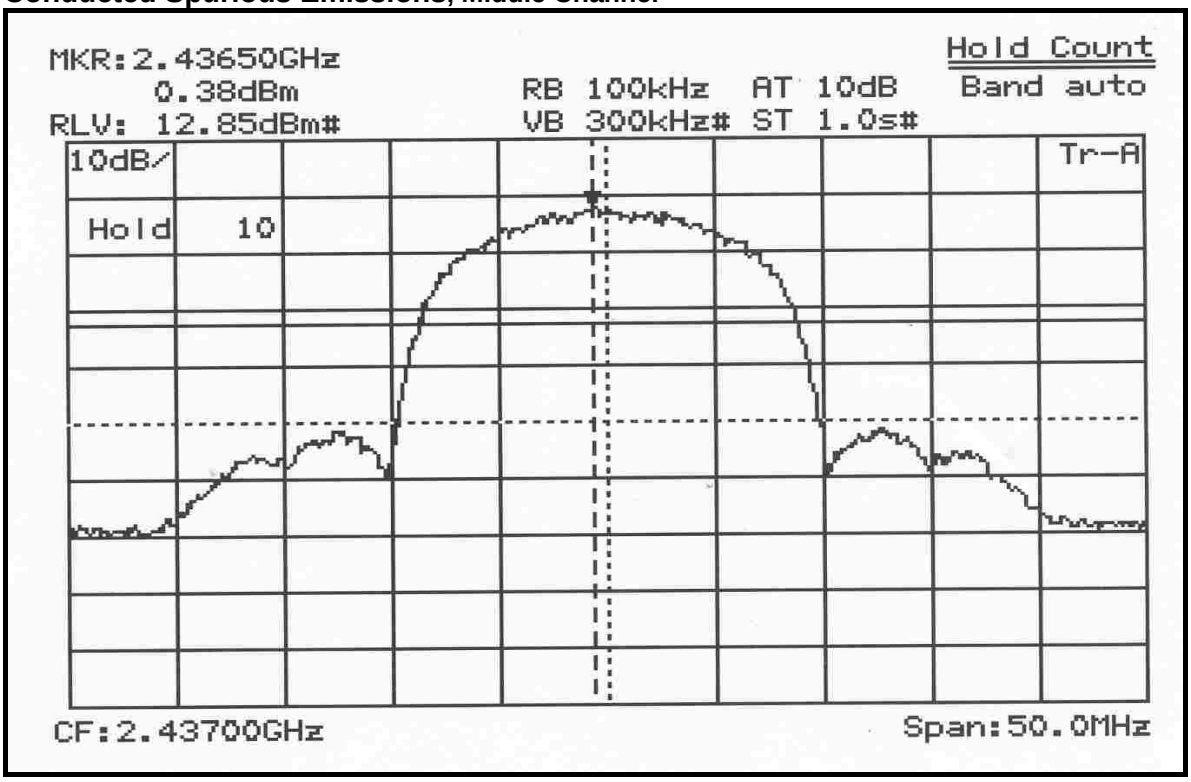


Conducted Spurious Emissions, Lowest Channel

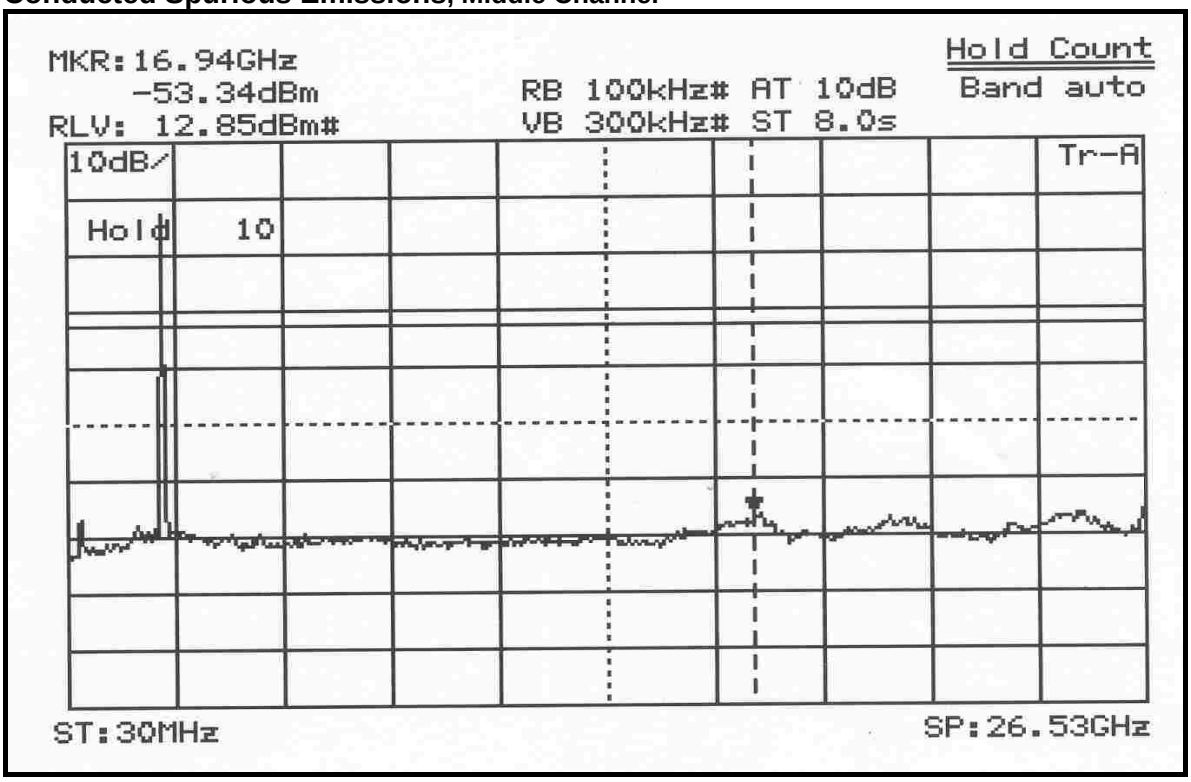


PLOT OF TEST DATA

Conducted Spurious Emissions, Middle Channel

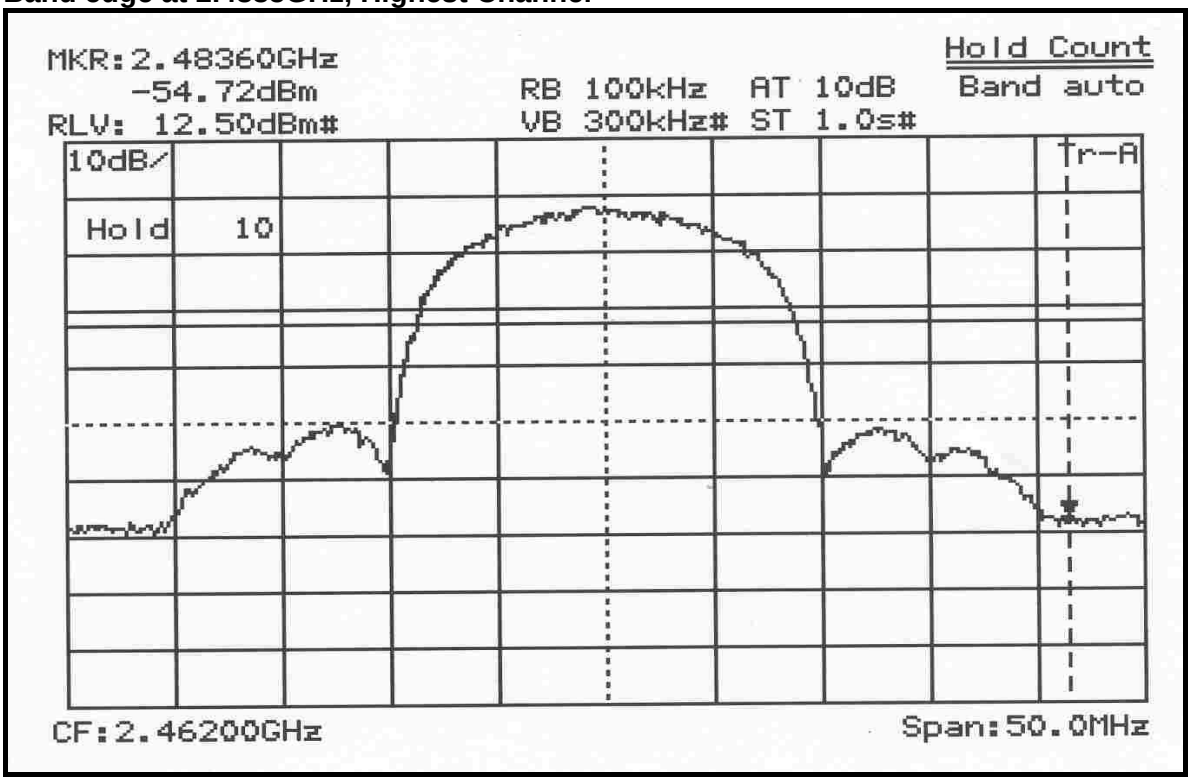


Conducted Spurious Emissions, Middle Channel

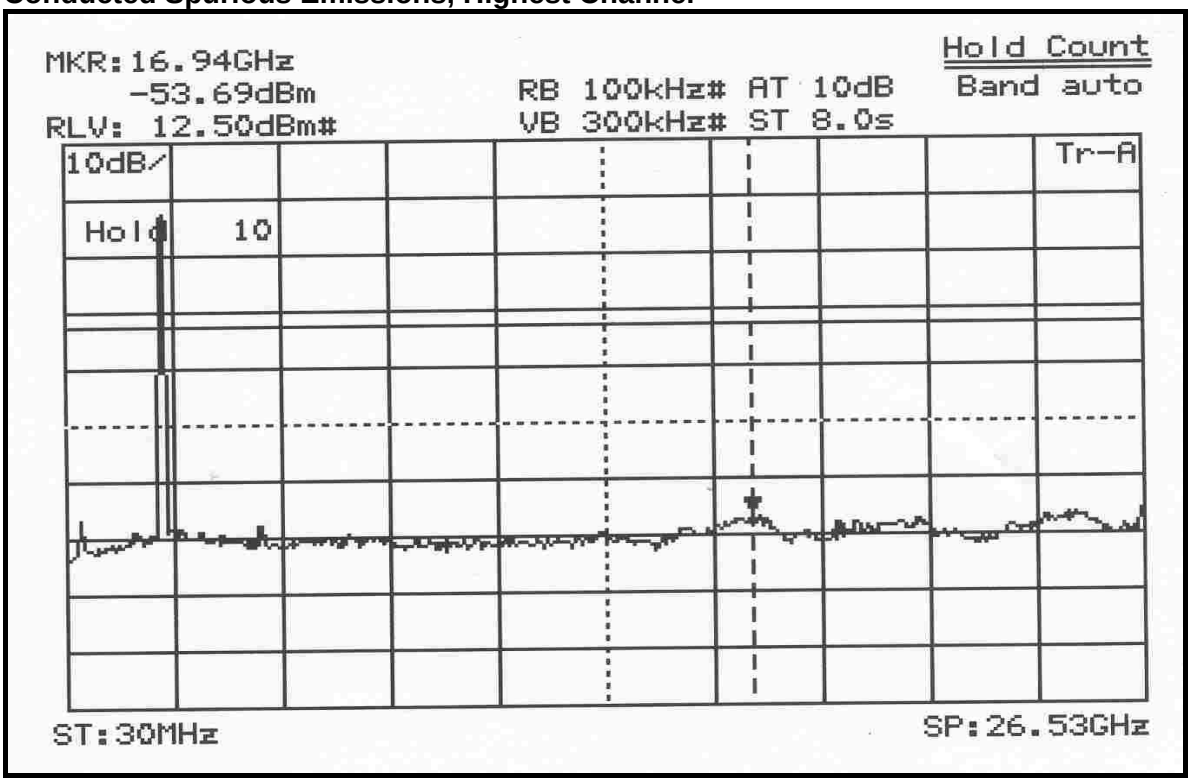


PLOT OF TEST DATA

Band edge at 2.4835GHz, Highest Channel

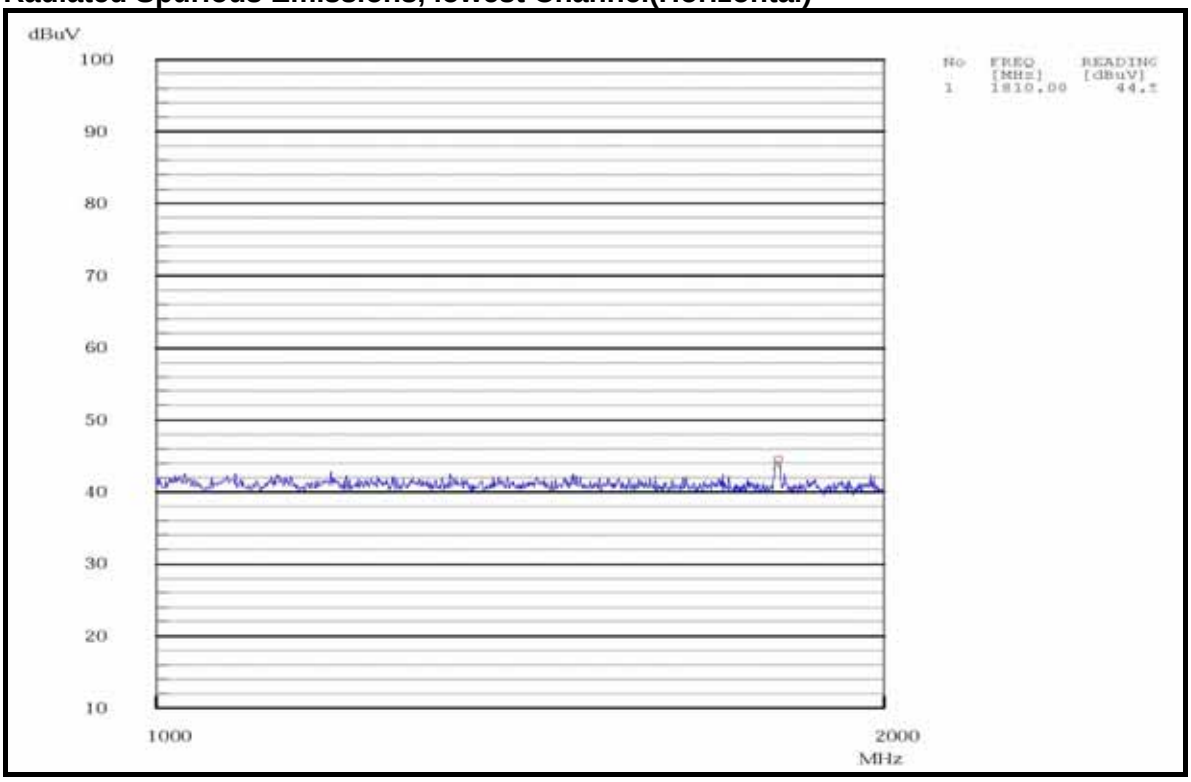


Conducted Spurious Emissions, Highest Channel

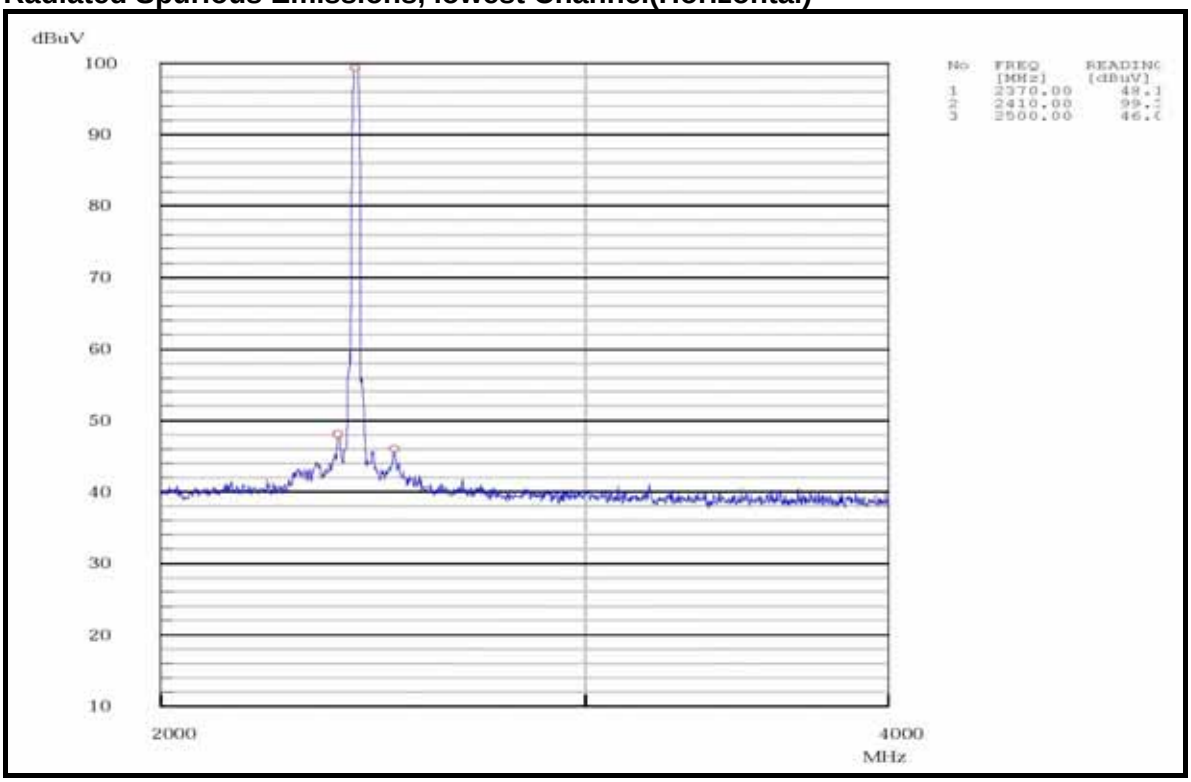


PLOT OF TEST DATA

Radiated Spurious Emissions, lowest Channel(Horizontal)

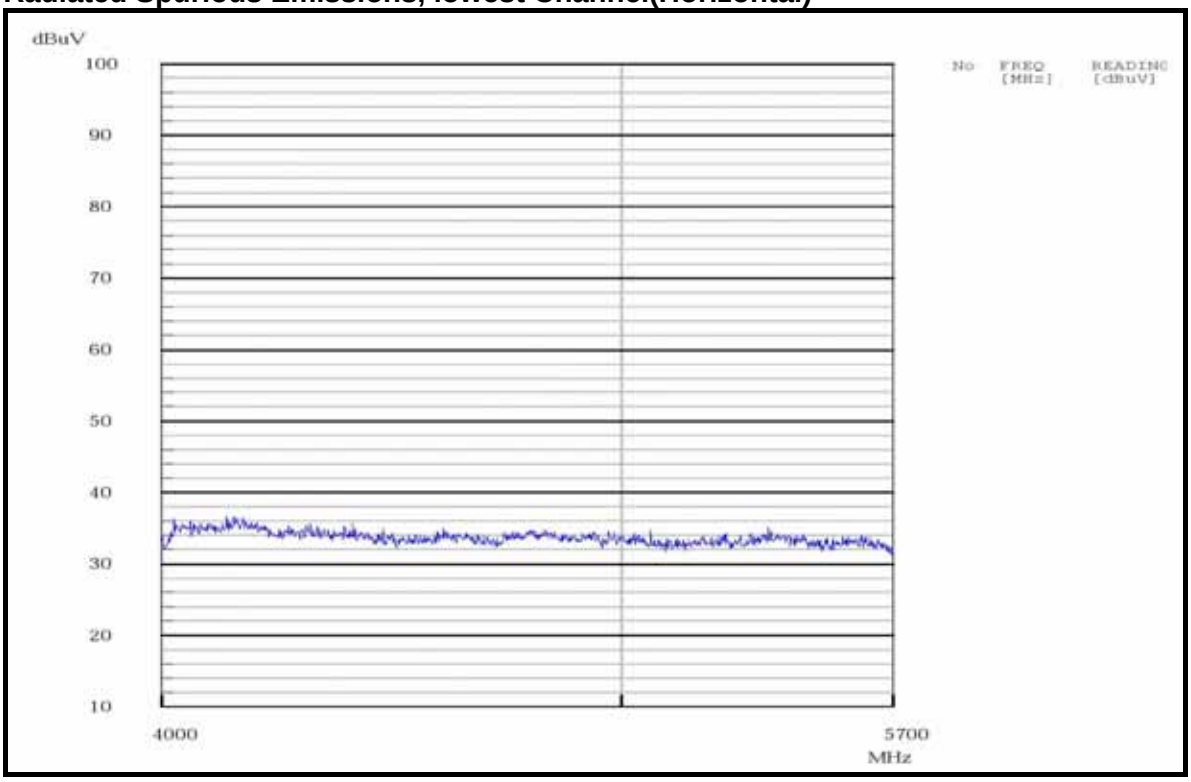
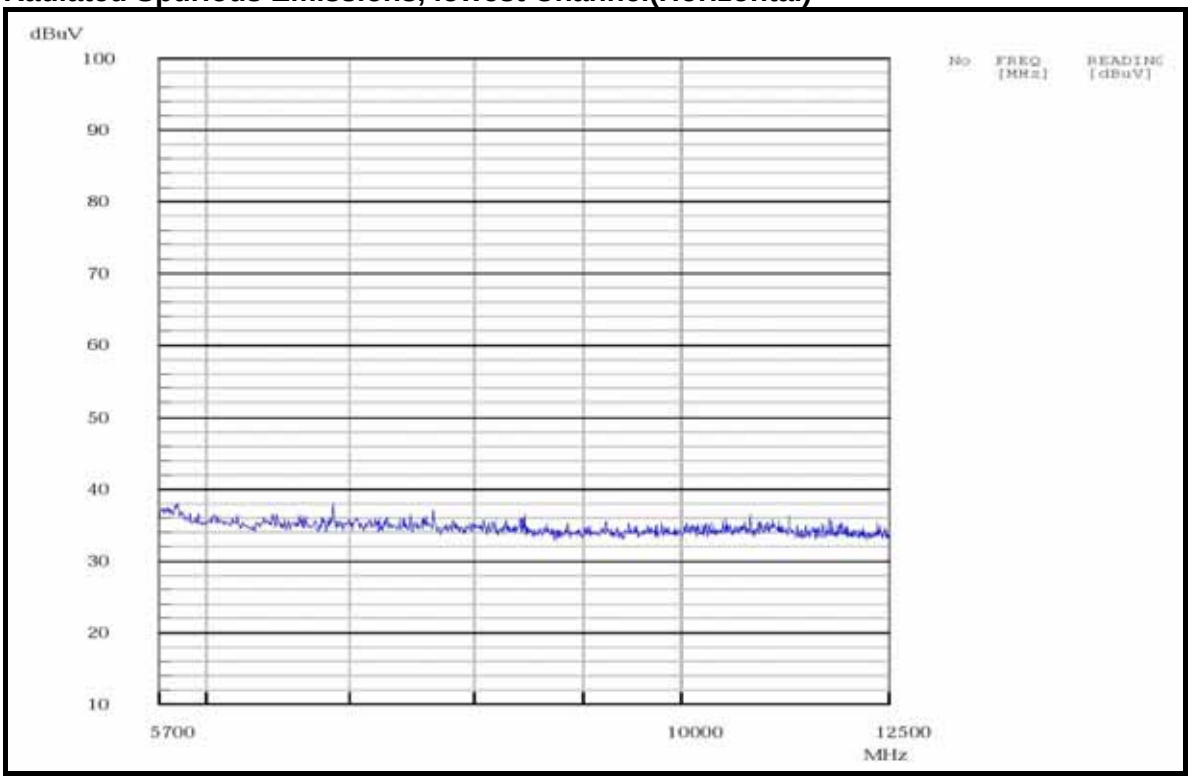


Radiated Spurious Emissions, lowest Channel(Horizontal)



PLOT OF TEST DATA

Radiated Spurious Emissions, lowest Channel(Horizontal)



Radiated Spurious Emissions, lowest Channel(Horizontal)