Nemko Korea CO., Ltd.

300-2, Osan-Ri, Mohyun-Myun, Yongin-City, Kyungki-Do, KOREA
TEL:+82 31 322 2333 FAX:+82 31 322 2332

FCC EVALUATION REPORT FOR CERTIFICATION

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. Hagyoun Bae

Dates of Issue : November 24, 2003
Test Report No. : NK2DE699
Test Site : Nemko Korea Co., Ltd.
EMC site, Korea

FCC ID	***A3LWBS24COMBO***
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. Hagyoun Bae** **Telephone No. : +82 31 279 4387**

Applied Standard: FCC 47 CFR Part 15, Subpart C : 2000
Classification : FCC Class B Device
EUT Type: WLAN Access Point

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 C63.4-1992.

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.

Baek sung hun

Tested By : S. H. Baek
Senior Engineer

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

TABLE OF CONTENTS

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.

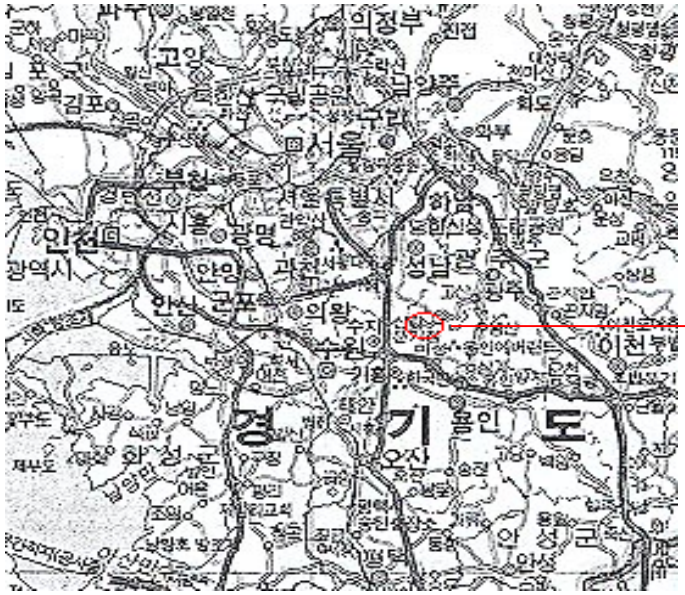
Responsible Party* :	Samsung Electronics Co., Ltd.
Contact Person :	Mr. Hagyoun Bae
Manufacturer :	Samsung Electronics Co.,LTD. #259, Gongdan-Dong, Gumi-City, Gyeong-Buk, Korea, 730-030

- FCC ID: A3LWBS24COMBO
- Model: WBS24(Combo)
- Brand Name: SAMSUNG
- EUT Type: WLAN Access Point
- Classification: FCC Class B
- Applied Standard: FCC 47 CFR Part 15 , Subpart C
- Test Procedure(s): ANSI C63.4 (1992)
- Dates of Test: October 20, 2003 to October 30, 2003
- Place of Tests: Nemko Korea Co., Ltd. EMC Site
- Test Report No.: NK2DE699

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 C63.4-1992) was used in determining radiated and conducted emissions emanating from **Samsung Electronics Co., Ltd.**
FCC ID : **A3LWBSCOMBO**

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 October 19, 1992.



Nemko Korea Co., Ltd.
EMC Lab.
300-2, Osan-Ri, Mohyun-Myun, Yongin-City Kyungki-Do,KOREA 449-852
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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 WBS24(Combo) interfaces with the IDCS500 Key Telephone System through LAN and offers the voice/data service.

Support Equipment

WLAN Phone	Samsung Model: WIP-5000M	S/N: N/A
Desktop charger	R.F.Tec Model: WIP-5000M 2.0m unshielded AC power cable	S/N: N/A
WLAN Access Point	Samsung Model:WBS24(Combo) 3.0m RJ-45 twisted pair cable	S/N: N/A
VoIP phone	Samsung Model:LCD24BKEYSETDCO	23J549281
IDCS500Key Telephone System	Samsung Model: Idcs500 2.0m unshielded AC power cord 3.0m RJ-45 twisted pair cable	S/N: SG74T1C206

EUT Information

Clock:	25MHz(Y3), 20MHz(Y2), 2.048MHz(Y1)
Clock(RF Card):	32.768MHz(X1), 44MHz(U13)
Chipset:	U17(VC35210-PBC80), U8/18(K4S643232E-TC06) U6(AM29LV320DT120EI), U5(74LCX16373) U11/12(TP3406V), U13/14/15(TC74LCX125FN) U20(KM616V1002BT-10), U16(VC5409-PGE)
Chipset(RF Card):	U11(ISL3684), U701(RF5117_MLF), U5(ISL3871)
RF frequency (Center Frequency)	2412 ~ 2462GHz
RF output power	Maximum of 18dBm
Cell implementation	3 clear channel
Ethernet	10/100BASE-T
Voice Codec	G.711/G729A/G726
Size	328(width)x80(length)x41(height)mm
Weight	About 1kg
Power	DC : -48V (supplied from the system)
Antenna	2 External Antenna Diversity
External Connector	External power jack, RJ45 LAN, RJ45 API, RJ45 SIO, and PCMCIA slots

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	
Maximum Permissible Exposure	1.1307(b)	Complies	

RECOMMENDATION/CONCLUSION

The data collected shows that the **Samsung Electronics Co., Ltd.**
FCC ID : **A3LWBS24COMBO**
The highest emission observed was at **394.72MHz** for radiated emissions with a margin of **4.7 dB.**

SAMPLE CALCULATION

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

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

EX. 1.

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

Reading = 19.1 dB μV(calibrated level)
Antenna factor + Cable Loss = 10.12 dB
Total = 29.22 dB μV/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.

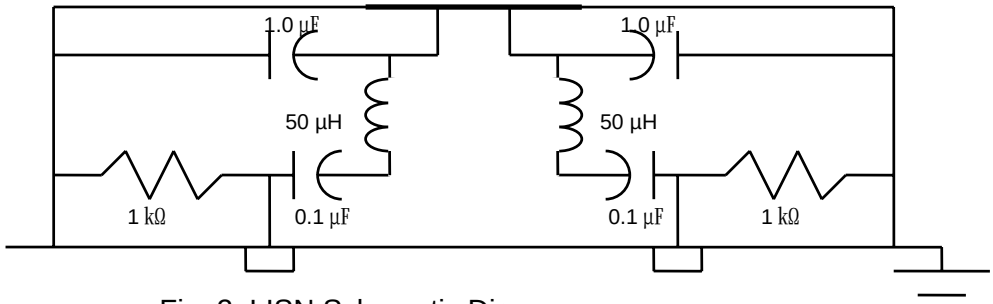


Fig. 2. LISN Schematic Diagram

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.

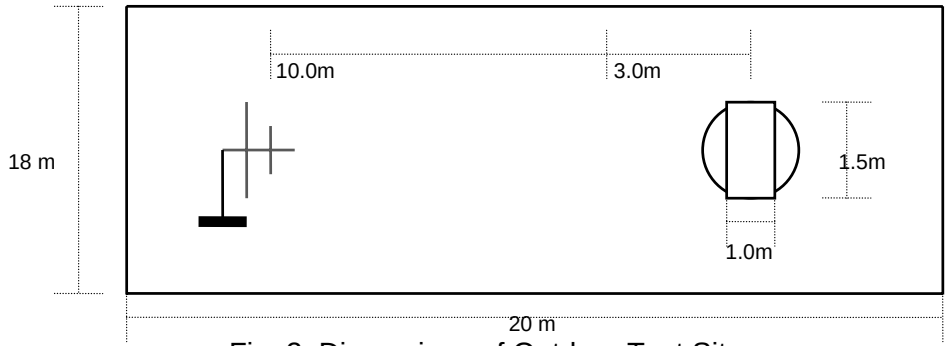
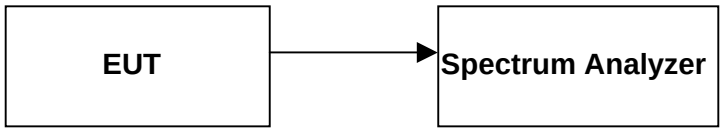


Fig. 2. Dimensions of Outdoor Test Site

DESCRIPTION OF TEST

Modulated Bandwidth (6dB Bandwidth)

Test Setup

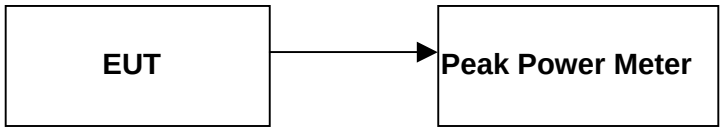


Test Procedure

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



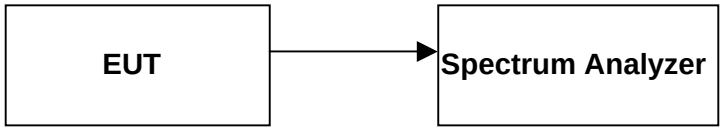
Test Procedure

The transmitter output is connected to the peak power meter.

DESCRIPTION OF TEST

Conducted Spurious Emission

Test Setup

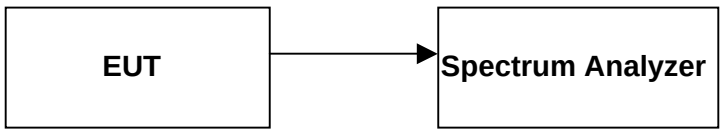


Test Procedure

The transmitter output is connected to the spectrum analyzer.
The RBW of spectrum analyzer is set to 100KHz and VBW is set to the 100KHz.
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 : A3LWBS24COMBO
Test Mode : set to each channel.

Frequency (MHz)	Level(dBμV)		Line	Limit(dBμV)		Margin(dB)	
	Q-Peak	Average		Q-Peak	Average	Q-Peak	Average
0.15	46.1	35.8	Line	66.0	56.0	19.9	20.2
0.21	51.1	51.0	Line	63.2	53.2	12.1	2.2
0.28	34.7	36.2	N	60.8	50.8	26.1	14.6
0.34	44.1	45.6	N	59.2	49.2	15.1	3.6
0.41	45.6	45.6	Line	57.6	47.6	12.0	2.0
0.55	40.0	40.0	Line	56.0	46.0	16.0	6.0

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

Baek Sung Hun

*Tested by **S. H. Baek***

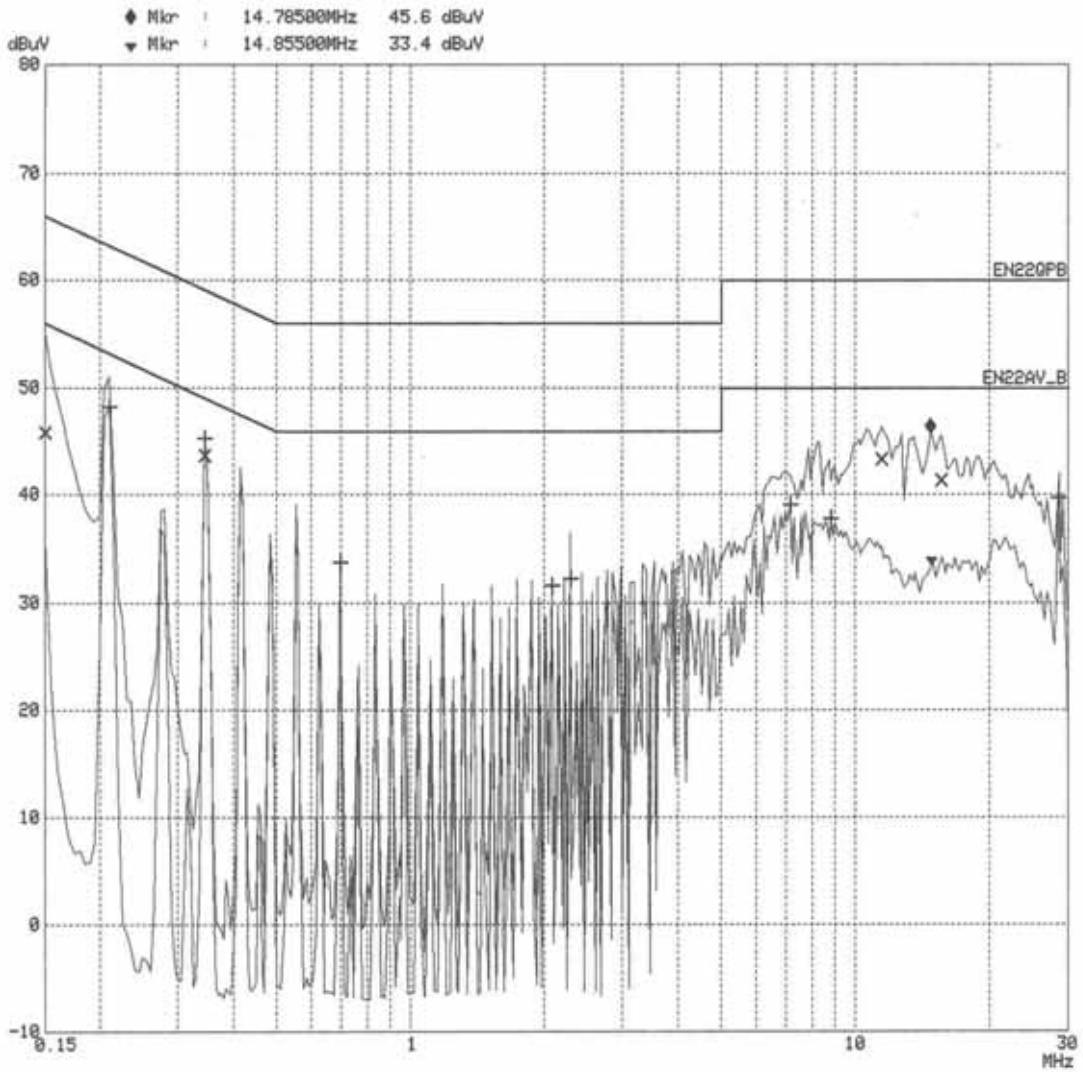
PLOTS OF EMISSIONS

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

```
Scan Settings (1 Range)
¦--------- Frequencies -----------¦¦--------- Receiver Settings ---------¦
   Start        Stop         Step      IF BW  Detector  M-Time  Atten Preamp
 150k          30M          5k          9k    PK+AV     20ms AUTO LN    OFF

Transducer No. Start       Stop       Name
             1   150k        30M      CE_LINE

Final Measurement: x QP / + AV
                   Meas Time:  200 ms
                   Subranges:    8
                   Acc Margin:  15dB
```



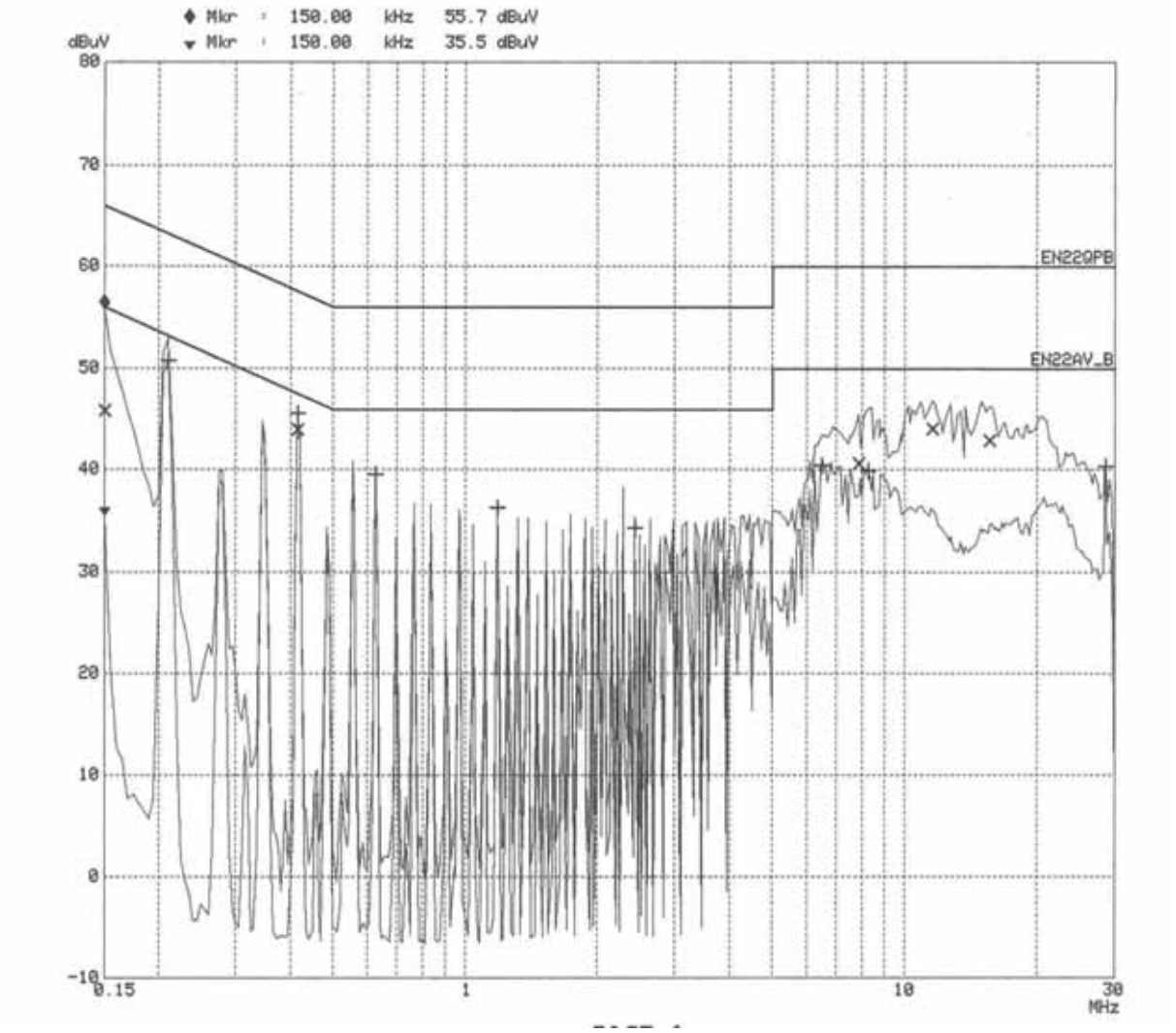
PLOTS OF EMISSIONS

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

```
Scan Settings (1 Range)
¦--------- Frequencies -----------¦¦--------- Receiver Settings ---------¦
   Start        Stop         Step      IF BW  Detector  M-Time  Atten Preamp
 150k          30M           5k          9k     PK+AV     20ms AUTO LN    OFF

Transducer No. Start       Stop       Name
            1   150k        30M      CE_LINE

Final Measurement: x QP / + AV
                   Meas Time:   200 ms
                   Subranges:     8
                   Acc Margin:  15dB
```



TEST DATA

Radiated Emissions(general requirements)-15.209

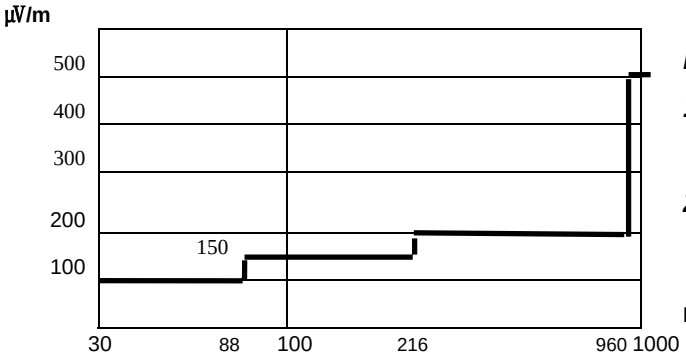
FCC ID : A3LWBS24COMBO
Test Mode :

The test data show the worst emission level from Lowest channel and Middle channel and Highest channel

Frequency (MHz)	Reading (dBμV)	Pol* (H/V)	AF+CL+Amp (dB)**	Result (dBμV/m)	Limit (dBμV/m)	Margin (dB)
297.72	49.9	H	-11.4	38.5	46.0	7.5
373.38	47.7	H	-9.4	38.3	46.0	7.7
394.72	50.1	H	-8.8	41.3	46.0	4.7
572.23	42.4	H	-4.4	38.0	46.0	8.0
600.36	43.0	H	-3.6	39.4	46.0	6.6
721.61	40.3	H	-0.4	39.9	46.0	6.1

** : Harmonics of the highest fundamental frequency.*

Table 1. Radiated Measurements at 3meters



NOTES:

1. All modes of operation were investigated the worst-case emission are 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. Up to the 10th harmonics were investigated according to §15.33 and the worst –case is reported.

Baek sung Hun

Tested by ***S. H. Baek***

TEST DATA

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

FCC ID : A3LWBS24COMBO

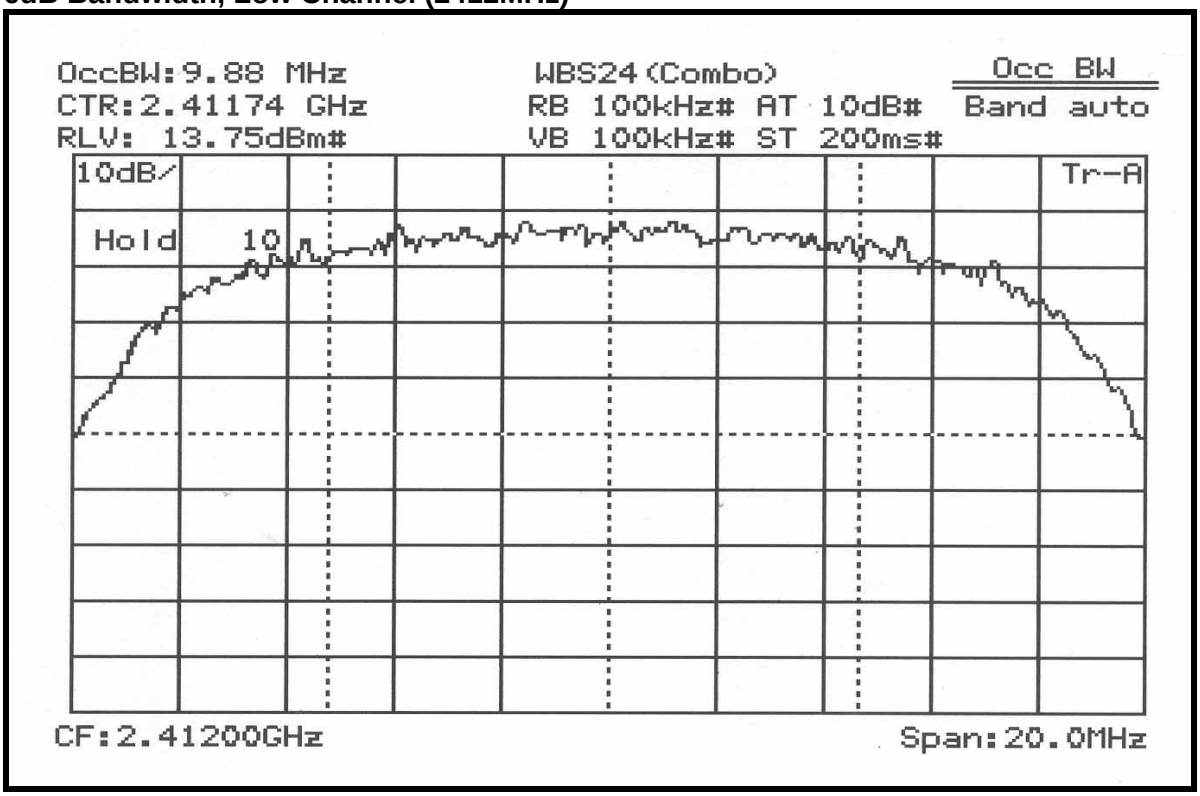
Test Mode : set to Lowest channel and Middle channel and Highest channel

Channel	Frequency (MHz)	Result (KHz)	Limit (KHz)	Margin (KHz)
1	2412	9880	500	9380
6	2437	9920	500	9420
11	2462	9560	500	9050

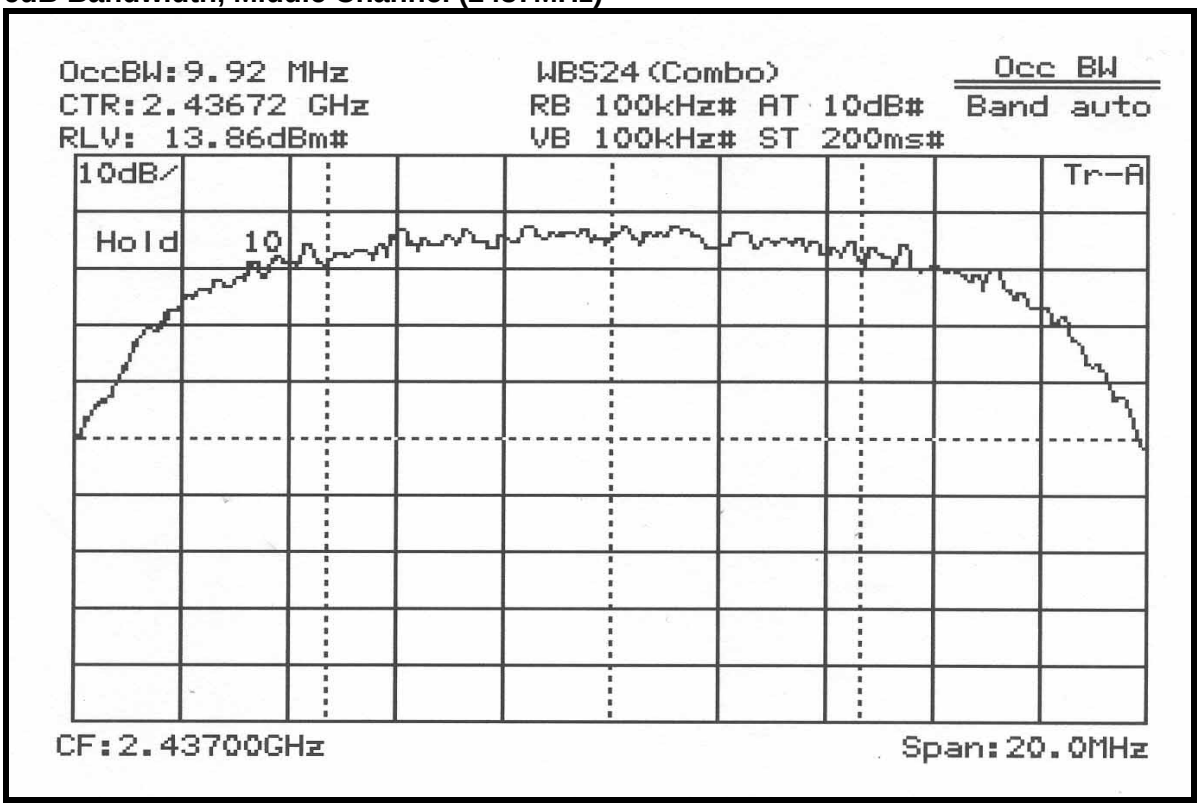
Tested by ***S. H. Baek***

PLOT OF TEST DATA

6dB Bandwidth, Low Channel (2412MHz)

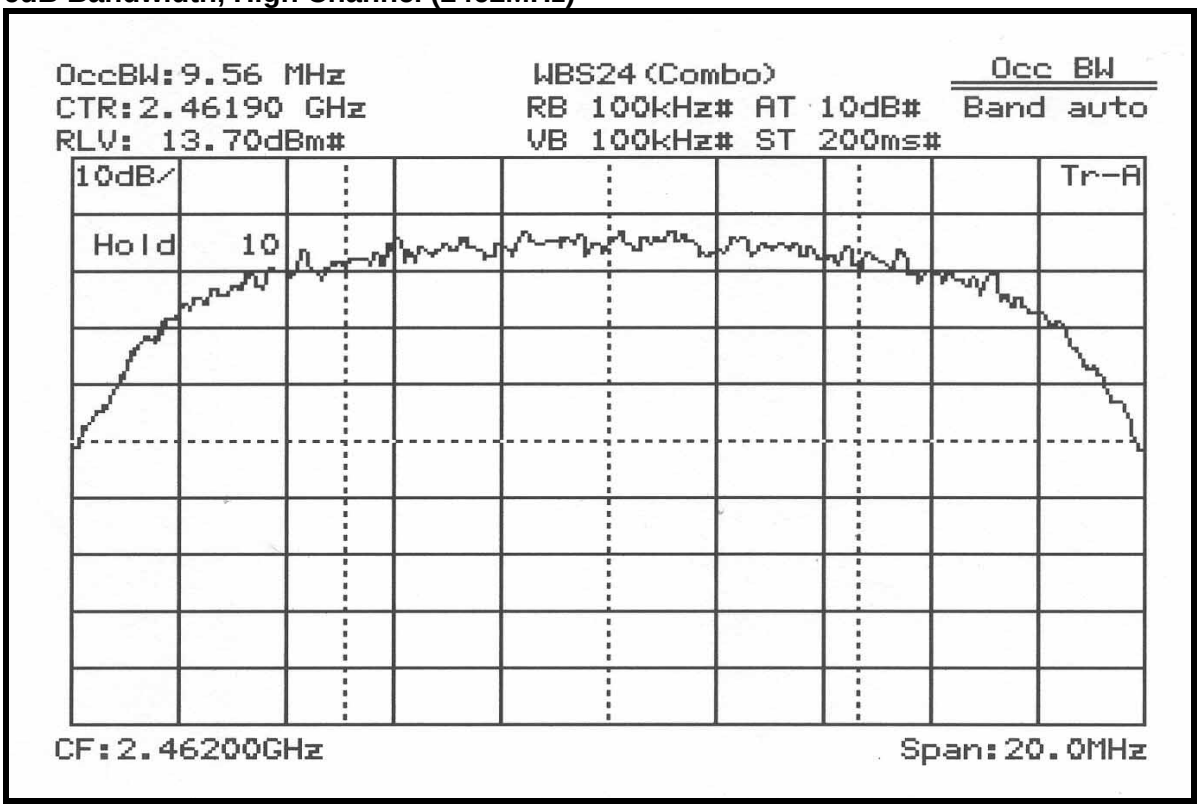


6dB Bandwidth, Middle Channel (2437MHz)



PLOT OF TEST DATA

6dB Bandwidth, High Channel (2462MHz)



TEST DATA

Peak Power Output-15.247(b)

FCC ID : A3LWBS24COMBO

Test Mode : set to Lowest channel and Middle channel and Highest channel

Channel	Frequency (MHz)	Result (dBm)	Limit (dBm)	Margin (dBm)
1	2412	14.49	30	-15.51
6	2437	14.33	30	-15.67
11	2462	13.60	30	-16.40

Tested by ***S. H. Baek***

TEST DATA

Conducted Spurious Emission-15.247(c)

FCC ID : A3LWBS24COMBO
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 : A3LWBS24COMBO
Test Mode : set to Lowest channel and Middle channel and Highest channel

***)The result of EUT was under 20dB below fundamental.**

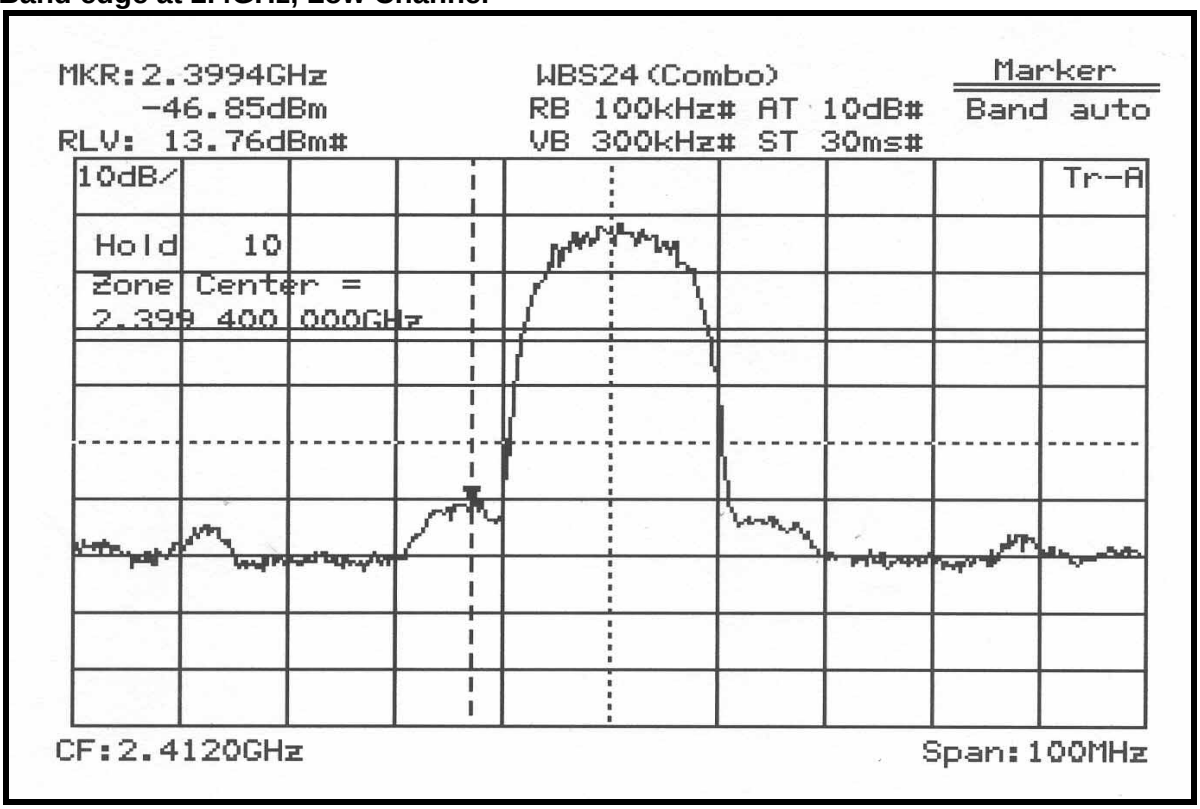
Channel	Frequency (MHz)	Pol (H/V)	*)Result (dBuV)	Fundamental (dBuV/m)	Margin (dB)
1	2412	H	Under 20dB below fundamental	47.2	
1	2412	V	Under 20dB below fundamental	64.0	
6	2437	H	Under 20dB below fundamental	47.7	
6	2437	V	Under 20dB below fundamental	65.7	
11	2462	H	Under 20dB below fundamental	52.2	
11	2462	V	Under 20dB below fundamental	63.0	

Baek sung khun

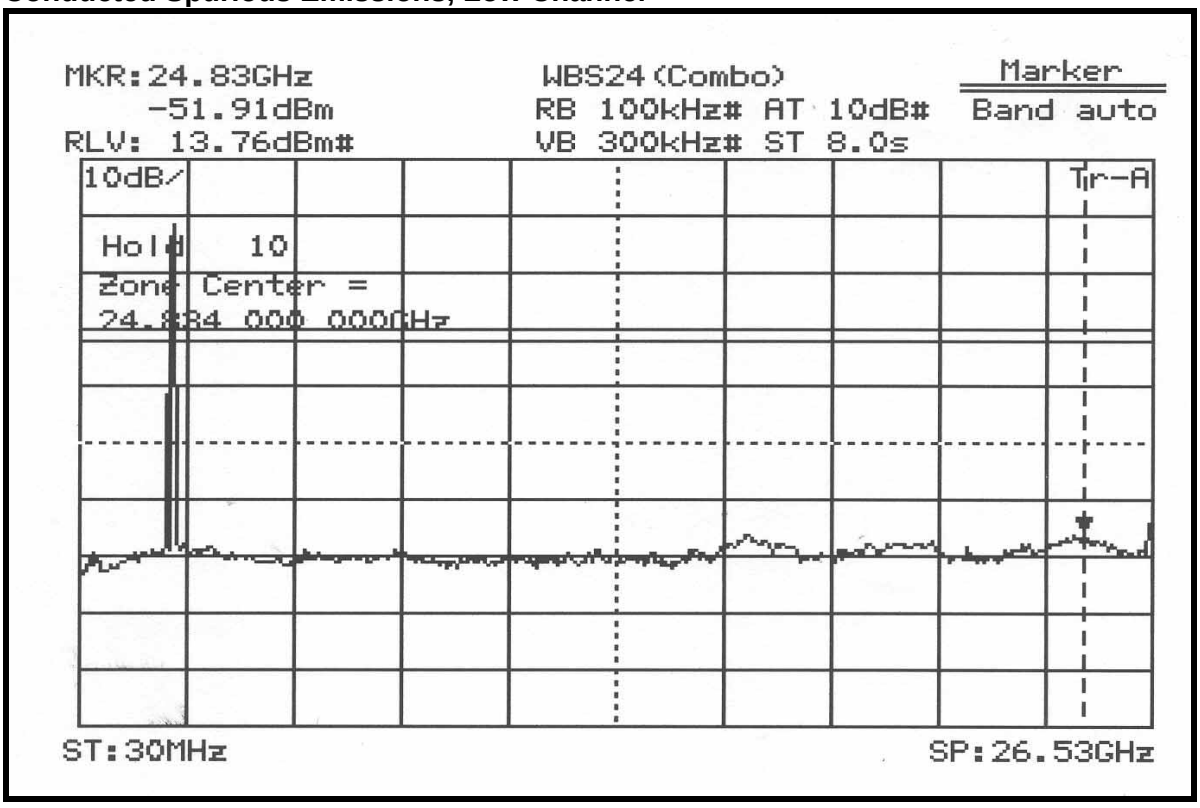
Tested by ***S. H. Baek***

PLOT OF TEST DATA

Band edge at 2.4GHz, Low Channel

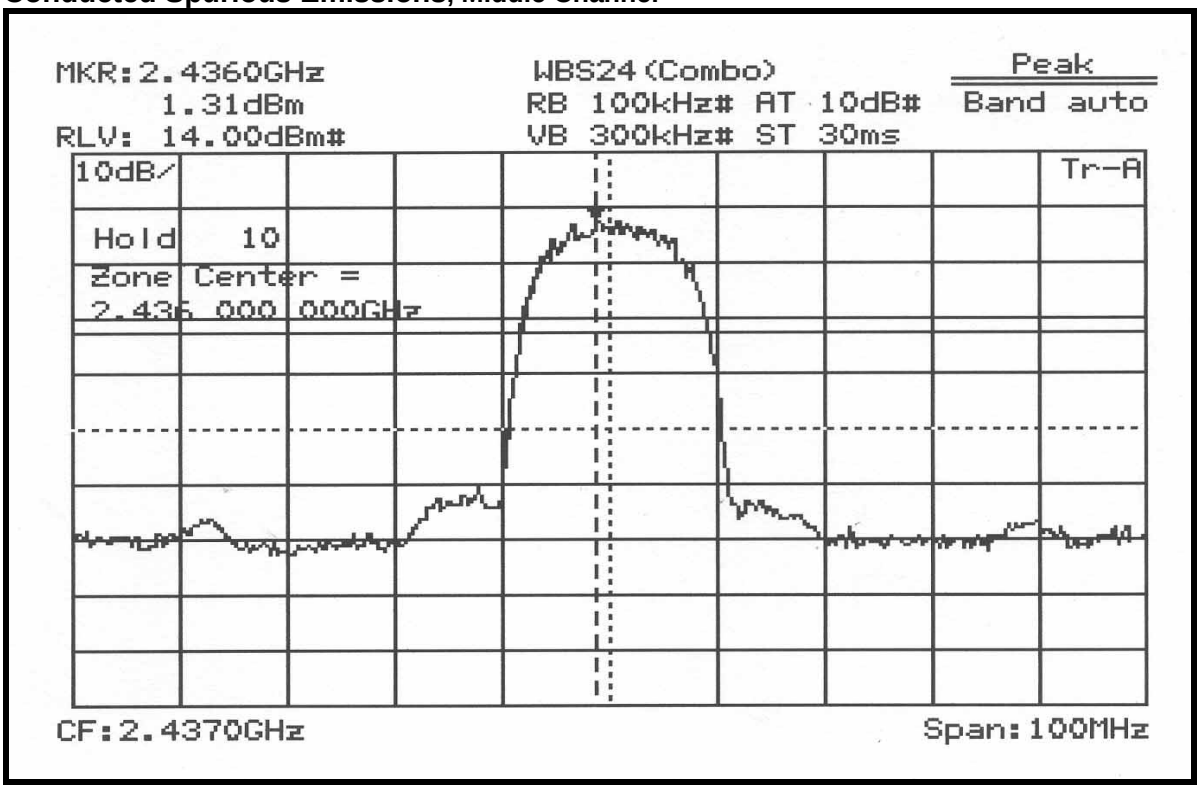


Conducted Spurious Emissions, Low Channel

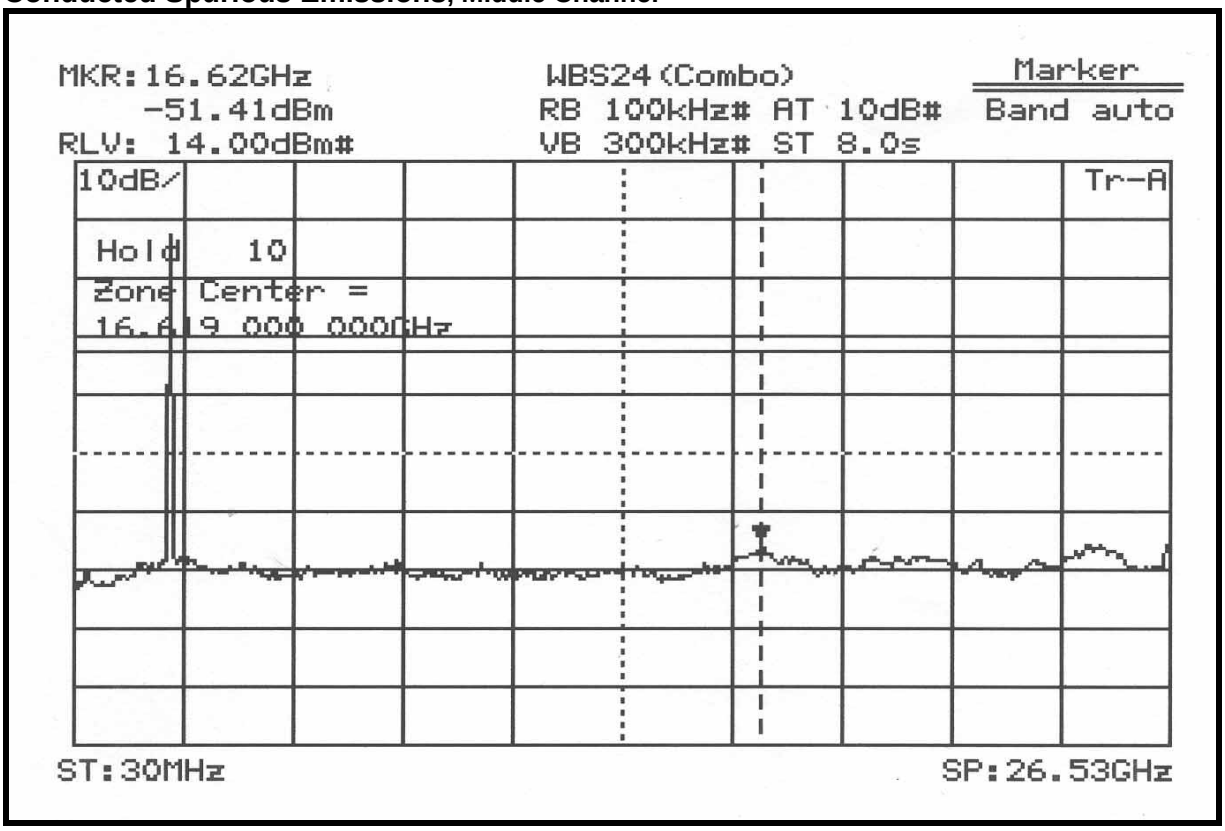


PLOT OF TEST DATA

Conducted Spurious Emissions, Middle Channel

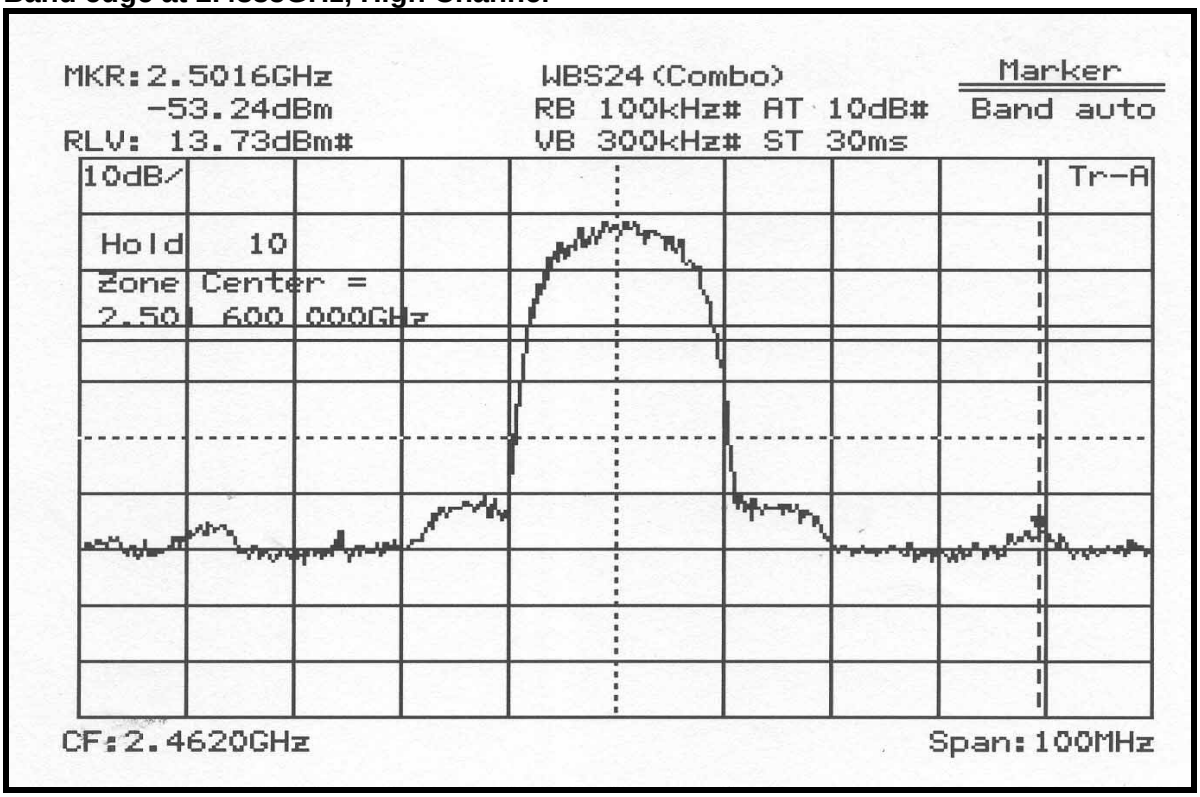


Conducted Spurious Emissions, Middle Channel

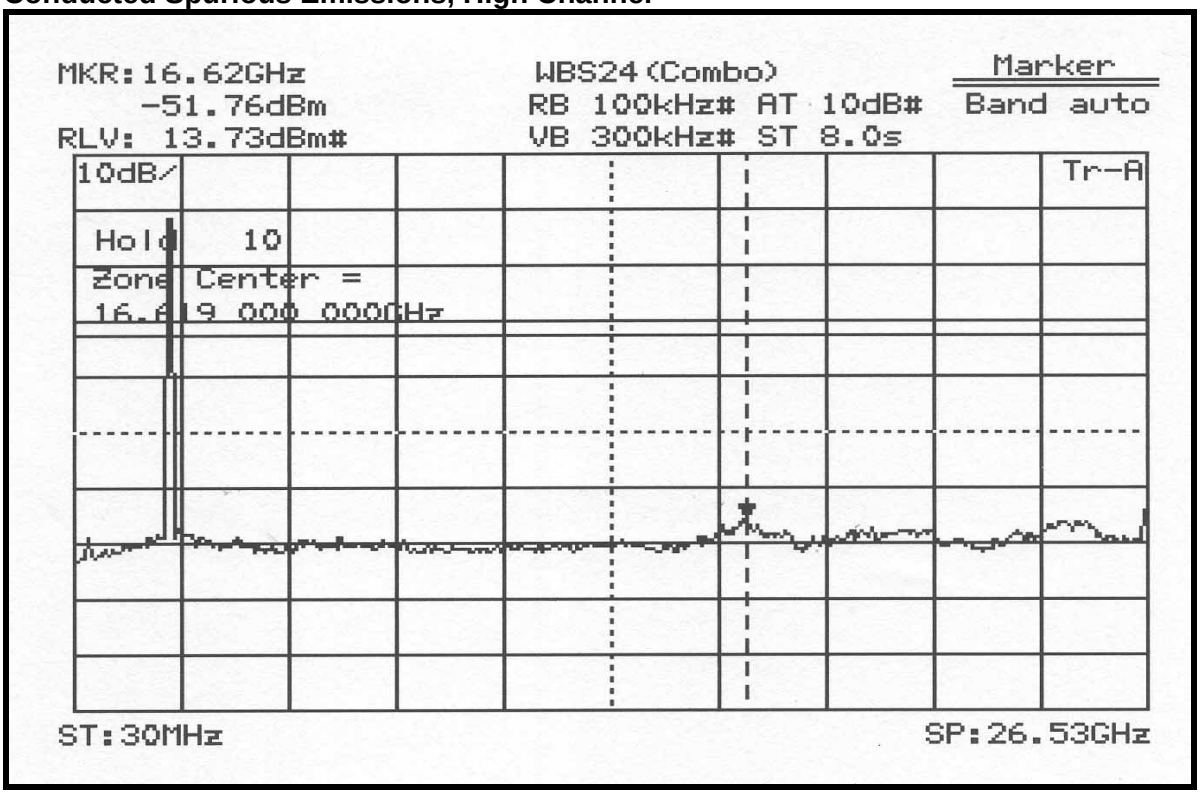


PLOT OF TEST DATA

Band edge at 2.4835GHz, High Channel

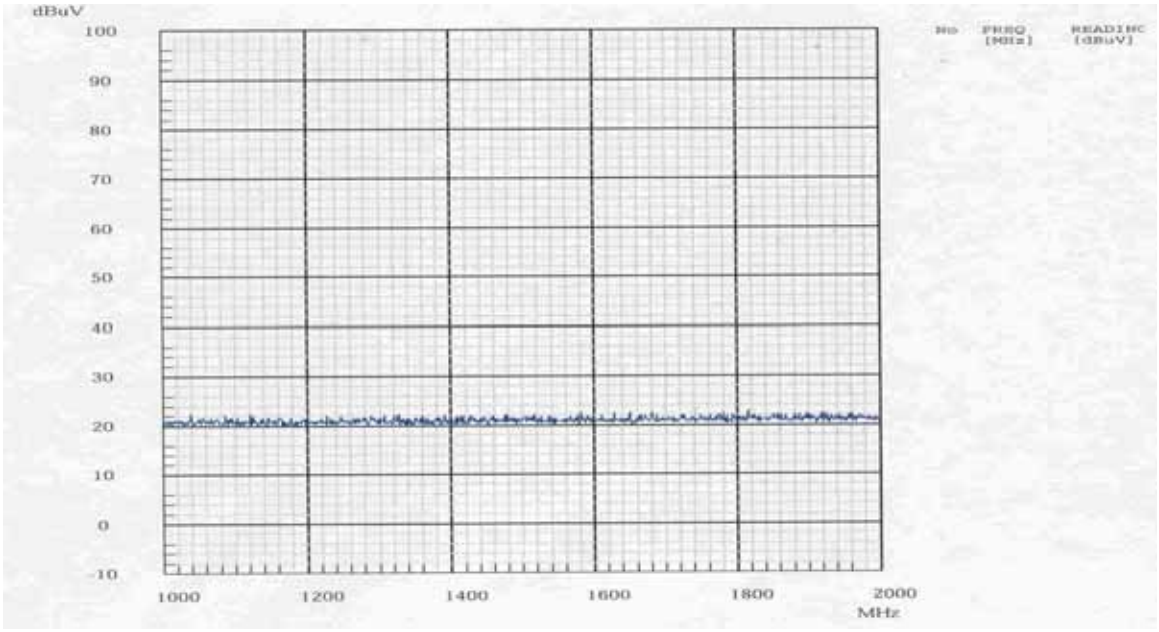


Conducted Spurious Emissions, High Channel

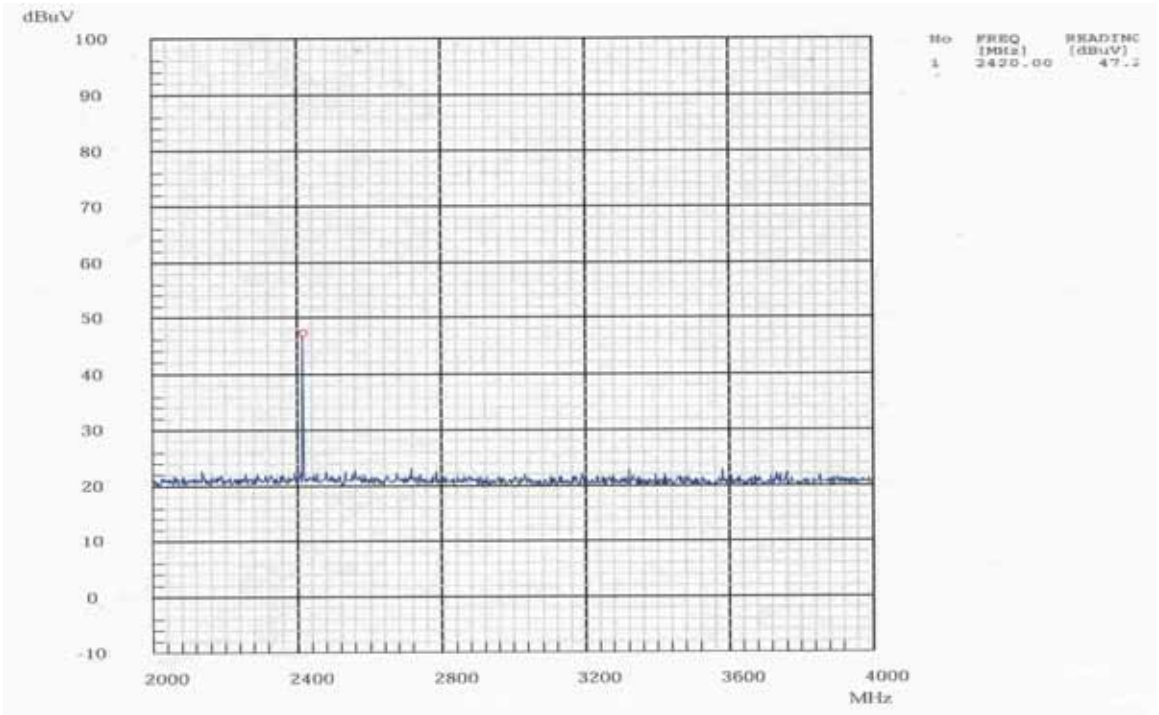


PLOT OF TEST DATA

Radiated Spurious Emissions, low Channel(Horizontal)

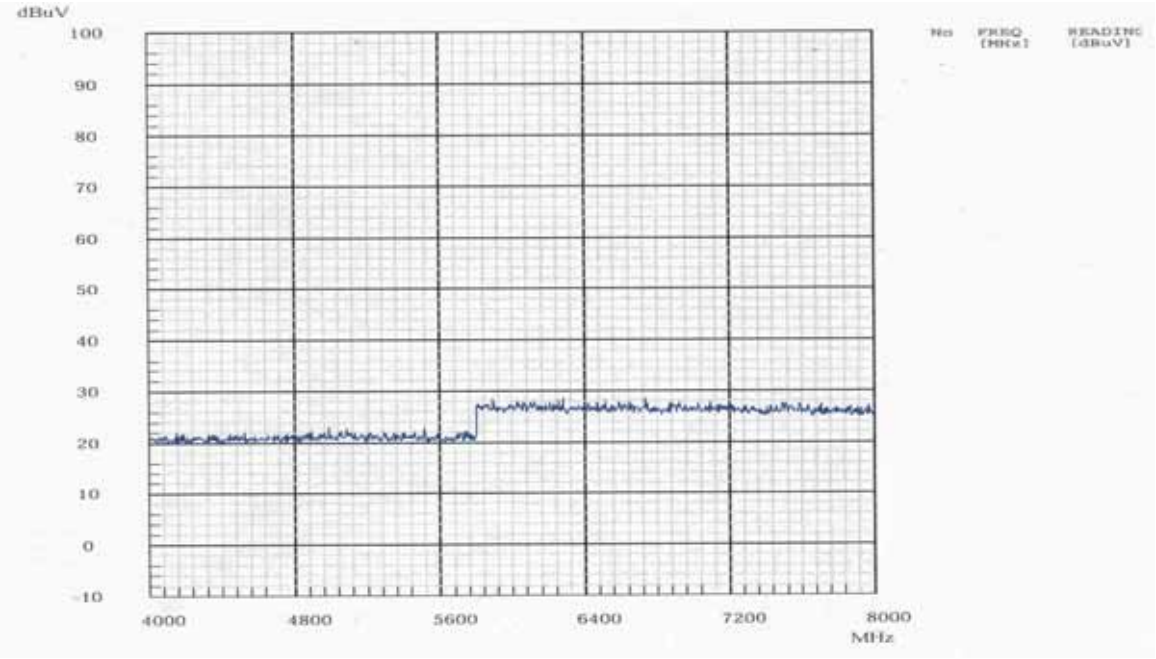


Radiated Spurious Emissions, low Channel(Horizontal)

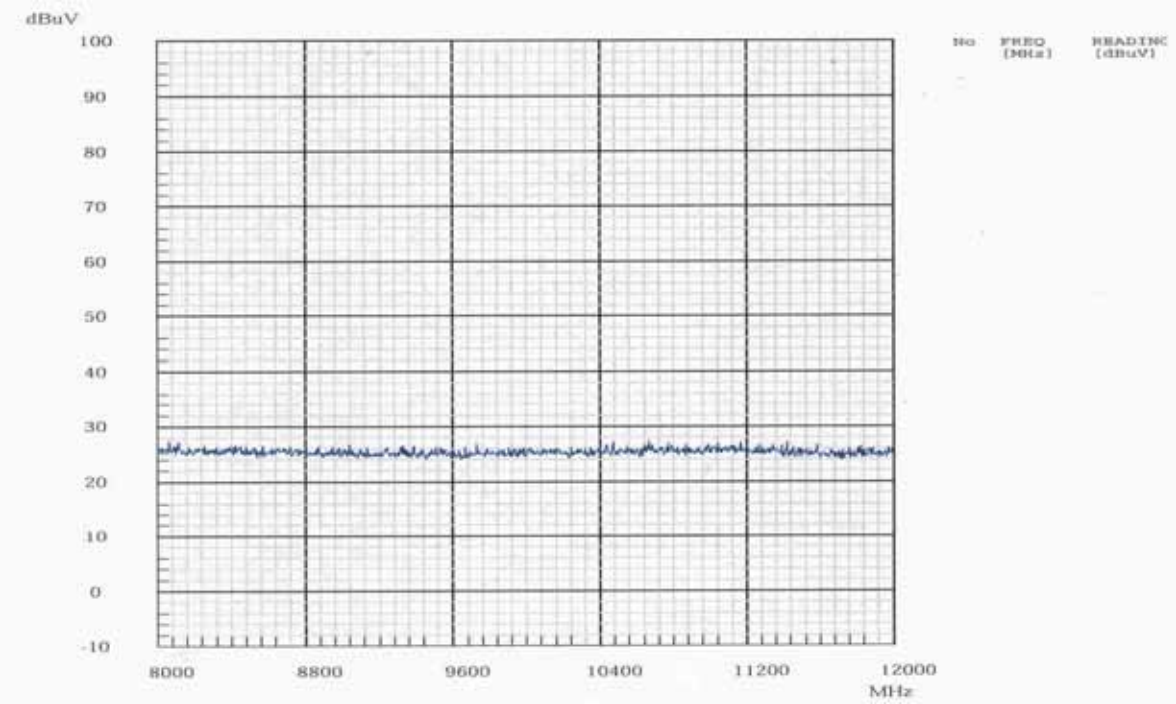


PLOT OF TEST DATA

Radiated Spurious Emissions, low Channel(Horizontal)

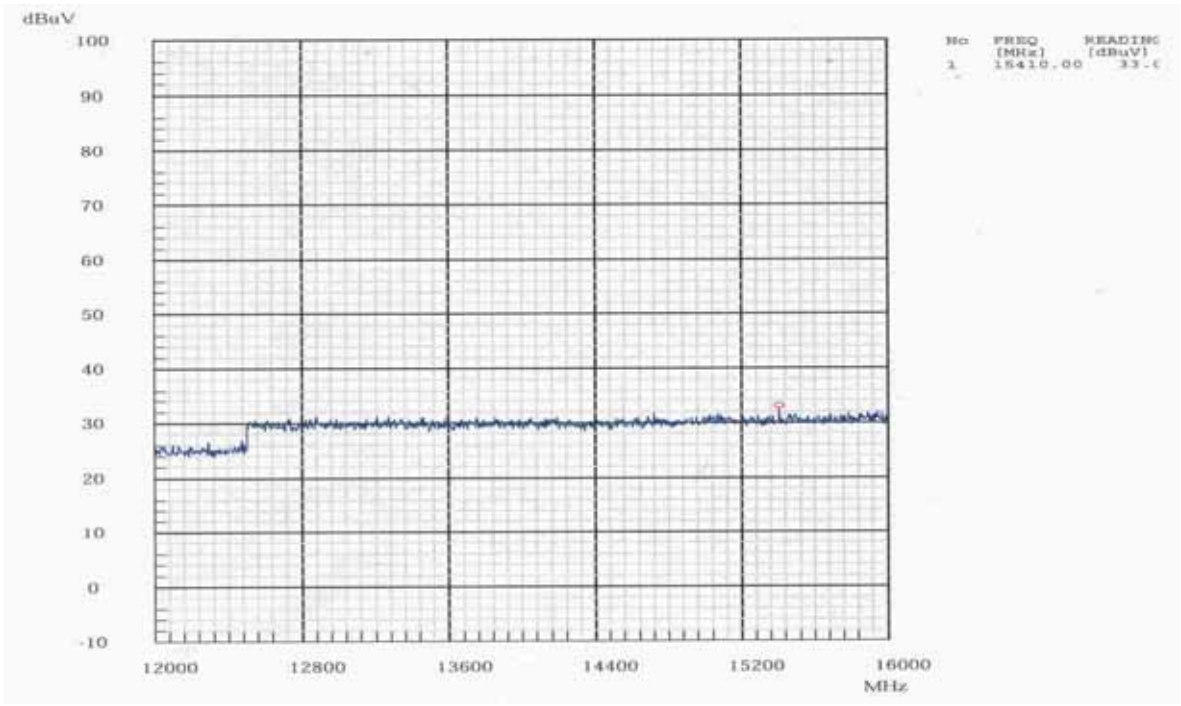


Radiated Spurious Emissions, low Channel(Horizontal)

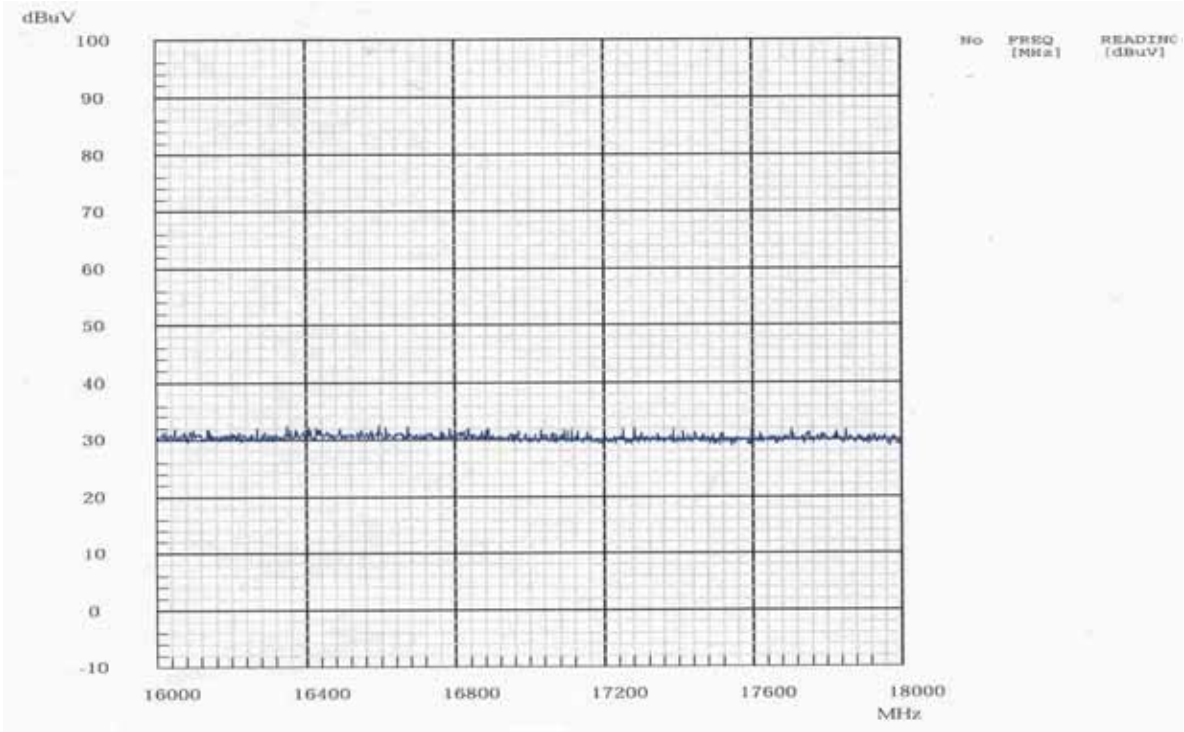


PLOT OF TEST DATA

Radiated Spurious Emissions, low Channel(Horizontal)

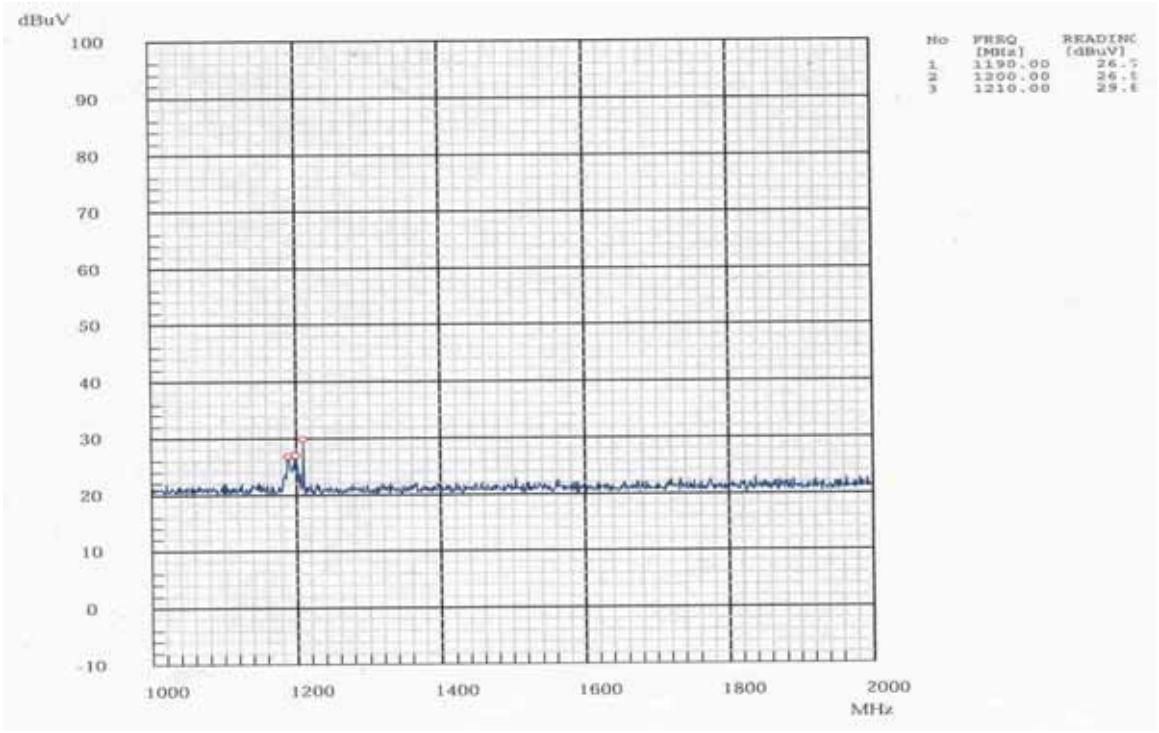


Radiated Spurious Emissions, low Channel(Horizontal)

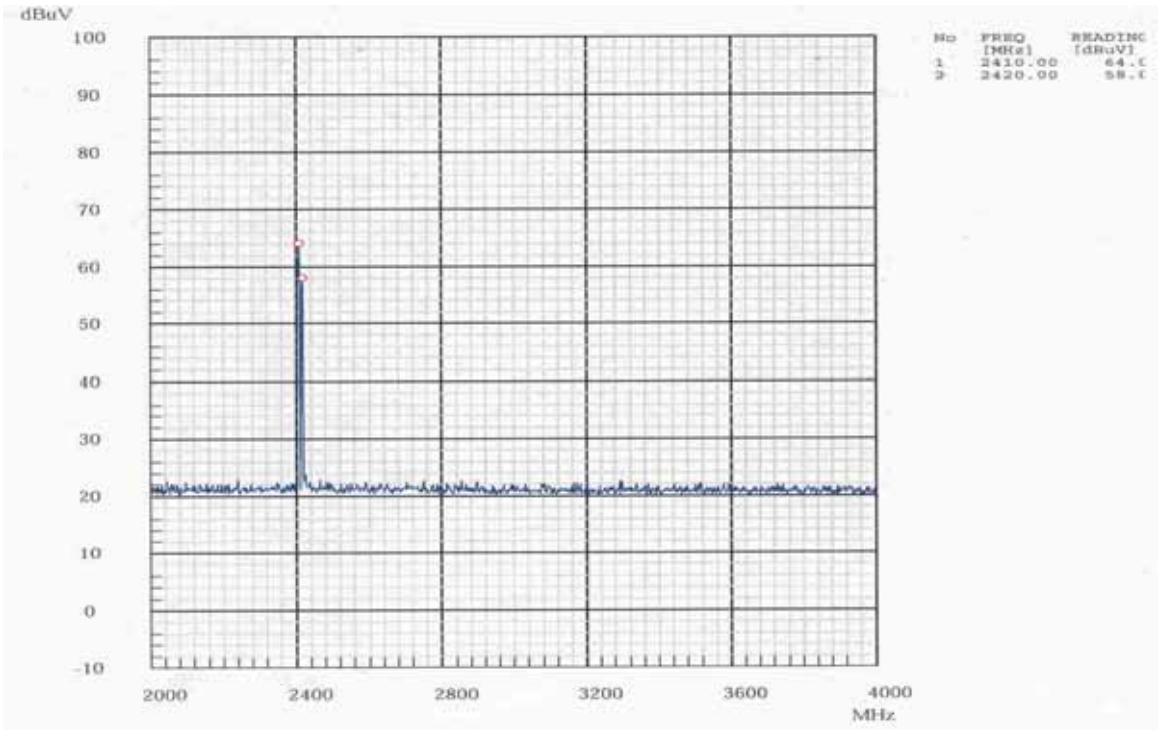


PLOT OF TEST DATA

Radiated Spurious Emissions, low Channel(Vertical)

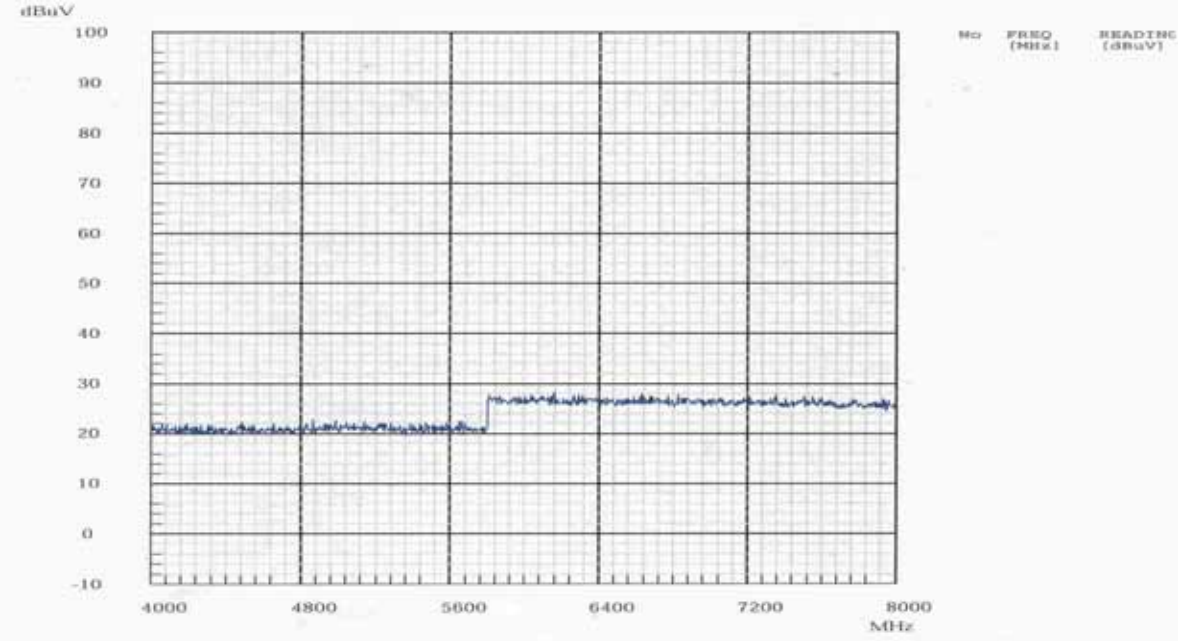


Radiated Spurious Emissions, low Channel(Vertical)

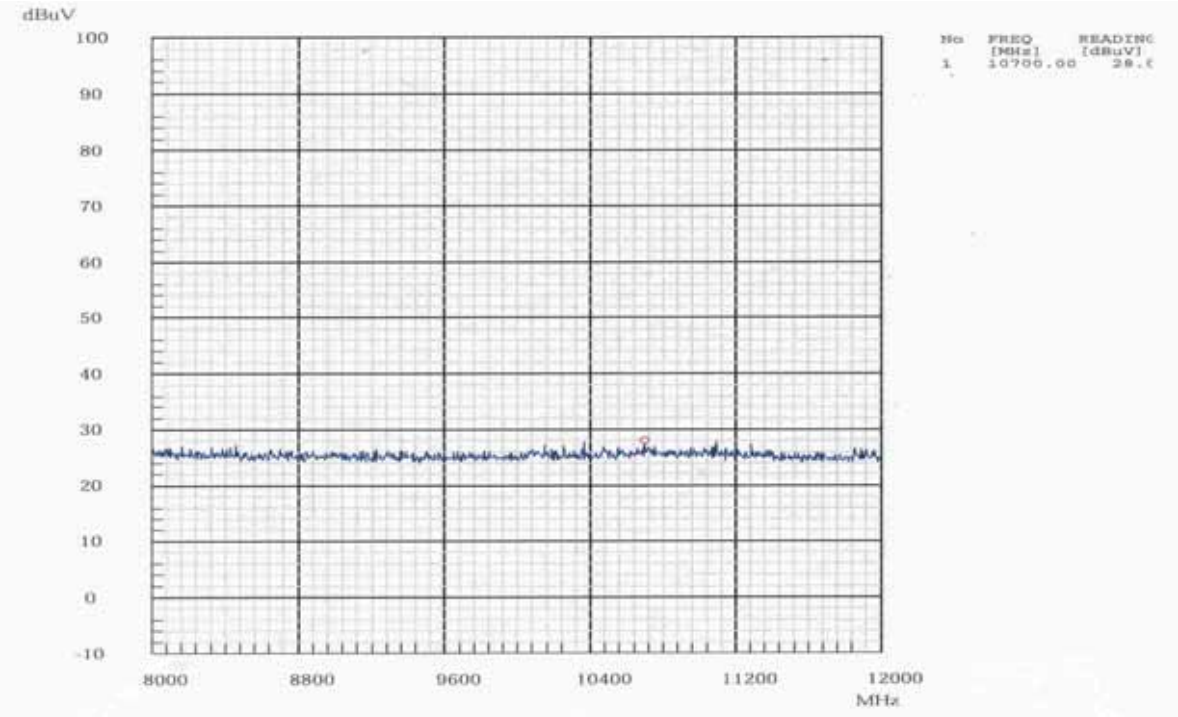


PLOT OF TEST DATA

Radiated Spurious Emissions, low Channel(Vertical)

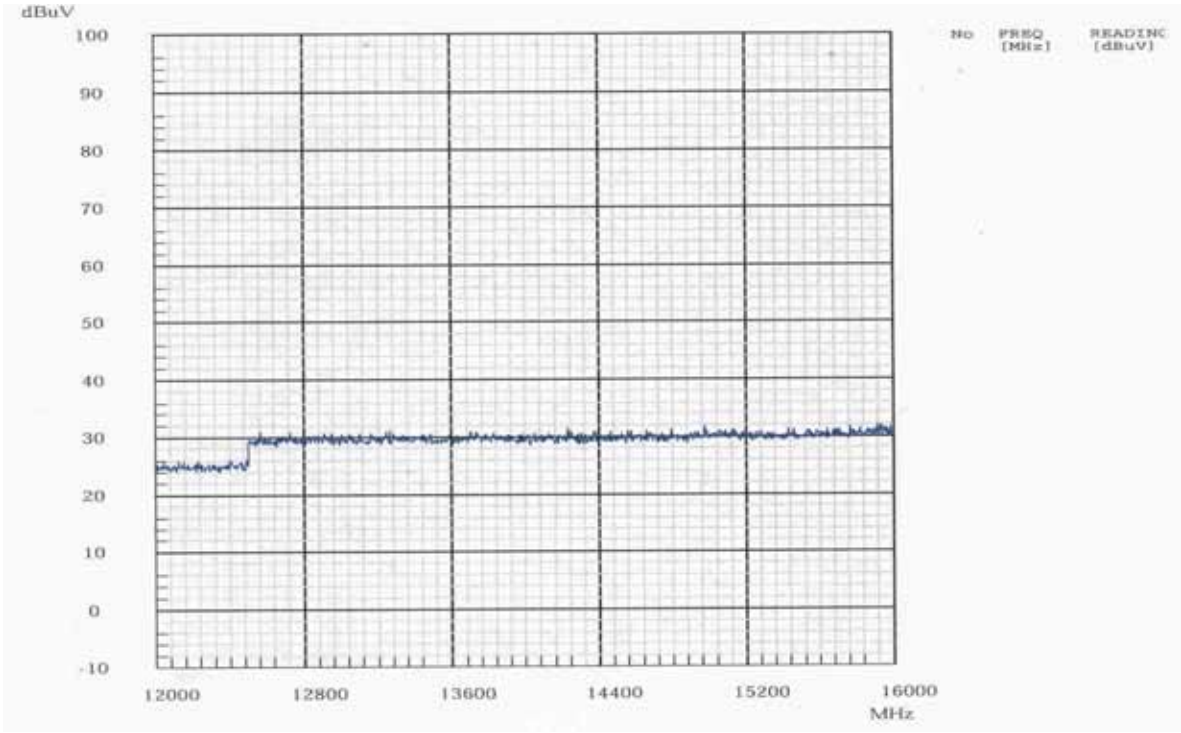


Radiated Spurious Emissions, low Channel(Vertical)

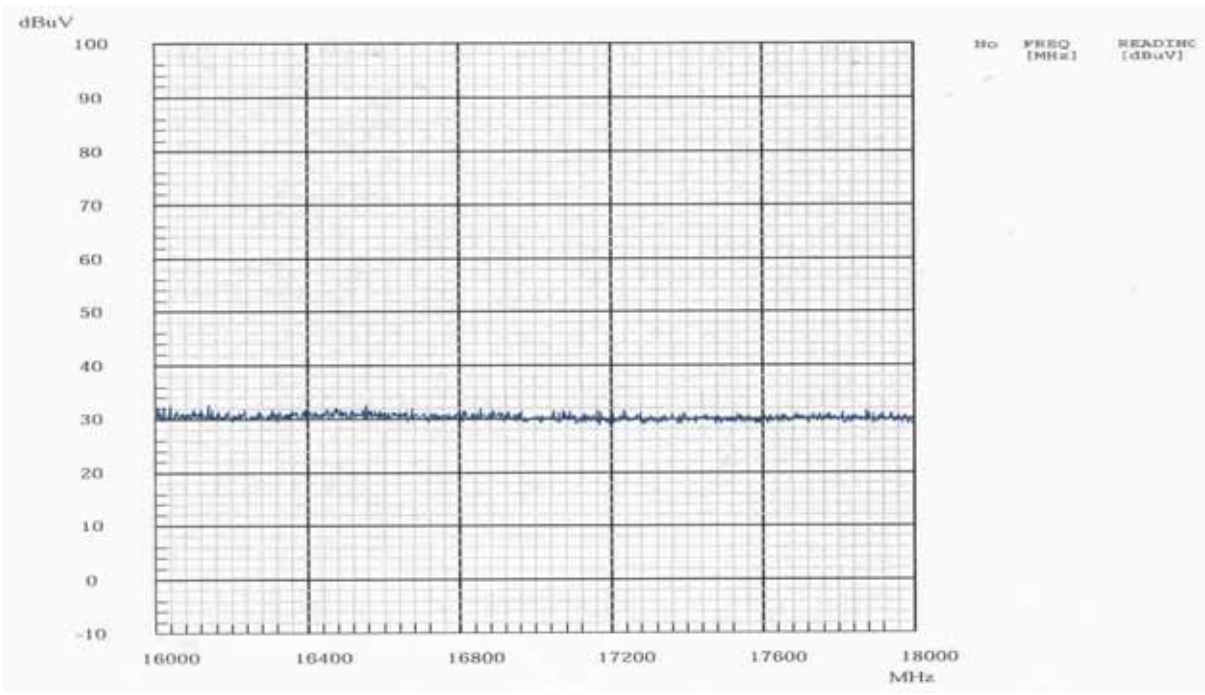


PLOT OF TEST DATA

Radiated Spurious Emissions, low Channel(Vertical)

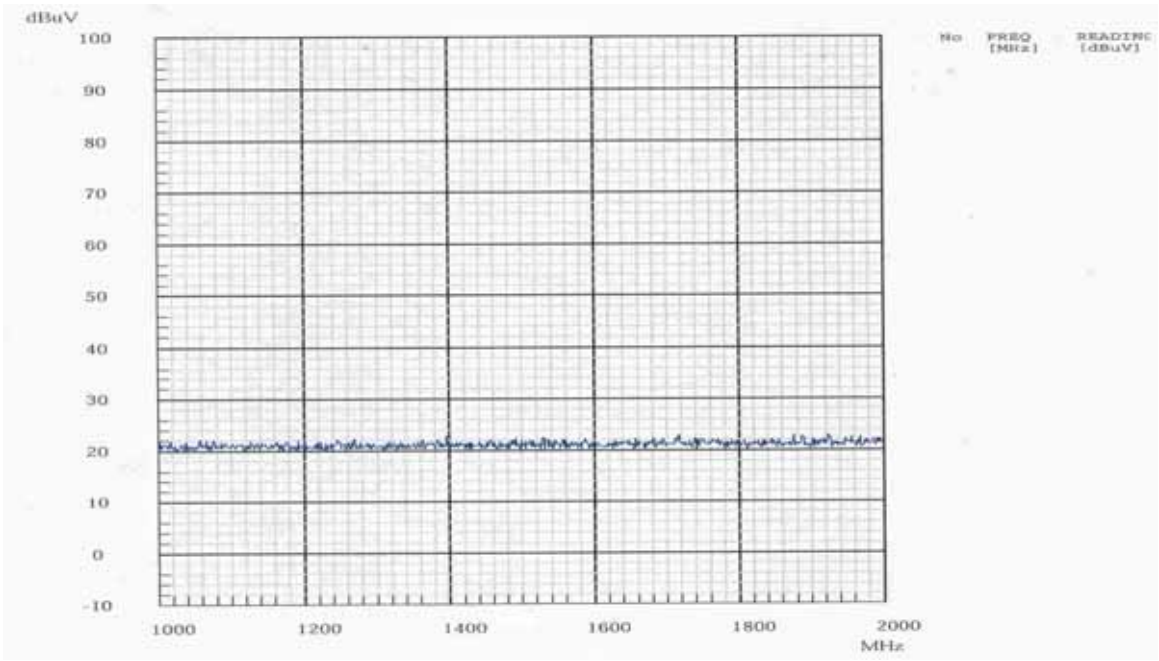


Radiated Spurious Emissions, low Channel(Vertical)

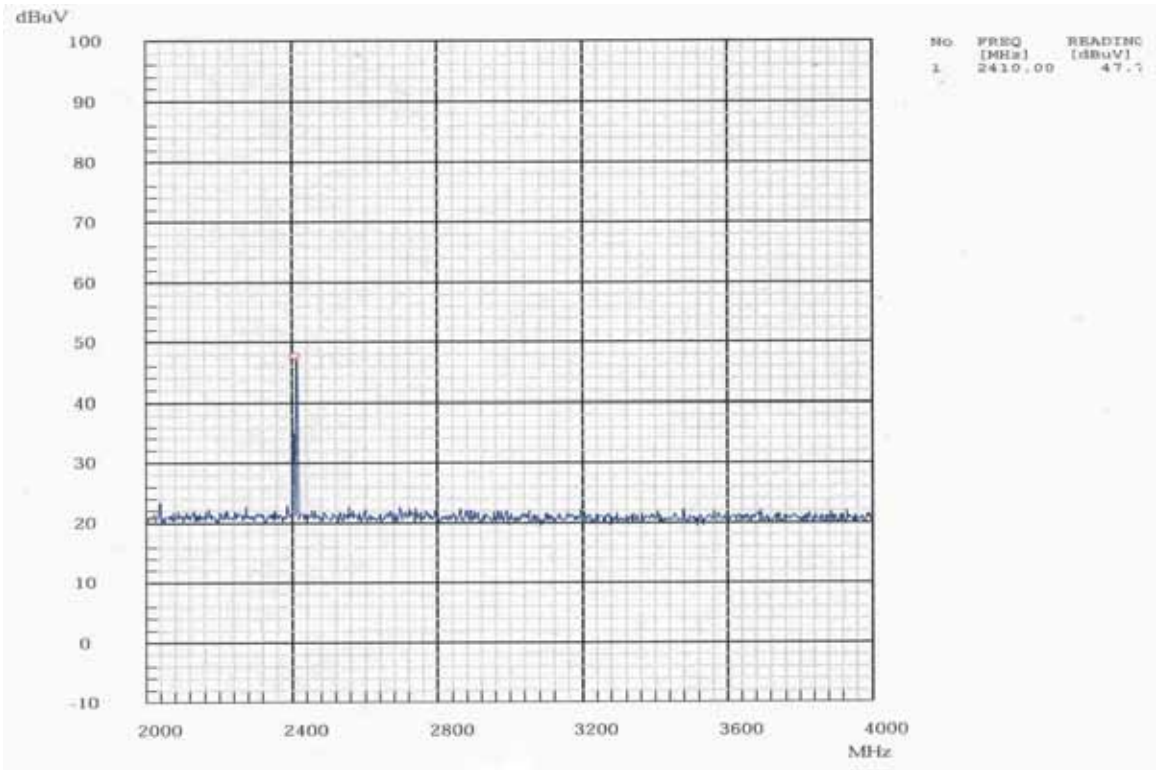


PLOT OF TEST DATA

Radiated Spurious Emissions, middle Channel(Horizontal)

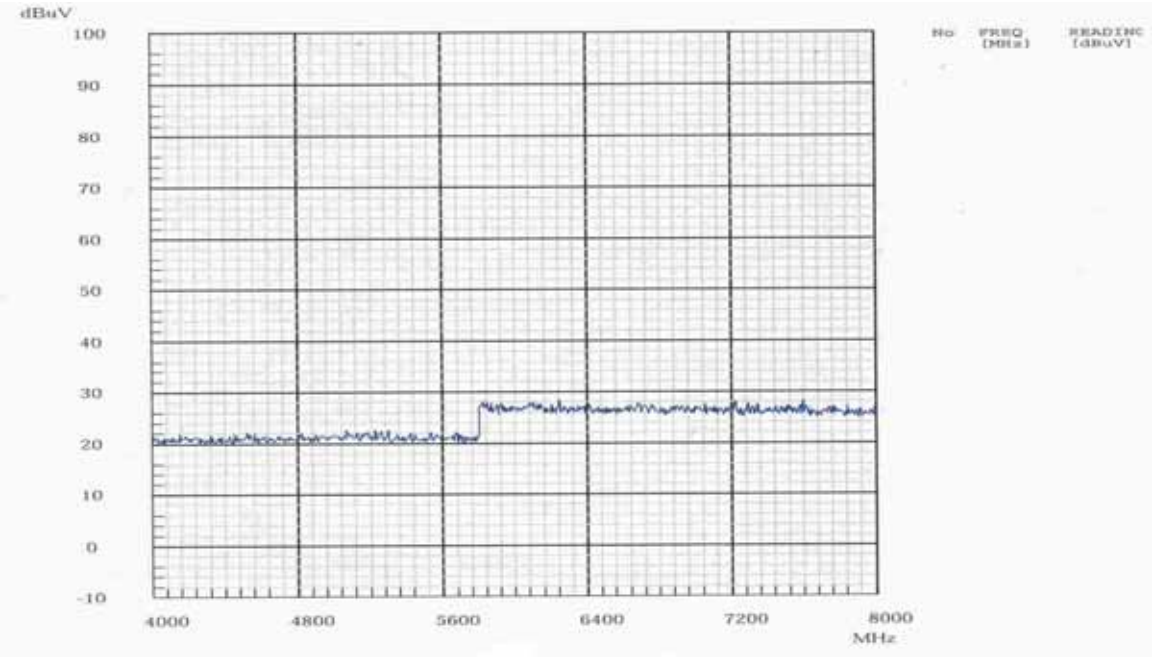


Radiated Spurious Emissions, middle Channel(Horizontal)

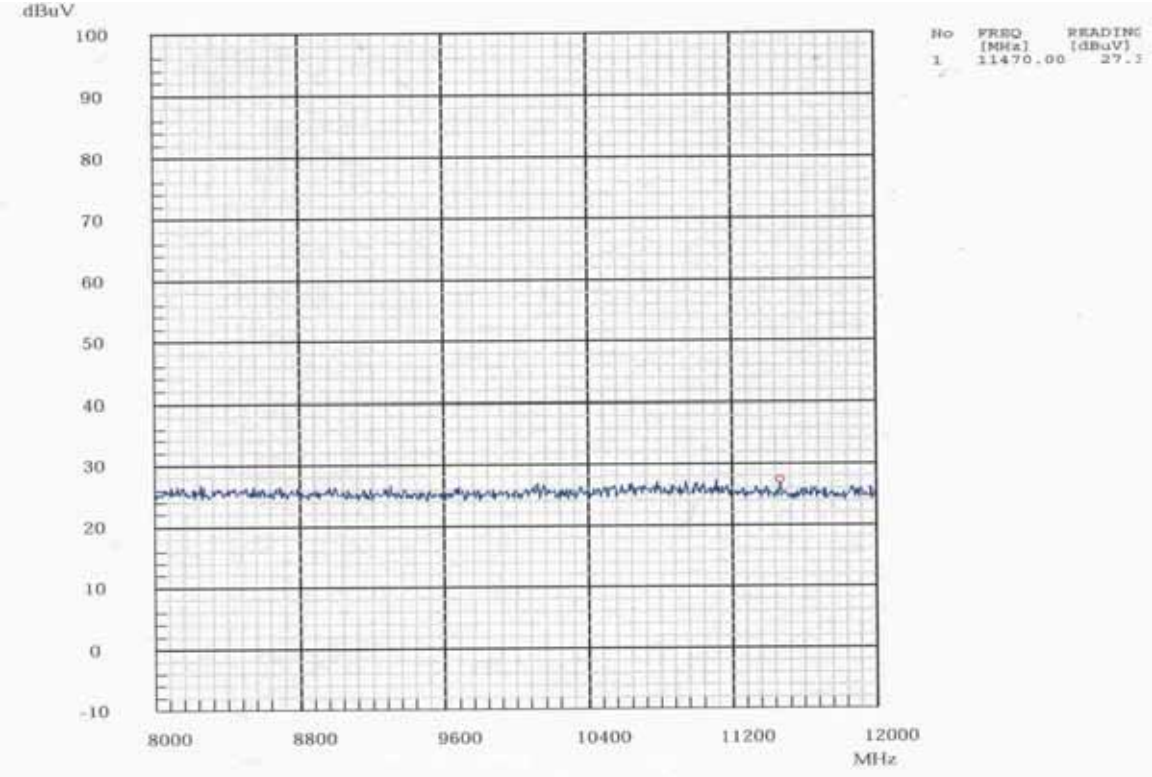


PLOT OF TEST DATA

Radiated Spurious Emissions, middle Channel(Horizontal)

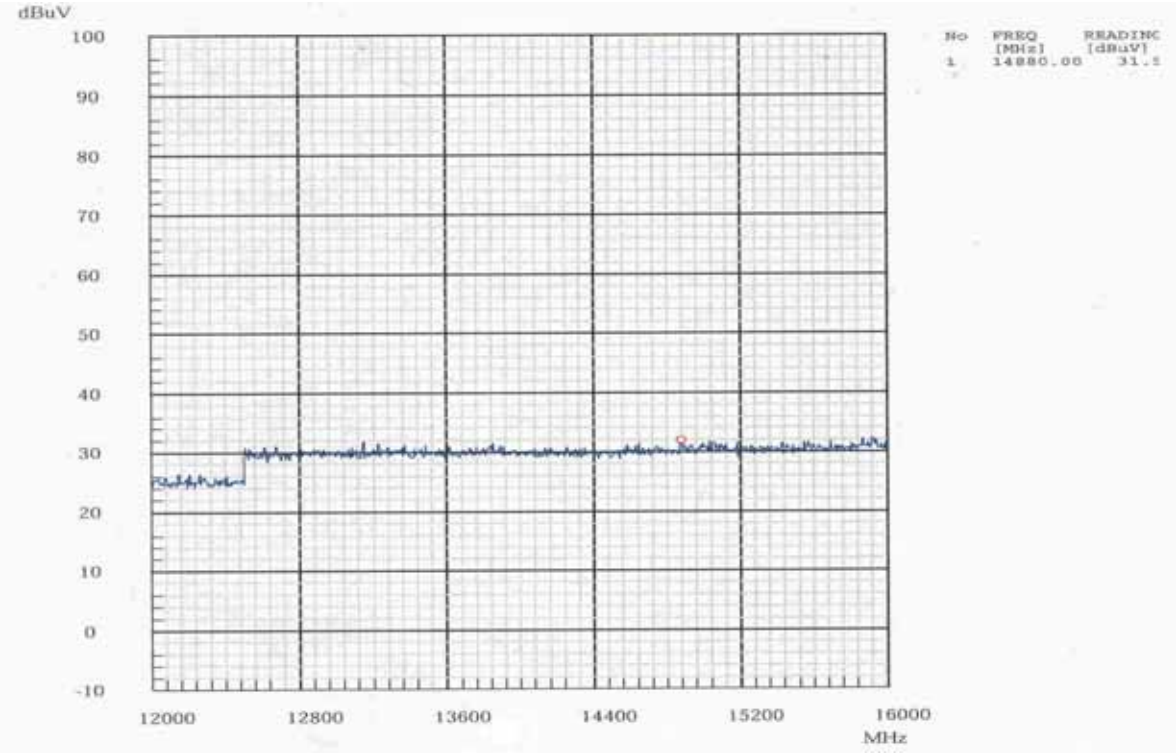


Radiated Spurious Emissions, middle Channel(Horizontal)

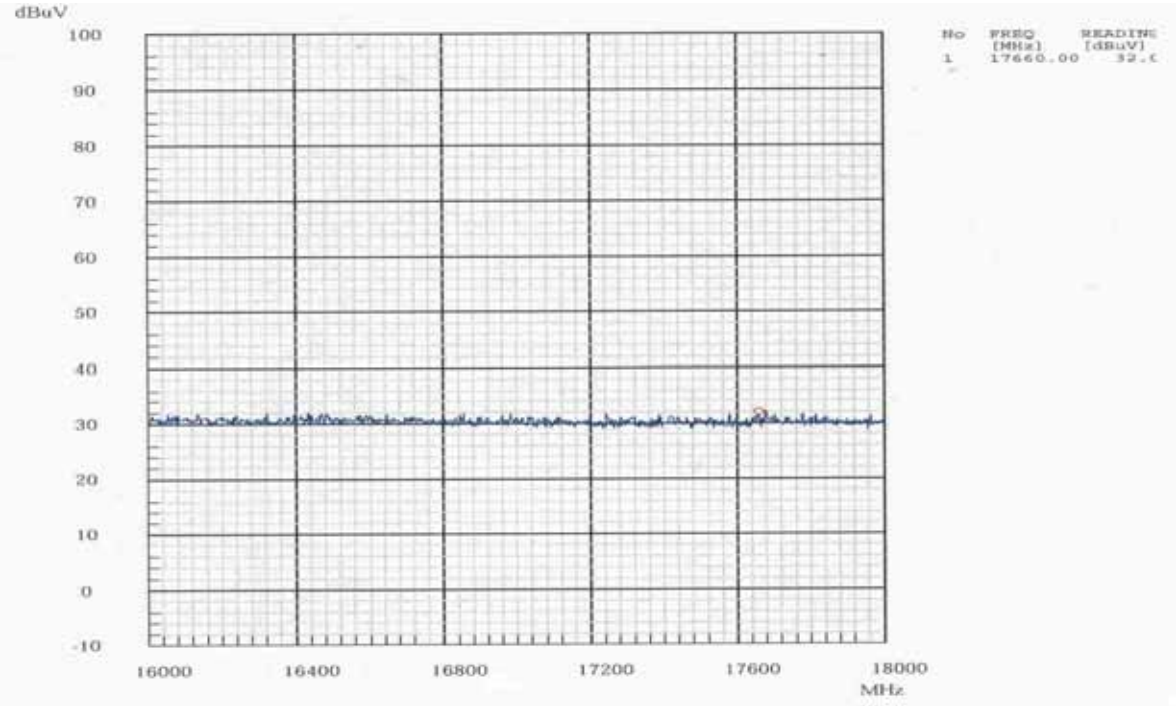


PLOT OF TEST DATA

Radiated Spurious Emissions, middle Channel(Horizontal)

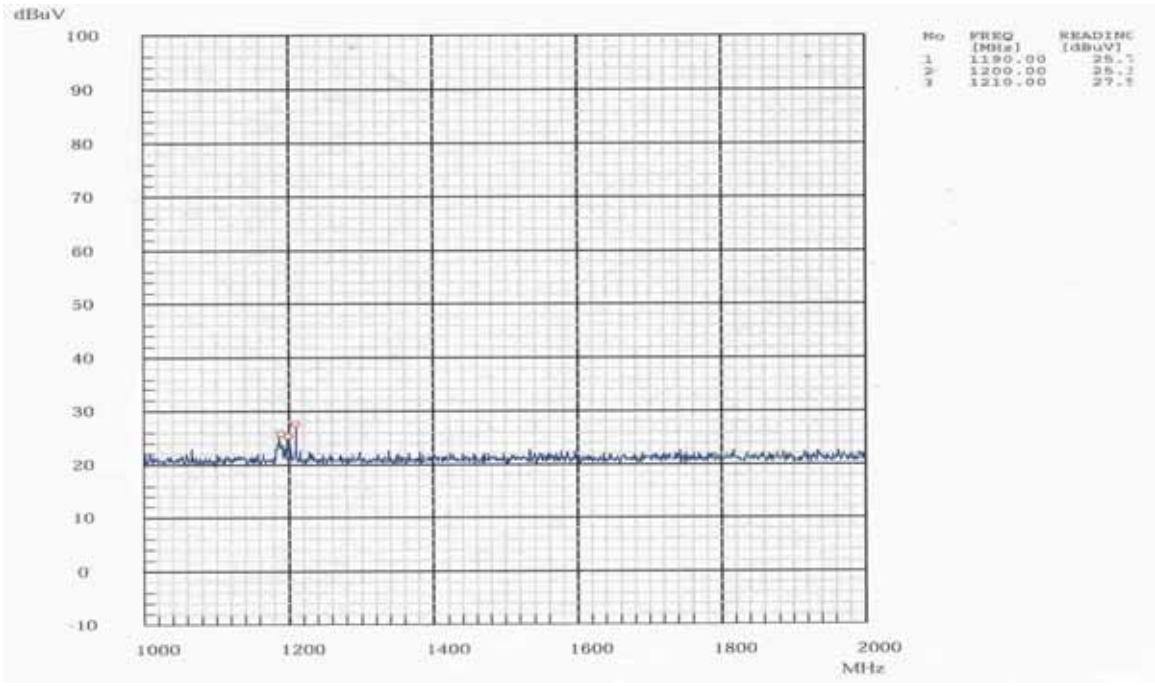


Radiated Spurious Emissions, middle Channel(Horizontal)

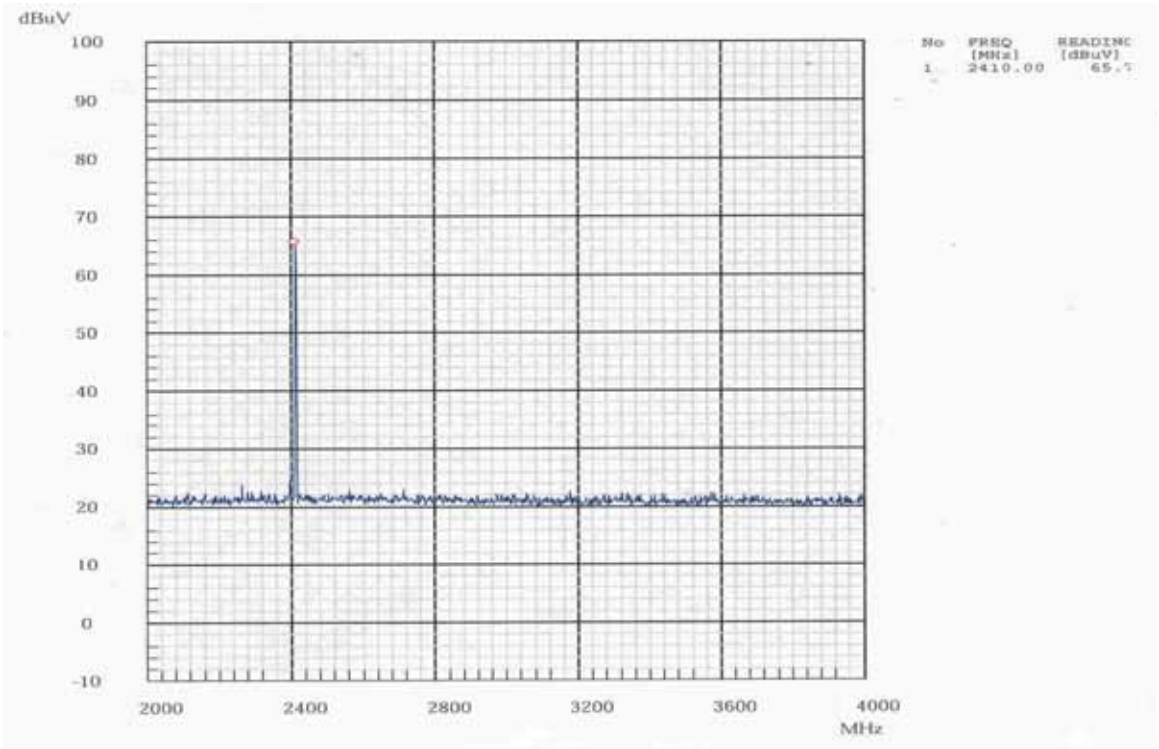


PLOT OF TEST DATA

Radiated Spurious Emissions, middle Channel(Vertical)

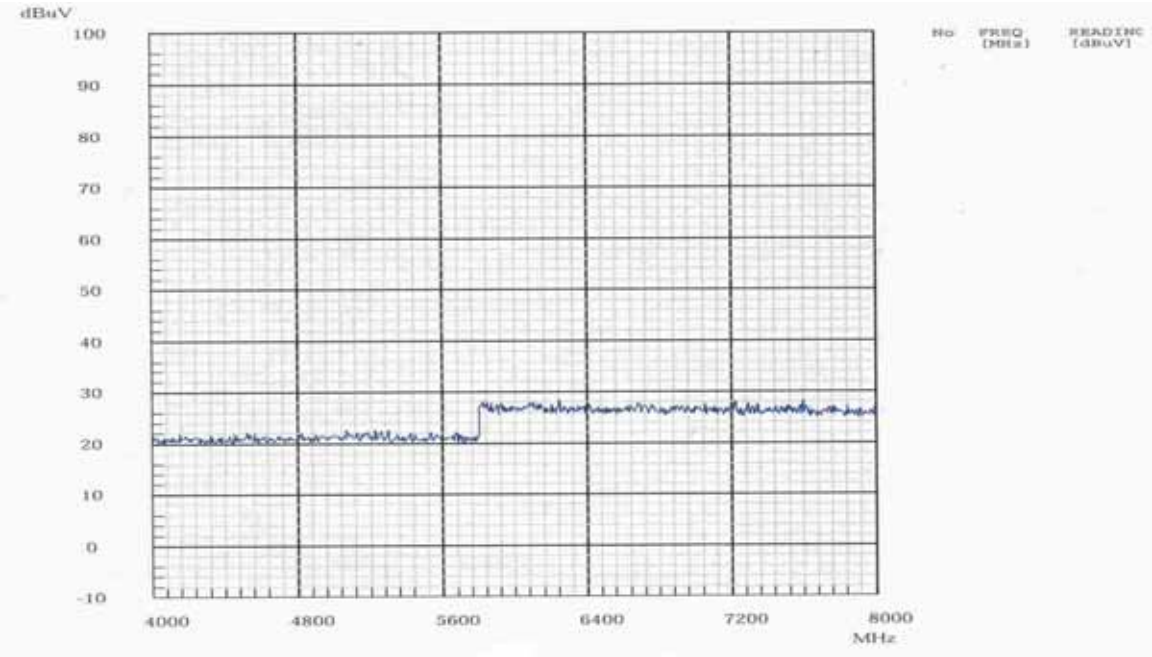


Radiated Spurious Emissions, middle Channel(Vertical)

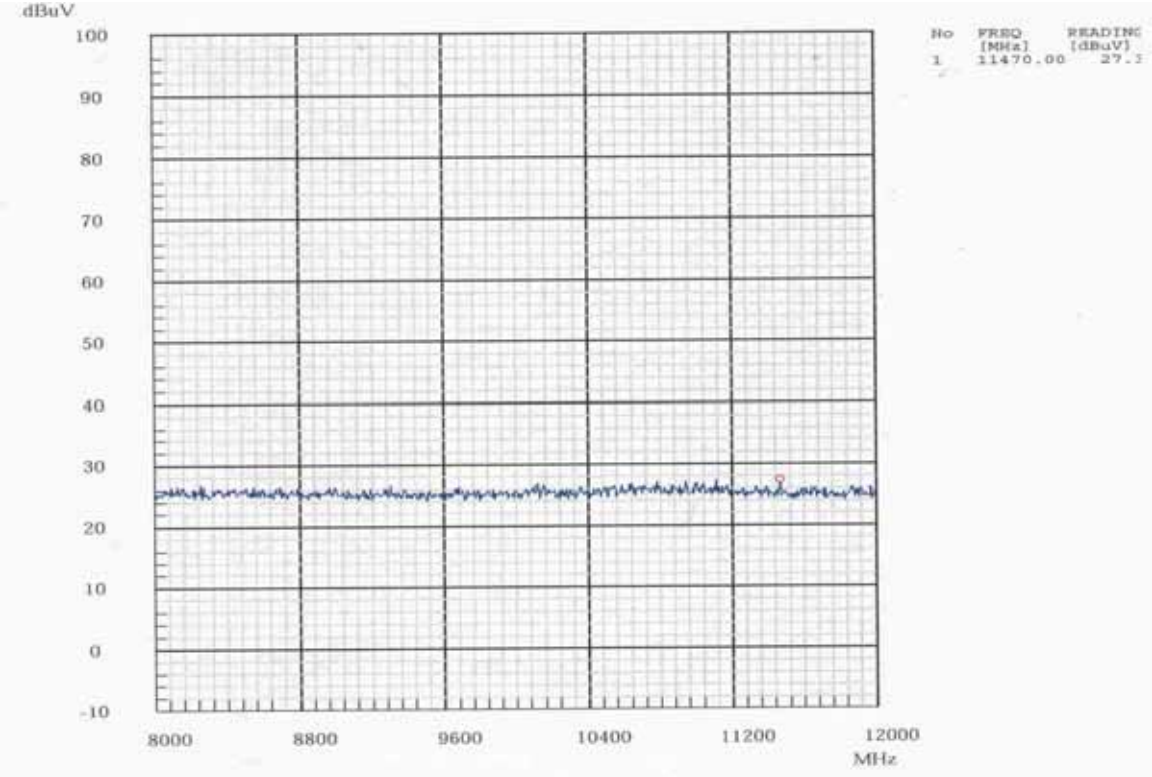


PLOT OF TEST DATA

Radiated Spurious Emissions, middle Channel(Vertical)

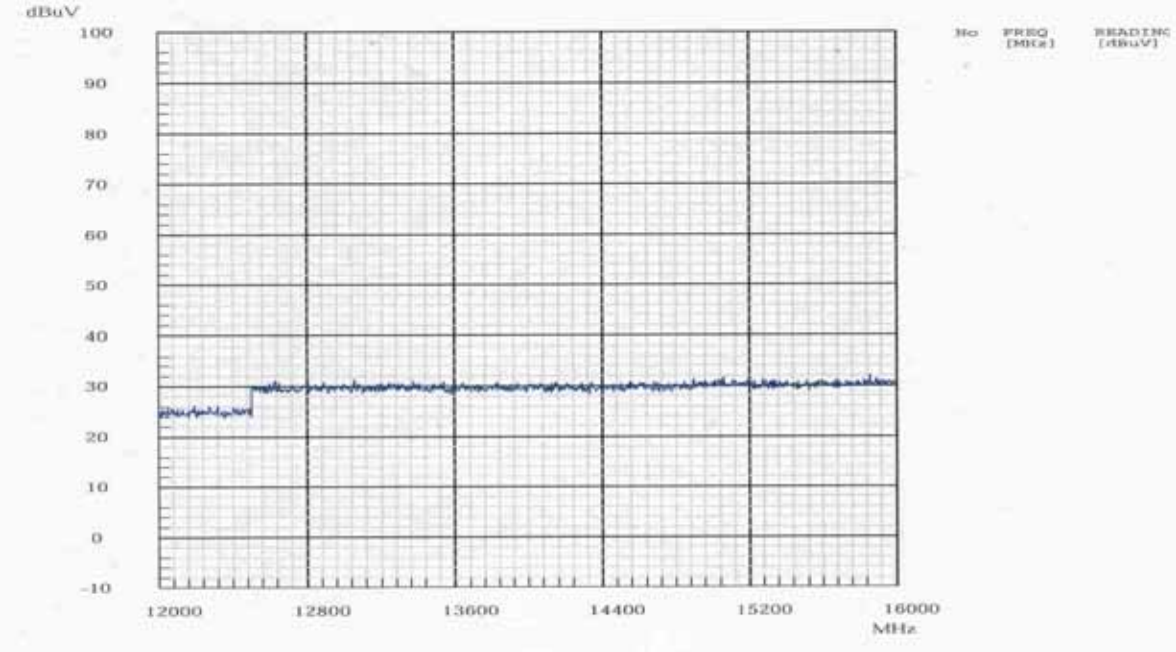


Radiated Spurious Emissions, middle Channel(Vertical)

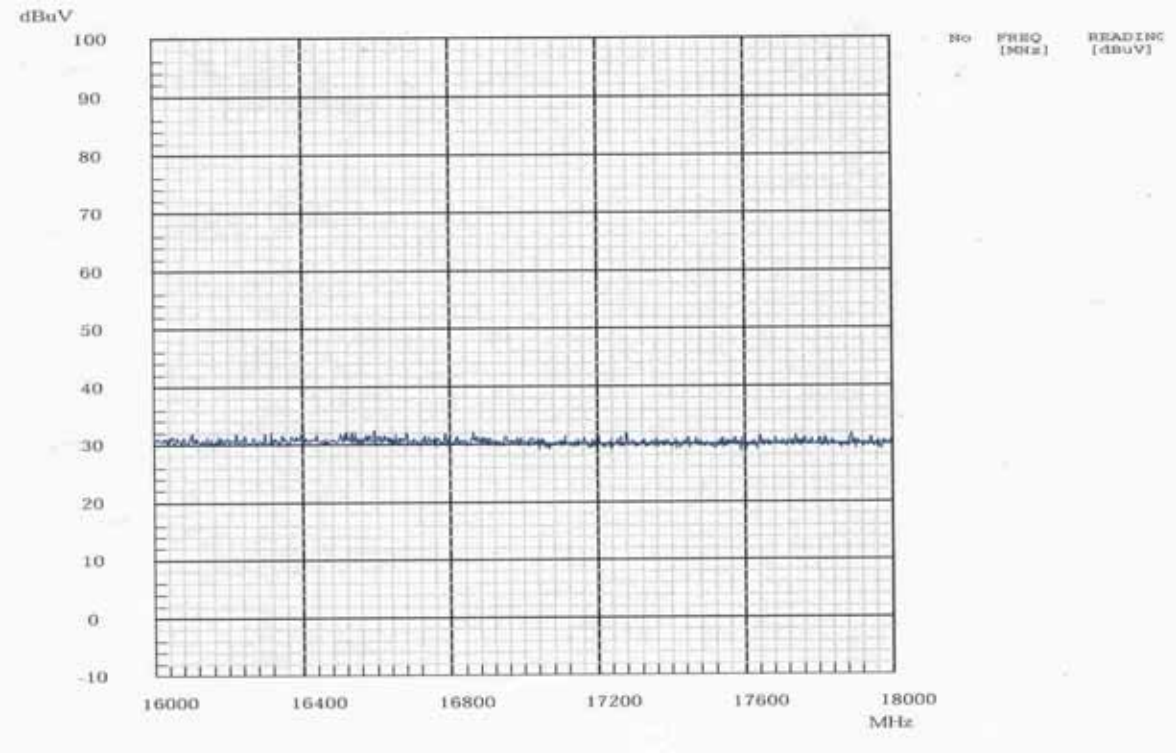


PLOT OF TEST DATA

Radiated Spurious Emissions, middle Channel(Vertical)

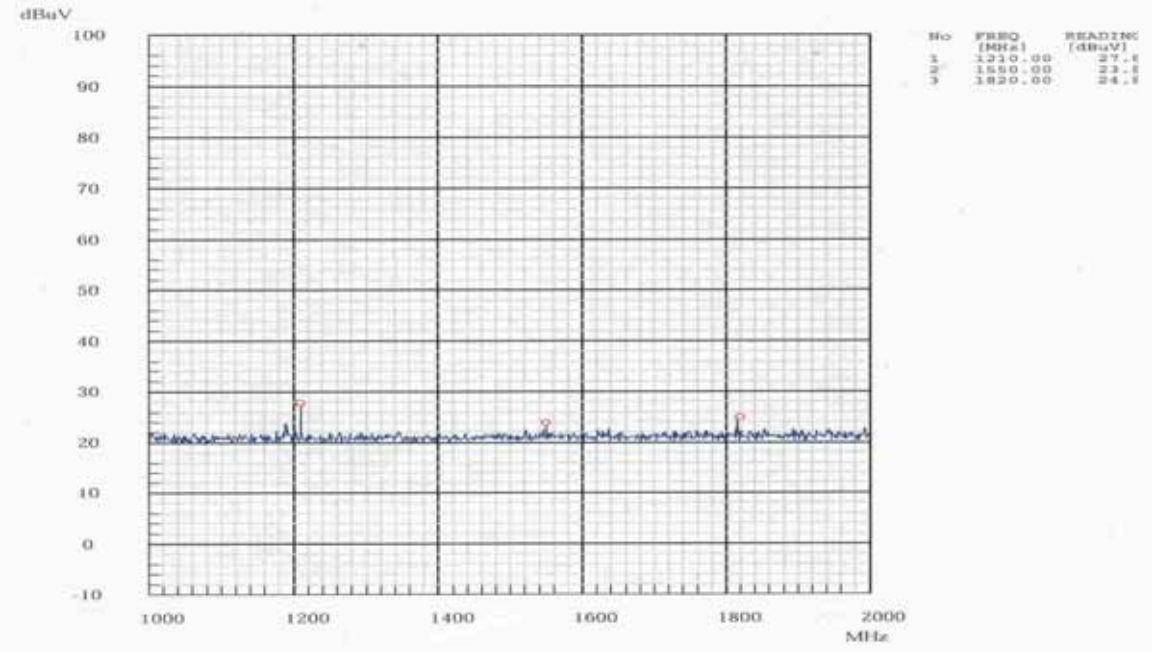


Radiated Spurious Emissions, middle Channel(Vertical)

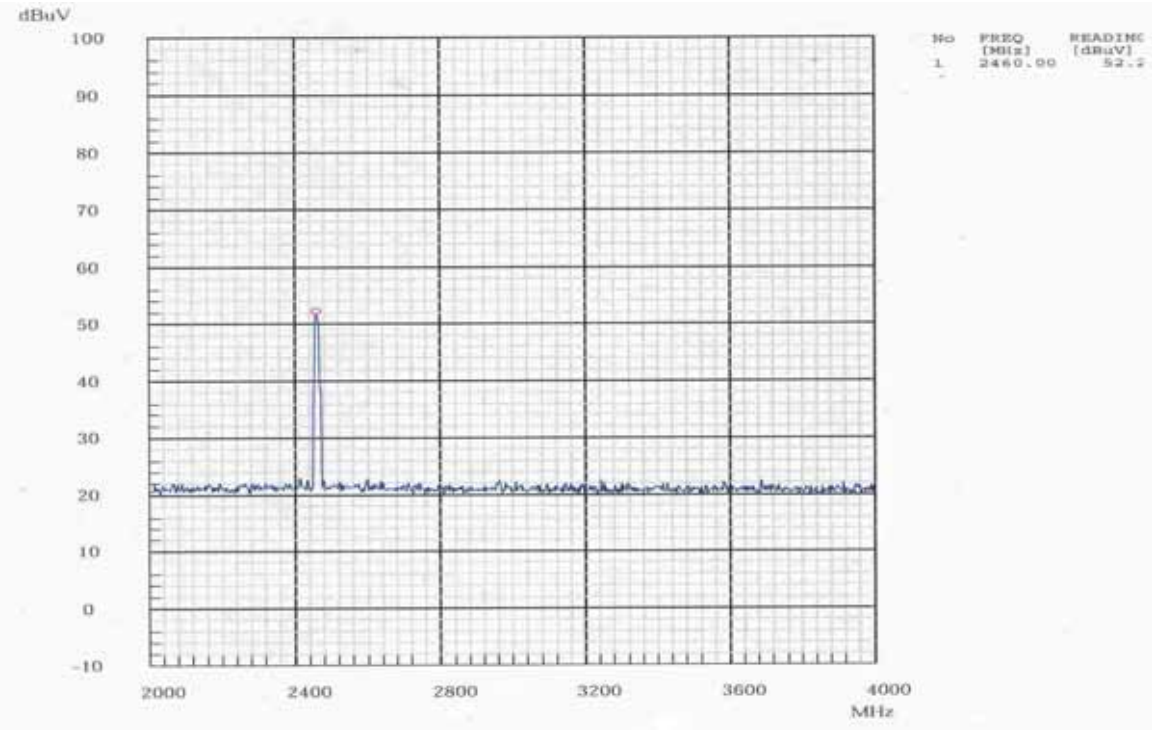


PLOT OF TEST DATA

Radiated Spurious Emissions, Highest Channel(Horizontal)

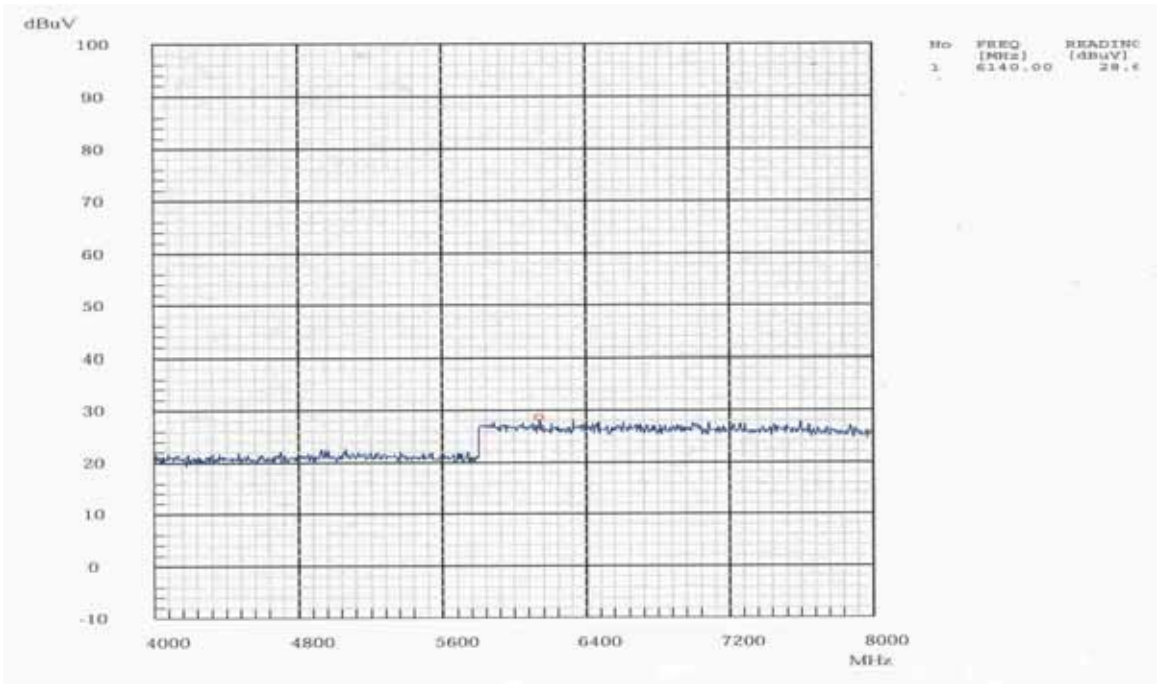


Radiated Spurious Emissions, Highest Channel(Horizontal)

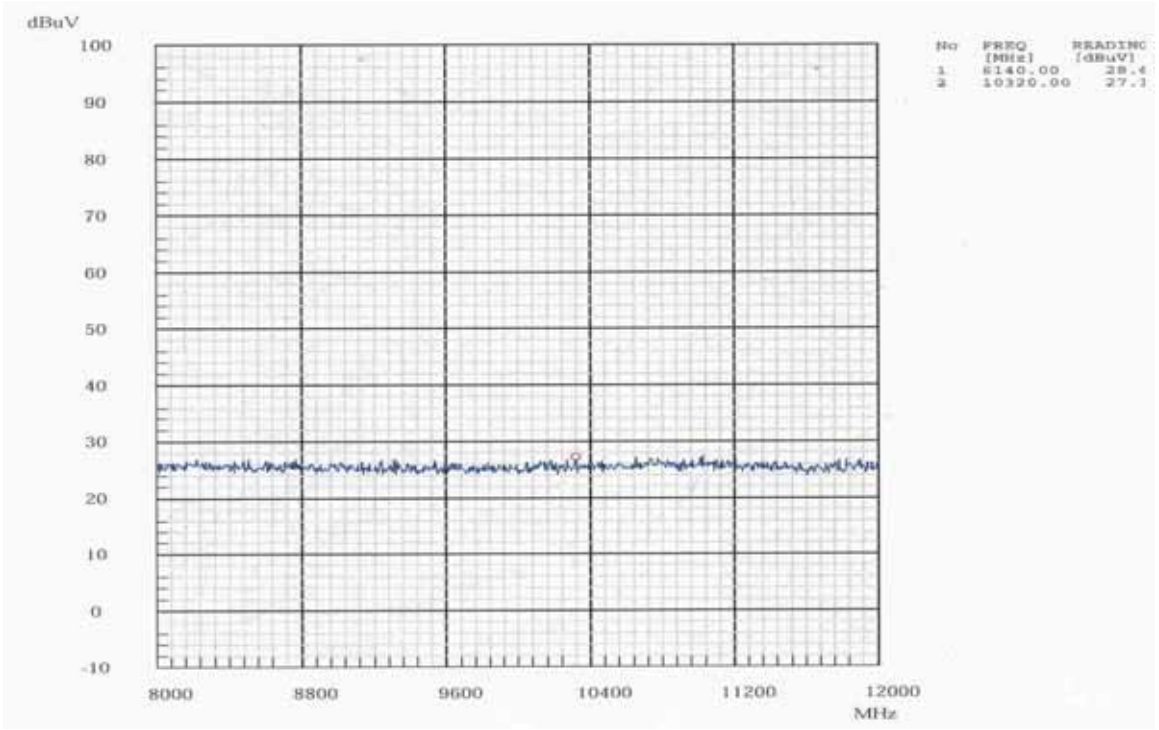


PLOT OF TEST DATA

Radiated Spurious Emissions, Highest Channel(Horizontal)

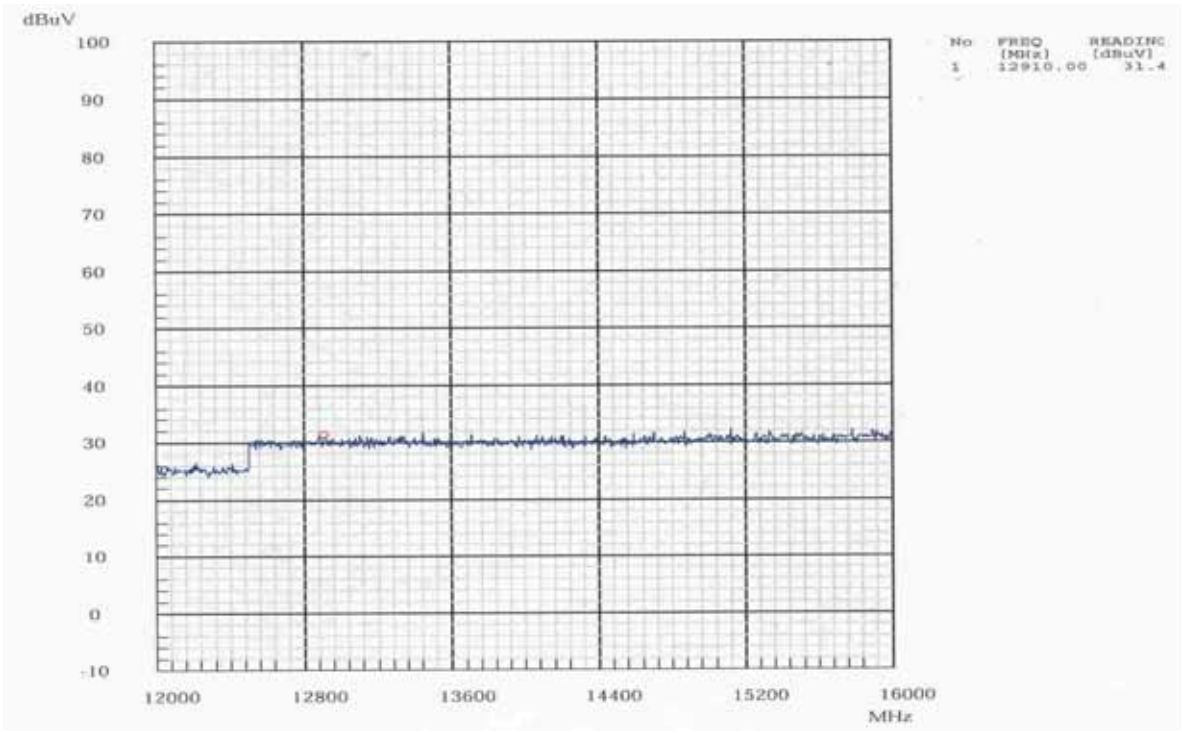


Radiated Spurious Emissions, Highest Channel(Horizontal)

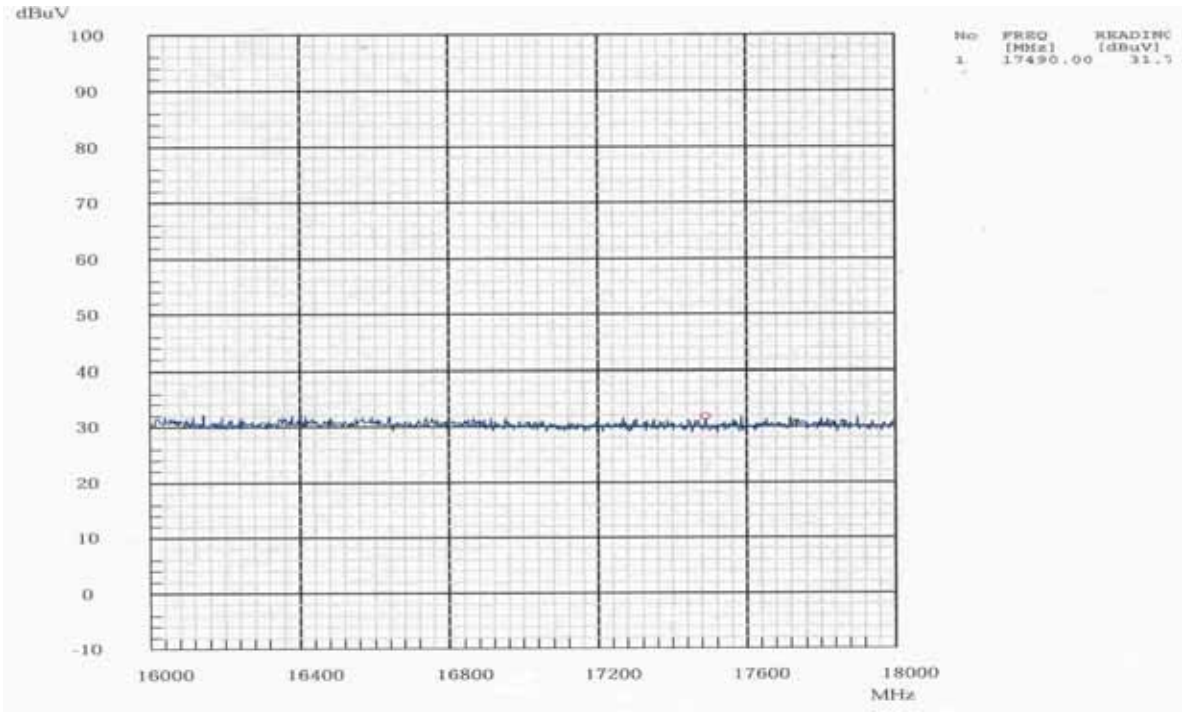


PLOT OF TEST DATA

Radiated Spurious Emissions, Highest Channel(Horizontal)

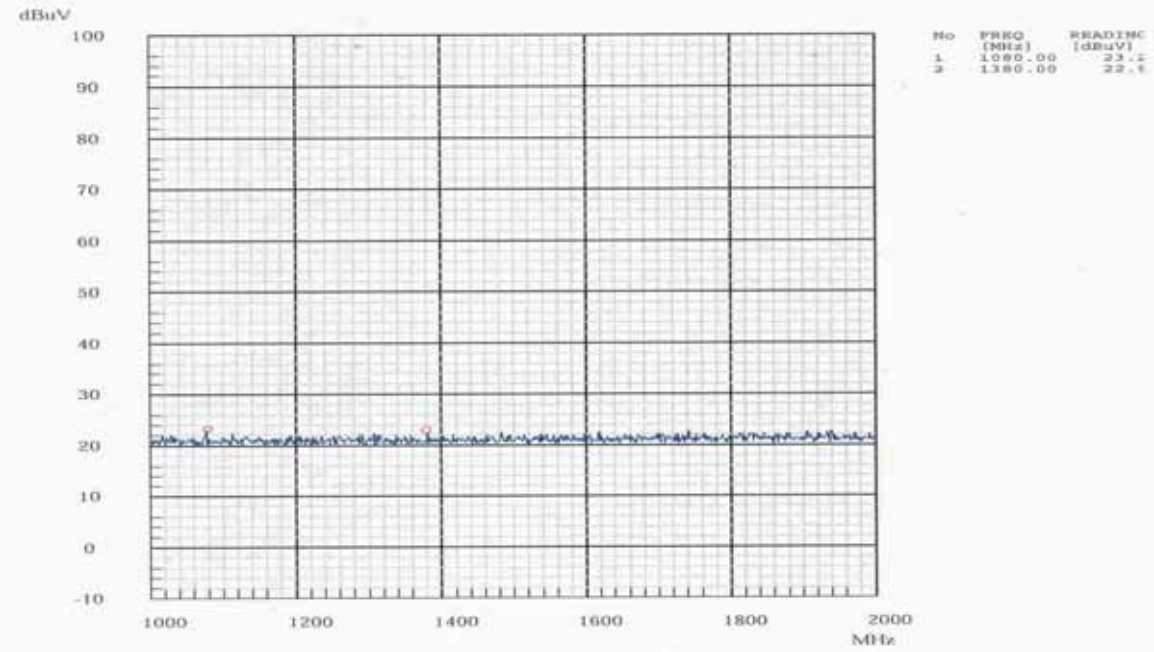


Radiated Spurious Emissions, Highest Channel(Horizontal)

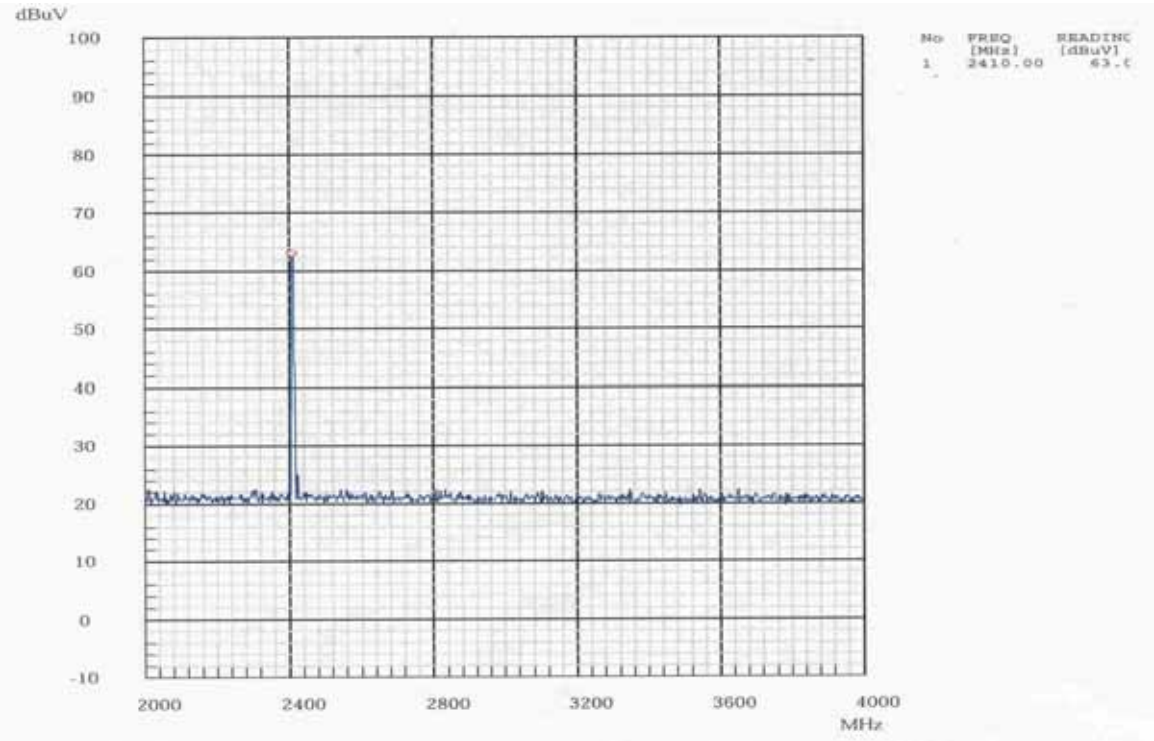


PLOT OF TEST DATA

Radiated Spurious Emissions, Highest Channel(Vertical)

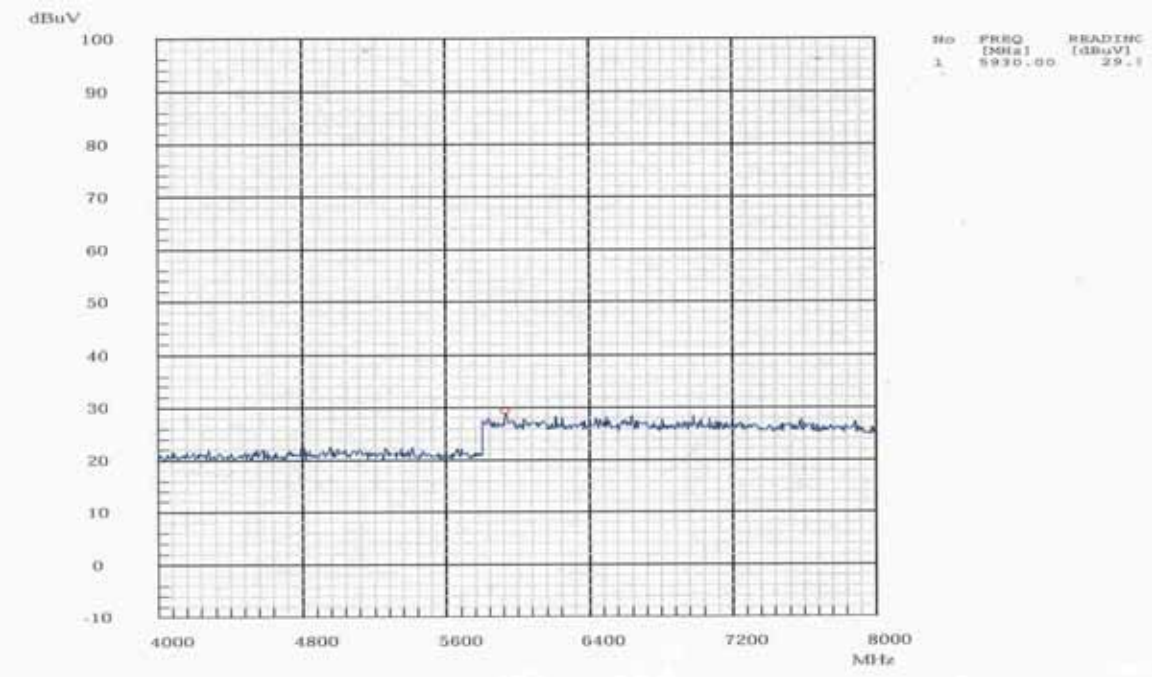


Radiated Spurious Emissions, Highest Channel(Vertical)

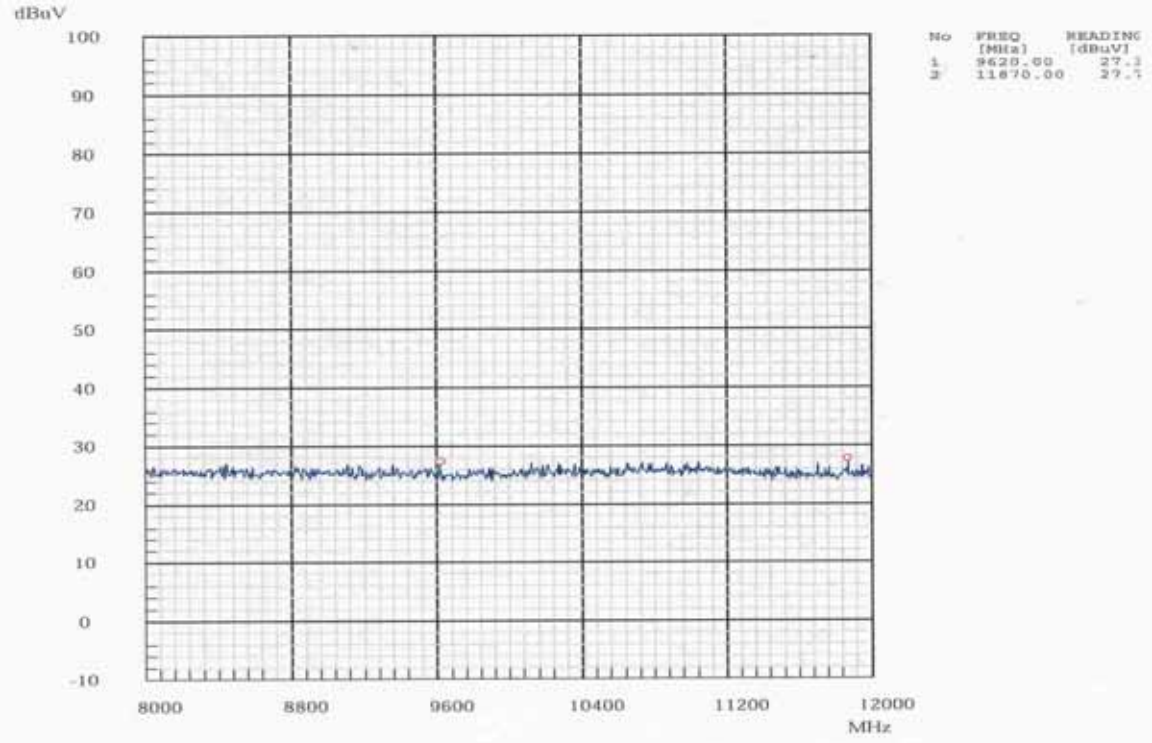


PLOT OF TEST DATA

Radiated Spurious Emissions, Highest Channel(Vertical)

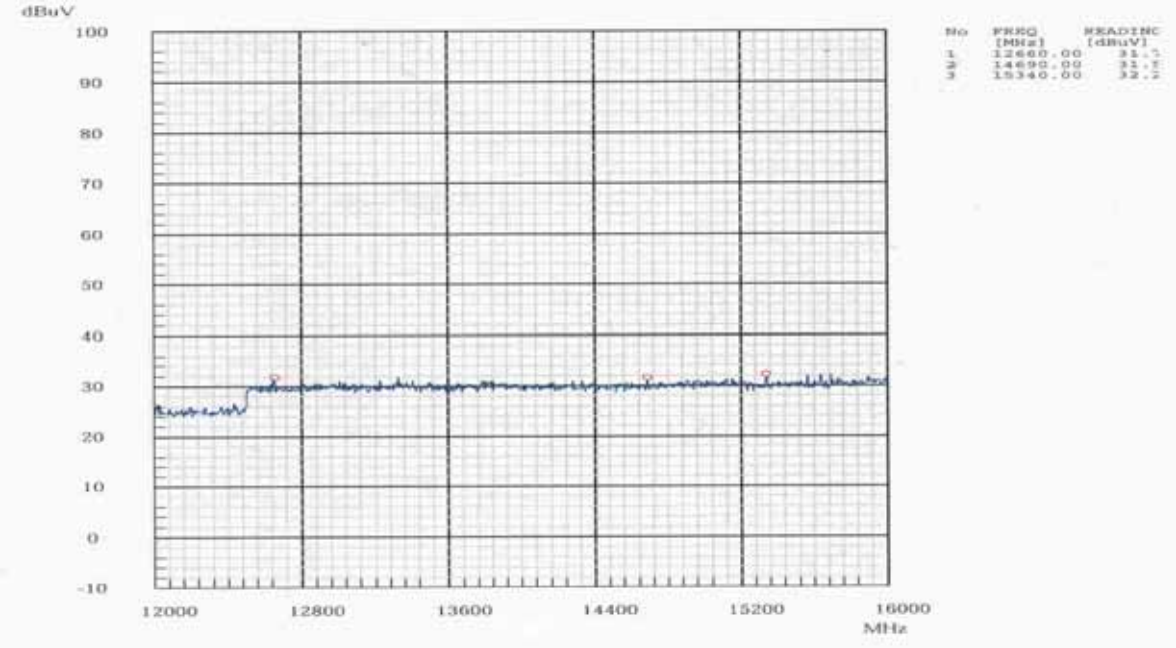


Radiated Spurious Emissions, Highest Channel(Vertical)

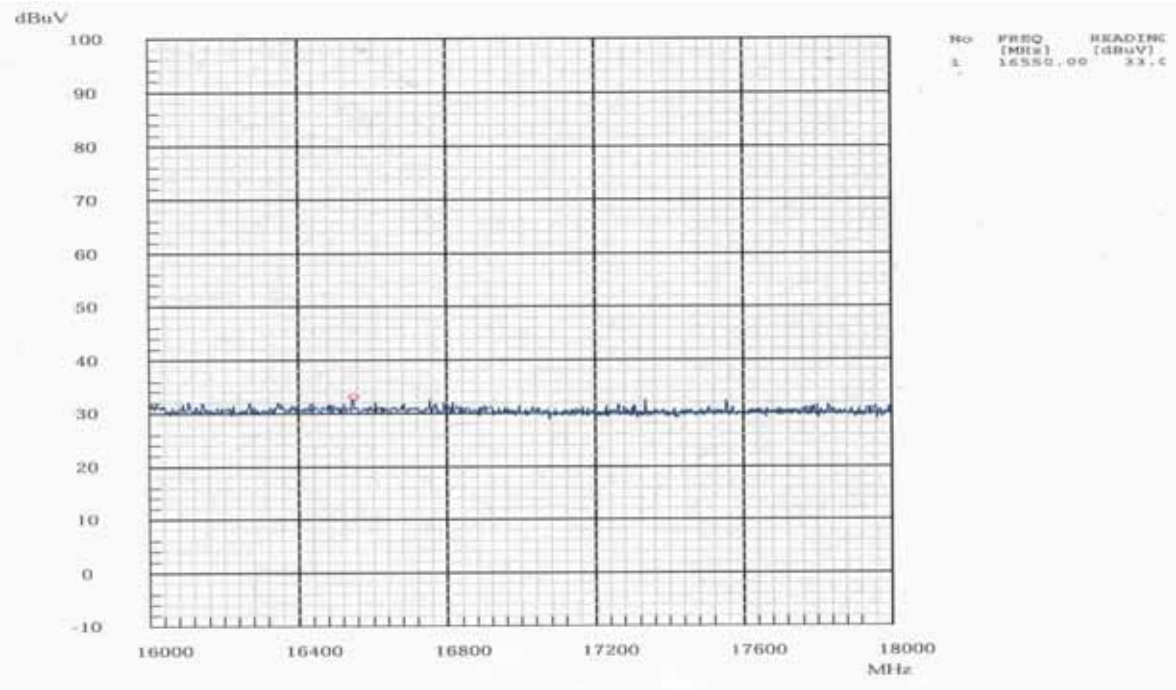


PLOT OF TEST DATA

Radiated Spurious Emissions, Highest Channel(Vertical)



Radiated Spurious Emissions, Highest Channel(Vertical)



TEST DATA

Peak Power Spectral Density-15.247(d)

FCC ID : A3LWBS24COMBO

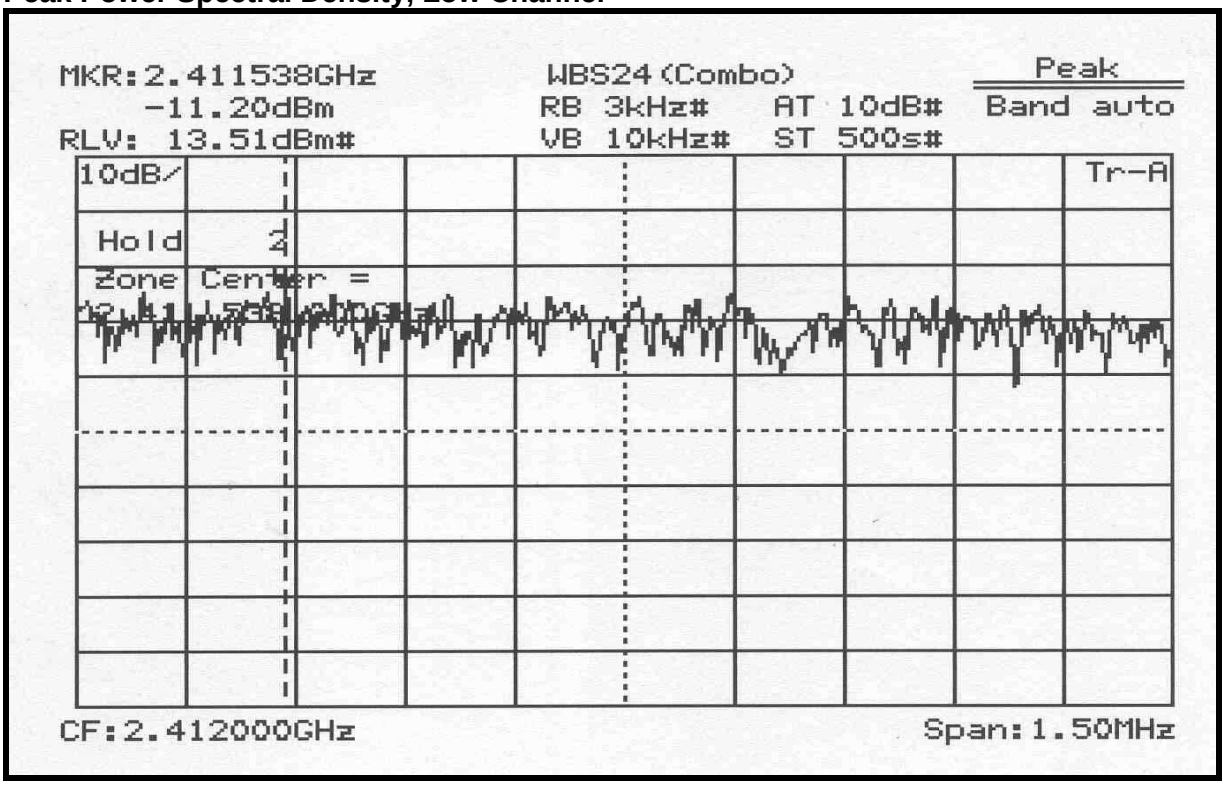
Test Mode : set to lowest channel and middle channel and highest channel.

Channel	Frequency (MHz)	Result (dBm)	Limit (dBm)	Margin (dB)
1	2412	-11.20	8	-19.20
6	2437	-11.28	8	-19.28
11	2462	-12.05	8	-20.05

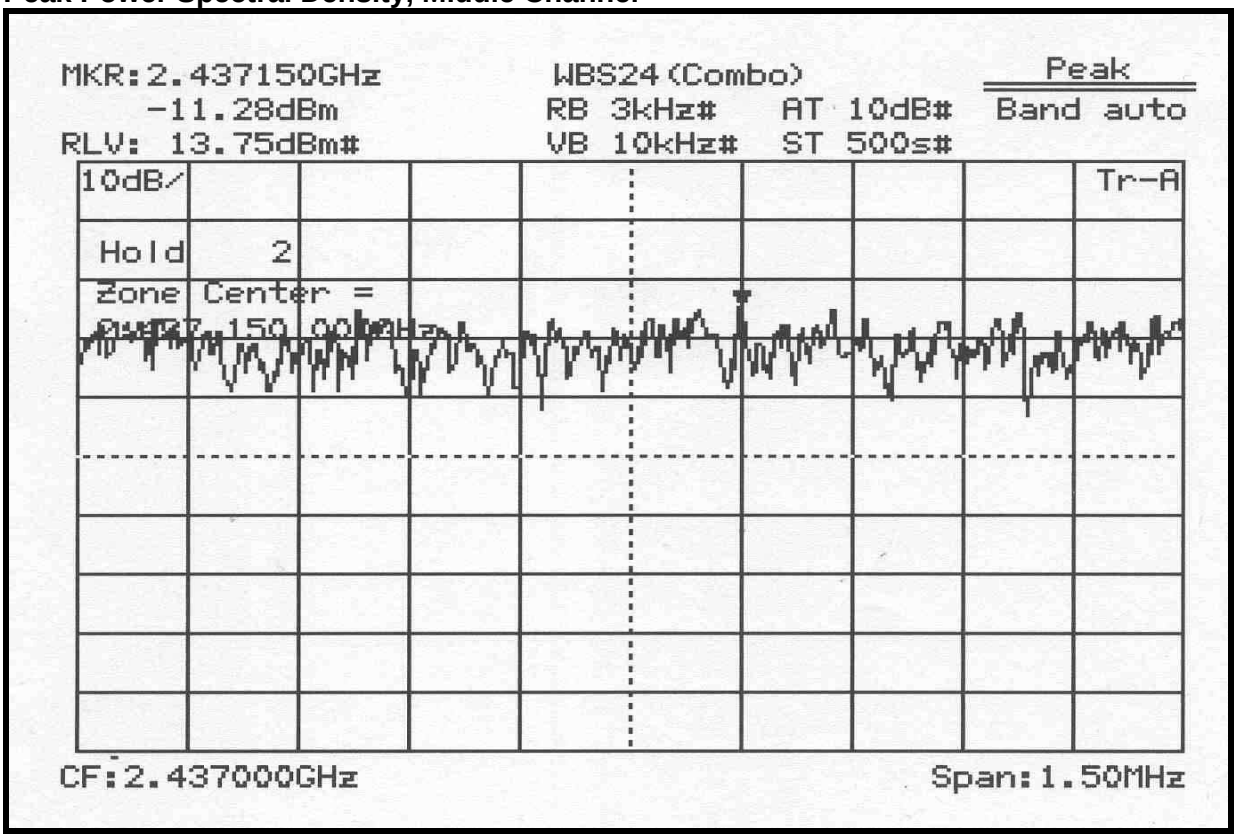
Tested by ***S. H. Baek***

PLOT OF TEST DATA

Peak Power Spectral Density, Low Channel

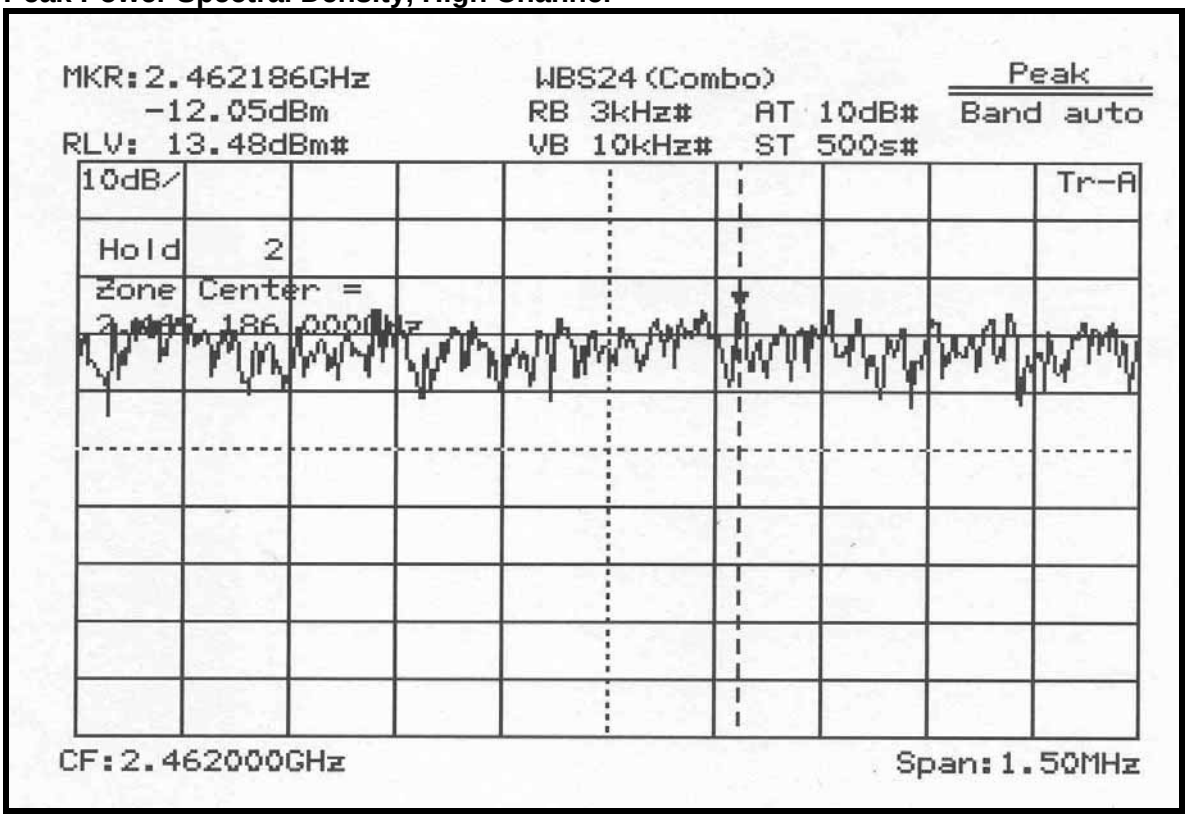


Peak Power Spectral Density, Middle Channel



PLOT OF TEST DATA

Peak Power Spectral Density, High Channel



TEST DATA

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)	Average Time (Minutes)
(A) Limits for Occupational / Control Exposure				
30 - 300	6.14	0.163	1.0	6
300 - 1500	…	…	F/300	6
1500 - 100000	…	…	5	6
(A) 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)

Friis Formula

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

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

Where

Pd = Power density in mW/cm^2

Pout = Output power to antenna in mW

G = Gain of antenna in linear scale

$\pi = 3.1416$

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

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

TEST DATA

Test Result

The maximum antenna gain is 2dBi or 1.585(Numeric)

Output power into antenna and RF Exposure Distance

Channel	Frequency (MHz)	Output power to Antenna (mW)	RF Exposure Distance (cm)
1	2412	28.12	1.88
6	2437	27.10	1.85
11	2462	22.91	1.70

MPE Safe Distance = 1.88cm

Baek sung hun

Tested by ***S. H. Baek***

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 Inperfections	Rectangular	± 2.0
Mismatch:Receiver VRC ri=0.3 Antenna VRC rR=0.1(Bi)0.4(Lp) Uncertainty Limits 20Log(1+/-ri rR)	U-Shaped	+ 0.25 / - 0.26
System Repeatibilty	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 ri=0.3 LISN vrc rg=0.1 Uncertainty Limits 20Log(1+/-ri rR)	U-Shaped	± 0.26
System Repeatibilty	Std.deviation	± 0.68
Repeatability of EUT	-	-
Combined Standard Uncertainty	Normal	± 1.18
Expended Uncertainty U	Normal (k=2)	± 2.4

TEST EQUIPMENT

No.	Instrument	Manufacturer	Model	Calibration Date
1	*Test Receiver	R & S	ESCS 30	2003.09
2	Amplifier	HP	8447F	2003.07
3	*Amplifier	HP	8447F	2003.11
4	*Amplifier	HP	8449B	2003.04
5	*Spectrum Analyzer	Advantest	R4136	2003.03
6	*Spectrum Analyzer	H.P	8566B	2003.03
7	*Spectrum Analyzer	Anritsu	MS2668C	2002.12
8	*Logbicon Super Antenna	Schwarzbeck	VULB9166	2003.05
9	Log-Periodic Antenna	R & S	HL025	2003.01
10	Dipole Antenna	R & S	VHA9103	2003.05
11	Dipole Antenna	R & S	UHA9105	2003.05
12	*Biconical Log Antenna	ARA	LPB-2520/A	2003.05
13	Asorbing Clamp	R & S	MDS21	2003.06
14	*Horn Antenna	Schwarzbeck	BBHA 9120D	2003.05
15	Signal Generater	R & S	SMP02	2002.12
16	Matching Pad	R & S	RAM358.5414.02	2003.05
17	*LISN	R & S	ESH3-Z5	2003.10
18	*LISN	Kyoritsu	KNW-408	2002.12
19	LISN	Kyoritsu	KNW-407	2003.04
20	*Position Controller	EM Eng.	N/A	N/A
21	*Turn Table	EM Eng.	N/A	N/A
22	*Antenna Mast	EM Eng.	N/A	N/A
23	*Anechoic Chamber	EM Eng.	N/A	N/A
24	*Shielded Room	EM Eng.	N/A	N/A
25	*Shielded Room	EM Eng.	N/A	N/A
26	*Power Meter	R & S	NRVS	2003.02
27	*Peak Power Sensor	R & S	NRV-Z32	2003.02

***) Test equipment used during the test**

APPENDIX B – CIRCUIT DIAGRAM

APPENDIX E – USER'S MANUAL

APPENDIX F – SCHEMATIC DIAGRAM

APPENDIX G - OPERATING DESCRIPTION

-48V DC power of the system is supplied from the 8WLI to the WBS24 through the DASL transmission line.
Provides voice communication through OfficeServ 500 System using a Voice over WLAN phone.
Provides the wireless RF interface that meets IEEE 802.11b, the wireless LAN standard.
Provides the wired LAN interface that meets IEEE 802.3, the wired LAN standard.
Separates the wirelessly received voice and data from each other and transmits them
To OfficeServ 500 System and LAN.