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.
416,Maetan-3Dong,Yeongtong-Gu Suwon-City, Gyeonggi-Do, Korea.
(Post code : : 443-742)
Attn. : Mr. JeHwan Seo

Dates of Issue : Dec 24, 2008
Test Report No. : NK08R261
Test Site : Nemko Korea Co., Ltd. EMC site, Korea

FCC ID	***A3LSWPZ01-TX***
IC ID	***649E-SWPZ01-TX***
Brand Name	***SAMSUNG***
CONTACT PERSON	**Samsung Electronics Co., Ltd.** **416, Maetan3-Dong, Youngtong-Gu, Suwon-City,** **Gyeonggi-Do, Korea, 443-742** **Mr. JeHwan Seo** **Telephone No. : +82-31-277-1649**

Applied Standard: FCC 47 CFR Part 15 and IC RSS-210
Classification : FCC Class B Device
EUT Type: RF Remote Controller

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

Tested By : Minchul Shin
Engineer

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

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1. SCOPE

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

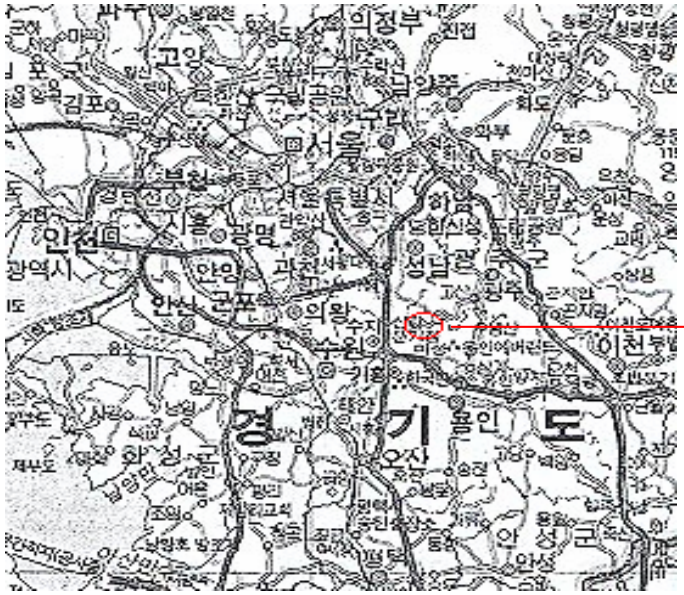
Responsible Party :	Samsung Electronics Co., Ltd.
Contact Person :	Mr. JeHwan Seo
Manufacturer :	SAMJIN CO.,LTD. 199-6, Anyang-7Dong, Manan-Gu, Anyang-City Gyeonggi-Do, Korea

- FCC ID: A3LSWPZ01-TX
- IC ID: 649E-SWPZ01-TX
- Model: SWPZ01-TX
- Brand Name: SAMSUNG
- EUT Type: Remote controller
- Classification: FCC Class B
- Applied Standard: FCC 47 CFR Part 15 and IC RSS-210
- Test Procedure(s): ANSI C63.4 (2003)
- Dates of Test: Dec 10, 2008 ~ Dec 23, 2008
- Place of Tests: Nemko Korea Co., Ltd. EMC Site
- Test Report No.: NK08R261

2. INTRODUCTION

The measurement procedure described in American National Standard for Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9kHz to 40GHz (ANSI C63.4-2003) was used in determining radiated and conducted emissions emanating from **Samsung Electronics Co., Ltd.**
FCC ID : **A3LSWPZ01-TX** and **IC ID : 649E-SWPZ01-TX**

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 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 2003.



Nemko Korea Co., Ltd.
EMC Lab.
300-2, Osan-Ri, Mohyun-Myun, Yongin-City Kyungki-Do,KOREA 449-852
Tel)+82-31-322-2333
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.

3. TEST CONDITIONS & EUT INFORMATION

Environmental Conditions

Temperature	20 ℃ ~ 25 ℃
Relative Humidity	35 % ~ 55 %

Operating During Test

The EUT was operated at maximum output power with center channel and rotated through three orthogonal axes to determine which attitude and configuration produces the highest emission.

Support Equipment

RF Remote Controller (EUT)	Samsung Electronics Co., Ltd. Model: SWPZ01-TX	S/N: N/A
Spectrum Analyzer	Hewlett & Packard Model : 8593E 1.8 m unshielded power cable	S/N: 3626A04282

EUT Information

Type of device	RF Remote Controller
Frequency bands	2405 MHz ~ 2480 MHz
Channel space	5 MHz
Channel number	16
Data rate	250 kbps
RF output power	6.61 dBm (4.58 mW)
Size(with stand)	152 x 30.0 x 246 mm
Weight	165 g
Input power	3.0 Vdc
Antenna type	Chip antenna (-0.97 dBi)

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
Radiated Emission (Spurious)	15.209(a)	RSS-102	Complies	
Modulated Bandwidth (6dB Bandwidth)	15.247(a)(2)	RSS-210 A8.2(1)	Complies	
Peak Power Output	15.247(b)(3)	RSS-210 A8.4(4)	Complies	
Conducted Spurious Emission	15.247(d)	RSS-210 A8.5	Complies	
Radiated Spurious Emission	15.247(d)	RSS-210 A8.5	Complies	
Power Spectral Density	15.247(e)	RSS-210 A8.2	Complies	
Maximum Permissible Exposure	1.1307(b)	RSS-102	Complies	

5. RECOMMENDATION/CONCLUSION

The data collected shows that the **Samsung Electronics Co., Ltd.**
FCC ID : **A3LSWPZ01-TX, IC ID: 649E-SWPZ01-TX, RF Remote Controller.**
The highest emission observed was at **1952 MHz** for radiated emissions with a margin of **4.47 dB**.

6. 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 + Amplifier Gain = 10.12 dB

Total = 29.22 dB μN/m

Margin = 40.0 – 29.22 = 10.78

10.78 dB below the limit

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 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.

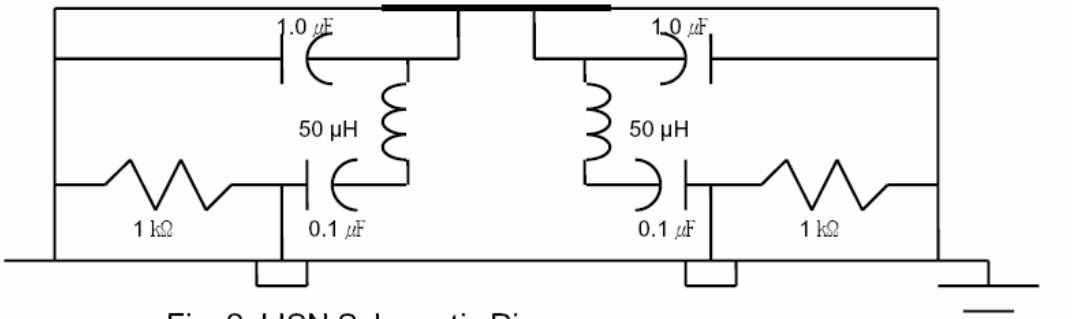


Fig. 2. LISN Schematic Diagram

7.2 Radiated Emissions

Preliminary measurement were made indoors at 3 meter using broad band antennas, broadband amplifier, and spectrum analyzer to determine the frequency producing the maximum EME. Appropriate precaution was taken to ensure that all EME from the EUT were maximized and investigated. The Technology configuration, clock speed, mode of operation or video resolution, turntable azimuth with respect to the antenna was note for each frequency found.
The spectrum was scanned from 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.(Schwarzbeck BBHA9120D:upto18GHz , BBHA9170:Upto40GHz)
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.

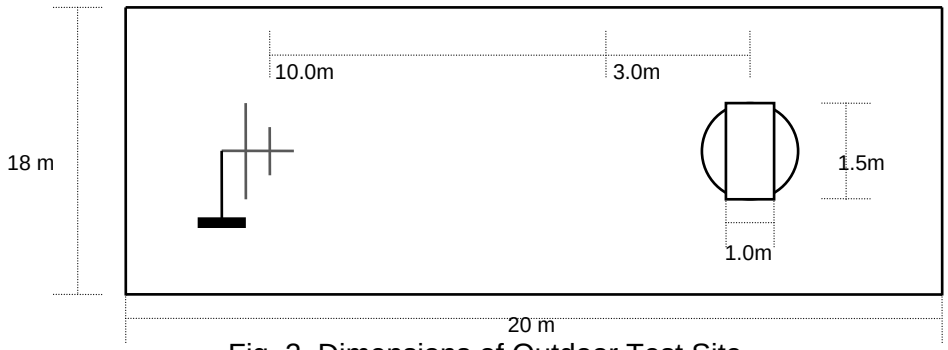
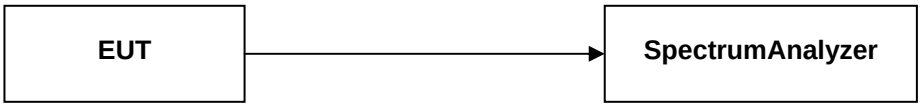


Fig. 2. Dimensions of Outdoor Test Site

7.3 Modulated Bandwidth (6dB Bandwidth)

Test Setup

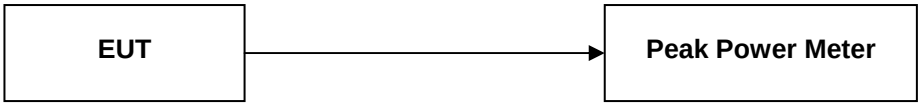


Test Procedure

The transmitter 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.

7.4 Peak Power Output

Test Setup

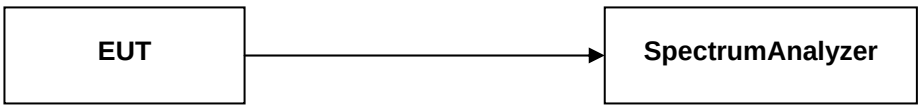


Test Procedure

The transmitter is connected to the Peak power meter.

7.5 Conducted Spurious Emission

Test Setup

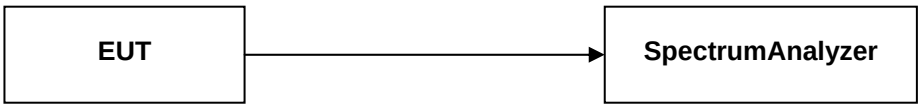


Test Procedure

The transmitter 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.

7.6 Peak Power Spectral Density

Test Setup



Test Procedure

The transmitter 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 9KHz.
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.

8. TEST DATA

8.1 Modulated Bandwidth (6dB Bandwidth)

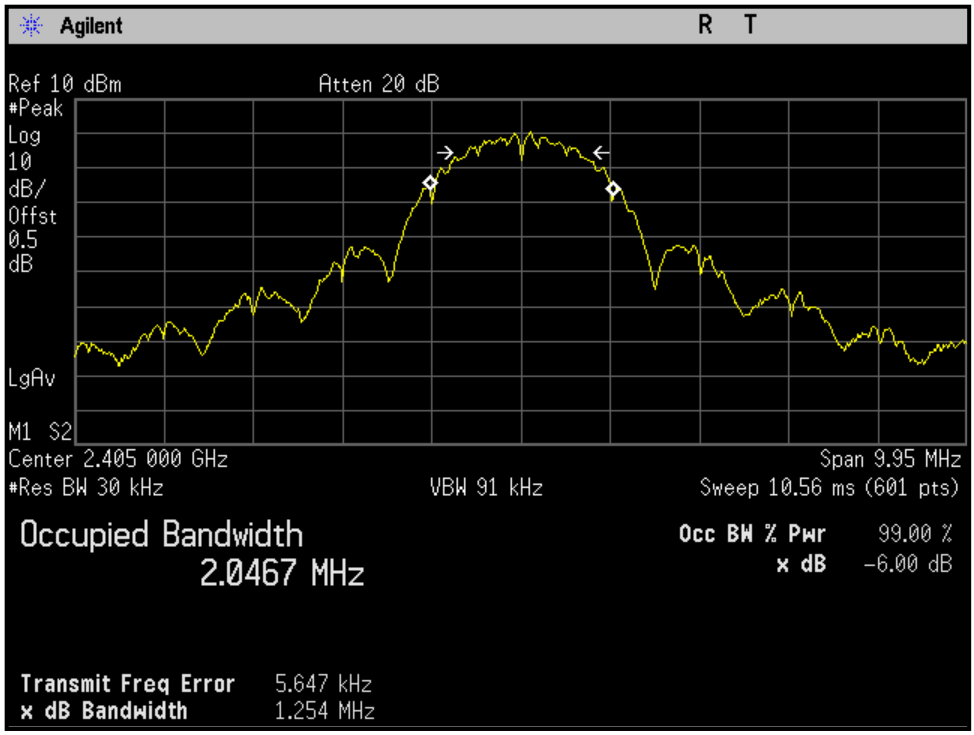
Test Mode : Set to Lowest channel, Middle channel and Highest channel

Result:

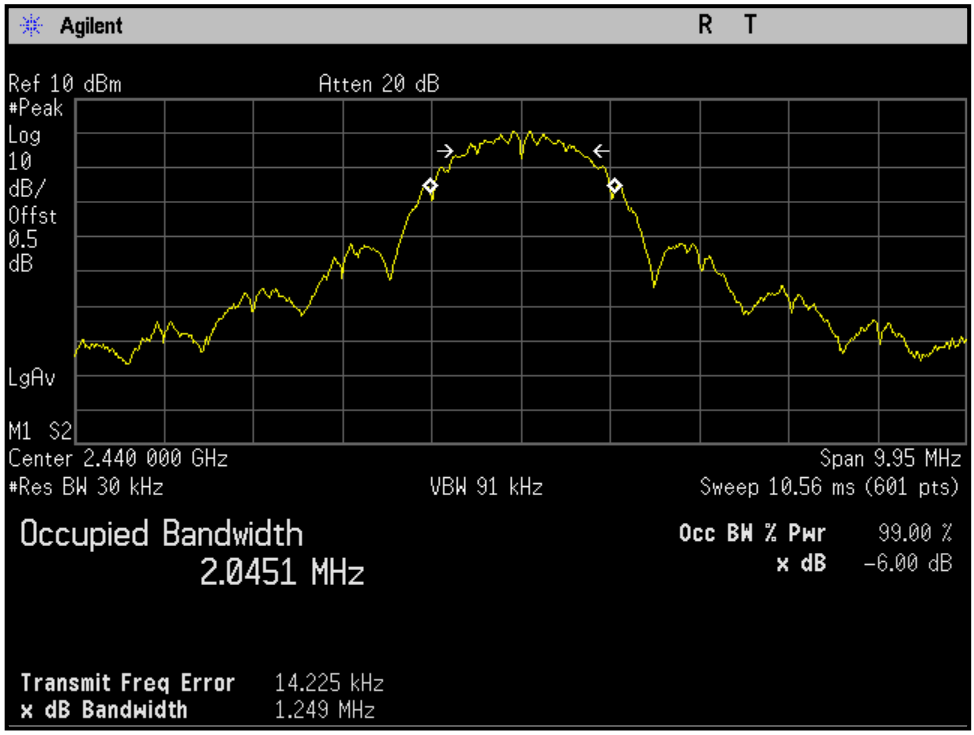
Channel	Frequency(MHz)	Result(KHz)	Limit(KHz)	Margin(KHz)
Low	2405	1297	500	797
Middle	2440	1273	500	773
High	2480	1295	500	795

PLOTS OF EMISSIONS

6dB Bandwidth, Lowest Channel (2405 MHz)

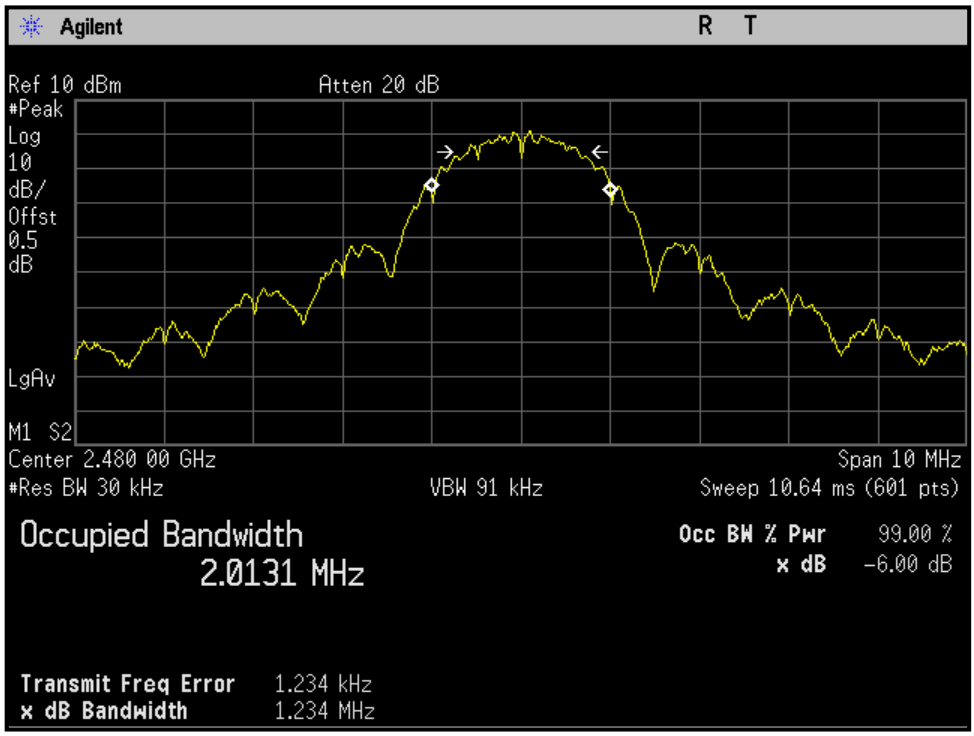


6dB Bandwidth, Middle Channel (2440 MHz)



PLOTS OF EMISSIONS

6dB Bandwidth, Highest Channel (2480 MHz)



TEST DATA

8.2 Peak Power Output

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

Result:

Channel	Frequency(MHz)	Result(dBm)	Limit(dBm)	Margin(dB)
Low	2405	6.00	30	24.00
Middle	2440	6.48	30	23.52
High	2480	6.61	30	23.39

Antenna Gain : -0.97 dBi

8.3 Conducted Spurious Emission

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

Result:

Channel	Frequency(MHz)	Result(dBc)	Limit(dBc)	Margin(dB)
Low	2405	More than 40dBc	20	More than 10dB
Middle	2440	More than 40dBc	20	More than 10dB
High	2480	More than 40dBc	20	More than 10dB

TEST DATA

8.4 Radiated Spurious Emission

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

Result:

The Lowest channel

Frequency (MHz)	Reading (dBμV)	Pol* (H/V)	mode	AF+CL+Amp (dB)**	Result (dBμV/m)	Limit (dBμV/m)	Margin (dB)
1924	52.3	H	peak	-3.73	48.6	74.0	25.45
1924	49.8	H	average	-3.73	46.1	54.0	7.93
4810	48.0	V	peak	4.02	52.0	74.0	21.99
4810	39.1	V	average	4.02	43.1	54.0	10.90

The Middle channel

Frequency (MHz)	Reading (dBμV)	Pol* (H/V)	mode	AF+CL+Amp (dB)**	Result (dBμV/m)	Limit (dBμV/m)	Margin (dB)
1952	53.9	V	peak	-3.71	50.2	74.0	23.80
1952	53.2	V	average	-3.71	49.5	54.0	4.47
4880	51.7	V	peak	4.46	56.2	74.0	17.80
4880	44.0	V	average	4.46	48.5	54.0	5.54

TEST DATA

The Highest channel

Frequency (MHz)	Reading (dBμV)	Pol* (H/V)	mode	AF+CL+Amp (dB)**	Result (dBμV/m)	Limit (dBμV/m)	Margin (dB)
1984	55.1	V	peak	-3.68	51.4	74.0	22.60
1984	52.4	V	average	-3.68	48.8	54.0	5.25
4960	51.4	V	peak	4.95	56.4	74.0	17.63
4960	43.1	V	average	4.95	48.1	54.0	5.95

1. *Pol. H =Horizontal V=Vertical

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

3. Other spurious are under 20 dB below Fundamental.

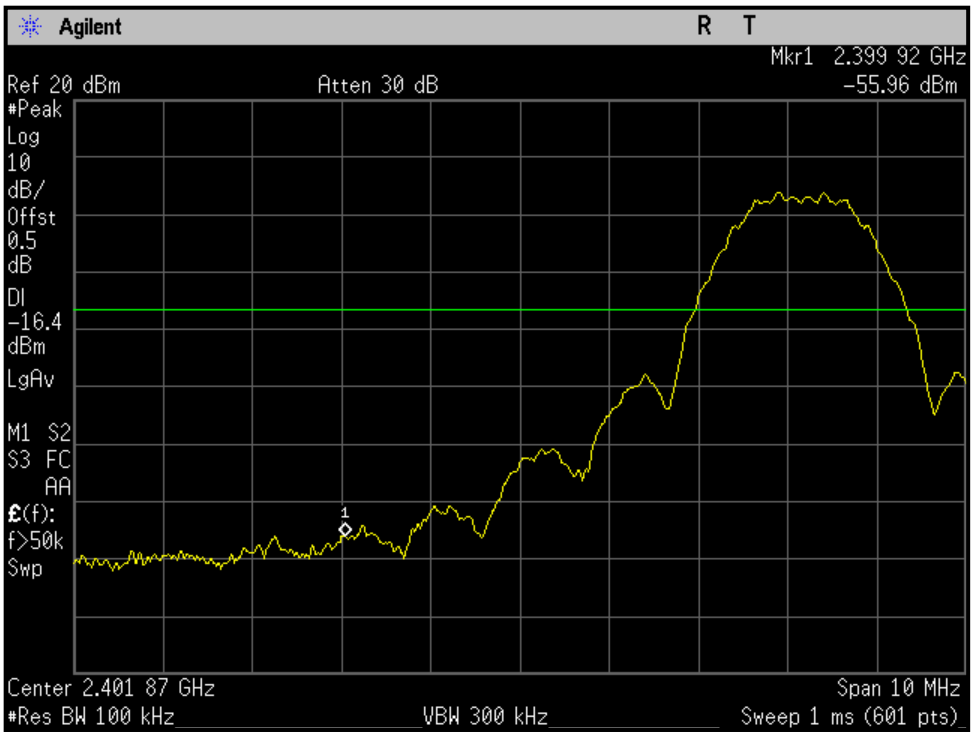
4. The radiated emissions testing was made by rotating through three orthogonal axes. The worst date was recorded.

5. For measurements 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.

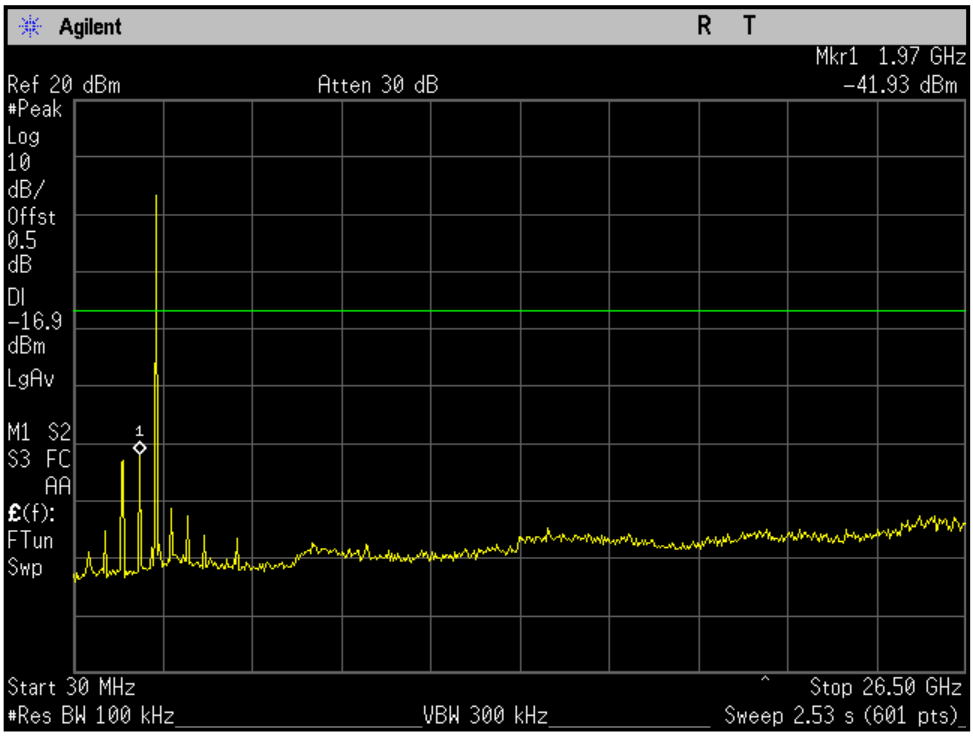
6. For measurements the peak detection was used.

PLOT OF TEST DATA

Band edge at 2.4GHz, Lowest Channel

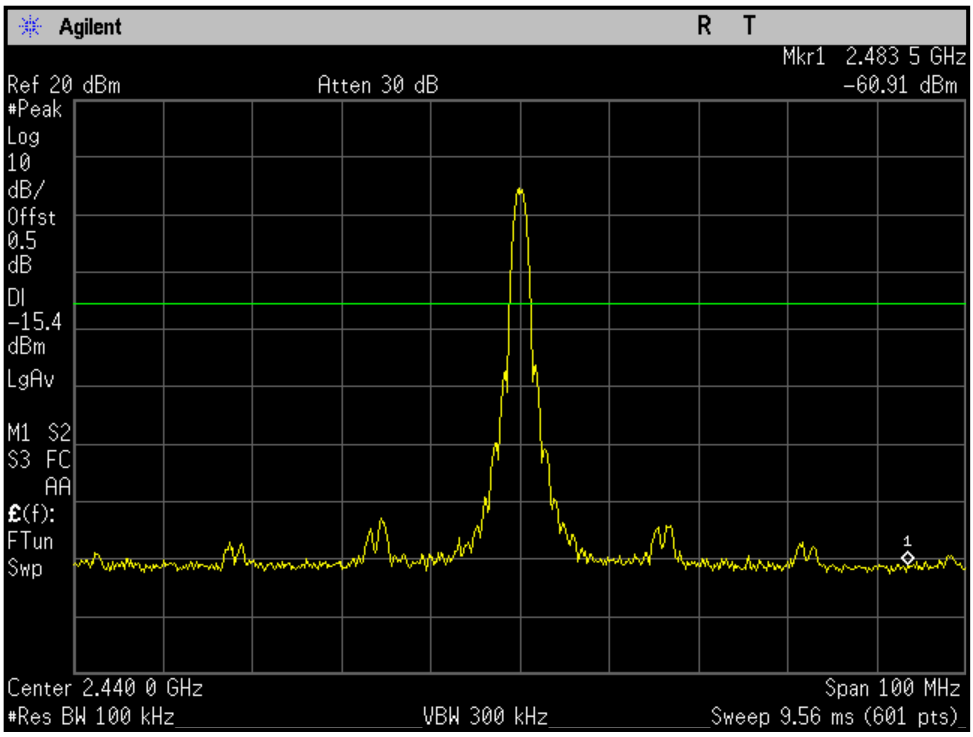


Conducted Spurious Emissions, Lowest Channel

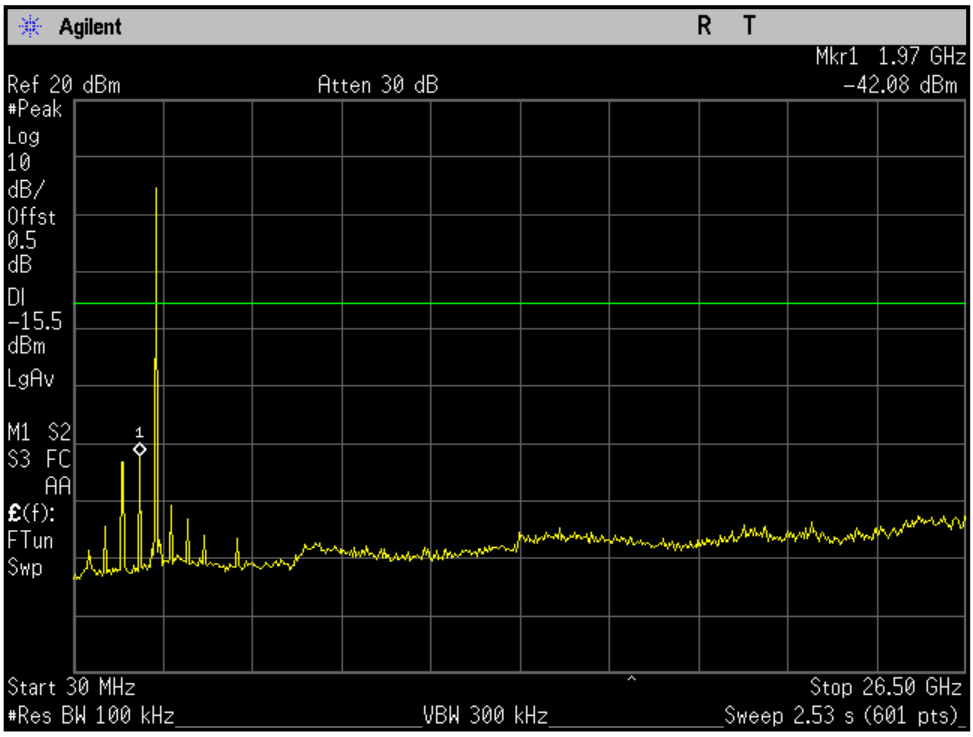


PLOT OF TEST DATA

Band edge at 2.4GHz, Middle Channel

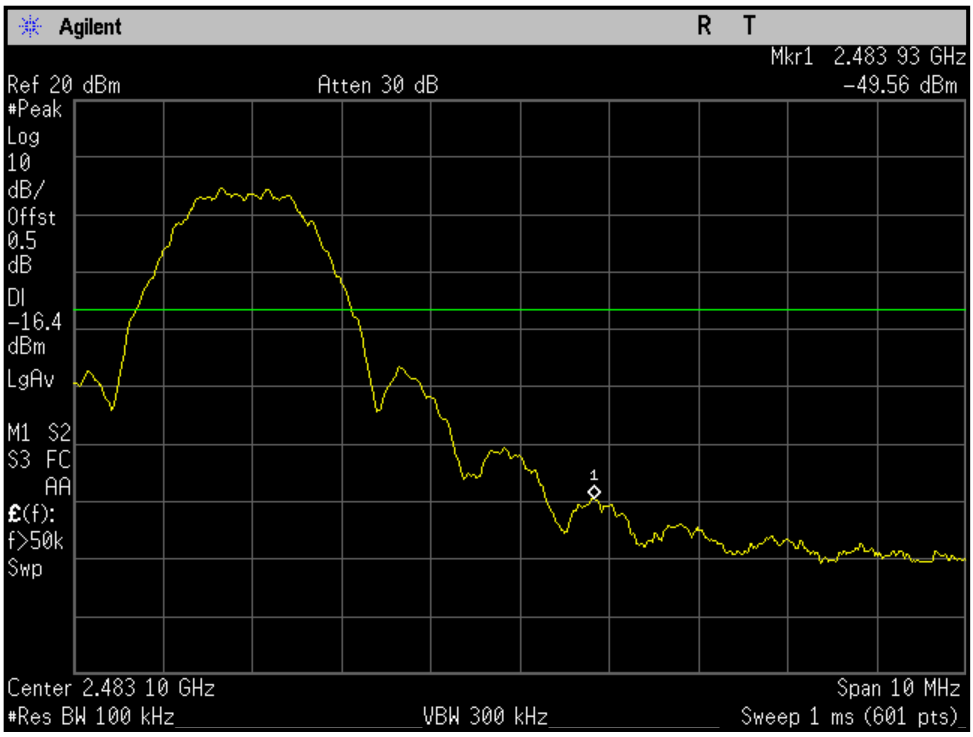


Conducted Spurious Emissions, Middle channel

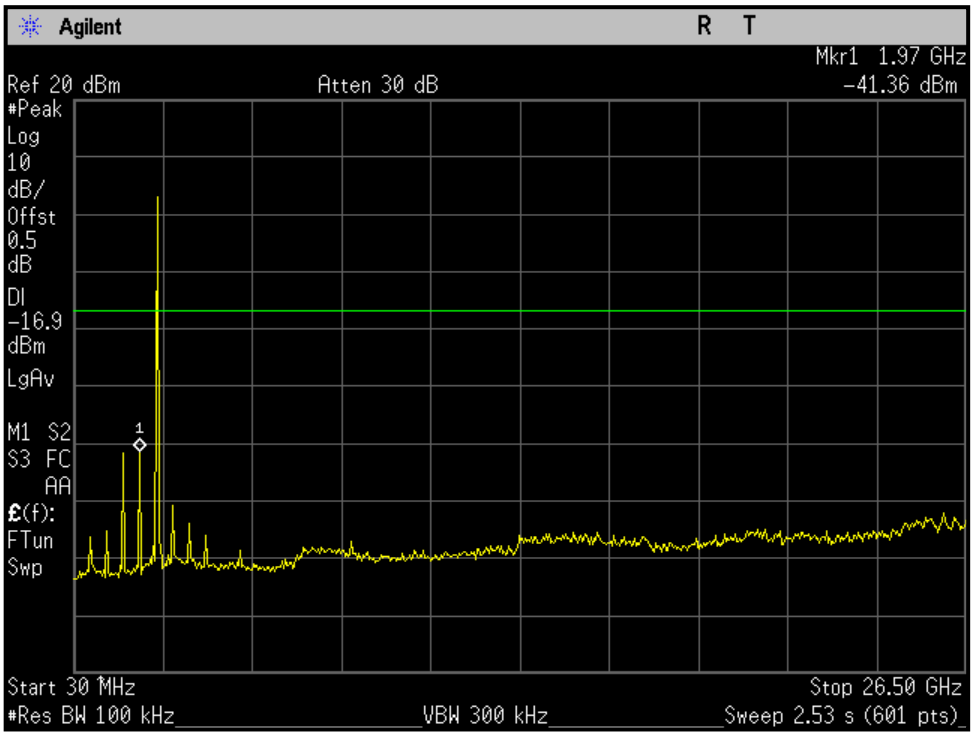


PLOT OF TEST DATA

Band edge at 2.4GHz, Highest Channel



Conducted Spurious Emissions, Highest Channel



TEST DATA

8.5 Peak Power Spectral Density

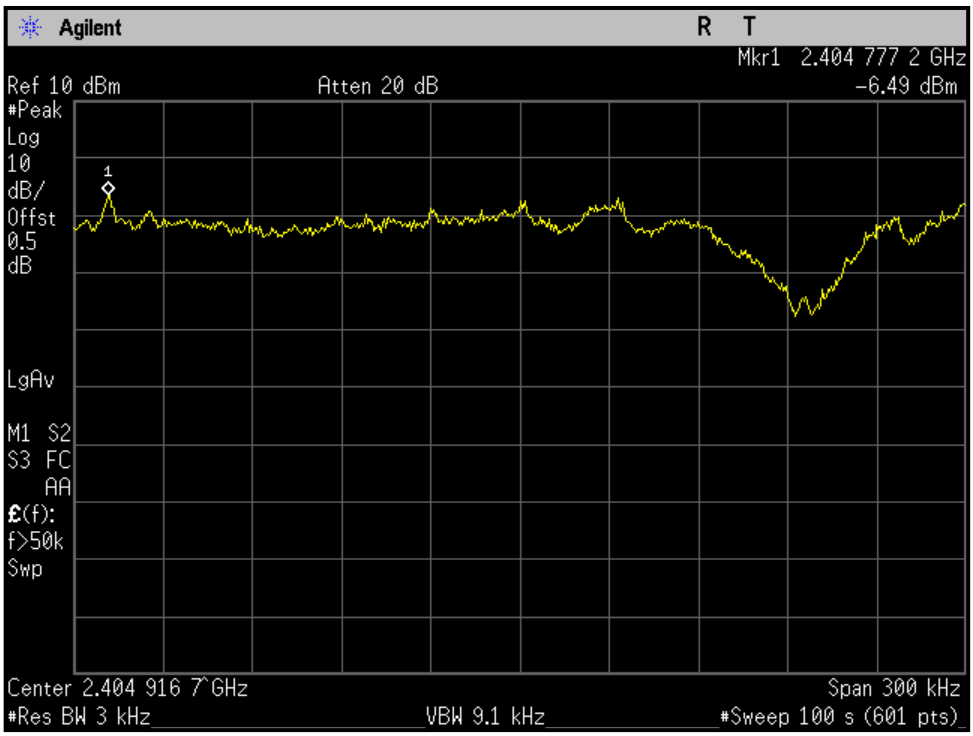
Test Mode : Set to Lowest channe, Middle channel and Highest channel.

Result:

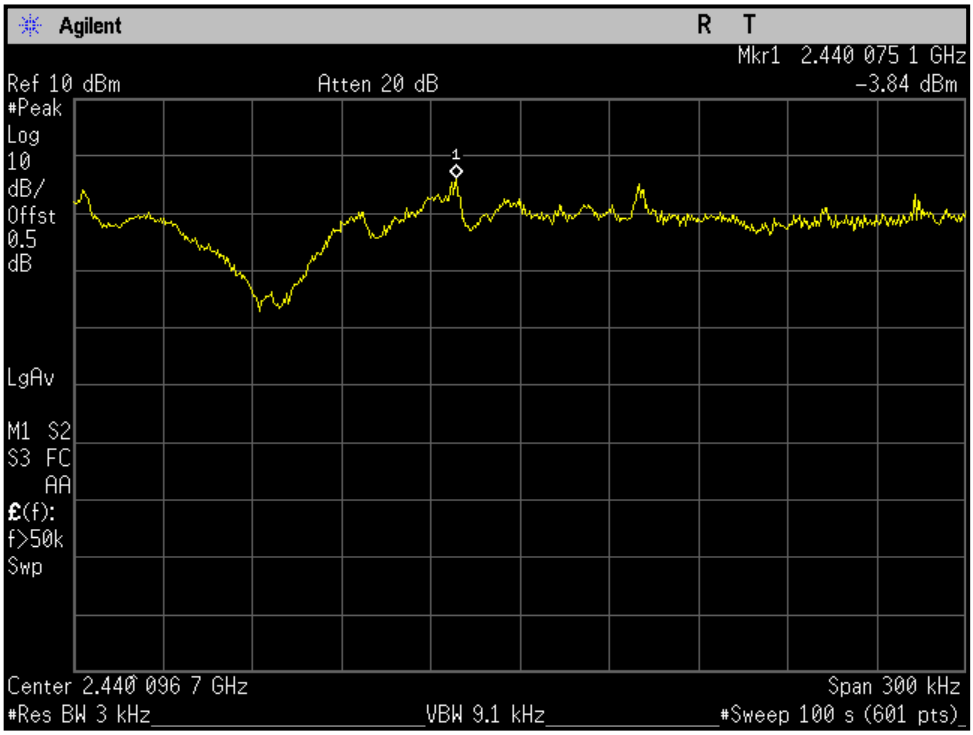
Channel	Frequency(MHz)	Result(dBm)	Limit(dBm)	Margin(dB)
Low	2405	-6.49	8	14.49
Middle	2440	-3.84	8	11.84
High	2480	-5.88	8	13.88

PLOT OF TEST DATA

Peak Power Spectral Density, Lowest Channel

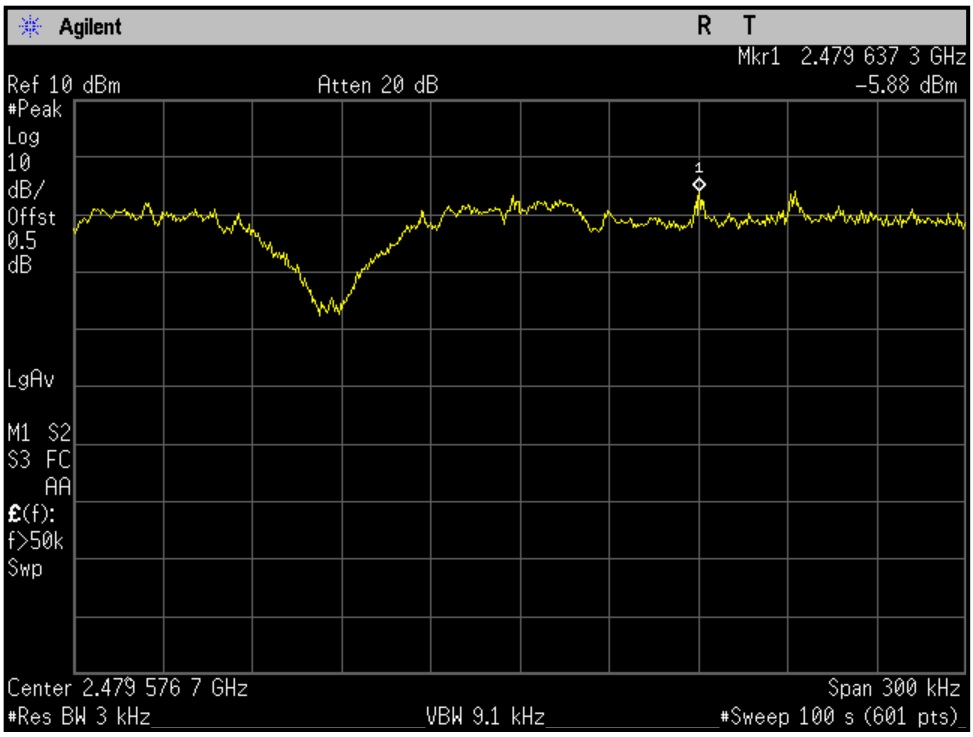


Peak Power Spectral Density, Middle Channel



PLOT OF TEST DATA

Peak Power Spectral Density, Highest Channel



TEST DATA

8.6 Radiated Emissions

▶ **X-Axis**

Frequency (MHz)	Reading (dBμV)	Pol* (H/V)	AF+CL+Amp (dB)**	Result (dBμV / m)	Limit (dBμV / m)	Margin (dB)
154.79	36.5	V	-9.1	27.4	43.5	16.1
165.00	37.0	V	-9.3	27.7	43.5	15.8
169.53	36.0	V	-10.3	25.7	43.5	17.8
210.00	42.7	V	-11.1	31.6	43.5	11.9
280.10	49.4	V	-10.4	39.0	46.0	7.0
353.81	37.8	V	-9.4	28.4	46.0	17.6

Table 1. Radiated Measurements at 3 meters

▶ **Y-Axis**

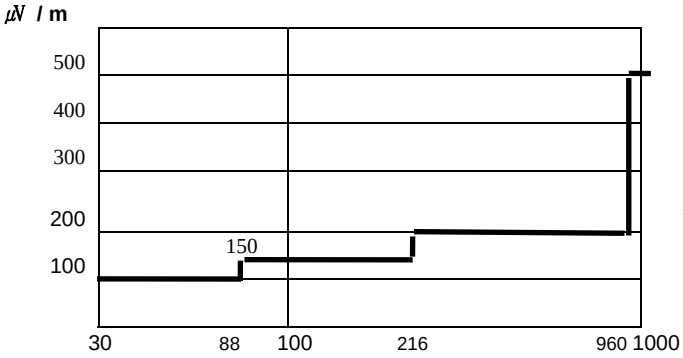
Frequency (MHz)	Reading (dBμV)	Pol* (H/V)	AF+CL+Amp (dB)**	Result (dBμV / m)	Limit (dBμV / m)	Margin (dB)
154.79	36.1	V	-9.1	27.0	43.5	16.5
165.00	37.1	V	-9.3	27.8	43.5	15.7
169.53	35.9	V	-10.3	25.6	43.5	17.9
210.00	41.9	V	-11.1	30.8	43.5	12.7
280.10	48.8	V	-10.4	38.4	46.0	7.6
353.81	40.1	V	-9.4	30.7	46.0	15.3

Table 2. Radiated Measurements at 3 meters

▶ **Z-Axis**

Frequency (MHz)	Reading (dBμV)	Pol* (H/V)	AF+CL+Amp (dB)**	Result (dBμV / m)	Limit (dBμV / m)	Margin (dB)
154.79	35.8	V	-9.1	26.7	43.5	16.8
165.00	36.8	V	-9.3	27.5	43.5	16.0
169.53	35.7	V	-10.3	25.4	43.5	18.1
210.00	41.4	V	-11.1	30.3	43.5	13.2
280.10	49.9	V	-10.4	39.5	46.0	6.5
353.81	40.3	V	-9.4	30.9	46.0	15.1

Table 3. Radiated Measurements at 3 meters



NOTES:

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

2 The radiated limits are shown on Figure 1.

Above 1 GHz the limit is 500 μV / m.

Fig. 1. Limits at 3 meters

NOTES:

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

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

3. Measurements using CISPR quasi-peak mode.

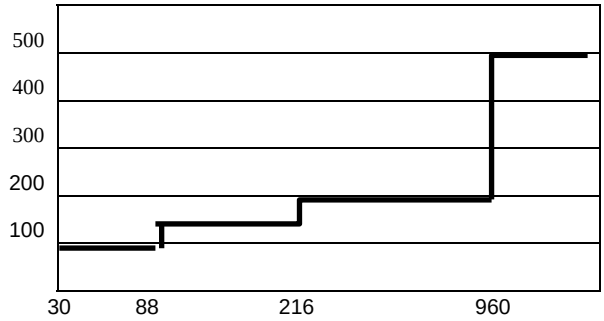
4. The limit is on the FCC Part section 15.109(a), 15.209(a).

TEST DATA

8.7 Receiver Radiated Emissions

Frequency (MHz)	Reading (dBμV)	Pol* (H/V)	AF+CL+Amp (dB)**	Result (dBμV / m)	Limit (dBμV / m)	Margin (dB)
154.79	33.9	V	-9.1	26.7	43.5	16.8
165.00	35.0	V	-9.3	27.5	43.5	16.0
169.53	35.2	V	-10.3	25.4	43.5	18.1
210.00	39.0	V	-11.1	30.3	43.5	13.2
280.10	47.8	V	-10.4	39.5	46.0	6.5
353.81	38.6	V	-9.4	30.9	46.0	15.1

Radiated Measurements at 3 meters



Limits at 3 meters

NOTES:

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

2. The radiated limits are shown on left figure.

NOTES:

1. *Pol. H =Horizontal V=Vertical

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

3. Measurements were performed using a CISPR quasi-peak mode for emissions below 1 GHz and average detector mode for emissions above 1GHz with the resolution bandwidth of 300 kHz.

4. The spurious emission was measured on frequency range from 30 MHz to 3 times the highest tuneable frequency.

5. The limit is on the RSS-210 and RSS-Gen.

9. 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

10. TEST EQUIPMENT

No.	Instrument	Manufacturer	Model	Serial No.	Calibration Date	Calibration Interval
1	*Test Receiver	R & S	ESCS 30	833364/020	Apr. 01 2008	1year
2	Test Receiver	R & S	ESCS 30	100302	Dec. 04 2008	1year
3	*Amplifier	HP	8447F	2805A03427	Apr. 07 2008	1year
4	*Amplifier	HP	8447F	2805A03351	Apr. 17 2008	1year
5	*Amplifier	HP	8447F	2805A03406	Apr. 17 2008	1year
6	*Amplifier	HP	8449B	3008A00107	Feb. 27 2008	1year
7	Spectrum Analyzer	Agilent	E4440A	MY44022567	Sep. 09 2008	1year
8	Power Meter	R & S	NRVS	835360/002	Nov. 11 2008	1year
9	Peak Power Sensor	R & S	NRV-Z32	836019/028	Nov. 11 2008	1year
10	Spectrum Analyzer	R & S	FSP 40	100361	Sep. 04 2008	1year
11	*Spectrum Analyzer	ADVANTEST	R3265A	45060401	Nov. 12 2008	1year
12	Loop Antenna	EMCO	EMCO/6502	8911-2436	Dec. 13 2008	1year
13	*Biconical Log Anten	ARA	LPB-2520/A	1180	Apr. 21 2008	1year
14	*Biconical Log Anten	ARA	LPB-2520/A	1209	Dec. 08 2008	1year
15	* Horn Antenna	SCHWARZBECK	BBHA9120D	9120D-508	Dec. 27 2007	1year
16	*Horn Antenna	SCHWARZBECK	BBHA9120D	9120D-474	June. 13 2008	1year
17	Signal Generater	R & S	SMP02	833286/003	Jul.21 2008	1year
18	LISN	R & S	ESH3-Z5	833874/006	Nov. 11 2008	1year
19	LISN	R & S	ESH2-Z5	100227	Sep. 02 2008	1year
20	*Position Controller	DAEIL EMC	N/A	N/A	N/A	N/A
21	*Turn Table	DAEIL EMC	N/A	N/A	N/A	N/A
22	*Antenna Mast	DAEIL EMC	N/A	N/A	N/A	N/A
23	*Anechoic Chamber	EM Eng.	N/A	N/A	N/A	N/A
24	*Shielded Room	EM Eng.	N/A	N/A	N/A	N/A
25	*Position Controller	Seo-Young EMC	N/A	N/A	N/A	N/A
26	*Turn Table	Seo-Young EMC	N/A	N/A	N/A	N/A
27	*Antenna Mast	Seo-Young EMC	N/A	N/A	N/A	N/A

) Test equipment used during the test