



ELECTROMAGNETIC EMISSION COMPLIANCE REPORT FOR PCS PRIVATE LAND MOBILE LICENSED DATA TRANSCEIVER

Test report file number : E053R-083

Applicant : Hoseo Telnet Co., Ltd.

Address : 157-033, 680 Deungcheon3-Dong, Kangseo-Gu, Seoul Korea

Manufacturer : Hoseo Telnet Co., Ltd.

Address : 157-033, 680 Deungcheon3-Dong, Kangseo-Gu, Seoul Korea

Type of Equipment : Telemetry Equipment

FCC ID. : R2SEFC

Model Name : Eagle 2

Added Model Name : Condor 2 and Falcon 2

Serial number : None

Total page of Report : 32 pages (including this page)

Date of Incoming : March 15, 2005

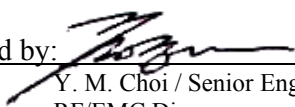
Date of issue : March 31, 2005

SUMMARY

The equipment complies with the regulation; **FCC Part 24D and 90.**

This test report only contains the result of a single test of the sample supplied for the examination.

It is not a generally valid assessment of the features of the respective products of the mass-production.

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**1. VERIFICATION OF COMPLIANCE**

APPLICANT : Hoseo Telnet Co., Ltd.
ADDRESS : 157-033, 680 Deungcheon3-Dong, Kangseo-Gu, Seoul Korea
CONTACT PERSON : C. H. Kim / Marketing & Sales Director
TELEPHONE NO : +82-2-2659-7345
FCC ID : R2SEFC
MODEL NO/NAME : Eagle 2
SERIAL NUMBER : N/A
DATE : March 31, 2005

DEVICE TYPE	PCS Private Land Mobile Data Transceiver Telemetry Equipment
THIS REPORT CONCERNS	ORIGINAL GRANT
MEASUREMENT PROCEDURES	ANSI C63.4/2003
TYPE OF EQUIPMENT TESTED	PRE-PRODUCTION
KIND OF EQUIPMENT AUTHORIZATION REQUESTED	CERTIFICATION
EQUIPMENT WILL BE OPERATED UNDER FCC RULES PART(S)	PART 24D and 90
MODIFICATIONS ON THE EQUIPMENT TO ACHIEVE COMPLIANCE	No
FINAL TEST WAS CONDUCTED ON	3 METER(S) OPEN AREA TEST SITE

- This device has shown compliance with the conducted emissions limits in 15.207 adopted under FCC 02-107 (ET Docket 98-80). The device may be marketed after July 11, 2005 and is not affected by the 15.37(j) transition provisions.
- The above equipment was tested by ONETECH Corp. for compliance with the requirement set forth in the FCC Rules and Regulations. This said equipment in the configuration described in this report, shows the maximum emission levels emanating from equipment are within the compliance requirements.



2. TEST SUMMARY

2.1 Test items and results

SECTION	TEST ITEMS	RESULTS
2.1046, 24.132, 90.635	RF Power Output at Antenna Terminals	Met the Limit / PASS
2.1049, 24.131, 90.209(b), 90.210(j)	Occupied Bandwidth, Bandwidth Limitation, Emission Masks	Met the Limit / PASS
2.1051, 24.133, 90.210(j)	Spurious Emissions at Antenna Terminals	Met the Limit / PASS
2.1053, 24.133, 90.210(j)	Field strength of Spurious Radiation	Met the Limit / PASS
2.1055(a)(1), 24.135, 90.213	Frequency Stability with Temperature variation	Met the Limit / PASS
2.1055(d), 24.135, 90.213	Frequency stability with primary voltage variation	Met the Limit / PASS
15.109(b)	Field strength of Spurious Radiation in Receiving Mode	Met the Limit / PASS
15.207 and 15.107	Conducted Limits	Met the Limit / PASS

2.2 Additions, deviations, exclusions from standards

No additions, deviations or exclusions have been made from standard.

2.3 Related Submittal(s) / Grant(s)

Original submittal only

2.4 Purpose of the test

To determine whether the equipment under test fulfills the requirements of the regulation stated in section 2.1.

2.5 Test Methodology

Radiated testing was performed according to the procedures in ANSI C63.4/2003. Radiated testing was performed at a distance of 3 meters from EUT to the antenna.

2.6 Test Facility

The Electromagnetic compatibility measurement facilities are located on at 426-1 Daessangryung-Ri, Chowol-Myeon, Gwangju-Si, Gyeonggi-Do 464-080 Korea. Description details of test facilities were submitted to the Federal Communications Commission on January 18, 2002 (Registration Number: 92819 and 340658), accredited by KOLAS (Korea Laboratory Accreditation Scheme, No: 85) and approved by TUV, DNV, and MIC (Ministry of Information and Communications in Korea) according to the requirement of ISO17025.



3. GENERAL INFORMATION

3.1 Product Description

The Hoseo Telnet Co., Ltd., Model Eagle 2 (referred to as the EUT in this report) is a **Telemetry Equipment**, which should be capable of communicating wirelessly over the ReFLEX network. It should contain modules to obtain GPS location data, monitor digital inputs, control digital outputs, monitor analog inputs, and communicate with peripheral devices attached to its serial ports. The EUT is specified to operate in a vehicle with expansion capabilities. The product specification described herein was obtained from product data sheet or user's manual.

DEVICE TYPE		PCS Private Land Mobile Data Transceiver
EMISSION DESIGNATOR		7K25F1D
OPERATING FREQUENCY	Transmitting Frequency	896~902 MHz
	Receiving Frequency.	929MHz~932MHz, and 935~942MHz
APPLICABLE FREQUENCY	PART 24	901~902 MHz
	PART 90	896~901 MHz
OUTPUT POWER		Up to 2W into Antenna
MODULATION		4 Level FSK
DATA TRANSFER RATE	Transmitter	1600 ~ 9600 bps
	Receiver	6400 bps
CHANNEL SPACING	Transmitter	12.5 kHz in 6.25kHz Steps
	Receiver	10 kHz and 12.5kHz
USED CPU		uPD703017 (MASK ROM :128Kbyte, RAM :4Kbyte)
USED MEMORY	EEPROM	32 K bit
	SRAM	2 Kbytes
ANTENNA	Transmitter	Fixed Helical Antenna, Model No: HW-899H-MSMA
	Receiver	Fixed Helical Antenna, Model No: HW-899H-MSMA
ANTENNA GAIN		0 dBi
LIST OF EACH OSC. OR CRY. FREQ.(FREQ.>=1MHz)		14.7456, 16.8 MHz and 32.768MHz
NUMBER OF LAYER		4 Layers
POWER REQUIREMENT		DC 4.0V
EXTERNAL CONNECTOR	Eagle2 Model	2 SMA Antenna Connector for GPS and ReFLEX Module and 1 DB 25 Connector
	Condor 2 Model	1 SMA Antenna Connector and 1 DB 25 Connector
	Falcon 2 Model	One DC Jack for Battery Charging

3.2 Alternative type(s)/model(s); also covered by this test report.

The following list consists of added model name and their difference. The basic and added models use same RF module and GPS module, but main boards are different. Please refer to product photo.

	Model Name	FCC ID	Remark
Basic Model Name	Eagle2	R2SEFC	The product has 2 external antenna ports for RF Module and GPS Module and data bus port.
Added Model Name	Condor2	R2SEFC	Without GPS Module and GPS antenna port on Eagle 2
	Falcon2	R2SEFC	The product does not have external antenna and data bus ports

4. EUT MODIFICATIONS

None

5. SYSTEM TEST CONFIGURATION

5.1 Justification

This device was configured for testing in a typical way as a normal customer is supposed to be used. During the test, the following components were installed inside of the EUT.

DEVICE TYPE	MANUFACTURER	MODEL/PART NUMBER	FCC ID
ReFlex Module	Hoseo Telnet Co., Ltd.	ATM200	R2SATM200
GPS Module	Hadaru	UGM8-01	N/A
Main Board	Hoseo Telnet Co., Ltd.	H050120B for Eagle2	N/A
Main Board	Hoseo Telnet Co., Ltd.	H050120A for Falcon2	N/A

5.3 Peripheral equipment

Defined as equipment needed for correct operation of the EUT, but not considered as tested:

Model	Manufacturer	FCC ID	Description	Connected to
Eagle2	Hoseo Telnet Co., Ltd.	R2SEFC	Telemetry Equipment (EUT)	Power Supply
DRP-305DN	Digital Electronics Co., Ltd.	N/A	DC Power Supply	EUT

5.4 Mode of operation during the test

The EUT was continuously transmitted with max power at 800, 1600, 6800 and 9600 bps and the worst data was recorded in this test report.

6. RF POWER OUTPUT at ANTENNA TERMINAL

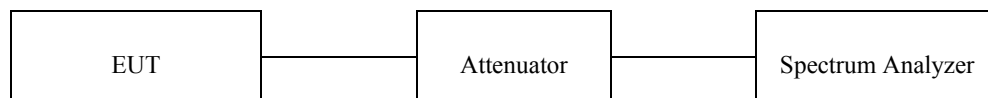
6.1 Operating environment

Temperature : 19°C

Relative humidity : 42 %

6.2 Test set-up

The RF output port of the EUT was connected to the input of the spectrum analyzer through sufficient attenuation. The resolution bandwidth was set to 2 MHz and video bandwidth of the spectrum analyzer was set at 3 MHz and the spectrum as recorded in the frequency band ± 5 MHz from the carrier frequency.



6.3 Test equipment used

	Model Number	Manufacturer	Description	Serial Number
■ -	8564E	HP	Spectrum Analyzer	3650A00756
■ -	N/A	HP	30dB Attenuator Assembly	2350A3133
■ -	DRP-305DN	Digital Electronics	DC Power Supply	

All test equipment used is calibrated on a regular basis.



6.4 Test data

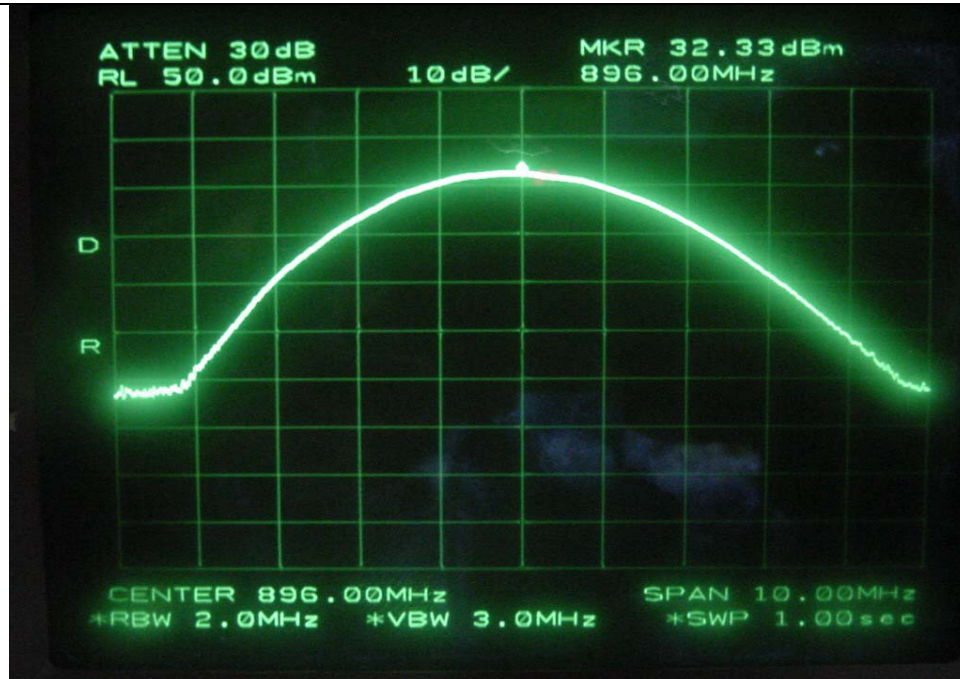
- Test Date : March 15, 2005
- Test Result : Pass

CHANNEL	FREQUENCY (MHz)	MEASURED VLAUE (dBm)	LOSS (dB)	TOTAL (dBm)	RESULT (W)
Low	896	32.33	0.5	32.83	1.92
High	902	32.33	0.5	32.83	1.92

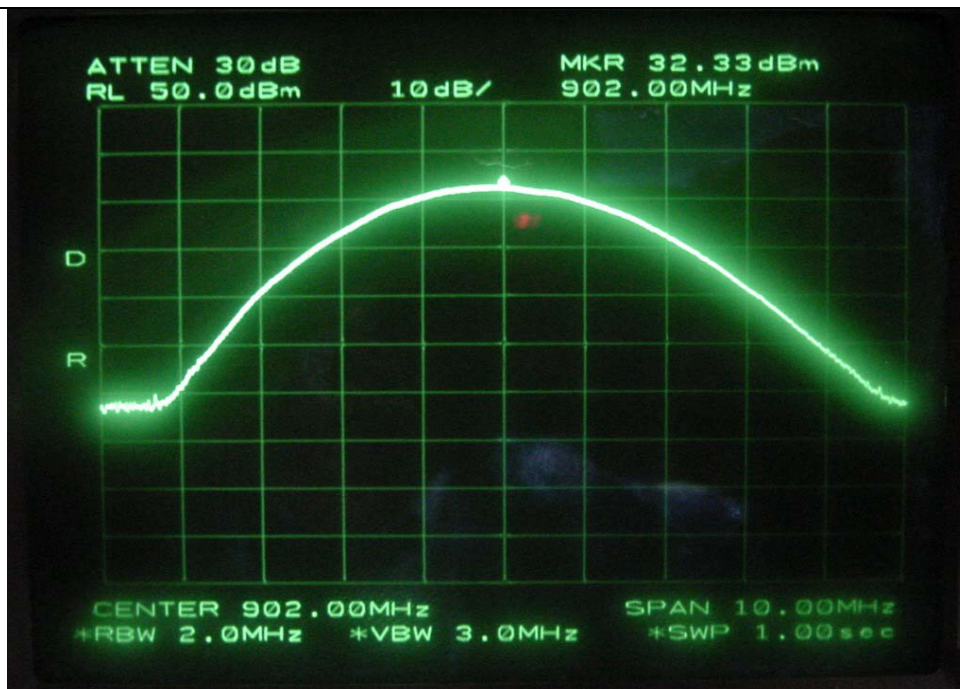
Remark: See next page for an overview sweep performed with peak detector and spectrum analyzer offset function was used for attenuator.

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Tested by: Ki-Hong, Nam / Test Engineer



Low Channel



High Channel



8. OCCUPIED BANDWIDTH, BANDWIDTH LIMITATION, EMISSION MASKS

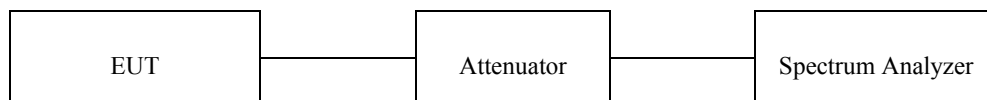
8.1 Operating environment

Temperature : 19°C

Relative humidity : 42 %

8.2 Test set-up

The RF output port of the EUT was connected to the input of the spectrum analyzer through sufficient attenuation. The resolution bandwidth and video bandwidth of the spectrum analyzer was set at 300 Hz for emission mask, 1 kHz for 99% occupied bandwidth and the spectrum was recorded in the frequency band ± 25 kHz from the carrier frequency.



8.3 Test equipment used

Model Number	Manufacturer	Description	Serial Number
■ - 8564E	HP	Spectrum Analyzer	3650A00756
■ - N/A	HP	30dB Attenuator Assembly	2350A3133
■ - 3033B	B&J TMI	DC Power Supply	2056036

All test equipment used is calibrated on a regular basis.



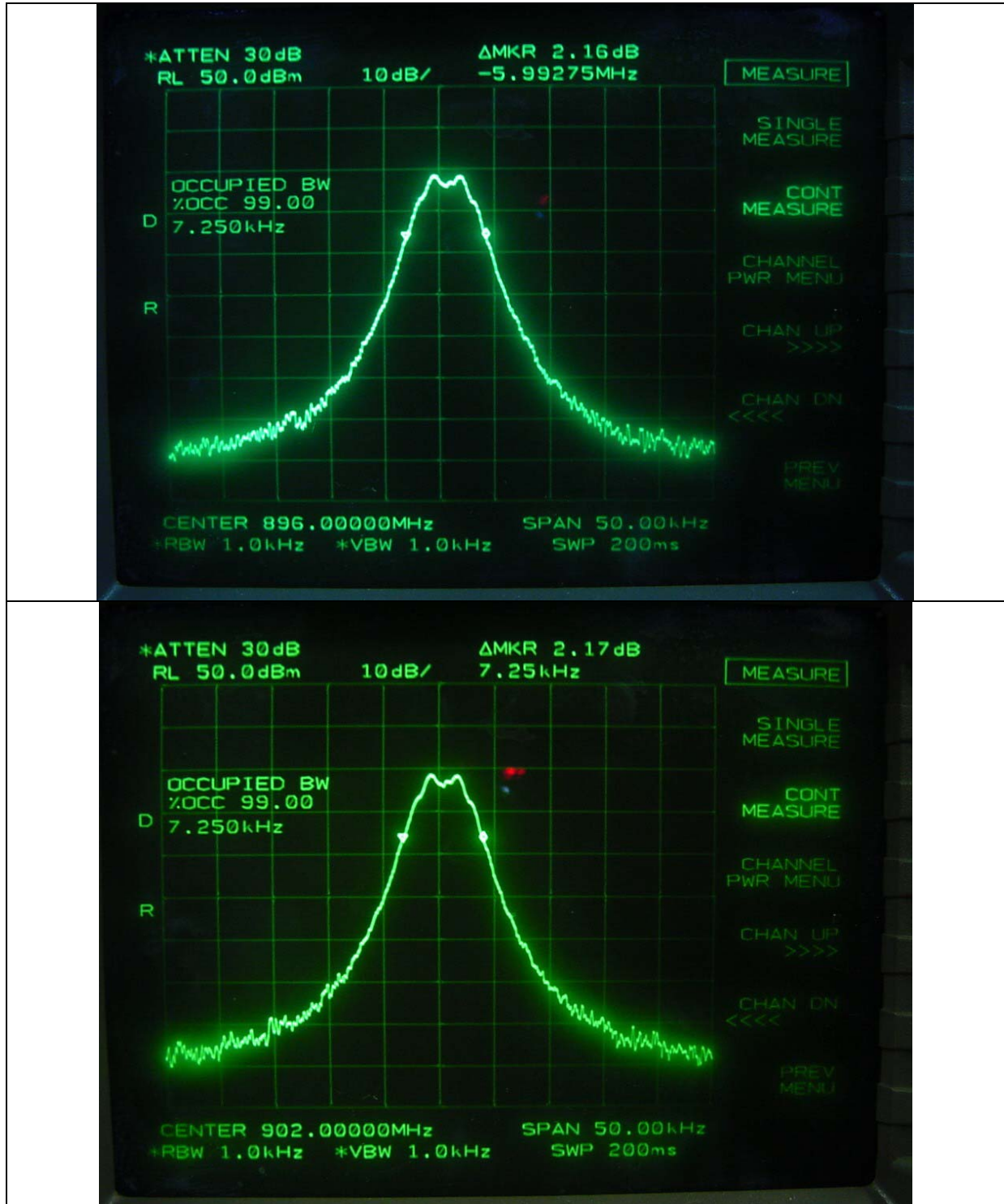
8.4 Test data

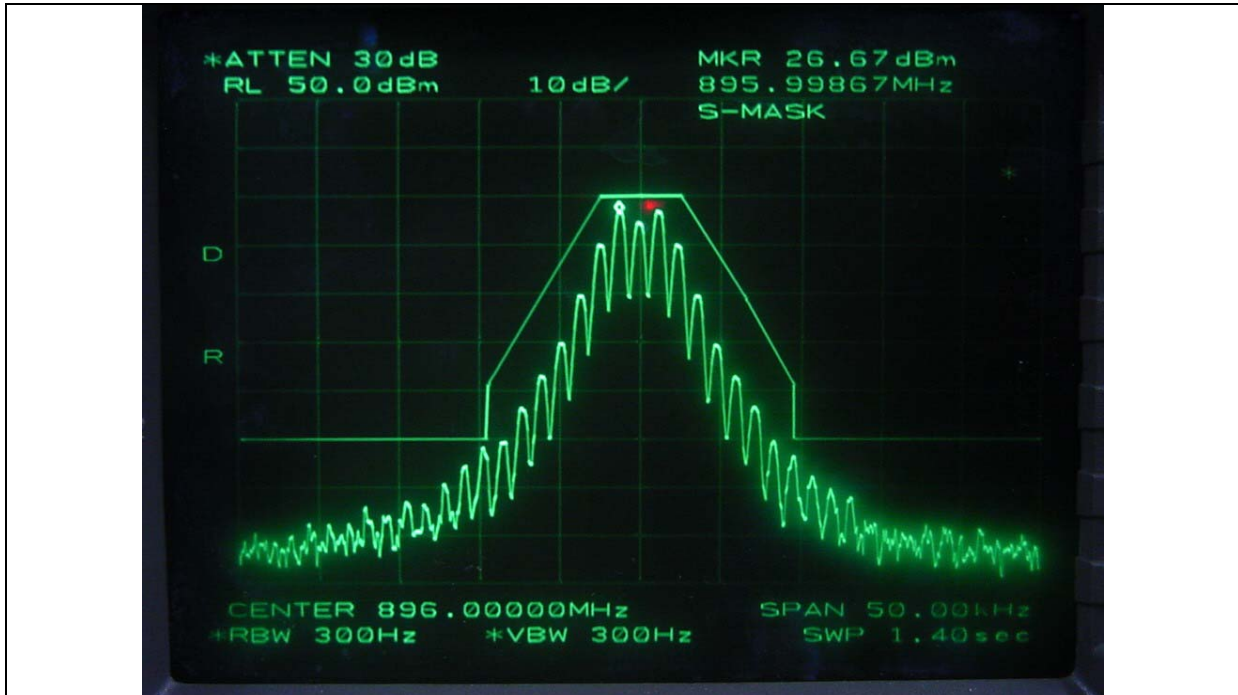
- Test Date : March 15, 2005
- Test Result : Pass

CHANNEL	FREQUENCY(MHz)	MEASURED VLAUE (kHz)	LIMIT (kHz)	MARGIN (kHz)
Low	896	7.25	10.0 kHz for Part 24	-2.417
High	902	7.25	13.6 kHz for Part 90	

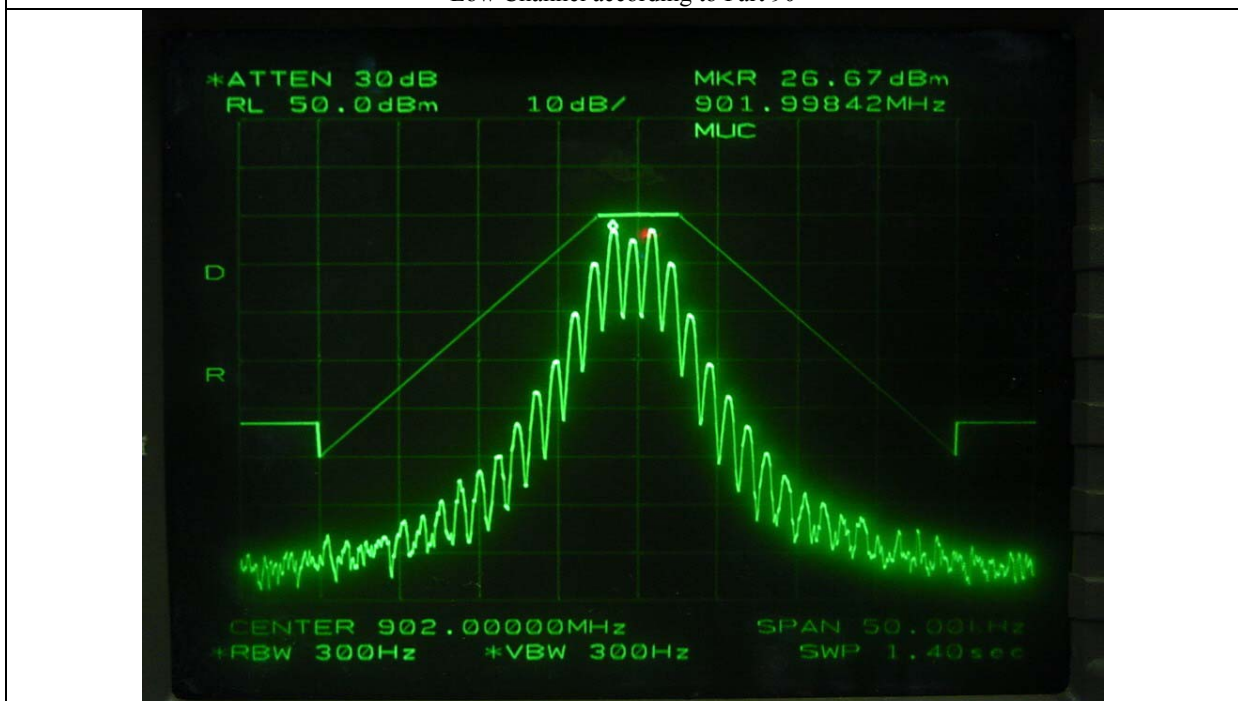
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Tested by: Ki-Hong, Nam / Test Engineer





Low Channel according to Part 90



High Channel according to Part 24D

9. SPURIOUS EMISSION AT ANTENNA TERMINAL

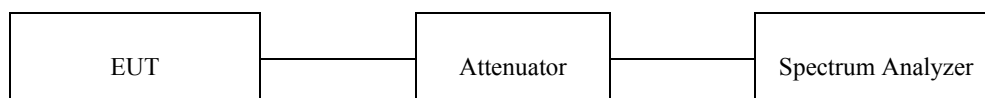
9.1 Operating environment

Temperature : 18°C

Relative humidity : 40 %

9.2 Test set-up for conducted measurement

The RF output port of the EUT was connected to the input of the spectrum analyzer through sufficient attenuation. The resolution bandwidth and video bandwidth of the spectrum analyzer was set at 100 kHz and sufficient scans were taken to show any out of band emissions up to 10 GHz.



9.3 Test equipment used

	Model Number	Manufacturer	Description	Serial Number
■ -	8564E	HP	Spectrum Analyzer	3650A00756
■ -	N/A	HP	30dB Attenuator Assembly	2350A3133
■ -	3033B	B&J TMI	DC Power Supply	2056036

All test equipment used is calibrated on a regular basis.



9.4. Test data

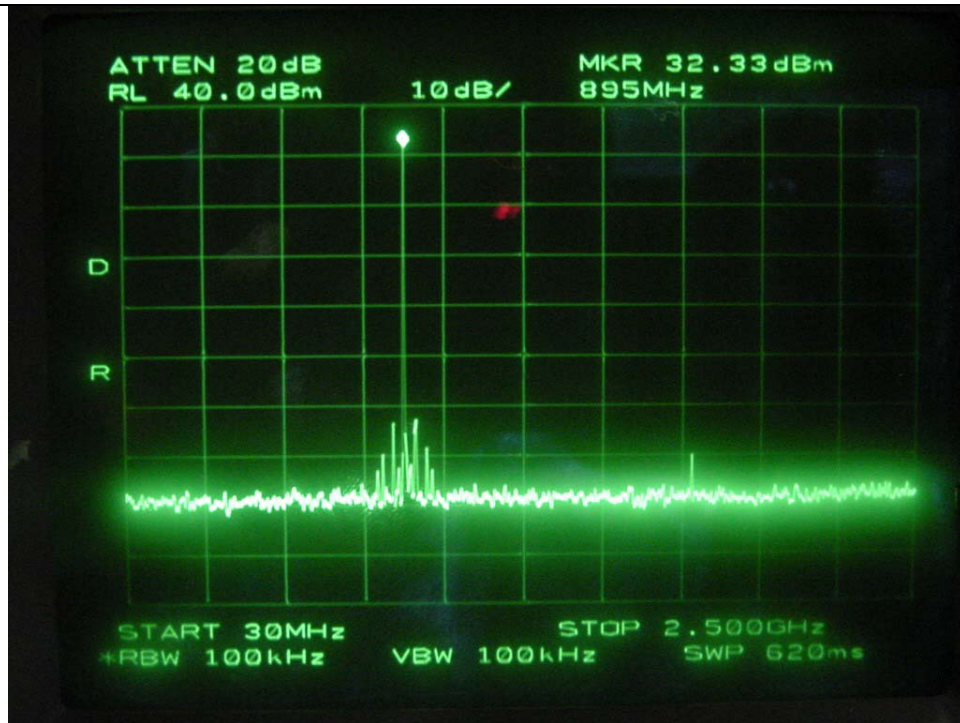
- Test Date : March 18, 2005
- Frequency range : 30 MHz ~ 10 GHz
- Result : PASSED BY -4.67 dB at Low Channel

Carrier Freq. (MHz)	Harmonic Freq. (MHz)	Measured Value (dBm)	Cable Loss (dB)	TOTAL (dBm)	Limit (dBm)	Margin (dB)
896.0	862	-23.33	0.5	-22.83	-13.0	-11.83
	927	-22.83	0.5	-22.33		-11.33
	1788	-30.00	0.67	-29.33		-18.33
	2678	-36.83	1.08	-35.75		-24.75
	5363	-36.00	1.60	-34.40		-23.40
	6250	-40.33	1.67	-38.66		-27.66
902.0	870	-27.00	0.50	-26.50	-13.0	-15.50
	886	-22.17	0.50	-21.67		-10.67
	919	-22.67	0.50	-22.17		-11.17
	1800	-30.33	0.67	-29.66		-18.66
	2700	-36.83	1.08	-35.75		-24.75
	5400	-36.17	1.60	-34.57		-23.57
	6300	-40.33	1.67	-38.66		-27.66

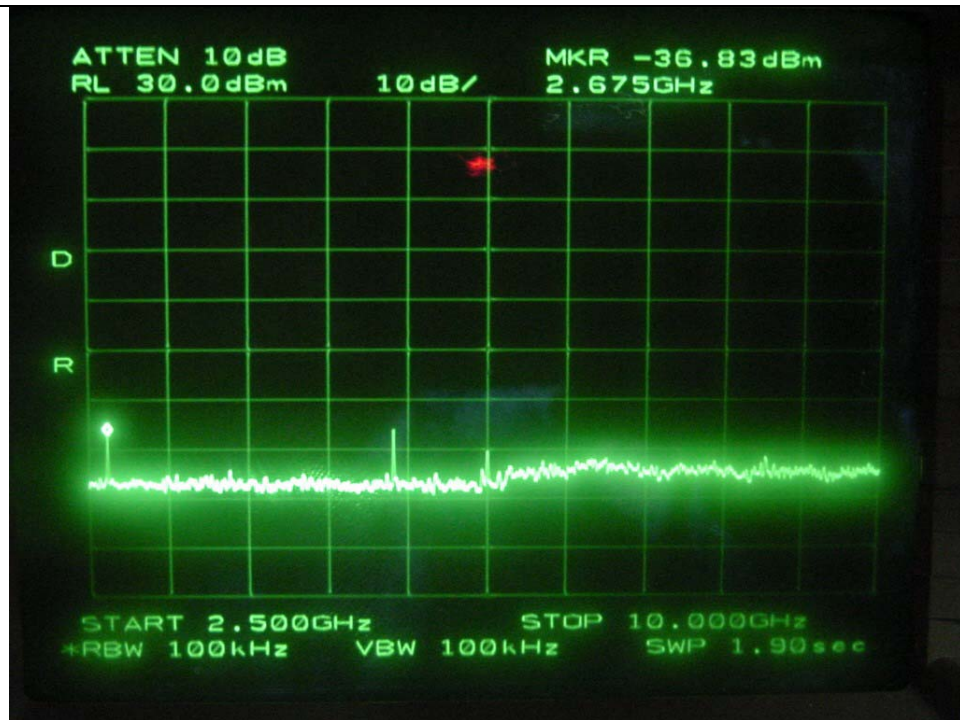
According to Part 24D, out of band emission shall be attenuated by $43 + 10 \log (P)$ dBc, equates to -13.0dBm.

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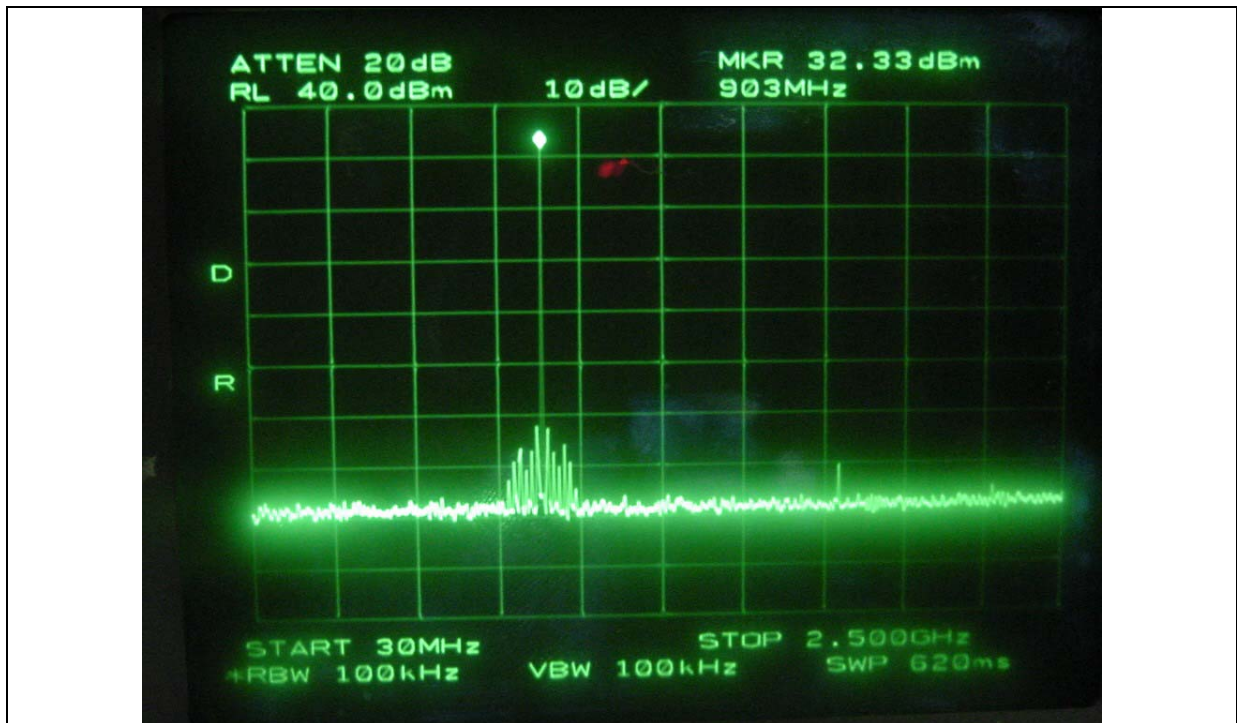
Tested by: Ki-Hong, Nam / Test Engineer



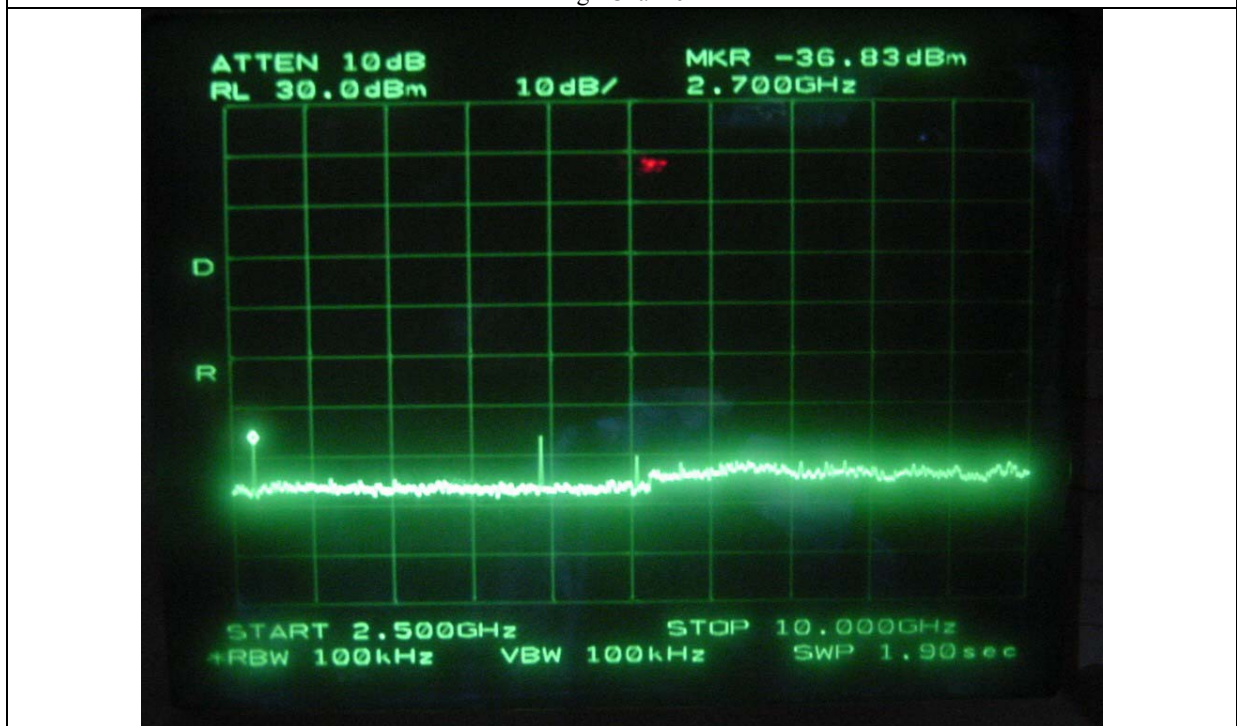
Low Channel



Low Channel



High Channel



High Channel

10 FIELD STRENGTH OF SPURIOUS RADIATION

10.1 Operating environment

Temperature : 13°C

Relative humidity : 39 %

10.2 Test set-up

The radiated emissions measurements were on the 3 meters, open-field test site. The EUT and other support equipment were placed on a non-conductive turntable above the ground plane. The interconnecting cables from outside test site were inserted into ferrite clamps at the point where the cables reach the turntable.

The frequency spectrum from 30MHz to up to 10th harmonic of the fundamental frequency was scanned and emission levels maximized at each frequency recorded. The system was rotated 360°, and the antenna was varied in height between 1.0 and 4.0 meters in order to determine the maximum emission levels. The test was performed by placing the EUT on 3-orthogonal axis. This procedure was performed for both horizontal and vertical polarization of the receiving antenna.

Remove the EUT and replace it with substitution antenna. A signal generator was connected to the substitution antenna by a non-radiating cable. The absolute levels of the spurious emissions were measured by the substitution.

10.3 Test equipment used

Model Number	Manufacturer	Description	Serial Number
■ - ESVS10	Rohde & Schwarz	EMI Test Receiver	827864/005
■ - 85650A	Hewlett Packard	Quasi-Peak Adapter	3107A01542
■ - 8568B	Hewlett-Packard	Spectrum Analyzer	3109A05456
■ - 85685A	Hewlett-Packard	RF Preselector	3107A01264
■ - 8564E	Hewlett-Packard	Spectrum Analyzer	3650A00756
■ - 8449B	Hewlett-Packard	Preamplifier	3008A00833
□ - 83051A	Agilent	Preamplifier	3950M00201
■ - BBHA9170	Schwarzbeck	Horn Antenna	BBHA9170178
□ - 8449B	Hewlett-Packard	RF Amplifier	3008A00833
□ - 8447F	HP	RF Amplifier	3113A04554
■ - 1070-1	EMCO	Antenna Master	9109-1624
■ - MA220	HD	Turn Table	N/A
■ - HD240	HD	Antenna Mast	N/A
■ - 3104C	EMCO	Biconical Antenna	9109-4441
■ - 3146	EMCO	Log Periodic Antenna	9109-3214
■ - YSE 500B	YoungShin Eng.	Frequency Converter	950413001
■ - ETCR-10	DaeHa	Automatic Voltage Com.	N/A

All test equipment used is calibrated on a regular basis.



10.4 Test data for Spurious & Harmonic Radiated Emission radiated emission

10.4.1 Test data for Eagle 2 Model

- Test Date : March 16, 2005
- Resolution bandwidth : 1 MHz for Peak and Average Mode
- Video bandwidth : 1 MHz for Peak Mode, 10Hz for Average Mode
- Frequency range : 1 GHz ~ 10 GHz
- Measurement distance : 3m
- Result : PASSED BY -16.24 dB at 2688.00 MHz of Low Channel

Frequency (MHz)	Spectrum Reading (dBuV)	Generator Reading (dBm)	Ant. Gain (dBi)	Ant. Pol. (H/V)	Dipole Gain (dB)	Cable Loss (dB)	Total (dBm)	Limit (dBm)	Margin (dB)
Test Data for Low Channel, 896.0 MHz									
896.0	107.00	30.50		H	0	0.84	29.96		
896.0	105.10	29.10		V	0	0.84	28.26		
1792.0	42.15	-37.80	10.32	H	2.15	1.17	-30.80	-13.0	-19.80
1792.0	39.83	-40.55	10.32	V	2.15	1.17	-33.55	-13.0	-22.55
2688.0	44.50	-35.71	10.95	H	2.15	1.33	-28.24	-13.0	-17.24
2688.0	40.75	-39.50	10.95	V	2.15	1.33	-32.03	-13.0	-21.03
Test Data for High Channel, 902.0 MHz									
902.0	106.17	30.50		H	0	0.84	29.66		
902.0	103.83	28.00		V	0	0.84	27.16		
1804.0	41.83	-37.30	10.35	H	2.15	1.17	-20.27	-13.0	-19.27
1804.0	37.83	-43.10	10.35	V	2.15	1.17	-36.07	-13.0	-25.07
2706.0	44.33	-36.00	10.97	H	2.15	1.33	-28.51	-13.0	-17.51
2706.0	37.00	-43.20	10.97	V	2.15	1.33	-35.71	-13.0	-24.71

Tabulated test data for Restricted Band

Remark: "H": Horizontal, "V": Vertical,

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Tested by: Ki-Hong, Nam / Test Engineer



10.4.2 Test data for Falcon2 Model

- Test Date : March 16, 2005
- Resolution bandwidth : 1 MHz for Peak and Average Mode
- Video bandwidth : 1 MHz for Peak Mode, 10Hz for Average Mode
- Frequency range : 1 GHz ~ 10 GHz
- Measurement distance : 3m
- Result : PASSED BY -16.69 dB at 2706.0 MHz of High Channel

Frequency (MHz)	Spectrum Reading (dBuV)	Generator Reading (dBm)	Ant. Gain (dBi)	Ant. Pol. (H/V)	Dipole Gain (dB)	Cable Loss (dB)	Total (dBm)	Limit (dBm)	Margin (dB)
Test Data for Low Channel, 896.0 MHz									
896.0	104.00	28.60		H	0	0.84	27.76		
896.0	101.30	27.00		V	0	0.84	26.16		
1792.0	39.50	-39.85	10.32	H	2.15	1.17	-32.85	-13.0	-21.85
1792.0	39.10	-40.10	10.32	V	2.15	1.17	-33.10	-13.0	-22.10
2688.0	42.85	-36.95	10.95	H	2.15	1.33	-29.48	-13.0	-18.48
2688.0	41.13	-38.33	10.95	V	2.15	1.33	-30.86	-13.0	-19.86
Test Data for High Channel, 902.0 MHz									
902.0	103.80	28.38		H	0	0.84	27.54		
902.0	102.83	27.86		V	0	0.84	27.02		
1804.0	39.82	-39.50	10.35	H	2.15	1.17	-32.47	-13.0	-21.47
1804.0	37.50	-41.63	10.35	V	2.15	1.17	-34.76	-13.0	-23.76
2706.0	42.15	-36.18	10.97	H	2.15	1.33	-28.69	-13.0	-17.69
2706.0	40.10	-38.73	10.97	V	2.15	1.33	-31.24	-13.0	-20.24

Tabulated test data for Restricted Band

Remark: "H": Horizontal, "V": Vertical,

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Tested by: Ki-Hong, Nam / Test Engineer

11. MAXIMUM PERMISSIBLE EXPOSURE

11.1 RF Exposure Calculation

According to the FCC rule 1.1310 table 1B, the limit for the maximum permissible RF exposure for an uncontrolled environment is 1mW/cm².

The electric field generated for a 1mW/cm² exposure is calculated as follows:

$$E = \sqrt{(30 * P * G) / d}, \text{ and } S = E^2 / Z = E^2 / 3770, \text{ because } 1\text{mW} / \text{cm}^2 = 10\text{W} / \text{m}^2$$

Where

S = Power density in mW/cm², Z = Impedance of free space, 377Ω

E = Electric field strength in Volts/m, G = Numeric antenna gain, and d = distance in meter

Combining equations and rearranging the terms to express the distance as a function of the remaining variable

$$d = \sqrt{(30 * P * G) / (3770 * S)}$$

Changing to units of mW and cm, using P (mW) = P (W) / 1000, d (cm) = 100 * d (m)

$$d = 0.282 * \sqrt{(P * G) / S}$$

Where

d = distance in cm, P = Power in mW, G = Numeric antenna gain, and S = Power density in mW/cm²

11.2 Calculated MPE Safe Distance

According to above equation, the following result was obtained.

Operating Mode	Peak Output Power		Antenna Gain	Calculated RF Exposure Separation Distance (cm)
	(dBm)	(mW)	dBi	
Tx Mode	32.83	1918.7	0.0	12.35

Following Caution on the manual will be described.

“CAUTION: Exposure to Radio Frequency Radiation.

Antenna shall be mounted in such a manner to minimize the potential for human contact during normal operation. The antenna should not be contacted during operation to avoid the possibility of exceeding the FCC radio frequency exposure limit.”

12. FREQUENCY STABILITY WITH TEMPERATURE VARIATION

12.1 Operating environment

Temperature : 18°C

Relative humidity : 40 %

12.2 Test set-up

The EUT was connected to an external DC power supply and the RF output port of the EUT was connected to a frequency counter via feed-through attenuators. The EUT was placed inside of the temperature chamber. The DC leads and RF output cable exited the chamber through an opening made for the purpose.

Turn EUT off and set chamber temperature to -30°C and then allow sufficient time (approximately 20 to 30 minutes after chamber reach the assigned temperature) for EUT to stabilize. Turn ON EUT and measure the EUT operating frequency and then turn off the EUT after the measurement.

Repeat above method emission measurements at +50°C and then record all measured frequencies on each temperature step.

12.3 Test equipment used

	Model Number	Manufacturer	Description	Serial Number
■ -	8564E	HP	Spectrum Analyzer	3650A00756
■ -	53152A	HP	Frequency Counter	US39270295
■ -	N/A	HP	30 dB Attenuator Assembly	2350A03133
■ -	3033B	B&J TMI	DC Power Supply	2056036
■ -	EY-101	Tabai ESPEC Corp.	Chamber	5104390

All test equipment used is calibrated on a regular basis.

**12.4 Test data**

- Test Date : March 18, 2005
- Operating Condition : 800/1600/6400/9200 bps was transmitted.
- Result : PASSED BY -0.58PPM at 20°C on 896MHz

Temperature (°C)	Center Freq. (Hz)	Measured Freq.(Hz)	Result (PPM)	Limit
-30	896000000	896000047	0.0524554	1 PPM
-20		896000293	0.3270089	
-10		896000347	0.3872768	
0		896000024	0.0267857	
10		896000398	0.4441964	
20		896000517	0.5770089	
30		896000494	0.5513393	
40		896000361	0.4029018	
50		896000462	0.5156250	
-30	902000000	902000159	0.1762749	1 PPM
-20		902000109	0.1208426	
-10		902000103	0.1141907	
0		902000046	0.0509987	
10		902000142	0.1574279	
20		902000429	0.4756098	
30		902000247	0.2738359	
40		902000349	0.3869180	
50		902000485	0.5376940	

Tested by: Ki-Hong, Nam / Test Engineer



13. FREQUENCY STABILITY WITH VOLTAGE VARIATION

13.1 Operating environment

Temperature : 18°C

Relative humidity : 40 %

13.2 Test set-up

An external variable DC power supply was connected to the battery terminals of the EUT. The voltage of EUT set to 115% of the nominal value and was then decreased until the EUT light no longer illuminated; i.e., the battery end point. The output frequency was recorded for each battery voltage.

13.3 Test equipment used

Model Number	Manufacturer	Description	Serial Number
■ - 8564E	HP	Spectrum Analyzer	3650A00756
■ - 53152A	HP	Frequency Counter	US39270295
■ - N/A	HP	30 dB Attenuator Assembly	2350A03133
■ - 3033B	B&J TMI	DC Power Supply	2056036

All test equipment used is calibrated on a regular basis.



13.4 Test data

- Test Date : March 18, 2005
- Rated Supply Voltage : 4Vdc
- Result : PASSED BY 0.39 PPM at 4.6Vdc on 902 MHz

Voltage (Vdc)	Carrier Freq. (Hz)	Measured Freq. (Hz)	Result (PPM)	Limit
3.40	896000000	896000325	0.36272321	1 PPM
4.60		896000185	0.20647321	
3.40	902000000	902000190	0.21064302	1 PPM
4.60		902000356	0.39467849	

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14. FIELD STRENGTH OF SPURIOUS RADIATED EMISSION IN RECEIVING MODE

14.1 Operating environment

Temperature : 16°C

Relative humidity : 41 %

14.2 Test set-up

The radiated emissions measurements were on the 3 meters, open-field test site. The EUT and other support equipment were placed on a non-conductive turntable above the ground plane. The interconnecting cables from outside test site were inserted into ferrite clamps at the point where the cables reach the turntable.

The frequency spectrum from 30MHz to 1000MHz was scanned and emission levels maximized at each frequency recorded. The system was rotated 360°, and the antenna was varied in height between 1.0 and 4.0 meters in order to determine the maximum emission levels. This procedure was performed for both horizontal and vertical polarization of the receiving antenna.

14.3 Test equipment used

Model Number	Manufacturer	Description	Serial Number
■ - ESVS10	Rohde & Schwarz	EMI Test Receiver	827864/005
■ - 85650A	Hewlett Packard	Quasi-Peak Adapter	3107A01542
■ - 8568B	Hewlett-Packard	Spectrum Analyzer	3109A05456
■ - 85685A	Hewlett-Packard	RF Preselector	3107A01264
□ - 8449B	Hewlett-Packard	RF Amplifier	3008A00833
□ - 8447F	HP	RF Amplifier	3113A04554
■ - 1070-1	EMCO	Antenna Master	9109-1624
■ - MA220	HD	Turn Table	N/A
■ - HD240	HD	Antenna Mast	N/A
■ - 3104C	EMCO	Biconical Antenna	9109-4441
■ - 3146	EMCO	Log Periodic Antenna	9109-3214
■ - YSE 500B	YoungShin Eng.	Frequency Converter	950413001
■ - ETCR-10	DaeHa	Automatic Voltage Com.	N/A

All test equipment used is calibrated on a regular basis.

**14.4 Test data****14.4.1 Test data for Eagle2 Model**

- Test Date : March 25, 2005
- Resolution bandwidth : 120 kHz
- Frequency range : 30MHz ~ 2.0GHz
- Measurement distance : 3m
- Operating Condition : Receiving mode at Low and High Channel
- Result : PASSED BY 6.56 dB at 910.84 MHz

Frequency (MHz)	Reading (dBuV)	Ant. Pol. (H/V)	Ant. Factor (dB/m)	Cable Loss	Emission Level(dBuV/m)	Limits (dBuV/m)	Margin (dB)
180.00	15.30	H	15.97	1.90	33.17	43.52	-10.35
181.00	15.00	H	15.97	1.89	32.86	46.02	-10.66
320.00	19.60	H	13.99	3.12	36.71	46.02	-9.31
323.00	20.10	H	14.02	3.17	37.29	46.02	-8.73
642.50	16.20	H	19.18	3.63	39.01	46.02	-7.01
910.84	11.40	H	22.86	5.20	39.46	46.02	-6.56
964.13	13.50	H	22.58	5.23	41.31	53.97	-12.66
It was not observed any emission from the EUT up to 2.0GHz.							

Tabulated test data for Radiated Electromagnetic Field

Remark: "H": Horizontal, "V": Vertical

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**14.4.2 Test data for Falcon2 Model**

- Test Date : March 25, 2005
- Resolution bandwidth : 120 kHz
- Frequency range : 30MHz ~ 2.0GHz
- Measurement distance : 3m
- Operating Condition : Receiving mode at Low and High Channel
- Result : PASSED BY 5.96dB at 911.00 MHz

Frequency (MHz)	Reading (dBuV)	Ant. Pol. (H/V)	Ant. Factor (dB/m)	Cable Loss	Emission Level(dBuV/m)	Limits (dBuV/m)	Margin (dB)
179.50	12.40	H	15.95	1.90	30.25	43.52	-13.27
320.00	15.70	H	13.99	3.12	32.81	46.02	-13.21
325.00	18.70	H	14.05	3.20	35.95	46.02	-10.07
642.50	13.20	H	19.18	3.63	36.01	46.02	-10.01
911.00	12.00	H	22.86	5.20	40.06	46.02	-5.96
964.10	12.50	H	22.58	5.23	40.31	46.02	-13.66
It was not observed any emission from the EUT up to 2.0GHz.							

Tabulated test data for Radiated Electromagnetic Field

Remark: "H": Horizontal, "V": Vertical

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15. CONDUCTED EMISSION TEST

15.1 Operating environment

Temperature : 19°C

Relative humidity : 41 %

15.2 Test set-up

The conducted emission measurements of power line were performed in a shielded room. The EUT was placed on a wooden table, 0.8 meters height above the floor. Power was fed to the EUT through a 50 ohm/ 50 microhenry Line Impedance Stabilization Network (LISN). The ground plane was electrically bonded to the shield room ground system and all power lines entering the shield room were filtered.

15.3 Test equipment used

Model Number	Manufacturer	Description	Serial Number
■ - ESHS10	Rohde & Schwarz	EMI Test Receiver	834467/007
■ - 3825/2	EMCO	AMN	9109-1869
■ - N/A	HanKook Shield room	Shield Room	N/A
■ - YSE 500B	YoungShin Eng.	Frequency Converter	950413001
■ - ETCR-10	DaeHa	Automatic Voltage Com.	N/A

All test equipment used is calibrated on a regular basis.



15.4 Test data

- Test Date : March 16, 2005
- Resolution bandwidth : 9 kHz
- Frequency range : 0.15MHz ~ 30MHz
- Result : PASSED BY -26.08 dB at 0.57 MHz with Peak Detector

Frequency (MHz)	Line	Quasi-Peak (dBuV)			Margin (dB)	Average (dBuV)		Margin (dB)
		Emission level	Detector Mode	Limits		Emission level	Limits	
0.15	H	41.77	P	66.00	-24.23			
0.35	H	31.35	P	58.96	-27.61			
0.535	H	35.23	P	56.00	-20.77			
0.715	H	30.74	P	56.00	-25.26			
3.565	H	32.47	P	56.00	-23.53			
3.735	H	31.94	P	56.00	-24.06			

Line Conducted Emissions Tabulated Data

Remark : "H": Hot Line, "N": Neutral line, "P": Peak detect.

Average mode was not recorded, because peak values were under the average limit.

Receiving mode was tested, but the result has margin more than 35 dB, so the data was not recorded.

See next page for an overview sweep performed with peak and average detector.

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