

ELECTROMAGNETIC EMISSION COMPLIANCE REPORT FOR PCS LICENSED TRANSMITTER

Test Report No. : E086R-081
AGR No. : A085A-030
Applicant : Inkel Corp.
Address : 177 Cheongcheon-dong, Bupyeong-gu, Incheon Korea
Manufacturer : Inkel Corp.
Address : 3-8 Cheongcheon-dong, Bypyeong-gu, Incheon Korea
Type of Equipment : RF Repeater
FCC ID. : P87JR20CU
Model Name : JR-20
Serial number : N/A
Total page of Report : 77 pages (including this page)
Date of Incoming : May 22, 2008
Date of issue : June 27, 2008

SUMMARY

The equipment complies with the regulation; **FCC Part 22 Subpart H and Part 24 Subpart E.**

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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ONETECH Corp.

Reviewed by: 
Y. K. Kwon / Managing Director
EMC/RF Center
ONETECH Corp.

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1. VERIFICATION OF COMPLIANCE

APPLICANT : Inkel Corp.
ADDRESS : 177 Cheongcheon-dong, Bupyeong-gu, Incheon Korea
CONTACT PERSON : Mr. Ohvom, Kwon / Senior Research Engineer
TELEPHONE NO : +82-2-818-8614
FCC ID : P87JR20CU
MODEL NAME : JR-20
SERIAL NUMBER : N/A
DATE : June 27, 2008

EQUIPMENT CLASS	PCB - PCS Licensed Transmitter
EQUIPMENT DESCRIPTION	RF Repeater
THIS REPORT CONCERNS	Original Grant
MEASUREMENT PROCEDURES	ANSI C63.4: 2003, EIA/TAI 603B
TYPE OF EQUIPMENT TESTED	PRE-PRODUCTION
KIND OF EQUIPMENT AUTHORIZATION REQUESTED	CERTIFICATION
EQUIPMENT WILL BE OPERATED UNDER FCC RULES PART(S)	PART 22 Subpart H and Part 24 Subpart E
MODIFICATIONS ON THE EQUIPMENT TO ACHIEVE COMPLIANCE	No
FINAL TEST WAS CONDUCTED ON	3 METER(S) OPEN AREA TEST SITE

-. 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, 24.232	RF Power Output at Antenna Terminals	Met the Limit / PASS
2.1047, 22.915	Modulation Characteristics	Met the requirement / PASS
2.1049, 24.238	Occupied Bandwidth, Bandwidth Limitation	Met the Limit / PASS
2.1049, 22.917	Band Edge	Met the Limit / PASS
2.1051, 22.917, 24.238 (a)	Spurious Emissions at Antenna Terminals	Met the Limit / PASS
2.1053, 22.917, 24.238 (a)	Field strength of Spurious Radiation	Met the Limit / PASS
2.1055(a)(1), 24.235	Frequency Stability with Temperature variation	Met the requirement / PASS
2.1055(d), 22.355, 24.235	Frequency stability with primary voltage variation	Met the requirement / PASS
2.1093	RF Exposure	Met the Limit / PASS
15.209	Radiated Emission Limits, General Requirement	Met the Limit / PASS
15.207	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 Grant

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 307-51 Daessangnyeong-ri, Chowol-eup, Gwangju-si, Gyeonggi-do, 464-862, Korea. Description details of test facilities were submitted to the Federal Communications Commission on August 30, 2005 (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 Inkel Corp., Model JR-20 (referred to as the EUT in this report) is a RF Repeater system that consists of Coverage Unit (CU), Donor Unit (DU), Coverage Antenna, and BIAS-T. The DC Power shall be fed to BIAS-T and then the power shall be supplied to CU and DU through BIAS-T. The role of the DU is to communicate with the BTS and it is usually located outside the building where service is to be improved and the unit can be mounted onto a wall or a pole, depending on the specific installation needs. The role of the CU is to communicate with the mobiles within the building where needs improved coverage. It is intended for wall mounting. According to above aim of each unit, the DU downlink port shall be connected to BIAS-T using coaxial cable and the output of BIAS-T shall be connected to the Uplink port of the CU using coaxial cable. The FCC ID for CU is P87JR20CU and the FCC ID of DU is P87JR20DU and this report covers for CU and another report for DU shall be issued with another test report. The product specification described herein was obtained from product data sheet or user's manual.

DEVICE TYPE		RF Repeater
OPERATING FREQUENCY	CELLULAR	Downlink: (869~894) MHz, Uplink: (824~869) MHz,
	PCS	Downlink: (1930~1990)MHz, Uplink: (1850~1910) MHz
RATED CONDUCTED RF OUTPUT POWER	CELLULAR	Downlink: 12 dBm (0.013 W), Uplink: - 38 dBm
	PCS	Downlink: 17 dBm (0.05 W), Uplink: - 50 dBm
TYPE OF MODULATION		F9W
EMISSION DESIGNATOR		1M34F9W
DC VOLTAGE & CURRENT INTO FINAL AMPLIFIER	CELLULAR	Downlink: 5 V, 85 mA , Uplink: 4.96 V, 70 mA
	PCS	Downlink: 3.3 V, 230 mA, Uplink: 4.96 V, 70 mA
USED COVERAGE ANTENNA	TYPE	Model No: TB-800/1900-T, MFR: Satena
	GAIN	1 dBi
ANTENNA CONNECTOR		SMA Type
NUMBER OF LAYER		4 Layers
POWER REQUIREMENT		DC 12 V, 5 A through BIAS-T from AC/DC Adapter
EXTERNAL CONNECTOR		SMA Type and TNC Connector

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

-. None

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
Coverage Unit	Main Board	Inkel Corp.	MPE25K_CU(7020-21657-001-0S)	N/A

5.2 Peripheral equipment

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

Model	Manufacturer	FCC ID	Description	Connected to
JR-20	Inkel Corp.	P87JR20CU	Coverage Unit (EUT)	BIAS-T
		P87JR20DU	Donor Unit (DU)	BIAS-T
DSA-60W-12 1UL	BT Telecom	N/A	AC/DC Adapter	BIAS-T
HSP-800/1900-10S	Satena	N/A	LINK Antenna	Inserted into the DU
TB-800/1900-T	Satena	N/A	Coverage Antenna	EUT
MPE25K	N/A	N/A	BIAS-T (DC Injector)	EUT & DU

5.3 Mode of operation during the test

The EUT was received signal form signal generator and then each mode, IS-95 CDMA, CDMA2000 and 1xEVDO was configured for producing maximum signal gain and bandwidth. The EUT was operated in a manner representative of the typical usage of the equipment. During all testing, system components were manipulated within the confines of typical usage to maximize each emission. Also The EUT has dip switches for frequency band and power selecting, but the software used to control the EUT for frequency band and maximum RF output power.

5.4 Modulation Characteristics

The EUT uses CDMA modulation, so the voice is digitized and coded into a bit stream. Also the EUT does not produce a modulated signal, so the test dose not performed and met the requirement.

6. RF POWER OUTPUT at ANTENNA TERMINAL

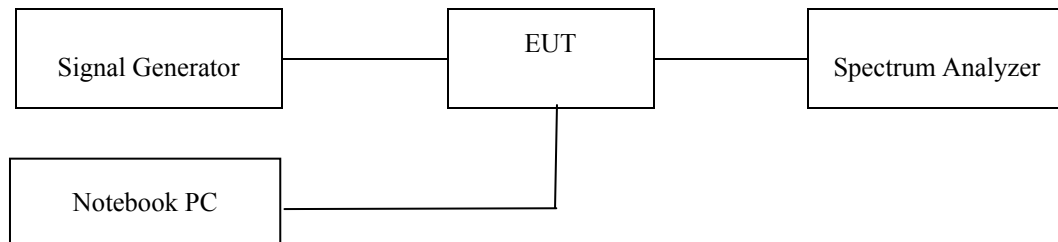
6.1 Operating environment

Temperature : 23 °C
Relative humidity : 45.8 %R.H.

6.2 Test set-up

The RF output port of the EUT was connected to the input of the spectrum analyzer. The software for RF control on the notebook PC was set to transmit maximum signal gain and bandwidth. The test was performed at three frequencies (low, middle, and high channels) using all modulation.

RF output power was measured by channel power measurement function of the spectrum analyzer.



6.3 Test equipment used

	Model Number	Manufacturer	Description	Serial Number	Last Cal.
□ -	437B	HP	Power Meter	3125U25121	June 19, 2007
□ -	8481A	HP	Power Sensor	1550A14928	Dec. 18, 2007
■ -	E4432B	HP	Signal Generator	US38440950	June 19, 2007
■ -	SMJ 100A	R/S	Vecter Signal Generator	101037	June 19, 2007
■ -	FSP	R/S	Spectrum Analyzer	100017	Mar. 15, 2008

All test equipment used is calibrated on a regular basis.

6.4 Test data

-. Test Date : June 04~05, 2008
-. Test Result : **Pass**

6.4.1 Test result for Cellular Band

Configuration	Modulation	Channel	Frequency (MHz)	Input Power (dBm)	Output Power (dBm)	Output Power (W)	Limit (W)
Downlink	IS-95 CDMA	Low	871.11	-55.00	11.00	0.012589	500.00
		Middle	881.52	-55.50	11.00		
		High	893.31	-56.17	11.00		
	CDMA2000	Low	871.11	-56.90	11.00		
		Middle	881.52	-57.50	11.00		
		High	893.31	-56.90	11.00		
	1xEVDO	Low	871.11	-57.00	11.00		
		Middle	881.52	-57.55	11.00		
		High	893.31	-57.84	11.00		

Remark. Uplink mode was not tested because the signal shall be connected to the BIAS-T using coaxial cable.

6.4.2 Test result for PCS Band

Configuration	Modulation	Channel	Frequency (MHz)	Input Power (dBm)	Output Power (dBm)	Output Power (W)	Limit (W)
Downlink	IS-95	Low	1931.25	-56.17	17.00	0.050119	100.00
		Middle	1957.50	-55.00	17.00		
		High	1988.75	-55.50	17.00		
	CDMA	Low	1931.25	-56.50	17.00		
		Middle	1957.50	-56.17	17.00		
		High	1988.75	-56.33	17.00		
	EVDO	Low	1931.25	-56.71	17.00		
		Middle	1957.50	-56.00	17.00		
		High	1988.75	-56.10	17.00		

Remark. Uplink mode was not tested because the signal shall be connected to the BIAS-T using coaxial cable.

기홍

Tested by: Ki-Hong, Nam / Test Engineer

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EMC-003 (Rev.1)

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7. OCCUPIED BANDWIDTH

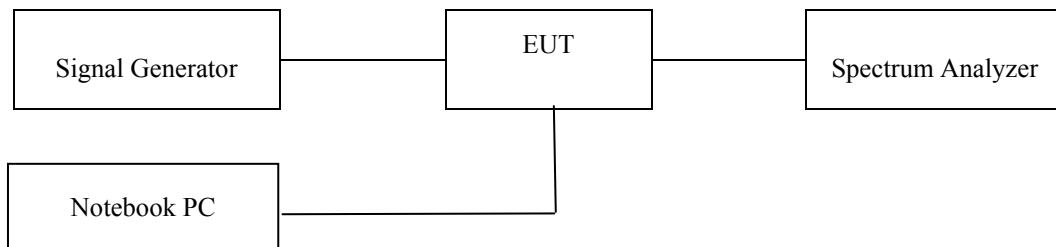
7.1 Operating environment

Temperature : 23.5 °C
Relative humidity : 45.8 %R.H.

7.2 Test set-up

The RF output port of the EUT was connected to the input of the spectrum analyzer. The software for RF control on the notebook PC was set to transmit maximum signal gain and bandwidth. The test was performed at three frequencies (low, middle, and high channels).

For the testing, the RBW was set to 1 % to 3 % of the -26 dB bandwidth. The VBW is set to 3 times the RBW and sweep time is coupled.



7.3 Test equipment used

	Model Number	Manufacturer	Description	Serial Number	Last Cal.
■ -	8564E	HP	Spectrum Analyzer	3650A00756	June 19, 2007
■ -	E4432B	HP	Signal Generator	US38440950	June 19, 2007
■ -	SMJ 100A	R/S	Vector Signal Generator	101037	June 19, 2007
□ -	FSP	R/S	Spectrum Analyzer	100017	Mar. 15, 2008

All test equipment used is calibrated on a regular basis.

7.4 Test data

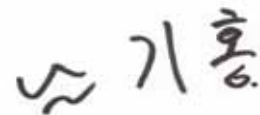
- Test Date : June 4 ~ 5 2008
- Test Result : Pass

7.4.1 Test result for Cellular Band

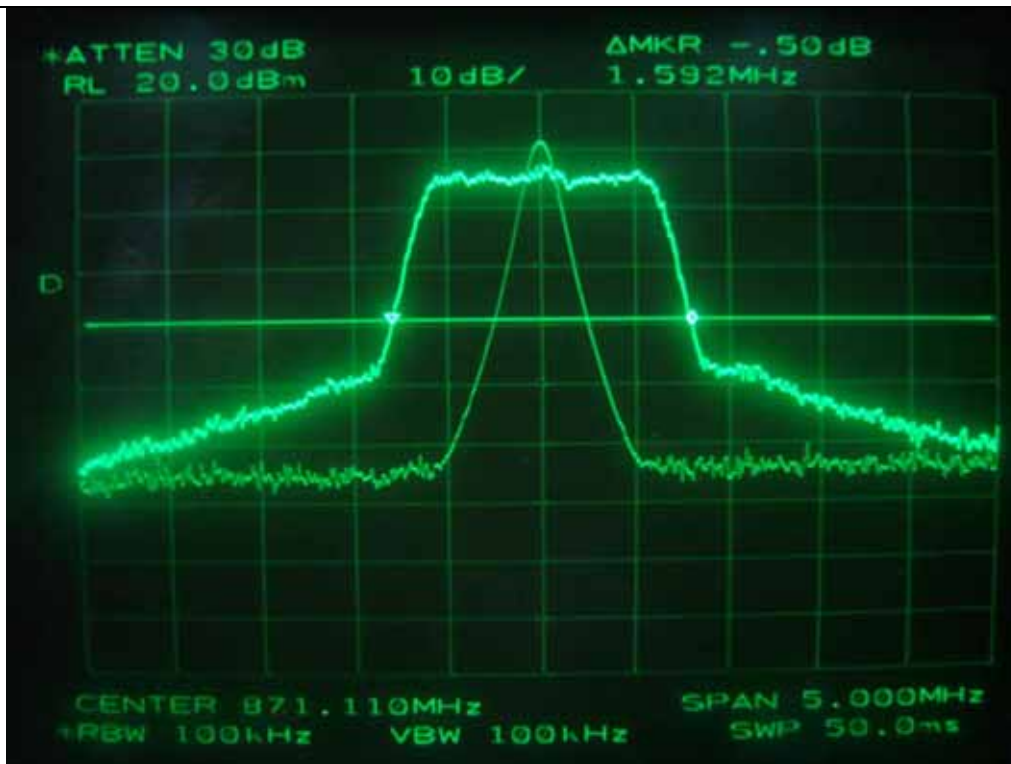
Configuration	Modulation	Channel	26dB Bandwidth (kHz)
Downlink	IS-95	Low	1592
		Middle	1583
		High	1567
	CDMA	Low	1583
		Middle	1583
		High	1575
	EVDO	Low	1583
		Middle	1567
		High	1583

Remark:

1. Uplink mode was not tested because the signal shall be connected to the BIAS-T using coaxial cable.
2. According to above result, the carrier frequency shall be within the frequency block edges.



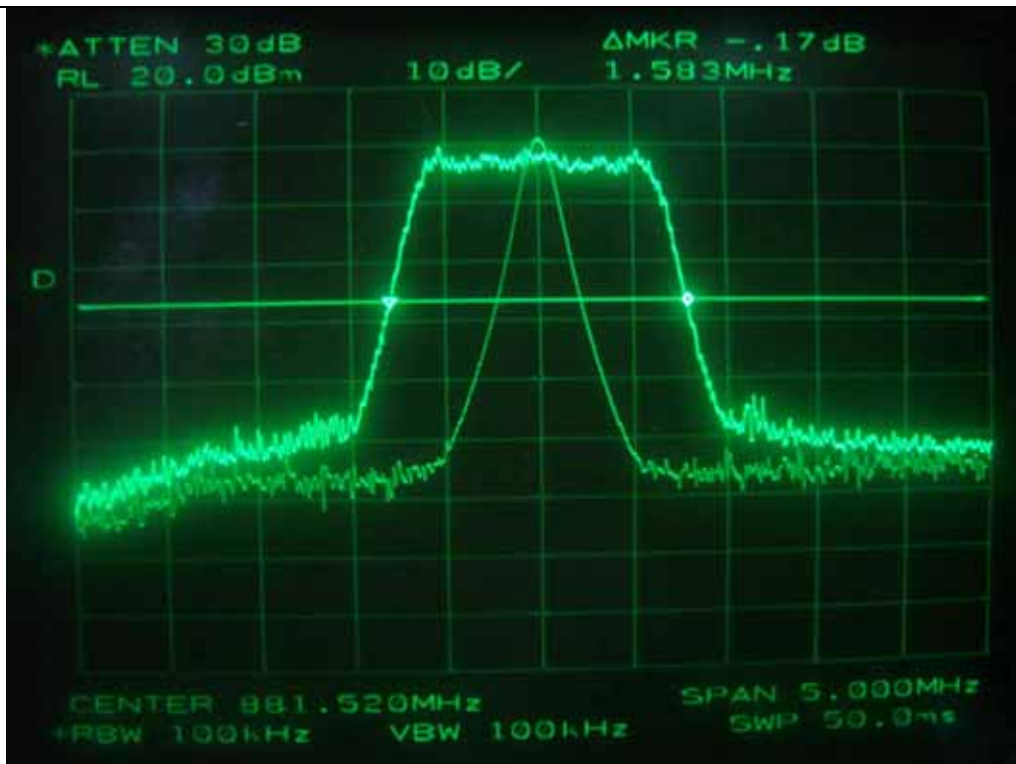
Tested by: Ki-Hong, Nam / Test Engineer



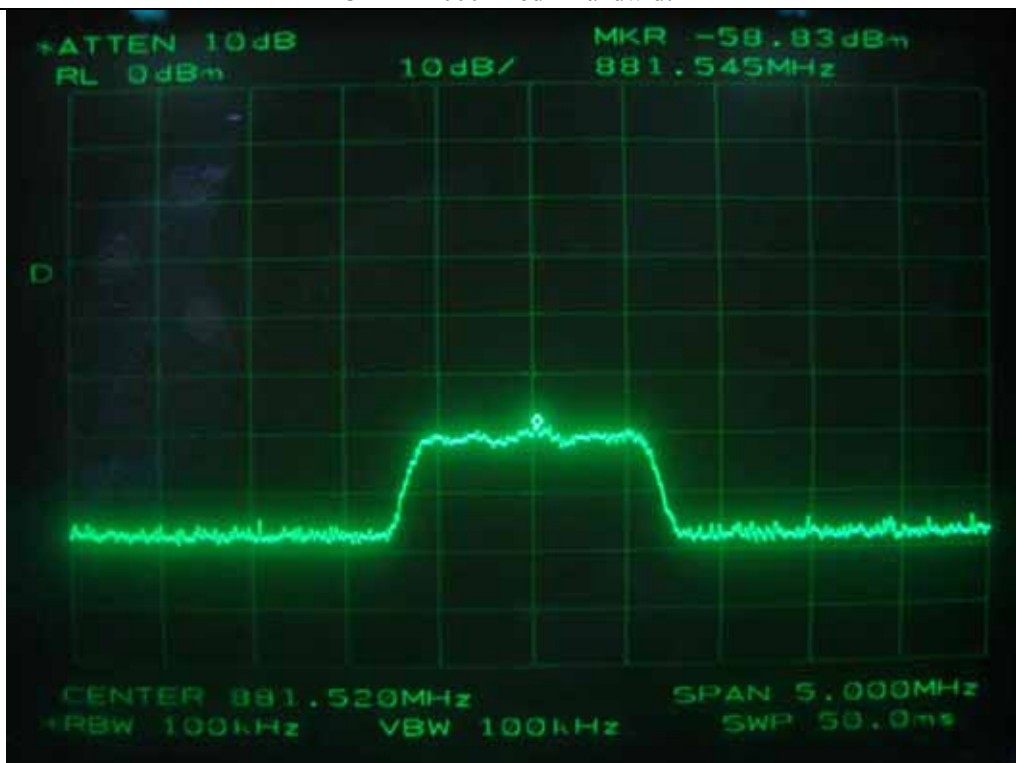
IS-95 CDMA - 26dB Bandwidth



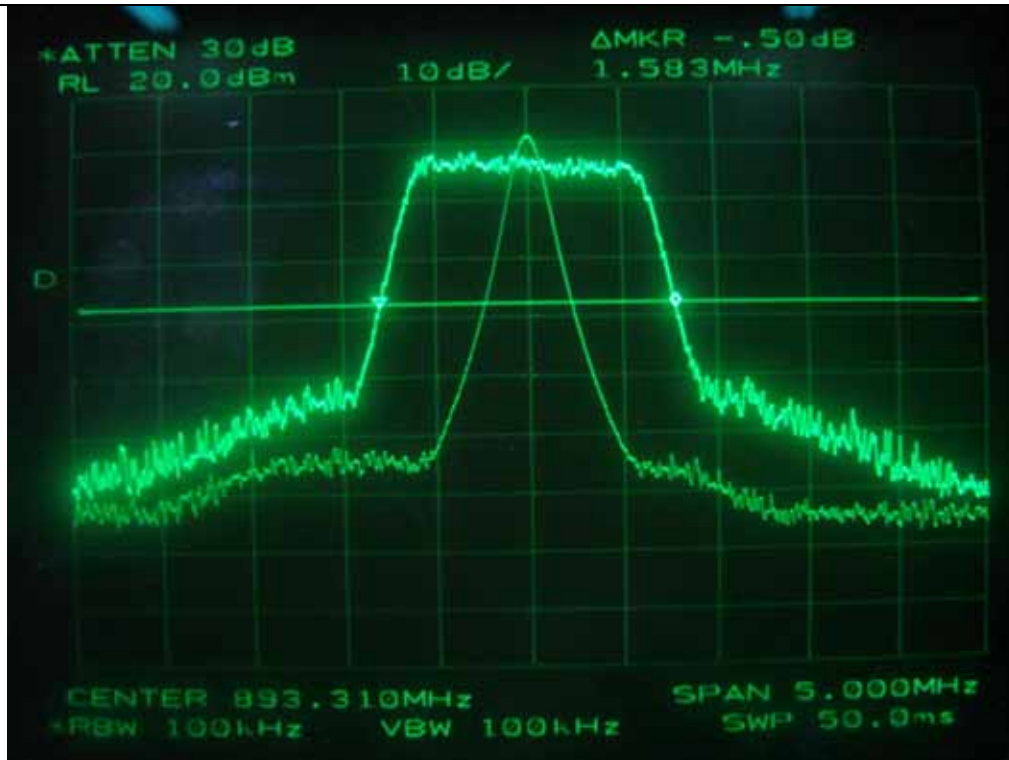
IS-95 CDMA – Input Signal



CDMA 2000 - 26dB Bandwidth



CDMA 2000 – Input Signal



1x EVDO - 26dB Bandwidth



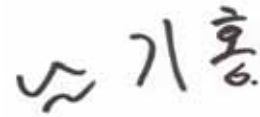
1x EVDO – Input Signal

7.4.2 Test result for PCS Band

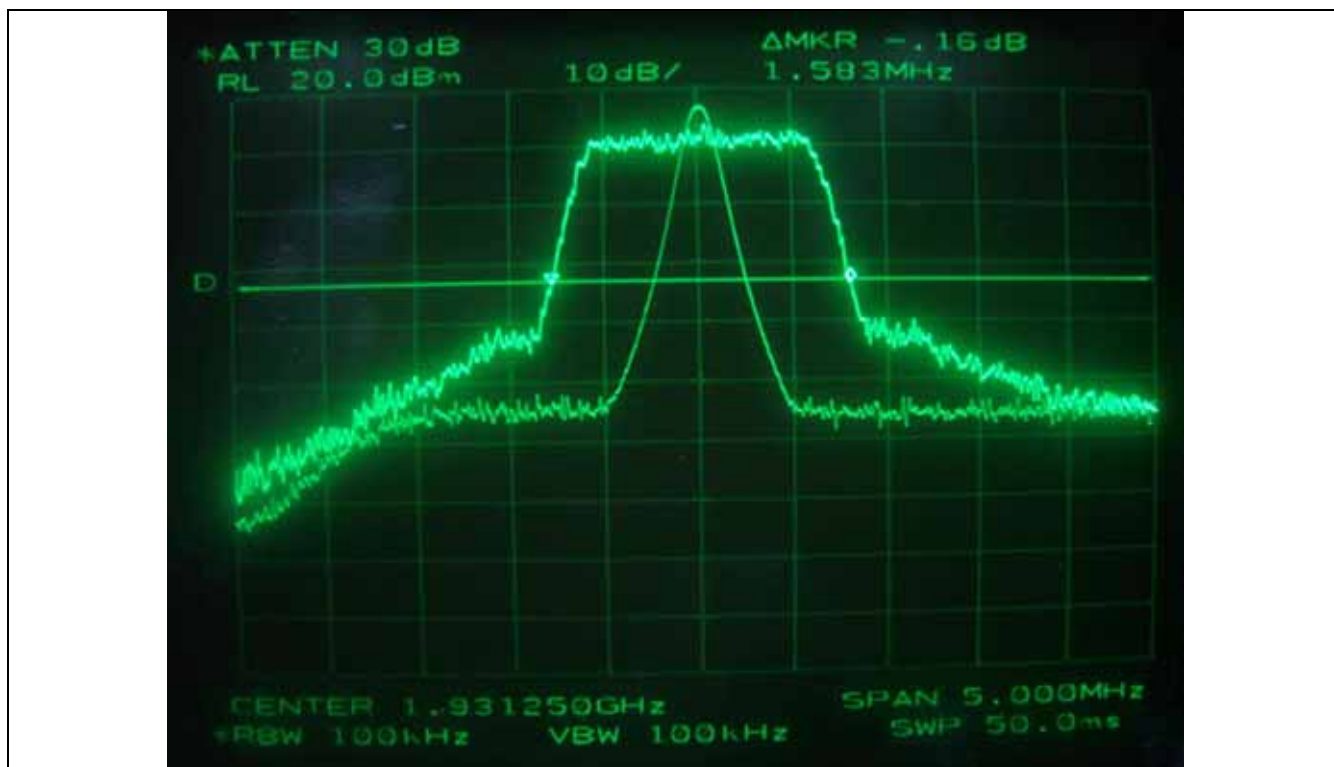
Configuration	Modulation	Channel	26dB Bandwidth (kHz)
Downlink	IS-95 CDMA	Low	1583
		Middle	1583
		High	1583
	CDMA 2000	Low	1583
		Middle	1592
		High	1583
	1xEVDO	Low	1567
		Middle	1583
		High	1592

Remark.

1. Uplink mode was not tested because the signal shall be connected to the BIAS-T using coaxial cable.
2. According to above result, the carrier frequency shall be within the frequency block edges.



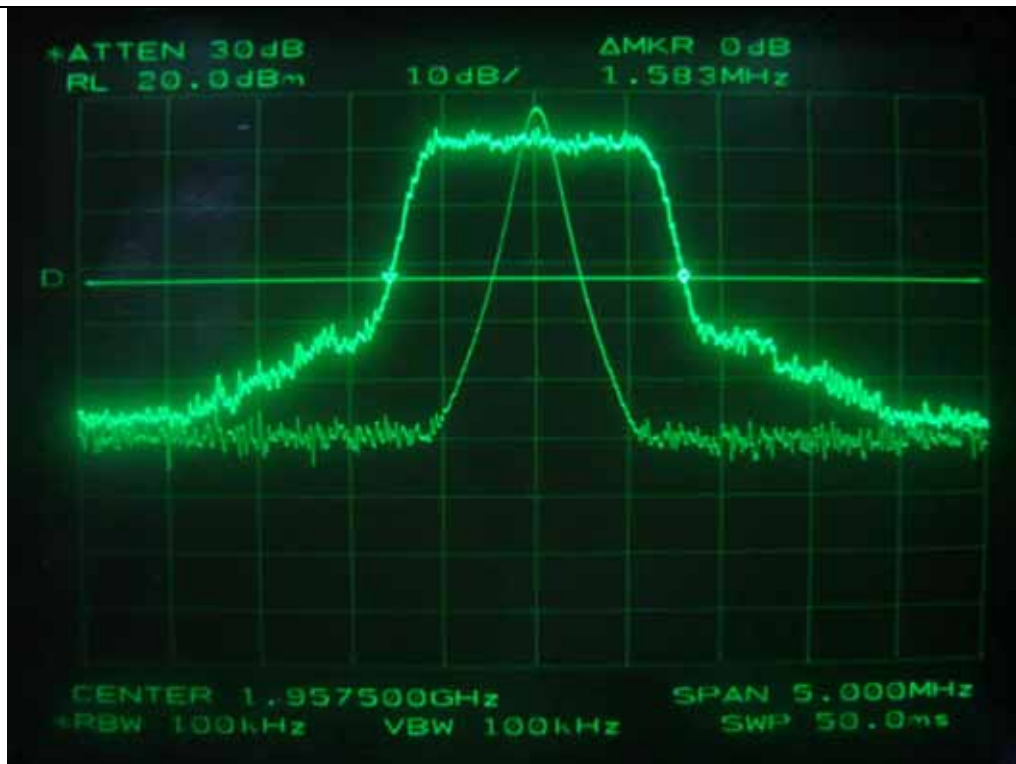
Tested by: Ki-Hong, Nam / Test Engineer



IS-95 CDMA - 26dB Bandwidth



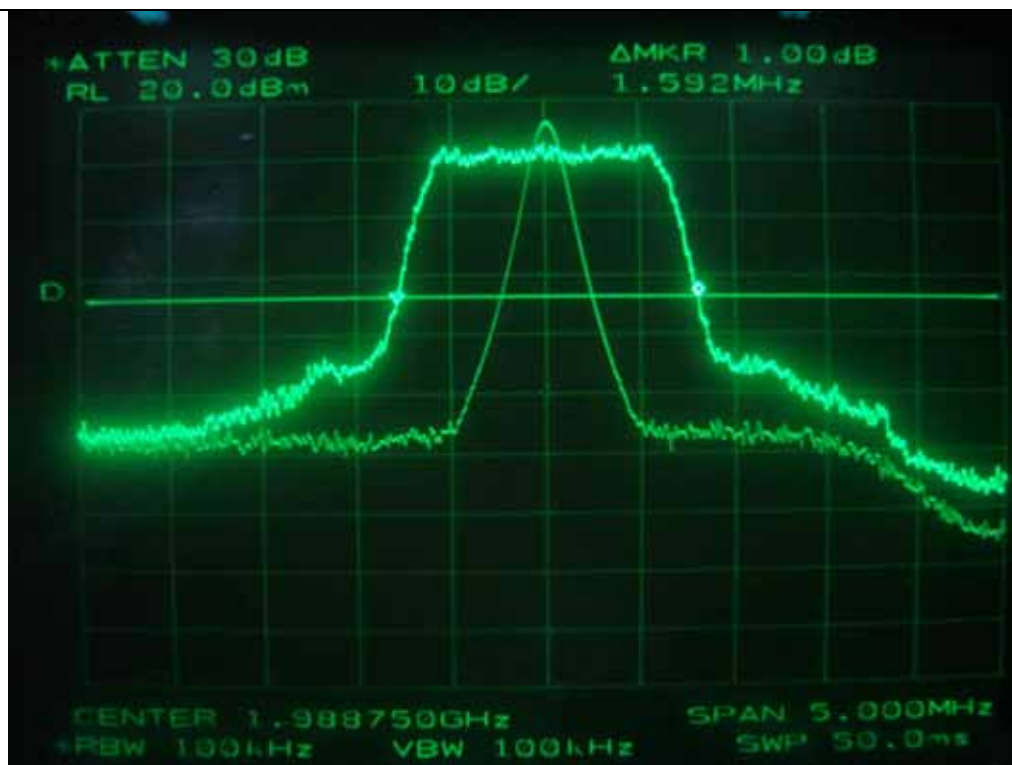
IS-95 CDMA – Input Signal



CDMA 2000 - 26dB Bandwidth



CDMA 2000 – Input Signal



1x EVDO - 26dB Bandwidth



1x EVDO – Input Signal

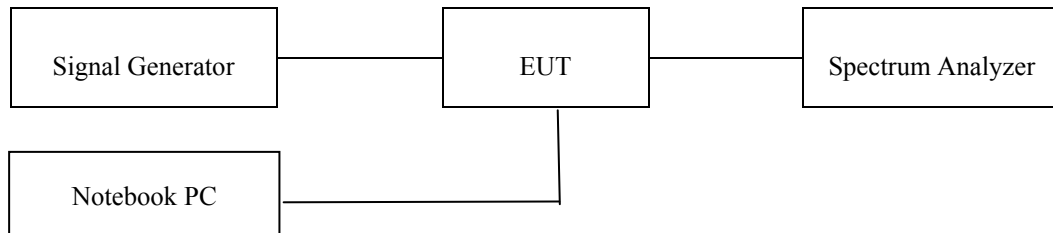
8. SPURIOUS EMISSION AT ANTENNA TERMINAL

8.1 Operating environment

Temperature : 23.5 °C
Relative humidity : 45.8 %R.H.

8.2 Test set-up for conducted measurement

The RF output port of the EUT was connected to the input of the spectrum analyzer. The resolution bandwidth and video bandwidth of the spectrum analyzer was set at 1 MHz and sufficient scans were taken to show any out of band emissions up to 20 GHz. The software for RF control on the notebook PC was set to zero



8.3 Test equipment used

	Model Number	Manufacturer	Description	Serial Number	Last Cal.
■ -	8564E	HP	Spectrum Analyzer	3650A00756	June 19, 2007
■ -	E4432B	HP	Signal Generator	US38440950	June 19, 2007
■ -	SMU 100A	R/S	Vector Signal Generator	101037	June 19, 2007
□ -	FSP	R/S	Spectrum Analyzer	100017	Mar. 15, 2008

All test equipment used is calibrated on a regular basis.

8.4 Test data

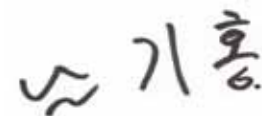
-. Test Date : June 4 ~ 5 2008
-. Frequency range : 30 MHz ~ 20 GHz
-. Result : **PASSED**

8.4.1 Test result for Cellular Band

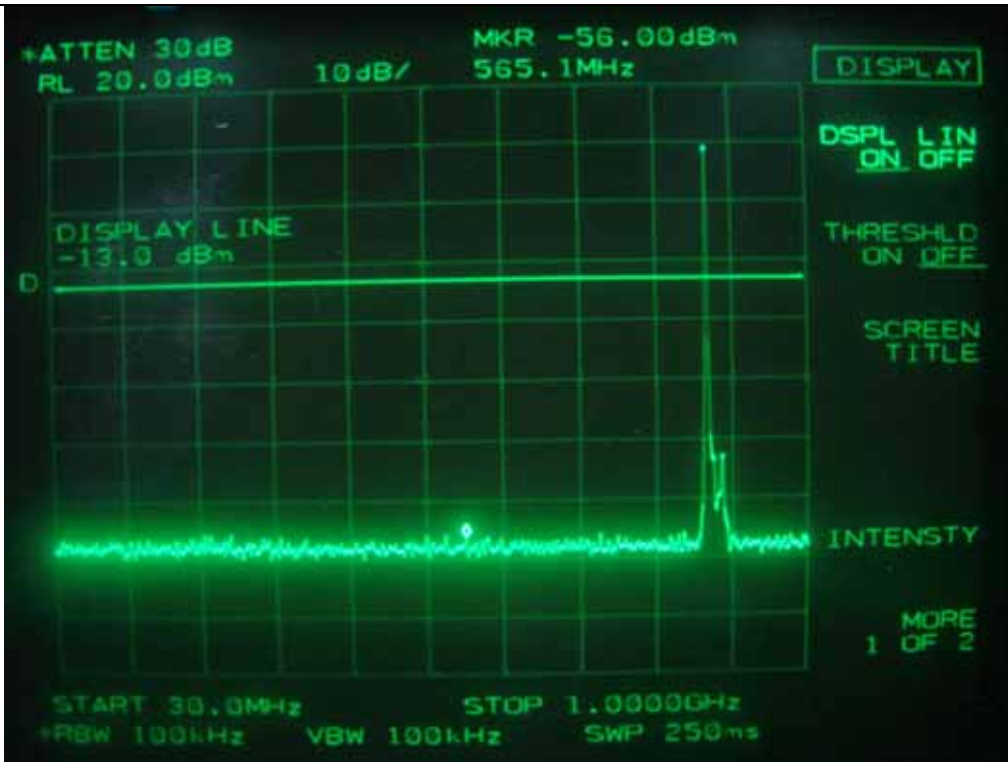
Mode	Modulation	Harmonic Frequency (MHz)		Measured Value (dBm)	Cable Loss (dB)	Total (dBm)	Limit (dBm)	Margin (dB)
Downlink	IS-95 CDMA	Low	1940.00	-27.83	0.84	-26.99	-13.0	-13.99
		Middle	1940.00	-28.00	0.84	-27.16		-14.16
		High	1940.00	-28.67	0.84	-27.83		-14.83
	CDMA2000	Low	1940.00	-28.17	0.84	-27.33	-13.0	-14.33
		Middle	1940.00	-28.00	0.84	-27.16		-14.16
		High	1940.00	-28.67	0.84	-27.83		-14.83
	1xEVDO	Low	1940.00	-28.33	0.84	-27.49	-13.0	-14.49
		Middle	1940.00	-28.33	0.84	-27.49		-14.49
		High	1940.00	-28.83	0.84	-27.99		-14.99

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

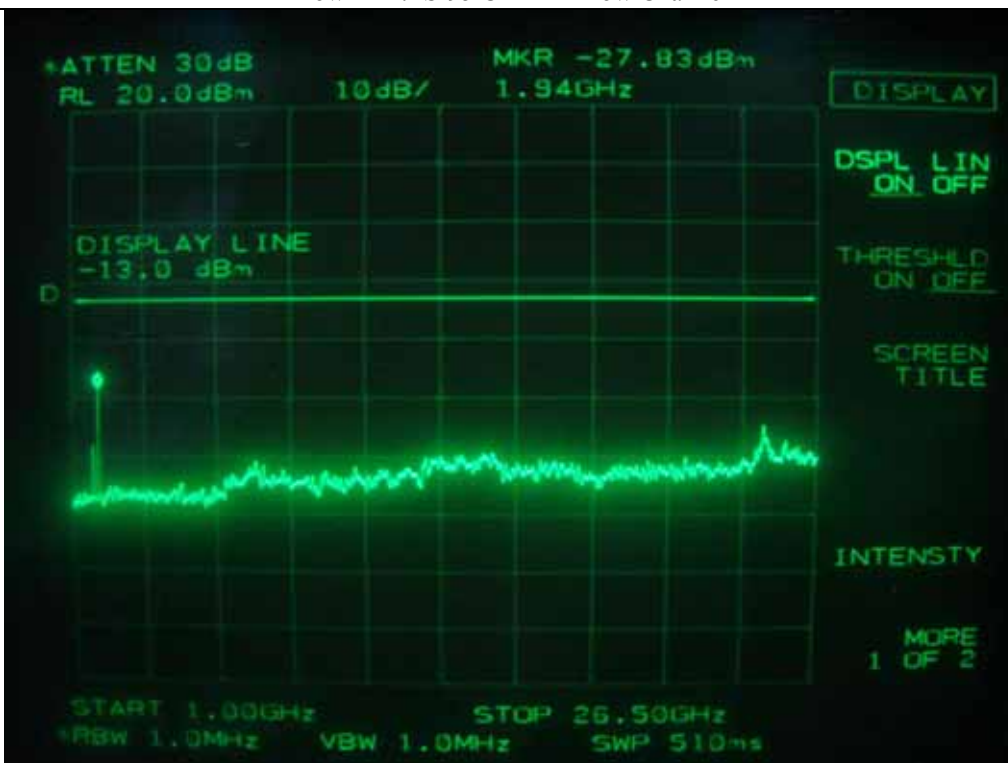
Remark. Uplink mode was not tested because the signal shall be connected to the BIAS-T using coaxial cable.



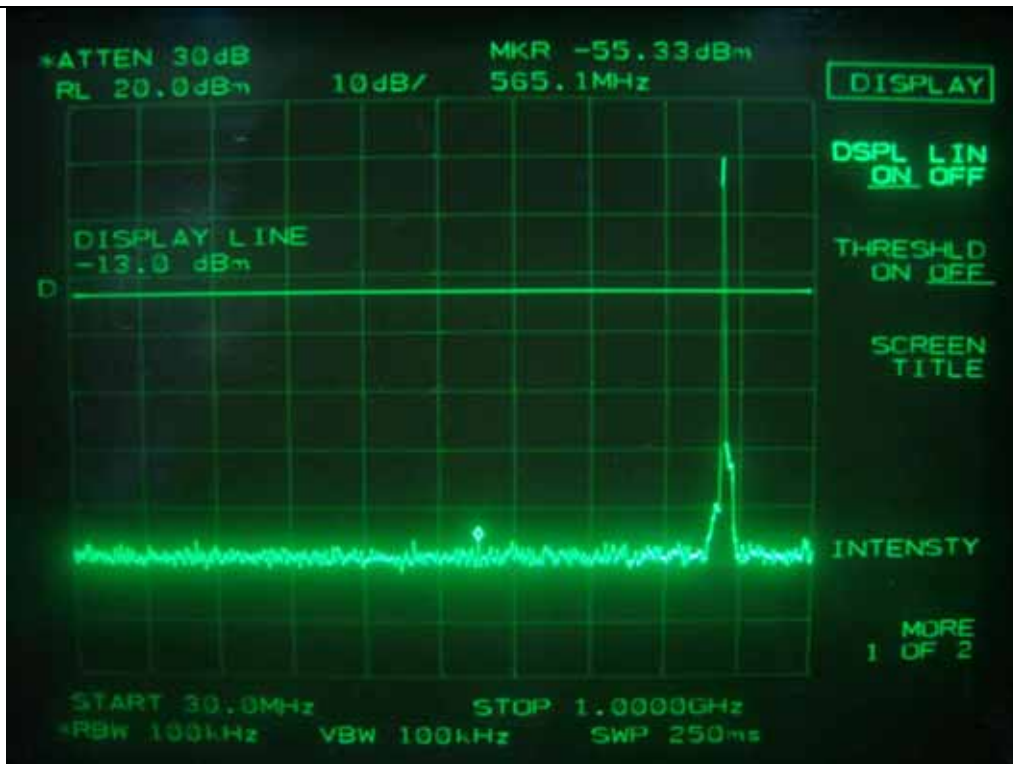
Tested by: Ki-Hong, Nam / Test Engineer



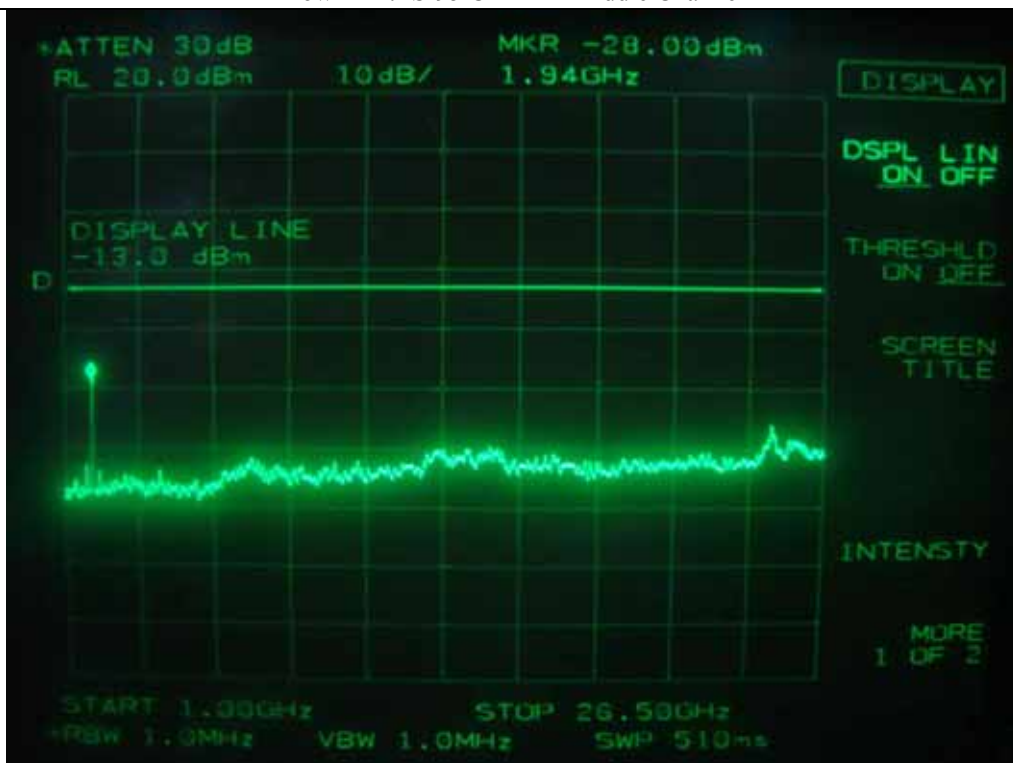
Downlink: IS-95 CDMA - Low Channel



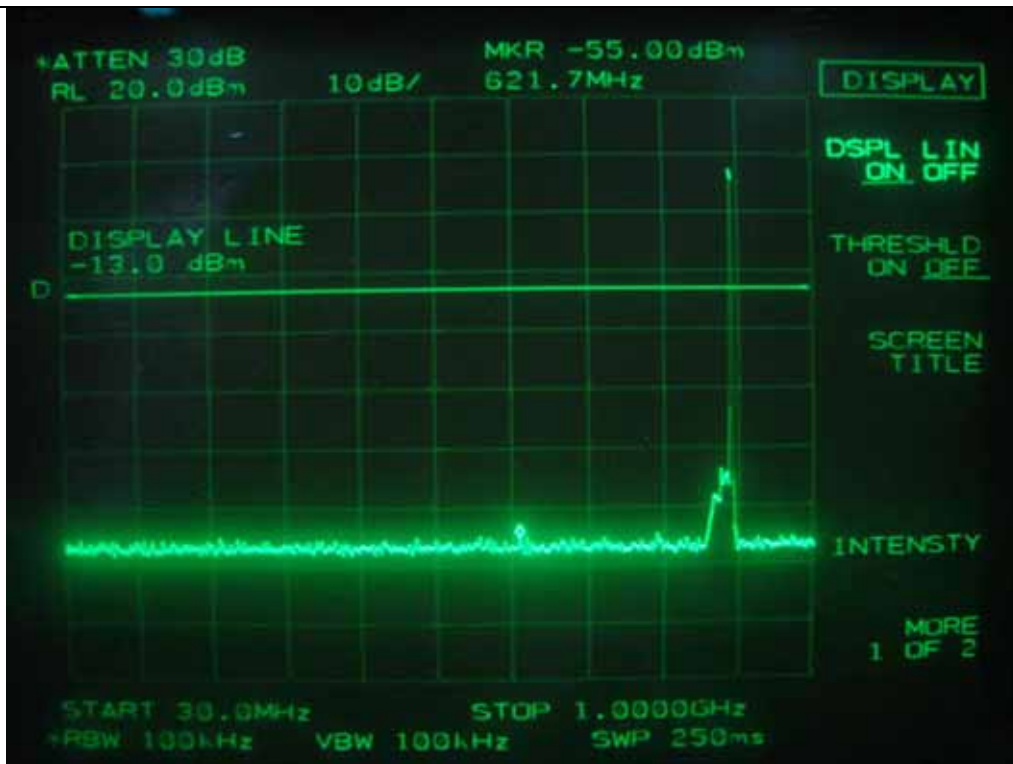
Downlink: IS-95 CDMA - Low Channel



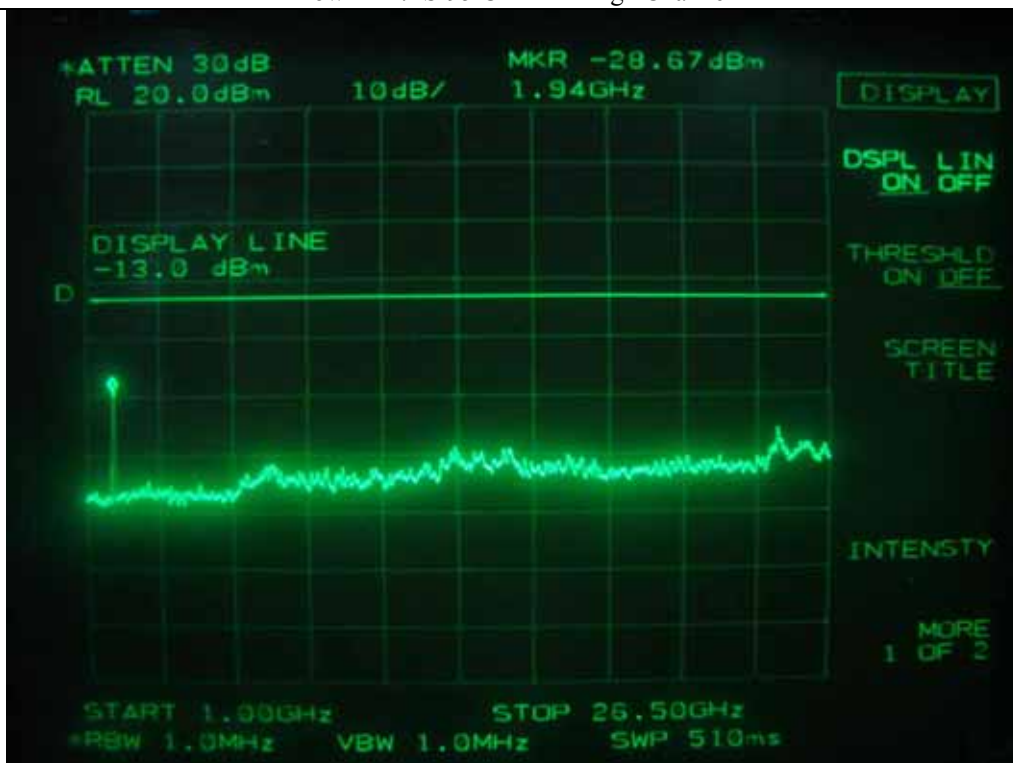
Downlink: IS-95 CDMA - Middle Channel



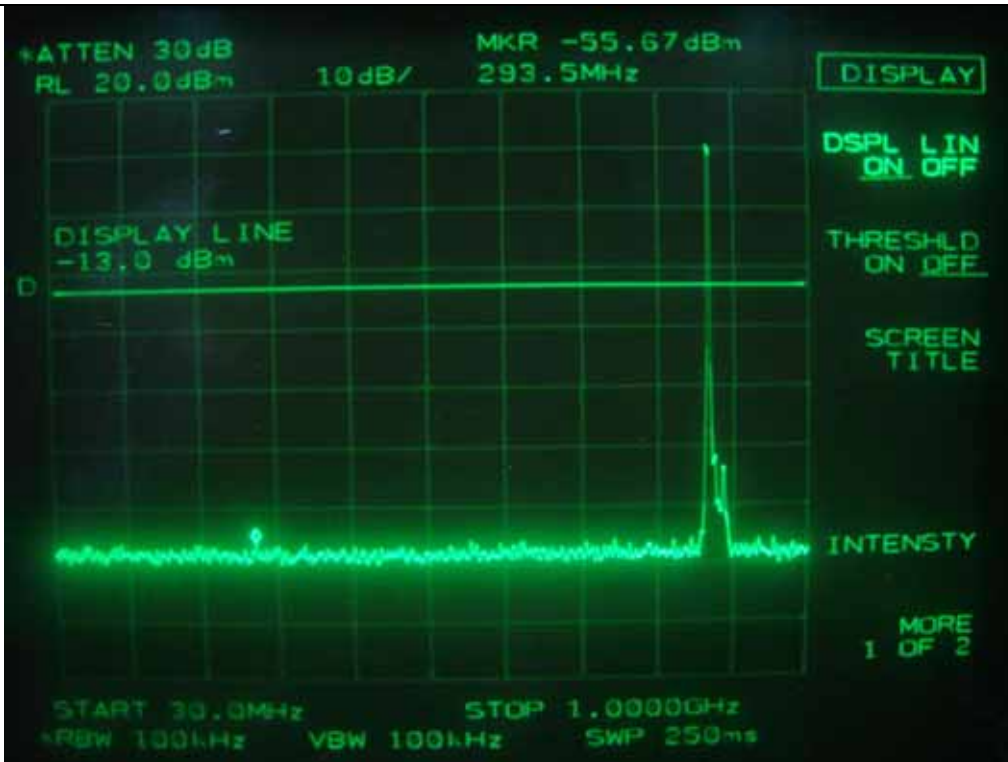
Downlink: IS-95 CDMA - Middle Channel



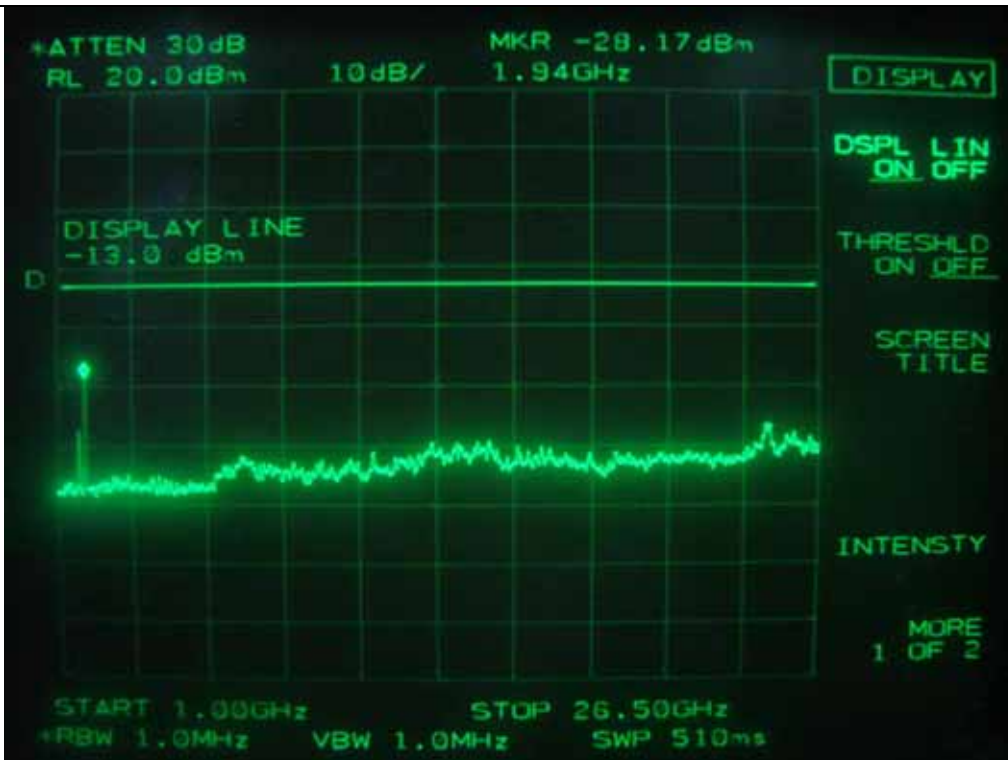
Downlink: IS-95 CDMA - High Channel



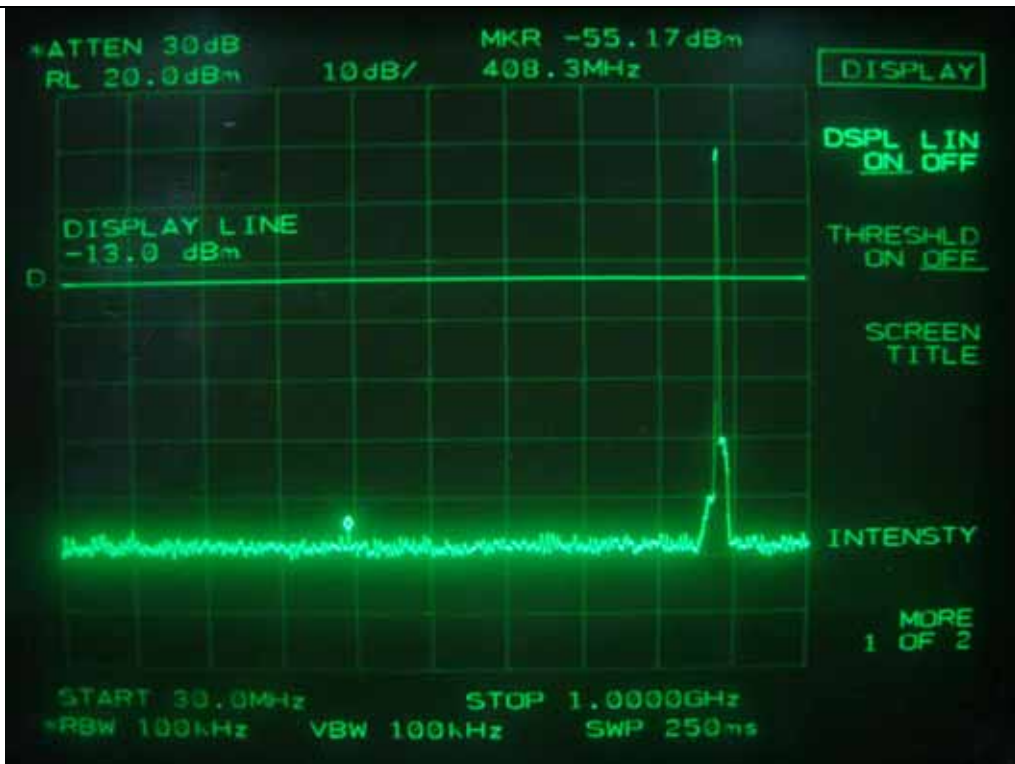
Downlink: IS-95 CDMA - High Channel



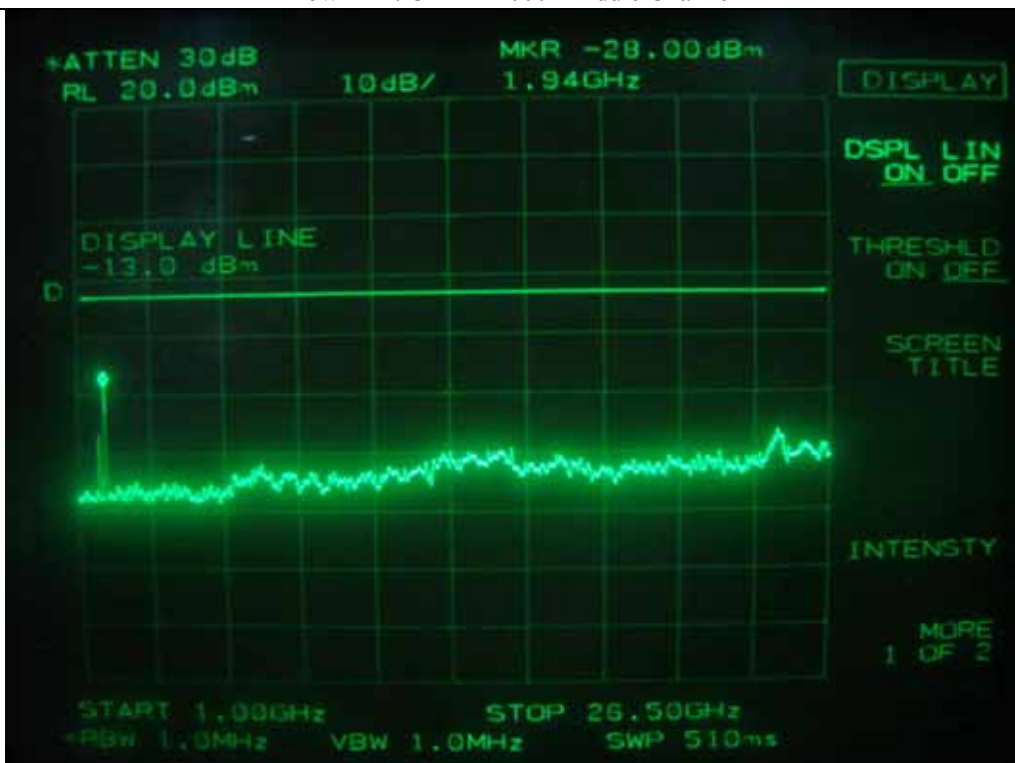
Downlink: CDMA 2000- Low Channel



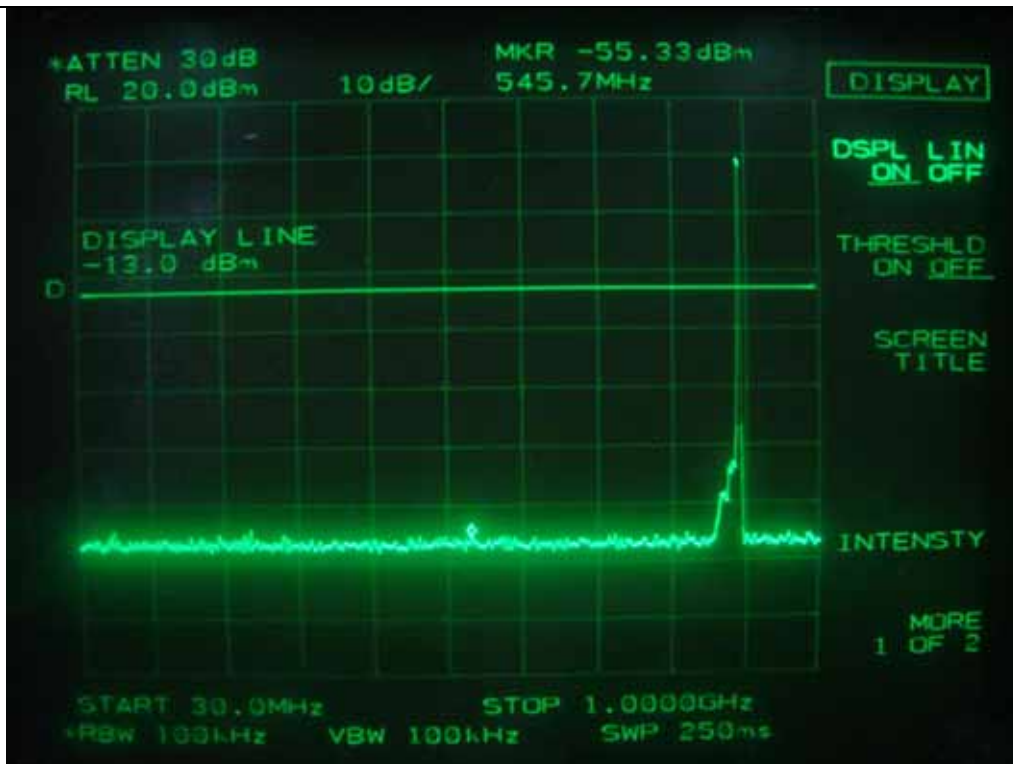
Downlink: CDMA 2000- Low Channel



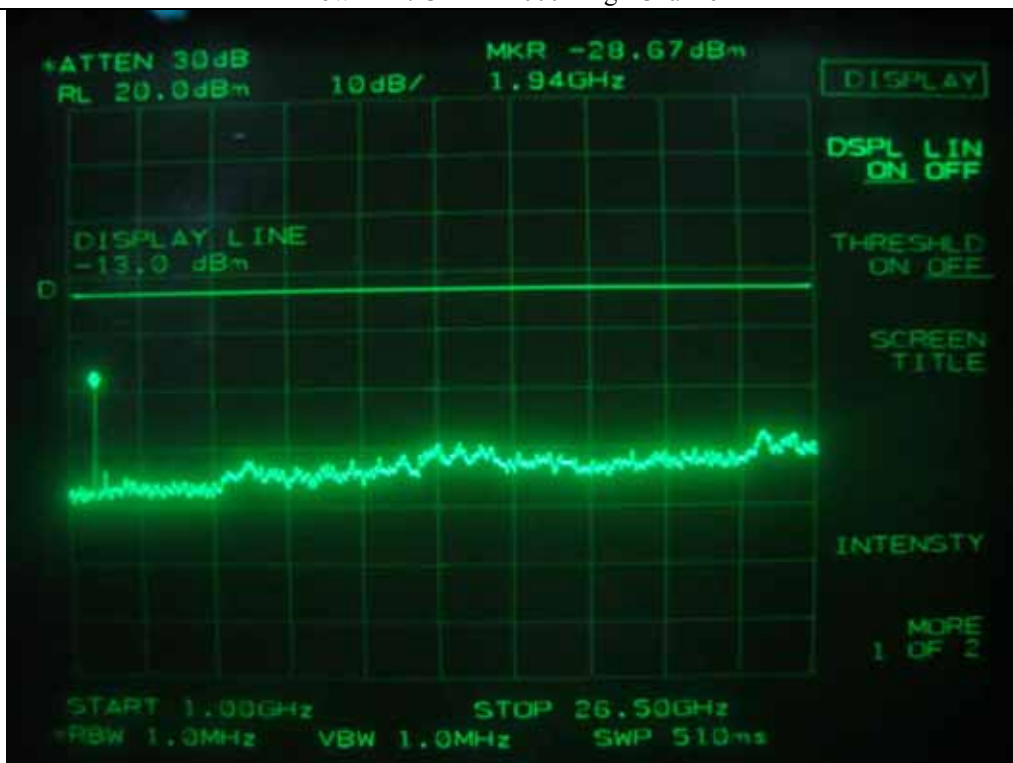
Downlink: CDMA 2000- Middle Channel



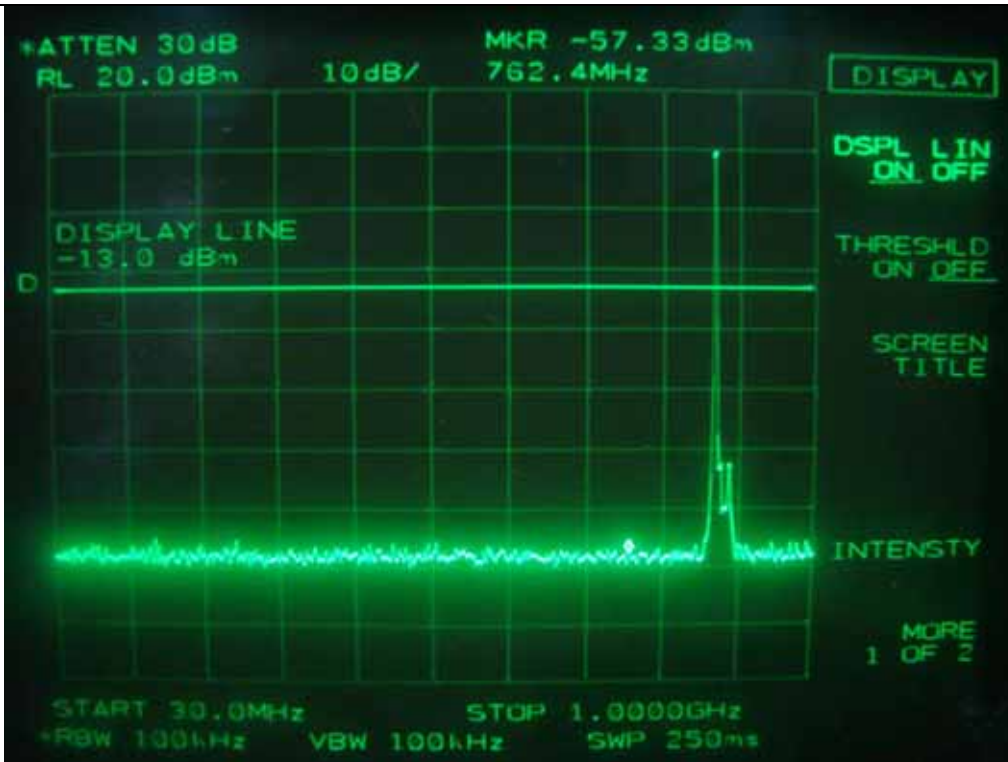
Downlink: CDMA 2000- Middle Channel



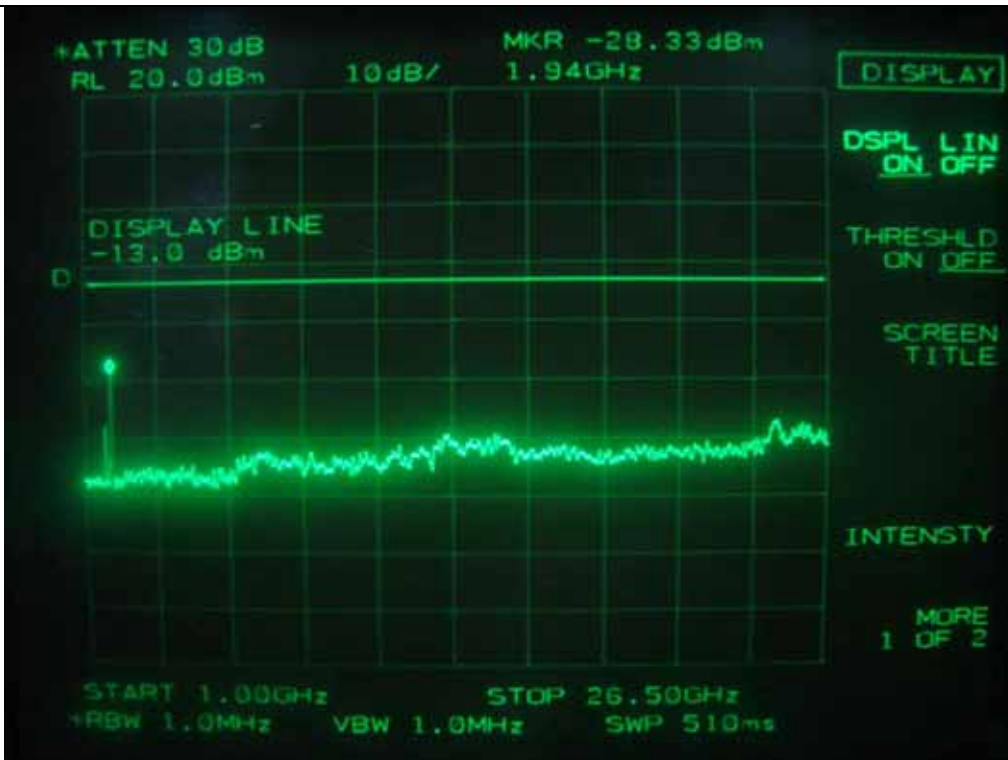
Downlink: CDMA 2000- High Channel



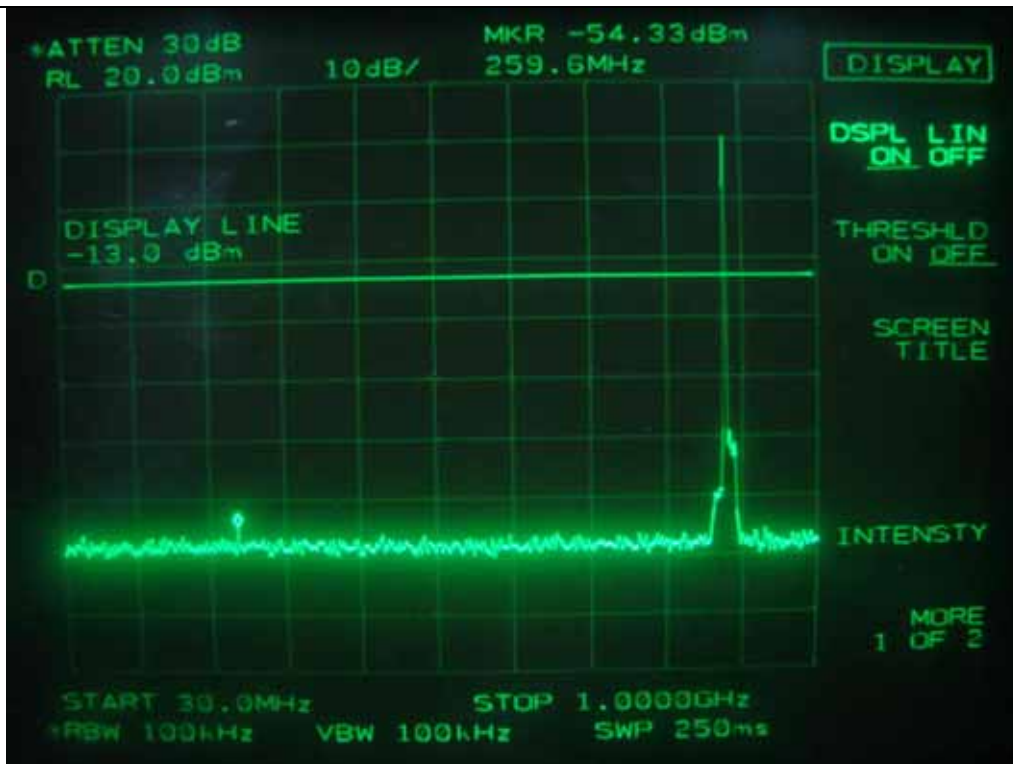
Downlink: CDMA 2000- High Channel



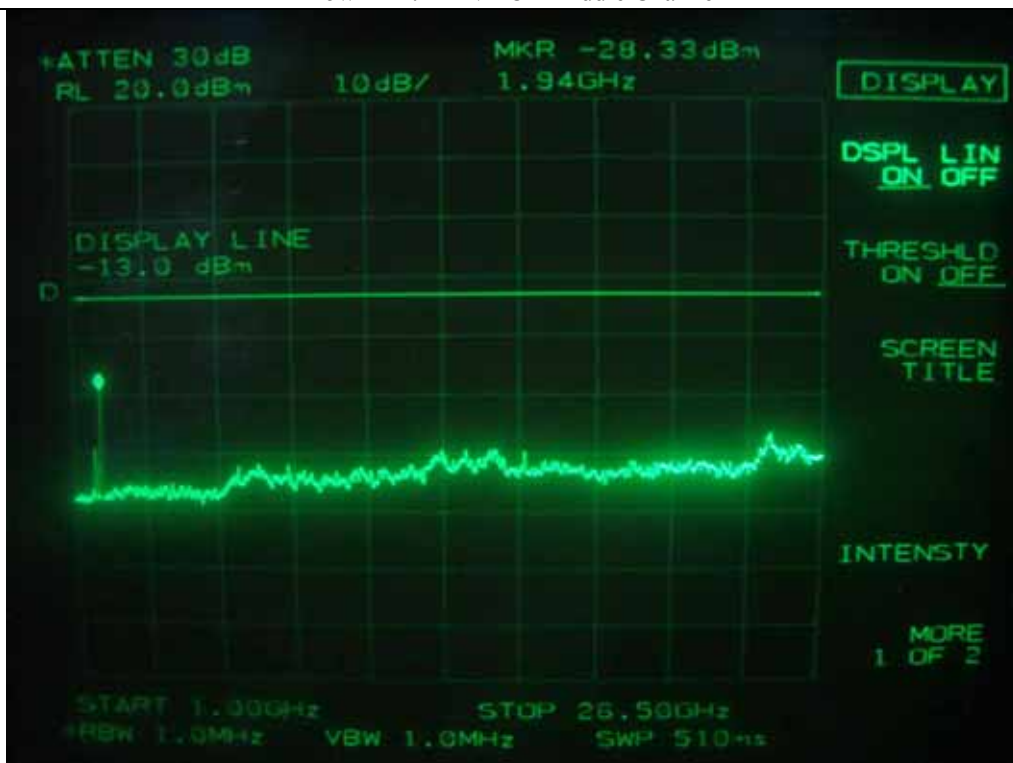
Downlink: 1xEVDO - Low Channel



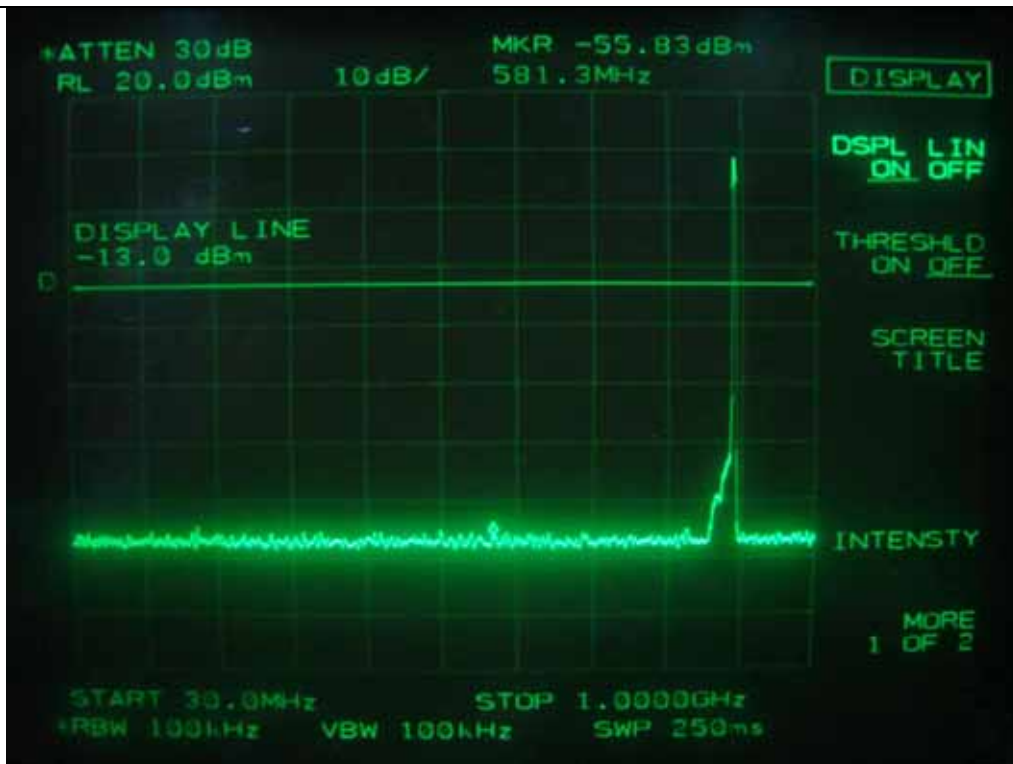
Downlink: 1xEVDO - Low Channel



Downlink: 1xEVDO - Middle Channel



Downlink: 1xEVDO - Middle Channel



Downlink: 1xEVDO - High Channel



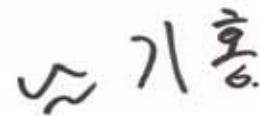
Downlink: 1xEVDO - High Channel

8.4.2 Test result for PCS Band

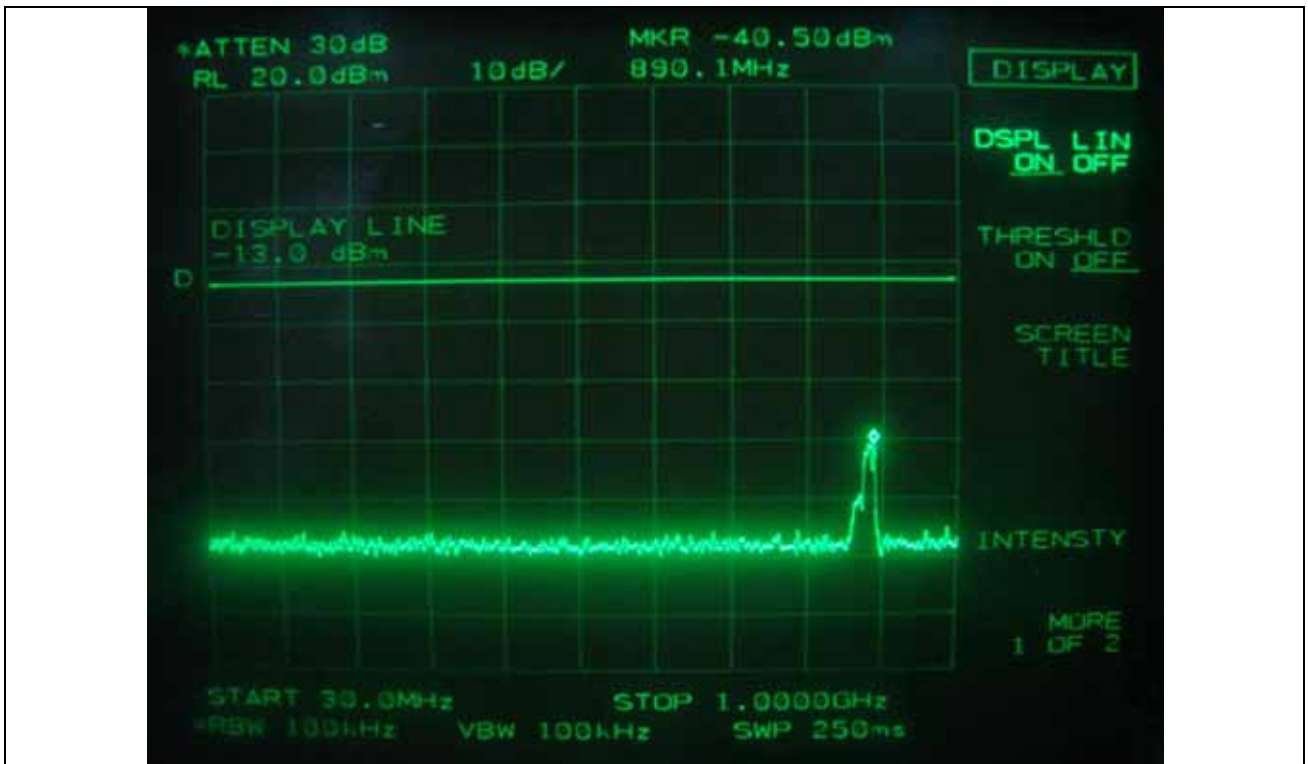
Mode	Modulation	Harmonic Frequency (MHz)		Measured Value (dBm)	Cable Loss (dB)	Total (dBm)	Limit (dBm)	Margin (dB)
Downlink	IS-95 CDMA	Low	890.10	-40.50	0.50	-40.00	-13.0	-27.00
		Middle	882.00	-40.17	0.50	-39.67		-26.67
		High	891.70	-40.33	0.50	-39.83		-26.83
	CDMA2000	Low	882.00	-41.67	0.50	-41.17	-13.0	-28.17
		Middle	885.20	-40.83	0.50	-40.33		-27.33
		High	885.20	-40.67	0.50	-40.17		-27.17
	1xEVDO	Low	885.20	-41.00	0.50	-40.50	-13.0	-27.50
		Middle	885.20	-39.00	0.50	-38.50		-25.50
		High	883.60	-41.50	0.50	-41.00		-28.00

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

Remark. Uplink mode was not tested because the signal shall be connected to the BIAS-T using coaxial cable.



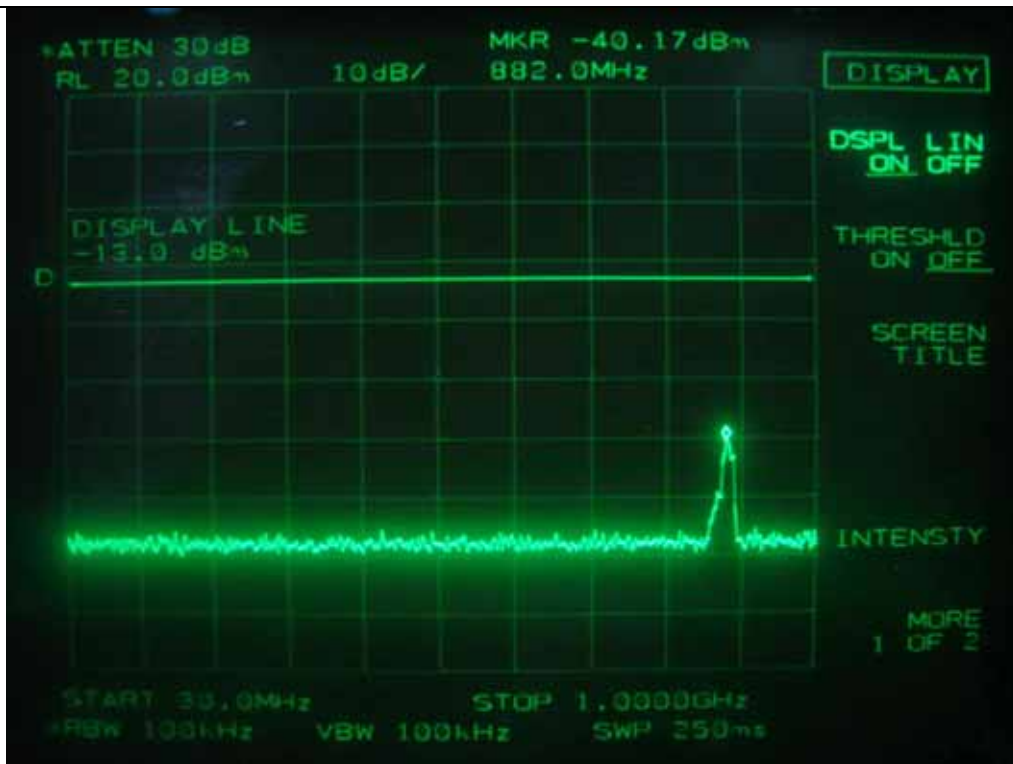
Tested by: Ki-Hong, Nam / Test Engineer



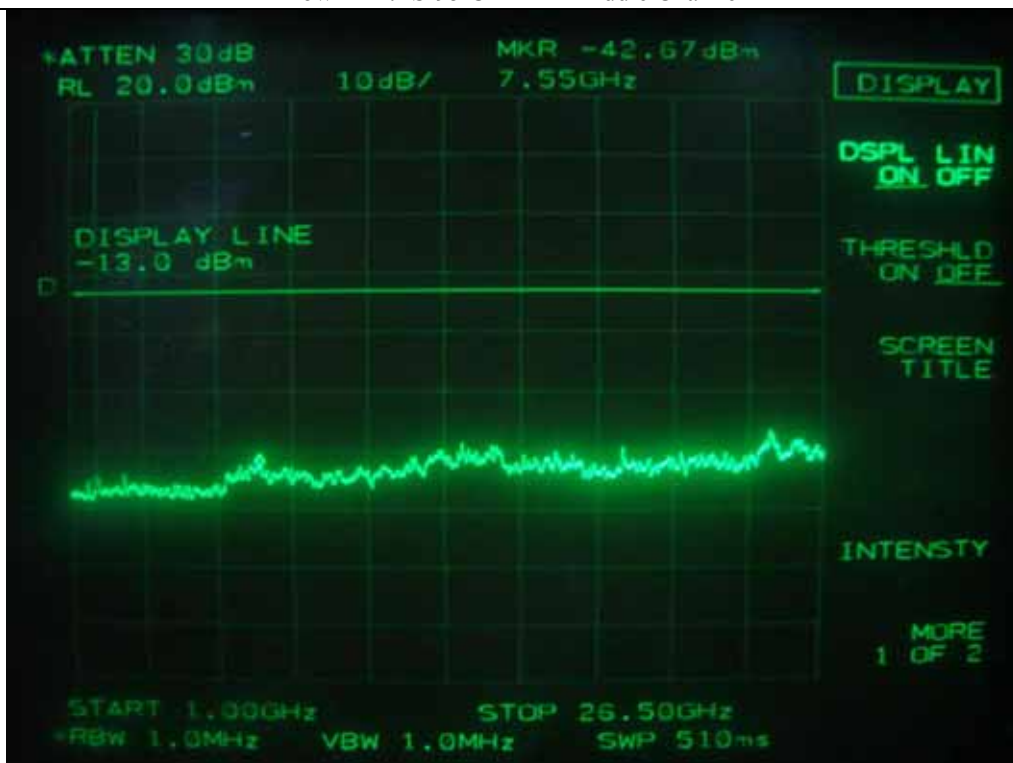
Downlink: IS-95 CDMA - Low Channel



Downlink: IS-95 CDMA - Low Channel



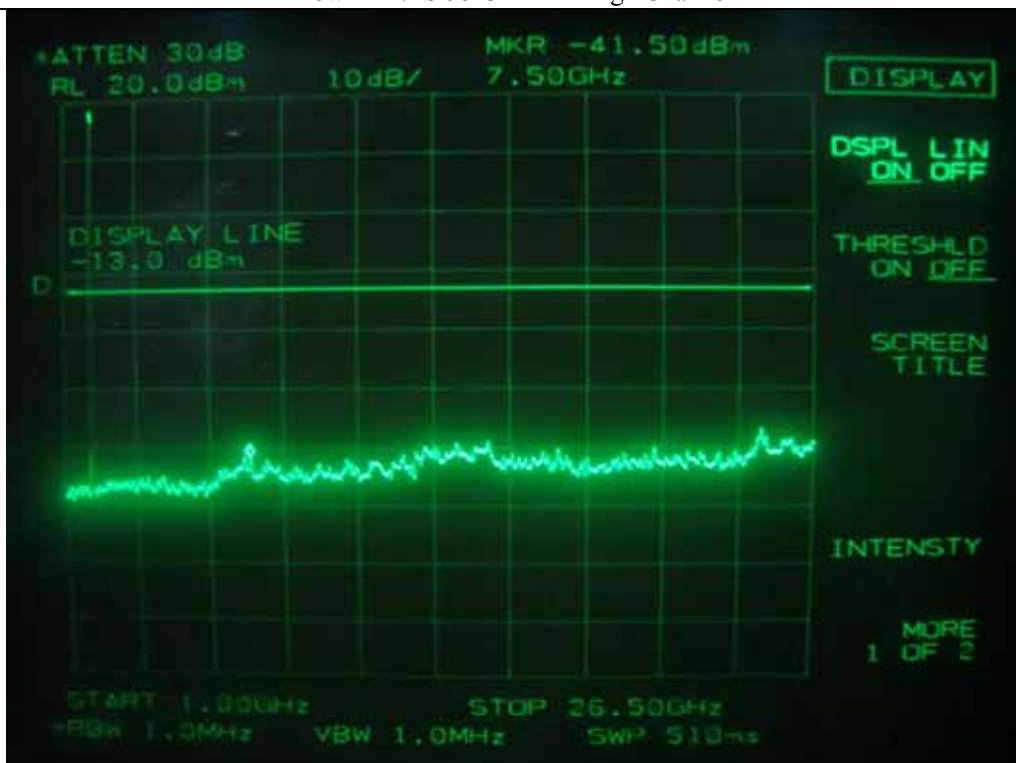
Downlink: IS-95 CDMA - Middle Channel



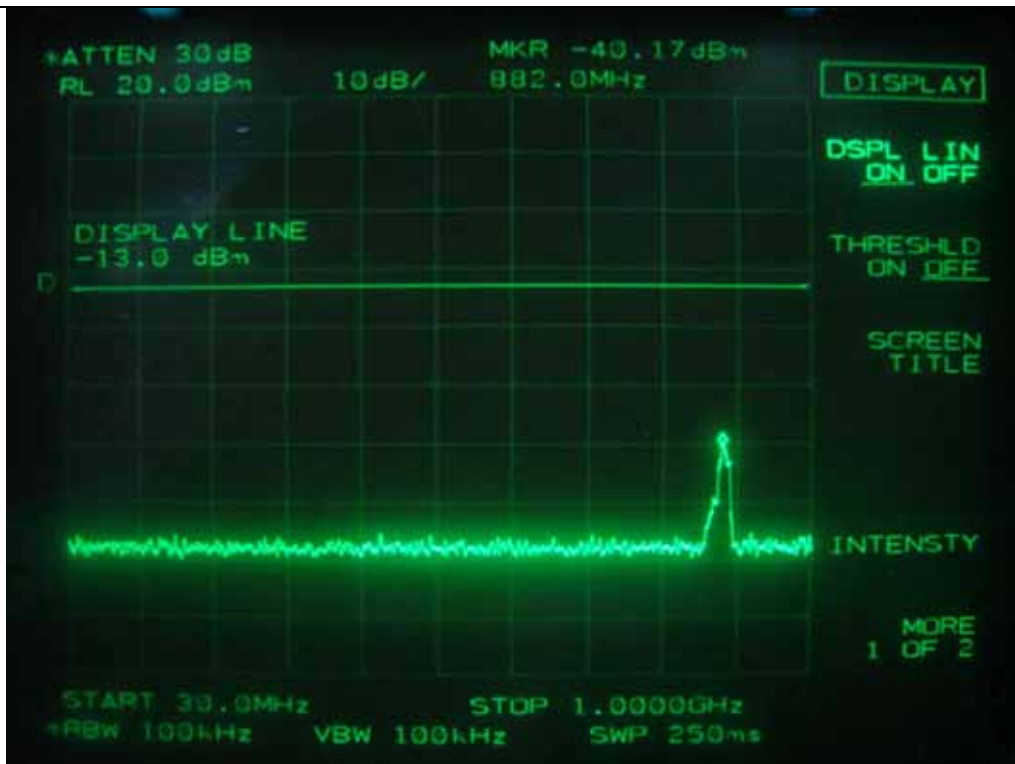
Downlink: IS-95 CDMA - Middle Channel



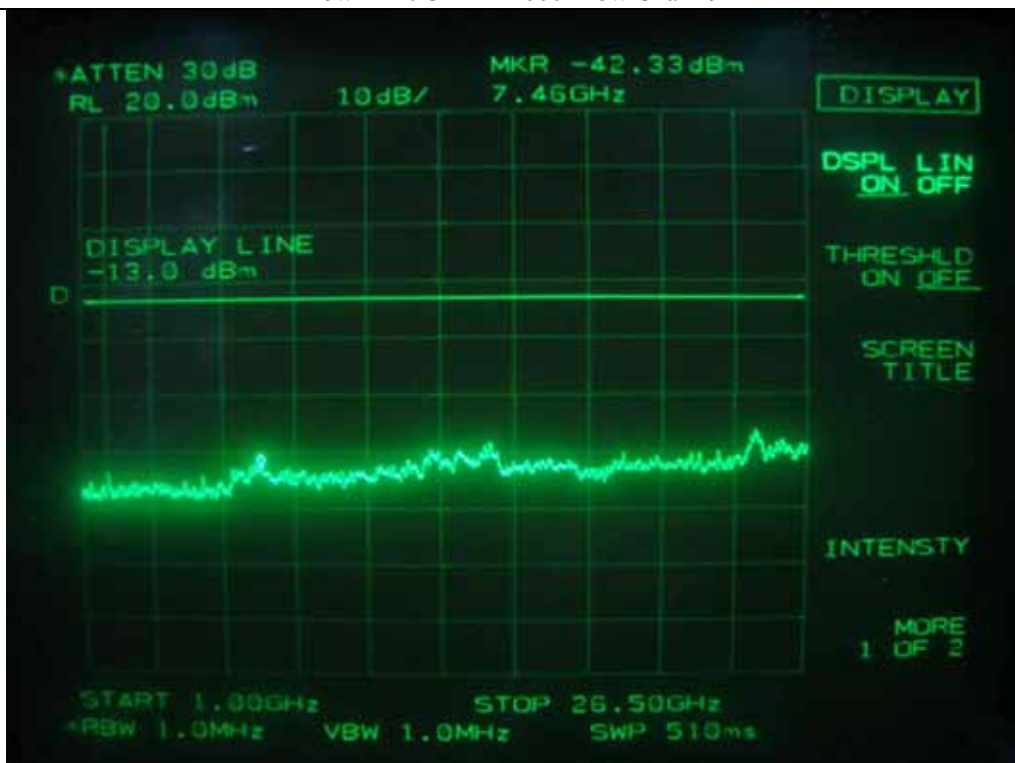
Downlink: IS-95 CDMA - High Channel



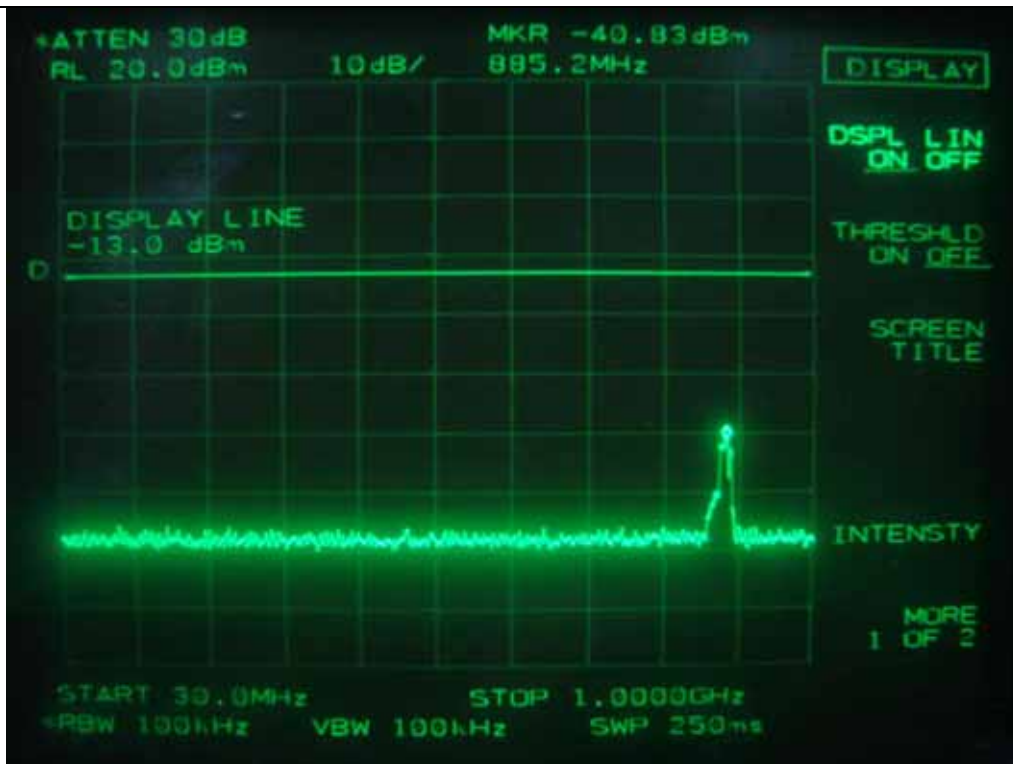
Downlink: IS-95 CDMA - High Channel



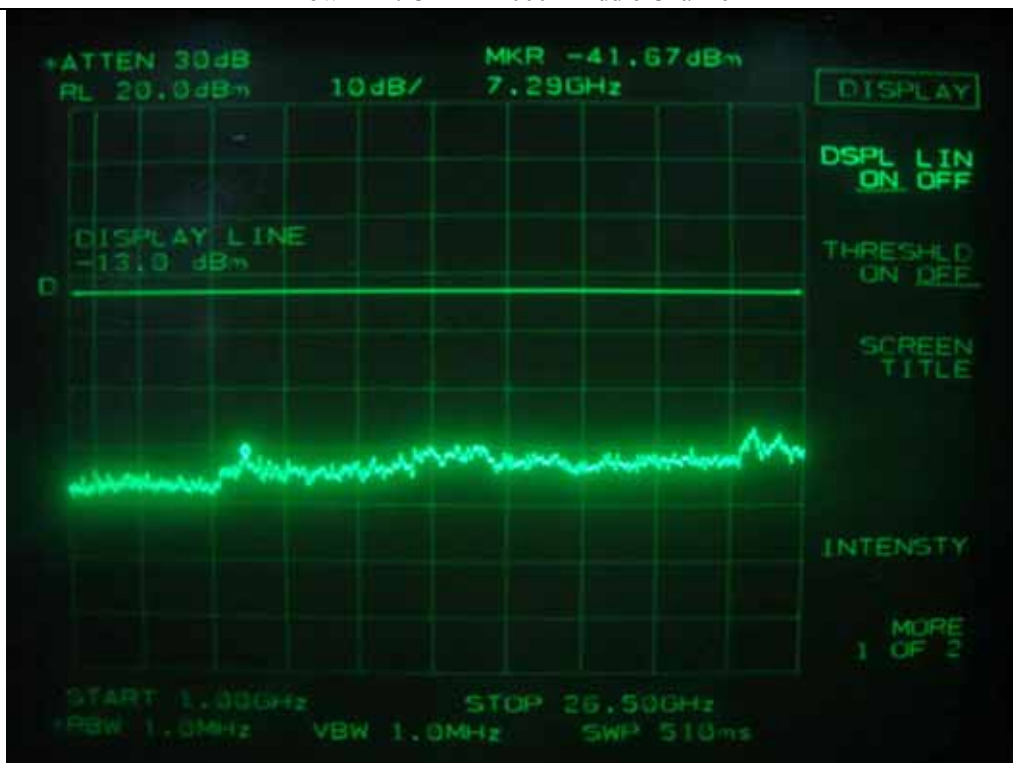
Downlink: CDMA 2000- Low Channel



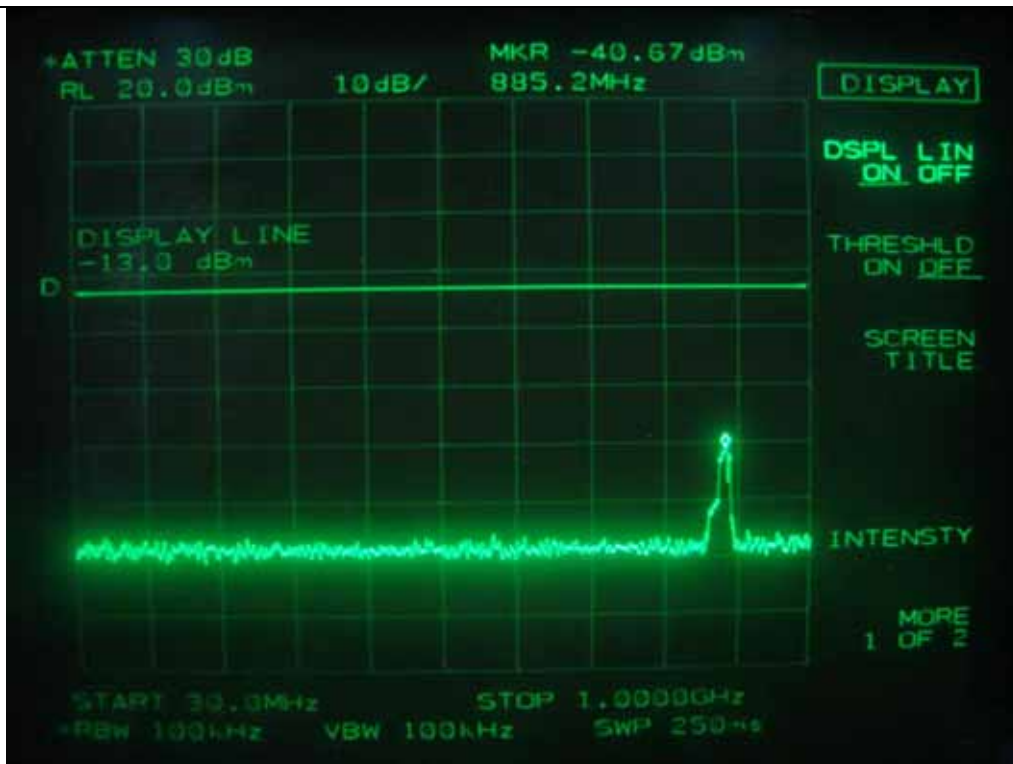
Downlink: CDMA 2000- Low Channel



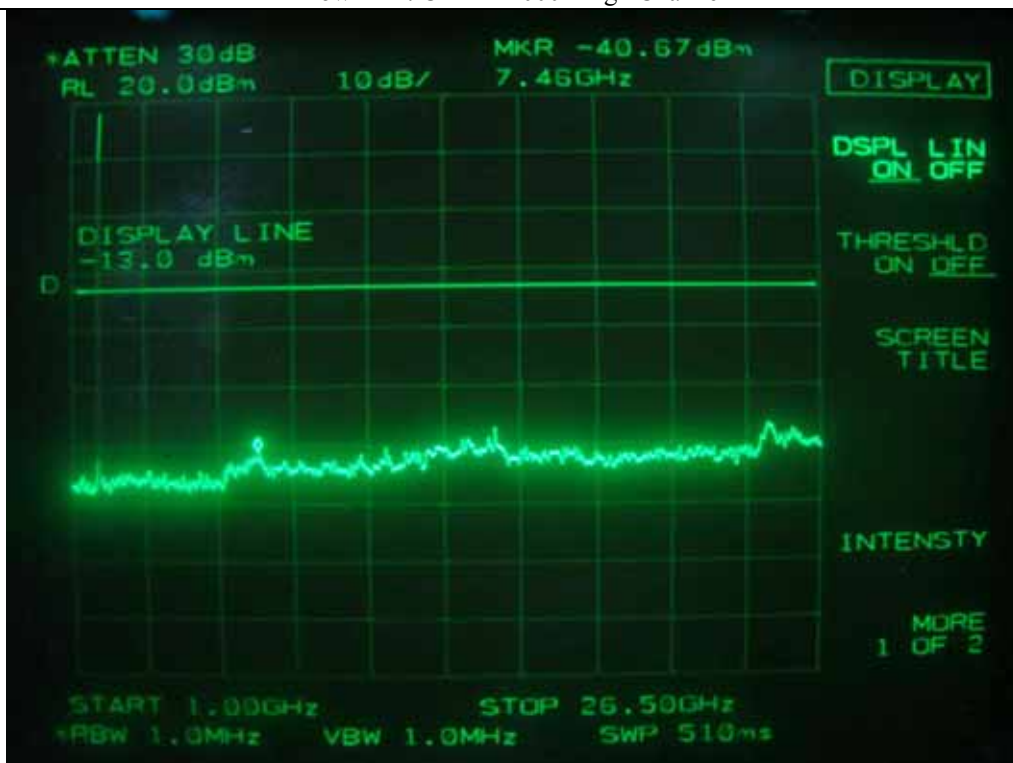
Downlink: CDMA 2000- Middle Channel



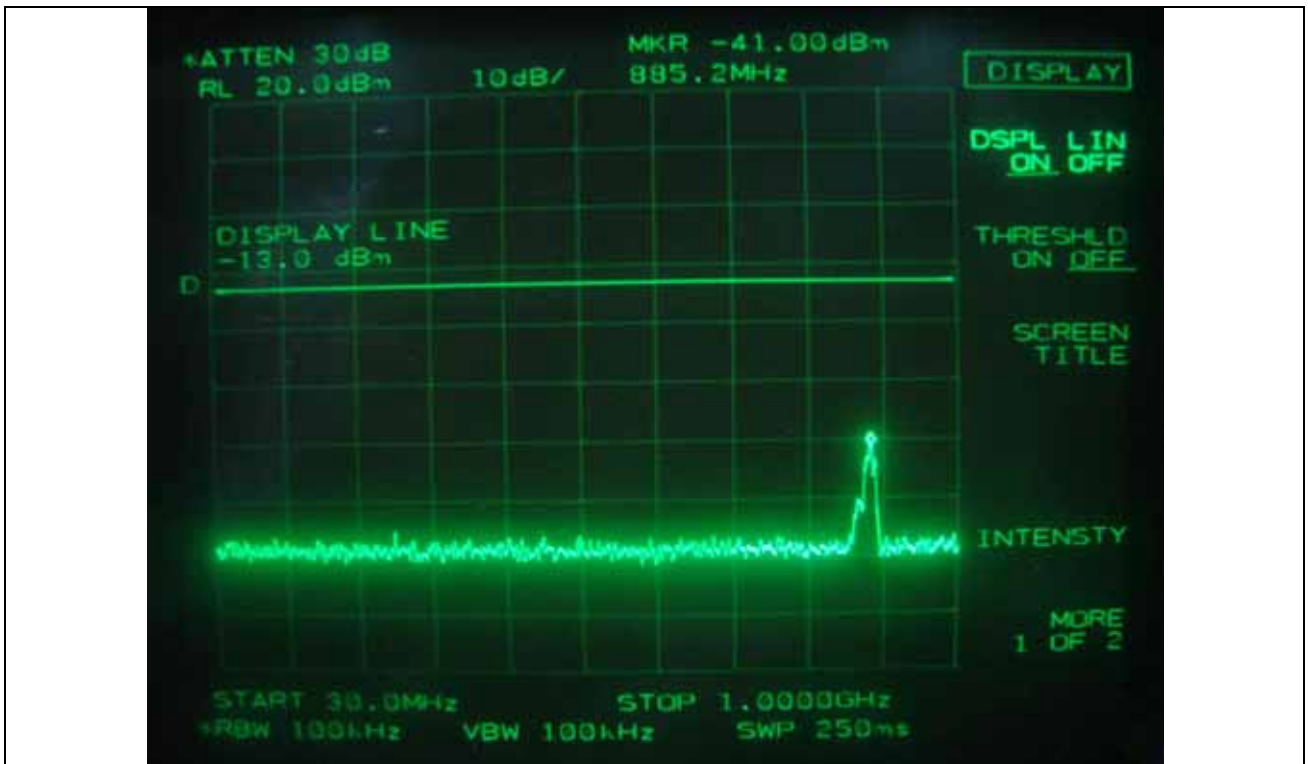
Downlink: CDMA 2000- Middle Channel



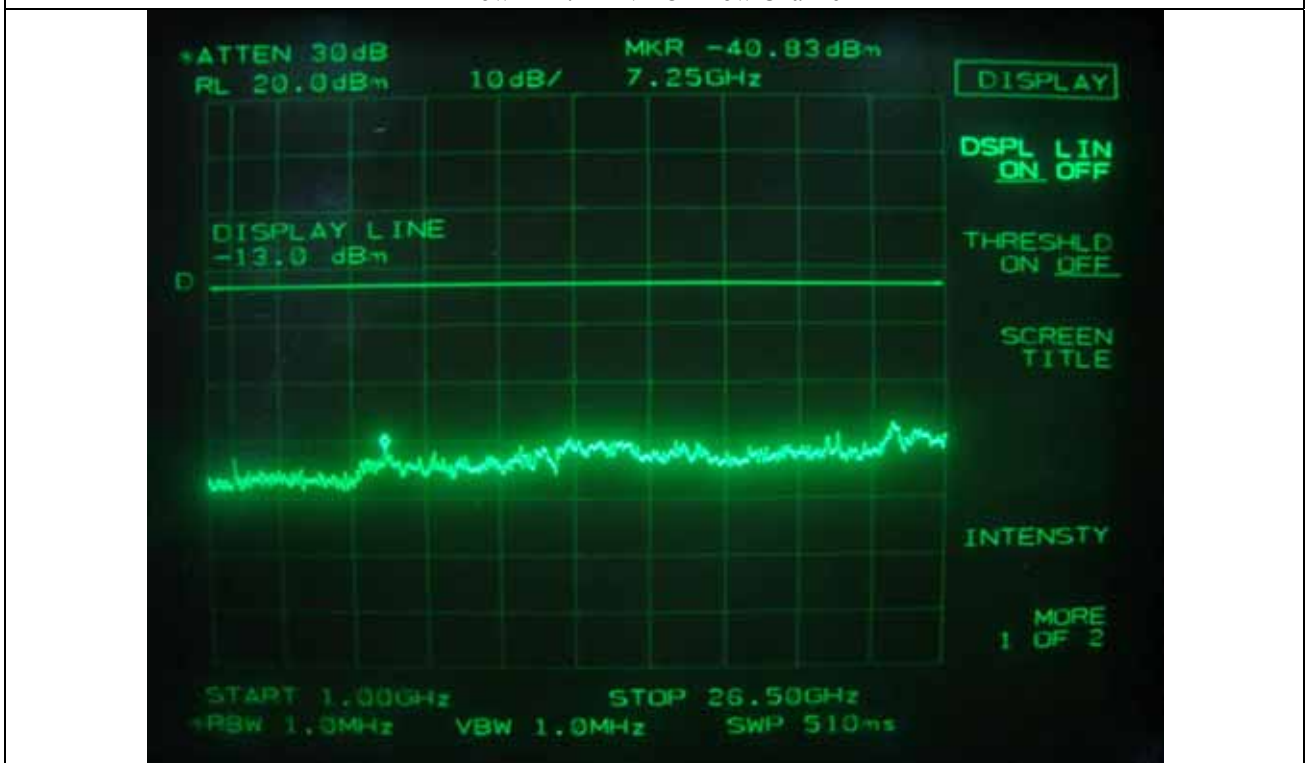
Downlink: CDMA 2000- High Channel



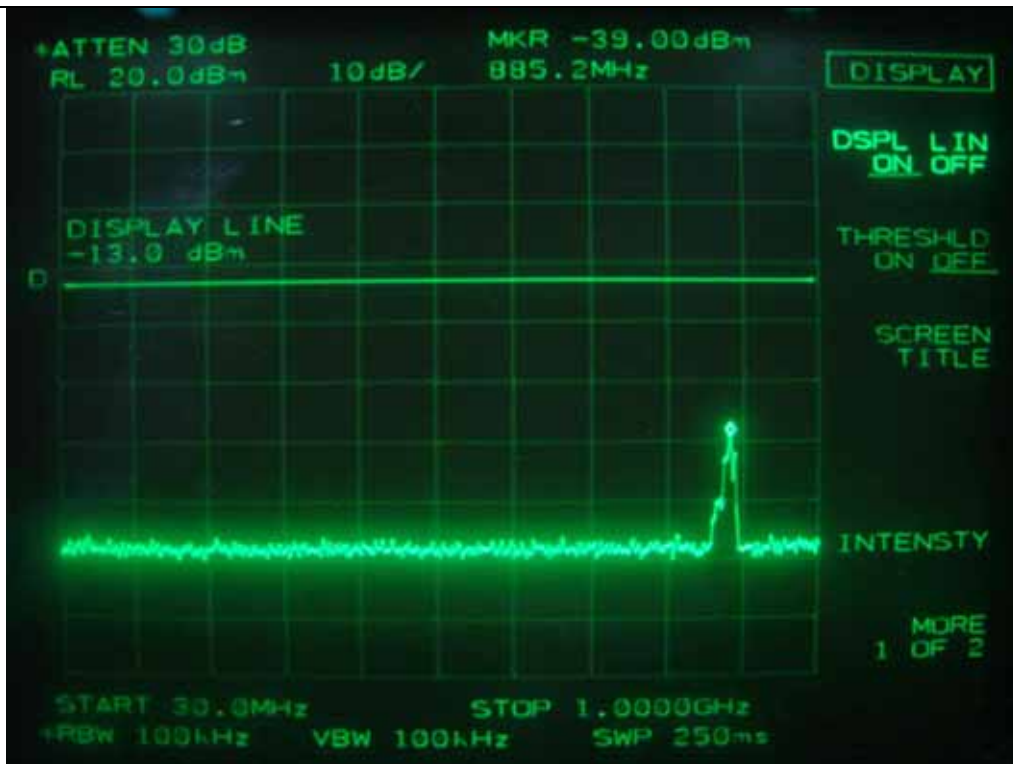
Downlink: CDMA 2000- High Channel



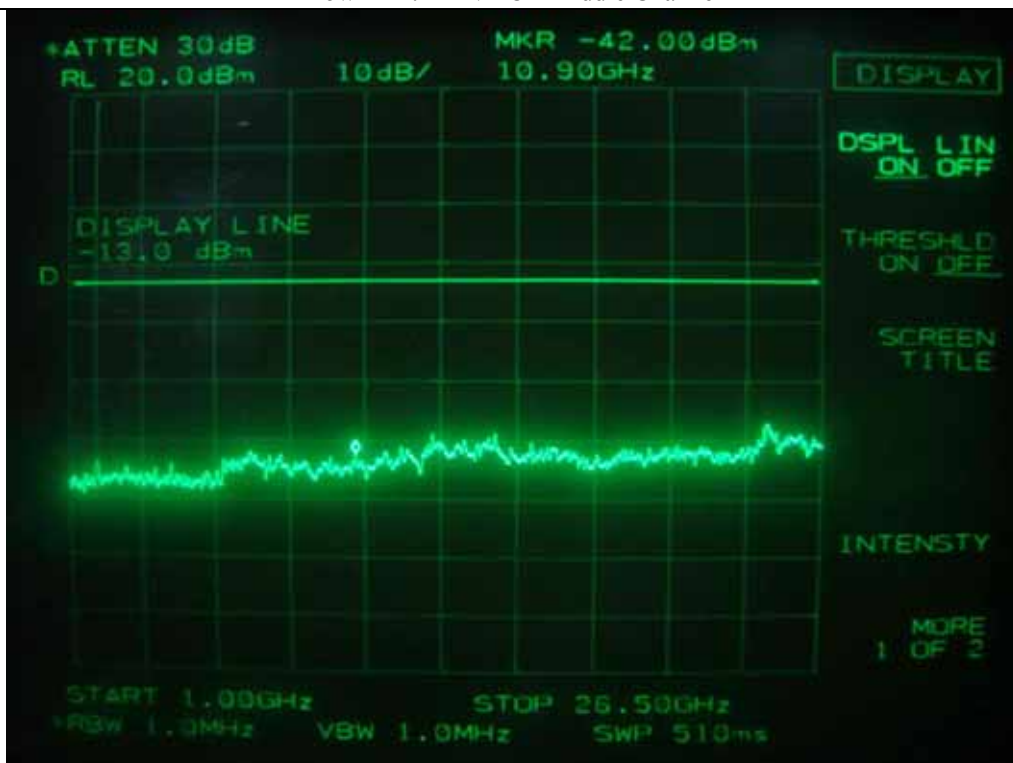
Downlink: 1xEVDO - Low Channel



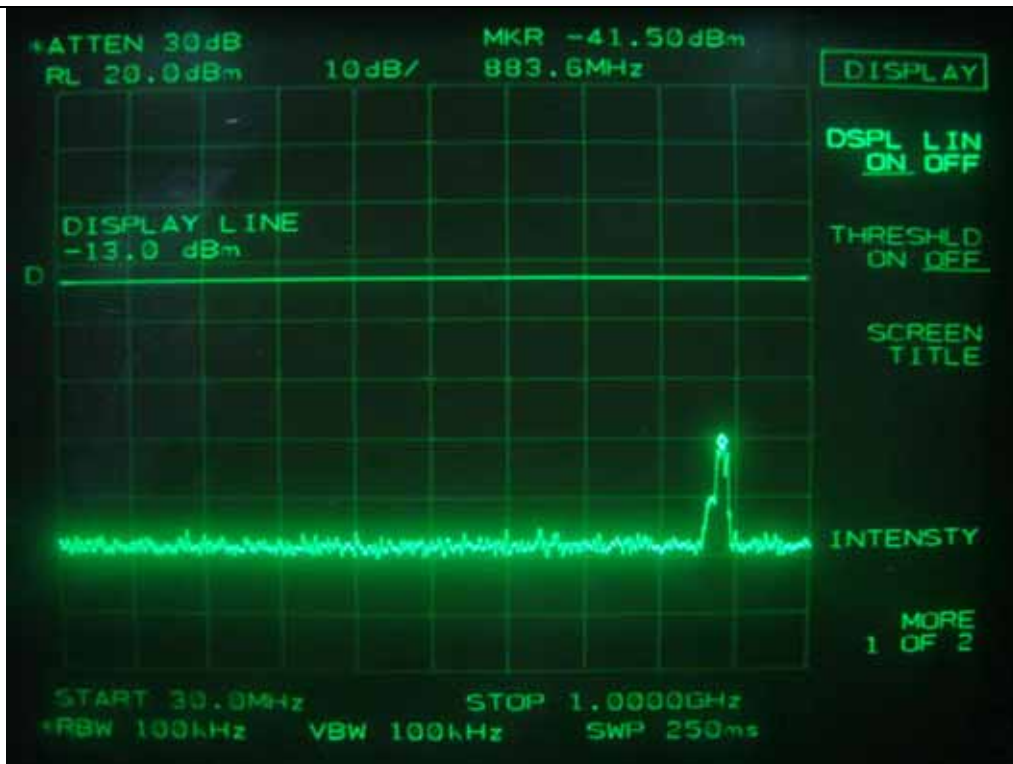
Downlink: 1xEVDO - Low Channel



Downlink: 1xEVDO - Middle Channel



Downlink: 1xEVDO - Middle Channel



Downlink: 1xEVDO - High Channel



Downlink: 1xEVDO - High Channel

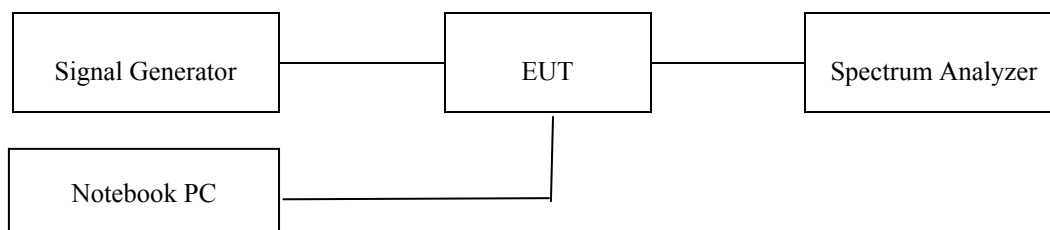
9. SPURIOUS EMISSION AT ANTENNA TERMINAL AT BLOCK EDGES ± 1 MHz

9.1 Operating environment

Temperature : 23.5 °C
Relative humidity : 45.8 %R.H.

9.2 Test set-up for conducted measurement

The RF output port of the EUT was connected to the input of the spectrum analyzer. The software for RF control on the notebook PC was set to transmit maximum signal gain and bandwidth. The test was performed at three frequencies (low, middle, and high channels).



9.3 Test equipment used

	Model Number	Manufacturer	Description	Serial Number	Last Cal.
□ -	8564E	HP	Spectrum Analyzer	3650A00756	June 19, 2007
■ -	E4432B	HP	Signal Generator	US38440950	June 19, 2007
■ -	SMJ 100A	R/S	Vector Signal Generator	101037	June 19, 2007
■ -	FSP	R/S	Spectrum Analyzer	100017	Mar. 15, 2008

All test equipment used is calibrated on a regular basis.

9.4 Test data

-. Test Date : June 4 ~ 5 2008
-. Result : **PASSED**

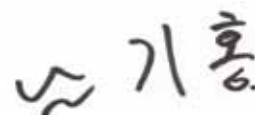
9.4.1 Test result

Band	Modulation	Channel	Measured Frequency (MHz)	Max. Measured Value (dBm)	Limit (dBm)
Cellular	IS-95 CDMA	Low	869.86	-56.89	-13.0
		High	894.56	-61.47	
	CDMA2000	Low	869.86	-57.47	
		High	894.56	-61.47	
	1xEVDO	Low	869.86	-58.15	
		High	894.56	-62.03	
PCS	IS-95 CDMA	Low	1.930	-44.22	-13.0
		High	1.990	-47.94	
	CDMA2000	Low	1.930	-44.75	
		High	1.990	-47.47	
	1xEVDO	Low	1.930	-44.26	
		High	1.990	-48.11	

Remark.

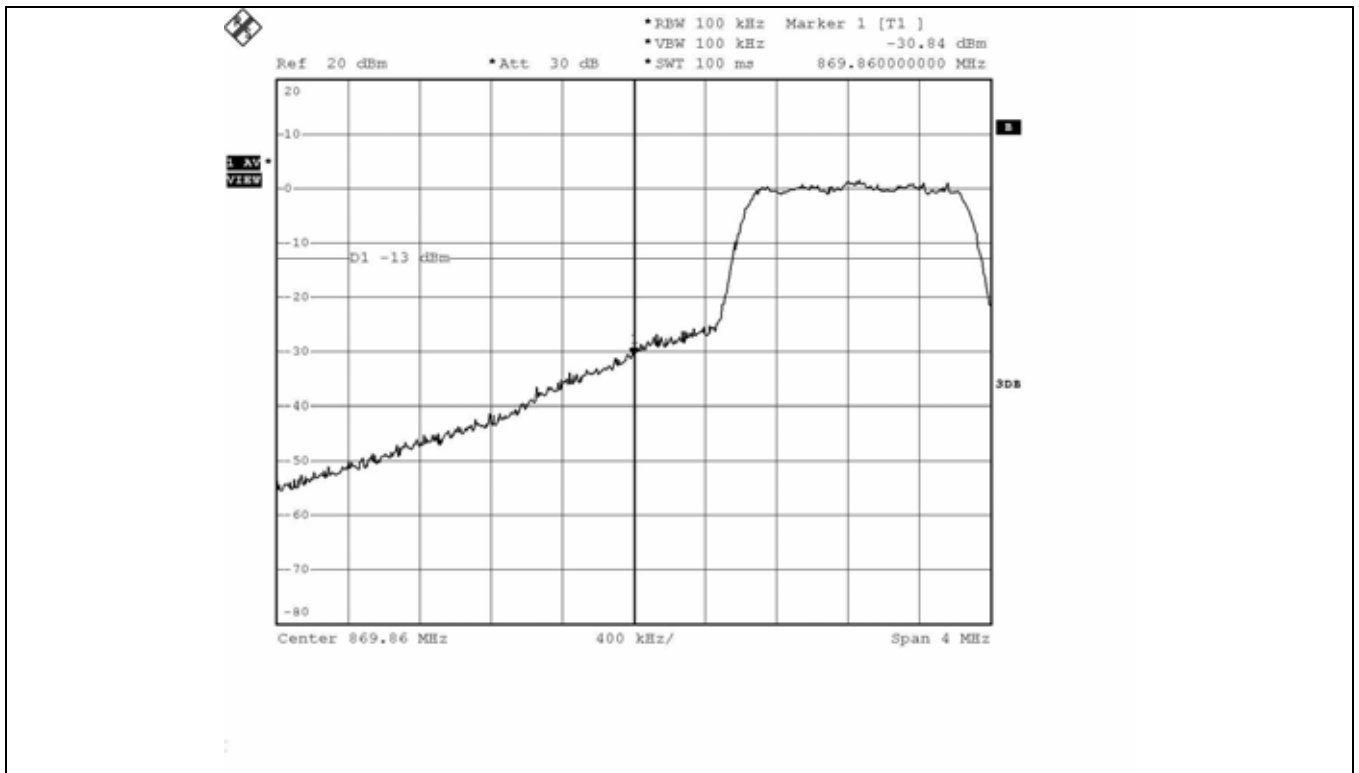
1. Downlink mode was not tested because the signal shall be connected to the BIAS-T using coaxial cable.
2. According to the rule, out of band emission shall be attenuated by $43 + 10 \log (P)$ dBc, equates to -13.0 dBm.

Remark. Uplink mode was not tested because the signal shall be connected to the BIAS-T using coaxial cable.

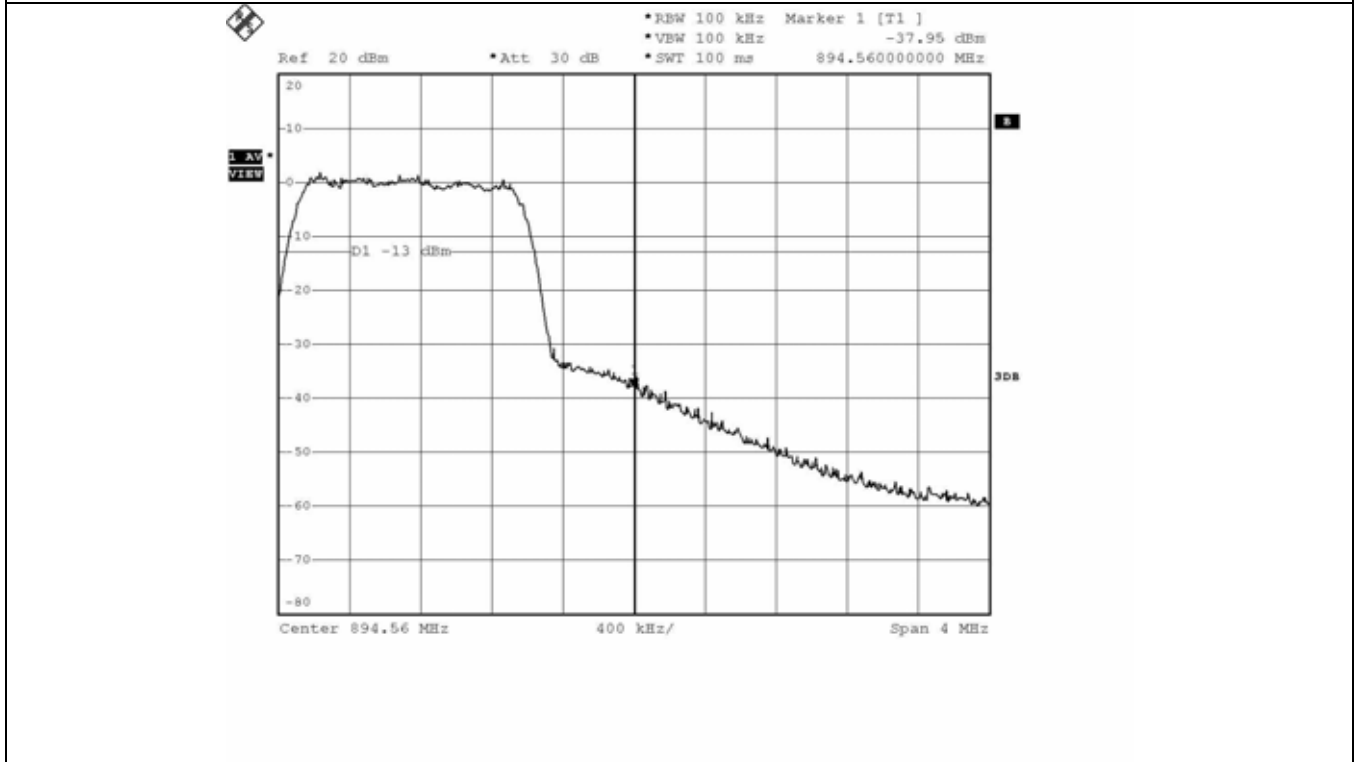


Tested by: Ki-Hong, Nam / Test Engineer

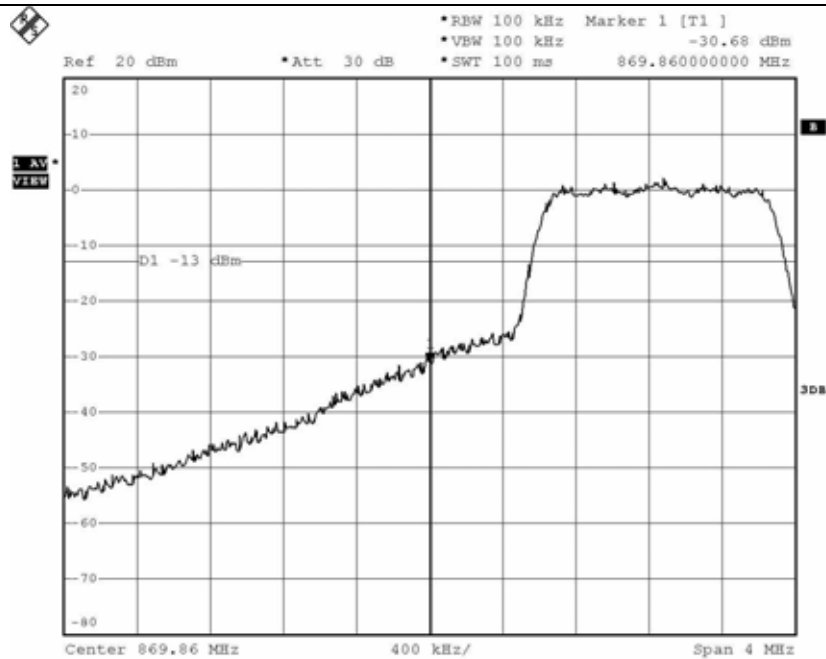
9.4.2 Screen Photo for Cellular Band



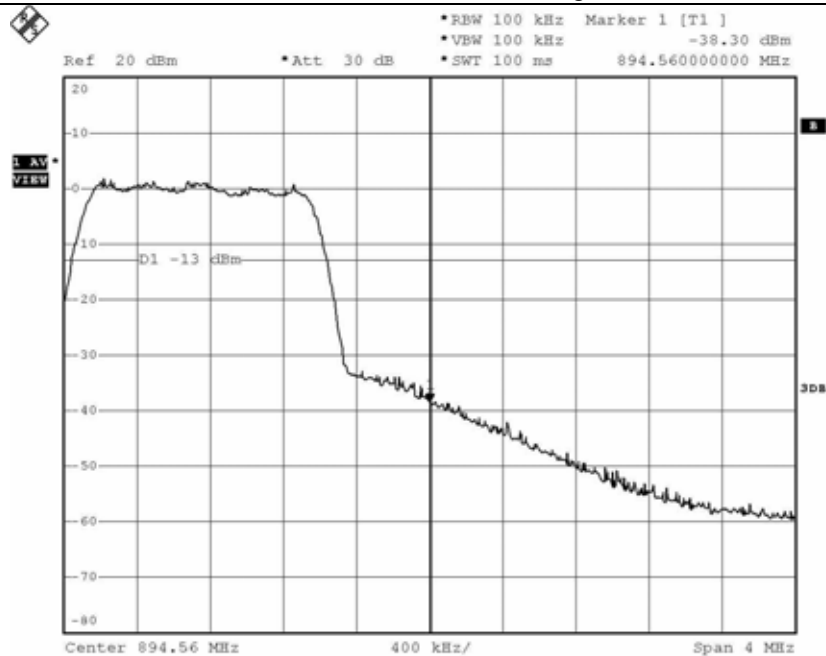
Downlink: IS-95 CDMA - Band Edge-Low Channel



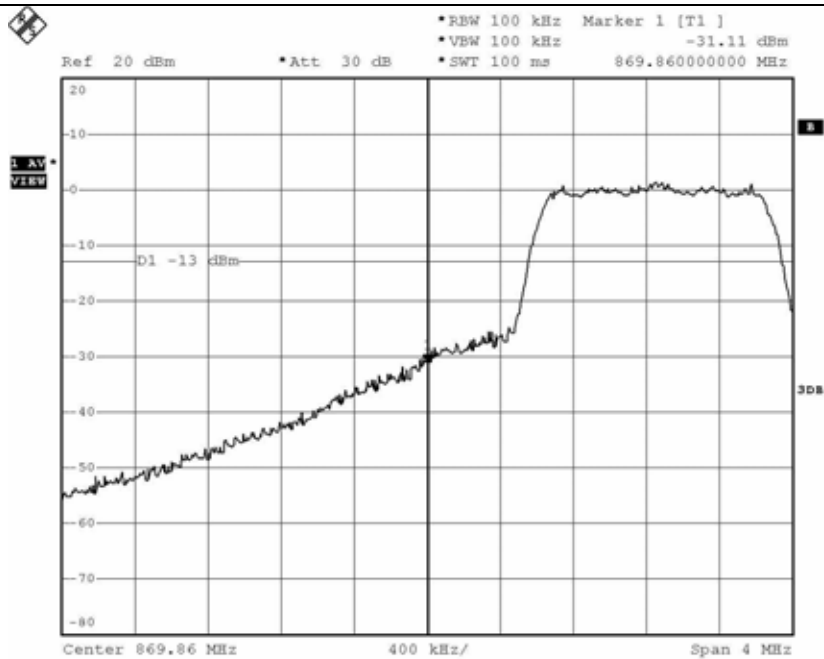
Downlink: IS-95 CDMA - Band Edge-High Channel



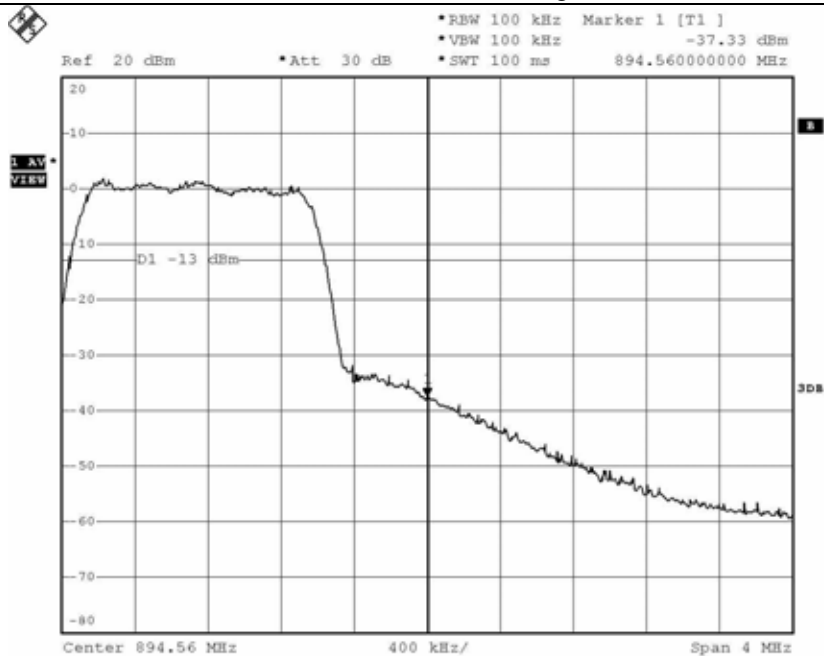
Downlink: CDMA2000 - Band Edge-Low Channel



Downlink: CDMA2000 - Band Edge-High Channel



Downlink: 1xEVDO – Band Edge-Low Channel



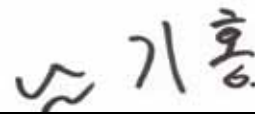
Downlink: 1xEVDO – Band Edge-High Channel

9.4.2 Test result for PCS Band

Mode	Modulation	Channel	Measured Frequency (GHz)	Max. Measured Value (dBm)	Limit (dBm)
Downlink	IS-95 CDMA	Low	1.930	-44.22	-13.0
		High	1.990	-47.94	
	CDMA2000	Low	1.930	-44.75	-13.0
		High	1.990	-47.47	
	1xEVDO	Low	1.930	-44.26	
		High	1.990	-48.11	

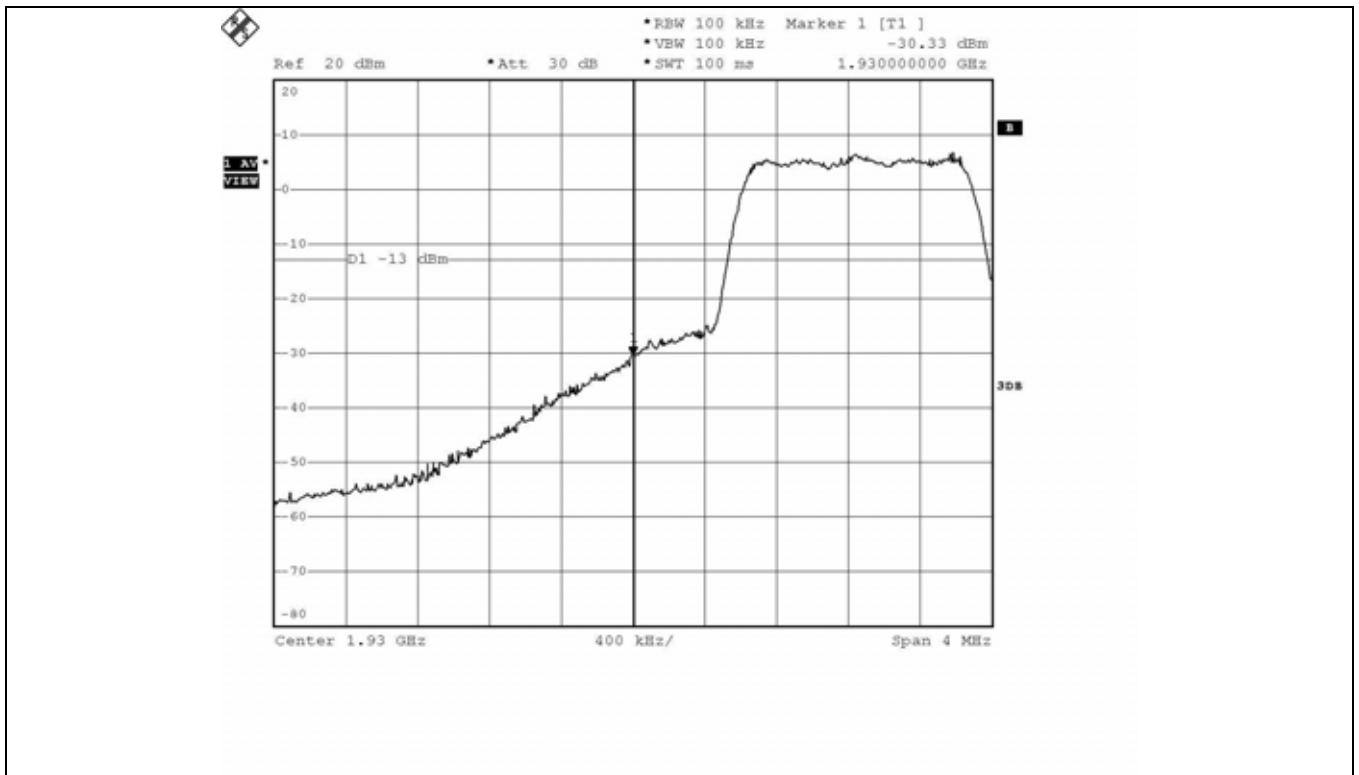
According to the rule, out of band emission shall be attenuated by $43 + 10 \log (P)$ dBc, equates to -13.0 dBm.

Remark. Uplink mode was not tested because the signal shall be connected to the BIAS-T using coaxial cable.

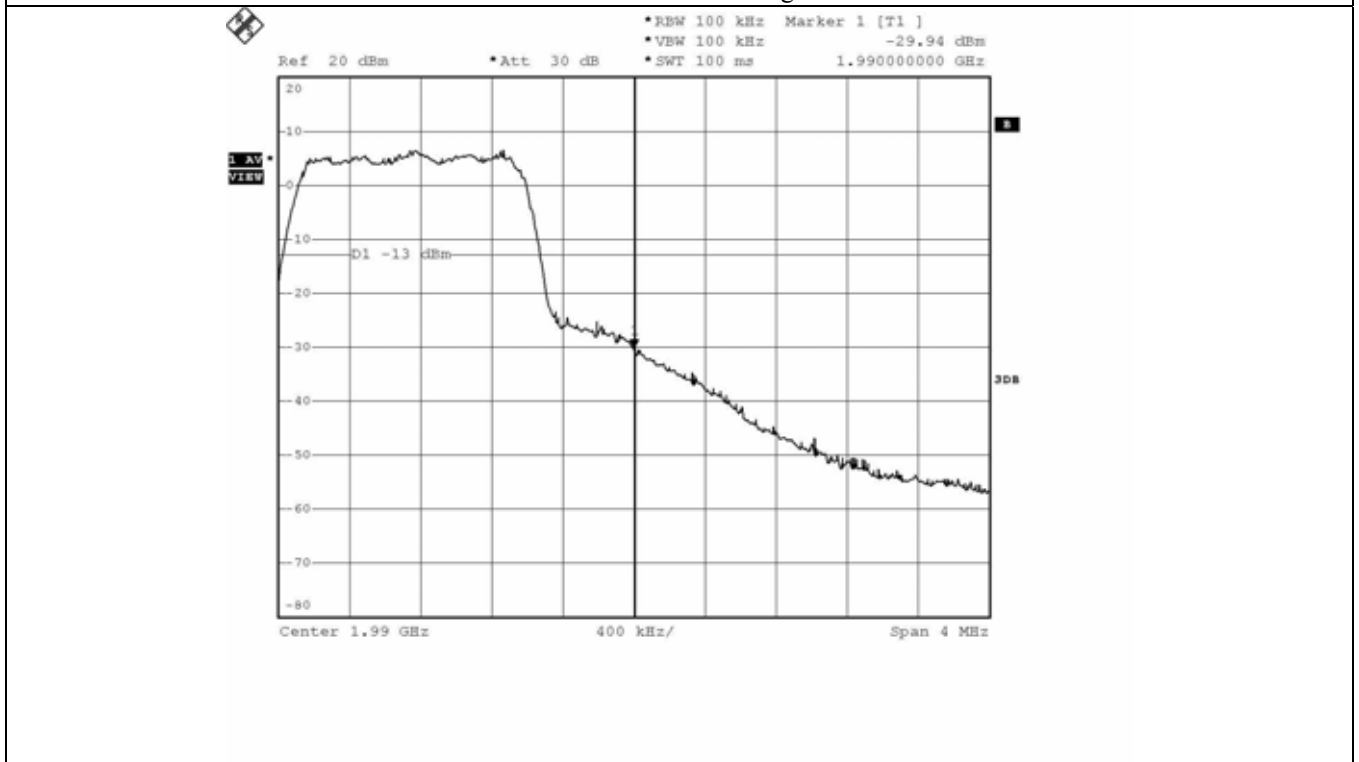


Tested by: Ki-Hong, Nam / Test Engineer

9.4.3 Screen Photo for PCS Band



Downlink: IS-95 CDMA - Band Edge-Low Channel



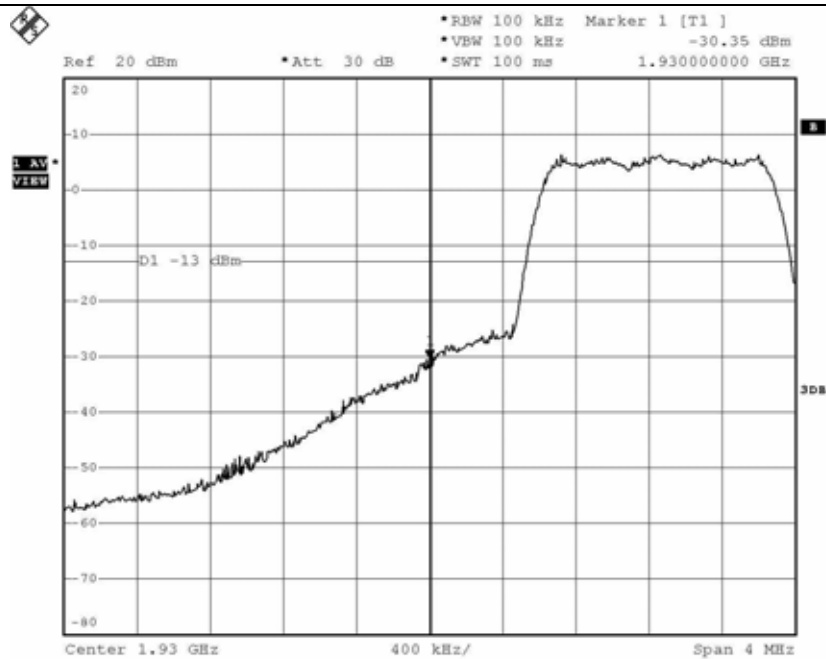
Downlink: IS-95 CDMA - Band Edge-High Channel

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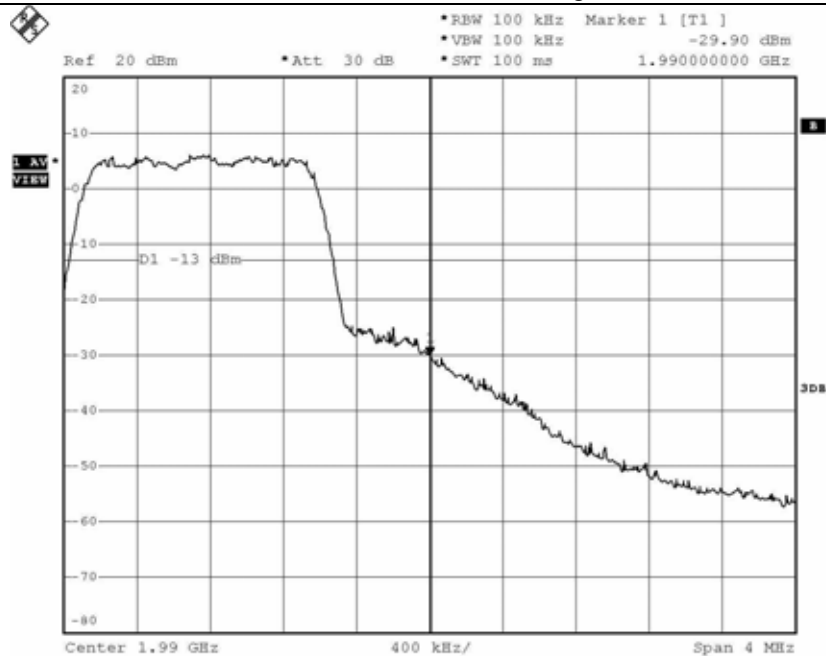
EMC-003 (Rev.1)

HEAD OFFICE : #505 SK Apt. Factory 223-28, Sangdaewon1-dong, Jungwon-gu, Seongnam-si, Gyeonggi-do, 462-705, Korea
(TEL: +82-31-746-8500, FAX: +82-31-746-8700)

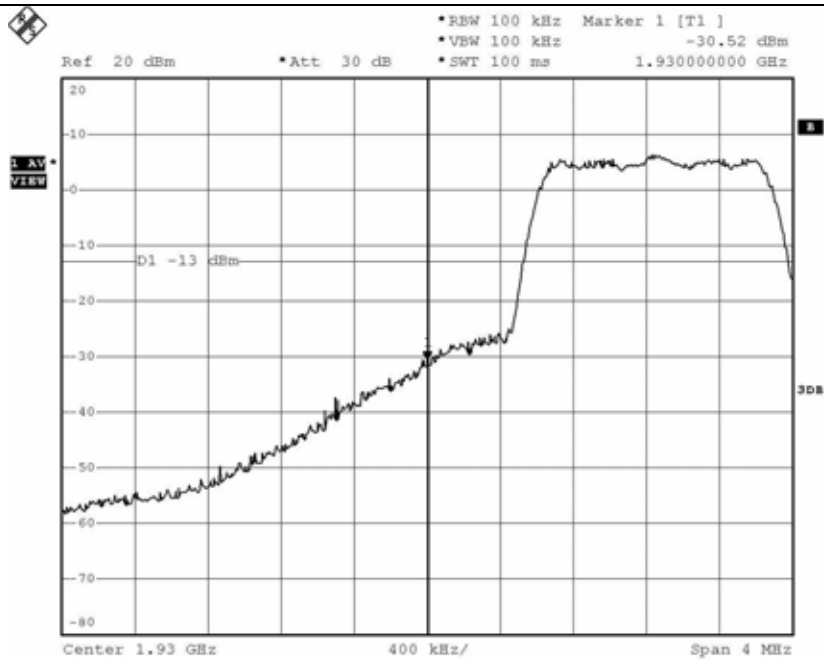
EMC Testing Dept : 307-51 Daessangnyeong-ri, Chowol-eup, Gwangju-si, Gyeonggi-do, 464-862, Korea. (TEL: +82-31-765-8289, FAX: +82-31-766-2904)



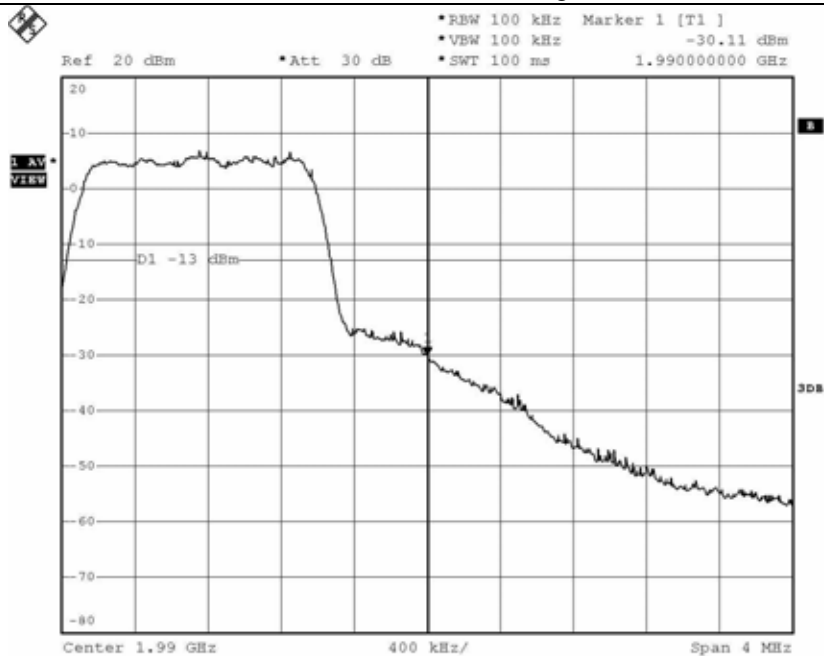
Downlink: CDMA2000 - Band Edge-Low Channel



Downlink: CDMA2000 - Band Edge-High Channel



Downlink: 1xEVDO – Band Edge-Low Channel



Downlink: 1xEVDO – Band Edge-High Channel

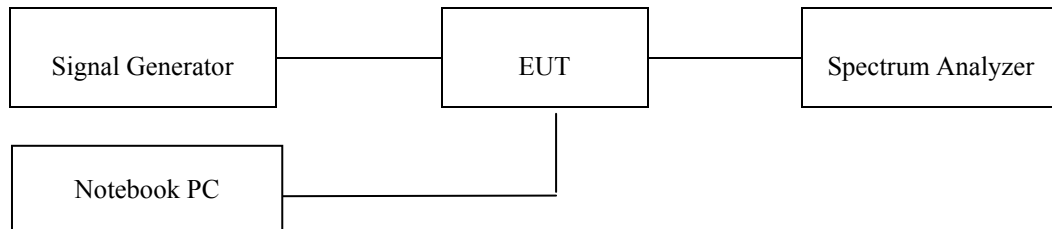
10. INTERMODULATION TEST

10.1 Operating environment

Temperature : 25.7 °C
Relative humidity : 44.7 % R.H.

10.2 Test set-up

The RF output port of the EUT was connected to the input of the spectrum analyzer. The resolution bandwidth, 100 kHz and video bandwidth, 100 kHz of the spectrum analyzer was set and sufficient scans were taken to show any out of band emissions up to 10th harmonic. The attenuator of the EUT was set to zero by the software for RF control on the notebook PC. Two input signals are equal in level and were sent to the input of the EUT.



10.3 Test equipment used

	Model Number	Manufacturer	Description	Serial Number	Last Cal.
■ -	8564E	HP	Spectrum Analyzer	3650A00756	June 19, 2007
■ -	E4432B	HP	Signal Generator	US38440950	June 19, 2007
■ -	SMJ 100A	R/S	Vector Signal Generator	101037	June 19, 2007
□ -	FSP	R/S	Spectrum Analyzer	100017	Mar. 15, 2008

All test equipment used is calibrated on a regular basis.

10.4 Test data

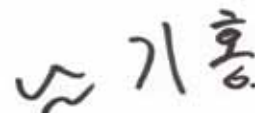
-. Test Date : June 4 ~ 5 2008
-. Test Result : Pass

10.4.1 Test result for Cellular Band

Band	Modulation	Channel	Measured
Cellular	IS-95 CDMA	Low	< -13dBm
		High	< -13dBm
	CDMA2000	Low	< -13dBm
		High	< -13dBm
	1xEVDO	Low	< -13dBm
		High	< -13dBm
PCS	IS-95 CDMA	Low	< -13dBm
		High	< -13dBm
	CDMA2000	Low	< -13dBm
		High	< -13dBm
	1xEVDO	Low	< -13dBm
		High	< -13dBm

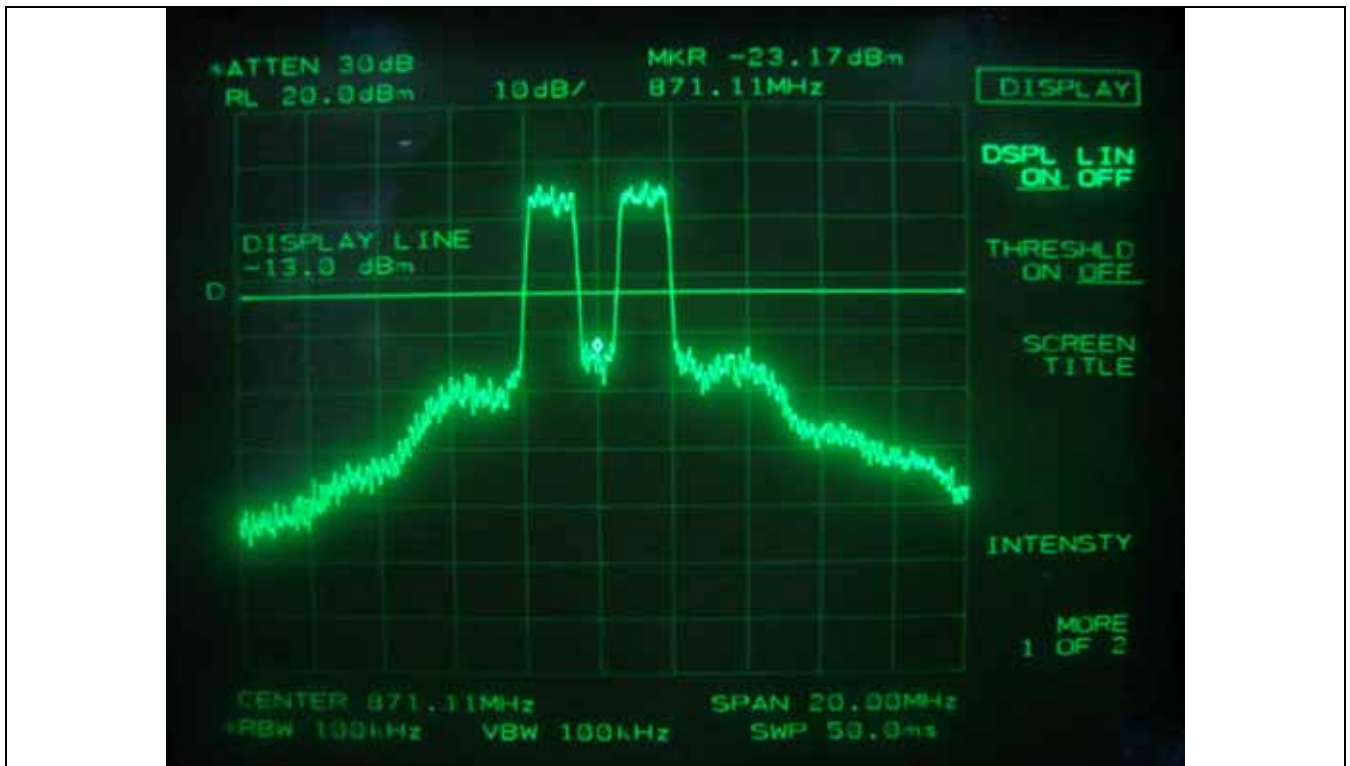
Remark:

1. Uplink mode was not tested because the signal shall be connected to the BIAS-T using coaxial cable.
2. Intermodulation products must be attenuated below the rated power of the EUT at least $43 + 10\log(P_w)$ (Pw), equivalent to -13 dBm.
3. The emissions from other frequencies except for screen captured in next pages were almost same with spurious emission test data, so the data were not included in this test report.

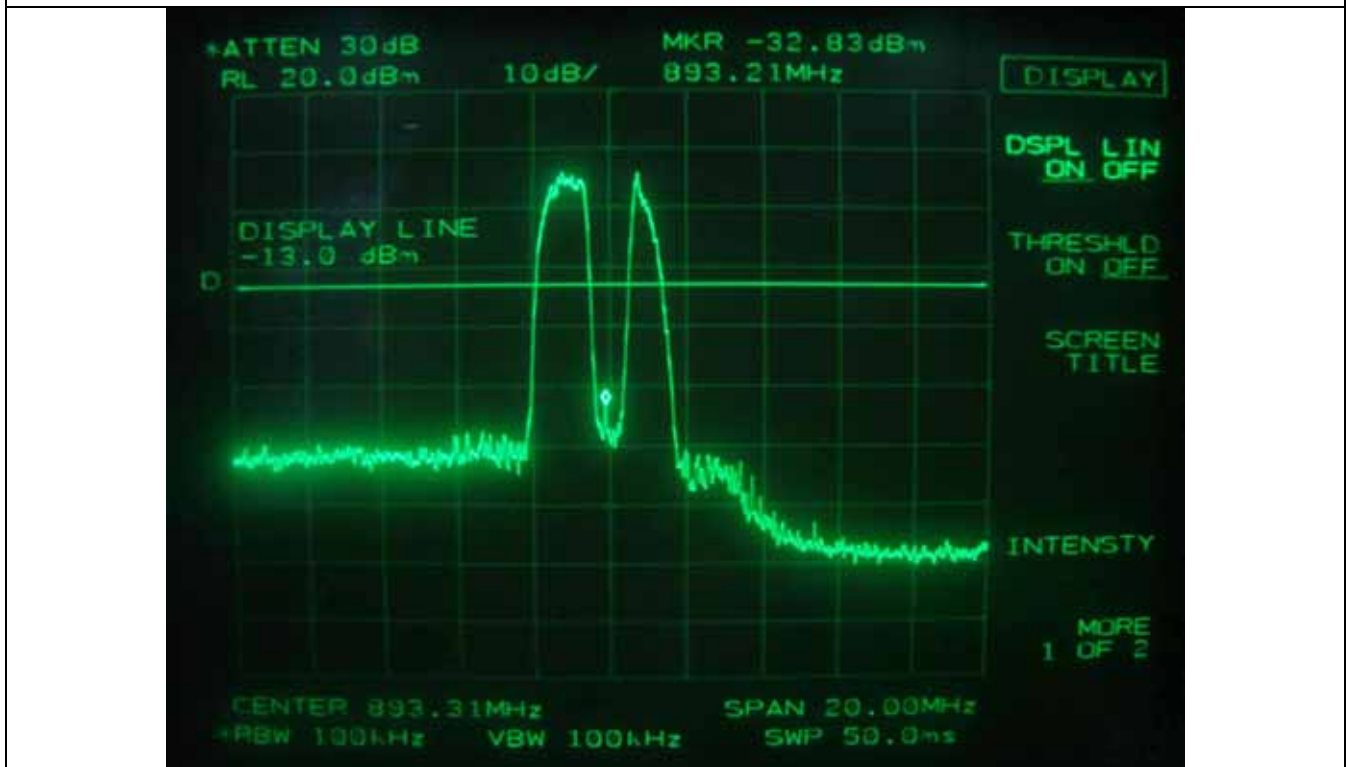


Tested by: Ki-Hong, Nam / Test Engineer

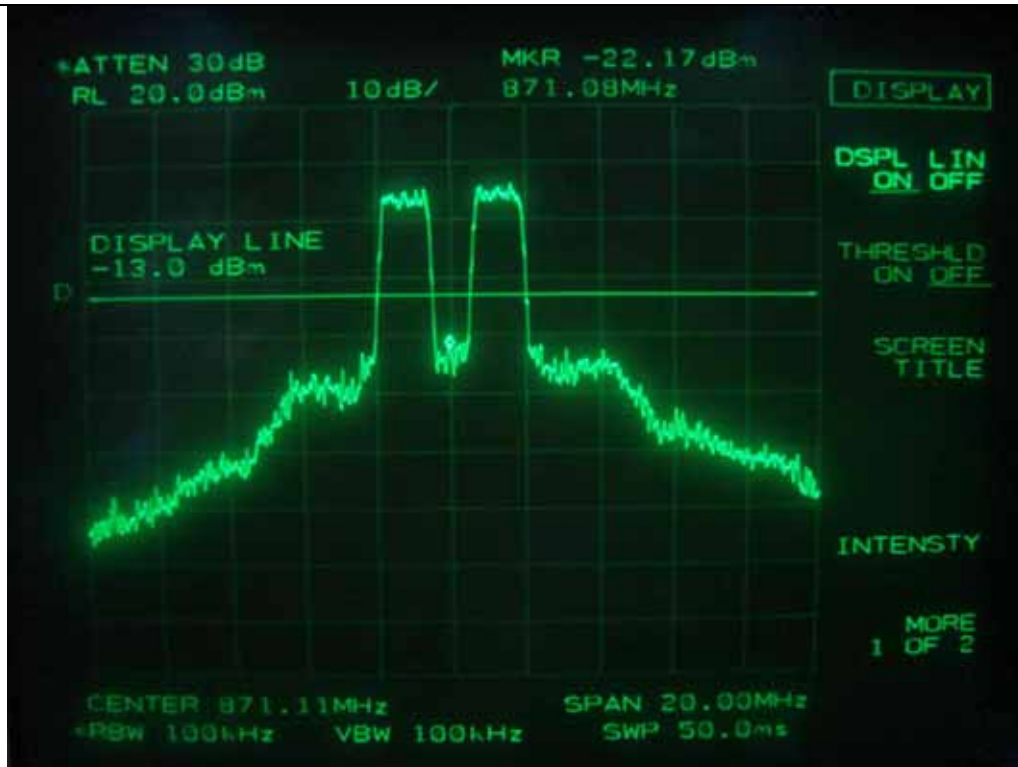
10.4.2 Screen Photo for Cellular Band



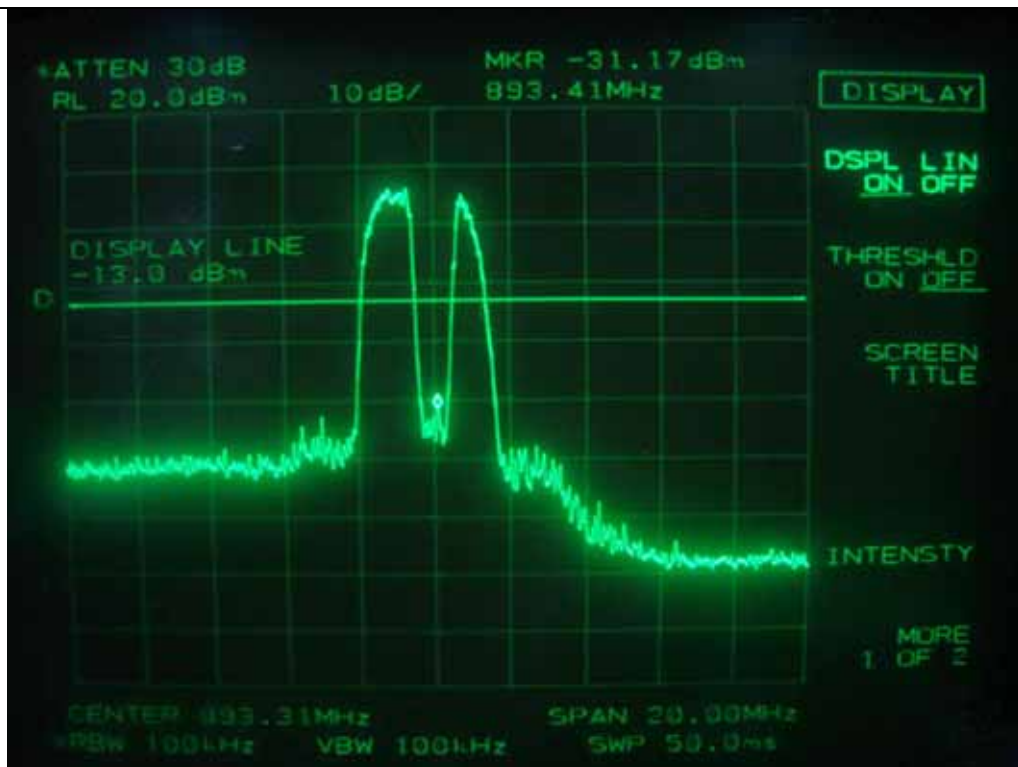
Downlink: IS-95 CDMA - Low Channel



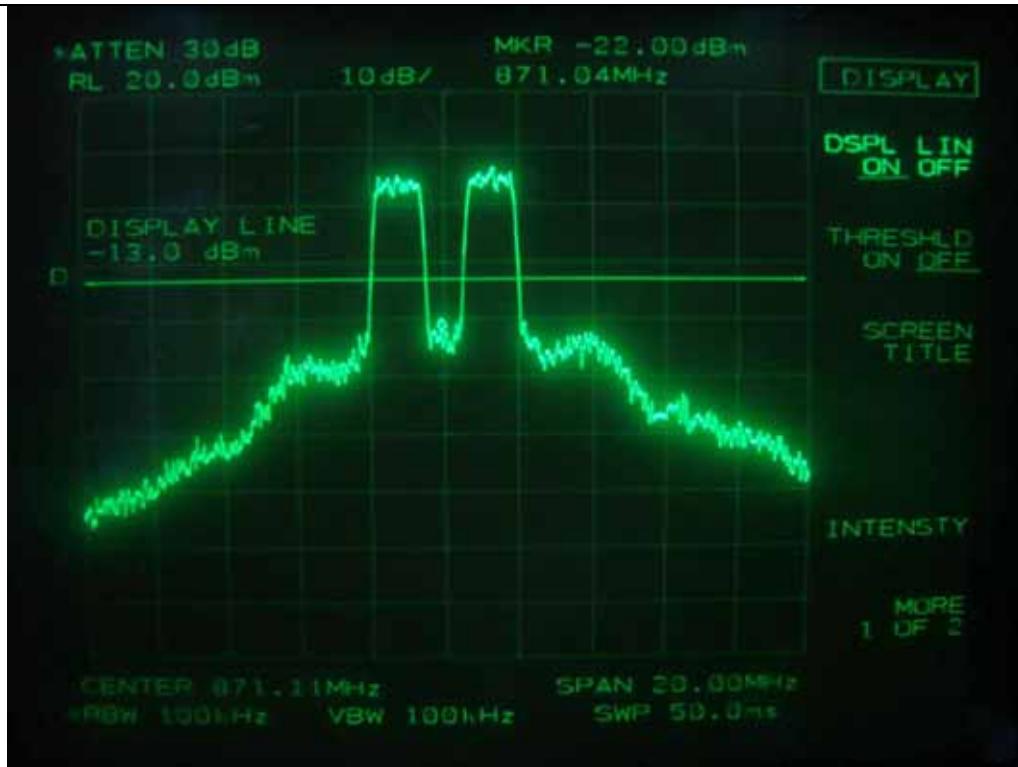
Downlink: IS-95 CDMA - High Channel



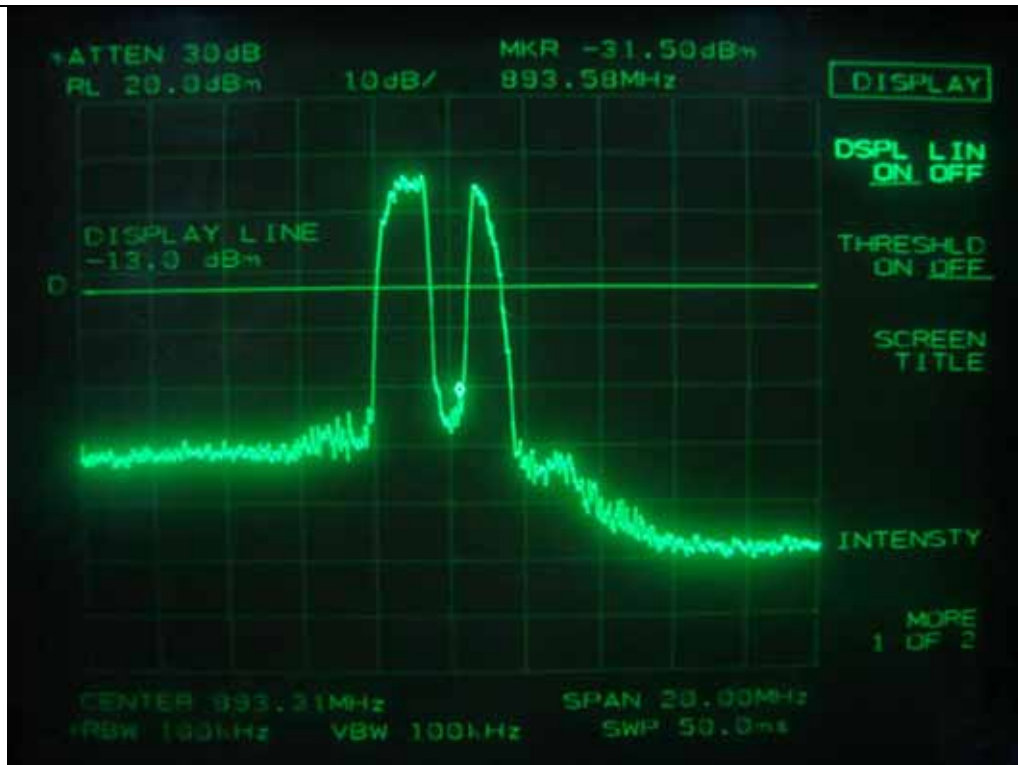
Downlink: CDMA2000 - Low Channel



Downlink: CDMA2000 - High Channel

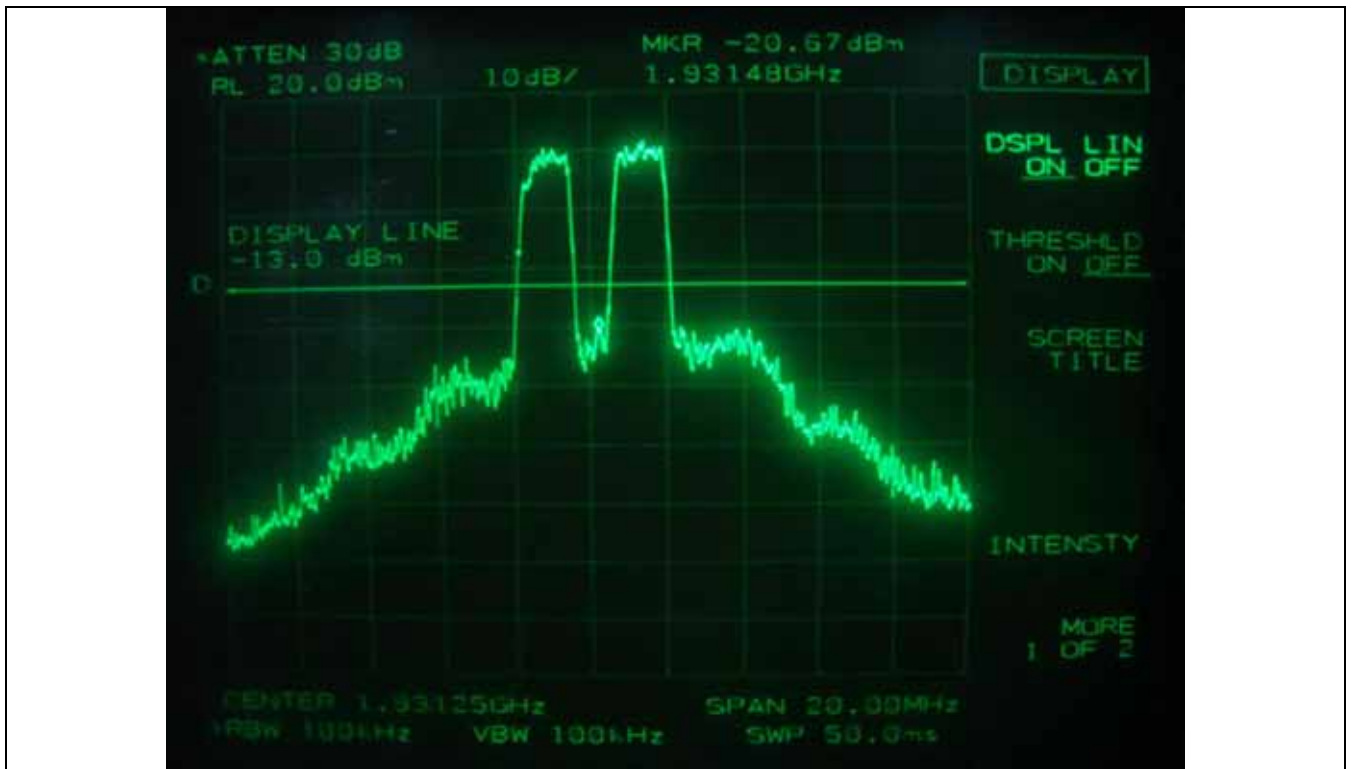


Downlink: 1xEVDO - Low Channel



Downlink: 1xEVDO - High Channel

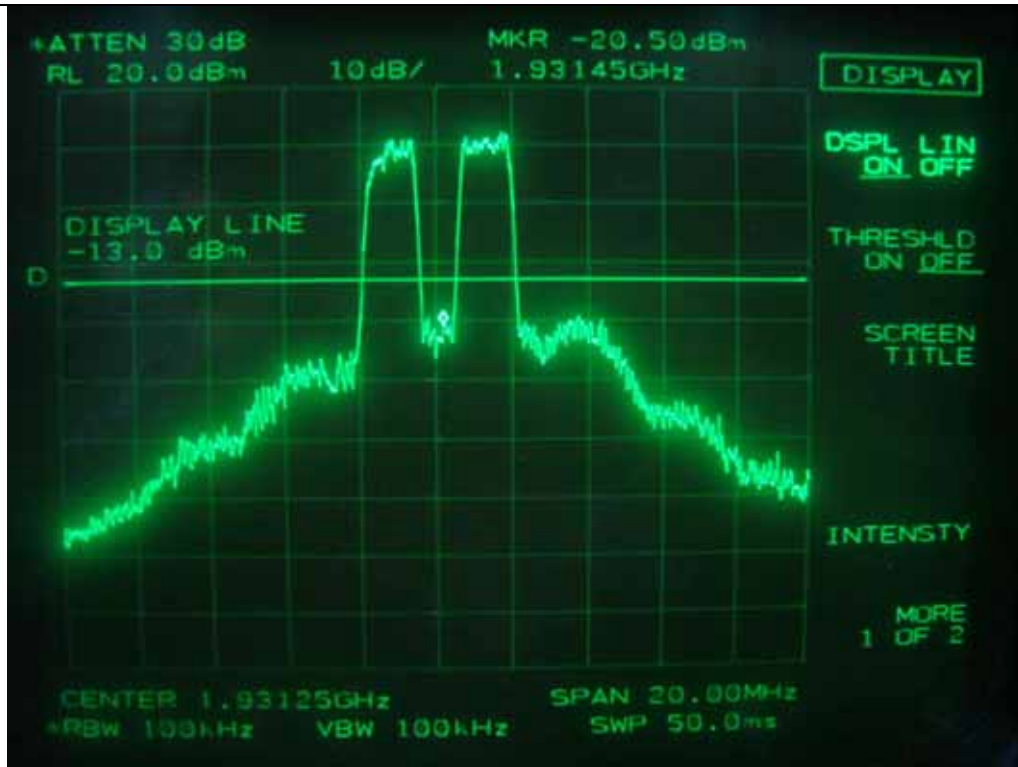
10.4.3 Screen Photo for PCS Band



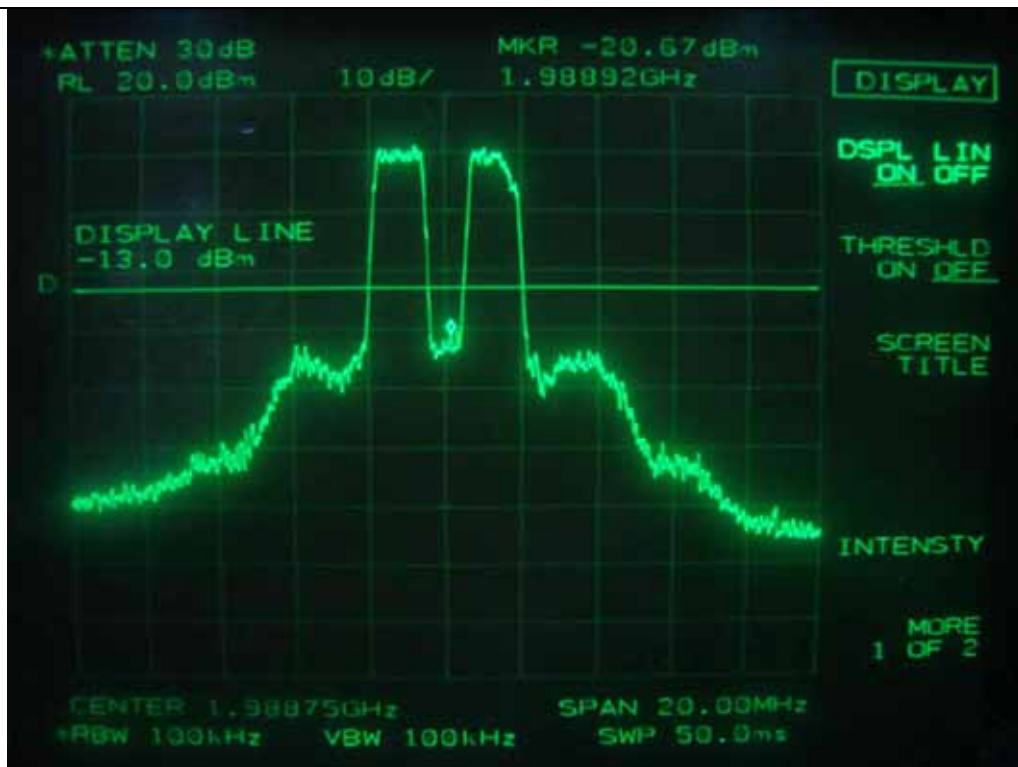
Downlink: IS-95 CDMA - Low Channel



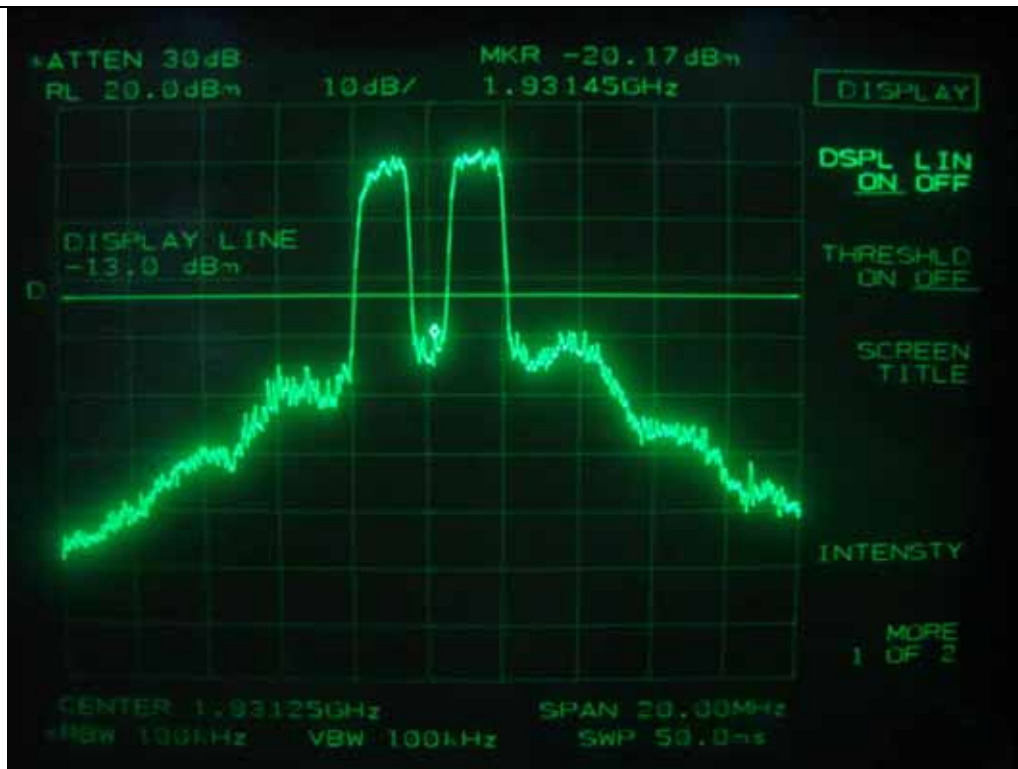
Downlink: IS-95 CDMA - High Channel



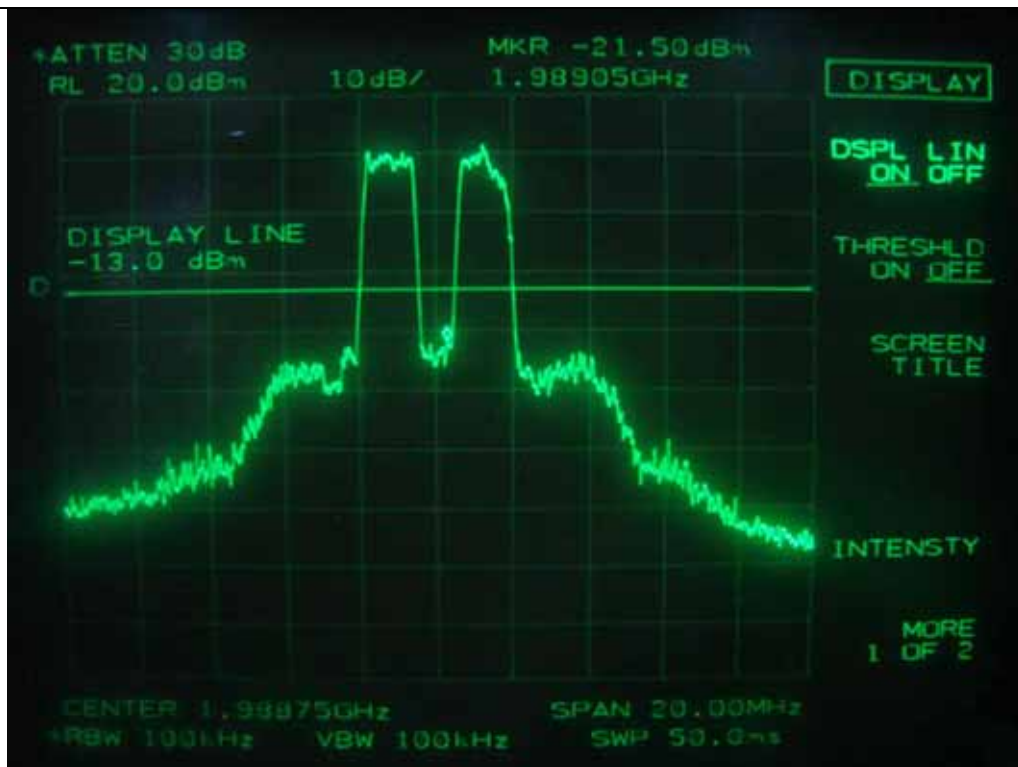
Downlink: CDMA2000 - Low Channel



Downlink: CDMA2000 - High Channel



Downlink: 1xEVDO - Low Channel



Downlink: 1xEVDO - High Channel

11. FIELD STRENGTH OF SPURIOUS RADIATION

11.1 Operating environment

Temperature : 27 °C
Relative humidity : 43.5 %R.H.

11.2 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 30 MHz 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.

The maximum radiated emission was recorded and used as reference for the effective radiated power measurement. The EUT was then replaced by a tuned dipole antenna or Horn antenna and was oriented for vertical polarization and then the length was adjusted to correspond to the frequency of the transmitter. The substitution antenna was connected to a signal generator with a coaxial cable. The receiving antenna height was raised and lowered again through the specified range of height until maximum signal level is detected by the measuring receiver. The signal to the substitution antenna was adjusted to the level that produces a level detected by the measuring receiver, that is equal to the level noted while the EUT radiated power measured, corrected for the change of input attenuation setting of the measuring receiver. The signal generator level was recorded and corrected by the power loss in the cable between the signal generator and substitution antenna and further corrected for the gain of the dipole antenna or horn antenna used relative to an ideal tuned dipole antenna. The measurement was repeated with the test antenna and the substitution antenna oriented for horizontal polarization. The measure of the effective radiated power is the larger of the two levels recorded.

10.3 Test equipment used

	Model Number	Manufacturer	Description	Serial Number	Last Cal.
■ -	ESVS10	Rohde & Schwarz	EMI Test Receiver	827864/005	Dec. 21, 2007
■ -	8574B	Hewlett Packard	Quasi-Peak Adapter	2811A01432	June 20, 2007
■ -	8568B	Hewlett-Packard	Spectrum Analyzer	3109A05456	June 20, 2007
■ -	8564E	Hewlett-Packard	Spectrum Analyzer	3650A00756	June 19, 2007
■ -	83051A	Agilent	Preamplifier	3950M00201	June 20, 2007
■ -	E4432B	Hewlett-Packard	Signal Generator	US38440950	June 19, 2007
■ -	83650L	Hewlett-Packard	Signal Generator	3844A00415	June 19, 2007
■ -	BBHA9120D	Schwarzbeck	Horn Antenna	BBHA9120D294	July 03, 2006(3Y)
■ -	BBHA9120D	Schwarzbeck	Horn Antenna	BBHA9120D295	July 04, 2006(3Y)
■ -	SMJ 100A	R/S	Vector Signal Generator	101037	June 19, 2007
■ -	FSP	R/S	Spectrum Analyzer	100017	Mar. 14, 2008

All test equipment used is calibrated on a regular basis.

11.4. Test data for Cellular Band

11.4.1 Test result for IS-95 CDMA

- . Test Date : June 11, 2008
- . Resolution bandwidth : 1 MHz
- . Video bandwidth : 1 MHz
- . Frequency range : 1 GHz ~ 20 GHz
- . Measurement distance : 3 m
- . Result : PASSED

Frequency (GHz)	Spectrum Reading (dBuV)	Generator Reading (dBm)	Ant. Pol. (H/V)	AMP Gain (dB)	Ant. Gain (dBi)	Dipole Gain (dBd)	Cable Loss (dB)	Total (dBm)	Limit (dBm)	Margin (dB)
Test Data for Low Channel										
871.11	57.50	-11.50	H		0.00	0.00	0.33	-11.17		
	58.83	-9.83	V					-9.50		
1742.22	37.50	-61.50	H	26.1	9.15	7.00	0.50	-58.85	-13.00	-45.85
	37.33	-61.17	V					-58.52	-13.00	-45.52
Test Data for Middle Channel										
881.52	57.83	-11.37	H		0.00	0.00	0.33	-11.04		
	58.10	-10.53	V					-10.20		
1763.04	37.67	-61.96	H	26.1	9.23	7.08	0.50	-59.31	-13.00	-46.31
	37.33	-61.17	V					-58.52	-13.00	-45.52
Test Data for High Channel										
893.31	57.50	-11.50	H		0.00	0.00	0.33	-11.17		
	58.67	-9.67	V					-9.34		
1786.62	37.50	-62.00	H	26.1	9.32	7.17	0.50	-59.35	-13.00	-46.35
	37.83	-60.50	V					-57.85	-13.00	-44.85

Tabulated test data for Restricted Band

11.4.2 Test result for CDMA 2000

-. Test Date : June 11, 2008
-. Resolution bandwidth : 1 MHz
-. Video bandwidth : 1 MHz
-. Frequency range : 1 GHz ~ 20 GHz
-. Measurement distance : 3 m
-. Result : PASSED

Frequency (GHz)	Spectrum Reading (dBuV)	Generator Reading (dBm)	Ant. Pol. (H/V)	AMP Gain (dB)	Ant. Gain (dBi)	Dipole Gain (dBd)	Cable Loss (dB)	Total (dBm)	Limit (dBm)	Margin (dB)
Test Data for Low Channel										
871.11	57.50	-11.50	H		0.00	0.00	0.33	-11.17		
871.11	58.72	-9.94	V		0.00	0.00	0.33	-9.61		
1742.22	37.33	-61.67	H	26.1	9.15	7.00	0.50	-59.02	-13.00	-46.02
1742.22	37.83	-60.67	V	26.1	9.15	7.00	0.50	-58.02	-13.00	-45.02
Test Data for Middle Channel										
881.52	57.95	-11.25	H		0.00	0.00	0.33	-10.92		
	59.00	-9.63	V		0.00	0.00	0.33	-9.30		
1763.04	37.50	-62.13	H	26.1	9.23	7.08	0.50	-59.48	-13.00	-46.48
	37.10	-61.40	V	26.1	9.23	7.08	0.50	-58.75	-13.00	-45.75
Test Data for High Channel										
893.31	57.83	-11.17	H		0.00	0.00	0.33	-10.84		
	58.92	-9.42	V		0.00	0.00	0.33	-9.09		
1786.62	37.50	-62.00	H	26.1	9.32	7.17	0.50	-59.35	-13.00	-46.35
	37.17	-61.16	V	26.1	9.32	7.17	0.50	-58.51	-13.00	-45.51

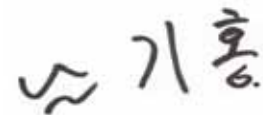
Tabulated test data for Restricted Band

11.4.3 Test result for 1x EVDO

-. Test Date : June 11, 2008
-. Resolution bandwidth : 1 MHz
-. Video bandwidth : 1 MHz
-. Frequency range : 1 GHz ~ 20 GHz
-. Measurement distance : 3 m
-. Result : PASSED

Frequency (GHz)	Spectrum Reading (dBuV)	Generator Reading (dBm)	Ant. Pol. (H/V)	AMP Gain (dB)	Ant. Gain (dBi)	Dipole Gain (dBd)	Cable Loss (dB)	Total (dBm)	Limit (dBm)	Margin (dB)
Test Data for Low Channel										
871.11	57.72	-11.28	H		0.00	0.00	0.33	-10.95		
	58.90	-9.76	V					-9.43		
1742.22	37.50	-61.50	H	26.1	9.15	7.00	0.50	-58.85	-13.00	-45.85
	37.33	-61.17	V					-58.52	-13.00	-45.52
Test Data for Middle Channel										
881.52	57.67	-11.53	H		0.00	0.00	0.33	-11.20		
	58.67	-9.96	V					-9.63		
1763.04	37.00	-61.29	H	26.1	9.23	7.08	0.50	-58.64	-13.00	-45.64
	37.33	-61.17	V					-58.52	-13.00	-45.52
Test Data for High Channel										
893.31	57.50	-11.50	H		0.00	0.00	0.33	-11.17		
	58.30	-10.04	V					-9.71		
1786.62	37.50	-62.00	H	26.1	9.32	7.17	0.50	-59.35	-13.00	-46.35
	37.83	-60.50	V					-57.85	-13.00	-44.85

Tabulated test data for Restricted Band



Tested by: Ki-Hong, Nam / Test Engineer

11.5. Test data for PCS Band

11.5.1. Test result for IS-95 CDMA

- . Test Date : June 11, 2008
- . Resolution bandwidth : 1 MHz
- . Video bandwidth : 1 MHz
- . Frequency range : 1 GHz ~ 20 GHz
- . Measurement distance : 3 m
- . Result : PASSED

Frequency (GHz)	Spectrum Reading (dBuV)	Generator Reading (dBm)	Ant. Pol. (H/V)	AMP Gain (dB)	Ant. Gain (dBi)	Dipole Gain (dBd)	Cable Loss (dB)	Total (dBm)	Limit (dBm)	Margin (dB)
Test Data for Low Channel										
1931.25	84.80	9.68	H		10.03	7.88	0.50	12.33		
	83.50	12.53	V					15.18		
3862.50	38.50	-62.55	H	26.1	11.88	9.73	0.84	-59.56	-13.00	-46.56
	38.33	-60.67	V					-57.68	-13.00	-44.68
Test Data for Middle Channel										
1957.50	84.00	10.33	H		10.14	7.99	0.50	12.98		
	83.00	12.03	V					14.68		
3915.00	38.72	-61.88	H	26.1	11.95	9.80	0.84	-58.89	-13.00	-45.89
	38.50	-59.50	V					-56.51	-13.00	-43.51
Test Data for High Channel										
1988.75	83.50	10.66	H		10.27	8.12	0.50	13.31		
	84.30	12.47	V					15.12		
3977.50	38.50	-63.68	H	26.1	12.04	9.89	0.84	-60.69	-13.00	-47.69
	38.33	-59.69	V					-56.70	-13.00	-43.70

Tabulated test data for Restricted Band

11.5.2. Test result for CDMA 2000

- . Test Date : June 11, 2008
- . Resolution bandwidth : 1 MHz
- . Video bandwidth : 1 MHz
- . Frequency range : 1 GHz ~ 20 GHz
- . Measurement distance : 3 m
- . Result : PASSED

Frequency (GHz)	Spectrum Reading (dBuV)	Generator Reading (dBm)	Ant. Pol. (H/V)	AMP Gain (dB)	Ant. Gain (dBi)	Dipole Gain (dBd)	Cable Loss (dB)	Total (dBm)	Limit (dBm)	Margin (dB)
Test Data for Low Channel										
1931.25	84.50	9.38	H		10.03	7.88	0.50	12.03		
	83.33	12.36	V					15.01		
3862.50	38.67	-62.38	H	26.1	11.88	9.73	0.84	-59.39	-13.00	-46.39
	38.50	-60.50	V					-57.51	-13.00	-44.51
Test Data for Middle Channel										
1957.50	83.83	10.16	H		10.14	7.99	0.50	12.81		
	83.17	12.20	V					14.85		
3915.00	38.50	-62.10	H	26.1	11.95	9.80	0.84	-59.11	-13.00	-46.11
	38.67	-59.33	V					-56.34	-13.00	-43.34
Test Data for High Channel										
1988.75	83.67	10.83	H		10.27	8.12	0.50	13.48		
	84.00	12.17	V					14.82		
3977.50	38.83	-63.35	H	26.1	12.04	9.89	0.84	-60.36	-13.00	-47.36
	38.50	-59.52	V					-56.53	-13.00	-43.53

Tabulated test data for Restricted Band

11.5.3 Test result for 1x EVDO

-. Test Date : June 11, 2008
-. Resolution bandwidth : 1 MHz
-. Video bandwidth : 1 MHz
-. Frequency range : 1 GHz ~ 20 GHz
-. Measurement distance : 3 m
-. Result : PASSED

Frequency (GHz)	Spectrum Reading (dBuV)	Generator Reading (dBm)	Ant. Pol. (H/V)	AMP Gain (dB)	Ant. Gain (dBi)	Dipole Gain (dBd)	Cable Loss (dB)	Total (dBm)	Limit (dBm)	Margin (dB)
Test Data for Low Channel										
1931.25	84.67	9.55	H		10.03	7.88	0.50	12.20		
	84.00	13.03	V					15.68		
3862.50	38.83	-62.22	H	26.1	11.88	9.73	0.84	-59.23	-13.00	-46.23
	39.00	-60.00	V					-57.01	-13.00	-44.01
Test Data for Middle Channel										
1957.50	84.17	10.50	H		10.14	7.99	0.50	13.15		
	83.33	12.36	V					15.01		
3915.00	38.50	-62.10	H	26.1	11.95	9.80	0.84	-59.11	-13.00	-46.11
	38.67	-59.33	V					-56.34	-13.00	-43.34
Test Data for High Channel										
1988.75	83.33	10.49	H		10.27	8.12	0.50	13.14		
	84.50	12.67	V					15.32		
3977.50	38.67	-63.51	H	26.1	12.04	9.89	0.84	-60.52	-13.00	-47.52
	38.83	-59.19	V					-56.20	-13.00	-43.20

Tabulated test data for Restricted Band

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Tested by: Ki-Hong, Nam / Test Engineer

12. FREQUENCY STABILITY WITH TEMPERATURE VARIATION

12.1 Operating environment

Temperature : 23.5 °C
Relative humidity : 45.8 %R.H.

12.2 Test set-up

The RF output port of the EUT was connected to the input of the spectrum analyzer. The software for RF control on the notebook PC was set to transmit maximum signal gain and bandwidth. The test was performed at center frequency.

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. The temperature in the chamber was raised 10 °C step from -30 °C to +50 °C. Repeat above method for frequency measurements every 10 °C step and then record all measured frequencies on each temperature step.

12.3 Test equipment used

Model Number	Manufacturer	Description	Serial Number	Last Cal.
■ - 8564E	HP	Spectrum Analyzer	3650A00756	July 19, 2007
■ - 53152A	HP	Frequency Counter	US39270295	Dec. 7, 2007
■ - SSE-43-CI-A	Samkun Tech Develop.	Chamber	N/A	July 11, 2007
■ - SMJ 100A	R/S	Vector Signal Generator	101037	June 19, 2007
■ - FSP	R/S	Spectrum Analyzer	100017	Mar. 14, 2008

All test equipment used is calibrated on a regular basis.

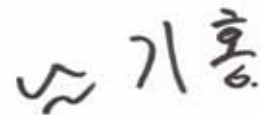
12.4 Test data

-. Test Date : June 2 ~ 3, 2008

-. Result : PASSED

Band	Temperature (°C)	Input Freq. (Hz)	Measured Freq. (Hz)	Result (PPM)	Limit
Cellular	-30	871110000	871109993	-0.0080	Within the Authorized Frequency block
	-20		871109995	-0.0057	
	-10		871109994	-0.0069	
	0		871109993	-0.0080	
	10		871109995	-0.0057	
	20		871109993	-0.0080	
	30		871109995	-0.0057	
	40		871109994	-0.0069	
	50		871109994	-0.0069	
PCS	-30	1931250000	1931249986	-0.0072	Within the Authorized Frequency block
	-20		1931249986	-0.0072	
	-10		1931249985	-0.0078	
	0		1931249987	-0.0067	
	10		1931248886	-0.5768	
	20		1931249987	-0.0067	
	30		1931249986	-0.0072	
	40		1931249986	-0.0072	
	50		1931249985	-0.0078	

Remark. Uplink mode was not tested because the signal shall be connected to the BIAS-T using coaxial cable.



Tested by: Ki-Hong, Nam / Test Engineer

13. FREQUENCY STABILITY WITH VOLTAGE VARIATION

13.1 Operating environment

Temperature : 23.5 °C
Relative humidity : 45.8 %R.H.

13.2 Test set-up

The RF output port of the EUT was connected to the input of the spectrum analyzer. The signal generator was set to 1931.25 MHz with an unmodulated signal. The voltage of EUT set to 115 % of the nominal value and then was reduced to 85 % of nominal voltage. The output frequency was recorded at each step.

13.3 Test equipment used

Model Number	Manufacturer	Description	Serial Number	Last Cal.
■ - 8564E	HP	Spectrum Analyzer	3650A00756	July 19, 2007
■ - 53152A	HP	Frequency Counter	US39270295	Dec. 7, 2007
■ - SSE-43-CI-A	Samkun Tech Develop.	Chamber	N/A	July 11, 2007
■ - SMJ 100A	R/S	Vector Signal Generator	101037	June 19, 2007
■ - FSP	R/S	Spectrum Analyzer	100017	Mar. 14, 2008

All test equipment used is calibrated on a regular basis.

13.4 Test data

-. Test Date : June 2~3, 2008
-. Rated Supply Voltage : 110 Vac
-. Result : PASSED

13.4 .1 Test result for Downlink Mode

Band	Voltage (Vac)	Input Freq. (Hz)	Measured Freq. (Hz)	Result (PPM)	Limit
Cellular	126.5(115%)	871110000	871109994	-0.0069	Within the Authorized Frequency block
	110(100%)		871109993	-0.0080	
	93.5(85%)		871109994	-0.0069	
PCS	126.5(115%)	1931250000	1931249987	-0.0067	Within the Authorized Frequency block
	110(100%)		1931249986	-0.0072	
	93.5(85%)		1931249986	-0.0072	

Remark. Uplink mode was not tested because the signal shall be connected to the BIAS-T using coaxial cable.

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Tested by: Ki-Hong, Nam / Test Engineer

14. RADIATED EMISSION TEST FOR GENERAL REQUIREMENT

14.1 Operating environment

Temperature : 26.5 °C
Relative humidity : 42 %R.H.

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 30 MHz to 1 000 MHz 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.

The test set-up photos are included in appendix VI.

14.3 Test equipment used

Model Number	Manufacturer	Description	Serial Number	Last Cal.
■ - ESVS10	Rohde & Schwarz	EMI Test Receiver	827864/005	Dec. 21, 2007
■ - SMJ 100A	R/S	Vector Signal Generator	101037	June 19, 2007
■ - FSP	R/S	Spectrum Analyzer	100017	Mar. 14, 2008
■ - 8574B	Hewlett Packard	Quasi-Peak Adapter	2811A01432	June 20, 2007
■ - 8568B	Hewlett-Packard	Spectrum Analyzer	3109A05456	June 20, 2007
■ - MA240	HD GmbH	Antenna Master	N/A	N/A
■ - HD100	HD GmbH	Position Controller	N/A	N/A
■ - DS420S	HD GmbH	Turn Table	N/A	N/A
■ - 3110	EMCO	Biconical Antenna	9003-1121	Jan. 18, 2008
■ - 3146	EMCO	Log Periodic Antenna	9001-2614	Jan. 18, 2008

All test equipment used is calibrated on a regular basis.

14.4 Test data for Cellular Band

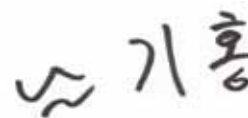
- Test Date : June 10, 2008
- Resolution bandwidth : 100 kHz
- Video bandwidth : 300 kHz
- Frequency range : 30 MHz ~ 1 000 MHz
- Measurement distance : 3 m

Frequency (MHz)	Reading (dBuV)	Ant. Pol. (H/V)	Ant. Factor (dB/m)	Cable Loss	Emission Level(dBuV/m)	Limits (dBuV/m)	Margin (dB)
213.14	17.50	H	16.66	3.16	37.32	43.52	-6.20
272.25	15.00	H	18.03	3.09	36.12	46.02	-9.90
415.72	17.17	H	15.61	4.19	36.97	46.02	-9.05
431.36	17.00	H	17.01	4.29	38.30	46.02	-7.72
754.52	14.00	H	20.69	5.82	40.51	46.02	-5.51
875.00	11.00	H	22.66	6.85	40.51	46.02	-5.51

Tabulated test data for Radiated Electromagnetic Field

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

Low, Middle and High channels for IS-95CDMA, CDMA2000 and 1xEVDO modes were tested, but the worst emissions levels were recorded in this test report.



Tested by: Ki-Hong, Nam / Test Engineer

14.5 Test data for PCS Band

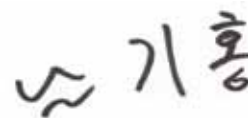
- Test Date : June 10, 2008
- Resolution bandwidth : 100 kHz
- Video bandwidth : 300 kHz
- Frequency range : 30 MHz ~ 1 000 MHz
- Measurement distance : 3 m

Frequency (MHz)	Reading (dBuV)	Ant. Pol. (H/V)	Ant. Factor (dB/m)	Cable Loss	Emission Level(dBuV/m)	Limits (dBuV/m)	Margin (dB)
213.14	18.00	H	16.66	3.16	37.82	43.52	-5.70
272.25	14.67	H	18.03	3.09	35.79	46.02	-10.23
415.72	17.83	H	15.61	4.19	37.63	46.02	-8.39
431.36	17.33	H	17.01	4.29	38.63	46.02	-7.39
754.52	15.00	H	20.69	5.82	41.51	46.02	-4.51
875.00	11.00	H	22.66	6.85	40.51	46.02	-5.51

Tabulated test data for Radiated Electromagnetic Field

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

Low, Middle and High channels for IS-95CDMA, CDMA2000 and 1xEVDO modes were tested, but the worst emissions levels were recorded in this test report.



Tested by: Ki-Hong, Nam / Test Engineer

15. CONDUCTED EMISSION TEST

15.1 Operating environment

Temperature : 24 °C
Relative humidity : 53 %R.H.

15.2 Test set-up

The EUT was placed on a wooden table, 0.8 meters height above the floor. The EUT was connected to adaptor and the power line of adaptor was fed through a 50 ohm/ 50 uH + 5 ohm Artificial Mains Network (AMN). The ground plane was electrically bonded to the reference ground system and all power lines were filtered from ambient.

15.3 Test equipment used

	Model Number	Manufacturer	Description	Serial Number	Last Cal.
■ -	ESHS10	Rohde & Schwarz	EMI Test Receiver	834467/007	May 13, 2008
■ -	NSLK 8126	Schwarzbeck	AMN	8126-404	July 04, 2007
■ -	3825/2	EMCO	AMN	9109-1867	June 21, 2007
■ -	SMJ 100A	R/S	Vector Signal Generator	101037	June 19, 2007
■ -	FSP	R/S	Spectrum Analyzer	100017	Mar. 14, 2008

All test equipment used is calibrated on a regular basis.

15.4 Test data for Cellular Band

- Test Date : June 9, 2008
- Resolution bandwidth : 9 kHz
- Frequency range : 0.15 MHz ~ 30 MHz
- Result : PASSED BY -23.90 dB at 0.18 MHz

Frequency (MHz)	Line	Peak (dBuV)			Margin (dB)	Average (dBuV)		Margin (dB)
		Emission level	Detector Mode	Limits		Emission level	Limits	
0.18	H	40.36	P	64.26	-23.90	-	-	-
0.24	H	37.93	P	61.92	-23.99	-	-	-
0.31	N	33.66	P	59.97	-26.31	-	-	-
0.37	N	28.19	P	58.50	-30.31	-	-	-
3.36	N	29.86	P	56.00	-26.14	-	-	-
26.00	H	25.60	P	60.00	-34.40	-	-	-

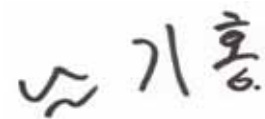
Line Conducted Emissions Tabulated Data

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

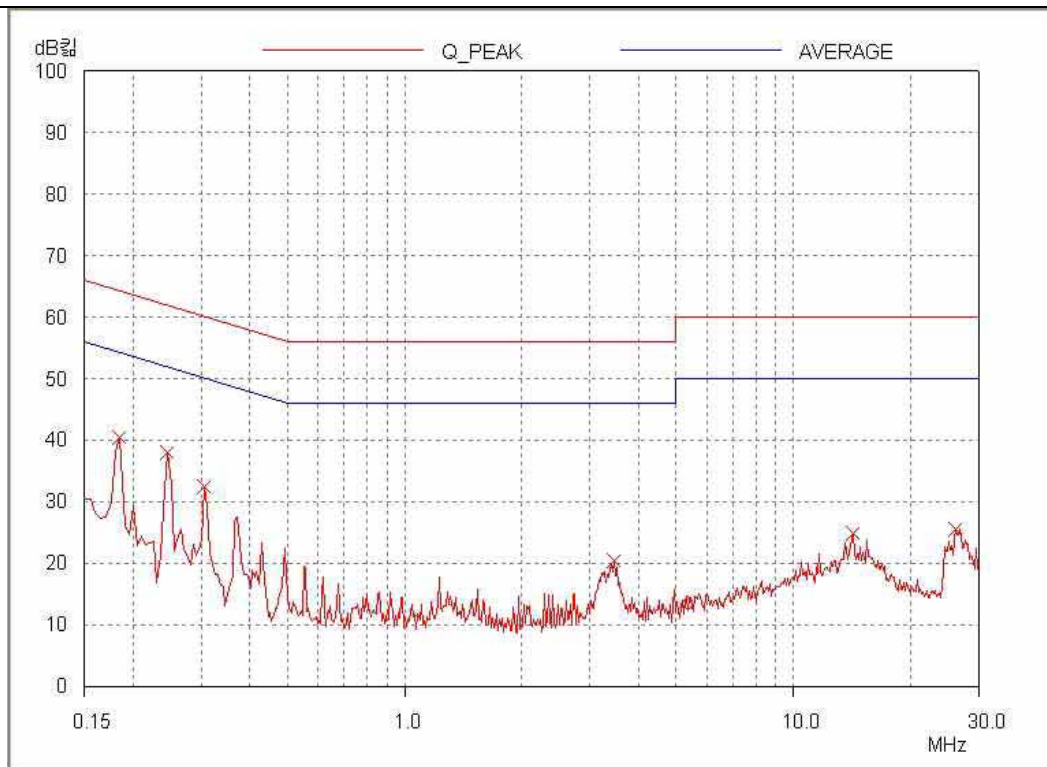
Average mode was not measured, because peak values were under the Average limit.

The test of IS-95 CDMA, CDMA2000 and 1xEVDO modes were performed, but the worst data was recorded in this report.

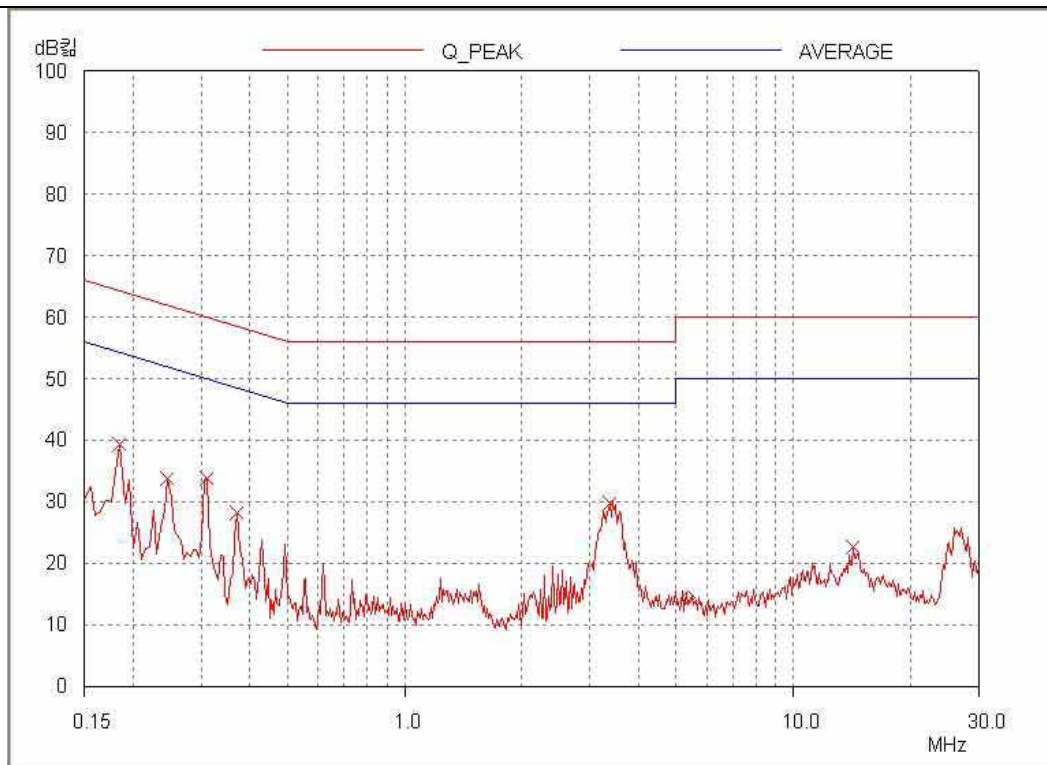
See next page for an overview sweep performed with peak detector.



Tested by: Ki-Hong, Nam / Test Engineer



HOT LINE



NEUTRAL LINE

15.5 Test data for PCS Band

- Test Date : June 9, 2008
- Resolution bandwidth : 9 kHz
- Frequency range : 0.15 MHz ~ 30 MHz
- Result : PASSED BY -25.00 dB at 0.24 MHz

Frequency (MHz)	Line	Peak (dBuV)			Margin (dB)	Average (dBuV)		Margin (dB)
		Emission level	Detector Mode	Limits		Emission level	Limits	
0.18	H	37.70	P	64.49	-26.79	-	-	-
0.24	H	36.92	P	61.92	-25.00	-	-	-
0.30	N	32.85	P	60.11	-27.26	-	-	-
3.46	N	29.24	P	56.00	-26.76	-	-	-
26.26	H	24.74	P	60.00	-35.26	-	-	-
27.66	N	25.04	P	60.00	-34.96	-	-	-

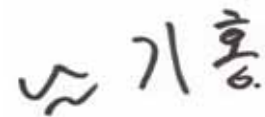
Line Conducted Emissions Tabulated Data

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

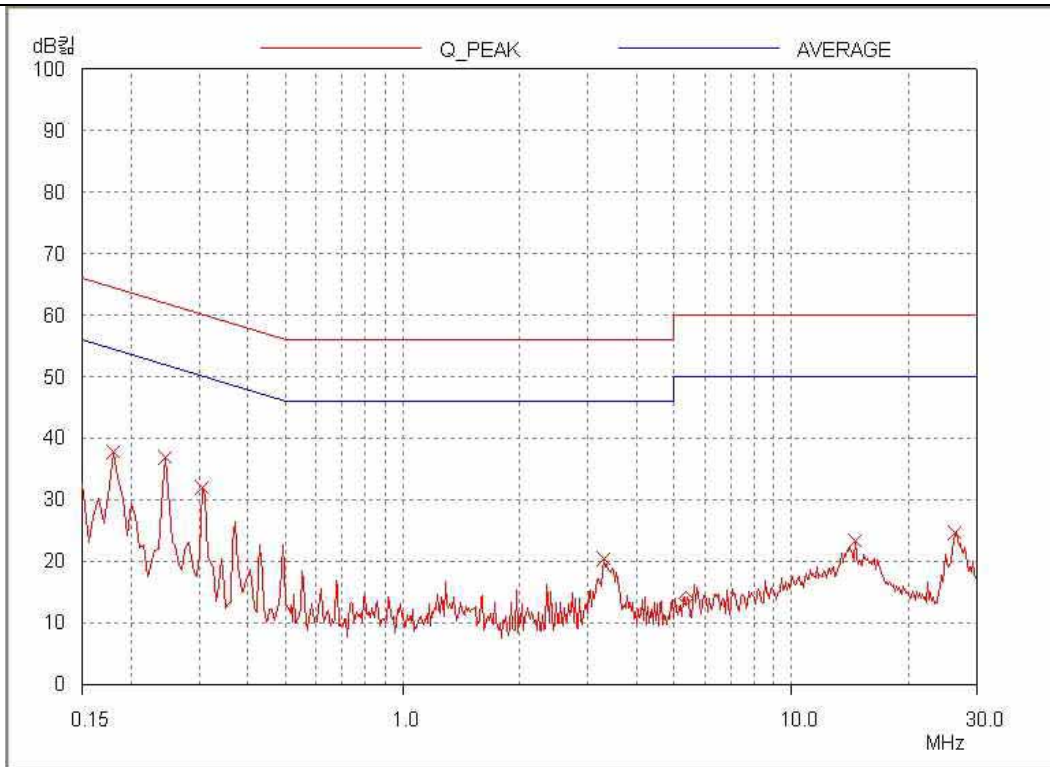
Average mode was not measured, because peak values were under the Average limit.

The test of IS-95 CDMA, CDMA2000 and 1xEVDO modes were performed, but the worst data was recorded in this report.

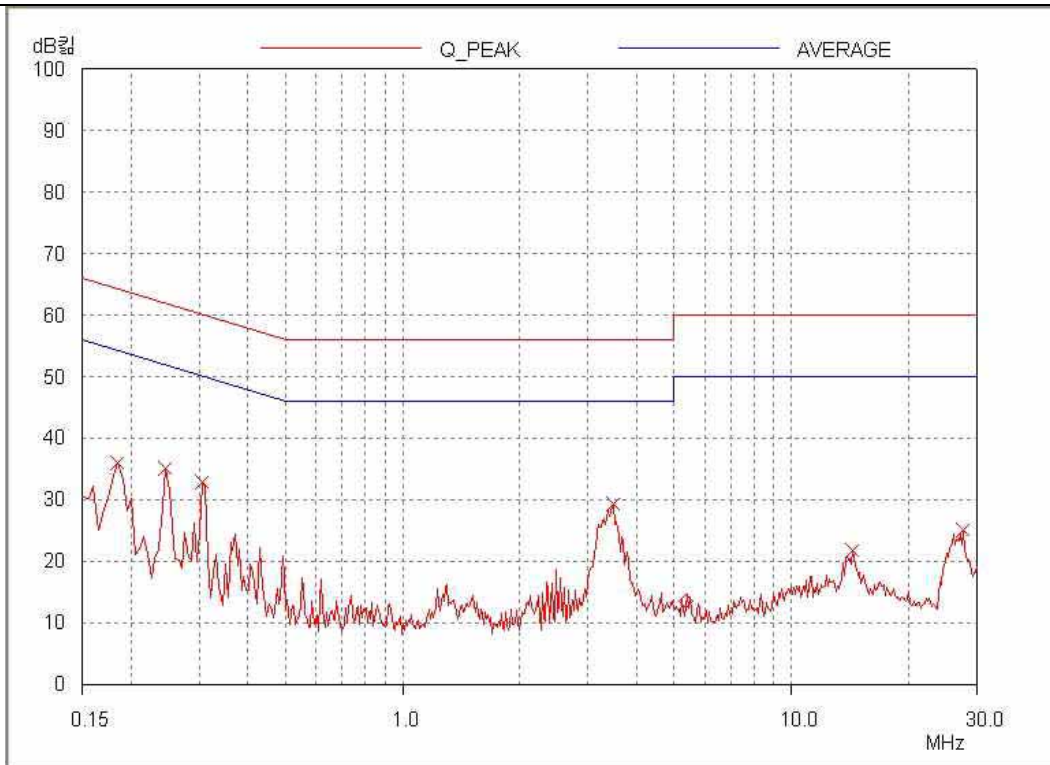
See next page for an overview sweep performed with peak detector.



Tested by: Ki-Hong, Nam / Test Engineer



HOT LINE



NEUTRAL LINE

16. MAXIMUM PERMISSIBLE EXPOSURE

16.1 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 for PCS Band and 0.596mW/cm² for Cellular Band.

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

$$E = \sqrt{(30 * P * G) / d}, \text{ and } S = E^2 / Z = E^2 / 377, \text{ because } 1\text{mW} / \text{cm}^2 = 10\text{W} / \text{m}^2$$

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)

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

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

Where

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

16.2 Calculated MPE Safe Distance

According to above equation, the following result was obtained.

Band	Peak Output Power		Antenna Gain		Power Density(mW/cm ²) @ 20cm Separation
	(dBm)	(mW)	Log	Linear	
Cellular	12.0	15.85	1.0	1.26	0.28
PCS	17.0	50.0	1.0	1.26	0.50

According to above table,

The power density for Cellular Band, $S = 0.282 * \sqrt{15.85 * 1.26 / 20} = 0.282$

The power density for PCS Band, $S = 0.282 * \sqrt{50.0 * 1.26 / 20} = 0.50$

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.”