

FCC PART 24 TYPE APPROVAL EMI MEASUREMENT AND TEST REPORT

For

Ace Antenna

9201 Irvine Blvd.
Irvine, CA 92618

FCC ID: L9UUSHR-1900

January 20, 2003

This Report Concerns: ☒ Original Report	Equipment Type: PCS Amplifier
Test Engineer:	Benjamin Jing
Report No.:	R0212171
Test Date:	December 17, 2002
Reviewed By:	Jeff Lee
Prepared By:	Bay Area Compliance Laboratory Corporation 230 Commercial Street Sunnyvale, CA 94085 Tel: (408) 732-9162 Fax: (408) 732 9164

Note: This test report is specially limited to the above client company and the product model only. It may not be duplicated without prior written consent of Bay Area Compliance Laboratory Corporation. This report **must not** be used by the client to claim product endorsement by NVLAP or any agency of the U.S. Government.

TABLE OF CONTENTS

1 - GENERAL INFORMATION.....	4
1.1 PRODUCT DESCRIPTION FOR EQUIPMENT UNDER TEST (EUT).....	4
1.2 OBJECTIVE	4
1.3 RELATED SUBMITTAL(S)/GRANT(S).....	4
1.4 TEST METHODOLOGY	4
1.5 TEST FACILITY	4
1.6 TEST EQUIPMENT LIST	5
1.7 LOCAL SUPPORT EQUIPMENT LIST AND DETAILS.....	5
1.8 EXTERNAL I/O CABLING LIST AND DETAILS	5
2 - SYSTEM TEST CONFIGURATION.....	6
2.1 JUSTIFICATION	6
2.2 SCHEMATICS/BLOCK DIAGRAM	6
2.3 TEST SETUP BLOCK DIAGRAM	6
2.4 EQUIPMENT MODIFICATIONS.....	6
3 - SUMMARY OF TEST RESULTS	7
4 - RF POWER OUTPUT.....	8
4.1 APPLICABLE STANDARD.....	8
4.2 TEST PROCEDURE	8
4.3 TEST EQUIPMENT	8
4.4 TEST RESULTS.....	8
5 - EMISSION BANDWIDTH.....	10
5.1 APPLICABLE STANDARDS.....	10
5.2 TEST PROCEDURE	10
5.3 TEST EQUIPMENT	10
5.4 PLOTS OF OCCUPIED BANDWIDTH.....	10
6 - OUT OF BAND EMISSIONS AT ANTENNA TERMINALS	23
6.1 APPLICABLE STANDARDS.....	23
6.2 TEST PROCEDURE	23
6.3 TEST EQUIPMENT	23
6.4 TEST RESULTS.....	23
6.5 PLOTS OF OUT-OF-BAND EMISSIONS AT ANTENNA TERMINAL	23
7 - TWO-TONE TEST.....	30
7.1 APPLICABLE STANDARDS.....	30
7.2 TEST PROCEDURE	30
7.3 TEST EQUIPMENT	30
7.4 TEST RESULTS.....	30
7.5 PLOTS OF TWO-TONE TEST RESULT	30
8 - FIELD STRENGTH OF SPURIOUS RADIATION.....	37
8.1 TEST PROCEDURE	37
8.2 TEST PROCEDURE	37
8.3 TEST EQUIPMENT	37
8.4 TEST RESULT	37
9 - BAND EDGE TEST.....	40
9.1 APPLICABLE STANDARDS.....	40
9.2 TEST PROCEDURE	40
9.3 TEST EQUIPMENT	40
9.4 PLOTS OF OUT-OF-BAND-EDGE EMISSIONS AT ANTENNA TERMINAL	40
10 - MODULATION CHARACTERISTICS	43
11 - FREQUENCY STABILITY.....	44

12 - CONDUCTED EMISSION	45
12.1 MEASUREMENT UNCERTAINTY	45
12.2 EUT SETUP	45
12.3 SPECTRUM ANALYZER SETUP	45
12.4 TEST PROCEDURE	45
12.5 SUMMARY OF TEST RESULTS	46
12.6 CONDUCTED EMISSIONS TEST DATA	46
12.7 PLOT OF CONDUCTED EMISSIONS TEST DATA	46
13 - RF EXPOSURE	47

1 - GENERAL INFORMATION

1.1 Product Description for Equipment Under Test (EUT)

The *Ace Antenna*'s product, model: *USHR-1900* or the "EUT" as referred to in this report is a PCS amplifier. The EUT measures approximately 3.8"L x 3.1"W x 1.2"H.

The system was fed by ACE AC/DC adapter, M/N: DRS-051200.

** The test data was only good for test sample. It may have deviation for other product samples.*

1.2 Objective

This type approval report is prepared on behalf of *Ace Antenna* in accordance with Part 2, Subpart J, Part 15, Subparts A and B, and Part 24 Subpart E, of the Federal Communication Commissions rules.

The objective of the manufacturer is to demonstrate compliance with FCC Part 2, Part 15 and Part 24.

1.3 Related Submittal(s)/Grant(s)

No Related Submittals

1.4 Test Methodology

All measurements contained in this report were conducted with ANSI C63.4-1992 and TIA/EIA 603A, American National Standard for Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the range of 9 kHz to 40 GHz.

All radiated and conducted emissions measurement was performed by Bay Area Compliance Laboratory, Corp. The radiated testing was performed at an antenna-to-EUT distance of 3 meters.

1.5 Test Facility

The Open Area Test site used by BACL to collect radiated and conducted emission measurement data is located in the back parking lot of the building at 230 Commercial Street, Sunnyvale, California, USA.

Test site at BACL has been fully described in reports submitted to the Federal Communication Commission (FCC) and Voluntary Control Council for Interference (VCCI). The details of these reports has been found to be in compliance with the requirements of Section 2.948 of the FCC Rules on February 11 and December 10, 1997 and Article 8 of the VCCI regulations on December 25, 1997. The facility also complies with the radiated and AC line conducted test site criteria set forth in ANSI C63.4-1992.

The Federal Communications Commission and Voluntary Control Council for Interference has the reports on file and is listed under FCC file 31040/SIT 1300F2 and VCCI Registration No.: C-1298 and R-1234. The test site has been approved by the FCC and VCCI for public use and is listed in the FCC Public Access Link (PAL) database.

Additionally, BACL is a National Institute of Standards and Technology (NIST) accredited laboratory, under the National Voluntary Laboratory Accredited Program (Lab Code 200167-0). The scope of the accreditation covers the FCC Method – 47 CFR Part – Digital Devices, CISPER 22: 1997: Electromagnetic Interference – Limits and Methods of Measurement of Information Technology Equipment test methods.

1.6 Test Equipment List

Manufacturer	Description	Model	Serial Number	Cal. Due Data
HP	Spectrum Analyzer	8566B	2610A02165	12/6/03
HP	Spectrum Analyzer	8593B	2919A00242	12/20/03
HP	Amplifier	8349B	2644A02662	12/20/03
HP	Quasi-Peak Adapter	85650A	917059	12/6/03
HP	Amplifier	8447E	1937A01046	12/6/03
A.H. System	Horn Antenna	SAS0200/571	261	12/27/03
Com-Power	Log Periodic Antenna	AL-100	16005	11/2/03
Com-Power	Biconical Antenna	AB-100	14012	11/2/03
Solar Electronics	LISN	8012-50-R-24-BNC	968447	12/28/03
Com-Power	LISN	LI-200	12208	12/20/03
Com-Power	LISN	LI-200	12005	12/20/03
BACL	Data Entry Software	DES1	0001	12/20/03
Rohde & Schwarz	Signal Generator	SMIQ03B	1125.5555.03	7/10/2003
Rohde & Schwarz	I/Q Modulation Generator	AMIQ	1110.2003.02	8/10/2003
HP	Power Meter	E 4418A	N/A	4/29/03

Statement of Traceability: Bay Area Compliance Laboratory Corp. declares that all equipment has been performed calibration using suitable standard traceable to National Institute of Standard and Technology (NIST).

1.7 Local Support Equipment List and Details

Manufacturer	Description	Model	Serial Number	FCC ID
Rohde & Schwarz	Signal Generator	SMIQ03	1125.555.03	DoC
Rohde & Schwarz	I/Q Modulation	AMIQ02	1110.2003.02	DoC

1.8 External I/O Cabling List and Details

Cable Description	Length (M)	Port/From	To
RF Cable	1.0	RF Port/EUT	RF Port/SMIQ03

2 - SYSTEM TEST CONFIGURATION

2.1 Justification

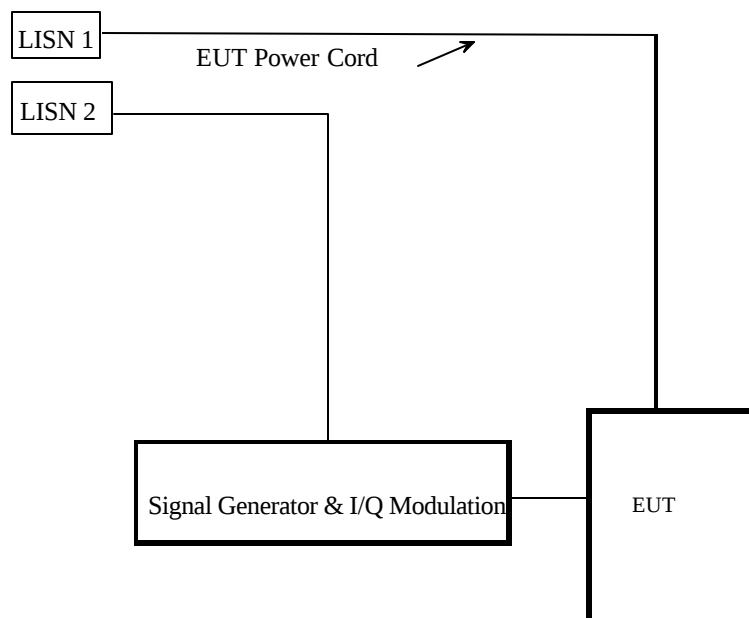
The EUT was configured for testing in a typical fashion (as normally used in a typical application).

The final qualification test was performed with the EUT operating at normal mode.

2.2 Schematics/Block Diagram

Please refer to Exhibit D.

2.3 Test Setup Block Diagram



2.4 Equipment Modifications

No modifications were necessary for the EUT to comply with the applicable standard and limit.

3 - SUMMARY OF TEST RESULTS

FCC RULE	DESCRIPTION OF TEST	Measured	Result
§2.1046 § 24.232	RF power output	7.92Bm	Compliant
§ 2.1049 § 24.238	Emission Bandwidth	CDMA: 1.425MHz GSM: 337MHz TDMA: 136kHz	Compliant
2.1051 § 24.238(a)	Spurious emissions at antenna terminals	<-13dBm	Compliant
2.1051 § 24.238 (a)	Two-Tone Test (Spurious emissions at antenna terminals)	<-13dBm	Compliant
2.1053 § 24.238 (a)	Field strength of spurious radiation	Section 8	Compliant
§ 2.1055 (a) § 2.1055 (d) § 24.235	Frequency stability vs. temperature Frequency stability vs. voltage	N/A	Compliant
15.107	AC Line Conducted emission	46.5 dBµV	Compliant

4 - RF POWER OUTPUT

4.1 Applicable Standard

According to FCC §2.1046 and §24.232 (a), in no case may the peak output power of a base station transmitter exceed 100 watt.

4.2 Test Procedure

The antenna was removed and SMA connector was connected to the transmitter output. The transmitter output was connected to a calibrated coaxial attenuator (50 Ohm), the other end of which was connected to a spectrum analyzer. Transmitter output was read off the spectrum analyzer in dBm. The power output at the transmitter was determined by adding the value of the attenuator to the spectrum analyzer reading.

The test was performed at three frequencies (low, middle, and high channels) and on all power levels which can be setup on the transmitter.

4.3 Test equipment

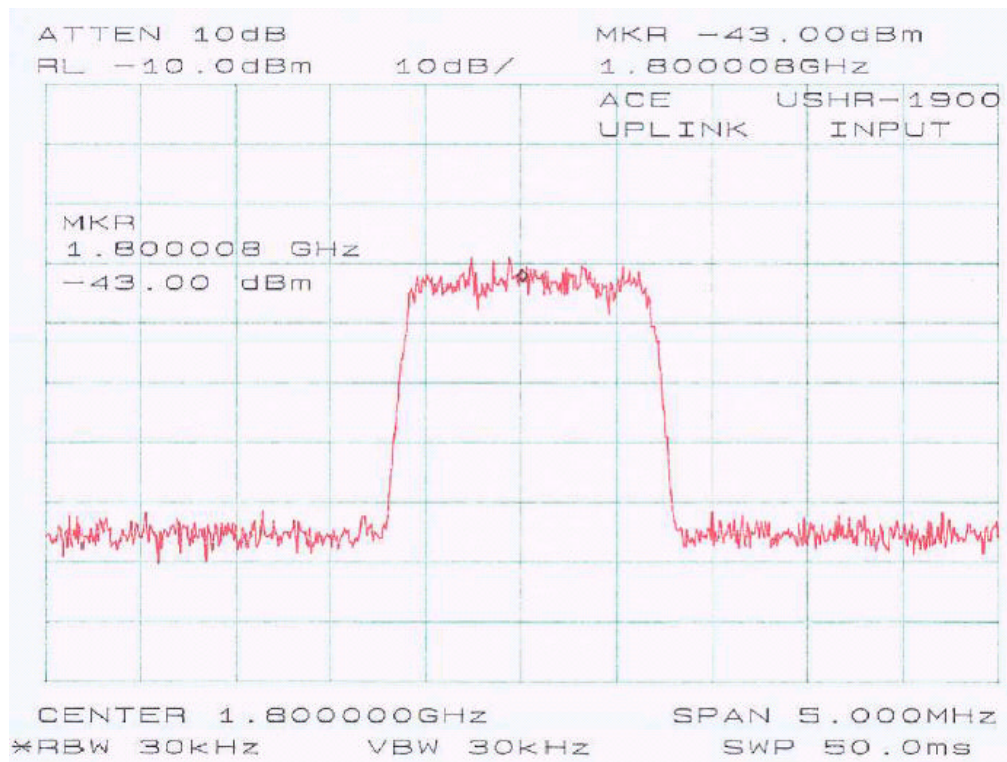
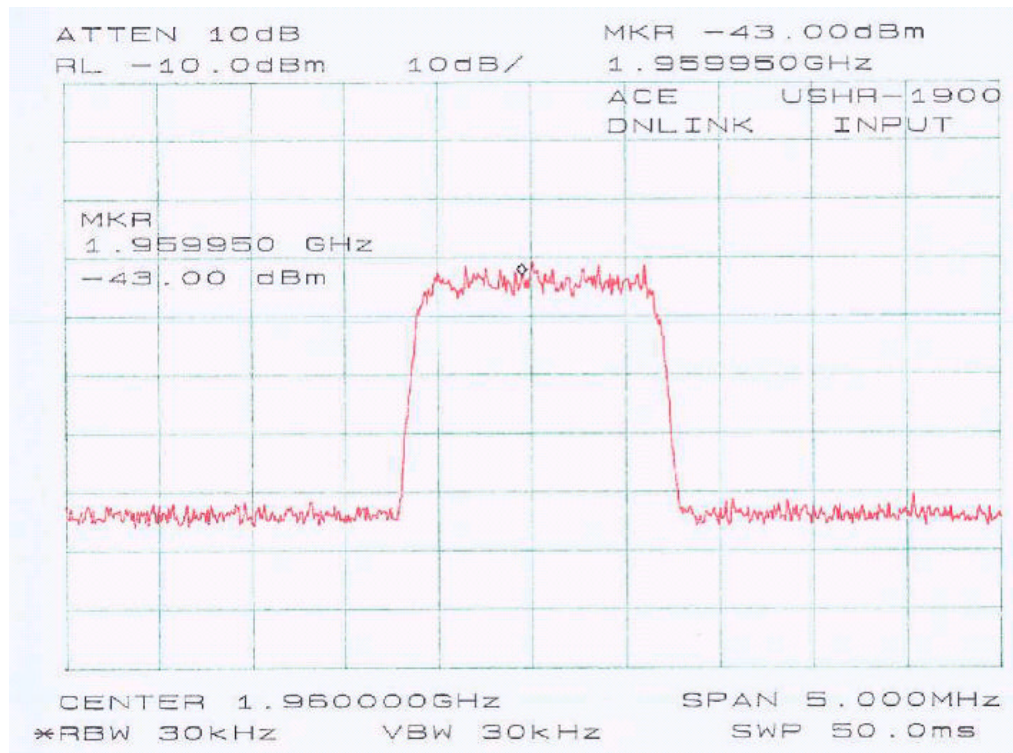
Hewlett Packard HP8566B Spectrum Analyzer
Hewlett Packard HP 7470A Plotter
Rohde & Schwarz SMIQ03B Signal Generator
Rohde & Schwarz AMIQ I/Q Modulation Generator

4.4 Test Results

Modulation	Mode	Channel	Input Power in dBm	Output Power in dBm	Output Power in mW
CDMA	Up-link	Low	-43	7.65	5.82
		Mid	-43	7.72	5.91
		High	-43	6.24	4.21
	Down-link	Low	-43	5.63	3.66
		Mid	-43	7.92	6.19
		High	-43	7.81	6.04
GSM	Up-link	Low	-43	7.54	5.68
		Mid	-43	7.79	6.01
		High	-43	6.38	4.35
	Down-link	Low	-43	5.96	3.94
		Mid	-43	7.87	6.12
		High	-43	7.65	5.82
TDMA	Up-link	Low	-43	7.68	5.86
		Mid	-43	7.75	5.96
		High	-43	6.63	4.6
	Down-link	Low	-43	5.81	3.81
		Mid	-43	7.64	5.8
		High	-43	7.59	5.74

Note: The maximum input power is -43 dBm. When the input power exceeds -43 dBm, it causes the output level exceeds the prescribed limit, then the circuit shut down the amplifier.

Plots of input signal are shown hereinafter.



5 - EMISSION BANDWIDTH

5.1 Applicable Standards

According to FCC §2.1049 and §24.238 (b), the emission bandwidth is defined as the width of the signal between two points, one below the carrier center frequency and one above the carrier center frequency, outside of which all emissions are attenuated at least 26dB below the transmitter power.

5.2 Test Procedure

The RF output of the transmitter was connected to the input of the spectrum analyzer through sufficient attenuation.

The resolution bandwidth of the spectrum analyzer was set at 30 KHz and the spectrum was recorded.

5.3 Test Equipment

Hewlett Packard HP8566B Spectrum Analyzer
 Hewlett Packard HP 7470A Plotter
 Rohde & Schwarz SMIQ03B Signal Generator
 Rohde & Schwarz AMIQ I/Q Modulation Generator

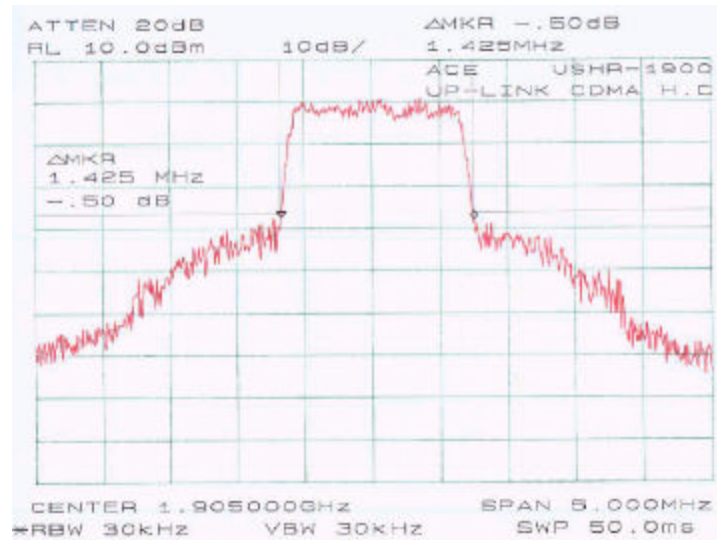
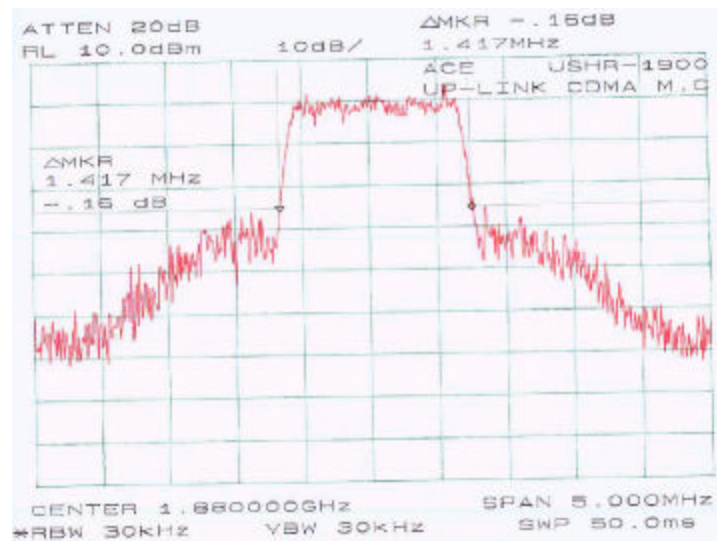
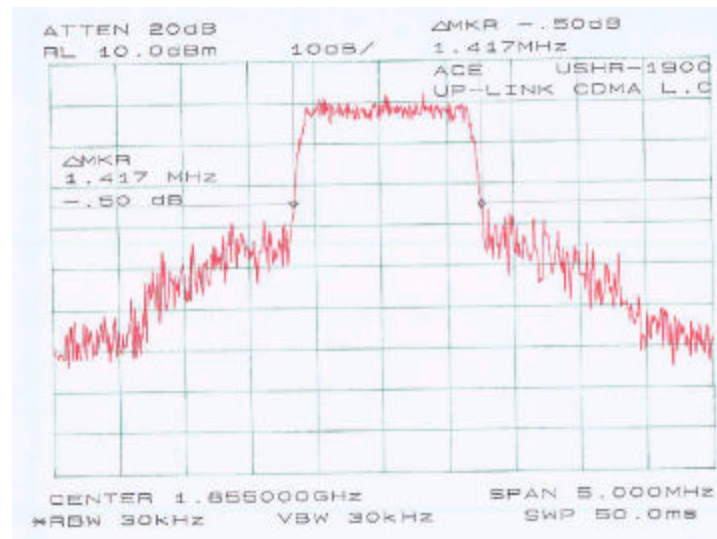
5.4 Plots of Occupied Bandwidth

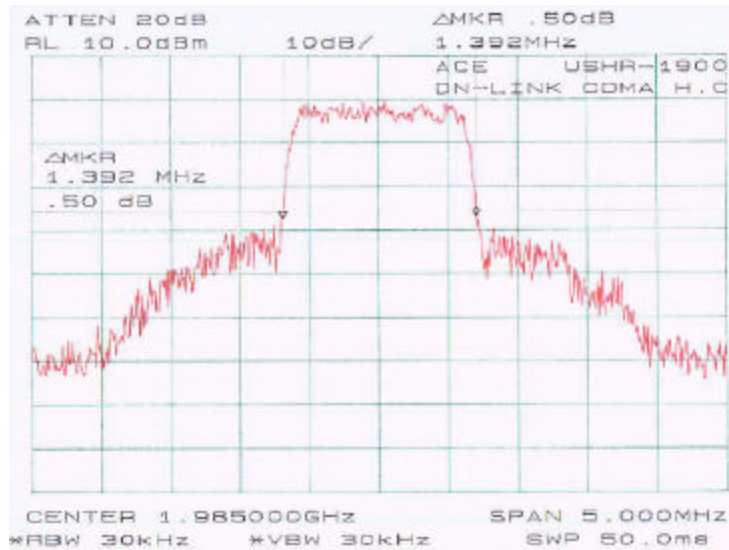
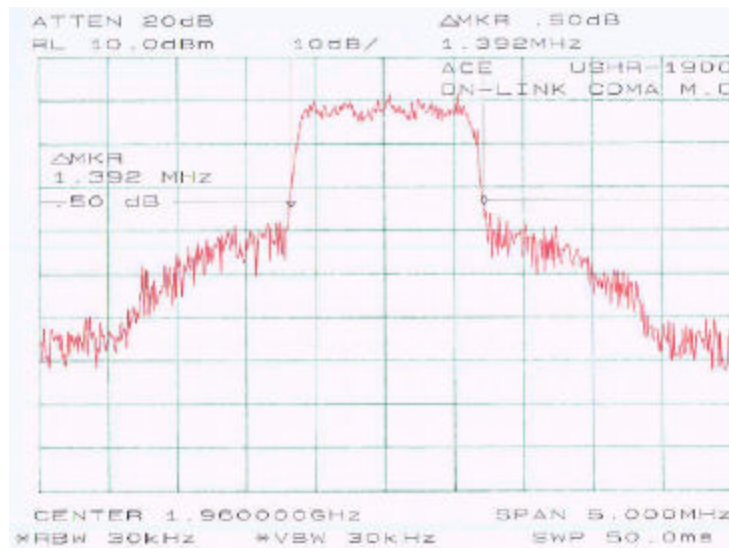
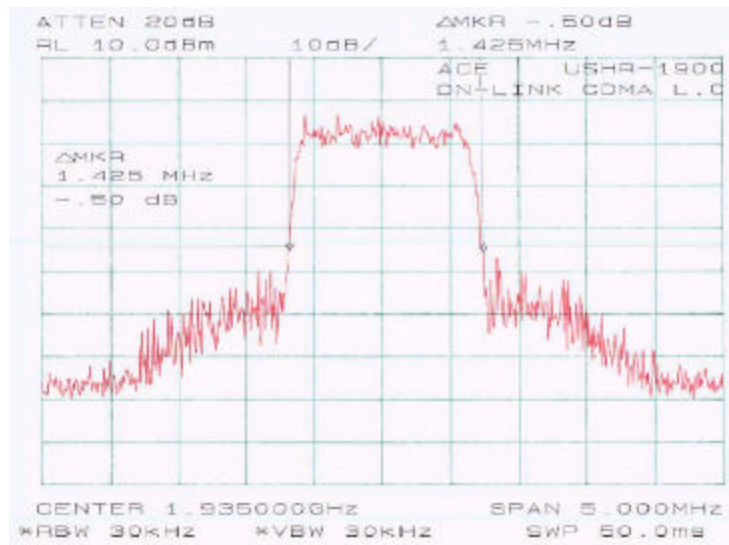
Please refer to plots hereinafter.

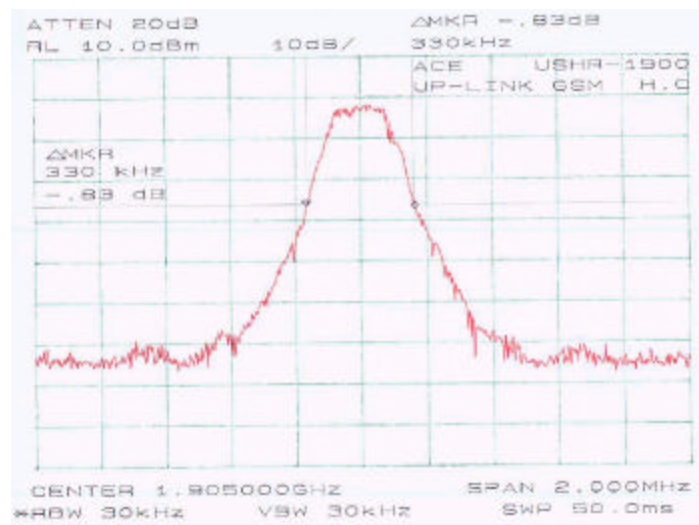
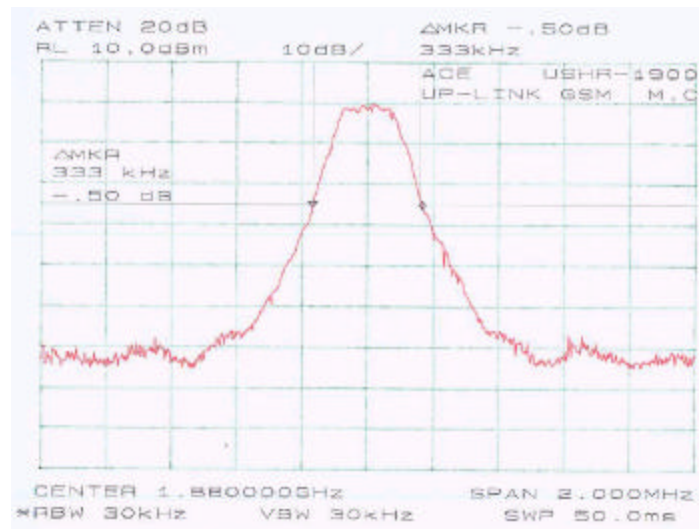
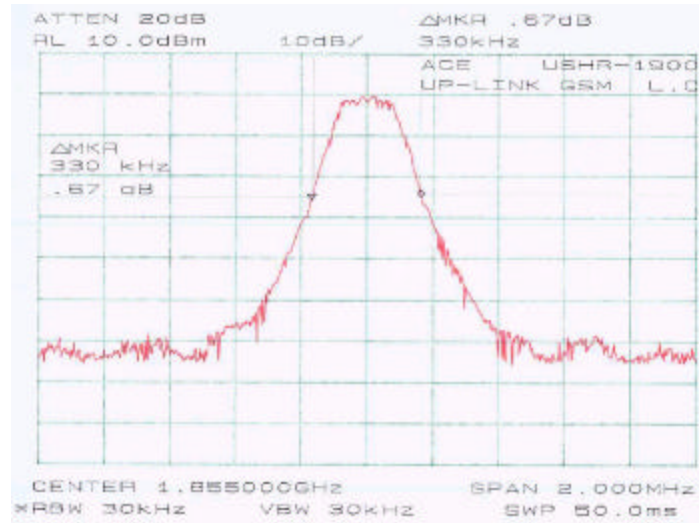
Test Data Summary

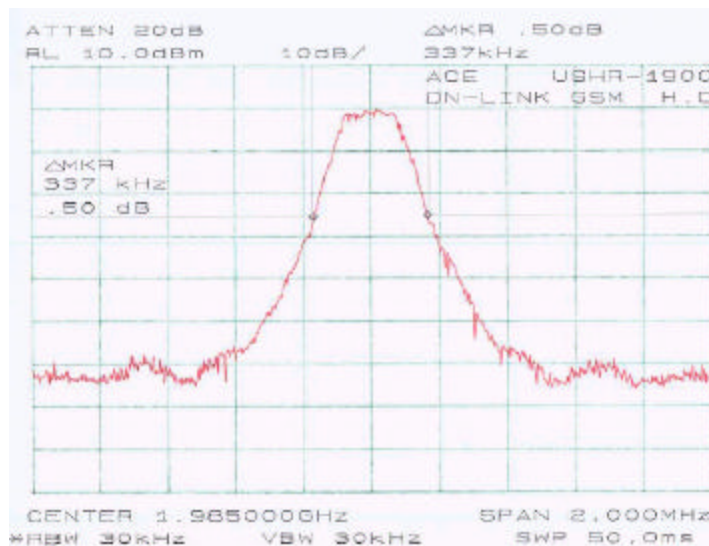
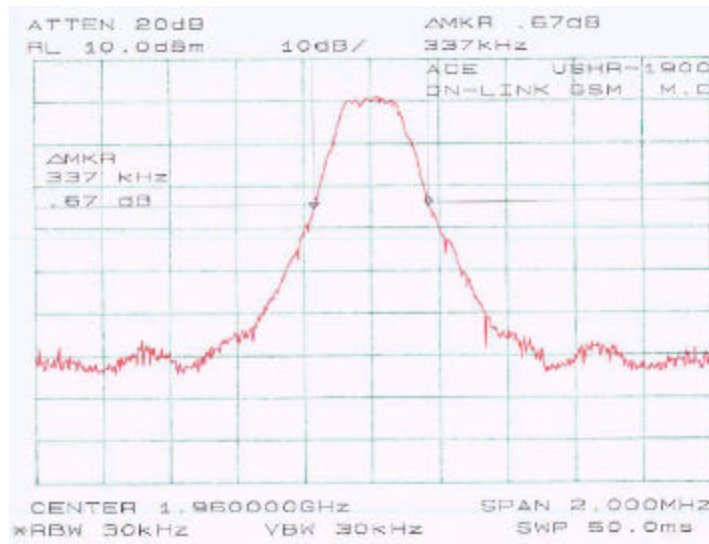
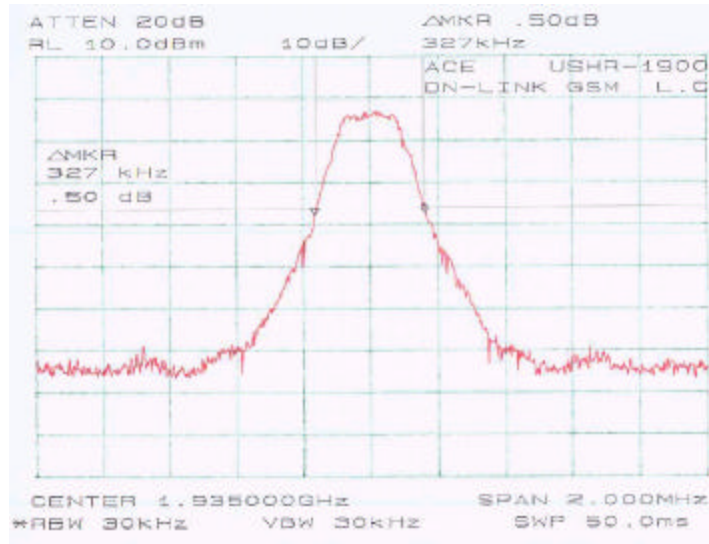
Modulation	Mode	Channel	Emission Bandwidth in kHz
CDMA	Up-link	Low	1417
		Mid	1417
		High	1425
	Down-link	Low	1425
		Mid	1392
		High	1392
GSM	Up-link	Low	330
		Mid	333
		High	330
	Down-link	Low	327
		Mid	337
		High	337
TDMA	Up-link	Low	130
		Mid	130
		High	123
	Down-link	Low	123
		Mid	130
		High	123

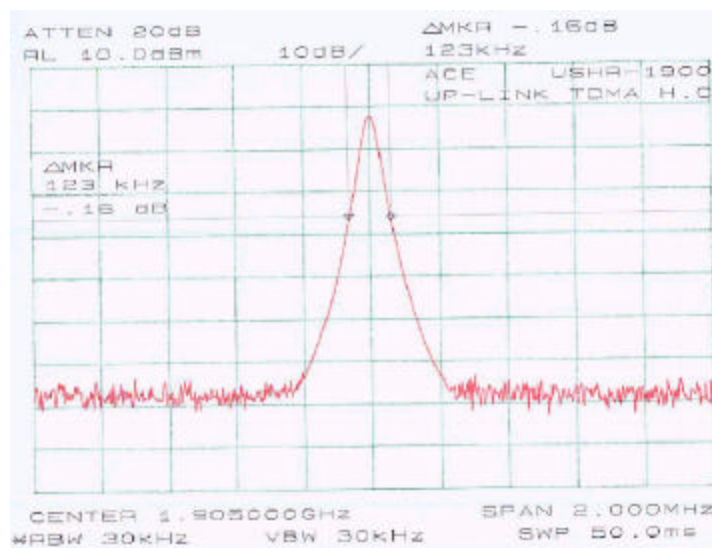
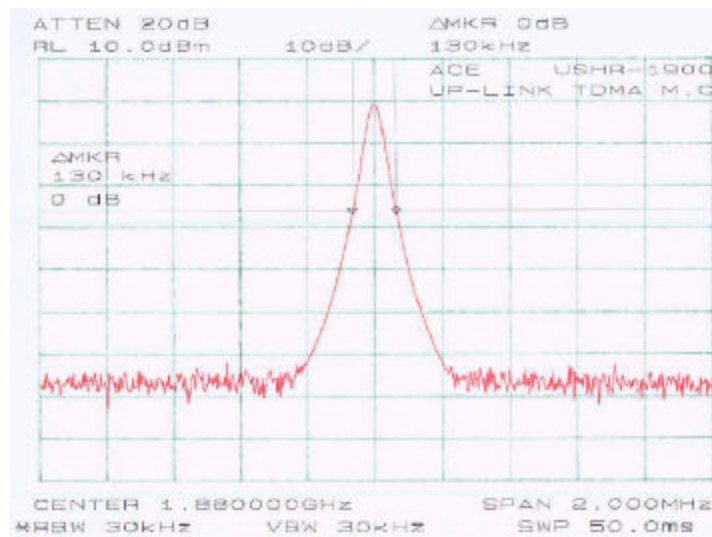
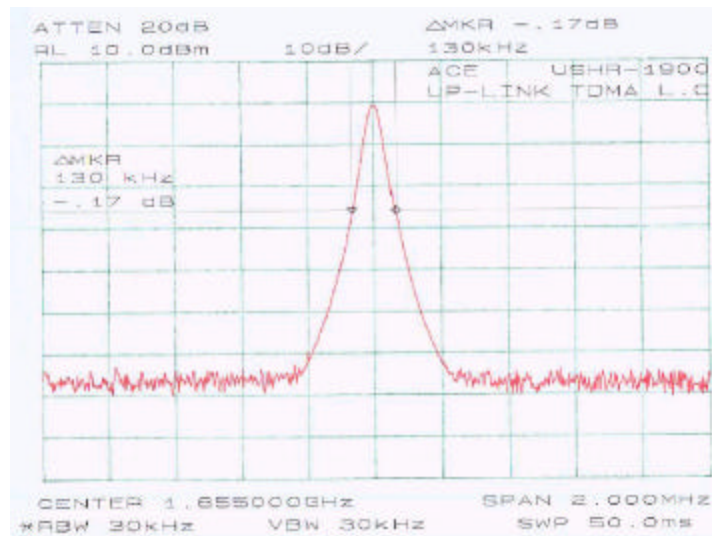
Plots of Output Signal

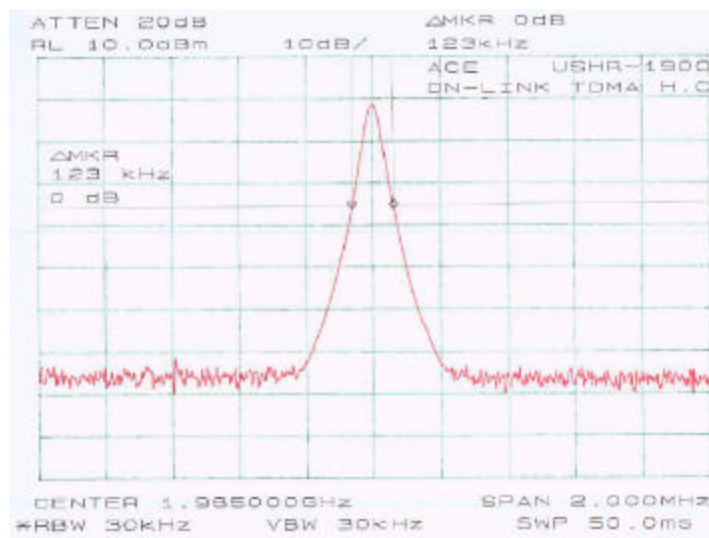
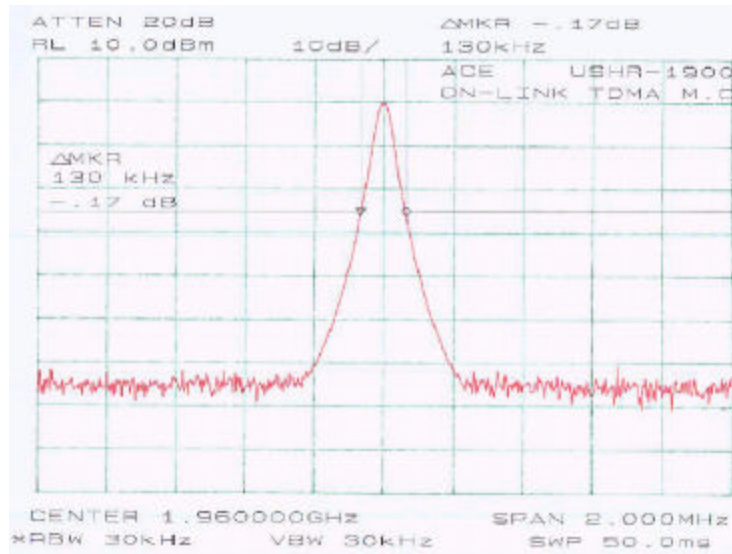
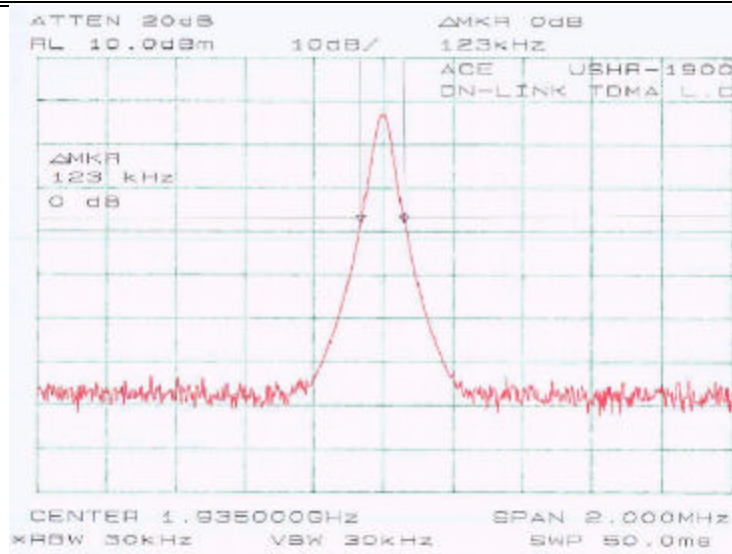




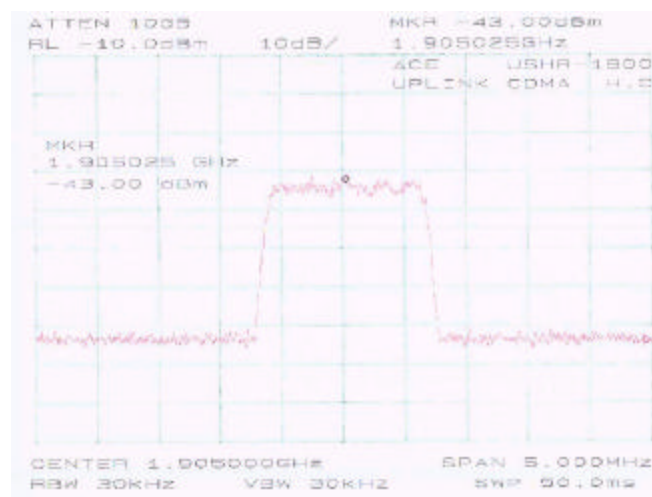
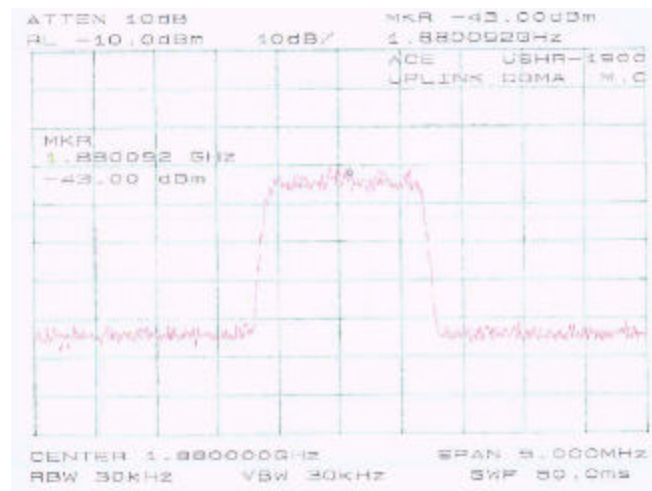
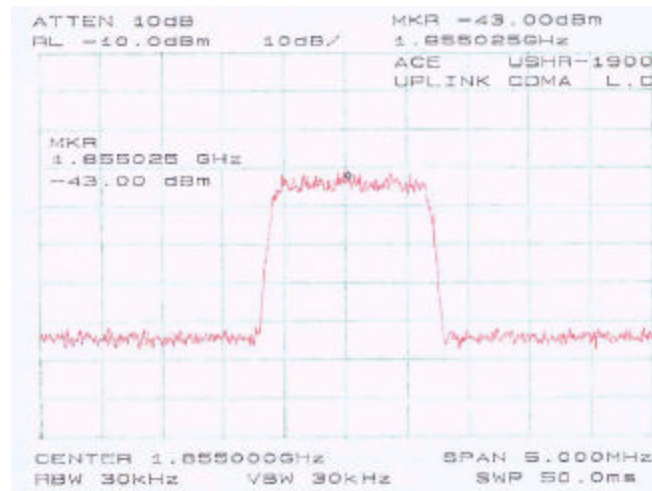


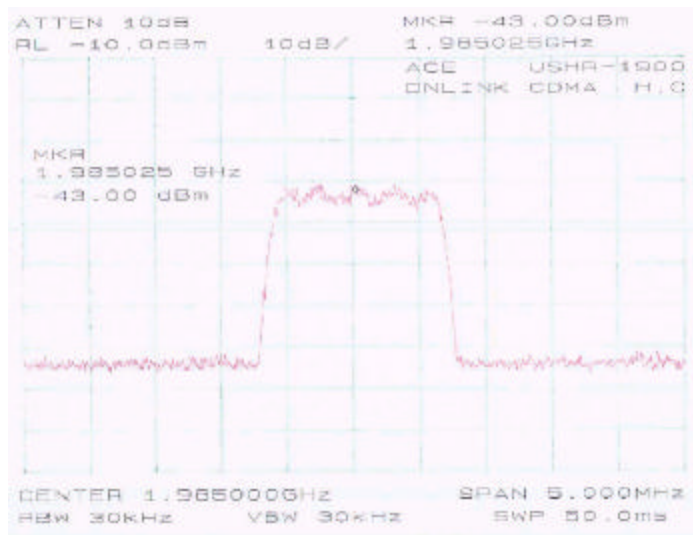
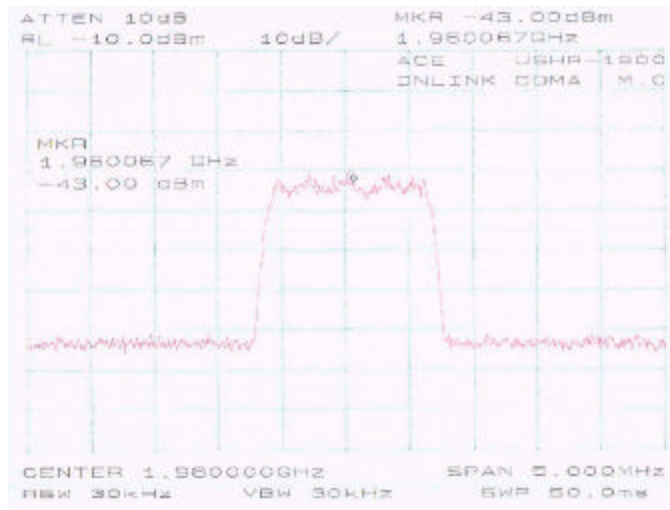
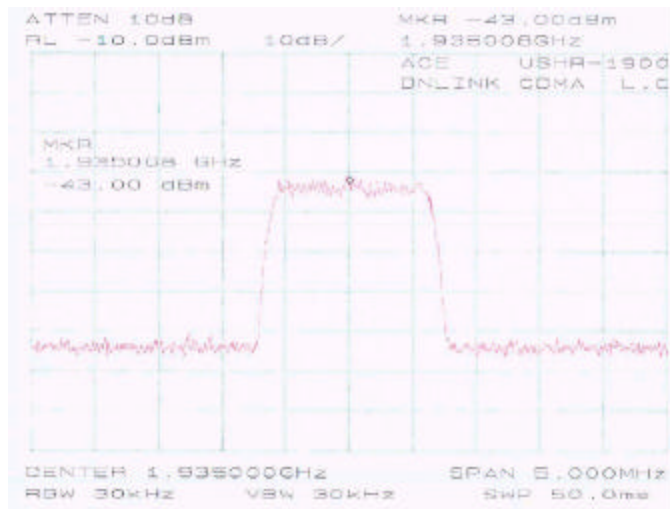


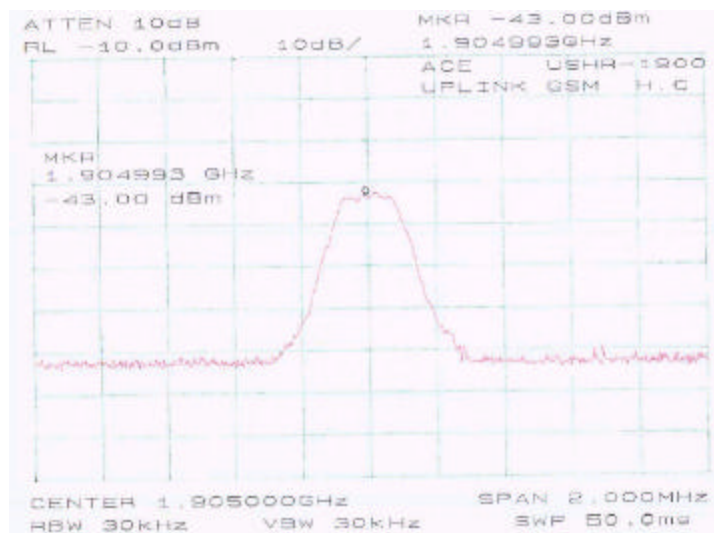
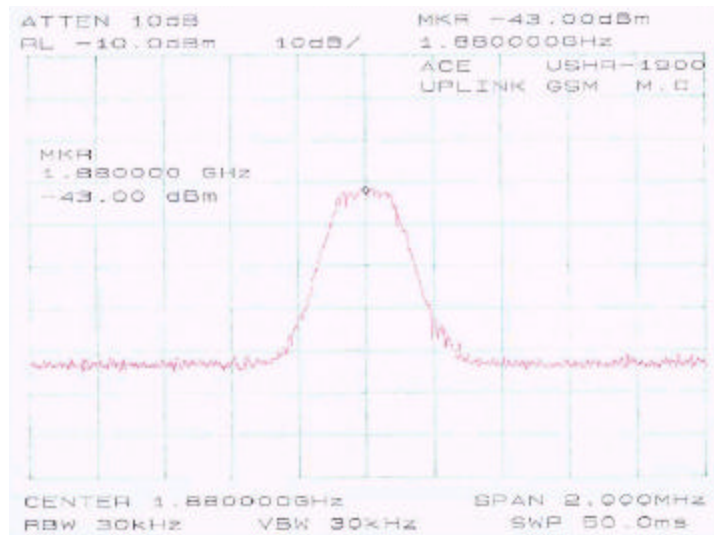
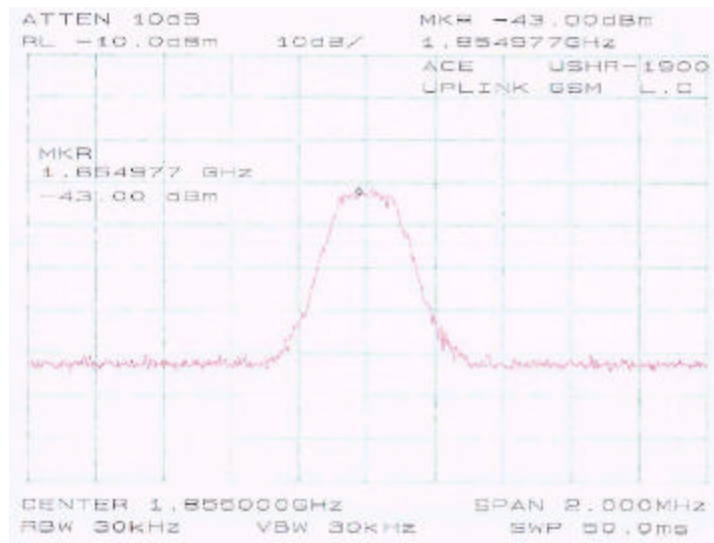


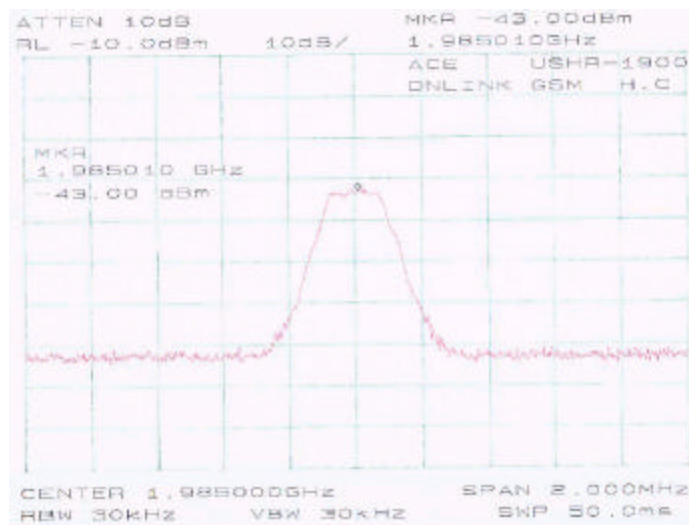
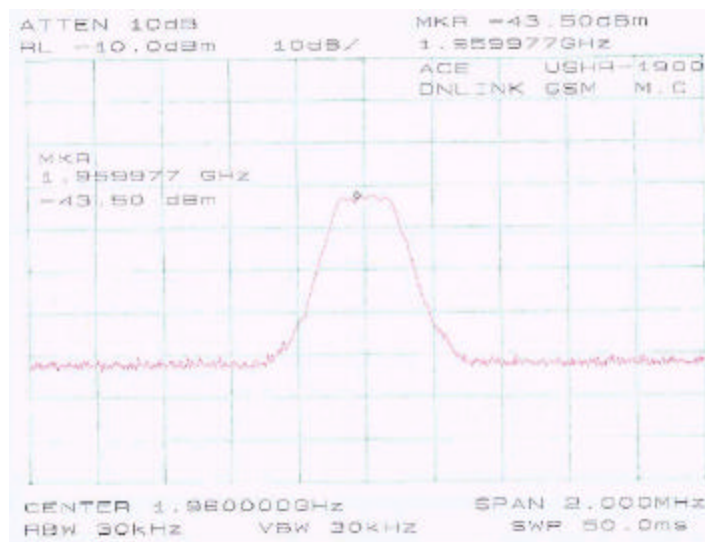
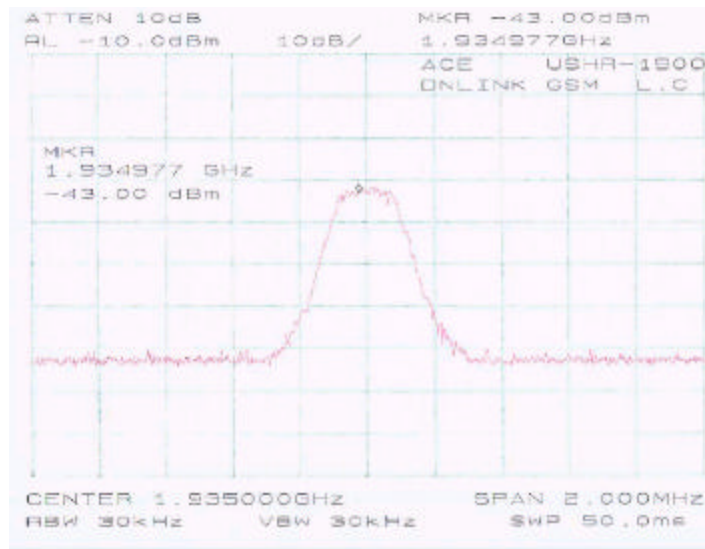


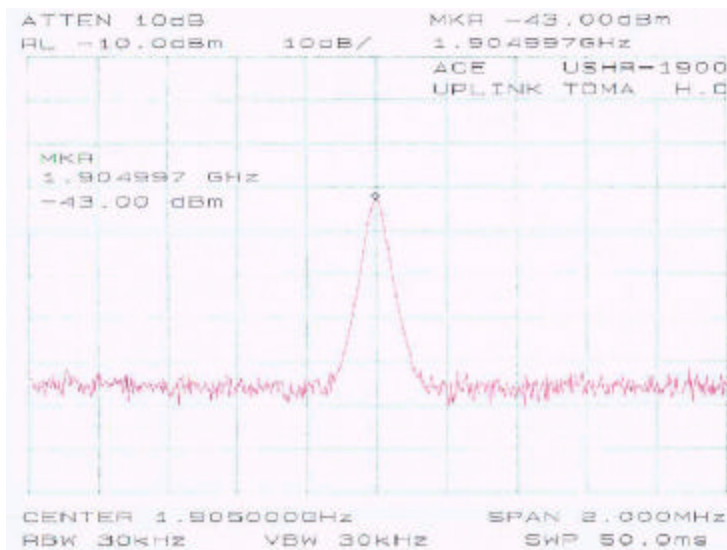
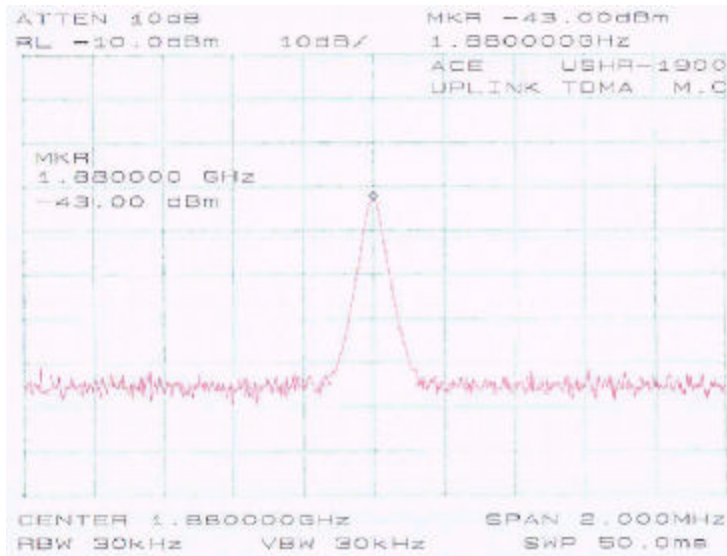
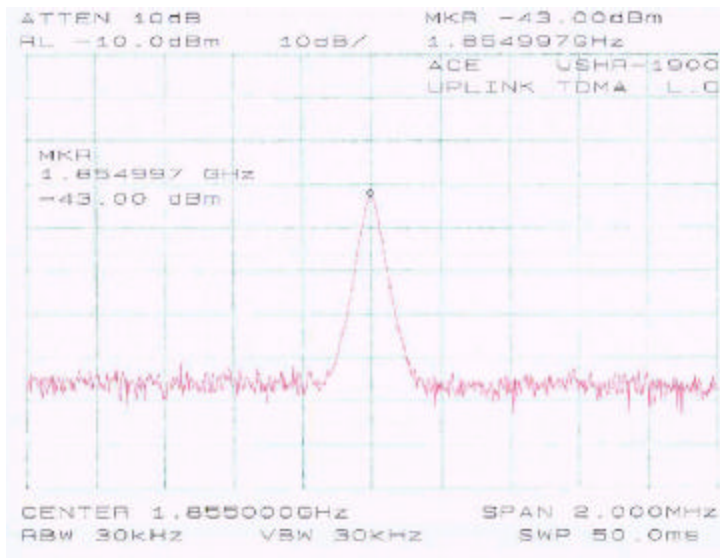
Plots of Input Signal

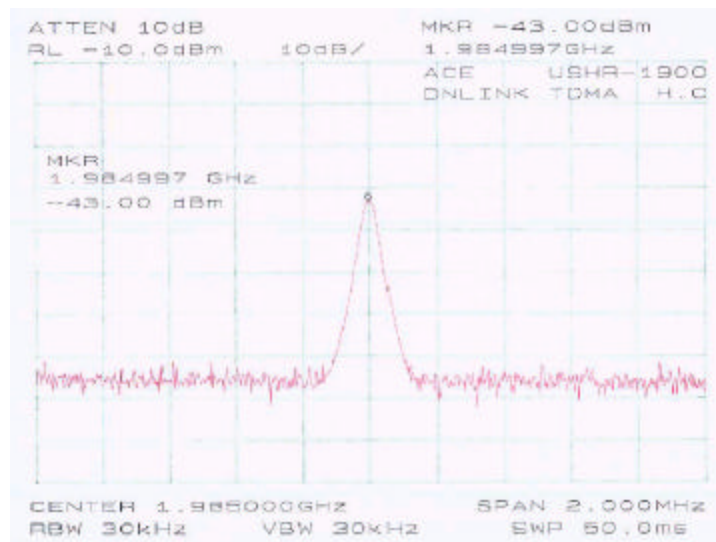
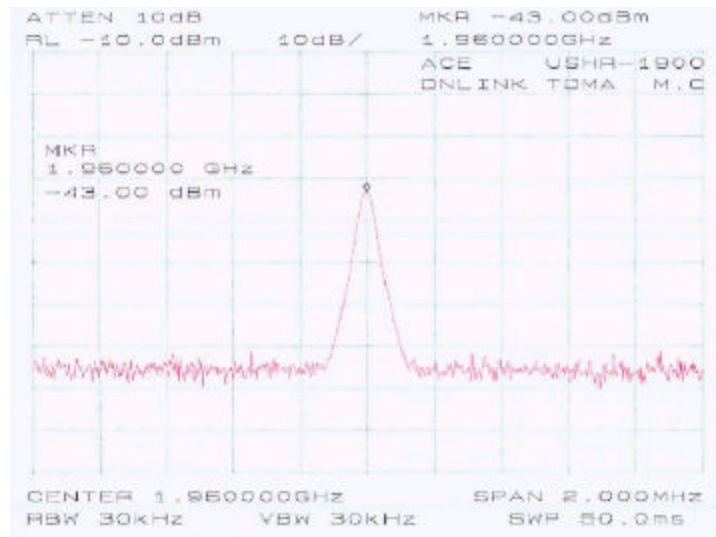
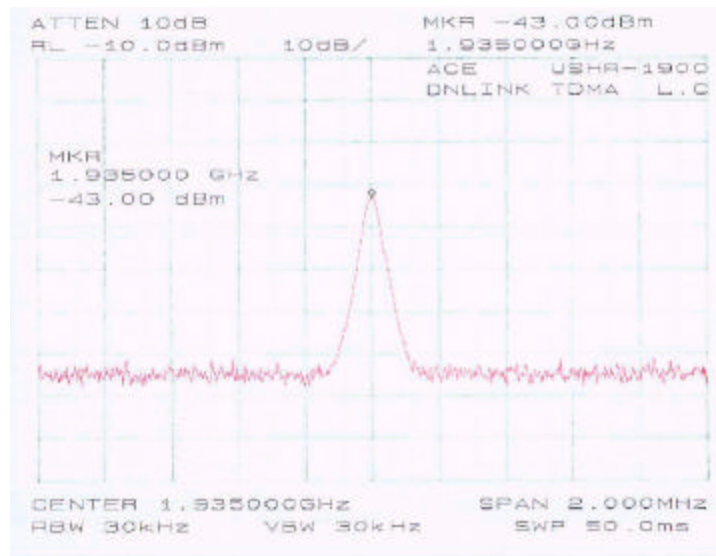












6 - OUT OF BAND EMISSIONS AT ANTENNA TERMINALS

6.1 Applicable Standards

According to FCC §2.1049 and §24.238, on any frequency outside a licensee's frequency block, the power of any emission shall be attenuated below the transmitter power (P) by at least $43 + 10 \log (P)$ dB.

6.2 Test Procedure

The RF output of the transceiver was connected to a spectrum analyzer through appropriate attenuation. The resolution bandwidth of the spectrum analyzer was set at 1 MHz. Sufficient scans were taken to show any out of band emissions up to 10th harmonic.

6.3 Test Equipment

HP 8566B Spectrum Analyzer
HP 7470A Plotter
Hewlett Packard HP8566B Spectrum Analyzer
Hewlett Packard HP 7470A Plotter
Rohde & Schwarz SMIQ03B Signal Generator
Rohde & Schwarz AMIQ I/Q Modulation Generator

6.4 Test Results

Modulation	Mode	Channel	Measured
CDMA	Up-link	Low	< -13dBm
		Mid	< -13dBm
		High	< -13dBm
	Down-link	Low	< -13dBm
		Mid	< -13dBm
		High	< -13dBm

6.5 Plots of Out-of-Band Emissions at Antenna Terminal

Please refer to plots hereinafter.

