FCC CFR47 PART 22 SUBPART H
AND PART 24 SUBPART E
CERTIFICATION

TEST REPORT
FOR

EMBEDDED WIRELESS RADIO MODEM

MODEL NUMBER: EM5625

FCC ID: N7N-EM5625

REPORT NUMBER: 05U3228-1

ISSUE DATE: FEBRUARY 02, 2005

Prepared for
SIERRA WIRELESS
2290 COSMOS CT.
CARLSBAD CALIFORNIA 92009
U.S.A.

Prepared by
COMPLIANCE ENGINEERING SERVICES, INC.
d.b.a.
COMPLIANCE CERTIFICATION SERVICES
561F MONTEREY ROAD,
MORGAN HILL, CA 95037, USA
TEL: (408) 463-0885
FAX: (408) 463-0888

LAB CODE:200065-0

Revision History

Rev.	Revisions	Revised By
1	Revised user manual to allow max antenna's gain of 5.1dBi in Cellular bands and 3.9dBi in PCS bands.	Client
2	Revised report in MPE section based on max antenna's gain	Thu

TABLE OF CONTENTS

1. ATTESTATION OF TEST RESULTS

COMPANY NAME: SIERRA WIRELESS
2290 COSMOS CT.
CARLSBAD CALIFORNIA 92009
U.S.A.

EUT DESCRIPTION: EMBEDDED WIRELESS RADIO MODEM

MODEL: EM5625

SERIAL NUMBER: 12224500027

DATE TESTED: JANUARY 30 - FEBRUARY 01, 2005

APPLICABLE STANDARDS	
STANDARD	**TEST RESULTS**
FCC PART 22 SUBPART H	NO NON-COMPLIANCE NOTED
FCC PART 24 SUBPART E	NO NON-COMPLIANCE NOTED

Compliance Certification Services, Inc. tested the above equipment in accordance with the requirements set forth in the above standards. The test results show that the equipment tested is capable of demonstrating compliance with the requirements as documented in this report.

Note: The results documented in this report apply only to the tested sample, under the conditions and modes of operation as described herein. This document may not be altered or revised in any way unless done so by Compliance Certification Services and all revisions are duly noted in the revisions section. Any alteration of this document not carried out by Compliance Certification Services will constitute fraud and shall nullify the document. No part of this report may be used to claim product certification, approval, or endorsement by NVLAP, NIST, or any government agency.

Approved & Released For CCS By:

THU CHAN
EMC SUPERVISOR
COMPLIANCE CERTIFICATION SERVICES

Tested By:

CHIN PANG AND VIEN TRAN
EMC TECHNICIANS
COMPLIANCE CERTIFICATION SERVICES

2. TEST METHODOLOGY

The tests documented in this report were performed in accordance with TIA/EIA 603A (2001), ANSI C63.4-2003, FCC CFR 47 Part 2, FCC CFR 47 Part 15 and FCC CFR 47 Part 22H and 24E.

3. FACILITIES AND ACCREDITATION

The test sites and measurement facilities used to collect data are located at 561F Monterey Road, Morgan Hill, California, USA. The sites are constructed in conformance with the requirements of ANSI C63.4, ANSI C63.7 and CISPR Publication 22. All receiving equipment conforms to CISPR Publication 16-1, "Radio Interference Measuring Apparatus and Measurement Methods."

CCS is accredited by NVLAP, Laboratory Code 200065-0. The full scope of accreditation can be viewed at http://www.ccsemc.com.

4. CALIBRATION AND UNCERTAINTY

4.1. MEASURING INSTRUMENT CALIBRATION

The measuring equipment utilized to perform the tests documented in this report has been calibrated in accordance with the manufacturer's recommendations, and is traceable to recognized national standards.

4.2. MEASUREMENT UNCERTAINTY

Where relevant, the following measurement uncertainty levels have been estimated for tests performed on the apparatus:

PARAMETER	UNCERTAINTY
Radiated Emission, 30 to 200 MHz	+/- 3.3 dB
Radiated Emission, 200 to 1000 MHz	+4.5 / -2.9 dB
Radiated Emission, 1000 to 2000 MHz	+4.5 / -2.9 dB
Power Line Conducted Emission	+/- 2.9 dB

Uncertainty figures are valid to a confidence level of 95%.

5. EQUIPMENT UNDER TEST

5.1. DESCRIPTION OF EUT

The EUT is a dual band with non diversity 800 / 1900MHZ CDMA Module

The module is manufactured by Sierra Wireless.

5.2. MAXIMUM OUTPUT POWER

The transmitter has a maximum conducted average and peak output powers as follows:

824 to 849 MHz Authorized Band

Frequency Range (MHz)	Modulation	Conducted Average Power (dBm)	Conducted Average Power (mW)	Conducted Peak Power (dBm)	Conducted Peak Power (mW)
824.7 - 848.31	CDMA	25.13	325.84	28.99	792.50

1850 to 1910 MHz Authorized Band

Frequency Range (MHz)	Modulation	Conducted Average Power (dBm)	Conducted Average Power (mW)	Conducted Peak Power (dBm)	Conducted Peak Power (mW)
1851.25 - 1908.75	CDMA	25.5	354.81	28.60	724.44

NOTE: RBW=VBW=3MHz.

5.3. DESCRIPTION OF AVAILABLE ANTENNAS

The radio utilizes a monopole antenna, with a maximum allowed gain of 5.1dBi for Cellular bands and 3.9dBi for PCS bands.

5.4. SOFTWARE AND FIRMWARE

The firmware installed in the EUT during testing was SPR
The test utility software used during testing was rev 2.00.3

5.5. WORST-CASE CONFIGURATION AND MODE

The worst-case channel is determined as the channel with the highest output power. The highest measured output power was at 824.7 MHz and 1851.25 MHz.

5.6. DESCRIPTION OF TEST SETUP

SUPPORT EQUIPMENT

PERIPHERAL SUPPORT EQUIPMENT LIST				
Description	**Manufacturer**	**Model**	**Serial Number**	**FCC ID**
DC Power Supply	HP	E3610A	NA	NA

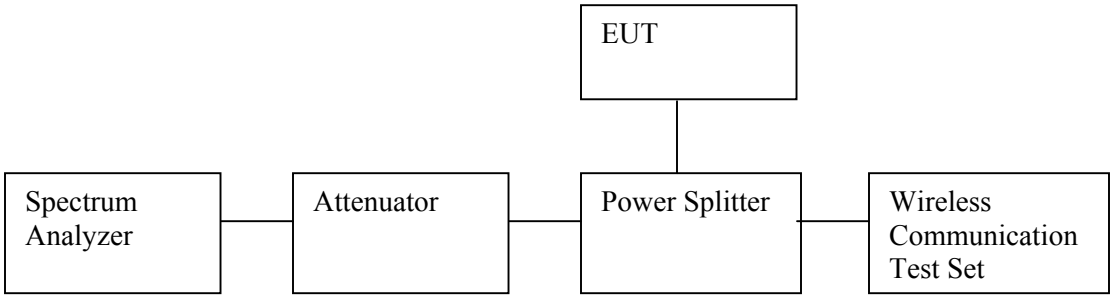
I/O CABLES

I/O CABLE LIST						
Cable No.	**Port**	**# of Identical Ports**	**Connector Type**	**Cable Type**	**Cable Length**	**Remarks**
1	AC	1	US 115V	Un-shielded	2m	NA
2	DC	1	DC	Un-shielded	0.5m	NA

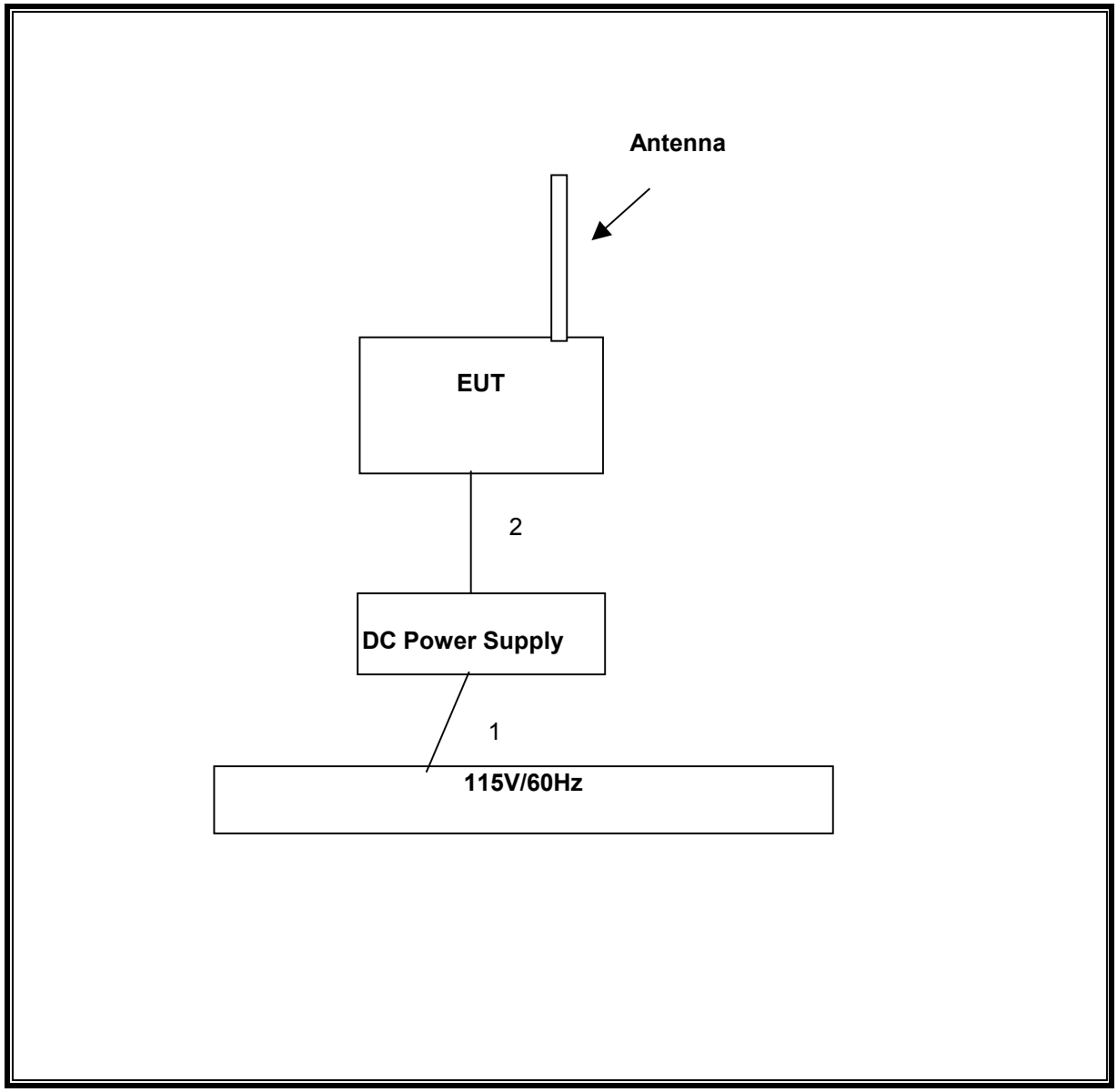
TEST SETUP

The EUT is installed as a stand-alone device during the tests. The Wireless Communication test set exercised the EUT.

CONDUCTED TEST SETUP DIAGRAM



RADIATED TEST SETUP DIAGRAM



6. TEST AND MEASUREMENT EQUIPMENT

The following test and measurement equipment was utilized for the tests documented in this report:

TEST EQUIPMENT LIST				
Description	**Manufacture**	**Model**	**Serial Number**	**Cal Due**
SA Display Section 2	HP	85662A	2816A16696	05/24/2005
Quasi-Peak Adaptor	HP	85650A	2811A01155	5/24/05
SA RF Section, 1.5 GHz	HP	85680B	2814A04227	2/22/05
Preamplifier, 1300MHz	HP	8447D	2944A06833	8/17/05
30MHz---- 2Ghz	Sunol Sciences	JB1 Antenna	A121003	9/22/05
Antenna, Horn 1 ~ 18 GHz	EMCO	3117	29301	9/12/05
Antenna, Horn 1 ~ 18 GHz	EMCO	3115	6717	9/12/05
Amplifier 1-26GHz	MITEQ	NSP2600-SP	924341	8/17/05
Wireless Communication Test Set	Agilent	8960 Series10	GB43344480	9/3/05
Spectrum Analyzer, 26.5 GHz	HP	8593EM	3710A00205	1/6/06
Dipole	EMCO	3121C-DB2	22435	3/25/05
Signal Generator 2 -40 GHz	R & S	SMP04	DE 34210	5/2/05
Signal Generator, 1024 MHz	R & S	SMY01	DE 12311	4/11/06
Peak Power Meter	Agilent	E4416A	GB41291160	2/9/06
Peak / Average Power Sensor	Agilent	E9327A	US40440755	2/10/06
DC Power Suppy	Kenwood	PA-36-3A	N/A	NCR
Power Splitter	HP	11667B	N/A	N/A
Notch Filter	K & L	3TNF-500/1000-N/N	469	N/A
Notch Filter	K & L	3TNF-1000/2000-N/N	517	N/A

7. LIMITS AND RESULTS

7.1. OCCUPIED BANDWIDTH

LIMIT

None; for reporting purposes only.

TEST PROCEDURE

The transmitter output is connected to the spectrum analyzer. The RBW is set to 1% to 3% of the –26 dB bandwidth. The VBW is set to 3 times the RBW. The sweep time is coupled. The spectrum analyzer internal –26 dB bandwidth function is utilized.

RESULTS

No non-compliance noted:

800MHZ CELL CDMA Modulation

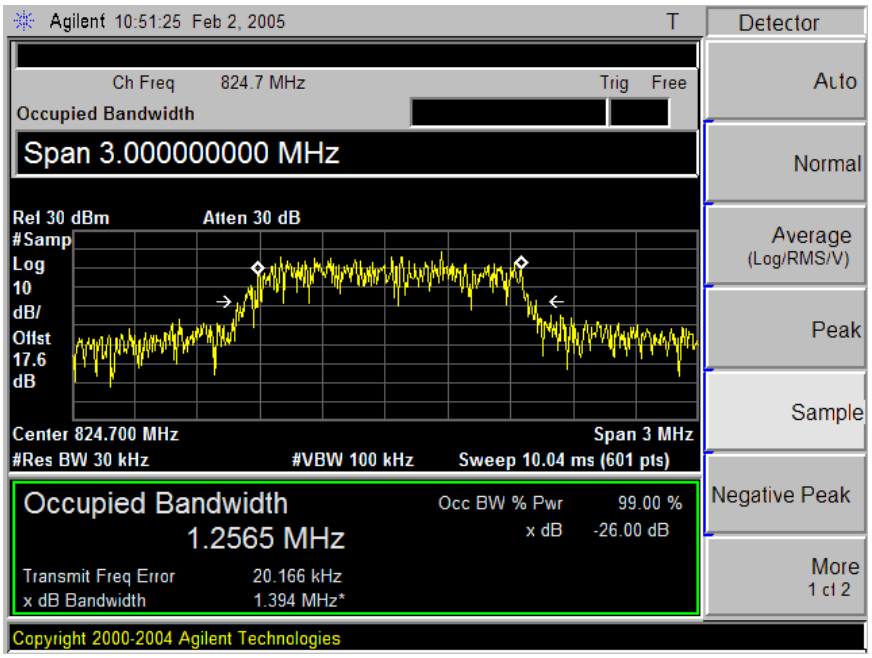
Channel	Frequency (MHz)	Bandwidth (MHz)
Low	824.7	1.394
Middle	836.5	1.395
High	848.3	1.396

1900MHz PCS Modulation

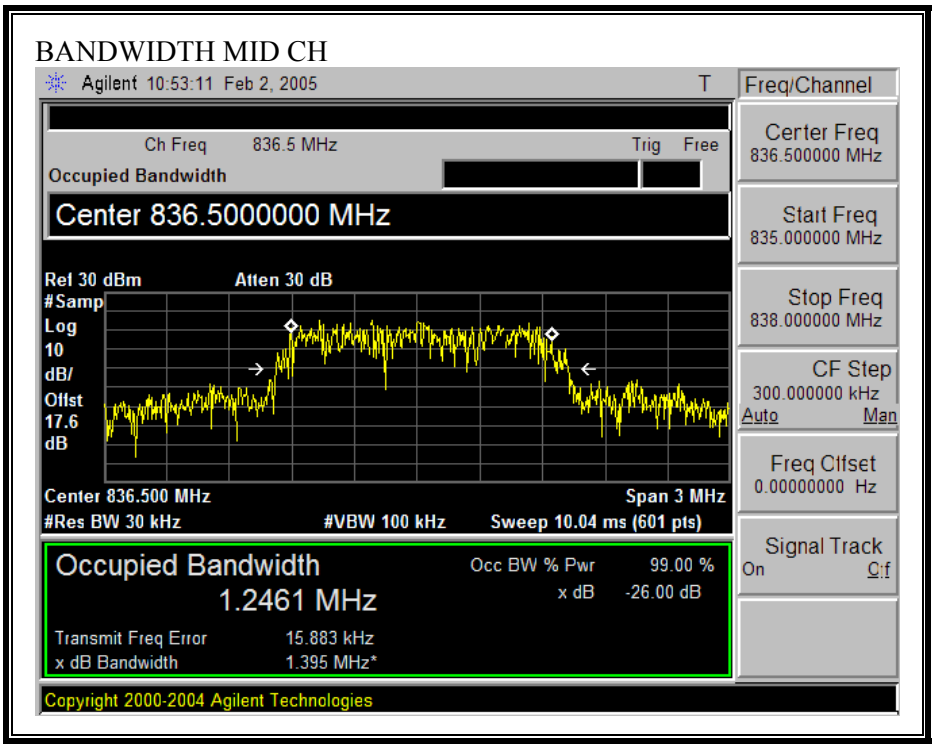
Channel	Frequency (MHz)	Bandwidth (MHz)
Low	1851.25	1.427
Middle	1880	1.406
High	1908.75	1.433

800MHz CELL CDMA 26 dB BANDWIDTH

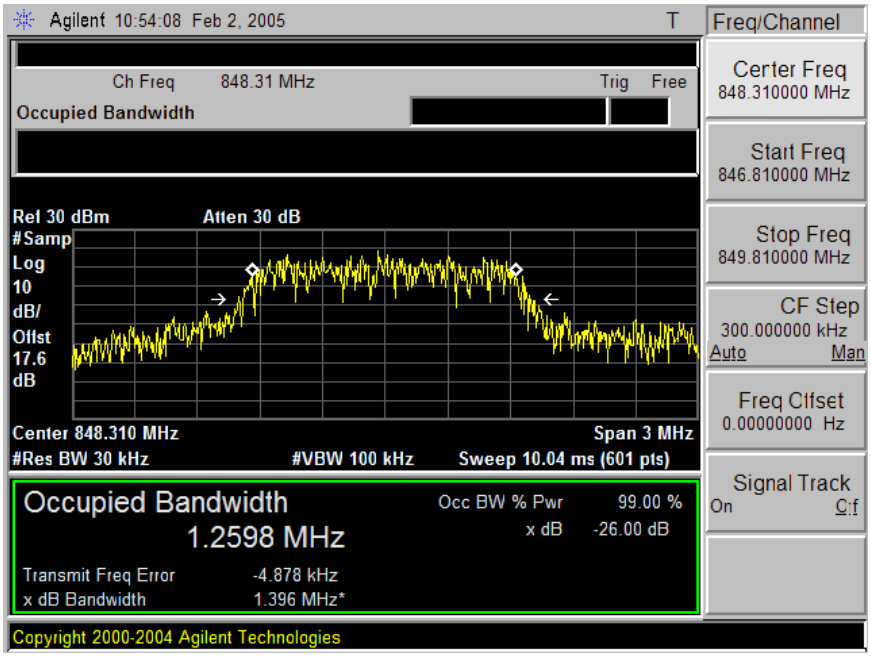
BANDWIDTH LOW CH



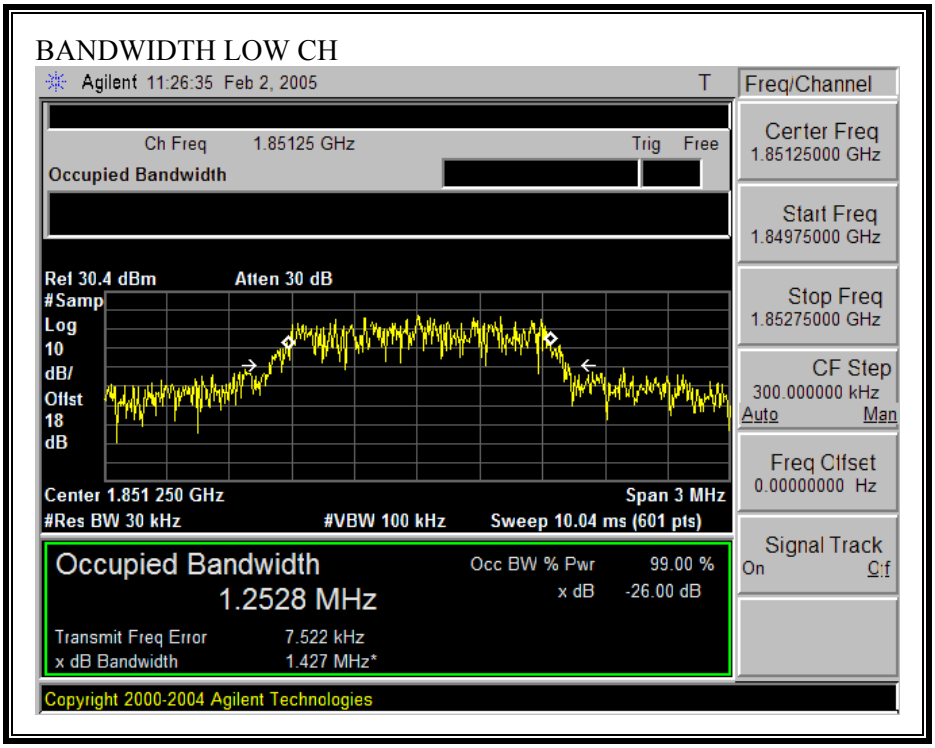
BANDWIDTH MID CH



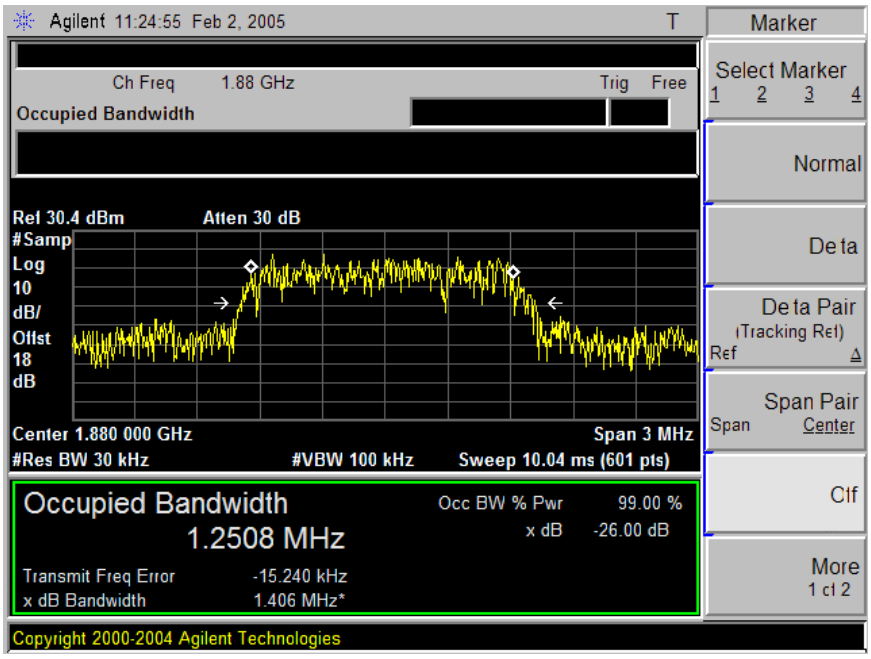
BANDWIDTH HIGH CH



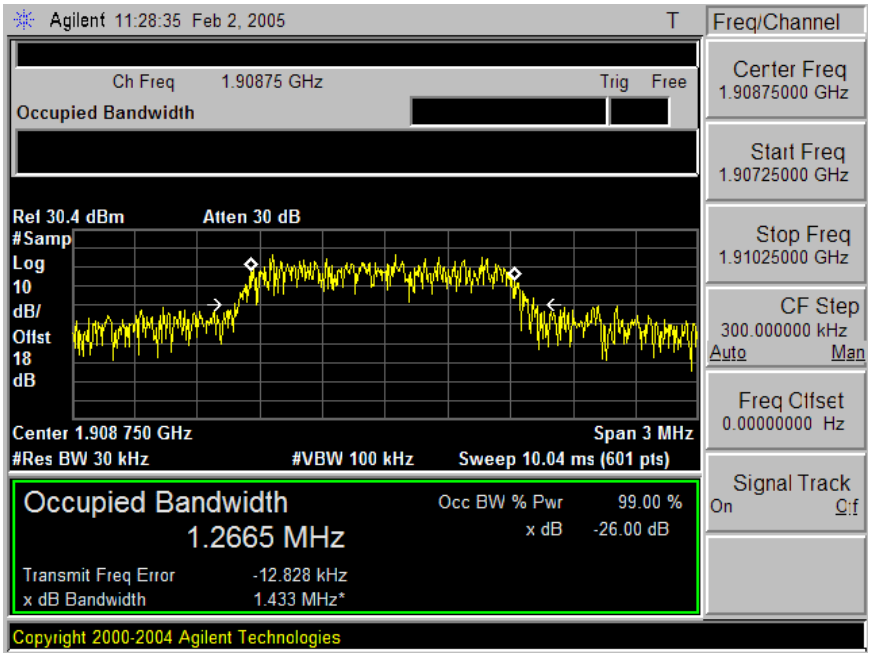
1900MHz PCS CDMA 26 dB BANDWIDTH



BANDWIDTH MID CH



BANDWIDTH HIGH CH



7.2. RF POWER OUTPUT

LIMIT

22.913(a) The ERP of mobile transmitters and auxiliary test transmitters must not exceed 7 Watts.
24.232(b) Mobile/portable stations are limited to 2 watts e.i.r.p. peak power and the equipment must employ means to limit the power to the minimum necessary for successful communications.

TEST PROCEDURE

ANSI / TIA / EIA 603 Clause 2.2.17

RESULTS

No non-compliance noted.

800MHZ CELL CDMA Modulation

Channel	Frequency (MHz)	Conducted Peak Power (dBm)	Conducted Peak Power (mW)
Low	824.7	28.97	788.86
Middle	836.5	28.44	698.23
High	848.3	28.36	685.49

1900MHz PCS Modulation

Channel	Frequency (MHz)	Conducted Peak Power (dBm)	Conducted Peak Power (mW)
Low	1851.25	27.80	602.56
Middle	1880	28.39	690.24
High	1908.75	27.38	547.02

NOTE: RBW=VBW=3MHz.

CDMA Output Power (ERP)

f MHz	SA reading (dBuV/m)	Ant. Pol. (H/V)	SG reading (dBm)	CL (dB)	Gain (dBd)	ERP (dBm)	Limit (dBm)	Margin (dB)	Notes
Low Ch									
824.70	103.1	V	27.4	0.8	0.0	26.6	38.5	-11.9	
824.70	100.2	H	25.3	0.8	0.0	24.5	38.5	-14.0	
Mid Ch									
836.50	101.3	V	26.4	0.8	0.0	25.6	38.5	-12.9	
836.50	100.1	H	24.9	0.8	0.0	24.1	38.5	-14.4	
High Ch									
848.30	101.6	V	27.2	0.8	0.0	26.4	38.5	-12.1	
848.30	100.2	H	25.3	0.8	0.0	24.5	38.5	-14.0	

NOTE: EUT tested at worst antenna position with 0dBi reference dipole antenna, RBW=VBW=3MHz

PCS Output Power (EIRP)

f GHz	SA reading (dBuV/m)	Ant. Pol. (H/V)	SG reading (dBm)	CL (dB)	Gain (dBi)	Gain (dBd)	EIRP (dBm)	Limit (dBm)	Margin (dB)	Notes
Low Ch										
1.851	94.3	V	21.2	1.4	4.1	2.0	24.0	33.0	-9.0	
1.851	99.3	H	26.3	1.4	4.1	2.0	29.1	33.0	-3.9	
Mid Ch										
1.880	92.1	V	20.5	1.4	4.1	1.9	23.2	33.0	-9.8	
1.880	96.7	H	24.7	1.4	4.1	1.9	27.4	33.0	-5.6	
High Ch										
1.909	91.4	V	20.4	1.4	4.0	1.9	23.1	33.0	-9.9	
1.909	97.9	H	25.7	1.4	4.0	1.9	28.3	33.0	-4.7	

NOTE: EUT tested at worst antenna position with 0dBi reference dipole antenna, RBW=VBW=3MHz

7.3. SPURIOUS EMISSION AT ANTENNA TERMINAL

LIMIT

§22.917 (e) and §24.238 (a) Out of band emissions. The power of any emission outside of the authorized operating frequency ranges must be attenuated below the transmitting power (P) by a factor of at least 43 + 10 log (P) dB.

TEST PROCEDURE

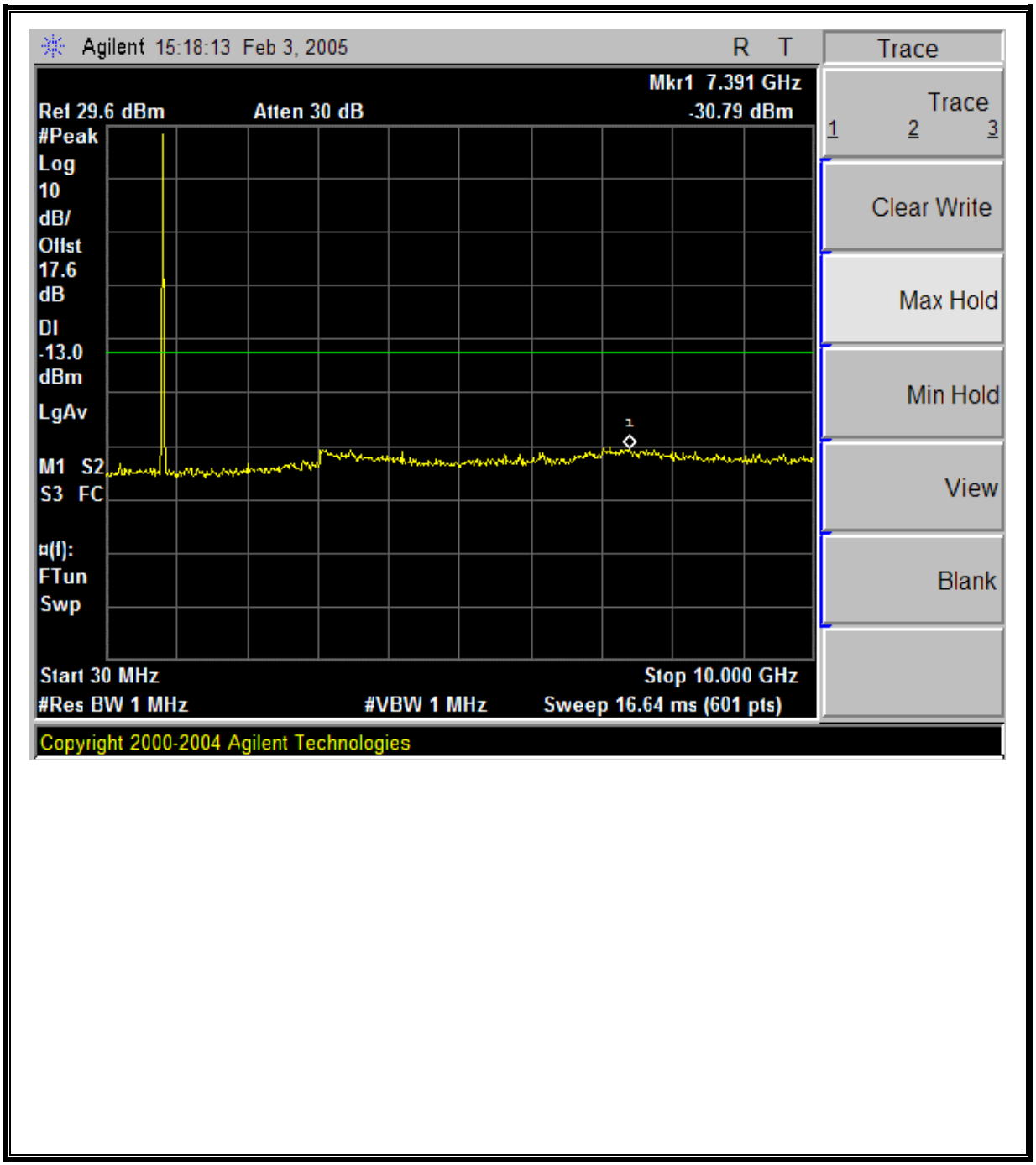
ANSI / TIA / EIA 603 Clause 3.2.12, FCC 22.917 (h), & FCC 24.238 (b)

RESULTS

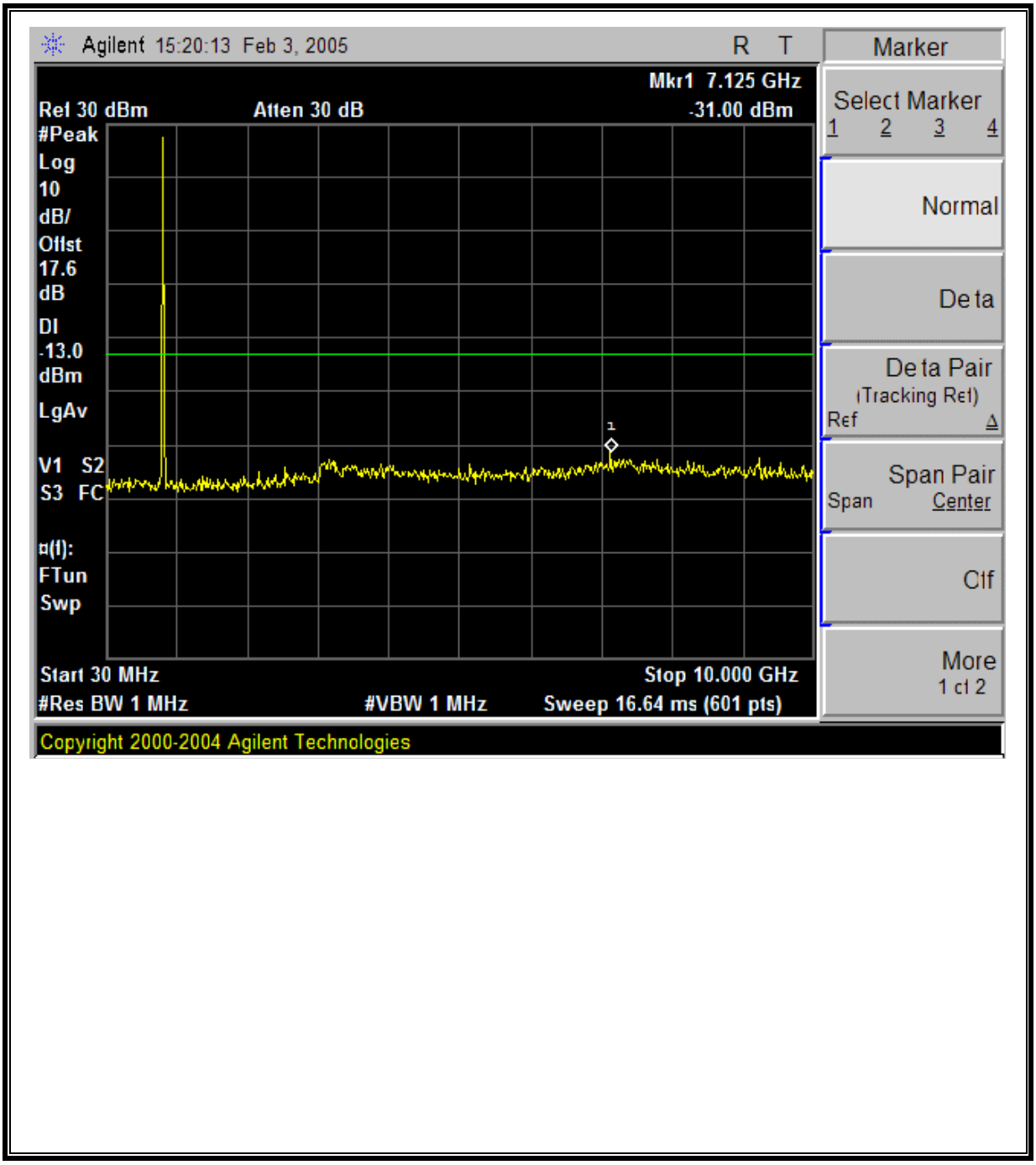
No non-compliance noted.

800MHz CELL CDMA MODULATION RESULTS

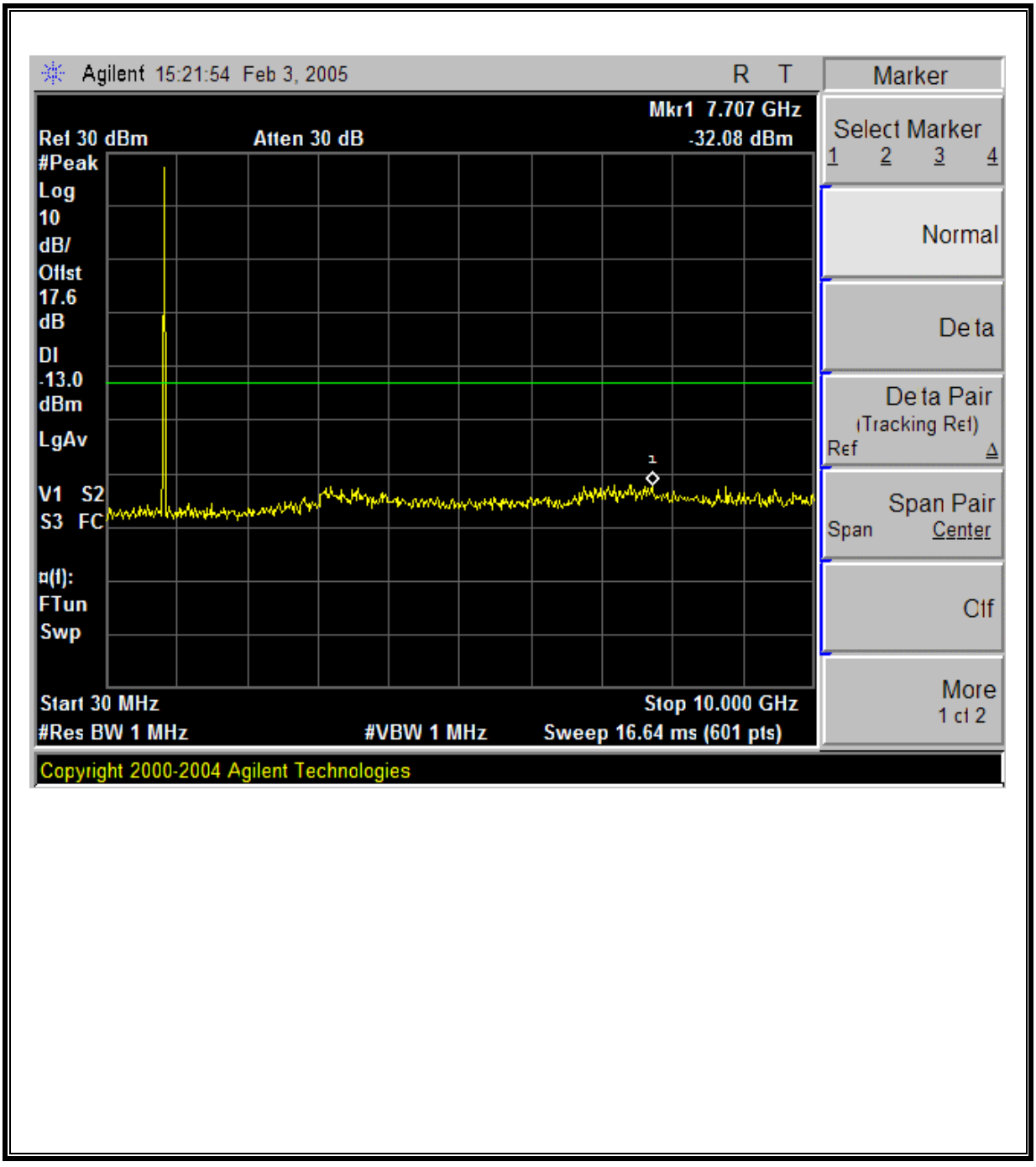
CDMA Modulation: Low Channel, Out-Of-Band Emissions



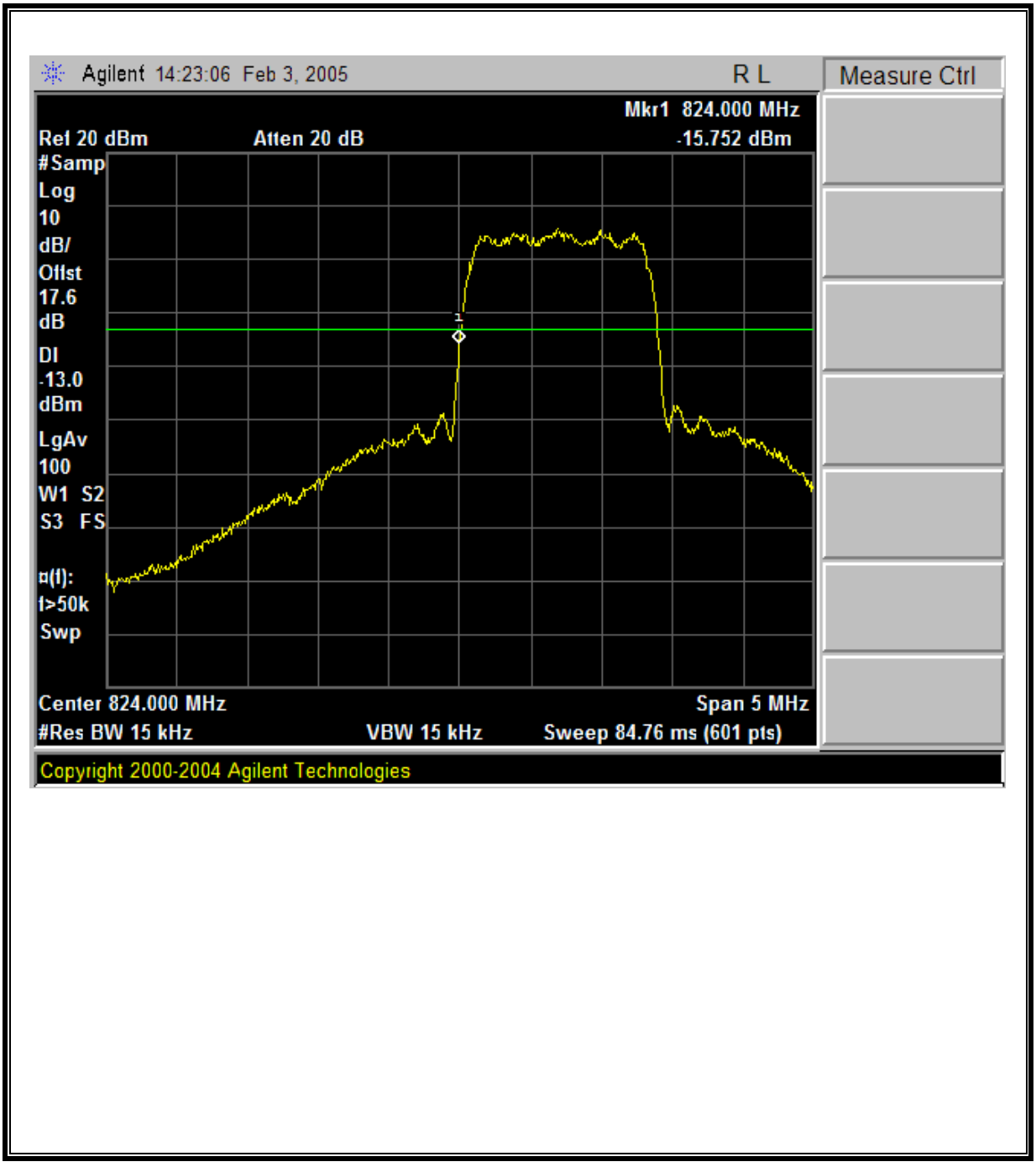
CDMA Modulation: Mid Channel, Out-Of-Band Emissions



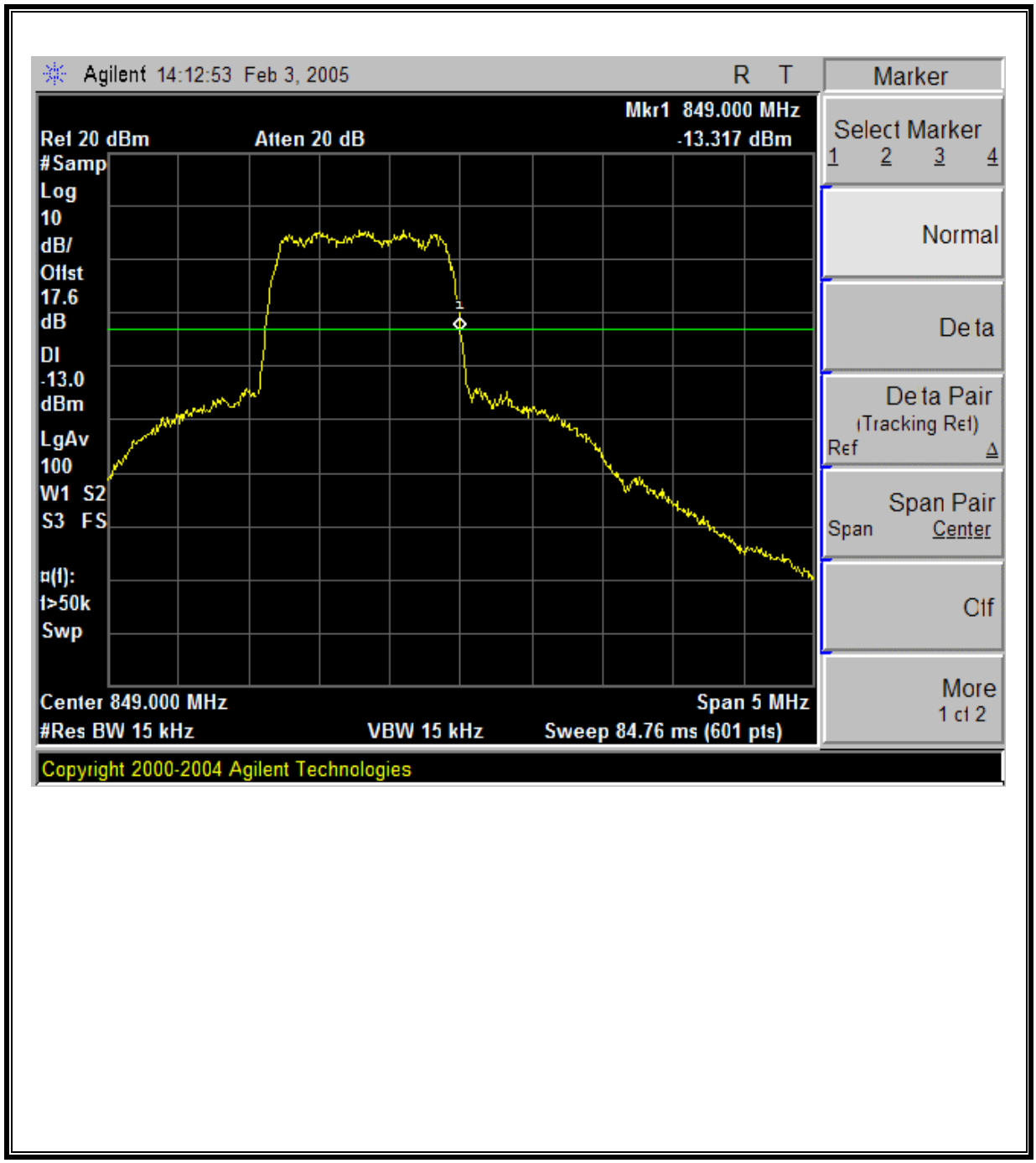
CDMA Modulation: High Channel, Out-Of-Band Emissions



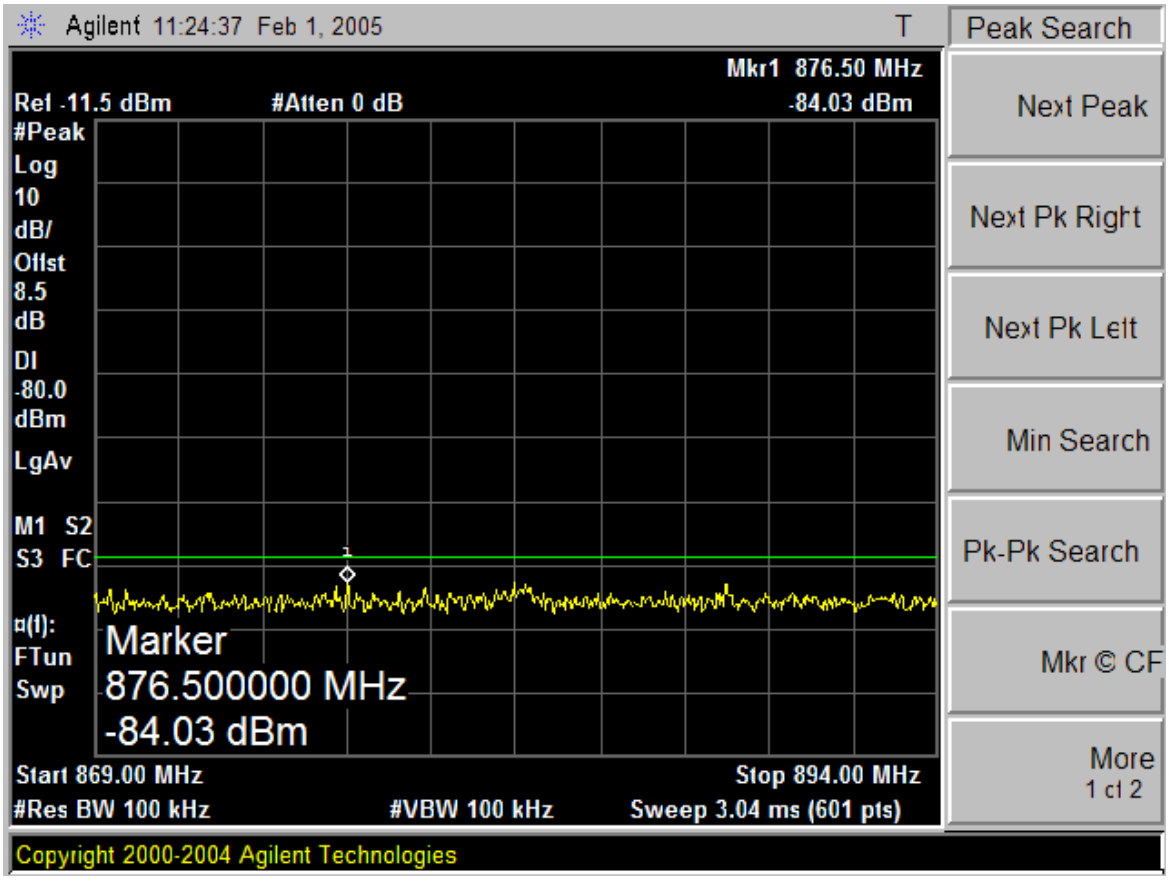
800MHz CELL CDMA Modulation: Low Channel Band Edge



800MHZ CELL CDMA Modulation: High Channel Band Edge

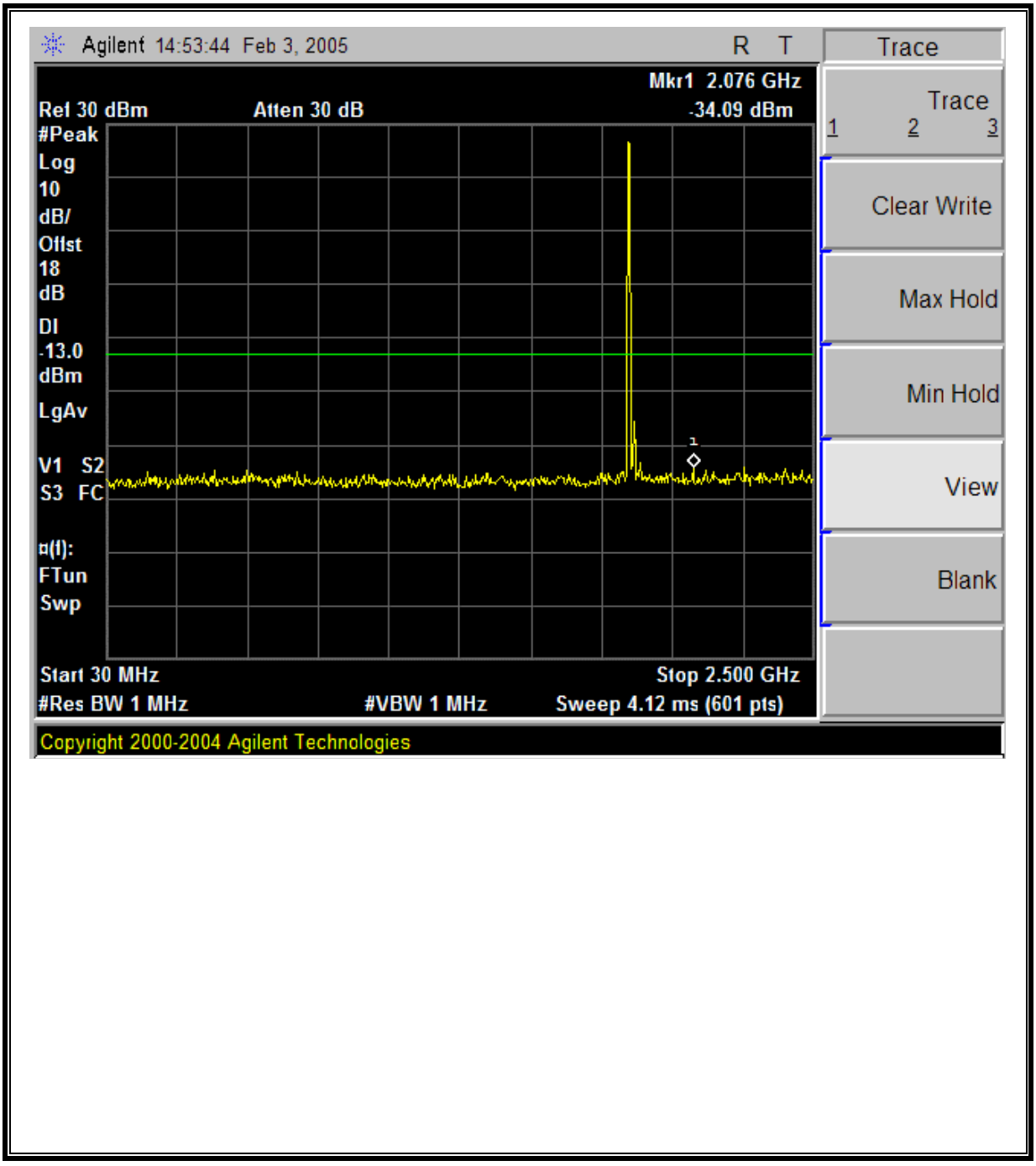


800MHZ CELL CDMA Mobile Emissions in Base Frequency Range



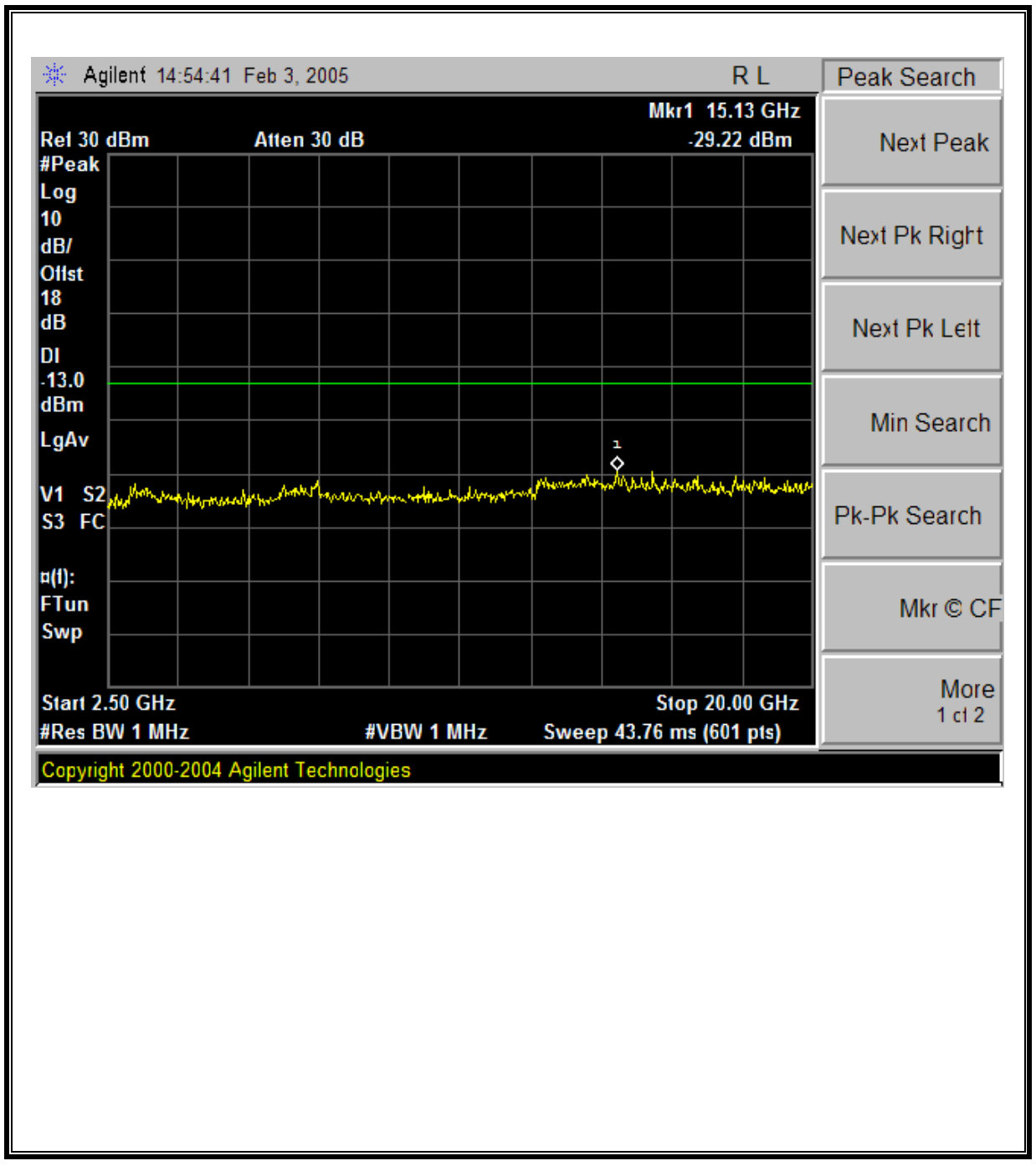
1900MHZ PCS CDMA MODULATION RESULTS

PCS CDMA Modulation: Low Channel Out-Of-Band Emissions #1

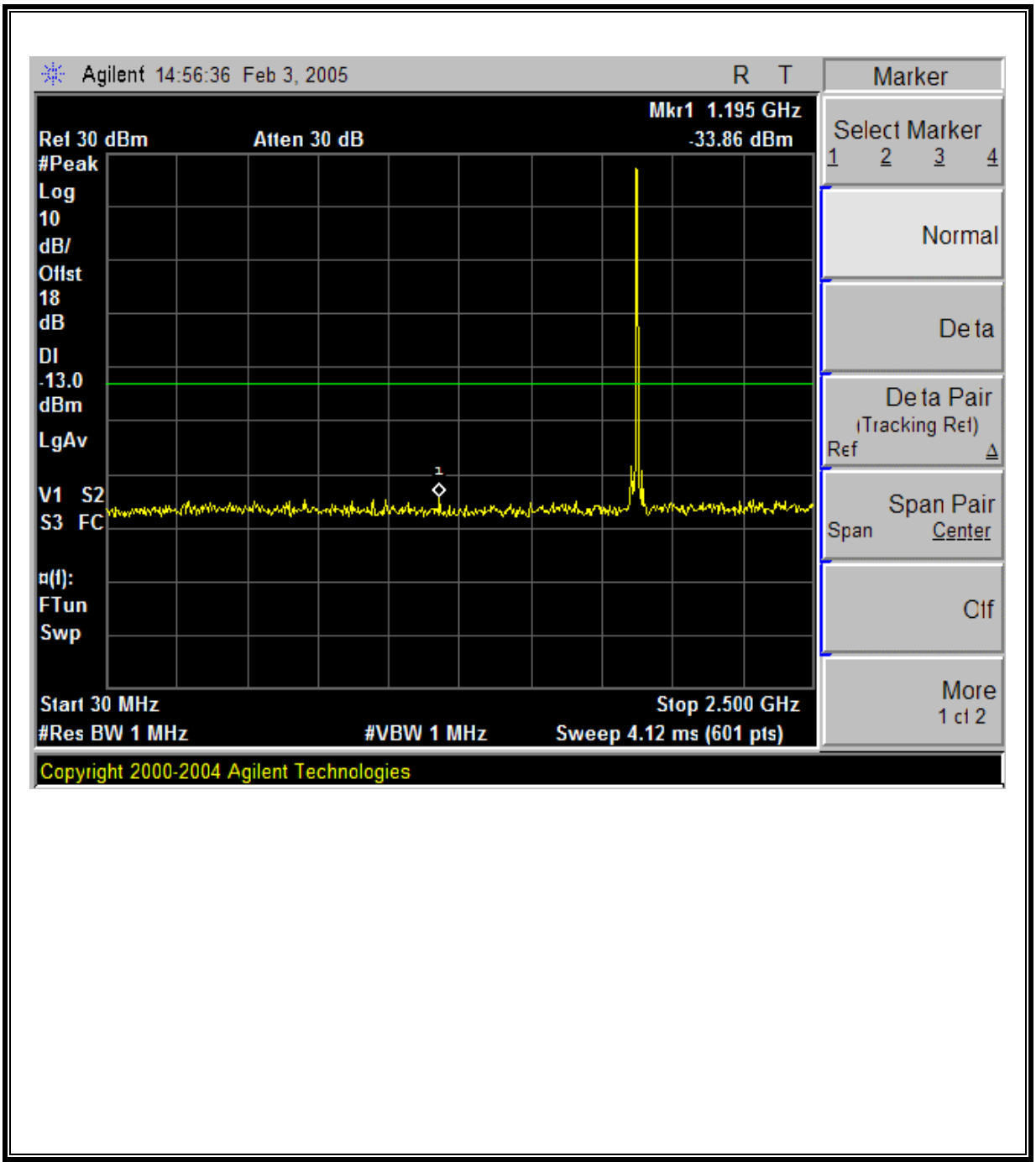


1900MHZ PCS CDMA MODULATION RESULTS

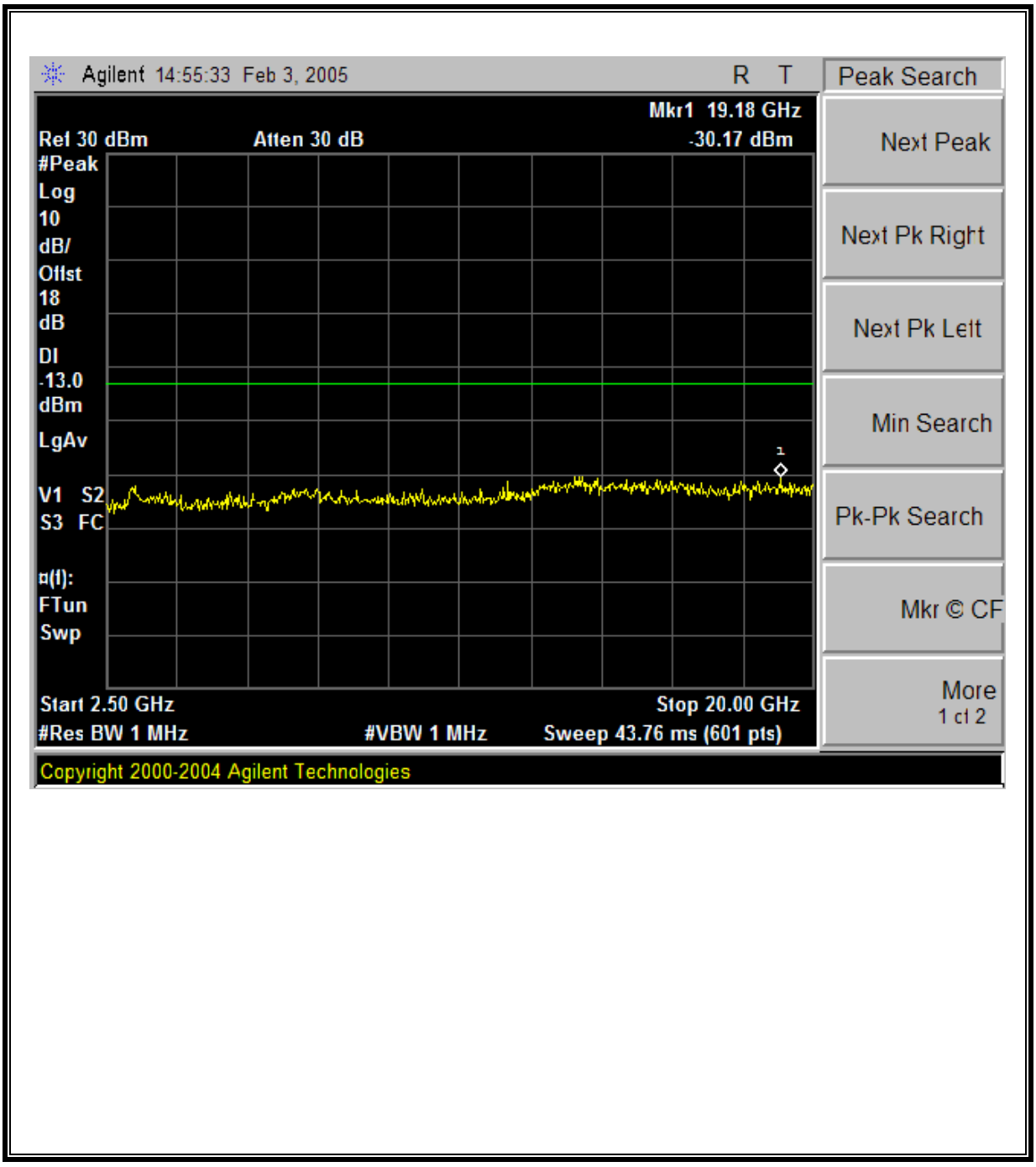
PCS CDMA Modulation: Low Channel Out-Of-Band Emissions #2



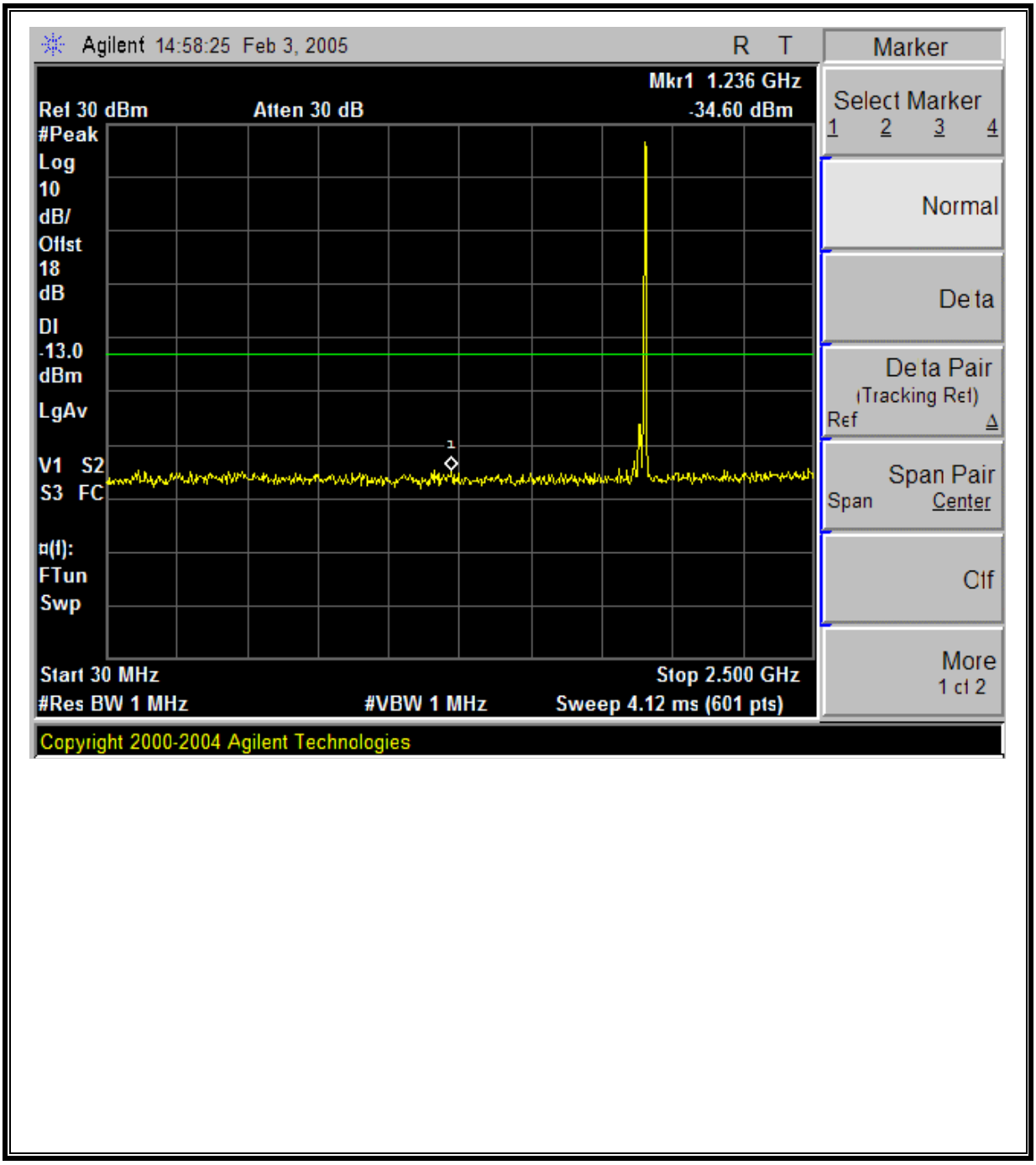
PCS CDMA Modulation: Mid Channel Out-Of-Band Emissions #1



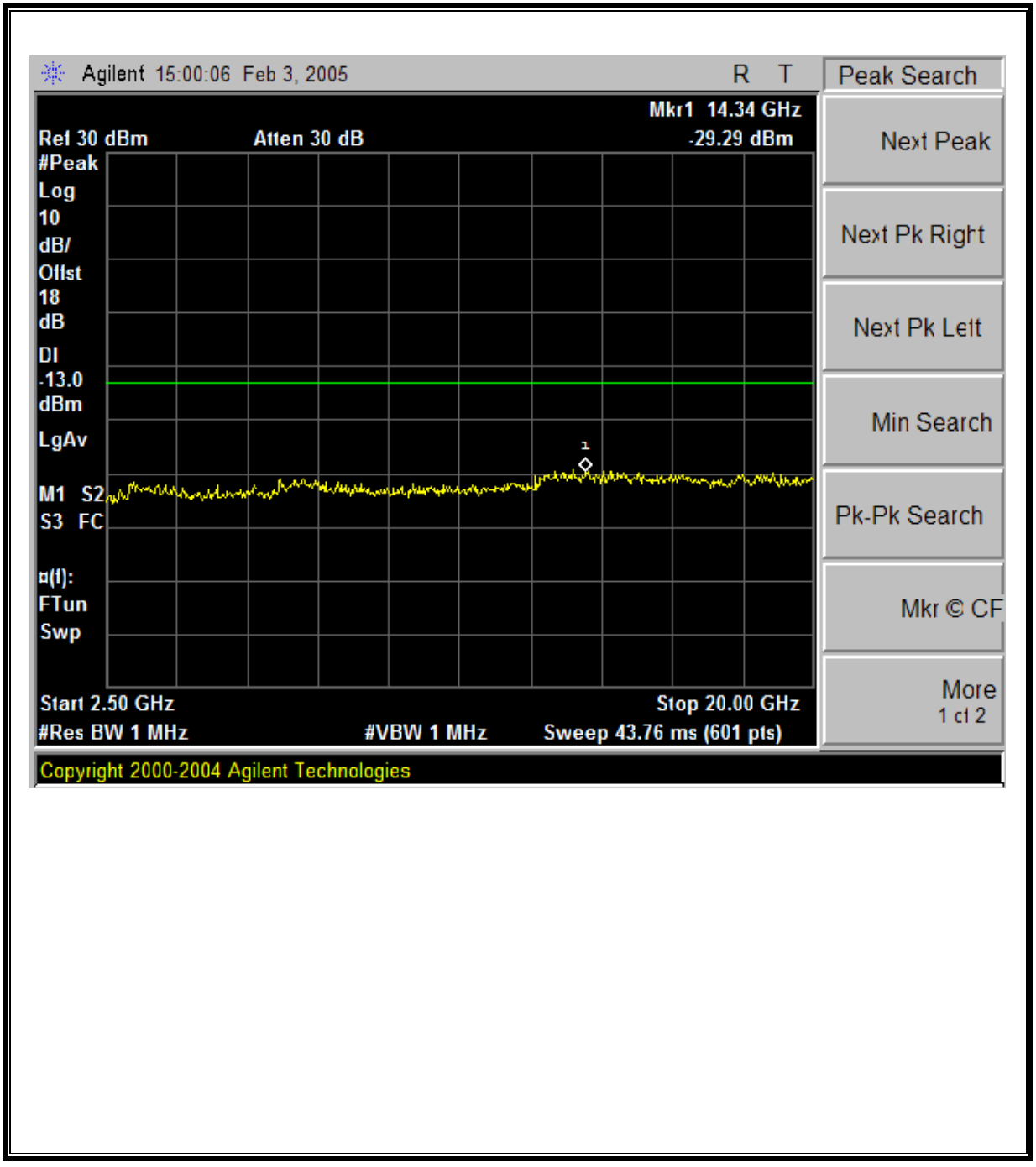
PCS CDMA Modulation: Mid Channel Out-Of-Band Emissions #2



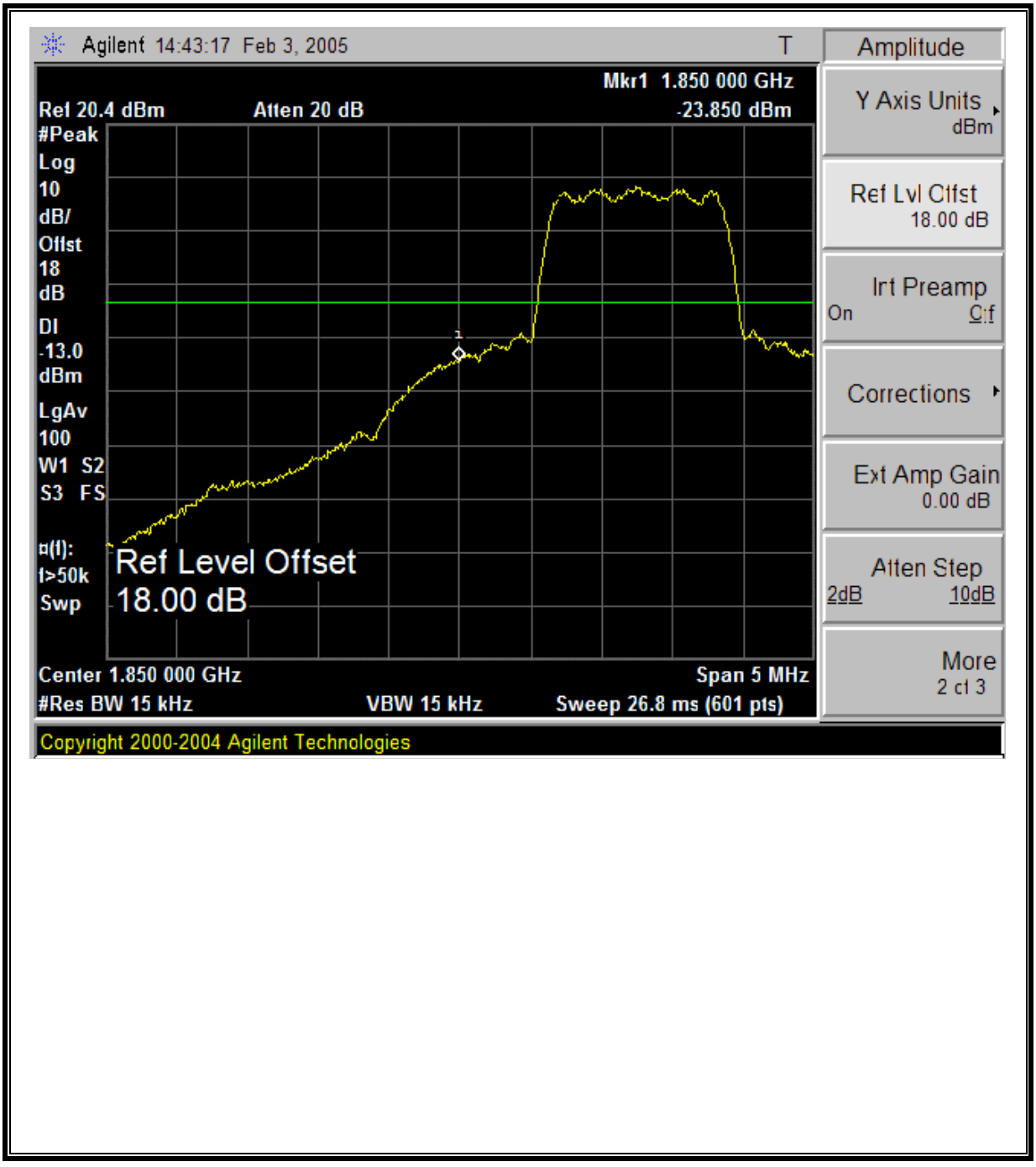
PCS CDMA Modulation: High Channel Out-Of-Band Emissions #1



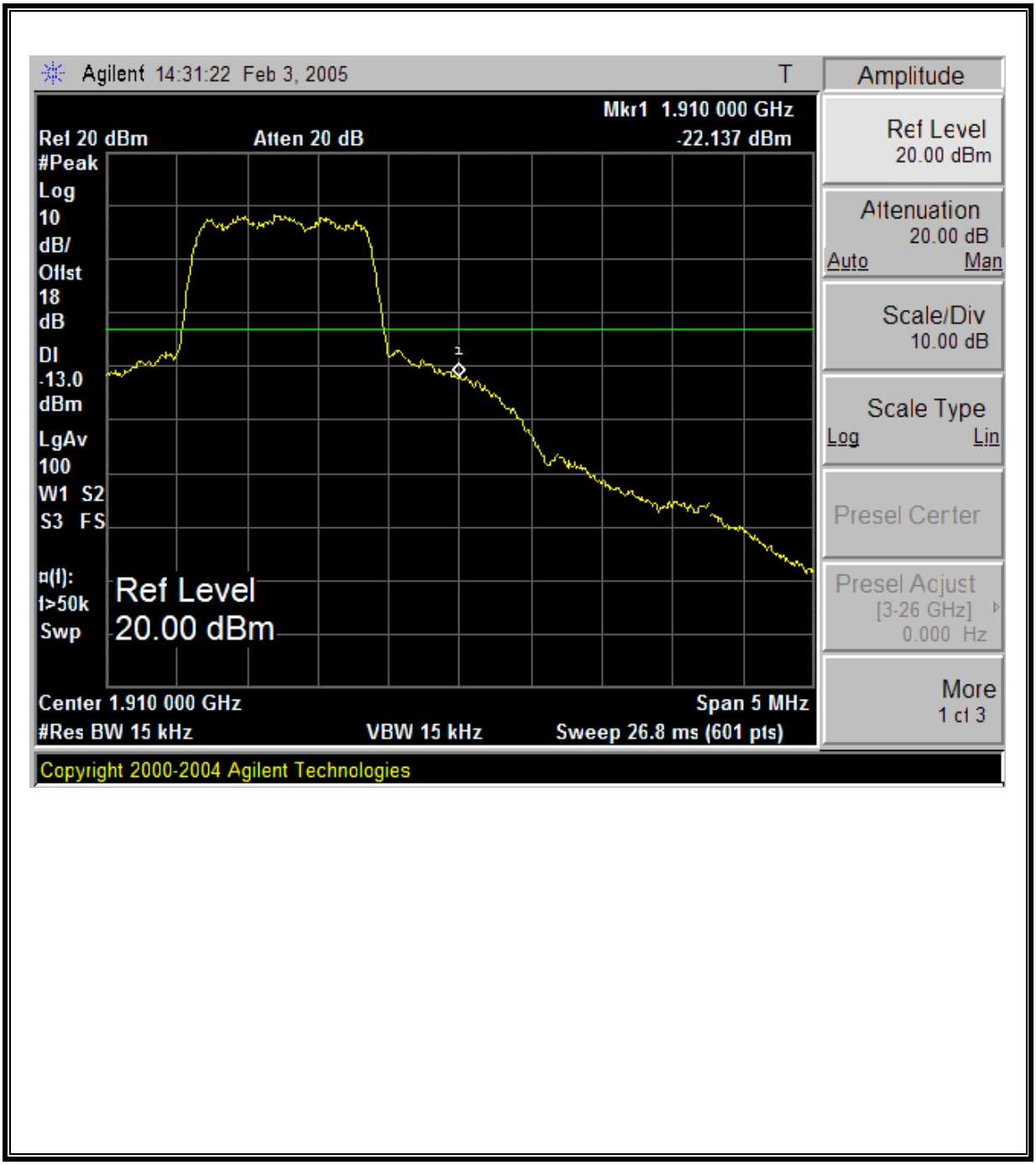
PCS CDMA Modulation: High Channel Out-Of-Band Emissions



PCS CDMA Modulation: Low Channel Band Edge



PCS CDMA Modulation: High Channel Band Edge



7.4. FIELD STRENGTH OF SPURIOUS EMISSION

LIMIT

§22.917 (e) and §24.238 (a) Out of band emissions. The power of any emission outside of the authorized operating frequency ranges must be attenuated below the transmitting power (P) by a factor of at least 43 + 10 log (P) dB.

TEST PROCEDURE

ANSI / TIA / EIA 603 Clause 3.2.12, FCC 22.917 (h), & FCC 24.238 (b)

RESULTS

No non-compliance noted.

800MHz Band CDMA Spurious & Harmonic (ERP), 30-1000MHz

02/02/05 **High Frequency Measurement**
Compliance Certification Services, Morgan Hill Open Field Site

Test Engr:Chin Pang
Project #:05U3228-2
Company:Sierra Wireless
EUT Descrip.:Dual Band 800/1900MHz CDMA Module
EUT M/N:EM5625
Test Target: FCC Part 22 / RSS 129
Mode Oper:800MHz Band, TX Mode

Test Equipment:

Bilog Antenna	Cable	Pre-amplifer 8447D	Limit
5m Chamber Sunol Bilog	5m Chamber Cable	T5 8447D	ERP

f MHz	SA reading (dBuV/m)	Ant. Pol. (H/V)	SG reading (dBm)	CL (dB)	Gain (dBi)	Gain (dBd)	ERP (dBm)	Limit (dBm)	Margin (dB)	Notes
53.40	62.3	H	-52.4	1.1	-4.0	-6.1	-59.6	-13.0	-46.6	
204.00	60.0	H	-47.1	1.8	4.9	2.7	-46.2	-13.0	-33.2	
297.00	54.0	H	-53.0	2.1	6.0	3.9	-51.3	-13.0	-38.3	
596.60	54.8	H	-47.9	2.9	6.9	4.7	-46.1	-13.0	-33.1	
47.20	64.5	V	-49.6	1.0	-6.4	-8.5	-59.1	-13.0	-46.1	
102.60	70.3	V	-39.5	1.3	-1.2	-3.3	-44.2	-13.0	-31.2	
299.00	65.0	V	-42.4	2.1	6.0	3.9	-40.7	-13.0	-27.7	
596.60	60.2	V	-32.7	2.9	6.9	4.7	-30.9	-13.0	-17.9	

800MHz Band CDMA Spurious & Harmonic (ERP)

Compliance Certification Services, Morgan Hill 5m Chamber Site
Febuary 1, 2005
Test Engr:Chin Pang
Project #:05U3228-2
Company:Sierra Wireless
EUT Descrip.:Dual Band 800/1900MHz CDMA Module
EUT M/N:EM5625
Test Target:FCC Part 24
Mode Oper:Tx, 800MHz Band

Test Equipment:

EMCO Horn 1-18GHz: T73; S/N: 6717 @3m
Horn > 18GHz:
Limit: FCC 22
☑ High Pass Filter
Hi Frequency Cables: ☐ (2 ft) ☑ (2 ~ 3 ft) ☐ (4 ~ 6 ft) ☑ (12 ft)
Pre-amplifer 1-26GHz: T86 Miteq 924341
Pre-amplifer 26-40GHz:

f GHz	SA reading (dBuV/m)	Ant. Pol. (H/V)	SG reading (dBm)	CL (dB)	Gain (dBi)	Gain (dBd)	ERP (dBm)	Limit (dBm)	Margin (dB)	Notes
Low Ch										
1.649	62.8	V	-48.2	1.6	7.5	5.4	-44.4	-13.0	-31.4	
2.474	66.3	V	-43.5	1.9	8.6	6.4	-39.0	-13.0	-26.0	
3.299	58.5	V	-48.1	2.3	9.3	7.2	-43.2	-13.0	-30.2	
4.124	54.0	V	-50.1	2.6	9.9	7.7	-45.1	-13.0	-32.1	
1.649	61.5	H	-49.8	1.6	7.5	5.4	-46.0	-13.0	-33.0	
2.474	65.3	H	-42.5	1.9	8.6	6.4	-38.0	-13.0	-25.0	
3.299	55.7	H	-47.9	2.3	9.3	7.2	-43.0	-13.0	-30.0	
4.124	53.7	H	-50.0	2.6	9.9	7.7	-44.9	-13.0	-31.9	
Mid Ch										
1.673	61.4	V	-50.4	1.6	7.6	5.4	-46.6	-13.0	-33.6	
2.510	65.0	V	-43.6	1.9	8.6	6.4	-39.1	-13.0	-26.1	
3.346	55.0	V	-51.5	2.3	9.3	7.2	-46.6	-13.0	-33.6	
4.183	52.6	V	-52.5	2.6	9.9	7.8	-47.4	-13.0	-34.4	
1.673	62.3	H	-48.8	1.6	7.6	5.4	-45.0	-13.0	-32.0	
2.510	62.0	H	-46.4	1.9	8.6	6.4	-41.9	-13.0	-28.9	
3.346	54.5	H	-51.9	2.3	9.3	7.2	-47.0	-13.0	-34.0	
4.183	54.0	H	-50.8	2.6	9.9	7.8	-45.7	-13.0	-32.7	
high Ch										
1.697	62.4	V	-49.7	1.6	7.6	5.5	-45.9	-13.0	-32.9	
2.545	66.0	V	-42.3	2.0	8.6	6.5	-37.7	-13.0	-24.7	
3.393	56.2	V	-46.4	2.3	9.4	7.2	-41.5	-13.0	-28.5	
4.242	53.9	V	-50.6	2.7	10.0	7.8	-45.4	-13.0	-32.4	
1.697	61.8	H	-49.5	1.6	7.6	5.5	-45.7	-13.0	-32.7	
2.545	66.3	H	-43.0	2.0	8.6	6.5	-38.4	-13.0	-25.4	
3.393	57.5	H	-47.2	2.3	9.4	7.2	-42.3	-13.0	-29.3	
4.242	54.0	H	-50.8	2.7	10.0	7.8	-45.6	-13.0	-32.6	

Note: No other emissions were detected above the system noise floor.

PCS Spurious & Harmonic (EIRP): 30-1000MHz

02/02/05 **High Frequency Measurement**
Compliance Certification Services, Morgan Hill Open Field Site

Test Engr:Chin Pang
Project #:04U3228-2
Company:Sierra Wireless
EUT Descrip.:Dual Band 800/1900MHz CDMA Module
EUT M/N:EM5625
Test Target:FCC Part 24 / RSS-133
Mode Oper:1900MHz Band, TX Mode

Test Equipment:

Bilog Antenna	Cable	Pre-amplifer 8447D	Limit
5m Chamber Sunol Bilog	5m Chamber Cable	T5 8447D	EIRP

f MHz	SA reading (dBuV/m)	Ant. Pol. (H/V)	SG reading (dBm)	CL (dB)	Gain (dBi)	Gain (dBd)	EIRP (dBm)	Limit (dBm)	Margin (dB)	Notes
132.00	54.7	H	-52.8	1.5	-1.7	-3.8	-56.0	-30.0	-26.0	
207.00	61.0	H	-46.4	1.8	5.3	3.2	-42.9	-36.0	-6.9	
298.00	54.0	H	-53.0	2.1	6.0	3.9	-49.1	-36.0	-13.1	
661.00	53.0	H	-48.8	3.0	6.8	4.7	-45.0	-36.0	-9.0	
45.50	64.0	V	-49.5	1.0	-7.3	-9.4	-57.7	-36.0	-21.7	
190.00	63.6	V	-45.9	1.7	3.7	1.5	-43.9	-36.0	-7.9	
298.00	60.0	V	-47.5	2.1	6.0	3.9	-43.5	-36.0	-7.5	

PCS Spurious & Harmonic (EIRP):

02/01/05 **High Frequency Substitution Measurement**
Compliance Certification Services, Morgan Hill 5m Chamber Site

Test Engr:Chin Pang
Project #:05U3228-2
Company:Sierra Wireless
EUT Descrip.:Dual Band 800/1900MHz CDMA Module
EUT M/N:EM5625
Test Target:FCC Part 24
Mode Oper:Tx, 1900MHz Band

Test Equipment:

EMCO Horn 1-18GHz: T73; S/N: 6717 @3m
Horn > 18GHz:
Limit: FCC 24
☑ High Pass Filter

Hi Frequency Cables: ☐ (2 ft) ☑ (2 ~ 3 ft) ☐ (4 ~ 6 ft) ☑ (12 ft)

Pre-amplifer 1-26GHz: T86 Miteq 924341
Pre-amplifer 26-40GHz:

f GHz	SA reading (dBuV/m)	Ant. Pol. (H/V)	SG reading (dBm)	CL (dB)	Gain (dBi)	Gain (dBd)	EIRP (dBm)	Limit (dBm)	Margin (dB)	Notes
Low Ch										
3.703	72.0	V	-33.8	2.4	9.6	7.4	-26.7	-13.0	-13.7	
5.554	73.3	V	-29.7	3.2	11.1	9.0	-21.8	-13.0	-8.8	
7.405	70.0	V	-30.3	3.7	11.6	9.4	-22.4	-13.0	-9.4	
9.256	58.0	V	-38.0	4.2	10.5	8.4	-31.7	-13.0	-18.7	
3.703	73.8	H	-31.9	2.4	9.6	7.4	-24.8	-13.0	-11.8	
5.554	71.2	H	-30.9	3.2	11.1	9.0	-23.0	-13.0	-10.0	
7.405	67.8	H	-31.7	3.7	11.6	9.4	-23.8	-13.0	-10.8	
9.256	58.0	H	-38.0	4.2	10.5	8.4	-31.7	-13.0	-18.7	
Mid Ch										
3.760	70.0	V	-43.2	2.5	9.6	7.4	-36.1	-13.0	-23.1	
5.640	71.3	V	-42.9	3.3	11.2	9.0	-35.0	-13.0	-22.0	
7.520	71.0	V	-29.0	3.7	11.5	9.4	-21.2	-13.0	-8.2	
9.400	56.8	V	-40.9	4.2	10.8	8.7	-34.3	-13.0	-21.3	
3.760	72.6	H	-43.6	2.5	9.6	7.4	-36.5	-13.0	-23.5	
5.640	70.6	H	-42.9	3.3	11.2	9.0	-35.0	-13.0	-22.0	
7.520	69.3	H	-29.9	3.7	11.5	9.4	-22.1	-13.0	-9.1	
9.400	56.0	H	-39.9	4.2	10.8	8.7	-33.3	-13.0	-20.3	
high Ch										
3.818	70.7	V	-46.2	2.5	9.6	7.5	-39.1	-13.0	-26.1	
5.763	72.5	V	-44.9	3.3	11.3	9.1	-36.9	-13.0	-23.9	
7.635	69.6	V	-30.2	3.8	11.5	9.3	-22.5	-13.0	-9.5	
9.544	56.3	V	-39.5	4.3	11.1	9.0	-32.7	-13.0	-19.7	
3.818	71.4	H	-45.1	2.5	9.6	7.5	-38.0	-13.0	-25.0	
5.763	69.3	H	-45.4	3.3	11.3	9.1	-37.4	-13.0	-24.4	
7.635	68.2	H	-30.8	3.8	11.5	9.3	-23.1	-13.0	-10.1	
9.544	56.0	H	-39.8	4.3	11.1	9.0	-33.0	-13.0	-20.0	
Note: No other emissions were detected above the system noise floor.										

7.5. MAXIMUM PERMISSIBLE EXPOSURE

LIMITS

§1.1310 The criteria listed in Table 1 shall be used to evaluate the environmental impact of human exposure to radio-frequency (RF) radiation as specified in §1.1307(b), except in the case of portable devices which shall be evaluated according to the provisions of §2.1093 of this chapter.

TABLE 1—LIMITS FOR MAXIMUM PERMISSIBLE EXPOSURE (MPE)

Frequency range (MHz)	Electric field strength (V/m)	Magnetic field strength (A/m)	Power density (mW/cm^2)	Averaging time (minutes)
(A) Limits for Occupational/Controlled Exposures				
0.3–3.0	614	1.63	*(100)	6
3.0–30	1842/f	4.89/f	*($900/f^2$)	6
30–300	61.4	0.163	1.0	6
300–1500			f/300	6
1500–100,000			5	6
(B) Limits for General Population/Uncontrolled Exposure				
0.3–1.34	614	1.63	*(100)	30
1.34–30	824/f	2.19/f	*($180/f^2$)	30

TABLE 1—LIMITS FOR MAXIMUM PERMISSIBLE EXPOSURE (MPE)—Continued

Frequency range (MHz)	Electric field strength (V/m)	Magnetic field strength (A/m)	Power density (mW/cm^2)	Averaging time (minutes)
30–300	27.5	0.073	0.2	30
300–1500			f/1500	30
1500–100,000			1.0	30

f = frequency in MHz
* = Plane-wave equivalent power density

NOTE 1 TO TABLE 1: Occupational/controlled limits apply in situations in which persons are exposed as a consequence of their employment provided those persons are fully aware of the potential for exposure and can exercise control over their exposure. Limits for occupational/controlled exposure also apply in situations when an individual is transient through a location where occupational/controlled limits apply provided he or she is made aware of the potential for exposure.

NOTE 2 TO TABLE 1: General population/uncontrolled exposures apply in situations in which the general public may be exposed, or in which persons that are exposed as a consequence of their employment may not be fully aware of the potential for exposure or can not exercise control over their exposure.

CALCULATIONS

Given

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

and

$S = E \wedge 2 / 3770$

where

E = Field Strength in Volts/meter
P = Power in Watts
G = Numeric antenna gain
d = Distance in meters
S = Power Density in milliwatts/square centimeter

Combining equations and rearranging the terms to express the distance as a function of the remaining variables yields:

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

Changing to units of Power to mW and Distance to cm, using:

P (mW) = P (W) / 1000 and
d (cm) =100 * d (m)

yields

$d = 100 * \sqrt{((30 * (P / 1000) * G) / (3770 * S))}$
$d = 0.282 * \sqrt{(P * G / S)}$

where

d = distance in cm
P = Power in mW
G = Numeric antenna gain
S = Power Density in mW/cm^2

Substituting the logarithmic form of power and gain using:

P (mW) = 10 ^ (P (dBm) / 10) and
G (numeric) = 10 ^ (G (dBi) / 10)

yields

$d = 0.282 * 10 \wedge ((P + G) / 20) / \sqrt{S}$ Equation (1)

where

d = MPE distance in cm
P = Power in dBm
G = Antenna Gain in dBi
S = Power Density Limit in mW/cm^2

Equation (1) and the measured peak power is used to calculate the MPE distance.

LIMITS

From §1.1310 Table 1 (B), S = 1.0 mW/cm^2

RESULTS

No non-compliance noted:

Mode	Power Density Limit (mW/cm^2)	Output Power (dBm)	Antenna Gain (dBi)	MPE Distance (cm)
800MHz Celllar	0.6	28.97	5.10	19.04
1900 MHz PCS	1.0	28.39	3.90	11.61

NOTE: For mobile or fixed location transmitters, the minimum separation distance is 20 cm, even if calculations indicate that the MPE distance would be less.

7.6. FREQUENCY STABILITY

LIMIT

§22.355 Except as otherwise provided in this part, the carrier frequency of each transmitter in the Public Mobile Services must be maintained within the tolerances given in Table C–1 of this section.

For Mobile devices operating in the 824 to 849 MHz band at a power level less than or equal to 3 Watts, the limit specified in Table C-1 is +/- 2.5 ppm.

§24.235 The frequency stability shall be sufficient to ensure that the fundamental emission stays within the authorized frequency block.

TEST PROCEDURE

ANSI / TIA / EIA 603 Clause 2.3.1 and 2.3.2

RESULTS

No non-compliance noted.

800MHz CELLULAR – MID CHANNEL

Reference Frequency: CELLULAR Mid Channel 836.520010MHz @ 20*C Limit: to stay +- 2.5 ppm = 2091.300 Hz				
Power Supply	**Environment**	**Frequency Deviation Measureed with Time Elapse**		
(Vdc)	**Temperature (*C)**	**(MHz)**	**Delta (ppm)**	**Limit (ppm)**
4.00	50	836.520019	-0.011	2.5
4.00	40	836.520015	-0.006	2.5
4.00	30	836.519991	0.023	2.5
4.00	***20***	***836.520010***	***0***	2.5
4.00	10	836.520012	-0.002	2.5
4.00	0	836.520033	-0.027	2.5
4.00	-10	836.520007	0.004	2.5
4.00	-20	836.520009	0.001	2.5
4.00	-30	836.520011	-0.001	2.5

Reference Frequency: CDMA Mid Channel 836.520010MHz @ 20*C Limit: to stay +- 2.5 ppm = 2091.300 Hz				
Power Supply	**Environment**	**Frequency Deviation Measureed with Time Elapse**		
(Vdc)	**Temperature (*C)**	**(MHz)**	**Delta (ppm)**	**Limit (ppm)**
4.00	***20***	***836.520010***	***0***	***2.5***
2.9 (end point)	20	836.520035	*-0.030*	2.5
3.4	20	836.519989	*0.025*	2.5
4.6	20	836.520012	*-0.002*	2.5

1900MHz PCS – MID CHANNEL

Reference Frequency: PCS Mid Channel 1880.000030MHz @ 20*C Limit: within the authorized block or +- 2.5 ppm = 4700.000 Hz				
Power Supply (Vdc)	Environment Temperature (?C)	Frequency Deviation Measureed with Time Elapse (MHz)	Delta (ppm)	Limit (ppm)
4.00	50	1880.000016	0.007	2.5
4.00	40	1879.999983	0.025	2.5
4.00	30	1880.000058	-0.015	2.5
4.00	***20***	***1880.000030***	***0***	***2.5***
4.00	10	1879.999960	0.037	2.5
4.00	0	1879.999979	0.027	2.5
4.00	-10	1880.000040	-0.005	2.5
4.00	-20	1880.000015	0.008	2.5
4.00	-30	1880.000026	0.002	2.5

Reference Frequency: CDMA Mid Channel 1880.000030MHz @ 20?C Limit: within the authorized block or +- 2.5 ppm = 4700.000 Hz				
Power Supply (Vdc)	Environment Temperature (*C)	Frequency Deviation Measureed with Time Elapse (MHz)	Delta (ppm)	Limit (ppm)
4.00	***20***	***1880.000030***	***0***	***2.5***
2.95 (end point)	20	1880.000022	*0.004*	2.5
3.4	20	1880.000000	*0.016*	2.5
4.6	20	1880.000016	*0.007*	2.5