FCC CFR47 PART 22 SUBPART H
FCC CFR47 PART 24 SUBPART E
CERTIFICATION TEST REPORT

FOR

iPad with CDMA 1xRTT/CDMA 1xEVDO Rev. A, Bluetooth EDR and WiFi 802.11 abgn

MODEL NUMBER: A1397

FCC ID: BCGA1397

REPORT NUMBER: 11U13613-1

ISSUE DATE: JANUARY 31, 2011

Prepared for

APPLE
1 INFINITE LOOP
CUPERTINO, CA 95014, U.S.A.

Prepared by

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NVLAP LAB CODE 200065-0

Revision History

Rev.	Issue Date	Revisions	Revised By
---	1/31/2011	Initial Issue	T. Chan

TABLE OF CONTENTS

1. ATTESTATION OF TEST RESULTS

COMPANY NAME:	APPLE 1 INFINITE LOOP CUPERTINO, CA 95014, U.S.A.
EUT DESCRIPTION:	iPad with CDMA 1xRTT/CDMA 1xEVDO Rev. A, Bluetooth EDR and WiFi 802.11 abgn
MODEL:	A1397
SERIAL NUMBER:	DLXF1007DL0Y (Conducted Unit), DLXF101GDL0W (Radiated Unit)
DATE TESTED:	JANUARY 17-26, 2011

APPLICABLE STANDARDS	
STANDARD	**TEST RESULTS**
FCC PART 22 SUBPART H AND 24 SUBPART E	Pass

Compliance Certification Services (UL CCS) tested the above equipment in accordance with the requirements set forth in the above standards. All indications of Pass/Fail in this report are opinions expressed by UL CCS based on interpretations and/or observations of test results. Measurement Uncertainties were not taken into account and are published for informational purposes only. 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 UL CCS and all revisions are duly noted in the revisions section. Any alteration of this document not carried out by UL CCS will constitute fraud and shall nullify the document. This report must not be used by the client to claim product certification, approval, or endorsement by NVLAP, NIST, any agency of the Federal Government, or any agency of any government.

Approved & Released For UL CCS By:

THU CHAN
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Tested By:

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2. TEST METHODOLOGY

The tests documented in this report were performed in accordance with TIA-603-C, FCC CFR 47 Part 2, FCC CFR 47 Part 22, and FCC CFR Part 24.

3. FACILITIES AND ACCREDITATION

The test sites and measurement facilities used to collect data are located at 47173 Benicia Street, Fremont, California, USA.

UL 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. SAMPLE CALCULATION

Where relevant, the following sample calculation is provided:

Field Strength (dBuV/m) = Measured Voltage (dBuV) + Antenna Factor (dB/m) + Cable Loss (dB) – Preamp Gain (dB)

36.5 dBuV + 18.7 dB/m + 0.6 dB – 26.9 dB = 28.9 dBuV/m

4.3. MEASUREMENT UNCERTAINTY

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

PARAMETER	UNCERTAINTY
Conducted Disturbance, 0.15 to 30 MHz	3.52 dB
Radiated Disturbance, 30 to 1000 MHz	4.94 dB

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

5. EQUIPMENT UNDER TEST

5.1. DESCRIPTION OF EUT

The Apple iPad, Model A1397 is a tablet device with iPod functions (music, application support, and video), 802.11a/b/g/n radio, Bluetooth with EDR radio functions, and cellular using the CDMA data 1xRTT/CDMA 1xEVDO Release A. This device measures 241.36 mm (9.5 inches) tall x 185.85 mm (7.31 inches) wide in the landscape orientation, 8.80mm (0.373 inches) thick and weighs 612.3 grams (1.35Lbs) The rechargeable battery is not user accessible.

5.2. MAXIMUM OUTPUT POWER

The transmitter has a maximum conducted and ERP / EIRP output powers as follows:

Part 22 Cellular Band

Frequency range (MHz)	Modulation	Conducted		ERP	
		dBm	mW	dBm	mW
824.7 – 848.31	1xRTT (RC1, SO55)	28.82	762.1	25.00	316.2
824.7 – 848.31	EV-DO - REV A	29.27	845.3	25.15	327.3

Part 24 PCS Band

Frequency range (MHz)	Modulation	Conducted		EIRP	
		dBm	mW	dBm	mW
1851.25 – 1908.8	1xRTT (RC1, SO55)	27.36	544.5	29.90	977.2
1851.25 – 1908.8	EV-DO - REV A	28.35	683.9	30.10	1023.3

5.3. DESCRIPTION OF AVAILABLE ANTENNAS

The radio utilizes an integral antenna for the 850MHz and 1900MHz bands with a maximum peak gain of 0.11 dBi for cell band and 1.85 dBi for PCS band.

5.4. SOFTWARE AND FIRMWARE

The firmware installed in the EUT during testing was 0.9.09_1.

The EUT software installed during testing was 8F5153D

The EUT is linked with Agilent 8960 Communication Test Set.

5.5. WORST-CASE CONFIGURATION AND MODE

The worst-case channel for RF radiated emissions below 1GHz and AC conducted emissions are determined as the channel with the AC Power Adapter Source

Based on the investigation results, the highest peak power and enhanced data rate is the worst-case scenario for all measurements.

Worst-case modes:
- For Cellular and PCS band: 1xRTT (RC1 SO55)
- For Cellular and PCS band: CDMA2000 1xEV-DO Revision A (Rev. A)

The worst-case configuration has been evaluated on EUT at X-position for 850MHz and Y-position for 1900MHz bands by comparing the fundamental ERP / EIRP output power.

5.6. DESCRIPTION OF TEST SETUP

I/O CABLES (RF CONDUCTED TEST)

I/O CABLE LIST						
Cable No.	**Port**	**# of Identica Ports**	**Connector Type**	**Cable Type**	**Cable Length**	**Remarks**
1	AC	2	US 115V	Un-shielded	2m	NA
2	DC	1	DC	Un-shielded	2m	NA
3	Directional	1	EUT	Un-shielded	1m	NA
4	Directional	1	Spectrum Analyzer	Un-shielded	1m	NA
5	RF In/Out	1	Communications Test Set	Un-shielded	NA	NA

I/O CABLES (RF RADIATED TEST)

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	1m	NA
3	RF In/Out	1	Horn	Un-shielded	1.5m	NA

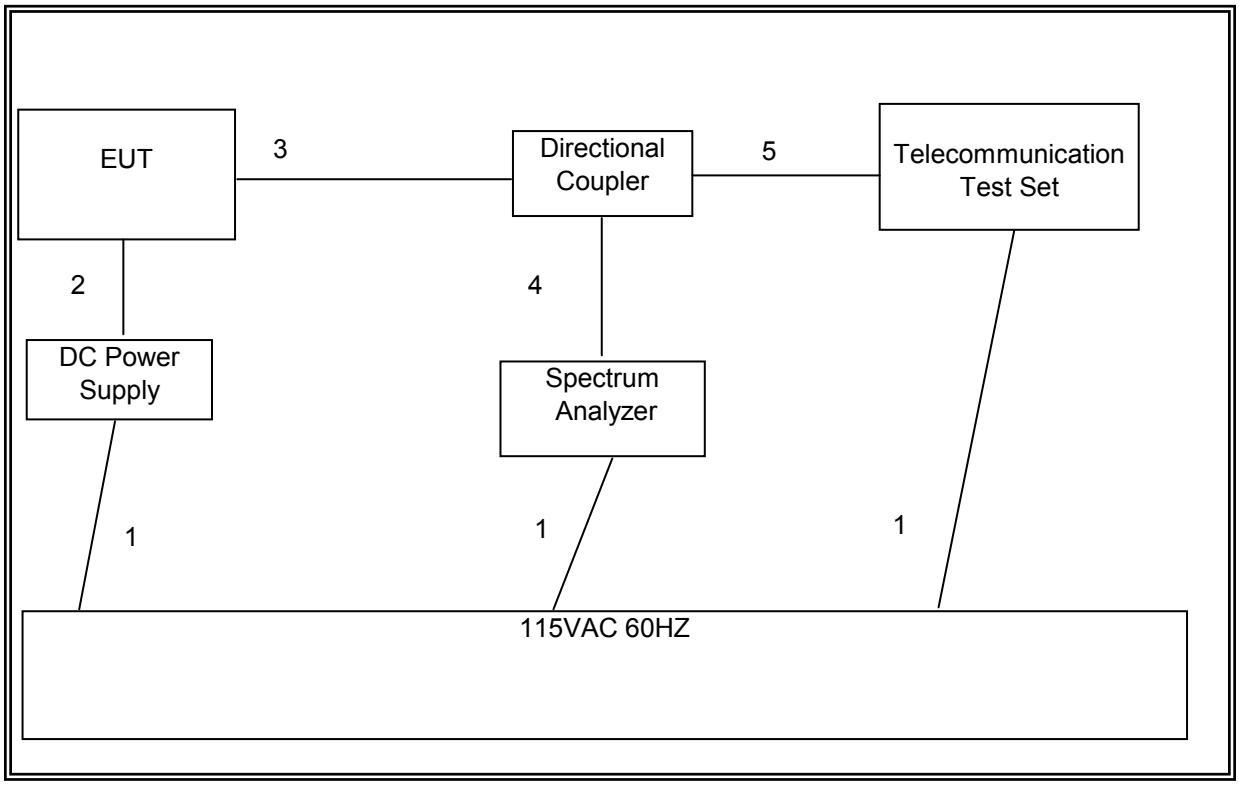
SUPPORT EQUIPMENT

PERIPHERAL SUPPORT EQUIPMENT LIST				
Description	Manufacturer	Model	Serial Number	FCC ID
AC Adapter	Foxlink Technology Ltd.	A1357	6072804	DoC
DC Power Supply	HP	E3610A	KR24104150	NA

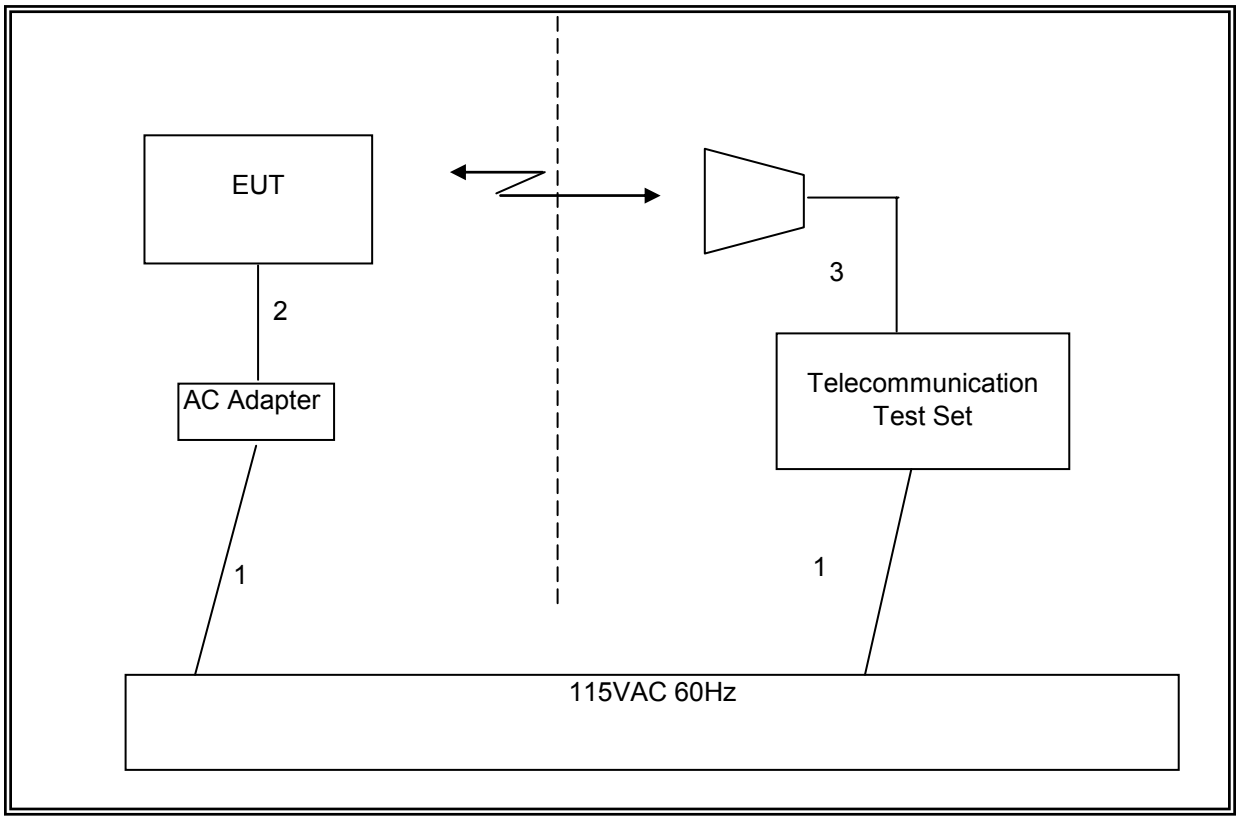
TEST SETUP

The EUT is a stand-alone device. The Wireless Communication test set exercised the EUT.

SETUP DIAGRAM FOR RF CONDUCTED TESTS



SETUP DIAGRAM FOR RF RADIATED TESTS



6. TEST AND MEASUREMENT EQUIPMENT

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

TEST EQUIPMENT LIST				
Description	**Manufacturer**	**Model**	**Asset**	**Cal Due**
Spectrum Analyzer, 44 GHz	Agilent / HP	E4446A	C01159	05/08/11
Antenna, Horn, 18 GHz	EMCO	3115	C00872	06/29/11
Antenna, Bilog, 2 GHz	Sunol Sciences	JB1	C01011	07/14/11
Preamplifier, 1300 MHz	Agilent / HP	8447D	C00885	01/27/12
Preamplifier, 26.5 GHz	Agilent / HP	8449B	C01063	07/14/11
EMI Test Receiver, 30 MHz	R & S	ESHS 20	N02396	05/06/11
Communication Test Set	Agilent / HP	E5515C	C01086	06/17/11
LISN, 30 MHz	FCC	LISN-50/250-25-2	N02625	11/10/11
Temperature / Humidity Chamber	Thermotron	SE 600-10-10	C00930	04/11/11
Highpass Filter, 1.5 GHz	Micro-Tronics	HPM13193	N02689`	CNR
Highpass Filter, 2.7 GHz	Micro-Tronics	HPM13194	N02687	CNR
Directional Coupler, 4.2 GHz, 40 dB	A-R	DC7144A	C00983	CNR
Signal Generator, 20 GHz	Agilent / HP	83732B	C00774	07/14/12
Antenna, Tuned Dipole 400~1000 MHz	ETS	3121C DB4	C00993	06/28/11

7. RF POWER OUTPUT VERIFICATION

Maximum output power is verified on the Low, Middle and High channels according to procedures in section 4.4.5.2 of 3GPP2 C.S0011/TIA-98-E for 1xRTT, section 3.1.2.3.4 of 3GPP2 C.S0033-0/TIA-866 for Rel. 0 and section 4.3.4 of 3GPP2 C.S0033-A for Rev. A

CELL, CDMA200, EVDO REV A

Data Rate	Peak (dBm)
128	28.02
256	27.98
512	27.94
768	27.94
1024	28.02
1536	28.00
2048	27.97
3072	27.95
4096	**28.07**
6144	28.06
8192	27.91
12288	27.97

PCS, CDMA200, EVDO REV A

Data Rate	Peak (dBm)
128	27.83
256	27.62
512	27.66
768	27.53
1024	27.57
1536	27.91
2048	27.61
3072	27.86
4096	**28.36**
6144	28.15
8192	28.29
12288	27.97

7.1. RF POWER OUTPUT FOR 1xRTT

This procedure assumes the Agilest 8960 Test Set has the following applications installed and with valid license.

Application	Rev, License
CDMA2000 Mobile Test	B.13.08, L

- Call Setup > Shift & Preset
- Cell Info > Cell Parameters > System ID (SID) > 18
  > Network ID (NID) > 65535
- Protocol Rev > 6 (IS-2000-0)
- Radio Config (RC) > Please see following table or details
- FCH Service Option (SO) Setup > Please see following table or details
- Traffic Data Rate > Full
- TDSO SCH Info > F-SCH Parameters > F-SCH Data Rate > 153.6 kbps
  > R-SCH Parameters > R-SCH Data Rate > 153.6 kbps
- Rvs Power Ctrl > Active bits
  - Rvs Power Ctrl > All Up bits (Maximum TxPout)

RF Power Output Results for 1XRTT

RF Output Power for Cellular Band

Radio Configuration (RC)	Service Option (SO)	Conducted Output Power (dBm)		
		Ch. 1013 / 824.7 MHz	Ch. 384 / 836.52 MHz	Ch. 777 / 848.31 MHz
		Peak	Peak	Peak
RC1	2 (Loopback)	28.45	27.80	28.70
	55 (Loopback)	28.51	27.81	**28.82**
RC2	9 (Loopback)	28.43	27.77	28.75
	55 (Loopback)	28.50	27.74	28.79
RC3	2 (Loopback)	28.15	27.51	28.58
	55 (Loopback)	28.27	27.51	28.50
	32 (+ F-SCH)	28.10	27.44	28.57
	32 (+ SCH)	28.19	27.53	28.57
RC4	2 (Loopback)	28.26	27.51	28.54
	55 (Loopback)	28.31	27.54	28.51
	32 (+ F-SCH)	28.25	27.47	28.50
	32 (+ SCH)	28.19	27.49	28.49
RC5	9 (Loopback)	28.17	27.49	28.37
	55 (Loopback)	28.19	27.56	28.55

RF Power Output Results for 1XRTT

RF Output Power for PCS Band

Radio Configuration (RC)	Service Option (SO)	Conducted Output Power (dBm)		
		Ch. 25 / 1851.25 MHz	Ch. 600 / 1880 MHz	Ch. 1175 / 1908.75 MHz
		Peak	Peak	Peak
RC1	2 (Loopback)	27.19	27.10	27.18
	55 (Loopback)	27.27	**27.36**	27.04
RC2	9 (Loopback)	27.23	27.04	26.97
	55 (Loopback)	27.06	27.04	26.92
RC3	2 (Loopback)	26.55	26.47	26.71
	55 (Loopback)	26.72	26.59	26.73
	32 (+ F-SCH)	26.68	26.60	26.69
	32 (+ SCH)	26.70	26.51	26.48
RC4	2 (Loopback)	26.70	26.46	26.71
	55 (Loopback)	26.69	26.49	26.59
	32 (+ F-SCH)	26.72	26.50	26.70
	32 (+ SCH)	26.69	26.49	26.52
RC5	9 (Loopback)	26.56	26.56	26.48
	55 (Loopback)	26.90	26.45	26.43

7.2. RF POWER OUTPUT FOR CDMA2000 1xEV-DO Release 0 (Rel. 0)

This procedure assumes the Agilent 8960 Test Set has the following applications installed and with valid license.

Application	Rev, License
1xEV-DO Terminal Test	A.09.13

EVDO Release 0 - RTAP

- Call Setup > Shift & Preset
- Call Control:
  - Access Network Info > Cell Parameters > Sector ID > 00000000 > Subnet Mask > 0
  - Generator Info > Termination Parameters > Max Forward Packet Duration > 16 Slots
- Call Parms:
  - Cell Power > -105.5 dBm/1.23 MHz
  - Cell Band > (Select US Cellular or US PCS)
  - Channel > (Enter channel number)
  - Application Config > Enhanced Test Application Protocol > RTAP
  - RTAP Rate > 153.6 kbps
  - Rvs Power Ctrl > Active bits
  - Protocol Rel > 0 (1xEV-DO)
- Press “Start Data Connection” when “Session Open” appear in “Active Cell”
- Rvs Power Ctrl > All Up bits (Maximum TxPout)

EVDO Release 0 - FTAP

- Call Setup > Shift & Preset
- Call Control:
  - Access Network Info > Cell Parameters > Sector ID > 00000000 > Subnet Mask > 0
  - Generator Info > Termination Parameters > Max Forward Packet Duration > 16 Slots
- Call Parms:
  - Cell Power > -105.5 dBm/1.23 MHz
  - Cell Band > (Select US Cellular or US PCS)
  - Channel > (Enter channel number)
  - Application Config > Enhanced Test Application Protocol > FTAP (default)
  - FTAP Rate > 307.2 kbps (2 Slot, QPSK)
  - Rvs Power Ctrl > Active bits
  - Protocol Rel > 0 (1xEV-DO)
- Press “Start Data Connection” when “Session Open” appear in “Active Cell”
- Rvs Power Ctrl > All Up bits (Maximum TxPout)

RF Power Output for CDMA2000 1xEV-DO Release 0 (Rel. 0)

Cell Band

FTAP Rate	RTAP Rate	Channel	f (MHz)	Conducted power (dBm)	
				Average	Peak
307.2 kbps (2 slot, QPSK)	153.6 kbps	1013	824.70		28.31
		384	836.52		27.75
		777	848.31		28.89

PCS Band

FTAP Rate	RTAP Rate	Channel	f (MHz)	Conducted power (dBm)	
				Average	Peak
307.2 kbps (2 slot, QPSK)	153.6 kbps	25	1851.25		27.48
		600	1880.00		27.23
		1175	1908.75		27.05

7.3. RF POWER OUTPUT FOR CDMA2000 1xEV-DO Revision A (Rev. A)

This procedure assumes the Agilent 8960 Test Set has the following applications installed and with valid license.

Application	Rev, License
1xEV-DO Terminal Test	A.09.13

EVDO Release A – RETAP
- Call Setup > Shift & Preset
- Cell Power > -60 dBm/1.23 MHz
- Protocol Rev > A (1xEV-DO-A)
- Application Config > Enhanced Test Application Protocol > RETAP
- R-Data Pkt Size > 4096
- Protocol Subtype Config > Release A Physical Layer Subtype > Subtype 2

> PL Subtype 2 Access Channel MAC Subtype > Default (Subtype 0)
- Access Network Info > Cell Parameters > Sector ID > 00000000 > Subnet Mask > 0
- Generator Info > Termination Parameters > Max Forward Packet Duration >16 Slots > ACK R-Data After > Subpacket 0 (All ACK)
- Rvs Power Ctrl > All Up bits (to get the maximum power)

EVDO Release A - FETAP
- Call Setup > Shift & Preset
- Cell Power > -60 dBm/1.23 MHz
- Protocol Rev > A (1xEV-DO-A)
- Application Config > Enhanced Test Application Protocol > FETAP
- F-Traffic Format > 4 (1024, 2,128) Canonical (307.2k, QPSK)
- Protocol Subtype Config > Release A Physical Layer Subtype > Subtype 2

> PL Subtype 2 Access Channel MAC Subtype > Default (Subtype 0)
- Access Network Info > Cell Parameters > Sector ID > 00000000 > Subnet Mask > 0
- Generator Info > Termination Parameters > Max Forward Packet Duration >16 Slots > ACK R-Data After > Subpacket 0 (All ACK)
- Rvs Power Ctrl > All Up bits (to get the maximum power)

RF Power Output Results for CDMA2000 1xEV-DO Revision A (Rev. A)

Cell Band

FETAP-Traffic Format	RETAP-Data Payload Size	Channel	f (MHz)	Conducted power (dBm)	
				Average	Peak
307.2k, QPSK/ ACK channel is transmitted at all the slots	4096	1013	824.70		28.83
		384	836.52		28.07
		777	848.31		**29.27**

PCS Band

FETAP-Traffic Format	RETAP-Data Payload Size	Channel	f (MHz)	Conducted power (dBm)	
				Average	Peak
307.2k, QPSK/ ACK channel is transmitted at all the slots	4096	25	1851.25		28.27
		600	1880.00		**28.35**
		1175	1908.75		27.79

8. CONDUCTED TEST RESULTS

8.1. OCCUPIED BANDWIDTH

RULE PART(S)

FCC: §2.1049

LIMITS

For reporting purposes only

TEST PROCEDURE

The transmitter output was connected to a calibrated coaxial cable and coupler, the other end of which was connected to a spectrum analyzer. The occupied bandwidth was measured with the spectrum analyzer at the low, middle and high channel in each band. The -26dB bandwidth was also measured and recorded.

MODES TESTED

- 1xRTT – RC1, SO55
- CDMA2000 1xEV-DO Revision A (Rev. A)

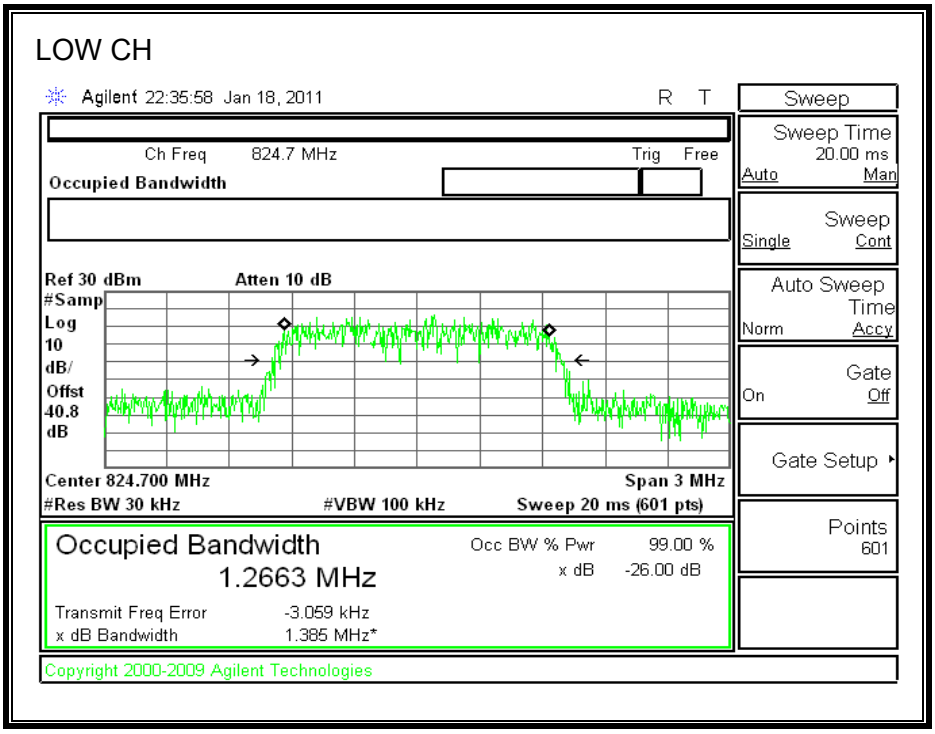
RESULTS

Band	Mode	Channel	f (MHz)	99% BW (MHz)	-26dB BW MHz)
Cellular	1xRTT	1013	824.70	1.2663	1.385
		384	836.52	1.2675	1.424
		777	848.31	1.2642	1.396
	CDMA2000 1xEV-DO Revision A (Rev. A)	1013	824.70	1.2685	1.384
		384	836.52	1.2551	1.402
		777	848.31	1.2724	1.376
PCS	1xRTT	25	1851.25	1.2717	1.385
		600	1880.0	1.2709	1.416
		1175	1908.75	1.2706	1.415
	CDMA2000 1xEV-DO Revision A (Rev. A)	25	1851.25	1.2722	1.415
		600	1880.0	1.2697	1.399
		1175	1908.75	1.2789	1.399

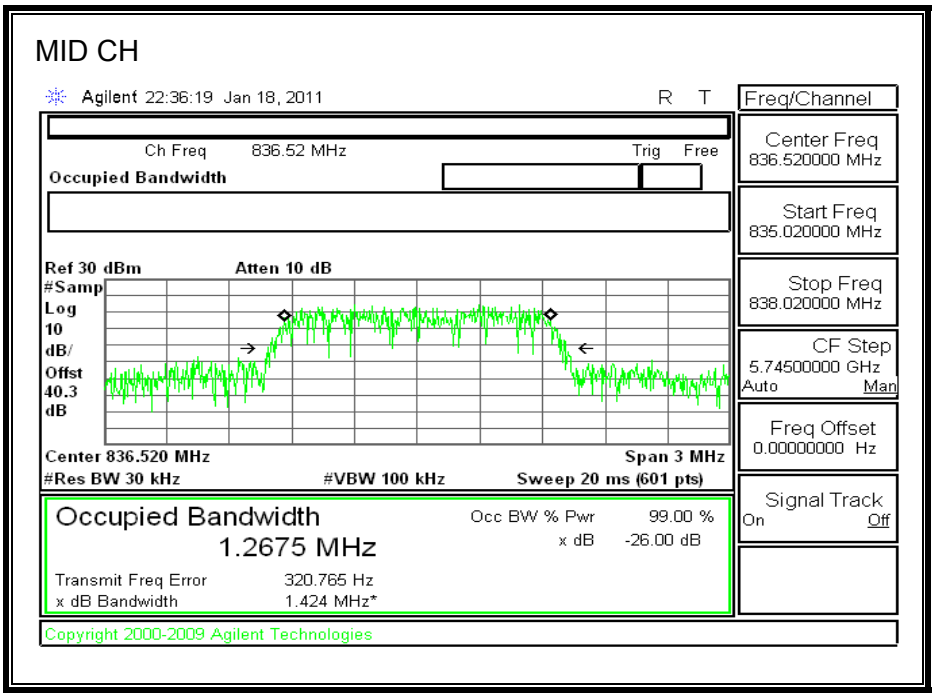
CDMA2000 1xRTT Mode (Cellular Band)

99% BANDWIDTH and 26dB

LOW CH



MID CH



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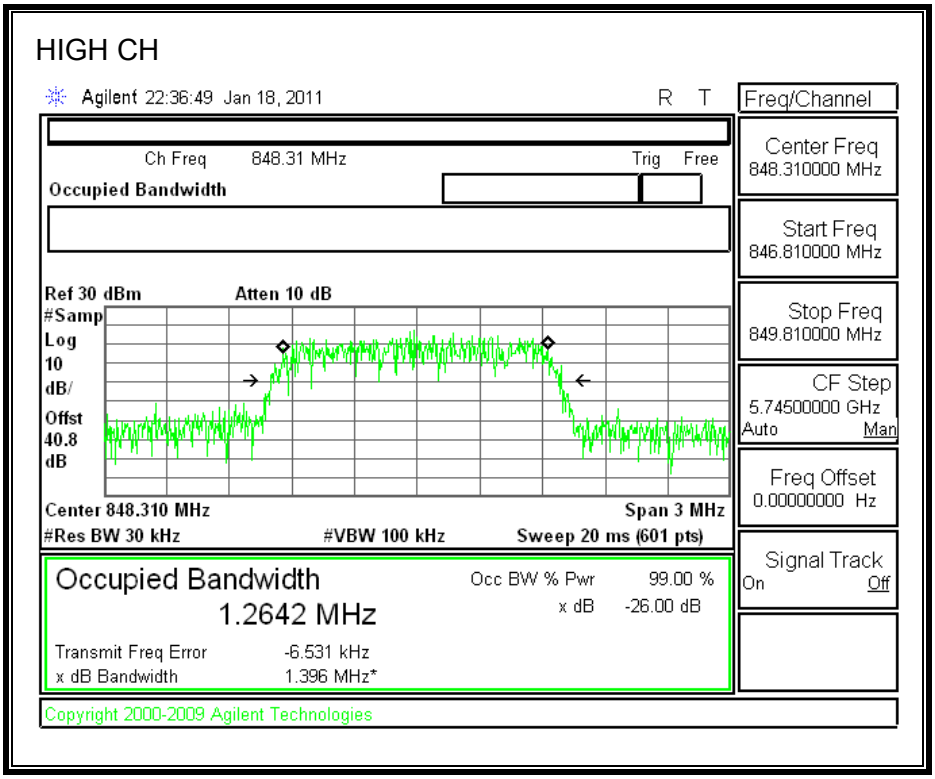
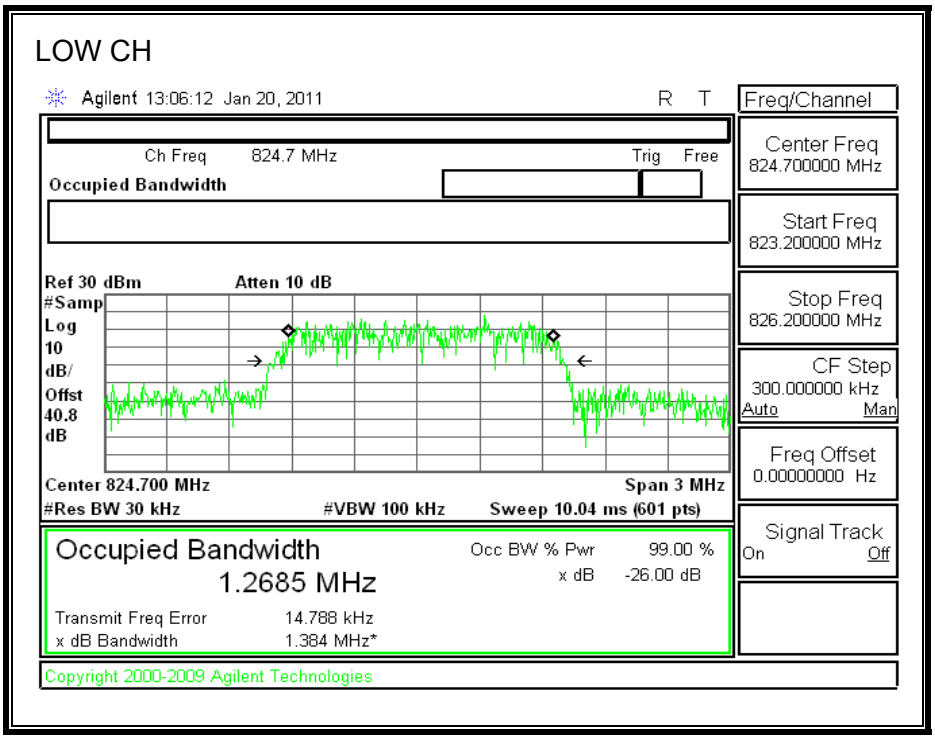


CDMA2000 1xEV-DO Revision A (Rev. A) Cellular Band

LOW CH



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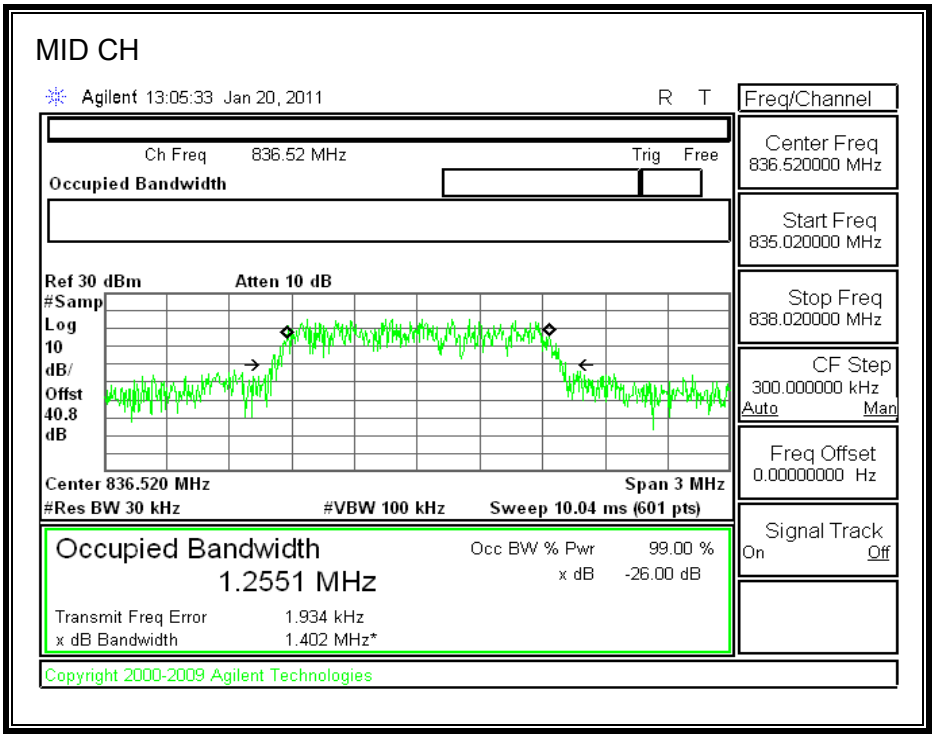

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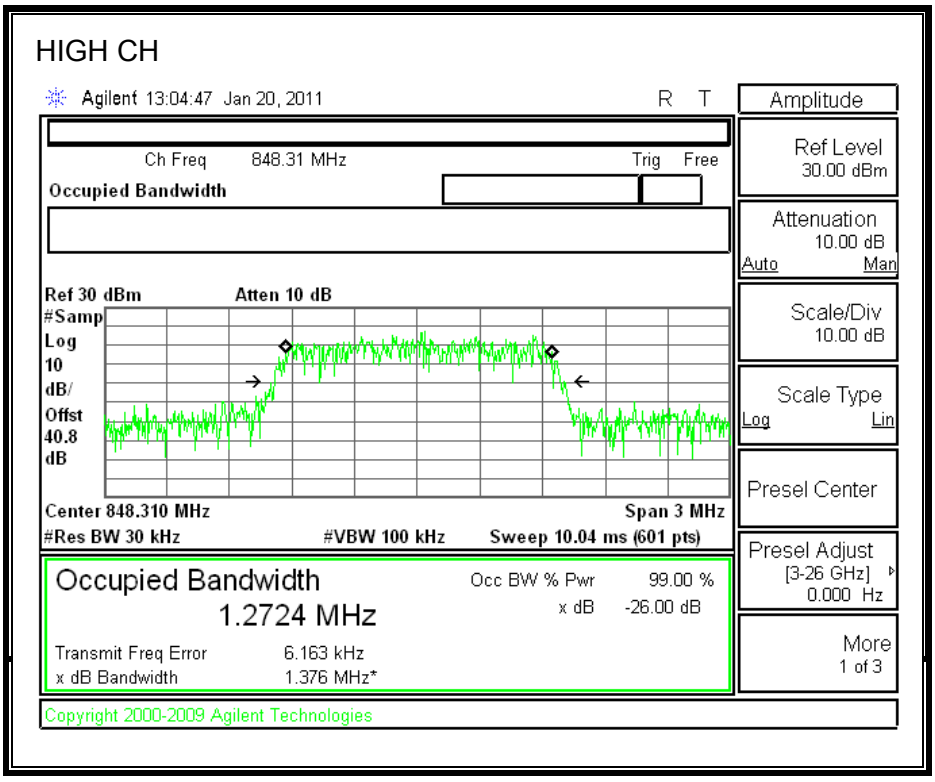

CDMA2000 1xRTT Mode (PCS Band)

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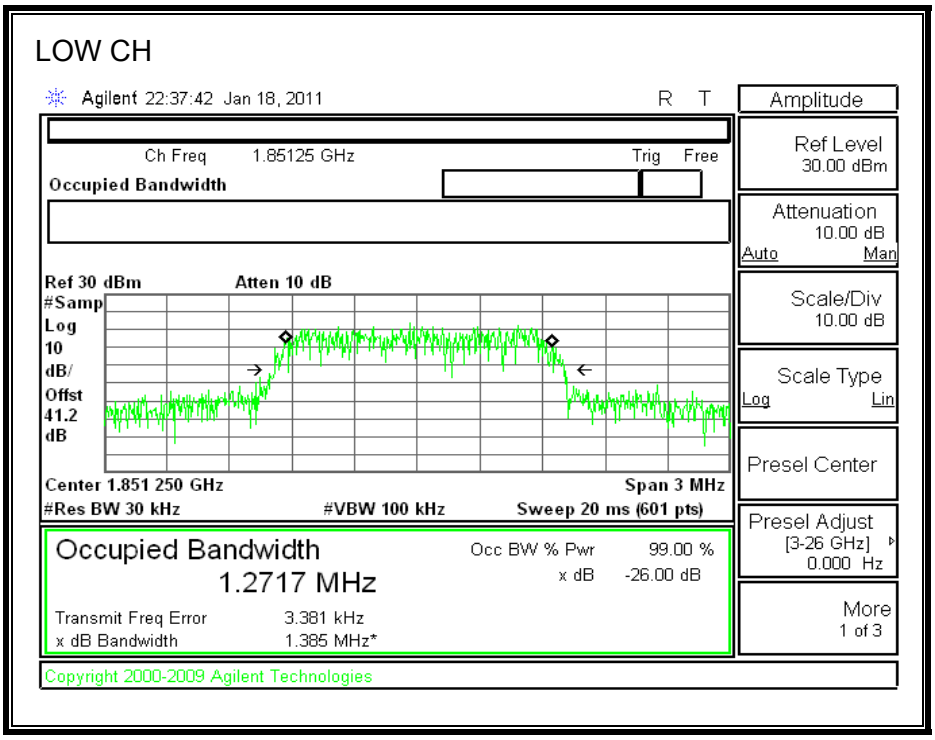

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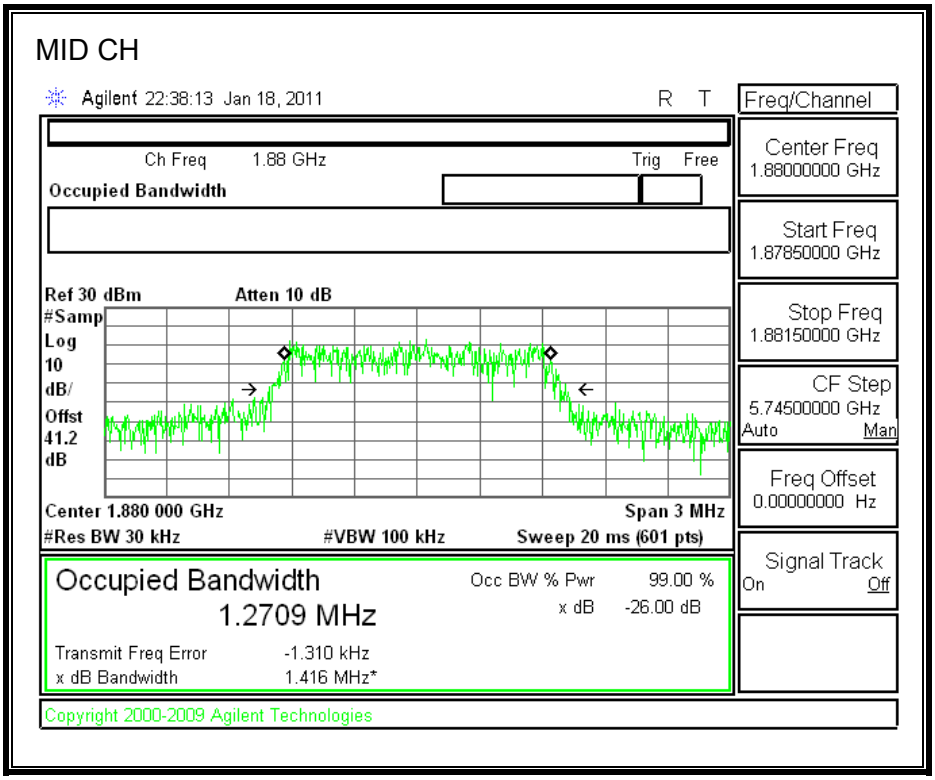

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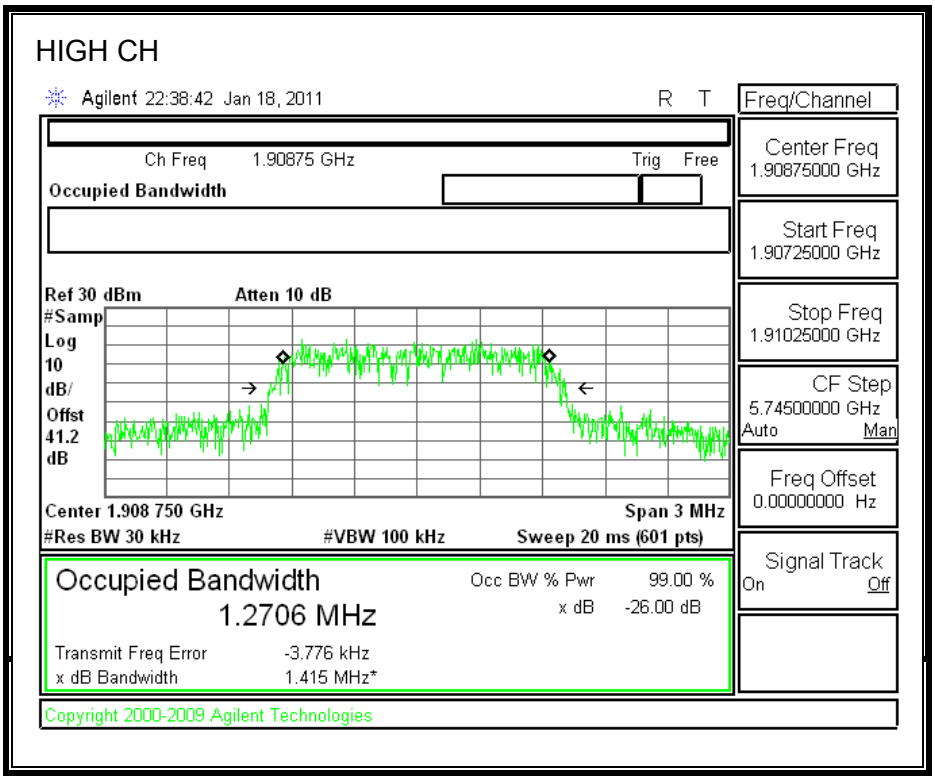
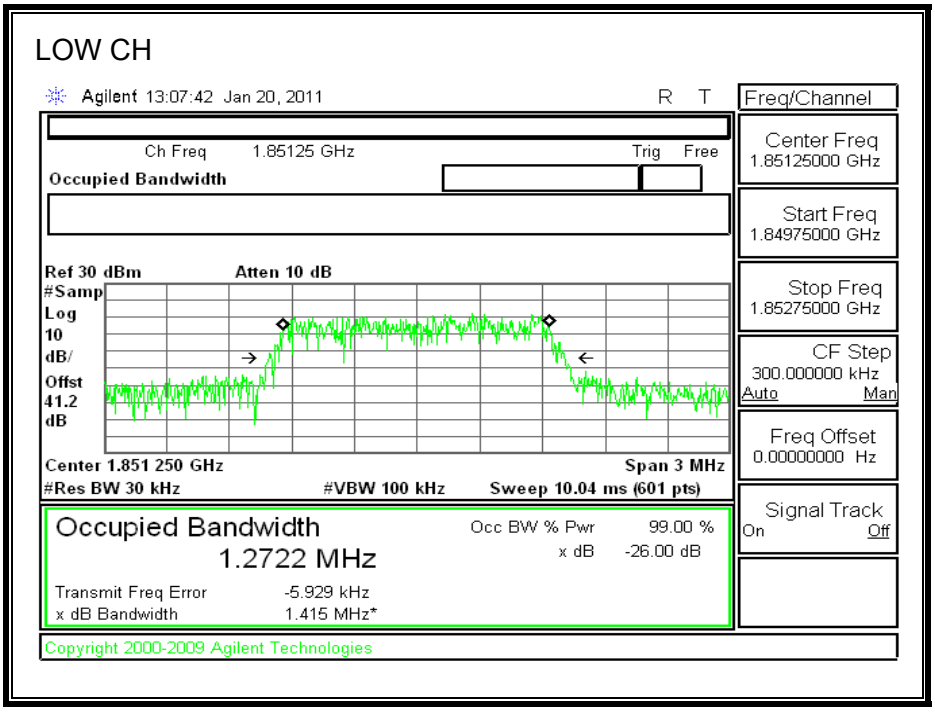


CDMA2000 1xEV-DO Revision A (Rev. A) Mode (PCS Band)

LOW CH



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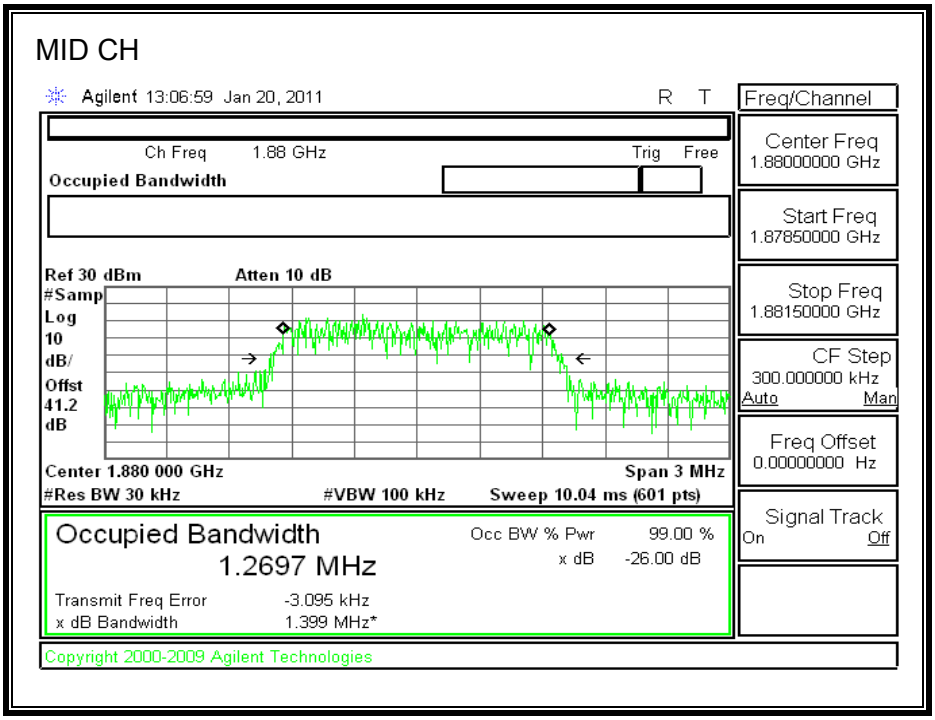

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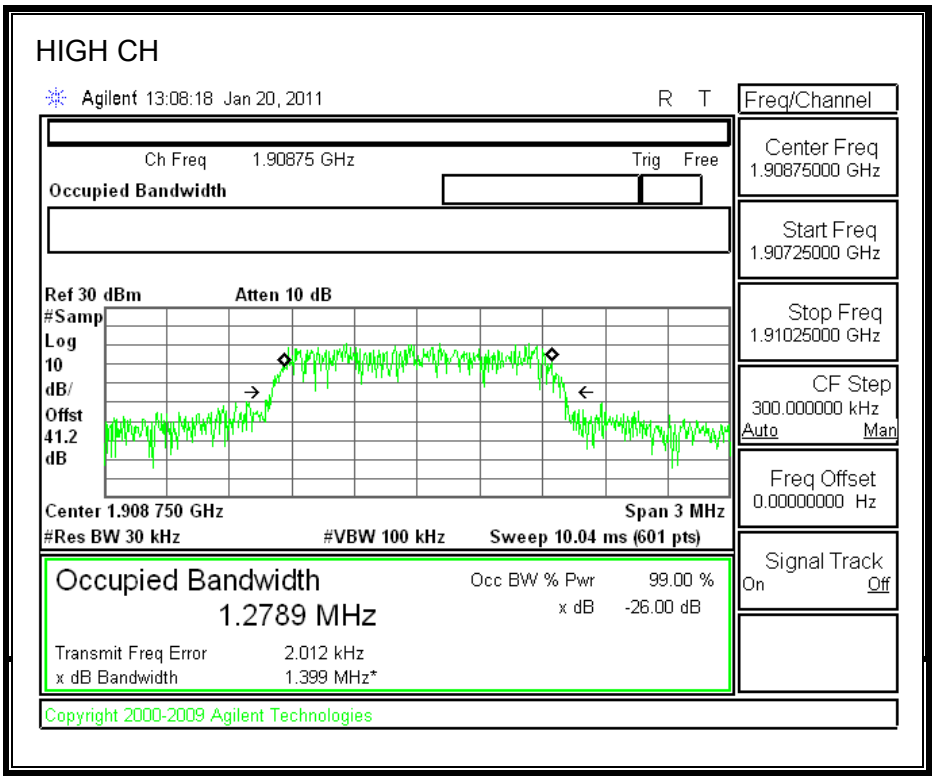


8.2. BAND EDGE

RULE PART(S)

FCC: §22.359, 24.238

LIMITS

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

The transmitter output was connected to a Agilent 8960 Test Set and configured to operate at maximum power. The band edge emissions were measured at the required operating frequencies in each band on the Spectrum Analyzer.
For each band edge measurement:

- Set the spectrum analyzer span to include the block edge frequency (824, 848, 1850, 1910MHz)
- Set a marker to point the corresponding band edge frequency in each test case.
- Set display line at -13 dBm
- Set resolution bandwidth to at least 1% of emission bandwidth.

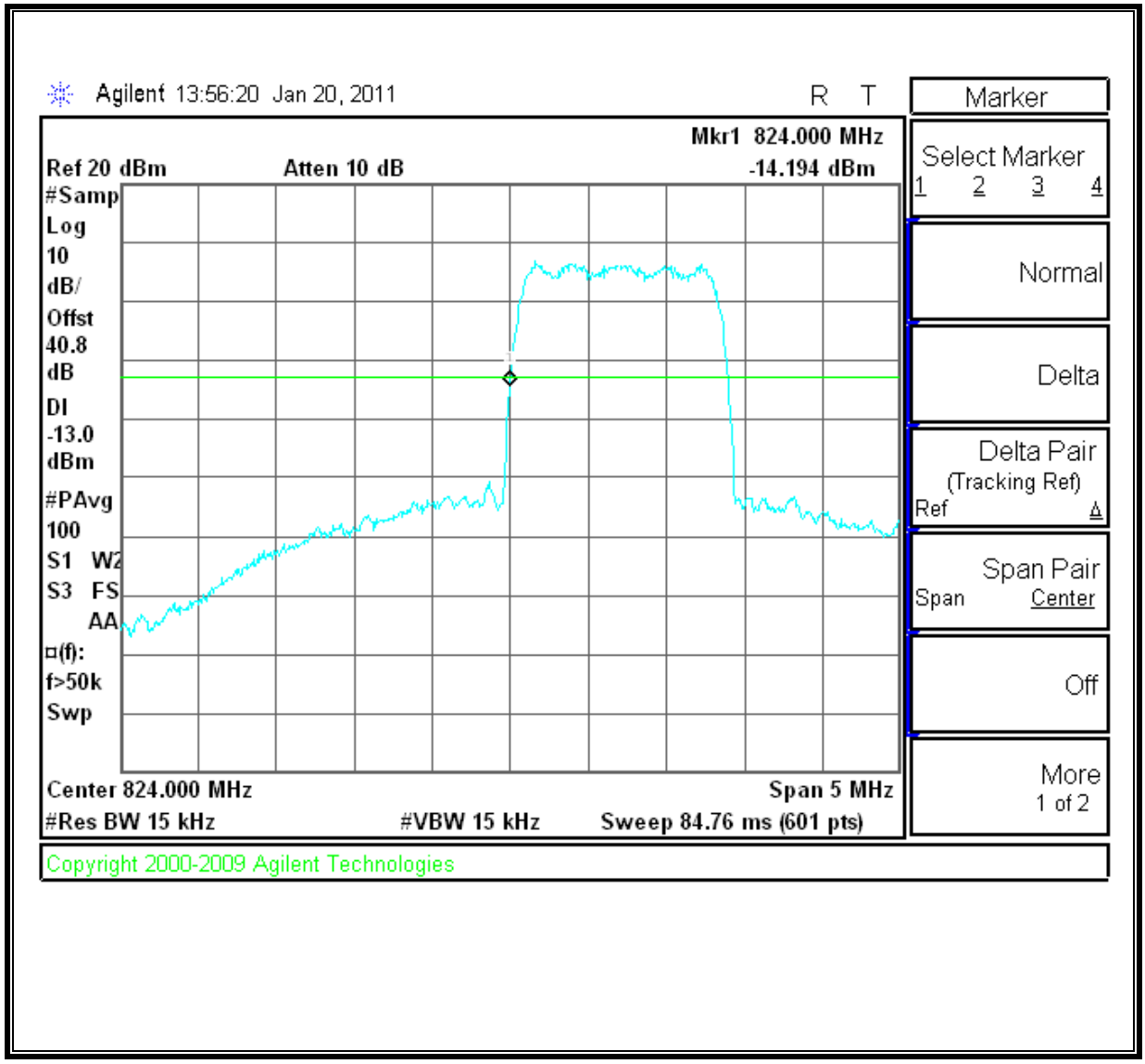
MODES TESTED

- 1xRTT – RC1 SO55
- CDMA2000 1xEV-DO Revision A (Rev. A)

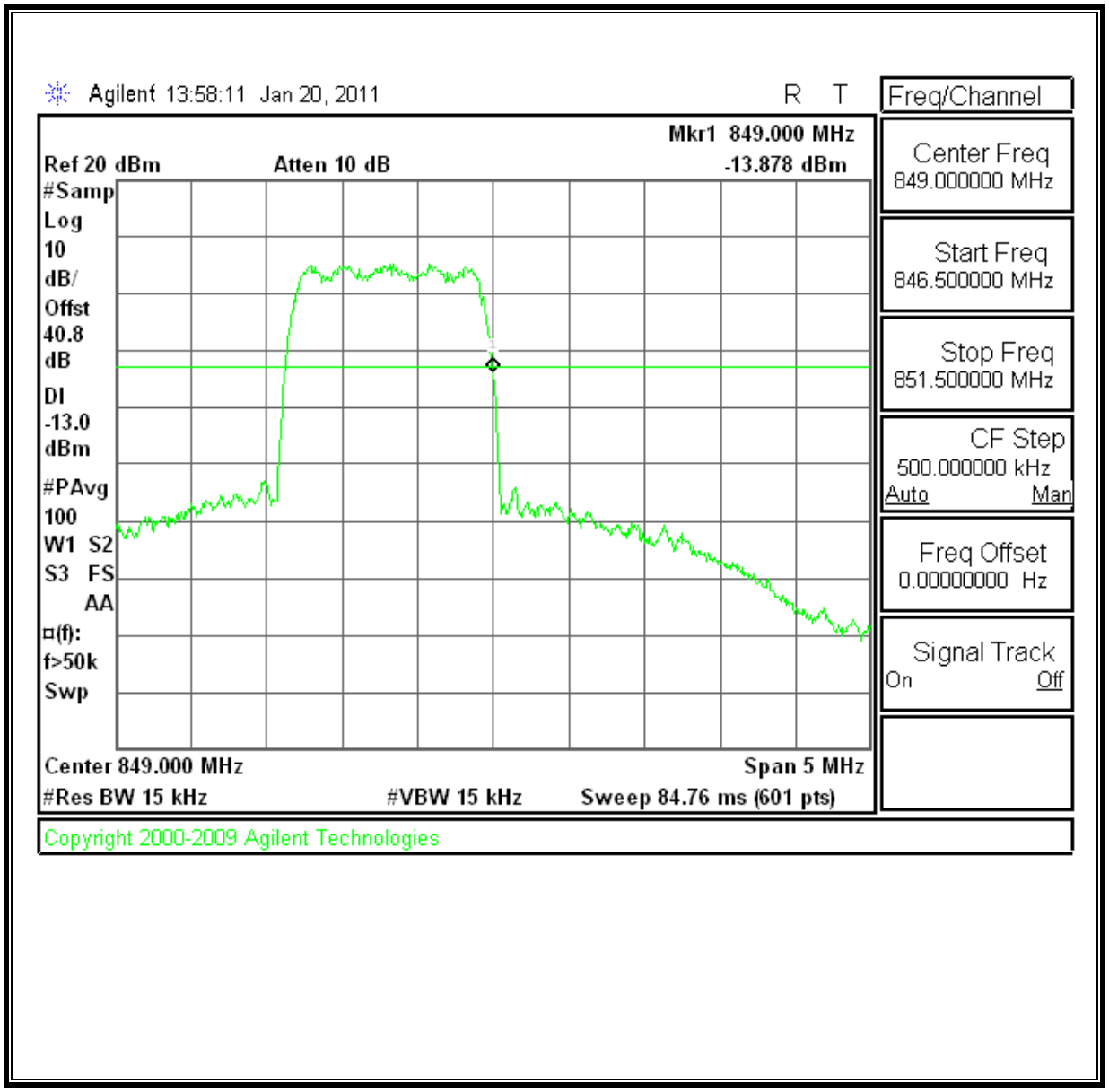
RESULTS

CDMA2000 1xRTT mode (Cellular Band)

Low Channel Band Edge

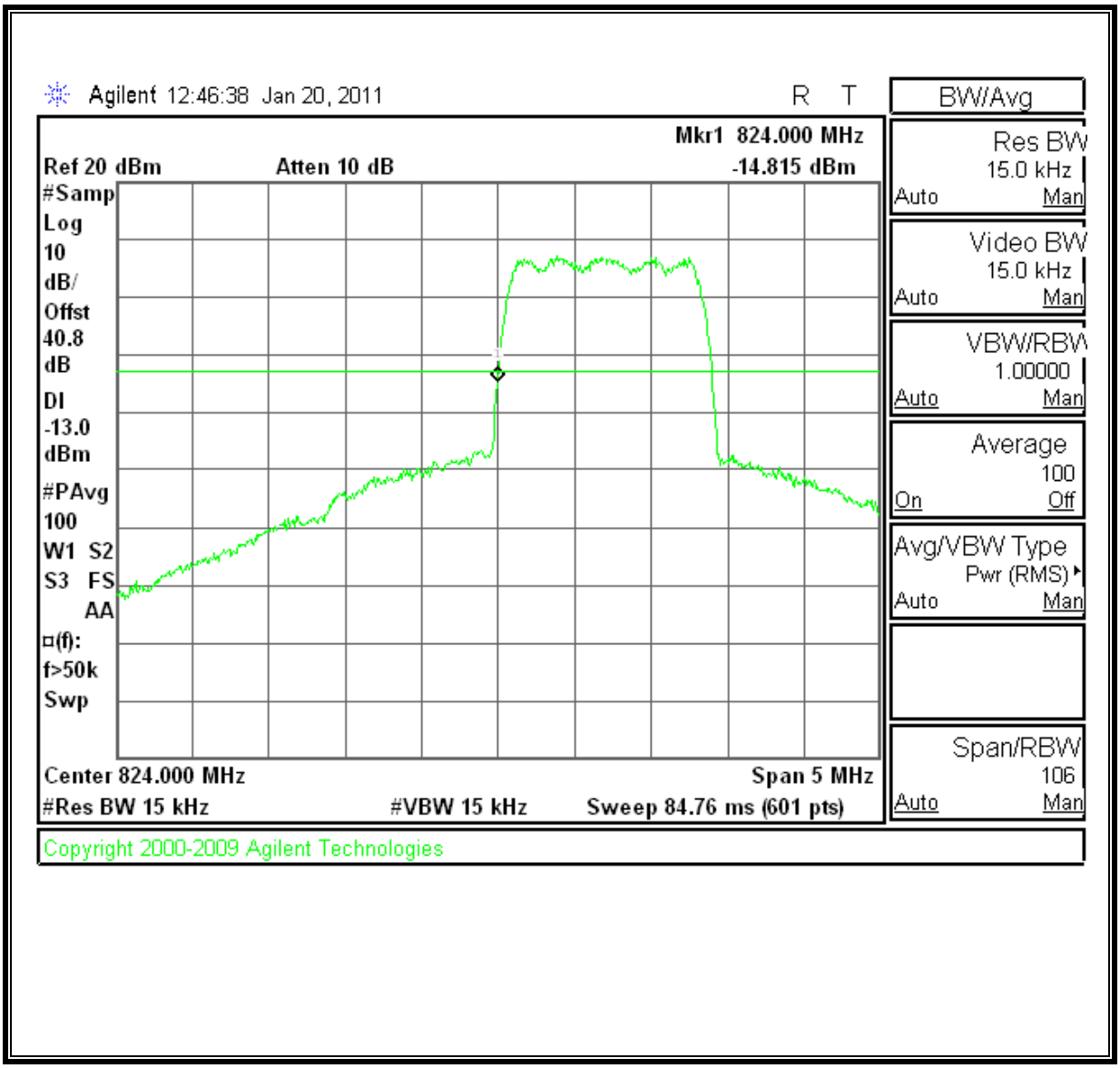


High Channel Band Edge

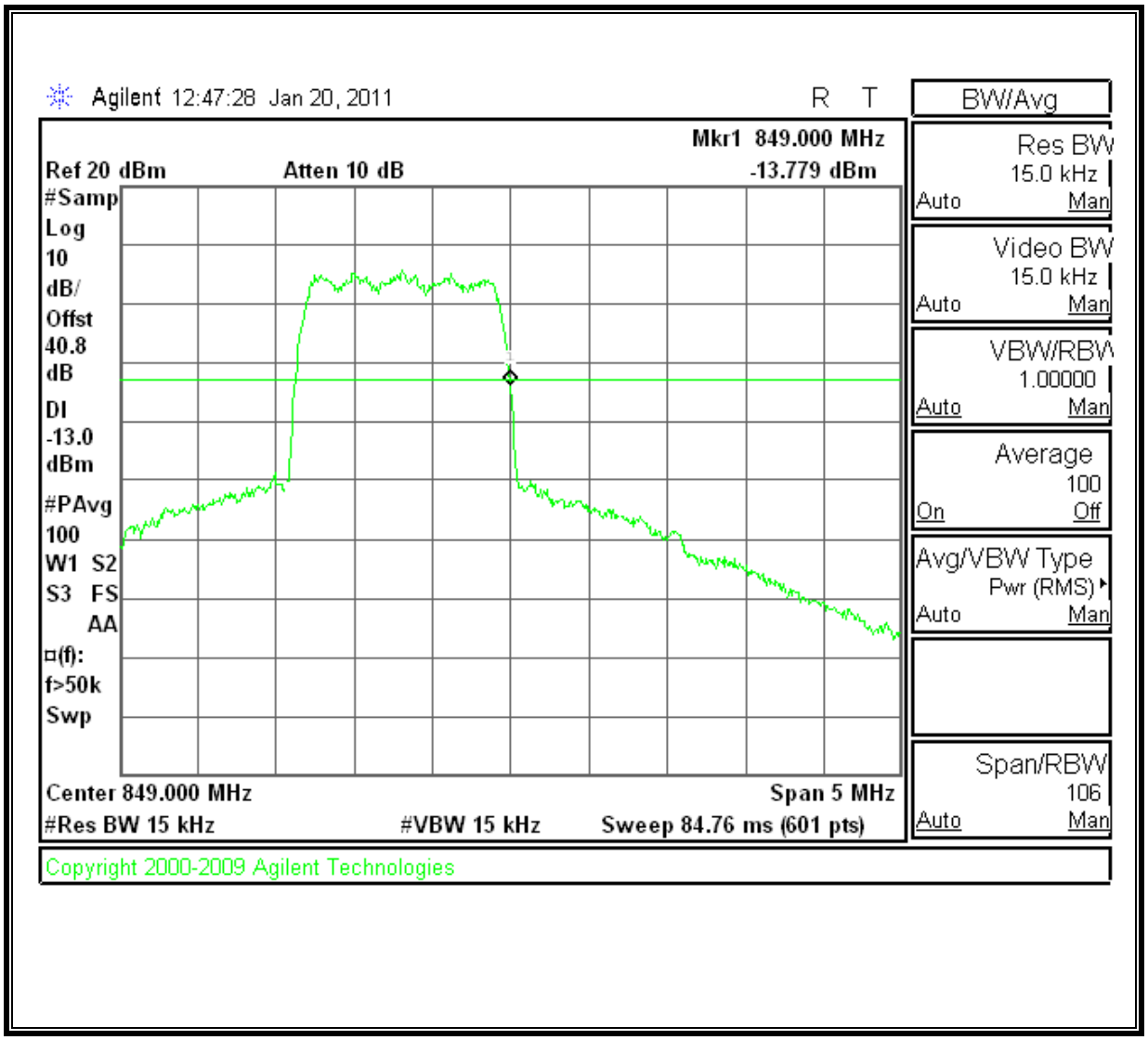


CDMA2000 1xEV-DO Revision A (Rev. A) mode (Cellular Band)

Low Channel Band Edge

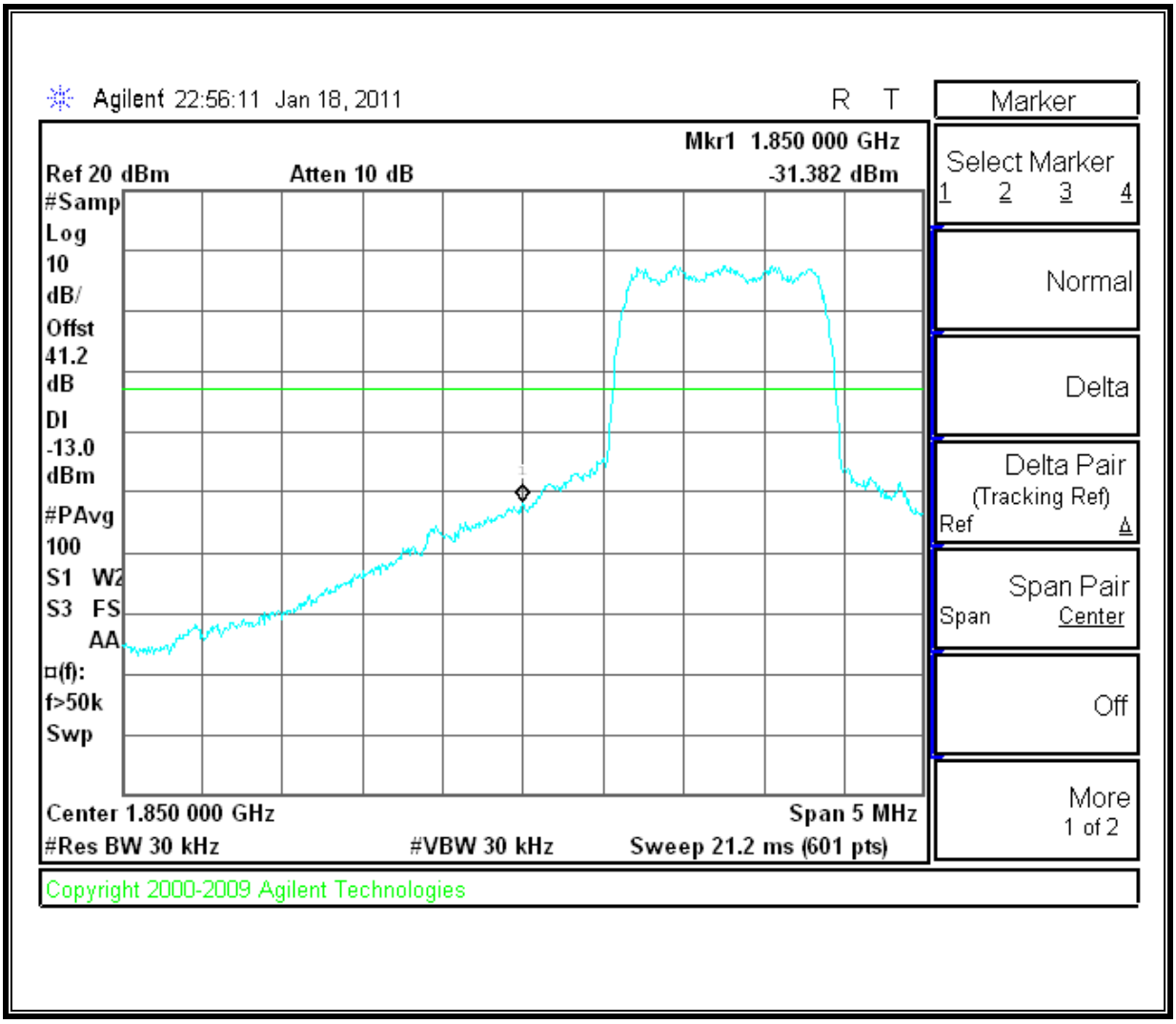


High Channel Band Edge

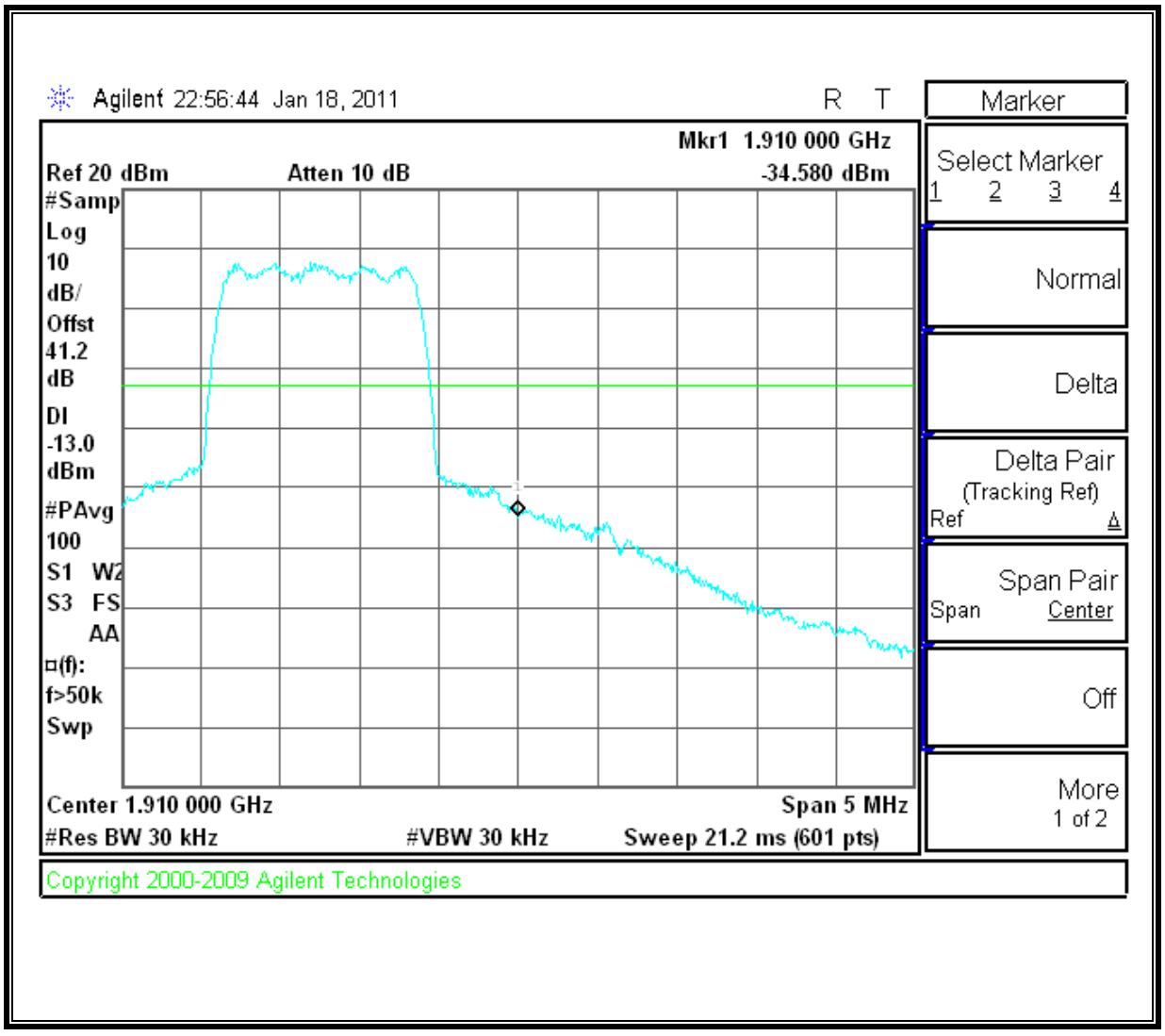


CDMA2000 1xRTT mode (PCS Band)

Low Channel Band Edge

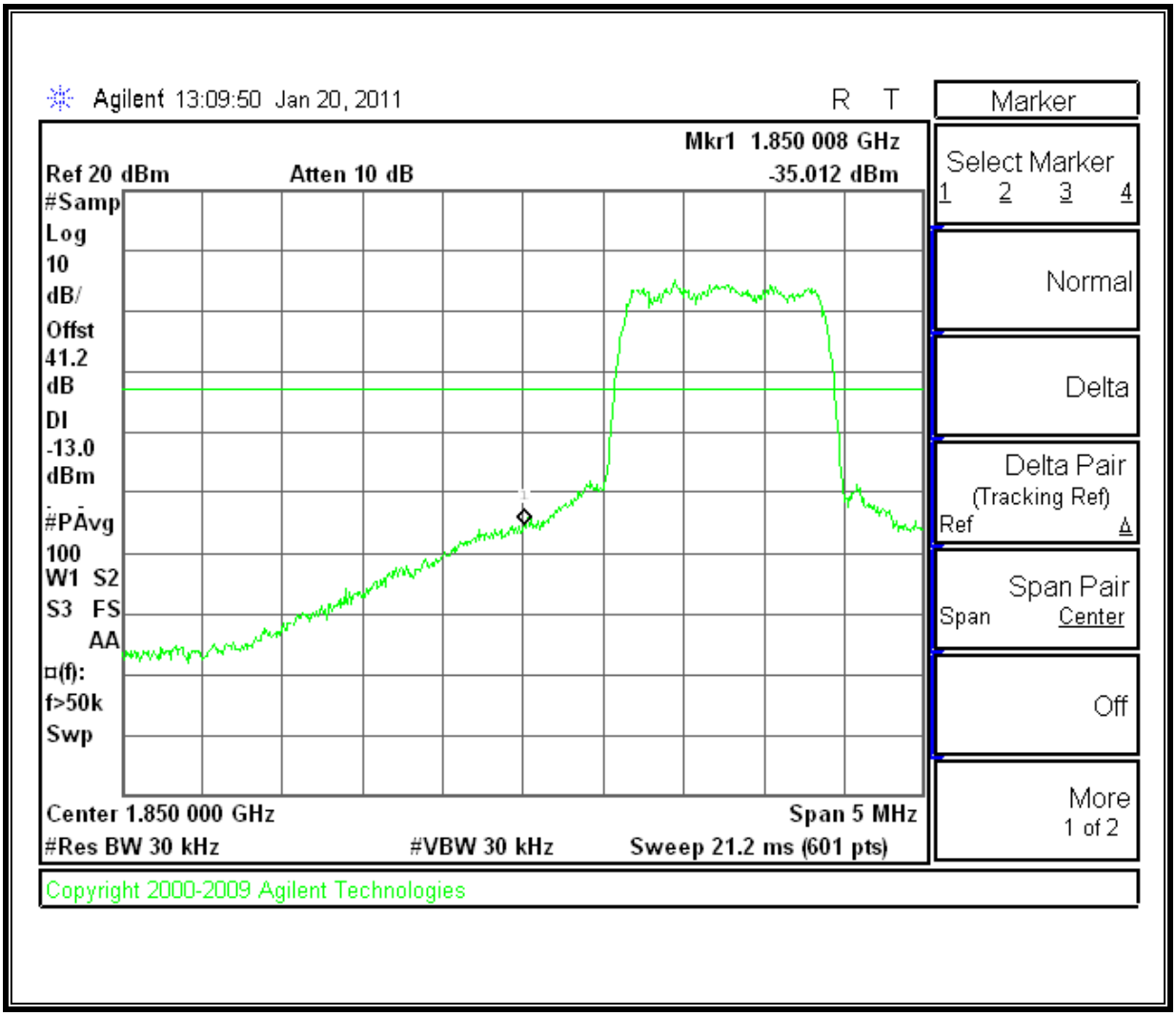


High Channel Band Edge

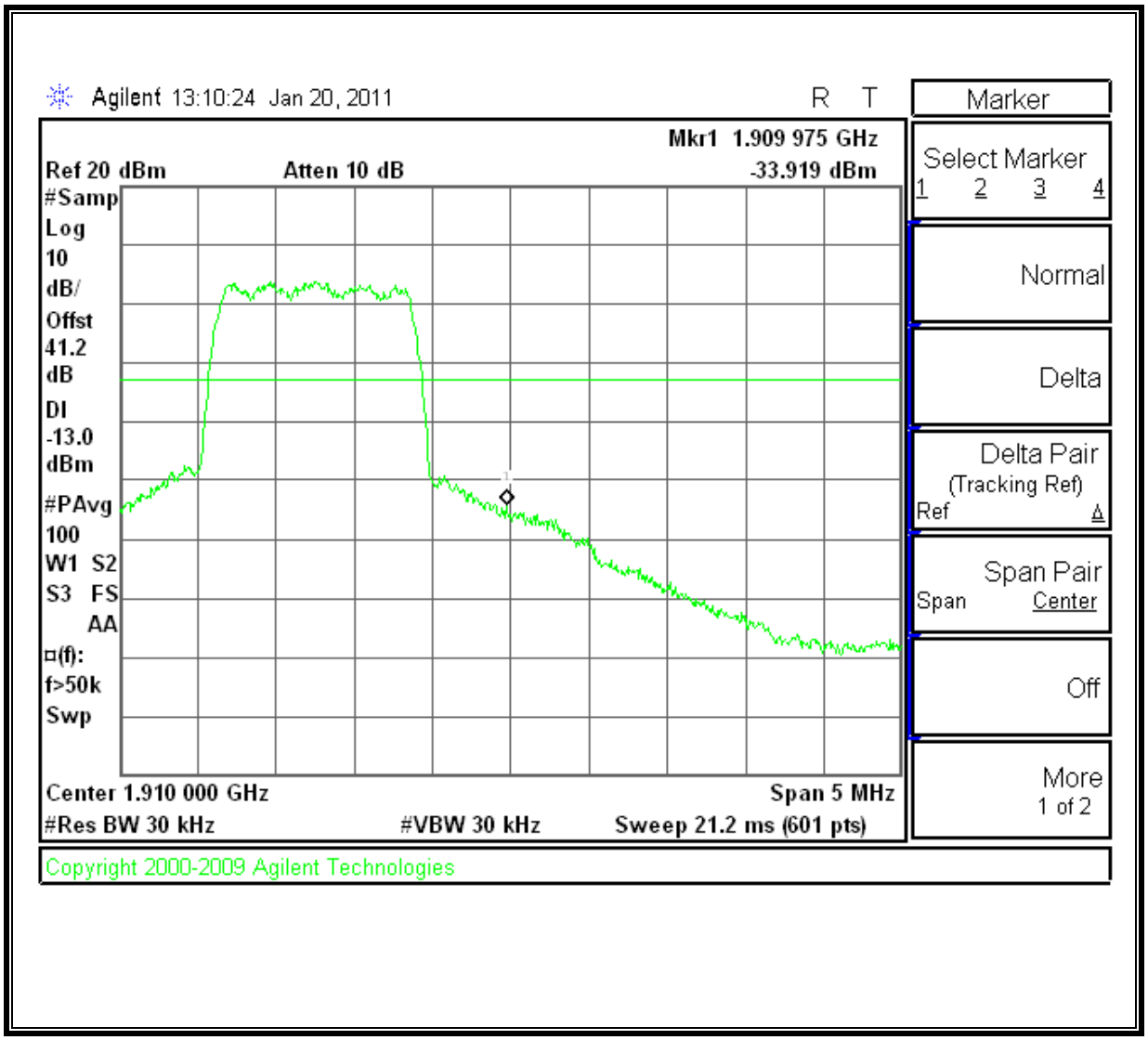


CDMA2000 1xEV-DO Revision A (Rev. A) mode (PCS Band)

Low Channel Band Edge



High Channel Band Edge



8.3. OUT OF BAND EMISSIONS

RULE PART(S)

FCC: §2.1051, §22.901, §22.917, §24.238
IC: RSS-132, 4.5; RSS-133, 6.5

LIMITS

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

The RF output of the transmitter was connected to a spectrum analyzer through a calibrated coaxial cable. Sufficient scans were taken to show the out-of-band Emissions, if any, up to 10th harmonic. Multiple sweeps were recorded in maximum hold mode using a peak detector to ensure that the worst-case emissions were caught.

For each out of band emissions measurement:

- Set display line at -13 dBm
- Set RBW & VBW to 100 kHz for the measurement below 1 GHz, and 1 MHz for the measurement above 1 GHz.

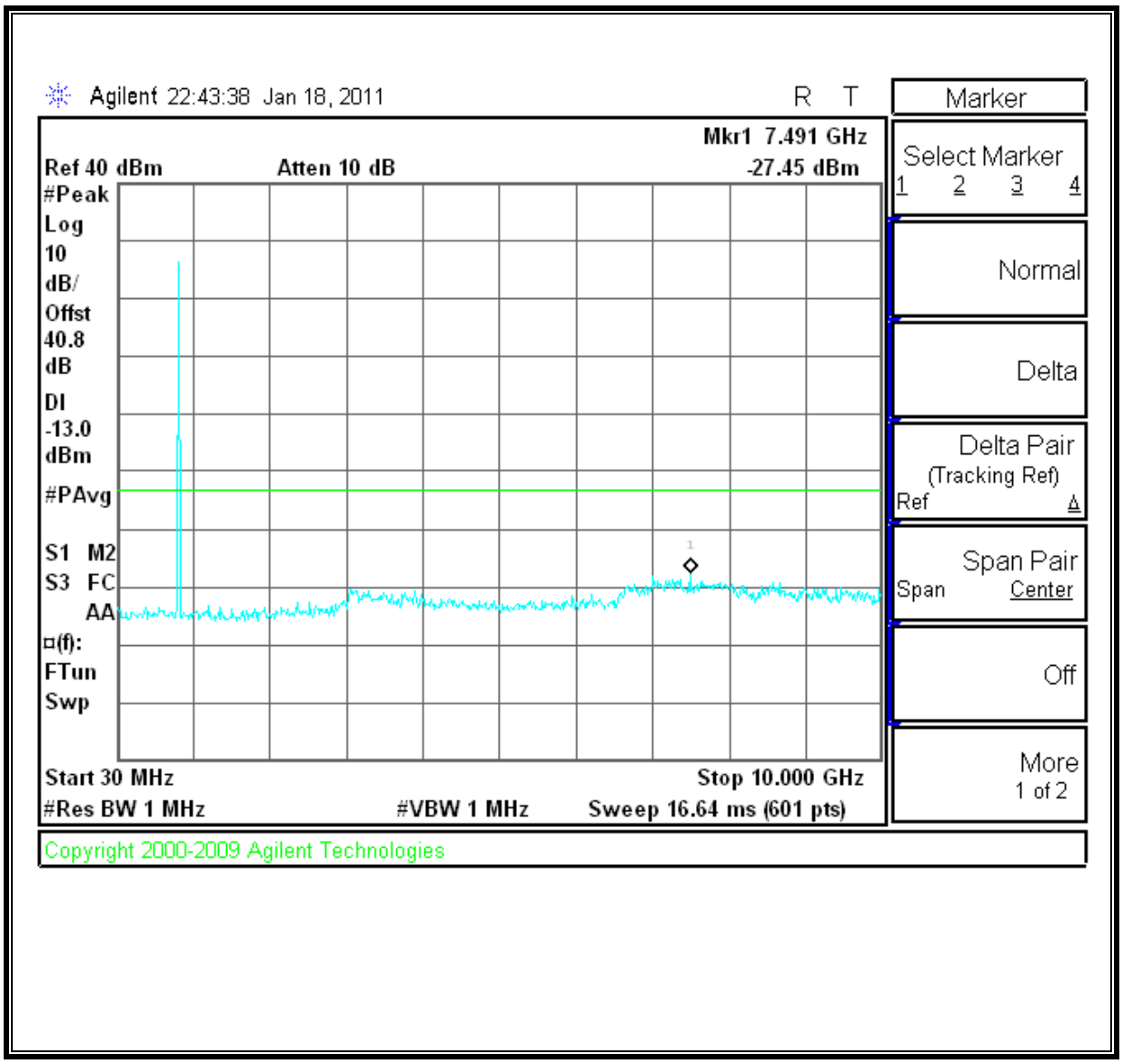
MODES TESTED

- 1xRTT – RC1, SO55
- CDMA2000 1xEV-DO Revision A (Rev. A)

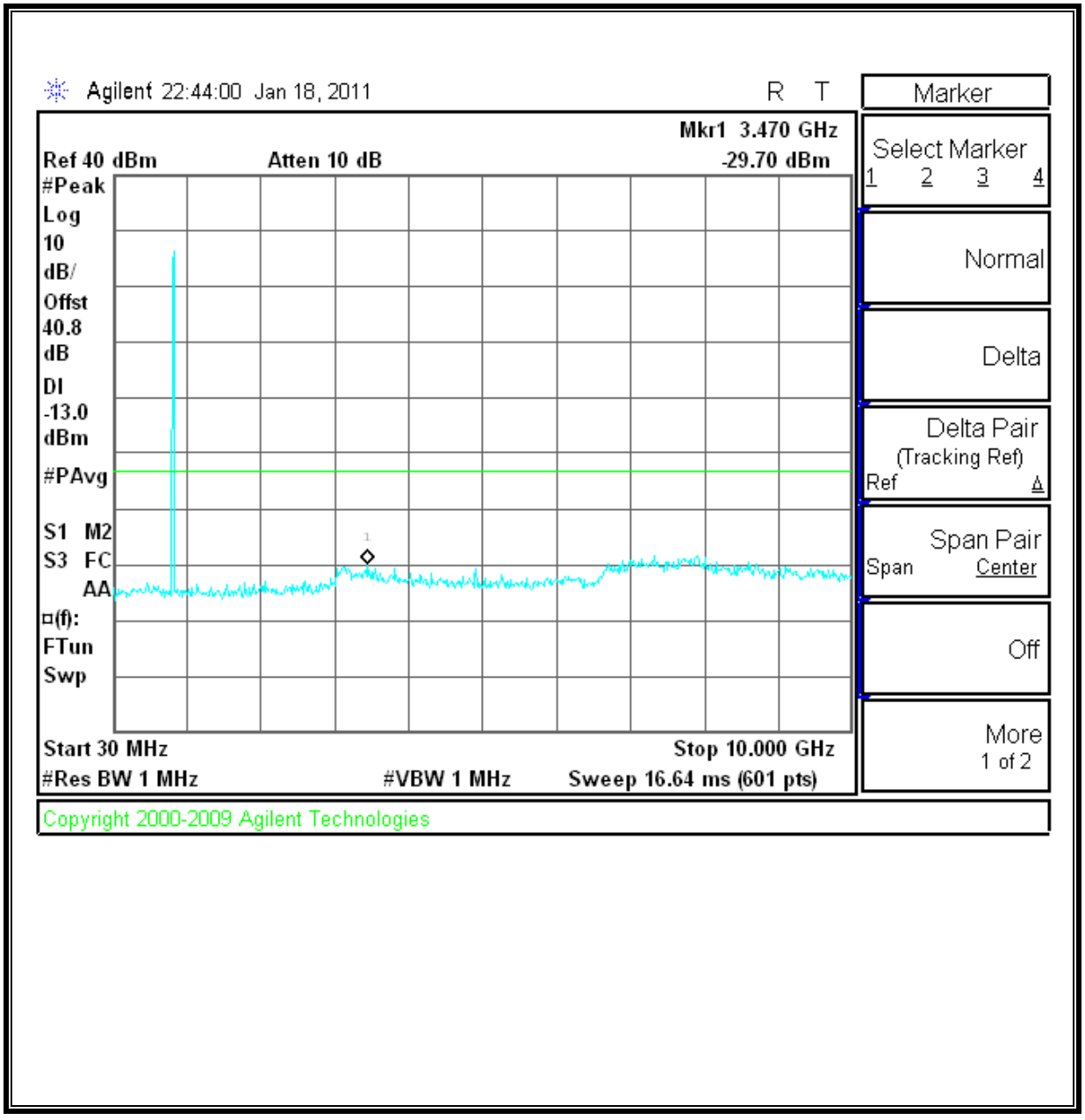
RESULTS

1xRTT Mode (Cellular Band)

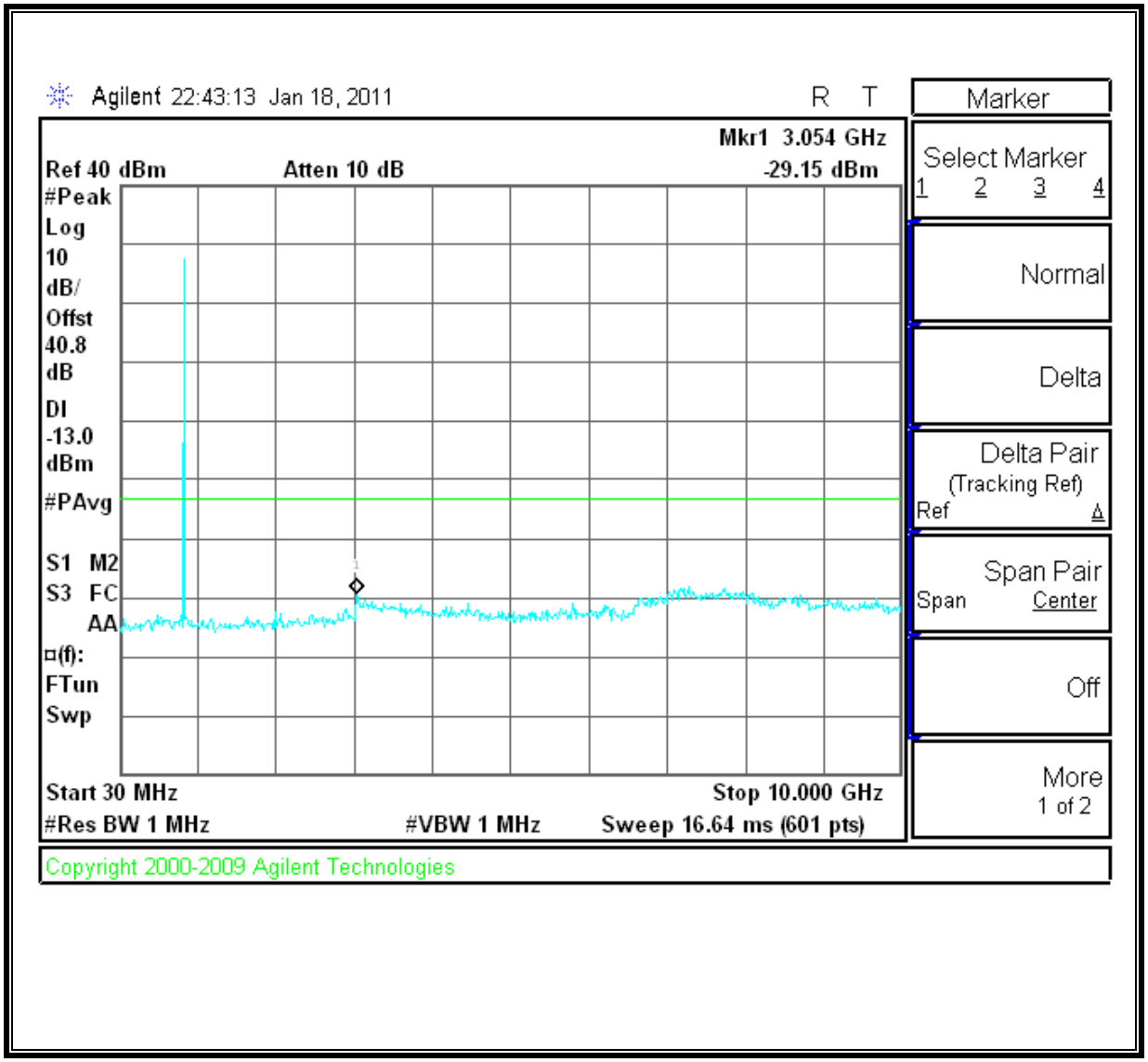
LOW CHANNEL



MID CHANNEL

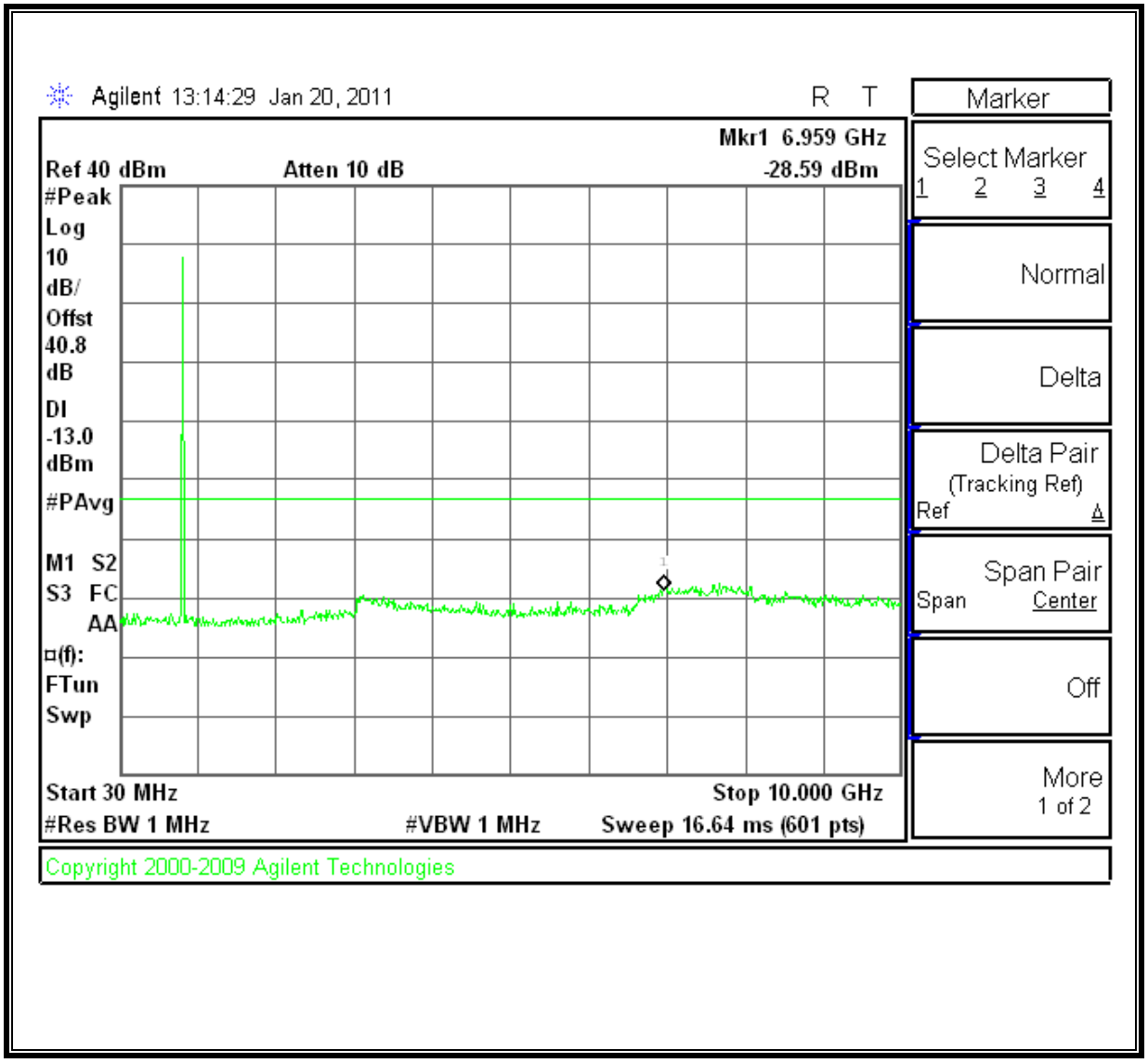


High Channel

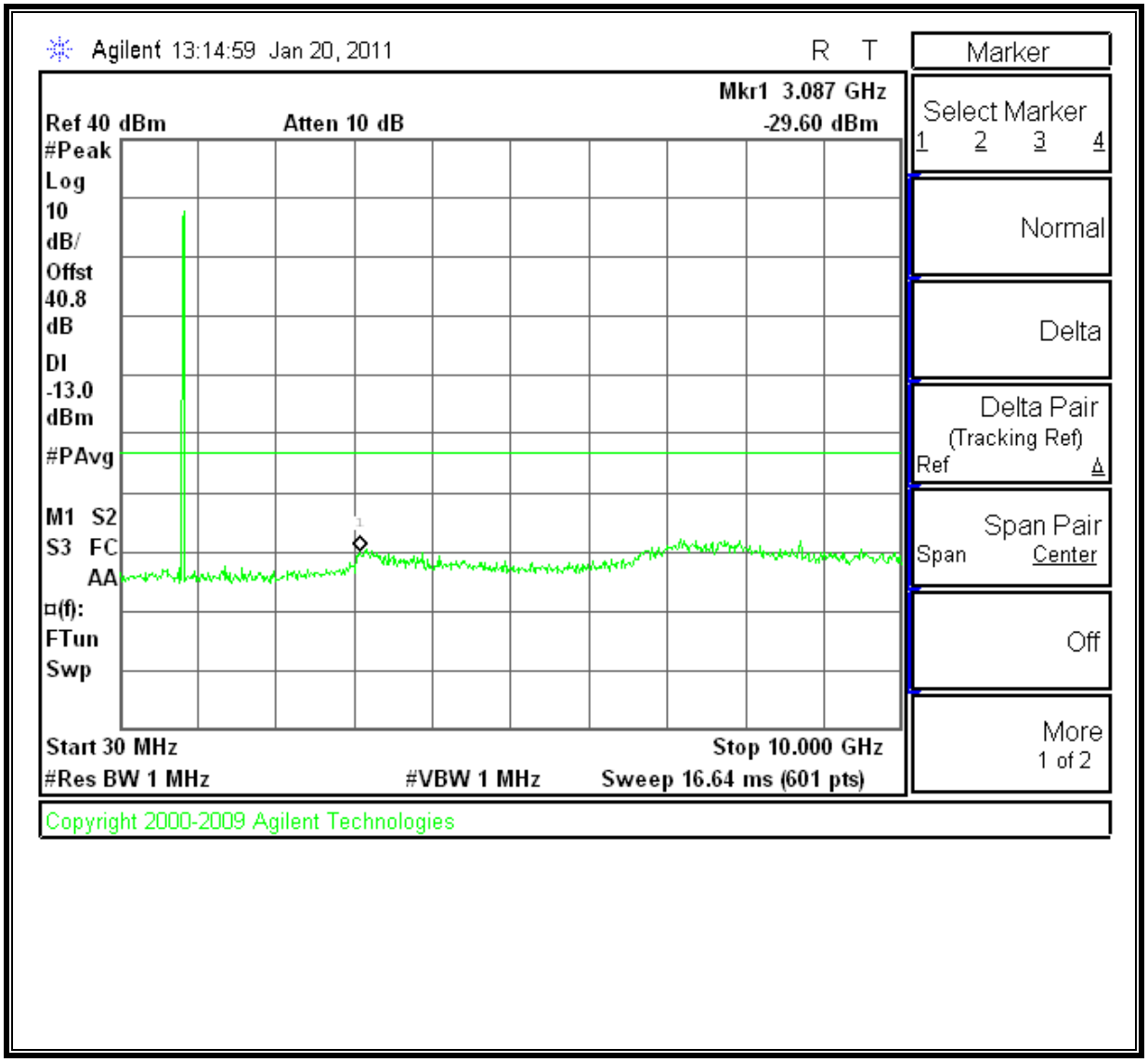


CDMA2000 1xEV-DO Revision A (Rev. A) Mode (Cellular Band)

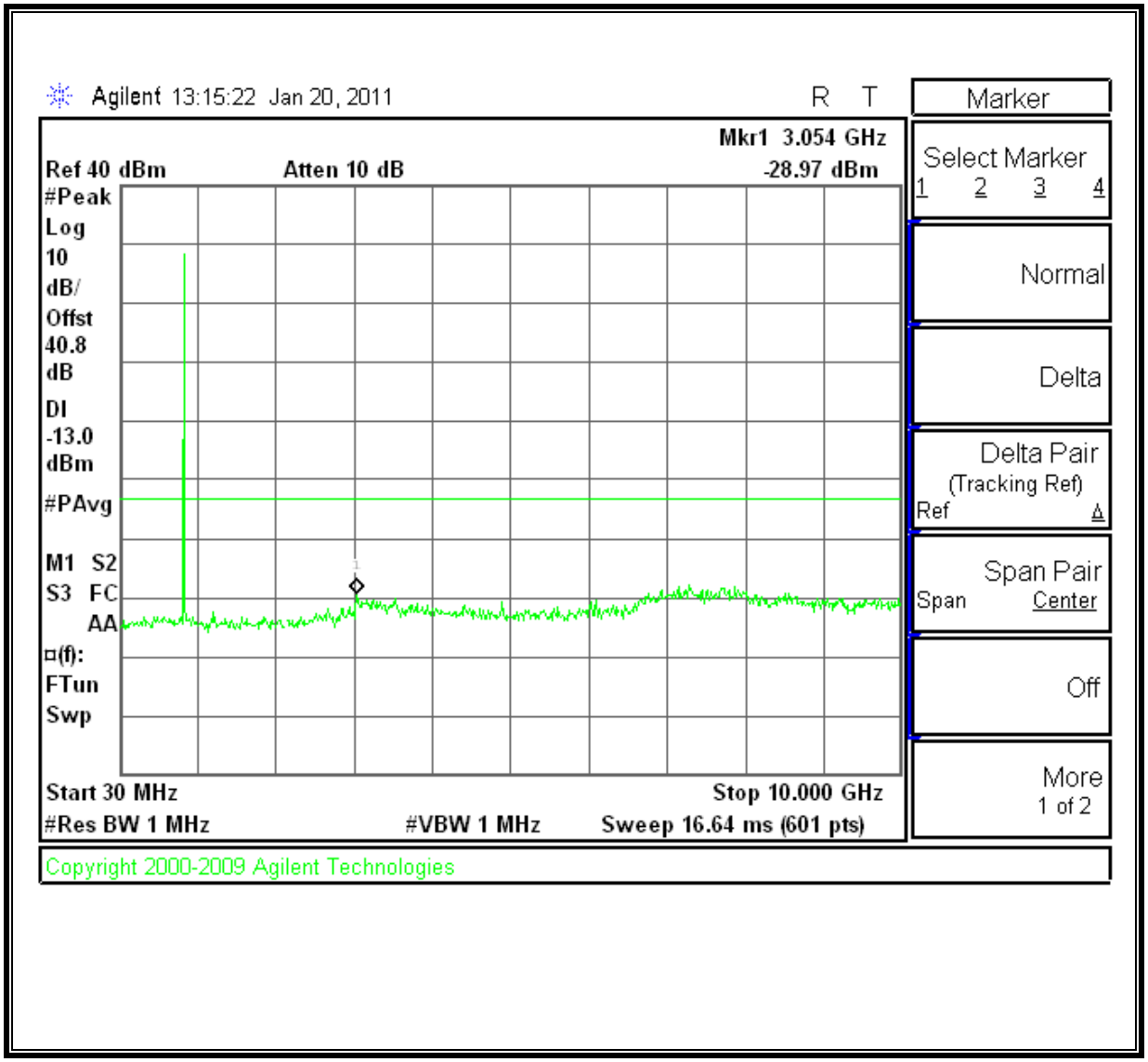
LOW CHANNEL



MID CHANNEL

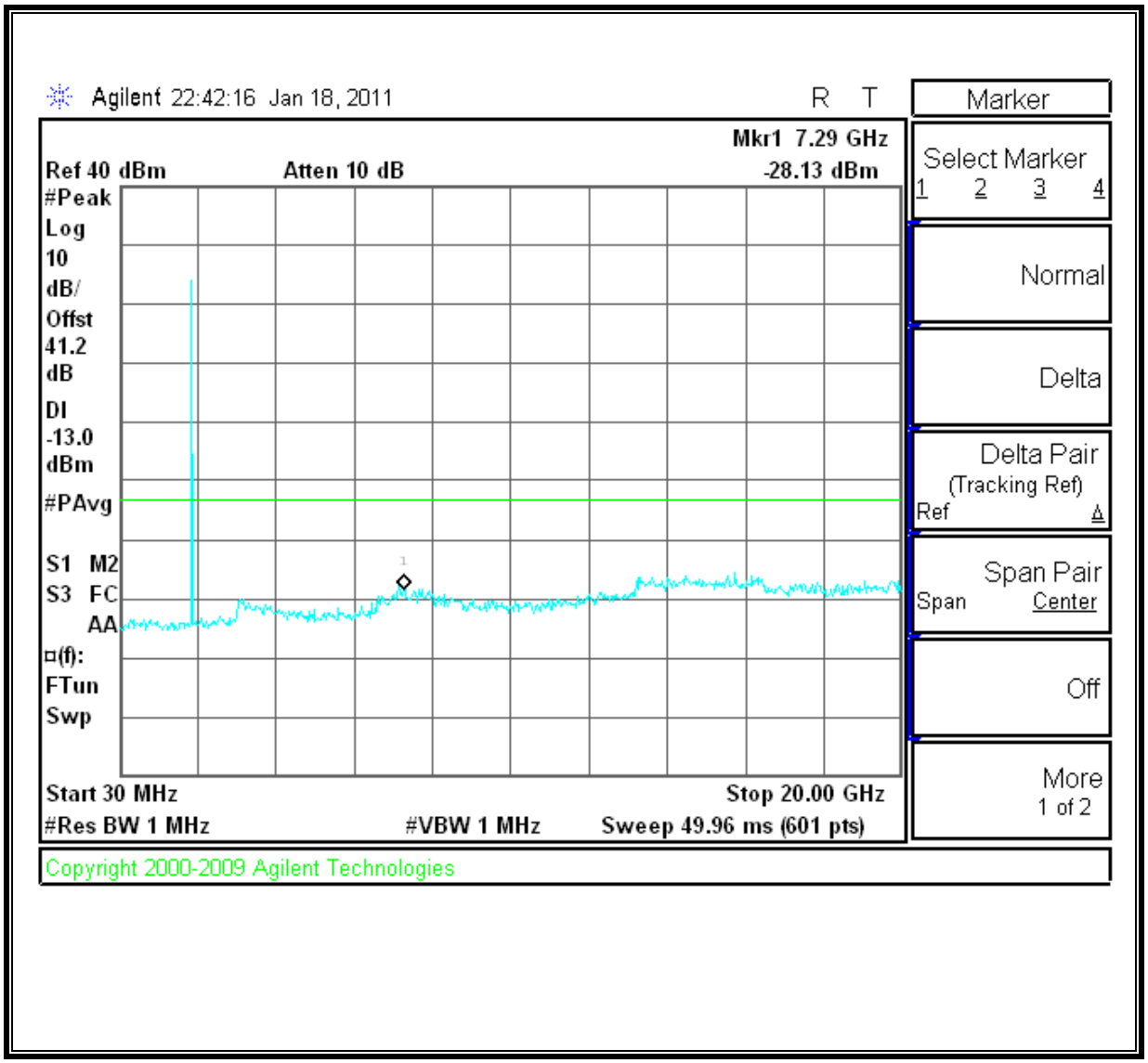


HIGH CHANNEL

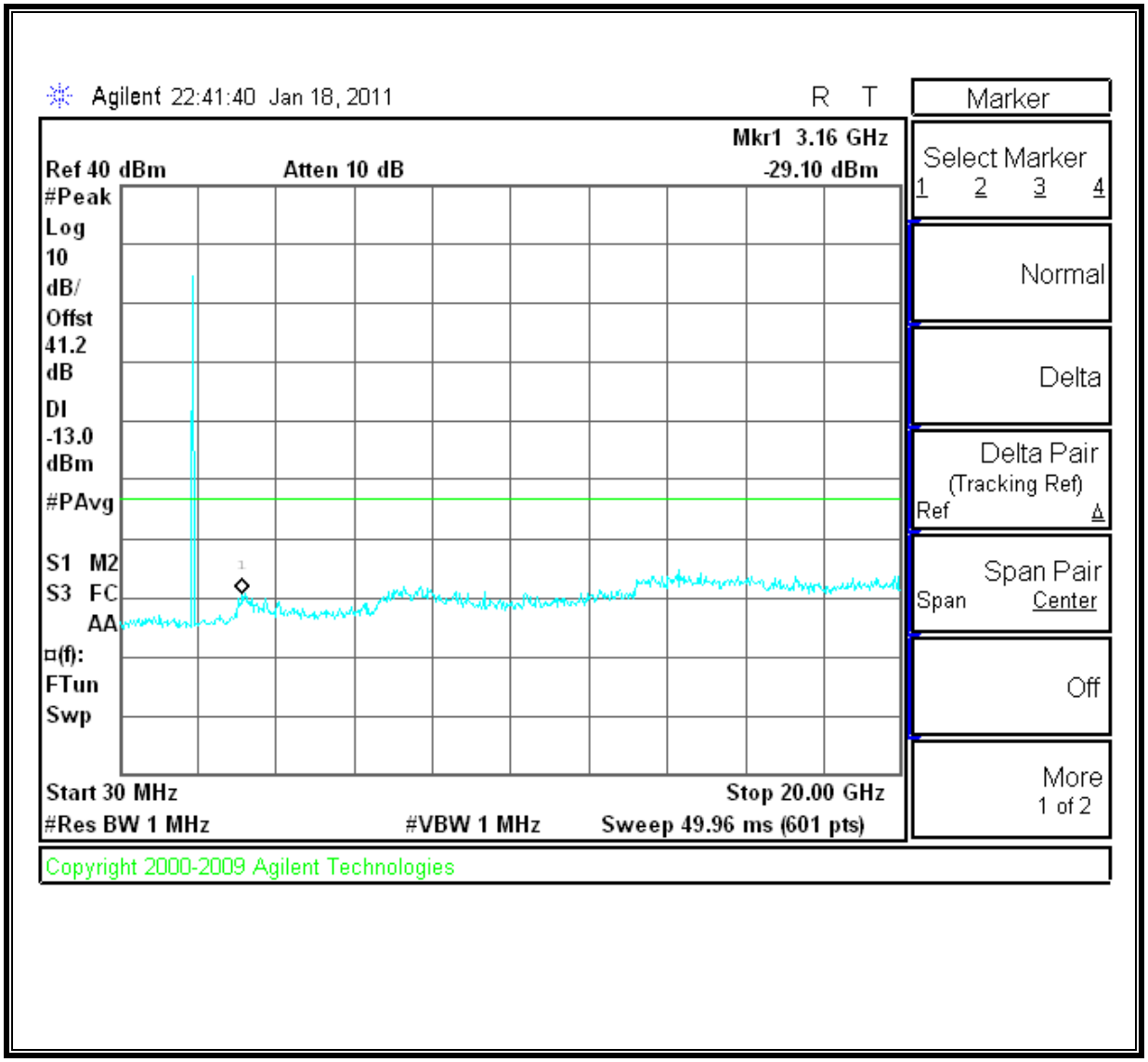


1xRTT Mode (PCS Band)

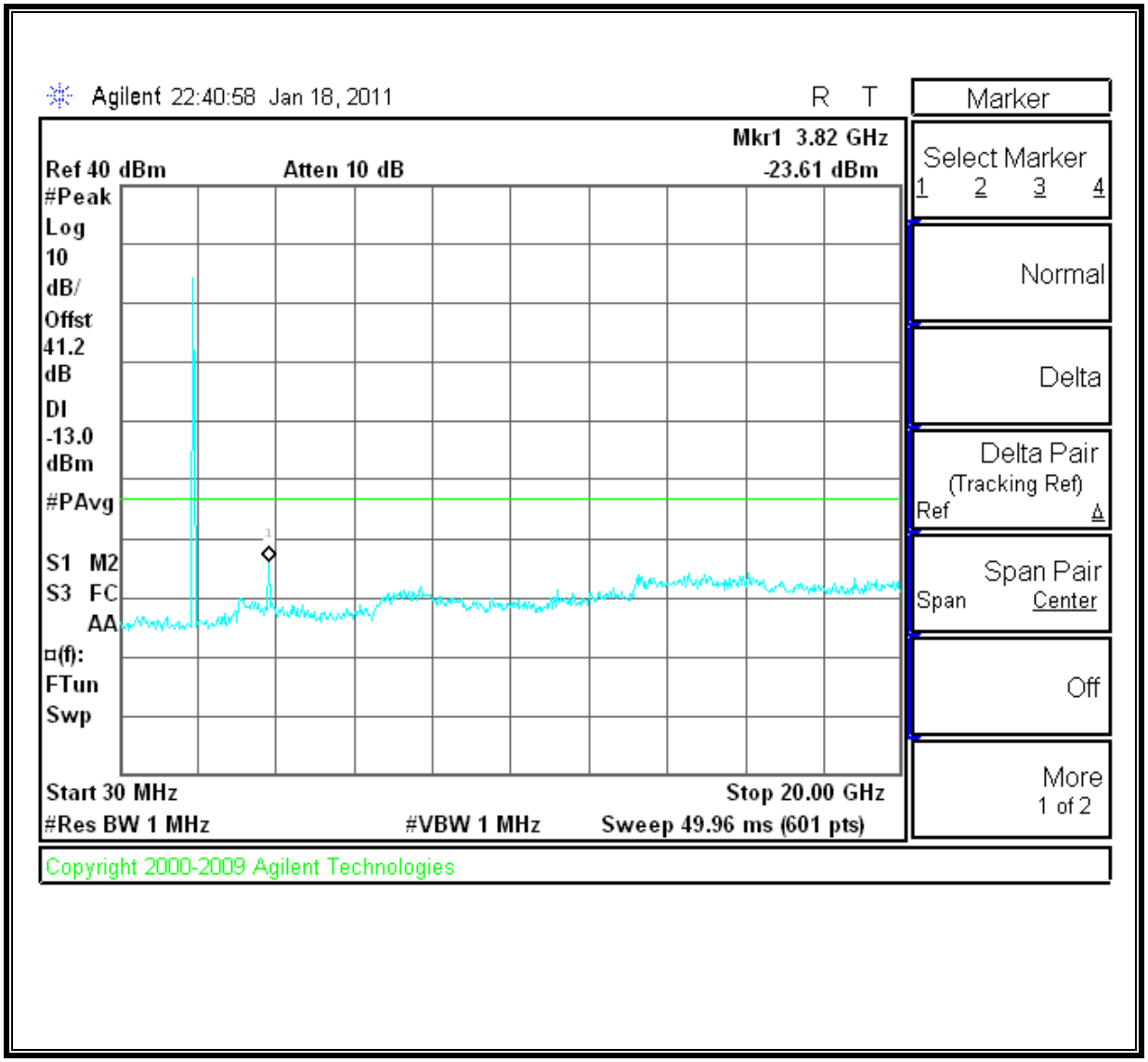
LOW CHANNEL



MID CHANNEL

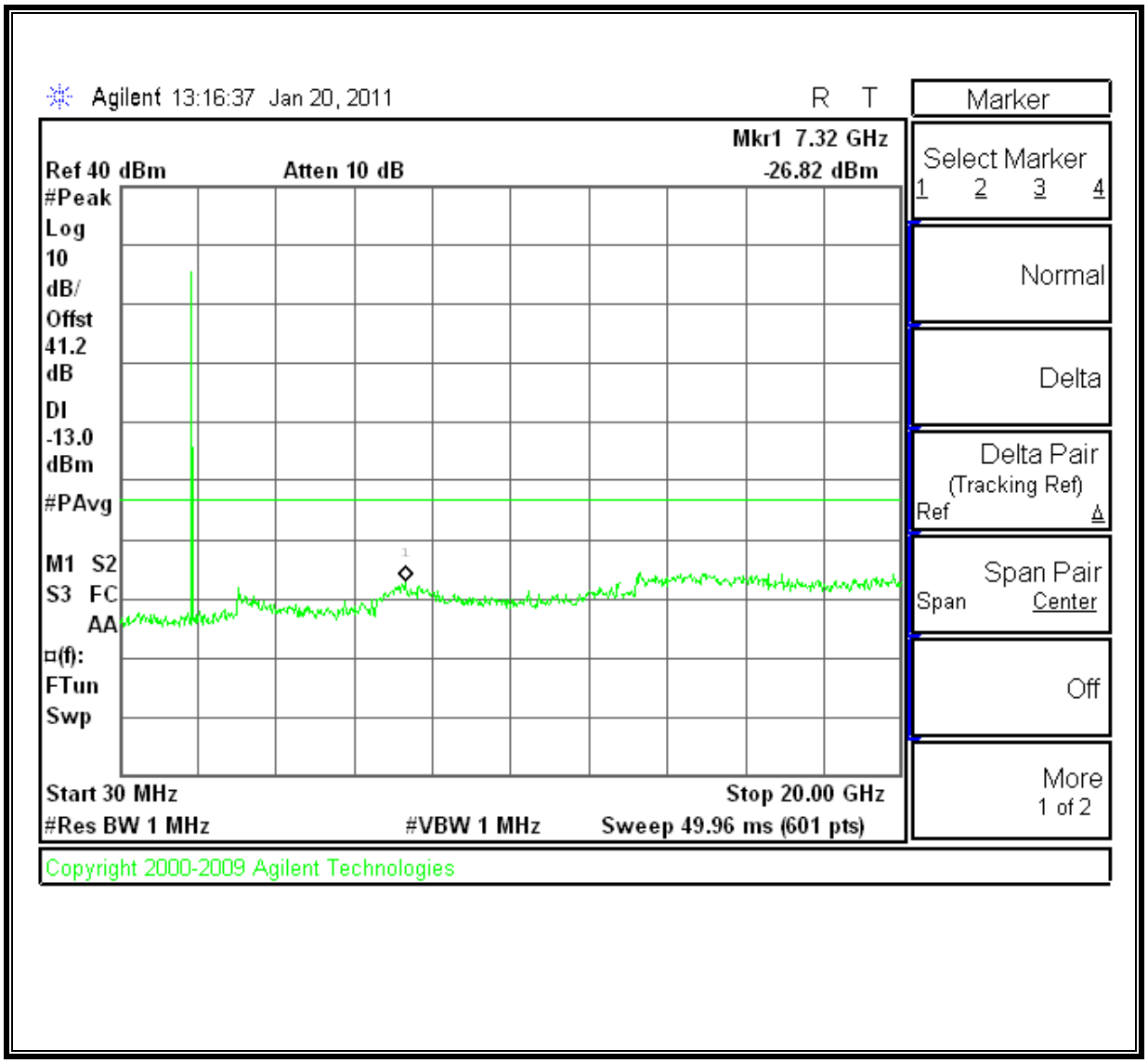


HIGH CHANNEL

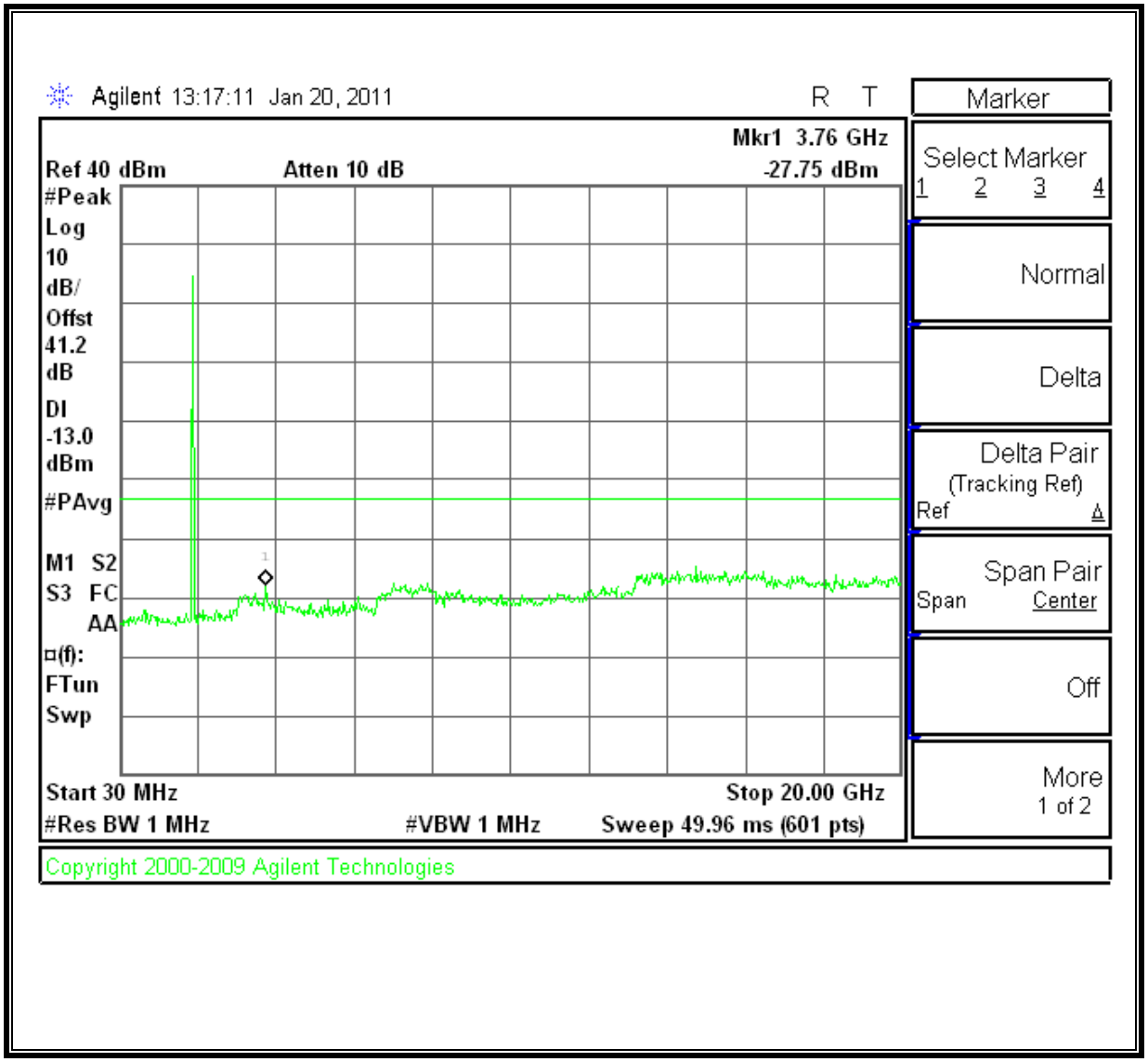


CDMA2000 1xEV-DO Revision A (Rev. A) Mode (PCS Band)

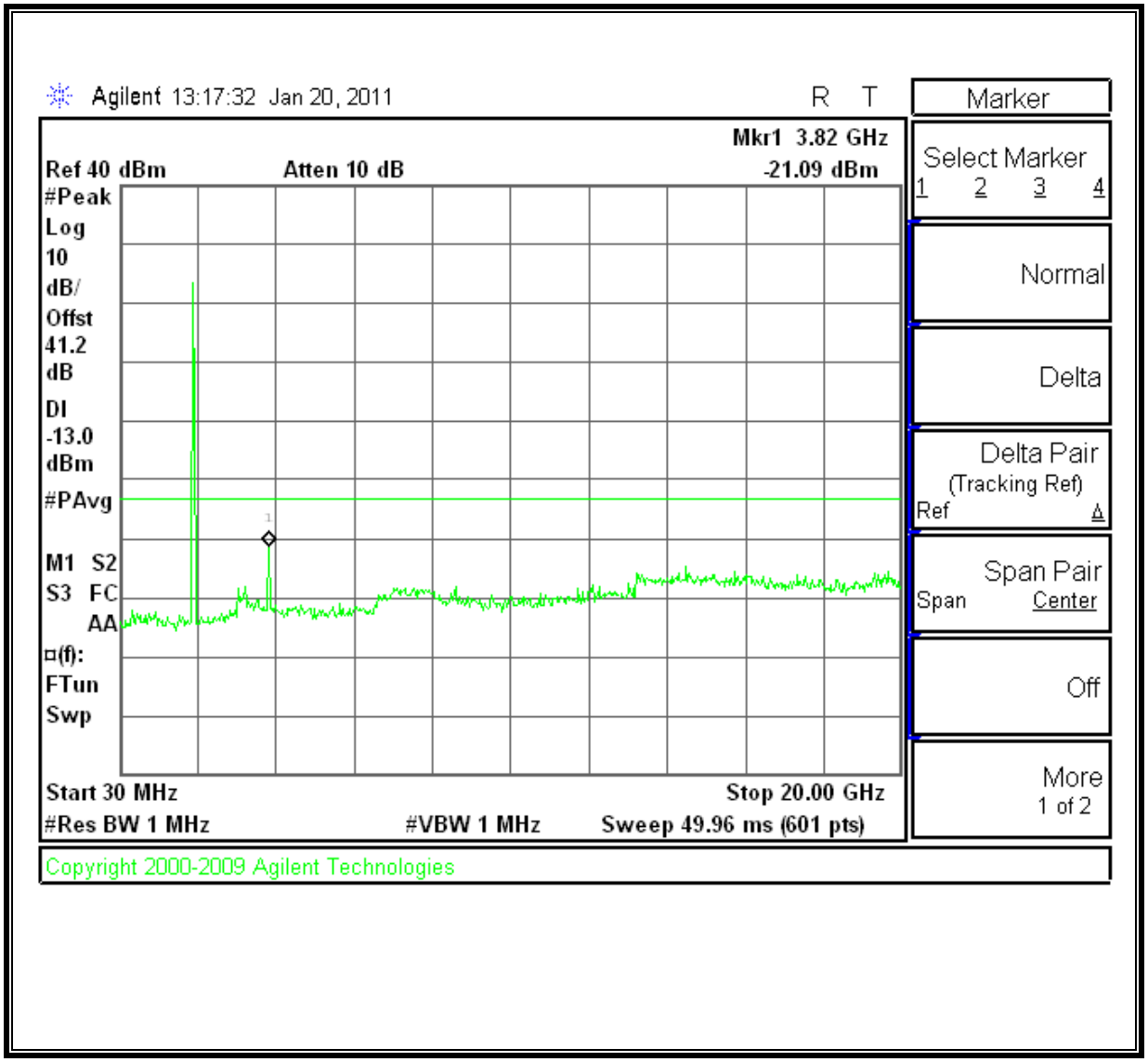
LOW CHANNEL



MID CHANNEL



HIGH CHANNEL



8.4. FREQUENCY STABILITY

RULE PART(S)

FCC: §2.1055, §22.355, §24.235

LIMITS

- §22.355 - The carrier frequency shall not depart from the reference frequency in excess of ±2.5 ppm for mobile stations.

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

TEST PROCEDURE

Use Agilent 8960 with Frequency Error measurement capability.

- Temp. = −20° to +50°C
- Voltage = 3.80 Vdc (85% - 115%)

Frequency Stability vs Temperature:

The EUT is place inside a temperature chamber. The temperature is set to 20ºC and allowed to stabilize. After sufficient soak time, the transmitting frequency error is measured. The temperature is increased by 10 degrees, allowed to stabilize and soak, and then the measurement is repeated. This is repeated until +50ºC is reached.

Frequency Stability vs Voltage:

The peak frequency error is recorded (worst-case).

MODES TESTED

- CDMA2000 1xEV-DO Revision A (Rev. A)

RESULTS

See the following pages.

CELL CDMA2000 1xEV-DO Revision A (Rev. A) – MID CHANNEL

Reference Frequency: Cellular Mid Channel 836.519996Hz @ 20ºC Limit: to stay +- 2.5 ppm = 2091.300 Hz				
DC Power Supply (Vdc)	Environment Temperature (ºC)	Frequency Deviation Measureed with Time Elapse		
		(MHz)	Delta (ppm)	Limit (ppm)
3.80	50	836.520001	-0.006	2.5
3.80	40	836.520000	-0.005	2.5
3.80	30	836.519999	-0.004	2.5
3.80	***20***	***836.519996***	***0***	2.5
3.80	10	836.520000	-0.004	2.5
3.80	0	836.519998	-0.002	2.5
3.80	-10	836.520000	-0.005	2.5
3.80	-20	836.519997	-0.001	2.5
3.80	-30	836.519998	-0.002	2.5

Reference Frequency: Cellular Mid Channel 836.519996MHz @ 20ºC Limit: to stay +- 2.5 ppm = 2091.300 Hz				
DC Power Supply (Vdc)	Environment Temperature (ºC)	Frequency Deviation Measureed with Time Elapse		
		(MHz)	Delta (ppm)	Limit (ppm)
3.80	20	836.519996	***0.000***	2.5
3.40	20	836.519992	0.005	2.5
4.26	20	836.520002	-0.007	2.5
3.3 (end point voltage)	20	836.519997	-0.001	2.5

PCS, CDMA2000 1xEV-DO Revision A (Rev. A) – MID CHANNEL

Reference Frequency: PCS Mid Channel 1879.999997MHz @ 20ºC Limit: within the authorized block or +- 2.5 ppm = 4700.000 Hz				
Power Supply (Vdc)	Environment Temperature (ºC)	Frequency Deviation Measureed with Time Elapse		
		(MHz)	Delta (ppm)	Limit (ppm)
3.80	50	1880.000000	-0.002	2.5
3.80	40	1879.999995	0.001	2.5
3.80	30	1879.999997	0.000	2.5
3.80	***20***	***1879.999997***	***0***	***2.5***
3.80	10	1879.999995	0.001	2.5
3.80	0	1879.999998	-0.001	2.5
3.80	-10	1880.000002	-0.003	2.5
3.80	-20	1879.999999	-0.001	2.5
3.80	-30	1879.999990	0.004	2.5

Reference Frequency: PCS Mid Channel 1879.999997MHz @ 20ºC Limit: within the authorized block or +- 2.5 ppm = 4700.000 Hz				
Power Supply (Vdc)	Environment Temperature (ºC)	Frequency Deviation Measureed with Time Elapse		
		(MHz)	Delta (ppm)	Limit (ppm)
3.80	***20***	***1879.999997***	***0***	***2.5***
3.40	20	1880.000002	-0.003	2.5
4.20	20	1879.999995	0.001	2.5
3.3V (End Point)	20	1879.999996	0.001	2.5

9. RADIATED TEST RESULTS

9.1. RADIATED POWER (ERP & EIRP)

RULE PART(S)

FCC: §2.1046, §22.913, §24.232

LIMITS

22.913(a) - The ERP of mobile transmitters and auxiliary test transmitters must not exceed 7 Watts.

24.232(c) - 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 603C

MODES TESTED

- 1xRTT – RC1, SO55
- CDMA2000 1xEV-DO Revision A (Rev. A)

RESULTS for Cellular Band (ERP)

Mode	Channel	f (MHz)	ERP	
			dBm	mW
1xRTT (RC1, SO55)	1013	824.70	25.00	316.23
	384	836.52	23.50	223.87
	777	848.31	23.67	232.81
EVDO-REV A	1013	824.70	25.15	327.34
	384	836.52	23.30	213.80
	777	848.31	23.71	234.96

RESULTS for PCS Band (EIRP)

Mode	Channel	f (MHz)	EIRP	
			dBm	mW
1xRTT (RC1, SO55)	25	1851.25	28.60	724.44
	600	1880.00	29.30	851.14
	1175	1908.75	29.90	977.24
EVDO-REV A	25	1851.25	28.50	707.95
	600	1880.00	29.60	912.01
	1175	1908.75	30.10	1023.29

ERP for 1xRTT Mode (Cellular Band)

High Frequency Substitution Measurement
Compliance Certification Services Chamber B

Company: APPLE
Project #: 11U13613
Date: 1/19/2011
Test Engineer: Chin Pang
Configuration: EUT with AC Adapter
Mode: TX, CDMA2000, Cell Band 1xRTT

Test Equipment:
Receiving: Sunol T130, and 3m Chamber N-type Cable (Setup this one for testing EUT)
Substitution: Dipole S/N: 00022117, 6ft SMA Cable (SN # 208947003) Warehouse.

f MHz	SG reading (dBm)	Ant. Pol. (H/V)	Cable Loss (dB)	Antenna Gain (dBd)	ERP (dBm)	Limit (dBm)	Margin (dB)	Notes
824.70	21.1	V	0.5	0.0	20.62	38.5	-17.8	
824.70	25.5	H	0.5	0.0	25.00	38.5	-13.4	
836.52	16.7	V	0.5	0.0	16.24	38.5	-22.2	
836.52	24.0	H	0.5	0.0	23.50	38.5	-14.9	
848.31	19.5	V	0.5	0.0	19.01	38.5	-19.4	
848.31	24.2	H	0.5	0.0	23.67	38.5	-14.8	

Rev. 1.24.7

ERP for CDMA2000 1xEV-DO Revision A (Cellular Band)

High Frequency Substitution Measurement
Compliance Certification Services Chamber B

Company: APPLE
Project #: 11U13613
Date: 1/21/2011
Test Engineer: Chin Pang
Configuration: EUT with AC Adapter
Mode: TX, CDMA2000, Cell Band, EVDO-REV A

Test Equipment:
Receiving: Sunol T130, and 3m Chamber N-type Cable (Setup this one for testing EUT)
Substitution: Dipole S/N: 00022117, 6ft SMA Cable (SN # 208947003) Warehouse.

f MHz	SG reading (dBm)	Ant. Pol. (H/V)	Cable Loss (dB)	Antenna Gain (dBd)	ERP (dBm)	Limit (dBm)	Margin (dB)	Notes
824.70	20.72	V	0.5	0.0	20.22	38.5	-18.2	
824.70	25.65	H	0.5	0.0	25.15	38.5	-13.3	
836.52	20.24	V	0.5	0.0	19.74	38.5	-18.7	
836.52	23.80	H	0.5	0.0	23.30	38.5	-15.2	
848.31	18.61	V	0.5	0.0	18.11	38.5	-20.3	
848.31	24.21	H	0.5	0.0	23.71	38.5	-14.7	

Rev. 1.24.7

EIRP for 1xRTT Mode (PCS Band)

High Frequency Fundamental Measurement
Compliance Certification Services Chamber B

Company: APPLE
Project #: 11U13613
Date: 1/19/2011
Test Engineer: Chin Pang
Configuration: EUT and AC Adapter
Mode: TX, CDMA2000 1xRTT, PCS

Test Equipment:
Receiving: Horn T59, and Camber B SMA Cables
Substitution: Horn T60 Substitution, 6ft SMA Cable (208947003) Warehouse

f GHz	SG reading (dBm)	Ant. Pol. (H/V)	Cable Loss (dB)	Antenna Gain (dBi)	EIRP (dBm)	Limit (dBm)	Delta (dB)	Notes
1.851	18.7	V	0.85	8.01	25.8	33.0	-7.2	
1.851	21.5	H	0.85	8.01	28.6	33.0	-4.4	
1.880	18.0	V	0.85	8.07	25.2	33.0	-7.8	
1.880	22.1	H	0.85	8.07	29.3	33.0	-3.7	
1.909	18.5	V	0.85	8.13	25.8	33.0	-7.2	
1.909	22.6	H	0.85	8.13	29.9	33.0	-3.1	

Rev. 1.24.7

EIRP for CDMA2000 1xEV-DO Revision A (PCS Band)

High Frequency Fundamental Measurement
Compliance Certification Services Chamber B

Company: APPLE
Project #: 11U13613
Date: 1/19/2011
Test Engineer: Chin Pang
Configuration: EUT and AC Adapter
Mode: TX, CDMA2000 EVDO-REV A, PCS

Test Equipment:
Receiving: Horn T59, and Camber B SMA Cables
Substitution: Horn T60 Substitution, 6ft SMA Cable (208947003) Warehouse

f GHz	SG reading (dBm)	Ant. Pol. (H/V)	Cable Loss (dB)	Antenna Gain (dBi)	EIRP (dBm)	Limit (dBm)	Delta (dB)	Notes
1.851	18.6	V	0.85	8.01	25.8	33.0	-7.2	
1.851	21.3	H	0.85	8.01	28.5	33.0	-4.6	
1.880	20.3	V	0.85	8.07	27.6	33.0	-5.4	
1.880	22.4	H	0.85	8.07	29.6	33.0	-3.4	
1.909	20.2	V	0.85	8.13	27.5	33.0	-5.6	
1.909	22.8	H	0.85	8.13	30.1	33.0	-2.9	

Rev. 1.24.7

9.2. FIELD STRENGTH OF SPURIOUS RADIATION

RULE PART(S)

FCC: §2.1053, §22.917, §24.238

LIMIT

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

For Cellular equipment - Compliance with these rules is based on the use of measurement instrumentation employing a resolution bandwidth of 100 kHz or greater. In the 1 MHz bands immediately outside and adjacent to the frequency block a resolution bandwidth of at least one percent of the emission bandwidth of the fundamental emission of the transmitter may be employed. A narrower resolution bandwidth is permitted in all cases to improve measurement accuracy provided the measured power is integrated over the full required measurement bandwidth (i.e. 100 kHz or 1 percent of emission bandwidth, as specified). 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 26 dB below the transmitter power.

For PCS equipment - Compliance with these rules is based on the use of measurement instrumentation employing a resolution bandwidth of 1 MHz or greater. However, in the 1 MHz bands immediately outside and adjacent to the frequency block a resolution bandwidth of at least one percent of the emission bandwidth of the fundamental emission of the transmitter may be employed. A narrower resolution bandwidth is permitted in all cases to improve measurement accuracy provided the measured power is integrated over the full required measurement bandwidth (i.e. 1 MHz or 1 percent of emission bandwidth, as specified). 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 26 dB below the transmitter power.

MODES TESTED

- 1xRTT – RC1, SO55
- CDMA2000 1xEV-DO Revision A (Rev. A)

RESULTS

1xRTT Mode (Cellular Band)

Compliance Certification Services
Above 1GHz High Frequency Substitution Measurement

Company: Apple
Project #: 11U13613
Date: 1/20/2011
Test Engineer: Chin Pang
Configuration: EUT and AC Adapter
Mode: TX, CDMA2000 1xRTT, Cell Band

Chamber	Pre-amplifer	Filter	Limit
5m Chamber B	T145 8449B	Filter 1	Part 22

f GHz	SG reading (dBm)	Ant. Pol. (H/V)	Distance (m)	Preamp (dB)	Filter (dB)	ERP (dBm)	Limit (dBm)	Delta (dB)	Notes
Low Ch, 824.7MHz									
1.65	-25.2	V	3.0	35.5	1.0	-59.7	-13.0	-46.7	
2.47	-17.8	V	3.0	35.4	1.0	-52.2	-13.0	-39.2	
1.65	-23.8	H	3.0	35.5	1.0	-58.3	-13.0	-45.3	
2.47	-20.8	H	3.0	35.4	1.0	-55.2	-13.0	-42.2	
Mid Ch, 836.52MHz									
1.65	-26.2	V	3.0	35.5	1.0	-60.7	-13.0	-47.7	
2.47	-18.6	V	3.0	35.4	1.0	-53.0	-13.0	-40.0	
1.65	-24.8	H	3.0	35.5	1.0	-59.3	-13.0	-46.3	
2.47	-23.3	H	3.0	35.4	1.0	-57.7	-13.0	-44.7	
High Ch, 848.31MHz									
1.70	-24.6	V	3.0	35.5	1.0	-59.1	-13.0	-46.1	
2.54	-16.8	V	3.0	35.4	1.0	-51.3	-13.0	-38.3	
1.70	-22.3	H	3.0	35.5	1.0	-56.8	-13.0	-43.8	
2.54	-19.2	H	3.0	35.4	1.0	-53.6	-13.0	-40.6	

Rev. 01.21.11
Note: No other emissions were detected above the system noise floor.

CDMA2000 1xEV-DO Revision A (Rev. A) Mode (Cellular Band)

Compliance Certification Services
Above 1GHz High Frequency Substitution Measurement

Company:	Apple
Project #:	11U13613
Date:	1/21/2011
Test Engineer:	Chin Pang
Configuration:	EUT and AC Adapter
Mode:	TX, CDMA2000 EVDO ReV A, Cell Band

Chamber	Pre-amplifer	Filter	Limit
5m Chamber B	T145 8449B	Filter 1	Part 22

f GHz	SG reading (dBm)	Ant. Pol. (H/V)	Distance (m)	Preamp (dB)	Filter (dB)	ERP (dBm)	Limit (dBm)	Delta (dB)	Notes
Low Ch, 824.7MHz									
1.65	-26.2	V	3.0	35.5	1.0	-60.7	-13.0	-47.7	
2.47	-20.8	V	3.0	35.4	1.0	-55.2	-13.0	-42.2	
1.65	-23.0	H	3.0	35.5	1.0	-57.5	-13.0	-44.5	
2.47	-23.0	H	3.0	35.4	1.0	-57.4	-13.0	-44.4	
Mid Ch, 836.52MHz									
1.65	-27.3	V	3.0	35.5	1.0	-61.8	-13.0	-48.8	
2.47	-21.8	V	3.0	35.4	1.0	-56.2	-13.0	-43.2	
1.65	-25.5	H	3.0	35.5	1.0	-60.0	-13.0	-47.0	
2.47	-24.2	H	3.0	35.4	1.0	-58.6	-13.0	-45.6	
High Ch, 848.31MHz									
1.70	-23.1	V	3.0	35.5	1.0	-57.6	-13.0	-44.6	
2.54	-22.0	V	3.0	35.4	1.0	-56.5	-13.0	-43.5	
1.70	-20.3	H	3.0	35.5	1.0	-54.8	-13.0	-41.8	
2.54	-21.9	H	3.0	35.4	1.0	-56.3	-13.0	-43.3	

Rev. 01.21.11
Note: No other emissions were detected above the system noise floor.

1xRTT Mode (PCS Band)

Compliance Certification Services
Above 1GHz High Frequency Substitution Measurement

Company:	Apple
Project #:	11U13613
Date:	1/21/2011
Test Engineer:	Chin Pang
Configuration:	EUT and AC Adapter
Mode:	TX, CDMA2000 1xRTT, PCS Band

Chamber	Pre-amplifer	Filter	Limit
5m Chamber B	T145 8449B	Filter 1	Part 24

f GHz	SG reading (dBm)	Ant. Pol. (H/V)	Distance (m)	Preamp (dB)	Filter (dB)	EIRP (dBm)	Limit (dBm)	Delta (dB)	Notes
Low Ch, 1851.25MHz									
3.70	-7.7	V	3.0	35.4	1.0	-42.0	-13.0	-29.0	
5.55	-16.8	V	3.0	35.4	1.0	-51.2	-13.0	-38.2	
3.70	-5.4	H	3.0	35.4	1.0	-39.7	-13.0	-26.7	
5.55	-17.4	H	3.0	35.4	1.0	-51.8	-13.0	-38.8	
Mid Ch, 1880MHz									
3.76	1.3	V	3.0	35.3	1.0	-33.0	-13.0	-20.0	
5.64	-16.5	V	3.0	35.4	1.0	-50.9	-13.0	-37.9	
3.76	1.1	H	3.0	35.3	1.0	-33.2	-13.0	-20.2	
5.64	-15.8	H	3.0	35.4	1.0	-50.3	-13.0	-37.3	
High Ch, 1908.75MHz									
3.82	3.9	V	3.0	35.3	1.0	-30.4	-13.0	-17.4	
5.73	-18.6	V	3.0	35.4	1.0	-53.1	-13.0	-40.1	
3.82	3.9	H	3.0	35.3	1.0	-30.4	-13.0	-17.4	
5.73	-16.7	H	3.0	35.4	1.0	-51.1	-13.0	-38.1	

Rev. 01.21.11
Note: No other emissions were detected above the system noise floor.

CDMA2000 1xEV-DO Revision A (Rev. A) Mode (PCS Band)

Compliance Certification Services
Above 1GHz High Frequency Substitution Measurement

Company:	Apple
Project #:	11U13613
Date:	1/21/2011
Test Engineer:	Chin Pang
Configuration:	EUT and AC Adapter
Mode:	TX, CDMA2000 EVDO-Rev A, PCS Band

Chamber	Pre-amplifer	Filter	Limit
5m Chamber B	T145 8449B	Filter 1	Part 24

f GHz	SG reading (dBm)	Ant. Pol. (H/V)	Distance (m)	Preamp (dB)	Filter (dB)	EIRP (dBm)	Limit (dBm)	Delta (dB)	Notes
Low Ch, 1851.25MHz									
3.70	-5.7	V	3.0	35.4	1.0	-40.0	-13.0	-27.0	
5.55	-16.3	V	3.0	35.4	1.0	-50.7	-13.0	-37.7	
3.70	-2.0	H	3.0	35.4	1.0	-36.3	-13.0	-23.3	
5.55	-16.7	H	3.0	35.4	1.0	-51.1	-13.0	-38.1	
Mid Ch, 1880MHz									
3.76	-2.9	V	3.0	35.3	1.0	-37.3	-13.0	-24.3	
5.64	-16.5	V	3.0	35.4	1.0	-50.9	-13.0	-37.9	
3.76	-0.5	H	3.0	35.3	1.0	-34.8	-13.0	-21.8	
5.64	-15.8	H	3.0	35.4	1.0	-50.3	-13.0	-37.3	
High Ch, 1908.75MHz									
3.82	2.4	V	3.0	35.3	1.0	-31.9	-13.0	-18.9	
5.73	-13.6	V	3.0	35.4	1.0	-48.1	-13.0	-35.1	
3.82	6.4	H	3.0	35.3	1.0	-27.9	-13.0	-14.9	
5.73	-15.9	H	3.0	35.4	1.0	-50.3	-13.0	-37.3	

Rev. 01.20.11
Note: No other emissions were detected above the system noise floor.

10. SETUP PHOTOS

ANTENNA PORT CONDUCTED RF MEASUREMENT SETUP

ANTENNA PORT CONDUCTED PHOTO

RADIATED RF MEASUREMENT SETUP FOR PORTABLE CONFIGURATION

X-AXIS PHOTO

Y-AXIS PHOTO

Z-AXIS PHOTO

ENVIRONMENTAL CHAMBER

END OF REPORT