Test Report

CFR 47 FCC Part 24, Subpart E
CFR 47 FCC Part 2, Subpart J
Industry Canada RSS-133

Star Solutions iCell EVDO Indoor Compact BTS 1900MHz

FCC ID # S52-2-07-01-00-1
IC ID # 8076A-20701001

Project Code C-0098109

(Report C-0098109-RA-1-1)
Revision: 1

October 21, 2010

Prepared for:	Star Solutions
Author:	Daryl Therens Senior Test Specialist
Approved by:	Nick Kobrosly Director of Canadian Operations

Report Summary

Test Facility:	**National Technical Systems, Canada** Product Integrity Laboratory 5151-47th Street, NE Calgary Alberta T3J 3R2
Applicant:	Star Solutions 120 – 4600 Jacombs Road Richmond, BC, Canada V6V 3B1
Customer Representative:	Name: Azadeh Farzin Phone #: (604) 276-0055, x244 Email Address: azadeh.farzin@starsolutions.com

EUT Description[1]

EUT Description / Model	Manufacturer	Revision	Serial Number
iCell EVDO Indoor Compact BTS, Macro, 1F, Sector 1 Main, 1900MHz FullBand (3U unit) 24246647GS	Star Solutions	A4	17IOY8CKEIOF
iCell EVDO Indoor Compact BTS, Macro, 1F, Sector 2/3, 1900MHz, FullBand (2, 2U Units) 24244743GS	Star Solutions	A3	17NFY9EKEIRN 17NFY9EKEIRM

[1] See section 2.1 for more detail.

Test Summary

Appendix	Test/Requirement Description	Deviations* from:			Pass / Fail	Applicable FCC Rule Parts	Applicable Industry Canada Rule Parts
		Base Standard	Test Basis	NTS Procedure			
A	RF Power Output	No	No	No	PASS	FCC 24.232	RSS-133[2] 4.1, 6.4 RSS-Gen[3] 4.8
B	Occupied Bandwidth (26dB emission bandwidth)	No	No	No	PASS	FCC 24.238	N/A
B	Occupied Bandwidth (99% emission bandwidth)	No	No	No	PASS	N/A	RSS-Gen 4.6.1
C	Conducted Spurious Emissions Band Edge	No	No	No	PASS	FCC 24.238	RSS-133 6.5
C	Conducted Spurious Emissions	No	No	No	PASS	FCC 24.238	RSS-133 6.5
D	TX Frequency Stability	No	No	No	PASS	FCC 24.235	RSS-133 6.3 RSS-Gen 4.7
E	Peak to Average Power	No	No	No	PASS	FCC 24.232	RSS-133 6.4
F	Tx / Rx Radiated Spurious Emissions	No	No	No	PASS	FCC 24.238	RSS-133 6.3 RSS-133 6.6 RSS-Gen

Test Result: The product presented for testing complied with test requirements as shown above.

Prepared By: Daryl Therens 2010.10.25 12:52:28 -06'00'

Daryl Therens
Senior Test Specialist

Reviewed By: Digitally signed by Glen Moore DN: cn=Glen Moore, c=CA, o=NTS, email=glen.moore@ntscorp.com Date: 2010.10.25 12:57:56 -06'00'

Glen Moore
Wireless/EMC Manager

Approved By: Alex Mathews 2010.10.25 12:59:07 -06'00'

Alex Mathews
Quality Management Representative

[2] RSS-133, Issue 5, February 2009
[3] RSS-Gen, Issue 2, June, 2007

Table of Contents

Register of Revisions

Revision	Date	Description of Revisions
1	October 21, 2010	Initial release to client

1.0 INTRODUCTION

1.1 PURPOSE

The purpose of this document is to describe the tests applied by NTS Canada to demonstrate compliance of the iCell EVDO Indoor Compact BTS 1900 MHz, Fullband from Star Solutions to FCC Part 24 Subpart E, FCC Part 2 Subpart J, and equivalent sections of Industry Canada's RSS-133, RSS-Gen.

All conducted testing in this report was performed on the 3U unit. The transmitter section of the Main 3U assembly and the 2U assembly is identical. The configuration tested is the worst case and covers off all product configurations.

2.0 EUT DESCRIPTION

2.1 CONFIGURATION

	Name / Model	Revision	Serial Number
EUT	iCell EVDO Indoor Compact BTS, Macro, 1F, Sector 1 Main, 1900MHz FullBand (3U unit) 24246647GS	A4	17IOY8CKEIOF
	iCell EVDO Indoor Compact BTS, Macro, 1F, Sector 2/3, 1900MHz, FullBand (2, 2U Units) 24244743GS	A3	17NFY9EKEIRN 17NFY9EKEIRM
Classification	Base-station		
Modulation	EVDO		
Frequency Range	See section 2.4		
Size	3U unit:13.33 cm High x 48.26 cm Wide x 60.96 cm Deep 2U unit: 8.54 dm High x 48.26 cm Wide x 60.96 cm Deep		
Weight	3U unit: 25kg 2U unit: 20.74kg		
General Functional Description	The Compact BTS is a part of Star Solutions end-to-end all IP-based wireless communication solution providing the mobility and media in a packet-based environment. The Main 3U-high Assembly contains all the components required for 1 sector operation. The main unit also supports the addition of 2 more sector units. Each sector unit comes in a 2U-high rack mounted chassis. The transmitter section of the Main 3U assembly and the 2U assembly is identical.		

2.2 EUT POWER

Voltage	110 – 240 VAC, 50 / 60 Hz
Number of Feeds	1, 3-wire AC power cable (line, neutral, ground), #14 AWG
Power Consumption	450 watts for the Main 3U Assembly

2.3 EUT CABLING

Item	Routing		Description	Length
	From	To		
1	EUT	Attenuator/ Load	Sucoflex RF Cable for Main Ant. Port (1xRTT)	3m
2	EUT	GPS Splitter	LMR400 RF Cable for GPS Port	8m
3	EUT	Earth Ground	#2 AWG Ground Cable	10m

2.4 FREQUENCIES

The following table lists the lowest and highest supported channels of the Compact BTS.

ACS Type (duplexer)	Lowest Supported Channel	Highest Supported Channel
Fullband	25	1175

The following table lists the channels tested that meet the FCC Part 24.238 -13dBm limit at the applicable band / block edges.

ACS Type	Tested Channel Number (Block)	Frequency (MHz)	Applicable Band / Block Edge and Frequency (MHz)
Fullband	25 (A)	1931.25	Lower Band A edge (1930 MHz)
	275 (A)	1943.75	Upper Block A edge (1945 MHz)
	325 (D)	1946.25	Lower Block D edge (1945 MHz)
	375 (D)	1948.75	Upper Block D edge (1950 MHz)
	425 (B)	1951.25	Lower Block B edge (1950 MHz)
	675 (B)	1963.75	Upper Block B edge (1965 MHz)
	725 (E)	1966.25	Lower Block E edge (1965 MHz)
	775 (E)	1968.75	Upper Block E edge (1970 MHz)
	825 (F)	1971.25	Lower Block F edge (1970 MHz)
	875 (F)	1973.75	Upper Block F edge (1975 MHz)
	925 (C)	1976.25	Lower Block C edge (1975 MHz)
	1175 (C)	1988.75	Upper Band C edge (1990 MHz)

3.0 TEST ENVIRONMENT

3.1 NORMAL TEST CONDITIONS

Temperature:	20 – 23 °C
Relative Humidity:	28 – 35 %
Atmospheric pressure:	883 – 890 mbar
Nominal test voltage:	120 VAC, 60 Hz

APPENDICES

APPENDIX A: POWER OUTPUT

A.1. Base Standard & Test Basis

Base Standard	FCC Part 24.232; IC RSS-133 4.1, 6.4, RSS-Gen 4.8
Test Basis	FCC 2.1046
Test Method	TIA/EIA 603

A.2. Specifications

FCC Part 2.1046

(a) For transmitters other than single sideband, independent sideband and controlled carrier radiotelephone, power output shall be measured at the RF output terminals when the transmitter is adjusted in accordance with the tune -up procedure to give the values of current and voltage on the circuit elements specified in 2.983(d)(5). The electrical characteristics of the radio frequency load attached to the output terminals when this test is made shall be stated.

A.3. FCC Limit

FCC Part 24.232

The maximum RF power from a base station must not exceed 100 Watts.

A.4. Deviations

Deviation Number	Time & Date	Description and Justification of Deviation	Deviation Reference			Approval
			Base Standard	Test Basis	NTS Procedure	
none						

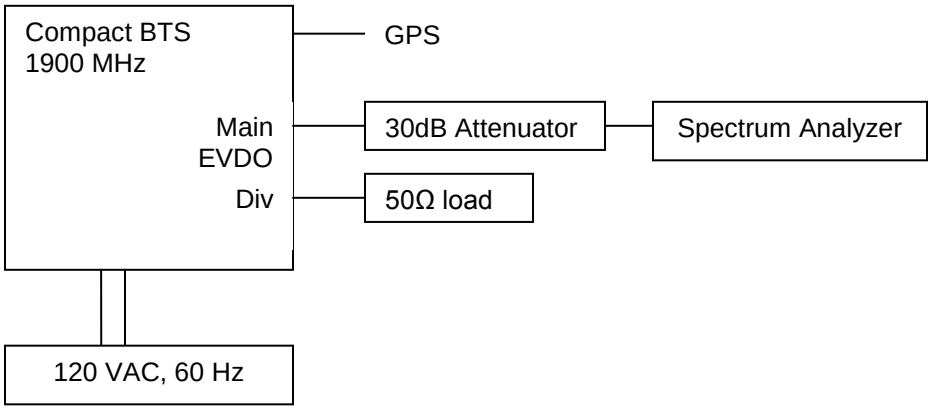
A.5. Test Method

The EUT was setup via a PC and Star Solutions software to transmit at maximum power in EVDO mode, at the low, middle, and high end of the frequency band. Power measurements were made at the low, middle, and high end of the frequency band at different modulation types and data rates. The RF output power was measured using a PSA spectrum analyzer with average detector.

A.6. Test Setup

The set-up used for the RF output power test is illustrated below. RF output power measurements were referenced to the Sector 1 main antenna port. The diversity antenna port was terminated into a 50Ω load.

Figure 1: Power Output Setup



A.7. Test Results

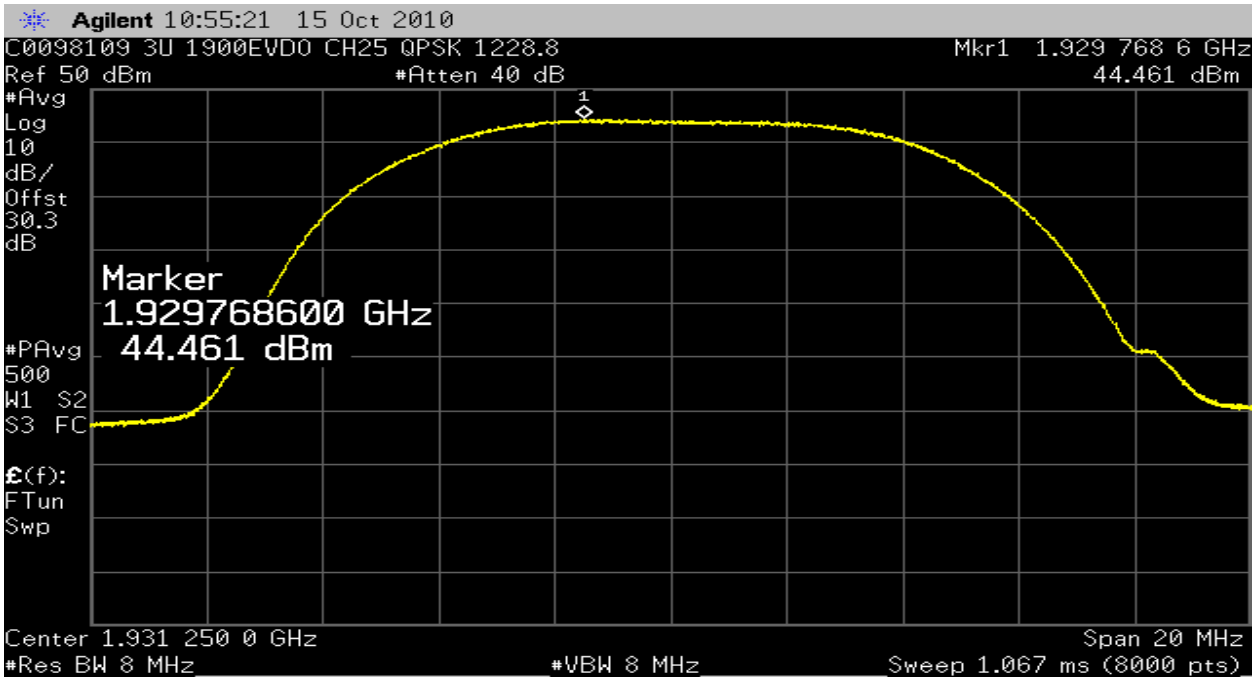
To reduce the number of Figures, only the plot of the highest power is shown.

Table 1: EVDO RF Power Output

Channel Numbers (Block)	Modulation	Frequency (MHz)	Measured Average RF Output Power (dBm)
600 (B)	8PSK, 1843.2 kbps 1 slot	1960.00	43.9
600 (B)	8PSK, 921.6 kbps 2 slots	1960.00	44.2
600 (B)	QPSK, 38.4 kbps, 16 slots	1960.00	44.0
600 (B)	QPSK, 1228.8 kbps, 1 slot	1960.00	44.4
600 (B)	16QAM, 2457.6 kbps 1slot	1960.00	44.4
600 (B)	16QAM, 1536 kbps 2 slots	1960.00	43.6
25 (A)	8PSK, 1843.2 kbps 1 slot	1931.25	44.4
25 (A)	QPSK, 1228.8 kbps, 1 slot	1931.25	44.5
25 (A)	16QAM, 2457.6 kbps 1slot	1931.25	44.3
1175 (C)	8PSK, 1843.2 kbps 1 slot	1988.75	44.3
1175 (C)	QPSK, 1228.8 kbps, 1 slot	1988.75	44.4
1175 (C)	16QAM, 2457.6 kbps 1slot	1988.75	44.4

Note: All final reported values are corrected for cable and attenuator losses.

Figure 2: RF Power Output, Channel 25, QPSK, 1228.8kbps



A.8. Tested By

Name: Daryl Therens
Senior Test Specialist

A.9. Test Dates

Test Start: October 14, 2010
Test Complete: October 15, 2010

APPENDIX B: OCCUPIED BANDWIDTH / 26DB BANDWIDTH

B.1. Base Standard and Test Basis

Base Standard	FCC Part 24.238; IC RSS-Gen 4.6.1
Test Basis	FCC PART 2.1049
Test Method	FCC PART 2.1049 / 24.238

B.2. Specifications

FCC Part 2.1049

The OBW, that is the frequency bandwidth such that, below its lower and above its upper frequency limits, the mean powers radiated are each equal to 0.5 percent of the total mean power radiated by a given emission shall be measured under the following conditions as applicable:

(g) Transmitter in which the modulating baseband comprises not more than three independent channels - when modulated by the full complement of signals for which the transmitter is rated. The level of modulation for each channel should be set to that prescribed in rule parts applicable to the services for which the transmitter is intended. If specific modulation levels are not set forth in the rules, the tests should provide the manufacturer's maximum rated condition.

(h) Transmitters employing digital modulation techniques - when modulated by an input signal such that its amplitude and symbol rate represent the maximum rated conditions under which the equipment will be operated. The signal shall be applied through any filter networks, pseudo-random generators or other devices required in normal service. Additionally, the occupied bandwidth shall be shown for operation with any devices used for modifying the spectrum when such devices are optional at discretion of the user.

B.3. Deviations

Deviation Number	Time & Date	Description and Justification of Deviation	Deviation Reference			Approval
			Base Standard	Test Basis	NTS Procedure	
none						

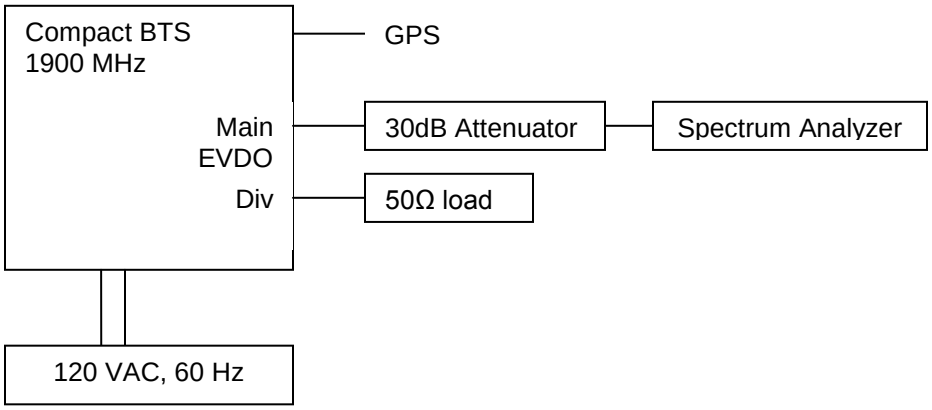
B.4. Test Method

The EUT was setup via a PC and Star Solutions software to transmit at maximum power in EVDO mode, at the low, middle, and high end of the frequency band. Measurements were made at the low, middle, and high end of the frequency band at different modulation types and data rates. Industry Canada occupied bandwidth was measured using the 99% channel power feature of the spectrum analyzer.

B.5. Test Setup

The test setup for Occupied BW is as illustrated below. Occupied bandwidth measurements were performed on Sector 1 main antenna port. The diversity antenna port was terminated into a 50Ω load.

Figure 3: Occupied BW Setup



B.6. Test Results

To reduce the number of Figures, only plots for channels 25 and 1175 are shown.

Table 2: EVDO Occupied BW

Channel Number (Block)	Modulation	Frequency (MHz)	IC 99% Measured Occupied BW (MHz)	FCC 26dB Measured Occupied BW (MHz)
25 (A)	8PSK, 1843.2 kbps 1 slot	1931.25	1.27	1.32
600 (B)	8PSK, 1843.2 kbps 1 slot	1960.00	1.28	1.32
1175 (C)	8PSK, 1843.2 kbps 1 slot	1988.75	1.28	1.32
25 (A)	QPSK, 1228.8 kbps, 1 slot	1931.25	1.28	1.32
600 (B)	QPSK, 1228.8 kbps, 1 slot	1960.00	1.28	1.32
1175 (C)	QPSK, 1228.8 kbps, 1 slot	1988.75	1.28	1.32
25 (A)	16QAM, 2457.6 kbps 1slot	1931.25	1.28	1.32
600 (B)	16QAM, 2457.6 kbps 1slot	1960.00	1.28	1.32
1175 (C)	16QAM, 2457.6 kbps 1slot	1988.75	1.28	1.32

Figure 4: FCC 26dB Occupied BW, Channel 25, 8PSK, 1843.2kbps

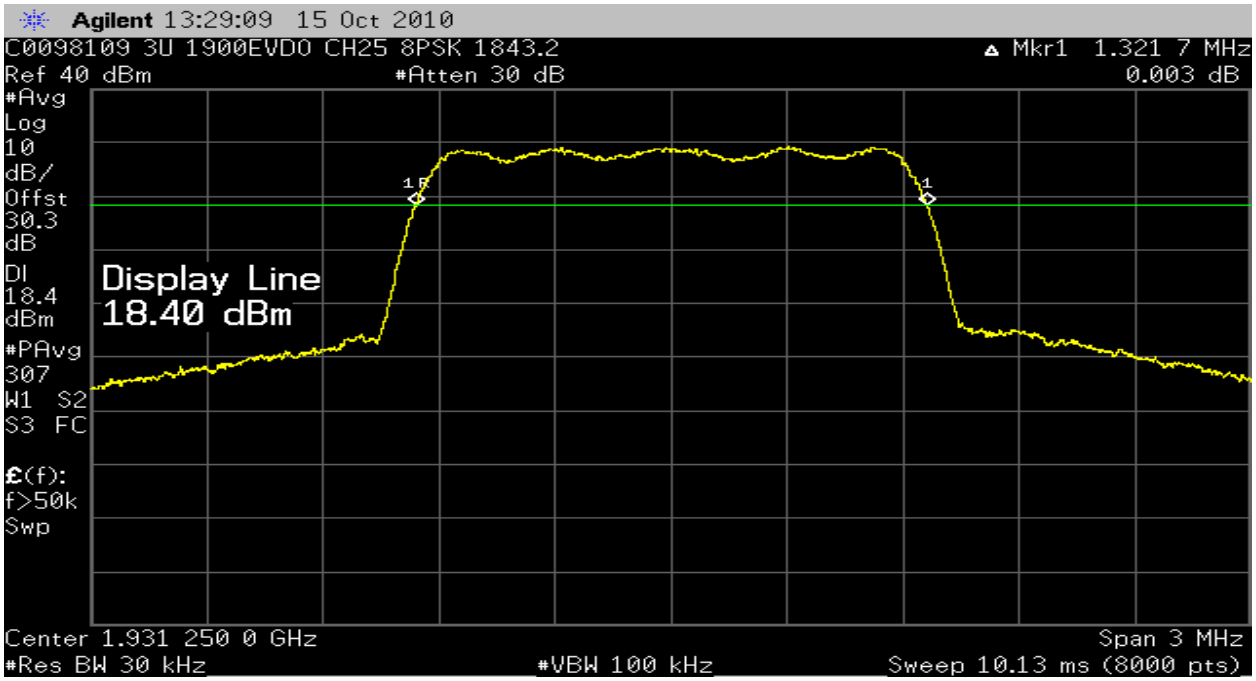


Figure 5: IC 99% Occupied BW, Channel 25, 8PSK, 1843.2kbps

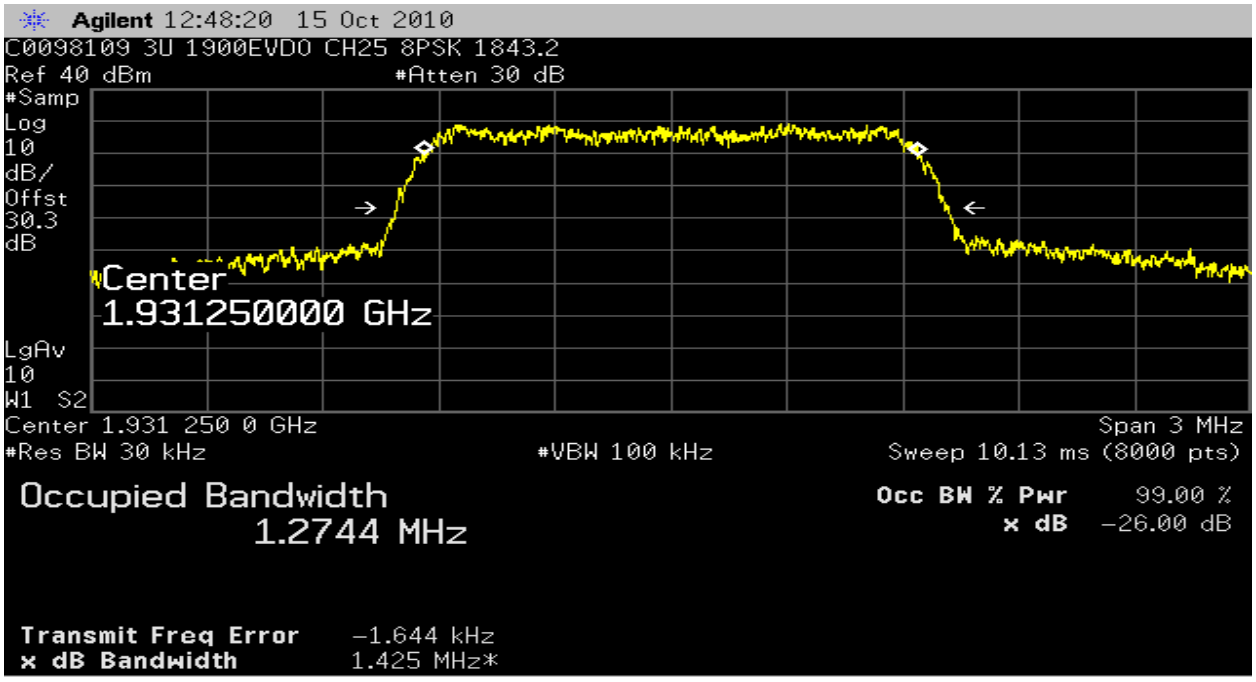


Figure 6: FCC 26dB Occupied BW, Channel 25, QPSK, 1228.8kbps

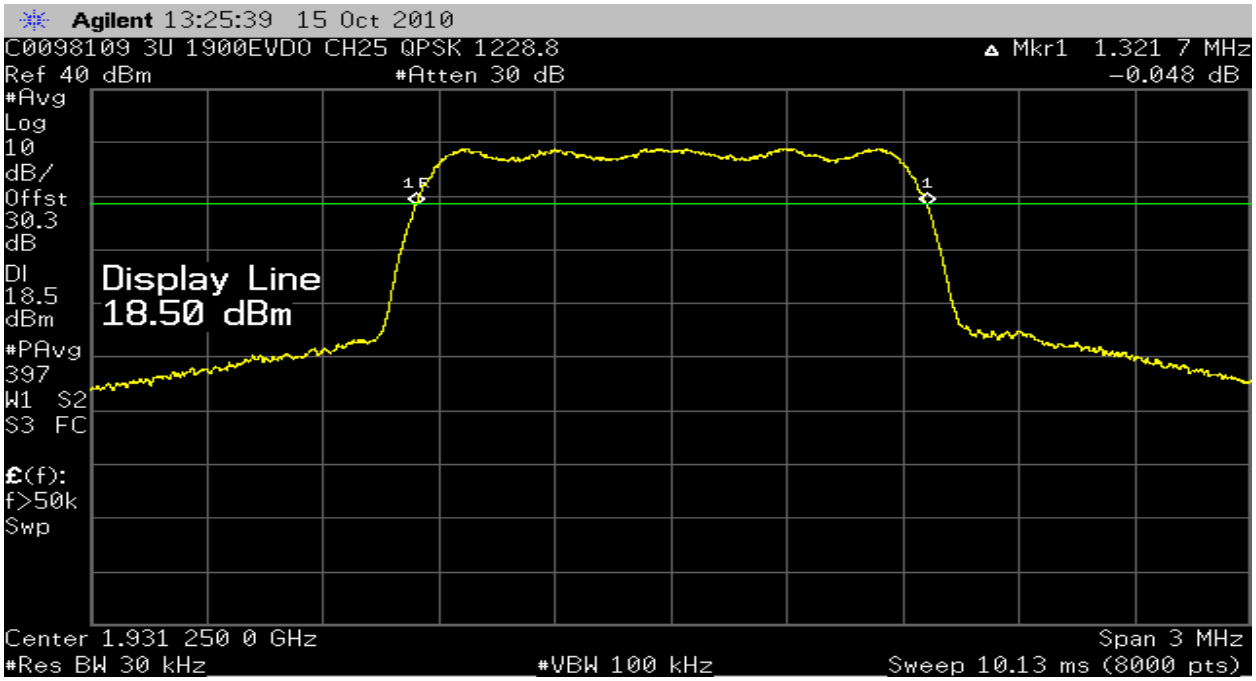


Figure 7: IC 99% Occupied BW, Channel 25, QPSK, 1228.8kbps

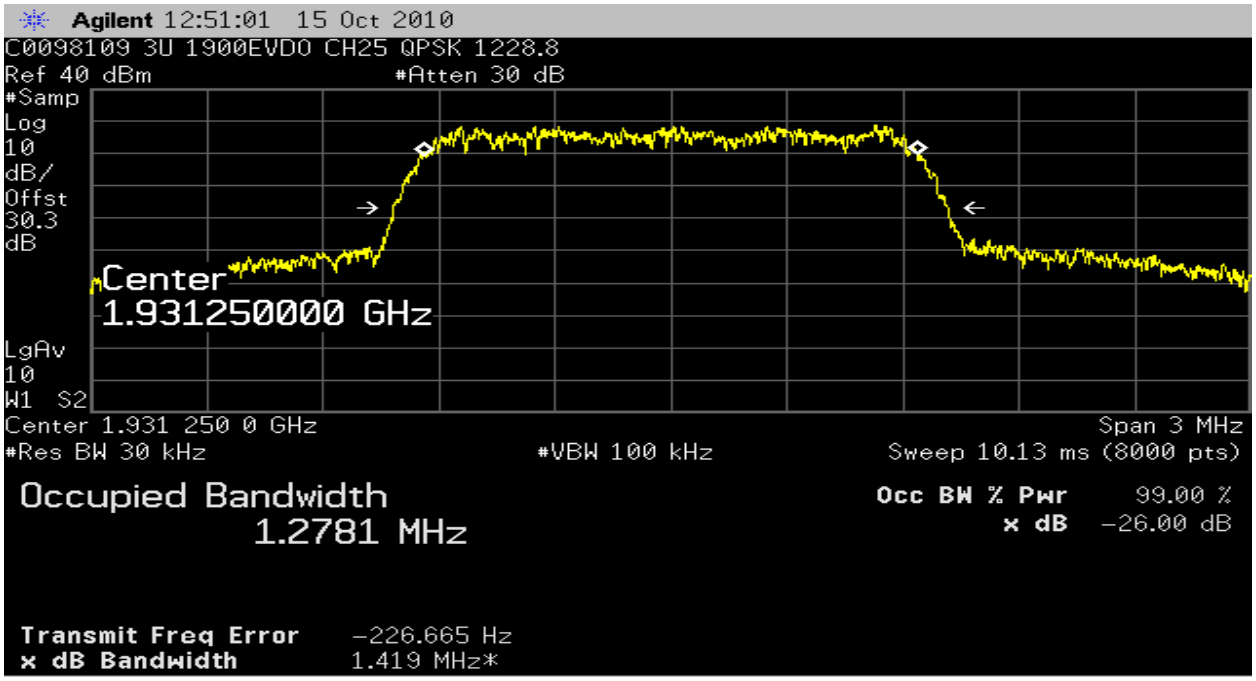


Figure 8: FCC 26dB Occupied BW, Channel 25, 16QAM, 2457.6kbps

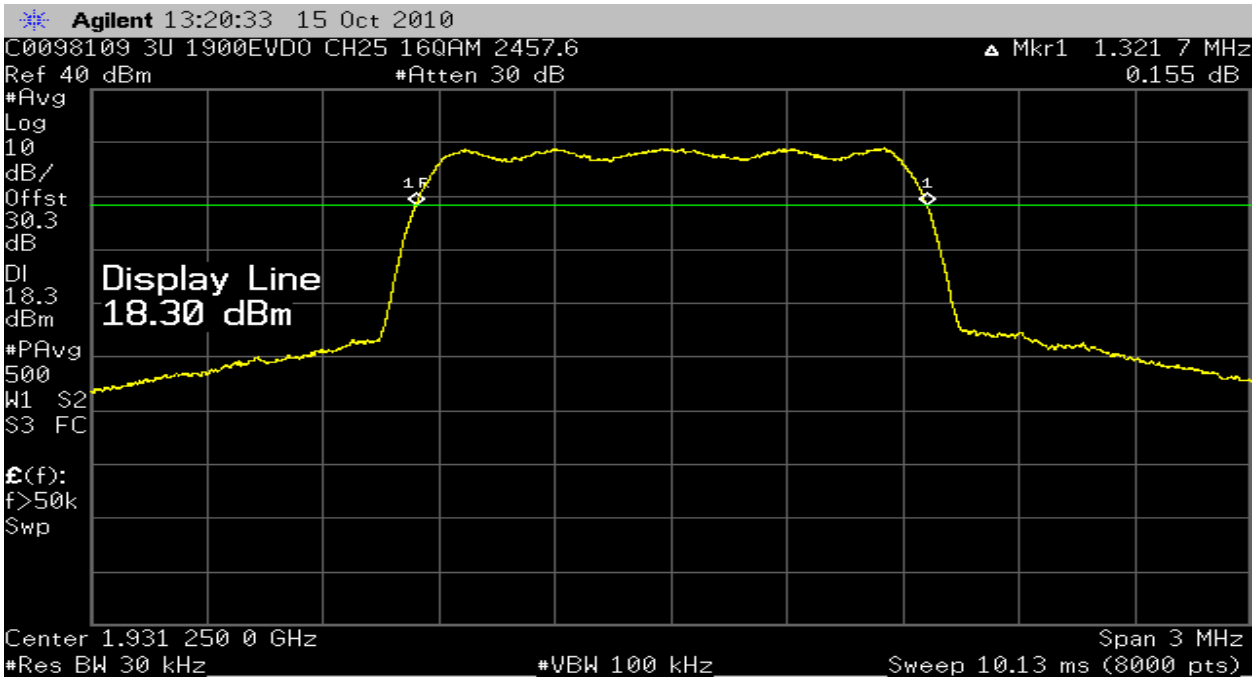


Figure 9: IC 99% Occupied BW, Channel 25, 16QAM, 2457.6kbps

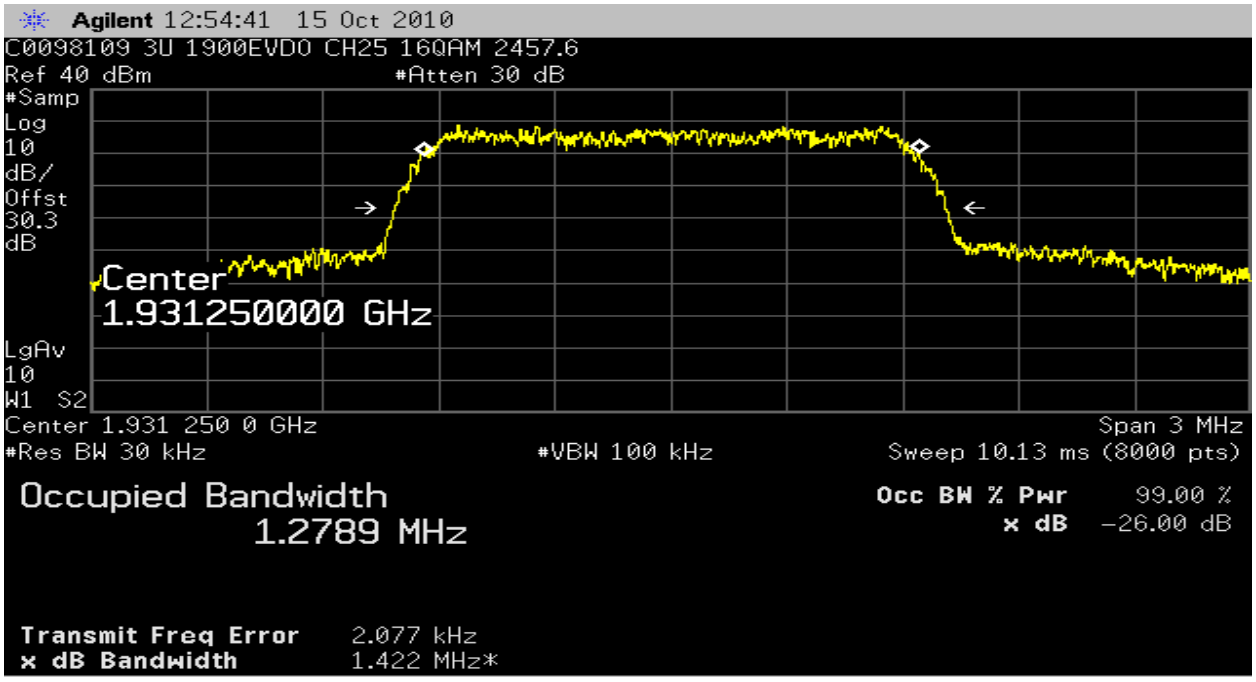


Figure 10: FCC 26dB Occupied BW, Channel 1175, 8PSK, 1843.2kbps

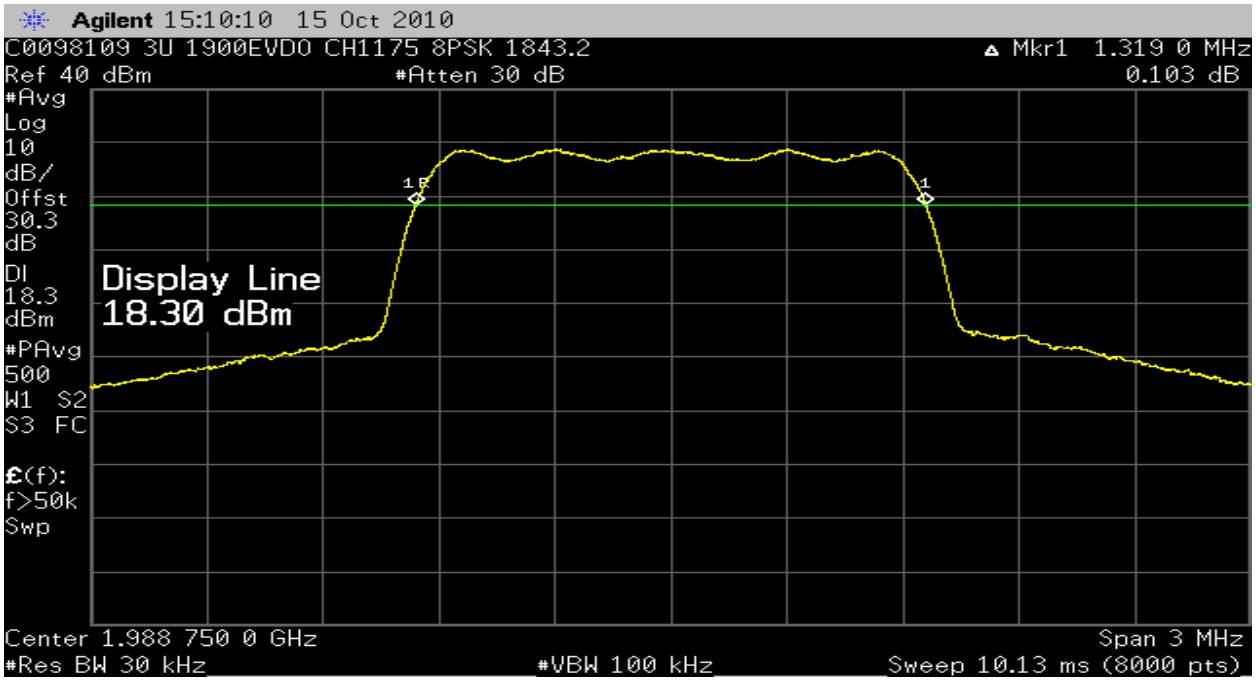


Figure 11: IC 99% Occupied BW, Channel 1175, 8PSK, 1843.2kbps

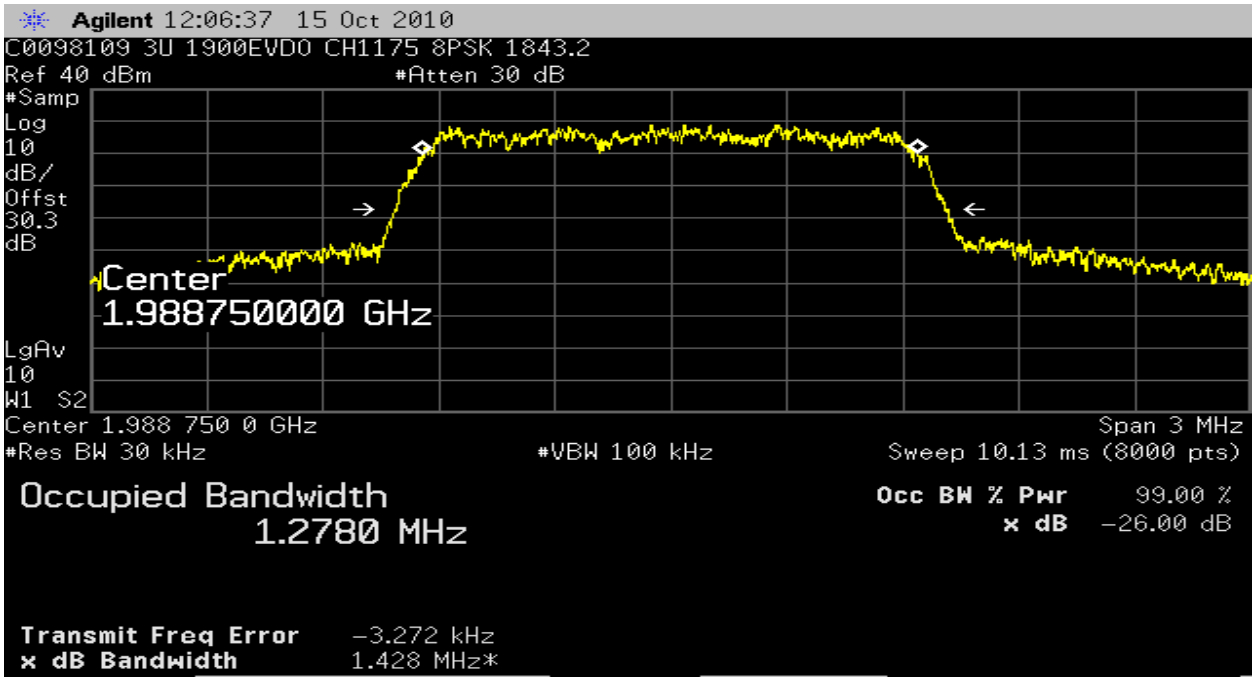


Figure 12: FCC 26dB Occupied BW, Channel 1175, QPSK, 1228.8kbps

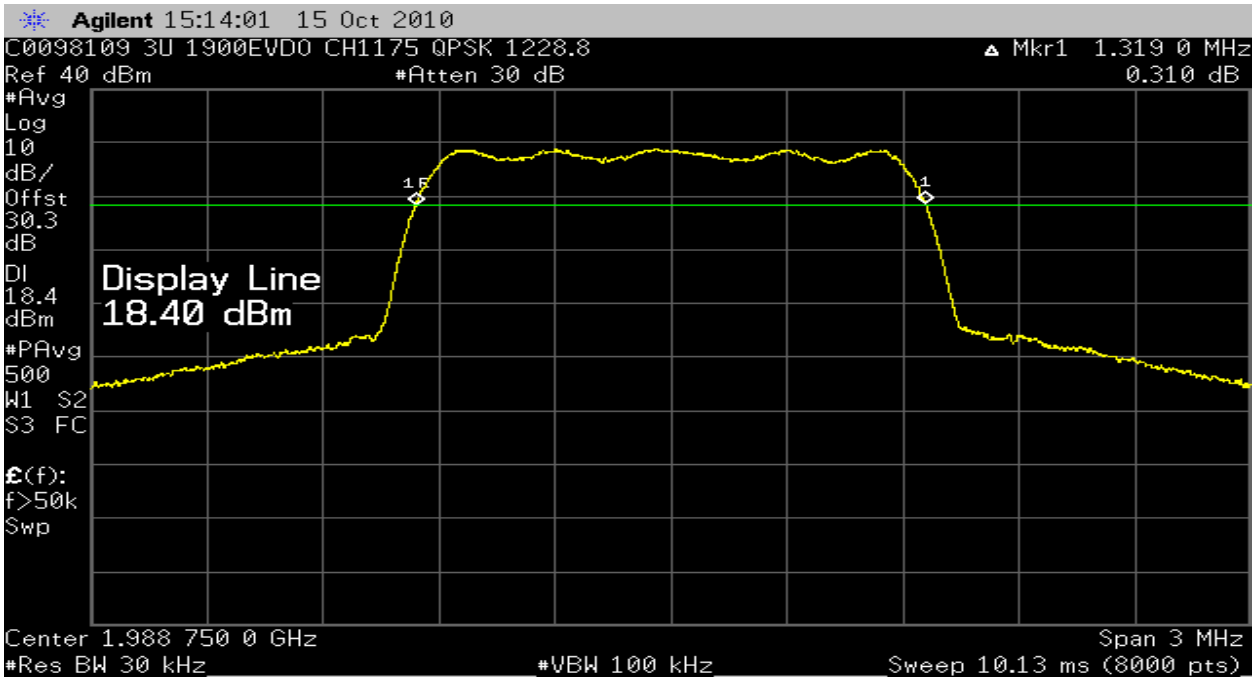


Figure 13: IC 99% Occupied BW, Channel 1175, QPSK, 1228.8kbps

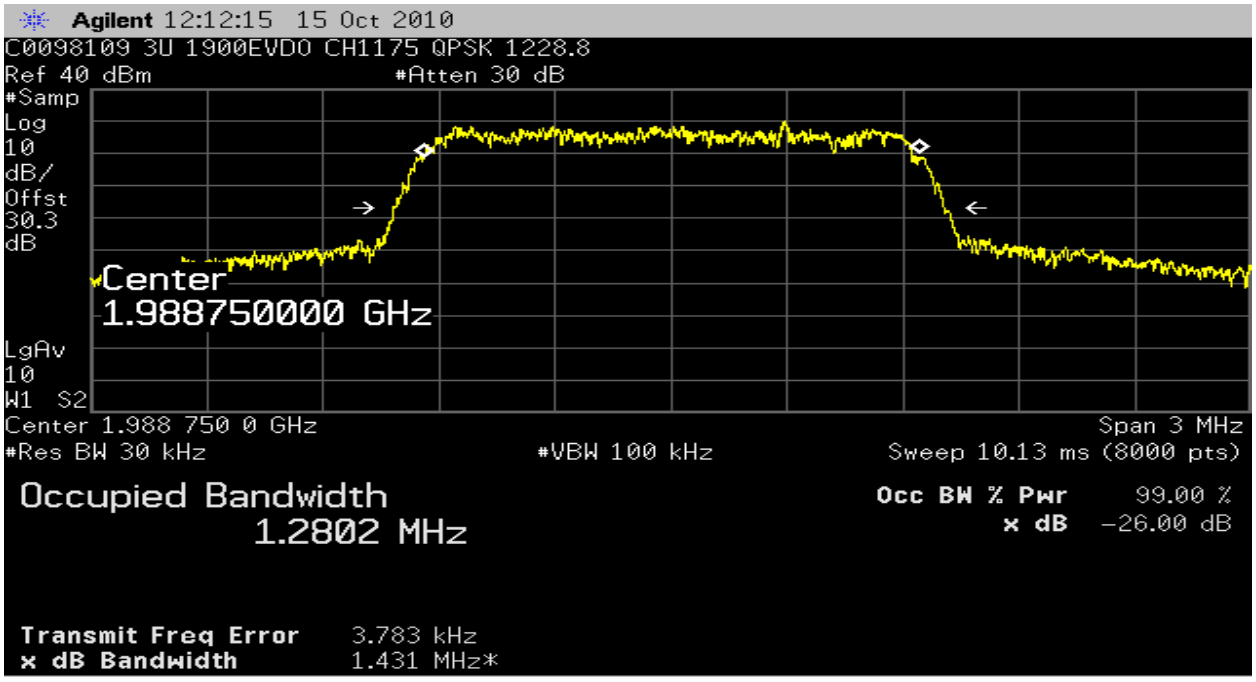


Figure 14: FCC 26dB Occupied BW, Channel 1175, 16QAM, 2457.6kbps

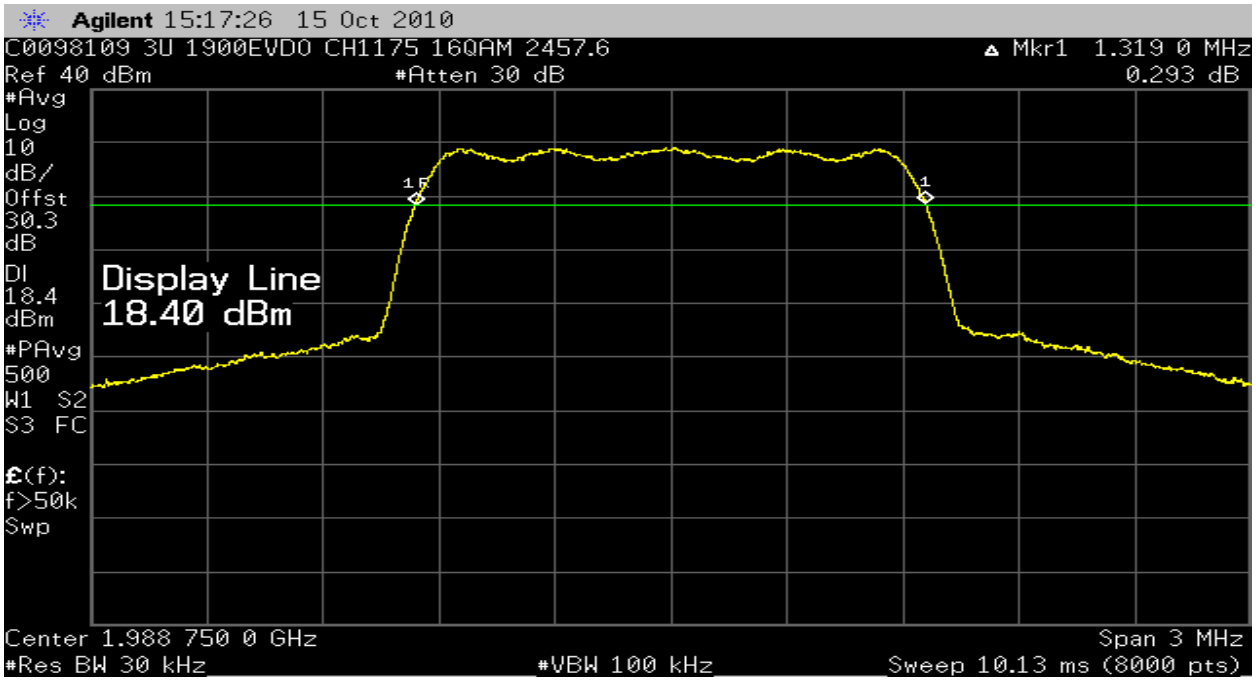
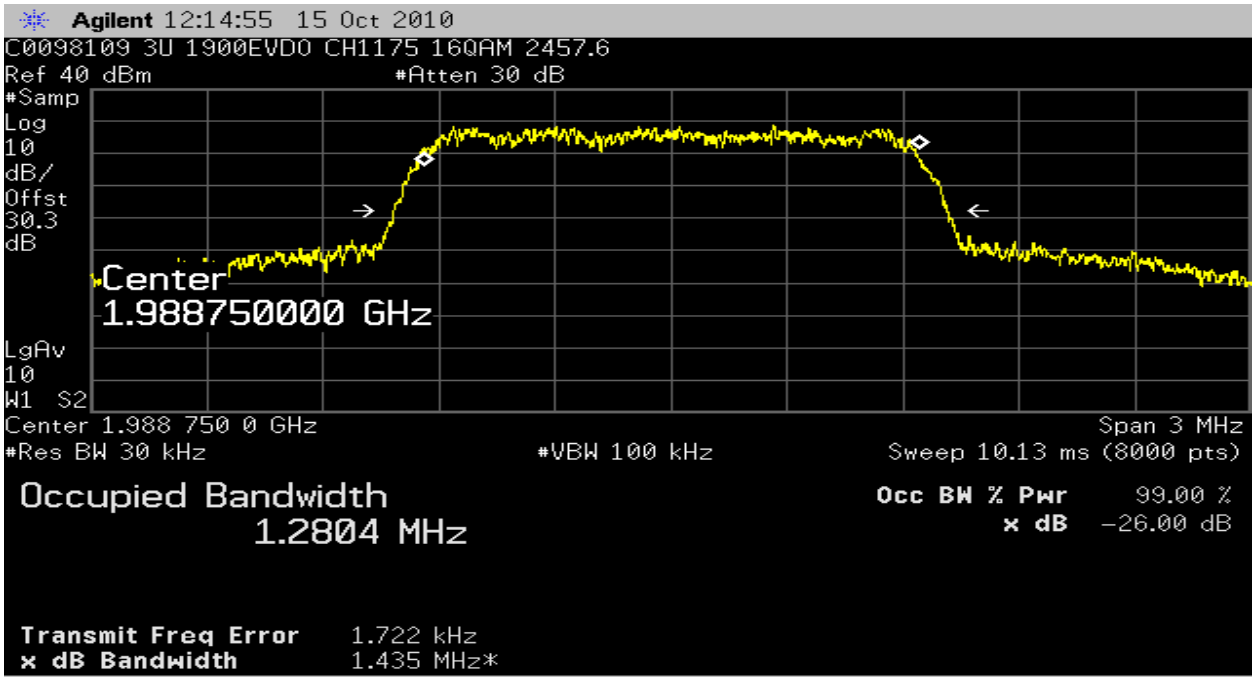


Figure 15: IC 99% Occupied BW, Channel 1175, 16QAM, 2457.6kbps



B.7. Tested By

Name: Daryl Therens
Senior Test Specialist

B.8. Test Dates

Test Start: October 15, 2010
Test Complete: October 15, 2010

APPENDIX C: SPURIOUS EMISSIONS AT ANTENNA TERMINALS

C.1. Base Standard & Test Basis

Base Standard	FCC Part 24.238; IC RSS-133 6.5
Test Basis	FCC 2.1051
Test Method	FCC 2.1051

C.2. Specifications

FCC Part 2.1051

The radio frequency voltage or powers generated within the equipment and appearing on a spurious frequency shall be checked at the equipment output terminals when properly loaded with a suitable artificial antenna. Curves or equivalent data shall show the magnitude of each harmonic and other spurious emission that can be detected when the equipment is operated under the conditions specified in 2.1049 as appropriate. The magnitude of spurious emissions which are attenuated more than 20 dB below the permissible value need not be specified.

FCC Part 2.1057 - Frequency Spectrum to be investigated

(a) In all of the measurements set forth in 2.1051 and 2.1053, the spectrum shall be investigated from the lowest radio frequency signal generated in the equipment, without going below 9 kHz, up to at least the frequency shown below:(1) If the equipment operates below 10 GHz: to the tenth harmonic of the highest fundamental frequency or to 40 GHz, whichever is lower.

(2) If the equipment operates at or above 10 GHz and below 30 GHz: to the fifth harmonic of the highest fundamental frequency or to 100 GHz, whichever is lower.

(3) If the equipment operates at or above 30 GHz: to the fifth harmonic of the highest fundamental frequency or to 200 GHz, whichever is lower.

(b) Particular attention should be paid to harmonics and sub-harmonics of the carrier frequency as well as to those frequencies removed from the carrier by multiples of the oscillator frequency. Radiation at the frequencies of multiplier stages should also be checked.

(c) The amplitude of spurious emissions which are attenuated more than 20 dB below the permissible value need not be reported.

(d) Unless otherwise specified, measurements above 40 GHz shall be performed using a minimum resolution bandwidth of 1 MHz.

FCC Part 24.238 Limit

The rules in this section govern the spectral characteristics of emissions in the Broadband Personal Communications Service.

(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.

(b) Measurement procedure. 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.

(c) Alternative out of band emission limit. Licensees in this service may establish an alternative out of band emission limit to be used at specified band edge(s) in specified geographical areas, in lieu of that set forth in this section, pursuant to a private contractual arrangement of all affected licensees and applicants. In this event, each party to such contract shall maintain a copy of the contract in their station files and disclose it to prospective assignees or transferees and, upon request, to the FCC.

(d) Interference caused by out of band emissions. If any emission from a transmitter operating in this service results in interference to users of another radio service, the FCC may require a greater attenuation of that emission than specified in this section.

C.3. Deviations

Deviation Number	Time & Date	Description and Justification of Deviation	Deviation Reference			Approval
			Base Standard	Test Basis	NTS Procedure	
none						

C.4. Test Method

The EUT was setup via a PC and Star Solutions software to transmit at maximum power in EVDO mode. Measurements were made at all modulation types and data rates, and at all Band / Block edges of the frequency band. Spurious emission measurements were performed on Sector 1 main antenna port. The diversity antenna port was terminated into a 50Ω load.

The following spectrum analyzer settings were used for the measurement of the antenna port spurious emissions:

Band-edge to indicated cellular band (Upper and Lower)

Resolution Bandwidth: 15 kHz
Video Bandwidth: 100 kHz
Trace Average: 200 Averages
Detector: Average
Span: 5 MHz
Attenuation: 30 dB
Ref. Level: 30 dBm
Ref. Level Offset: Set according to cable/attenuator loss

All spectrum analyzer settings were coupled as per the manufacturer's recommendations to improve measurement time, without compromising data.

All other Spurious Emissions up to 20 GHz

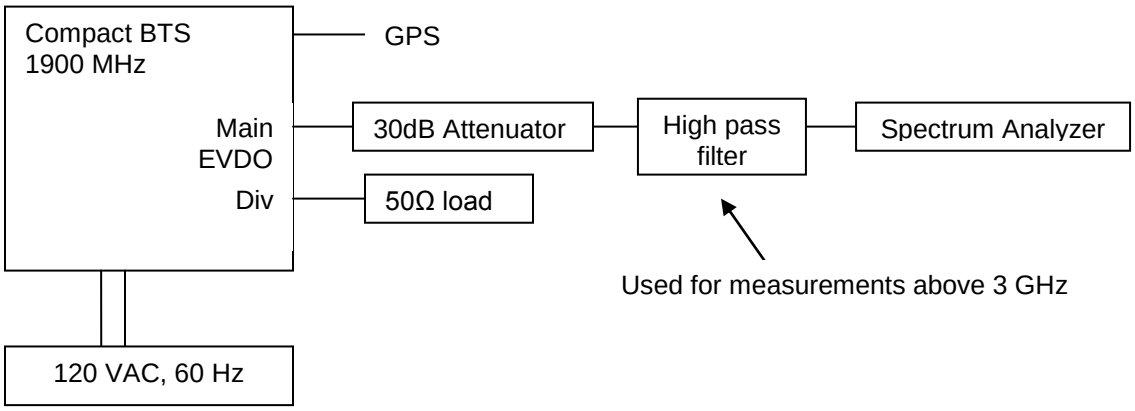
Resolution Bandwidth: 1 MHz
Video Bandwidth: 3 MHz
Detector: Average
Span: Set as per range tested
Attenuation: Optimized as per range tested
Ref. Level: Optimized as per range tested
Ref. Level Offset: Set according to cable/attenuator/high pass filter loss

Calibrated cables and attenuators were used (losses to 20GHz). The calibrated loss is the reference level offset on the spectrum analyzer.

C.5. Test Setup

The test setup for conducted spurious emissions is as shown in the figure below.

Figure 16: Conducted Spurious Emission Setup



C.6. Test Results

The frequency spectrum from 4 MHz to 20 GHz was scanned for emissions using the spectrum analyzer settings outlined in the test method.

The table below shows the spurious emissions at the antenna port of the Compact BTS in EVDO mode.

For EVDO operation, all modulation types and data rates were tested.

To reduce the number of Figures, not all plots are shown.

The Compact BTS complies with the limit of -13 dBm.

Table 3: Conducted Spurious Emissions at Antenna Ports, EVDO Mode

Channel	Modulation	Comment	Emission Frequency (MHz)	Level (dBm)	Limit (dBm)	Margin (dB)
25	8PSK, 921.6 kbps	Lower band edge	1.929999	-16.04	-13	3.04
25	8PSK, 1843.2 kbps	Lower band edge	1.929999	-16.05	-13	3.05
25	QPSK, 38.4 kbps	Lower band edge	1.929999	-15.76	-13	2.76
25	QPSK, 1228.8 kbps	Lower band edge	1.929999	-16.34	-13	3.34
25	16QAM, 1536 kbps	Lower band edge	1.929999	-16.76	-13	3.76
25	16QAM, 2457.6 kbps	Lower band edge	1.929999	-16.05	-13	3.05
1175	8PSK, 921.6 kbps	Upper band edge	1.9900001	-14.99	-13	1.99
1175	8PSK, 1843.2 kbps	Upper band edge	1.9900001	-14.45	-13	1.45
1175	QPSK, 38.4 kbps	Upper band edge	1.9900001	-14.01	-13	1.01
1175	QPSK, 1228.8kbps	Upper band edge	1.9900001	-14.36	-13	1.36
1175	16QAM, 1536 kbps	Upper band edge	1.9900001	-14.20	-13	1.20
1175	16QAM, 2457.6 kbps	Upper band edge	1.9900001	-14.55	-13	1.55
1175	8PSK, 921.6 kbps	Measurement noise floor	2.2842	-33.39	-13	20.39
1175	8PSK, 921.6 kbps	2^{nd} harmonic	3.9776	-50.16	-13	37.16
1175	8PSK, 921.6 kbps	3^{rd} harmonic	5.9647	-34.51	-13	21.51

Note 1: Since a resolution bandwidth of 15 kHz was used for the band edge measurements, add 0.6 more pass margin with bandwidth correction applied.

Note 2: All final reported values are corrected for cable and attenuator losses.

Figure 17: Band-edge, Channel 25, 8PSK, 921.6kbps

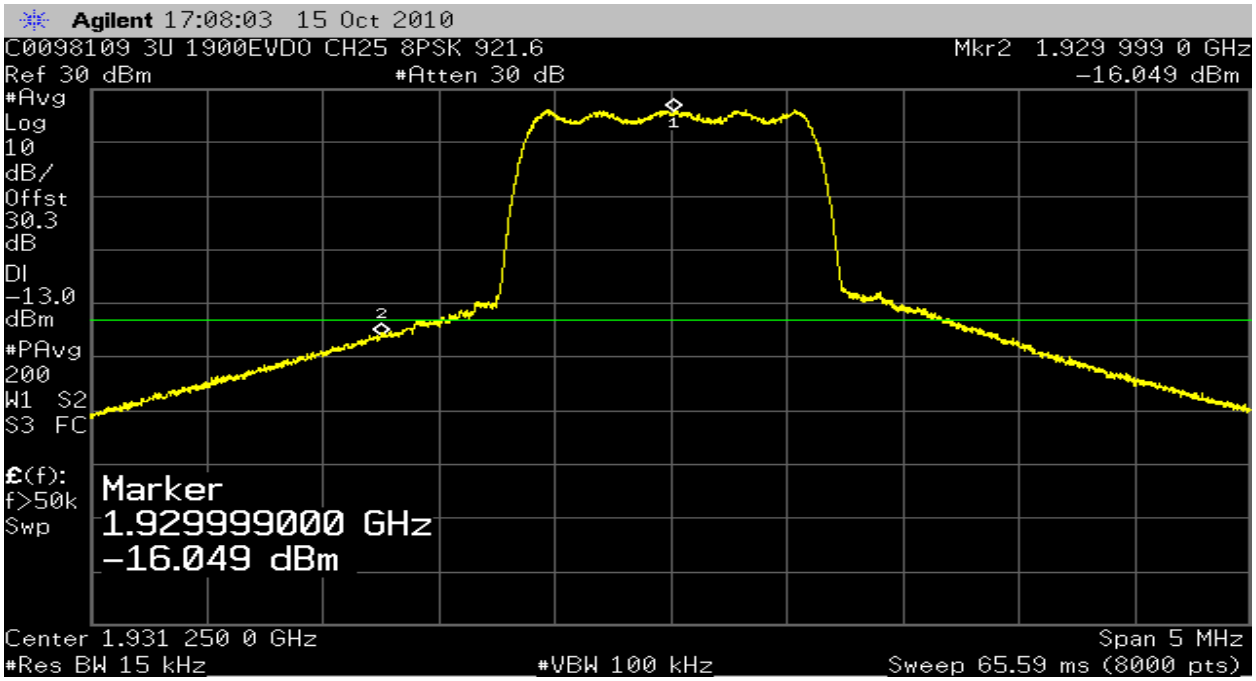


Figure 18: Band-edge, Channel 25, 8PSK, 1843.6kbps

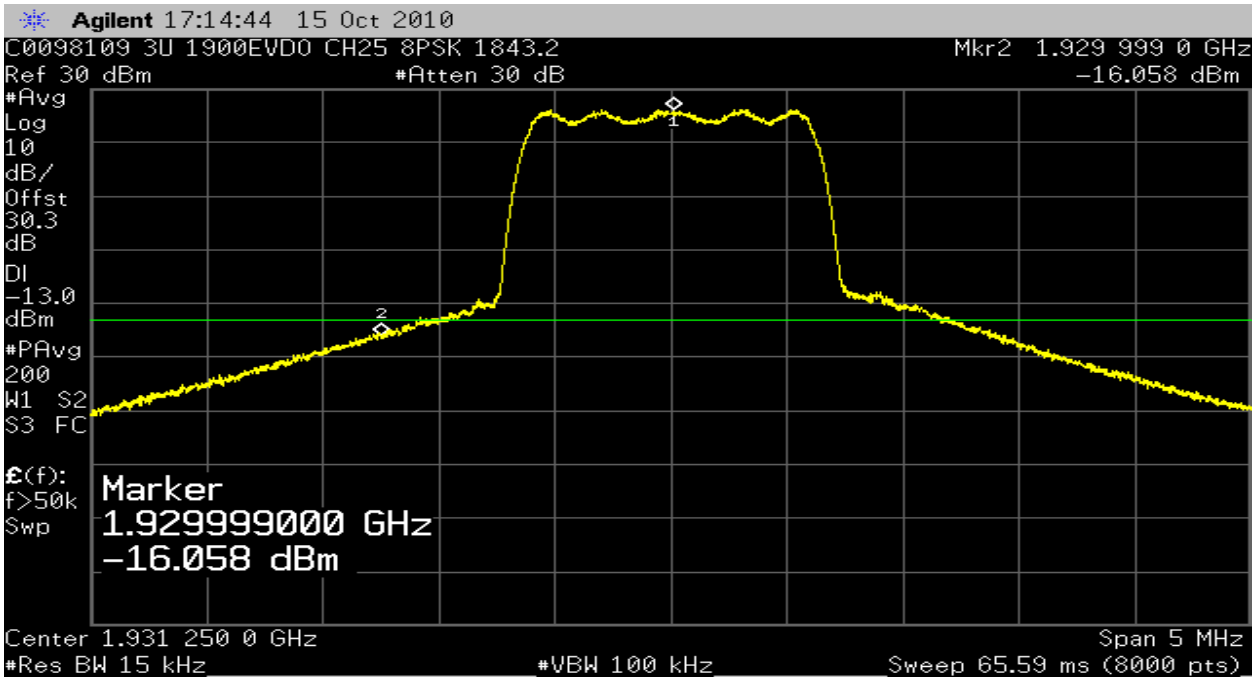


Figure 19: Band-edge, Channel 25, QPSK, 38.4kbps

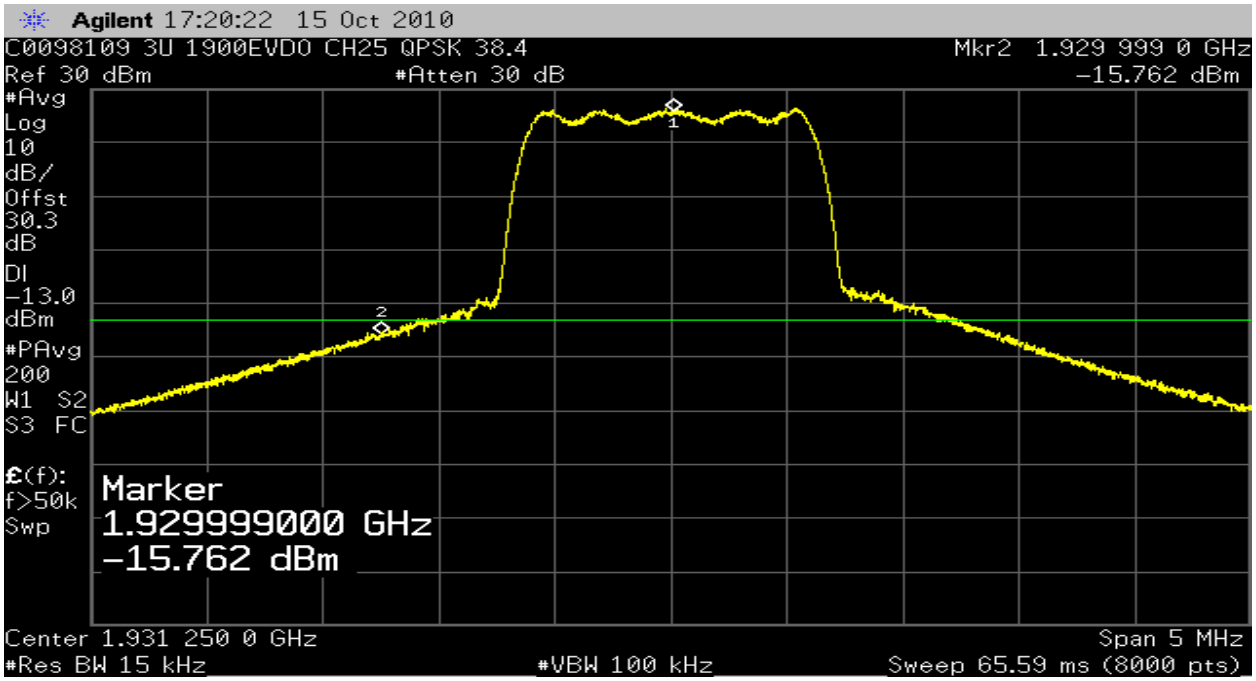


Figure 20: Band-edge, Channel 25, QPSK, 1228.8kbps

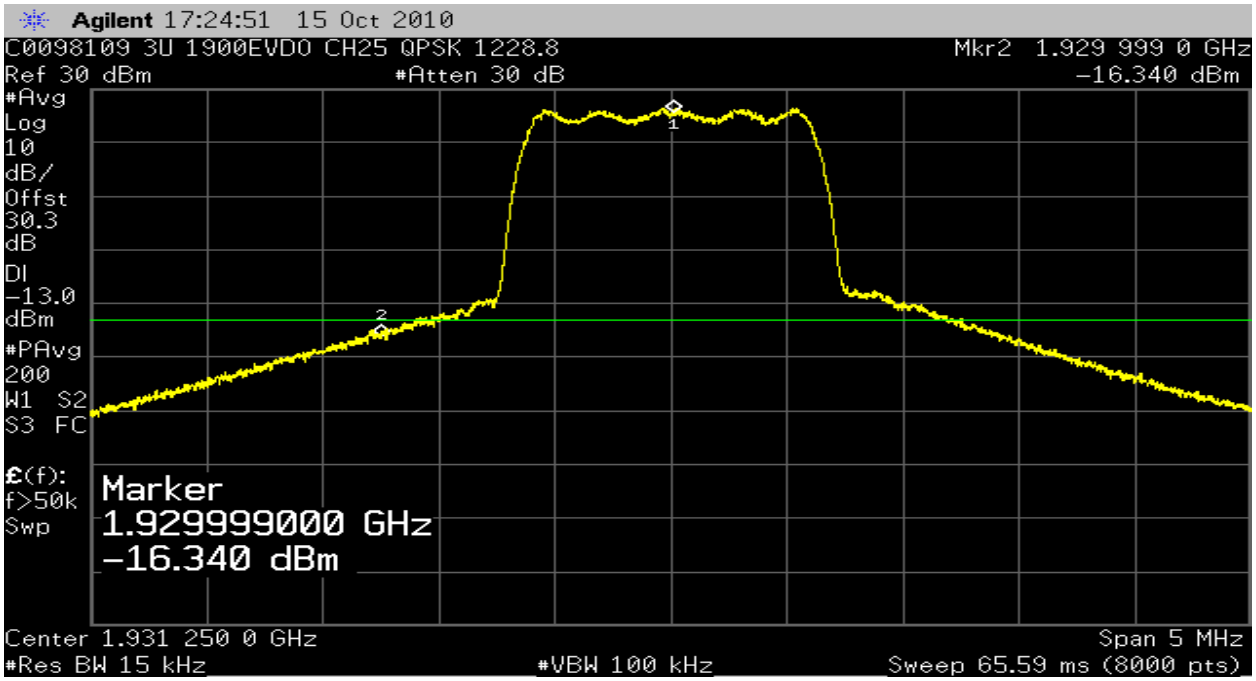


Figure 21: Band-edge, Channel 25, 16QAM, 1536kbps

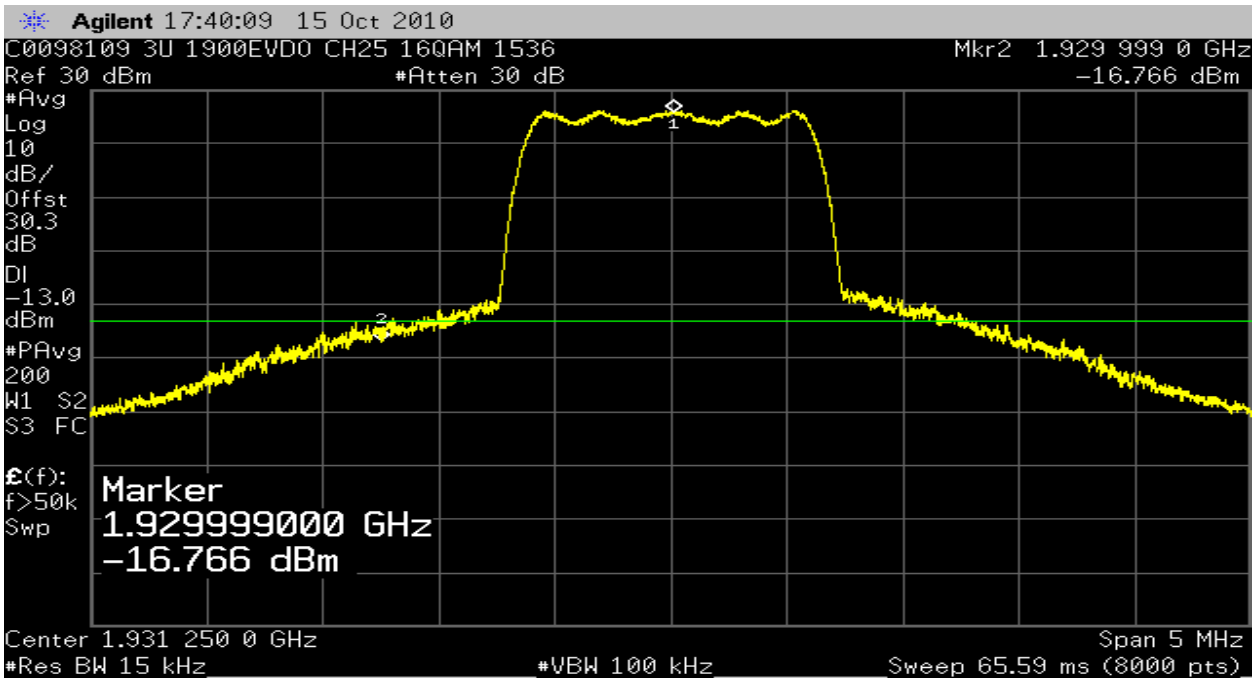


Figure 22: Band-edge, Channel 25,16QAM, 2457.6kbps

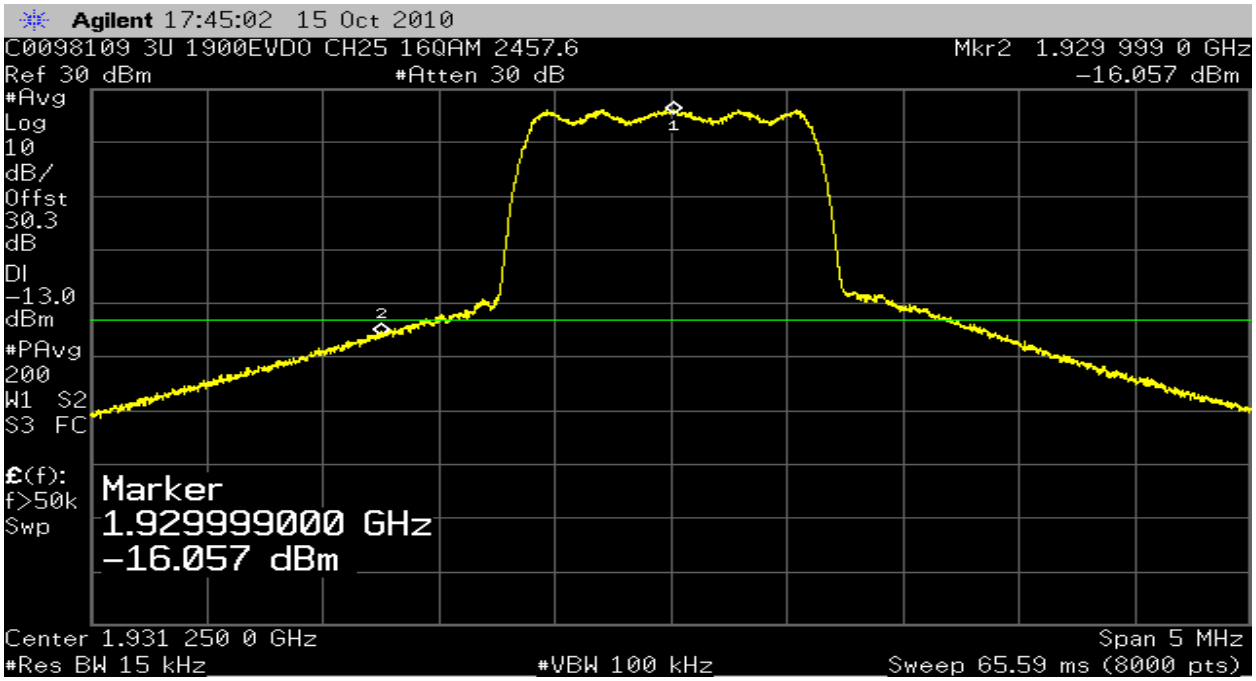


Figure 23: Band-edge, Channel 1175, 8PSK, 921.6kbps

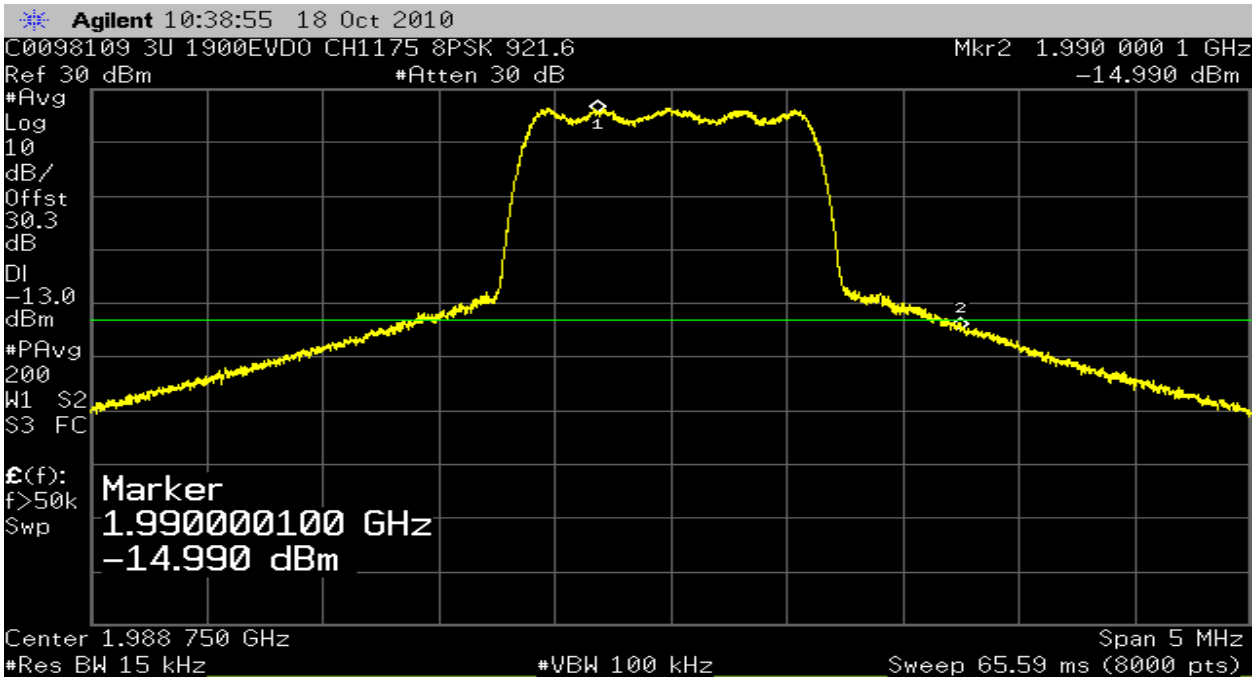


Figure 24: Band-edge, Channel 1175, 8PSK, 1843.2kbps

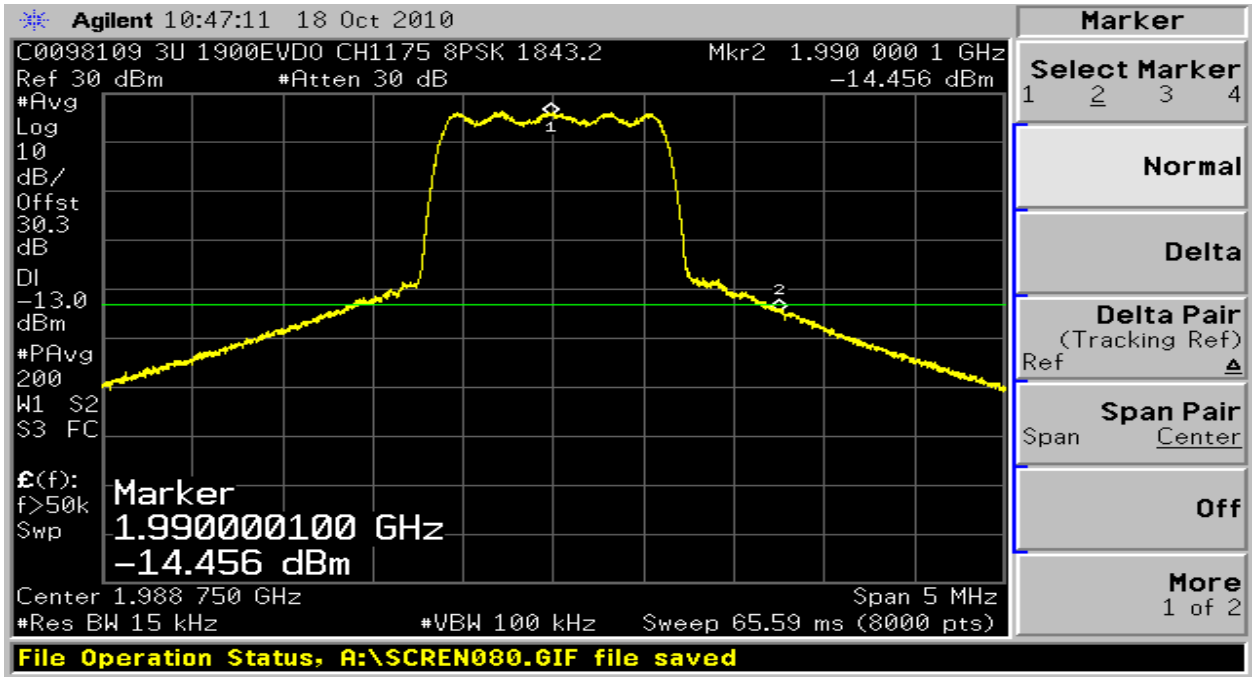


Figure 25: Band-edge, Channel 1175, QPSK, 38.4kbps

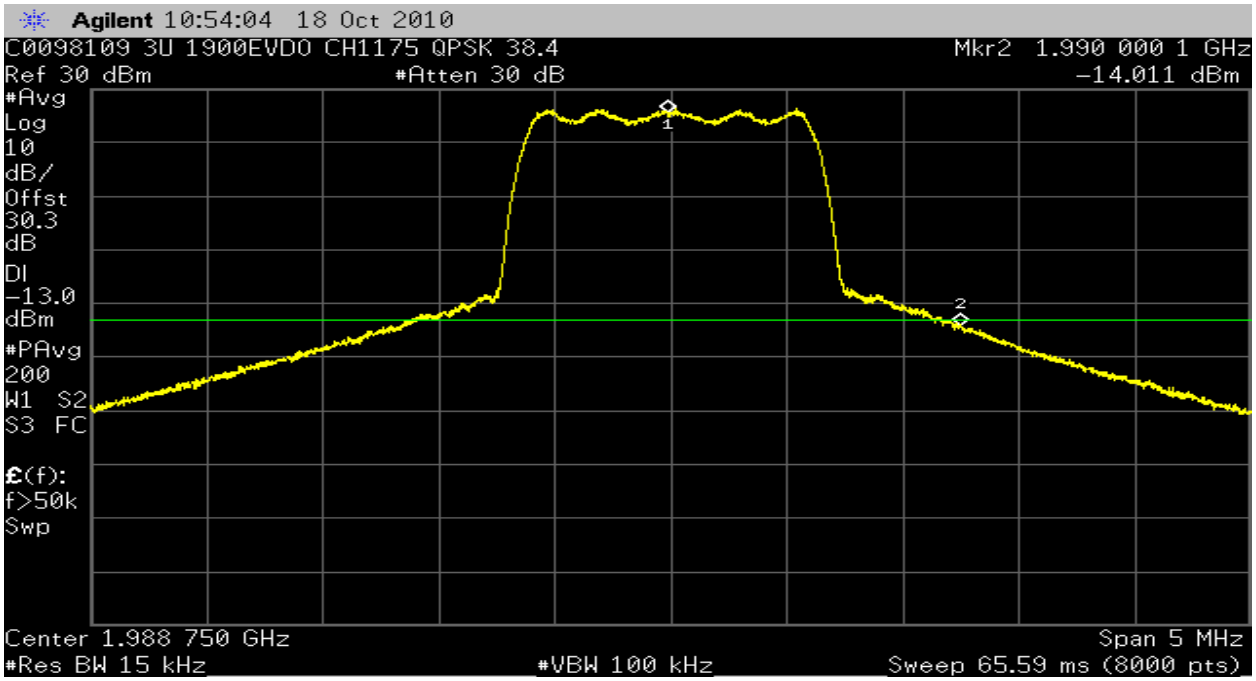


Figure 26: Band-edge, Channel 1175, QPSK, 1228.8kbps

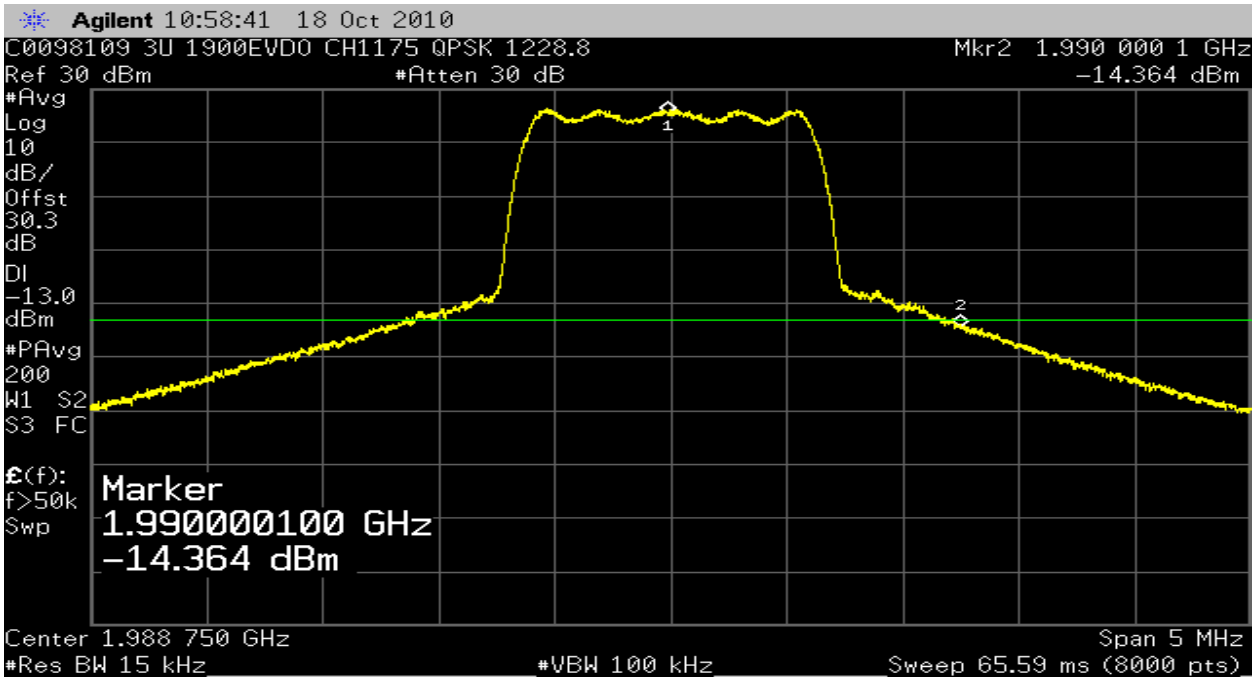


Figure 27: Band-edge, Channel 1175,16QAM, 1536kbps

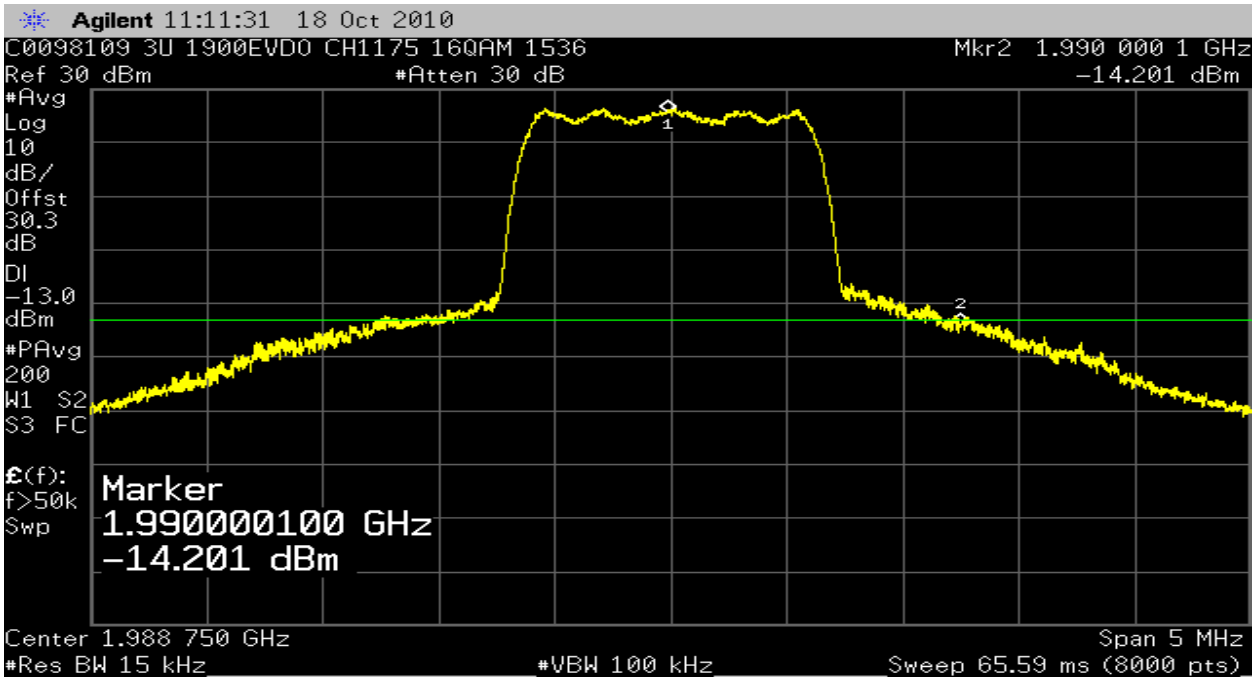


Figure 28: Band-edge, Channel 1175, 16QAM, 2457.6kbps

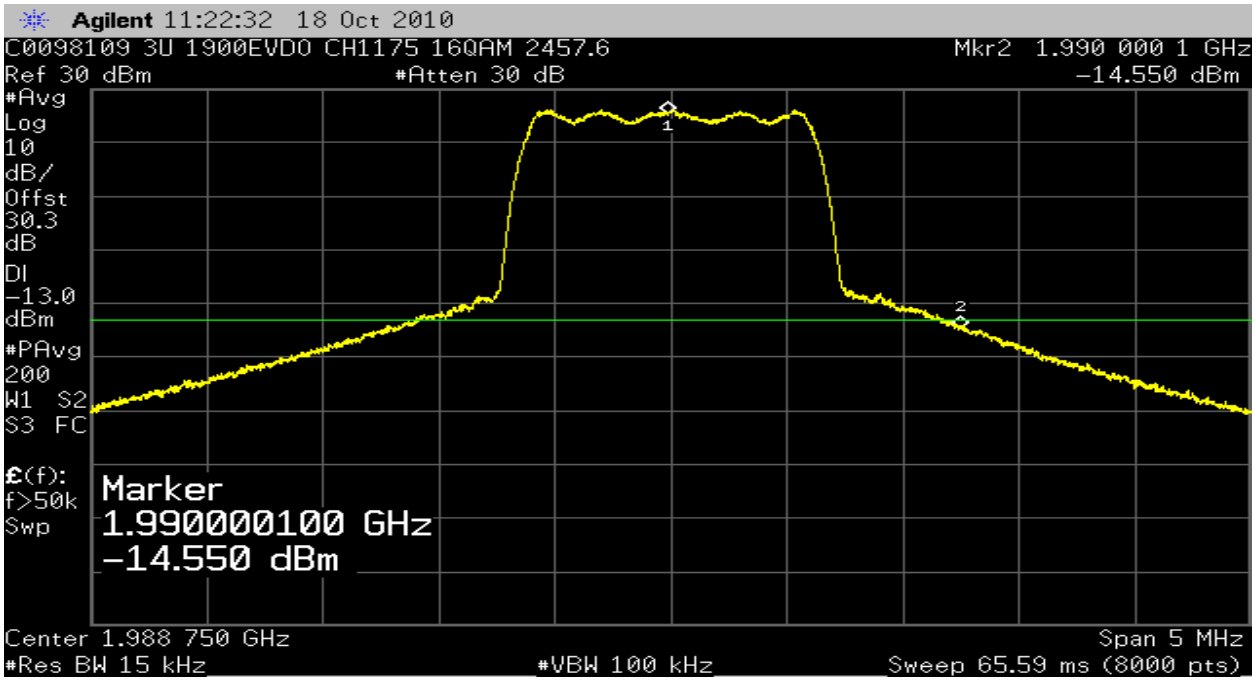


Figure 29: 4MHz – 3GHz, Channel 1175, 8PSK, 921.6kbps

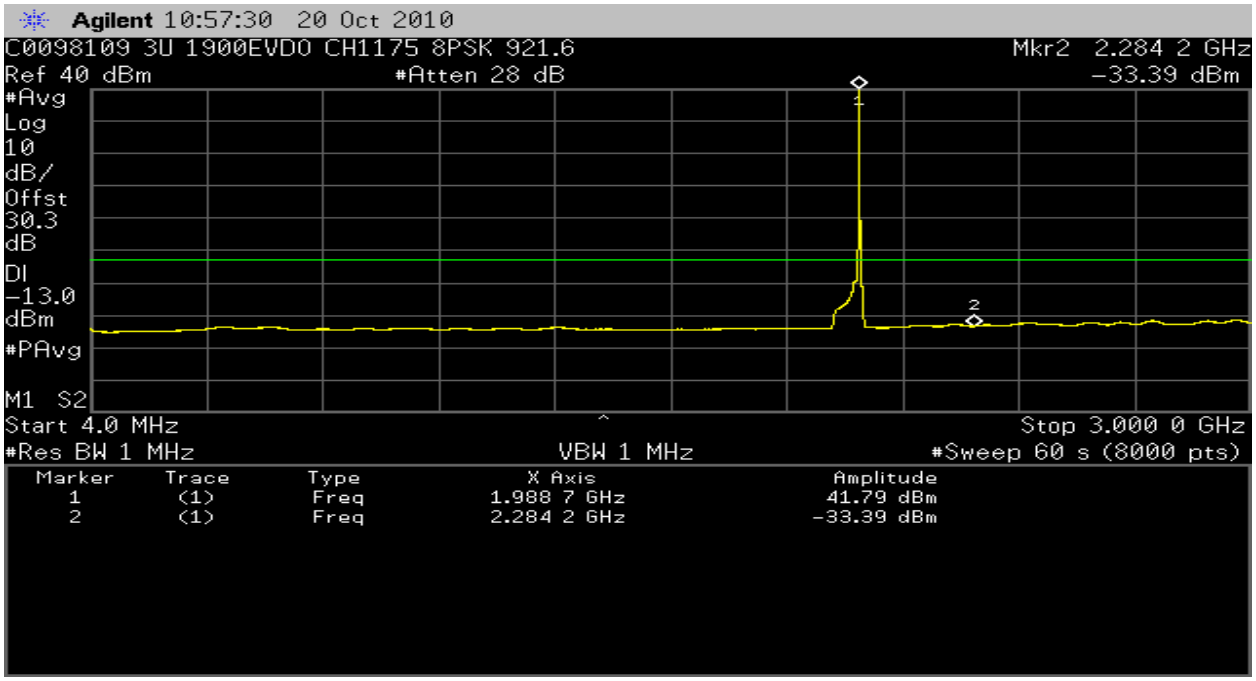
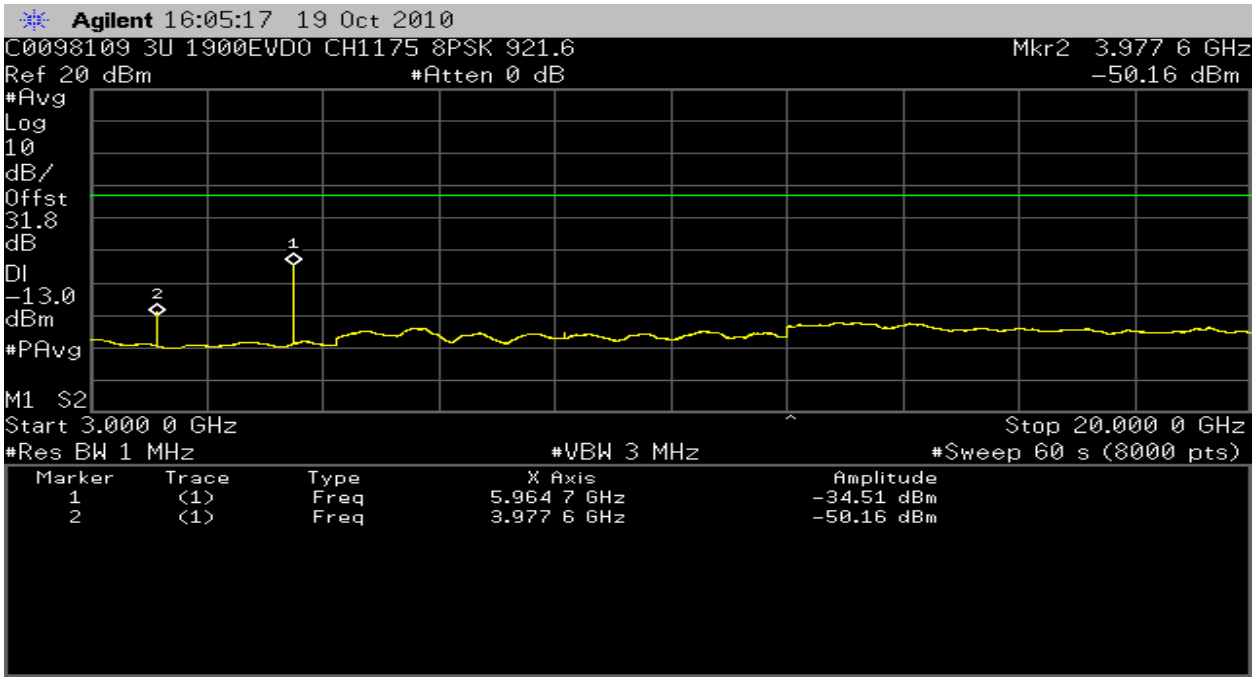


Figure 30: 3GHz – 20GHz, Channel 1175, 8PSK, 921.6kbps



C.7. Tested By

Name: Daryl Therens
Senior Test Specialist

C.8. Test Dates

Test Start: October 15, 2010
Test Complete: October 20, 2010

APPENDIX D: FREQUENCY STABILITY

D.1. Base Standard & Test Basis

Base Standard	FCC 24.235; IC RSS-133 6.3, RSS-Gen 4.7
Test Basis	FCC Part 2.1055
Test Method	FCC Part 2.1055/EIA/TIA 603

D.2. FCC Part 2.1055

(a) The frequency stability shall be measured with variation of ambient temperature as follows:

(1) From -30 to +50 centigrade for all equipment except that specified in subparagraphs (2) and (3) of this paragraph.

(b) Frequency measurements shall be made at the extremes of the specified temperature range and at intervals of not more than 10 centigrade through the range. A period of time sufficient to stabilize all of the components of the oscillator circuit at each temperature level shall be allowed prior to frequency measurement. The short term transient effects on the frequency of the transmitter due to keying (except for broadcast transmitters) and any heating element cycling normally occurring at each ambient temperature level also shall be shown. Only the portion or portions of the transmitter containing the frequency determining and stabilizing circuitry need be subjected to the temperature variation test.

(d) The frequency stability shall be measured with variation of primary supply voltage as follows:

(1) Vary primary supply voltage from 85 to 115 percent of the nominal value for other than hand carried battery equipment.

(2) For hand carried, battery powered equipment, reduce primary supply voltage to the battery operating end point which shall be specified by the manufacturer.

(3) The supply voltage shall be measured at the input to the cable normally provided with the equipment, or at the power supply terminals if cables are not normally provided. Effects on frequency of transmitter keying (except for broadcast transmitters) and any heating element cycling at the nominal supply voltage and at each extreme also shall be shown.

(e) When deemed necessary, the Commission may require tests of frequency stability under conditions in addition to those specifically set out in paragraphs (a), (b), (c) and (d) of this section. (For example, measurements showing the effect of proximity to large metal objects, or of various types of antennas, may be required for portable equipment.)

FCC Part 24.235 Limit

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

IC RSS-133 Limit

The carrier frequency shall not depart from the reference frequency in excess of ±1.0 ppm for base stations.

In lieu of meeting the above stability value, the test report may show that the frequency stability is sufficient to ensure that the emission bandwidth stays within the operating frequency block when tested to the temperature and supply voltage variations specified in RSS-Gen.

D.3. Deviations

Deviation Number	Time & Date	Description and Justification of Deviation	Deviation Reference			Approval
			Base Standard	Test Basis	NTS Procedure	
none						

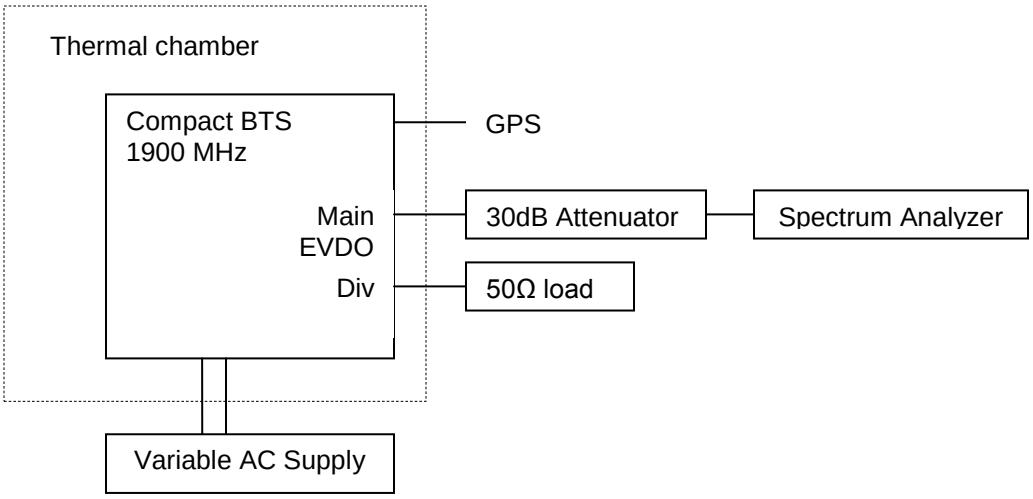
D.4. Test Method

The EUT was setup via a PC and Star Solutions software to transmit at maximum power in EVDO mode. Frequency stability measurements were performed on Sector 1 main antenna port. The diversity antenna port was terminated into a 50Ω load.

To verify the stability of the frequency determining components, the EVDO carrier was set to transmit in CW mode. An external GPS reference was connected to the Compact BTS during test. Measurements were taken at startup and at 1 minute intervals for 10 minutes. Note that only the maximum frequency error reading is listed.

D.5. Test Set Up

Figure 31: Frequency Stability Setup



D.6. Test Results

Complies. In EVDO Mode, the maximum frequency drift is -104 Hz. This is sufficient to ensure the fundamental stays within the assigned frequency block.

The RF carrier frequency also stayed within the specified reference frequency limit over the temperature and supply voltage ranges. The reference frequency is the frequency at 20°C and 120 VAC.

Table 4: EVDO Mode Frequency Stability Data

Channel / Frequency	Operating conditions	Maximum Frequency Error (Hz)
CH 1175, 1988.75 MHz	50°C and 120VAC	-102
	47°C and 120VAC	-95
	45°C and 120VAC	-101
	40°C and 120VAC	-104
	30°C and 120VAC	-91
	20°C and 120VAC	-101
	20°C and 138VAC	-100
	20°C and 102VAC	-99
	10°C and 120VAC	-89
	0°C and 120VAC	-92
	-10°C and 120VAC	-97
	-20°C and 120VAC	-52
	-23°C and 120VAC	-80
	-25°C and 120VAC	-87
	-26°C and 120VAC	-93
	-27°C and 120VAC	Transmitter would not key on
	-30°C and 120VAC	Transmitter would not key on

D.7. Tested By

Name: Daryl Therens
Senior Test Specialist

D.8. Test Dates

Test Start: October 8, 2010
Test Complete: October 12, 2010

APPENDIX E: PEAK-TO-AVERAGE POWER RATIO

E.1. Base Standard & Test Basis

Base Standard	FCC Part 24.232; IC RSS-133 6.4
Test Basis	FCC 2.1046
Test Method	TIA/EIA 603

E.2. FCC Part 24.232

FCC Limit

The peak-to-average ratio of the power shall not exceed 13 dB.

E.3. Deviations

Deviation Number	Time & Date	Description and Justification of Deviation	Deviation Reference			Approval
			Base Standard	Test Basis	NTS Procedure	
none						

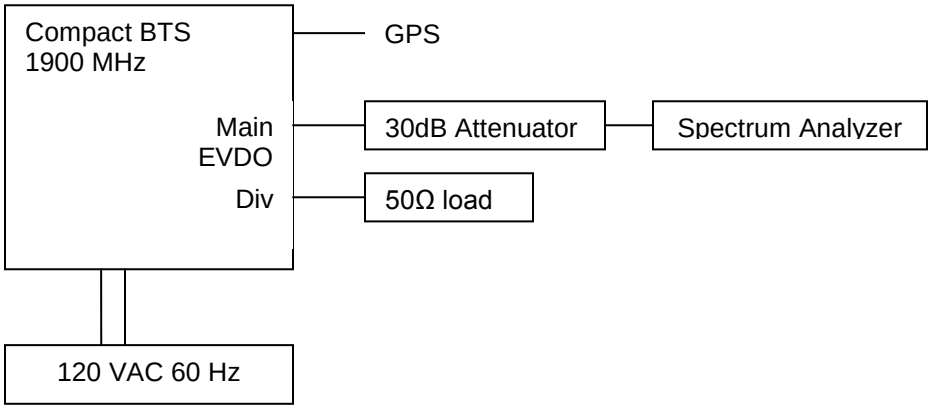
E.4. Test Method

The EUT was setup via a PC and Star Solutions software to transmit at maximum power in EVDO mode. Peak to Average power ratio measurements were performed on Sector 1 main antenna port. The diversity antenna port was terminated into a 50Ω load.

The PSA spectrum analyzer CCDF function was used for Peak to Average power ratio measurements.

E.5. Test Set Up

Figure 32: Peak-to-Average Power Ratio Setup



E.6. Test Results

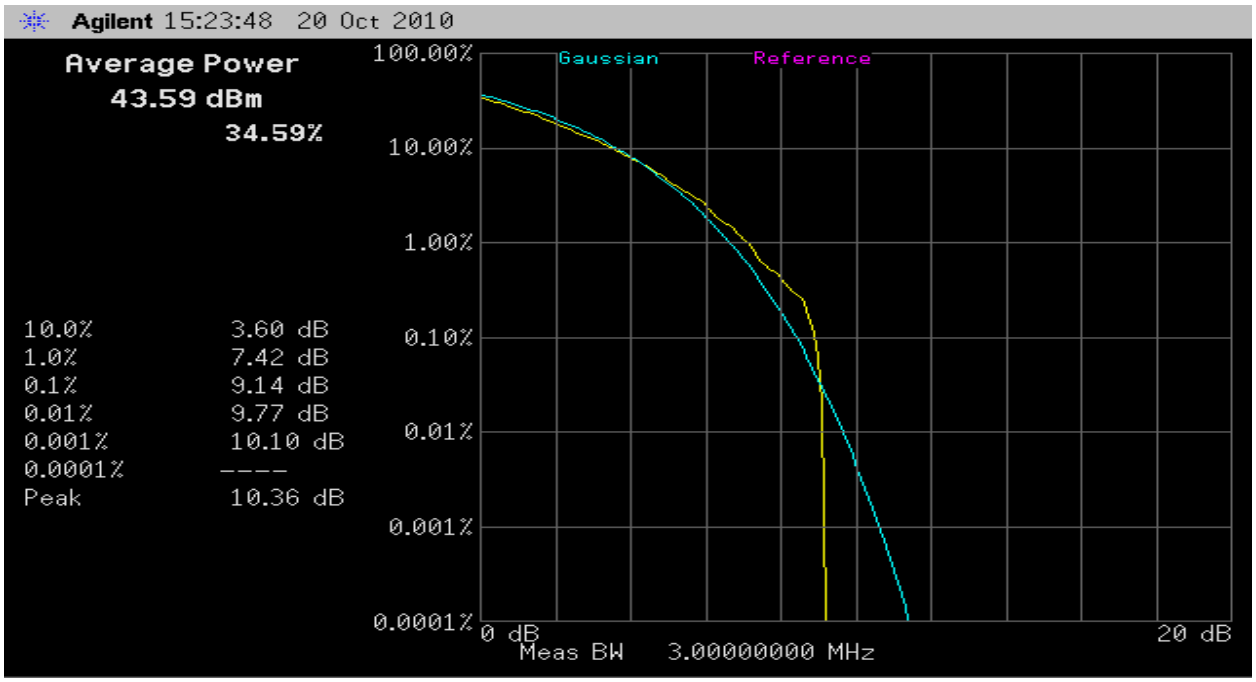
Complies. In EVDO Mode, the maximum peak-to-average power ratio was 10.36 dB.

To reduce the number of Figures, only the plot of the maximum peak-to-average power ratio is shown.

Table 5: EVDO Mode Peak-to-Average Power Ratio

Channel / Frequency	Operating Mode	Peak-to-Average Power Ratio in dB
CH 600, 1960.00 MHz	16QAM, 2457.6kbps, 1slot	10.30
	QPSK, 1228.8kbps, 1slot	10.36
	8PSK, 1843.2kbps, 1slot	10.05

Figure 33: Peak to Average Power Ratio, Channel 600, QPSK, 1228.8kbps



E.7. Tested By

Name: Daryl Therens
Senior Test Specialist

E.8. Test Dates

Test Start: October 20, 2010
Test Complete: October 20, 2010

APPENDIX F: RADIATED E-FIELD EMISSIONS; TX / RX SPURIOUS EMISSIONS – 30MHZ TO 20GHZ

F.1. Base Standard & Test Basis

Base Standard	CFR Title 47 – Telecommunications, Chapter I, Subchapter B, FCC Part 24 – Personal Communication Services IC RSS-133 6.3, IC RSS-133 6.6, RSS-Gen
Test Basis	EIA/TIA 603 C
Test Method	• NTS Emission Test Methods CAG EMC 02 • NTS Emission Verification Test Methods CAG EMC 01

F.2. Specifications

Frequency (MHz)	**47 CFR FCC Part 24**	
	Theoretical Peak @ 3m[1] dBμV/m	**EIRP[2] dBm**
1000 - 20000	84.3	-13

Note 1: Calculated using: Pd-(43 + 10 log(Pw)
where Pd is the EUT power in dBm and Pw is the EUT power in watts
Note 2: Calculated using: 120+20log(SQRT(49.2*Pw)/3)
where Pw is the EUT power in watts

F.3. Measurement Uncertainty

Radiated Emissions	**Measurement Uncertainty (dB)**	**Expanded Uncertainty (K=2)**
30 MHz – 1 GHz	+2.32/-2.36	+4.65/-4.72
1 GHz – 20 GHz	+3.48/-3.51	+6.96/-7.02

F.4. Deviations

Deviation Number	**Time & Date**	**Descriptions**	**Deviation Reference**			**Approval**
			Base Standard	**Test Basis**	**NTS Procedure**	
None						

F.5. Special Considerations

None

F.6. Operating Mode During Test

1900MHz CDMA EVDO was set to transmit at low, mid and high channels with maximum power, 8PSK and 921.6 kbps.

F.7. Tx Test Results

Table 6: Compliance Scan Summary: 30MHz to 1GHz

There were no FCC Part 24 related emissions detected in this frequency range.

Table 7: Compliance Scan Summary: 1GHz to 20GHz

Cha-nnel	Polari-zation	Frequency (MHz)	Emission Level (dBuV/m)	Substitution Signal Generator Level (dBm)	Substitution Antenna Gain (dBi)	Cable Loss (dB)	EIRP Level (dBm)	Limit (dBm)	Margin (dB)
25	H-pol	3862.50	72.91	-30.20	9.97	2.05	-22.28	-13	9.28
	V-pol	3862.48	76.15	-26.90	9.81	2.05	-19.14	-13	6.14
	V-pol	5793.56	55.91	-48.30	11.31	2.55	-39.54	-13	26.54
500	H-pol	3910.15	67.10	-36.60	9.99	2.07	-28.68	-13	15.68
	V-pol	3909.67	66.56	-36.50	9.81	2.07	-28.76	-13	15.76
1175	H-pol	3977.78	64.39	-39.00	9.96	2.09	-31.13	-13	18.13
	V-pol	3977.40	68.91	-34.20	9.91	2.09	-26.38	-13	13.38

F.8. Rx Spurious Emissions

No Rx spurious emissions were detected.

F.9. Observations

None.

F.10. Sample Calculation

3m Limit = 10m Limit – 20 * log (3/10)
Emission Level = Measured Level + Correction Factors
Margin = Limit – Emission Level
ERP Limit (dBm) = Pd-(43 + 10 log(Pw)
where Pd is the EUT power in dBm and Pw is the EUT power in watts
Theoretical EIRP Limit (dBuV/m) 120+20log(SQRT(49.2*Pw)/3)
where Pw is the EUT power in watts

F.11. Tested By

This testing was conducted in accordance with the ISO 17025:2005 scope of accreditation table 1; Quality Manual.

Name: Lixin Wang
EMC Technologist

F.12. Test Dates

Test Start: October 05, 2010
Test Complete: October 06, 2010

APPENDIX G: TEST EQUIPMENT LIST

G.1. Test Equipment

Descriptions	Manufacturer	Type/Model	Serial #	Cal Due	Cal Date
Test Receiver	Rohde & Schwarz	ESMI	CG0433	4-May-11	4-May-09
Receiver Display	Rohde & Schwarz	ESAI	CG0123	26-Feb-11	26-Feb-09
Bilog Antenna	Teseq	CBL 6112D	CG1177	14-Sep-12	6-Oct-09[4]
Horn Antenna (Rx) 1 GHz – 18 GHz	EMCO	3115	CG0368	8-Sep-11	8-Sep-09
High Pass Filter f>1 GHz	MicroTronics	HPM14576	CG0963	NCR	NCR
LNA 1 GHz<f<18 GHz	Miteq	JSD00121	CG0761	13-Nov-11	13-Nov-09
Spectrum Analyzer 9 kHz – 40 GHz*	Rohde & Schwarz	FSEK-20	CG0118	13-Sep-11	13-Sep-10
High Pass Filter f>2.8 GHz	MicroTronics	HPM50111	CG0951	NCR	NCR
PSA Spectrum Analyzer 3 Hz – 44 GHz	Agilent	E4446A	US42510248	09-Sep-12	09-Sep-10
Attenuator	Weinschel	30dB 150W	CG0751	NCR	NCR
RF cable	Sucoflex	104	115760/4	NCR	NCR
RF cable	Sucoflex	104	115766/4	NCR	NCR
Multi-meter	Fluke	87	CG0383	11-Mar-11	11-Mar-10
Variable AC Supply	General Radio USA	Variac	CG1456	NCR	NCR
Data Acquisition Switch Unit	Fluke	Hydra	CG0213	3-May-11	3-May-10
Temperature Chamber	Staples and Stevens Co.	DSW	97817	NCR	NCR

[4] Antenna was hold “In Service” program until 14 September, 2011

END OF DOCUMENT