

TECHNICAL CONSULTING LTD



卓時檢測

TIMEWAY TESTING LABORATORY



ISO/IEC17025Accredited Lab.

Report No:

FCC 1101241

File reference No:

2011/2/18

Applicant:

Rainkine Thompson Ltd

Product:

RTL LINX1+ vehicle telematics unit

Model No:

RTL LINX1+

Trademark:

RTL

Test Standards:

FCC Part 2 Subpart J & Part 22 Subpart H & Part 24 Subpart E

Test result:

It is herewith confirmed and found to comply with the requirements set up by ANSI C63.4& FCC Part 2 Subpart J & Part 22 Subpart H & Part 24 Subpart E regulations for the evaluation of electromagnetic compatibility

Approved By

Jack Chung

Jack Chung

Manager

Dated:

February 18, 2011

**Results appearing herein relate only to the sample tested**

**The technical reports is issued errors and omissions exempt and is subject to withdrawal at**

**SHENZHEN TIMEWAY TECHNOLOGY CONSULTING CO LTD**

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## Special Statement:

The testing quality ability of our laboratory meet with "Quality Law of People's Republic of China" Clause 19.

The testing quality system of our laboratory meets with ISO/IEC-17025 requirements, which is approved by CNAS. This approval result is accepted by MRA of APLAC.

Our test facility is recognized, certified, or accredited by the following organizations:

### **CNAS-LAB Code: L2292**

The EMC Laboratory has been assessed and in compliance with CNAS-CL01 accreditation criteria for testing Laboratories (identical to ISO/IEC 17025:1999 General Requirements) for the Competence of testing Laboratories.

### **FCC-Registration No.: 899988**

The EMC Laboratory has been registered and fully described in a report filed with the (FCC) Federal Communications commission. The acceptance letter from the FCC is maintained in our files. Registration No.:899988.

### **IC- Registration No.: IC5205A-01**

The EMC Laboratory has been registered and fully described in a report filed with the (IC) Industry Canada. The acceptance letter from the IC is maintained in our files. Registration No.: IC 5205A-01.

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## 1.0 General Details

### 1.1 Test Lab Details

Name : SHENZHEN TIMEWAY TECHNOLOGY CONSULTING CO LTD  
Address: 5/F,Block 4, Anhua Industrial Zone.,No.8 TaiRan Rd.CheGongMiao,FuTian District, Shenzhen,CHINA.  
Telephone: (755) 83448688  
Fax: (755) 83442996

Site on File with the Federal Communications Commission – United States

Registration Number: 899988

For 3m & 10 m OATS

Site Listed with Industry Canada of Ottawa, Canada

Registration Number: IC: 5205A-01

For 3m & 10 m OATS

### 1.2 Applicant Details

Applicant: Rainkine Thompson Ltd  
Address: 44a Lower Market Street, Broadbottom, Cheshire, SK14 6AA, UK  
Telephone: +44 (0) 1457767309  
Fax: +44 1457 762247

### 1.3 Description of EUT

Product: RTL LINX1+ vehicle telematics unit

Manufacturer: Cwlinux Ltd.

Brand Name: **RTL**

Model Number: RTL LINX1+

Additional Model Name N/A

Emission Designator: Cellular band :1M44F9W

PCS band : 1M43F9W

Power Supply 12VDC

Type of Modulation CDMA

Frequency range 824.7-848.31MHz 1851.25-1908.75MHz

Antenna type the antenna gain is 1.0 dBi

### 1.4 Submitted Sample: 2 Sample

### 1.5 Test Duration

2011-01-15 to 2011-01-23

### 1.6 Test Uncertainty

Conducted Emissions Uncertainty =3.6dB

Radiated Emissions Uncertainty =4.7dB

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1.7 Test Engineer

*Terry Tang*

The sample tested by \_\_\_\_\_

Print Name: Terry Tang

Test Equipments					
Instrument Type	Manufacturer	Model	Serial No.	Date of Cal.	Due Date
ESPI Test Receiver	ROHDE&SCHWARZ	ESPI 3	100379	2010-12-06	2011-12-05
Absorbing Clamp	ROHDE&SCHWARZ	MDS-21	100126	2010-12-06	2011-12-05
TWO Line-V-NETW	ROHDE&SCHWARZ	EZH3-Z5	100294	2010-12-06	2011-12-05
TWO Line-V-NETW	ROHDE&SCHWARZ	EZH3-Z5	100253	2010-12-06	2011-12-05
Ultra Broadband ANT	ROHDE&SCHWARZ	HL562	100157	2010-12-06	2011-12-05
ESDV Test Receiver	ROHDE&SCHWARZ	ESDV	100008	2010-12-06	2011-12-05
4-WIRE ISN	ROHDE&SCHWARZ	ENY 41	830663/044	2010-12-06	2011-12-05
GG ENY22 Double 2-Wire ISN	ROHDE&SCHWARZ	ENY22	83066/016	2010-12-06	2011-12-05
Impuls-Begrenzer	ROHDE&SCHWARZ	ESH3-Z2	100281	2010-12-06	2011-12-05
System Controller	CT	SC100	-	2010-12-06	2011-12-05
Printer	EPSON	PHOTO EX3	CFNH234850	2010-12-06	2011-12-05
FM-AM Signal Generator	JUNG.JIN	SG-150M	389911177	2010-12-06	2011-12-05
Color TV Pattern Generator	PHILIPS	PM5418	LO621747	2010-12-06	2011-12-05
Computer	IBM	8434	1S8434KCE99BLX LO*	-	-
Oscillator	KENWOOD	AG-203D	3070002	2010-12-06	2011-12-05
Power meter	Anritsu	ML2487A	6K00003613	2010-12-06	2011-12-05
Power sensor	Anritsu	MA2491A	32263	2010-12-06	2011-12-05

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Spectrum Analyzer	HAMEG	HM5012	-	2010-12-06	2011-12-05
Power Supply	LW	APS1502	-	-	-
5K VA AC Power Source	California Instruments	5001iX	56060	2010-12-06	2011-12-05
CDN	EM TEST	CDN M2/M3	-	2010-12-06	2011-12-05
Attenuation	EM TEST	ATT6/75	-	2010-12-06	2011-12-05
Resistance	EM TEST	R100	-	2010-12-06	2011-12-05
Electromagnetic Injection Clamp	LITTHI	EM101	35708	2010-12-06	2011-12-05
Signal Generator	ROHDE&SCHWARZ	SMT03	100029	2010-12-06	2011-12-05
Power Amplifier	AR	150W1000	300999	2010-12-06	2011-12-05
Field probe	Holaday	HI-6005	105152	2010-12-06	2011-12-05
Bilog Antenna	Chase	CBL6111C	2576	2010-12-06	2011-12-05
ESPI Test Receiver	ROHDE&SCHWARZ	ESI26	838786/013	2010-12-06	2011-12-05
3m OATS	--	--	N/A	2010-12-06	2011-12-05
Horn Antenna	SCHWARZBECK	BBHA 9170	BBHA9170265	2010-12-06	2011-12-05
Horn Antenna	SCHWARZBECK	BBHA 9120D	9120D-631	2010-12-06	2011-12-05
Rohde & Schwarz	Universal Radio Communication Tester	CMU200	1100.0008.02	2010-12-06	2011-12-05
Agilent	Spectrum Analyzer	E4440A	----	2010-12-06	2011-12-05
Agilent	Analyzer,commuications	E5155C	----	2010-12-06	2011-12-05

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### 3.0 Technical Details

#### 3.1 Summary of test results

FCC RULE	DESCRIPTION OF TEST	Result
§1.1037, §2.1091	RF Exposure	Compliant
§2.1046; § 22.913 (a) § 24.232 (c)	RF Output Power	Compliant
§ 2.1047	Modulation Characteristics	N/A
§ 2.1049 § 22.905 § 22.917 § 24.238	99% & -26 dB Occupied Bandwidth	Compliant
§ 2.1051, § 22.917 (a) § 24.238 (a)	Spurious Emissions at Antenna Terminal	Compliant
§ 2.1053 § 22.917 (a) § 24.238 (a)	Field Strength of Spurious Radiation	Compliant
§ 22.917 (a) § 24.238 (a)	Out of band emission, Band Edge	Compliant
§ 2.1055 § 22.355 § 24.235	Frequency stability vs. temperature Frequency stability vs. voltage	Compliant

#### 3.2 Test Standards

FCC Part 2 Subpart J & Part 22 Subpart H & Part 24 Subpart E

#### 4.0 EUT Modification

No modification by Shenzhen Timeway Technology Consulting Co.,Ltd

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## 5.0 RF EXPOSURE

### 5.1 Applicable Standards:

§1.1310 and §2.1093

According to 1.1307(b)(1), systems operating under the provisions of this section shall be operated in Manner that ensures that the public is not exposed to radio frequency energy level in excess of the Commission's guidelines.

According to 1.1310 and 2.1091 RF exposure is calculated . Limits for Maximum Pemmissible Exposure (MPE)

Frequency range (MHz)	Electric field strength (V/m)	Magnetic field strength (A/m)	Power density (mW/cm <sup>2</sup> )	Averaging time (minutes)
(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 <sup>2</sup> )	30
30 - 300	27. 5	0. 073	0. 2	30
300 - 1500	--.	--.	f/1500	30
1500 - 100, 000	--	--	1. 0	30

### 5.2 Test Data:

$$S = PG/4\pi R^2$$

Where: S= Power density

P= Power input to antenna

G=Power gain of the antenna in the direction of interest relative to an isotropic radiator

R=Distance to the center of raidation of the antenna

FOR CELLULAR BAND

**Maximum peak output power at antenna input terminal : 25.36 (dBm) =0.344(W)**

**Prediction distance 20 (cm) Prediction frequency : 824.7 (MHz) Antenna Gain: 1.0 dBi**

**Power density at predication frequency at 20cm :0.06847(mW/cm<sup>2</sup>)**

**MPE Limit for uncontrolled exposure at prediction frequency : 0.5498(mW/cm<sup>2</sup>)**

FOR PCS BAND

**Maximum peak output power at antenna input terminal : 24.96 (dBm) = 0.313 (W)**

**Prediction distance 20 (cm) Prediction frequency : 1908.75 (MHz) Antenna Gain: 1.0 dBi**

**Power density at predication frequency at 20cm :0.0623(mW/cm<sup>2</sup>)**

**MPE Limit for uncontrolled exposure at prediction frequency : 1(mW/cm<sup>2</sup>)**

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## 6.0 MODULATION CHARACTERISTIC

### 6.1 Applicable Standards:

According to FCC § 2.1047(d), Part 22H & 24E there is no specific requirement for digital modulation, therefore modulation characteristic is not presented.

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## 7.0 RF OUTPUT POWER

### 7.1 Applicable Standards

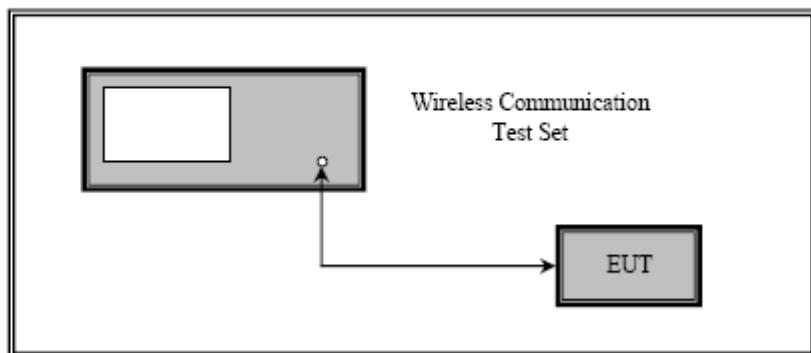
According to FCC §2.1046 and §22.913 (a), the ERP of mobile transmitters and auxiliary test transmitters must not exceed 7 watts.

According to FCC §2.1046 and §24.232 (C), in no case may the peak output power of a base station transmitter exceed 2 watt EIRP.

### 7.2 Test Procedure

*Conducted method:*

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



*Radiated method:*

The transmitter was placed on a wooden turntable, and it was transmitting into a non-radiating load which was also placed on the turntable.

The measurement antenna was placed at a distance of 3 meters from the EUT. During the tests, the antenna height and polarization as well as EUT azimuth were varied in order to identify the maximum level of emissions from the EUT. The test was performed by placing the EUT on 3-orthogonal axis.

The frequency range up to tenth harmonic of the fundamental frequency was investigated.

Remove the EUT and replace it with substitution antenna. A signal generator was connected to the substitution antenna by a non-radiating cable. The absolute levels of the fundamental frequency emissions were measured by the substitution.

Please refer to TIA 603-C section 2.2.17

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### 7.3 Test Data:

Environmental conditions

Temperature:	25 °C
Relative Humidity:	56 %
ATM Pressure:	100.0kPa

### Conducted Power

Cellular Band Part 22H:

Mode	FED	REV	Low CH (824.7 MHz)	Middle CH (836.52 MHz)	High CH (848.31MHz)	Part 22H Limit (dBm)
CDMA2000 1xRTT	RC1	RC1(S02)	24.73	24.94	24.86	38.45
	RC1	RC1(S055)	24.98	24.06	25.02	38.45
	RC2	RC2(S09)	24.58	24.29	24.40	38.45
	RC2	RC2(S055)	24.58	24.87	24.61	38.45
	RC3	RC3(S02)	24.71	25.10	24.94	38.45
	RC3	RC3(S055)	25.36	25.18	25.00	38.45
	RC4	RC3(S02)	24.61	24.53	24.56	38.45
	RC4	RC3(S055)	24.49	24.50	24.84	38.45
	RC5	RC4(S09)	24.25	24.64	24.78	38.45
	RC5	RC4(S055)	24.35	25.02	24.79	38.45

Mode	Low CH (824.7 MHz)	Middle CH (836.52 MHz)	High CH (848.31MHz)	Part 22H Limit (dBm)
1xEV-DO Rev 0	25.18	25.04	25.09	38.45
1xEV-DO Rev A	24.30	24.52	24.71	38.45

Note: Limit = 7 Watts = 38.45 dBm

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PCS Band Part 24E:

Mode	FED	REV	Low CH (1851.25 MHz)	Middle CH (1880.00 MHz)	High CH (1908.75MHz)	Part 24E Limit (dBm)
CDMA2000 1xRTT	RC1	RC1(S02)	23.68	24.17	24.70	33
	RC1	RC1(S055)	23.37	24.76	24.72	33
	RC2	RC2(S09)	23.50	24.57	24.30	33
	RC2	RC2(S055)	23.83	23.89	24.96	33
	RC3	RC3(S02)	23.54	24.15	24.36	33
	RC3	RC3(S055)	24.23	24.32	24.79	33
	RC4	RC3(S02)	23.61	23.72	24.81	33
	RC4	RC3(S055)	23.45	24.25	24.29	33
	RC5	RC4(S09)	23.94	23.90	24.72	33
	RC5	RC4(S055)	23.93	24.14	24.94	33

Mode	Low CH (1851.25 MHz)	Middle CH (1880.00 MHz)	High CH (1908.75MHz)	Part 24E Limit (dBm)
1xEV-DO Rev 0	20.48	21.21	22.73	33
1xEV-DO Rev A	20.32	21.17	21.21	33

Note: Limit 2 Watts = 33 dBm

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**Radiated Power (ERP and EIRP)**

Cellular Band Part 22H:

Indicated		Azimuth (degree)	Test Antenna		Substituted				Absolute Level (dBm)	Limit (dBm)	Margin (dB)
Freq. (MHz)	Amp. (dBuV)		Height (m)	Polar (H/V)	Freq. (MHz)	Level (dBm)	Antenna Gain Correction (dBd)	Cable Loss (dB)			
824.70	100.44	199	106	V	824.7	27.18	0	0.21	26.97	38.45	-11.48
824.70	100.39	212	100	H	824.7	22.04	0	0.21	21.83	38.45	-16.62
836.52	100.39	199	106	V	836.52	26.61	0	0.21	26.40	38.45	-12.05
836.52	100.62	212	100	H	836.52	22.87	0	0.21	22.66	38.45	-15.79
848.31	99.16	199	106	V	848.31	26.00	0	0.21	25.79	38.45	-12.66
848.31	99.62	212	100	H	848.31	22.34	0	0.21	22.13	38.45	-16.32

PCS Band Part 24E:

Indicated		Azimuth (degree)	Test Antenna		Substituted				Absolute Level (dBm)	Limit (dBm)	Margin (dB)
Freq. (MHz)	Amp. (dBuV)		Height (m)	Polar (H/V)	Freq. (MHz)	Level (dBm)	Antenna Gain Correction (dBi)	Cable Loss (dB)			
1851.25	92.85	161	210	V	1851.25	16.03	9.5	0.38	25.15	33	-7.85
1851.25	93.39	113	110	H	1851.25	16.57	9.5	0.38	25.69	33	-7.31
1880.00	92.52	161	210	V	1880.00	16.25	9.0	0.38	24.87	33	-8.13
1880.00	94.43	114	115	H	1880.00	18.16	9.0	0.38	26.78	33	-6.22
1908.75	91.56	163	210	V	1908.75	15.36	9.0	0.38	23.98	33	-9.02
1908.75	94.60	118	120	H	1908.75	18.40	9.0	0.38	27.02	33	-5.98

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## 8.0 Occupied Bandwidth

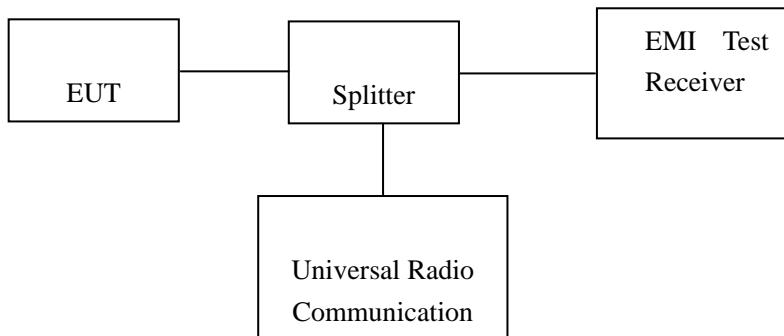
### 8.1 Applicable Standards:

CFR 47 §2.1049, §22.917, §22.905 and §24.238.

### 8.2 Test Procedure

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

The resolution bandwidth of the spectrum analyzer was set at 30 kHz (Cellular /PCS) and the 26 dB & 99% bandwidth was recorded.



### 8.3 Test Data:

Environmental conditions:

Temperature:	25 ° C
Relative Humidity:	56%
ATM Pressure:	100.0kPa

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**Cellular Band Part 22H:**

Channel	Frequency (MHz)	26 dB Occupied Bandwidth (MHz)	99% Occupied Bandwidth (MHz)
1xRTT			
Low	824.7	1.421	1.2694
Middle	836.52	1.411	1.2595
High	848.31	1.427	1.2620
1xEV-DO Rev. 0			
Low	824.7	1.453	1.2668
Middle	836.52	1.419	1.2557
High	848.31	1.430	1.2668
1xEV-DO Rev. A			
Low	824.7	1.448	1.2779
Middle	836.52	1.414	1.2622
High	848.31	1.424	1.2686

**PCS Band Part 24E:**

Channel	Frequency (MHz)	26 dB Occupied Bandwidth (MHz)	99% Occupied Bandwidth (MHz)
1xRTT			
Low	1851.25	1.427	1.2643
Middle	1880.00	1.423	1.2545
High	1908.75	1.429	1.2652
1xEV-DO Rev. 0			
Low	1851.25	1.422	1.2555
Middle	1880.00	1.434	1.2595
High	1908.75	1.430	1.2606
1xEV-DO Rev. A			
Low	1851.25	1.438	1.2647
Middle	1880.00	1.428	1.2628
High	1908.75	1.431	1.2694

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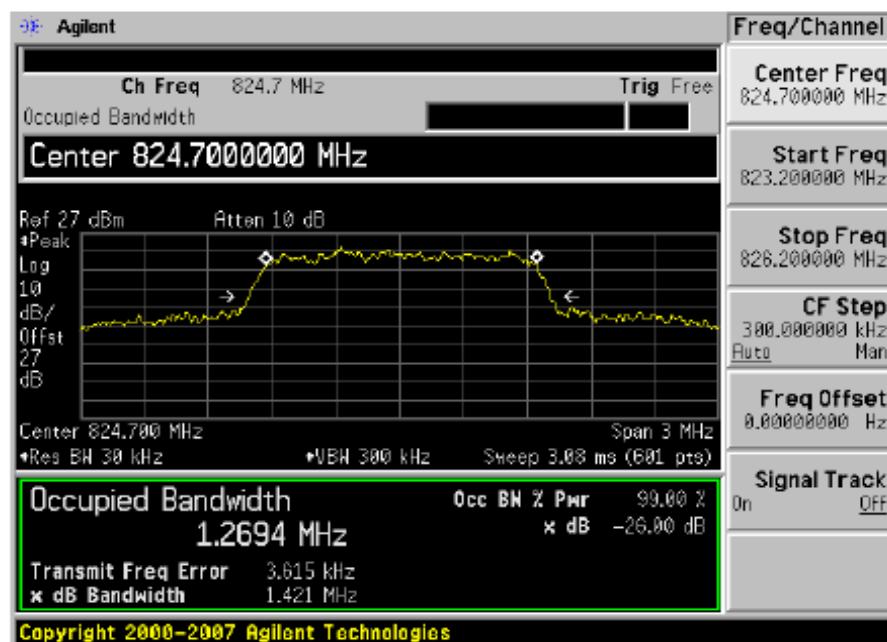
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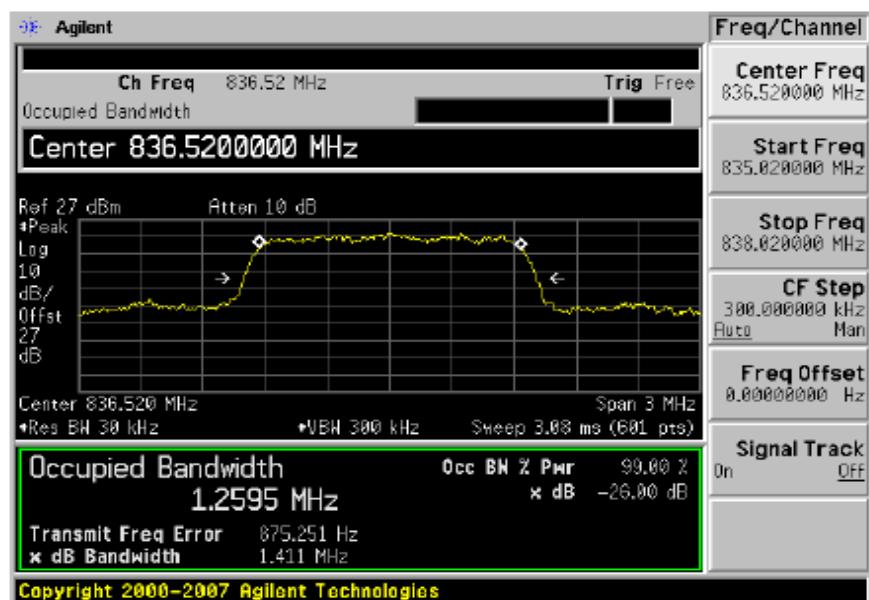
### Plots of Occupied Bandwidth for Part 22H

1xRTT

#### Low Channel



#### Middle Channel



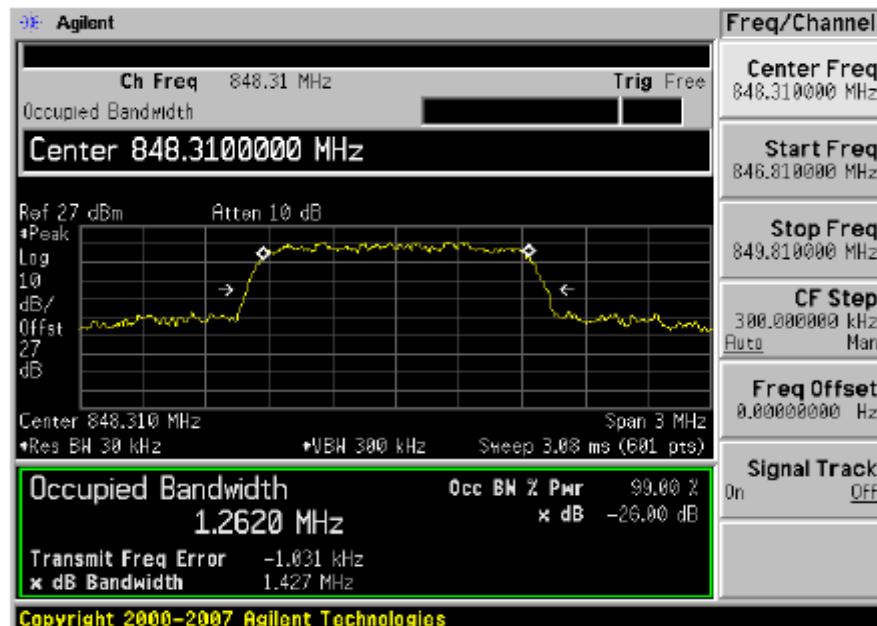
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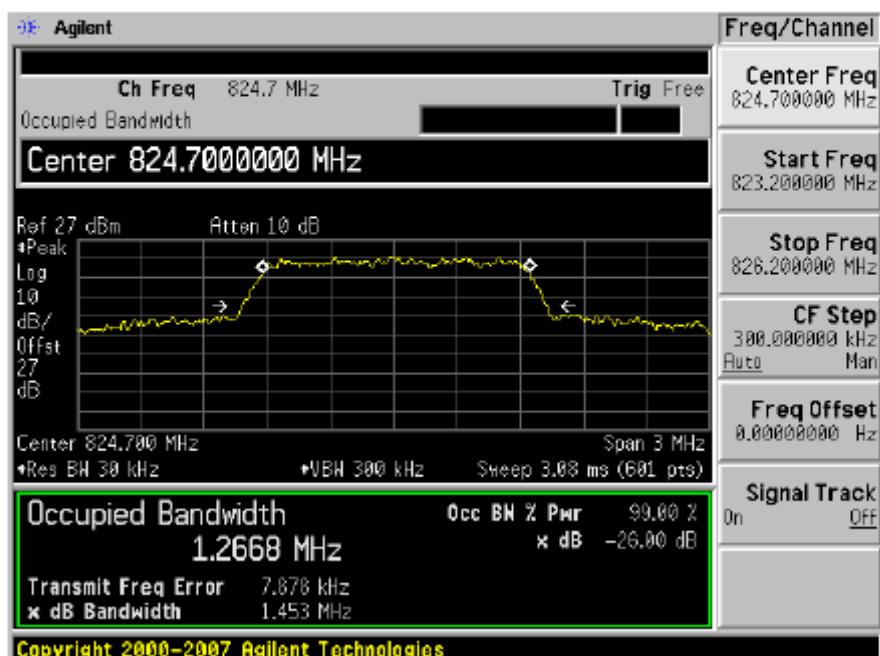


### High Channel



1xEV-DO Rev. 0

### Low Channel



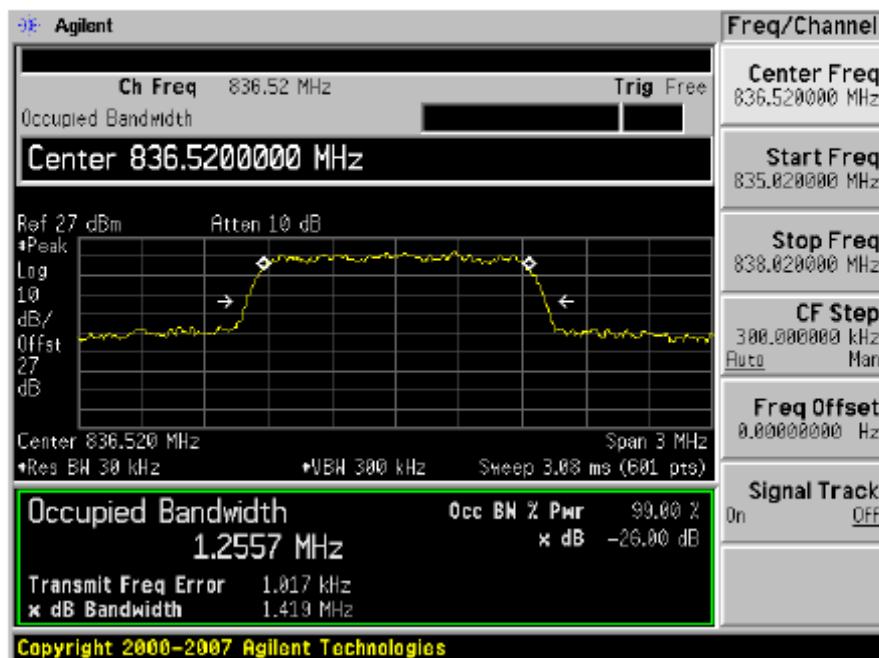
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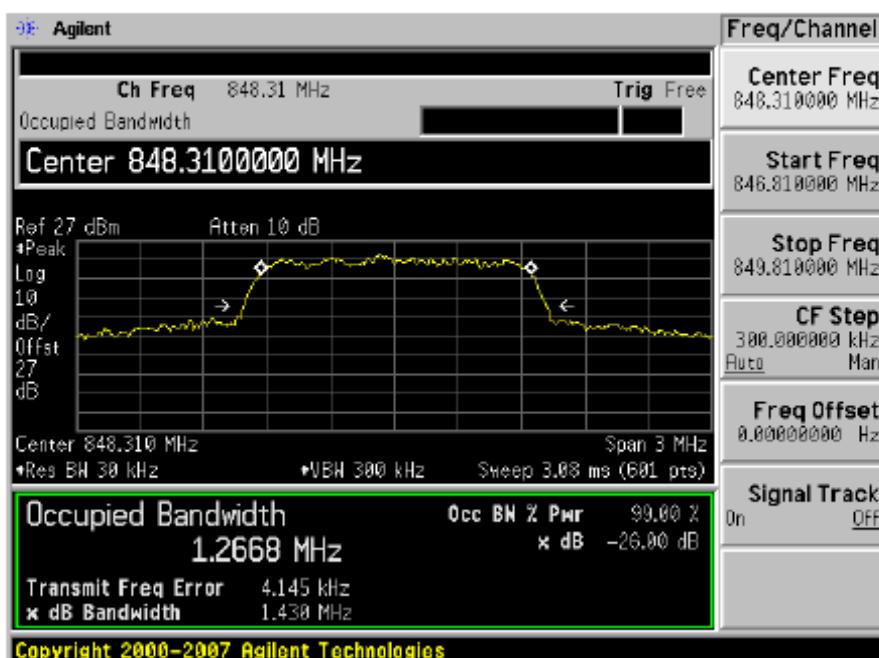
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### Middle Channel



### High Channel



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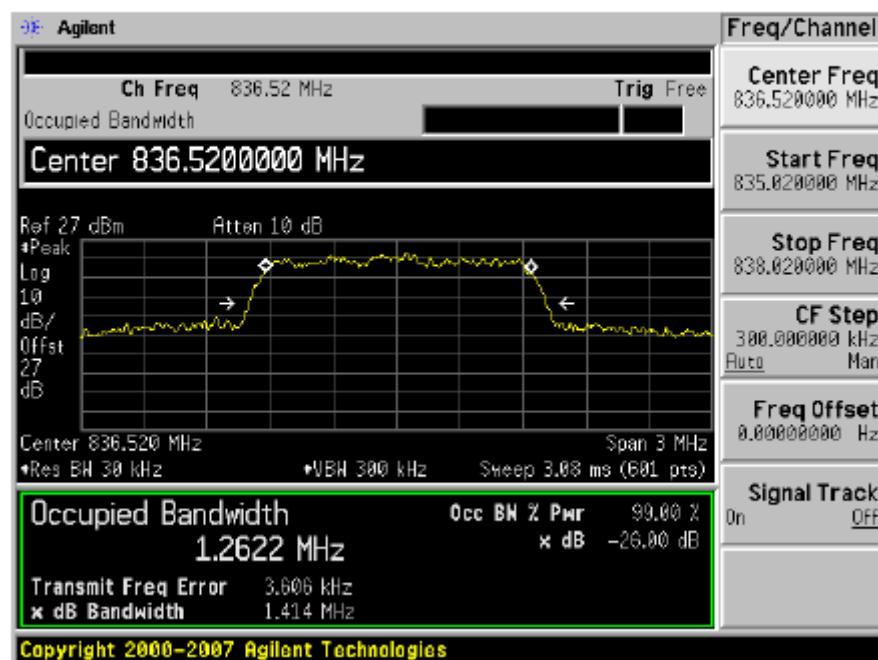


1xEV-DO Rev. A

### Low Channel



### Middle Channel



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### High Channel



### Plots of Occupied Bandwidth for Part 24E

1xRTT

### Low Channel



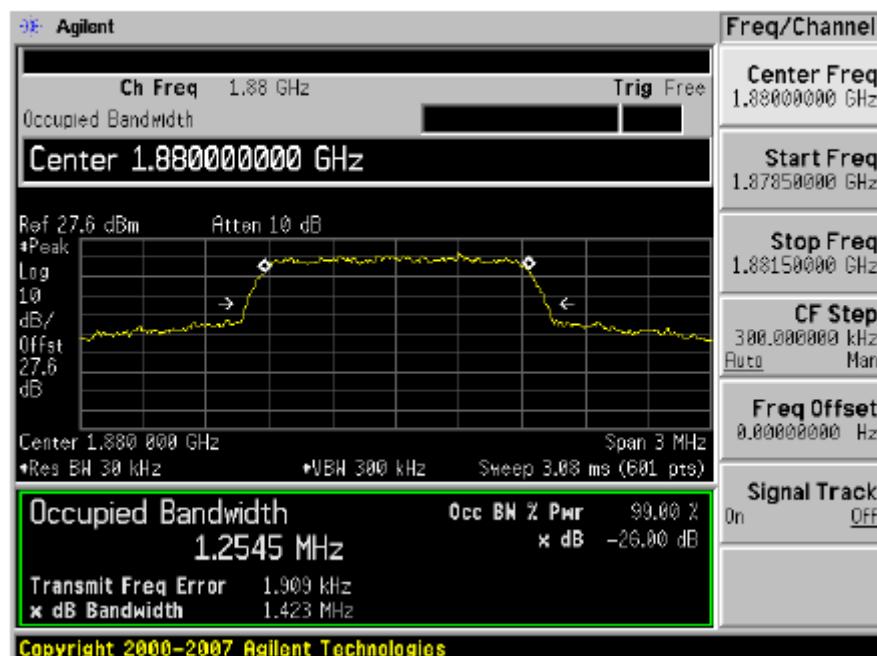
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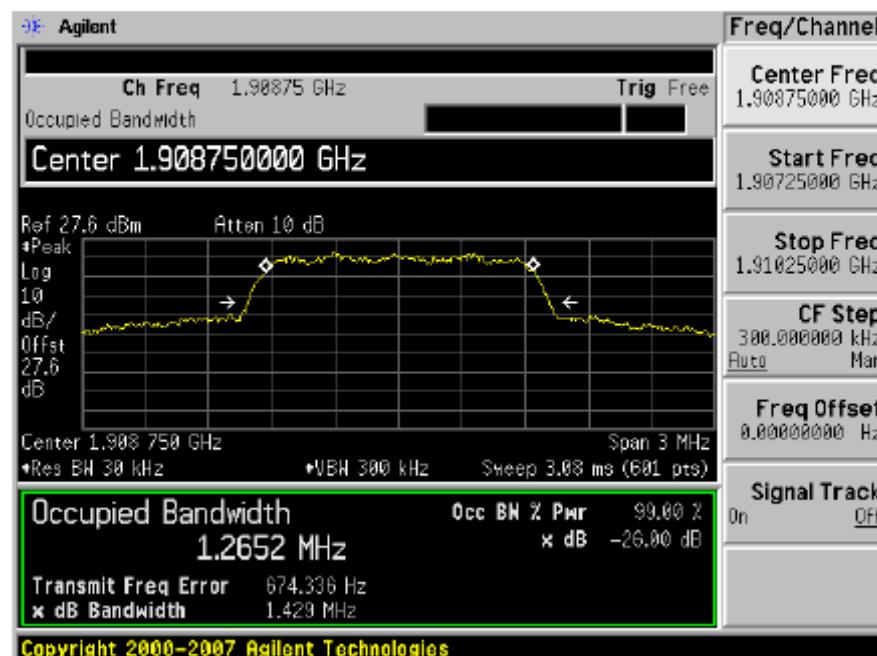
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### Middle Channel



### High Channel



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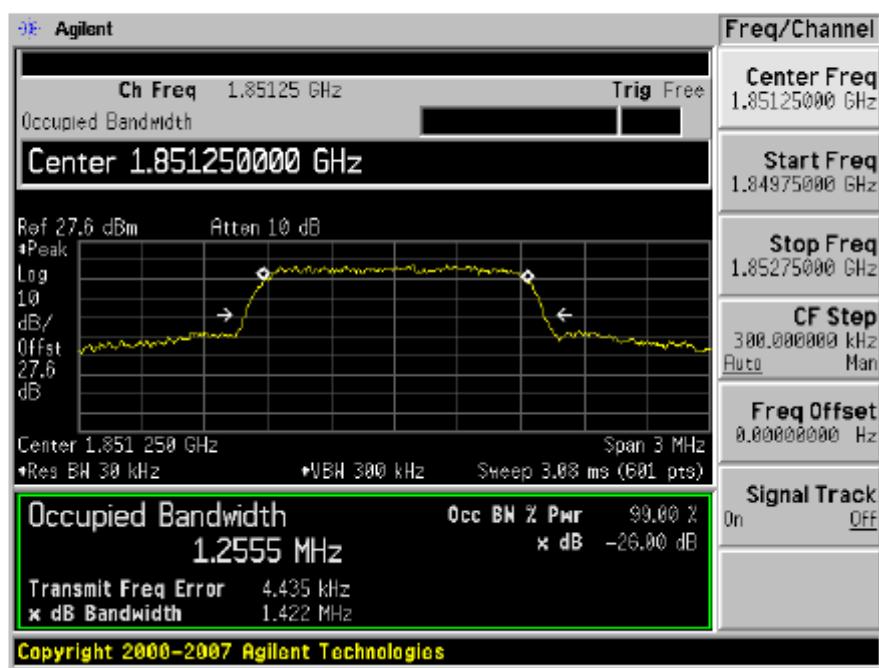
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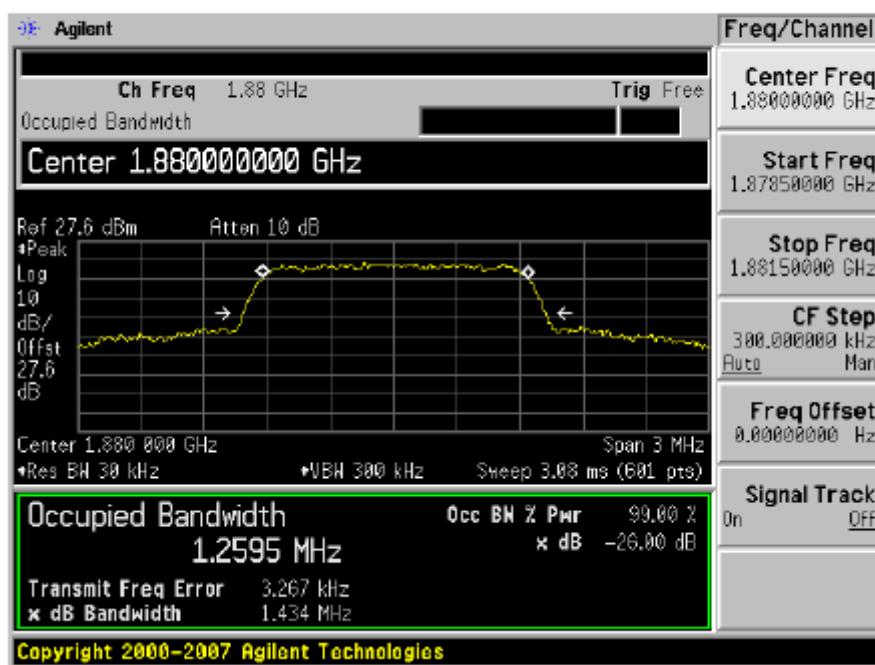


1xEV-DO Rev. 0

### Low Channel



### Middle Channel



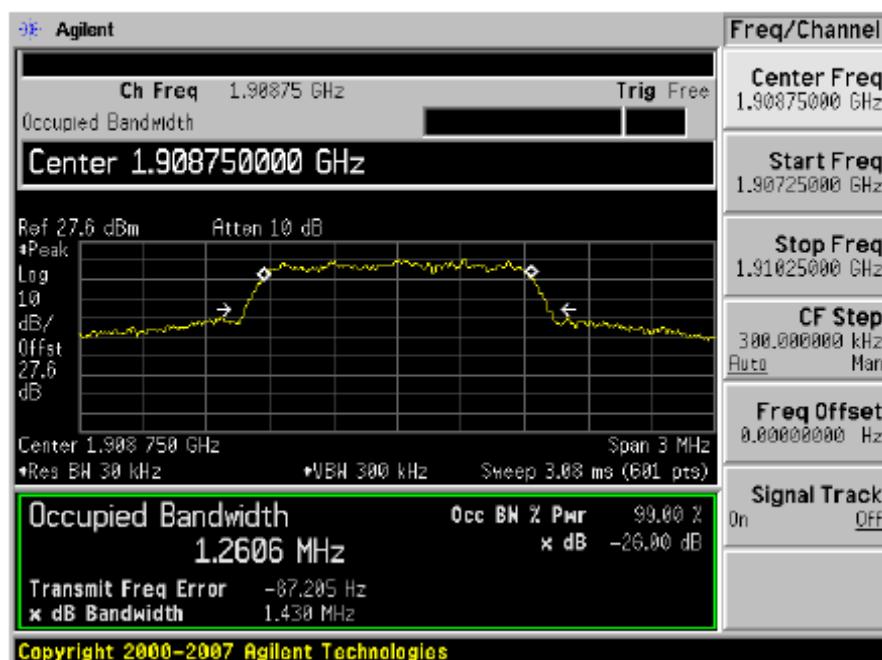
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### High Channel



1xEV-DO Rev. A

### Low Channel



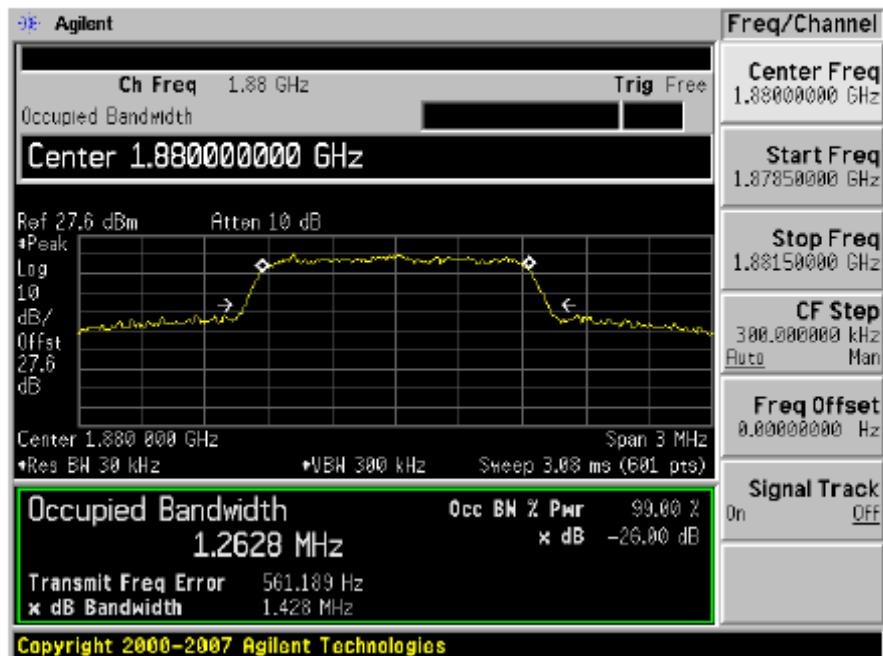
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### Middle Channel



### High Channel



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## 9.0 SPURIOUS EMISSIONS AT ANTENNA TERMINALS

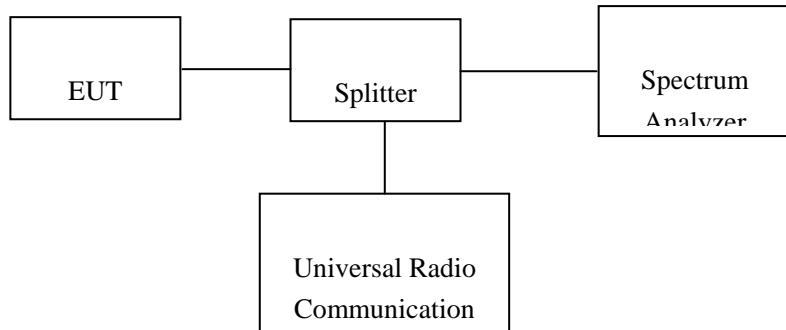
### 9.1 Applicable Standards

CFR 47 §2.1051, §22.917(a) and §24.238(a).

The spectrum was to be investigated to the tenth harmonics of the highest fundamental frequency as specified in § 2.1051.

### 9.2 Test Procedure

The RF output of the transceiver was connected to a spectrum analyzer and simulator through appropriate attenuation. The resolution bandwidth of the spectrum analyzer was set at 100 kHz for 22H, And for 24E, 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.. Sufficient scans were taken to show any out of band emissions up to 10<sup>th</sup> harmonic.



### 9.3 Test Data:

#### Environmental conditions:

Temperature:	25 °C
Relative Humidity:	56 %
ATM Pressure:	100.0kPa

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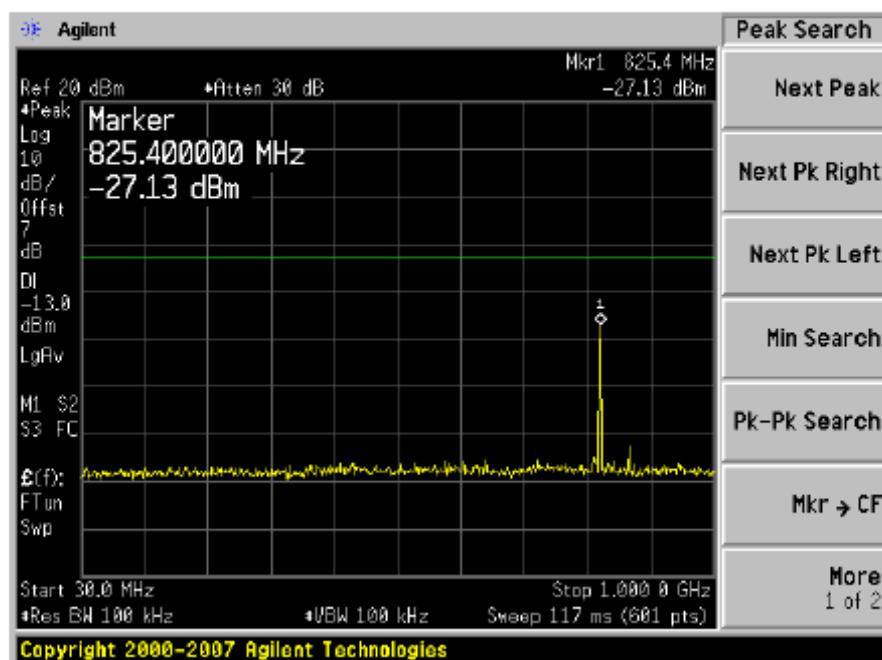


Please refer to the hereinafter plots.

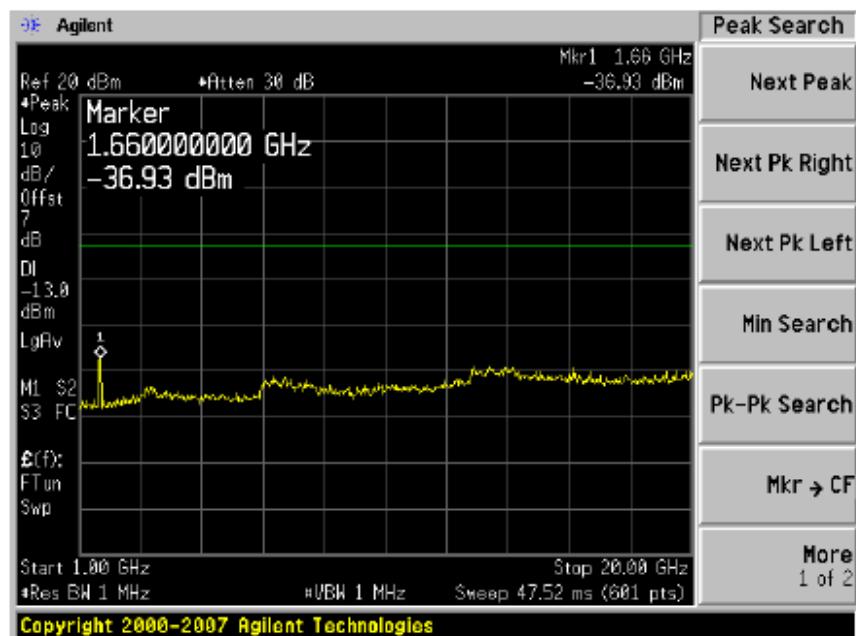
### Plots of Spurious Emissions for Part 22H

1xRTT

#### Low Channel (f = 824.7 MHz)



Plot 1a: 30 MHz – 1 GHz



Plot 2a: 1 GHz – 20 GHz

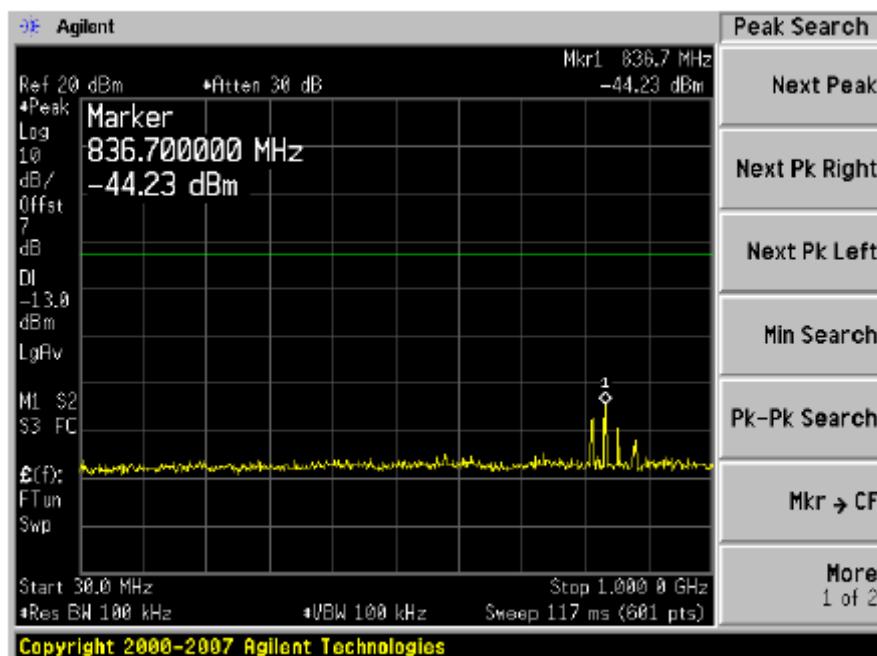
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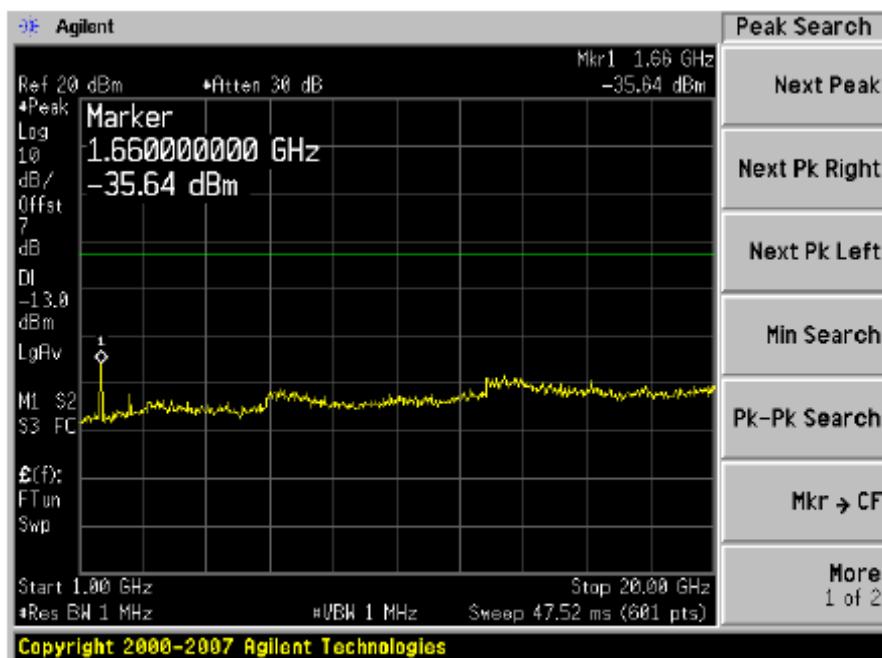
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Middle Channel (f = 836.52 MHz)



Plot 1b: 30 MHz – 1 GHz



Plot 2b: 1 GHz – 20 GHz

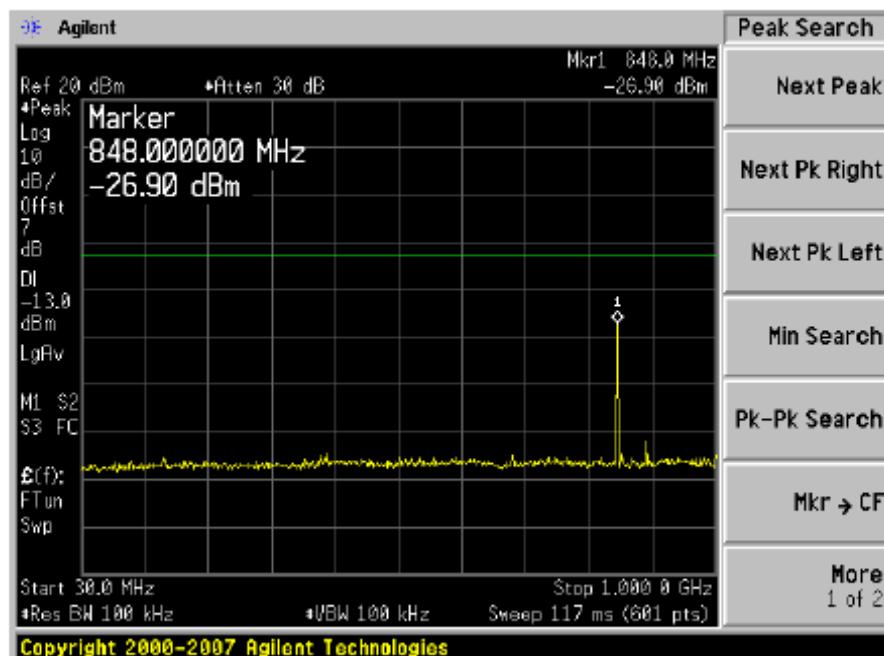
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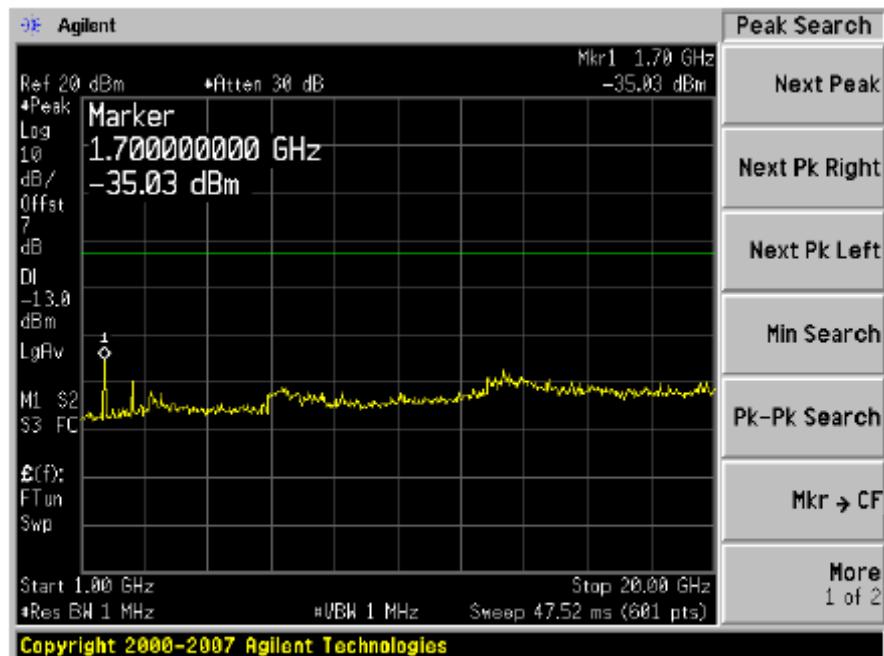
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### High Channel (f = 848.31 MHz)



Plot 1c: 30 MHz – 1 GHz



Plot 2c: 1 GHz – 20 GHz

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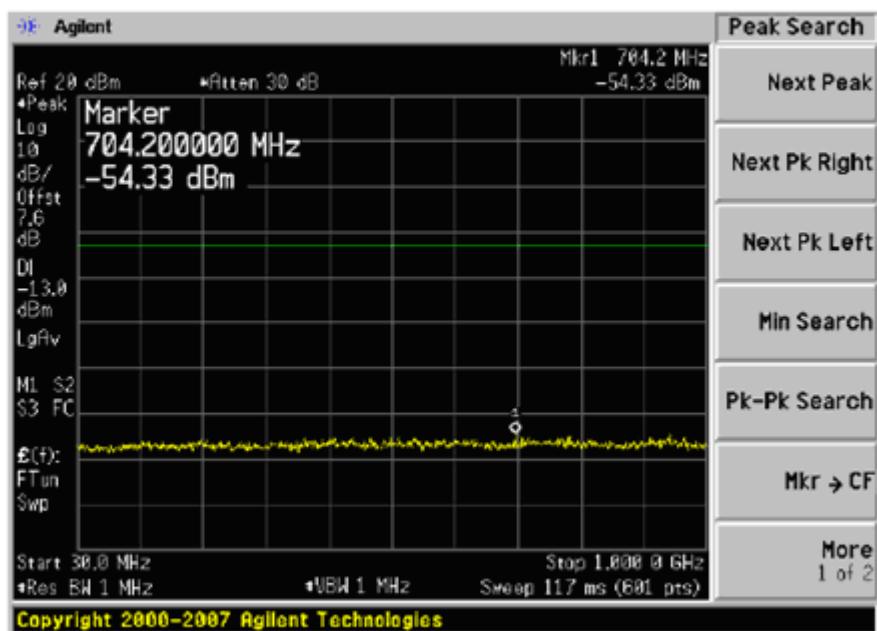
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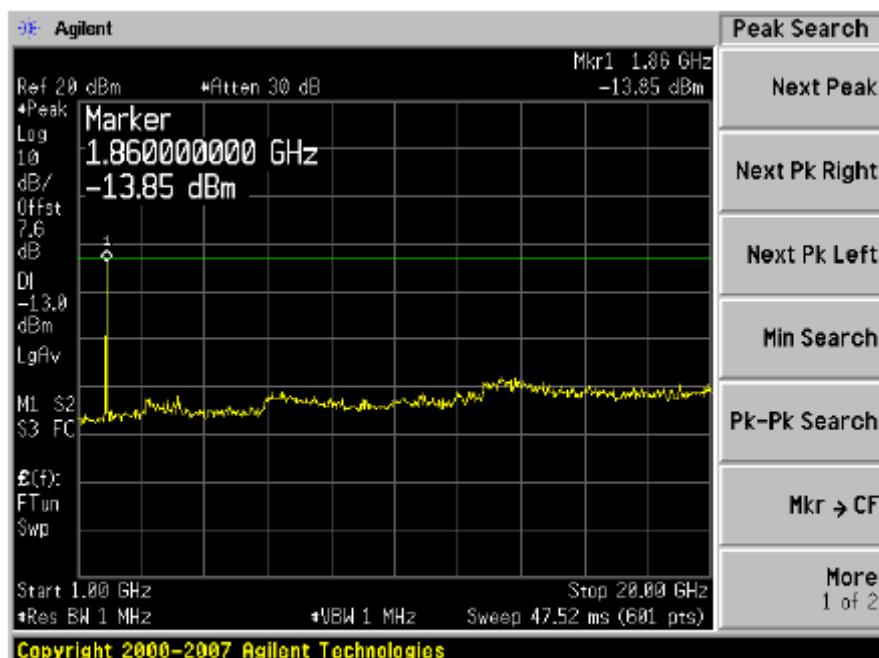
### Plots of Spurious Emissions for Part 24E

1xRTT

Low Channel (f = 1851.25 MHz)



Plot 1d: 30 MHz – 1 GHz



Plot 2d: 1 GHz –20 GHz

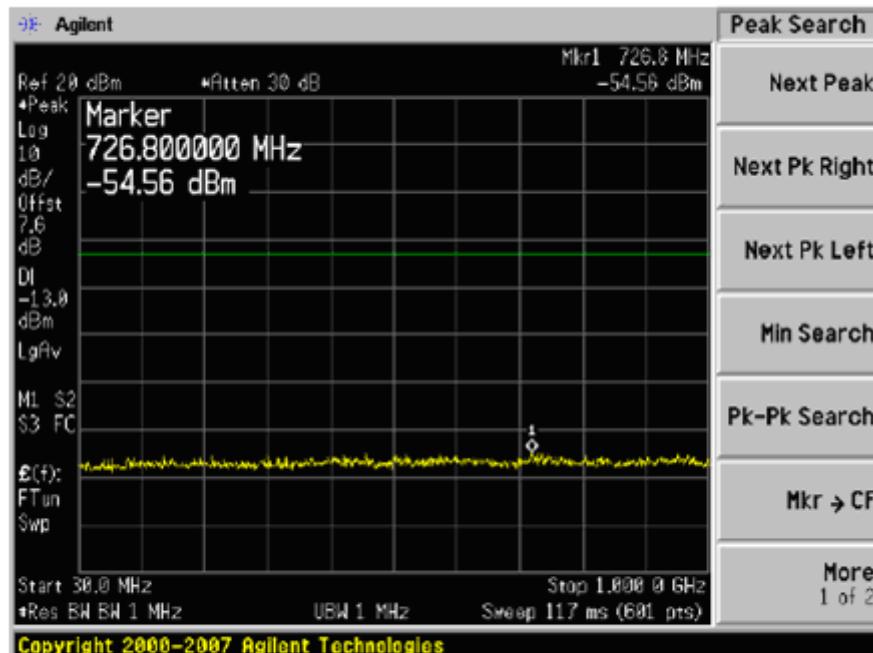
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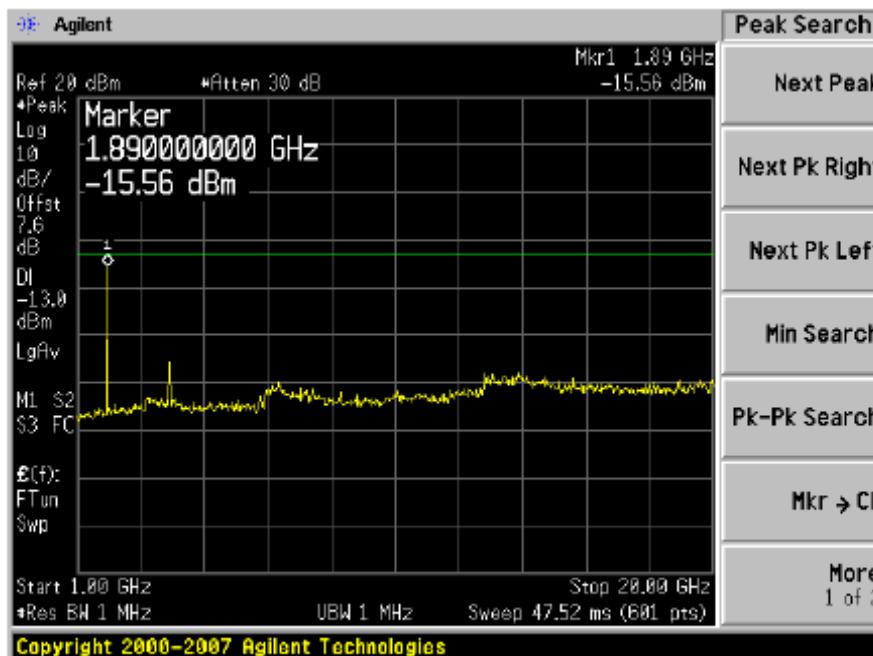
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Middle Channel (f = 1880 MHz)



Plot 1e: 30 MHz – 1 GHz



Plot 2e: 1 GHz –20 GHz

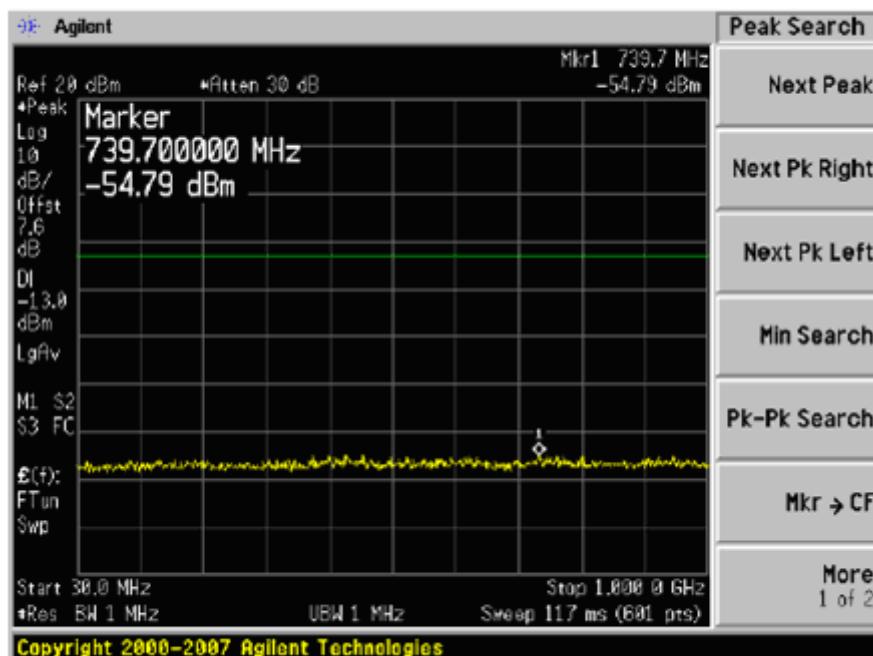
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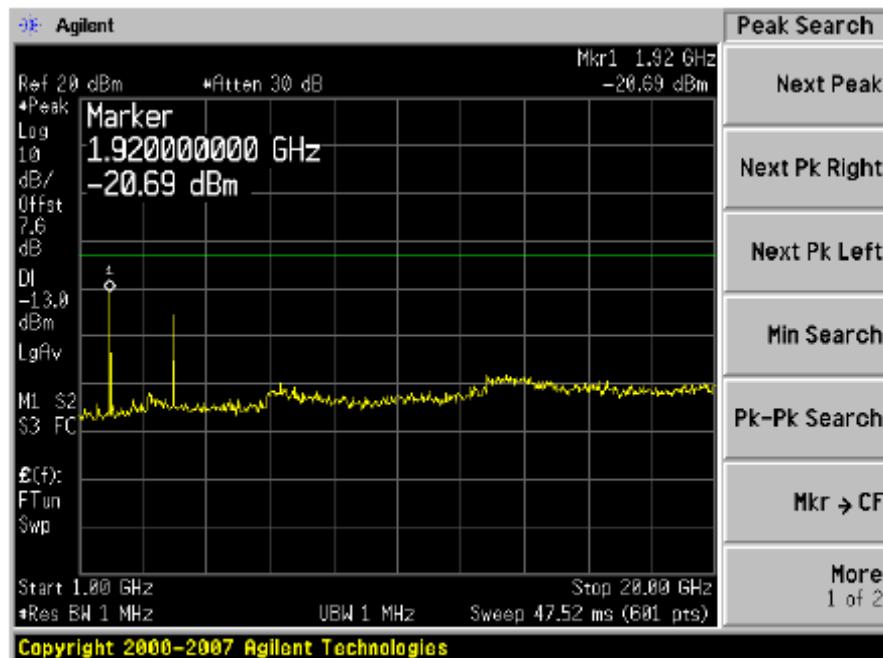
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High Channel (f = 1908.75 MHz)



Plot 1f: 30 MHz – 1 GHz



Plot 2f: 1 GHz – 20 GHz

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## 10.0 SPURIOUS RADIATED EMISSIONS

### 10.1 Applicable Standards:

CFR 47 § 2.1053, 22.917 and § 24.238.

### 10.2 Test Procedure

The transmitter was placed on a wooden turntable, and it was transmitting into a non-radiating load which was also placed on the turntable.

The measurement antenna was placed at a distance of 3 meters from the EUT. During the tests, the antenna height and polarization as well as EUT azimuth were varied in order to identify the maximum level of emissions from the EUT. The test was performed by placing the EUT on 3-orthogonal axis.

The frequency range up to tenth harmonic of the fundamental frequency was investigated.

Remove the EUT and replace it with substitution antenna. A signal generator was connected to the substitution antenna by a non-radiating cable. The absolute levels of the spurious emissions were measured by the substitution.

Spurious emissions in dB =  $10 \lg (\text{TXpwr in Watts}/0.001)$  – the absolute level

Spurious attenuation limit in dB =  $43 + 10 \log_{10} (\text{power out in Watts})$

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### 10.3 Test Data:

#### Environmental conditions:

Temperature:	25 ° C
Relative Humidity:	56%
ATM Pressure:	100.0kPa

#### Cellular Band, Part 22H:

30 MHz -10 GHz Radiated Emission at 3-meter (Middle Channel, 836.52 MHz)

Indicated Frequency (MHz)	S.A. Amp. (dBuV)	Azimuth (degree)	Test Antenna		Substituted				Absolute Level (dBm)	Part 22H	
			Height (m)	Polar (H/V)	Frequency (MHz)	S.G. Level (dBm)	Antenna Gain (dBd)	Cable Loss (dB)		Limit (dBm)	Margin (dB)
3346.08	55.84	91	100	V	3346.08	-36.11	9.7	1.67	-28.08	-13	-15.08
1673.04	67.72	207	187	H	1673.04	-39.69	9.3	1.05	-31.44	-13	-18.44
817.30	62.76	138	100	H	817.30	-32.32	0.0	0.55	-32.87	-13	-19.87
3346.08	49.87	198	181	H	3346.08	-41.77	9.7	1.67	-33.74	-13	-20.74
1673.04	64.11	156	100	V	1673.04	-43.55	9.3	1.05	-35.30	-13	-22.30
817.30	57.30	200	100	V	817.30	-36.39	0.0	0.55	-36.94	-13	-23.94
2509.56	52.05	180	110	V	2509.56	-46.6	9.4	1.37	-38.57	-13	-25.57
856.10	58.96	145	100	H	856.10	-39.06	0.0	0.55	-39.61	-13	-26.61
856.10	55.59	196	100	V	856.10	-40.35	0.0	0.55	-40.90	-13	-27.90
2509.56	50.89	326	103	H	2509.56	-49.24	9.4	1.37	-41.21	-13	-28.21

#### PCS Band, Part 24E:

30 MHz -20 GHz Radiated Emission at 3-meter (Middle Channel, 1880 MHz)

Indicated Frequency (MHz)	S.A. Amp. (dBuV)	Azimuth (degree)	Test Antenna		Substituted				Absolute Level (dBm)	Part 24E	
			Height (m)	Polar (H/V)	Frequency (MHz)	S.G. Level (dBm)	Antenna Gain (dBd)	Cable Loss (dB)		Limit (dBm)	Margin (dB)
3760	55.91	160	163	V	3760	-40.10	10.9	1.84	-31.04	-13	-18.04
5640	52.22	311	100	V	5640	-39.68	10.6	2.53	-31.61	-13	-18.61
5640	46.62	331	250	H	5640	-44.34	10.6	2.53	-36.27	-13	-23.27
3760	52.54	249	100	H	3760	-47.21	10.9	1.84	-38.15	-13	-25.15

Note: The resolution bandwidth of the spectrum analyzer was set at 1MHz for 24E,

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## 11.0 BAND EDGES

### 11.1 Applicable Standards:

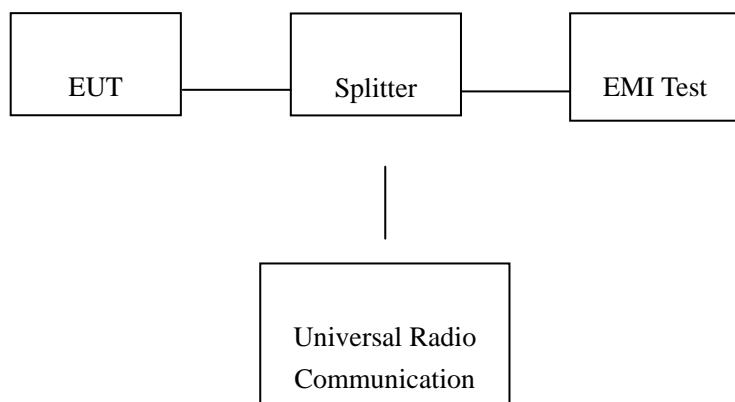
According to § 22.917(a), the power of any emissions outside of the authorized operating frequency ranges must be attenuated below the transmitting power (P) by a factor of at least  $43 + 10 \log(P)$  dB.

According to §24.238(a), the power of any emissions 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.

### 11.2 Test Procedure

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

The center of the spectrum analyzer was set to block edge frequency, RBW set to 10 kHz.



### 11.3 Test Data

#### Environmental conditions:

<b>Temperature:</b>	25 °C
<b>Relative Humidity:</b>	56 %
<b>ATM Pressure:</b>	100.0kPa

Please refer to the following tables and plots.

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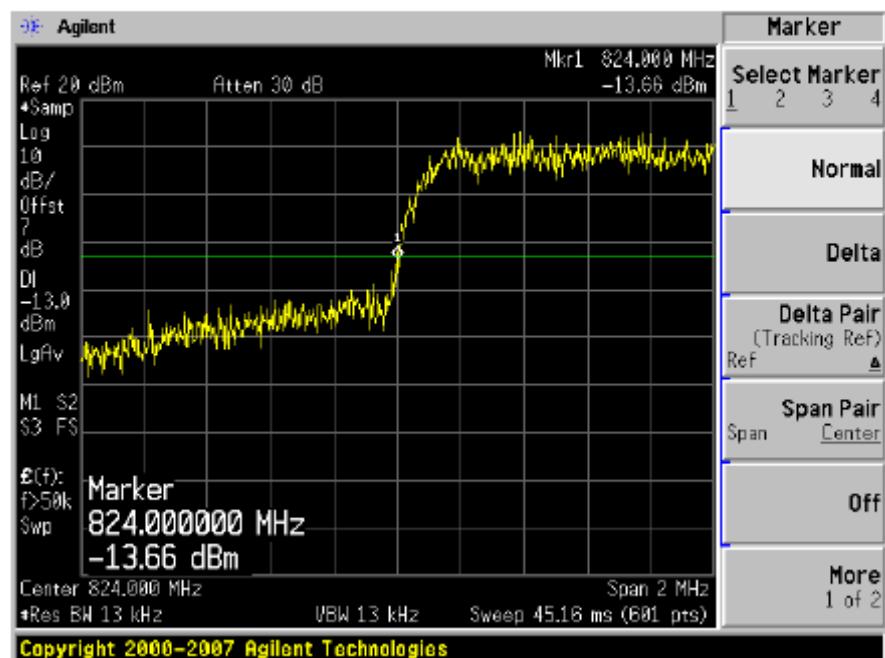
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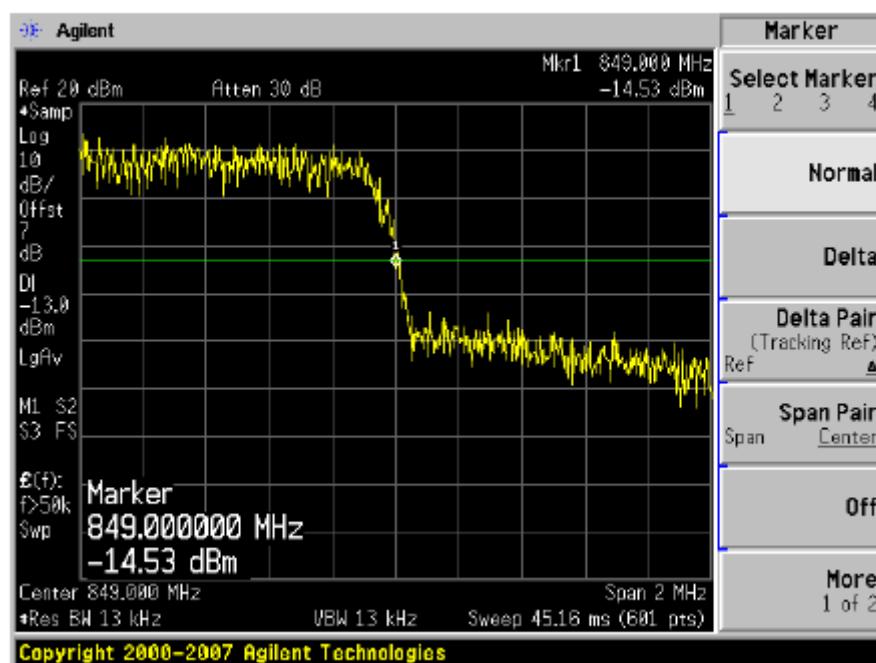
### Plots of Band Edge for Part 22H

1xRTT

#### Lowest Channel



#### Highest Channel



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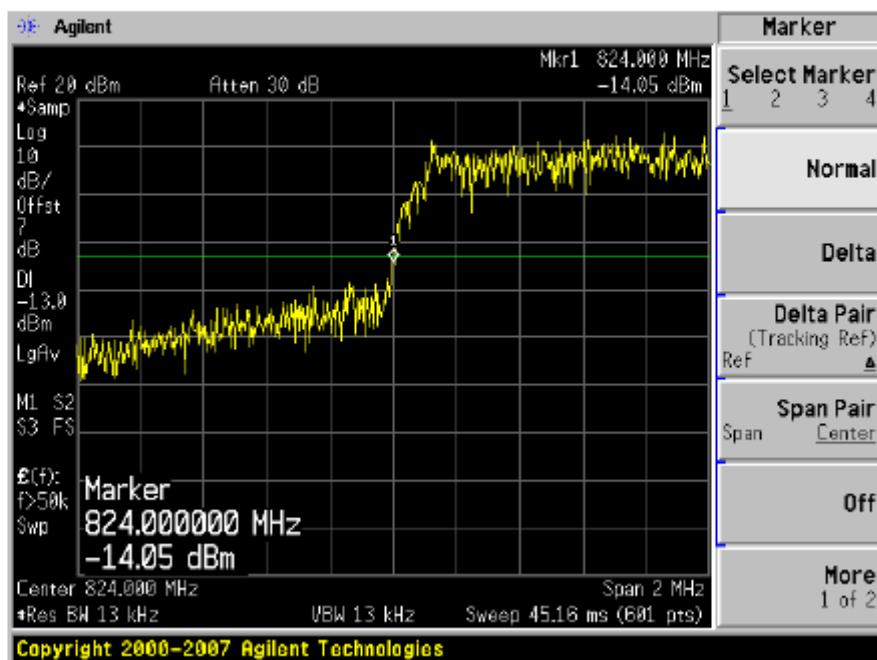
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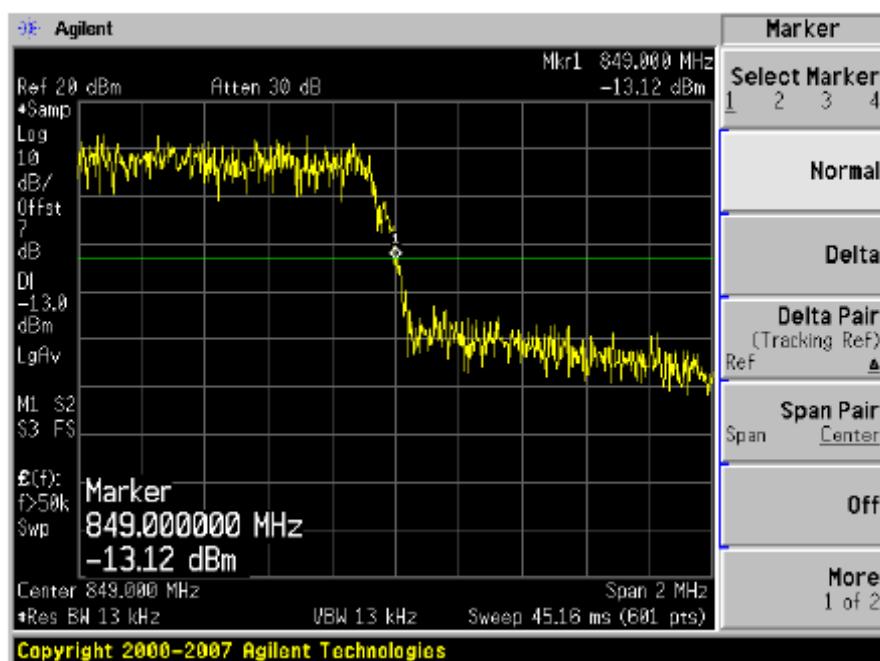


1xEV-DO Rev 0

### Lowest Channel



### Highest Channel



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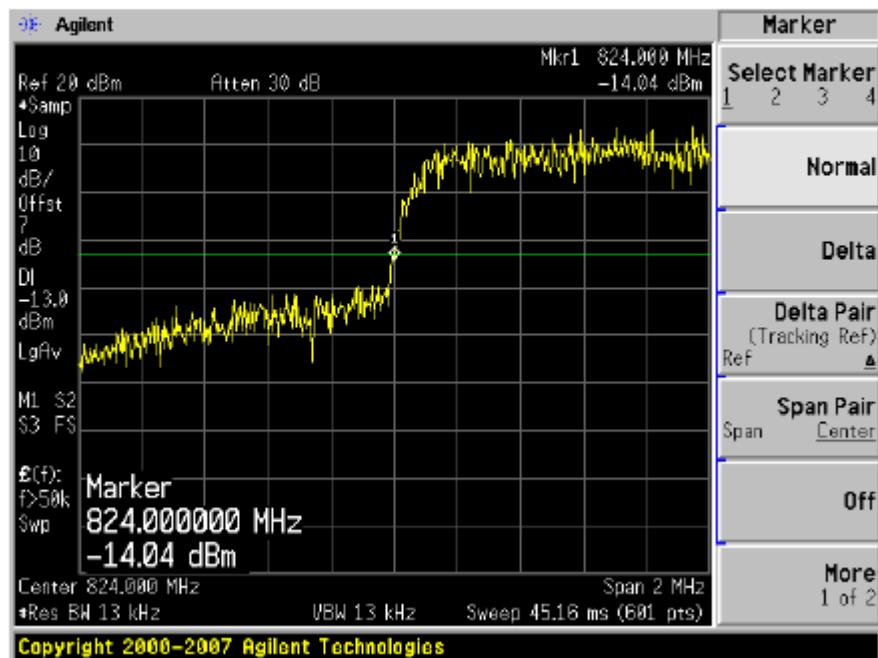
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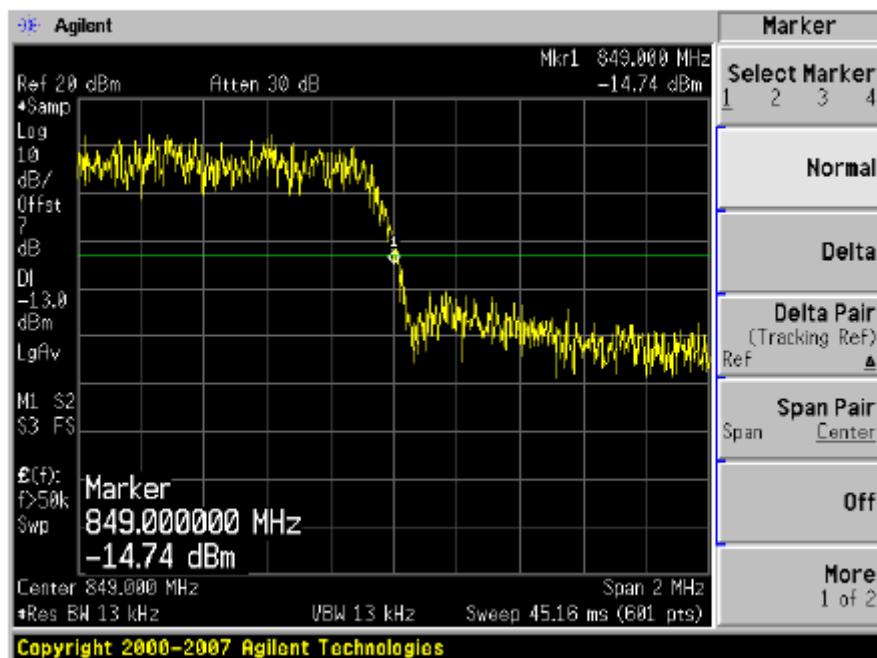


1xEV-DO Rev. A

### Lowest Channel



### Highest Channel



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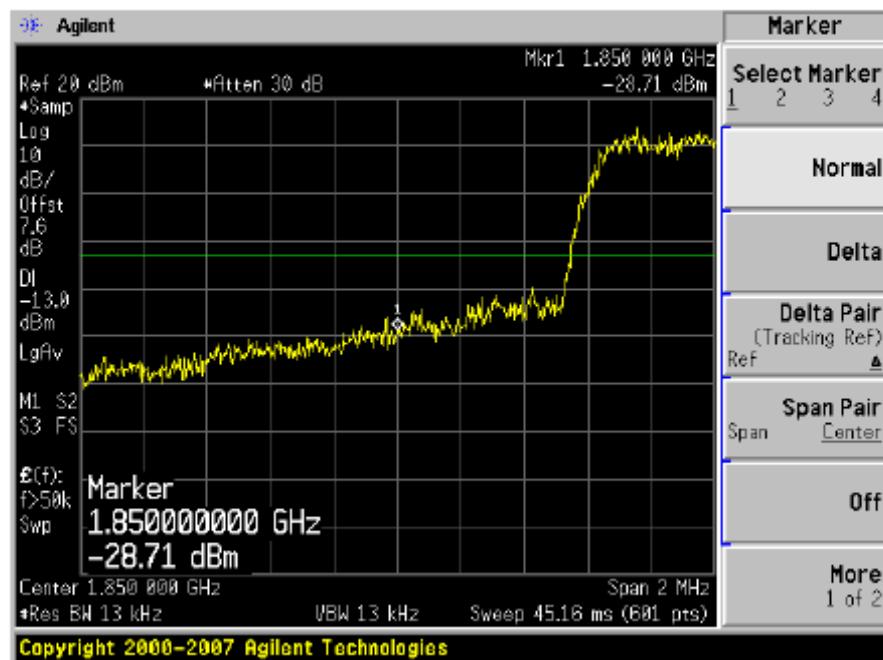
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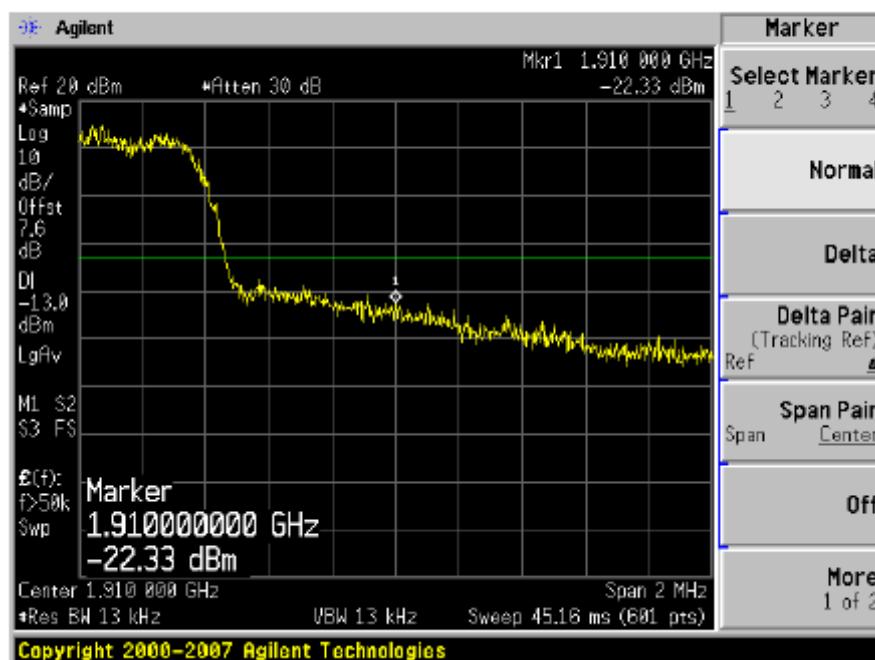
### Plots of Band Edge for Part 24E

1xRTT

#### Lowest Channel



#### Highest Channel



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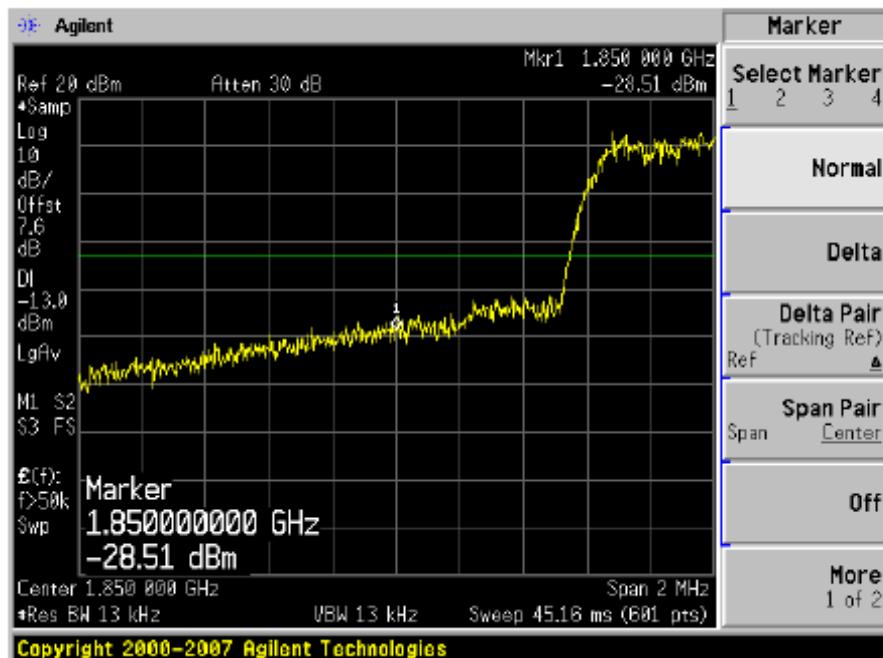
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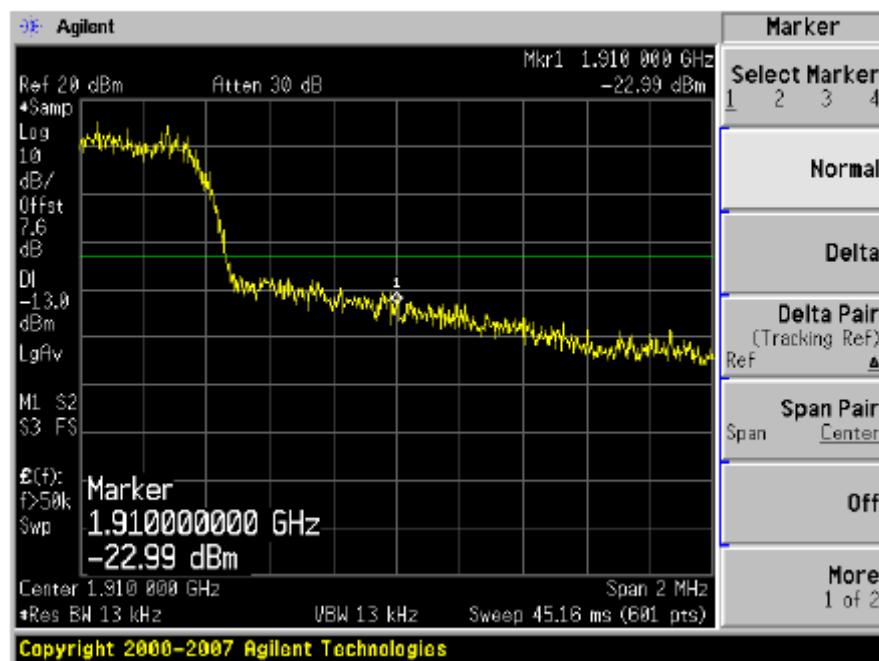


1xEV-DO Rev. 0

## Lowest Channel



### Highest Channel



The report refers only to the sample tested and does not apply to the bulk

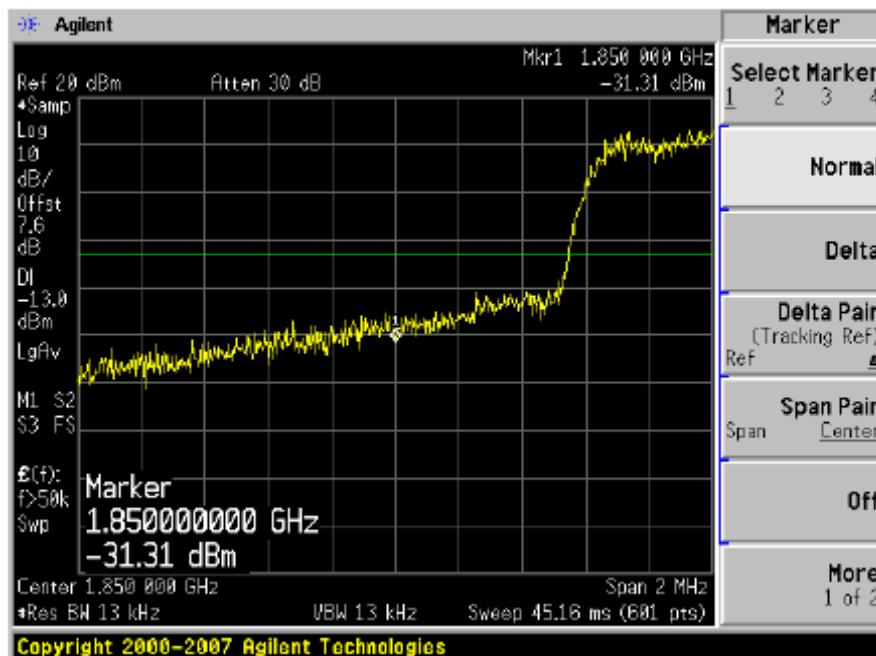
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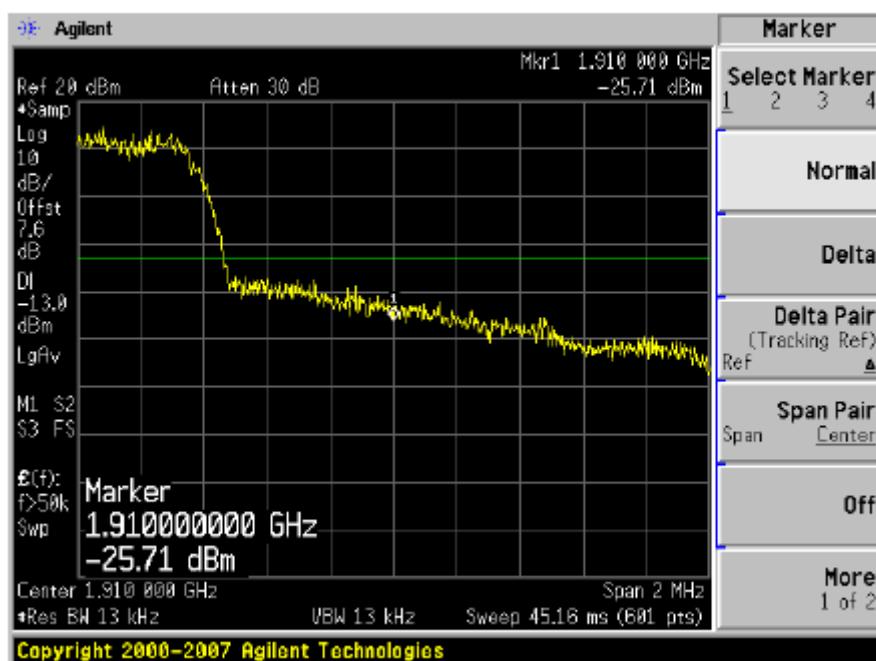


1xEV-DO Rev. A

### Lowest Channel



### Highest Channel



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## 12.0 FREQUENCY STABILITY

### 12.1 Applicable Standards:

CFR47 § 2.1055 (a), § 2.1055 (d), §22.355, §24.235

According to §22.355, the carrier frequency of each transmitter in the Public Mobile Services must be maintained within the tolerances given in Table below:

Frequency Tolerance for Transmitters in the Public Mobile Services

Frequency Range (MHz)	Base, fixed (ppm)	Mobile ≤ 3 watts (ppm)	Mobile ≤ 3 watts (ppm)
25 to 50	20.0	20.0	50.0
50 to 450	5.0	5.0	50.0
450 to 512	2.5	5.0	5.0
821 to 896	1.5	2.5	2.5
928 to 929.	5.0	N/A	N/A
929 to 960.	1.5	N/A	N/A
2110 to 2220	10.0	N/A	N/A

According to §24.235, the frequency stability shall be sufficient to ensure that the fundamental emissions stays within the authorized frequency block.

### 12.2 Test Procedure

Frequency Stability vs. Temperature: The equipment under test was connected to an external DC power supply and the RF output was connected to communication test set via feed-through attenuators. The EUT was placed inside the temperature chamber. The DC leads and RF output cable exited the chamber through an opening made for the purpose.

After the temperature stabilized for approximately 20 minutes, the frequency output was recorded from the communication test set.

Frequency Stability vs. Voltage: An external variable DC power supply was connected to the battery terminals of the equipment under test. The voltage was set to 115% of the nominal value and was then decreased until the transmitter light no longer illuminated; i.e., the battery end point. The output frequency was recorded for each battery voltage.

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### 12.3 Test Data

#### Environmental conditions:

Temperature:	25 ° C
Relative Humidity:	56%
ATM Pressure:	100.0kPa

#### Cellular Band, Part 22H:

Middle channel, fo =836.52MHz				
Temperature (°C)	Power Supplied (V)	Frequency Error (Hz)	Error (ppm)	Limit (ppm)
-30	4.25	-21	-0.0251	2.5
	5.0	-24	-0.0287	2.5
	5.75	-23	-0.0275	2.5
-20	4.25	-21	-0.0251	2.5
	5.0	-27	-0.0323	2.5
	5.75	-24	-0.0287	2.5
-10	4.25	-23	-0.0275	2.5
	5.0	-23	-0.0275	2.5
	5.75	-24	-0.0287	2.5
0	4.25	-23	-0.0275	2.5
	5.0	-23	-0.0275	2.5
	5.75	-24	-0.0287	2.5
10	4.25	-32	-0.0383	2.5
	5.0	-25	-0.0299	2.5
	5.75	-24	-0.0287	2.5
20	4.25	-28	-0.0335	2.5
	5.0	-37	-0.0442	2.5
	5.75	-25	-0.0299	2.5
30	4.25	-59	-0.0705	2.5
	5.0	-27	-0.0323	2.5
	5.75	-32	-0.0383	2.5
40	4.25	-70	-0.0837	2.5
	5.0	-41	-0.0490	2.5
	5.75	-32	-0.0383	2.5
50	4.25	-72	-0.0861	2.5
	5.0	-34	-0.0406	2.5
	5.75	-32	-0.0383	2.5

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**PCS Band, Part 24E:**

Middle channel, fo =1880MHz				
Temperature (°C)	Power Supplied (V)	Frequency Error (Hz)	Error (ppm)	Limit (ppm)
-30	4.25	-17	-0.0090	2.5
	5.0	-15	-0.0080	2.5
	5.75	-14	-0.0074	2.5
-20	4.25	-16	-0.0085	2.5
	5.0	-15	-0.0080	2.5
	5.75	-16	-0.0085	2.5
-10	4.25	-18	-0.0096	2.5
	5.0	-8	-0.0043	2.5
	5.75	-16	-0.0085	2.5
0	4.25	-18	-0.0096	2.5
	5.0	-17	-0.0090	2.5
	5.75	-16	-0.0085	2.5
10	4.25	-14	-0.0074	2.5
	5.0	-15	-0.0080	2.5
	5.75	-16	-0.0085	2.5
20	4.25	-21	-0.0112	2.5
	5.0	-22	-0.0117	2.5
	5.75	-18	-0.0096	2.5
30	4.25	-26	-0.0138	2.5
	5.0	-24	-0.0128	2.5
	5.75	-18	-0.0096	2.5
40	4.25	-31	-0.0165	2.5
	5.0	-28	-0.0149	2.5
	5.75	-18	-0.0096	2.5
50	4.25	-28	-0.0149	2.5
	5.0	-29	-0.0154	2.5
	5.75	-18	-0.0096	2.5

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