Global Telecom Solutions Sector

FCC ID: IHET6EK1

# SC480 1X-EVDO with cPAs @ 1.9 GHz CDMA BTS TEST REPORT EXHIBIT

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**APPLICANT: MOTOROLA** 

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# **Section A**

## **Summary of RF Measurements**

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## **Summary of Radiated RF Measurements**

Maximum Radiated RF Spur Level for SC480 EVDO @ 1.9 GHz CDMA BTS

	Radiated RF Measurements					Result
Channel	Spurious Frequency (MHz)	Antenna Polarity	Measured Radiated Field Strength (dBuV/m)	Measured Radiated Field Strength (dBm) (Note 1)	FCC Part 22/24 MAX LIMIT (dBm)	(Pass/ Fail)
1175	5965.966	V	64.97	-30.26	-13	Pass

#### Maximum Radiated RF Spur Level for SC480 1X @ 1.9 GHz CDMA BTS

	Radiated RF Measurements					
Channel	Spurious Frequency (MHz)	Antenna Polarity	Measured Radiated Field Strength (dBuV/m)	Measured Radiated Field Strength (dBm) (Note 1)	FCC Part 22/24 MAX LIMIT (dBm)	(Pass/ Fail)
1175	5965.966	v	70.51	-24.72	-13	Pass

Notes:

 Converting dBuV/M to dBm at 3 meters: (dBuV/M) + 9.542 - 104.77 = dBm Converting dBuV/M to dBm at 10 meters:
 (dBuV/M) + 20 - 104.77 = dBm

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07.02.04

Signature

Date

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## **Summary of Conducted RF Measurements**

SC480 EVDO @ 1.9 GHz CDMA BTS FCC Part 24

CHANNEL	FREQUENCY (MHz)	SPUR LEVEL MEASURED (dB <b>nl</b> V)	SPUR LEVEL MEASURED (dBm)	FCC MAX LIMIT (dBm)	PASS / FAIL
1175	19093.611	84.00	-23.00	-13	Pass

### SC480 1X @ 1.9 GHz CDMA BTS FCC Part 24

CHANNEL	FREQUENCY (MHz)	SPUR LEVEL MEASURED (dB <b>nl</b> V)	SPUR LEVEL MEASURED (dBm)	FCC MAX LIMIT (dBm)	PASS / FAIL
1175	18679.984	83.50	-23.50	-13	Pass

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# **Section B** Summary of Modulation Characteristics

SC480 EVDO @ 1.9 GHz CDMA BTS

CHANNEL	TUNE FREQUENCY (MHz)	RHO Measured	RHO Specifications	PASS / FAIL
25	1931.25	.99785	> 0.970	Pass
1175	1988.75	.99867	> 0.970	Pass

#### SC480 1X @ 1.9 GHz CDMA BTS

CHANNEL	TUNE FREQUENCY (MHz)	RHO Measured	RHO Specifications	PASS / FAIL
25	1931.25	.98444	> 0.912	Pass
1175	1988.75	.98441	> 0.912	Pass

The BTS was configured for maximum power out of 43.00 dBm and minimum power out of -6.00 dBm depending on the configuration. The output power was set respectively to 20.0 Watts or 0.25 mWatts using an HP437B power meter. The external attenuation at 43.0 dBm, 36.5 dBm, and 26.0 dBm was 41.2 dB for channel 25 and 42.6 dB for channel 1175. The external attenuation at -6.0 dBm for core unit was 0.5 dB for channel 25 and channel 1175.

rancisco J. Chiolos

07.02.04

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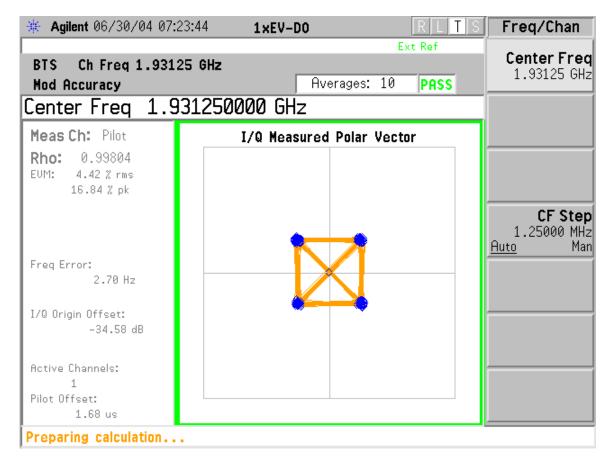
Date

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## <u>SC480 EVDO – Modulation Characteristics</u>

## High Power with cPA - 43.00 dBm - 8PSK



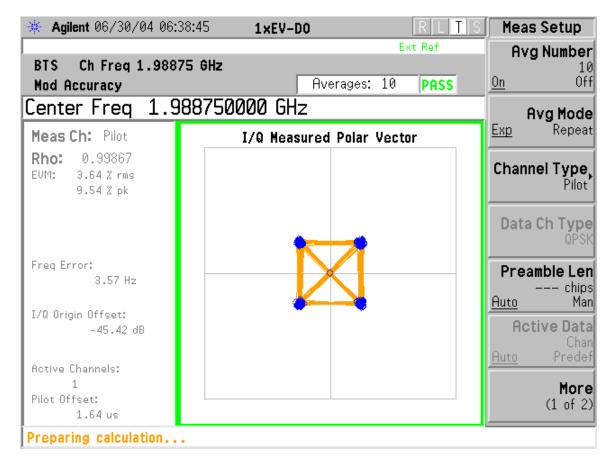
Channel 25 - 1931.25 MHz

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## **SC480 EVDO – Modulation Characteristics**

## High Power with CPA - 43.00 dBm - 16QAM



Channel 1175 – 1988.75 MHz

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## **SC480 EVDO – Modulation Characteristics**

## Low Power with cPA – 36.5 dBm – 8PSK

🔆 Agilent 06/30/04 07:	25:45 1xEV-DO	RLTS	Meas Setup
BTS Ch Freq 1.931 Mod Accuracy	Ave	Ext Ref rages: 9 PASS	Avg Number 10 <u>On</u> Off
Center Freq 1.9	131250000 GHz		Avg Mode
Meas Ch: Pilot	I/Q Measured	Polar Vector	<u>Exp</u> Repeat
<b>Rho:</b> 0.99785 EVM: 4.62%rms 11.18%pk			Channel Type, Pilot
	•	*	Data Ch Type QPSK
Freq Error: 1.54 Hz			Preamble Len chips <u>Auto</u> Man
I/Q Origin Offset: −31.66 dB			<b>Active Data</b> Chan Auto Predef
Active Channels: 1 Pilot Offset: 1.68 us			<b>More</b> (1 of 2)
Preparing calculation			

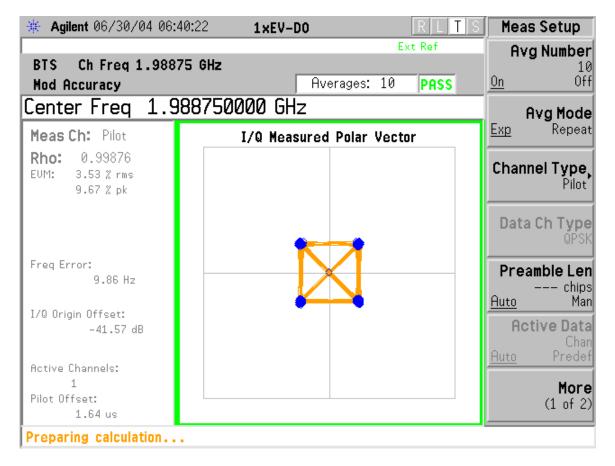
Channel 25 – 1931.25 MHz

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## **SC480 EVDO – Modulation Characteristics**

## Low Power with cPA-36.5 dBm - 16QAM



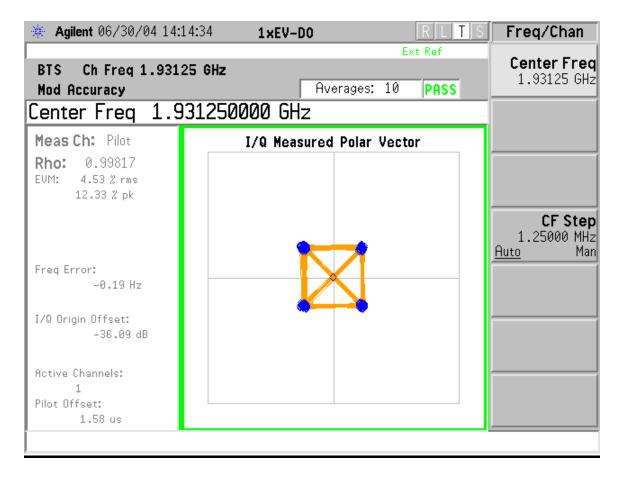
Channel 1175 – 1988.75 MHz

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## <u>SC480 EVDO – Modulation Characteristics</u>

## Low Power with Core – -6.0 dBm – 8PSK



Channel 25 – 1931.25 MHz

FCC ID: IHET6EK1

## <u>SC480 EVDO – Modulation Characteristics</u>

## Low Power with Core - -6.0 dBm - 16QAM

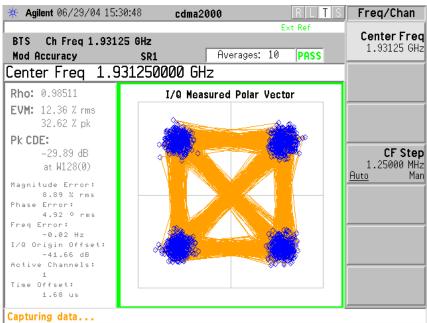
🔆 Agilent 06/30/04 14:	07:52 1xEV-DO	R L T S Meas Setup
BTS Ch Freq 1.988	75 GHz Average	Ext Ref 10 es: 10 PASS On Off
Mod Accuracy Center Freq 1.9		Avg Mode
Meas Ch: Pilot	I/Q Measured Pola	ar Vector <u>Exp</u> Repeat
Rho: 0.99868 EVM: 3.74%rms 10.67%pk		Channel Type, Pilot
		Data Ch Type QPSK
Freq Error: 3.49 Hz		Preamble Len chips Auto Man
I/Q Origin Offset: -45.83 dB		<b>Active Data</b> Chan Auto Predef
Active Channels: 1		More
Pilot Offset: 1.57 us		(1 of 2)
Preparing calculation	•	

Channel 1175 – 1988.75 MHz

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## SC480 1X – Modulation Characteristics



## High Power with cPAs-43.00 dBm

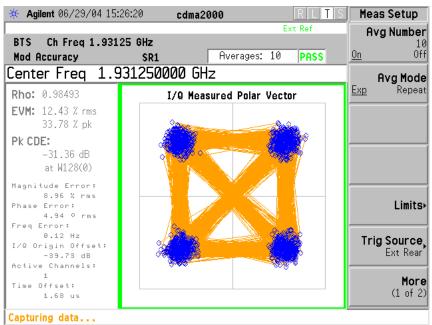
Channel 25– 1931.25 MHz

🔆 Agilent 06/29/04 15:4	41:45 cdma2000	R L T S Meas Setup
BTS Ch Freq 1.988 Mod Accuracy Center Freq 1.9	75 GHz SR1 Averages: 10	Ext Ref PASS Avg Number 10 0n Off Avg Mode
Rho: 0.98500 EVM: 12.39 % rms 33.75 % pk Pk CDE: -28.02 dB at W128(0) Magnitude Error:	I/Q Measured Polar Vec	Evn Donost
8.90 % rms Phase Error: 4.94 0 rms Freq Error: 0.32 Hz I/Q Origin Offset: -36.78 dB Active Channels: 1 Time Offset: 1.64 us		Limits> Trig Source, Ext Rear More (1 of 2)

Channel 1175 - 1988.75 MHz

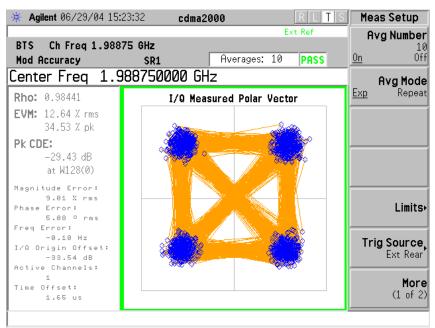
#### FCC ID: IHET6EK1

## **SC480 1X – Modulation Characteristics**



## Low Power with cPA – 26.0 dBm

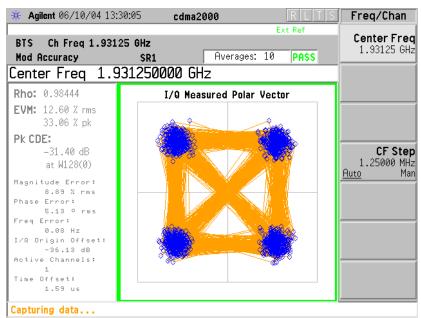
Channel 25 – 1931.25 MHz



Channel 1175-1988.75 MHz

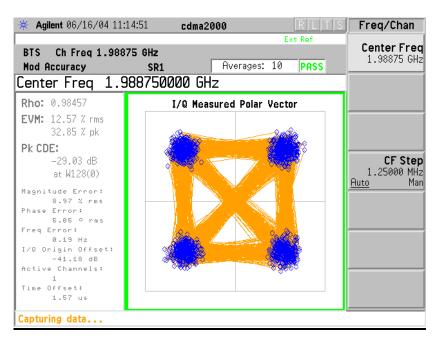
#### FCC ID: IHET6EK1

## **SC480 1X – Modulation Characteristics**



### Low Power with Core – -6.0 dBm

Channel 25 – 1931.25 MHz



Channel 1175 – 1988.75 MHz

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# **Section C**

## **Spurious and Harmonic Emissions Radiated**

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## **Radiated RF Measurements**

#### Maximum Radiated RF Spur Levels for SC480 EVDO @ 1.9 GHz CDMA BTS

	Radiated RF Measurements					
Channel	Spurious Frequency (MHz)	Antenna Polarity	Measured Radiated Field Strength (dBuV/m)	Measured Radiated Field Strength (dBm) (Note 1)	FCC Part 22/24 MAX LIMIT (dBm)	(Pass/ Fail)
25	5793.794	v	61.49	-33.74	-13	Pass
1175	5965.966	V	64.97	-30.26	-13	Pass

#### Maximum Radiated RF Spur Levels for SC480 1X @ 1.9 GHz CDMA BTS

Radiated RF Measurements						Result
Channel	Spurious Frequency (MHz)	Antenna Polarity	Measured Radiated Field Strength (dBuV/m)	Measured Radiated Field Strength (dBm) (Note 1)	FCC Part 22/24 MAX LIMIT (dBm)	(Pass/ Fail)
25	5793.794	V	62.87	-32.36	-13	Pass
1175	5965.966	V	70.51	-24.72	-13	Pass

Notes:

 $\label{eq:converting dBuV/M to dBm at 3 meters: } \\ (dBuV/M) + 9.542 - 104.77 = dBm \\ Converting dBuV/M to dBm at 10 meters: \\ (dBuV/M) + 20 - 104.77 = dBm \\ \end{tabular}$ 

rancisco J. Ocrolos 07.02.04

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Date

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**APPLICANT: MOTOROLA** 

FCC ID: IHET6EK1

# **Section C**

## **Spurious and Harmonic Emissions Conducted**



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## **Conducted RF Measurements**

#### SC480 EVDO @ 1.9 GHz CDMA BTS FCC Part 24

CHANNEL	FREQUENCY (MHz)	SPUR LEVEL MEASURED (dB <b>nl</b> V)	SPUR LEVEL MEASURED (dBm)	FCC MAX LIMIT (dBm)	PASS / FAIL
25	13223.444	78.08	-28.92	-13	Pass
1175	19093.611	84.00	-23.00	-13	Pass

#### SC480 1X @ 1.9 GHz CDMA BTS FCC Part 24

CHANNEL	FREQUENCY (MHz)	SPUR LEVEL MEASURED (dB <b>ni</b> V)	SPUR LEVEL MEASURED (dBm)	FCC MAX LIMIT (dBm)	PASS / FAIL
25	19242.877	82.10	-24.90	-13	Pass
1175	18679.984	83.50	-23.50	-13	Pass

#### FCC Maximum Limit Per 47 CFR:

- " = Transmitted Power (10  $\text{Log}_{10}(P_{\text{watt}})) (43 + 10 \text{Log}_{10}(P_{\text{watt}})) \text{ dBW}$
- " =  $10 \text{ Log}_{10}(P_{\text{watt}}) (43 + 10 \text{ Log}_{10}(P_{\text{watt}})) \text{ dBW}$
- " = -43 dBW
- " = -13 dBm

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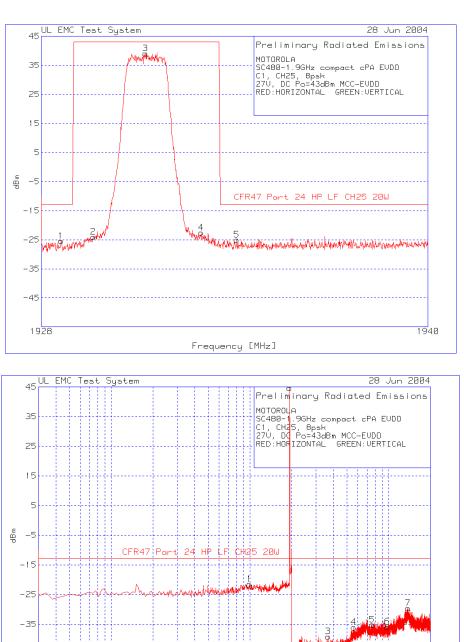
Date

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#### FCC ID: IHET6EK1

20000

10000



1000

Frequency [MHz]

#### **Spurious and Harmonic Emissions Conducted** CDMA EVDO Channel 25 – 43.00 dBm – 8PSK

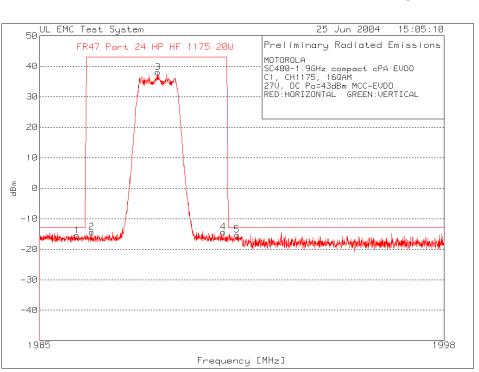
100

-45

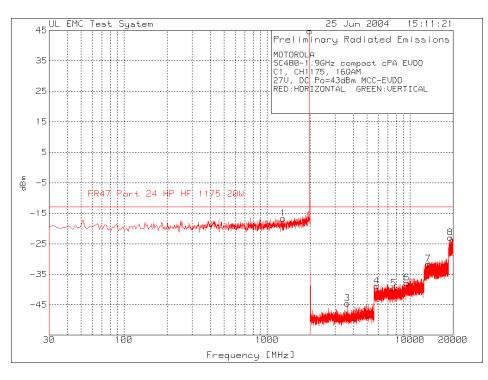
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#### FCC ID: IHET6EK1



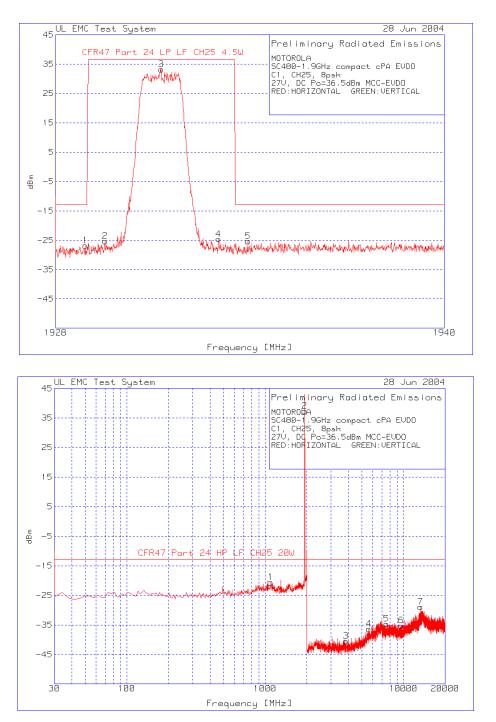
#### **Spurious and Harmonic Emissions Conducted** CDMA EVDO Channel 1175 – 43.00 dBm – 16QAM



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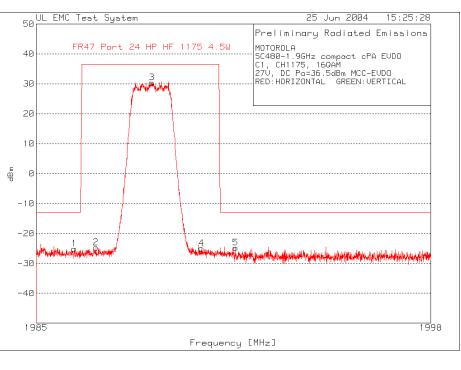
#### **Spurious and Harmonic Emissions Conducted** CDMA EVDO Channel 25 – 36.5 dBm – 8PSK



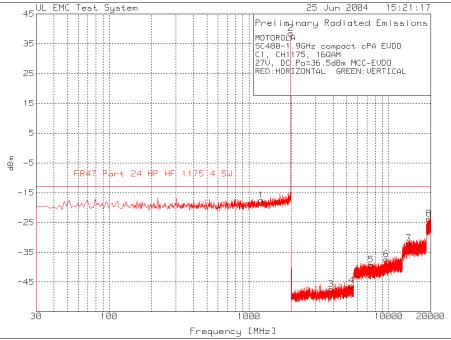
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#### FCC ID: IHET6EK1

### **Spurious and Harmonic Emissions Conducted**



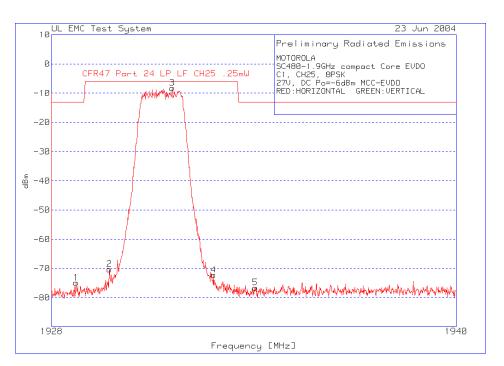
CDMA EVDO Channel 1175 - 36.5 dBm - 16QAM

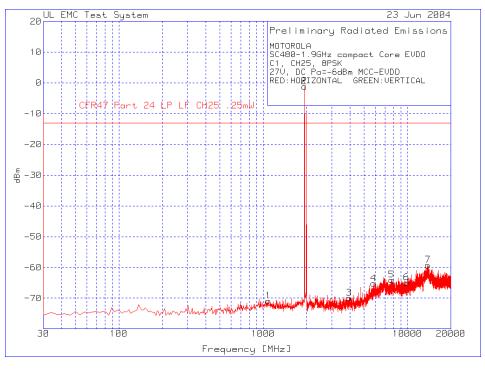


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#### FCC ID: IHET6EK1

#### **Spurious and Harmonic Emissions Conducted** CDMA EVDO Channel 25– -6.0 dBm – 8PSK

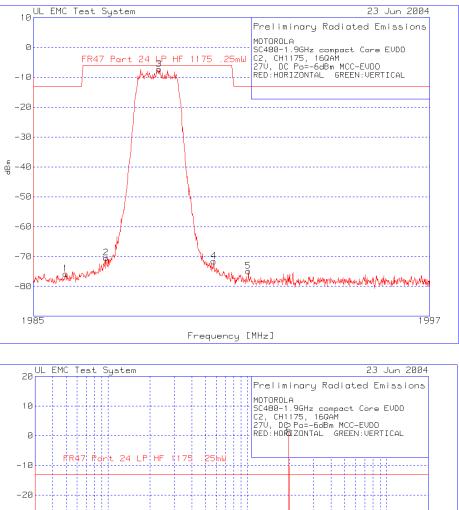


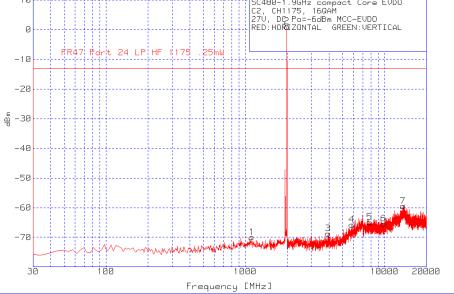


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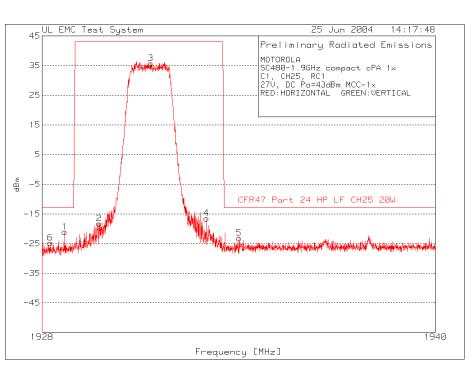
#### FCC ID: IHET6EK1

#### **Spurious and Harmonic Emissions Conducted** CDMA EVDO Channel 1175 – -6.0 dBm – 16QAM

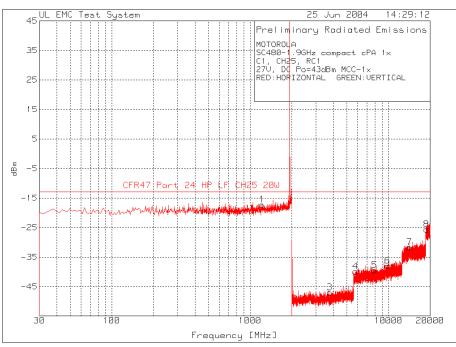




#### FCC ID: IHET6EK1

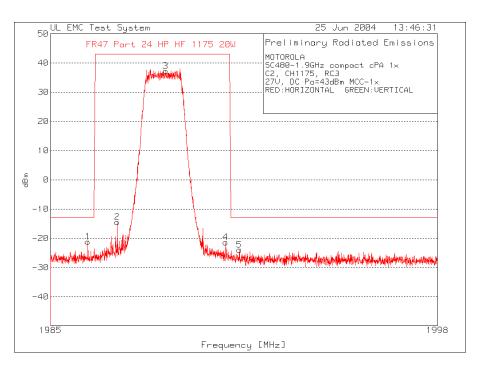


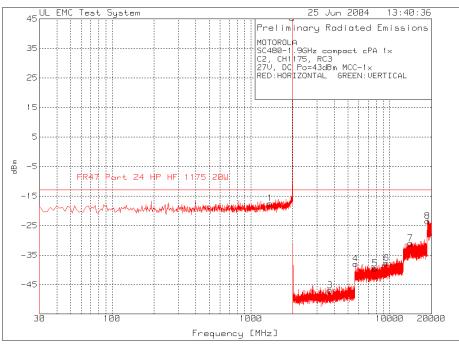
#### **Spurious and Harmonic Emissions Conducted** CDMA 1X Channel 25 – 43.0 dBm



#### FCC ID: IHET6EK1

#### **Spurious and Harmonic Emissions Conducted** CDMA 1X Channel 1175 – 43.0 dBm

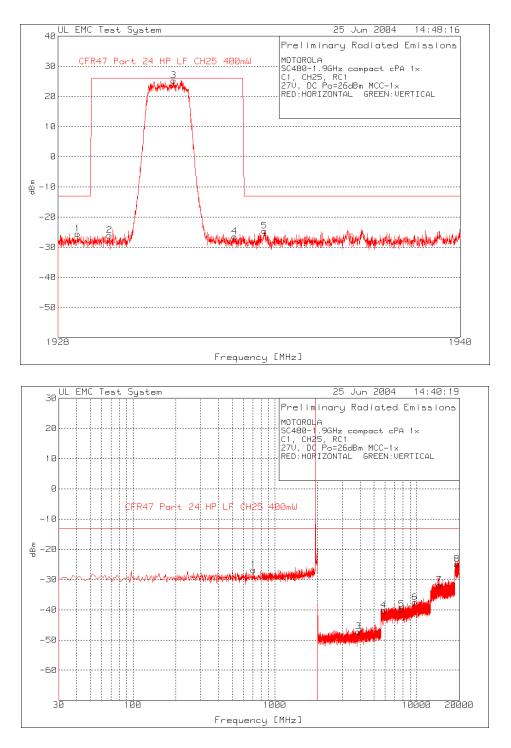




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#### **Spurious and Harmonic Emissions Conducted** CDMA 1X Channel 25 – 26.0 dBm



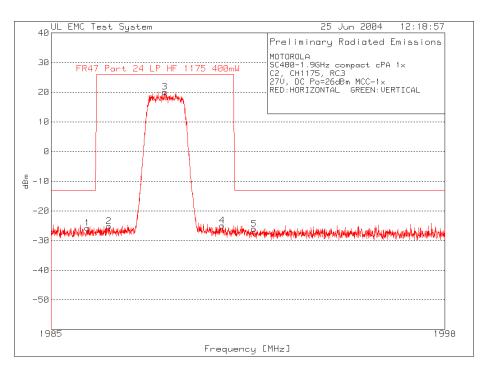
 $\mathbf{M}$ 

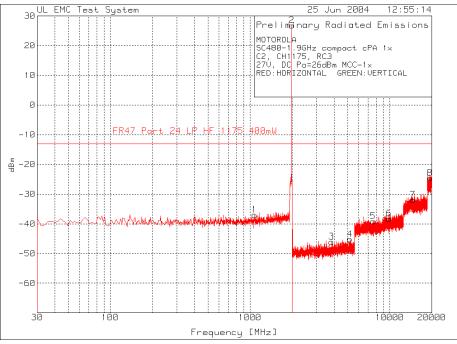
**APPLICANT: MOTOROLA** 

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#### FCC ID: IHET6EK1

#### **Spurious and Harmonic Emissions Conducted** CDMA 1X Channel 1175 – 26.0 dBm

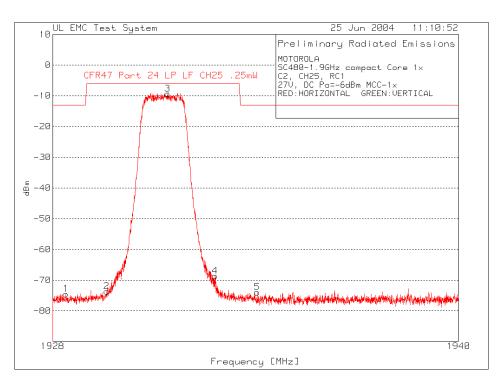


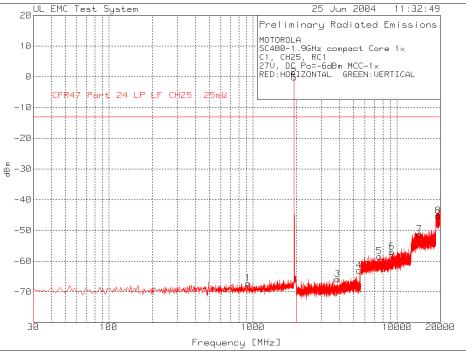


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#### FCC ID: IHET6EK1

#### **Spurious and Harmonic Emissions Conducted** CDMA 1X Channel 25 – -6.0 dBm

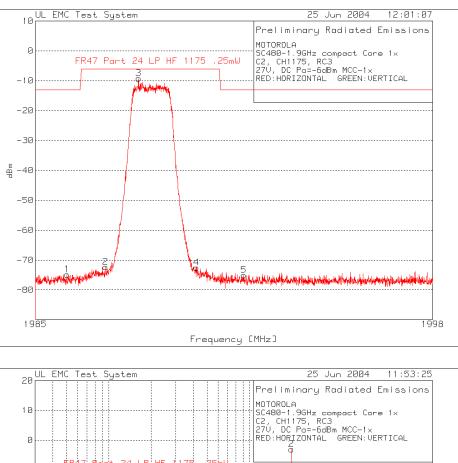


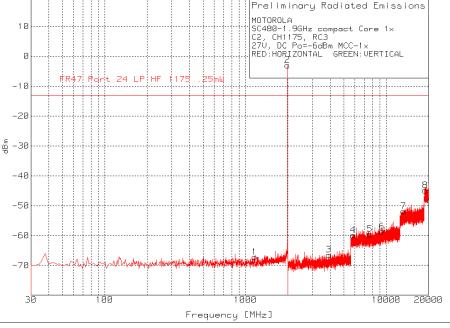


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#### **Spurious and Harmonic Emissions Conducted** CDMA 1X Channel 1175 – -6.0 dBm





## SECTION E OCCUPIED BANDWIDTH

<u>NOTE:</u> The BTS was configured for maximum power out of 43.00 dBm and minimum power out of -6.00 dBm depending on the configuration. The output power was set respectively to 20.0 Watts or 0.25 mWatts using an HP437B power meter. The external attenuation at 43.0 dBm, 36.5 dBm, and 26.0 dBm was 41.2 dB for channel 25 and 42.6 dB for channel 1175. The external attenuation at -6.0 dBm for core unit was 0.5 dB for channel 1175.

The following formula is used to obtain the correct power reference point from which the OBW of the CDMA signal is obtained. See example calculation below:

Power (measured in 30 kHz bandwidth) +  $10 \log (1.30 \text{ MHz} / 30 \text{ kHz})$ 

Example: 26.63 dBm + 16.37 dB = 43.00 dBm

The occupied bandwidth is measured in a 30 kHz resolution bandwidth. The summary is listed below.

CHANNEL	Power Level (dBm)	FREQUENCY (MHz)	MEASURED (MHz)	FCC LIMIT (MHz)	Pass / Fail
25	-6.0	1931.25	1.2781	1.30	Pass
1175	-6.0	1988.75	1.2745	1.30	Pass

#### SC480 EVDO @ 1.9 GHz SUMMARY OF OCCUPIED BANDWIDTH

#### SC480 1X @ 1.9 GHz SUMMARY OF OCCUPIED BANDWIDTH

CHANNEL	Power Level (dBm)	FREQUENCY (MHz)	MEASURED (MHz)	FCC LIMIT (MHz)	Pass / Fail
25	26.0	1931.25	1.2263	1.30	Pass
1175	-6.0	1988.75	1.2260	1.30	Pass

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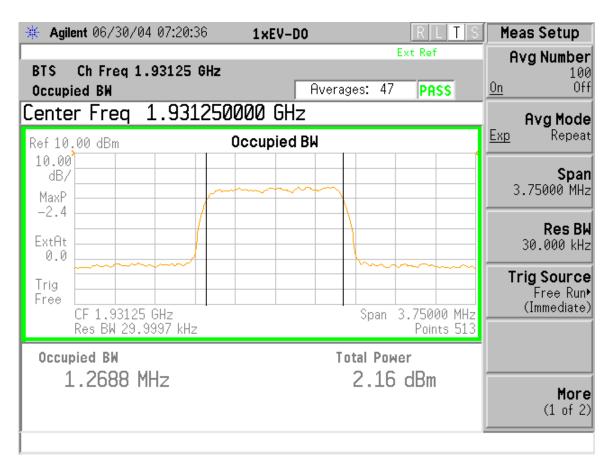
07.02.04

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Date

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### SC480 EVDO with cPA – Occupied Bandwidth – 43.00 dBm- 8PSK

Channel 25 – 1931.25 MHz

FCC ID: IHET6EK1

### SC480 EVDO with cPA – Occupied Bandwidth – 43.00 dBm – 16QAM

★ Agilent 06/30/04 06:33:26         1xEV-D0         R         L         T         S	Meas Setup
Ext Ref BTS Ch Freq 1.98875 GHz Occupied BW Averages: 100 PASS Center Freq 1.988750000 GHz	Avg Number 100 0n Off Avg Mode
Ref 10.00 dBm Occupied BW	<u>Exp</u> Repeat
10.00 dB/ MaxP	<b>Span</b> 3.75000 MHz
-0.7 ExtAt 0.0	<b>Res BW</b> 30.000 kHz
Trig Free CF 1.98875 GHz Res BW 29.9997 kHz Span 3.75000 MHz Points 513	<b>Trig Source</b> Free Run∙ (Immediate)
Оссиріеd BW Total Ромеr 1.2728 MHz Ø.53 dBm	More (1 of 2)

Channel 1175 - 1988.75 MHz

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### SC480 EVDO with cPA – Occupied Bandwidth – 36.5 dBm – 8PSK

★ Agilent 06/30/04 07:26:58         1xEV-D0         R L T S	Meas Setup
Ext Ref BTS Ch Freq 1.93125 GHz Occupied BW Averages: 100 PASS Center Freq 1.931250000 GHz	Avg Number 100 0n Off Avg Mode
Ref 10.00 dBm Occupied BW	<u>Exp</u> Repeat
10.00 dB/	<b>Span</b> 3.75000 MHz
-2.4 ExtAt 0.0	<b>Res BW</b> 30.000 kHz
Trig Free CF 1.93125 GHz Res BW 29.9997 kHz CF 1.93125 GHz CF 1.9312 GHZ CF 1.9	<b>Trig Source</b> Free Run∙ (Immediate)
Occupied BW Total Power 1.2728 MHz –4.59 dBm	More (1 of 2)

Channel 25 – 1931.25 MHz

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### SC480 EVDO with cPA – Occupied Bandwidth – 36.5 dBm – 16QAM

ዡ         Agilent         06/30/04         06:35:18         1xEV-D0         R         L         T         S	Meas Setup
Ext Ref BTS Ch Freq 1.98875 GHz Occupied BW Averages: 100 PASS Center Freq 1.988750000 GHz	Avg Number 100 0n Off Avg Mode
Ref 0.00 dBm Occupied BW	<u>Exp</u> Repeat
dB/	<b>Span</b> 3.75000 MHz
-0.7 ExtAt 0.0	<b>Res BW</b> 30.000 kHz
Trig Free CF 1.98875 GHz Res BW 29.9997 kHz Span 3.75000 MHz Points 513	<b>Trig Source</b> Free Run∙ (Immediate)
Occupied BW Total Power 1.2708 MHz –6.12 dBm	More (1 of 2)

Channel 1175 – 1988.75 MHz

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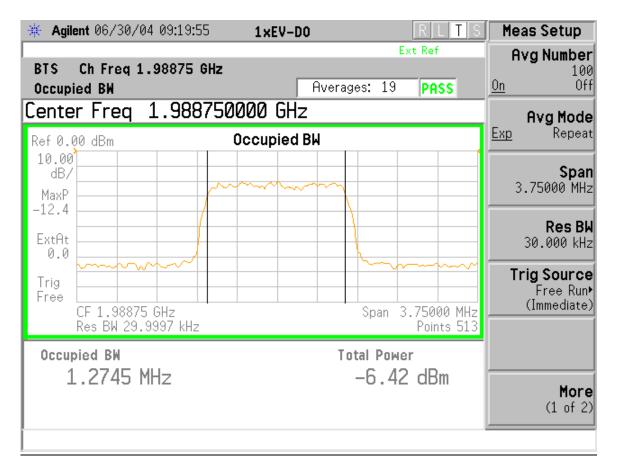
★ Agilent 06/30/04 09:24:46     1xEV-D0   R	S Meas Setup
Ext Ref BTS Ch Freq 1.93125 GHz Occupied BW Averages: 100 PASS	Avg Number 100 On Off
Center Freq         1.931250000         GHz           Ref 0.00 dBm         Occupied BW	Avg Mode
10.00 dB/	<b>Span</b> 3.75000 MHz
-12.4	<b>Res BW</b> 30.000 kHz
Trig         Span         Span <th< th=""><td></td></th<>	
Occupied BW Total Рожег 1.2781 MHz —6.40 dBm	More (1 of 2)

## SC480 EVDO with Core – Occupied Bandwidth – -6.0 dBm – 8PSK

Channel 25–1931.25 MHz

FCC ID: IHET6EK1

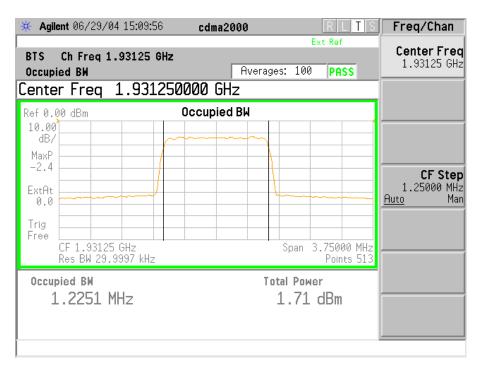
### SC480 EVDO with Core – Occupied Bandwidth – -6.0 dBm – 16QAM



Channel 1175 – 1988.75 MHz

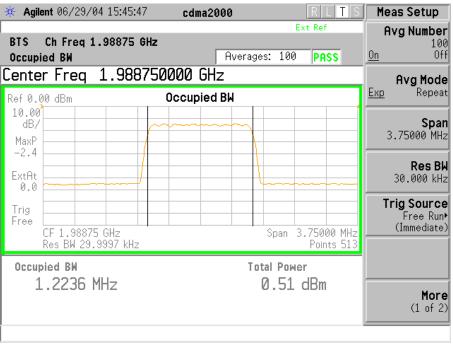
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#### FCC ID: IHET6EK1



#### SC480 1X with cPA – Occupied Bandwidth – 43.00 dBm

Channel 25 - 1931.25 MHz



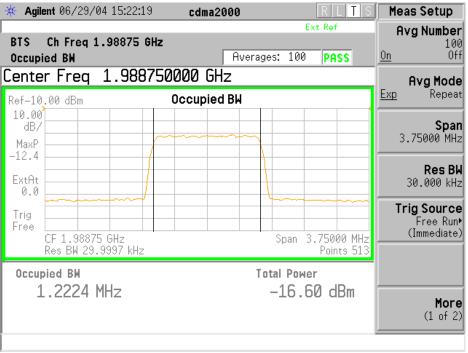
Channel 1175–1988.75 MHz

#### FCC ID: IHET6EK1

### SC480 1X with cPA – Occupied Bandwidth – 26.0 dBm

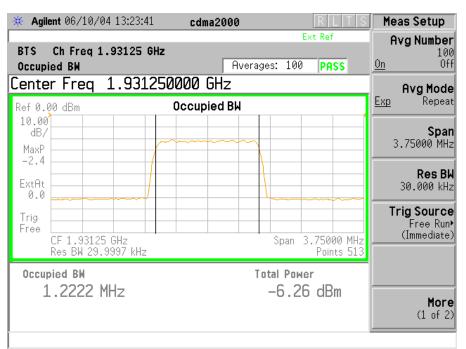
**Agilent** 06/29/04 15:19:33 cdma2000 RITIS Freq/Chan Ext Ref **Center Freq** BTS Ch Freg 1.93125 GHz 1.93125 GHz Occupied BW Averages: 100 PASS 1.931250000 GHz Center Frea Occupied BW Ref-10.00 dBm 10.00 dB/ MaxP -12.4 CF Step 1.25000 MHz ExtAt Auto Man 0.0 Trig Free CF 1.93125 GHz Span 3.75000 MHz Points 513 Res BW 29.9997 kHz **Occupied BW** Total Power 1.2263 MHz -15.57 dBm

Channel 25-1931.25 MHz



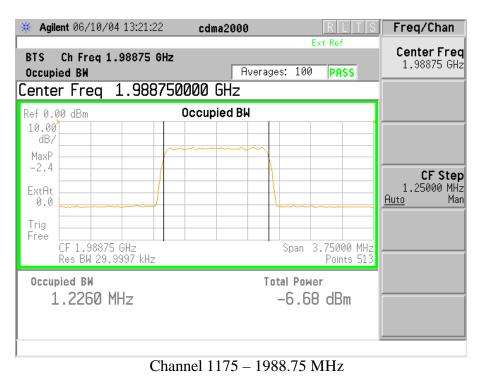
Channel 1175 – 1988.75 MHz

#### FCC ID: IHET6EK1



#### SC480 1X with Core – Occupied Bandwidth – -6.0 dBm

Channel 25 - 1931.25 MHz



Global Telecom Solutions Sector

**APPLICANT: MOTOROLA** 

FCC ID: IHET6EK1

# Section F

## Maximum Permissible Exposure (MPE)

MPE Levels for Uncontrolled Environment

MPE Levels based on ANSI/IEEE C95.1-1992 and 47 CFR 1.1310, Table 1 requirements

Antenna	Antenna Gain	Uncontrolled Exposure Specification 1.00 mW/cm <sup>2</sup>	Measured level at Specified distance	Published Uncontrolled Exposure Distance ( Note 1)
DB792SM5N-KU	2.1dBi	$1.00 \text{ mW/cm}^2$	1.00 mW/cm <sup>2</sup> @ cm	0.75 m
DB794SL5N-KM	5.5dBi	$1.00 \text{ mW/cm}^2$	$1.00 \text{ mW/cm}^2 \text{ @ cm}$	0.75 m

**Note 1:** Warning Label will specify uncontrolled exposure boundary distance per ANSI C95.2

 $1900/1500 = 1.00 \text{ mW/cm}^2$  uncontrolled limit

Francisco J. Chrolos 07.02.04

Signature

Date

Global Telecom Solutions Sector

FCC ID: IHET6EK1

# **SECTION G**

## FREQUENCY STABILITY

MODE	27V POWER	WORST CASE ? PPM	FCC REQUIREMENT	Pass / Fail
CSA	85-115%	< 0.02	+/- 1.5 PPM MAX	Pass

MODE	TEMPERATURE	WORST CASE ? PPM	FCC REQUIREMENT	Pass / Fail
CSA	-30° to +50° C	<0.2	+/- 1.5 PPM MAX	Pass

07.02.04

Signature

Date

Terry Schwenk

# $\mathbb{N}$

#### **APPLICANT: MOTOROLA**

Global Telecom Solutions Sector

#### FCC ID: IHET6EK1

