KTL Test Report:	8R01058
Applicant:	Allen Telecom Group 140 Vista Centre Drive Forest, Virginia 24551
Equipment Under Test: (E.U.T.)	Brite Cell Dual Band
FCC ID:	BCR-BCEL-DUALBAND
In Accordance With:	**FCC Part 22, Subpart H** Cellular Band Repeaters
Tested By:	KTL Ottawa Inc. 3325 River Road, R.R. 5 Ottawa, Ontario K1V 1H2
Authorized By:	_____ T. Tidwell, Wireless Group Manager
Date:	_____
Total Number of Pages:	63

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Section 1. Summary of Test Results

Manufacturer: Allen Telecom Group

Model No.: TFA 2301H-2

Serial No.: Demo 2

General: **All measurements are traceable to national standards.**

These tests were conducted on a sample of the equipment for the purpose of demonstrating compliance with FCC Part 22, Subpart H.

☒ New Submission ☐ Production Unit

☐ Class II Permissive Change ☒ Pre-Production Unit

T	N	B

Equipment Code

THIS TEST REPORT RELATES ONLY TO THE ITEM(S) TESTED.

THE FOLLOWING DEVIATIONS FROM, ADDITIONS TO, OR EXCLUSIONS FROM THE TEST SPECIFICATIONS HAVE BEEN MADE. None
See " Summary of Test Data".

NVLAP LAB CODE: 100351-0

TESTED BY: _____ DATE: _____
Kevin Carr, Technologist

TECHNICAL REVIEW:_____ DATE:_____

Summary Of Test Data

NAME OF TEST	PARA. NO.	SPEC.	MEAS.	RESULT
RF Power Output	22.913(a)	500W ERP	20.3 dBm	Complies
Occupied Bandwidth (Voice & SAT)	22.917(c)	Mask C	Plot	Complies
Occupies Bandwidth (Wideband Data)	22.917(d)	Mask D	Plot	Complies
Occupied Bandwidth (ST)	22.917(d)	Mask D	Plot	Complies
Occupied Bandwidth (Digital)	None	Input vs. Output	Plot	Complies
Spurious Emissions at Antenna Terminals	22.917	-13 dBm	Plot	Complies
Field Strength of Spurious Emissions	22.917	-13 dBm E.I.R.P.	-45.0 dBm	Complies
Frequency Stability	22.355	1.5 ppm	N/A	N/A

Footnotes For N/A's:

Test Conditions: Temperature: 22 °C
Humidity: 32 %

.

Section 2. General Equipment Specification

Supply Voltage Input:		120 VAC, 60 Hz
Frequency Range:	**Downlink:**	869.0 – 894.0 MHz
20 dB Bandwidth:		49.30 MHz

Type of Modulation and Designator:

CDMA (F9W)	GSM (GXW)	NADC (DXW)	CDPD (F9W)	AMPS (F8W, F1D)
☒	☐	☒	☐	☒

AGC Threshold:		Not Applicable
Output Impedance:		50 ohm
Gain:		5 dB Nominal
Max Input Power:		15.2 dBm
RF Output (Rated):	**Single:**	19.1 dBm
	Composite:	16.1 dBm / 2 Carrier

Frequency Translation:

F1-F1	F1-F2	N/A
☒	☐	☐

Band Selection:

Software	Duplexer Change	Fullband Coverage
☐	☐	☒

Description of Modifications For Class II Permissive Change

NOT APPLICABLE

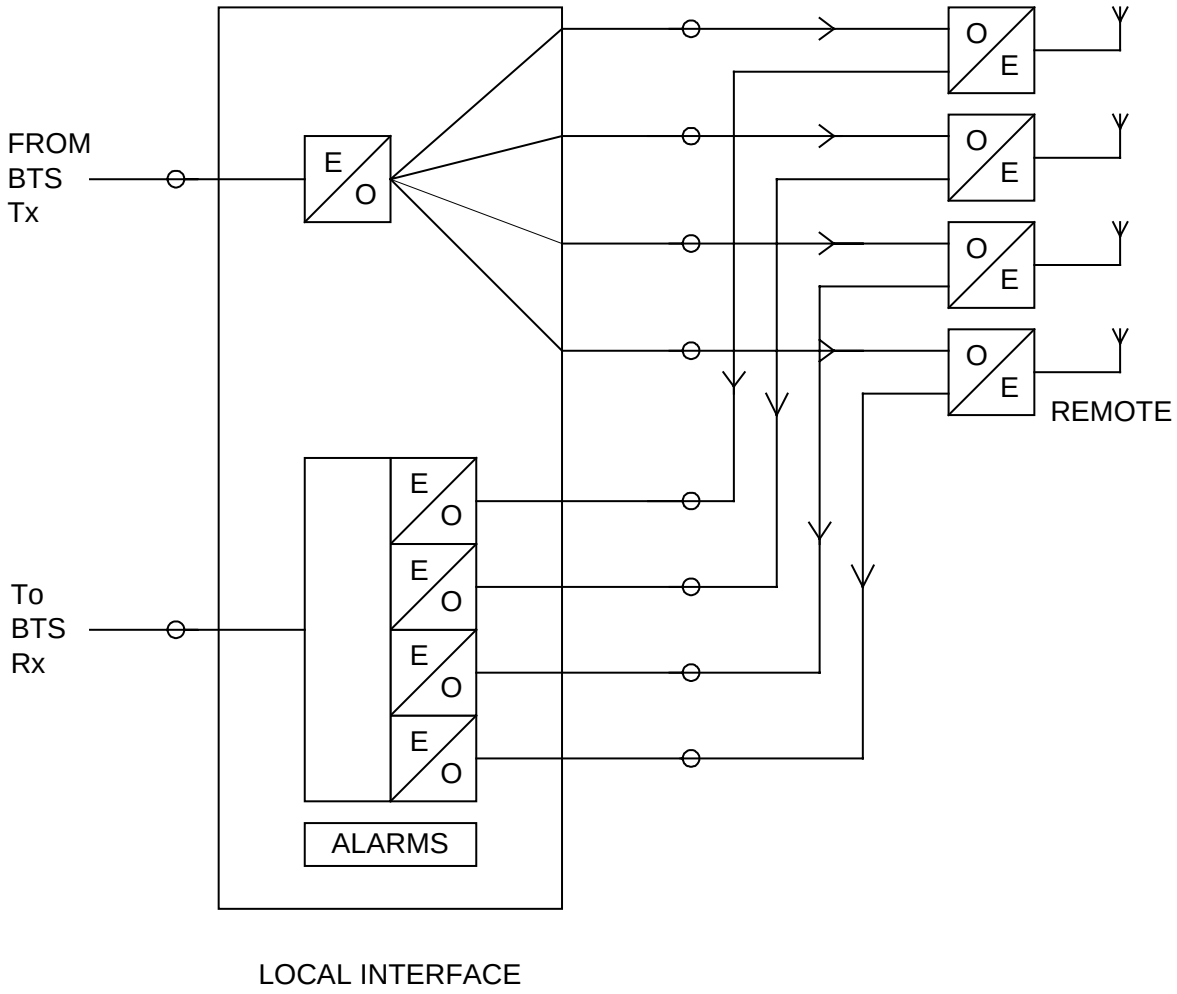
Modifications Made During Testing

NOT APPLICABLE

Theory of Operation

The Brite Cell Dual Band is an active indoor coverage system incorporating fibre optic and RF technologies. The device operates in the 800 MHz cell band and the 1990 MHz band. It features dual RF outputs and can operate from a 120 VAC line or battery. This system is hardwired to the base station and only re-transmits the downlink signal.

System Diagram



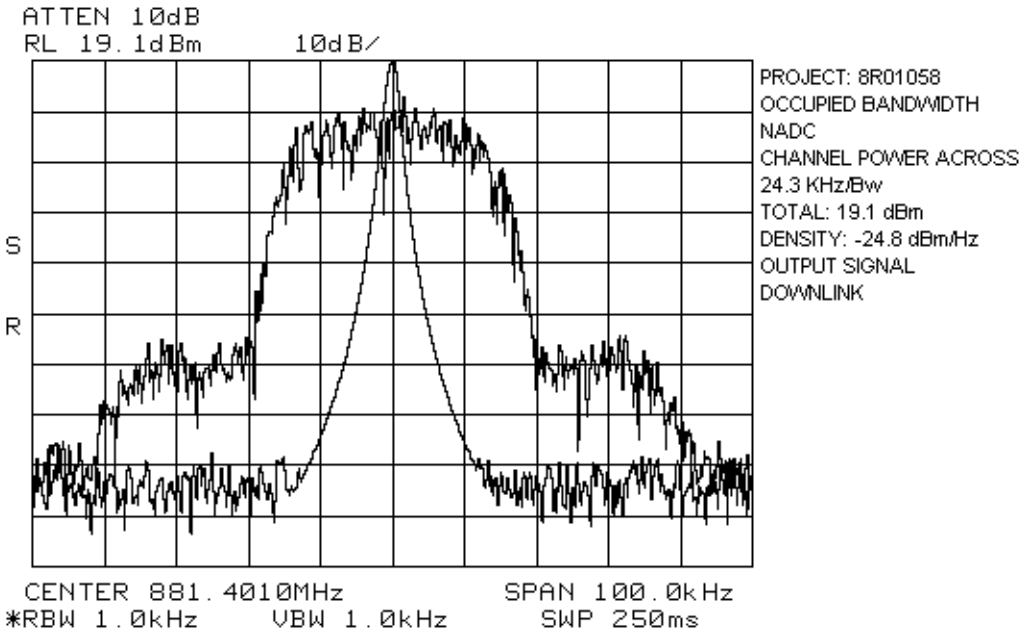
Section 3. RF Power Output

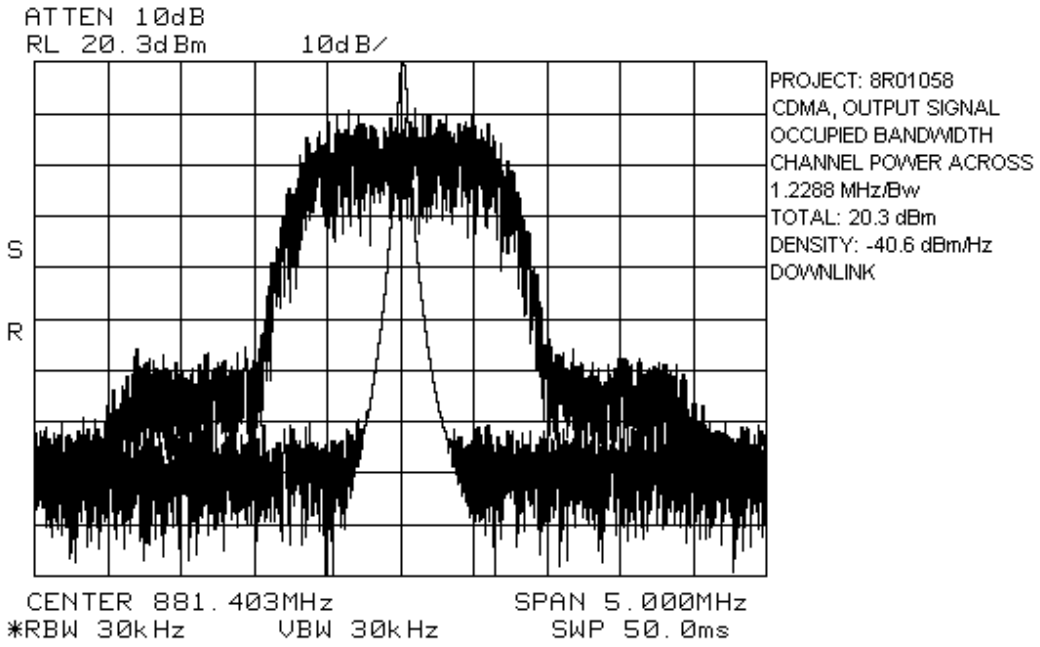
NAME OF TEST: RF Power Output	PARA. NO.: 2.985
TESTED BY: Kevin Carr	DATE: November 26, 1998

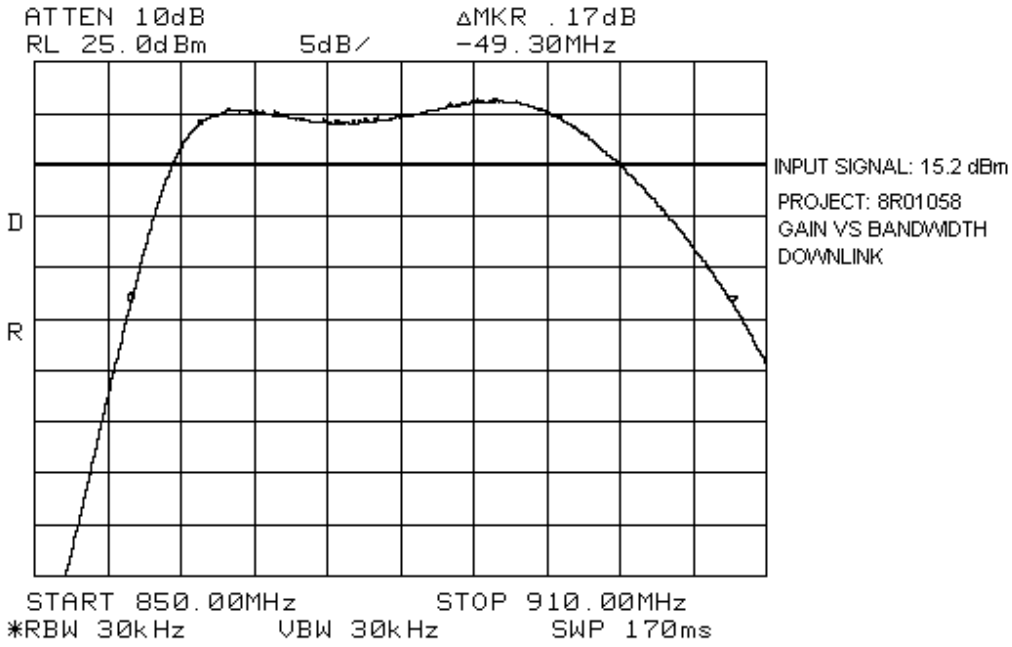
Test Results: Complies.

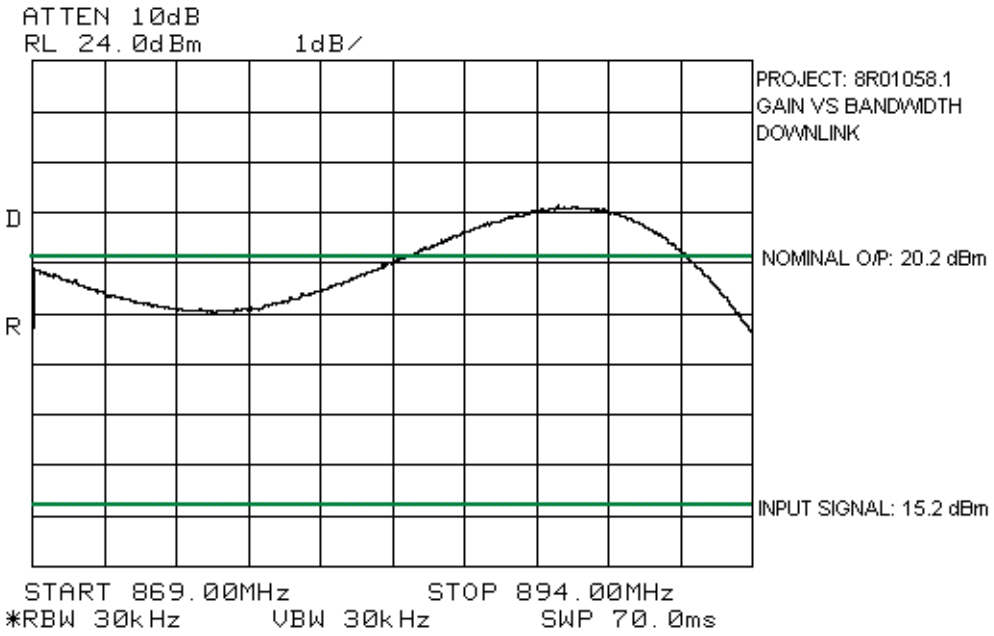
Measurement Data:

	Modulation Type	Per Channel Power Output (dBm)	Composite Power Output (dBm)
Downlink	AMPS	17.2	20.2
Downlink	CDMA	17.3	20.3
Downlink	NADC	16.1	19.1


ATTEN 10dB
RL 19.1dBm
10dB/
S
R
PROJECT: 8R01058
OCCUPIED BANDWIDTH
NADC
CHANNEL POWER ACROSS
24.3 KHz/Bw
TOTAL: 19.1 dBm
DENSITY: -24.8 dBm/Hz
OUTPUT SIGNAL
DOWNLINK
CENTER 881.4010MHz
SPAN 100.0kHz
*RBW 1.0kHz
VBW 1.0kHz
SWP 250ms


ATTEN 10dB
RL 20.3dBm
10dB/
S
R
PROJECT: 8R01058
CDMA, OUTPUT SIGNAL
OCCUPIED BANDWIDTH
CHANNEL POWER ACROSS
1.2288 MHz/Bw
TOTAL: 20.3 dBm
DENSITY: -40.6 dBm/Hz
DOWNLINK
CENTER 881.403MHz
SPAN 5.000MHz
*RBW 30kHz
VBW 30kHz
SWP 50.0ms


ATTEN 10dB
RL 25.0dBm
5dB/
ΔMKR .17dB
-49.30MHz
INPUT SIGNAL: 15.2 dBm
PROJECT: 8R01058
GAIN VS BANDWIDTH
DOWNLINK
D
R
START 850.00MHz
STOP 910.00MHz
*RBW 30kHz
VBW 30kHz
SWP 170ms

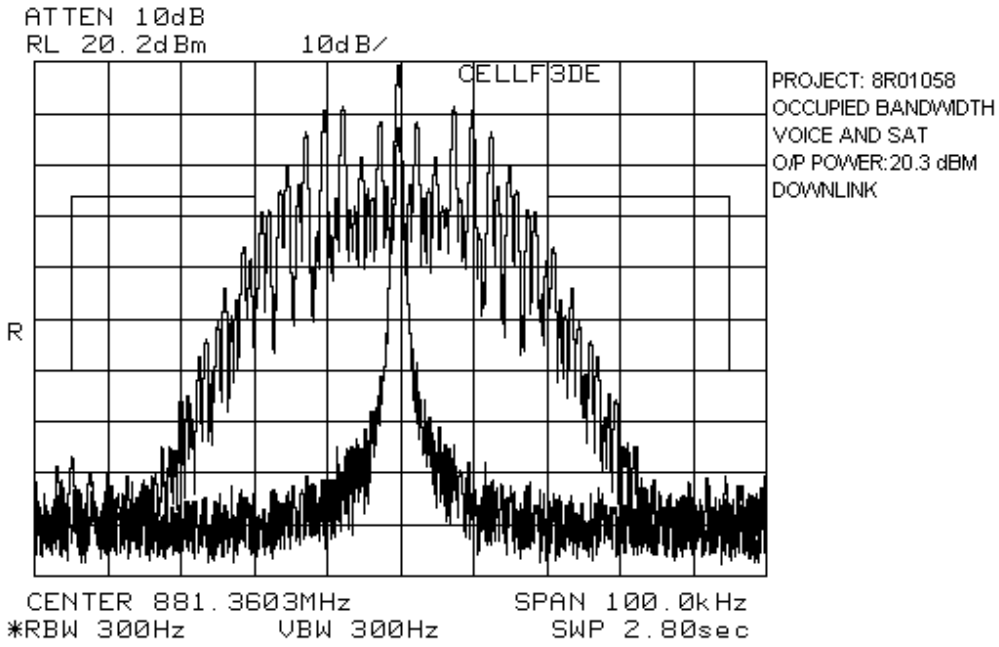

ATTEN 10dB
RL 24.0dBm
1dB/
PROJECT: 8R01058.1
GAIN VS BANDWIDTH
DOWNLINK
D
R
NOMINAL O/P: 20.2 dBm
INPUT SIGNAL: 15.2 dBm
START 869.00MHz
STOP 894.00MHz
*RBW 30kHz
VBW 30kHz
SWP 70.0ms

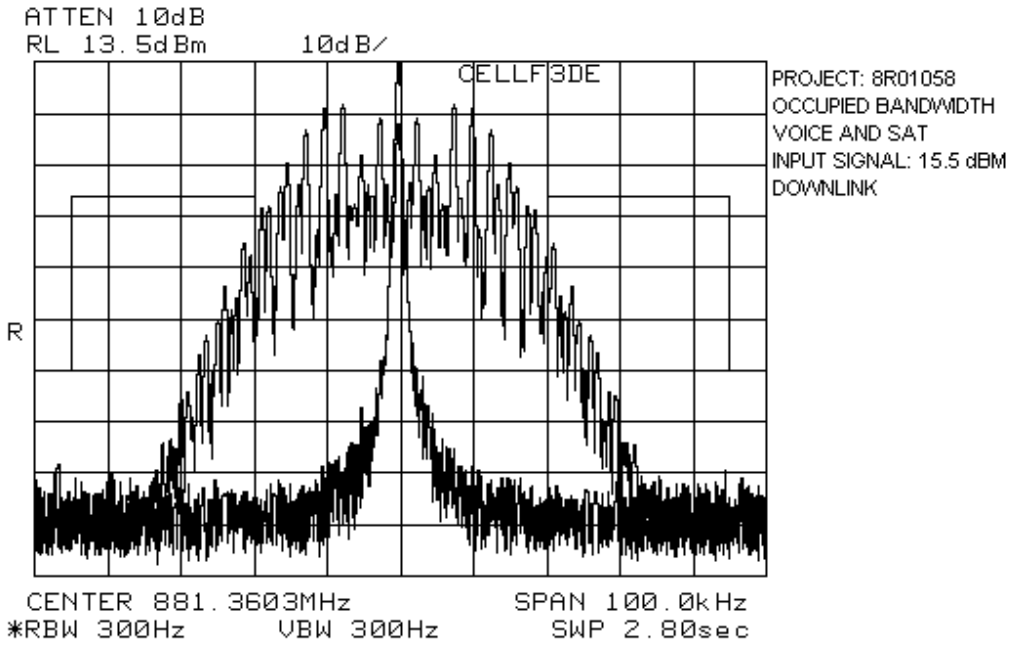
Section 4. Occupied Bandwidth

NAME OF TEST: Occupied Bandwidth (Voice + SAT)	PARA. NO.: 2.917(c)
TESTED BY: Kevin Carr	DATE: November 26, 1998

Test Results: Complies.

Test Data: See attached graph(s).

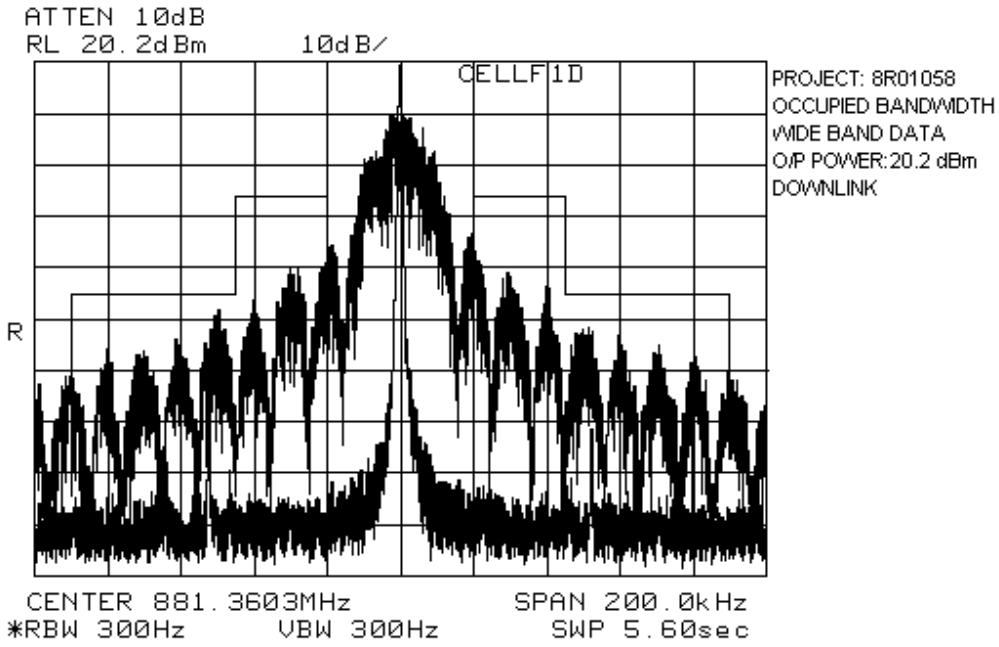

ATTEN 10dB
RL 20.2dBm
10dB/
CELLF3DE
PROJECT: 8R01058
OCCUPIED BANDWIDTH
VOICE AND SAT
O/P POWER:20.3 dBM
DOWNLINK
R
CENTER 881.3603MHz
SPAN 100.0kHz
*RBW 300Hz
VBW 300Hz
SWP 2.80sec

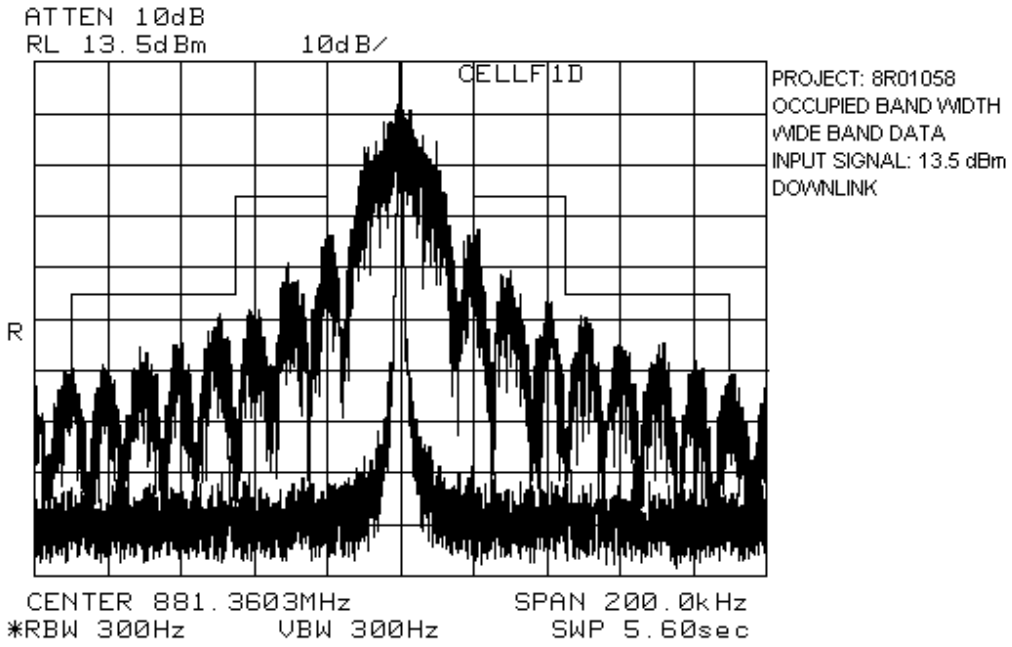

ATTEN 10dB
RL 13.5dBm
10dB/
CELLF3DE
PROJECT: 8R01058
OCCUPIED BANDWIDTH
VOICE AND SAT
INPUT SIGNAL: 15.5 dBM
DOWNLINK
R
CENTER 881.3603MHz
SPAN 100.0kHz
*RBW 300Hz
VBW 300Hz
SWP 2.80sec

NAME OF TEST: Occupied Bandwidth (WB Data)	PARA. NO.: 2.917 (d)
TESTED BY: Kevin Carr	DATE: November 26, 1998

Test Results: Complies.

Test Data: See attached graph(s).

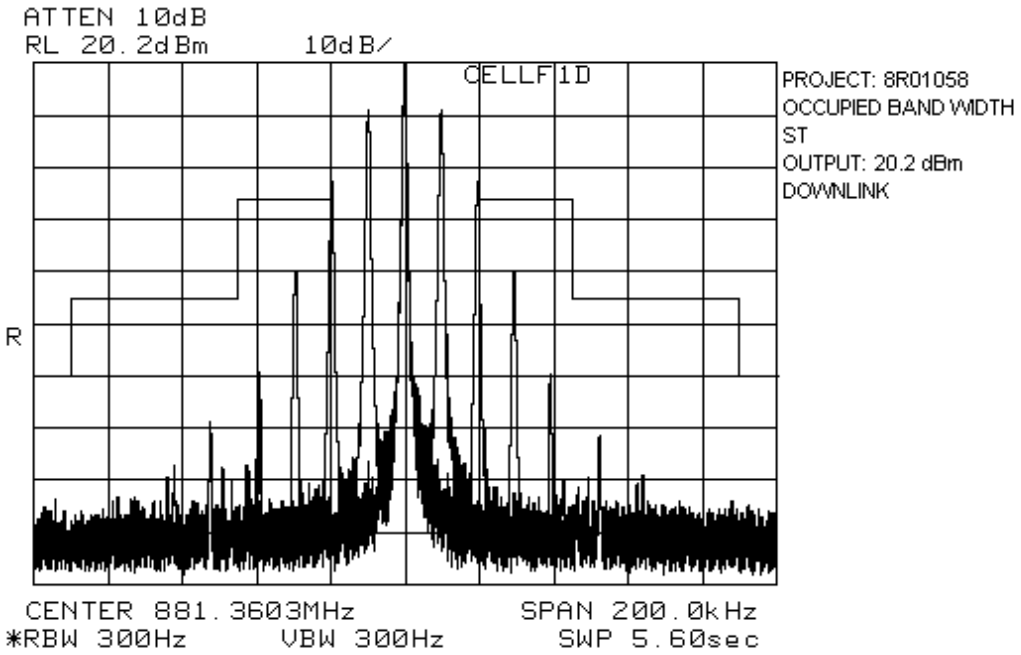

ATTEN 10dB
RL 20.2dBm
10dB/
CELLF1D
PROJECT: 8R01058
OCCUPIED BANDWIDTH
WIDE BAND DATA
O/P POWER:20.2 dBm
DOWNLINK
R
CENTER 881.3603MHz
SPAN 200.0kHz
*RBW 300Hz
VBW 300Hz
SWP 5.60sec

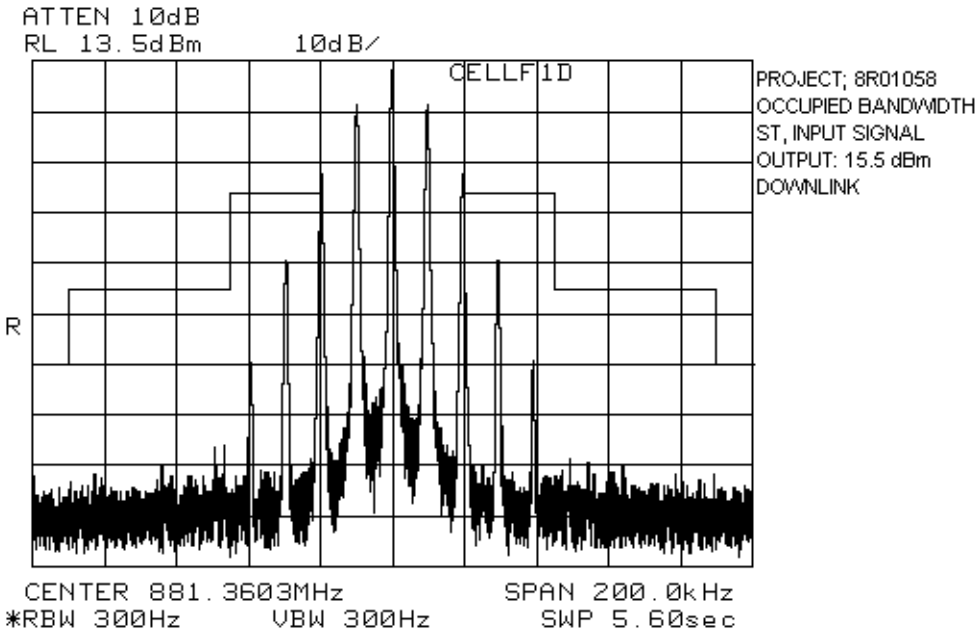

ATTEN 10dB
RL 13.5dBm
10dB/
CELLF1D
PROJECT: 8R01058
OCCUPIED BAND WIDTH
WIDE BAND DATA
INPUT SIGNAL: 13.5 dBm
DOWNLINK
R
CENTER 881.3603MHz
SPAN 200.0kHz
*RBW 300Hz
VBW 300Hz
SWP 5.60sec

NAME OF TEST: Occupied Bandwidth (ST)	PARA. NO.: 2.917(d)
TESTED BY: Kevin Carr	DATE: November 26, 1998

Test Results: Complies.

Test Data: See attached graph(s).

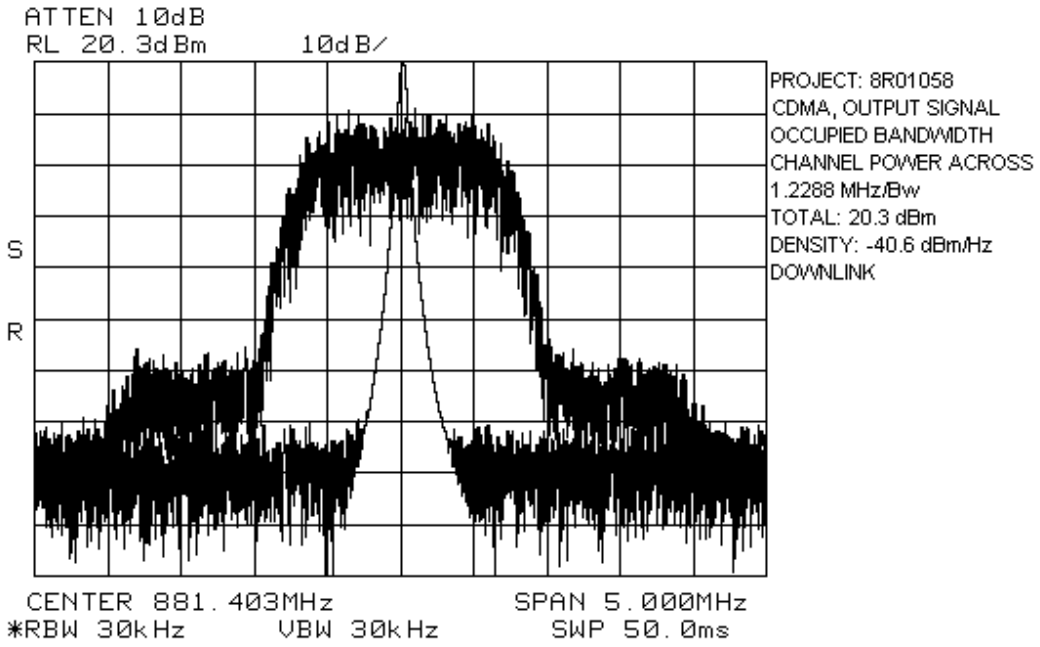

ATTEN 10dB
RL 20.2dBm
10dB/
CELLF1D
PROJECT: 8R01058
OCCUPIED BAND WIDTH
ST
OUTPUT: 20.2 dBm
DOWNLINK
R
CENTER 881.3603MHz
SPAN 200.0kHz
*RBW 300Hz
VBW 300Hz
SWP 5.60sec

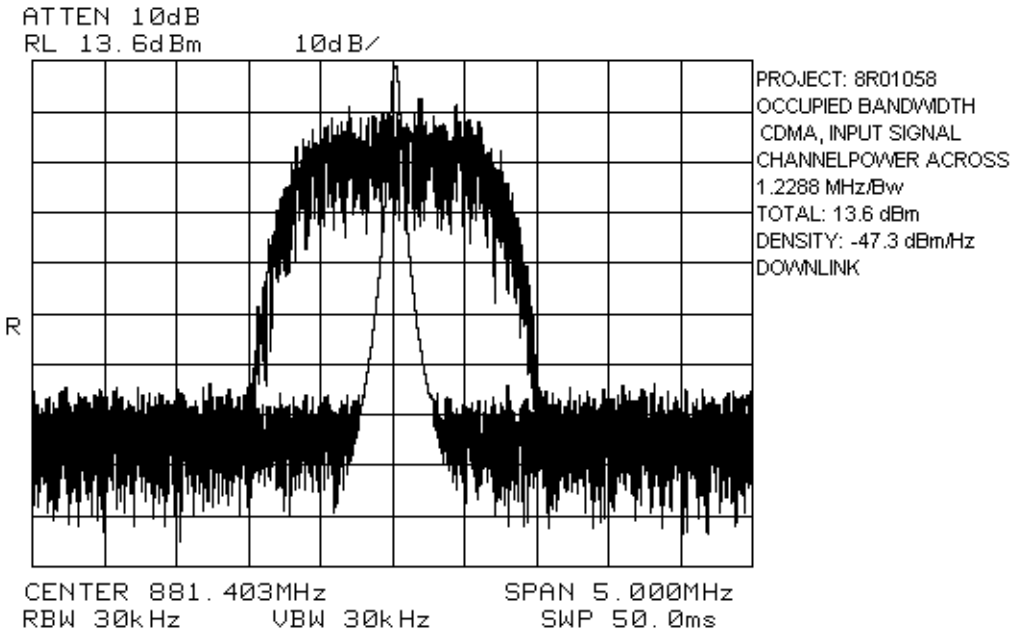

ATTEN 10dB
RL 13.5dBm
10dB/
CELLFID
PROJECT; 8R01058
OCCUPIED BANDWIDTH
ST, INPUT SIGNAL
OUTPUT: 15.5 dBm
DOWNLINK
R
CENTER 881.3603MHz
SPAN 200.0kHz
*RBW 300Hz
VBW 300Hz
SWP 5.60sec

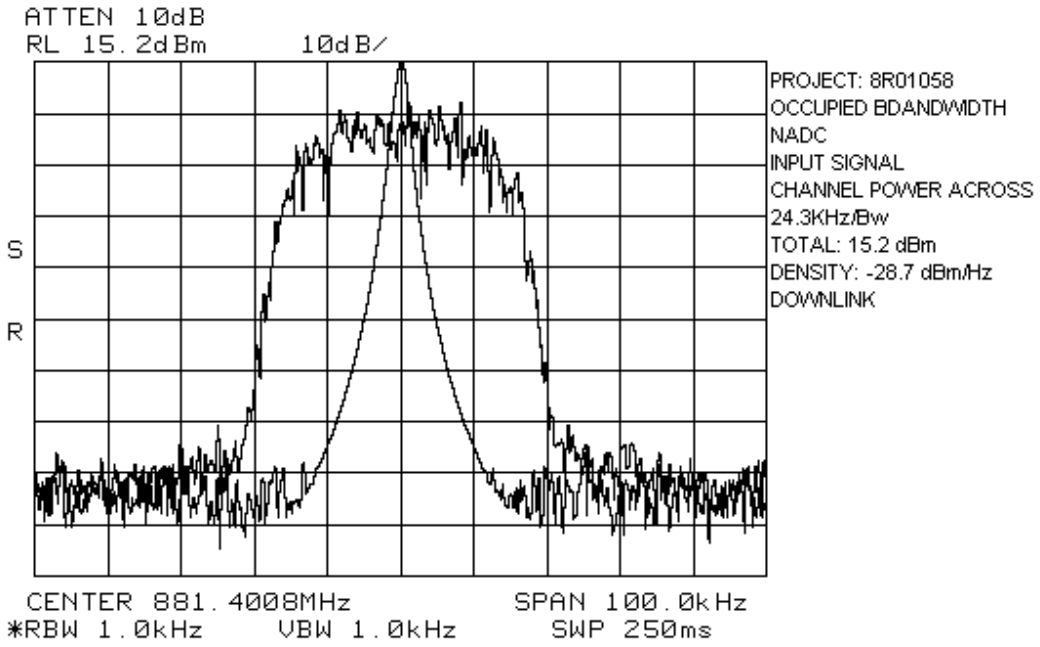
NAME OF TEST: Occupied Bandwidth (Digital Mod.)	PARA. NO.: 2.917(e)
TESTED BY: Kevin Carr	DATE: November 26, 1998

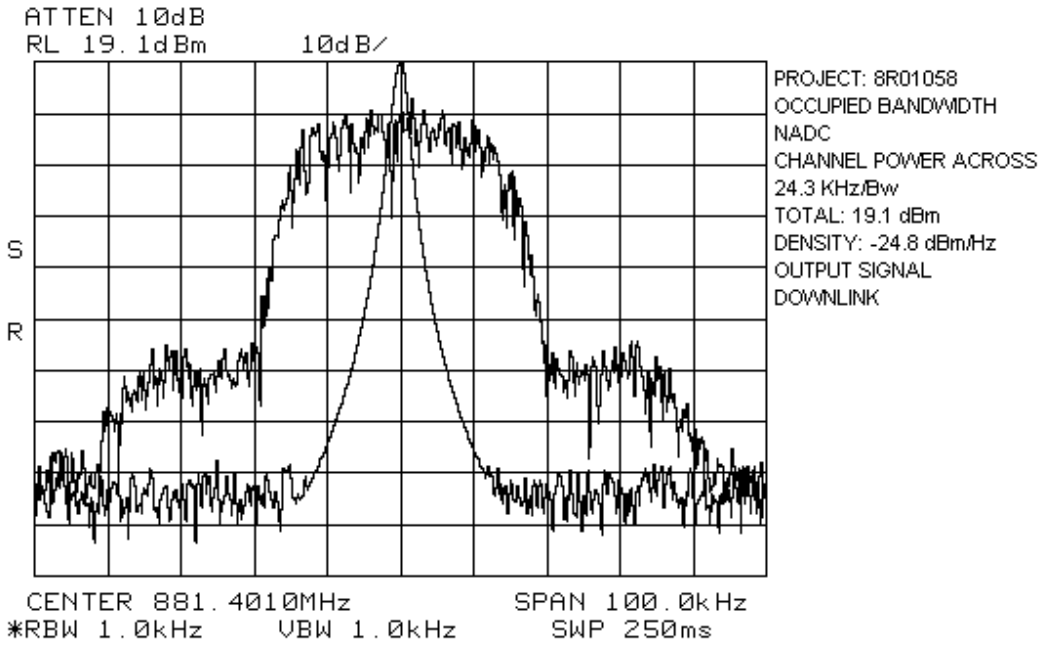
Test Results: Complies.

Test Data: See attached graph(s).


ATTEN 10dB
RL 20.3dBm
10dB/
S
R
PROJECT: 8R01058
CDMA, OUTPUT SIGNAL
OCCUPIED BANDWIDTH
CHANNEL POWER ACROSS
1.2288 MHz/Bw
TOTAL: 20.3 dBm
DENSITY: -40.6 dBm/Hz
DOWNLINK
CENTER 881.403MHz
SPAN 5.000MHz
*RBW 30kHz
VBW 30kHz
SWP 50.0ms


ATTEN 10dB
RL 13.6dBm
10dB/
R
PROJECT: 8R01058
OCCUPIED BANDWIDTH
CDMA, INPUT SIGNAL
CHANNELPOWER ACROSS
1.2288 MHz/Bw
TOTAL: 13.6 dBm
DENSITY: -47.3 dBm/Hz
DOWNLINK
CENTER 881.403MHz
SPAN 5.000MHz
RBW 30kHz
VBW 30kHz
SWP 50.0ms


ATTEN 10dB
RL 15.2dBm
10dB/
S
R
PROJECT: 8R01058
OCCUPIED BDANDWIDTH
NADC
INPUT SIGNAL
CHANNEL POWER ACROSS
24.3KHz/Bw
TOTAL: 15.2 dBm
DENSITY: -28.7 dBm/Hz
DOWNLINK
CENTER 881.4008MHz
SPAN 100.0kHz
*RBW 1.0kHz
VBW 1.0kHz
SWP 250ms


ATTEN 10dB
RL 19.1dBm
10dB/
S
R
PROJECT: 8R01058
OCCUPIED BANDWIDTH
NADC
CHANNEL POWER ACROSS
24.3 KHz/Bw
TOTAL: 19.1 dBm
DENSITY: -24.8 dBm/Hz
OUTPUT SIGNAL
DOWNLINK
CENTER 881.4010MHz
SPAN 100.0kHz
*RBW 1.0kHz
VBW 1.0kHz
SWP 250ms

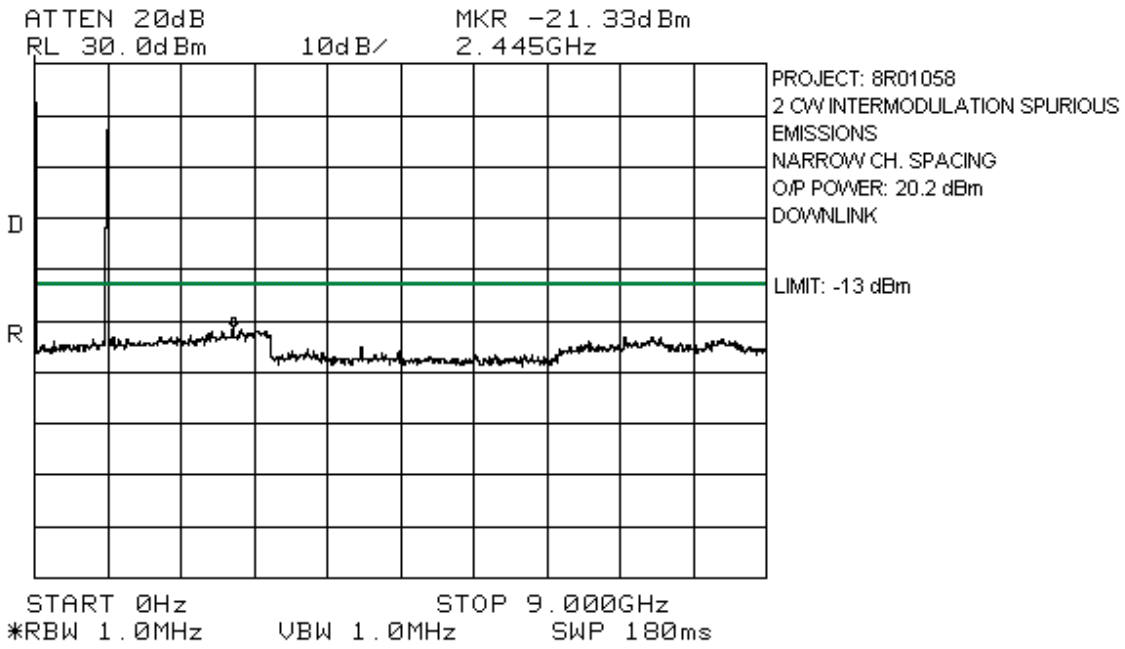
Section 5. Spurious Emissions at Antenna Terminals

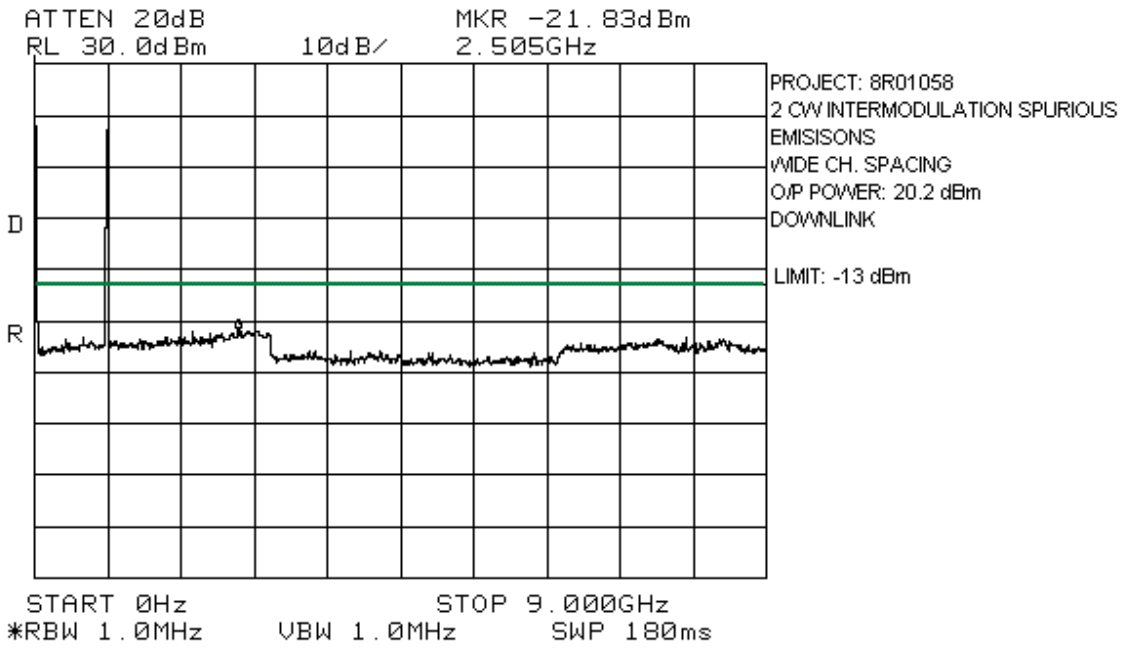
NAME OF TEST: Spurious Emissions @ Antenna Terminals	PARA. NO.: 2.917(e)
TESTED BY: Kevin Carr	DATE: November 26, 1998

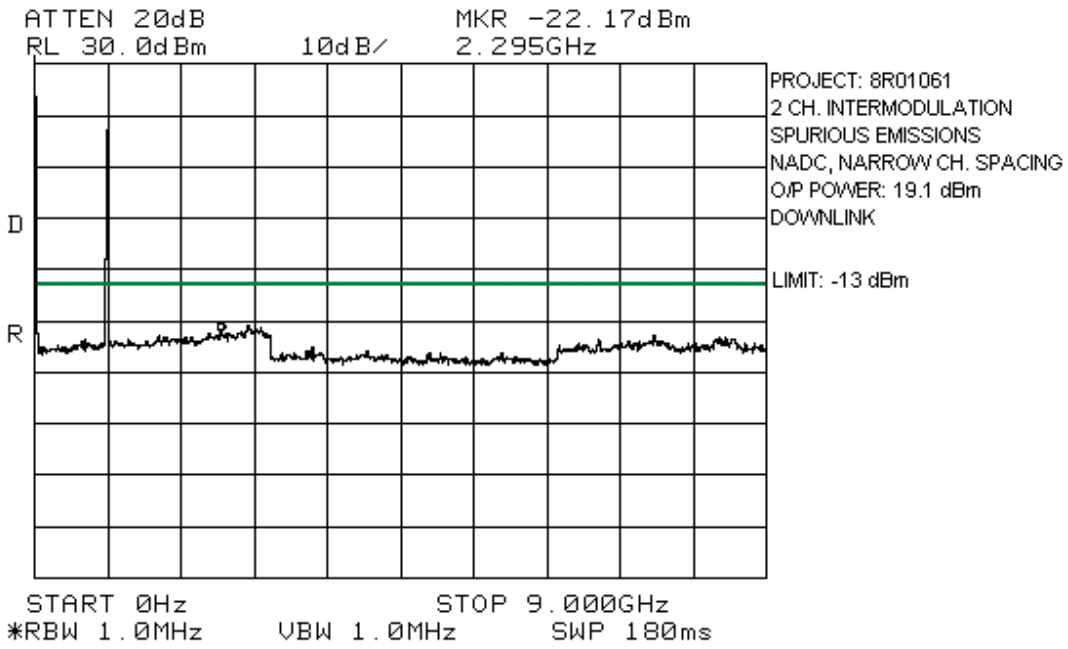
Test Results: Complies.

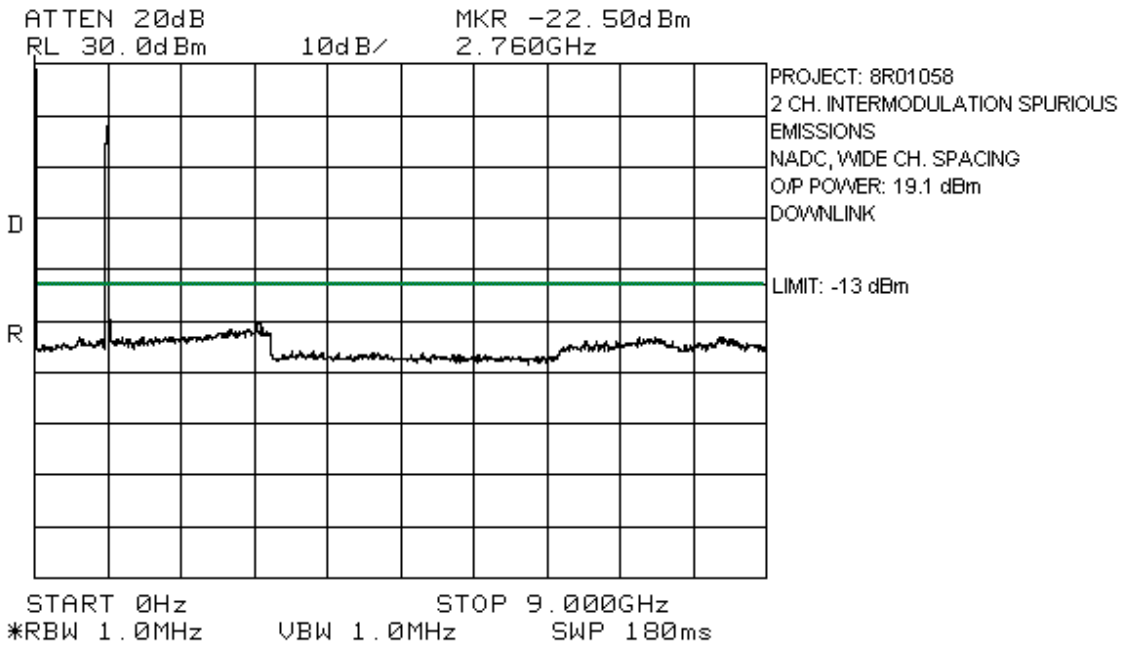
Test Data:

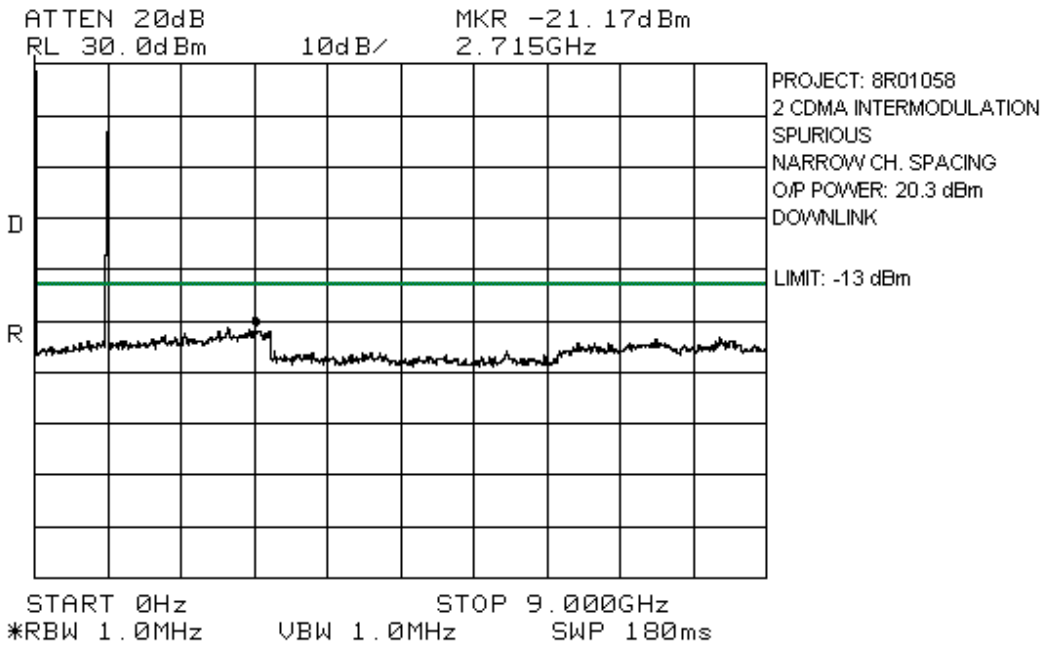
NAME OF TEST	WORST-CASE SPURIOUS LEVEL(dBm)
0 to 10 GHz spurious (Downlink)	-21.17
3 - signal intermodulation (Downlink)	-13.17
Lower band edge spurious (Downlink)	-15.70
Upper band edge spurious (Downlink)	-14.20

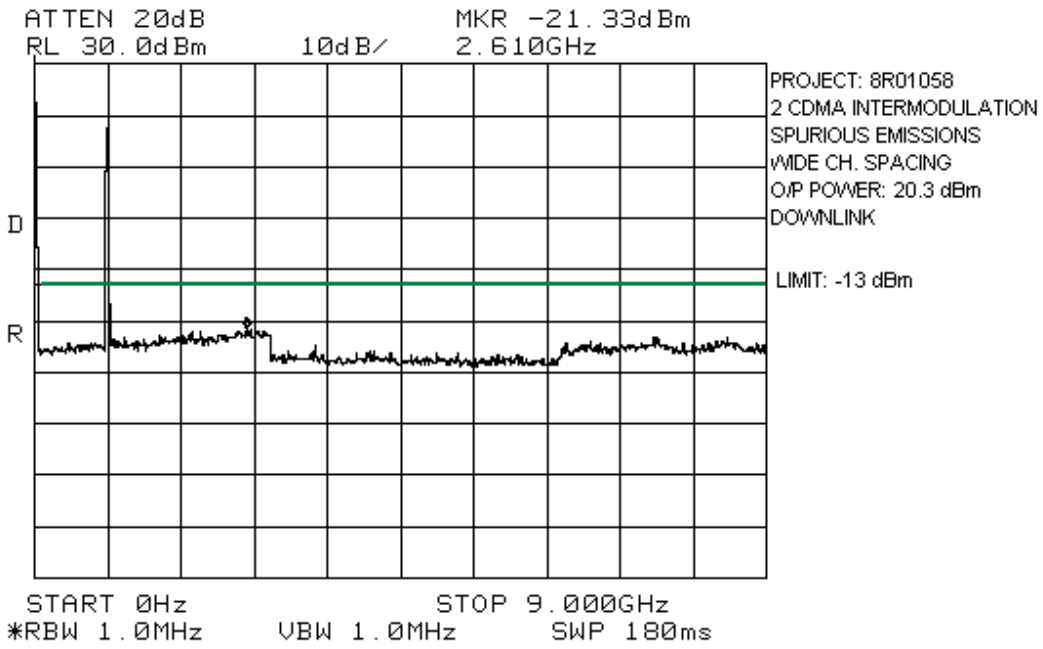

ATTEN 20dB
RL 30.0dBm
10dB/
MKR -21.33dBm
2.445GHz
D
R
PROJECT: 8R01058
2 C/W INTERMODULATION SPURIOUS EMISSIONS
NARROW CH. SPACING
O/P POWER: 20.2 dBm
DOWNLINK
LIMIT: -13 dBm
START 0Hz
STOP 9.000GHz
*RBW 1.0MHz
VBW 1.0MHz
SWP 180ms

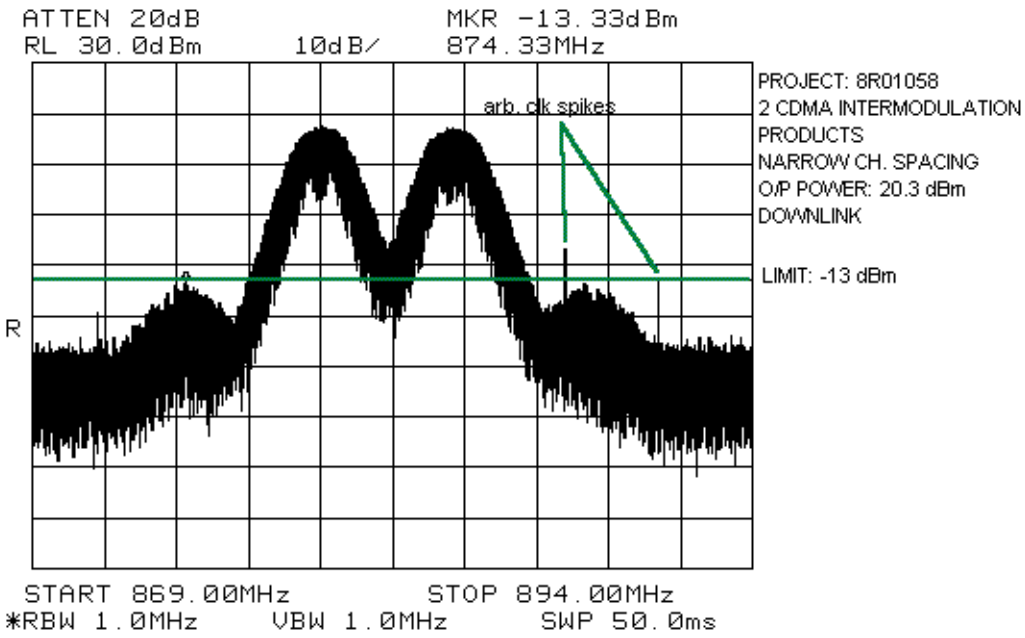

ATTEN 20dB
RL 30.0dBm
10dB/
MKR -21.83dBm
2.505GHz
D
R
PROJECT: 8R01058
2 CW INTERMODULATION SPURIOUS EMISISONS
WIDE CH. SPACING
O/P POWER: 20.2 dBm
DOWNLINK
LIMIT: -13 dBm
START 0Hz
STOP 9.000GHz
*RBW 1.0MHz
VBW 1.0MHz
SWP 180ms

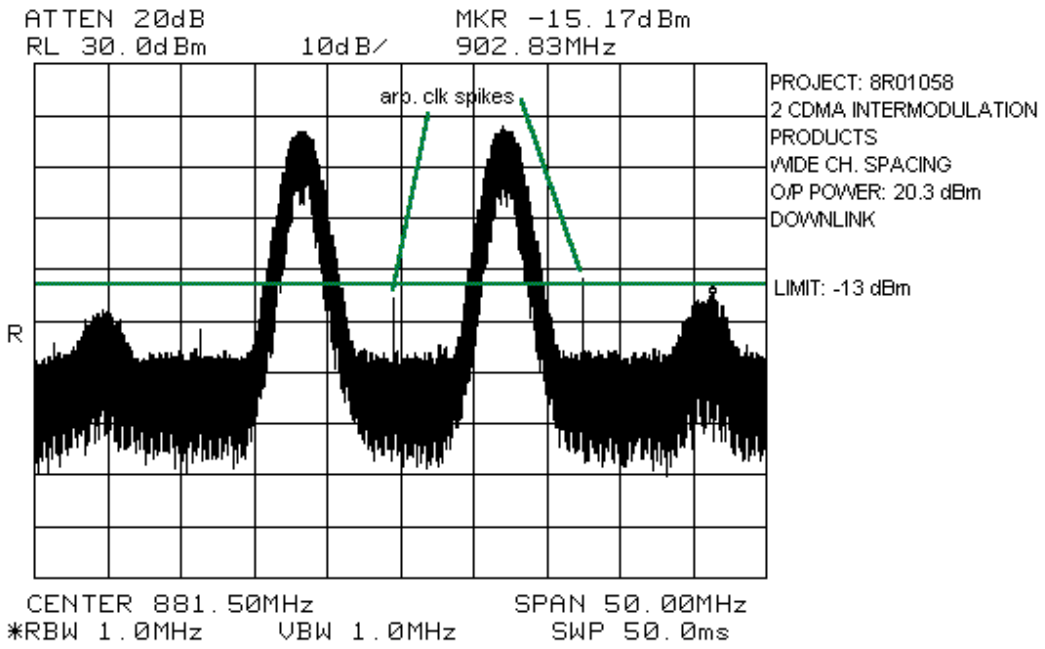

ATTEN 20dB
RL 30.0dBm
10dB/
MKR -22.17dBm
2.295GHz
PROJECT: 8R01061
2 CH. INTERMODULATION
SPURIOUS EMISSIONS
NADC, NARROW CH. SPACING
O/P POWER: 19.1 dBm
DOWNLINK
LIMIT: -13 dBm
D
R
START 0Hz
STOP 9.000GHz
*RBW 1.0MHz
VBW 1.0MHz
SWP 180ms

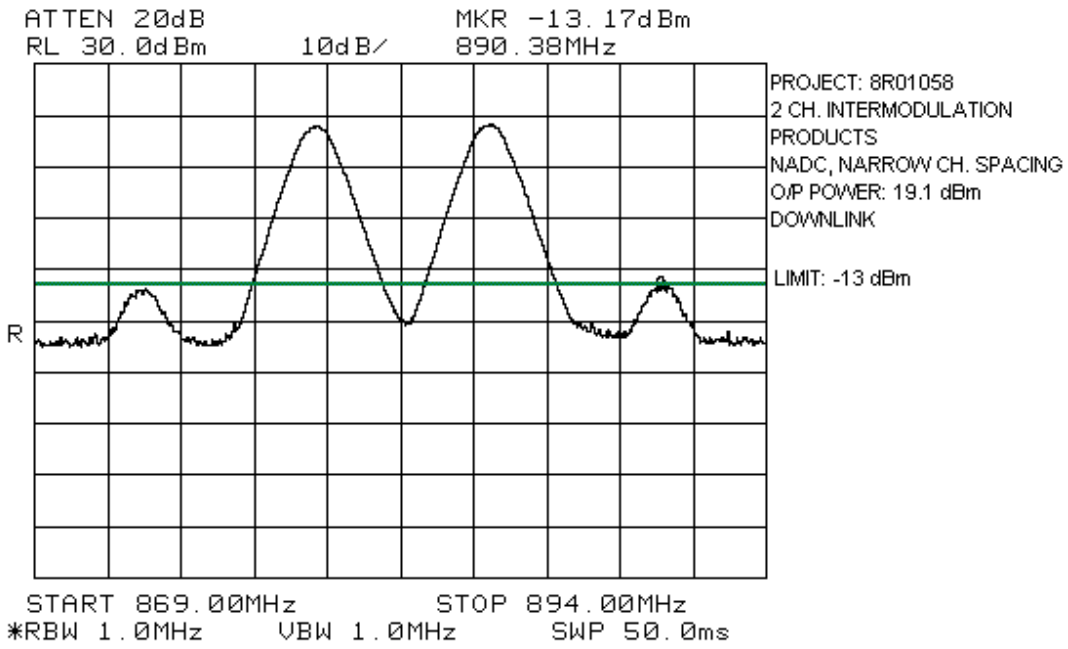

ATTEN 20dB
RL 30.0dBm
10dB/
MKR -22.50dBm
2.760GHz
PROJECT: 8R01058
2 CH. INTERMODULATION SPURIOUS EMISSIONS
NADC, WIDE CH. SPACING
O/P POWER: 19.1 dBm
DOWNLINK
LIMIT: -13 dBm
D
R
START 0Hz
STOP 9.000GHz
*RBW 1.0MHz
VBW 1.0MHz
SWP 180ms

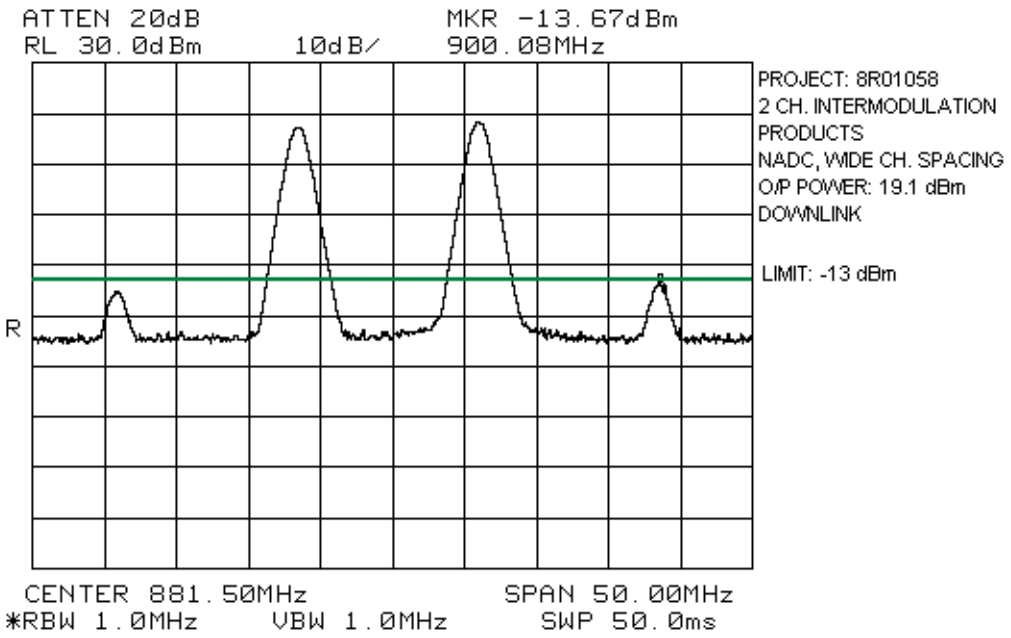

ATTEN 20dB
RL 30.0dBm
10dB/
MKR -21.17dBm
2.715GHz
D
R
PROJECT: 8R01058
2 CDMA INTERMODULATION
SPURIOUS
NARROW CH. SPACING
O/P POWER: 20.3 dBm
DOWNLINK
LIMIT: -13 dBm
START 0Hz
STOP 9.000GHz
*RBW 1.0MHz
VBW 1.0MHz
SWP 180ms

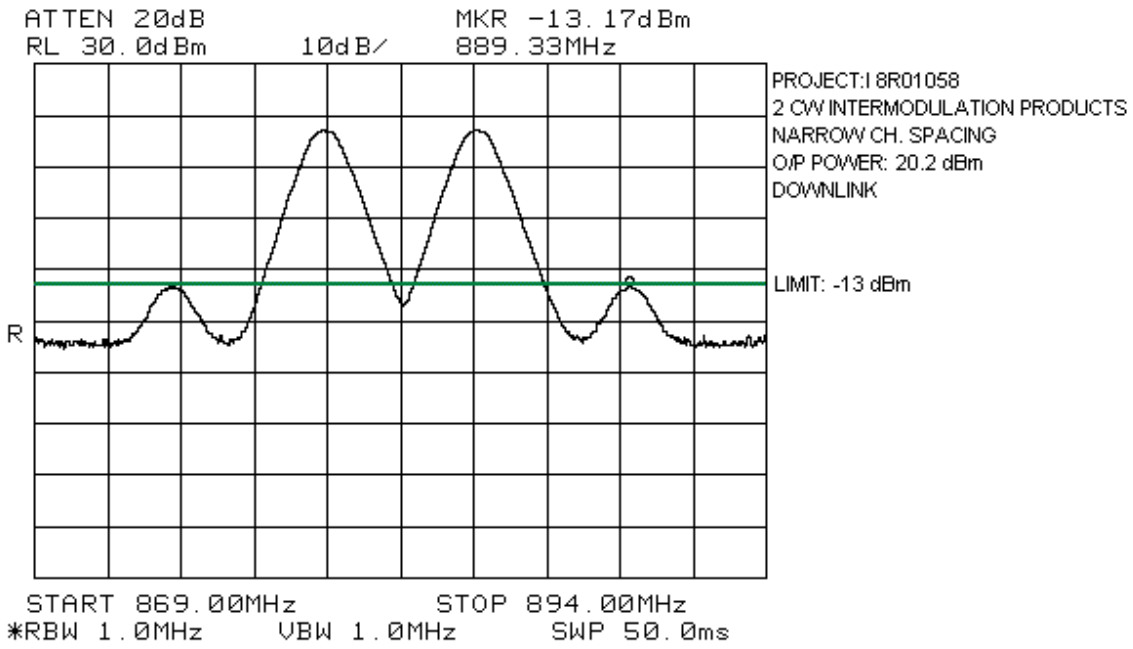

ATTEN 20dB
RL 30.0dBm
10dB/
MKR -21.33dBm
2.610GHz
PROJECT: 8R01058
2 CDMA INTERMODULATION
SPURIOUS EMISSIONS
WIDE CH. SPACING
O/P POWER: 20.3 dBm
DOWNLINK
LIMIT: -13 dBm
D
R
START 0Hz
STOP 9.000GHz
*RBW 1.0MHz
VBW 1.0MHz
SWP 180ms

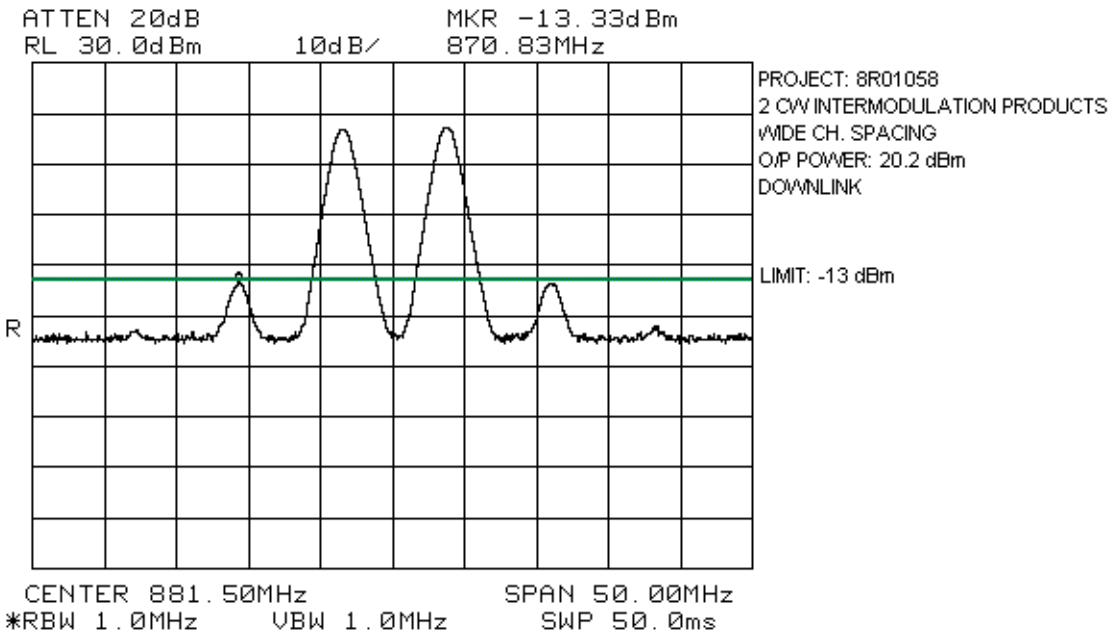

ATTEN 20dB
RL 30.0dBm
10dB/
MKR -13.33dBm
874.33MHz
arb. clk spikes
PROJECT: 8R01058
2 CDMA INTERMODULATION
PRODUCTS
NARROW CH. SPACING
O/P POWER: 20.3 dBm
DOWNLINK
LIMIT: -13 dBm
R
START 869.00MHz
STOP 894.00MHz
*RBW 1.0MHz
VBW 1.0MHz
SWP 50.0ms

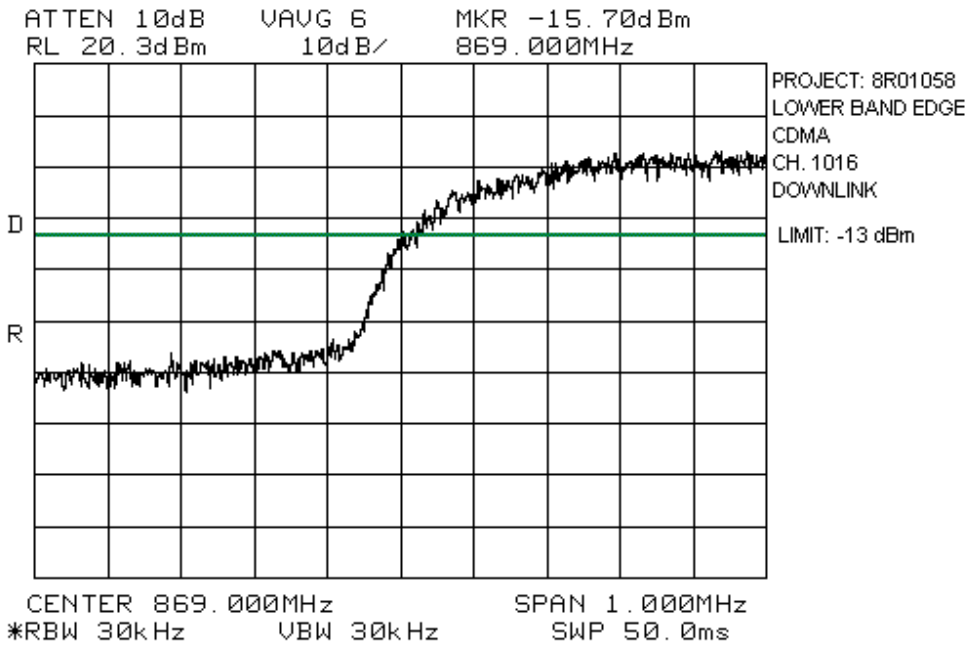

ATTEN 20dB
RL 30.0dBm
10dB/
MKR -15.17dBm
902.83MHz
arb. clk spikes
PROJECT: 8R01058
2 CDMA INTERMODULATION
PRODUCTS
WIDE CH. SPACING
O/P POWER: 20.3 dBm
DOWNLINK
LIMIT: -13 dBm
R
CENTER 881.50MHz
SPAN 50.00MHz
*RBW 1.0MHz
VBW 1.0MHz
SWP 50.0ms

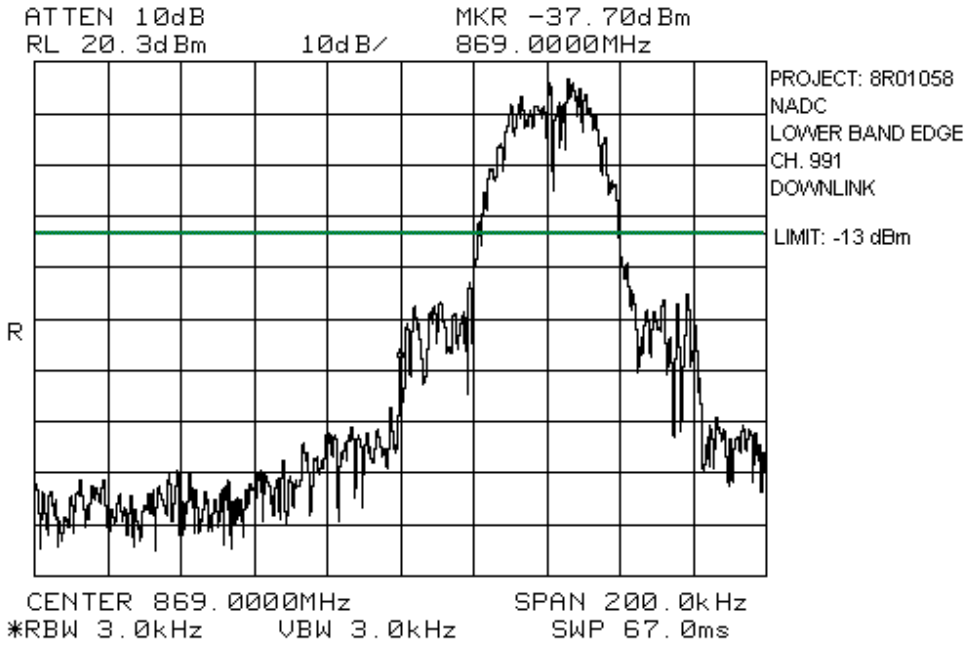

ATTEN 20dB
RL 30.0dBm
10dB/
MKR -13.17dBm
890.38MHz
PROJECT: 8R01058
2 CH. INTERMODULATION
PRODUCTS
NADC, NARROW CH. SPACING
O/P POWER: 19.1 dBm
DOWNLINK
LIMIT: -13 dBm
R
START 869.00MHz
STOP 894.00MHz
*RBW 1.0MHz
VBW 1.0MHz
SWP 50.0ms

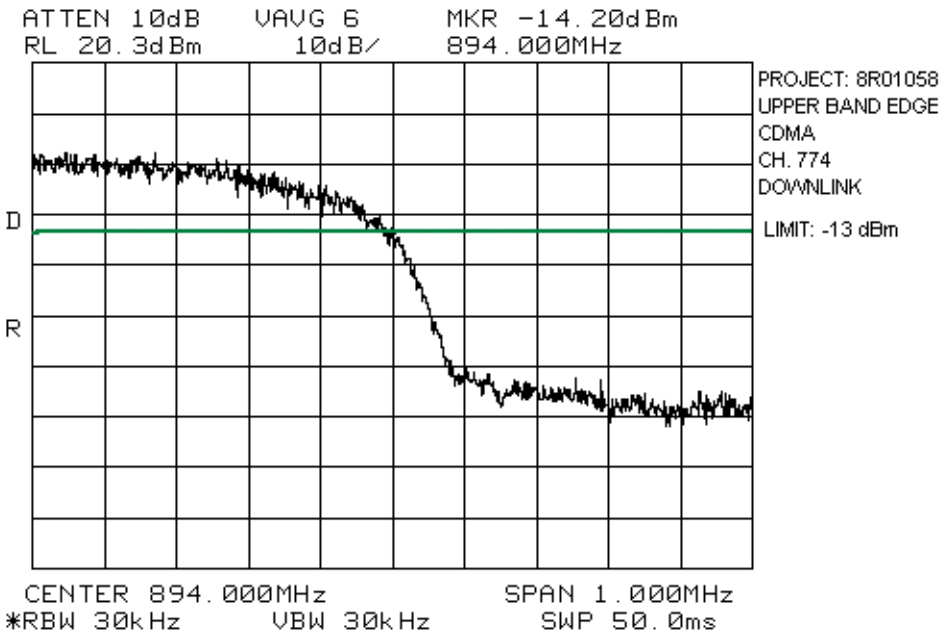

ATTEN 20dB
RL 30.0dBm
10dB/
MKR -13.67dBm
900.08MHz
PROJECT: 8R01058
2 CH. INTERMODULATION
PRODUCTS
NADC, WIDE CH. SPACING
O/P POWER: 19.1 dBm
DOWNLINK
LIMIT: -13 dBm
R
CENTER 881.50MHz
SPAN 50.00MHz
*RBW 1.0MHz
VBW 1.0MHz
SWP 50.0ms

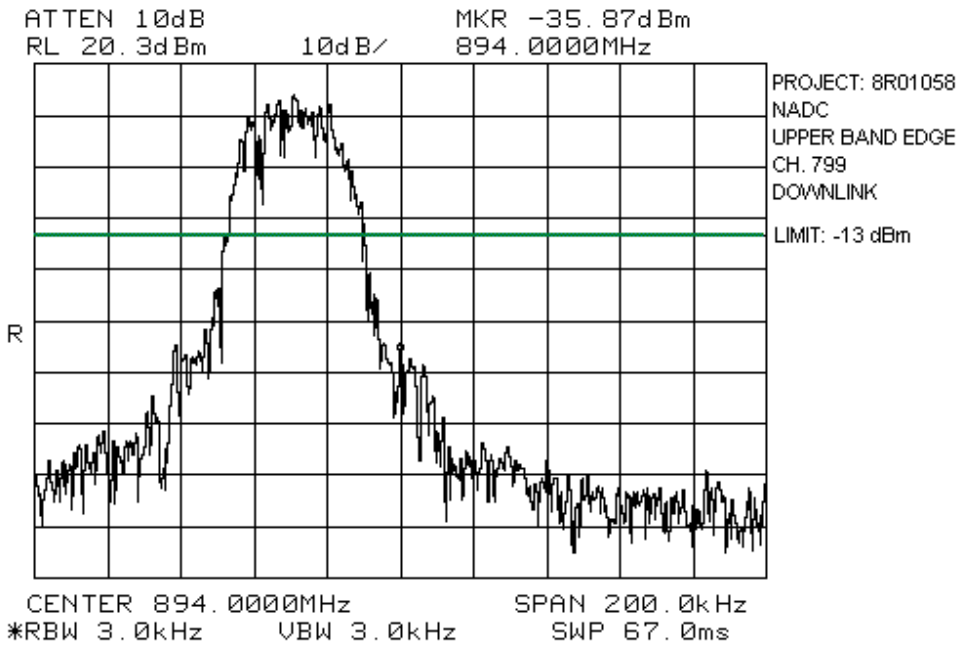

ATTEN 20dB
RL 30.0dBm
10dB/
MKR -13.17dBm
889.33MHz
PROJECT:I 8R01058
2 CW INTERMODULATION PRODUCTS
NARROW CH. SPACING
O/P POWER: 20.2 dBm
DOWNLINK
LIMIT: -13 dBm
R
START 869.00MHz
STOP 894.00MHz
*RBW 1.0MHz
VBW 1.0MHz
SWP 50.0ms


ATTEN 20dB
RL 30.0dBm
10dB/
MKR -13.33dBm
870.83MHz
PROJECT: 8R01058
2 C/W INTERMODULATION PRODUCTS
WIDE CH. SPACING
O/P POWER: 20.2 dBm
DOWNLINK
LIMIT: -13 dBm
R
CENTER 881.50MHz
SPAN 50.00MHz
*RBW 1.0MHz
VBW 1.0MHz
SWP 50.0ms


ATTEN 10dB
RL 20.3dBm
VAVG 6
10dB/
MKR -15.70dBm
869.000MHz
PROJECT: 8R01058
LOWER BAND EDGE
CDMA
CH. 1016
DOWNLINK
D
LIMIT: -13 dBm
R
CENTER 869.000MHz
SPAN 1.000MHz
*RBW 30kHz
VBW 30kHz
SWP 50.0ms


ATTEN 10dB
RL 20.3dBm
10dB/
MKR -37.70dBm
869.0000MHz
PROJECT: 8R01058
NADC
LOWER BAND EDGE
CH. 991
DOWNLINK
LIMIT: -13 dBm
R
CENTER 869.0000MHz
SPAN 200.0kHz
*RBW 3.0kHz
VBW 3.0kHz
SWP 67.0ms


ATTEN 10dB
RL 20.3dBm
VAVG 6
10dB/
MKR -14.20dBm
894.000MHz
PROJECT: 8R01058
UPPER BAND EDGE
CDMA
CH. 774
DOWNLINK
LIMIT: -13 dBm
D
R
CENTER 894.000MHz
SPAN 1.000MHz
*RBW 30kHz
VBW 30kHz
SWP 50.0ms


ATTEN 10dB
RL 20.3dBm
10dB/
MKR -35.87dBm
894.0000MHz
PROJECT: 8R01058
NADC
UPPER BAND EDGE
CH. 799
DOWNLINK
LIMIT: -13 dBm
R
CENTER 894.0000MHz
SPAN 200.0kHz
*RBW 3.0kHz
VBW 3.0kHz
SWP 67.0ms

Section 6. Field Strength of Spurious

NAME OF TEST: Field Strength of Spurious	PARA. NO.: 2.917(e)
TESTED BY: Kevin Carr	DATE: November 26, 1998

Test Results: Complies.
The maximum field strength is 50.2 dBµV/m @ 7920 & 8800 MHz @ 3m.

Test Data:

Test Data - Radiated Emissions - Downlink

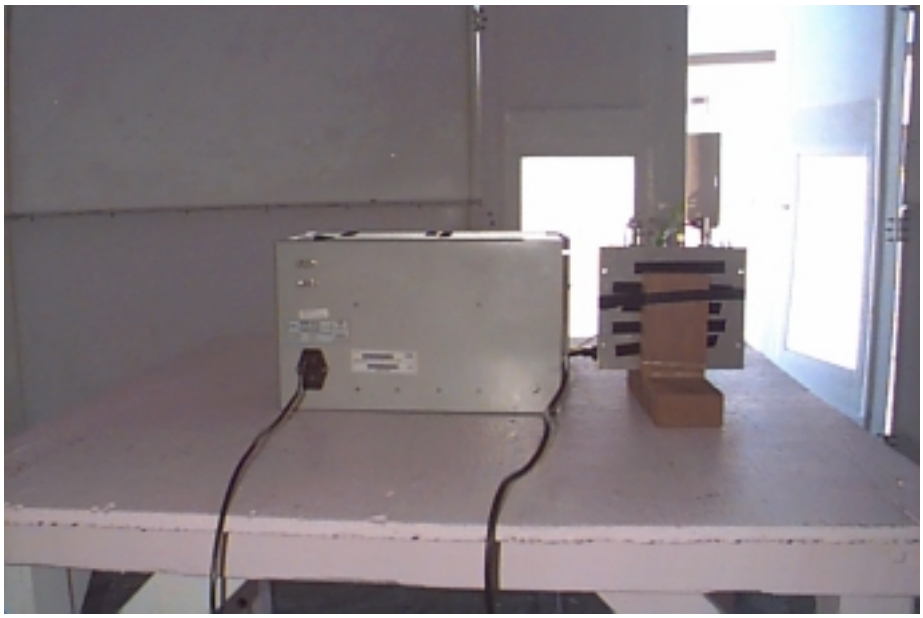
Test Distance (meters) : 3		Range: A Tower		Receiver: HP8566B		RBW(1 MHz): 1 MHz		Detector: PEAK			
Freq. (MHz)	Ant. *	Pol. (V/H)	Ant. HGT. (m)	Table (deg.)	RCVD Signal (dBµV/m)	Ant. Factor (dB)**	Amp. Gain (dB)***	Dist. Corr. (dB)	Field Strength (dBµV/m)	Limit (dBµV/m)	Margin (dB)
1760.0	Hrn2	V			51.5	29.8	-43.1		38.2	82.3	44.1
1760.0	Hrn2	H			53.6	29.8	-43.1		40.3	82.3	42.0
2640.0	Hrn2	V			49.5	31.6	-45.5		35.6	82.3	46.7
2640.0	Hrn2	H			50.3	31.6	-45.5		36.4	82.3	45.9
3520.0	Hrn2	V			44.2	35.3	-42.2		37.3	82.3	45.0
3520.0	Hrn2	H			43.1	35.3	-42.2		36.2	82.3	46.1
4400.0	Hrn2	V			47.0	37.0	-43.2		40.8	82.3	41.5
4400.0	Hrn2	H			48.2	37.0	-43.2		42.0	82.3	40.3
5280.0	Hrn2	V			46.8	39.7	-44.0		42.5	82.3	39.8
5280.0	Hrn2	H			47.0	39.7	-44.0		42.7	82.3	39.6
6160.0	Hrn2	V			46.1	42.5	-40.8		47.8	82.3	34.5
6160.0	Hrn2	H			46.3	42.5	-40.8		48.0	82.3	34.3
7040.0	Hrn2	V			44.6	44.1	-42.6		46.1	82.3	36.2
7040.0	Hrn2	H			45.0	44.1	-42.6		46.5	82.3	35.8
7920.0	Hrn2	V			44.8	45.8	-40.6		50.0	82.3	32.3
7920.0	Hrn2	H			45.0	45.8	-40.6		50.2	82.3	32.1
8800.0	Hrn2	V			43.4	49.9	-43.1		50.2	82.3	32.1
8800.0	Hrn2	H			43.0	49.9	-43.1		49.8	82.3	32.5

Notes:
The spectrum was search up to the 10th harmonic of the fundamental frequency.
B/C = Biconical, B/L = Biconilog, L/P = Log-Periodic, H = Horn, D/P = Dipole
* Includes cable loss when amplifier is not used.
** Includes cable loss.
( ) Denotes failing emission level.

Photographs of Test Setup

Front View

Rear View



Section 7. Frequency Stability

NAME OF TEST: Frequency Stability	PARA. NO.: 22.355
TESTED BY:	DATE:

Test Results: Complies/Does Not Comply.

Measurement Data: Standard Test Frequency: _____ MHz
Standard Test Voltage: _____ Vdc

NOT APPLICABLE

Section 8. Test Equipment List

CAL CYCLE	EQUIPMENT	MANUFACTURER	MODEL	SERIAL	LAST CAL.	NEXT CAL.	
1 Year	Spectrum Analyzer	Hewlett Packard	8565E	FA000981	May 20/98	May 20/99	
1 Year	Spectrum Analyzer-**2**	Hewlett Packard	8566B	1950A00400	July 22/98	July 22/99	
1 Year	Spectrum Analyzer Display-**2**	Hewlett Packard	85662A	1950A01177	July 22/98	July 22/99	
1 Year	Quasi Peak Adaptor-**2**	Hewlett Packard	85650A	2251A00620	July 22/98	July 22/99	
	Power Supply	Astron	VS-50M	8405071	NCR	NCR	
1 Year	Attenuator	Narda	768-20	9507	July 24/98	July 24/99	
1 Year	Attenuator	Narda	765-20	9510	July 24/98	July 24/99	
1 Year	RF Millivoltmeter	Rohde & Schwarz	URV5	FA000420	July 23/98	July 23/99	
1 Year	Insertion Unit	Rohde & Schwarz	URV5-Z4	FA000905	July 23/98	July 23/99	
2 Year	Horn Antenna	EMCO #2	3115	4336	Oct. 30/97	Oct. 30/99	
1 Year	50 ohm Combiner Pad	Mini Circuits	ZA3PD-2	9746	July 23/98	July 23/99	
1 Year	Low Noise Amplifier	Avantek	AWT-8035	1005	Aug. 4/98	Aug. 4/99	
1 Year	Low Noise Amplifier	DBS Microwave	DWT-13035	9623	Aug. 4/98	Aug. 4/99	
1 Year	Signal Generator	Rohde & Schwarz	SM1Q03	1084-8004-03	July 23/98	July 23/99	
1 Year	Arbitrary Waveform Gen.	Sony/Tektronix	AWG2021	J310495	NCR	NCR	
3 Year	Standard Gain Horn	Electro-Metrics	SH-50/60-1	FA000479	July 29/97	July 29/00	
3 Year	RF Generator	Rohde & Schwarz	SME3	DE14439	June 29/96	June 29/99	
1 Year	RF Amp.	Comtest	GPA301	BCS320-1040	NCR	NCR	

NA: Not Applicable
NCR: No Cal Required

ANNEX A

TEST METHODOLOGIES

NAME OF TEST: RF Power Output	**PARA. NO.: 2.985**

Test Conditions: Standard Temperature & Humidity
Standard Test Voltage

Minimum Standard: Para. No. 22.913(a). The maximum effective radiated power (ERP) of base transmitters and cellular repeaters must not exceed 500 watts.

Method Of Measurement:

Detachable Antenna:
The peak power at antenna terminals is measured using an in-line peak power meter. Power output is measured with the maximum rated input level.

Integral Antenna:
If the antenna is not detachable from the circuit then the Peak Power Output is derived from the peak radiated field strength of the fundamental emission by using the plane wave relation $GP/4\pi R^2 = E^2/120\pi$ and proceeding as follows:

$$P = \frac{E^2 R^2}{30G} = \frac{E^2 3^2}{30G}$$

where,

P = the equivalent isotropic radiated power in watts
E = the maximum measured field strength in V/m
R = the measurement range (3 meters)
G = the numeric gain of the transmit antenna in relation to an isotropic radiator

NAME OF TEST: Occupied Bandwidth (Voice & SAT) PARA. NO.: 2.989

Test Conditions: Standard Temperature & Humidity
Standard Test Voltage

Minimum Standard: 22.917(c) The mean power of any emission removed from the carrier frequency by a displacement frequency (f_d in kHz) must be attenuated below the mean power of the unmodulated carrier (P) as follows:

(i) On any frequency removed from the carrier frequency by more than 12 kHz but not more than 20 kHz:

at least 117 log (f_d/12)

(ii) On any frequency removed from the carrier frequency by more than 20 kHz, up to the first multiple of the carrier frequency:

at least 100 log (f_d/11) dB or 43 + 10 log (P) dB, whichever is the lesser attenuation.

Method Of Measurement:

Spectrum Analyzer Settings:

RBW: 300 Hz
VBW: ≥ RBW
Span: 100 kHz
Sweep: Auto
Mask: CELLF3E

Input Signal Characteristics (F3E/F3D):

RF level: Maximum recommended by manufacturer
AF1 frequency: 6 kHz
AF1 level: sufficient to produce 2 kHz deviation
AF2 frequency: 2.5 kHz
AF2 level: sufficient to produce 12 kHz deviation.

NAME OF TEST: Occupied Bandwidth (WB Data) PARA. NO.: 2.989

Test Conditions: Standard Temperature & Humidity
Standard Test Voltage

Minimum Standard: 22.917(c) The mean power of any emission removed from the carrier frequency by a displacement frequency (f_d in kHz) must be attenuated below the mean power of the unmodulated carrier (P) as follows:

(1) On any frequency removed from the carrier frequency by more than 20 kHz but not more than 45 kHz:

at least 26 dB

(2) On any frequency removed from the carrier frequency by more than 45 kHz but not more than 90 kHz:

at least 45 dB

(3) On any frequency removed from the carrier frequency by more than 90 kHz, up to the first multiple of the carrier frequency:

at least 60 dB or 43 + 10 log (P) dB, whichever is the lesser attenuation.

Method Of Measurement:

Spectrum Analyzer Settings:
RBW: 300 Hz
VBW: ≥ RBW
Span: 200 kHz
Sweep: Auto
Mask: CELLF1D

Input Signal Characteristics:
RF level: Maximum recommended by manufacturer
AF1 frequency: 10 kHz, random bit sequence
AF1 level: sufficient to produce 8 kHz deviation

NAME OF TEST: Occupied Bandwidth (ST)	**PARA. NO.: 2.989**

Test Conditions: Standard Temperature & Humidity
Standard Test Voltage

Minimum Standard: 22.917(c) The mean power of any emission removed from the carrier frequency by a displacement frequency (f_d in kHz) must be attenuated below the mean power of the unmodulated carrier (P) as follows:

(1) On any frequency removed from the carrier frequency by more than 20 kHz but not more than 45 kHz:

at least 26 dB

(2) On any frequency removed from the carrier frequency by more than 45 kHz but not more than 90 kHz:

at least 45 dB

(3) On any frequency removed from the carrier frequency by more than 90 kHz, up to the first multiple of the carrier frequency:

at least 60 dB or 43 + 10 log (P) dB, whichever is the lesser attenuation.

Method Of Measurement:

Spectrum Analyzer Settings:
RBW: 300 Hz
VBW: ≥ RBW
Span: 200 kHz
Sweep: Auto
Mask: CELLF1D

Input Signal Characteristics:
RF level: Maximum recommended by manufacturer
AF1 frequency: 10 kHz tone
AF1 level: sufficient to produce 8 kHz deviation

NAME OF TEST: Occupied Bandwidth (Digital Modulation) PARA. NO.: 2.989

Test Conditions: Standard Temperature & Humidity
Standard Test Voltage

Minimum Standard: Not defined by FCC. Input vs. Output.

Method Of Measurement:

Spectrum Analyzer Settings:
RBW: CDMA (30 kHz), GSM (30 kHz), NADC (1 kHz) and CDPD (1 kHz)
VBW: ≥ RBW
Span: As required
Sweep: Auto
Mask:

Input Signal Characteristics:
RF level: Maximum recommended by manufacturer

NAME OF TEST: Spurious Emission at Antenna Terminals PARA. NO.: 2.991

Test Conditions: Standard Temperature & Humidity
Standard Test Voltage

Minimum Standard: Para. No. 22.917(e). The mean power of emissions must be attenuated below the mean power of the unmodulated carrier on any frequency twice or more than twice the fundamental emission by at least 43 + 10 log P. This is equivalent to -13 dBm absolute power.

Method Of Measurement:

Spectrum Analyzer Settings:
RBW: 30 kHz (AMPS). As required for digital modulations.
VBW: ≥ RBW
Start Frequency: 0 MHz
Stop Frequency: 10 GHz
Sweep: Auto

NAME OF TEST: Field Strength of Spurious Radiation	**PARA. NO.: 2.993**

Test Conditions: Outdoor Range
Standard Test Voltage

Minimum Standard: Para. No. 22.917(e). The mean power of emissions must be attenuated below the mean power of the unmodulated carrier on any frequency twice or more than twice the fundamental emission by at least 43 + 10 log P. This is equivalent to -13 dBm absolute power.

Calculation Of Field Strength Limit:

An example of attenuation requirement of 43 + 10 Log P is equivalent to -13 dBm (5×10^{-5} Watts) at the antenna terminal. We determine the field strength limit by using the plane wave relation.

$GP/4\pi R^2 = E^2/120\pi$

For emissions ≤ 1 GHz:

G = 1.64 (Dipole Gain)
P = 10^{-5} Watts (Maximum spurious output power)
R = 3m (Measurement Distance)

$$E = \frac{\sqrt{30GP}}{R}$$

$$\mathrm{E} = \frac{\sqrt{30 \times 1.64 \times 5 \times 10^{-5}}}{3} = 0.016533 \text{ V / m} = 84.4 \text{ dB}\mu\text{V / m}$$

For emissions > 1 GHz:

G = 1 (Isotropic Gain)
P = 1×10^{-5} Watts (Maximum spurious output power)
R = 3m (Measurement Distance)

$$E = 84.4 - 20Log\sqrt{1.64} = 82.3 dB\mu V \ / \ m@3m$$

The spectrum is searched to 10 GHz.

NAME OF TEST: Frequency Stability **PARA. NO.: 2.995**

Test Conditions: As per measurement data.

Minimum Standard: Para. No. 22.355. The transmitter carrier frequency shall remain within the tolerances given in Table C-1.

Freq. Range (MHz)	Base, fixed	Mobile > 3 W	Mobile ≤ 3 W
821 to 896	1.5	2.5	2.5

Table C-1

Method Of Measurement:

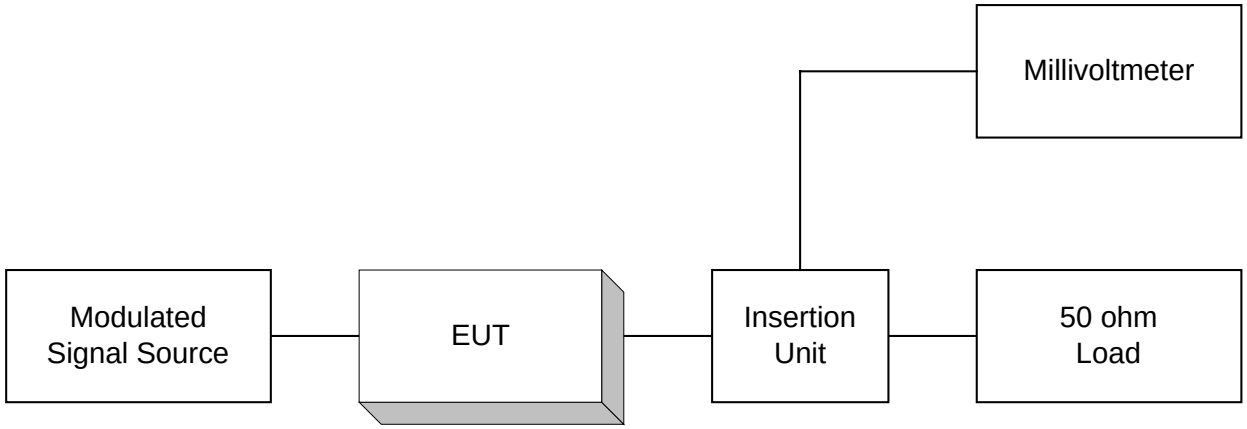
Frequency Stability With Voltage Variation:
The E.U.T. is placed in an environmental chamber and allowed to stabilize at +20 degrees Celsius for at least 15 minutes. The frequency counter and signal generator are phase locked with the same 10 MHz reference frequency by connecting the 10 MHz ref. out of the counter to the 10 MHz ref, in of the signal generator. With the voltage input to the E.U.T. set to 85% S.T.V., the frequency is measured in 30 second intervals for a period of 5 minutes. This procedure is repeated at 100% S.T.V. and 115% S.T.V.

Frequency Stability With Temperature Variation:
The input voltage to the E.U.T. is set to S.T.V. and the temperature of the environmental chamber is varied in 10 degree steps from -30 degrees C to +50 degrees C. The E.U.T. is allowed to stabilize at each temperature and the frequency is measured in 30 second intervals for a period of 5 minutes.

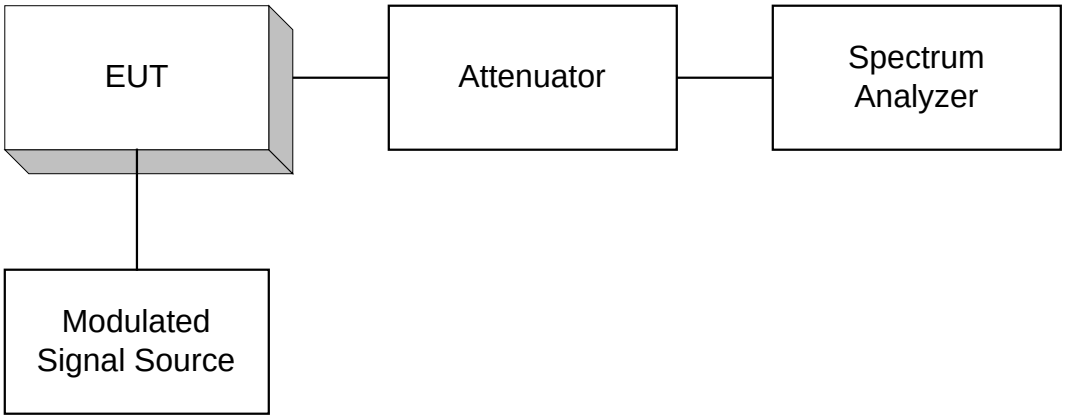
ANNEX B

TEST DIAGRAMS

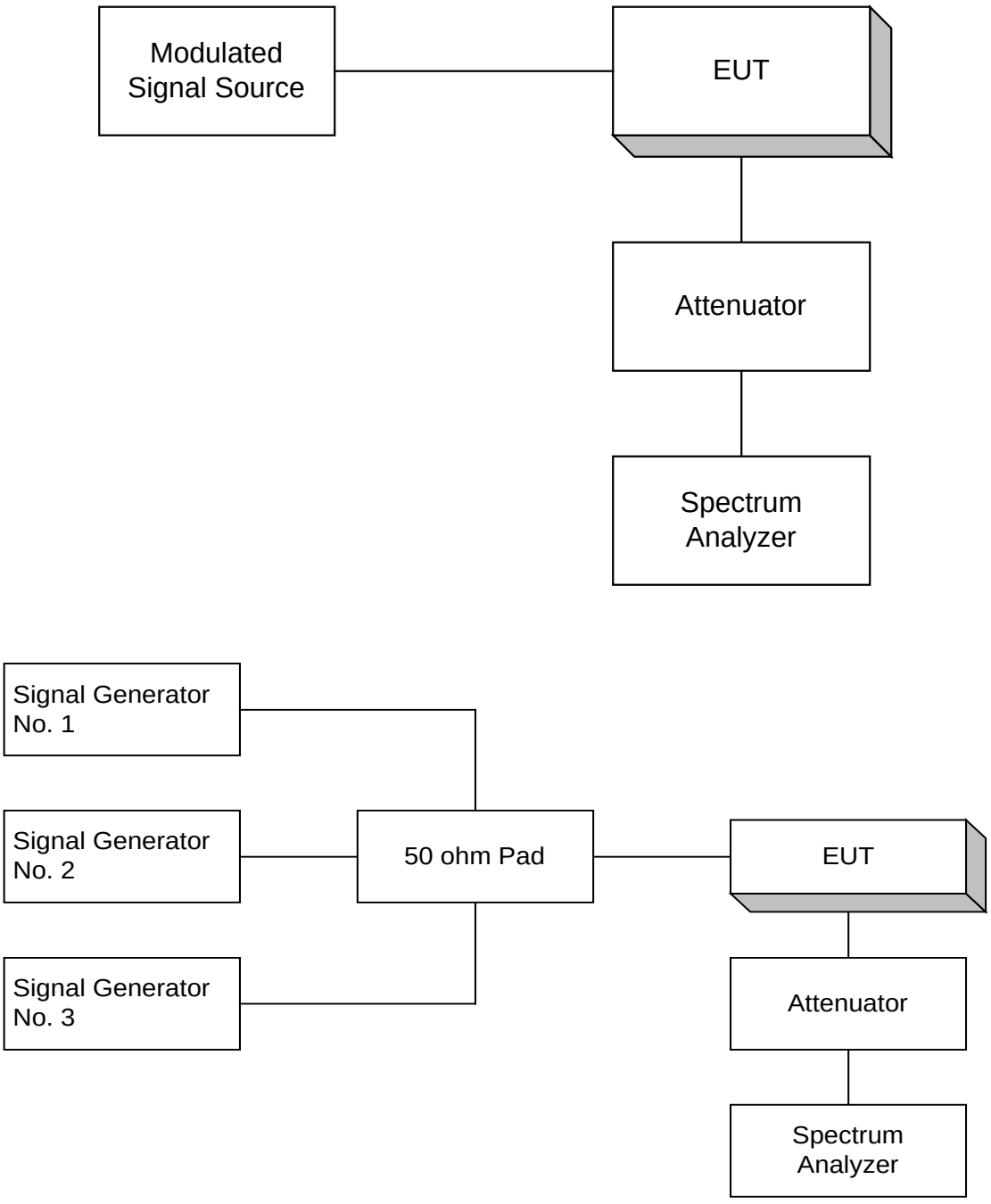
Para. No. 2.985 - R.F. Power Output



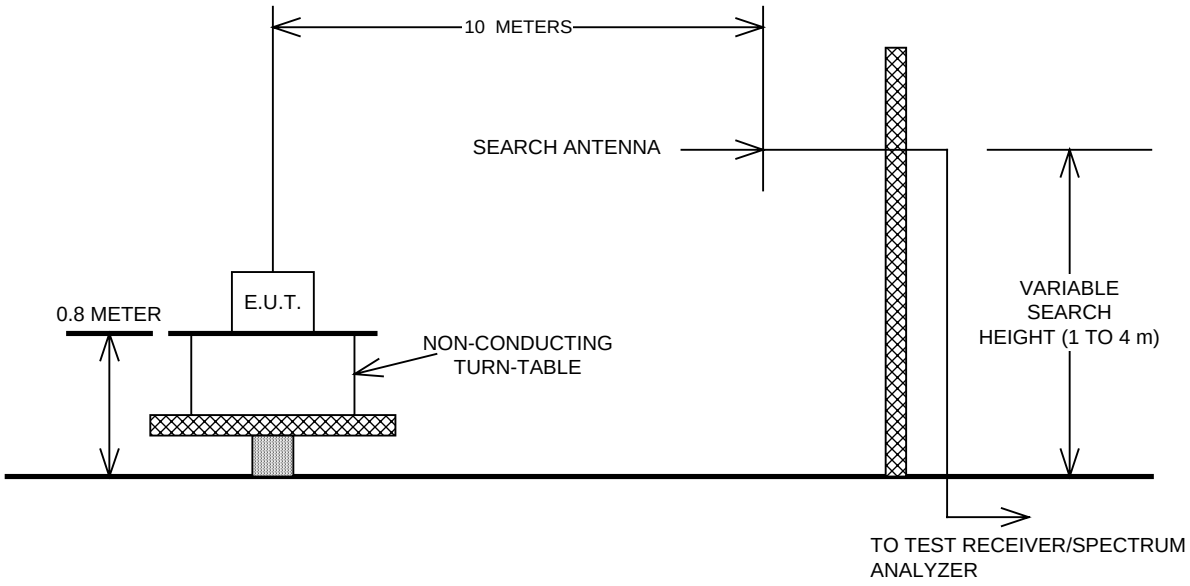
Para. No. 2.989 - Occupied Bandwidth



Para. No. 2.991 Spurious Emissions at Antenna Terminals



Para. No. 2.993 - Field Strength of Spurious Radiation



Para. No. 2.995 - Frequency Stability