Nemko Test Report:	2L0300RUS1
Applicant:	Hop-On Wireless, Inc. 12966 Euclid Street Garden Grove, CA 92840
FCC ID. No.	QHOHPN1600
Equipment Under Test: **(E.U.T.)**	Dundee Single Mode Cellular Telephone HPN1600
In Accordance With:	**FCC Part 22, Subpart H** 800 MHz Cellular Subscriber Units
Tested By:	Nemko Dallas Inc. 802 N. Kealy Lewisville, TX 75057-3136
Authorized By:	 Tom Tidwell, RF Group Manager
Date:	7/16/02
Total Number of Pages:	33

Table of Contents

Section 1. Summary of Test Results

Manufacturer: Holley Communications

Model No.: HPN1600

Serial No.: None

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

FCC Product Code: TNT

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.
See " Summary of Test Data".

Summary Of Test Data

NAME OF TEST	PARA. NO.	RESULT
RF Power Output	2.1046	Complies
Audio Frequency Response	2.1047	N/A
Audio Low Pass Filter Response	2.1047	N/A
Modulation Limiting	2.1047	N/A
Occupied Bandwidth (Voice & SAT)	2.1049	N/A
Occupied Bandwidth (WB Data & SAT)	2.1049	N/A
Occupied Bandwidth (CDMA)	2.1049	Complies
Spurious Emissions at Antenna Terminals	2.1051	Complies
Field Strength of Spurious Emissions	2.1053	Complies
Frequency Stability	2.1055	Complies

Footnotes:

This device does not support analog operation. CDMA modulation only.

.

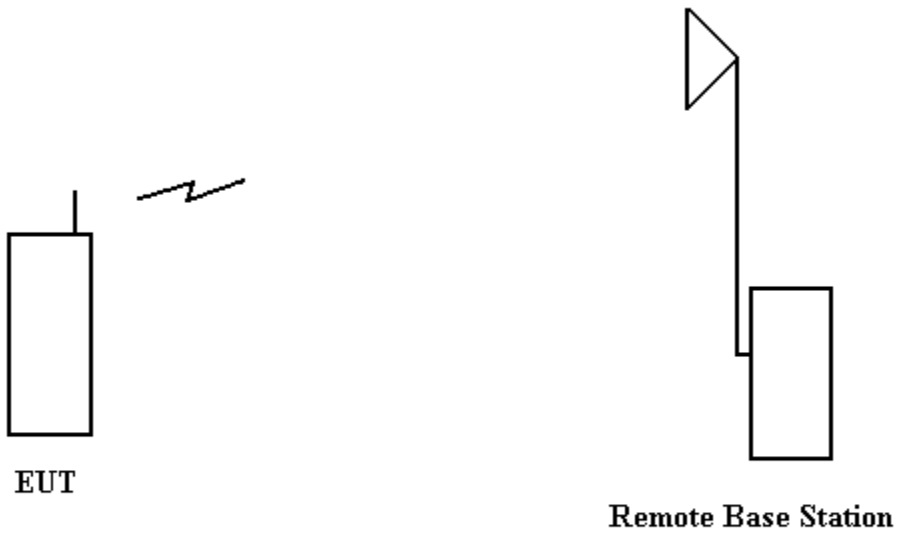
Section 2. General Equipment Specification

Frequency Range:	824.7 to 848.31 MHz
Necessary Bandwidth:	1.23 MHz
Type of Modulation and Designator:	CDMA 1M25G7W
Output Impedance:	50 ohms
RF Power Output (rated):	200 mW (23 dBm)
Duty Cycle:	Continuous
Channel Spacing:	30 kHz
Operator Selection of Frequency:	Frequency is controlled in a closed loop system between the BTS and the subscriber.
Power Output Adjustment Capability:	Power is controlled in a closed loop system between the BTS and the subscriber.
Power Supply:	4.2V Lithium-Ion

Operational Description

The device is a CDMA phone operating in the cellular band. The phone is not intended for use against the user's head. There is no microphone or speaker in the device.

System Diagram



Section 3. RF Power Output

NAME OF TEST: RF Power Output	PARA. NO.: 2.1046
TESTED BY: David Light	DATE: 6/20/2002

Test Results: Complies.

Measurement Data:

Antenna Conducted

Channel	Measured Output Power (dBm)	Measured Output Power (W)	Rated Power (dBm)
1013	23.1	.204	23.0
384	23.0	.200	23.0
777	23.1	.204	23.0

All power measurements were made at the antenna terminal test port. Power output was measured using the FSEK30 spectrum analyzer utilizing the channel power measurement with RMS detector.

ERP

Channel	Measured Effective Radiated Power (dBm)	Measured Effective Radiated Power (W)	Rated ERP (dBm)
383	25.6	.363	25.2

The rated gain of the integral antenna is 0 dBi (2.15 dBd).

Equipment Used: 1036-1629-1478-1471

Measurement Uncertainty: +/- 1.6 dB

Temperature: 24 °C

Relative Humidity: 45 %

Note – This unit was tested with a new battery.

Data Plot

RF Power Output

Page 1 of 3

Complete C

Job No.: 2L0300 Date: 6/20/2002 Preliminary:

Specification: PT 22 Temperature(°C): 24

Tested By: David Light Relative Humidity(%) 45

E.U.T.: CDMA CELL PHONE

Configuration: TX CDMA SIGNAL FULL POWER CONTROLLED BY SOFTWARE

Sample Number: 1

Location: Lab 1 RBW: 30 kHz Measurement

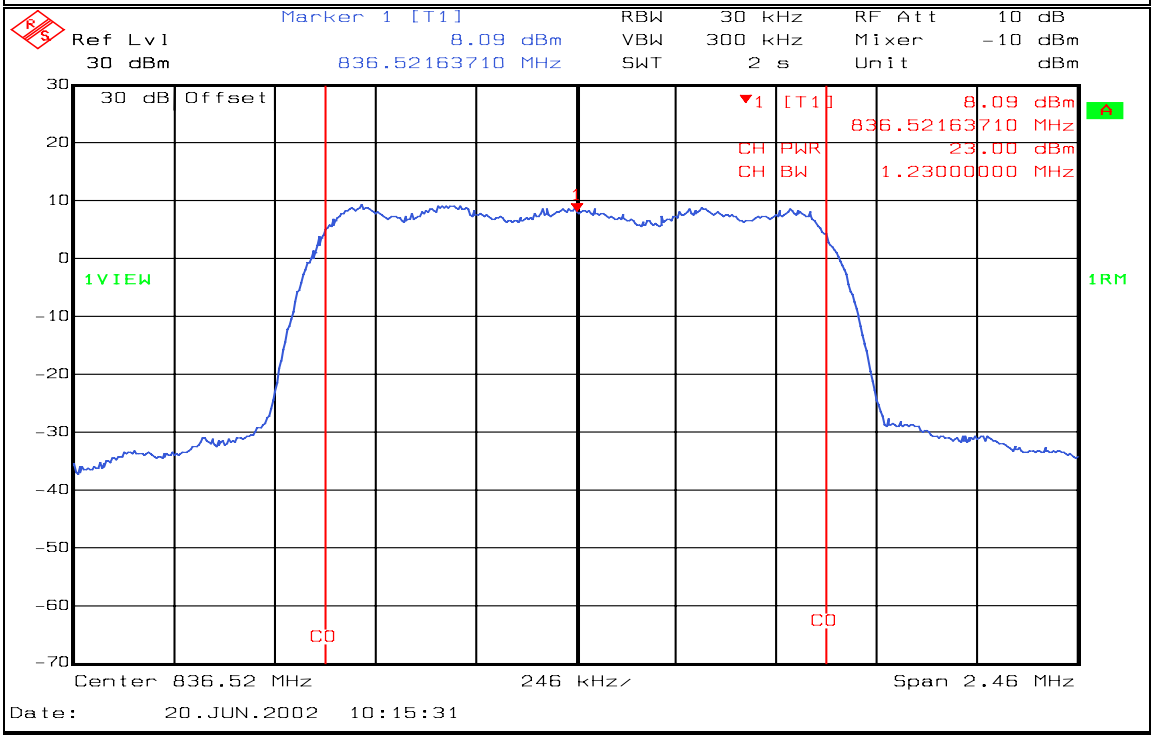
Detector Type: Rms VBW: 300 kHz Distance: NA m

Test Equipment Used

Antenna:		Directional Coupler:	
Pre-Amp:		Cable #1:	1629
Filter:		Cable #2:	
Receiver:	1036	Cable #3:	
Attenuator #1	1478	Cable #4:	
Attenuator #2:	1471	Mixer:	

Additional equipment used:

Measurement Uncertainty: +/-1.7 dB

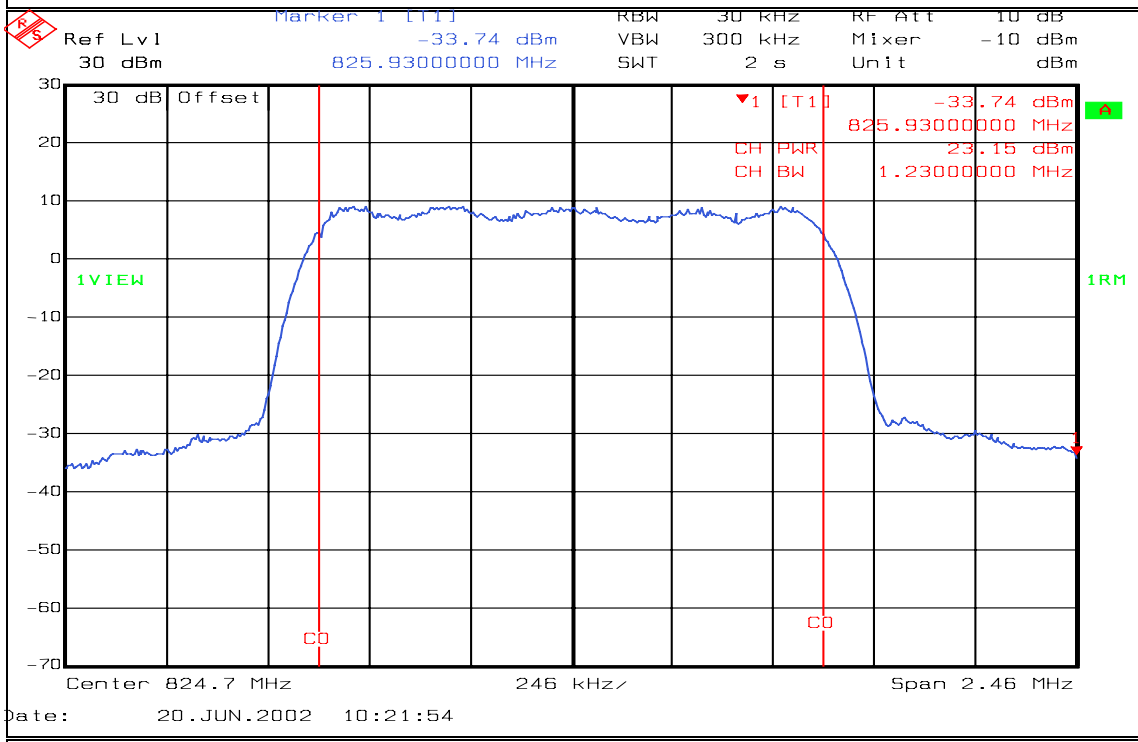


Notes: **Channel 384**

Data Plot **RF Power Output**

Page 2 of 3

Job No.:	2L0300	Date:	6/20/2002
Specification:	PT 22	Temperature(°C):	24
Tested By:	David Light	Relative Humidity(%)	45
E.U.T.:	CDMA CELL PHONE		
Configuration:	TX CDMA SIGNAL FULL POWER CONTROLLED BY SOFTWARE		

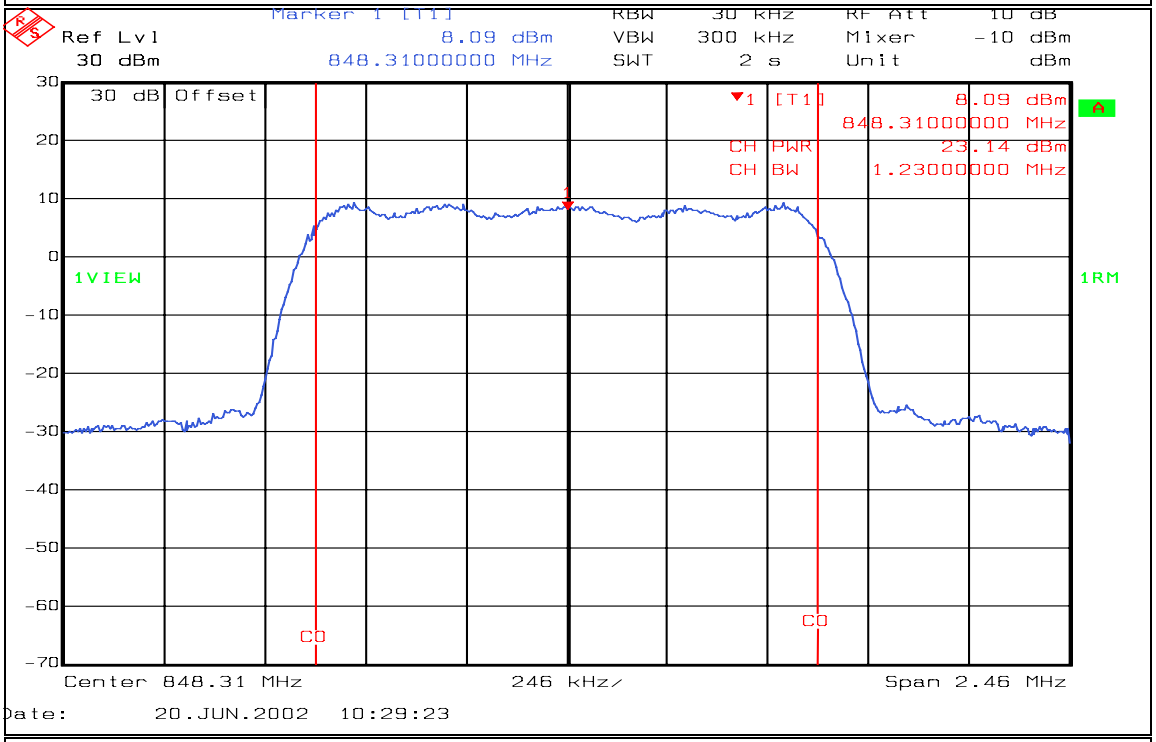


Notes: **Channel 1013**

Data Plot **RF Power Output**

Page 3 of 3

Job No.:	2L0300	Date:	6/20/2002
Specification:	PT 22	Temperature(°C):	24
Tested By:	David Light	Relative Humidity(%)	45
E.U.T.:	CDMA CELL PHONE		
Configuration:	TX CDMA SIGNAL FULL POWER CONTROLLED BY SOFTWARE		



Notes: **CHANNEL 777**

ERP Substitution Method

Page 1 of 1

Complete X
Preliminary

Job No.: 2L0300 Date: 6/20/2002
Specification: PT22 Temperature(°C): 22
Tested By: David Light Relative Humidity(%) 50
E.U.T.: 800 MHz CDMA PHONE
Configuration: TX FULL POWER AT CENTER CHANNEL (384)
Sample No: 1
Location: AC 3 RBW: 1 MHz Measurement
Detector Type: Peak VBW: 1 MHz Distance: 3 m

Test Equipment Used

Antenna: 1304 Directional Coupler:
Pre-Amp: Cable #1: 1484
Filter: Cable #2: 1485
Receiver: 1464 Cable #3:
Attenuator #1 Cable #4:
Attenuator #2: Mixer:
Additional equipment used: 993, 1053
Measurement Uncertainty: +/-1.7 dB

Frequency (MHz)	Meter Reading (dBm)	Substitution Level (dBm)		Pre-Amp Gain (dB)	Substitution Antenna Gain (dBd)		ERP (dBm)	ERP (mW)	Polarity	Comments
										UPRIGHT
836.52	-11.4	20.8		0	4.9		25.6	364.4741	V	Channel power
836.52	-29.7	0.6		0	4.9		5.5	3.5345	H	Channel power
										LYING FLAT
836.52	-31.7	0.5		0	4.9		5.3	3.4015	V	Channel power
836.52	-13.7	16.6		0	4.9		21.5	140.7127	H	Channel power
										ON SIDE
836.52	-21.6	10.6		0	4.9		15.4	34.8070	V	Channel power
836.52	-13.8	16.5		0	4.9		21.4	137.5097	H	Channel power

Notes: **Upright confirmed to be worst case emission**
Tested with fresh battery. All measurements were made at center channel 384

Section 4. Occupied Bandwidth

NAME OF TEST: Occupied Bandwidth	PARA. NO.: 2.1047
TESTED BY: David Light	DATE: 6/20/2002

Test Results: Complies.

Measurement Data: See attached graph.

Measurement Uncertainty: +/-1.6 dB

Test Plot – Occupied Bandwidth (CDMA)

Dallas Headquarters:
802 N. Kealy
Lewisville, TX 75057
Tel: (972) 436-9600
Fax: (972) 436-2667

Nemko Dallas, Inc.

Data Plot — **Occupied Bandwidth**

Page 1 of 1

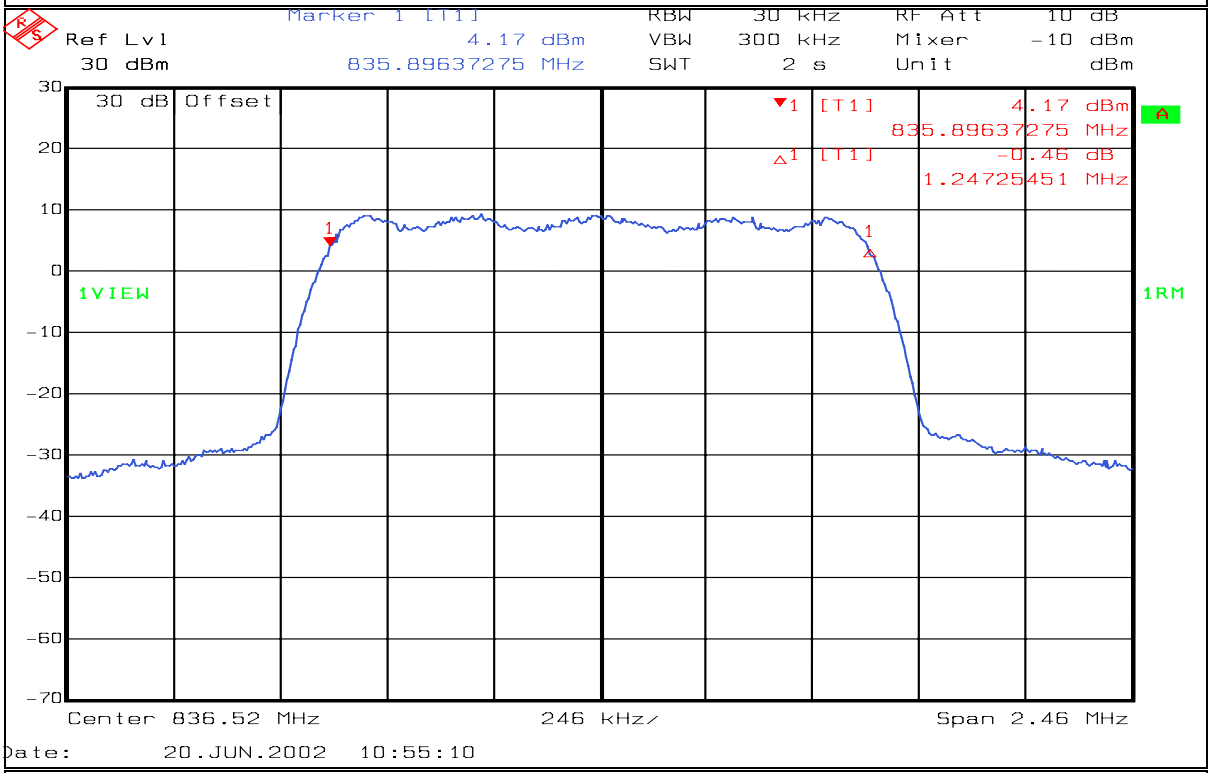
Job No.:	2L0300	Date:	6/20/2002	Complete	x
Specification:	PT 22	Temperature(°C):	24	Preliminary:	
Tested By:	David Light	Relative Humidity(%)	45		
E.U.T.:	CDMA CELL PHONE				
Configuration:	TX CDMA SIGNAL FULL POWER CONTROLLED BY SOFTWARE				
Sample Number:	1				
Location:	Lab 1	RBW:	30 kHz	Measurement	
Detector Type:	Rms	VBW:	300 kHz	Distance:	NA m

Test Equipment Used

Antenna:		Directional Coupler:	
Pre-Amp:		Cable #1:	1629
Filter:		Cable #2:	
Receiver:	1036	Cable #3:	
Attenuator #1	1478	Cable #4:	
Attenuator #2:	1471	Mixer:	

Additional equipment used:

Measurement Uncertainty: +/-1.7 dB



Notes: **Channel 384**

Section 5. Spurious Emissions at Antenna Terminals

NAME OF TEST: Spurious Emissions At Antenna Terminals	PARA. NO.: 2.1051
TESTED BY: David Light	DATE: 6/20/2002

Test Results: Complies.

Measurement Data: See attached graph.

Measurement Uncertainty: +/-1.6 dB

Test Plot – Spurious Emissions at Antenna Terminals

Dallas Headquarters:
802 N. Kealy
Lewisville, TX 75057
Tel: (972) 436-9600
Fax: (972) 436-2667

Nemko Dallas, Inc.

Data Plot — **Spurious Emissions at Antenna Terminals**

Page 1 of 3

Complete X
Preliminary:

Job No.:	2L0300	Date:	6/20/2002
Specification:	PT22	Temperature(°C):	24
Tested By:	David Light	Relative Humidity(%)	45
E.U.T.:	CDMA PHONE		
Configuration:	TX FULL POWER		
Sample Number:	1		
Location:	Lab 1	RBW:	30 kHz
Detector Type:	Rms	VBW:	300 kHz

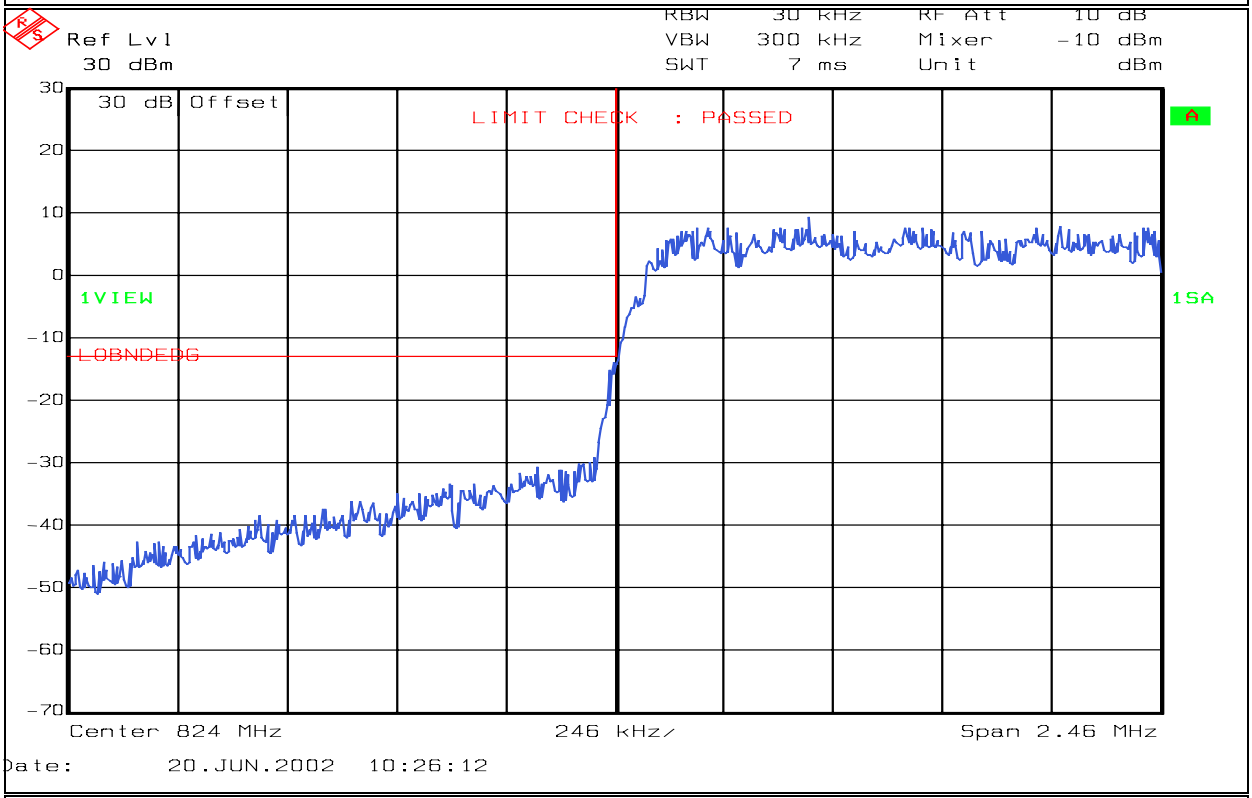
Measurement Distance: NA m

Test Equipment Used

Antenna:		Directional Coupler:	
Pre-Amp:		Cable #1:	1629
Filter:		Cable #2:	
Receiver:	1036	Cable #3:	
Attenuator #1	1478	Cable #4:	
Attenuator #2:	1471	Mixer:	

Additional equipment used:

Measurement Uncertainty: +/-1.7 dB



Notes: LOWER BANDEDGE
TRANSMITT FULL POWER AT CHANNEL 1013

Test Plot – Spurious Emissions at Antenna Terminals

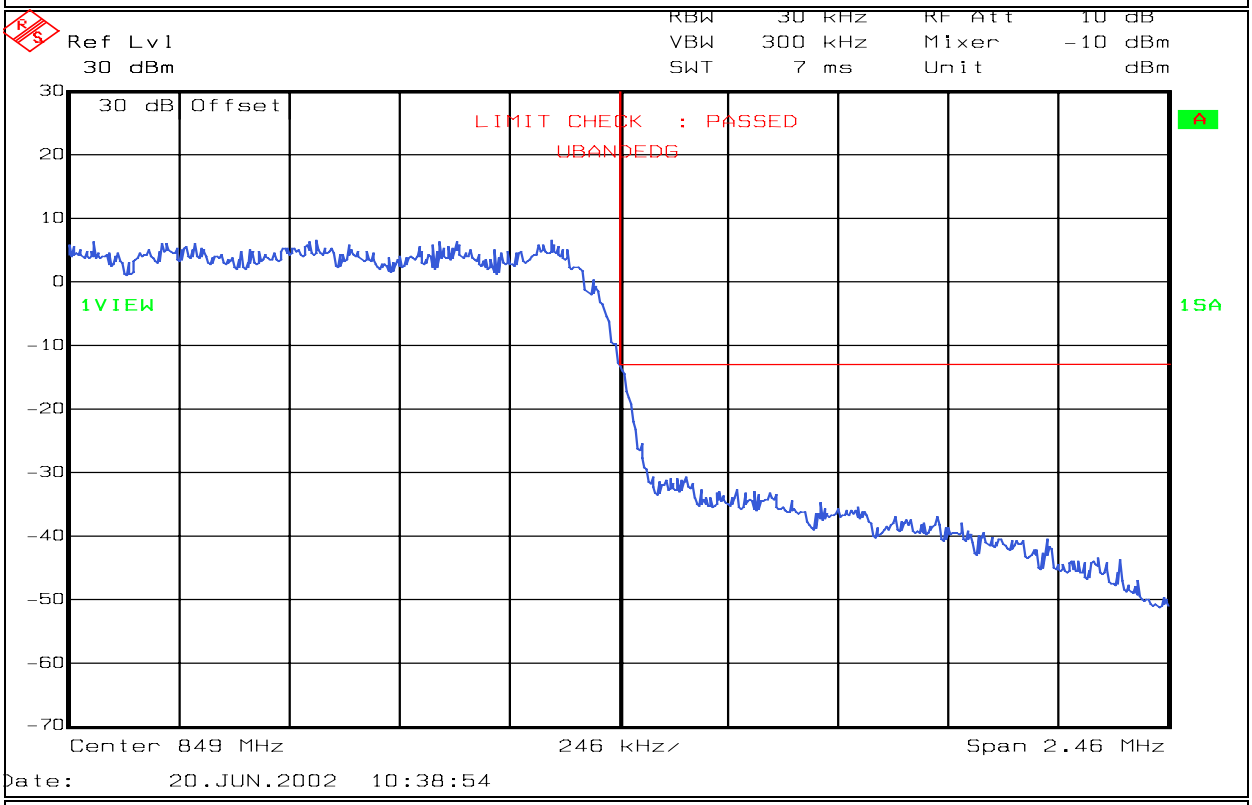
Dallas Headquarters:
802 N. Kealy
Lewisville, TX 75057
Tel: (972) 436-9600
Fax: (972) 436-2667

Nemko Dallas, Inc.

Data Plot — **Spurious Emissions at Antenna Terminals**

Page 2 of 3

Job No.:	2L0300	Date:	6/20/2002
Specification:	PT22	Temperature(°C):	24
Tested By:	David Light	Relative Humidity(%)	45
E.U.T.:	CDMA PHONE		
Configuration:	TX FULL POWER		



Notes: **UPPER BANDEDGE**
TRANSMIT FULL POWER AT CHANNEL 777

Test Plot – Spurious Emissions at Antenna Terminals

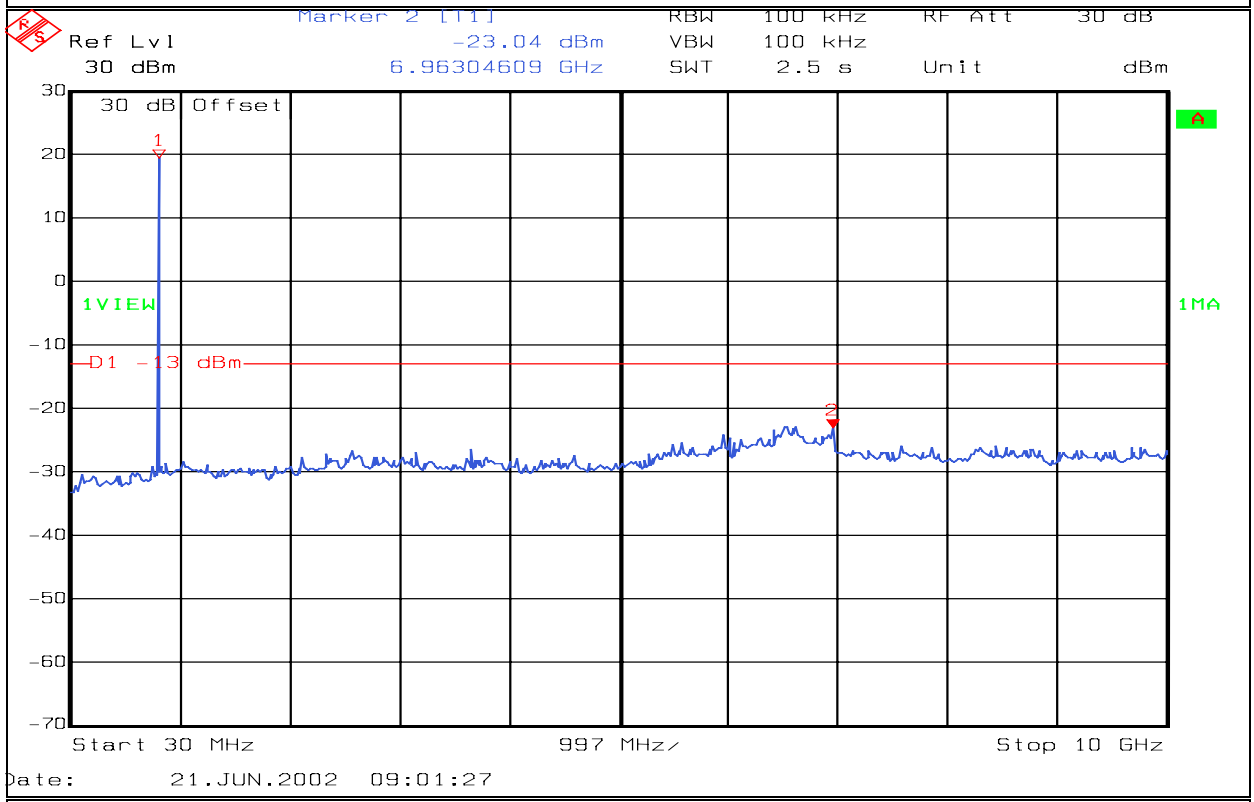
Dallas Headquarters:
802 N. Kealy
Lewisville, TX 75057
Tel: (972) 436-9600
Fax: (972) 436-2667

Nemko Dallas, Inc.

Data Plot — **Spurious Emissions at Antenna Terminals**

Page 3 of 3

Job No.:	2L0300	Date:	6/20/2002
Specification:	PT22	Temperature(°C):	24
Tested By:	David Light	Relative Humidity(%)	45
E.U.T.:	CDMA PHONE		
Configuration:	TX FULL POWER		



Notes:
TX FULL POWER AT CHANNEL 384
MARKER 1 INDICATES CARRIER
MARKER 2 INDICATES HIGHEST EMISSION

Section 6. Field Strength of Spurious

NAME OF TEST: Field Strength of Spurious	PARA. NO.: 2.1053
TESTED BY: David Light	DATE: 6/20/2002

Test Results: Complies.

Measurement Data: See attached table.

Measurement Uncertainty: +/-3.6 dB

Note – This unit was tested on three axis. Upright was deemed to be worst case

Test Data - Radiated Emissions

ERP Substitution Method

Page 1 of 1 — Complete X — Preliminary

Job No.: 2L0300 — Date: 6/20/2002

Specification: PT22 — Temperature(°C): 24

Tested By: David Light — Relative Humidity(%) 45

E.U.T.: 800 MHz CDMA PHONE

Configuration: TX FULL POWER AT CHANNEL 384

Sample No: 1

Location: AC 3 — RBW: 1 MHz — Measurement

Detector Type: Peak — VBW: 1 MHz — Distance: 3 m

Test Equipment Used

Antenna: 1304 — Directional Coupler:

Pre-Amp: 1016 — Cable #1: 1484

Filter: 1481 — Cable #2: 1485

Receiver: 1464 — Cable #3:

Attenuator #1 — Cable #4:

Attenuator #2: — Mixer:

Additional equipment used:

Measurement Uncertainty: +/-3.6 dB

Frequency (MHz)	Meter Reading (dBm)		Substitution Level (dBm)		Substitution Antenna Gain (dBd)		ERP (dBm)	ERP (mW)	Polarity	Comments
1673.04	-82.5		-49.5		7.3		-42.3	0.000060	H	
2509.56	-70.2		-68.5		8.0		-60.6	0.000001	H	
3346.08	-67.2		-64.7		8.0		-56.7	0.000002	H	
4182.60	-72.6		-71.1		8.2		-62.9	0.000001	H	Noise floor
5019.12	-71.0		-66.2		8.2		-58.0	0.000002	H	Noise floor
5855.64	-74.3		-69.8		9.3		-60.5	0.000001	H	Noise floor
6692.16	-71.0		-64.8		9.4		-55.5	0.000003	H	Noise floor
7528.68	-75.0		-66.5		9.2		-57.4	0.000002	H	Noise floor
8365.20	-73.7		-65.4		9.1		-56.3	0.000002	H	Noise floor
1673.04	-78.0		-47.0		7.3		-39.8	0.000106	V	
2509.56	-72.5		-70.8		8.0		-62.9	0.000001	V	
3346.08	-65.7		-59.7		8.0		-51.7	0.000007	V	
4182.60	-72.6		-60.6		8.2		-52.4	0.000006	V	Noise floor
5019.12	-71.0		-63.2		8.2		-55.0	0.000003	V	Noise floor
5855.64	-74.3		-67.8		9.3		-58.5	0.000001	V	Noise floor
6692.16	-71.0		-62.7		9.4		-53.3	0.000005	V	Noise floor
7528.68	-75.0		-66.2		9.2		-57.0	0.000002	V	Noise floor
8365.20	-73.7		-65.1		9.1		-56.0	0.000003	V	Noise floor

Notes: SCANNED TO TENTH HARMONIC

Photographs of Test Setup

FRONT VIEW

REAR VIEW

Section 8. Frequency Stability

NAME OF TEST: Frequency Stability	PARA. NO.: 2.1055
TESTED BY: David Light	DATE: 6/21/2002

Test Results: Complies.

Measurement Data: See attached table.

Standard Test Frequency:	836.52	MHz
Standard Test Voltage:	4.2	Vdc

Device tested with a fresh battery.

Measurement Uncertainty: 1×10^{-7} ppm

Test Data – Frequency Stability

Dallas Headquarters:
802 N. Kealy
Lewisville, TX 75057
Tel: (972) 436-9600
Fax: (972) 436-2667

Frequency Stability

Client: HOLLEY W.O.# 2L0300

EUT: 800 MHz CDMA Phone S/N: None (prototype)

Date: 6/21/2002 Tech: Light

Test Equipment used: 283

Temperature	Voltage	Frequency Error (Hz)	Rho
20 °C	4.2 Vdc	-25.0	0.978
10 °C	4.2 Vdc	+51.5	0.973
0 °C	4.2 Vdc	-37.1	0.974
-10 °C	4.2 Vdc	-62.9	0.968
-20 °C	4.2 Vdc	-34.8	0.977
-30 °C	4.2 Vdc	-37	0.976
30 °C	4.2 Vdc	-37.2	0.976
40 °C	4.2 Vdc	-30.8	0.976
50 °C	4.2 Vdc	-28.3	0.977
Used Agilent CDMA Mobile Test Set Model E8285A s/n US40332929			
Cal date 12/2/01 Due date 12/2/02			

Note – This unit was tested with a new battery.

Section 9. Test Equipment List

Nemko ID	Description	Manufacturer Model Number	Serial Number	Calibration Date	Calibration Due
1304	HORN ANTENNA	ELECTRO METRICS RGA-60	6151	07/30/01	07/30/03
1464	Spectrum analyzer	Hewlett Packard 8563E	3551A04428	01/02/01	01/03/03
1036	SPECTRUM ANALYZER	ROHDE & SCHWARZ FSEK30	830844/006	12/18/01	12/19/03
1471	10 db Attenuator DC 18 GHz	MCL Inc. BW-S10W2 10db-2WDC	NONE	CBU	N/A
1484	Cable 2.0-18.0 GHz	Storm PR90-010-072	N/A	06/01/02	06/01/03
1485	Cable 2.0-18.0 Ghz	Storm PR90-010-216	N/A	06/01/02	06/01/03
1487	Pre Amp	ICC LN12-18	452	06/06/02	06/06/03
1629	CABLE, 6 ft	MEGAPHASE 10311 1GVT4	N/A	CBU	N/A
1016	Pre-Amp	HEWLETT PACKARD 8449A	2749A00159	05/30/02	05/30/03
1481	Microwave Highpass Filter	K & L 3DH1-2000/T8000-0/0	4	Cal B4 Use	N/A
283	Environmental Chamber with controller # 1189006	ENVIROTRONICS SH27 & 2030-22844	129010083	01/10/02	01/10/03
993	Horn antenna	A.H. Systems SAS-200/571	XXX	01/08/02	01/09/04
1053	SIGNAL GENERATOR	ROHDE & SCHWARZ SMIQ 03	DE22081	08/09/01	08/09/02
Holley	CDMA Mobile Test Set	Agilent E8285A	4540332929	12/02/01	12/02/02

ANNEX A - TEST DETAILS

NAME OF TEST: RF Power Output **PARA. NO.: 1.1046**

Minimum Standard: Para. No. 22.913(a). The E.R.P. of mobile transmitter and auxiliary test transmitter must not exceed 7 watts.

EIA is 19B Para. No. 3.2.1.3. The transmitter shall be compiled of 8 distinct power levels.

The output power shown above shall be maintained within the range of +2 dB, -4 dB of nominal dBW value

PL	I	II	III
0	+6	+2	-2
1	+2	+2	-2
2	-2	-2	-2
3	-6	-6	-6
4	-10	-10	-10
5	-14	-14	-14
6	-18	-18	-18
7	-22	-22	-22

Method Of Measurement:

Detachable Antenna:
The power at antenna terminals is measured using an in-line power meter.

Integral Antenna:
TIA/EIA-603-1992, Section 2.2.12

The antenna substitution method was used to determine the equivalent radiated power at spurious frequencies. The spurious emissions were measured at a distance of 3 meters. The EUT was then replaced with a reference substitution antenna with a known gain referenced to a dipole. This antenna was fed with a signal at the spurious frequency. The level of the signal was adjusted to repeat the previously measured level. The resulting erp is the signal level fed to the reference antenna corrected for gain referenced to a dipole.

NAME OF TEST: Occupied Bandwidth (CDMA)	**PARA. NO.: 2.1049**

Minimum Standard: There is no specific requirement within the FCC regulations.

Method Of Measurement:

Spectrum Analyzer Settings:
RBW: 30 kHz
VBW: ≥ RBW
Span: 5 MHz
Sweep: Auto

NAME OF TEST: Spurious Emission at Antenna Terminals PARA. NO.: 2.1051

Minimum Standard: Para. No. 22.917(b). 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.
VBW: ≥ RBW
Start Frequency: 0 MHz
Stop Frequency: 10 GHz
Sweep: Auto

NAME OF TEST: Field Strength of Spurious Radiation	**PARA. NO.: 2.1053**

Minimum Standard: Para. No. 22.917(b). 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.

Test Method:

The antenna substitution method was used to determine the equivalent radiated power at spurious frequencies. The spurious emissions were measured at a distance of 3 meters. The EUT was then replaced with a reference substitution antenna with a known gain referenced to a dipole. This antenna was fed with a signal at the spurious frequency. The level of the signal was adjusted to repeat the previously measured level. The resulting erp is the signal level fed to the reference antenna corrected for gain referenced to a dipole.

NAME OF TEST: Frequency Stability **PARA. NO.: 2.1055**

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

Freq. Range (MHz)	Mobile > 3 W	Mobile ≤ 3 W
821 to 896	2.5	2.5

Table C-1

Method Of Measurement:

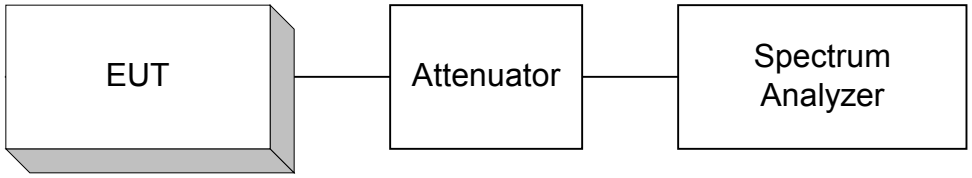
Frequency Stability With Voltage Variation:
The E.U.T. is placed in an environmental chamber and allowed to stabilize at +20 degrees Celsius for at least 15 minutes. The frequency counter and signal generator are phase locked with the same 10 MHz reference frequency by connecting the 10 MHz ref. out 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.

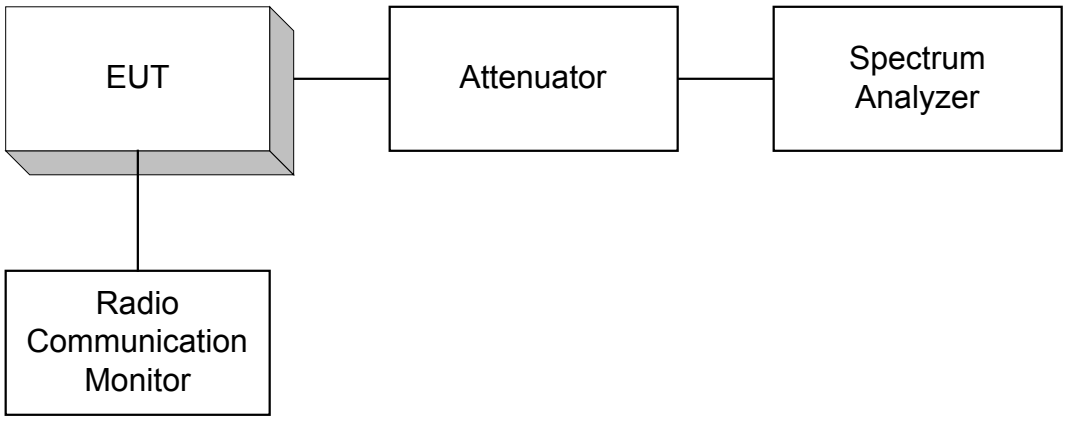
For CDMA radio systems, the frequency stability is measured in a closed-loop system with the phone communicating with a CDMA test set. Modulation quality (rho) and frequency error are measured and reported.

ANNEX B - TEST DIAGRAMS

Para. No. 2.1046 - R.F. Power Output

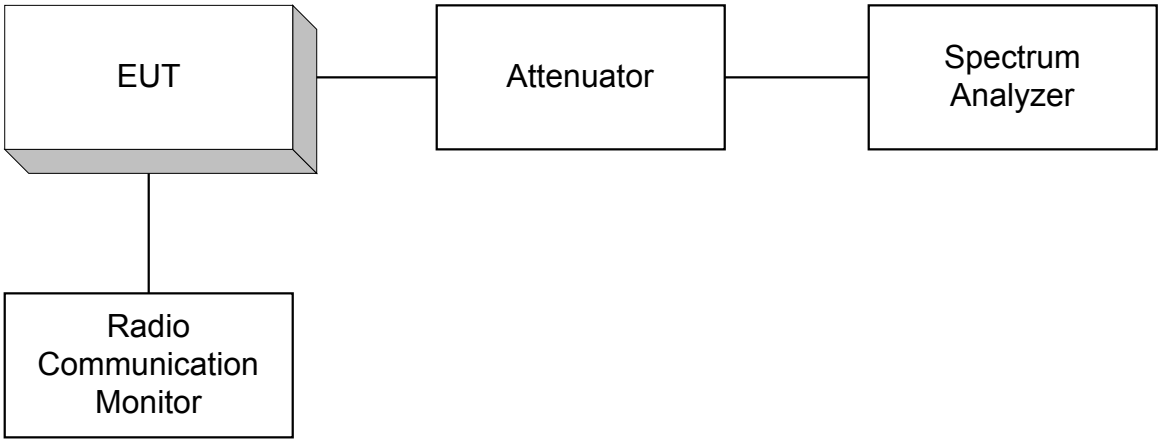


Para. No. 2.1049 - Occupied Bandwidth



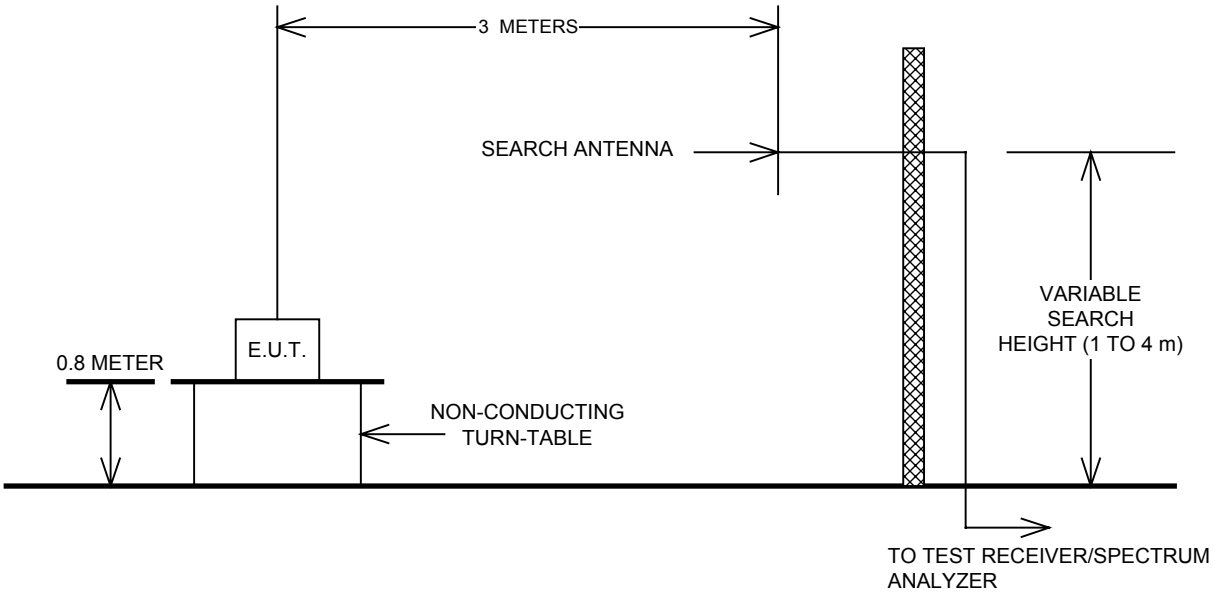
The Radio Communication Monitor is used only to provide modulation input for external modulation.

Para. No. 2.1051 Spurious Emissions at Antenna Terminals

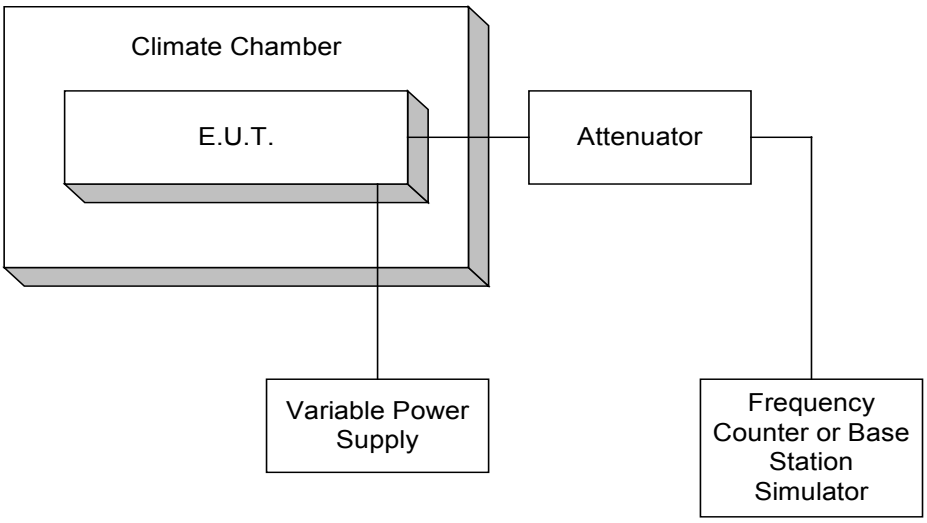


The Radio Communication Monitor is used only to provide modulation input for external modulation.

Para. No. 2.1053 - Field Strength of Spurious Radiation



Para. No. 2.1055 - Frequency Stability



Para. No. 2.1045 – Audio Frequency Response, Audio Low Pass Filter Response And Modulation Limiting