

Nemko Test Report: 3L0250RUS1

Applicant: Allen Telecom
108 Rand Park Drive
Garner, NC 27529

**Equipment Under Test:
(E.U.T.)** Britecell UHF

FCC ID: BCR-BCEL-400

In Accordance With: **FCC Part 90, Subpart I**
Private Land Mobile Transmitter

Tested By: Nemko Dallas Inc.
802 N. Kealy
Lewisville, TX 75057-3136

Authorized By:



Tom Tidwell, Frontline Manager

Date: 7/31/03

Total No. of Pages: 33

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EQUIPMENT: **UHF Britecell**

TEST REPORT NO.: **3L0250RUS1**

Section 1. Summary of Test Results

Manufacturer: Allen Telecom

Model No.: Britecell UHF

Serial No.: Remote: 014203287
 Local: 014203292

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 90, Subpart I.



New Submission



Production Unit



Class II Permissive Change



Pre-Production Unit

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

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EQUIPMENT: **UHF Britecell**

TEST REPORT NO.: **3L0250RUS1**

Summary Of Test Data

NAME OF TEST	PARA. NO.	RESULT
RF Power Output	90.205	Complies
Audio Frequency Response	TIA EIA-603.3.2.6	NA
Audio Low-Pass Filter Response	TIA EIA-603.3.2.6	NA
Modulation Limiting	TIA EIA-603.3.2.6	NA
Occupied Bandwidth	90.210	Complies
Spurious Emissions at Antenna Terminals	90.210	Complies
Field Strength of Spurious Emissions	90.210	Complies
Frequency Stability	90.213	Complies
Transient Frequency Behavior	90.214	NA

Footnotes:

This equipment does not provide a means to modulate the input signal.

The device does not have an audio low pass filter

This equipment does not provide audio modulation capability and therefore does not limit modulation.

.

EQUIPMENT: **UHF Britecell**

TEST REPORT NO.: **3L0250RUS1**

Section 2. General Equipment Specification

Transmitter

Supply Voltage Input:	Remote Unit	-72 to -36 Vdc				
	Local unit	120 Vac to rack (12 Vdc proprietary backplane)				
Frequency Range:		406.0055 MHz to 511.992 MHz				
Tunable Bands:		Full band coverage				
Necessary Bandwidth:		16 kHz (2 x 3 kHz + 2 x 5 kHz)				
Type(s) of Modulation:		F3E (FM)	F1D	F2D	D7W (QAM)	Other
		☒	☐	☐	☐	☐
Data Rate(s)		NA				
Internal/External Data Source:		NA				
Emission Designator:		16K0F3E				
Output Impedance:		50 ohms				
RF Power Output (rated):		20 dBm (100 mW)				
Duty Cycle:		None				
Channel Spacing(s):		6.25 kHz				
Operator Selection of Operating Frequency:		None				
Power Output Adjustment Capability:		None				

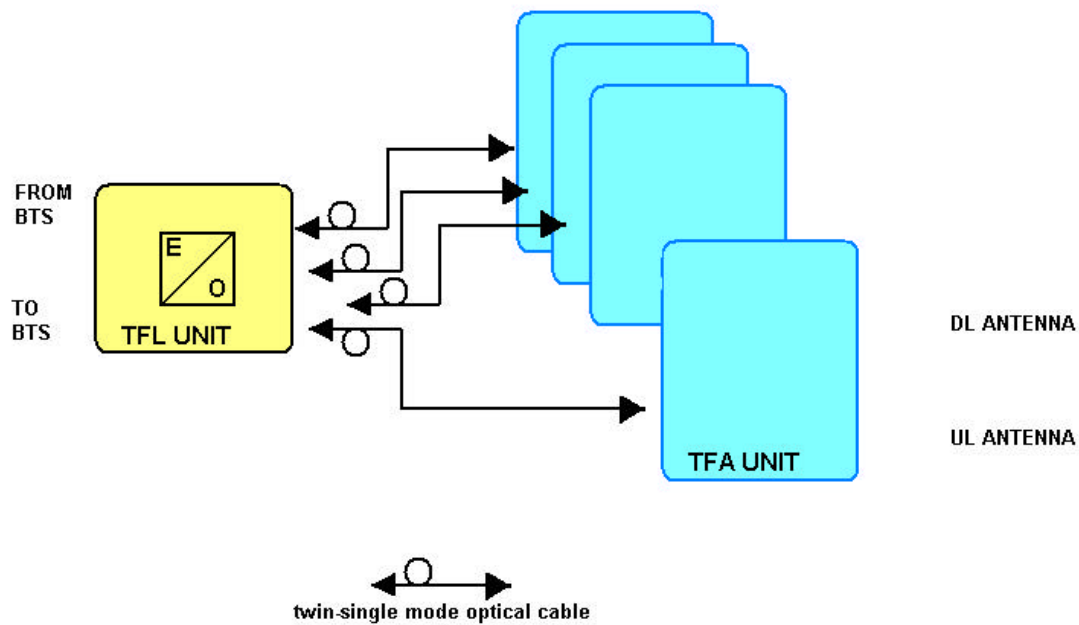
EQUIPMENT: **UHF Britecell**

TEST REPORT NO.: **3L0250RUS1**

System Description

BRITECELL™ UHF is a plug and play fibre optic distributed antenna kit.

System Diagram



EQUIPMENT: **UHF Britecell**

TEST REPORT NO.: **3L0250RUS1**

Section 3. RF Power Output

NAME OF TEST: RF Power Output	PARA. NO.: 2.985
TESTED BY: David Light	DATE: 7/19/03

Measurement Results: Complies.

Measurement Data:

Frequency (MHz)	Measured Power (dBm)	Rated Power (dBm)	Measured/Rated (dB)
460	20	20	0

Note: The device was tested at voltage extremes with no effect on output power.

Measurement Uncertainty: +/- 1.7 dB

EQUIPMENT: **UHF Britecell**

TEST REPORT NO.: **3L0250RUS1**

Section 4. Occupied Bandwidth

NAME OF TEST: Occupied Bandwidth	PARA. NO.: 2.989
TESTED BY: David Light	DATE: 7/19/03

Measurement Results: Complies.

Measurement Data: See attached data

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

Necessary Bandwidth = (2 x deviation) + (2 x highest modulating freq.)
= 2 x 3 kHz + 2 x 5 kHz = 6 kHz + 10 kHz = 16 kHz

EQUIPMENT: **UHF Britecell**

TEST REPORT NO.: **3L0250RUS1**

Test Data – Occupied Bandwidth



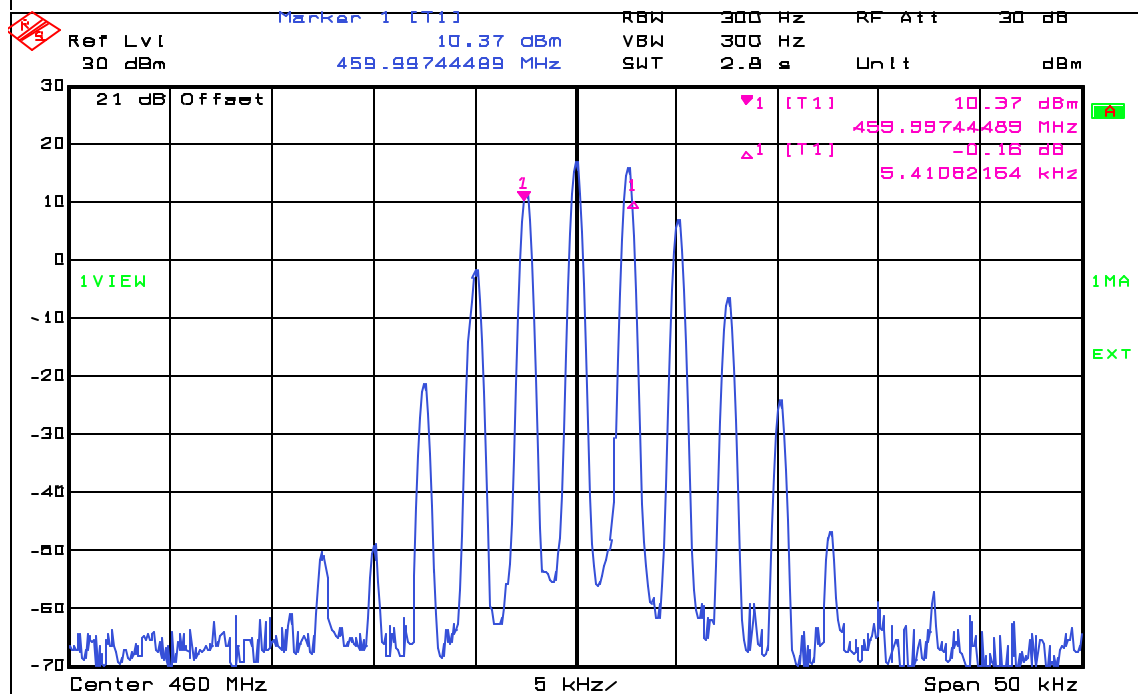
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Test Plot: OCCUPIED BANDWIDTH

Page 6 of 7

Job No.: 3L0250 Date: 7/19/2003
Specification: PT 90 Temperature(°C): 22
Tested By: David Light Relative Humidity(%) 50
E.U.T.: BRITECELL UHF
Configuration: TX FULL POWER



Date: 19.JUL.2003 09:51:02

Notes: RF OUTPUT - FULL POWER
2.5 kHz Input w/ 3 kHz Deviation

EQUIPMENT: **UHF Britecell**

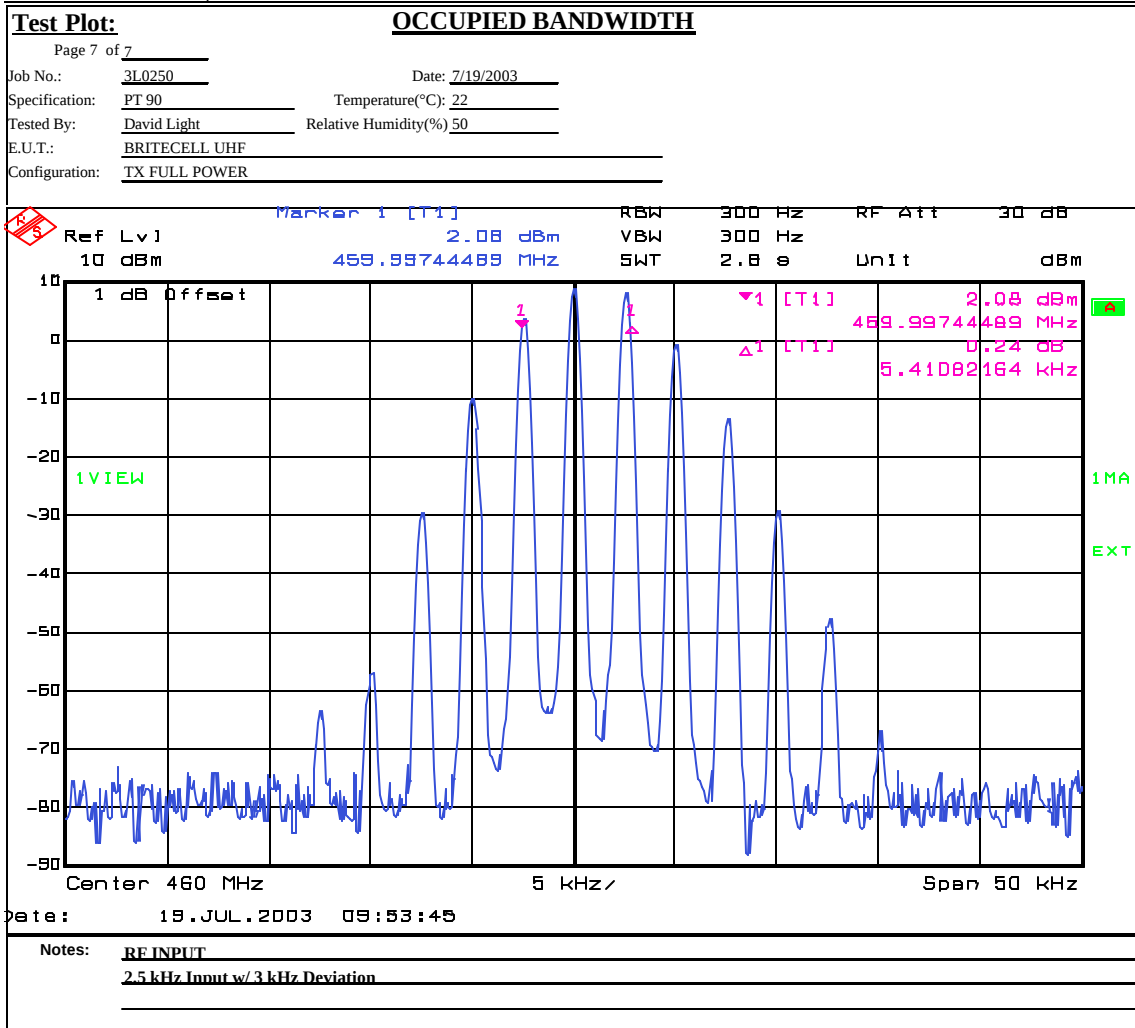
TEST REPORT NO.: **3L0250RUS1**

Test Data – Occupied Bandwidth



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EQUIPMENT: **UHF Britecell**

TEST REPORT NO.: **3L0250RUS1**

Section 5. Spurious Emissions at Antenna Terminals

NAME OF TEST: Spurious Emissions @ Antenna Terminals	PARA. NO.: 2.991
TESTED BY: David Light	DATE: 7/19/03

Measurement Results: Complies.

Measurement Data: See attached data

Measurement Uncertainty: +/- 1.7 dB

EQUIPMENT: **UHF Britecell**

TEST REPORT NO.: **3L0250RUS1**

Test Data – Spurious Emissions at Antenna Terminals



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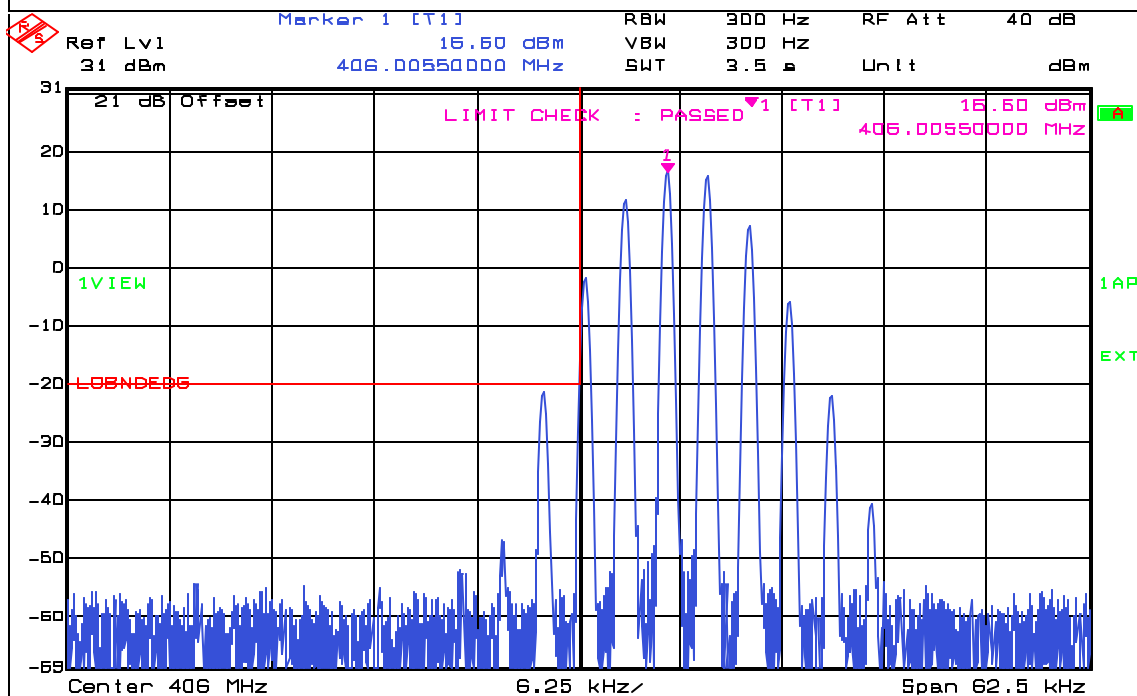
Data Plot

Spurious Emissions at Antenna Terminals

Page 1 of 2
Job No.: 3L0250 Date: 7/19/2003 Complete _____
Specification: PT 90 Temperature(°C): 22 Preliminary: _____
Tested By: David Light Relative Humidity(%): 50
E.U.T.: BRITECELL UHF
Configuration: TX FULL POWER
Sample Number: 1
Location: Lab 1 RBW: Refer to plots Measurement
Detector Type: Peak VBW: Refer to plots Distance: NA m

Test Equipment Used

Antenna: _____ Directional Coupler: _____
Pre-Amp: _____ Cable #1: 1626
Filter: _____ Cable #2: _____
Receiver: 1036 Cable #3: _____
Attenuator #1: 1064 Cable #4: _____
Attenuator #2: _____ Mixer: _____
Additional equipment used: _____
Measurement Uncertainty: +/-1.7 dB



Date: 19.JUL.2003 09:09:35

Notes: **LOWER BAND EDGE - LOWEST PERMISSIBLE FREQUENCY**

20 dBm OUTPUT (100 mW)

2.5 kHz Input w/ 3 kHz Deviation

EQUIPMENT: **UHF Britecell**

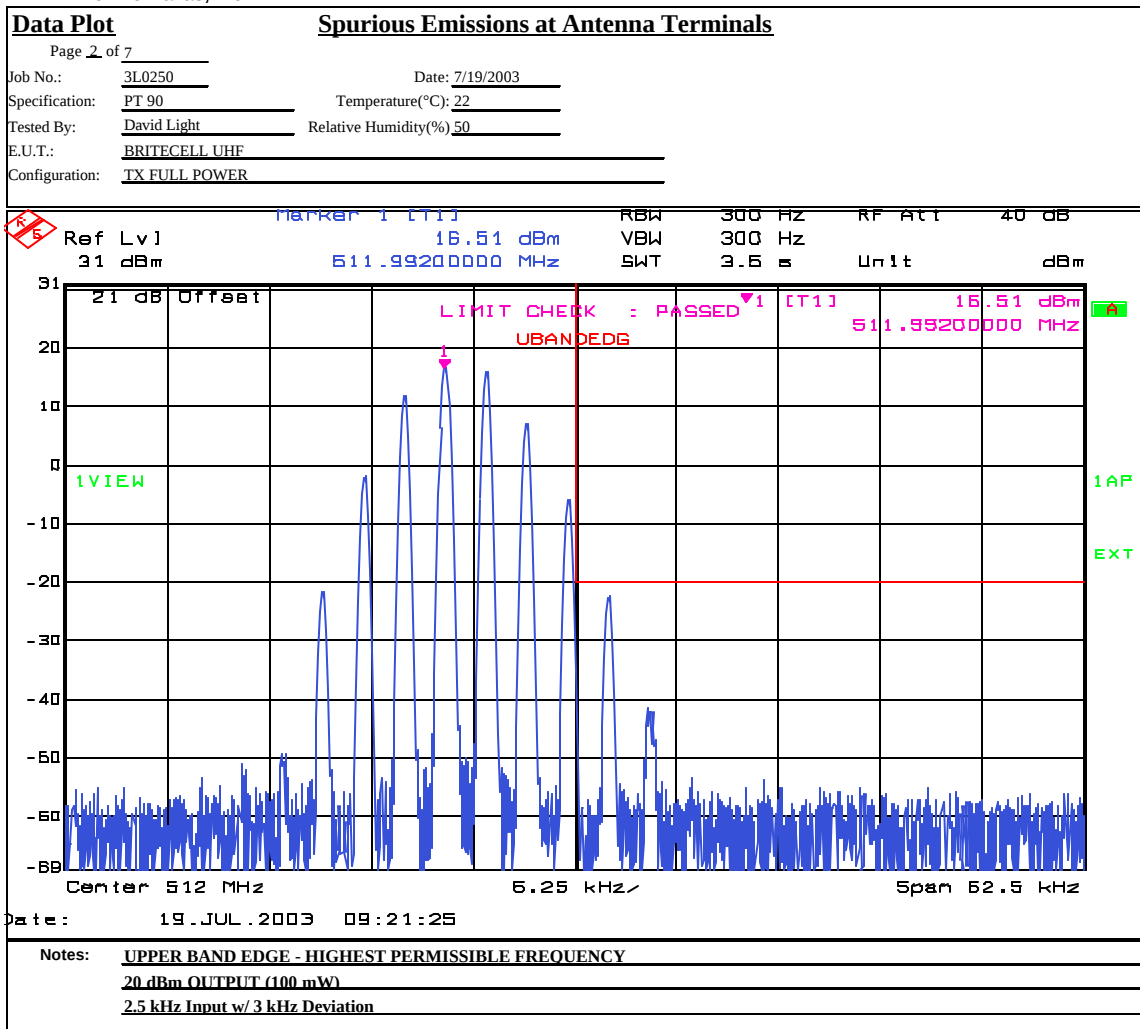
TEST REPORT NO.: **3L0250RUS1**

Test Data – Spurious Emissions at Antenna Terminals



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EQUIPMENT: **UHF Britecell**

TEST REPORT NO.: **3L0250RUS1**

Test Data – Spurious Emissions at Antenna Terminals



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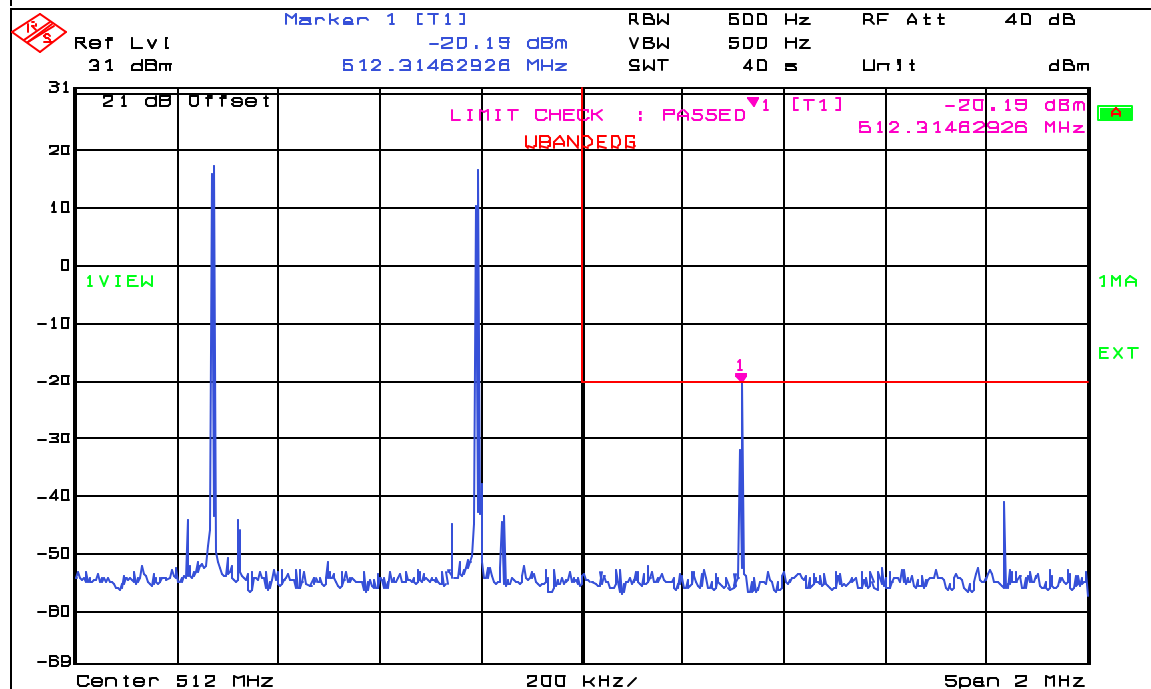
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Data Plot

Spurious Emissions at Antenna Terminals

Page 3 of 7

Job No.: 3L0250 Date: 7/19/2003
Specification: PT 90 Temperature(°C): 22
Tested By: David Light Relative Humidity(%) 50
E.U.T.: BRITECELL UHF
Configuration: TX FULL POWER



Date: 19.JUL.2003 09:32:52

Notes: INTERMOD CHARACTERISTICS - OUTPUT @ 17 dBm EACH

EQUIPMENT: **UHF Britecell**

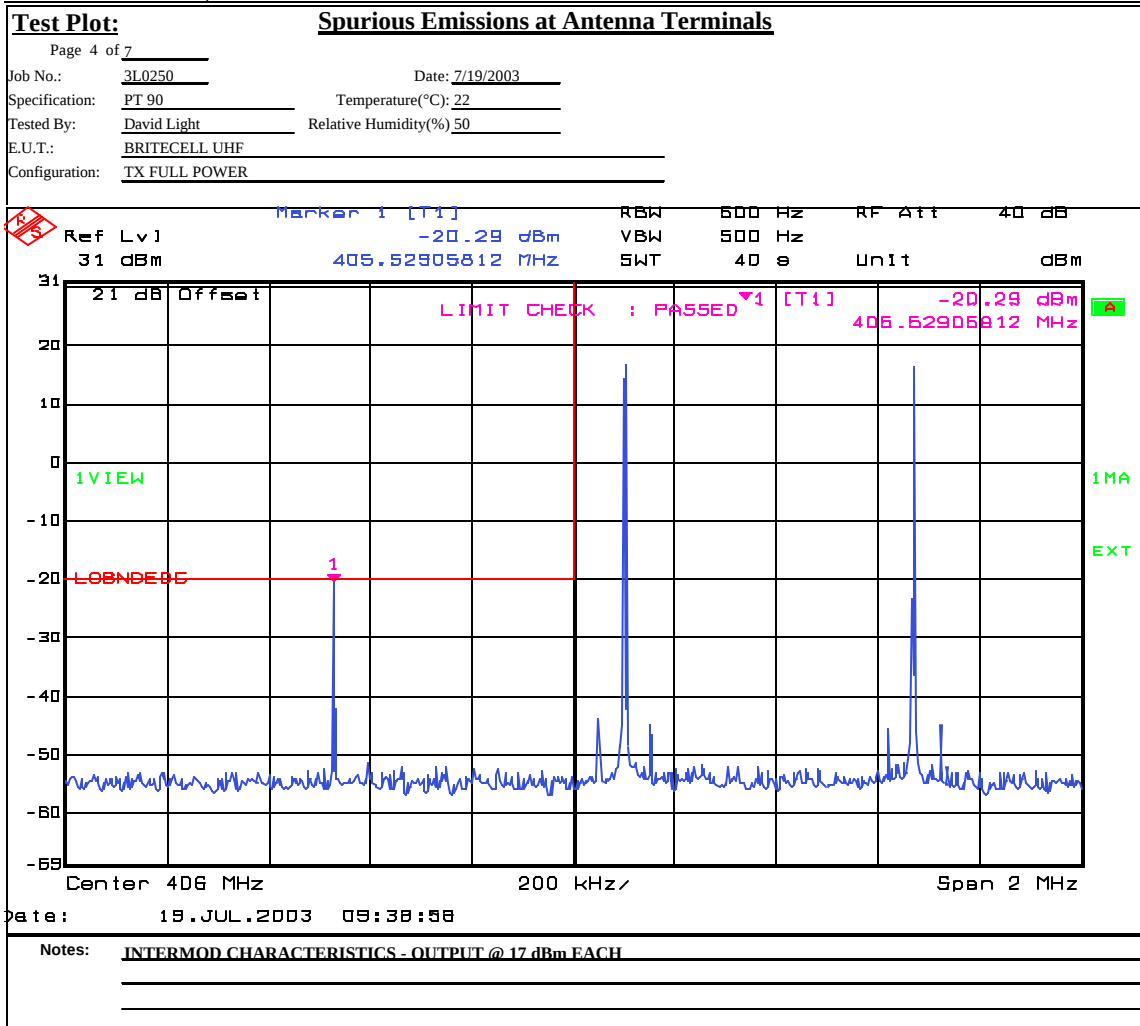
TEST REPORT NO.: **3L0250RUS1**

Test Data – Spurious Emissions at Antenna Terminals



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EQUIPMENT: **UHF Britecell**

TEST REPORT NO.: **3L0250RUS1**

Test Data – Spurious Emissions at Antenna Terminals



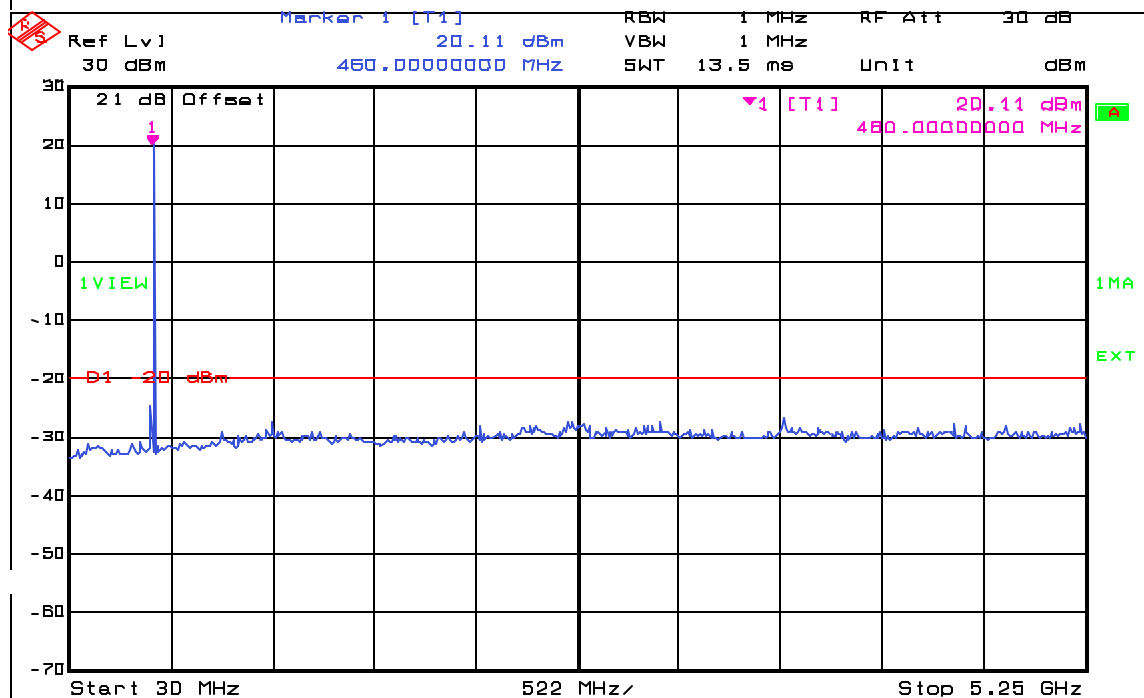
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Test Plot: Spurious Emissions at Antenna Terminals

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Job No.: 3L0250 Date: 7/19/2003
Specification: PT 90 Temperature(°C): 22
Tested By: David Light Relative Humidity(%) 50
E.U.T.: BRITECELL UHF
Configuration: TX FULL POWER



Date: 19.JUL.2003 09:44:41

Notes: MARKER INDICATES CARRIER

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FCC PART 90, SUBPART I
PRIVATE LAND MOBILE TRANSMITTER

EQUIPMENT: **UHF Britecell**

TEST REPORT NO.: **3L0250RUS1**

Section 6. Field Strength of Spurious Emissions

NAME OF TEST: Field Strength of Spurious Emissions	PARA. NO.: 2.993
TESTED BY: David Light	DATE: 7/21/03

Measurement Results: Complies.

Measurement Data: See attached data

EQUIPMENT: **UHF Britecell**

TEST REPORT NO.: **3L0250RUS1**

Test Data - Radiated Emissions



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ERP Substitution Method

Page 1 of 1

Job No.: 3L0250 Date: 7/21/03 Complete X
Specification: PT 90 Temperature(°C): 22 Preliminary _____
Tested By: David Light Relative Humidity(%) 45
E.U.T.: BRITCELL UHF
Configuration: TX FULL POWER @ 460 MHz
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: _____
Measurement Uncertainty: +/-1.7 dB

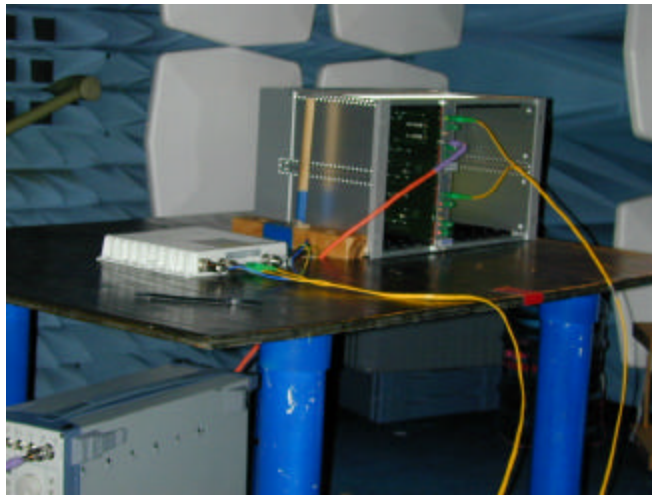
Frequency (MHz)	Meter Reading (dBm)	Substitution Level (dBm)		Pre-Amp Gain (dB)	Substitution Antenna Gain (dBd)	ERP (dBm)	Limit (dBm)	Margin (dB)	Polarity	Comments
920	-77.0	-47.7		0	5.0	-42.7	-20.0	-22.7	V	Noise floor
1380	-75.5	-44.0		0	4.9	-39.2	-20.0	-19.2	V	Noise floor
4140	-78.0	-32.7		0	8.2	-24.5	-20.0	-4.5	V	Noise floor
4600	-77.8	-33.8		0	8.7	-25.2	-20.0	-5.2	V	Noise floor
920	-77.0	-46.0		0	5.0	-41.0	-20.0	-21.0	H	Noise floor
1380	-75.5	-44.8		0	4.9	-40.0	-20.0	-20.0	H	Noise floor
4140	-78.0	-43.2		0	8.2	-35.0	-20.0	-15.0	H	Noise floor
4600	-77.8	-42.3		0	8.7	-33.7	-20.0	-13.7	H	Noise floor

Notes: Searched spectrum to 10th harmonic

EQUIPMENT: **UHF Britecell**

TEST REPORT NO.: **3L0250RUS1**

Photographs of Test Setup



EQUIPMENT: **UHF Britecell**

TEST REPORT NO.: **3L0250RUS1**

Section 7. Frequency Stability

NAME OF TEST: Frequency Stability	PARA. NO.: 2.995
TESTED BY: David Light	DATE: 7/15/03

Measurement Results: Complies.

Measurement Data: See attached data

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

EQUIPMENT: **UHF Britecell**

TEST REPORT NO.: **3L0250RUS1**

Test Data – Frequency Stability



Dallas Headquarters:

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Lewisville, TX 75057
Tel: (972) 436-9600
Fax: (972) 436-2667

Frequency Stability

Client: Allen Telecom

W.O.# 3L0250R

EUT: BRITECELL UHF

S/N: None

Date: 7/15/03

Tech: D. LIGHT

Test Equipment used: 1026, 1629, 1053, 1626, 1604

Temperature	Voltage (Vdc)	Frequency	Frequency Error
		(MHz)	(Hz)
20 °C	-40.8	460.000000	0
20 °C	-48	460.000000	0
20 °C	-55.2	460.000000	0
10 °C	-48	460.000000	0
0 °C	-48	460.000000	0
-10 °C	-48	460.000000	0
-20 °C	-48	460.000000	0
-30 °C	-48	460.000000	0
30 °C	-48	460.000000	0
40 °C	-48	460.000000	0
50 °C	-48	460.000000	0

EQUIPMENT: **UHF Britecell**

TEST REPORT NO.: **3L0250RUS1**

Section 8. Test Equipment List

Nemko ID	Description	Manufacturer Model Number	Serial No.	Cal. Date	Cal. Due
1036	Spectrum Analyzer	Rohde & Schwarz FSEK30	830844/006	12/18/01	12/18/03
1304	Horn Antenna	Electrometrics RGA-60	6151	07/30/01	07/30/03
1016	Pre-Amp	Hewlett Packard 8449A	2749A00159	07/15/03	07/15/04
1484	Cable	Storm PR90-010-072	N/A	07/15/03	07/15/04
1485	Cable	Storm PR90-010-216	N/A	07/15/03	07/15/04
1464	Spectrum Analyzer	Hewlett Packard 8563E	3551A04428	02/11/03	02/11/05
1626	Cable	Megaphase 10311 1GVT4	N/A	CBU	N/A
1064	Attenuator	Narda 776B-20	None	CBU	N/A
1026	Frequency Counter	Hewlett Packard 5350B	8232A01493	08/13/02	08/13/03
1629	Cable	Megaphase 10311 1GVT4	N/A	CBU	N/A
1053	Signal Generator	Rohde & Schwarz SMIQ 03	DE22081	06/10/03	06/09/04
1626	Cable	Megaphase 10311 1GVT4	N/A	CBU	N/A
1604	Attenuator	Narda 776B-20	None	N/A	N/A

EQUIPMENT: **UHF Britecell**

TEST REPORT NO.: **3L0250RUS1**

ANNEX A - TEST METHODOLOGIES

**Nemko
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FCC PART 90, SUBPART I
PRIVATE LAND MOBILE TRANSMITTER

EQUIPMENT: **UHF Britecell**

TEST REPORT NO.: **3L0250RUS1**

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

Minimum Standard: Para. No. 90.205(a). The maximum allowable station ERP is dependent upon the stations HAAT and required service area and will be authorized in accordance with Table 1 of 90.205(d).

Method Of Measurement:

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.

EQUIPMENT: **UHF Britecell**

TEST REPORT NO.: **3L0250RUS1**

NAME OF TEST: Audio Frequency Response	PARA. NO.: 2.987(a)
---	----------------------------

Test Method: TIA/EIA-603

Minimum Standard: TIA/EIA-603, Para. 3.2.6 from 300 Hz to 3000 Hz. The transmitter audio frequency response shall have a nominal 6 dB per octave pre-emphasis characteristic.

NAME OF TEST: Audio Low-Pass Filter Frequency Response	PARA. NO.: 2.987(a)
---	----------------------------

Test Method: TIA/EIA-603

Minimum Standard: TIA/EIA-603

NAME OF TEST: Modulation Limiting	PARA. NO.: 2.987(a)
--	----------------------------

Test Method: TIA/EIA-603

Minimum Standard: TIA/EIA-603

EQUIPMENT: **UHF Britecell**

TEST REPORT NO.: **3L0250RUS1**

NAME OF TEST: Occupied Bandwidth

PARA. NO.: 2.989

Minimum Standard: Para. No. 90.210, see table 1 below for applicable mask.

Table 1

Frequency Band (MHz)	Mask for equipment with Low Pass Filter	Mask for equipment without Low Pass Filter
Below 25	A or B	A or C
25 - 50	B	C
72 - 76	B	C
150 - 174	B, D or E	C, D or E
150 Paging only	B	C
220 - 222	F	F
421 - 512	B, D or E	C, D or E
450 paging only	B	H
806 - 821/ 851 - 866	B	G
821 - 824/ 866 - 869	B	H
896 - 901/ 935 - 940	I	J
902 - 928	K	K
929 - 930	B	G
Above 940	B	C
All other bands	B	C

Test Method:

RBW: 1% of emission bandwidth in 0 - 1 GHz range. 1 MHz at frequencies above 1 GHz.

VBW: ? RBW

The spectrum is search up to 10 times the fundamental frequency.

EQUIPMENT: **UHF Britecell**

TEST REPORT NO.: **3L0250RUS1**

NAME OF TEST: Field Strength of Spurious

PARA. NO.: 2.993

Minimum Standard: Para. No. 90.210, see table 1 for applicable mask.

Test Method:

The effective radiated power was measured using the substitution antenna method as described in EIA/TIA 603B. The device under test is placed on a turntable and a receive antenna is placed at a distance of 3 meters. At each detected emission frequency, the antenna height and test sample azimuth are adjusted to maximize the emission amplitude. The device under test is then replaced with a substitution antenna of known gain. A signal is fed to the substitution and the level is adjusted to match the previously measured level. The erp is the rf input level to the substitution antenna plus the antenna gain.

MASK	Spurious Limit
A,B,C,G,H,I	-13dBm
D,J	-20dBm
E,F,K	-25dBm

EQUIPMENT: **UHF Britecell**

TEST REPORT NO.: **3L0250RUS1**

NAME OF TEST: Frequency Stability

PARA. NO.: 2.995

Minimum Standard: Para. No. 990.213. The transmitter carrier frequency shall remain within the assigned frequency below in ppm.

Table 2

Frequency Band (MHz)	Fixed And Base Stations	Mobile Stations	
		> 2 Watts o/p pwr	< 2 Watts o/p pwr
Below 25	100	100	200
25 - 50	20	20	50
72 - 76	5	-	50
150 - 174	5	5	5
220 - 222	0.1	1.5	1.5
421 - 512	2.5	5	5
806 - 821	1.5	2.5	2.5
821 - 824	1.0	1.5	15
851 - 866	1.5	2.5	2.5
866 - 869	1.0	1.5	1.5
869 - 901	0.1	1.5	1.5
902 - 928	2.5	2.5	2.5
929 - 930	1.5	-	-
935 - 940	0.1	1.5	1.5
1427 - 1435	300	300	300
Above 2450	-	-	-

NAME OF TEST: Transient Frequency Behaviour

PARA. NO.: 2.214

Minimum Standard:

Transient Frequency Behaviour for Equipment Designed to Operate on 25 kHz Channels

	Maximum	Frequency ranges (MHz) All equipment					
		Base station and portable radios			Mobile Radios		
Time intervals ^{1,2}	Frequency difference ³ (kHz)	150 - 174 (ms)	450 - 500 (ms)	500 - 512 (ms)	150 - 174 (ms)	450 - 500 (ms)	500 - 512 (ms)
t ₁ ⁴	? 25	5.0	10.0	20.0	5.0	10.0	5.0
t ₂	? 12	20.0	25.0	50.0	20.0	25.0	20.0
t ₃ ⁴	? 25	5.0	10.0	10.0	5.0	10.0	5.0

Transient Frequency Behaviour for Equipment Designed to Operate on 12.5 kHz & 6.25 kHz Channels

	Maximum	Frequency ranges (MHz) All equipment		
		150 - 174 (ms)	450 - 500 (ms)	500 - 512 (ms)
Time intervals ^{1,2}	Frequency difference ³ (kHz)			
t ₁ ⁴	? 12.5 / ? 6.25	5.0	10.0	20.0
t ₂	? 6.25 / ? 3.125	20.0	25.0	50.0
t ₃ ⁴	? 12.5 / ? 6.25	5.0	10.0	10.0

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FCC PART 90, SUBPART I
PRIVATE LAND MOBILE TRANSMITTER

EQUIPMENT: **UHF Britecell**

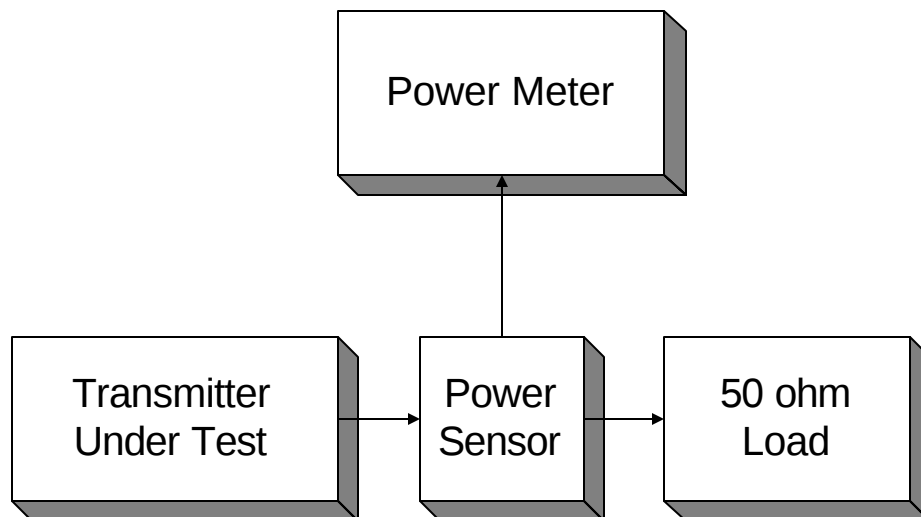
TEST REPORT NO.: **3L0250RUS1**

ANNEX B - TEST DIAGRAMS

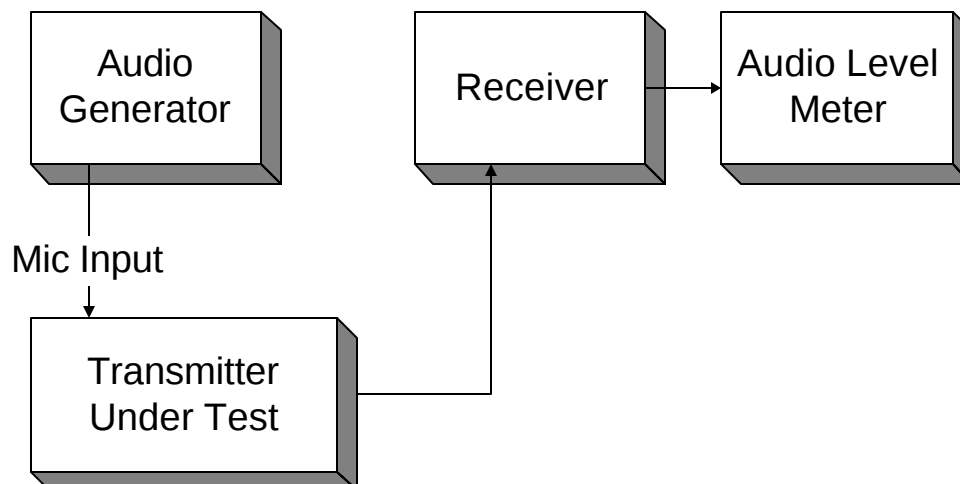
EQUIPMENT: **UHF Britecell**

TEST REPORT NO.: **3L0250RUS1**

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



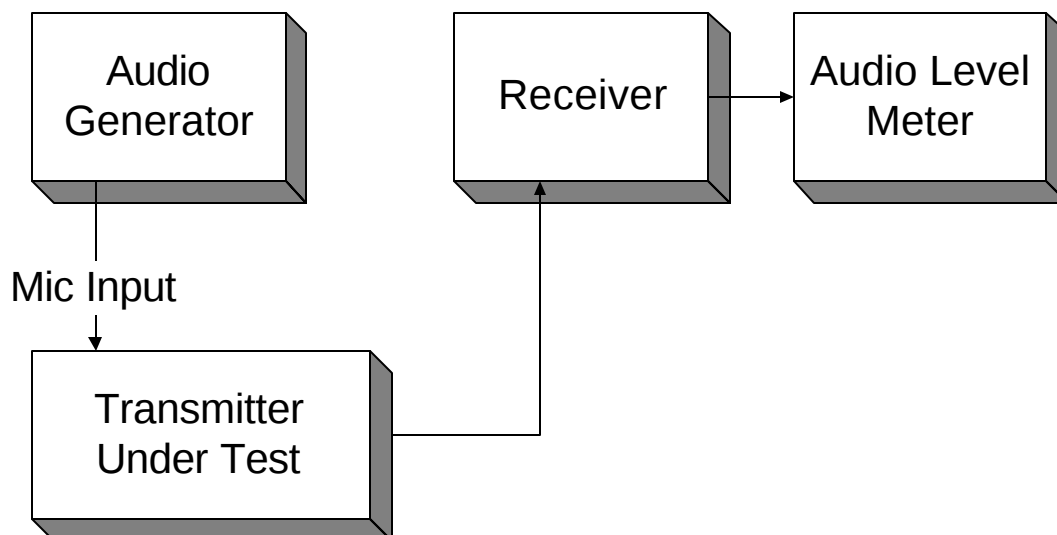
Para. No. 2.987(a) - Audio Frequency Response



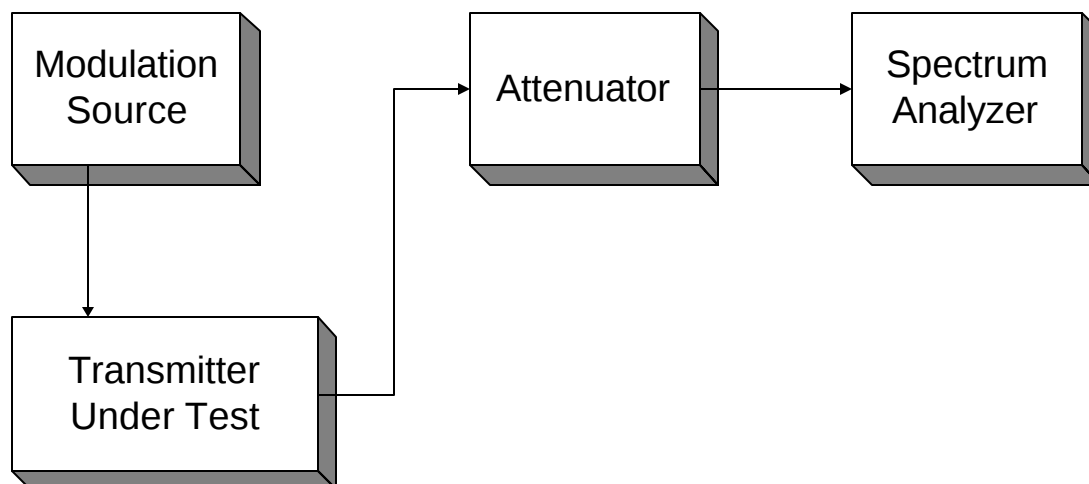
EQUIPMENT: **UHF Britecell**

TEST REPORT NO.: **3L0250RUS1**

Para. No. 2.987(b) - Modulation Limiting



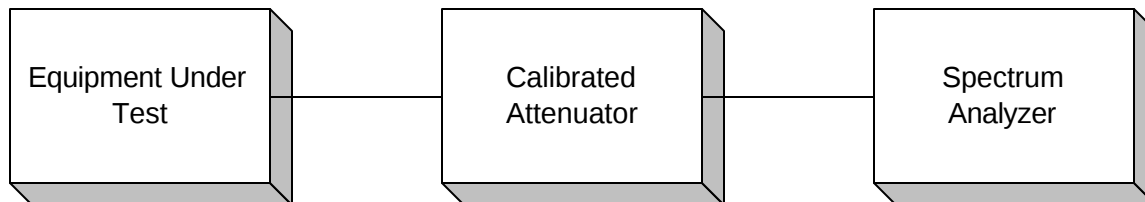
Para. No. 2.989 - Occupied Bandwidth



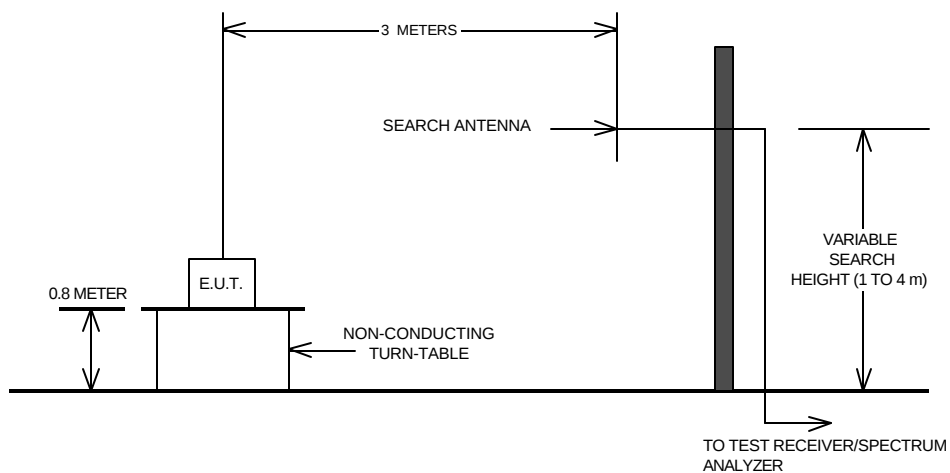
EQUIPMENT: **UHF Britecell**

TEST REPORT NO.: **3L0250RUS1**

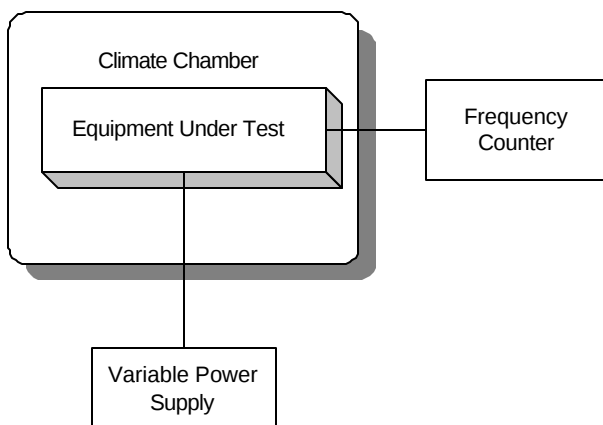
Para. No. 2.991 - Spurious Emissions at Antenna Terminals



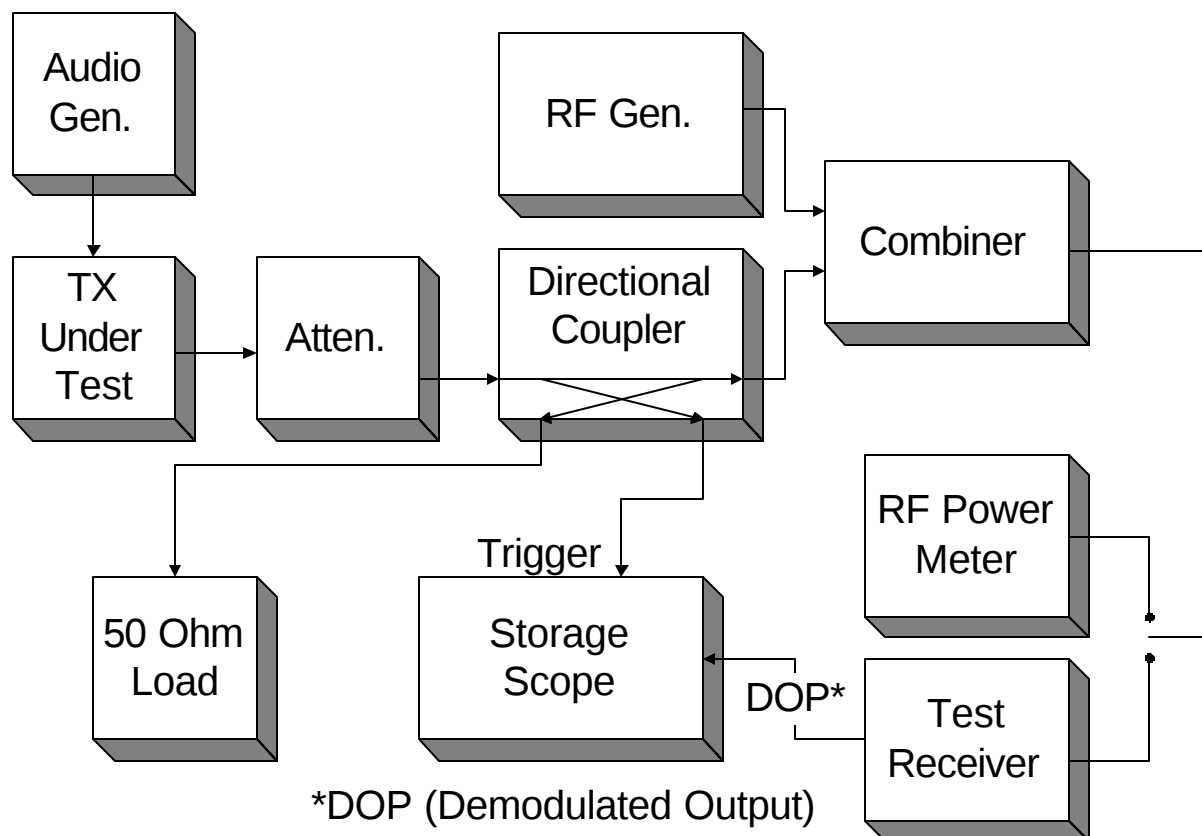
Para. No. 2.993 - Field Strength of Spurious Radiation



Para. No. 2.995 - Frequency Stability



Para. No. 90.214 - Transient Frequency Behaviour



Voice

This measurement was made using measurement procedure TIA/EIA Land Mobile FM or PM Communications Equipment Measurement and Performance Standards TIA/EIA-603 February 1993 Telecommunications Industry Association (American National Standard ANSI/TIA/EIA-603-1992 Approved: October 27, 1992) Para. no. 2.2 Methods of Measurement for Transmitters Para. no. 2.2.19 Transient Frequency Behaviour (page no. 83).

Data

This measurement was made using measurement procedure TIA/EIA Digital C4FM/CQPSK Transceiver Measurement Methods TSB102.CAAA Para. no. 2.2.17 Transient Frequency Behaviour (page no. 74).