

Nemko Test Report: 2L0417RUS1

Applicant: Allen Telecom
108 Rand Park Drive
Suite 240
Garner, NC 27529

Equipment Under Test: BRITECELL 800/900
(E.U.T.)

In Accordance With: FCC Part 24, Subpart D
and Part 90, Subpart I

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

Authorized By:



John F. Smith

Date: 31 July, 2003

Total Number of Pages: 59

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EQUIPMENT: **BRITECELL 800/900****PROJECT NO.: 2L0417RUS1**

Section 1. Summary of Test Results

Manufacturer: Allen Telecom

Model No.: BRITECELL 800/900 Dual Band

Serial No.: 032001708

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 and Part 24, Subpart D



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: **BRITECELL 800/900****PROJECT NO.: 2L0417RUS1**

Summary Of Test Data

NAME OF TEST	PARA. NO.	RESULT
RF Power Output	24.132(a)	Complies
	90.635	Complies
Audio Frequency Response	TIA EIA-603.3.2.6	N/A
Audio Low-Pass Filter Response	TIA EIA-603.3.2.6	N/A
Modulation Limiting	TIA EIA-603.3.2.6	N/A
Occupied Bandwidth	24.131	Complies
	90.210(j)	Complies
Spurious Emissions at Antenna Terminals	24.133 (a)(1)	Complies
	90.210(j)	Complies
Field Strength of Spurious Emissions	24.133 (a)(1)	Complies
	90.210(j)	Complies
Frequency Stability	24.135	Complies
	90.213	Complies
Transient Frequency Behavior	90.214	N/A

Footnotes For N/A's:

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

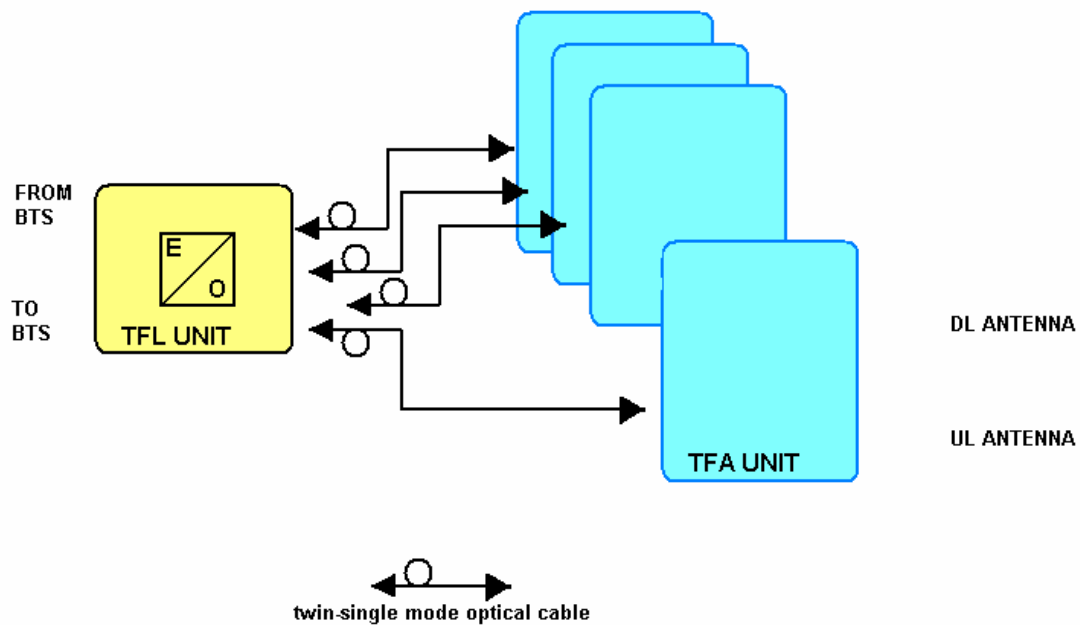
The RF carrier is not keyed. The amplifier is always active.

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Theory of Operation

BRITECELL™ 800/900 is a dual band plug and play fibre optic distributed antenna kit.

System Diagram



EQUIPMENT: BRITECELL 800/900

PROJECT NO.: 2L0417RUS1

Section 3. RF Power Output

NAME OF TEST: RF Power Output	PARA. NO.: 2.985
TESTED BY: David Light	DATE: 7/30/03

Test Results: Complies.**Measurement Data:**

Single Carrier:

Frequency (MHz)	Modulation	Measured Power (dBm)	Measured Power (mW)
860	Analog	20	100
860	iDEN	20	100
938	2FSK	20	100
938	4FSK	20	100
938	Analog	20	100

Two Carriers:

Frequency (MHz)	Modulation	Composite Measured Power (dBm)	Composite Measured Power (mW)
Upper bandedge/Lower band	Analog	15	31.6
Lower bandedge/Lower band	Analog	15	31.6
Upper bandedge/Lower band	iDEN	15	31.6
Lower bandedge/Lower band	iDEN	15	31.6
Upper bandedge/Upper band	Analog	15	31.6
Lower bandedge/Upper band	Analog	15	31.6
Upper bandedge/Upper band	2FSK	15	31.6
Lower bandedge/Upper band	2FSK	15	31.6
Upper bandedge/Upper band	4FSK	15	31.6
Lower bandedge/Upper band	4FSK	15	31.6

Measurements were made using PEAK detector utilizing a 30 kHz RBW.

Test equipment used: 1036-1064-1629

Test conditions:

Relative Humidity 40%
Temperature: 22°C

EQUIPMENT: **BRITECELL 800/900**

PROJECT NO.: 2L0417RUS1

Section 4. Occupied Bandwidth

NAME OF TEST: Occupied Bandwidth	PARA. NO.: 2.989
TESTED BY: David Light	DATE: 7/30/03

Test Results: Complies.

Test Data: See attached graph(s).

EQUIPMENT: BRITECELL 800/900

PROJECT NO.: 2L0417RUS1

Test data – Occupied Bandwidth



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Data Plot		Occupied Bandwidth	
Page 1 of 1		Complete <u>X</u>	
Job No.:	2L0417R	Date:	7/30/2003
Specification:	PARTS 90 & 24	Temperature(°C):	22
Tested By:	David Light	Relative Humidity(%)	40
E.U.T.:	BRITECELL 800/900		
Configuration:	TX FULL POWER		
Sample Number:	1		
Location:	Lab 1	RBW:	Refer to plots
Detector Type:	Peak	VBW:	Refer to plots
Test Equipment Used		Measurement Distance: <u>NA</u> m	
Antenna:	Directional Coupler:		
Pre-Amp:	Cable #1:	1629	
Filter:	Cable #2:		
Receiver:	Cable #3:		
Attenuator #1:	Cable #4:		
Attenuator #2:	Mixer:		
Additional equipment used:			
Measurement Uncertainty:	+/-1.7 dB		

Ref	Lvl	Delta 1 [T1]	RBW	300 Hz	RF Att	30 dB
30	dBm	0.00 dB	VBW	300 Hz		
		5.05010020 kHz	SWT	2.25 s	Unit	dBm

Center 860 MHz 4 kHz/ Span 40 kHz

Date: 30.JUL.2003 06:10:53

Notes: RF OUTPUT - SMR BAND - 2 kHz TONE/2.5 kHz DEVIATION

EQUIPMENT: BRITECELL 800/900

PROJECT NO.: 2L0417RUS1

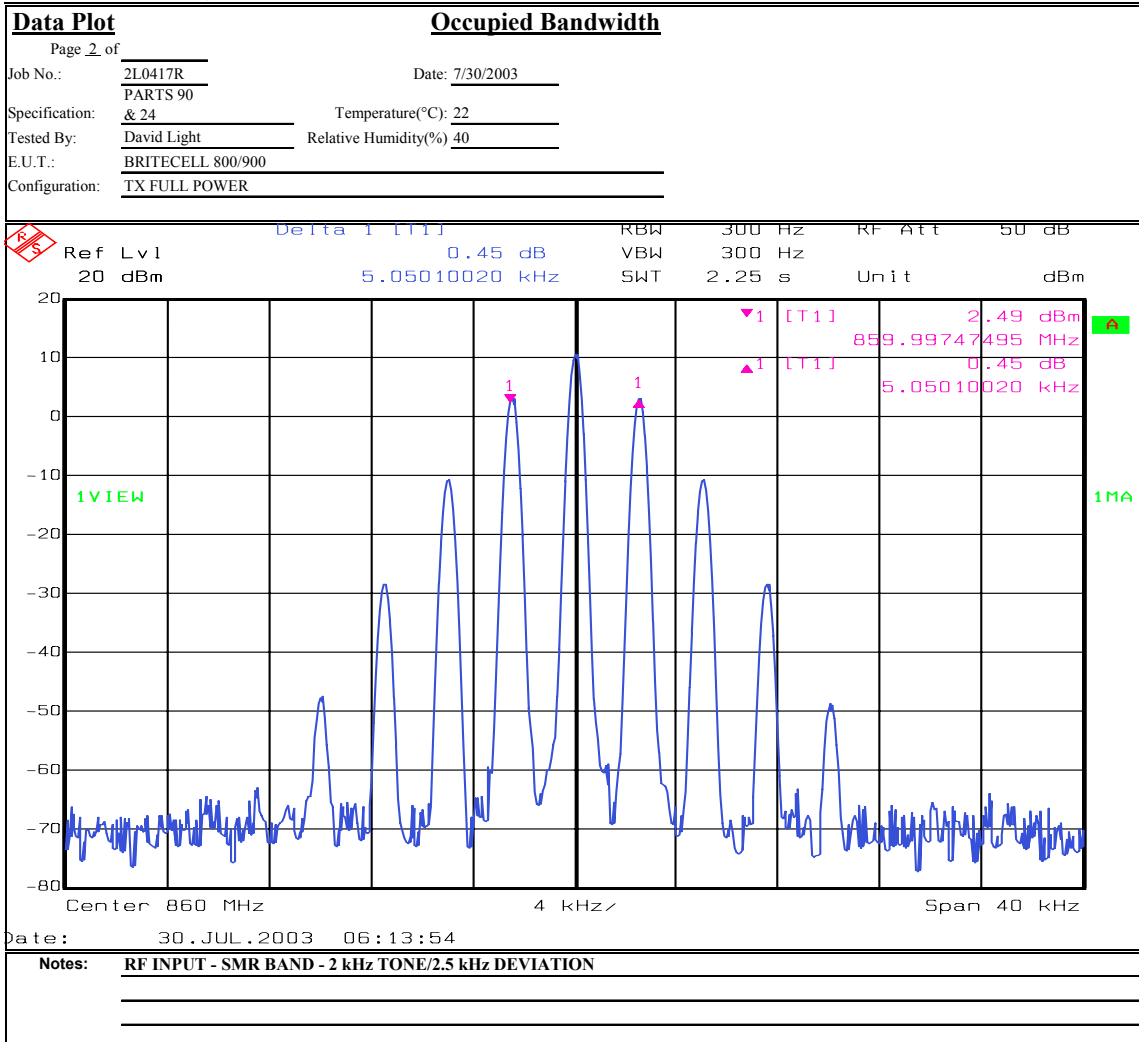
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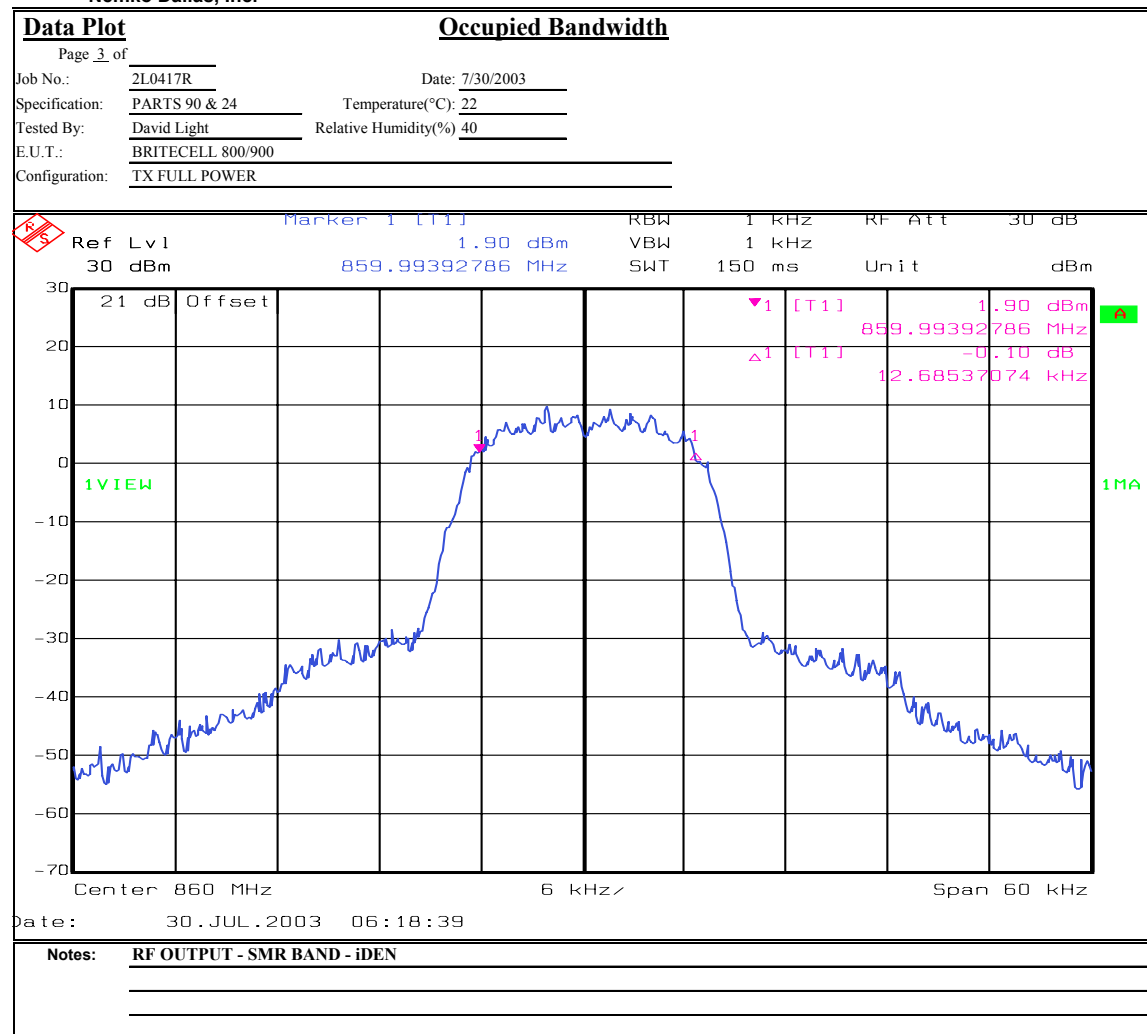
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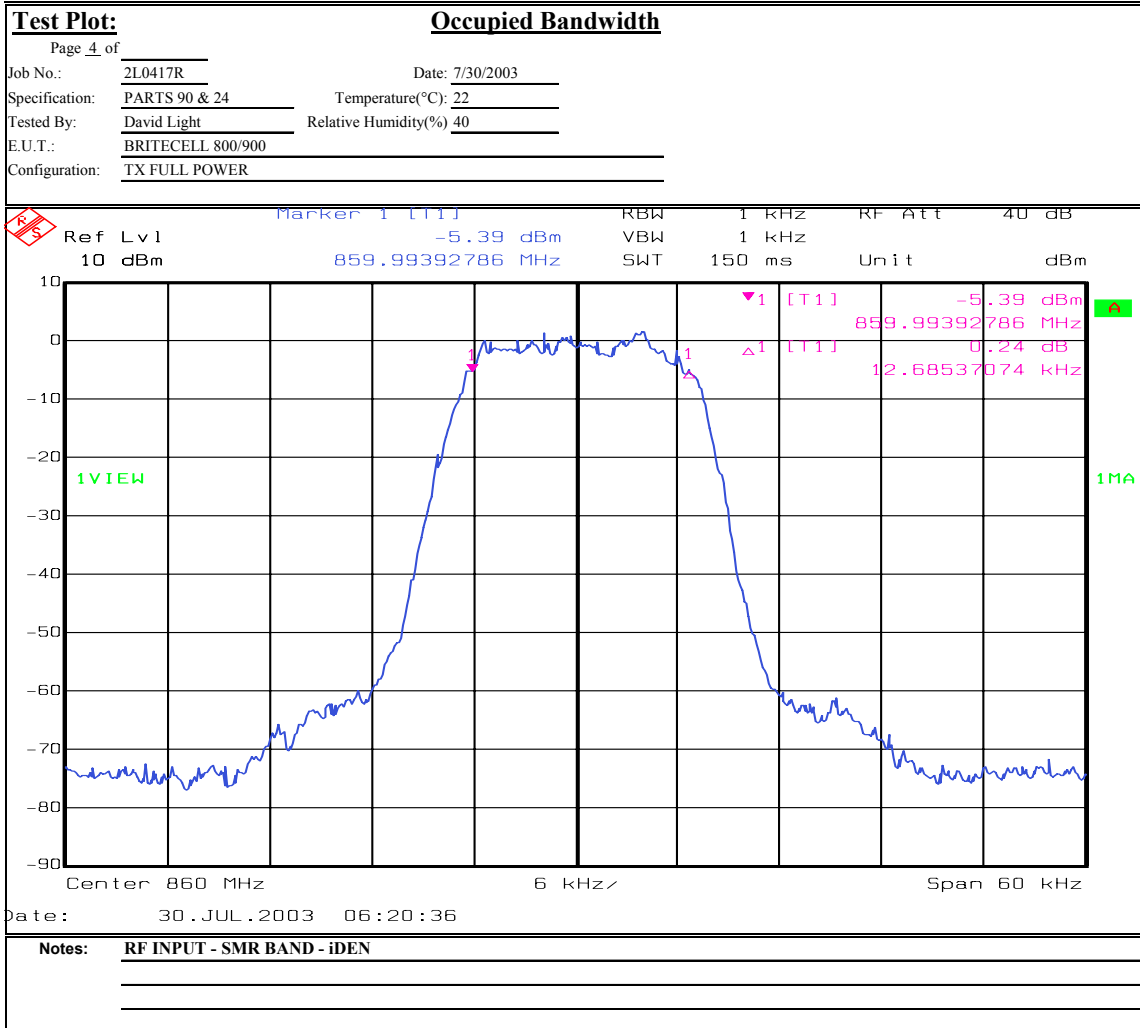
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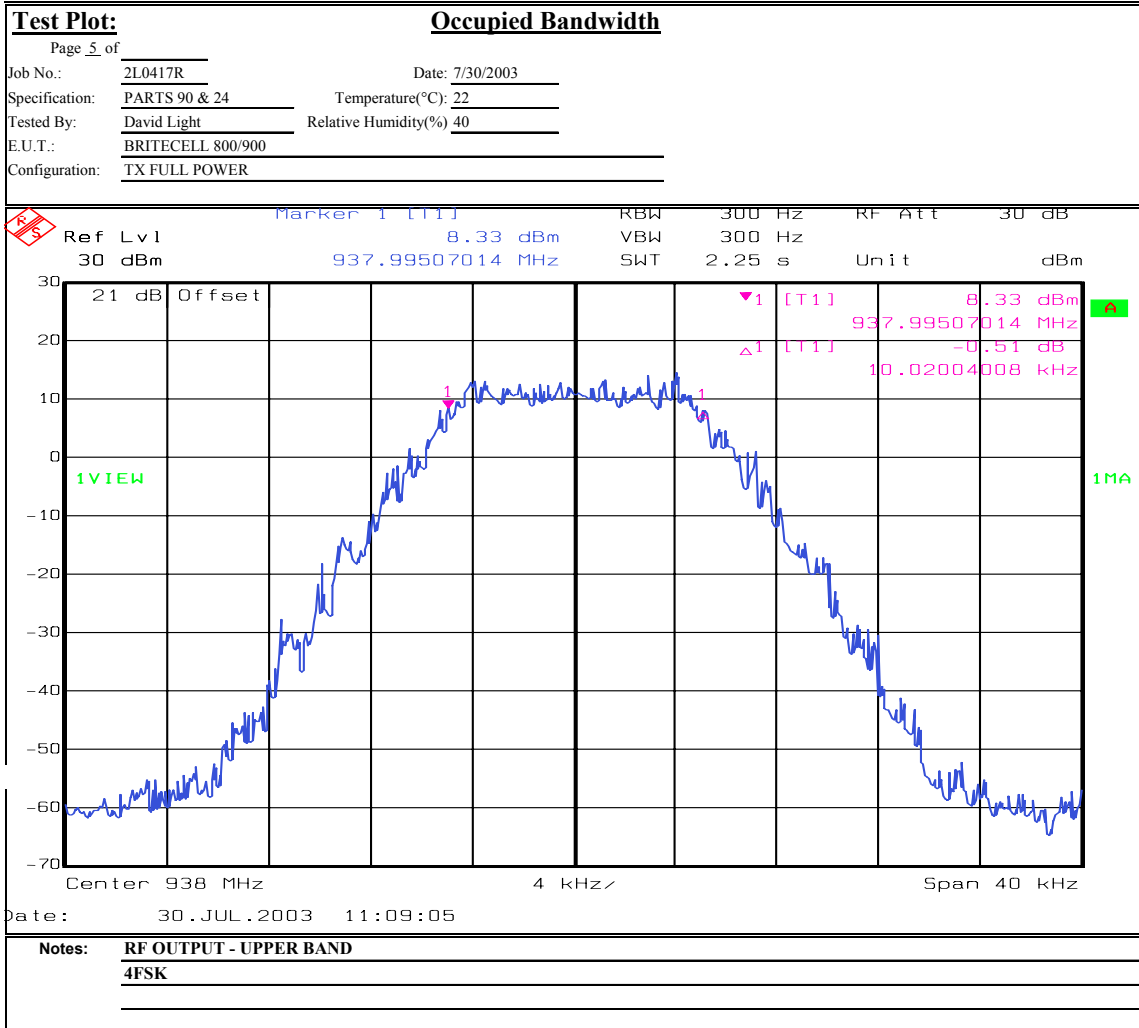
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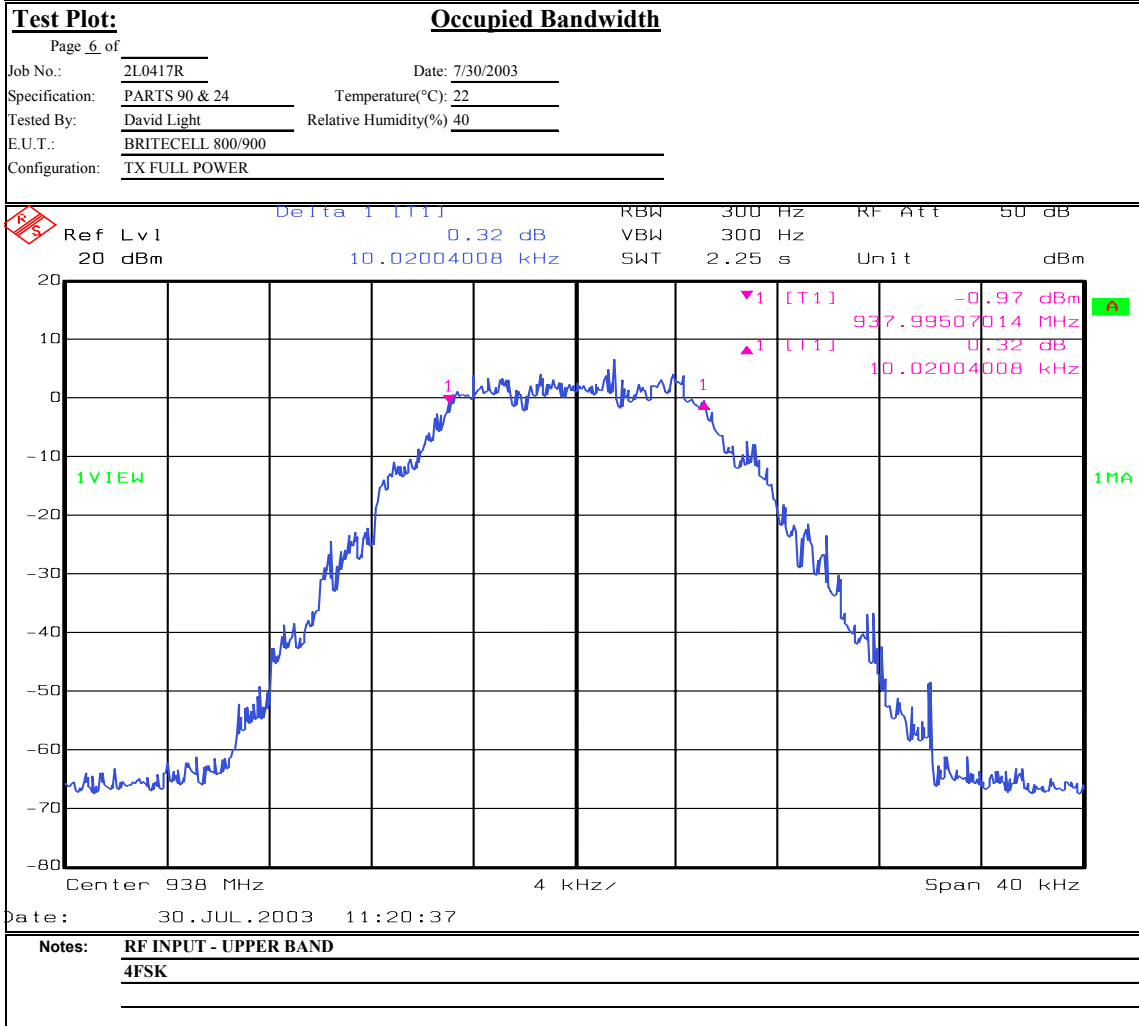
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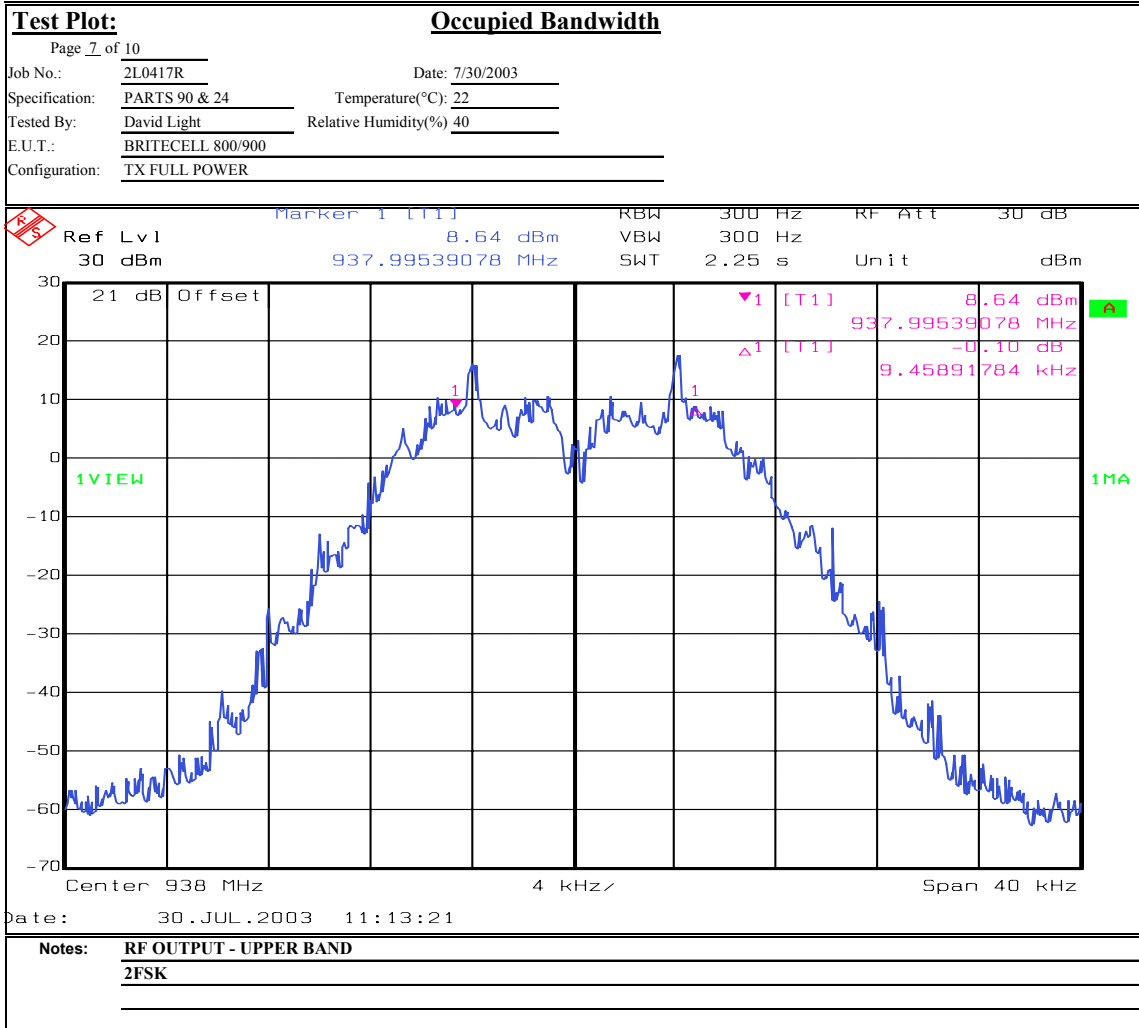
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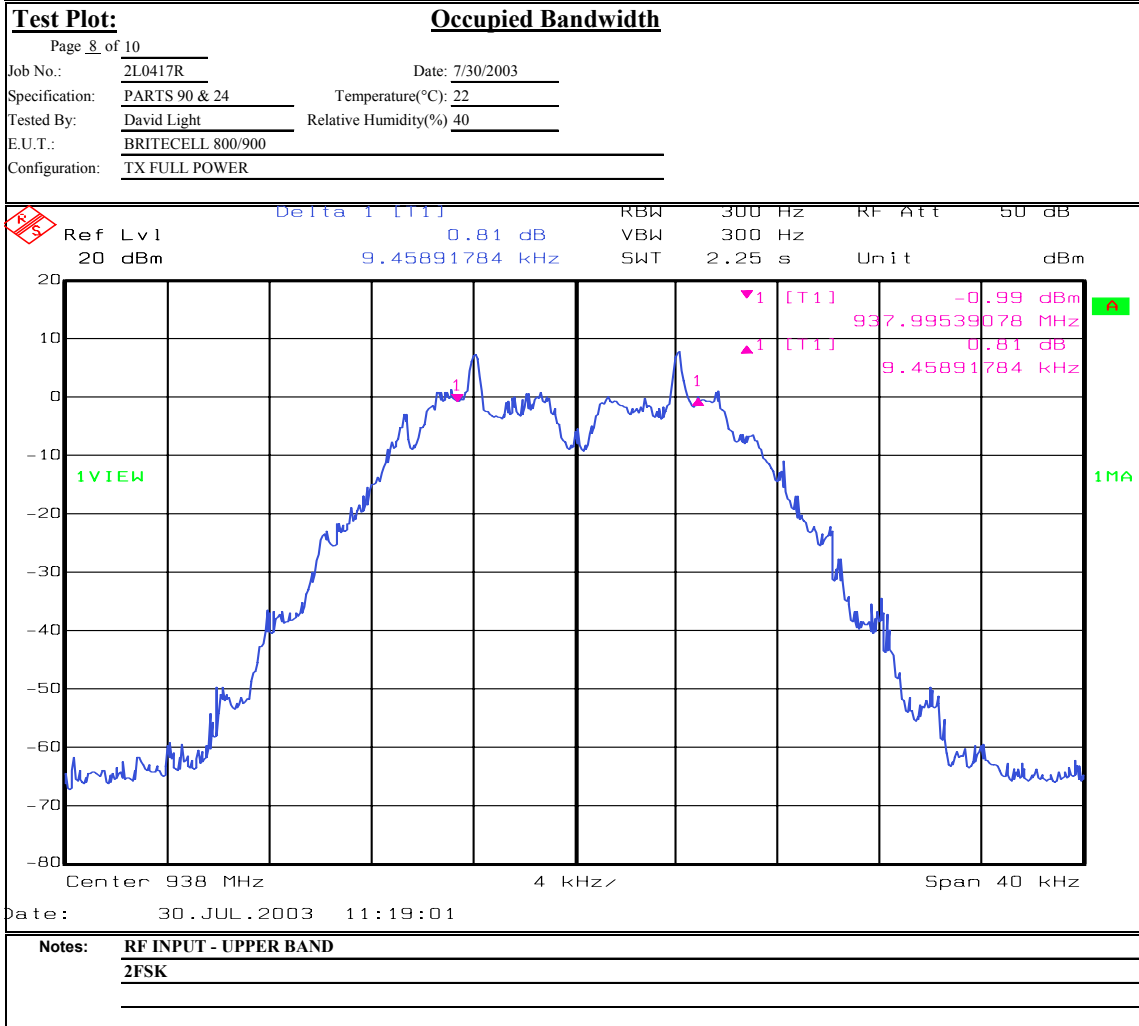
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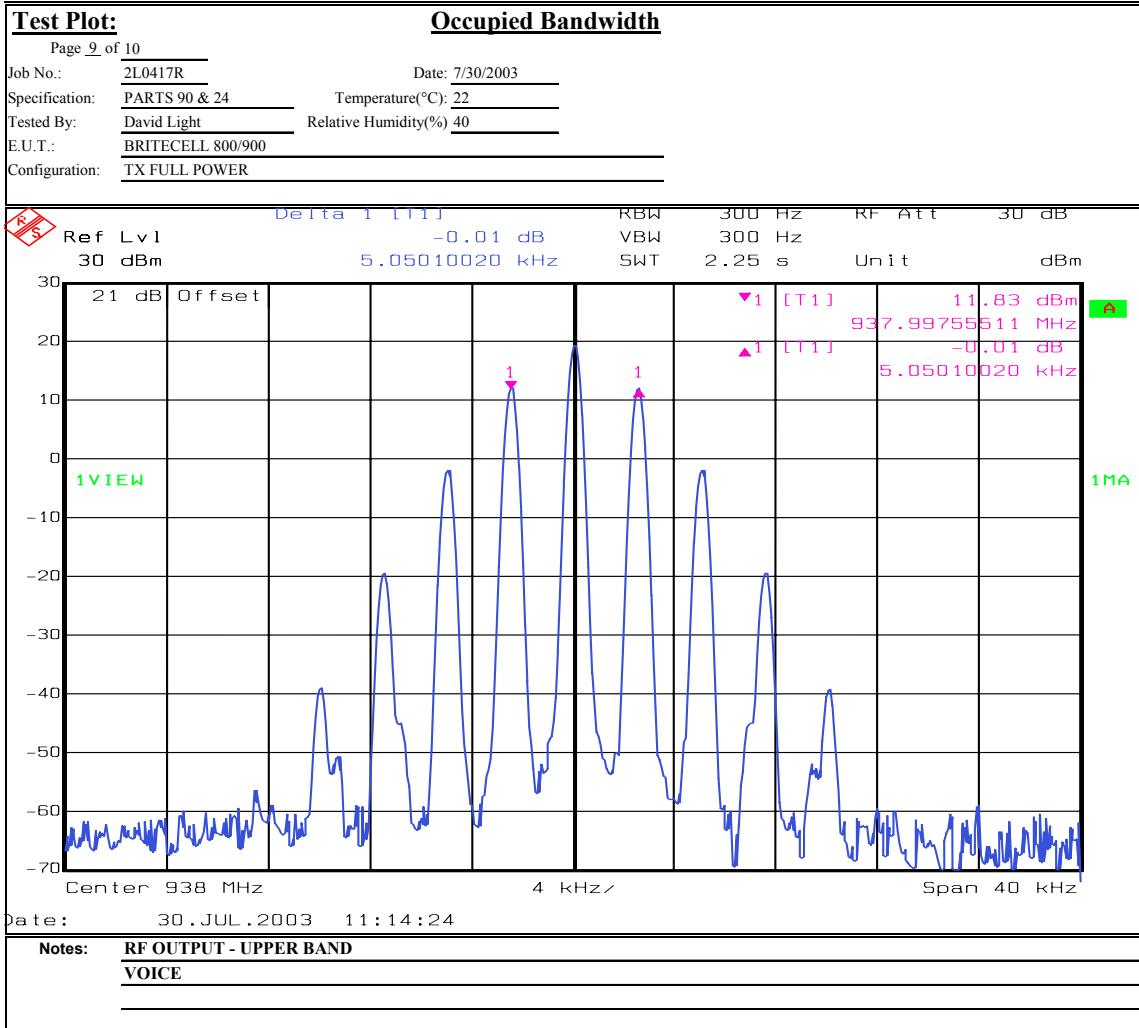
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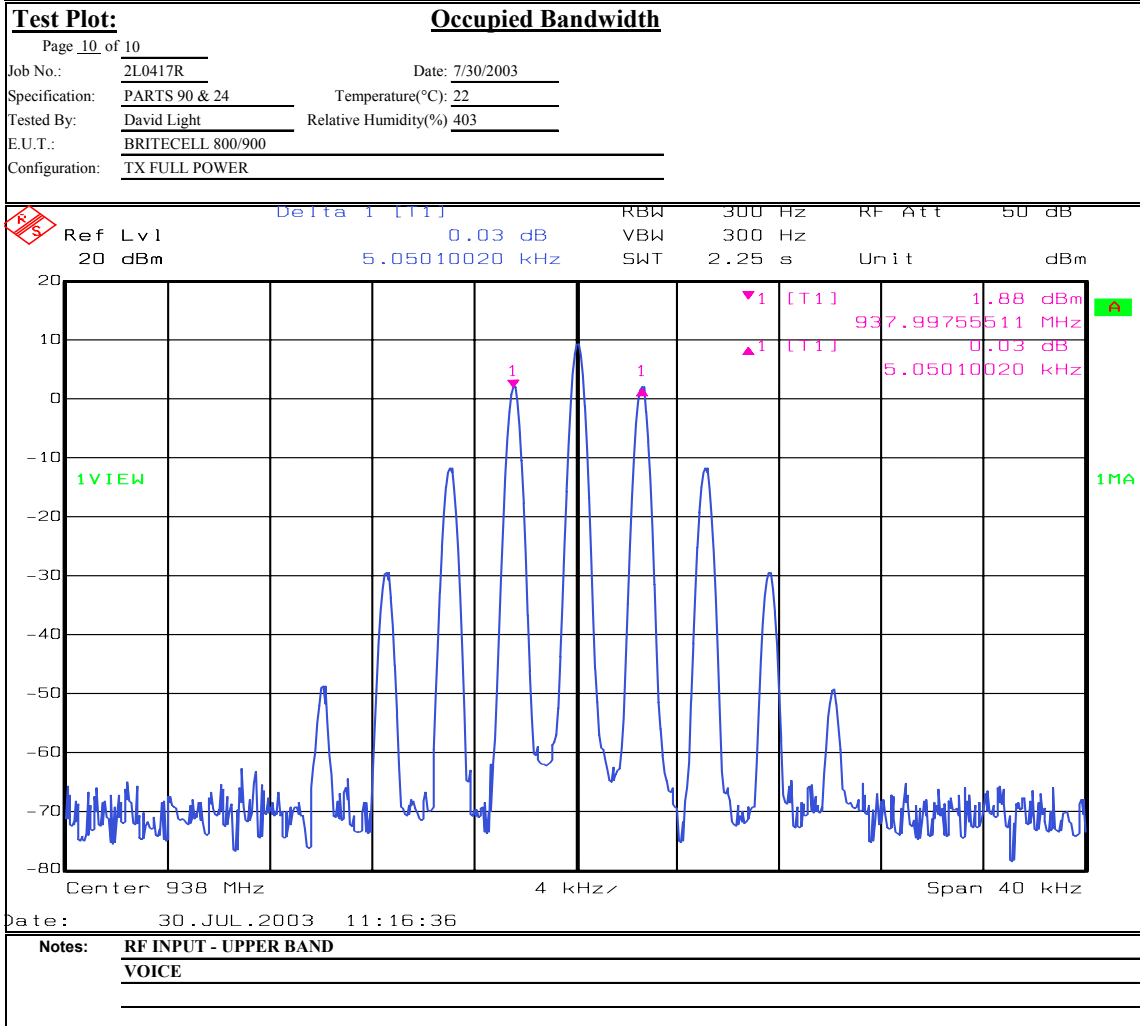
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Test data – Occupied Bandwidth



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EQUIPMENT: **BRITECELL 800/900**

PROJECT NO.: **2L0417RUS1**

Section 5. Spurious Emissions at Antenna Terminals

NAME OF TEST: Spurious Emissions @ Antenna Terminals	PARA. NO.: 2.991
TESTED BY: David Light	DATE: 7/30/03

Test Results: Complies.

Test Data: See attached graph(s).

EQUIPMENT: BRITECELL 800/900

PROJECT NO.: 2L0417RUS1

Test Data – Spurious Emissions at Antenna Terminals



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Data Plot

Page 1 of 10

Job No.: 2L0417R

Date: 7/30/2003

Specification: PARTS 90 & 24

Temperature(°C): 22

Tested By: David Light

Relative Humidity(%)	40
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E.U.T.:	BRITECELL 800/900
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Configuration: TX FULL POWER

Sample Number: 1

Location:	Lab
-----------	-----

Detector Type:	Peak
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RBW: Refer to plots

VBW: Refer to plots

Measurement

Distance: NA m

Test Equipment Used

Antenna:

Directional Coupler:

Pre-Amp: _____

Cable #1: 1629

Filter: _____

Cable #2:

Receiver:	1036
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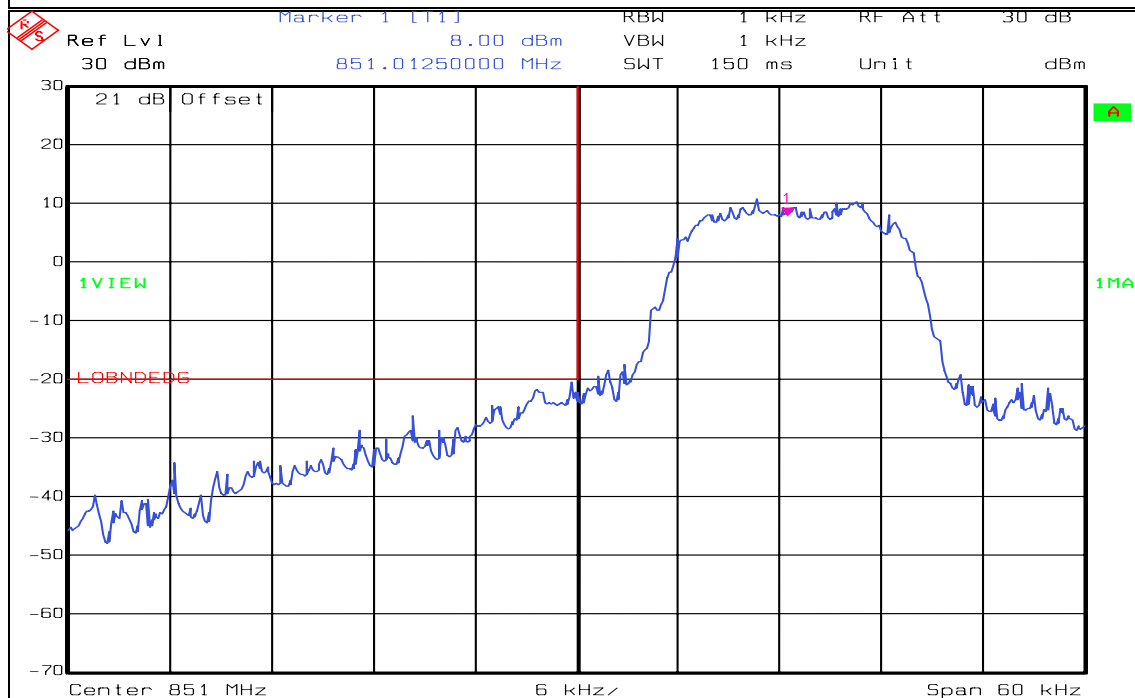
Cable #3: _____

Attenuator #1	1064
---------------	------

Cable #4: _____

Attenuator #2: _____

Additional equipment used:	
Measurement Uncertainty:	+/-1.7 dB



Date: 30.JUL.2003 06:27:34

Notes: **LOWEST OPERATING FREQUENCY - SMR BAND - iDEN**

EQUIPMENT: BRITECELL 800/900

PROJECT NO.: 2L0417RUS1

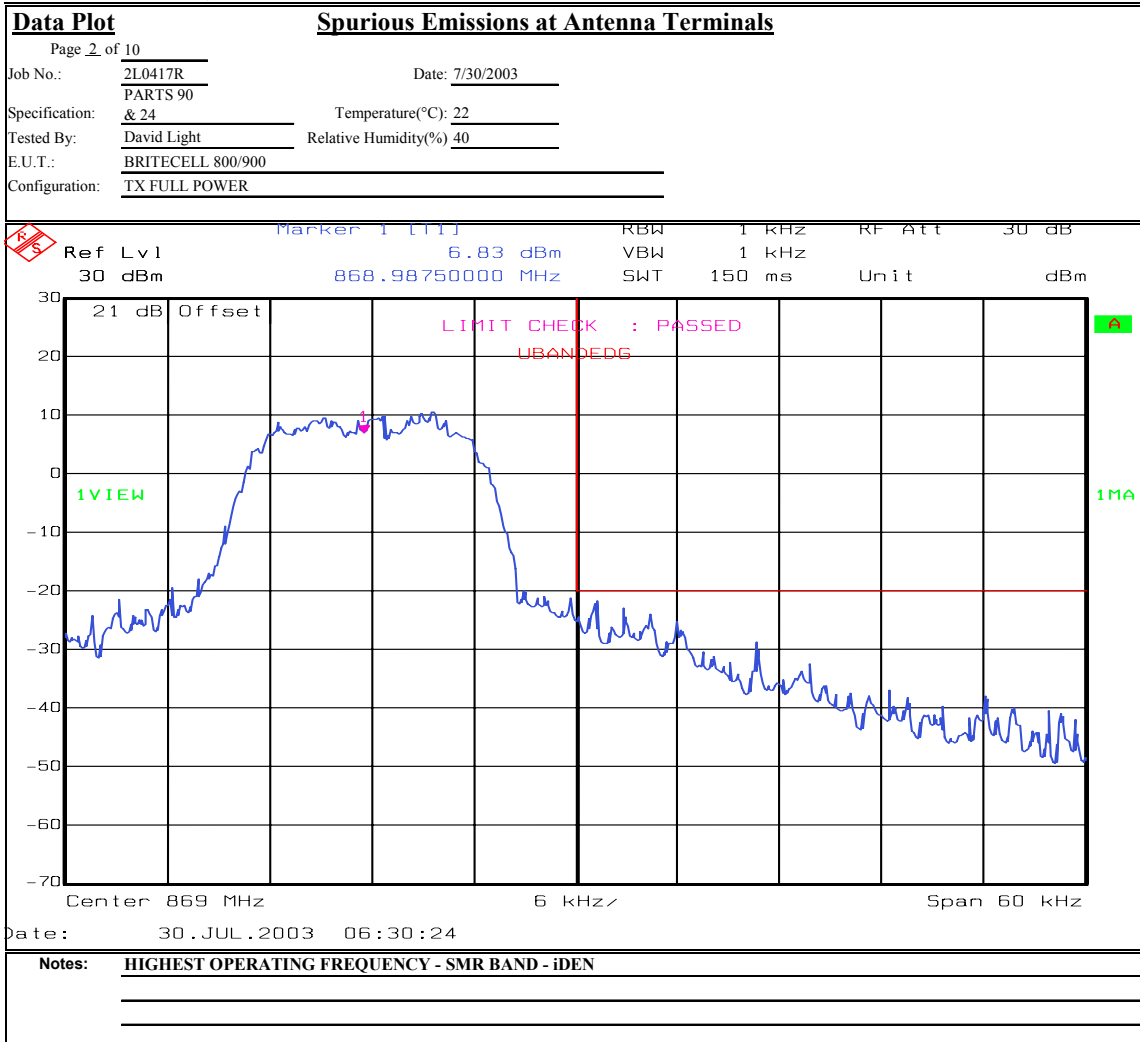
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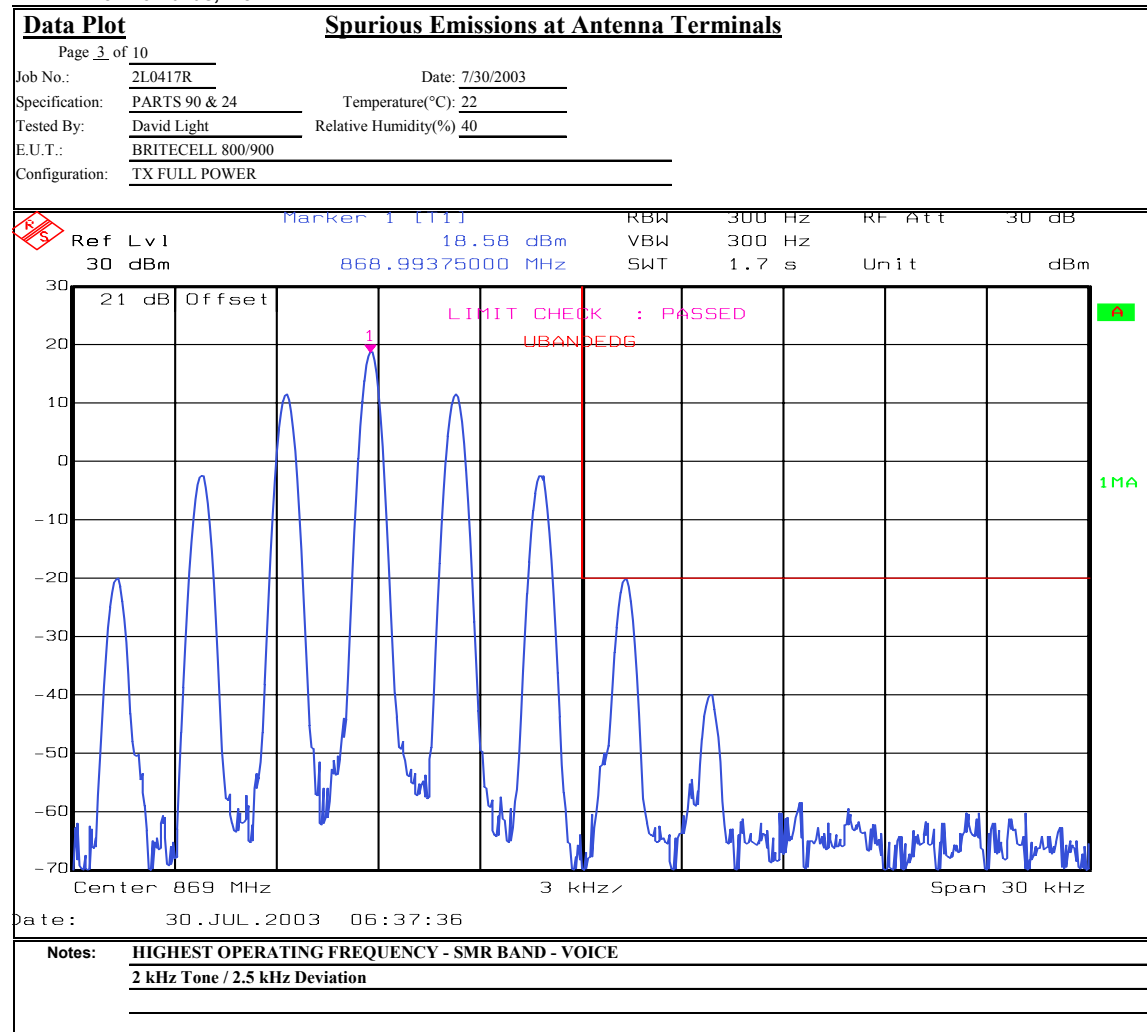
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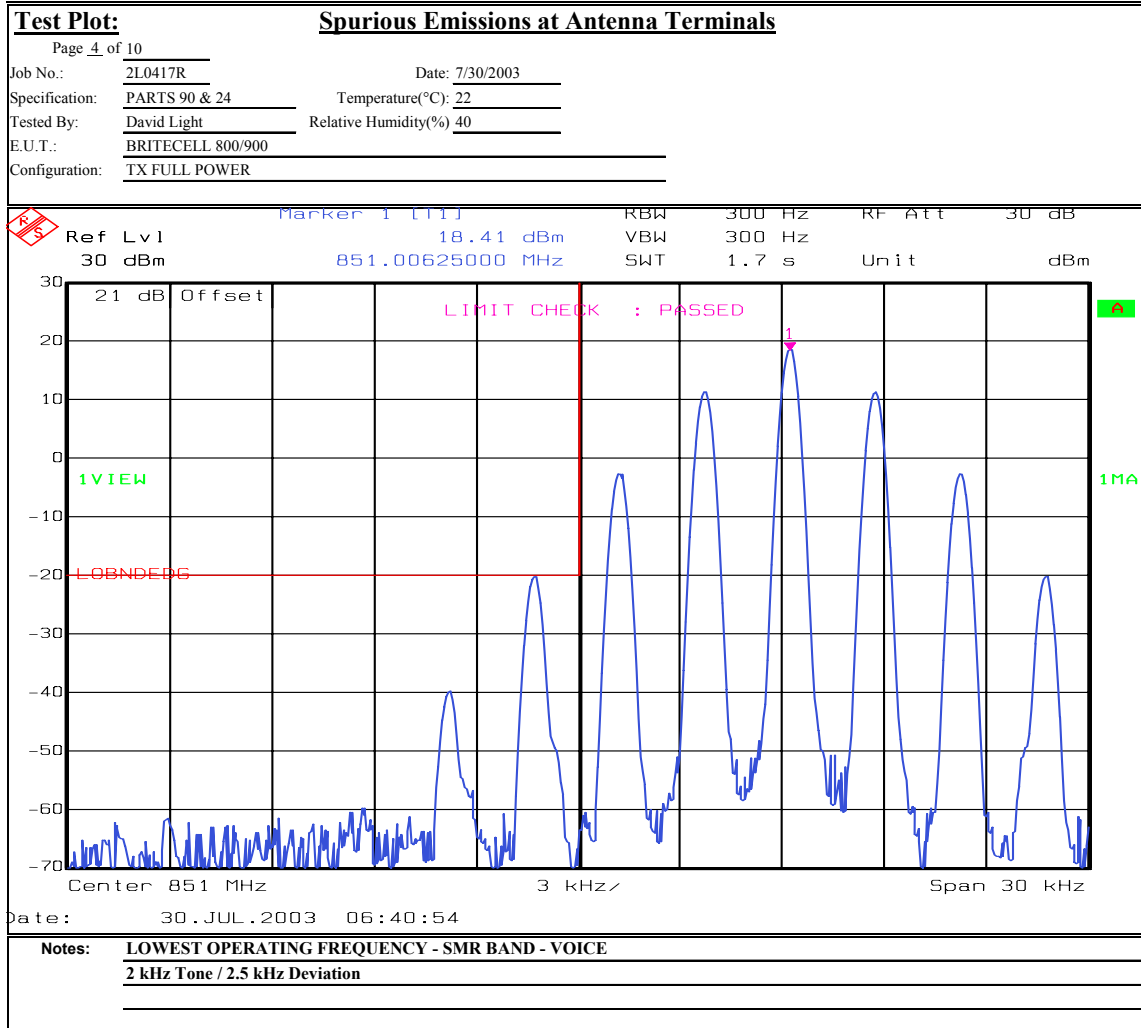
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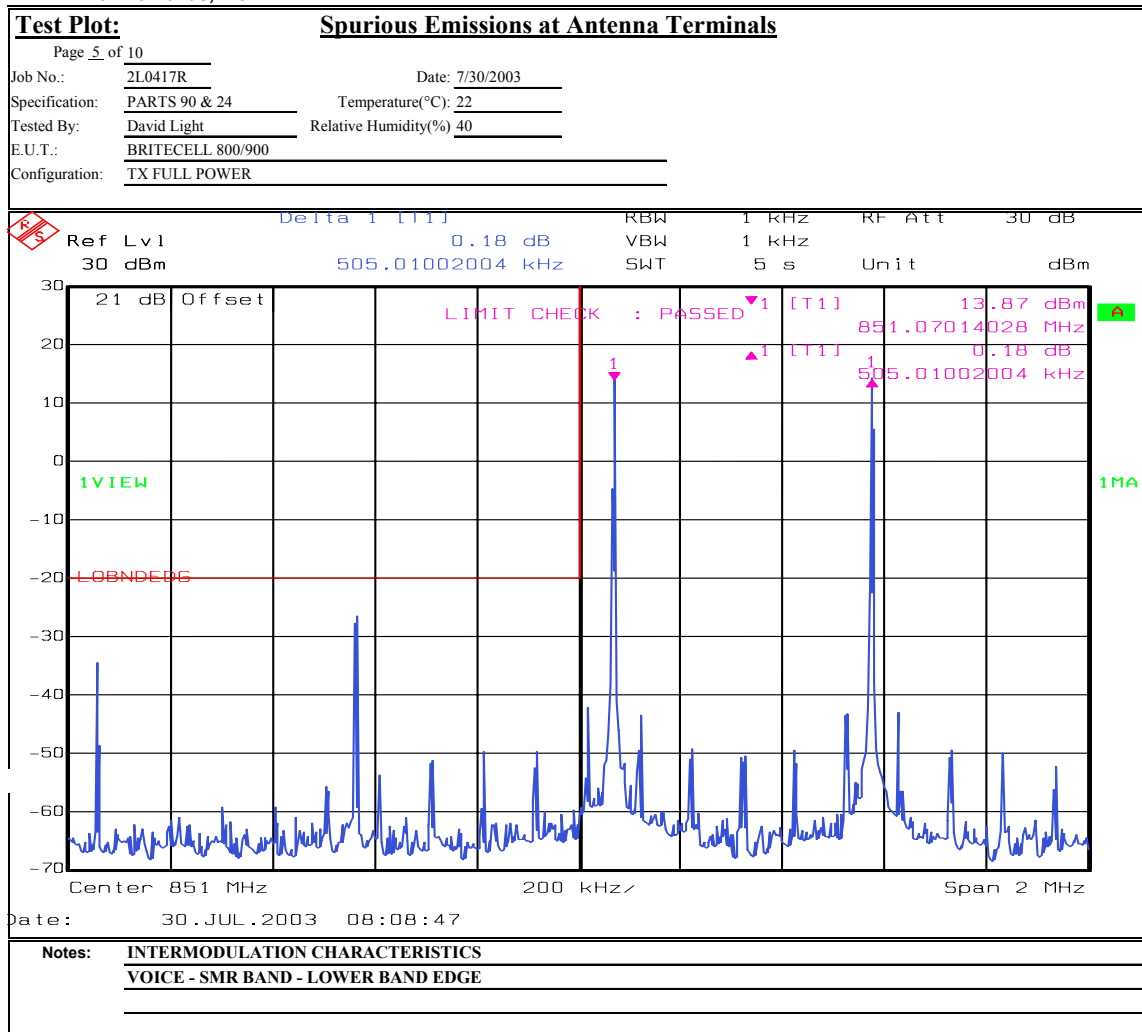
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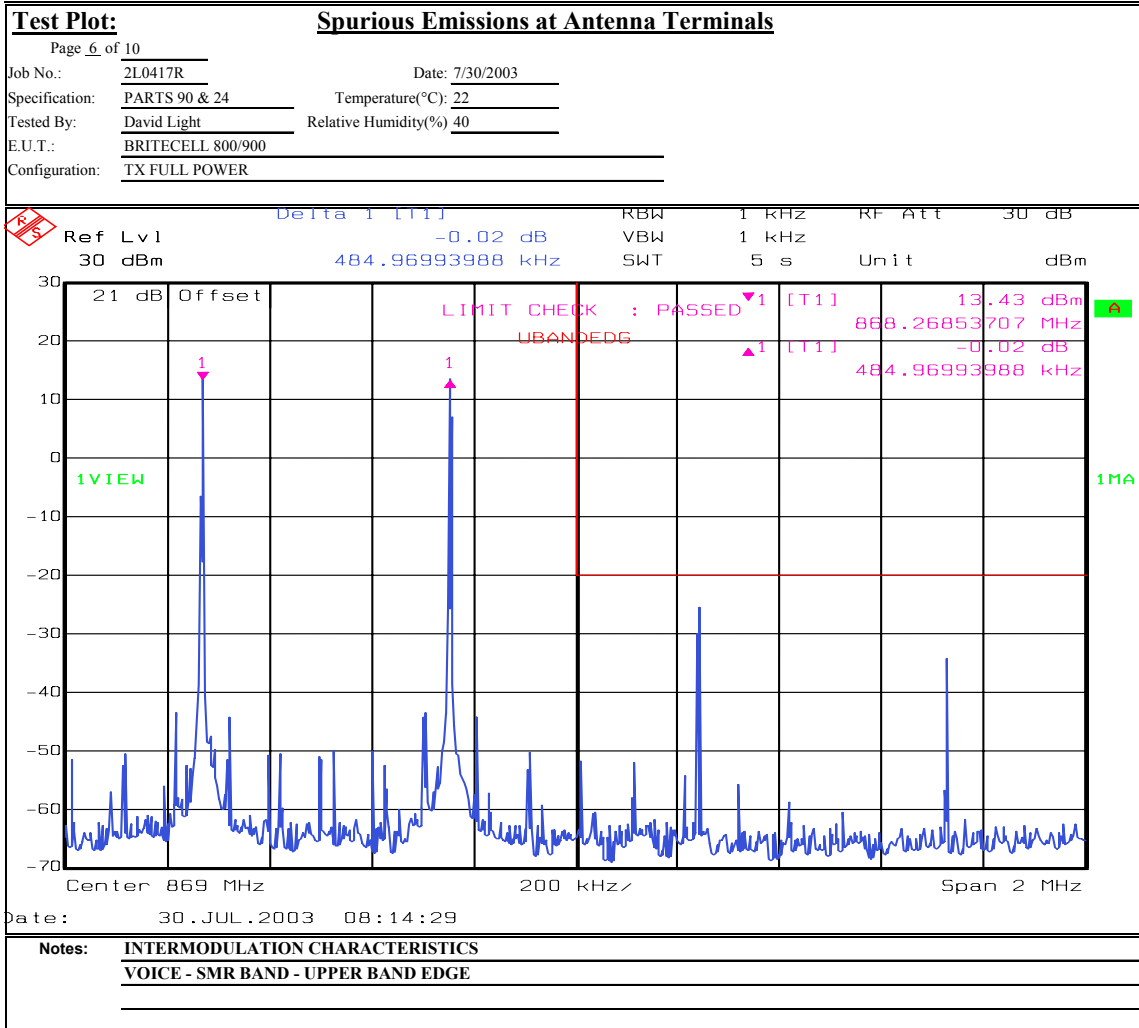
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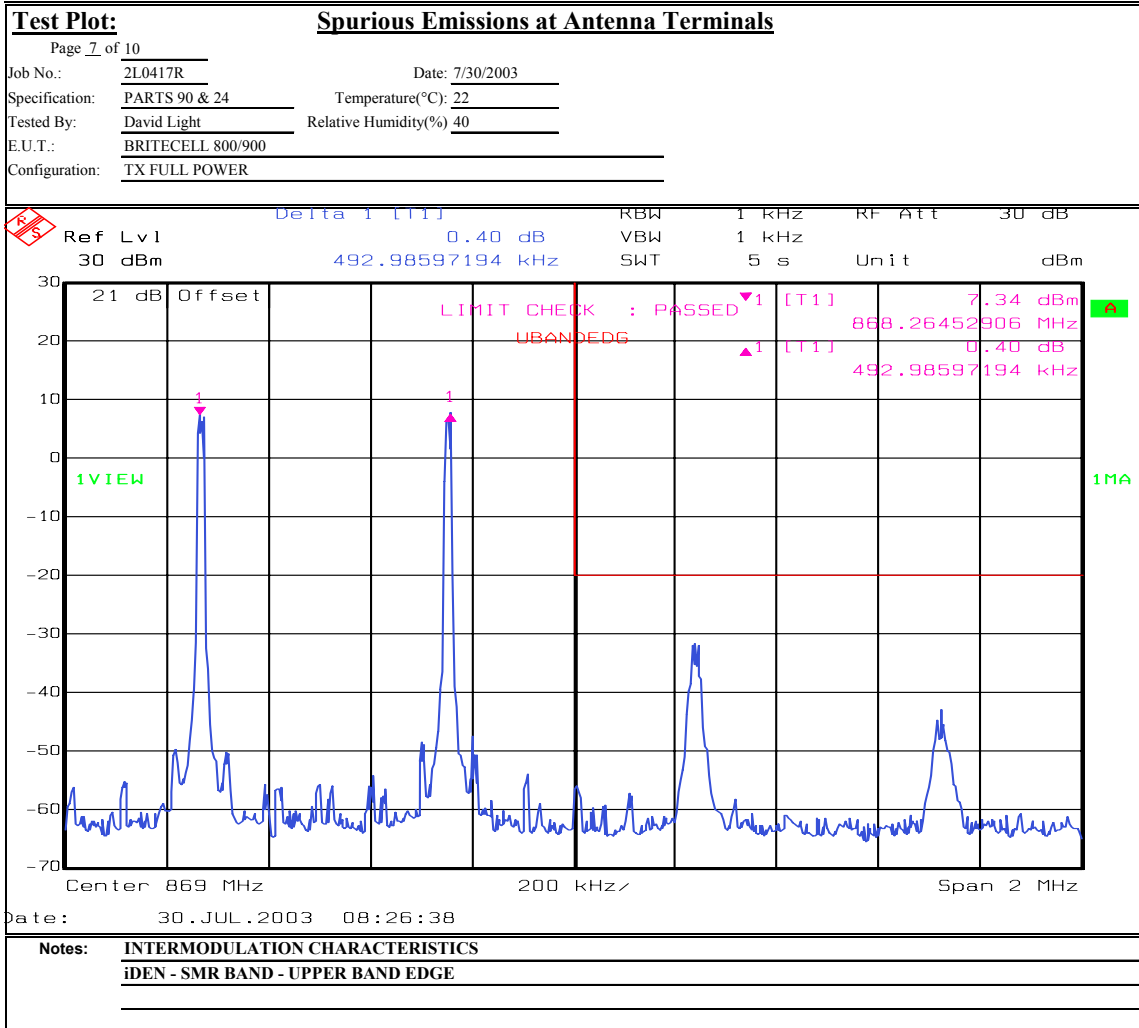
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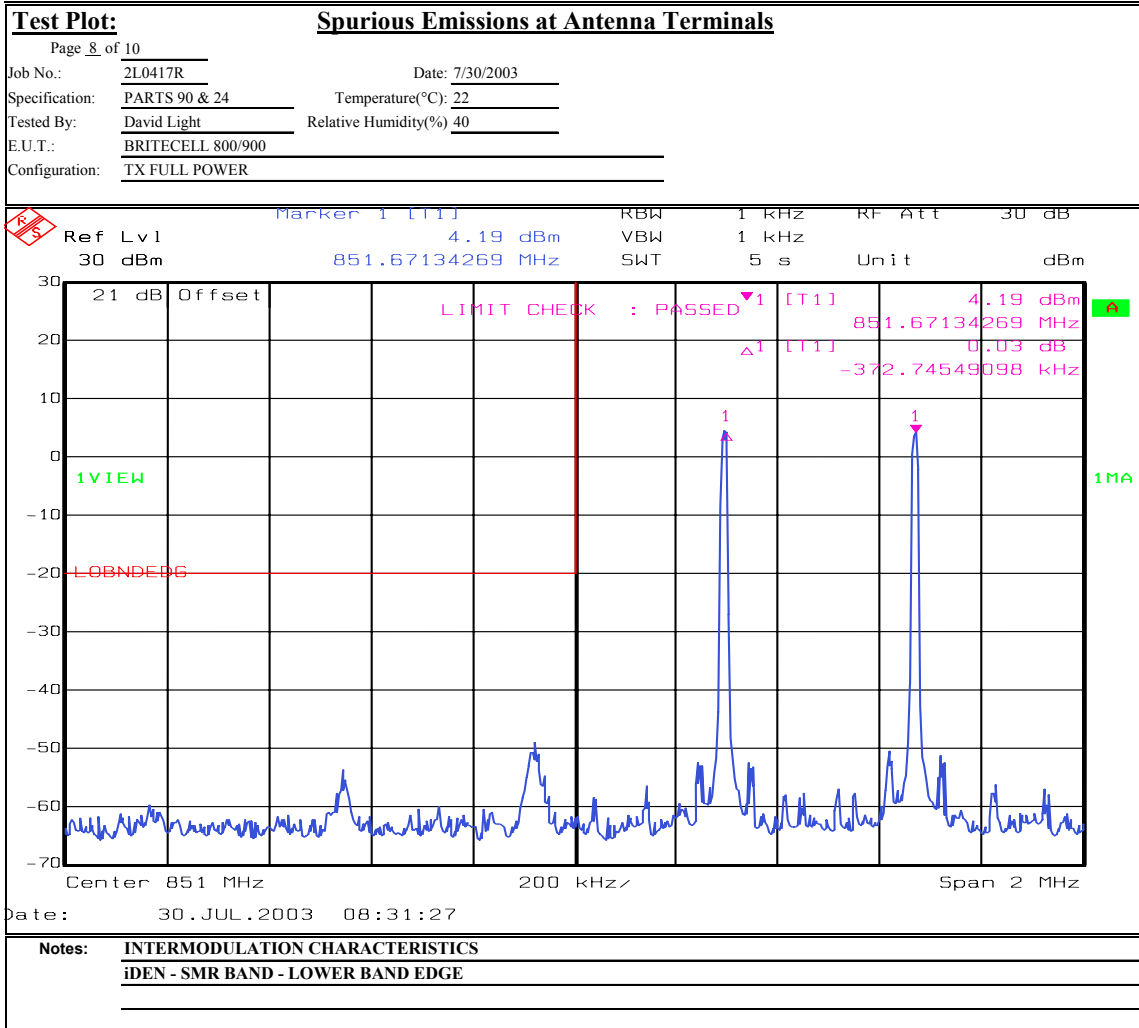
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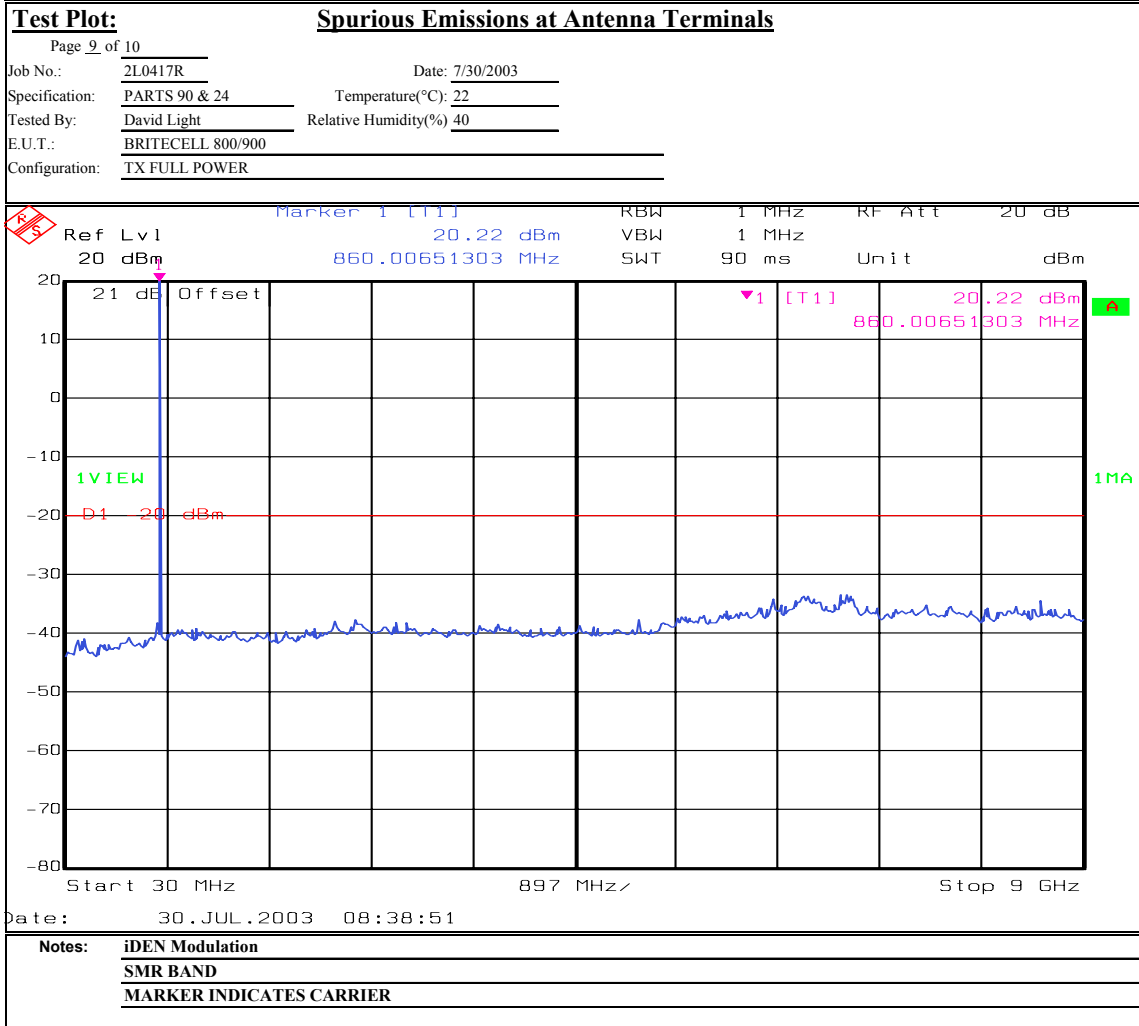
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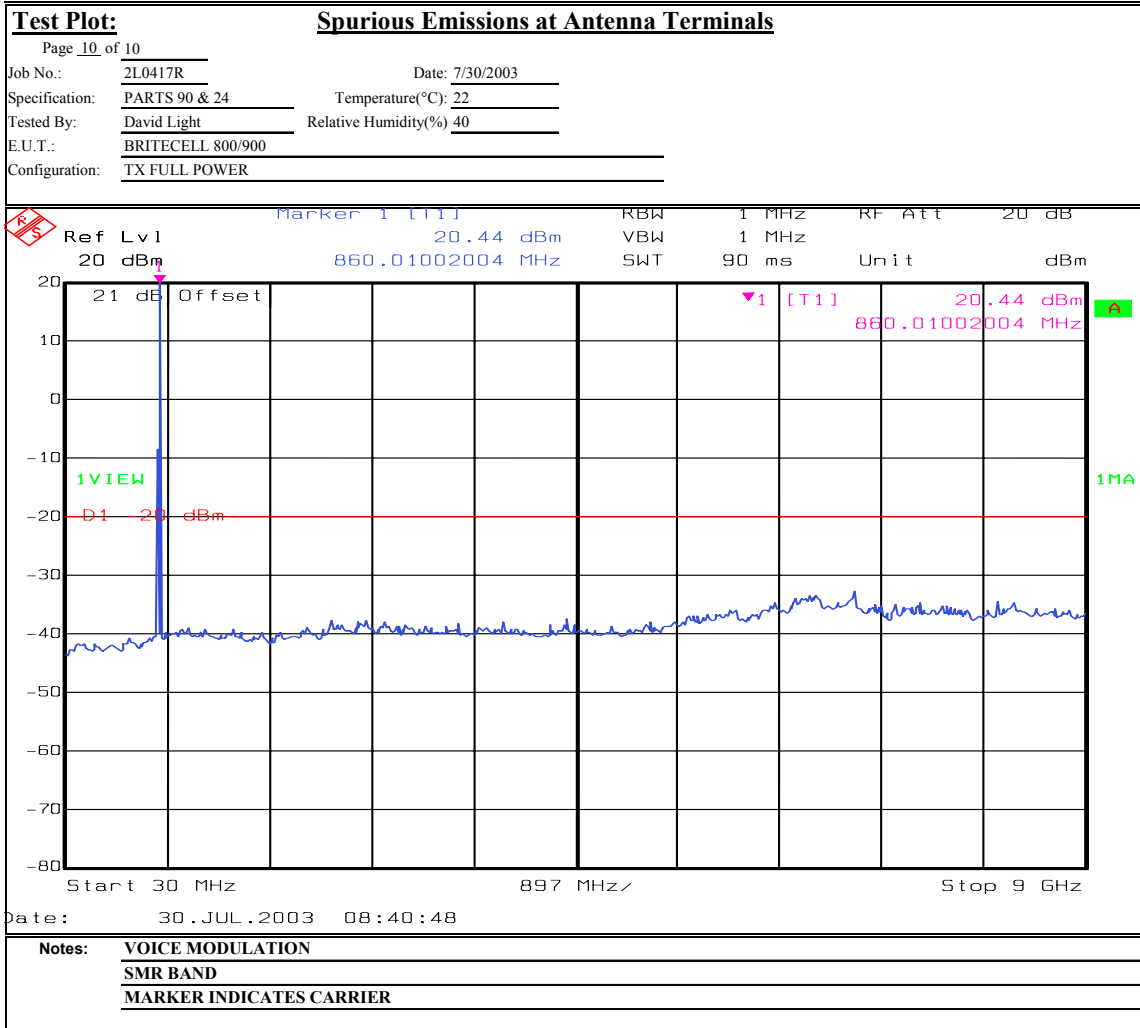
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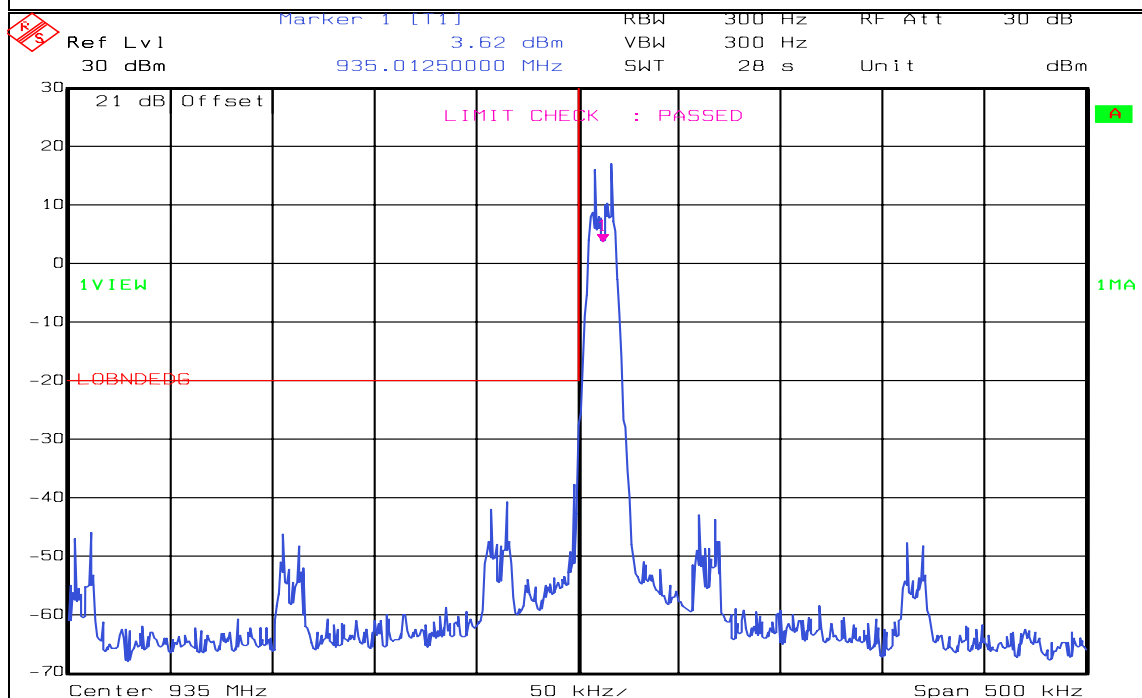
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Data Plot		Spurious Emissions at Antenna Terminals	
Page 1 of 15		Complete <u>X</u>	
Job No.: 2L0417R	Date: 7/30/2003	Preliminary: _____	
Specification: PARTS 90 & 24	Temperature(°C): 22		
Tested By: David Light	Relative Humidity(%): 40		
E.U.T.: BRITECELL 800/900			
Configuration: TX FULL POWER - UPPER BAND			
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: 1629		
Filter: _____	Cable #2: _____		
Receiver: 1036	Cable #3: _____		
Attenuator #1: 1064	Cable #4: _____		
Attenuator #2: _____	Mixer: _____		
Additional equipment used: _____			
Measurement Uncertainty: +/-1.7 dB			
			
Date: 30.JUL.2003 09:47:21			
Notes: LOWEST OPERATING FREQUENCY - UPPER BAND - 2FSK			

EQUIPMENT: BRITECELL 800/900

PROJECT NO.: 2L0417RUS1

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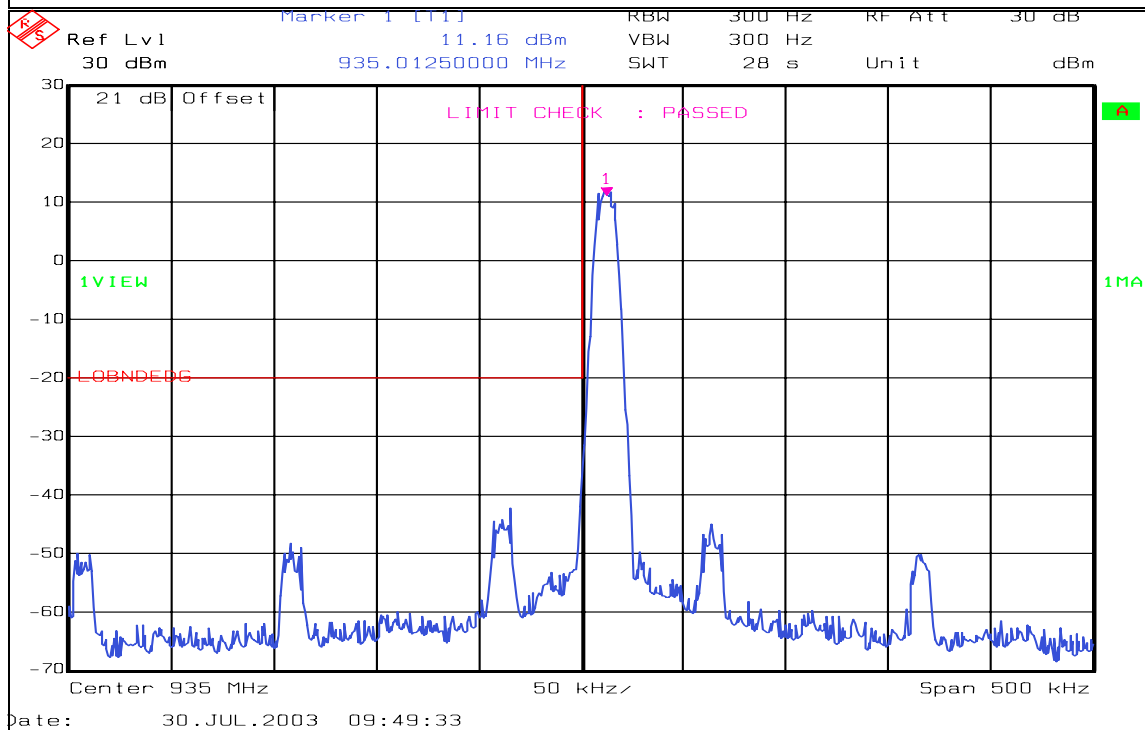
Nemko Dallas, Inc.

Data Plot

Page 2 of 15

Job No.:	2L0417R	Date:	7/30/2003
Specification:	PARTS 90 & 24	Temperature(°C):	22
Tested By:	David Light	Relative Humidity(%)	40
E.U.T.:	BRITECELL 800/900		
Configuration:	TX FULL POWER - UPPER BAND		

Spurious Emissions at Antenna Terminals



Notes: **LOWEST OPERATING FREQUENCY - UPPER BAND - 4FSK**

EQUIPMENT: BRITECELL 800/900

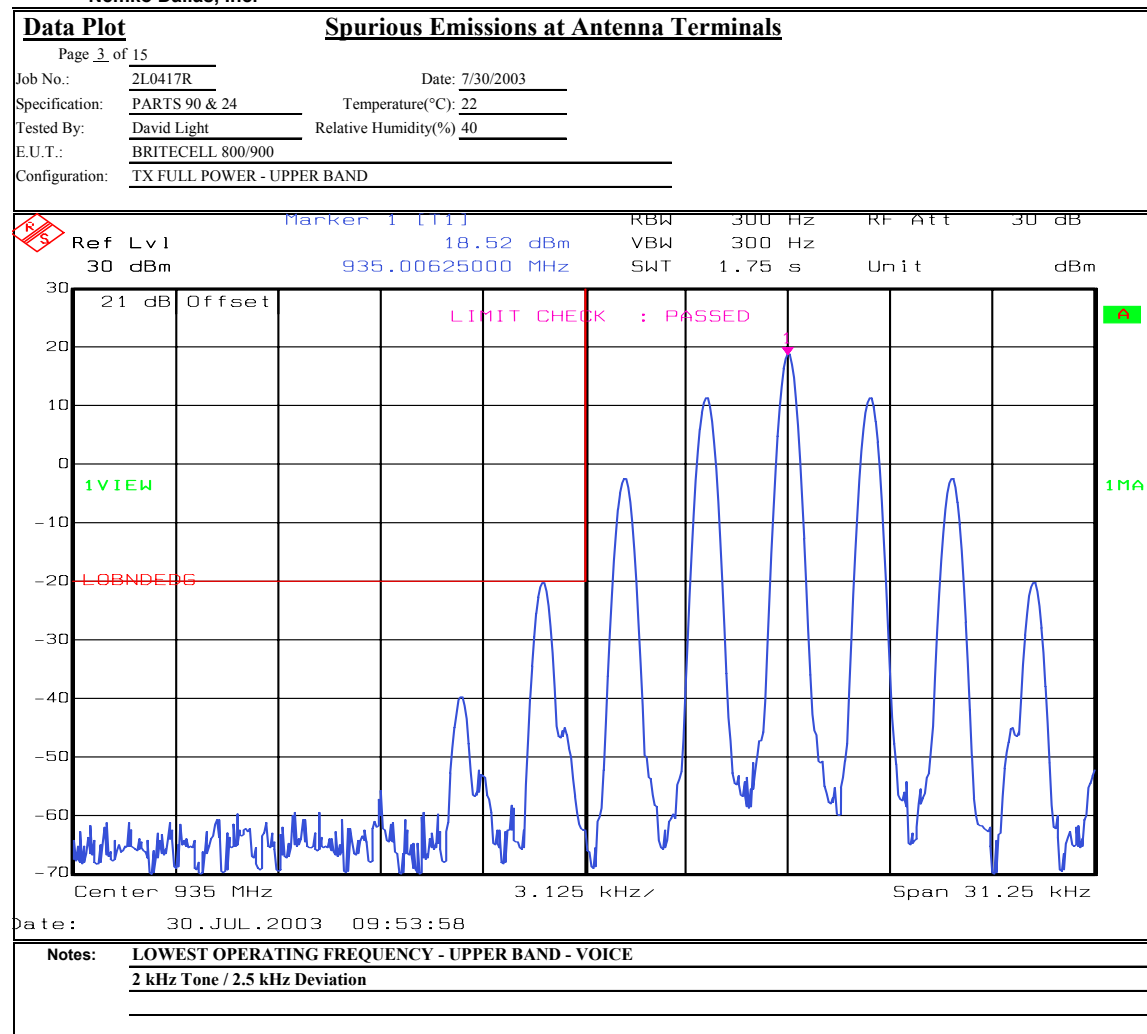
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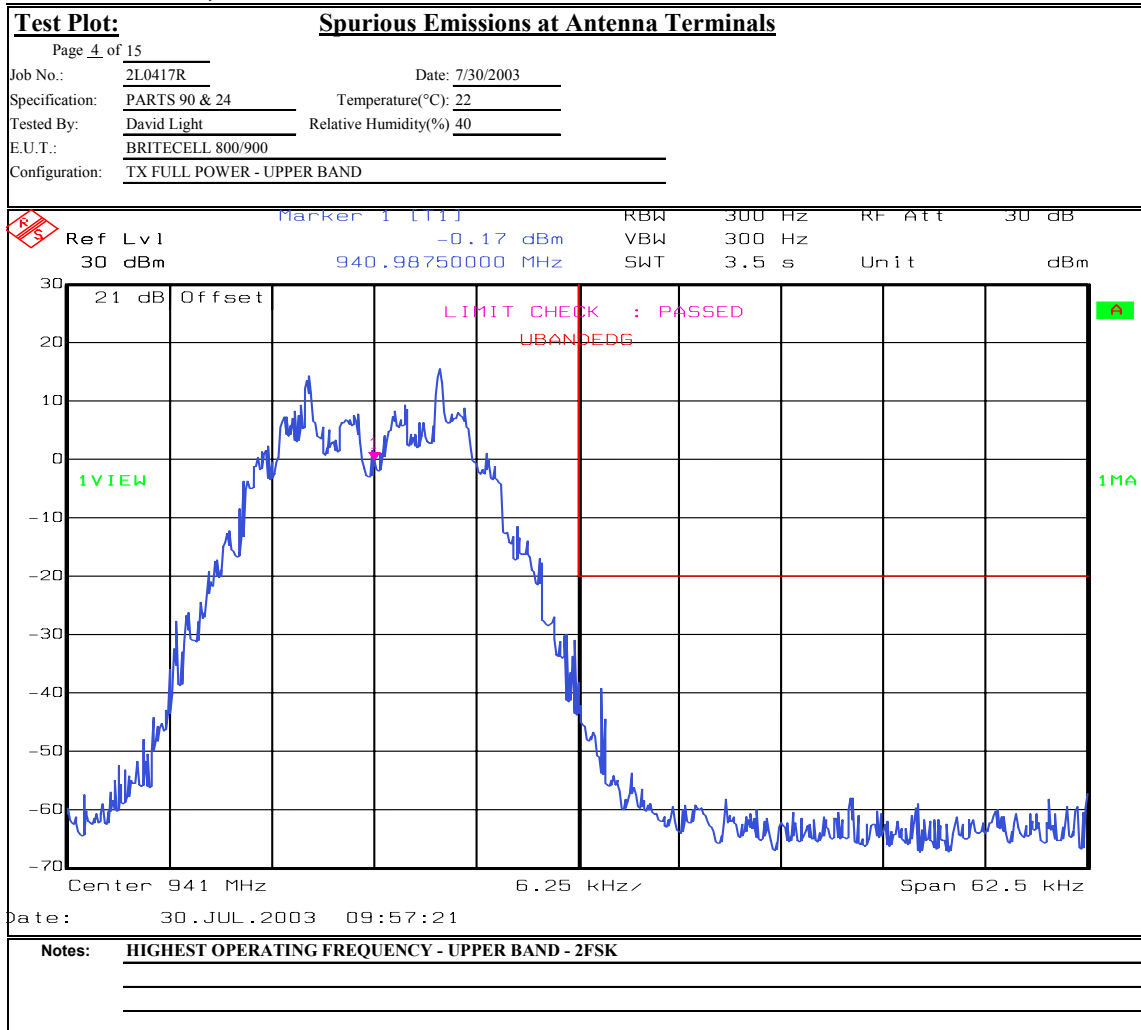
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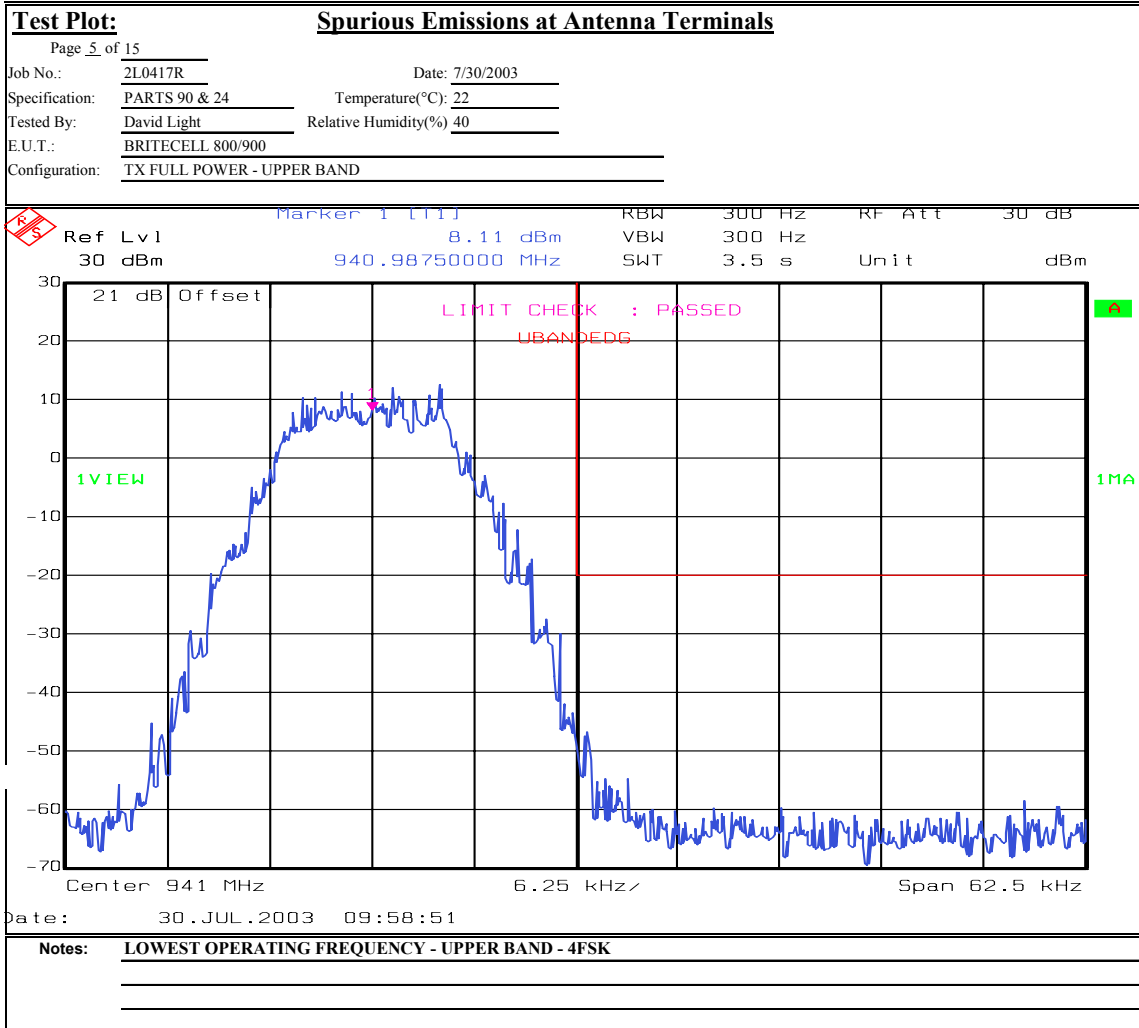
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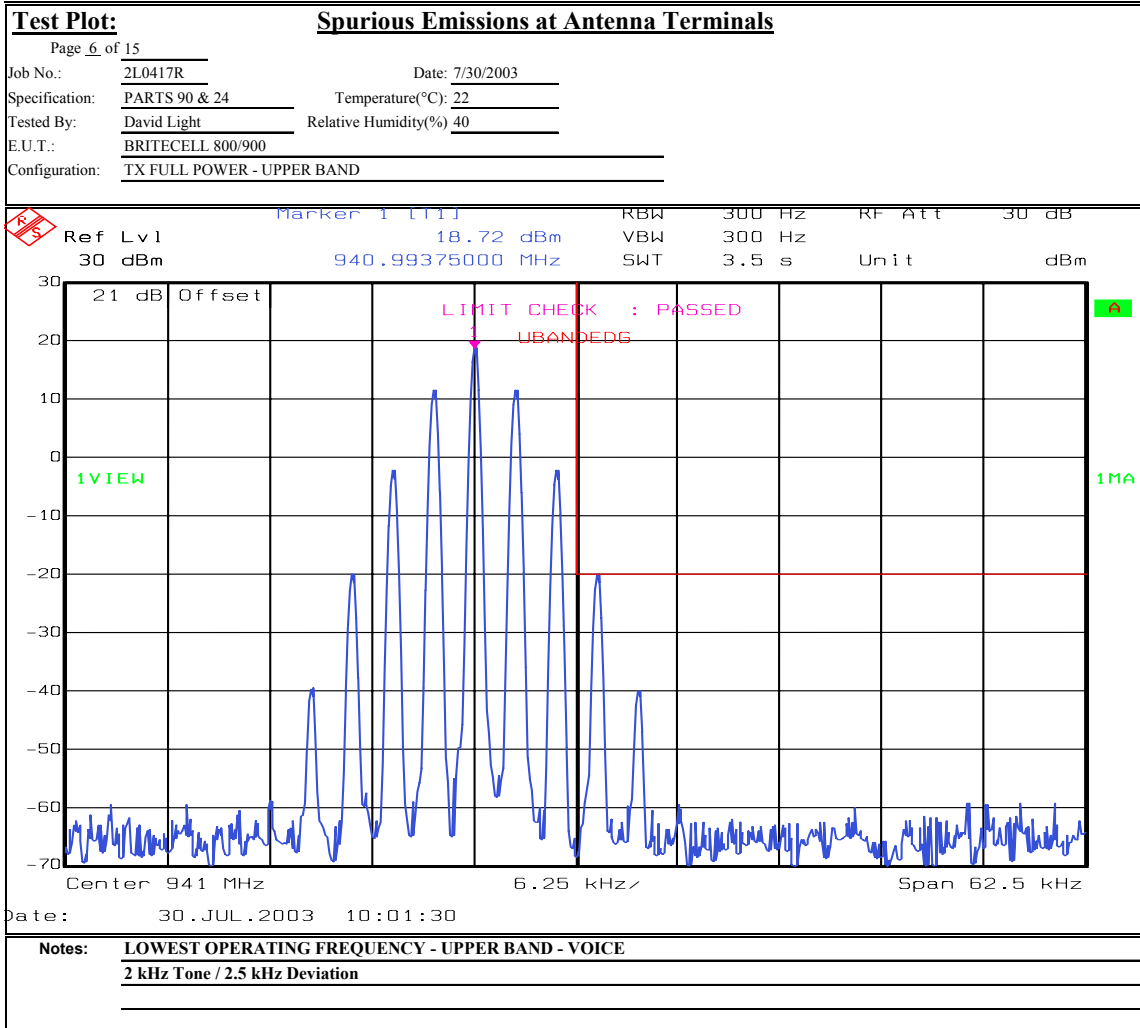
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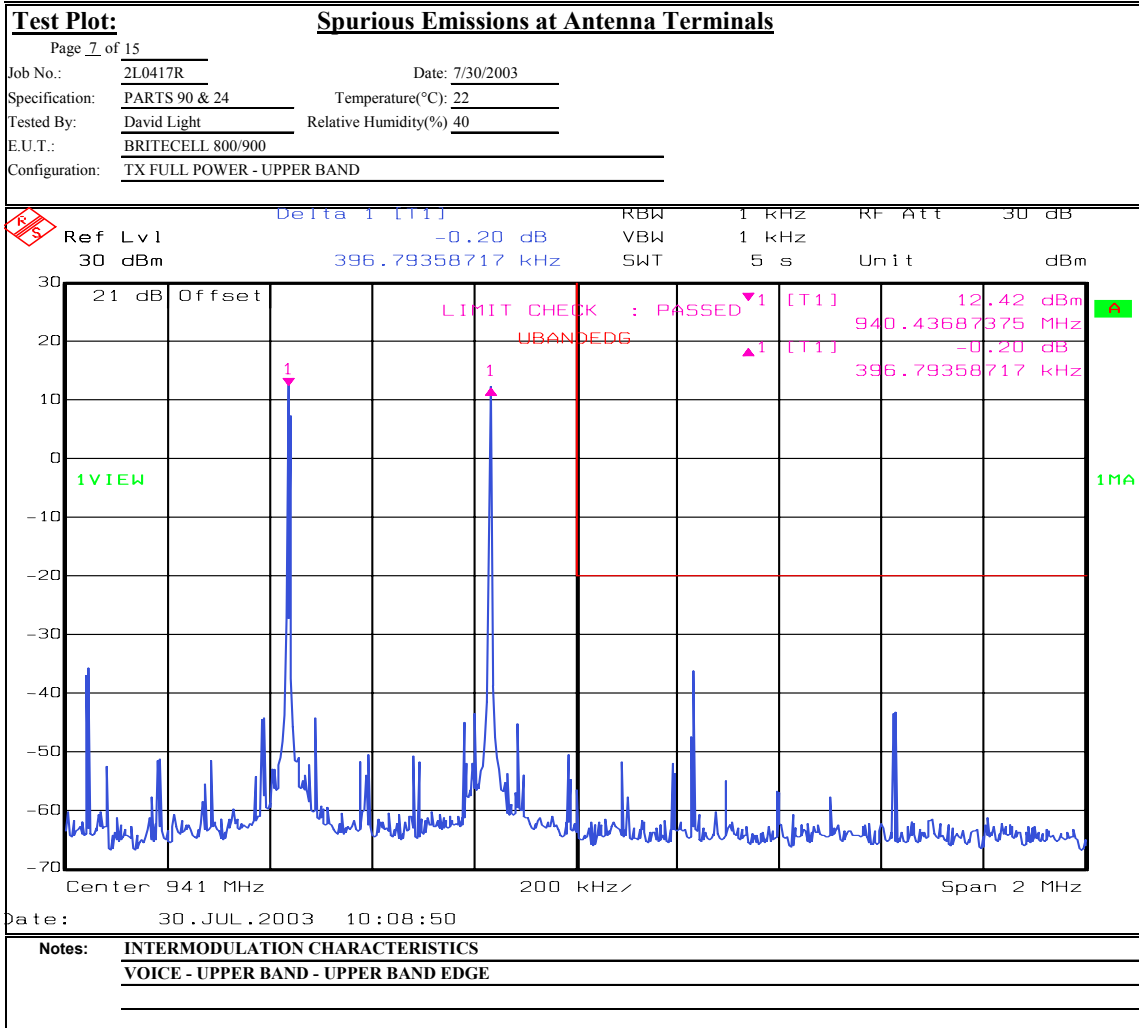
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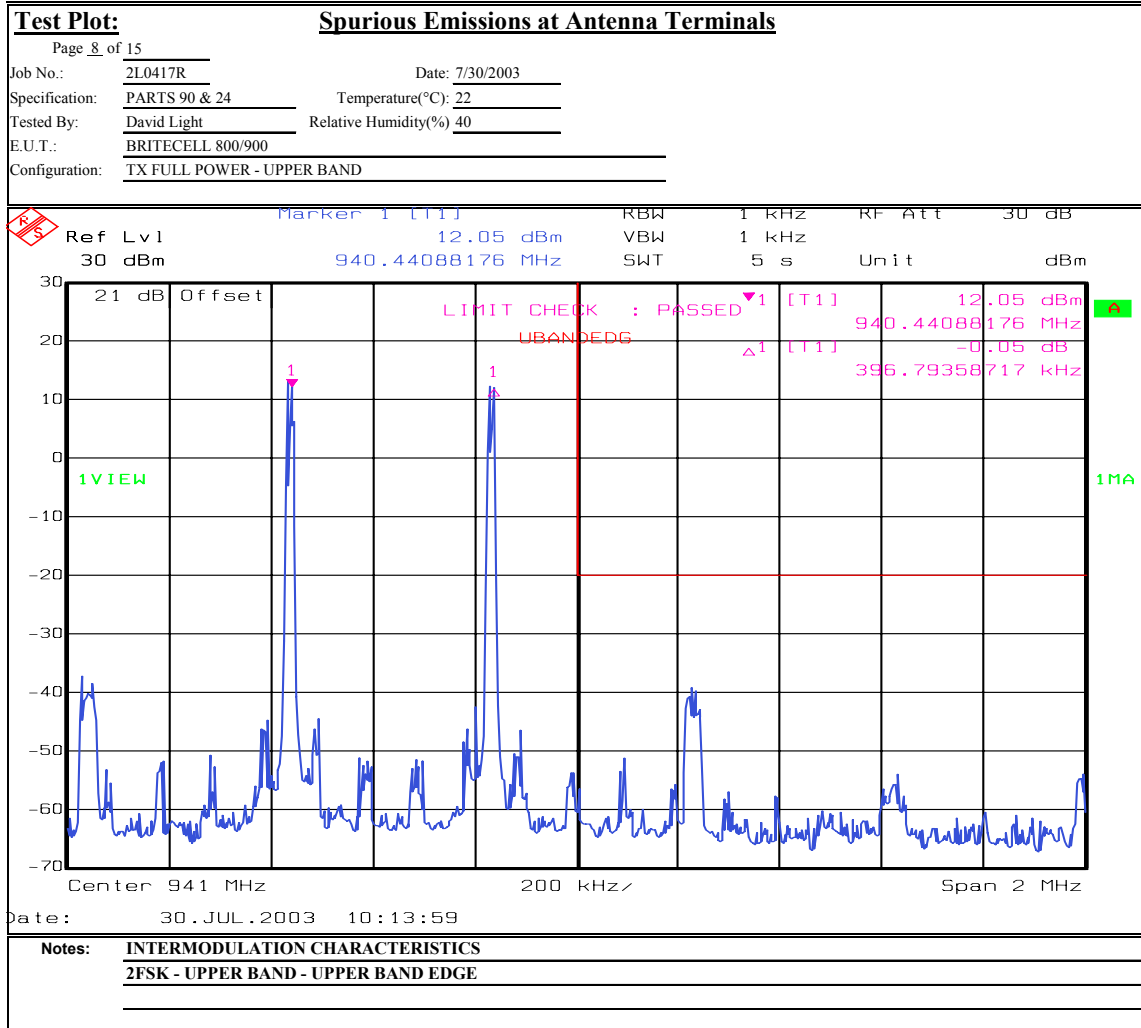
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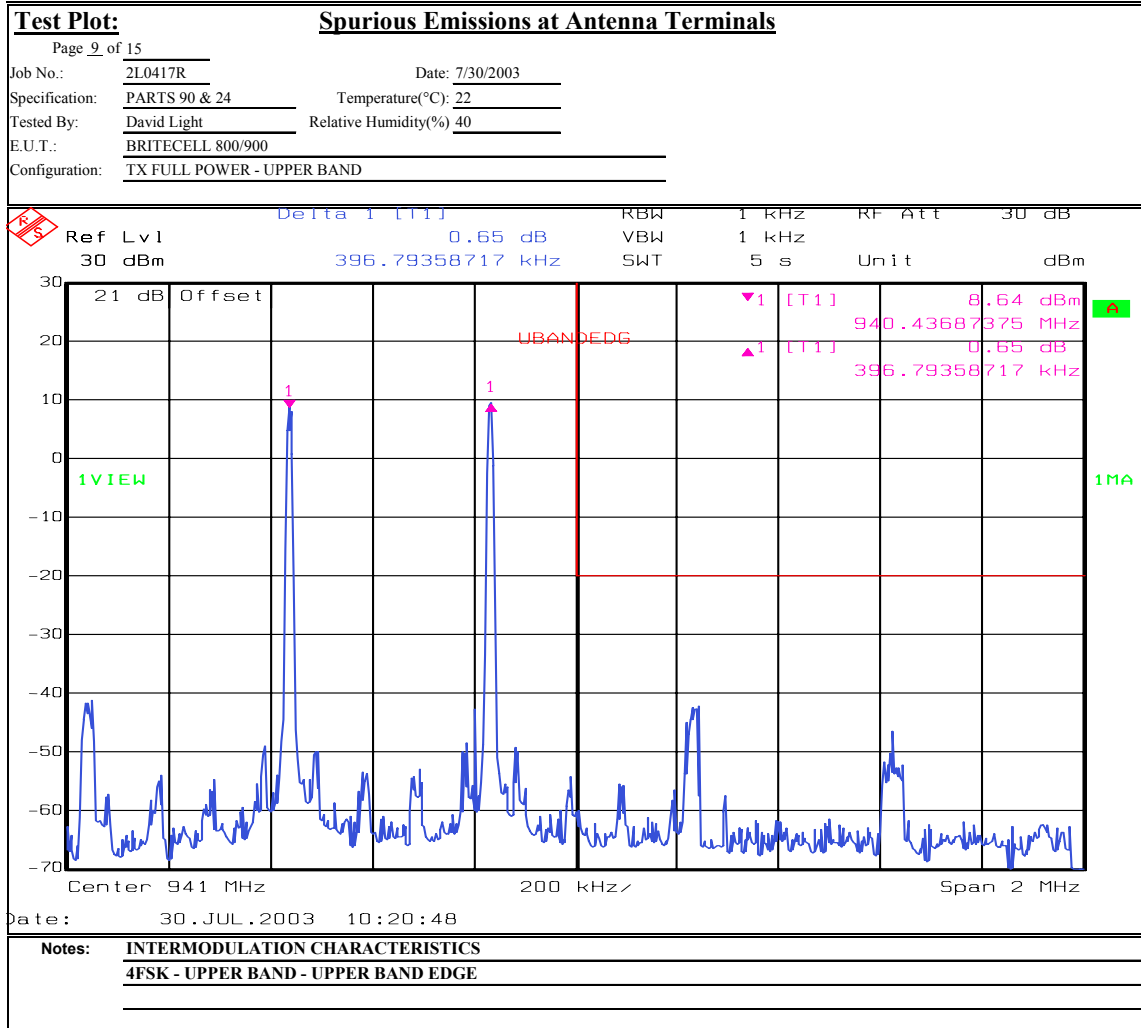
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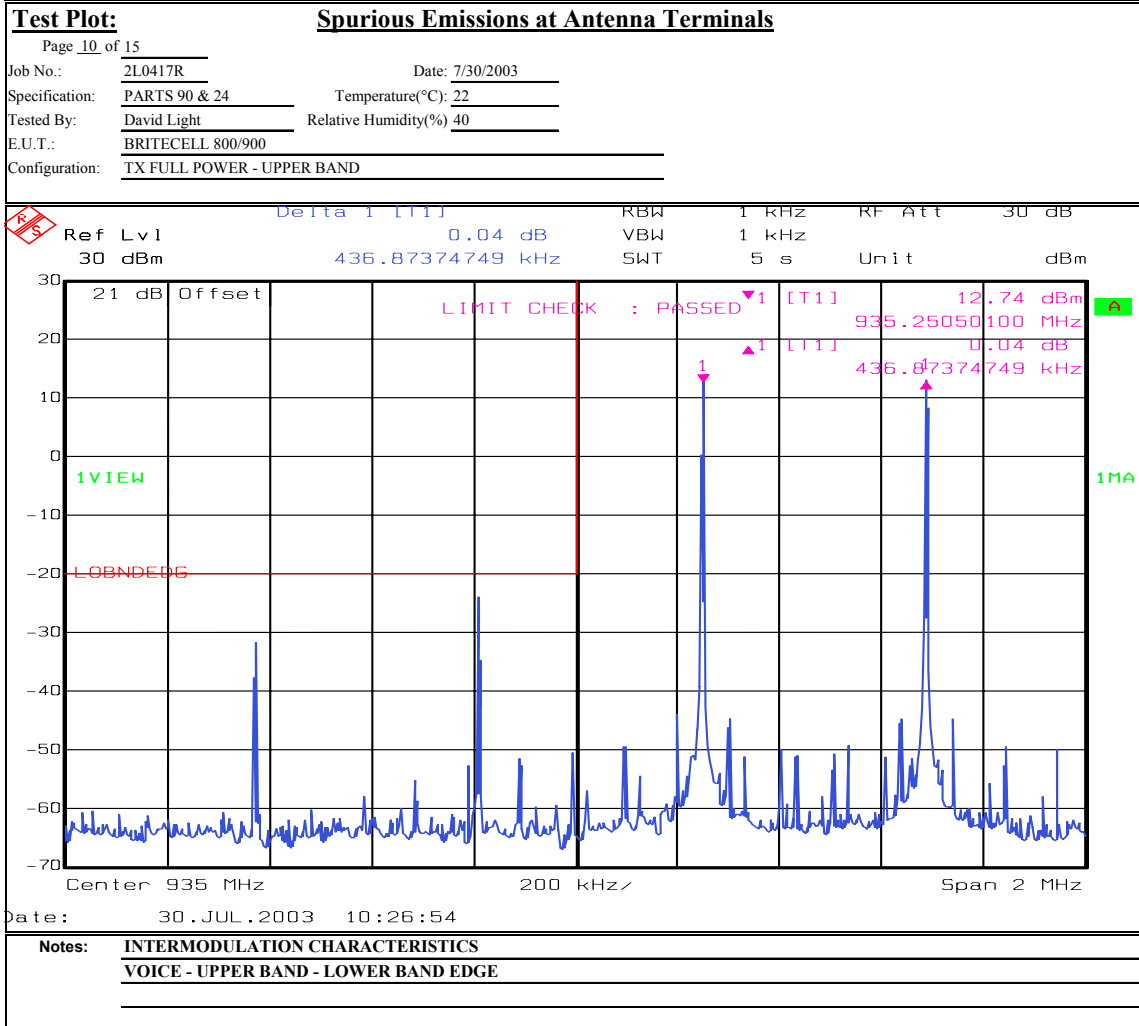
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Nemko Dallas, Inc.

Dallas Headquarters:

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

EQUIPMENT: BRITECELL 800/900

PROJECT NO.: 2L0417RUS1

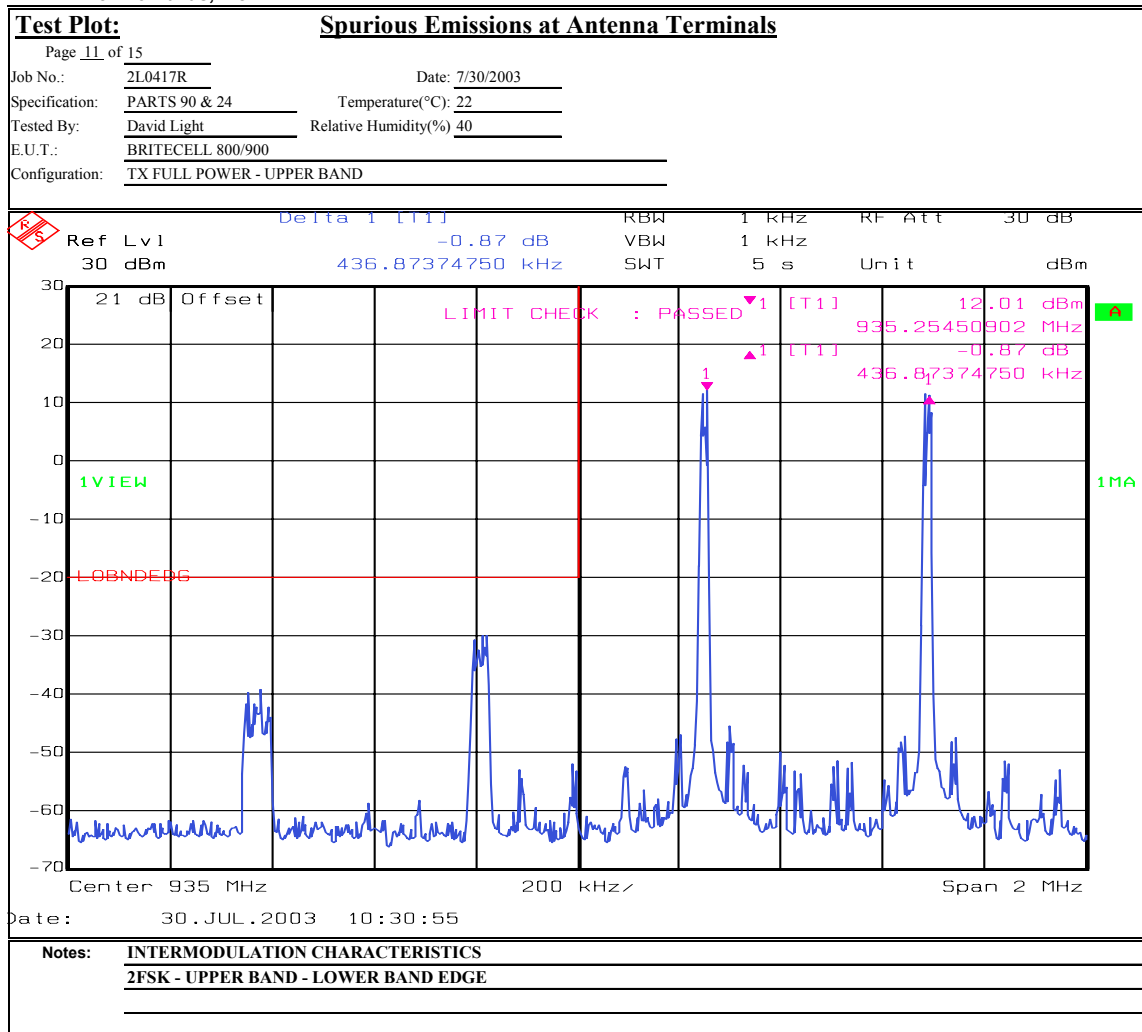
Test Data – Spurious Emissions at Antenna Terminals



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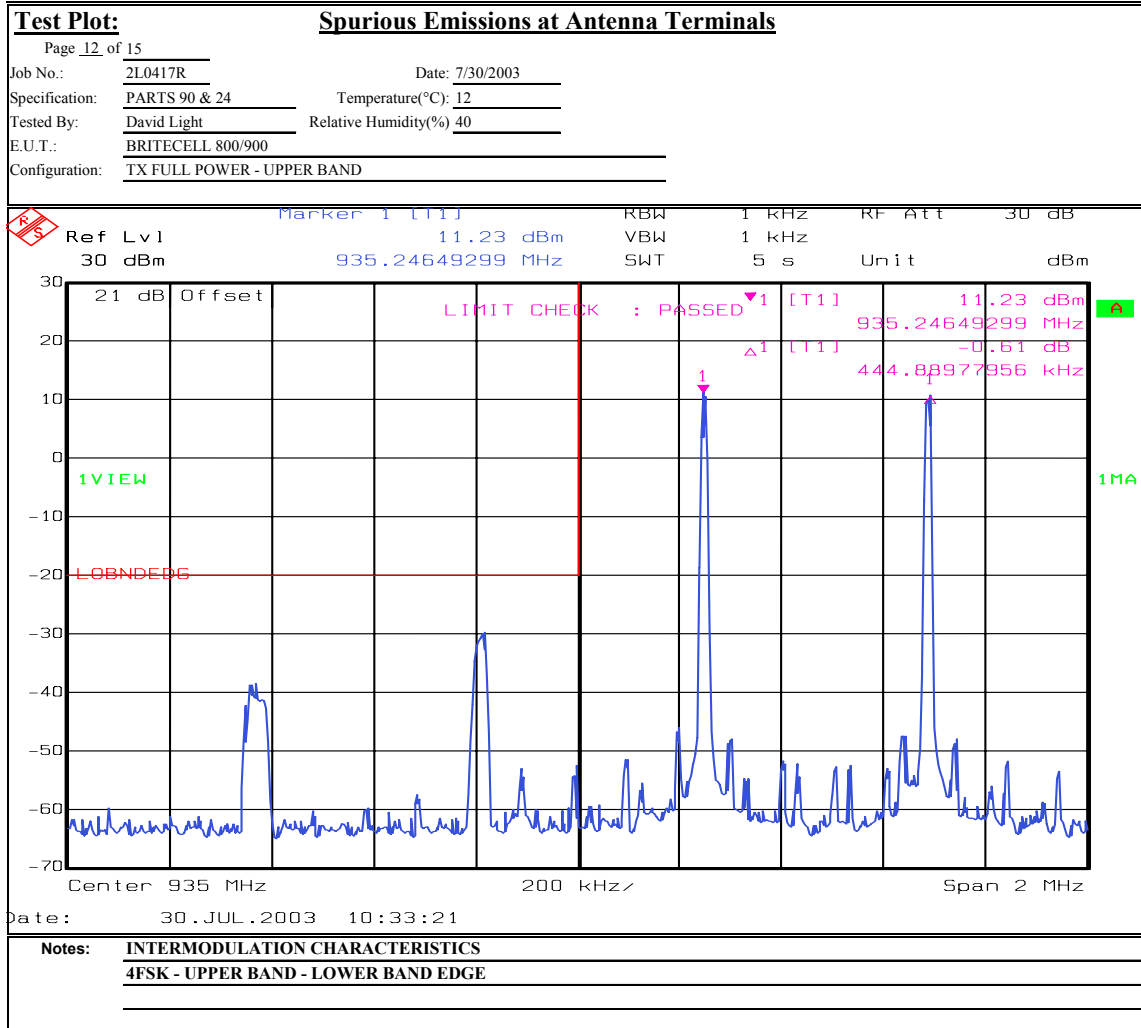
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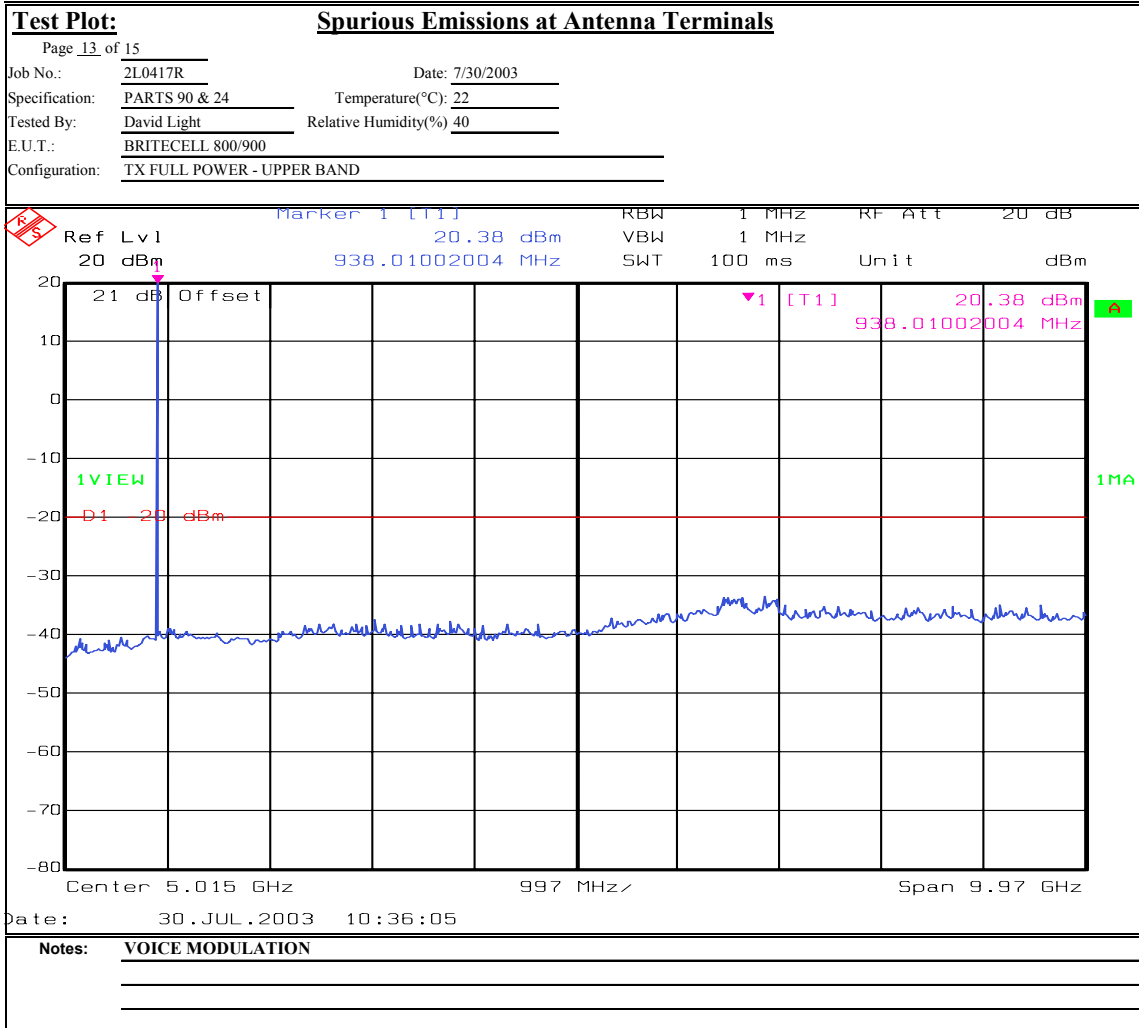
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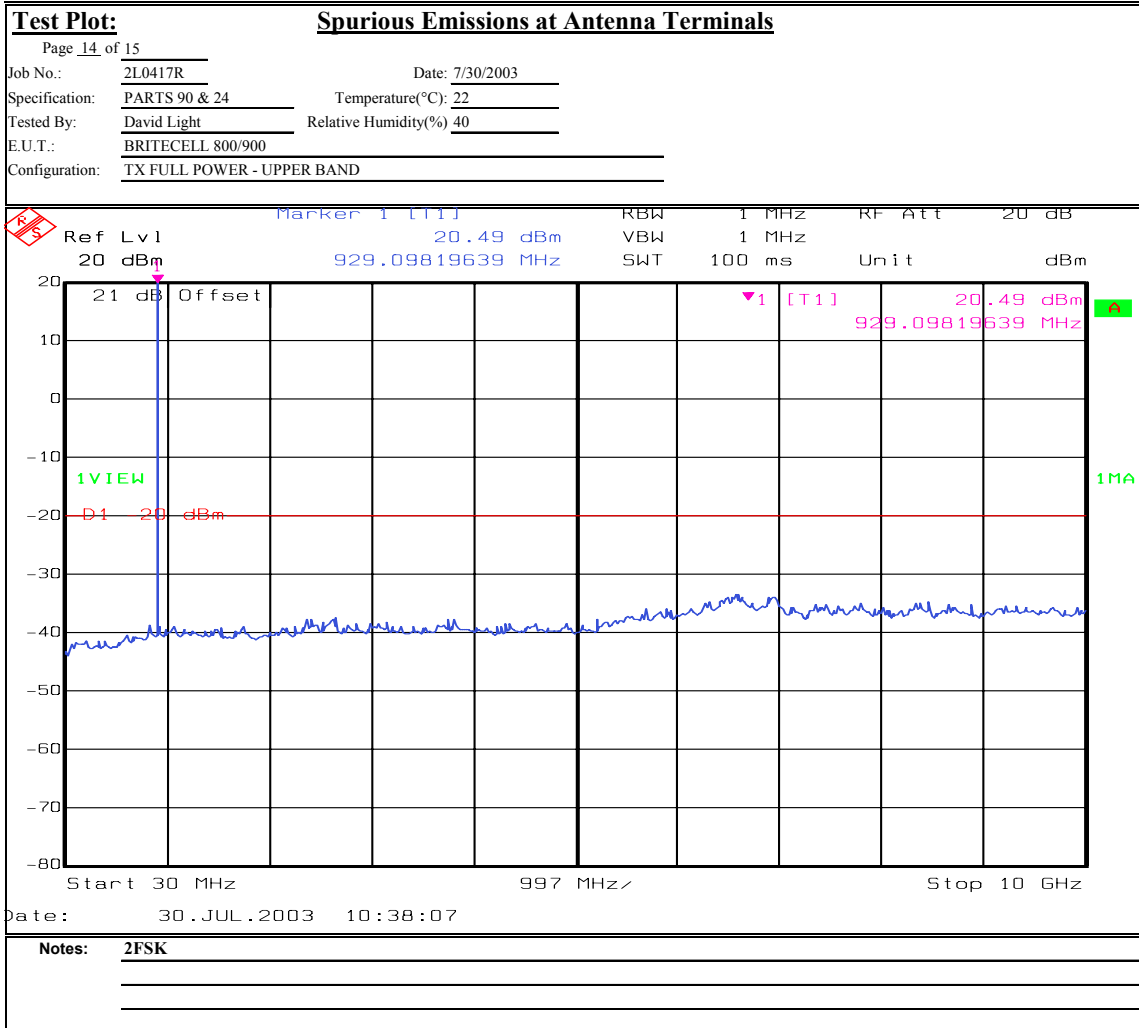
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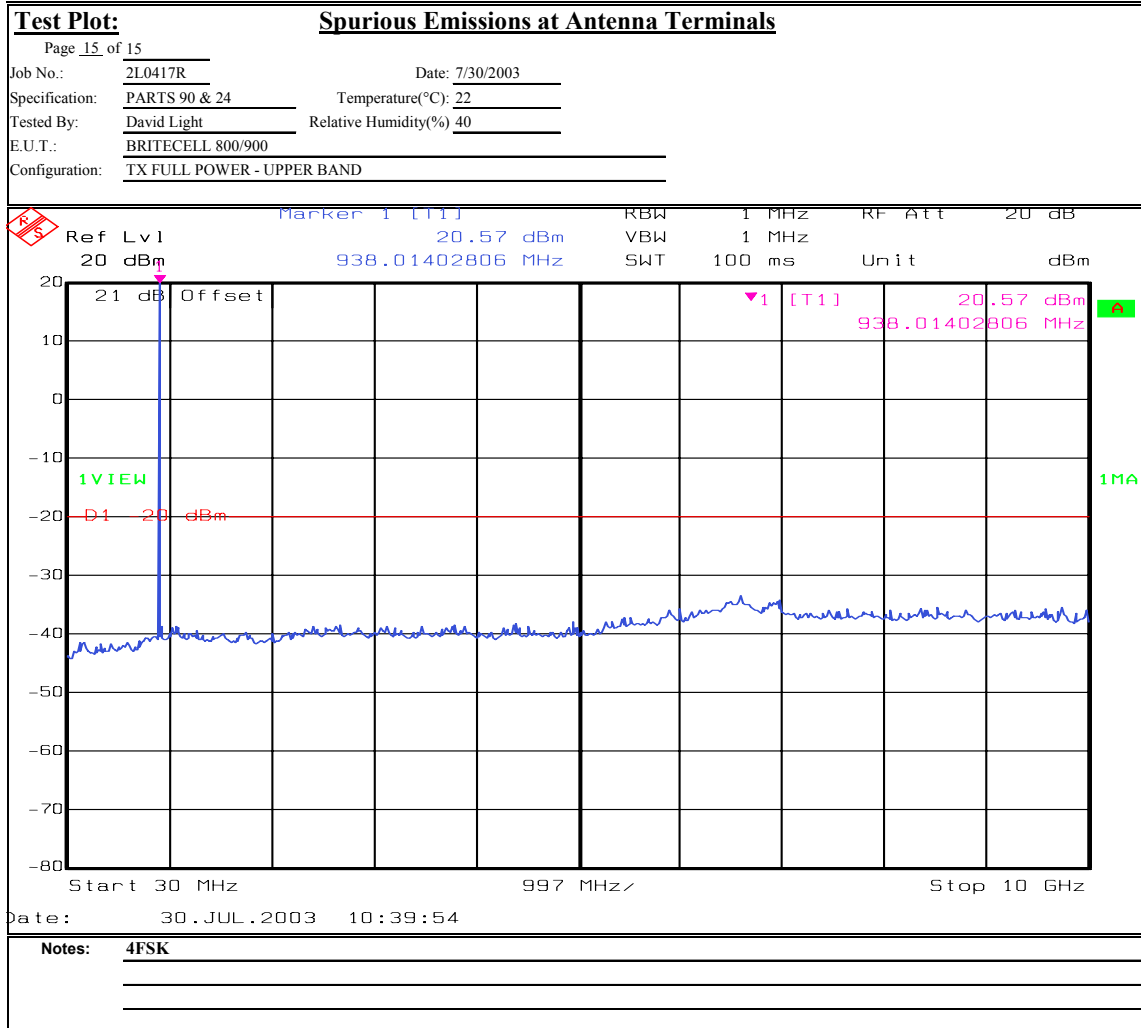
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EQUIPMENT: BRITECELL 800/900PROJECT NO.: 2L0417RUS1

Section 6. Field Strength of Spurious Emissions

NAME OF TEST: Field Strength of Spurious Emissions	PARA. NO.: 2.993
TESTED BY: David Light	DATE: 7/30/03

Test Results: Complies.**Test Data:** There were no emissions detected above the noise floor which was at least 30 dB below the spec limit. Tests were performed with a carrier in each band of operation.**Test equipment used:** 1464-1304-1484-1485-1016**Test Method:** 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.

Test conditions:Relative humidity: 20%
Temperature: 22°C

Photographs of Test Setup



EQUIPMENT: **BRITECELL 800/900**

PROJECT NO.: 2L0417RUS1

Section 7. Frequency Stability

NAME OF TEST: Frequency Stability	PARA. NO.: 2.995
TESTED BY: David Light	DATE:7/30/03

Test Results: Complies.

Measurement Data: See attached tables.

EQUIPMENT: BRITECELL 800/900

PROJECT NO.: 2L0417RUS1

Test Data – Frequency Stability



Dallas Headquarters:

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

Frequency Stability

Client: Allen TelecomW.O.# 2L0417REUT: BRITECELL 800/900S/N: 032001708Date: 7/30/03Tech: D. LIGHT

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

Temperature	Voltage (Vdc)	Frequency	Frequency Error
		(MHz)	(Hz)
20 °C	-40.8	860.000000	0
20 °C	-48	860.000000	0
20 °C	-55.2	860.000000	0
10 °C	-48	860.000000	0
0 °C	-48	860.000000	0
-10 °C	-48	860.000000	0
-20 °C	-48	860.000000	0
-30 °C	-48	860.000000	0
30 °C	-48	860.000000	0
40 °C	-48	860.000000	0
50 °C	-48	860.000000	0

EQUIPMENT: **BRITECELL 800/900****PROJECT NO.:** **2L0417RUS1****Section 8. Test Equipment List**

Nemko ID	Description	Manufacturer Model Number	Serial Number	Calibration Date	Calibration Due
1064	ATTENUATOR	NARDA 776B-20	NONE	CBU	N/A
1036	SPECTRUM ANALYZER	ROHDE & SCHWARZ FSEK30	830844/006	12/18/01	12/19/03
1629	CABLE, 6 ft	MEGAPHASE 10311 1GVT4	N/A	CBU	N/A
1464	Spectrum analyzer	Hewlett Packard 8563E	3551A04428	02/11/03	02/11/05
1484	Cable 2.0-18.0 Ghz	Storm PR90-010-072	N/A	07/24/03	07/23/04
1485	Cable 2.0-18.0 Ghz	Storm PR90-010-216	N/A	07/24/03	07/23/04
1016	Pre-Amp	HEWLETT PACKARD 8449A	2749A00159	07/15/02	07/15/03
1304	HORN ANTENNA	ELECTRO METRICS RGA-60	6151	07/30/01	07/31/03

ANNEX A - TEST METHODOLOGIES

Nemko Dallas

FCC Part 24, Subpart D
FCC Part 90, Subpart I

EQUIPMENT: **BRITECELL 800/900**

PROJECT NO.: 2L0417RUS1

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:

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.

FCC Part 24, Subpart D
FCC Part 90, Subpart I

PROJECT NO.: 2L0417RUS1

PARA. NO.: 2.991

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

VBW: $\Rightarrow$ RBW

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

EQUIPMENT: BRITECELL 800/900

PROJECT NO.: 2L0417RUS1

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

EQUIPMENT: **BRITECELL 800/900****PROJECT NO.:** **2L0417RUS1**

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

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

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

EQUIPMENT: BRITECELL 800/900

PROJECT NO.: 2L0417RUS1

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

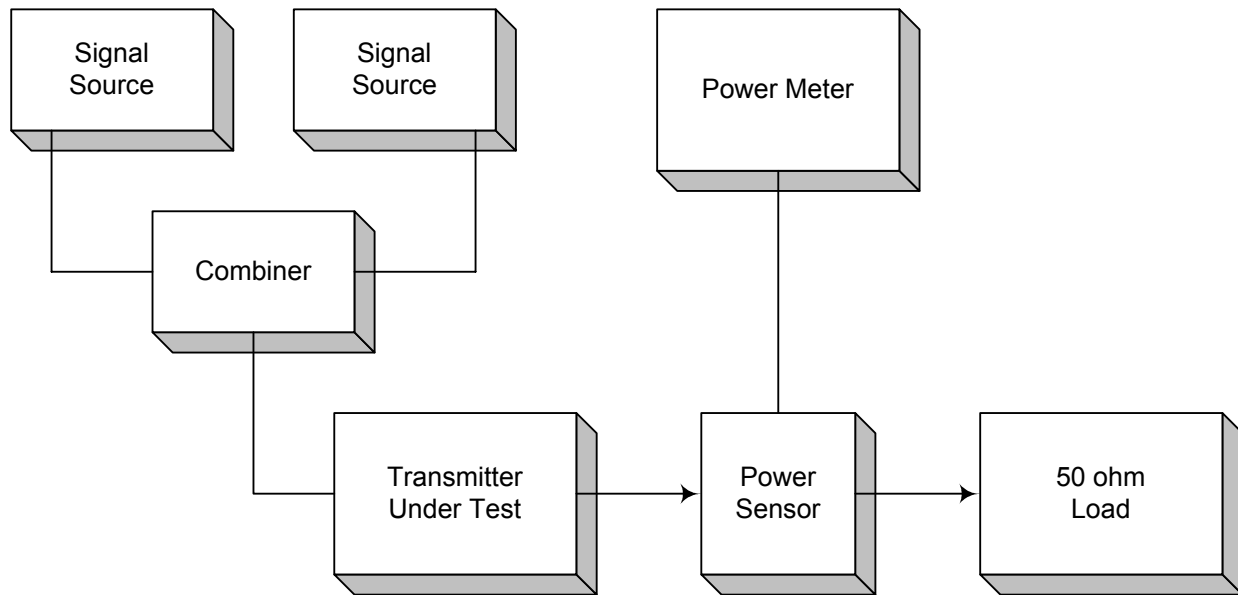
Minimum Standard: Para. No. 990.213. The transmitter carrier frequency shall remain within the assigned frequency below in ppm.

Table 2

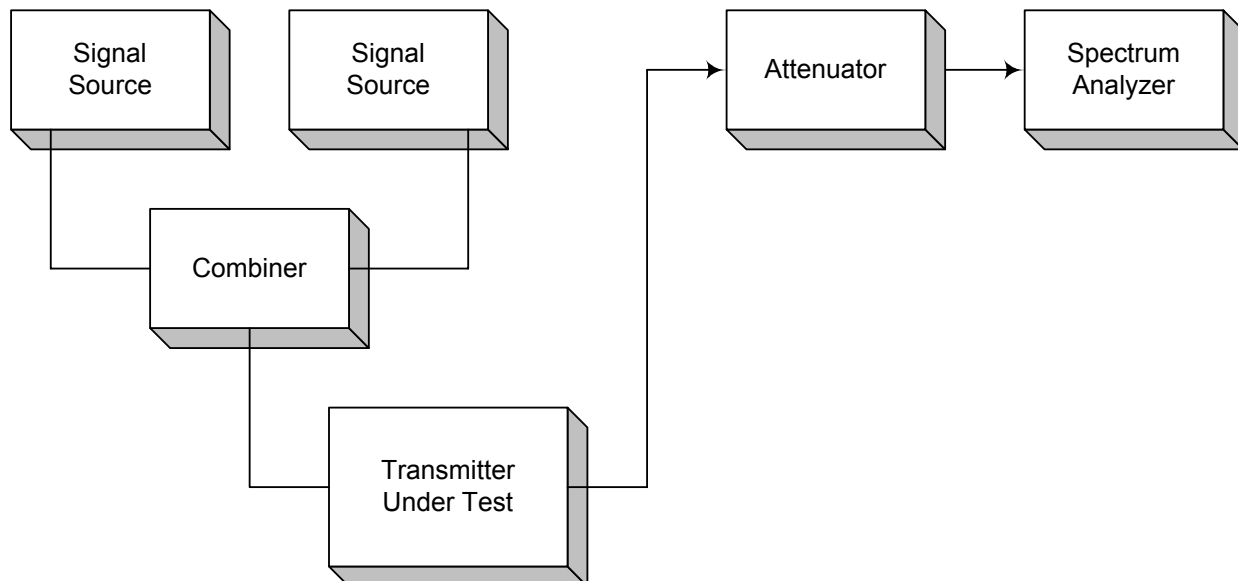
Frequency Band (MHz)	Fixed And Base Stations	Mobile Stations	
		> 2 Watts o/p pwr	< 2 Watts o/p pwr
Below 25	100	100	200
25 - 50	20	20	50
72 - 76	5	-	50
150 - 174	5	5	5
220 - 222	0.1	1.5	1.5
421 - 512	2.5	5	5
806 - 821	1.5	2.5	2.5
821 - 824	1.0	1.5	15
851 - 866	1.5	2.5	2.5
866 - 869	1.0	1.5	1.5
869 - 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	-	-	-

ANNEX B - TEST DIAGRAMS

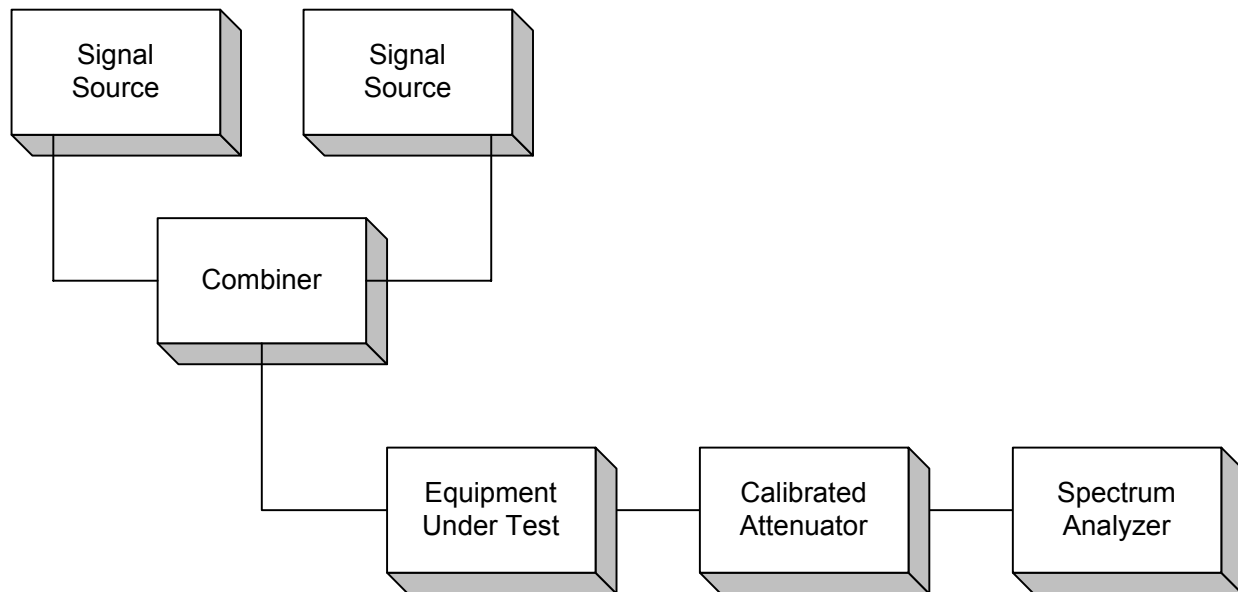
Para. No. 2.985 - R.F. Power Output



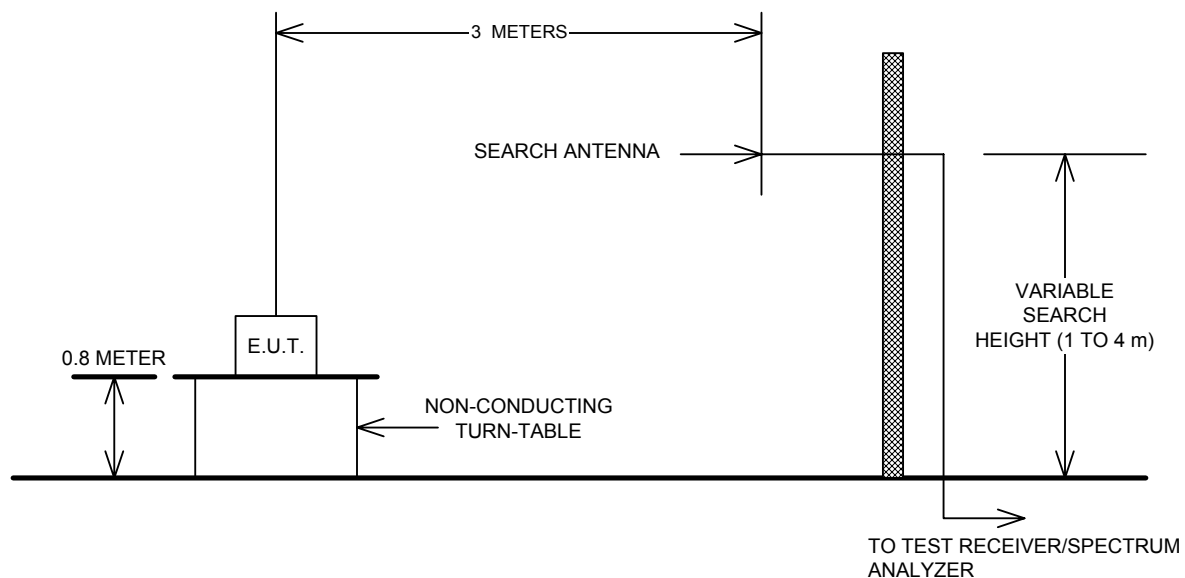
Para. No. 2.989 - Occupied Bandwidth



Para. No. 2.991 - Spurious Emissions at Antenna Terminals



Para. No. 2.993 - Field Strength of Spurious Radiation



Para. No. 2.995 - Frequency Stability

