

Nemko Test Report: 2L0436RUS1

Applicant: Navini Networks
2240 Campbell Creek Blvd. Suite 110
Richardson, TX 75082

**Equipment Under Test:
(E.U.T.)** 2.3 GHz WCS Band BTS

In Accordance With: FCC CFR 47, PART 27, Subpart C
Wireless Communication Services

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

Authorized By:

A handwritten signature in dark ink, appearing to read 'John Fish', is centered above the name.

John Fish, Senior EMC Engineer

Date: 9/26/2003

Total Number of Pages: 86

EQUIPMENT: 2.3 GHz WCS BTS

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*EQUIPMENT: 2.3 GHz WCS BTS***Section 1. Summary of Test Results**

Manufacturer: Navini Networks

Model No.: 2300-Digital, 2300-RF

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 27, Subpart C.



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
See " Summary of Test Data".

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This report applies only to the items tested.

Summary Of Test Data

NAME OF TEST	PARA. NO.	SPEC.	RESULT
RF Power Output	2.1046/27.50(a)(1)	2000 W EIRP	Complies
Occupied Bandwidth	2.1049/27.53(a)	27.53 (a) Mask	Complies
Spurious Emissions @ Antenna Terminals	2.1051/27.53(a)	27.53(a)	Complies
Field Strength of Spurious Radiation	2.1053/27.53(a)	27.53(a)	Complies
Frequency Stability	2.1055/27.54	27.53 (a) Mask	Complies

Footnotes:

*EQUIPMENT: 2.3 GHz WCS BTS***Section 2. General Equipment Specification****Supply Power:** 27 Vdc**Frequency Range:** 2305 – 2320 MHz
2345 – 2360 MHz**Type(s) of Modulation:**

F3E (Voice)	F1D	F2D	D7W (QAM)	DQPSK (F9W)
☐	☐	☐	☒	☐

Emission Designator: 500KD7W**Output Impedance:** 50 ohms**RF Power Output Rated:** 398 watts eirp
(see page 5)
+30 dBm (1 watt) at antenna terminals for all configurations.
+36 dBm (4 watts) at EUT for 10 carrier configuration
+37 dBm (5 watts) at EUT for 8 carrier configuration
+37 dBm (5 watts) at EUT for 6 carrier configuration**Duty Cycle:** Software controlled 50% to 75% TDD**Operator Selection Of
Operating Frequency:** Software controlled**Power Output Adjustment
Capability:** Software controlled

*EQUIPMENT: 2.3 GHz WCS BTS***Description Of EUT**

The EUT is a high capacity, broadband data communication Base Station Transceiver. The EUT can operate in WCS channels AB high, AB low, C, or D by design with appropriate block or channel filters inserted into the EUT. Three capacity configurations are available which consists of 10, 8, or 6 Carriers. A Carrier is a fundamental transmitter signal that is 500 kHz wide in bandwidth. An EUT Channel Bandwidth of 5 MHz consists of 10 Carriers each with a 500 kHz bandwidth. The following table summarizes the three capacity configurations for an EUT:

Capacity Configurations	WCS Channels	Number of Carriers	EUT Channel Bandwidth	Max EUT Power Output *	Loss to ANT	Max Power to ANT Terminal**
1	A or B	10	5 MHz	+36 dBm	6 dB	+30 dBm
2	A or B	8	4 MHz	+37 dBm	7 dB	+30 dBm
3	C or D	6	3 MHz	+37 dBm	7 dB	+30 dBm

* EUT output power will be lowered dB for dB Loss to ANT is lower.

**Power to ANT terminal will be lowered dB for dB Loss to ANT is higher.

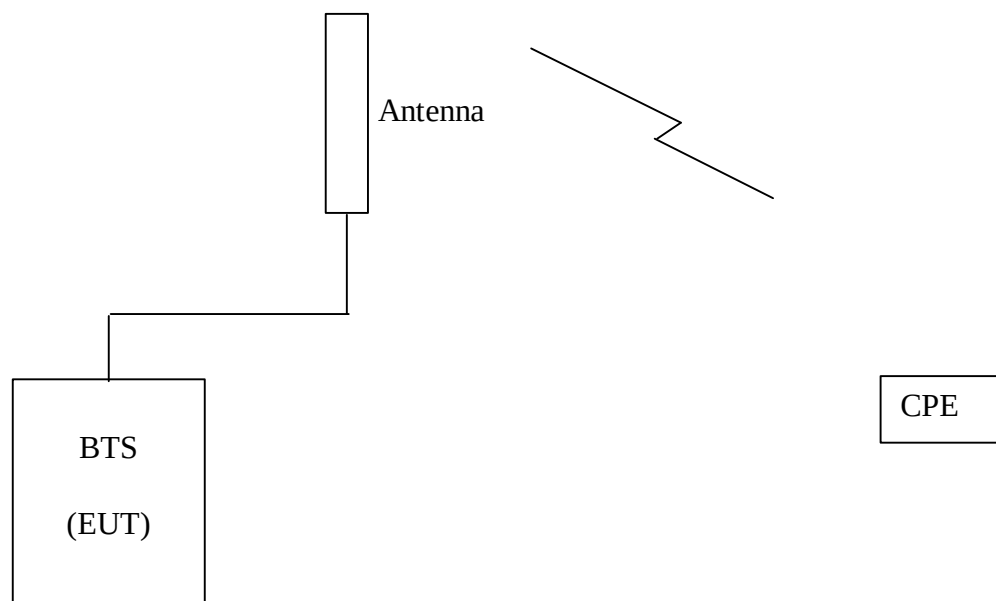
EIRP is calculated as follows:

Max. antenna gain = 18dBi

Max BTS rf output = +30 dBm RMS

Peak-to-Average Ratio = 8 dB

Max. rf output power = 30 dBm + 8 dB + 18 dBi = +56 dBm (Peak EIRP)

System Diagram

EQUIPMENT: 2.3 GHz WCS BTS

Section 3. RF Power Output

NAME OF TEST: RF Power Output	PARA. NO.: 2.1046
TESTED BY: Tom Tidwell	DATE: 9/3/2002

Test Results: Complies**Measurement Data:**

Power Output	RF Power Output	Max. Antenna Gain	RF Power Output (EIRP)
(dBm)	(Watts)	(dBi)	(Watts)
+30	1 watt @ Antenna input	18	398
+36	4 watts @ EUT rf output with 10 carriers. 1 watt @ antenna input	18	398
+37	5 watts @ EUT rf output with 8 carriers. 1 watt @ antenna input	18	398
+37	5 watts @ EUT rf output with 6 carriers. 1 watt @ antenna input	18	398

Test Equipment Used: Agilent Model E4416A s/n GB41290732
Agilent Model E9327A s/n US40440319
Agilent Model E4419B s/n GB39461846
Agilent Model E9401 s/n MY41495108

Duty Cycle: 50%

Output power was measured with full traffic 10 carrier software load.

The maximum rf output power is + 30 dBm at the antenna input terminals. The maximum rf output power (EIRP)

Measurement Uncertainty: +/- 0.6 dBm

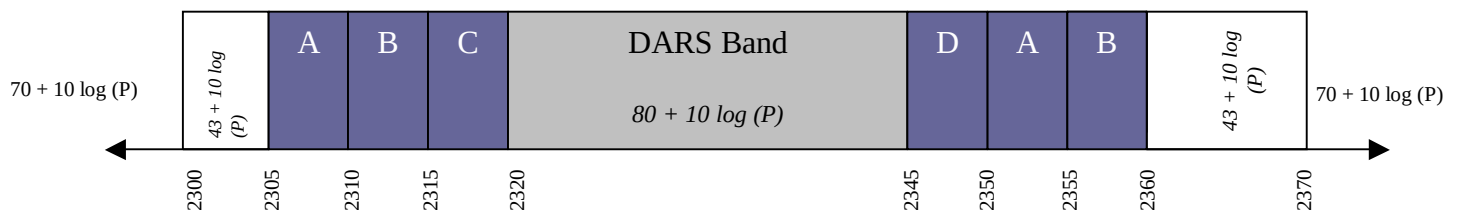
EQUIPMENT: 2.3 GHz WCS BTS

Section 4. Occupied Bandwidth

NAME OF TEST: Occupied Bandwidth	PARA. NO.: 2.1049
TESTED BY: Tom Tidwell	DATE: 9/16/2002

Test Results: Complies**Measurement Data:** See attached data sheets.

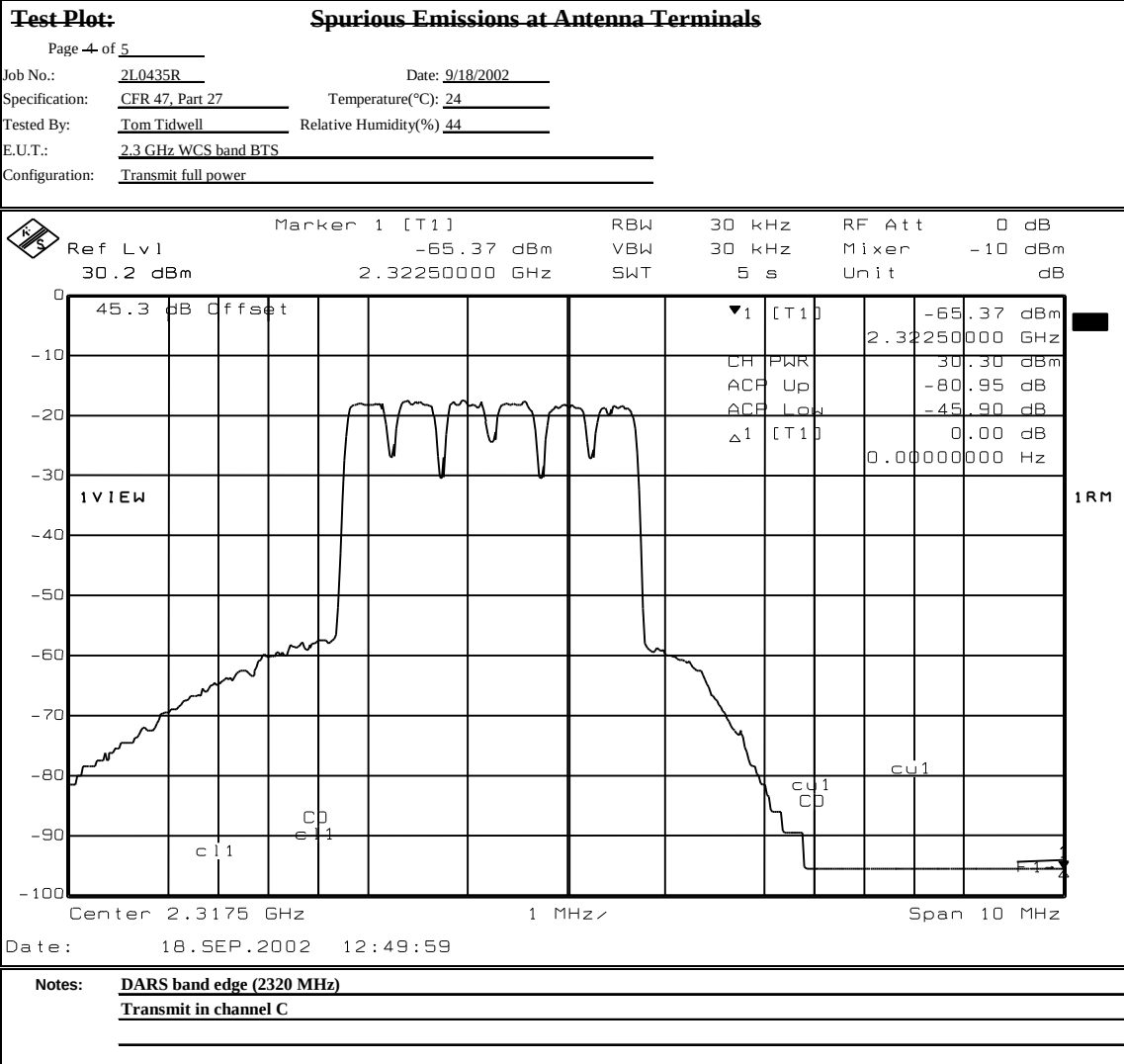
The absolute RMS output power of the EUT is measured with a power meter. The occupied BW spectrum analyzer plots are not intended to represent the absolute channel power “CH PWR” of the EUT but provide measurement for the occupied channel BW of the EUT.

Measurement Uncertainty: $\pm 1 \times 10^{-7}$ ppm, ± 1.7 dB

EQUIPMENT: 2.3 GHz WCS BTS

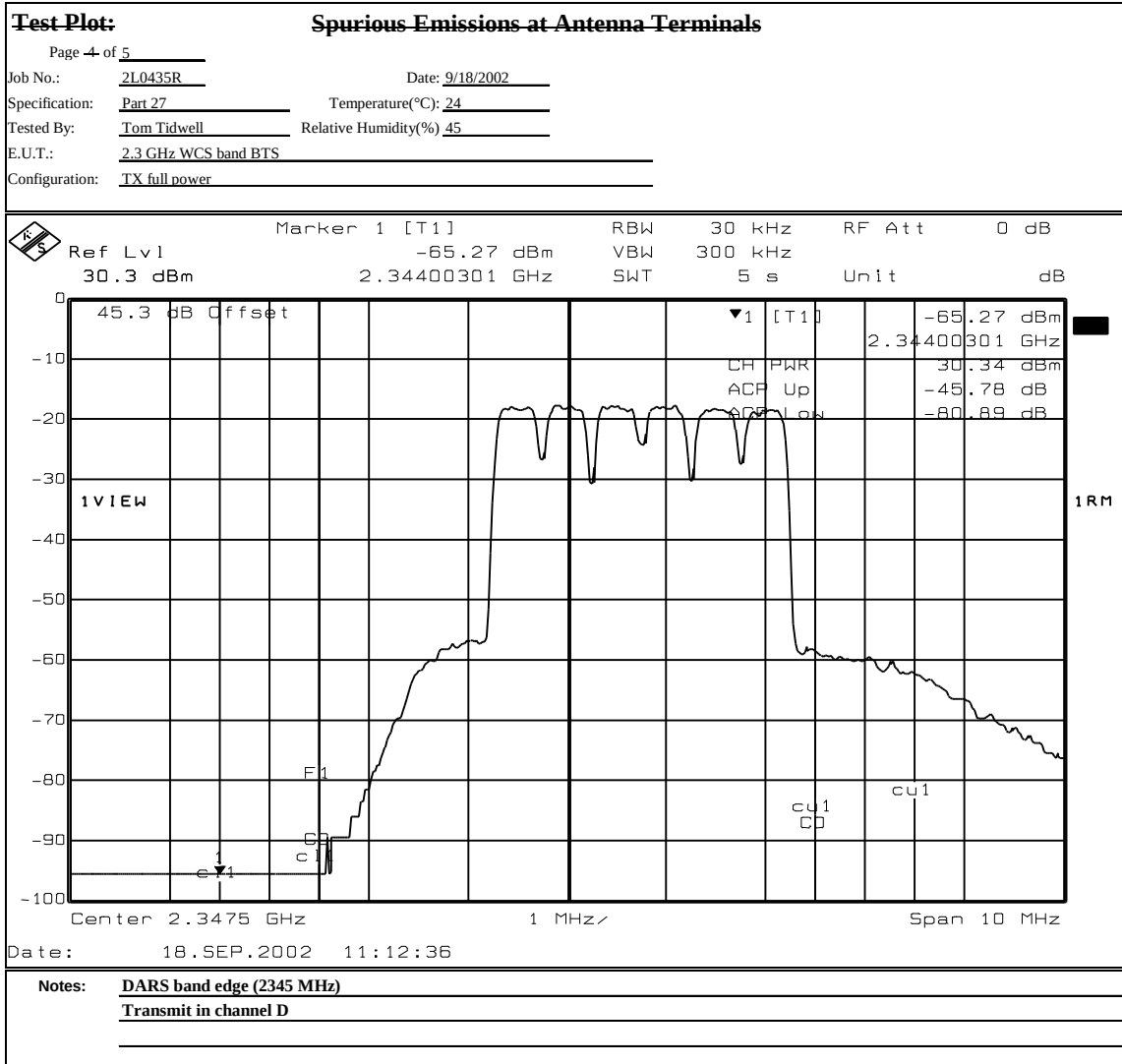
Test Data – Emission Mask

6 Carriers



EQUIPMENT: 2.3 GHz WCS BTS

6 Carriers



EQUIPMENT: 2.3 GHz WCS BTS

Data Plot		Occupied Bandwidth	
Page 1 of 5		Complete <u>X</u>	
Job No.: 2L0436R	Date: 9/16/2002	Preliminary: _____	
Specification: _____	Temperature(°C): 25		
Tested By: Tom Tidwell	Relative Humidity(%): 44		
E.U.T.: 2.3 GHz WCS band BTS			
Configuration: TX full power			
Sample Number: None			
Detector Type: Rms		RBW: Refer to plots	
		VBW: Refer to plots	
Test Equipment Used			
Antenna: _____	Directional Coupler: Anaren 1C087-20		
Pre-Amp: _____	Cable #1: _____		
Filter: _____	Cable #2: _____		
Receiver: 1036	Cable #3: _____		
Attenuator #1: _____	Cable #4: _____		
Attenuator #2: _____	Mixer: _____		
Additional equipment used: _____			
Measurement Uncertainty: +/-1.7 dB			

Ref Lvl		Marker 1 [T1]		RBW		50 kHz		RF Att		20 dB	
30 dBm		-26.29 dBm		VBW		300 kHz		Mixer		-20 dBm	
		2.31500501 GHz		SWT		5 s		Unit		dB	

Title:		Date:	
20C		16.SEP.2002 12:50:23	

Notes:	

8 Carriers

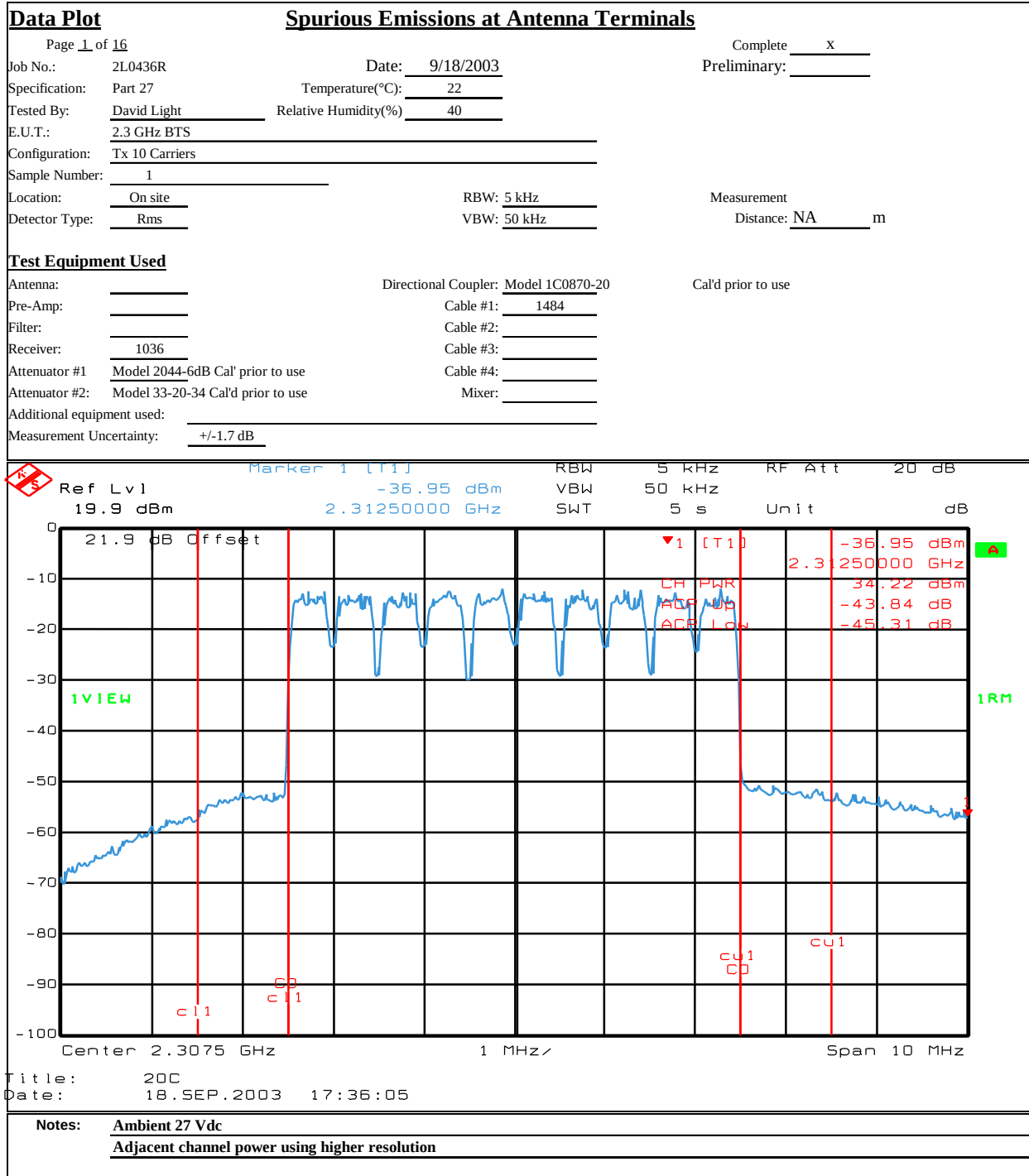
EQUIPMENT: 2.3 GHz WCS BTS

Test data – Emission Mask



Nemko Dallas, Inc.

Dallas Headquarters:

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Tel: (972) 436-9600
Fax: (972) 436-2667

EQUIPMENT: 2.3 GHz WCS BTS

Test data – Emission Mask



Dallas Headquarters:

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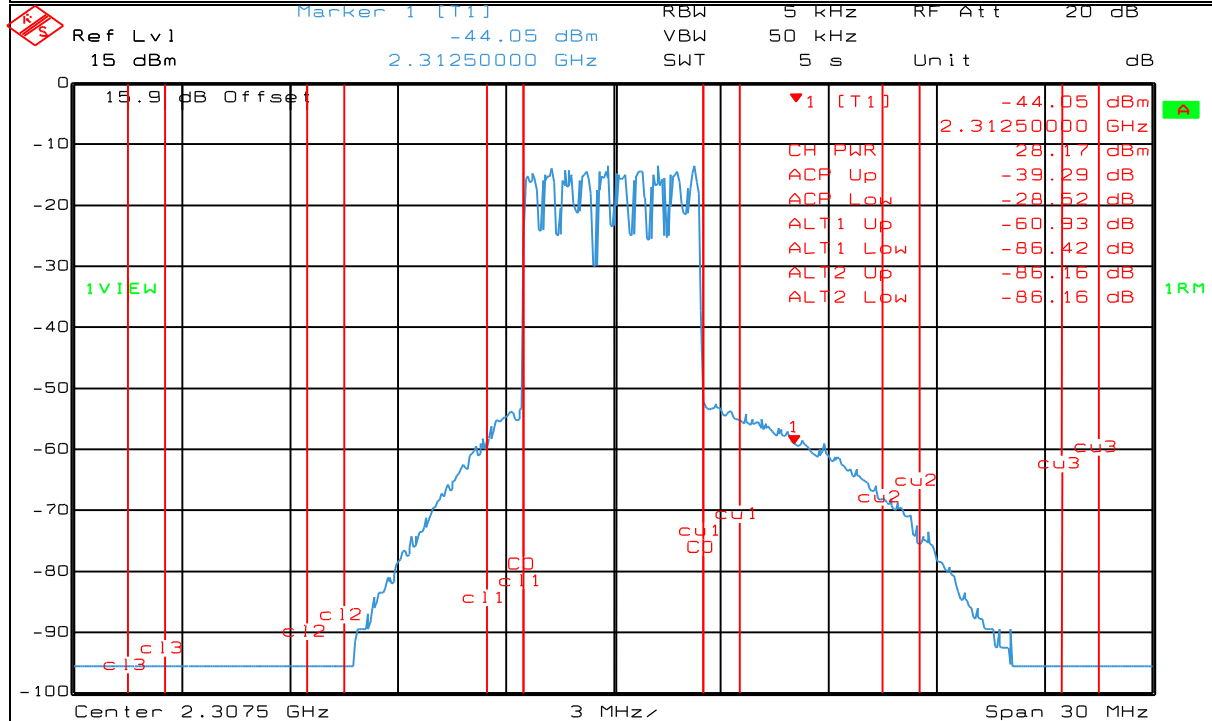
Nemko Dallas, Inc.

Test Plot:

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Job No.:	2L0436R	Date:	9/18/2003
Specification:	Part 27	Temperature(°C):	22
Tested By:	David Light	Relative Humidity(%)	40
E.U.T.:	2.3 GHz BTS		
Configuration:	Tx 10 Carriers		

Spurious Emissions at Antenna Terminals



```
Title:      20C
Date:      18.SEP.2003   17:40:09
```

Notes: Ambient 27 Vdc
Co-adjacent channel power

EQUIPMENT: 2.3 GHz WCS BTS

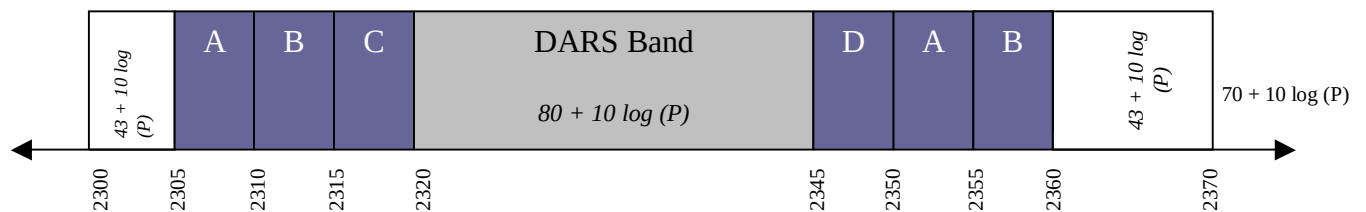
Section 5. Spurious Emissions at Antenna Terminals

NAME OF TEST: Spurious Emissions @ Antenna Terminals	PARA. NO.: 2.1051
TESTED BY: Tom Tidwell	DATE: 9/16/2002

Test Results: Complies

Measurement Data: See attached data sheets.

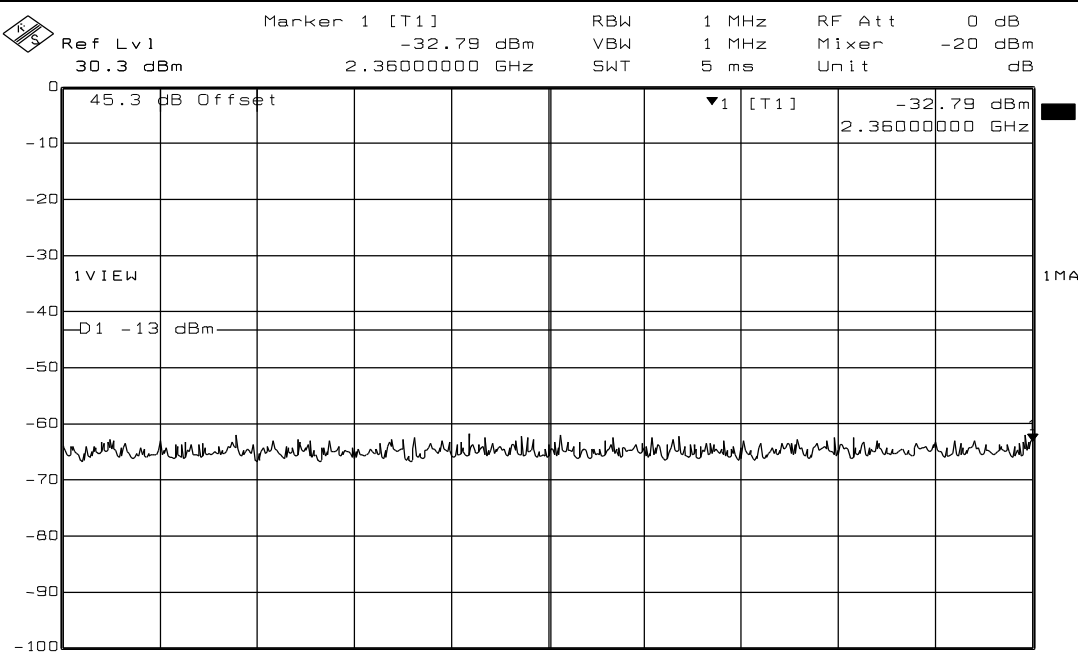
Measurement Uncertainty: +/- 1.7 dB



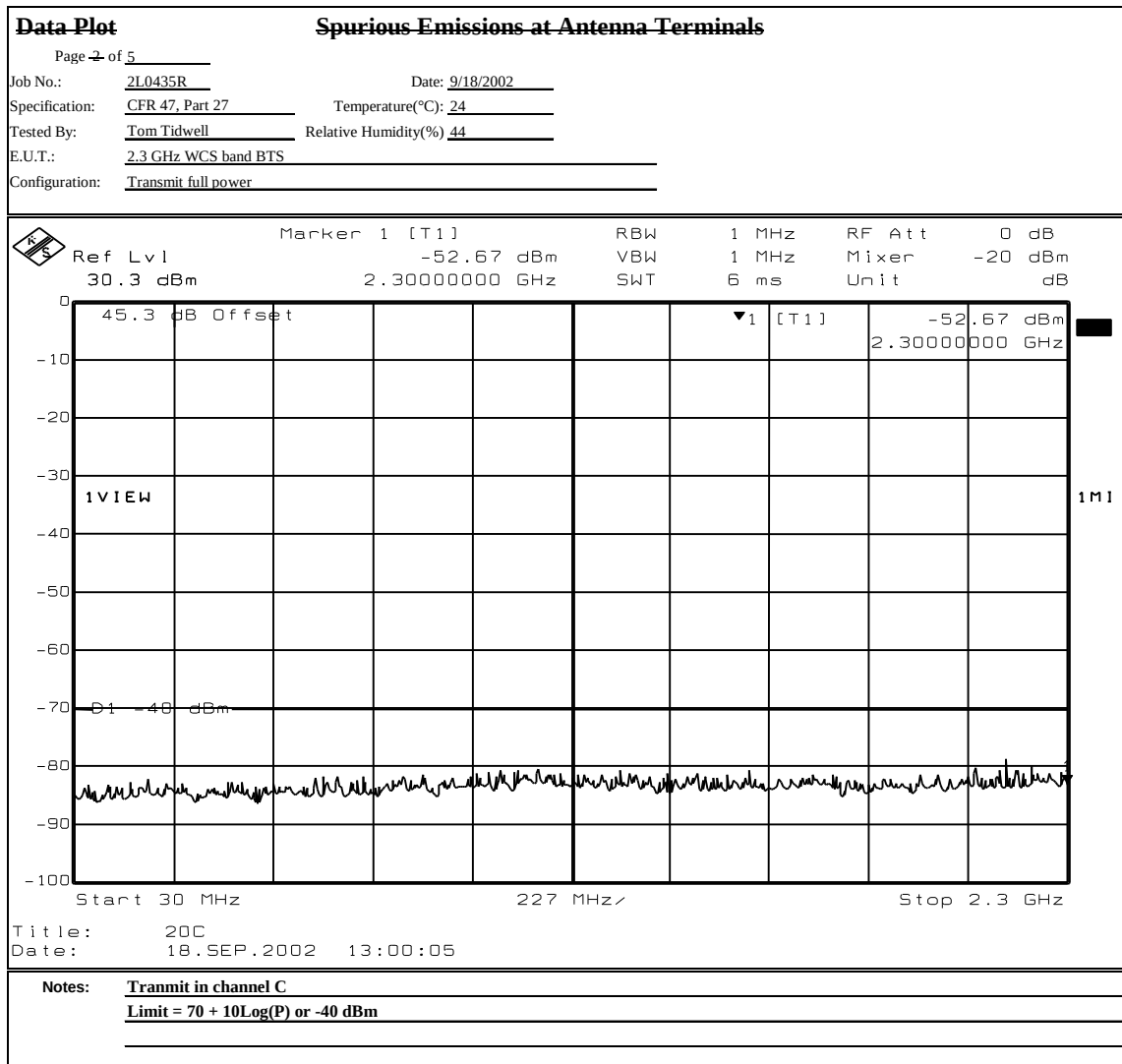
EQUIPMENT: 2.3 GHz WCS BTS

Test Data – Spurious Emissions at Antenna Terminals

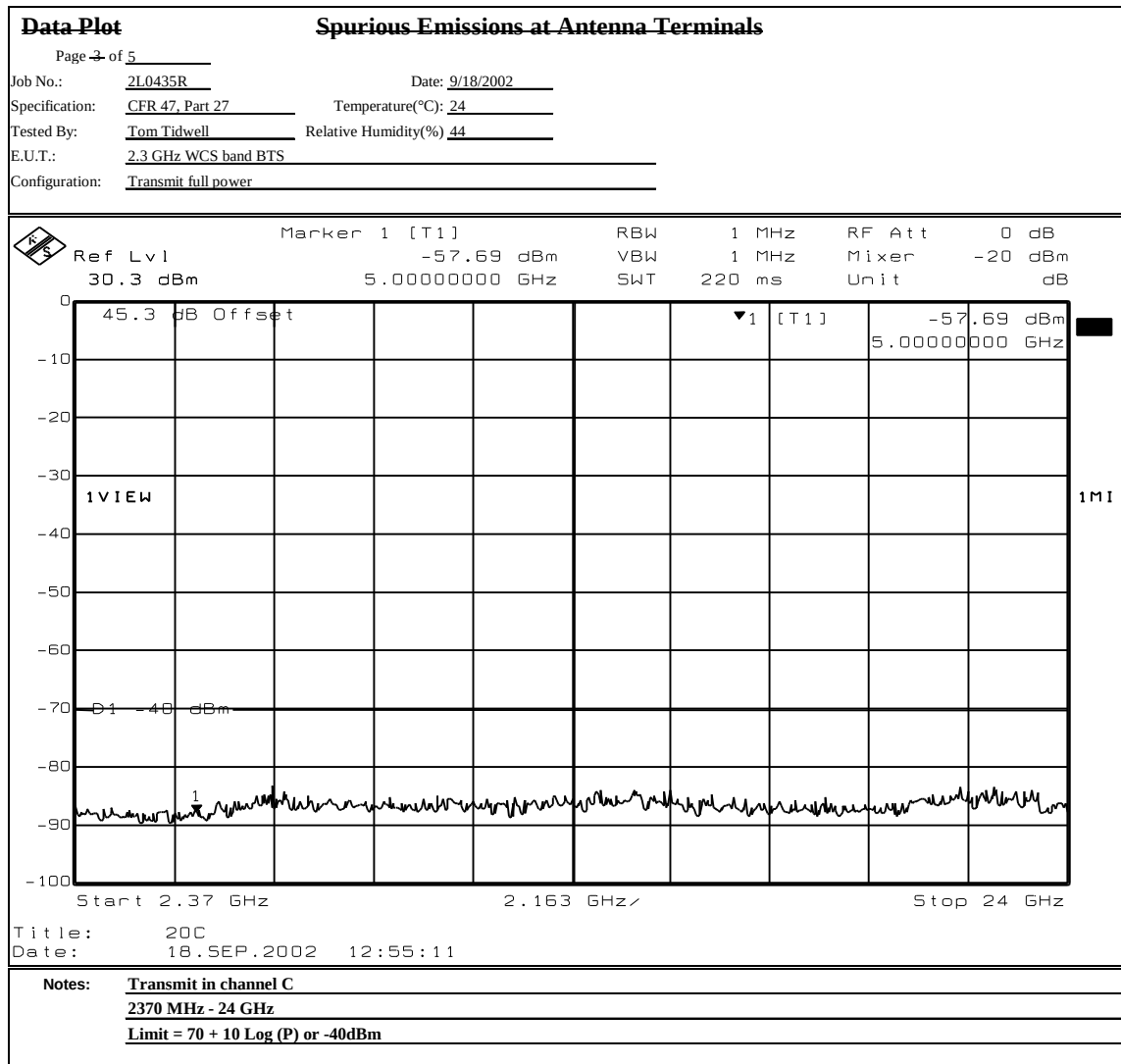
Band C

Data Plot		Spurious Emissions at Antenna Terminals	
Page 1 of 5		Complete <u>X</u>	
Job No.:	2L0435R	Date:	9/18/2002
Specification:	CFR 47, Part 27	Temperature(°C):	24
Tested By:	Tom Tidwell	Relative Humidity(%):	44
E.U.T.:	2.3 GHz WCS band BTS		
Configuration:	Transmit full power		
Sample Number:	1		
Location:		RBW:	Refer to plots
Detector Type:	Rms	VBW:	Refer to plots
Test Equipment Used			
Antenna:		Directional Coupler:	Anaron 1C0870-20 20 dB coupler
Pre-Amp:		Cable #1:	
Filter:		Cable #2:	
Receiver:	1036	Cable #3:	
Attenuator #1:	3320-34	Cable #4:	
Attenuator #2:		Mixer:	
Additional equipment used:			
Measurement Uncertainty:	+/-1.7 dB		
			
Title: 20C Date: 18.SEP.2002 12:58:51			
Notes: Transmit in channel C 2345 - 2360 MHz Limit = 43 + 10Log(P) or -13 dBm			

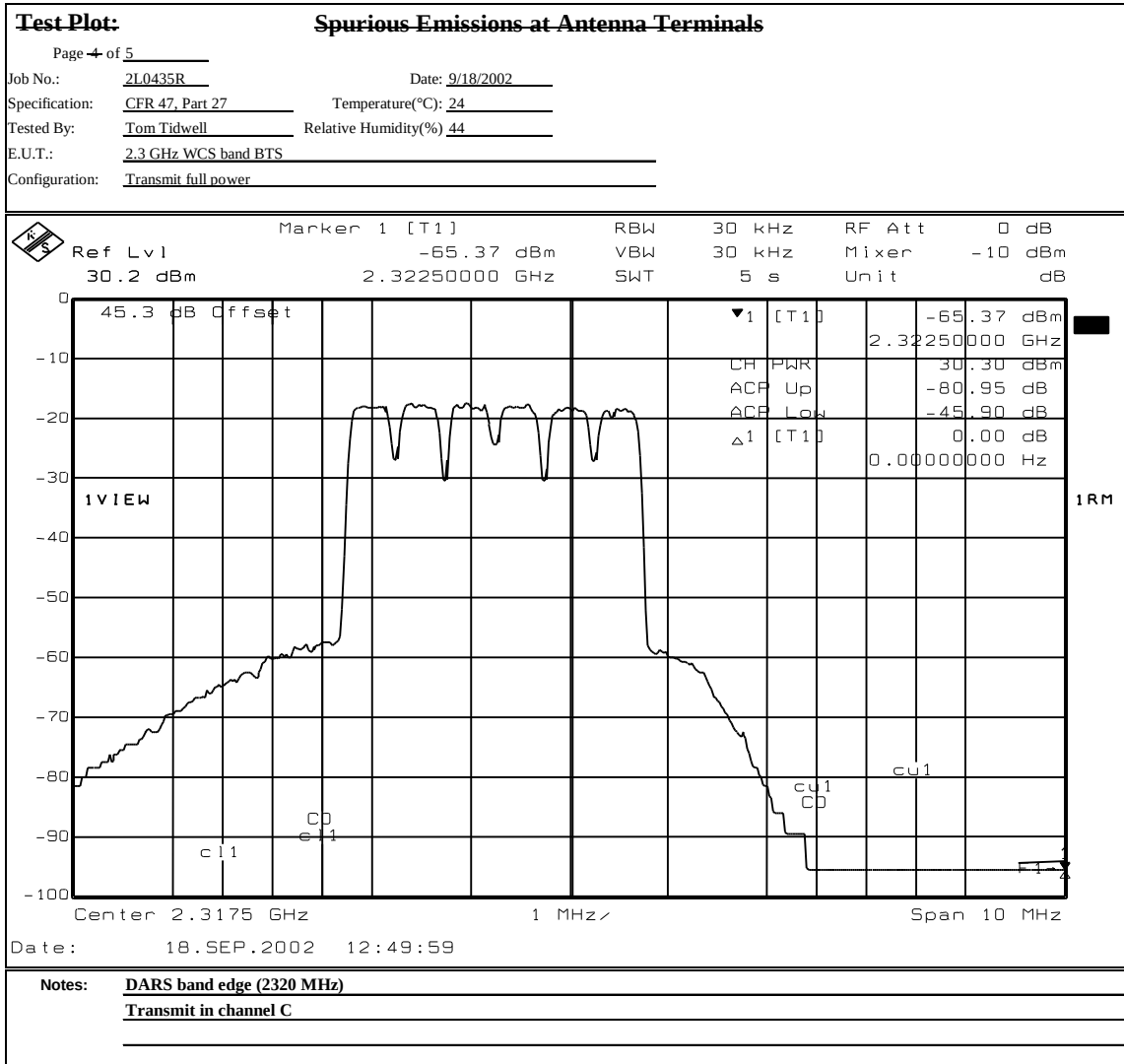
EQUIPMENT: 2.3 GHz WCS BTS



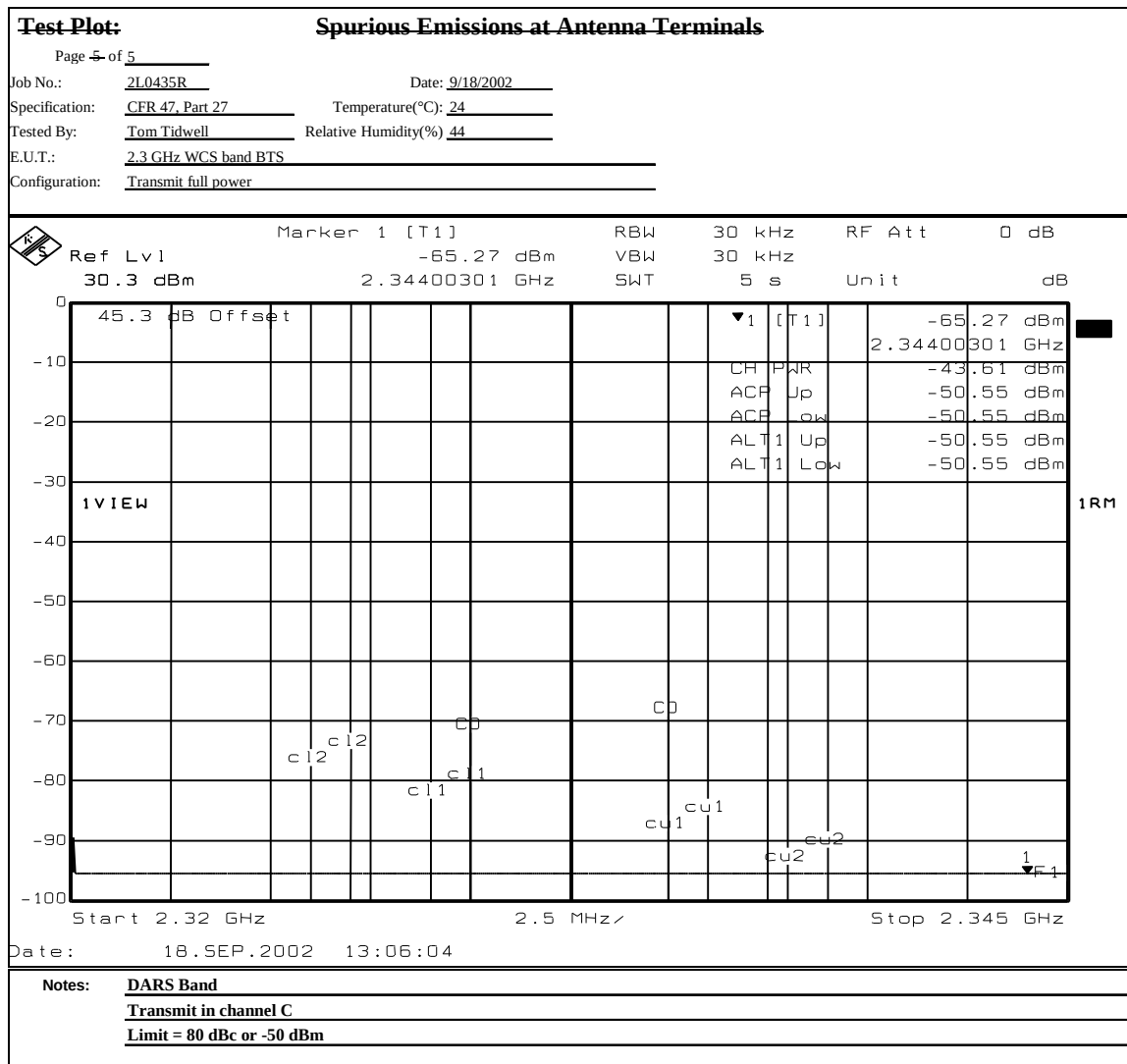
EQUIPMENT: 2.3 GHz WCS BTS



EQUIPMENT: 2.3 GHz WCS BTS



EQUIPMENT: 2.3 GHz WCS BTS



Test Data – Spurious Emissions at Antenna Terminals

Data Plot		Spurious Emissions at Antenna Terminals					
Page 4 of 5				Complete <u>X</u>			
Job No.:	2L0435R	Date:	<u>9/18/2002</u>	Preliminary: _____			
Specification:	Part 27	Temperature(°C):	<u>24</u>				
Tested By:	<u>Tom Tidwell</u>	Relative Humidity(%)	<u>45</u>				
E.U.T.:	<u>2.3 GHz WCS band BTS</u>						
Configuration:	<u>TX full power</u>						
Sample Number:	<u>1</u>						
Location:	_____	RBW:	<u>Refer to plots</u>				
Detector Type:	<u>Rms</u>	VBW:	<u>Refer to plots</u>				

Test Equipment Used

Antenna:	_____	Directional Coupler:	<u>Anaron 1C0870-20 dB coupler</u>
Pre-Amp:	_____	Cable #1:	_____
Filter:	_____	Cable #2:	_____
Receiver:	<u>1036</u>	Cable #3:	_____
Attenuator #1:	_____	Cable #4:	_____
Attenuator #2:	_____	Mixer:	_____
Additional equipment used:	_____		
Measurement Uncertainty:	<u>+/-1.7 dB</u>		

	Ref Lvl	RBW	1 MHz	RF Att	0 dB
	30.3 dBm	VBW	1 MHz	Mixer	-20 dBm
		SWT	5 ms	Unit	dB

Start 2.3 GHz
2 MHz
Stop 2.32 GHz

Title:	20C	
Date:	18.SEP.2002	11:39:04

Notes: Transmit in channel D

2300 - 2320 MHz

Limit = 43 + 10Log(P) or -13 dBm

Data Plot

Page 2 of 5

Job No.: 2L0435R Date: 9/18/2002
Specification: Part 27 Temperature(°C): 24
Tested By: Tom Tidwell Relative Humidity(%): 45
E.U.T.: 2.3 GHz WCS band BTS
Configuration: TX full power

K/S Ref Lvl 30.3 dBm RBW 1 MHz RF Att 0 dB
VBW 1 MHz Mixer -20 dBm
SWT 6 ms Unit dB

45.3 dB Offset

VIEW

D1 -40 dBm

WCSDARS

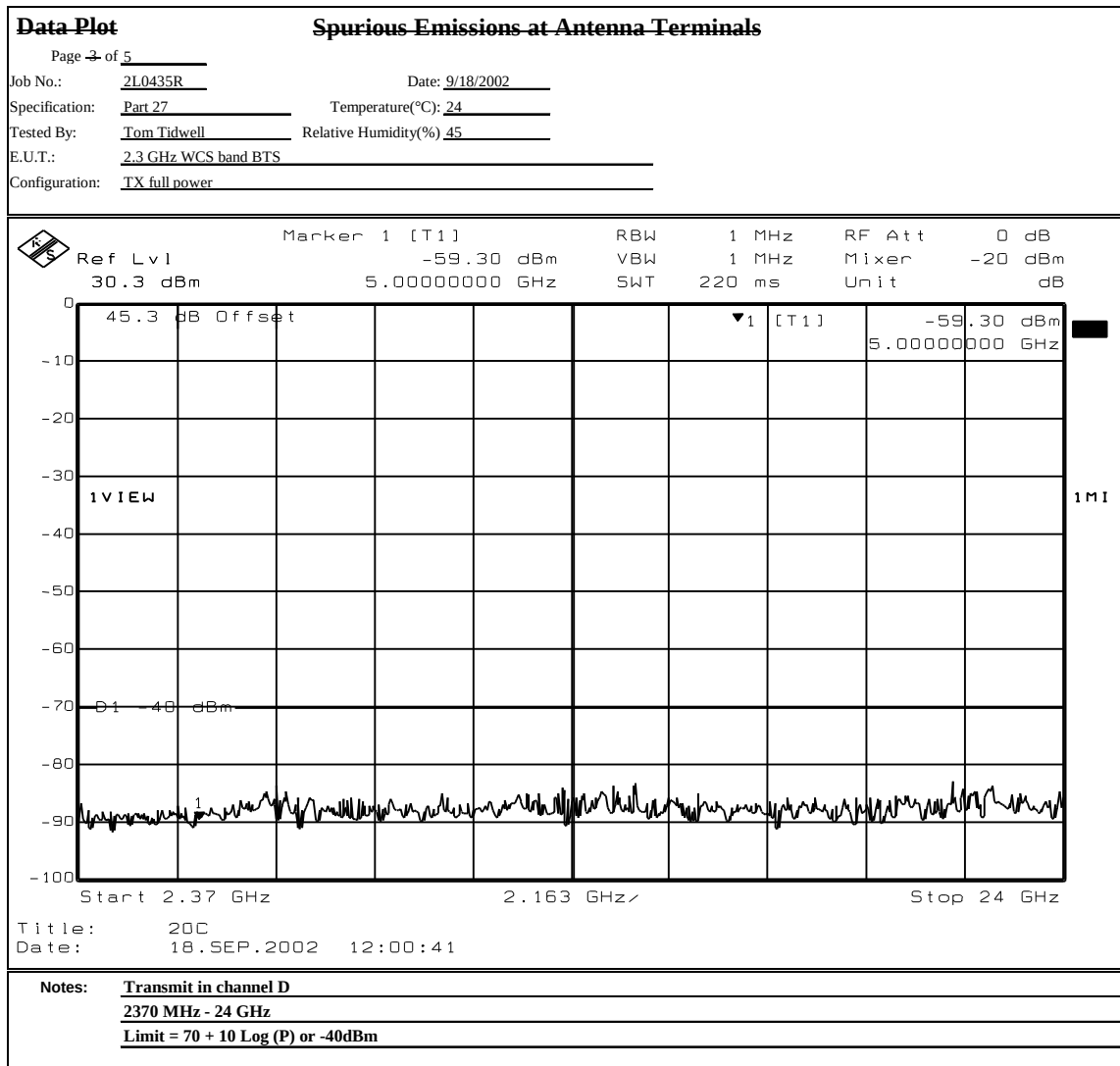
Start 30 MHz 227 MHz / Stop 2.3 GHz

Title: 20C
Date: 18.SEP.2002 11:36:11

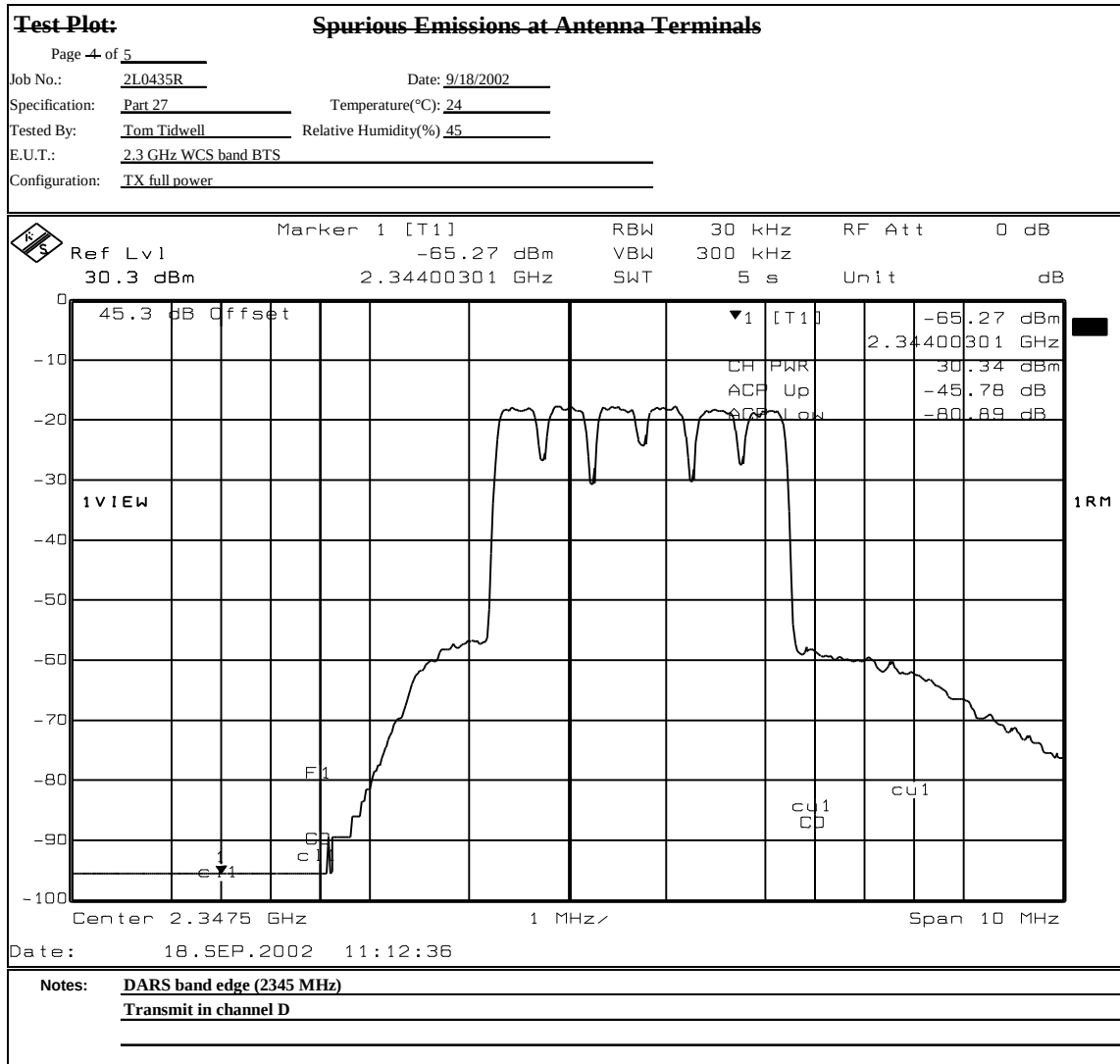
Notes:

- Transmit in channel D
- Limit = $70 + 10\log(P)$ or -40 dBm

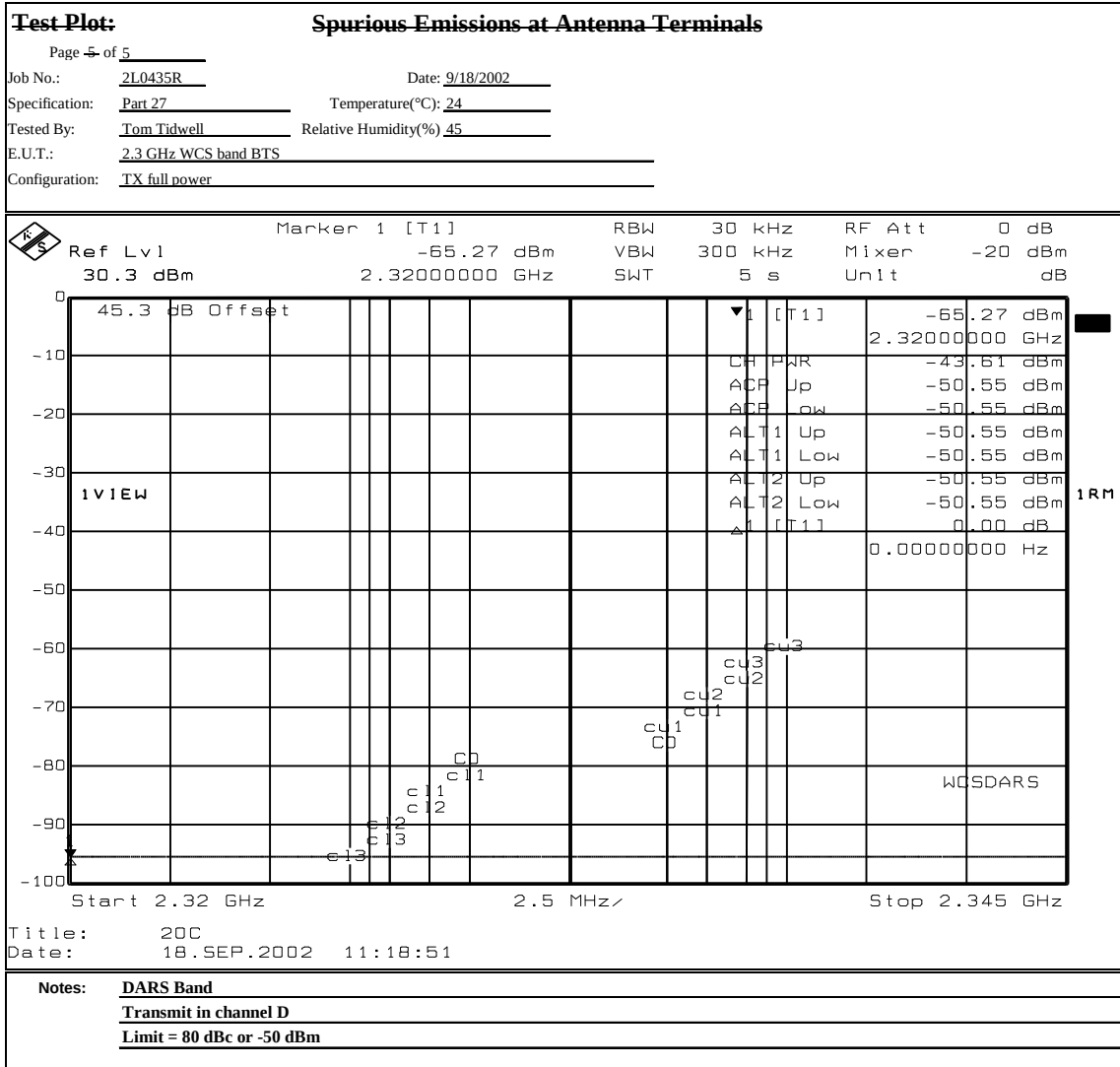
EQUIPMENT: 2.3 GHz WCS BTS



EQUIPMENT: 2.3 GHz WCS BTS



EQUIPMENT: 2.3 GHz WCS BTS



EQUIPMENT: 2.3 GHz WCS BTS

Data Plot

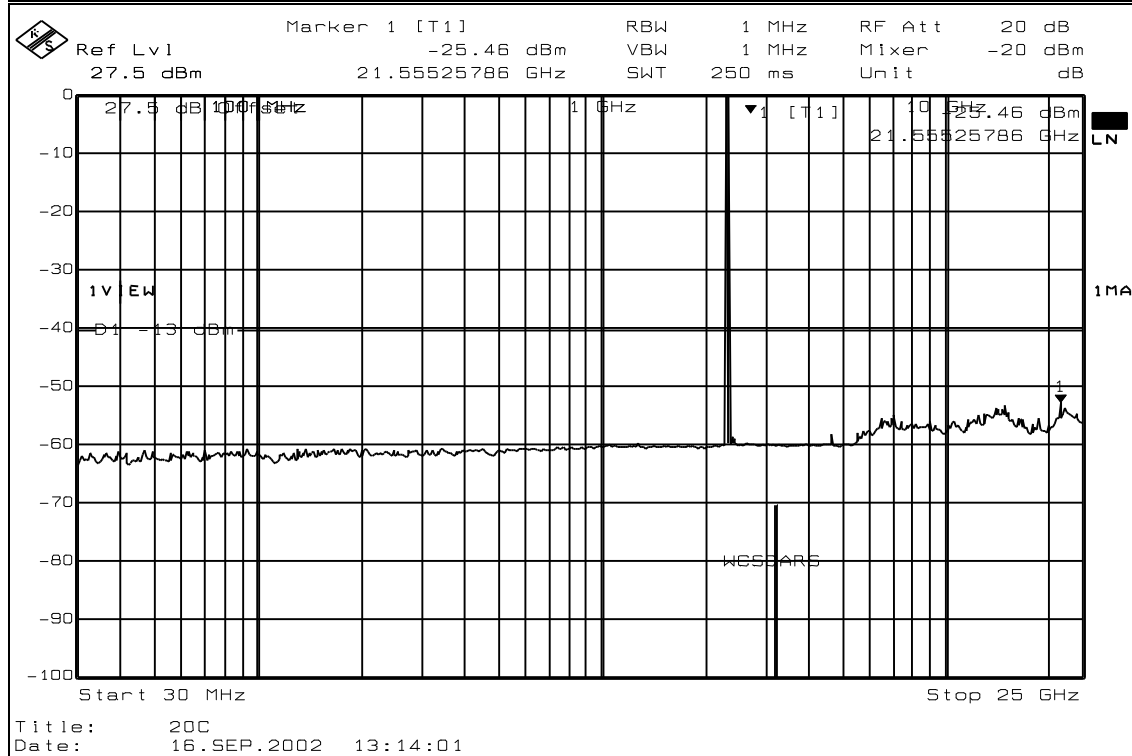
Spurious Emissions at Antenna Terminals

Page 1 of 3

Job No.: 2L0436R Date: 9/16/2002 Complete X
Specification: Part 27 Temperature(°C): 24 Preliminary: _____
Tested By: Tom Tidwell Relative Humidity(%): 45
E.U.T.: 2.3 GHz WCS band BTS
Configuration: TX full power
Sample Number: 1
Location: _____ RBW: Refer to plots
Detector Type: Rms VBW: Refer to plots

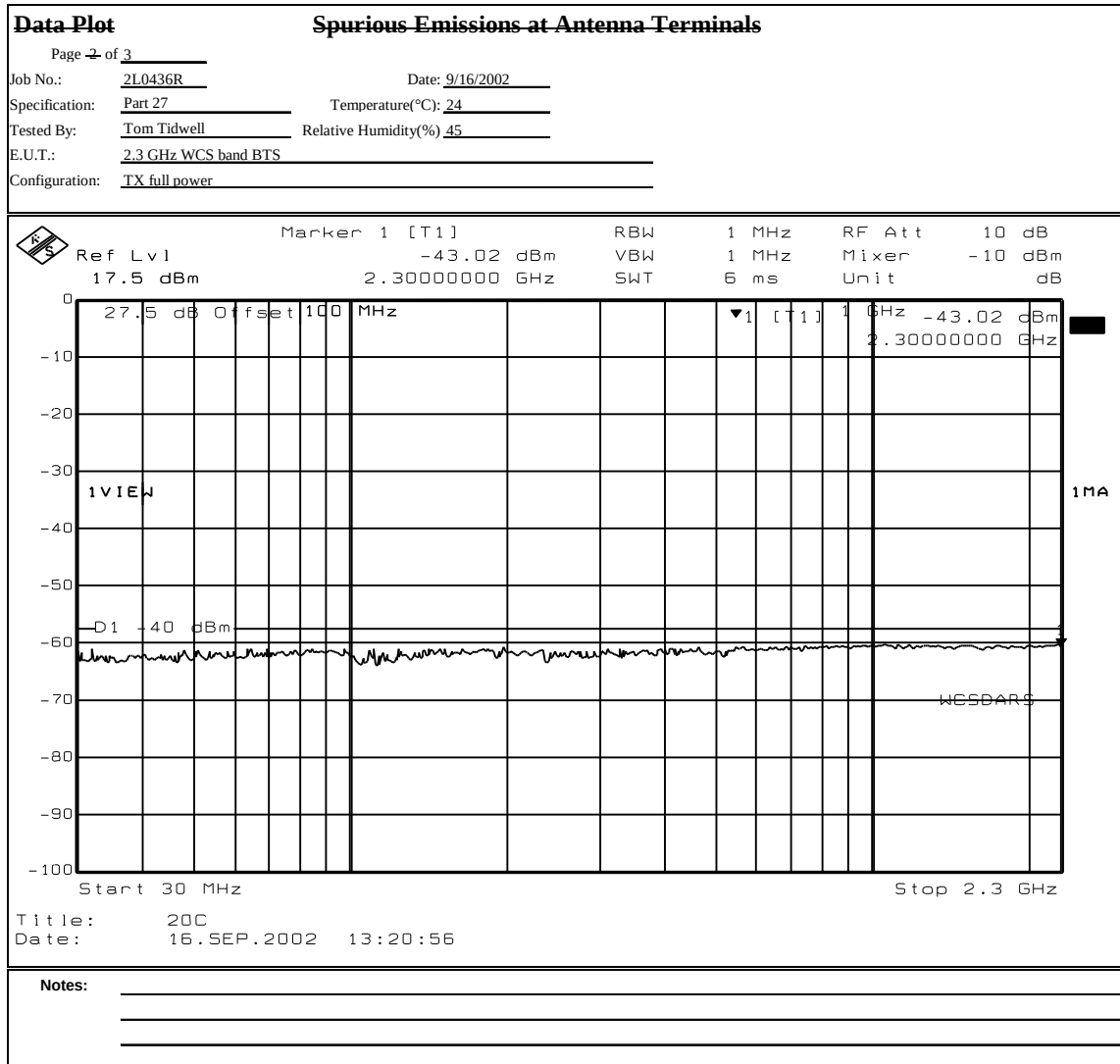
Test Equipment Used

Antenna: _____ Directional Coupler: Anaren 10616-10
Pre-Amp: _____ Cable #1: _____
Filter: _____ Cable #2: _____
Receiver: 1036 Cable #3: _____
Attenuator #1: _____ Cable #4: _____
Attenuator #2: _____ Mixer: _____
Additional equipment used: _____
Measurement Uncertainty: +/-1.7 dB

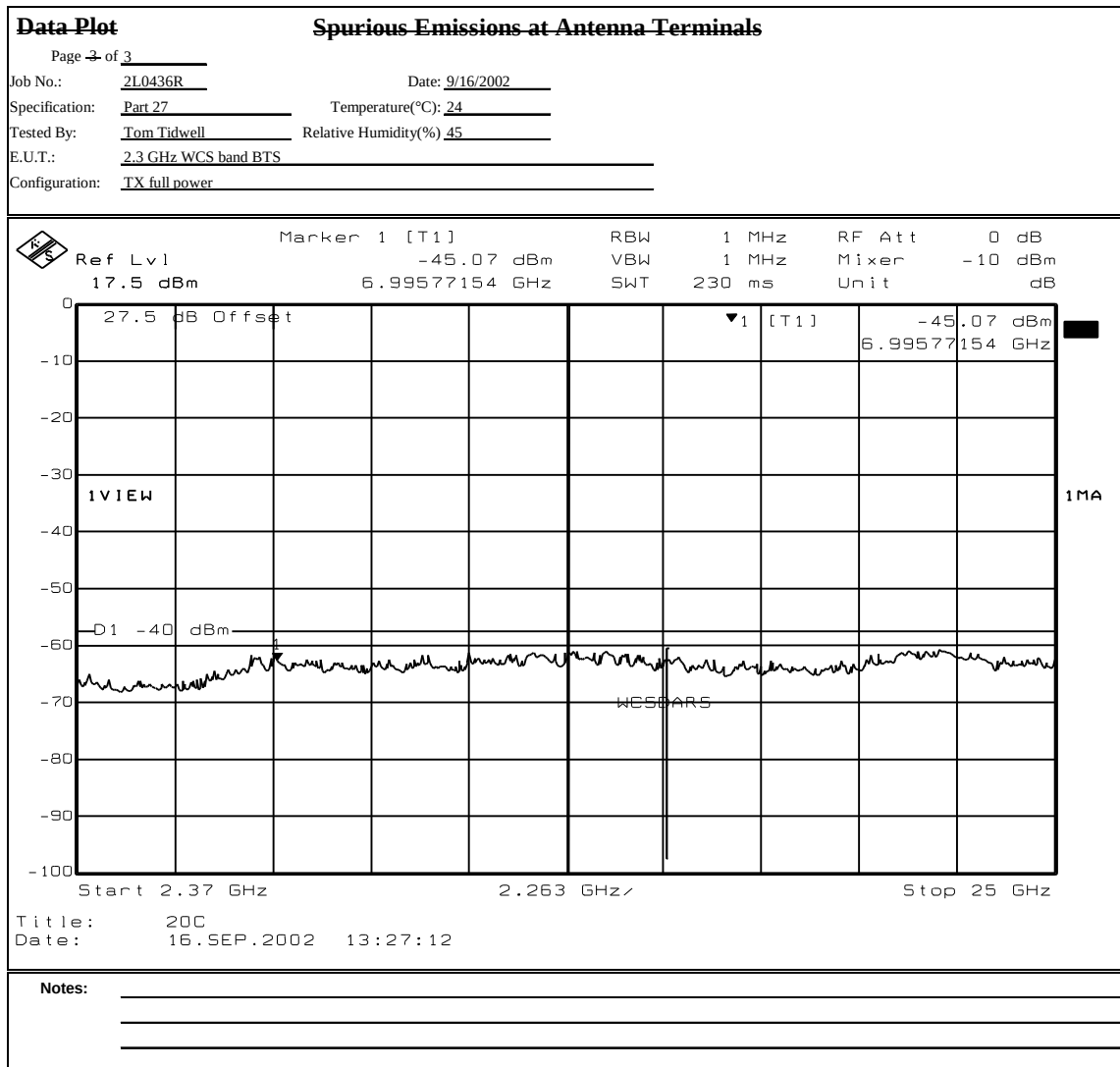


Notes: Center of Channel 2312.5 MHz

EQUIPMENT: 2.3 GHz WCS BTS



EQUIPMENT: 2.3 GHz WCS BTS



EQUIPMENT: 2.3 GHz WCS BTS

Section 6. Field Strength of Spurious

NAME OF TEST: Field Strength of Spurious Emissions	PARA. NO.: 2.1053
TESTED BY: Tom Tidwell	DATE:10/7/2002

Test Results: Complies

Measurement Data: See attached table.

Measurement Uncertainty: +/-1.7 dB

EQUIPMENT: 2.3 GHz WCS BTS
Test Data - Radiated Emissions

Dallas Headquarters:

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EIRP Substitution Method

Page 1 of 1

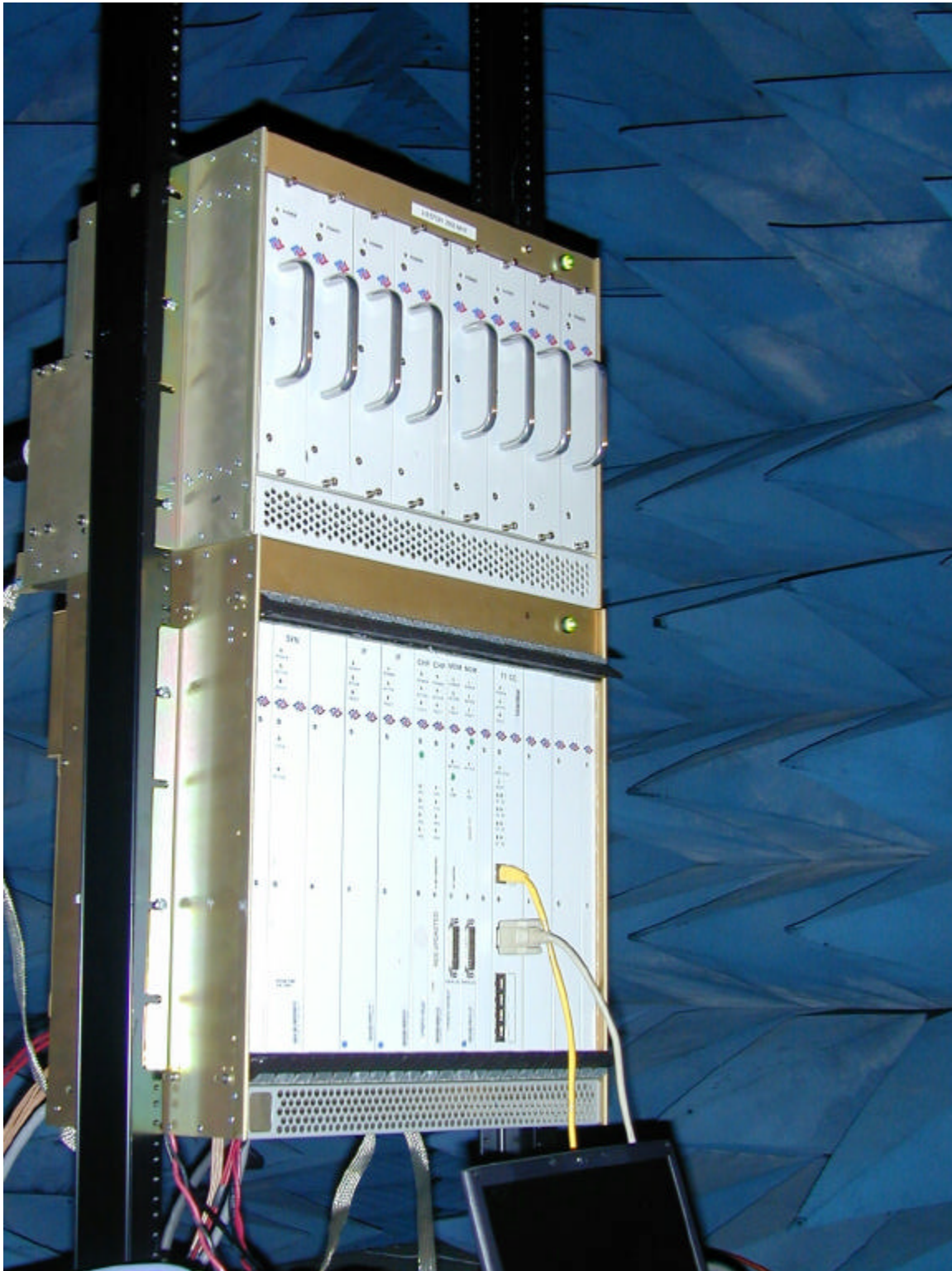
Job No.: 2L0436R Date: 10/7/02 Complete X
Specification: CFR 47, Part 27 Temperature(°C): 23 Preliminary _____
Tested By: Tom Tidwell Relative Humidity(%) 44
E.U.T.: 2.3 GHz BTS, Active antenna mode
Configuration: TX full power
Sample No: 01
Location: AC 3 RBW: 1 MHz Measurement
Detector Type: Peak VBW: 1 MHz Distance: 3 m
Test Equipment Used
Antenna: 1304 Directional Coupler: _____
Pre-Amp: 1016 Cable #1: 1483
Filter: Cable #2: 1484
Receiver: 1036 Cable #3: _____
Attenuator #1: Cable #4: _____
Attenuator #2: Mixer: _____
Additional equipment used: _____
Measurement Uncertainty: +/-1.7 dB EIRP: +30 dBm + 18 dBi + 8 dB = +56 dBm

Frequency (MHz)	Meter Reading (dBm)	Correction Factor (dB)	Pre-Amp Gain (dB)	Substitution Antenna Gain (dBd)	EIRP (dBm)	EIRP Limit (dBm)	Margin (dB)	Polarity	Comments
1461.8	-70.7	31.5	32.4	7.0	-64.6	-40.0	-24.6	V	
1461.8	-64.8	30.7	32.4	7.0	-59.5	-40.0	-19.5	H	
2172.5	-62.4	34.2	32.8	8.9	-52.1	-40.0	-12.1	V	
2172.5	-59.5	37.0	32.8	8.9	-46.4	-40.0	-6.4	H	
2320	-72.4	34.2	32.8	8.9	-62.1	-50.0	-12.1	V	NF
2320	-72.0	37.0	32.8	8.9	-58.9	-50.0	-8.9	H	NF
2340	-71.0	34.2	32.8	8.9	-60.7	-50.0	-10.7	V	NF
2340	-72.2	37.0	32.8	8.9	-59.1	-50.0	-9.1	H	NF
4696	-84.5	44.0	33.2	10.8	-62.9	-40.0	-22.9	V	NF
4696	-71.7	35.5	33.2	10.8	-58.6	-40.0	-18.6	H	NF
6128.1	-73.8	40.5	31.9	11.7	-53.5	-40.0	-13.5	V	NF
6124.6	-73.5	38.7	31.9	11.7	-55.0	-40.0	-15.0	H	NF
6151.2	-73.9	40.5	31.9	11.7	-53.6	-40.0	-13.6	V	NF
6152.4	-73.5	38.7	31.9	11.7	-55.0	-40.0	-15.0	H	NF
7044	-74.1	40.8	32.1	10.9	-54.5	-40.0	-14.5	V	NF
7044	-75.1	40.3	32.1	10.9	-56.0	-40.0	-16.0	H	NF
9392	-71.9	41.3	34.2	11.7	-53.1	-40.0	-13.1	V	NF
9392	-72.5	42.3	34.2	11.7	-52.7	-40.0	-12.7	H	NF
11740	-70.1	42.8	35.1	12.6	-49.8	-40.0	-9.8	V	NF
11740	-71.7	47.0	35.1	12.6	-47.2	-40.0	-7.2	H	NF
14088	-73.3	47.8	33.6	12.8	-46.3	-40.0	-6.3	V	NF
14088	-74.6	47.5	33.6	12.8	-47.9	-40.0	-7.9	H	NF
16436	-73.1	43.2	33.1	16.3	-46.7	-40.0	-6.7	V	NF
16436	-74.6	45.5	33.1	16.3	-45.9	-40.0	-5.9	H	NF
18784	-65.5	52.7	47.7	12.7	-47.8	-40.0	-7.8	V	NF
18784	-74.1	53.7	47.7	12.7	-55.4	-40.0	-15.4	H	NF
21132	-63.7	52.7	50.2	12.7	-48.5	-40.0	-8.5	V	NF
21132	-73.8	53.7	50.2	12.7	-57.6	-40.0	-17.6	H	NF

EQUIPMENT: 2.3 GHz WCS BTS

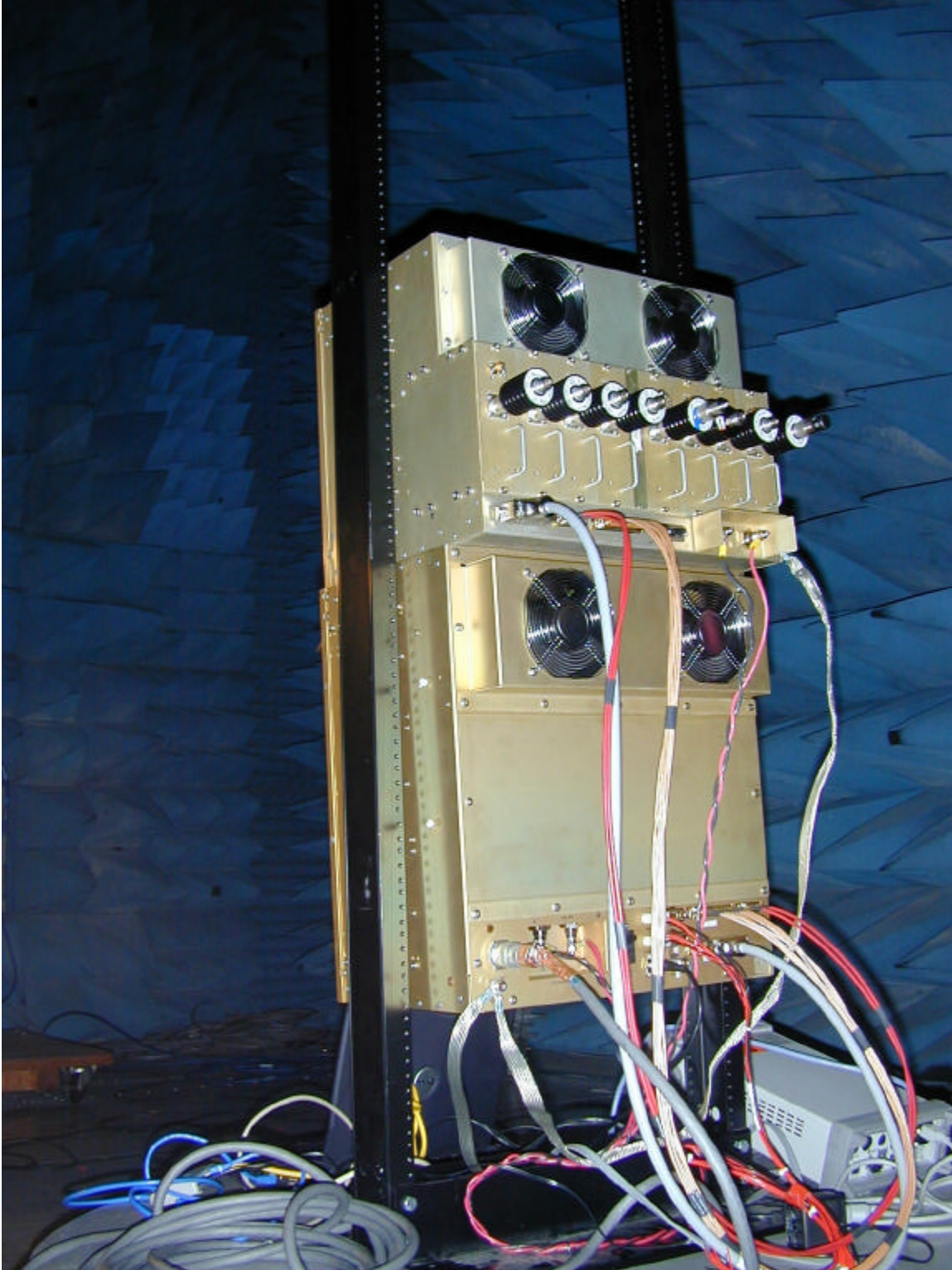
Photos – Field Strength of Spurious Emissions

Front



EQUIPMENT: 2.3 GHz WCS BTS

Rear



EQUIPMENT: 2.3 GHz WCS BTS

Section 7. Frequency Stability

NAME OF TEST: Frequency Stability	PARA. NO.: 2.1055
TESTED BY: Tom Tidwell	DATE:9/16 –9/18/2002

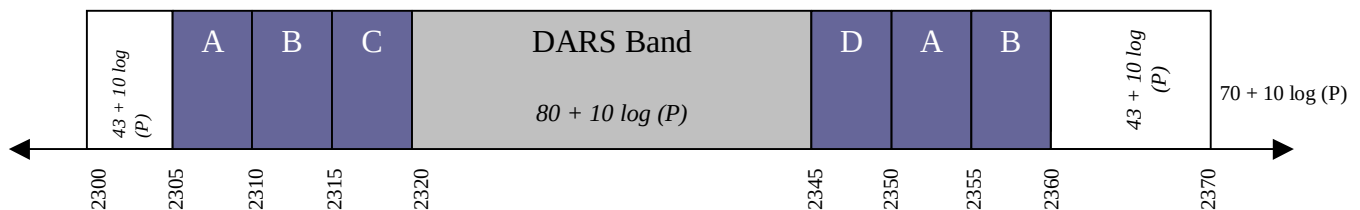
Test Results: Complies**Measurement Data:** See attached data sheets.

The following plots show that the transmitted signal stays within the required emission limits when the equipment is subjected to temperature variations.

For 10 Carrier configuration plots, with the spectrum analyzer span >10 MHz, the Adjacent Channel Power(ACP) measurement is not Valid due to internal operation of the spectrum analyzer dealing with swept Resolution BW and the integrated 1 MHz noise BW measurement. The spectrum analyzer plots are provided to show compliance to the noise emissions in the DARS band and the Out-of-Band requirements.

For 10 Carrier configuration, the absolute RMS output power of the EUT is measured with a power meter. The frequency stability spectrum analyzer plots do not intend to represent the absolute channel power “CH PWR” of the EUT but provide measurement for the noise emission compliance of the EUT.

Note –.The device ceased operation when the temperature was below 0 deg. Celsius. The equipment is designed to cease transmission at temperatures below 0 deg. Celsius.

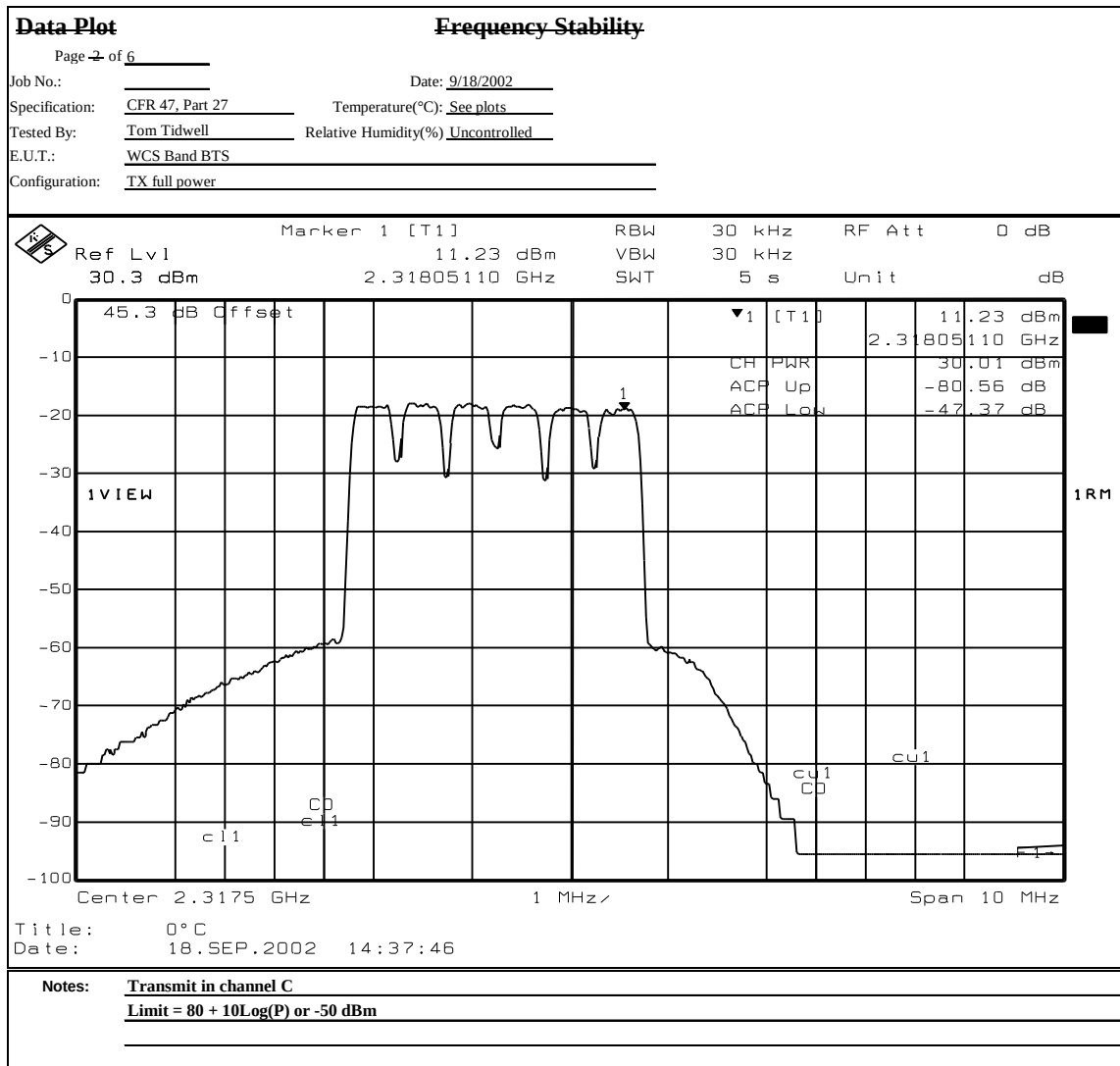
Measurement Uncertainty: 1×10^{-7} ppm

EQUIPMENT: 2.3 GHz WCS BTS

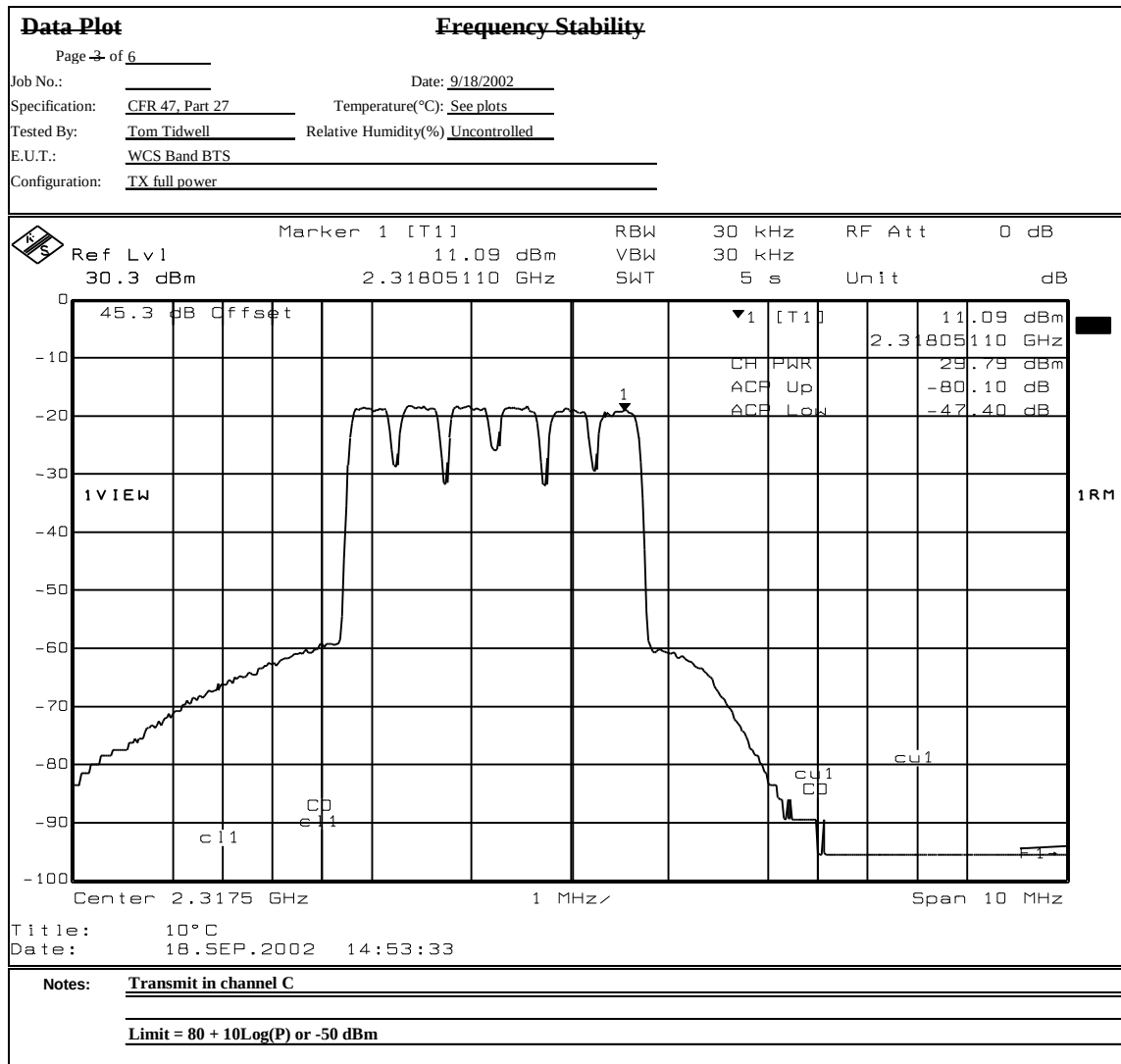
NOTE: All tests are performed at full carrier power.

Data Plot		Frequency Stability	
Page 4 of 6		Complete <u>X</u>	
Job No.:	Date: <u>9/18/2002</u>	Preliminary: _____	
Specification: CFR 47, Part 27	Temperature(°C): <u>See plots</u>		
Tested By: <u>Tom Tidwell</u>	Relative Humidity(%): <u>Uncontrolled</u>		
E.U.T.: <u>WCS Band BTS</u>			
Configuration: <u>TX full power</u>			
Sample Number: <u>1</u>			
Location: _____	RBW: <u>Refer to plots</u>		
Detector Type: <u>Rms</u>	VBW: <u>Refer to plots</u>		
Test Equipment Used			
Antenna: _____	Directional Coupler: <u>Anaron 1C0870-20 20 dB coupler</u>		
Pre-Amp: _____	Cable #1: _____		
Filter: _____	Cable #2: _____		
Receiver: <u>1036</u>	Cable #3: _____		
Attenuator #1: <u>3320-34</u>	Cable #4: _____		
Attenuator #2: _____	Mixer: _____		
Additional equipment used: _____			
Measurement Uncertainty: <u>+/-1.7 dB</u>			
Marker 1 [T1] Ref Lvl 30.2 dBm 2.32250000 GHz RBW 30 kHz VBW 30 kHz SWT 5 s RF Att 0 dB Mixer -10 dBm Unit dB Center 2.3175 GHz 1 MHz Span 10 MHz			
Date: 18.SEP.2002 12:49:59			
Notes: <u>Transmit in channel C</u> <u>20 deg. C</u> <u>Limit = 80 + 10Log(P) or -50 dBm</u>			

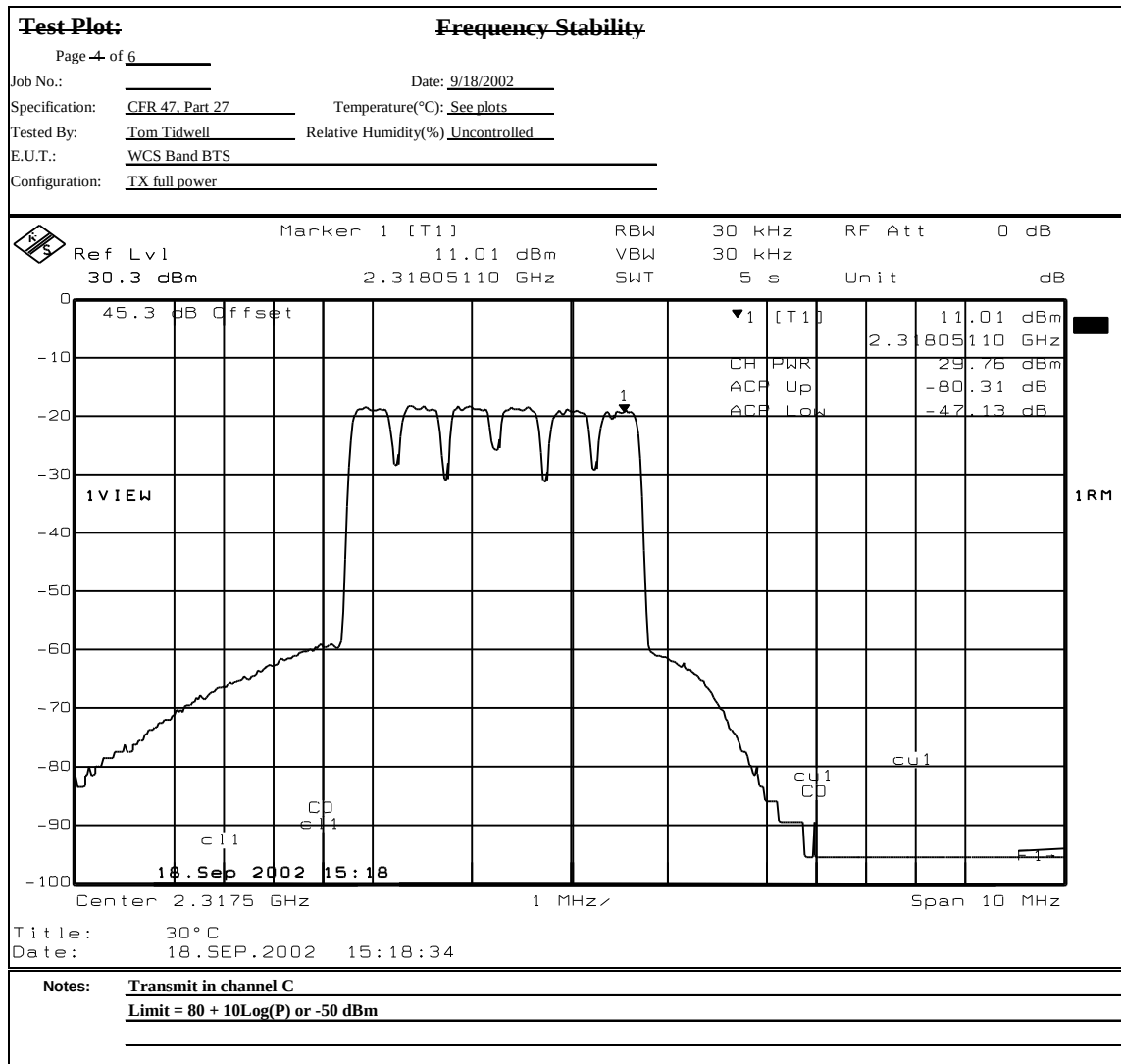
EQUIPMENT: 2.3 GHz WCS BTS



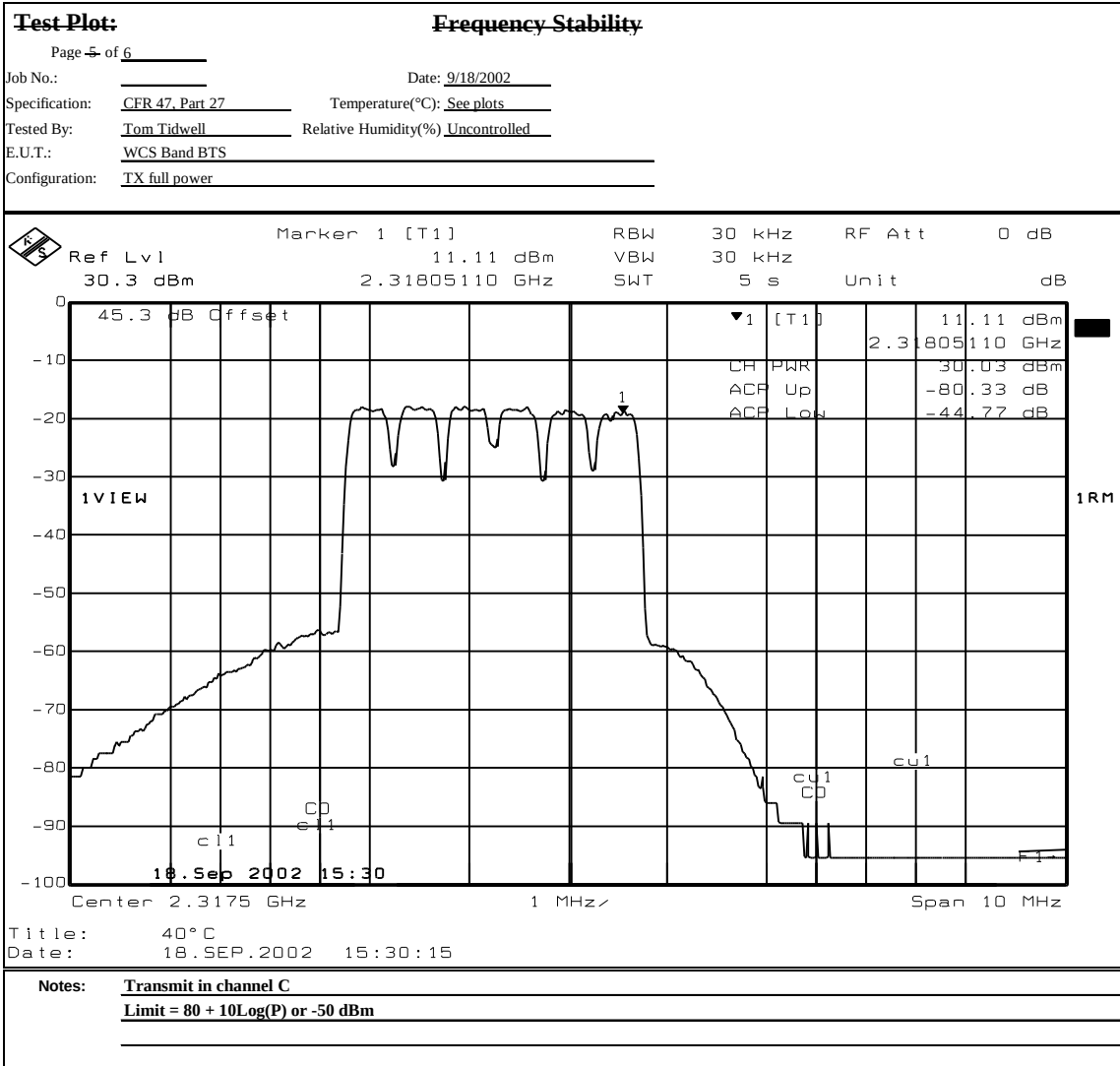
EQUIPMENT: 2.3 GHz WCS BTS



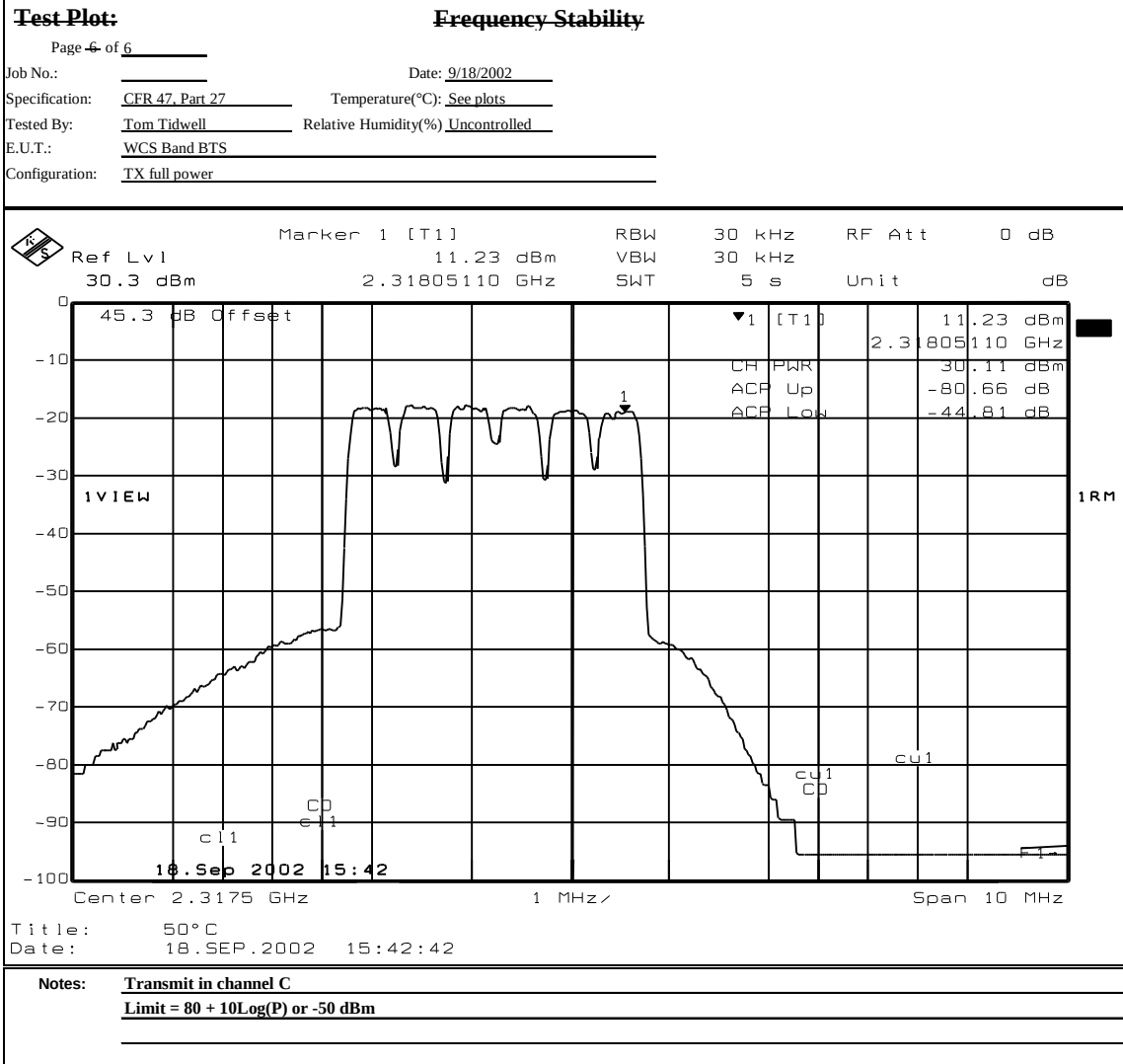
EQUIPMENT: 2.3 GHz WCS BTS



EQUIPMENT: 2.3 GHz WCS BTS



EQUIPMENT: 2.3 GHz WCS BTS



EQUIPMENT: 2.3 GHz WCS BTS

Test Plot:

Occupied Bandwidth

Page 5 of 5

Job No.: 2L0436R

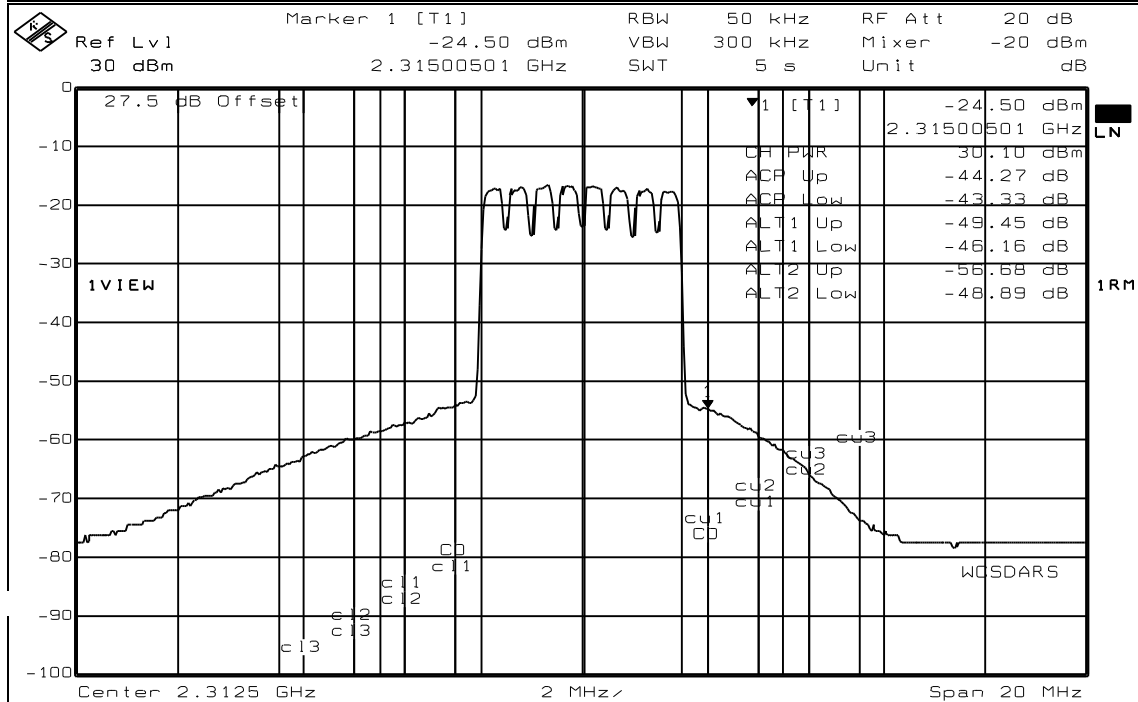
Date: 9/16/2002

Specification: Temperature(°C): 25

Tested By: Tom Tidwell Relative Humidity(%) 44

E.U.T.: 2.3 GHz WCS band BTS

Configuration: TX full power



Title: 10C

Date: 16.SEP.2002 15:35:40

Notes:

EQUIPMENT: 2.3 GHz WCS BTS

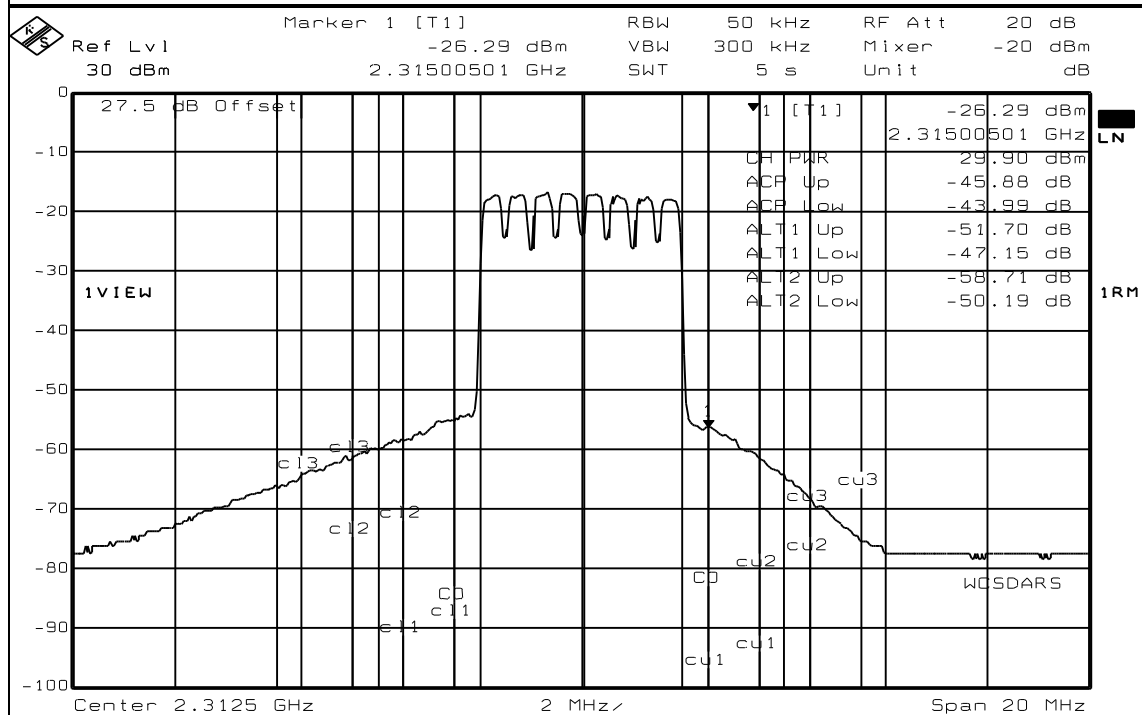
Data Plot

Occupied Bandwidth

Page 1 of 5
Job No.: 2L0436R Date: 9/16/2002 Complete X
Specification: Temperature(°C): 25 Preliminary: _____
Tested By: Tom Tidwell Relative Humidity(%) 44
E.U.T.: 2.3 GHz WCS band BTS
Configuration: TX full power
Sample Number: None
Detector Type: Rms RBW: Refer to plots
VBW: Refer to plots

Test Equipment Used

Antenna: _____ Directional Coupler: Anaren 1C087-20
Pre-Amp: _____ Cable #1: _____
Filter: _____ Cable #2: _____
Receiver: 1036 Cable #3: _____
Attenuator #1: _____ Cable #4: _____
Attenuator #2: _____ Mixer: _____
Additional equipment used: _____
Measurement Uncertainty: +/-1.7 dB



Title: 20C
Date: 16.SEP.2002 12:50:23

Notes:

Data Plot

Page 2 of 5

Job No.: 210436R Date: 9/16/2002

Specification: Temperature(°C): 25

Tested By: Tom Tidwell Relative Humidity(%): 44

E.U.T.: 2.3 GHz WCS band BTS

Configuration: TX full power

Marker 1 [T1]

Ref Lvl	-27.08 dBm	RBW	50 kHz	RF Att	20 dB
30 dBm	2.31500501 GHz	VBW	300 kHz	Mixer	-20 dBm
		SWT	5 s	Unit	dB

▼1 [T1] -27.08 dBm
2.31500501 GHz

CH PWR 29.61 dBm
ACF Up -46.40 dB
ACF Low -44.12 dB
ALT1 Up -52.54 dB
ALT1 Low -47.41 dB
ALT2 Up -59.33 dB
ALT2 Low -50.55 dB

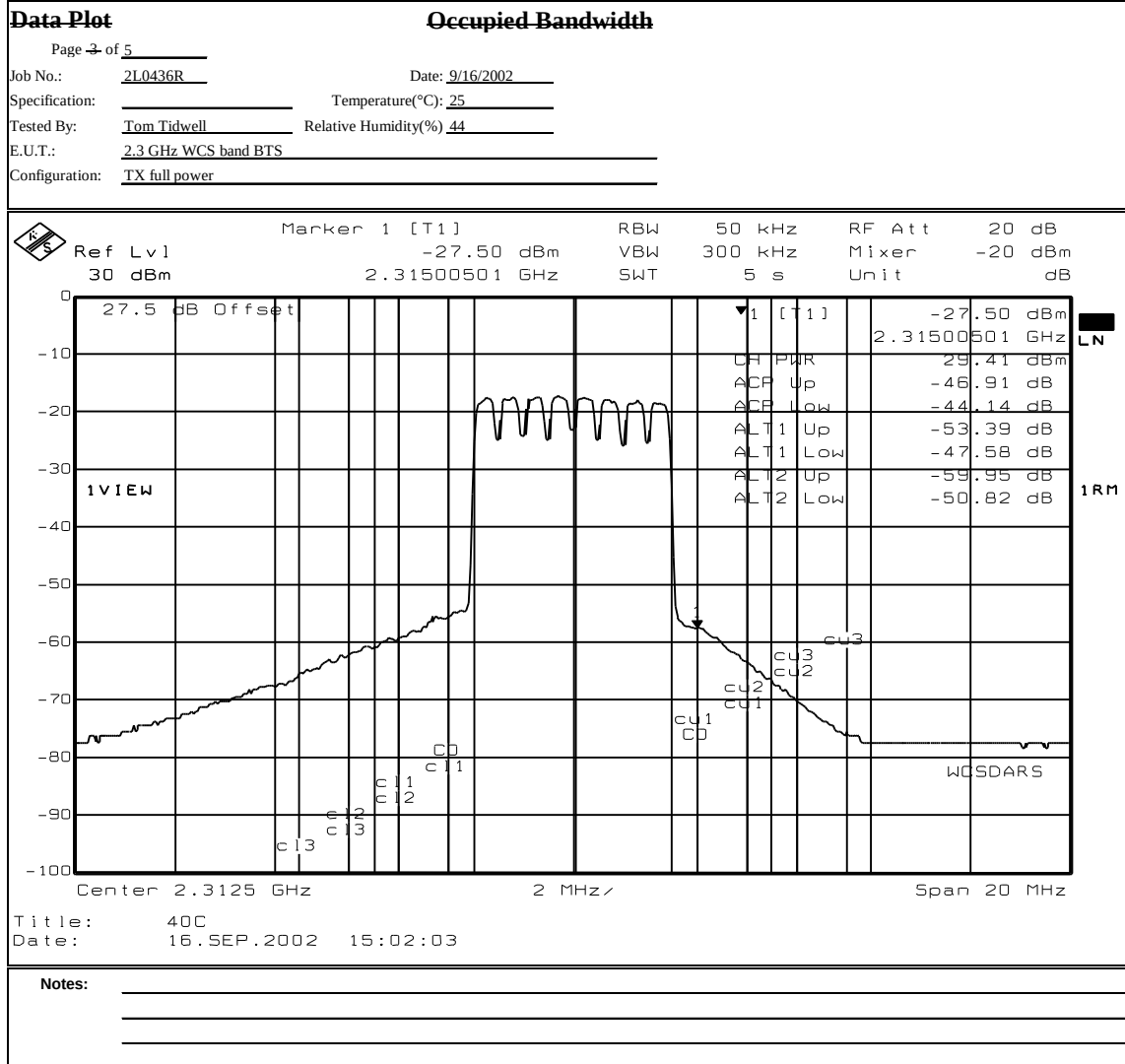
c1 c2 c3

Center 2.3125 GHz 2 MHz Span 20 MHz

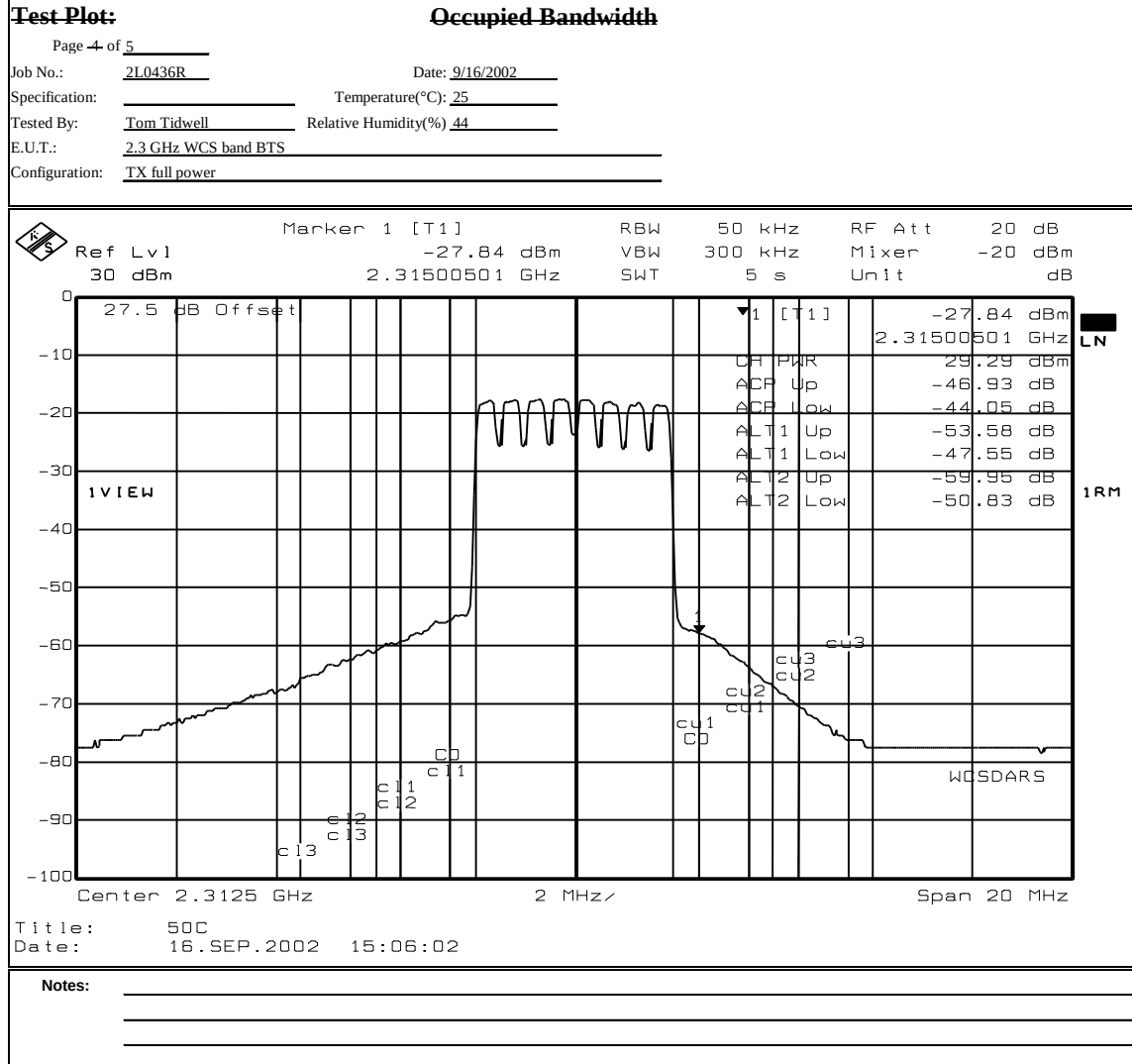
Title: 30C
Date: 16.SEP.2002 14:39:10

Notes:

EQUIPMENT: 2.3 GHz WCS BTS



EQUIPMENT: 2.3 GHz WCS BTS



EQUIPMENT: 2.3 GHz WCS BTS

NOTE: All tests are performed at full carrier power.



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Data Plot

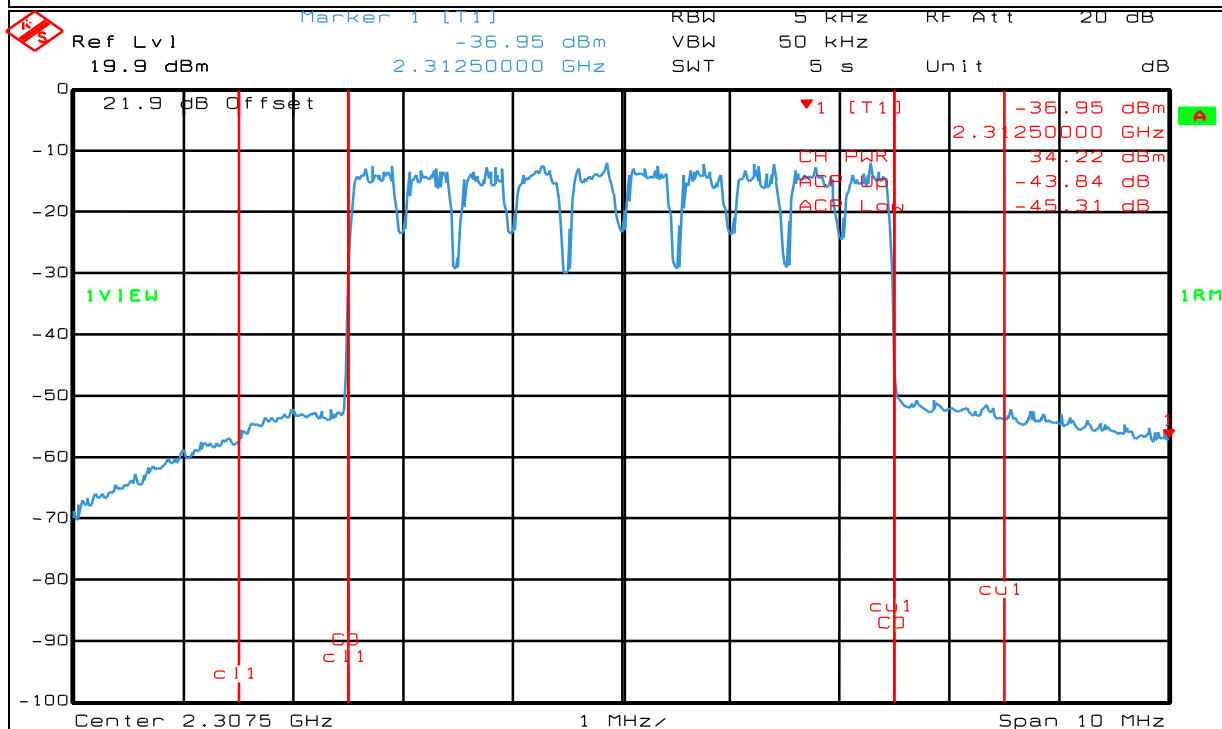
Spurious Emissions at Antenna Terminals

Page 1 of 16

Job No.: 2L0436R Date: 9/18/2003 Complete x
 Specification: Part 27 Temperature(°C): 22 Preliminary: _____
 Tested By: David Light Relative Humidity(%): 40
 E.U.T.: 2.3 GHz BTS
 Configuration: Tx 10 Carriers
 Sample Number: 1
 Location: On site RBW: 5 kHz Measurement
 Detector Type: Rms VBW: 50 kHz Distance: NA m

Test Equipment Used

Antenna: _____ Directional Coupler: Model 1C0870-20 Cal'd prior to use
 Pre-Amp: _____ Cable #1: 1484
 Filter: _____ Cable #2: _____
 Receiver: 1036 Cable #3: _____
 Attenuator #1: Model 2044-6dB Cal'd prior to use Cable #4: _____
 Attenuator #2: Model 33-20-34 Cal'd prior to use Mixer: _____
 Additional equipment used: _____
 Measurement Uncertainty: +/-1.7 dB



Title: 20C
 Date: 18.SEP.2003 17:36:05

Notes: Ambient 27 Vdc
 Adjacent channel power using higher resolution

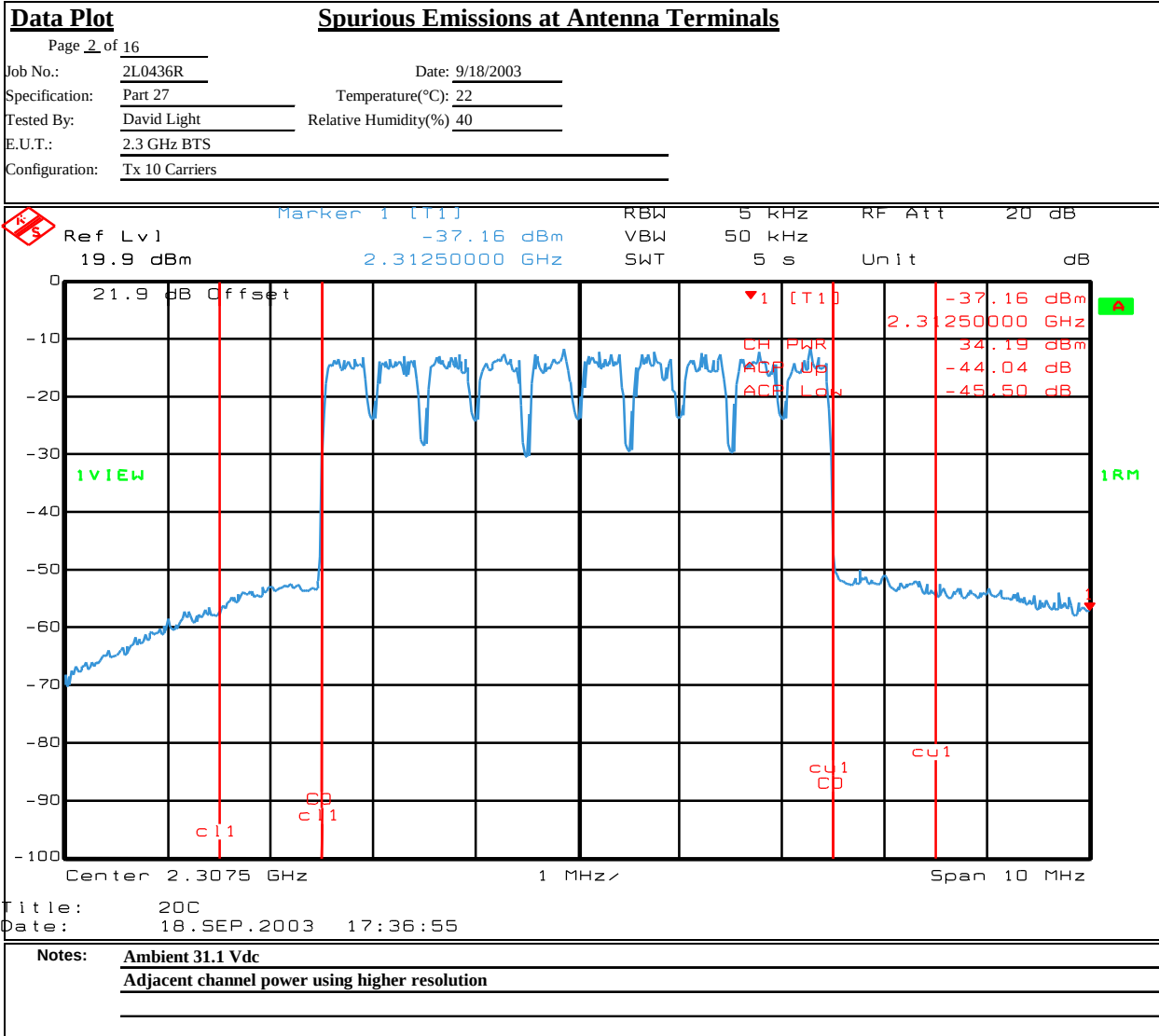
EQUIPMENT: 2.3 GHz WCS BTS



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EQUIPMENT: 2.3 GHz WCS BTS



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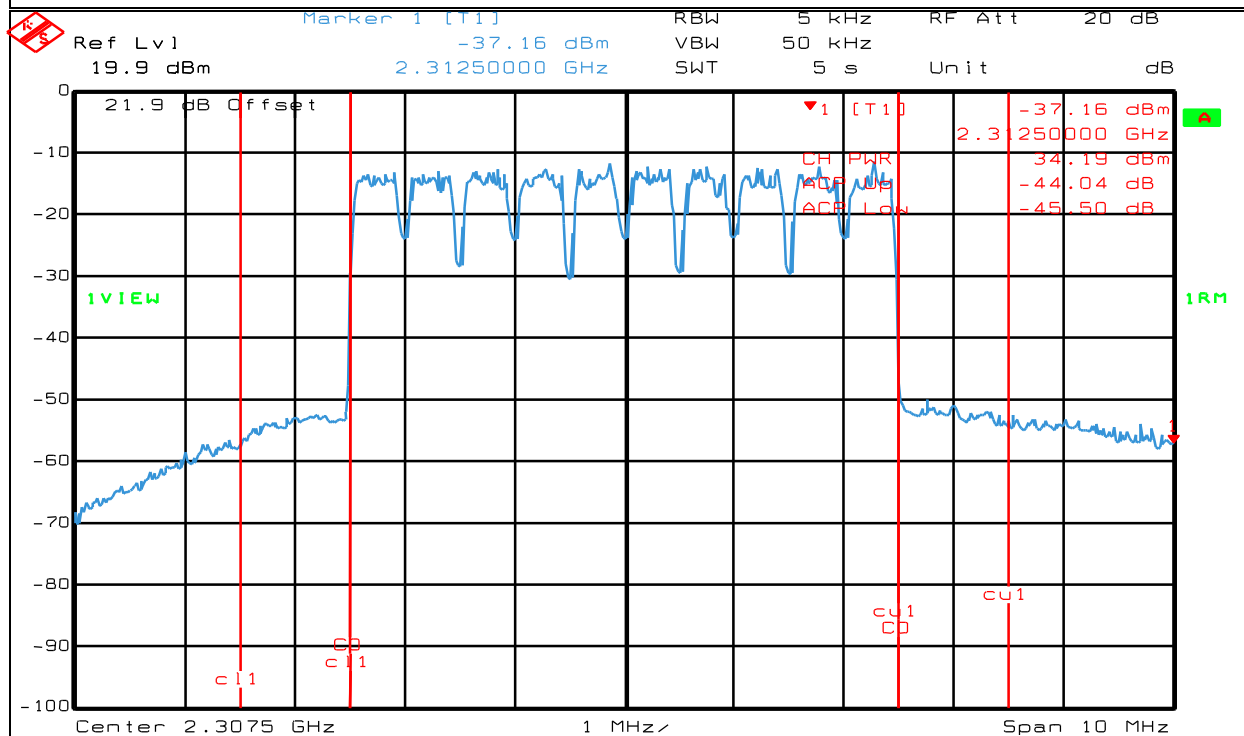
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Data Plot

Page 3 of 16

Job No.: 2L0436R Date: 9/18/2003
Specification: Part 27 Temperature(°C): 22
Tested By: David Light Relative Humidity(%) 40
E.U.T.: 2.3 GHz BTS
Configuration: Tx 10 Carriers

Spurious Emissions at Antenna Terminals



Title: 20C
Date: 18.SEP.2003 17:37:24

Notes: Ambient 22.9 Vdc
Adjacent channel power using higher resolution

EQUIPMENT: 2.3 GHz WCS BTS



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Test Plot:

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Job No.: 2L0436R

Date: 9/18/2003

Specification:	Part 27
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Temperature(°C): 22

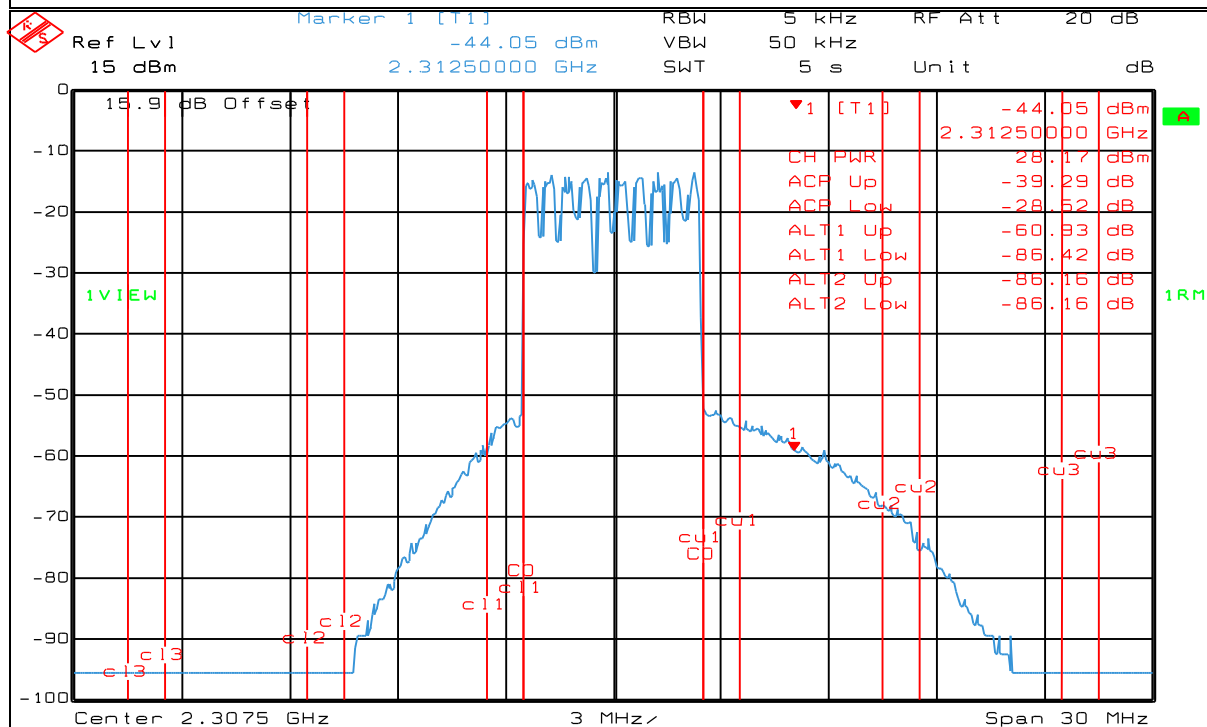
Tested By:	David Light
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Relative Humidity(%) 40

E.U.T.:	2.3 GHz BTS
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Configuration:	Tx 10 Carriers
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Spurious Emissions at Antenna Terminals



```
Title:      20C
Date:      18.SEP.2003   17:40:09
```

Notes: Ambient 27 Vdc
Co-adjacent channel power

EQUIPMENT: 2.3 GHz WCS BTS



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Test Plot:

Page 5 of 16

Job No.:	2L0436R
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Date: 9/18/2003

Specification:	<u>Part 27</u>
----------------	----------------

Temperature(°C): 22

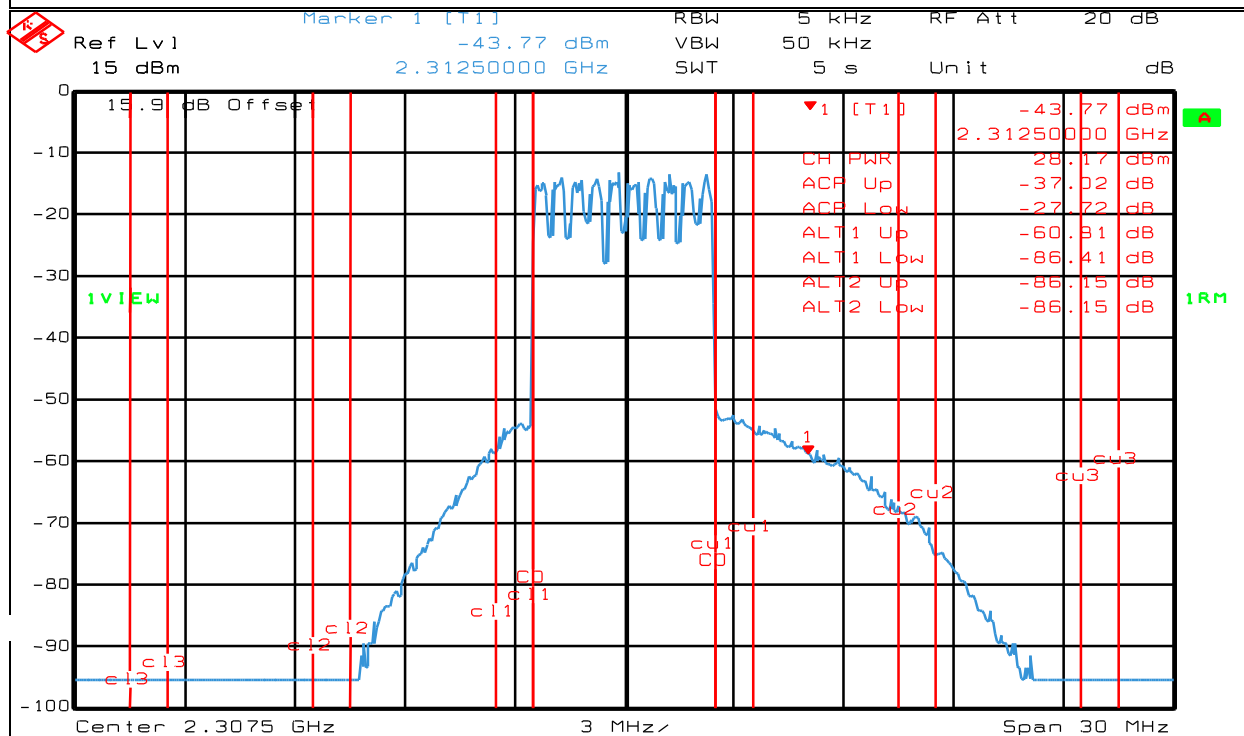
Tested By:	David Light
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Relative Humidity(%) 40

E.U.T.:	2.3 GHz BTS
---------	-------------

Configuration:	Tx 10 Carriers
----------------	----------------

Spurious Emissions at Antenna Terminals



Title: 20C
Date: 18.SEP.2003 17:39:27

Notes: Ambient 31.1 Vdc
Co-adjacent channel power

EQUIPMENT: 2.3 GHz WCS BTS



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Test Plot:

Page 6 of 16

Job No.: 2L0436R

Date: 9/18/2003

Specification:	<u>Part 27</u>
----------------	----------------

Temperature(°C): 22

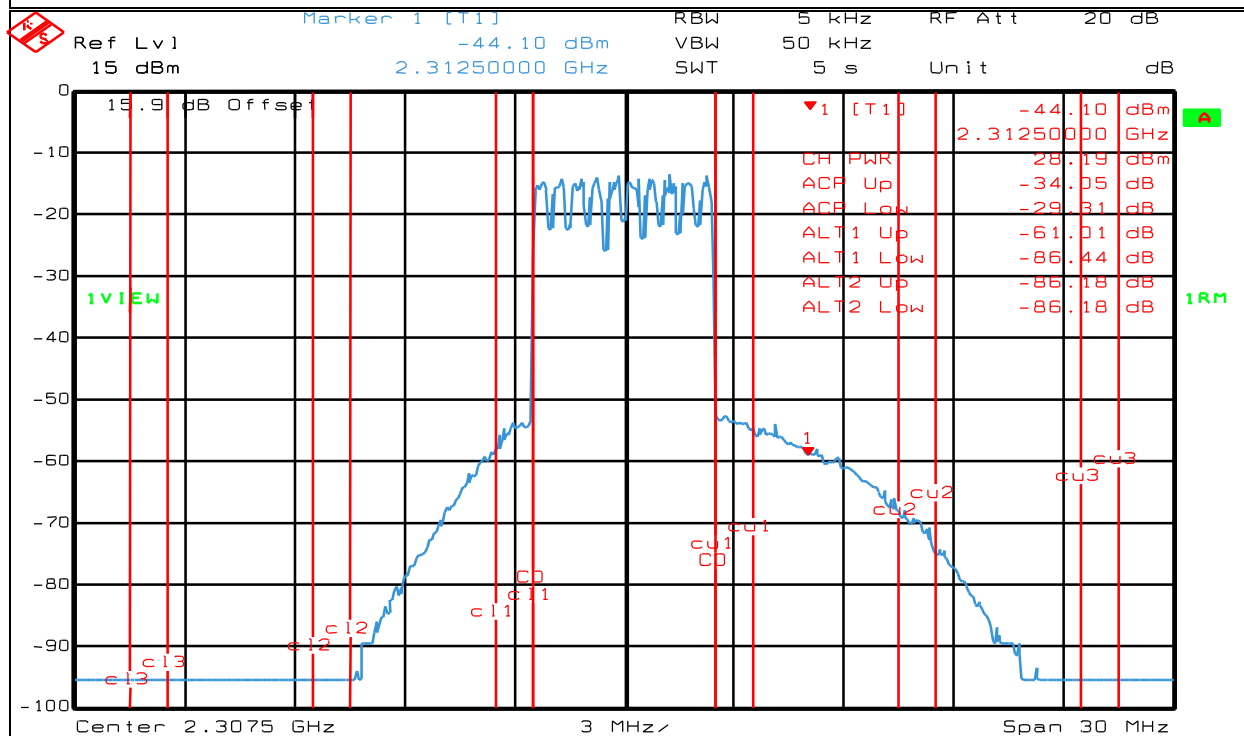
Tested By:	David Light
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Relative Humidity(%) 40

E.U.T.:	2.3 GHz BTS
---------	-------------

Configuration:	Tx 10 Carriers
----------------	----------------

Spurious Emissions at Antenna Terminals



Title: 20C
Date: 18.SEP.2003 17:38:16

Notes: Ambient 22.9 Vdc
Co-adjacent channel power

EQUIPMENT: 2.3 GHz WCS BTS



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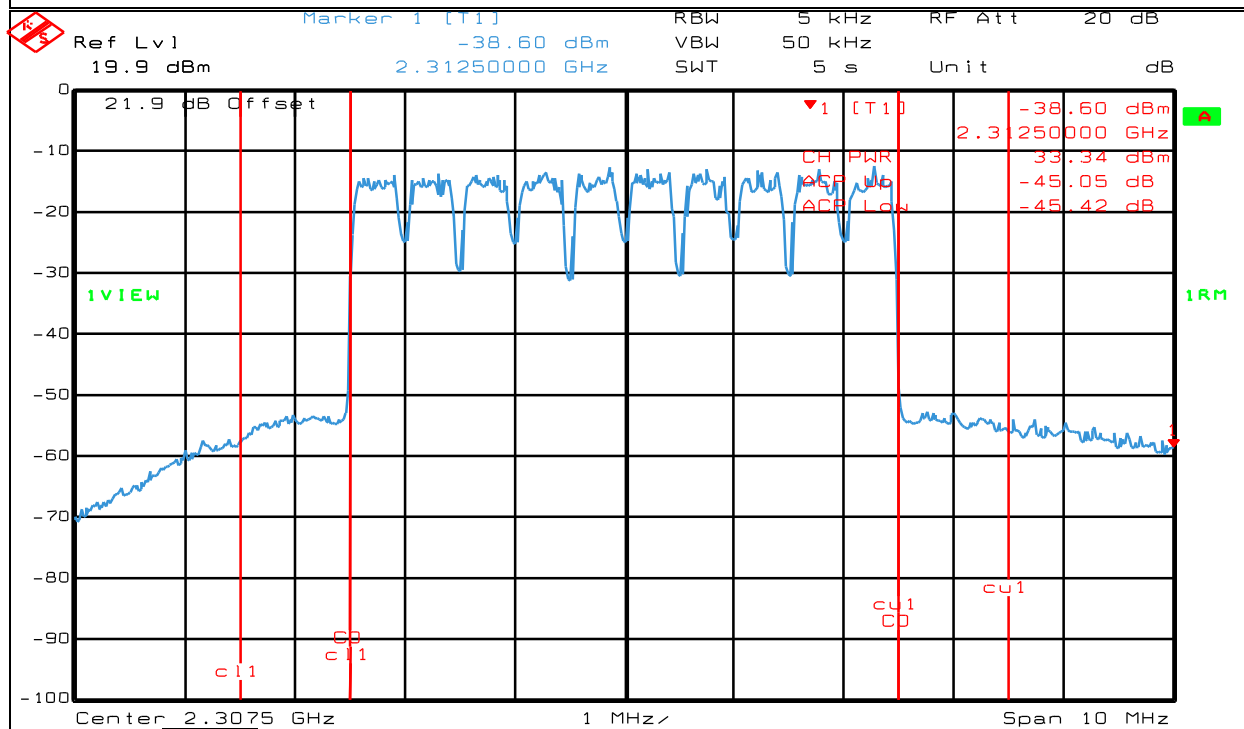
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Test Plot:

Spurious Emissions at Antenna Terminals

Page 7 of 16

Job No.: 2L0436R Date: 9/18/2003
Specification: Part 27 Temperature(°C): 22
Tested By: David Light Relative Humidity(%) 40
E.U.T.: 2.3 GHz BTS
Configuration: Tx 10 Carriers



Title: [REDACTED]
Date: 18.SEP.2003 17:24:47

Notes: +10°C
Adjacent channel power using higher resolution

EQUIPMENT: 2.3 GHz WCS BTS



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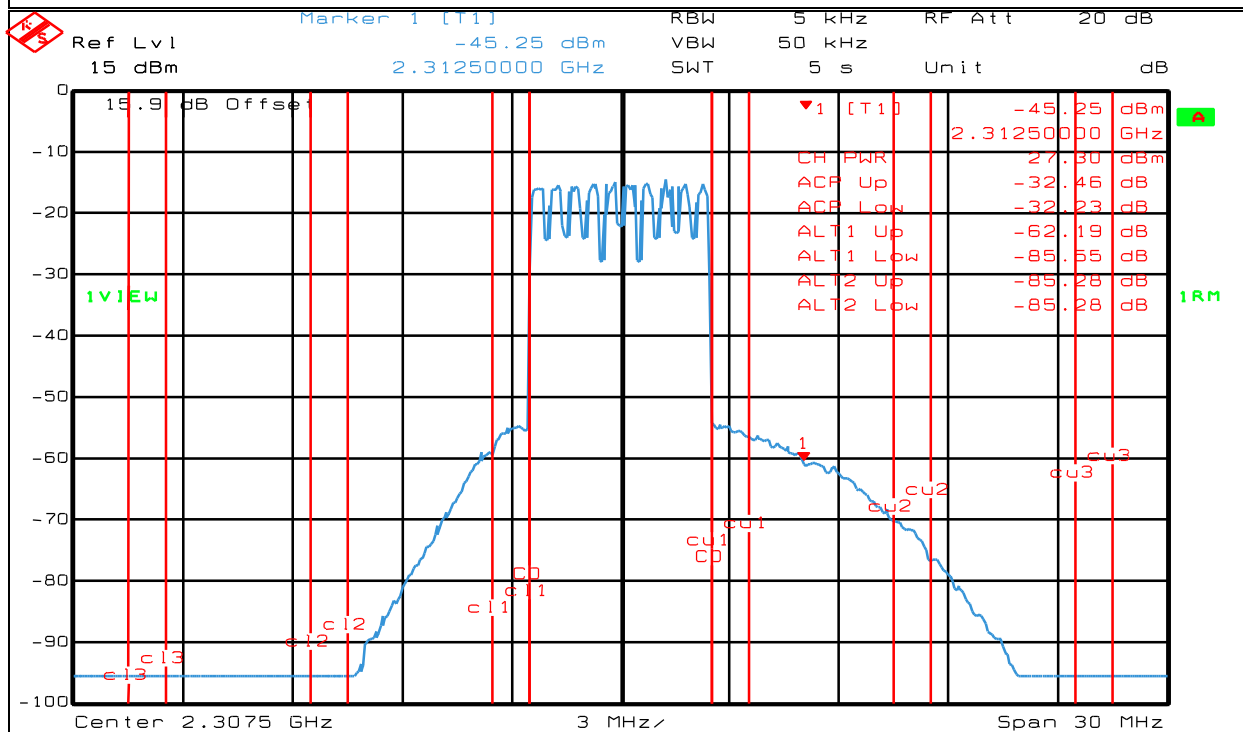
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Test Plot:

Page 8 of 16

Spurious Emissions at Antenna Terminals

Job No.: 2L0436R Date: 9/18/2003
Specification: Part 27 Temperature(°C): 22
Tested By: David Light Relative Humidity(%) 40
E.U.T.: 2.3 GHz BTS
Configuration: Tx 10 Carriers



Title: [REDACTED]
Date: 18.SEP.2003 17:23:56

Notes: +10°C
Co-adjacent channel power

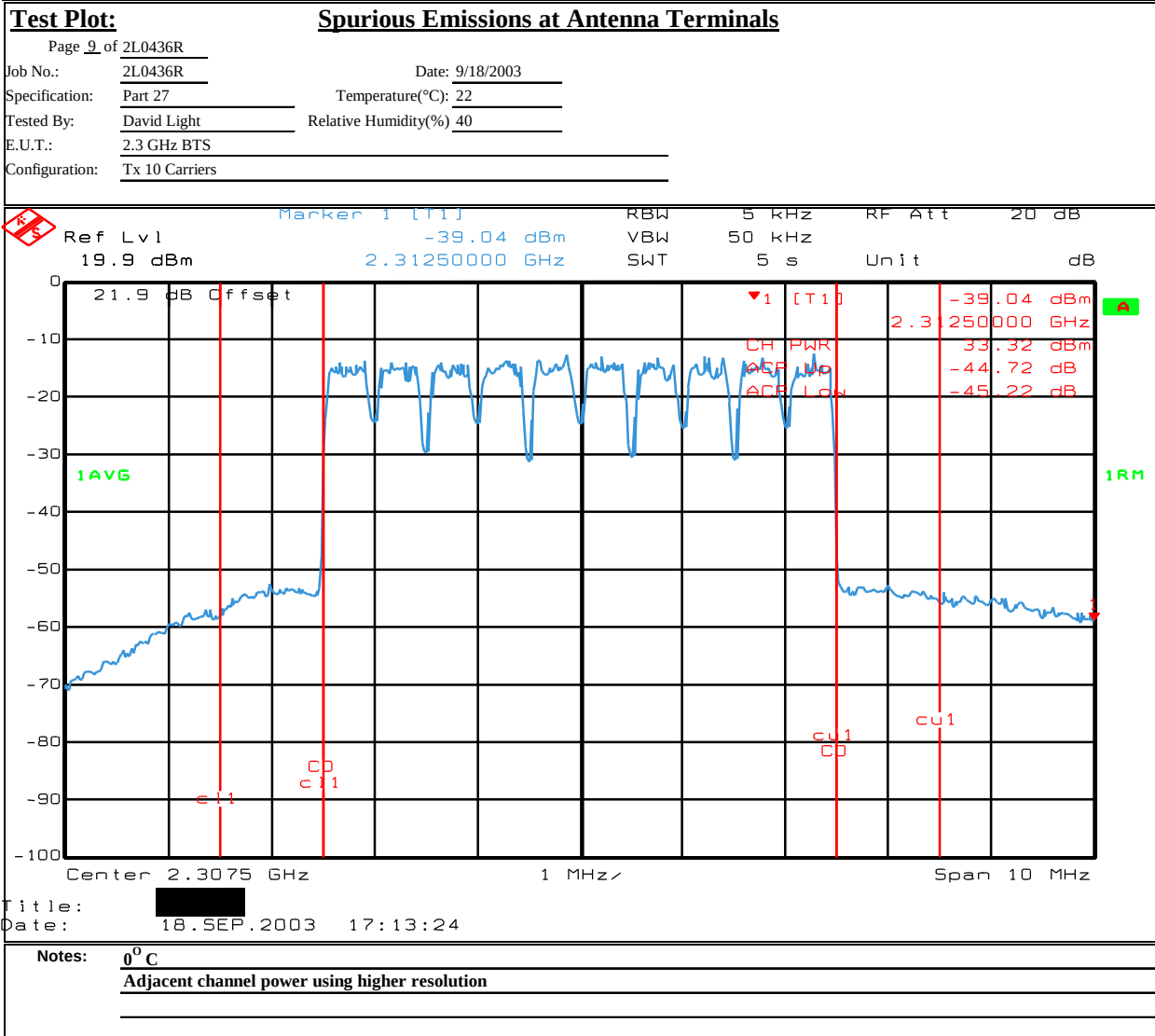
EQUIPMENT: 2.3 GHz WCS BTS



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EQUIPMENT: 2.3 GHz WCS BTS



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Data Plot

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Job No.: 2L0436R

Date: 9/18/2003

Specification: Part 27

Temperature(°C): 22

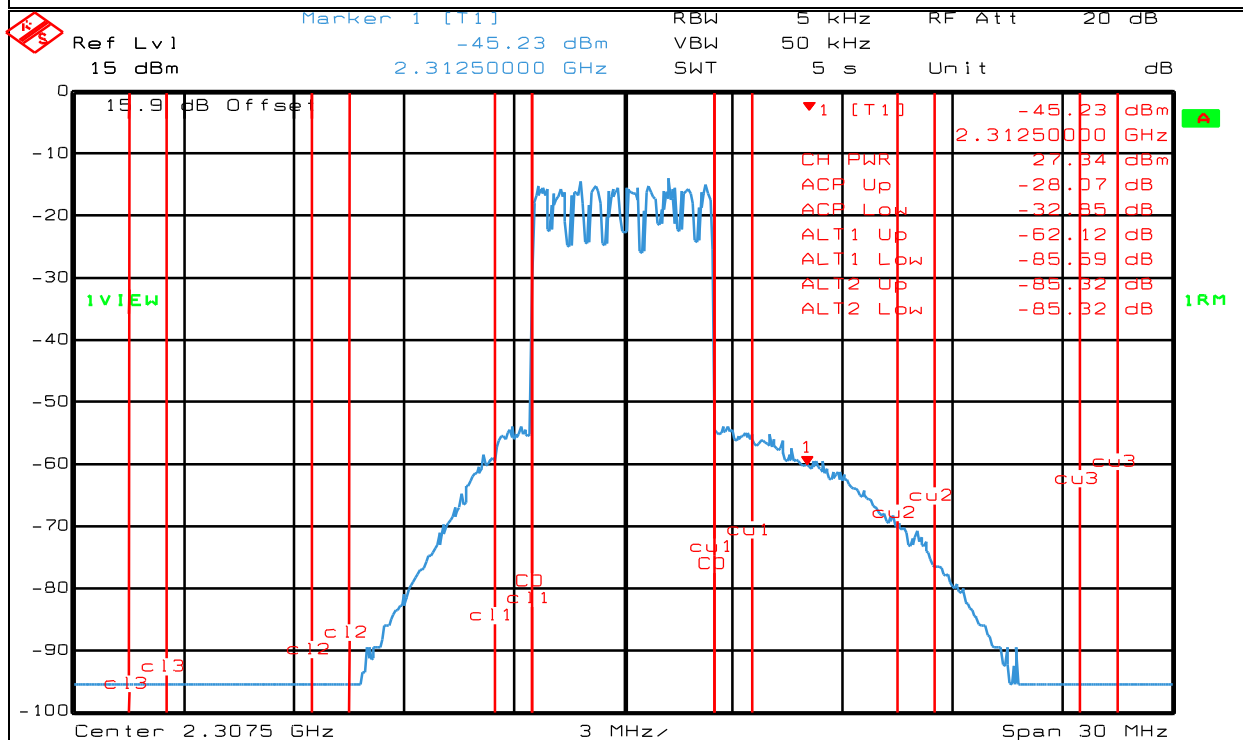
Tested By: David Light

Relative Humidity(%) 40

E.U.T.: 2.3 GHz BTS

Configuration: Tx 10 Carriers

Spurious Emissions at Antenna Terminals



Title:

Date: 18.SEP.2003 17:14:13

Notes: 0°C

Co-adjacent channel power

EQUIPMENT: 2.3 GHz WCS BTS



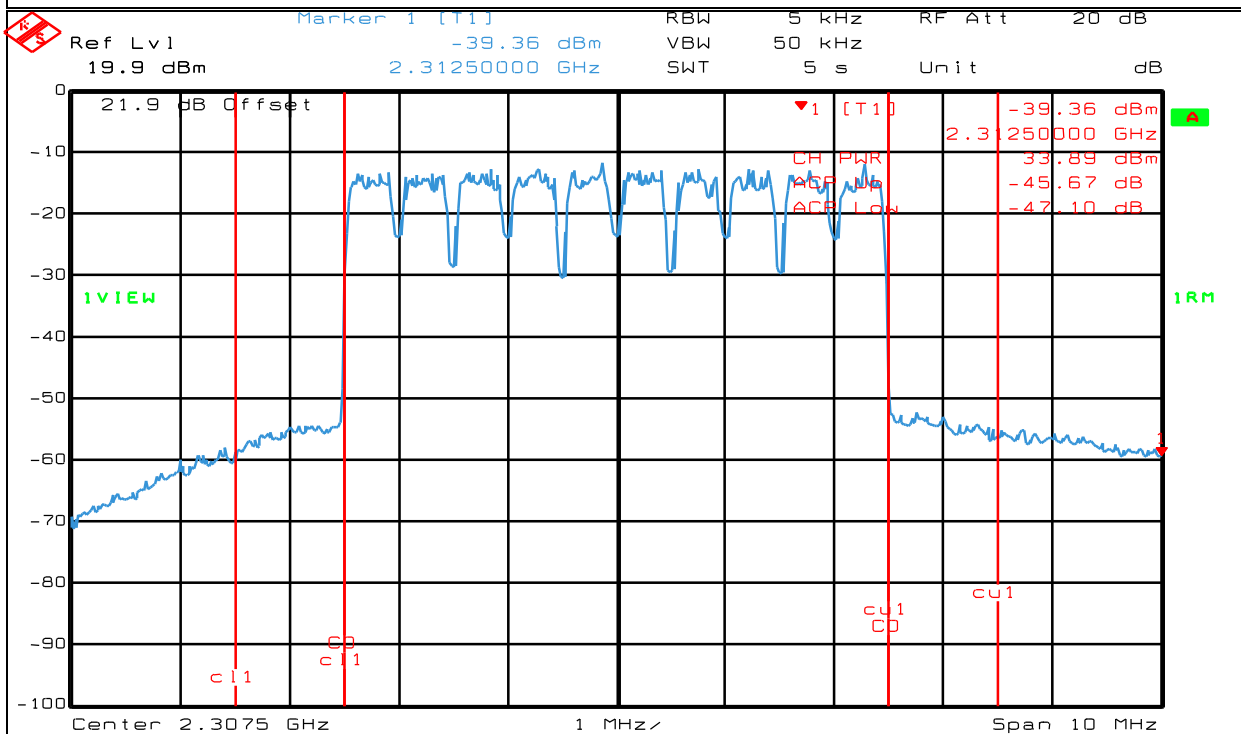
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Test Plot:

Page 11 of 2L0436R
Job No.: 2L0436R Date: 9/18/2003
Specification: Part 27 Temperature(°C): 22
Tested By: David Light Relative Humidity(%) 40
E.U.T.: 2.3 GHz BTS
Configuration: Tx 10 Carriers

Spurious Emissions at Antenna Terminals

Title: [REDACTED]
Date: 18.SEP.2003 17:58:49

Notes: +30°C
Adjacent channel power using higher resolution

EQUIPMENT: 2.3 GHz WCS BTS



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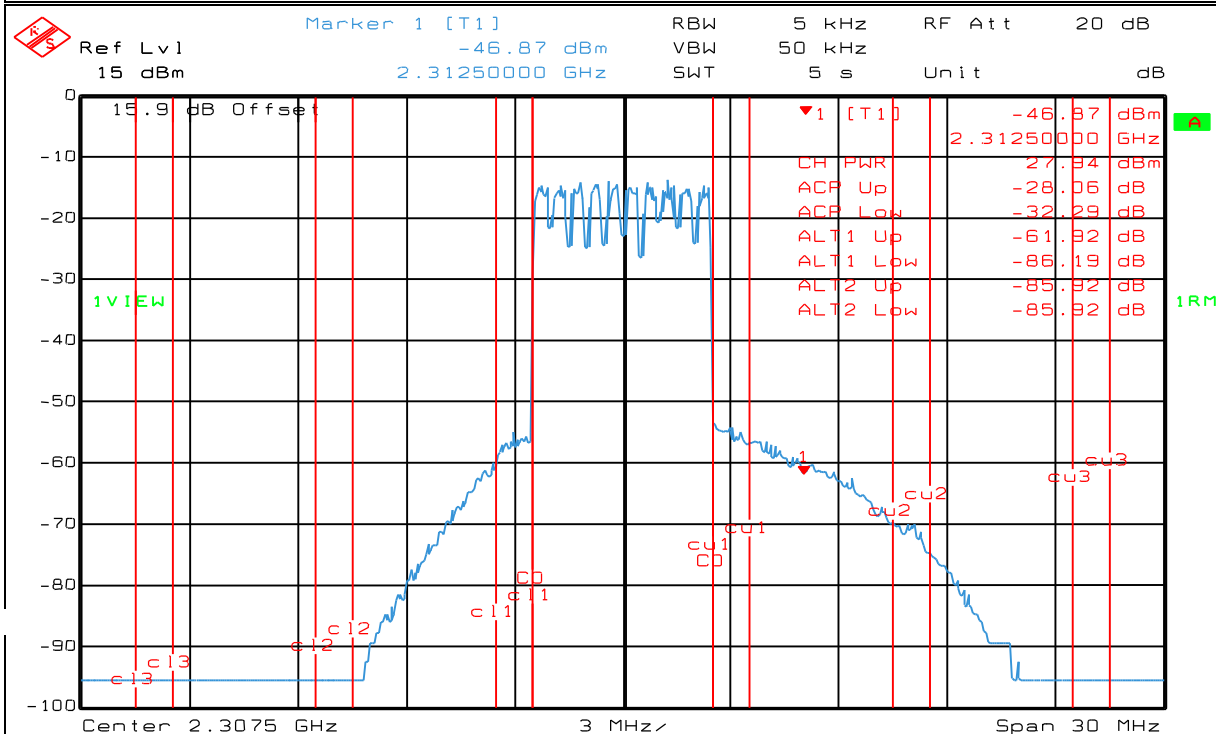
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Fax: (972) 436-2667**Test Plot:**Page 12 of 2L0436R
Job No.: 2L0436R
Specification: Part 27
Tested By: David Light
E.U.T.: 2.3 GHz BTS
Configuration: Tx 10 Carriers**Spurious Emissions at Antenna Terminals**

Date: 9/18/2003

Temperature(°C): 22

Relative Humidity(%) 40

Title: [REDACTED]
Date: 18.SEP.2003 17:57:33Notes: +30°C
Co-adjacent channel power

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Page 13 of 2L0436R

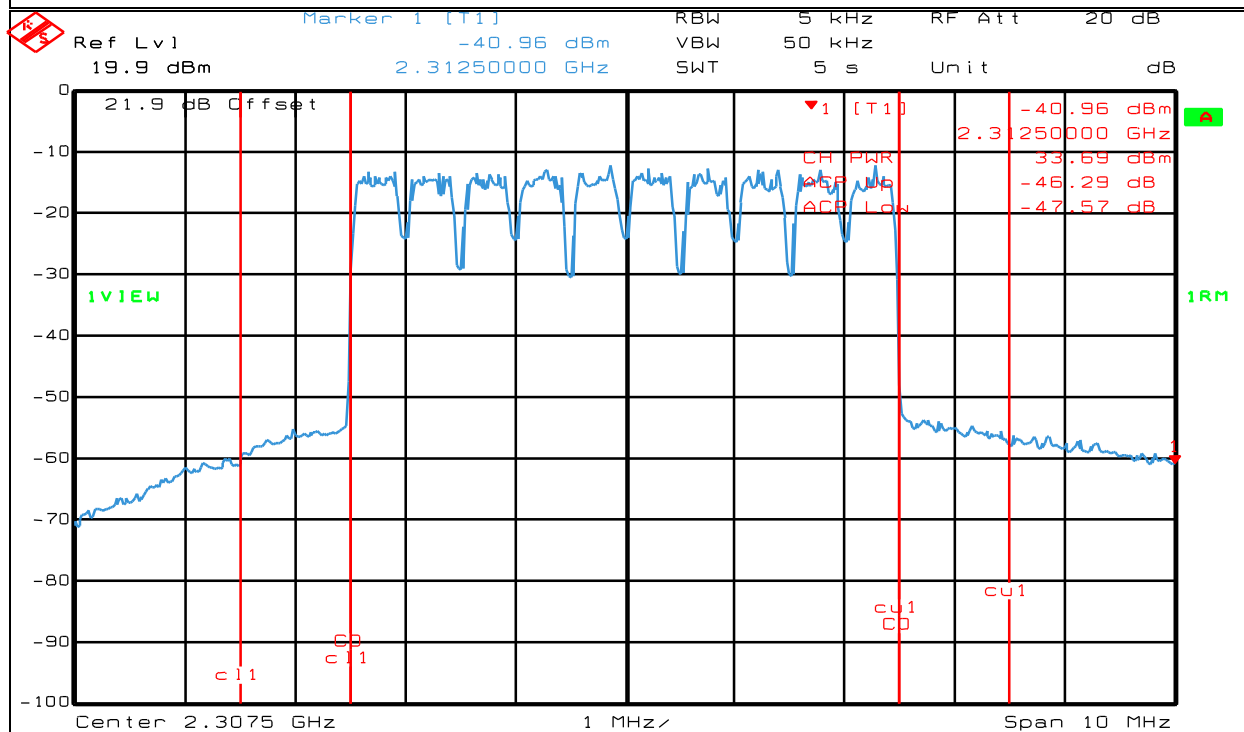
Job No.: 2L0436R Date: 9/18/2003

Specification: Part 27 Temperature(°C): 22

Tested By: David Light Relative Humidity(%) 40

E.U.T.: 2.3 GHz BTS

Configuration: Tx 10 Carriers



Title: [REDACTED]
Date: 18.SEP.2003 18:07:54

Notes: +40⁰ C
Adjacent channel power using higher resolution

EQUIPMENT: 2.3 GHz WCS BTS



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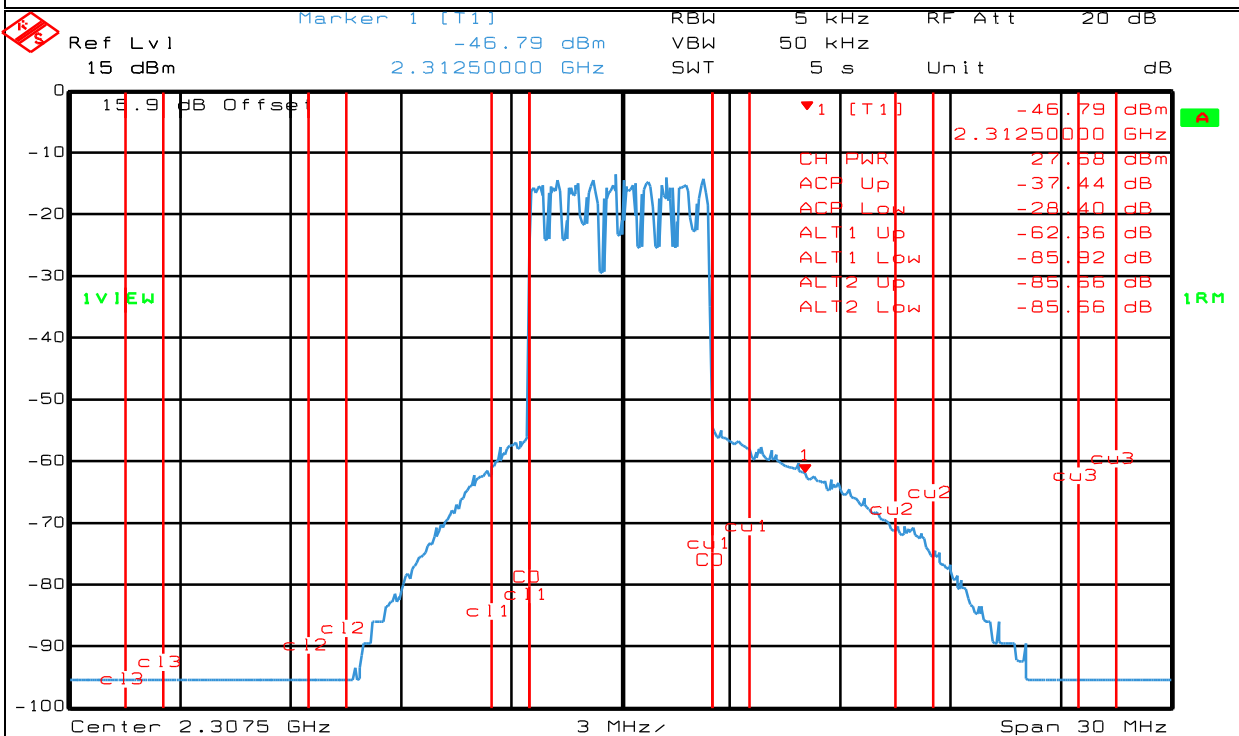
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Test Plot:

Page 14 of 2L0436R
Job No.: 2L0436R Date: 9/18/2003
Specification: Part 27 Temperature(°C): 22
Tested By: David Light Relative Humidity(%) 40
E.U.T.: 2.3 GHz BTS
Configuration: Tx 10 Carriers

Spurious Emissions at Antenna Terminals



Title: [REDACTED]
Date: 18.SEP.2003 18:08:47

Notes: +40°C
Co-adjacent channel power

EQUIPMENT: 2.3 GHz WCS BTS



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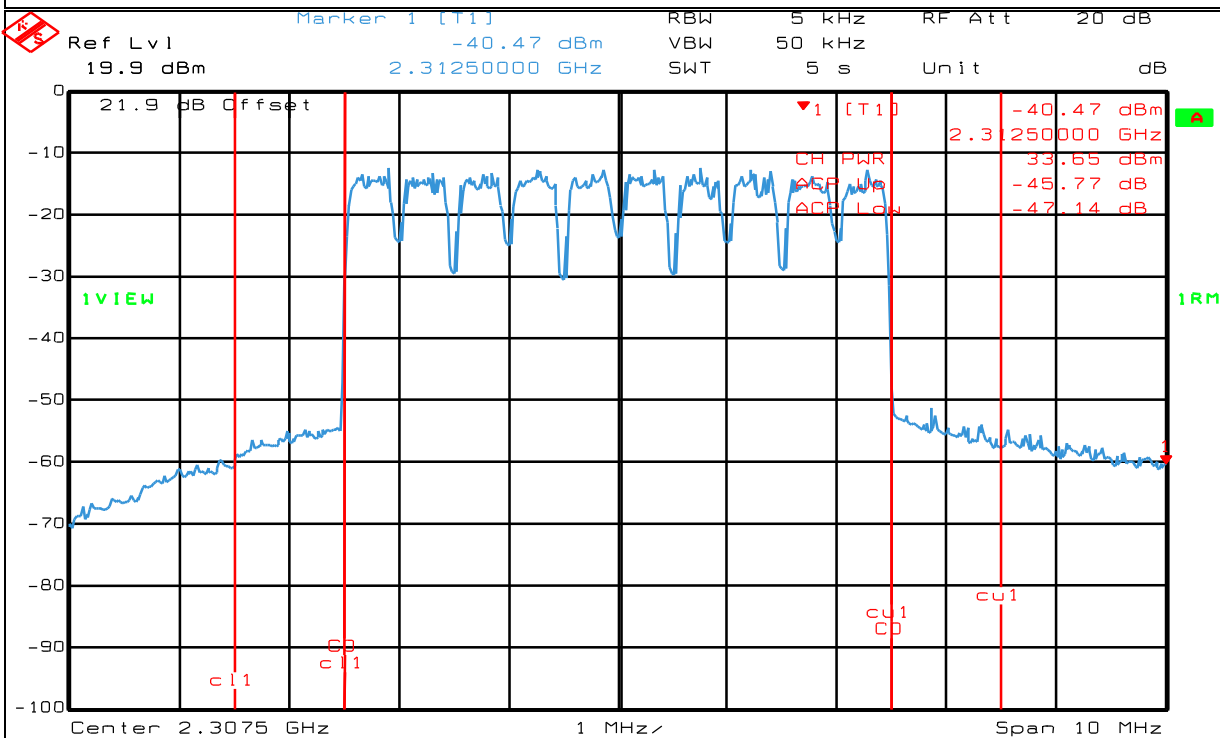
Dallas Headquarters:

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Tel: (972) 436-9600
Fax: (972) 436-2667**Test Plot:**Page 15 of 2L0436R
Job No.: 2L0436R
Specification: Part 27
Tested By: David Light
E.U.T.: 2.3 GHz BTS
Configuration: Tx 10 Carriers**Spurious Emissions at Antenna Terminals**

Date: 9/18/2003

Temperature(°C): 22

Relative Humidity(%) 40

Title: 20C
Date: 18 SEP 2003 18:18:20

Notes: +50° C

Adjacent channel power using higher resolution

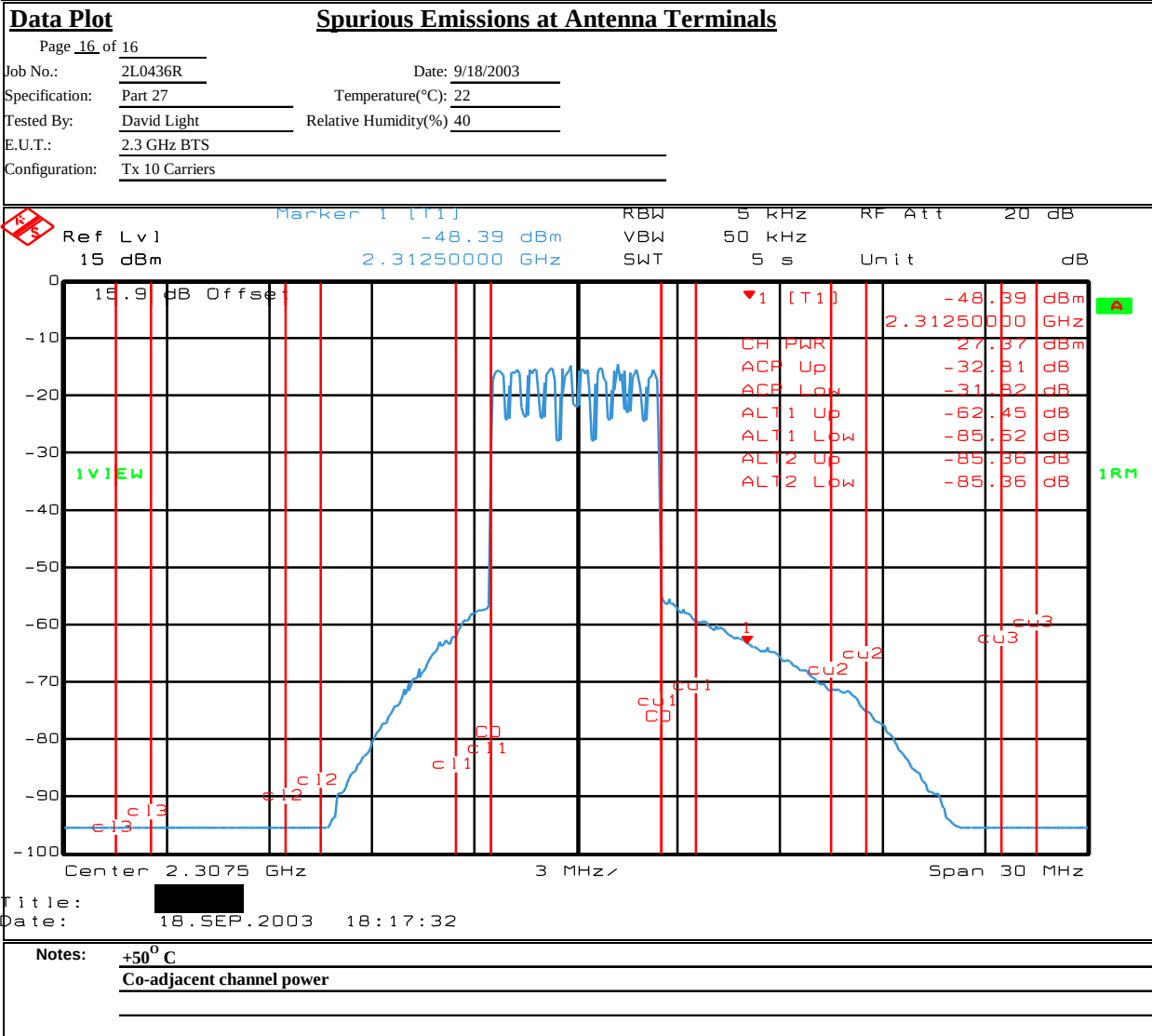
EQUIPMENT: 2.3 GHz WCS BTS



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EQUIPMENT: 2.3 GHz WCS BTS



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Data Plot

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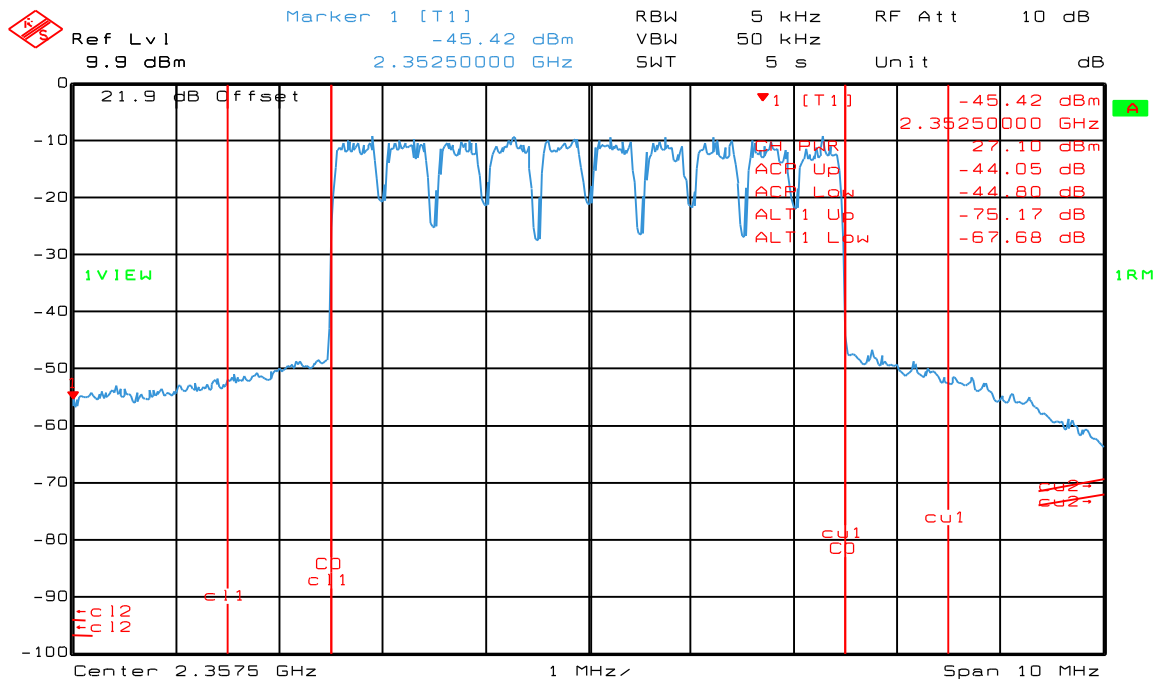
Job No.:	210436	Date:	9/18/2003
Specification:	PART 27	Temperature(°C):	22
Tested By:	David Light	Relative Humidity(%)	40
E.U.T.:	2.3 GHz bts		
Configuration:	10 CARRIERS		
Sample Number:	1		
Location:	ON SITE	RBW:	5 kHz
Detector Type:	Rms	VBW:	50 kHz

Complete X
Preliminary:

Test Equipment Used

Antenna:	_____	Directional Coupler:	Model 1C0870-20
Pre-Amp:	_____	Cable #1:	1484
Filter:	_____	Cable #2:	_____
Receiver:	1036	Cable #3:	_____
Attenuator #1	Model 2044-6dB Cal' prior to use	Cable #4:	_____
Attenuator #2:	Model 33-20-34 Cal'd prior to use	Mixer:	_____
Additional equipment used:	_____		
Measurement Uncertainty:	+/- 1.7 dB		

Cal'd prior to use



Title: 20C
Date: 18.SEP.2003 10:49:41

Notes: Ambient 27 Vdc
Adjacent channel power using higher resolution

EQUIPMENT: 2.3 GHz WCS BTS



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Data Plot

Page 1 of 16

Job No.: 210436

Specification: PART 27

Tested By: David Light

E.U.T.:	<u>2.3 GHz bts</u>
---------	--------------------

Configuration:	10 CARRIERS
----------------	-------------

Sample Number: 1

Location:	ON SITE
-----------	---------

Detector Type:	Rms
----------------	-----

Date: 9/18/2003

Temperature(°C): 22

Relative Humidity(%)	40
----------------------	----

RBW: 5 kHz

VBW: 50 kHz

Complete X

Preliminary:

Measurement

Distance: NA m

Test Equipment Used

Antenna: _____

Pre-Amp: _____

Filter: _____

Receiver: 1036Attenuator #1 Model 2044-6dB Cal' prior to use

Attenuator #2: Model 33-20-34 Cal'd prior to use

Additional equipment used:

Measurement Uncertainty:	+/-1.7 dB
--------------------------	-----------

Directional Coupler: Model 1C0870-20

Cable #1:	1484
-----------	------

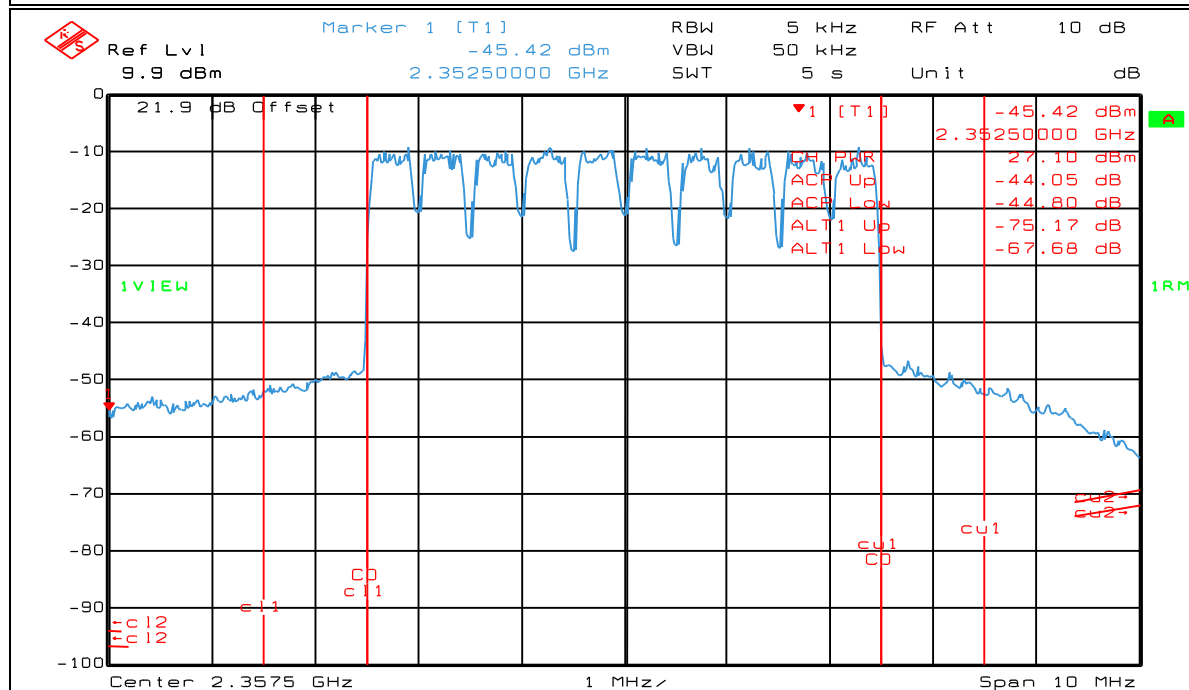
Cable #2: _____

Cable #3: _____

Cable #4: _____

Mixer:

Cal'd prior to use



Title: 20C
Date: 18.SEP.2003 10:49:41

Notes: Ambient 27 Vdc
Adjacent channel power using higher resolution

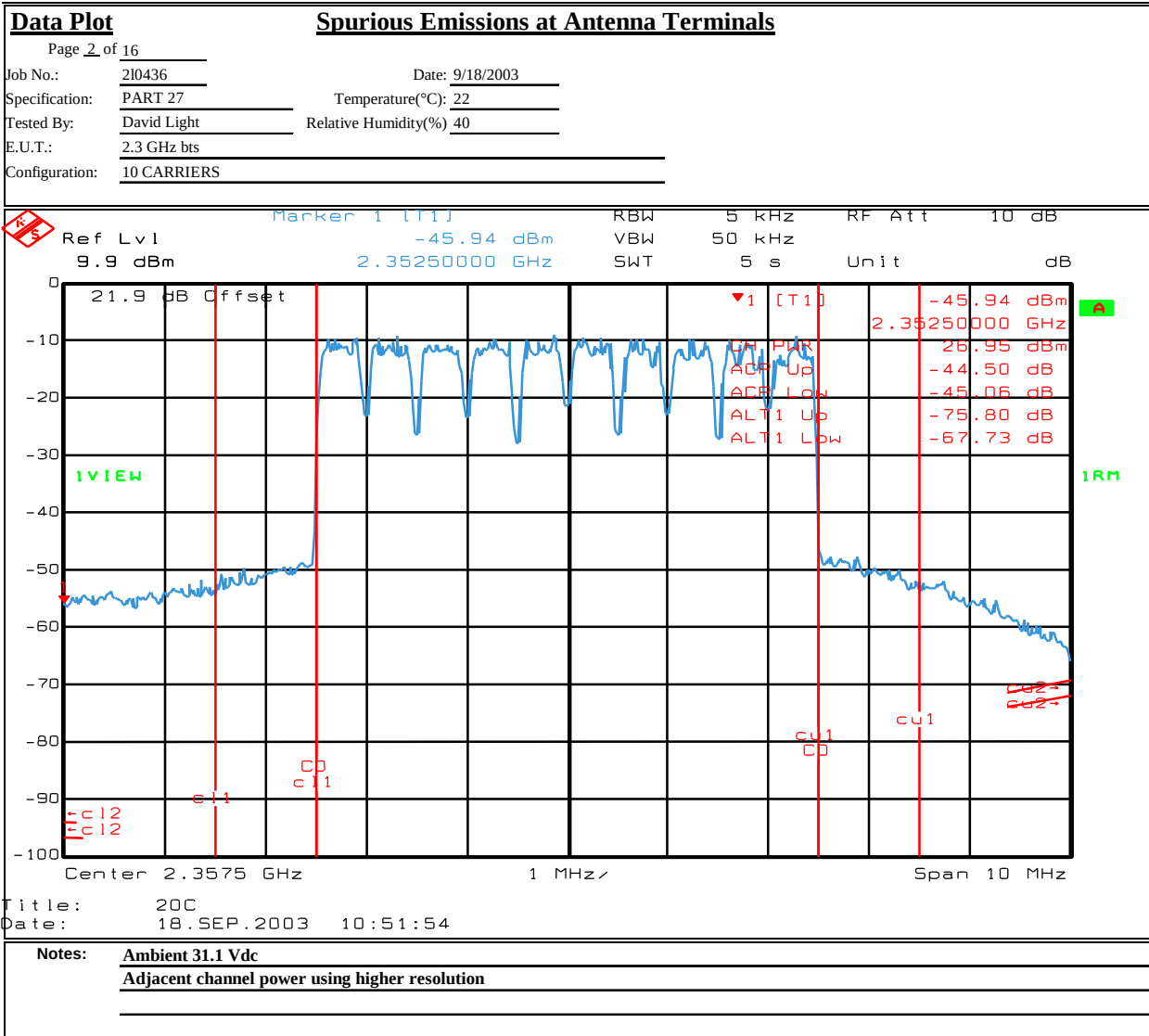
EQUIPMENT: 2.3 GHz WCS BTS



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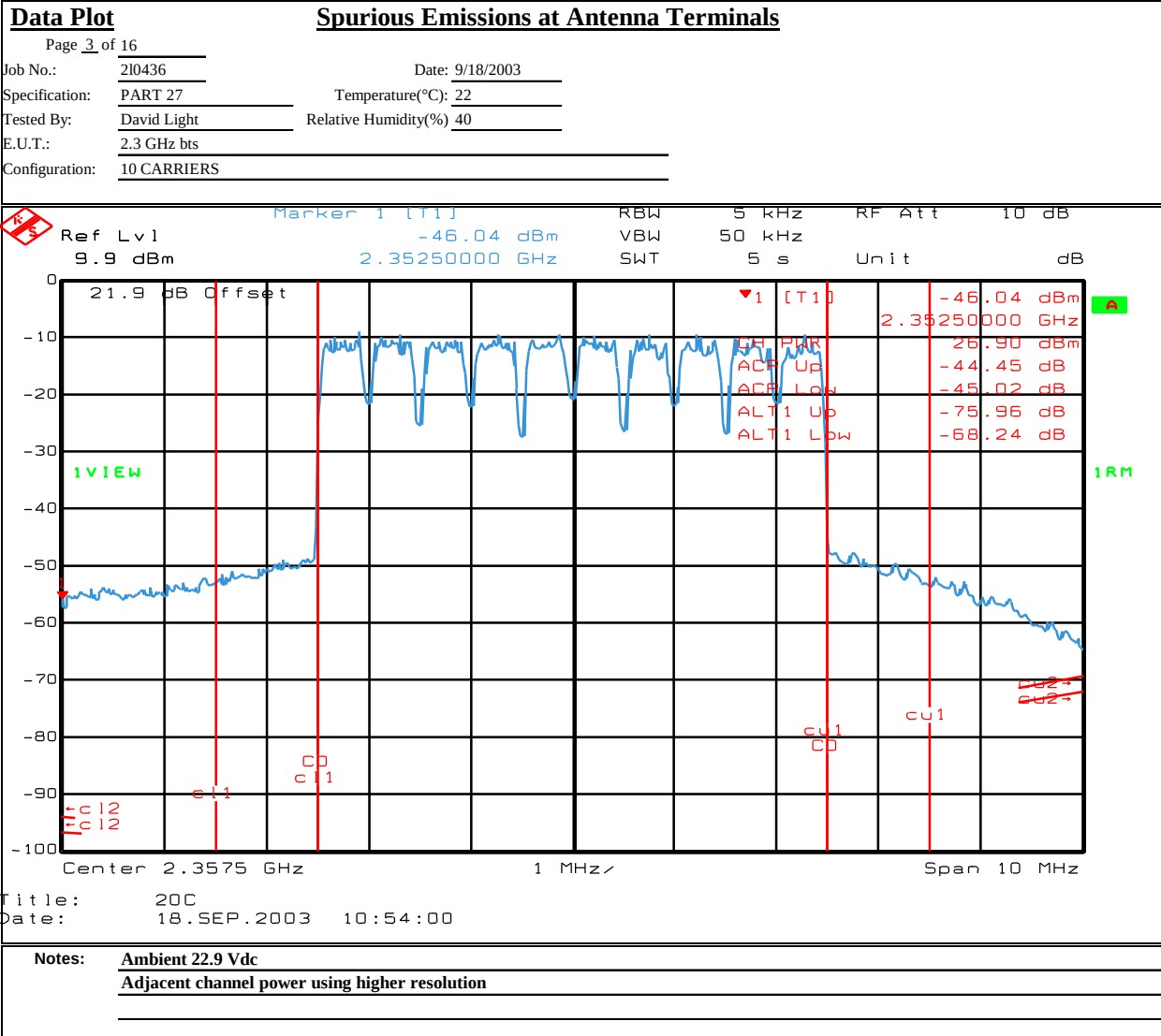


EQUIPMENT: 2.3 GHz WCS BTS



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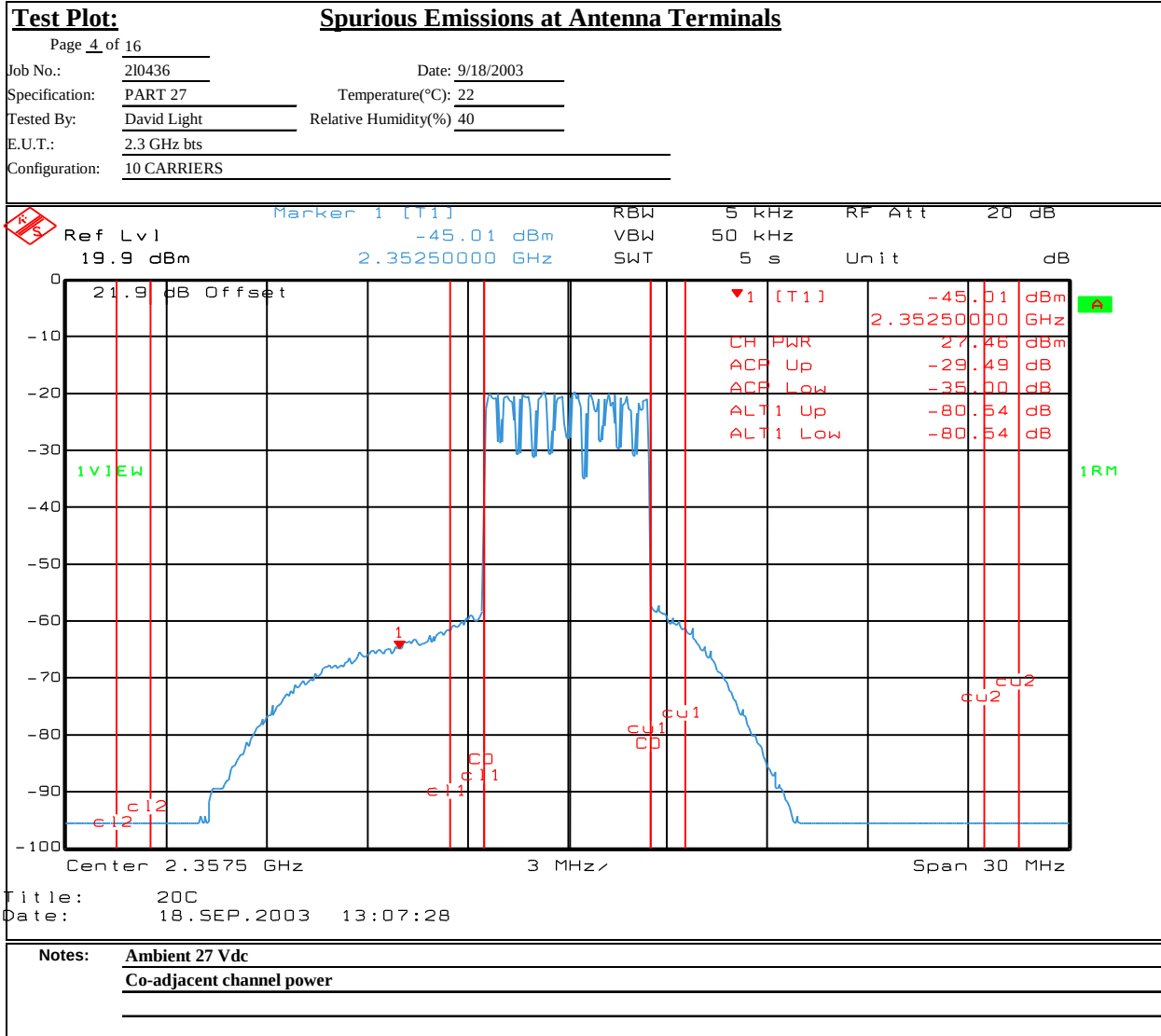
EQUIPMENT: 2.3 GHz WCS BTS



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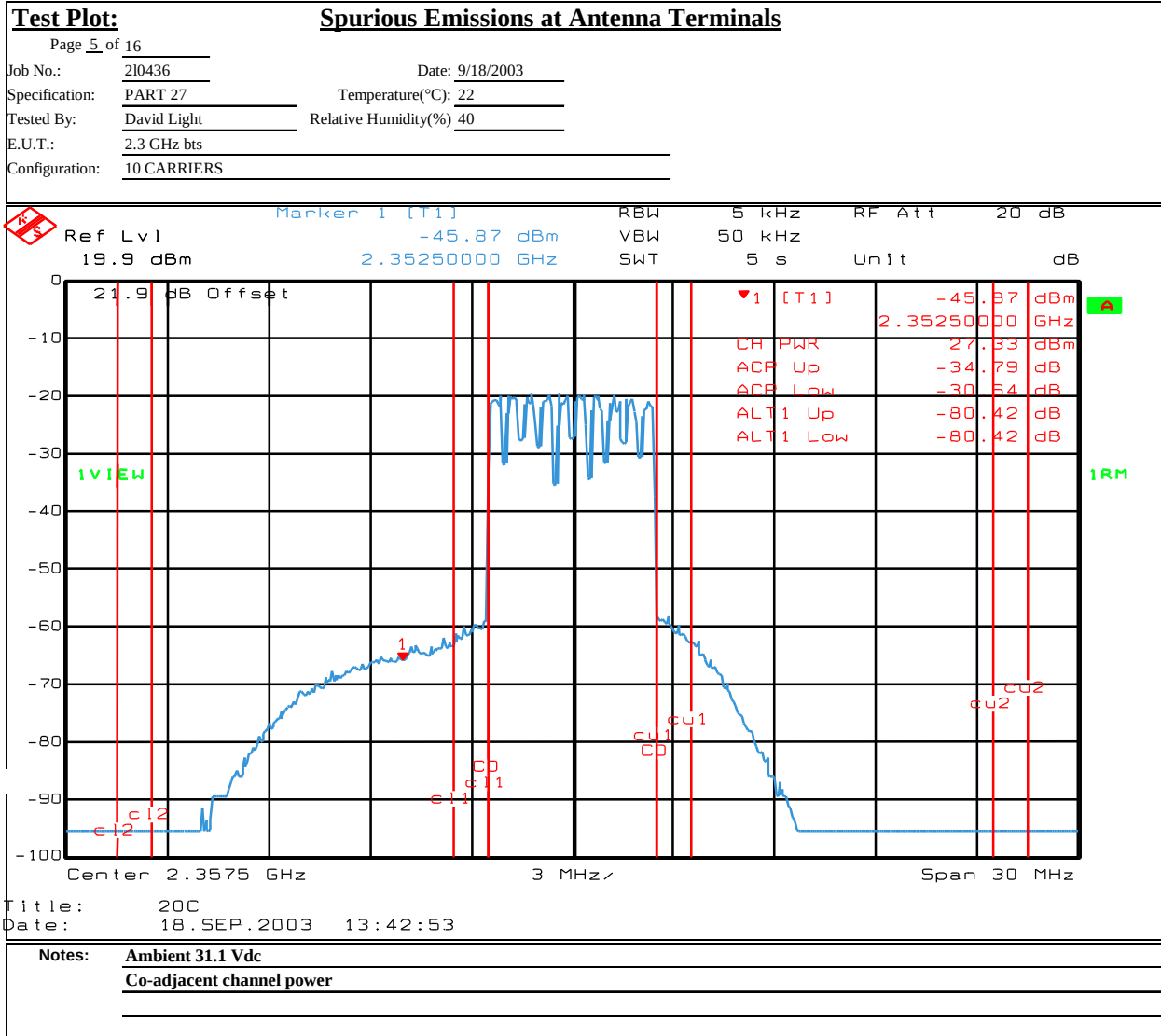


EQUIPMENT: 2.3 GHz WCS BTS



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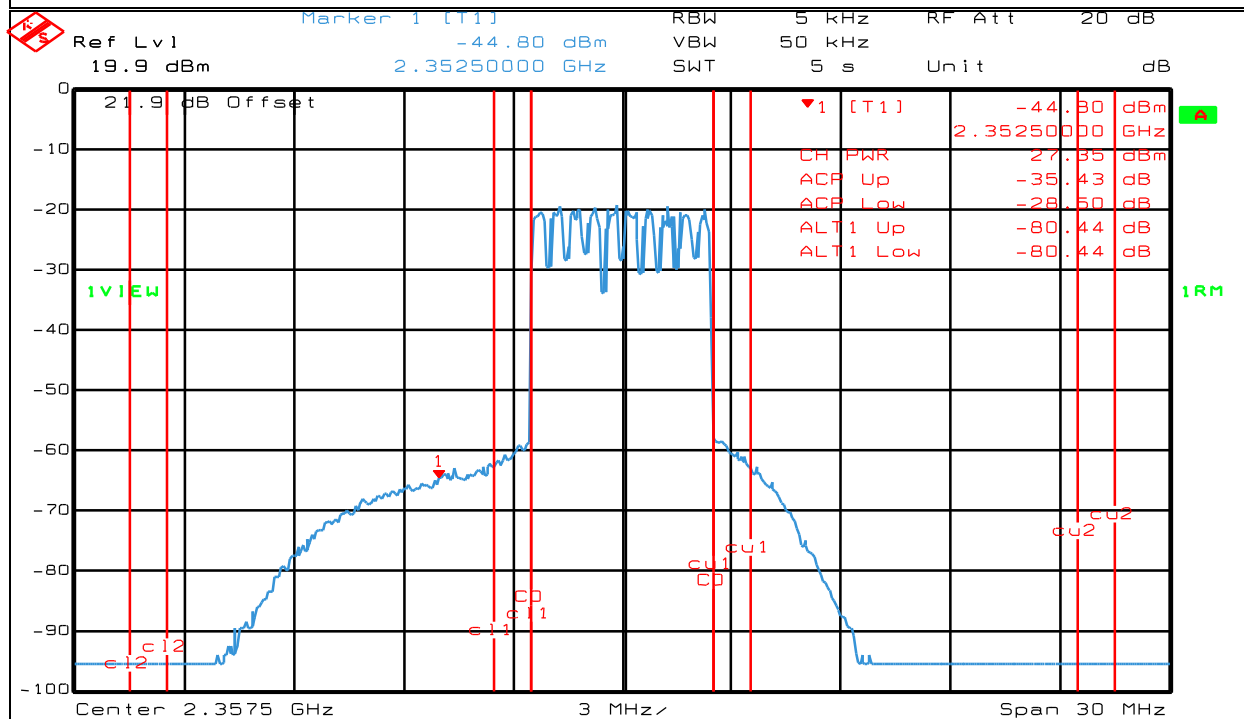
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Test Plot:

Spurious Emissions at Antenna Terminals

Page 6 of 16

Job No.: 210436 Date: 9/18/2003
Specification: PART 27 Temperature(°C): 22
Tested By: David Light Relative Humidity(%) 40
E.U.T.: 2.3 GHz bts
Configuration: 10 CARRIERS



Title: 20C
Date: 18.SEP.2003 13:44:00

Notes: Ambient 22.9 Vdc
Co-adjacent channel power

EQUIPMENT: 2.3 GHz WCS BTS



Nemko Dallas, Inc.

Dallas Headquarters:

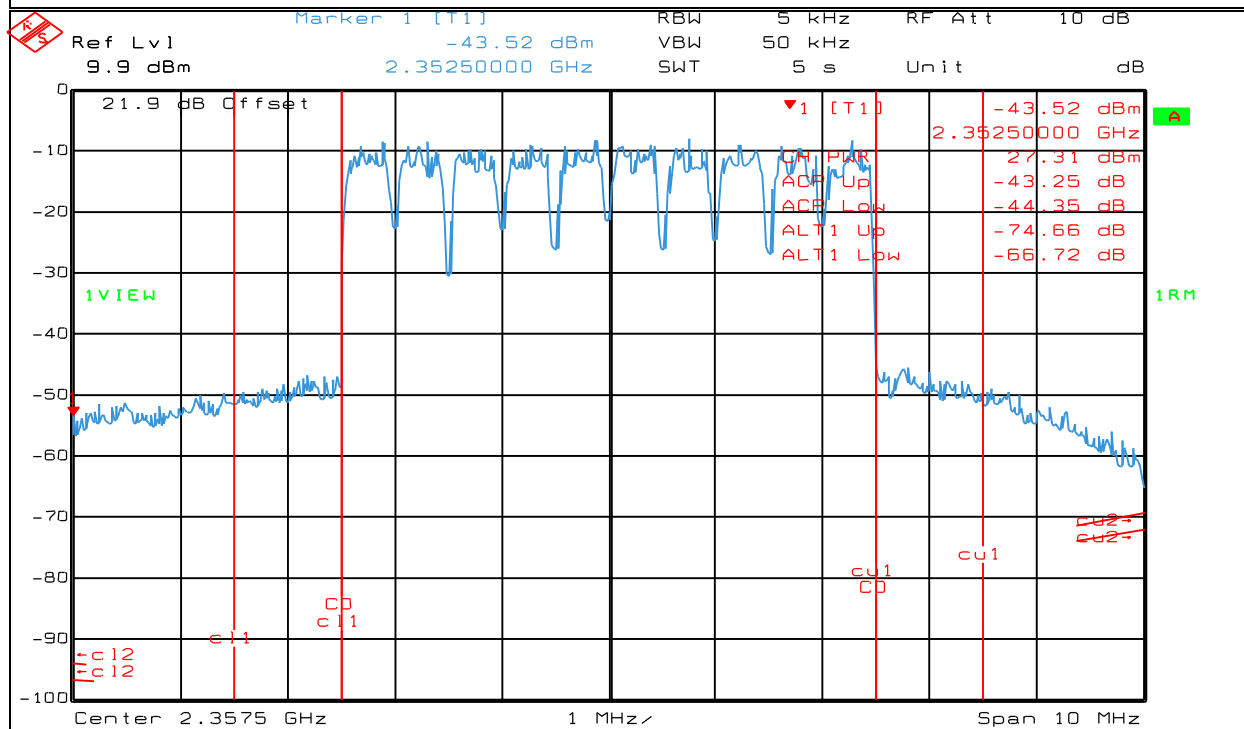
802 N. Kealy
Lewisville, TX 75057
Tel: (972) 436-9600
Fax: (972) 436-2667

Test Plot:

Spurious Emissions at Antenna Terminals

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Job No.: 210436 Date: 9/18/2003
Specification: PART 27 Temperature(°C): 22
Tested By: David Light Relative Humidity(%) 40
E.U.T.: 2.3 GHz bts
Configuration: 10 CARRIERS



Title: [REDACTED]
Date: 18.SEP.2003 11:57:59

Notes: +10° C
Adjacent channel power using higher resolution

EQUIPMENT: 2.3 GHz WCS BTS



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Dallas Headquarters:

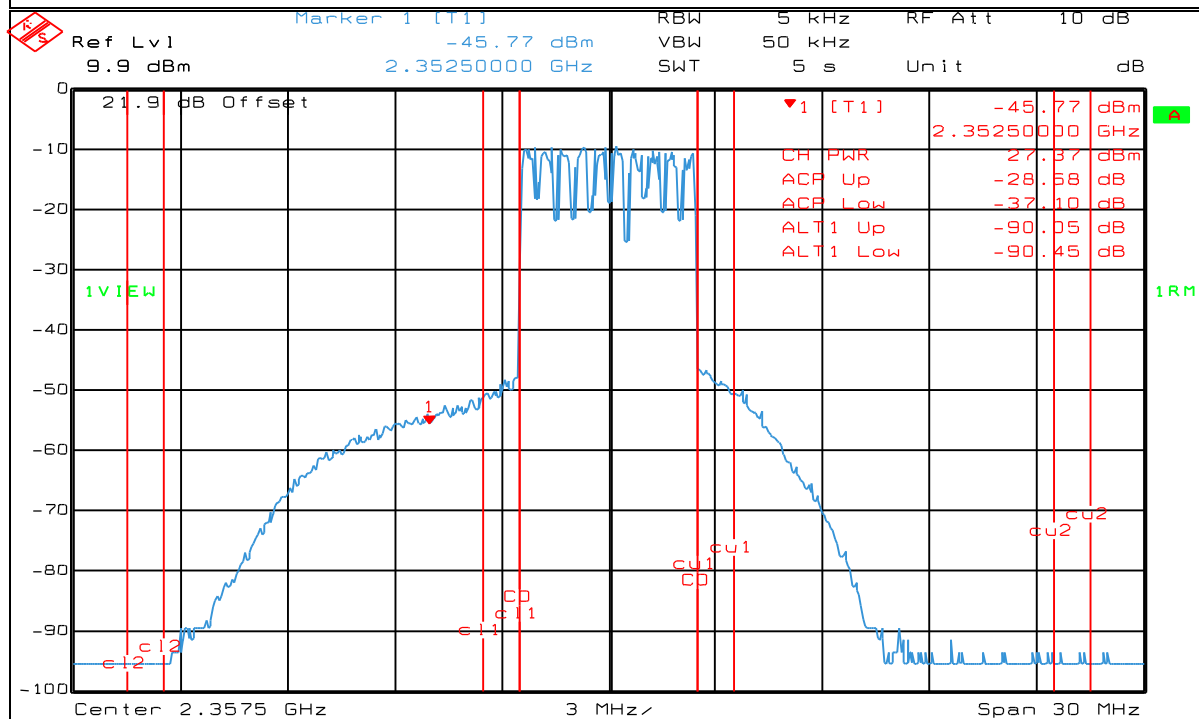
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Test Plot:

Spurious Emissions at Antenna Terminals

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Job No.: 210436 Date: 9/18/2003
Specification: PART 27 Temperature(°C): 22
Tested By: David Light Relative Humidity(%) 40
E.U.T.: 2.3 GHz bts
Configuration: 10 CARRIERS



Title: [REDACTED]
Date: 18.SEP.2003 12:00:37

Notes: +10⁰ C
Co-adjacent channel power

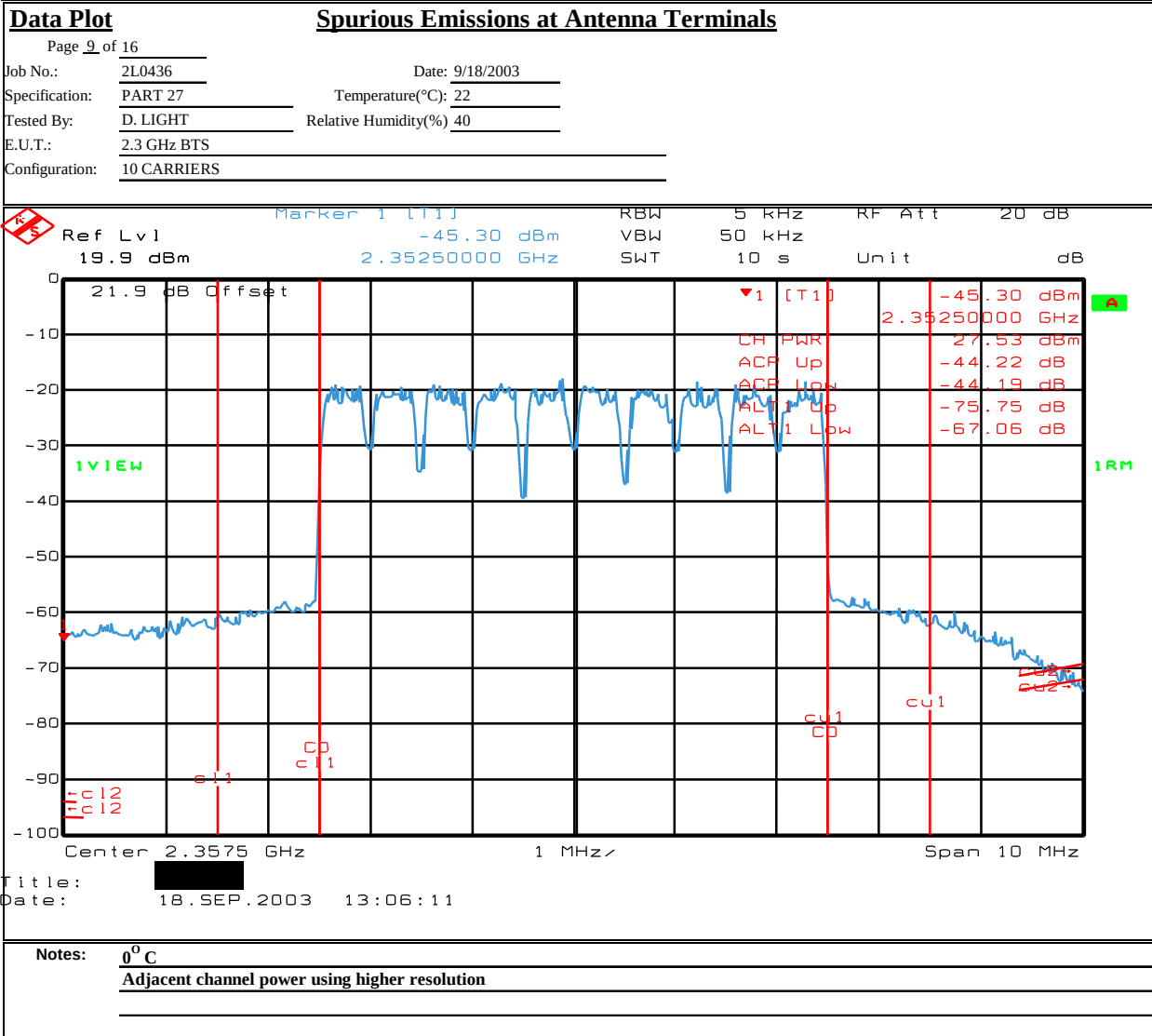
EQUIPMENT: 2.3 GHz WCS BTS



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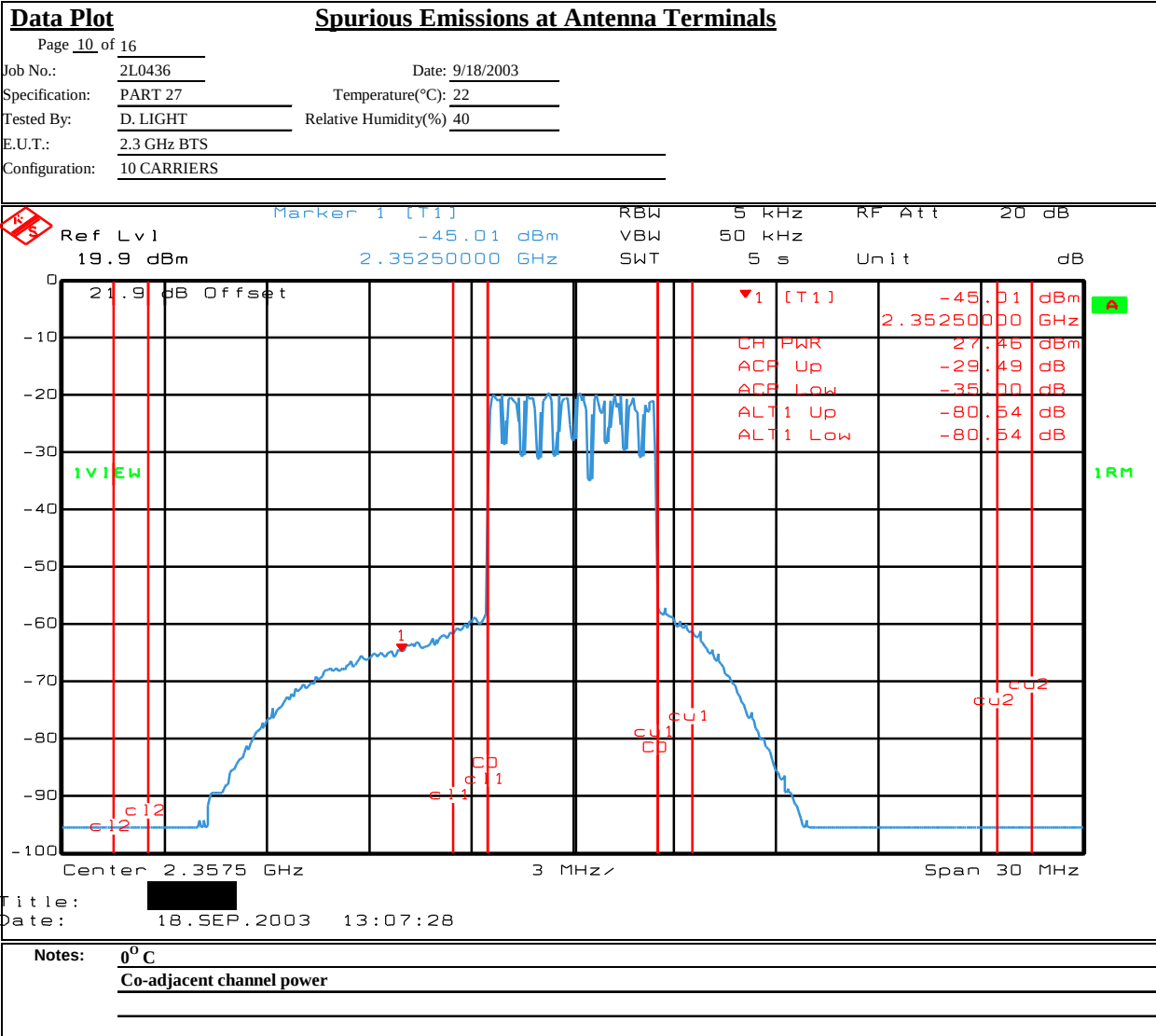
EQUIPMENT: 2.3 GHz WCS BTS



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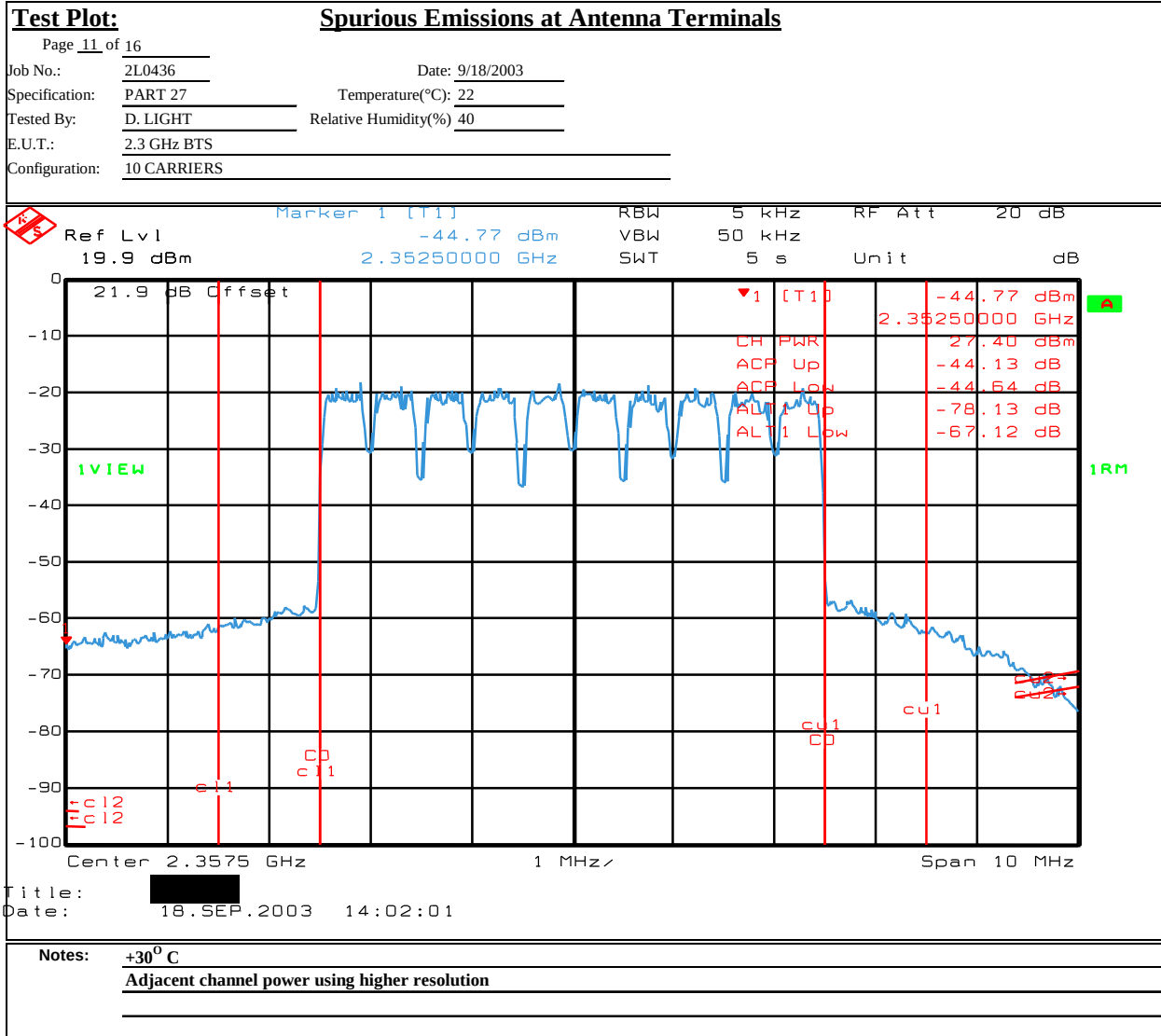
EQUIPMENT: 2.3 GHz WCS BTS



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Nemko Dallas, Inc.



EQUIPMENT: 2.3 GHz WCS BTS



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Test Plot:

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Job No.: 2L0436

Date: 9/18/2003

Specification:	PART 27
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Temperature(°C): 22

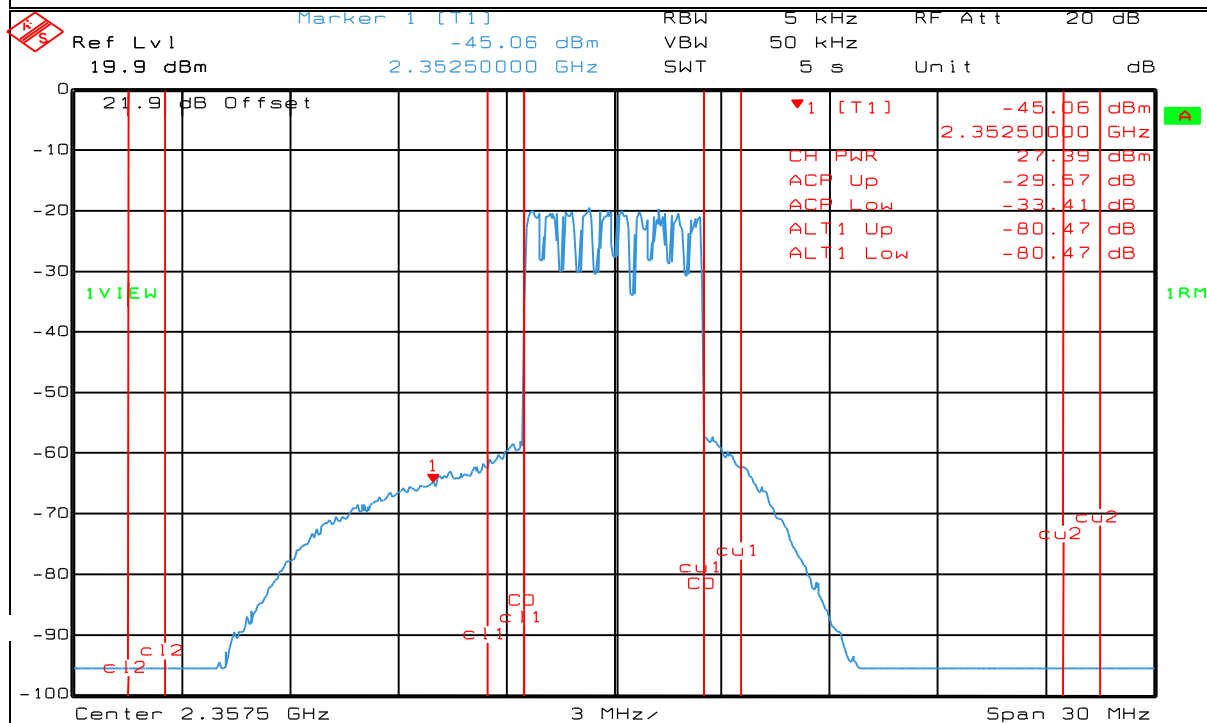
Tested By:	D. LIGHT
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Relative Humidity(%) 40

E.U.T.:	2.3 GHz BTS
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Configuration:	10 CARRIERS
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Spurious Emissions at Antenna Terminals



Title: [REDACTED]
Date: 18.SEP.2003 14:01:05

Notes:	+30 ^o C
	Co-adjacent channel power

EQUIPMENT: 2.3 GHz WCS BTS



Nemko Dallas, Inc.

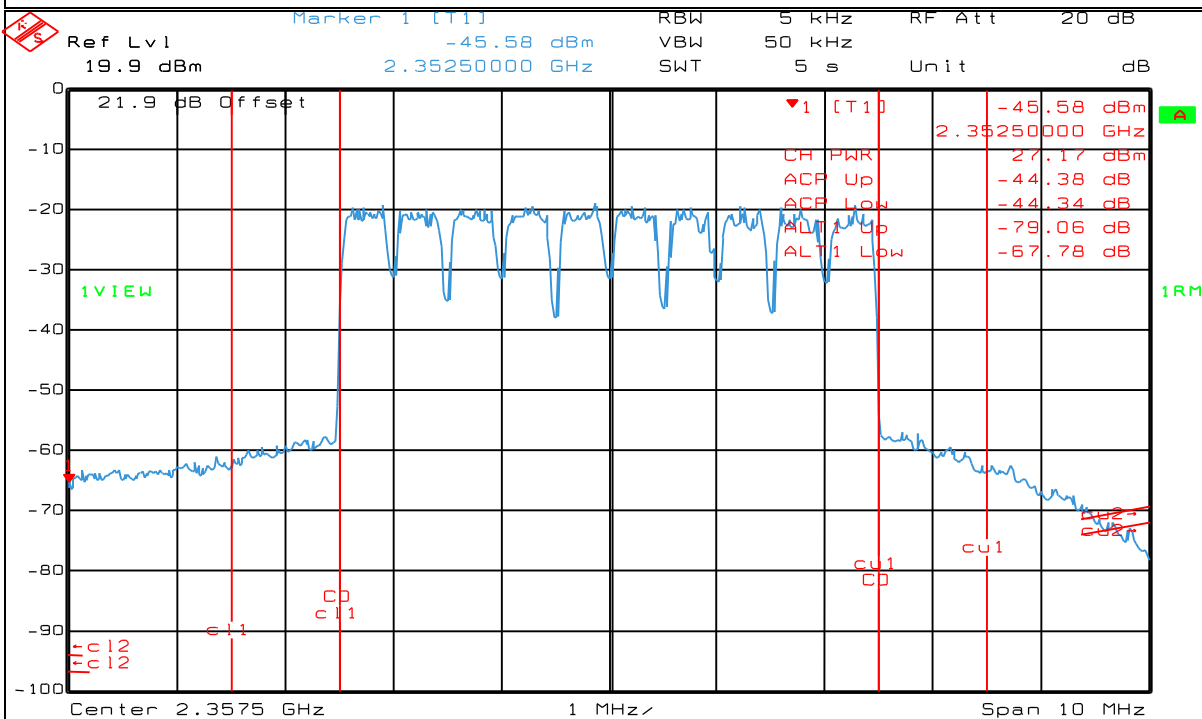
Dallas Headquarters:

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

Test Plot:

Spurious Emissions at Antenna Terminals

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Job No.: 2L0436 Date: 9/18/2003
Specification: PART 27 Temperature(°C): 22
Tested By: D. LIGHT Relative Humidity(%) 40
E.U.T.: 2.3 GHz BTS
Configuration: 10 CARRIERS



Title: [REDACTED]
Date: 18.SEP.2003 14:29:00

Notes: +40°C
Adjacent channel power using higher resolution

EQUIPMENT: 2.3 GHz WCS BTS



Nemko Dallas, Inc.

Dallas Headquarters:

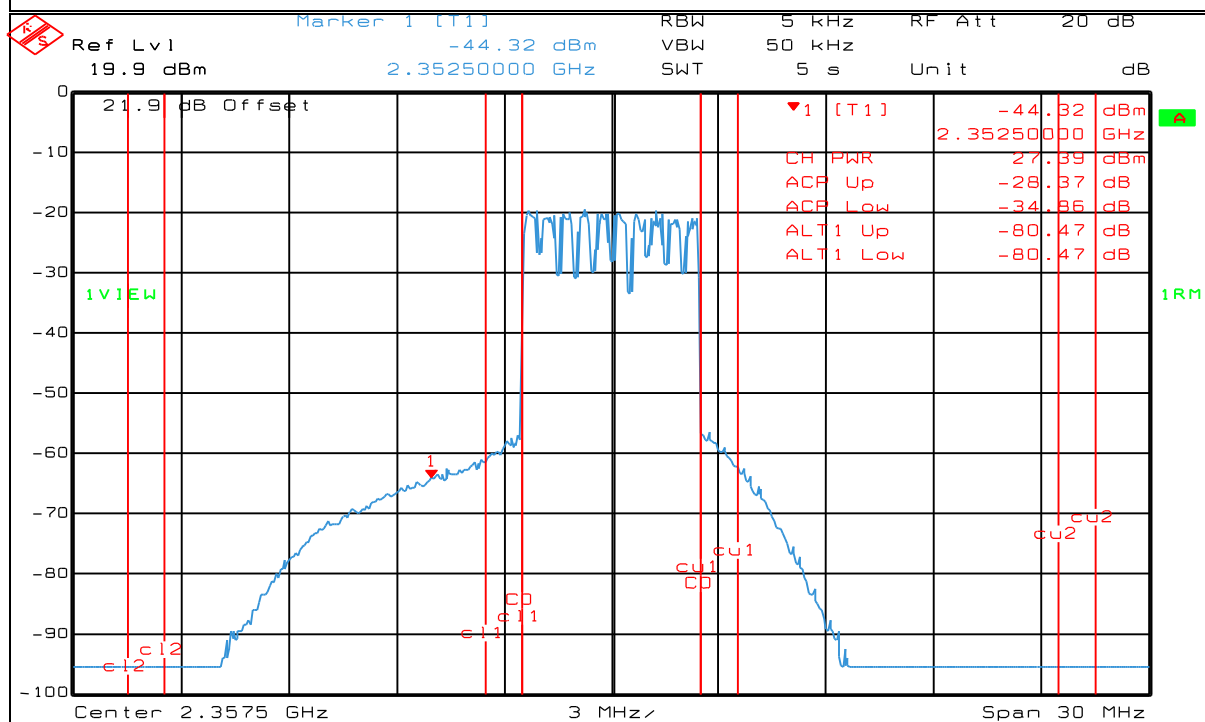
802 N. Kealy
Lewisville, TX 75057
Tel: (972) 436-9600
Fax: (972) 436-2667

Test Plot:

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Spurious Emissions at Antenna Terminals

Job No.: 2L0436 Date: 9/18/2003
Specification: PART 27 Temperature(°C): 22
Tested By: D. LIGHT Relative Humidity(%) 40
E.U.T.: 2.3 GHz BTS
Configuration: 10 CARRIERS



Title: [REDACTED]
Date: 18.SEP.2003 14:30:00

Notes: +40°C
Co-adjacent channel power

EQUIPMENT: 2.3 GHz WCS BTS



Nemko Dallas, Inc.

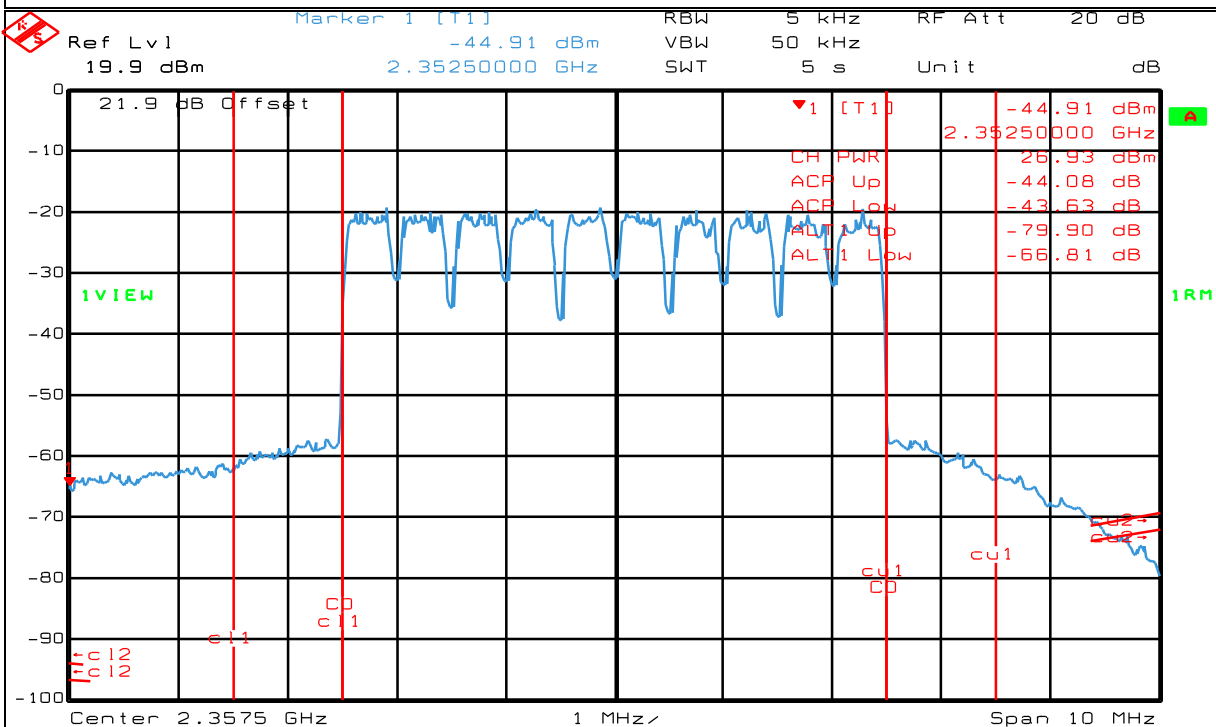
Dallas Headquarters:

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Lewisville, TX 75057
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Test Plot:

Spurious Emissions at Antenna Terminals

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Job No.: 2L0436 Date: 9/18/2003
Specification: PART 27 Temperature(°C): 22
Tested By: D. LIGHT Relative Humidity(%) 40
E.U.T.: 2.3 GHz BTS
Configuration: 10 CARRIERS



Title: [REDACTED]
Date: 18.SEP.2003 14:59:16

Notes: +50°C
Adjacent channel power using higher resolution

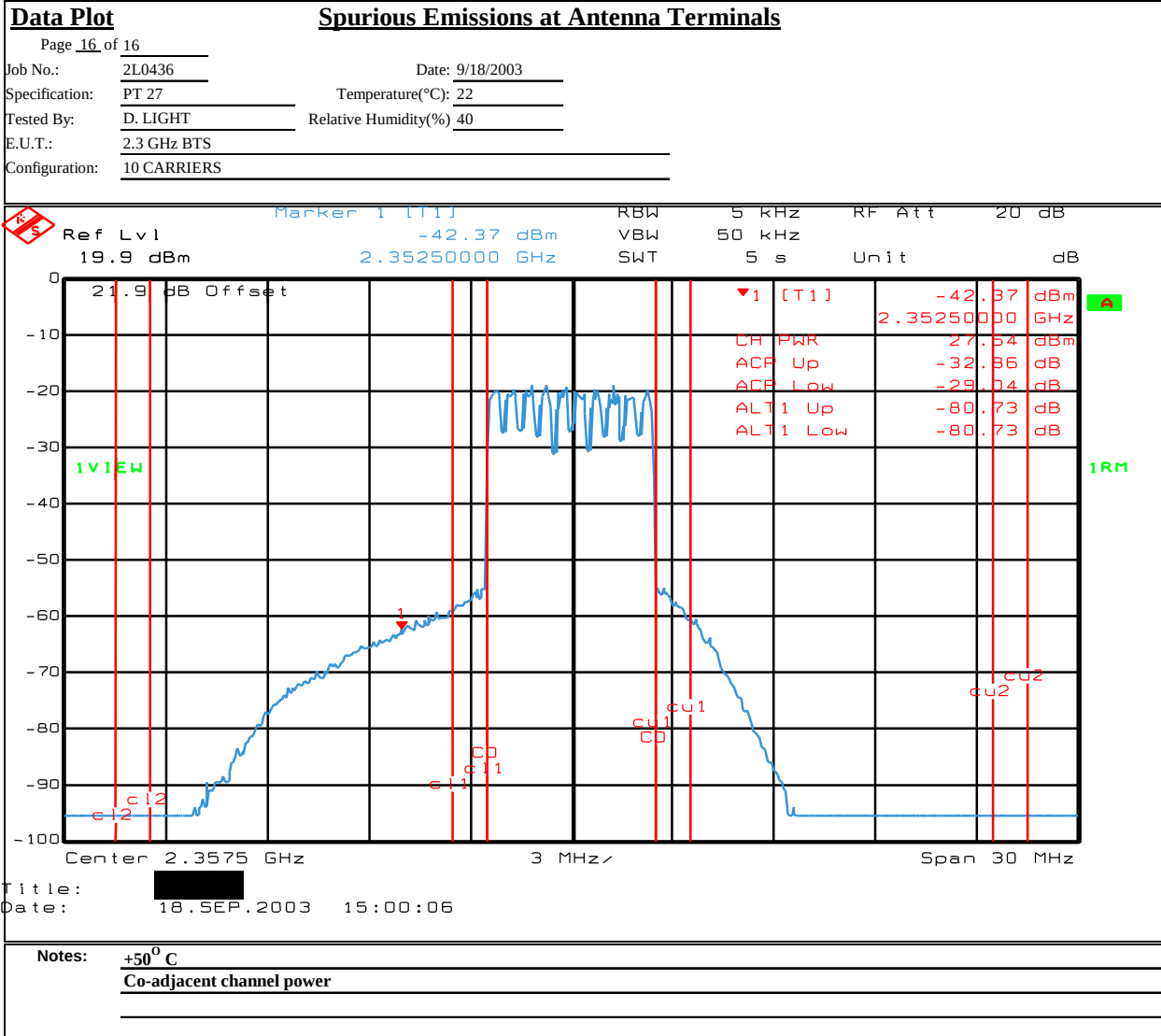
EQUIPMENT: 2.3 GHz WCS BTS



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Nemko Dallas, Inc.



*EQUIPMENT: 2.3 GHz WCS BTS***Section 8. Test Equipment List**

Nemko ID	Description	Manufacturer Model Number	Serial Number	Calibration Date	Calibration Due
1036	SPECTRUM ANALYZER	ROHDE & SCHWARZ FSEK30	830844/006	12/18/01	12/19/03
1042	CABLE, 4M	STORM PR90-010-144	N/A	06/14/02	06/14/03
1304	HORN ANTENNA	ELECTRO METRICS RGA-60	6151	07/30/01	07/31/03
1283	Spectrum analyzer display	Hewlett Packard 85662A	1811A00223	10/17/01	10/17/02
1016	Pre-Amp	HEWLETT PACKARD 8449A	2749A00159	07/15/02	07/15/03
1484	Cable 2.0-18.0 Ghz	Storm PR90-010-072	N/A	07/15/02	07/15/03
1485	Cable 2.0-18.0 Ghz	Storm PR90-010-216	N/A	07/15/02	07/15/03
	Power meter	Agilent E4416A	GB41290732	10/05/01	10/05/02
	Power sensor	Agilent E9327A	US40440319	08/16/02	08/16/03
	Directional coupler	Anaren 1C087-20	136	CBU	N/A
	Power meter	Agilent E4419B	GB39401846	12/11/02	12/11/03
	Power sensor	Agilent E9401	MY41495108	12/11/02	12/11/03

Nemko Dallas

FCC PART 27, SUBPART C
WIRELESS COMMUNICATION SERVICES
PROJECT NO.:2L0436RUS1

EQUIPMENT: 2.3 GHz WCS BTS

Section 9. Test Details

*EQUIPMENT: 2.3 GHz WCS BTS***NAME OF TEST: RF Power Output****PARA. NO.: 2.1046****Method Of Measurement:****Antenna Conducted:**

The maximum RMS power is measured with a power meter. In some cases the spectrum analyzer is amplitude offset for the channel power to match the power meter absolute power measurement.

E.I.R.P.:

If the antenna is not detachable from the circuit then the EIRP is measured using the substitution antenna method of measurement as described in EIA/TIA 603B. The field strength of the fundamental emission is measured using a RBW setting on the spectrum analyzer greater than the 20 dB bandwidth of the transmitted waveform. The EUT is then replaced with an antenna with known gain relative to either a dipole or an isotropic radiator. A signal generator is used to feed the substitution antenna until the previously measured field strength level is obtained. The level of signal needed to drive the substitution antenna to obtain the previously measured field strength is the erp or eirp after correction for substitution antenna gain.

EQUIPMENT: 2.3 GHz WCS BTS

NAME OF TEST: Occupied Bandwidth	PARA. NO.: 2.1049
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Method Of Measurement:

A portion of the transmitted signal is coupled to a Spectrum Analyzer with a resolution bandwidth of at least 1% of the bandwidth of the fundamental transmit signal. The emissions energy is integrated over 1 MHz of spectrum.

EQUIPMENT: 2.3 GHz WCS BTS

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

Adjacent Band Emissions

A portion of the transmitted signal is coupled to a Spectrum Analyzer with a resolution bandwidth of at least 1% of the bandwidth of the fundamental transmit signal. The emissions energy is integrated over 1 MHz of spectrum.

Out of Band Emissions

A portion of the transmitted signal is coupled to a Spectrum Analyzer with a resolution bandwidth of 1 MHz.

The limits in CFR 47, Part 27.53(a) are given as attenuation below carrier power. The measurement is thus a relative measurement. Both the rf output power and the spurious emission levels are measured as RMS levels.

EQUIPMENT: 2.3 GHz WCS BTS

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

If the antenna is detachable from the transmitter, it is removed and replaced with a 50 ohm load. Emissions are measured up to the 10th harmonic of the highest transmit frequency that the transmitter is capable of producing.

If the antenna is not detachable from the transmitter, emissions are measured radiated only.

E.I.R.P.:

If the antenna is detachable from the circuit then the antenna is replaced with a 50 ohm load for this test.. The ERP is measured using the substitution antenna method of measurement as described in EIA/TIA 603B. The field strength of the emission is measured using a RBW setting on the spectrum analyzer greater than the 20 dB bandwidth of the transmitted waveform. The EUT is then replaced with an antenna with known gain relative to either a dipole or an isotropic radiator. A signal generator is used to feed the substitution antenna until the previously measured field strength level is obtained. The level of signal needed to drive the substitution antenna to obtain the previously measured field strength is the erp or eirp after correction for substitution antenna gain.

*EQUIPMENT: 2.3 GHz WCS BTS***NAME OF TEST: Frequency Stability****2.1055****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. With the voltage input to the E.U.T. set to 85% S.T.V., the spectrum is measured to prove compliance with the specified limits. 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 spectrum is measured as described above.

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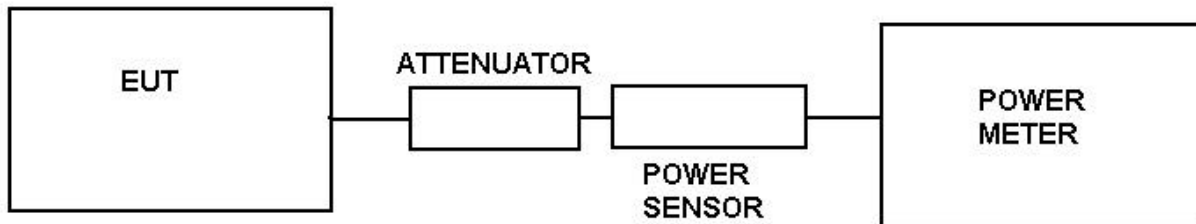
FCC PART 27, SUBPART C
WIRELESS COMMUNICATION SERVICES
PROJECT NO.:2L0436RUS1

EQUIPMENT: 2.3 GHz WCS BTS

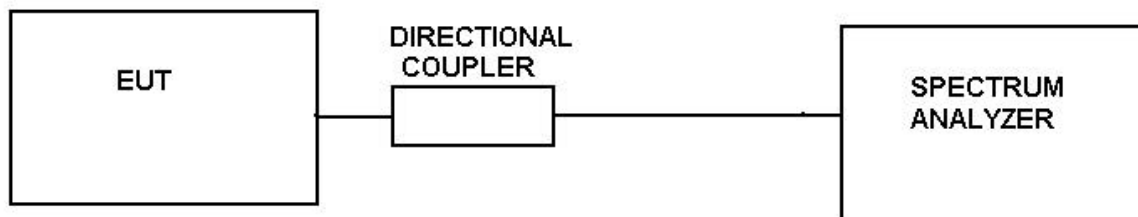
Section 10. Test Diagrams

EQUIPMENT: 2.3 GHz WCS BTS

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

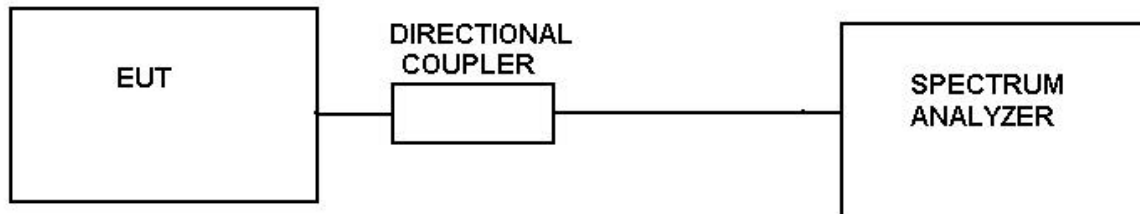


Para. No. 2.1049 - Occupied Bandwidth



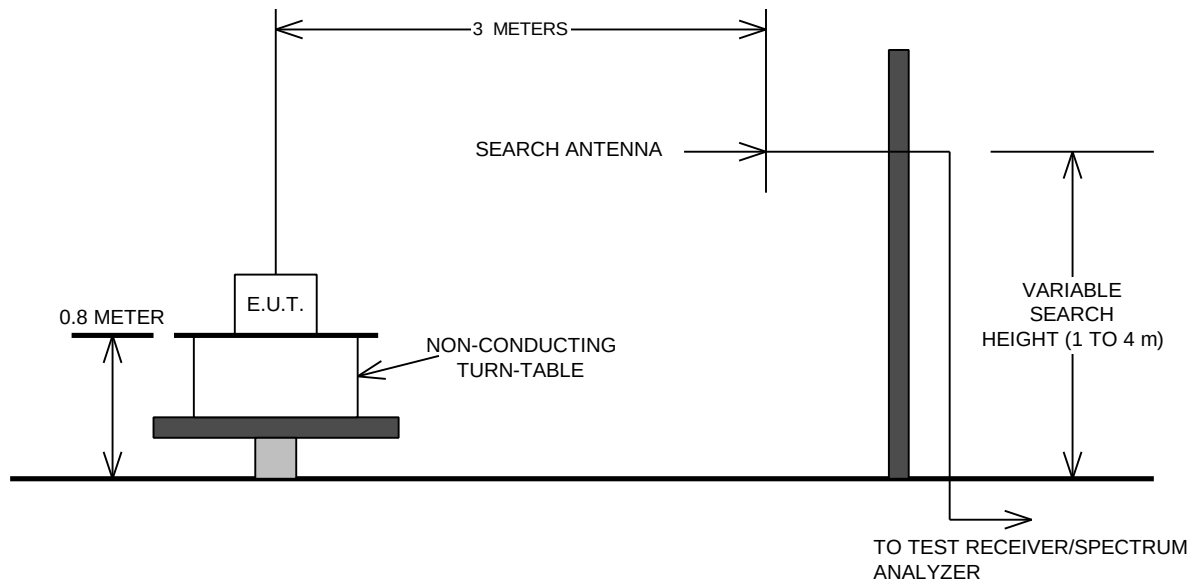
EQUIPMENT: 2.3 GHz WCS BTS

Para. No. 2.1051 - Spurious Emissions at Antenna Terminals



EQUIPMENT: 2.3 GHz WCS BTS

Para. No. 2.1053 - Field Strength of Radiation



Para. No. 2.1055 - Frequency Stability

