

**Nemko Test Report:** 4L0372RUS2Rev2

**Applicant:** Electronic Systems Technology  
415 N. Quay Street  
Suite 4  
Kennewick, WA 99336

**Equipment Under Test:  
(E.U.T.)** 195Eg Wireless Access Point

**In Accordance With:** **FCC Part 15, Subpart C, 15.247**  
Systems Using Digital Modulation Techniques

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

**Authorized By:**



David Light, Production Group Manager

**Date:** 8/30/04

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**Section 1. Summary of Test Results**

Manufacturer: Electronic Systems Technology

Model No.: 195Eg

Serial No.: E-14002

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 Part 15, Subpart C, Paragraph 15.247 for Systems Using Digital Modulation Techniques. Radiated tests were conducted in accordance with ANSI C63.4-1992. Radiated emissions are made on an open area test site. A description of the test facility is on file with the FCC.

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



**NVLAP LAB CODE: 100426-0**

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**Summary Of Test Data**

<b>NAME OF TEST</b>	<b>PARA. NO.</b>	<b>RESULT</b>
Powerline Conducted Emissions	15.207(a)	Complies
Minimum 6 dB Bandwidth	15.247(a)(2)	Complies
Maximum Peak Power Output	15.247(b)(1)	Complies
Spurious Emissions (Antenna Conducted)	15.247(c)	Complies
Spurious Emissions (Restricted Bands)	15.247(c)	Complies
Peak Power Spectral Density	15.247(d)	Complies

**Footnotes:**

All antennas are detachable and use unique adapters (Reverse gender TNC on the transmitter rf output and either reverse gender TNC, reverse gender N-Type, or permanently attached cable at the antenna rf input).

## Section 2. Equipment Under Test (E.U.T.)

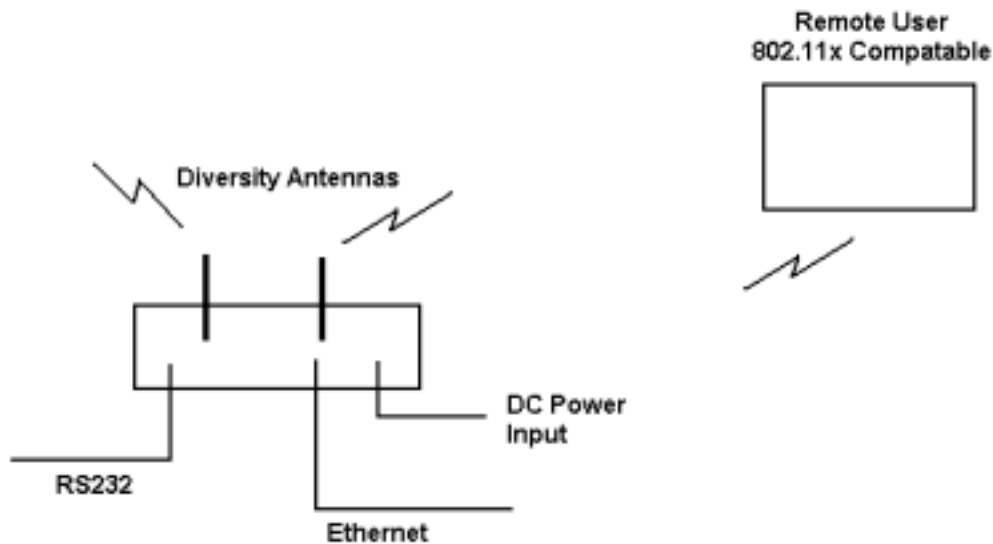
### General Equipment Information

<b>Frequency Band:</b>	2412 to 2462 MHz (Channels 1 – 11)
<b>Channel Spacing:</b>	5 MHz
<b>User Frequency Adjustment:</b>	Software controlled
<b>Power Supply P/N.:</b>	EST P/N.: AA 176 Input: 100 - 240 VAC, 50 – 60 Hz. 1.5 A, Output: 12 VDC, 4.16 A Phihong Model No.: PSA60W-120, S/N. C30600214A6

### Theory of Operation

Wireless Access Point for Industrial control and law enforcement.

### System Diagram



Note: The system can also be installed as a point-to-point system using a parabolic antenna. The second antenna port is RX only.

**Section 3. Powerline Conducted Emissions**

NAME OF TEST: Powerline Conducted Emissions	PARA. NO.: 15.207(a)
TESTED BY: Arturo Ruvalcaba	DATE: 6/7/04

**Test Results:** Complies.

**Measurement Data:** See attached plots.

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

Test Data – Powerline Conducted Emissions



NEMKO Dallas, Inc.

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

Conducted Emissions Powerline Voltage Measurement													
Complete	<u>  X  </u>		Job # : <u>4L0372E</u>					Test # : <u>CEPV-01</u>					
Preliminary	<u>      </u>		Page <u>  1  </u>					of <u>  1  </u>					
Client Name :	<u>Electronic Systems Technology</u>												
EUT Name :	<u>ESTeem Wireless Access Point</u>												
EUT Model # :	<u>195Eg</u>												
EUT Part # :	<u>None</u>												
EUT Serial # :	<u>E-14002</u>												
EUT Config. :	<u>Stand Alone with antennas and terminations.</u>												
	<u>Tx Full power</u>												
Specification :	<u>CFR 47 Part 15, Subpart B - Class A</u>						Reference :						
Transducer # :	<u>545</u>	Temp. (deg. C) :	<u>27</u>									Date :	<u>06/07/04</u>
HP Filter # :	<u>1433</u>	Humidity (%) :	<u>36</u>									Time :	<u>11:15</u>
Cable 1 # :	<u>1113</u>	EUT Voltage :	<u>120VAC</u>									Staff :	<u>Art Ruvalcaba</u>
Cable 2 # :	<u>1129</u>	EUT Frequency :	<u>60Hz</u>									Location :	<u>Lab 5</u>
Detector 1 # :	<u>1278</u>	Peak Bandwidth:	<u>10kHz</u>									Photo ID:	<u>4L0372E CEPV-01</u>
Detector 2 # :	<u>966</u>	QP Bandwidth	<u>10kHz</u>										
Limiter # :	<u>N/A</u>	Avg. Bandwidth	<u>10kHz</u>										

Meas. Freq. (MHz)	EUT Test Point	Detector Type (P,QP, A)	Limit Type (QP, A)	Meter Reading (dBuV)	Path Loss (dB)	Transducer Factor (dB)	Corrected Reading (dBuV)	Spec.limit (dBuV)		CR/SL Diff. (dB)	Pass Fail Unc.	Comment
								Q.P.	Avg.			
0.205	H	P	A	37.7	0	0	37.7	79	66	-28.3	Pass	
0.274	H	P	A	31.9	0	0	31.9	79	66	-34.1	Pass	
0.412	H	P	A	33.0	0	0	33.0	79	66	-33.0	Pass	
3.8	H	P	A	26.4	0	0	26.4	73	60	-33.6	Pass	
19.6	H	P	A	34.8	0	0	34.8	73	60	-25.2	Pass	
29.7	H	P	A	34.2	0	0	34.2	73	60	-25.8	Pass	
0.205	N	P	A	39.6	0	0	39.6	79	66	-26.4	Pass	
0.274	N	P	A	31.4	0	0	31.4	79	66	-34.6	Pass	
0.412	N	P	A	32.0	0	0	32.0	79	66	-34.0	Pass	
3.5	N	P	A	30.0	0	0	30.0	73	60	-30.0	Pass	
19.6	N	P	A	34.9	0	0	34.9	73	60	-25.1	Pass	
29.7	N	P	A	34.0	0	0	34.0	73	60	-26.0	Pass	
												Scanned .150-30 MHz

..\EMCShare\AUTOMATE\DATASHTS\CEPV\_Voltage Rev C.xls Document Control #EMC DS EM COND VOLT

**Setup Photographs**





**Section 4. Minimum 6 dB Bandwidth**

NAME OF TEST: Minimum 6 dB Bandwidth	PARA. NO.: 15.247(a)(2)
TESTED BY: Tom Tidwell	DATE: 8/6/04

**Test Results:** Complies.

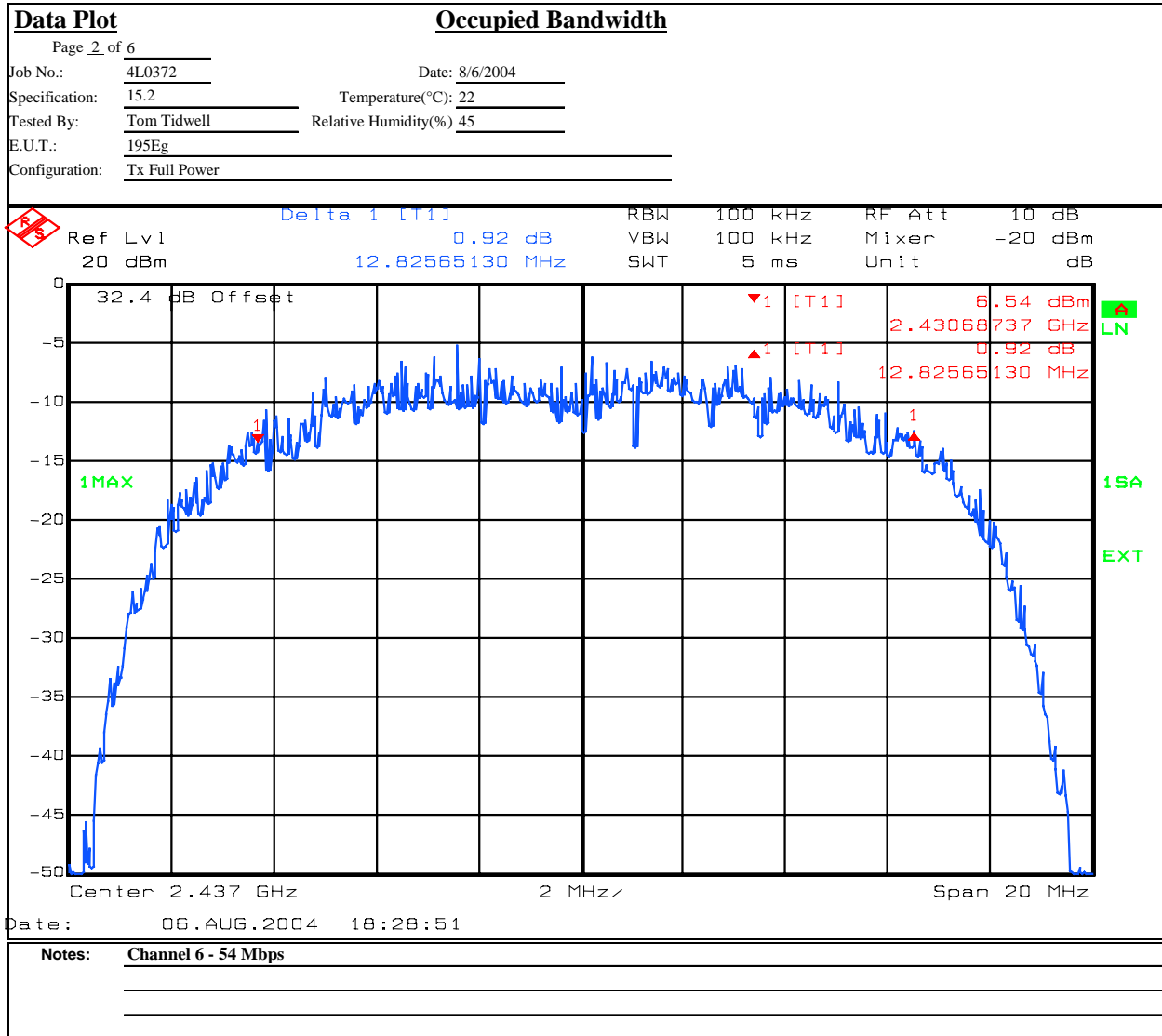
**Measurement Data:** See 6 dB BW plot(s)  
Measured 6 dB bandwidth: 13.1 MHz Worst case  
Channel Separation: 5 MHz

**Measurement Uncertainty:** +/- 0.7 dB

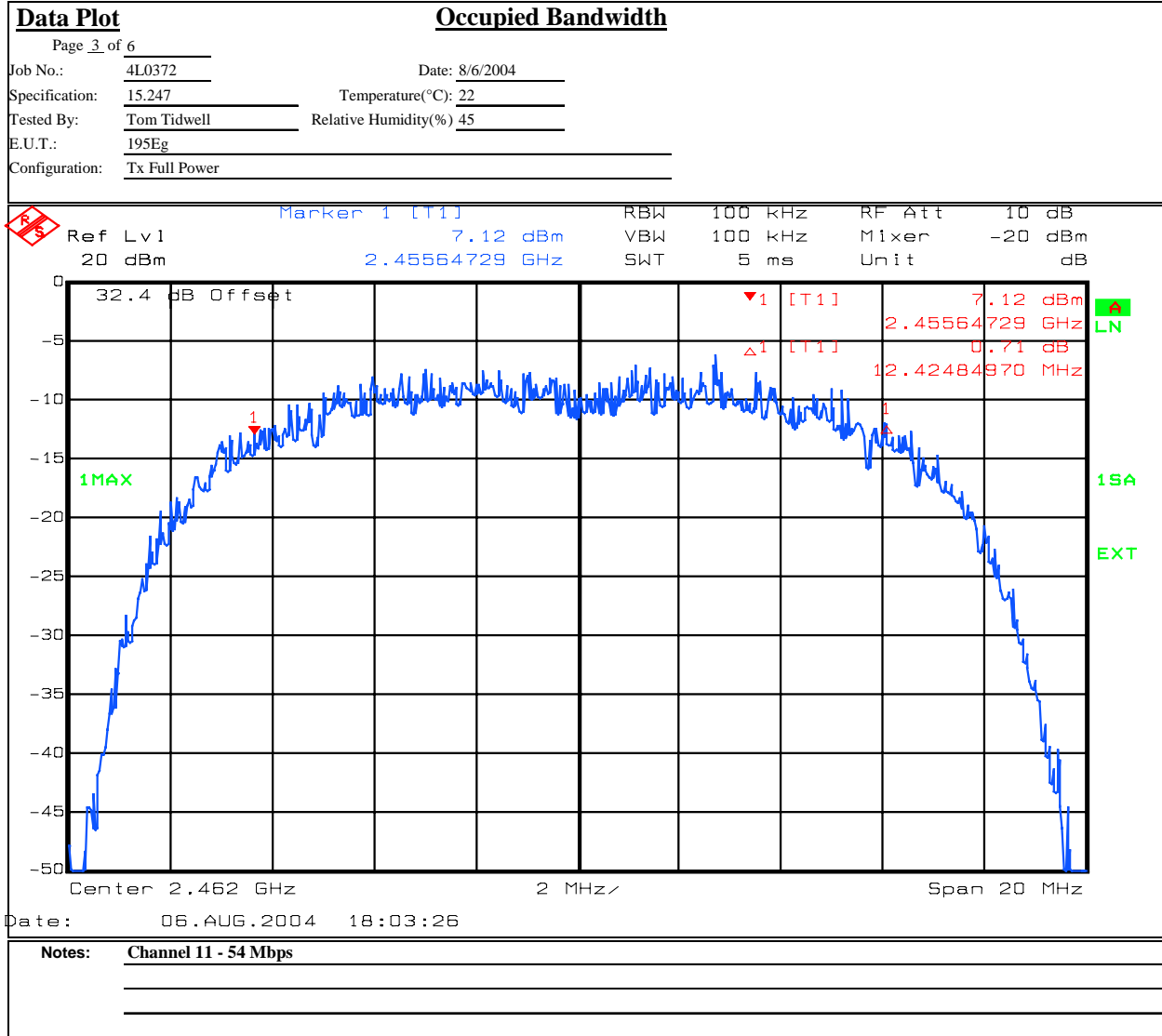
**Test Data – 6dB Bandwidth**

Data Plot	Occupied Bandwidth																			
Page <u>1</u> of <u>6</u>	Date: <u>8/6/2004</u>	Complete <u>x</u>																		
Job No.: <u>4L0372</u>	Temperature(°C): <u>22</u>	Preliminary: _____																		
Specification: <u>15.247</u>	Relative Humidity(%): <u>45</u>																			
Tested By: <u>Tom Tidwell</u>																				
E.U.T.: <u>195Eg</u>																				
Configuration: <u>Tx Full Power</u>																				
Sample Number: <u>1</u>																				
Location: <u>Lab 1</u>	RBW: <u>100 kHz</u>	Measurement Distance: <u>na</u> m																		
Detector Type: <u>Peak</u>	VBW: <u>100 kHz</u>																			
<b>Test Equipment Used</b>																				
Antenna: _____	Directional Coupler: _____																			
Pre-Amp: _____	Cable #1: <u>1484</u>																			
Filter: _____	Cable #2: <u>1485</u>																			
Receiver: <u>1036</u>	Cable #3: _____																			
Attenuator #1: <u>1467</u>	Cable #4: _____																			
Attenuator #2: <u>1477</u>	Mixer: _____																			
Additional equipment used: _____																				
Measurement Uncertainty: <u>+/-1.7 dB</u>																				
<table border="0" style="width:100%; font-family: monospace;"> <tr> <td style="width: 15%;">Ref Lvl</td> <td style="width: 15%;">Delta 1 [T1]</td> <td style="width: 15%;">RBW</td> <td style="width: 15%;">100 kHz</td> <td style="width: 15%;">RF Att</td> <td style="width: 15%;">10 dB</td> </tr> <tr> <td>20 dBm</td> <td>0.12 dB</td> <td>VBW</td> <td>100 kHz</td> <td>Mixer</td> <td>-20 dBm</td> </tr> <tr> <td></td> <td>13.10621242 MHz</td> <td>SWT</td> <td>5 ms</td> <td>Unit</td> <td>dB</td> </tr> </table>			Ref Lvl	Delta 1 [T1]	RBW	100 kHz	RF Att	10 dB	20 dBm	0.12 dB	VBW	100 kHz	Mixer	-20 dBm		13.10621242 MHz	SWT	5 ms	Unit	dB
Ref Lvl	Delta 1 [T1]	RBW	100 kHz	RF Att	10 dB															
20 dBm	0.12 dB	VBW	100 kHz	Mixer	-20 dBm															
	13.10621242 MHz	SWT	5 ms	Unit	dB															
<p>Center 2.412 GHz      2 MHz/      Span 20 MHz</p>																				
Date: <u>06.AUG.2004 18:23:02</u>																				
Notes: <u>Channel 1 - 54 Mbs</u>																				

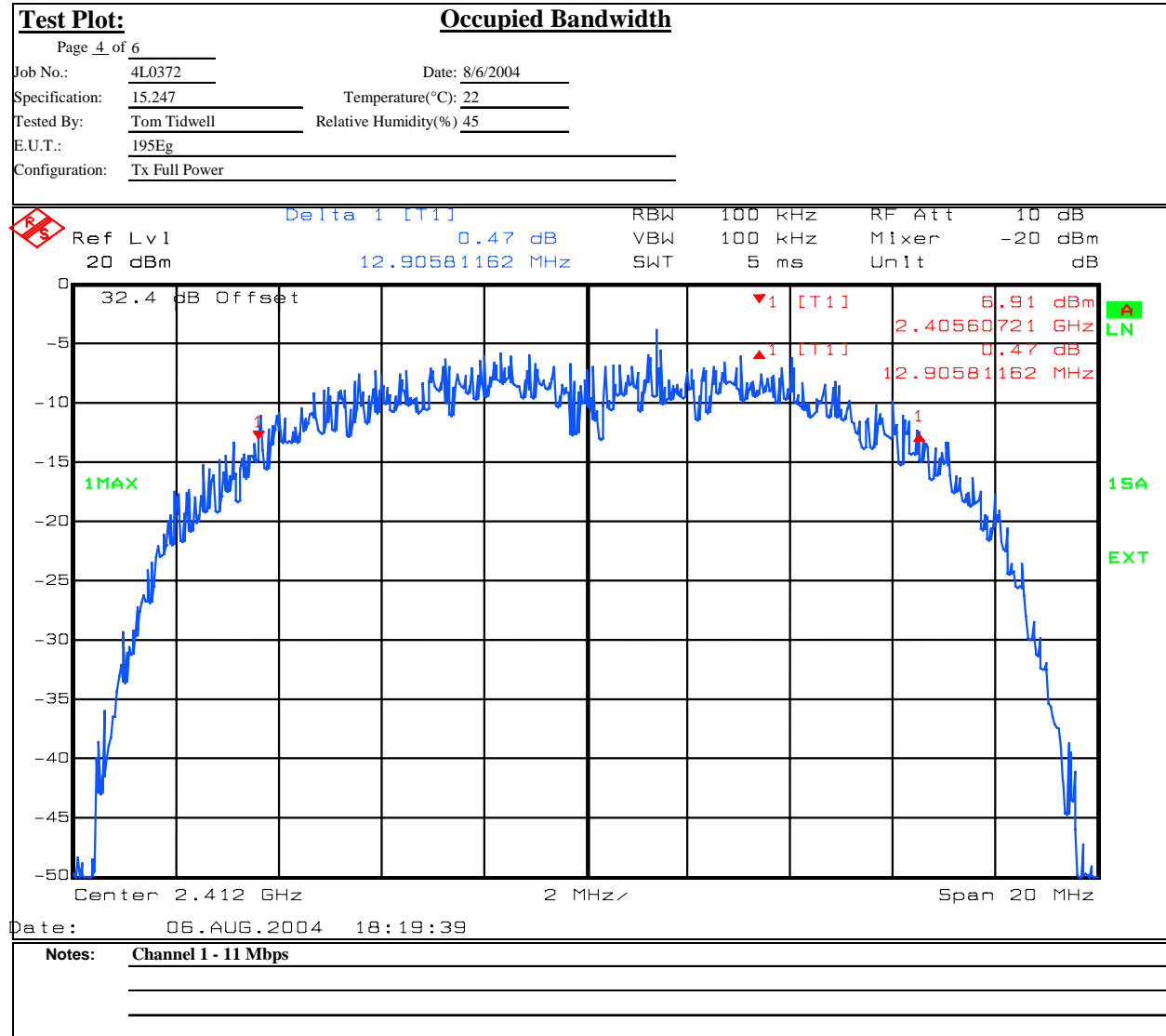
Test Data – 6dB Bandwidth



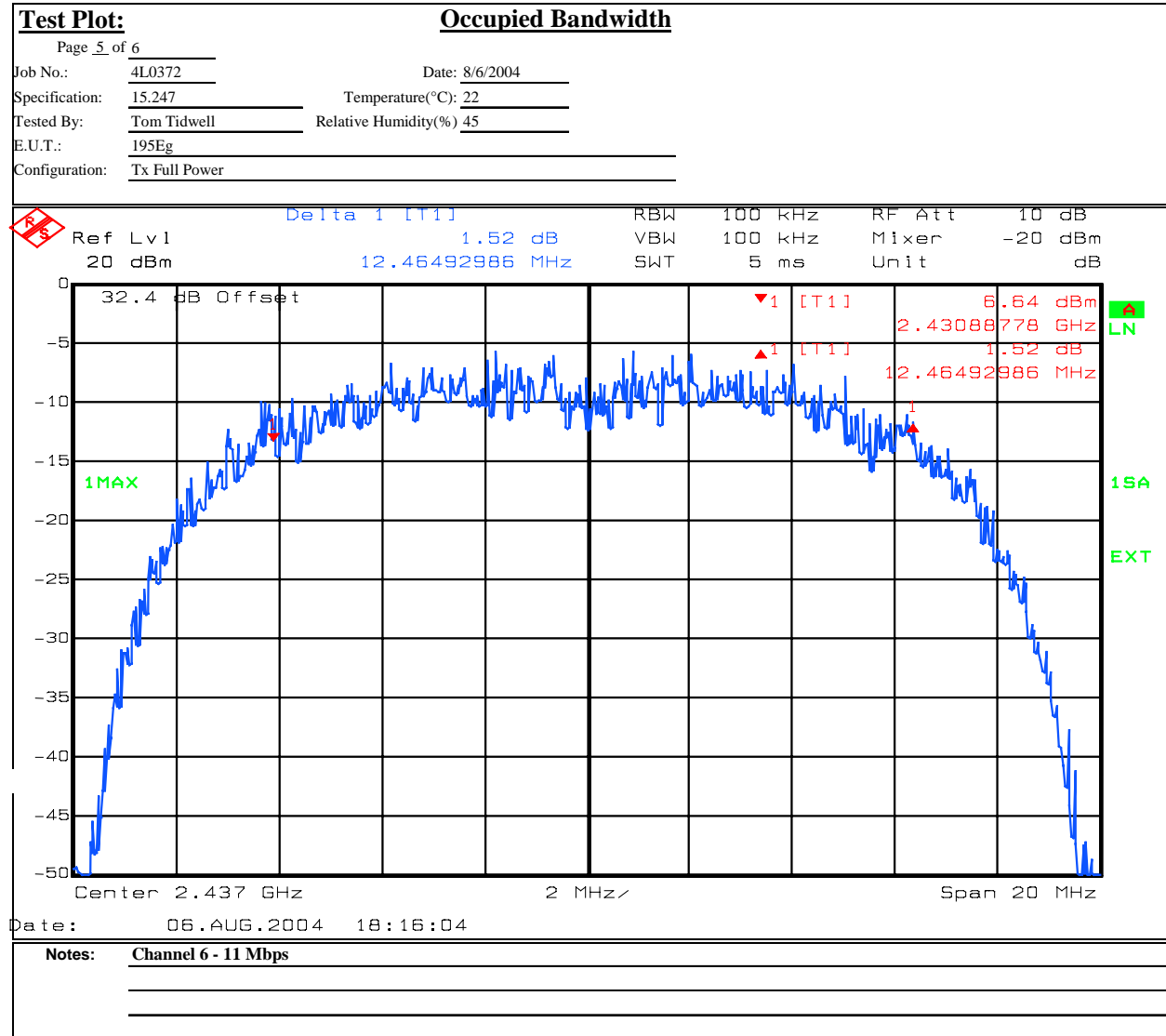
Test Data – 6dB Bandwidth



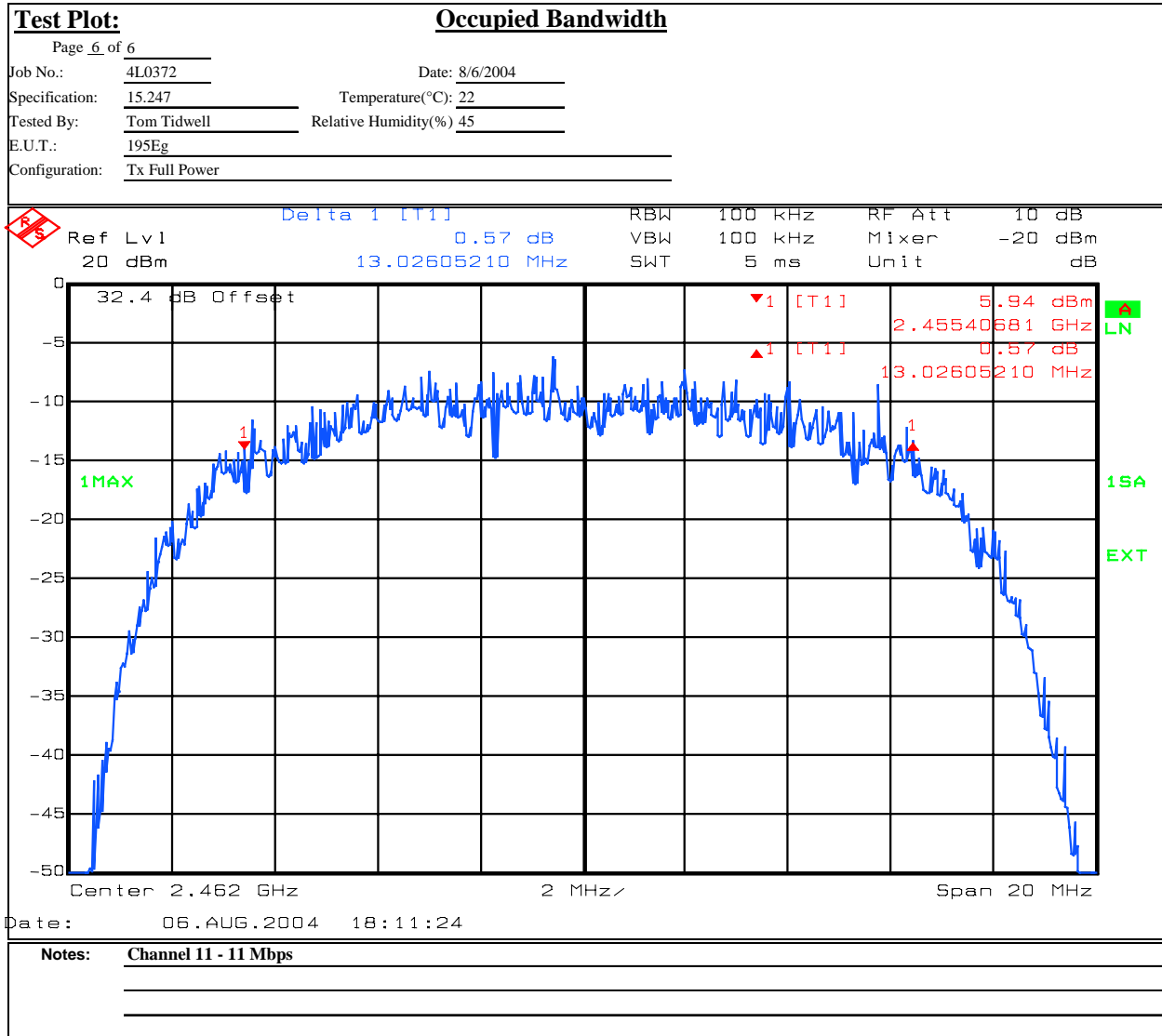
**Test Data – 6dB Bandwidth**



Test Data – 6dB Bandwidth



**Test Data – 6dB Bandwidth**



**Section 5. Maximum Peak Output Power**

NAME OF TEST: Maximum Peak Output power	PARA. NO.: 15.247(b)(3)
TESTED BY: Tom Tidwell	DATE: 8/6/04

**Test Results:** Complies.

**Measurement Data:**

**NOTE: The following data represents the worst-case (highest) power levels with a variation in supplied power from 102 – 138 VAC (85% to 115% of nominal 120 VAC).**

**Omni-Directional Operation**

Frequency (MHz)	Data Rate (Mb/s)	Peak Power (dBm)	Peak Power (mW)	Antenna Type	Gain (dBi)	E.I.R.P (dBm)	E.I.R.P. (Watts)	
2412	54	30	1000.00	Duck	2	32	1.58	AA01S
2436	54	29.9	977.24	Duck	2	31.9	1.55	AA01S
2462	54	29.9	977.24	Duck	2	31.9	1.55	AA01S
2412	11	30	1000.00	Duck	2	32	1.58	AA01S
2436	11	29.9	977.24	Duck	2	31.9	1.55	AA01S
2462	11	29.9	977.24	Duck	2	31.9	1.55	AA01S
2412	54	30	1000.00	Unit Mnt.	5	35	3.16	AA20DMEg
2436	54	29.9	977.24	Unit Mnt.	5	34.9	3.09	AA20DMEg
2462	54	29.9	977.24	Unit Mnt.	5	34.9	3.09	AA20DMEg
2412	11	30	1000.00	Unit Mnt.	5	35	3.16	AA20DMEg
2436	11	29.9	977.24	Unit Mnt.	5	34.9	3.09	AA20DMEg
2462	11	29.9	977.24	Unit Mnt.	5	34.9	3.09	AA20DMEg
2412	54	30	1000.00	Omni	6	36	3.98	AA20Eg
2436	54	29.9	977.24	Omni	6	35.9	3.89	AA20Eg
2462	54	29.9	977.24	Omni	6	35.9	3.89	AA20Eg
2412	11	30	1000.00	Omni	6	36	3.98	AA20Eg
2436	11	29.9	977.24	Omni	6	35.9	3.89	AA20Eg
2462	11	29.9	977.24	Omni	6	35.9	3.89	AA20Eg
2412	54	*25.6	398.11	Yagi	10	36	3.98	AA203Eg
2436	54	*25.6	389.05	Yagi	10	35.9	3.89	AA203Eg



2462	54	*25.5	389.05	Yagi	10	35.9	3.89	AA203Eg
2412	11	*25.6	398.11	Yagi	10	36	3.98	AA203Eg
2436	11	*25.6	389.05	Yagi	10	35.9	3.89	AA203Eg
2462	11	*25.5	389.05	Yagi	10	35.9	3.89	AA203Eg
2436	11	*25.6	389.05	Yagi	10	35.9	3.89	AA203Eg
2462	11	*25.5	389.05	Yagi	10	35.9	3.89	AA203Eg

\*Permanently attached cable with 4 dB loss

**Point-to-Point Operation**

Frequency (MHz)	Data Rate (Mb/s)	Peak Power (dBm)	Peak Power (mW)	Antenna Type	Gain (dBi)	E.I.R.P (dBm)	E.I.R.P. (Watts)	
2412	54	**25.7	371.54	Parabolic	19	44.7	29.51	AA204Eg
2436	54	**25.6	363.08	Parabolic	19	44.6	28.84	AA204Eg
2462	54	**25.6	363.08	Parabolic	19	44.6	28.84	AA204Eg
2412	11	**25.7	371.54	Parabolic	19	44.7	29.51	AA204Eg
2436	11	**25.6	363.08	Parabolic	19	44.6	28.84	AA204Eg
2462	11	**25.6	363.08	Parabolic	19	44.6	28.84	AA204Eg

**\*\*The power level is set at the factory through configuration software only available to the manufacturer. When a system is sold for Point-to-Point operation the rf power output is set to a maximum of +25.7 dBm at the antenna output port.**

Equipment Used: 1036-1467-1477

Measurement Uncertainty: +/- 0.7 dB

Temperature: 22 °C

Relative Humidity: 45 %

**Section 6. RF Exposure**

NAME OF TEST: RF Exposure	PARA. NO.: 15.247(b)(4)
---------------------------	-------------------------

**Test Results:** Complies.

**Measurement Data:**

**Section 7. Spurious Emissions (Antenna Conducted)**

NAME OF TEST: Spurious Emissions (conducted)	PARA. NO.: 15.247(c)
TESTED BY: Tom Tidwell	DATE: 8/9/04

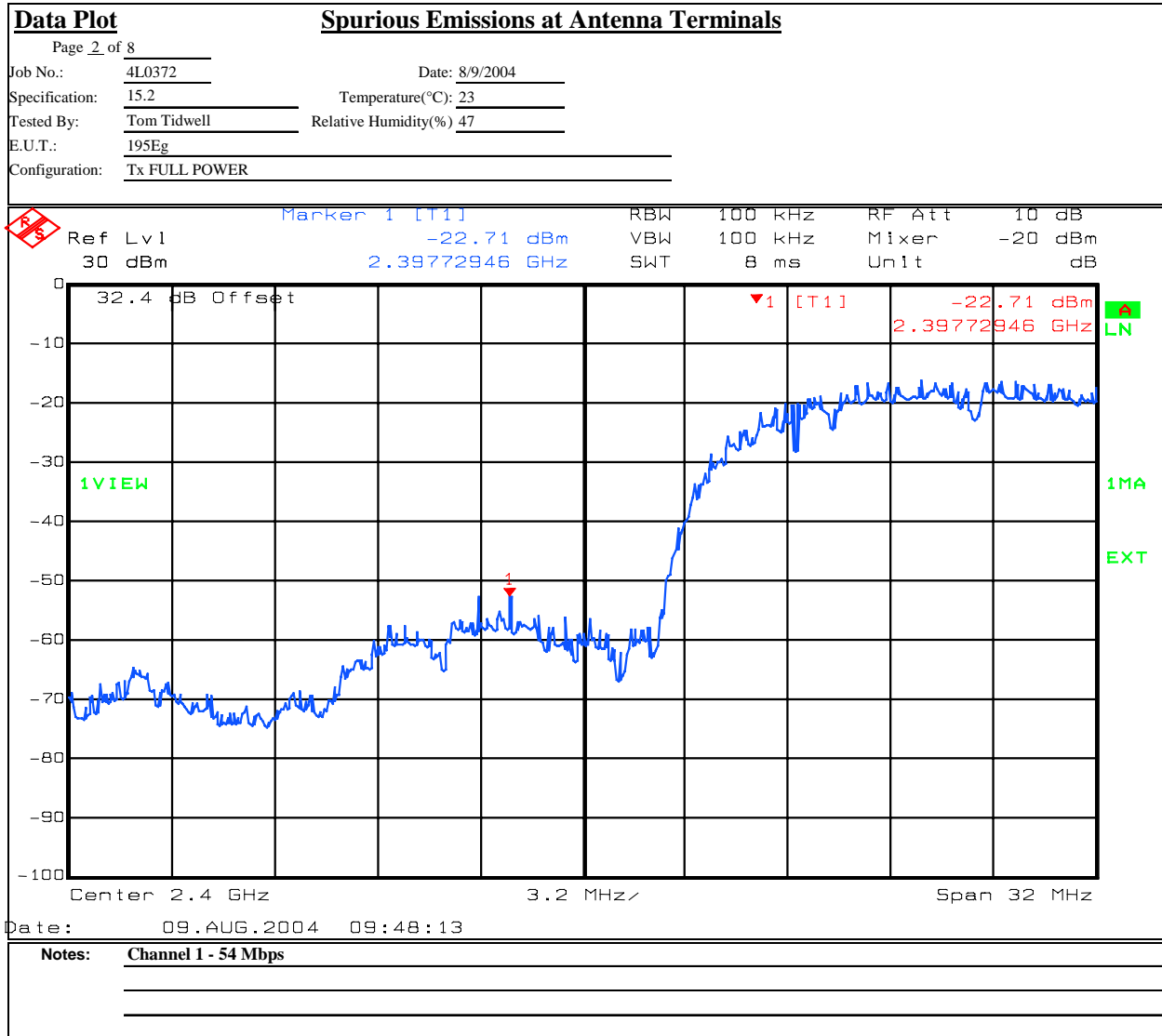
**Test Results:** Complies.

**Measurement Data:** See attached plots.

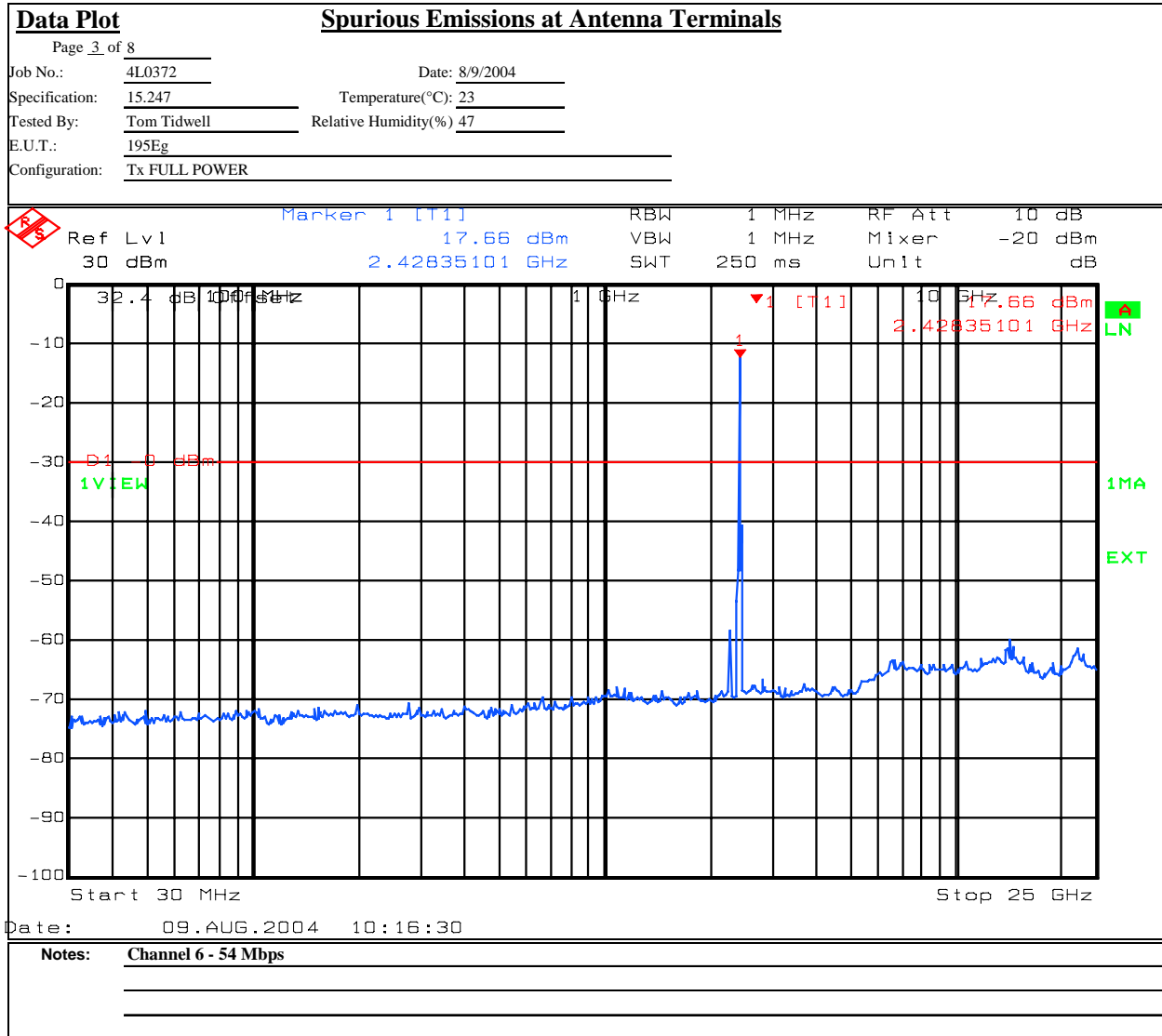
**Test Data – Spurious Emissions at Antenna Terminals**

<u>Data Plot</u>		<u>Spurious Emissions at Antenna Terminals</u>																			
Page 1 of 8		Date: 8/9/2004	Complete <input checked="" type="checkbox"/> X																		
Job No.: 4L0372		Temperature(°C): 23	Preliminary: <input type="checkbox"/>																		
Specification: 15.247		Relative Humidity(%): 47																			
Tested By: Tom Tidwell																					
E.U.T.: 195Eg																					
Configuration: Tx FULL POWER																					
Sample Number: 1		RBW: 100 kHz	Measurement																		
Location: Lab 1		VBW: 100 kHz	Distance: NA m																		
Detector Type: Peak																					
<b><u>Test Equipment Used</u></b>																					
Antenna: _____		Directional Coupler: _____																			
Pre-Amp: _____		Cable #1: 1045																			
Filter: _____		Cable #2: _____																			
Receiver: 1036		Cable #3: _____																			
Attenuator #1: 1469		Cable #4: _____																			
Attenuator #2: 1477		Mixer: _____																			
Additional equipment used: _____																					
Measurement Uncertainty: +/-1.7 dB																					
<table border="0" style="width:100%; font-size: small;"> <tr> <td style="width: 20%;">Ref Lvl</td> <td style="width: 20%;">14.35 dBm</td> <td style="width: 10%;">RBW</td> <td style="width: 10%;">1 MHz</td> <td style="width: 10%;">RF Att</td> <td style="width: 10%;">10 dB</td> </tr> <tr> <td>30 dBm</td> <td>2.39584169 GHz</td> <td>VBW</td> <td>1 MHz</td> <td>Mixer</td> <td>-20 dBm</td> </tr> <tr> <td></td> <td></td> <td>SWT</td> <td>250 ms</td> <td>Unit</td> <td>dB</td> </tr> </table>				Ref Lvl	14.35 dBm	RBW	1 MHz	RF Att	10 dB	30 dBm	2.39584169 GHz	VBW	1 MHz	Mixer	-20 dBm			SWT	250 ms	Unit	dB
Ref Lvl	14.35 dBm	RBW	1 MHz	RF Att	10 dB																
30 dBm	2.39584169 GHz	VBW	1 MHz	Mixer	-20 dBm																
		SWT	250 ms	Unit	dB																
<p style="font-size: x-small;">             The plot shows a spectrum from 30 MHz to 25 GHz. A prominent signal is observed at 2.39584169 GHz with a level of 14.35 dBm. A red horizontal line is drawn at -30 dBm. A blue vertical line marks the signal peak. Labels include 'D1 0.1 dBm', '1 VIEW', '1MA', and 'EXT'. A red diamond icon is in the top left corner.         </p>																					
Start 30 MHz		Stop 25 GHz																			
Date: 09.AUG.2004 09:24:00																					
Notes: Channel 1 - 54 Mbps																					

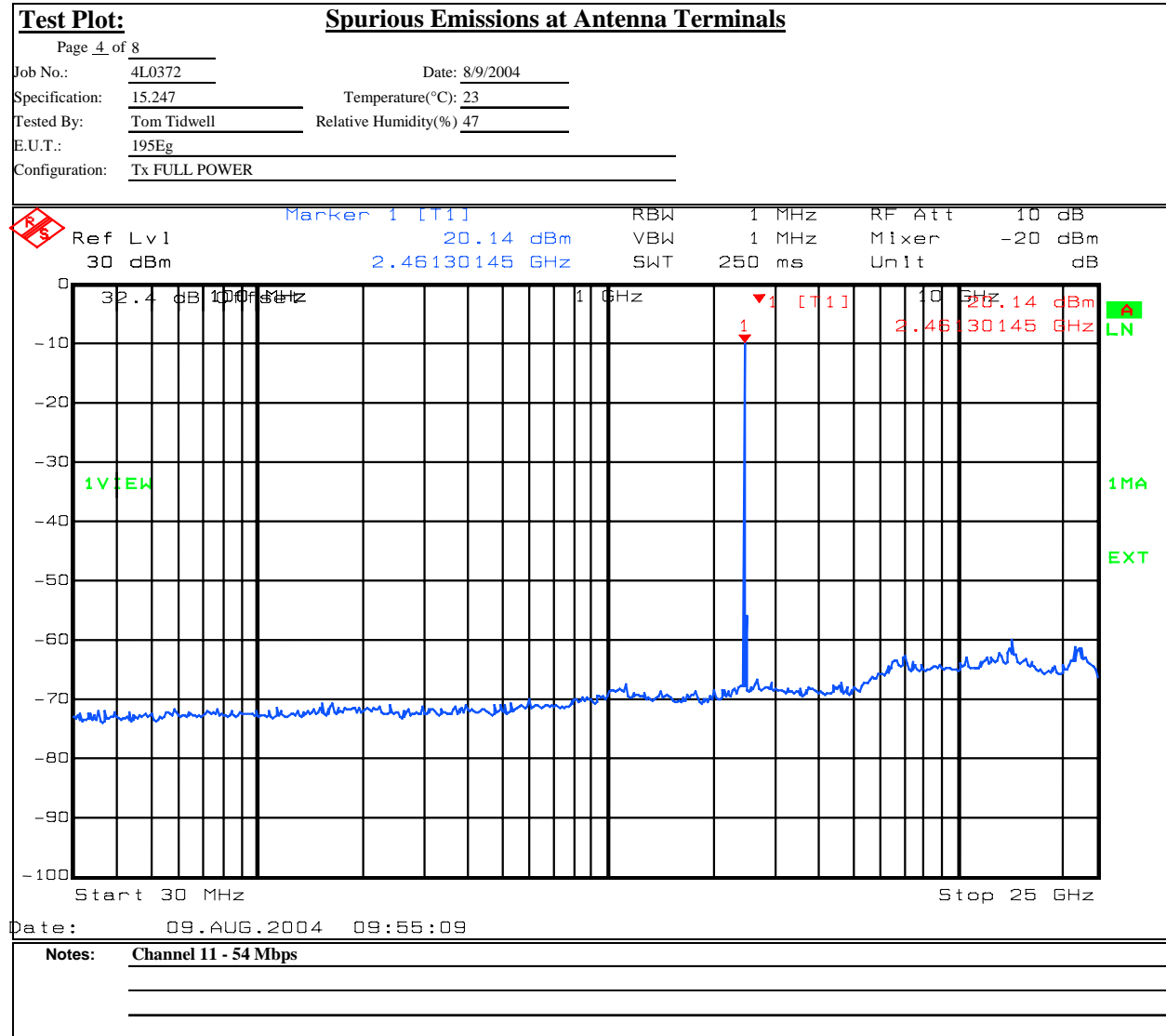
**Test Data – Spurious Emissions at Antenna Terminals**



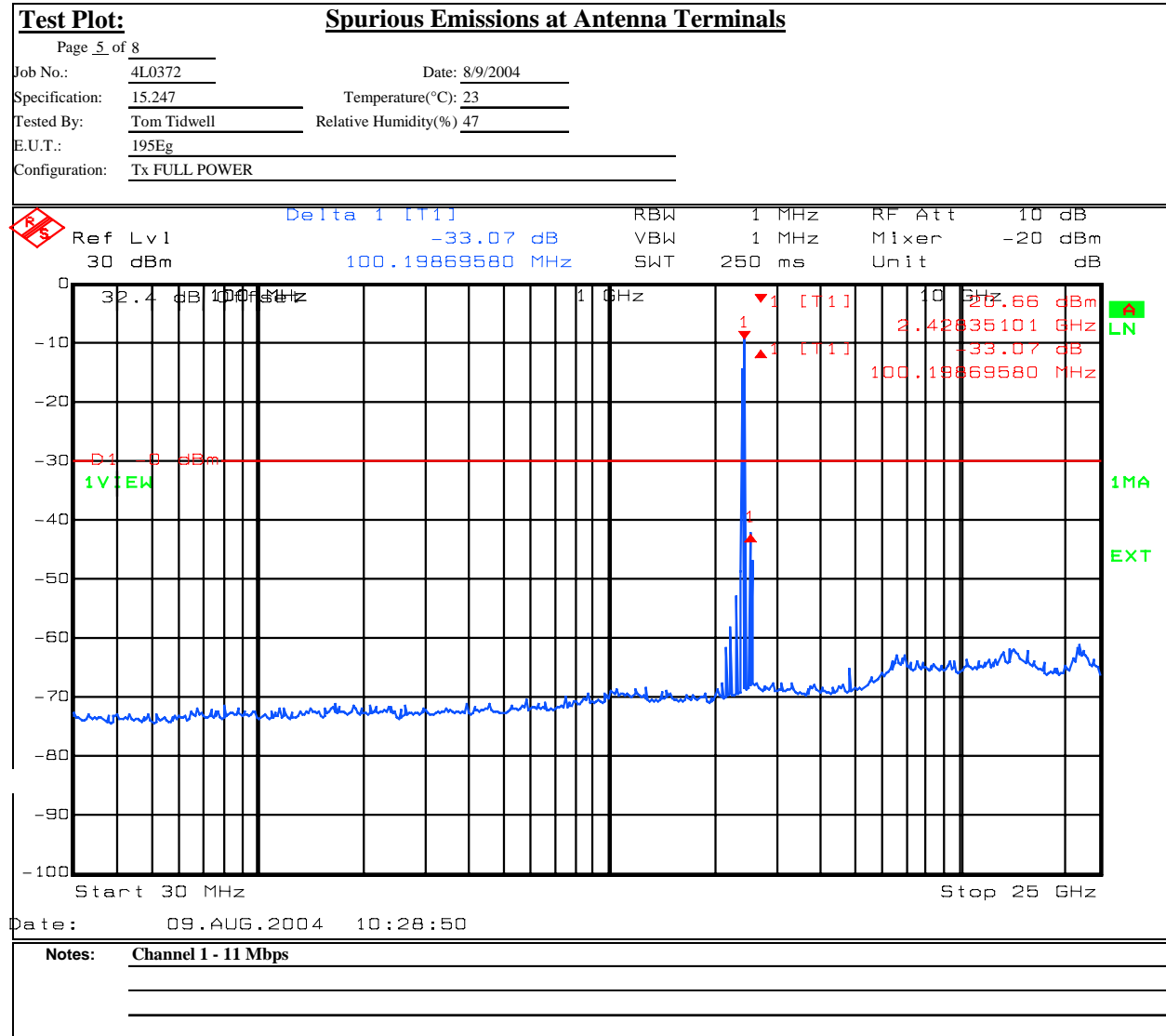
Test Data – Spurious Emissions at Antenna Terminals



**Test Data – Spurious Emissions at Antenna Terminals**

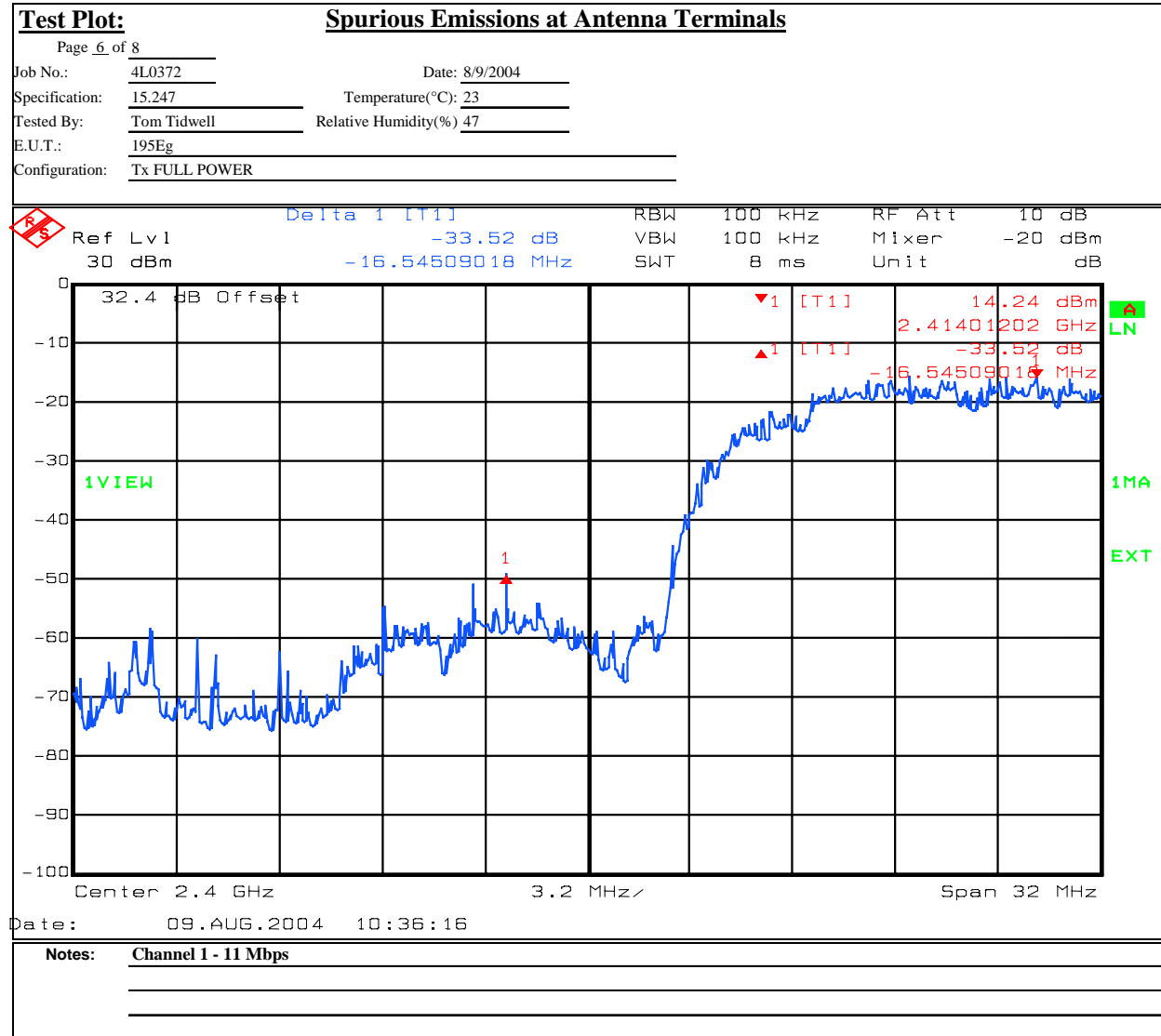


**Test Data – Spurious Emissions at Antenna Terminals**

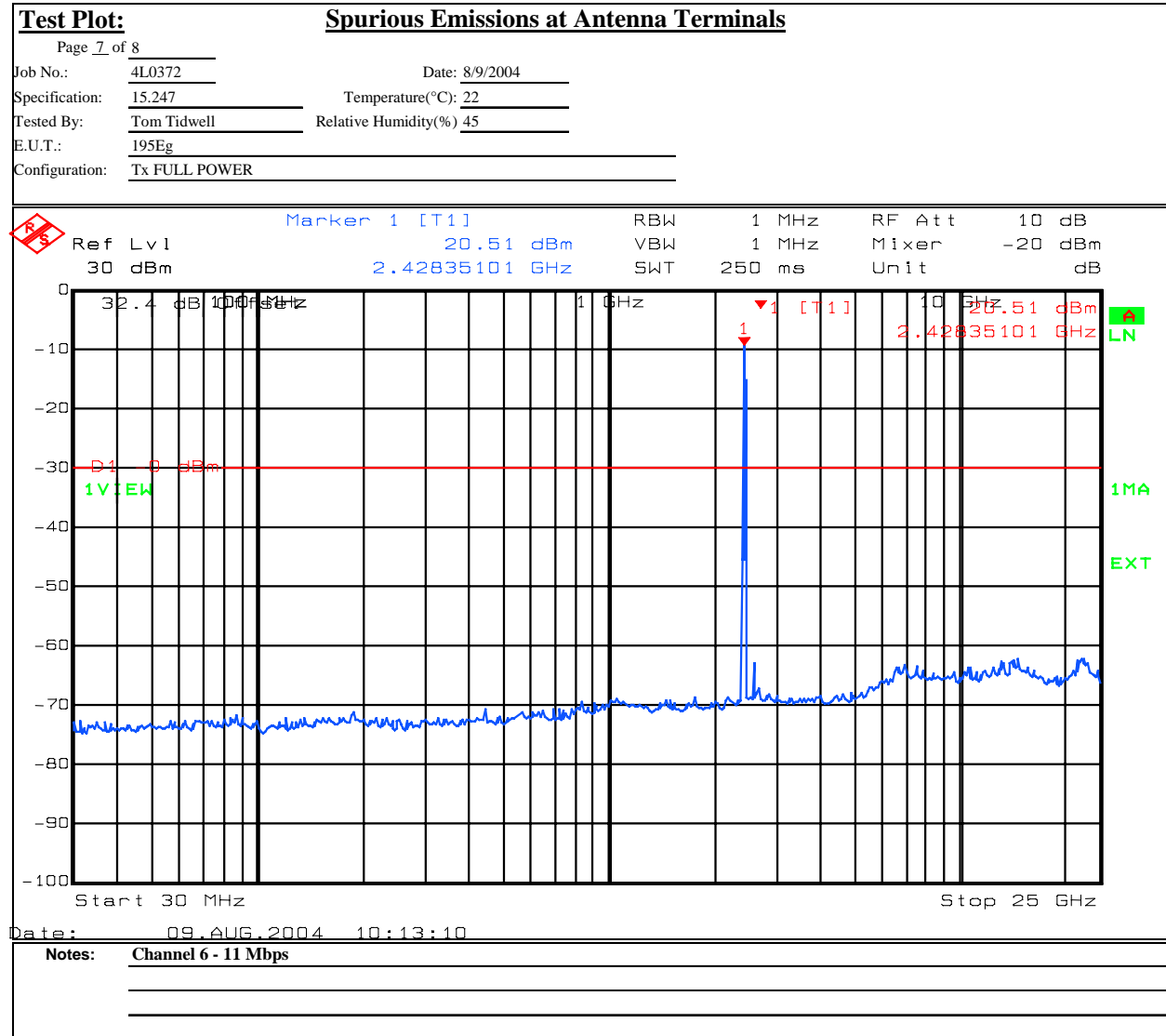




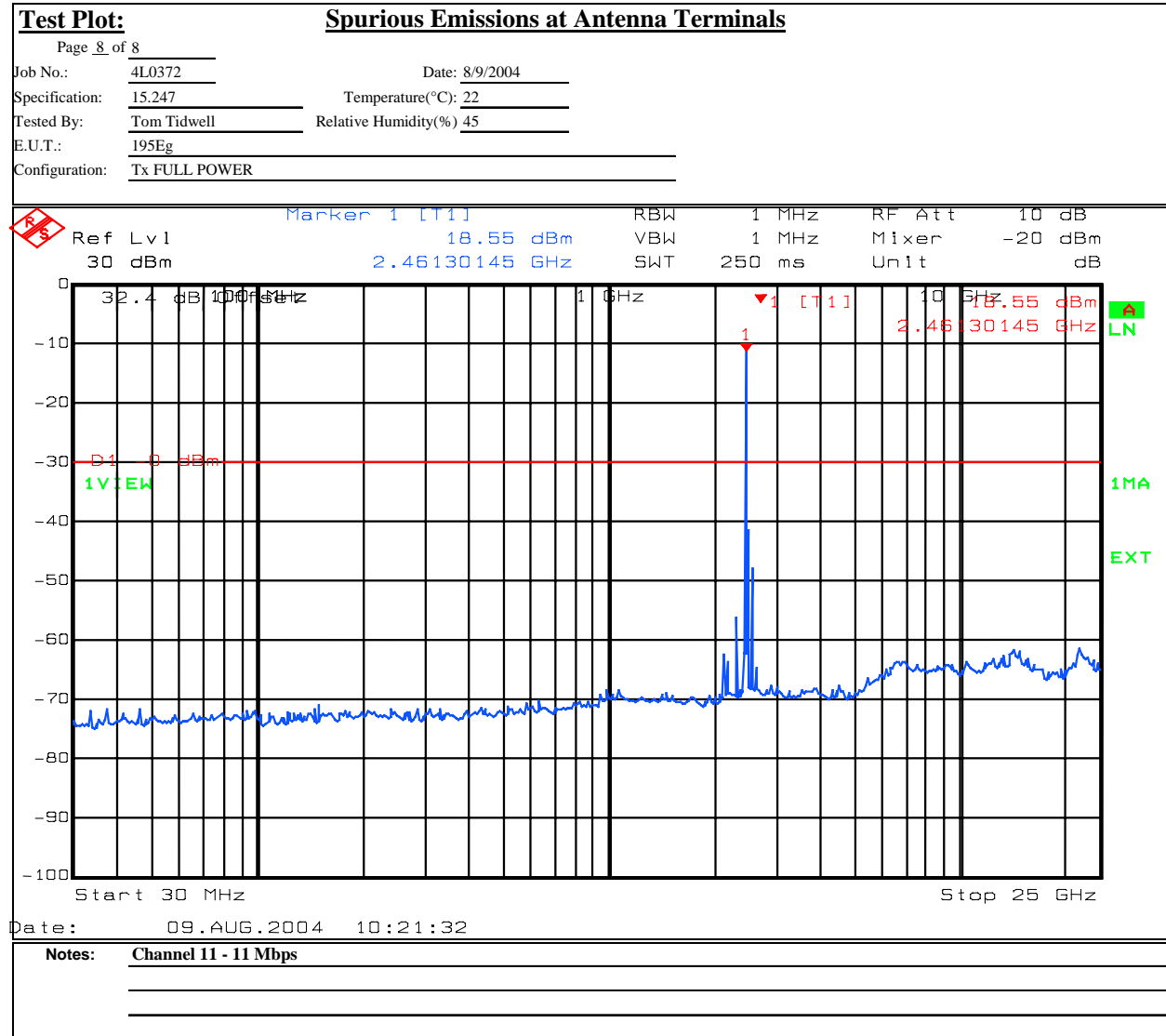
**Test Data – Spurious Emissions at Antenna Terminals**



**Test Data – Spurious Emissions at Antenna Terminals**



**Test Data – Spurious Emissions at Antenna Terminals**



**Section 8. Spurious Emissions (Radiated)**

NAME OF TEST: Spurious Emissions (radiated)	PARA. NO.: 15.247 (c)
TESTED BY: Tom Tidwell	DATE: 8/10/04

**Test Results:** Complies.

**Measurement Data:** See attached table.

**Test Data - Spurious Emissions (Radiated)**

<u>Radiated Emissions</u>			
Page <u>1</u> of <u>1</u>			
Job No.:	<u>4L0372</u>	Date:	<u>8/10/2004</u>
Specification:	<u>15.247/15.209</u>	Temperature(°C):	<u>23</u>
Tested By:	<u>Tom Tidwell</u>	Relative Humidity(%):	<u>41</u>
E.U.T.:	<u>195Eg</u>		
Configuration:	<u>Channel 11 - 11 Mbps (The spectrum was searched with the radio set to channels 1 and 6 also)</u>		
Sample Number	<u>1</u>		
Location:	<u>AC 3</u>	RBW:	<u>1 MHz</u> 1 MHz for Avg.
Detector Type:	<u>Peak</u>	VBW:	<u>1 MHz</u> 10 Hz for Avg.
<u>Test Equipment Used</u>			
Antenna:	<u>1304</u>	Directional Coupler:	<u>#N/A</u>
Pre-Amp:	<u>1016</u>	Cable #1:	<u>1484</u>
Filter:	<u>1482</u>	Cable #2:	<u>1485</u>
Receiver:	<u>1036</u>	Cable #3:	<u>#N/A</u>
Attenuator #1:	<u>#N/A</u>	Cable #4:	<u>#N/A</u>
Attenuator #2:	<u>#N/A</u>	Mixer:	<u>#N/A</u>
Measurement Uncertainty:	<u>+/- 3.6 dB</u>		

Frequency (GHz)	Meter Reading (dBuV)	Antenna Factor (dB)	Cable Loss (dB)	Pre-Amp Gain (dB)	Corrected Reading (dBuV/m)	Limit (dBuV/m)	Delta (dB)	Comment
								<b>Duck antenna</b>
2.4835	34	28.2	3.1		65.3	74	-8.7	Vertical - Peak
2.4835	12	28.2	3.1		43.3	54	-10.7	Vertical - Average
2.4835	25.4	28.2	3.1		56.7	74	-17.3	Horizontal - Peak
2.4835	12	28.2	3.1		43.3	54	-10.7	Horizontal - Average
								<b>10 dB Yagi(MYP24010PTRPNM)</b>
2.4835	36	28.2	3.1		67.3	74	-6.7	Vertical - Peak
2.4835	12	28.2	3.1		43.3	54	-10.7	Vertical - Average
2.4835	25	28.2	3.1		56.3	74	-17.7	Horizontal - Peak
2.4835	12	28.2	3.1		43.3	54	-10.7	Horizontal - Average
								<b>Unit Mount (Larsen)</b>
2.4835	36	28.2	3.1		67.3	74	-6.7	Vertical - Peak
2.4835	13	28.2	3.1		44.3	54	-9.7	Vertical - Average
2.4835	32	28.2	3.1		63.3	74	-10.7	Horizontal - Peak
2.4835	12	28.2	3.1		43.3	54	-10.7	Horizontal - Average
								<b>6 dB Omni</b>
2.4835	37.4	28.2	3.1		68.7	74	-5.3	Vertical - Peak
2.4835	13	28.2	3.1		44.3	54	-9.7	Vertical - Average
2.4835	28	28.2	3.1		59.3	74	-14.7	Horizontal - Peak
2.4835	12	28.2	3.1		43.3	54	-10.7	Horizontal - Average
								<b>19dBi Parabolic</b>
2.4835	38	28.2	3.1		69.3	74	-4.7	Vertical - Peak
2.4835	12	28.2	3.1		43.3	54	-10.7	Vertical - Average
2.4835	32	28.2	3.1		63.3	74	-10.7	Horizontal - Peak
2.4835	12	28.2	3.1		43.3	54	-10.7	Horizontal - Average

Notes: There were no emissions detected other than bandedge. The spectrum was searched to 25 GHz.

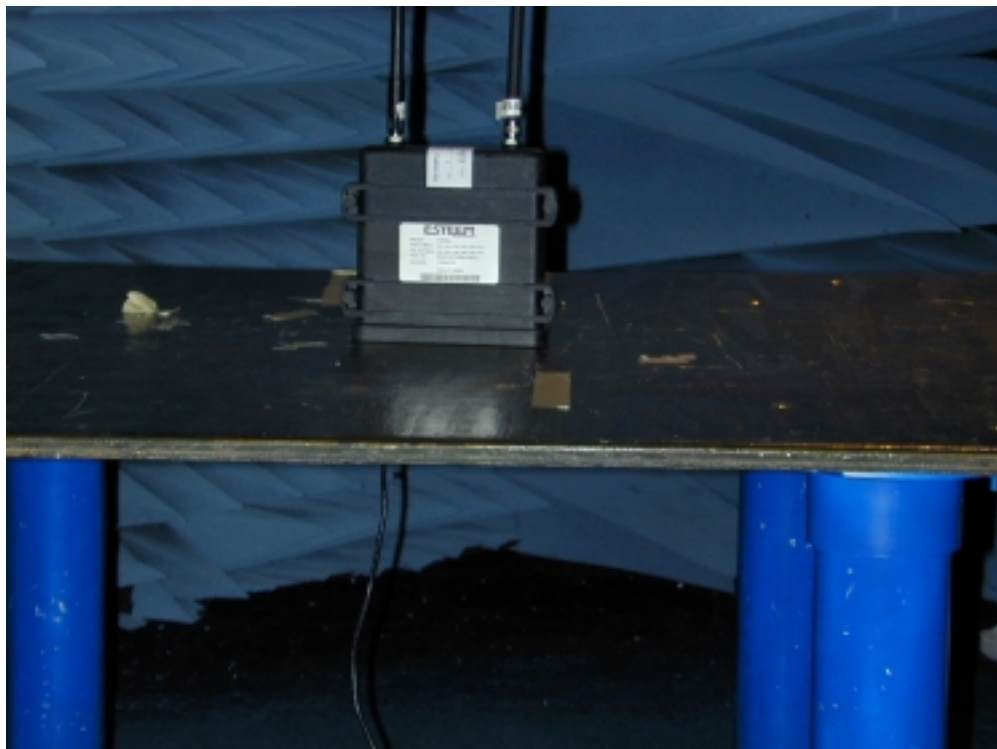
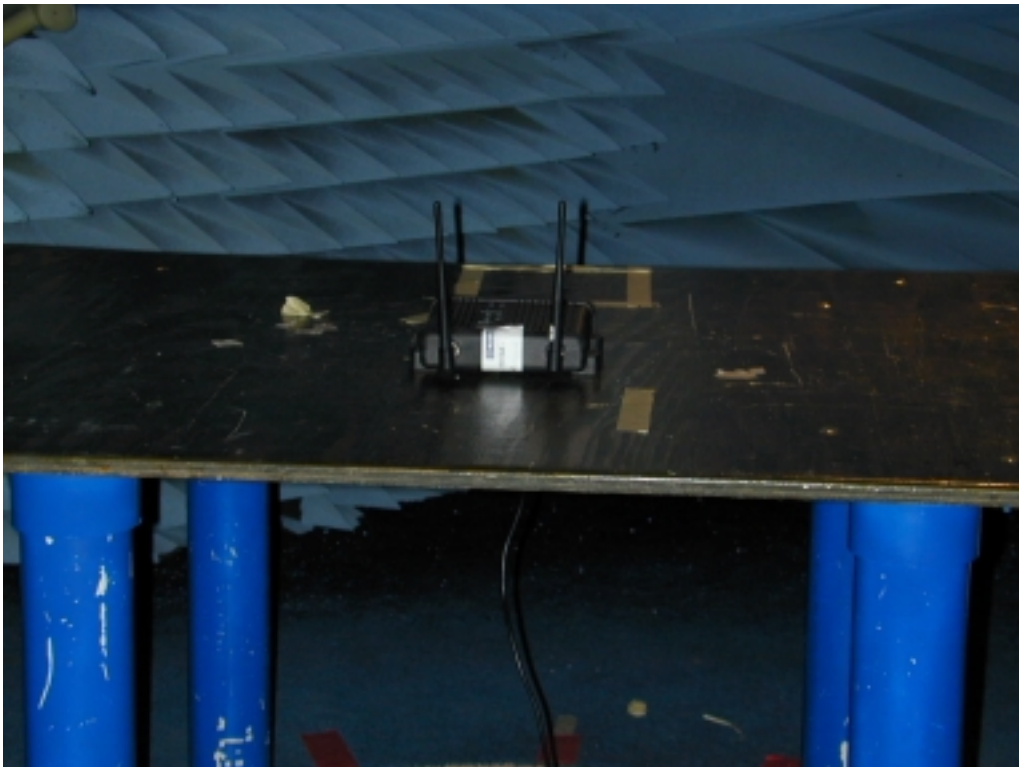
**Test Data - Spurious Emissions (Radiated)**

<u>Radiated Emissions</u>			
Page 1 of 1			
Job No.:	4L0372	Date:	8/10/2004
Specification:	15.247/15.209	Temperature(°C):	23
Tested By:	Tom Tidwell	Relative Humidity(%)	41
E.U.T.:	195Eg		
Configuration:	Channel 11 - 54 Mbps		
Sample Number:	1		
Location:	AC 3	RBW:	1 MHz
Detector Type:	Peak	VBW:	1 MHz
			1 MHz for Avg. 10 Hz for Avg.
<u>Test Equipment Used</u>			
Antenna:	1304	Directional Coupler:	#N/A
Pre-Amp:	#N/A	Cable #1:	1484
Filter:	#N/A	Cable #2:	1485
Receiver:	1036	Cable #3:	#N/A
Attenuator #1:	#N/A	Cable #4:	#N/A
Attenuator #2:	#N/A	Mixer:	#N/A
Measurement Uncertainty:	+/- 3.6 dB		

Frequency (GHz)	Meter Reading (dBuV)	Antenna Factor (dB)	Cable Loss (dB)	Pre-Amp Gain (dB)	Corrected Reading (dBuV/m)	Limit (dBuV/m)	Delta (dB)	Comment
<b>Duck antenna</b>								
2.4835	36	28.2	3.1		67.3	74	-6.7	Vertical - Peak
2.4835	12	28.2	3.1		43.3	54	-10.7	Vertical - Average
2.4835	28	28.2	3.1		59.3	74	-14.7	Horizontal - Peak
2.4835	12	28.2	3.1		43.3	54	-10.7	Horizontal - Average
<b>Unit Mount (Larsen)</b>								
2.4835	40	28.2	3.1		71.3	74	-2.7	Vertical - Peak
2.4835	13	28.2	3.1		44.3	54	-9.7	Vertical - Average
2.4835	33	28.2	3.1		64.3	74	-9.7	Horizontal - Peak
2.4835	12	28.2	3.1		43.3	54	-10.7	Horizontal - Average
<b>10 dB Yagi</b>								
2.4835	40	28.2	3.1		71.3	74	-2.7	Vertical - Peak
2.4835	13	28.2	3.1		44.3	54	-9.7	Vertical - Average
2.4835	33	28.2	3.1		64.3	74	-9.7	Horizontal - Peak
2.4835	12	28.2	3.1		43.3	54	-10.7	Horizontal - Average
<b>6 dB Omni</b>								
2.4835	40	28.2	3.1		71.3	74	-2.7	Vertical - Peak
2.4835	13	28.2	3.1		44.3	54	-9.7	Vertical - Average
2.4835	33	28.2	3.1		64.3	74	-9.7	Horizontal - Peak
2.4835	12	28.2	3.1		43.3	54	-10.7	Horizontal - Average
<b>19 dBi Parabolic</b>								
2.4835	40	28.2	3.1		71.3	74	-2.7	Vertical - Peak
2.4835	15	28.2	3.1		46.3	54	-7.7	Vertical - Average
2.4835	34	28.2	3.1		65.3	74	-8.7	Horizontal - Peak
2.4835	12	28.2	3.1		43.3	54	-10.7	Horizontal - Average

Notes: There were no emissions detected other than bandedge

**Setup Photographs**



**Setup Photographs**





**Setup Photographs**



**Section 9. Peak Power Spectral Density**

NAME OF TEST: Peak Power Spectral Density	PARA. NO.: 15.247(d)
TESTED BY: Tom Tidwell	DATE: 8/9/04

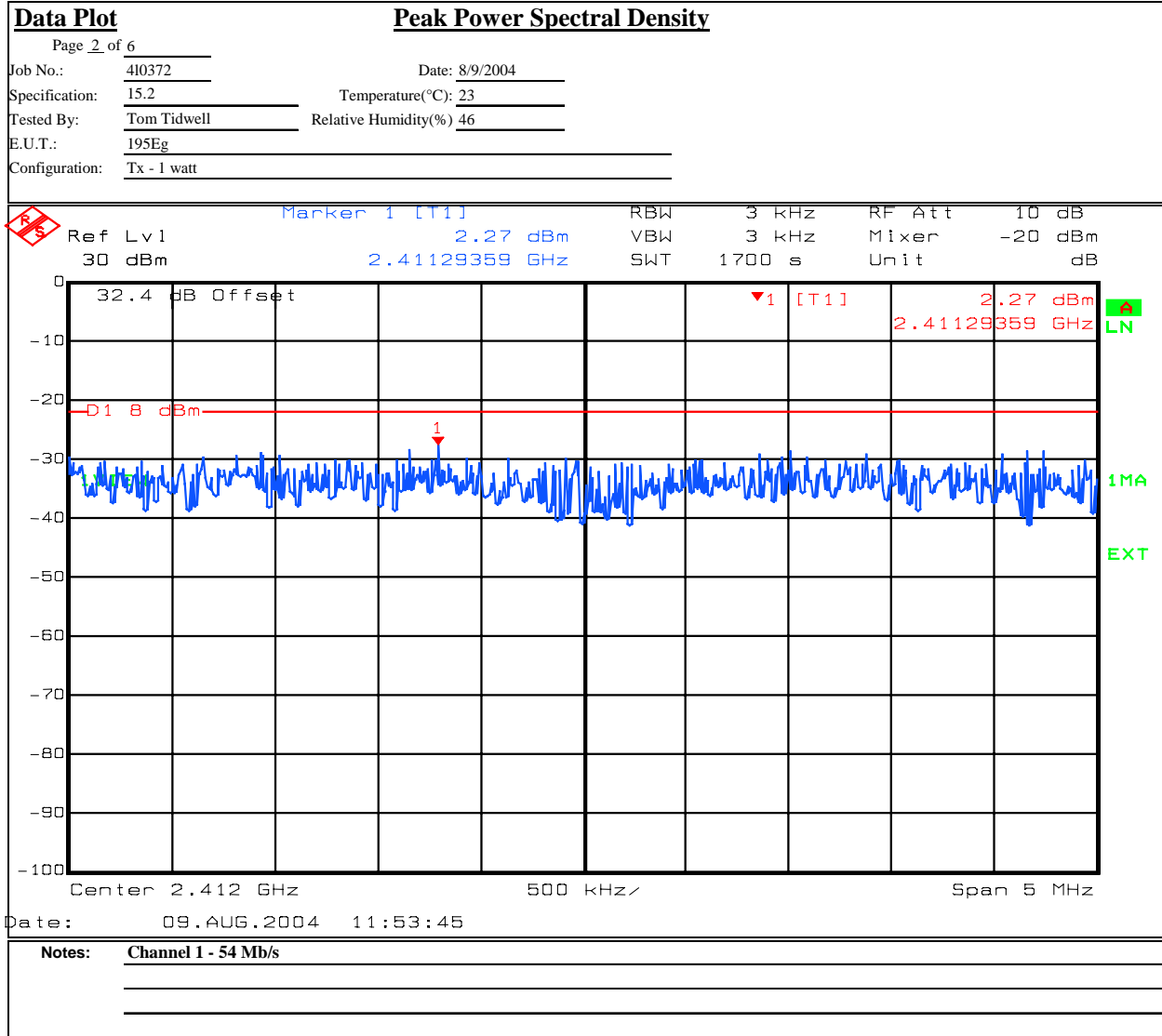
**Test Results:** Complies.

**Measurement Data:** See attached plots.

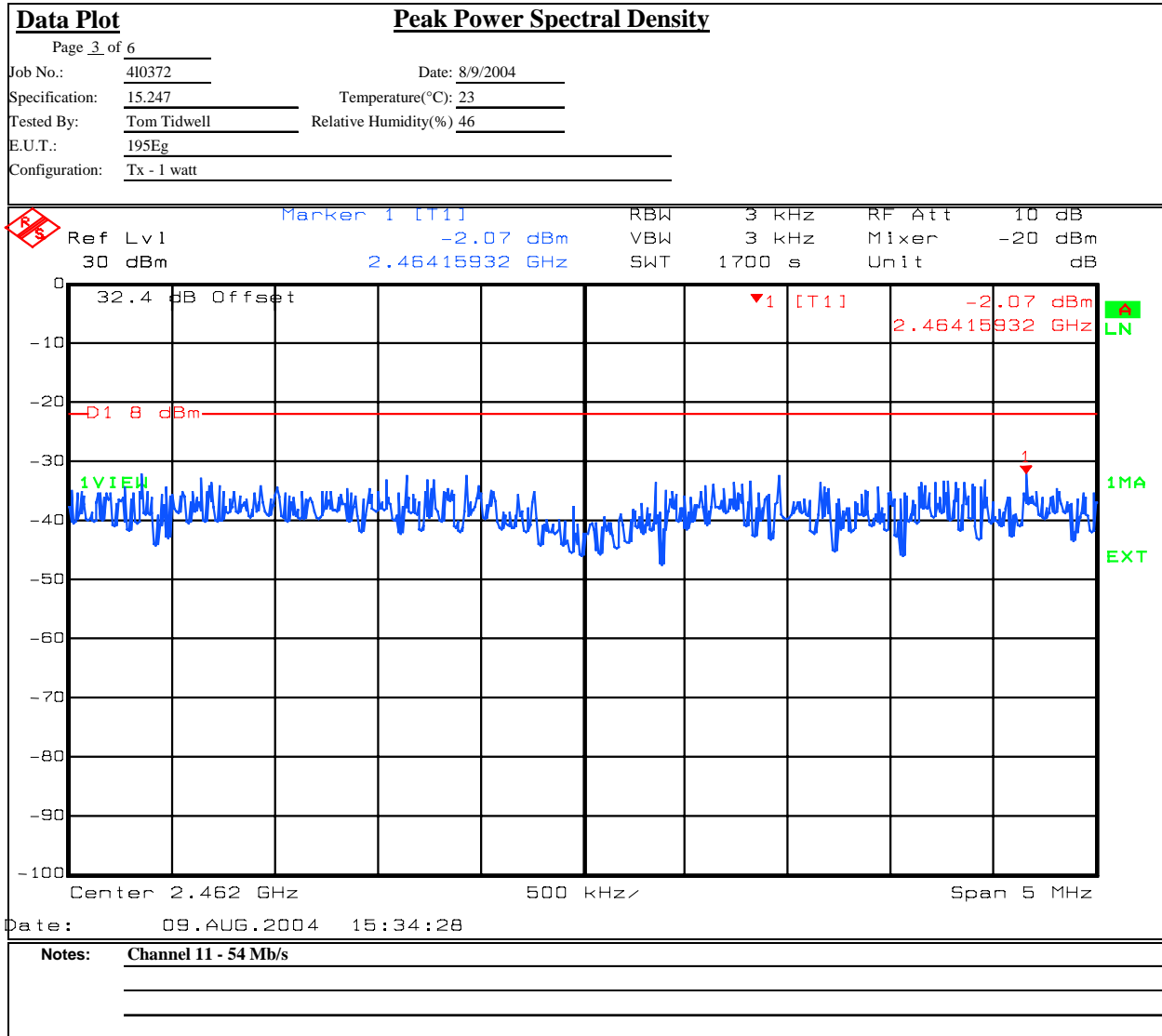
**Test Data – Spectral Density**

<u>Data Plot</u>		<u>Peak Power Spectral Density</u>													
Page <u>1</u> of <u>6</u>		Complete _____													
Job No.: <u>410372</u>	Date: <u>8/9/2004</u>	Preliminary: _____													
Specification: <u>15.247</u>	Temperature(°C): <u>23</u>														
Tested By: <u>Tom Tidwell</u>	Relative Humidity(%): <u>46</u>														
E.U.T.: <u>195Eg</u>															
Configuration: <u>Tx - 1 watt</u>															
Sample Number: <u>1</u>															
Location: <u>Lab 1</u>	RBW: <u>3 kHz</u>	Measurement													
Detector Type: <u>Peak</u>	VBW: <u>3 kHz</u>	Distance: <u>na</u> m													
<b><u>Test Equipment Used</u></b>															
Antenna: _____	Directional Coupler: _____														
Pre-Amp: _____	Cable #1: <u>1484</u>														
Filter: _____	Cable #2: _____														
Receiver: <u>1036</u>	Cable #3: _____														
Attenuator #1: <u>1469</u>	Cable #4: _____														
Attenuator #2: <u>1477</u>	Mixer: _____														
Additional equipment used: <u>1036</u>															
Measurement Uncertainty: <u>+/-1.7 dB</u>															
<table border="0" style="width:100%; border-collapse: collapse;"> <tr> <td style="width:15%;"></td> <td style="width:45%;">Marker 1 [T1]</td> <td style="width:15%;">RBW 3 kHz</td> <td style="width:15%;">RF Att 10 dB</td> </tr> <tr> <td>Ref Lvl</td> <td style="text-align: center;">-6.57 dBm</td> <td>VBW 3 kHz</td> <td>Mixer -20 dBm</td> </tr> <tr> <td>30 dBm</td> <td style="text-align: center;">2.43450000 GHz</td> <td>SWT 1700 s</td> <td>Unit dB</td> </tr> </table>					Marker 1 [T1]	RBW 3 kHz	RF Att 10 dB	Ref Lvl	-6.57 dBm	VBW 3 kHz	Mixer -20 dBm	30 dBm	2.43450000 GHz	SWT 1700 s	Unit dB
	Marker 1 [T1]	RBW 3 kHz	RF Att 10 dB												
Ref Lvl	-6.57 dBm	VBW 3 kHz	Mixer -20 dBm												
30 dBm	2.43450000 GHz	SWT 1700 s	Unit dB												
Center 2.437 GHz		500 kHz	Span 5 MHz												
Date: <u>09.AUG.2004 12:58:47</u>															
<b>Notes:</b> <u>Channel 6 - 54 Mbs</u>															

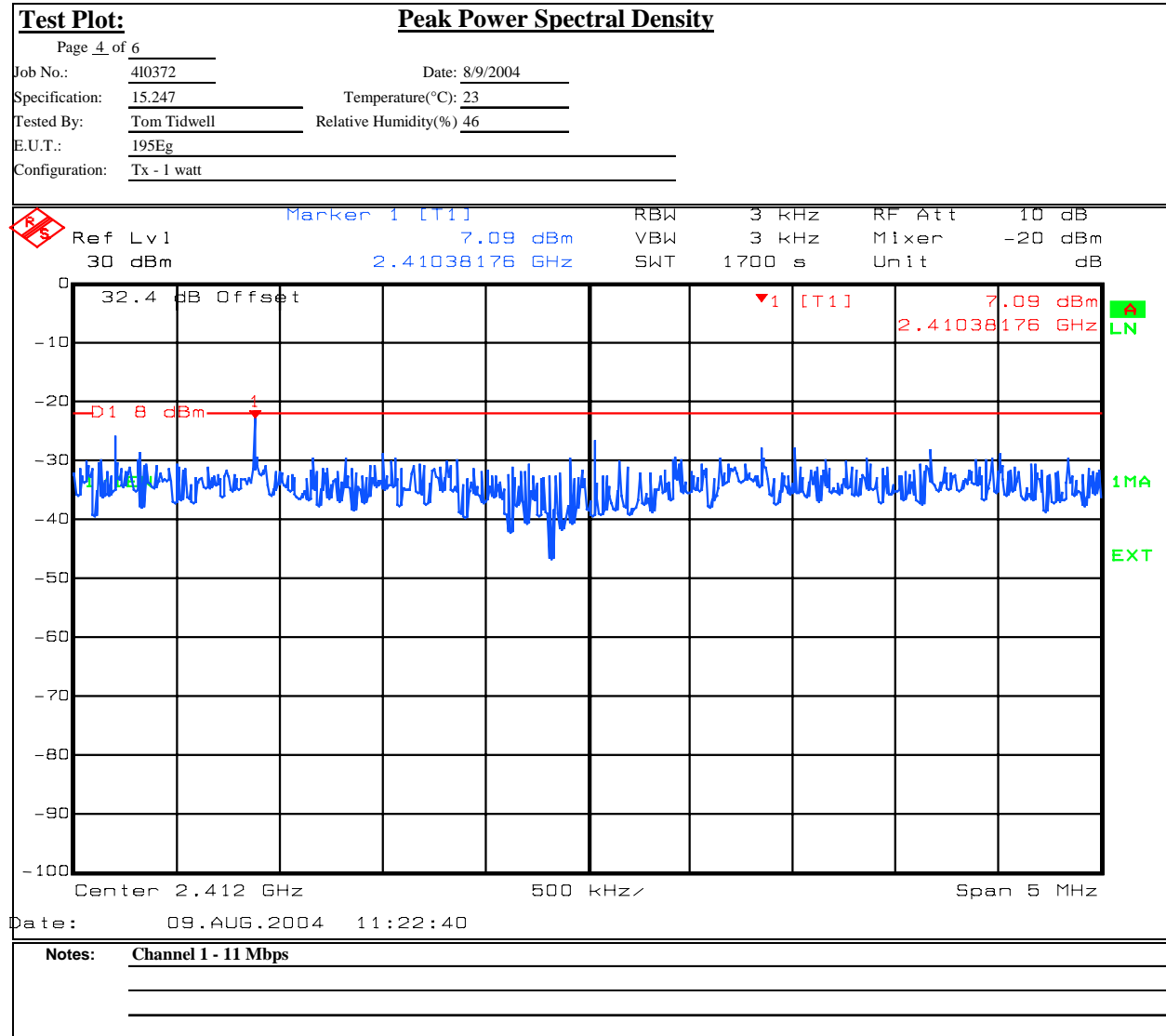
Test Data – Spectral Density



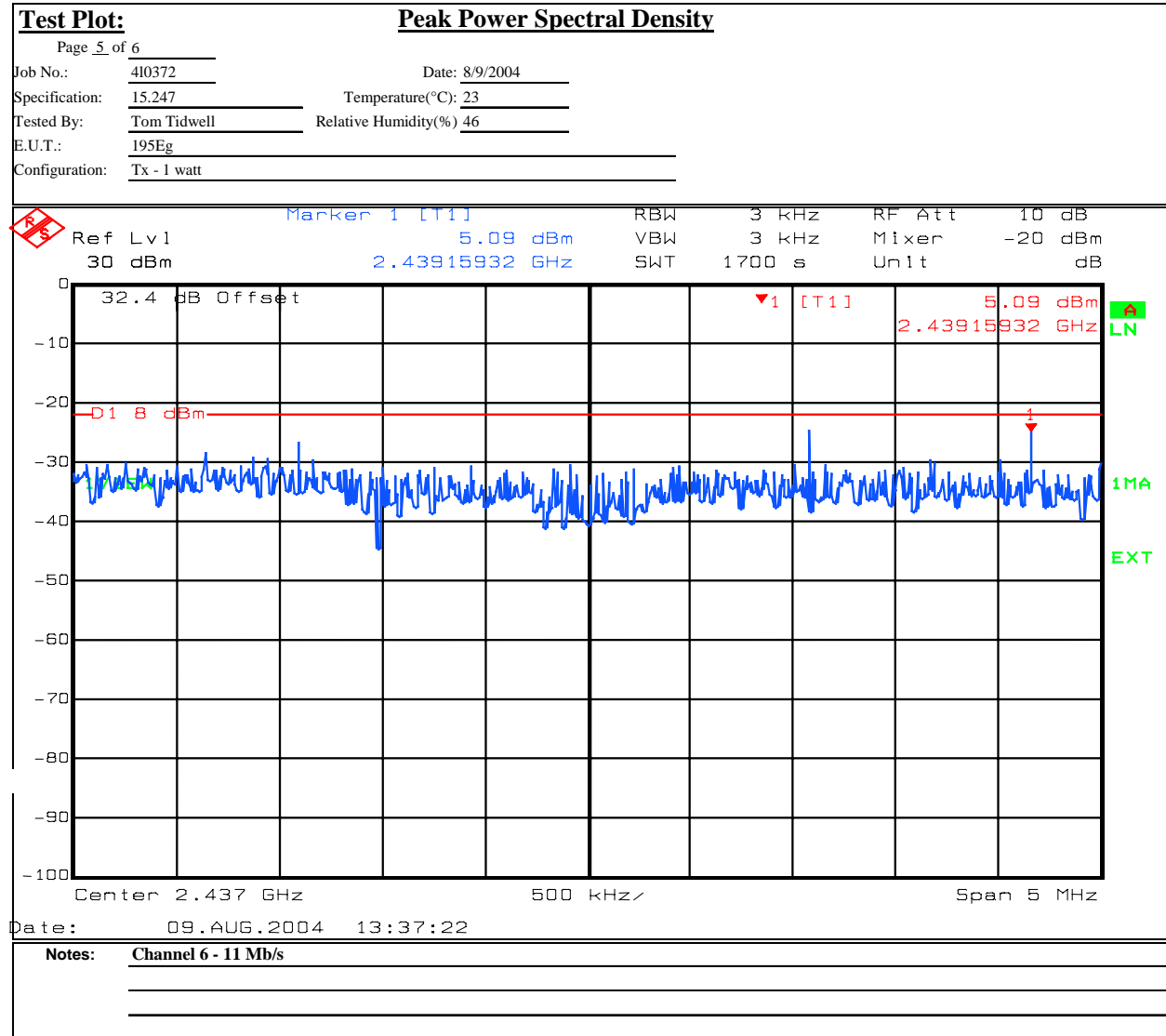
Test Data – Spectral Density



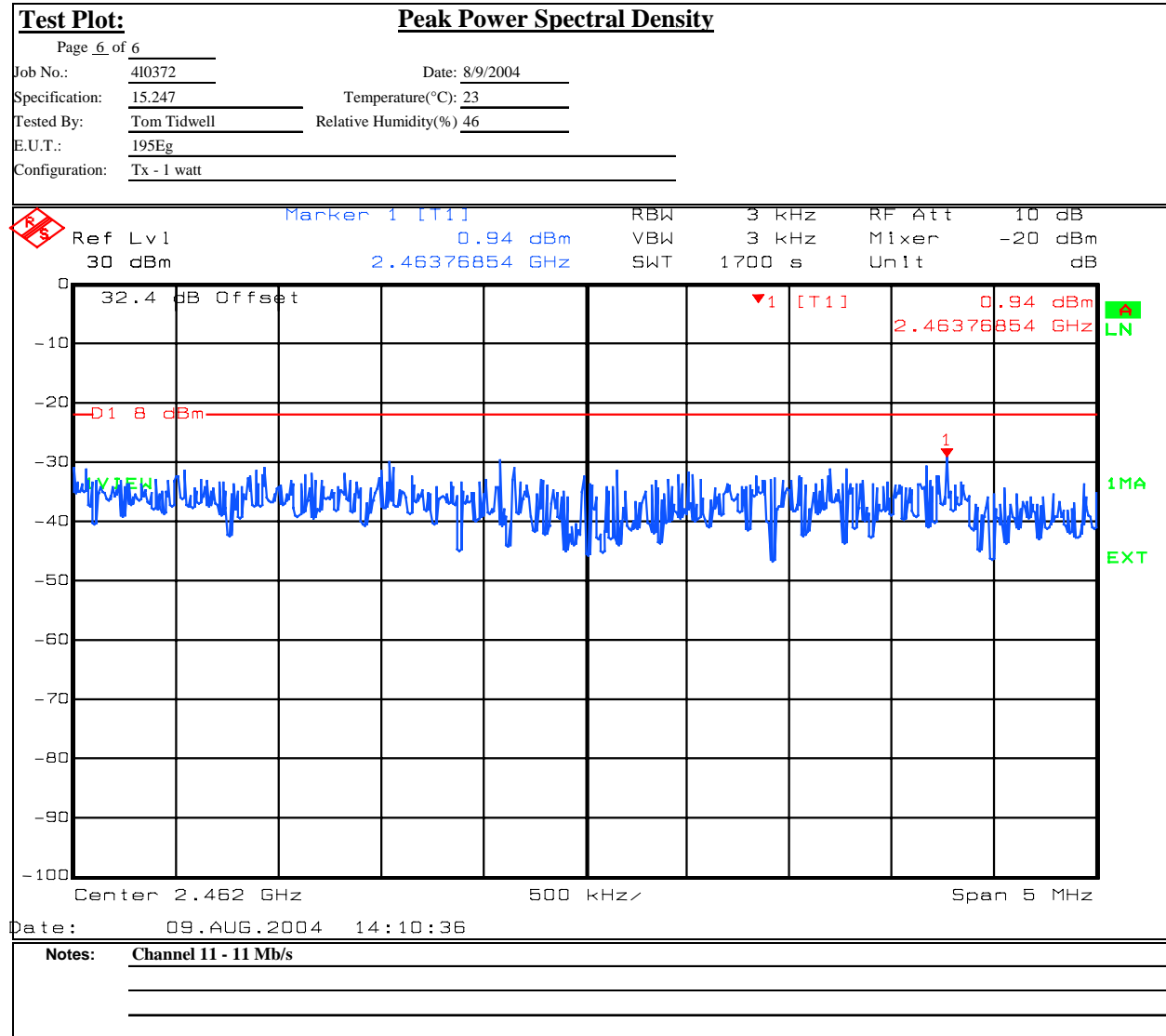
Test Data – Spectral Density



**Test Data – Spectral Density**



**Test Data – Spectral Density**





**Section 10. Test Equipment List**

Nemko ID	Description	Manufacturer Model Number	Serial Number	Calibration Date	Calibration Due
545	LISN	Schwarz Beck 8120	8120350	09/01/03	08/31/04
1433	High pass filter	Solar 7930-5.0	933142	02/04/04	02/03/05
1113	CABLE, 1m	KTL RG223	N/A	06/09/04	06/09/05
1129	CABLE, 9.5m	KTL RG58	N/A	06/09/04	06/09/05
1278	SPECTRUM ANALYZER	HEWLETT PACKARD 8566B	2618A02843	12/19/03	12/18/04
966	Receiver	Rohde & Schwartz ESH2	880370/029	09/17/03	09/16/04
1036	SPECTRUM ANALYZER	ROHDE & SCHWARZ FSEK30	830844/006	03/22/04	03/23/06
1467	10 db Attenuator DC 18 GHz	MCL Inc. BW-S10W2 10db-2WDC	NONE	CBU	N/A
1477	20db Attenuator DC 18 GHz	MCL Inc. BW-S20W5	NONE	CBU	N/A
1484	Cable 2.0-18.0 GHz	Storm PR90-010-072	N/A	08/26/04	08/26/05
1485	Cable 2.0-18.0 GHz	Storm PR90-010-216	N/A	08/02/04	08/02/05
1469	10 db Attenuator DC 18 GHz	MCL Inc. BW-S10W2 10db-2WDC	NONE	CBU	N/A
1045	CABLE 2m	Astrolab Inc. 32027-2-29094-72TC	N/A	08/26/04	08/26/05

## **Annex A – Test Details**

NAME OF TEST: Powerline Conducted Emissions	PARA. NO.: 15.207(a)
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**Minimum Standard:** (a) Except as shown in paragraphs (b) and (c) of this section, for an intentional radiator that is designed to be connected to the public utility (AC) power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies, within the band 150 kHz to 30 MHz, shall not exceed the limits in the following table, as measured using a 50 mH/50 ohms line impedance stabilization network (LISN). Compliance with the provisions of this paragraph shall be based on the measurement of the radio frequency voltage between each power line and ground at the power terminal. The lower limit applies at the boundary between the frequency ranges.

Frequency of Emission (MHz)	Conducted Limit (dB $\mu$ V)	
	Quasi-peak	Average
0.015 – 0.5	66 to 56*	46 to 56*
0.5 – 5.0	56	46
5.0 – 30.0	60	50

\* Decreases with the logarithm of the frequency.

NAME OF TEST: Minimum 6 dB bandwidth	PARA. NO.: 15.247(a)(2)
--------------------------------------	-------------------------

**Minimum Standard:**        The minimum 6 dB bandwidth shall be at least 500 kHz

NAME OF TEST: Maximum Peak Output Power	PARA. NO.: 15.247(b)(1)
---	-------------------------

**Minimum Standard:** The maximum peak output power shall not exceed 1 watt.

If transmitting antennas of directional gain greater than 6 dBi are used, the power shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

Systems operating in the 2400-2483.5 MHz band that are used exclusively for fixed, point to point operation may employ transmitting antennas with directional gain greater than 6 dBi provided the maximum peak output power is reduced by 1 dB for every 3 dB that the directional gain of the antenna exceed 6 dBi.

Systems operating in the 5725 – 5850 MHz band that are used exclusively for fixed, point-to-point operation may employ transmitting antennas with directional gain greater than 6 dBi without any corresponding reduction in transmitter peak output power.

**Direct Measurement Method For Detachable Antennas:**

If the antenna is detachable, a peak power meter is used to measure the power output with the transmitter operating into a 50 ohm load. The dBi gain of the antenna(s) employed shall be reported.

The RBW of the spectrum analyzer shall be set to a value greater than the measured 6 dB occupied bandwidth of the E.U.T.

Number of channels tested:

Tuning range	Number of channels tested	Channel location in band
1 MHz or less	1	middle
1 to 10 MHz	2	top and bottom
more than 10 MHz	3	top, middle, bottom

NAME OF TEST: RF Exposure	PARA. NO.: 15.247(b)(4)
---------------------------	-------------------------

**Minimum Standard:**

Systems operating under the provisions of this section shall be operated in a manner that ensures the public is not exposed to radio frequency energy levels in excess of the Commission's guidelines stipulated in 1.1307(b)(1) of CFR 47.

NAME OF TEST: Spurious Emissions(conducted)	PARA. NO.: 15.247(c)
---	----------------------

**Minimum Standard:** In any 100kHz bandwidth outside the frequency band in which the transmitter is operating, emissions shall be at least 20 dB below the fundamental emission or shall not exceed the following field strength limits. Emissions falling in the restricted bands of 15.205 shall not exceed the following field strength limits:

Frequency (MHz)	Field Strength (µV/m @ 3m)	Field Strength (dB @ 3m)
30 - 88	100	40.0
88 - 216	150	43.5
216 - 960	200	46.0
Above 960	500	54.0

**THE SPECTRUM IS SEARCHED TO THE 10th HARMONIC OF THE HIGHEST FREQUENCY GENERATED IN THE EUT.**

**Method Of Measurement:**

30 MHz - 10th harmonic plot

RBW: 100 kHz  
VBW: 300 kHz  
Sweep: Auto  
Display line: -20 dBc

Lower Band Edge

RBW: At least 1% of span/div.  
VBW: >RBW  
Span: As necessary to display any spurious at band edge.  
Sweep: Auto  
Center Frequency: 902 MHz, 2400 MHz, or 5725 MHz  
Marker: Peak of fundamental emission  
Marker Δ: Peak of highest spurious level below center frequency.

Upper Band Edge

RBW: At least 1% of span/div.  
VBW: >RBW  
Span: As necessary to display any spurious at band edge.  
Sweep: Auto  
Center Frequency: 928 MHz, 2483.5 MHz, or 5850 MHz  
Marker: Peak of fundamental emission  
Marker Δ: Peak of highest spurious level above center frequency.

Number of channels tested:

Tuning range	Number of channels tested	Channel location in band
1 MHz or less	1	middle
1 to 10 MHz	2	top and bottom
more than 10 MHz	3	top, middle, bottom

NAME OF TEST: Radiated Spurious Emissions	PARA. NO.: 15.247(c)
---	----------------------

**Minimum Standard:** In any 100kHz bandwidth outside the frequency band in which the transmitter is operating, emissions shall be at least 20 dB below the fundamental emission or shall not exceed the following field strength limits:

**Emissions falling in the restricted bands of 15.205 shall not exceed the following field strength limits:**

Frequency (MHz)	Field Strength ( $\mu\text{V/m}$ @ 3m)	Field Strength (dB @ 3m)
30 - 88	100	40.0
88 - 216	150	43.5
216 - 960	200	46.0
Above 960	500	54.0

*THE SPECTRUM WAS SEARCHED TO THE 10th HARMONIC*

**15.205 Restricted Bands**

MHz	MHz	MHz	GHz
0.09-0.11	16.42-16.423	399.9-410	4.5-5.25
0.495-0.505	16.69475-16.69525	608-614	5.35-5.46
2.1735-2.1905	16.80425-16.80475	960-1240	7.25-7.75
4.125-4.128	25.5-25.67	1300-1427	8.025-8.5
4.17725-4.17775	37.5-38.25	1435-1626.5	9.0-9.2
4.20725-4.20775	73-74.6	1645.5-1646.5	9.3-9.5
6.125-6.218	74.8-75.2	1660-1710	10.6-12.7
6.26775-6.26825	108-121.94	1718.8-1722.2	13.25-13.4
6.31175-6.31225	123-138	2200-2300	14.47-14.5
8.291-8.294	149.9-150.05	2310-2390	15.35-16.2
8.362-8.366	156.52475-156.52525	2483.5-2500	17.7-21.4
8.37625-8.38675	156.7-156.9	2655-2900	22.01-23.12
8.41425-8.41475	162.0125-167.17	3260-3267	23.6-24.0
12.29-12.293	167.72-173.2	3332-3339	31.2-31.8
12.51975-12.52025	240-285	3345.8-3358	36.43-36.5
12.57675-12.57725	322-335.4	3600-4400	Above 38.6
13.36-13.41	1718		

Number of channels tested:

Tuning range	Number of channels tested	Channel location in band
1 MHz or less	1	middle
1 to 10 MHz	2	top and bottom
more than 10 MHz	3	top, middle, bottom



NAME OF TEST: Transmitter Power Density	PARA. NO.: 15.247(d)
---	----------------------

**Minimum Standard:** The transmitted power density averaged over any 1 second interval shall not be greater than +8 dBm in any 3 kHz bandwidth.

**Method Of Measurement:** The spectrum analyzer is set as follows:

- RBW: 3 kHz
- VBW: >3 kHz
- Span: => measured 6 dB bandwidth
- Sweep: Span(kHz)/3 (i.e. for a span of 1.5 MHz the sweep rate is 1500/3 = 500 sec.
- LOG dB/div.: 2 dB

**Note:** For devices with spectrum line spacing =< 3 kHz, the RBW of the analyzer is reduced until the spectral lines are resolved. The measurement data is normalized to 3 kHz by summing the power of all the individual spectral lines within a 3 kHz band in linear power units.

**For Devices With Integral Antenna:**

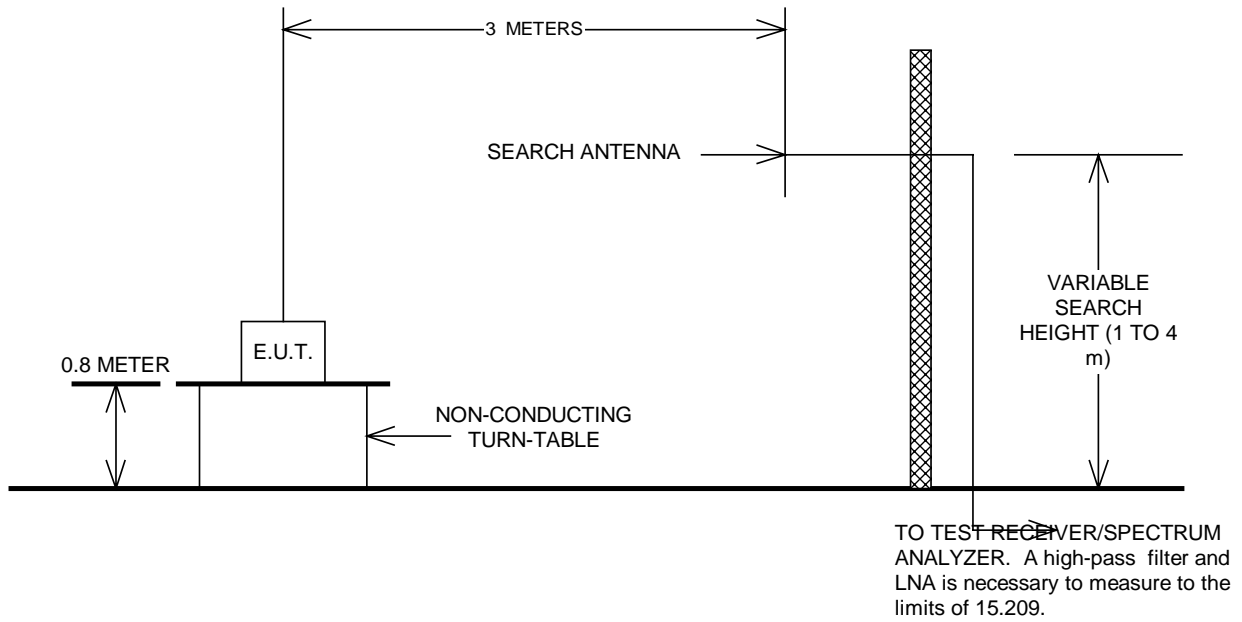
For devices with non-detachable antennas, the received field strength is peaked and the spectrum analyzer is set as above. The peak emission level is then measured and converted to a field strength by adding the appropriate antenna factor and cable loss. This field strength is then converted to an equivalent isotropic radiated power using the same method as described for Peak Power output.

Number of channels tested:

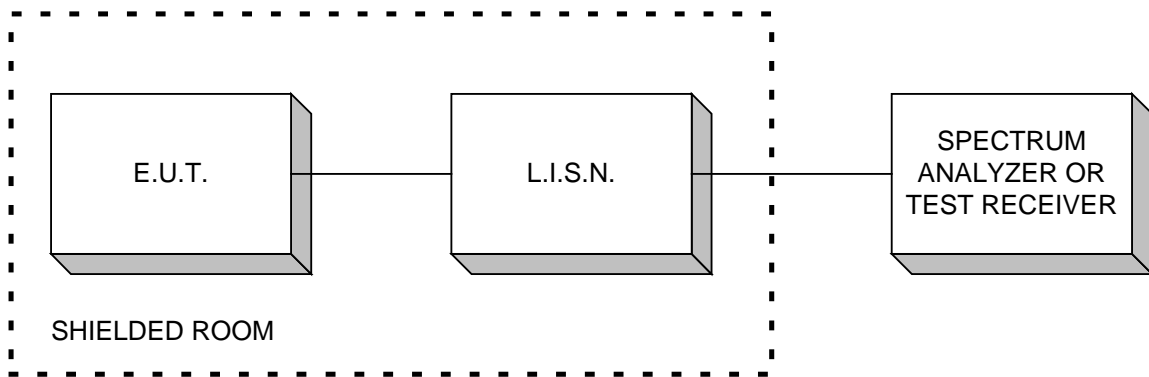
Tuning Range	Number Of Channels Tested	Channel Location In Band
1 MHz or Less	1	Middle
1 to 10 MHz	2	Top And Bottom
More Than 10 MHz	3	Top, Middle, Bottom

## **Annex B – Test Diagrams**

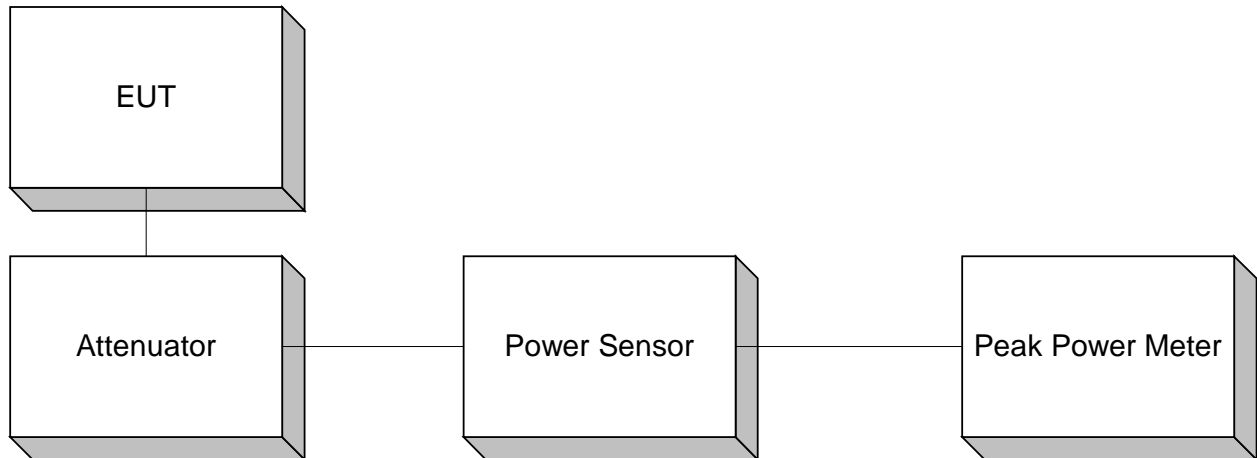
**Test Site For Radiated Emissions**



**Conducted Emissions**



**Peak Power At Antenna Terminals**



**Minimum 6 dB Bandwidth  
Peak Power Spectral Density  
Spurious Emissions (conducted)**

