

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:

A handwritten signature in black ink, appearing to read "David Light", is positioned above the printed name.

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

NAME OF TEST	PARA. NO.	RESULT
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.)

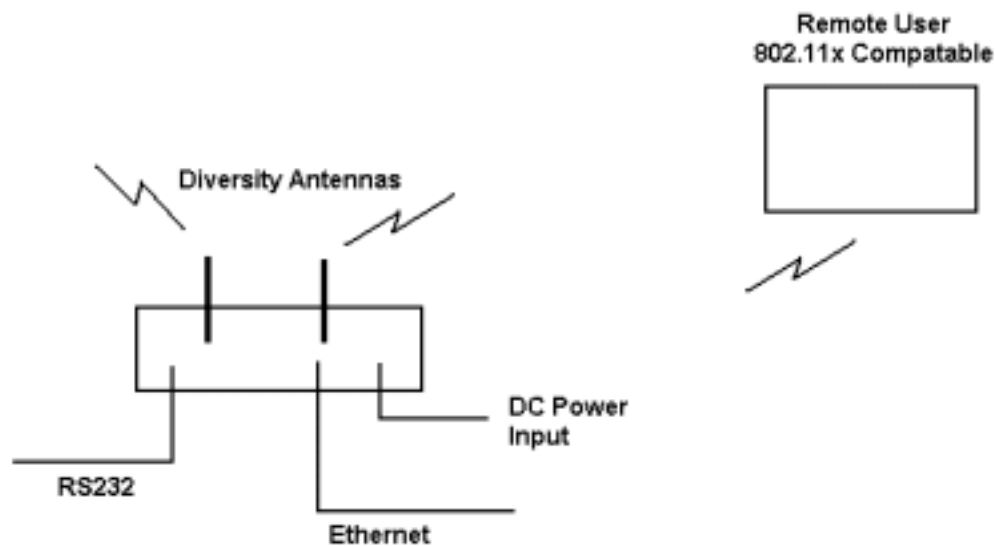
General Equipment Information

Frequency Band:	2412 to 2462 MHz (Channels 1 – 11)
Channel Spacing:	5 MHz
User Frequency Adjustment:	Software controlled
Power Supply P/N.:	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

Nemko

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

[illegible]

..\EMCShare\AUTOMATE\DATASHTS\CEP 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

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

Data Plot

Occupied Bandwidth

Page 2 of 6	
Job No.: 4L0372	Date: 8/6/2004
Specification: 15.2	Temperature(°C): 22
Tested By: Tom Tidwell	Relative Humidity(%): 45
E.U.T.: 195Eg	
Configuration: Tx Full Power	

Delta 1 [T1] RBW 100 kHz RF Att 10 dB
Ref Lvl 0.92 dB VBW 100 kHz Mixer -20 dBm
 20 dBm 12.82565130 MHz SWT 5 ms Unit dB

32.4 dB Offset

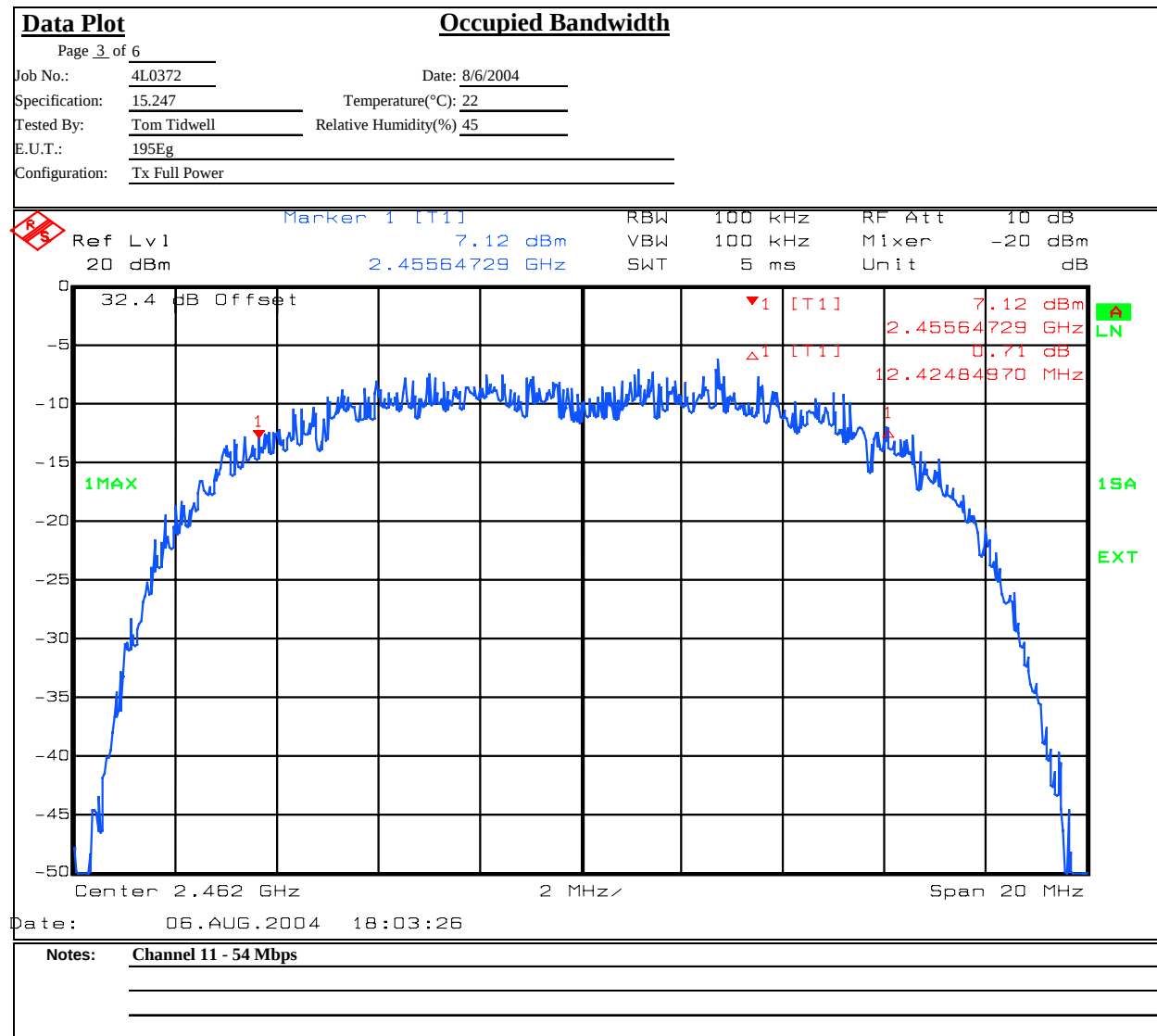
▼1 [T1] 6.54 dBm
 ▲1 [T1] 2.43068737 GHz LN
 12.82565130 MHz 1SA
 1MAX EXT

Center 2.437 GHz 2 MHz
 Span 20 MHz

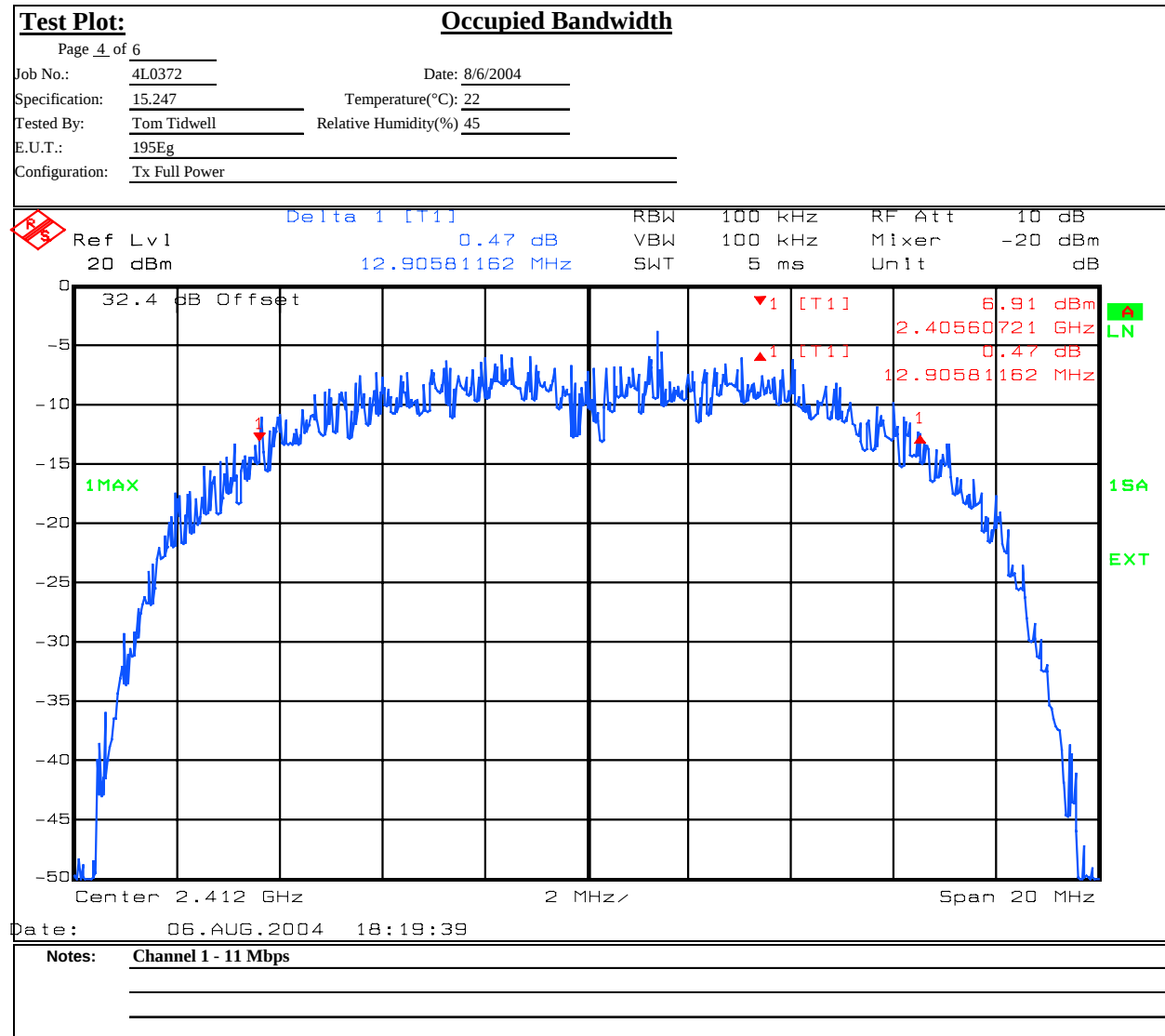
Date: 06.AUG.2004 18:28:51

Notes: Channel 6 - 54 Mbps

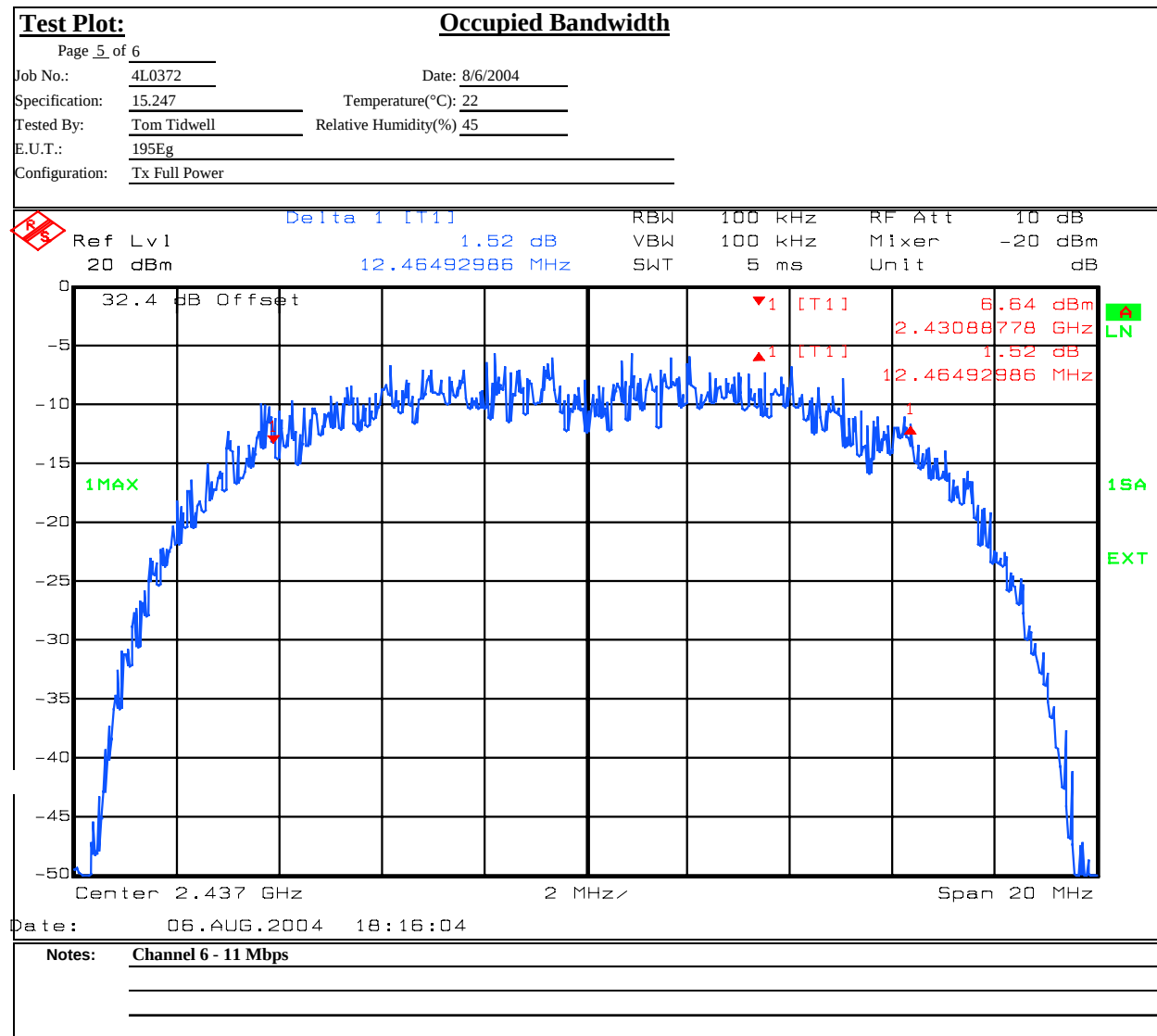
Test Data – 6dB Bandwidth



Test Data – 6dB Bandwidth



Test Data – 6dB Bandwidth



Test Plot:

Page 6 of 6

Job No.: 4L0372

Date: 8/6/2004

Specification: 15.247

Temperature(°C): 22

Tested By: Tom Tidwell

Relative Humidity(%) 45

E.U.T.: 195Eg

Configuration: Tx Full Power

Delta 1 [T1]

Ref Lvl 0.57 dB

20 dBm 13.02605210 MHz

RBW 100 kHz

VBW 100 kHz

SWT 5 ms

RF Att 10 dB

Mixer -20 dBm

Unit dB

32.4 dB Offset

▼1 [T1] 5.94 dBm

▲1 [T1] 2.45540681 GHz

13.02605210 MHz

1MAX

1SA

EXT

The plot shows a blue line representing the occupied bandwidth across a frequency span of 20 MHz. The y-axis represents power in dB, ranging from -50 to 0. The x-axis is labeled 'Center 2.462 GHz' and '2 MHz' per division. The plot shows a noisy signal with a peak around -15 dB. A green arrow points to the peak, labeled '1MAX'. A red arrow points to the peak, labeled '1SA'. A green arrow points to the peak, labeled 'EXT'.

Center 2.462 GHz

2 MHz

Span 20 MHz

Date: 06.AUG.2004 18:11:24

Notes: Channel 11 - 11 Mbps

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

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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)
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Test Results: Complies.

Measurement Data:

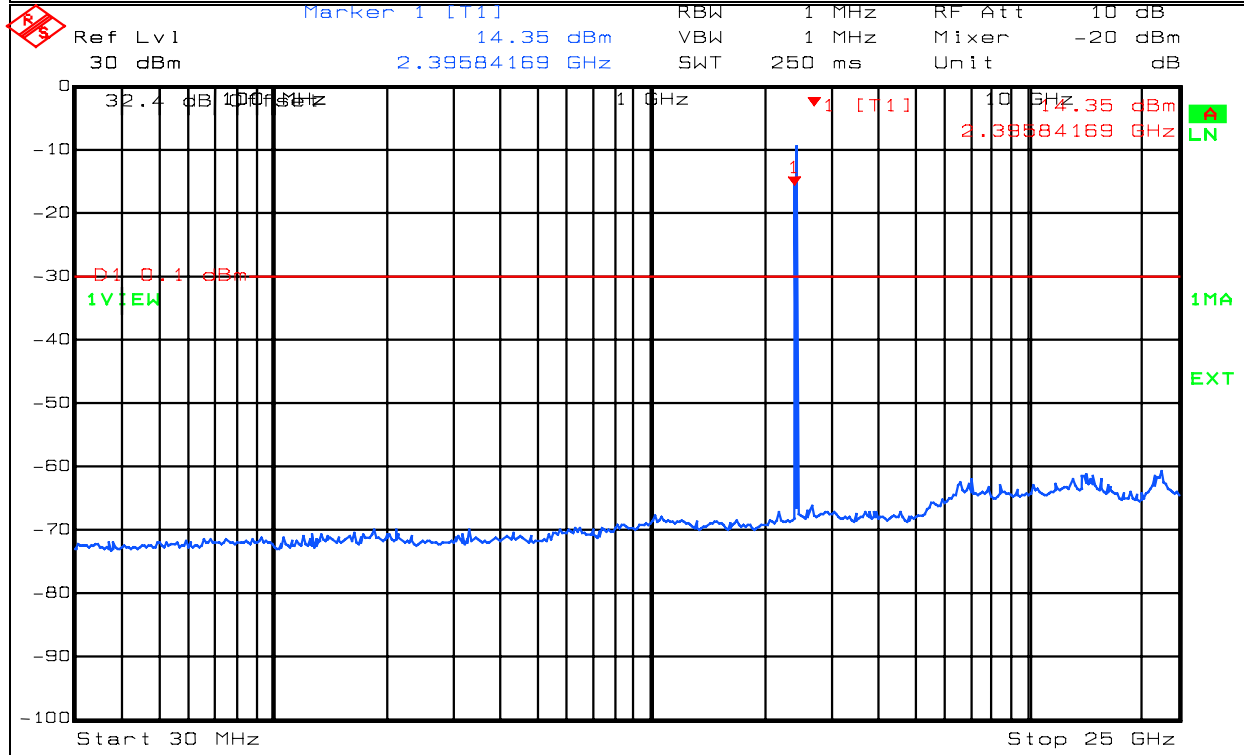
Section 7. Spurious Emissions (Antenna Conducted)

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

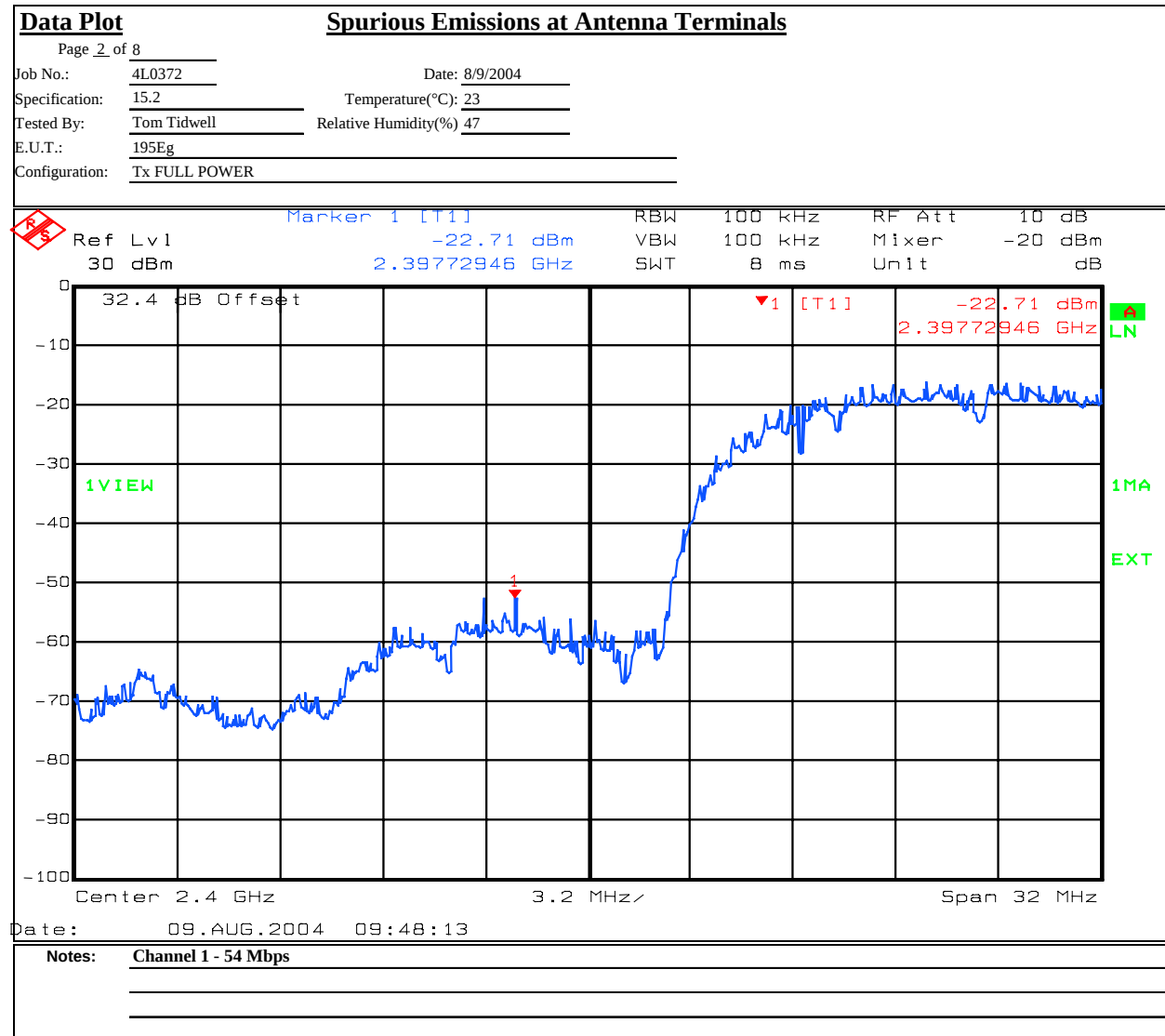
Test Results: Complies.

Measurement Data: See attached plots.

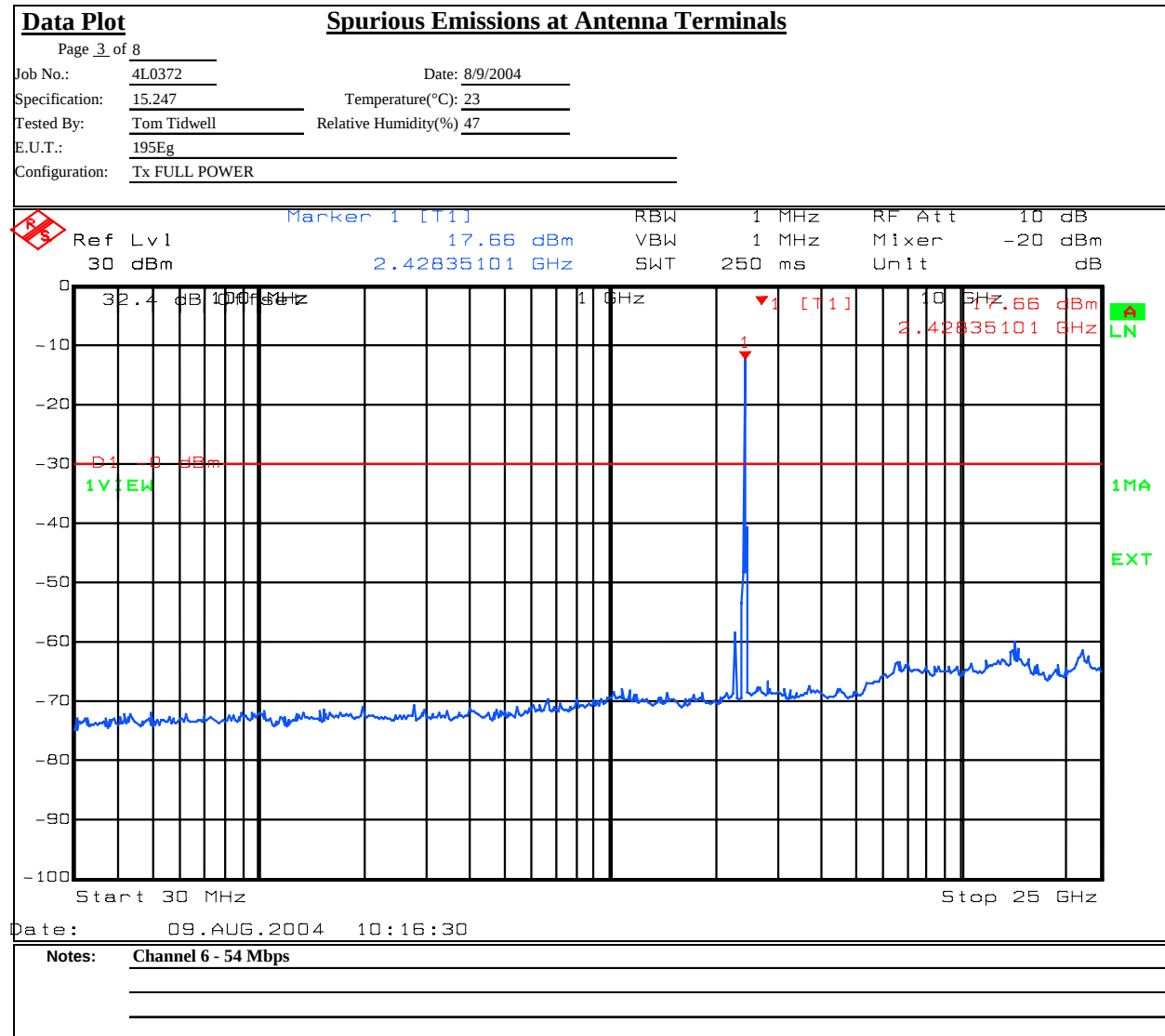
Test Data – Spurious Emissions at Antenna Terminals

Data Plot		Spurious Emissions at Antenna Terminals	
Page 1 of 8		Complete ☒ X	
Job No.: 4L0372	Date: 8/9/2004	Preliminary: ☐	
Specification: 15.247	Temperature(°C): 23		
Tested By: Tom Tidwell	Relative Humidity(%): 47		
E.U.T.: 195Eg			
Configuration: Tx FULL POWER			
Sample Number: 1			
Location: Lab 1	RBW: 100 kHz	Measurement	
Detector Type: Peak	VBW: 100 kHz	Distance: NA m	
Test Equipment Used			
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			
			
Date: 09.AUG.2004 09:24:00			
Notes: Channel 1 - 54 Mbps			

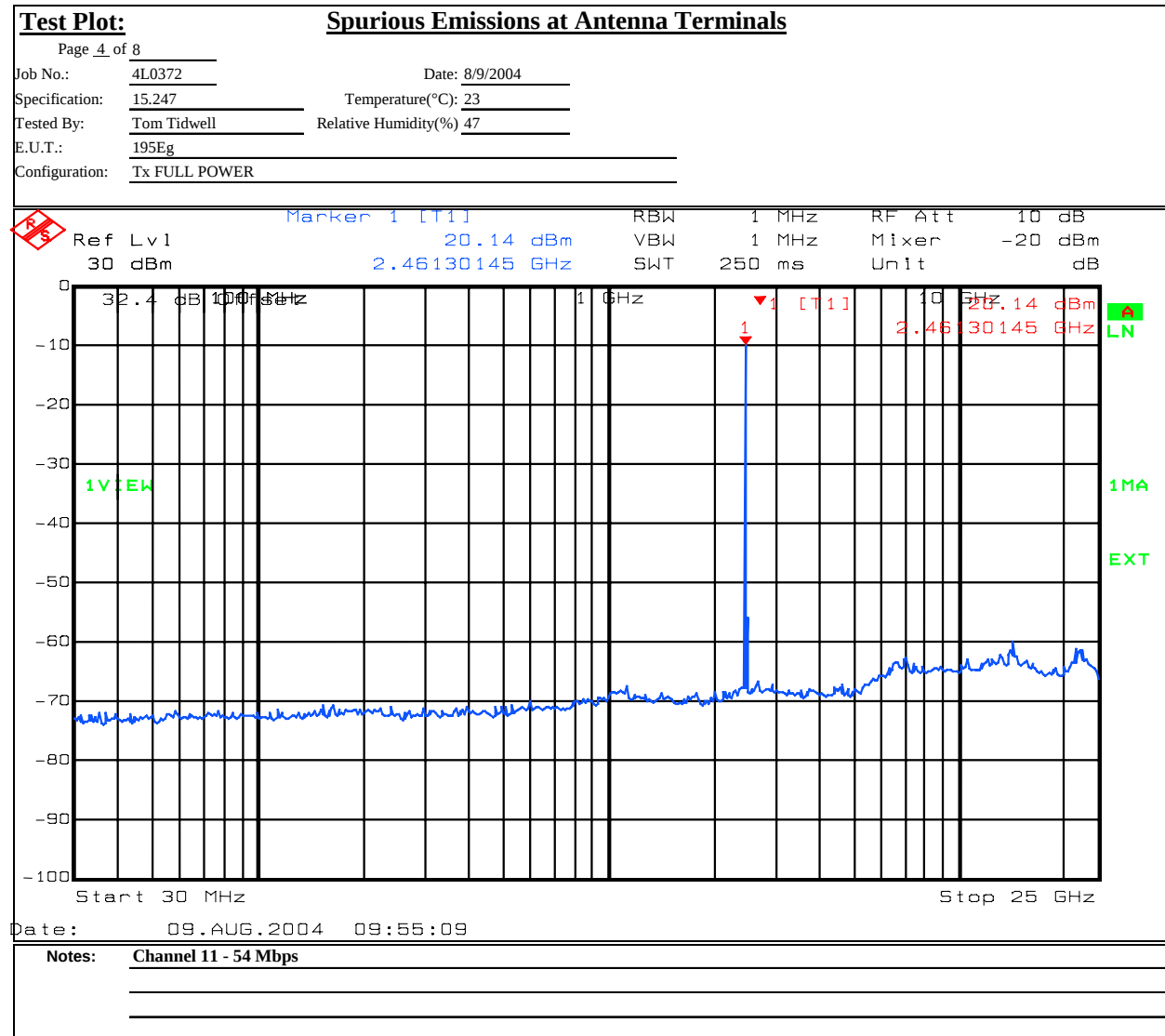
Test Data – Spurious Emissions at Antenna Terminals



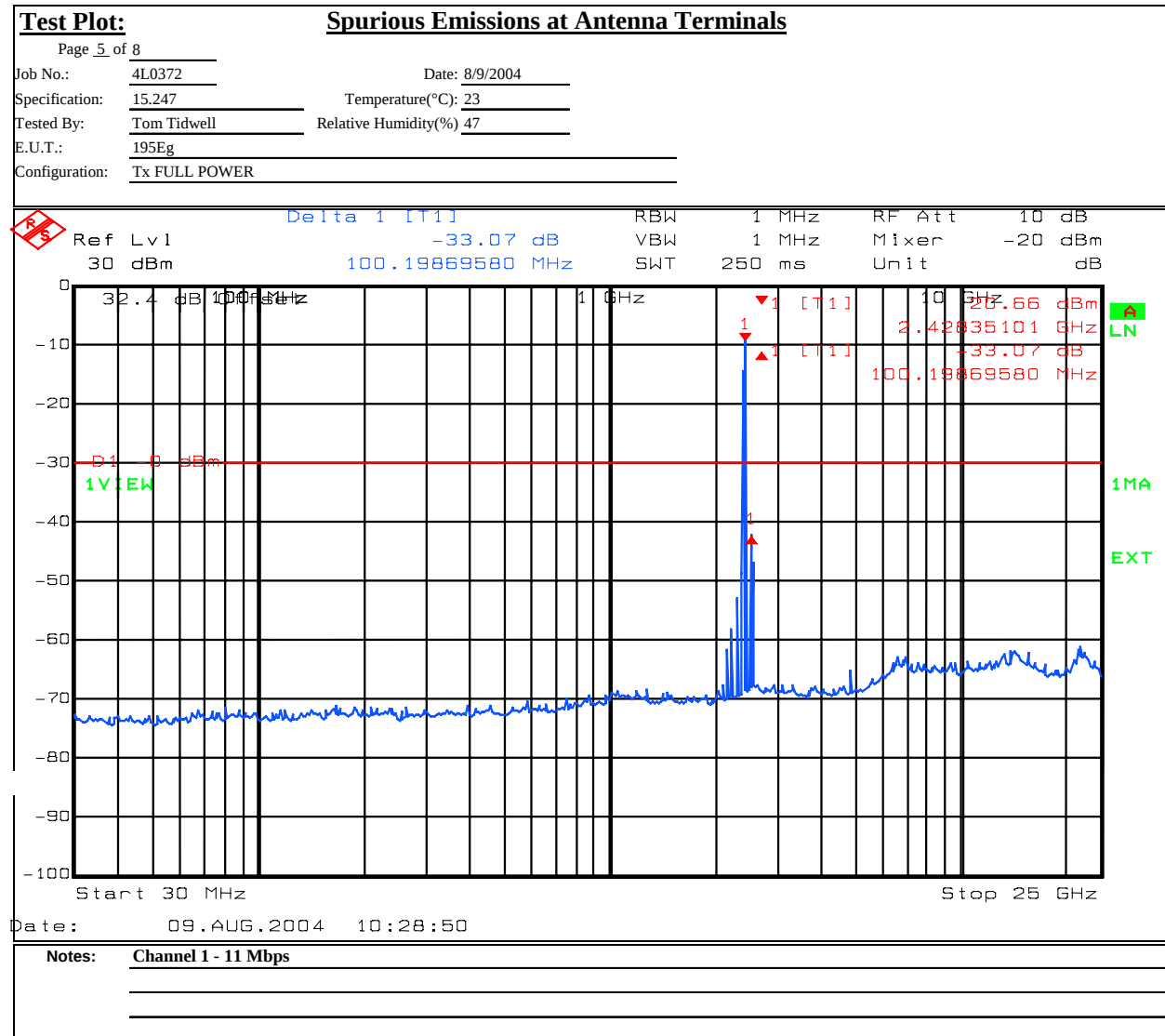
Test Data – Spurious Emissions at Antenna Terminals



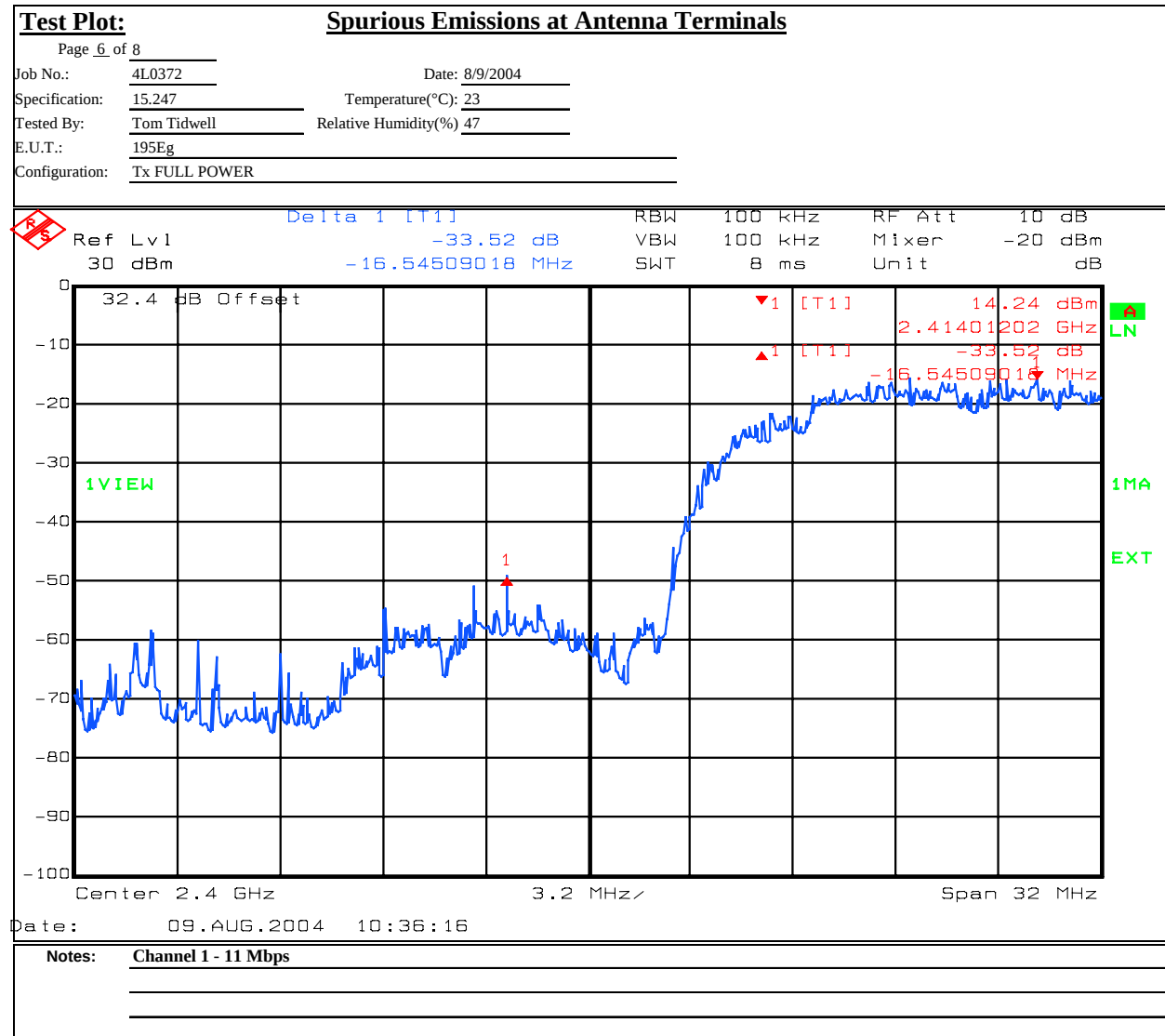
Test Data – Spurious Emissions at Antenna Terminals



Test Data – Spurious Emissions at Antenna Terminals



Test Data – Spurious Emissions at Antenna Terminals



Test Plot:

Page 7 of 8

Job No.: 4L0372

Date: 8/9/2004

Specification: 15.247

Temperature(°C): 22

Tested By: Tom Tidwell

Relative Humidity(%) 45

E.U.T.: 195Eg

Configuration: Tx FULL POWER

Marker 1 [T1]

Ref Lvl 20.51 dBm

30 dBm

2.42835101 GHz

RBW 1 MHz

VBW 1 MHz

SWT 250 ms

RF Att 10 dB

Mixer -20 dBm

Unit dB

1

1 [T1]

20.51 dBm

2.42835101 GHz

32.4 dB

100 MHz

1 GHz

10 GHz

25 GHz

Start 30 MHz

Stop 25 GHz

1VIEW

1MA

EXT

0

-10

-20

-30

-40

-50

-60

-70

-80

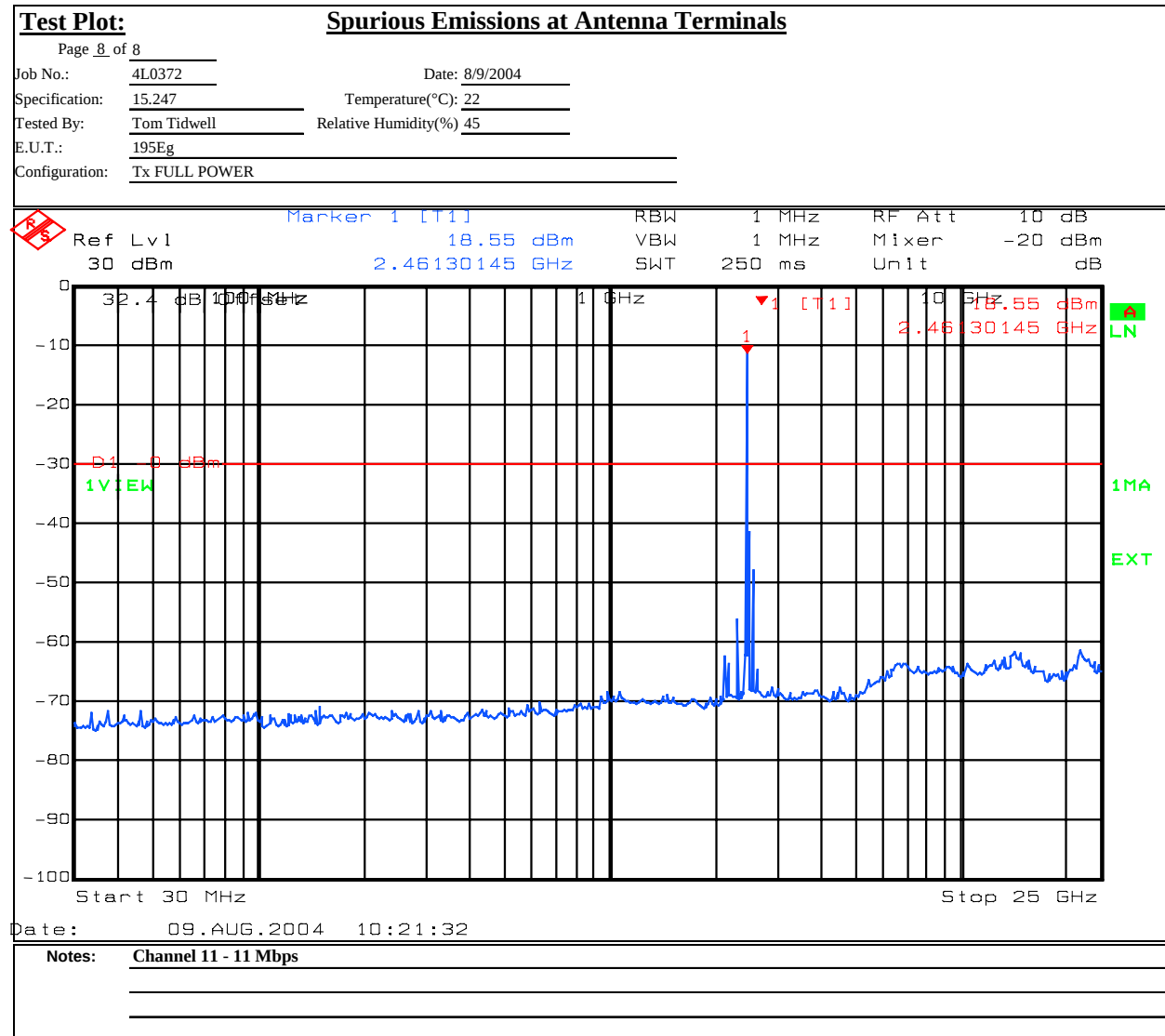
-90

-100

Date: 09.AUG.2004 10:13:10

Notes: Channel 6 - 11 Mbps

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)

Radiated Emissions								
Page <u>1</u> of <u>1</u>								
Job No.: 4L0372		Date: 8/10/2004						
Specification: 15.247/15.209		Temperature(°C): <u>23</u>						
Tested By: Tom Tidwell		Relative Humidity(%) <u>41</u>						
E.U.T.: 195Eg								
Configuration: Channel 11 - 11 Mbps (The spectrum was searched with the radio set to channels 1 and 6 also)								
Sample Number <u>1</u>								
Location: AC 3		RBW: 1 MHz		1 MHz for Avg.				
Detector Type: Peak		VBW: 1 MHz		10 Hz for Avg.				
Test Equipment Used								
Antenna: 1304		Directional Coupler: #N/A						
Pre-Amp: 1016		Cable #1: 1484						
Filter: 1482		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
Duck antenna								
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
10 dB Yagi(MYP24010PTRPNM)								
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
Unit Mount (Larsen)								
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
6 dB Omni								
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
19dBi Parabolic								
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.								

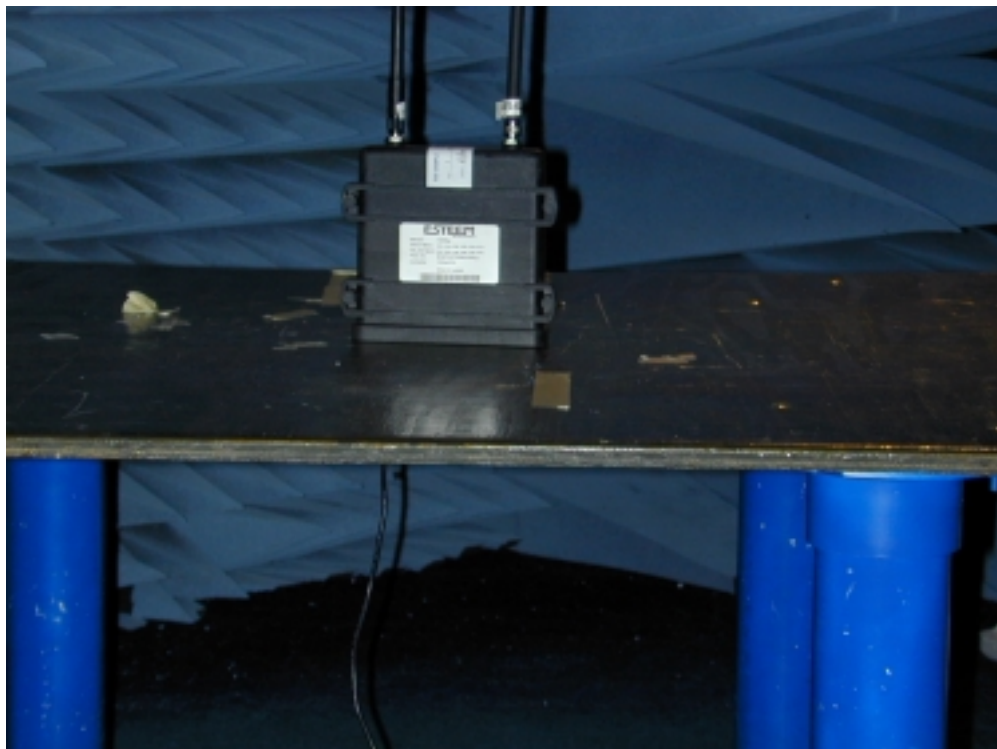
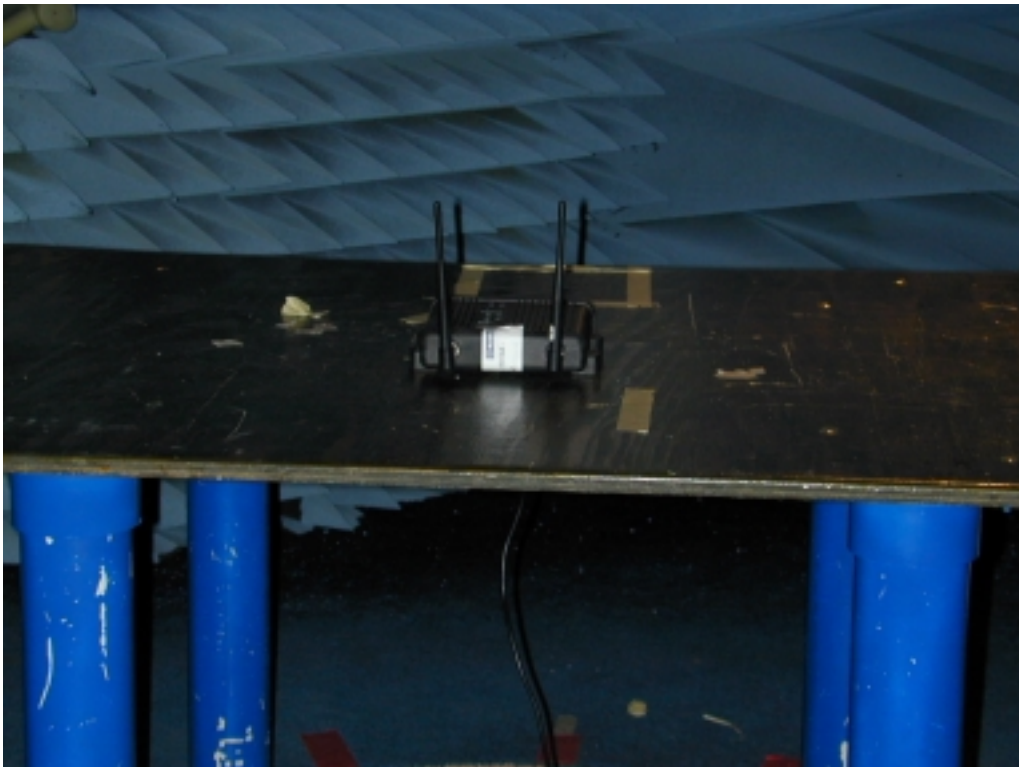
EQUIPMENT: 195Eg

Report No.: 4L0372RUS2

Test Data - Spurious Emissions (Radiated)

Radiated Emissions								
Page <u>1</u> of <u>1</u>								
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		1 MHz for Avg.				
Detector Type: Peak		VBW: 1 MHz		10 Hz for Avg.				
Test Equipment Used								
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
Duck antenna								
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
Unit Mount (Larsen)								
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
10 dB Yagi								
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
6 dB Omni								
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
19 dBi Parabolic								
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.

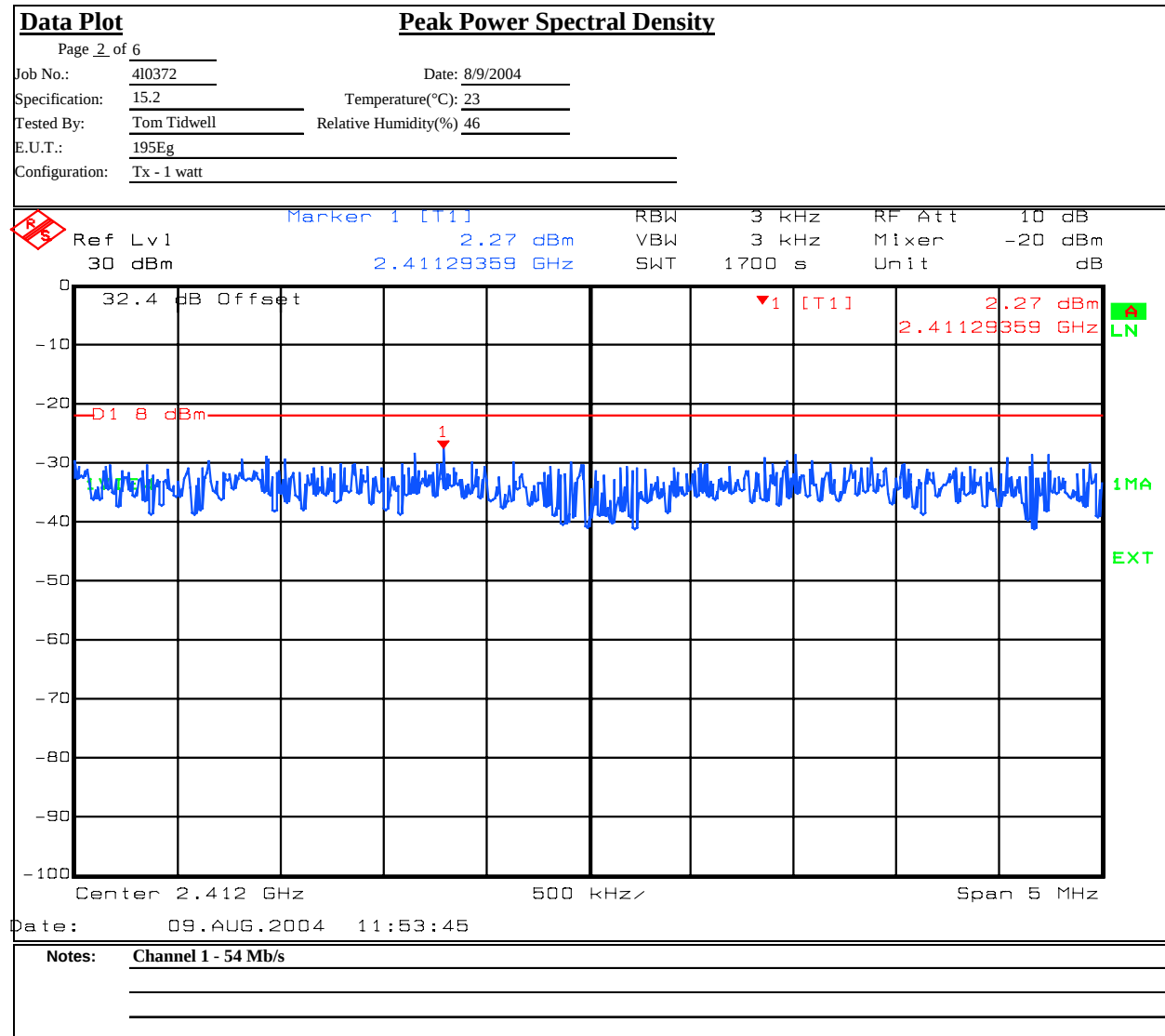
Test Data – Spectral Density

Data Plot		Peak Power Spectral Density	
Page 1 of 6			
Job No.: 410372	Date: 8/9/2004	Complete	
Specification: 15.247	Temperature(°C): 23	Preliminary:	
Tested By: Tom Tidwell	Relative Humidity(%): 46		
E.U.T.: 195Eg			
Configuration: Tx - 1 watt			
Sample Number: 1			
Location: Lab 1	RBW: 3 kHz	Measurement	
Detector Type: Peak	VBW: 3 kHz	Distance: na	m
Test Equipment Used			
Antenna:	Directional Coupler:		
Pre-Amp:	Cable #1: 1484		
Filter:	Cable #2:		
Receiver: 1036	Cable #3:		
Attenuator #1: 1469	Cable #4:		
Attenuator #2: 1477	Mixer:		
Additional equipment used: 1036			
Measurement Uncertainty: +/-1.7 dB			
Ref Lvl 30 dBm Marker 1 [T1] -6.57 dBm 2.43450000 GHz RBW 3 kHz VBW 3 kHz SWT 1700 s RF Att 10 dB Mixer -20 dBm Unit dB 32.4 dB Offset D1 8 dBm 1 [T1] -6.57 dBm 2.43450000 GHz 1MA EXT Center 2.437 GHz 500 kHz Span 5 MHz			

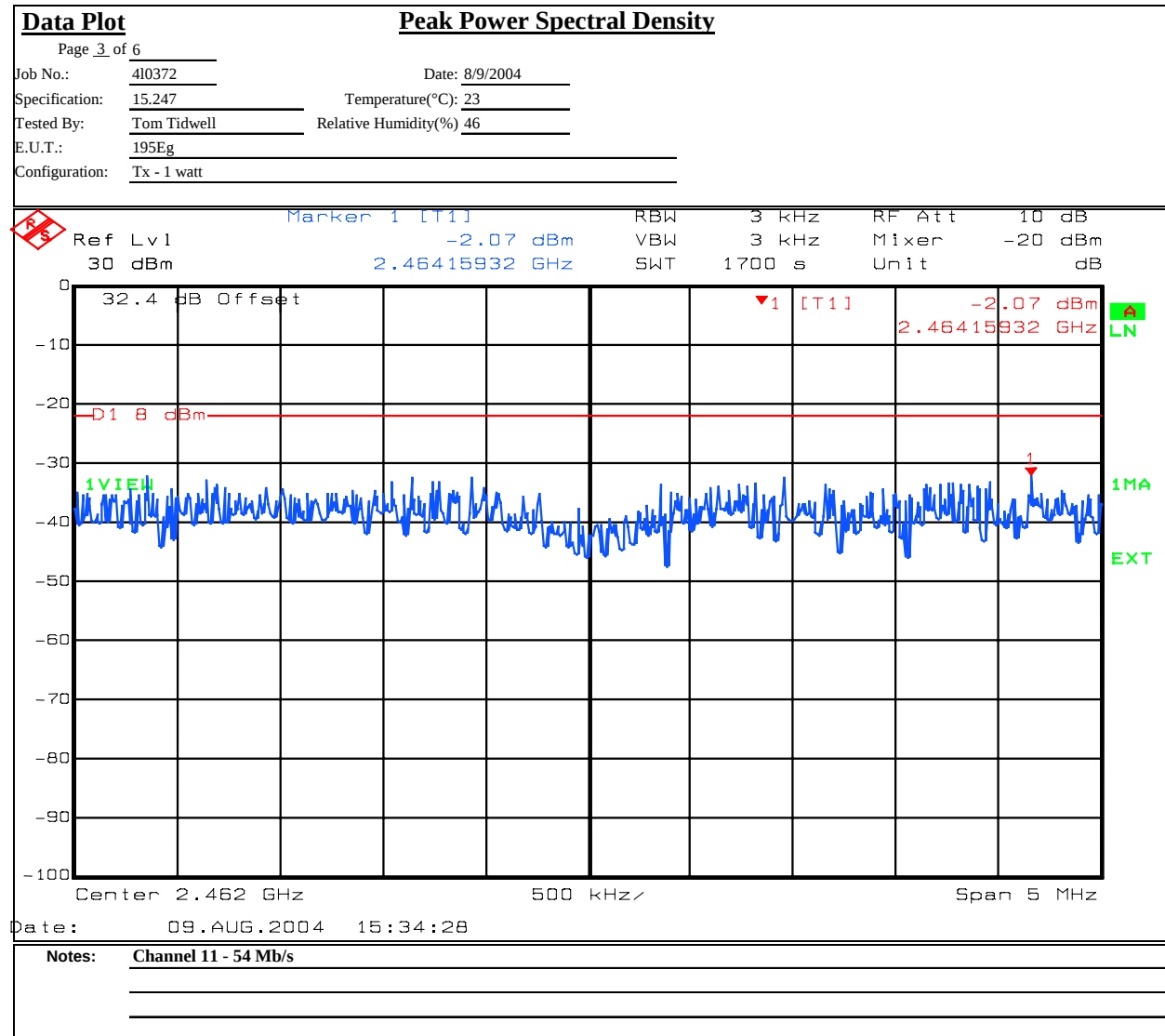
Date: 09.AUG.2004 12:58:47

Notes: Channel 6 - 54 Mbs

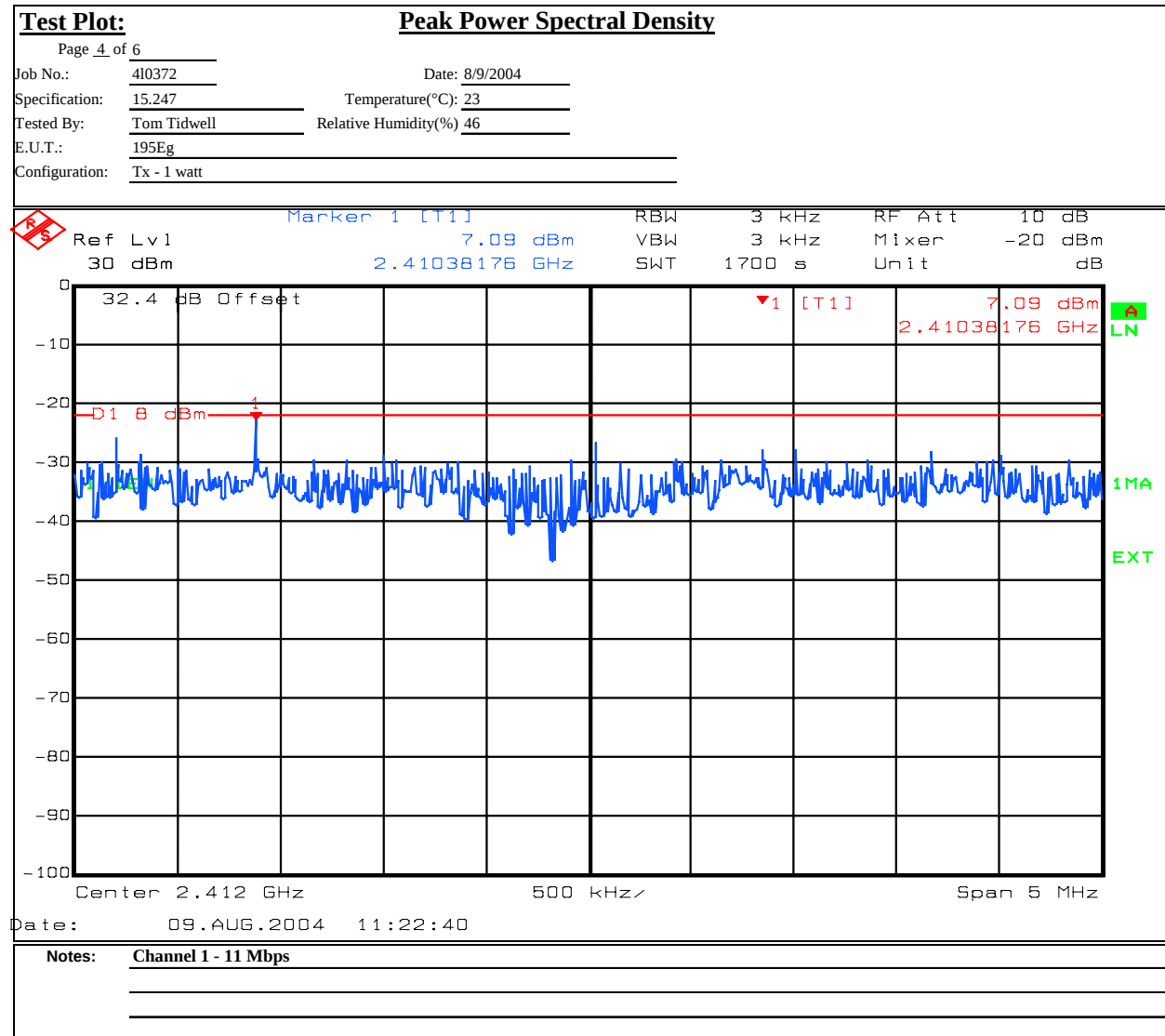
Test Data – Spectral Density



Test Data – Spectral Density



Test Data – Spectral Density



Test Plot:

Page 5 of 6

Job No.: 410372 Date: 8/9/2004

Specification: 15.247 Temperature(°C): 23

Tested By: Tom Tidwell Relative Humidity(%) 46

E.U.T.: 195Eg

Configuration: Tx - 1 watt

Peak Power Spectral Density

Ref Lvl 30 dBm Marker 1 [T1] RBW 3 kHz RF Att 10 dB
5.09 dBm VBW 3 kHz Mixer -20 dBm
2.43915932 GHz SWT 1700 s Unit dB

32.4 dB Offset

D1 8 dBm

▼1 [T1] 5.09 dBm
2.43915932 GHz LN

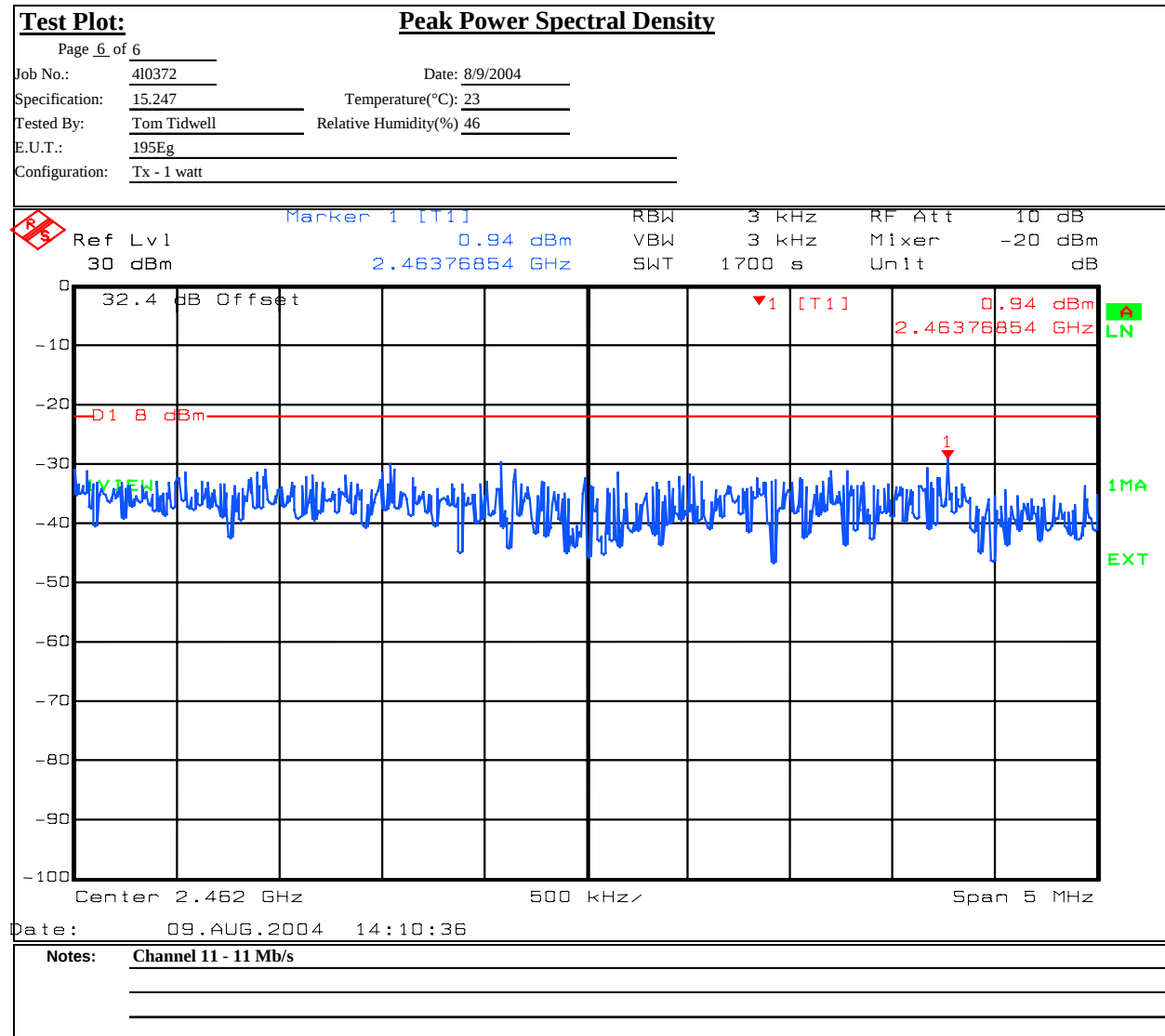
IMA EXT

Center 2.437 GHz 500 kHz Span 5 MHz

Date: 09.AUG.2004 13:37:22

Notes: Channel 6 - 11 Mb/s

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)

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 (dBμV)	
	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)
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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)
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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 ($\mu\text{V/m}$ @ 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 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:

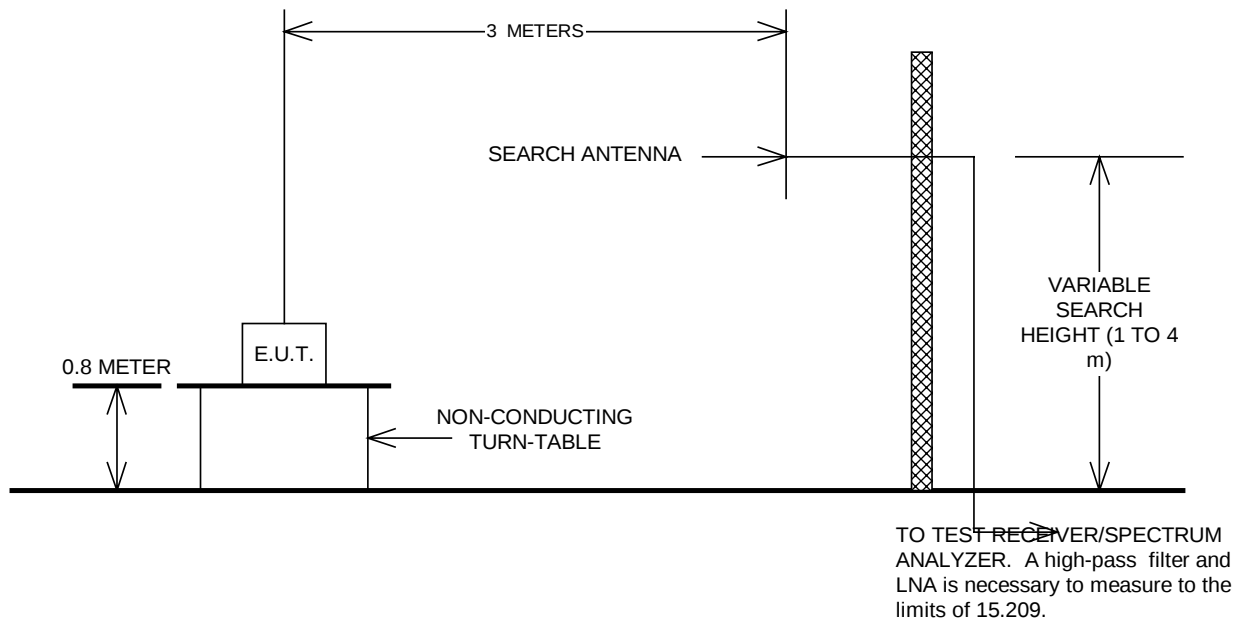
For devices with non-detachable antennas, the received field strength is peaked and the spectrum analyzer is set as above. The peak emission level is then measured and converted to a field strength by adding the appropriate antenna factor and cable loss. This field strength is then converted to an equivalent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

Number of channels tested:

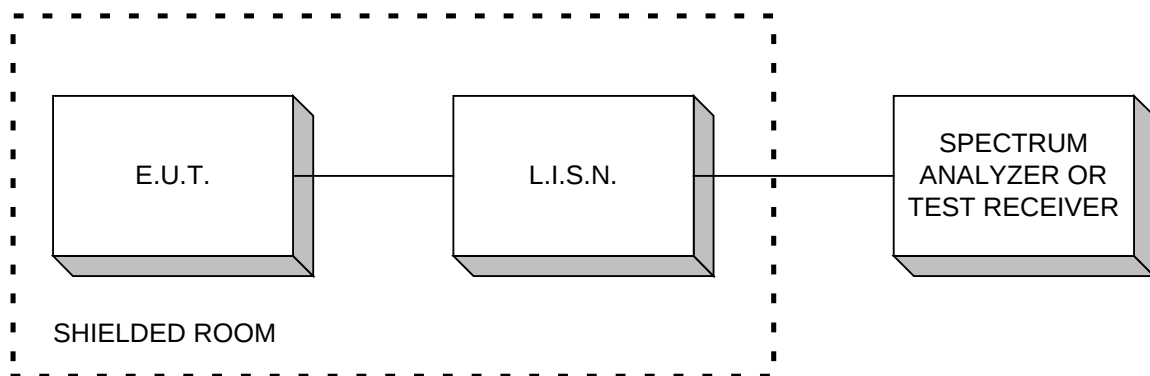
Tuning Range	Number Of Channels Tested	Channel Location In Band
1 MHz or Less	1	Middle
1 to 10 MHz	2	Top And Bottom
More Than 10 MHz	3	Top, Middle, Bottom

Annex B – Test Diagrams

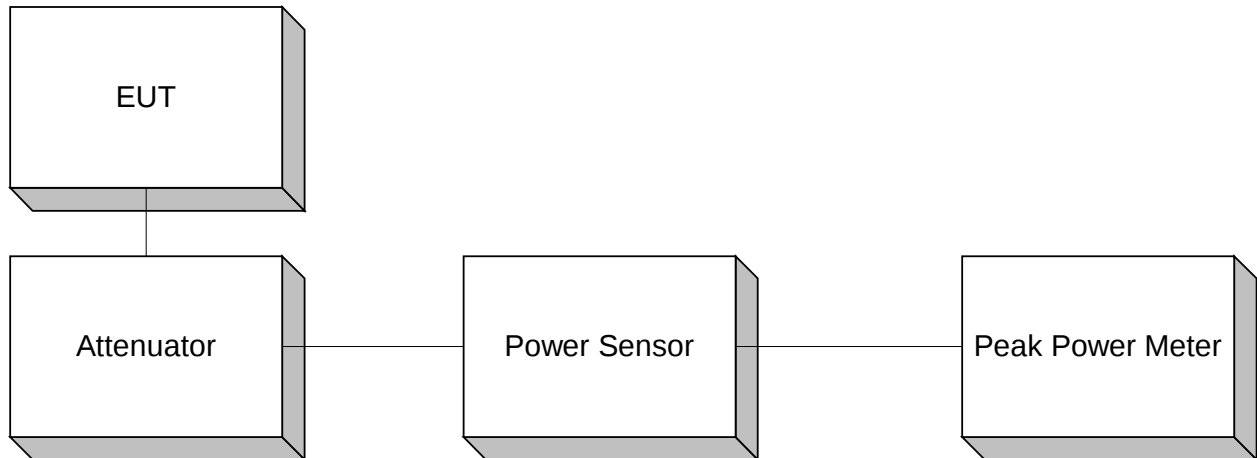
Test Site For Radiated Emissions



Conducted Emissions



Peak Power At Antenna Terminals



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

