



Nemko Test Report: 5L0270RUS1Rev1

Applicant: Siemens Subscriber Networks, Inc.
4849 Alpha Rd.
Dallas, Texas 75244

**Equipment Under Test:
(E.U.T.)** SpeedStream 5883
060-5883-0XX

In Accordance With: **FCC Part 15, Subpart C, 15.247**
Digital Transmission System Transmitter

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

Authorized By: 
John Fish, EMC Engineer

Date: 20 July, 2005

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Section 1. Summary of Test Results

Manufacturer: Siemens Subscriber Networks, LLC

Model No.: SpeedStream 5883

Part. No.: 060-5883-0XX

Serial No.: 303

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 Digital Transmission Systems. Radiated tests were conducted in accordance with ANSI C63.4-2002. Radiated emissions are made on an open area test site. A description of the test facility is on file with the FCC.

- | | | | |
|-------------------------------------|----------------------------|-------------------------------------|---------------------|
| <input checked="" type="checkbox"/> | New Submission | <input type="checkbox"/> | Production Unit |
| <input type="checkbox"/> | Class II Permissive Change | <input checked="" type="checkbox"/> | 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.

See " Summary of Test Data".



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:

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

General Equipment Information

Frequency Band: 2412 to 2462 MHz

Antenna: 5 dBi gain

Channel Spacing: 5 MHz

User Frequency Adjustment: Software controlled

Configuration of Equipment

EQUIPMENT CONFIGURATION LIST (HARDWARE/PERIPHERALS): on 060-5883-xxx

Place an "*" next to EUT and any item that is part of the EUT.

Item	*	Generic Description	Manufacturer	Model No.	Serial #	Rev.	FCC ID Status ¹
(A)	*	5883 Modem	Siemens/Efficient	060-5883-1xx/ -0xx	SN#303 or 304, or 305	n/a	n/a
(B)	*	AC WallWart Adapter(Euro)	GCI	AM-1201000V	n/a	n/a	n/a
(C)	*	AC WallWart Adapter(Dom.)	Ten-Pao	S024AU1200150	n/a	n/a	n/a
(D)		Monitor	Gateway	E5005	HDA7JB001012	n/a	IAWE5005
(E)		Computer	Dell	MMS	ENUTB	n/a	n/a
(F)		Keyboard	Dell	SK-8000	CN-035KKW-38844-09D-B	A00	n/a
(G)		Mouse	Logitech-Dell	M-S34	LZA54814607	n/a	DZL210472
(H)		Laptop Computer	Dell	PPL	12800-966-3390	n/a	n/a
(I)		AC Adapter for Laptop Comp.	Dell	AA20031	CN09364U-1629113J0DQN	A00	n/a

¹ FCC ID STATUS

- 1. FCC DOC
- 2. FCC A/B Verification
- 3. None - (If performing FCC testing, contact lab manager)
- 4. Certification (include FCC ID in parenthesis)

INTER-CONNECTION CABLES:

Place an "*" next to EUT and any item that is part of the EUT.

Item	*	Cable Type	Manufacturer	Ln (m)	Term ²	Shield	Qty.
(1)		CAT5E	General Cable	100m	3	no	5
(2)							
(3)							
(4)							
(5)							
(6)							
(7)							
(8)							
(9)							

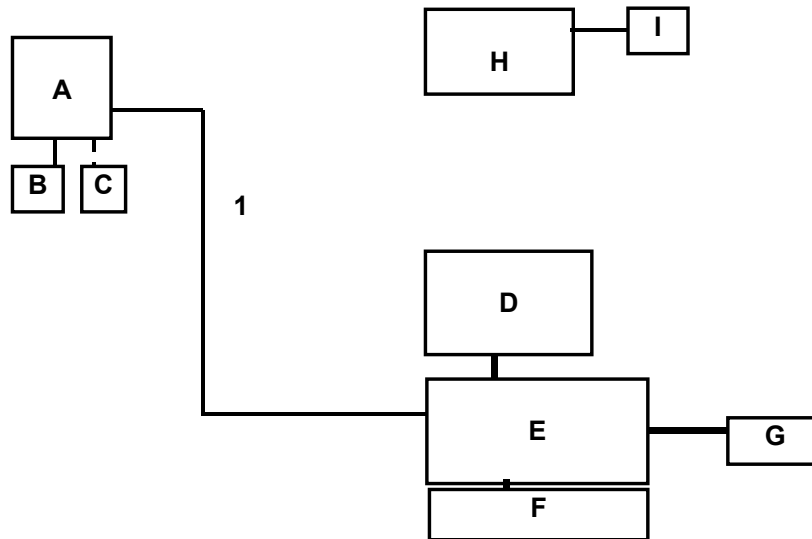
² TERMINATION

- 1. Peripheral
- 2. Loopback
- 3. EUT
- 4. Resistive
- 5. Remote Equipment
- 6. Other

Description of EUT

Wireless 802.11b/g Ethernet modem.

System Diagram



Section 3. Powerline Conducted Emissions

NAME OF TEST: Powerline Conducted Emissions	PARA. NO.: 15.207(a)
TESTED BY: Arturo Ruvalcaba	DATE: 6/8/2005

Test Results: Complies.

Measurement Data: See attached plots.

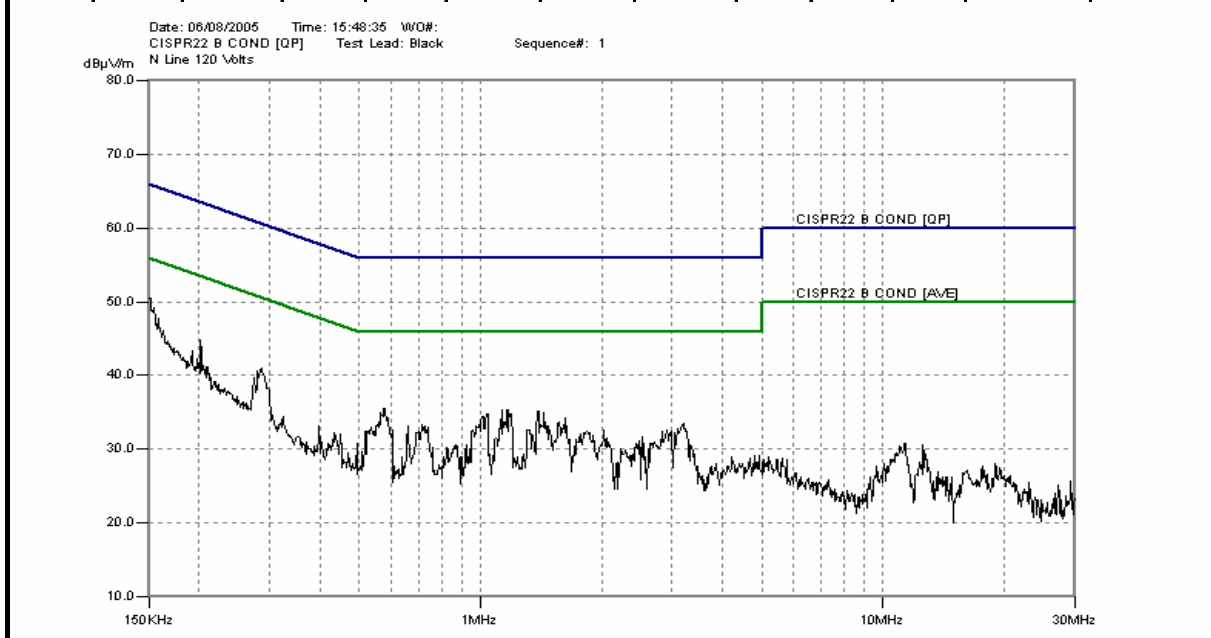
Measurement Uncertainty: +/- 2.27 dB

The worst-case emission is 50.5dB μ V at 0.153 MHz on the Neutral side of the line. This is 5.3 dB below the average specification limit of 55.8dB μ V.

Test Data – Powerline Conducted Emissions

Conducted Emissions			
Powerline Voltage Measurement			
Complete	<u> X </u>	Job # : <u>5L0270E</u>	Test # : <u>CEPV-01</u>
Preliminary	<u> </u>	Page <u> 1 </u>	of <u> 2 </u>
Client Name : <u>Siemens Subscriber Networks, LLC.</u>			
EUT Name : <u>Siemens Subscriber Networks LLC SpeedStream Wireless Business Modem</u>			
EUT Model # : <u>SpeedStream 5883, 5881</u>			
EUT Part # : <u>060-5883-xxx</u>			
EUT Serial # : <u>SN#303</u>			
EUT Config. : <u>Tx</u>			
Specification : <u>CFR 47 Part 15 Subpart B</u>		Reference : <u>CISPR 22</u>	
Transducer # :	<u>545</u>	Temp. (deg. C) :	<u>23</u>
HP Filter # :	<u>1555</u>	Humidity (%) :	<u>32</u>
Cable 1 # :	<u>1553</u>	EUT Voltage :	<u>120 Vac</u>
Cable 2 # :	<u>1998</u>	EUT Frequency :	<u>60Hz</u>
Detector 1 # :	<u>966</u>	Peak Bandwidth:	<u>10kHz</u>
Detector 2 # :	<u>1284</u>	QP Bandwidth	<u>9kHz</u>
Limiter # :	<u>NA</u>	Avg. Bandwidth	<u>9kHz</u>
		Date :	<u>06/08/05</u>
		Time :	<u>16:10</u>
		Staff :	<u>Art Ruvalcaba</u>
		Location :	<u>SE</u>
		Photo ID :	<u>5L0270E CEPV-01</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.			
0.153	N	P	A	50.0	1	0	50.5	65.84	55.836	-5.3	Pass	



Test Data – Powerline Conducted Emissions

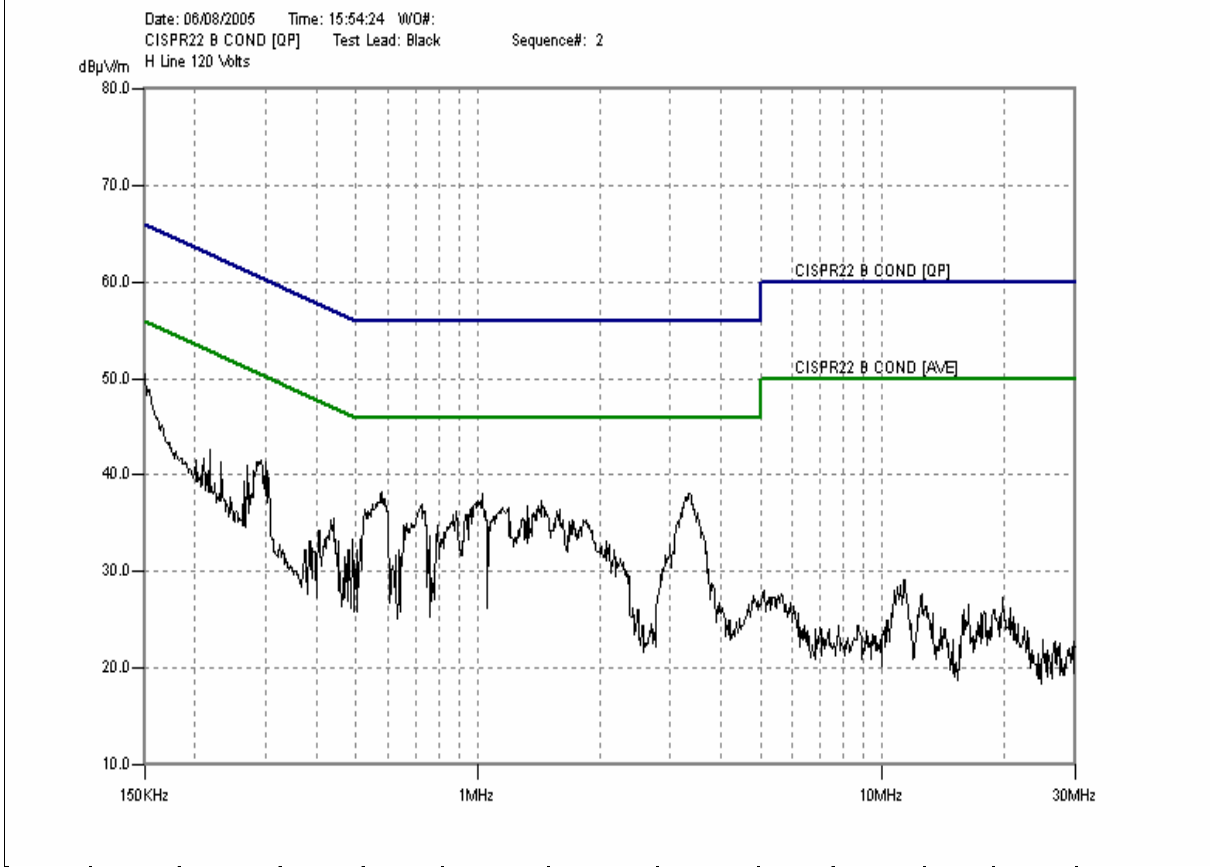
Conducted Emissions
Powerline Voltage Measurement

Complete X Job # : 5L0270E Test # : CEPV-01
Preliminary Page 2 of 2

Client Name : Siemens Subscriber Networks, LLC.
EUT Name : Siemens Subscriber Networks LLC SpeedStream Wireless Business Modem
EUT Model # : SpeedStream 5883, 5881
EUT Part # : 060-5883-xxx
EUT Serial # : SN#303
EUT Config. : Tx

Specification : CFR 47 Part 15 Subpart B Reference : CISPR 22

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.			



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

Photos – Powerline Conducted Emissions

Front



Side



Section 4. Occupied Bandwidth

NAME OF TEST: Occupied Bandwidth	PARA. NO.: 15.247(a)(2)
TESTED BY: David Light	DATE: 6/20/05

Test Results: Complies.

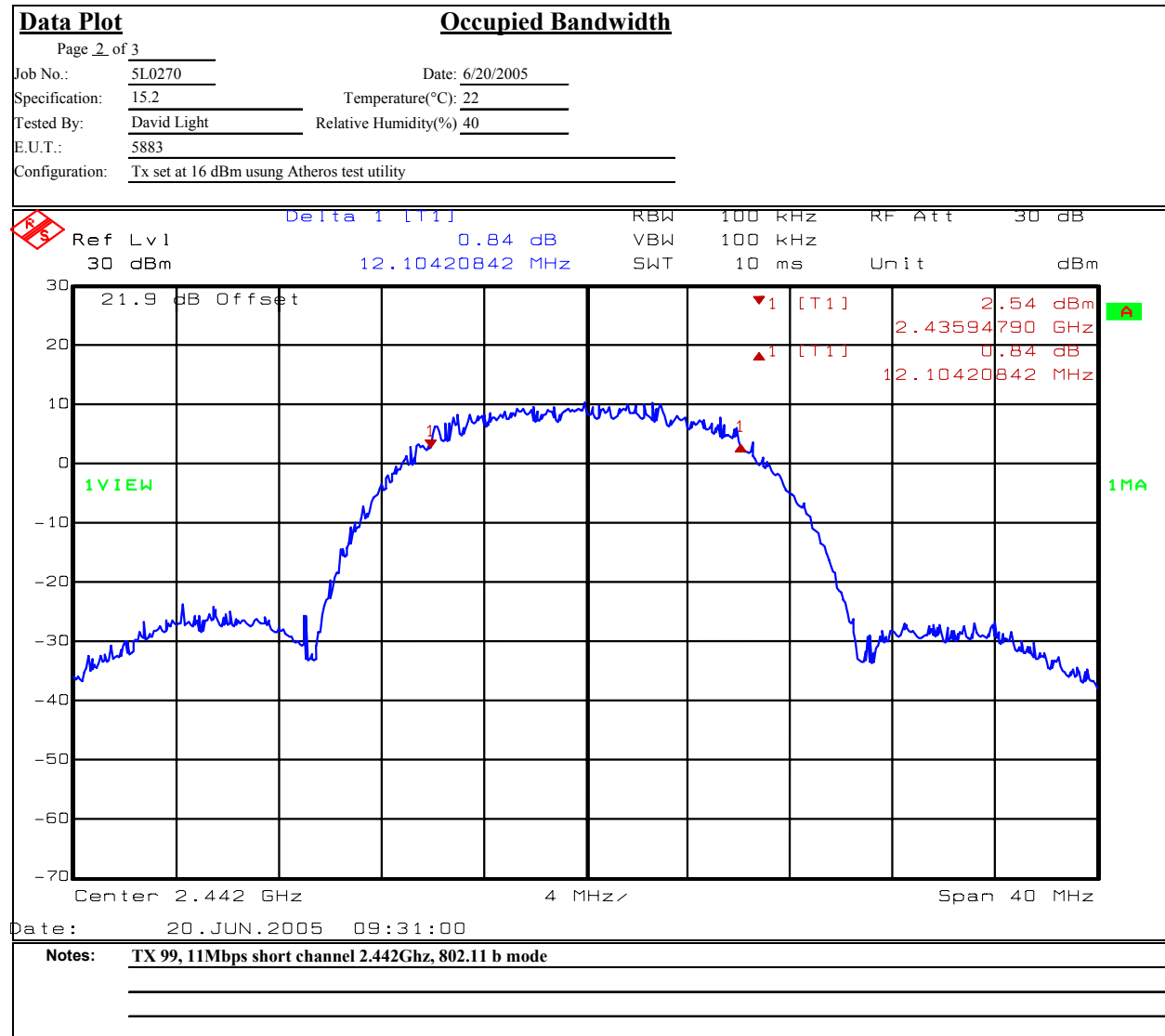
Measurement Data: See 6 dB BW plot

Measured 6 dB bandwidth:
Channel Separation: 5 MHz

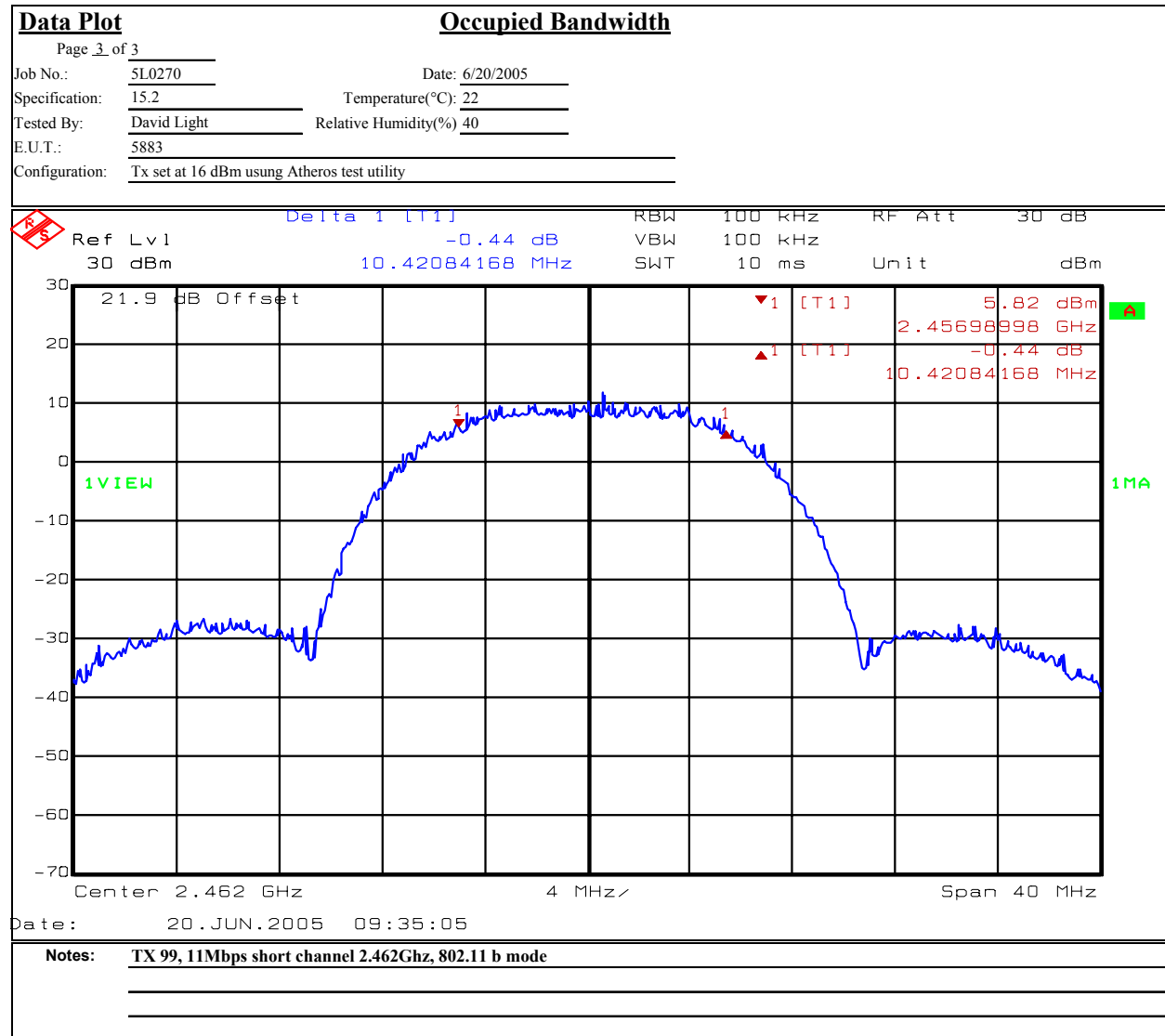
Test Data – Occupied Bandwidth

<u>Data Plot</u>		<u>Occupied Bandwidth</u>		Complete <u> X </u>																					
Page 1 of 3				Preliminary: _____																					
Job No.:	5L0270	Date:	6/20/2005																						
Specification:	15.247	Temperature(°C):	22																						
Tested By:	David Light	Relative Humidity(%):	40																						
E.U.T.:	5883																								
Configuration:	Tx set at 16 dBm using Atheros test utility																								
Serial Number:	3																								
Location:	Lab 2	RBW:	100 kHz																						
Detector Type:	Peak	VBW:	100 kHz																						
Test Equipment Used																									
Antenna:	_____	Directional Coupler:	_____																						
Pre-Amp:	_____	Cable #1:	_____																						
Filter:	_____	Cable #2:	_____																						
Receiver:	1036	Cable #3:	_____																						
Attenuator #1:	1472	Cable #4:	_____																						
Attenuator #2:	_____	Mixer:	_____																						
Additional equipment used:	_____																								
Measurement Uncertainty:	+/-1x10 ⁻⁷ ppm																								
<table border="1" style="width:100%; border-collapse: collapse; margin-top: 10px;"> <tr> <td style="width: 15%;"></td> <td style="width: 35%;">Ref Lvl1</td> <td style="width: 15%;">Delta 1 [T1]</td> <td style="width: 10%;">RBW</td> <td style="width: 10%;">100 kHz</td> <td style="width: 10%;">RF Att</td> <td style="width: 10%;">30 dB</td> </tr> <tr> <td></td> <td>30 dBm</td> <td>0.58 dB</td> <td>VBW</td> <td>100 kHz</td> <td></td> <td></td> </tr> <tr> <td></td> <td></td> <td>11.14228457 MHz</td> <td>SWT</td> <td>10 ms</td> <td>Unit</td> <td>dBm</td> </tr> </table>						Ref Lvl1	Delta 1 [T1]	RBW	100 kHz	RF Att	30 dB		30 dBm	0.58 dB	VBW	100 kHz					11.14228457 MHz	SWT	10 ms	Unit	dBm
	Ref Lvl1	Delta 1 [T1]	RBW	100 kHz	RF Att	30 dB																			
	30 dBm	0.58 dB	VBW	100 kHz																					
		11.14228457 MHz	SWT	10 ms	Unit	dBm																			
Date: 20.JUN.2005 09:29:08																									
Notes: TX 99, 11Mbps short channel 2.412Ghz, 802.11 b mode																									




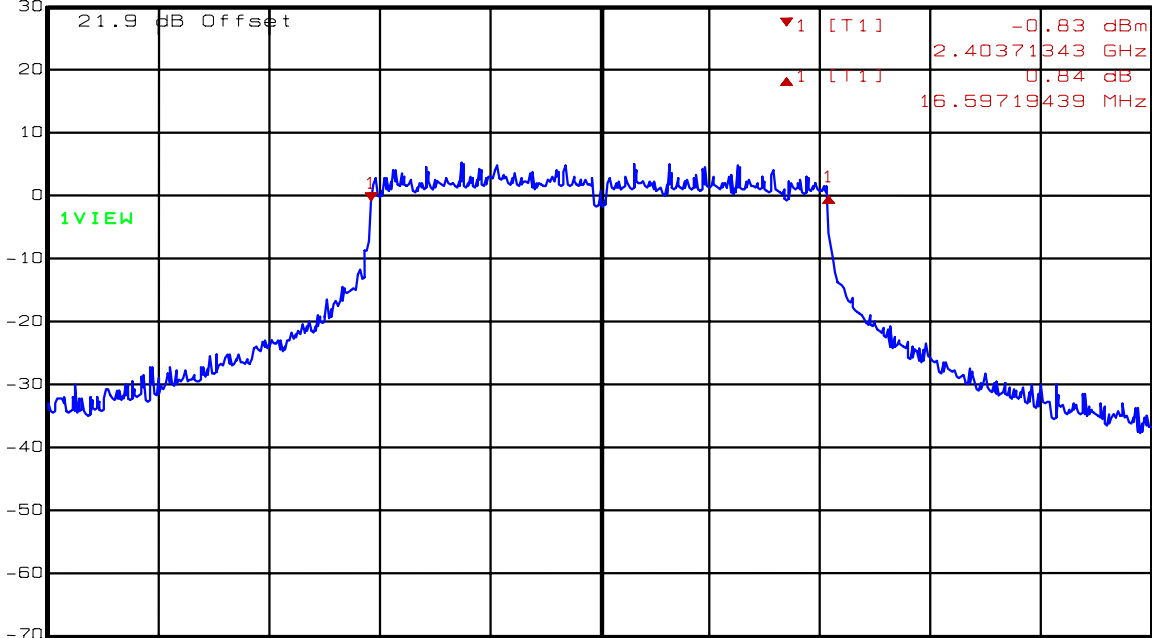
Test Data – Occupied Bandwidth



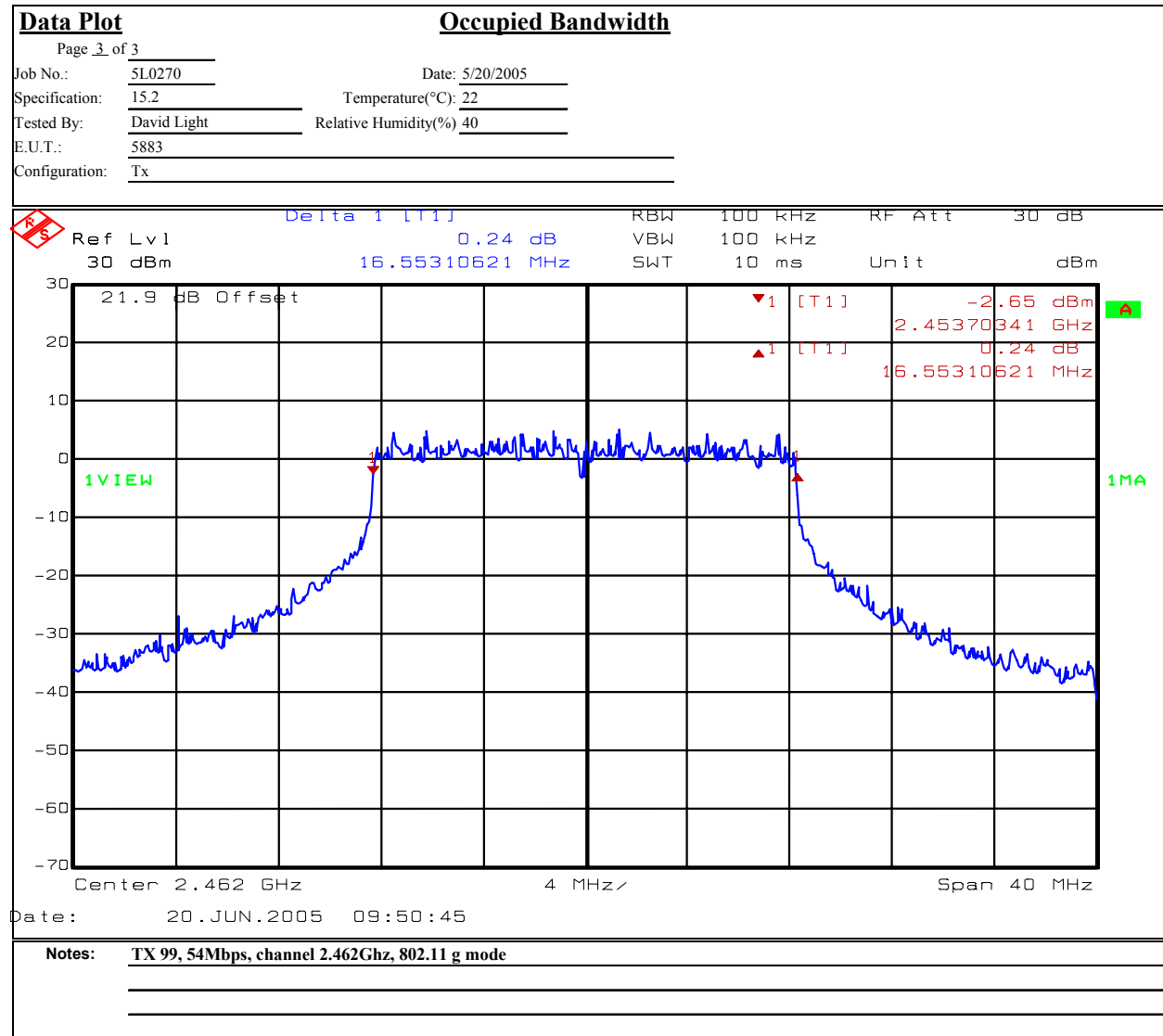
Test Data – Occupied Bandwidth



Test Data – Occupied Bandwidth

<u>Data Plot</u>		<u>Occupied Bandwidth</u>		Complete <u> X </u>												
Page <u>1</u> of <u>3</u>		Date: <u>5/20/2005</u>		Preliminary: _____												
Job No.:	<u>5L0270</u>	Temperature(°C):	<u>22</u>													
Specification:	<u>15.247</u>	Relative Humidity(%):	<u>40</u>													
Tested By:	<u>David Light</u>															
E.U.T.:	<u>5883</u>															
Configuration:	<u>Tx</u>															
Serial Number:	<u>3</u>															
Location:	<u>Lab 2</u>	RBW:	<u>100 kHz</u>													
Detector Type:	<u>Peak</u>	VBW:	<u>100 kHz</u>													
<u>Test Equipment Used</u>																
Antenna:	_____	Directional Coupler:	_____													
Pre-Amp:	_____	Cable #1:	_____													
Filter:	_____	Cable #2:	_____													
Receiver:	<u>1036</u>	Cable #3:	_____													
Attenuator #1:	<u>1472</u>	Cable #4:	_____													
Attenuator #2:	_____	Mixer:	_____													
Additional equipment used: _____																
Measurement Uncertainty: <u>+/-1.7 dB</u>																
<table border="1" style="width:100%; border-collapse: collapse; margin-top: 10px;"> <tr> <td style="text-align: center;">  </td> <td style="text-align: center;"> Delta 1 [T1] </td> <td style="text-align: center;"> RBW <u>100 kHz</u> </td> <td style="text-align: center;"> RF Att <u>30 dB</u> </td> </tr> <tr> <td style="text-align: center;"> Ref Lvl <u>30 dBm</u> </td> <td style="text-align: center;"> <u>0.84 dB</u> </td> <td style="text-align: center;"> VBW <u>100 kHz</u> </td> <td style="text-align: center;"> Unit <u>dBm</u> </td> </tr> <tr> <td style="text-align: center;"> <u>21.9 dB Offset</u> </td> <td style="text-align: center;"> <u>16.59719439 MHz</u> </td> <td style="text-align: center;"> SWT <u>10 ms</u> </td> <td></td> </tr> </table>						Delta 1 [T1]	RBW <u>100 kHz</u>	RF Att <u>30 dB</u>	Ref Lvl <u>30 dBm</u>	<u>0.84 dB</u>	VBW <u>100 kHz</u>	Unit <u>dBm</u>	<u>21.9 dB Offset</u>	<u>16.59719439 MHz</u>	SWT <u>10 ms</u>	
	Delta 1 [T1]	RBW <u>100 kHz</u>	RF Att <u>30 dB</u>													
Ref Lvl <u>30 dBm</u>	<u>0.84 dB</u>	VBW <u>100 kHz</u>	Unit <u>dBm</u>													
<u>21.9 dB Offset</u>	<u>16.59719439 MHz</u>	SWT <u>10 ms</u>														
																
Center <u>2.412 GHz</u> <u>4 MHz</u> Span <u>40 MHz</u>																
Date: <u>20 JUN 2005 09:44:10</u>																
Notes: <u>TX 99, 54Mbps, channel 2.412Ghz, 802.11 g mode</u>																

Test Data – Occupied Bandwidth



Test Data – Occupied Bandwidth

Data Plot	Occupied Bandwidth		Complete <u> X </u>															
Page <u> 1 </u> of <u> 1 </u>			Preliminary: <u> </u>															
Job No.: 5L0270	Date: <u> 5/20/2005 </u>																	
Specification: 15.247	Temperature(°C): <u> 22 </u>																	
Tested By: <u> David Light </u>	Relative Humidity(%): <u> 40 </u>																	
E.U.T.: <u> 5883 </u>																		
Configuration: <u> TX </u>																		
Serial Number: <u> 3 </u>																		
Location: <u> Lab 2 </u>	RBW: <u> 100 kHz </u>																	
Detector Type: <u> Peak </u>	VBW: <u> 100 kHz </u>																	
Test Equipment Used																		
Antenna: <u> </u>	Directional Coupler: <u> </u>																	
Pre-Amp: <u> </u>	Cable #1: <u> </u>																	
Filter: <u> </u>	Cable #2: <u> </u>																	
Receiver: <u> 1036 </u>	Cable #3: <u> </u>																	
Attenuator #1: <u> 1472 </u>	Cable #4: <u> </u>																	
Attenuator #2: <u> </u>	Mixer: <u> </u>																	
Additional equipment used: <u> </u>																		
Measurement Uncertainty: <u> +/-1x10⁻⁷ ppm </u>																		
<table border="1" style="width:100%; border-collapse: collapse;"> <tr> <td style="width:15%; text-align: center;">Ref Lvl</td> <td style="width:35%; text-align: center;">Delta 1 [T1]</td> <td style="width:15%; text-align: center;">RBW</td> <td style="width:15%; text-align: center;">RF Att</td> <td style="width:20%; text-align: center;">30 dB</td> </tr> <tr> <td style="text-align: center;">30 dBm</td> <td style="text-align: center;">-0.77 dB</td> <td style="text-align: center;">100 kHz</td> <td style="text-align: center;">100 kHz</td> <td></td> </tr> <tr> <td></td> <td style="text-align: center;">32.91583166 MHz</td> <td style="text-align: center;">SWT</td> <td style="text-align: center;">19 ms</td> <td style="text-align: center;">Unit dBm</td> </tr> </table>				Ref Lvl	Delta 1 [T1]	RBW	RF Att	30 dB	30 dBm	-0.77 dB	100 kHz	100 kHz			32.91583166 MHz	SWT	19 ms	Unit dBm
Ref Lvl	Delta 1 [T1]	RBW	RF Att	30 dB														
30 dBm	-0.77 dB	100 kHz	100 kHz															
	32.91583166 MHz	SWT	19 ms	Unit dBm														
<p style="font-size: small;"> 21.9 dB Offset 1VIEW 1MA Center 2.437 GHz 7.5 MHz Span 75 MHz Date: 20 JUN 2005 09:58:06 </p>																		
Notes: <u> TX 99, 108Mbps, channel 2.437GHz, 802.11 g turbo mode </u> <u> </u> <u> </u> <u> </u>																		

Section 5. Maximum Peak Output Power

NAME OF TEST: Maximum Peak Output power	PARA. NO.: 15.247(b)(1)
TESTED BY: David Light	DATE: 6/20/2005

Test Results: Complies.

Measurement Data: Refer to attached data

The measurement was repeated at +/- 15% of nominal supply voltage with no variation noted in rf power output.

Frequency (MHz)	Data Rate (Mbps)	Mode	Peak Power (dBm)	Peak Power (mW)
2412	11	b	21.63	145.6
2442	11	b	21.63	145.6
2462	11	b	21.39	137.8
2412	54	g	22.35	171.9
2442	54	g	22.62	182.8
2462	54	g	22.31	170.4
2437	108	g Turbo	22.51	178.1

NOTE: The antenna is 5.0 dBi gain. The rf power measurements above are conducted power at the antenna port.

Test Equipment: 1029-1030-1472

Test Conditions: 22°C
40% RH

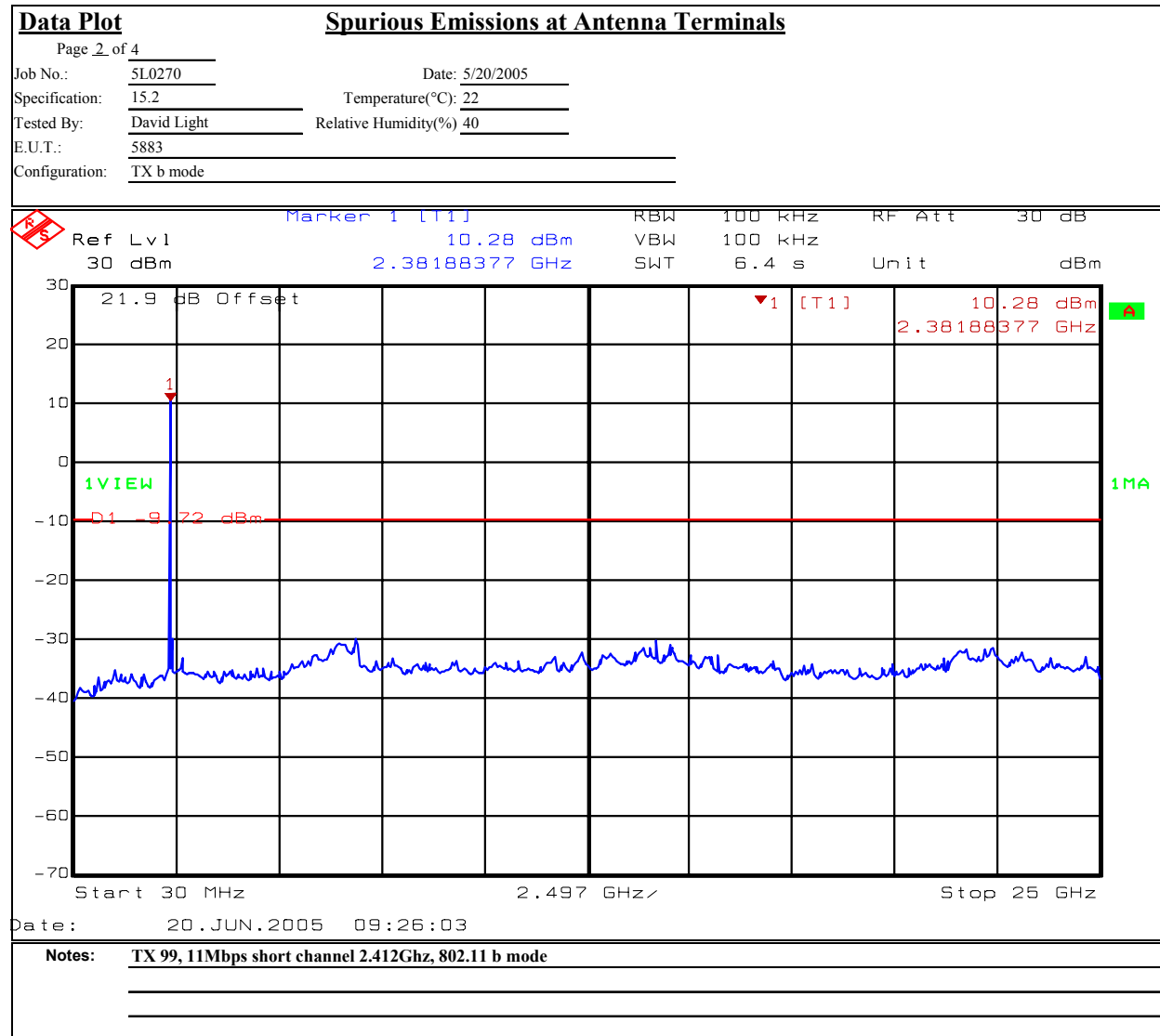
Section 6 Spurious Emissions at Antenna Terminals

NAME OF TEST: Spurious Emissions at Antenna Terminals	PARA. NO.: 15.247 (c)
TESTED BY: David Light	DATE: 6/20/2005

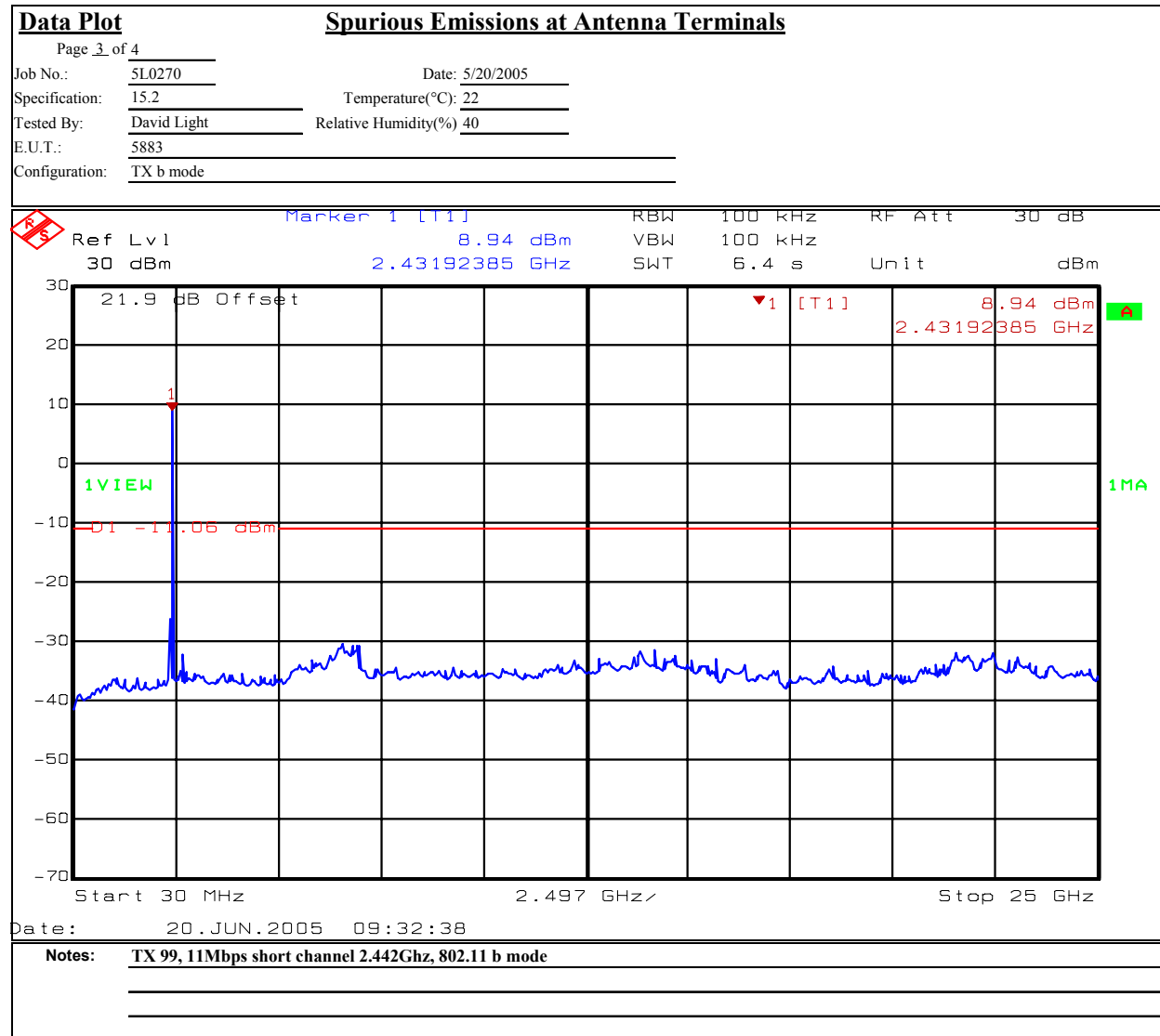
Test Results: Complies.

Measurement Data: See attached plots.

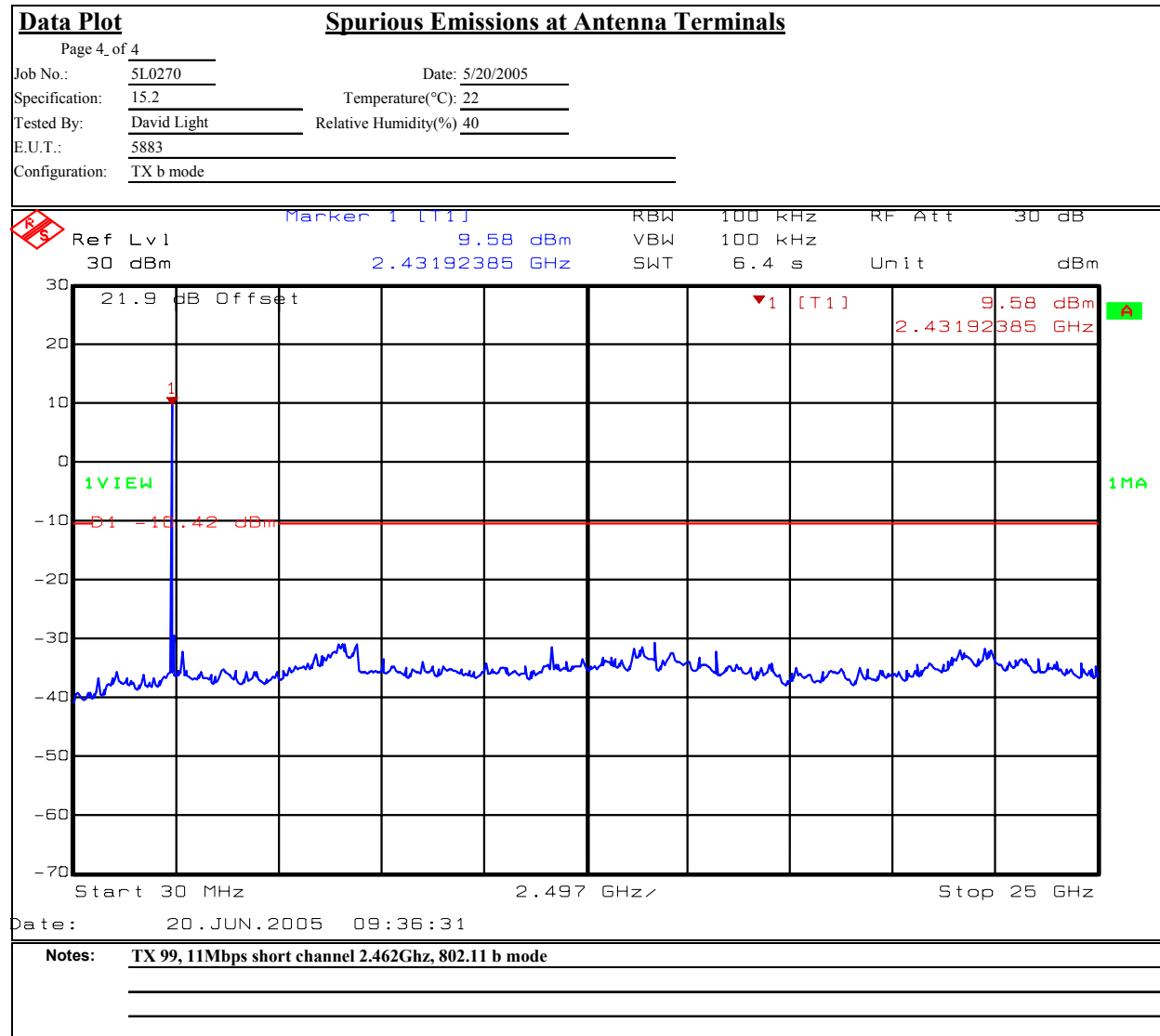
Test Data – Spurious Emissions at Antenna Terminals



Test Data – Spurious Emissions at Antenna Terminals



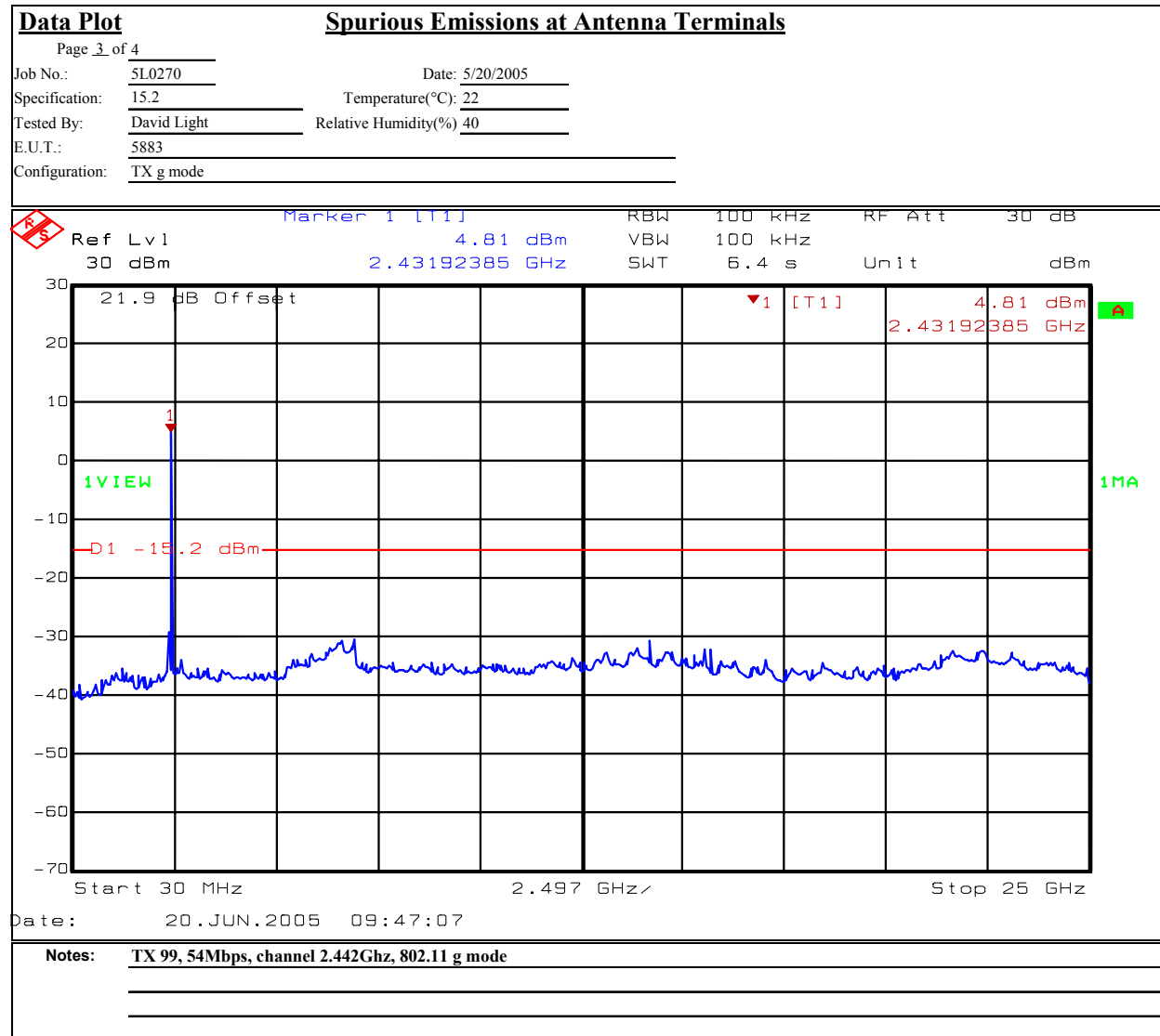
Test Data – Spurious Emissions at Antenna Terminals



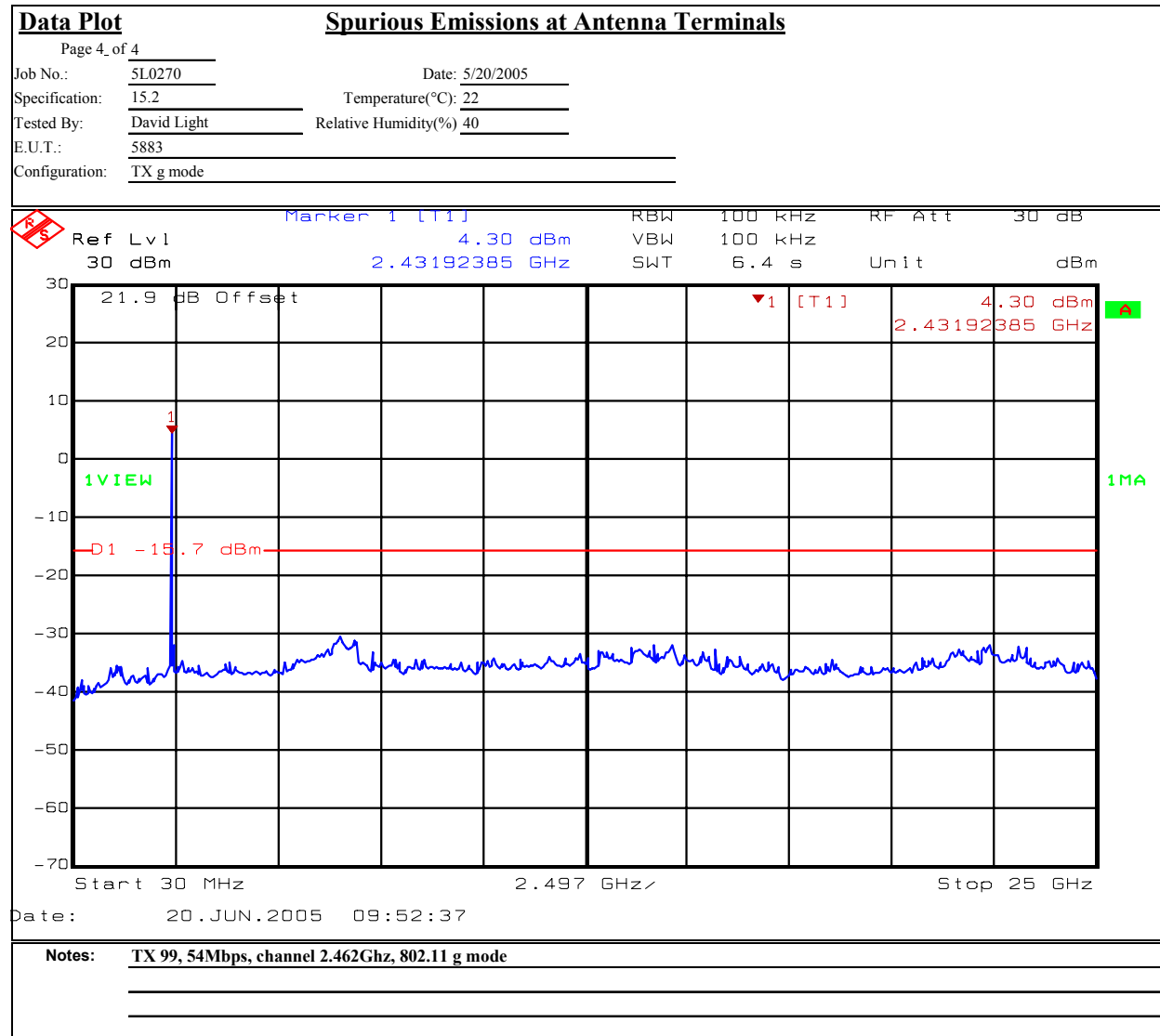
Test Data – Spurious Emissions at Antenna Terminals

Data Plot		Spurious Emissions at Antenna Terminals	
Page 1 of 4		Complete <u>X</u>	
Job No.: 5L0270	Date: 5/20/2005	Preliminary: _____	
Specification: 15.247	Temperature(°C): 22		
Tested By: David Light	Relative Humidity(%): 40		
E.U.T.: 5883	_____		
Configuration: TX g mode	_____		
Serial Number: 3	_____		
Location: Lab 2	RBW: 100 kHz	_____	
Detector Type: Peak	VBW: 100 kHz	_____	
Test Equipment Used			
Antenna: _____	Directional Coupler: _____	_____	
Pre-Amp: _____	Cable #1: _____	_____	
Filter: _____	Cable #2: _____	_____	
Receiver: 1036	Cable #3: _____	_____	
Attenuator #1: 1472	Cable #4: _____	_____	
Attenuator #2: 1478	Mixer: _____	_____	
Additional equipment used: _____			
Measurement Uncertainty: +/-1.7 dB			
Date: 20.JUN.2005 09:41:09			
Notes: TX 99, 54Mbps, channel 2.412Ghz, 802.11 g mode			

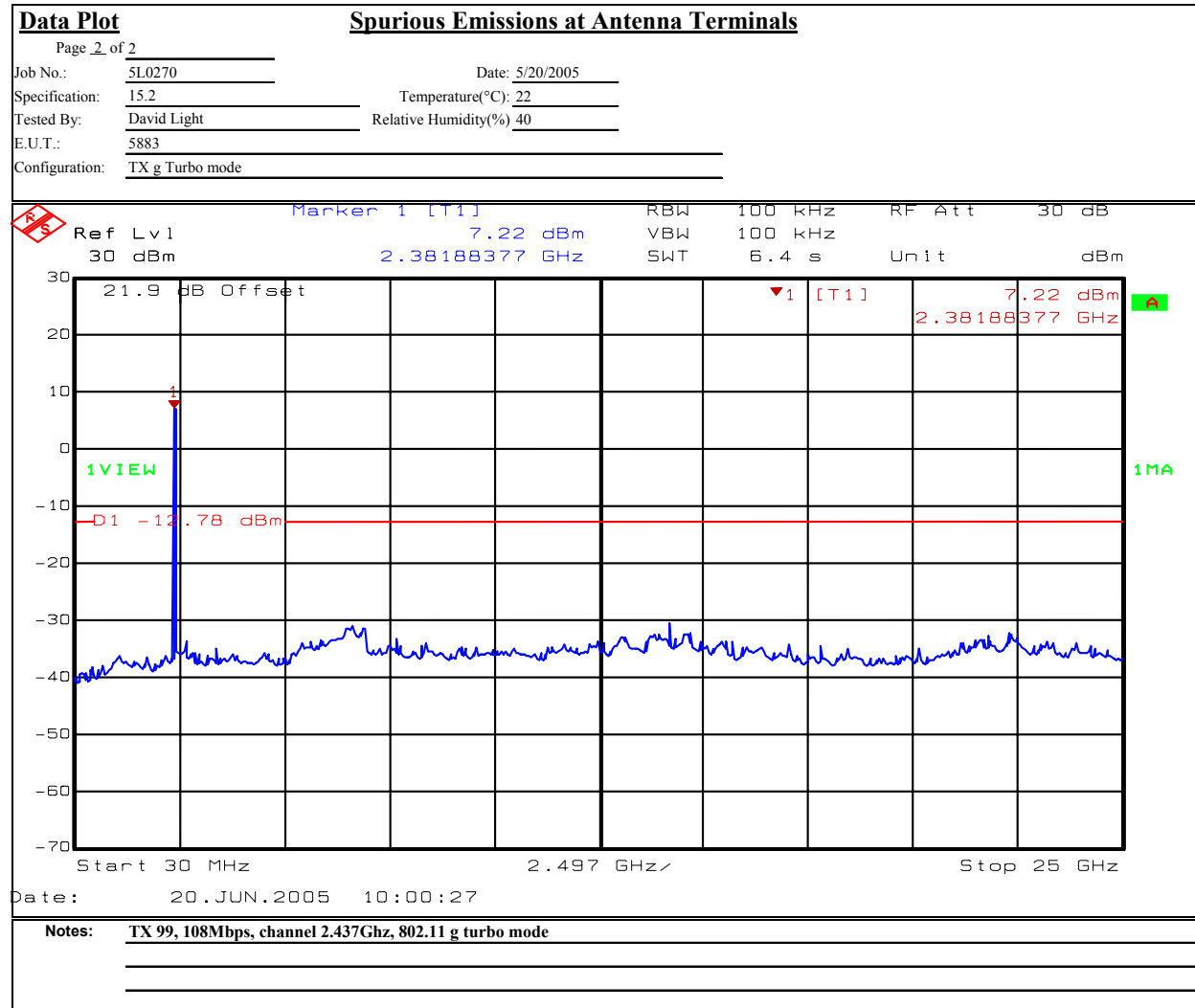
Test Data – Spurious Emissions at Antenna Terminals



Test Data – Spurious Emissions at Antenna Terminals



Test Data – Spurious Emissions at Antenna Terminals



Section 7. Radiated Emissions

NAME OF TEST: Radiated Emissions	PARA. NO.: 15.247 (c)
TESTED BY: Kevin Rose	DATE: 6/17/2005

Test Results: Complies.

Measurement Data: See attached table.

Radiated Emissions

<u>Radiated Emissions</u>								
Page <u>1</u> of <u>1</u>								
Job No.:	5L0270R			Date: <u>6/17/2005</u>				
Specification:	15.247			Temperature(°C): <u>21</u>				
Tested By:	<u>Kevin Rose</u>			Relative Humidity(%) <u>42</u>				
E.U.T.:	<u>5883</u>							
Configuration:	<u>TX 99, 11Mbps short channel 2.462Ghz 802.11 b mode</u>							
Sample Number:	<u>1</u>							
Location:	<u>AC 3</u>			RBW: <u>1 MHz</u>				
Detector Type:	<u>Peak</u>			VBW: <u>1 MHz</u>				
<u>Test Equipment Used</u>								
Antenna:	<u>1304</u>			Directional Coupler: <u>#N/A</u>				
Pre-Amp:	<u>#N/A</u>			Cable #1: <u>1484</u>				
Filter:	<u>#N/A</u>			Cable #2: <u>1485</u>				
Receiver:	<u>1464</u>			Cable #3: <u>1081</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)	Peak Limit (dBuV/m)	Average Limit (dBuV/m)	Detector / Polarity
2.4835	33.3	28.2	3.1	0.0	64.6	74	54	Peak - / Vertical
2.4835	19.8	28.2	3.1	0.0	51.1	74	54	Average - / Vertical md
2.4835	43.2	28.2	3.1	12.8	61.7	74	54	Peak - / Horizontal
2.4835	32.3	28.2	3.1	12.8	50.8	74	54	Average - NF / Horizontal
								md=marker delta
Notes:								
The spectrum was searched to 25 GHz								
marker delta method was used for the bandedge measurement.A preamp and 20db pad was used								
The device was tested at 2.412, 2.437 and 2.462 MHz and no emissions were found above the noise floor.								
Data presented is to demonstrate upper bandedge compliance on channle 11								

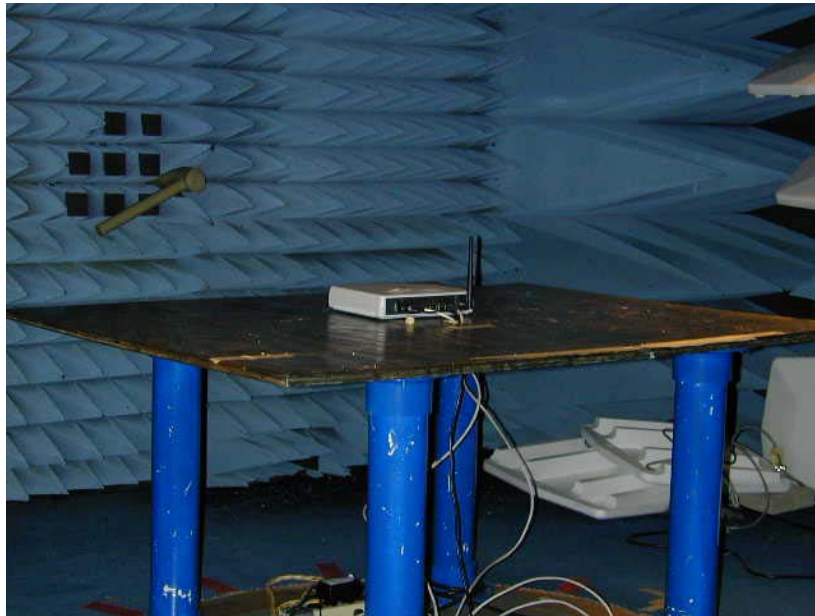
Radiated Emissions

<u>Radiated Emissions</u>								
Page <u>1</u> of <u>1</u>								
Job No.:	5L0270R			Date:	6/17/2005			
Specification:	15.247		Temperature(°C):	21				
Tested By:	Kevin Rose		Relative Humidity(%)	42				
E.U.T.:	5883							
Configuration:	TX 99, 54Mbps channel 2.462Ghz 802.11 g mode							
Sample Number:	1							
Location:	AC 3			RBW:	1 MHz			
Detector Type:	Peak			VBW:	1 MHz			
<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:	1464			Cable #3:	1081			
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)	Peak Limit (dBuV/m)	Average Limit (dBuV/m)	Detector / Polarity
2.4835	42.5	28.2	3.1	0.0	73.8	74	54	Peak - / Vertical
2.4835	20.4	28.2	3.1	0.0	51.7	74	54	Average - / Vertical md
2.4835	44.0	28.2	3.1	12.8	62.5	74	54	Peak - / Horizontal
2.4835	32.8	28.2	3.1	12.8	51.3	74	54	Average - NF / Horizontal
								md = marker delta
Notes:	The spectrum was searched to 25 GHz							
	marker delta method was used for the bandedge measurement.Horizontal a pre amp with a 20db pad was used							
	The device was tested at 2.412, 2.437 and 2.462 MHz and no emissions were found above the noise floor.							
	Data presented is to demonstrate upper bandedge compliance on channle 11							

Radiated Emissions

<u>Radiated Emissions</u>								
Page <u>1</u> of <u>1</u>								
Job No.:	5L0270R			Date: <u>6/17/2005</u>				
Specification:	15.247			Temperature(°C): <u>21</u>				
Tested By:	<u>Kevin Rose</u>			Relative Humidity(%) <u>42</u>				
E.U.T.:	<u>5883</u>							
Configuration:	<u>TX 99, 108Mbps channel 2.437Ghz 802.11 g turbo mode</u>							
Sample Number:	<u>1</u>							
Location:	<u>AC 3</u>			RBW: <u>1 MHz</u>				
Detector Type:	<u>Peak</u>			VBW: <u>1 MHz</u>				
<u>Test Equipment Used</u>								
Antenna:	<u>1304</u>			Directional Coupler: <u>#N/A</u>				
Pre-Amp:	<u>#N/A</u>			Cable #1: <u>1484</u>				
Filter:	<u>#N/A</u>			Cable #2: <u>1485</u>				
Receiver:	<u>1464</u>			Cable #3: <u>1081</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)	Peak Limit (dBuV/m)	Average Limit (dBuV/m)	Detector / Polarity
2.4835	38.3	28.2	3.1	0.0	69.6	74	54	Peak - / Vertical
2.4835	22.7	28.2	3.1	0.0	54.0	74	54	Average - / Vertical md
2.4835	34.0	28.2	3.1	0.0	65.3	74	54	Peak - / Horizontal
2.4835	21.9	28.2	3.1	0.0	53.2	74	54	Average - NF / Horizontal
								md = marker delta
Notes: The spectrum was searched to 25 GHz								
The device was tested at 2.412, 2.437 and 2.462 MHz and no emissions were found above the noise floor.								
Data presented is to demonstrate upper bandedge compliance on channle 11								

Radiated Photographs



Section 8. Peak Power Spectral Density

NAME OF TEST: Peak Power Spectral Density	PARA. NO.: 15.247(d)
TESTED BY: Kevin Rose	DATE: 6/17/2005

Test Results: Complies.

Measurement Data: See attached data..

Peak Power Spectral Density

Data Plot

Peak Power Spectral Density

Page 1 of 3

Complete X

Job No.: 5L0270R

Date: 6/17/2005

Preliminary: _____

Specification: PART 15.247(d)

Temperature(°C): 21

Tested By: Kevin Rose

Relative Humidity(%): 42

E.U.T.: 5883

Configuration: TX 99, 11Mbps short, channel 2.412Ghz, 2.442Ghz, 2.462Ghz, 802.11 b mode

Sample Number: 1

Location: Lab 2

RBW: Refer to plots

Detector Type: Peak

VBW: Refer to plots

Test Equipment Used

Antenna: _____

Directional Coupler: _____

Pre-Amp: _____

Cable #1: 1083

Filter: _____

Cable #2: _____

Receiver: 1464

Cable #3: _____

Attenuator #1: 1477

Cable #4: _____

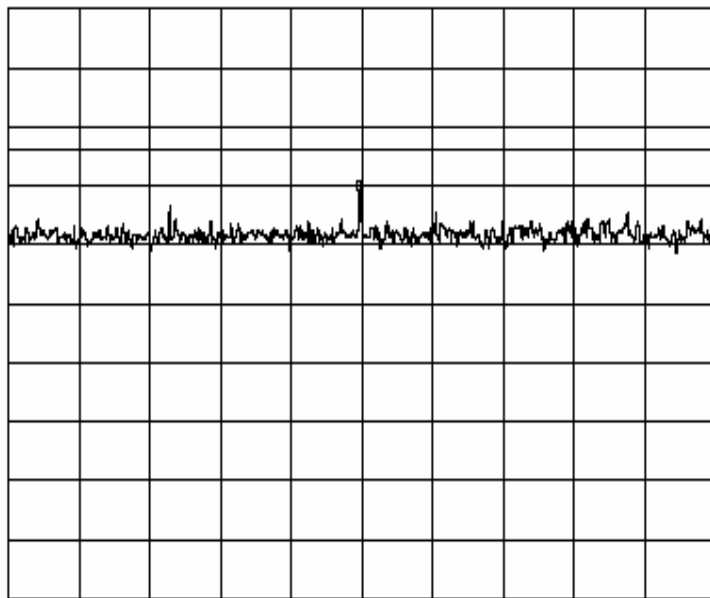
Attenuator #2: _____

Mixer: _____

Additional equipment used: _____

Measurement Uncertainty: +/-1.7 dB

*ATTEN 20dB
RL 31.9dBm 10dB/
MKR .90dBm
2.411993GHz



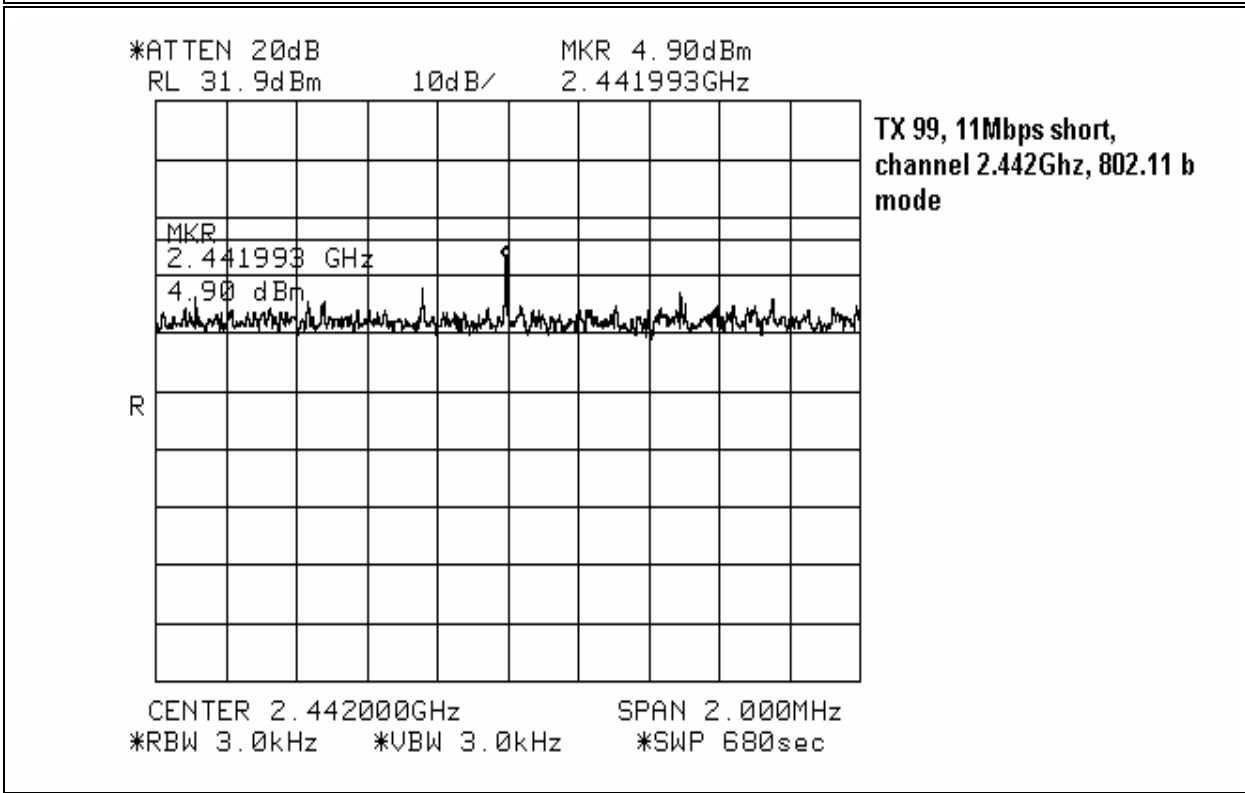
TX 99, 11Mbps short
channel 2.412Ghz 802.11 b
mode

CENTER 2.412000GHz SPAN 2.000MHz
*RBW 3.0kHz *VBW 3.0kHz *SWP 680sec

Notes: TX 99, 11Mbps short, channel 2.412Ghz, 802.11 b mode

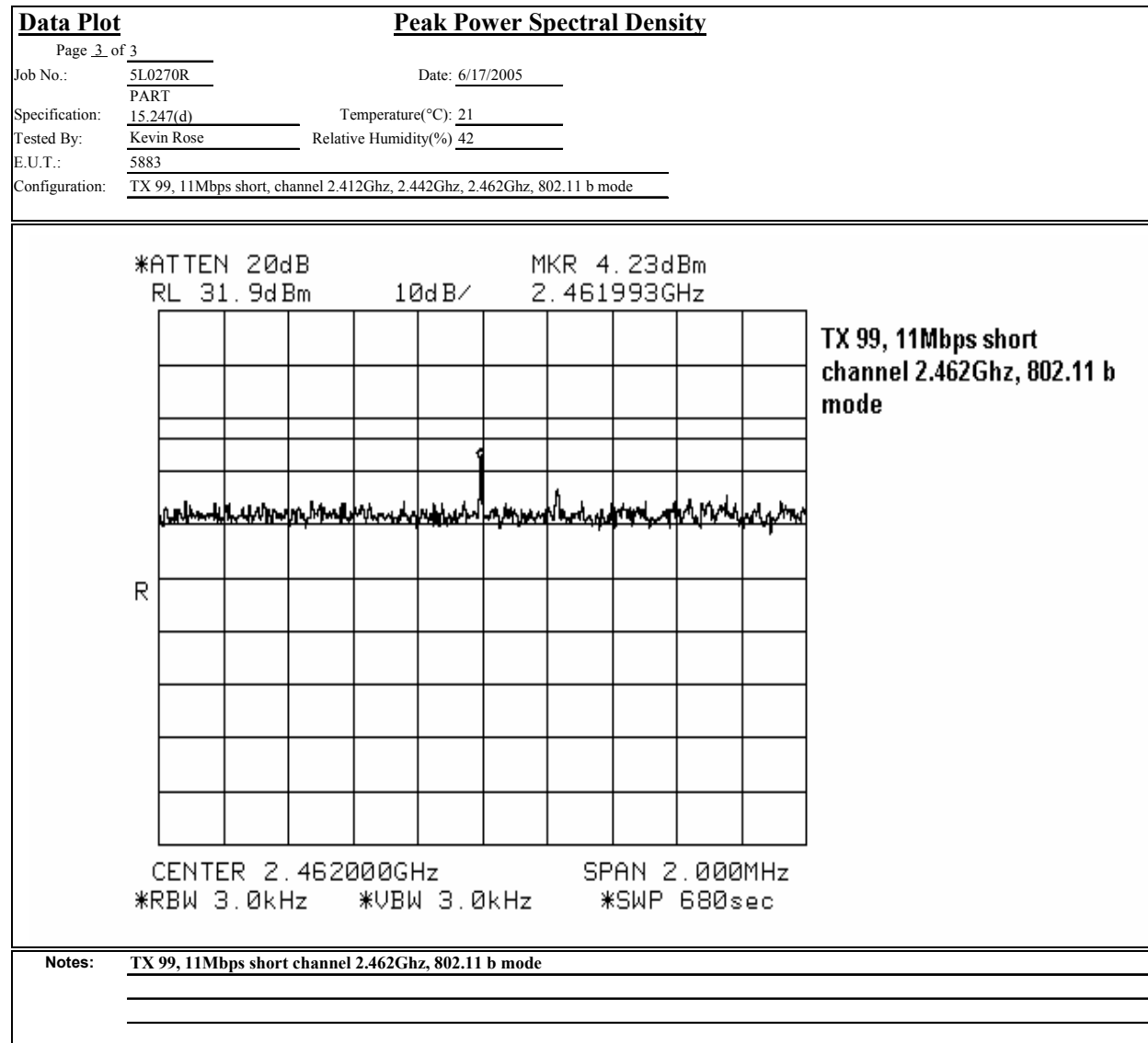
Peak Power Spectral Density

Data Plot	Peak Power Spectral Density	
Page 2 of 3		
Job No.: 5L0270R	Date: 6/17/2005	
PART		
Specification: 15.247(d)	Temperature(°C): 21	
Tested By: Kevin Rose	Relative Humidity(%) 42	
E.U.T.: 5883		
Configuration: TX 99, 11Mbps short, channel 2.412Ghz, 2.442Ghz, 2.462Ghz, 802.11 b mode		



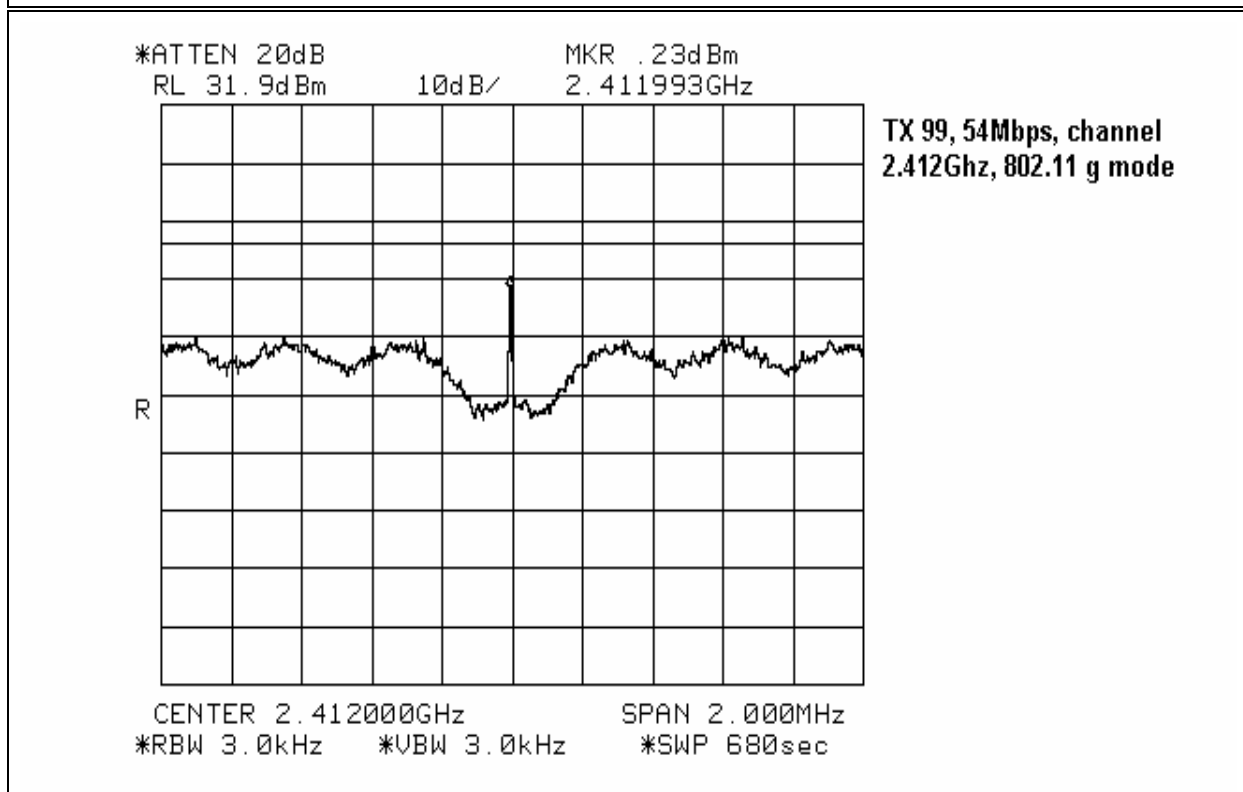
Notes: TX 99, 11Mbps short channel 2.442GHz, 802.11 b mode

Peak Power Spectral Density



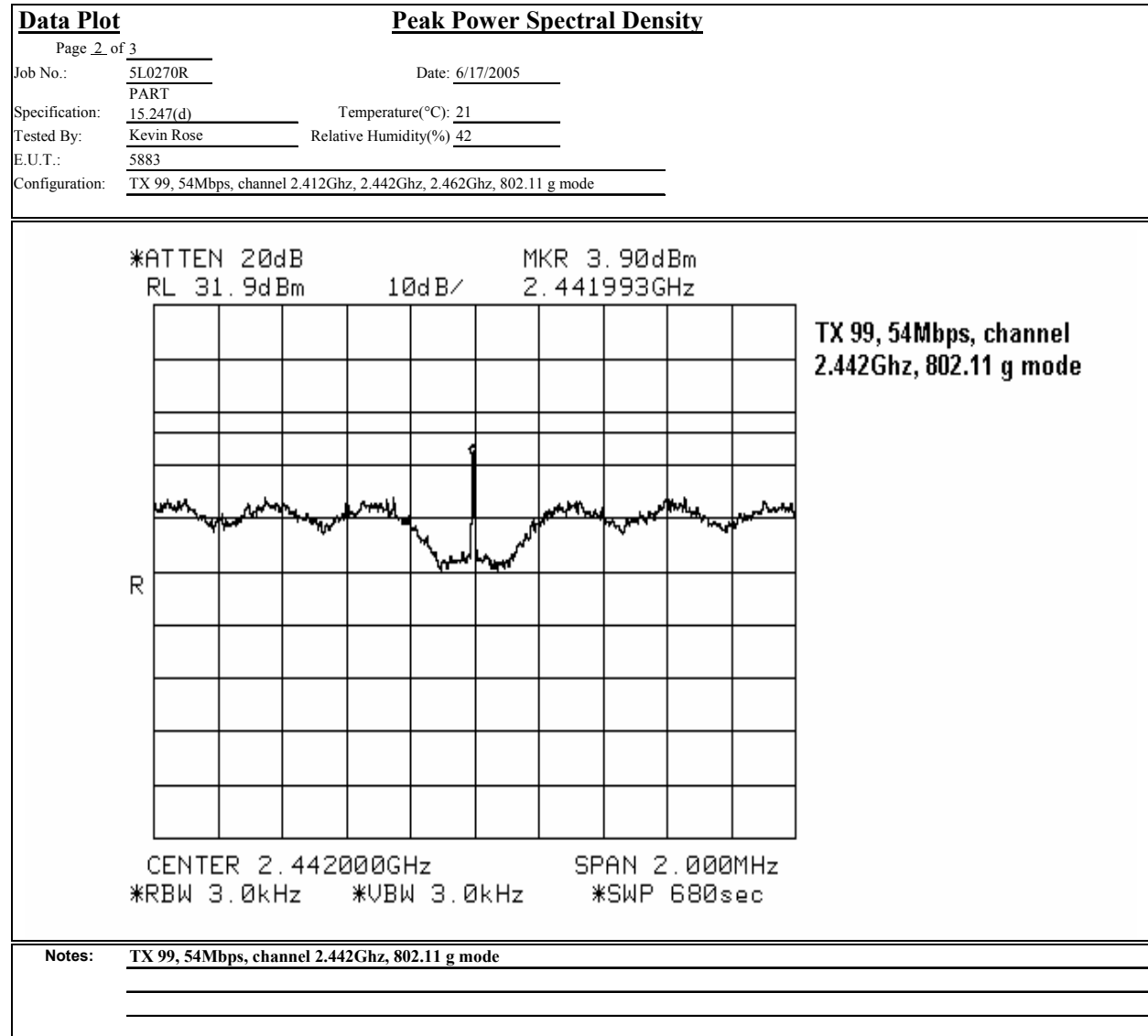
Peak Power Spectral Density

<u>Data Plot</u>		<u>Peak Power Spectral Density</u>		Complete <u>X</u>
Page 1 of 3				Preliminary: _____
Job No.: 5L0270R		Date: 6/17/2005		
Specification: PART 15.247(d)		Temperature(°C): 21		
Tested By: Kevin Rose		Relative Humidity(%): 42		
E.U.T.: 5883				
Configuration: TX 99, 54Mbps, channel 2.412Ghz, 2.442Ghz, 2.462Ghz, 802.11 g mode				
Sample Number: 1				
Location: Lab 2		RBW: Refer to plots		
Detector Type: Peak		VBW: Refer to plots		
Test Equipment Used				
Antenna: _____		Directional Coupler: _____		
Pre-Amp: _____		Cable #1: 1083		
Filter: _____		Cable #2: _____		
Receiver: 1464		Cable #3: _____		
Attenuator #1: 1477		Cable #4: _____		
Attenuator #2: _____		Mixer: _____		
Additional equipment used: _____				
Measurement Uncertainty: +/-1.7 dB				

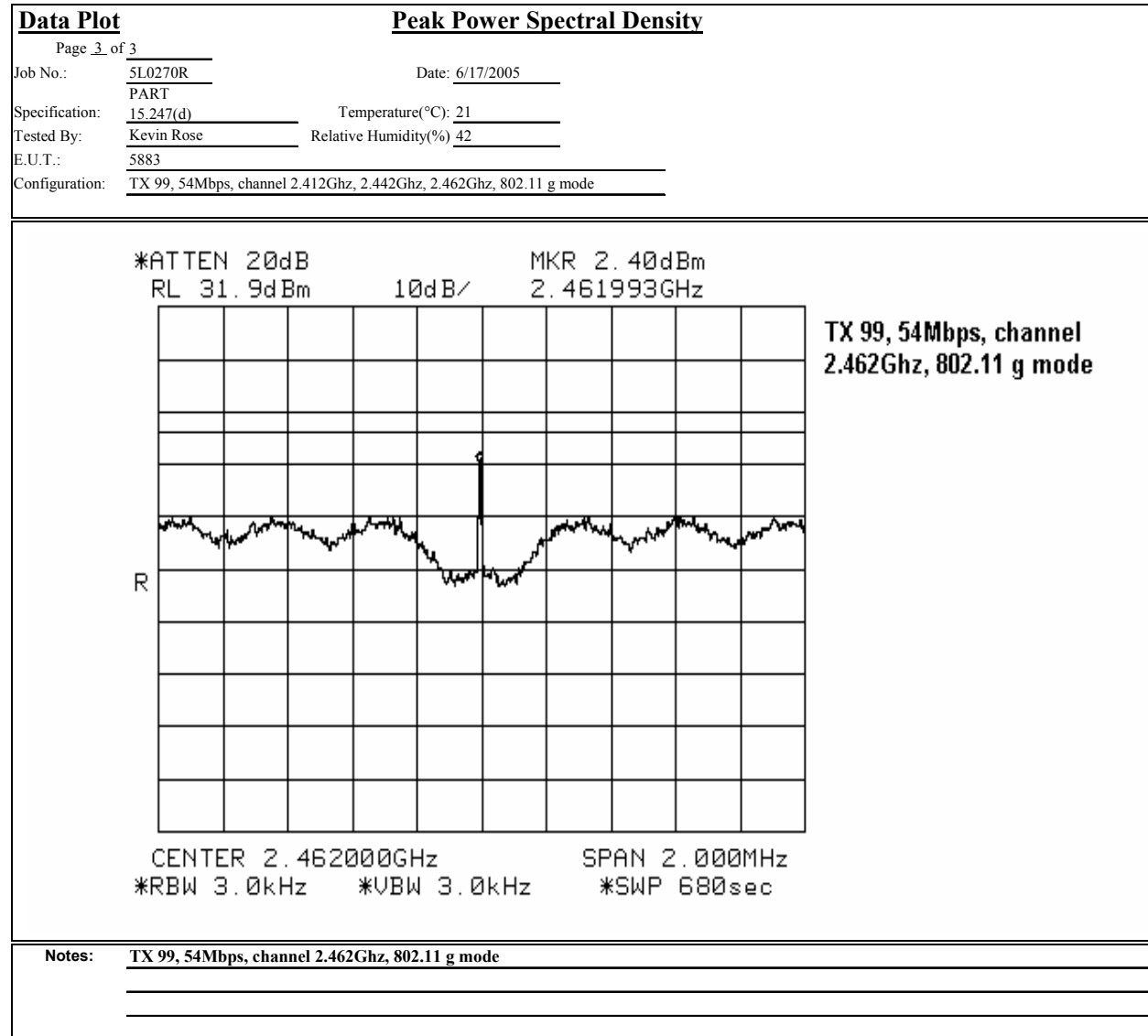


Notes: TX 99, 54Mbps, channel 2.412Ghz, 802.11 g mode

Peak Power Spectral Density



Peak Power Spectral Density



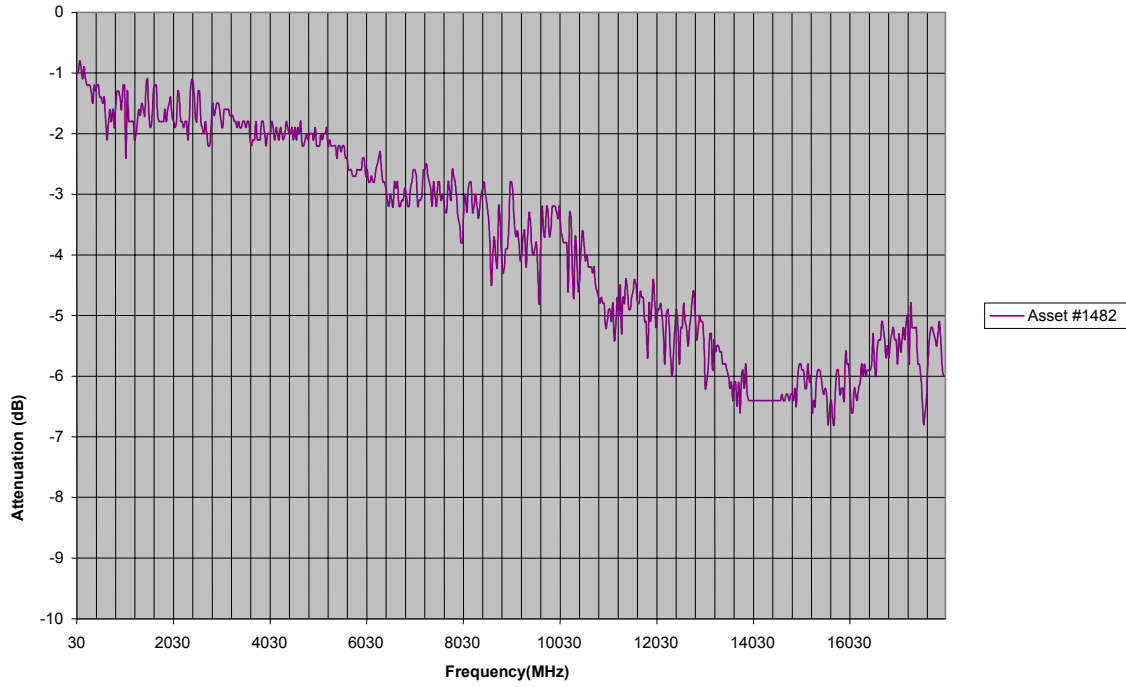
Section 9. Test Equipment List

Nemko ID	Description	Manufacturer Model Number	Serial Number	Calibration Date	Calibration Due
545	LISN	Schwarz Beck 8120	8120350	09/17/04	09/17/05
1555	Filter high pass 5 kHz	Solar Electronics 7930-5.0	933125	04/20/05	04/20/06
1553	CABLE 1m	KTL RG223	N/A	06/09/04	06/09/05
1998	CABLE, 1m	KTL RG223	N/A	06/09/04	06/09/05
1284	Spectrum analyzer display	Hewlett Packard 8566B	1811A00223	01/10/05	01/10/06
966	Receiver	Rohde & Schwartz ESH2	880370/029	09/20/04	09/20/05
1036	SPECTRUM ANALYZER	ROHDE & SCHWARZ FSEK30	830844/006	03/22/04	03/23/06
1472	20db Attenuator DC 18 GHz	Omni Spectra 20600-20db	NONE	Cal. On use	Cal. On use
1081	CABLE 2m	Astrolab 32027-2-29094-72TC	N/A	08/26/04	08/26/05
1029	PEAK POWER METER	HP 8900D	3303U0012	12/23/04	12/22/05
1030	PEAK POWER SENSOR	HP 84811A	2539A03573	12/23/04	12/22/05
1304	HORN ANTENNA	ELECTRO METRICS RGA-60	6151	09/22/03	09/22/05
1016	Pre-Amp	HEWLETT PACKARD 8449A	2749A00159	11/12/04	11/12/05
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
1464	Spectrum analyzer	Hewlett Packard 8563E	3551A04428	01/14/05	01/15/07
759	ANTENNA, LOG PERIODIC	A.H. SYSTEMS SAS-200/510	556	07/23/04	07/23/05
760	Antenna biconical	Electro Metrics MFC-25	477	06/22/04	07/22/05
791	PREAMP, 25dB	ICC LNA25	398	11/12/04	11/12/05

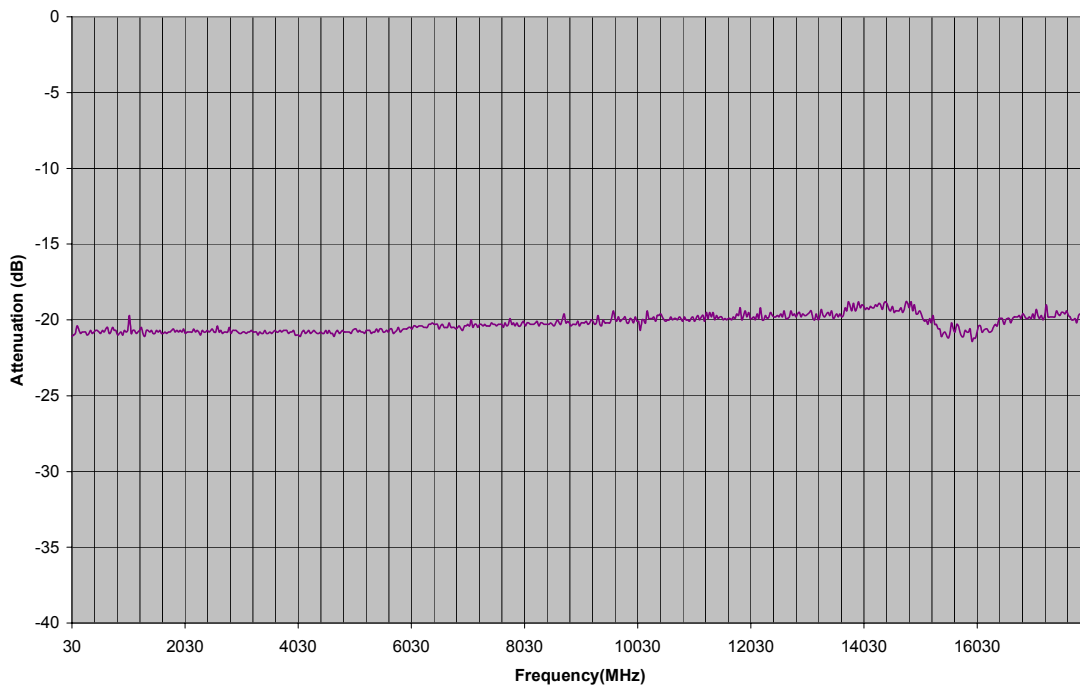
1083	Cable 2m	Astrolab 32027-2-29094-72TC	N/A	Cal. On use	Cal. On use
1477	20db Attenuator DC 18 GHz	MCL Inc. BW-S20W5	NONE	Cal. On use	Cal. On use
1478	20db Attenuator DC 18 Ghz	MCL Inc. BW-S20W6	NONE	02/21/05	02/21/06

*The calibration was extended on this equipment for one month according to Nemko quality system procedures.

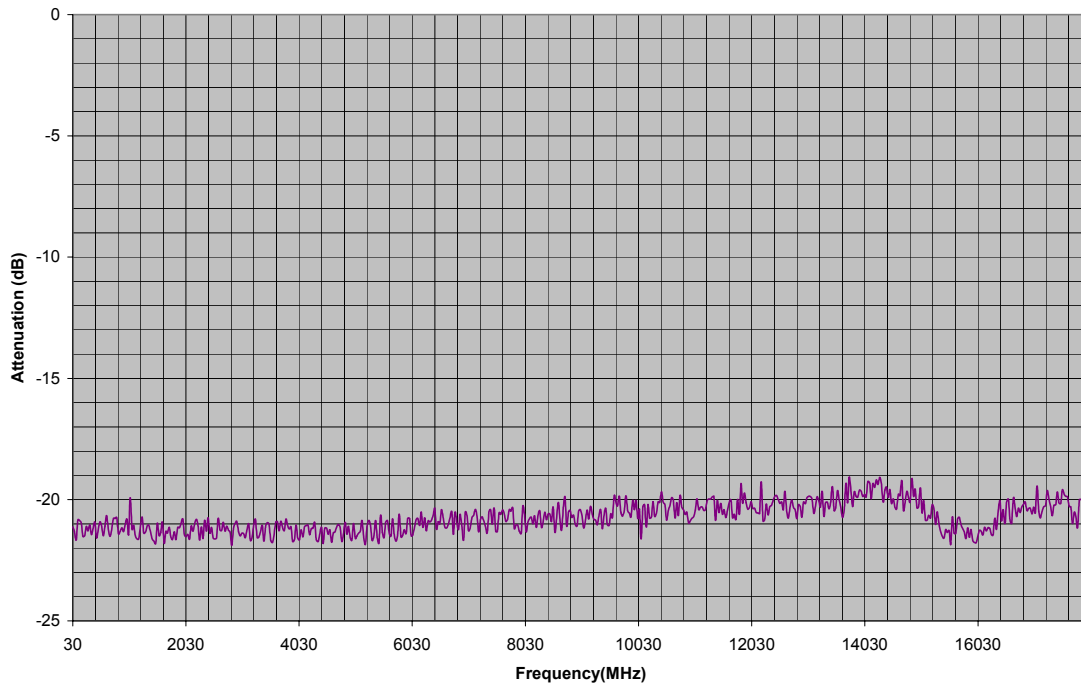
Asset #1083 Insertion Loss



Asset #1472 Insertion Loss



Asset #1477 Insertion Loss



ANNEX A - TEST DETAILS

NAME OF TEST: Powerline Conducted Emissions	PARA. NO.: 15.207(a)
---	----------------------

Minimum Standard: §15.207 Conducted limits.

(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 Conducted Emission (MHz)	Limit (dBmV)	
	Quasi-peak	Average
0.15-0.5	66 to 56*	56 to 46*
0.5-5	56	46
5-30	60	50

* Decreases with the logarithm of the frequency.

(b) The limit shown in paragraph (a) of this section shall not apply to carrier current systems operating as intentional radiators on frequencies below 30 MHz. In lieu thereof, these carrier current systems shall be subject to the following standards:

(1) For carrier current systems containing their fundamental emission within the frequency band 535-1705 kHz and intended to be received using a standard AM broadcast receiver: no limit on conducted emissions.

(2) For all other carrier current systems: 1000 mV within the frequency band 535-1705 kHz, as measured using a 50 mH/50 ohms LISN.

(3) Carrier current systems operating below 30 MHz are also subject to the radiated emission limits as provided in §15.205 and §§15.209, 15.221, 15.223, 15.225 or 15.227, as appropriate.

(c) Measurements to demonstrate compliance with the conducted limits are not required for devices which only employ battery power for operation and which do not operate from the AC power lines or contain provisions for operation while connected to the AC power lines. Devices that include, or make provision for, the use of battery chargers which permit operating while charging, AC adaptors or battery eliminators or that connect to the AC power lines indirectly, obtaining their power through another device which is connected to the AC power lines, shall be tested to demonstrate compliance with the conducted limits.

NAME OF TEST: Occupied 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.

Substitution Antenna Method for Integral Antennas:

The peak field strength of the carrier is measured in a worst-case configuration with a RBW > 5 times the occupied bandwidth of the transmitted waveform. For cases where the RBW of the test instrument is not sufficient, the power is measured using a peak power meter instead of the spectrum analyzer.

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: Channel Separation

PARA. NO.: 15.247(a)(1)

Minimum Standard:

Frequency hopping systems shall have hopping channel carrier frequencies separated by a minimum of 25 kHz or the 20 dB bandwidth of the hopping channel, whichever is greater.

NAME OF TEST: Pseudorandom Hopping Algorithm

PARA. NO.: 15.247(a)(1)

Minimum Standard:

The system shall hop to channel frequencies that are selected from a pseudo-randomly ordered list of hopping frequencies. Each frequency must be used equally on average by each transmitter. The system receivers shall have input bandwidths that match the hopping channel bandwidths of their transmitters and shall shift frequencies in synchronization with the transmitted signals.

NAME OF TEST: Time of Occupancy	PARA. NO.: 15.247(a)(1)(ii)
---------------------------------	-----------------------------

Minimum Standard:

Frequency Band (MHz)	20 dB Bandwidth	No. of Hopping Channels	Average Time of Occupancy
902 - 928	<250 kHz	50	=<0.4 sec. in 20 sec.
902 - 928	=>250 kHz	25	=<0.4 sec. in 10 sec.
2400 - 2483.5	-----	75	=<0.4 sec. in 30 sec.
5725 - 5850	-----	75	=<0.4 sec. in 30 sec.

Method Of Measurement:

The spectrum analyzer is set as follows:

- RBW: 1 MHz
- VBW: = RBW
- Span: 0 Hz
- LOG dB/div.: 10 dB
- Sweep: Sufficient to see one hop time sequence.
- Trigger: Video

The occupancy time of one hop is measured as above. The average time of occupancy is calculated over the appropriate period of time from above table (10, 20, or 30 seconds).

Avg. time of occupancy = (period from table/duration of one hop)/no. of channels multiplied by the duration of one hop.

For instance:

If a 2.4 GHz system has a measured hop duration time of 1 msec. and uses 75 channels, then the average time of occupancy would be:

$$(30 \text{ sec.} / .001 \text{ sec.}) / 75 \text{ chan.} = 400 \times 1 \text{ msec.} = 400 \text{ msec. or } 0.4 \text{ sec. in } 30 \text{ sec.}$$

NAME OF TEST: Occupied Bandwidth	PARA. NO.: 15.247(a)(2)
----------------------------------	-------------------------

Minimum Standard:

Frequency Band (MHz)	Maximum 20 dB Bandwidth
902 - 928	500 kHz
2400 – 2483.5	1 MHz
5725 – 5850	1 MHz

Method Of Measurement:

The spectrum analyzer is set as follows:

RBW: At least 1% of span/div.

VBW: >RBW

Span: Sufficient to display 20 dB bandwidth

LOG dB/div.: 10 dB

Sweep: Auto

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 ($\mu\text{V/m @ 3m}$)	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:

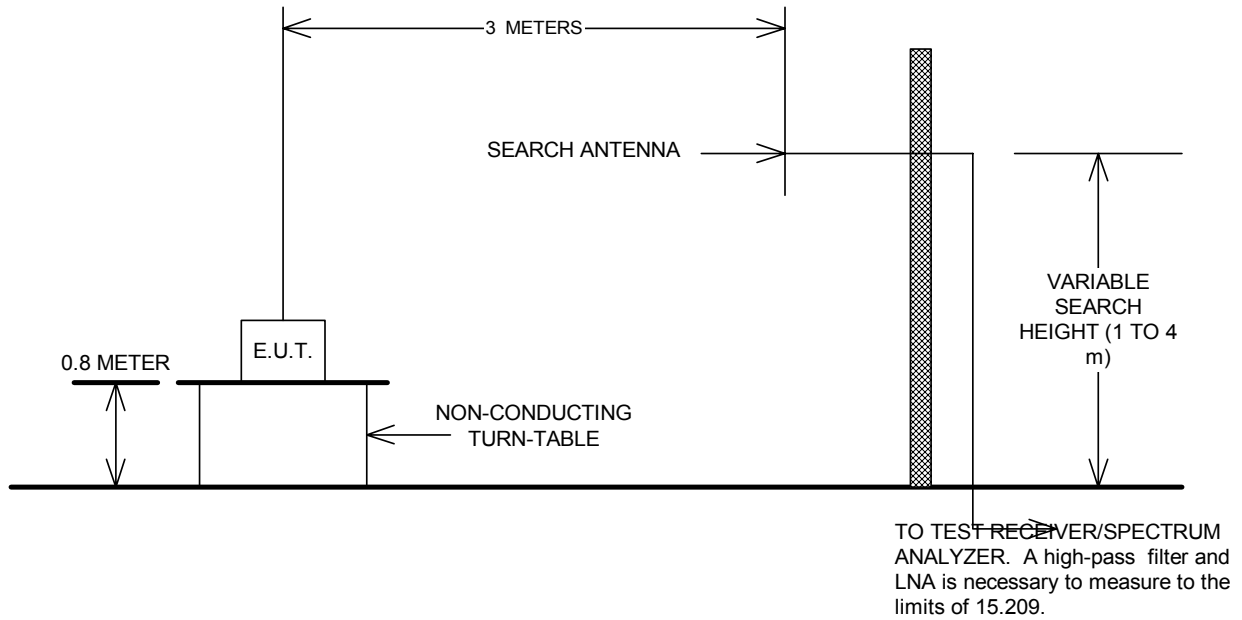
For devices with non-detachable antennas, the received field strength is peaked and the spectrum analyzer is set as above. The peak emission level is then measured and converted to a field strength by adding the appropriate antenna factor and cable loss. This field strength is then converted to an equivalent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

Number of channels tested:

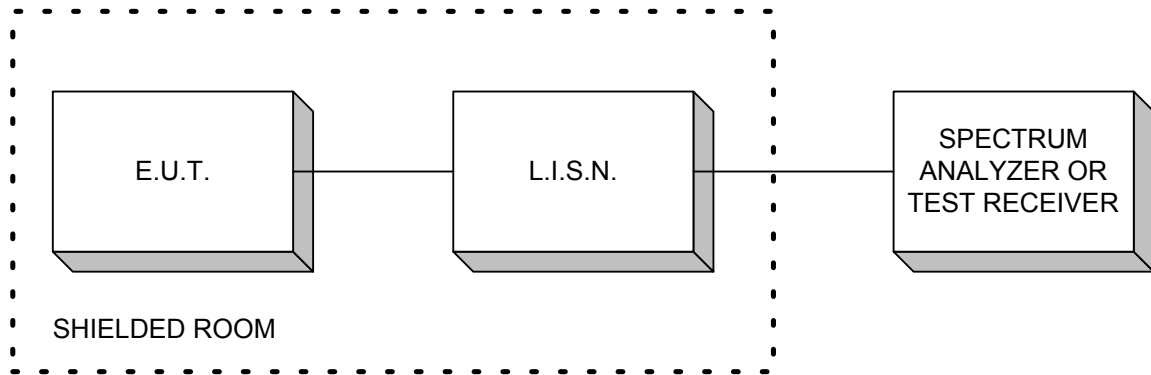
Tuning Range	Number Of Channels Tested	Channel Location In Band
1 MHz or Less	1	Middle
1 to 10 MHz	2	Top And Bottom
More Than 10 MHz	3	Top, Middle, Bottom

ANNEX B - TEST DIAGRAMS

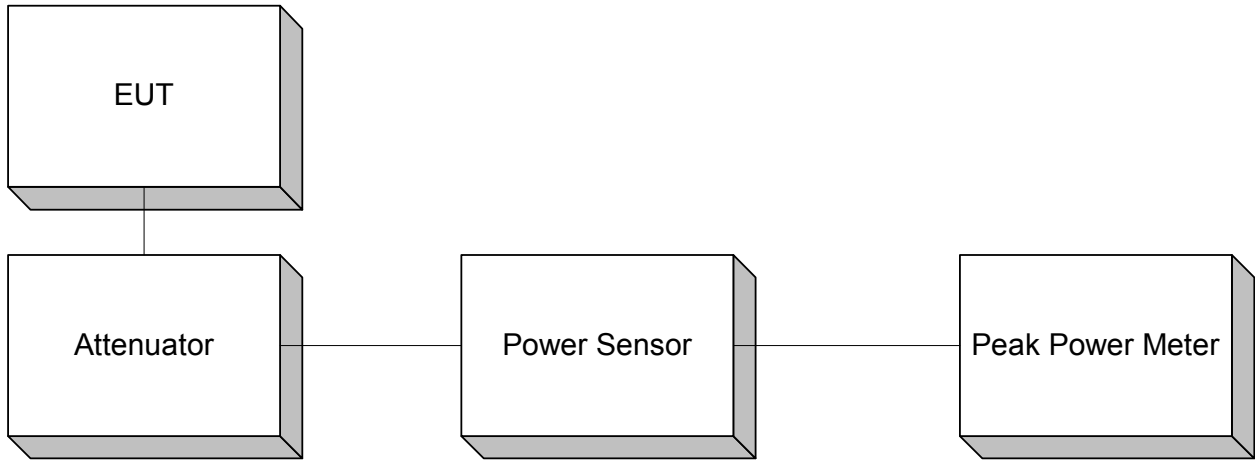
Test Site For Radiated Emissions



Conducted Emissions



Peak Power At Antenna Terminals



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

