

Nemko Test Report: 4L0489RUS1rev1

Applicant: Andrew Corporation.

**Equipment Under Test:
(E.U.T.)** 385700-5000-001 to -004

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: 
Tom Tidwell, Frontline Manager

Date: 15 September, 2005

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Section 1. Summary of Test Results

Manufacturer: Andrew Corporation

Model No.: 385700-5000-001 to -004

Serial No.: None

General: **All measurements are traceable to national standards.**

These tests were conducted on a sample of the equipment for the purpose of demonstrating compliance with Part 15, Subpart C, Paragraph 15.247 for Direct Sequence Spread Spectrum devices. Radiated tests were conducted in accordance with ANSI C63.4-2003. 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
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: 2448 to 2472 MHz

Channel Spacing: 5 MHz

User Frequency Adjustment: Software controlled

Detachable antenna: Yes. The radio is professionally installed.

Description of EUT

Provide optical signal routing.

The 385700-5000-001 to -004 system consists of the Andrew EOCCell Remote model number 385700-5000, the Andrew EOCCell Master model number 385700-6000 the Invensys Safetran Spread Spectrum Radio model number ATC-24027 and Andrew Radiax antenna p/n(s) RCT6-S-1A-AX, RCT6-S-1A-RN, RCT6-S-1A-RNT1 or RCT6-S-1A-RNT or 12 dBi gain horn.

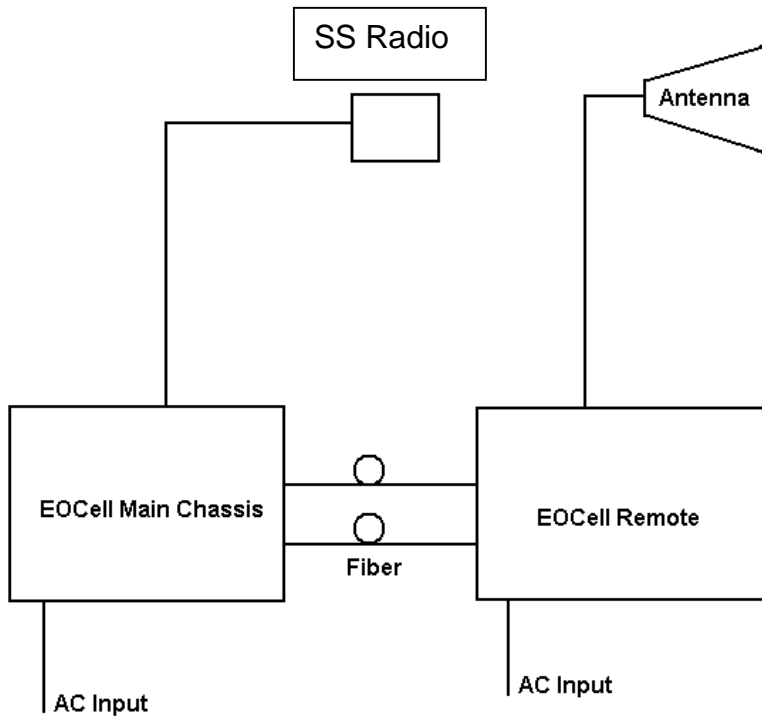
The horn antenna is for point to point operation.

The electrical characteristics are equal on all antennas. The differences are listed below.

- (1) RCT6-S-1A-AX --> 1-1/4" Tuned Foil RADIAX w/BUMP, For outdoor installation with no fire retardant properties, halogen free
- (2) RCT6-S-1A-RN --> 1-1/4" Tuned Foil RADIAX w/BUMP, Fire Retardant, Low Smoke and Fume (LSF), halogen free
- (3) RCT6-S-1A-RNT1 --> 1-1/4" Tuned Foil RADIAX w/BUMP, Fire Retardant, Low Smoke and Fume (LSF), halogen free with single mica tape
- (4) RCT6-S-1A-RNT --> 1-1/4" Tuned Foil RADIAX w/BUMP, Fire Retardant, Low Smoke and Fume (LSF), halogen free with double mica tape

Radiax antennas have 20 dBi loss.

System Diagram



Section 3. Powerline Conducted Emissions

NAME OF TEST: Powerline Conducted Emissions	PARA. NO.: 15.207(a)
TESTED BY: Kevin Rose	DATE: 3/31/05

Test Results: Complies.

Measurement Data: See attached plots.

Measurement Uncertainty: +/- 1.7 dB

Test Data – Powerline Conducted Emissions

Conducted Emissions

Powerline Voltage Measurement

Complete X Job # : 4L0489E Test # : CEPV-01
Preliminary Page 1 of 2

Client Name : Andrew Corporation
EUT Name : 2.4 GHz EOCcell Remote
EUT Model # : 385700-5000-001 to -004 and -101 to -104
EUT Part # : 385700-5000-001 to -004 and -101 to -104
EUT Serial # : NA
EUT Config. : Transmitting RF Signals from remote to master (vice versa)

Specification : EN 50121-4:2000 Reference : EN 61000-4-6
Transducer # : 969 Temp. (deg. C) : 21 Date : 03/31/05
HP Filter # : 704 Humidity (%) : 56 Time : 12:00
Cable 1 # : 1553 EUT Voltage : 230 Staff : Kevin Rose
Cable 2 # : 1115 EUT Frequency : 60 Location : LAB 4
Detector 1 # : 716 Peak Bandwidth: 10kHz Photo ID: 4L0489E CEPV-01
Detector 2 # : NA QP Bandwidth 9kHz
Limiter # : NA Avg. Bandwidth 9kHz

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.			
2.68	N	QP	QP	33.0	0	0	33.0	73	60	-40.0	Pass	
2.68	N	A	A	22.0	0	0	22.0	73	60	-38.0	Pass	

Date: 31.MAR.2005 16:06:50
Path: ..\\EMCShare\\AUTOMATE\\DATASHTS\\CEPV_Voltage Rev C.xl: Document Control #EMC DS EM COND VOLT

Test Data – Powerline Conducted Emissions

Conducted Emissions

Powerline Voltage Measurement

Complete X
Preliminary

Job # : 4L0489E Test # : CEPV-01
Page 2 of 2

Client Name : Andrew Corporation
EUT Name : 2.4 GHz EOCcell Remote
EUT Model # : 385700-5000-001 to -004 and -101 to -104
EUT Part # : 385700-5000-001 to -004 and -101 to -104
EUT Serial # : NA
EUT Config. : Transmitting RF Signals from remote to master (vice versa)

Specification : EN 50121-4:2000 Reference : EN 61000-4-6

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.			
2.68	H	QP	QP	34	0	0	34.2	73	60	-38.8	Pass	
2.68	H	A	A	31	0	0	31.0	73	60	-29.0	Pass	
1.61	H	QP	QP	39	0	0	39.0	73	60	-34.0	Pass	
161	H	A	A	31	0	0	31.0	73	60	-29.0	Pass	

Ref 97 dBuV Att 10 dB *RBW 10 kHz *VBW 10 kHz SWT 300 ms Marker 1 [T1] 36.01 dBuV 1.224600000 MHz

Offset 10 dB LIMIT CHECK PASS

Start 150 kHz 2.985 MHz/ Stop 30 MHz

Date: 31.MAR.2005 16:05:49

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

Photos – Powerline Conducted Emissions

Front



Side



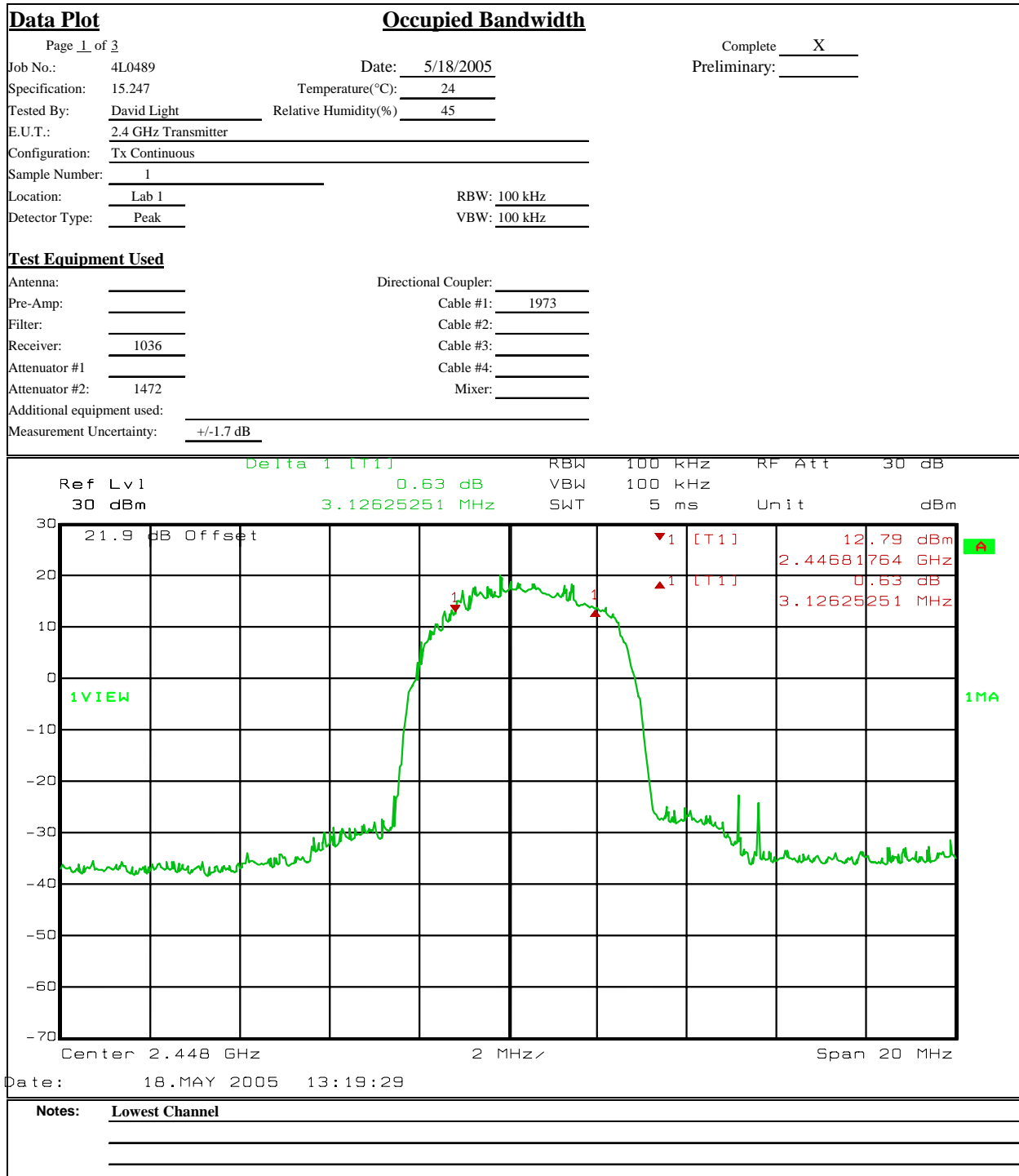
Section 4. Occupied Bandwidth

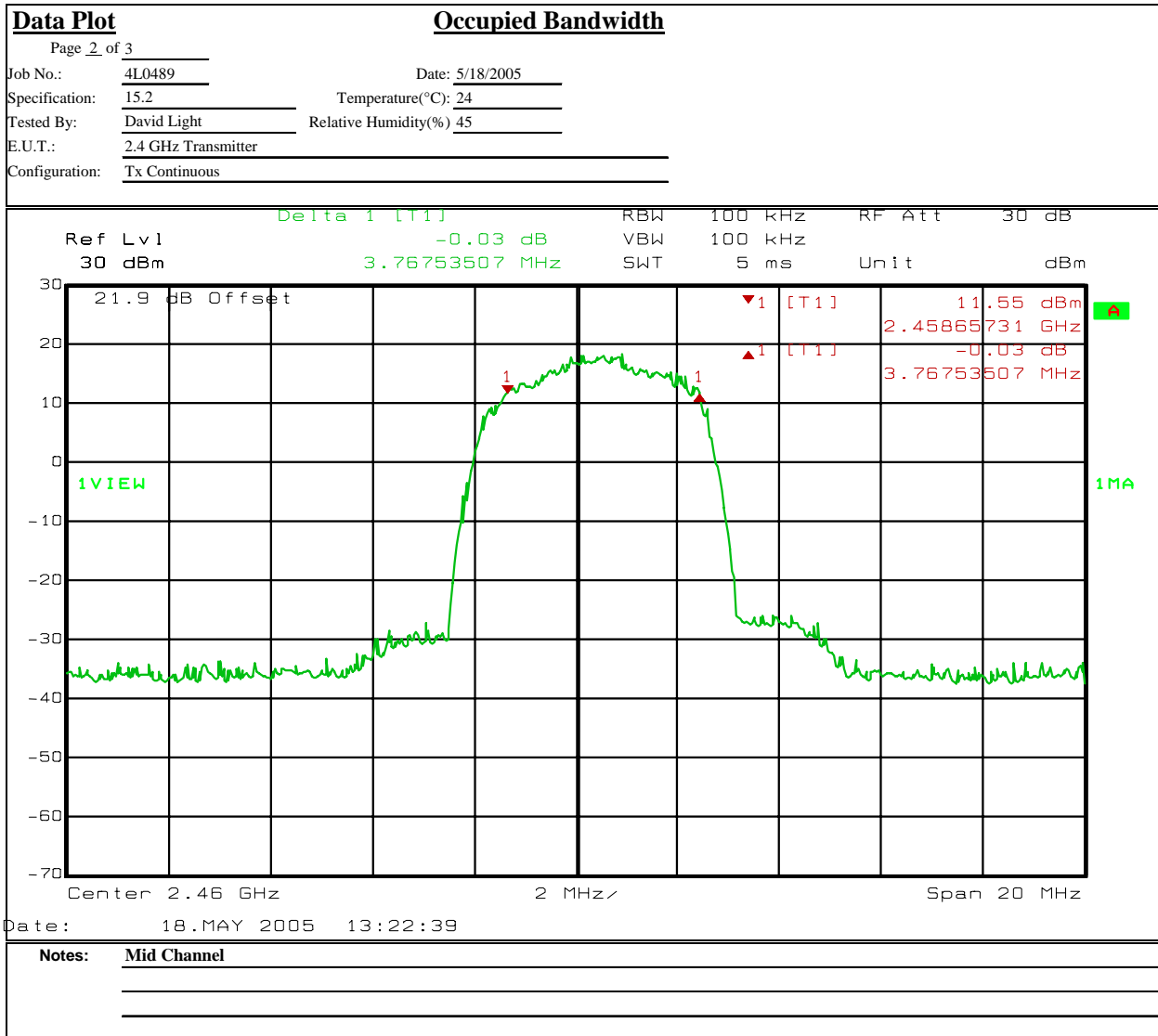
NAME OF TEST: Occupied Bandwidth	PARA. NO.: 15.247(a)(2)
TESTED BY: David Light	DATE: 5/18/05

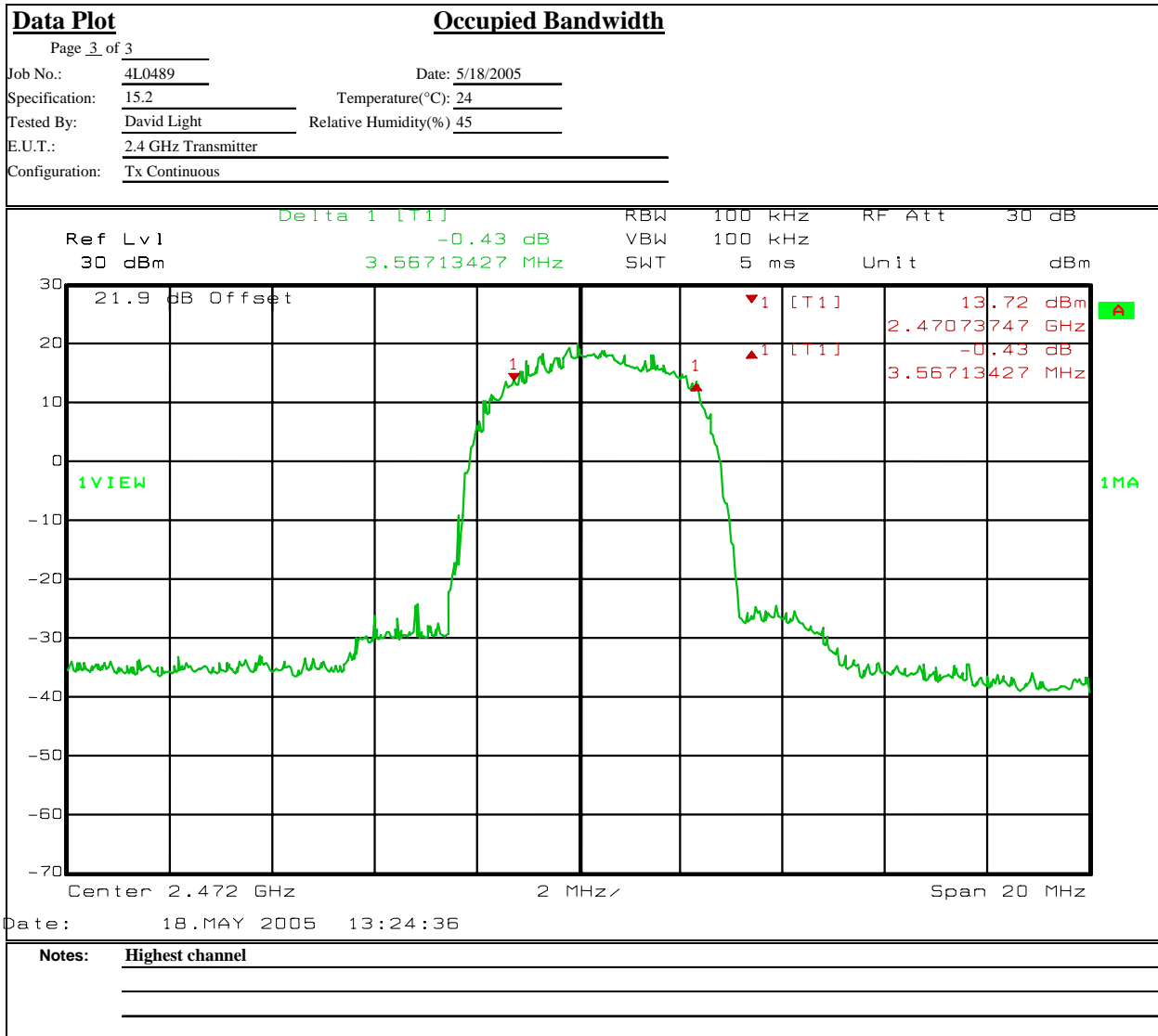
Test Results: Complies.

Measurement Data: See 6 dB BW plot

Measured 6 dB bandwidth: 3.8 MHz max
Channel Separation: 5 MHz







Section 5. Maximum Peak Output Power

NAME OF TEST: Maximum Peak Output power	PARA. NO.: 15.247(b)(1)
TESTED BY: David Light	DATE: 5/26/05

Test Results: Complies.

Measurement Data: 27.5 dBm / 562 mW Max Refer to attached data

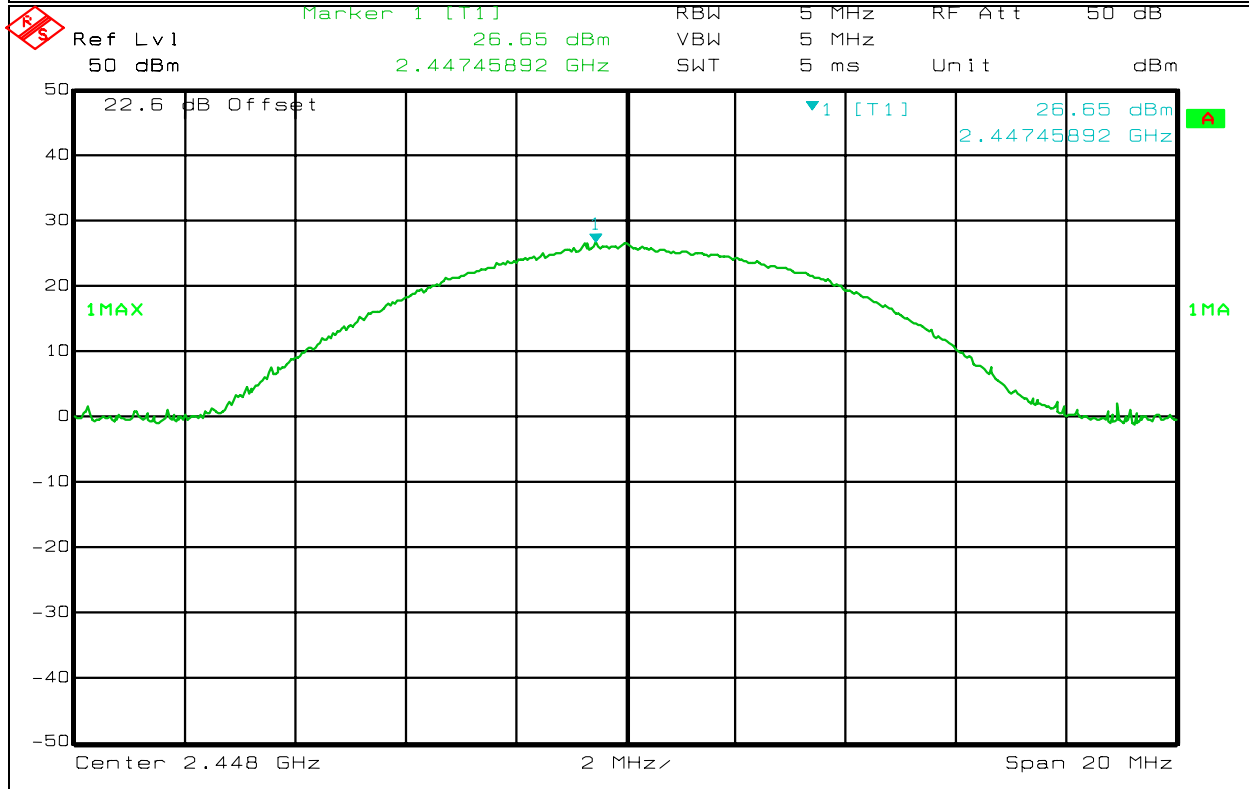
The measurement was repeated at +/- 15% of nominal supply voltage with no variation noted in rf power output.

Antenna Gain:

Horn +12 dBi (Point to point operation)
Radiax 20 dBi loss

Test Data – Peak Power

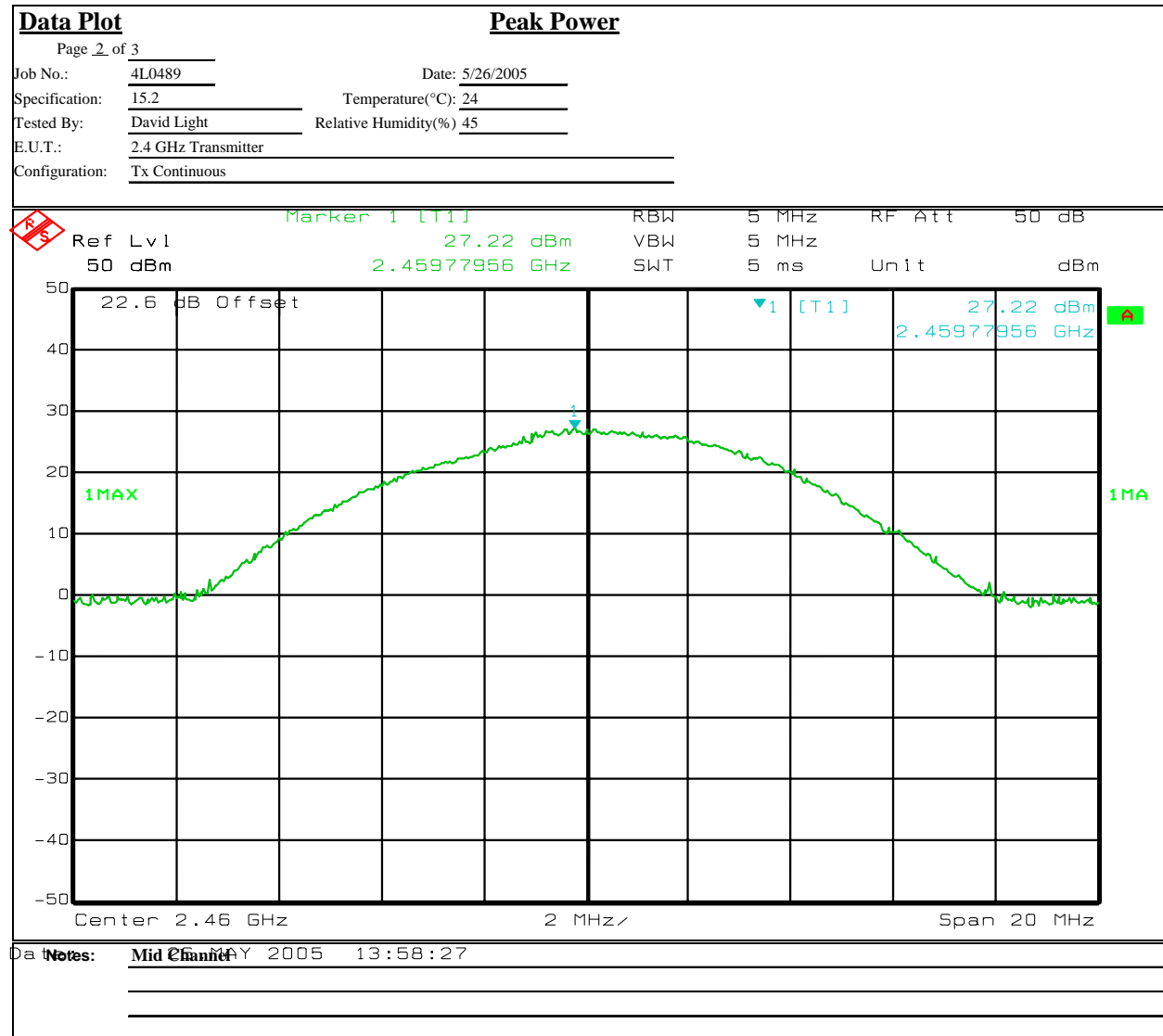
<u>Data Plot</u>		<u>Peak Power</u>	
Page 1 of 3			Complete <u>X</u>
Job No.: 4L0489	Date: 5/26/2005		Preliminary: _____
Specification: 15.247	Temperature(°C): 24		
Tested By: David Light	Relative Humidity(%): 45		
E.U.T.: 2.4 GHz Transmitter			
Configuration: Tx Continuous			
Sample Number: 1			
Location: Lab 1	RBW: 100 kHz		
Detector Type: Peak	VBW: 100 kHz		
<u>Test Equipment Used</u>			
Antenna: _____	Directional Coupler: _____		
Pre-Amp: _____	Cable #1: 1973		
Filter: _____	Cable #2: _____		
Receiver: 1036	Cable #3: _____		
Attenuator #1: _____	Cable #4: _____		
Attenuator #2: 1472	Mixer: _____		
Additional equipment used: _____			
Measurement Uncertainty: +/-1.7 dB			



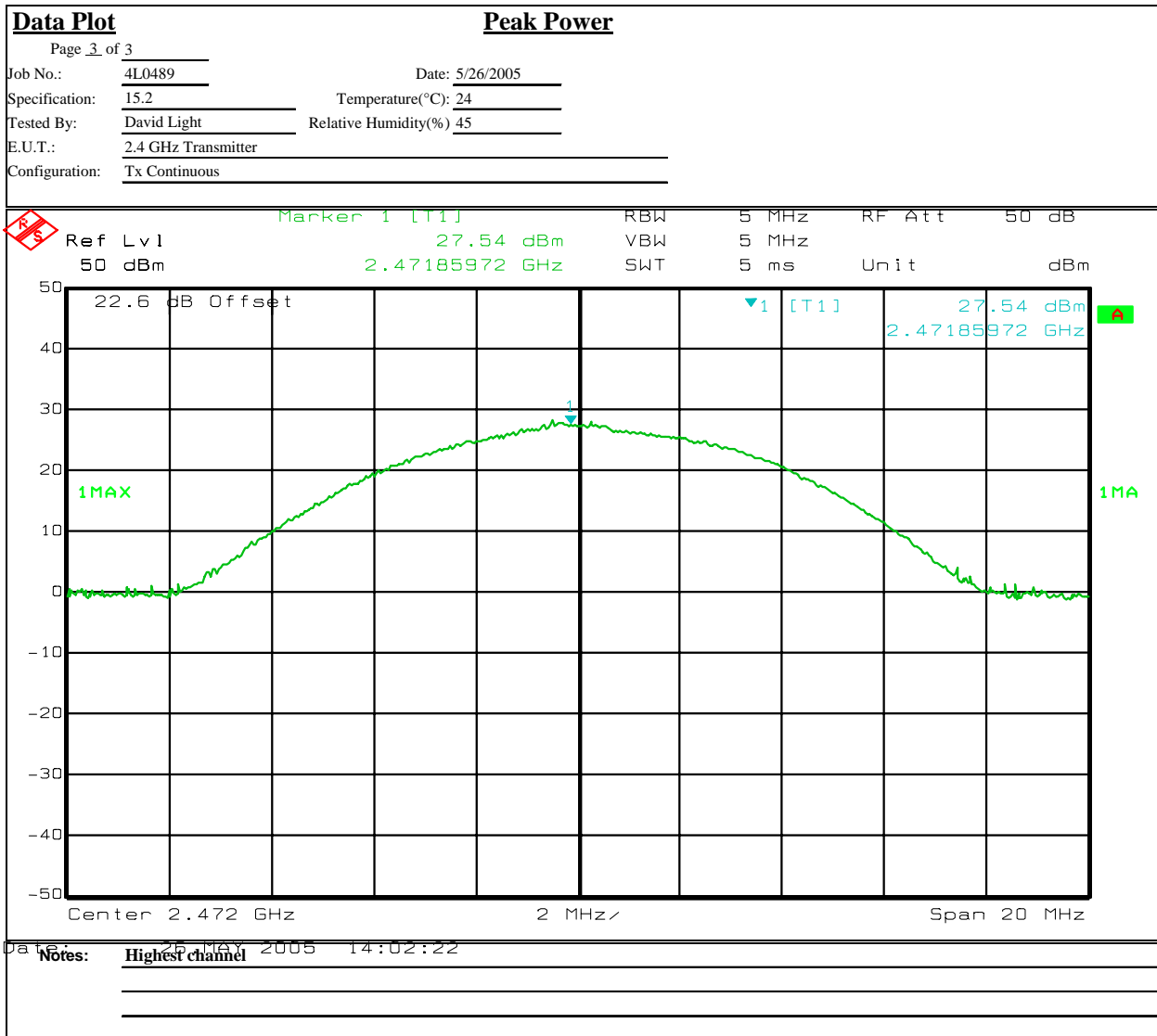
Date: 26 MAY 2005 13:56:24

Notes: Lowest Channel

Test Data – Peak Power



Test Data – Peak Power



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: 5/24/05

Test Results: Complies.

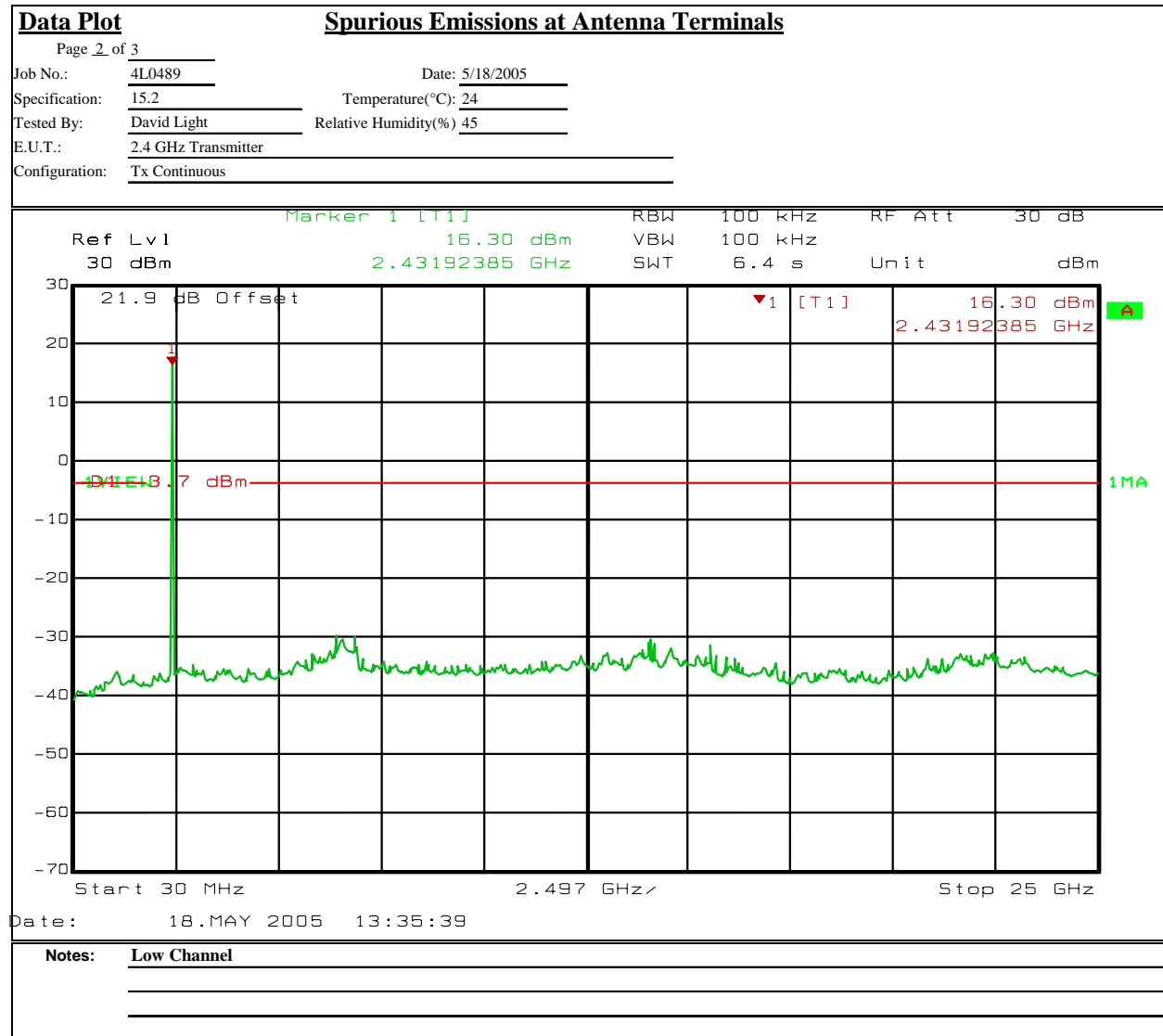
Measurement Data: See attached plots.

The spectrum was thoroughly searched to the 10th harmonic in all modes on three channels. There were no emissions detected within 20 dB of the specification limit of -20 dBc in any 100 kHz bandwidth.

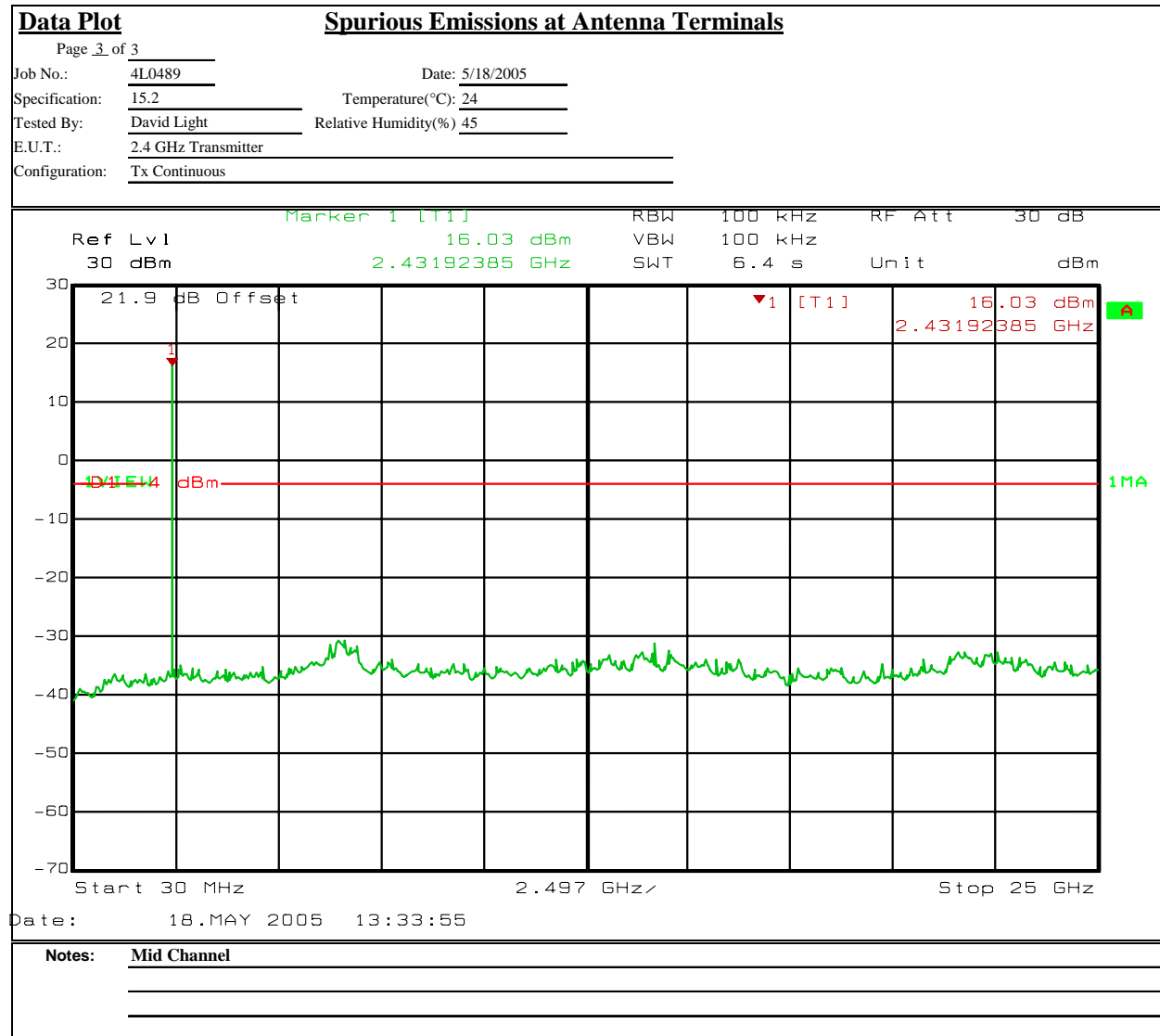
Test Data – Spurious Emissions at Antenna Terminals

<u>Data Plot</u>		<u>Spurious Emissions at Antenna Terminals</u>																			
Page 1 of 3		Complete <u>X</u>																			
Job No.: 4L0489	Date: 5/18/2005	Preliminary: _____																			
Specification: 15.247	Temperature(°C): 24																				
Tested By: David Light	Relative Humidity(%): 45																				
E.U.T.: 2.4 GHz Transmitter	_____																				
Configuration: Tx Continuous	_____																				
Sample Number: 1	_____																				
Location: Lab 1	RBW: 100 kHz																				
Detector Type: Peak	VBW: 100 kHz																				
Test Equipment Used																					
Antenna: _____	Directional Coupler: _____																				
Pre-Amp: _____	Cable #1: 1973																				
Filter: _____	Cable #2: _____																				
Receiver: 1036	Cable #3: _____																				
Attenuator #1: _____	Cable #4: _____																				
Attenuator #2: 1472	Mixer: _____																				
Additional equipment used: _____																					
Measurement Uncertainty: +/-1.7 dB																					
<table border="1"> <tr> <td>Ref Lvl</td> <td>Delta 1 [T1]</td> <td>RBW</td> <td>100 kHz</td> <td>RF Att</td> <td>30 dB</td> </tr> <tr> <td>30 dBm</td> <td>58.01 dB</td> <td>VBW</td> <td>100 kHz</td> <td>Unit</td> <td>dBm</td> </tr> <tr> <td></td> <td>48.39679359 MHz</td> <td>SWT</td> <td>25 ms</td> <td></td> <td></td> </tr> </table>				Ref Lvl	Delta 1 [T1]	RBW	100 kHz	RF Att	30 dB	30 dBm	58.01 dB	VBW	100 kHz	Unit	dBm		48.39679359 MHz	SWT	25 ms		
Ref Lvl	Delta 1 [T1]	RBW	100 kHz	RF Att	30 dB																
30 dBm	58.01 dB	VBW	100 kHz	Unit	dBm																
	48.39679359 MHz	SWT	25 ms																		
Date: 18.MAY 2005 13:37:07																					
Notes: <u>Lowest Channel</u> <u>Lower band edge</u>																					

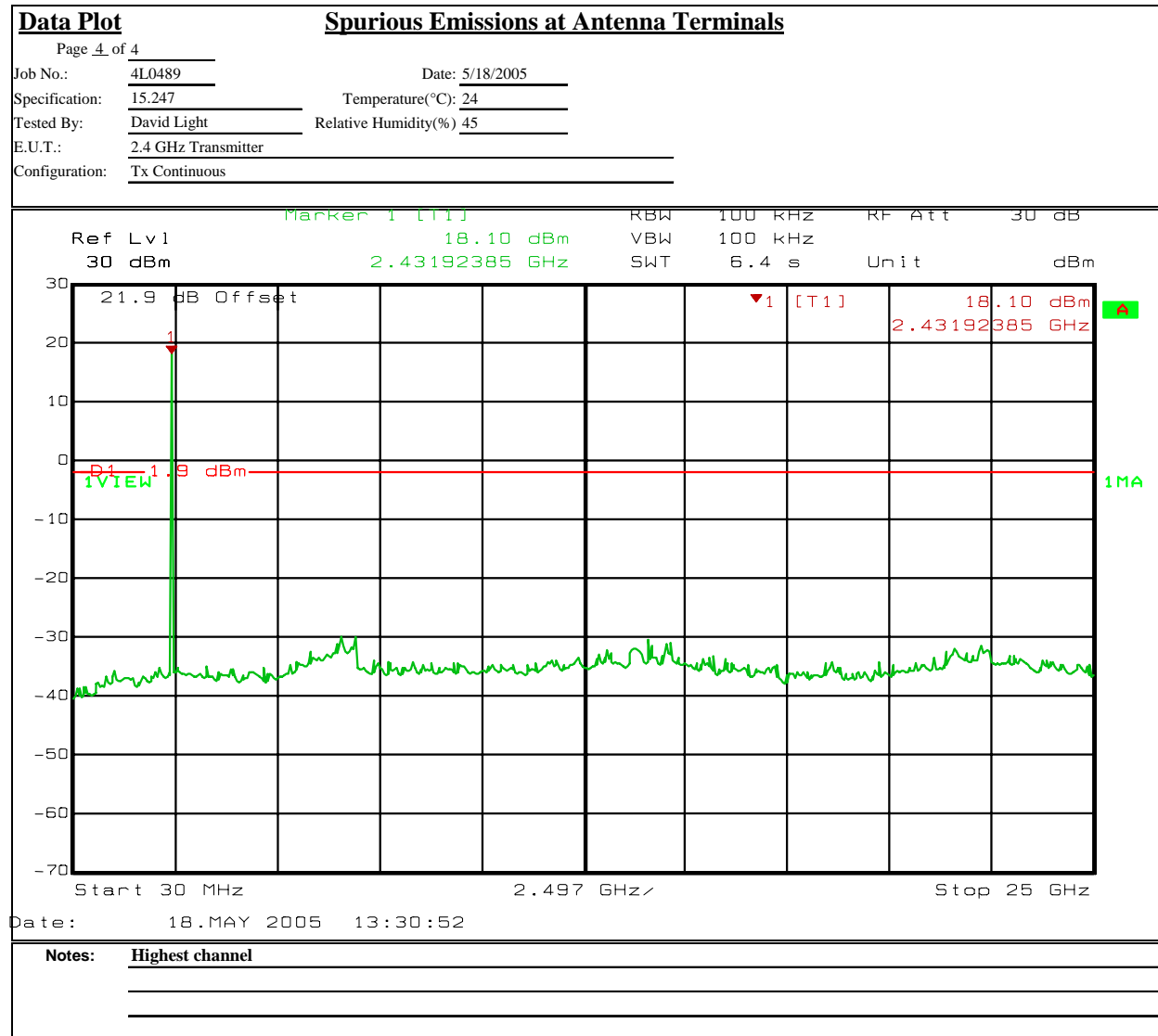
Test Data – Spurious Emissions at Antenna Terminals



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: David Light	DATE: 5/24/05

Test Results: Complies.

Measurement Data: See attached table.

Note: The EUT was tested from 30 MHz to 25 GHz. There were no emissions detected above the noise floor. Data provided to show band edge compliance.

Radiated Emissions – Radiax Antenna

<u>Radiated Emissions</u>	
Page <u>1</u> of <u>1</u>	
Job No.: <u>4L0489</u>	Date: <u>5/24/2005</u>
Specification: <u>15.247/15.205</u>	Temperature(°C): <u>22</u>
Tested By: <u>David Light</u>	Relative Humidity(%) <u>55</u>
E.U.T.: <u>2.4 GHz DTS System</u>	
Configuration: <u>Tx Continuous at full power</u>	
Sample Number: <u>1</u>	
Location: <u>AC 3</u>	RBW: <u>1 MHz</u>
Detector Type: <u>Peak</u>	Peak VBW: <u>1 MHz</u>
Average VBW: <u>1 kHz</u>	
<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>1464</u>	Cable #3: <u>#N/A</u>
Attenuator #1: <u>1472</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>	

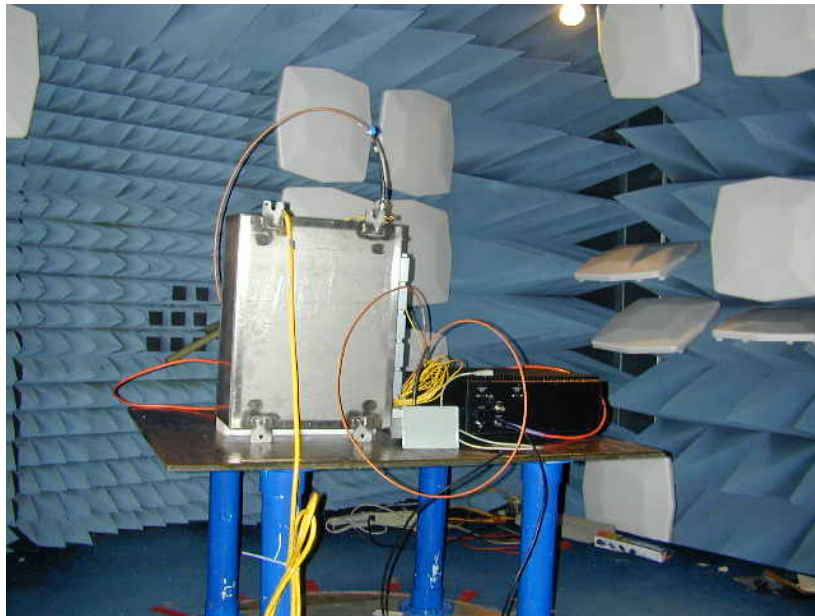
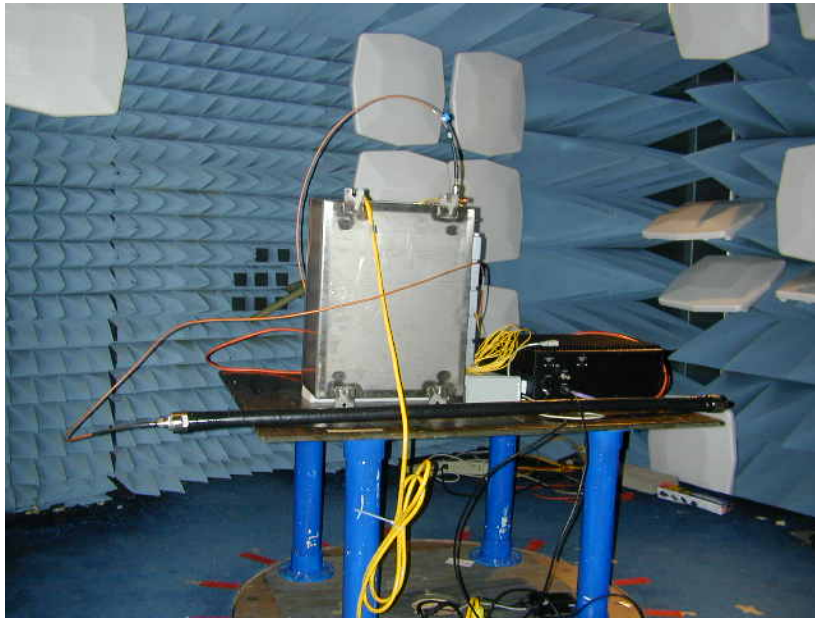
Frequency (GHz)	Meter Reading (dBuV)	Antenna Factor (dB)	Cable Loss (dB)	Pre-Amp Gain (dB)	Corrected Reading (dBuV/m)	Peak Limit (dBuV/m)	Average Limit (dBuV/m)	Detector / Polarity
								Tx at 2472 MHz
2.4835	45.0	28.2	3.1	12.8	63.5	74	54	
2.4835	32.3	28.2	3.1	12.8	50.8	74	54	
2.4835	45.0	28.2	3.1	12.8	63.5	74	54	
2.4835	32.3	28.2	3.1	12.8	50.8	74	54	

Radiated Emissions – Horn Antenna

<u>Radiated Emissions</u>	
Page <u>1</u> of <u>1</u>	
Job No.: <u>4L0489</u>	Date: <u>5/24/2005</u>
Specification: <u>15.247/15.205</u>	Temperature(°C): <u>22</u>
Tested By: <u>David Light</u>	Relative Humidity(%) <u>55</u>
E.U.T.: <u>2.4 GHz DTS System</u>	
Configuration: <u>Tx Continuous at full power</u>	
Sample Number: <u>1</u>	
Location: <u>AC 3</u>	RBW: <u>1 MHz</u>
Detector Type: <u>Peak</u>	Peak VBW: <u>1 MHz</u>
Average VBW: <u>1 kHz</u>	
<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>1464</u>	Cable #3: <u>#N/A</u>
Attenuator #1: <u>1472</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
								Tx at 2472 MHz
2.4835	45.0	28.2	3.1	12.8	63.5	74	54	
2.4835	32.3	28.2	3.1	12.8	50.8	74	54	
2.4835	45.0	28.2	3.1	12.8	63.5	74	54	
2.4835	32.3	28.2	3.1	12.8	50.8	74	54	

Radiated Photographs



Section 8. Peak Power Spectral Density

NAME OF TEST: Peak Power Spectral Density	PARA. NO.: 15.247(d)
TESTED BY: David Light	DATE: 5/26/05

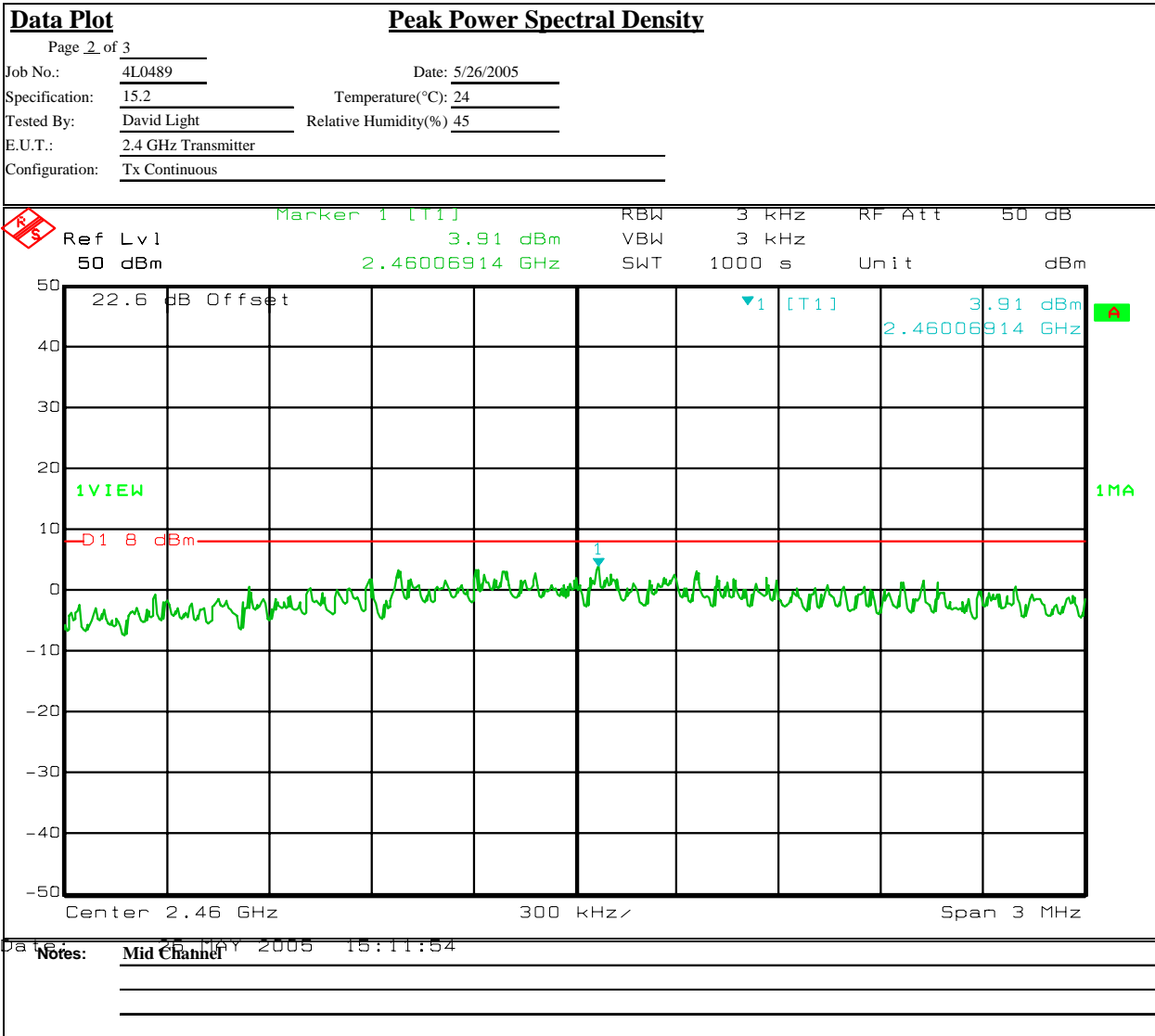
Test Results: Complies.

Measurement Data: See attached data..

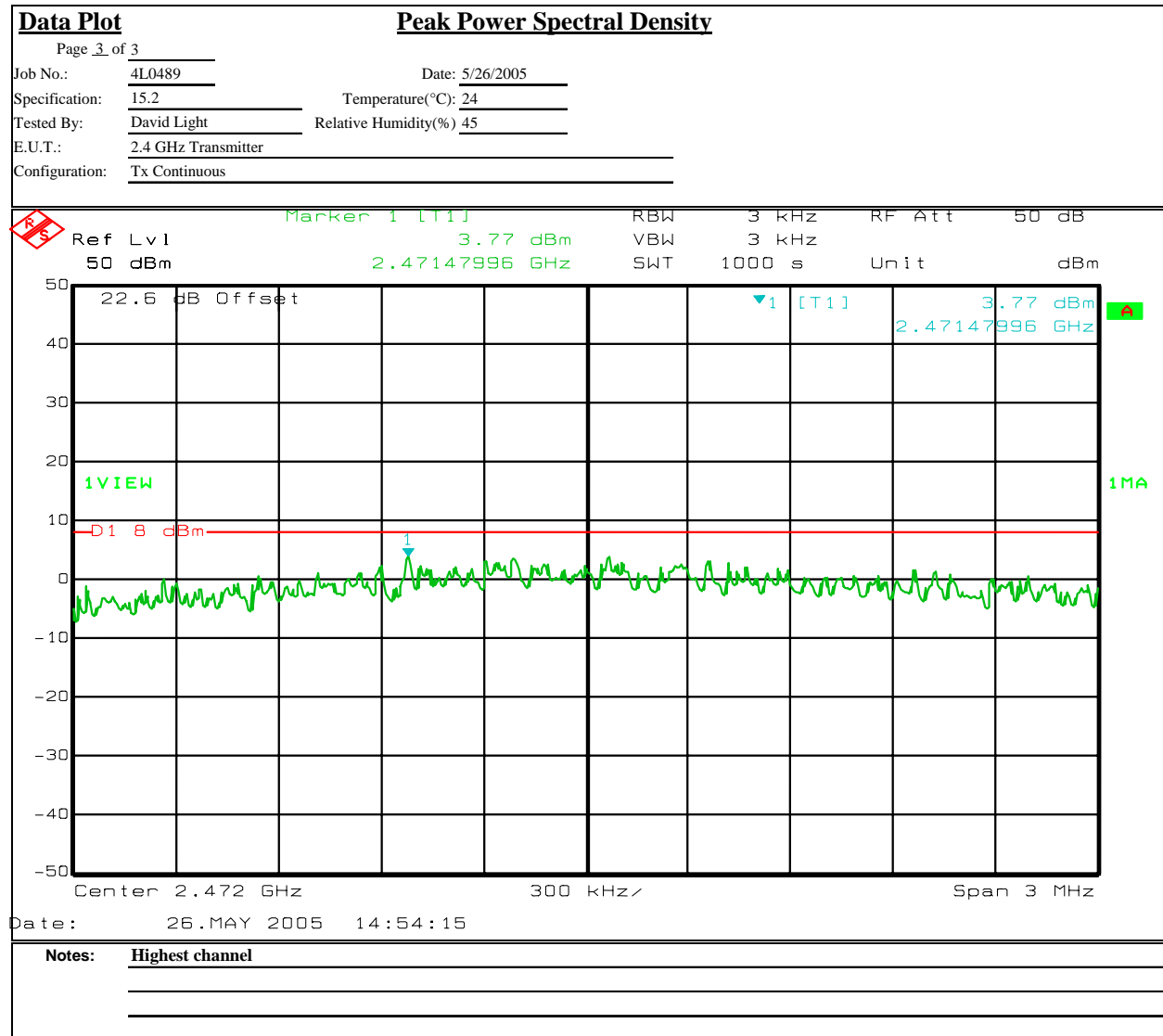
Peak Power Spectral Density

Data Plot	<u>Peak Power Spectral Density</u>			Complete <u> X </u>
Page 1 of 3				Preliminary: _____
Job No.: 4L0489	Date:	5/26/2005		
Specification: 15.247	Temperature(°C):	24		
Tested By: David Light	Relative Humidity(%)	45		
E.U.T.: 2.4 GHz Transmitter	Configuration: Tx Continuous			
Sample Number: 1	Location: Lab 1			
Detector Type: Peak	RBW:	100 kHz		
	VBW:	100 kHz		
Test Equipment Used				
Antenna: _____	Directional Coupler:	_____		
Pre-Amp: _____	Cable #1:	1973		
Filter: _____	Cable #2:	_____		
Receiver: 1036	Cable #3:	_____		
Attenuator #1 _____	Cable #4:	_____		
Attenuator #2: 1472	Mixer:	_____		
Additional equipment used: _____				
Measurement Uncertainty: +/-1.7 dB				
<div style="display: flex; justify-content: space-between; font-size: small;"> Ref Lvl 50 dBm Marker 1 [T1] 3.05 dBm RBW 3 kHz RF Att 50 dB </div> <div style="display: flex; justify-content: space-between; font-size: small;"> 2.44806313 GHz VBW 3 kHz SWT 1000 s Unit dBm </div>				
Center 2.448 GHz 300 kHz Span 3 MHz				
Date: 26 MAY 2005 15:30:56				
Notes: <u>Lowest Channel</u>				

Peak Power Spectral Density



Peak Power Spectral Density



EQUIPMENT: 385700-5000-001 to -004

TEST REPORT NO.:4L0489RUS1rev1

Section 9. Test Equipment List

Nemko ID	Description	Manufacturer Model Number	Serial Number	Calibration Date	Calibration Due
1482	Band Pass Filter	K & L 11SH10-4000/T12000-0/0	2	Cal B4 Use	N/A
1016	Pre-Amp	HEWLETT PACKARD 8449A	2749A00159	11/12/04	11/12/05
1304	HORN ANTENNA	ELECTRO METRICS RGA-60	6151	09/22/03	09/22/05
1036	SPECTRUM ANALYZER	ROHDE & SCHWARZ FSEK30	830844/006	03/22/04	03/23/06
1973	CABLE, 1m	KTL 0	N/A	08/02/04	08/02/05
1472	20db Attenuator DC 18 Ghz	Omni Spectra 20600-20db	NONE	CBU	N/A
1464	Spectrum analyzer	Hewlett Packard 8563E	3551A04428	01/14/05	01/15/07
1472	20db Attenuator DC 18 Ghz	Omni Spectra 20600-20db	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
969	lisn	Schwarzbeck 8120	8120281	09/17/04	09/17/05
704	FILTER, HIGH PASS, 5 KHz	SOLAR 7930-5.0	933126	02/05/04	02/04/05
1553	CABLE 1m	KTL RG223	N/A	06/09/04	06/09/05
1115	CABLE, 4.5m	KTL RG223	N/A	04/27/05	04/27/06
716	Receiver	Polorad ESH2	879342/005	02/02/04	02/01/05
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	06/22/05
791	PREAMP, 25dB	ICC LNA25	398	11/12/04	11/12/05

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.

EQUIPMENT: 385700-5000-001 to -004

TEST REPORT NO.:4L0489RUS1rev1

NAME OF TEST: Occupied 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.

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)
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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)
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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

EQUIPMENT: 385700-5000-001 to -004

TEST REPORT NO.:4L0489RUS1rev1

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)
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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:

UUUUUUUU30 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)
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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 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)
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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 \leq 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:

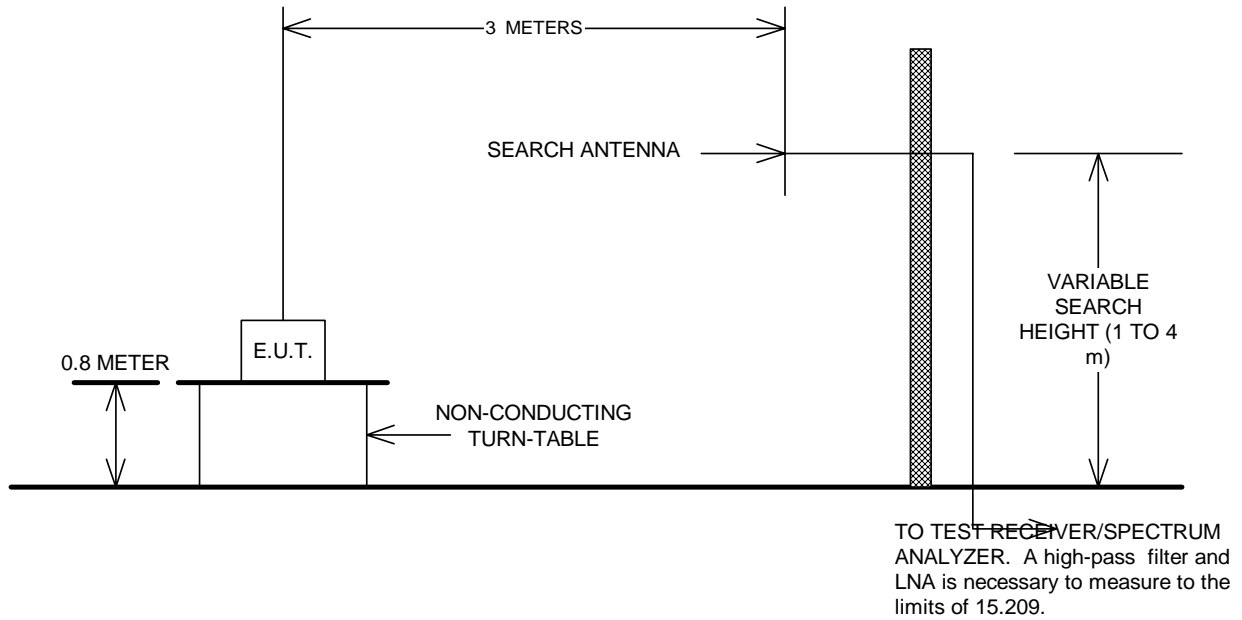
For devices with non-detachable antennas, the received field strength is peaked and the spectrum analyzer is set as above. The peak emission level is then measured and converted to a field strength by adding the appropriate antenna factor and cable loss. This field strength is then converted to an equivalent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

Number of channels tested:

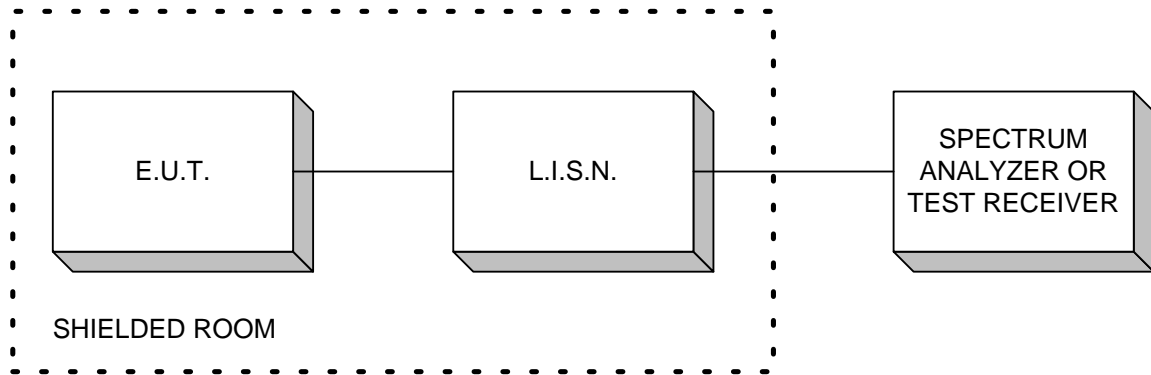
Tuning Range	Number Of Channels Tested	Channel Location In Band
1 MHz or Less	1	Middle
1 to 10 MHz	2	Top And Bottom
More Than 10 MHz	3	Top, Middle, Bottom

ANNEX B - TEST DIAGRAMS

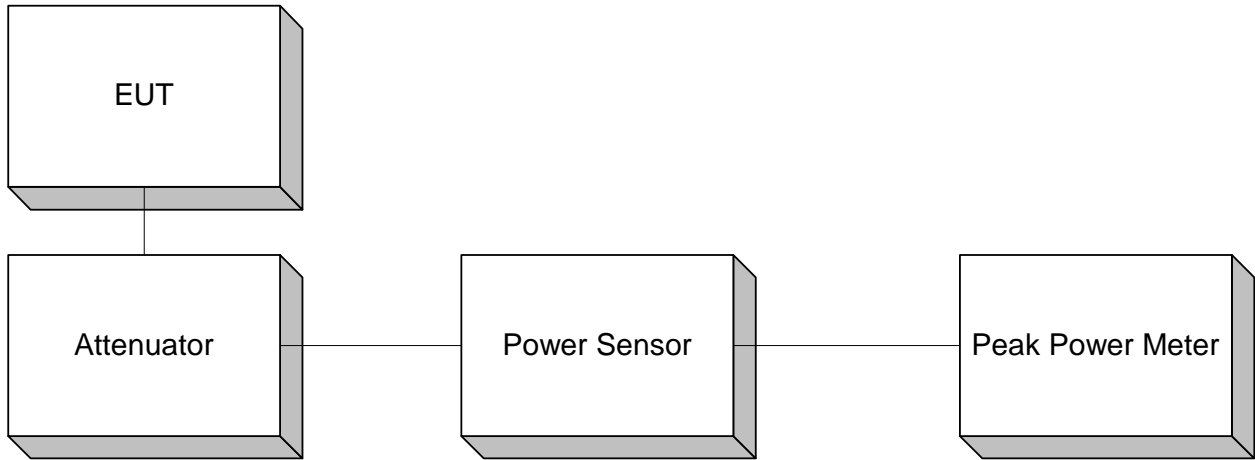
Test Site For Radiated Emissions



Conducted Emissions



Peak Power At Antenna Terminals



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

