



**Nemko Test Report:** 5L0114RUS4Rev1

**Applicant:** Motion Computing, Inc.  
8601 RR 2222 Bldg 2  
Austin, Texas 78730

**Equipment Under Test:** TS01  
(E.U.T.)

**In Accordance With:** **FCC Part 15, Subpart E**  
UNII Band Transceiver

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

**Authorized By:**

A handwritten signature in blue ink, appearing to read 'Tom Tidwell', is written over a horizontal line.

Tom Tidwell, Frontline Group Manager

**Date:** 1 December, 2005

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EQUIPMENT: TS01

TEST REPORT NO.: 5L0114RUS4Rev1

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**Section 1. Summary of Test Results**

Manufacturer: Motion Computing, Inc.

Model No.: TS01

Name: LS800

Serial No.: Proto 8

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 E for UNII devices. Radiated tests were conducted in accordance with ANSI C63.4-2001. 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
26 dB Bandwidth	15.407(a)	Complies
Maximum Peak Power Output	15.407(a)	Complies
Peak Excursion	15.407(b)	Comlies
Spurious Emissions (Antenna Conducted)	15.407(a)	Complies
Spurious Emissions (Restricted Bands)	15.407(a)	Complies
Peak Power Spectral Density	15.407(a)	Complies

**Footnotes:**

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

### **General Equipment Information**

**Frequency Band:**

☒ 5170 – 5240 MHz  
☒ 5260 – 5320 MHz  
☒ 5745 – 5805 MHz

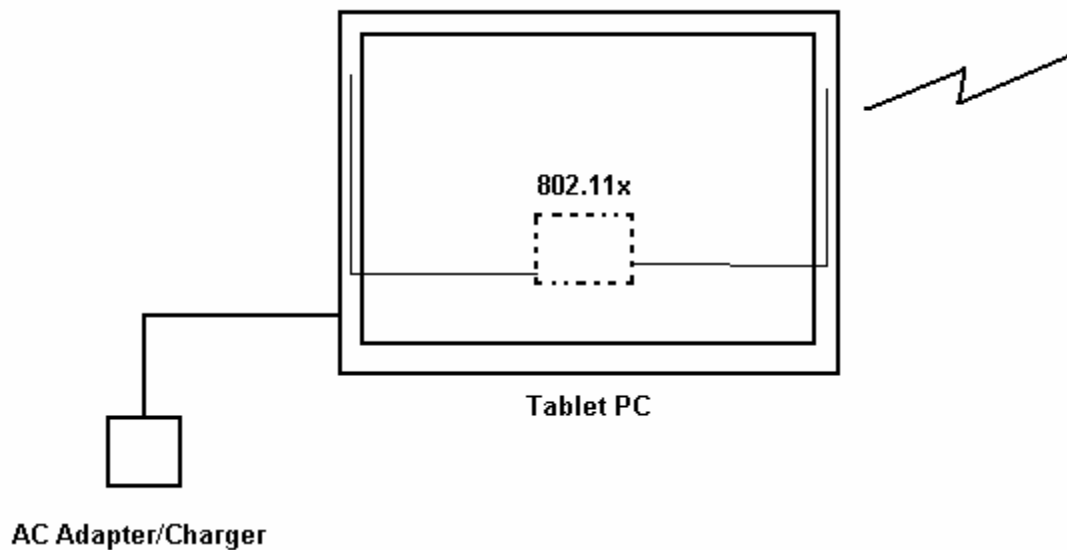
**Channel Spacing:** 5 MHz

**User Frequency Adjustment:** Software controlled

**Description of EUT**

The LS800 TS01 is a portable computer platform based on ultra-portable tablet PC technology utilizing Microsoft's Tablet version of Windows XP. The PC is compatible with 802.11a, b and g technologies.

The PC also has Bluetooth capability.

**System Diagram**

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**Section 3. Powerline Conducted Emissions**

NAME OF TEST: Powerline Conducted Emissions

PARA. NO.: 15.207(a)

TESTED BY: Brian Boyea

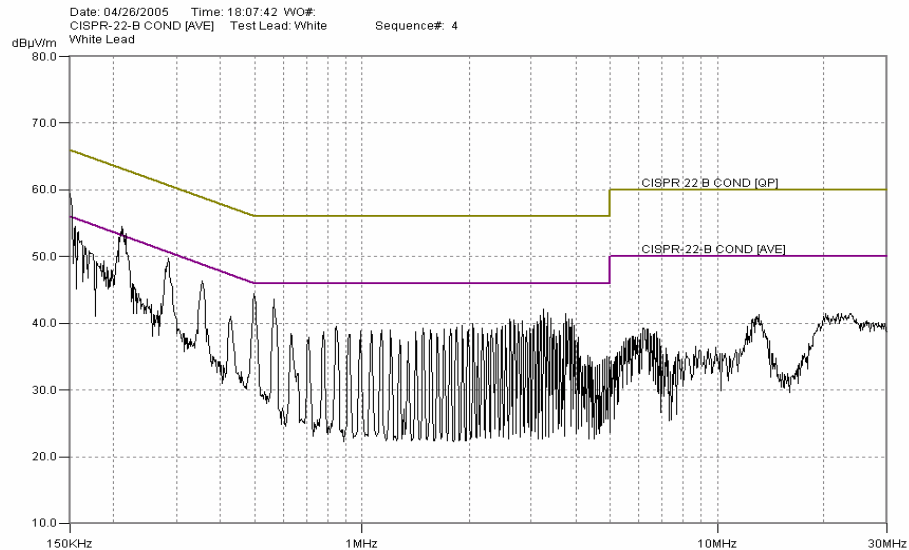
DATE: 4/19/05

**Test Results:** Complies.**Measurement Data:** See attached plots.**Measurement Uncertainty:** +/- 1.7 dB

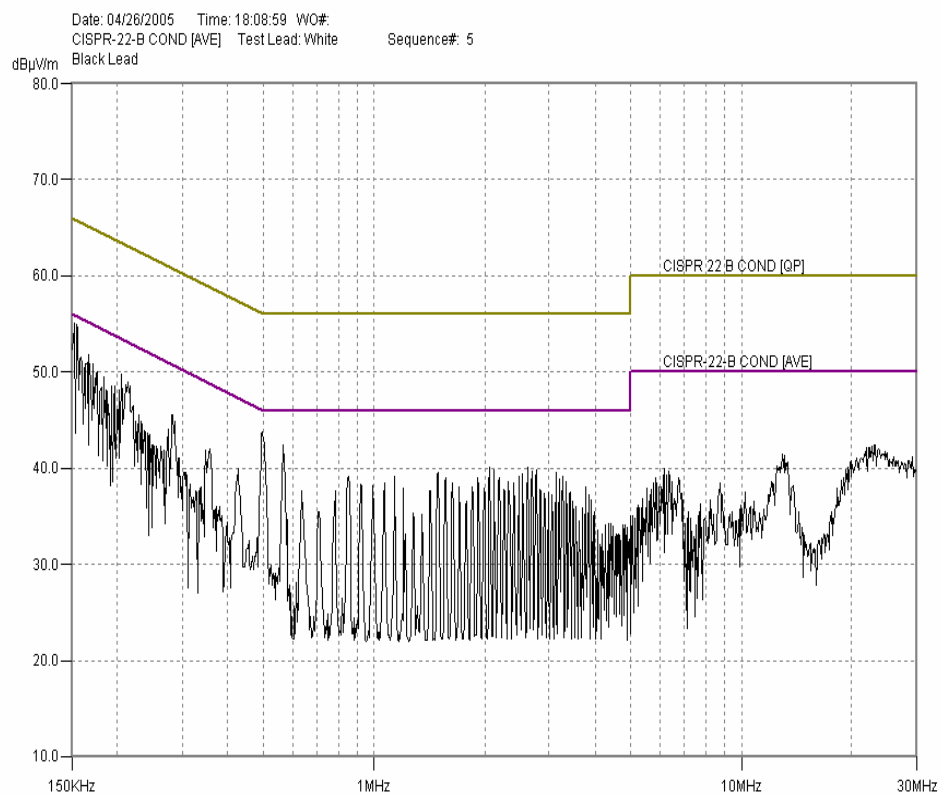
The worst case PEAK emission was 51 dB $\mu$ V at 150 kHz on the neutral line. This is 5 dB below the AVERAGE spec limit of 56 dB $\mu$ V.

**Test Data – Powerline Conducted Emissions**

Neutral



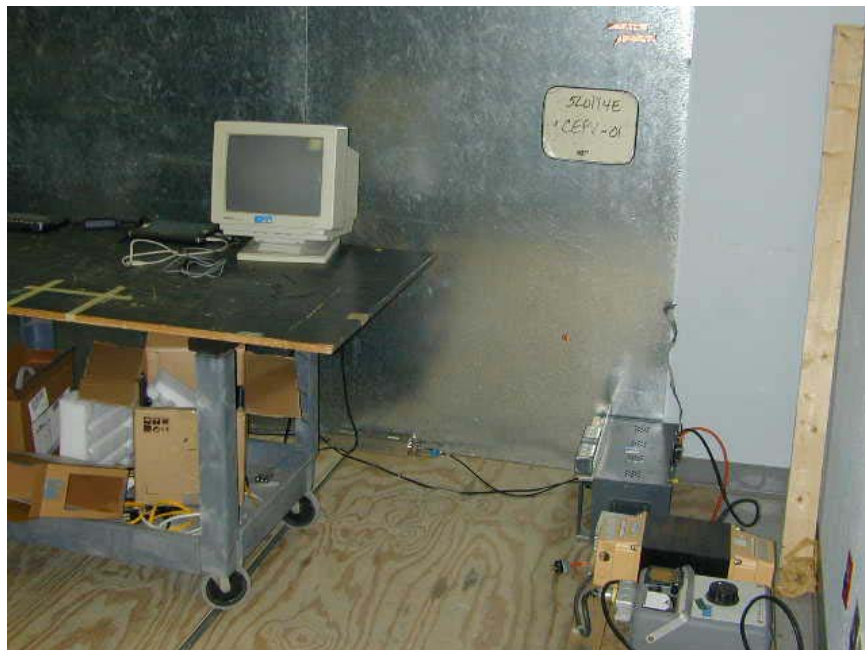
Hot





**Photos – Powerline Conducted Emissions**

Front



Side



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**Section 4.        26 dB Occupied Bandwidth**

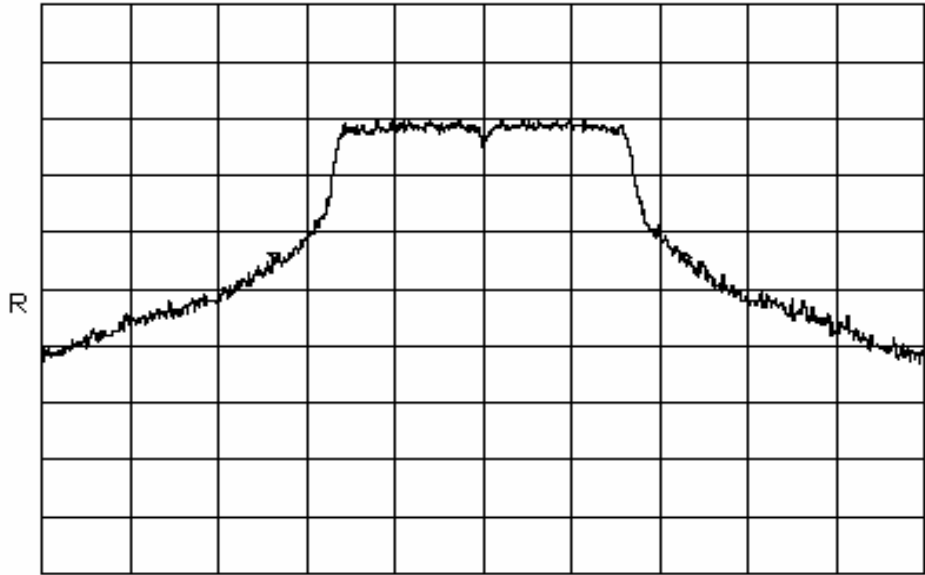
NAME OF TEST: Occupied Bandwidth	PARA. NO.: 15.407(a)
TESTED BY: David Light	DATE: 03 May 2005

**Test Results:**                      Complies.

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## Test Data – 26 dB Bandwidth

<u>Data Plot</u>		<u>Occupied Bandwidth</u>	
Page <u>1</u> of <u>2</u>		Complete <u>X</u>	
Job No.: <u>5L0114</u>	Date: <u>5/11/2005</u>	Preliminary: _____	
Specification: <u>15.407(a)</u>	Temperature(°C): <u>23</u>		
Tested By: <u>David Light</u>	Relative Humidity(%) <u>45</u>		
E.U.T.: <u>Tablet PC w/Atheros 802.11 a/b/g radio</u>			
Configuration: <u>Tx</u>			
Sample Number: <u>1</u>			
Location: <u>Lab 1</u>	RBW: <u>300 kHz</u>		
Detector Type: <u>Peak</u>	VBW: <u>300 kHz</u>		
<u>Test Equipment Used</u>			
Antenna: _____	Directional Coupler: _____		
Pre-Amp: _____	Cable #1: <u>1973</u>		
Filter: _____	Cable #2: _____		
Receiver: <u>1464</u>	Cable #3: _____		
Attenuator #1: <u>1472</u>	Cable #4: _____		
Attenuator #2: _____	Mixer: _____		
Additional equipment used: _____			
Measurement Uncertainty: <u>+/-1.7 dB</u>			
<div>ATTEN 10dB      ΔMKR -.50dB RL -23.6dBm      10dB/      23.33MHz</div>  <div>CENTER 5.17000GHz      SPAN 50.00MHz *RBW 300kHz      VBW 300kHz      SWP 50.0ms</div>			
Notes: _____ _____ _____			

EQUIPMENT: TS01

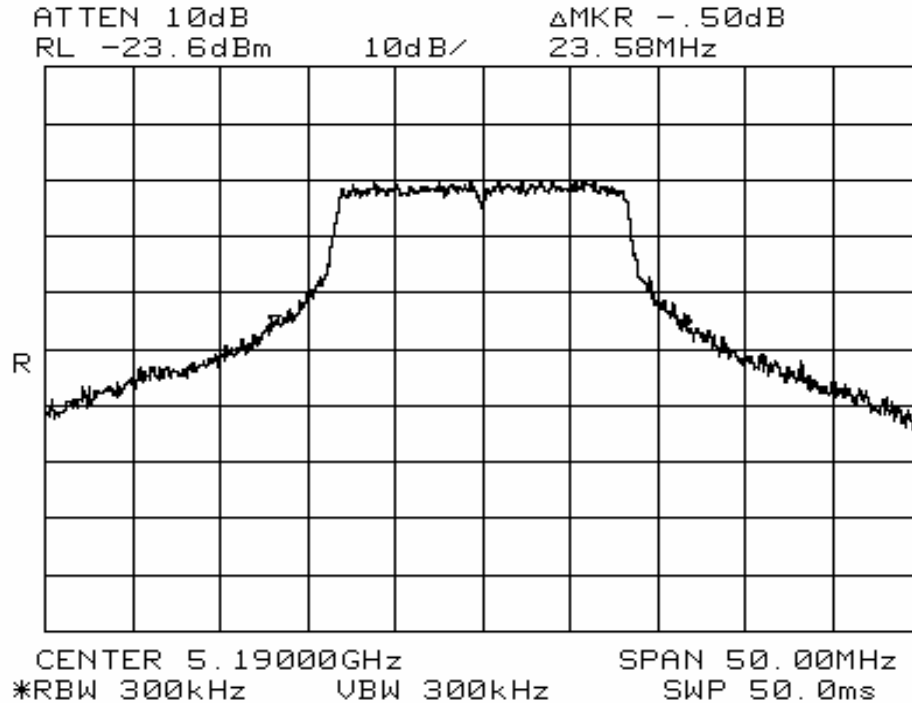
TEST REPORT NO.: 5L0114RUS4Rev1

## Test Data – 26 dB Bandwidth

**Data Plot****Occupied Bandwidth**

Page 2 of 9

Job No.: 5L0114 Date: 5/11/2005  
Specification: 15.407(a) Temperature(°C): 23  
Tested By: David Light Relative Humidity(%) 45  
E.U.T.: Tablet PC w/Atheros 802.11 a/b/g radio  
Configuration: Tx



Notes:

EQUIPMENT: TS01

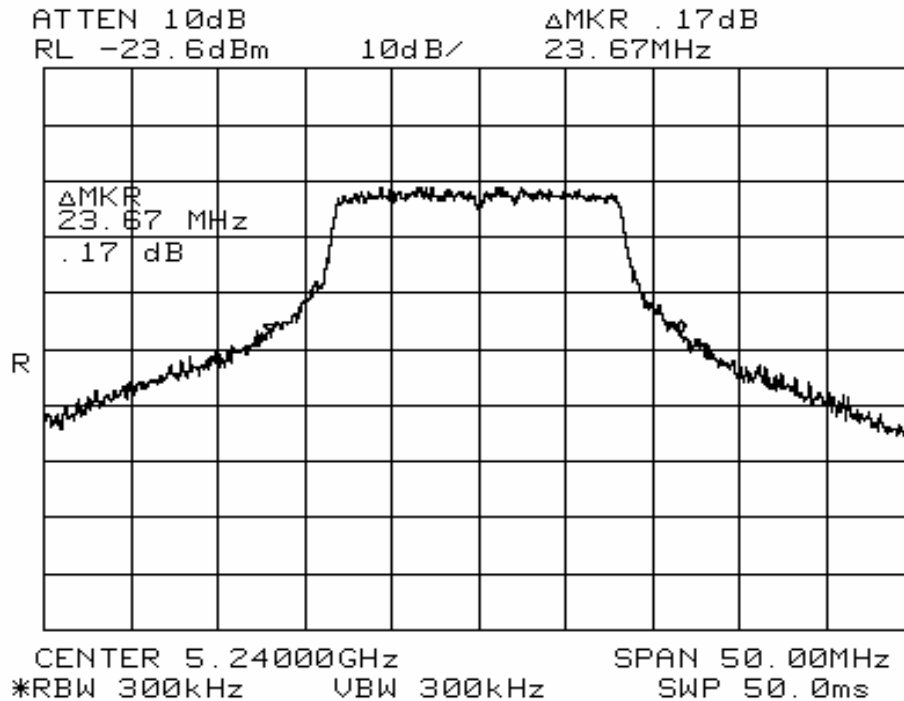
TEST REPORT NO.: 5L0114RUS4Rev1

## Test Data – 26 dB Bandwidth

**Data Plot**

Page 3 of 9

Job No.: 5L0114 Date: 5/11/2005  
Specification: 15.407(a) Temperature(°C): 23  
Tested By: David Light Relative Humidity(%) 45  
E.U.T.: Tablet PC w/Atheros 802.11 a/b/g radio  
Configuration: Tx

**Occupied Bandwidth**

Notes:

EQUIPMENT: TS01

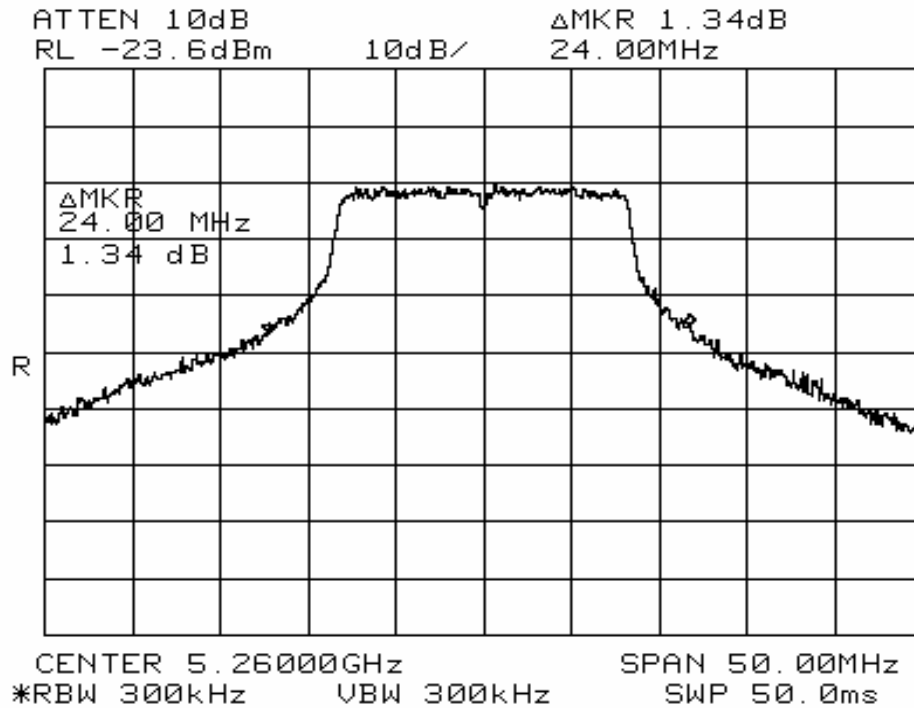
TEST REPORT NO.: 5L0114RUS4Rev1

## Test Data – 26 dB Bandwidth

**Data Plot****Occupied Bandwidth**

Page 4\_ of 9

Job No.:	5L0114	Date:	5/11/2005
Specification:	15.407(a)	Temperature(°C):	23
Tested By:	David Light	Relative Humidity(%)	45
E.U.T.:	Tablet PC w/Atheros 802.11 a/b/g radio		
Configuration:	Tx		



Notes:

EQUIPMENT: TS01

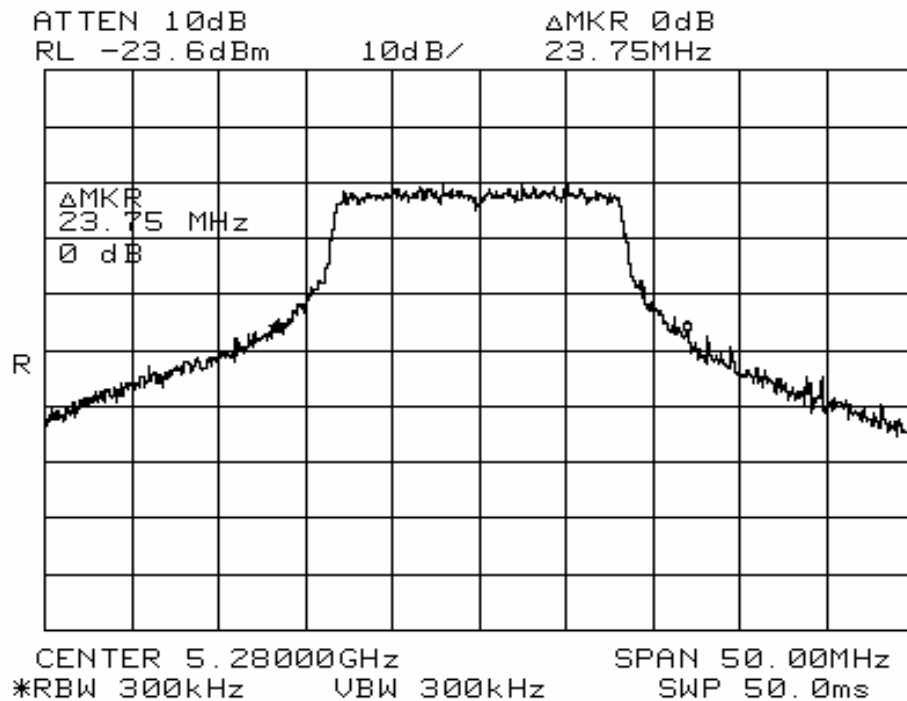
TEST REPORT NO.: 5L0114RUS4Rev1

## Test Data – 26 dB Bandwidth

**Data Plot****Occupied Bandwidth**

Page 5 of 9

Job No.: 5L0114 Date: 5/11/2005  
Specification: 15.407(a) Temperature(°C): 23  
Tested By: David Light Relative Humidity(%) 45  
E.U.T.: Tablet PC w/Atheros 802.11 a/b/g radio  
Configuration: Tx

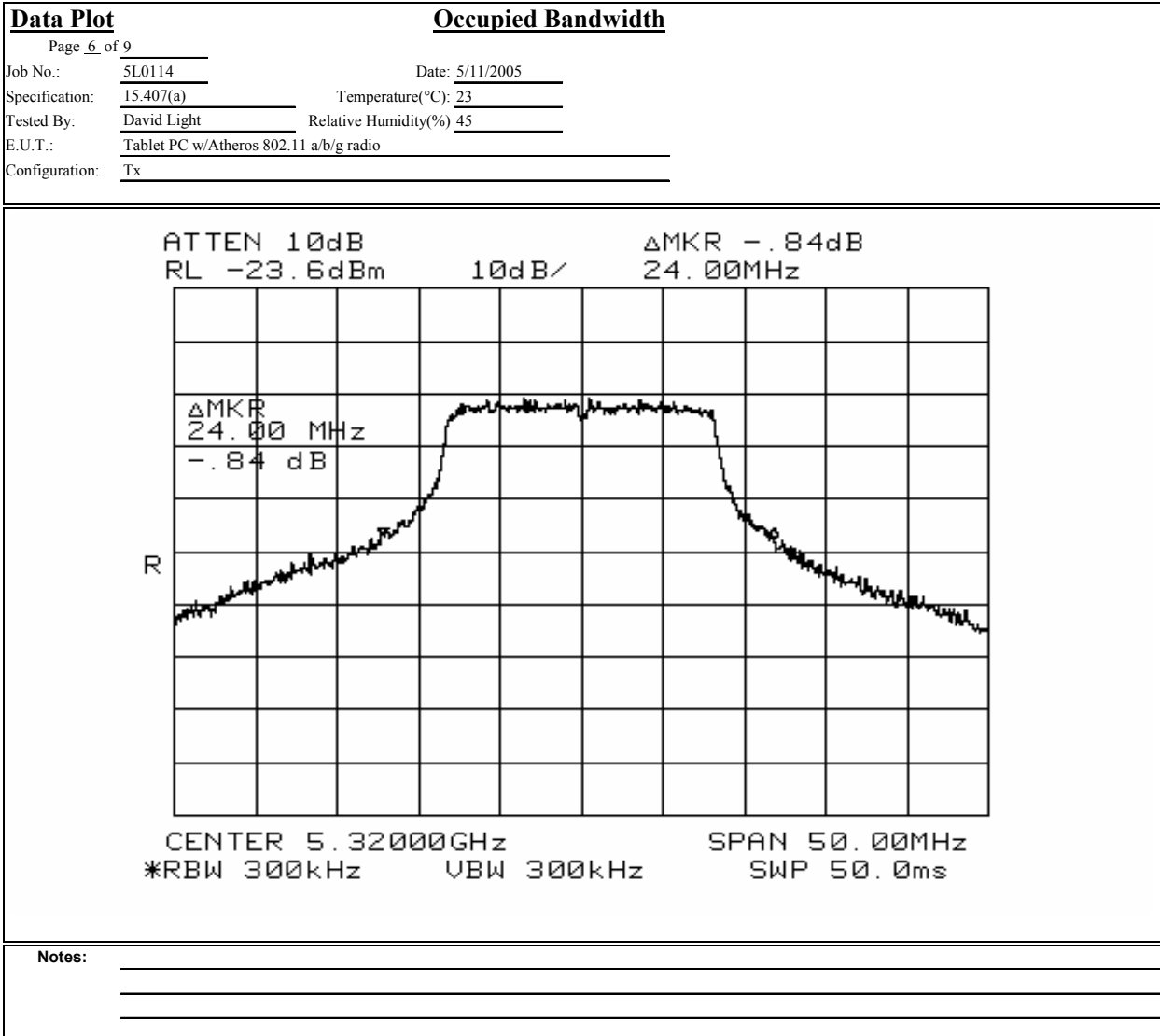


Notes:

EQUIPMENT: TS01

TEST REPORT NO.: 5L0114RUS4Rev1

## Test Data – 26 dB Bandwidth





EQUIPMENT: TS01

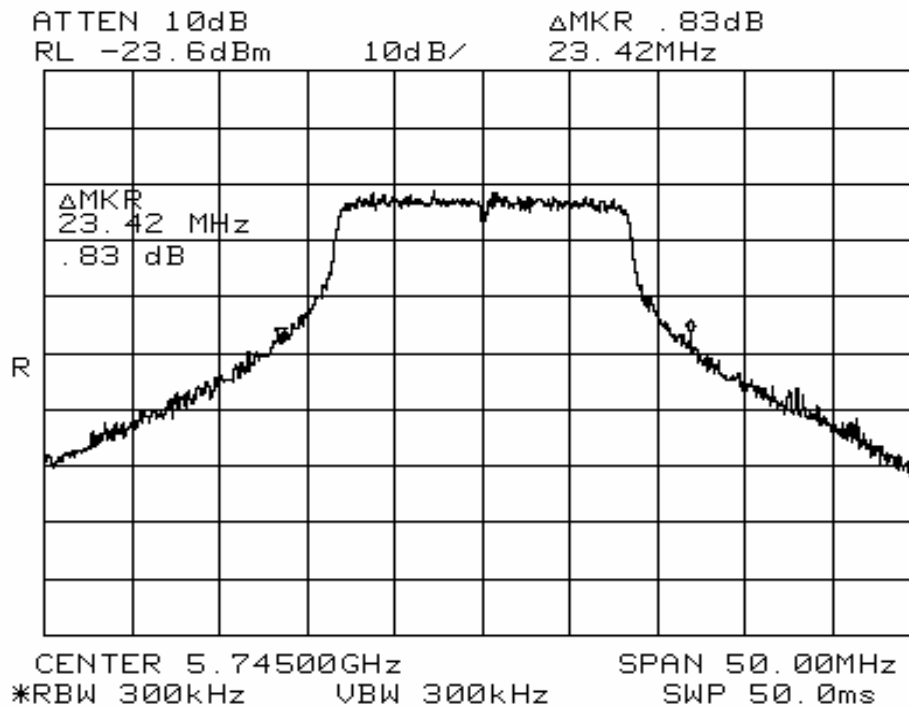
TEST REPORT NO.: 5L0114RUS4Rev1

## Test Data – 26 dB Bandwidth

**Data Plot****Occupied Bandwidth**

Page 9 of 9

Job No.:	5L0114	Date:	5/11/2005
Specification:	15.407(a)	Temperature(°C):	23
Tested By:	David Light	Relative Humidity(%)	45
E.U.T.:	Tablet PC w/Atheros 802.11 a/b/g radio		
Configuration:	Tx		



Notes:

EQUIPMENT: TS01

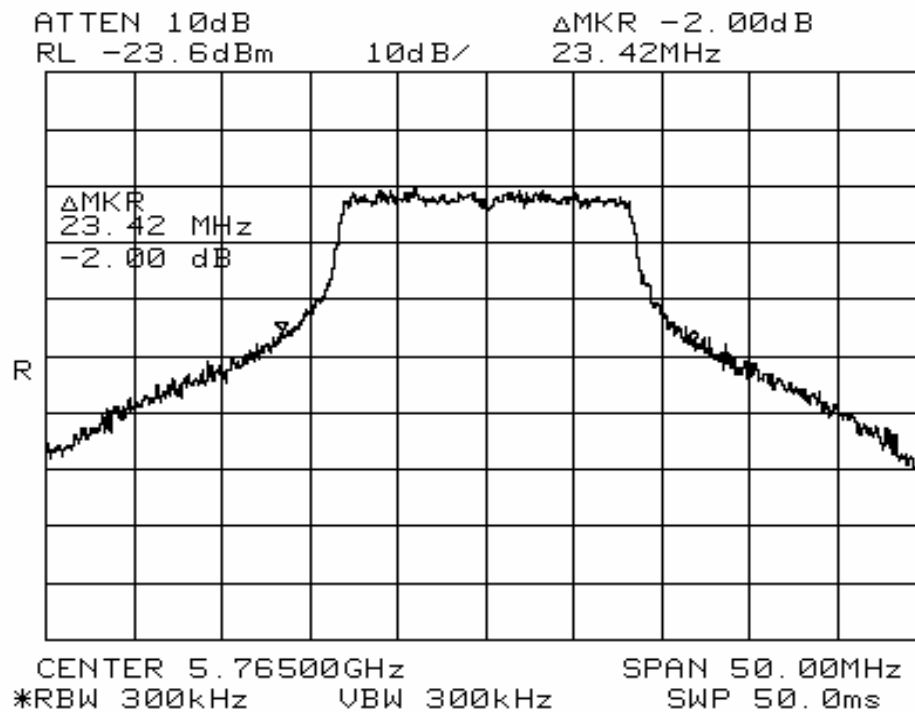
TEST REPORT NO.: 5L0114RUS4Rev1

## Test Data – 26 dB Bandwidth

**Data Plot****Occupied Bandwidth**

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Job No.: 5L0114 Date: 5/11/2005  
Specification: 15.407(a) Temperature(°C): 23  
Tested By: David Light Relative Humidity(%) 45  
E.U.T.: Tablet PC w/Atheros 802.11 a/b/g radio  
Configuration: Tx



Notes:

EQUIPMENT: TS01

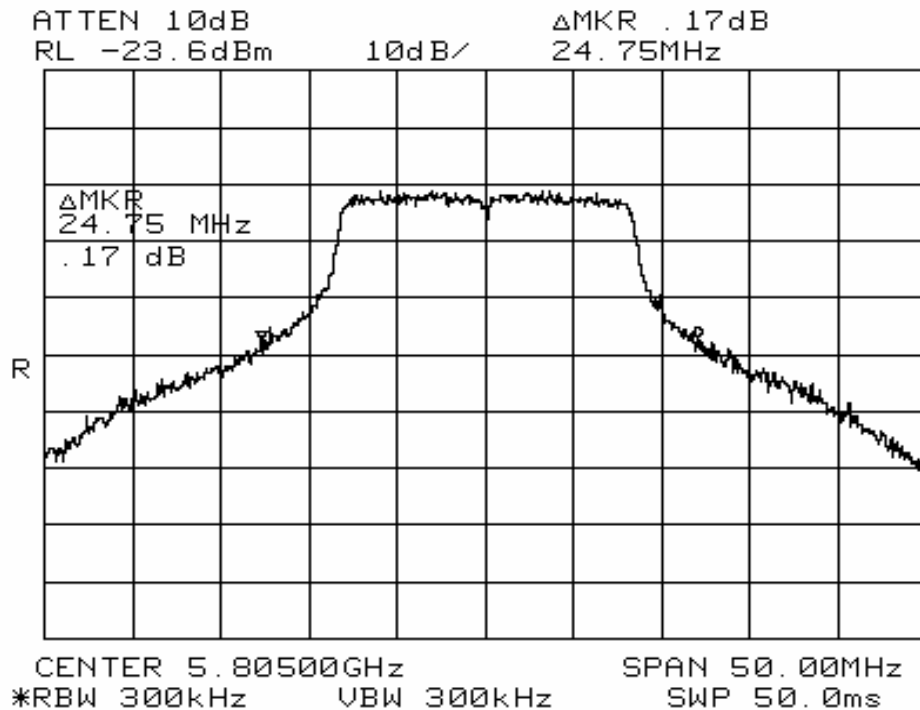
TEST REPORT NO.: 5L0114RUS4Rev1

## Test Data – 26 dB Bandwidth

**Data Plot****Occupied Bandwidth**

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Job No.: 5L0114 Date: 5/11/2005  
Specification: 15.407(a) Temperature(°C): 23  
Tested By: David Light Relative Humidity(%) 45  
E.U.T.: Tablet PC w/Atheros 802.11 a/b/g radio  
Configuration: Tx



Notes:

**Section 5. Maximum Peak Output Power**

NAME OF TEST: Maximum Peak Output power	PARA. NO.: 15.407(a)
TESTED BY: David Light	DATE: 03 May 2005

- (1) For the band 5.15-5.25 GHz, the maximum conducted output power over the frequency band of operation shall not exceed the lesser of 50 mW or 4 dBm + 10 log B, where B is the 26-dB emission bandwidth in MHz.

Limit = lesser of 50 mW(17 dBm) or 4 dBm + 10log(20) = 17 dBm

Limit = 50 mW(+17 dBm)

- (2) For the 5.25-5.35 GHz and 5.47-5.725 GHz bands, the maximum conducted output power over the frequency bands of operation shall not exceed the lesser of 250 mW or 11 dBm + 10 log B, where B is the 26 dB emission bandwidth in megahertz.

Limit = lesser of 250 mW(24 dBm) or 11 dBm + 10log(20) = +24 dBm

Limit = 250 mW(+24 dBm)

- (3) For the band 5.725-5.825 GHz, the maximum conducted output power over the frequency band of operation shall not exceed the lesser of 1 W or 17 dBm + 10 log B, where B is the 26-dB emission bandwidth in MHz. In addition, the peak power spectral density shall not exceed 17 dBm in any 1-MHz band. If transmitting antennas of directional gain greater than 6 dBi are used, both the maximum conducted output power and the peak power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi. However, fixed point-to-point U-NII devices operating in this band may employ transmitting antennas with directional gain up to 23 dBi without any corresponding reduction in the transmitter peak output power or peak power spectral density. For fixed, point-to-point U-NII transmitters that employ a directional antenna gain greater than 23 dBi, a 1 dB reduction in peak transmitter power and peak power spectral density for each 1 dB of antenna gain in excess of 23 dBi would be required. Fixed, point-to-point operations exclude the use of point-to-multipoint systems, omnidirectional applications, and multiple collocated transmitters transmitting the same information. The operator of the U-NII device, or if the equipment is professionally installed, the installer, is responsible for ensuring that systems employing high gain directional antennas are used exclusively for fixed, point-to-point operations.

Limit = lesser of 1 W (30 dBm) or 17 dBm + 10log(20) = +30 dBm

Limit = 1 W(+30 dBm)

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**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.

Maximum Peak Power:

Frequency (MHz)	Peak Power (dBm)	Peak Power (mW)
5150 – 5250 MHz band		
5170	12.9	9.8
5240	13.2	9.2
5250 – 5350 MHz band		
5260	10.7	9.0
5320	9.9	8.7
5725 – 5825 MHz band		
5745	8.1	8.2
5805	8.6	8.1

**Test Equipment Used:** 1464-1973-1472**Test Conditions:** 20°C  
50% RH

The carrier is continuous and method #1 of FCC Public Notice DA 02-2138 was used to make the measurement.

*EQUIPMENT:* TS01

TEST REPORT NO.: 5L0114RUS4Rev1

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**Section 6. Peak Excursion**

NAME OF TEST: Peak Excursion	PARA. NO.: 15. 407
TESTED BY: David Light	DATE: 13 May 2005

**Test Results:** Maximum excursion = 13.9 dB.

**Measurement Data:** See attached plots

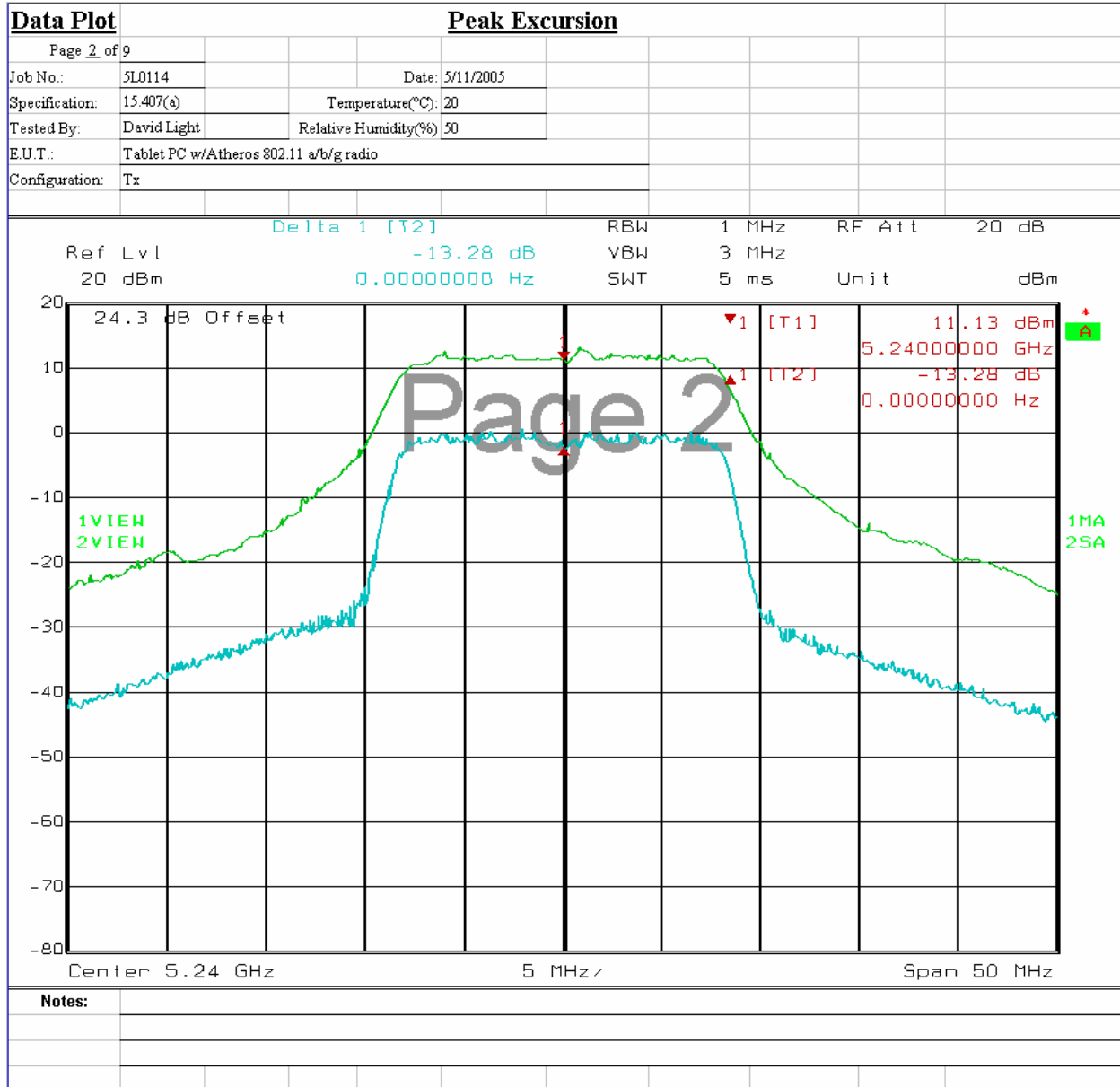
TEST REPORT NO.: 5L0114RUS4Rev1

<b>Data Plot</b>		<b>Peak Excursion</b>	
Page 1 of 2			
Job No.: 5L0114	Date: 5/11/2005	Complete	X
Specification: 15.407(a)	Temperature(°C): 20	Preliminary:	
Tested By: David Light	Relative Humidity(%): 50		
E.U.T.: Tablet PC w/Atheros 802.11 a/b/g radio			
Configuration: Tx			
Sample Number: 1			
Location: Lab 1	RBW: Refer to plots		
Detector Type: Peak	VBW: Refer to plots		
<b>Test Equipment Used</b>			
Antenna:	Directional Coupler:		
Pre-Amp:	Cable #1: 1081		
Filter:	Cable #2:		
Receiver: 1036	Cable #3:		
Attenuator #1: 1472	Cable #4:		
Attenuator #2:	Mixer:		
Additional equipment used:			
Measurement Uncertainty: +/-1.7 dB			
<p>Ref Lvl 20 dBm Unit dBm</p> <p>Center 5.17 GHz      5 MHz/      Span 50 MHz</p> <p>Delta 1 [T2] -13.75 dB 0.000000 Hz</p> <p>1VIEW 2VIEW</p> <p>13.59 dBm 5.17000000 GHz -13.75 dB 0.00000000 Hz</p> <p>1MA 25A</p>			
Notes:			

EQUIPMENT: TS01

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## Test Data – Peak Excursion

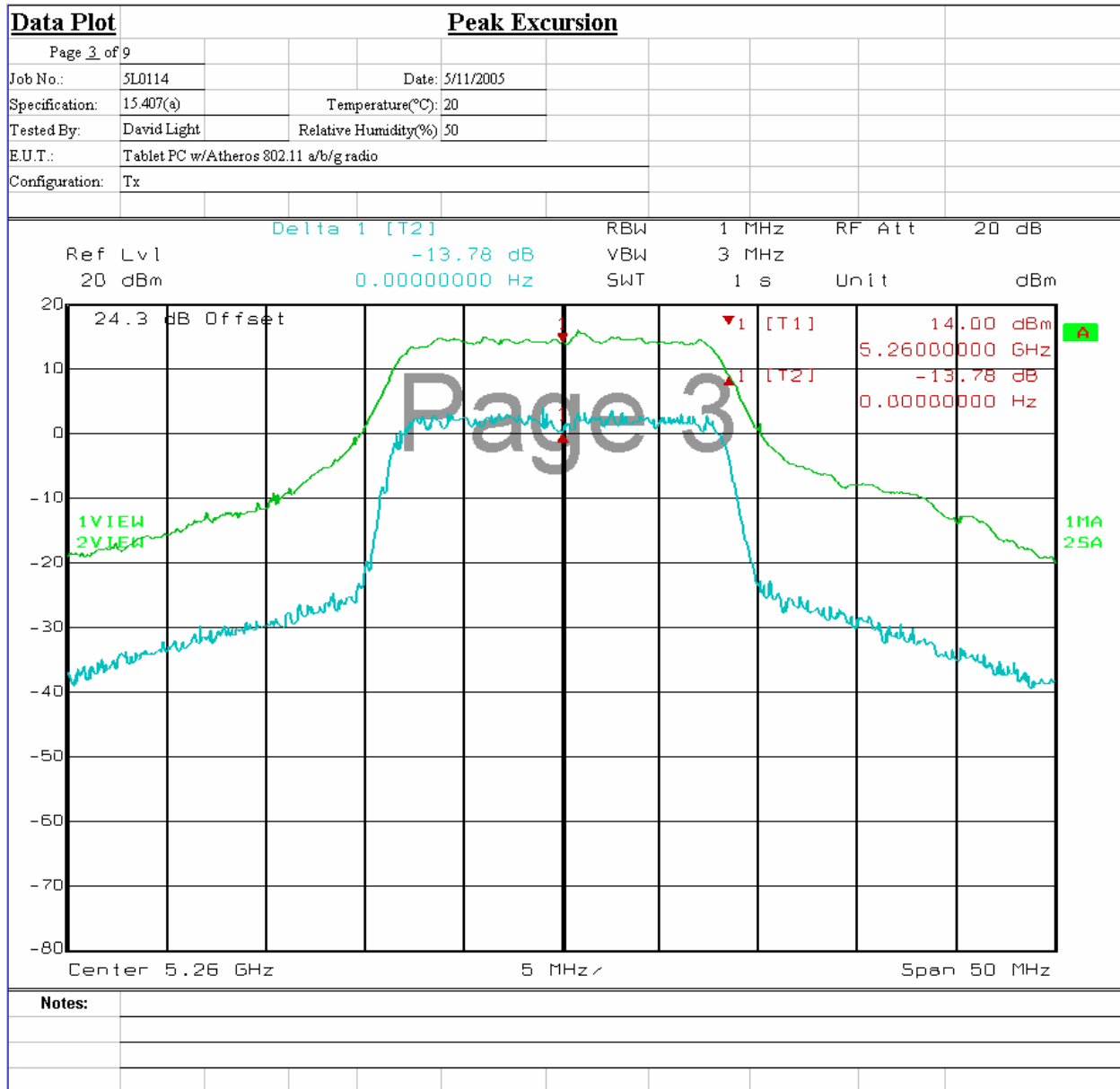




EQUIPMENT: TS01

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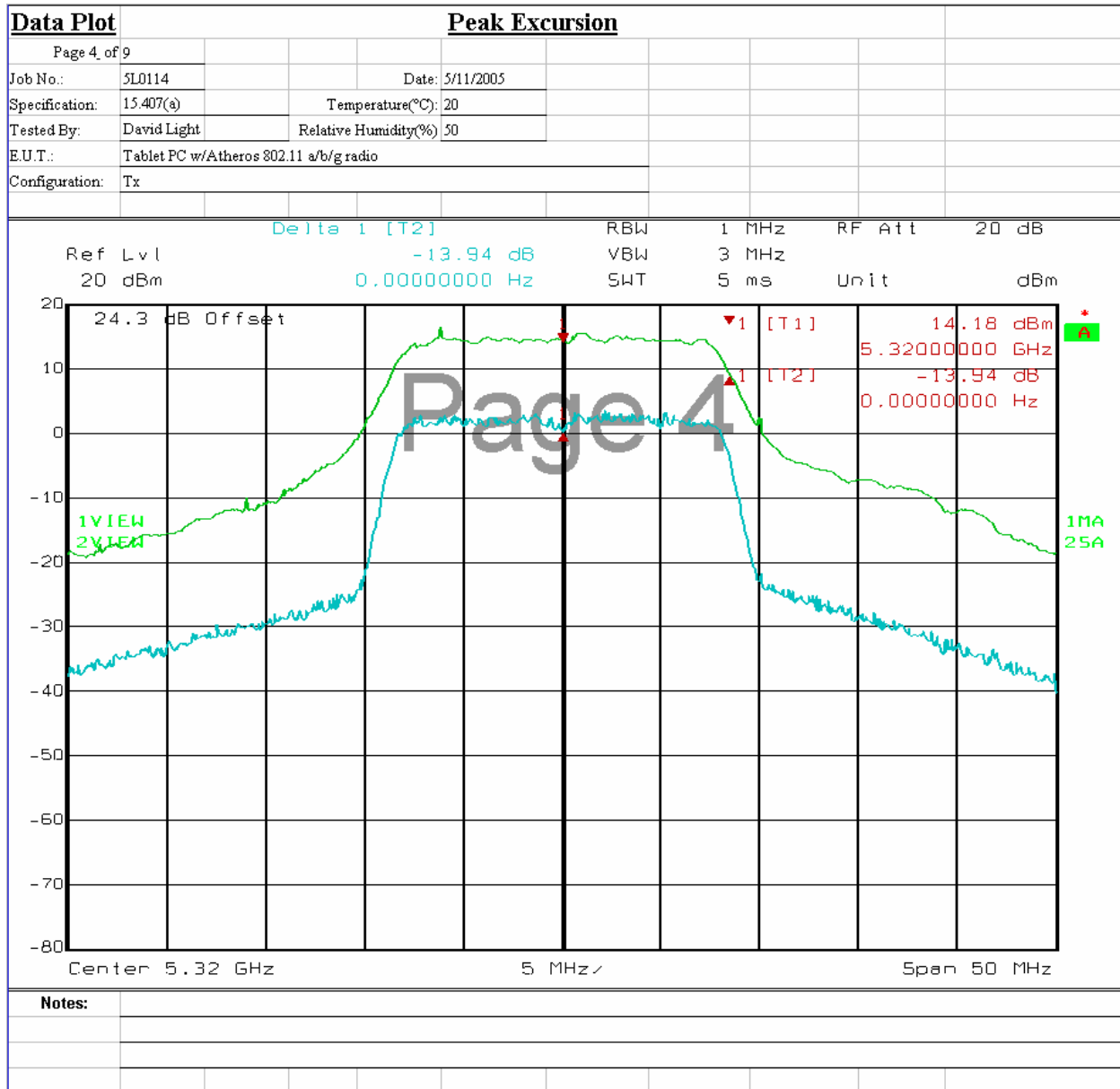
## Test Data – Peak Excursion



EQUIPMENT: TS01

TEST REPORT NO.: 5L0114RUS4Rev1

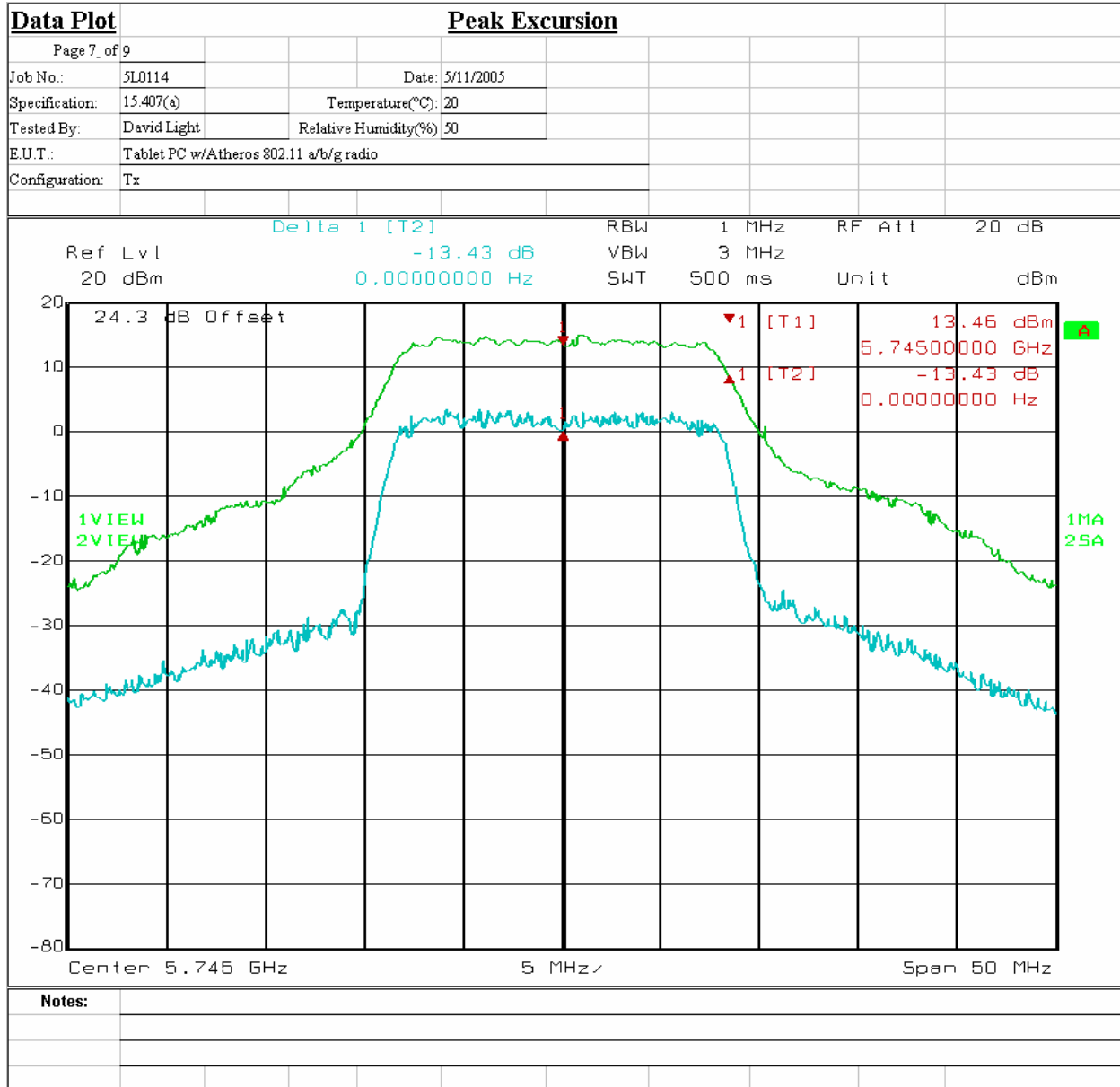
## Test Data – Peak Excursion



EQUIPMENT: TS01

TEST REPORT NO.: 5L0114RUS4Rev1

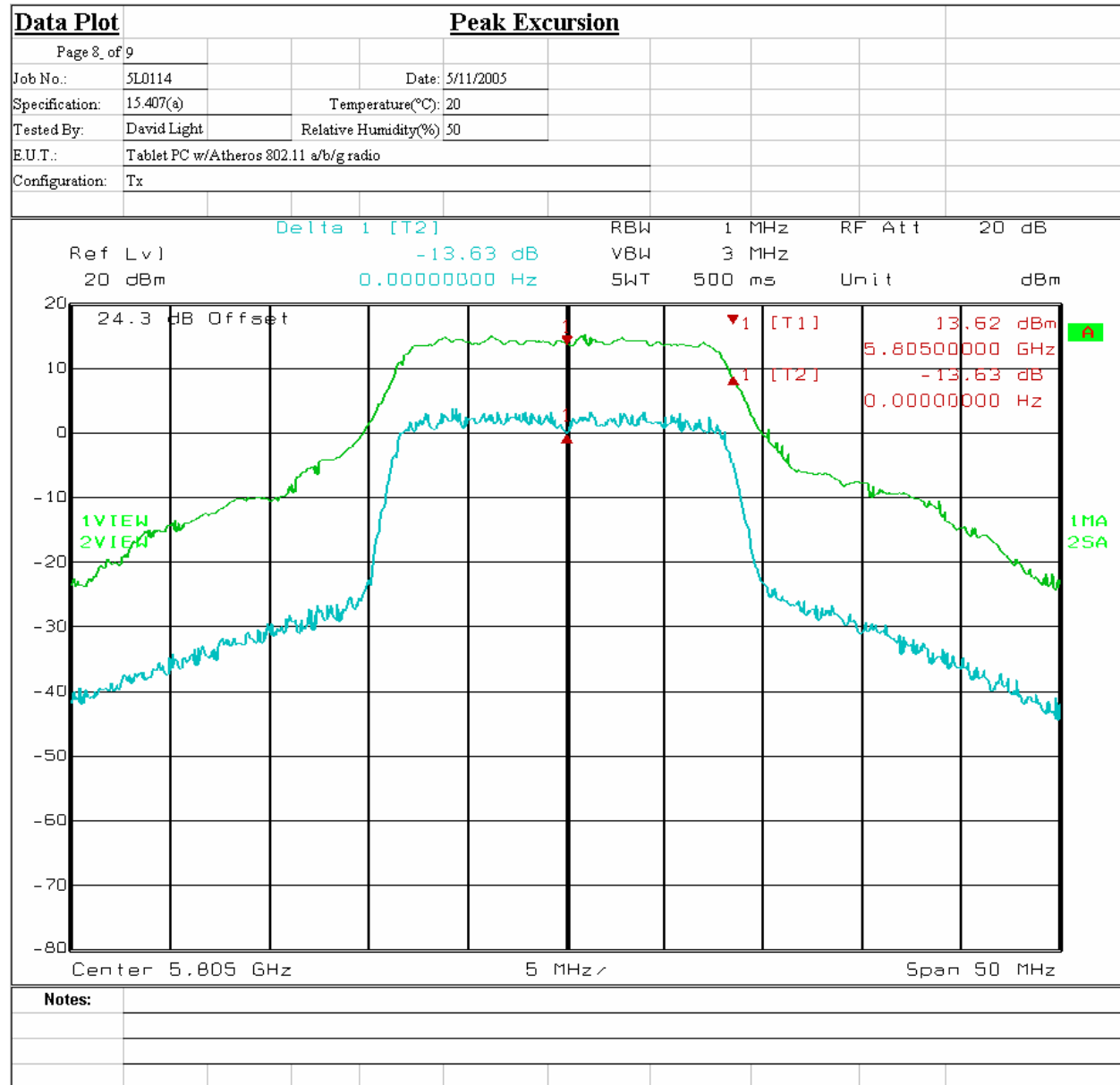
## Test Data – Peak Excursion



EQUIPMENT: TS01

TEST REPORT NO.: 5L0114RUS4Rev1

## Test Data – Peak Excursion



*EQUIPMENT:* TS01

TEST REPORT NO.: 5L0114RUS4Rev1

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**Section 7. Spurious Emissions (conducted)**

NAME OF TEST: Spurious Emissions (conducted)	PARA. NO.: 15.407
TESTED BY: David Light	DATE: 5/12/05

**Test Results:** Complies.

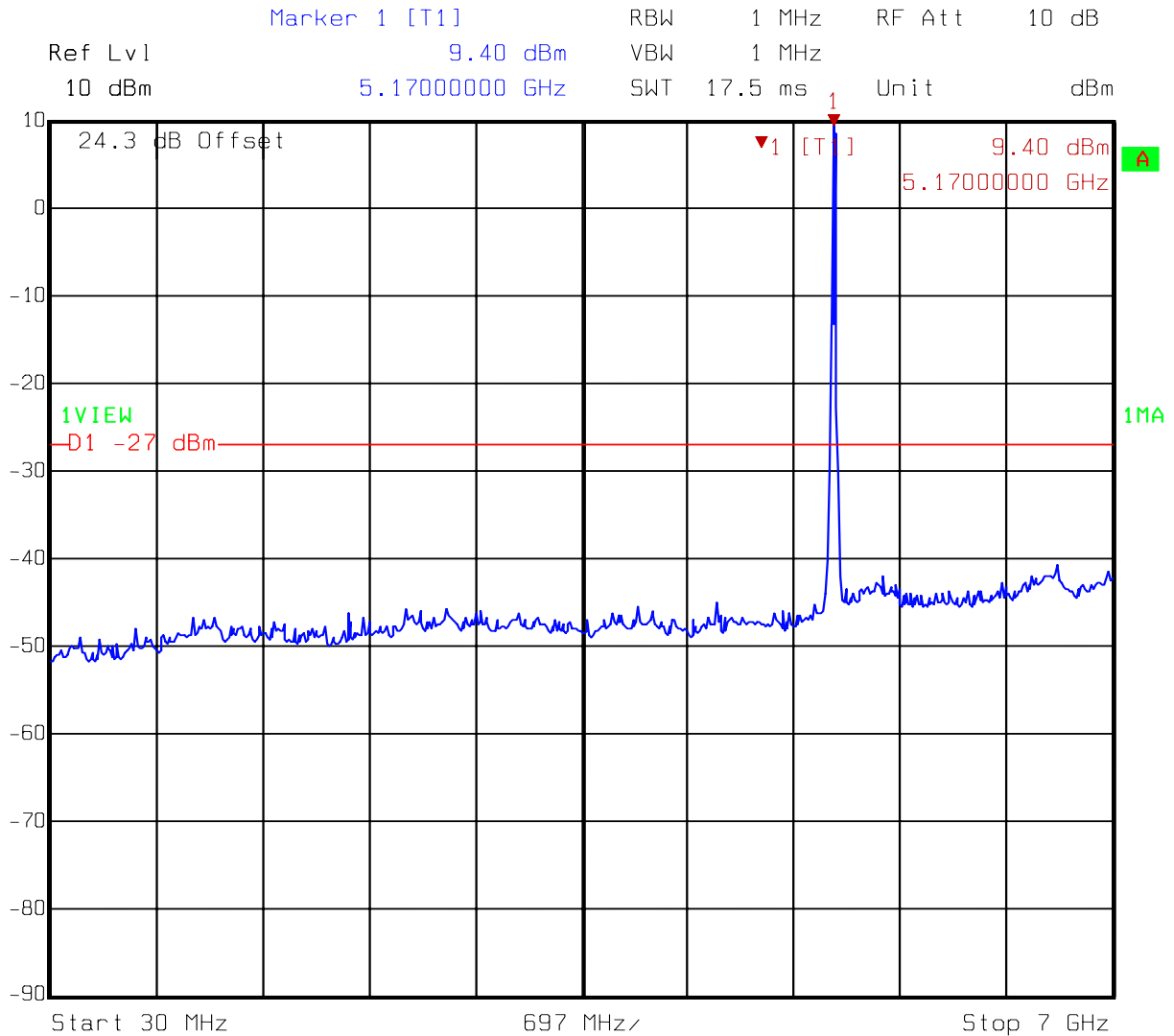
**Measurement Data:** Refer to attached plots

**Test Equipment:** 1036-1081-1472

EQUIPMENT: TS01

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Test Data – Spurious Emissions (5170 MHz)

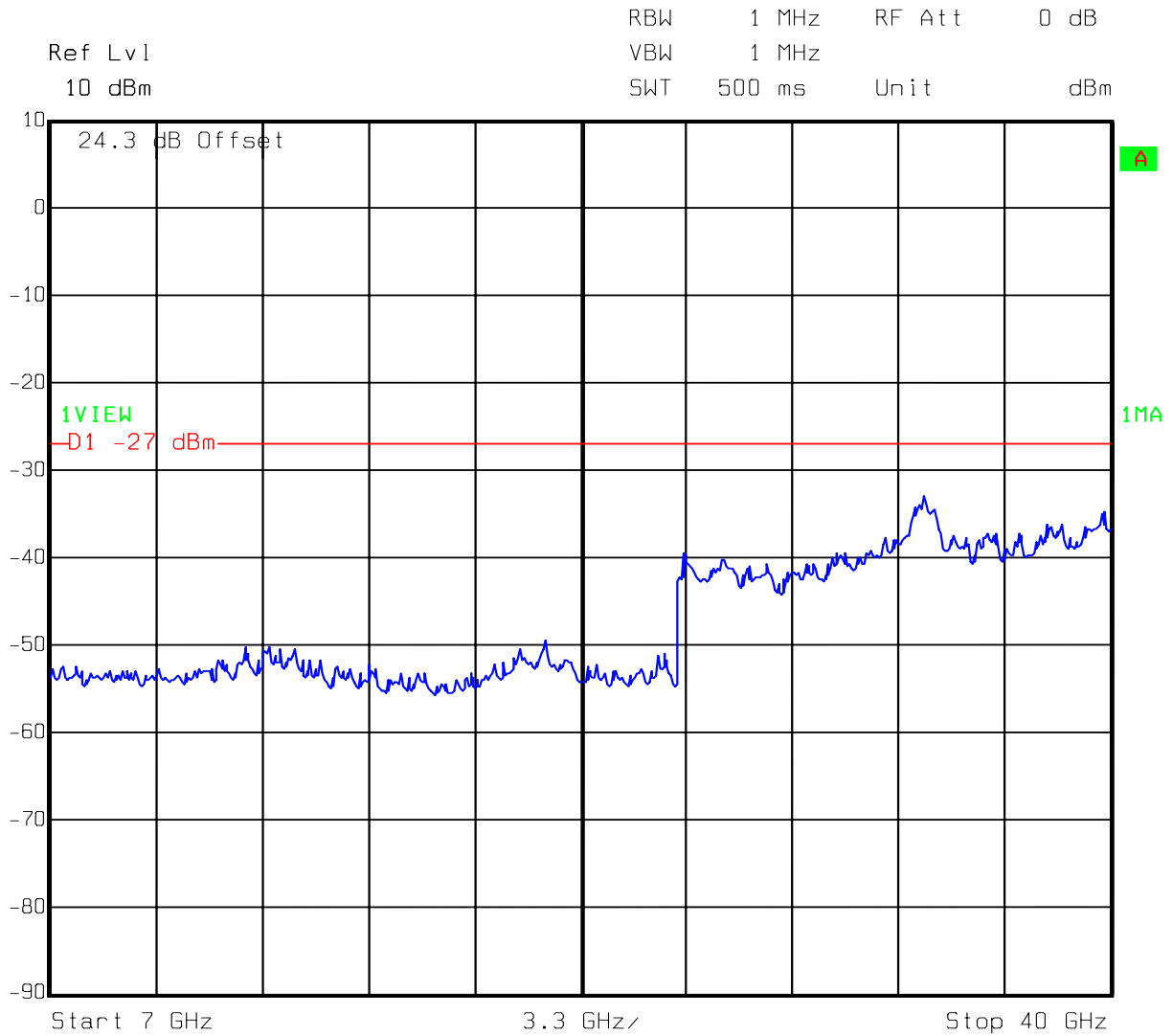


Date: 20.MAY 2005 10:19:12

EQUIPMENT: TS01

TEST REPORT NO.: 5L0114RUS4Rev1

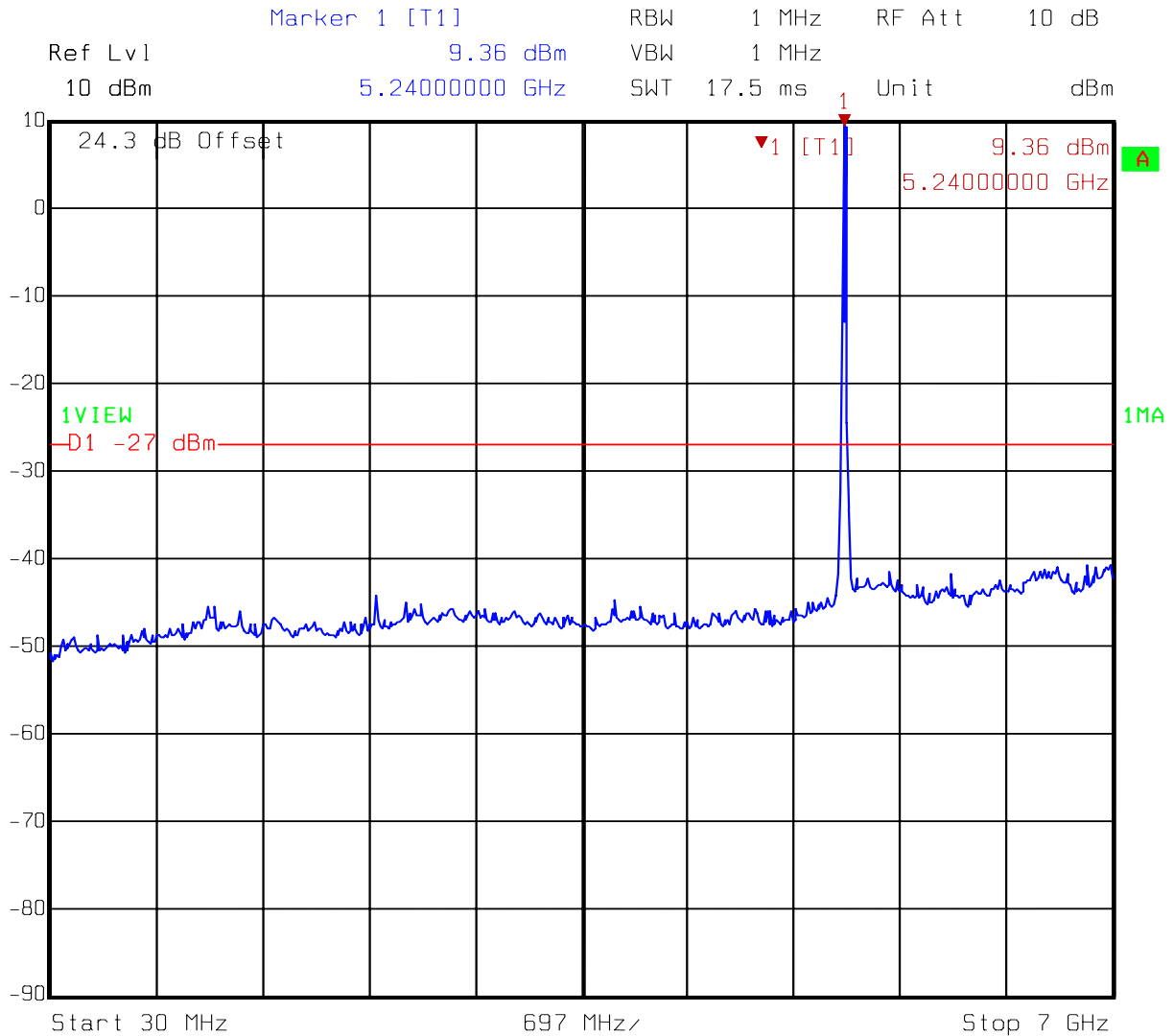
**Test Data – Spurious Emissions (5170 MHz)**



Date: 20.MAY 2005 10:01:33

EQUIPMENT: TS01

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**Test Data – Spurious Emissions (5240 MHz)**

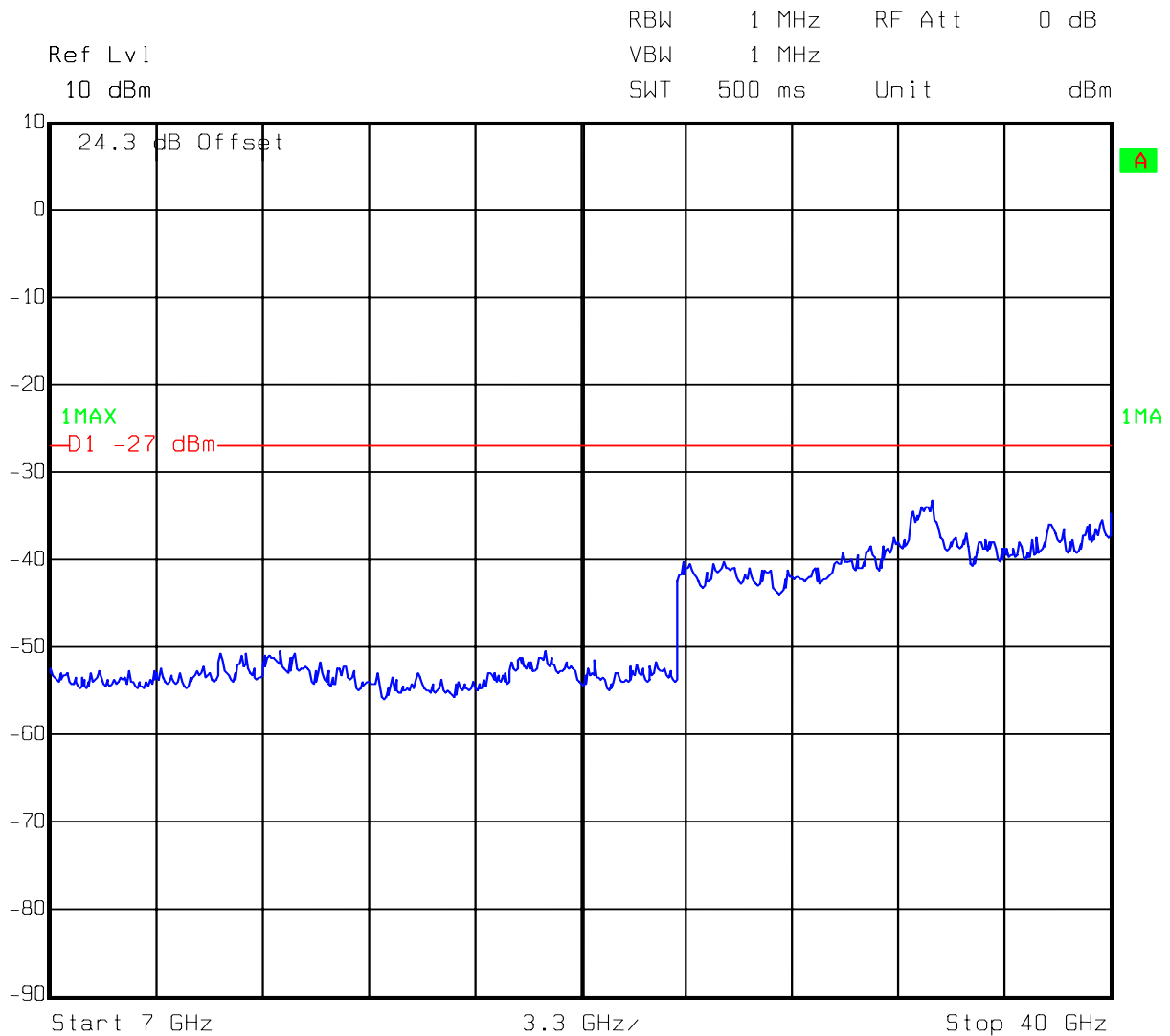
Date: 20.MAY 2005 10:18:34



EQUIPMENT: TS01

TEST REPORT NO.: 5L0114RUS4Rev1

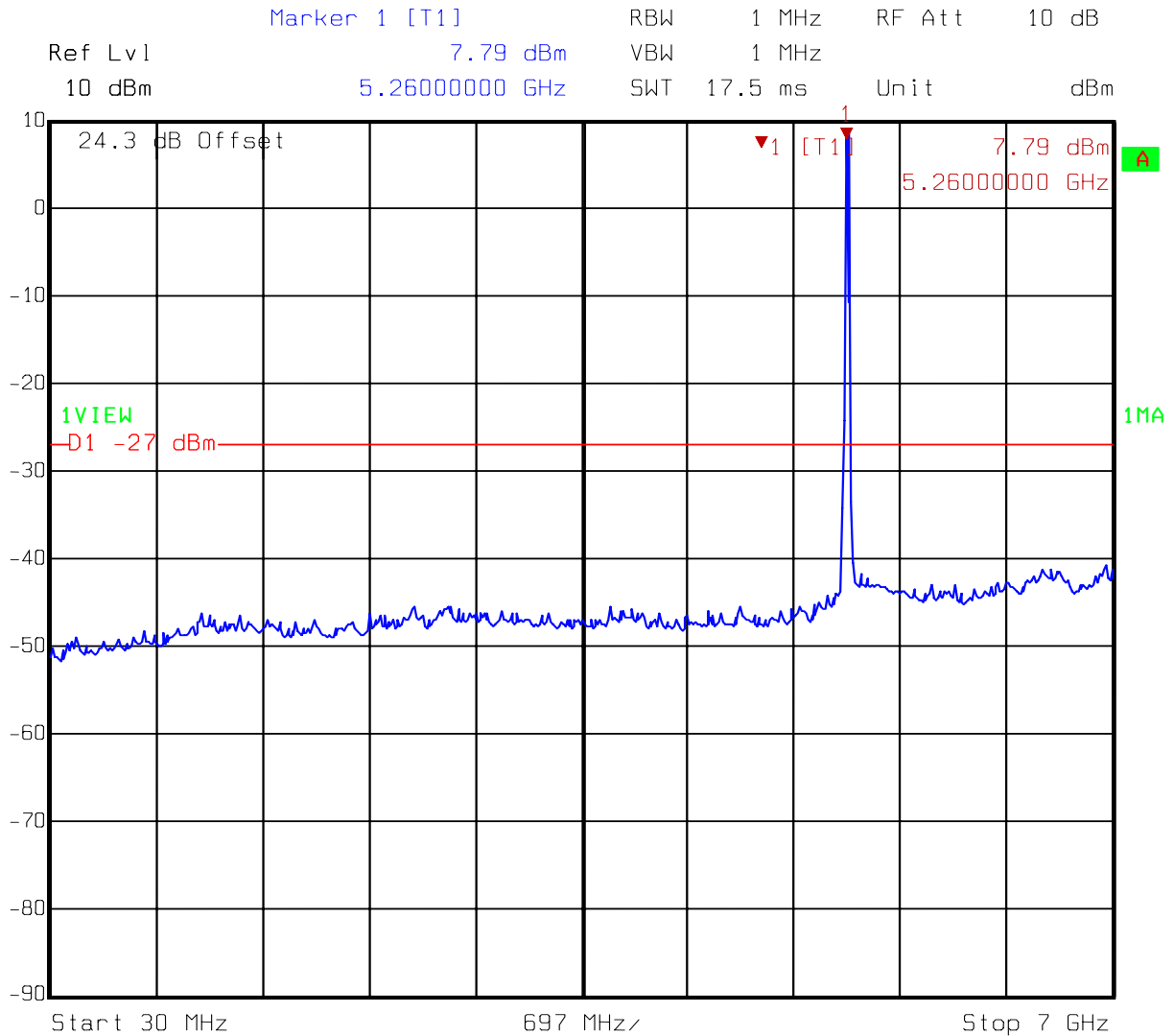
**Test Data – Spurious Emissions (5240 MHz)**



Date: 20.MAY 2005 10:02:15

EQUIPMENT: TS01

TEST REPORT NO.: 5L0114RUS4Rev1

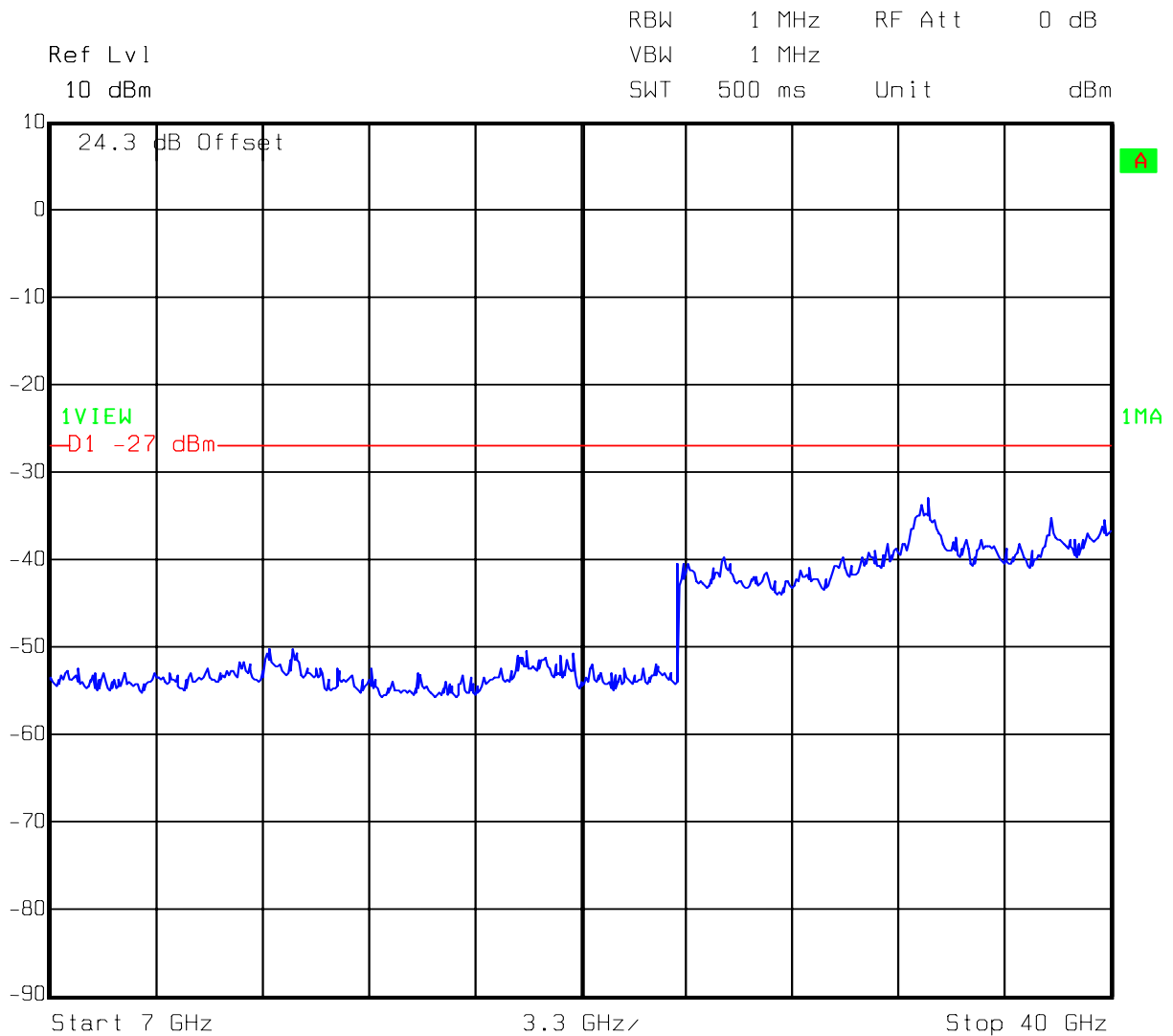
**Test Data – Spurious Emissions (5260 MHz)**

Date: 20.MAY 2005 10:17:57

EQUIPMENT: TS01

TEST REPORT NO.: 5L0114RUS4Rev1

Test Data – Spurious Emissions (5260 MHz)

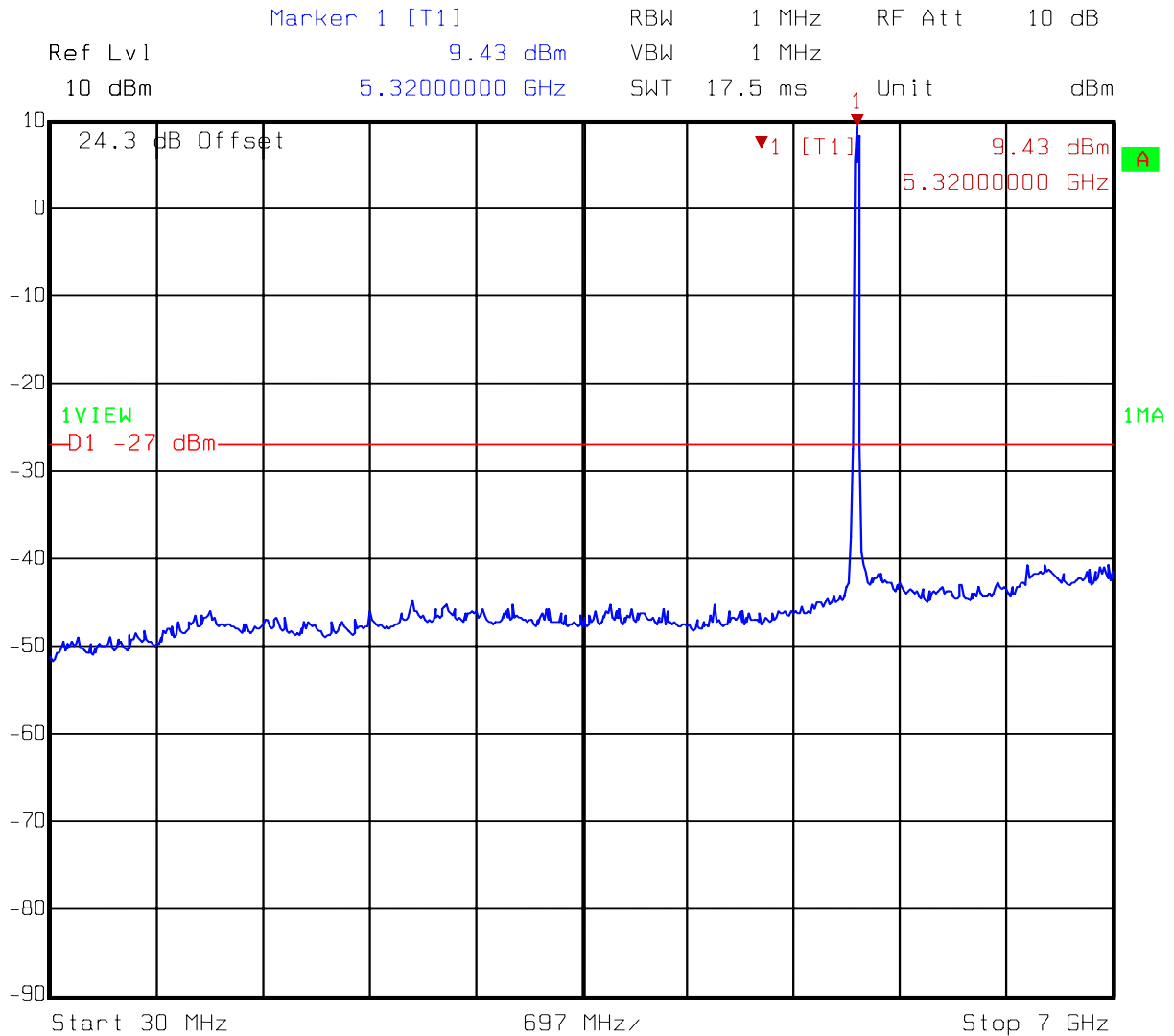


Date: 20.MAY 2005 10:03:04

EQUIPMENT: TS01

TEST REPORT NO.: 5L0114RUS4Rev1

Test Data – Spurious Emissions (5320 MHz)

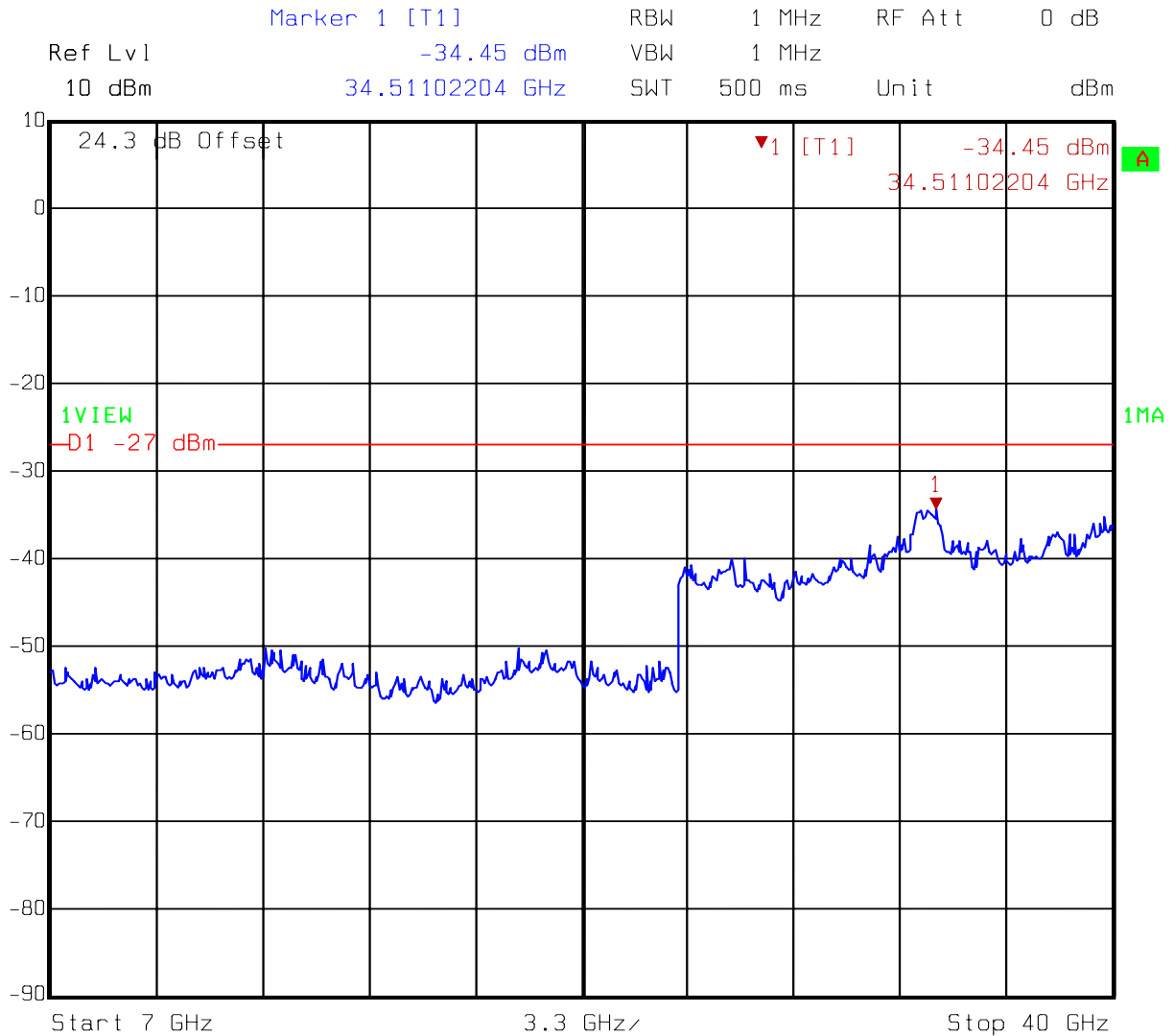


Date: 20.MAY 2005 10:14:41

EQUIPMENT: TS01

TEST REPORT NO.: 5L0114RUS4Rev1

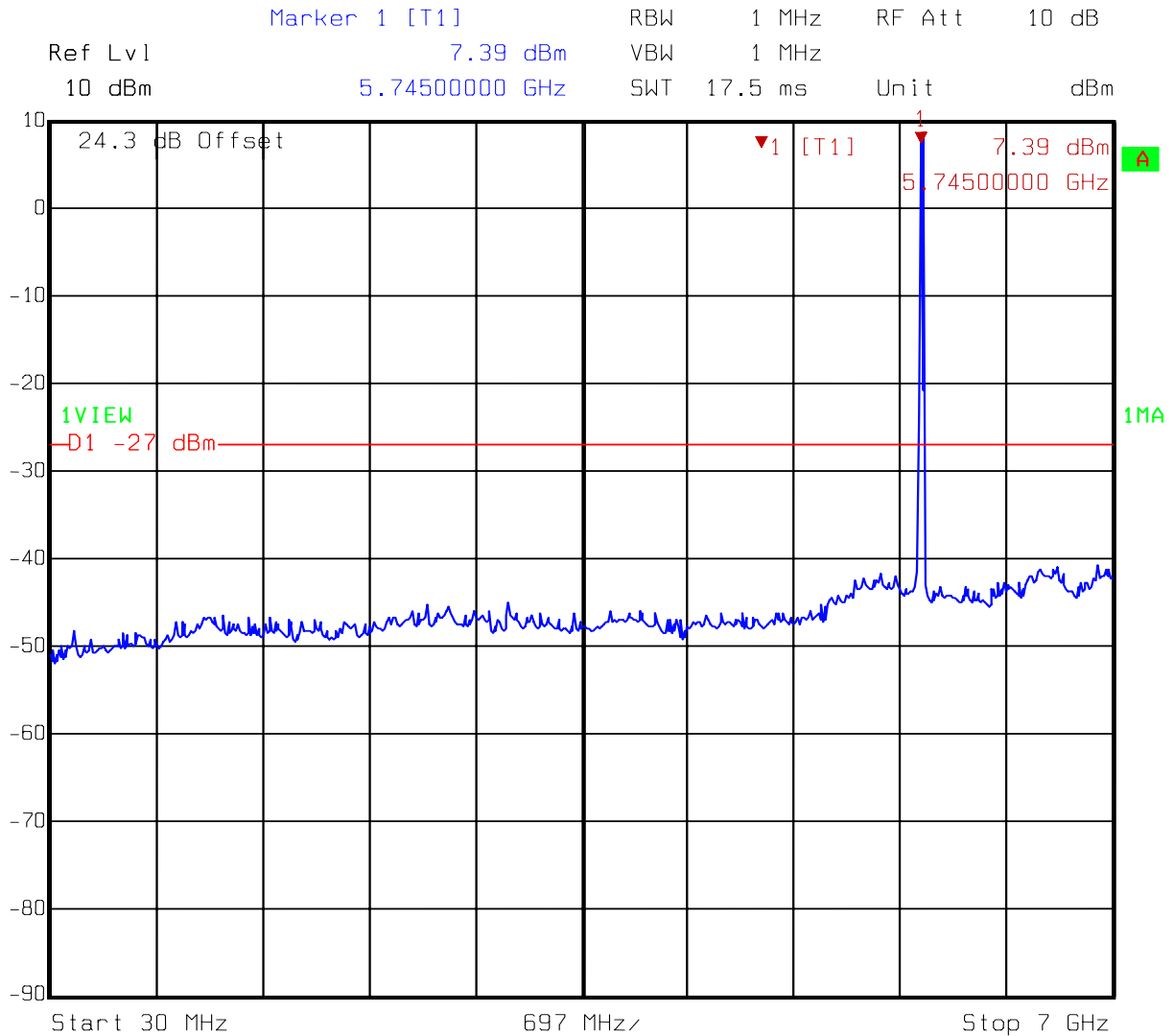
**Test Data – Spurious Emissions (5320 MHz)**



Date: 20.MAY 2005 10:03:55

EQUIPMENT: TS01

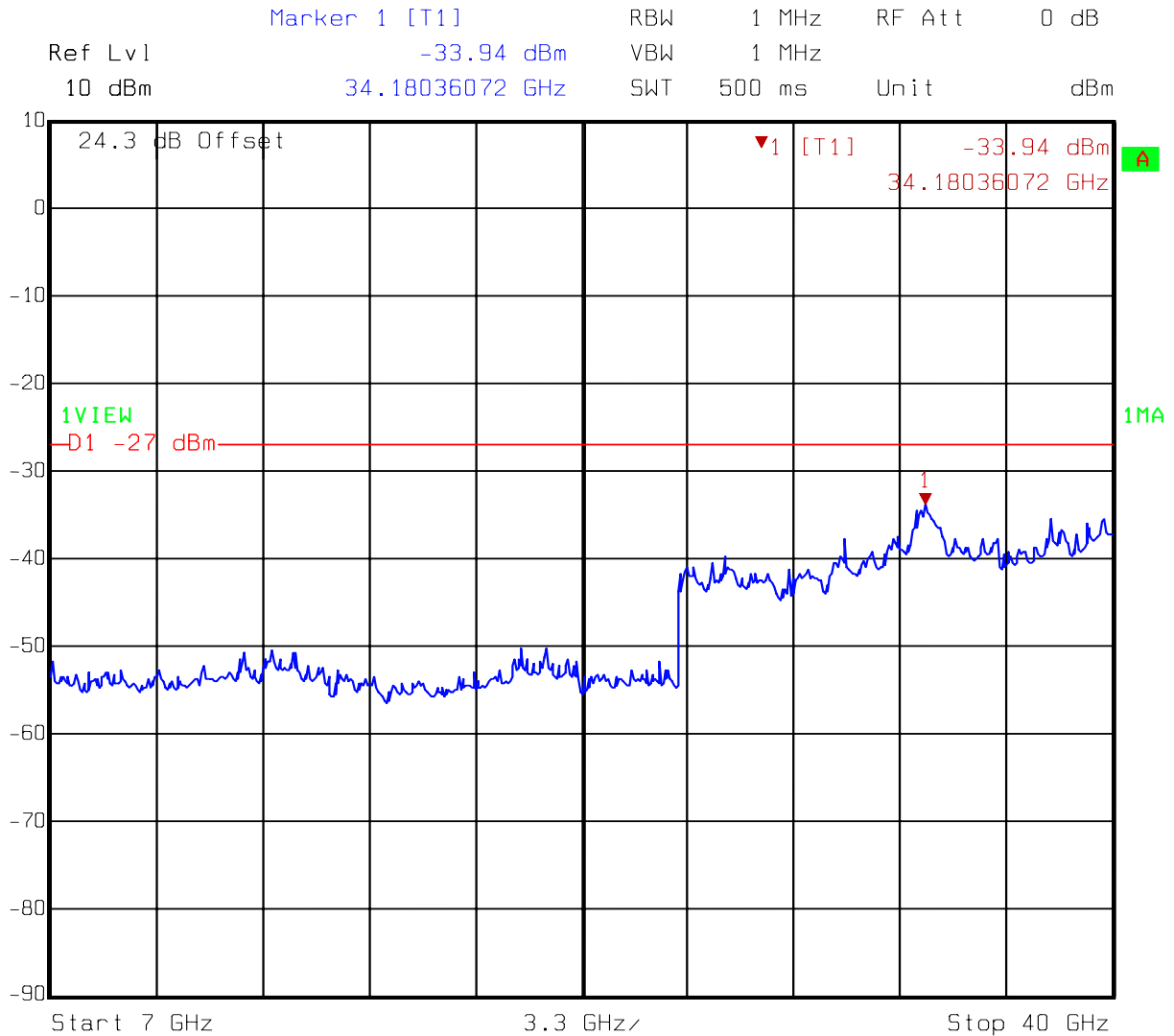
TEST REPORT NO.: 5L0114RUS4Rev1

**Test Data – Spurious Emissions (5745 MHz)**

Date: 20.MAY 2005 10:12:32

EQUIPMENT: TS01

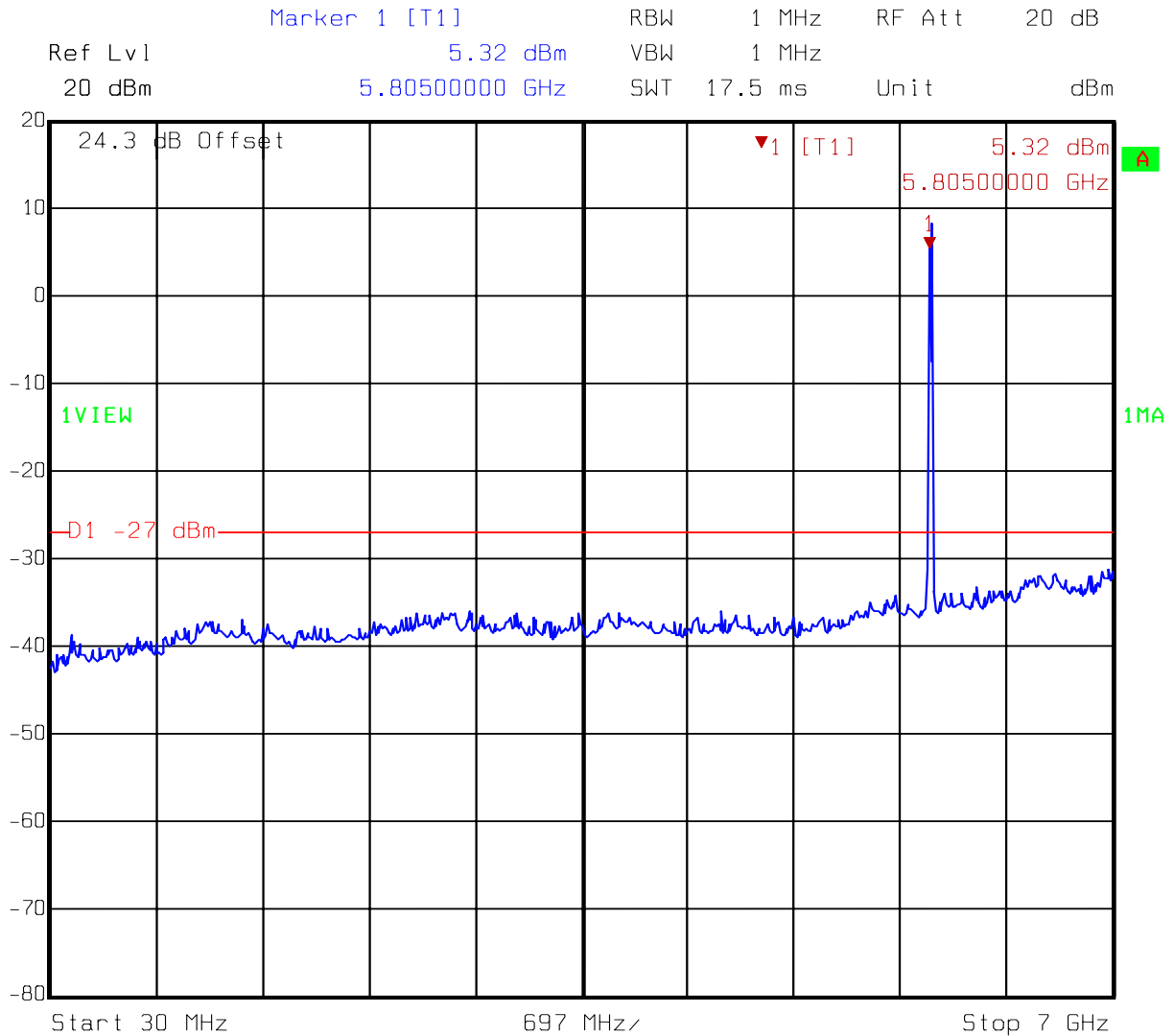
TEST REPORT NO.: 5L0114RUS4Rev1

**Test Data – Spurious Emissions (5745 MHz)**

Date: 20.MAY 2005 10:06:35

EQUIPMENT: TS01

TEST REPORT NO.: 5L0114RUS4Rev1

**Test Data – Spurious Emissions (5805 MHz)**

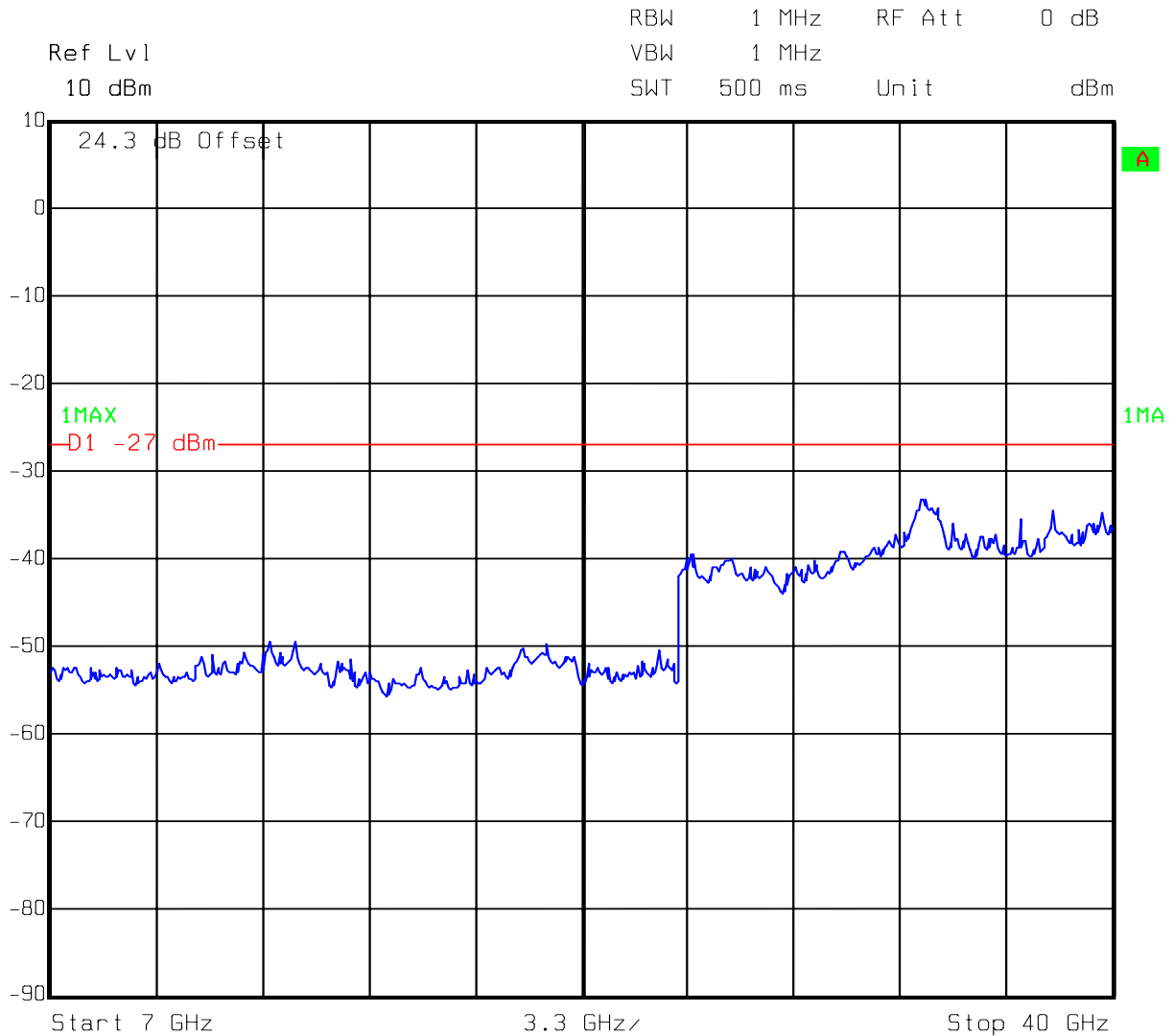
Date: 20.MAY 2005 10:09:48



EQUIPMENT: TS01

TEST REPORT NO.: 5L0114RUS4Rev1

**Test Data – Spurious Emissions (5805 MHz)**

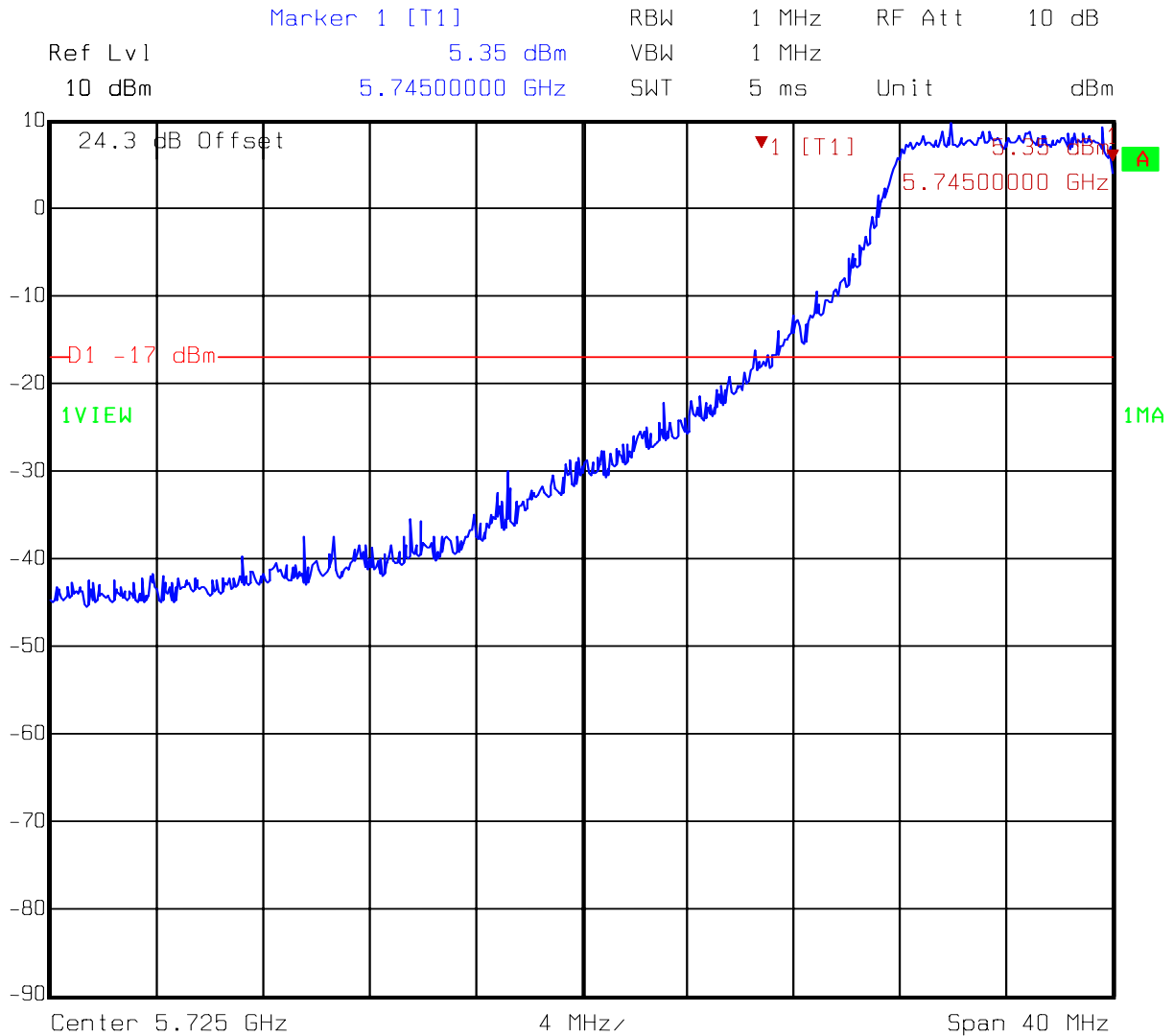


Date: 20.MAY 2005 10:07:38

EQUIPMENT: TS01

TEST REPORT NO.: 5L0114RUS4Rev1

Test Data – Spurious Emissions

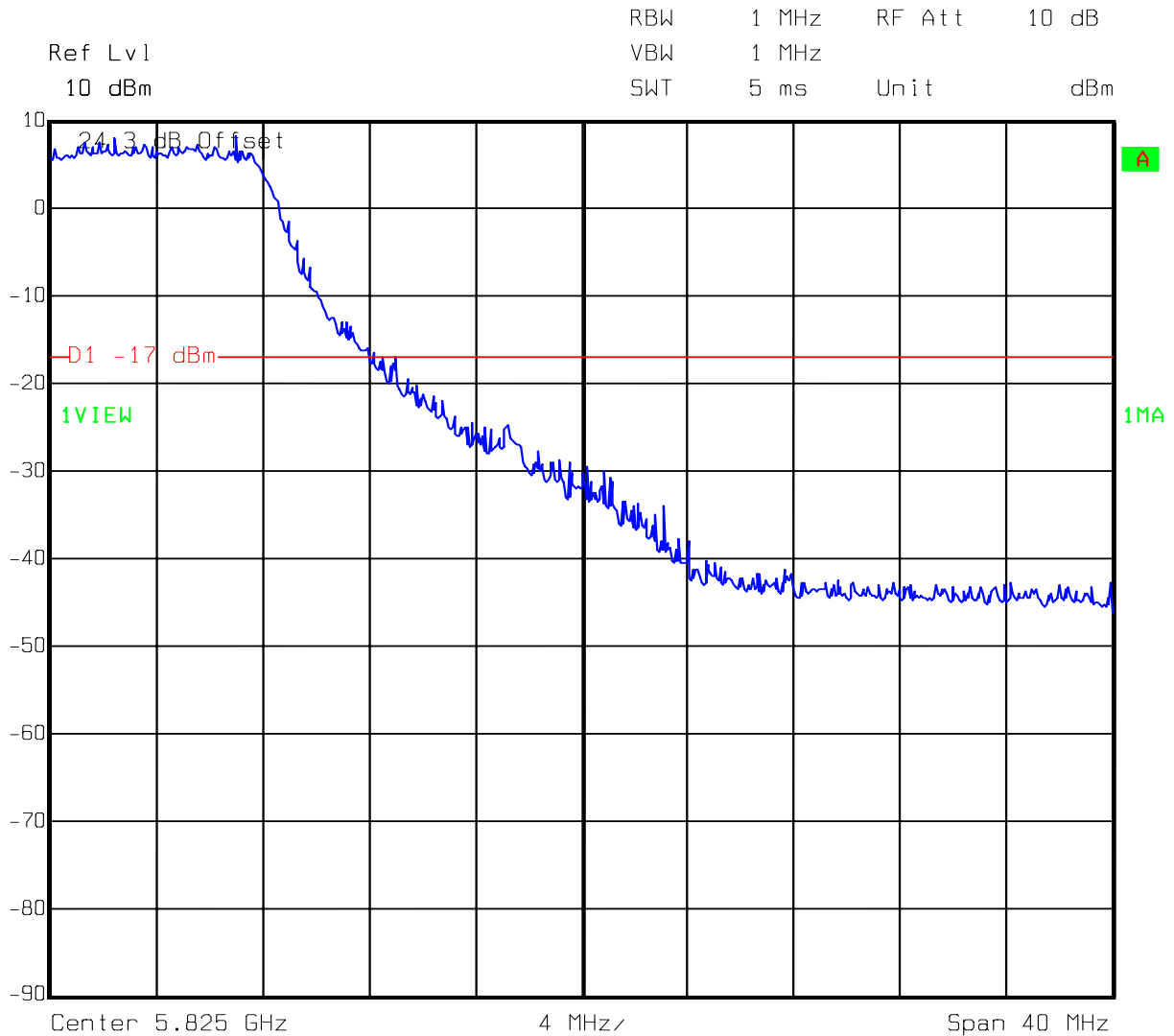


Date: 20.MAY 2005 10:11:49

EQUIPMENT: TS01

TEST REPORT NO.: 5L0114RUS4Rev1

Test Data – Spurious Emissions



Date: 20.MAY 2005 10:10:59

EQUIPMENT: TS01

TEST REPORT NO.: 5L0114RUS4Rev1

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

NAME OF TEST: Spurious Emissions (Radiated)	PARA. NO.: 15.407
TESTED BY: David Light	DATE: 5/12/05

**Test Results:** Complies.

**Measurement Data:** Statement:  
This transmitter was tested in 802.11a mode and at 5170, 5240, 5260, 5320, 5745, and 5805 MHz. There were no emissions detected above the noise floor. The ambient threshold of sensitivity is sufficient to detect signals within 20 dB of the specification limit. A high-pass filter was used to reject the fundamental transmission.

**Test Equipment:** 1464-1484-1485-1016-1304-760-759-791

*EQUIPMENT:* TS01

TEST REPORT NO.: 5L0114RUS4Rev1

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**Section 9. Peak Power Spectral Density**

NAME OF TEST: Peak Power Spectral Density	PARA. NO.: 15.407
TESTED BY: David Light	DATE: 5/11/05

**Test Results:** Complies.

**Measurement Data:** See attached data.

EQUIPMENT: TS01

TEST REPORT NO.: 5L0114RUS4Rev1

**Data Plot****Peak Power Spectral Density**

Page 1 of 9

Complete X

Job No.: 5L0114

Date: 5/11/2005

Preliminary: \_\_\_\_\_

Specification: 15.407(a)

Temperature(°C): 23

Tested By: David Light

Relative Humidity(%) 45

E.U.T.: Tablet PC w/Atheros 802.11 a/b/g radio

Configuration: Tx

Sample Number: 1

Location: Lab 1

RBW: 1 MHz

Detector Type: Peak

VBW: 3 MHz

**Test Equipment Used**

Antenna: \_\_\_\_\_

Directional Coupler: \_\_\_\_\_

Pre-Amp: \_\_\_\_\_

Cable #1: 1973

Filter: \_\_\_\_\_

Cable #2: \_\_\_\_\_

Receiver: 1464

Cable #3: \_\_\_\_\_

Attenuator #1: 1472

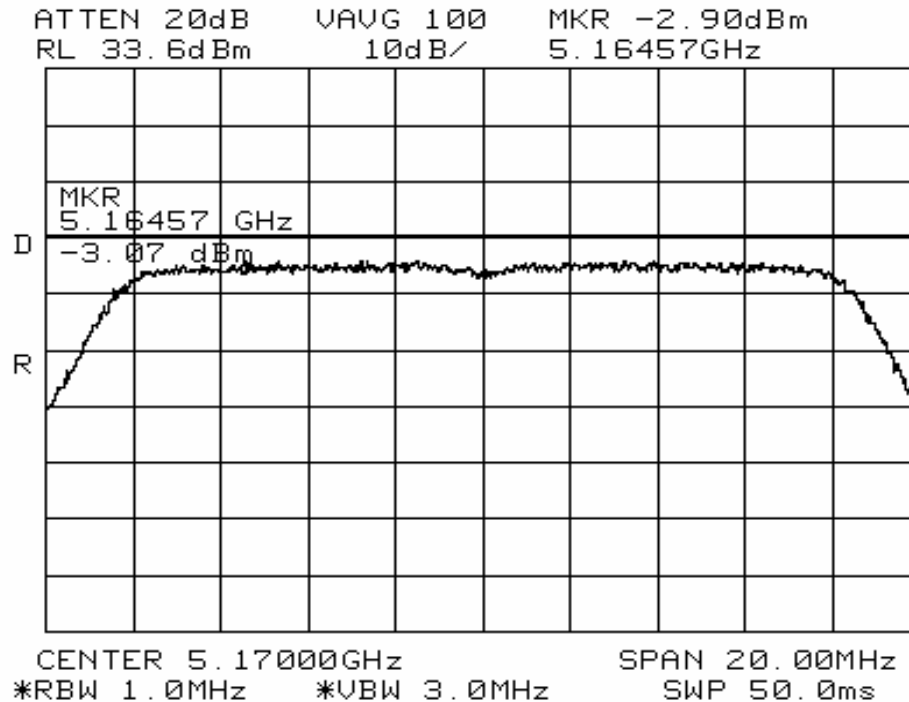
Cable #4: \_\_\_\_\_

Attenuator #2: \_\_\_\_\_

Mixer: \_\_\_\_\_

Additional equipment used: \_\_\_\_\_

Measurement Uncertainty: +/-1.7 dB



Notes: \_\_\_\_\_

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

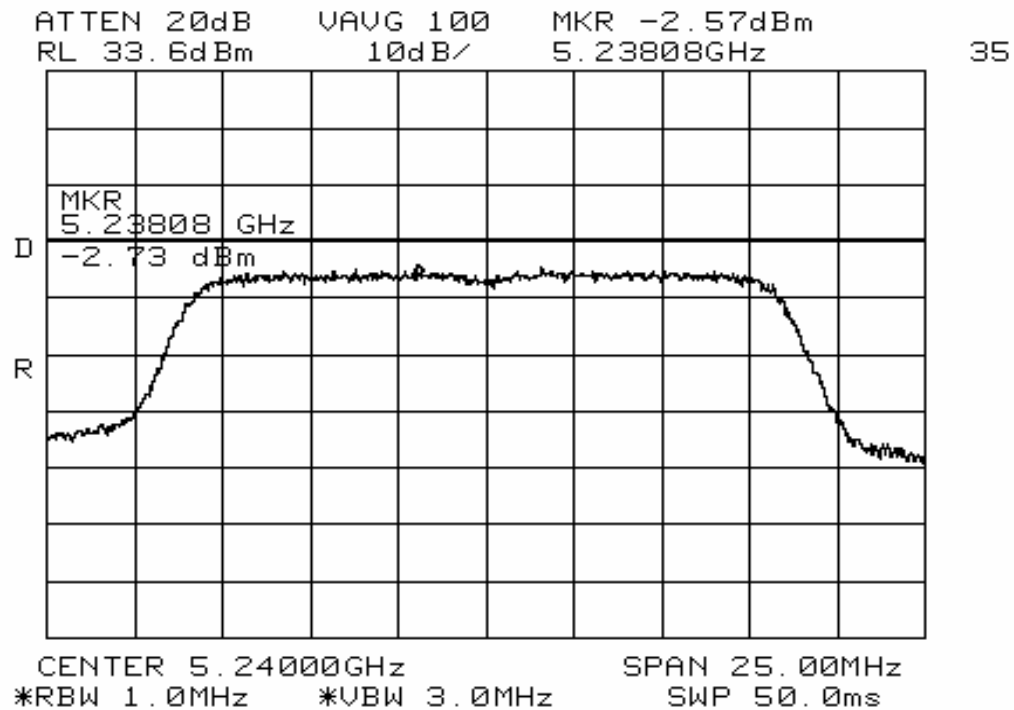
EQUIPMENT: TS01

TEST REPORT NO.: 5L0114RUS4Rev1

**Data Plot****Peak Power Spectral Density**

Page 2 of 9

Job No.: 5L0114 Date: 5/11/2005  
Specification: 15.407(a) Temperature(°C): 23  
Tested By: David Light Relative Humidity(%) 45  
E.U.T.: Tablet PC w/Atheros 802.11 a/b/g radio  
Configuration: Tx



Notes:

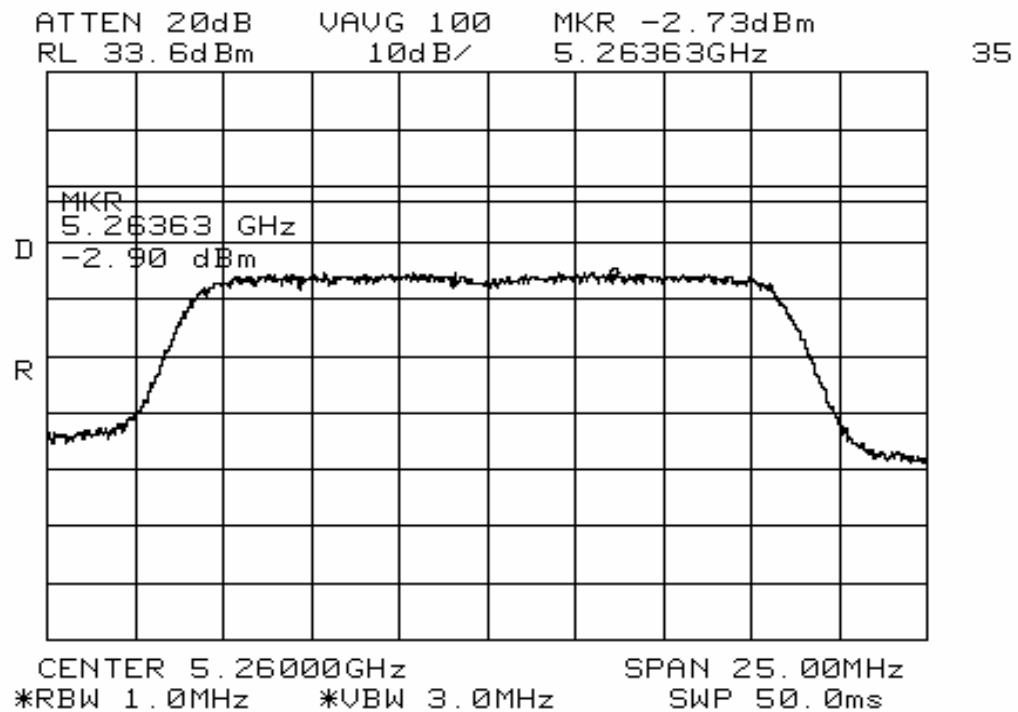
EQUIPMENT: TS01

TEST REPORT NO.: 5L0114RUS4Rev1

**Peak Power Spectral Density**

Page 3 of 9

Job No.: 5L0114 Date: 5/11/2005  
Specification: 15.407(a) Temperature(°C): 23  
Tested By: David Light Relative Humidity(%) 45  
E.U.T.: Tablet PC w/Atheros 802.11 a/b/g radio  
Configuration: Tx



Notes:



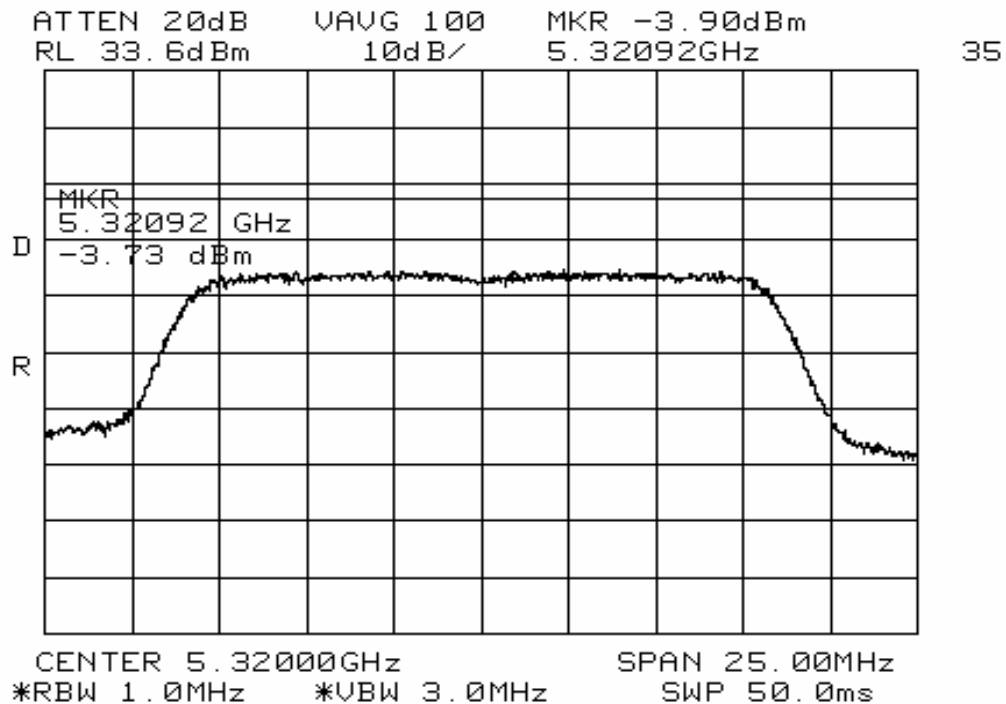
EQUIPMENT: TS01

TEST REPORT NO.: 5L0114RUS4Rev1

**Data Plot****Peak Power Spectral Density**

Page 4 of 9

Job No.: 5L0114 Date: 5/11/2005  
Specification: 15.407(a) Temperature(°C): 23  
Tested By: David Light Relative Humidity(%) 45  
E.U.T.: Tablet PC w/Atheros 802.11 a/b/g radio  
Configuration: Tx



Notes:

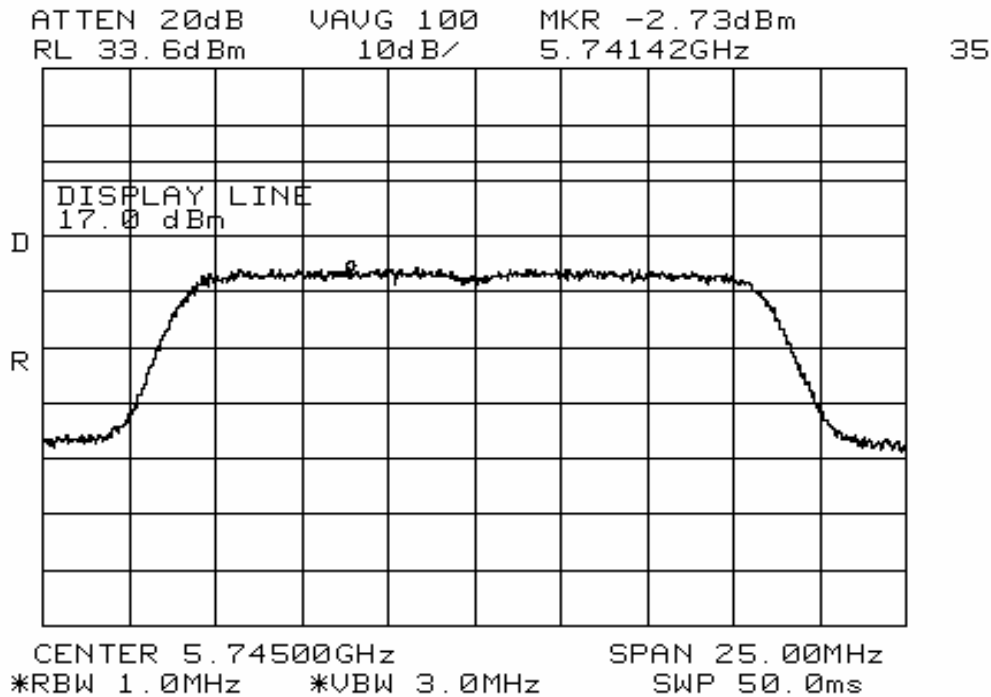
EQUIPMENT: TS01

TEST REPORT NO.: 5L0114RUS4Rev1

**Data Plot****Peak Power Spectral Density**

Page 7\_of 9

Job No.: 5L0114 Date: 5/11/2005  
Specification: 15.407(a) Temperature(°C): 23  
Tested By: David Light Relative Humidity(%) 45  
E.U.T.: Tablet PC w/Atheros 802.11 a/b/g radio  
Configuration: Tx



Notes:

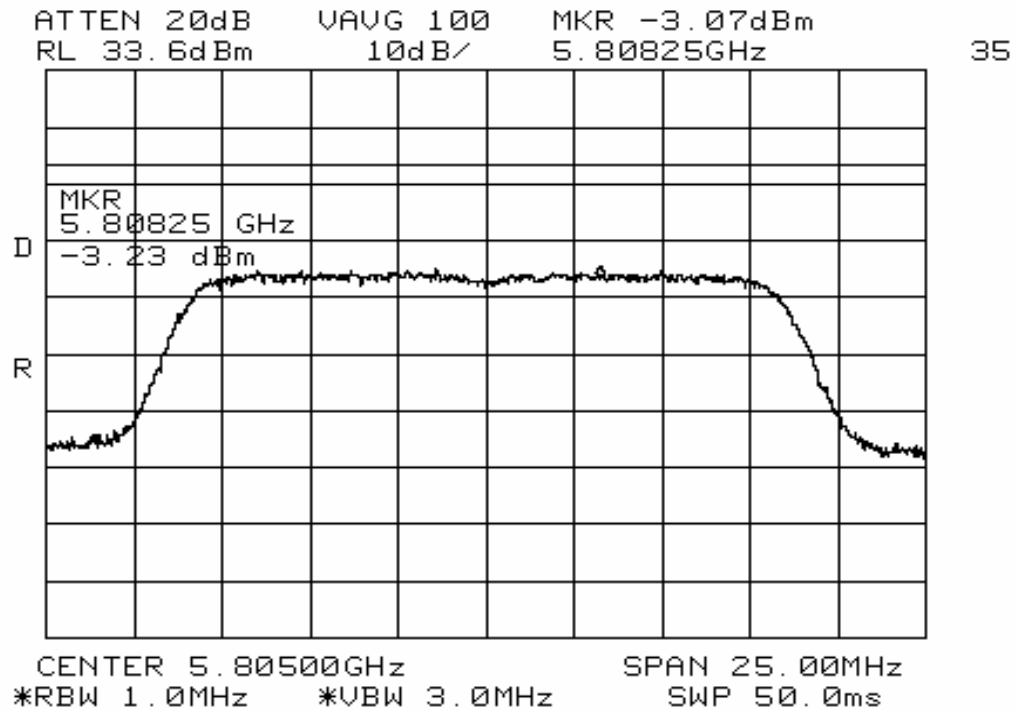
EQUIPMENT: TS01

TEST REPORT NO.: 5L0114RUS4Rev1

**Data Plot****Peak Power Spectral Density**

Page 8\_of 9

Job No.: 5L0114 Date: 5/11/2005  
Specification: 15.407(a) Temperature(°C): 23  
Tested By: David Light Relative Humidity(%) 45  
E.U.T.: Tablet PC w/Atheros 802.11 a/b/g radio  
Configuration: Tx



Notes:

EQUIPMENT: TS01

TEST REPORT NO.: 5L0114RUS4Rev1

## Section 10. Test Equipment List

Nemko ID	Description	Manufacturer Model Number	Serial Number	Calibration Date	Calibration Due
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
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
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
760	Antenna biconical	Electro Metrics MFC-25	477	06/22/04	06/22/05
759	ANTENNA, LOG PERIODIC	A.H. SYSTEMS SAS-200/510	556	07/23/04	07/23/05
791	PREAMP, 25dB	ICC LNA25	398	11/12/04	11/12/05
1081	CABLE 2m	Astrolab 32027-2-29094-72TC	N/A	08/26/04	08/26/05
1036	SPECTRUM ANALYZER	ROHDE & SCHWARZ FSEK30	830844/006	03/22/04	03/23/06
969	lisn	Schwarzbeck 8120	8120281	09/17/04	09/17/05
1547	CABLE .6m	KTL RG223	N/A	06/09/04	06/09/05
1115	CABLE, 4.5m	KTL RG223	N/A	04/27/05	04/27/06
718	HP SPECTRUM ANALYZER	HEWLETT PACKARD 8591EM	3639A00980	04/06/05	04/06/06
966	Receiver	Rohde & Schwartz ESH2	880370/029	09/20/04	09/20/05
1193	LIMITER	FISCHER FCC-450B-1.25N	956	02/24/04	02/24/05
1555	Filter high pass 5KHz	Solar Electronics 7930-5.0	933125	04/20/05	04/20/06

## **ANNEX A - TEST DETAILS**

EQUIPMENT: TS01

TEST REPORT NO.: 5L0114RUS4Rev1

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:* TS01

TEST REPORT NO.: 5L0114RUS4Rev1

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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

EQUIPMENT: TS01

TEST REPORT NO.: 5L0114RUS4Rev1

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



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*EQUIPMENT:* TS01TEST REPORT NO.: 5L0114RUS4Rev1

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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.

EQUIPMENT: TS01

TEST REPORT NO.: 5L0114RUS4Rev1

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:

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

EQUIPMENT: TS01

TEST REPORT NO.: 5L0114RUS4Rev1

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

*EQUIPMENT:* TS01

TEST REPORT NO.: 5L0114RUS4Rev1

---

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.

EQUIPMENT: TS01

TEST REPORT NO.: 5L0114RUS4Rev1

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: &gt;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  $\Delta$ : Peak of highest spurious level below center frequency.Upper Band Edge

RBW: At least 1% of span/div.

VBW: &gt;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  $\Delta$ : 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

EQUIPMENT: TS01

TEST REPORT NO.: 5L0114RUS4Rev1

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

EQUIPMENT: TS01

TEST REPORT NO.: 5L0114RUS4Rev1

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: &gt;3 kHz

Span: =&gt; 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.

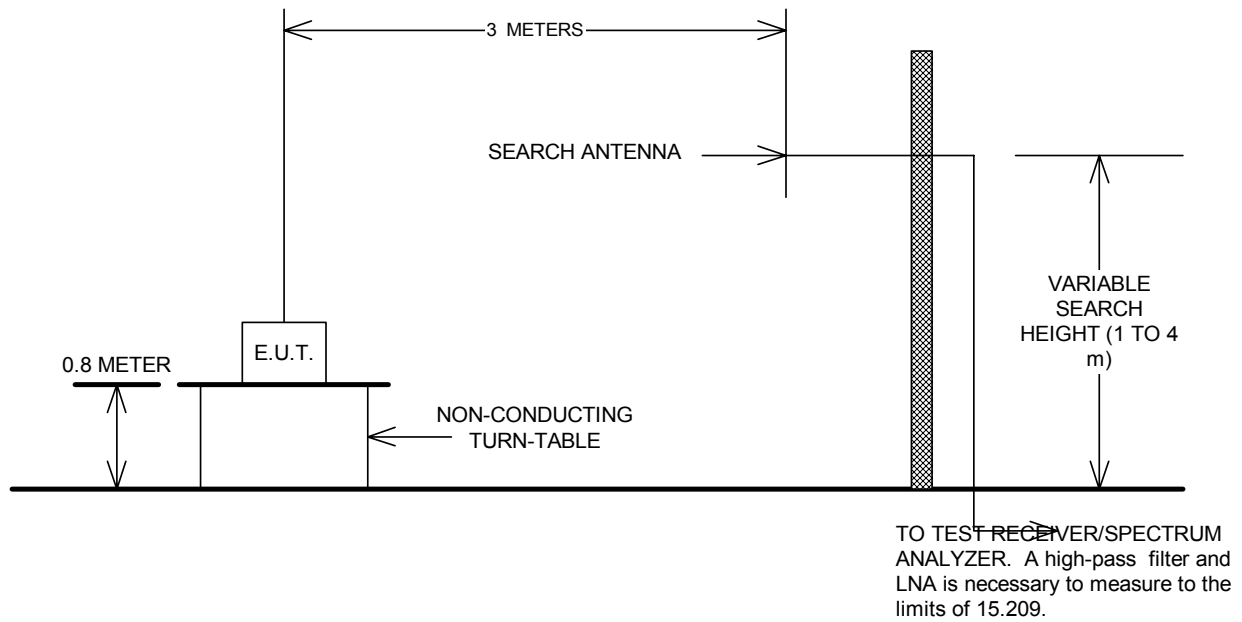
Number of channels tested:

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

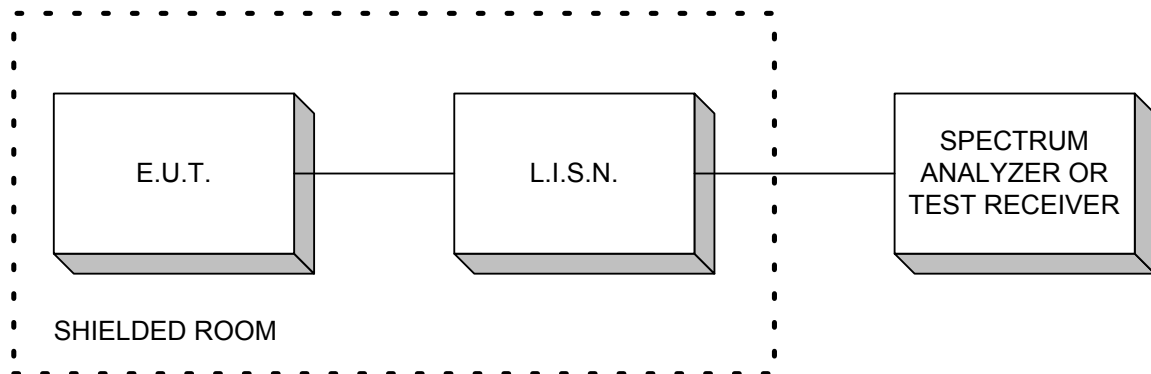
**ANNEX B - TEST DIAGRAMS**



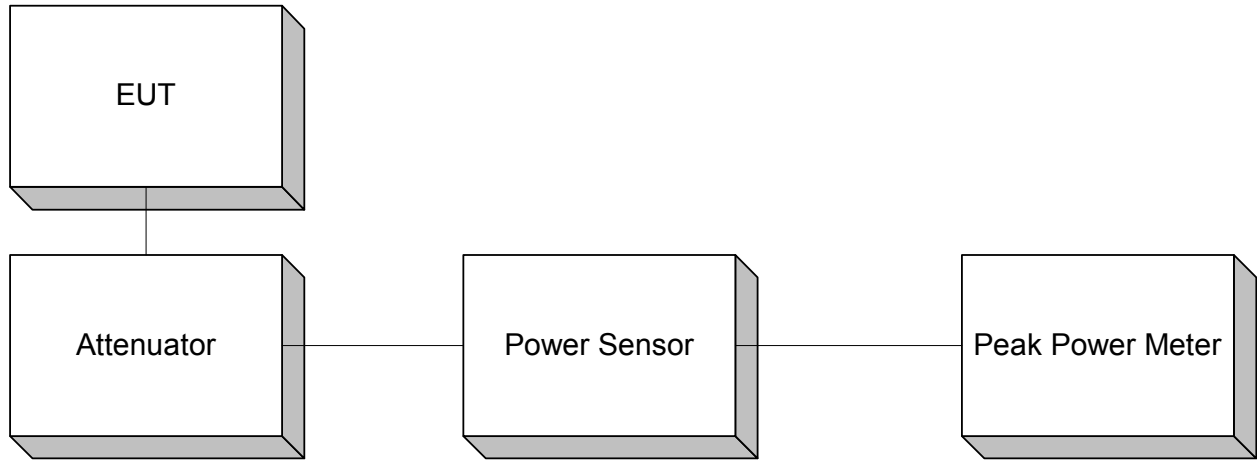
## Test Site For Radiated Emissions



## Conducted Emissions



**Peak Power At Antenna Terminals**



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

