

### FCC Test Report Test report no.: EMC 573FCC15.407 2003

FCC Part 15.407 for UNII Devices / CANADA RSS-210 Issue 5 for LELEAN Devices

EUT: WLAN Model: BCM94309MP HOST: Dell Laptop Model: PP05X FCC ID: QDS-BRCM1007



Accredited according to ISO/IEC 17025



Bluetooth Qualification Test Facility (BQTF)



FCC listed # 101450

IC recognized # 3925

CETECOM Inc.

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1.1 Notes

The test results of this test report relate exclusively to the test item specified in 1.5. The CETECOM Inc. USA does not assume responsibility for any conclusions and generalizations drawn from the test results with regard to other specimens or samples of the type of the equipment represented by the test item. The test report may only be reproduced or published in full. Reproduction or publication of extracts from the report requires the prior written approval of the CETECOM Inc USA.

### **TEST REPORT PREPARED BY: EMC Engineer: Harpreet Sidhu**

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#### **1.3** Details of applicant

Name	:	Broadcom corporation
Street	:	190 Mathilda Place
City / Zip Code	:	Sunnyvale, CA 94086
Country	:	USA
Contact	:	Dan Lawless
Telephone	:	408-922-5870
Tele-fax	•	408-543-3399
e-mail	:	dlawless@broadcom.com
C-man	•	
1.4 Application deta	ils	
Date of receipt test item		2003-11-11
Date of test	:	2003-11-11
1.5 Test item		
Manufacturer	:	Applicant
Model No. (EUT)	:	BCM94309MP
Model No. (Host)	:	PP05X (Dell Laptop)
Description	:	WLAN MiniPCI Multiband card incorporating 2.4GHz and
		5GHz radios
FCC ID	:	QDS-BRCM1007
Additional information	1	
Frequency	:	2412MHz – 2462MHz for 2.4GHz band
riequency	•	5180MHz - 5320MHz for 5GHz band
Type of modulation		DSSS / OFDM (orthogonal frequency division multiplexing)
Number of channels	•	11 for 2.4GHz band
	•	8 for 5GHz band
Antenna		5.6dBi max. gain antenna for 5GHz band
1 mitemia	•	(Hitachi model HFT01-DL01)
Power supply		3.3 VDC from Host
Output power		21.8dBm conducted peak power
Extreme temp. Tolerance	е:	$0^{\circ}$ C to $+70^{\circ}$ C
Zitterine temp. Forefullet		
1.6 Test standa	rds:	FCC Part 15 §15.247 / CANADA RSS-210
		Measurements done as per DA 02-2138



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#### **PROJECT OVERVIEW:**

This test report carries all measurements required for Class-2 permissive change to FCC ID: QDS-BRCM1007 with addition of new version of WLAN radio model BCM94309MP. Please refer to doc. *Manufacturer's Declaration* for more details.

This test report covers full radiated testing as per FCC 15.407 (DA 02-2138) on WLAN model# BCM94309MP in laptop model# PP05X. In addition all RF conducted measurements were repeated and conducted peak power on new version is confirmed to be same as of old version. WLAN was tested at different data rates. Test report shows only worst-case test results of all data rates.



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#### 2 Technical test

### 2.1 Summary of test results

No deviations from the technical specification(s) were ascertained in the course of the tests Performed			
Final Verdict: (Only "passed" if all single measurements are "passed")	Passed		

#### Technical responsibility for area of testing:

2003-12-01	EMC & Radio	Lothar Schmidt (Technical Manager)	lehmich
Date	Section	Name	Signature

**Responsible for test report and project leader:** 

Nort.

Λ

2003-12-01 EMC & Radio Harpreet Sidhu (EMC Engineer)

Date

Section

Name

Signature



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2.2 Test report

**TEST REPORT** 

Test report no.: EMC\_573FCC15.407\_2003

FCC Part 15.407 for UNII Devices / CANADA RSS-210



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TEST REPORT REFERENCE			
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99% POWER BANDWIDTH	<b>RSS-210</b>	§6.2.2(q1)(i)(ii)	12
PEAK OUTPUT POWER	§15.407 (	(a)(1)(2)	16
PEAK POWER SPECTRAL DENSITY	<b>§15.407</b> (	(a)(1)(2)(5)	18
POWER SPECTRAL DENSITY	<b>RSS-210</b>	§6.2.2(q1)(i)(ii)	22
PEAK EXCURSION	<b>§15.407</b> (	(a)(6)	26
BAND EDGE COMPLIANCE	§15.407 (	(b)(1)(2)(4)(6)	30
EMISSION LIMITATIONS	§15.407 (	(b)(1)(2)(4)(6)	34
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§15.407(a)(1)(2)

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### **EMISSION BANDWIDTH**

### 26dB bandwidth

### (Data rate – 6Mbps)

6Mbps is found to be worst-case for this measurement. Following method as defined in DA 02-2138 was used for this measurement.

#### **Test Procedure:**

- Use a RBW = approximately 1% of the emission bandwidth.
- Set the VBW > RBW
- Use a peak detector
- Do not use the max hold function. Rather, use the view button to capture the emission.
- Measure the maximum width of the emission that is 26dB down from the peak of the emission. Compare this with the RBW setting of the analyzer. Readjust RBW and repeat measurement as needed until the RBW/EBW ratio is approximately 1%.

### Test Results

TEST CONDITIONS		26 dB BANDWIDTH (MHz)		
Frequency (MHz)		5180	5260	5320
T <sub>nom</sub> (23)°C	V <sub>nom</sub> (3.3) VDC	18.83	21.54	24.94

### LIMIT

### SUBCLAUSE §15.407(c)

Determination of the emissions bandwidth is based on the use of measurement instrumentation employing a peak detector function with an instrument resolutions bandwidth approximately equal to 1.0 percent of the emission bandwidth of the device under measurement.

### ANALYZER SETTINGS: RBW=300KHz, VBW=1MHz



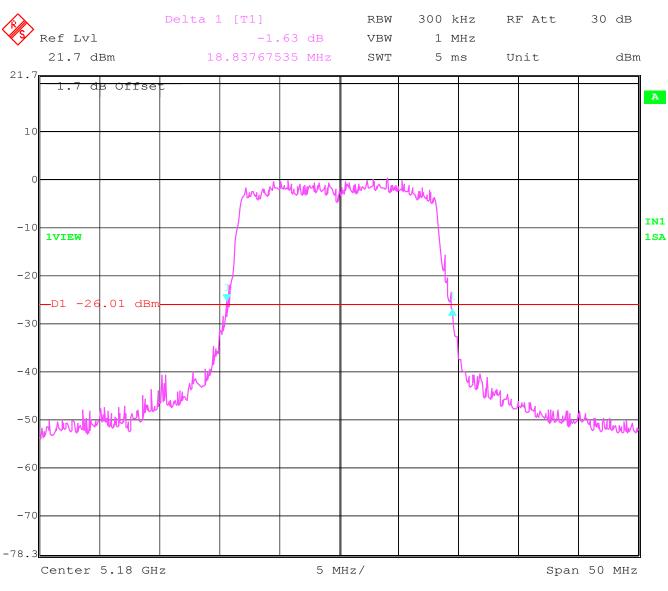
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§15.407(a)(1)(2)

EMISSION BANDWIDTH 26 dB bandwidth (Data rate – 6Mbps)

Lowest Channel: 5180MHz





18.NOV.2003 09:37:16



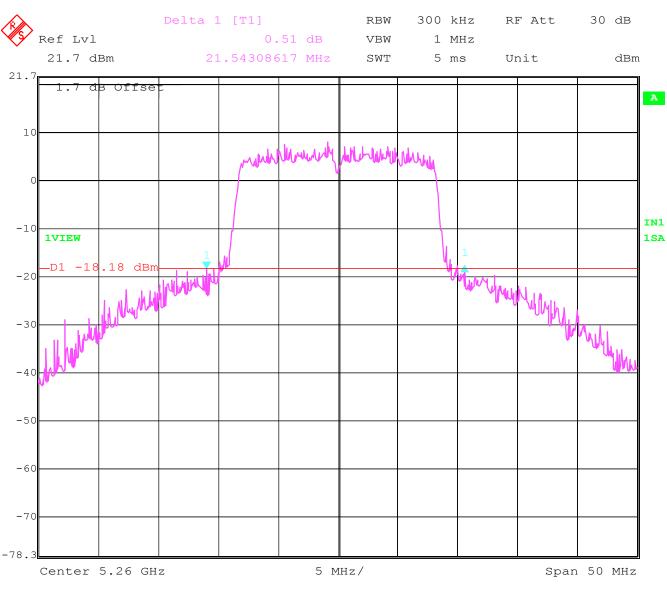
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§15.407(a)(1)(2)

EMISSION BANDWIDTH 26 dB bandwidth (Data rate – 6Mbps)

Mid Channel: 5260MHz







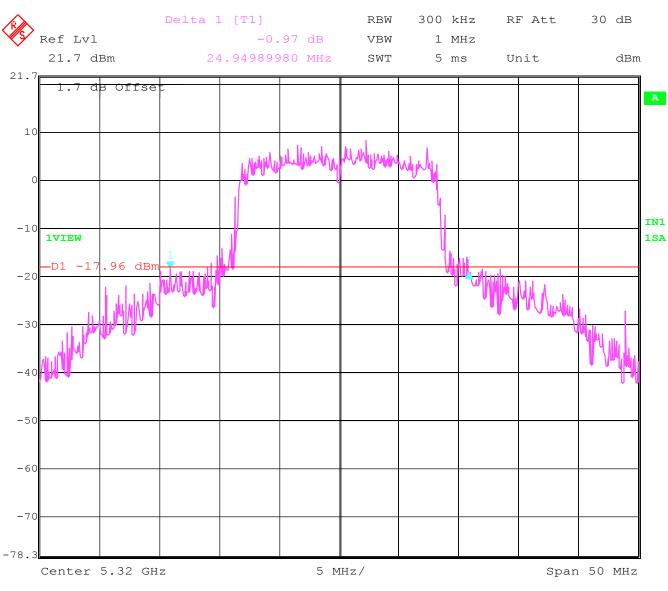
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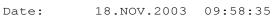
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§15.407(a)(1)(2)

EMISSION BANDWIDTH 26 dB bandwidth (Data rate – 6Mbps)

Highest Channel: 5320MHz







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99% POWER BANDWIDTH 20 dB bandwidth (Data rate – 6Mbps) RSS-210 §6.2.2(q1)(i)(ii)

**Test Results** 

TEST CONDITIONS		20 dI	B BANDWIDTH (	MHz)
Frequency (MHz)		5180	5260	5320
T <sub>nom</sub> (23)°C	V <sub>nom</sub> (3.3) VDC	17.83	17.93	17.93

ANALYZER SETTINGS: RBW=300KHz, VBW=1MHz



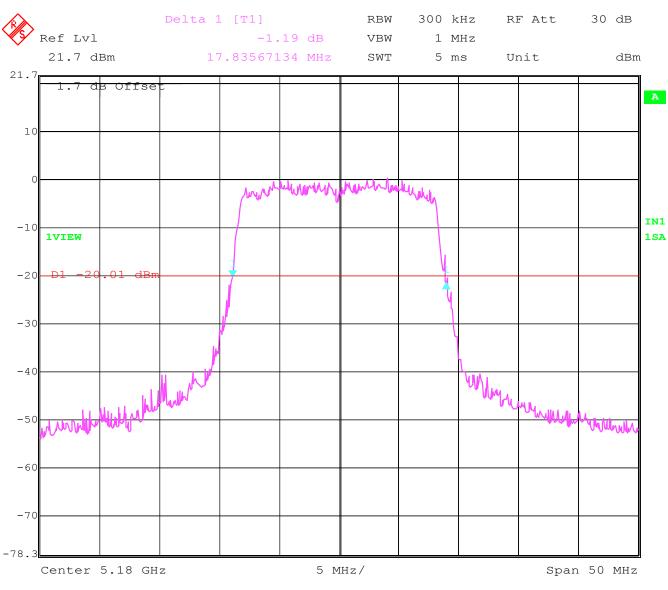
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RSS-210 §6.2.2(q1)(i)(ii)

99% POWER BANDWIDTH 20 dB bandwidth (Data rate – 6Mbps)

Lowest Channel: 5180MHz





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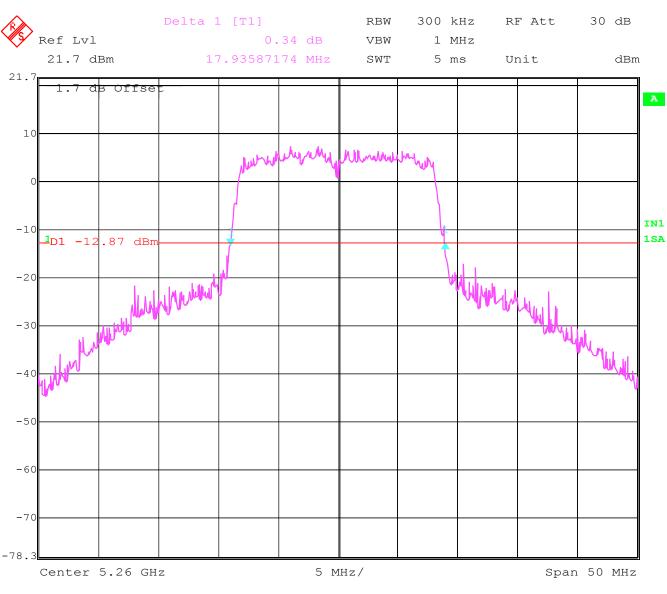
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RSS-210 §6.2.2(q1)(i)(ii)

99% POWER BANDWIDTH 20 dB bandwidth (Data rate – 6Mbps)

Mid Channel: 5260MHz







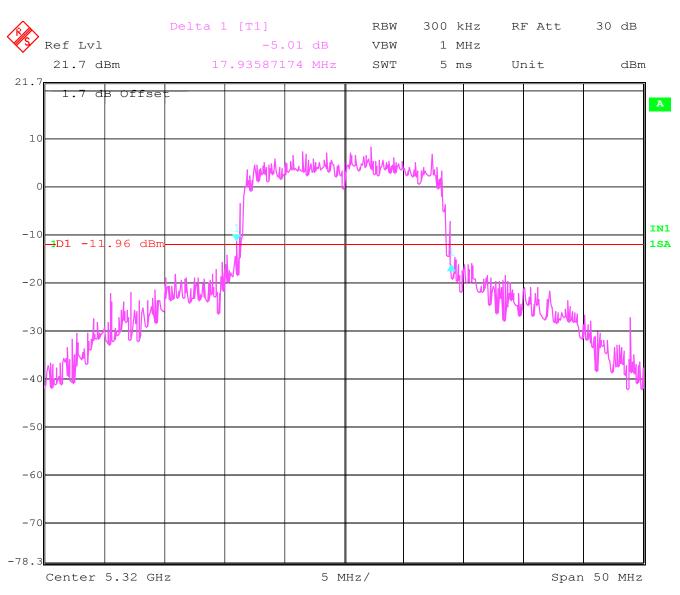
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RSS-210 §6.2.2(q1)(i)(ii)

99% POWER BANDWIDTH 20 dB bandwidth (Data rate – 6Mbps)

Highest Channel: 5320MHz







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#### PEAK OUTPUT POWER (Conducted)

### § 15.407 (a)(1)(2)

(Data rate – 54Mbps) 54Mbps is found to be worst-case for peak output power.

#### **Test Procedure:**

In original equipment authorization peak output power measurements were done using peak power meter; therefore same method has been adopted this time in order to keep consistency in test method.

#### Test Results

TEST CONDITIONS		MAXIMUM PEAK OUTPUT POWER (dBm)			
Frequency (MHz)		5180		5260	5320
T <sub>nom</sub> (23)°C	V <sub>nom</sub> (3.3) VDC	Pk	*15.0	*21.5	*21.8
Measurement uncertainty		±0.5dBm			

\*Measurements done using peak power meter.

#### SUBCLAUSE § 15.407 (a)(1)(2)

Frequency range (GHz)	Conducted Peak Power	
5.15 - 5.25	17dBm	
5.25 - 5.35	24dBm	



§ 15.407 (a)(1)(2)

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MAXIMUM PEAK OUTPUT POWER (RADIATED) (Data rate – 54Mbps) 54Mbps is found to be worst-case for peak output power. EIRP:

#### **Test Results**

TEST CONDITIONS		MAXIMUM PEAK OUTPUT POWER (dBm)		
Frequency (MHz)		5180	5260	5320
T <sub>nom</sub> (23)°C	V <sub>nom</sub> (3.3) VDC	*20.6	*27.1	*27.4
Measurement uncertainty		±0.5dBm		

\*Note: EIRP is calculated based on 5.6dBi antenna gain and conducted peak power measurements.

#### LIMIT

#### SUBCLAUSE § 15.407 (a)(1)(2)

Frequency range (GHz)	Conducted Peak Power
5.15 - 5.25	17dBm
5.25 - 5.35	24dBm
If transmitting antennas of directional gain greater that	in 6dBi are used, both the peak transmit
power and the peak spectral density shall be reduced	by the amount in dB that the directional
gain of the antenna exceeds 6dBi	



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### PEAK POWER SPECTRAL DENSITY

### §15.407 (a)(1)(2)(5)

#### (Data rate – 6Mbps)

6Mbps is found to be worst-case data rate for Power spectral density. Method-2 from DA 02-2138 was used for this measurement.

#### Test Procedure (Method-2):

Use sample detector and power averaging (not video averaging) mode. Set RBW=1MHz, VBW>1MHz. The PPSD is the highest level found across the emission in any 1-MHz band after 100 sweeps of averaging. This method is permitted only if the transmission pulse or sequence of pulses remains at maximum transmit power throughout each of the 100 sweeps of averaging and that the interval between pulses is not included in any of the sweeps. (e.g.; 100 sweeps occur during one transmission, or each sweep gated to occur during a transmission)

#### Test Results

TEST CO	NDITIONS	POWER SPECTRAL DENSITY (dBm)		ITY (dBm)
Frequen	cy (MHz)	5180	5260	5320
T <sub>nom</sub> (23)°C	V <sub>nom</sub> (3.3) VDC	-3.48	3.06	4.97

LIMIT	SUBCLAUSE § 15.407 (a)(1)(2)
Frequency range (GHz)	Conducted Peak Power
5.15 - 5.25	4dBm in any 1MHz band
5.25 - 5.35	11dBm in any 1MHz band
If transmitting antennas of directional gain greater that	an 6dBi are used, both the peak transmit
power and the peak spectral density shall be reduced	by the amount in dB that the directional
gain of the antenna exc	eeds 6dBi
ANALYZER SETTINGS: RBW=1MHz, VBW=3MHz	



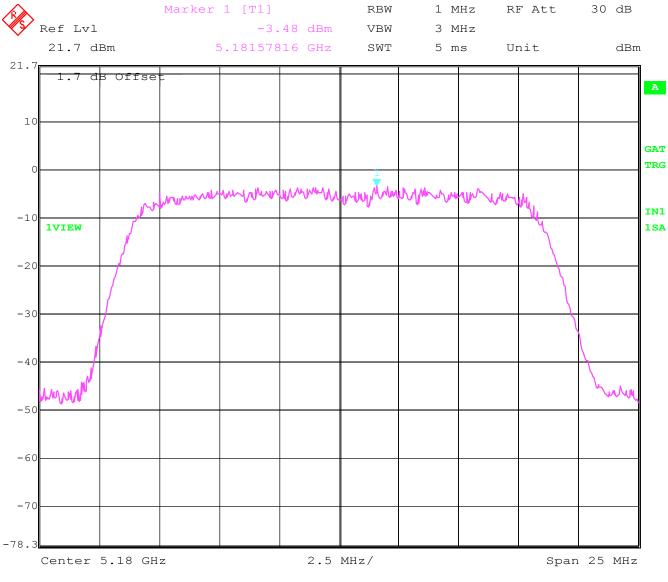
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§15.407(a)(1)(2)(5)

### **POWER SPECTRAL DENSITY** (Data rate – 6Mbps)

#### Lowest Channel: 5180MHz



Date: 18.NOV.2003 13:31:35



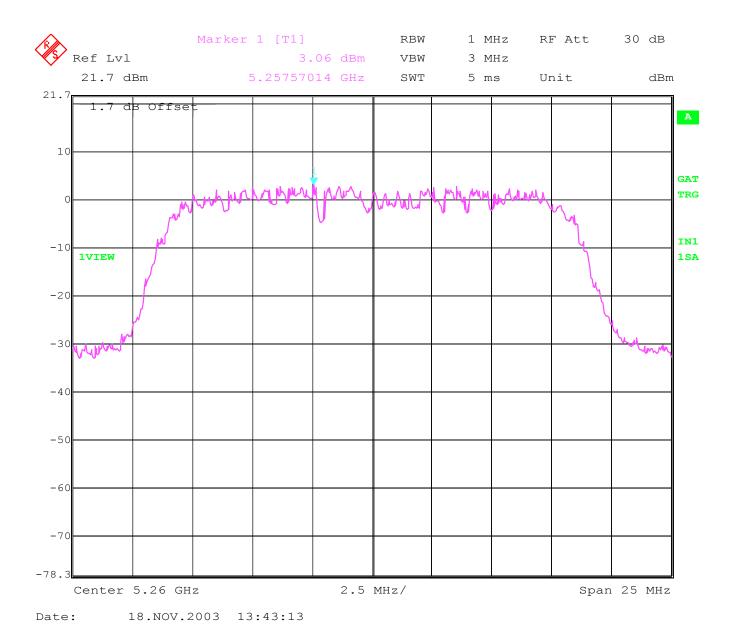
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§15.407(a)(1)(2)(5)

### **POWER SPECTRAL DENSITY** (Data rate – 6Mbps)

Mid Channel: 5260MHz



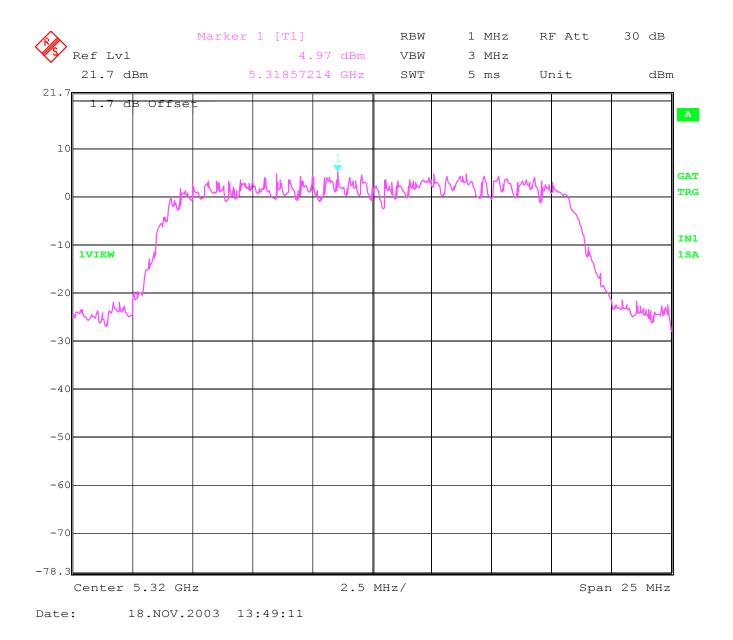


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**POWER SPECTRAL DENSITY** (Data rate – 6Mbps) §15.407(a)(1)(2)(5)

Highest Channel: 5320MHz





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POWER SPECTRAL DENSITY (Data rate – 6Mbps) RSS-210 §6.2.2(q1)(i)(ii)

**Test Results** 

TEST CO	NDITIONS	POWER SPECTRAL DENSITY (dBm)		ITY (dBm)
Frequen	cy (MHz)	5180	5260	5320
T <sub>nom</sub> (23)°C	V <sub>nom</sub> (3.3) VDC	-2.52	3.49	4.94

LIMIT	<b>RSS-210</b>
Frequency range (GHz)	Conducted Peak Power
5.15 - 5.25	10dBm in any 1MHz band
5.25 - 5.35	11dBm in any 1MHz band
If transmitting antennas of directional gain greater that	an 6dBi are used, both the peak transmit
power and the peak spectral density shall be reduced	by the amount in dB that the directional
gain of the antenna exc	eeds 6dBi

ANALYZER SETTINGS: RBW=VBW=1MHz



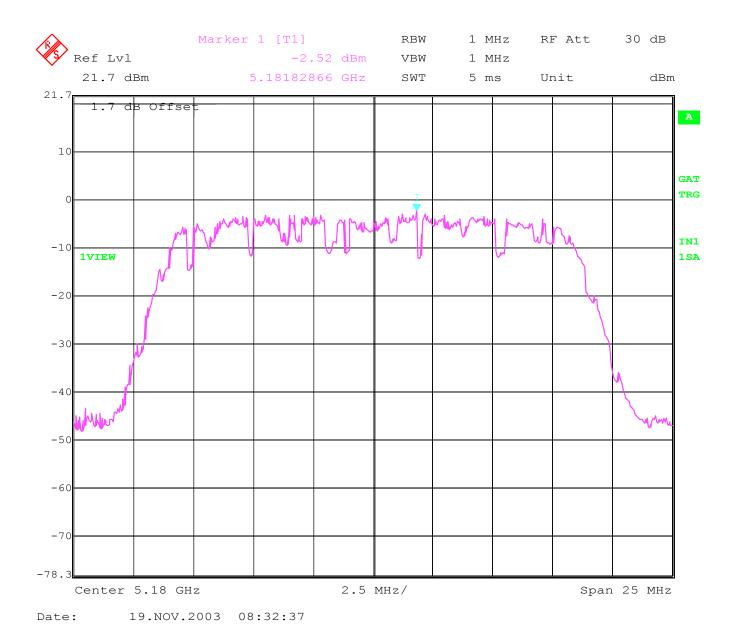
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### **POWER SPECTRAL DENSITY** (Data rate – 6Mbps)

RSS-210 §6.2.2(q1)(i)(ii)

#### Lowest Channel: 5180MHz





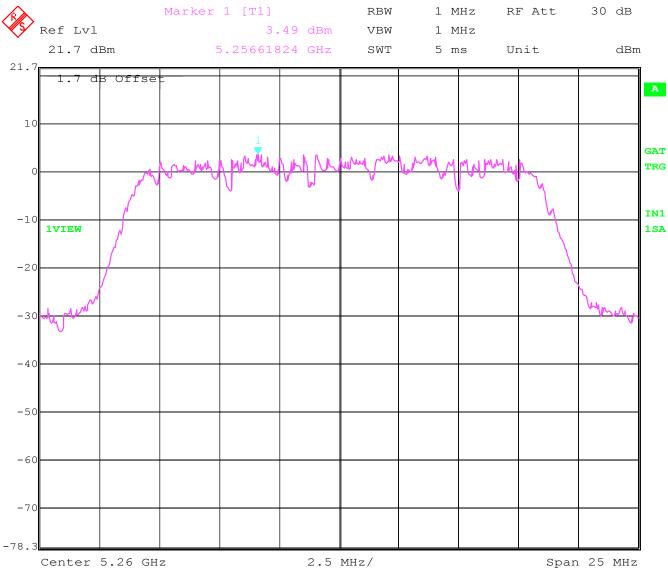
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### **POWER SPECTRAL DENSITY** (Data rate – 6Mbps)

### RSS-210 §6.2.2(q1)(i)(ii)

Mid Channel: 5260MHz







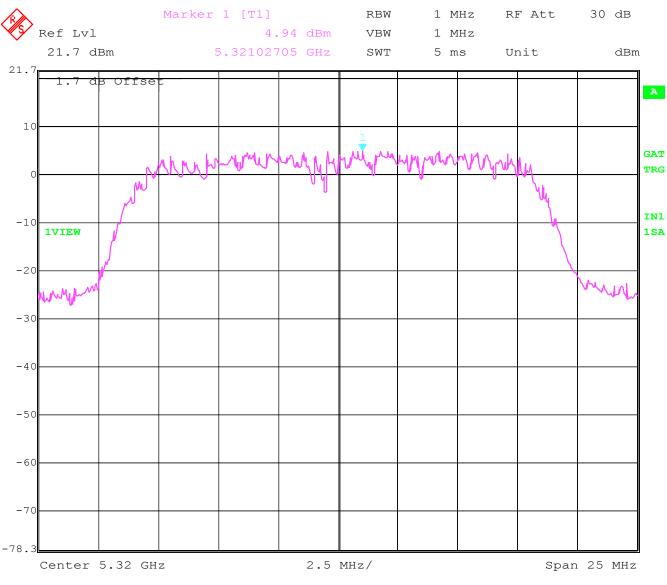
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#### POWER SPECTRAL DENSITY (Data rate – 6Mbps)

RSS-210 §6.2.2(q1)(i)(ii)

Highest Channel: 5320MHz





19.NOV.2003 08:37:57

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### PEAK EXCURSION

#### (Data rate – 54Mbps)

54Mbps is found to be worst-case for this measurement. Following method as defined in DA 02-2138 was used for this measurement.

### **Test Procedure:**

Set the spectrum analyzer span to view the entire emission bandwidth. The largest difference between the following two traces must be  $\leq 13$ dB for all frequencies across the emission bandwidth. Submit a plot.

1<sup>st</sup> Trace:

• Set RBW=1MHz, VBW≥3MHz with peak detector and max hold settings

2<sup>nd</sup> Trace:

- If method #1 was used for the peak conducted transmit output power test, then create the 2<sup>nd</sup> trace using the settings described in method #1.
- If method #2 or #3 were used for the peak conducted transmit power test, then create the 2<sup>nd</sup> trace using the settings described in method #3.

Since method #3 is applicable for measuring peak output power for EUT following analyzer settings were used;

 $1^{st}$  Trace: RBW = 1MHz, VBW = 3MHz  $2^{nd}$  Trace: RBW = 1MHz, VBW = 5KHz

### <u>Test Results</u>

TEST CC	ONDITIONS	PEAK I	EXCURSION RAT	ГІО (dB)
Freque	ncy (MHz)	5180	5260	5320
T <sub>nom</sub> (23)°C	V <sub>nom</sub> (3.3) VDC	11.83	12.54	11.76

### LIMIT

### SUBCLAUSE §15.407(a)(6)

The ratio of the peak excursion of the modulation envelope (measured using a peak hold function) to the peak transmit power shall not exceed 13dB across any 1MHz bandwidth or the emission bandwidth which ever is less.



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§15.407 (a)(6)

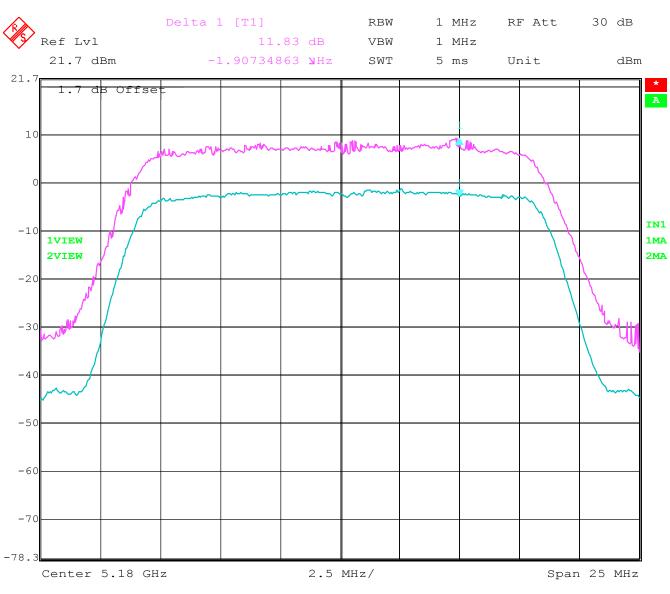


§15.407 (a)(6)

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### PEAK EXCURSION (Data rate – 54Mbps) Lowest Channel: 5180MHz



Date: 13.NOV.2003 08:24:50

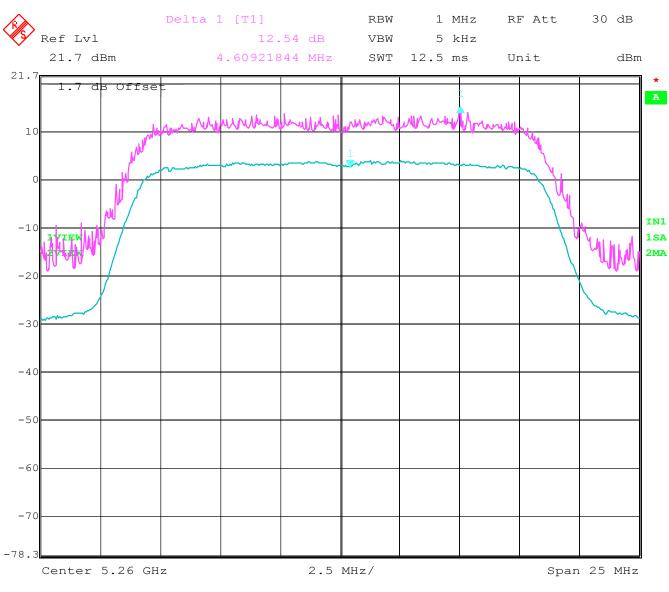


§15.407 (a)(6)

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### PEAK EXCURSION (Data rate – 54Mbps) Mid Channel: 5260MHz



Date: 17.NOV.2003 13:37:22

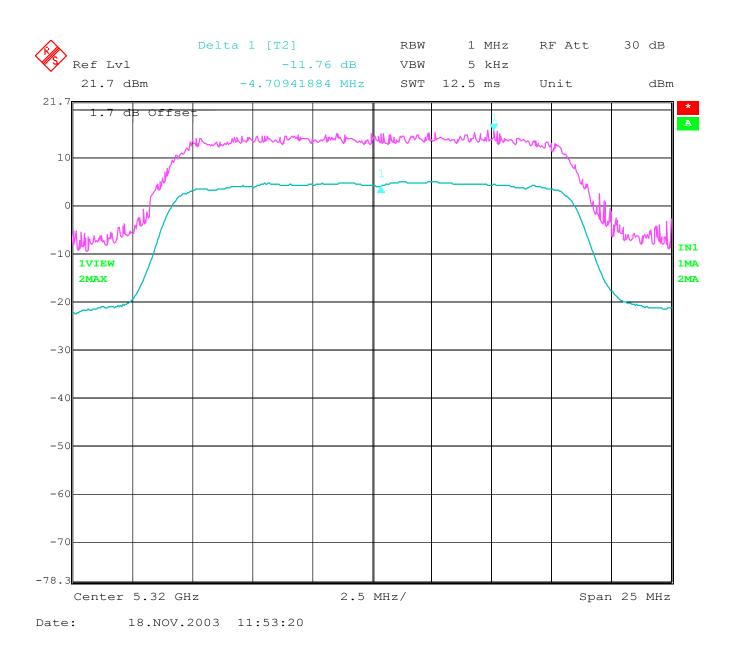


§15.407 (a)(6)

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### PEAK EXCURSION (Data rate – 54Mbps) Highest Channel: 5320MHz





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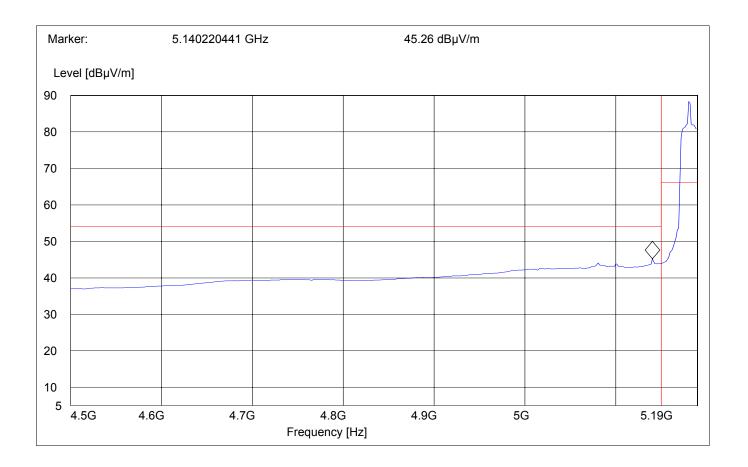
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#### BAND EDGE COMPLIANCE (Data rate – 54Mbps)

### §15.407 (b)(1)(2)(4)(6)

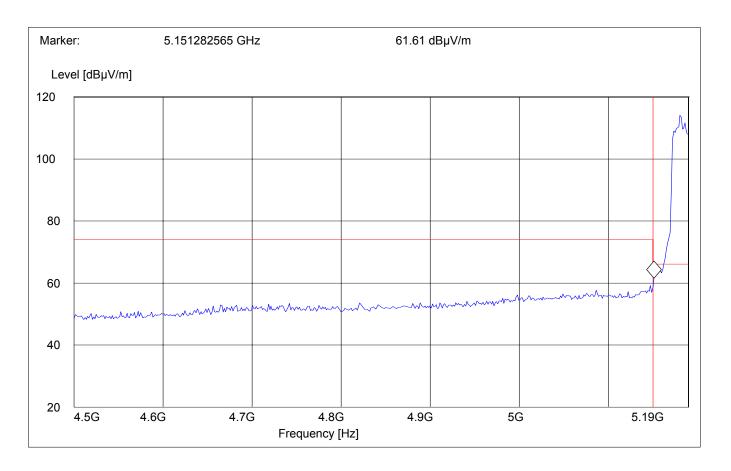
# Low frequency section (spurious in the restricted band 4500 – 5150 MHz) (Average measurement)

Antenna: EUT plane:	Horizontal Horizontal	with screen v	vertical @ 90	°	
Operating condition SWEEP TABLE Limit Line horizontal Limit Line vertical	:	Tx at 51801 "FCC15.40 54dBμV 5150MHz	MHz 7 LBE_AVG	'n	
Start Stop Frequency Frequenc	Detector Time	Meas. Bandw.	RBW	VBW	Transducer
4.5 GHz 5.19 GHz	5	Coupled	1 MHz	10Hz	#326 horn (dBi)



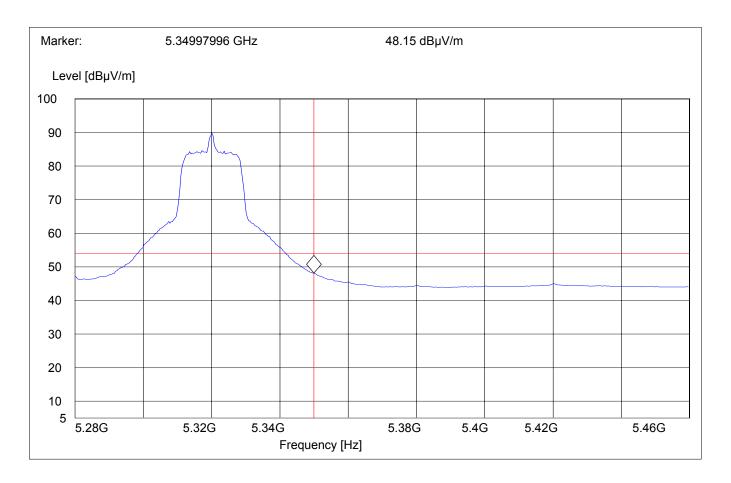


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BAND EDGE COMPLIANCE (Data rate – 54Mbps) Low frequency section (spurious in the restricted band 4500 (Peak measurement)						§15.407 (b)(1)(2)(4)(6) 150 MHz)
Antenna: EUT plane:	:	Horizontal Horizontal	with screen v	vertical @ 90	o	
Operating c SWEEP TA Limit Line I Limit Line v	BLE norizontal	:	Tx at 51801 "FCC15.40 74dBμV 5150MHz	MHz 7 LBE_Pk"		
Start Frequency 4.5 GHz	Stop Frequency 5.19 GHz	Detector Time MaxPeak	Meas. Bandw. Coupled	RBW 1MHz	VBW 1MHz	Transducer #326 horn (dBi)



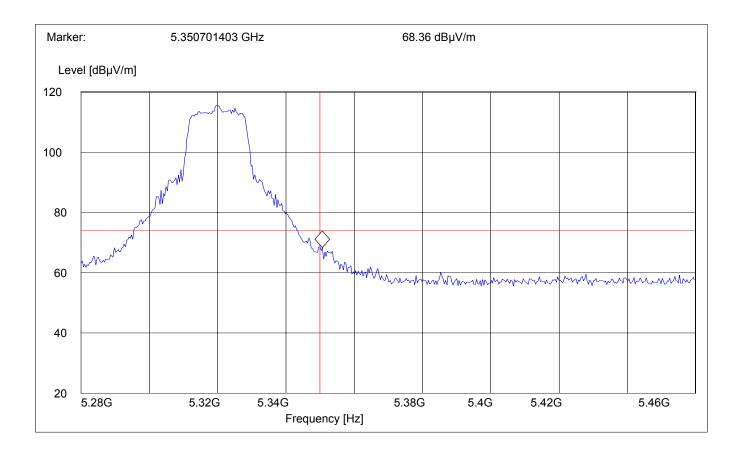


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(Data rate High freq	DGE COM e – 54Mbps uency secti measureme	) on (spuriou	is in the rea	stricted ba	nd 5350 – :	§15.407 (b)(1)(2)(4)(6) 5460 MHz)
Antenna: EUT plane:	:	Horizontal Horizontal	with screen v	vertical @ 90	0	
Operating of SWEEP TA Limit Line h Limit Line v	BLE lorizontal	:	Tx at 53201 "FCC15.40 54dBµV 5350MHz	MHz 7 HBE_AVG	n	
Start Frequency 5.28 GHz	Stop Frequency 5.46 GHz	Detector Time MaxPeak	Meas. Bandw. Coupled	RBW 1 MHz	VBW 10Hz	Transducer #326 horn (dBi)





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(Data rat High freq	DGE COM e – 54Mbps juency secti asurement)	) Ion (spuriou	s in the re	stricted bar	nd 5350 – 5	§15.407 (b)(1)(2)(4)(6) 5460 MHz)
Antenna: EUT plane:	,	Horizontal	with screen v	vertical @ 90°	2	
Operating c SWEEP TA Limit Line I Limit Line v	BLE norizontal	:	Tx at 53201 "FCC15.40 74dBµV 5350MHz			
Start Frequency 5.28 GHz	Stop Frequency 5.46 GHz	Detector Time MaxPeak	Meas. Bandw. Coupled	RBW 1 MHz	VBW 1MHz	Transducer #326 horn (dBi)





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#### EMISSION LIMITATIONS Transmitter (Radiated) (Data rate – 54Mbps)

### § 15.407 (b)(1)(2)(4)(6)

Limits		§ 15.209 / § 15.407
Freq. (MHz)	Field Strength (µV/m)	Field Strength (dBµV/m)
0.009-0.490	2400/F (kHz)	
0.490-1.750	24000/F (kHz)	
1.705-30.0	30	29.54
30-88	100	40.00
88-216	150	43.52
216-960	200	46.02
Above 960*	500	53.97
1000-40000**	2013.8	66.08

\*) Limit in restricted bands

\*\*) Limit outside restricted bands

#### NOTE:

1. The radiated emissions were done with different settings, using the relevant pre-amplifiers for the relevant frequency ranges. This is the reason that the graphs show different noise levels. In the range between 3 and 40 GHz very short cable connections to the antenna was used to minimize the noise level.

2. All measurements are done in peak mode unless specified with the plots.

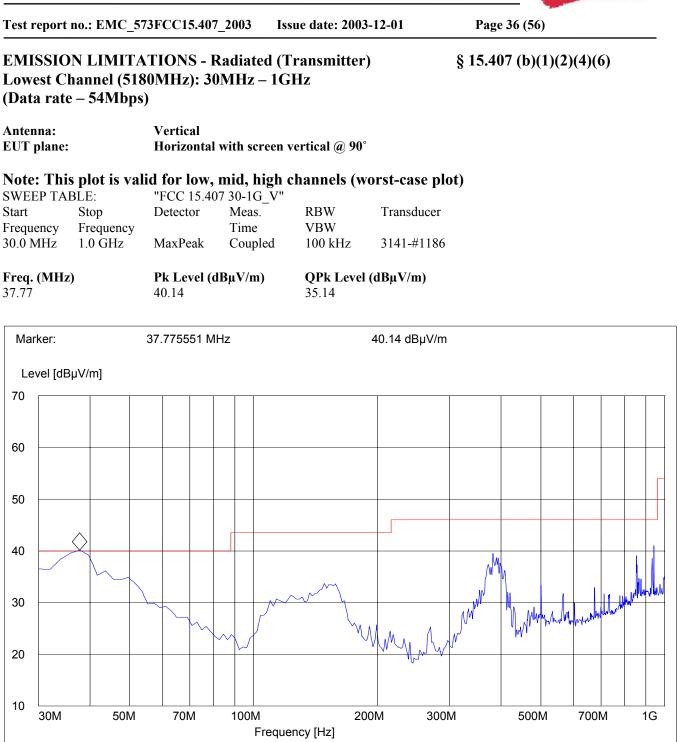


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Transmit at	t Lowest channel	Frequency 5180MHz				
Frequency (MHz)	Level (dBµV/m)					
	Peak	Quasi-Peak	Average			
37.77	40.14	35.14				
10350.7	33.82					
	t Middle channel	Frequency 5260MHz				
Frequency (MHz)	Level (dBµV/m)					
	Peak	Quasi-Peak	Average			
10527.0	42.44					
Transmit at	Highest channel	Frequency 5320MHz				
Frequency (MHz)		Level (dBµV/m)				
	Peak	Quasi-Peak	Average			
10637.2	48.4					







§ 15.407 (b)(1)(2)(4)(6)

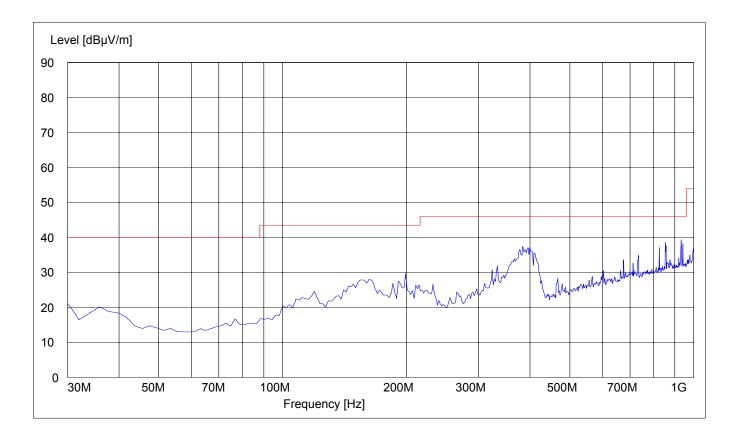
Test report no.: EMC\_573FCC15.407\_2003 Issue date: 2003-12-01 Page 37 (56)

#### EMISSION LIMITATIONS - Radiated (Transmitter) Lowest Channel (5180MHz): 30MHz – 1GHz (Data rate – 54Mbps)

Antenna:HorizontalEUT plane:Horizontal with screen vertical @ 90°

#### Note: This plot is valid for low, mid, high channels (worst-case plot)

SWEEP TAE	BLE:	"FCC 15.407	7 30-1G_H"		
Start	Stop	Detector	Meas.	RBW	Transducer
Frequency	Frequency		Time	VBW	
30.0 MHz	1.0 GHz	MaxPeak	Coupled	100 kHz	3141-#1186





EMISSIC Lowest C Average)	DN LIMITA	:: EMC_573FCC15.407_2003 Issue date: 2003-12-01 LIMITATIONS - Radiated (Transmitter) nnel (5180MHz): 1GHz – 7GHz 54Mbps)					Page 38 (56) § 15.407 (b)(1)(2)(4)(6)		
Antenna: EUT plane	:	Horizontal Horizontal	with screen	vertical @ 9	0°				
Note: The WEEP TA Start Trequency GHz	e peak abov BLE: Stop Frequency 7.0 GHz	e the limit "FCC 15.40 Detector MaxPeak		<b>carrier fre</b> RBW 1MHz	v <b>g.</b> VBW 10Hz	Transducer 326 horn			
Marker: Level [d		.184368737 G	Hz		103.12 dBµ∖	//m			
120	врилиј								
100							$\diamond$		
80									
60									
40							men for how	m m m m m m m m m m m m m m m m m m m	
20									
0									
-20			2G		3G	4G	5G	6G 7G	



est report no.: EMC_5'	73FCC15.407_2003	Issue date: 200	03-12-01	Page 39 (56)		
	ATIONS - Radiated 80MHz): 7GHz – 18 5)		r)	§ 15.407 (b)(1)(2)(4)(6)		
ntenna: UT plane:	Horizontal Horizontal with scree	en vertical @ 90	)°			
WEEP TABLE: tart Stop requency Frequency GHz 18.0 GHz	"FCC 15.407 7-18G" Detector Meas. Time MaxPeak Coupled	RBW VBW I 1MHz	Transducer 326 horn			
Level [dBµV/m]	10.350701403 GHz		33.82 dBµV/m	1		
80						
70						
50						
50						
40	$\diamond$		~~ ~~ ~~	~~~~~		
		har	~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~		~~	
30						



Test report no.: EMC\_573FCC15.407\_2003 Issue date: 2003-12-01 Page 40 (56) § 15.407 (b)(1)(2)(4)(6) **EMISSION LIMITATIONS - Radiated (Transmitter)** Lowest Channel (5260MHz): 1GHz – 7GHz (Average) (Data rate – 54Mbps) Antenna: Horizontal EUT plane: Horizontal with screen vertical @ 90° Note: The peak above the limit line is the carrier freq. "FCC 15.407 1-7G" SWEEP TABLE: Start Detector Meas. RBW Transducer Stop Frequency VBW Frequency Time 1GHz 7.0 GHz MaxPeak Coupled 1MHz 10Hz 326 horn Marker: 5.268537074 GHz 103.47 dBµV/m Level [dBµV/m] 120 100 80 60 40 20 0 -20 3G 6G 1G 2G 4G 5G 7G

Frequency [Hz]

20

7G

8G

10G



Test report no.: EMC\_573FCC15.407\_2003 Issue date: 2003-12-01 Page 41 (56) § 15.407 (b)(1)(2)(4)(6) **EMISSION LIMITATIONS - Radiated (Transmitter)** Lowest Channel (5260MHz): 7GHz – 18GHz (Data rate – 54Mbps) Antenna: Horizontal **EUT plane:** Horizontal with screen vertical @ 90° SWEEP TABLE: "FCC 15.407 7-18G" Start Stop Detector Meas. RBW Transducer Frequency Frequency Time VBW 7GHz 18.0 GHz Coupled 326 horn MaxPeak 1MHz Marker: 10.527054108 GHz 42.44 dBµV/m Level [dBµV/m] 80 70 60 50 40 Λ 30

12G

Frequency [Hz]

14G

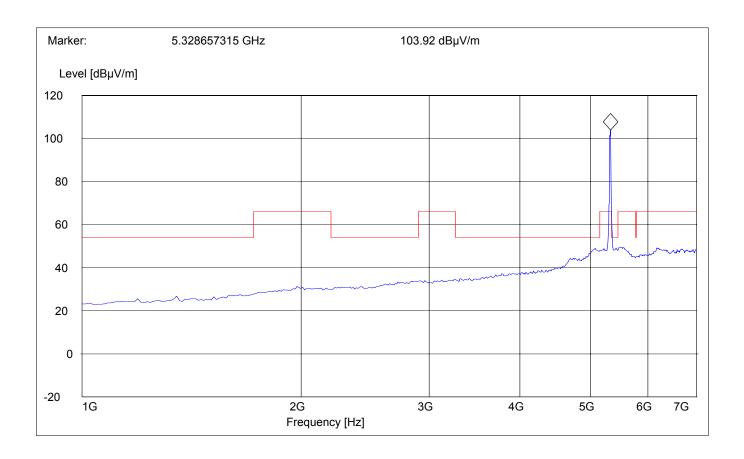
16G

18G

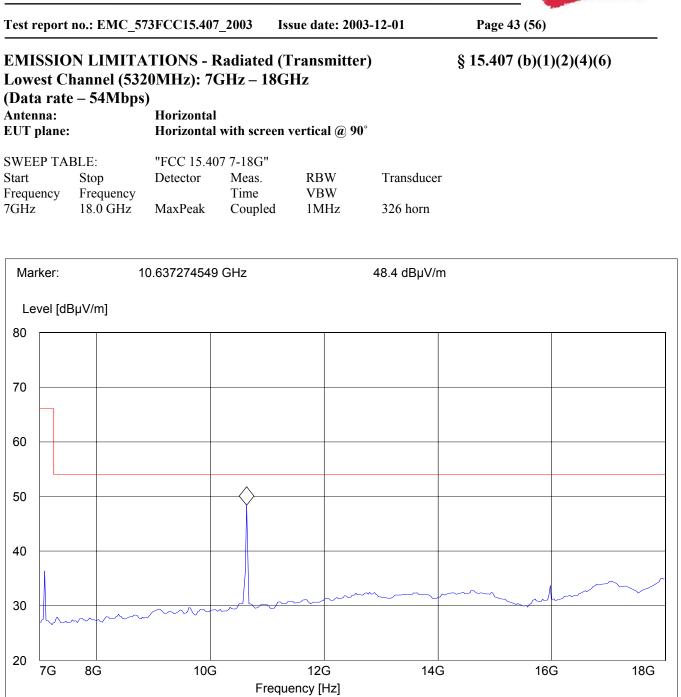


Test report	no.: EMC_57	73FCC15.407	_2003	Issue date: 2003	-12-01	Page 42 (56)
	ON LIMITA hannel (532			l (Transmitter GHz	)	§ 15.407 (b)(1)(2)(4)(6)
(Data rate (Average)	e – 54Mbps	)				
(Average) Antenna: EUT plane:	:	Horizontal Horizontal		een vertical @ 90°		
Note: The	e peak abov	e the limit	line is t	he carrier freq	•	
SWEEP TA	BLE:	"FCC 15.40	)7 1-7G"	-		
Start	Stop	Detector	Meas.	RBW		Transducer
Frequency	Frequency		Time		VBW	

Frequency	Frequency		Time		VBW	
1GHz	7.0 GHz	MaxPeak	Coupled	1MHz	10Hz	326 horn









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 EMISSION LIMITATIONS - Radiated (Transmitter)
 § 15.407 (b)(1)(2)(4)(6)

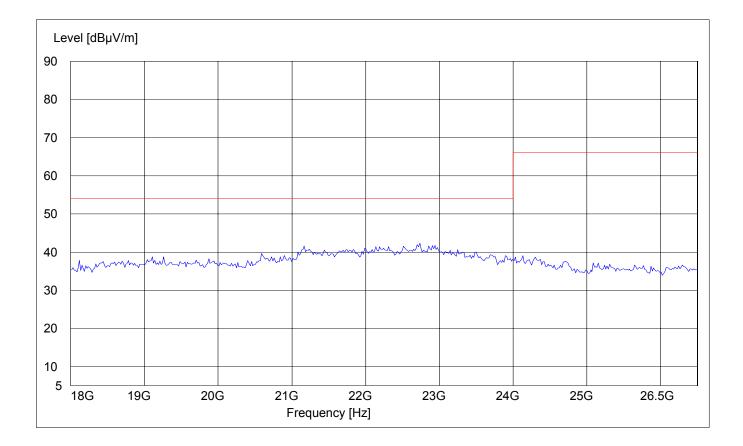
 18GHz - 26.5GHz
 (Data rate - 54Mbps)

 Antenna:
 Horizontal

 EUT plane:
 Horizontal with screen vertical @ 90°

#### Note: This plot is valid for low, mid, high channels (worst-case plot)

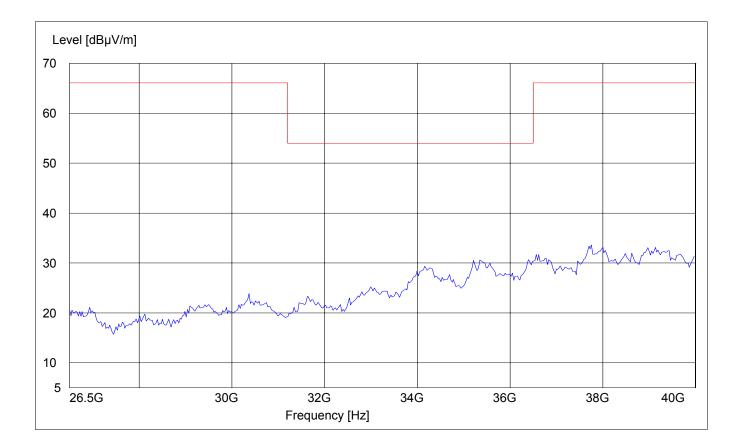
SWEEP TA	BLE:	"FCC 15.40	7 18-26.5G"		
Start	Stop	Detector	Meas.	RBW	Transducer
Frequency	Frequency		Time	VBW	
18GHz	26.5 GHz	MaxPeak	Coupled	1MHz	3160-09 horn





Test report no.: EMC\_573FCC15.407\_2003 Issue date: 2003-12-01 Page 45 (56) **EMISSION LIMITATIONS - Radiated (Transmitter)** § 15.407 (b)(1)(2)(4)(6) 26.5GHz - 40GHz (Data rate - 54Mbps) Antenna: Horizontal **EUT plane:** Horizontal with screen vertical @ 90° Note: This plot is valid for low, mid, high channels (worst-case plot)

SWEEP TAP	BLE:	"FCC 15.40"	7 26.5-40G"		
Start	Stop	Detector	Meas.	RBW	Transducer
Frequency	Frequency		Time	VBW	
26.5GHz	40 GHz	MaxPeak	Coupled	1MHz	3160-10 horn



CETECOM

Test report no.: EMC\_573FCC15.407\_2003 Issue date: 2003-12-01

#### **CONDUCTED EMISSIONS**

#### § 15.107/207

#### Measured with AC/DC power adapter

#### SWEEP TABLE: "55022 cond"

ption:	EN 55022 fo	or 150KHz-30	MHz	
Stop	Detector	Meas	IF	Transducer
Frequency		Time	Bandw.	
30.0 MHz	MaxPeak	Coupled	10 kHz	None
	Stop Frequency	Stop Detector Frequency	Stop Detector Meas Frequency Time	StopDetectorMeasIFFrequencyTimeBandw.

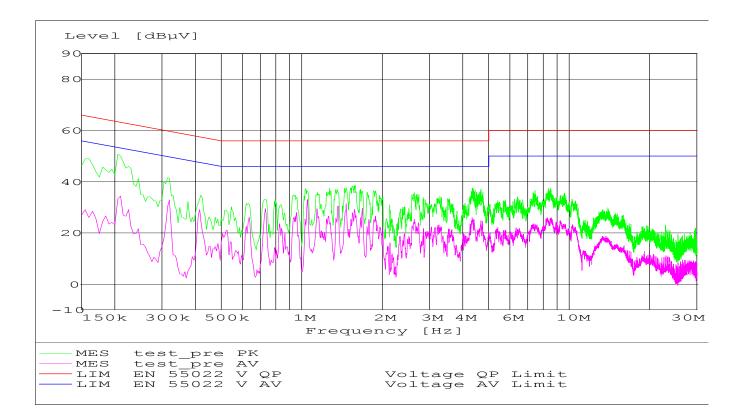
#### Technical specification: 15.107 / 15.207 (Revised as of August 20, 2002) Limit

Frequency of Emission (MHz)	Conducted Limit (dBµV)			
	Quasi-Peak	Average		
0.15 - 0.5	66 to 56*	56 to 46*		
0.5 - 5	56	46		
5 - 30	60	50		

\* Decreases with logarithm of the frequency

ANALYZER SETTINGS: RBW = 10KHz

VBW = 10KHz



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#### **RECEIVER SPURIOUS RADIATION**

§ 15.209

Limits

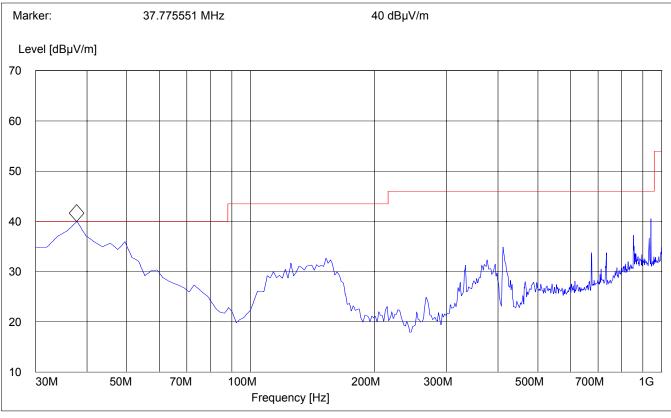
Frequency (MHz)	Field strength (µV/m)	Measurement distance (m)
0.009 - 0.490	2400/F (kHz)	300
0.490 - 1.705	24000/F (kHz)	30
1.705 - 30.0	30	30
30 - 88	100	3
88 - 216	150	3
216 - 960	200	3
above 960	500	3

#### NOTE:

The radiated emissions were done with different settings, using the relevant pre-amplifiers for the relevant frequency ranges. This is the reason that the graphs show different noise levels. In the range between 3 and 25 GHz very short cable connections to the antenna was used to minimize the noise level.

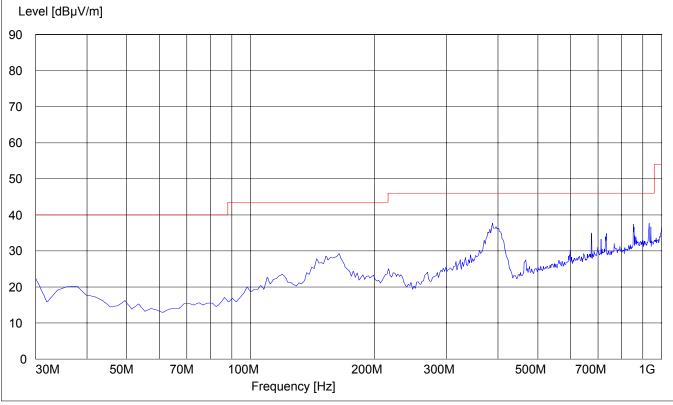


Test report	no.: EMC_57	73FCC15.407	2003 Iss	ue date: 2003	3-12-01	Page 48 (56)	
RECEIV 30MHz –	ER SPURI( 1GHz	OUS RADI	ATION			§ 15.209	
Antenna: EUT plane:		Vertical Horizontal	with screen v	ertical @ 90	0		
SWEEP TA	BLE:	"WLAN Sp	ouri hi 30-1G"				
Start Frequency	Stop Frequency	Detector	Meas. Time	RBW VBW	Transducer		
30.0 MHz	1.0 GHz	MaxPeak	Coupled	100 kHz	3141-#1186		
Freq. (MHz	z)	Pk Level (d	lBμV/m)		(dBµV/m)		
37.77		40.00		35.00			





RECEIVER SPURIOUS RADIATION 30MHz – 1GHz						§ 15.209
Antenna: EUT plane	:	Horizontal Horizontal		vertical @ 90	5	
SWEEP TA	BLE:	"WLAN Sp	ouri hi 30-1G"			
Start Frequency	Stop Frequency	Detector	Meas. Time	RBW VBW	Transducer	
30.0 MHz	1.0 GHz	MaxPeak	Coupled	100 kHz	3141-#1186	



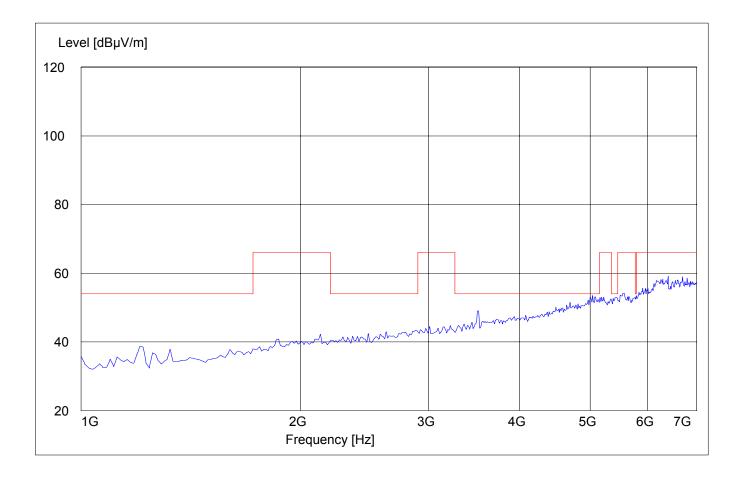


§ 15.209

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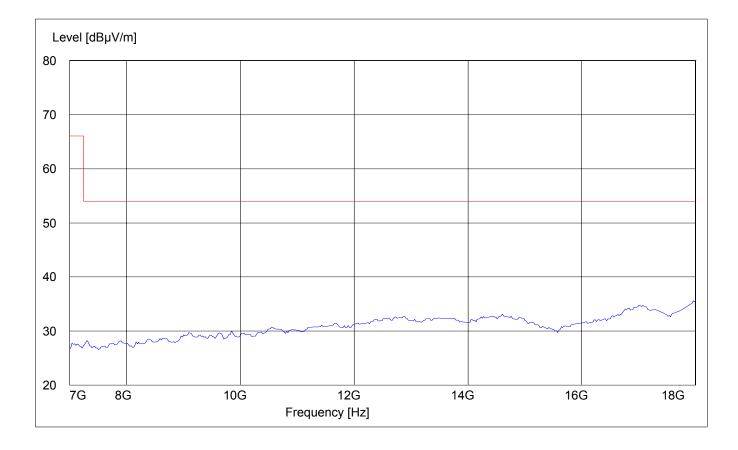
#### **RECEIVER SPURIOUS RADIATION 1GHz – 7GHz**

Antenna: EUT plane:		Horizontal Horizontal with screen vertical @ 90°				
SWEEP TAI	BLE:	"WLAN Spuri hi 1-7G"				
Start	Stop	Detector	Meas.	RBW		Transducer
Frequency	Frequency	Time	Bandw.		VBW	
1.0 GHz	7.0 GHz	MaxPeak	Coupled	1 MHz	1MHz	#326 horn (dBi)



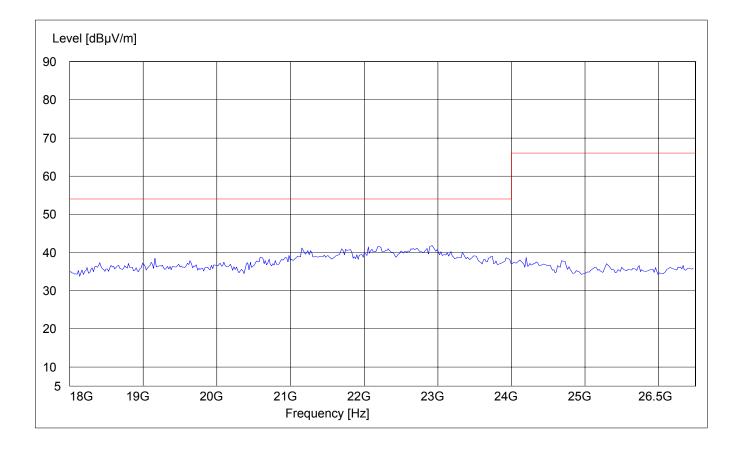


Test report	no.: EMC_57	73FCC15.407	7_2003 Is	sue date: 200	3-12-01	Page 51 (56)		
RECEIVER SPURIOUS RADIATION 7GHz – 18GHz						§ 15.209		
Antenna:HorizontalEUT plane:Horizontal with screen vertica				vertical @ 90	0			
SWEEP TA	BLE:	"WLAN Sp	ouri hi 7-18G"					
Start Frequency	Stop Frequency	Detector Time	Meas. Bandw.	RBW VBW	Transducer			
7.0 GHz	18 GHz	MaxPeak	Coupled	1 MHz	#326 horn (	dBi)		



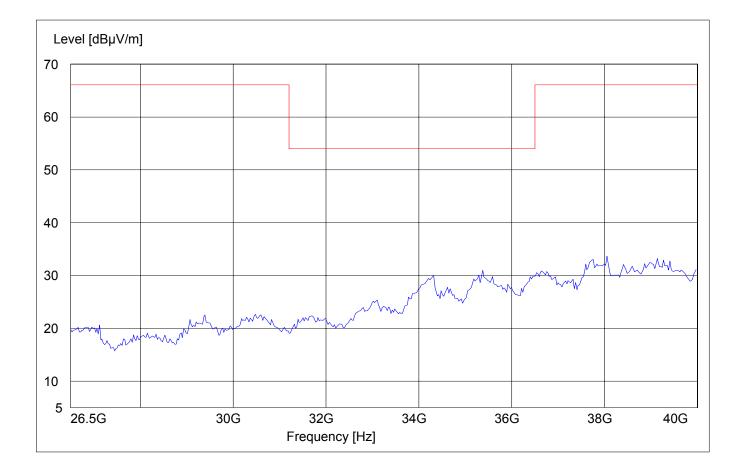


Test report	no.: EMC_5'	73FCC15.407	2003 Is	sue date: 2003	-12-01 Page 52 (56)
RECEIVER SPURIOUS RADIATION 18GHz – 26.5GHz					§ 15.209
Antenna:HorizontalEUT plane:Horizontal with screen vertical				vertical @ 90°	
SWEEP TABLE: "WLAN Spuri hi 18-26.5G"			ouri hi 18-26.5	G"	
Start Frequency	Stop Frequency	Detector Time	Meas. Bandw.	RBW VBW	Transducer
18 GHz	26.5 GHz	MaxPeak	Coupled	1 MHz	#141 horn (dBi)





Test report	no.: EMC_5	73FCC15.40	7_2003 Is	sue date: 200	3-12-01	Page 53 (56)	
RECEIVER SPURIOUS RADIATION 26.5GHz – 40GHz						§ 15.209	
Antenna:HorizontalEUT plane:Horizontal with screen vertica				vertical @ 90	)°		
SWEEP TABLE: "WLAN Spuri hi 26.5-40G"			)G"				
Start Frequency	Stop Frequency	Detector Time	Meas. Bandw.	RBW VBW	Transducer		
26.5 GHz	40 GHz	MaxPeak	Coupled	1 MHz	3160-10 hori	1	





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#### TEST EQUIPMENT AND ANCILLARIES USED FOR TESTS

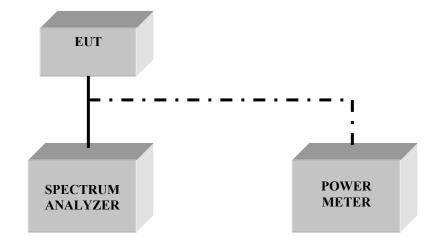
No	Instrument/Ancillary	Туре	Manufacturer	Serial No.
01	Spectrum Analyzer	ESIB 40	Rohde & Schwarz	100107
02	Spectrum Analyzer	FSEM 30	Rohde & Schwarz	826880/010
03	Biconilog Antenna	3141	EMCO	0005-1186
04	Horn Antenna (700M-18GHz)	SAS-200/571	AH Systems	325
05	Horn Antenna (18-26.5GHz)	3160-09	EMCO	1240
06	Horn Antenna (26.5-40GHz)	3160-10	EMCO	1156
07	2-3GHz Band reject filter	BRM50701	Microtronics	6
08	Power-Meter	NRVD	Rohde & Schwarz	0857.8008.02
09	Pre-Amplifier	TS-ANA	Rohde & Schwarz	
10	Pre-Amplifier	JS4-00102600	Miteq	00616



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**BLOCK DIAGRAMS Conducted Testing** 

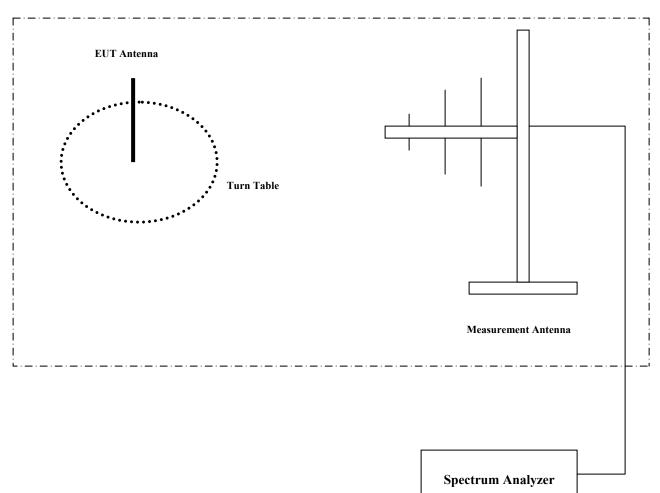




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#### **Radiated Testing**



#### **ANECHOIC CHAMBER**