



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



TTI-P-G 081/94-A0

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**

1.2 Testing laboratory
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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

1.4 Application details

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

Frequency : 2412MHz – 2462MHz for 2.4GHz band
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
(Hitachi model HFT01-DL01)
Power supply : 3.3 VDC from Host
Output power : 21.8dBm conducted peak power
Extreme temp. Tolerance : 0°C to +70°C

1.6 Test standards: **FCC Part 15 §15.247 / CANADA RSS-210**
Measurements done as per DA 02-2138

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.

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)



Date

Section

Name

Signature

Responsible for test report and project leader:

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



Date

Section

Name

Signature

2.2 Test report

TEST REPORT

Test report no.: EMC_573FCC15.407_2003

FCC Part 15.407 for UNII Devices / CANADA RSS-210

TEST REPORT REFERENCE

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EMISSION BANDWIDTH**§15.407(a)(1)(2)****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 _{nom} (23)°C	V _{nom} (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

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

§15.407(a)(1)(2)

Lowest Channel: 5180MHz



Delta 1 [T1]

RBW 300 kHz RF Att 30 dB

Ref Lvl -1.63 dB

VBW 1 MHz

21.7 dBm

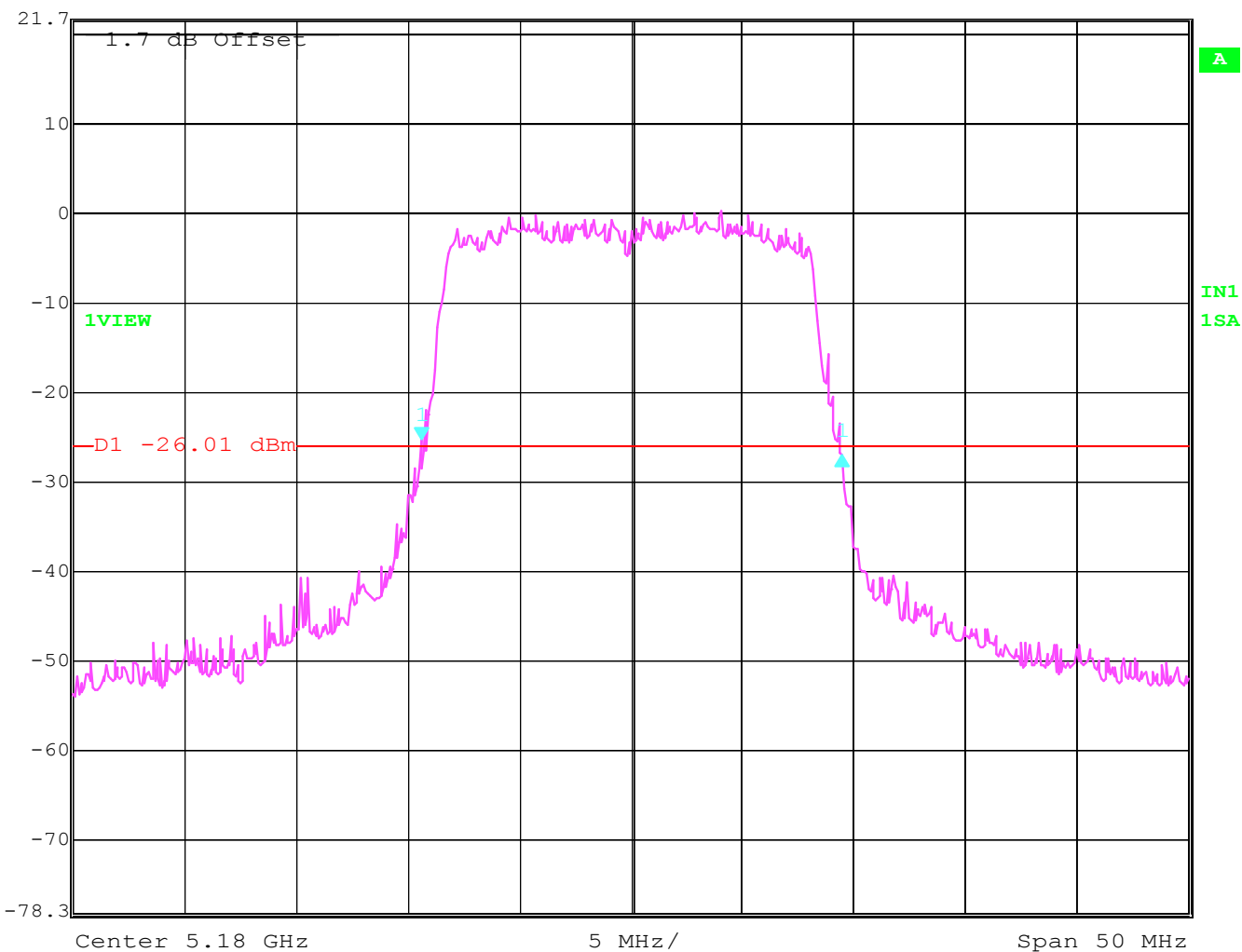
18.83767535 MHz

SWT

5 ms

Unit

dBm



Date: 18.NOV.2003 09:37:16

EMISSION BANDWIDTH

§15.407(a)(1)(2)

26 dB bandwidth

(Data rate – 6Mbps)

Mid Channel: 5260MHz



Delta 1 [T1]

RBW 300 kHz RF Att 30 dB

Ref Lvl 0.51 dB

VBW 1 MHz

21.7 dBm

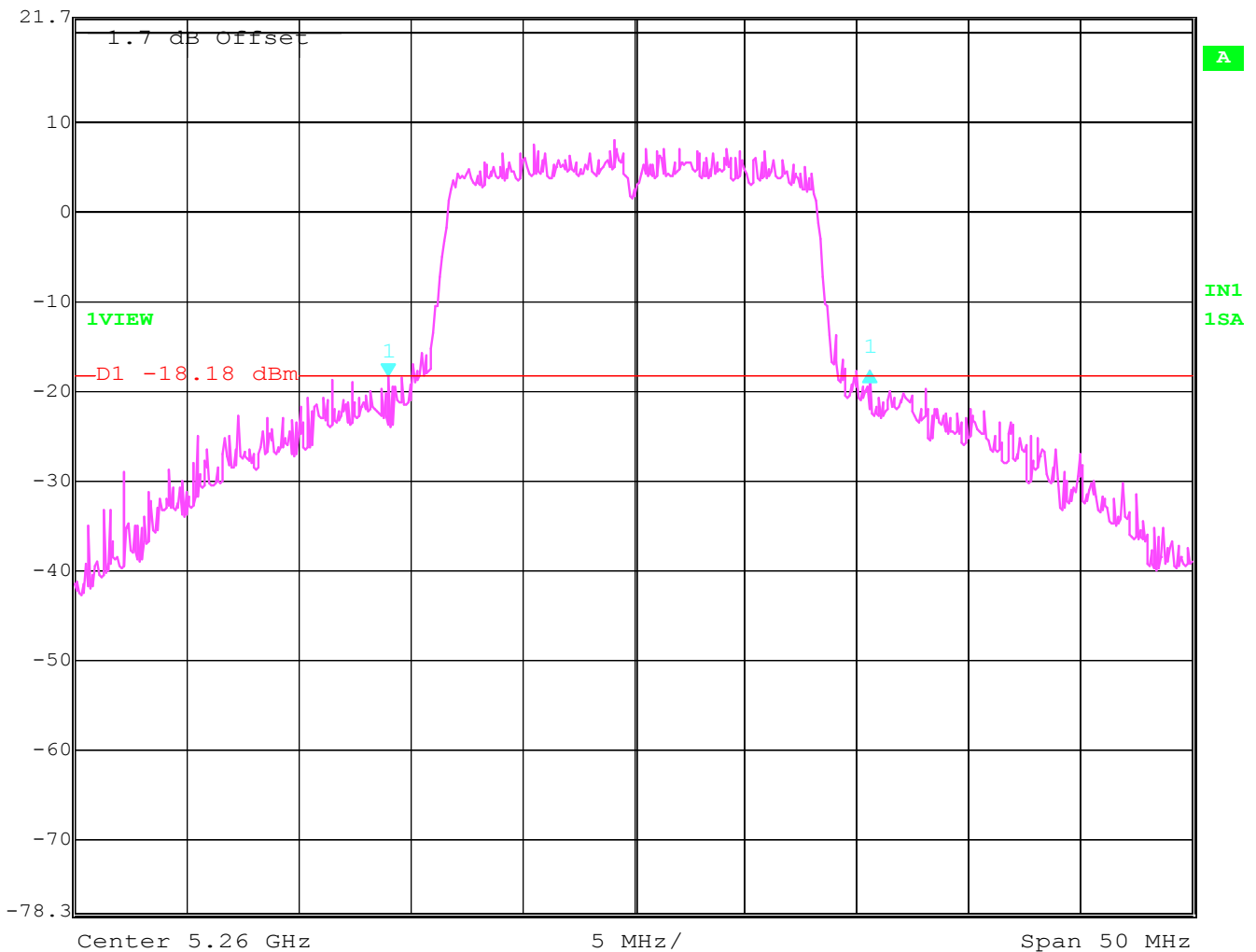
21.54308617 MHz

SWT

5 ms

Unit

dBm



Date: 18.NOV.2003 09:30:37

EMISSION BANDWIDTH

§15.407(a)(1)(2)

26 dB bandwidth

(Data rate – 6Mbps)

Highest Channel: 5320MHz



Delta 1 [T1]

RBW 300 kHz RF Att 30 dB

Ref Lvl -0.97 dB

VBW 1 MHz

21.7 dBm

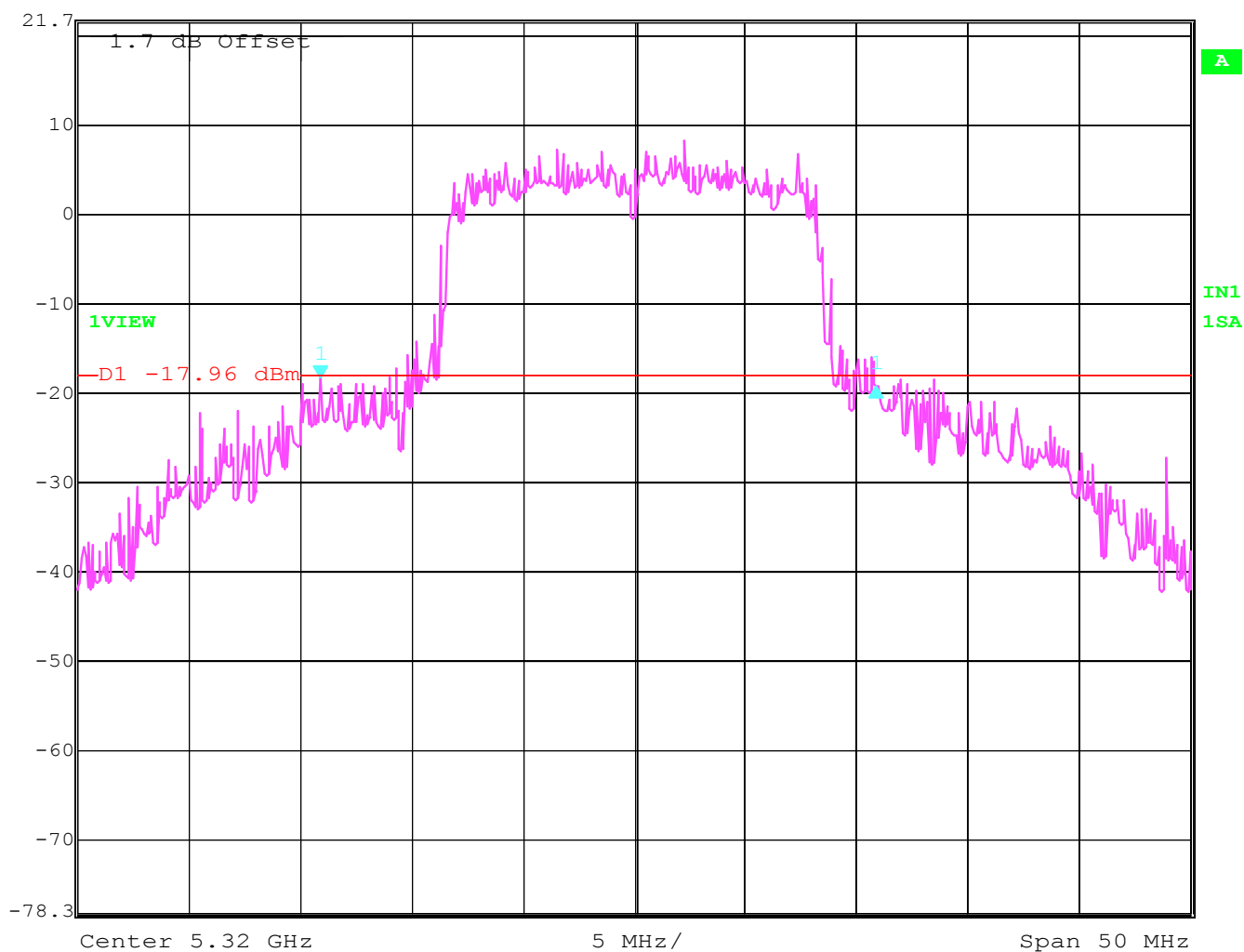
24.94989980 MHz

SWT

5 ms

Unit

dBm



Date: 18.NOV.2003 09:58:35

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

RSS-210 §6.2.2(q1)(i)(ii)

Test Results

TEST CONDITIONS		20 dB BANDWIDTH (MHz)		
Frequency (MHz)		5180	5260	5320
T _{nom} (23)°C	V _{nom} (3.3) VDC	17.83	17.93	17.93

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

99% POWER BANDWIDTH

RSS-210 §6.2.2(q1)(i)(ii)

20 dB bandwidth

(Data rate – 6Mbps)

Lowest Channel: 5180MHz



Delta 1 [T1]

RBW 300 kHz RF Att 30 dB

Ref Lvl -1.19 dB

VBW 1 MHz

21.7 dBm

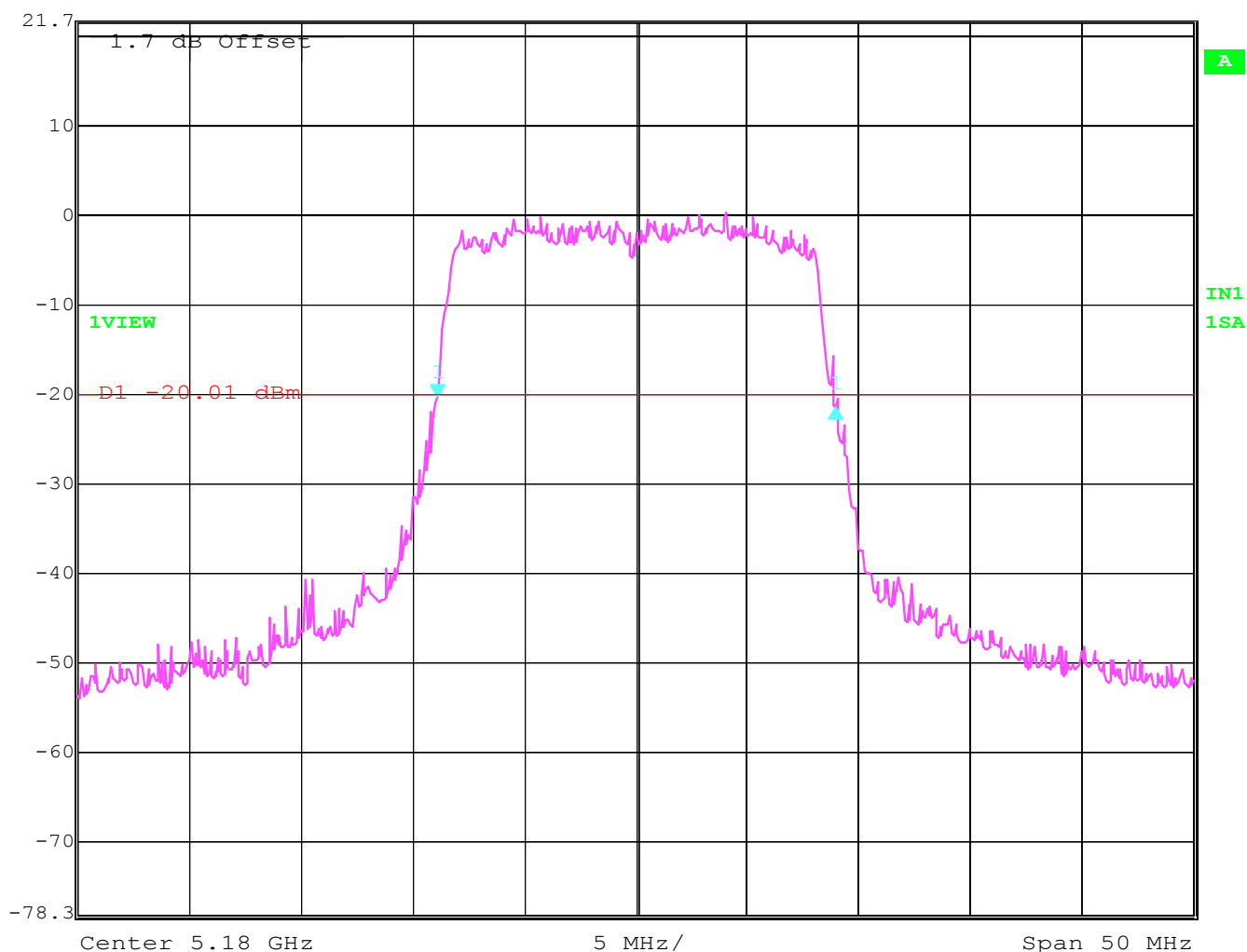
17.83567134 MHz

SWT

5 ms

Unit

dBm



Date: 18.NOV.2003 09:40:34

99% POWER BANDWIDTH

RSS-210 §6.2.2(q1)(i)(ii)

20 dB bandwidth

(Data rate – 6Mbps)

Mid Channel: 5260MHz



Delta 1 [T1]

RBW 300 kHz

RF Att

30 dB

Ref Lvl

0.34 dB

VBW 1 MHz

21.7 dBm

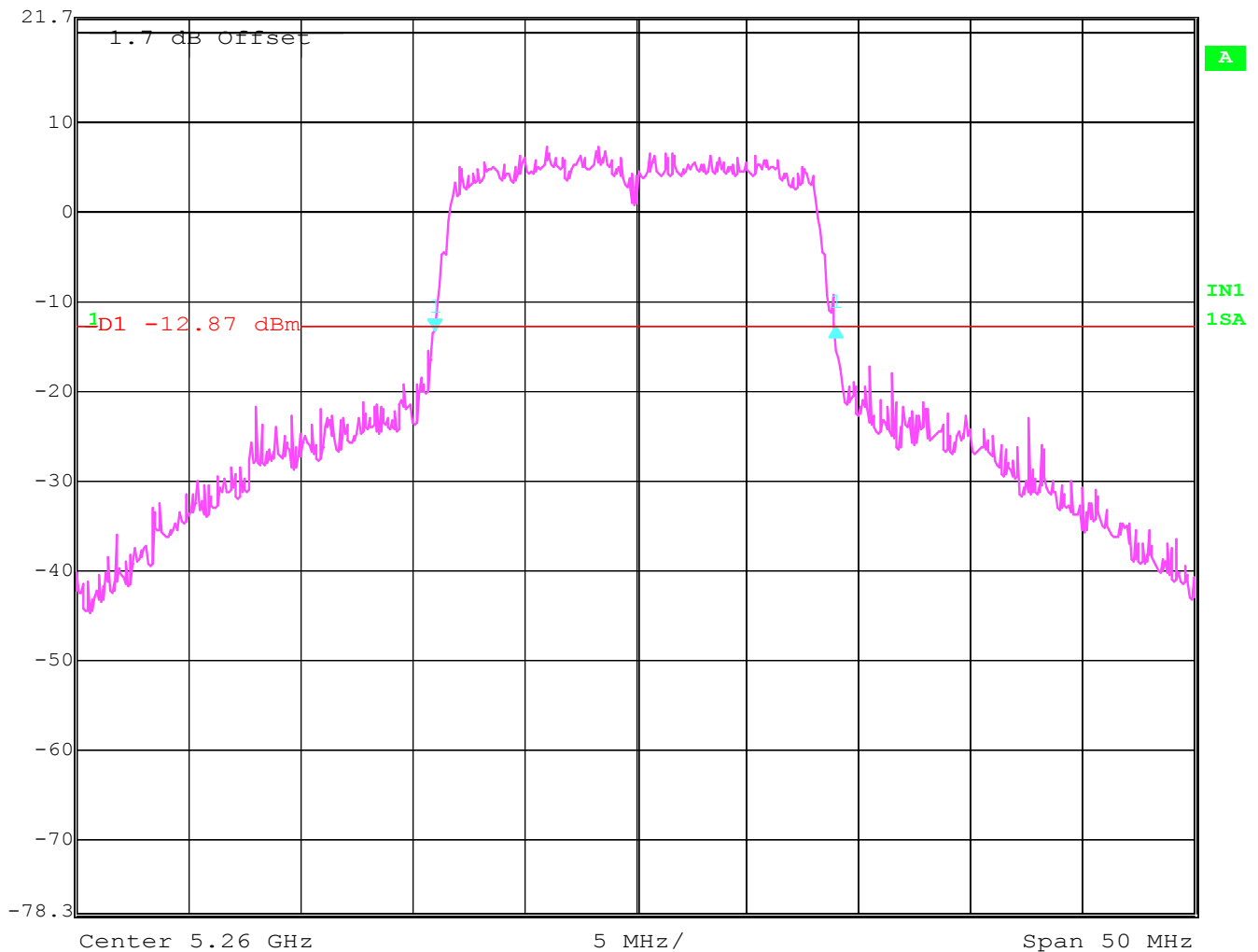
17.93587174 MHz

SWT

5 ms

Unit

dBm



Date: 18.NOV.2003 09:48:17

99% POWER BANDWIDTH

20 dB bandwidth

(Data rate – 6Mbps)

RSS-210 §6.2.2(q1)(i)(ii)

Highest Channel: 5320MHz



Delta 1 [T1]

RBW 300 kHz RF Att 30 dB

Ref Lvl -5.01 dB

VBW 1 MHz

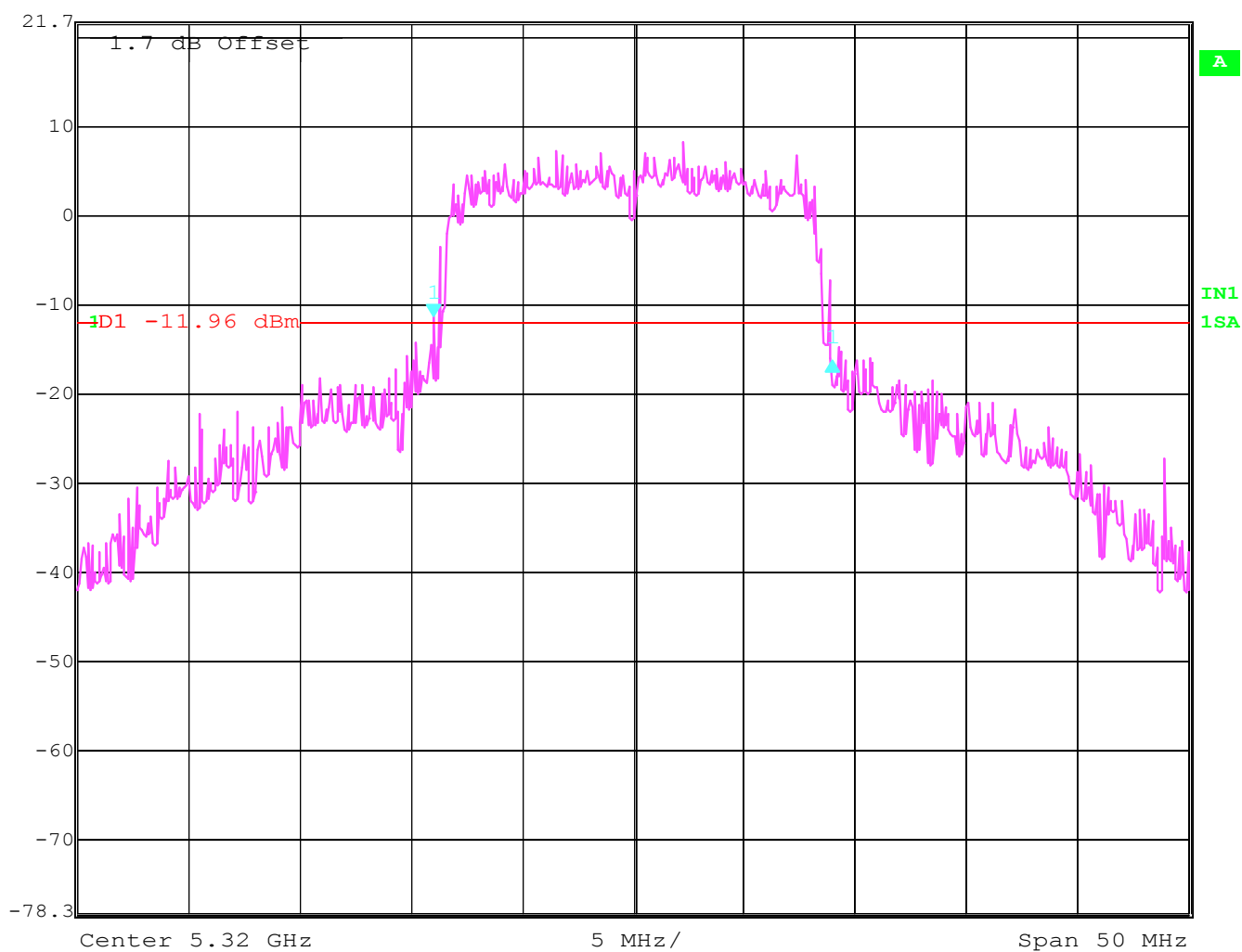
21.7 dBm

17.93587174 MHz

SWT 5 ms

Unit

dBm



Date: 18.NOV.2003 09:59:29

PEAK OUTPUT POWER**§ 15.407 (a)(1)(2)****(Conducted)****(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 _{nom} (23)°C	V _{nom} (3.3) VDC	Pk	*15.0	*21.5	*21.8
Measurement uncertainty		±0.5dBm			

*Measurements done using peak power meter.

LIMIT**SUBCLAUSE § 15.407 (a)(1)(2)**

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

**MAXIMUM PEAK OUTPUT POWER
(RADIATED)****§ 15.407 (a)(1)(2)****(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 _{nom} (23)°C	V _{nom} (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 than 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	

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 CONDITIONS		POWER SPECTRAL DENSITY (dBm)		
Frequency (MHz)		5180	5260	5320
T _{nom} (23)°C	V _{nom} (3.3) VDC	-3.48	3.06	4.97

LIMIT**SUBCLAUSE § 15.407 (a)(1)(2)**

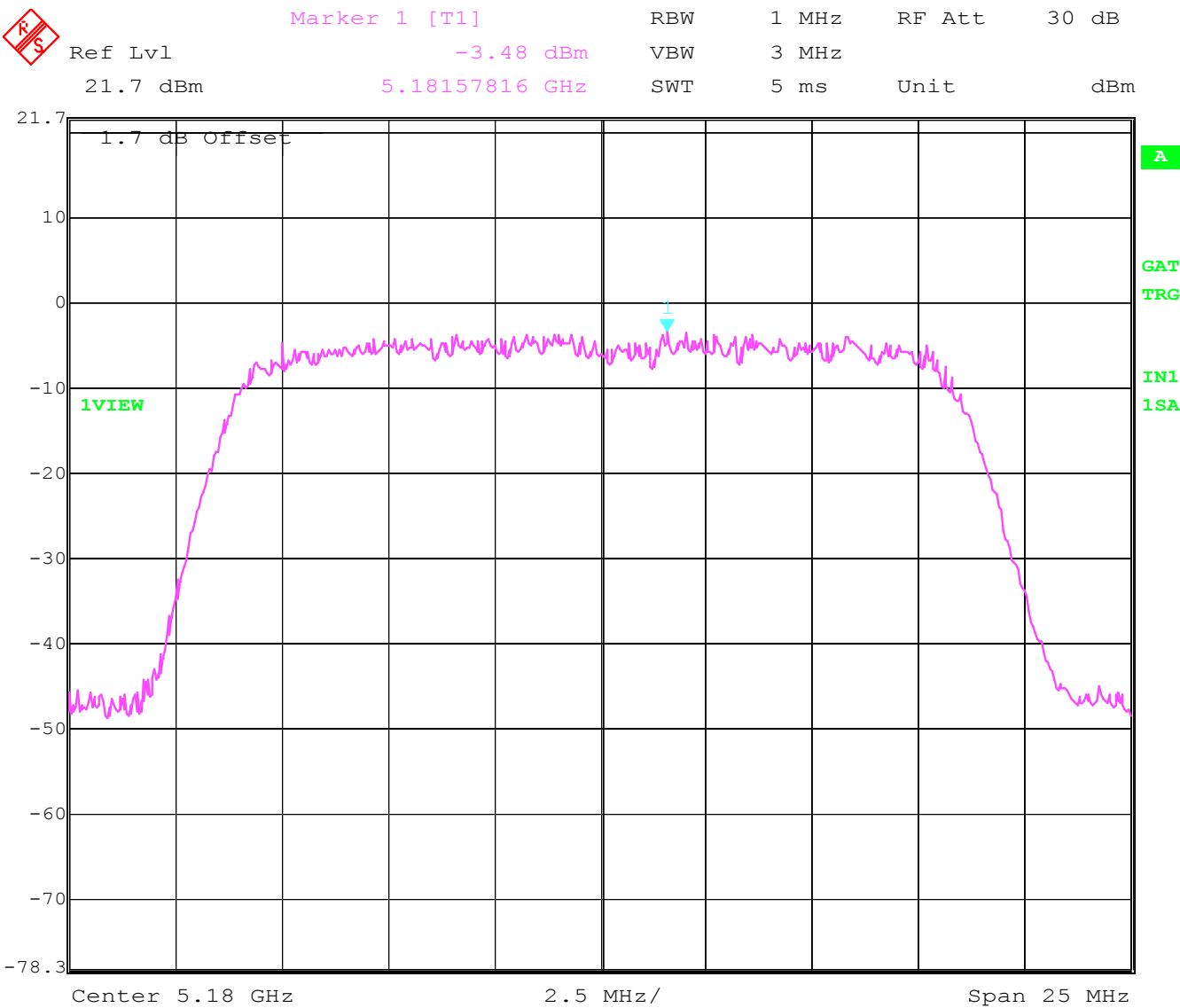
Frequency range (GHz)	Conducted Peak Power
5.15 – 5.25	4dBm in any 1MHz band
5.25 – 5.35	11dBm in any 1MHz band
If transmitting antennas of directional gain greater than 6dBi are used, both the peak transmit power and the peak spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6dBi	

ANALYZER SETTINGS: RBW=1MHz, VBW=3MHz

POWER SPECTRAL DENSITY
(Data rate – 6Mbps)

§15.407(a)(1)(2)(5)

Lowest Channel: 5180MHz



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

POWER SPECTRAL DENSITY (Data rate – 6Mbps)

§15.407(a)(1)(2)(5)

Mid Channel: 5260MHz



Marker 1 [T1]

RBW 1 MHz RF Att 30 dB

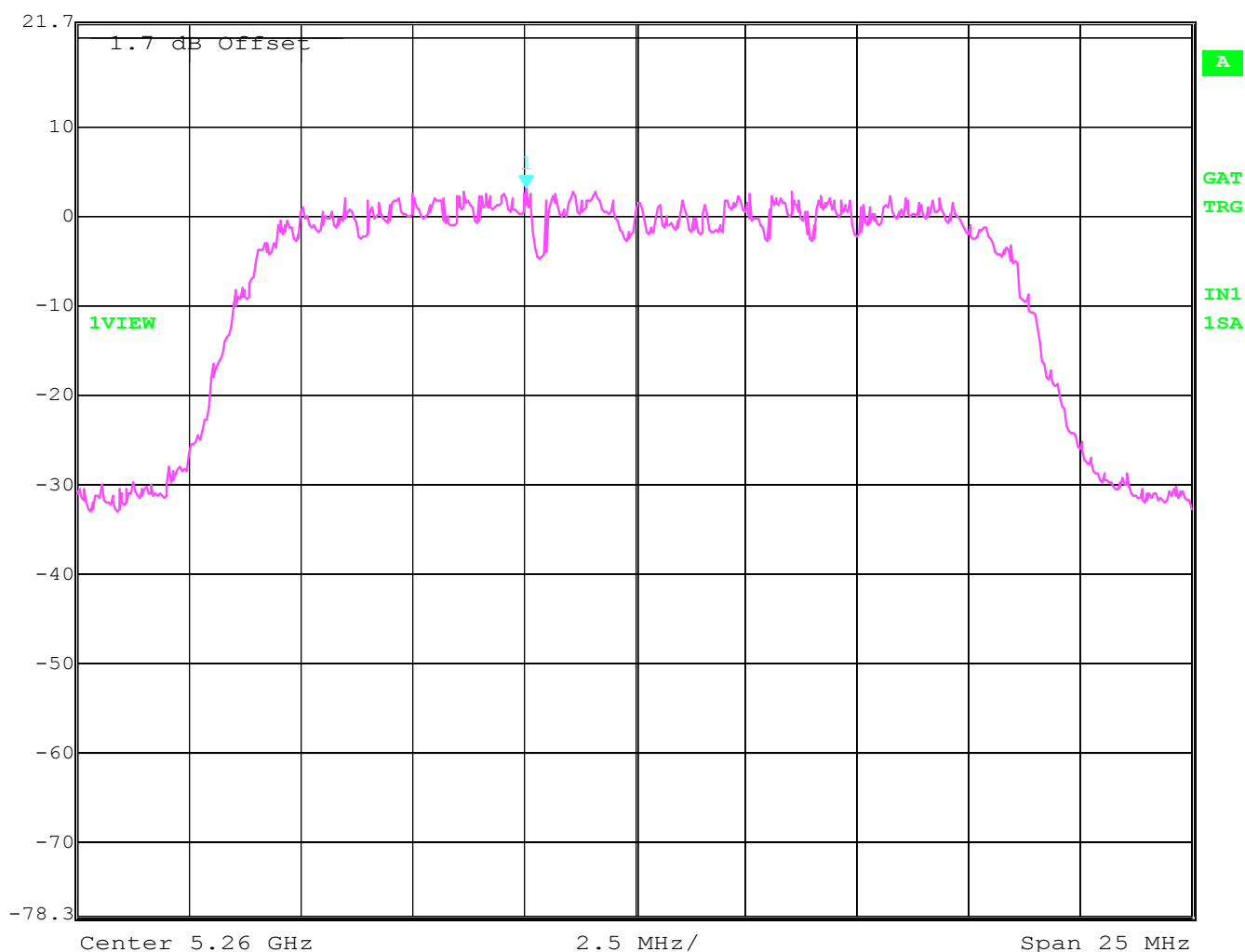
Ref Lvl 3.06 dBm

VBW 3 MHz

21.7 dBm

5.25757014 GHz

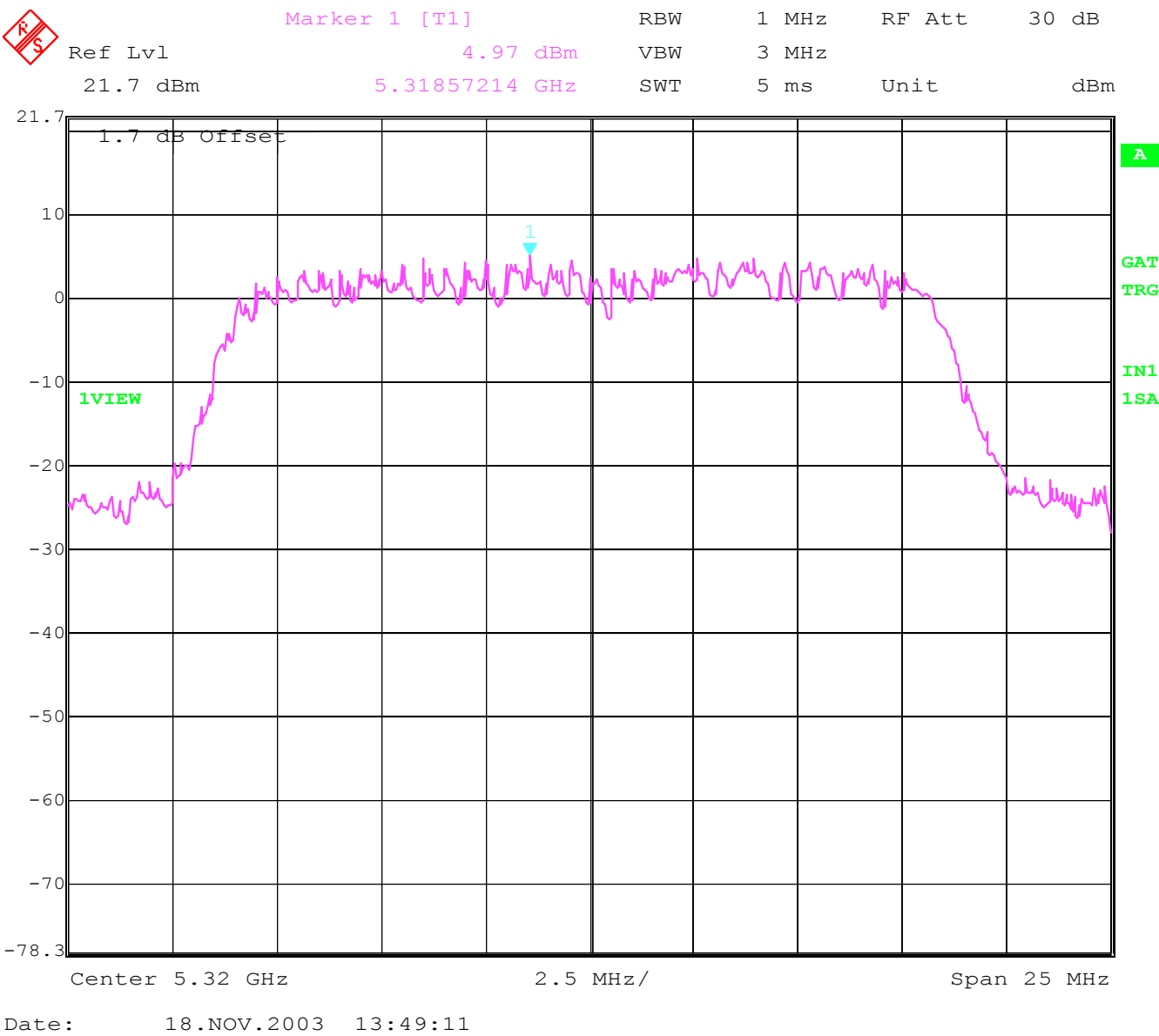
SWT 5 ms Unit dBm



Date: 18.NOV.2003 13:43:13

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

Highest Channel: 5320MHz



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

TEST CONDITIONS		POWER SPECTRAL DENSITY (dBm)		
Frequency (MHz)		5180	5260	5320
T _{nom} (23)°C	V _{nom} (3.3) VDC	-2.52	3.49	4.94

LIMIT**RSS-210**

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 than 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	

ANALYZER SETTINGS: RBW=VBW=1MHz

POWER SPECTRAL DENSITY
(Data rate – 6Mbps)**RSS-210 §6.2.2(q1)(i)(ii)****Lowest Channel: 5180MHz**

Marker 1 [T1]

RBW

1 MHz

RF Att

30 dB

Ref Lvl

-2.52 dBm

VBW

1 MHz

21.7 dBm

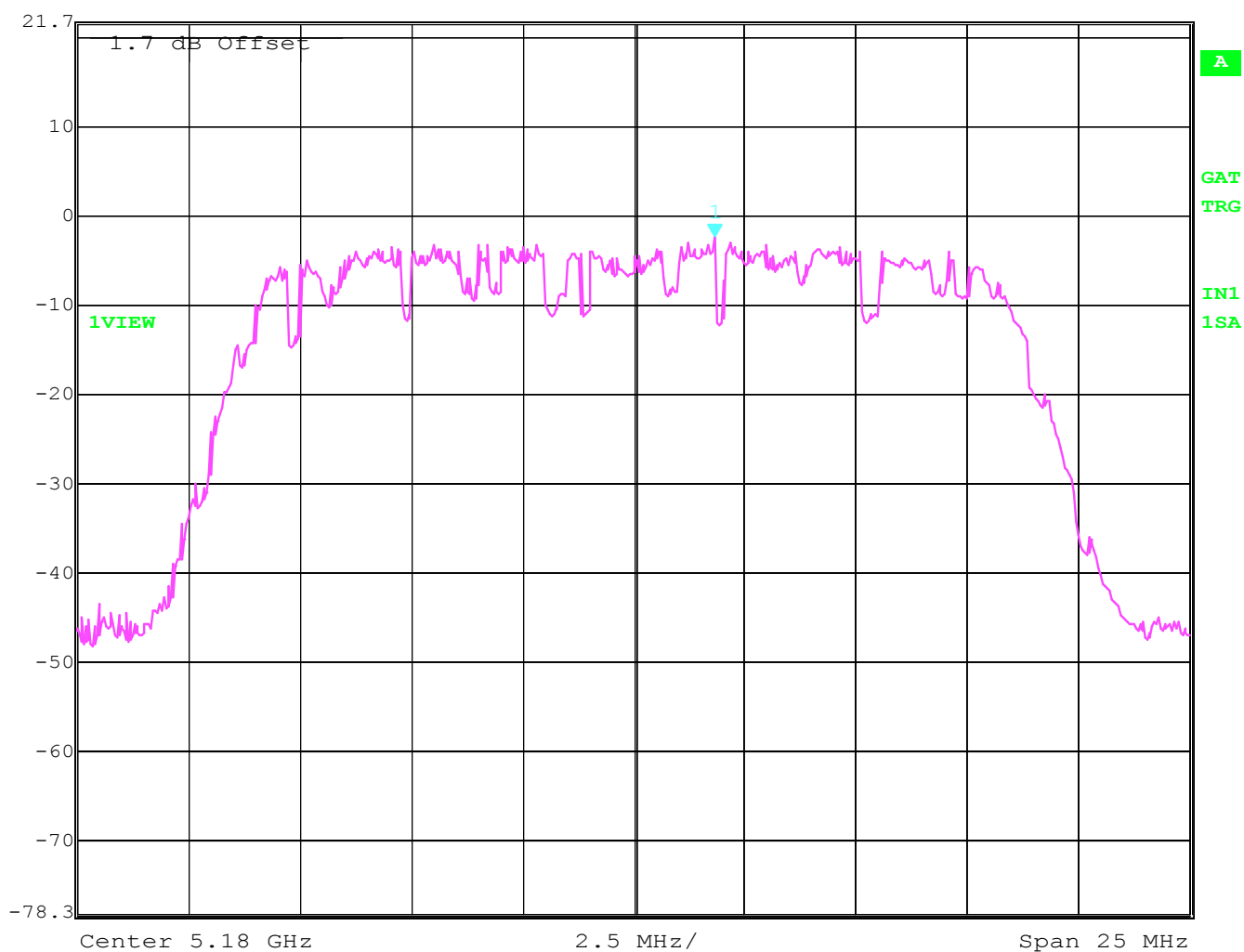
5.18182866 GHz

SWT

5 ms

Unit

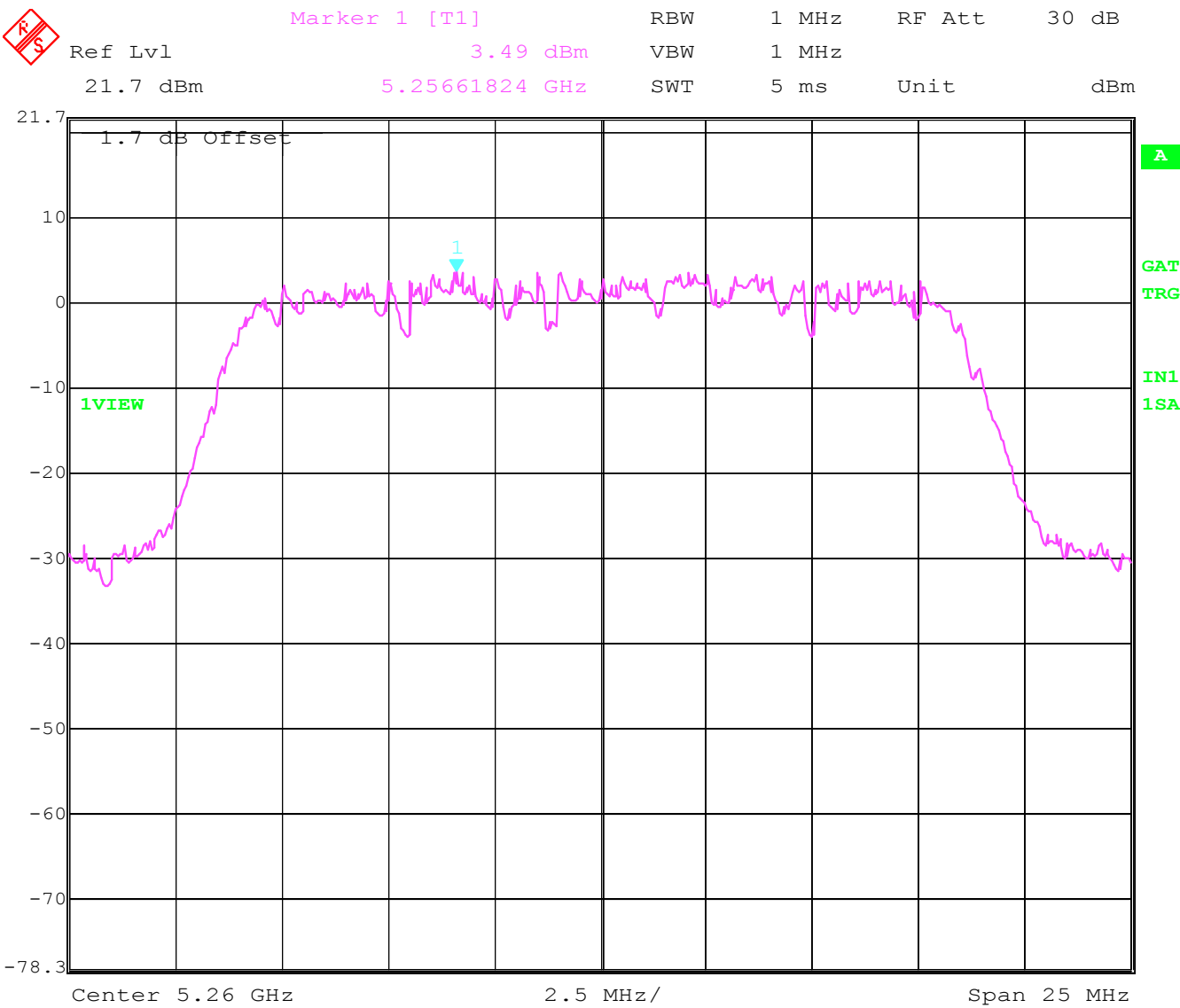
dBm



Date: 19.NOV.2003 08:32:37

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

Mid Channel: 5260MHz

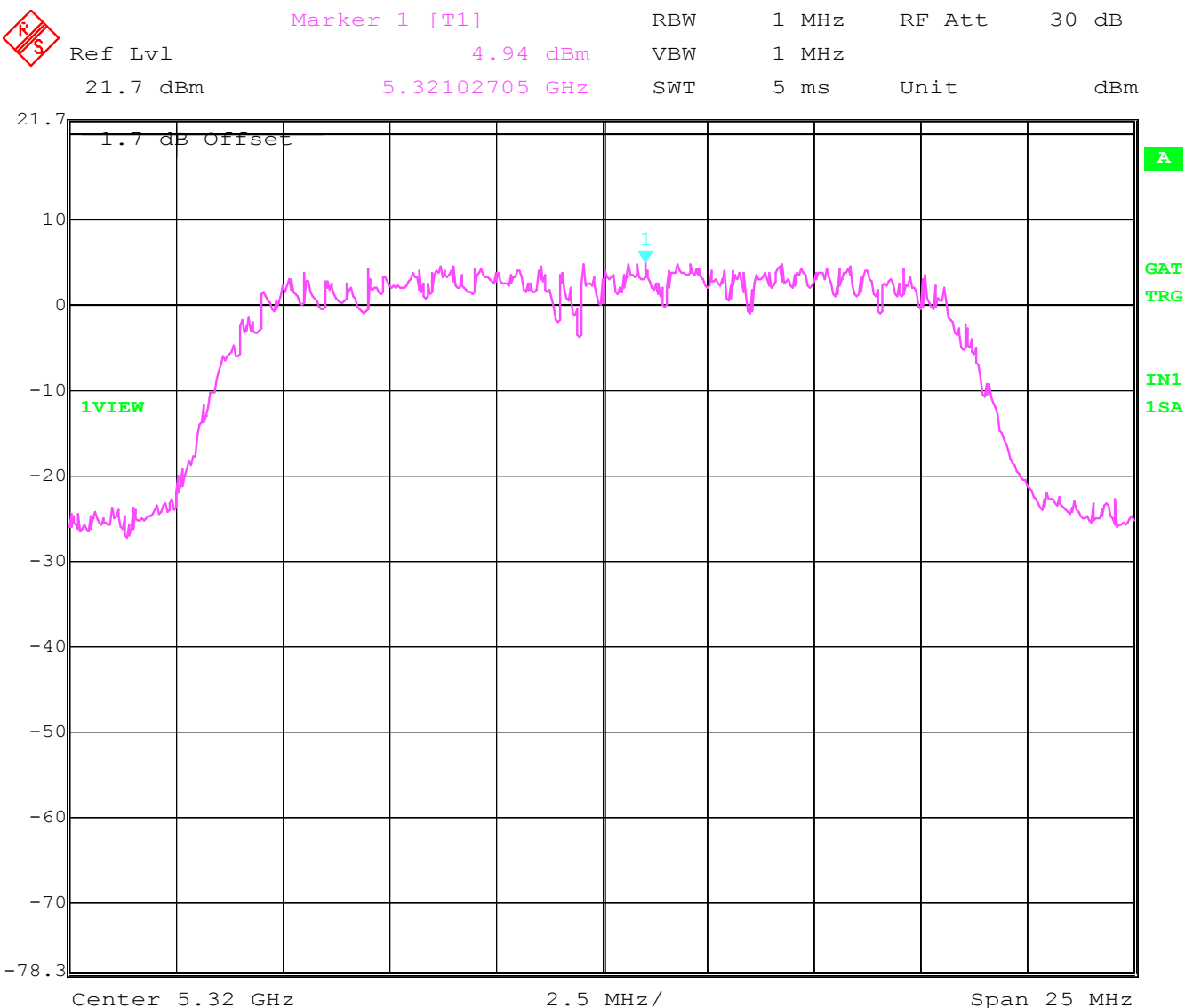


Date: 19.NOV.2003 08:34:08

POWER SPECTRAL DENSITY
(Data rate – 6Mbps)

RSS-210 §6.2.2(q1)(i)(ii)

Highest Channel: 5320MHz



Date: 19.NOV.2003 08:37:57

PEAK EXCURSION**§15.407 (a)(6)****(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 $\leq 13\text{dB}$ for all frequencies across the emission bandwidth. Submit a plot.

1st Trace:

- Set RBW=1MHz, VBW $\geq$ 3MHz with peak detector and max hold settings

2nd Trace:

- If method #1 was used for the peak conducted transmit output power test, then create the 2nd 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 2nd 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;

1st Trace: RBW = 1MHz, VBW = 3MHz

2nd Trace: RBW = 1MHz, VBW = 5KHz

Test Results

TEST CONDITIONS		PEAK EXCURSION RATIO (dB)		
Frequency (MHz)		5180	5260	5320
T _{nom} (23)°C	V _{nom} (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.

PEAK EXCURSION

§15.407 (a)(6)

(Data rate – 54Mbps)

Lowest Channel: 5180MHz



Delta 1 [T1]

RBW

1 MHz

RF Att

30 dB

Ref Lvl

11.83 dB

VBW

1 MHz

21.7 dBm

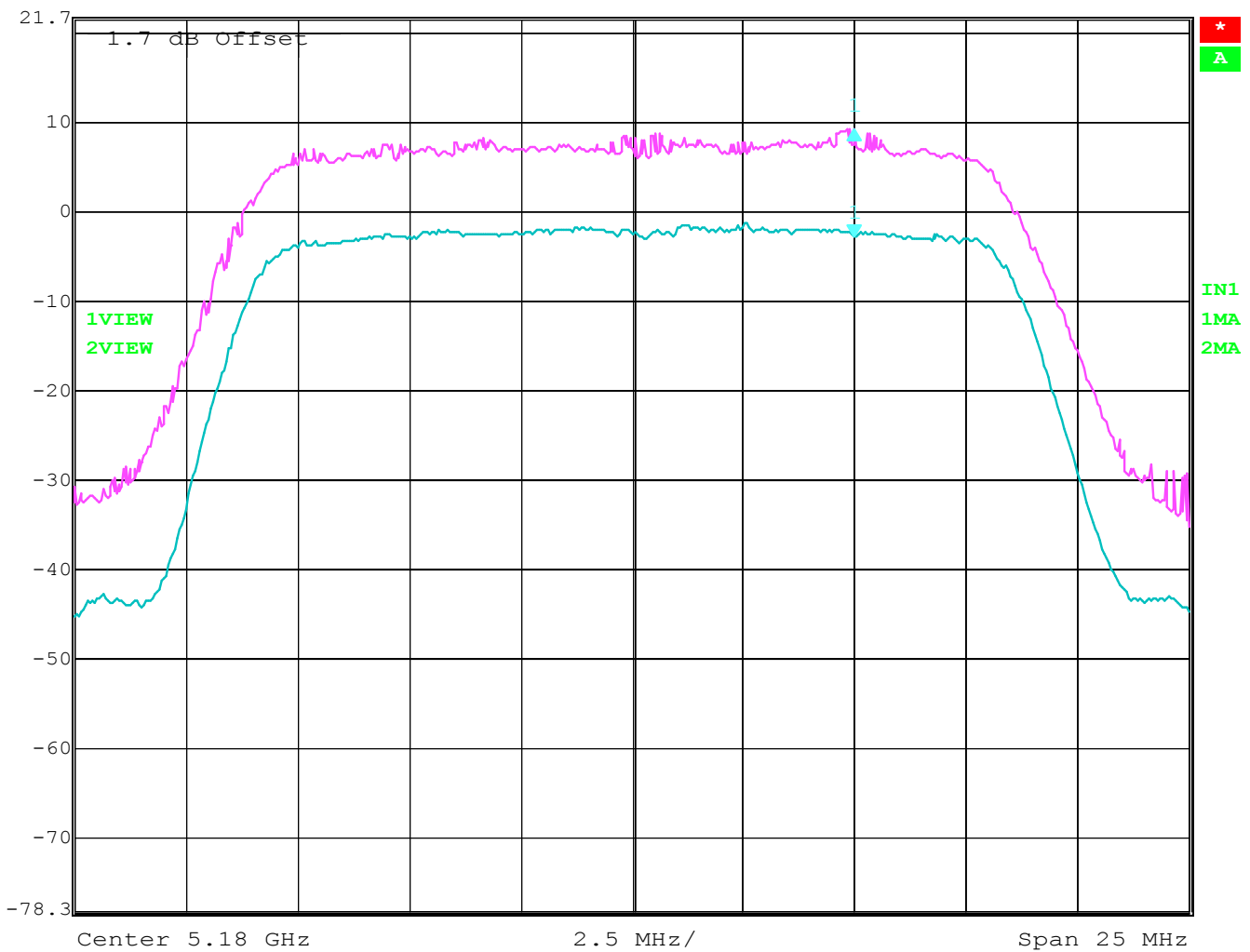
-1.90734863 MHz

SWT

5 ms

Unit

dBm



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

PEAK EXCURSION

§15.407 (a)(6)

(Data rate – 54Mbps)

Mid Channel: 5260MHz



Delta 1 [T1]

RBW 1 MHz RF Att 30 dB

Ref Lvl 12.54 dB

VBW 5 kHz

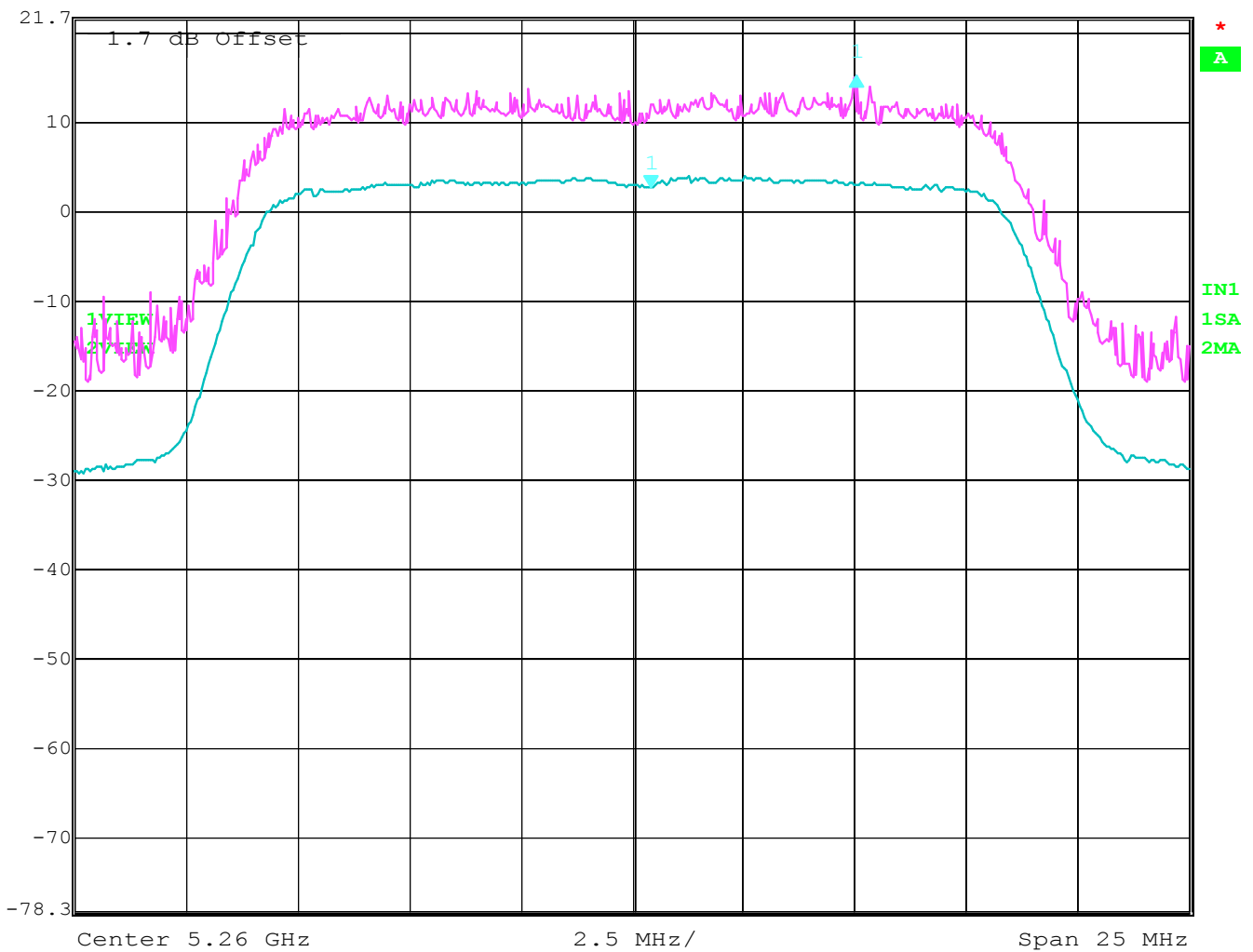
21.7 dBm

4.60921844 MHz

SWT 12.5 ms

Unit

dBm



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

PEAK EXCURSION

§15.407 (a)(6)

(Data rate – 54Mbps)

Highest Channel: 5320MHz



Delta 1 [T2]

RBW

1 MHz

RF Att

30 dB

Ref Lvl

-11.76 dB

VBW

5 kHz

21.7 dBm

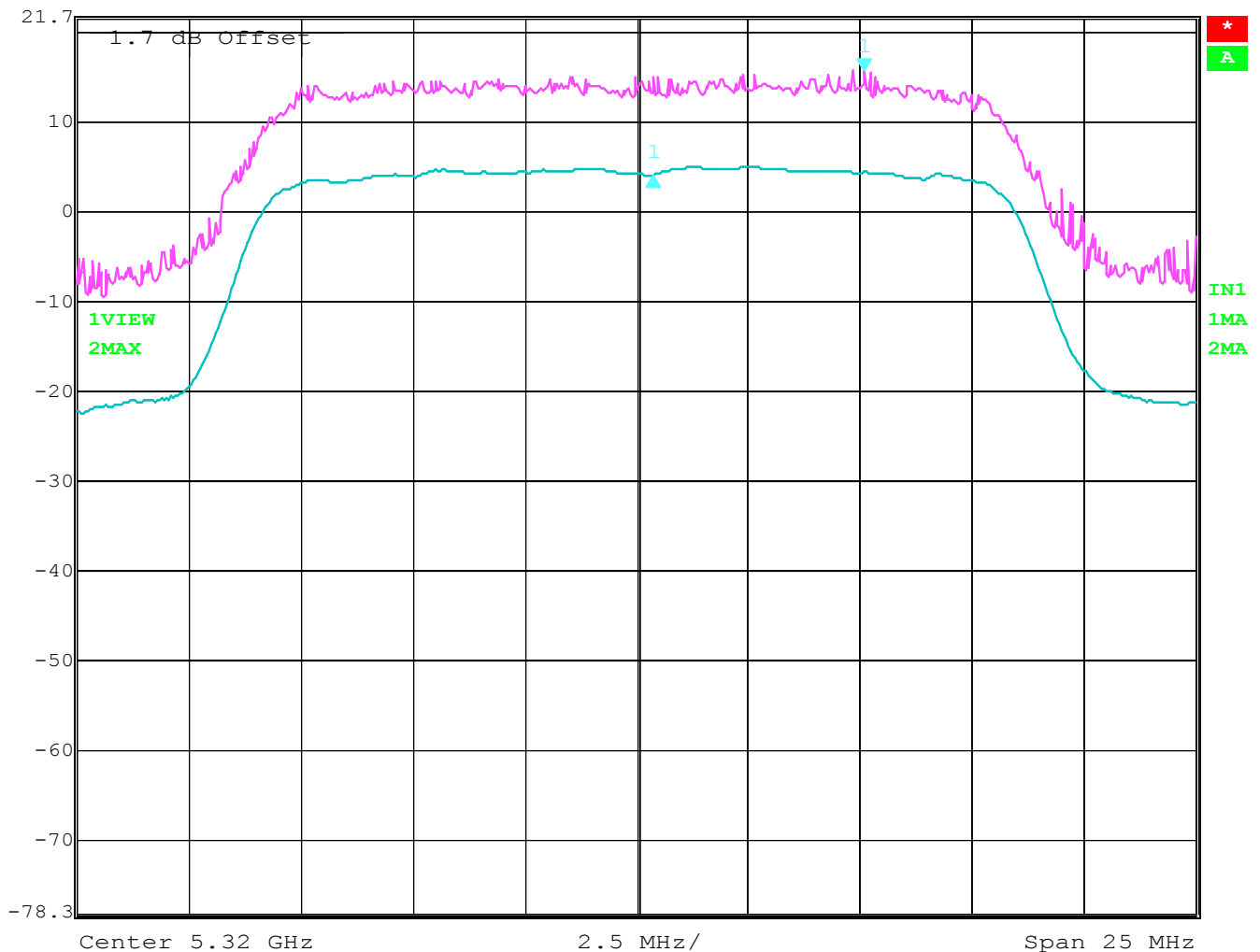
-4.70941884 MHz

SWT

12.5 ms

Unit

dBm



Date: 18.NOV.2003 11:53:20

BAND EDGE COMPLIANCE (Data rate – 54Mbps)

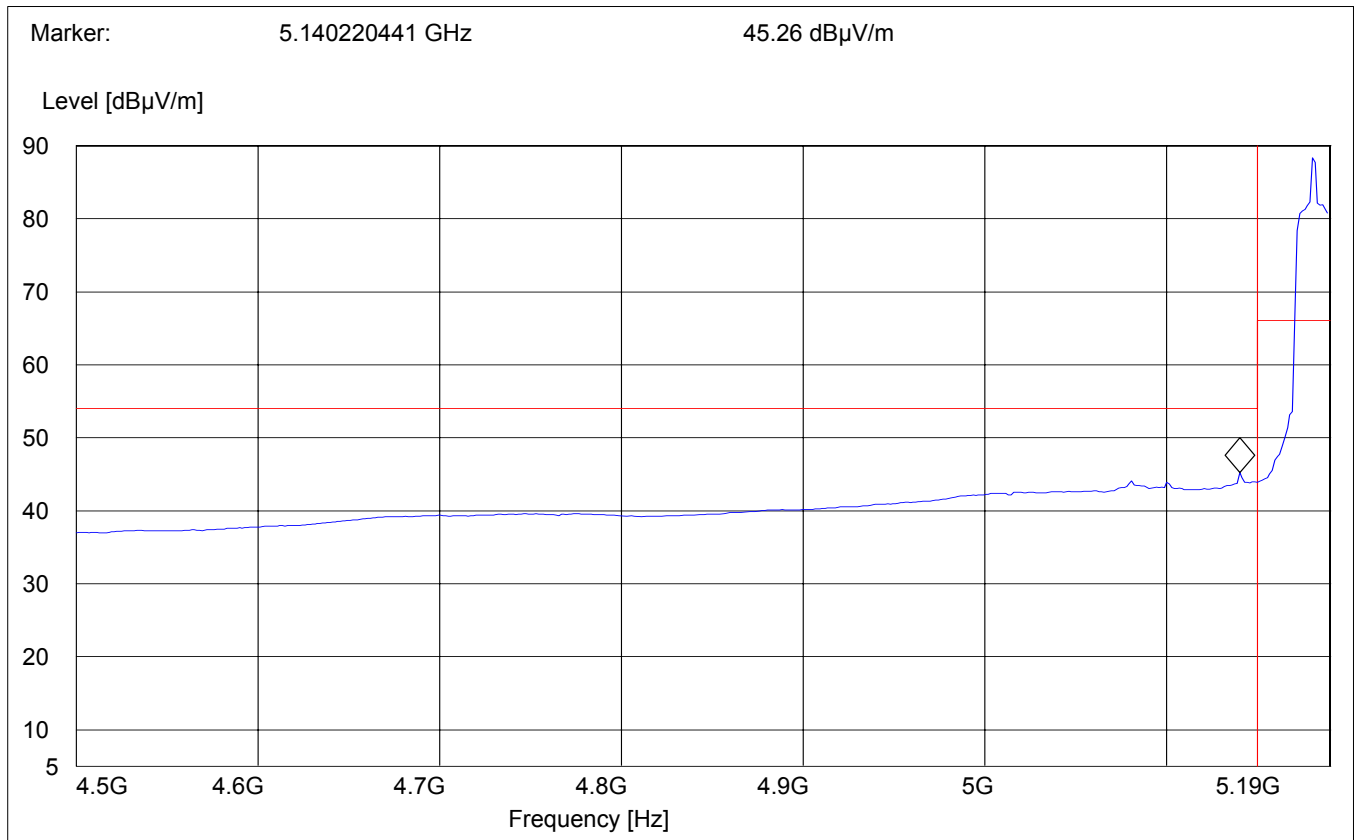
§15.407 (b)(1)(2)(4)(6)

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

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

Operating condition : Tx at 5180MHz
SWEEP TABLE : "FCC15.407 LBE_AVG"
Limit Line horizontal : 54dBμV
Limit Line vertical : 5150MHz

Start Frequency	Stop Frequency	Detector Time	Meas. Bandw.	RBW	VBW	Transducer
4.5 GHz	5.19 GHz	MaxPeak	Coupled	1 MHz	10Hz	#326 horn (dBi)



BAND EDGE COMPLIANCE

§15.407 (b)(1)(2)(4)(6)

(Data rate – 54Mbps)

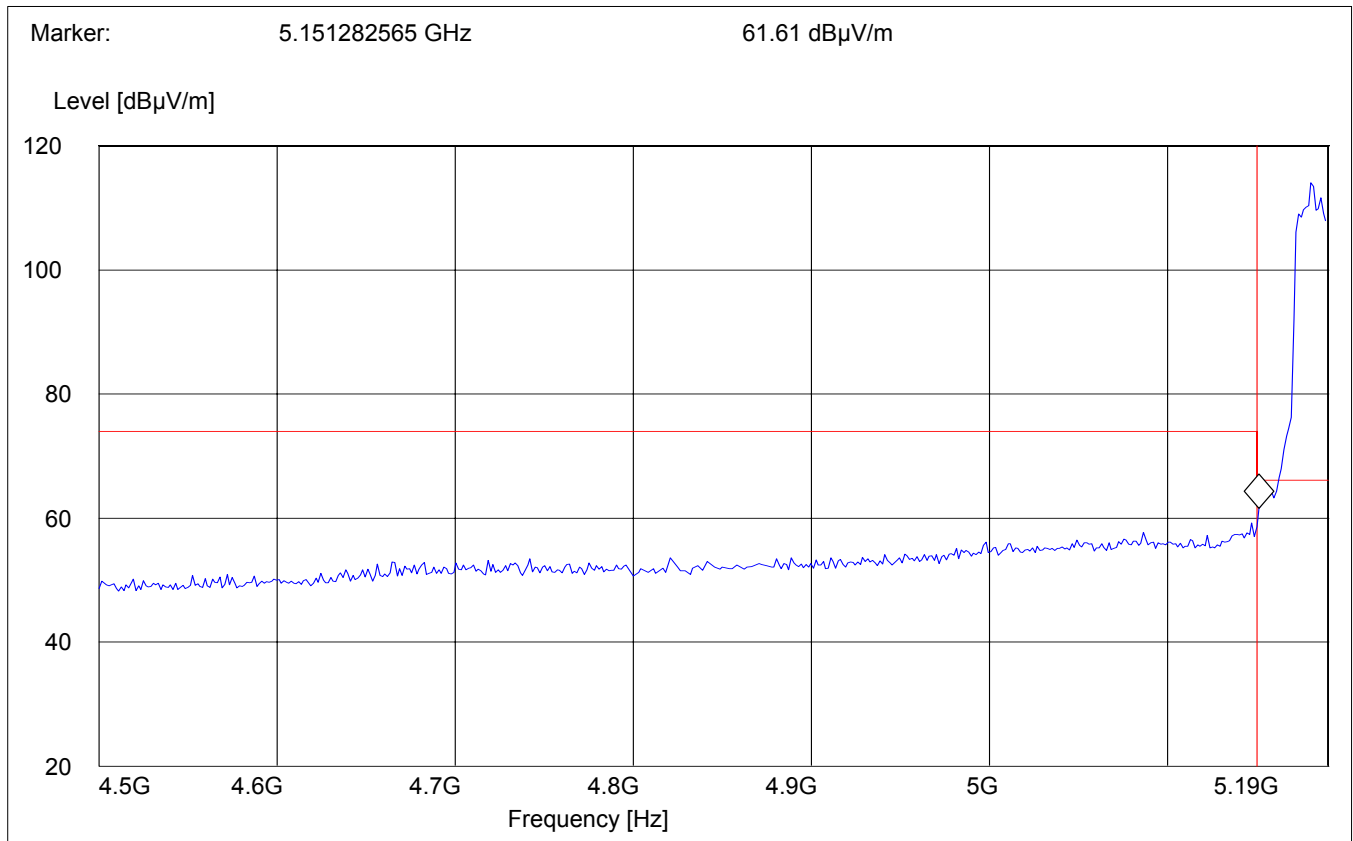
Low frequency section (spurious in the restricted band 4500 – 5150 MHz)

(Peak measurement)

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

Operating condition : Tx at 5180MHz
SWEEP TABLE : "FCC15.407 LBE_Pk"
Limit Line horizontal : 74dBμV
Limit Line vertical : 5150MHz

Start Frequency	Stop Frequency	Detector	Meas. Bandw.	RBW	VBW	Transducer
4.5 GHz	5.19 GHz	MaxPeak	Coupled	1MHz	1MHz	#326 horn (dBi)



BAND EDGE COMPLIANCE

§15.407 (b)(1)(2)(4)(6)

(Data rate – 54Mbps)

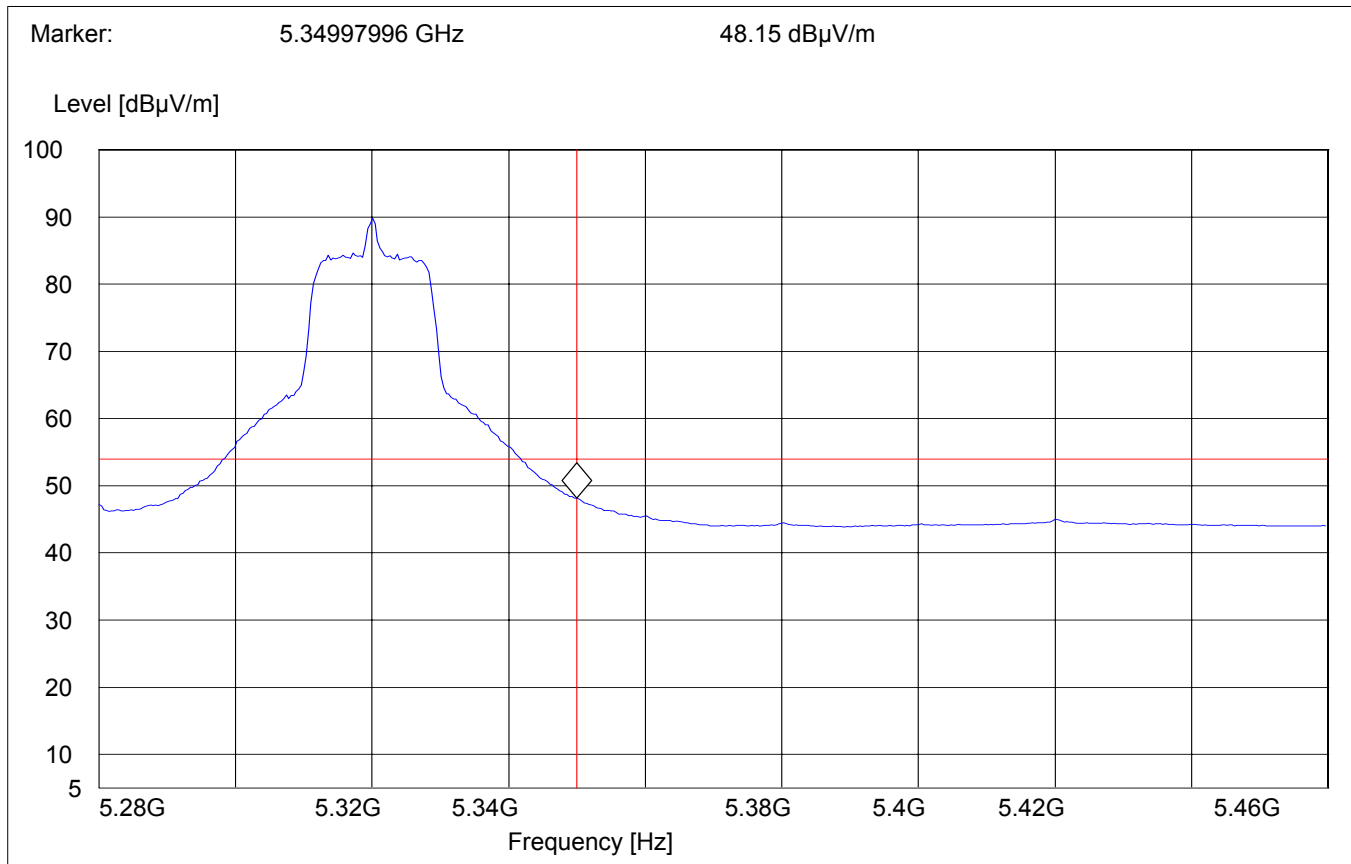
High frequency section (spurious in the restricted band 5350 – 5460 MHz)

(Average measurement)

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

Operating condition : Tx at 5320MHz
SWEEP TABLE : "FCC15.407 HBE_AVG"
Limit Line horizontal : 54dBμV
Limit Line vertical : 5350MHz

Start Frequency	Stop Frequency	Detector Time	Meas. Bandw.	RBW	VBW	Transducer
5.28 GHz	5.46 GHz	MaxPeak	Coupled	1 MHz	10Hz	#326 horn (dBi)



BAND EDGE COMPLIANCE

§15.407 (b)(1)(2)(4)(6)

(Data rate – 54Mbps)

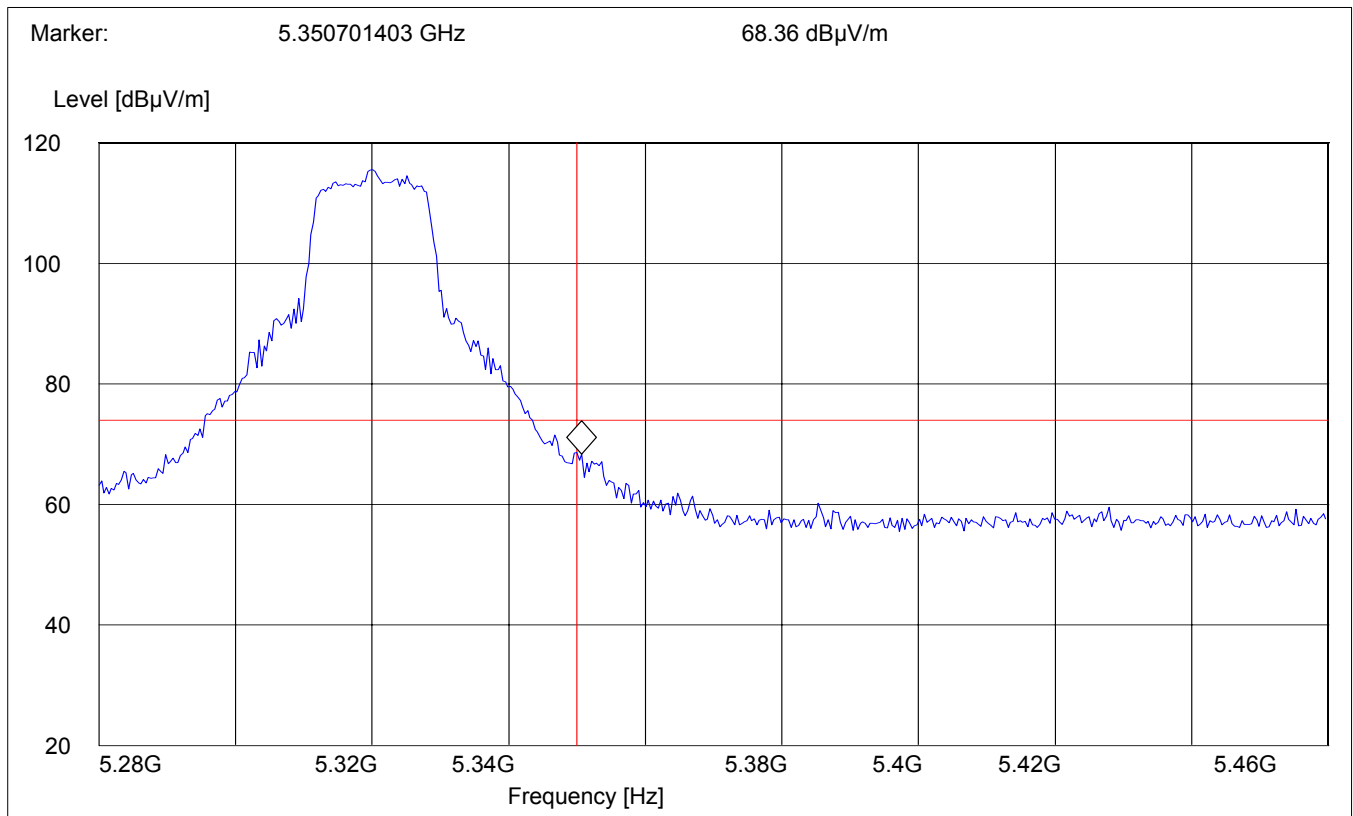
High frequency section (spurious in the restricted band 5350 – 5460 MHz)

(Peak measurement)

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

Operating condition : Tx at 5320MHz
SWEEP TABLE : "FCC15.407 HBE_Pk"
Limit Line horizontal : 74dBμV
Limit Line vertical : 5350MHz

Start Frequency	Stop Frequency	Detector Time	Meas. Bandw.	RBW	VBW	Transducer
5.28 GHz	5.46 GHz	MaxPeak	Coupled	1 MHz	1MHz	#326 horn (dBi)



EMISSION LIMITATIONS**§ 15.407 (b)(1)(2)(4)(6)****Transmitter (Radiated)****(Data rate – 54Mbps)****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.

Transmit at Lowest channel Frequency 5180MHz			
Frequency (MHz)	Level (dBμV/m)		
	Peak	Quasi-Peak	Average
37.77	40.14	35.14	
10350.7	33.82		
Transmit at 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		

EMISSION LIMITATIONS - Radiated (Transmitter)

§ 15.407 (b)(1)(2)(4)(6)

Lowest Channel (5180MHz): 30MHz – 1GHz

(Data rate – 54Mbps)

Antenna:

Vertical

EUT plane:

Horizontal with screen vertical @ 90°

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

SWEEP TABLE:

"FCC 15.407 30-1G_V"

Start	Stop	Detector	Meas.	RBW	Transducer
Frequency	Frequency		Time	VBW	
30.0 MHz	1.0 GHz	MaxPeak	Coupled	100 kHz	3141-#1186

Freq. (MHz)

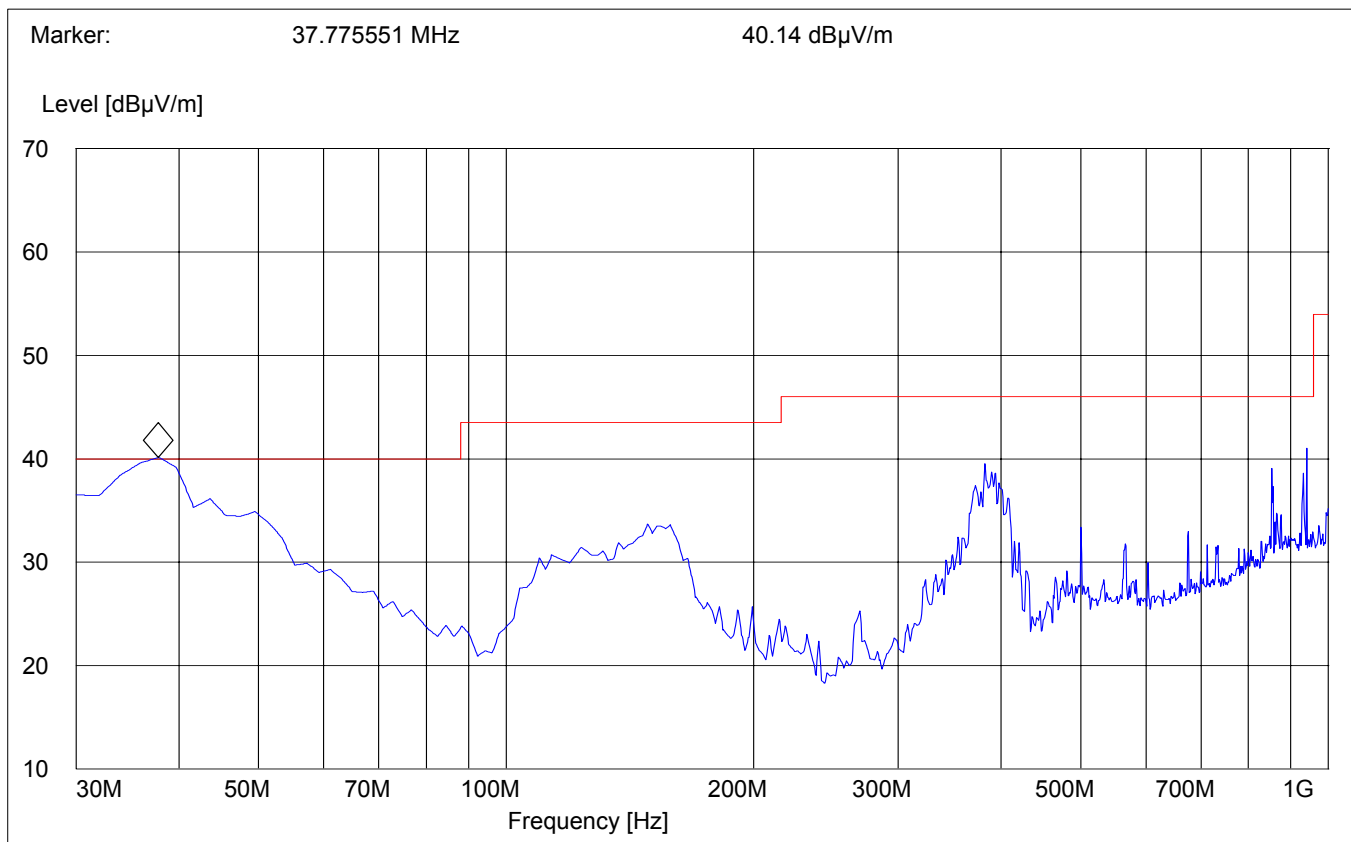
Pk Level (dBμV/m)

QPk Level (dBμV/m)

37.77

40.14

35.14



EMISSION LIMITATIONS - Radiated (Transmitter)

§ 15.407 (b)(1)(2)(4)(6)

Lowest Channel (5180MHz): 30MHz – 1GHz

(Data rate – 54Mbps)

Antenna:

Horizontal

EUT plane:

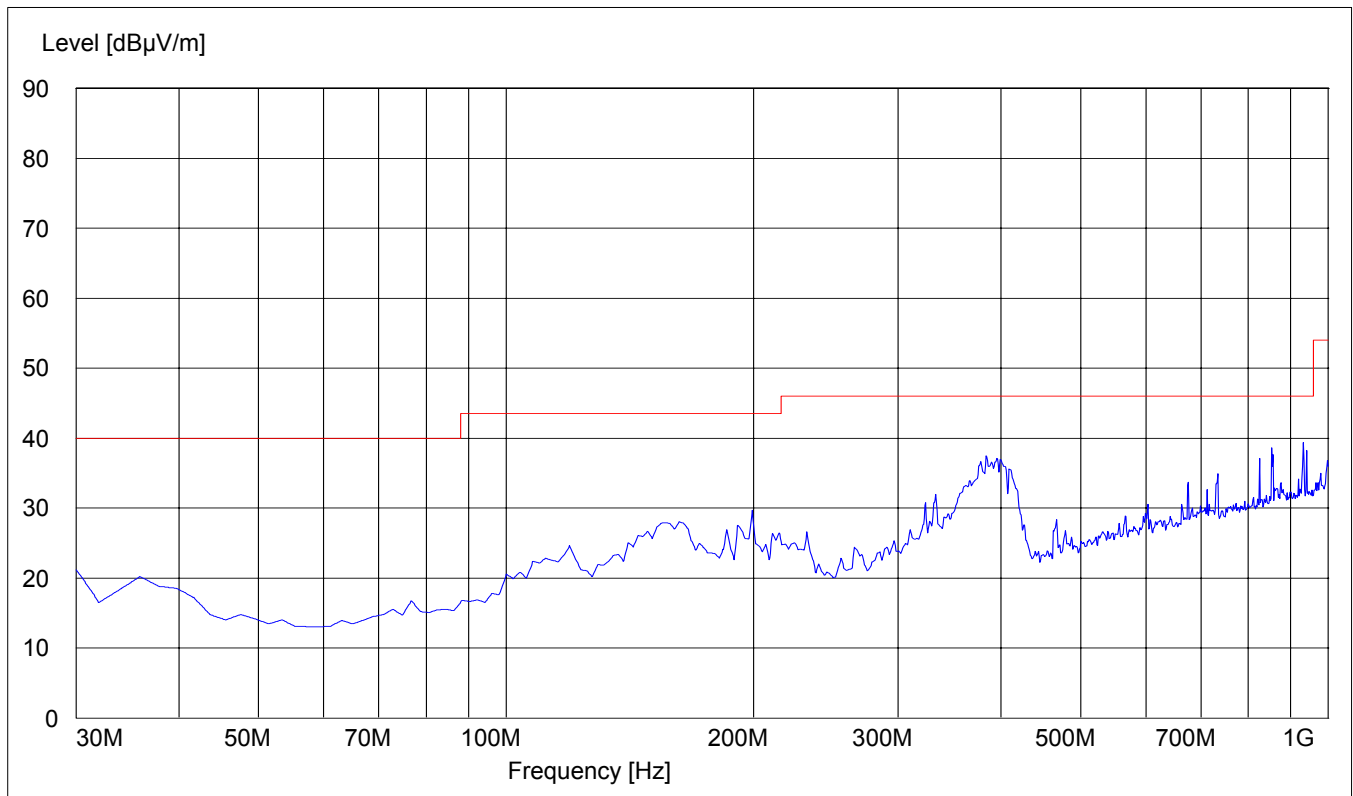
Horizontal with screen vertical @ 90°

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

SWEEP TABLE:

"FCC 15.407 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



EMISSION LIMITATIONS - Radiated (Transmitter)

§ 15.407 (b)(1)(2)(4)(6)

Lowest Channel (5180MHz): 1GHz – 7GHz

(Average)

(Data rate – 54Mbps)

Antenna:

Horizontal

EUT plane:

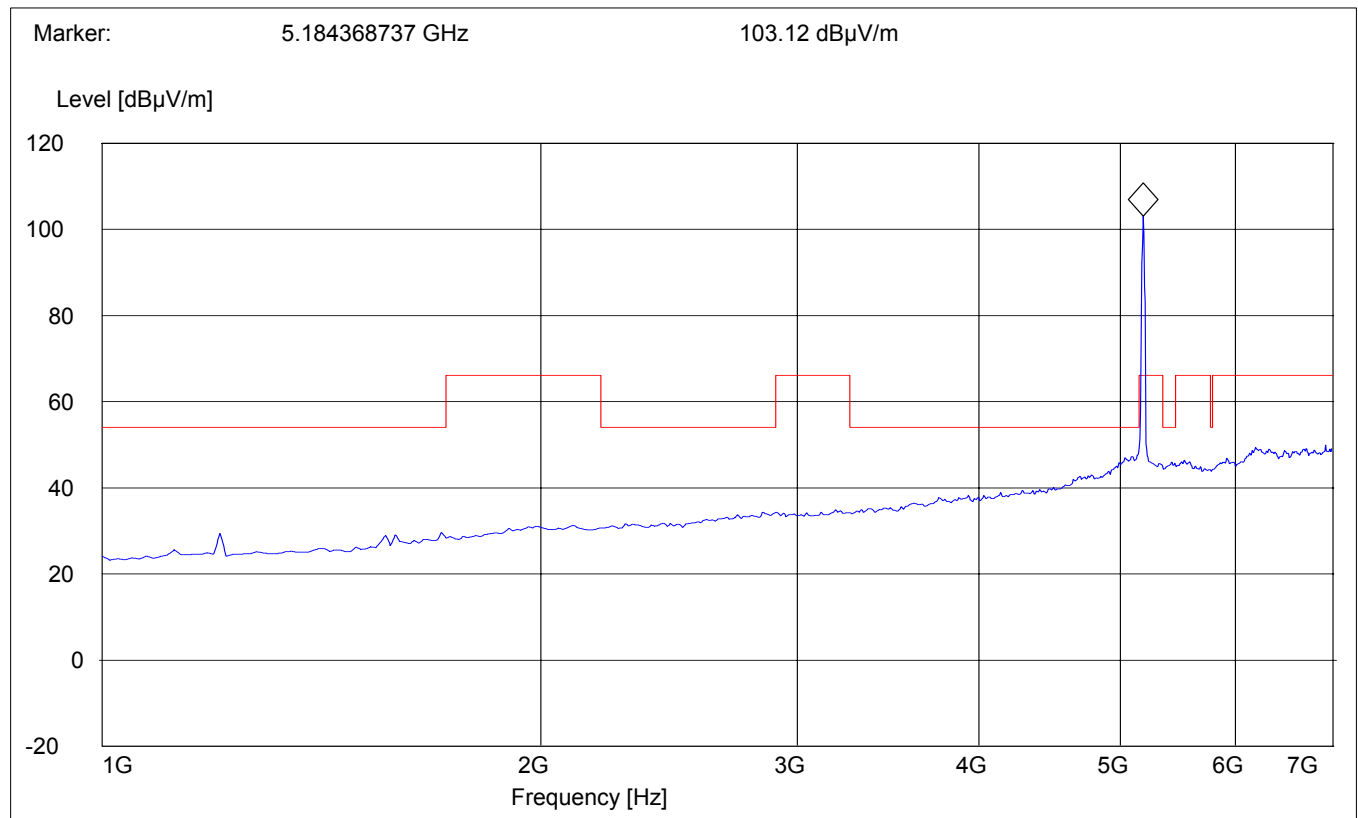
Horizontal with screen vertical @ 90°

Note: The peak above the limit line is the carrier freq.

SWEEP TABLE:

"FCC 15.407 1-7G"

Start	Stop	Detector	Meas.	RBW	VBW	Transducer
Frequency	Frequency		Time			
1GHz	7.0 GHz	MaxPeak	Coupled	1MHz	10Hz	326 horn



EMISSION LIMITATIONS - Radiated (Transmitter)

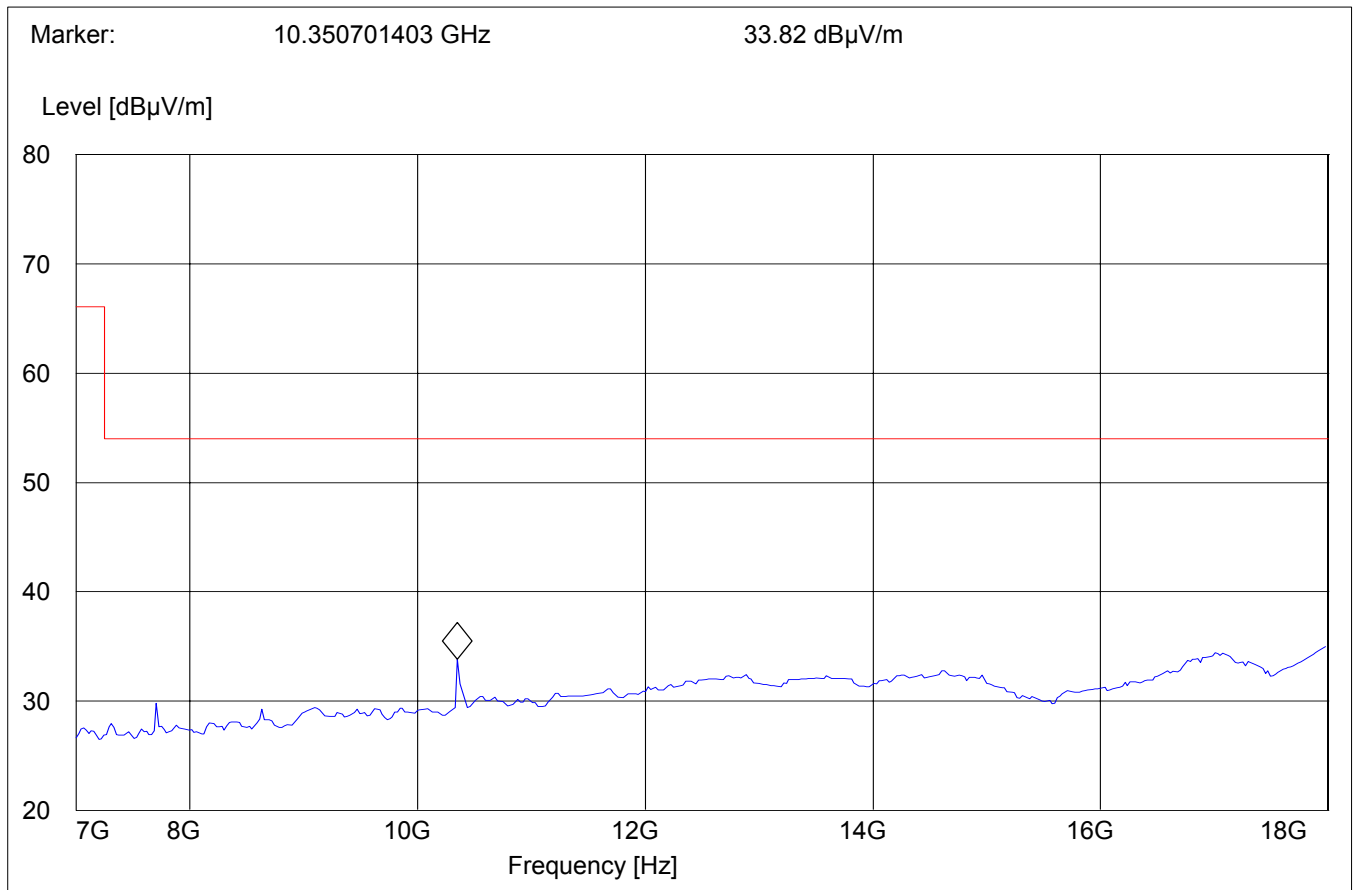
§ 15.407 (b)(1)(2)(4)(6)

Lowest Channel (5180MHz): 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	MaxPeak	Coupled	1MHz	326 horn



EMISSION LIMITATIONS - Radiated (Transmitter)

§ 15.407 (b)(1)(2)(4)(6)

Lowest Channel (5260MHz): 1GHz – 7GHz

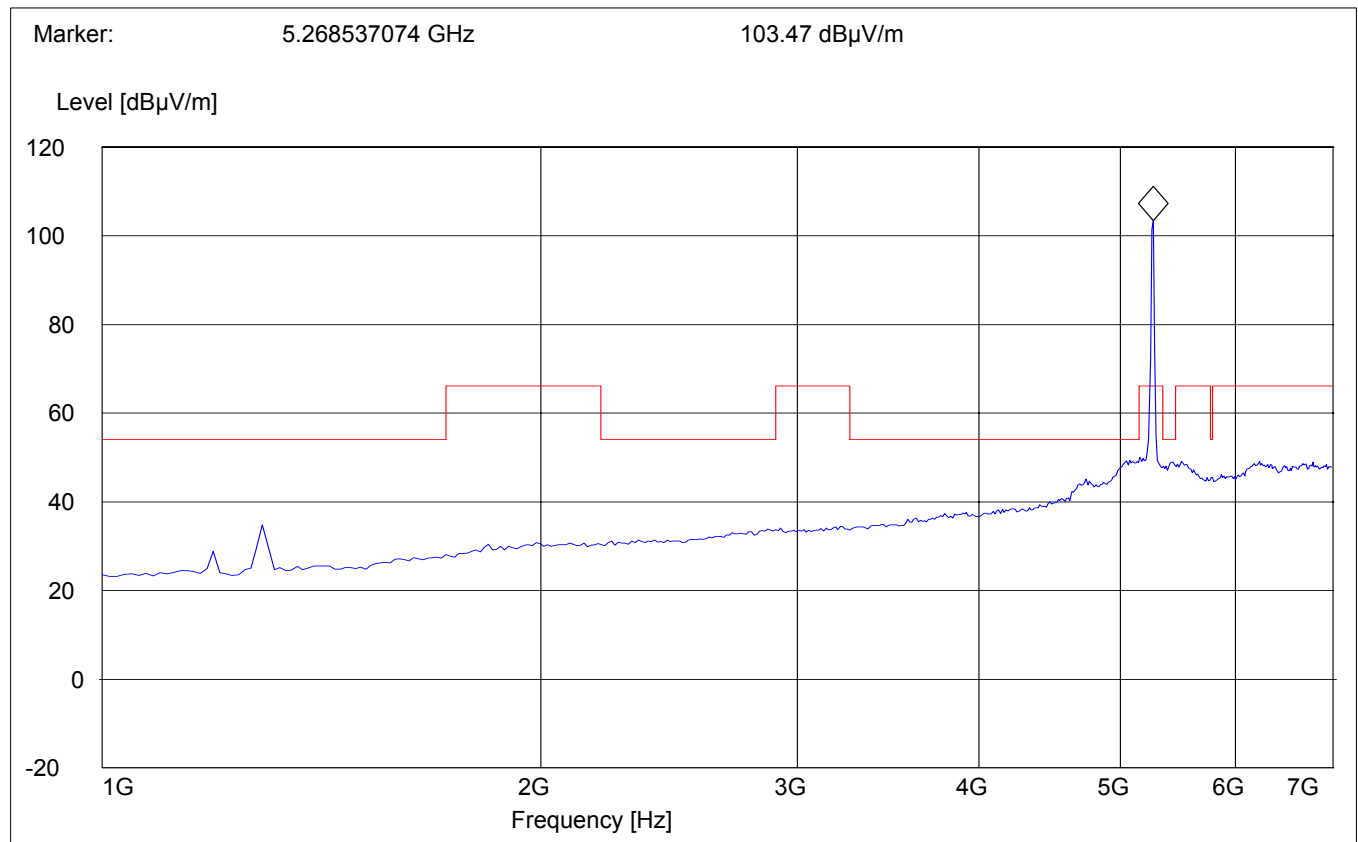
(Average)

(Data rate – 54Mbps)

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

Note: The peak above the limit line is the carrier freq.

SWEEP TABLE:		"FCC 15.407 1-7G"				
Start	Stop	Detector	Meas.	RBW	VBW	Transducer
Frequency	Frequency		Time			
1GHz	7.0 GHz	MaxPeak	Coupled	1MHz	10Hz	326 horn



EMISSION LIMITATIONS - Radiated (Transmitter)

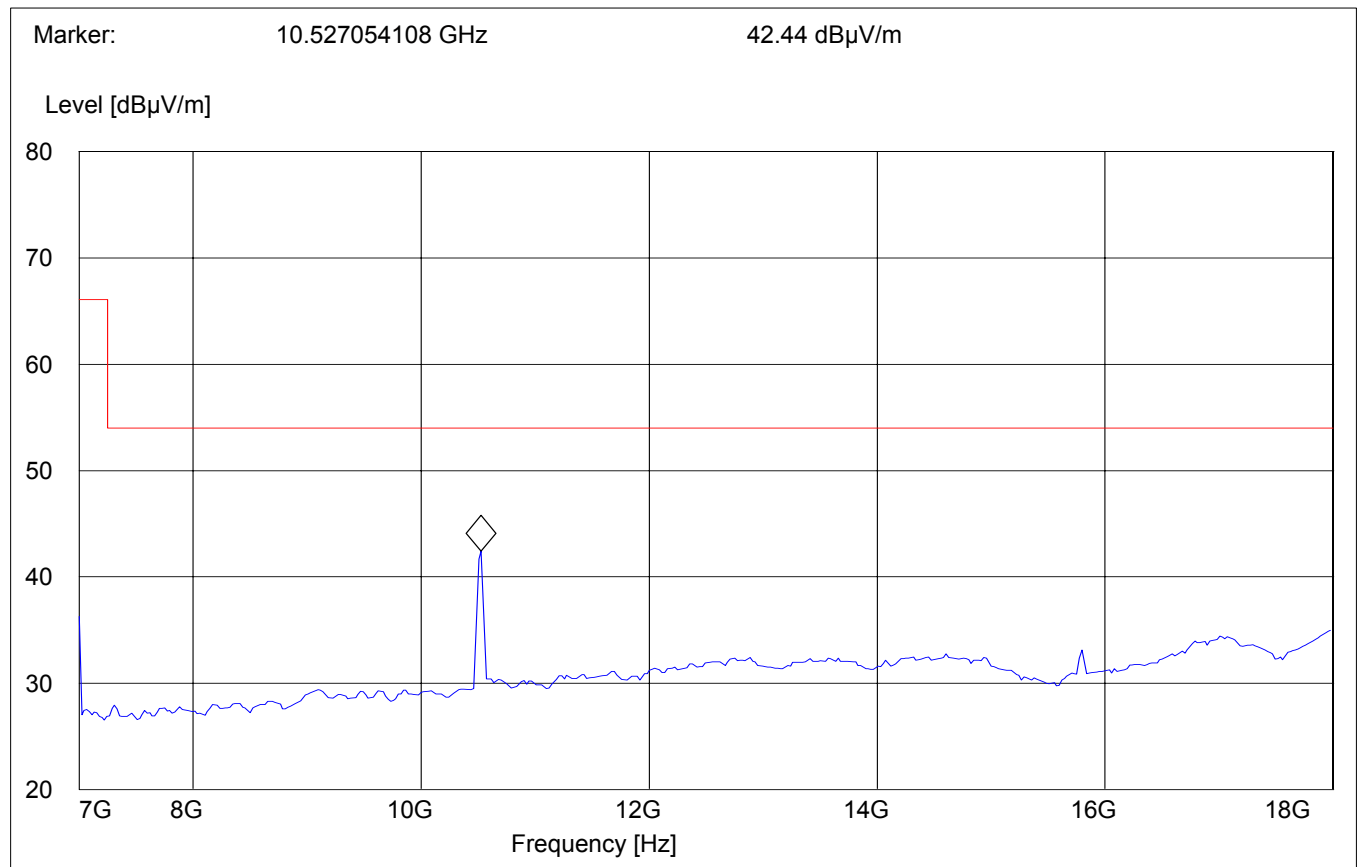
§ 15.407 (b)(1)(2)(4)(6)

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	MaxPeak	Coupled	1MHz	326 horn



EMISSION LIMITATIONS - Radiated (Transmitter)

§ 15.407 (b)(1)(2)(4)(6)

Lowest Channel (5320MHz): 1GHz – 7GHz

(Data rate – 54Mbps)

(Average)

Antenna:

Horizontal

EUT plane:

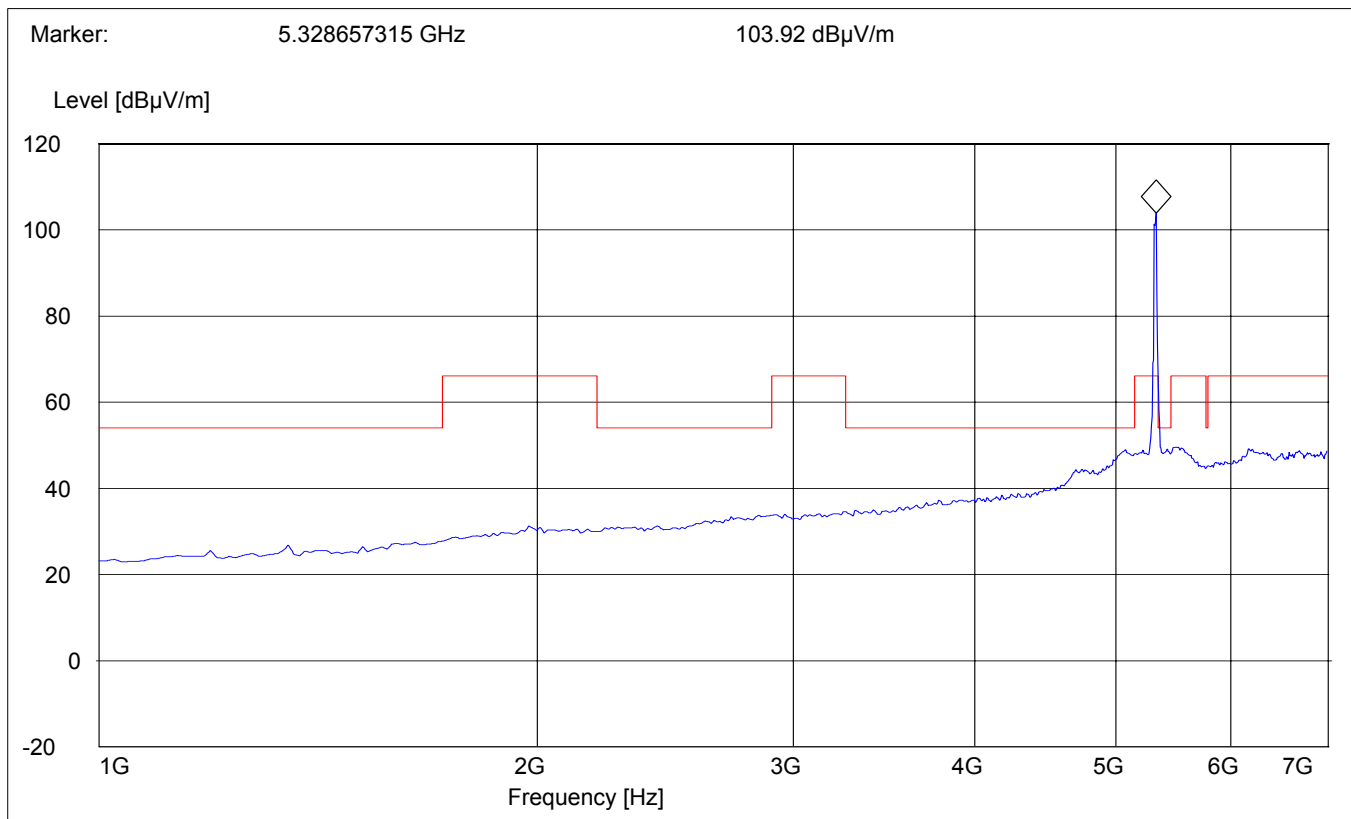
Horizontal with screen vertical @ 90°

Note: The peak above the limit line is the carrier freq.

SWEEP TABLE:

"FCC 15.407 1-7G"

Start	Stop	Detector	Meas.	RBW		Transducer
Frequency	Frequency		Time		VBW	
1GHz	7.0 GHz	MaxPeak	Coupled	1MHz	10Hz	326 horn



EMISSION LIMITATIONS - Radiated (Transmitter)

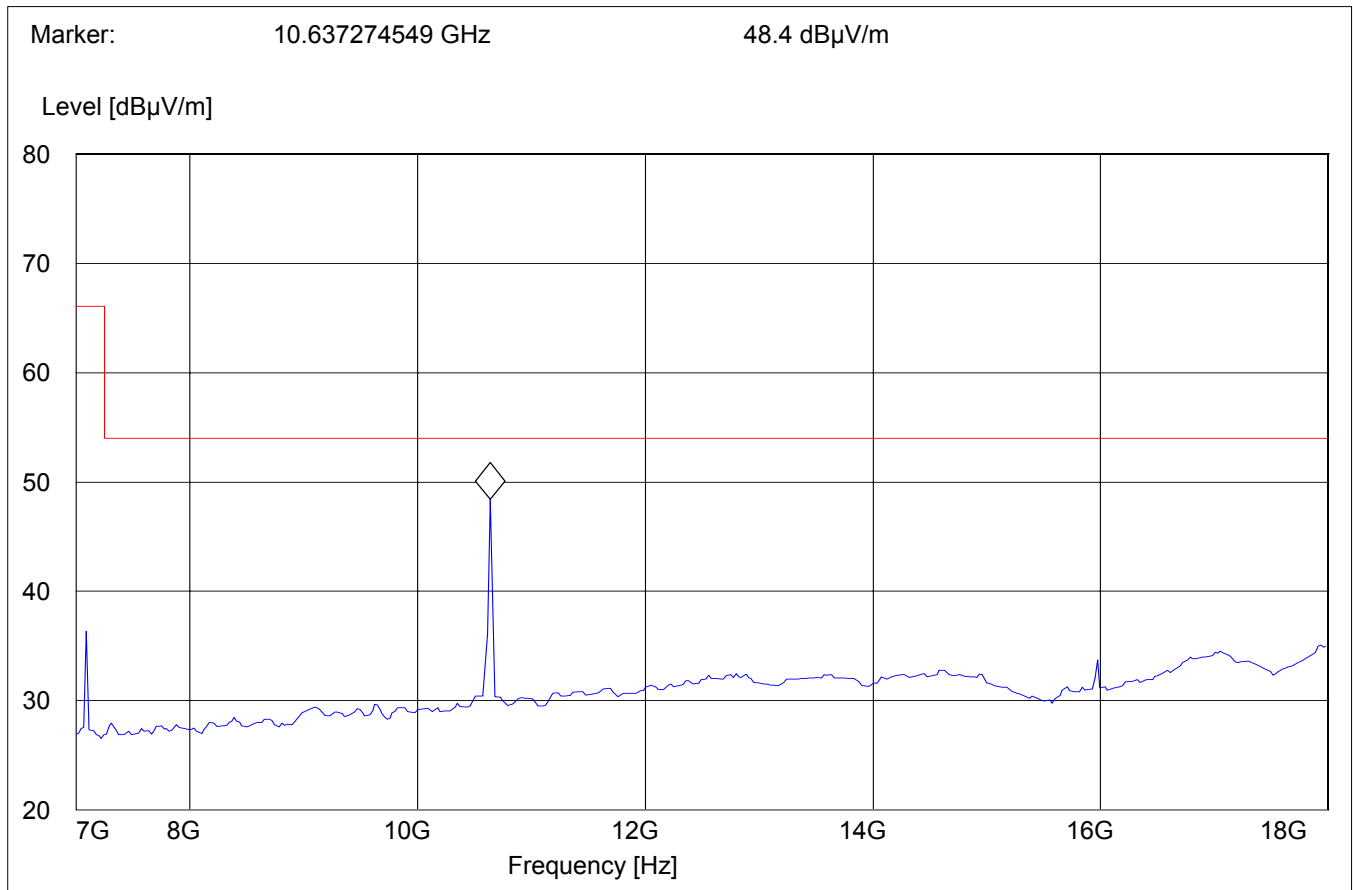
§ 15.407 (b)(1)(2)(4)(6)

Lowest Channel (5320MHz): 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	MaxPeak	Coupled	1MHz	326 horn



EMISSION LIMITATIONS - Radiated (Transmitter)

§ 15.407 (b)(1)(2)(4)(6)

18GHz – 26.5GHz

(Data rate – 54Mbps)

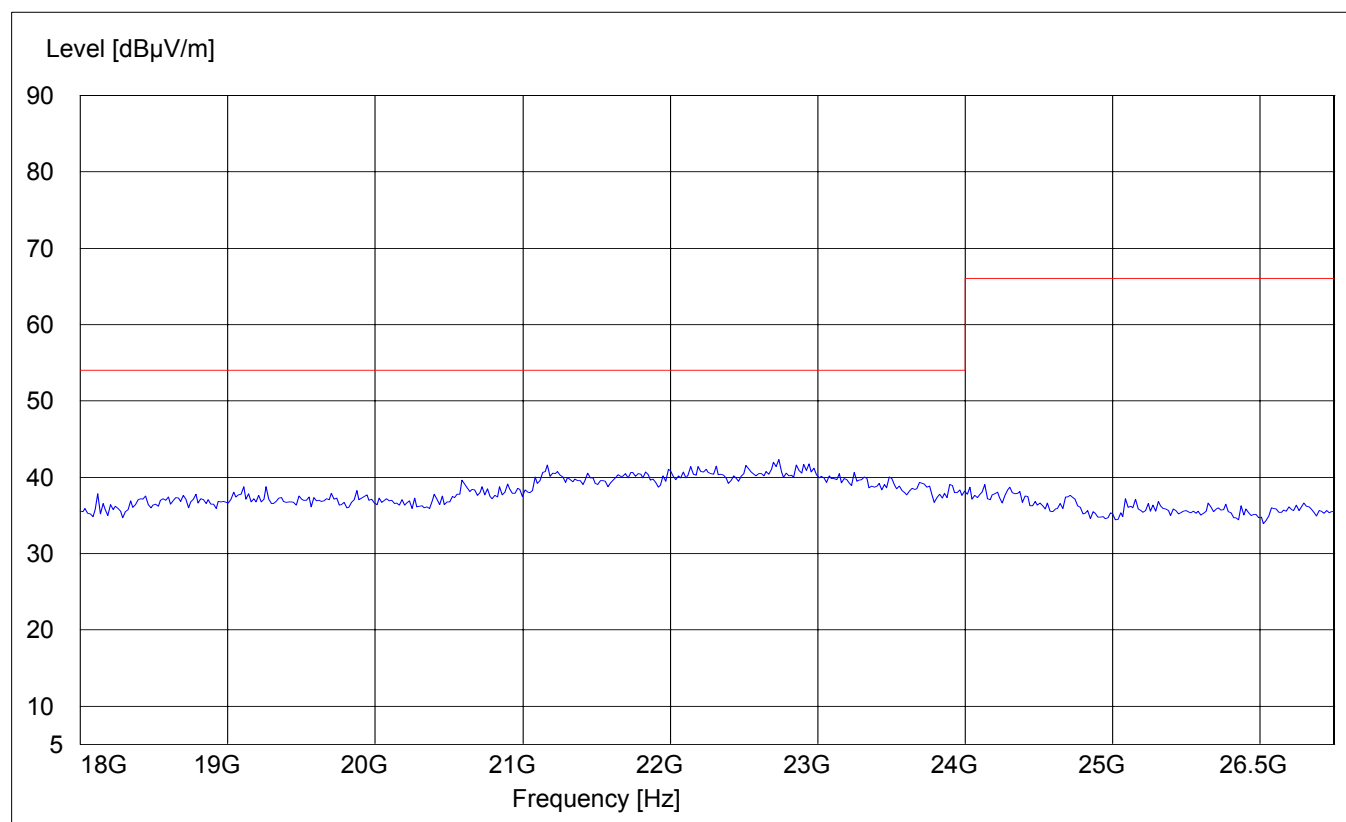
Antenna: Horizontal

EUT plane: Horizontal with screen vertical @ 90°

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

SWEEP TABLE: "FCC 15.407 18-26.5G"

Start	Stop	Detector	Meas.	RBW	Transducer
Frequency	Frequency		Time	VBW	
18GHz	26.5 GHz	MaxPeak	Coupled	1MHz	3160-09 horn



EMISSION LIMITATIONS - Radiated (Transmitter)

§ 15.407 (b)(1)(2)(4)(6)

26.5GHz – 40GHz

(Data rate – 54Mbps)

Antenna:

Horizontal

EUT plane:

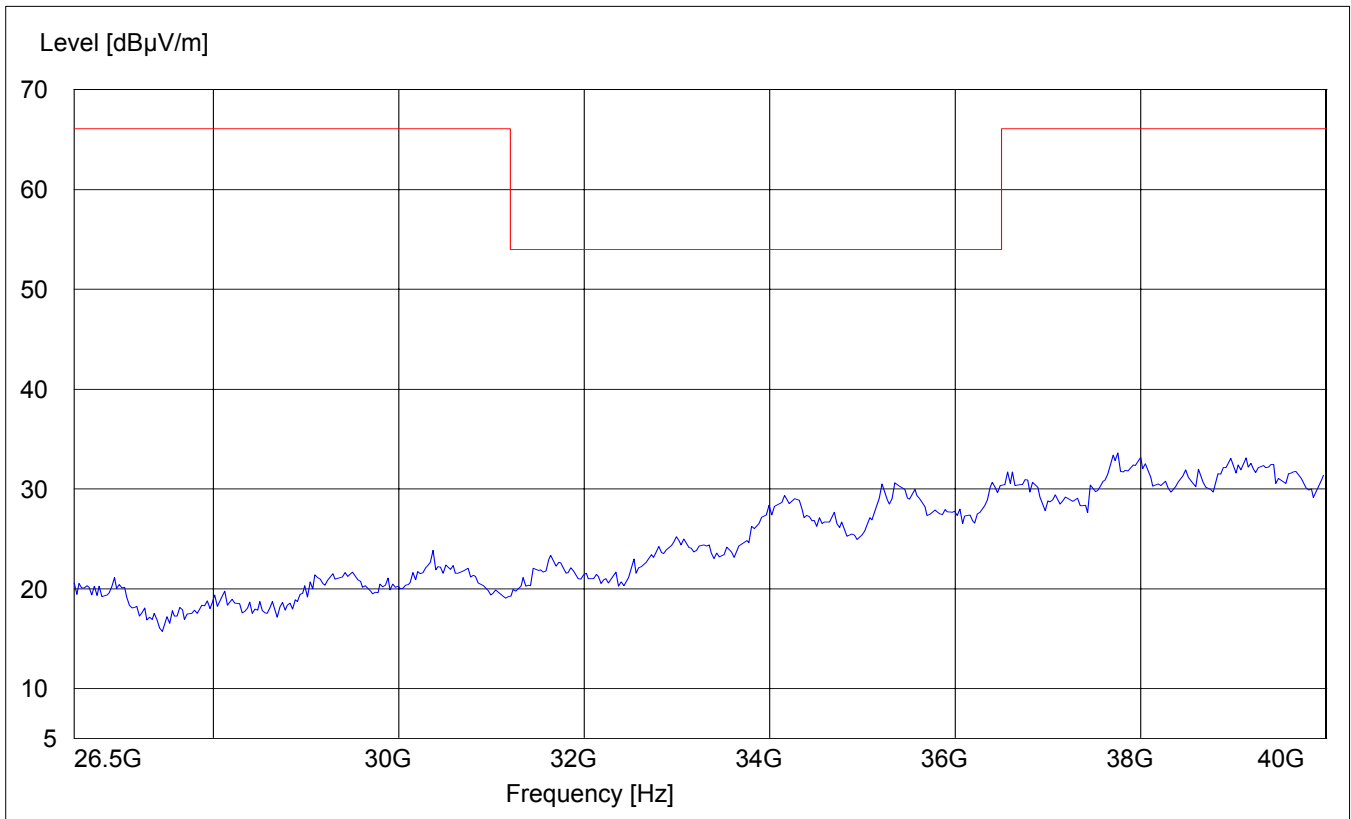
Horizontal with screen vertical @ 90°

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

SWEEP TABLE:

"FCC 15.407 26.5-40G"

Start	Stop	Detector	Meas.	RBW	Transducer
Frequency	Frequency		Time	VBW	
26.5GHz	40 GHz	MaxPeak	Coupled	1MHz	3160-10 horn



CONDUCTED EMISSIONS

§ 15.107/207

Measured with AC/DC power adapter

SWEEP TABLE: "55022 cond"

Short Description: EN 55022 for 150KHz-30MHz
 Start Stop Detector Meas IF Transducer
 Frequency Frequency Time Bandw.
 150.0 kHz 30.0 MHz MaxPeak Coupled 10 kHz None

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

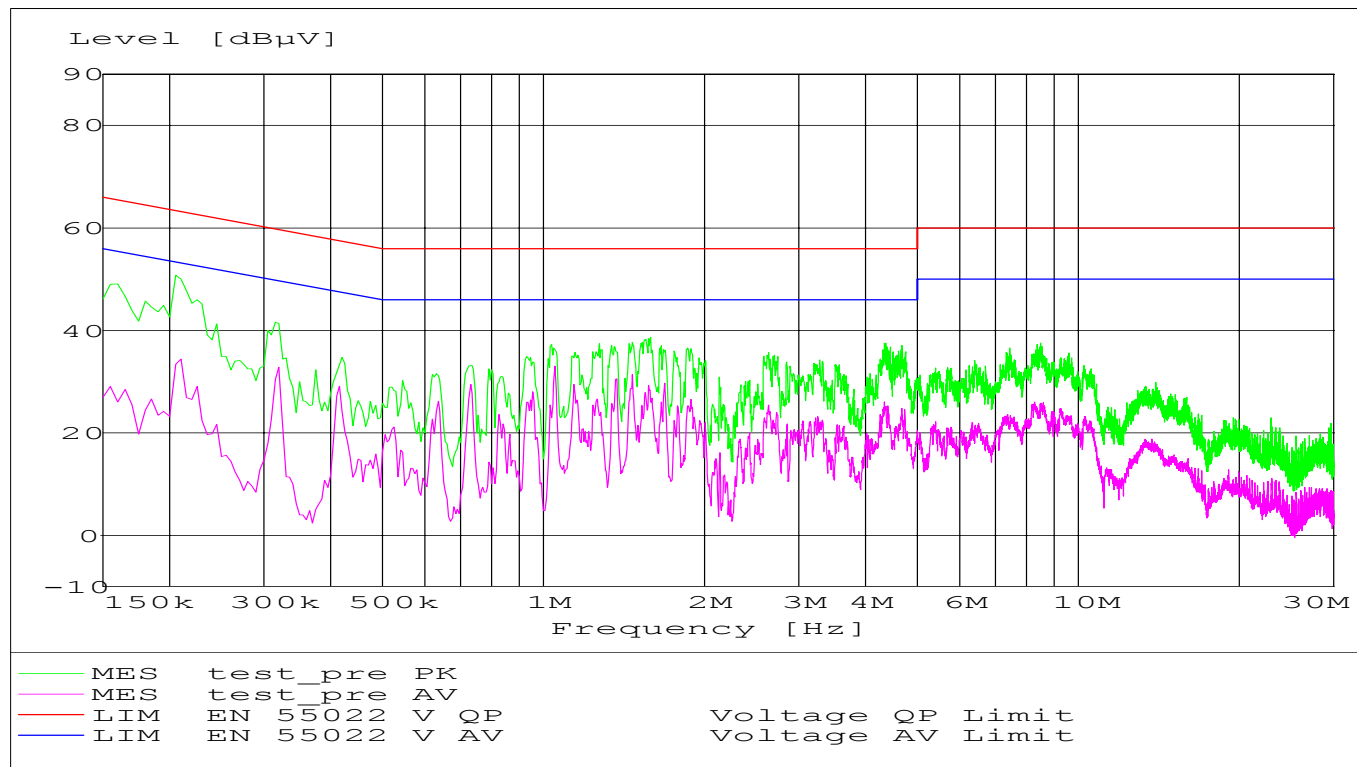
Limit

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



RECEIVER SPURIOUS RADIATION**§ 15.209****Limits**

Frequency (MHz)	Field strength ($\mu\text{V/m}$)	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.

RECEIVER SPURIOUS RADIATION 30MHz – 1GHz

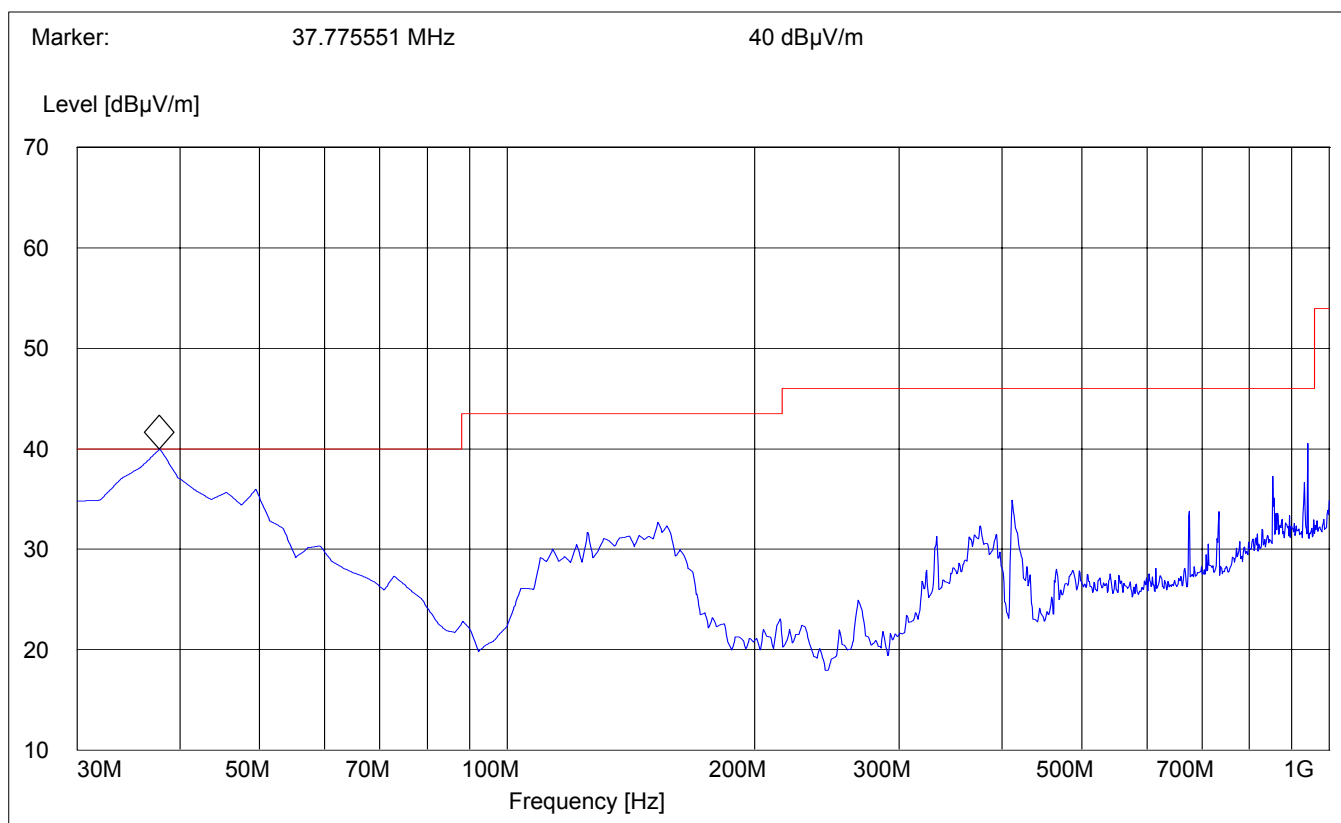
§ 15.209

Antenna: Vertical
EUT plane: Horizontal with screen vertical @ 90°

SWEEP TABLE: "WLAN Spuri hi 30-1G"

Start	Stop	Detector	Meas. Time	RBW	VBW	Transducer
30.0 MHz	1.0 GHz	MaxPeak	Coupled	100 kHz		3141-#1186

Freq. (MHz)	Pk Level (dBµV/m)	QPk Level (dBµV/m)
37.77	40.00	35.00



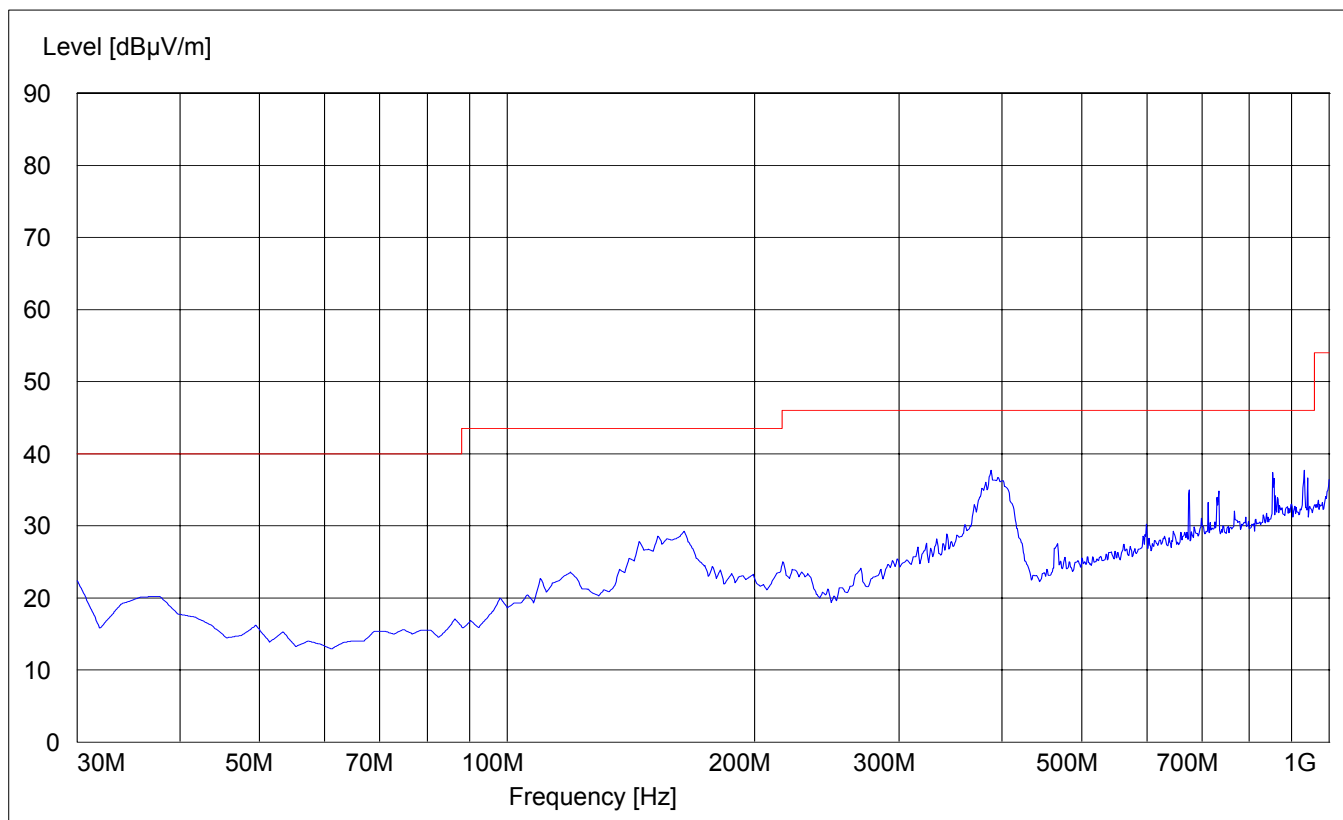
RECEIVER SPURIOUS RADIATION 30MHz – 1GHz

§ 15.209

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

SWEEP TABLE: "WLAN Spuri hi 30-1G"

Start	Stop	Detector	Meas. Time	RBW	VBW	Transducer
30.0 MHz	1.0 GHz	MaxPeak	Coupled	100 kHz		3141-#1186

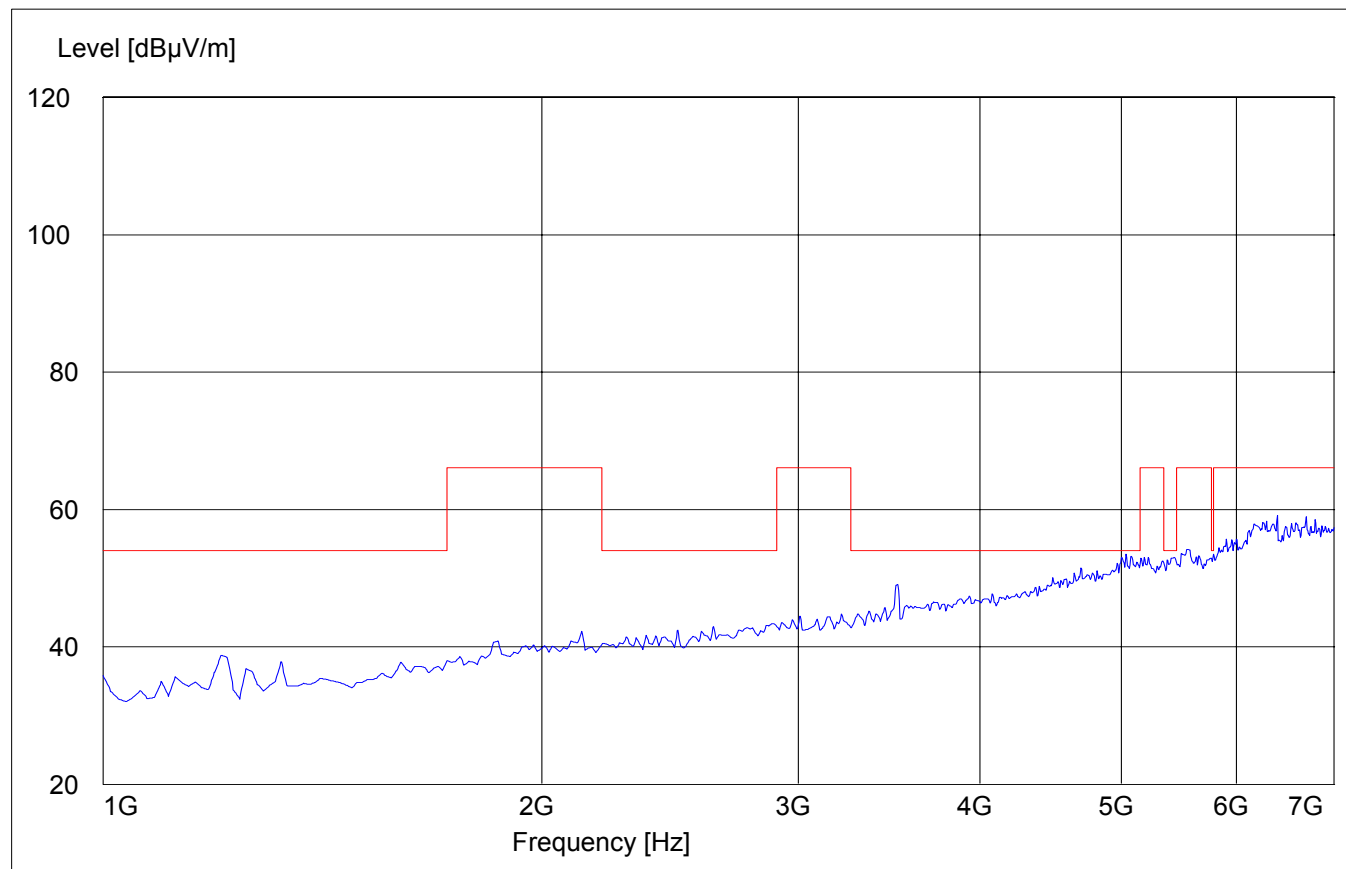


RECEIVER SPURIOUS RADIATION 1GHz – 7GHz

§ 15.209

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

SWEEP TABLE:		"WLAN Spuri hi 1-7G"				
Start	Stop	Detector	Meas.	RBW	VBW	Transducer
Frequency	Frequency	Time	Bandw.			
1.0 GHz	7.0 GHz	MaxPeak	Coupled	1 MHz	1MHz	#326 horn (dBi)



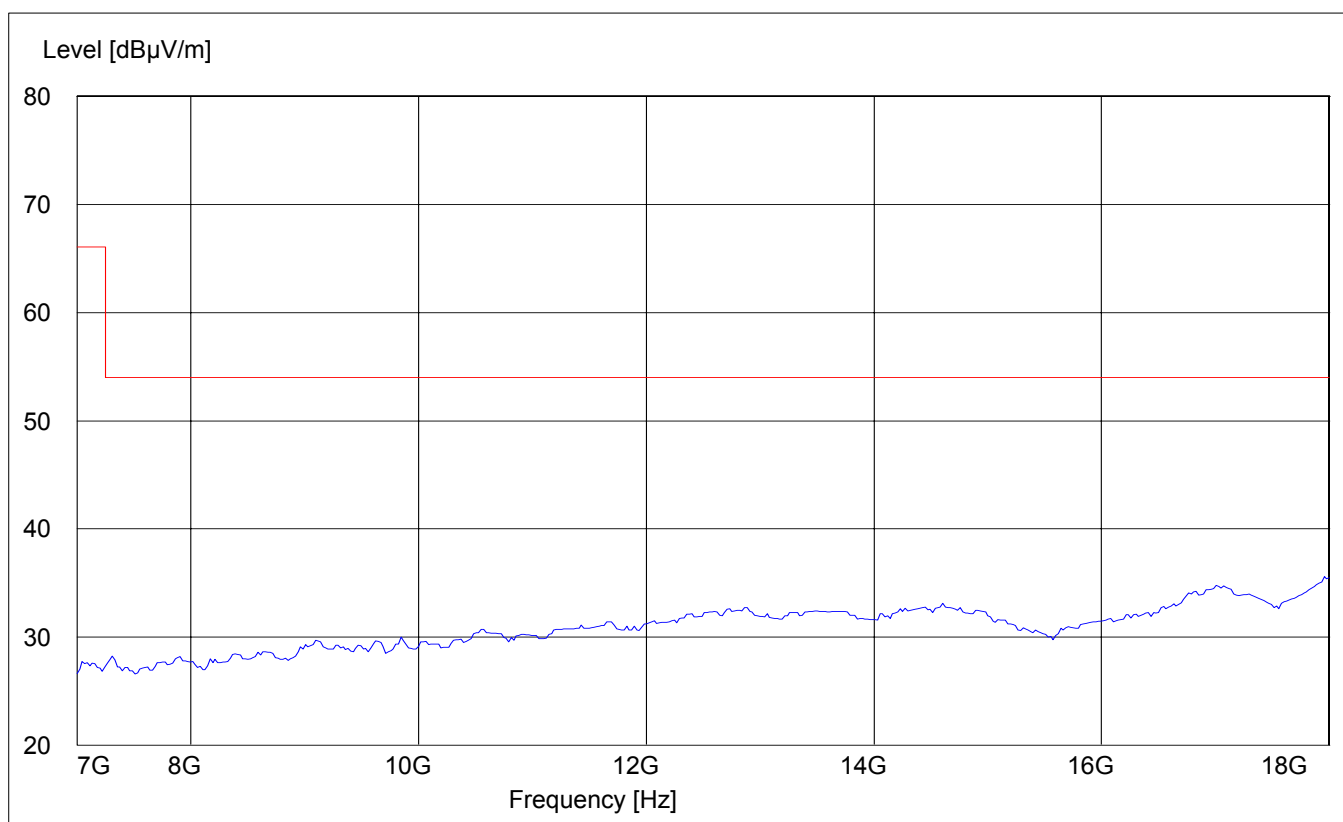
RECEIVER SPURIOUS RADIATION 7GHz – 18GHz

§ 15.209

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

SWEEP TABLE: "WLAN Spuri hi 7-18G"

Start	Stop	Detector	Meas.	RBW	Transducer
Frequency	Frequency	Time	Bandw.	VBW	
7.0 GHz	18 GHz	MaxPeak	Coupled	1 MHz	#326 horn (dBi)



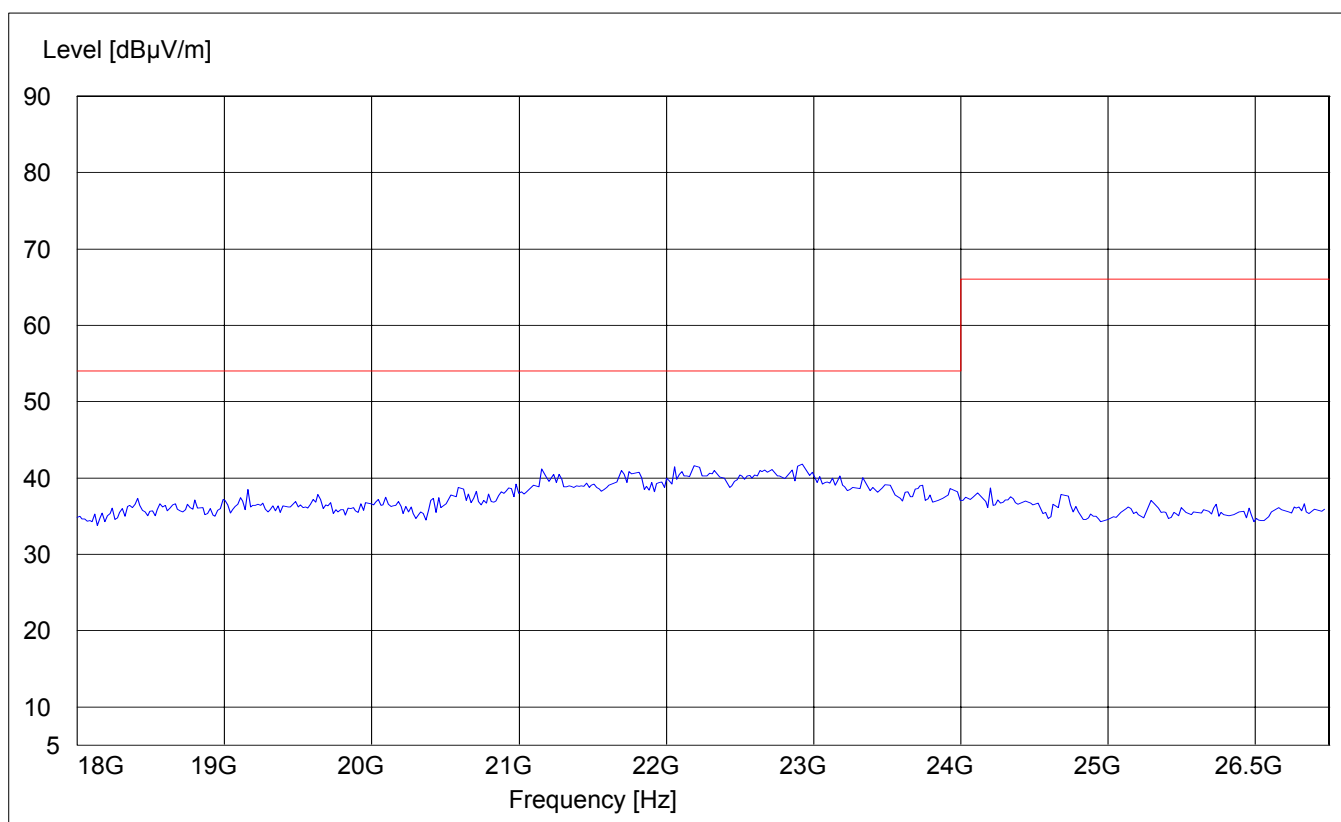
RECEIVER SPURIOUS RADIATION 18GHz – 26.5GHz

§ 15.209

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

SWEEP TABLE: "WLAN Spuri hi 18-26.5G"

Start	Stop	Detector	Meas.	RBW	Transducer
Frequency	Frequency	Time	Bandw.	VBW	
18 GHz	26.5 GHz	MaxPeak	Coupled	1 MHz	#141 horn (dBi)



RECEIVER SPURIOUS RADIATION

§ 15.209

26.5GHz – 40GHz

Antenna:

Horizontal

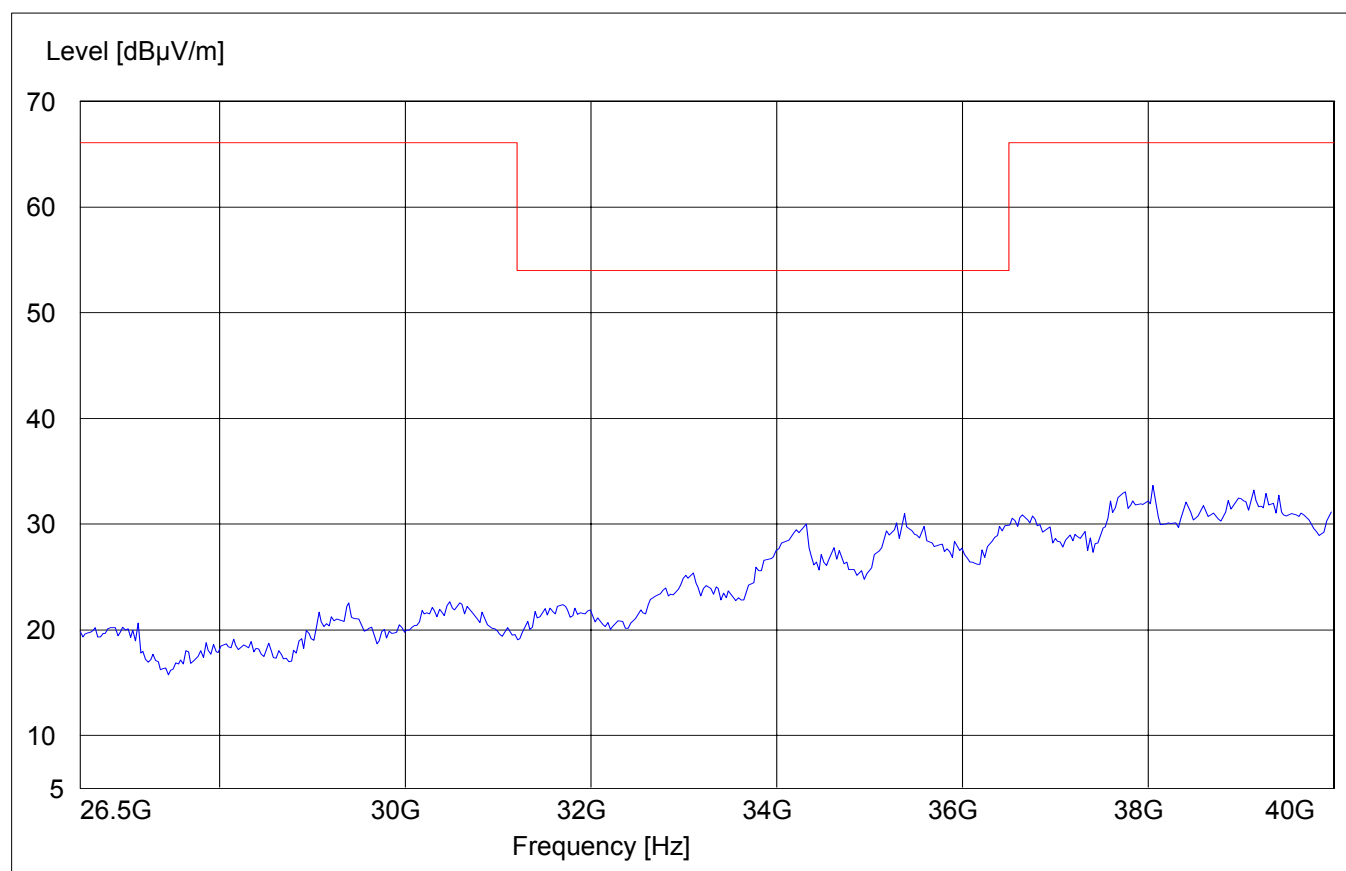
EUT plane:

Horizontal with screen vertical @ 90°

SWEEP TABLE:

"WLAN Spuri hi 26.5-40G"

Start	Stop	Detector	Meas.	RBW	Transducer
Frequency	Frequency	Time	Bandw.	VBW	
26.5 GHz	40 GHz	MaxPeak	Coupled	1 MHz	3160-10 horn

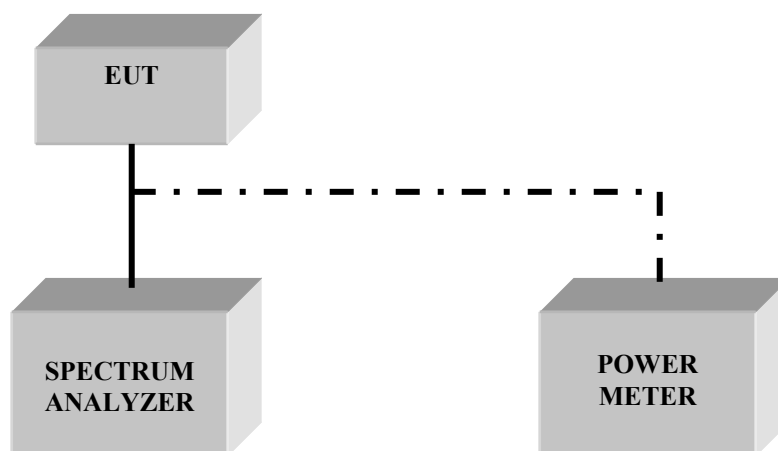


TEST EQUIPMENT AND ANCILLARIES USED FOR TESTS

No	Instrument/Ancillary	Type	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

BLOCK DIAGRAMS

Conducted Testing



Radiated Testing

ANECHOIC CHAMBER

