



FCC Test Report

Test report no.: EMC_440FCC15.247_2003_GC79
FCC Part 15.247 for DSSS systems / CANADA RSS-210

Model: GC79
FCC ID: PY7F1021011



TTI-P-G 081/94-A0

Accredited according to
ISO/IEC 17025



FCC listed # 101450

IC recognized # 3925

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Table of Contents

- 1 **General information**
- 1.1 **Notes**
- 1.2 **Testing laboratory**
- 1.3 **Details of applicant**
- 1.4 **Application details**
- 1.5 **Test item**
- 1.6 **Test standards**
- 2 **Technical test**
- 2.1 **Summary of test results**
- 2.2 **Test report**
- 1 **General information**
- 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:

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1.2 Testing laboratory

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Internet: www.cetecom.com

1.3 Details of applicant

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Country : United Kingdom
Contact : Jose Aurelio Rodrigo
Telephone : +44 1256774841
Tele-fax : +44 1256774280
e-mail : Jose-Aurelio.Rodrigo@sonyericsson.com

1.4 Application details

Date of receipt of application : 2003-02-25
Date of receipt test item : 2003-03-06
Date of test : 2003-03-20/31

1.5 Test item

Manufacturer : Applicant
Marketing Name : GC79
Model No. : GC79
Host Laptop Model : Dell Inspiron 8500
Description : [GSM triband \(900/1800/1900\) & 802.11b PCMCIA card](#)
FCC-ID : PY7F1021011

Additional information

Frequency : 2412MHz – 2462MHz for 802.11b
Type of modulation : DSSS
Number of channels : 11
Antenna : Embedded
Power supply : Via host
***Output power** : 20.37dBm (108.9mW) maximum conducted peak power measured for 802.11b
Extreme vol. Limits : 3.0VDC to 3.6VDC

* For EIRP please see page 16


1.6 Test standards: **FCC Part 15 §15.247 / CANADA RSS-210**

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:

2003-04-21	EMC & Radio	Lothar Schmidt (Manager)	
Date	Section	Name	Signature

Responsible for test report and project leader:

2003-04-21	EMC & Radio	Harpreet Sidhu (EMC Engineer)	
Date	Section	Name	Signature

2.2 Test report

TEST REPORT

Test report no.: EMC_440FCC15.247_2003_GC79

FCC ID: PY7F1021011

TEST REPORT REFERENCE

LIST OF MEASUREMENTS		PAGE
SPECTRUM BANDWIDTH OF DSSS SYSTEM	§15.247(a) (2)	7
OUTPUT POWER	§ 15.247 (b) (1)	11
POWER SPECTRAL DENSITY	§15.247 (d)	17
BAND EDGE COMPLIANCE	§15.247 (c)	25
EMISSION LIMITATIONS	§ 15.247 (c) (1)	29
CONDUCTED EMISSIONS	§ 15.107/207	42
RECEIVER SPURIOUS RADIATION	§ 15.209	44
TEST EQUIPMENT AND ANCILLARIES USED FOR TESTS		49
BLOCK DIAGRAMS		50

**SPECTRUM BANDWIDTH OF DSSS SYSTEM
6 dB bandwidth**

§15.247(a) (2)

TEST CONDITIONS		6 dB BANDWIDTH (MHz)		
Frequency (MHz)		2412	2437	2462
T_{nom}(23)°C	V_{nom}(3.3) VDC	11.57	11.12	11.57

LIMIT

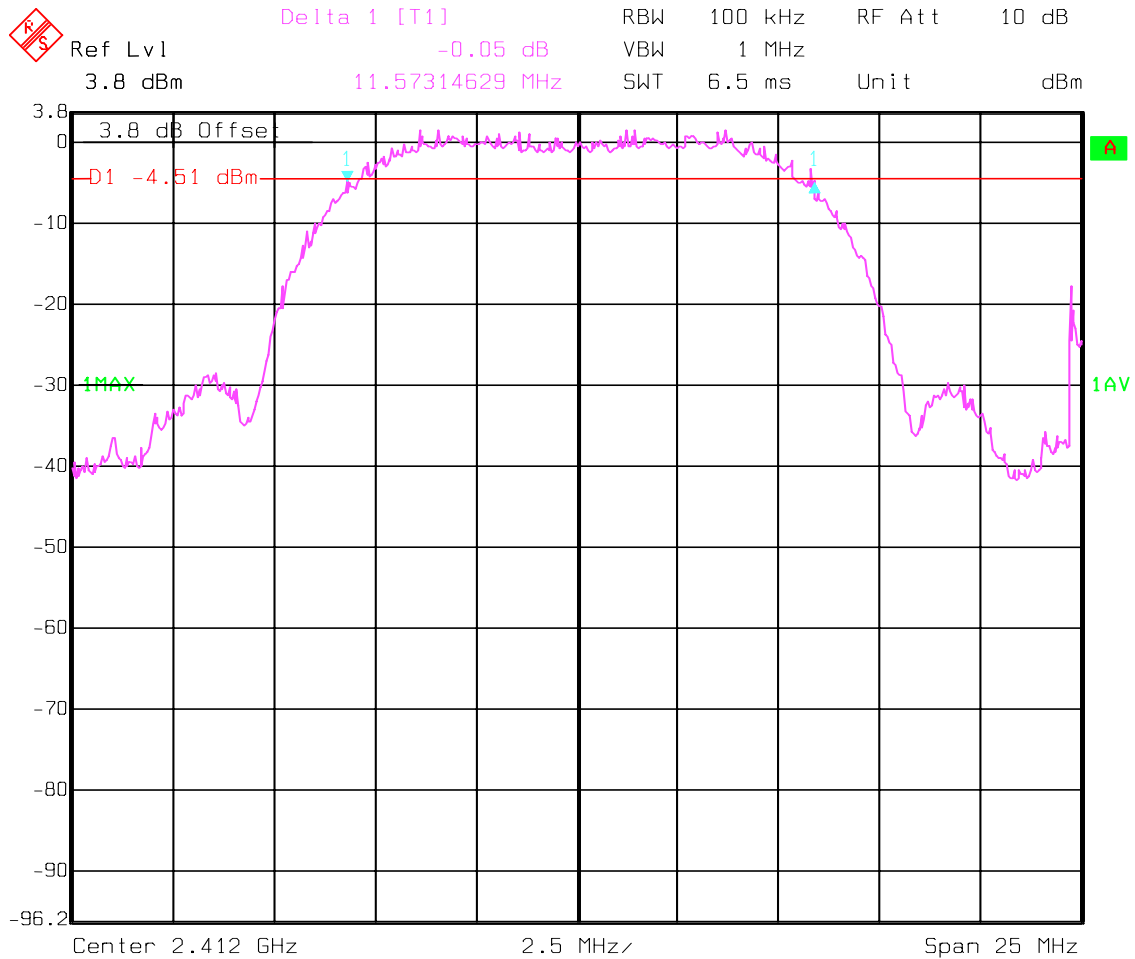
SUBCLAUSE §15.247(a) (2)

The minimum 6dB bandwidth shall be at least 500 KHz

**SPECTRUM BANDWIDTH OF DSSS SYSTEM
6 dB bandwidth**

§15.247(a) (2)

Lowest Channel: 2412MHz

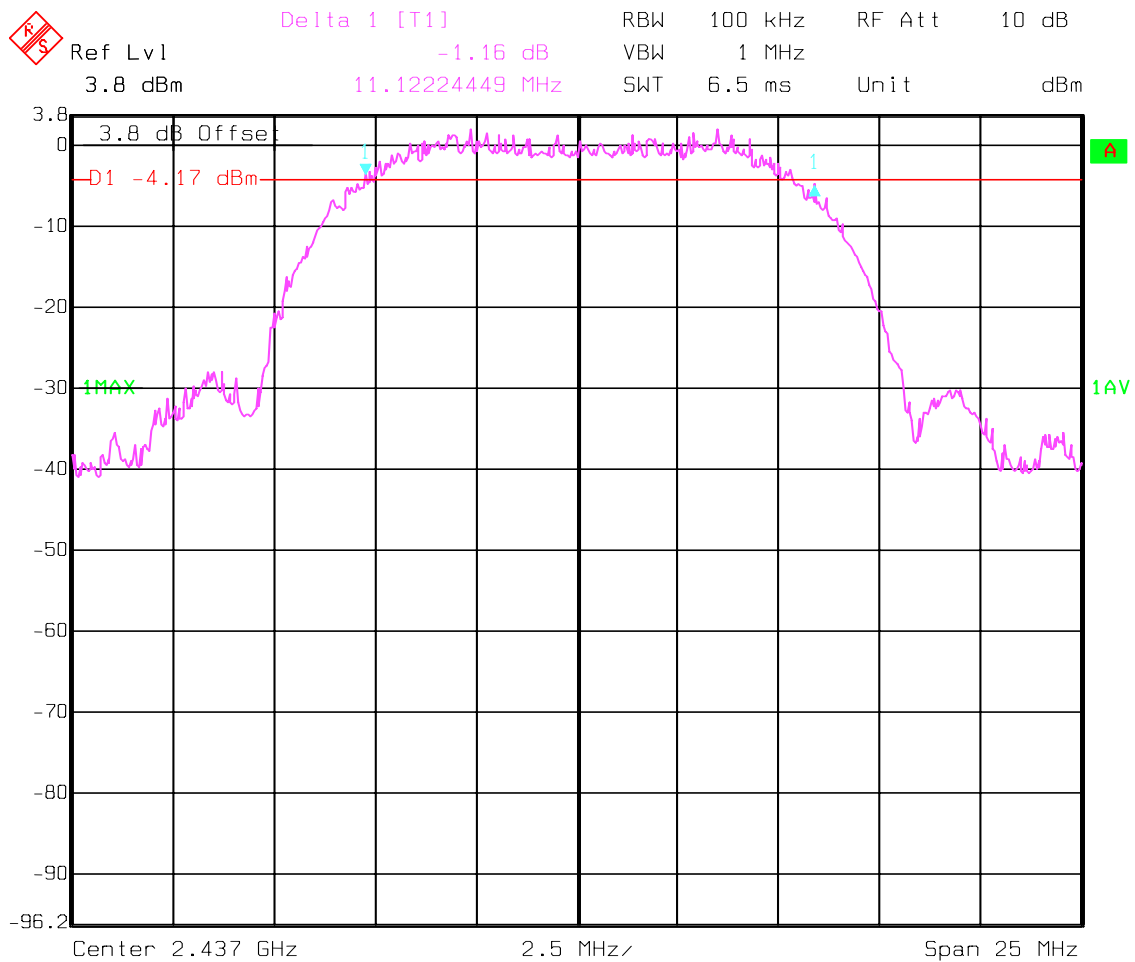


Date: 31.MAR.2003 11:08:46

SPECTRUM BANDWIDTH OF DSSSS SYSTEM
6 dB bandwidth

§15.247(a) (2)

Mid Channel: 2437MHz

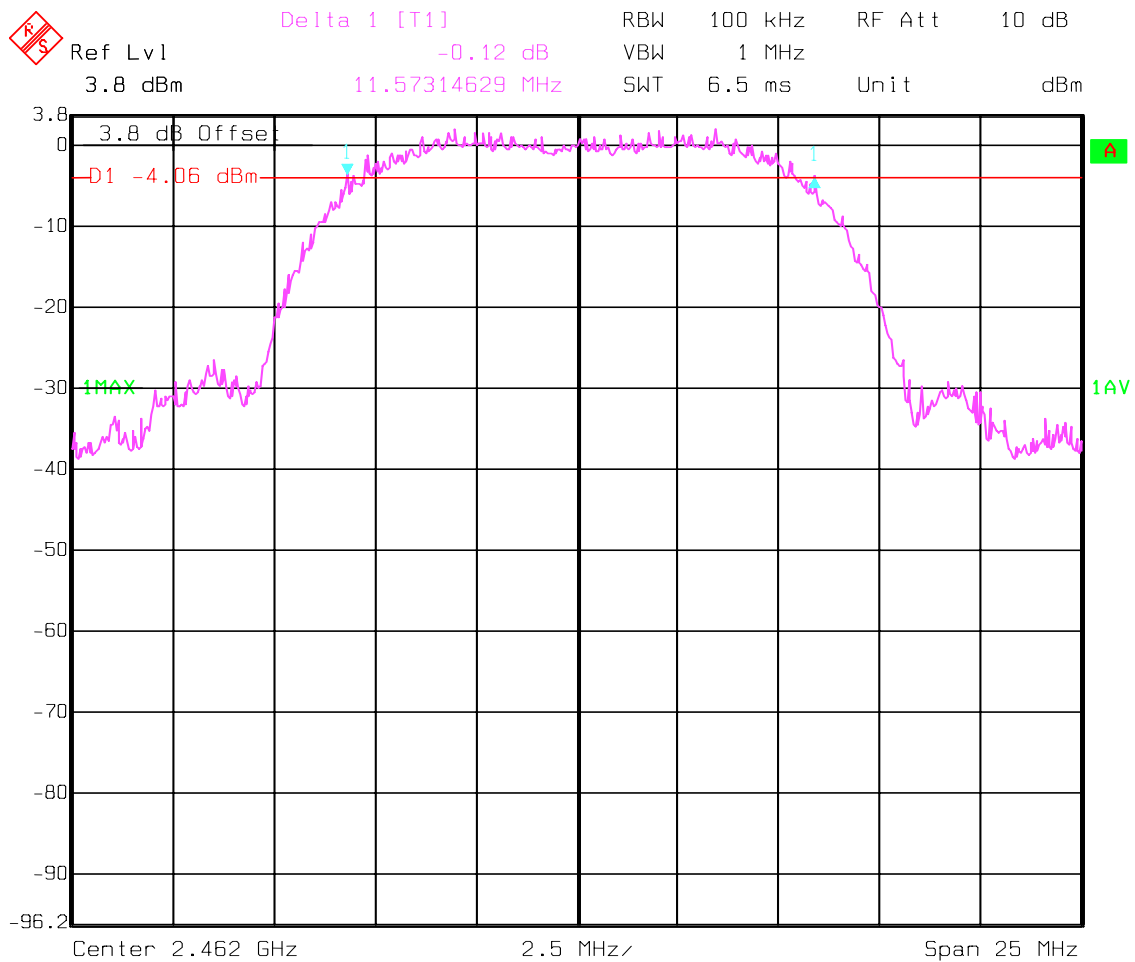


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SPECTRUM BANDWIDTH OF DSSS SYSTEM
6 dB bandwidth

§15.247(a) (2)

Highest Channel: 2462MHz



Date: 31.MAR.2003 11:12:28

OUTPUT POWER

§ 15.247 (b) (1)

	Low channel	Mid channel	High channel
*Conducted Peak Power	19.22dBm	19.57dBm	20.37dBm
*Radiated Power (EIRP)	20.72dBm	21.07dBm	21.87dBm

*For details please refer to pages 12(Conducted output power results), 16(EIRP calculation)

**MAXIMUM PEAK OUTPUT POWER
(Conducted)**

§ 15.247 (b) (1)

TEST CONDITIONS		MAXIMUM PEAK OUTPUT POWER (dBm)			
Frequency (MHz)		2412	2437	2462	
T _{nom} (23)°C	V _{nom} (3.3) VDC	Pk	19.22	19.57	20.37
Measurement uncertainty		±0.5dBm			

RBW / VBW: 10MHz

LIMIT

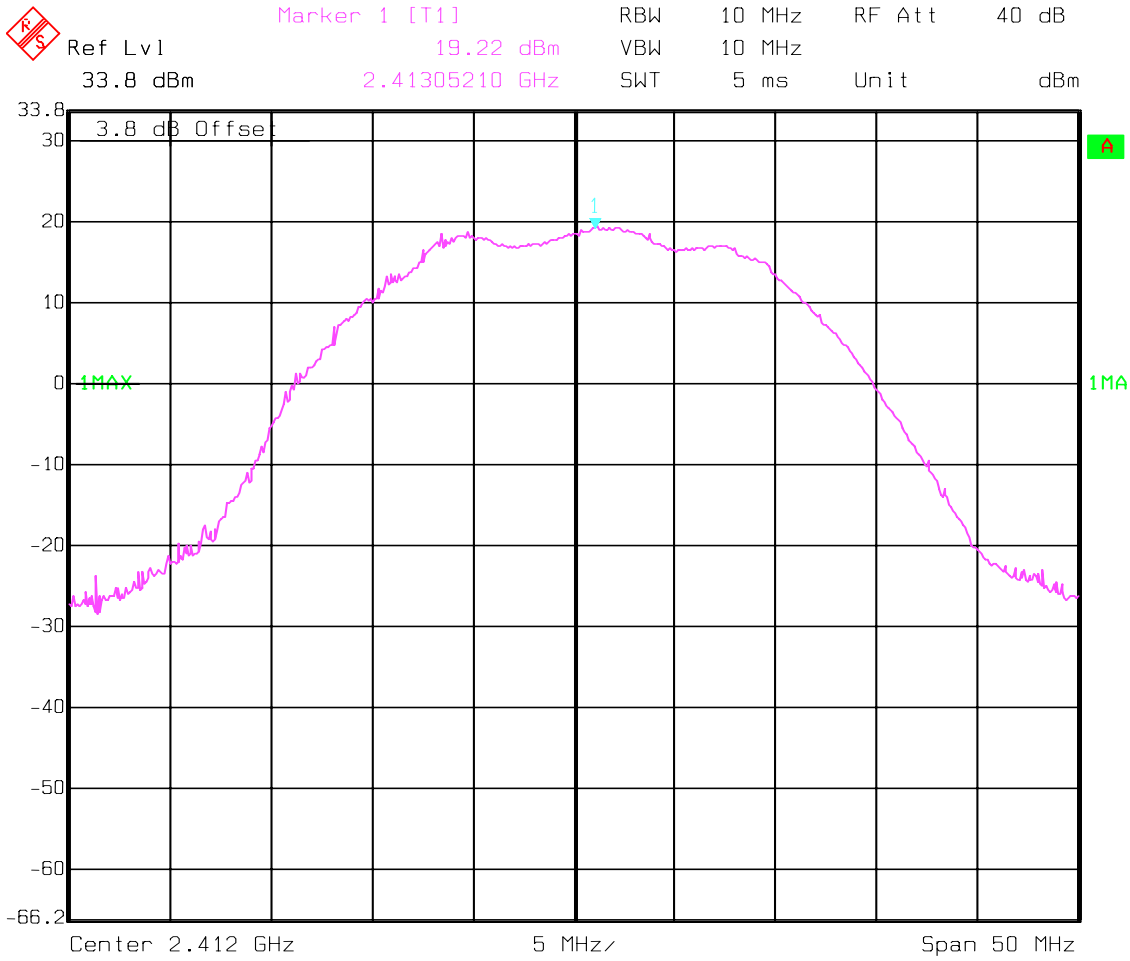
SUBCLAUSE § 15.247 (b) (1)

Frequency range	RF power output
2400-2483.5 MHz	1.0 Watt / 30dBm

PEAK OUTPUT POWER (CONDUCTED)

§15.247 (b) (1)

Lowest Channel: 2412MHz

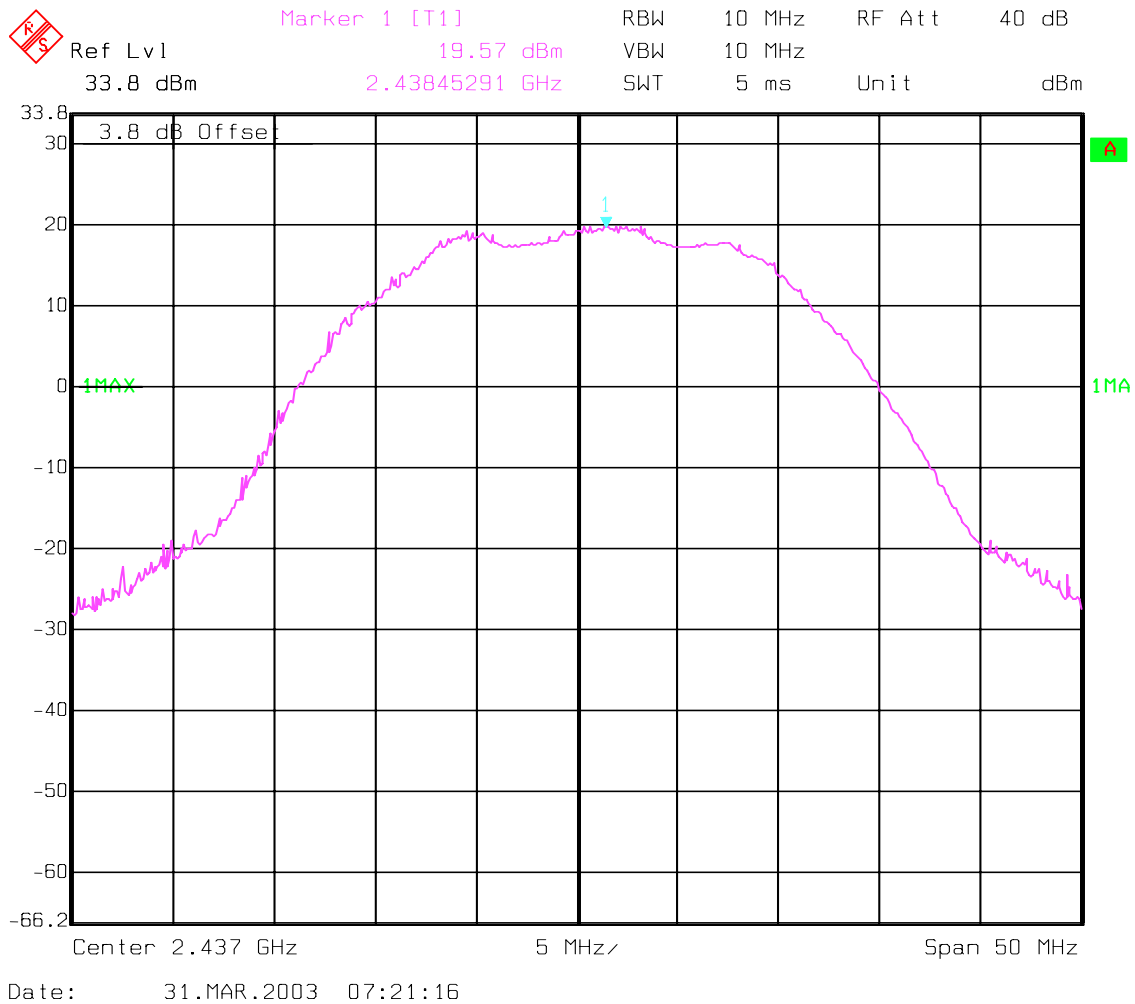


Date: 31.MAR.2003 07:19:50

PEAK OUTPUT POWER (CONDUCTED)

§15.247 (b)

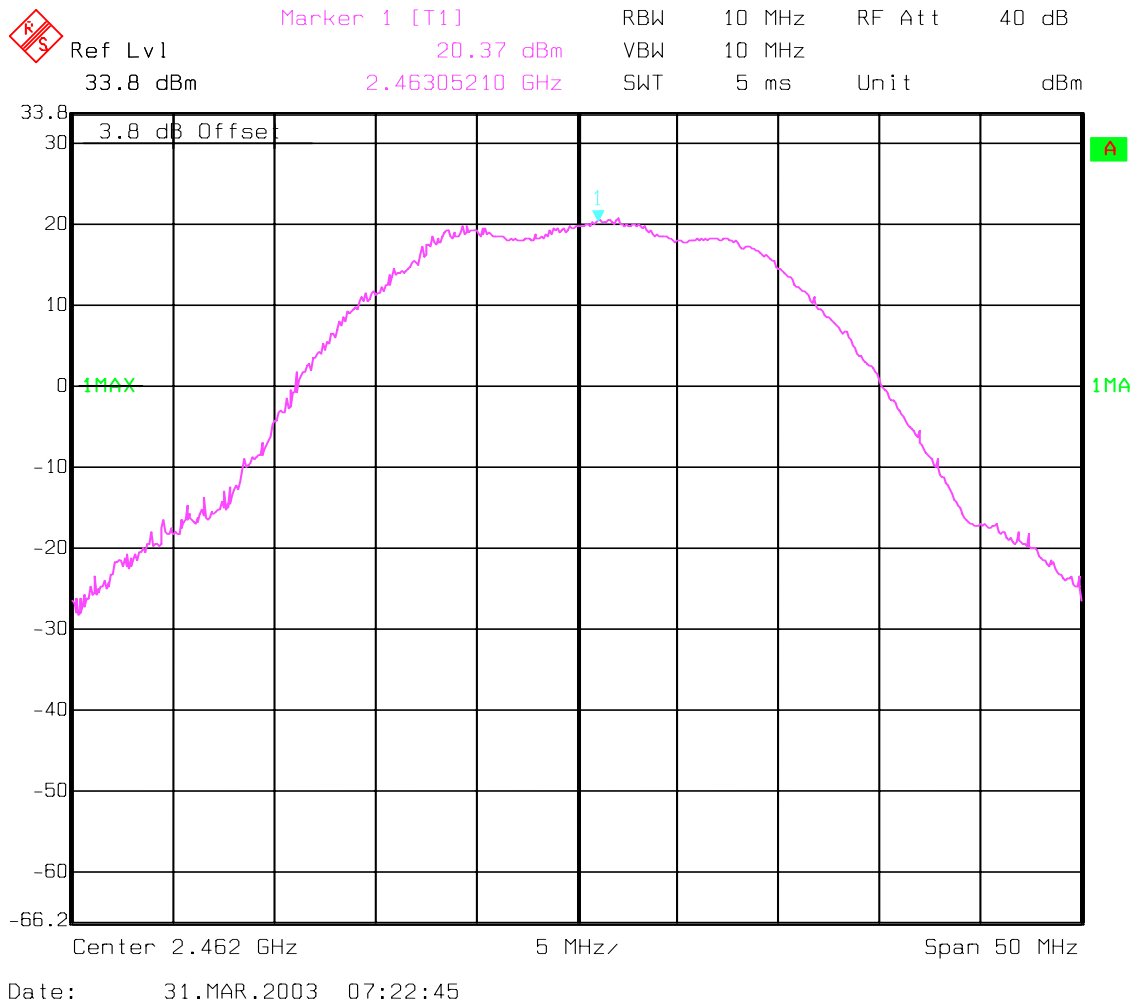
Mid Channel: 2437MHz



PEAK OUTPUT POWER (CONDUCTED)

§15.247 (b)

Highest Channel: 2462MHz



**MAXIMUM PEAK OUTPUT POWER
(RADIATED)**

§ 15.247 (b) (1)

EIRP:

TEST CONDITIONS		MAXIMUM PEAK OUTPUT POWER (dBm)		
		2412	2437	2462
Frequency (MHz)				
T _{nom} (23)°C	V _{nom} (3.3) VDC	20.72	21.07	21.87
Measurement uncertainty		±0.5dBm		

*Note: EIRP is calculated based on 1.5dBi antenna and conducted peak power measurements.

LIMIT

SUBCLAUSE § 15.247 (b) (1)

Frequency range	RF power output
2400-2483.5 MHz	30dBm on Conducted

POWER SPECTRAL DENSITY

§15.247 (d)

TEST CONDITIONS		POWER SPECTRAL DENSITY (dBm)		
		2412	2437	2462
Frequency (MHz)				
T _{nom} (23)°C	V _{nom} (3.3) VDC	-9.98	-10.59	-10.9

LIMIT

SUBCLAUSE §15.247(d)

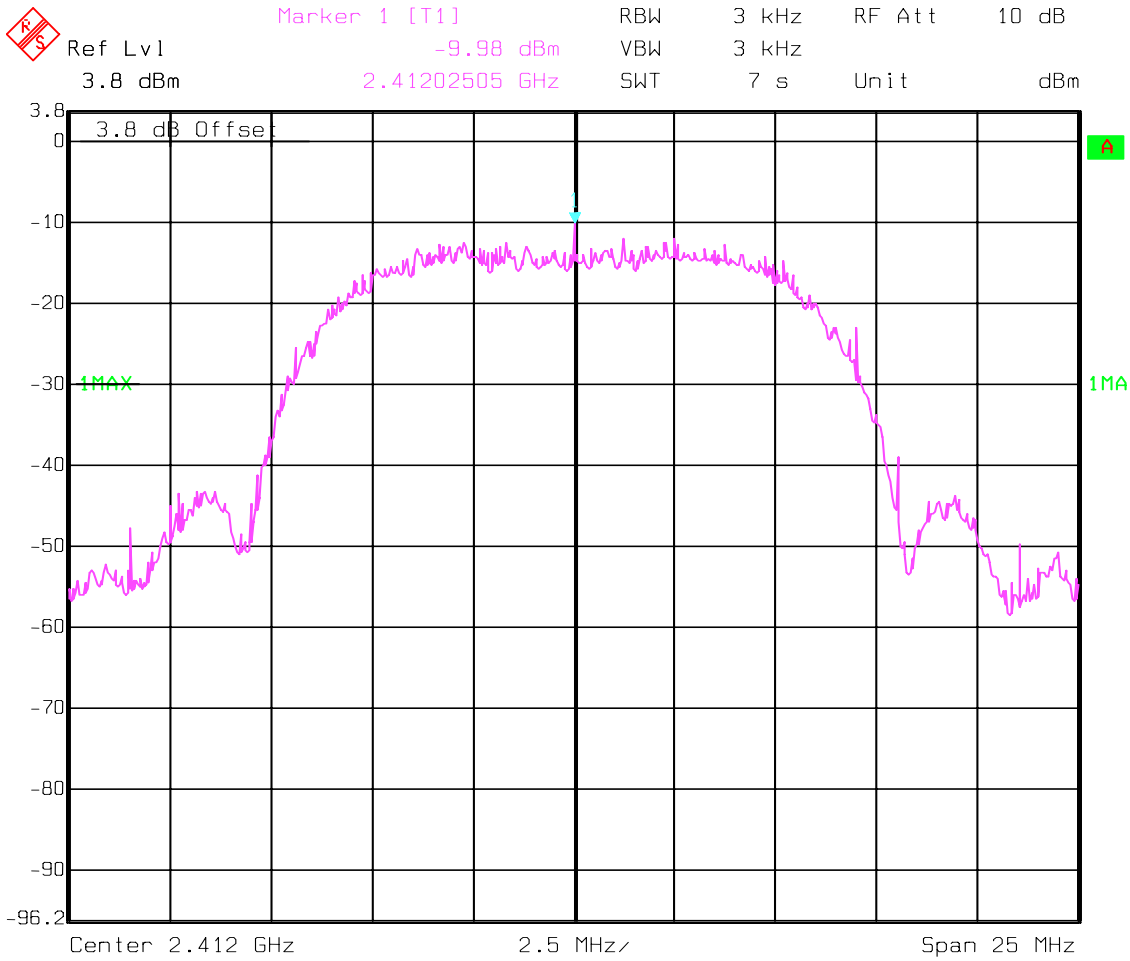
The peak power spectral density shall not be greater than 8dBm in any 3 kHz band

ANALYZER SETTINGS: RBW=3KHz, VBW=3KHz

POWER SPECTRAL DENSITY

§15.247(d)

Lowest Channel: 2412MHz

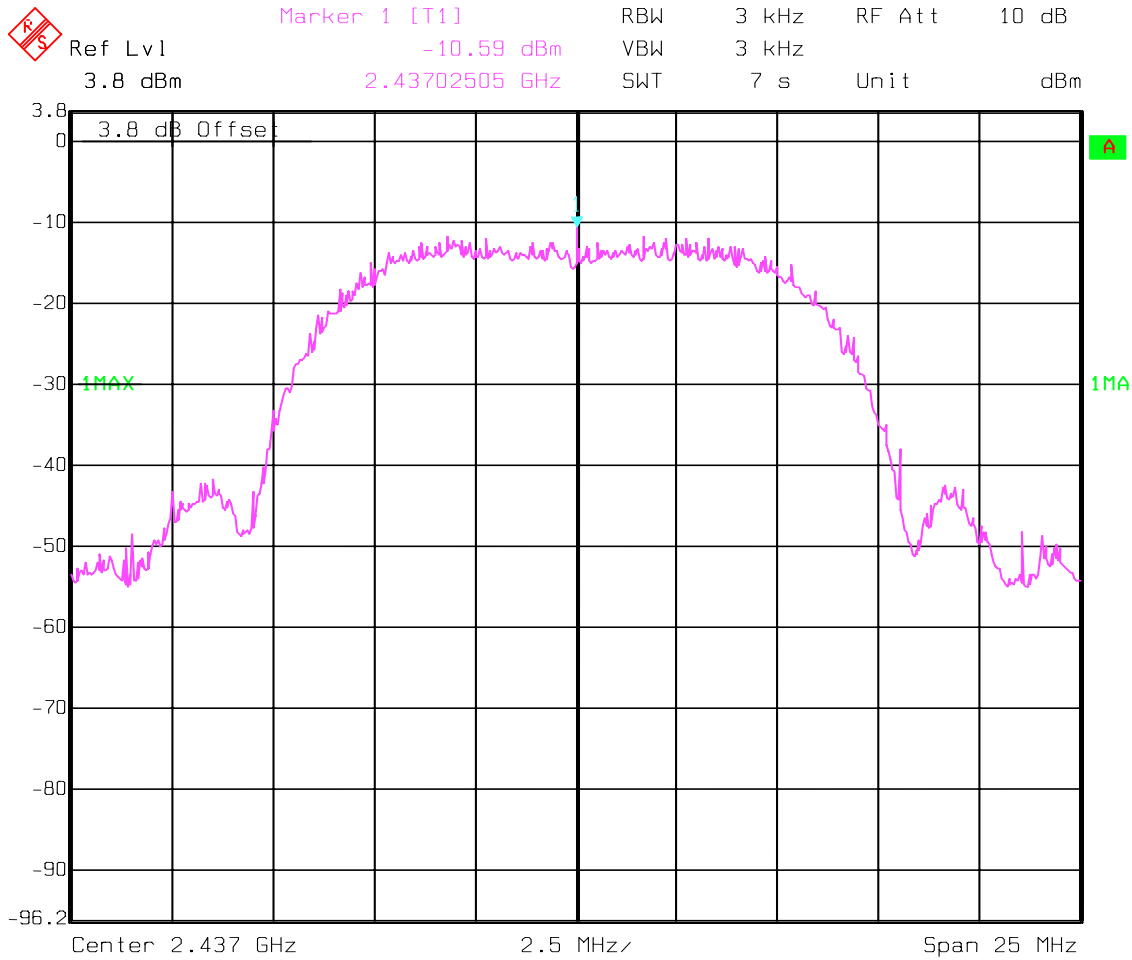


Date: 31.MAR.2003 11:29:49

POWER SPECTRAL DENSITY

§15.247(d)

Mid Channel: 2437MHz

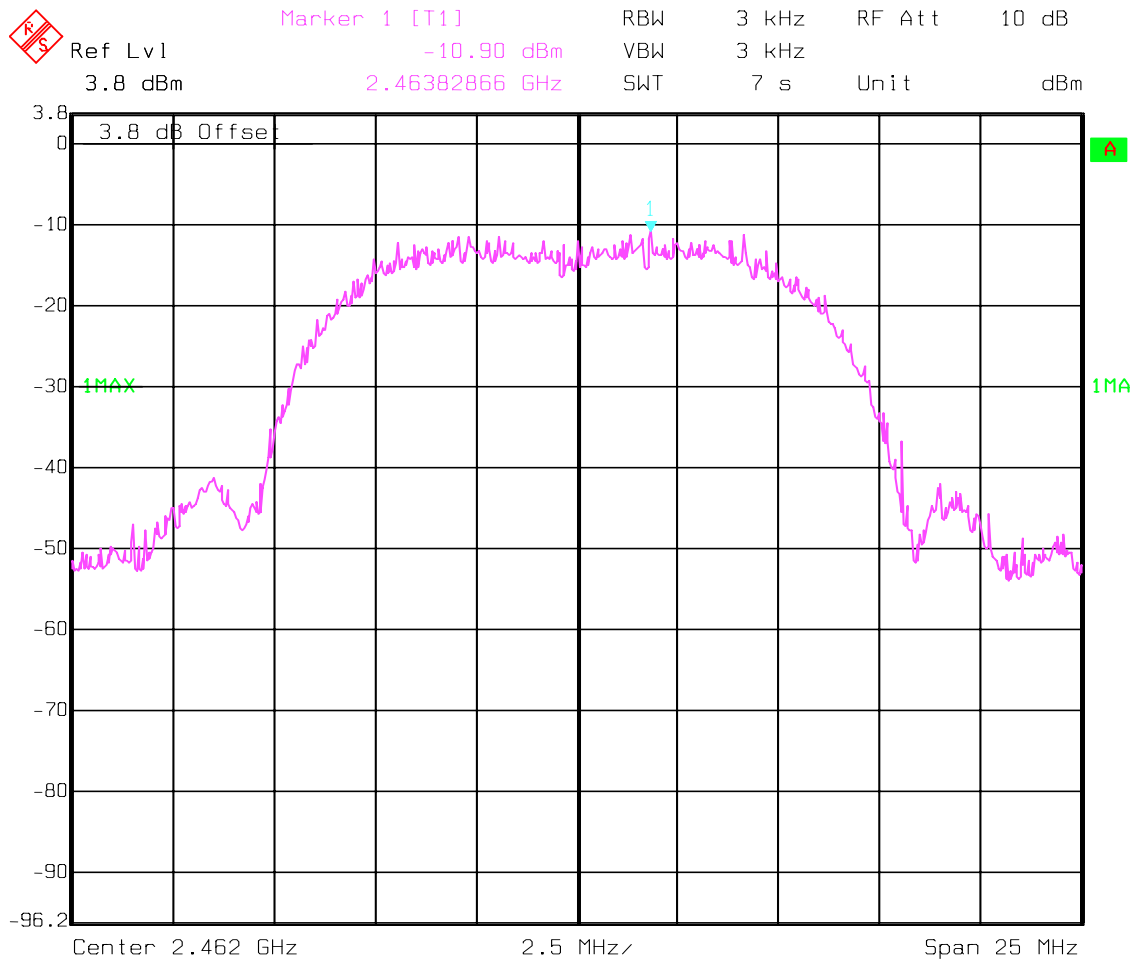


Date: 31.MAR.2003 11:32:24

POWER SPECTRAL DENSITY

§15.247(d)

Highest Channel: 2462MHz



Date: 31.MAR.2003 11:33:22

POWER SPECTRAL DENSITY

RSS-210

TEST CONDITIONS		POWER SPECTRAL DENSITY (dBm/MHz)		
		2412	2437	2462
T _{nom} (23)°C	V _{nom} (3.3) VDC	*11.83	*12.33	*12.86

*Correction factor of 60dBm is added to convert measured values from dBm/Hz to dBm/MHz

LIMIT

RSS-210

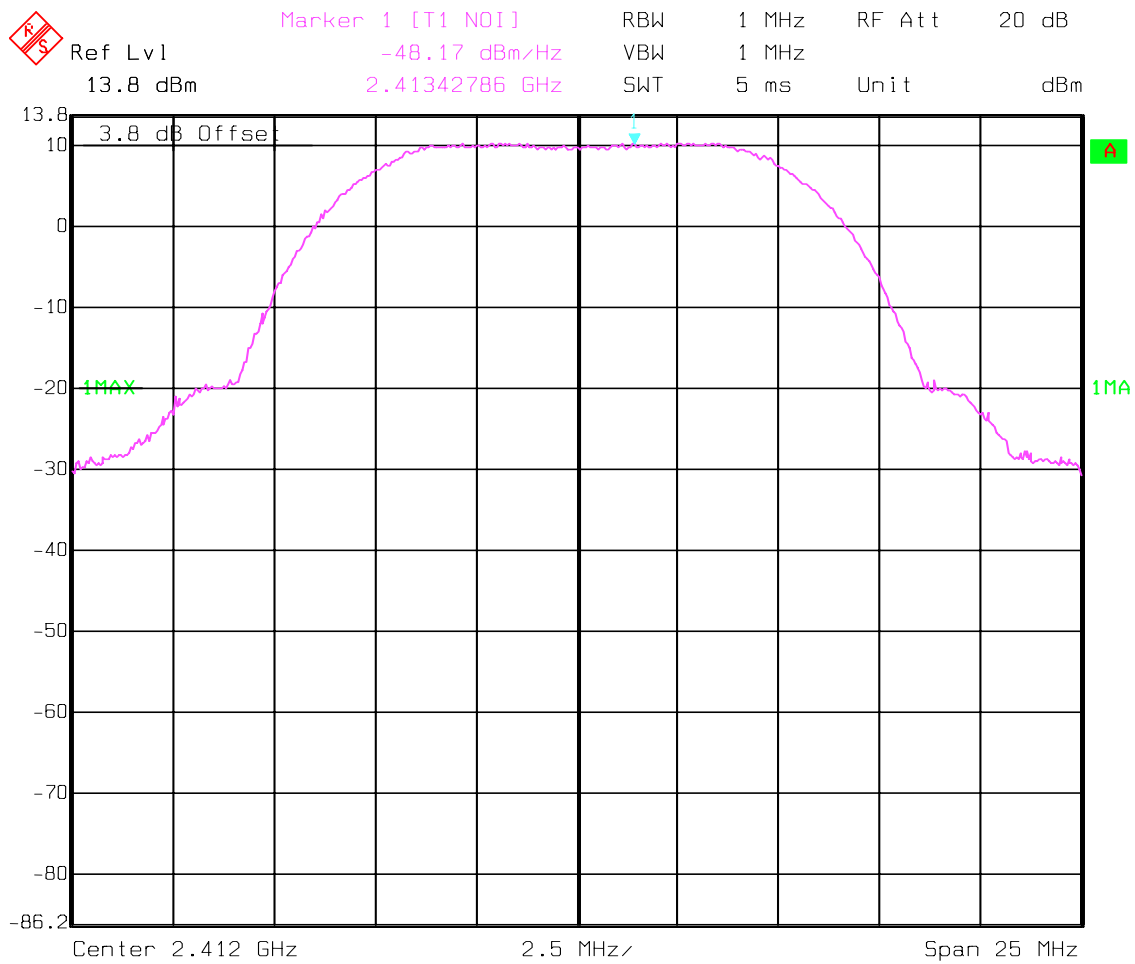
The peak power spectral density shall be $\leq 50\text{mW/MHz}$ (17dBm/MHz)

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

POWER SPECTRAL DENSITY

RSS-210

Lowest Channel: 2412MHz

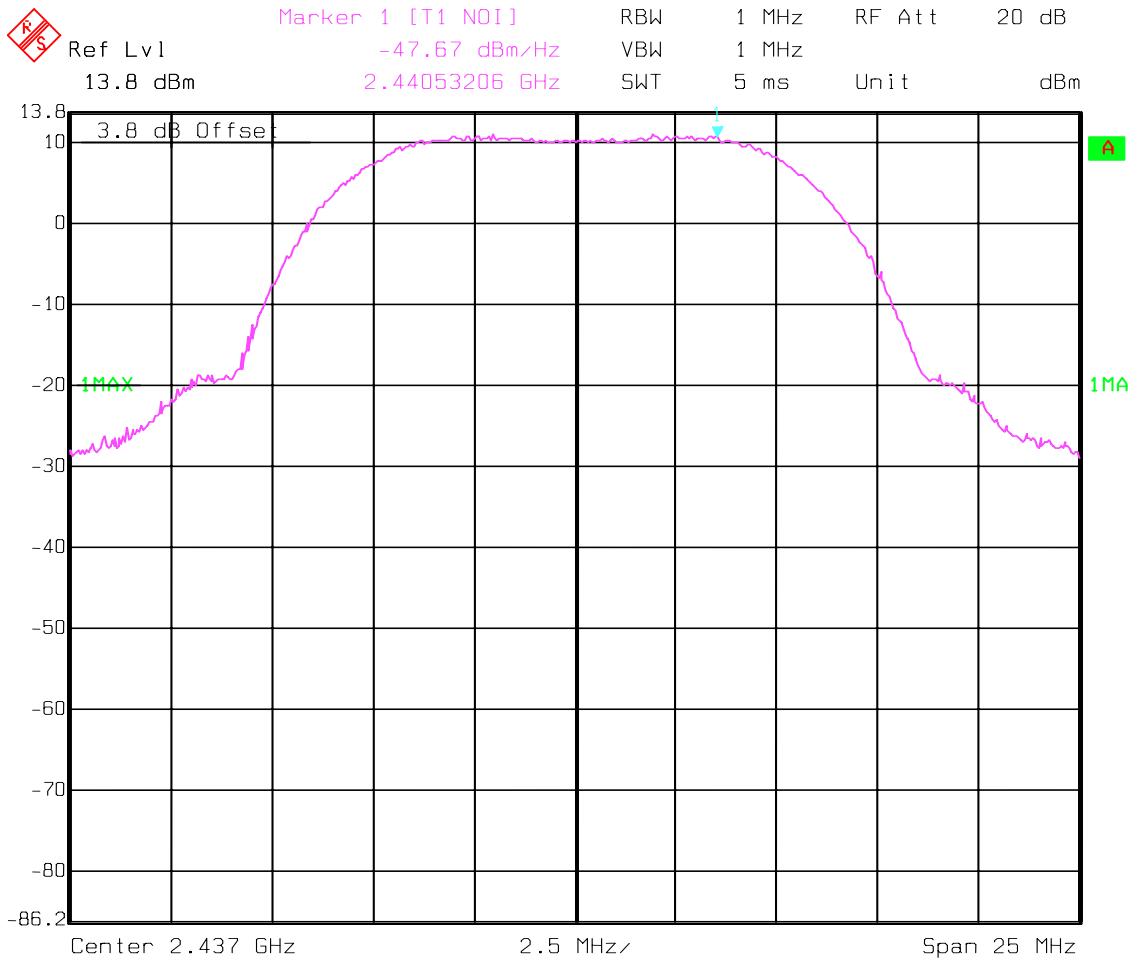


Date: 31.MAR.2003 11:35:53

POWER SPECTRAL DENSITY

RSS-210

Mid Channel: 2437MHz

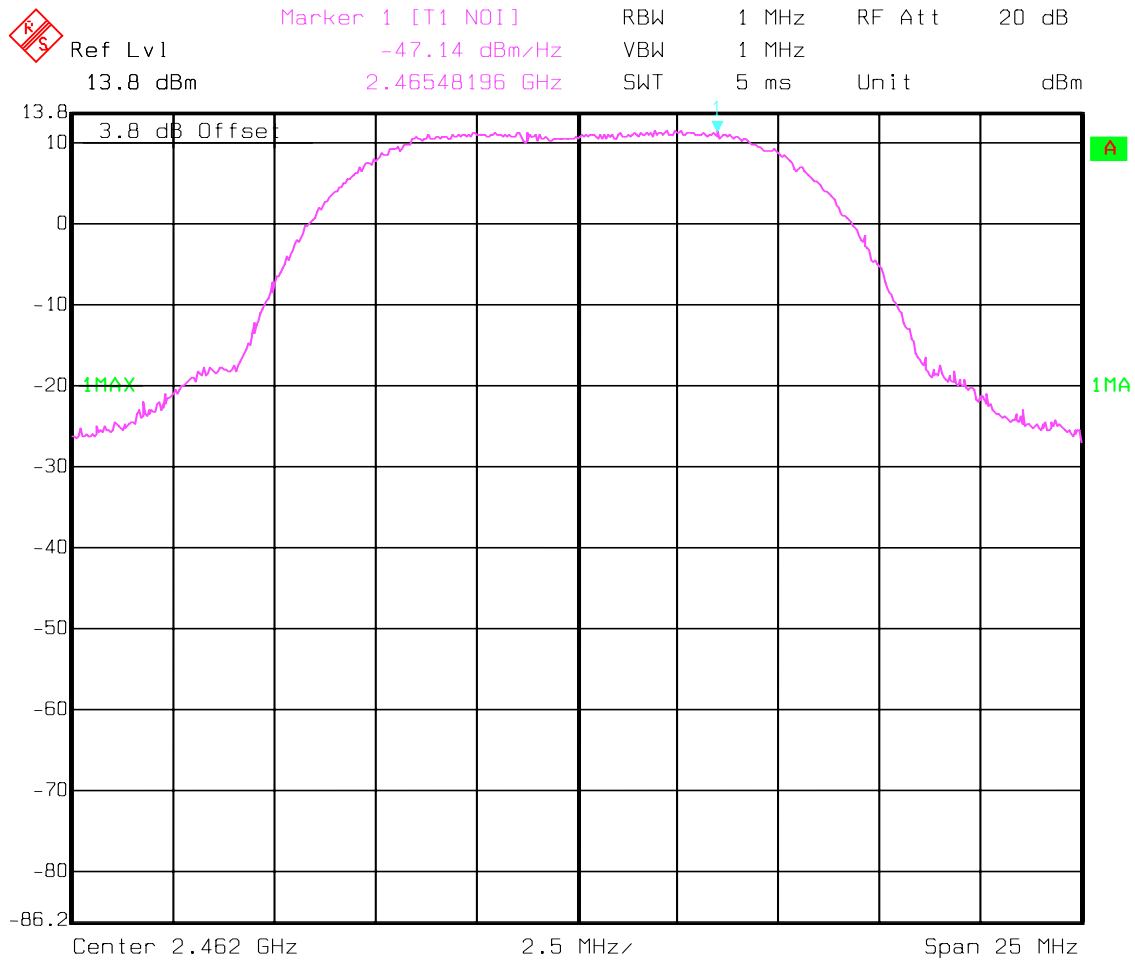


Date: 31.MAR.2003 11:37:52

POWER SPECTRAL DENSITY

RSS-210

Highest Channel: 2462MHz



Date: 31.MAR.2003 11:39:20

BAND EDGE COMPLIANCE

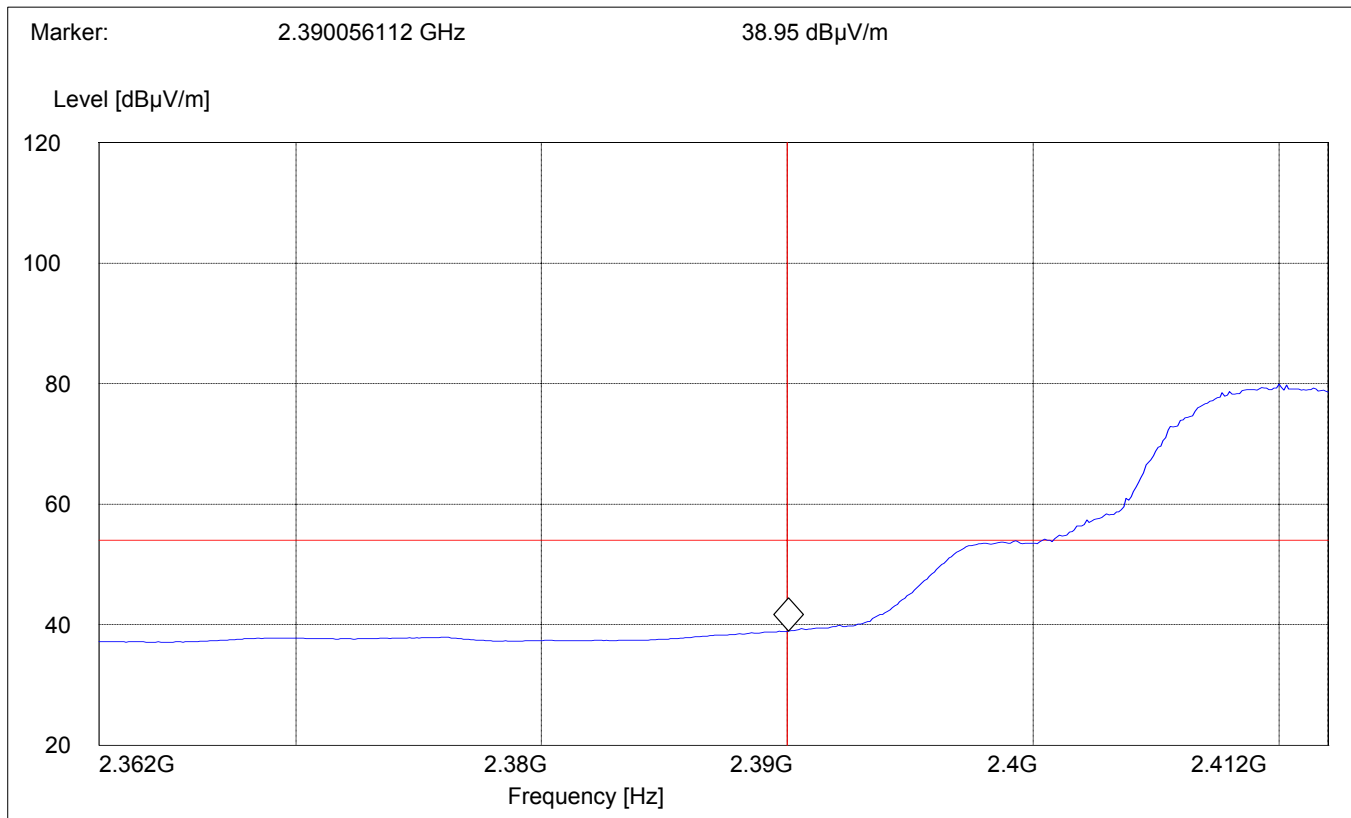
§15.247 (c)

Low frequency section (spurious in the restricted band 2310 – 2390 MHz)

(Average measurement)

Operating condition : Tx at 2412MHz
 SWEEP TABLE : "FCC15.247 LBE_AVG"
 Limit Line : 54dBμV

Start Frequency	Stop Frequency	Detector	Meas. Bandw.	RBW	VBW	Transducer
2.362 GHz	2.412 GHz	MaxPeak	Coupled	1 MHz	10Hz	#326 horn (dBi)



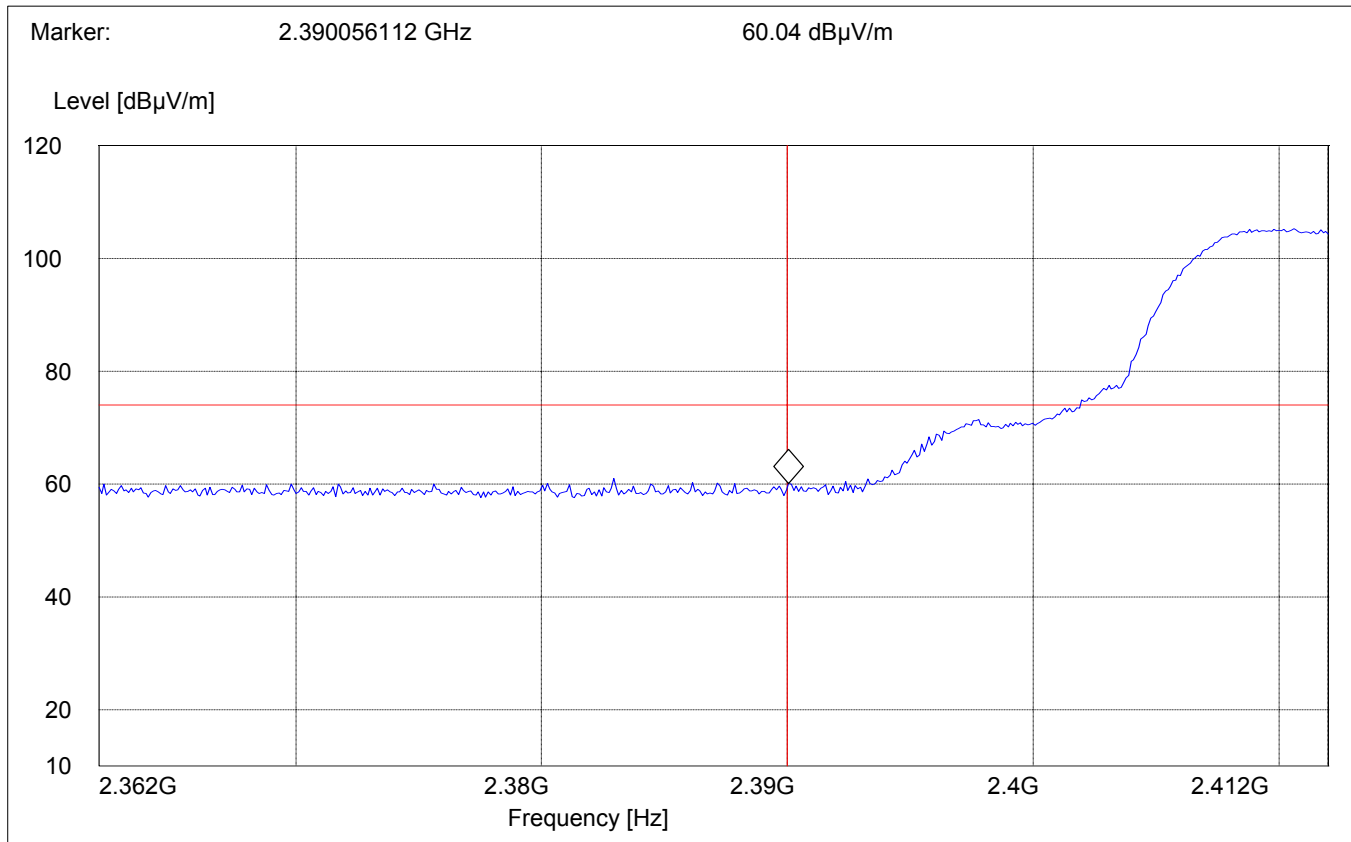
BAND EDGE COMPLIANCE

§15.247 (c)

**Low frequency section (spurious in the restricted band 2310 – 2390 MHz)
(Peak measurement)**

Operating condition : Tx at 2412MHz
 SWEEP TABLE : "FCC15.247 LBE_Pk"
 Limit Line : 74dBμV

Start Frequency	Stop Frequency	Detector	Meas. Bandw.	RBW	VBW	Transducer
2.362 GHz	2.412 GHz	MaxPeak	Coupled	1 MHz	1MHz	#326 horn (dBi)



BAND EDGE COMPLIANCE

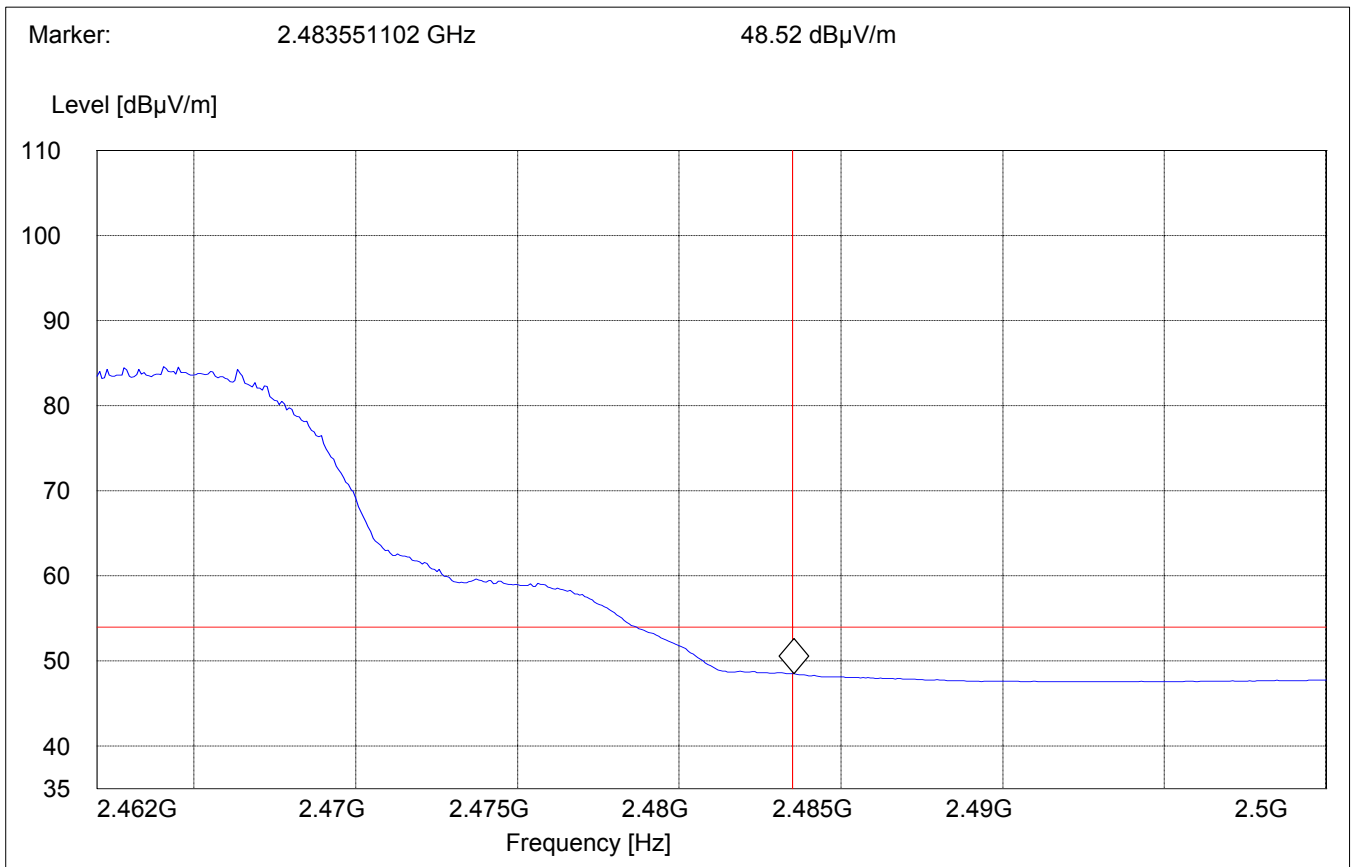
§15.247 (c)

High frequency section (spurious in the restricted band 2483.5 – 2500 MHz)

(Average measurement)

Operating condition : Tx at 2472MHz
 SWEEP TABLE : "FCC15.247 HBE_AVG"
 Limit Line : 54dB μ V

Start Frequency	Stop Frequency	Detector Time	Meas. Bandw.	RBW	VBW	Transducer
2.462 GHz	2.5 GHz	MaxPeak	Coupled	1 MHz	10Hz	#326 horn (dBi)



BAND EDGE COMPLIANCE

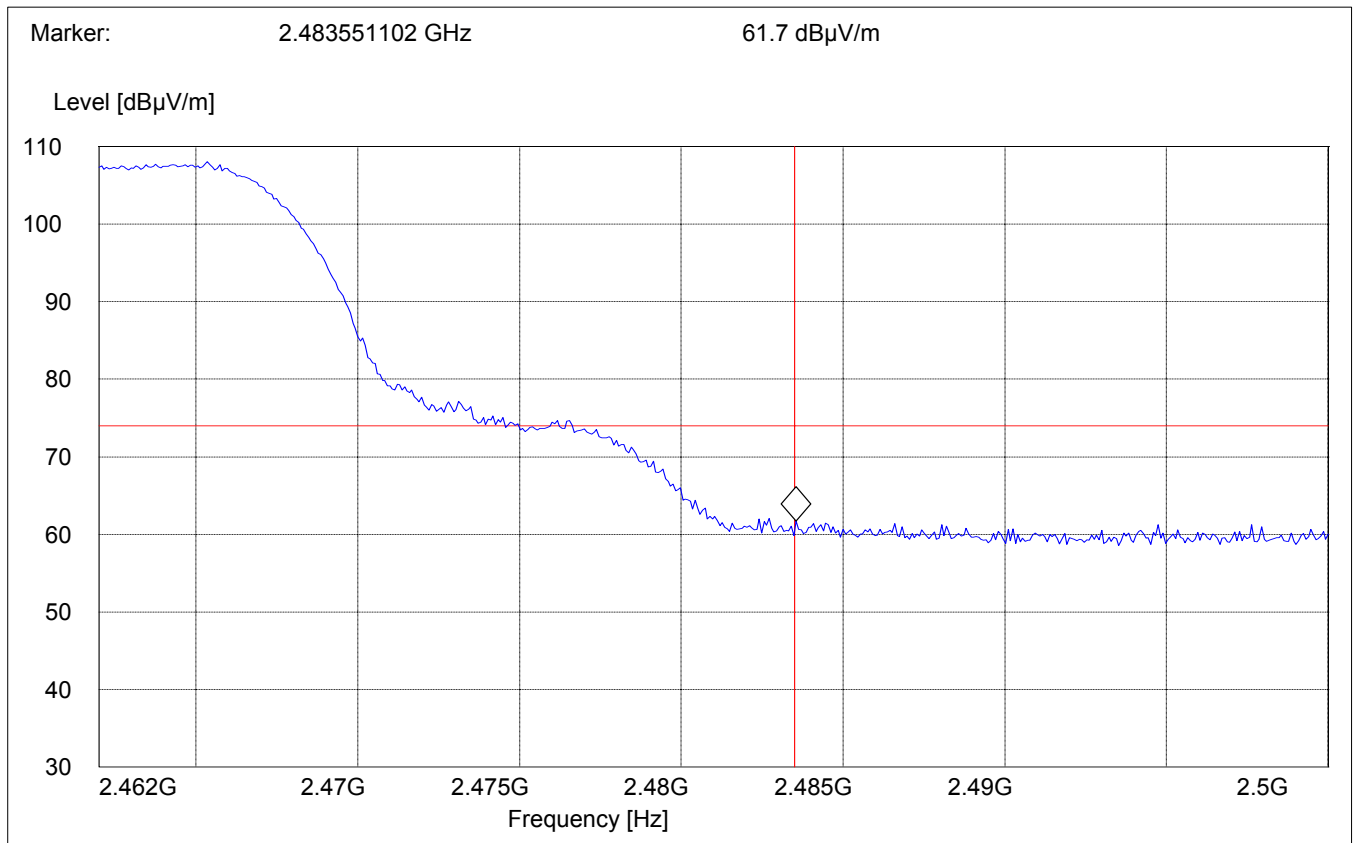
§15.247 (c)

High frequency section (spurious in the restricted band 2483.5 – 2500 MHz)

(Peak measurement)

Operating condition : Tx at 2472MHz
 SWEEP TABLE : "FCC15.247 HBE_PK"
 Limit Line : 74dBμV

Start Frequency	Stop Frequency	Detector Time	Meas. Bandw.	RBW	VBW	Transducer
2.462 GHz	2.5 GHz	MaxPeak	Coupled	1 MHz	1MHz	#326 horn (dBi)



**EMISSION LIMITATIONS
Transmitter (Conducted)
LIMITS**

§ 15.247 (c) (1)

In any 100 kHz bandwidth outside the frequency band at least 20dB below the highest level of the desired power. In addition, radiated emissions, which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emission limits specified in §15.209(a) (see §15.205(c).

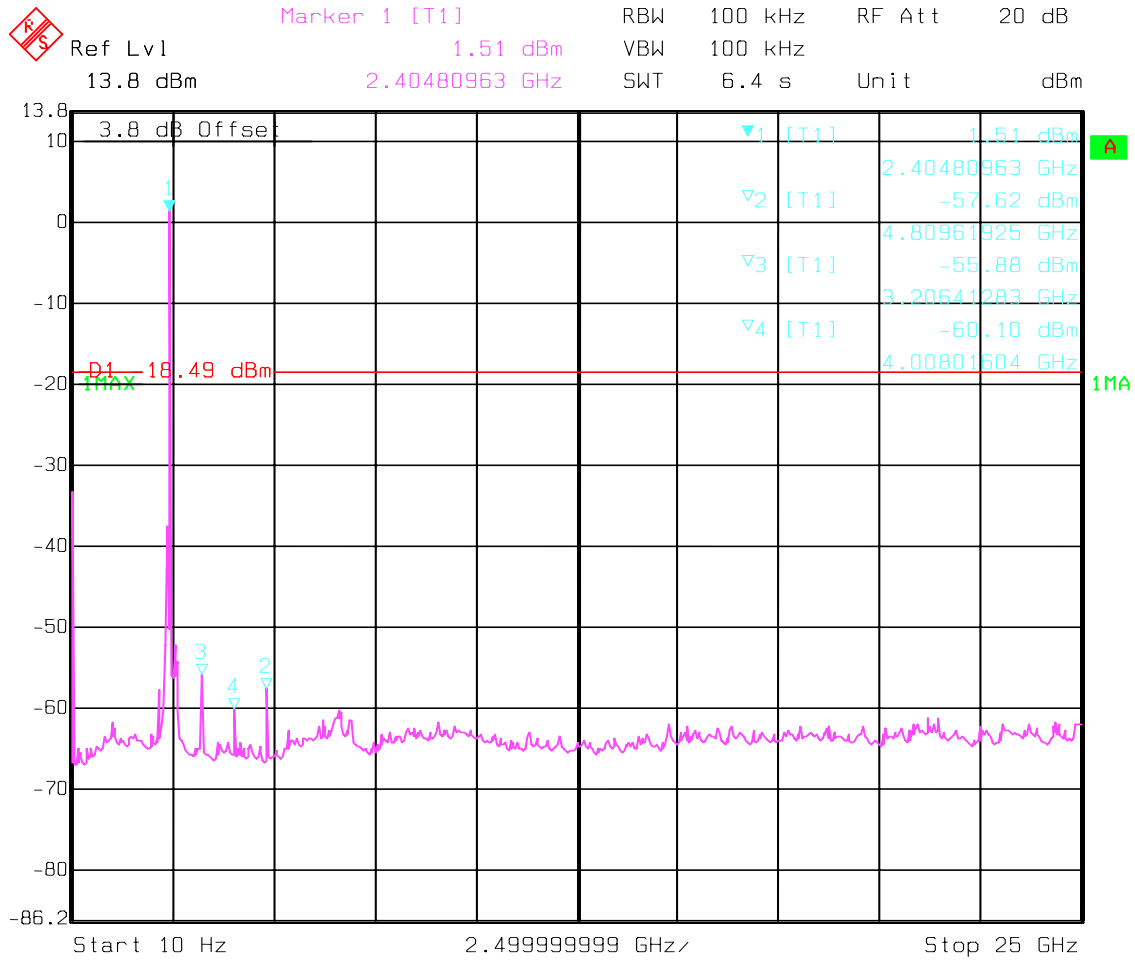
NOTE: Frequency resolution is not fine enough to show the exact frequency of the carrier.

EMISSION LIMITATIONS - Conducted (Transmitter)

§ 15.247 (c) (1)

Lowest Channel (2412MHz): 10Hz - 25GHz

NOTE: The peak above the limit line is the carrier frequency.



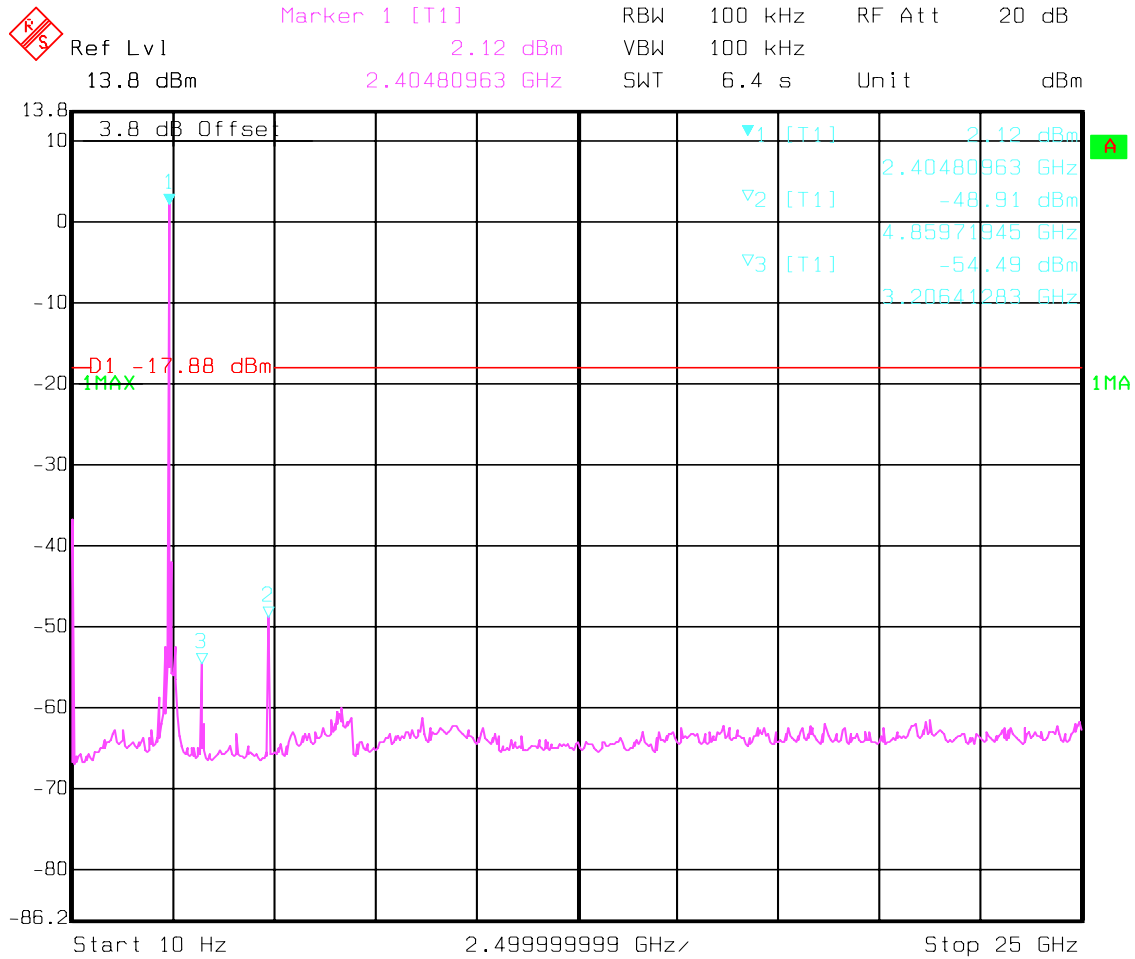
Date: 31.MAR.2003 11:26:21

EMISSION LIMITATIONS - Conducted (Transmitter)

§ 15.247 (c) (1)

Mid Channel (2437MHz): 10Hz - 25GHz

NOTE: The peak above the limit line is the carrier frequency.



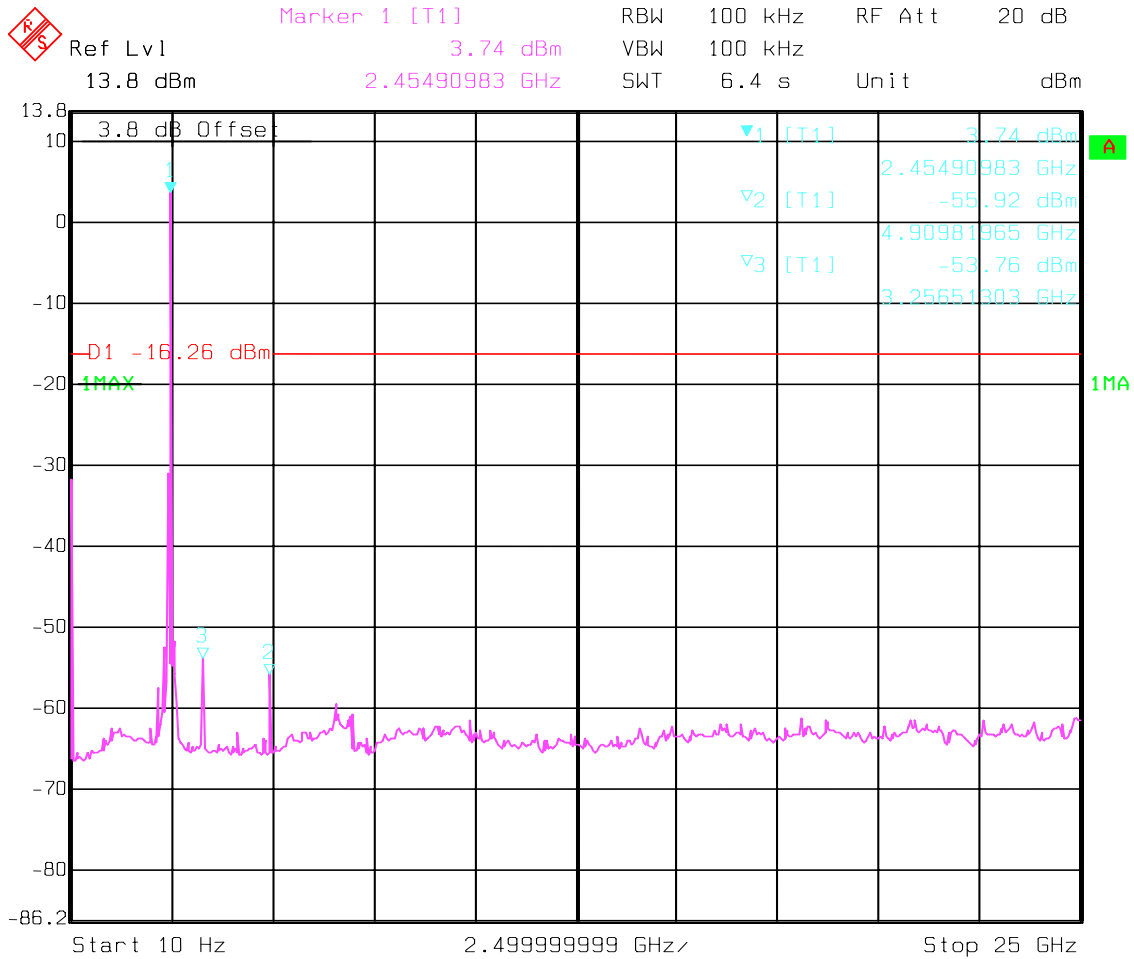
Date: 31.MAR.2003 11:24:36

EMISSION LIMITATIONS - Conducted (Transmitter)

§ 15.247 (c) (1)

Highest Channel (2462MHz): 10Hz - 25GHz

NOTE: The peak above the limit line is the carrier frequency.



Date: 31.MAR.2003 11:22:59

**EMISSION LIMITATIONS
Transmitter (Radiated)**

§ 15.247 (c) (1)

LIMITS

In any 100 kHz bandwidth outside the frequency band at least 20dB below the highest level of the desired power. In addition, radiated emissions, which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emission limits specified in §15.209(a) (see §15.205(c)).

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 25 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.

Results for the radiated measurements below 30MHz according § 15.33

Frequency	Measured values	Remarks
9KHz – 30MHz	No emissions found, caused by the EUT	This is valid for all the tested channels

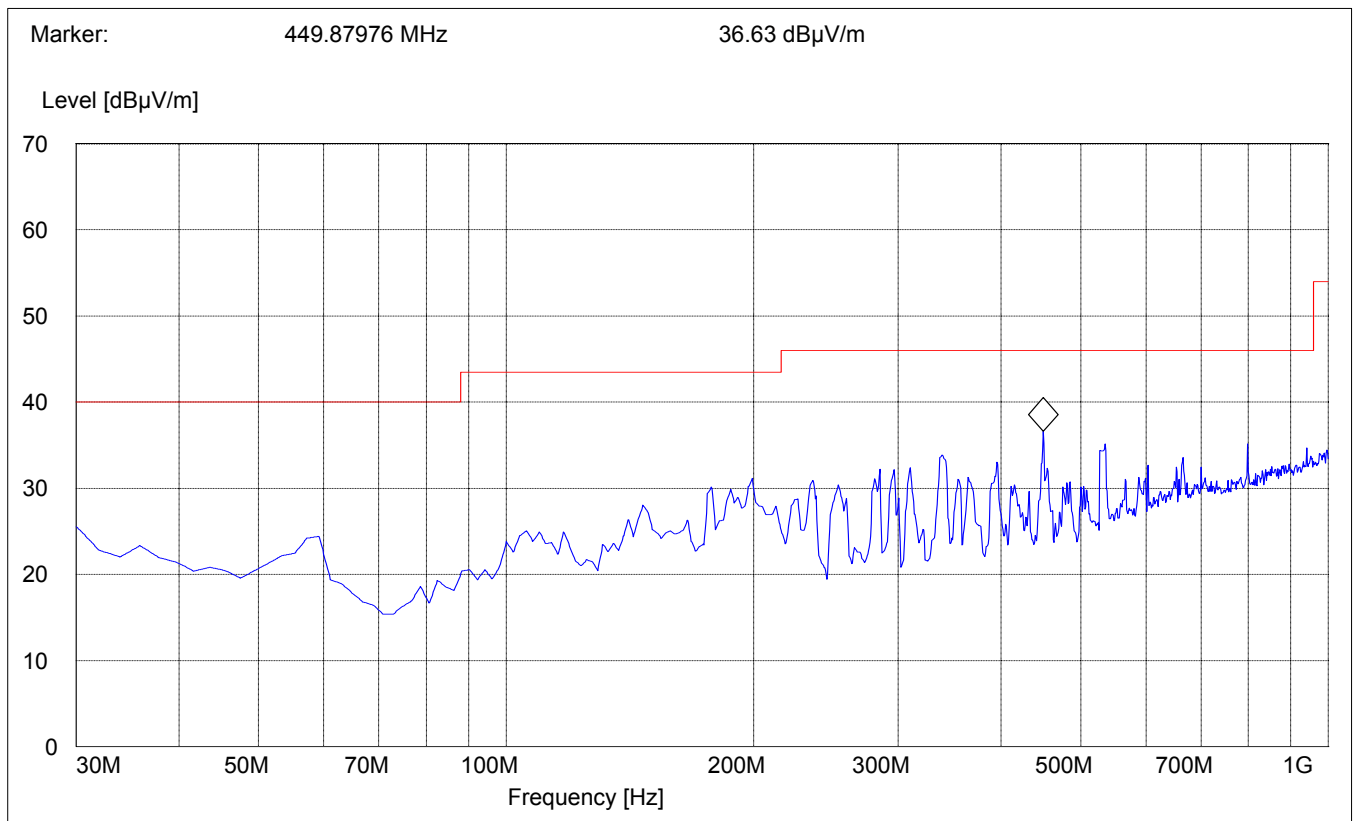
EMISSION LIMITATIONS - Radiated (Transmitter)

§ 15.247 (c) (1)

Lowest Channel (2412MHz): 30MHz – 1GHz

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

SWEEP TABLE:		"BT Spuri hi 30-1G"			
Short Description:		Bluetooth 30MHz-1GHz			
Start	Stop	Detector	Meas.	RBW	Transducer
Frequency	Frequency		Time	VBW	
30.0 MHz	1.0 GHz	MaxPeak	Coupled	100 kHz	3141-#1186

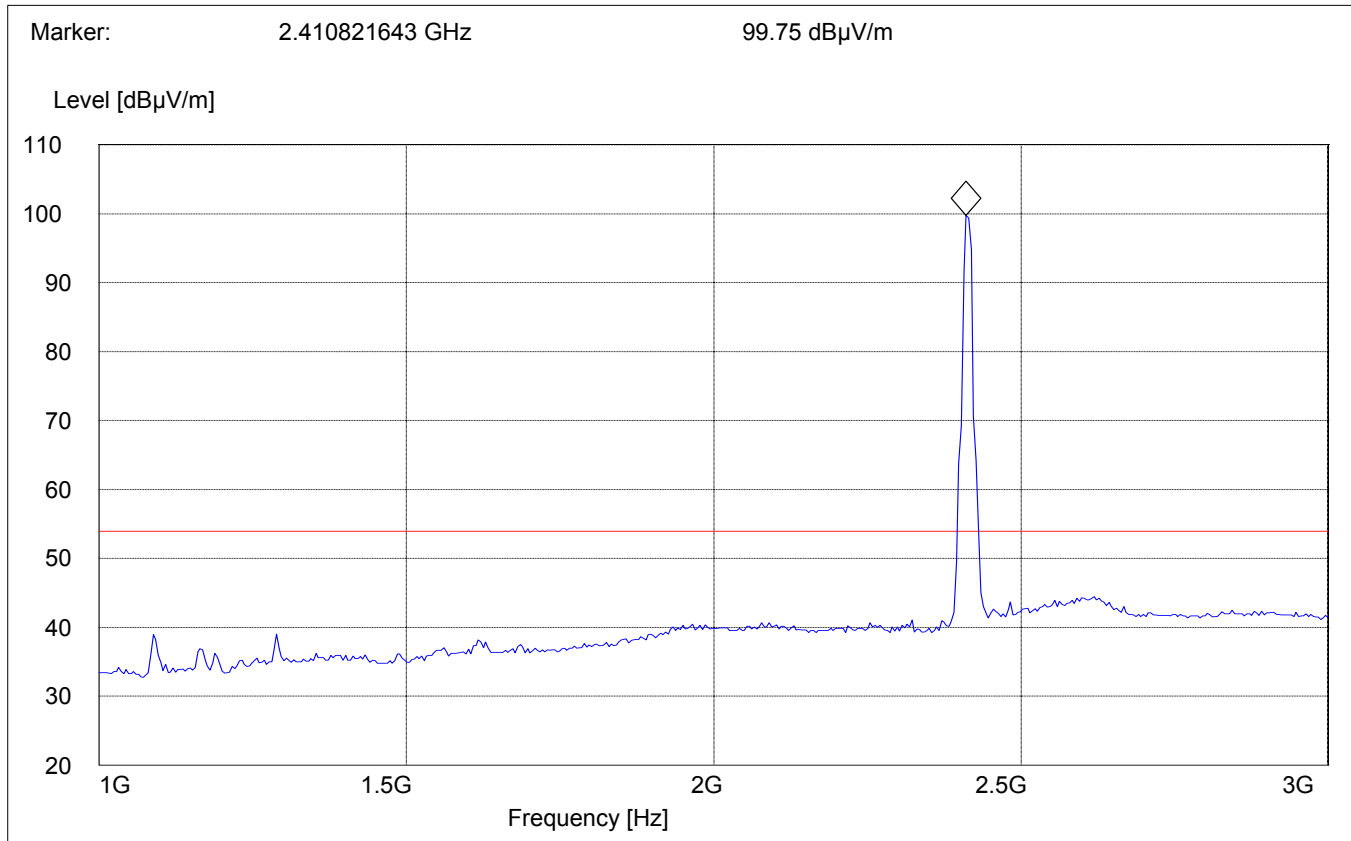


EMISSION LIMITATIONS - Radiated (Transmitter)
Lowest Channel (2412MHz): 1GHz – 3GHz

§ 15.247 (c) (1)

SWEEP TABLE:		"BT Spuri hi 1-3G"			
Short Description:		Bluetooth Spurious 1-3GHz			
Start	Stop	Detector	Meas.	RBW	Transducer
Frequency	Frequency	Time	Bandw.	VBW	
1.0 GHz	3.0 GHz	MaxPeak	Coupled	1 MHz	#326 horn (dBi)

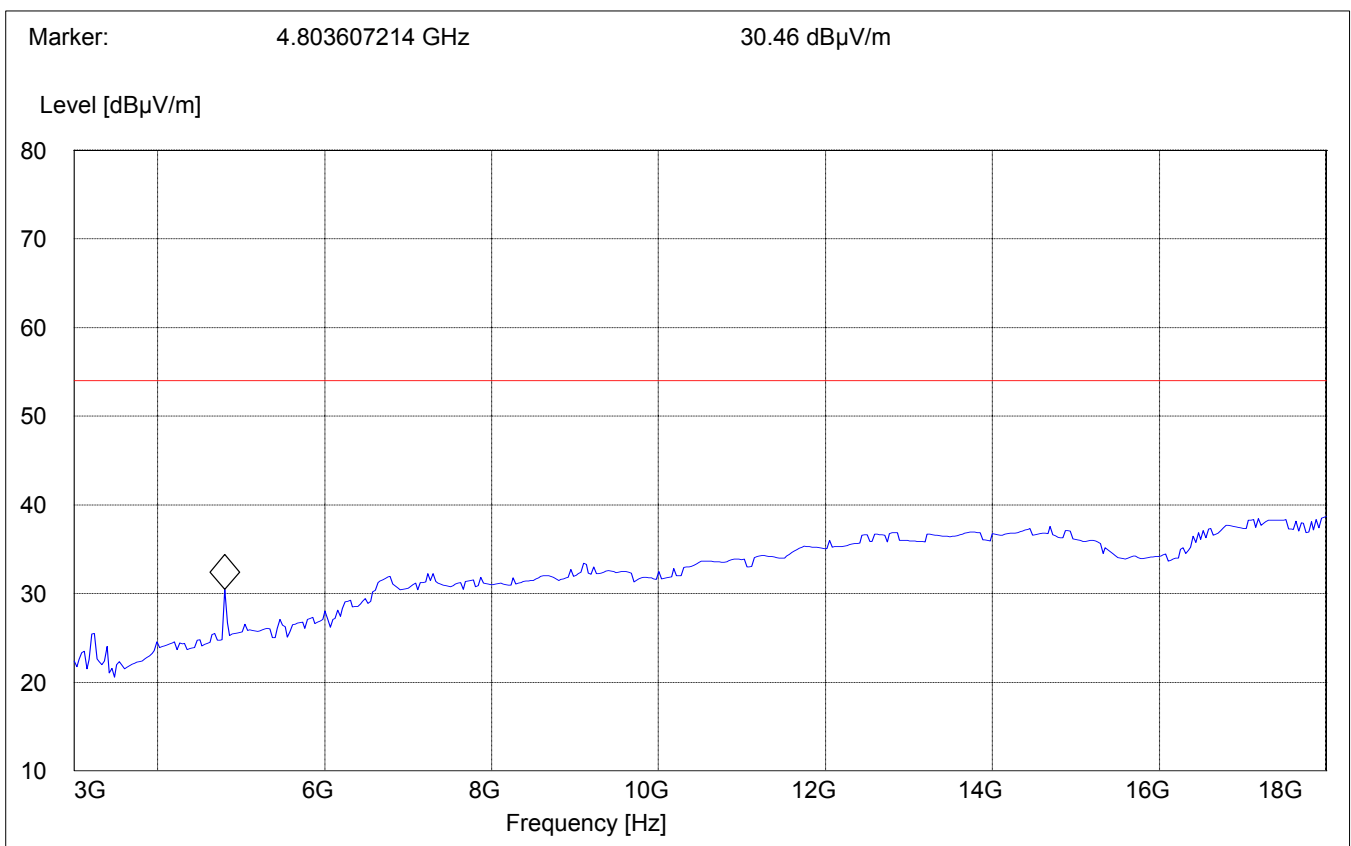
NOTE: The peak above the limit line is the carrier frequency.



EMISSION LIMITATIONS - Radiated (Transmitter)
Lowest Channel (2412MHz): 3GHz – 18GHz

§ 15.247 (c) (1)

SWEEP TABLE:		"BT Spuri hi 3-18G"			
Short Description:		Bluetooth Spurious 3-18GHz			
Start	Stop	Detector	Meas.	RBW	Transducer
Frequency	Frequency	Time	Bandw.	VBW	
3.0 GHz	18.0 GHz	MaxPeak	Coupled	1 MHz	#326 horn (dBi)

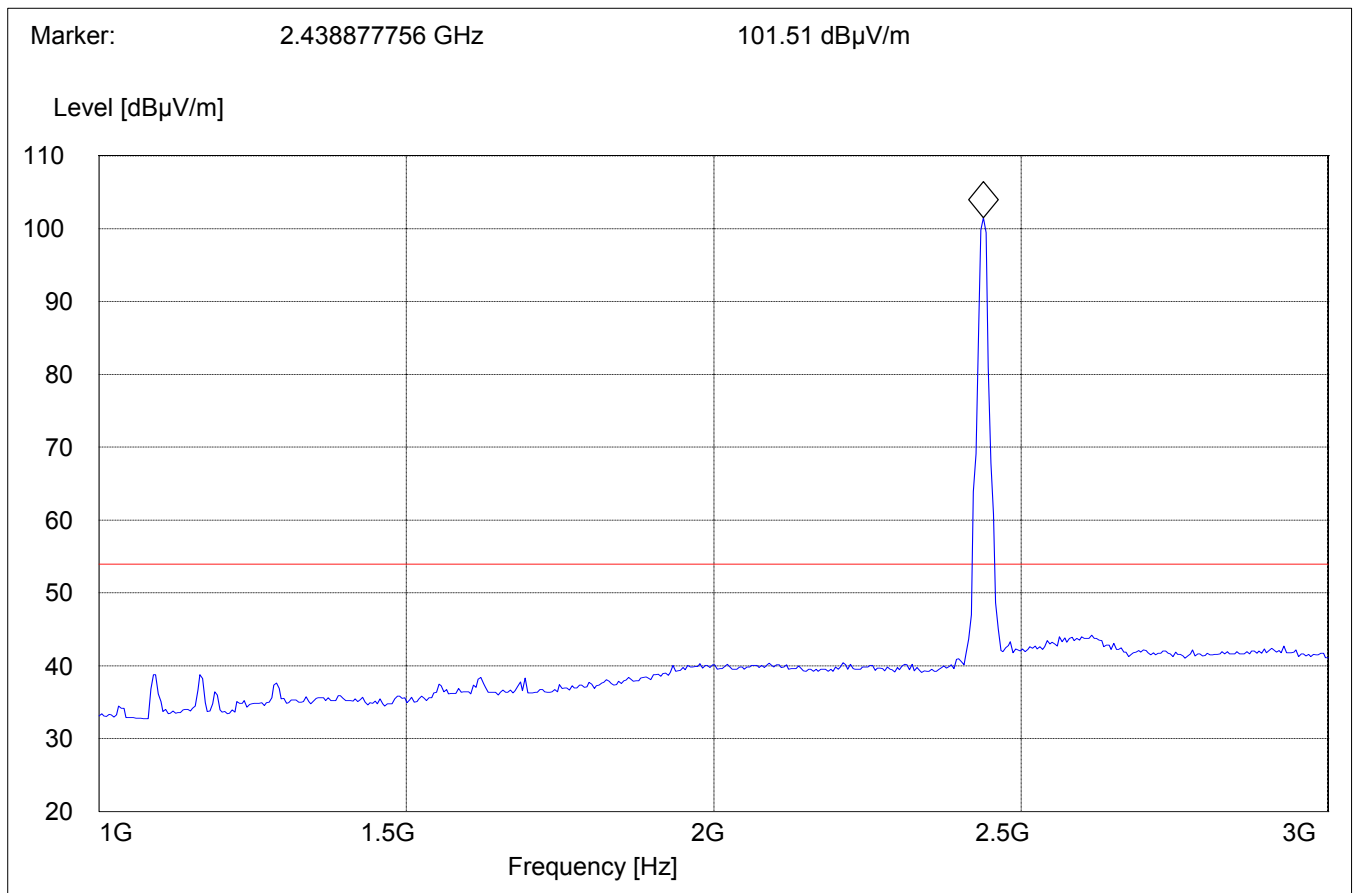


EMISSION LIMITATIONS - Radiated (Transmitter)
Mid Channel (2437MHz): 1GHz – 3GHz

§ 15.247 (c) (1)

SWEEP TABLE:		"BT Spuri hi 1-3G"			
Short Description:		Bluetooth Spurious 1-3GHz			
Start	Stop	Detector	Meas.	RBW	Transducer
Frequency	Frequency	Time	Bandw.	VBW	
1.0 GHz	3.0 GHz	MaxPeak	Coupled	1 MHz	#326 horn (dBi)

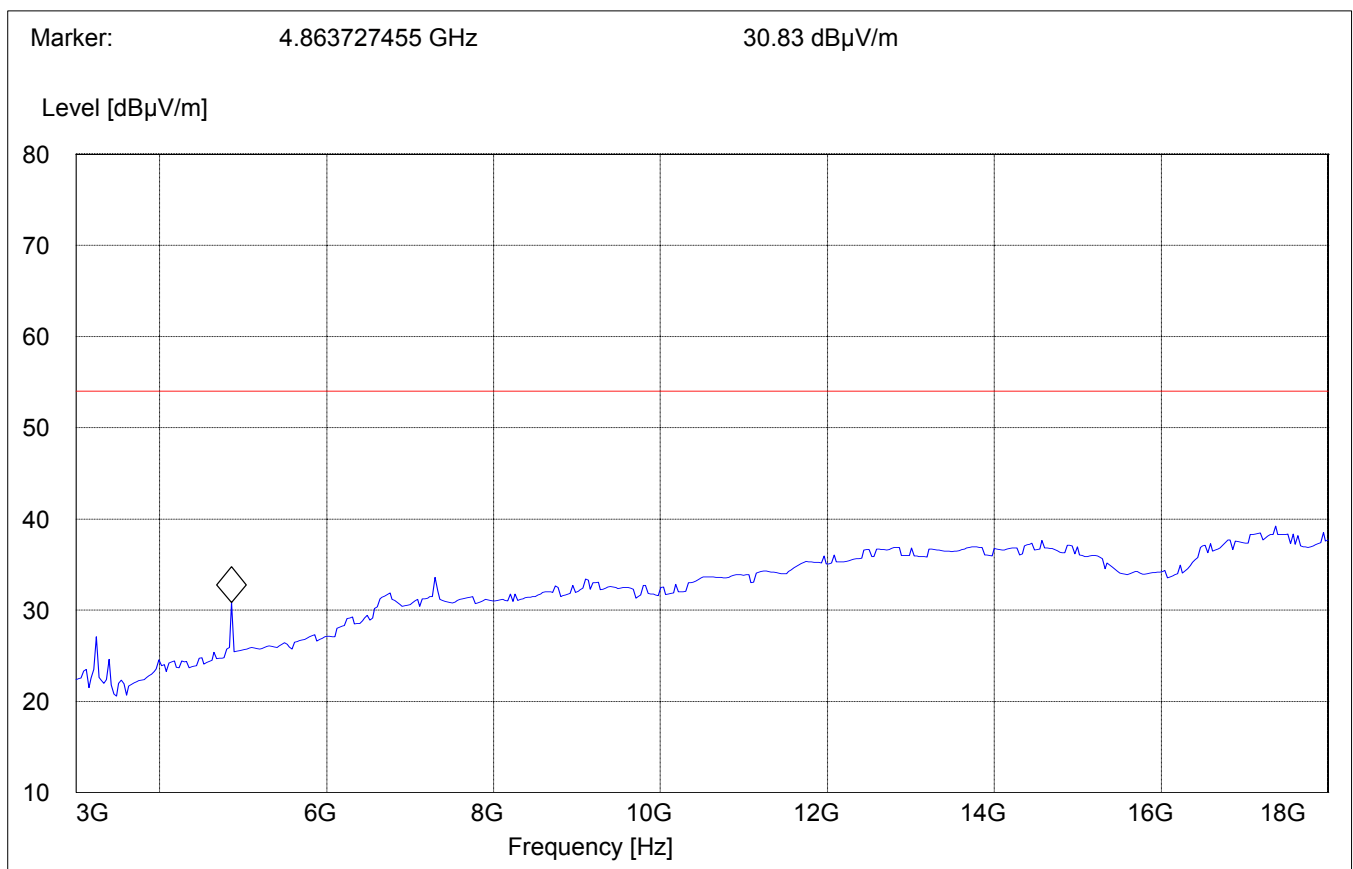
NOTE: The peak above the limit line is the carrier frequency.



EMISSION LIMITATIONS - Radiated (Transmitter)
Mid Channel (2437MHz): 3GHz – 18GHz

§ 15.247 (c) (1)

SWEEP TABLE:		"BT Spuri hi 3-18G"			
Short Description:		Bluetooth Spurious 3-18GHz			
Start	Stop	Detector	Meas.	RBW	Transducer
Frequency	Frequency	Time	Bandw.	VBW	
3.0 GHz	18.0 GHz	MaxPeak	Coupled	1 MHz	#326 horn (dBi)

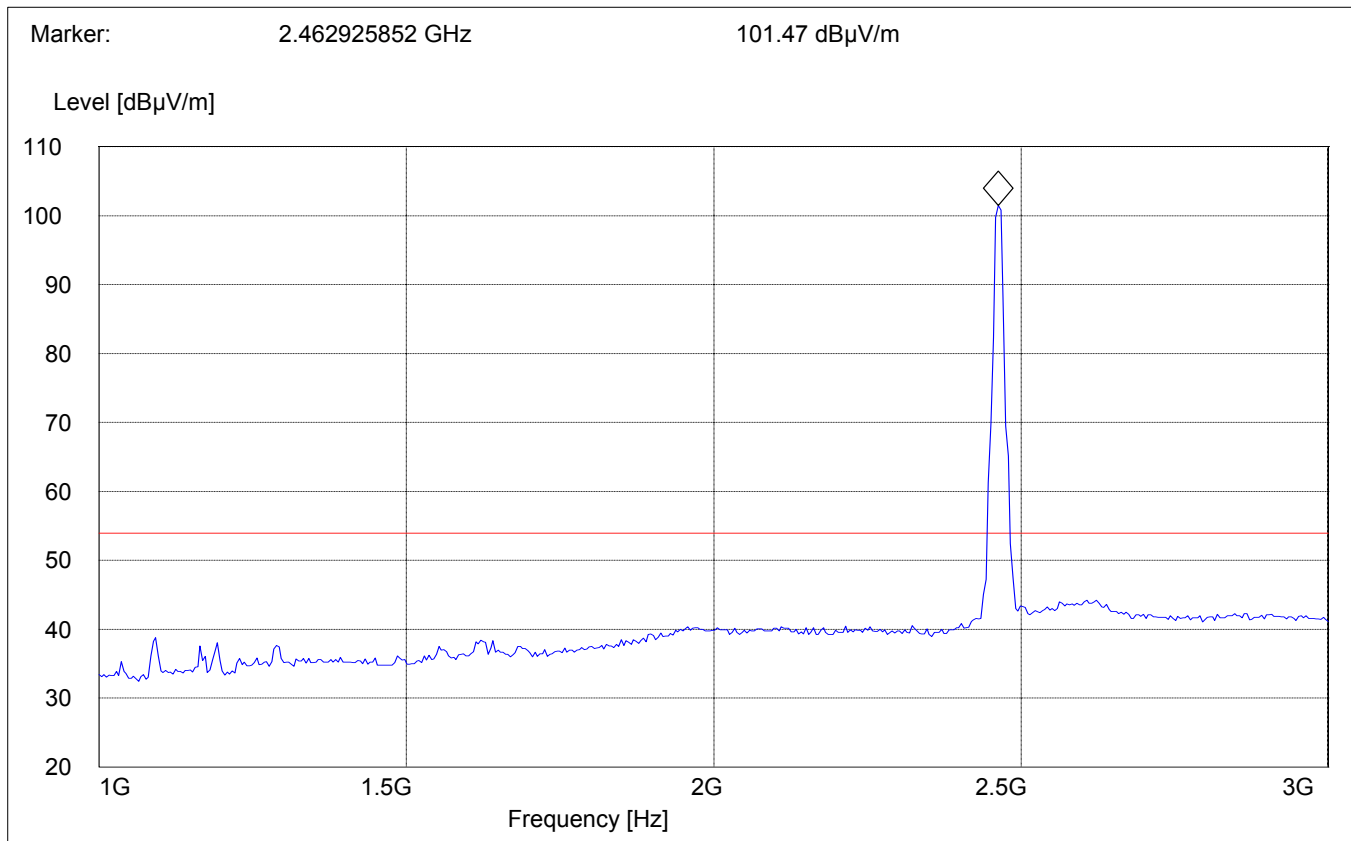


EMISSION LIMITATIONS - Radiated (Transmitter)
Highest Channel (2462MHz): 1GHz – 3GHz

§ 15.247 (c) (1)

SWEEP TABLE:		"BT Spuri hi 1-3G"			
Short Description:		Bluetooth Spurious 1-3GHz			
Start	Stop	Detector	Meas.	RBW	Transducer
Frequency	Frequency	Time	Bandw.	VBW	
1.0 GHz	3.0 GHz	MaxPeak	Coupled	1 MHz	#326 horn (dBi)

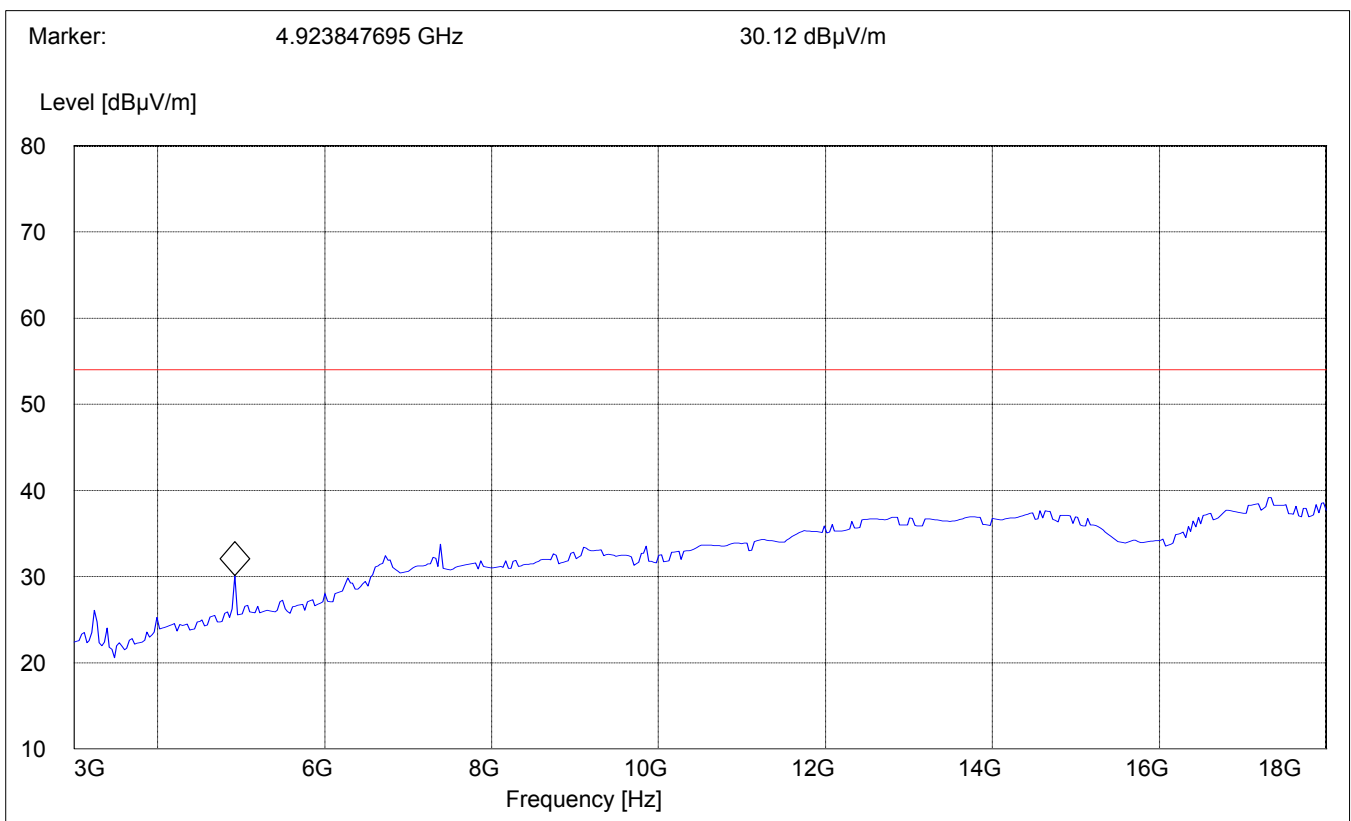
NOTE: The peak above the limit line is the carrier frequency.



EMISSION LIMITATIONS - Radiated (Transmitter)
Highest Channel (2462MHz): 3GHz – 18GHz

§ 15.247 (c) (1)

SWEEP TABLE:		"BT Spuri hi 3-18G"			
Short Description:		Bluetooth Spurious 3-18GHz			
Start	Stop	Detector	Meas.	RBW	Transducer
Frequency	Frequency	Time	Bandw.	VBW	
3.0 GHz	18.0 GHz	MaxPeak	Coupled	1 MHz	#326 horn (dBi)

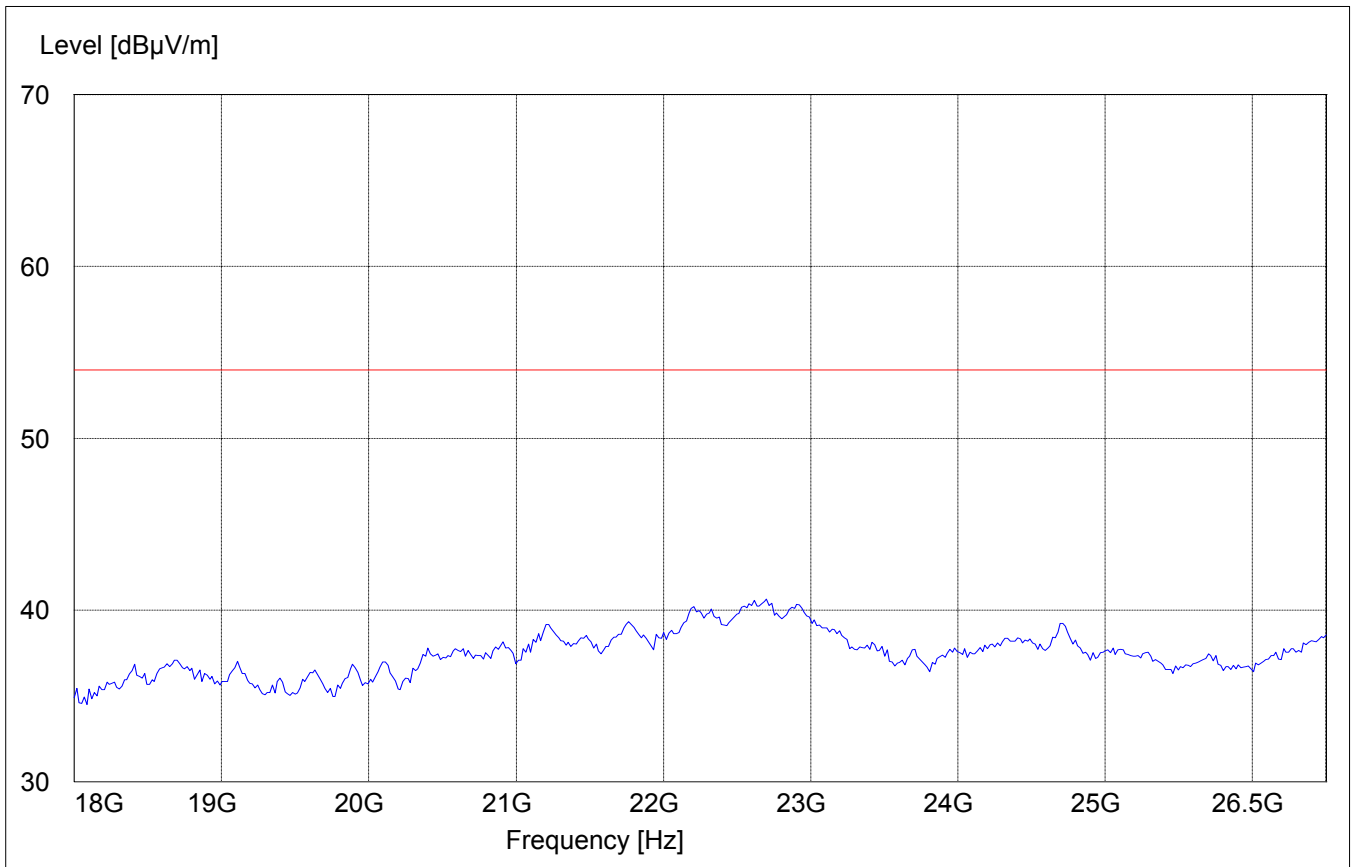


EMISSION LIMITATIONS - Radiated (Transmitter)

§ 15.247 (c) (1)

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

SWEEP TABLE:		"BT Spuri hi 18-25G"			
Short Description:		Bluetooth Spurious 18-25GHz			
Start	Stop	Detector	Meas.	RBW	Transducer
Frequency	Frequency	Time	Bandw.	VBW	
18 GHz	25 GHz	MaxPeak	Coupled	1 MHz	#326 horn (dBi)



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)

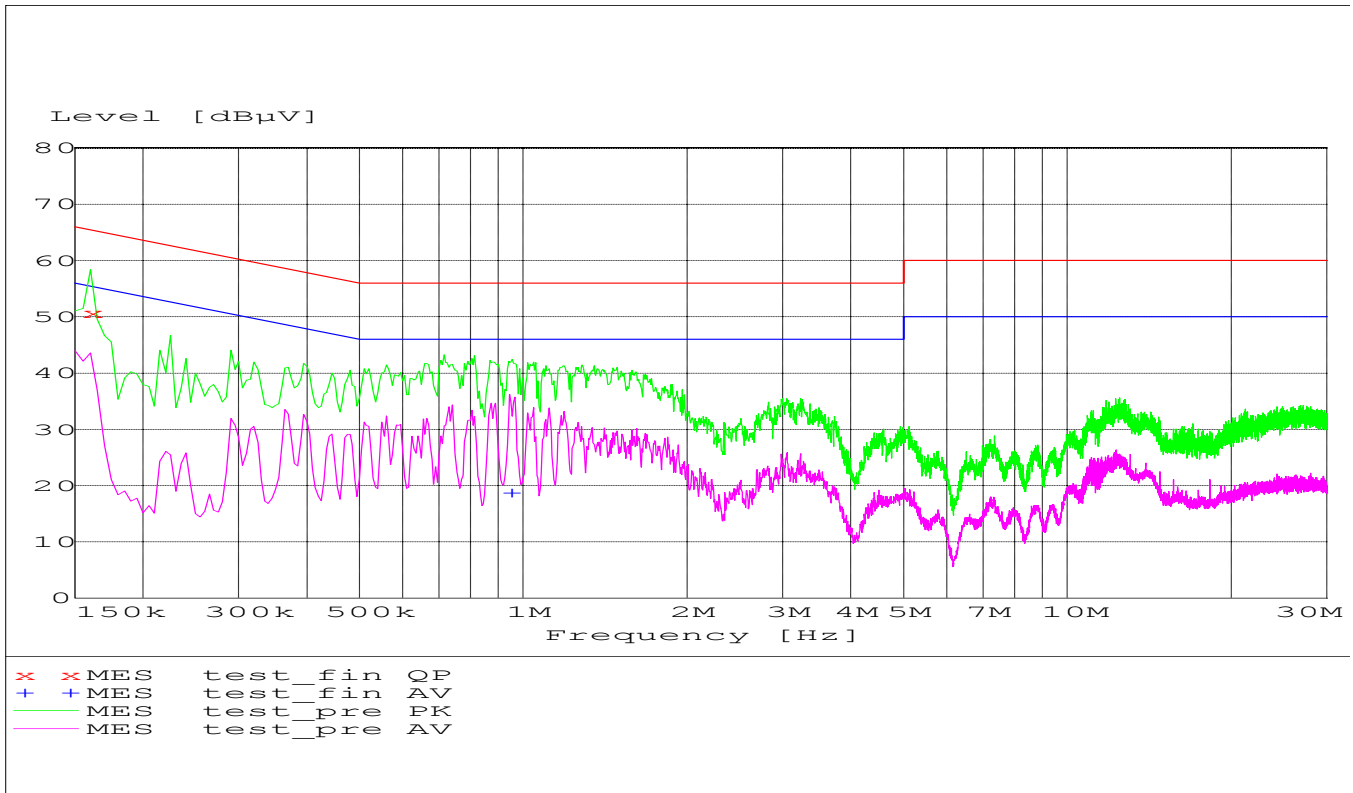
Limit

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



MEASUREMENT RESULT: "test_fin QP"

Frequency MHz	Level dBµV	Transd dB	Limit dBµV	Margin dB	Line	PE
0.160000	50.60	0.0	66	14.9	N	FLO

MEASUREMENT RESULT: "test_fin AV"

Frequency MHz	Level dBµV	Transd dB	Limit dBµV	Margin dB	Line	PE
0.945000	18.80	0.0	46	27.2	N	FLO

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

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

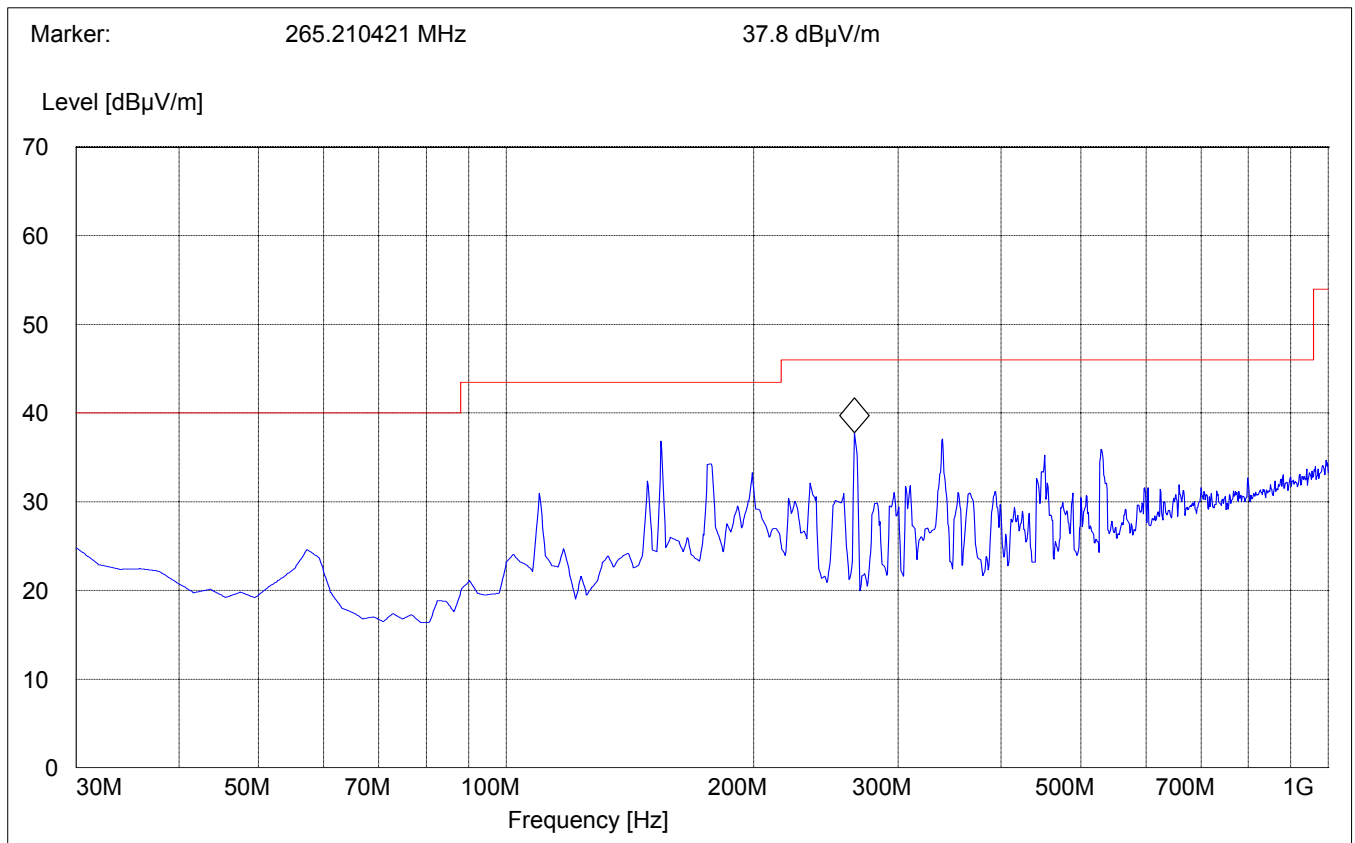
1. The radiated emissions were done with different settings, using the relevant pre-amplifiers for the relevant frequency ranges. This is the reason that the graphs show different noise levels. In the range between 3 and 25 GHz very short cable connections to the antenna was used to minimize the noise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

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

RECEIVER SPURIOUS RADIATION
30MHz – 1GHz

§ 15.209

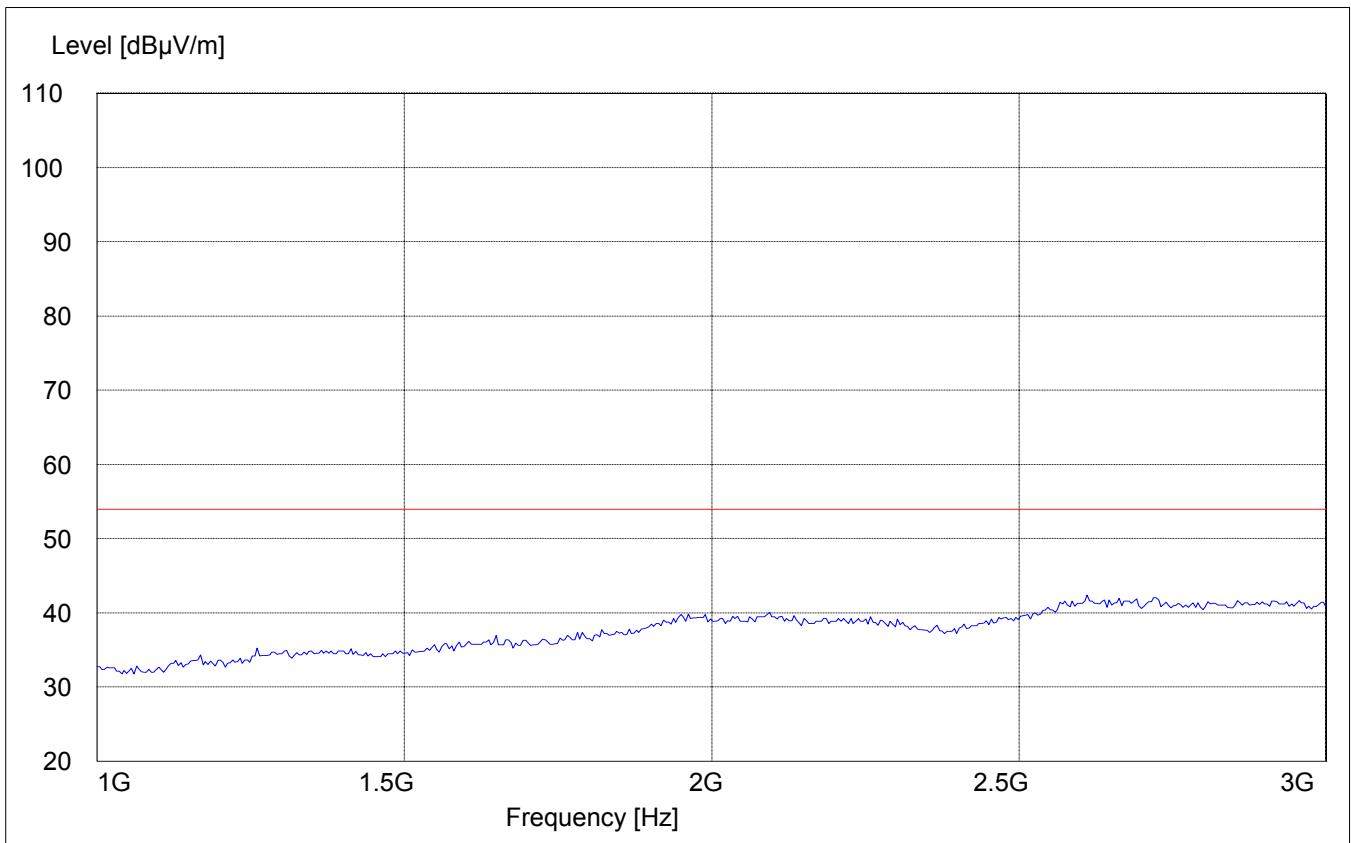
SWEEP TABLE:		"BT Spuri hi 30-1G"			
Short Description:		Bluetooth 30MHz-1GHz			
Start	Stop	Detector	Meas.	RBW	Transducer
Frequency	Frequency		Time	VBW	
30.0 MHz	1.0 GHz	MaxPeak	Coupled	100 kHz	3141-#1186



**RECEIVER SPURIOUS RADIATION
1GHz – 3GHz**

§ 15.209

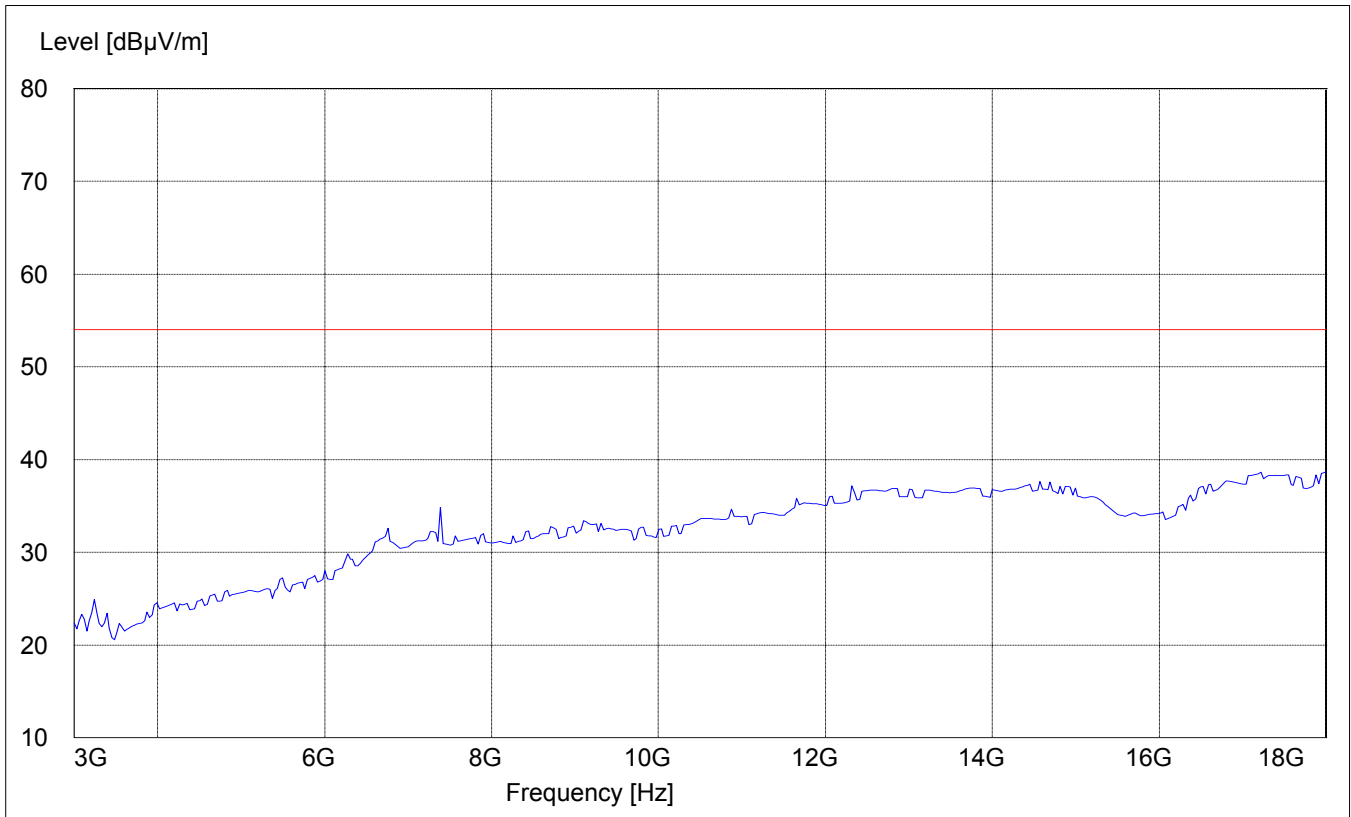
SWEEP TABLE:		"BT Spuri hi 1-3G"			
Short Description:		Bluetooth Spurious 1-3GHz			
Start	Stop	Detector	Meas.	RBW	Transducer
Frequency	Frequency	Time	Bandw.	VBW	
1.0 GHz	3.0 GHz	MaxPeak	Coupled	1 MHz	#326 horn (dBi)



RECEIVER SPURIOUS RADIATION
3GHz – 18GHz

§ 15.209

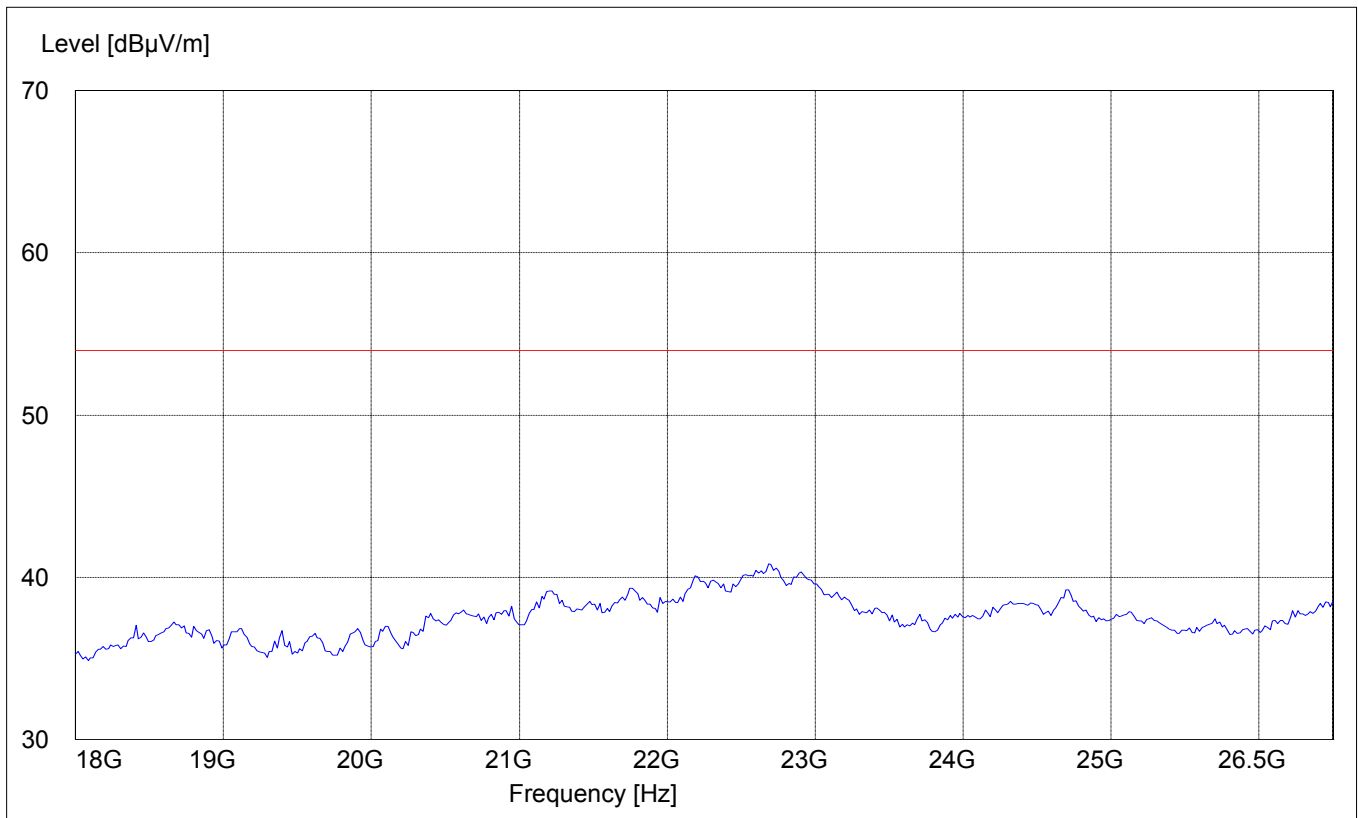
SWEEP TABLE:		"BT Spuri hi 3-18G"			
Short Description:		Bluetooth Spurious 3-18GHz			
Start	Stop	Detector	Meas.	RBW	Transducer
Frequency	Frequency	Time	Bandw.	VBW	
1.0 GHz	3.0 GHz	MaxPeak	Coupled	1 MHz	#326 horn (dBi)



RECEIVER SPURIOUS RADIATION
18GHz – 25GHz

§ 15.209

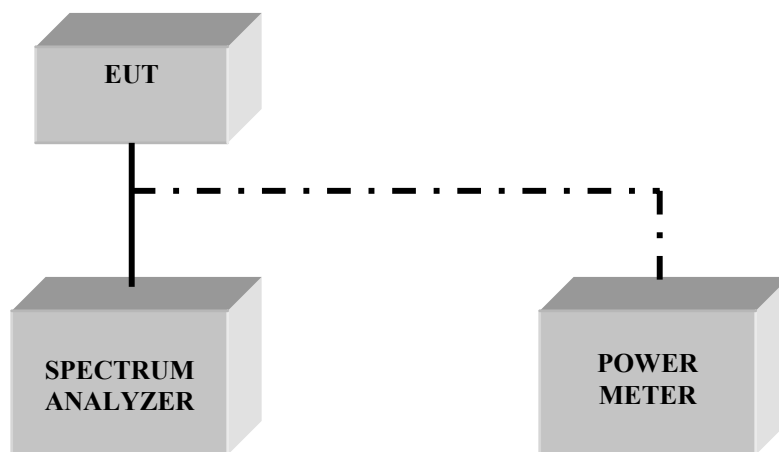
SWEEP TABLE:		"BT Spuri hi 18-25G"			
Short Description:		Bluetooth Spurious 18-25GHz			
Start	Stop	Detector	Meas.	RBW	Transducer
Frequency	Frequency	Time	Bandw.	VBW	
18 GHz	25 GHz	MaxPeak	Coupled	1 MHz	#141 horn (dBi)



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	2-3GHz Band reject filter	BRM50701	Microtronics	6
07	Pre-Amplifier	TS-ANA	Rohde & Schwarz	--
08	Pre-Amplifier	JS4-00102600	Miteq	00616

BLOCK DIAGRAMS
Conducted Testing



Radiated Testing

ANECHOIC CHAMBER

