



FCC Test Report

Test report no.: EMC_702FCC15.247_2003_WL007

FCC Part 15.247 for DSSS systems / CANADA RSS-210

EUT: WLAN AP Model: WL007

FCC ID: SHE-WL007

IC ID: 5324A-WL007



TTI-P-G 081/94-A0

Accredited according to **ISO/IEC 17025**



**Bluetooth Qualification
Test Facility
(BQTF)**

CTIA Authorized Test Lab

FCC listed # 101450

IC recognized # 3925

CETECOM Inc.

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Board of Directors: Dr. Harald Ansorge, Dr. Klaus Matkey, Hans Peter May

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:**EMC Engineer: Harpreet Sidhu**

1.2 Testing laboratory
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E-mail: lothar.schmidt@cetekomusa.com
Internet: www.cetekom.com

1.3 Details of applicant

Name : Alliant Networks, Inc.
Street : 1259 Birchwood Drive
City / Zip Code : Sunnyvale, CA 94089
Country : USA
Contact : John Huston
Telephone : 408 744 1500 x106
Tele-fax : 408 744 1511
e-mail : johnh@alliantnetworks.com

1.4 Application details

Date of receipt test item : 2004-08-07
Date of test : 2004-08-07, 2004-09-09/13

1.5 Test item

Manufacturer : Applicant
[Model No.](#) : [WL007](#)
[Description](#) : [802.11b/g WLAN AP](#)
FCC ID : SHE-WL007
FCC ID : 5324A-WL007

Additional information

Frequency : 2412MHz – 2462MHz
Type of modulation : DSSS / OFDM (orthogonal frequency division multiplexing)
Number of channels : 11
Antenna : External
Power supply : 12 VDC from AC adaptor
Output power : 27.8dBm (602.56mW) conducted peak power
Extreme temp. Tolerance : 0°C to +50°C

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

NOTE: EUT 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:

2004-09-23 EMC & Radio Lothar Schmidt (Manager)



Date

Section

Name

Signature

Responsible for test report and project leader:

2004-09-23 EMC & Radio Harpreet Sidhu (EMC Engineer)



Date

Section

Name

Signature

2.2 Test report

TEST REPORT

Test report no.: EMC_702FCC15.247_2004_WL007

FCC Part 15.247 for DSSS systems / CANADA RSS-210

TEST REPORT REFERENCE

LIST OF MEASUREMENTS		PAGE
SPECTRUM BANDWIDTH OF DSSS SYSTEM	§15.247(a) (2)	7
MAXIMUM PEAK OUTPUT POWER	§ 15.247 (b) (1)	11
POWER SPECTRAL DENSITY	§15.247 (d)	19
BAND EDGE COMPLIANCE	§15.247 (c)	23
EMISSION LIMITATIONS	§ 15.247 (c) (1)	27
CONDUCTED EMISSIONS	§ 15.107/207	42
RECEIVER SPURIOUS RADIATION	§ 15.209	44
TEST EQUIPMENT AND ANCILLARIES USED FOR TESTS		50
BLOCK DIAGRAMS		51

SPECTRUM BANDWIDTH OF DSSS SYSTEM
6 dB bandwidth**§15.247(a) (2)**

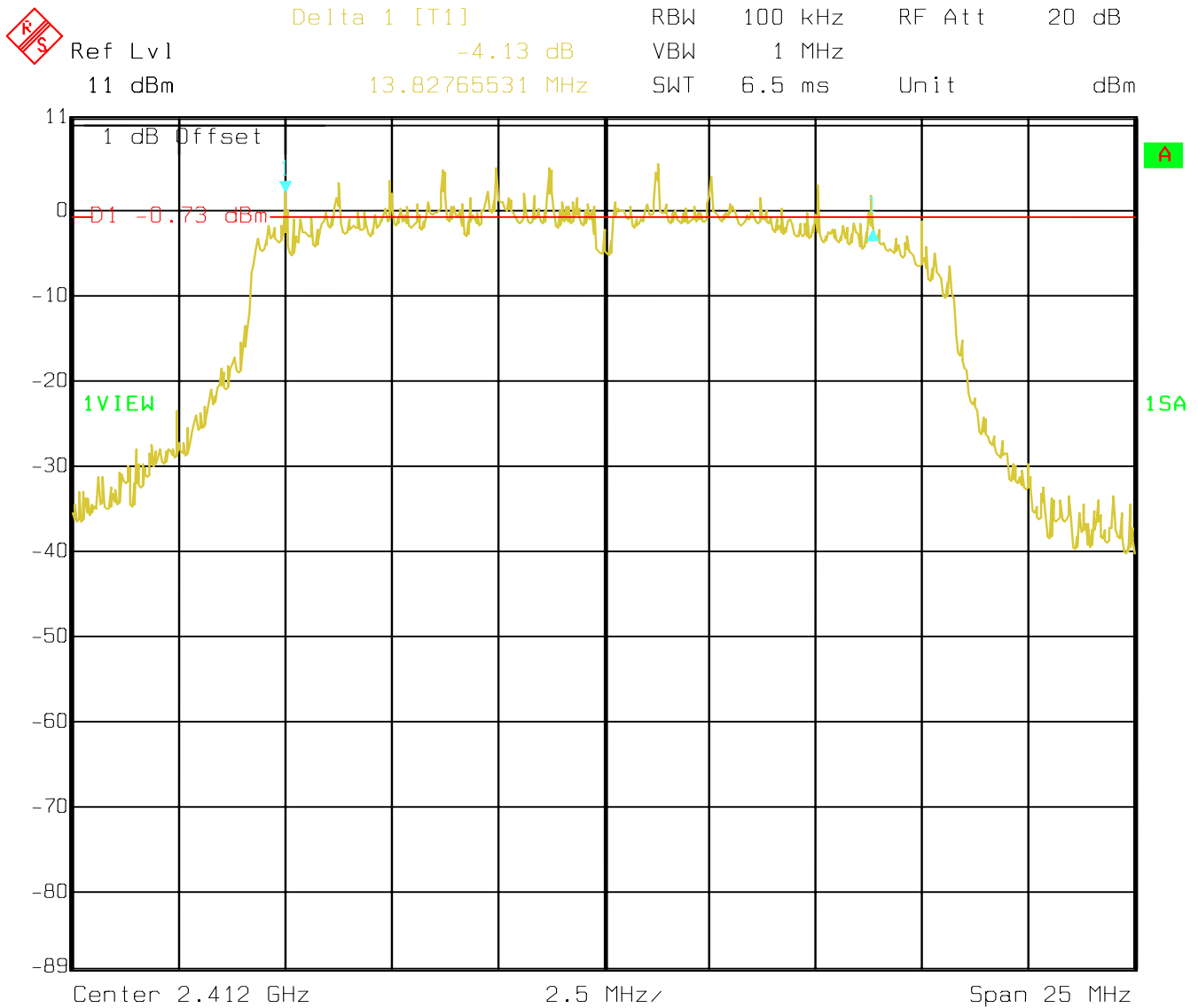
TEST CONDITIONS		6 dB BANDWIDTH (MHz)		
Frequency (MHz)		2412	2437	2462
T _{nom} (23)°C	V _{nom}	13.82	15.08	13.92

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

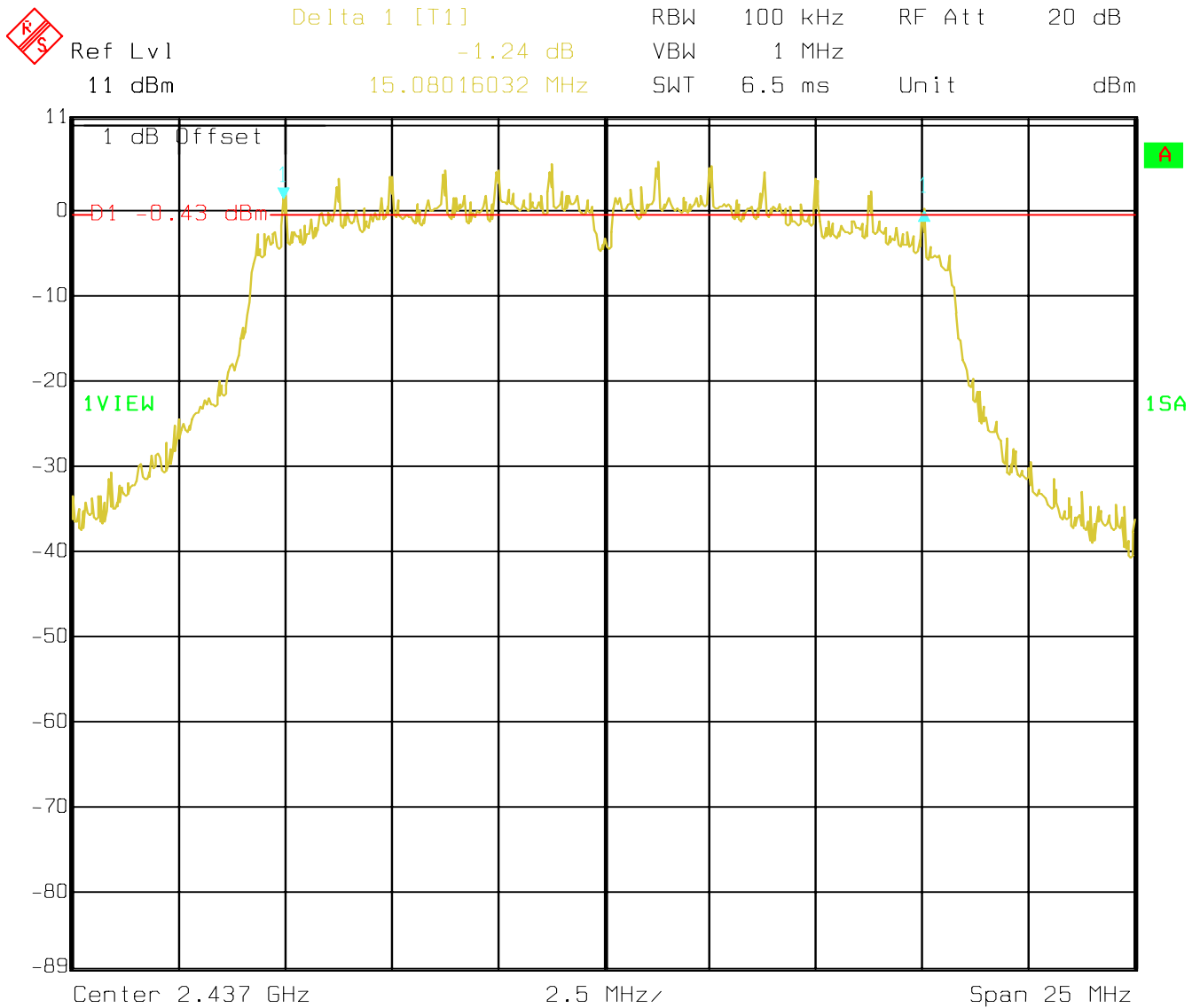


Date: 13.SEP.2004 13:52:15

SPECTRUM BANDWIDTH OF DSSSS SYSTEM 6 dB bandwidth

§15.247(a) (2)

Mid Channel: 2437MHz

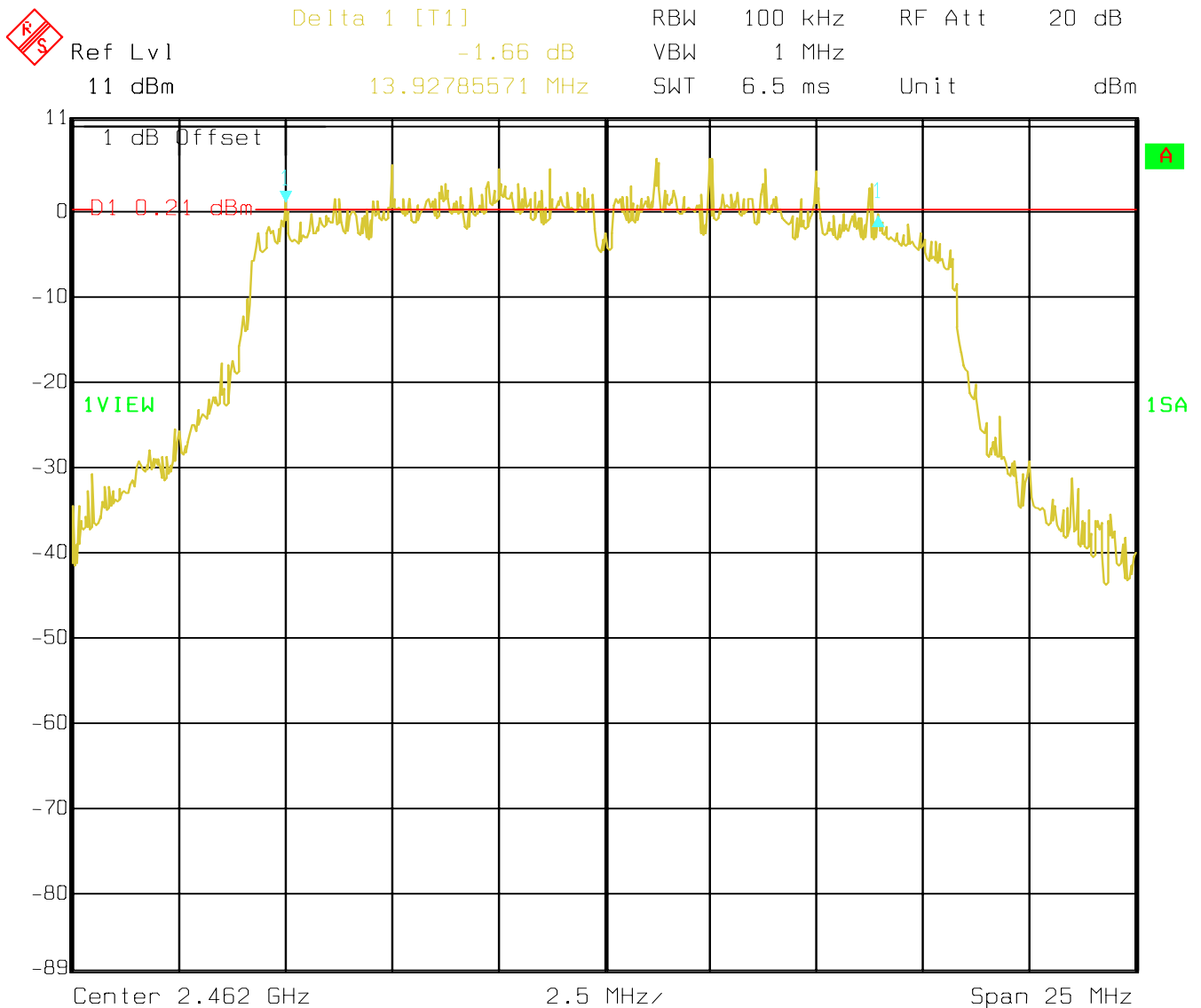


Date: 13.SEP.2004 13:50:11

SPECTRUM BANDWIDTH OF DSSS SYSTEM 6 dB bandwidth

§15.247(a) (2)

Highest Channel: 2462MHz



Date: 13.SEP.2004 13:54:07

**MAXIMUM PEAK OUTPUT POWER
(Conducted)****§ 15.247 (b) (1)**

TEST CONDITIONS		OUTPUT POWER (dBm)		
Frequency (MHz)		2412	2437	2462
T _{nom} (23)°C	V _{nom}	26.41	26.94	27.8
Measurement uncertainty		±0.5dBm		

RBW / VBW: 10MHz

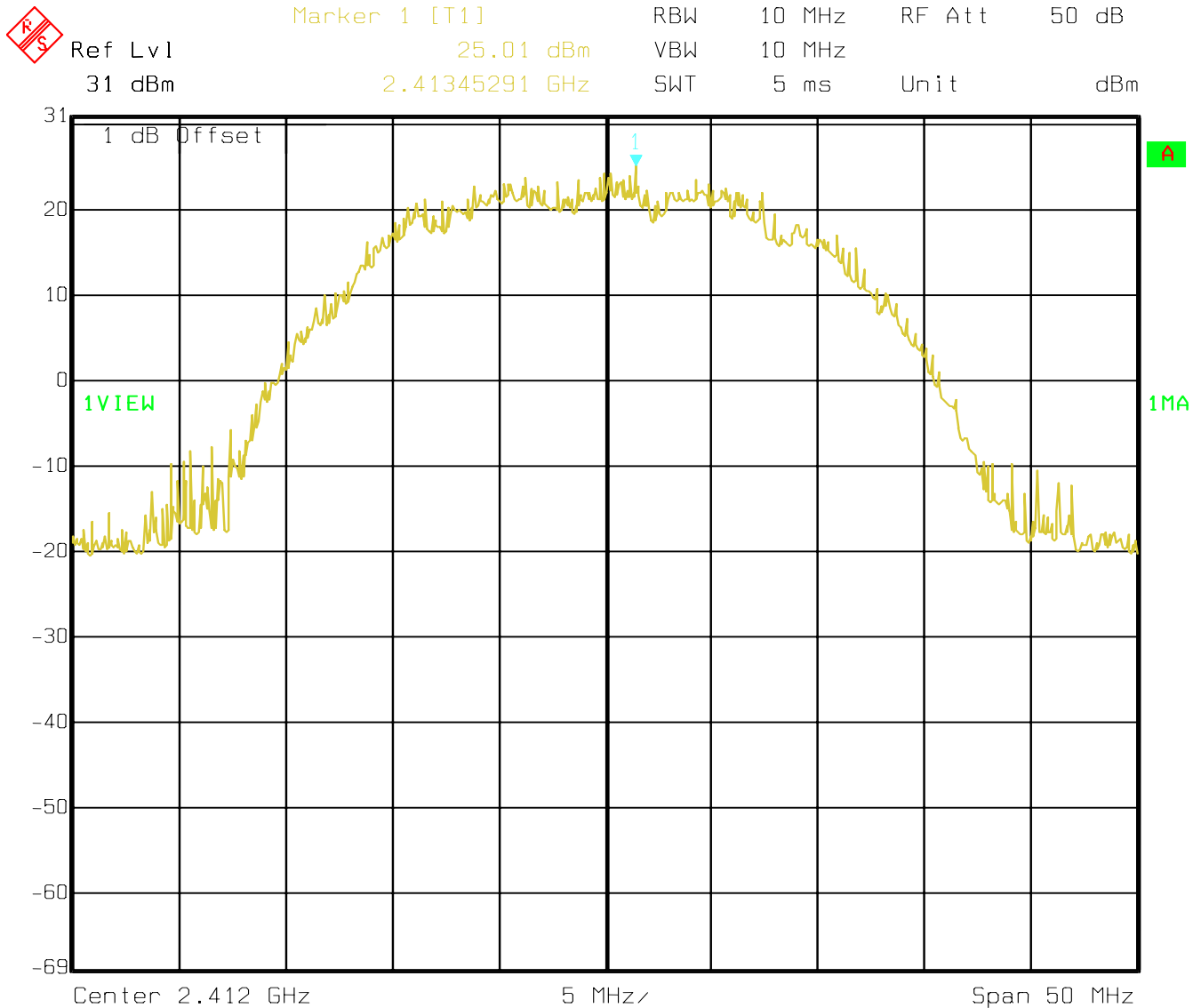
To comply with following;*RBW / VBW should be equal to or greater than the 6dB BW****All measured values are corrected by 10log 6dB BW / used BW****(Therefore correction factor of 1.4, 1.78 & 1.43 is added to low, mid& high channel measurements respectively)****LIMIT****SUBCLAUSE § 15.247 (b) (1)**

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

PEAK OUTPUT POWER (CONDUCTED)

§15.247 (b) (1)

Lowest Channel: 2412MHz

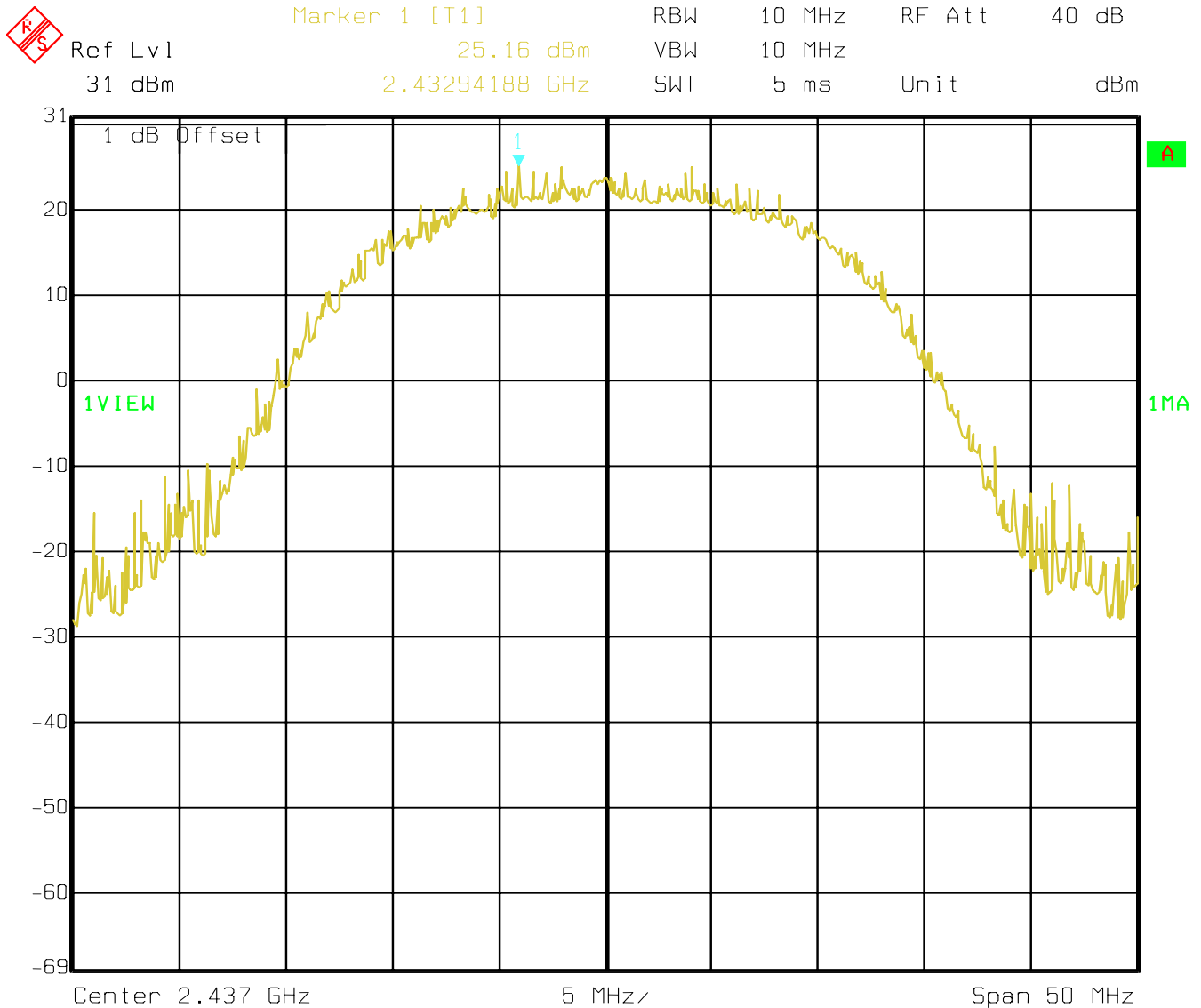


Date: 13.SEP.2004 12:21:22

PEAK OUTPUT POWER (CONDUCTED)

§15.247 (b)

Mid Channel: 2437MHz

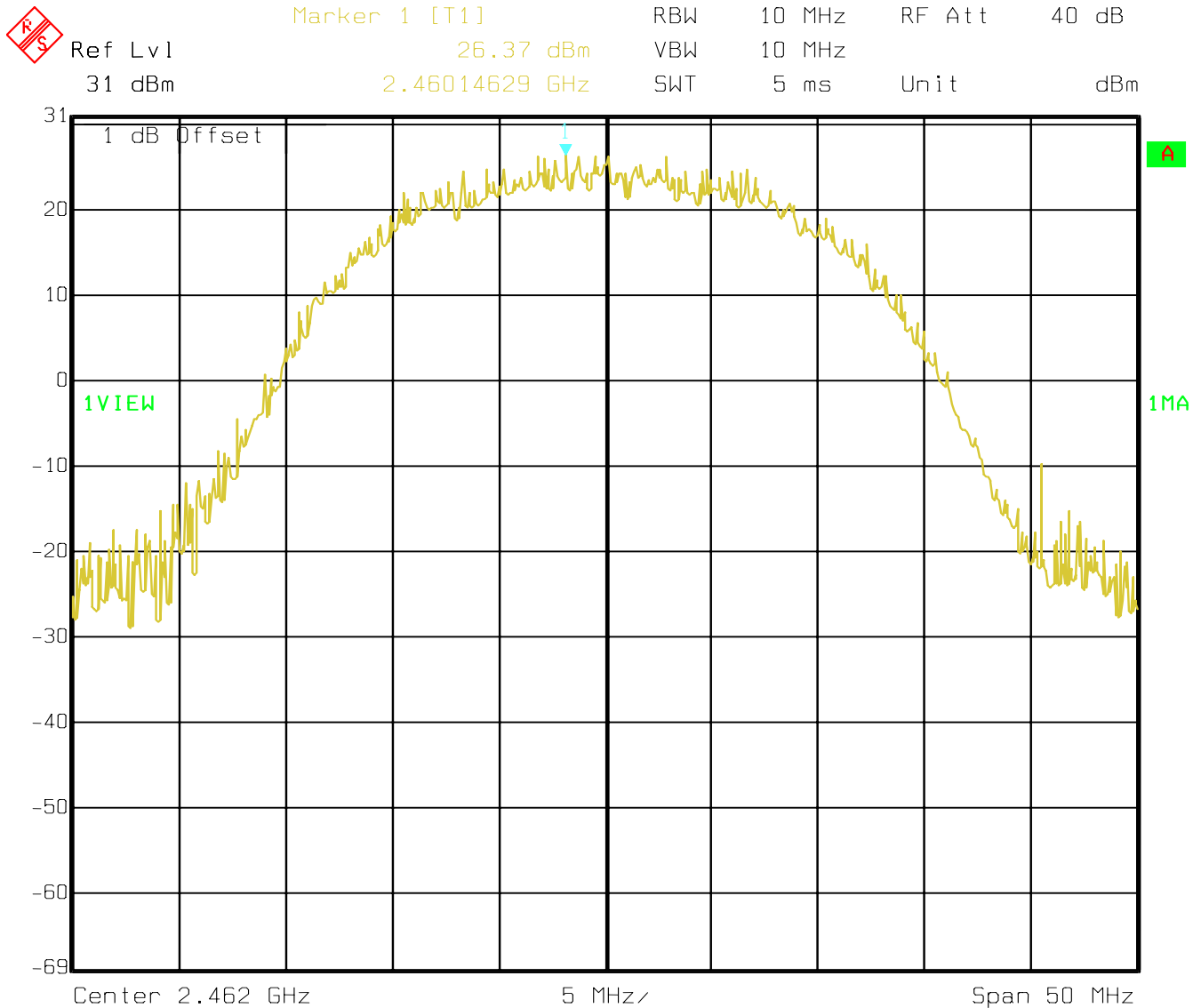


Date: 13.SEP.2004 12:42:02

PEAK OUTPUT POWER (CONDUCTED)

§15.247 (b)

Highest Channel: 2462MHz



Date: 13.SEP.2004 12:41:00

**MAXIMUM PEAK OUTPUT POWER
(RADIATED)**

§ 15.247 (b) (1)

EIRP:

TEST CONDITIONS		MAXIMUM PEAK OUTPUT POWER (dBm)		
Frequency (MHz)		2412	2437	2462
T _{nom} (23)°C	V _{nom}	26.12	25.85	26.62
Measurement uncertainty		±0.5dBm		

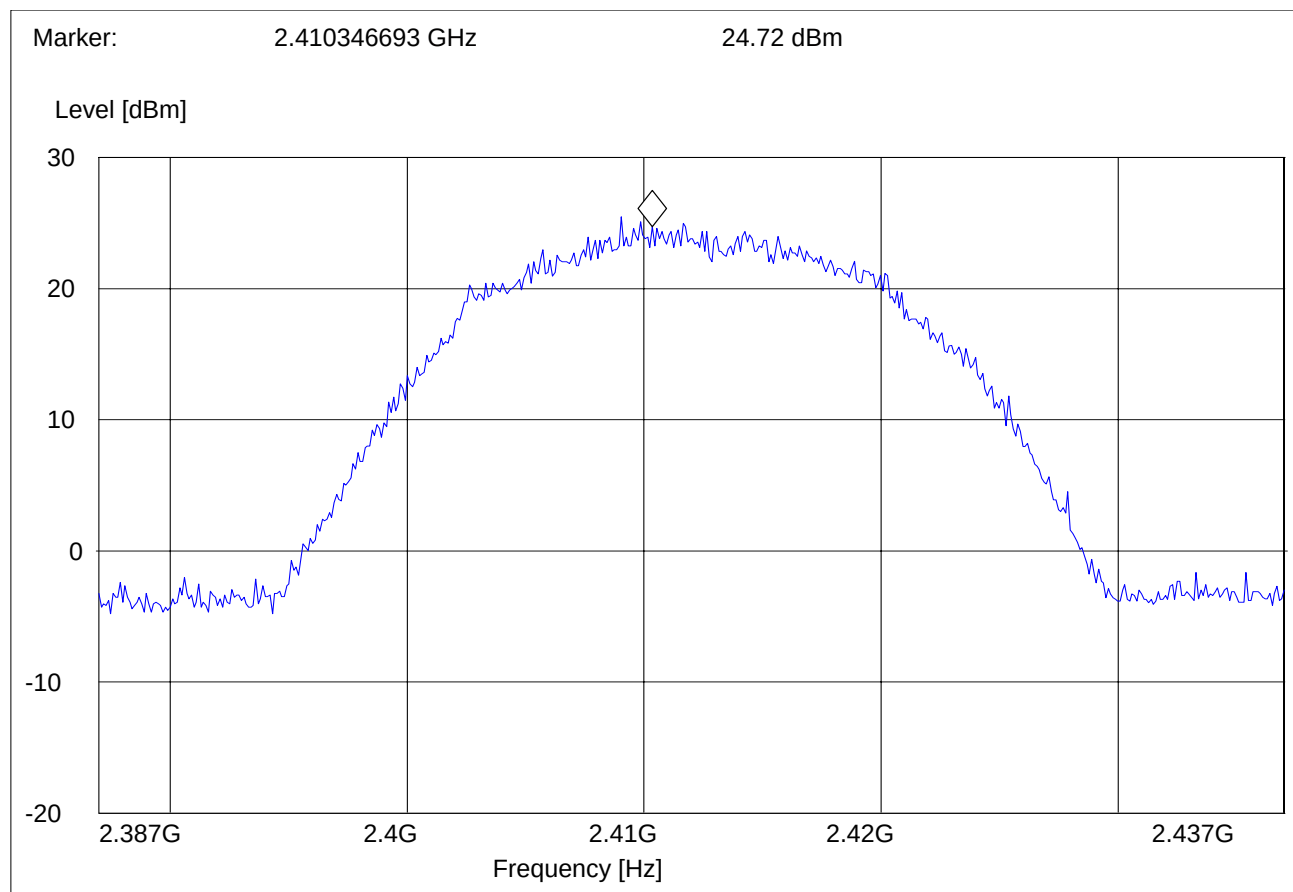
RBW/VBW: 10MHz

To comply with following;*RBW / VBW should be equal to or greater than the 6dB BW****All measured values are corrected by 10log 6dB BW / used BW****(Therefore correction factor of 1.4, 1.78 & 1.43 is added to low, mid& high channel measurements respectively)****LIMIT**

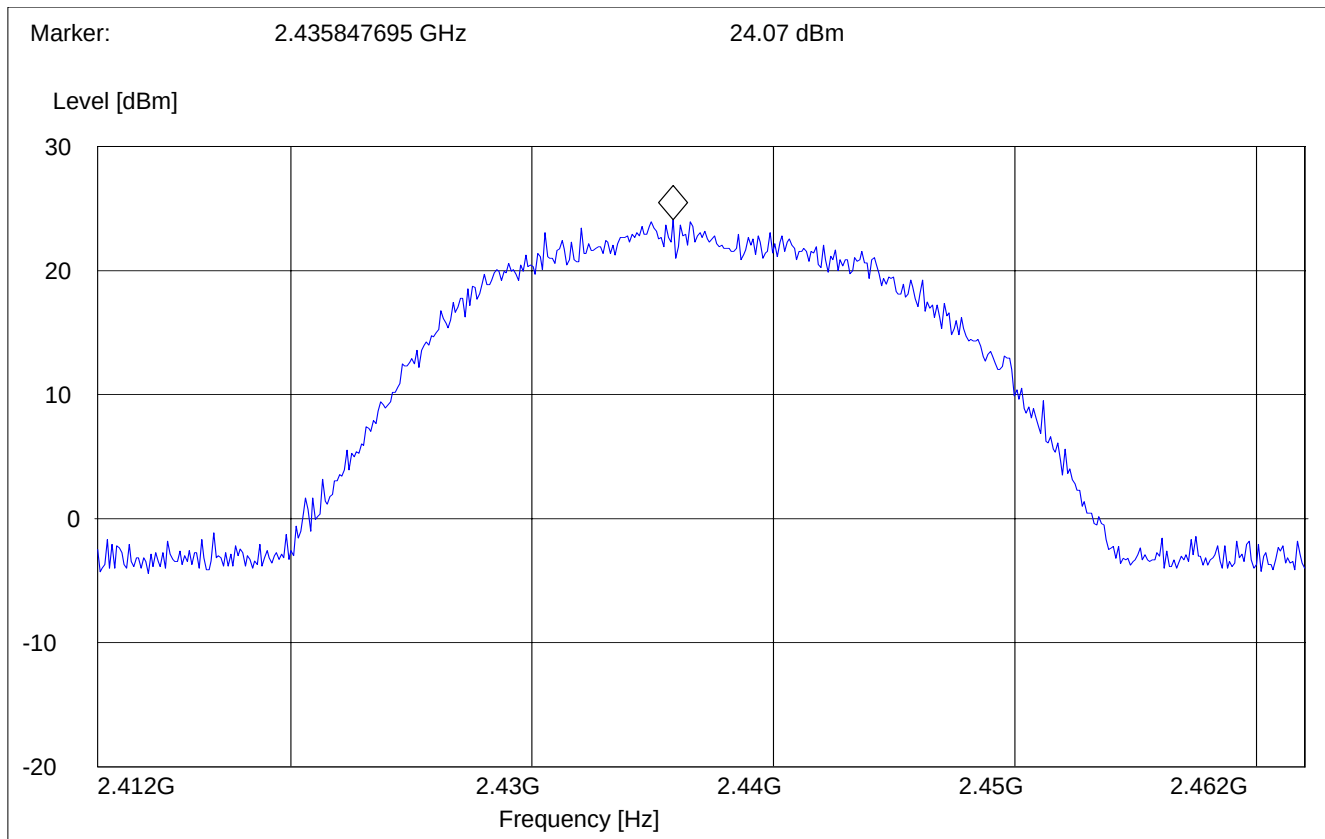
SUBCLAUSE § 15.247 (b) (1)

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

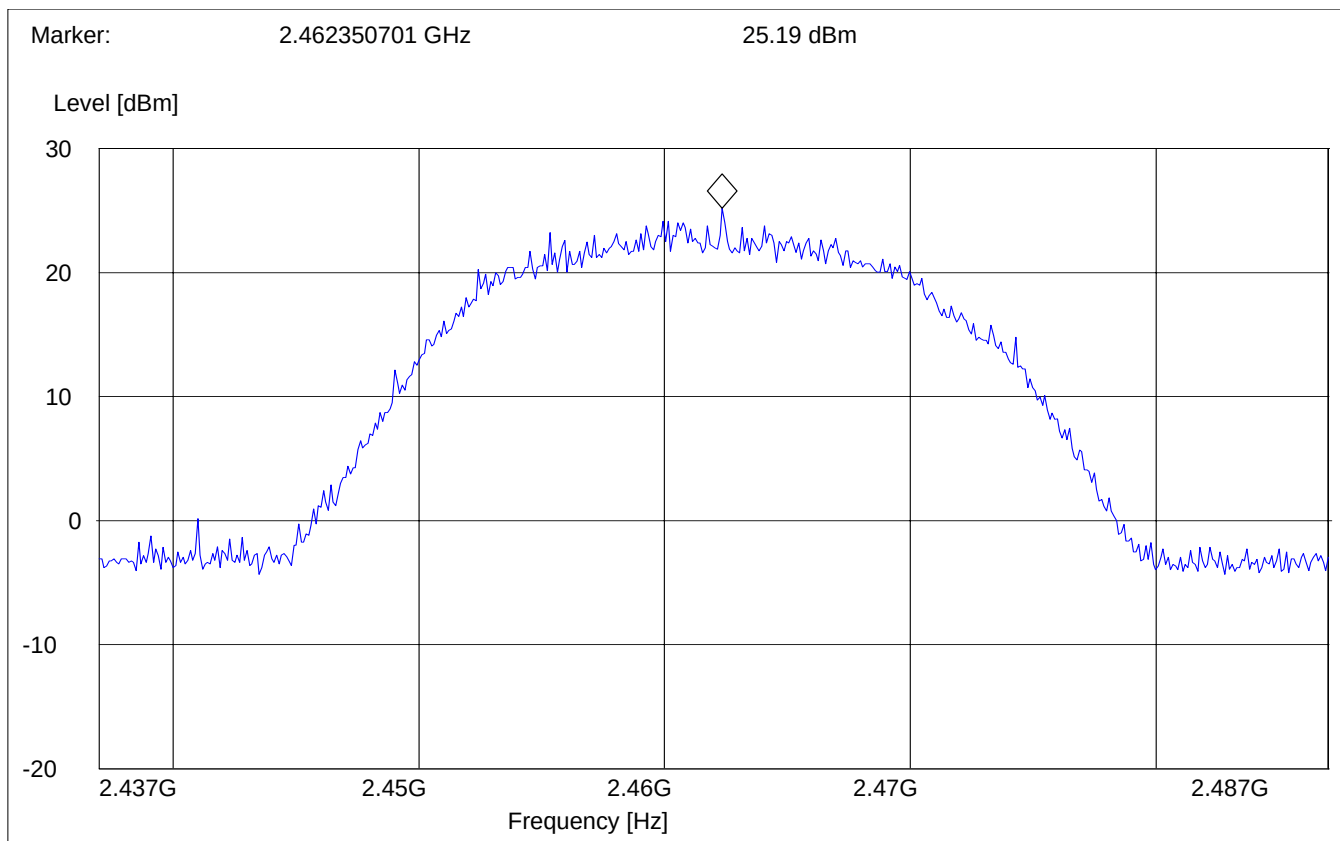
EIRP (2412MHz):



EIRP (2437MHz):



EIRP (2462MHz):



POWER SPECTRAL DENSITY**§15.247 (d)**

TEST CONDITIONS		POWER SPECTRAL DENSITY (dBm)		
Frequency (MHz)		2412	2437	2462
T _{nom} (23)°C	V _{nom}	-12.90	-12.63	-11.43

LIMIT**SUBCLAUSE §15.247(d)**

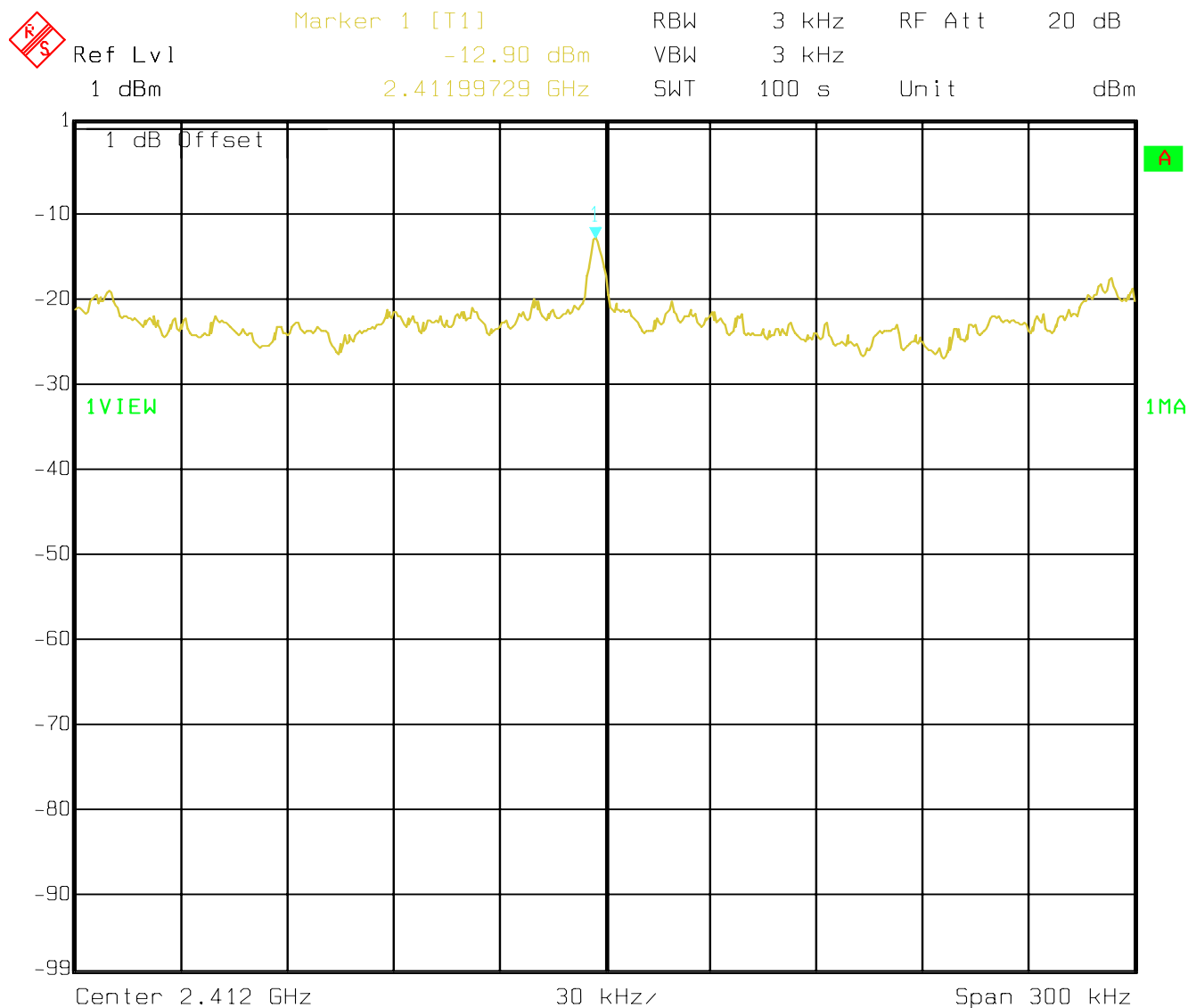
The peak power spectral density shall not be greater than 8 dBm in any 3 kHz band

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

POWER SPECTRAL DENSITY

§15.247(d)

Lowest Channel: 2412MHz

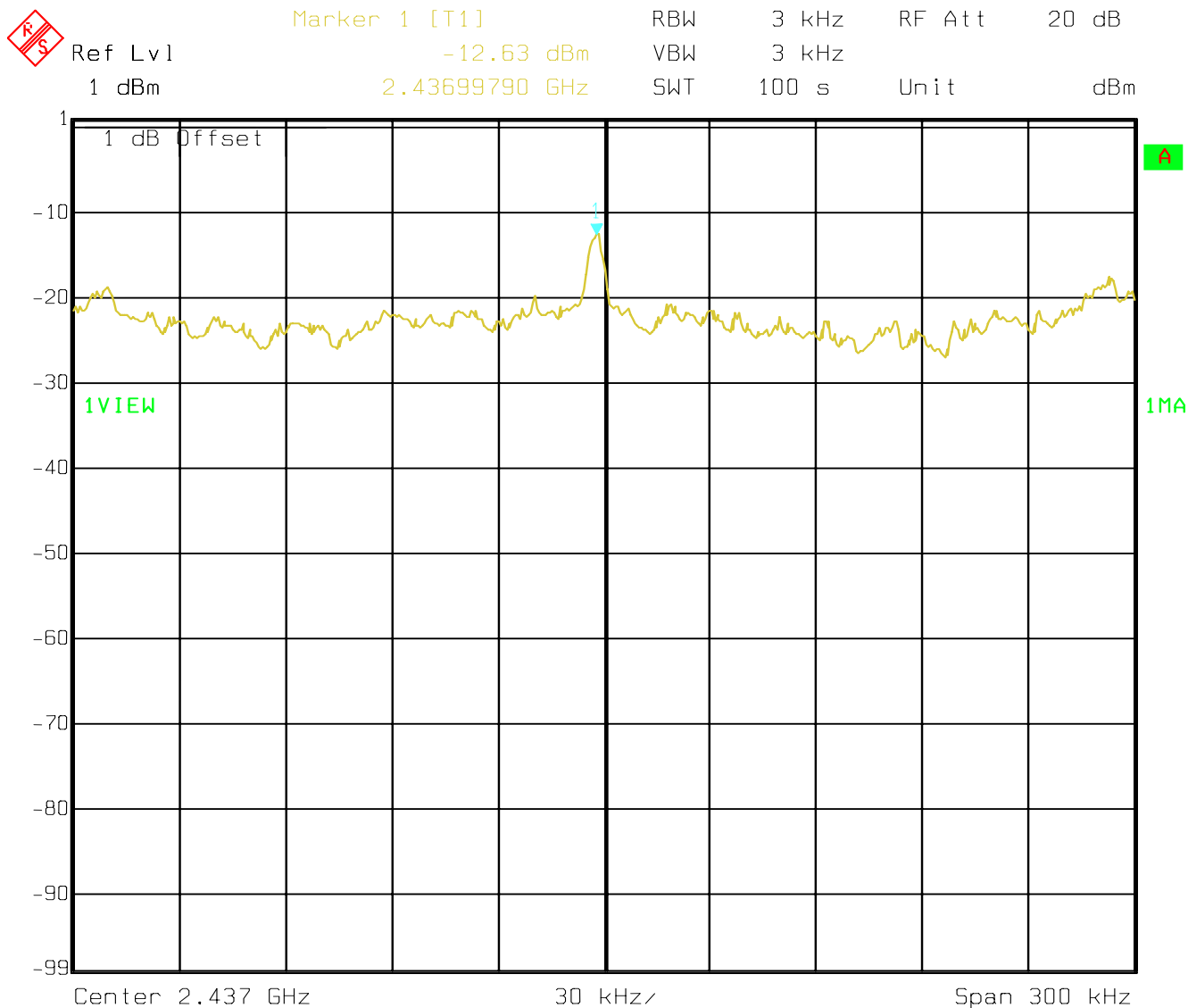


Date: 13.SEP.2004 14:07:18

POWER SPECTRAL DENSITY

§15.247(d)

Mid Channel: 2437MHz

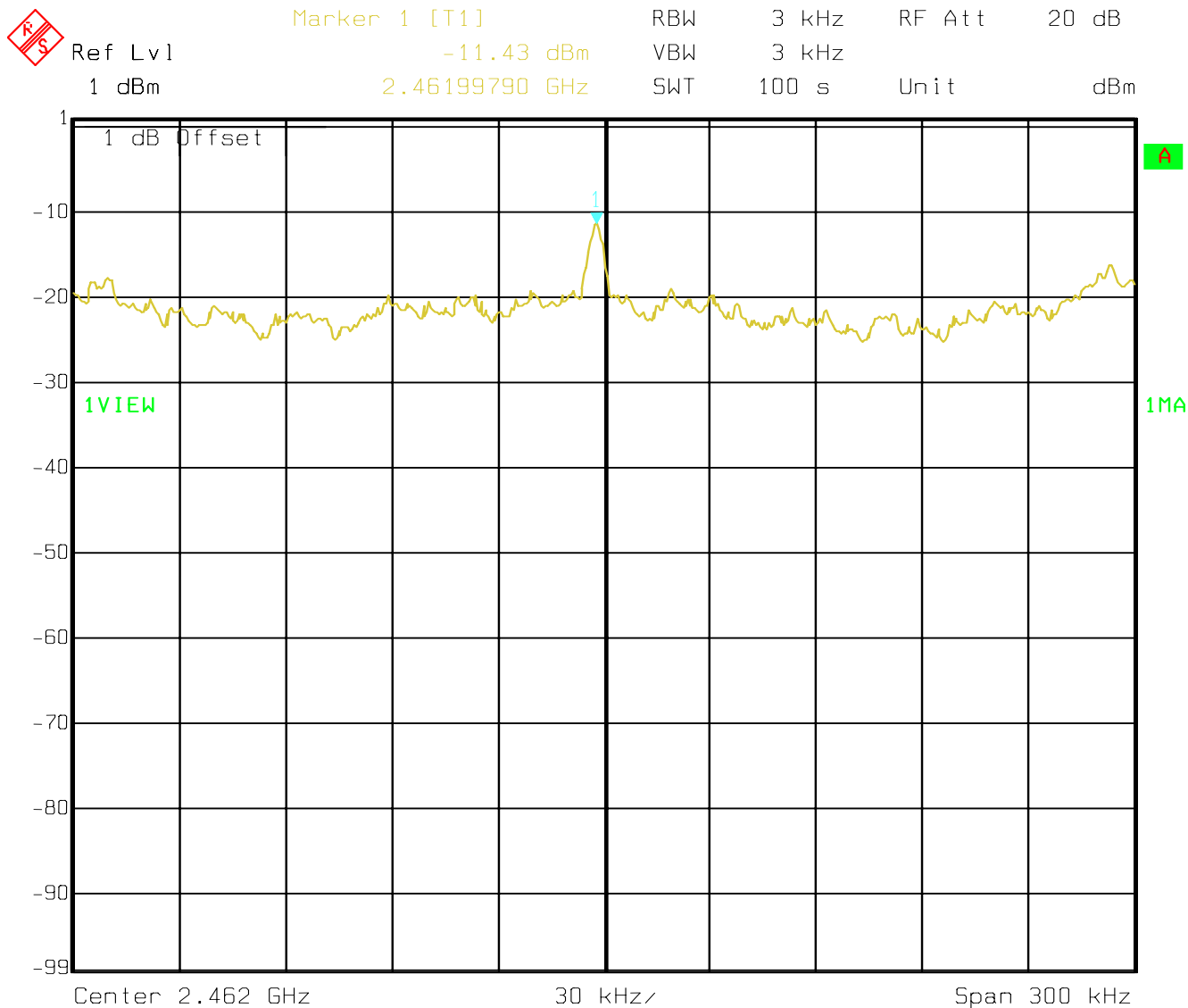


Date: 13.SEP.2004 14:04:52

POWER SPECTRAL DENSITY

§15.247(d)

Highest Channel: 2462MHz



Date: 13.SEP.2004 14:11:35

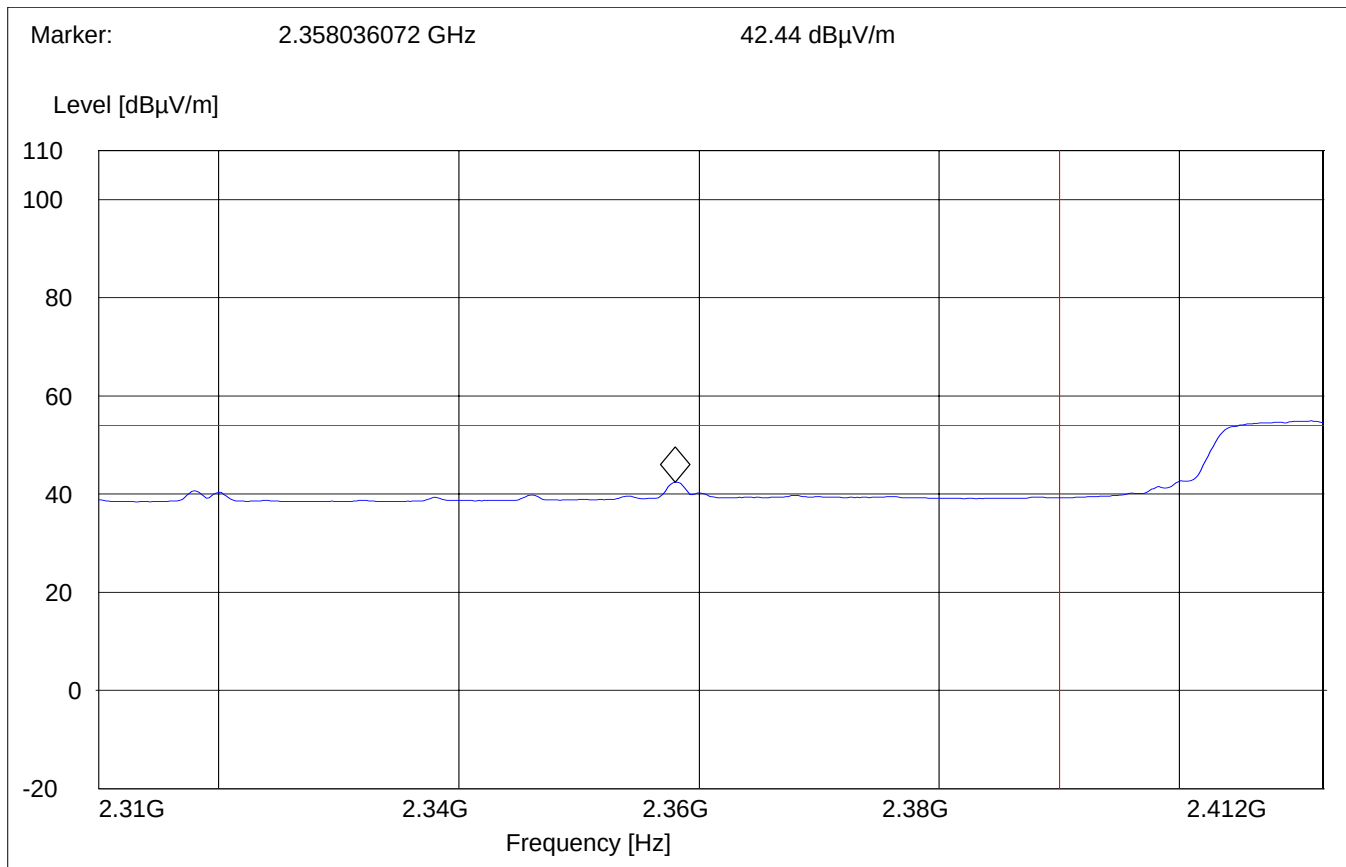
BAND EDGE COMPLIANCE

§15.247 (c)

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

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

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



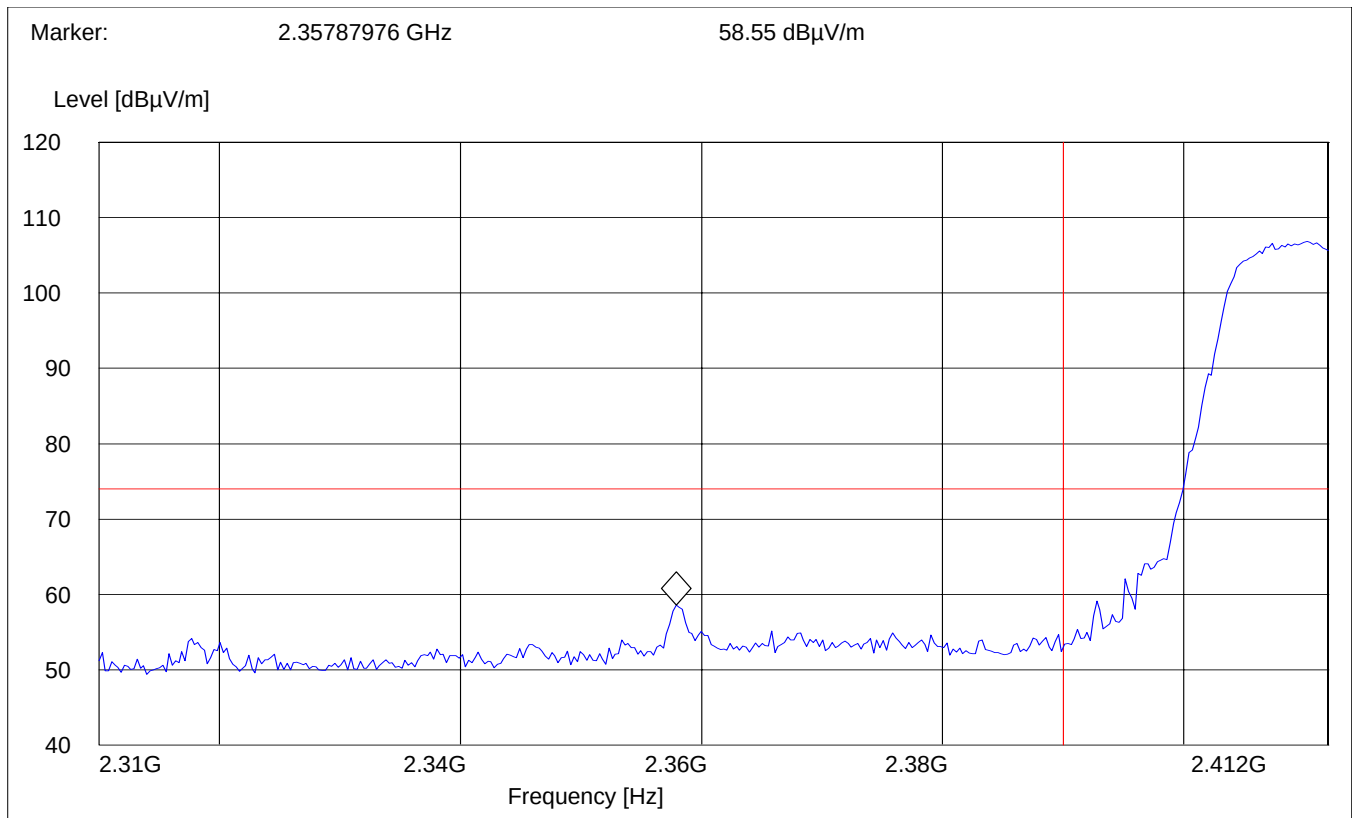
BAND EDGE COMPLIANCE

§15.247 (c)

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

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

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



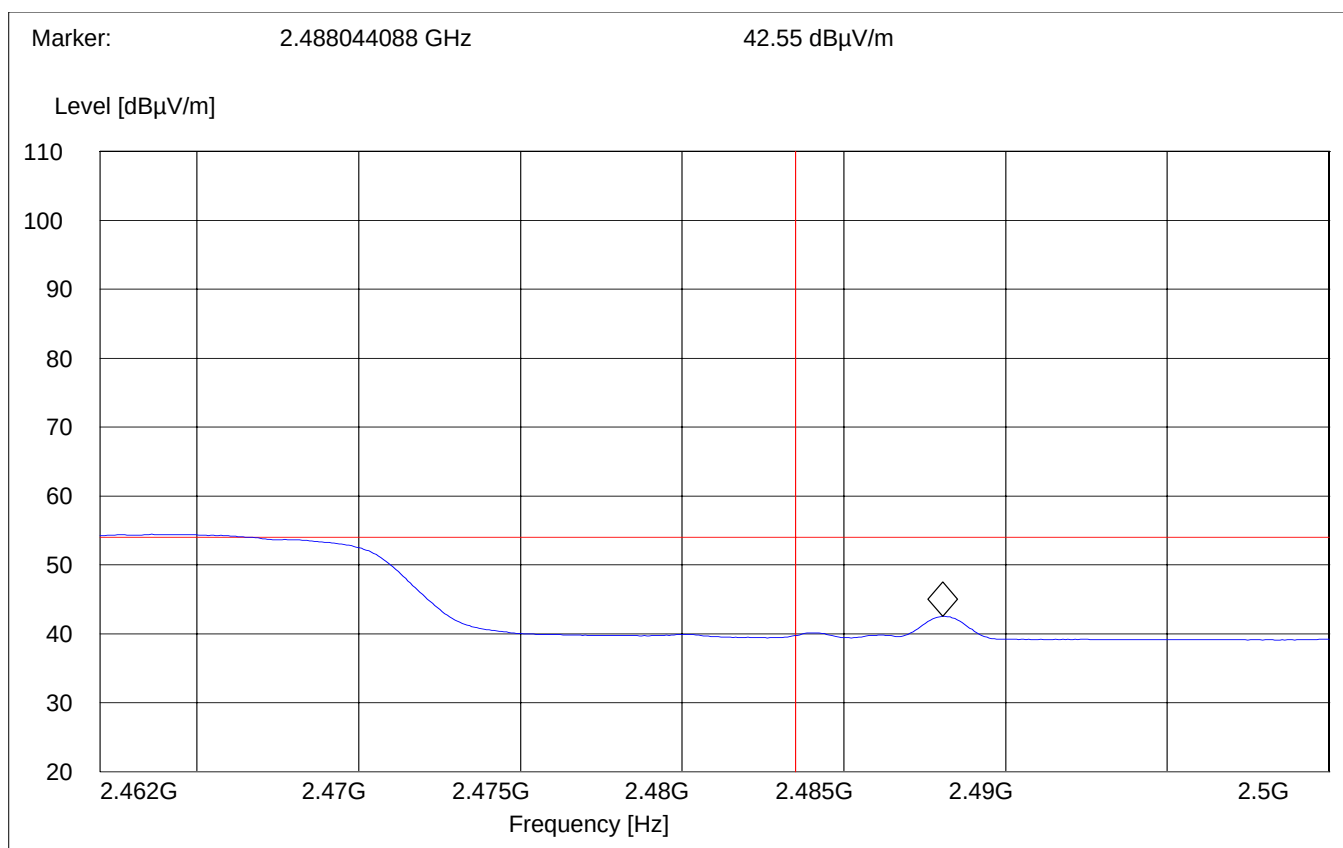
BAND EDGE COMPLIANCE

§15.247 (c)

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

Operating condition : Tx at 2462MHz
 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)



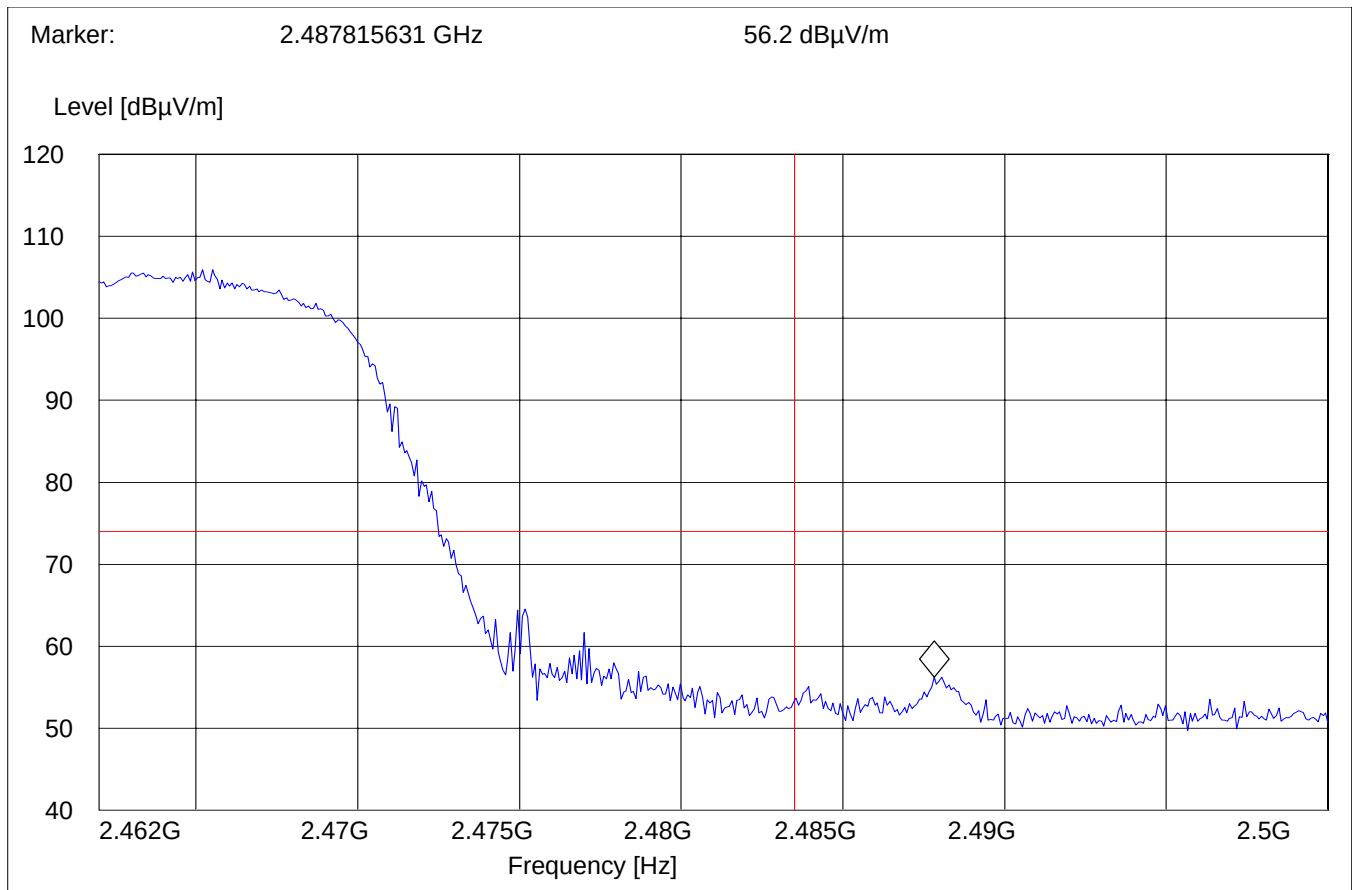
BAND EDGE COMPLIANCE

§15.247 (c)

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

Operating condition : Tx at 2462MHz
 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)).

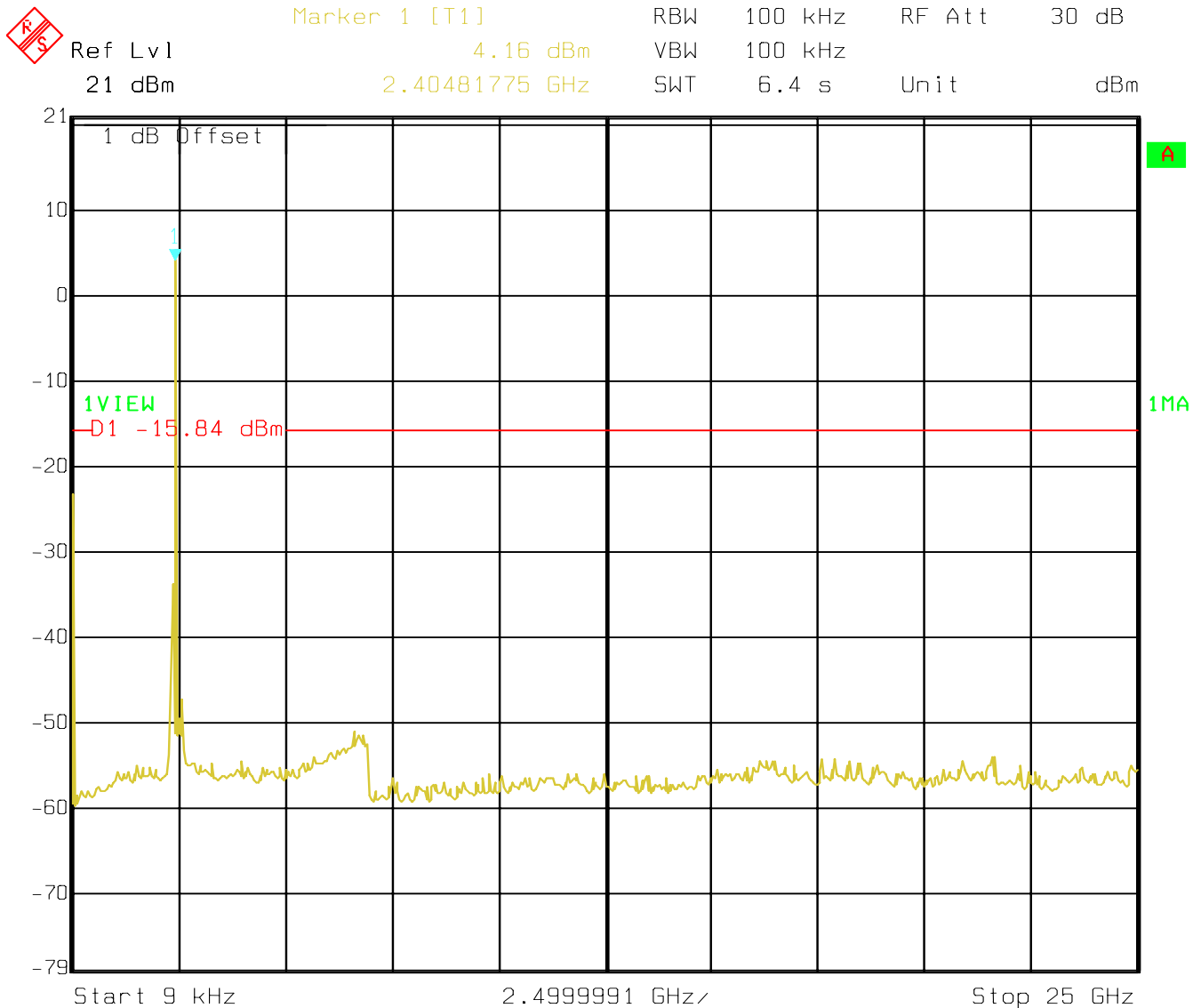
NOTE: Frequency resolution is not fine enough to show the exact frequency of the carrier, refer to plots under EIRP.

EMISSION LIMITATIONS - Conducted (Transmitter)

§ 15.247 (c) (1)

Lowest Channel (2412MHz): 9KHz - 25GHz

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



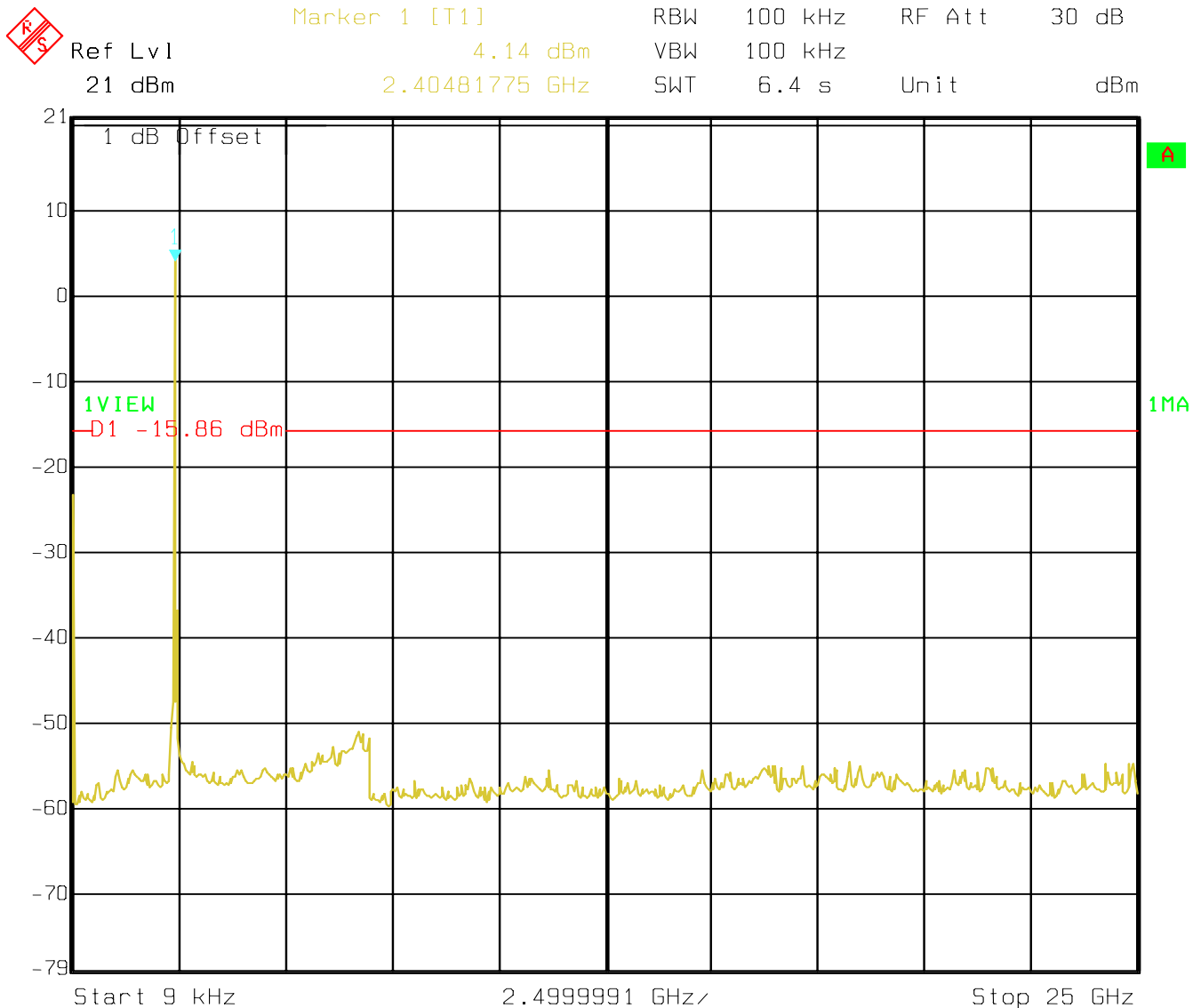
Date: 13.SEP.2004 14:18:28

EMISSION LIMITATIONS - Conducted (Transmitter)

§ 15.247 (c) (1)

Mid Channel (2437MHz): 9 KHz - 25GHz

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



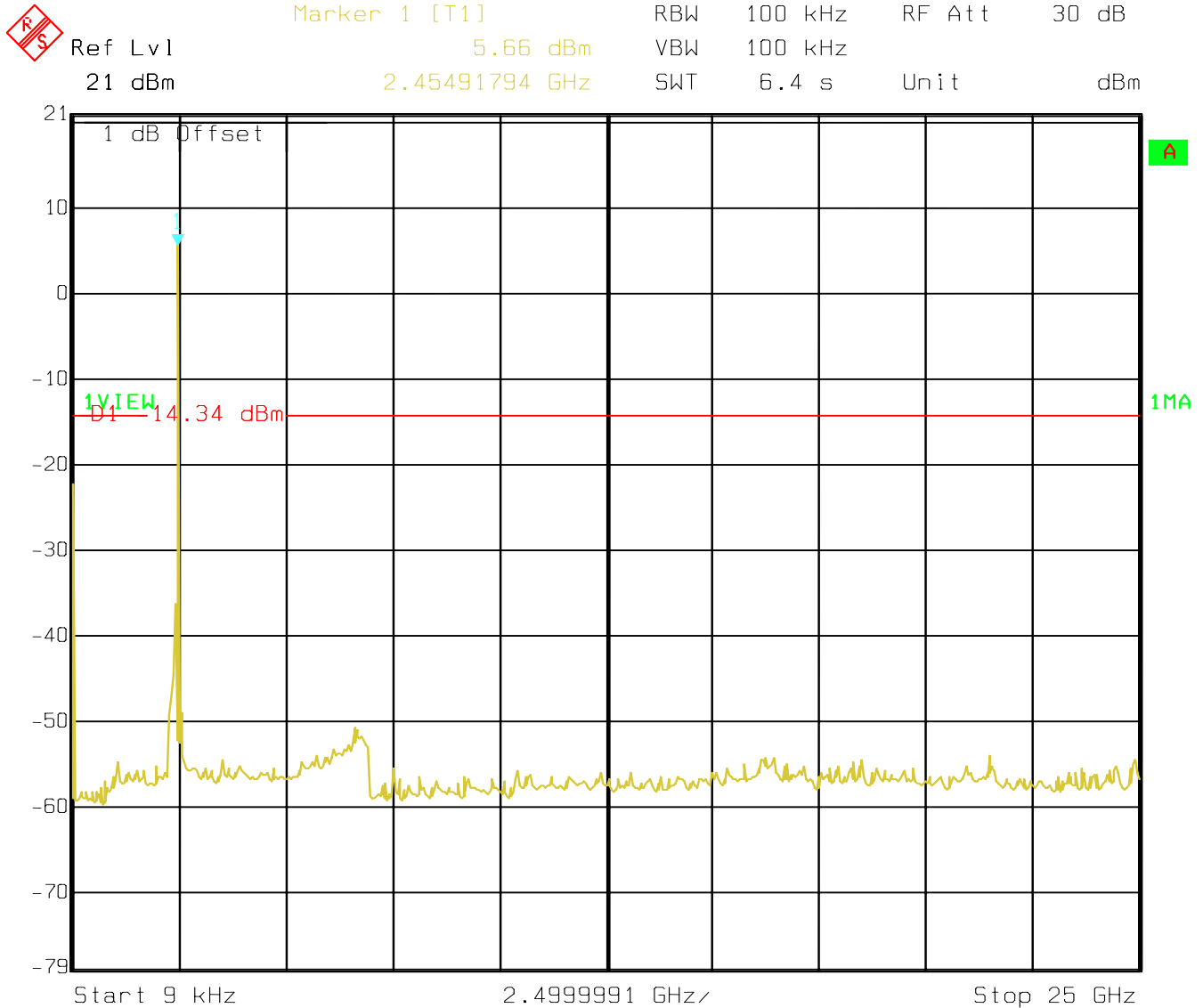
Date: 13.SEP.2004 14:16:58

EMISSION LIMITATIONS - Conducted (Transmitter)

§ 15.247 (c) (1)

Highest Channel (2462MHz): 30MHz - 25GHz

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



Date: 13.SEP.2004 14:16:05

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 26.5 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)

Transmit at Lowest channel Frequency 2412MHz			
Frequency (MHz)	Level (dBµV/m)		
	Peak	Quasi-Peak	Average
See plots			
Transmit at Middle channel Frequency 2437MHz			
Frequency (MHz)	Level (dBµV/m)		
	Peak	Quasi-Peak	Average
See plots			
Transmit at Highest channel Frequency 2462MHz			
Frequency (MHz)	Level (dBµV/m)		
	Peak	Quasi-Peak	Average
See plots			

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)

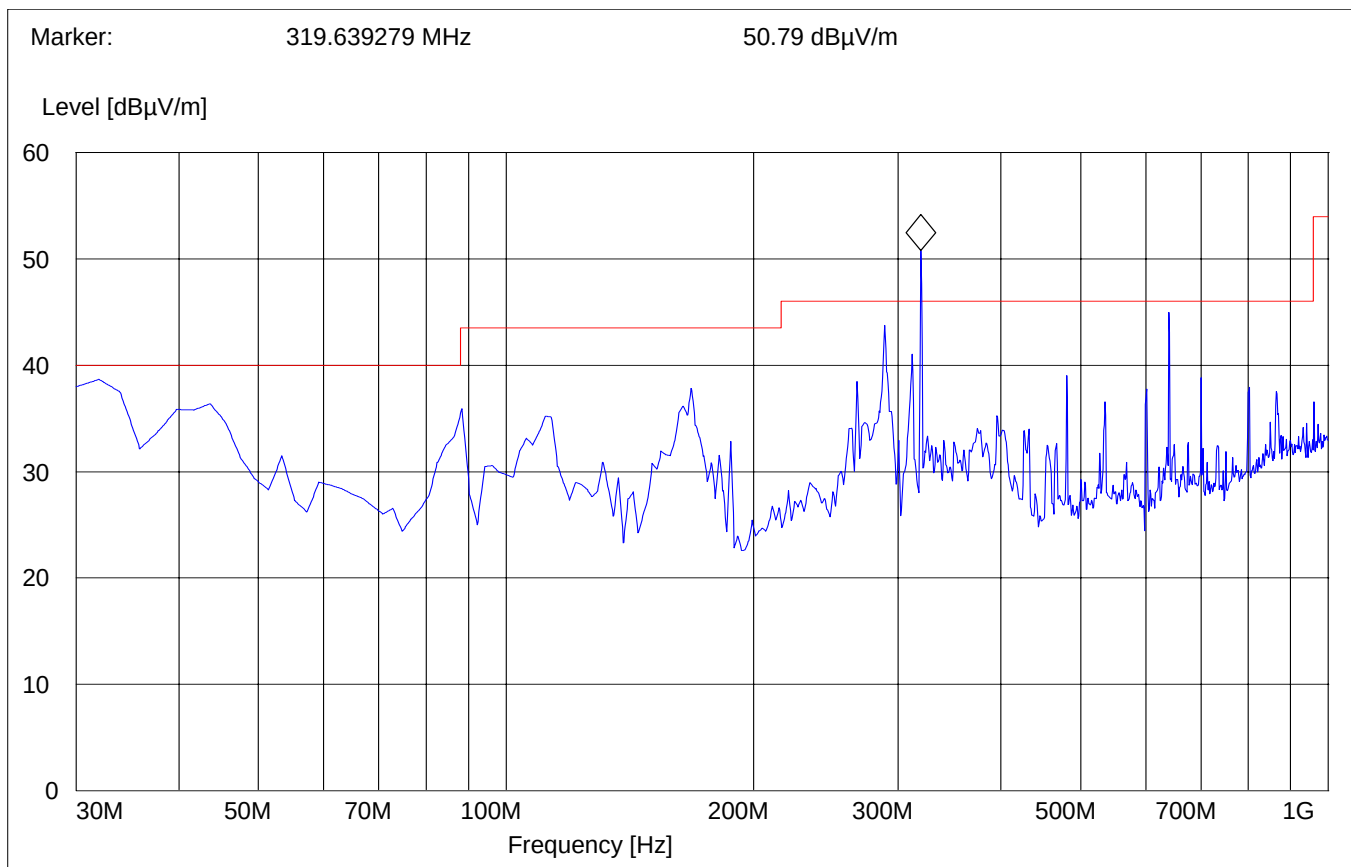
Antenna: vertical

SWEEP TABLE:

"Spuri hi 30-1G"

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

Freq. 319.639 MHz; Pk (dBuV/m) 50.79 dBuV/M QPk (dBuV/m) 42.83 dBuV/M



EMISSION LIMITATIONS - Radiated (Transmitter)

§ 15.247 (c) (1)

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

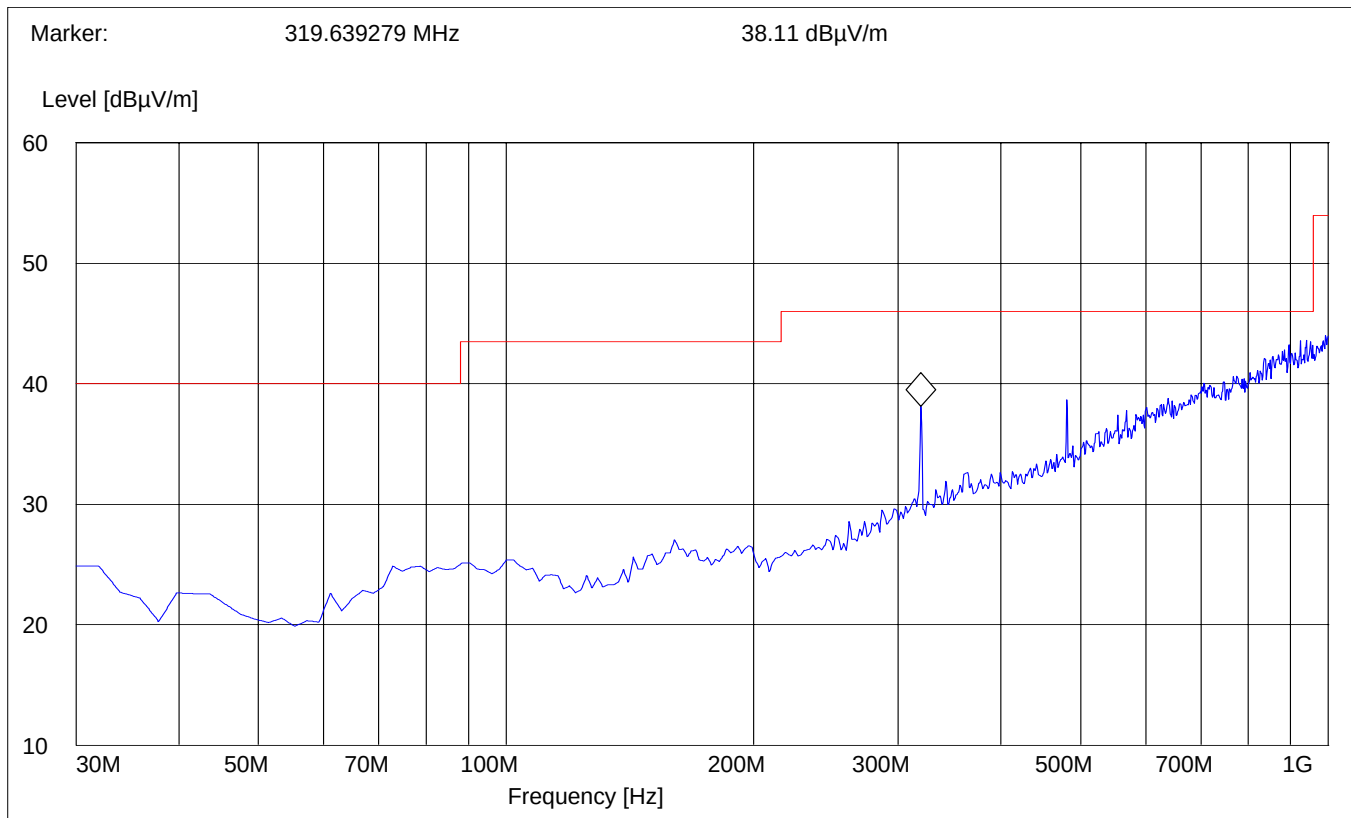
Antenna: horizontal

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

SWEEP TABLE:

"Spuri hi 30-1G"

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)

§ 15.247 (c) (1)

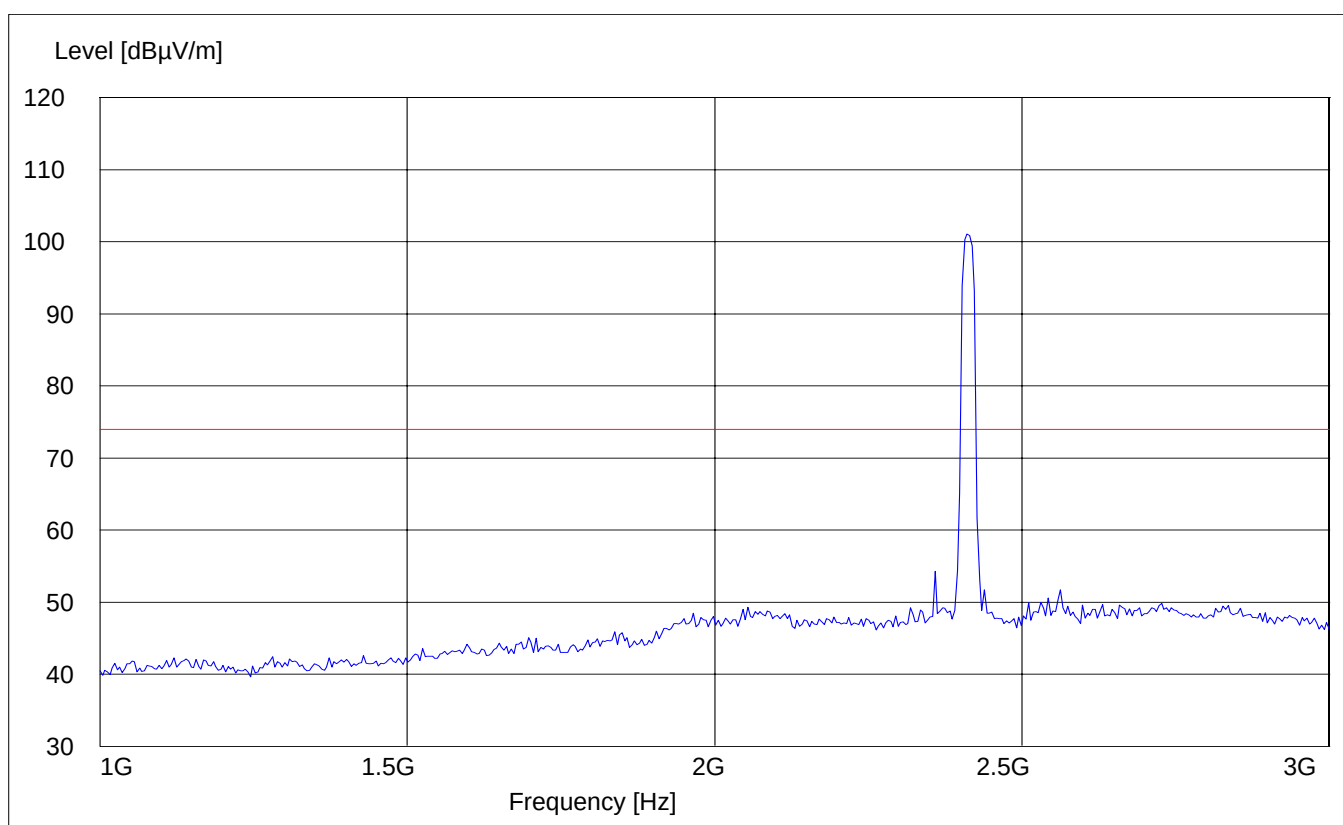
Lowest Channel (2412MHz): 1GHz – 3GHz

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

SWEEP TABLE:

"Spuri hi 1-3G"

Start	Stop	Detector	Meas.	RBW	VBW	Transducer
Frequency	Frequency	Time	Bandw.			
1.0 GHz	3.0 GHz	MaxPeak	Coupled	1 MHz	1MHz	#326 horn (dBi)



EMISSION LIMITATIONS - Radiated (Transmitter)

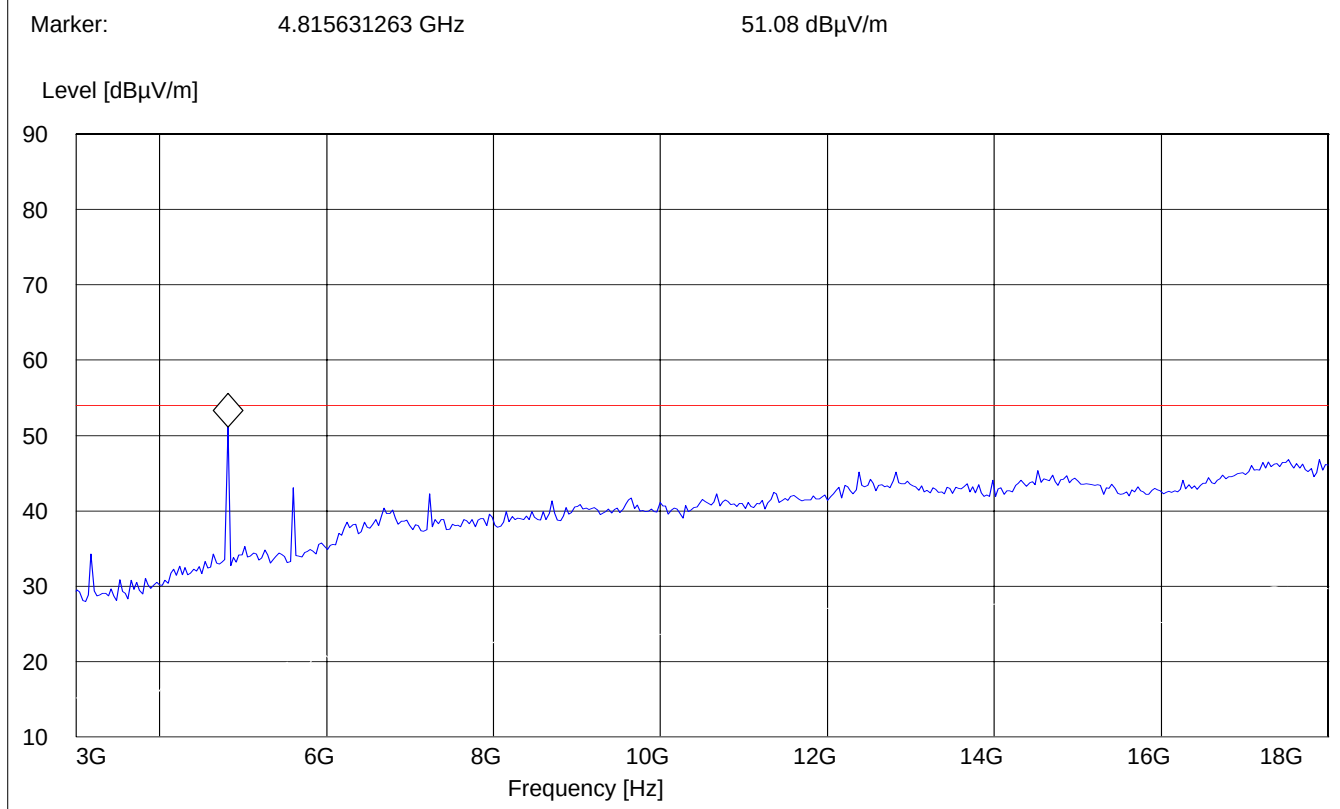
§ 15.247 (c) (1)

Lowest Channel (2412MHz): 3GHz – 18GHz

SWEEP TABLE:

Start	Stop	Detector	Meas.	RBW	VBW	Transducer
Frequency	Frequency	Time	Bandw.			
3.0 GHz	18.0 GHz	MaxPeak	Coupled	1 MHz	1MHz	#326 horn (dBi)

"Spuri hi 3-18G"



EMISSION LIMITATIONS - Radiated (Transmitter)

§ 15.247 (c) (1)

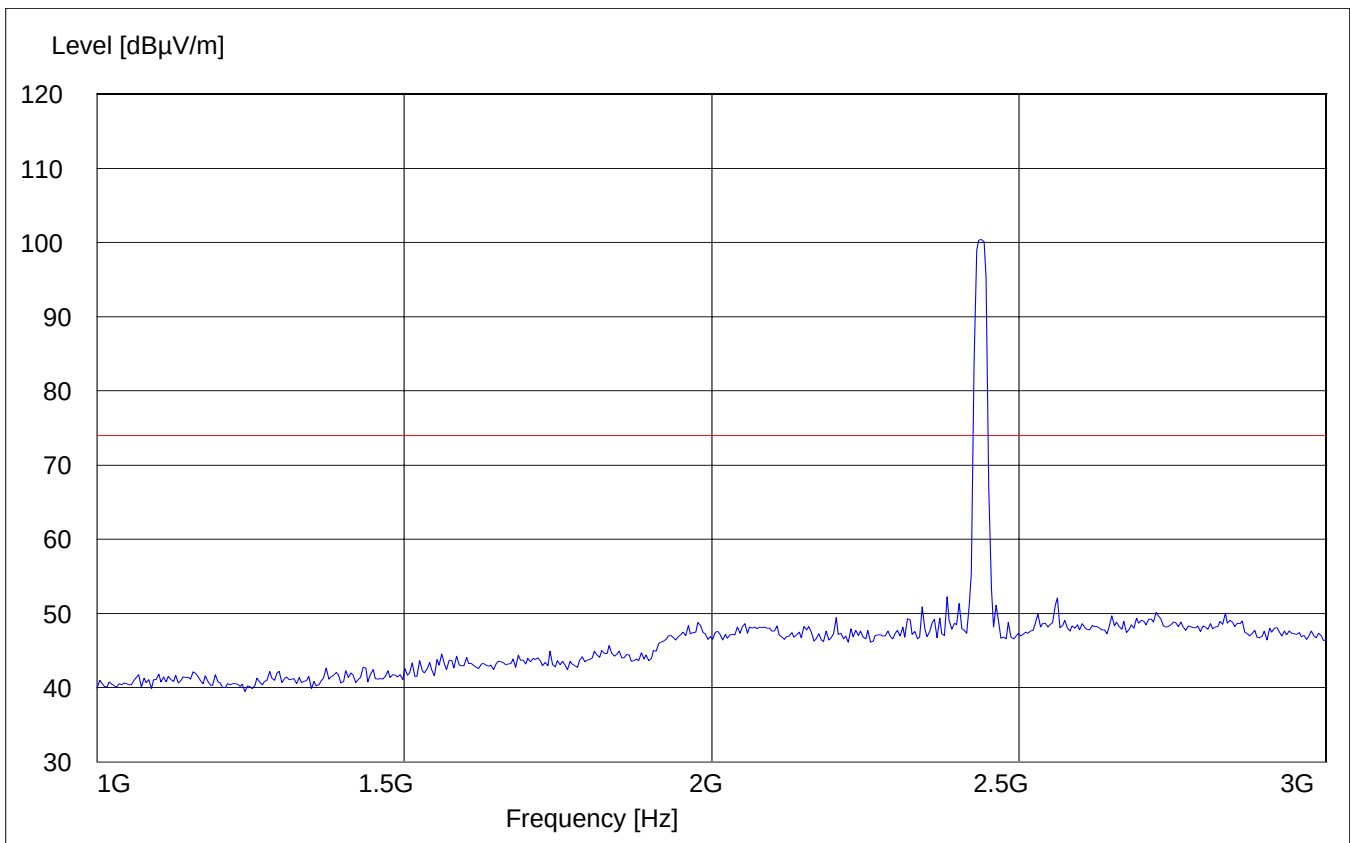
Mid Channel (2437MHz): 1GHz – 3GHz

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

SWEEP TABLE:

"Spuri hi 1-3G"

Start	Stop	Detector	Meas.	RBW	VBW	Transducer
Frequency	Frequency	Time	Bandw.			
1.0 GHz	3.0 GHz	MaxPeak	Coupled	1 MHz	1MHz	#326 horn (dBi)



EMISSION LIMITATIONS - Radiated (Transmitter)

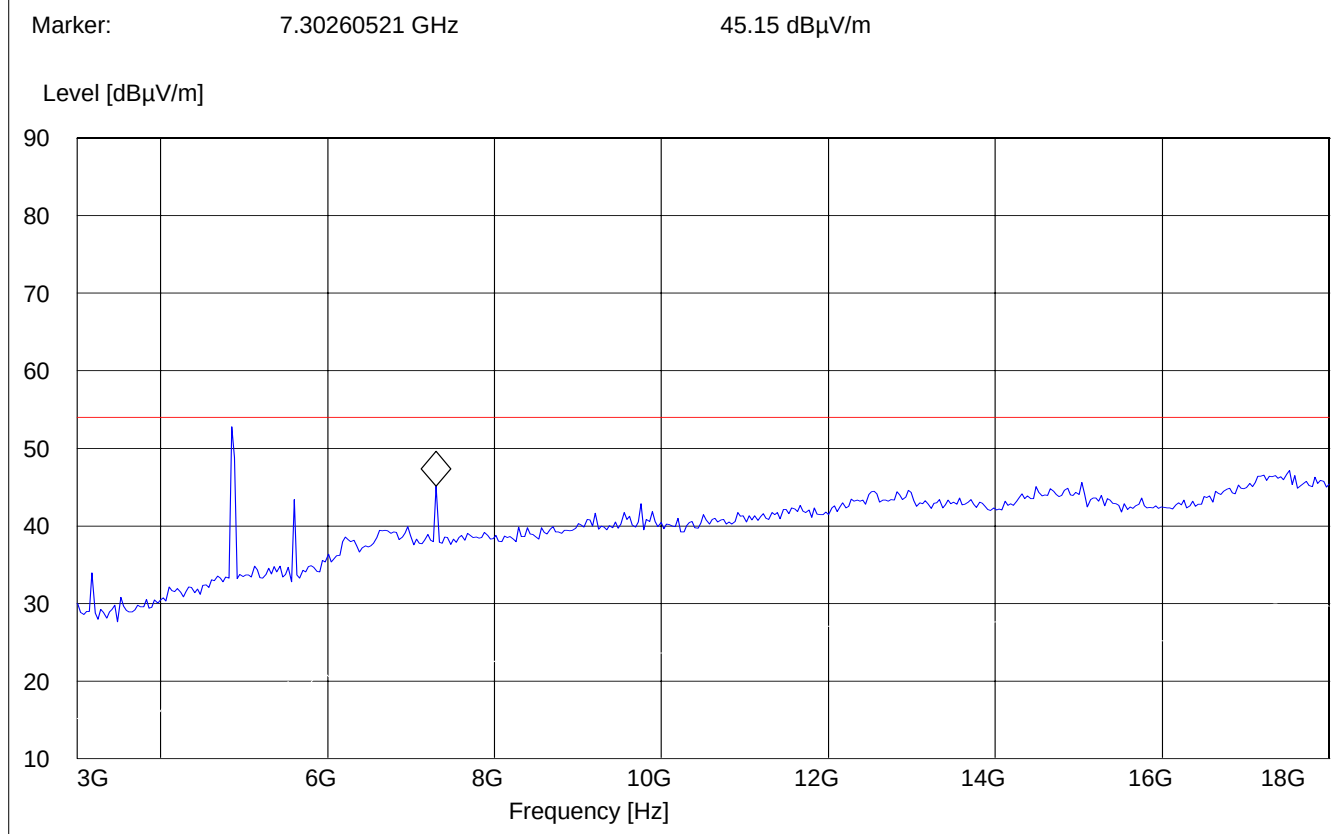
§ 15.247 (c) (1)

Mid Channel (2437MHz): 3GHz – 18GHz

SWEEP TABLE:

Start	Stop	Detector	Meas.	RBW	VBW	Transducer
Frequency	Frequency	Time	Bandw.			
3.0 GHz	18.0 GHz	MaxPeak	Coupled	1 MHz	1MHz	#326 horn (dBi)

"Spuri hi 3-18G"



EMISSION LIMITATIONS - Radiated (Transmitter)

§ 15.247 (c) (1)

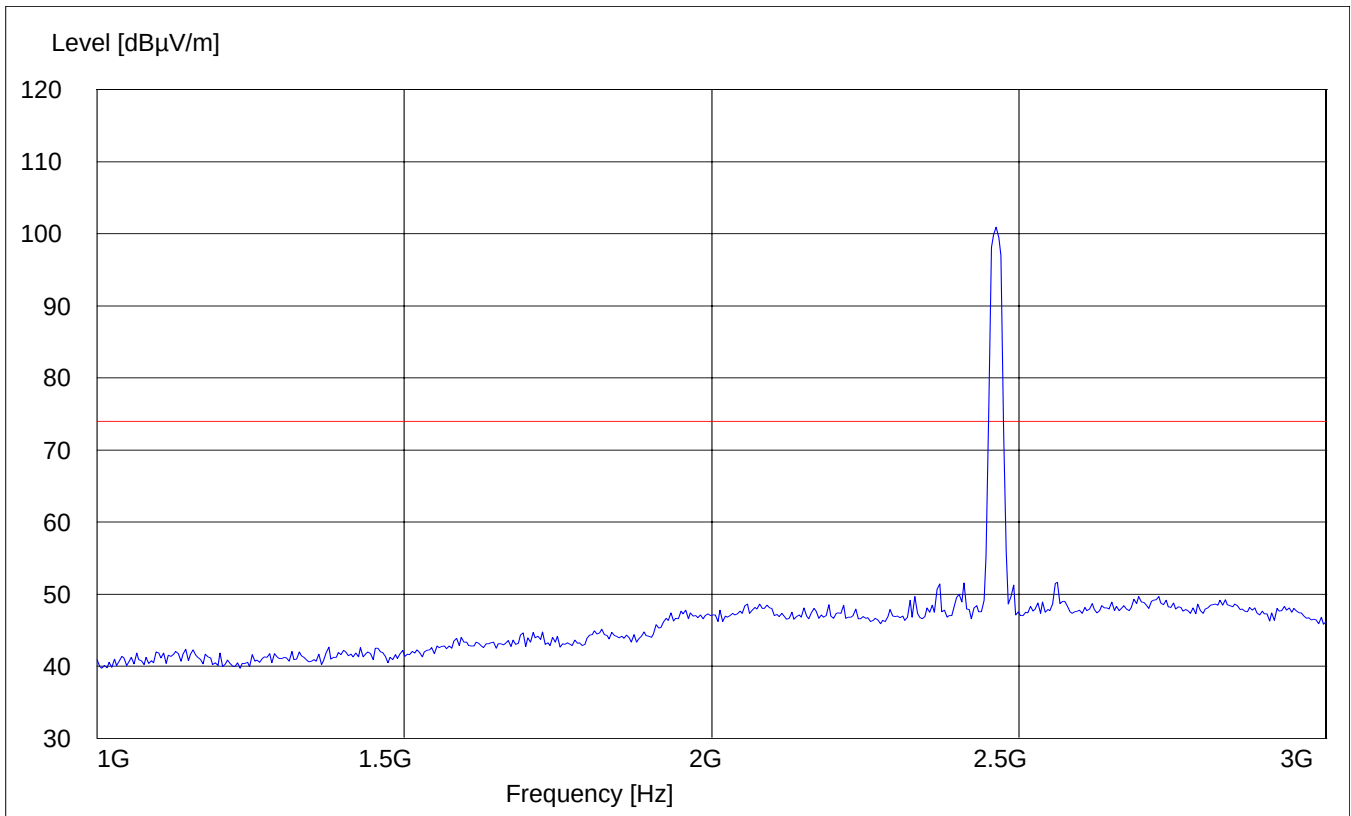
Highest Channel (2462MHz): 1GHz – 3GHz

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

SWEEP TABLE:

"Spuri hi 1-3G"

Start	Stop	Detector	Meas.	RBW	VBW	Transducer
Frequency	Frequency	Time	Bandw.			
1.0 GHz	3.0 GHz	MaxPeak	Coupled	1 MHz	1MHz	#326 horn (dBi)



EMISSION LIMITATIONS - Radiated (Transmitter)

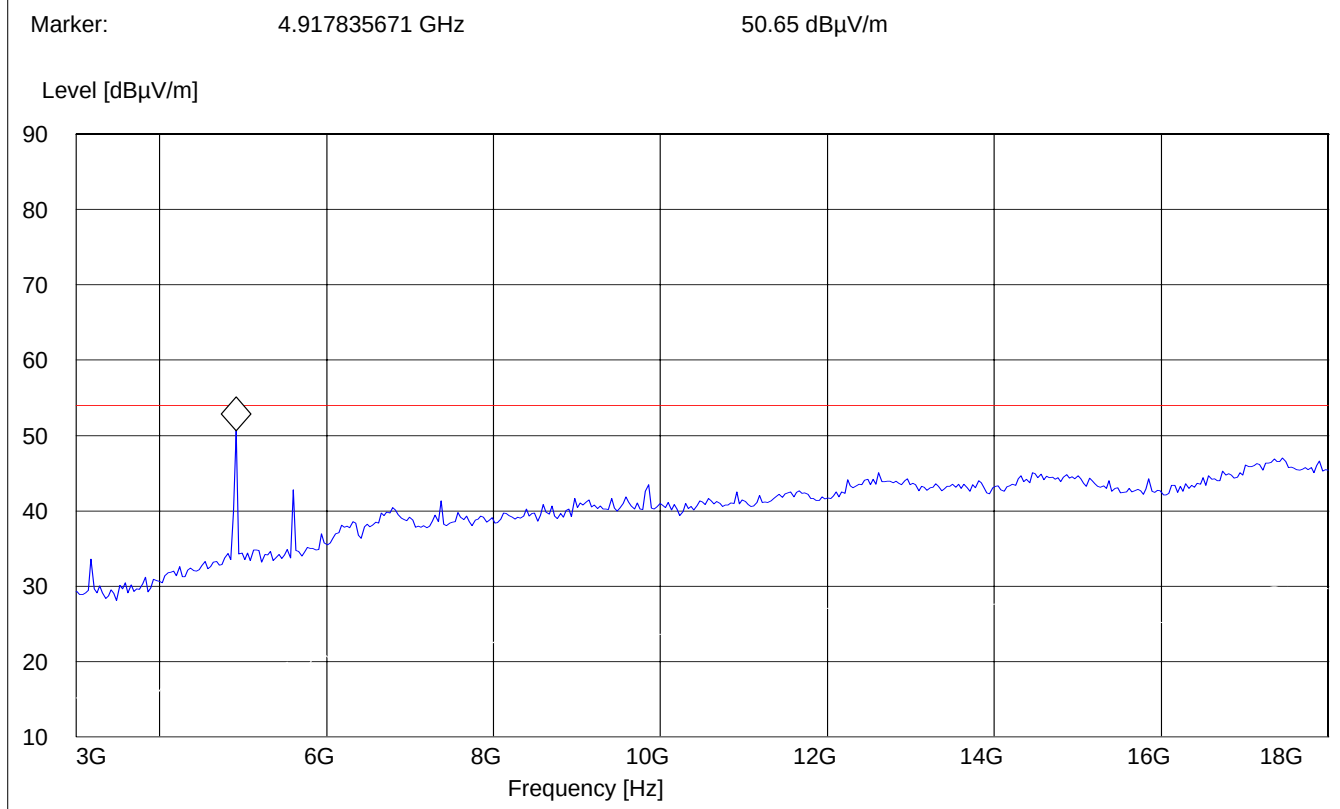
§ 15.247 (c) (1)

Highest Channel (2462MHz): 3GHz – 18GHz

SWEEP TABLE:

Start	Stop	Detector	Meas.	RBW	VBW	Transducer
Frequency	Frequency	Time	Bandw.			
3.0 GHz	18.0 GHz	MaxPeak	Coupled	1 MHz	1MHz	#326 horn (dBi)

"Spuri hi 3-18G"



EMISSION LIMITATIONS - Radiated (Transmitter)

§ 15.247 (c) (1)

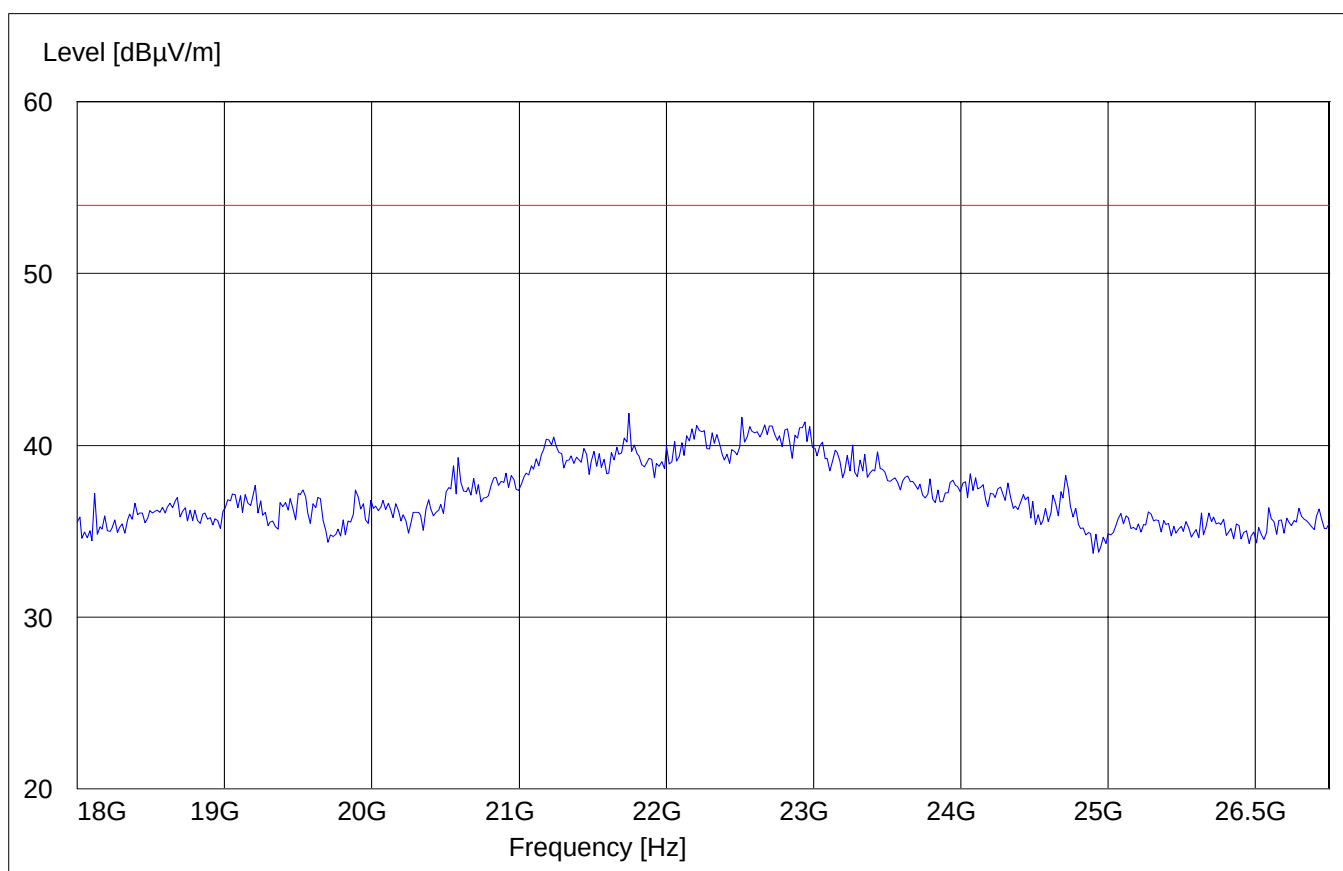
18GHz – 25GHz

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

SWEEP TABLE:

"Spuri hi 18-25G"

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)

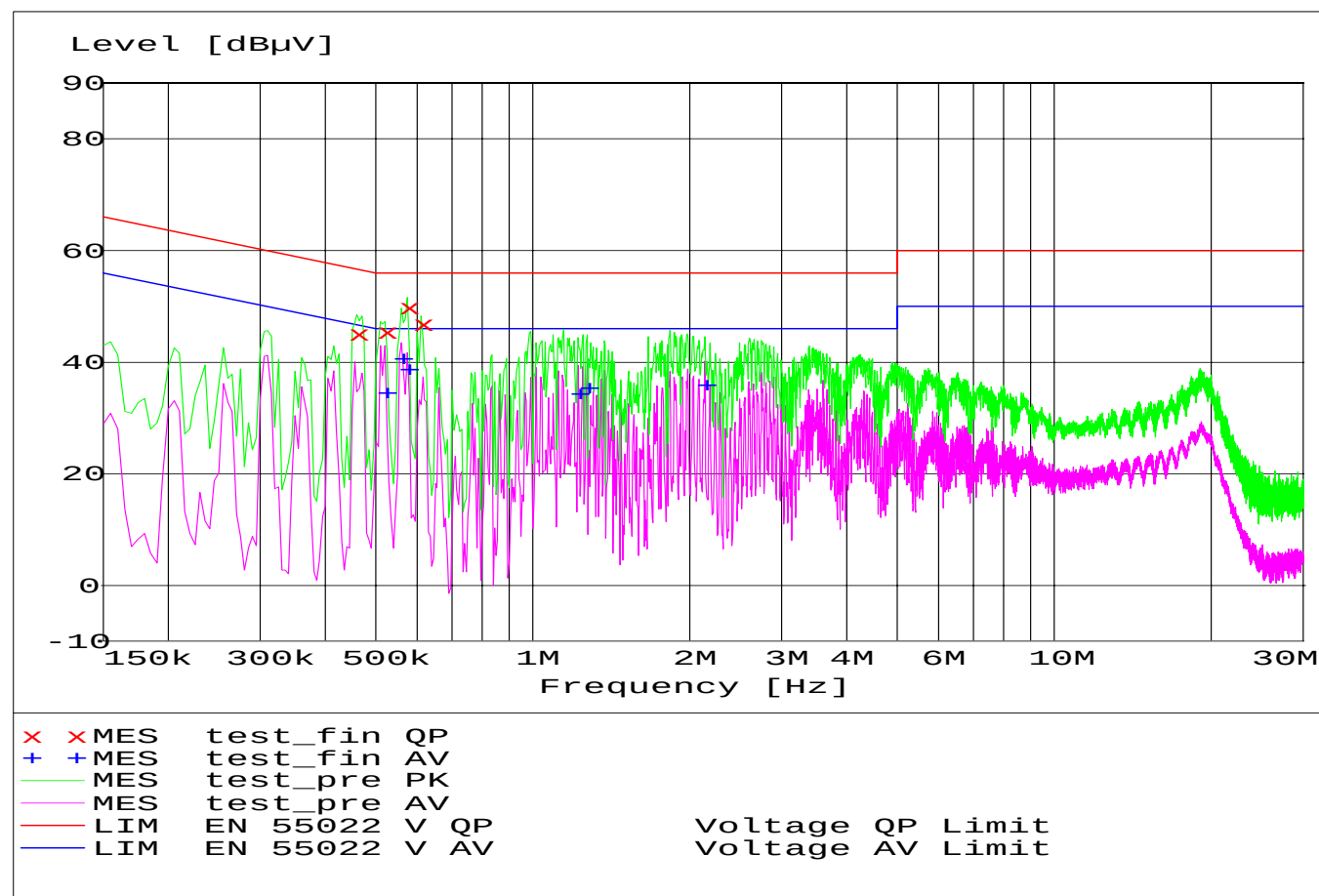
Limit

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
0.460000	45.00	0.0	57	11.7	N	GND
0.520000	45.40	0.0	56	10.6	L1	GND
0.575000	49.80	0.0	56	6.2	N	GND
0.610000	46.80	0.0	56	9.2	L1	GND

MEASUREMENT RESULT: "test_fin AV"

Frequency MHz	Level dBμV	Transd dB	Limit dBμV	Margin dB	Line	PE
0.520000	34.40	0.0	46	11.6	L1	GND
0.560000	40.50	0.0	46	5.5	L1	GND
0.575000	38.60	0.0	46	7.4	L1	GND
1.220000	34.20	0.0	46	11.8	N	GND
1.270000	35.20	0.0	46	10.8	L1	GND
2.135000	35.70	0.0	46	10.3	L1	GND

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 26.5 GHz very short cable connections to the antenna was used to minimize the noise level.

RECEIVER SPURIOUS RADIATION

§ 15.209

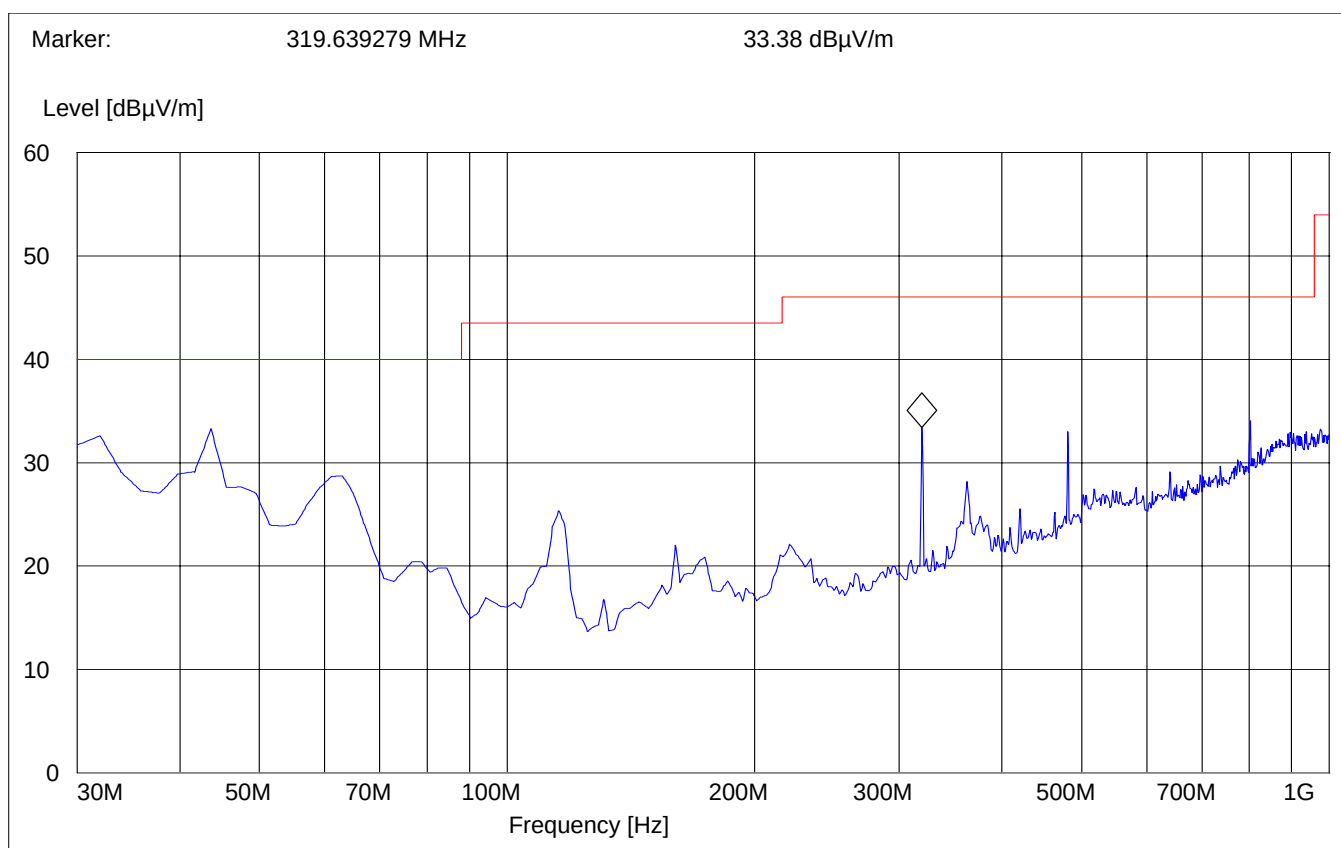
30MHz – 1GHz

Antenna: vertical

SWEEP TABLE:

"Spuri hi 30-1G"

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

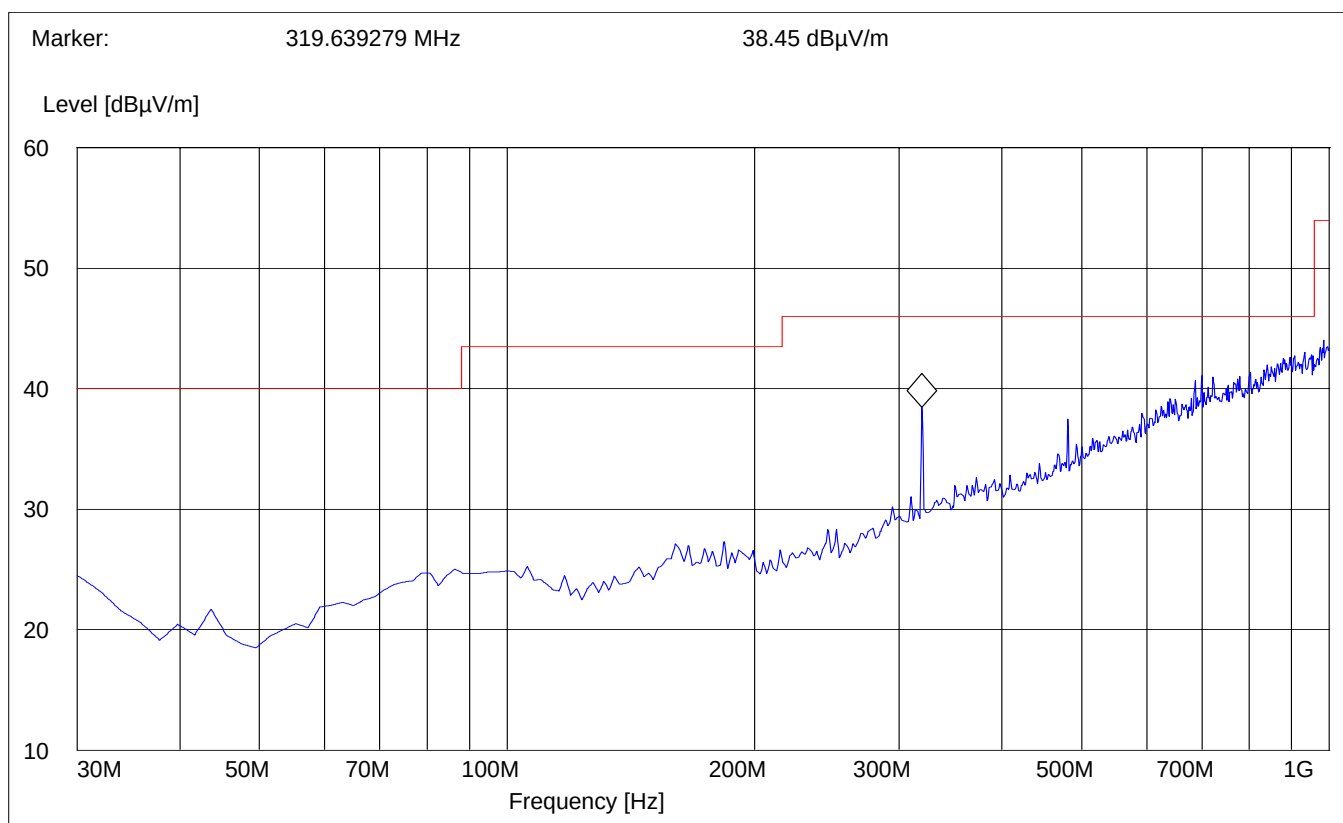
§ 15.209

30MHz – 1GHz

Antenna: horizontal

SWEEP TABLE:

Start		Stop		"Spuri hi 30-1G"	
Frequency	Frequency	Detector	Meas. Time	RBW	Transducer
30.0 MHz	1.0 GHz	MaxPeak	Coupled	100 kHz	3141-#1186

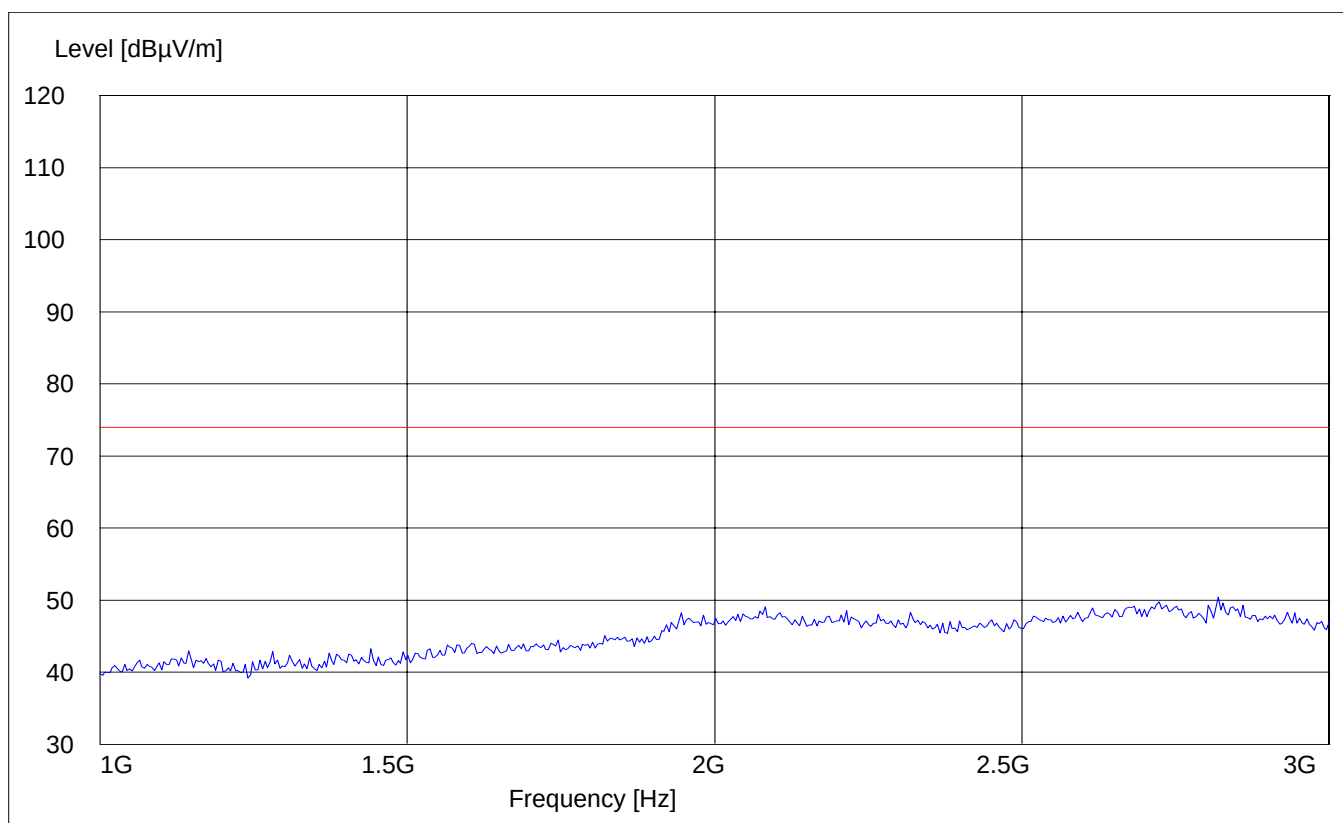


RECEIVER SPURIOUS RADIATION 1GHz – 3GHz

§ 15.209

SWEEP TABLE:

		"Spuri hi 1-3G"				
Start	Stop	Detector	Meas.	RBW	VBW	Transducer
Frequency	Frequency	Time	Bandw.			
1.0 GHz	3.0 GHz	MaxPeak	Coupled	1 MHz	1MHz	#326 horn (dBi)



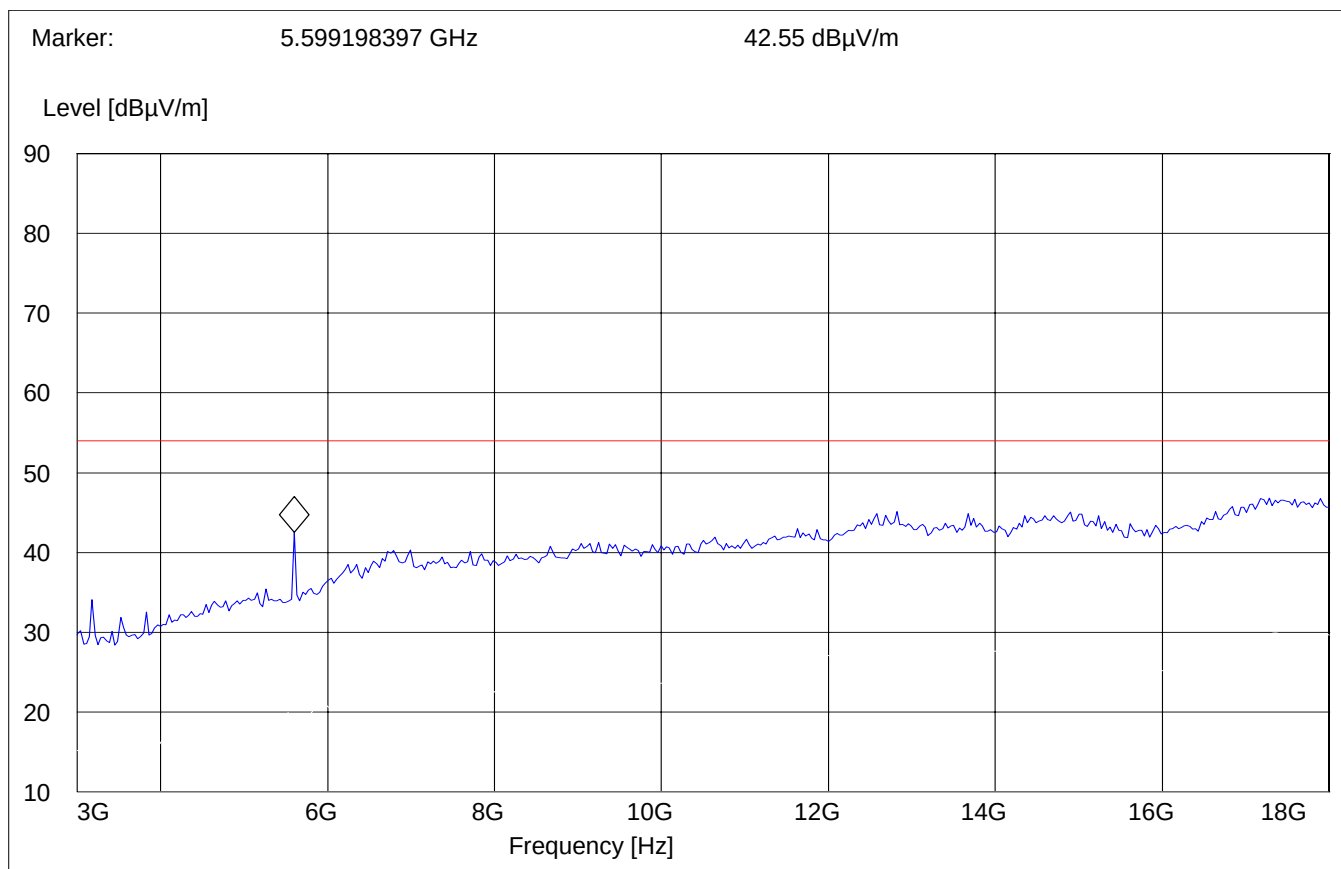
RECEIVER SPURIOUS RADIATION 3GHz – 18GHz

§ 15.209

SWEEP TABLE:

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

"Spuri hi 3-18G"



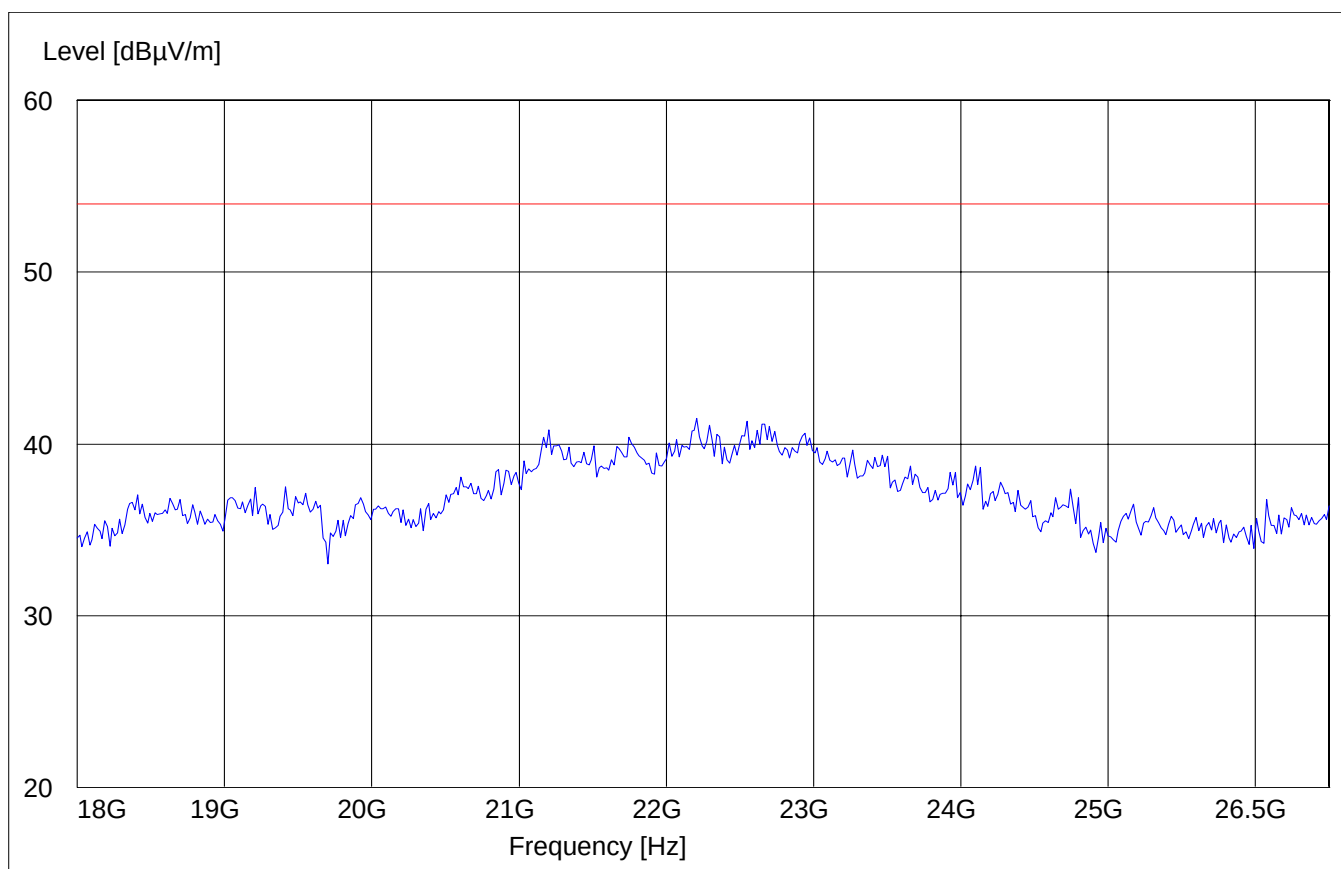
RECEIVER SPURIOUS RADIATION
18GHz – 26.5GHz

§ 15.209

SWEEP TABLE:

"Spuri hi 18-26.5G"

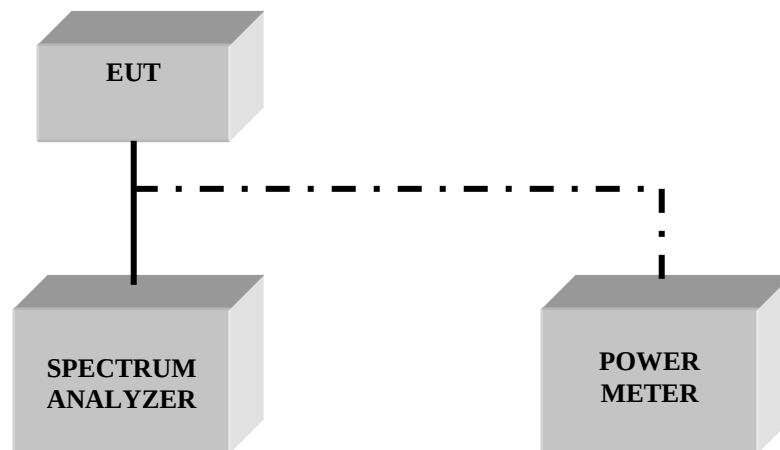
Start	Stop	Detector	Meas.	RBW	Transducer
Frequency	Frequency	Time	Bandw.	VBW	
18 GHz	26.5 GHz	MaxPeak	Coupled	1 MHz	#141 horn (dBi)



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	Power-Meter	NRVD	Rohde & Schwarz	0857.8008.02
08	Pre-Amplifier	TS-ANA	Rohde & Schwarz	--
09	Pre-Amplifier	JS4-00102600	Miteq	00616

BLOCK DIAGRAMS
Conducted Testing



Radiated Testing

