FCC Test Report

FCC Part 15.247 for FHSS systems/ CANADA RSS-210

FOR:

MODEL #: R8-Model 2, SPS880

TRIMBLE NAVIGATION LTD.,
935 STEWART DR.
P.O BOX 3642
SUNNYVALE, CA 94088-3642
U.S.A

FCC ID: Q23 31307 / 09EQ2426-SK
IC ID: 1756A-50158

TEST REPORT #: EMC_1098_2005_BLUETOOTH
DATE: DECEMBER 05, 2005

Deutscher Akkreditierungs Rat DAR

TTI-P-G 081/94-A0

Accredited according to **ISO/IEC 17025**

Bluetooth™

Bluetooth Qualification Test Facility (BQTF)

CTIA Authorized Test Lab
LAB CODE 20020328-00

FCC listed # 101450

IC recognized # 3925

***CETECOM* Inc.**
411 Dixon Landing Road ◆ Milpitas, CA 95035 ◆ U.S.A.
Phone: + 1 (408) 586 6200 ◆ Fax: + 1 (408) 586 6299 ◆ E-mail: info@cetecomusa.com ◆ http://www.cetecom.com
CETECOM Inc. is a Delaware Corporation with Corporation number: 2113686
Board of Directors: Dr. Harald Ansorge, Dr. Klaus Matkey, Hans Peter May

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1 Assessment

The following is in compliance with the applicable criteria specified in FCC rules Part 15.247 of the Code of Federal Regulations and in compliance with the applicable criteria specified in Industry Canada rules RSS210.

Company	Description	Model #
TRIMBLE NAVIGATION LTD	**GPS RECEIVER WITH BLUETOOTH DEVICE AND CELLULAR MOBILE GSM (824-849MHz) PCS DEVICE (2GHz) RECEIVER**	**R8-MODEL 2, SPS880**

2005-12-05
Neelesh Raj
Project Leader

2005-12-05
Lothar Schmidt
Test Lab Manager

2 Administrative Data

2.1 Identification of the Testing Laboratory Issuing the EMC Test Report

Company Name:	CETECOM Inc.
Department:	EMC
Address:	411 Dixon Landing Road Milpitas, CA 95035 U.S.A.
Telephone:	+1 (408) 586 6200
Fax:	+1 (408) 586 6299
Responsible Test Lab Manager:	Lothar Schmidt
Responsible Project Leader:	Neelesh Raj
Date of test:	2005-11-22 to 2005-12-02

2.2 Identification of the Client

Applicant's Name:	**Trimble Navigation Ltd**
Street Address:	**935 Stewart Dr.** **P.O. Box 3642**
City/Zip Code	**Sunnyvale 94088-3642**
Country	**USA**
Contact Person:	**Roy Urbach**
Phone No.	**408-481-8667**
Fax:	**408-481-7866**
e-mail:	**roy_urbach@trimble.com**

2.3 Identification of the Manufacturer

Manufacturer's Name:	**Trimble Navigation Ltd**
Manufacturers Address:	**935 Stewart Dr.** **P.O. Box 3642**
City/Zip Code	**Sunnyvale 94088-3642**
Country	**USA**

3 Equipment under Test (EUT)

3.1 Identification of the Equipment under Test

Marketing Name:	**R8-MODEL 2, SPS880**
Description:	**GPS Receiver with Bluetooth Device and Cellular Mobile GSM (824-849 MHz) PCS Device (2 GHz) Receiver**
Model No:	**R8-MODEL 2, SPS880**
FCC ID:	**Q23 31307 / 09EQ2426-SK**
IC ID:	**1756A-50158**
Frequency Range:	**2400-2483.5MHz**
Type(s) of Modulation:	**GFSK**
Number of Channels:	**79**
Antenna Type:	**INTERNAL**
Output Power:	**0.0019W CONDUCTED @ 2480MHz**

4 Subject Of Investigation

FCC:

FCC ID#: JUP-50158-R8, applies to previous R8 with different BT module. This ID isn't being permissive changed, but will be replaced on the label with the BT module ID (Q23 31307) and the GPRS module ID (O9EQ2426-SK).

INDUSTRY CANADA:

We are requesting a permissive change to 1756A-50158, which currently is based on the previous version of the R8 (has different digital and GPS electronics) with a different BT module, but with the same GPRS module. We will continue to ship both the existing R8 and the new R8-Model 2 (also called SPS880), all with the same IC ID: 1756A-50158.

SUMMARY:

This report contains Full testing on the Bluetooth Module (testing was performed on a stand-alone module in a testjig) as per FCC rules Part 15.247 of Title 47 of the Code of Federal Regulations and Industry Canada rules RSS210.

This report also contains tests that were performed on the R8-Model 2, SPS880 with the new Bluetooth Module, new CPU (MPC5200 CPU), and a second Maxwell V ASIC (GPS processing chip).

The following tests were performed on the R8-Model 2, SPS880:

- 30MHz – 25GHz RADIATED TRANSMITTER EMISSIONS as per FCC15.247 and RSS210 (Co-Location with Bluetooth and GPRS transmitting simultaneously)
- 30MHz – 25GHz RADIATED RECEIVER EMISSIONS as per RSS210 (with R8-Model 2, SPS880 in receive mode)
- 150KHz-30MHz AC POWERLINE CONDUCTED EMISSIONS as per FCC15.247 and RSS210 (Co-Location with Bluetooth and GPRS transmitting simultaneously)

The objective of the measurements done by Cetecom Inc. was to measure the performance of the EUT as specified by requirements listed in FCC rules Part 15.247 of Title 47 of the Code of Federal Regulations and Industry Canada rules RSS210.

5 Measurements For Bluetooth Module

5.1 MAXIMUM PEAK OUTPUT POWER § 15.247 (RADIATED)

5.1.1 LIMIT SUB CLAUSE § 15.247 (b) (1) (2) (3) (4)

Frequency range	RF power output
2400-2483.5 MHz	36dBm EIRP

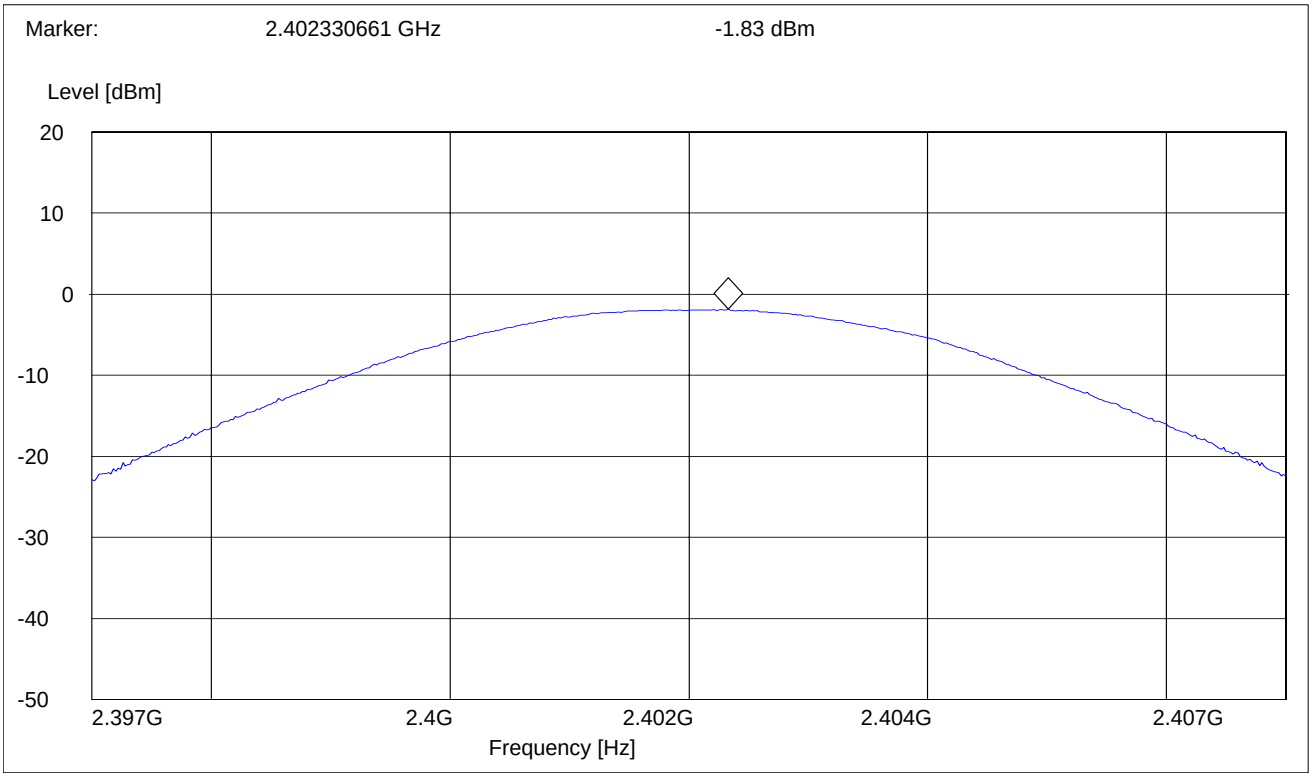
***limit is based upon antenna gain of less than or equal to 6dBi.**

5.1.2 RESULTS:

TEST CONDITIONS		MAXIMUM PEAK OUTPUT POWER (dBm)		
Frequency (MHz)		2402 MHz	2441 MHz	2480 MHz
T_{nom}(23)°C	V_{nom}VDC	-1.83	-2.23	-2.35
Measurement uncertainty		±0.5dBm		

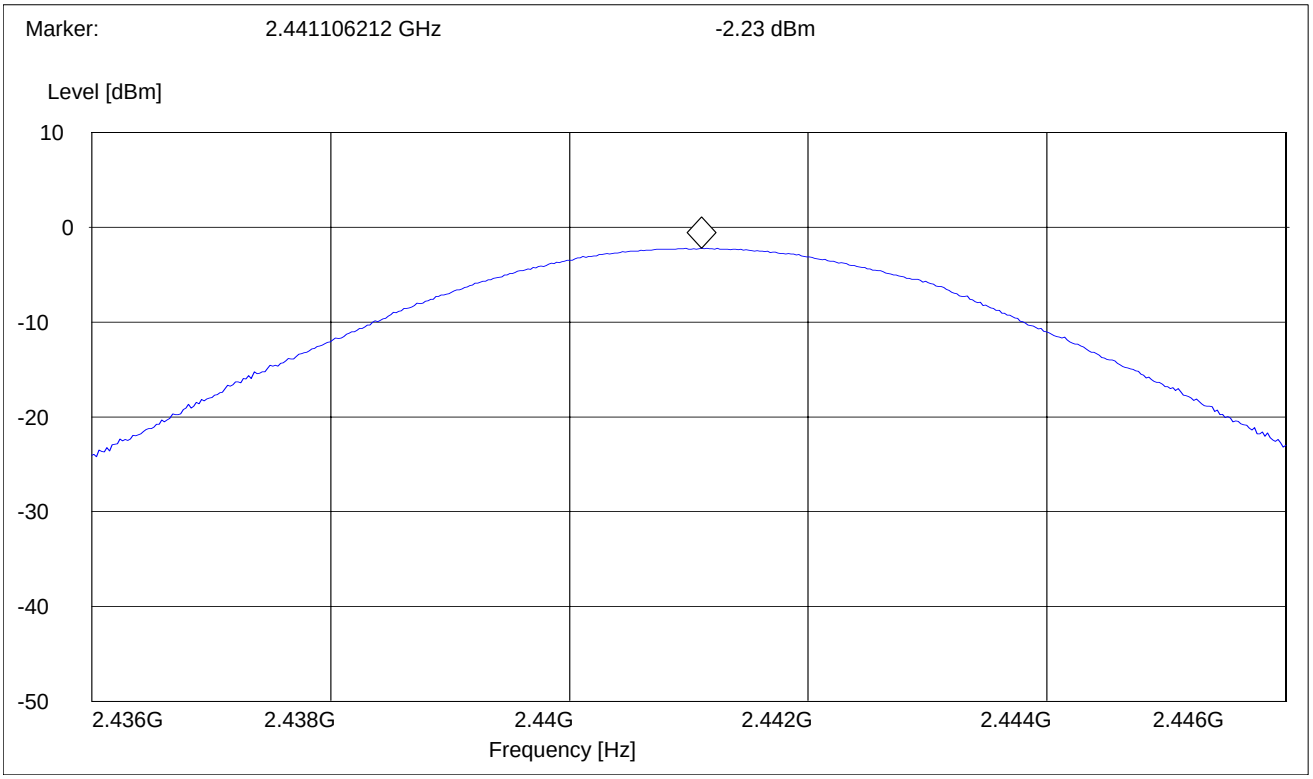
EIRP (2402 MHz)

Start Frequency	Stop Frequency	Detector	Meas. Time	IF BW
2397 MHz	2407 MHz	Max Peak	Coupled	3 MHz



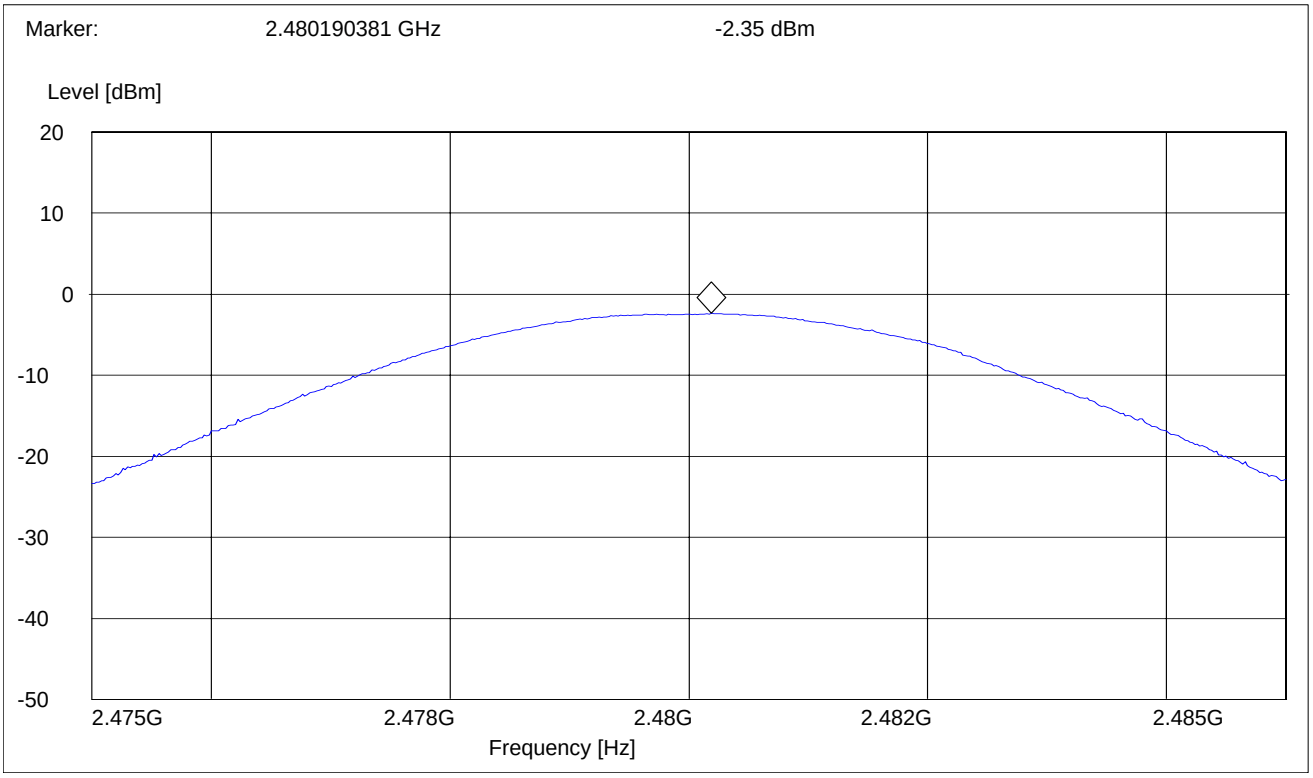
EIRP (2441 MHz)

Start Frequency	Stop Frequency	Detector	Meas. Time	IF BW
2436 MHz	2446 MHz	Max Peak	Coupled	3 MHz



EIRP (2480 MHz)

Start Frequency	Stop Frequency	Detector	Meas. Time	IF BW
2475 MHz	2478 MHz	Max Peak	Coupled	3 MHz



5.2 MAXIMUM PEAK OUTPUT POWER § 15.247 (CONDUCTED)

5.2.1 LIMIT SUB CLAUSE § 15.247 (b) (1)

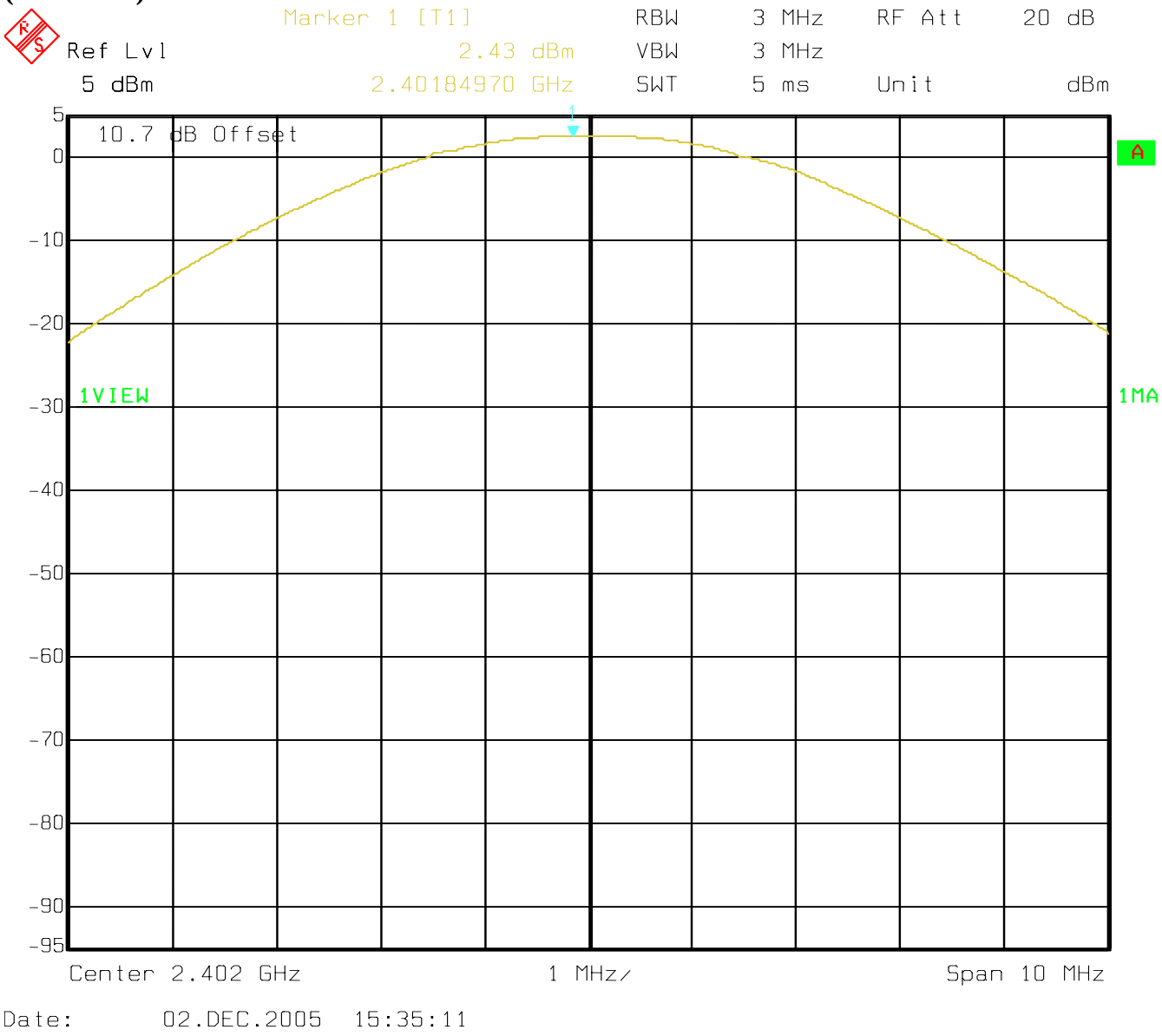
Frequency range	RF power output
2400-2483.5 MHz	30dBm

***limit is based upon antenna gain of less than or equal to 6dBi.**

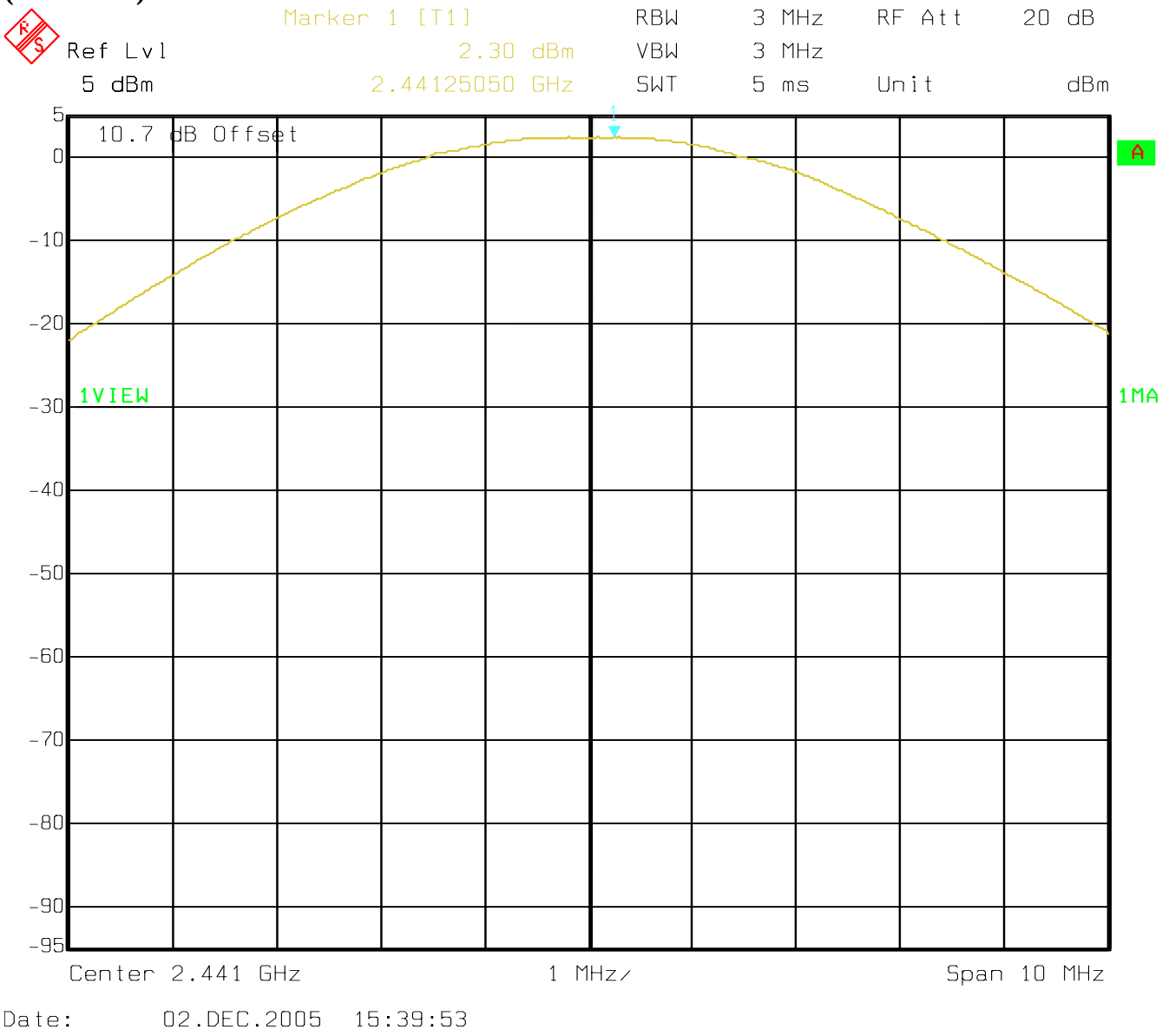
5.2.2 RESULTS:

TEST CONDITIONS		MAXIMUM PEAK OUTPUT POWER (dBm)		
Frequency (MHz)		2402 MHz	2441 MHz	2480 MHz
T_{nom}(23)°C	V_{nom}VDC	2.43	2.30	2.81

(2402 MHz)


Marker 1 [T1]
2.43 dBm
2.40184970 GHz
RBW 3 MHz
VBW 3 MHz
SWT 5 ms
RF Att 20 dB
Unit dBm
Ref Lvl
5 dBm
10.7 dB Offset
1VIEW
1MA
A
5
0
-10
-20
-30
-40
-50
-60
-70
-80
-90
-95
Center 2.402 GHz
1 MHz/
Span 10 MHz
Date: 02.DEC.2005 15:35:11

(2441 MHz)


Marker 1 [T1]
2.30 dBm
2.44125050 GHz
RBW 3 MHz
VBW 3 MHz
SWT 5 ms
RF Att 20 dB
Unit dBm
Ref Lvl
5 dBm
10.7 dB Offset
1VIEW
1MA
A
5
0
-10
-20
-30
-40
-50
-60
-70
-80
-90
-95
Center 2.441 GHz
1 MHz/
Span 10 MHz
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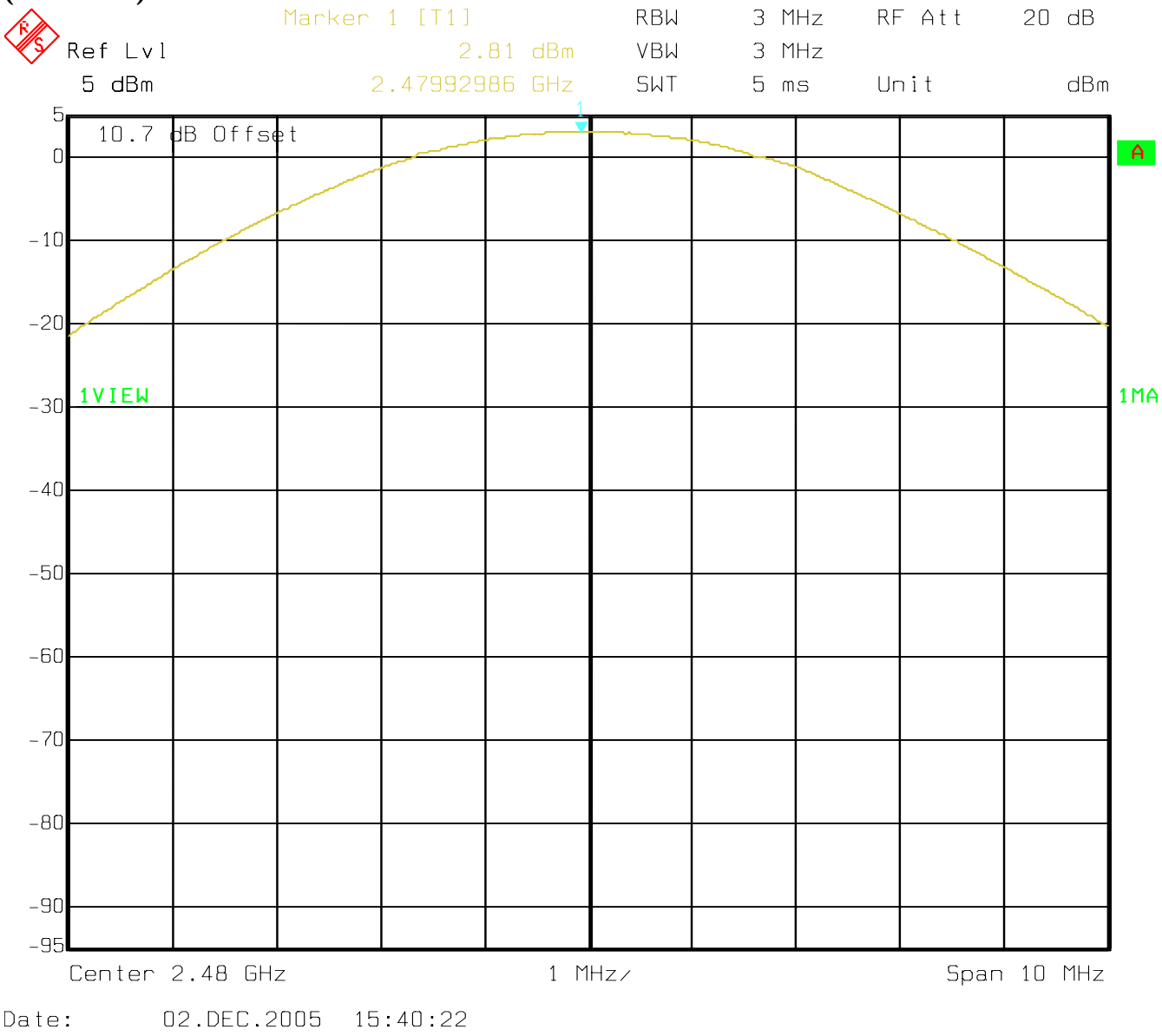
(2480 MHz)


Marker 1 [T1]
2.81 dBm
2.47992986 GHz
RBW 3 MHz
VBW 3 MHz
SWT 5 ms
RF Att 20 dB
Unit dBm
Ref Lvl
5 dBm
10.7 dB Offset
1VIEW
1MA
A
5
0
-10
-20
-30
-40
-50
-60
-70
-80
-90
-95
Center 2.48 GHz
1 MHz/
Span 10 MHz
Date: 02.DEC.2005 15:40:22

5.3 20dB BANDWIDTH

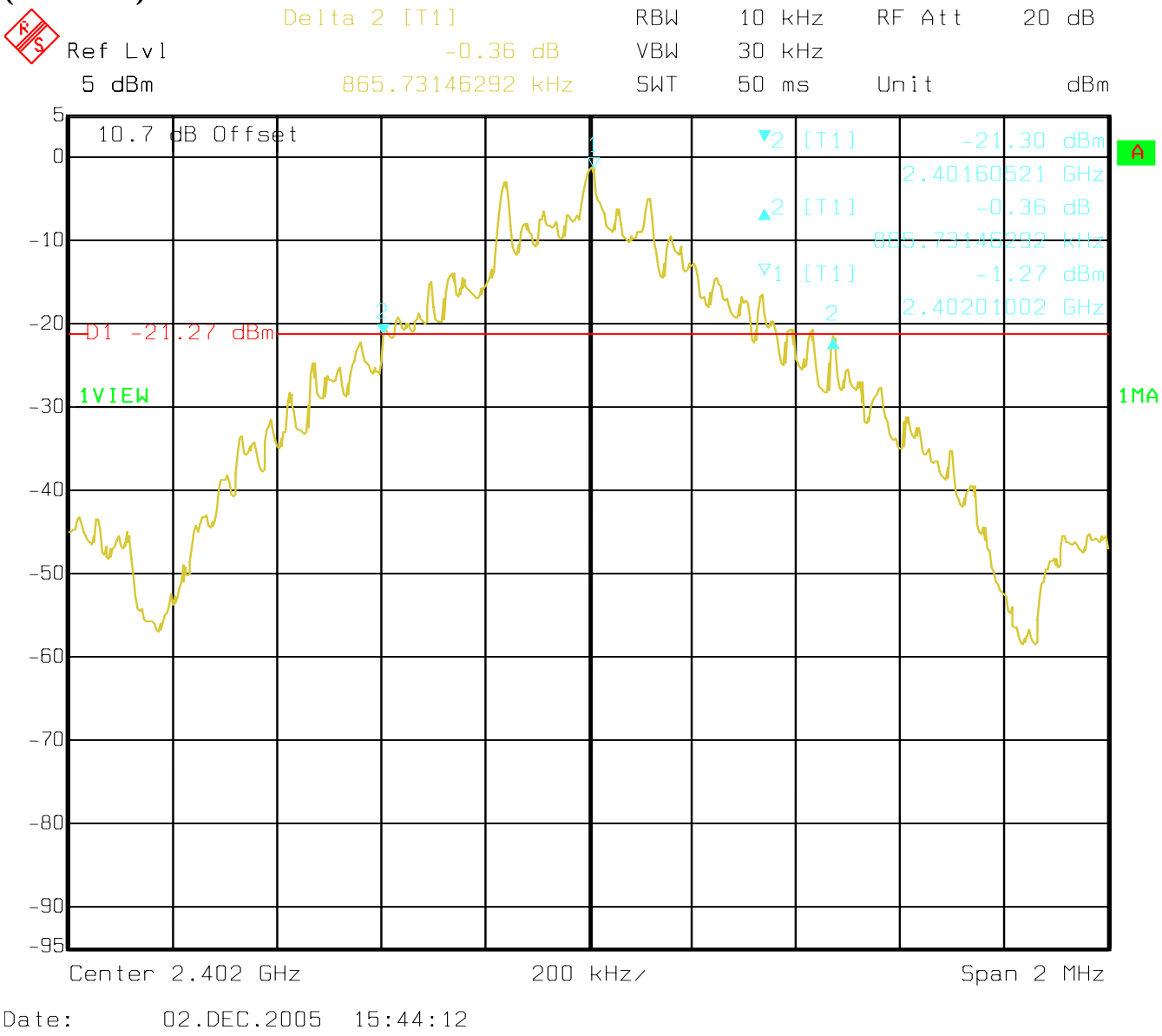
5.3.1 LIMIT SUB CLAUSE § 15.247 (a) (1) (i) (ii) (iii)

NUMBER OF CHANNELS	BANDWIDTH
79	<1MHz

5.3.2 RESULTS:

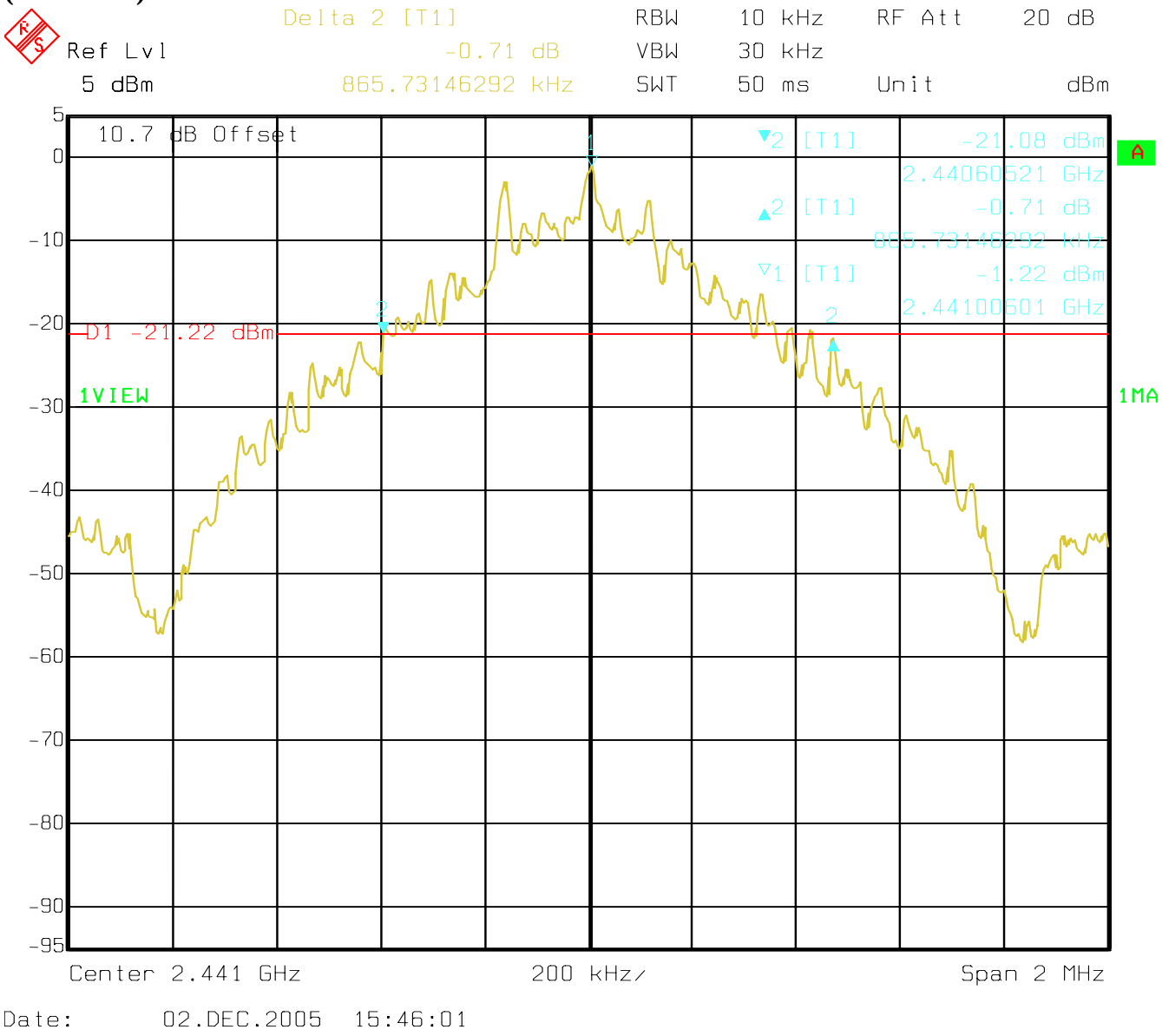
TEST CONDITIONS		BANDWIDTH (KHz)		
Frequency (MHz)		2402 MHz	2441 MHz	2480 MHz
T_{nom}(23)°C	V_{nom}VDC	865.73	865.73	865.73

(2402 MHz)



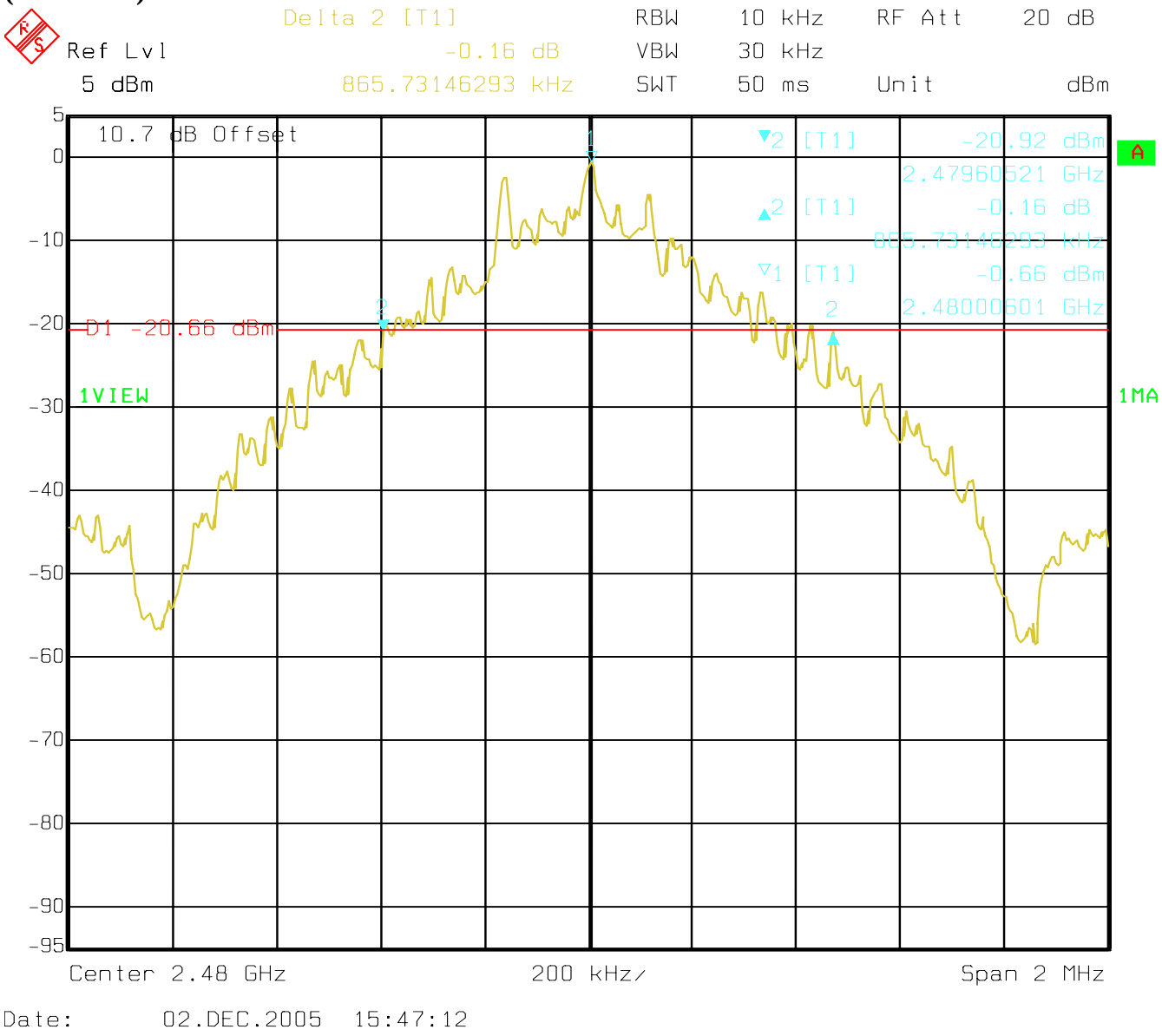
Date: 02.DEC.2005 15:44:12

(2441 MHz)



Date: 02.DEC.2005 15:46:01

(2480 MHz)


Delta 2 [T1]
-0.16 dB
865.73146293 kHz
RBW 10 kHz
VBW 30 kHz
SWT 50 ms
RF Att 20 dB
Unit dBm
Ref Lvl
5 dBm
10.7 dB Offset
▼2 [T1] -20.92 dBm
2.47960621 GHz
▲2 [T1] -0.16 dB
865.73146293 kHz
▽1 [T1] -0.66 dBm
2.48000601 GHz
D1 -20.66 dBm
1VIEW
1MA
A
5
0
-10
-20
-30
-40
-50
-60
-70
-80
-90
-95
Center 2.48 GHz
200 kHz/
Span 2 MHz
Date: 02.DEC.2005 15:47:12

5.4 CARRIER FREQUENCY SEPARATION

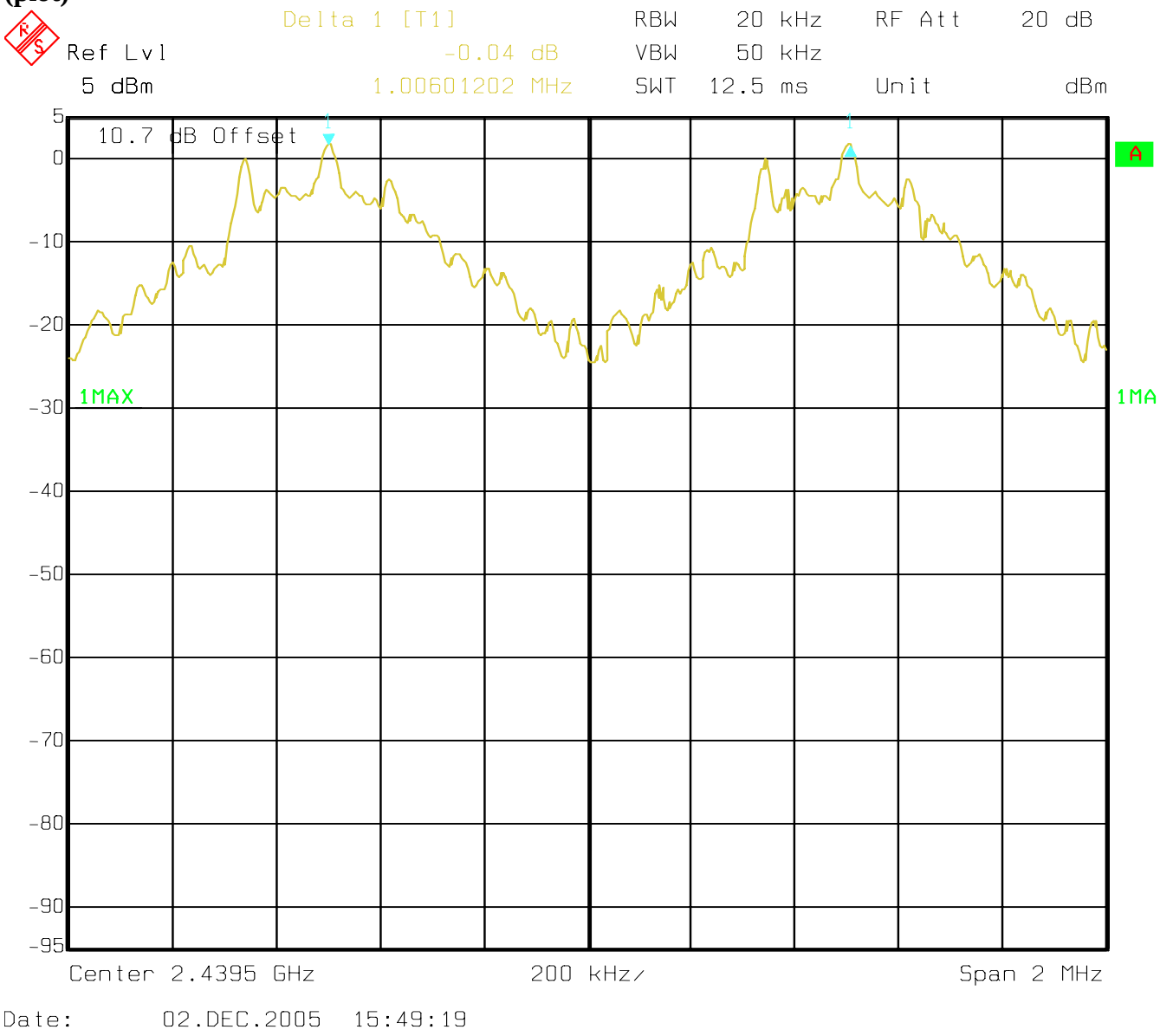
5.4.1 LIMIT SUB CLAUSE § 15.247 (a) (1) (i) (ii) (iii)

SEPARATION
> 25 KHz or > 20 dB BANDWIDTH

5.4.2 RESULTS:

TEST CONDITIONS		SEPARATION (MHz)
T_{nom}(23)°C	V_{nom}VDC	1.006

(plot)


Delta 1 [T1]
-0.04 dB
1.00601202 MHz
RBW 20 kHz
VBW 50 kHz
SWT 12.5 ms
RF Att 20 dB
Unit dBm
Ref Lvl
5 dBm
10.7 dB Offset
1MAX
1MA
A
5
0
-10
-20
-30
-40
-50
-60
-70
-80
-90
-95
Center 2.4395 GHz
200 kHz/
Span 2 MHz
Date: 02.DEC.2005 15:49:19

5.5 NUMBER OF HOPPING CHANNELS

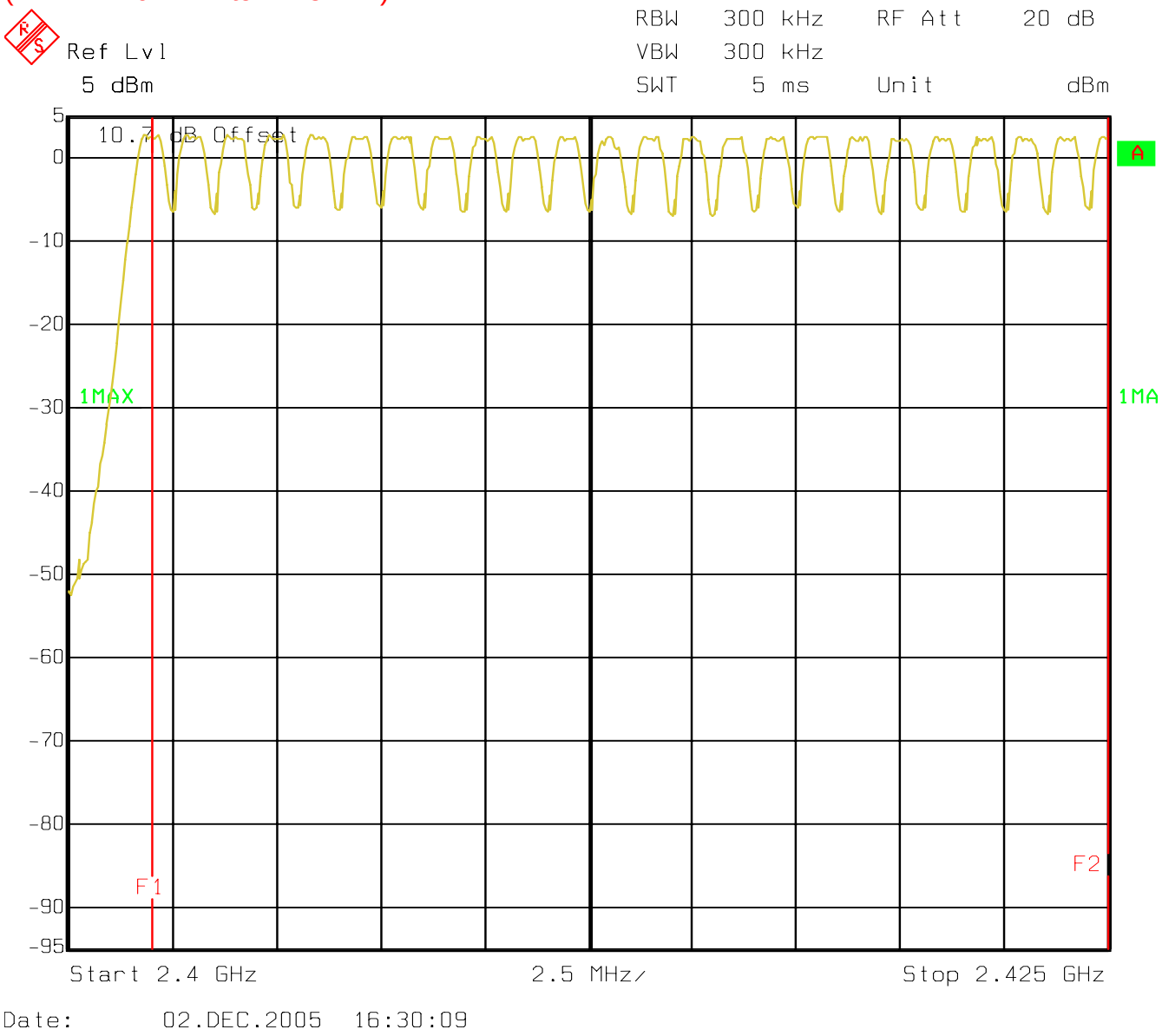
5.5.1 LIMIT SUB CLAUSE § 15.247 (a) (1) (iii)

NUMBER OF CHANNELS
> 15

5.5.2 RESULTS:

TEST CONDITIONS		NUMBER OF CHANNELS
T_{nom}(23)°C	**V_{nom}VDC**	**79**

(PLOT 1)
(F1-F2=2402MHz to 2425MHz)



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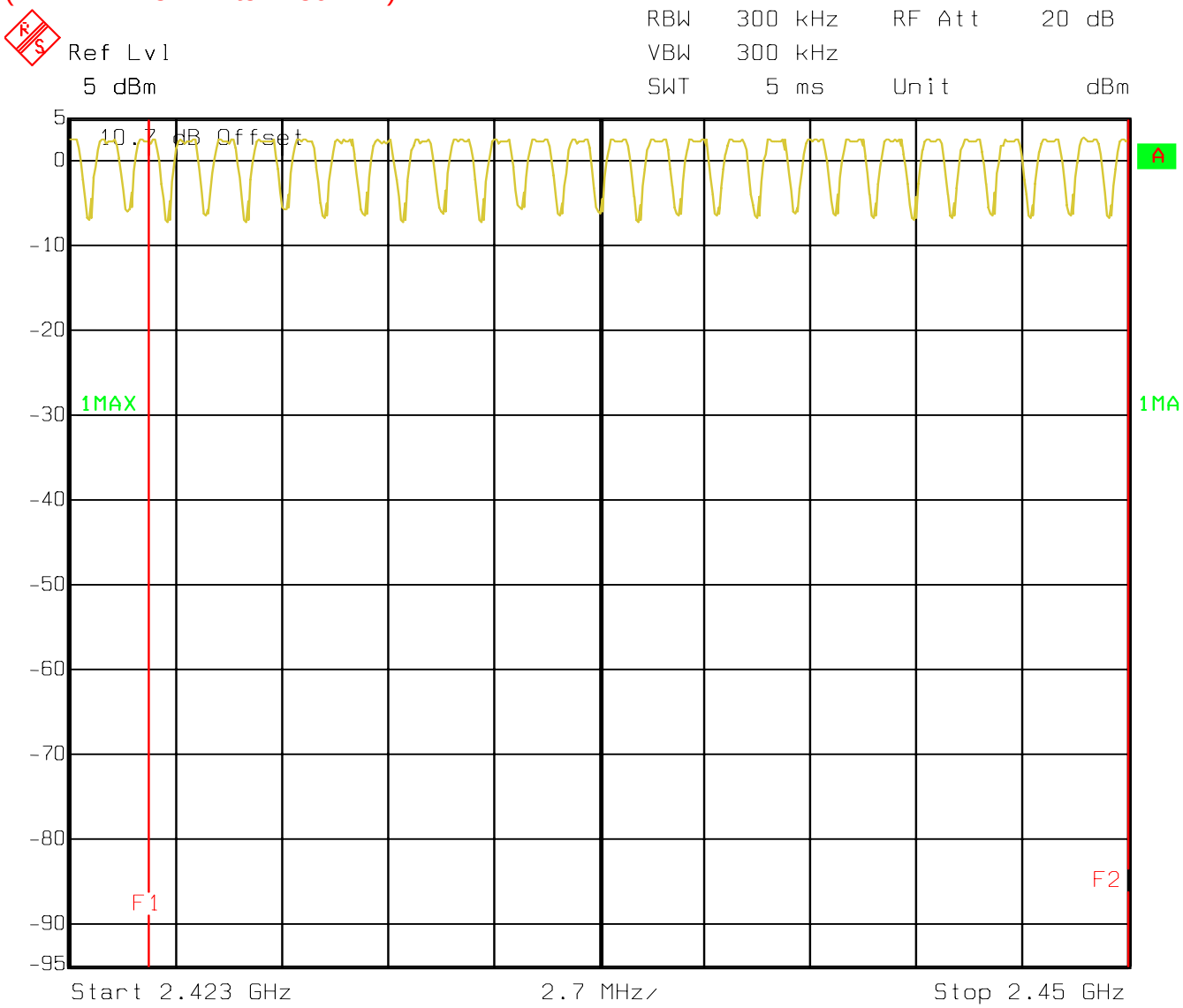
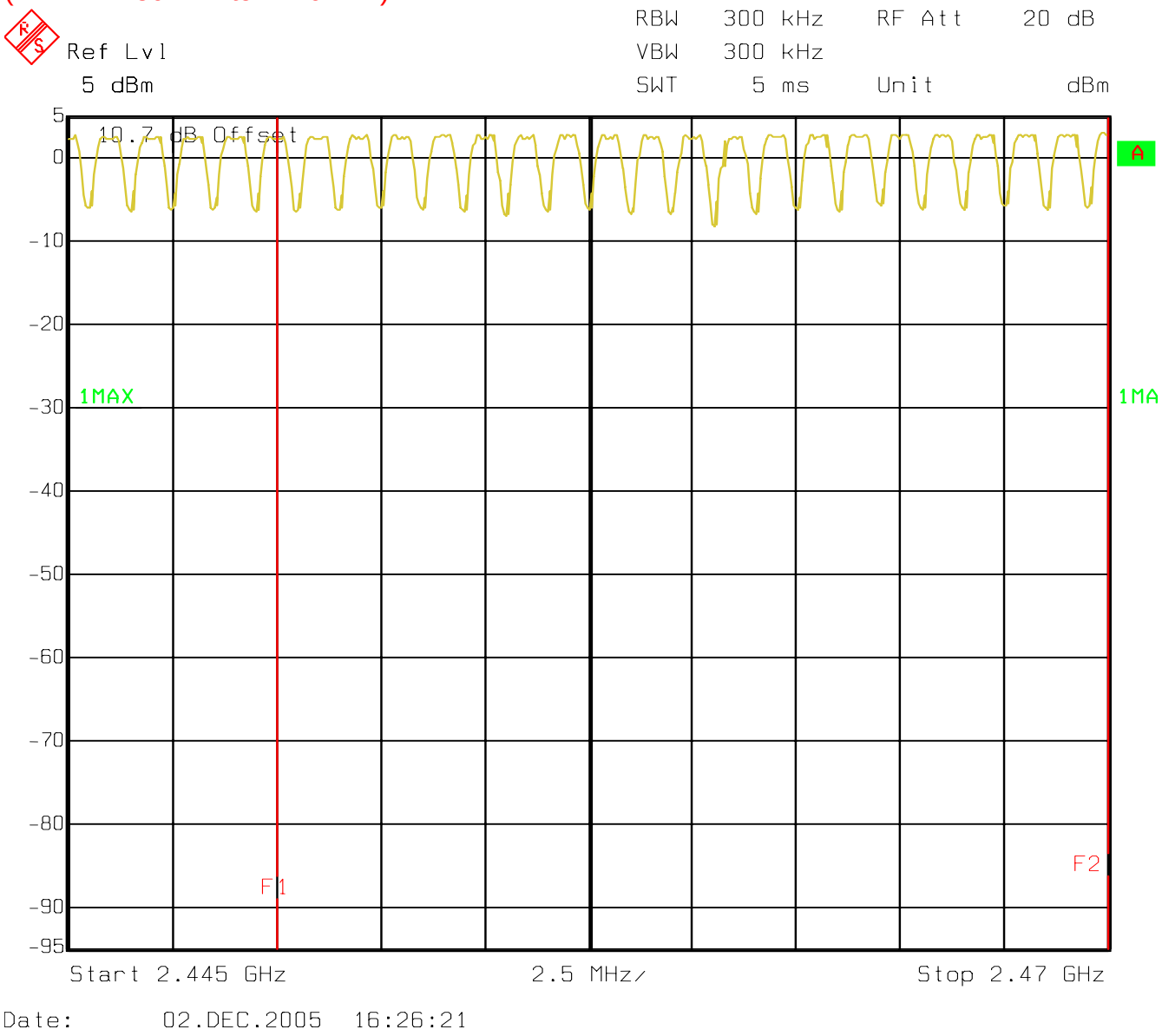
(PLOT 2)
(F1-F2=2425MHz to 2450MHz)



Date: 02.DEC.2005 16:25:20

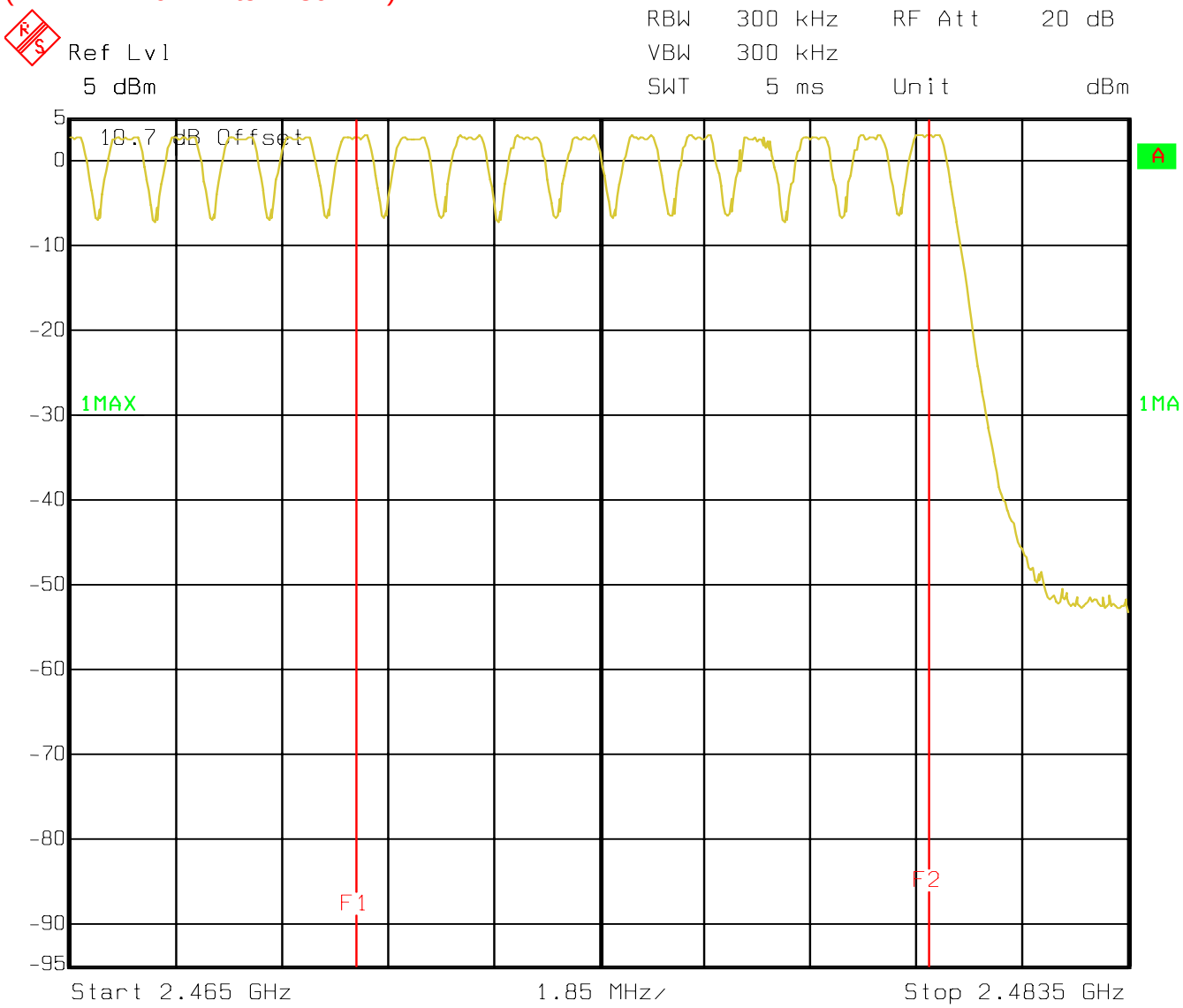
(PLOT 3)
(F1-F2=2450MHz to 2470MHz)



Date: 02.DEC.2005 16:26:21

(PLOT 4)

(F1-F2=2470MHz to 2480MHz)



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5.6 TIME OF OCCUPANCY (DWELL TIME)

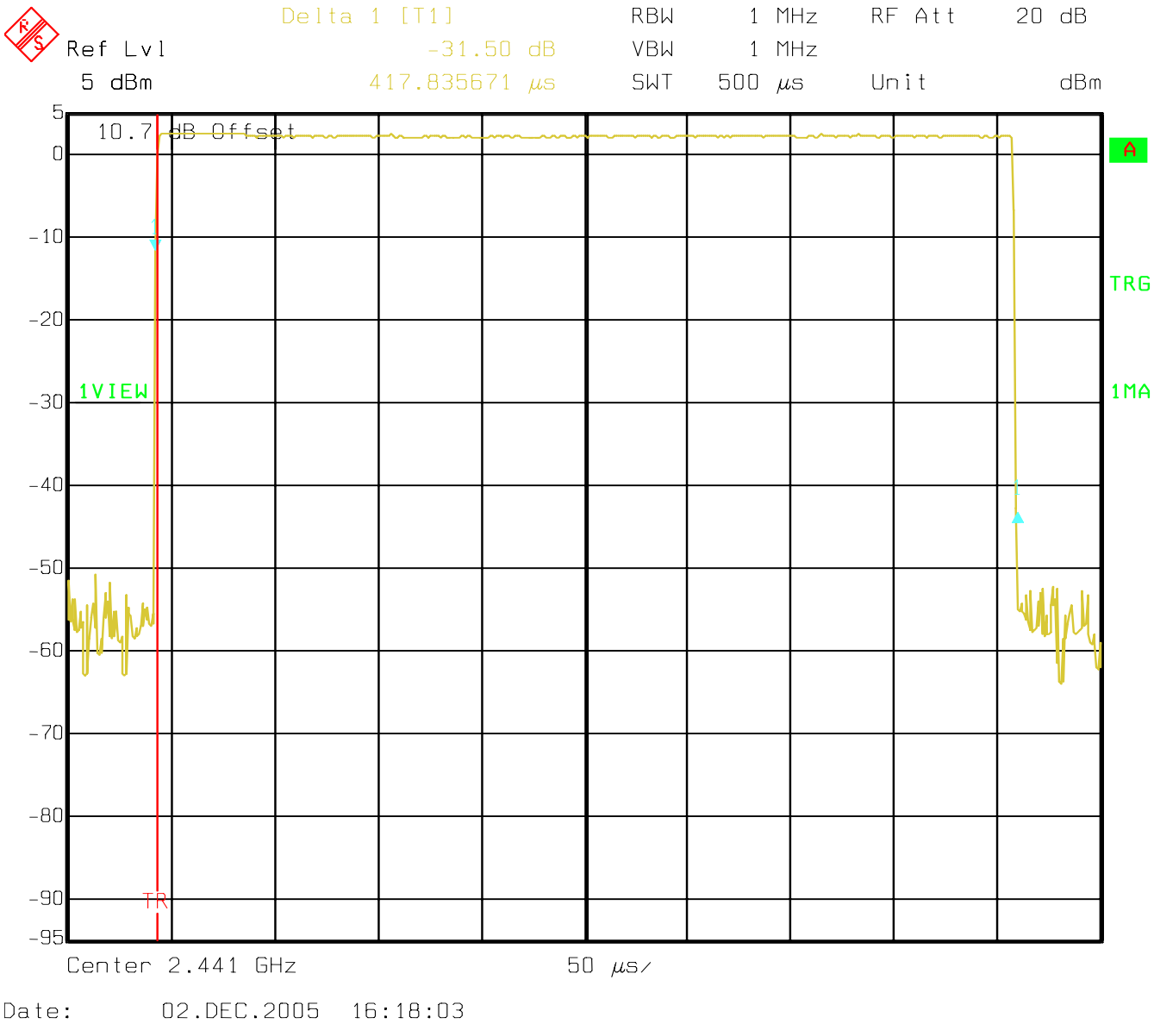
5.6.1 LIMIT SUB CLAUSE § 15.247 (a) (1) (i) (ii) (iii)

FREQUENCY RANGE	AVERAGE TIME OF OCCUPANCY PER 31.6 SECONDS (LIMIT)
2400-2483.5	0.4 SECONDS

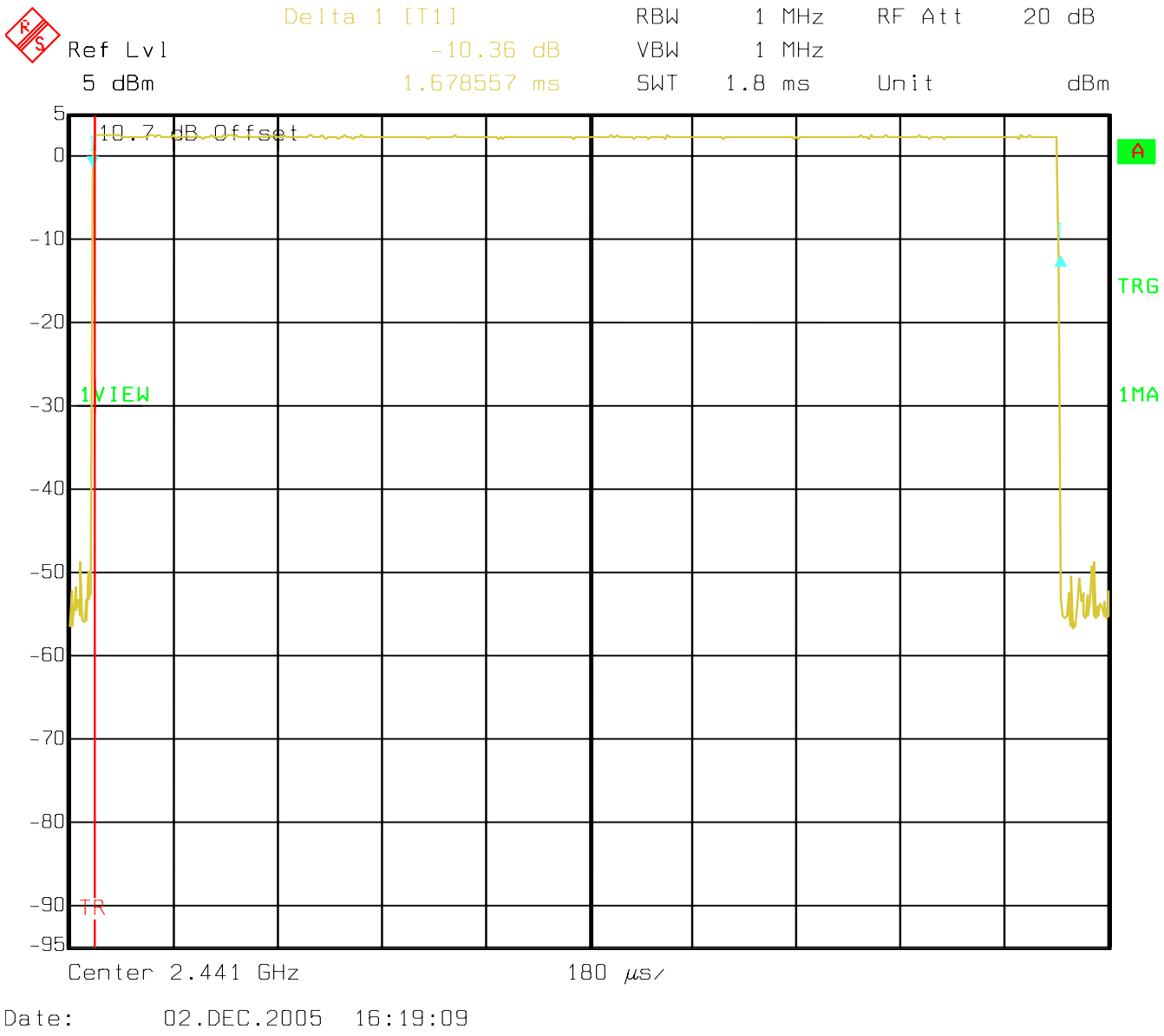
5.6.2 RESULTS:

TEST CONDITIONS		TIME OF OCCUPANCY IN 31.6 SECONDS		
PACKET TYPE		DH1	DH3	DH5
T_{nom}(23)°C	V_{nom}VDC	0.1338 Sec	0.271 Sec	0.311 Sec

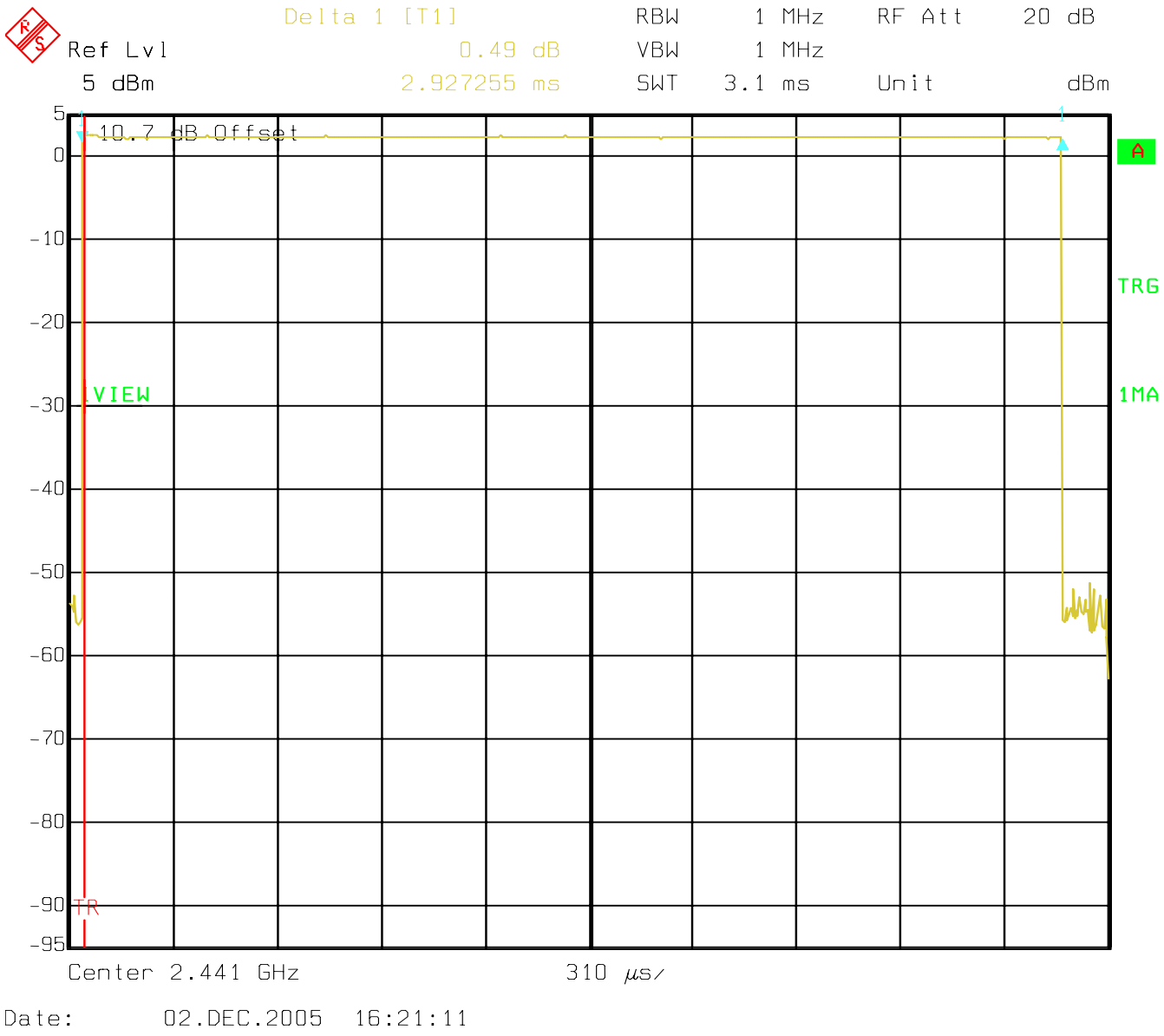
(DH1)
The system makes worst case 1600 hops per second or 1 time slot has a length of 625µs with 79 channels. A DH1 Packet need 1 time slot for transmitting and 1 time slot for receiving. Then the system makes worst case 800 hops per second with 79 channels. So you have each channel 10.13 times per second and so for 31.6 seconds you have 320.108 times of appearance.
Each Tx-time per appearance is 417.84µs.
<u>So we have 320.108 * 417.84µs = 133.8ms per 31.6 seconds.</u>



(DH3)
A DH3 Packets need 3 time slots for transmit and 1 for receiving, then the system makes worst case 400 hops per second with 79 channels. So you have each channel 5.1 times per second and so for 31.6 seconds you have 161.16 times of appearance.
Each Tx-time per appearance is 1.679ms.
So we have 161.16 * 1.679ms = 271ms per 31.6 seconds.



(DH5)
At DH5 Packets you need 5 time slots for transmit and 1 for receiving, then the system makes worst case 266.7 hops per second with 79 channels. So you have each channel 3.36 times per second and so for 30 seconds you have 106.176 times of appearance.
Each Tx-time per appearance is 2.93ms.
So we have 106.176 * 2.93ms = 311ms per 31.6 seconds.



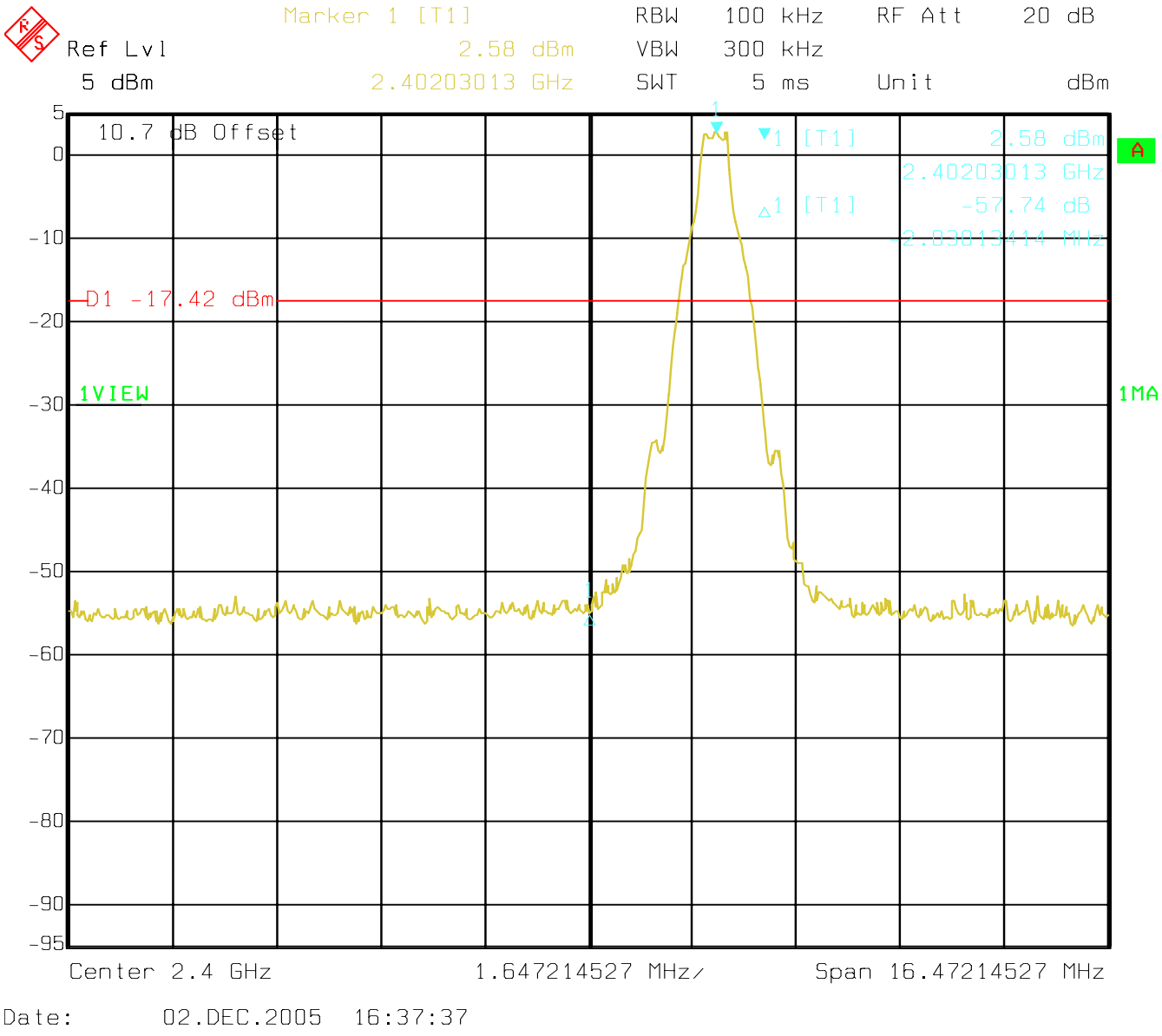
5.7 CONDUCTED SPURIOUS EMISSIONS

5.7.1 LIMIT SUB CLAUSE § 15.247 (d)

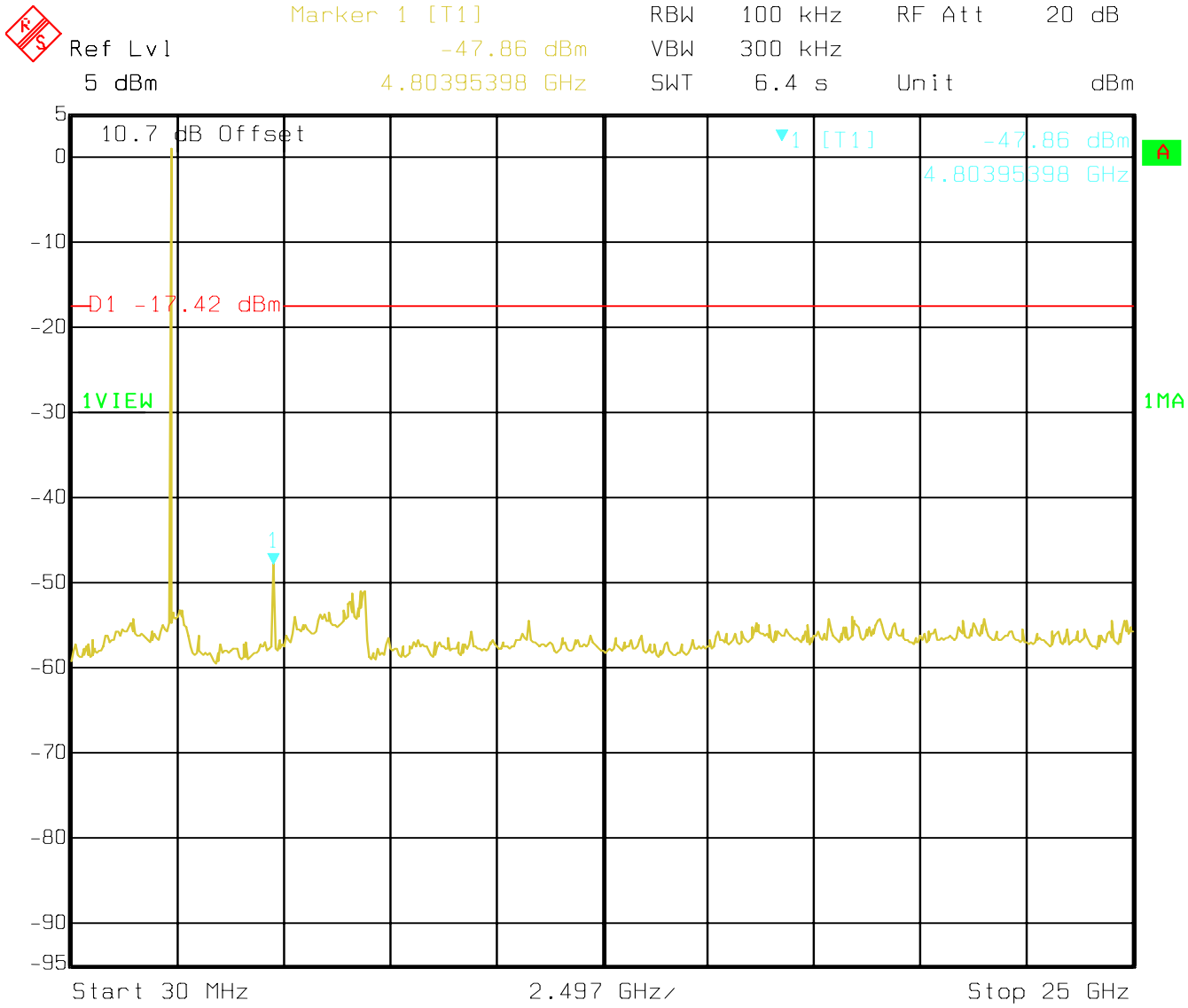
In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under paragraph (b)(3) of this section, the attenuation required under this paragraph shall be 30 dB instead of 20 dB. Attenuation below the general limits specified in Section 15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in Section 15.205(a), must also comply with the radiated emission limits specified in Section 15.209(a) (see Section 15.205(c)).

5.7.2 RESULTS

CONDUCTED BANDEGDE COMPLIANCE 2402 MHz



CONDUCTED SPURIOUS 2402 MHz



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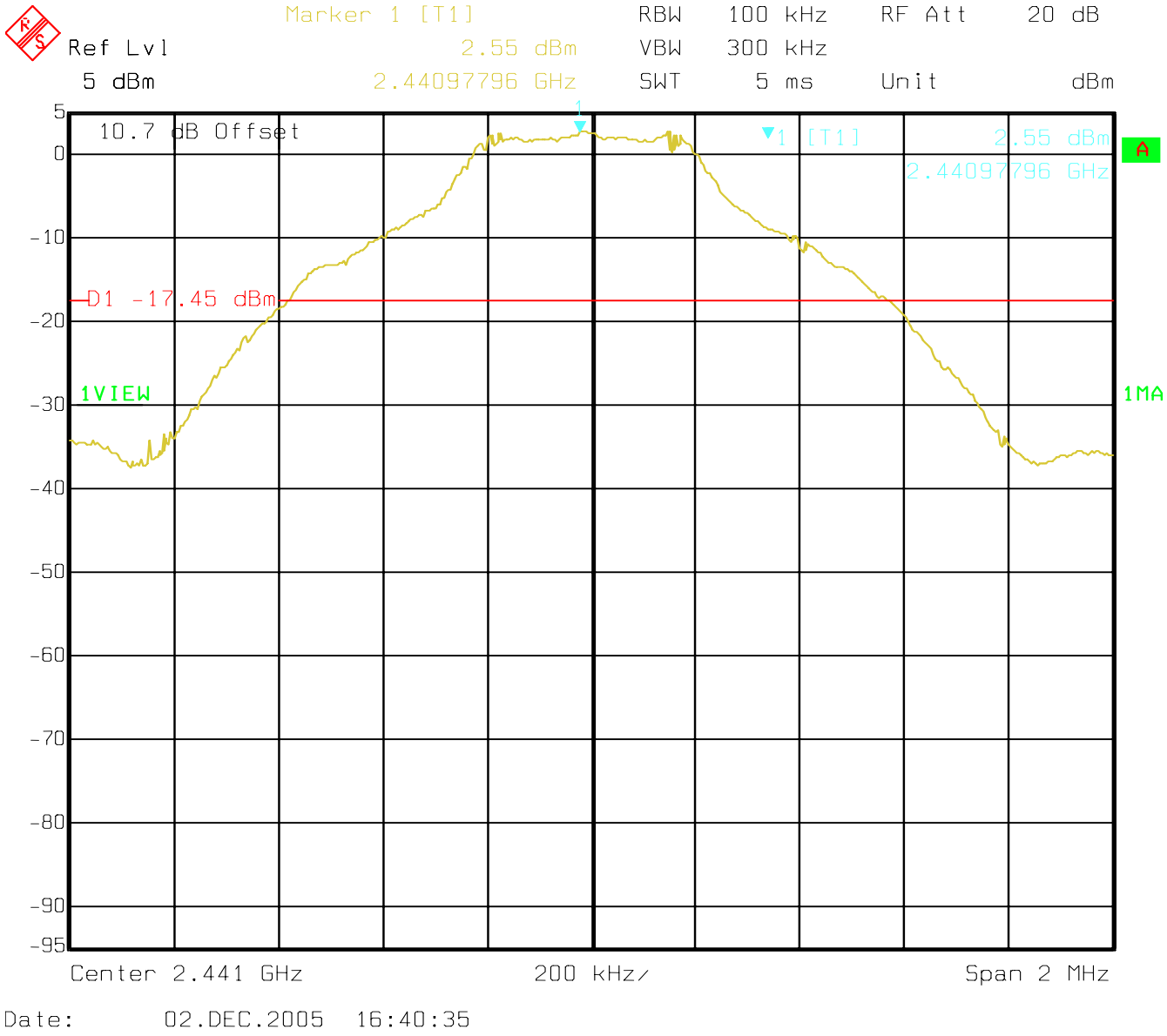
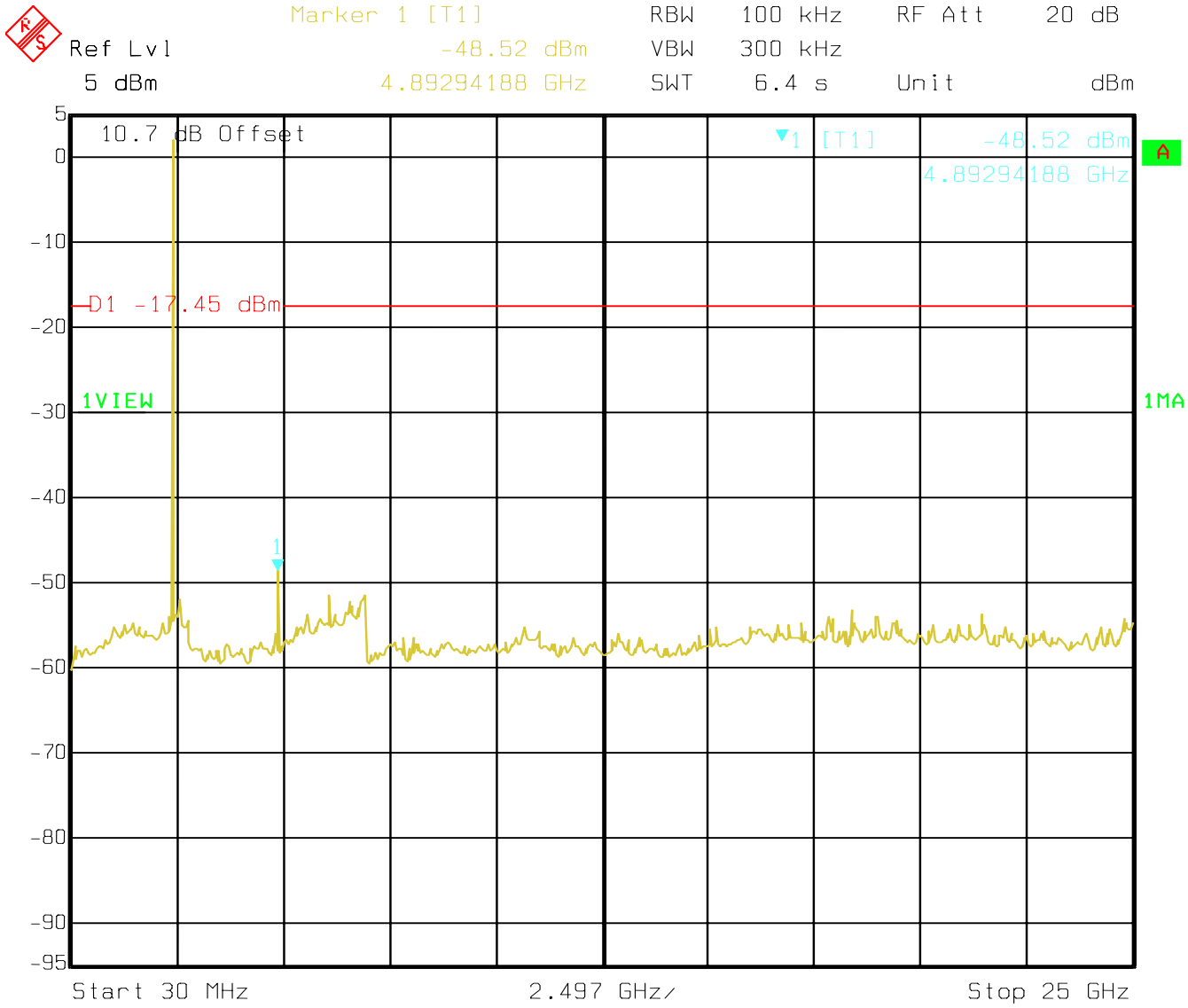
REFERENCE 2441 MHz



CONDUCTED SPURIOUS 2441 MHz



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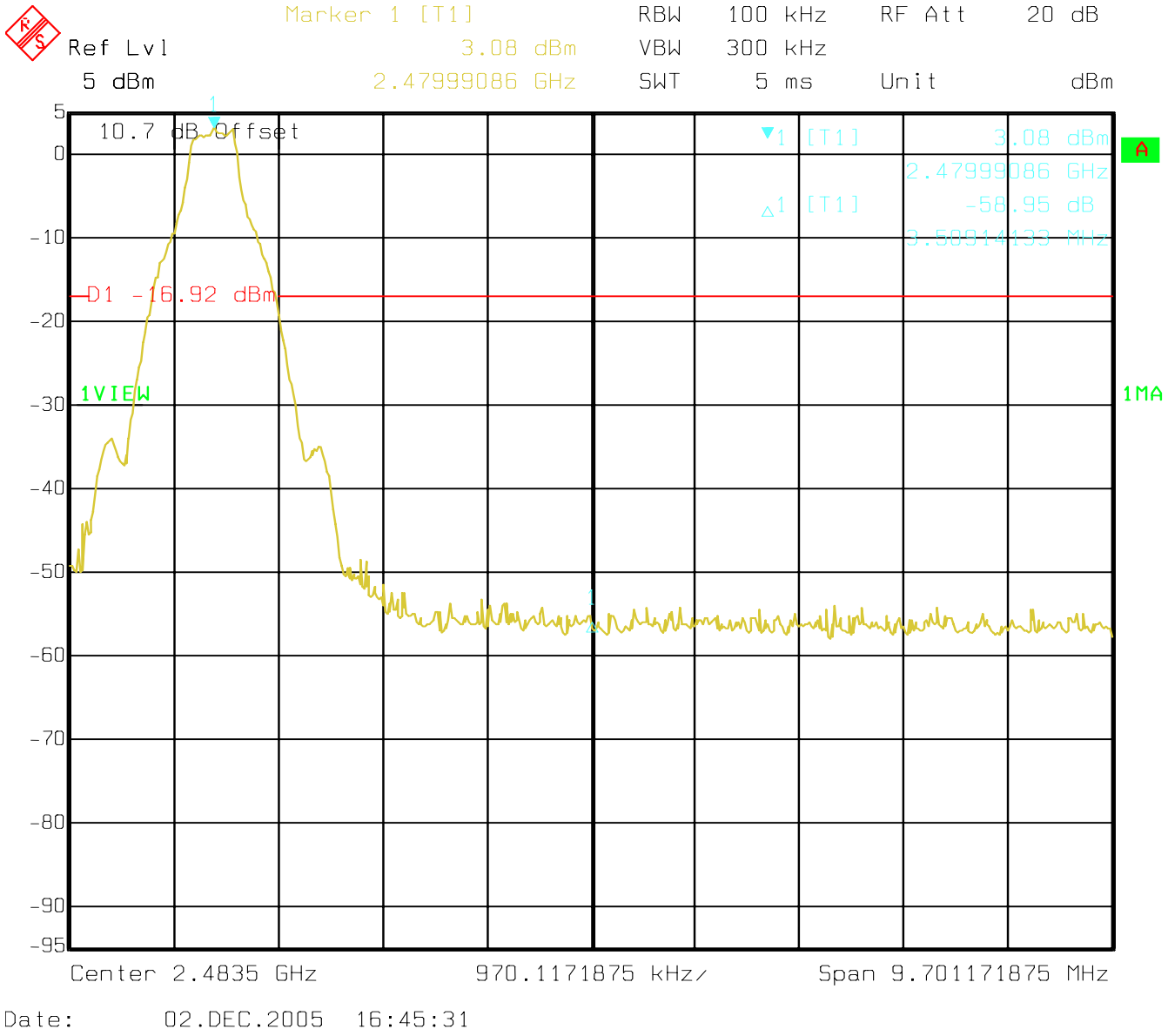
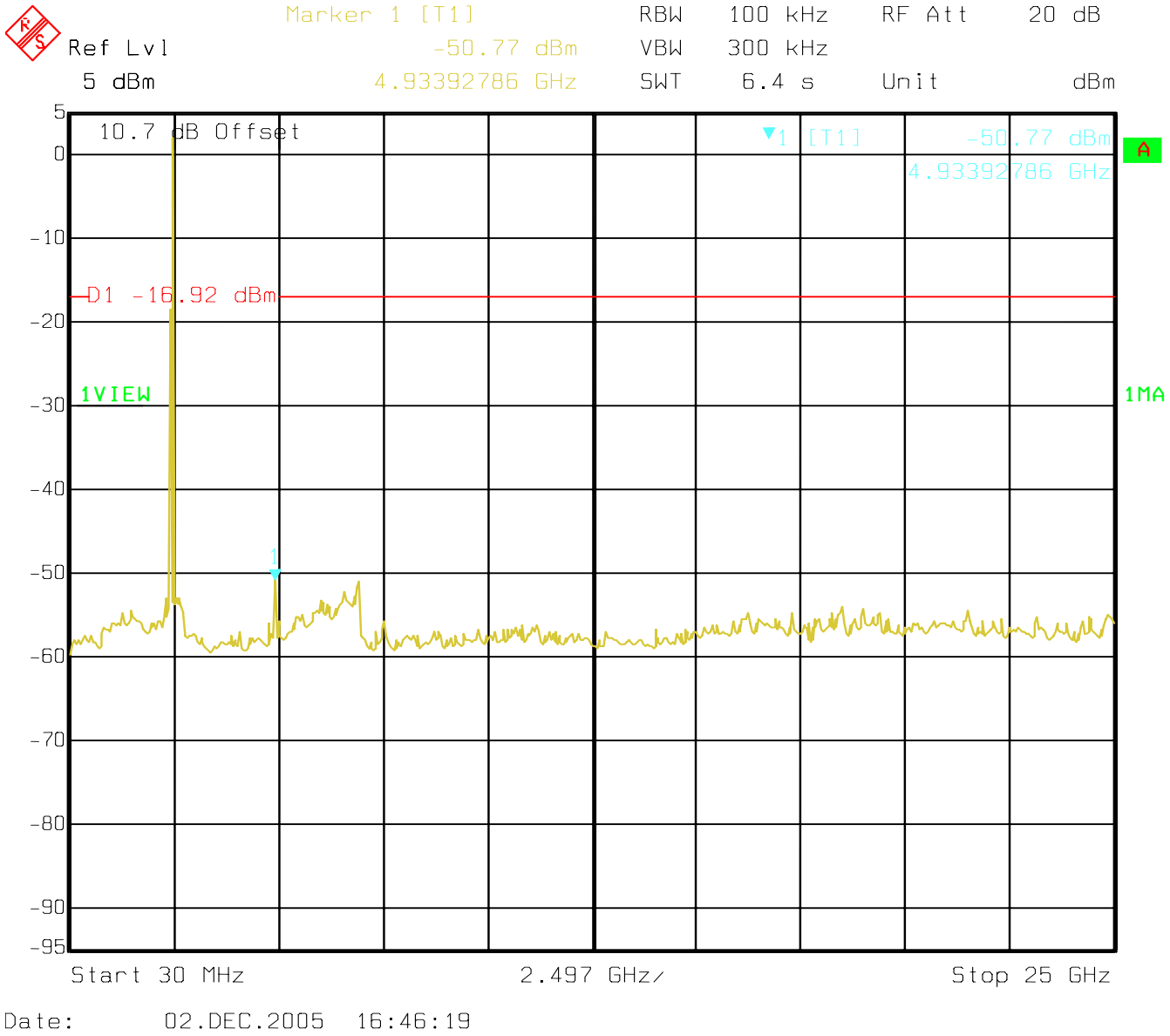
CONDUCTED BANDEGDE COMPLIANCE 2480 MHz



CONDUCTED SPURIOUS 2480 MHz



5.8 RESTRICTED BAND EDGE COMPLIANCE RADIATED §15.247/15.205

5.8.1 LIMITS

(a) Except as shown in paragraph (d) of this section, only spurious emissions are permitted in any of the frequency bands listed below:

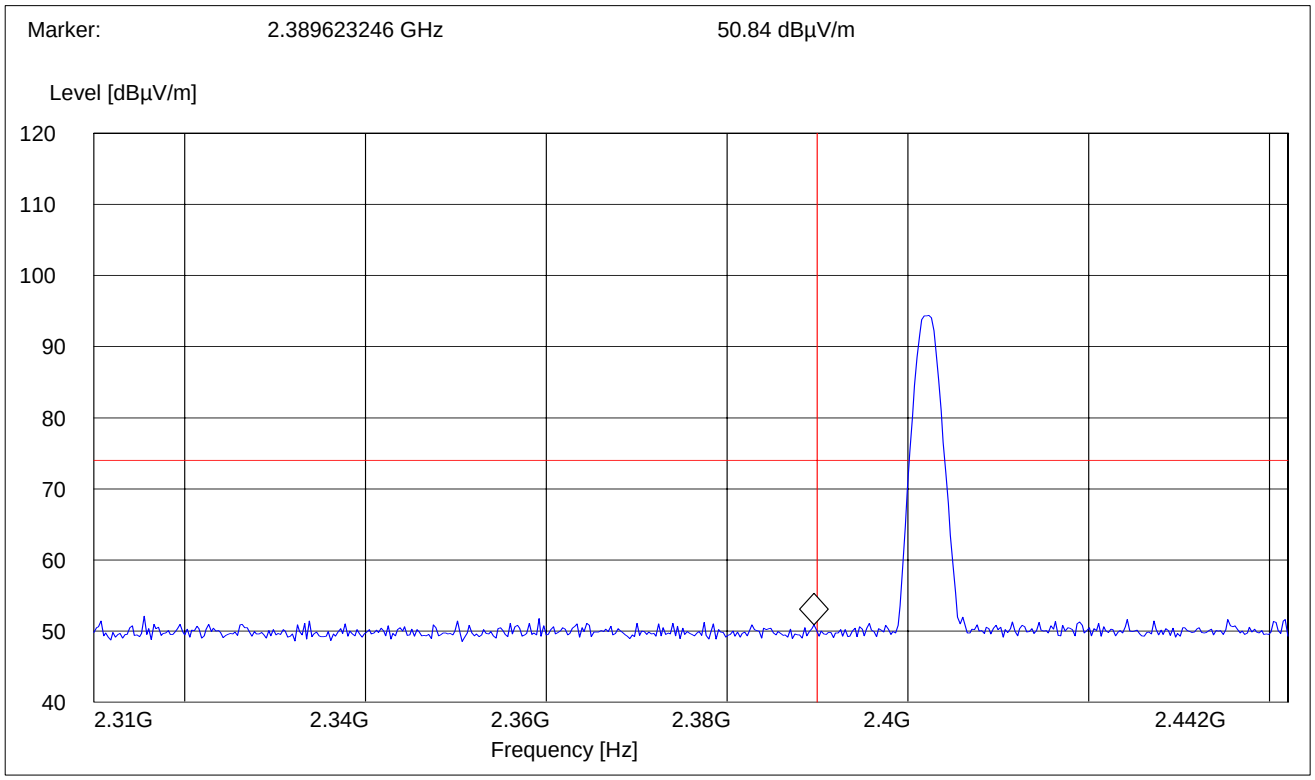
MHz	MHz	MHz	GHz
0.090 - 0.110	16.42 - 16.423	399.9 - 410	4.5 - 5.15
[1]0.495 - 0.505	16.69475 - 16.69525	608 - 614	5.35 - 5.46
2.1735 - 2.1905	16.80425 - 16.80475	960 - 1240	7.25 - 7.75
4.125 - 4.128	25.5 - 25.67	1300 - 1427	8.025 - 8.5
4.17725 - 4.17775	37.5 - 38.25	1435 - 1626.5	9.0 - 9.2
4.20725 - 4.20775	73 - 74.6	1645.5 - 1646.5	9.3 - 9.5
6.215 - 6.218	74.8 - 75.2	1660 - 1710	10.6 - 12.7
6.26775 - 6.26825	108 - 121.94	1718.8 - 1722.2	13.25 - 13.4
6.31175 - 6.31225	123 - 138	2200 - 2300	14.47 - 14.5
8.291 - 8.294	149.9 - 150.05	2310 - 2390	15.35 - 16.2
8.362 - 8.366	156.52475 - 156.52525	2483.5 - 2500	17.7 - 21.4
8.37625 - 8.38675	156.7 - 156.9	2690 - 2900	22.01 - 23.12
8.41425 - 8.41475	162.0125 - 167.17	3260 - 3267	23.6 - 24.0
12.29 - 12.293	167.72 - 173.2	3332 - 3339	31.2 - 31.8
12.51975 - 12.52025	240 - 285	3345.8 - 3358	36.43 - 36.5
12.57675 - 12.57725	322 - 335.4	3600 - 4400	([2])
13.36 - 13.41			

***PEAK LIMIT= 74dBuV**
***AVG. LIMIT= 54dBuV**

5.8.2 RESULTS (2402MHz)

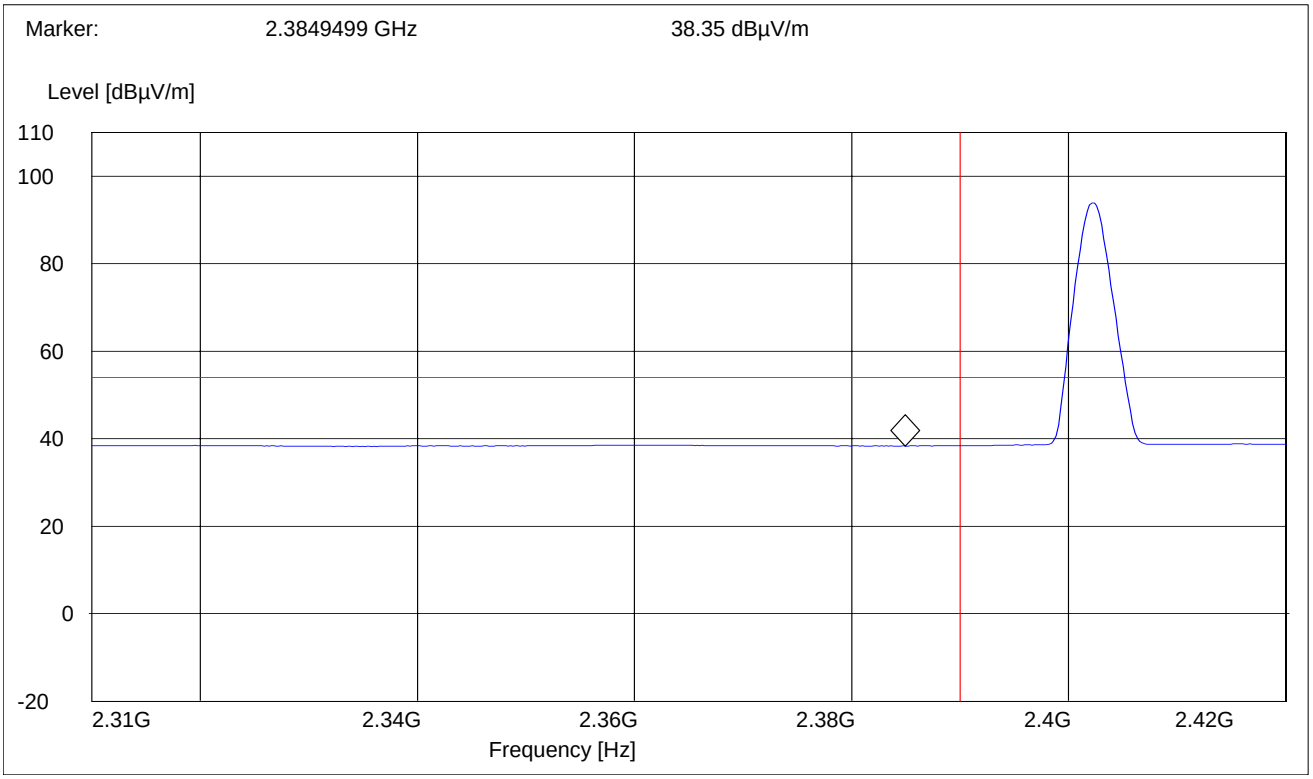
PEAK

Start Frequency	Stop Frequency	Detector	Meas. Time	RBW	VBW
2310 MHz	2442 MHz	Max Peak	Coupled	1 MHz	1 MHz



AVG

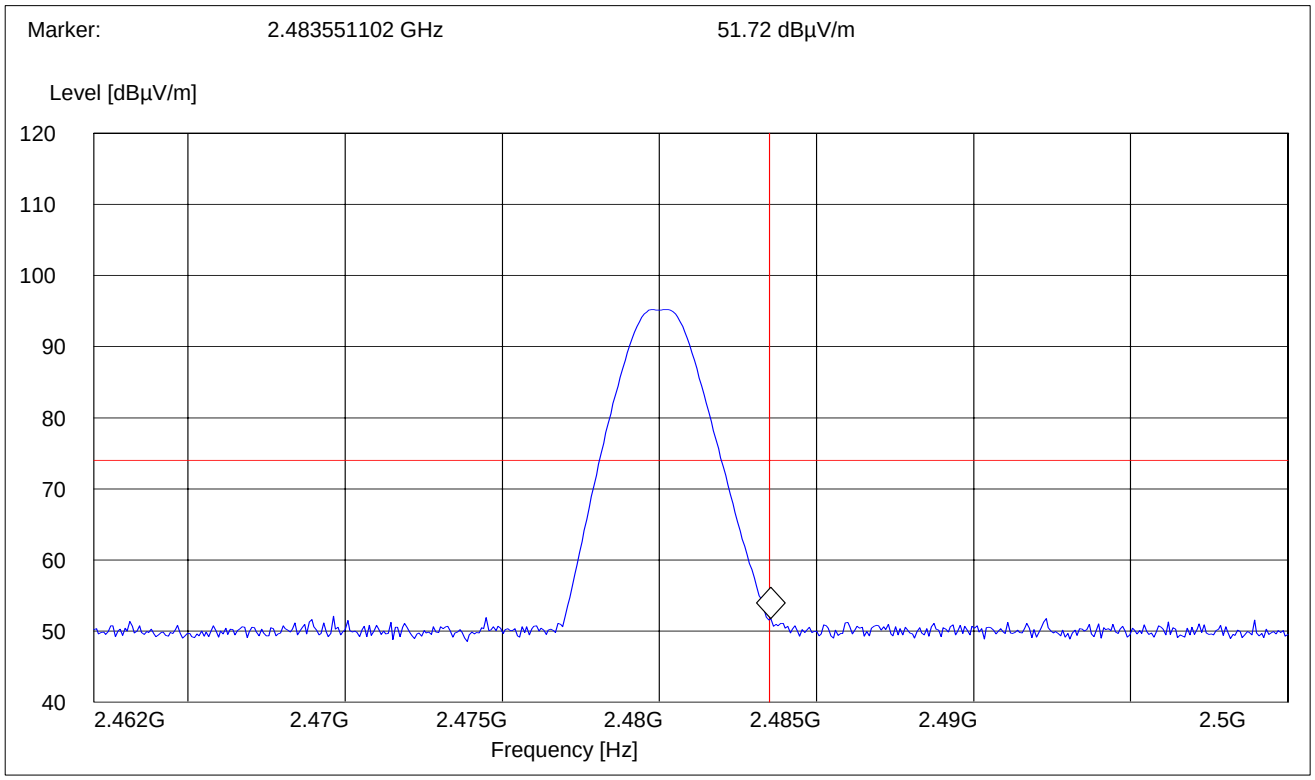
Start Frequency	Stop Frequency	Detector	Meas. Time	RBW	VBW
2310 MHz	2420 MHz	Max Peak	Coupled	1 MHz	10 Hz



5.8.3 RESULTS (2480MHz)

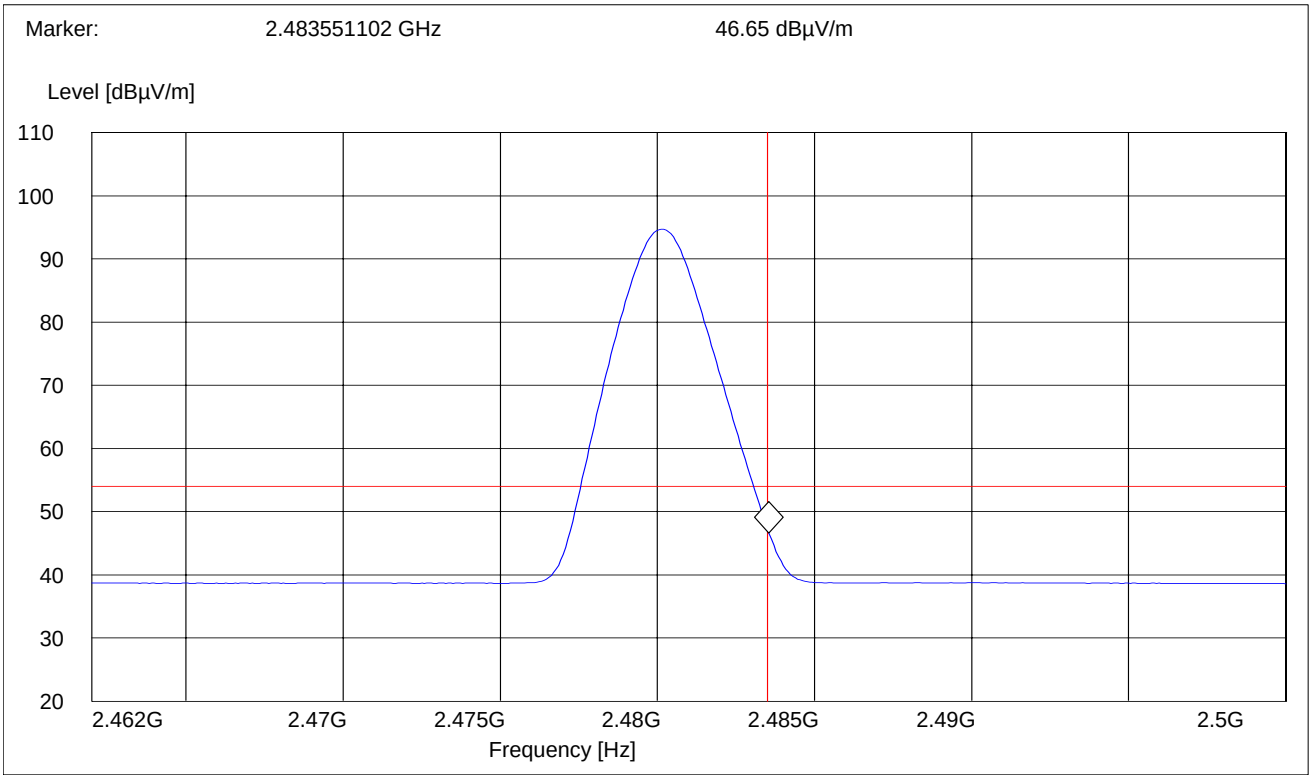
PEAK

Start Frequency	Stop Frequency	Detector	Meas. Time	RBW	VBW
2462 MHz	2500 MHz	Max Peak	Coupled	1 MHz	1 MHz



AVG

Start Frequency	Stop Frequency	Detector	Meas. Time	RBW	VBW
2462 MHz	2500 MHz	Max Peak	Coupled	1 MHz	10 Hz



5.9 TRANSMITTER SPURIOUS EMISSIONS RADIATED § 15.247/15.205/15.209

5.9.1 LIMITS

(a) Except as shown in paragraph (d) of this section, only spurious emissions are permitted in any of the frequency bands listed below:

MHz	MHz	MHz	GHz
0.090 - 0.110	16.42 - 16.423	399.9 - 410	4.5 - 5.15
[1]0.495 - 0.505	16.69475 - 16.69525	608 - 614	5.35 - 5.46
2.1735 - 2.1905	16.80425 - 16.80475	960 - 1240	7.25 - 7.75
4.125 - 4.128	25.5 - 25.67	1300 - 1427	8.025 - 8.5
4.17725 - 4.17775	37.5 - 38.25	1435 - 1626.5	9.0 - 9.2
4.20725 - 4.20775	73 - 74.6	1645.5 - 1646.5	9.3 - 9.5
6.215 - 6.218	74.8 - 75.2	1660 - 1710	10.6 - 12.7
6.26775 - 6.26825	108 - 121.94	1718.8 - 1722.2	13.25 - 13.4
6.31175 - 6.31225	123 - 138	2200 - 2300	14.47 - 14.5
8.291 - 8.294	149.9 - 150.05	2310 - 2390	15.35 - 16.2
8.362 - 8.366	156.52475 - 156.52525	2483.5 - 2500	17.7 - 21.4
8.37625 - 8.38675	156.7 - 156.9	2690 - 2900	22.01 - 23.12
8.41425 - 8.41475	162.0125 - 167.17	3260 - 3267	23.6 - 24.0
12.29 - 12.293	167.72 - 173.2	3332 - 3339	31.2 - 31.8
12.51975 - 12.52025	240 - 285	3345.8 - 3358	36.43 - 36.5
12.57675 - 12.57725	322 - 335.4	3600 - 4400	([2])
13.36 - 13.41			

***PEAK LIMIT= 74dBuV**
***AVG. LIMIT= 54dBuV**

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 using an average limit , unless specified with the plots.

Results for the radiated measurements below 30MHz according § 15.33

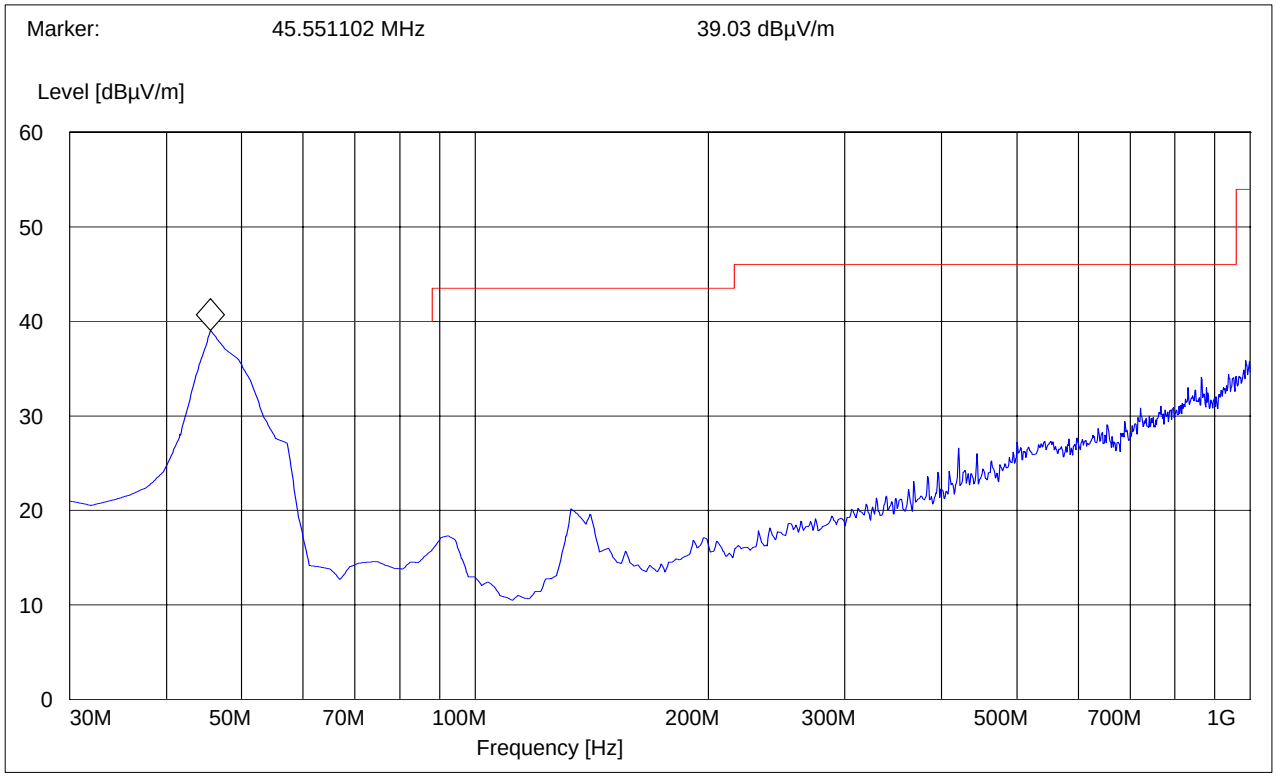
Frequency	Measured values	Remarks
9KHz – 30MHz	No emissions found, caused by the EUT	This is valid for all the tested channels

5.9.2 RESULTS

30MHz – 1GHz
Antenna: vertical

Start Frequency	Stop Frequency	Detector	Meas. Time	RBW	VBW
30MHz	1GHz	Max Peak	Coupled	100 KHz	100 KHz

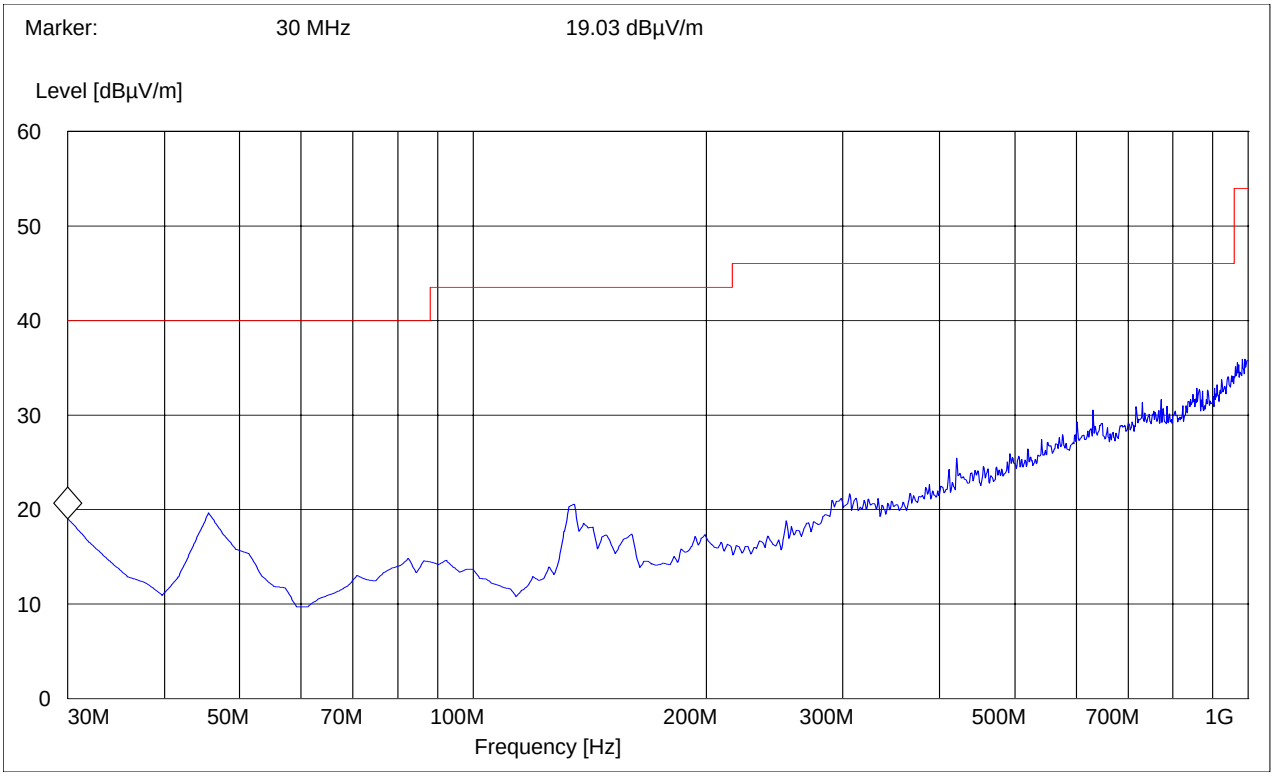
Note: This plot is valid for low, mid, high channels (worst-case plot)
Note: Peak reading vs. Quasi-peak limit



30MHz – 1GHz
Antenna: horizontal

Start Frequency	Stop Frequency	Detector	Meas. Time	RBW	VBW
30MHz	1GHz	Max Peak	Coupled	100 KHz	100 KHz

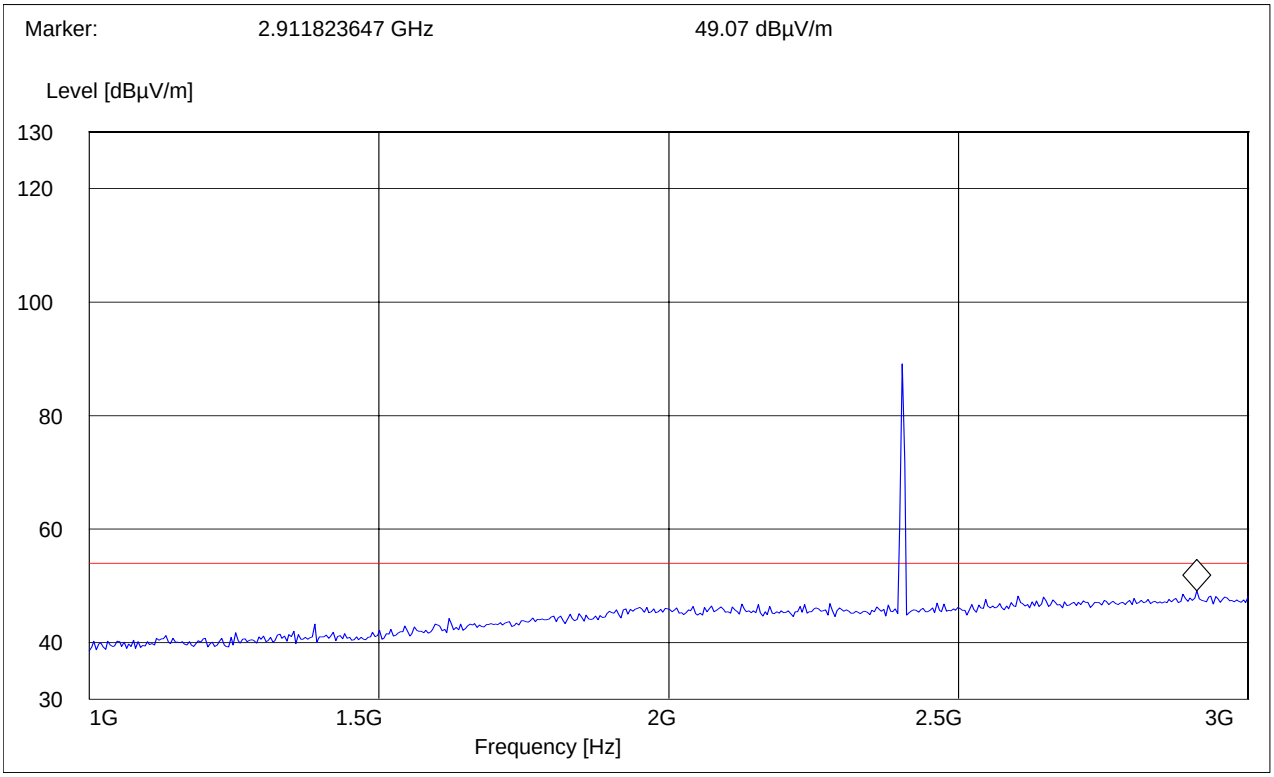
Note: This plot is valid for low, mid, high channels (worst-case plot)
Note: Peak reading vs. Quasi-peak limit



1-3GHz (2402MHz)

Start Frequency	Stop Frequency	Detector	Meas. Time	RBW	VBW
1GHz	3GHz	Max Peak	Coupled	1 MHz	1 MHz

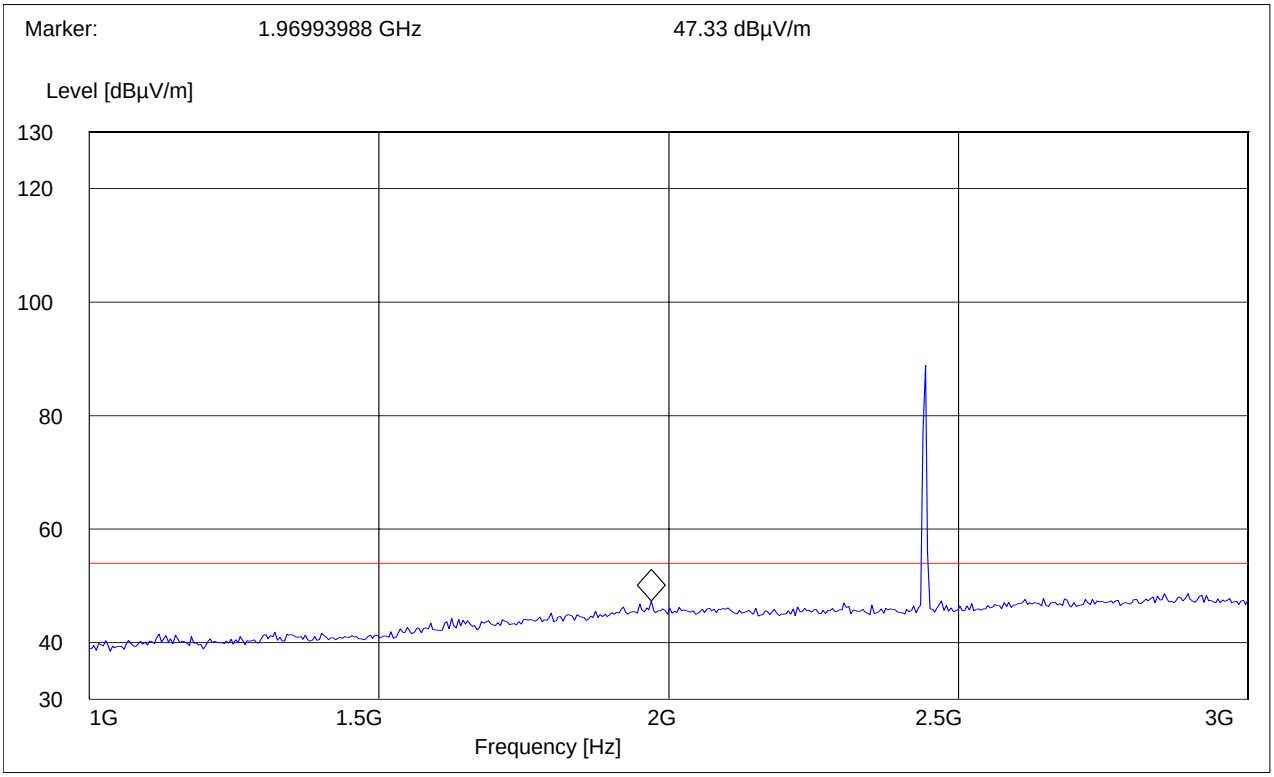
Note: The peaks above the limit line is the carrier freq.
Note: Peak Reading vs. Average limit



1-3GHz (2441MHz)

Start Frequency	Stop Frequency	Detector	Meas. Time	RBW	VBW
1GHz	3GHz	Max Peak	Coupled	1 MHz	1 MHz

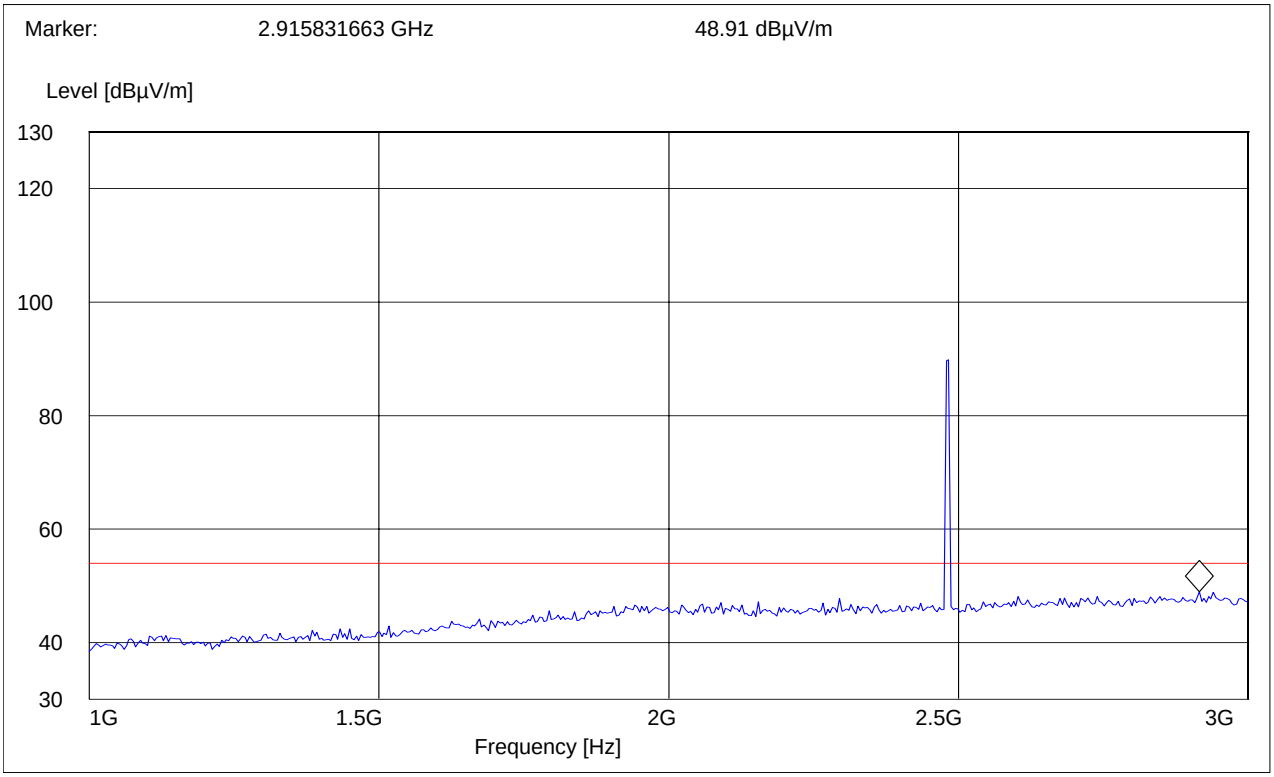
Note: The peaks above the limit line is the carrier freq.
Note: Peak Reading vs. Average limit



1-3GHz (2480MHz)

Start Frequency	Stop Frequency	Detector	Meas. Time	RBW	VBW
1GHz	3GHz	Max Peak	Coupled	1 MHz	1 MHz

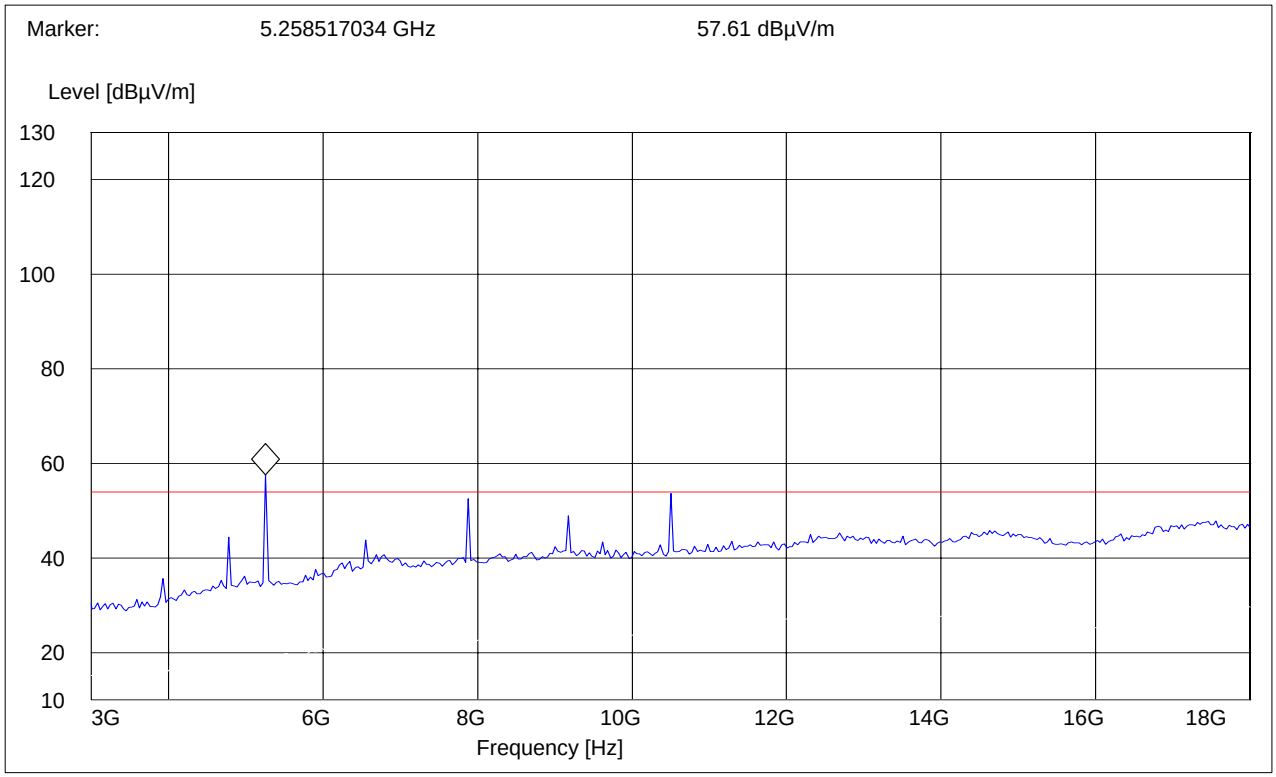
Note: The peaks above the limit line is the carrier freq.
Note: Peak Reading vs. Average limit



3-18GHz (2402MHz)

Start Frequency	Stop Frequency	Detector	Meas. Time	RBW	VBW
3GHz	18GHz	Max Peak	Coupled	1 MHz	1 MHz

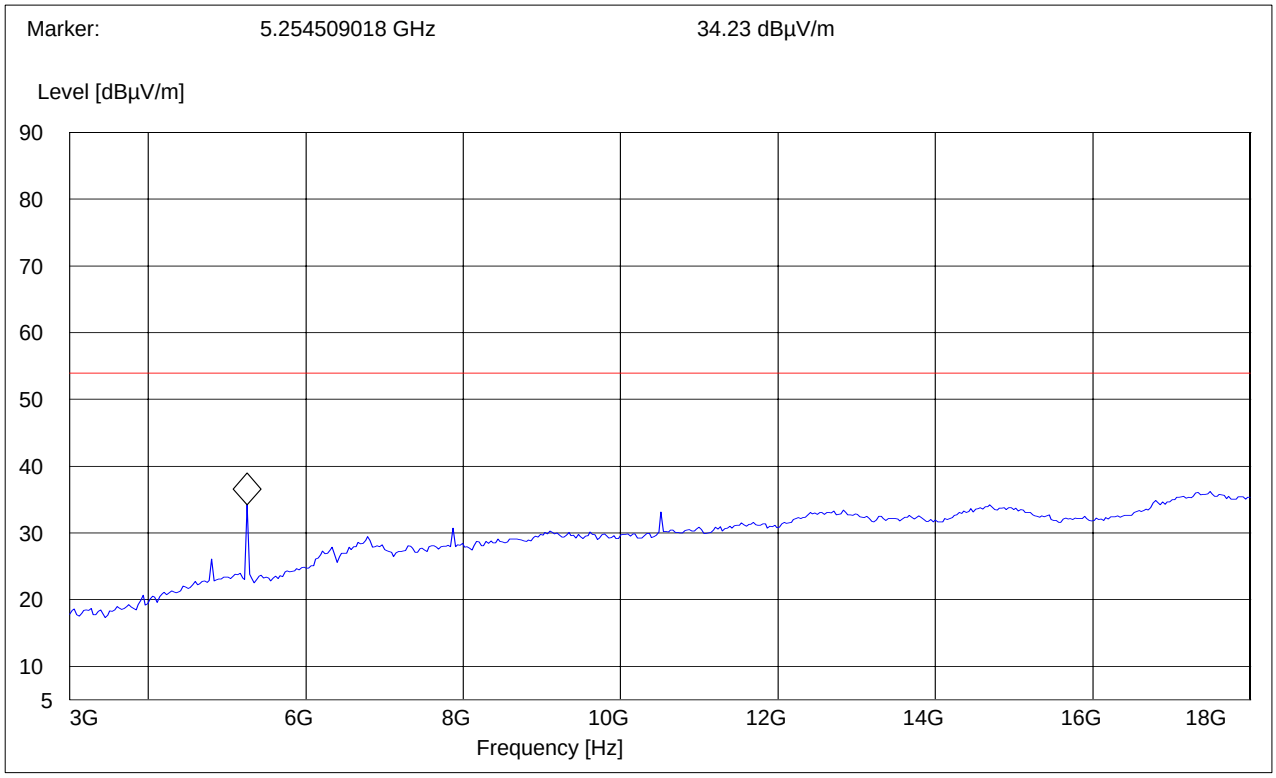
Note: Peak Reading vs. Average limit, see next page for Average Reading vs. Average limit



3-18GHz (2402MHz)

Start Frequency	Stop Frequency	Detector	Meas. Time	RBW	VBW
3GHz	18GHz	Max Peak	Coupled	1 MHz	10 Hz

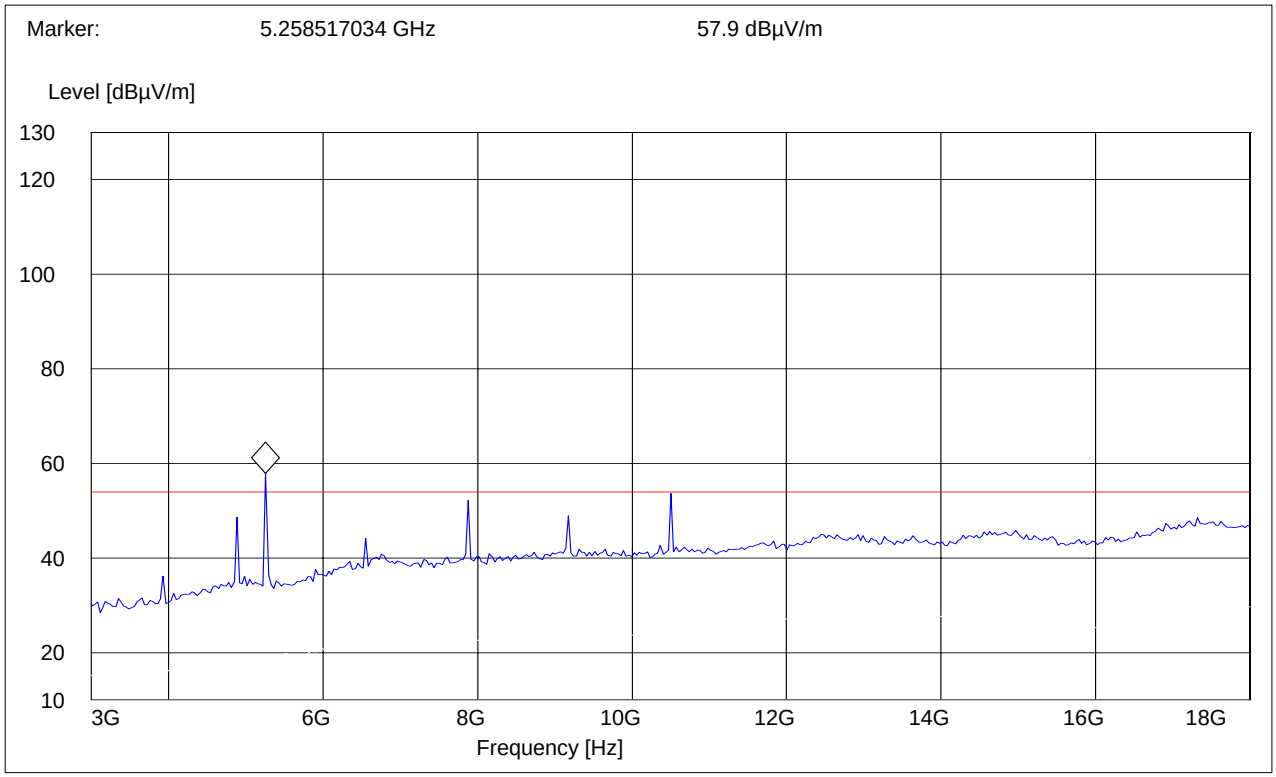
Note: Average Reading vs. Average limit



3-18GHz (2441MHz)

Start Frequency	Stop Frequency	Detector	Meas. Time	RBW	VBW
3GHz	18GHz	Max Peak	Coupled	1 MHz	1 MHz

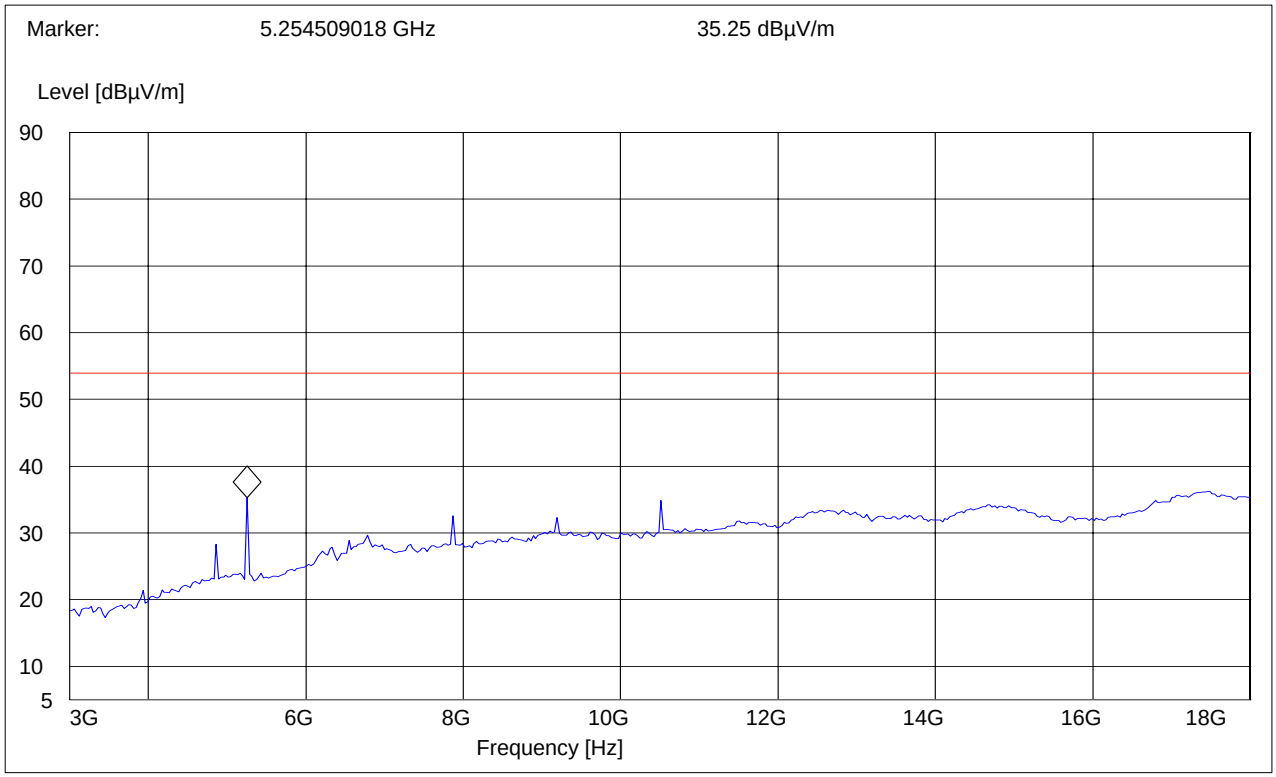
Note: Peak Reading vs. Average limit, see next page for Average Reading vs. Average limit



3-18GHz (2441MHz)

Start Frequency	Stop Frequency	Detector	Meas. Time	RBW	VBW
3GHz	18GHz	Max Peak	Coupled	1 MHz	10 Hz

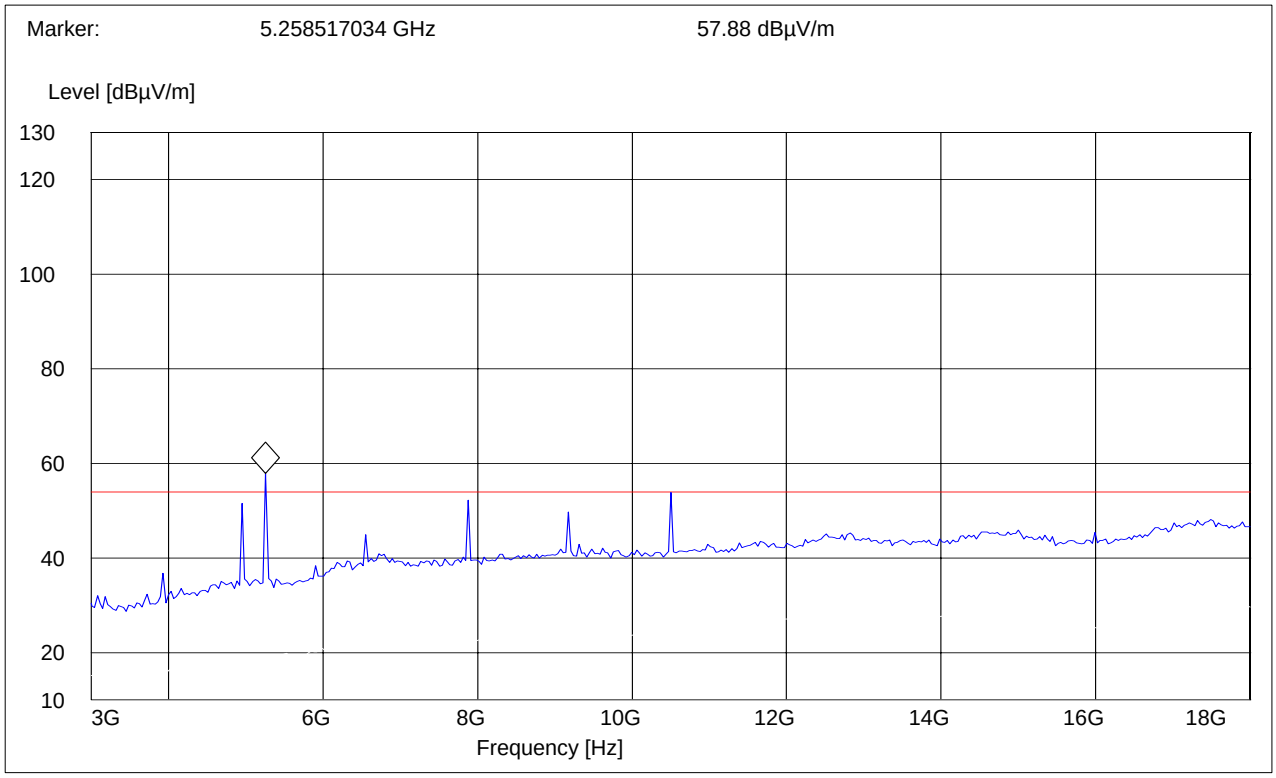
Note: Average Reading vs. Average limit



3-18GHz (2480MHz)

Start Frequency	Stop Frequency	Detector	Meas. Time	RBW	VBW
3GHz	18GHz	Max Peak	Coupled	1 MHz	1 MHz

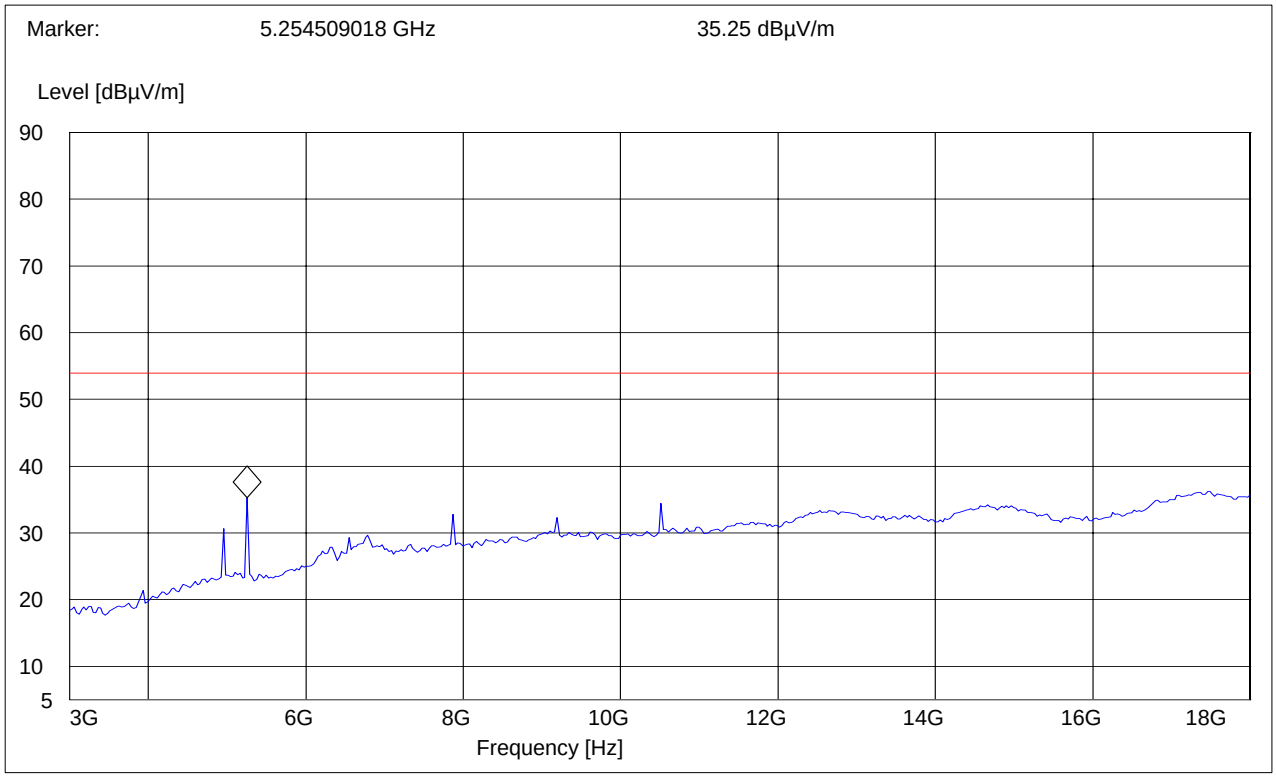
Note: Peak Reading vs. Average limit, see next page for Average Reading vs. Average limit



3-18GHz (2480MHz)

Start Frequency	Stop Frequency	Detector	Meas. Time	RBW	VBW
3GHz	18GHz	Max Peak	Coupled	1 MHz	10 Hz

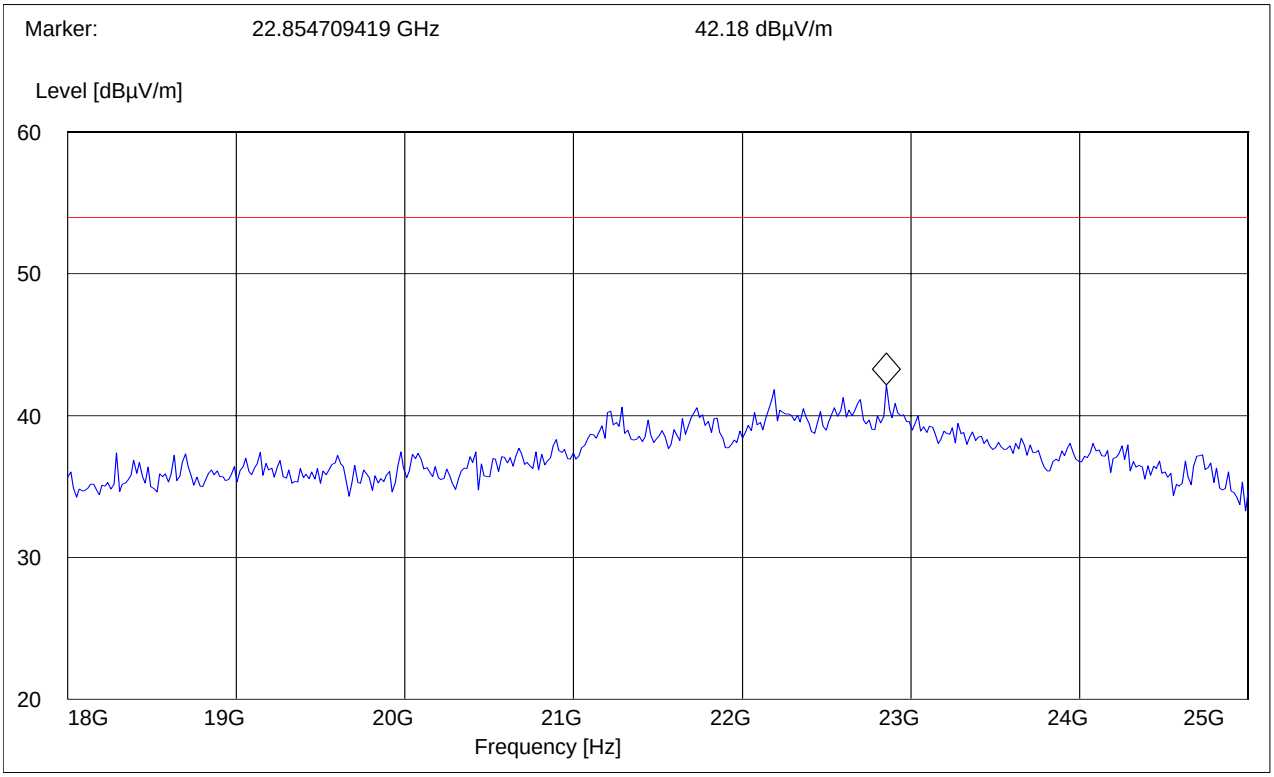
Note: Average Reading vs. Average limit



18-25GHz

Start Frequency	Stop Frequency	Detector	Meas. Time	RBW	VBW
18GHz	25GHz	Max Peak	Coupled	1 MHz	1 MHz

Note: This plot is valid for low, mid, high channels (worst-case plot)
Note: Peak Reading vs. Average limit



5.10 RECEIVER SPURIOUS RADIATION § 15.209/RSS210

5.10.1 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:
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.

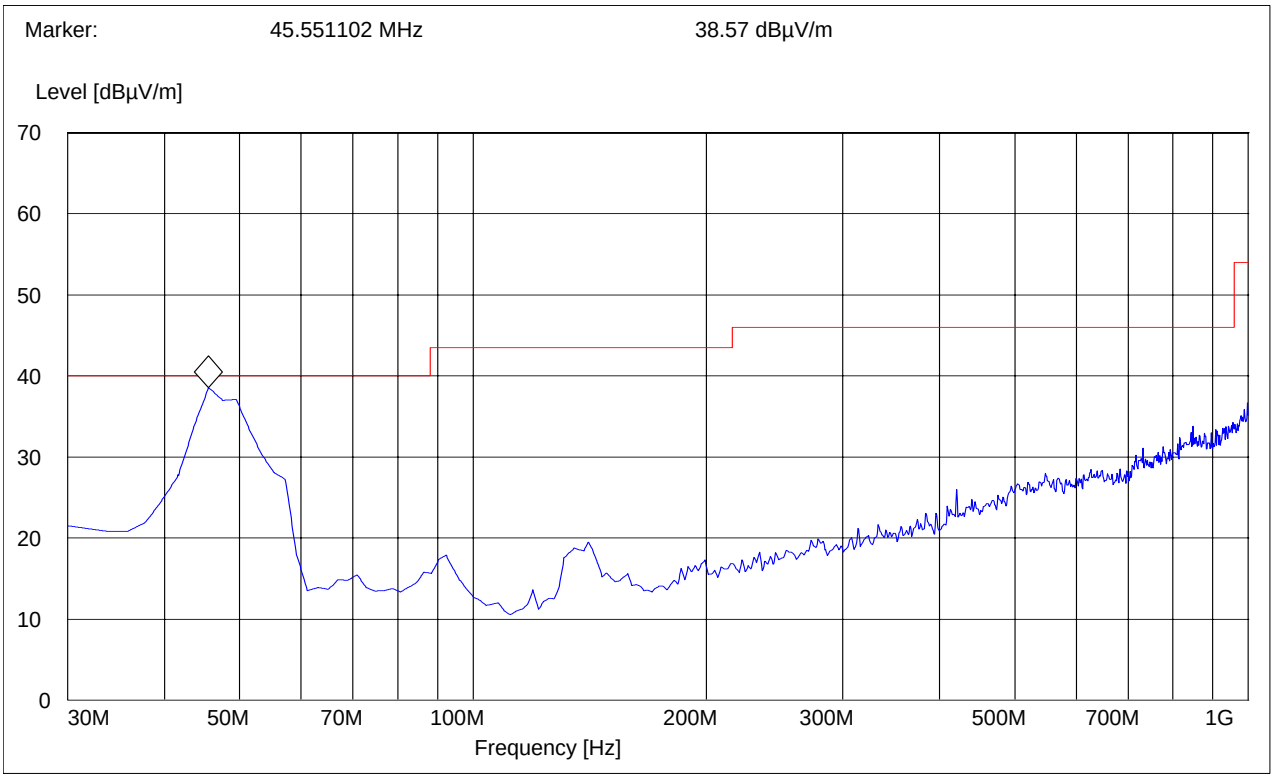
2. All measurements are done in peak mode using a quasi-peak or average limit , unless specified with the plots.

5.10.2 RESULTS

30MHz – 1GHz
Antenna: vertical

Start Frequency	Stop Frequency	Detector	Meas. Time	RBW	VBW
30MHz	1GHz	Max Peak	Coupled	100 KHz	100 KHz

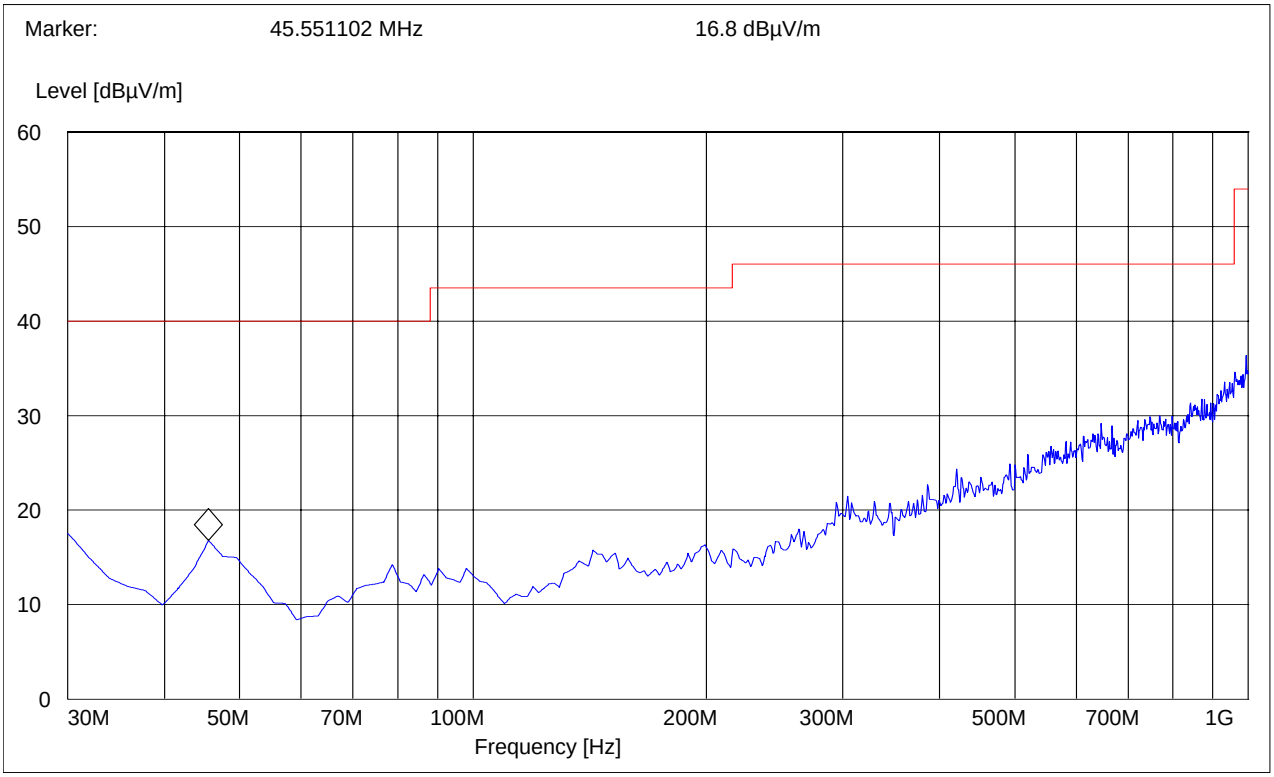
Note: Peak Reading vs. Quasi-peak limit



30MHz – 1GHz
Antenna: horizontal

Start Frequency	Stop Frequency	Detector	Meas. Time	RBW	VBW
30MHz	1GHz	Max Peak	Coupled	100 KHz	100 KHz

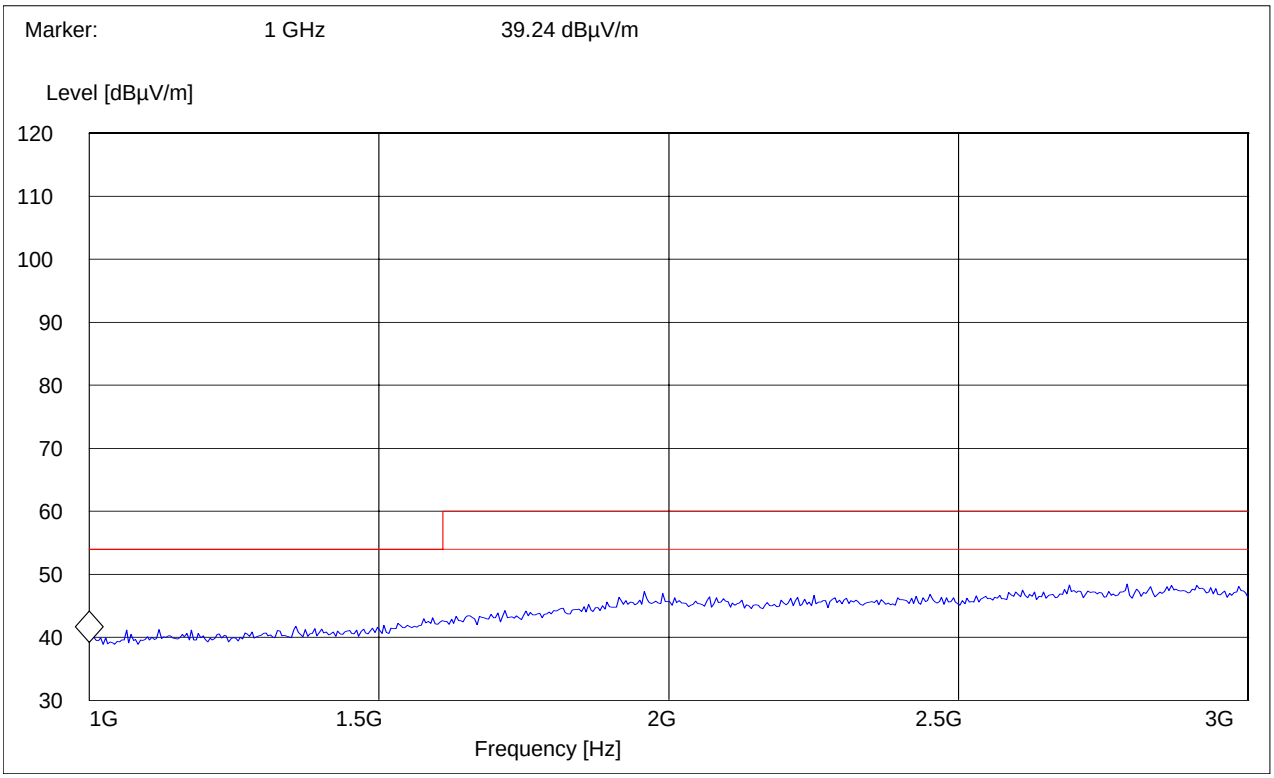
Note: Peak Reading vs. Quasi-peak limit



1-3GHz

Start Frequency	Stop Frequency	Detector	Meas. Time	RBW	VBW
1GHz	3GHz	Max Peak	Coupled	1 MHz	1 MHz

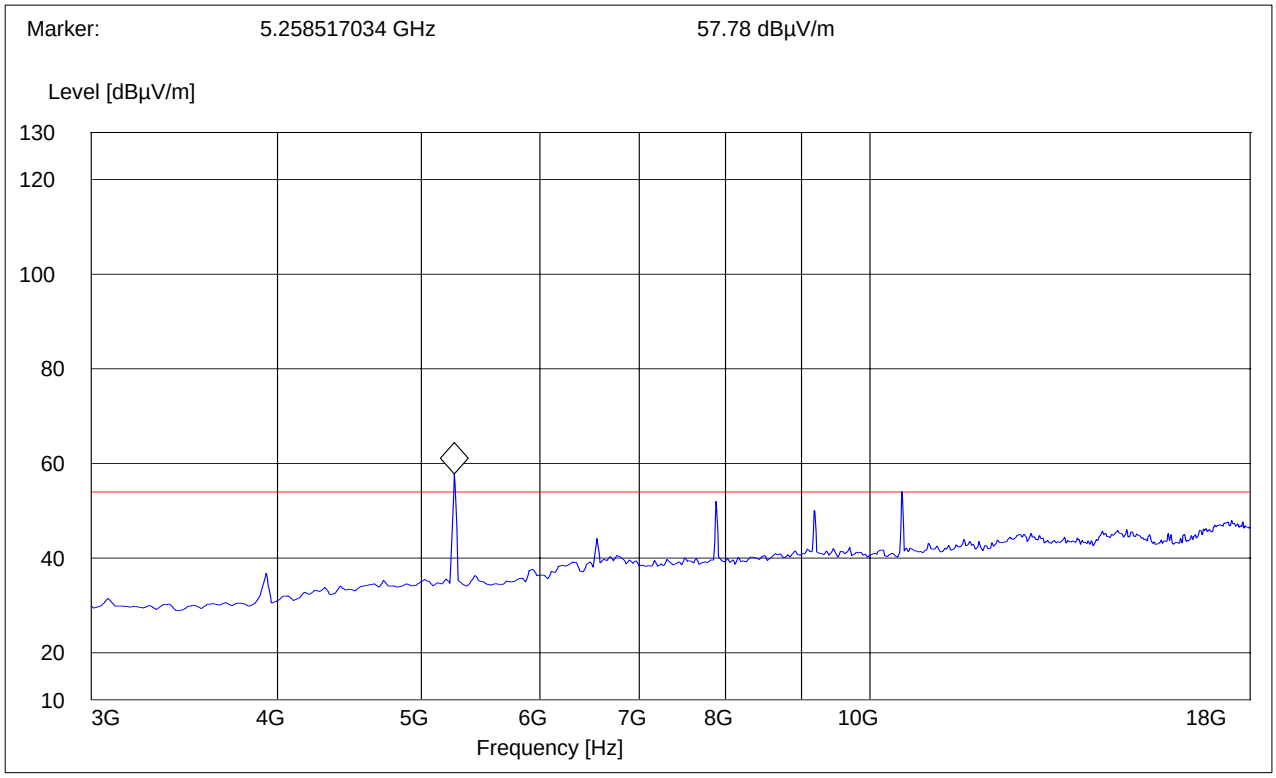
Note: Peak Reading vs. Average limit



3-18GHz

Start Frequency	Stop Frequency	Detector	Meas. Time	RBW	VBW
3GHz	18GHz	Max Peak	Coupled	1 MHz	1 MHz

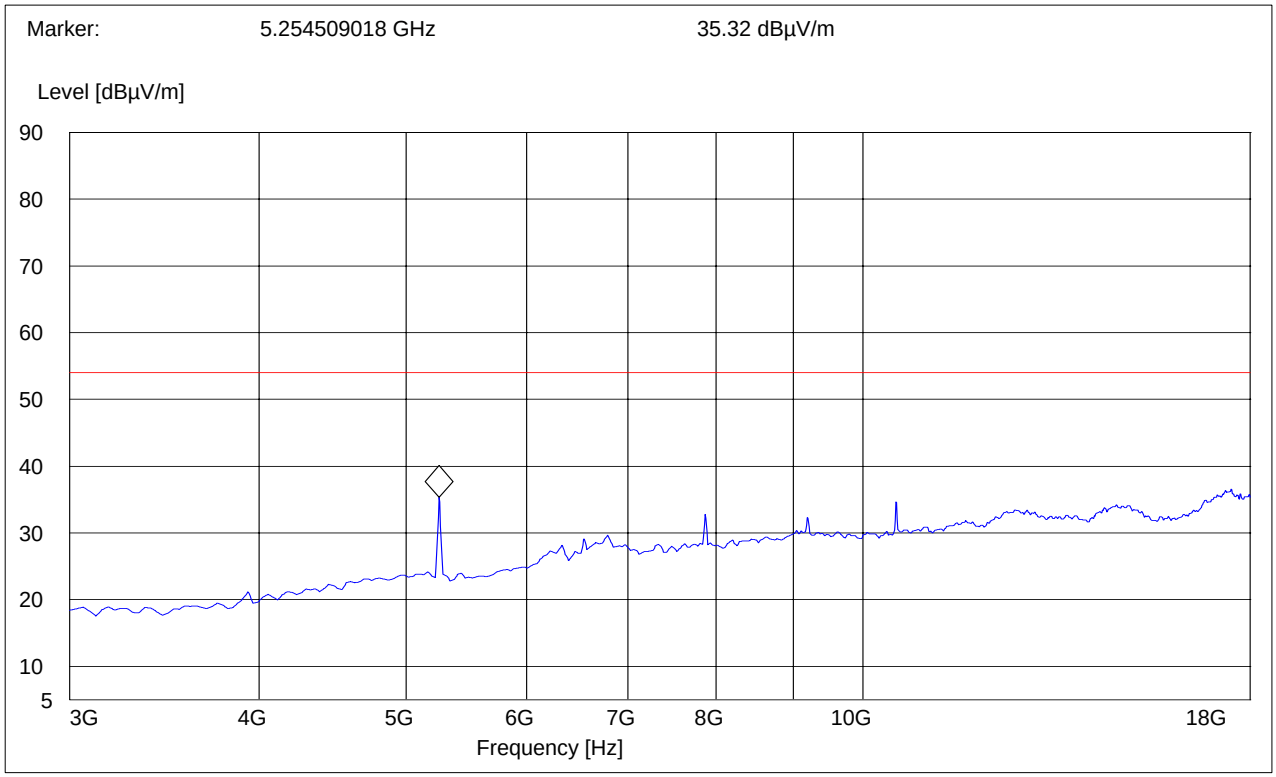
Note: Peak Reading vs. Average limit, see next page for Average Reading vs. Average limit



3-18GHz

Start Frequency	Stop Frequency	Detector	Meas. Time	RBW	VBW
3GHz	18GHz	Max Peak	Coupled	1 MHz	10 Hz

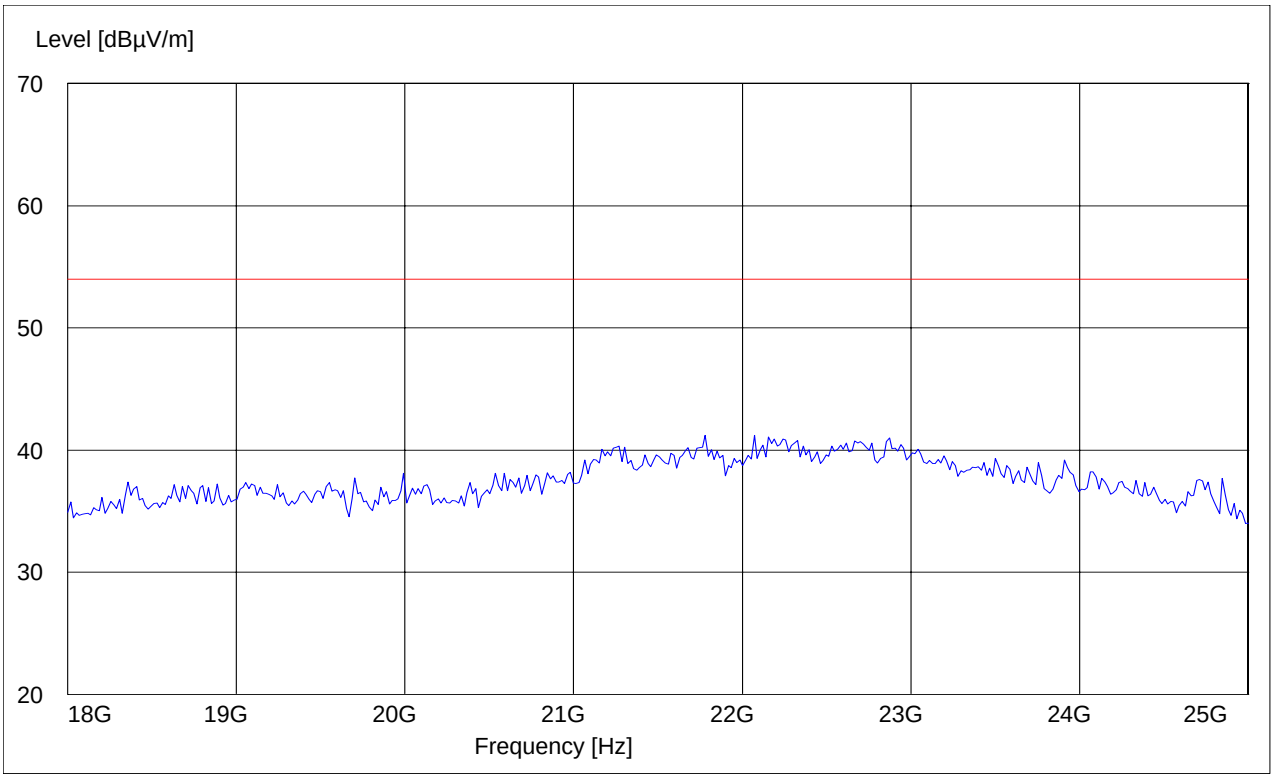
Note: Average Reading vs. Average limit



18-25GHz

Start Frequency	Stop Frequency	Detector	Meas. Time	RBW	VBW
18GHz	25GHz	Max Peak	Coupled	1 MHz	1 MHz

Note: Peak Reading vs. Average limit



5.11 AC POWER LINE CONDUCTED EMISSIONS § 15.107/207

5.11.1 LIMITS

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

5.11.2 RESULTS

Measured with AC/DC power adapter FRIWO model#:SDA5518

LISN

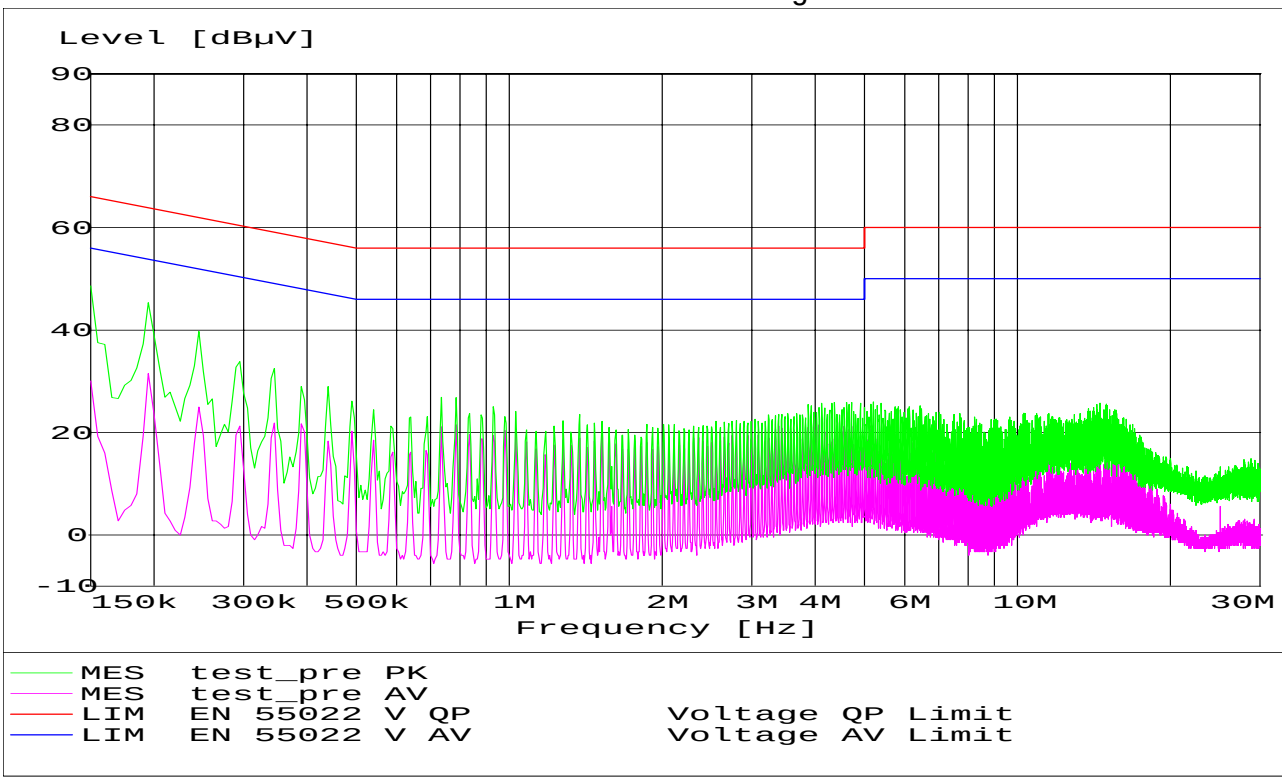
411 Dixon Landing Road, CA 95035

```
EUT / Description: bluetooth
Manufacturer:      trimble nav
Test mode:         tx @ 2402
Test Engineer:     neelesh
Phase:             L & N
Comment:           110 volt

Start of Test:     11/23/2005 / 1:08:23PM
```

SCAN TABLE: "EN 55022 Voltage"

```
   Short Description:            EN 55022 Voltage
   Start      Stop       Step       Detector  Meas.     IF
Transducer
   Frequency  Frequency  Width                Time      Bandw.
   150.0 kHz  30.0 MHz   5.0 kHz    MaxPeak   10.0 ms   9 kHz    None
                                    Average
```



6 Measurements For R8-MODEL 2, SPS880

6.1 CO-LOCATION

All Co-location testing was performed with the EUT transmitting in the PCS band (1880MHz) and the EUT transmitting in Bluetooth mode(2402MHz).

These channels were deemed worst case due to there EIRP readings. All testing was performed using FCC 15.247 procedures/limits.

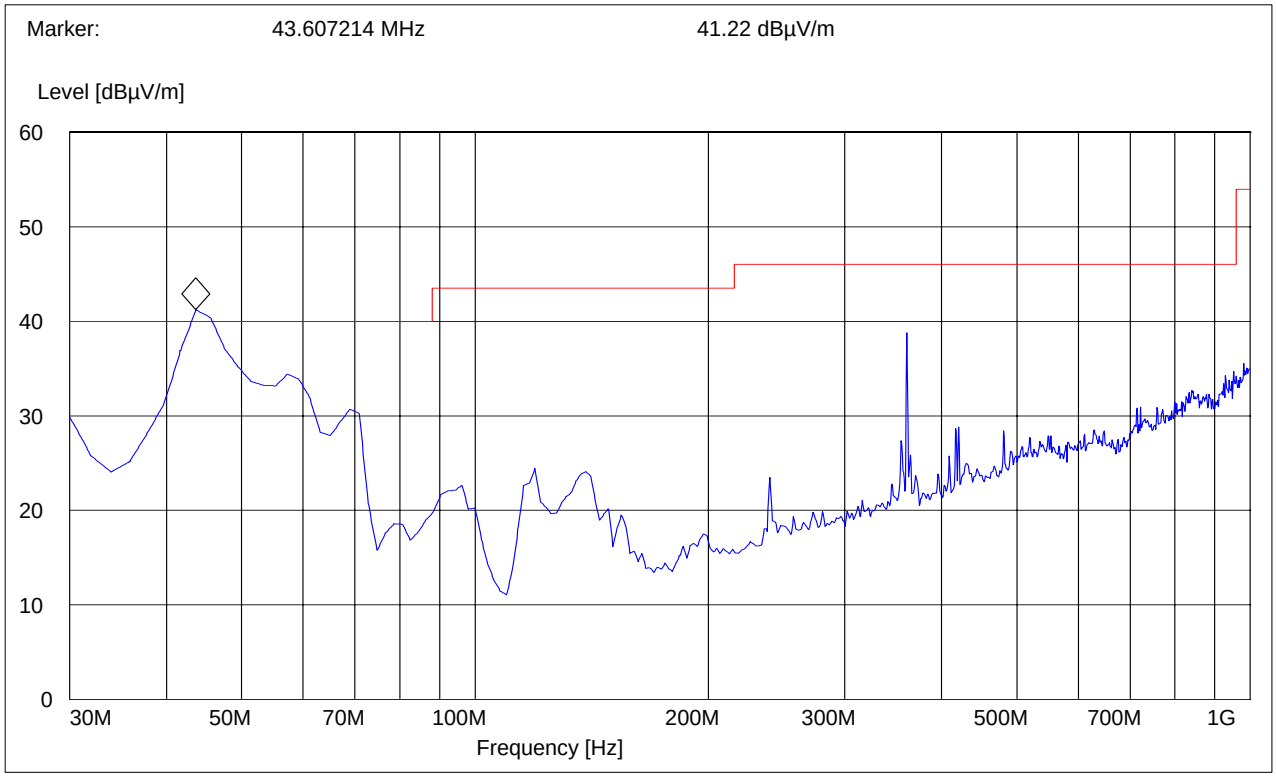
The attached graph (6.1.1) reflects peak measurements. If peak measurements exceeded the specified peak limits, additional quasi peak measurements have been conducted (if required by the standard). The quasi peak test result is then reflected in the result table below the graph, too.

6.1.1 RESULTS (PCS AND BLUETOOTH)

30MHz – 1GHz
Antenna: vertical

Start Frequency	Stop Frequency	Detector	Meas. Time	RBW	VBW
30MHz	1GHz	Max Peak	Coupled	100 KHz	100 KHz

Note: Peak Reading vs. Quasi-Peak limit

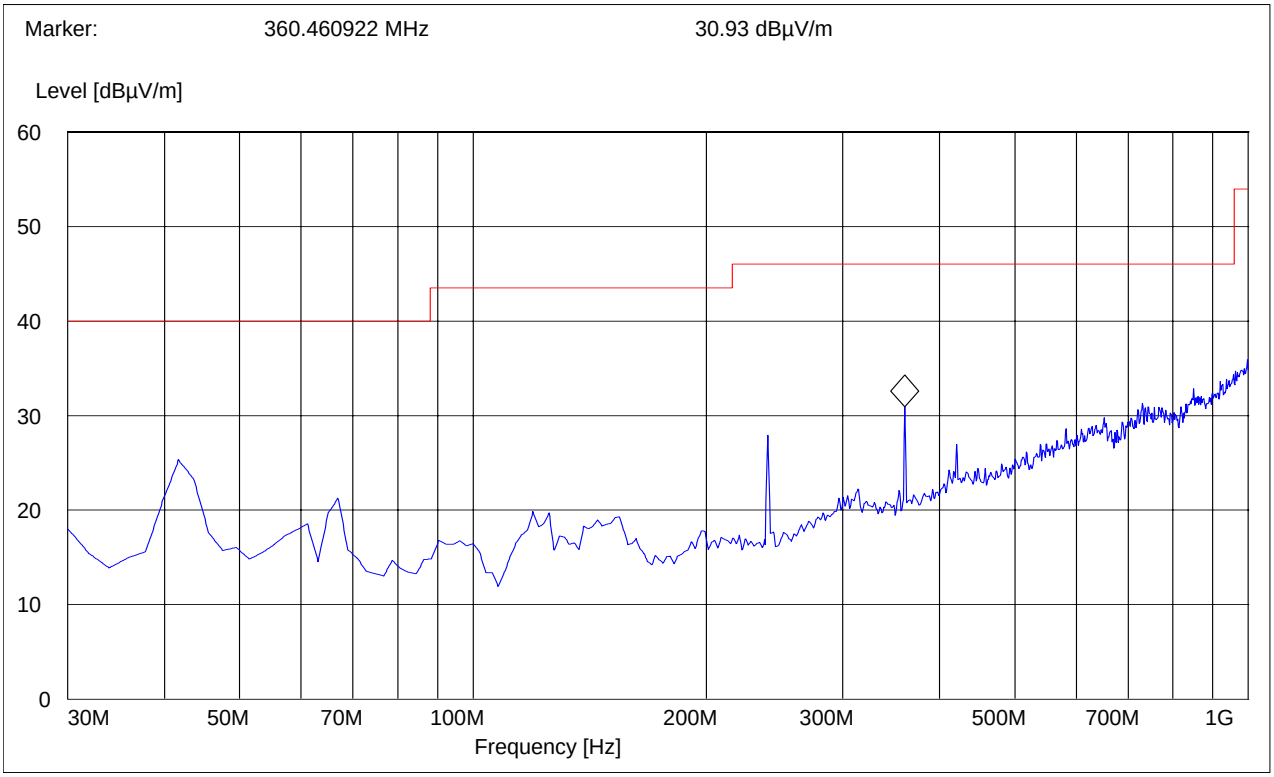


Frequency	Max Peak	Quasi-peak	Limit	Margin
43.6 MHz	41.22dBuV	36.22dBuV	40 dBuv	-3.78dB

30MHz – 1GHz
Antenna: horizontal

Start Frequency	Stop Frequency	Detector	Meas. Time	RBW	VBW
30MHz	1GHz	Max Peak	Coupled	100 KHz	100 KHz

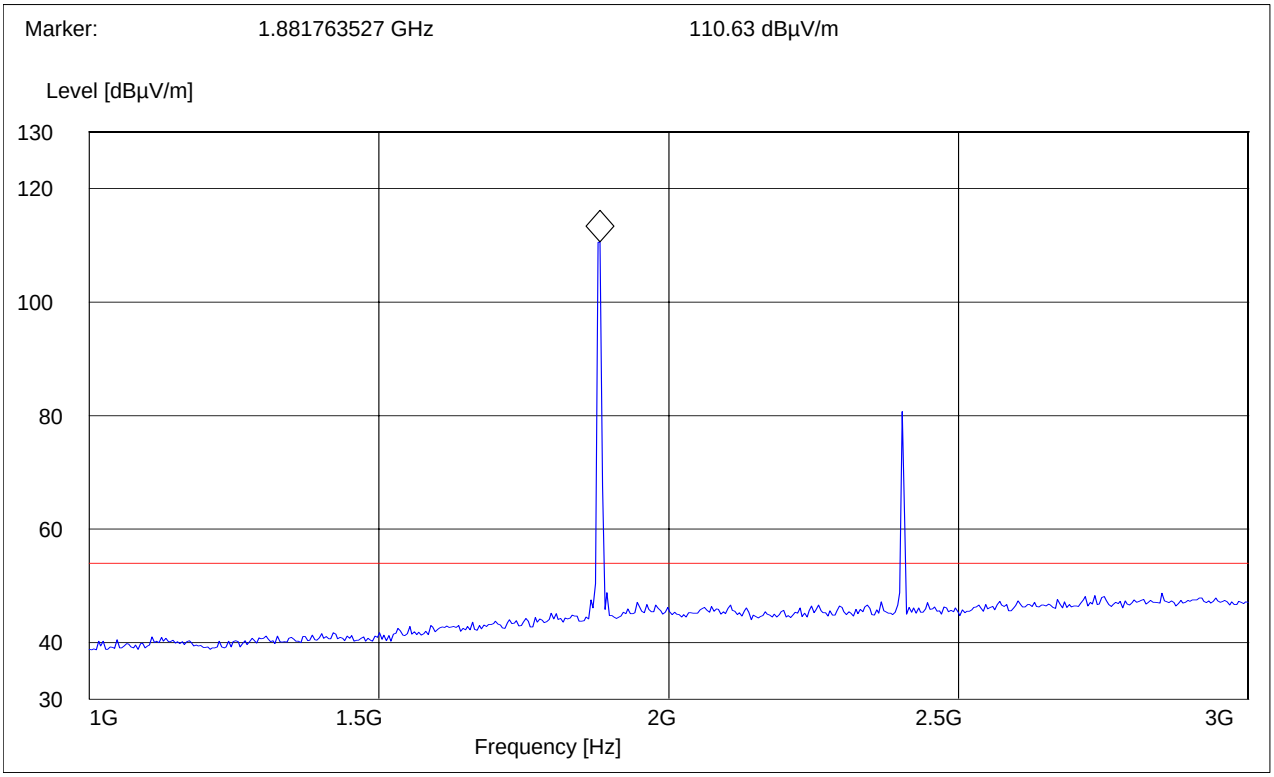
Note: Peak Reading vs. Quasi-Peak limit



1-3GHz

Start Frequency	Stop Frequency	Detector	Meas. Time	RBW	VBW
1GHz	3GHz	Max Peak	Coupled	1 MHz	1 MHz

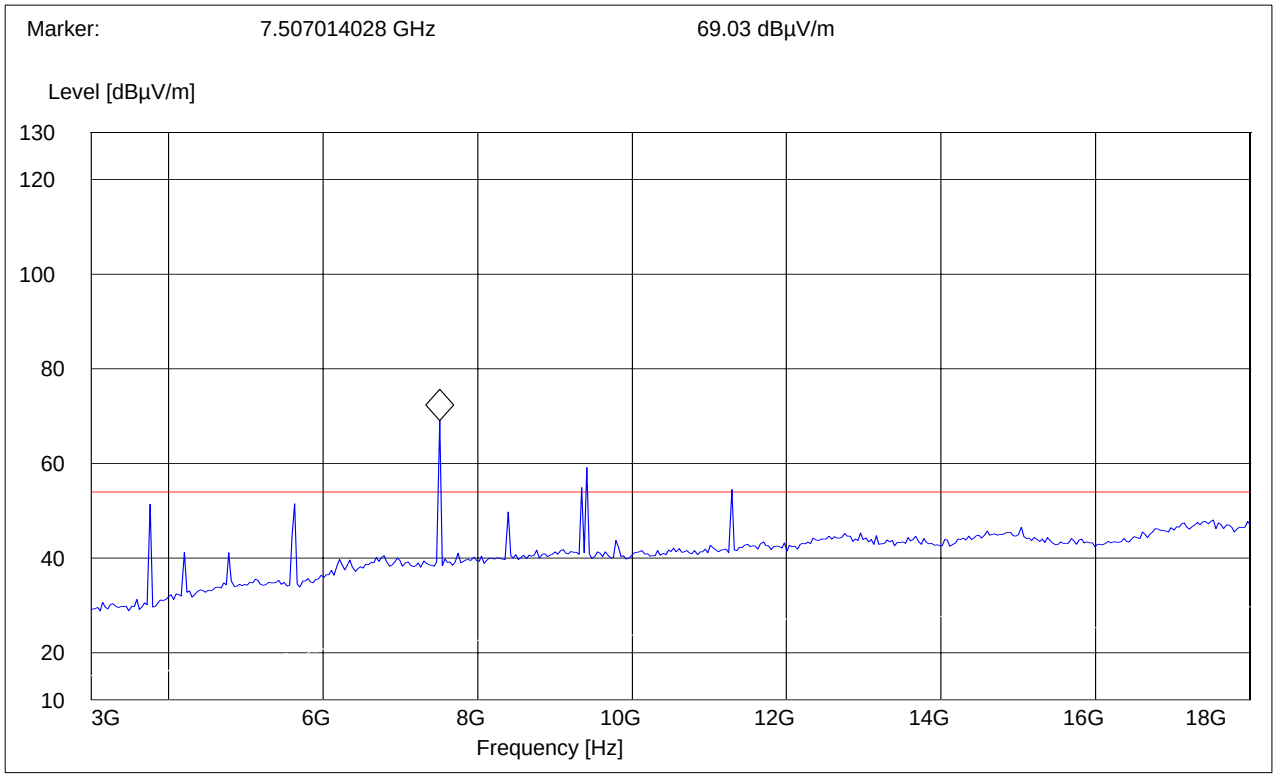
Note: The peaks above the limit line is the carrier freq of the Bluetooth and PCS transmitter.
Note: Peak Reading vs. Average limit



3-18GHz

Start Frequency	Stop Frequency	Detector	Meas. Time	RBW	VBW
3GHz	18GHz	Max Peak	Coupled	1 MHz	1 MHz

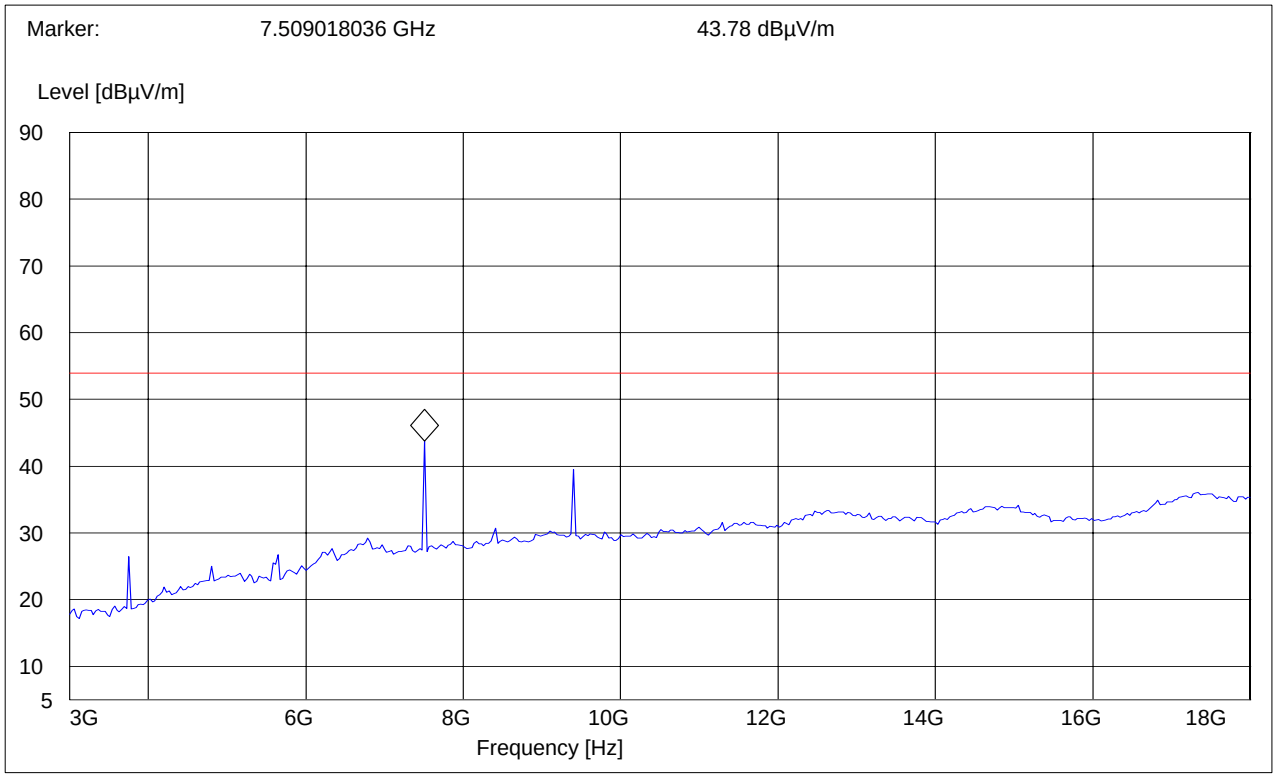
Note: Peak Reading vs. Average limit, see next page for Average Reading vs. Average limit



3-18GHz

Start Frequency	Stop Frequency	Detector	Meas. Time	RBW	VBW
3GHz	18GHz	Max Peak	Coupled	1 MHz	10 Hz

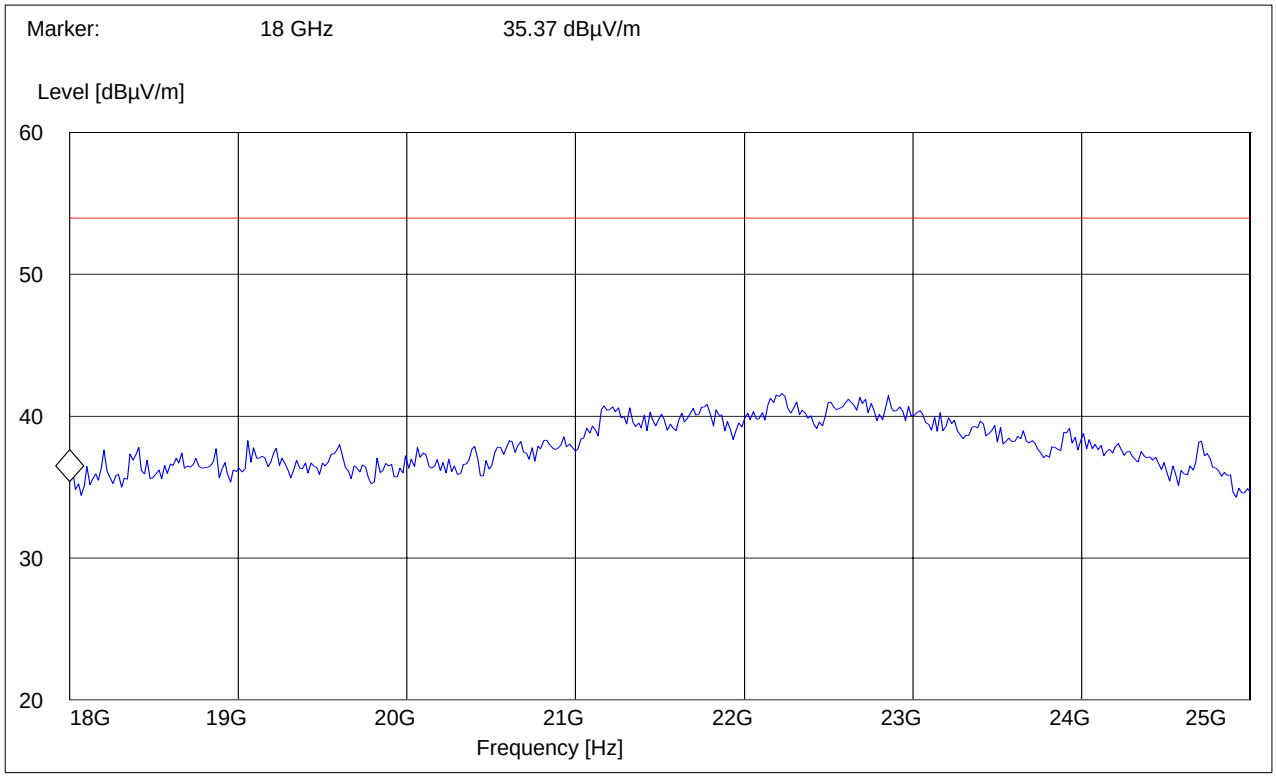
Note: Average Reading vs. Average limit



18-25GHz

Start Frequency	Stop Frequency	Detector	Meas. Time	RBW	VBW
18GHz	25GHz	Max Peak	Coupled	1 MHz	1 MHz

Note: Peak Reading vs. Average limit



6.2 RECEIVER SPURIOUS RADIATION § 15.209/RSS210

6.2.1 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:
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.

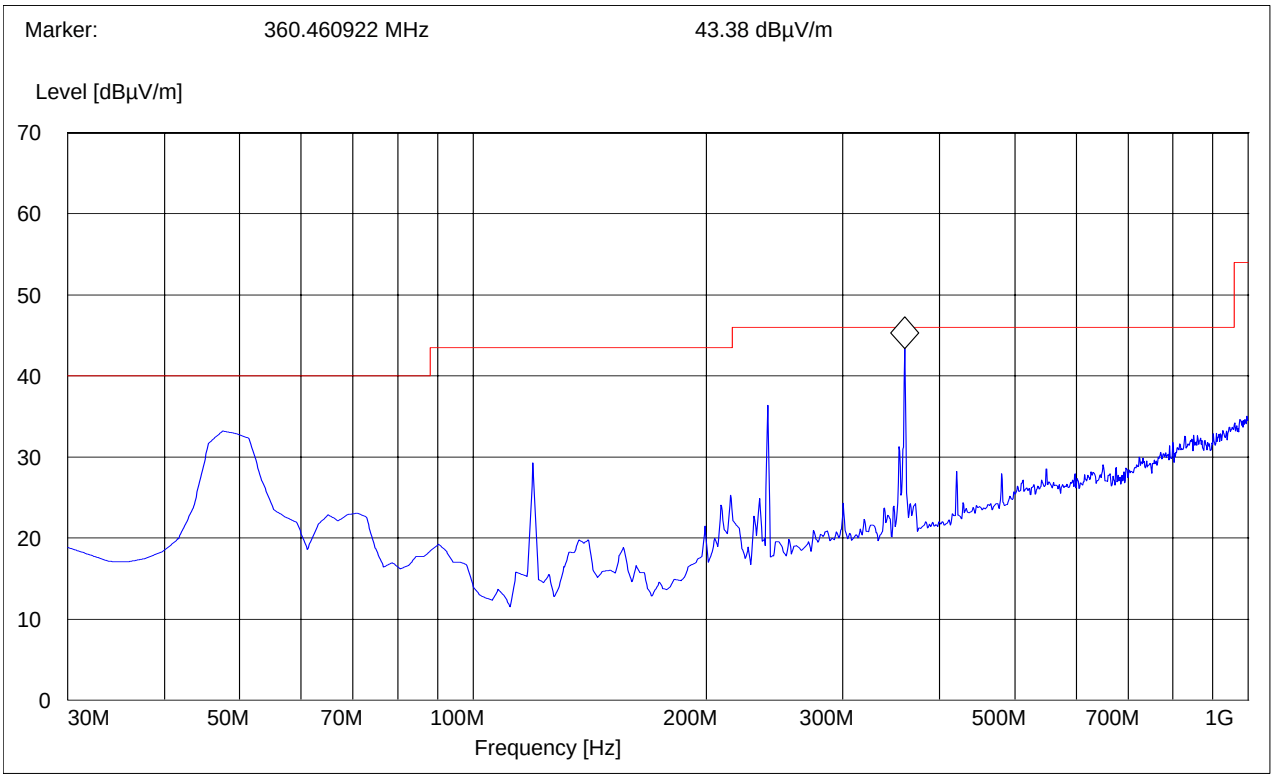
2. All measurements are done in peak mode using a quasi-peak or average limit , unless specified with the plots.

6.2.2 RESULTS

30MHz – 1GHz
Antenna: vertical

Start Frequency	Stop Frequency	Detector	Meas. Time	RBW	VBW
30MHz	1GHz	Max Peak	Coupled	100 KHz	100 KHz

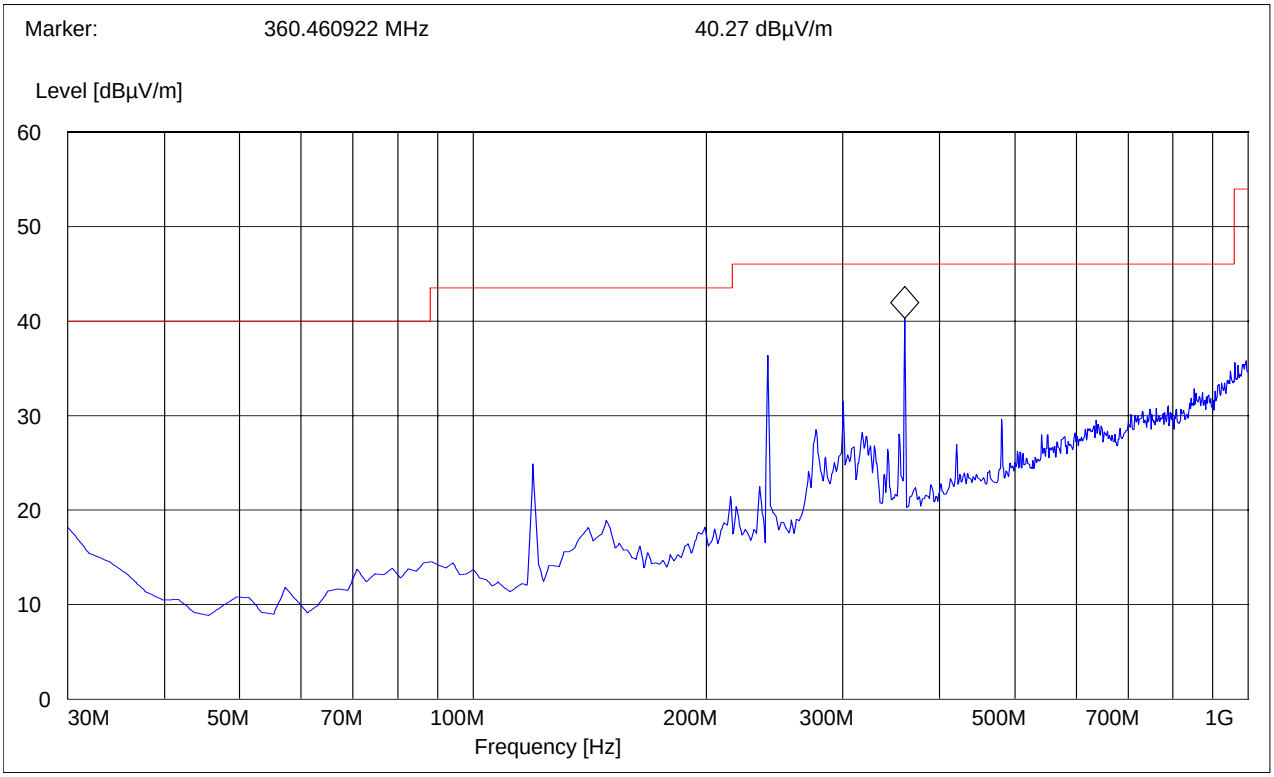
Note: Peak Reading vs. Quasi-peak limit



30MHz – 1GHz
Antenna: horizontal

Start Frequency	Stop Frequency	Detector	Meas. Time	RBW	VBW
30MHz	1GHz	Max Peak	Coupled	100 KHz	100 KHz

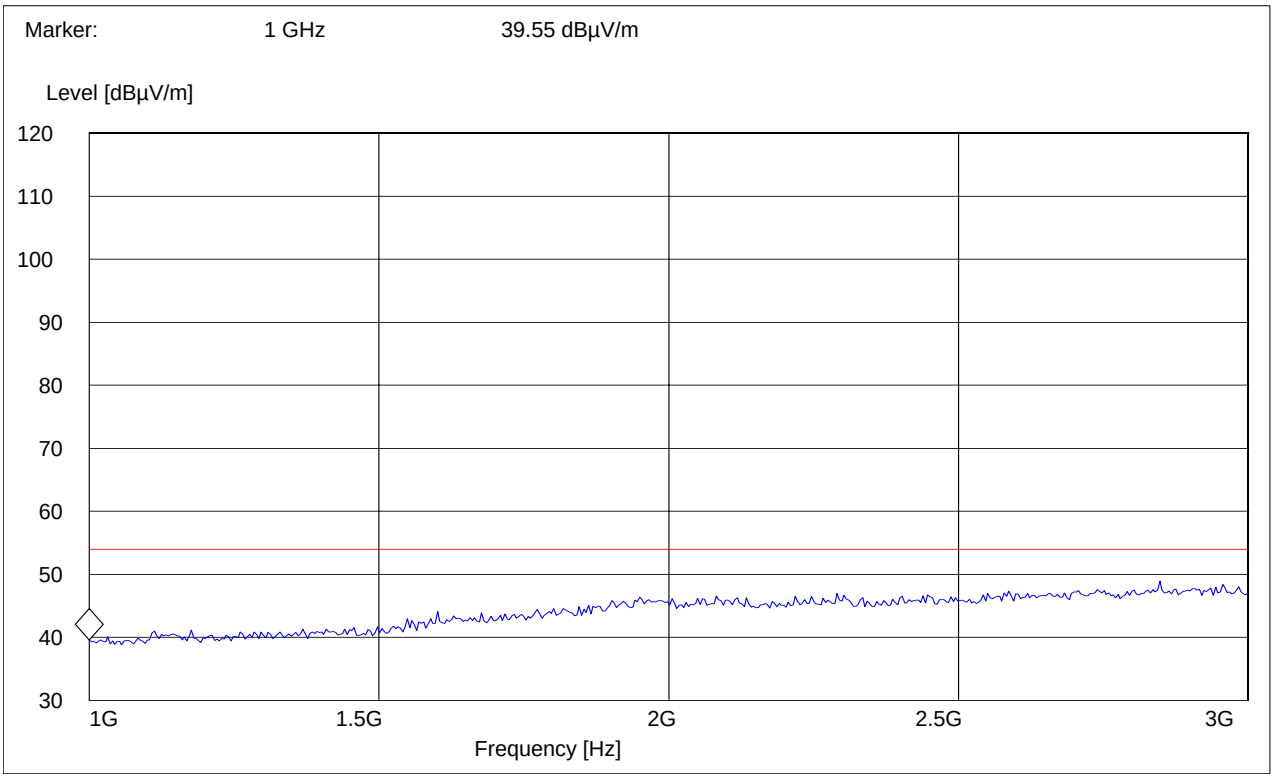
Note: Peak Reading vs. Quasi-peak limit



1-3GHz

Start Frequency	Stop Frequency	Detector	Meas. Time	RBW	VBW
1GHz	3GHz	Max Peak	Coupled	1 MHz	1 MHz

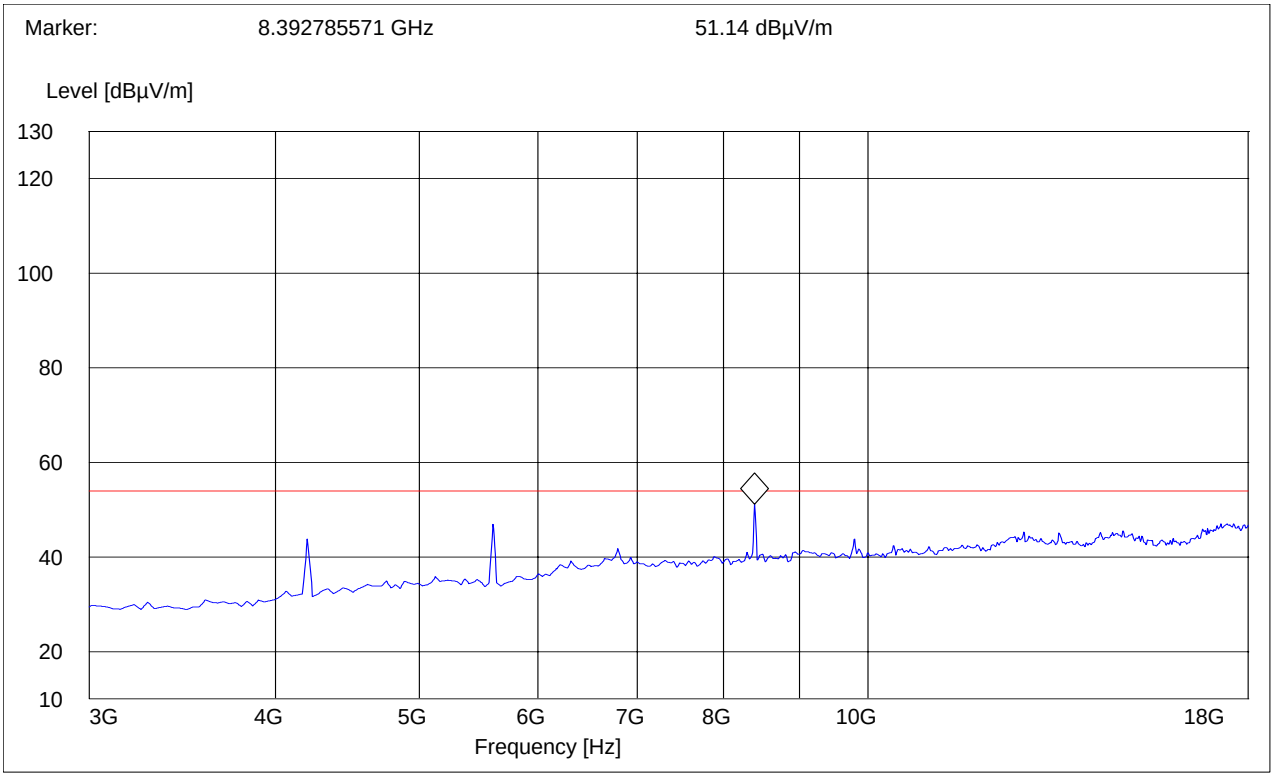
Note: Peak Reading vs. Average limit



3-18GHz

Start Frequency	Stop Frequency	Detector	Meas. Time	RBW	VBW
3GHz	18GHz	Max Peak	Coupled	1 MHz	1 MHz

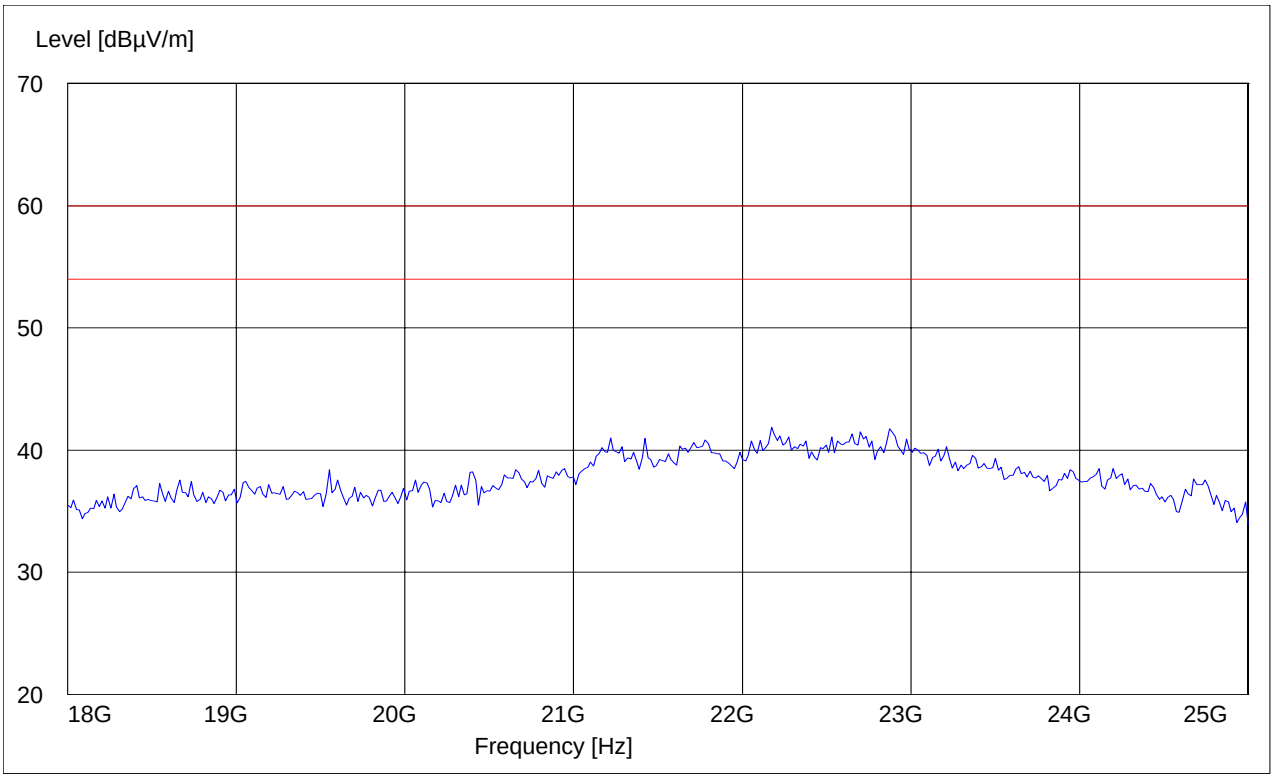
Note: Peak Reading vs. Average limit



18-25GHz

Start Frequency	Stop Frequency	Detector	Meas. Time	RBW	VBW
18GHz	25GHz	Max Peak	Coupled	1 MHz	1 MHz

Note: Peak Reading vs. Average limit



6.3 AC POWER LINE CONDUCTED EMISSIONS § 15.107/207

6.3.1 LIMITS

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

testing was performed with the EUT transmitting in the PCS band (1880MHz) and the EUT transmitting in Bluetooth mode(2402MHz).

6.3.2 RESULTS

Measured with AC/DC power adapter FRIWO model#:SDA5518

LISN

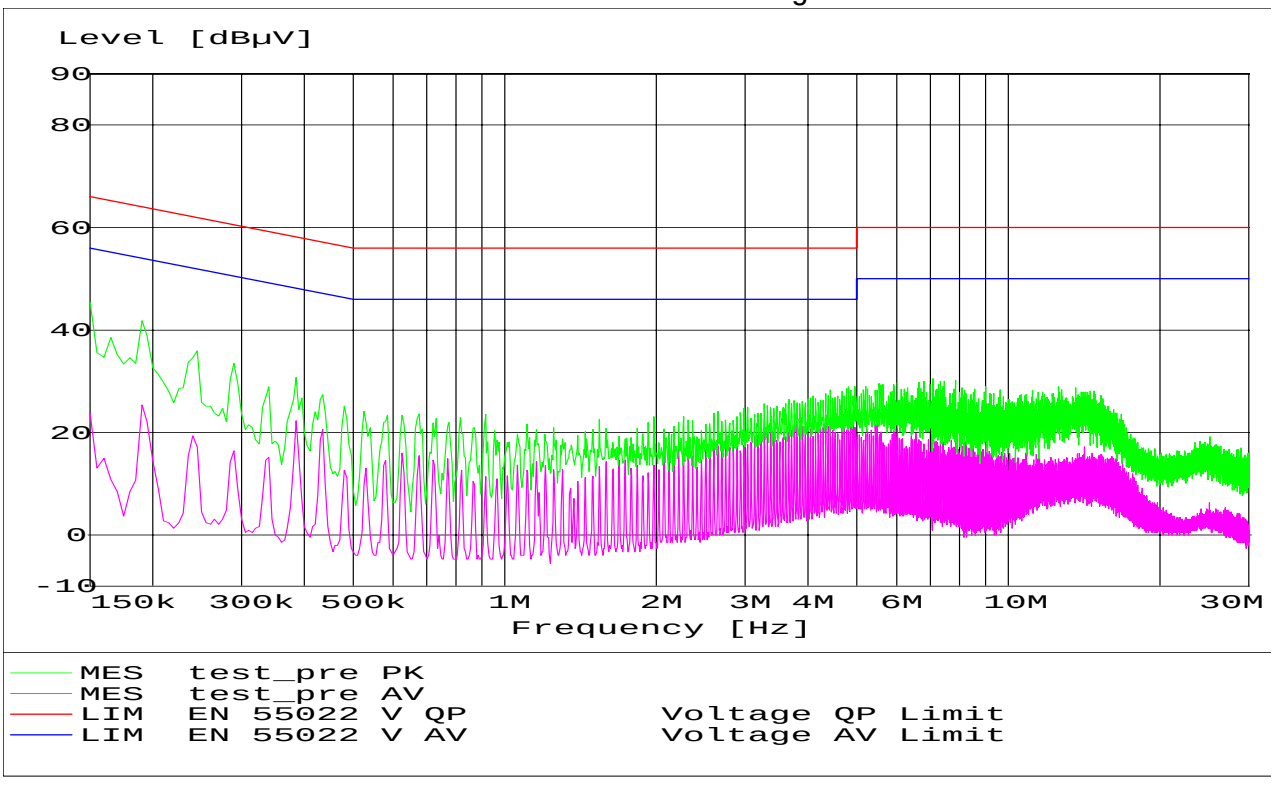
411 Dixon Landing Road, CA 95035

```
EUT / Description: Bluetooth Module
Manufacturer:      Trimble Navigation
Test mode:         PCS 1900 channel-661; Bluetooth TX@2402MHz
Test Engineer:     mark
Phase:             L & N
Comment:           110 volt

Start of Test:     11/28/2005 / 4:37:50PM
```

SCAN TABLE: "EN 55022 Voltage"

```
   Short Description:            EN 55022 Voltage
   Start      Stop       Step       Detector  Meas.     IF
Transducer
   Frequency  Frequency  Width                Time      Bandw.
   150.0 kHz  30.0 MHz   5.0 kHz    MaxPeak   10.0 ms   9 kHz    None
                                    Average
```



6.4 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

6.5 BLOCK DIAGRAMS

Radiated Testing