

FCC TEST REPORT

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Locations & Offices

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Network Navigation

• SEOUL
• YONGIN
• GUMI

February 27, 2006

NEX 1 Future Co., Ltd.

TEST REPORT CERTIFICATION

Applicant : Remote Solution Co., Ltd.

Adderss : 92, Chogokri, Nammyun, Kimchon city, Kyungbuk, 740-871, Korea

EUT Name : Color LCD Touch screen universal remote control

Model No. : RH60A and XTR39

Serial No. : Engineering Sample

FCCID : TX4RH60A

Testing location : Nex1 Future Co., Ltd.
133, Kongdan-Dong, Gumi-City, Kyeongsangbuk-Do, 730-030, R.O.K

Applied specification : FCC Part 15

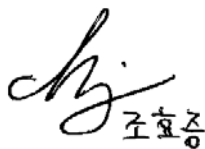
Test result : The above mentioned test item passed.

Test Date February 27, 2006 **Review Date** February 27, 2006

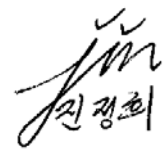
Tested by Hyo-Jeung, Cho **Reviewed by** Jeong-Hi, Jin

Title Engineer **Title** EMC Manager

Signature


조효정

Signature


진경희

I HEREBY CERTIFY THAT the data shown in this report were made in accordance with the procedures given in the applied specification and I assume full responsibility for accuracy and completeness of these data.

Note : This test report relates to the a. m. test item. Without permission of the test center this test report is not permitted to be duplicated in extracts. This test report does not entitle to carry any test mark on this or similar products.

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1. General Information

1.1 Product Description

Product Name : Color LCD Touch screen universal remote control
Product ID : RH60A and XTR39
Serial No. : Prototype
FCC ID : TX4RH60A

1.2 Project data

Receipt of EUT : February 13, 2006
Date of Test : February 27, 2006
Data of report : February 27, 2006

1.3 Applicant

Company Name : Remote Solution Co., Ltd.
Address : 92, Chogokri, Nammyun, Kimchon city, Kyungbuk,
740-871, Korea
Contact Person : Mr. Byung-Cheol, Kim

1.4 Manufacturer

Company Name : Remote Solution Co., Ltd.
Address : 92, Chogokri, Nammyun, Kimchon city, Kyungbuk,
740-871, Korea
Contact Person : Mr. Byung-Cheol, Kim

2. EUT Information

2.1 General EUT Information

Type	Transmitter	Receiver
FCC Classification	Direct Sequence Spread Spectrum(DSSS)	Direct Sequence Spread Spectrum(DSSS)
EUT Type	Zigbee (802.15.4)	Zigbee (802.15.4)
Modulation Type	OQPSK	OQPSK
Operating frequency range	2405 – 2475 MHz	2405 – 2475 MHz
Bands of operation	2.400 – 2.4835 GHz	2.400 – 2.4835 GHz
Number of Channels	15	15
Channel Separation	5MHz	5MHz
Type of Antenna	Dielectric Chip Antenna	Dielectric Chip Antenna
Power Supply	DC 3.7 V Lithium Ion	DC 3.7 V Lithium Ion

2.2 Center Frequency of Tested Channel

Frequency	Tx (MHz)	Rx (MHz)
Lowest	2405	2405
Middle	2440	2440
Highest	2475	2475

2.3 Test Environment

Temperature	25°C
Relative Humidity	30 ~ 60%
Voltage(DC)	DC 3.7V
Voltage(AC)	115V AC , 50Hz

2.4 Accessories and Ancillary Equipment

Equipment	Model No.	Serial Number	Maker
Laptop PC	PS428L-OE142	30014068J	Toshiba

3. Testing Facilities

Nex1 Future Co., Ltd.

133, Kongdan-Dong, Gumi-City, Kyeongsangbuk-Do, 730-030, R.O.K

4. EUT Description and Operational Description

The RH60 is designed to control various home appliances and sensor equipment safely and easily.

Using 3.9" full color touch screen makes everyone use easily the product and allows to redesign and recompose the control button according to the uses of each user.

The control system for the appliances is the infrared, and the 2.4GHz Zigbee is available as well.

The RH60 is designed to control all home appliances with only the 2.4GHz RF by Using the Zigbee to IR converter instead of using the infrared, which solve the distance and space problem caused by using the infrared.

There are various entertainment features. The alarm, clock, bio-rhythm, memo pad and game are supported.

With the manager program, the database and firmware are upgraded and the LCD screen and button are recomposed simply via USB.

It is possible to use the product for around 100 hours without charging because of The excellent power management and the high capacity rechargeable battery.

While the RH60 is sitting on the charging cradle, the appliances control is allowed in case of using its sub-remote.

5. Test Set-up

5.1 Principle of configuration

Conducted : The equipment under test (EUT) was configured with a temporary SMA Connector and EUT transmits its maximum power level.

Emission: The equipment under test (EUT) was configured to measure its highest possible radiation level. The test modes and test settings were adapted accordingly in reference to the instructions for use.

For details, please refer to the Operation mode in chapter 7.

5.2 Operational Modes

Fixed mode (2405Mhz, 2440Mhz and 2475Mhz)

5.3 Applied Specification

FCC Part 15

6. Test Report Summary

Related Clause	Test Cases	FCC Part Sections	Result (Note1)
7.1	Antenna Connector Requirements	15.203 15.204	C
7.2	AC Connected Emission	15.207	Pass
7.3	6dB Bandwidth	15.247(a)(2)	Pass
7.4	Power Spectral Density	15.247(e)	Pass
7.5	Peak Output Power	15.247(b)(3)	Pass
7.6	Band-edge Compliance	15.247(d)	Pass
7.7	Spurious Conducted emissions	15.247(d)	Pass
7.8	Spurious Radiated emissions	15.247(d)	Pass

* Note1: C: Complies, Pass: Passed, Fail : Failed and NA : Not Applicable

7. Test Results

7.1 Antenna Connector Requirements

Requirements

Subclause 15.203 and 15.204(c)

According to the Part 15.203, an intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the provisions of this Section.

The manufacturer may design the unit so that a broken antenna can be replaced by the user, but the use of a standard antenna jack or electrical connector is prohibited.

And according to the Part 15.204(c), only the antenna with which an intentional radiator is authorized may be used with the intentional radiator.

Test results

RESULT:

Complies

The antenna is permanently attached on the PCB.

The EUT has a Dielectric Chip Antenna.

For more information on the antenna:

Antenna gain : 0 dBi

Manufacturer : AMOTECH Co., Ltd.

Model No. : AMAN903010U2P5

Type : Dielectric Chip Antenna

7.2 AC Connected Emission

Test Mode and conditions

The power is supplied by a DC 3.7 V Lithium Ion or it can be charged with AC/DC adaptor.

Requirements

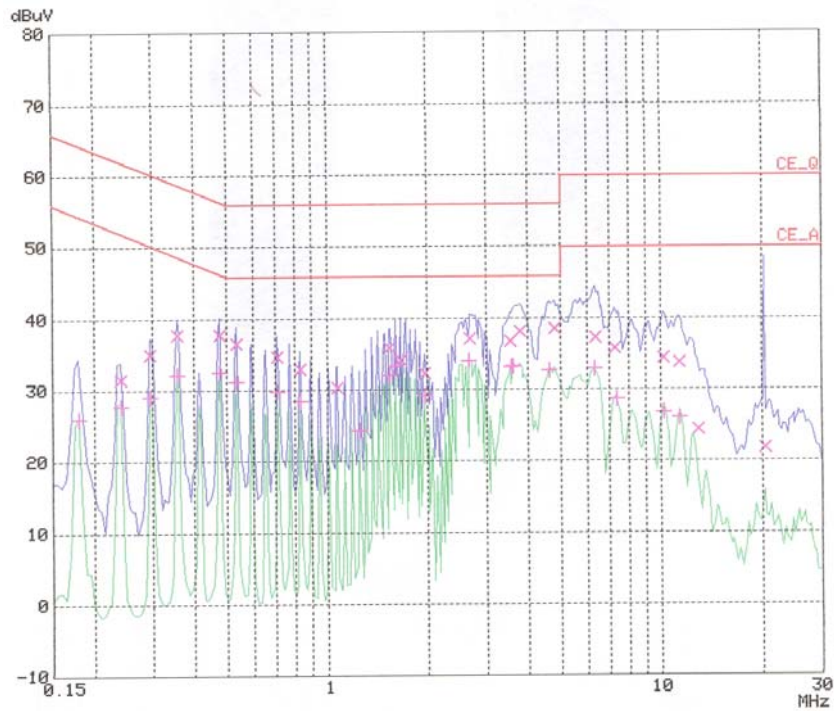
Subclause15.207(a)

For an intentional radiator that is designed to be connected to the public utility (AC) power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies within the band 150 kHz to 30 MHz shall not exceed the limits in the following table, as measured using a 50 μ H/50 ohms line impedance stabilization network (LISN).

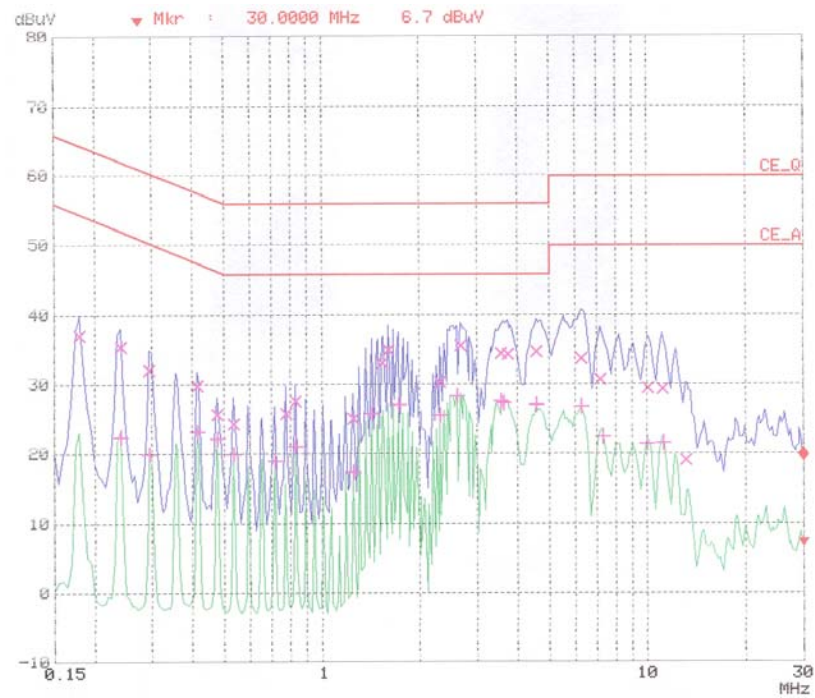
Frequency of Emission (M Hz)	Conducted Limit (dB μ V)	
	Quasi-peak	Average
0.15-0.5	66-56*	56-46*
0.5-5	56	46
5-30	60	50

* Decreases with the logarithm of the frequency.

Test results



< Fig 1. Conducted emission-Hot line >



< Fig 2. Conducted emission-Neutral line >

Frequency (MHz)	Insertion Loss	Cable Loss	Pol.	Quasi-Peak[dBuV]			Average[dBuV]			Margin[dBuV]	
				Limit	Reading	Result	Limit	Reading	Result	Quasi	Average
0.240	0.11	-0.21	N	62.10	35.5	35.40	52.10	22.5	22.40	26.69	29.69
0.475	0.14	-0.16	H	56.43	37.8	37.78	46.43	32.6	32.58	18.65	13.85
0.535	0.14	-0.19	H	56.00	36.5	36.45	46.00	31.3	31.25	19.55	14.75
0.710	0.15	-0.23	H	56.00	34.7	34.62	46.00	29.8	29.72	21.38	16.28
0.830	0.15	-0.23	H	56.00	32.9	32.82	46.00	28.5	28.42	23.18	17.58
1.540	0.17	-0.28	H	56.00	35.9	35.79	46.00	32.1	31.99	20.21	14.01
2.670	0.21	-0.20	H	56.00	37.2	37.21	46.00	34.1	34.11	18.79	11.89
3.795	0.24	-0.14	H	56.00	38.2	38.30	46.00	33.4	33.50	17.70	12.50
4.800	0.27	-0.16	H	56.00	38.6	38.72	46.00	32.8	32.92	17.28	13.08
6.350	0.32	-0.15	H	60.00	37.3	37.47	50.00	33.0	33.17	22.53	16.83
7.290	0.34	-0.06	H	60.00	35.8	36.08	50.00	28.7	28.98	23.92	21.02
10.190	0.40	0.00	H	60.00	34.4	34.80	50.00	26.8	27.20	25.20	22.80
11.320	0.45	0.00	H	60.00	33.9	34.35	50.00	26.1	26.55	25.65	23.45

*Comment : Pol : H (Live), N(Neut)
Insertion Loss : Insertion Loss of LISN
Cable Loss : Cable Loss + Pulse Limiter Insertion loss value

7.3 6dB Bandwidth

Test Mode and conditions

Mode of operation : Tx mode
Measurement Method : Conducted
Detector : PK
Trace : Max hold
RBW/VBW : 100kHz/100kHz

Requirements

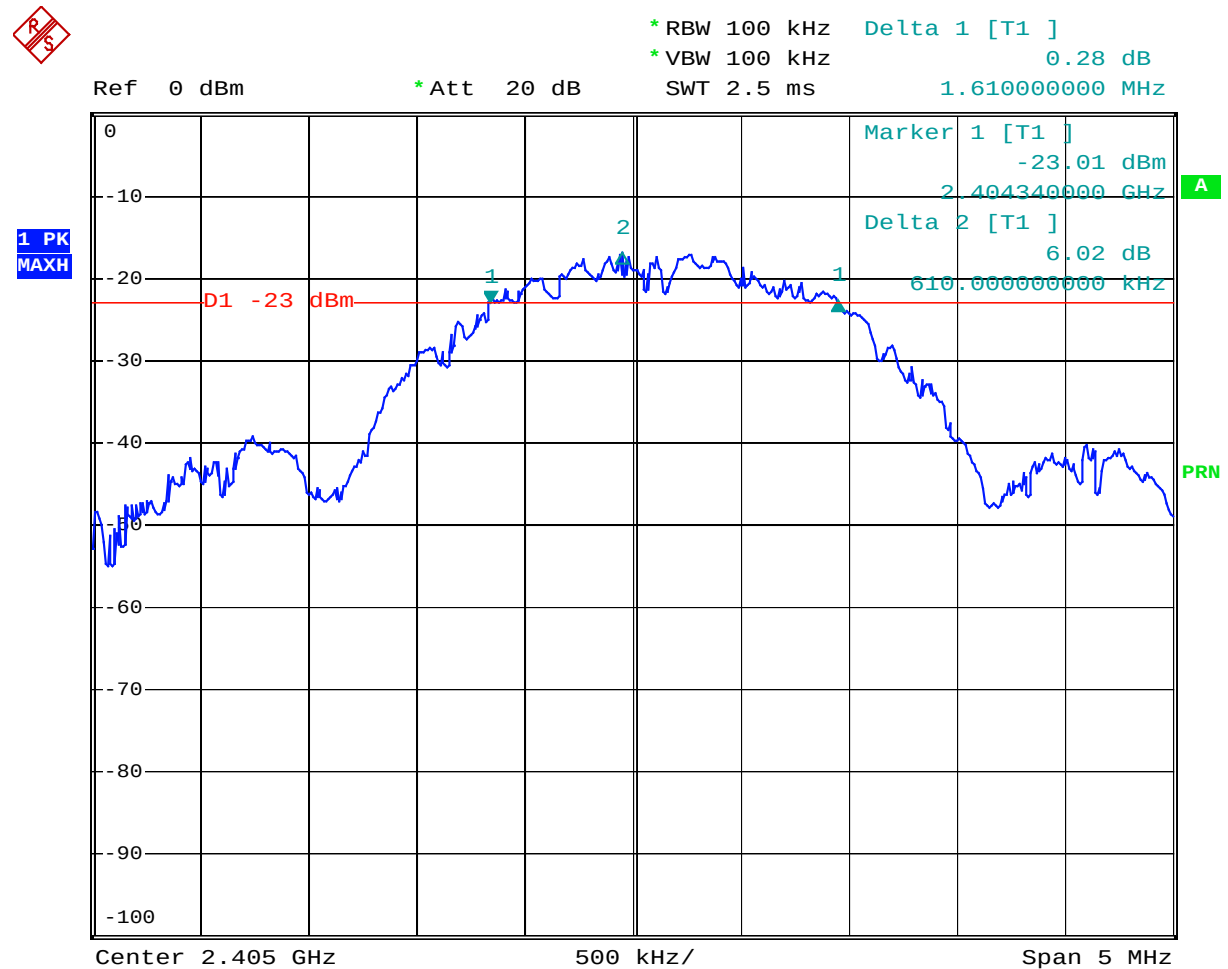
Subclause 15.247(a)(2)

Systems using digital modulation techniques may operate in the 902 - 928 MHz, 2400 - 2483.5 MHz, and 5725 - 5850 MHz bands. The minimum 6 dB bandwidth shall be at least 500 kHz.

Test results

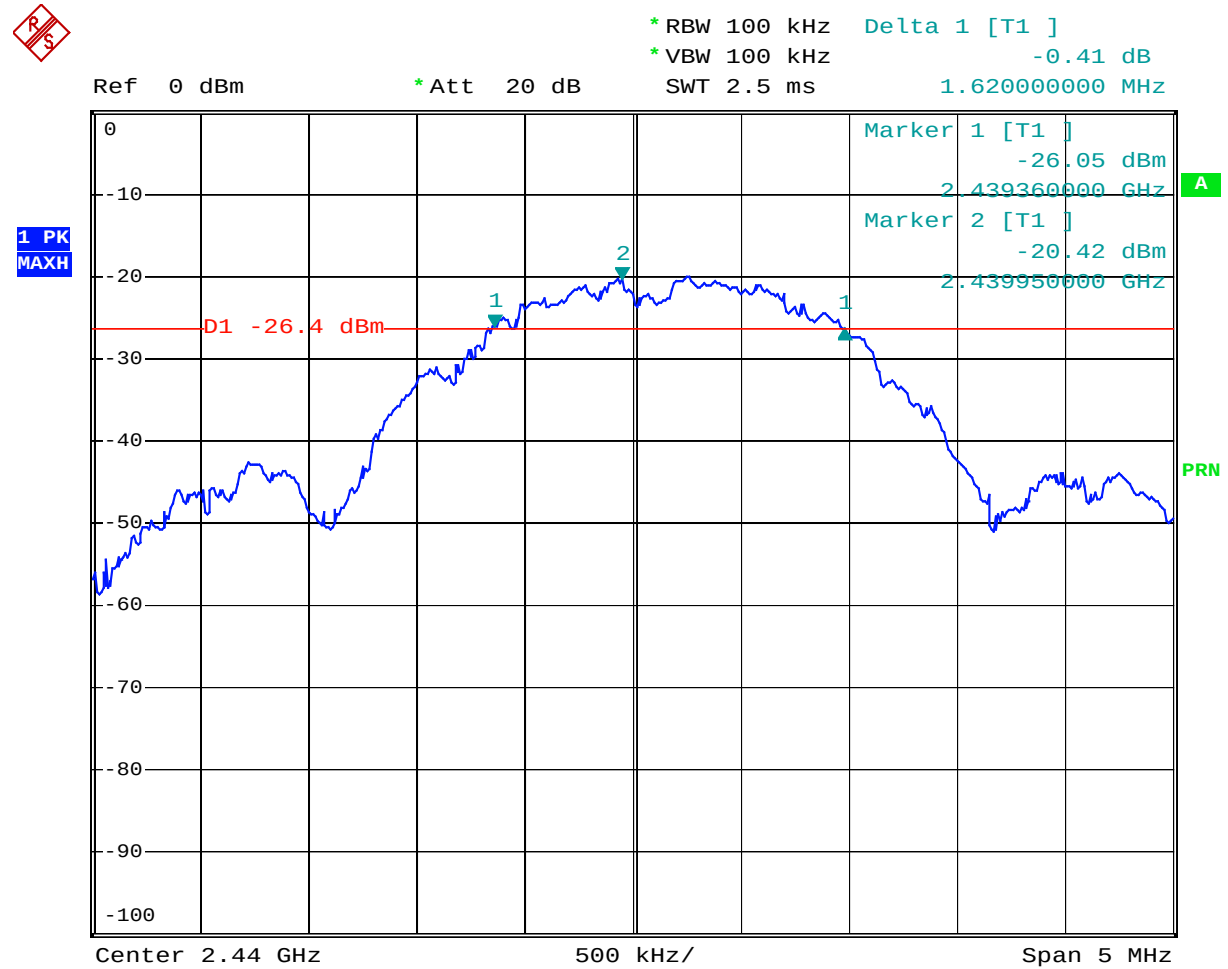
Test frequency (MHz)	6dB Bandwidth (MHz)	Limit (MHz)	Results
2405.000	1.61	> 0.5	Pass
2440.000	1.62	> 0.5	Pass
2475.000	1.60	> 0.5	Pass

6dB Bandwidth Plot-2405



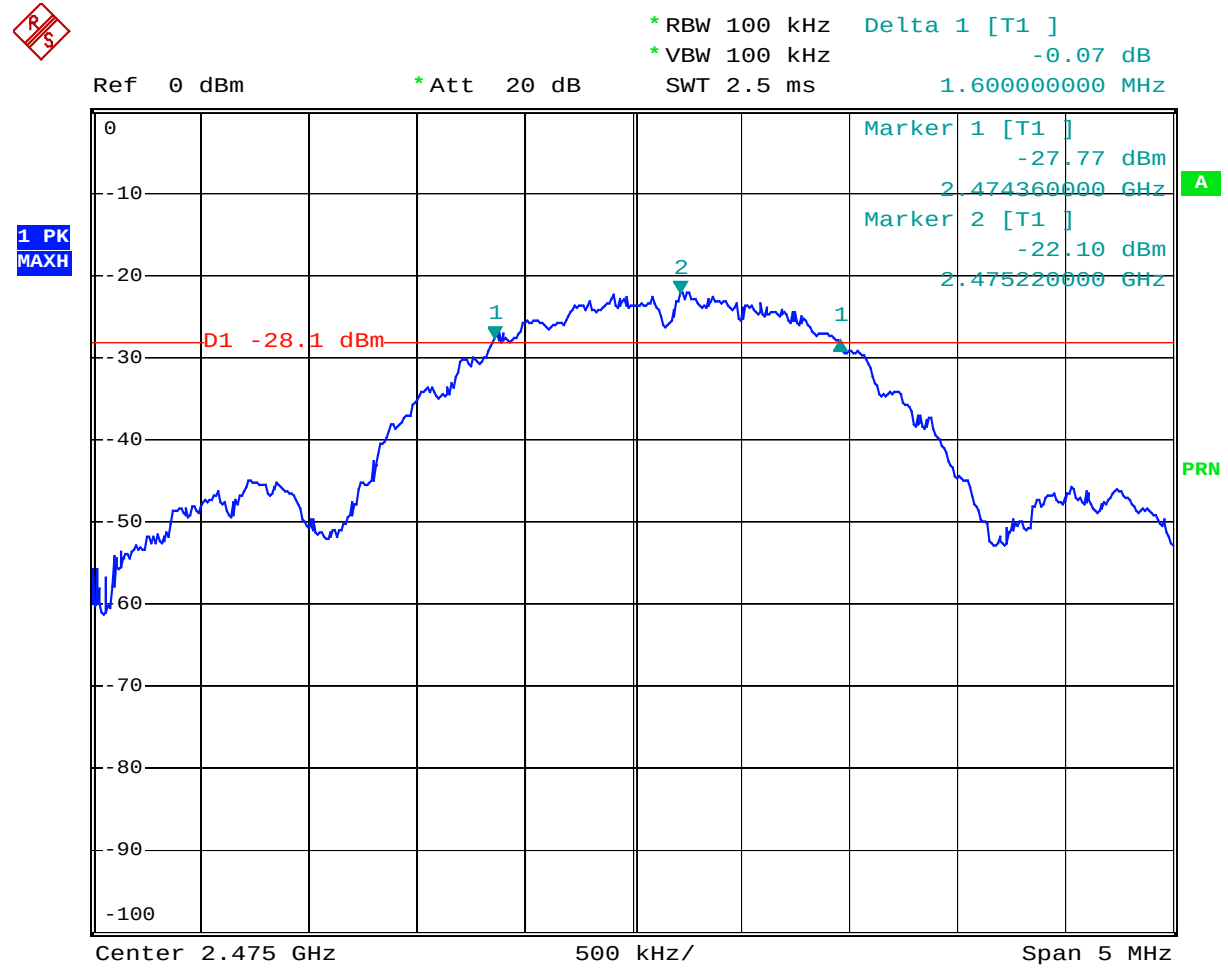
Date: 23.FEB.2006 18:22:05

6dB Bandwidth Plot-2440



Date: 23.FEB.2006 18:25:11

6dB Bandwidth Plot-2475



Date: 23.FEB.2006 18:27:50

7.4 Power Spectral Density

Test Mode and conditions

Mode of operation : Tx mode
Measurement Method : Conducted
Detector : PK
Trace : Max hold
RBW/VBW : 3kHz/10kHz

Requirements

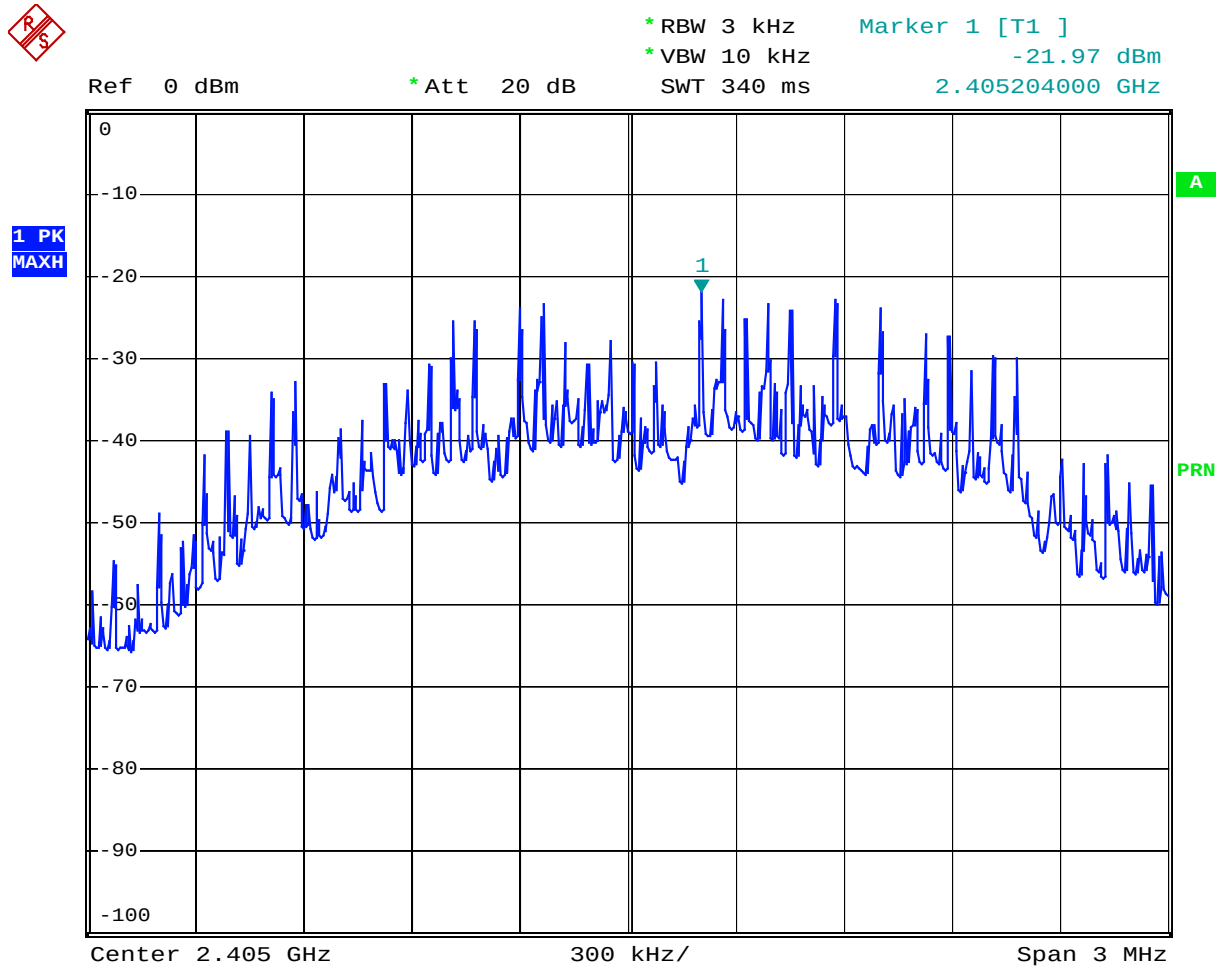
Subclause 15.247(e)

For digitally modulated systems, the power spectral density conducted from the intentional radiator to the antenna shall not be greater than 8 dBm in any 3 kHz band during any time interval of continuous transmission.

Test results

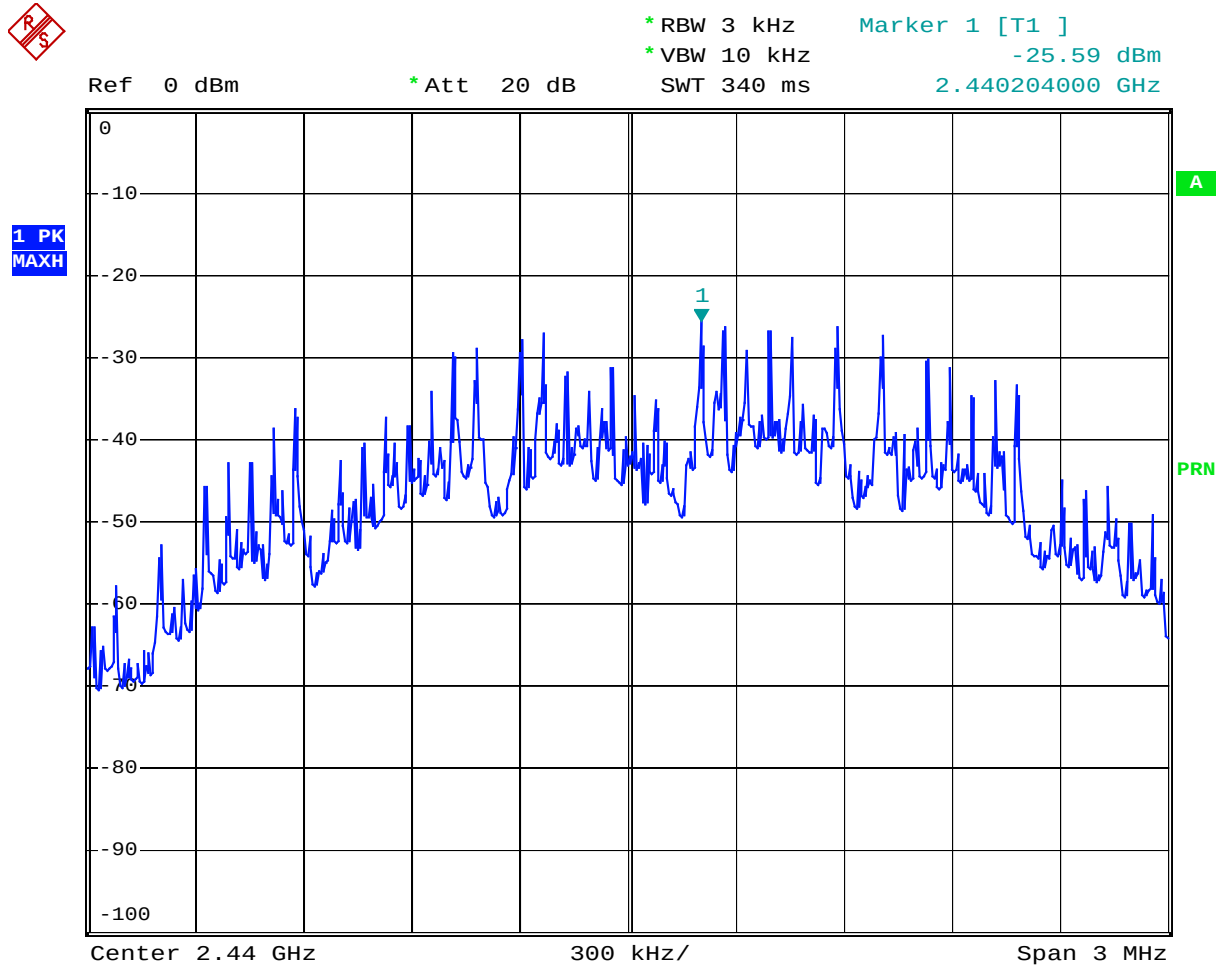
Test frequency (MHz)	Reading (dBm)	Cable attenuation (dB)	Power Spectral Density (dBm)	Limit (dBm)	Results
2405.000	-21.97	1.80	-20.170	8	Pass
2440.000	-25.59	1.83	-23.760	8	Pass
2475.000	-27.59	1.85	-25.740	8	Pass

Power Spectral Density Plot- 2405



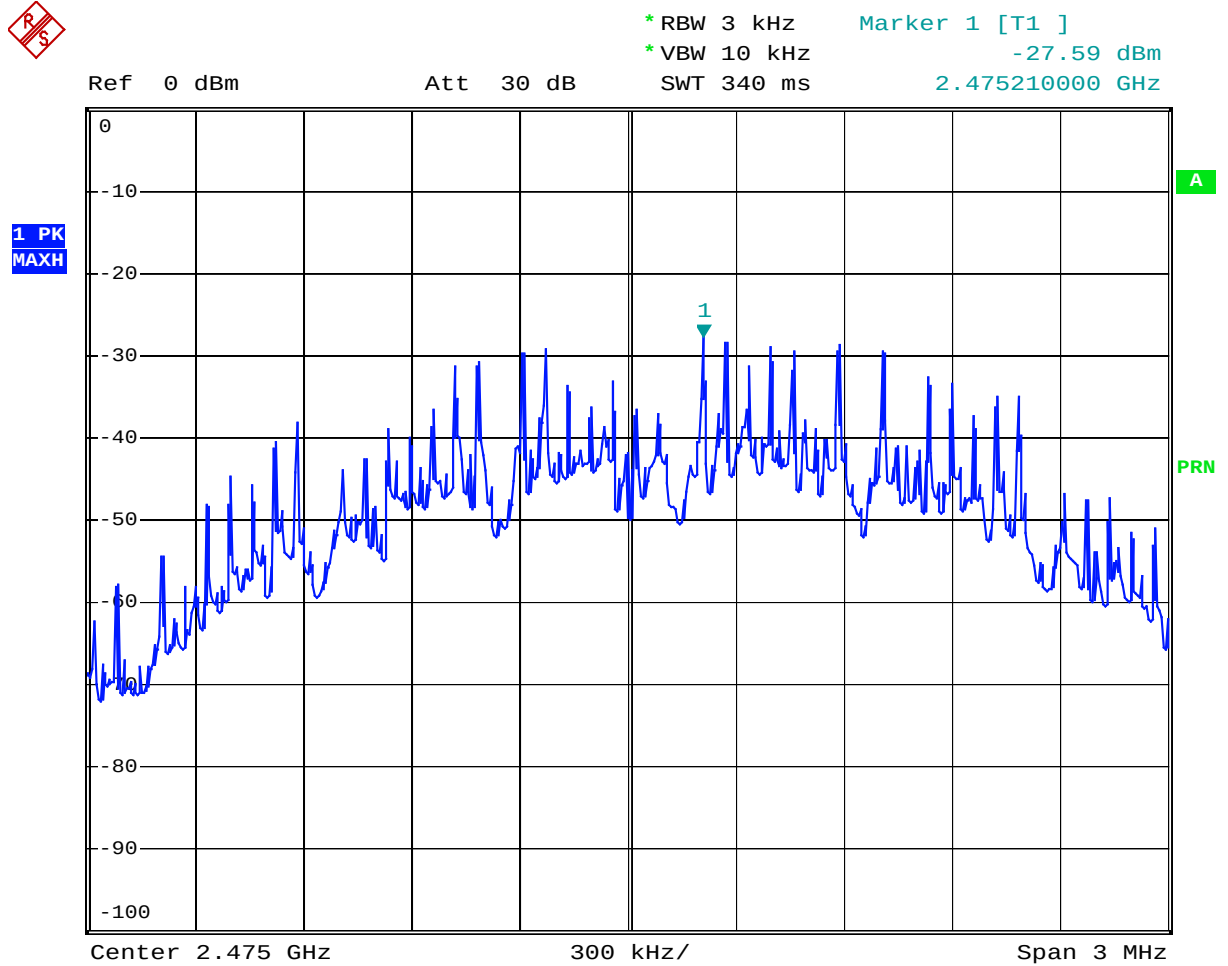
Date: 23.FEB.2006 18:38:00

Power Spectral Density Plot- 2440



Date: 23.FEB.2006 19:55:54

Power Spectral Density Plot- 2475



Date: 23.FEB.2006 10:05:38

7.5 Peak Output Power

Test Mode and conditions

Mode of operation : Tx mode
Measurement Method : Conducted
Detector : PK
Trace : Max hold
RBW/VBW : 3MHz/3MHz

Requirements

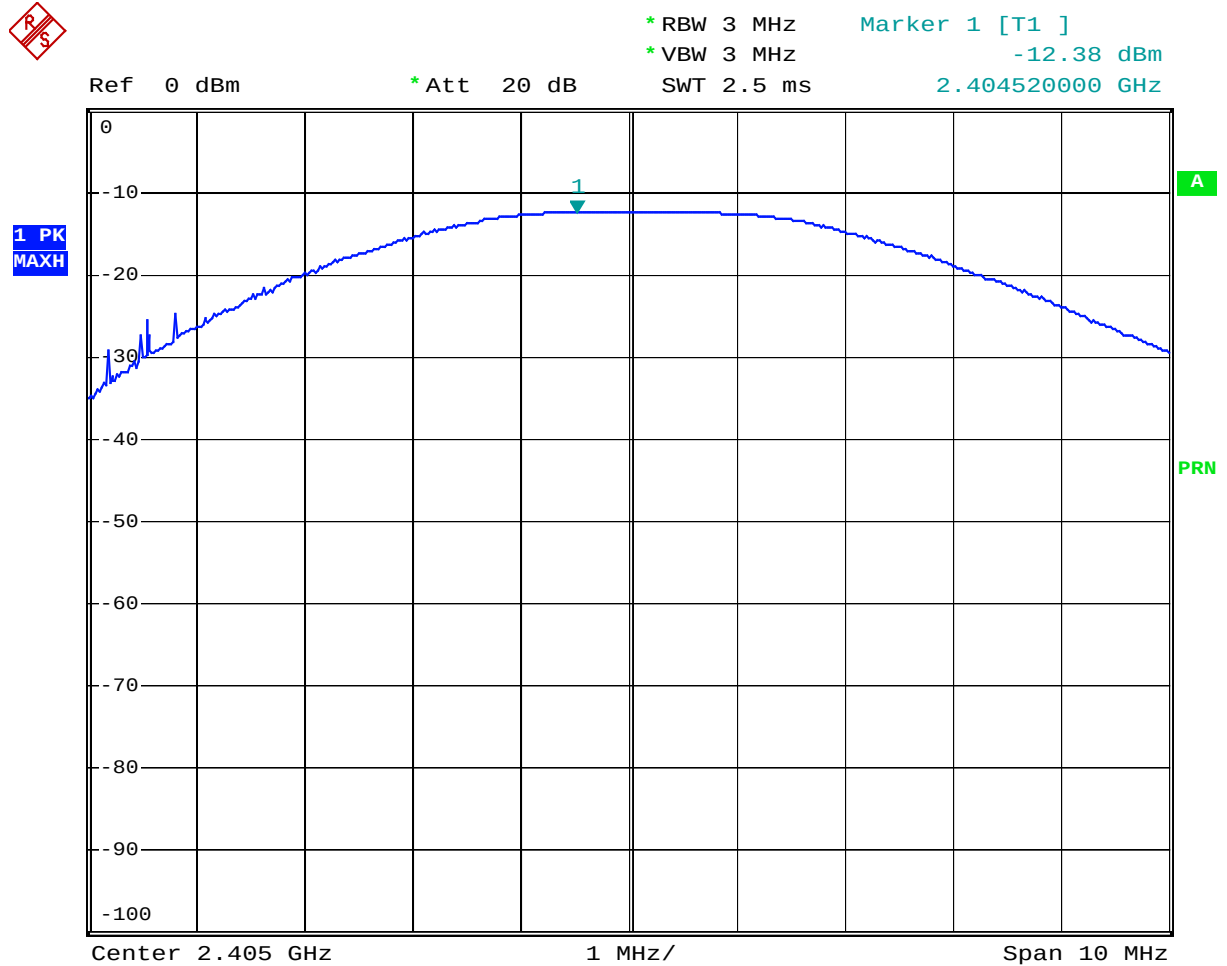
Subclause 15.247(b)(3)

For systems using digital modulation in the 902-928 MHz, 2400-2483.5 MHz, and 5725-5850 MHz bands: 1 Watt.

Test results

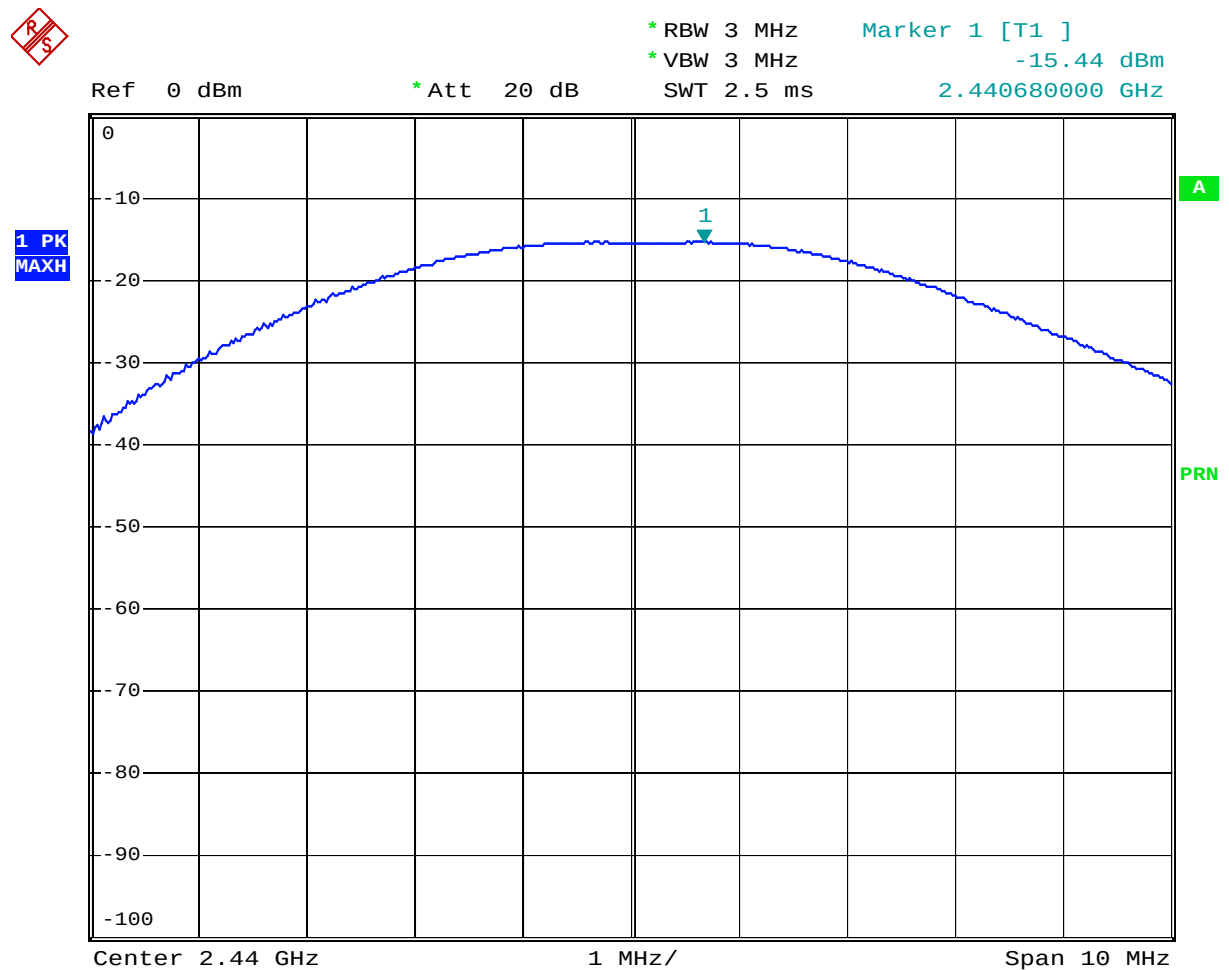
Test Frequency (MHz)	Reading (dBm)	Cable attenuation (dB)	Peak Output Power (W)	Limit (W)	Results
2405	-12.38	1.80	0.00000875	1.0	Pass
2440	-15.44	1.83	0.00000435	1.0	Pass
2475	-17.70	1.85	0.00000260	1.0	Pass

Peak Output Power Plot - 2405



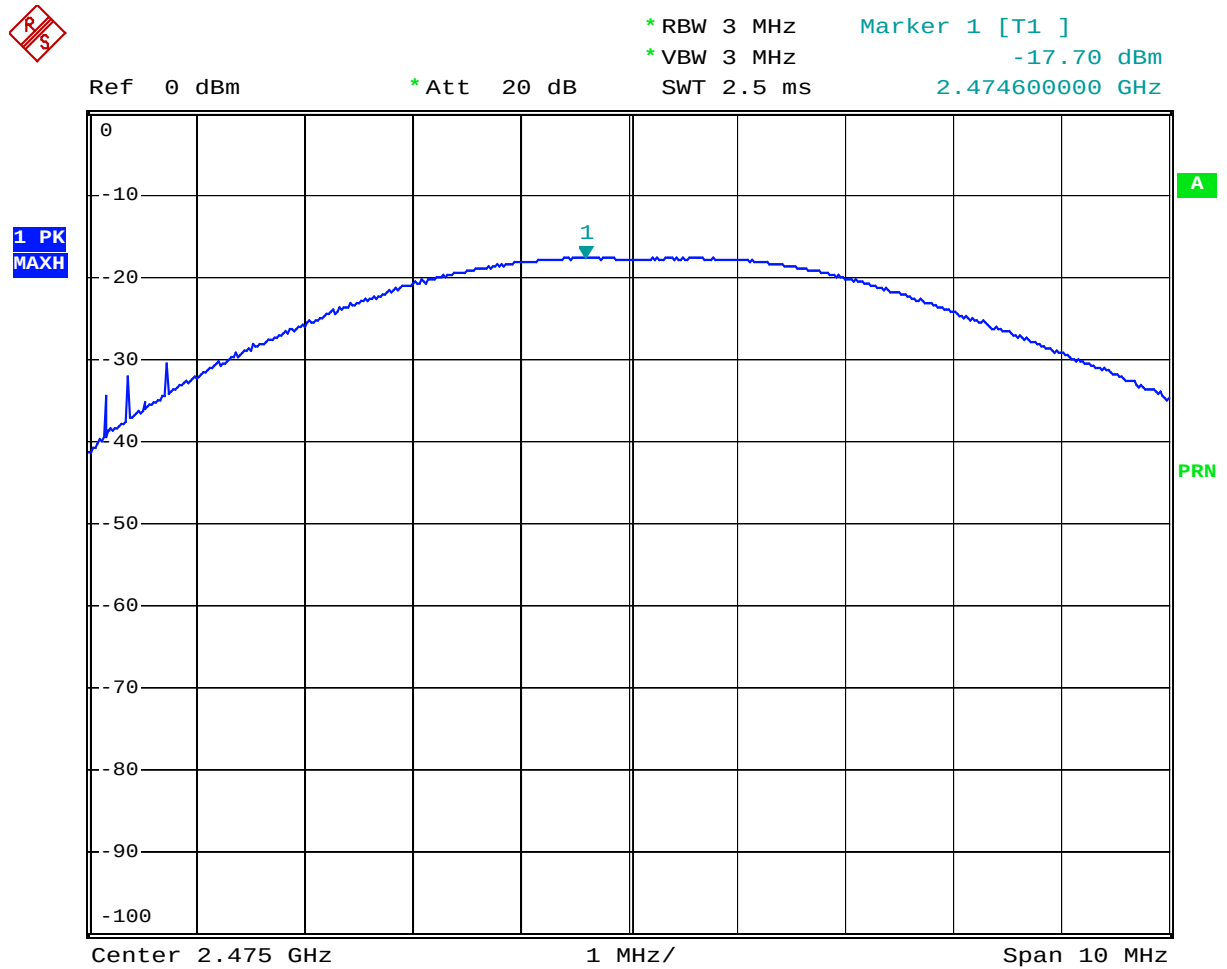
Date: 23.FEB.2006 18:33:36

Peak Output Power Plot – 2440



Date: 23.FEB.2006 18:34:15

Peak Output Power Plot – 2475



Date: 23.FEB.2006 18:35:07

7.6 Band-edge Compliance

Test Mode and conditions

Mode of operation : Tx mode
Measurement Method : Conducted
Detector : PK
Trace : Max hold
RBW/VBW : 100kHz/300kHz

Requirements

Subclause 15.247(d)

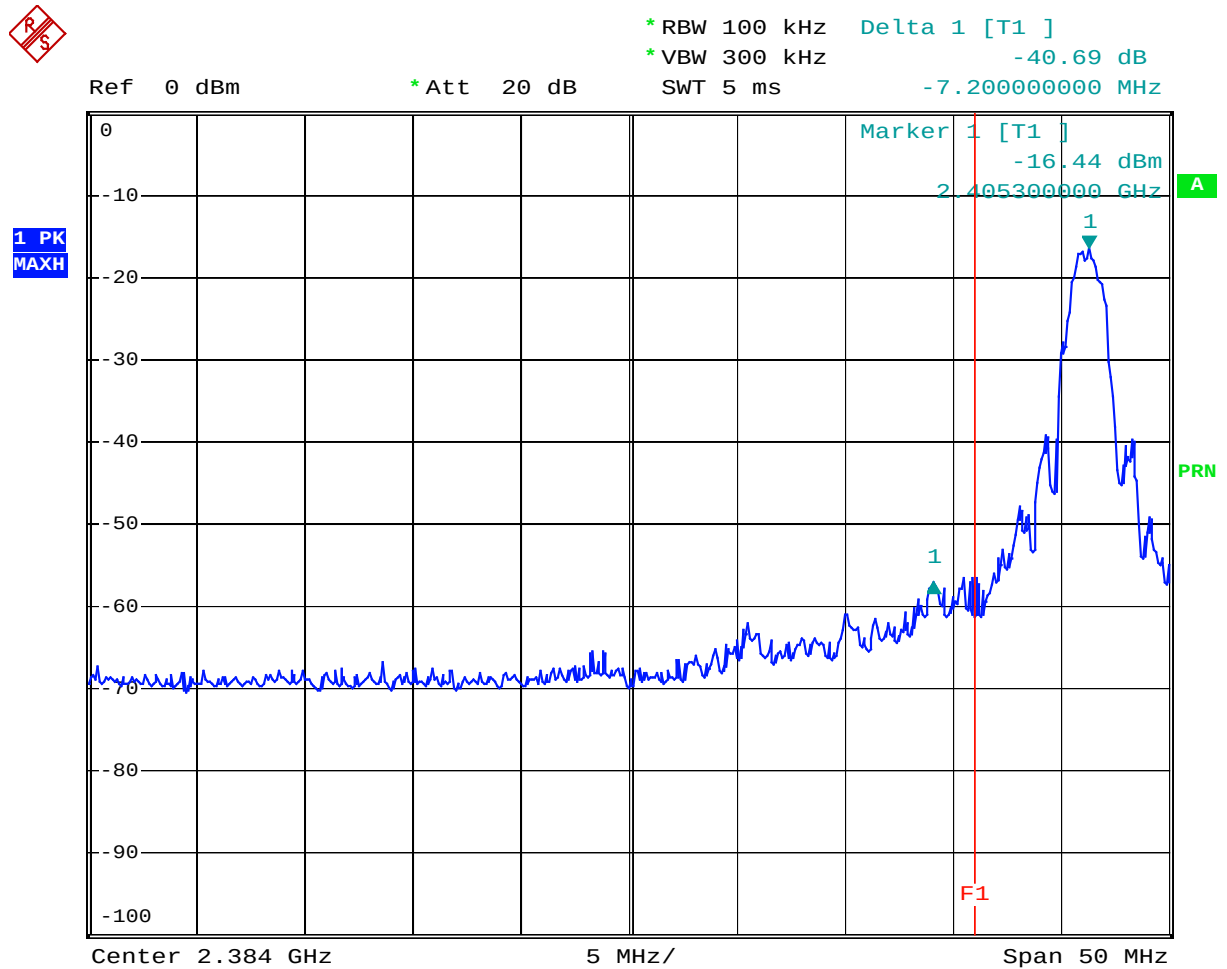
In any 100kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20dB below that in the 100kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement. Attenuation below the general limits specified in Section 15.209(a) is not required.

Test results

There is no peak found outside any 100kHz bandwidth of the operating frequency band in the three transmit frequency.

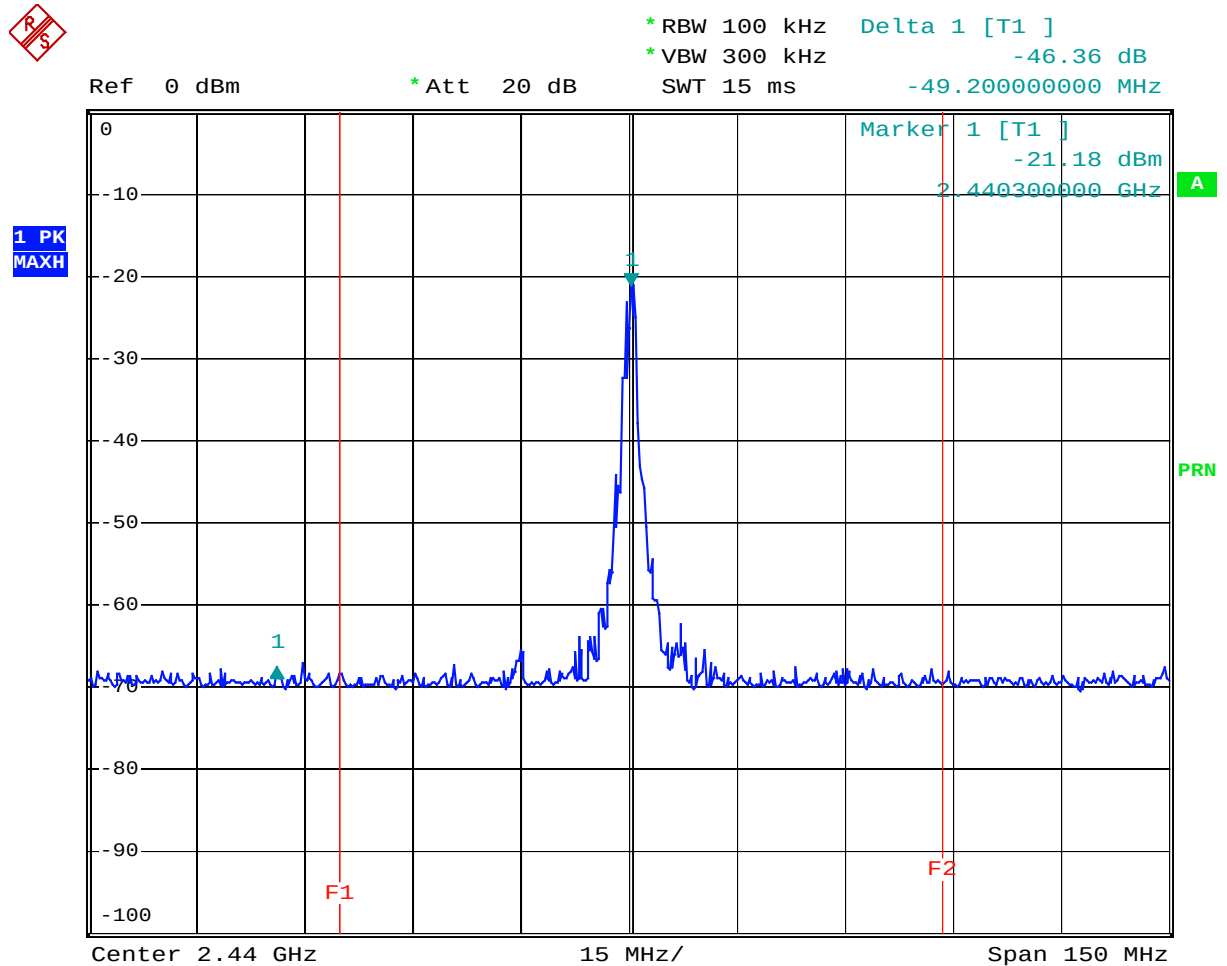
Tx Frequency (MHz)	RF power outside 100kHz BW (MHz)	Limit	Results
2405	No peak above 20dB	20dB below	Pass
2440	No peak above 20dB	20dB below	Pass
2475	No peak above 20dB	20dB below	Pass

Band-edge Compliance Plot - 2405



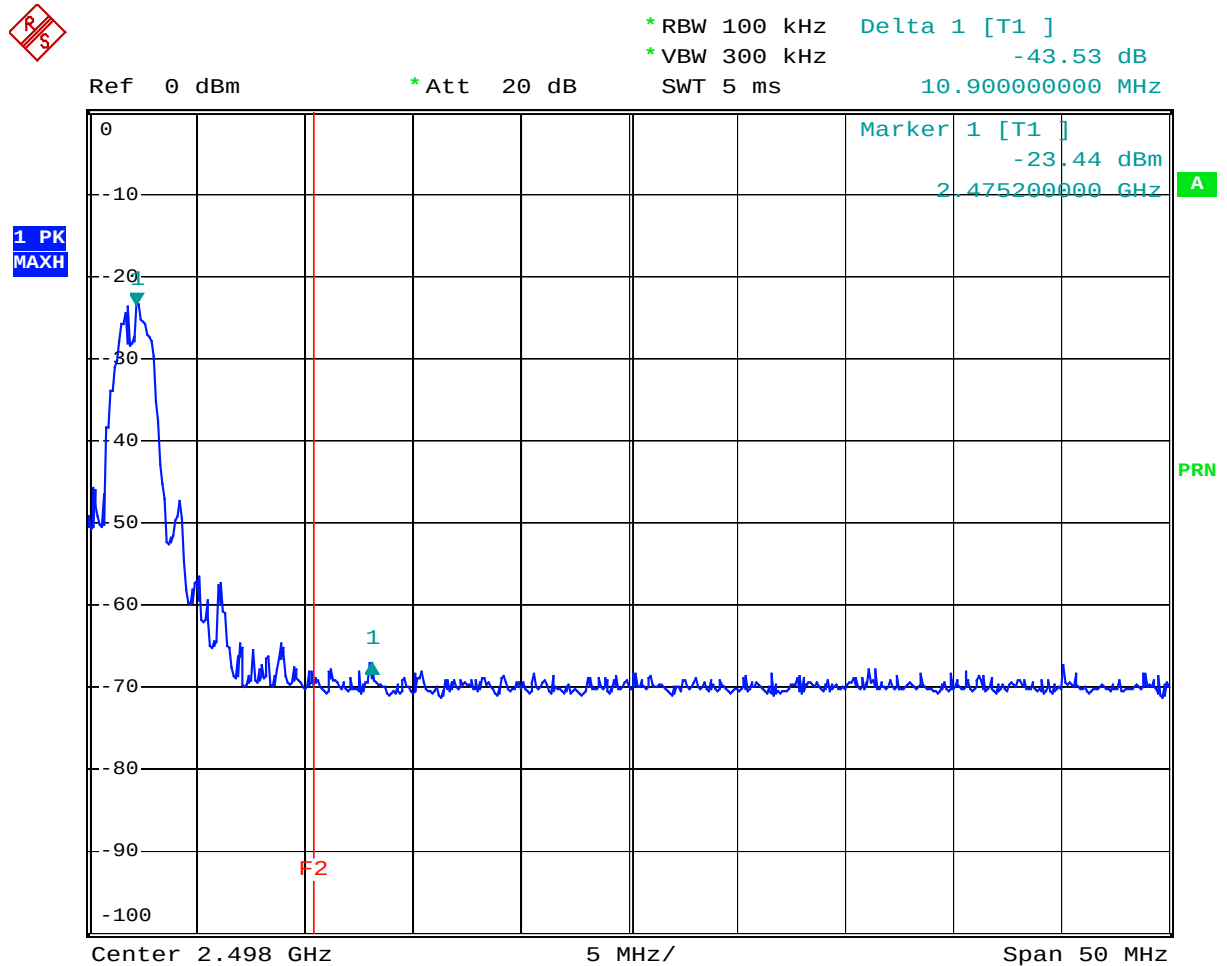
Date: 23.FEB.2006 18:50:42

Band-edge Compliance Plot – 2440



Date: 23.FEB.2006 18:52:45

Band-edge Compliance Plot – 2475



Date: 23.FEB.2006 18:54:07

7.7 Spurious Conducted emissions

Test Mode and conditions

Mode of operation : Tx mode
Measurement Method : Conducted
Detector : PK
Trace : Max hold
RBW/VBW : 100kHz/300kHz

Requirements

Subclause 15.247(d)

In any 100kHz 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 20dB below that in the 100kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement. Attenuation below the general limits specified in Section 15.209(a) is not required.

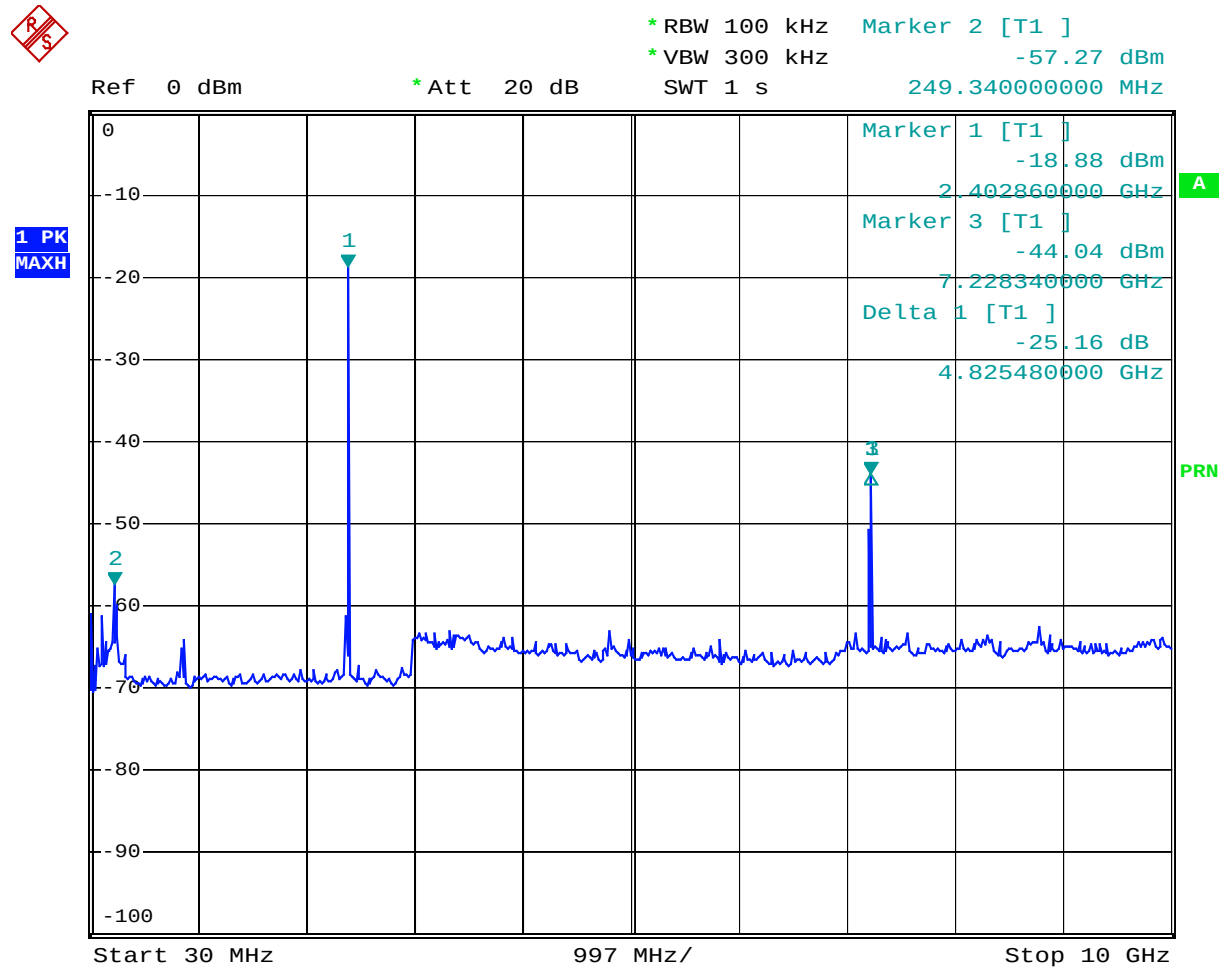
Test results

Frequency (MHz)	Reading Value (dBm)	Correction Factor (dB)	Results (dBm)	Reference Value (dBm)	Delta to Reference (dB)
<i>Operating frequency : 2405MHz</i>					
7228.34	-44.04	3.4	-40.64	-30.580	10.06
13960	-53.4	6.7	-46.7	-30.580	16.12
20090	-49.44	6.7	-42.74	-30.580	12.16

Frequency (MHz)	Reading Value (dBm)	Correction Factor (dB)	Results (dBm)	Reference Value (dBm)	Delta to Reference (dB)
<i>Operating frequency : 2440MHz</i>					
7328.04	-48.14	3.4	-44.74	-33.610	11.13
14800	-53.62	6.7	-46.92	-33.610	13.31
20040	-48.75	6.7	-42.05	-35.850	6.2

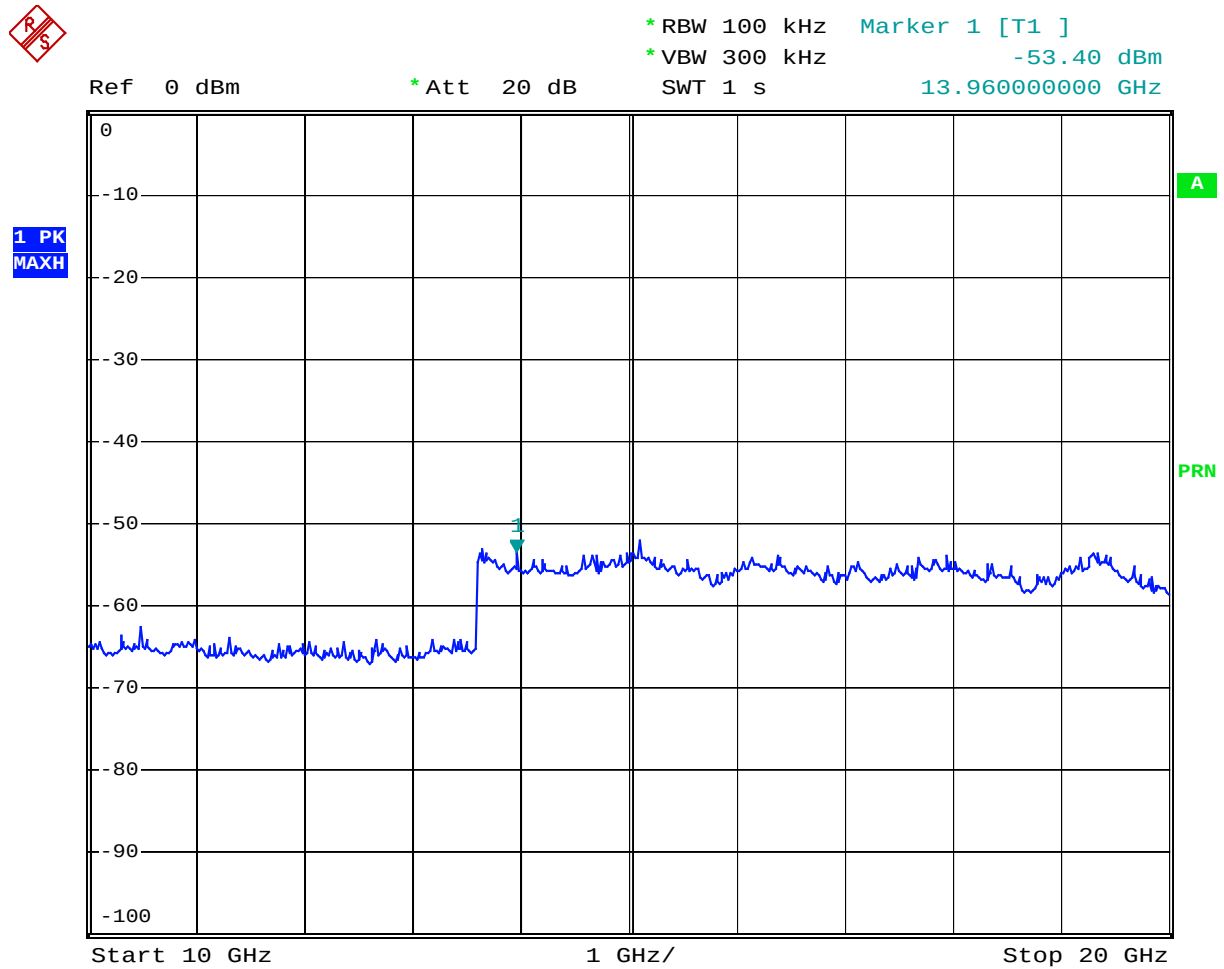
Frequency (MHz)	Reading Value (dBm)	Correction Factor (dB)	Results (dBm)	Reference Value (dBm)	Delta to Reference (dB)
<i>Operating frequency : 2475MHz</i>					
7427.74	-49.2	3.4	-45.8	-35.850	9.95
15060	-53.39	6.0	-47.39	-35.850	11.54
20050	-48.36	6.7	-41.66	-35.850	5.81

Spurious Conducted emissions plot- 2405 (30MHz~10GHz)



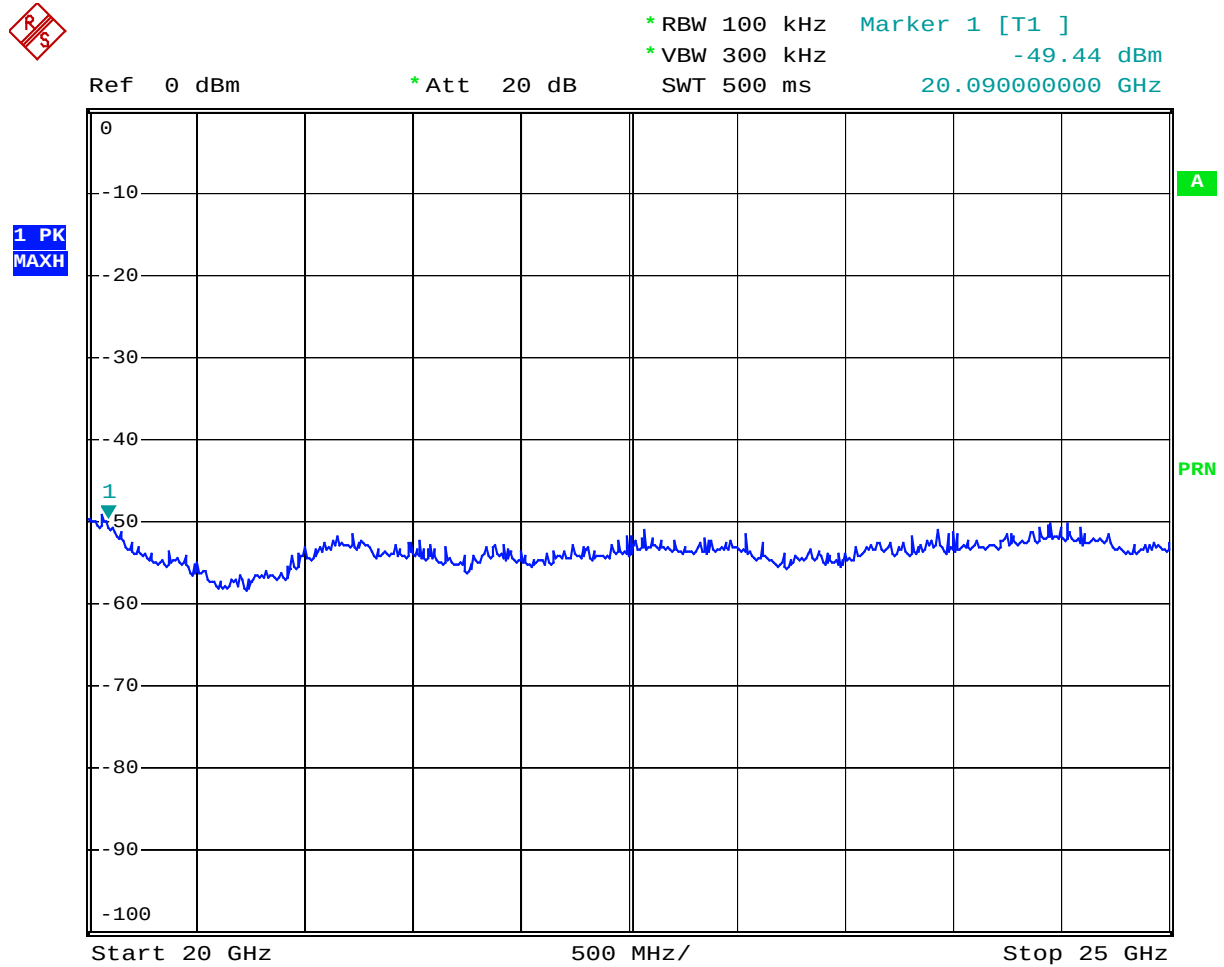
Date: 23.FEB.2006 18:57:30

Spurious Conducted emissions plot- 2405 (10GHz~20GHz)



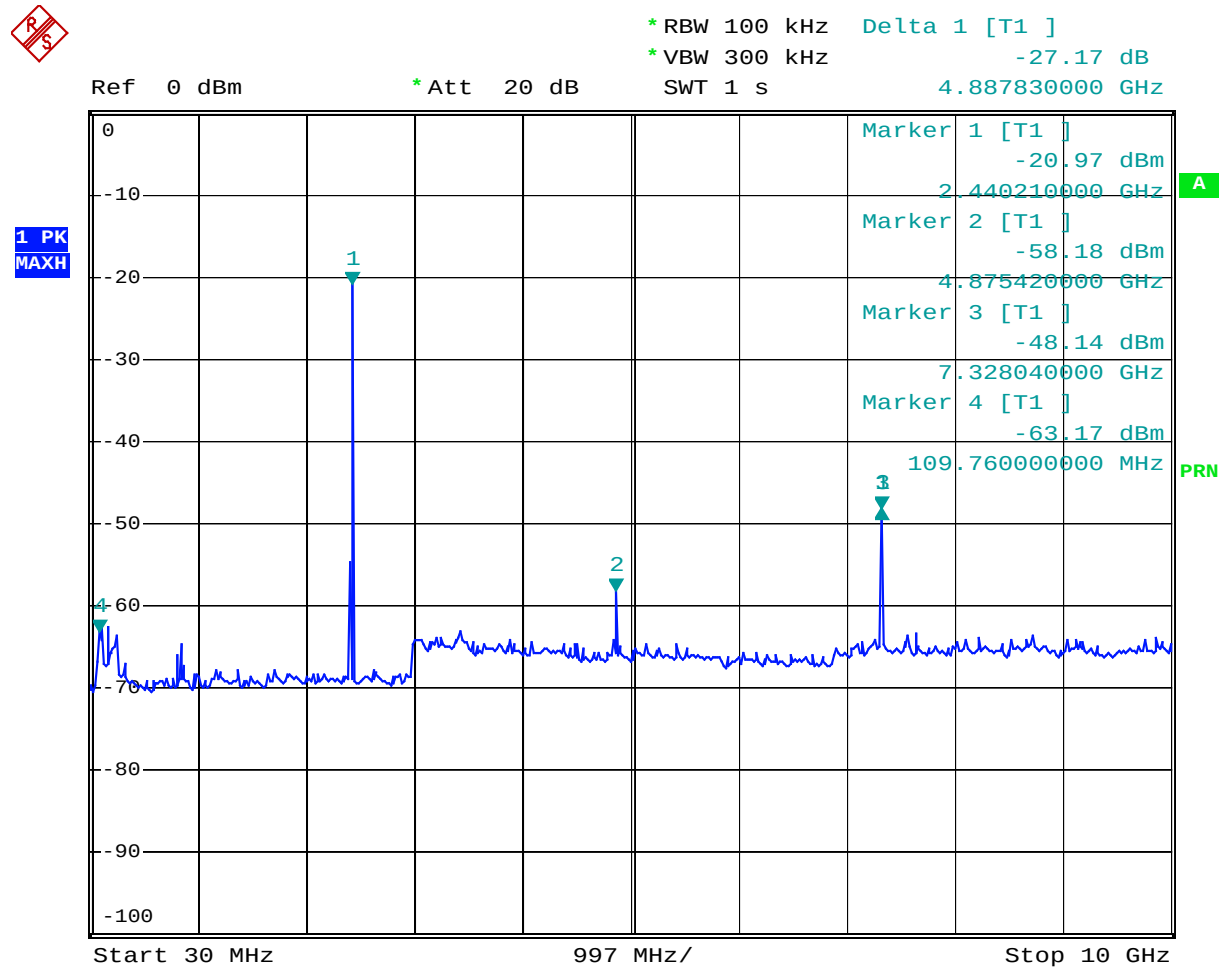
Date: 23.FEB.2006 18:58:35

Spurious Conducted emissions plot- 2405 (20GHz~25GHz)



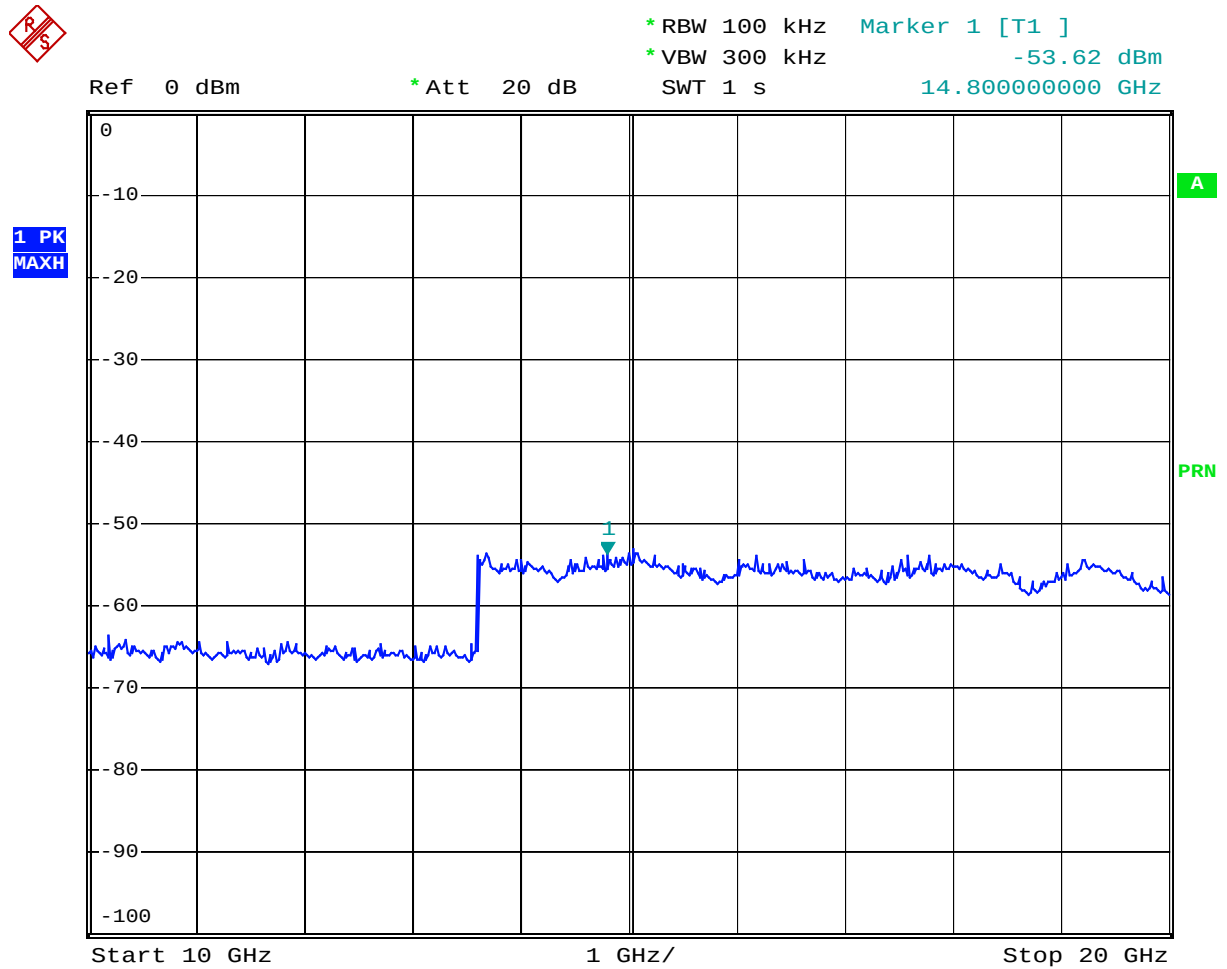
Date: 23.FEB.2006 18:59:19

Spurious Conducted emissions plot- 2440 (30MHz~10GHz)



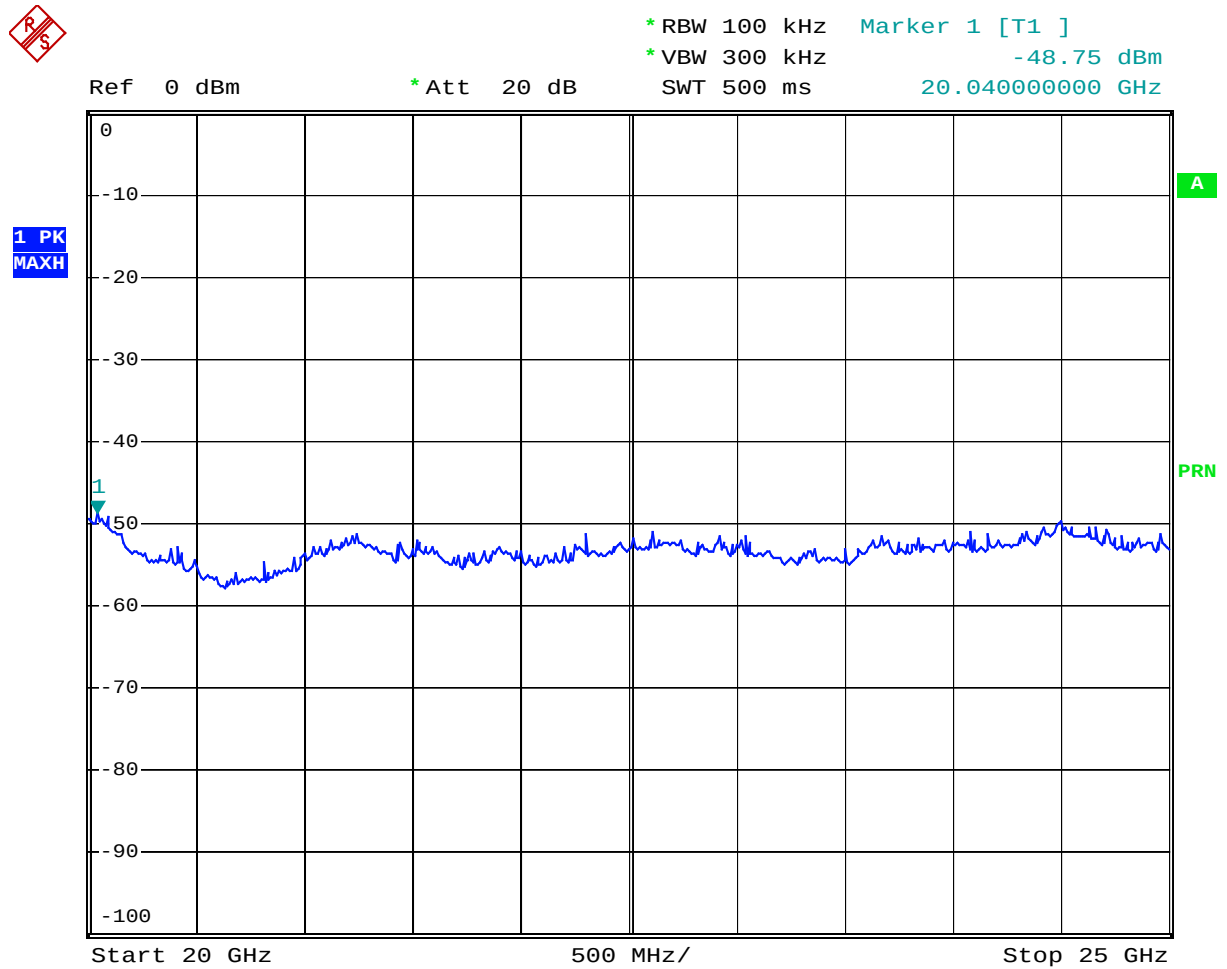
Date: 23.FEB.2006 19:42:47

Spurious Conducted emissions plot- 2440 (10GHz~20GHz)



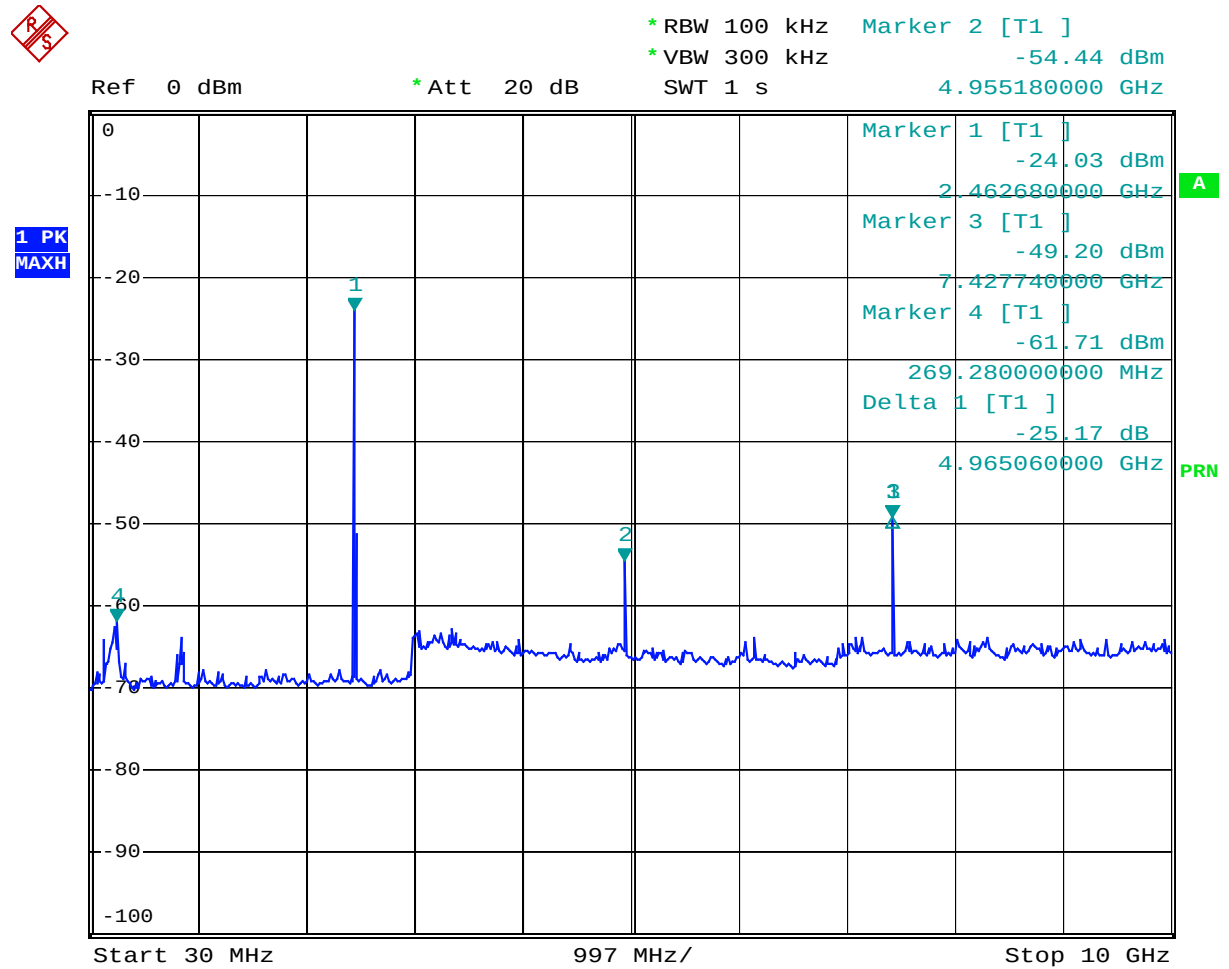
Date: 23.FEB.2006 19:06:48

Spurious Conducted emissions plot- 2440 (20GHz~25GHz)



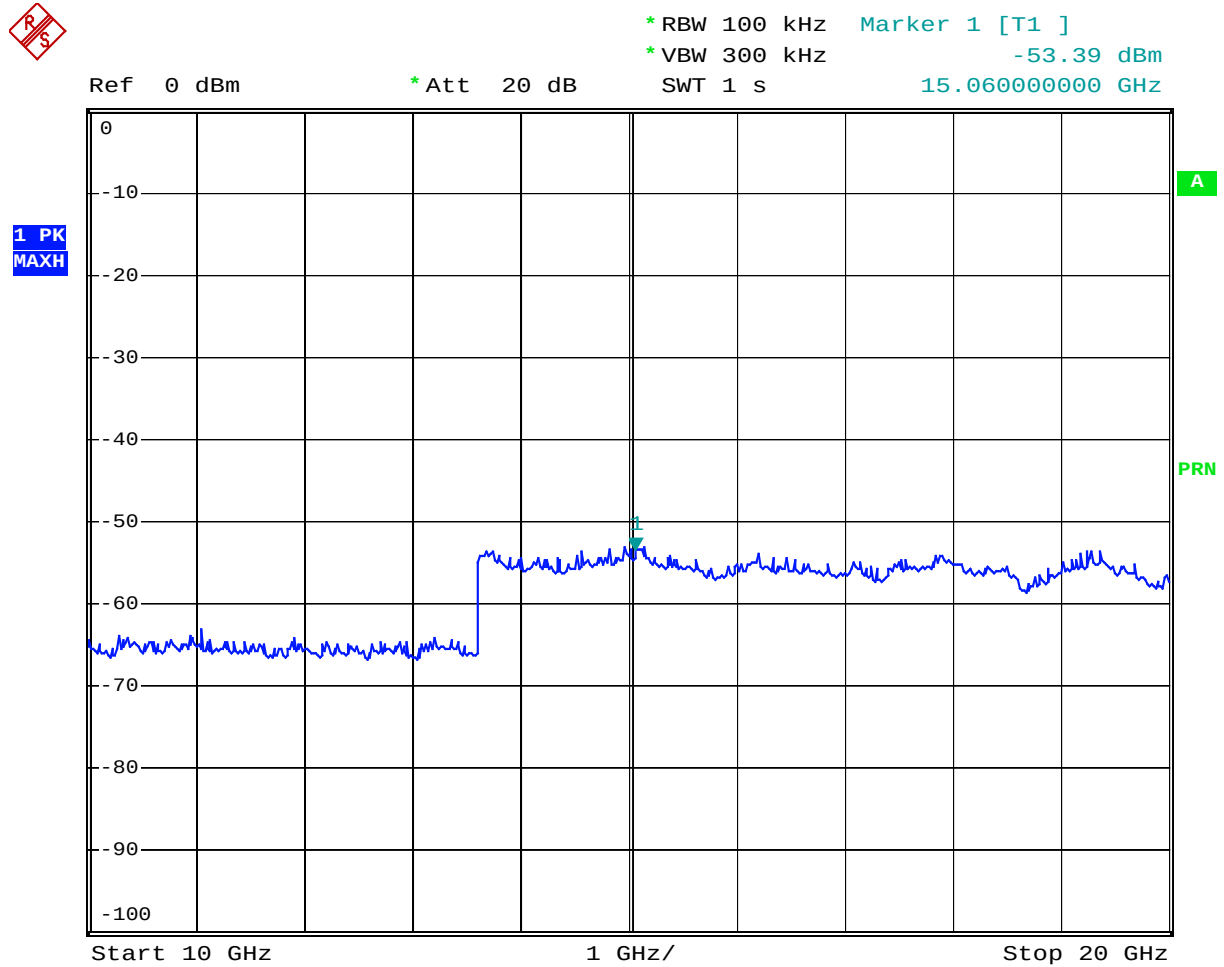
Date: 23.FEB.2006 10:07:21

Spurious Conducted emissions plot- 2475 (30MHz~10GHz)



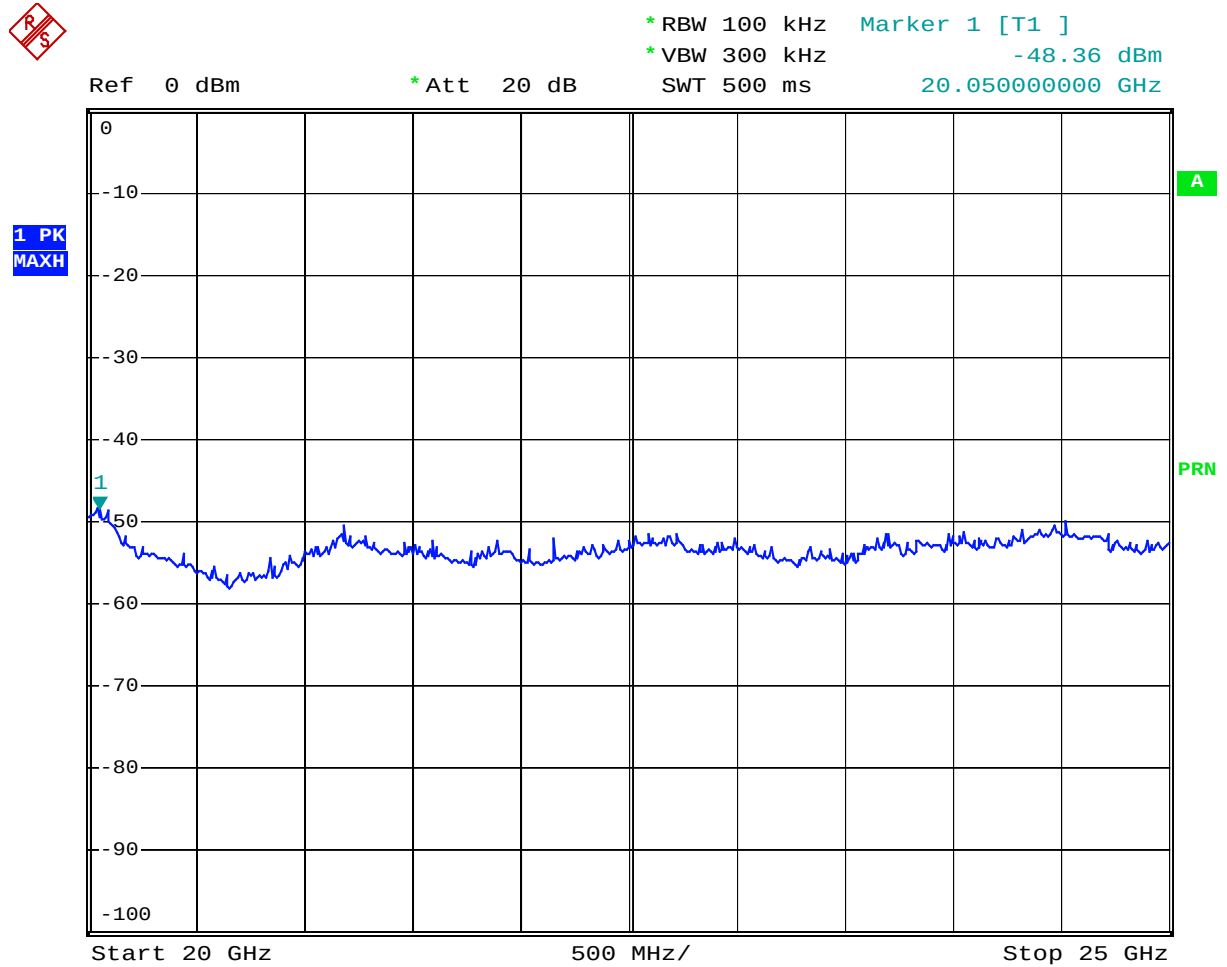
Date: 23.FEB.2006 19:12:22

Spurious Conducted emissions plot- 2475 (10GHz~20GHz)



Date: 23.FEB.2006 19:14:26

Spurious Conducted emissions plot- 2475 (20GHz~25GHz)



Date: 23.FEB.2006 19:44:52

7.8 Spurious Radiated emissions

Test Mode and conditions

Mode of operation : Tx mode
 Detector : PK
 Trace : Max hold
 Measurement Method : Radiated- Enclosure
 Measurement Distance : 3m
 Measurement BW : 1 MHz for $f \geq 1 \text{ GHz}$, 100kHz for $f < 1 \text{ GHz}$

Requirements

Subclause 15.247(c)

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)).

According to Section 15.209(a) , except as provided elsewhere in this Subpart, the emissions from an intentional radiator shall not exceed the field strength levels specified in the following table:

Frequency (MHz)	Field strength (microvolts/meter)	Field strength (dB μ V/m)	Measurement distance (meters)
30-88	100**	$20 \cdot \log(100) = 40.0$	3
88-216	150**	$20 \cdot \log(150) = 43.5$	3
216-960	200	$20 \cdot \log(200) = 46.0$	3
960-2500	500	$20 \cdot \log(500) = 54.0$	3

** Except as provided in paragraph(g), fundamental emissions from intentional radiators operating under this Section shall not be located in the frequency bands 54-72Mhz, 76-88Mhz, 174-216Mhz or 470-806Mhz. However, operation within these frequency bands is permitted under other sections of this Part, e.g., Sections 15.231 and 15.241. According to section 15.35(b), on any frequency or frequencies above 1000 MHz the radiated limits shown are based upon the use of measurement instrumentation employing an average detector function. When average radiated emission measurements are specified in this part, including emission measurements below

1000 MHz, there also is a limit on the radio frequency emissions, as measured using instrumentation with a peak detector function, corresponding to 20 dB above the maximum permitted average limit for the frequency being investigated

Test results

Frequ- ency (MHz)	Polariz- ation (H/V)	Corr. Factor (dB)	Result (dBuV/m)		Limit (dBuV/m)		Margin (dB)		Table Angle (Deg.)	Ant. Height (m)
			A	P	A	P	A	P		
Operating frequency : 2405Mhz										
7215	V	20.1	38.1	56.4	54	74	15.9	17.6	110	1.9
7215	H	20.1	37.9	56.6	54	74	16.1	17.4	60	1.6

Frequency (MHz)	Polariz- ation (H/V)	Corr. Factor (dB)	Result (dBuV/m)		Limit (dBuV/m)		Margin (dB)		Table Angle (Deg.)	Ant. Height (m)
			A	P	A	P	A	P		
Operating frequency : 2440Mhz										
7335	V	20.2	37.3	54.8	54	74	16.7	19.2	110	1.9
7335	H	20.2	37.6	54.9	54	74	16.4	19.1	60	1.6

Frequency (MHz)	Polarization (H/V)	Corr. Factor (dB)	Result (dBuV/m)		Limit (dBuV/m)		Margin (dB)		Table Angle (Deg.)	Ant. Height (m)
			A	P	A	P	A	P		
Operating frequency : 2475Mhz										
7440	V	20.5	37.4	54.5	54	74	16.6	19.5	110	1.9
7440	H	20.5	37.8	54.8	54	74	16.2	19.2	60	1.6

* Note :

1. Remark “*” means that the emission frequency is produced by local oscillator.
2. Remark“- - “ means that the emission level is too low to be measured.
3. The measurement uncertainty of the radiated emission test is $\pm 3\text{dB}$
4. “A” and “P” mean average and peak measurement respectively.
5. There are no spurious emissions found between the lowest internal oscillating frequency and 30 MHz.

8. List of Test and Measurement Instruments

	Kind of Equipment	Type	Manufacturer	S/N
☒	EMI Test Receiver	ESI26	R/S	8340.0010.02
☒	Spectrum Analyzer	FSP30	R/S	1093.4495.30
☐	Tracking Generator	ESMI-B1	R/S	1033.3240.52
☐	Spectrum Analyzer	8566B	HP	3638A0857E
☐	Spectrum Analyzer	E4407B	HP	MY41310181
☒	Wave Dipole Antenna	HZ-12	R/S	842006/0012
☒	Wave Dipole Antenna	HZ-12	R/S	846556/0004
☒	Biconical Antenna	3104C	EMCO	9408-4667
☐	Biconical Antenna	3109	EMCO	9405-2812
☒	Log-Periodic Antenna	3146A	EMCO	1064
☒	Biconilog Antenna	HLP2603	EMC Automaion	080100
☐	V-Network	ESH3-Z5	R/S	847265/030
☐	V-Network	ESH3-Z6	R/S	847250/016
☐	T-Network	E-Z10	R/S	84480/011
☐	LISN	3825/2	EMCO	9502-2334
☒	Turn Table	2081	EMCO	
☒	Antenna Tower	1072-5	EMCO	9202-1651
☒	Positioning Controller	1090	EMCO	
☐	Printer	C4569A	HP	SG78K1H1FS
☒	Absorbing Clamp	MDS 21	R/S	847905/005
☐	Signal Generator	2023	MARCONI	112246067
☐	Swept Signal Generator	83620B	HP	3722A00549
☐	10dB Attenuator	23-10-34	Weinschel co	BD4316
☐	10dB Attenuator	33-10-34	Weinschel co	BB9784
☒	Antenna	3142	EMCO	9710-1220
☒	Antenna	3115	EMCO	9202-3820
☒	Antenna	3160-08	EMCO	1168

☒	Antenna	3160-09	EMCO	1304
☒	Loop Antenna	6507	EMCO	9408-1327
☒	Amplifier	HP8447F	HP	3113A06911
☒	Amplifier	HP83006	HP	3104A00611
☒	Amplifier	HP8449B	HP	3008A00859
☒	EMI test receiver	ESCS30	R&S	839809/003
☒	Artificial mains network	ESH2-Z5	R&S	829991/009
☒	Artificial hand	FCC-AH-1	Fischer custom communications Inc.	2008

9. Notes

The test was conducted with XTR39 model which has additional UEI Controller(8Mhz clock) compared to RH60A.

The other designs to be effected to the electrical characteristics are identical for both models.