TEST REPORT

Report Number: 3093766MPK-002
Project Number: 3093766
Report Date: March 31, 2006

Testing performed on the

Model: GR-3
P/N: 01-050901-01
FCC ID: LCB-050901
to
FCC Part 15.247

for
Topcon Positioning Systems, Inc.

A2LA Certificate Number: 1755-01

Test Performed by:	**Test Authorized by:**
Intertek Testing Services NA, Inc	Topcon Positioning Systems, Inc.
1365 Adams Court	7400 National Drive
Menlo Park, CA 94025	Livermore, CA 94551 USA

Prepared by: **Date:** March 31, 2006

David Chernomordik, EMC Technical Manager

Reviewed by: **Date:** March 31, 2006

Ollie Moyrong, EMC Operation Manager

Report No. 3093766MPK-002

Equipment Under Test:	GNSS receiver with GPS, with 900 MHz SS modem and Bluetooth module
Trade Name:	Topcon Positioning Systems
Model No.:	GR-3
Part No.:	01-050901-01
FCC ID:	LCB-050901
Applicant:	Topcon Positioning Systems, Inc.
Contact:	Mr. Kent Mizuide
Address:	7400 National Drive Livermore, CA 94551
Country	USA
Tel. Number:	925-245-8376
Fax number:	925-245-8594
Tel. Number:	925-245-8300
Fax number:	925-245-8594
Applicable Regulation:	FCC Part 15, Subpart C
Test Site Location:	ITS – Site 1 1365 Adams Drive Menlo Park, CA 94025
Date of Test:	March 14 – 31, 2006

We attest to the accuracy of this report:

David Chernomordik
EMC Technical Manager

Ollie Moyrong
EMC Operation Manager

TABLE OF CONTENTS

1.0 Introduction

The Equipment under Test (EUT) is a composite device with two Spread Spectrum Transceivers operating in the 2.4 GHz and 900 MHz frequency bands.
This report is designed to show compliance of the 2.4 GHz transceiver with FCC Part 15.247 requirements.

1.1 Summary of Tests

TEST	REFERENCE	RESULTS
Output power	15.247(b)	Complies
20-dB Bandwidth	15.247(a)(1)	Complies
Channel Separation	15.247(a)(1)	Complies
Number of Hopping Channels	15.247(a)(1)	Complies
Average Channel Occupancy Time	15.47(a)(1)	Complies
Out-of-band Antenna Conducted Emission	15.247(c)	Complies
Out-of-Band Radiated Emission (except emissions in Restricted Bands)	15.247(c)	Not Applicable. The device passed Out-of-band Antenna Conducted Emission
Radiated Emission in Restricted Bands	15.247(c), 15.205	Complies
RF exposure	15.247(i)	Complies
AC Conducted Emission	15.207	Complies
Radiated Emission from Digital Parts and receiver	15.109	Complies
Antenna Requirement	15.203	Complies

2.0 General Description

2.1 Product Description

The EUT is a Dual Frequency GNSS receiver with GPS, with 900 MHz Spread Spectrum modem and Bluetooth module. In normal operation the EUT tracks a satellite, receives reference data from a base station via radio modem, and measures the position.

Overview of the EUT

Applicant	Topcon Positioning Systems, Inc. 7400 National Drive Livermore, CA 94551 USA
Manufacturer name & address	Topcon Positioning Systems, Inc. 7400 National Drive Livermore, CA 94551 USA
Trade Name & Part No.	GR-3, 01-050901-01
FCC Identifier	LCB-050901
Use of Product	GPS Survey Receiver
Manufacturer & Model of Spread Spectrum Module	TAIYO YUDEN Co., Ltd. EYSF2CAUX
Type of Transmission	Spread Spectrum, Frequency Hopping
Rated RF Output	1 mW
Frequency Range	2402-2480 MHz
Number of Channel(s)	79
Modulation Type	GFSK
Data Rate	1 Mbps
Antenna(s) type & Gain	Omnidirectional Dipole, 0.5 dBi, fixed internal module

A production version of the sample was received on March 9, 2006 in good condition. As declared by the Applicant, it is identical to production units.

Test start date: March 14, 2006
Test end date: March 31, 2006

2.2 Related Submittal(s) Grants

The FCC Part 15.247 Application for FHSS transmitter, operating in the 902 – 928 MHz band, is filed simultaneously with the same FCC ID.

2.3 Test Methodology

Radiated and AC Line conducted emissions measurements were performed according to the procedures in ANSI C63.4 (1992). Radiated tests were performed at an antenna to EUT distance of 3 meters, unless stated otherwise in the **"Data Sheet"** of this Application. All other measurements were made in accordance with the procedures described in DA 00-705.

2.4 Test Facility

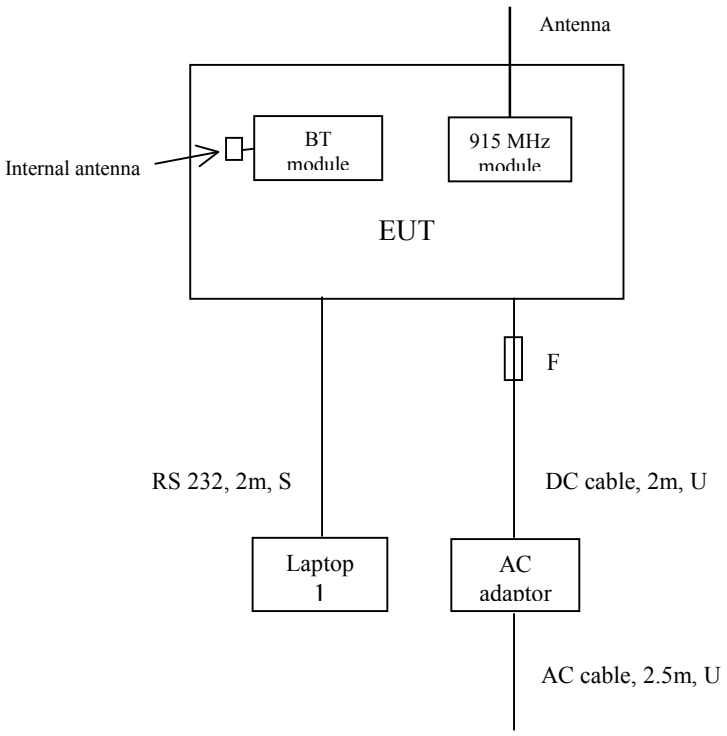
Then radiated emission test site and conducted measurement facility used to collect the data is site 1 located in Menlo Park, California. This test facility and site measurement data have been fully placed on file with the FCC.

3.0 System Test Configuration

3.1 Support Equipment

Item #	Description	Model No.
1	Compaq Laptop	Armada E 500

3.2 Block Diagram of Test Setup



AC adaptor: model PSA-30U-120, P/N 22-034101-01

S = Shielded **U** = Unshielded	**F** = With Ferrite **m** = Length in Meters

3.3 Justification

For radiated emission measurements the EUT is placed on a non-conductive table. The EUT is attached to peripherals and they are connected and operational (as typical as possible). The EUT is wired to transmit full power. During testing, all cables are manipulated to produce worst-case emissions.

The signal is maximized through rotation and placement in the three orthogonal axes. The antenna height and polarization are varied during the search for maximum signal level. The antenna height is varied from 1 to 4 meters. Radiated emissions are taken at three meters unless the signal level is too low for measurement at that distance. If necessary, a pre-amplifier is used and/or the test is conducted at a closer distance. All readings are extrapolated back to the equivalent three-meter reading using inverse scaling with distance.

In normal operation the EUT may be powered from internal battery or from AC mains using an AC/DC adapter. When the adapter is used, the internal battery is charging. The "charging mode" requires additional cables to be connected to the EUT. The worst case radiated emissions is concidered to be in this mode. Therefore, radiated and conducted emission measurements were performed in the charging mode.

3.4 Software Exercise Program

The EUT exercise program used during radiated and conducted testing was "Topsurv for FC-100" which exercised the various system components in a manner similar to a typical use.

3.5 Mode of Operation During Test

The transmitter was tested in test mode (simulating the normal operation) which allows to control the device from a computer (laptop). With hopping disable, the EUT was setup to transmit continuously at the lowest, middle, and highest channels (frequencies). Some tests were performed with hopping enabled. In addition, the EUT was tested in the receiving mode, setup on the middle channel.

3.6 Modifications Required for Compliance

No modifications were installed by Intertek Testing Services during compliance testing in order to bring the product into compliance (Please note that this list does not include changes made specifically by Topcon prior to compliance testing).

4.0 Measurement Results

4.1 Conducted Output Power at Antenna Terminals
FCC 15.247(b)(1)

Requirements

For systems operating in the 2400-2483.5 MHz band employing at least 75 hopping channels, the maximum peak output power is 1 watt (30 dBm), for all other systems 0.125 W (21 dBm).

Procedure

The antenna port of the EUT was connected to the input of a spectrum analyzer. Power was read directly and cable loss correction was added to the reading to obtain the power at the EUT antenna terminal.

In addition, the Power Density was measured with resolution bandwidth of 3 kHz.

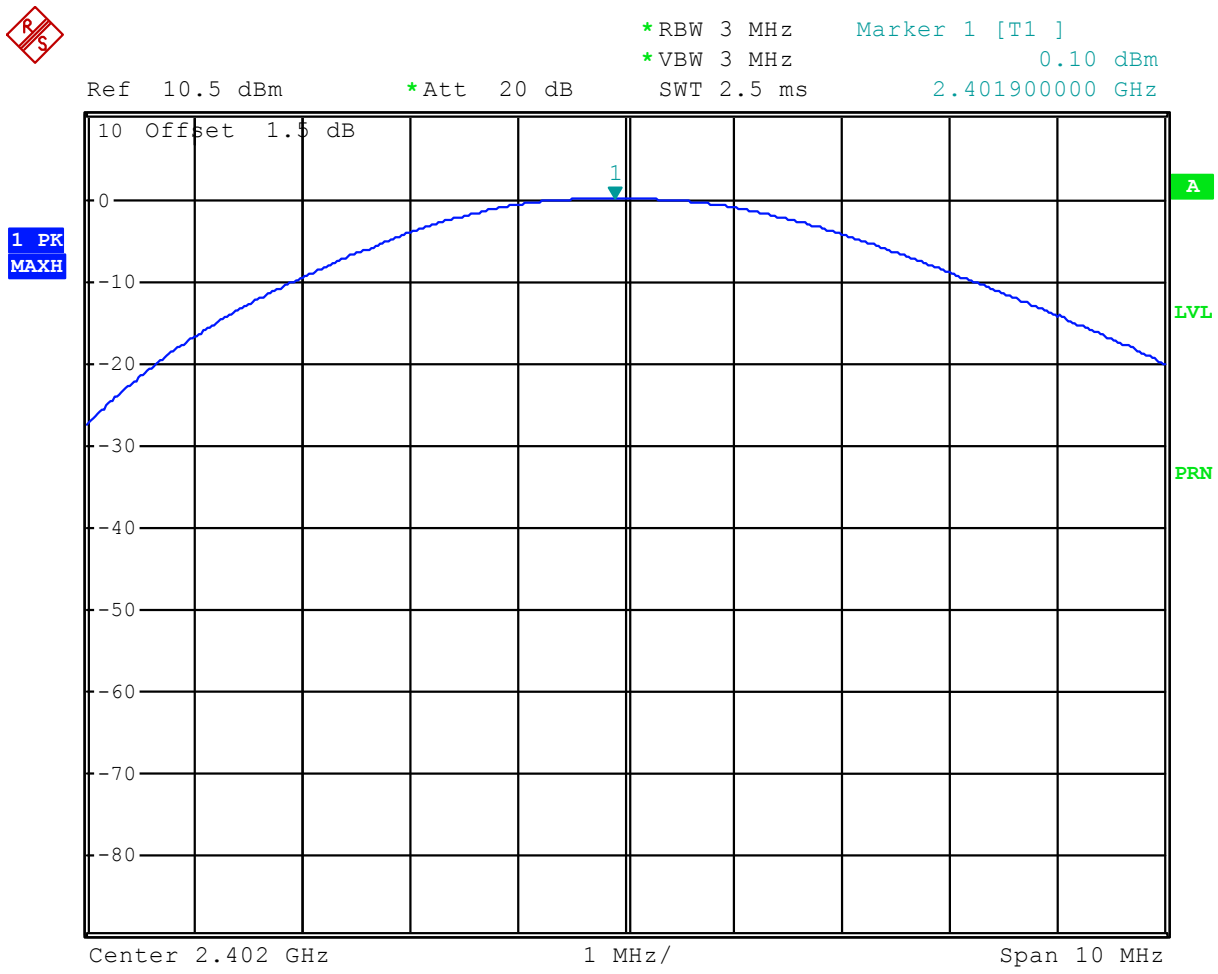
Test Results

Frequency (MHz)	Output in dBm	Output in mW	Plot number
2402	0.10	1.02	1.1
2440	-0.27	0.94	1.2
2480	-1.07	0.78	1.3

Notes: 1. Hopping function was disabled during the test.
2. The EUT's antenna has less than 6 dBi gain.

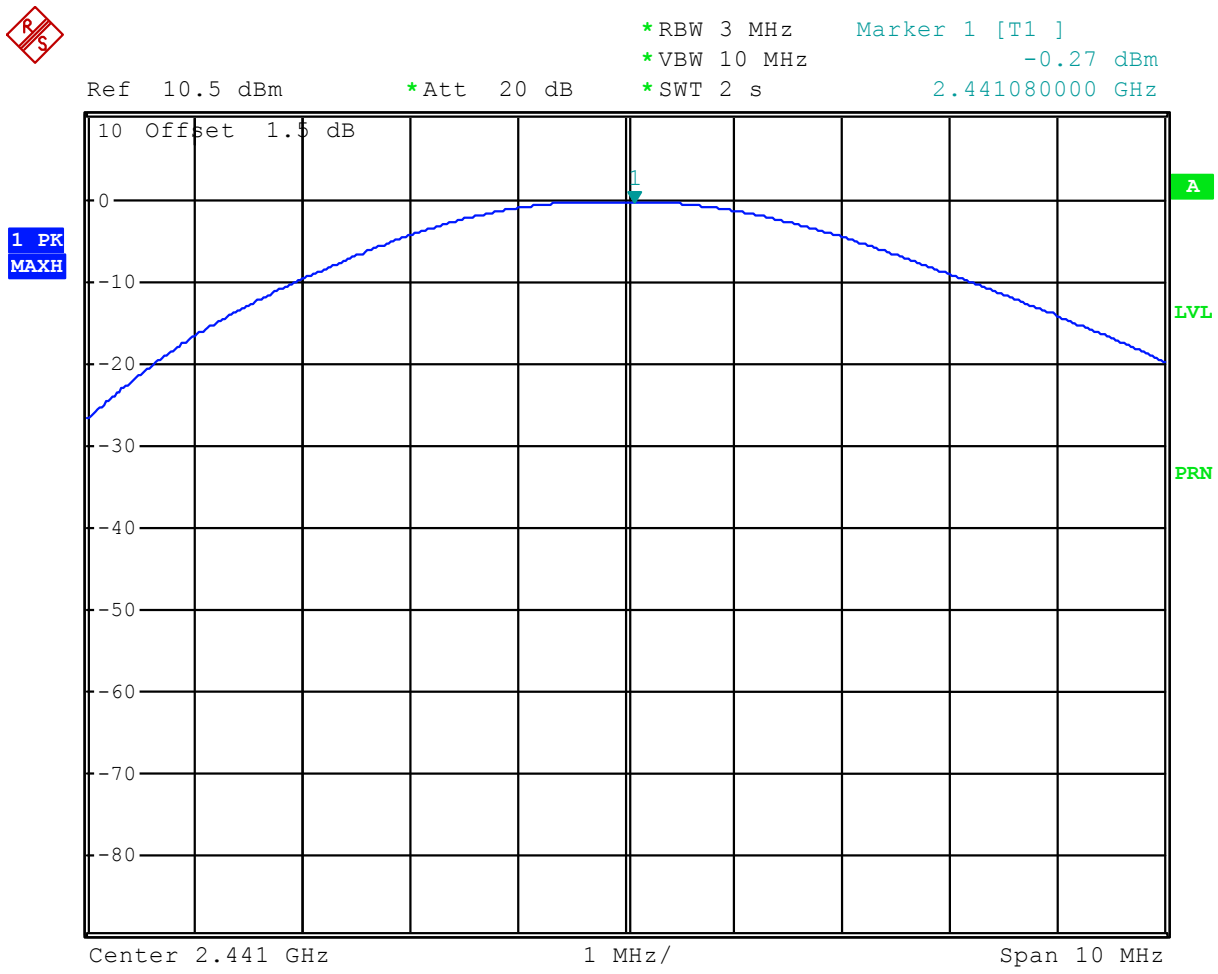
The Power Density in 3 kHz resolution bandwidth was measured as –3.29 dBm (see plots 1.4 – 1.6)

Plot 1.1



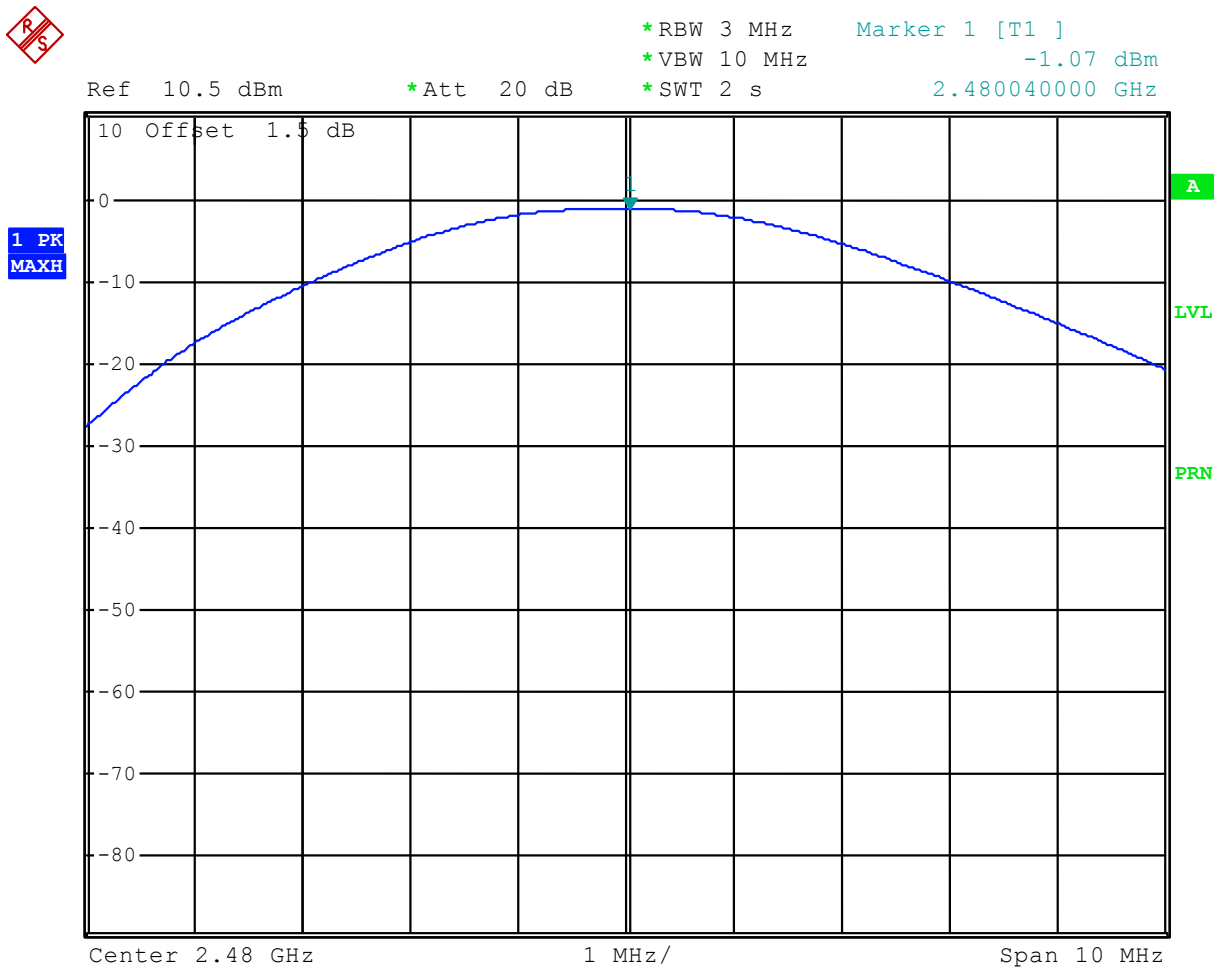
Comment: Peak output power
Date: 20.MAR.2006 14:30:42

Plot 1.2



Comment: Peak output power
Date: 20.MAR.2006 14:28:37

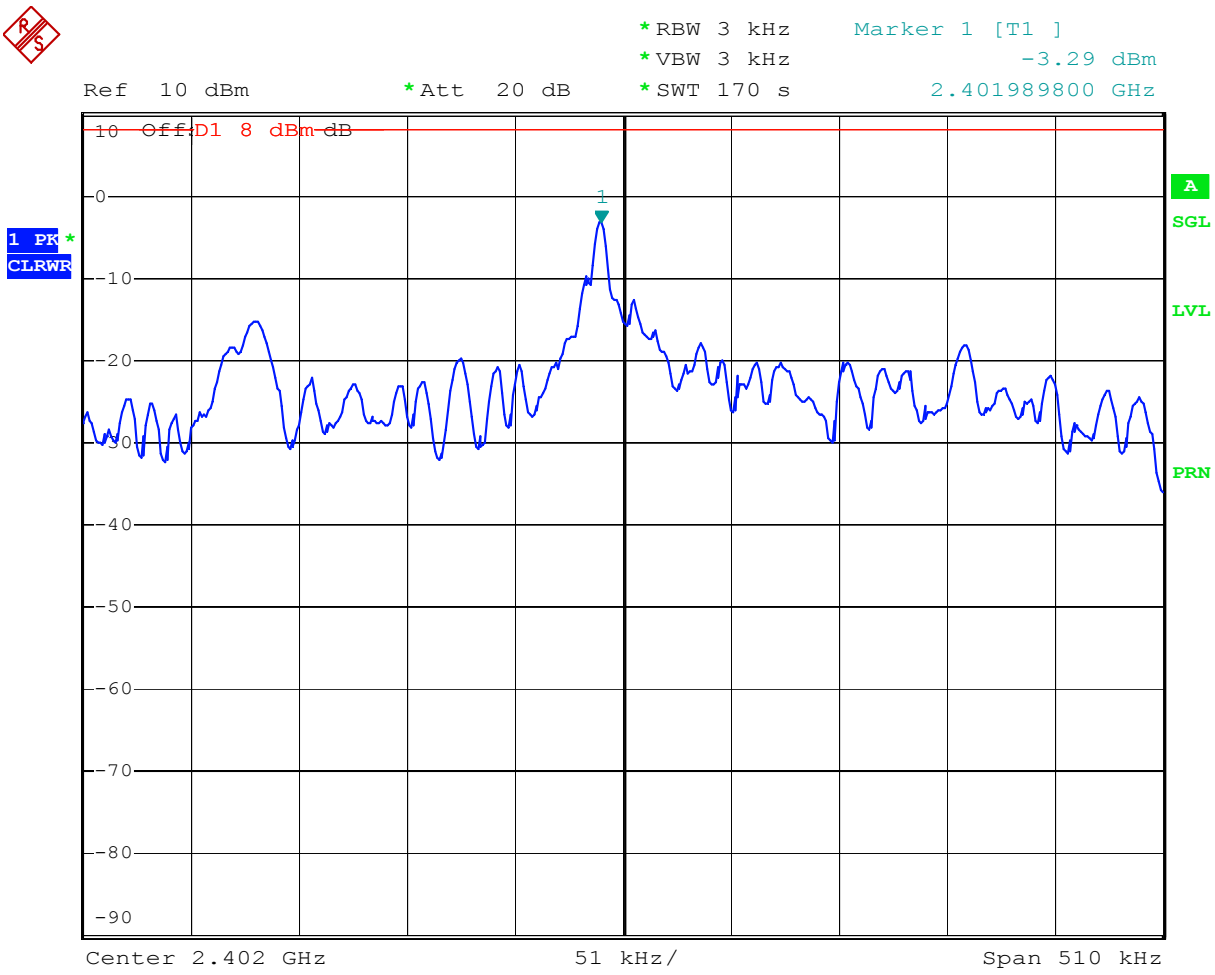
Plot 1.3



Comment: Peak output power
Date: 20.MAR.2006 14:31:25

Power Density

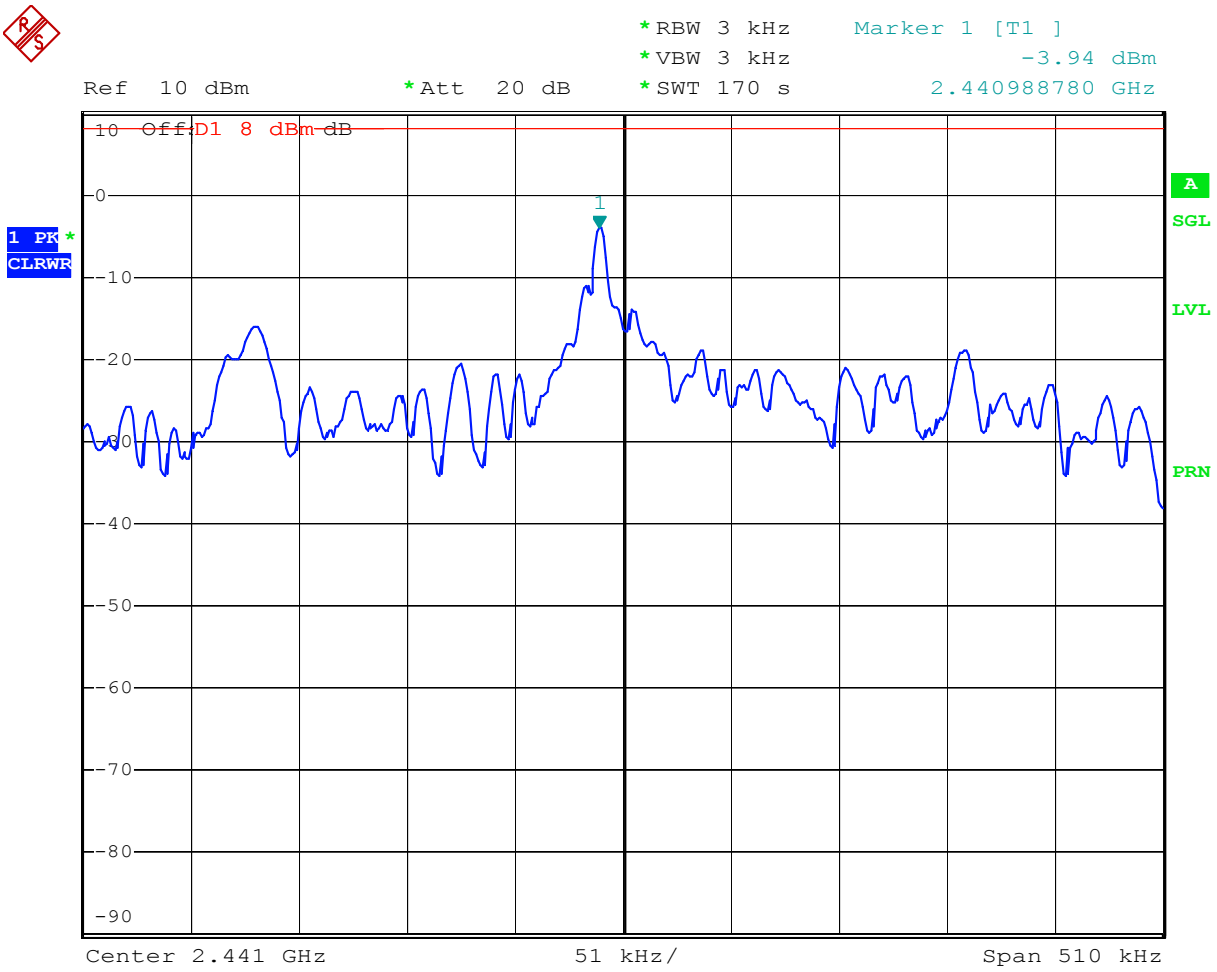
Plot 1.4



Comment: Power density
Date: 21.MAR.2006 14:21:11

Power Density

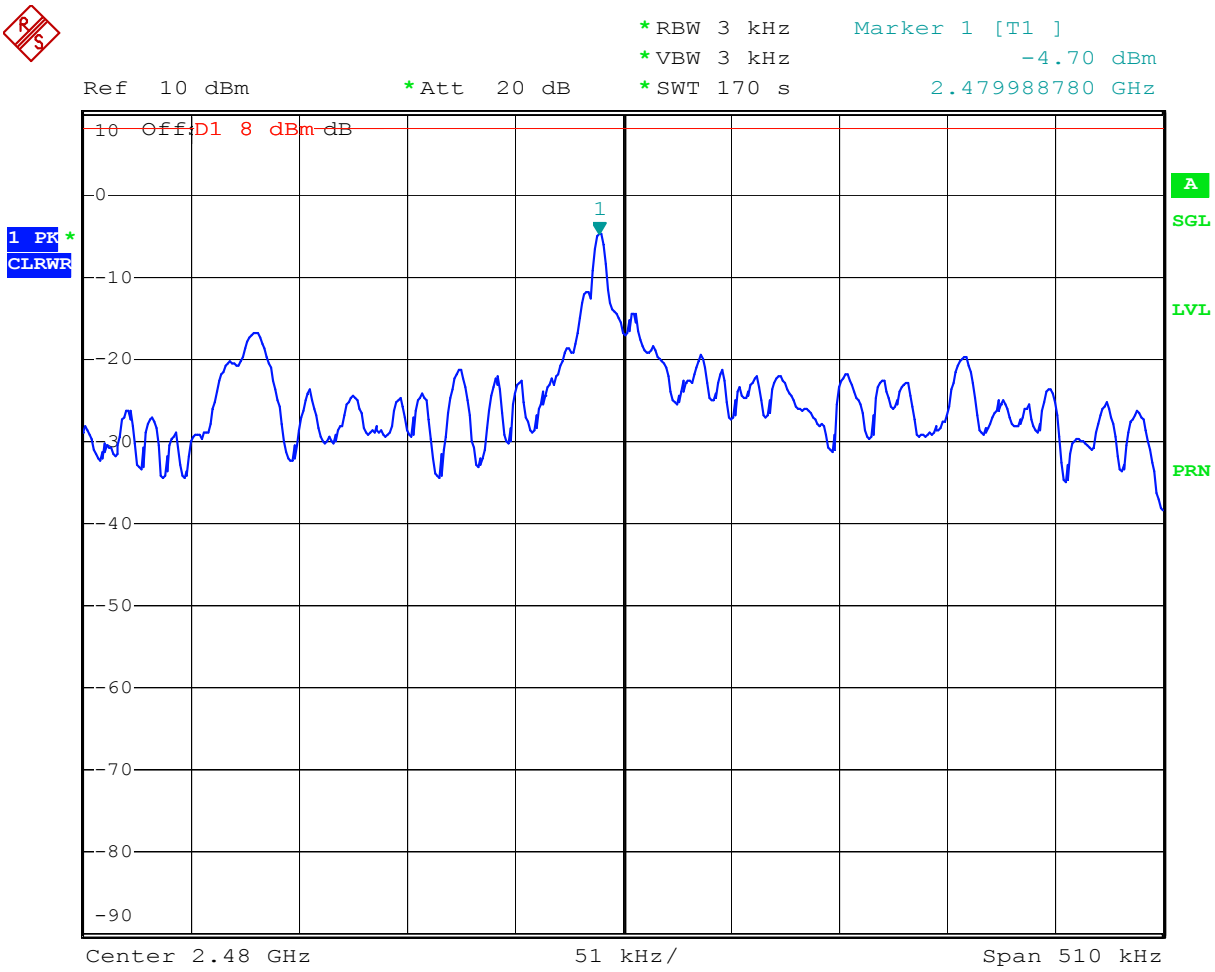
Plot 1.5



Comment: Power density
Date: 21.MAR.2006 14:28:35

Power Density

Plot 1.6



Comment: Power density
Date: 21.MAR.2006 14:32:25

4.2 Hopping Channel 20-dB Bandwidth
FCC 15.247(a)

Procedure

The antenna port of the EUT was connected to the input of a spectrum analyzer.
The spectrum analyzer resolution bandwidth was set to approximately 1% of the 20-dB Bandwidth. The 20-dB Bandwidth was measured by using the DELTA MARKER function of the analyzer.

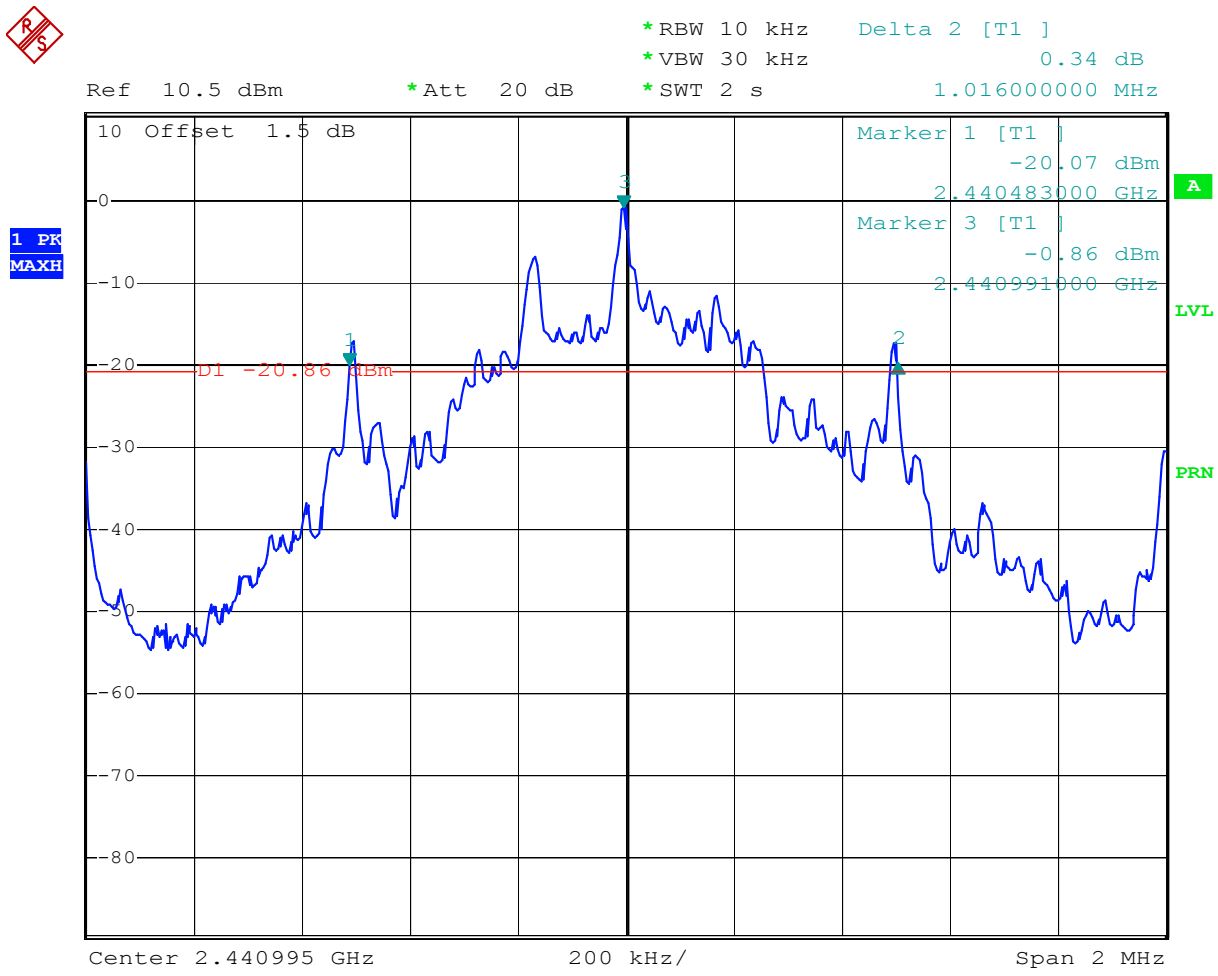
In addition, the occupied bandwidth (99%) was measured at the middle channel.

Test Results

Frequency (MHz)	20-dB channel bandwidth (MHz)	Plot
2402	1.016	2.1
2440	1.020	2.2
2480	1.020	2.3

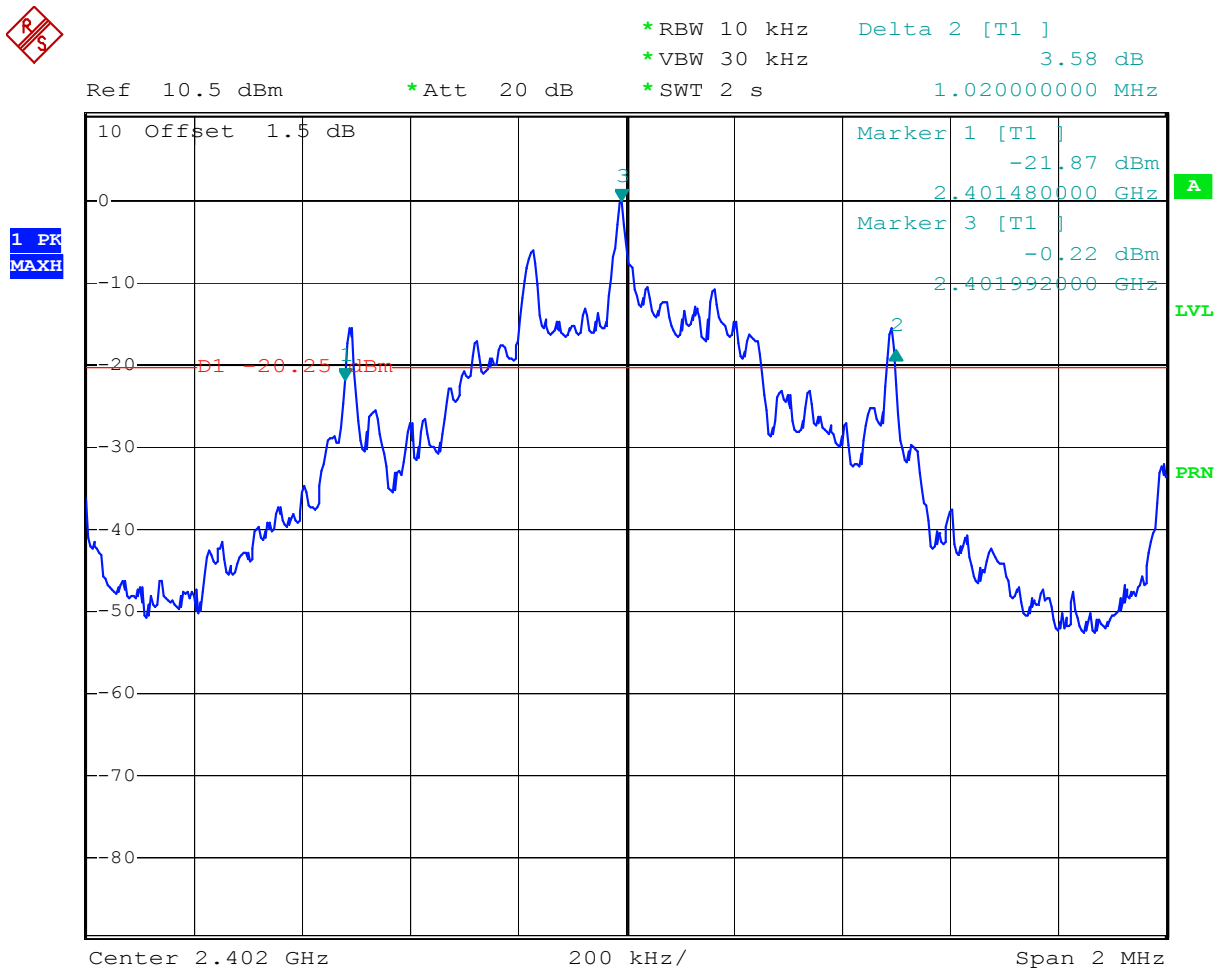
The occupied bandwidth was measured as 1.004 MHz (see plot #2.4)

Plot 2.1



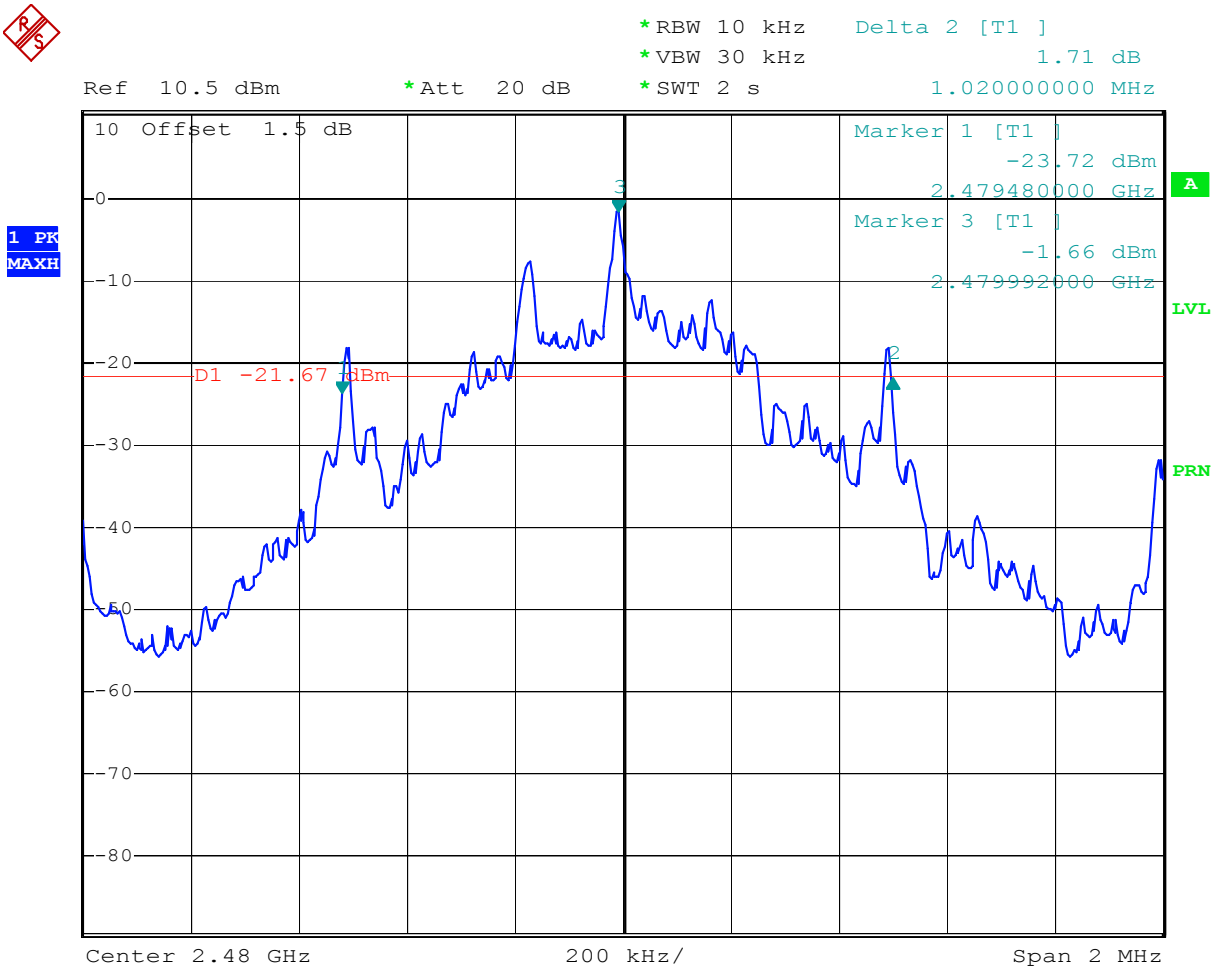
Comment: 20-dB bandwidth
Date: 20.MAR.2006 14:16:10

Plot 2.2



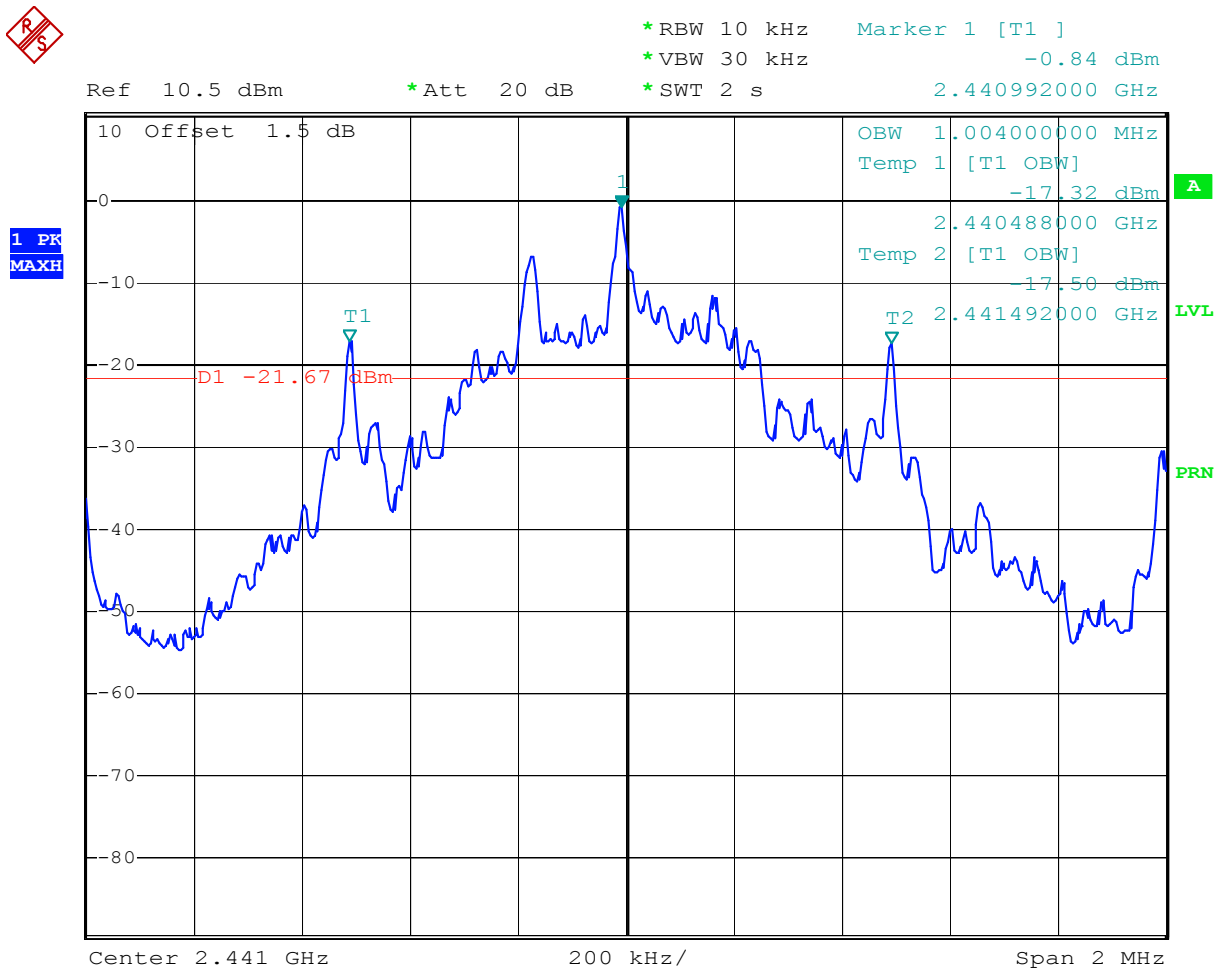
Comment: 20-dB bandwidth
Date: 20.MAR.2006 14:18:13

Plot 2.3



Comment: 20-dB bandwidth
Date: 20.MAR.2006 14:19:58

Plot 2.4



Comment: Occupied bandwidth
Date: 20.MAR.2006 14:23:27

4.3 Carrier Frequency Separation
FCC Ref: 15.247(a)(1)

Requirement

Systems shall have hopping channel carrier frequencies that are separated by 25 kHz or two-thirds of the 20-dB bandwidth of the hopping channel, whichever is greater.

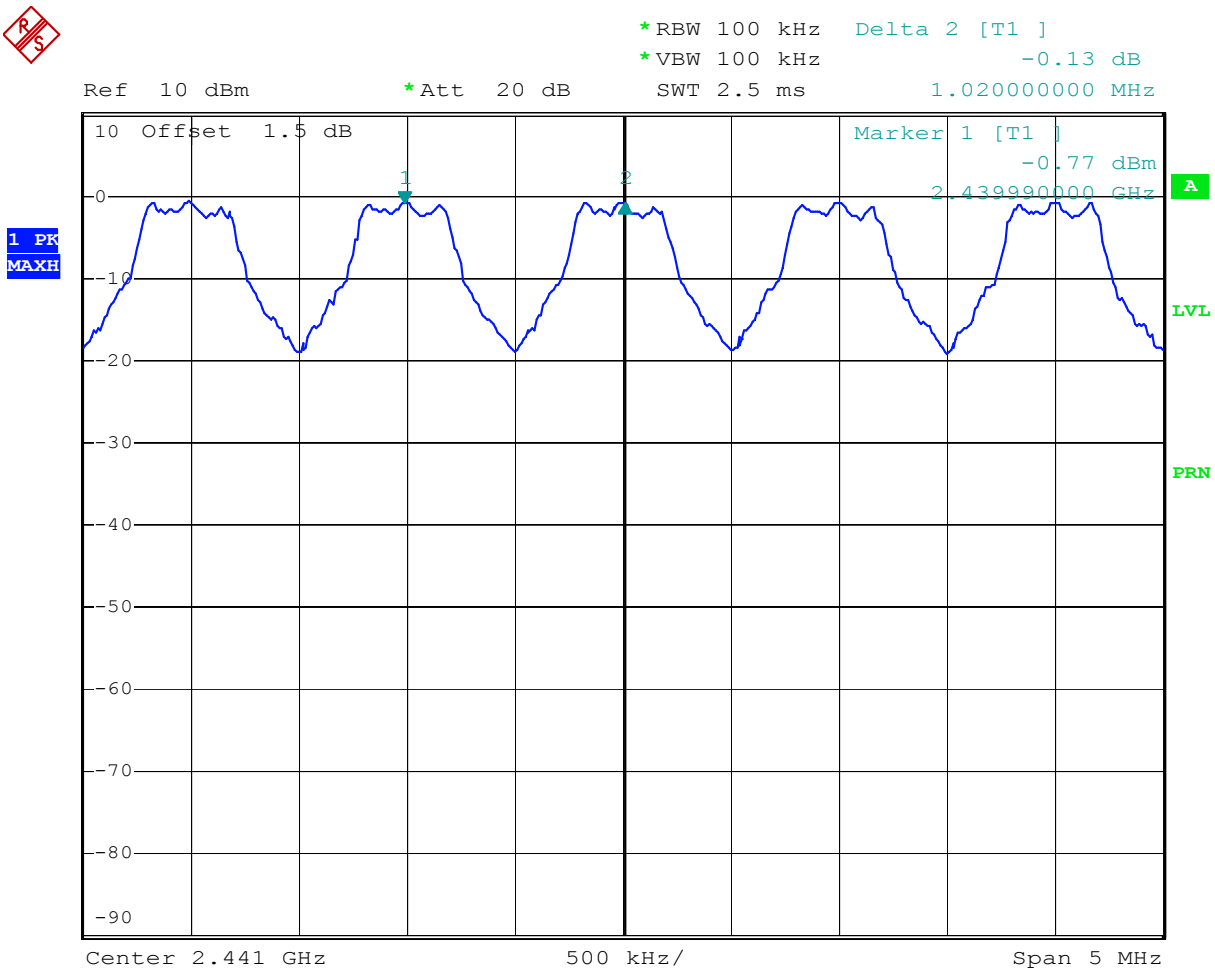
Procedure

Using the DELTA MARKER function of the analyzer, the frequency separation between two adjacent channels was measured and compared against the limit.

Test Results

Please refer to the attached spectrum analyzer plot # 3.1 for the test result. The channel separation is 1.020 MHz.

Plot 3.1



Comment: Carrier frequency separation
Date: 21.MAR.2006 13:01:31

4.4 Number of Hopping Channels
FCC Ref: 15.247(a)(1)(iii)

Requirement

Systems operating in the 2400-2483.5 MHz band shall use at least 15 hopping channels.

Procedure

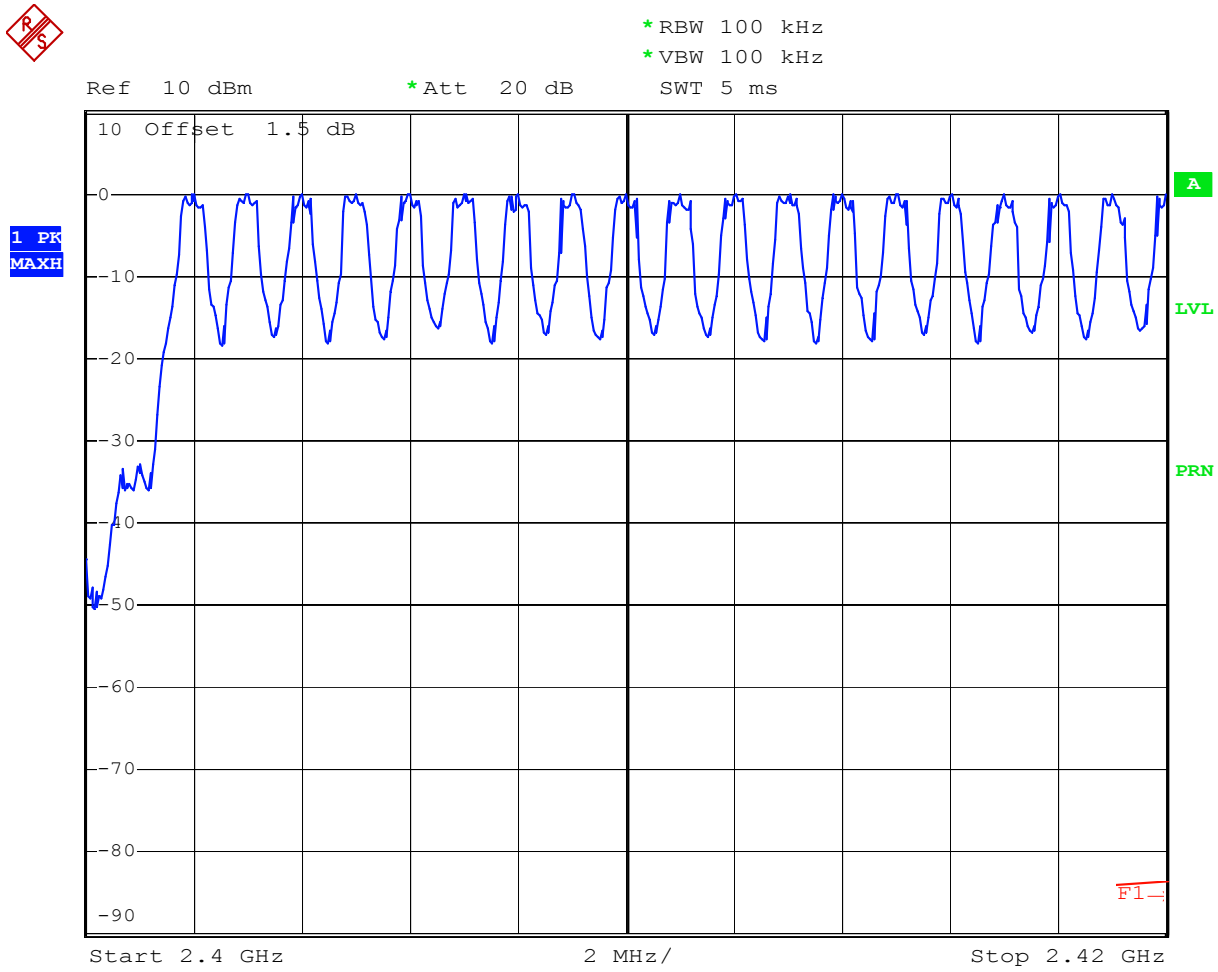
The RF passband of the EUT was divided into 3 approximately equal bands. With the analyzer set to MAX HOLD, readings were taken for 2 - 3 minutes in each band. The channel peaks so recorded were added together, and the total number compared to the minimum number of channels required in the regulation.

Test Results

Number of hopping channels	79

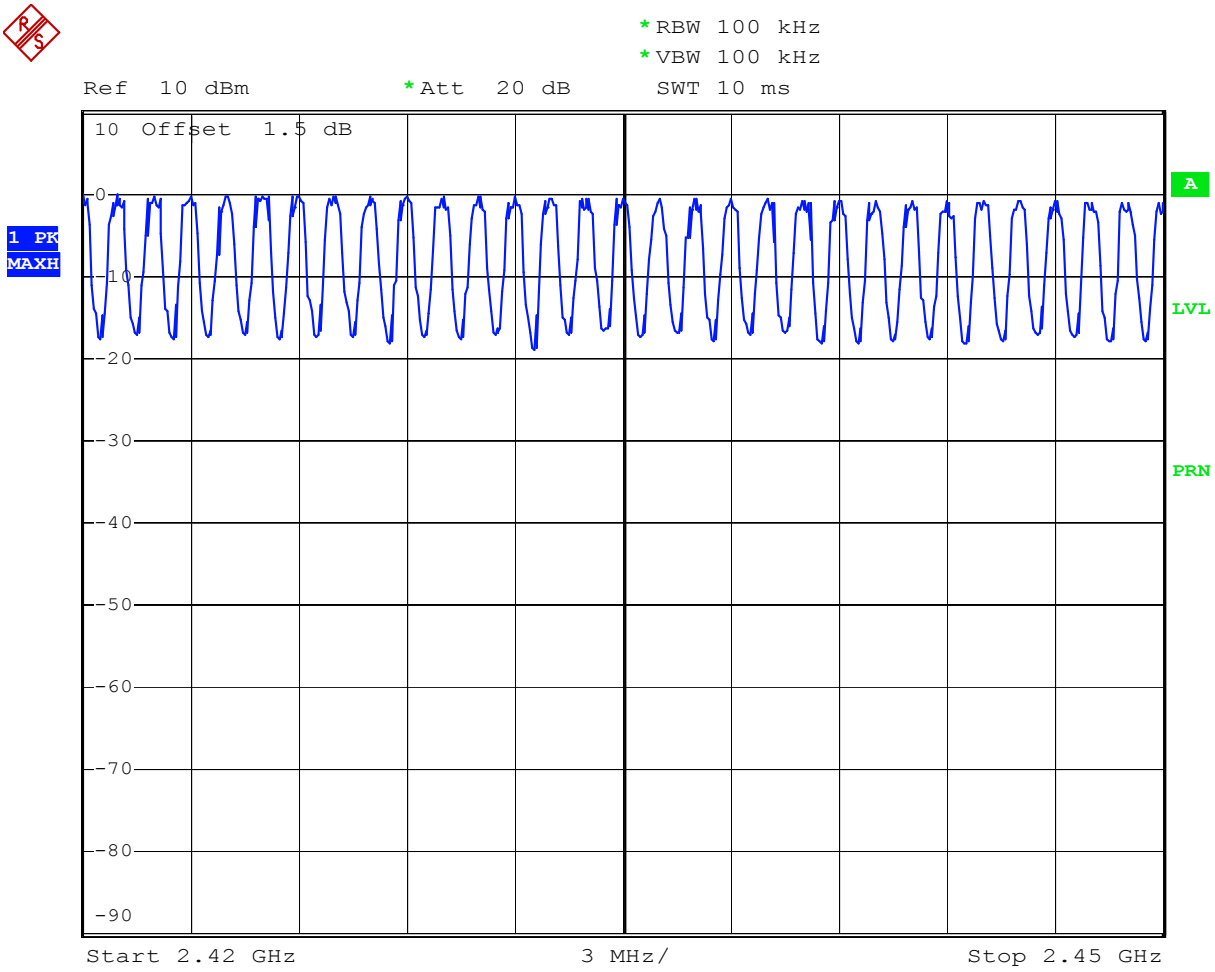
Refer to attached spectrum analyzer charts: Plots 4.1-4.3.

Plot 4.1



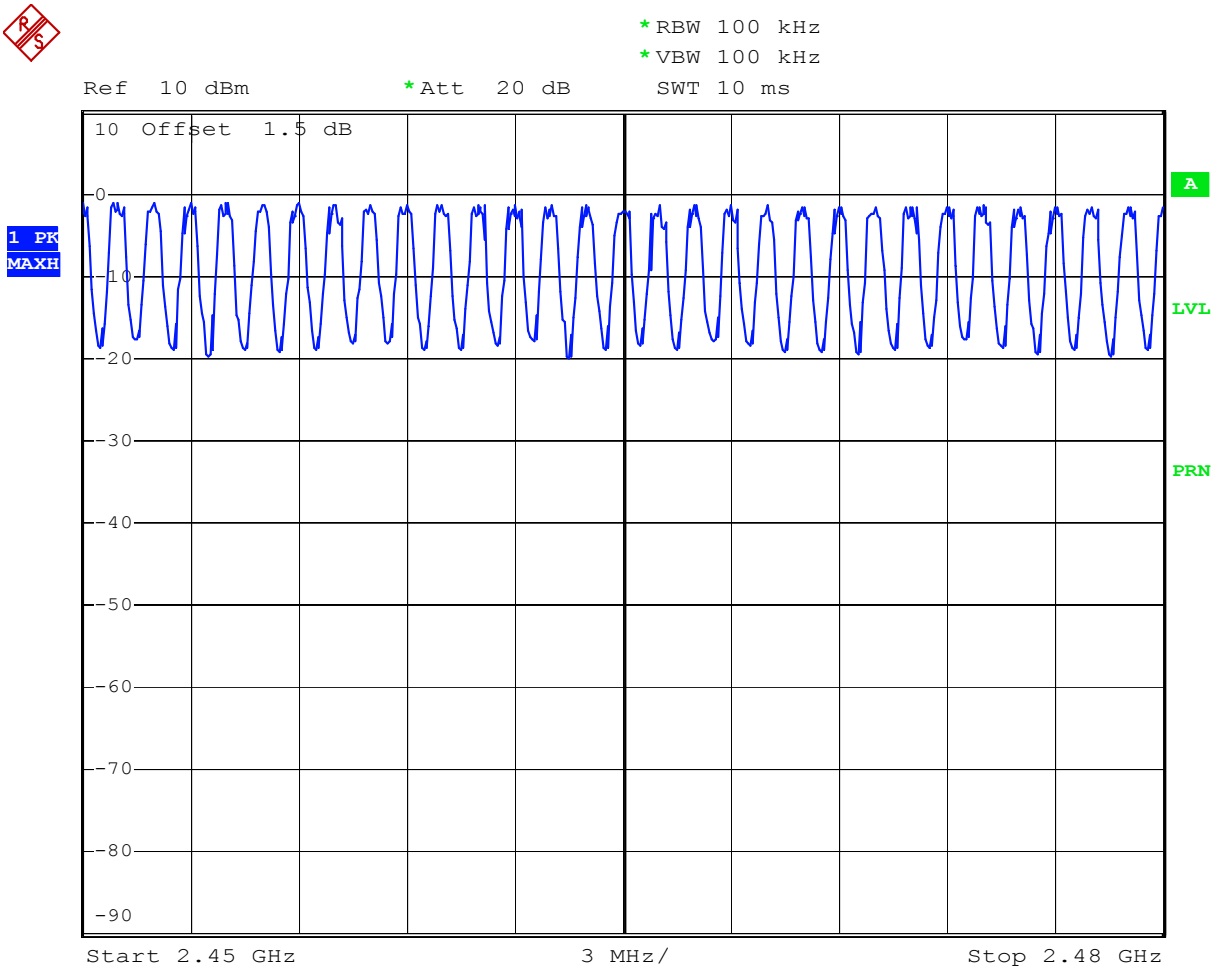
Comment: Number of hopping frequencies
Date: 21.MAR.2006 13:22:47

Plot 4.2



Comment: Number of hopping frequencies
Date: 21.MAR.2006 13:26:10

Plot 4.3



Comment: Number of hopping frequencies
Date: 21.MAR.2006 13:28:40

4.5 Average Channel Occupancy Time
FCC 15.247(a)(1)(ii)(iii)

Requirement

For systems operating in the 2400-2483.5 MHz band, the average time of occupancy on any channel shall not be greater than 0.4 second within a period of 0.4 second multiplied by the number of hopping channels employed.

Procedure

The spectrum analyzer center frequency was set to one of the known hopping channels, the SPAN was set to ZERO SPANS, and the TRIGGER was set to VIDEO. The time duration of the transmission so captured was measured with the MARKER DELTA function.

The test was performed with the transmission of DH1, DH3, and DH5 packets

Since the radio is employed 79 hopping channels, the Occupancy Time was calculated for the period of 0.4 * 79 = 31.6 sec.

Test Results

Occupancy Time For DH1 packet (see plots 5.1 and 5.2)

0.000432 * 11 *31.6 = 0.15 sec.

Occupancy Time For DH3 packet (see plots 5.3 and 5.4)

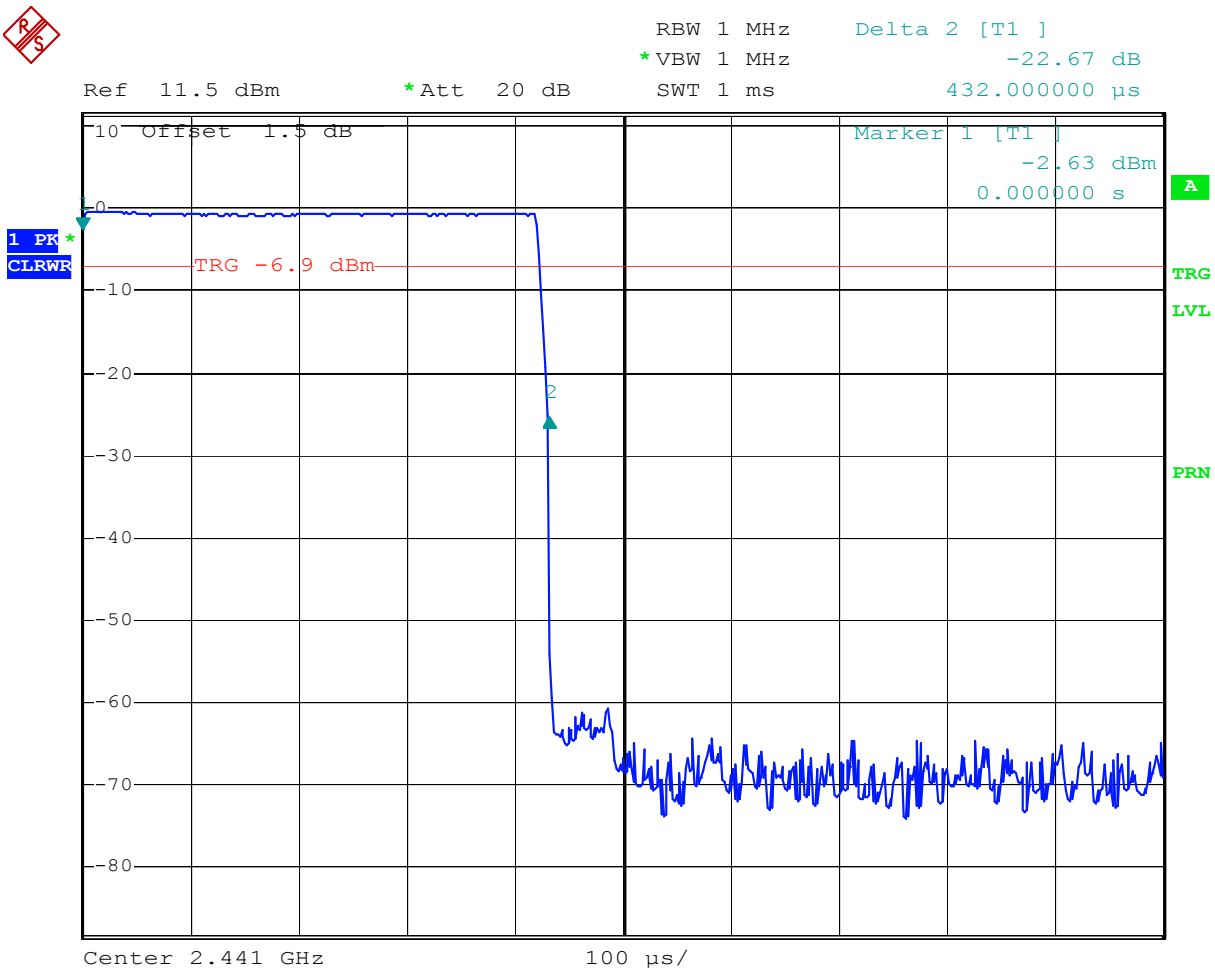
0.001692 * 6 *31.6 = 0.32 sec.

Occupancy Time For DH5 packet (see plots 5.5 and 5.6)

0.00294 * 4 *31.6 = 0.37 sec.

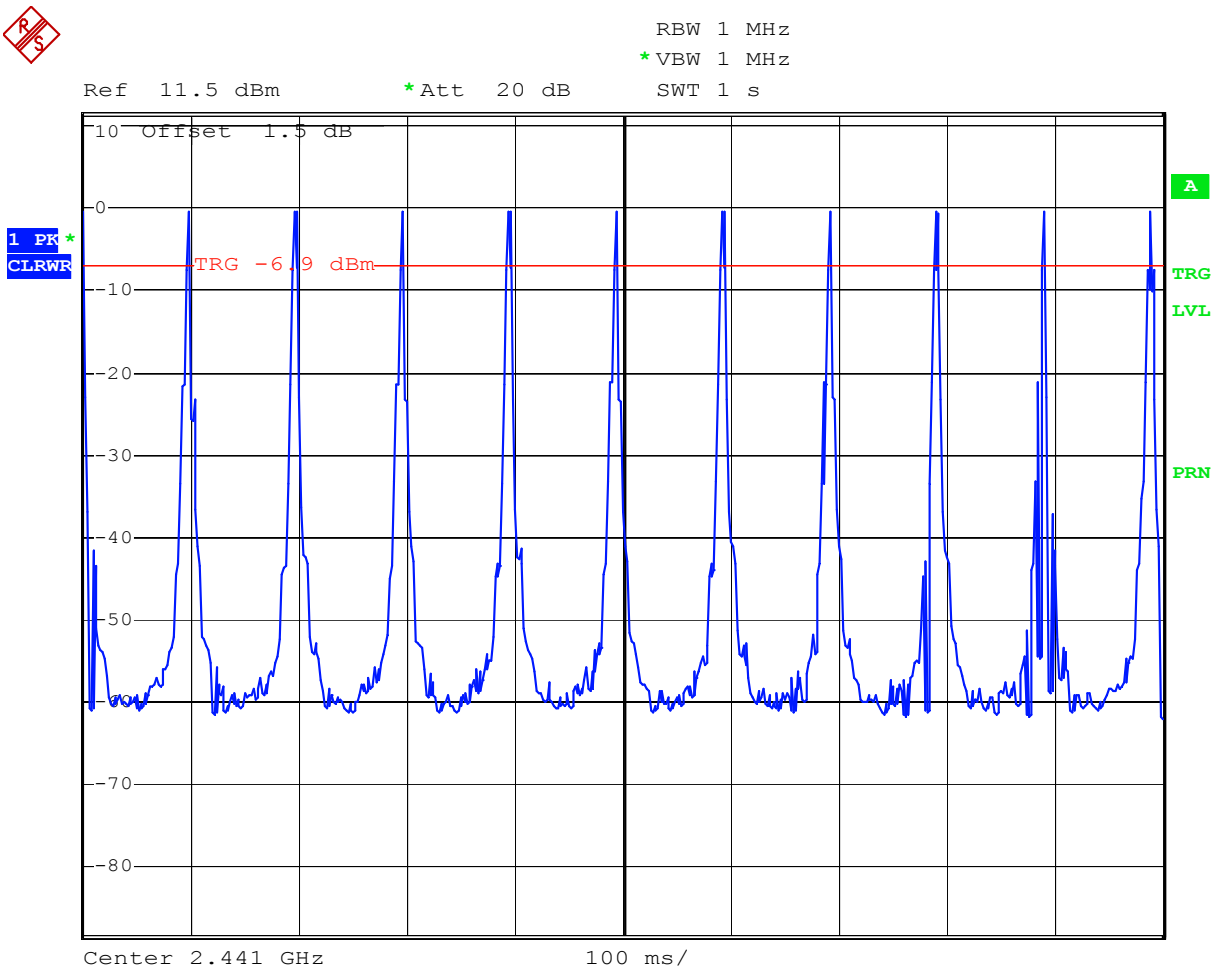
Refer to attached spectrum analyzer plots 5.1-5.6 for details.

Plot 5.1



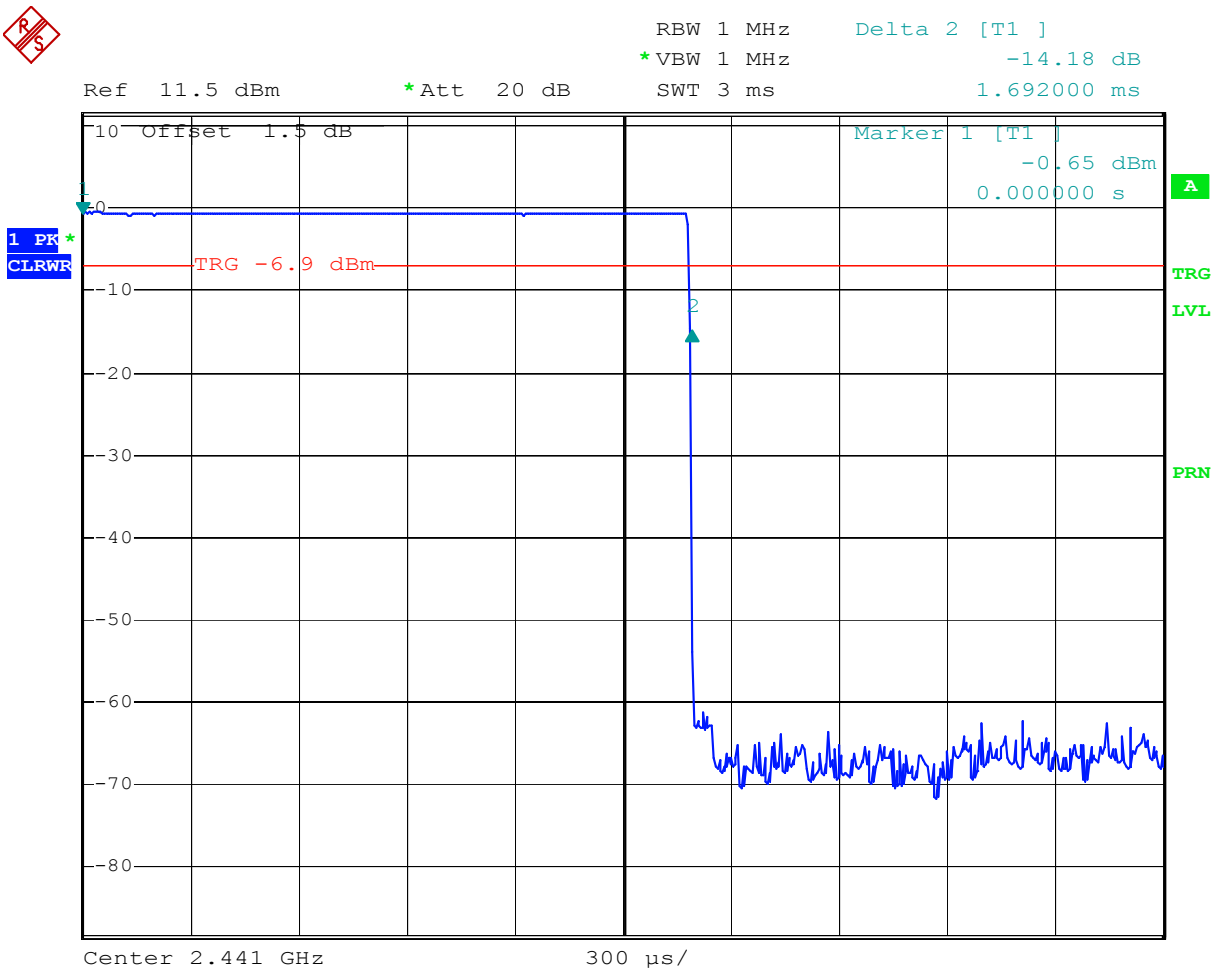
Comment: Time of occupancy, DH1 packet
Date: 22.MAR.2006 11:29:01

Plot 5.2



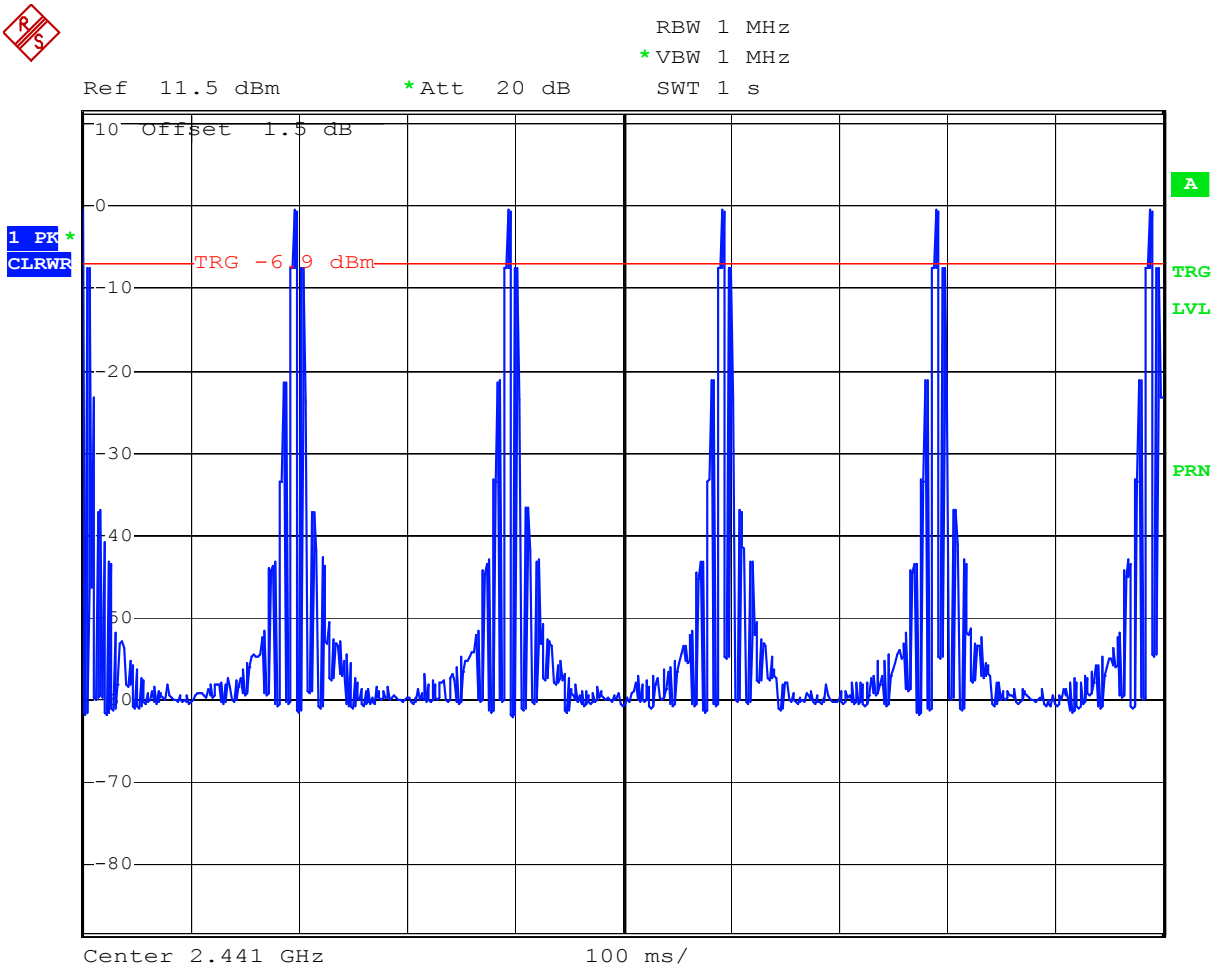
Comment: Time of occupancy, DH1 packet
Date: 22.MAR.2006 11:29:51

Plot 5.3



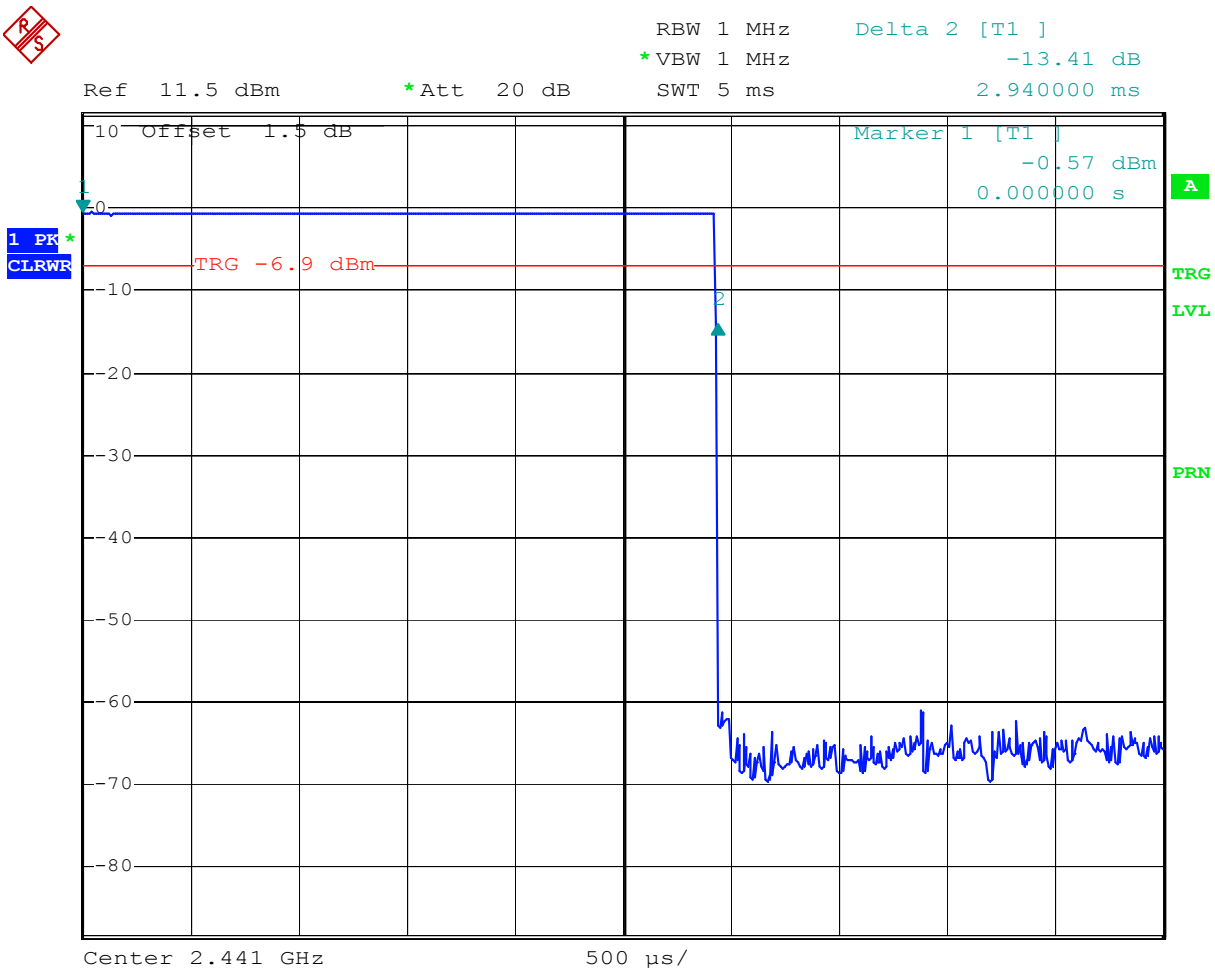
Comment: Time of occupancy, DH3 packet
Date: 22.MAR.2006 11:32:40

Plot 5.4



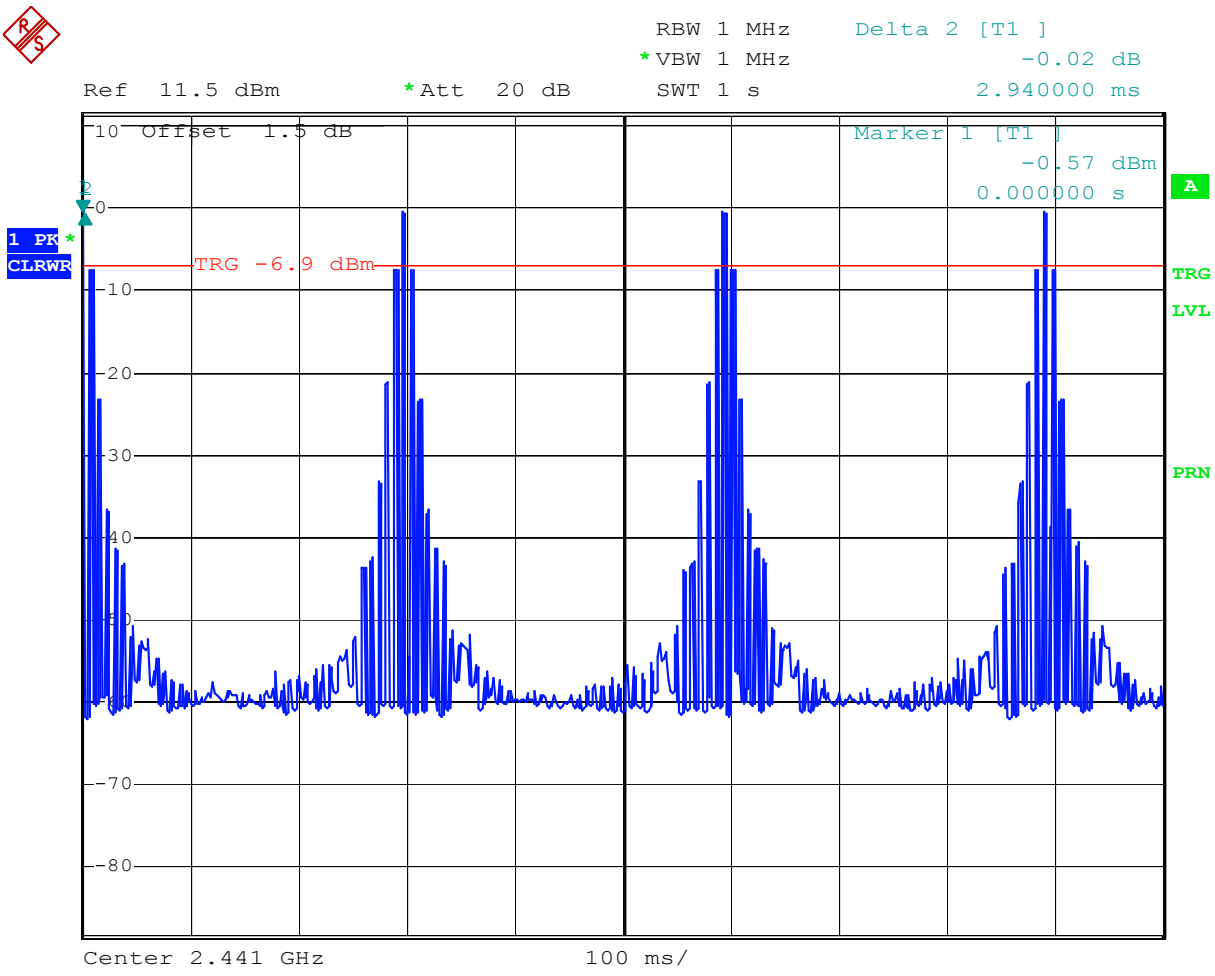
Comment: Time of occupancy, DH3 packet
Date: 22.MAR.2006 11:33:17

Plot 5.5



Comment: Time of occupancy, DH5 packet
Date: 22.MAR.2006 11:35:43

Plot 5.6



Comment: Time of occupancy, DH5 packet
Date: 22.MAR.2006 11:36:34

4.6 Out-of Band-Conducted Emissions
FCC 15.247(c)

Requirement

In any 100 kHz bandwidth outside the EUT pass-band, the RF power shall be at least 20 dB below that of the maximum in-band 100 kHz emission.

Procedure

A spectrum analyzer was connected to the antenna port of the transmitter. Analyzer Resolution Bandwidth was set to 100 kHz. For each channel investigated, the in-band and out-of-band emission measurements were performed. The out-of-band emissions were measured from 30 MHz to 25 GHz.

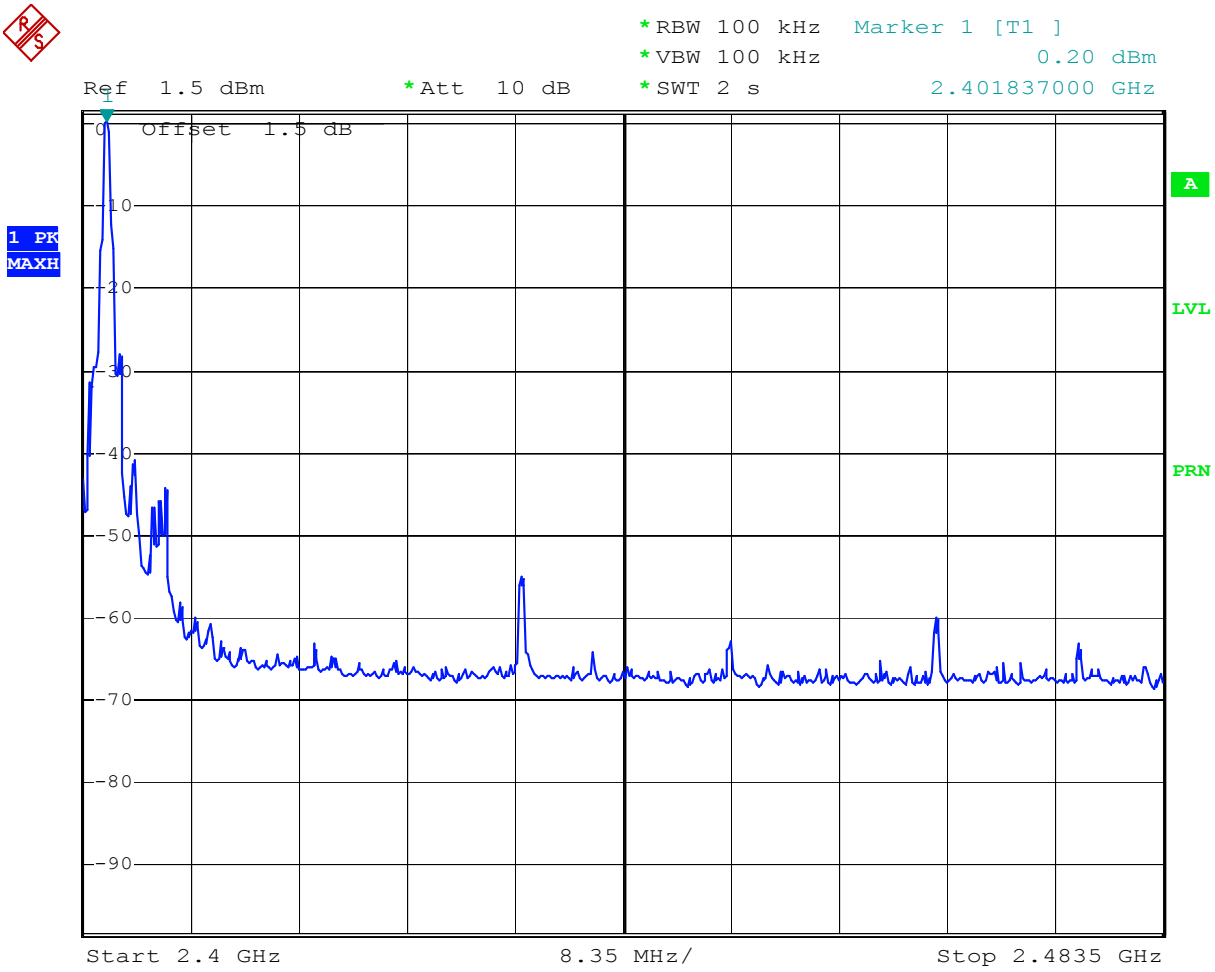
Test Result

Refer to the following plots for the test result:

Description	Comments	Plot number
In-band Emissions, F=2402 MHz		6.1
In-band Emissions, F=2441 MHz		6.2
In-band Emissions, F=2480 MHz		6.3
Emissions on the low band-edge frequency	Fixed channel, 2402 MHz	6.4
Emissions on the low band-edge frequency	Hopping mode	6.5
Emissions on the high band-edge frequency	Fixed channel, 2480 MHz	6.6
Emissions on the high band-edge frequency	Hopping mode	6.7
Out-of-band low Channel Emissions	Fixed channel, 2402 MHz	6.8 – 6.10
Out-of-band middle Channel Emissions	Fixed channel, 2441 MHz	6.11 – 6.13
Out-of-band high Channel Emissions	Fixed channel, 2480 MHz	6.14 – 6.16

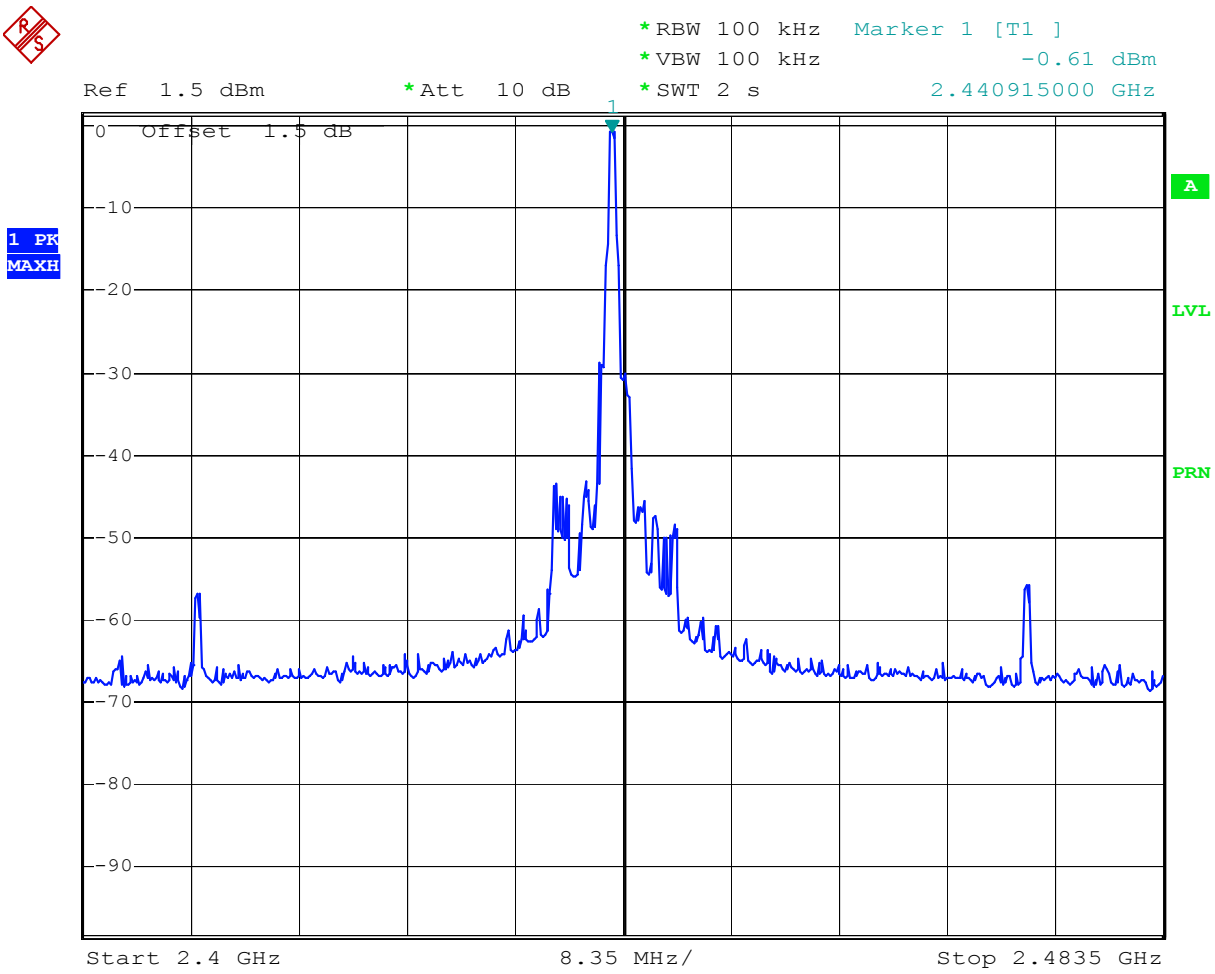
The attenuation is more than 20 dB.

Plot 6.1



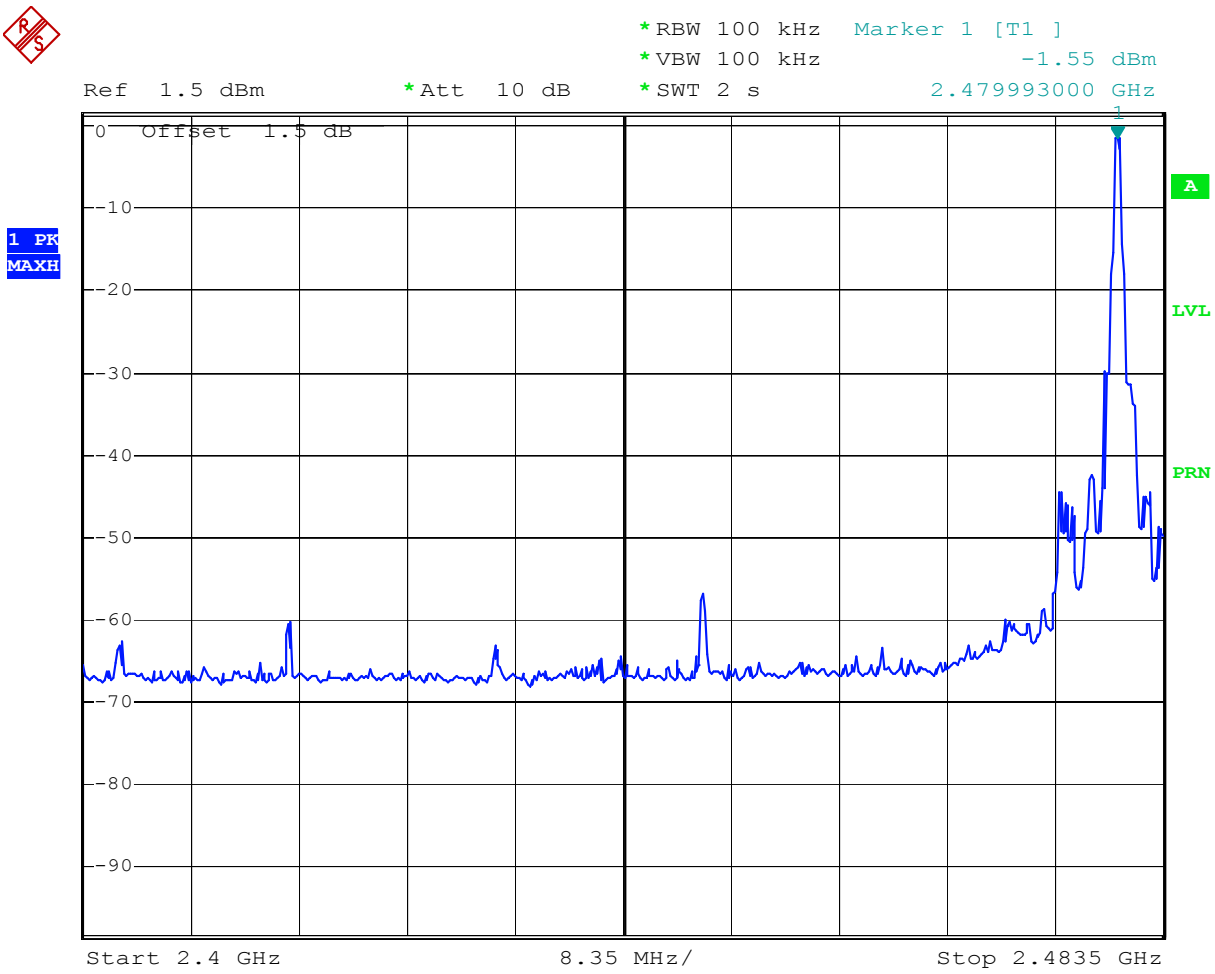
Comment: In-band emissions, f=2402 MHz
Date: 20.MAR.2006 14:57:28

Plot 6.2



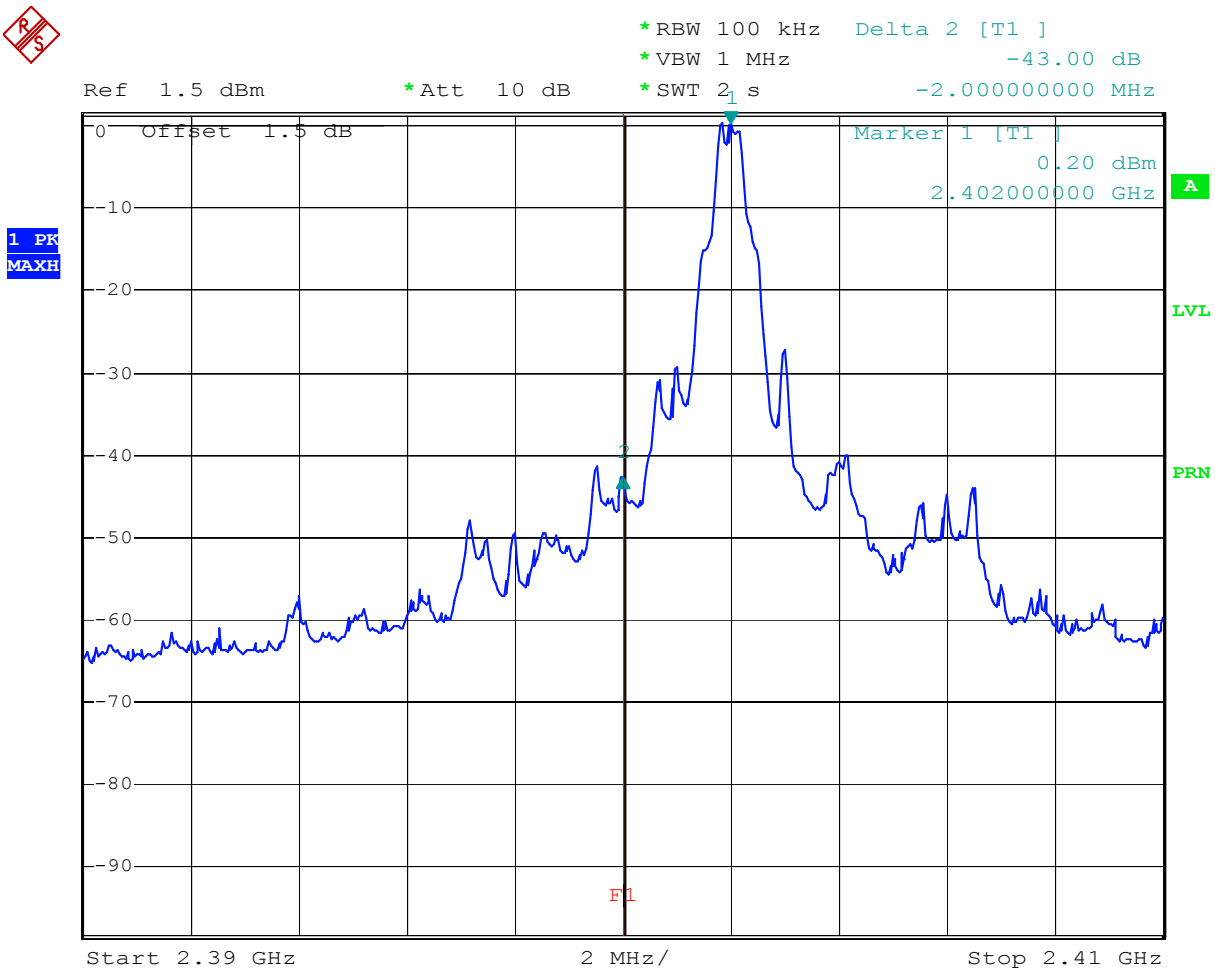
Comment: In-band emissions, f=2441 MHz
Date: 20.MAR.2006 14:56:17

Plot 6.3



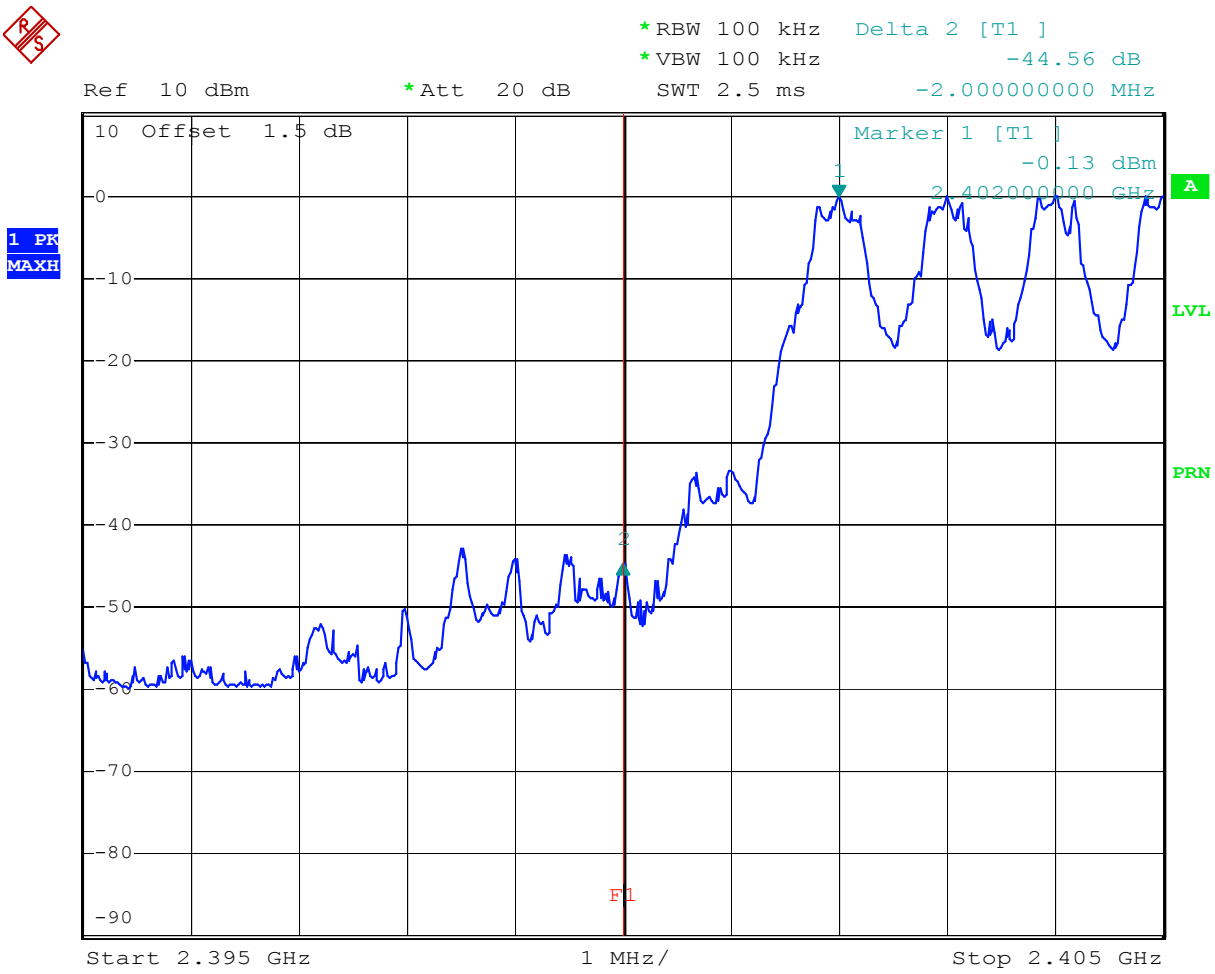
Comment: In-band emissions, f=2480 MHz
Date: 20.MAR.2006 14:55:01

Plot 6.4



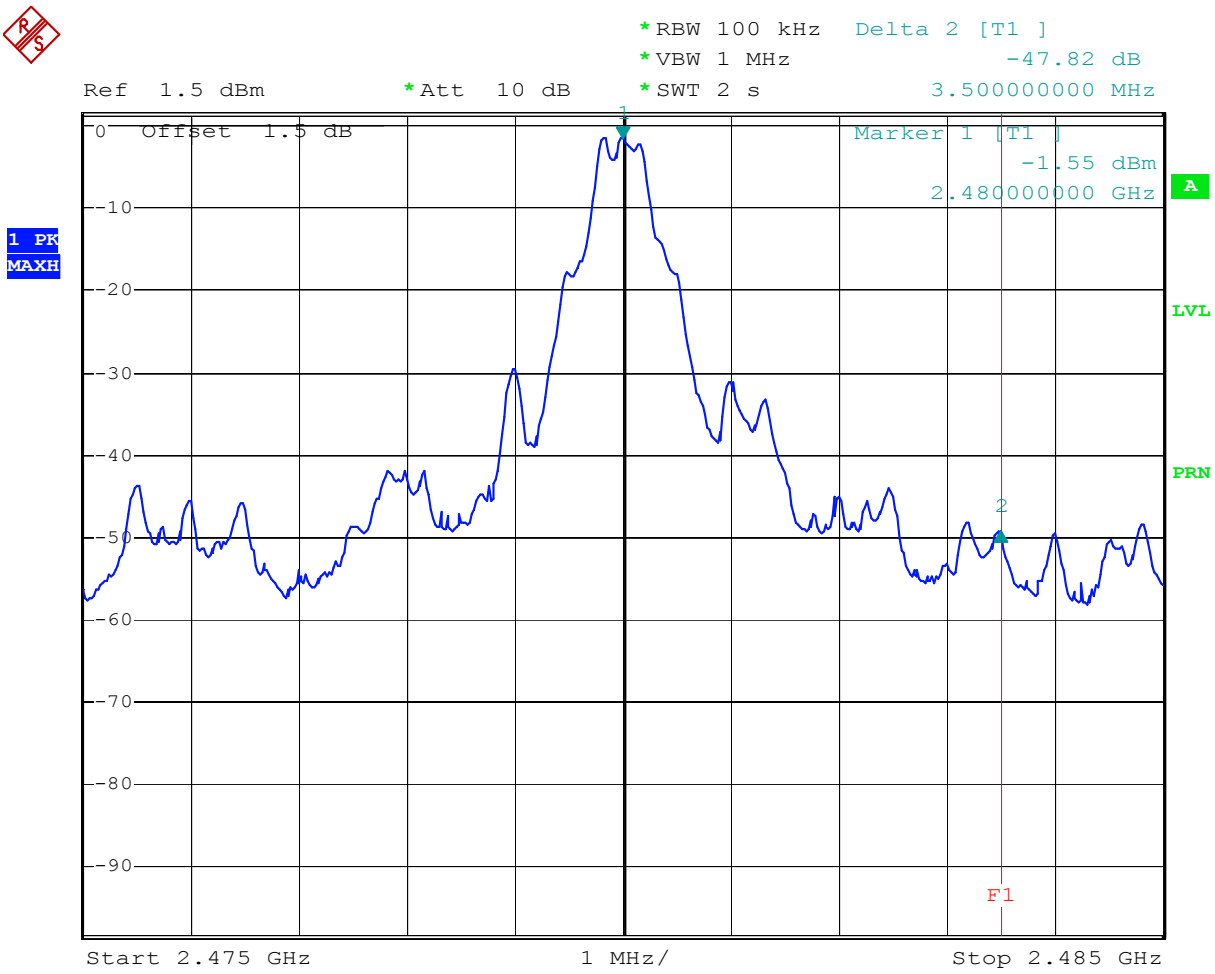
Comment: Band-edge frequency emissions
Date: 20.MAR.2006 14:41:38

Plot 6.5



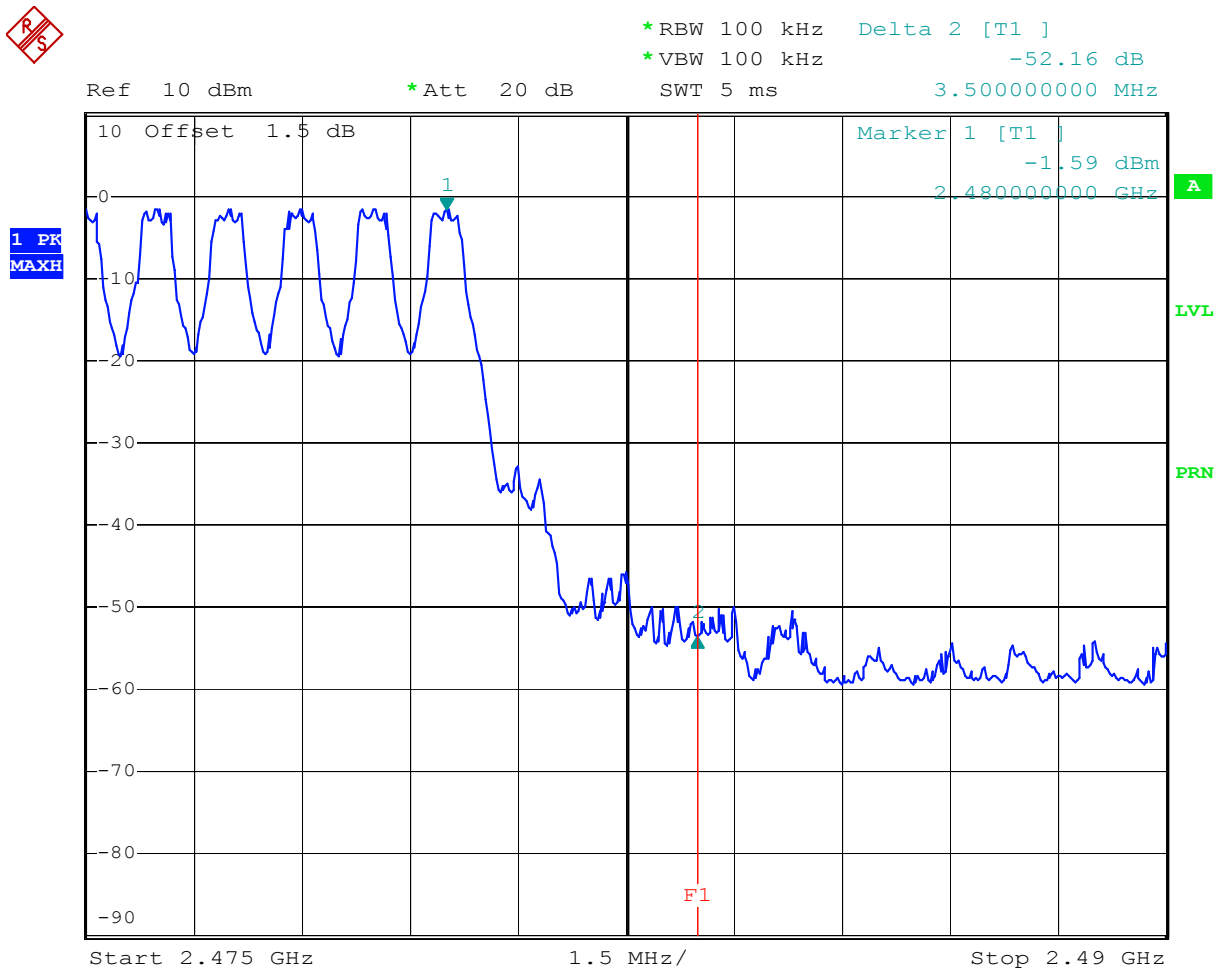
Comment: Band-edge frequency emissions, hopping mode
Date: 21.MAR.2006 13:08:26

Plot 6.6



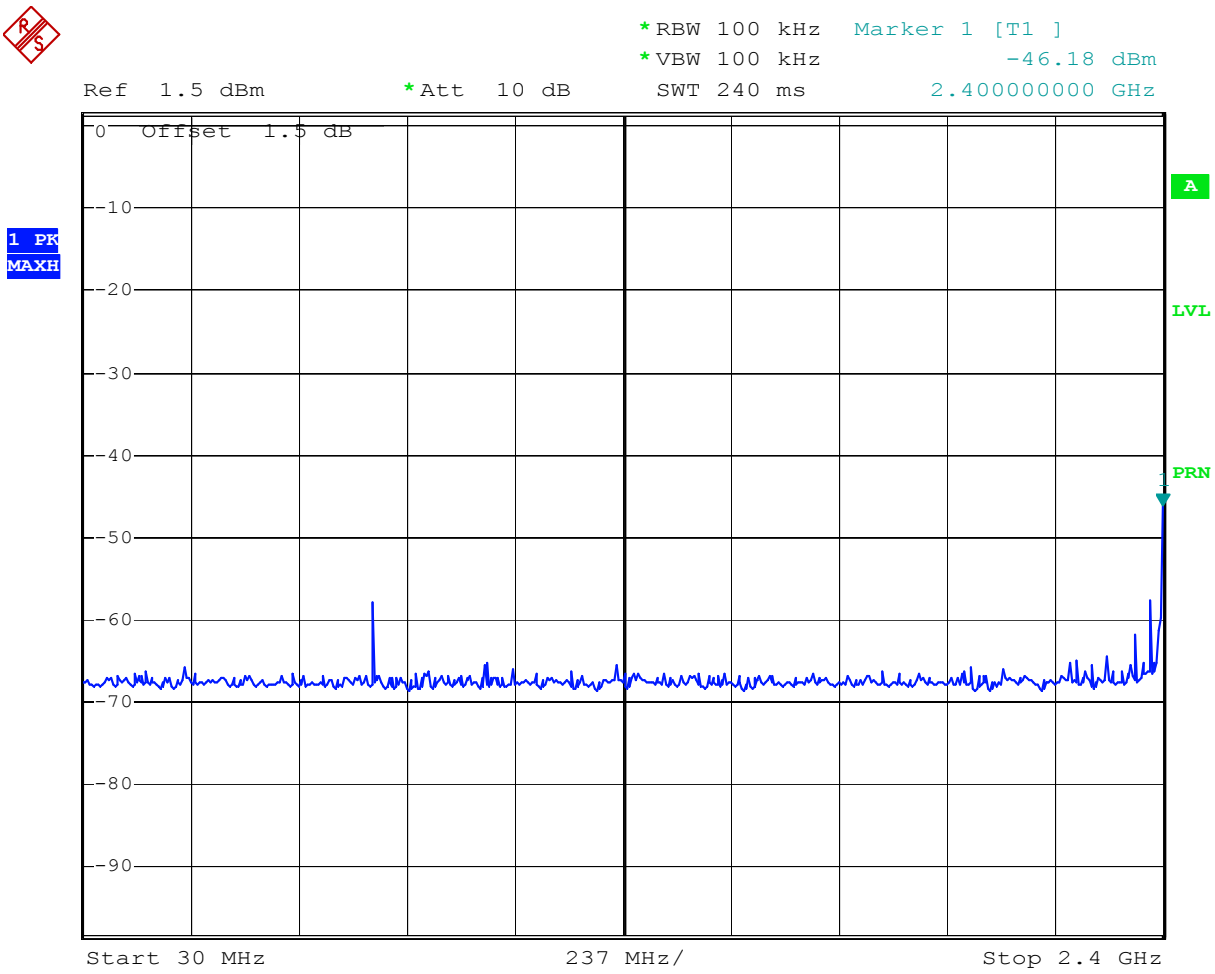
Comment: Band-edge frequency emissions
Date: 20.MAR.2006 14:45:06

Plot 6.7



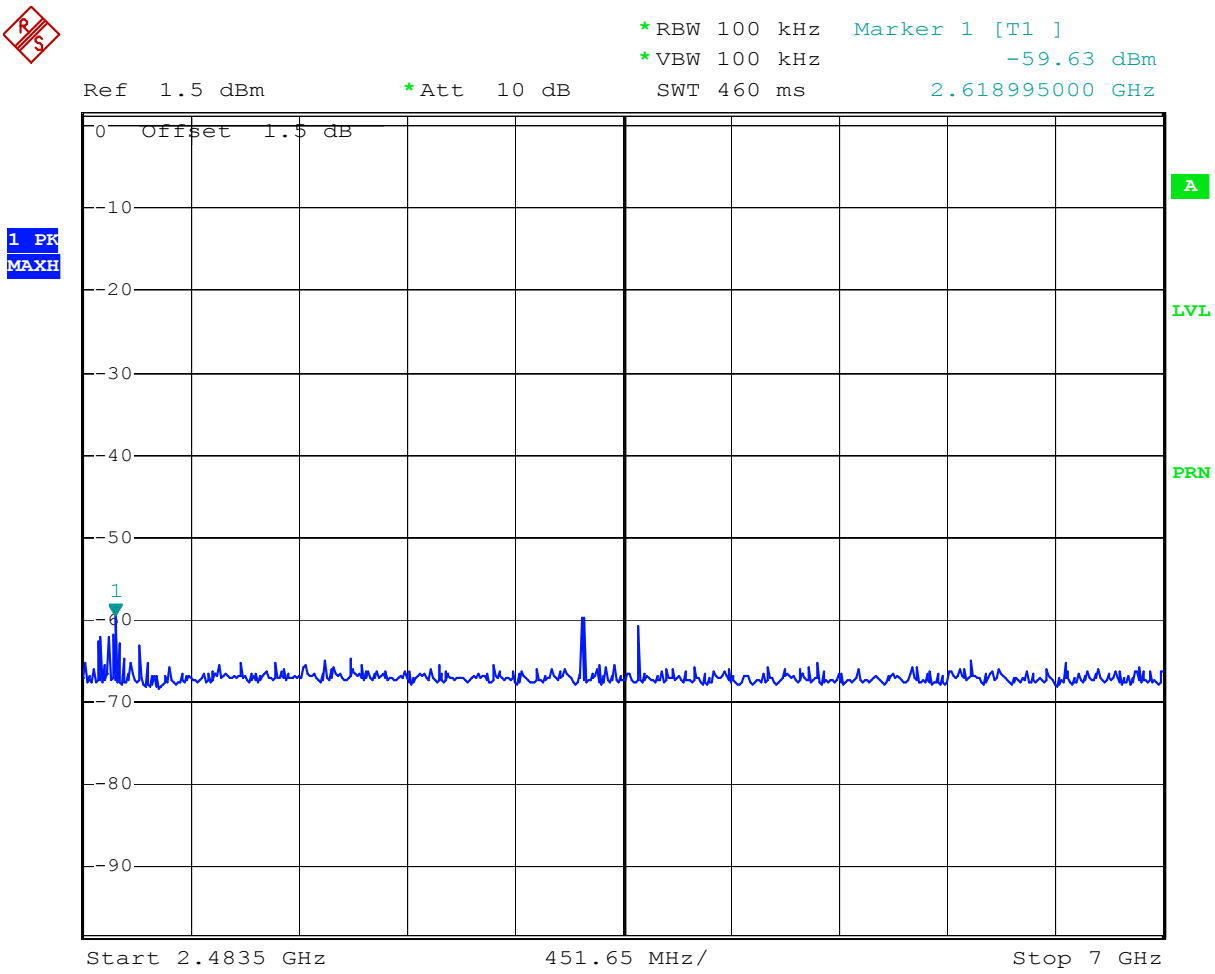
Comment: Band-edge frequency emissions, hopping mode
Date: 21.MAR.2006 13:16:51

Plot 6.8



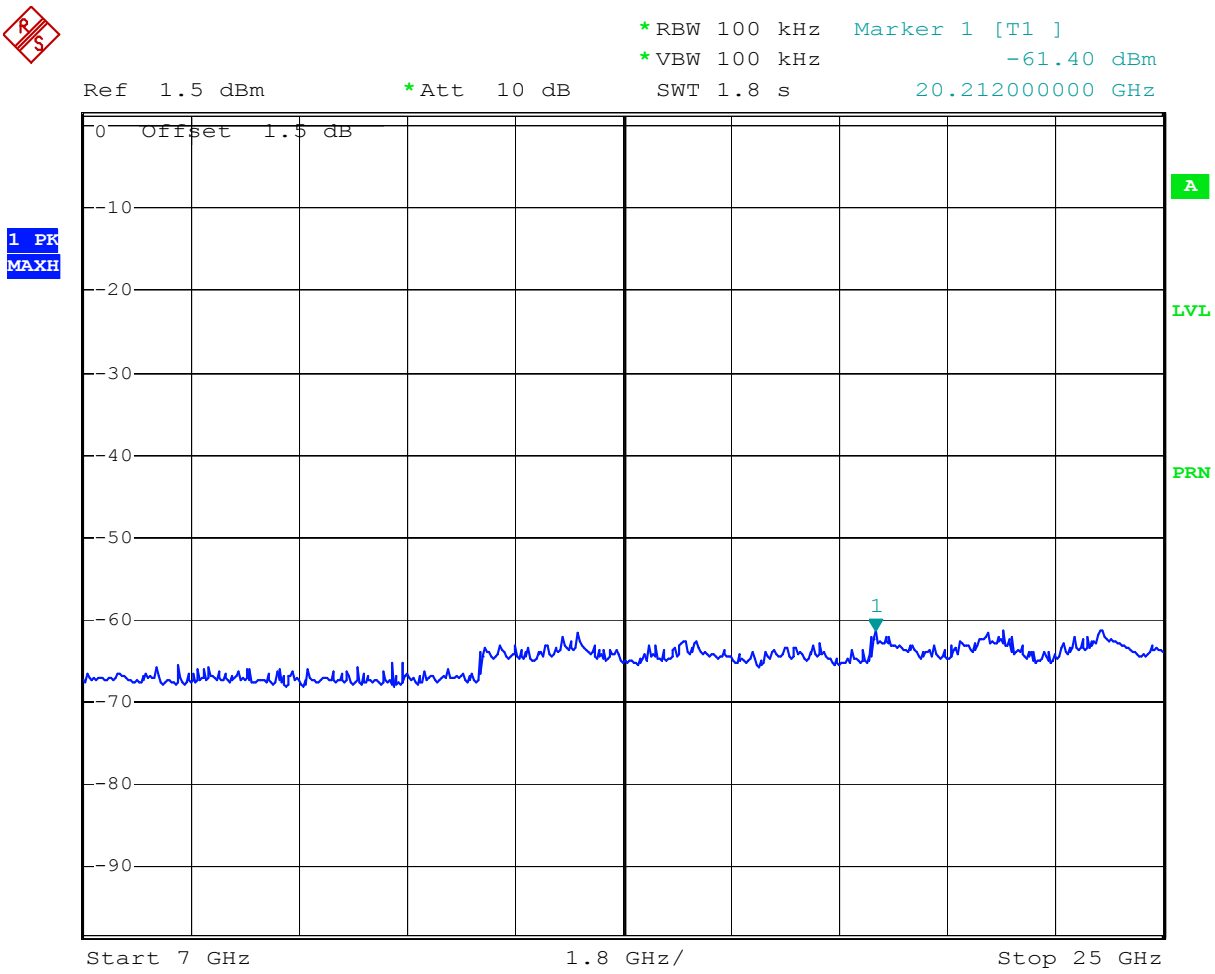
Comment: Out-of-band emissions, f=2402 MHz
Date: 21.MAR.2006 12:01:36

Plot 6.9



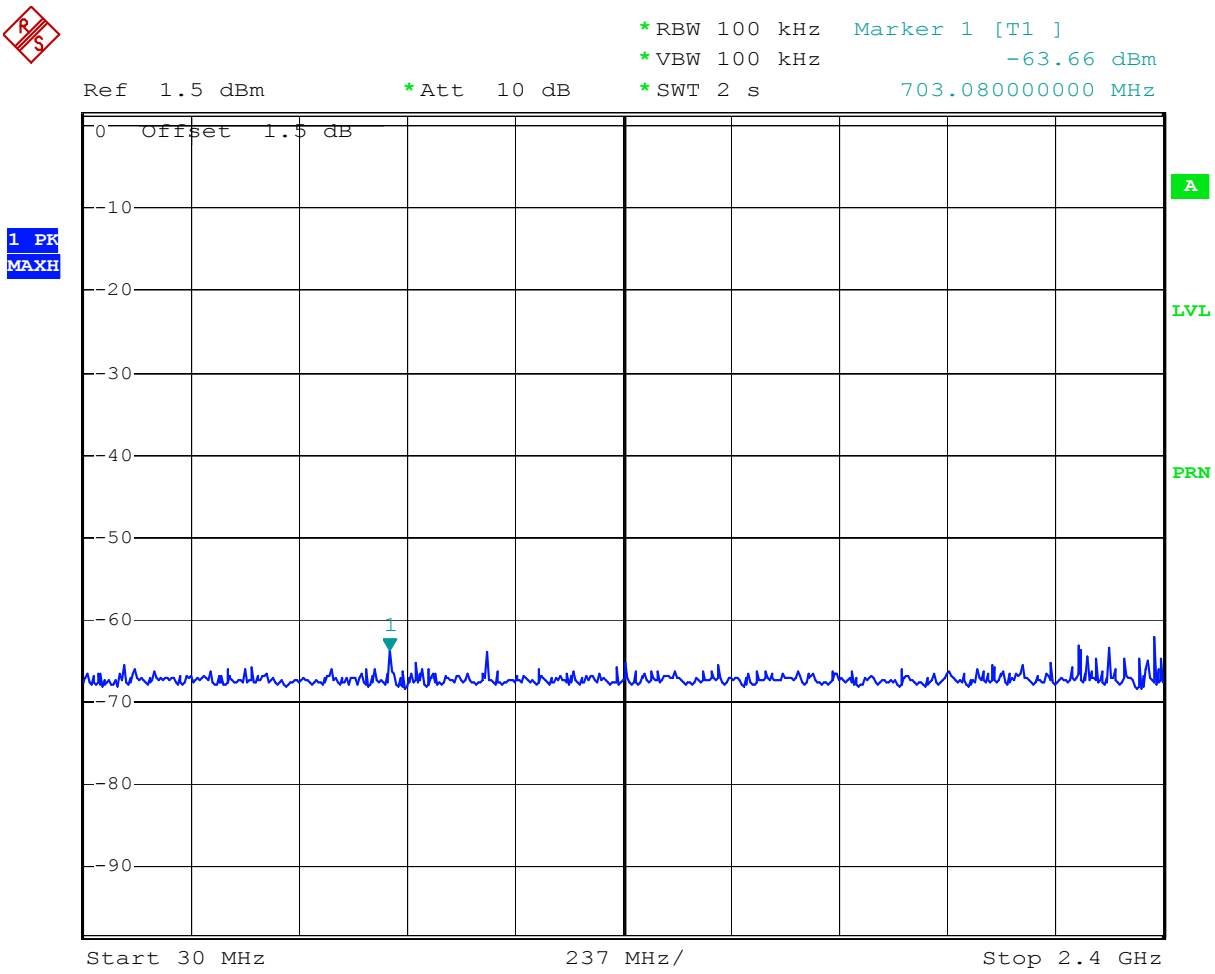
Comment: Out-of-band emissions, f=2402 MHz
Date: 21.MAR.2006 12:03:12

Plot 6.10



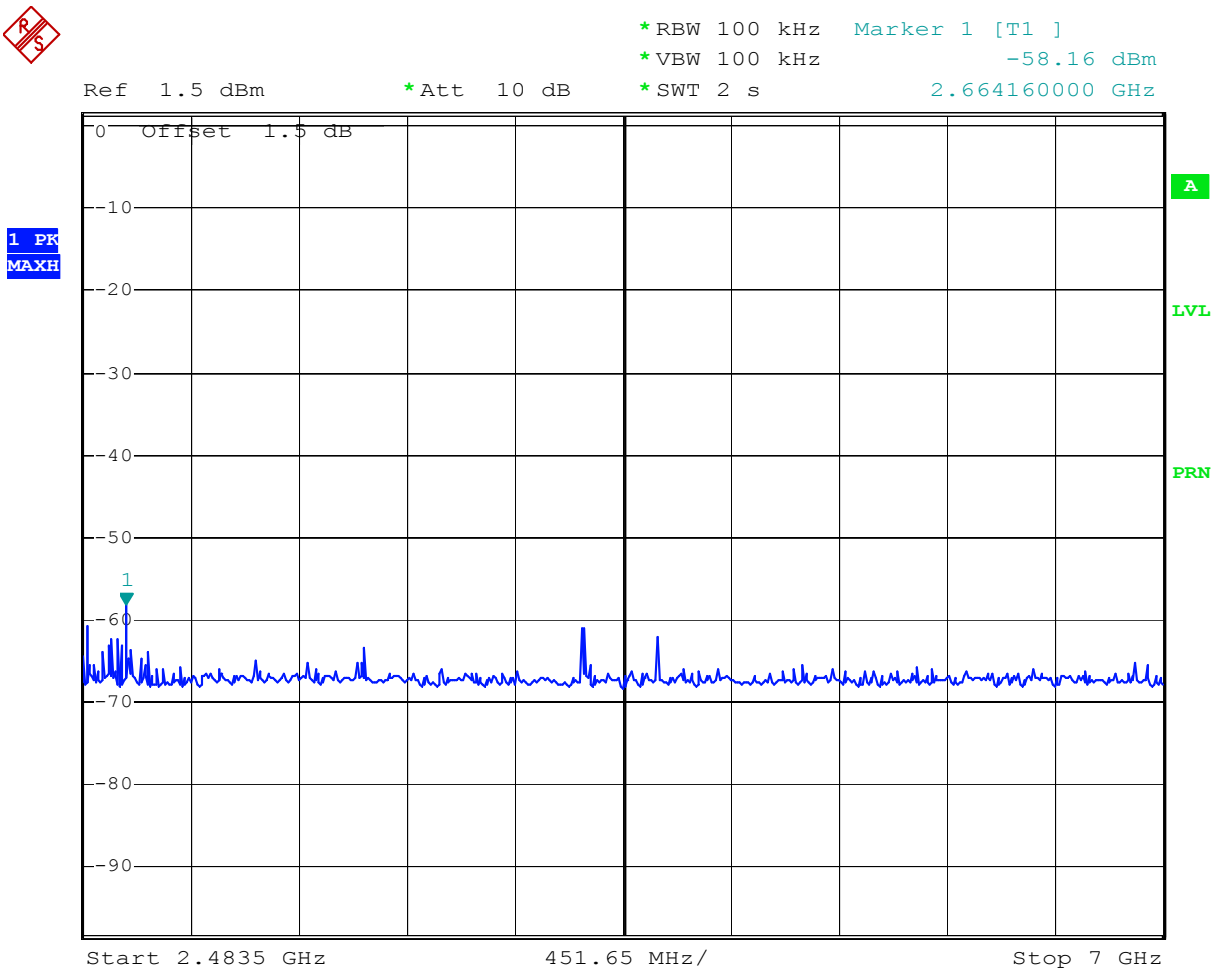
Comment: Out-of-band emissions, f=2402 MHz
Date: 21.MAR.2006 12:04:05

Plot 6.11



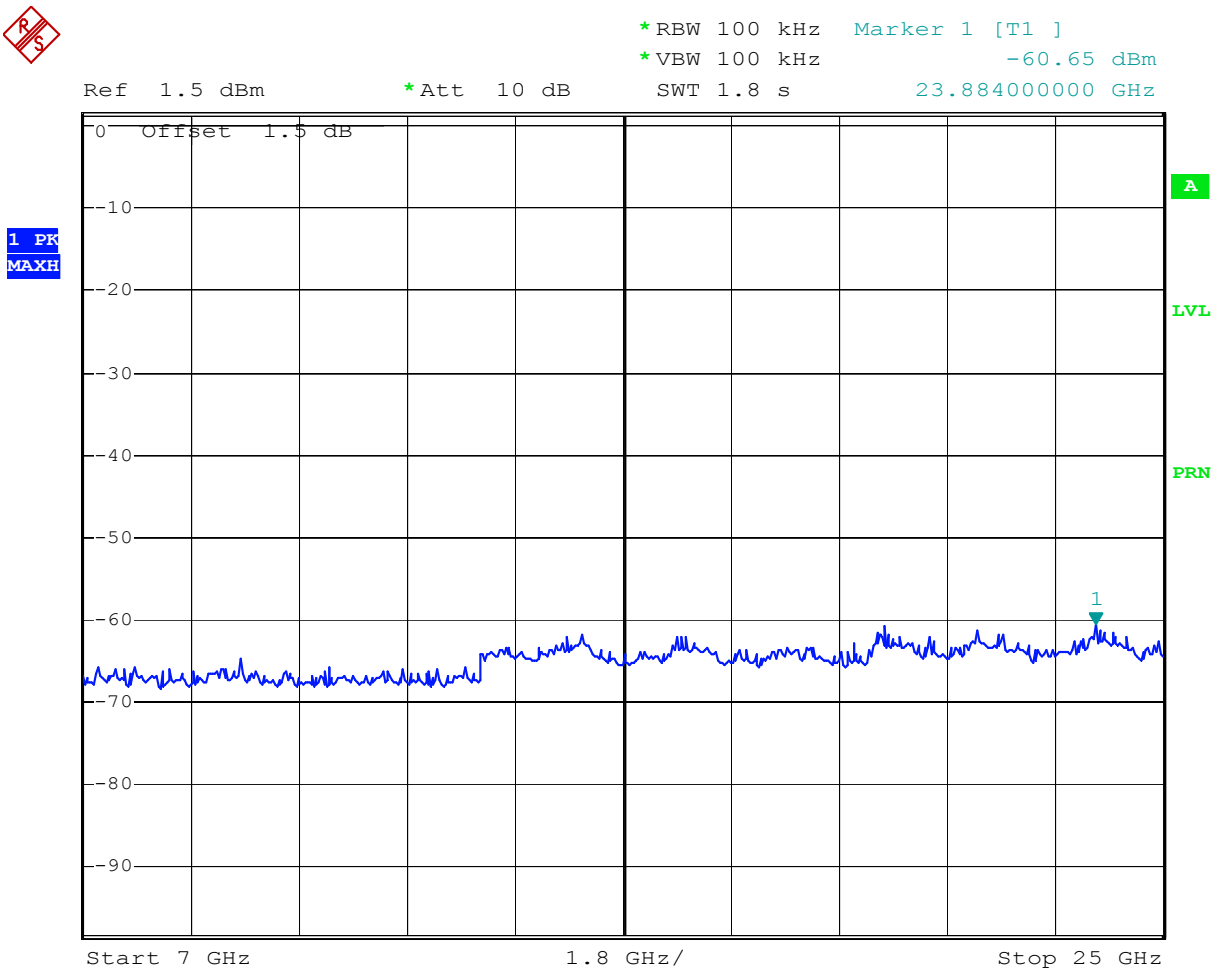
Comment: Out-of-band emissions, f=2441 MHz
Date: 21.MAR.2006 11:56:02

Plot 6.12



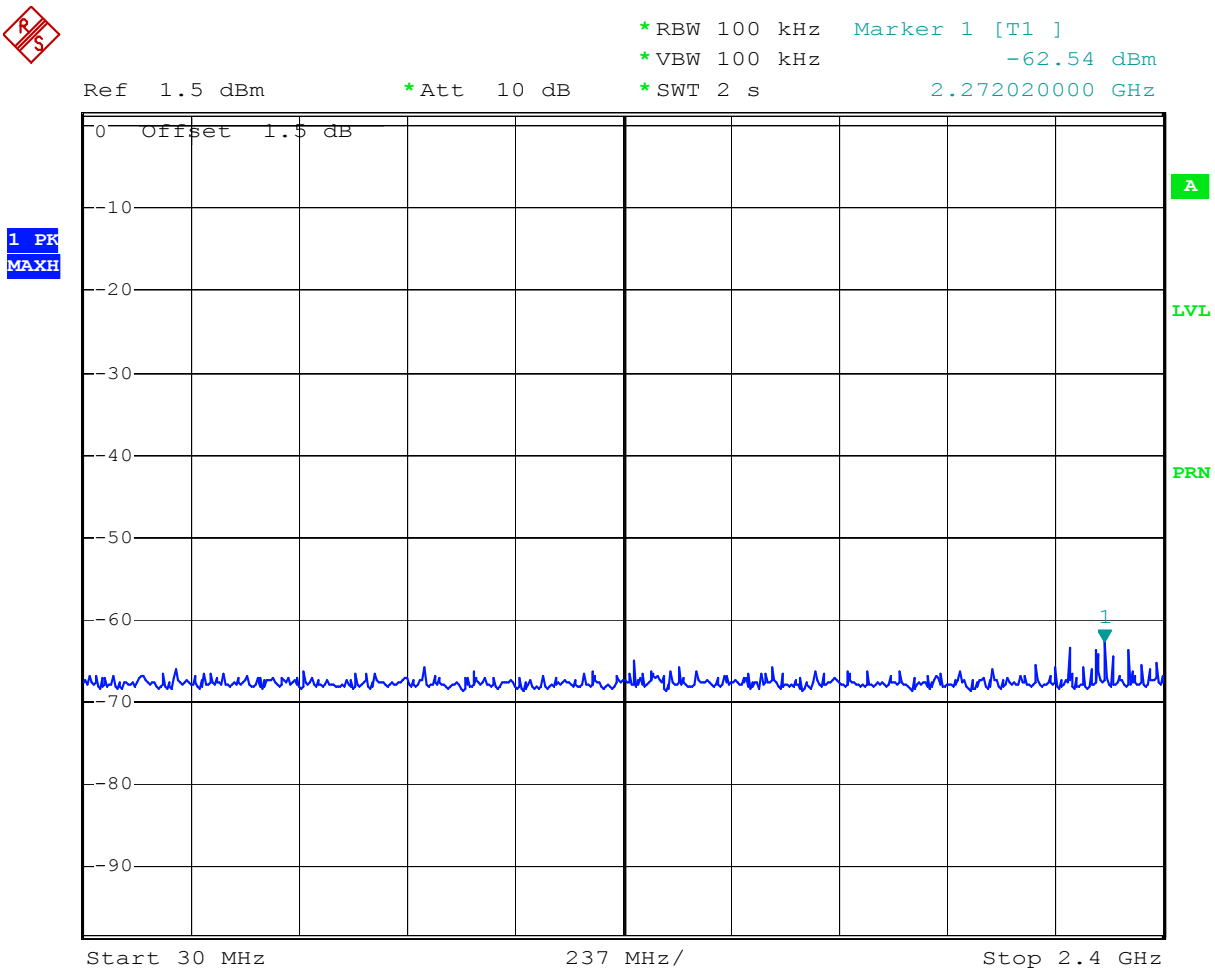
Comment: Out-of-band emissions, f=2441 MHz
Date: 21.MAR.2006 11:57:56

Plot 6.13



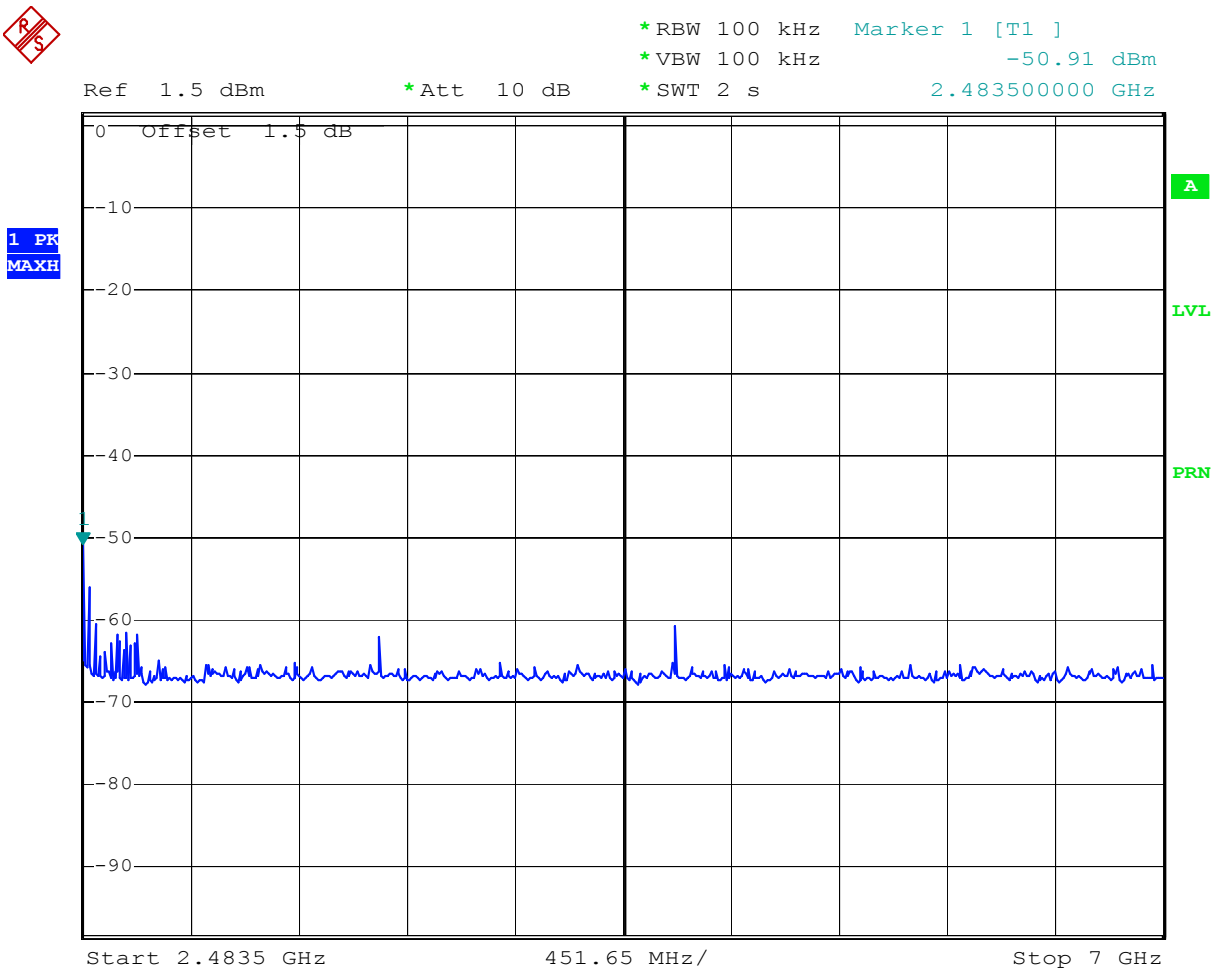
Comment: Out-of-band emissions, f=2441 MHz
Date: 21.MAR.2006 11:59:08

Plot 6.14



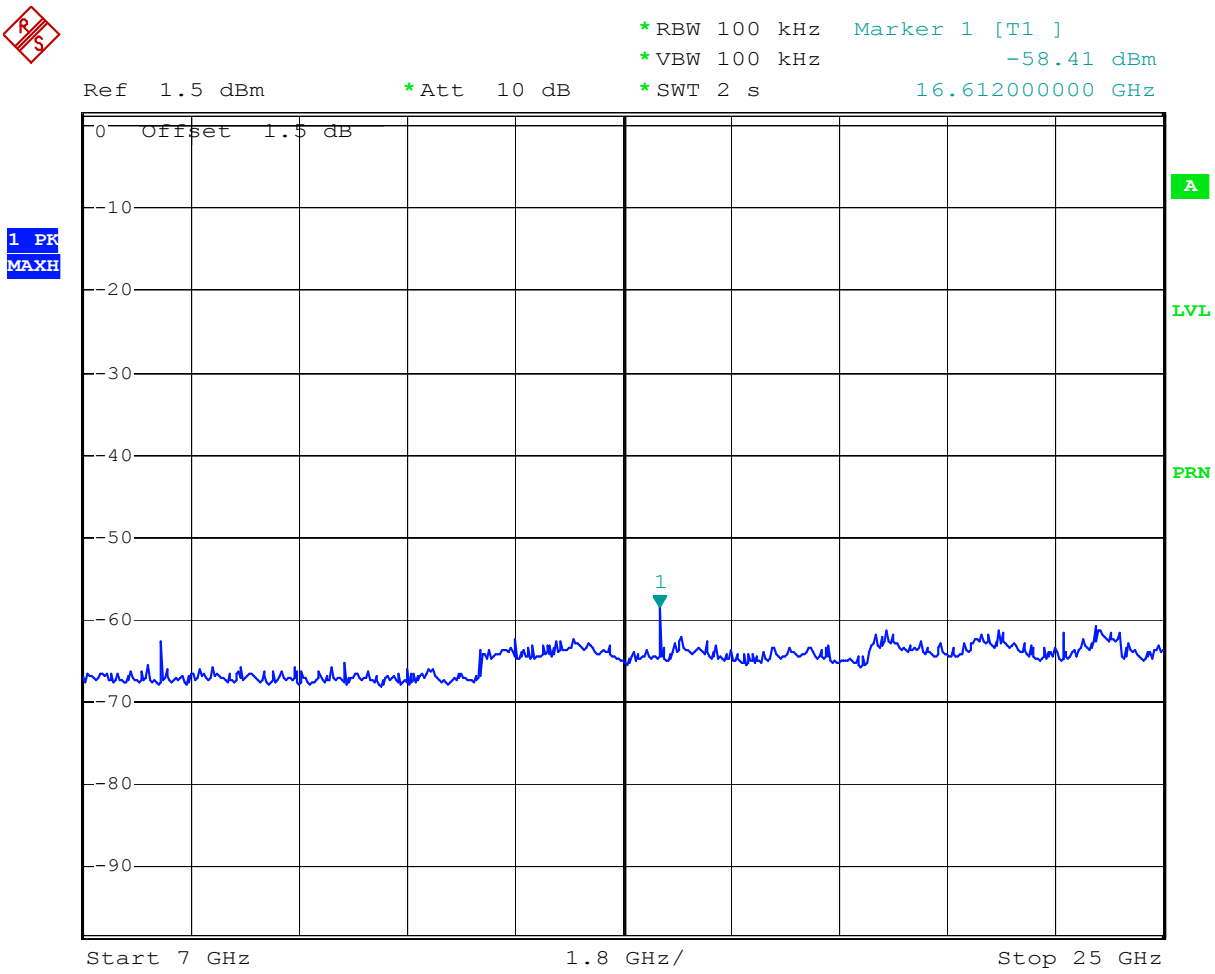
Comment: Out-of-band emissions, f=2480 MHz
Date: 20.MAR.2006 14:52:00

Plot 6.15



Comment: Out-of-band emissions, f=2480 MHz
Date: 20.MAR.2006 14:49:46

Plot 6.16



Comment: Out-of-band emissions, f=2480 MHz
Date: 20.MAR.2006 14:50:43

4.7 Out-of-Band Radiated Emissions (except emissions in restricted bands) FCC 15.247(c)

For out-of-band radiated emissions (except for frequencies in restricted bands) that are close to or that exceed the 20 dB attenuation requirement described in the specification, radiated measurements were performed at a 3 m separation distance to determine whether these emissions complied with the general radiated emission requirement.

Not performed, the EUT passed out-of-band antenna conducted emission test.

4.8 Transmitter Radiated Emissions in Restricted Bands
FCC 15.247 (c), 15.205

Procedure

Radiated emission measurements were performed from 30 MHz to 25,000 MHz. Spectrum Analyzer Resolution Bandwidth is 100 kHz or greater for frequencies 30 MHz to 1000 MHz, 1 MHz - for frequencies above 1000 MHz.

The EUT is placed on a non-conductive table. If the EUT attaches to peripherals, they are connected and operational (as typical as possible). During testing, all cables were manipulated to produce worst case emissions. The signal is maximized through rotation. The antenna height and polarization are varied during the search for maximum signal level. The antenna height is varied from 1 to 4 meters.

Radiated emissions are taken at three meters unless the signal level is too low for measurement at that distance. If necessary, a pre-amplifier is used and/or the test is conducted at a closer distance. All readings are extrapolated back to the equivalent three-meter reading using inverse scaling with distance.

Data is included of the worst case configuration (the configuration which resulted in the highest emission levels). A sample calculation, configuration photographs and data tables of the emissions are included.

Field Strength Calculation

The field strength is calculated by adding the Antenna Factor and Cable Factor, and subtracting the Amplifier Gain (if any) from the measured reading. The basic equation with a sample calculation is as follows:

FS = RA + AF + CF - AG
Where FS = Field Strength in dB(μV/m)
RA = Receiver Amplitude (including preamplifier) in dB(μV)
CF = Cable Attenuation Factor in dB
AF = Antenna Factor in dB
AG = Amplifier Gain in dB

Assume a receiver reading of 52.0 dB(μV) is obtained. The antennas factor of 7.4 dB(1/m) and cable factor of 1.6 dB is added. The amplifier gain of 29 dB is subtracted, giving field strength of 32 dB(μV/m). This value in dB(μV/m) was converted to its corresponding level in μV/m.
RA = 52.0 dB(μV)
AF = 7.4 dB(1/m)
CF = 1.6 dB
AG = 29.0 dB
FS = 52.0+7.4+1.6-29.0 = 32 dB(μV/m)
Level in μV/m = Common Antilogarithm [(32 dBμV/m)/20] = 39.8 μV/m

Result

The data on the following pages list the significant emission frequencies, the limit and the margin of compliance.

The field strength at the Band-edge frequencies was calculated as $E_F = E_o - \Delta$.

Where:

E_F = Field Strength of Band-edge Frequency

E_O = Field Strength of Fundamental Frequency

Δ = Delta between the levels of emissions at Fundamental Frequency and at Band-edge Frequency

The EUT passed the test by 4 dB.

Test Result	
FCC Part 15.247 Radiated Emission in Restricted Bands	
Temperature: 21.0 C	Topcon Inc.
Humidity: 39.8 %	Model: GR-3
Test distance = 3 m	
Test date: March 17, 2006	

Frequency MHz	Detector	SA reading dB(uV)	Correction Factor dB	Ant. Factor dB(1/m)	Field Strength dB(uV/m)	Limit dB(uV/m)	Margin dB
Tx at 2402 MHz							
2310 - 2390	Aver.	18.3	1.0	30.7	50.0	54	-4.0
4804	Peak	36.5	-15.0	34.9	56.4	74	-17.6
4804	Aver	25.4	-15.0	34.9	45.3	54	-8.7
12010	Peak	34.1	-13.8	41.2	61.5	74	-12.5
12010	Aver	21.7	-13.8	41.2	49.1	54	-4.9
Tx at 2441 MHz							
4882	Peak	36.5	-15.0	34.9	56.4	74	-17.6
4882	Aver.	25.4	-15.0	34.9	45.3	54	-8.7
7323	Peak	36.4	-21.7	37.7	52.4	74	-21.6
7323	Aver	23.5	-21.7	37.7	39.5	54	-14.5
12205	Peak	34.1	-13.8	41.2	61.5	74	-12.5
12205	Aver	21.7	-13.8	41.2	49.1	54	-4.9
Tx at 2480 MHz							
4960	Peak	36.5	-15.0	34.9	56.4	74	-17.6
4960	Aver	25.4	-15.0	34.9	45.3	54	-8.7
7440	Peak	36.4	-21.7	37.7	52.4	74	-21.6
7440	Aver	23.5	-21.7	37.7	39.5	54	-14.5
12400	Peak	34.1	-13.8	41.2	61.5	74	-12.5
12400	Aver	21.7	-13.8	41.2	49.1	54	-4.9
22300	Peak	42.9	-37.8	40.3	45.4	74	-28.6
22300	Aver	30.3	-37.8	40.3	32.8	54	-21.2

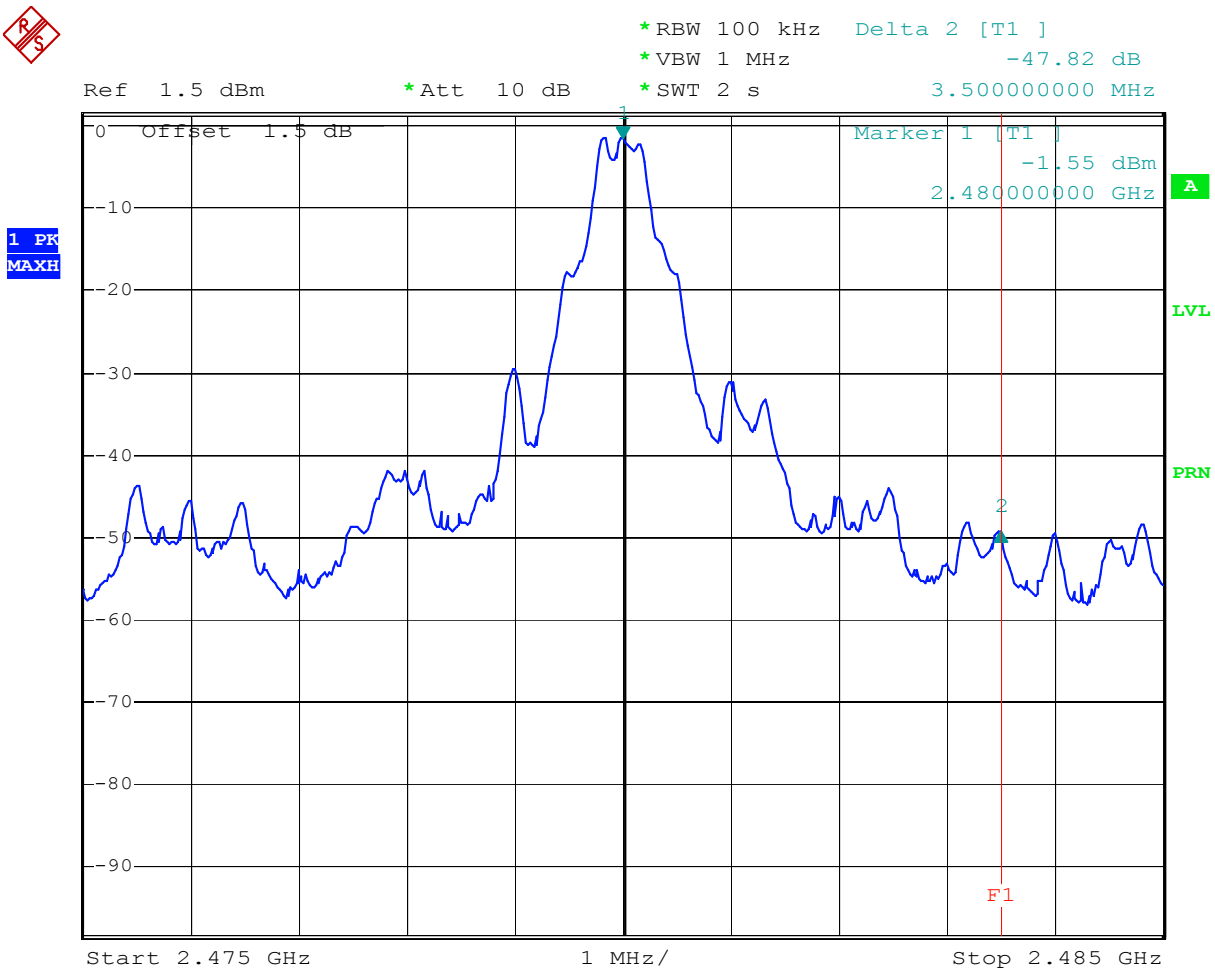
a) RBW = 1 MHz, VBW = 1 MHz - for peak measurements
RBW = 1MHz, VBW = 100 Hz - for average measurements
b) Correction Factor: Pre-amplifier gain + Cable loss + HP-Filter loss

Radiated Emission in Restricted Bands at the band-edge frequency
(measured using the "delta marker" method)

Frequency MHz	Detector	SA reading dB(uV)	Correction factor dB	Ant. factor dB(1/m)	Field Strength at 3 m dB(uV/m)	Limit at 3 m dB(uV/m)	Margin dB
2480.0	Aver.	55.5	2.5	30.7	88.7	-	-
2483.5 - 2500					88.7 – 47.6=41.1 *	54	-12.9

* delta = 47.6 dB is obtained from plot 8.1

Plot 8.1

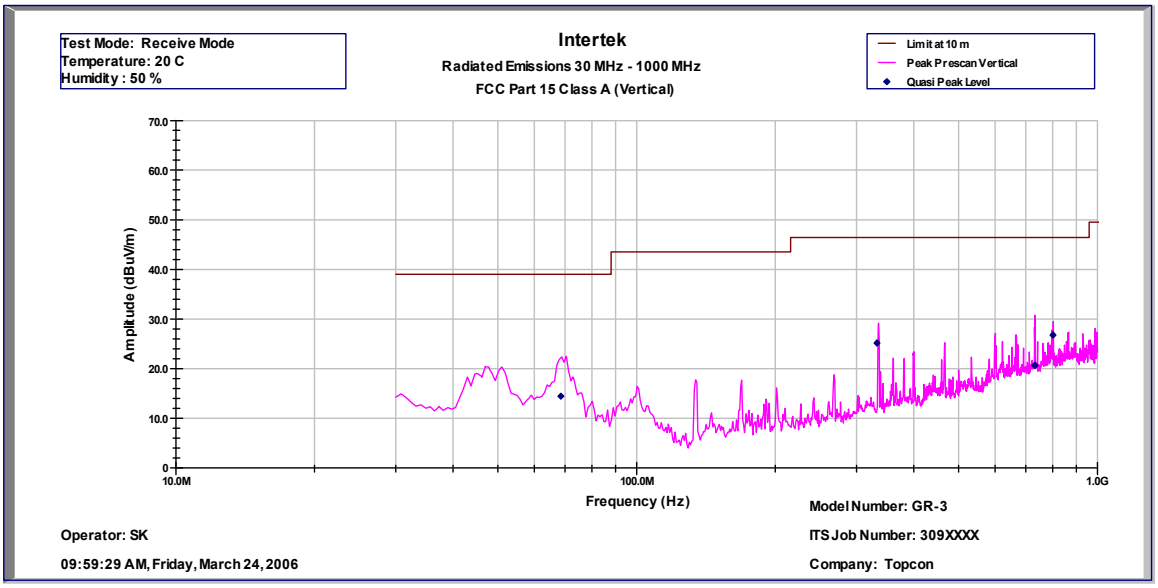


Comment: Band-edge frequency emissions
Date: 20.MAR.2006 14:45:06

4.9 Radiated Emissions from Digital Parts and Receiver
FCC Ref: 15.109

Radiated emission measurements were performed from 30 MHz to 7500 MHz. Spectrum Analyzer Resolution Bandwidth is 100 kHz or greater below 1000 MHz and 1 MHz above 1000 MHz.
Test results are attached.

The EUT passed by 19.6 dB for Class A, and by 10 dB for Class B.



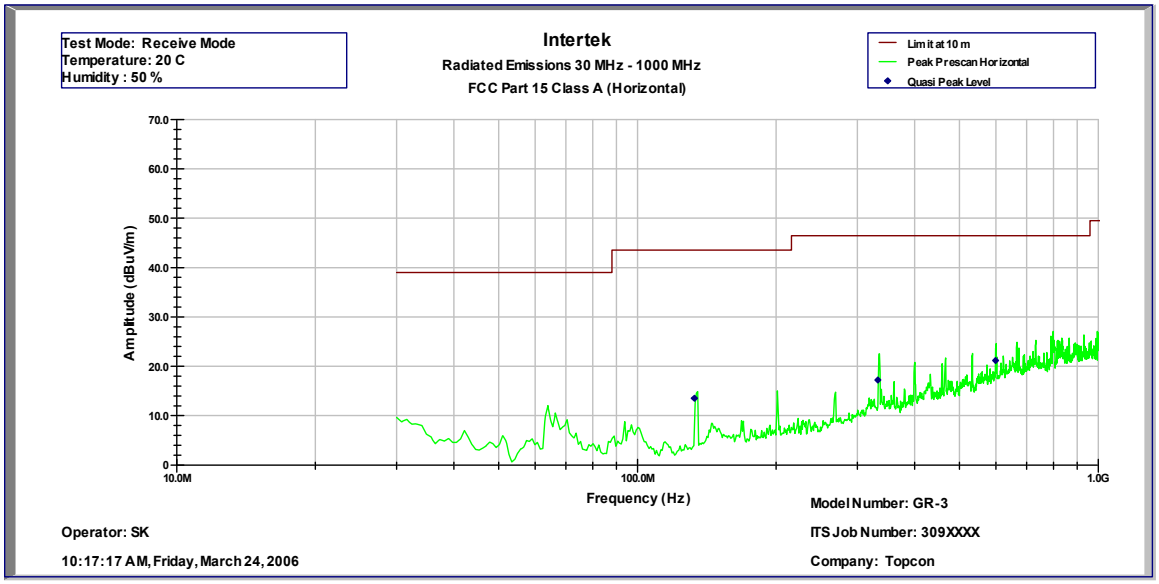
Intertek Testing Services
Radiated Emissions 30 MHz - 1000 MHz
FCC Part 15 Class A (QP-Vertical)

Operator: SK
Model Number: GR-3
ITS Job Number: 309XXXX

09:59:29 AM, Friday, March 24, 2006
Company: Topcon

Frequency	Quasi Pk FS	Limit@10m	Margin	RA	CF	AG	AF
MHz	dB(uV/m)	dB(uV/m)	dB	dB	dB	dB	dB(1/m)
68.53	14.4	39.0	-24.6	36.4	4.1	32.9	6.8
332.51	25.2	46.4	-21.2	37.7	5.7	32.8	14.6
732.36	20.6	46.4	-25.8	24.1	7.1	32.7	22.2
801.82	26.8	46.4	-19.6	29.3	7.3	32.7	22.8

Test Mode: Receive Mode
Temperature: 20 C
Humidity : 50 %



Intertek Testing Services
Radiated Emissions 30 MHz - 1000 MHz
FCC Part 15 Class A (QP-Horizontal)

Operator: SK
Model Number: GR-3
ITS Job Number: 309XXXX

10:17:17 AM, Friday, March 24, 2006
Company: Topcon

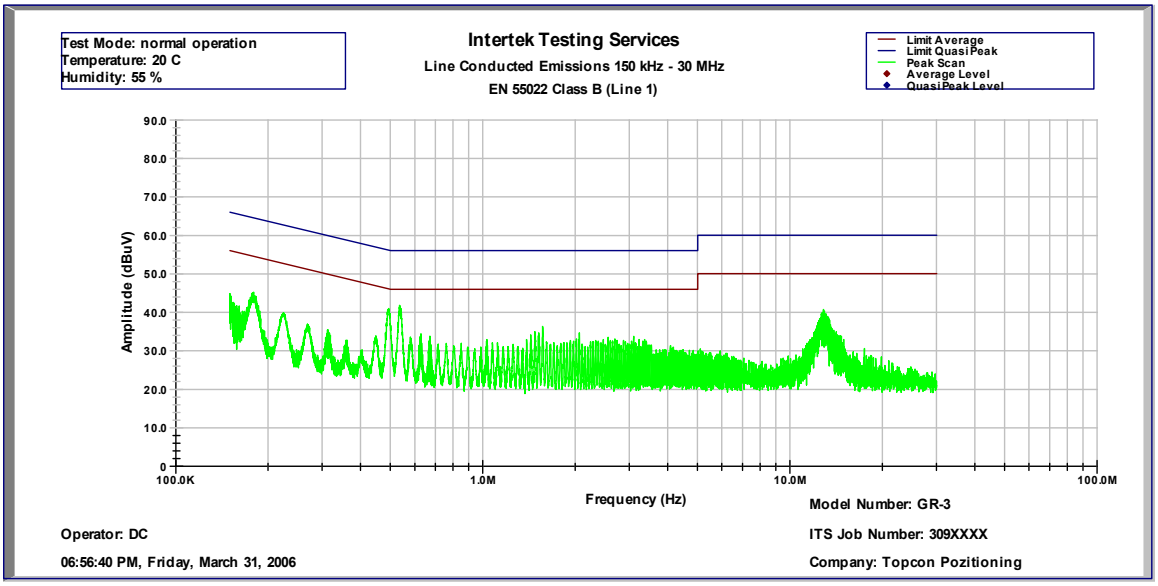
Frequency	Quasi Pk FS	Limit@10m	Margin	RA	CF	AG	AF
MHz	dB(uV/m)	dB(uV/m)	dB	dB(uV)	dB	dB	dB(1/m)
132.95	13.5	43.5	-30.0	34.2	4.6	32.9	7.6
332.51	17.2	46.4	-29.2	29.2	5.7	32.8	15.1
599.28	21.1	46.4	-25.3	27.2	6.8	32.7	19.8

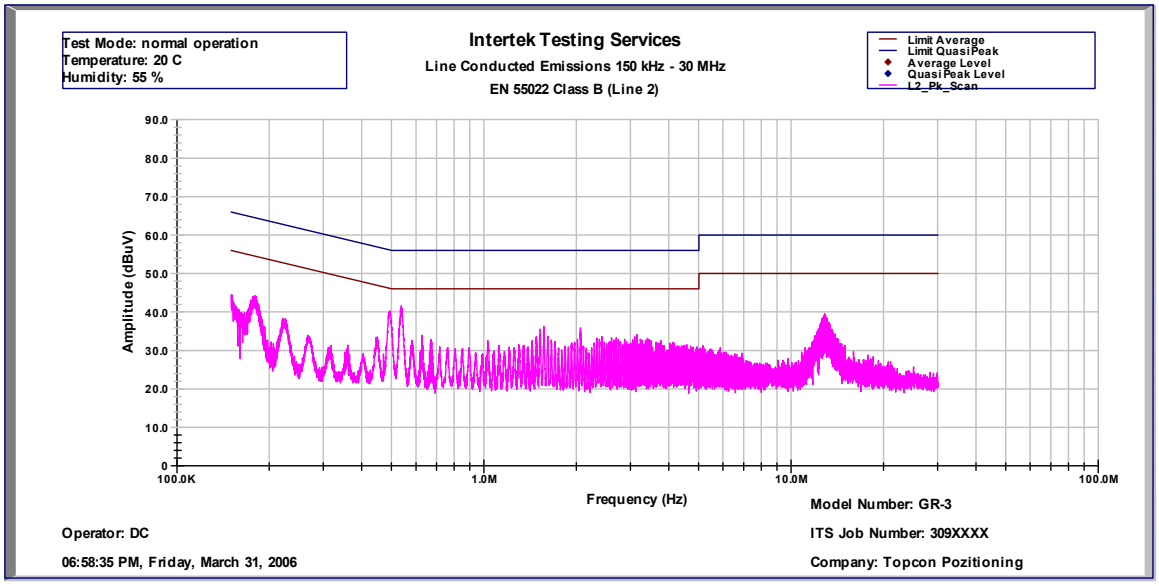
Test Mode: Receive Mode
Temperature: 20 C
Humidity : 50 %

4.10 AC Line Conducted Emission
FCC 15.207:

AC line conducted emission test was performed according the ANSI C63.4 (2003) standard. The EUT was connected to AC Line through the LISN.

For the test result, see attached plots.
The EUT passed by 5.0 dB.


Test Mode: normal operation
Temperature: 20 C
Humidity: 55 %
Intertek Testing Services
Line Conducted Emissions 150 kHz - 30 MHz
EN 55022 Class B (Line 1)
Limit Average
Limit QuasiPeak
Peak Scan
Average Level
QuasiPeak Level
Amplitude (dBuV)
90.0
80.0
70.0
60.0
50.0
40.0
30.0
20.0
10.0
0
100.0K
1.0M
10.0M
100.0M
Frequency (Hz)
Operator: DC
06:56:40 PM, Friday, March 31, 2006
Model Number: GR-3
ITS Job Number: 309XXXX
Company: Topcon Pozitioning


Test Mode: normal operation
Temperature: 20 C
Humidity: 55 %
Intertek Testing Services
Line Conducted Emissions 150 kHz - 30 MHz
EN 55022 Class B (Line 2)
Limit Average
Limit QuasiPeak
Average Level
QuasiPeak Level
L2_Pk_Scan
Amplitude (dBuV)
90.0
80.0
70.0
60.0
50.0
40.0
30.0
20.0
10.0
0
100.0K
1.0M
10.0M
100.0M
Frequency (Hz)
Operator: DC
06:58:35 PM, Friday, March 31, 2006
Model Number: GR-3
ITS Job Number: 309XXXX
Company: Topcon Pozitioning

5.0 RF Exposure evaluation

The EUT is a Bluetooth device used in mobile application, at least 20 cm from any body part of the user or near by persons.

The maximum conducted power is 1 mW; antenna is fix-mounted, 0.5 dBi gain. Therefore, to comply with RF Exposure Requirement, the MPE is calculated.

The maximum Peak EIRP calculated is 0.5 dBm or 1.1 mW. The Power Density can be calculated using the formula

$$S = EIRP/ 4\pi D^2$$

Where: S is Power Density in W/m^2
D is the distance from the antenna.

At 0.2 m, S = 0.002 W/m^2, which is below the MPE Limit of 10 W/m^2

6.0 List of test equipment

Measurement equipment used for emission compliance testing utilized the equipment on the following list:

Equipment	Manufacturer	Model/Type	Serial #	Cal Int	Cal Due
RF Filter Section	Hewlett Packard	85460A	3448A00267	12	9/12/06
EMI Receiver	Hewlett Packard	8546A	3710A00373	12	9/12/06
Spectrum Analyzer	R & S	FSP40	036612004	12	10/3/06
BI-Log Antenna	EMCO	3143	9509-1160	12	11/29/06
Horn Antenna	EMCO	3115	9107-3712	12	6/8/06
Horn Antenna	EMCO	3160-09	ITS51	#	#
LISN	FCC	FCC-LISN-50/250-60-2-02	01004	12	4/21/06
Pre-Amplifier	Sonoma Inst.	310	185634	12	3/29/06
Pre-Amplifier	Miteq	AMF-4D-001180-24-10P	799159	12	3/29/06
Pre-Amplifier	CTT	ALO/400-8023	47526	12	3/29/06

No Calibration required

7.0 Document History

Revision/ Job Number	Writer Initials	Date	Change
1.0 / 3093766	DC	March 31, 2006	Original document