TEST REPORT

Report Number: 3124418MPK-001
Project Number: 3124416 and 3124418
Report Date: May 31, 2007

Testing performed on the
Beacon Receiver with Bluetooth module
Model: BR-1
FCC ID: LCB-052001
IC ID: 6050B-052001
to
FCC Part 15.247 and RSS-210 (Annex 8)

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: David Chernomordik **Date:** May 31, 2007
David Chernomordik, EMC Technical Manager

Reviewed by: Ollie Moyrong **Date:** May 31, 2007
Ollie Moyrong, EMC Operation Manager

Report No. 3124418MPK-001

Equipment Under Test:	Beacon Receiver with Bluetooth module
Trade Name:	Topcon Positioning Systems
Model No.:	BR-1
FCC ID:	LCB-052001
IC ID:	6050B-052001
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 RSS-210, Annex 8
Test Site Location:	ITS – Site 1 1365 Adams Drive Menlo Park, CA 94025
Date of Test:	May 17 – 21, 2007

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 Bluetooth module (Frequency Hopping 2.4 GHz transceiver) installed in the Beacon Receiver. This report is designed to show compliance of the 2.4 GHz transceiver with FCC Part 15.247 and RSS-210, Annex 8 requirements.

1.1 Summary of Tests

Test	Reference FCC Subpart C	Reference RSS-210	RESULTS
Output power	15.247(b)	A8.4(2)	Complies
20-dB Bandwidth	15.247(a)(1)	A8.1(2)	Complies
Channel Separation	15.247(a)(1)	A8.1(2)	Complies
Number of Hopping Channels	15.247(a)(1)	A8.1(4)	Complies
Average Channel Occupancy Time	15.47(a)(1)	A8.1(4)	Complies
Out-of-band Antenna Conducted Emission	15.247(c)	A8.5	Complies
Out-of-Band Radiated Emission (except emissions in Restricted Bands)	15.247(c)	A8.5	Not Applicable, device passed out-of-band antenna conducted emission
Radiated Emission in Restricted Bands	15.247(c), 15.205	A8.5, 2.7	Complies
RF exposure	15.247(i)	RSS-102	Complies
AC Conducted Emission	15.207	RSS-Gen	Complies
Radiated Emission from Digital Parts and receiver	15.109	RSS-Gen	Complies
Antenna Requirement	15.203	RSS-Gen	Complies

2.0 General Description

2.1 Product Description

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
Model Number	BR-1
FCC Identifier	LCB-052001
IC Identifier	6050B-052001
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 May 16, 2007 in good condition. As declared by the Applicant, it is identical to production units.

Test start date: May 17, 2007
Test end date: May 21, 2007

2.2 Related Submittal(s) Grants

None

2.3 Test Methodology

Radiated and AC Line conducted emissions measurements were performed according to the procedures in ANSI C63.4 (2003) and RSS-210. 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.

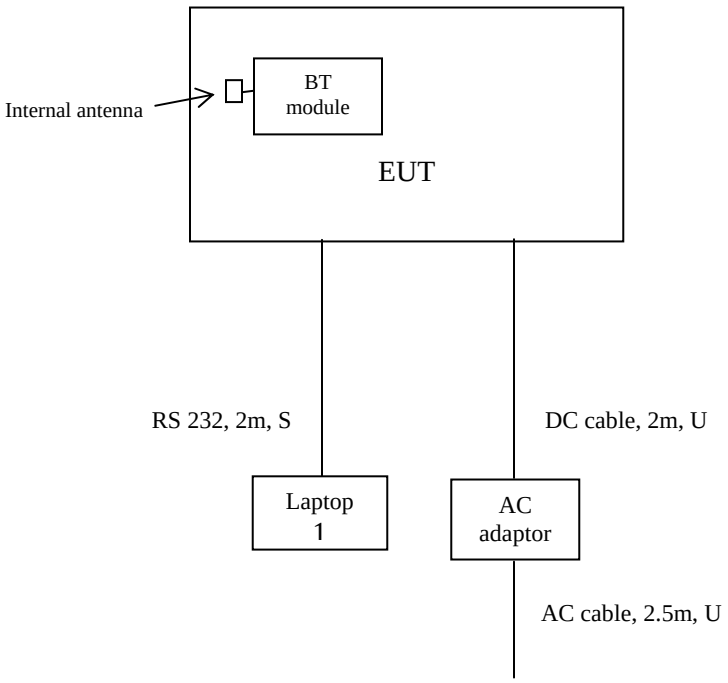
3.0 System Test Configuration

3.1 Equipment under Test and Support Equipment

Equipment Under Test		
Description	**Model Number**	**Serial Number**
Beacon Receiver	BR-1	0031
AC/DC Adaptor	A20A1-12MI	3912A300

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

3.2 Block Diagram of Test Setup



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 lowest 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)

4.1.1 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).

4.1.2 Test Proc**e**dure

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.

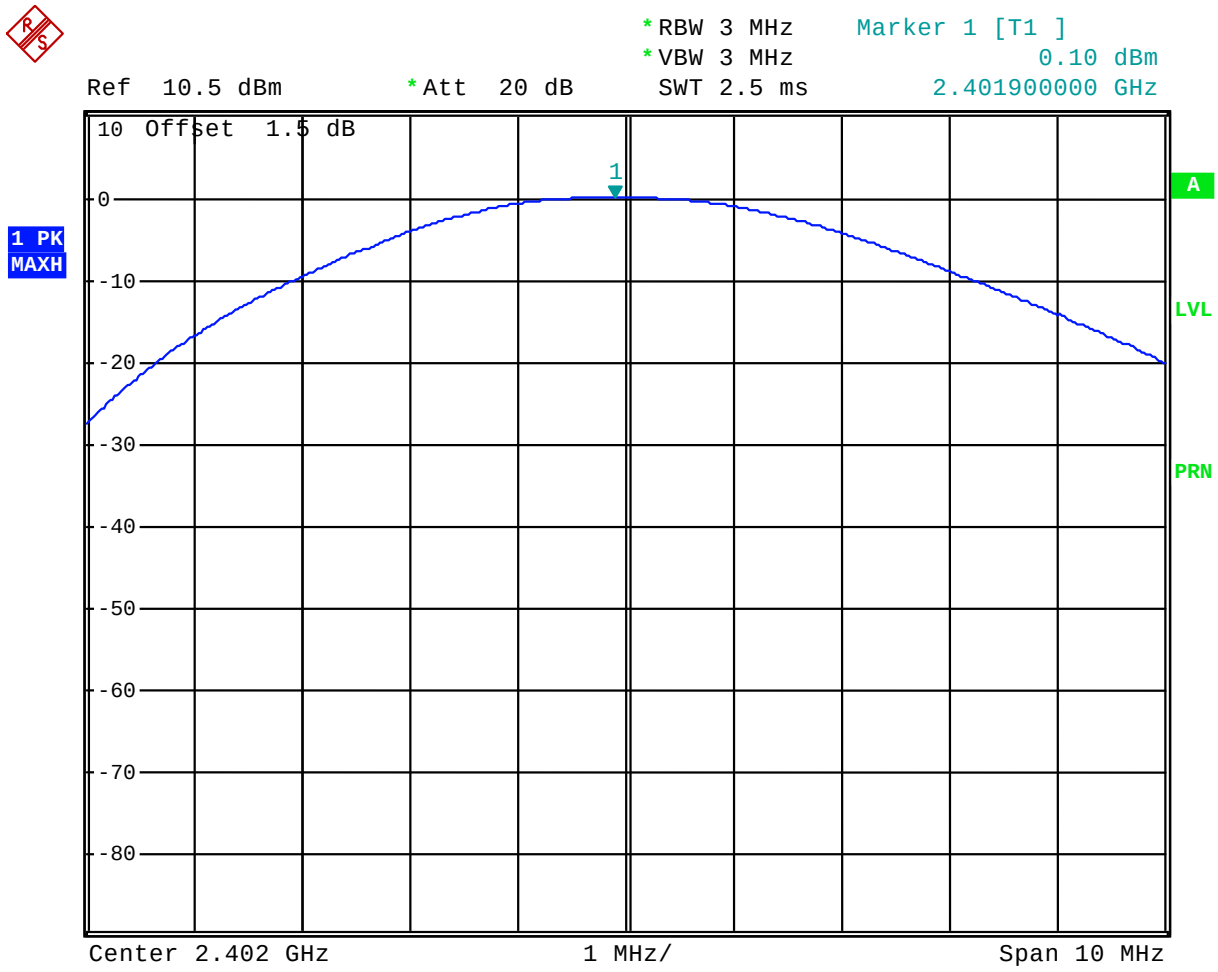
4.1.3 Test Results

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.

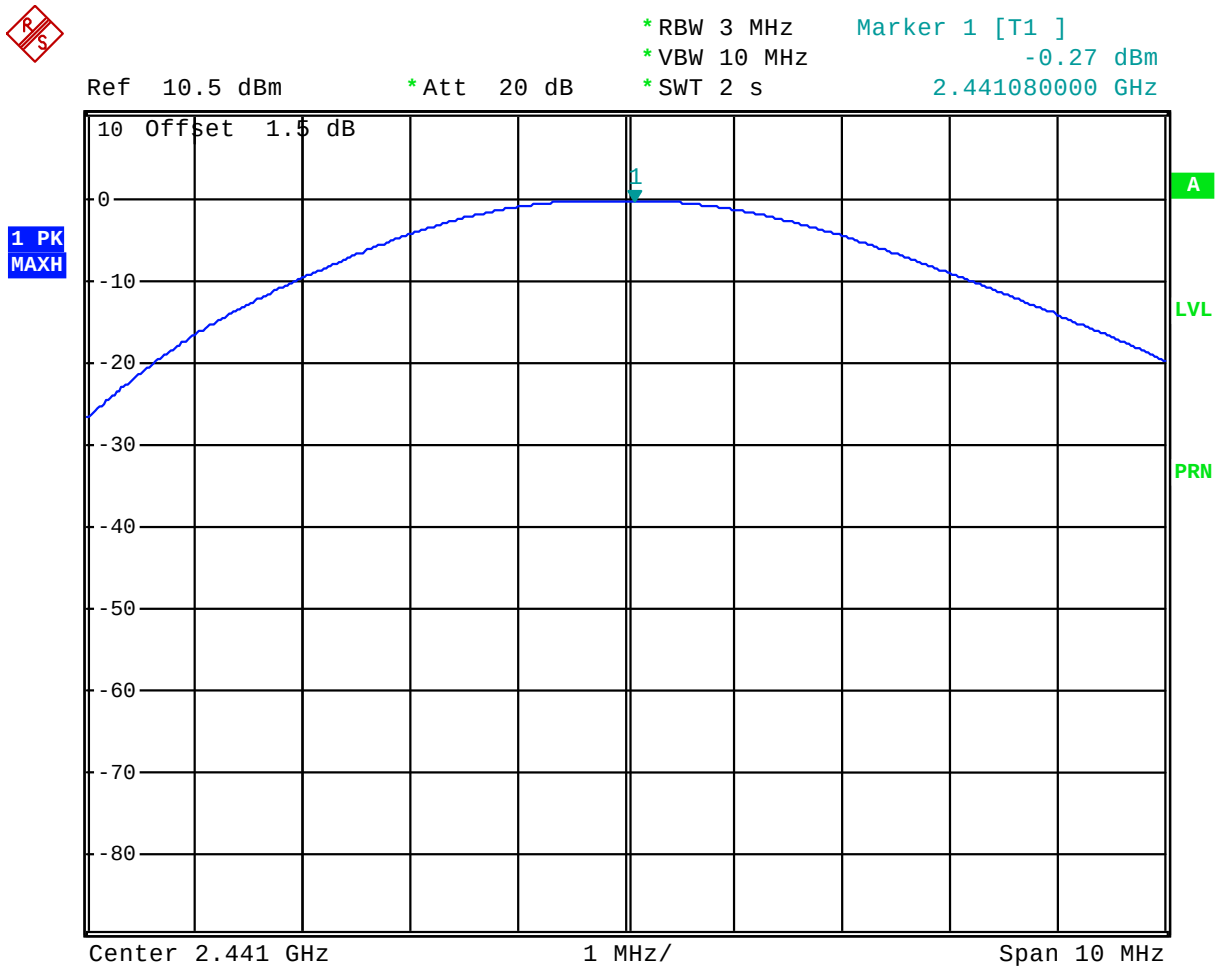
The Power Density in 3 kHz resolution bandwidth was measured as –3.29 dBm (see plots 1.4 – 1.6)

Plot 1.1



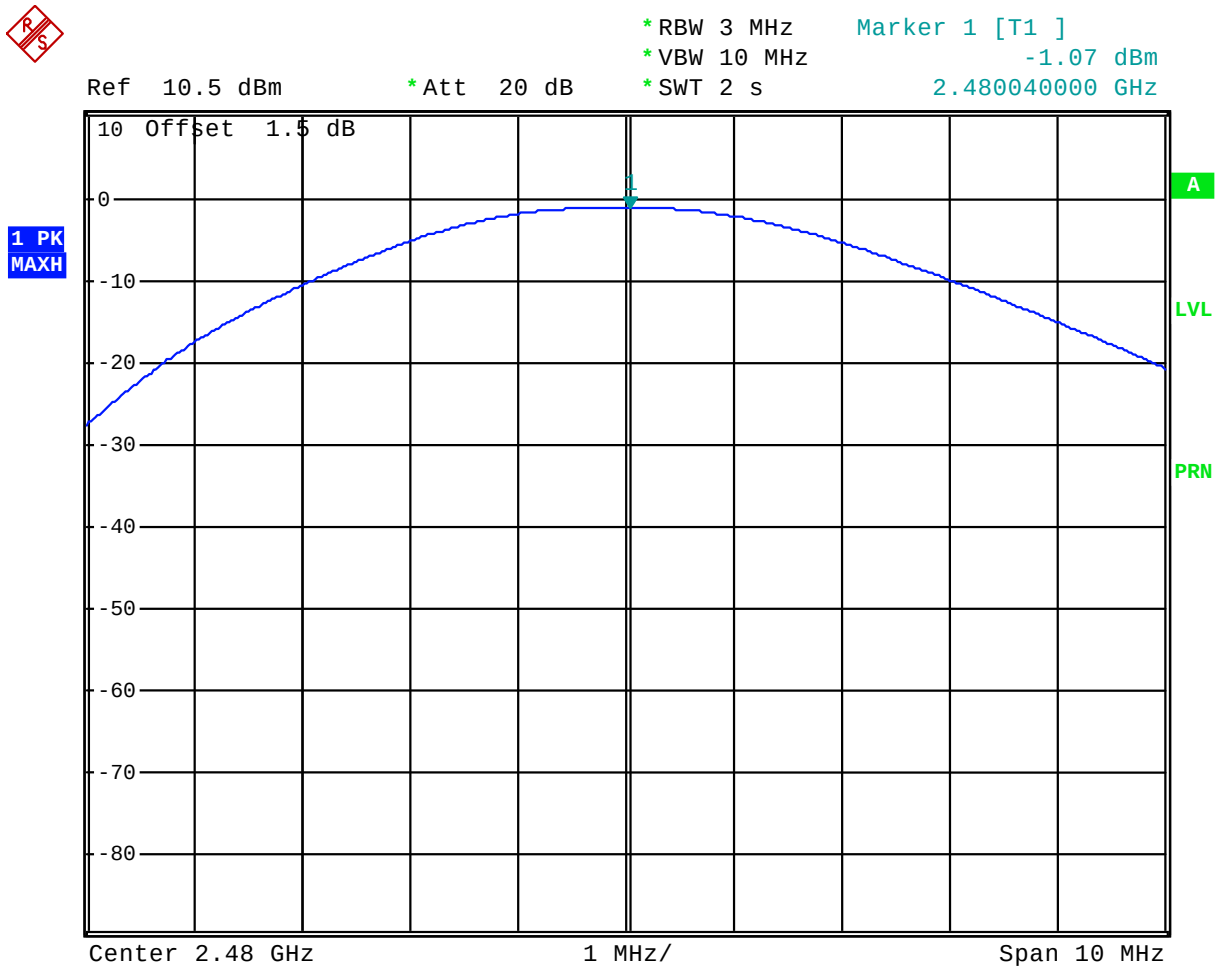
Comment: Peak output power
Date: 21.MAY.2007 14:30:42

Plot 1.2



Comment: Peak output power
Date: 21.MAY.2007 14:28:37

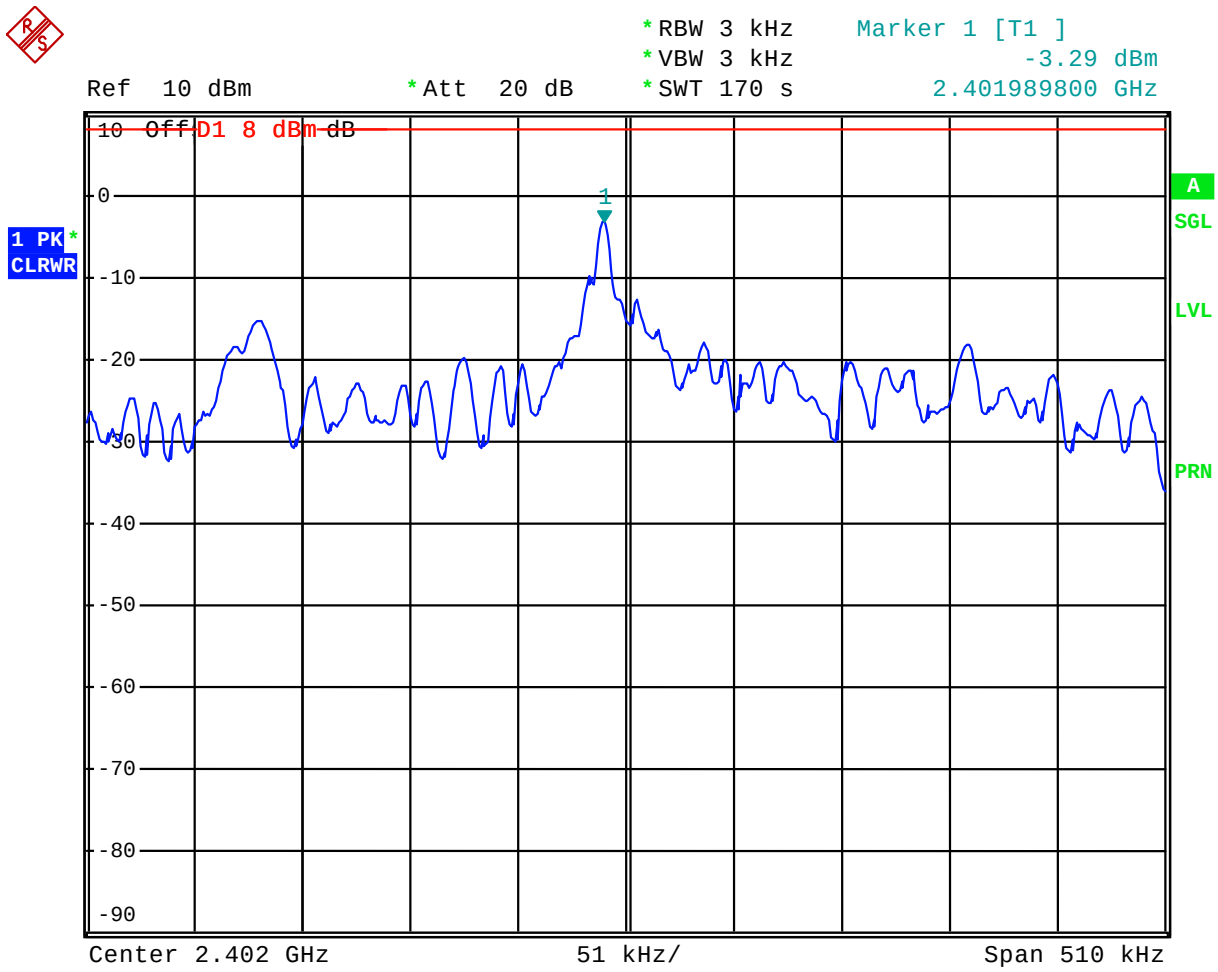
Plot 1.3



Comment: Peak output power
Date: 21.MAY.2007 14:31:25

Power Density

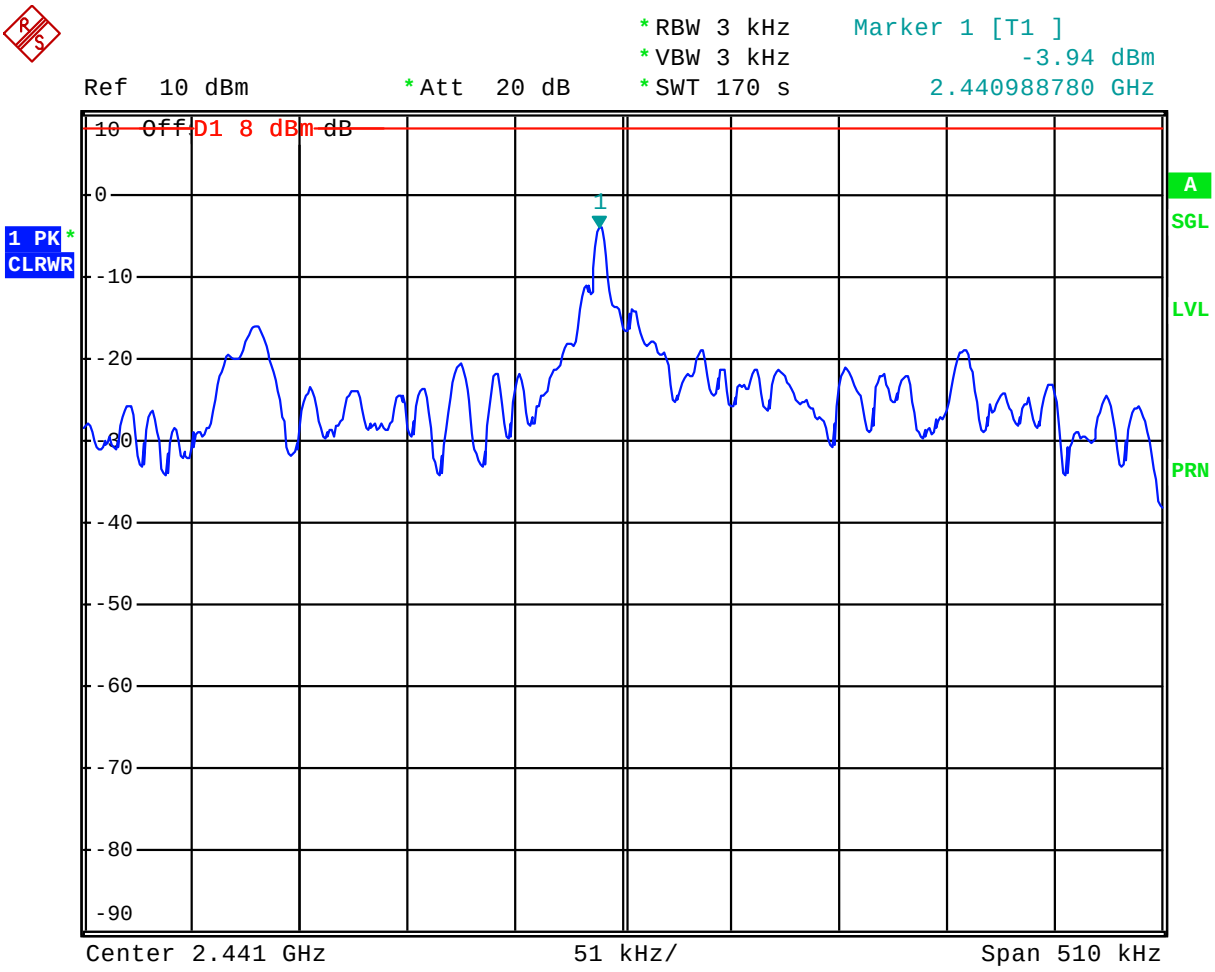
Plot 1.4



Comment: Power density
Date: 21.MAY.2007 14:21:11

Power Density

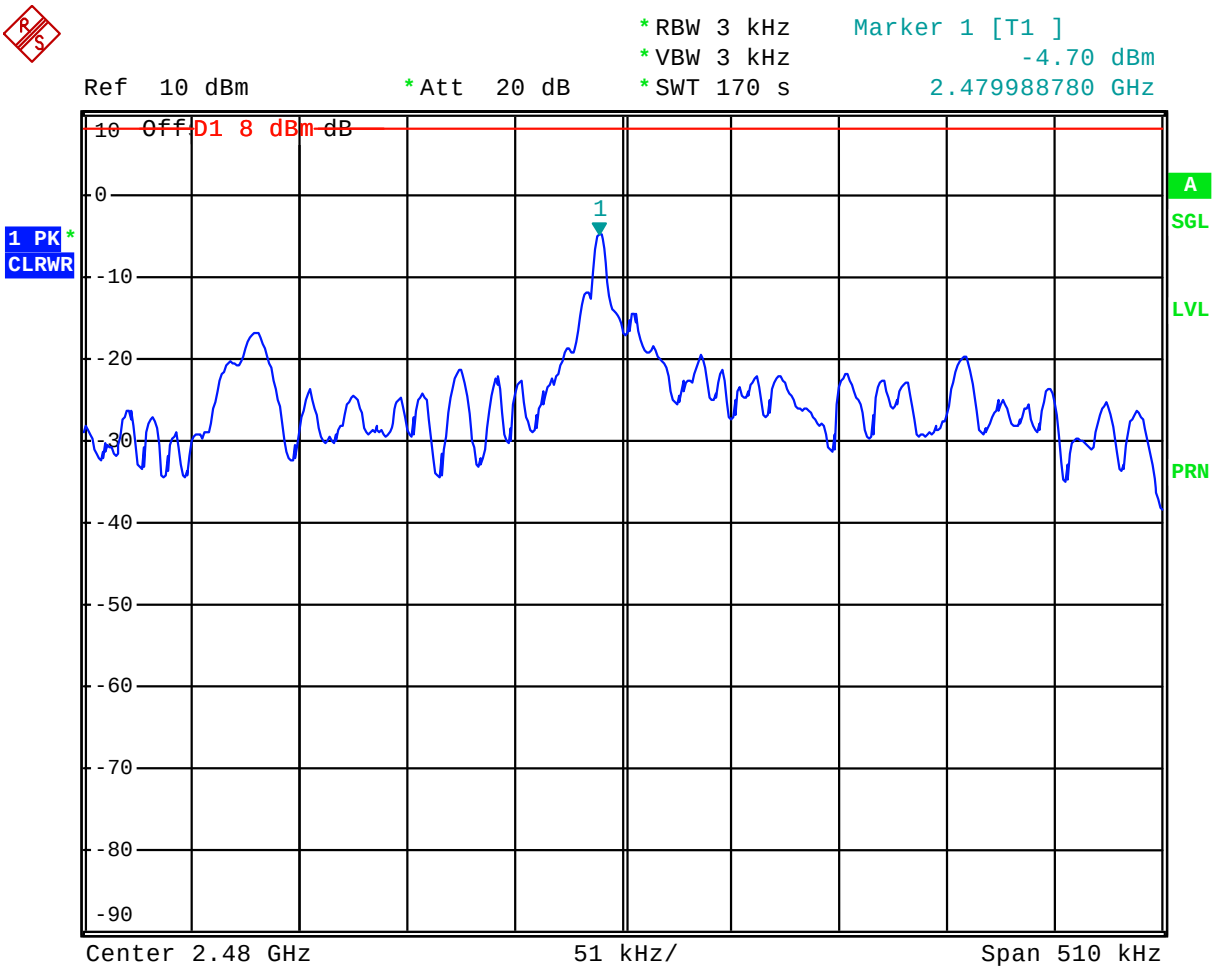
Plot 1.5



Comment: Power density
Date: 21.MAY.2007 14:28:35

Power Density

Plot 1.6



Comment: Power density
Date: 21.MAY.2007 14:32:25

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

4.2.1 Test 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.

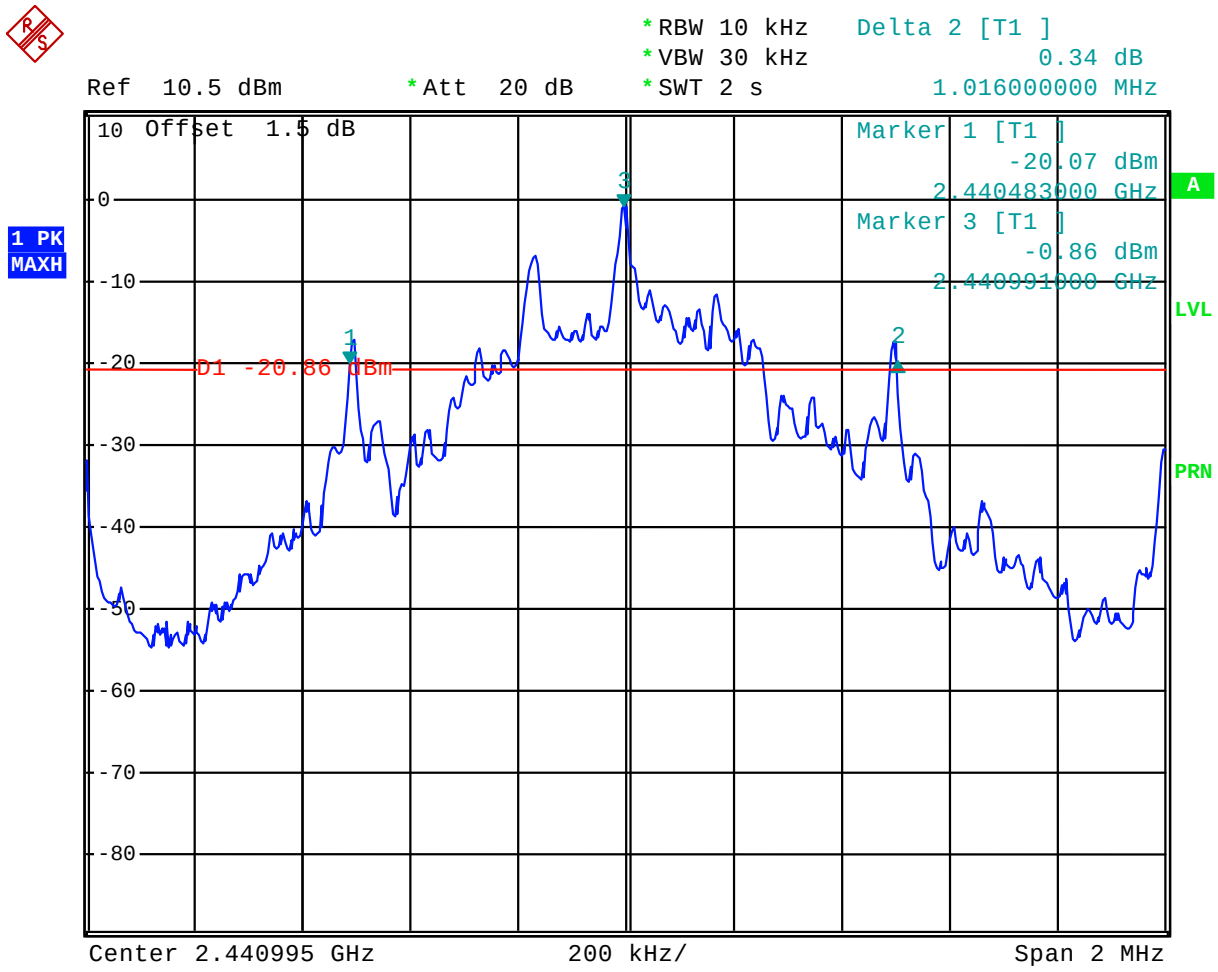
In addition, the occupied bandwidth (99%) was measured at the middle channel.

4.2.2 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

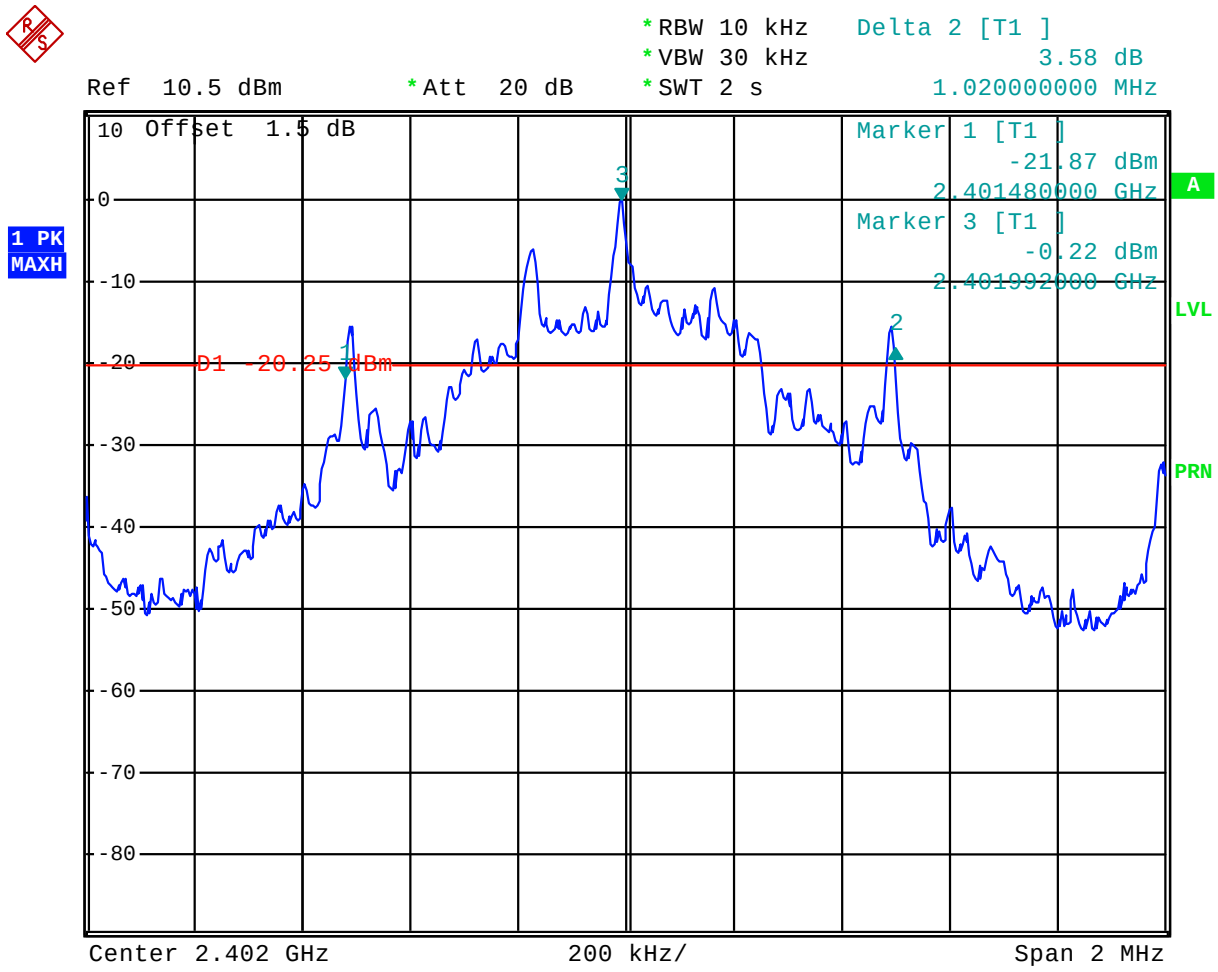
The occupied bandwidth was measured as 1.004 MHz (see plot #2.4)

Plot 2.1



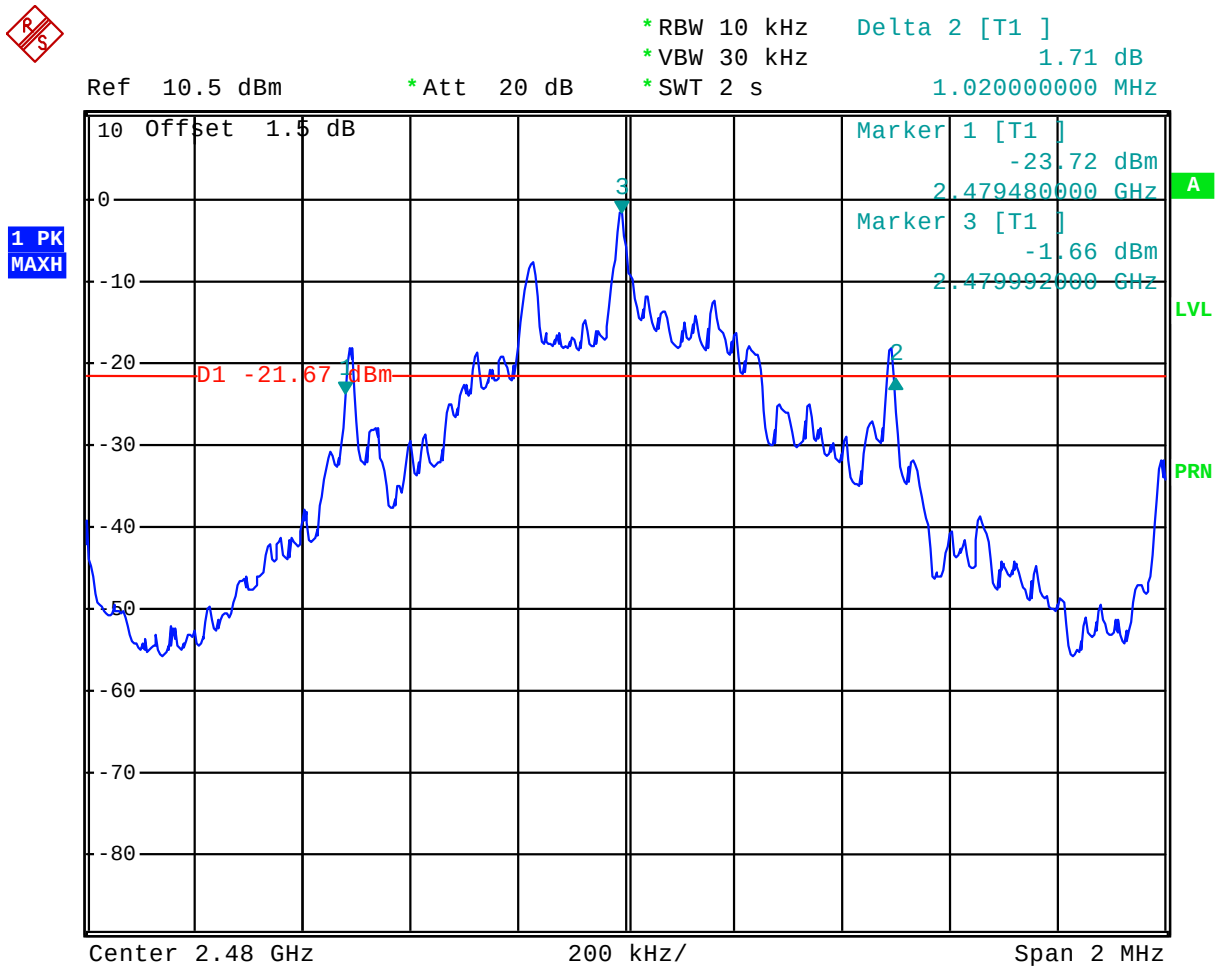
Comment: 20-dB bandwidth
Date: 21.MAY.2007 14:16:10

Plot 2.2



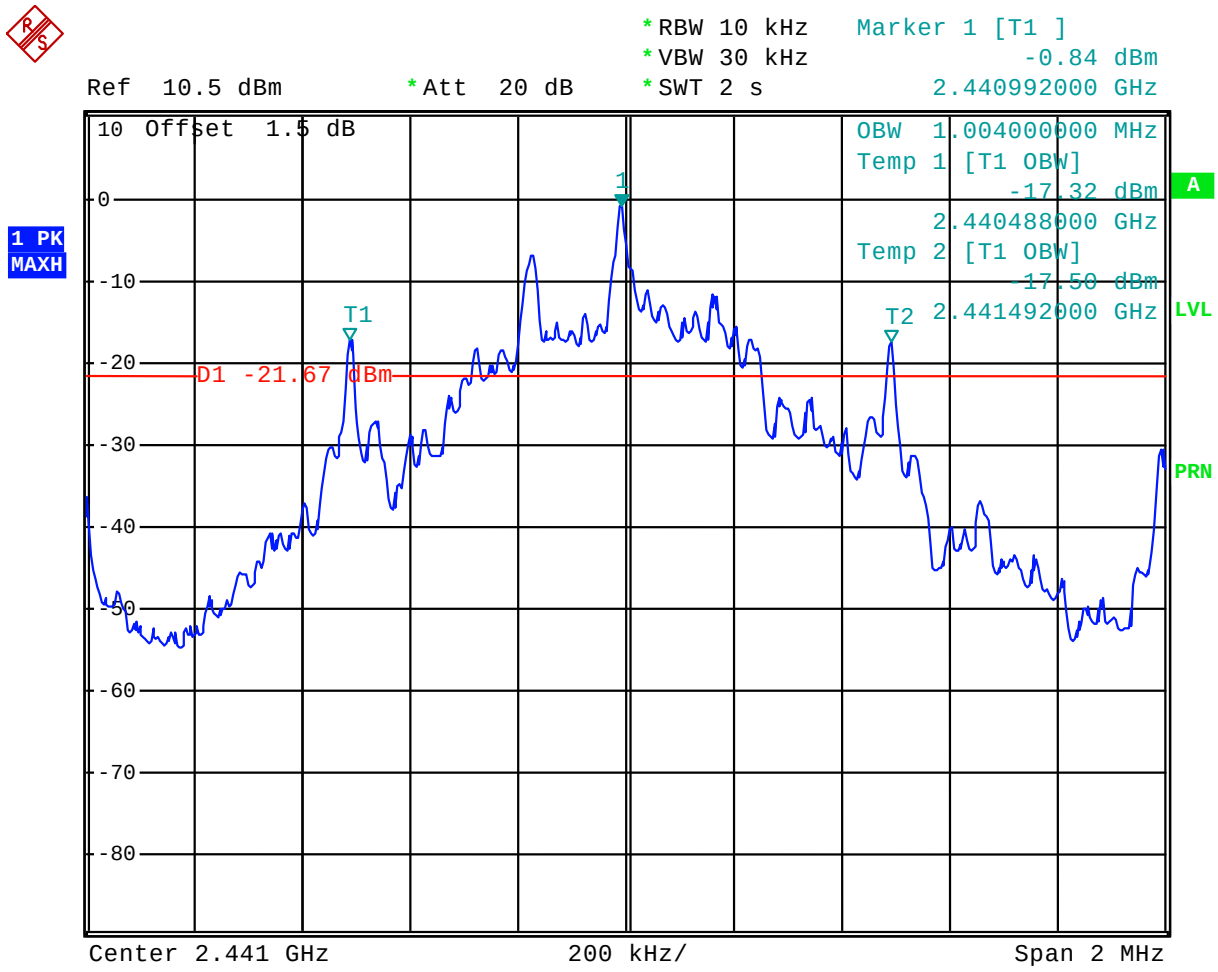
Comment: 20-dB bandwidth
Date: 21.MAY.2007 14:18:13

Plot 2.3



Comment: 20-dB bandwidth
Date: 21.MAY.2007 14:19:58

Plot 2.4



Comment: Occupied bandwidth
Date: 22.MAY.2007 14:23:27

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

4.3.1 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.

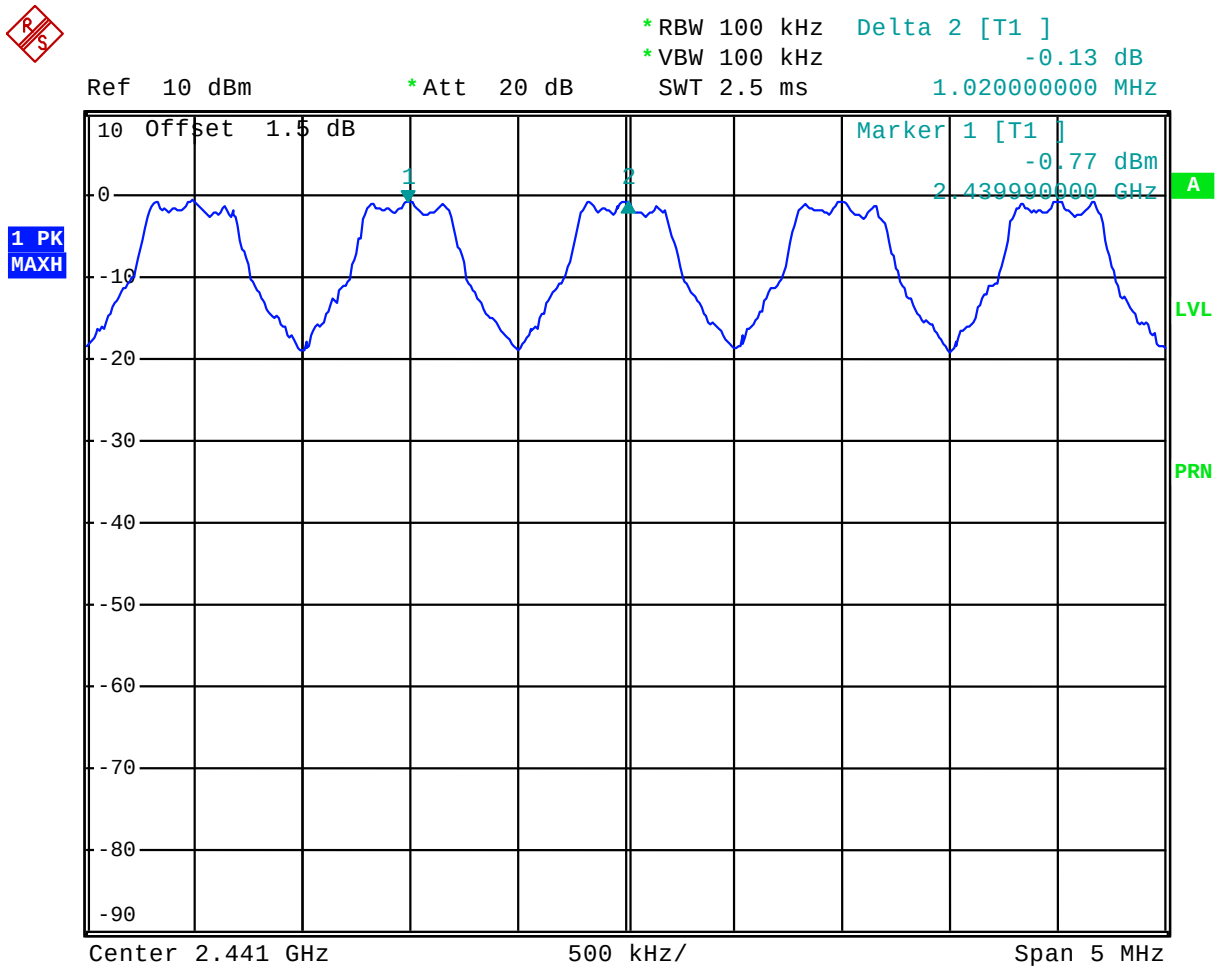
4.3.2 Test Procedure

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

4.3.3 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.MAY.2007 13:01:31

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

4.4.1 Requirement

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

4.4.2 Test Procedure

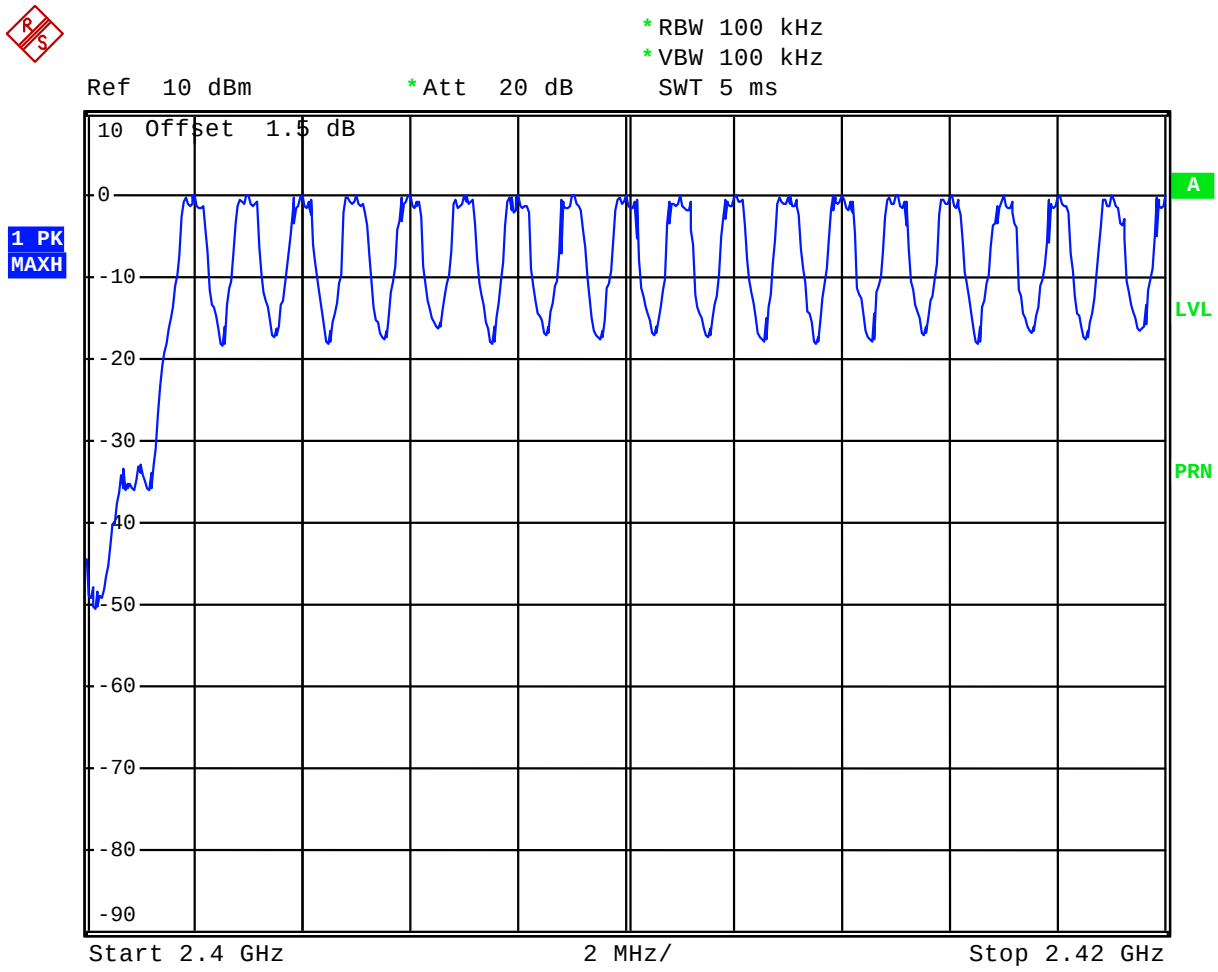
The RF passband of the EUT was divided into 3 approximately equal bands. With the analyzer set to MAX HOLD, readings were taken for 2 - 3 minutes in each band. The channel peaks so recorded were added together, and the total number compared to the minimum number of channels required in the regulation.

4.4.3 Test Results

Number of hopping channels	79

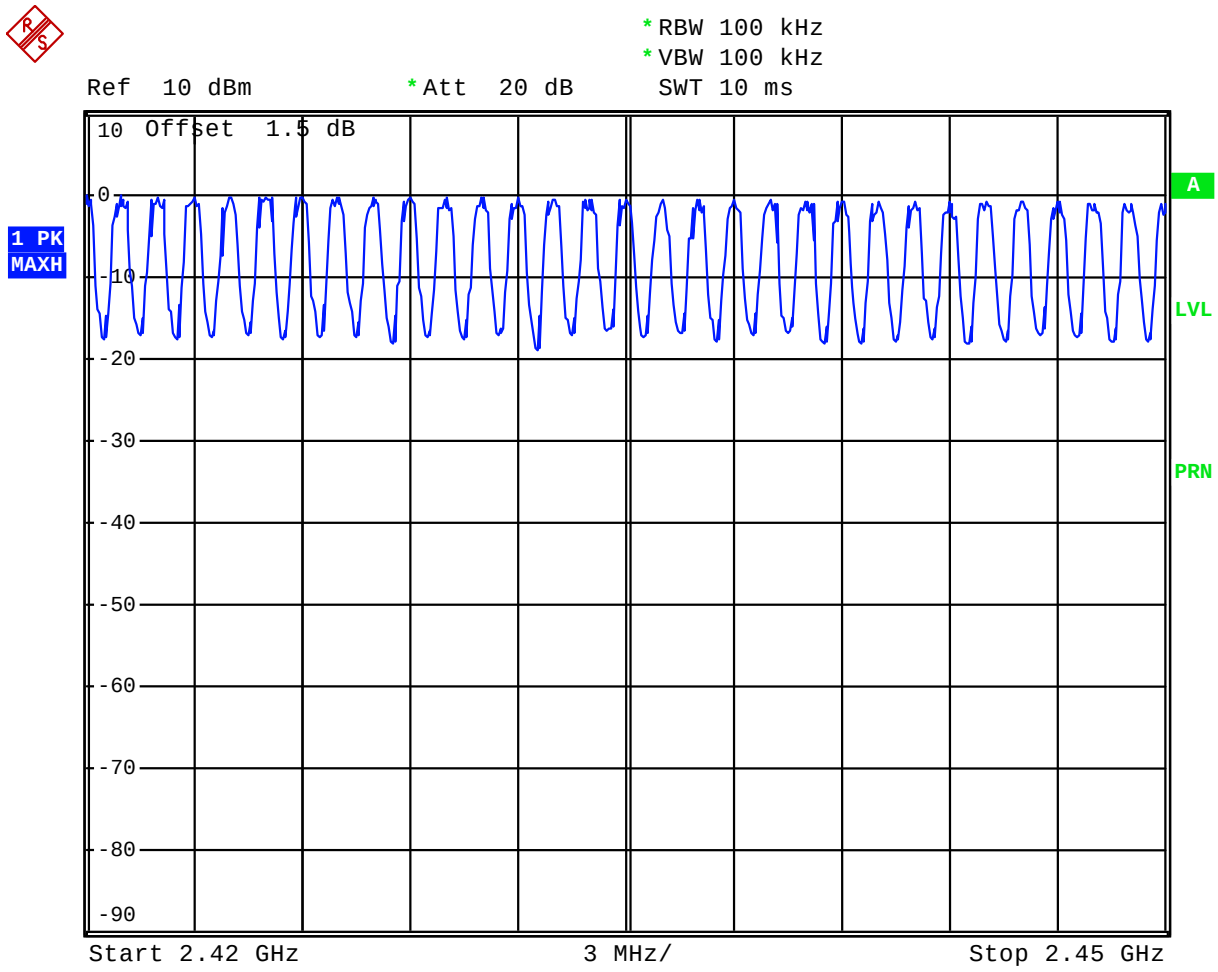
Refer to attached spectrum analyzer charts: Plots 4.1-4.3.

Plot 4.1



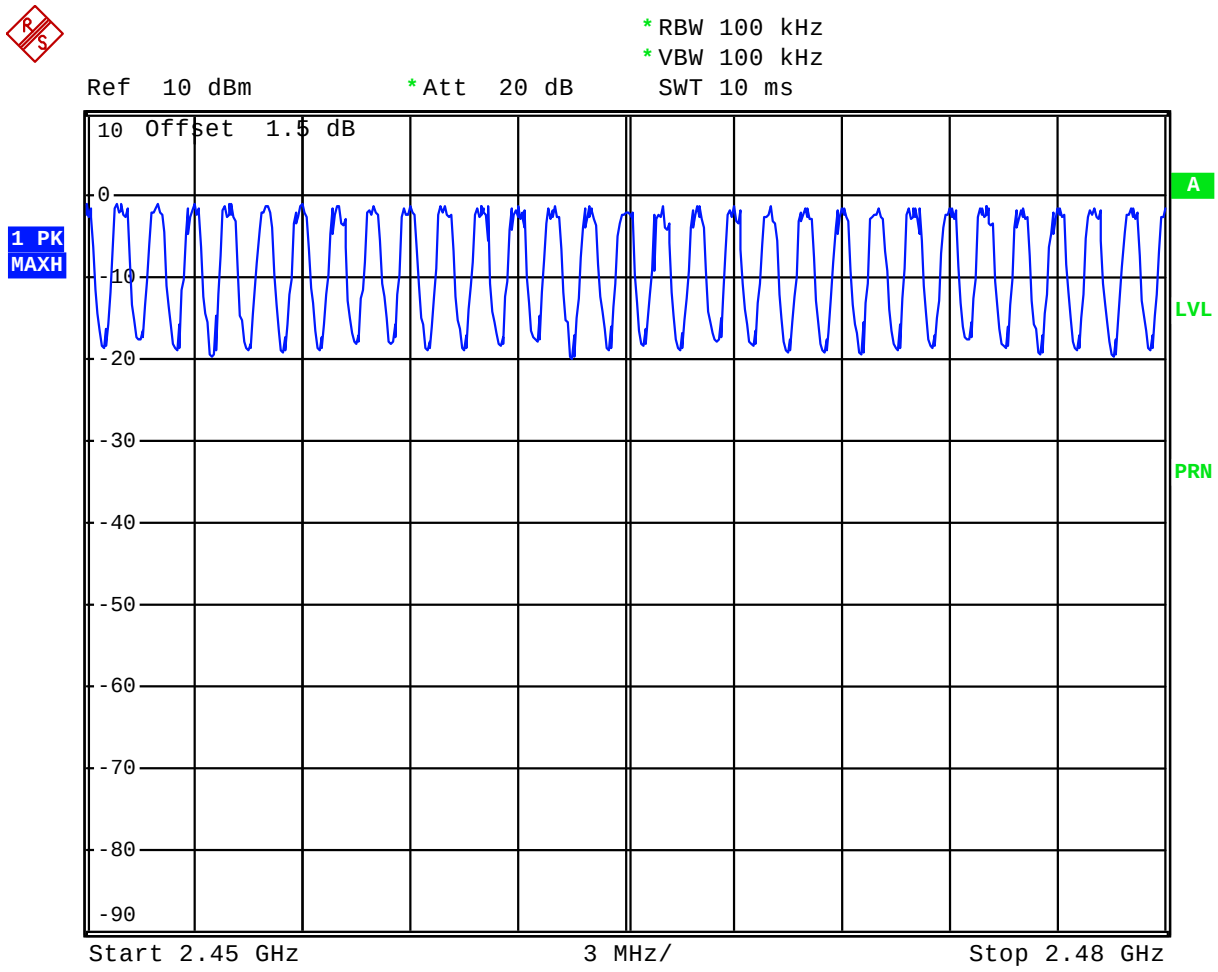
Comment: Number of hopping frequencies
Date: 21.MAY.2007 13:22:47

Plot 4.2



Comment: Number of hopping frequencies
Date: 21.MAY.2007 13:26:10

Plot 4.3



Comment: Number of hopping frequencies
Date: 21.MAY.2007 13:28:40

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

4.5.1 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.

4.5.2 Test 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.

4.5.3 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)

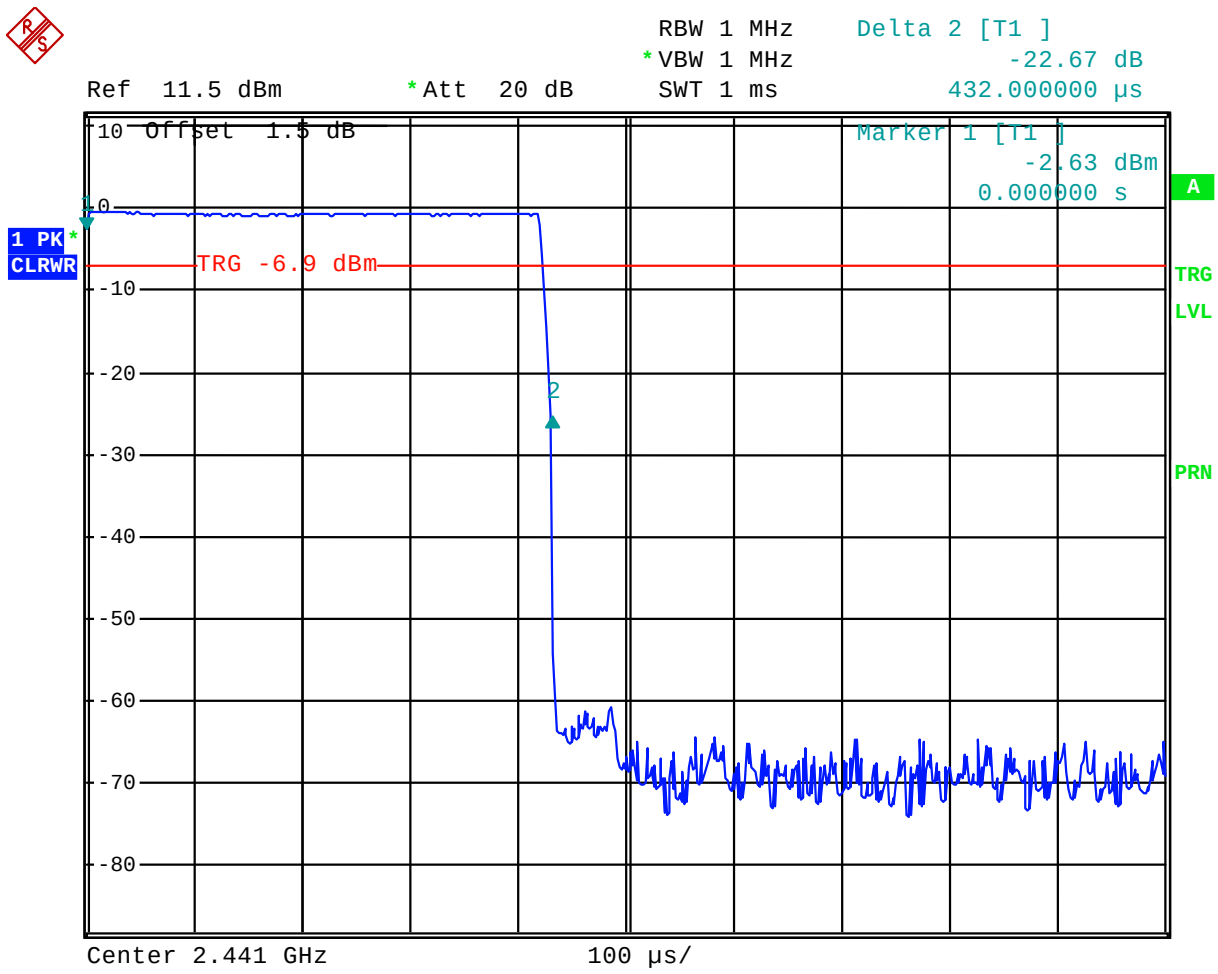
0.001692 * 6 *31.6 = 0.32 sec.

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

0.00294 * 4 *31.6 = 0.37 sec.

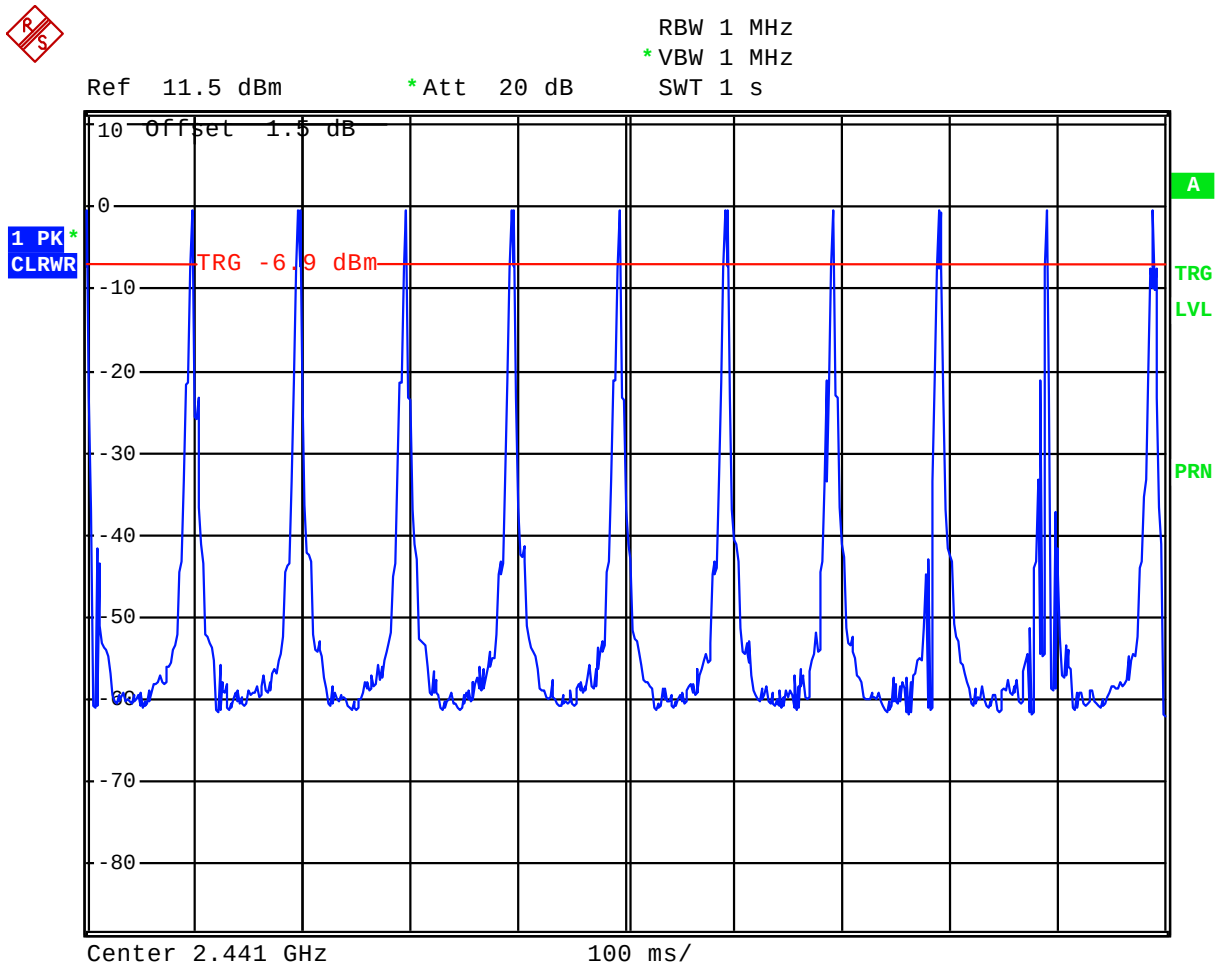
Refer to attached spectrum analyzer plots 5.1-5.6 for details.

Plot 5.1



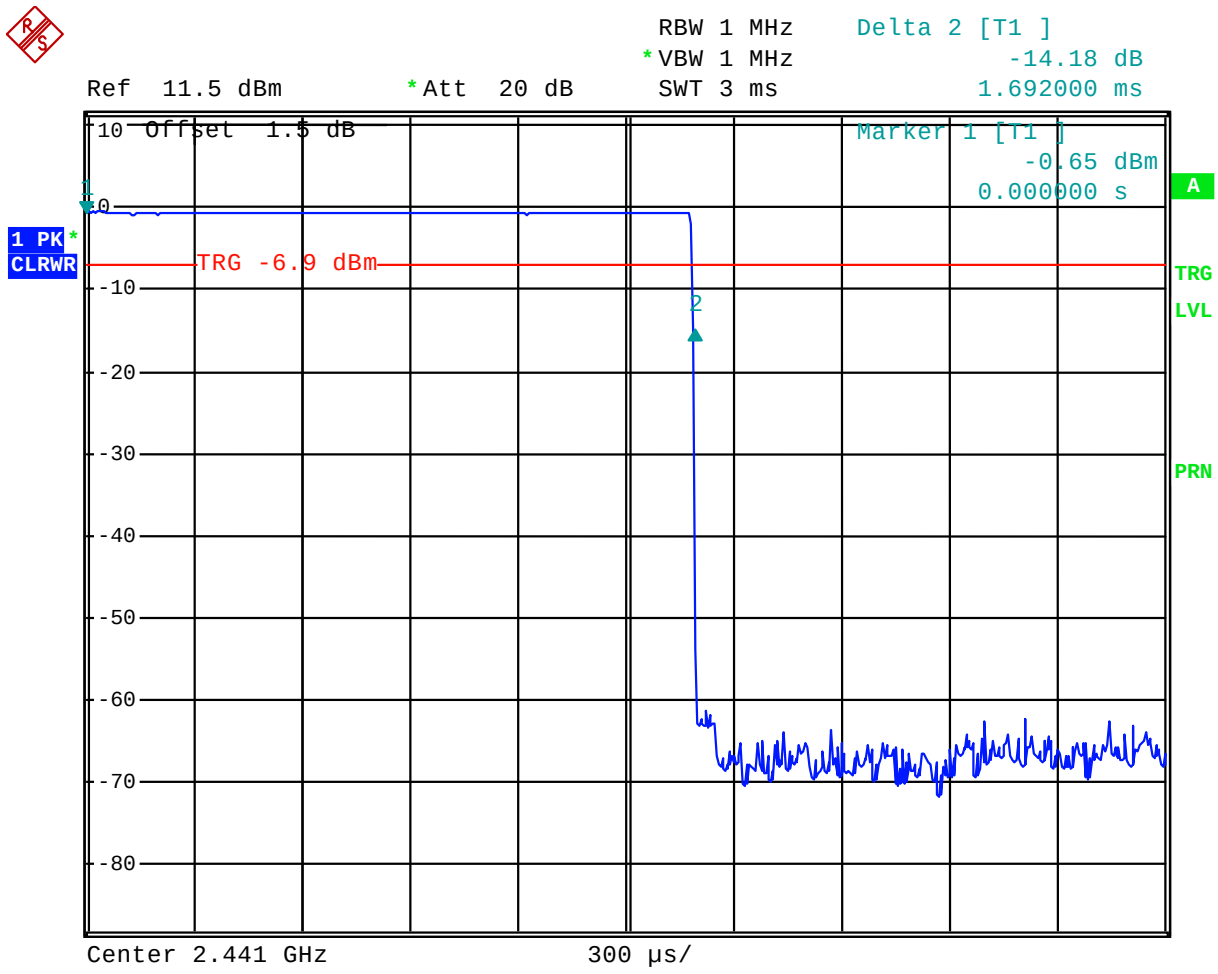
Comment: Time of occupancy, DH1 packet
Date: 22.MAY.2007 11:29:01

Plot 5.2



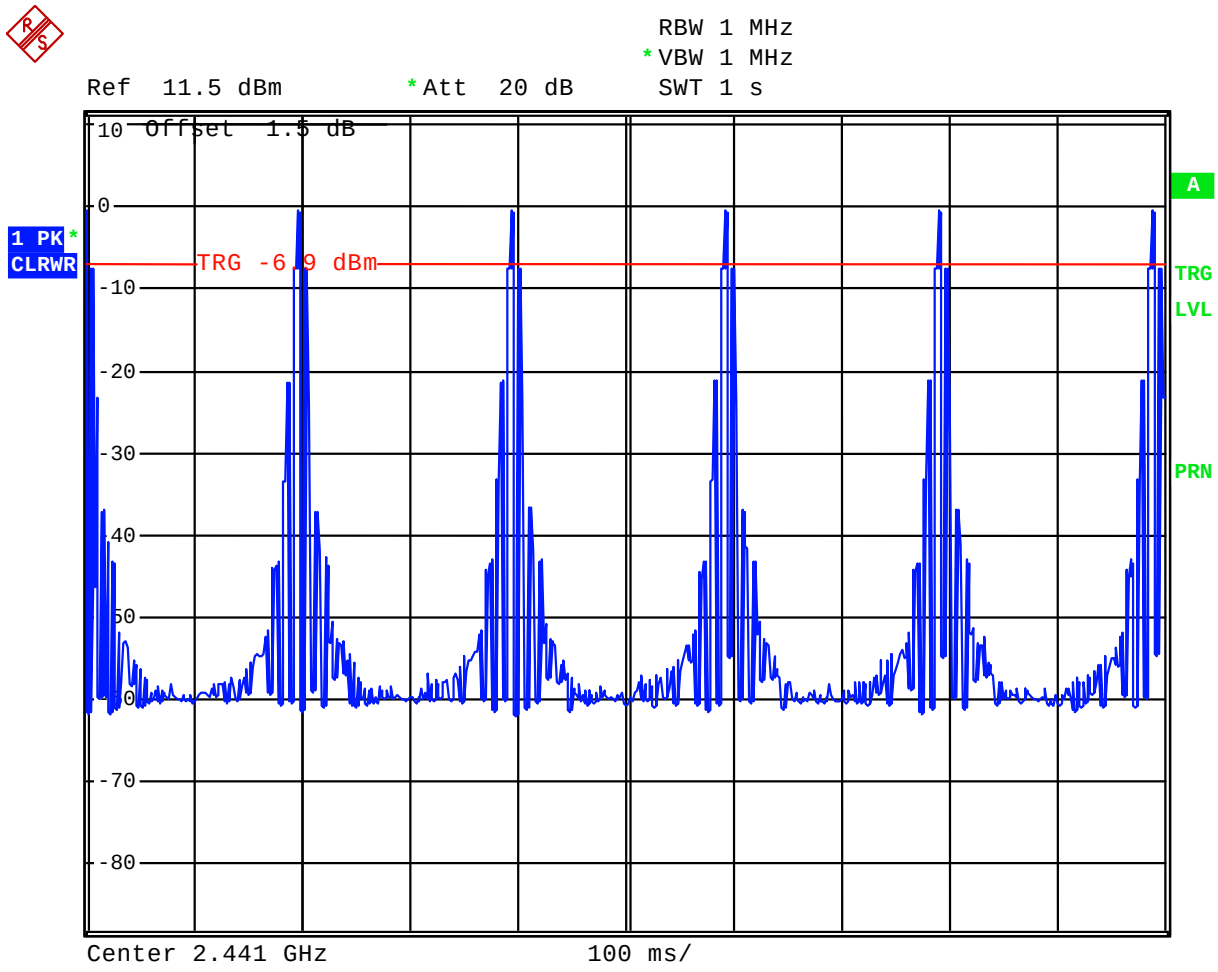
Comment: Time of occupancy, DH1 packet
Date: 22.MAY.2007 11:29:51

Plot 5.3



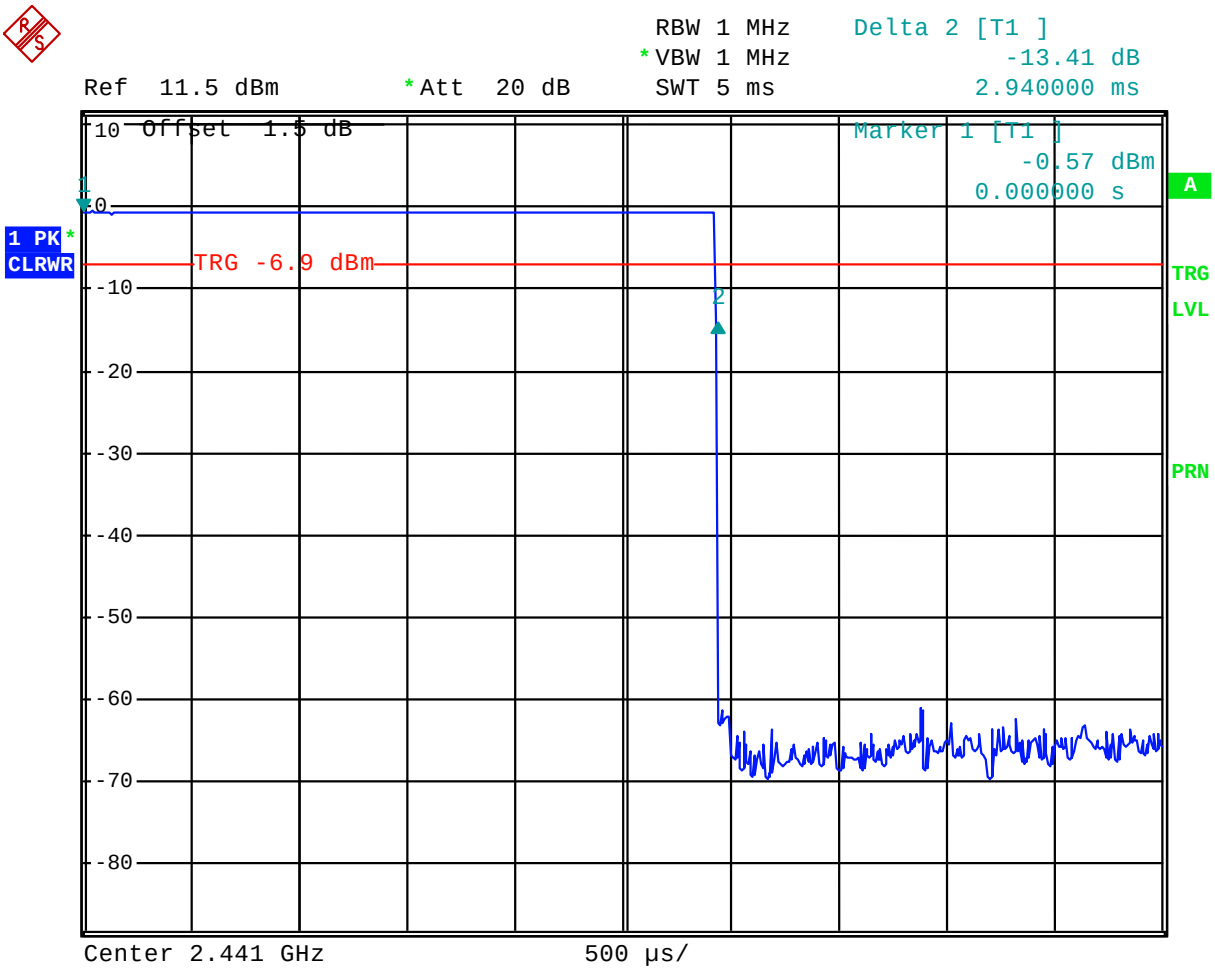
Comment: Time of occupancy, DH3 packet
Date: 22.MAY.2007 11:32:40

Plot 5.4



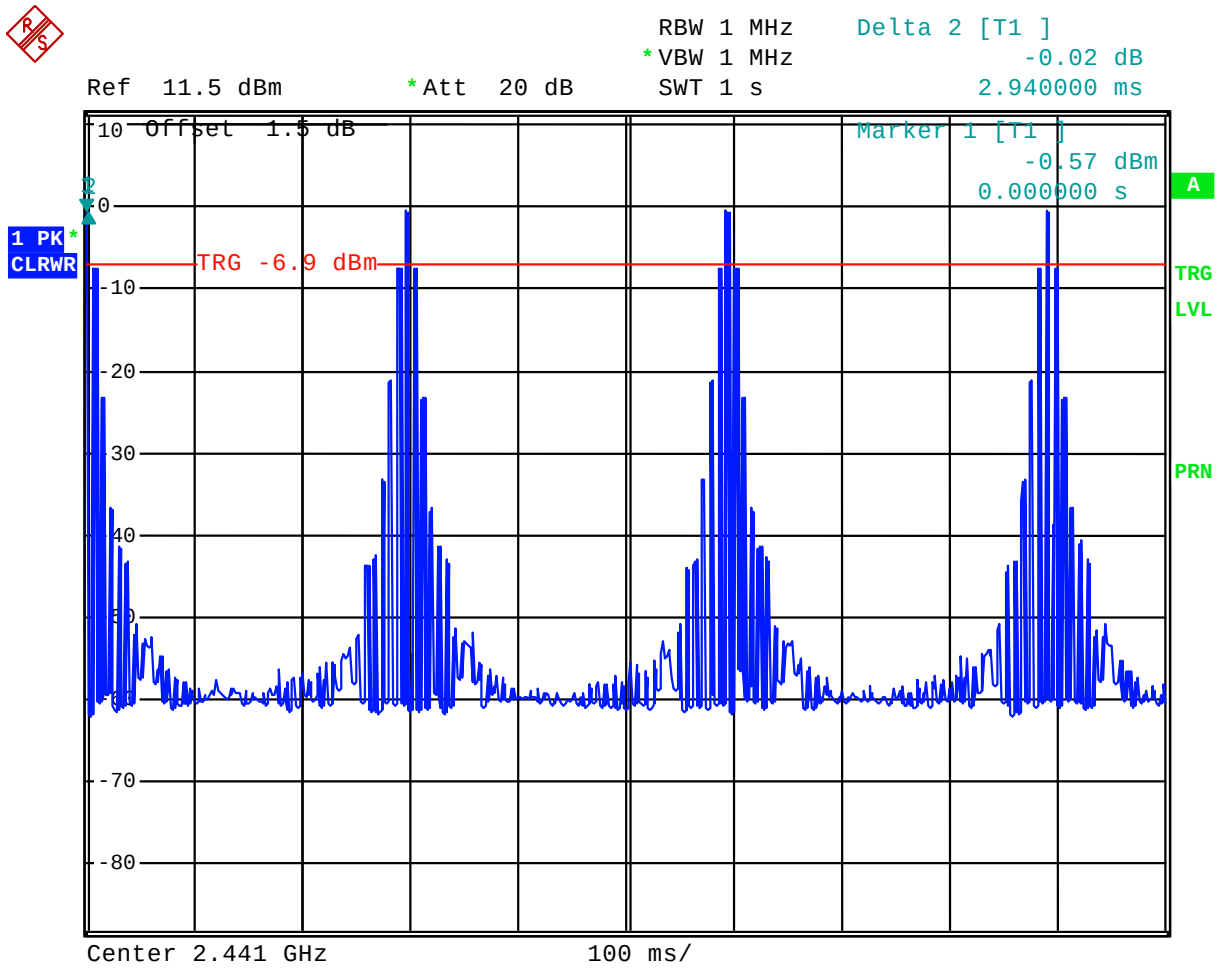
Comment: Time of occupancy, DH3 packet
Date: 22.MAY.2007 11:33:17

Plot 5.5



Comment: Time of occupancy, DH5 packet
Date: 22.MAY.2007 11:35:43

Plot 5.6



Comment: Time of occupancy, DH5 packet
Date: 22.MAY.2007 11:36:34

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

4.6.1 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.

4.6.2 Test 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.

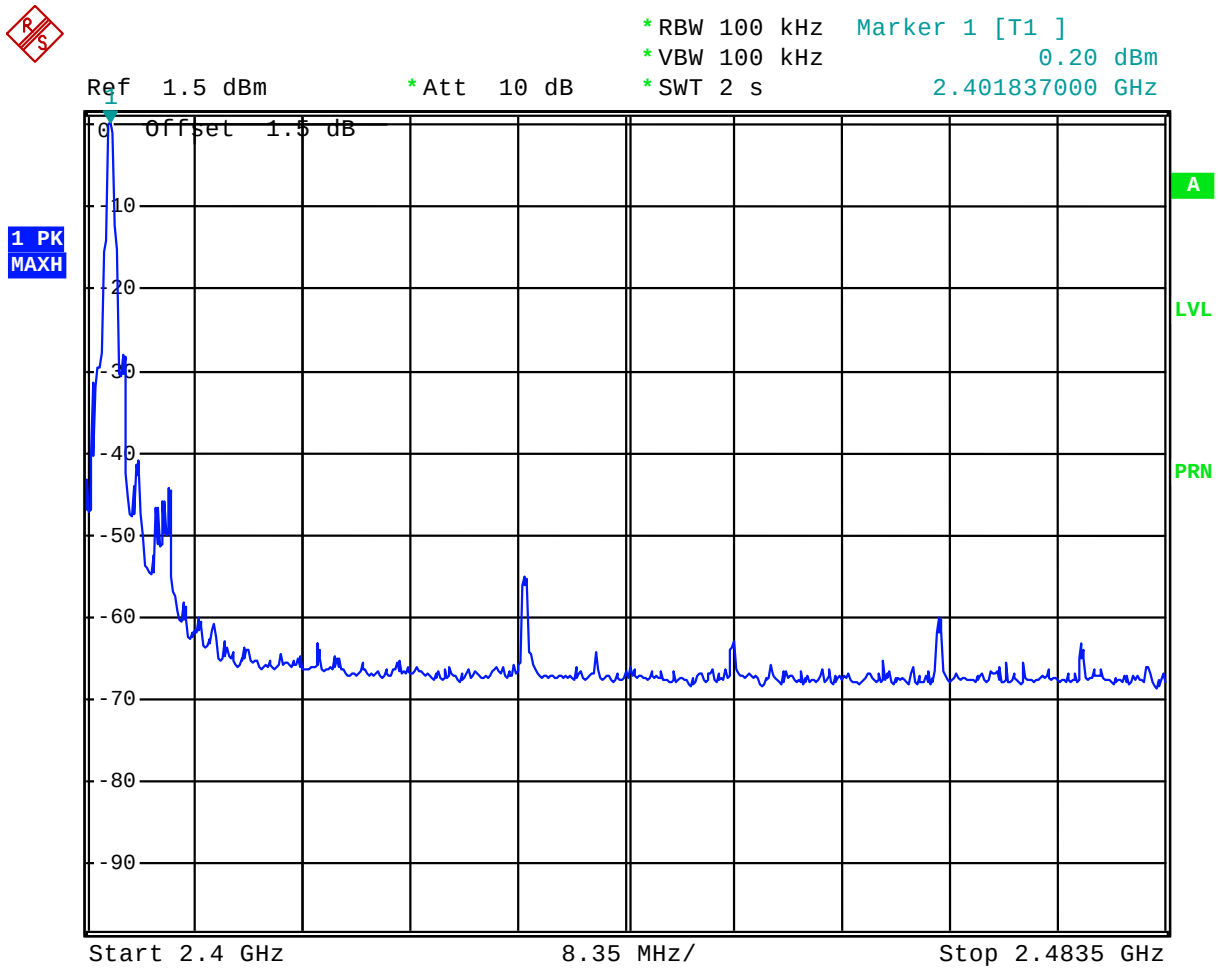
4.6.3 Test Results

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

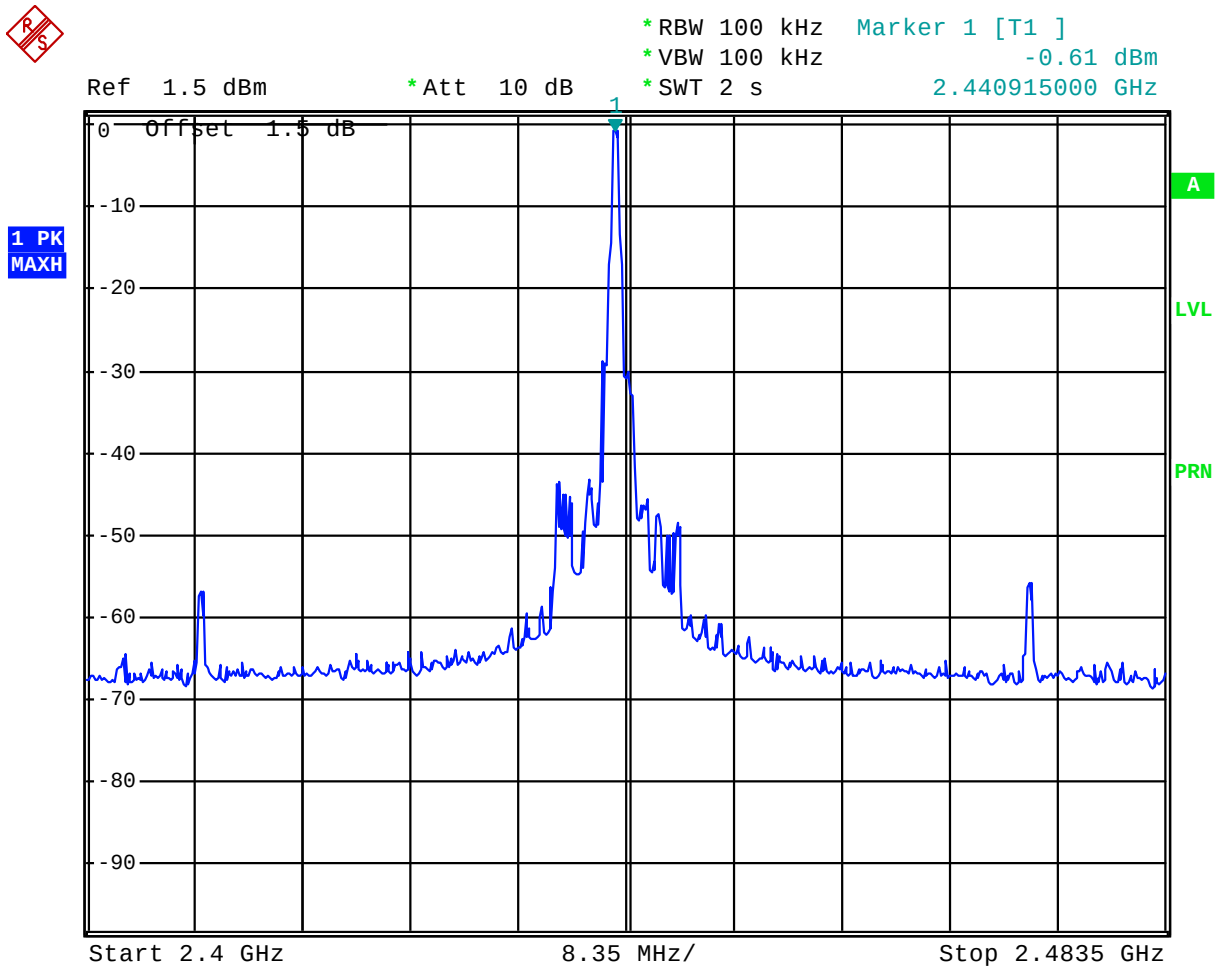
The attenuation is more than 20 dB.

Plot 6.1



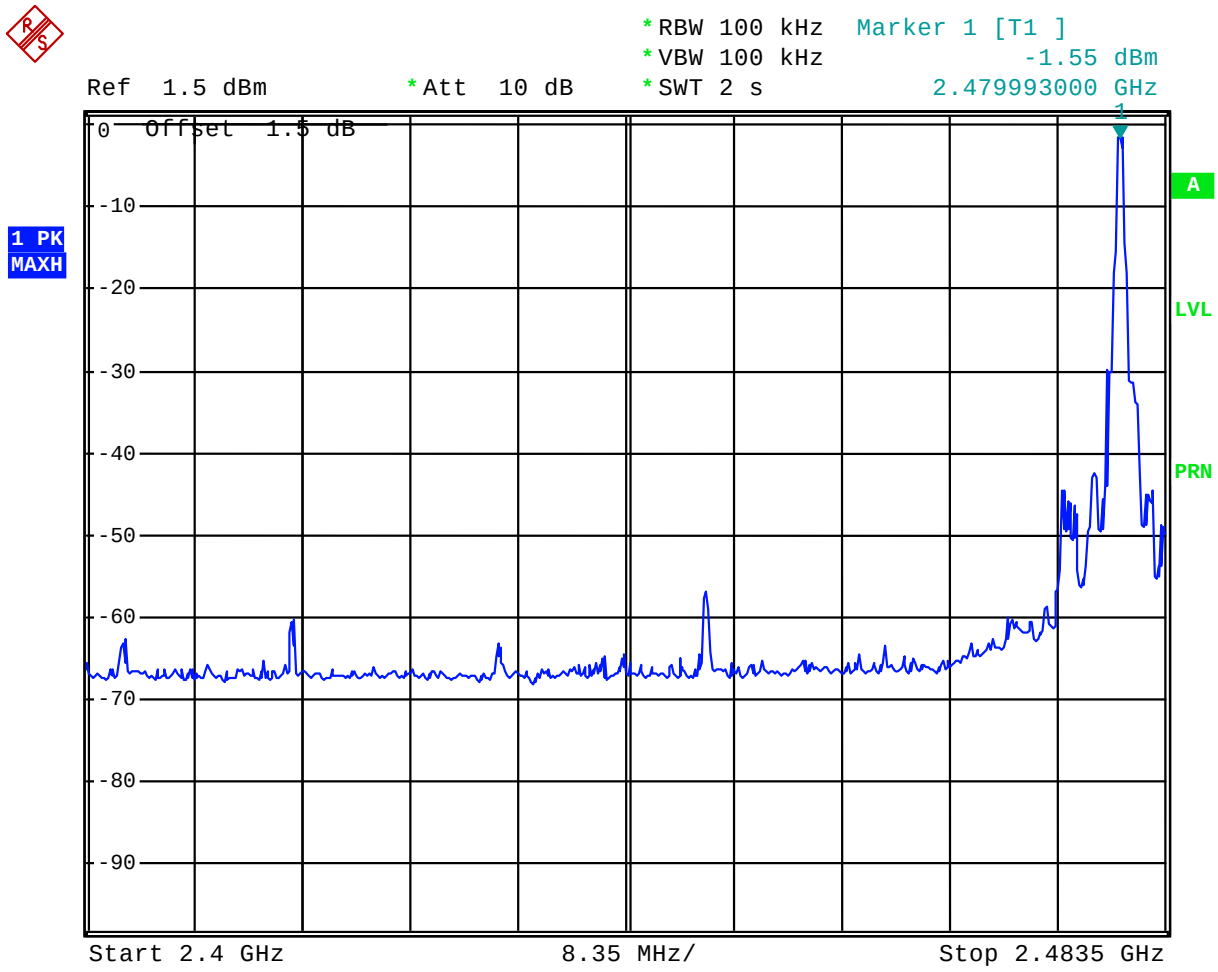
Comment: In-band emissions, f=2402 MHz
Date: 18.MAY.2007 14:57:28

Plot 6.2



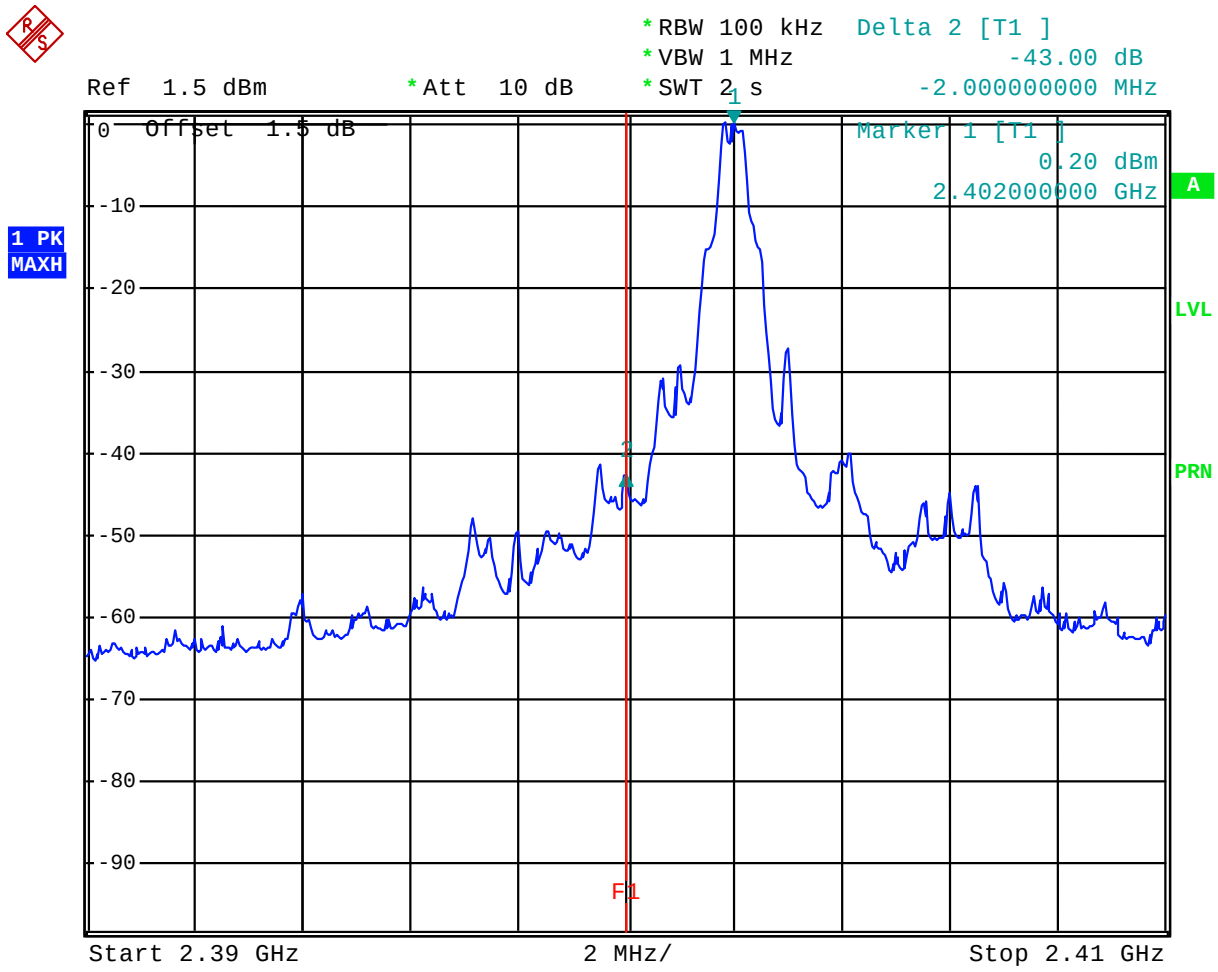
Comment: In-band emissions, f=2441 MHz
Date: 18.MAY.2007 14:56:17

Plot 6.3



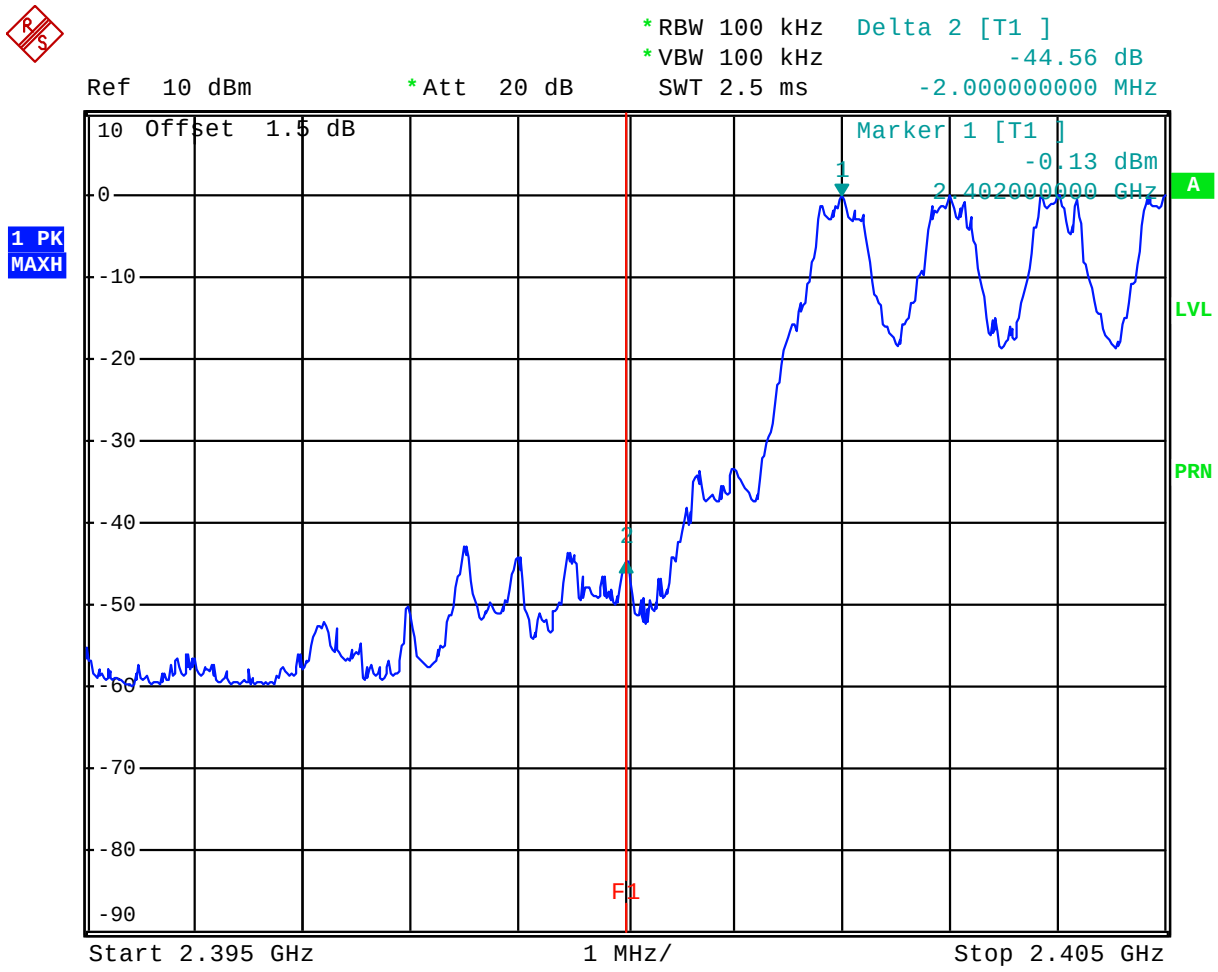
Comment: In-band emissions, f=2480 MHz
Date: 18.MAY.2007 14:55:01

Plot 6.4



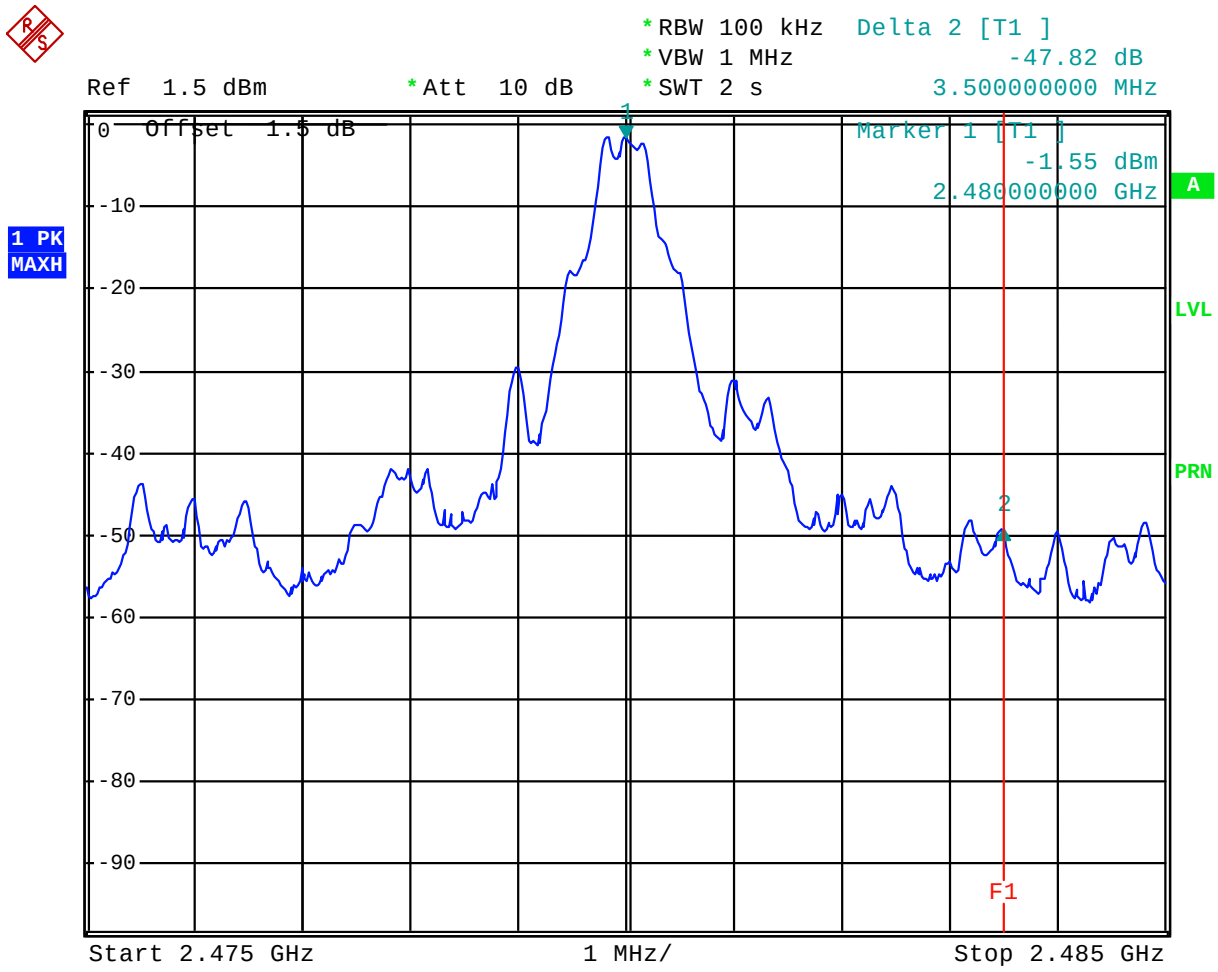
Comment: Band-edge frequency emissions
Date: 18.MAY.2007 14:41:38

Plot 6.5



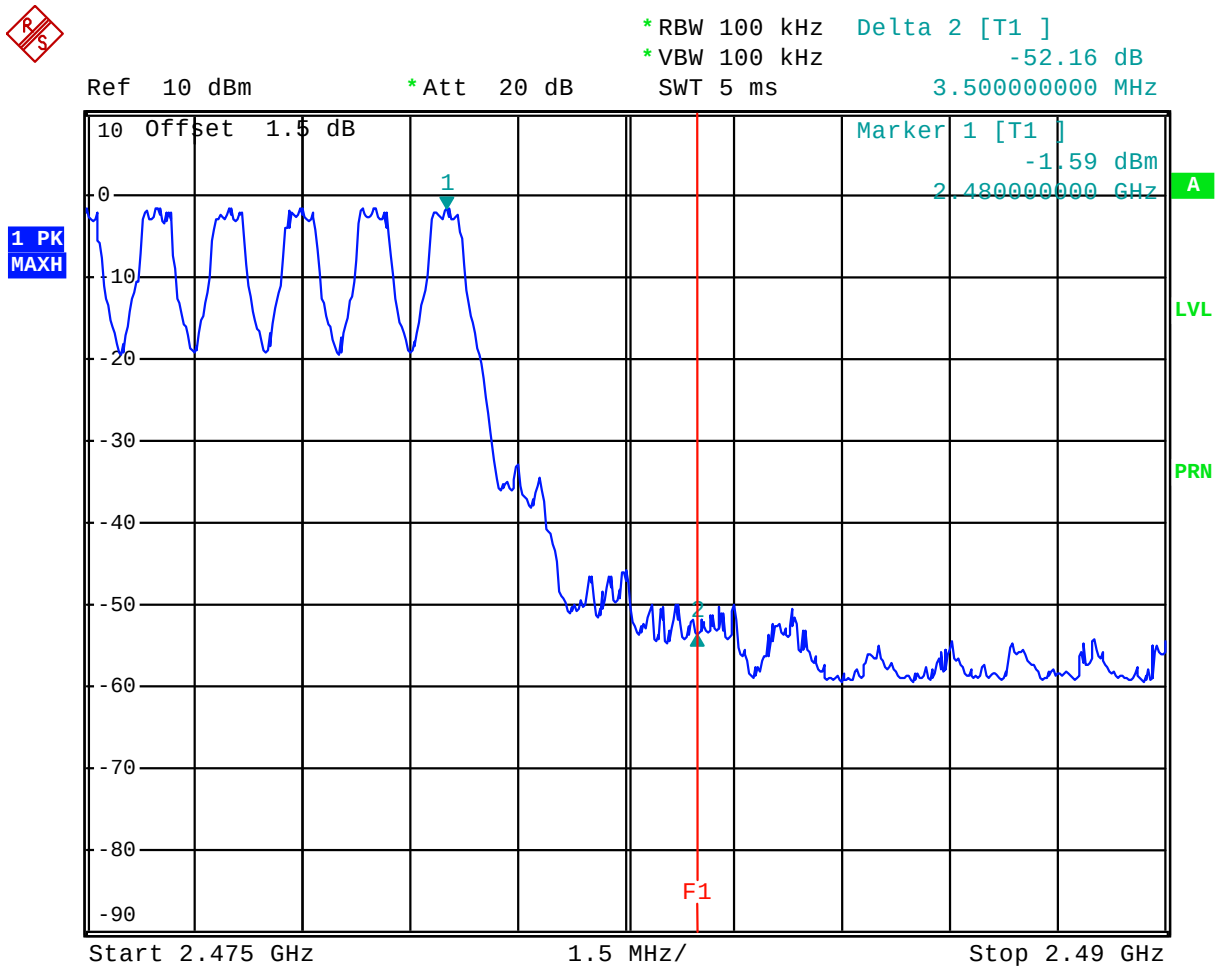
Comment: Band-edge frequency emissions, hopping mode
Date: 18.MAY.2007 13:08:26

Plot 6.6



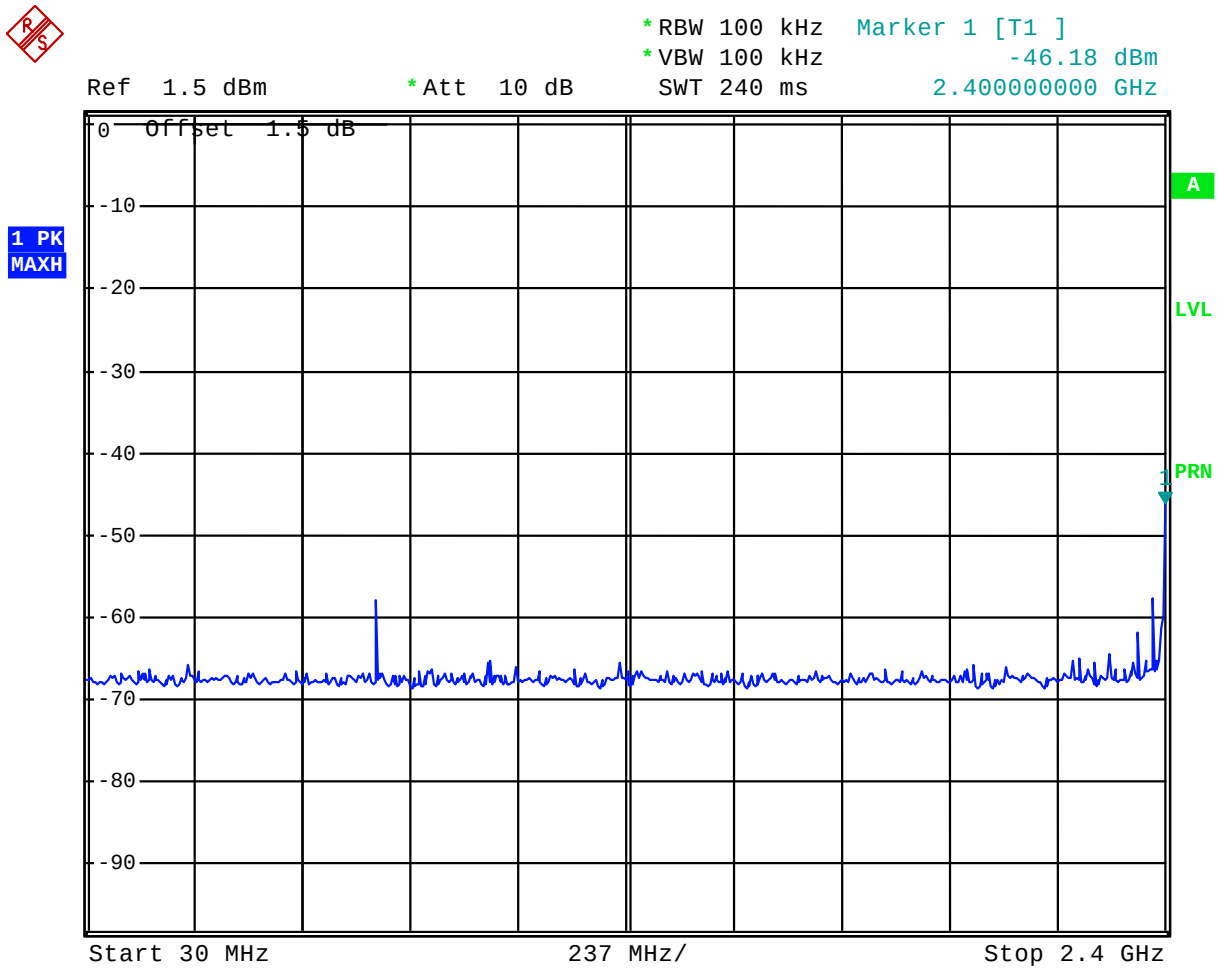
Comment: Band-edge frequency emissions
Date: 18.MAY.2007 14:45:06

Plot 6.7



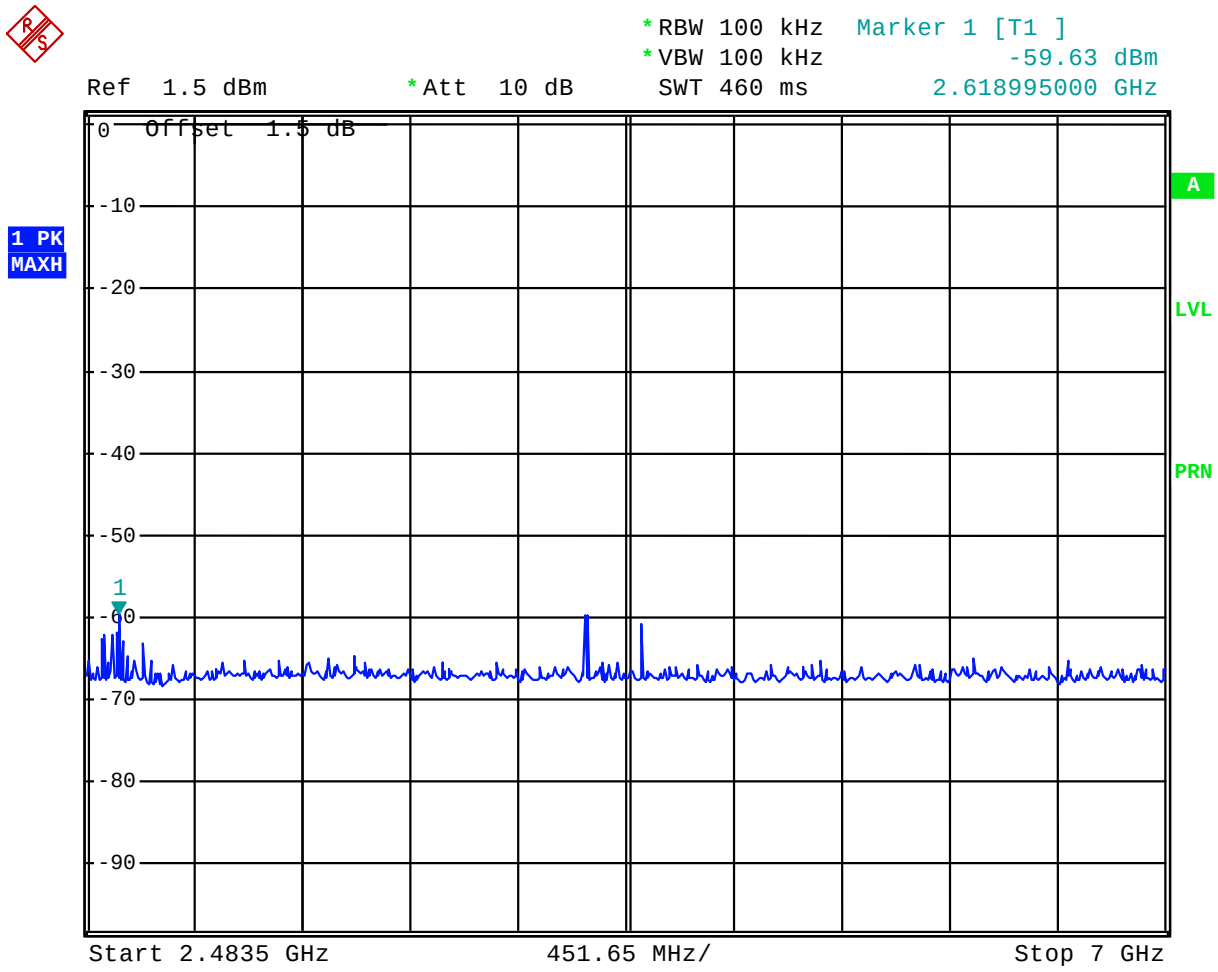
Comment: Band-edge frequency emissions, hopping mode
Date: 18.MAY.2007 13:16:51

Plot 6.8



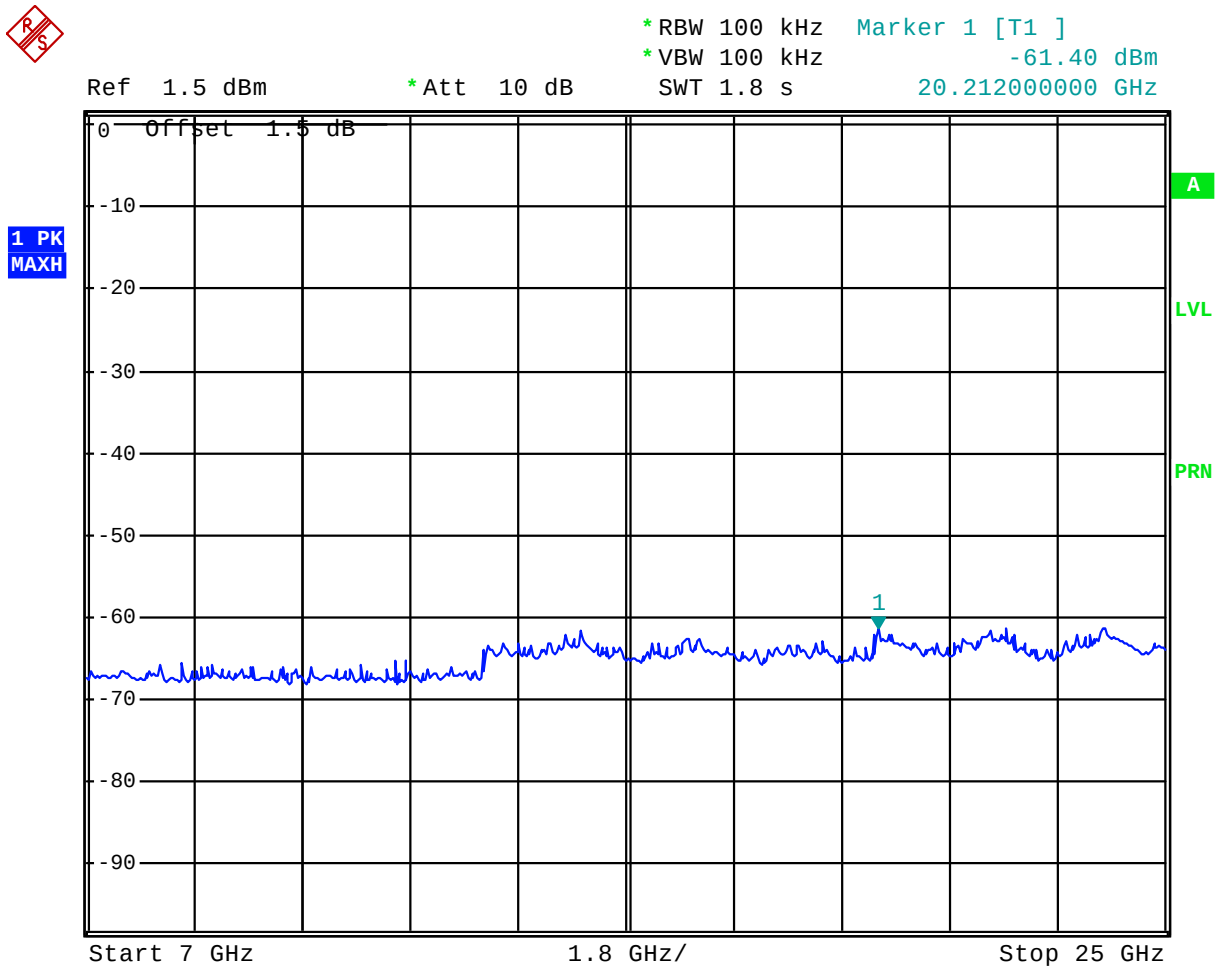
Comment: Out-of-band emissions, f=2402 MHz
Date: 18.MAY.2007 12:01:36

Plot 6.9



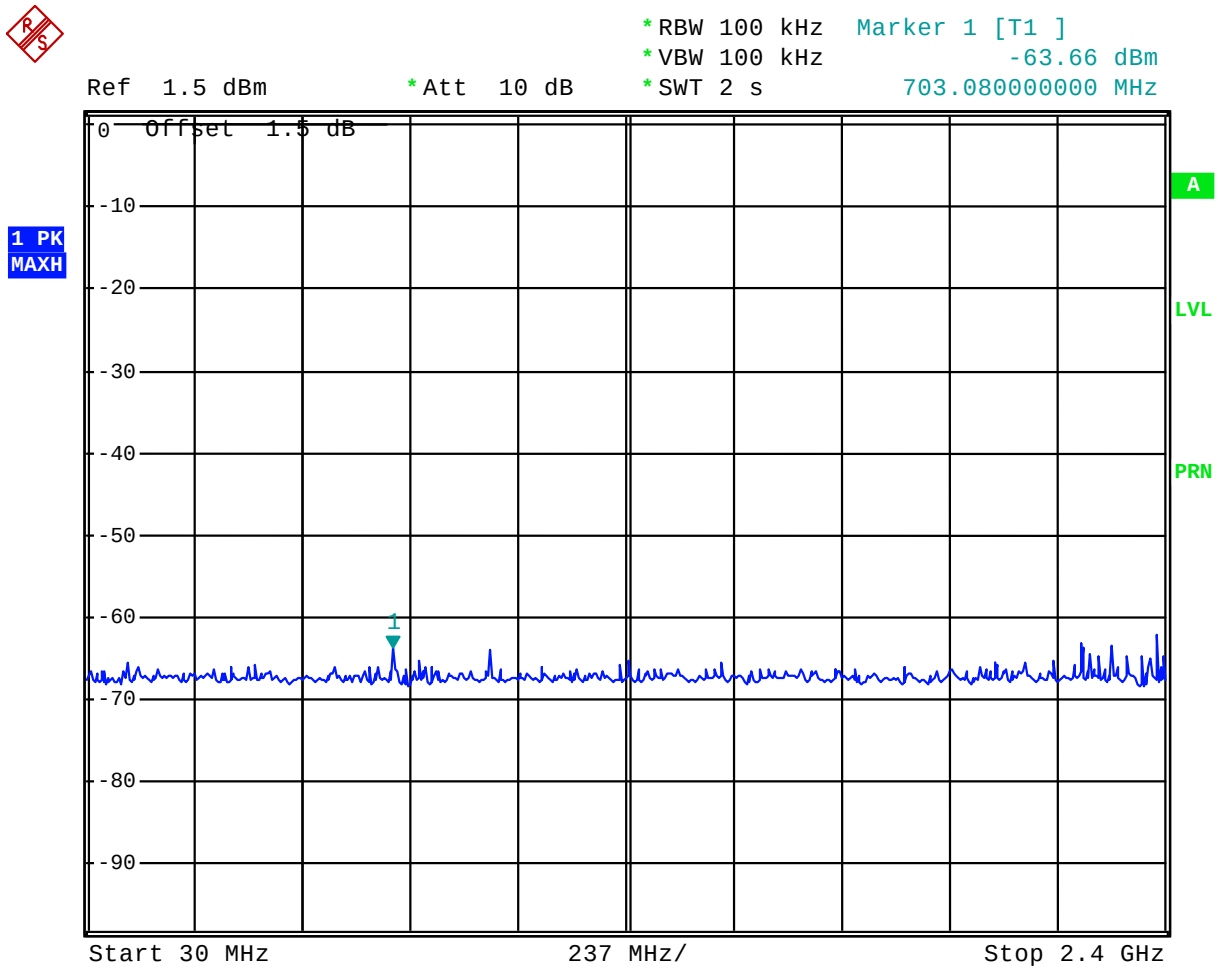
Comment: Out-of-band emissions, f=2402 MHz
Date: 18.MAY.2007 12:03:12

Plot 6.10



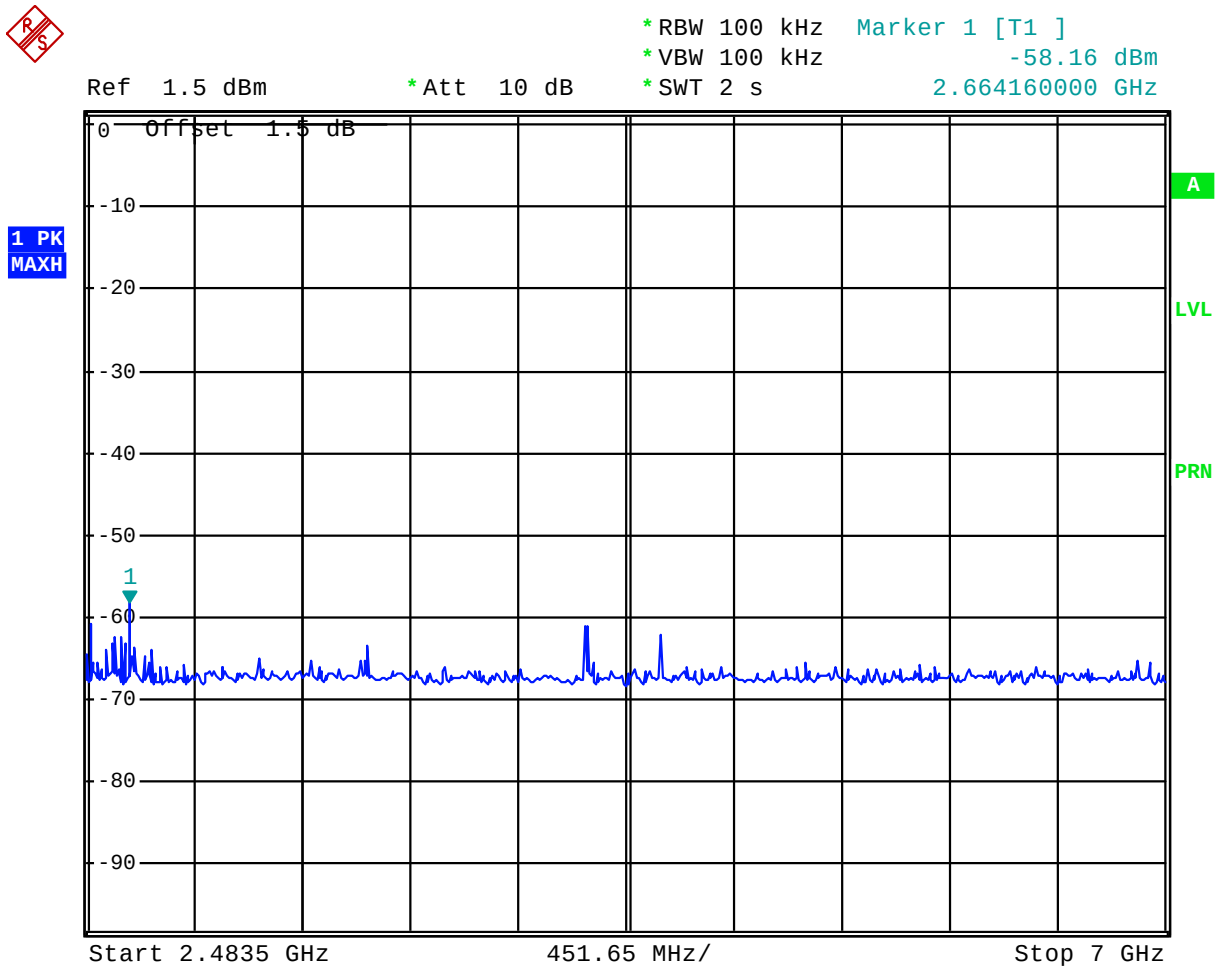
Comment: Out-of-band emissions, f=2402 MHz
Date: 18.MAY.2007 12:04:05

Plot 6.11



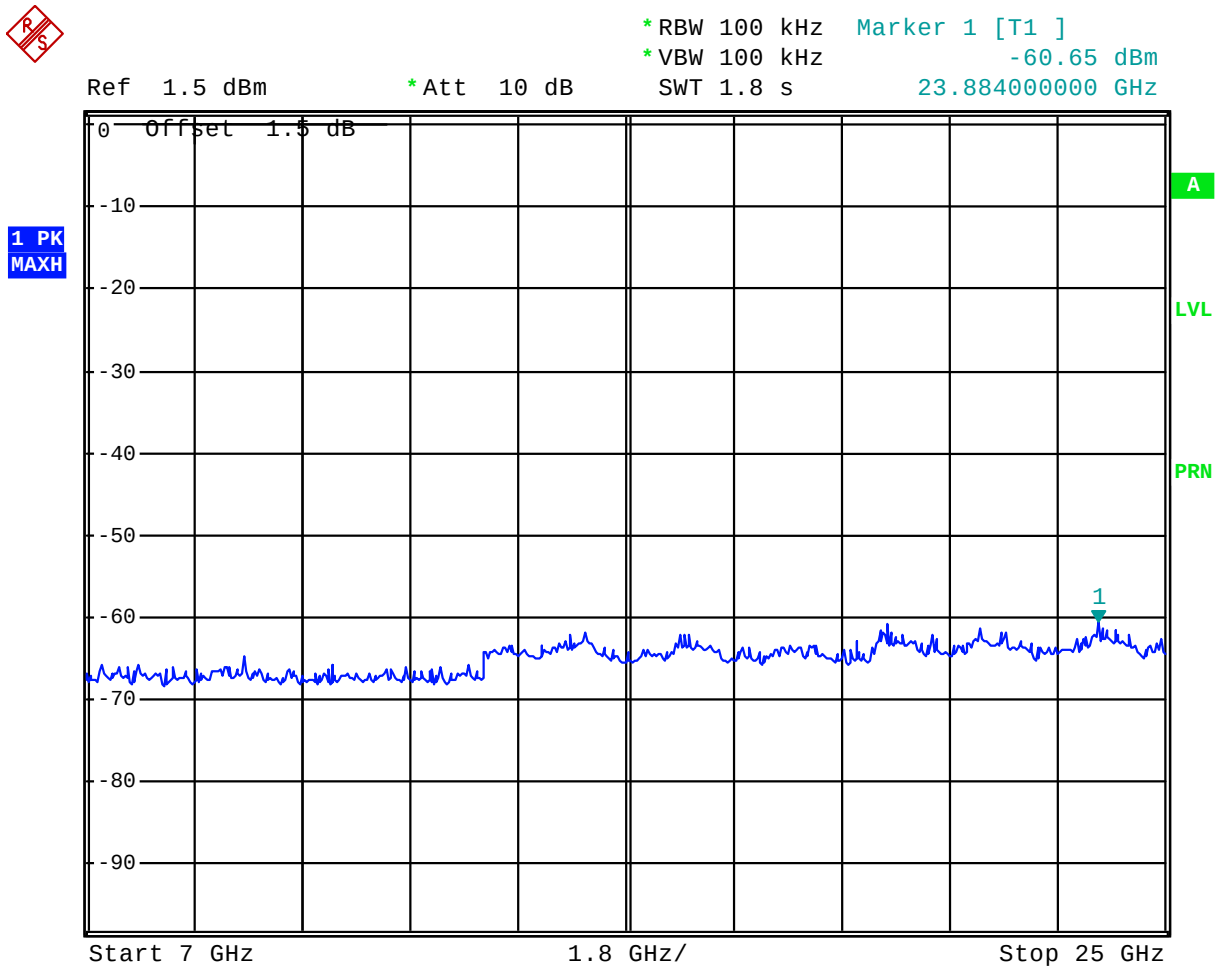
Comment: Out-of-band emissions, f=2441 MHz
Date: 18.MAY.2007 11:56:02

Plot 6.12



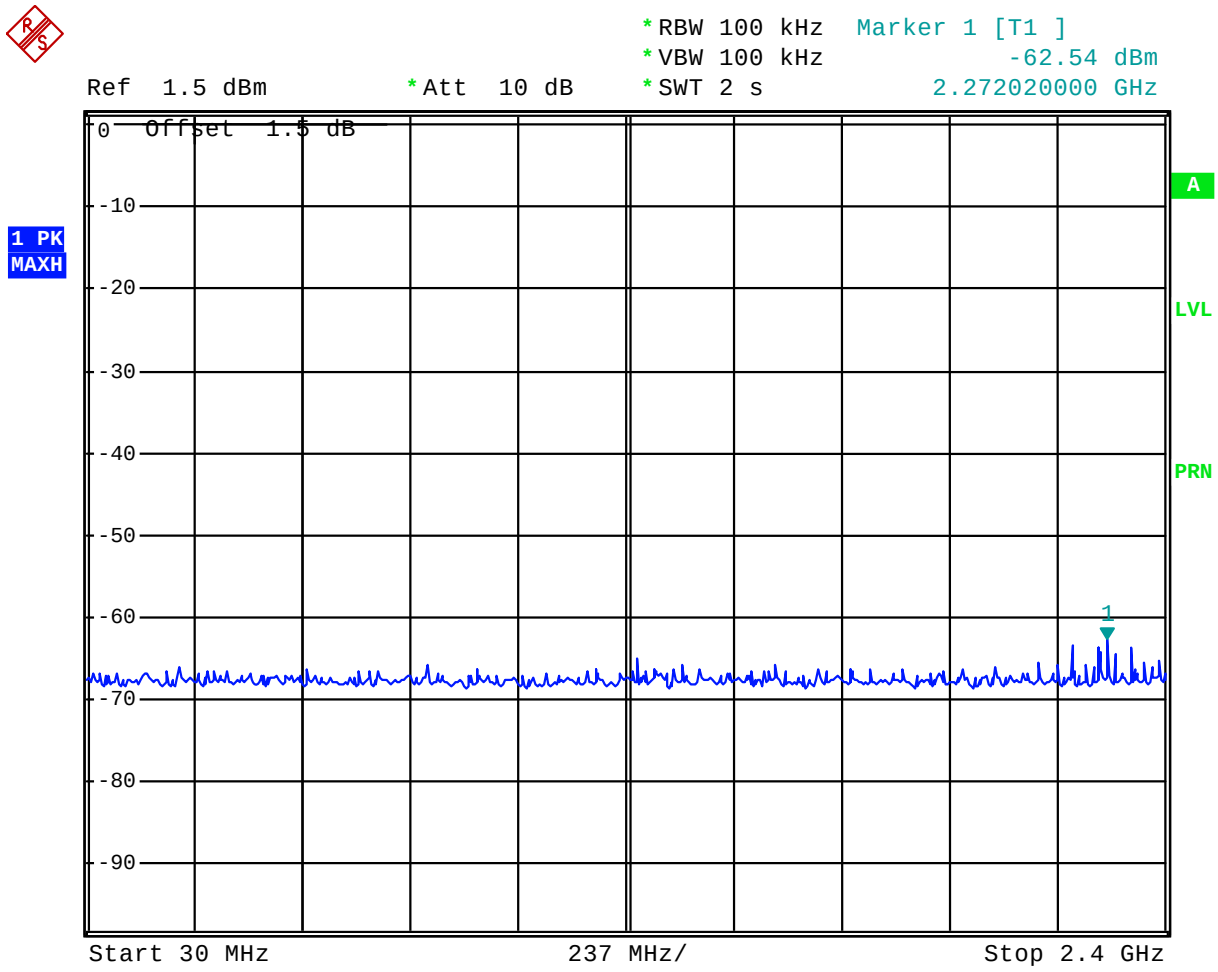
Comment: Out-of-band emissions, f=2441 MHz
Date: 18.MAY.2007 11:57:56

Plot 6.13



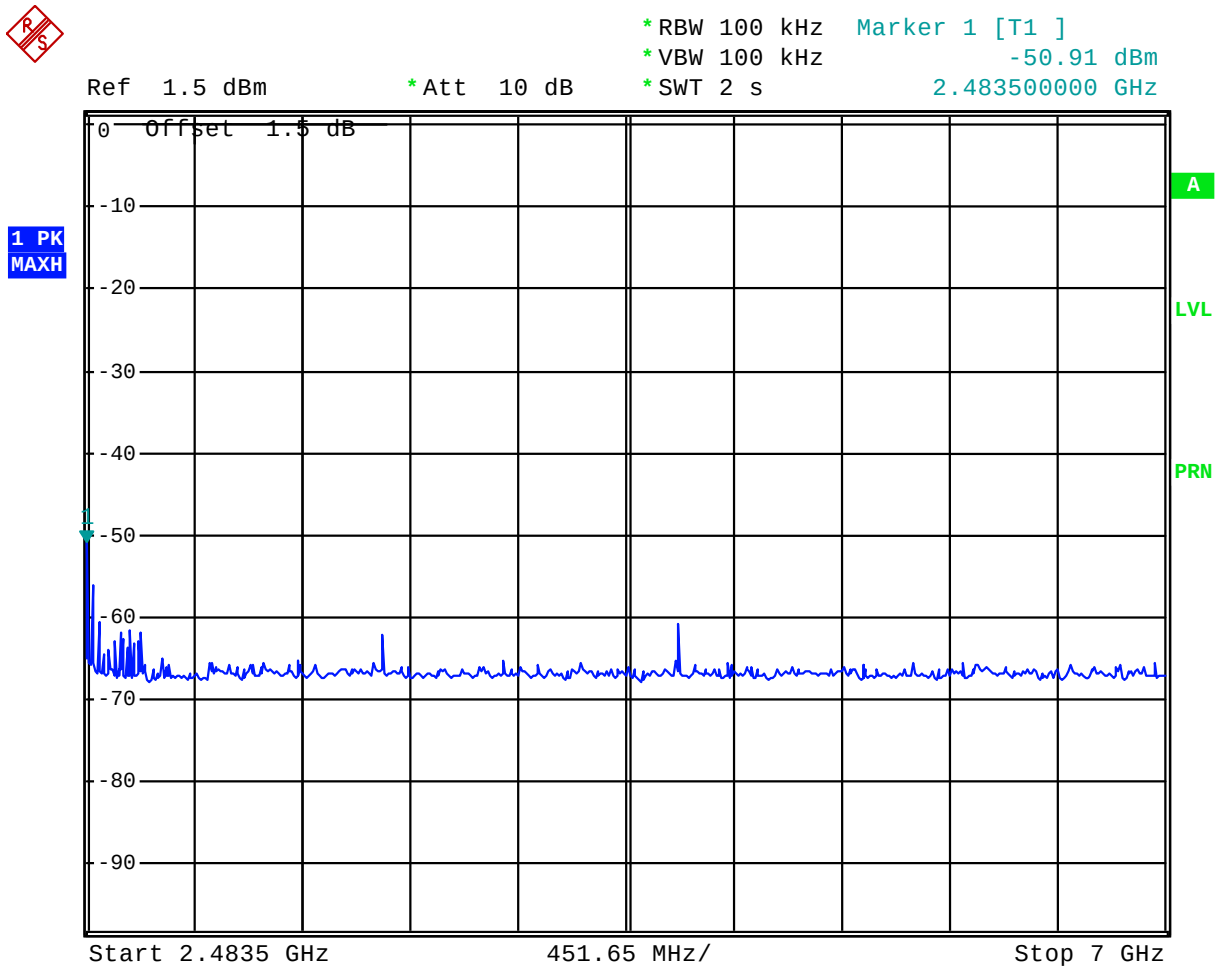
Comment: Out-of-band emissions, f=2441 MHz
Date: 18.MAY.2007 11:59:08

Plot 6.14



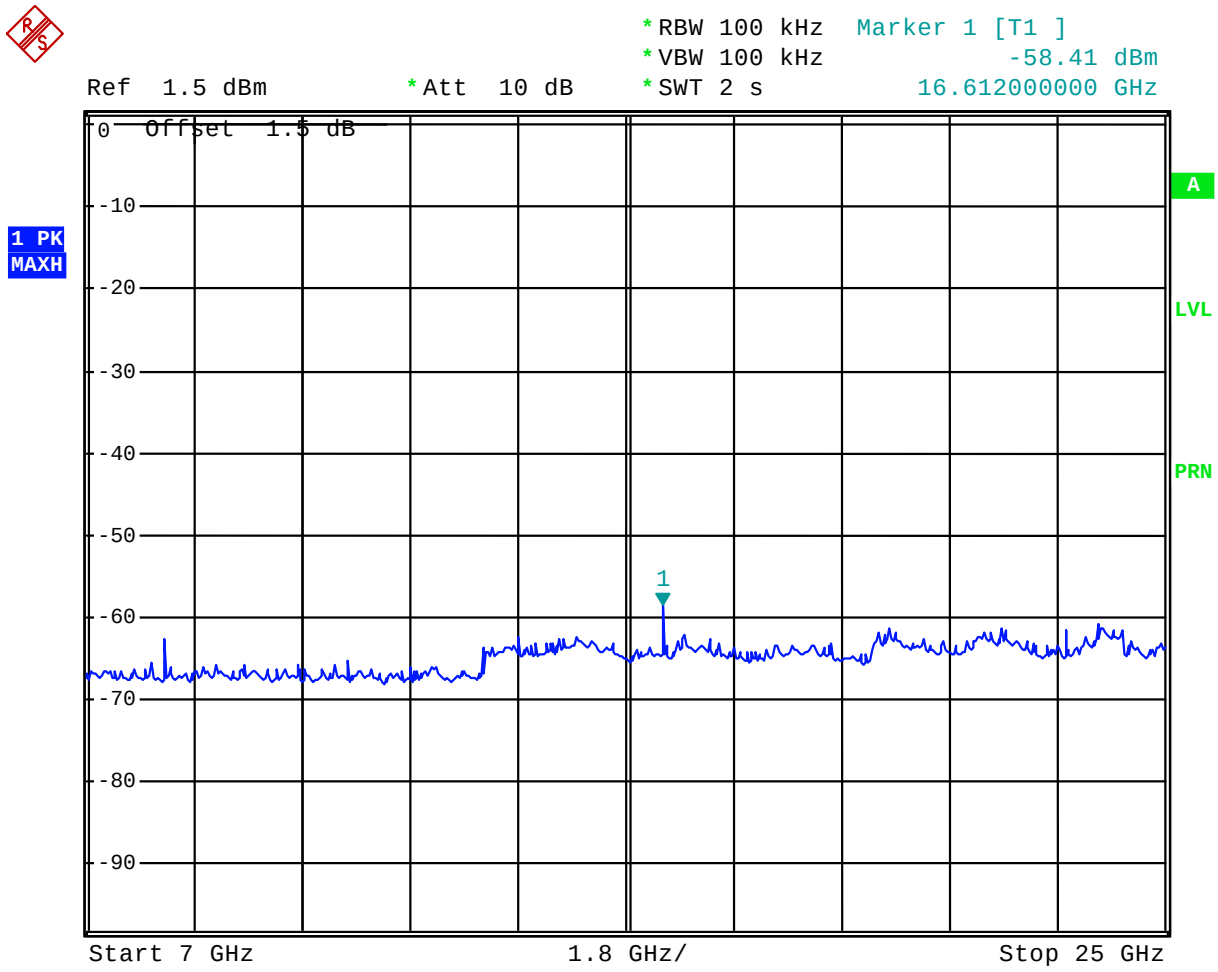
Comment: Out-of-band emissions, f=2480 MHz
Date: 18.MAY.2007 14:52:00

Plot 6.15



Comment: Out-of-band emissions, f=2480 MHz
Date: 18.MAY.2007 14:49:46

Plot 6.16



Comment: Out-of-band emissions, f=2480 MHz
Date: 18.MAY.2007 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

4.8.1 Test 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

4.8.2 Test Results

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

The EUT passed the test by 0.3 dB without taken a Duty Cycle into consideration.

Temperature: 20.0 C	Company: Topcon
Humidity: 50.0 %	Model: BR-1
Date: May 18, 2007	Engineer: KK

Frequency	Polarity	Detector	SA reading	AG**	Ant factor	Field Strength	Limit	Margin
MHz			dB (uV)	dB	dB(1/m)	dB(uV/m)	dB(uV/m)	dB
Ch: 0, 2402.0 MHz								
4804.0	V	Pk	45.4	31.3	33.9	48.0	74.0	-26.0
4804.0	V	Av	38.9	31.3	33.9	41.5	54.0	-12.5
7206.0	H/V	Pk	38.1*	29.9	37.0	45.2	74.0	-28.8
7206.0	H/V	Av	24.5*	29.9	37.0	31.6	54.0	-22.4
12010.0	H/V	Pk	36.4*	28.2	39.2	47.4	74.0	-26.6
12010.0	H/V	Av	22.3*	28.2	39.2	33.3	54.0	-20.7

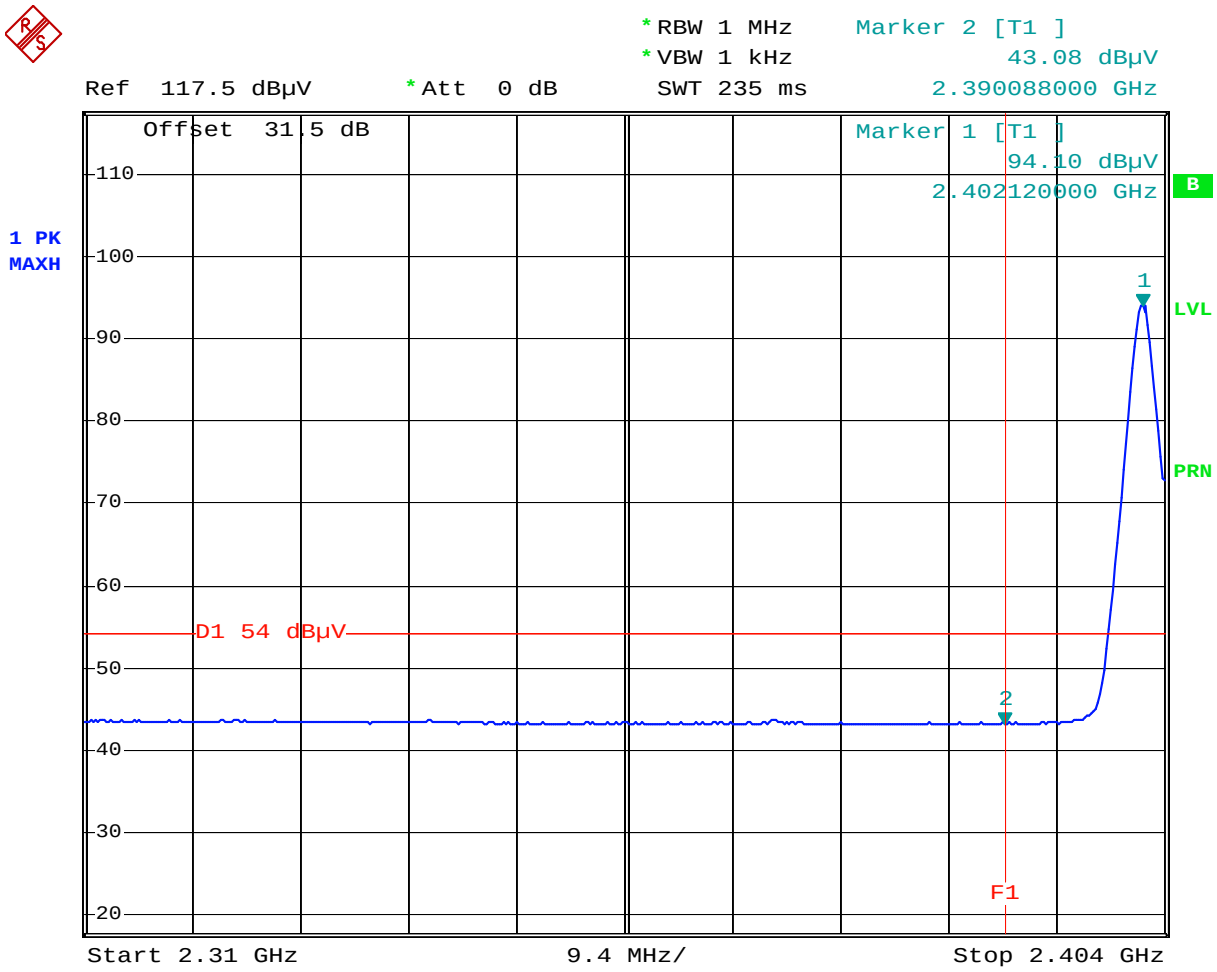
Frequency	Polarity	Detector	SA reading	AG**	Ant factor	Field Strength	Limit	Margin
MHz			dB (uV)	dB	dB(1/m)	dB(uV/m)	dB(uV/m)	dB
Ch: 38, 2441.0 MHz								
4882.0	V	Pk	46.8	31.5	34.1	49.4	74.0	-24.6
4882.0	V	Av	42.5	31.5	34.1	45.1	54.0	-8.9
7323.0	H/V	Pk	39.5*	29.9	37.3	46.9	74.0	-27.1
7323.0	H/V	Av	25.3*	29.9	37.3	32.7	54.0	-21.3
12205.0	H/V	Pk	36.0*	25.9	39.2	49.3	74.0	-24.7
12205.0	H/V	Av	21.4*	25.9	39.2	34.7	54.0	-19.3

Frequency	Polarity	Detector	SA reading	AG**	Ant factor	Field Strength	Limit	Margin
MHz			dB (uV)	dB	dB(1/m)	dB(uV/m)	dB(uV/m)	dB
Ch: 78, 2480.0 MHz								
4960.0	V	Pk	44.1	31.5	34.4	47.0	74.0	-27.0
4960.0	V	Av	35.8	31.5	34.4	38.7	54.0	-15.3
7440.0	H/V	Pk	37.6*	29.9	37.7	45.4	74.0	-28.6
7440.0	H/V	Av	25.2*	29.9	37.7	33.0	54.0	-21.0
12400.0	H/V	Pk	35.2*	25.9	39.1	48.4	74.0	-25.6
12400.0	H/V	Av	21.4*	25.9	39.1	34.6	54.0	-19.4

* Noise Floor measurements, **AG – Amplifier Gain includes Cable Attenuation Factor.

All other emissions not reported are at least 10 dB below the limit

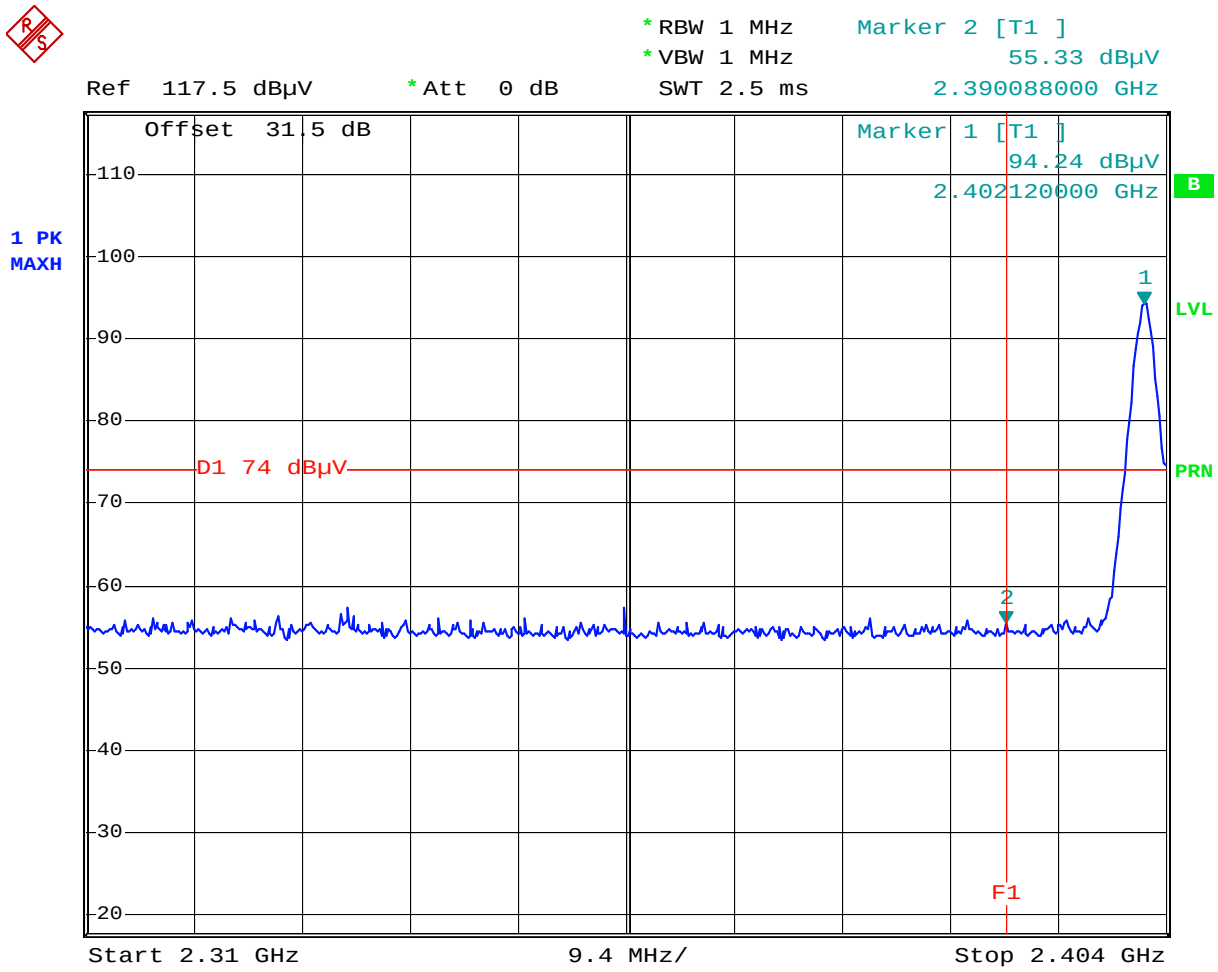
Radiated Emission in Restricted Bands at the band-edge frequency



Comment: Band-edge emissions, average
Date: 18.MAY.2007 19:15:40

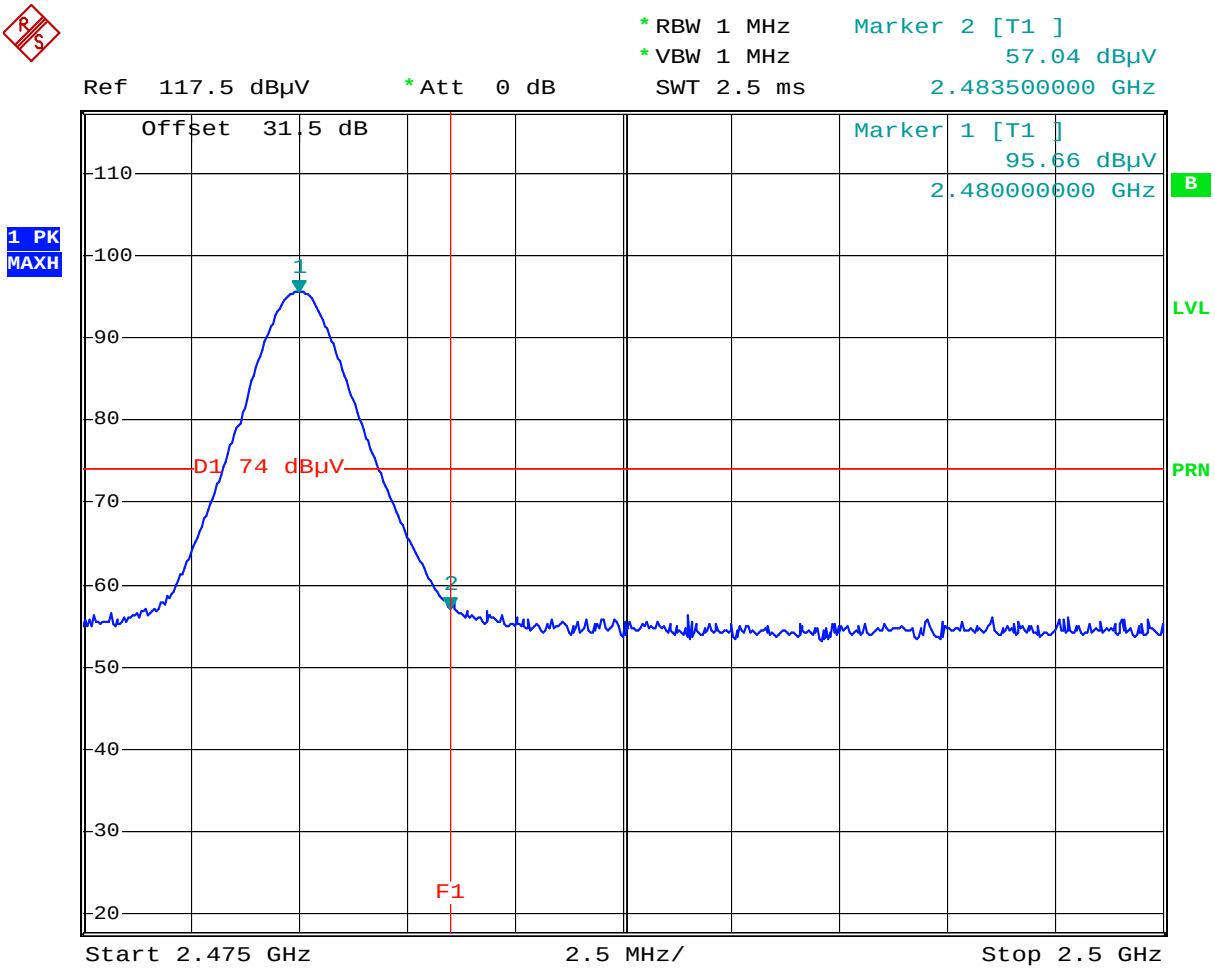
Note: Antenna Factor and Cable Loss are included in the SA OFFSET

Plot 8.1



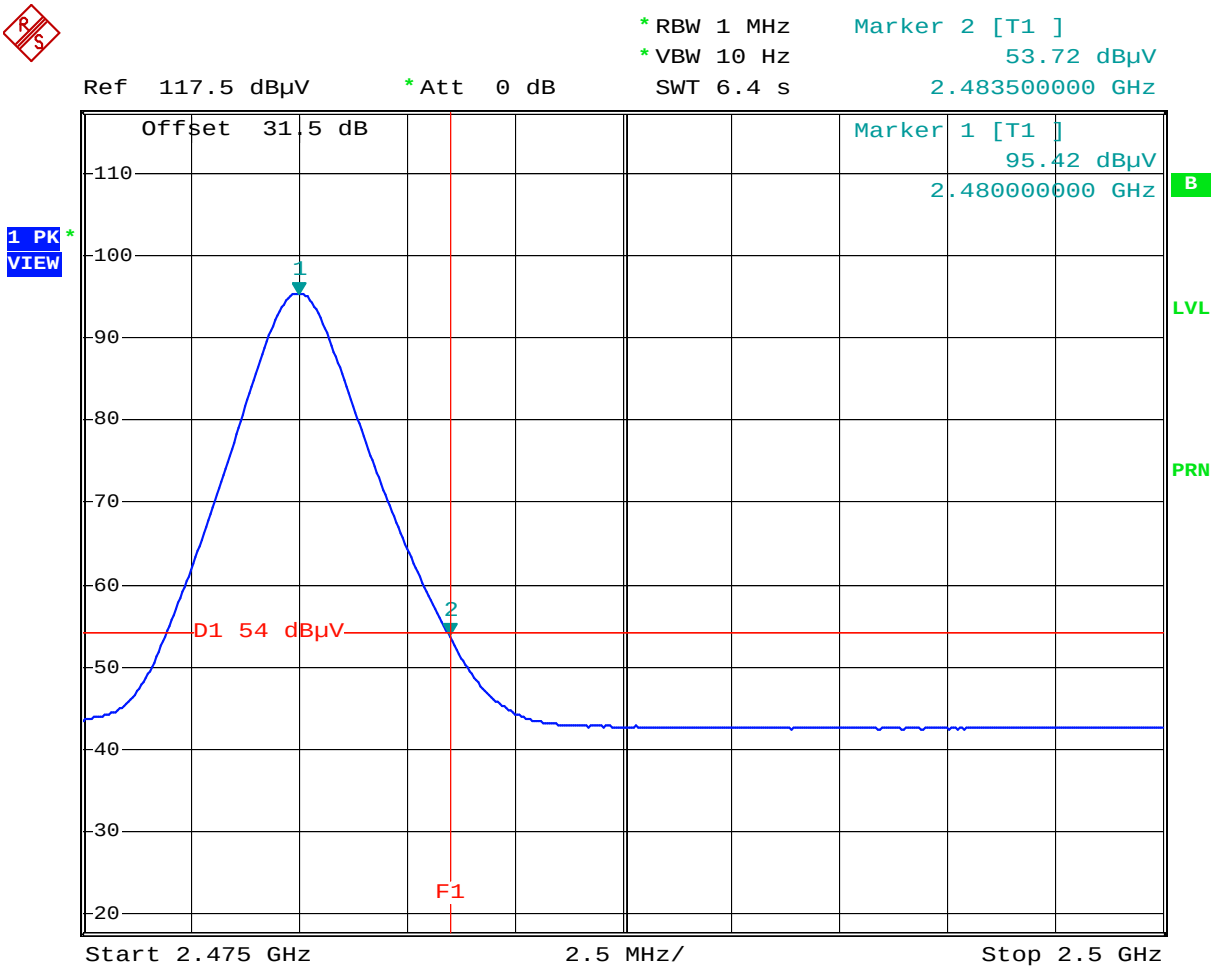
Comment: Band-edge emissions, peak
Date: 18.MAY.2007 19:16:50

Note: Antenna Factor and Cable Loss are included in the SA OFFSET



Comment: Band-edge emissions, peak
Date: 18.MAY.2007 19:26:07

Note: Antenna Factor and Cable Loss are included in the SA OFFSET



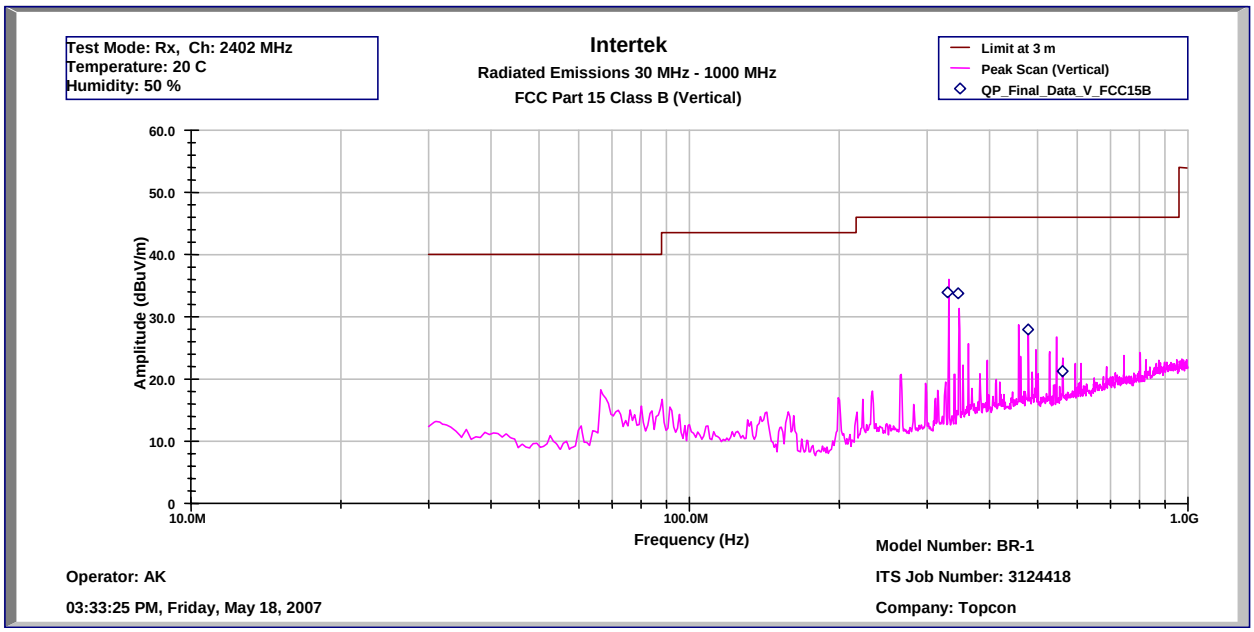
Comment: Band-edge emissions, average
Date: 18.MAY.2007 19:27:21

Note: Antenna Factor and Cable Loss are included in the SA OFFSET

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. All other emissions not reported are at least 10 dB below the limit

The EUT passed by 12.1 dB.



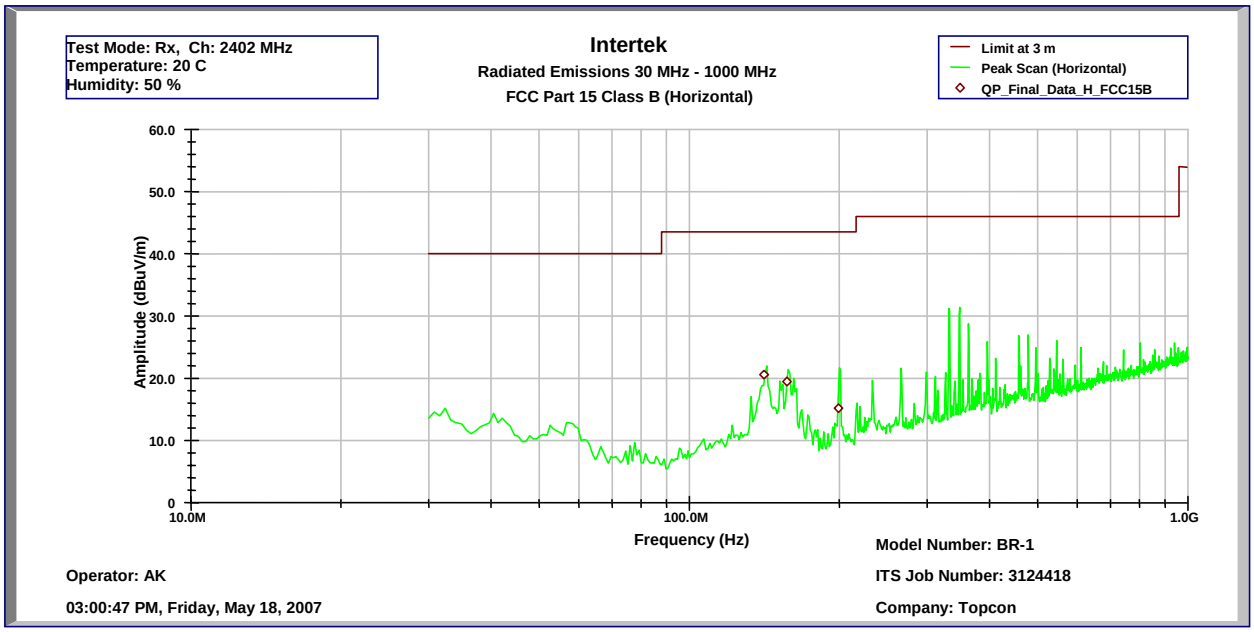
Intertek
Radiated Emissions 30 MHz - 1000 MHz
FCC Part 15 Class B (QP-Vertical)

Operator: AK
03:33:25 PM, Friday, May 18, 2007

Model Number: BR-1
ITS Job Number: 3124418
Company: Topcon

Frequency	Quasi Pk FS	Limit@3m	Margin	RA	AG	CF	AF	Atten.
MHz	dB(uV/m)	dB(uV/m)	dB	dB(uV/m)	dB	dB	dB(1/m)	dB
330.004	33.9	46.0	-12.1	44.9	31.2	2.7	14.5	3.0
346.505	33.8	46.0	-12.2	44.5	31.2	2.7	14.8	3.0
478.507	28.0	46.0	-18.0	35.9	31.2	3.3	17.0	3.0
561.013	21.3	46.0	-24.7	27.9	31.2	3.7	17.9	3.0

Test Mode: Rx, Ch: 2402 MHz
Temperature: 20 C
Humidity: 50 %



Intertek
Radiated Emissions 30 MHz - 1000 MHz
FCC Part 15 Class B (QP-Horizontal)

Operator: AK
03:00:47 PM, Friday, May 18, 2007

Model Number: BR-1
ITS Job Number: 3124418
Company: Topcon

Frequency	Quasi Pk FS	Limit@3m	Margin	RA	AG	CF	AF	Atten
MHz	dB(uV/m)	dB(uV/m)	dB	dB(uV)	dB	dB	dB(1/m)	dB
141.276	20.6	43.5	-22.9	37.2	31.2	1.7	9.9	3.0
157.124	19.5	43.5	-24.0	37.1	31.2	1.8	8.8	3.0
199.256	15.2	43.5	-28.3	30.8	31.2	2.0	10.6	3.0

Test Mode: Rx, Ch: 2402 MHz
Temperature: 20 C
Humidity: 50 %

4.10 AC Line Conducted Emission
FCC 15.207:

4.10.1 Test Limits

Table 3-2 FCC Part 15 Subpart B, and ICES 003 Limits for Conducted Emissions at the AC Mains Ports

Frequency Band MHz	Class A Limit dB (μV)		Class B Limit dB (μV)	
	Quasi-Peak	Average	Quasi-Peak	Average
0.15-0.50	79	66	66 to 56 Decreases linearly with the logarithm of the frequency	56 to 46 Decreases linearly with the logarithm of the frequency
0.50-5.00	73	60	56	46
5.00-30.00	73	60	60	50

Note: At the transition frequency the lower limit applies.

4.10.2 Test Procedure

Measurements are carried out using quasi-peak and average detector receivers in accordance with CISPR 16. A LISN is required to provide a defined impedance at high frequencies across the power feed at the point of measurement of terminal voltage and also to provide isolation of the circuit under test from the ambient noise on the power lines. A LISN as defined in CISPR 16 shall be used.

The EUT is located so that the distance between the boundary of the EUT and the closest surface of the LISN is 0.8m.

Where a flexible mains cord is provided by the manufacturer, this shall be 1m long or if in excess of 1m, the excess cable is folded back and forth as far as possible so as to form a bundle not exceeding 0.4m in length.

The EUT is arranged and connected with cables terminated in accordance with the product specification.

Conducted disturbance is measured between the phase lead and the reference ground, and between the neutral lead and the reference ground. Both measured values are reported.

The EUT, where intended for tabletop use, is placed on a table whose top is 0.8m above the ground plane. A vertical, metal reference plane is placed 0.4m from the EUT. The vertical metal reference-plane is at least 2m by 2m. The EUT shall be kept at least 0.8m from any other metal surface or other ground plane not being part of the EUT. The table is constructed of non-conductive materials. Its dimensions are 1m by 1.5m, but July be extended for larger EUT.

Floor standing EUTs are placed on a horizontal metal ground plane and isolated from the ground plane by 3 to 12 mm of insulating material. The metal ground plane extends at least 0.5m beyond the boundaries of the EUT and has minimum dimensions of 2m by 2m.

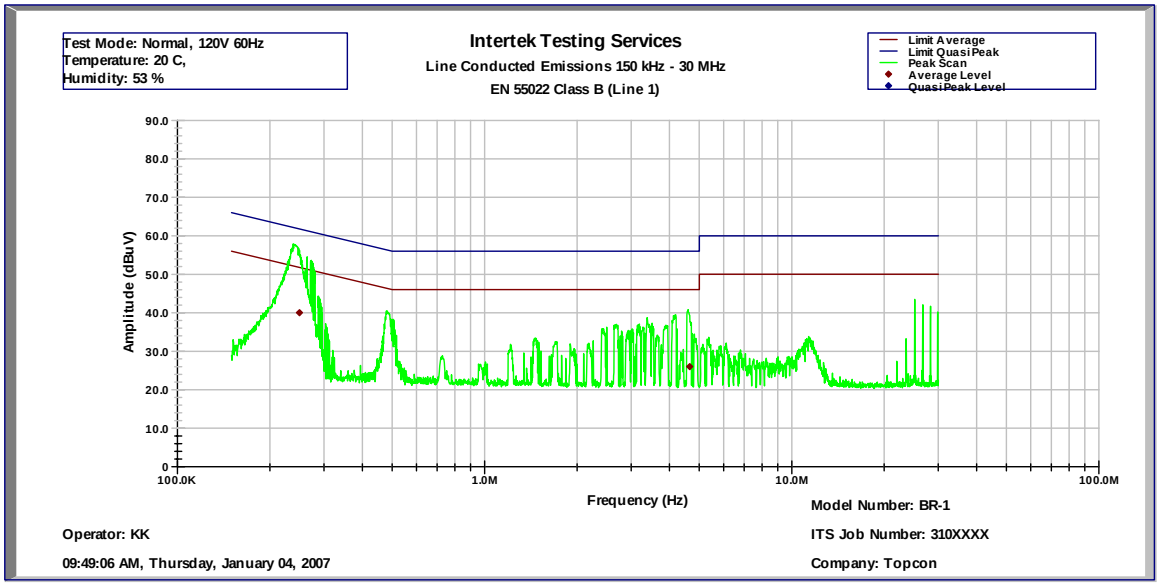
Equipment setup for conducted disturbance tests followed the guidelines of ANSI C63.4 (2003).

4.10.3 Test Results

Tested By:	Krishna K Vemuri
Test Date:	January 2, 2007

The EUT met the conducted disturbance requirement of FCC Part 15 and ICES 003 for a Class B device.

FCC 15B Conducted Disturbance at AC Mains



Intertek Testing Services
Line Conducted Emissions 150 kHz - 30 MHz
FCC Part 15/EN 55022 Class B (Line 1)

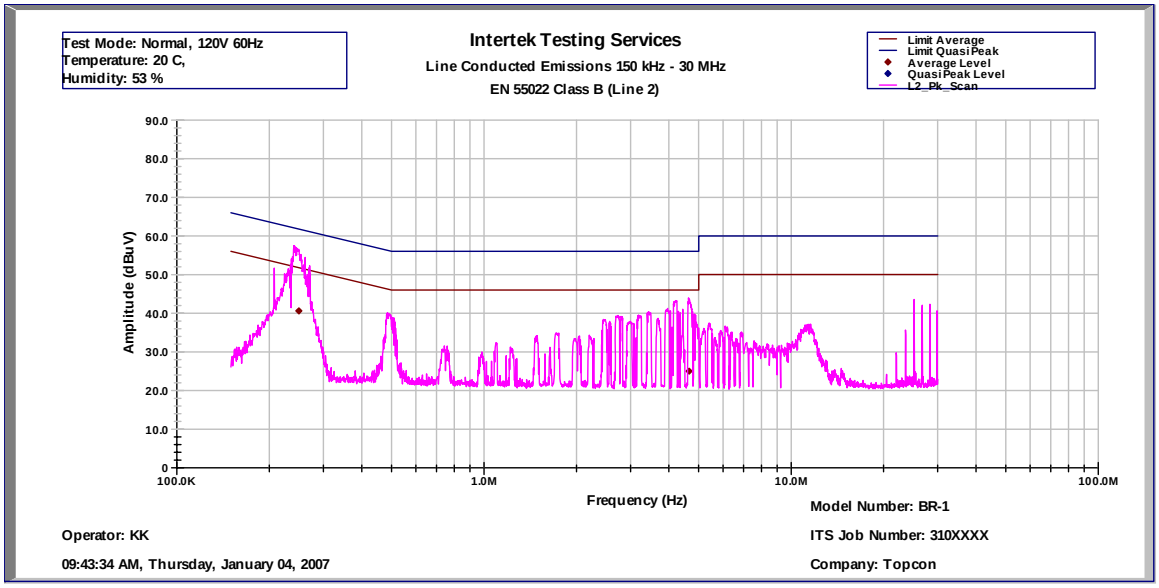
Operator: KK — Model Number: BR-1

09:49:06 AM, Thursday, January 04, 2007 — Company: Topcon

Frequency	Pk Level	Av Level	QP Level	Av Limit	QP Limit	Margin
MHz	(dBuV)	(dBuV)	(dBuV)	(dBuV)	(dBuV)	(dB)
0.249	57.9	40.0	-	53.5	63.5	-5.6
4.66	40.8	26.0	-	46.0	56.0	-15.2

Test Mode: Normal, 120V 60Hz
Temperature: 20 C,
Humidity: 53 %

FCC 15B Conducted Disturbance at AC Mains



Intertek Testing Services
Line Conducted Emissions 150 kHz - 30 MHz
FCC Part 15/EN 55022 Class B (Line 2)

Operator: KK — Model Number: BR-1

09:43:34 AM, Thursday, January 04, 2007 — Company: Topcon

Frequency	Pk Level	Av Level	QP Level	Av Limit	QP Limit	Margin
MHz	(dBuV)	(dBuV)	(dBuV)	(dBuV)	(dBuV)	(dB)
0.249	56.2	40.6	-	53.5	63.5	-7.3
4.65	43.9	25.0	-	46.0	56.0	-12.1

Test Mode: Normal, 120V 60Hz
Temperature: 20 C,
Humidity: 53 %

Results: **Complies** by 5.6 dB

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	9/11/07
EMI Receiver	Hewlett Packard	8546A	3710A00373	12	9/11/07
EMI Receiver	Rhode-Schwarz	FSP-40	100030	12	9/12/07
BI-Log Antenna	Antenna Research	LPB-2513/A	1154	12	8/29/07
Horn Antenna	EMCO	3115	9170-3712	12	5/10/07
Horn Antenna	EMCO	3160-09	Not Labeled	#	#
Pre-Amplifier	Sonoma Inst.	310	185634	12	8/11/07
Pre-Amplifier	Miteq	AMF-4D-001180-24-10P	799159	12	6/20/07
LISN	FCC	FCC-LISN-50/250-60-2-02	2012	12	7/19/07

No Calibration required

7.0 Document History

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