TEST REPORT

Report Number: 3191467MPK-001
Project Number: 3191467
Report Date: December 03, 2009

Testing performed on the
Advanced Control Pedal & Remote Control Master
for the WHITESTAR Signature™ system NGP680702
Model: Advanced Control Pedal & Remote Control Master 2.0
FCC ID: VGESIGREMM2
IC: 7228A-SIGREMM2
to

FCC Part 15.247 and RSS-210 Annex 8
For

Advanced Medical Optics

Test Performed by:	Test Authorized by:
Intertek	Advanced Medical Optics
1365 Adams Court	1700 E. Saint Andrew Place
Menlo Park, CA 94025	Santa Ana, CA 92705 USA

Prepared by: _____ **Date:** December 03, 2009
Krishna K Vemuri

Reviewed by: _____ **Date:** December 03, 2009
Ollie Moyrong

Report No. 3191467MPK-001

Equipment Under Test:	Advanced Control Pedal & Remote Control Master for the WHITESTAR Signature™ system NGP680702
Trade Name:	Advanced Medical Optics
Model No.:	Advanced Control Pedal & Remote Control Master 2.0
FCC ID:	VGESIGREMM2
IC:	7228A-SIGREMM2
Applicant:	Advanced Medical Optics
Contact:	Mr. Dung Ma
Address:	1700 E. Saint Andrew Place Santa Ana, CA 92705
Country	USA
Tel. Number:	714-247-8579
Fax number:	714-247-8678
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:	September 22 to October 22, 2009

We attest to the accuracy of this report:

Krishna K Vemuri
Test Engineer

Ollie Moyrong
Engineering Manager

TABLE OF CONTENTS

1.0 Introduction

The Equipment under Test (EUT) is a device with one Bluetooth transceivers operating in the 2.4GHz frequency band.

This report is designed to show compliance of the 2.4 GHz transceiver with FCC Part 15.247 and RSS-210 requirements.

1.1 Summary of Tests

TEST	REFERENCE FCC 17.247	REFERENCE RSS-210	RESULTS
Output power	15.247(b)	A8.4(2)	Complies
20-dB Bandwidth	15.247(a)(1)	A8.1(a)	Complies
Channel Separation	15.247(a)(1)	A8.1(b)	Complies
Number of Hopping Channels	15.247(a)(1)	A8.1(d)	Complies
Average Channel Occupancy Time	15.47(a)(1)	A8.1(d)	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	Complies
Radiated Emission in Restricted Bands	15.247(c), 15.205	2.2	Complies
RF exposure	15.247(i)	RSS-102	Complies
AC Conducted Emission	15.207	RSS-GEN	Not Applicable. The EUT does not have any direct connection to public power network. In normal use, EUT is installed inside the host unit and it is DC powered internally.
Radiated Emission from Digital Parts and receiver	15.109	ICES-003	Complies

2.0 General Description

2.1 Product Description

The WHITESTAR Signature Advanced Control Pedal & Remote Control system consists of the Advanced Control Pedal (*[1]RF module for a Foot Pedal control mounted in main system*) and Remote Control Master 2.0 (*[2]RF module for remote control of Monitor mounted in main system*), Advanced Control Pedal Slave (*[3]RF module for a Foot Pedal control mounted outside of main system*) and Remote Control Slave 2.0 (*[4]RF module for remote control of Monitor mounted outside of main system*).

The *[1]RF module for a Foot Pedal control mounted in main system* and *[3]RF module for a Foot Pedal control mounted outside of main system* consists two National Semiconductor's LMX98XX series Bluetooth radios ICs (transceivers), operating in the 2.4 GHz frequency band. Only one transmitter can report the data to the host at any given time. This radio subsystem is used to communicate the footpedal control signal to the WHITESTAR Signature™ system for use in cataract surgery.

The *[2]RF module for remote control of Monitor mounted in main system* and *[4]RF module for remote control of Monitor mounted outside of main system* consists one National Semiconductor's LMX98XX series Bluetooth radios ICs (transceivers), operating in the 2.4 GHz frequency band. This radio subsystem is used to communicate the monitor control signal to the WHITESTAR Signature™ system for use in cataract surgery.

This report covers the *[2]RF module for remote control of Monitor mounted in main system* and the *[1]RF module for a Foot Pedal control mounted in main system* is covered in separate report #3184783MPK-001A.

[3]RF module for a Foot Pedal control mounted outside of main system and *[4]RF module for remote control of Monitor mounted outside of main system* are already FCC and Industry Canada certified.

Overview of the EUT (Master)

Applicant	Advanced Medical Optics 1700 E. Saint Andrew Place Santa Ana, CA 92705 USA
Manufacturer name & address	Advanced Medical Optics 1700 E. Saint Andrew Place Santa Ana, CA 92705 USA
Trade Name & Part No.	Advanced Control Pedal & Remote Control Master 2.0
FCC Identifier	VGESIGREMM2
IC	7228A-SIGREMM2
Use of Product	WhiteStar Signature Remote Control system
Type of Transmission	Spread Spectrum, Frequency Hopping
Rated RF Output	0.123 mW
Frequency Range	2402-2480 MHz
Number of Channel(s)	79
Modulation Type	GFSK
Data Rate	1 Mbps
Antenna(s) type & Gain	On-board antenna, 4.1 dBi

A pre-production version of the sample was received on September 22, 2009 in good condition. As declared by the Applicant, it is identical to production units.

Test start date September 22, 2009
Test end date: October 22, 2009

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). 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 10m semi-anechoic chamber located in Menlo Park, California. This test facility and site measurement data have been fully placed on file with the FCC.

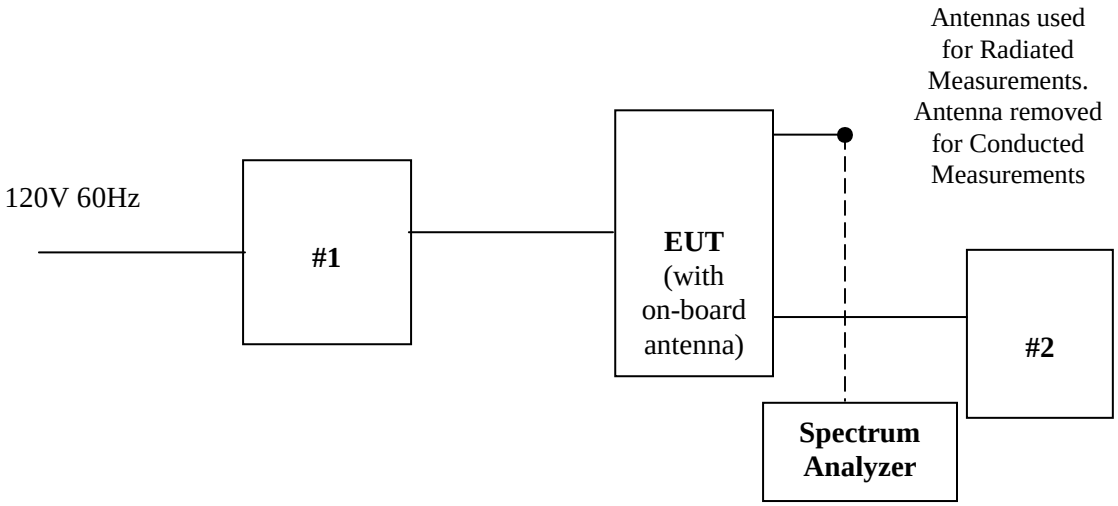
3.0 System Test Configuration

3.1 Support Equipment

Item #	Description	Model No.	Serial No.
1	LAMBDA power supply	Vega 650	2050820220
2	Laptop	Compaq Evo N610c	INTERTEK LAB PC#1

3.2 Block Diagram of Test Setup

The diagram shown below details the interconnection of the EUT and support equipment. For specific layout, refer to the test configuration photograph in the relevant section of this report.



S = Shielded	**F** = With Ferrite
U = Unshielded	**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.

In normal operation, EUT is installed inside the host unit and it is DC powered internally. For testing the EUT was attached to a test board, connected to a laptop, which provides the power to the EUT and control the radio by the test software.

3.4 Software Exercise Program

The EUT exercise program used during radiated and conducted testing was provided by the Applicant.

3.5 Mode of Operation During Test

The EUT was tested in two modes: hopping mode as in normal use and hopping disabled mode in which the EUT was transmitting at the lowest, middle, and highest channels (frequencies).

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 Advanced Medical Optics 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.

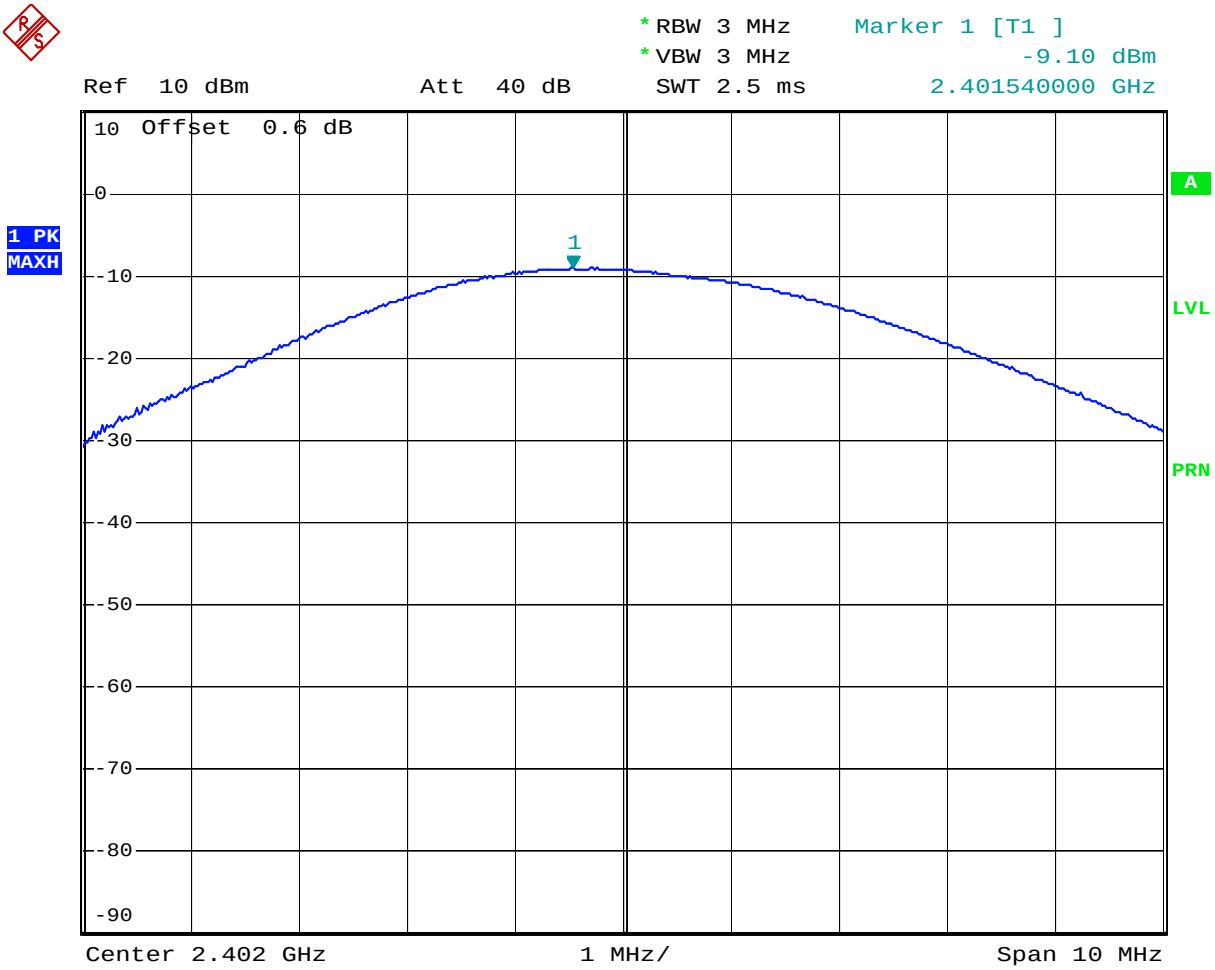
Test Results

Transmitter 1 (Tx1)

Frequency (MHz)	Output in dBm	Output in mW	Plot number
2402	-9.1	0.123	1.1
2440	-9.7	0.107	1.2
2480	-9.4	0.115	1.3

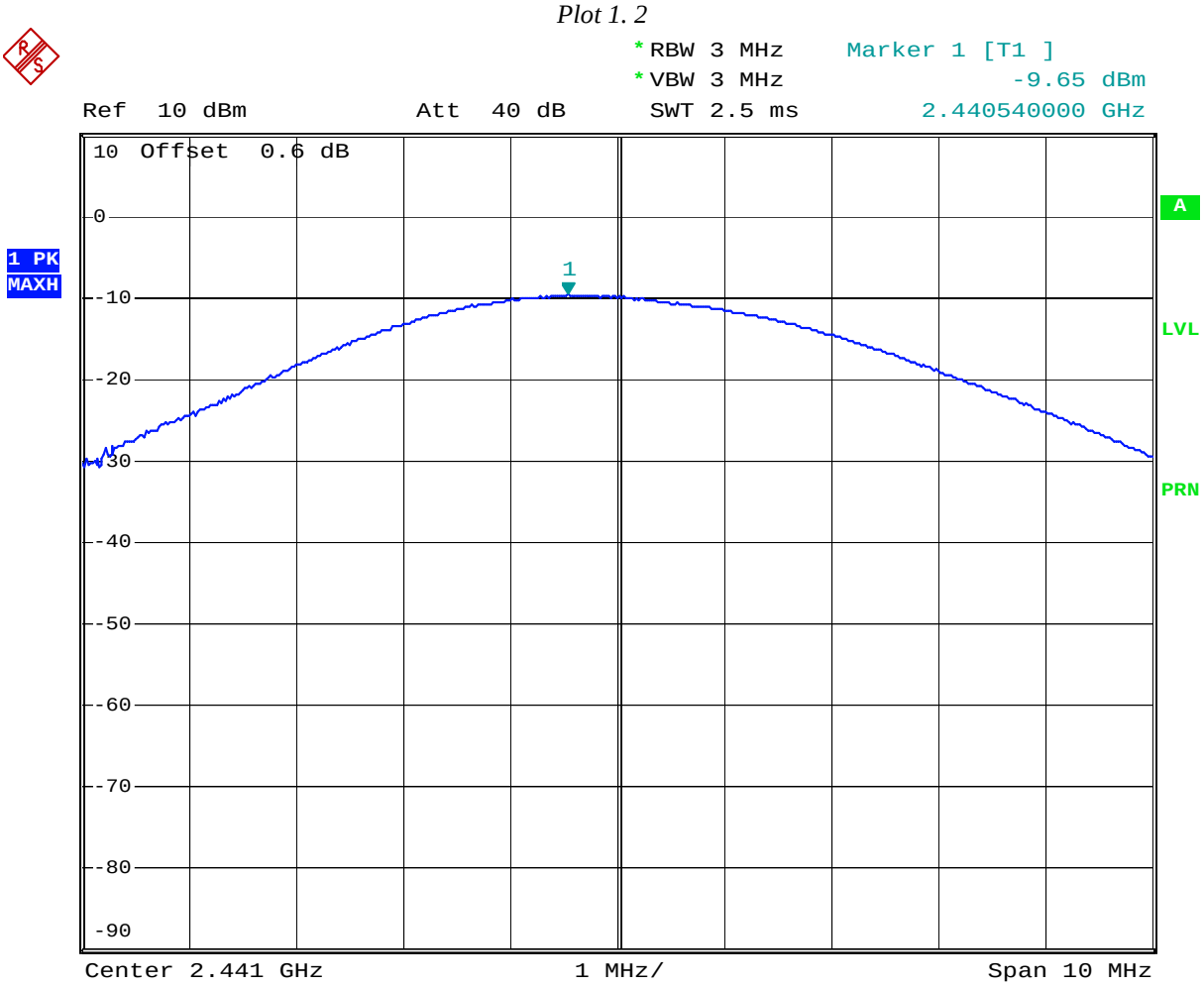
Notes: 1. Hopping function was disabled during the test.
2. The EUT's antenna has less than 6 dBi gain.

Plot 1. 1



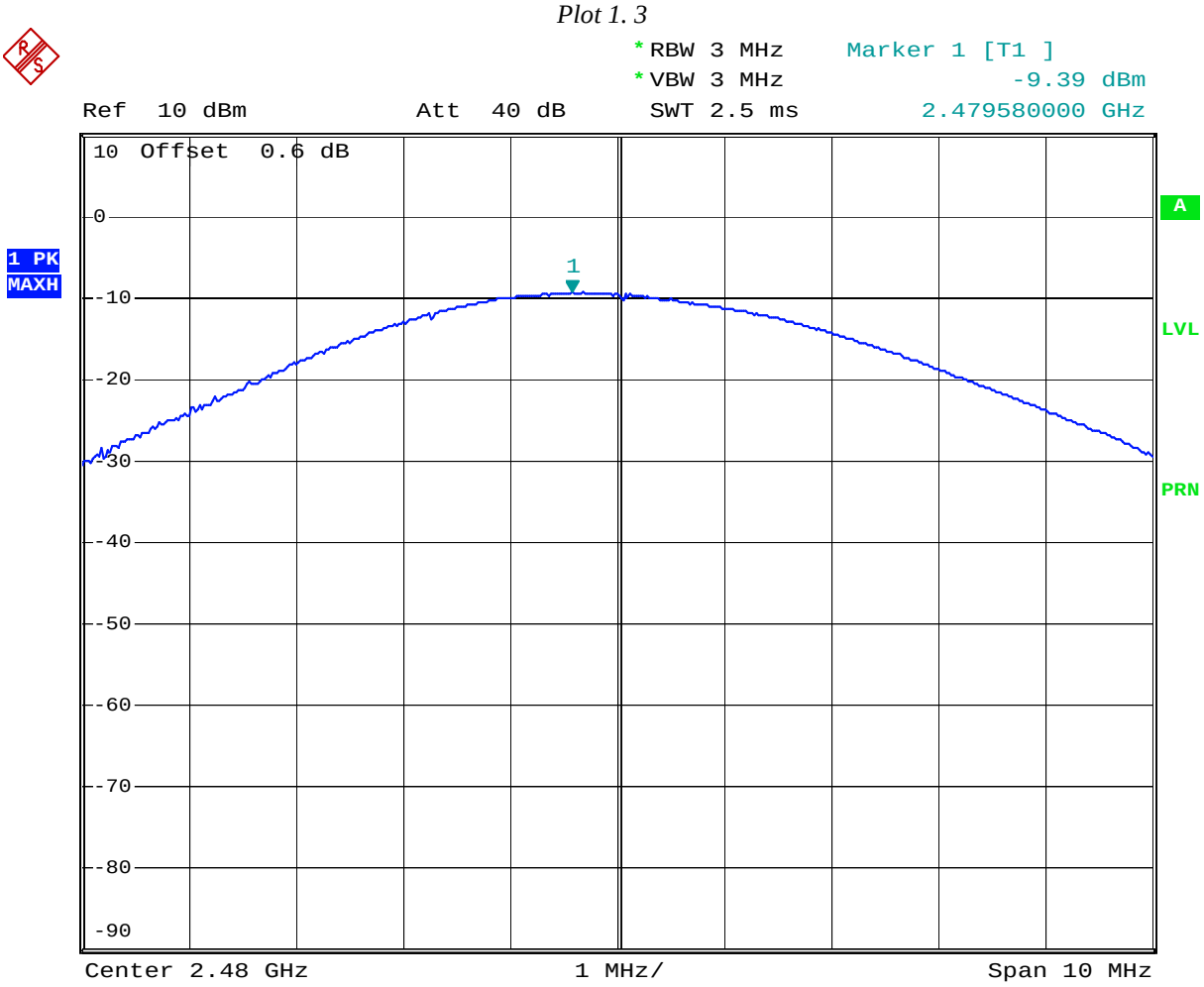
Comment: Output power
Date: 12.OCT.2009 08:02:36

Plot 1. 2



Comment: Output power
Date: 12.OCT.2009 08:04:27

Plot 1. 3



Comment: Output power
Date: 12.OCT.2009 08:06:16

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.

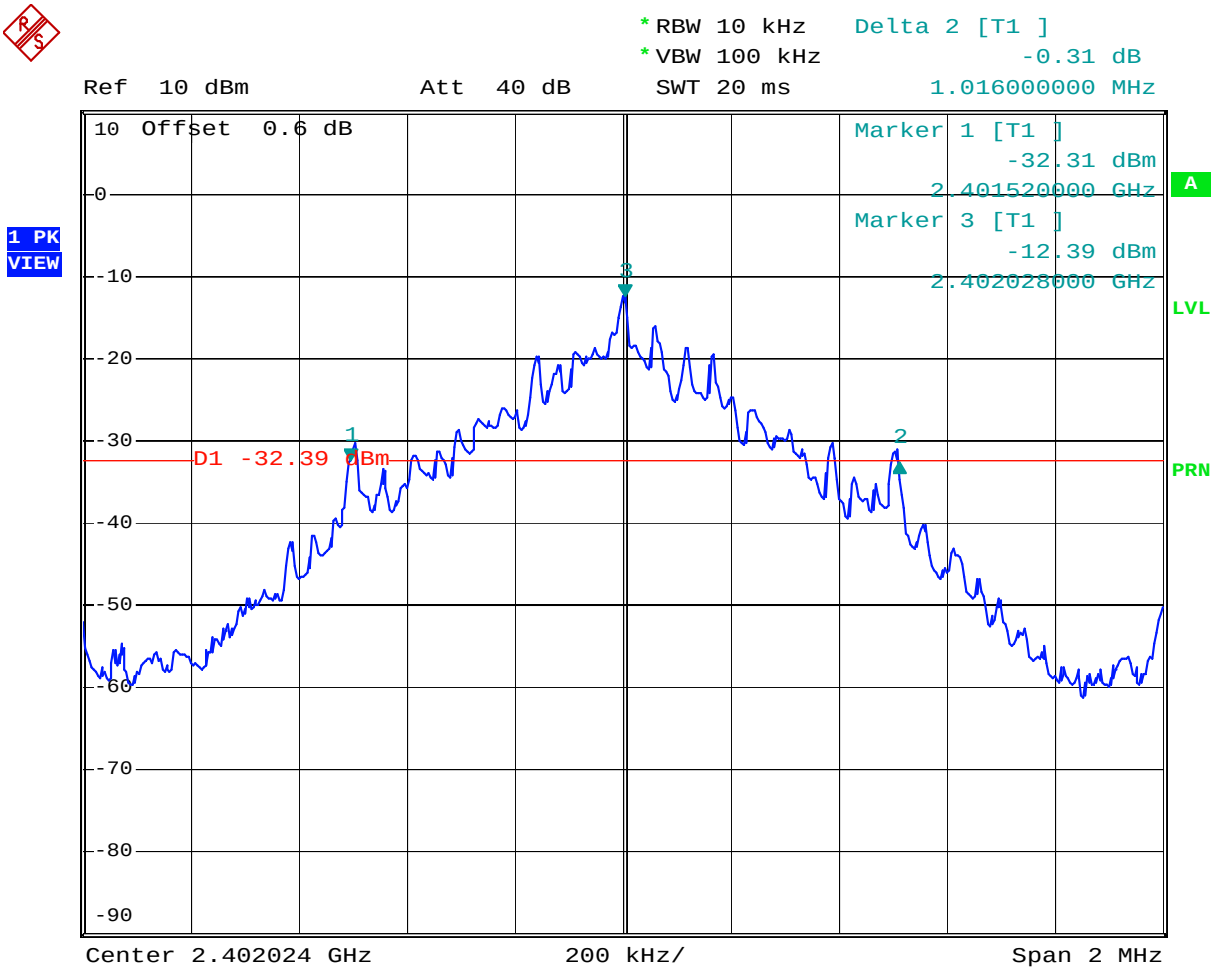
In addition, the occupied bandwidth (99%) was measured.

Test Results

Frequency (MHz)	20-dB channel bandwidth (MHz)	Plot
2402	1.016	2.1
2440	1.020	2.2
2480	1.024	2.3

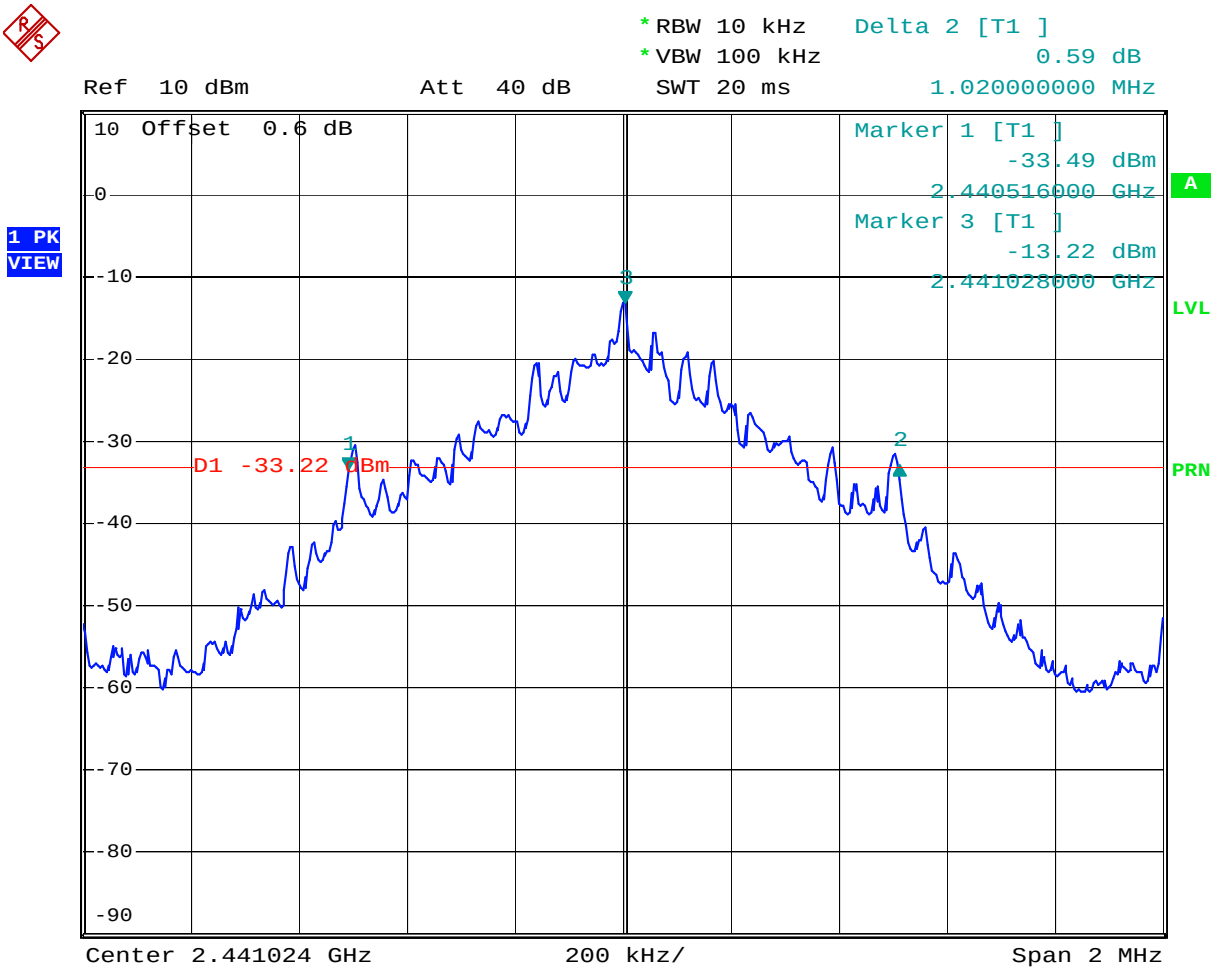
Frequency (MHz)	Occupied bandwidth (MHz)	Plot
2402	0.984	2.4
2440	0.984	2.5
2480	0.988	2.6

Plot 2. 1



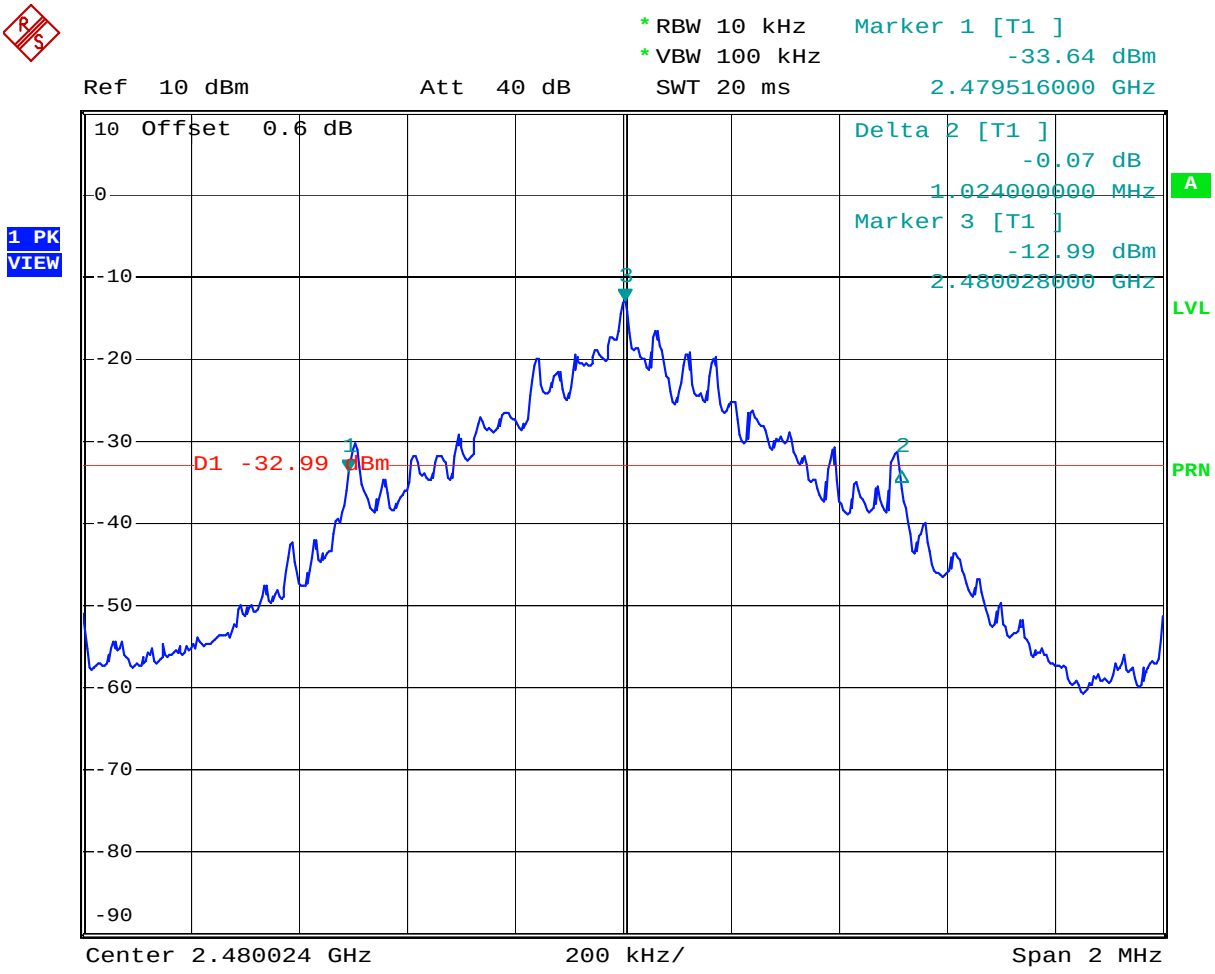
Comment: 20-dB Bandwidth
Date: 12.OCT.2009 09:16:13

Plot 2. 2



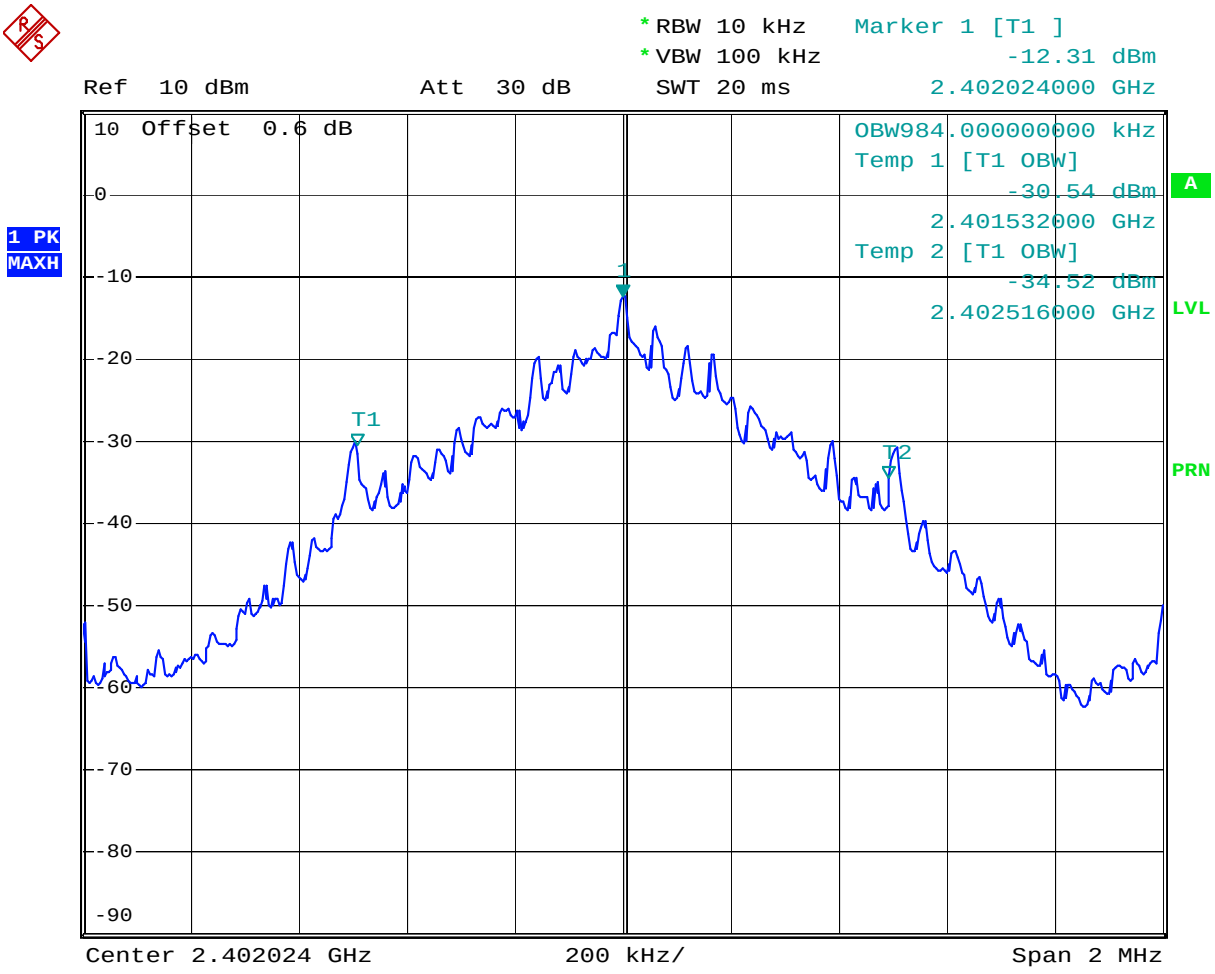
Comment: 20-dB Bandwidth
Date: 12.OCT.2009 09:57:26

Plot 2. 3



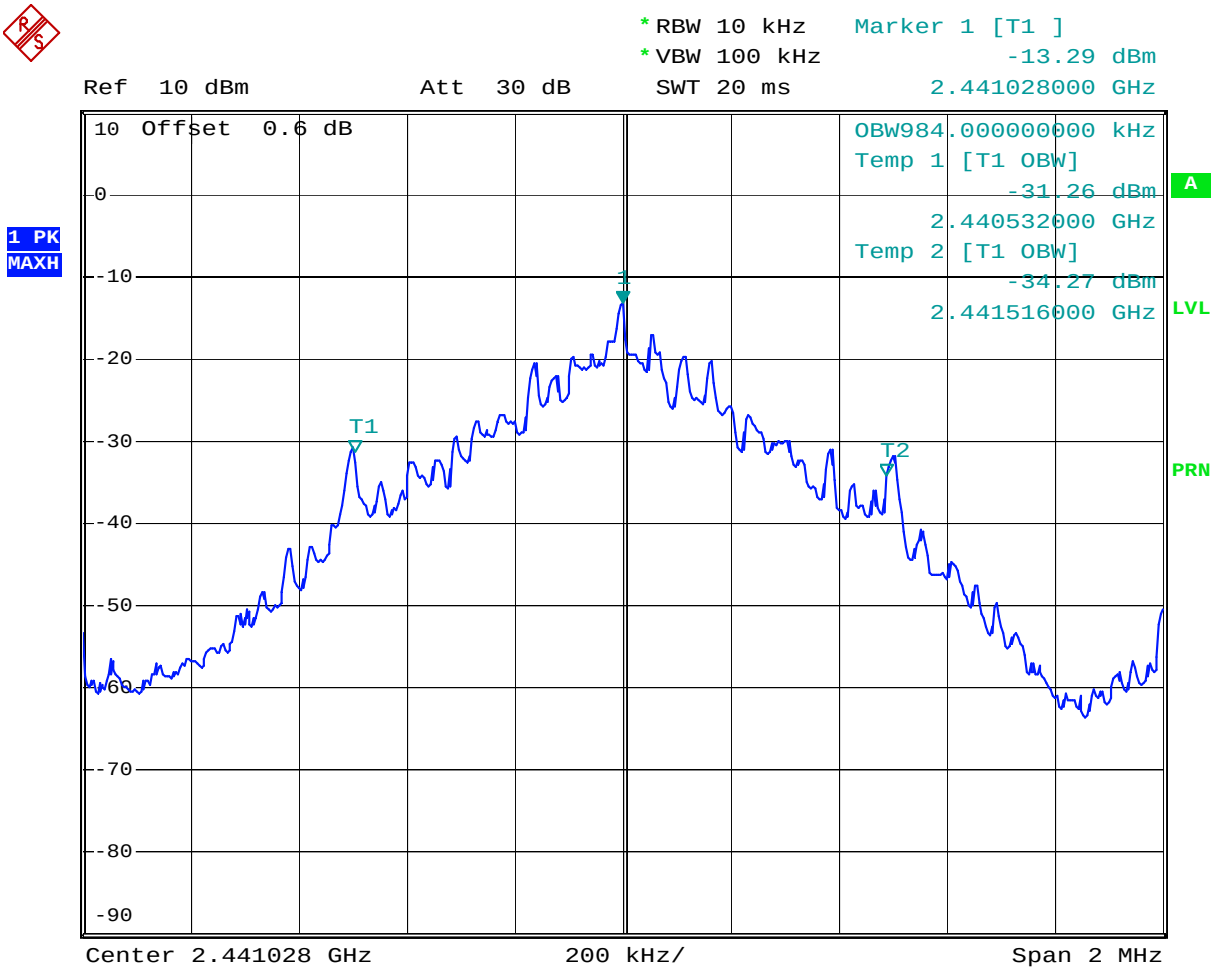
Comment: 20-dB Bandwidth
Date: 12.OCT.2009 10:06:40

Plot 2. 4



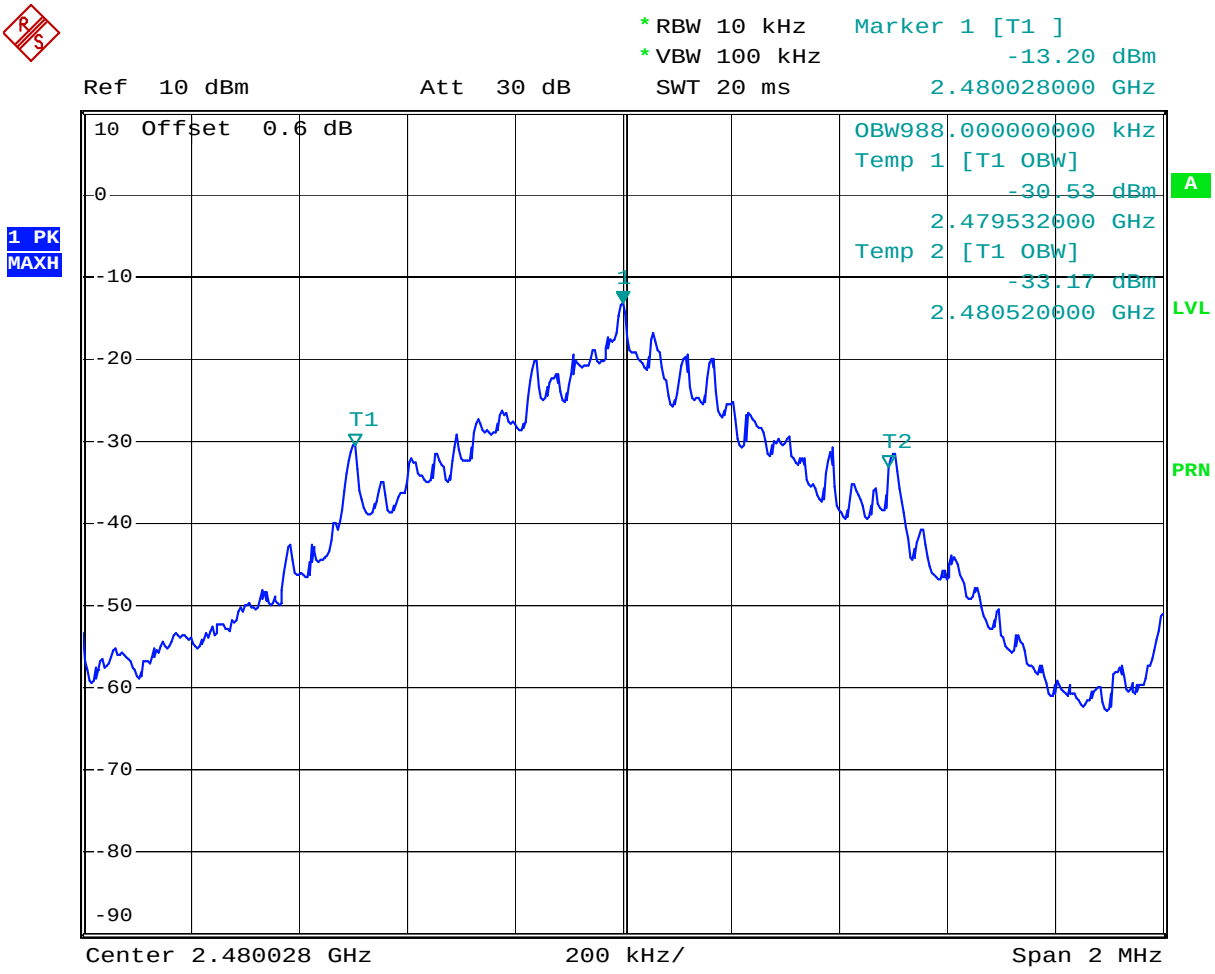
Comment: Occupied Bandwidth
Date: 12.OCT.2009 10:09:17

Plot 2. 5



Comment: Occupied Bandwidth
Date: 12.OCT.2009 10:10:13

Plot 2. 6



Comment: Occupied Bandwidth
Date: 12.OCT.2009 10:11:11

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.

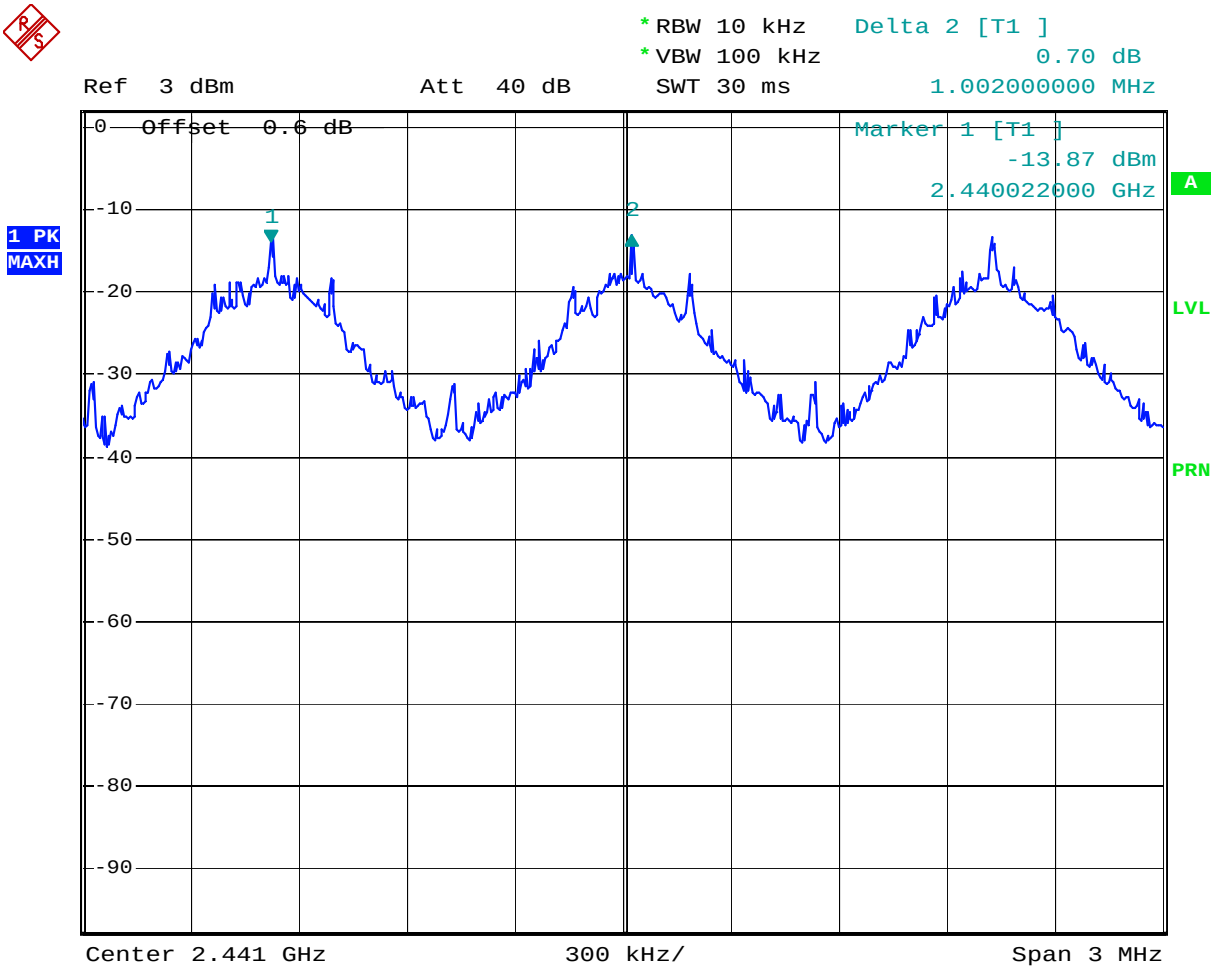
Procedure

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 1.002MHz.

Plot 3. 1



Comment: Carrier frequency separation
Date: 12.OCT.2009 12:24:41

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

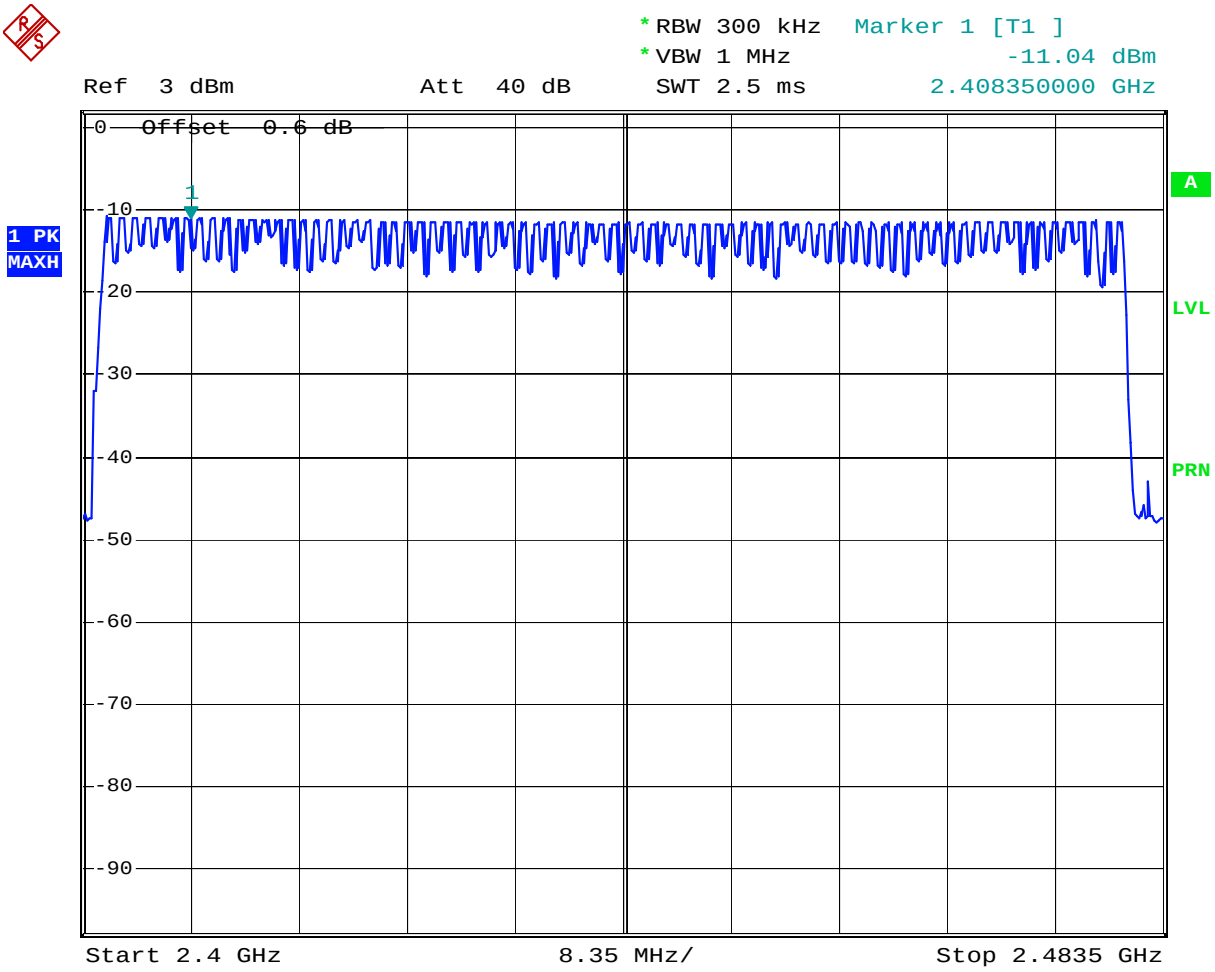
With the analyzer set to MAX HOLD, readings were taken for 2 - 3 minutes The channel peaks so recorded and compared to the minimum number of channels required in the regulation.

Test Results

Number of hopping channels	79

Refer to attached spectrum analyzer charts: Plots 4.1

Plot 4. 1



Comment: Number of hopping channels
Date: 12.OCT.2009 12:16:34

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.

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

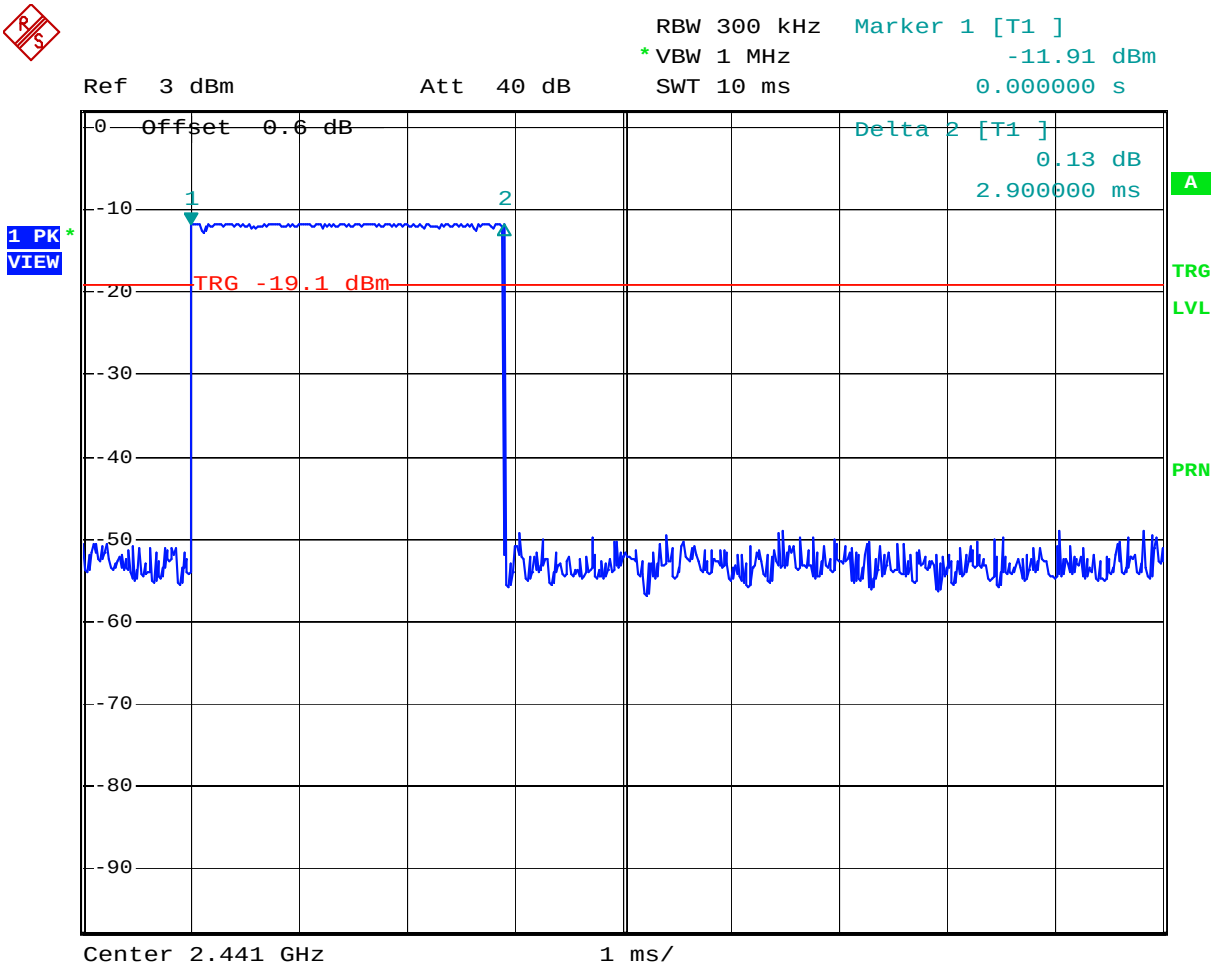
Test Results

Occupancy Time (see plots 5.1 and 5.2)

0.00290* 13 *10 = 0.377 sec.

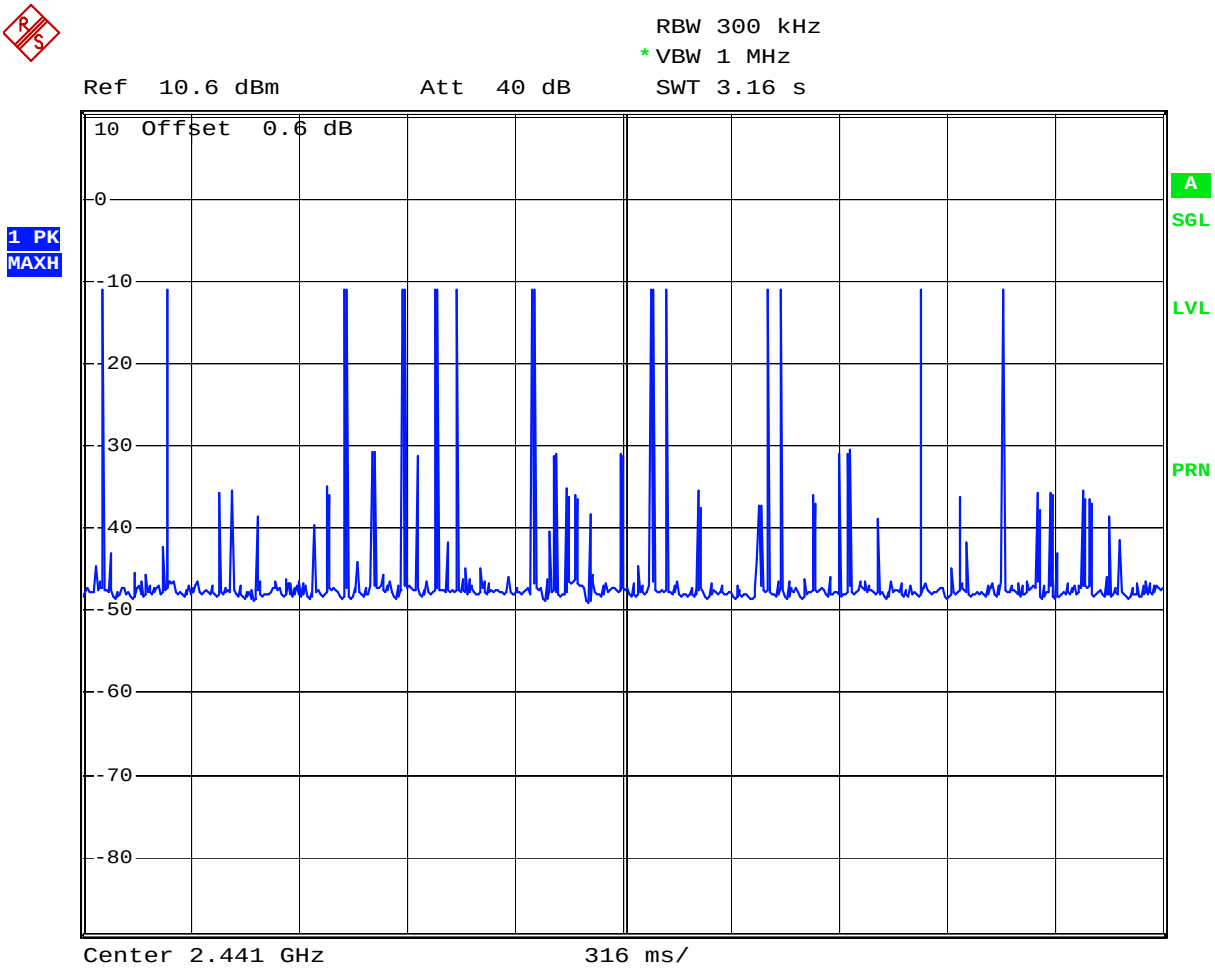
Refer to attached spectrum analyzer plots 5.1-5.2 for details.

Plot 5. 1



Comment: Dwell time
Date: 12.OCT.2009 12:33:46

Plot 5. 2



Comment: Dwell time
Date: 12.OCT.2009 13:41:04

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.

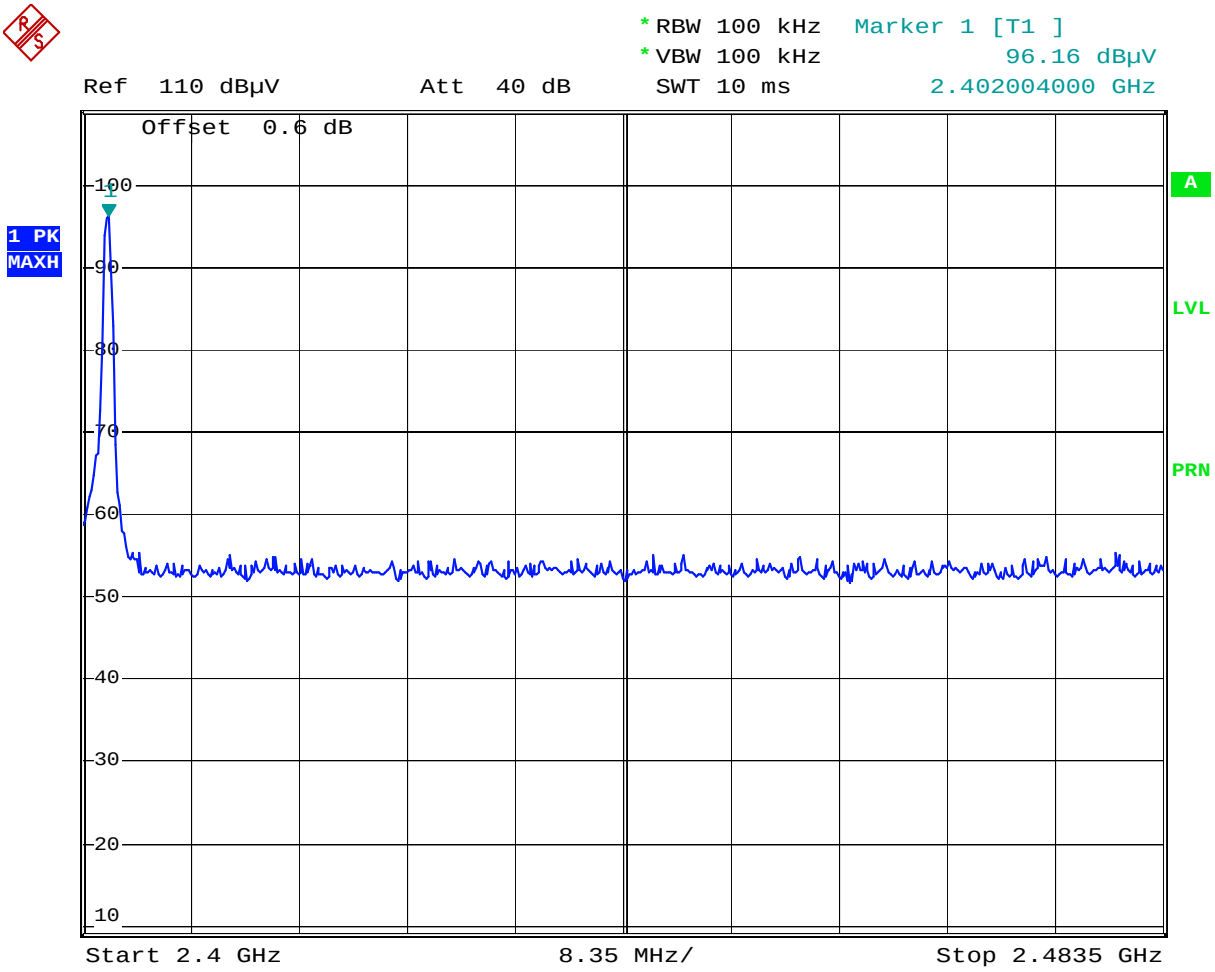
Test Result

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		6.5
In-band Emissions, F=2480 MHz		6.9
Emissions on the low band-edge frequency	Fixed channel, 2402 MHz	6.13
Emissions on the low band-edge frequency	Hopping mode	6.14
Emissions on the high band-edge frequency	Fixed channel, 2480 MHz	6.15
Emissions on the high band-edge frequency	Hopping mode	6.16
Out-of-band low Channel Emissions	Fixed channel, 2402 MHz	6.2 – 6.4
Out-of-band middle Channel Emissions	Fixed channel, 2441 MHz	6.6 – 6.8
Out-of-band high Channel Emissions	Fixed channel, 2480 MHz	6.10 – 6.12

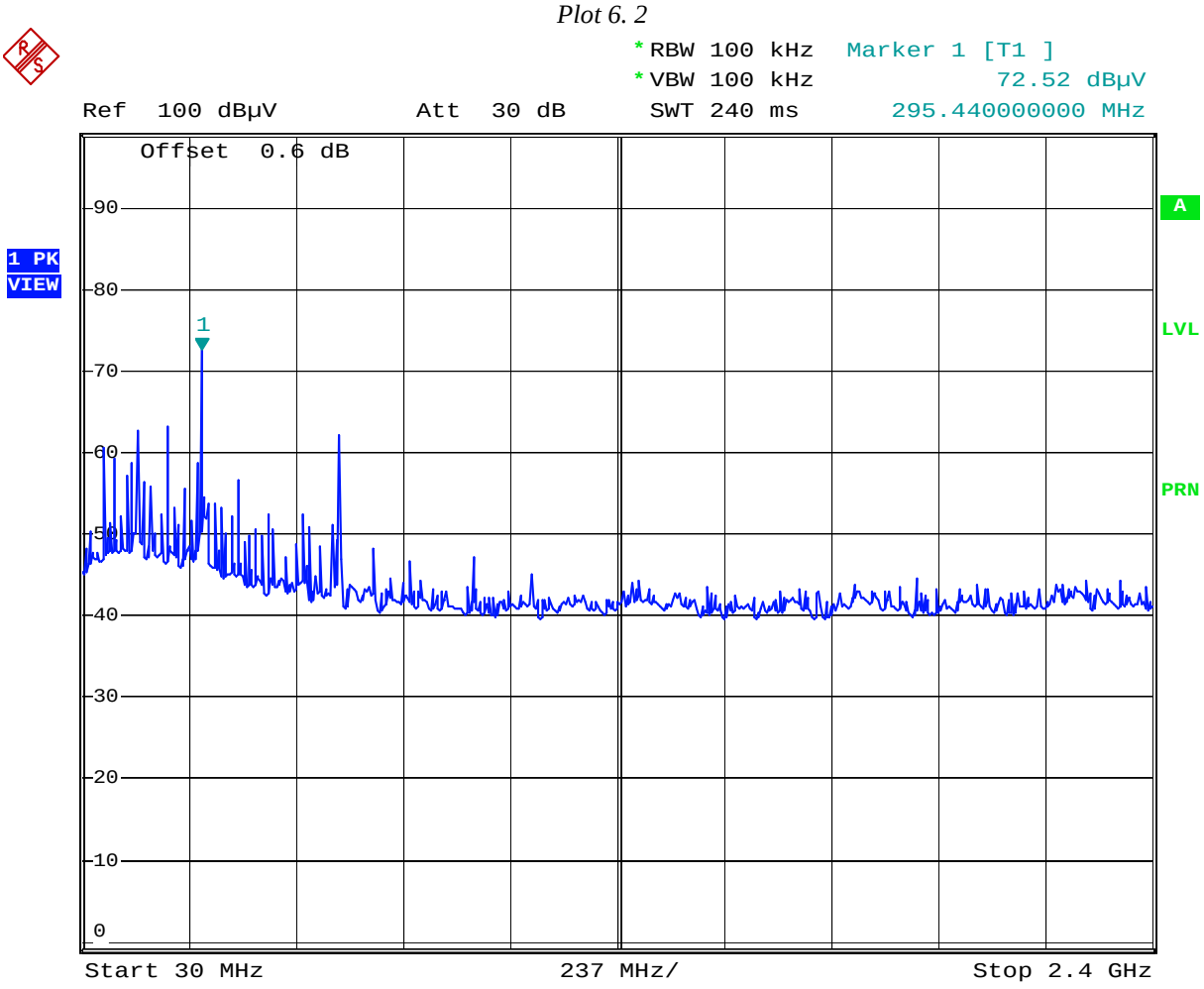
The attenuation is more than 20 dB.

Plot 6. 1



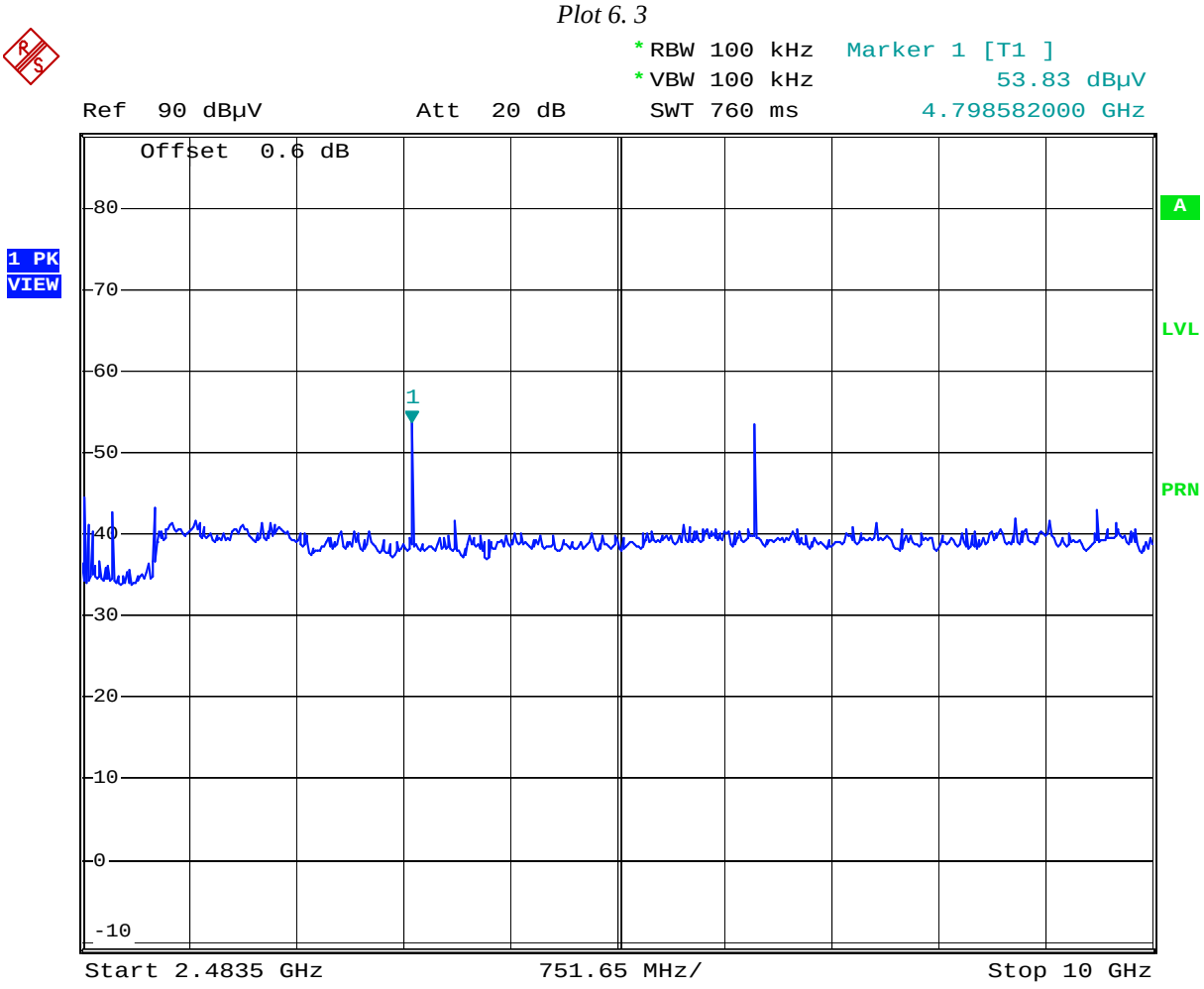
Comment: In-band emissions, Freq 2402MHz
Date: 12.OCT.2009 10:23:14

Plot 6. 2



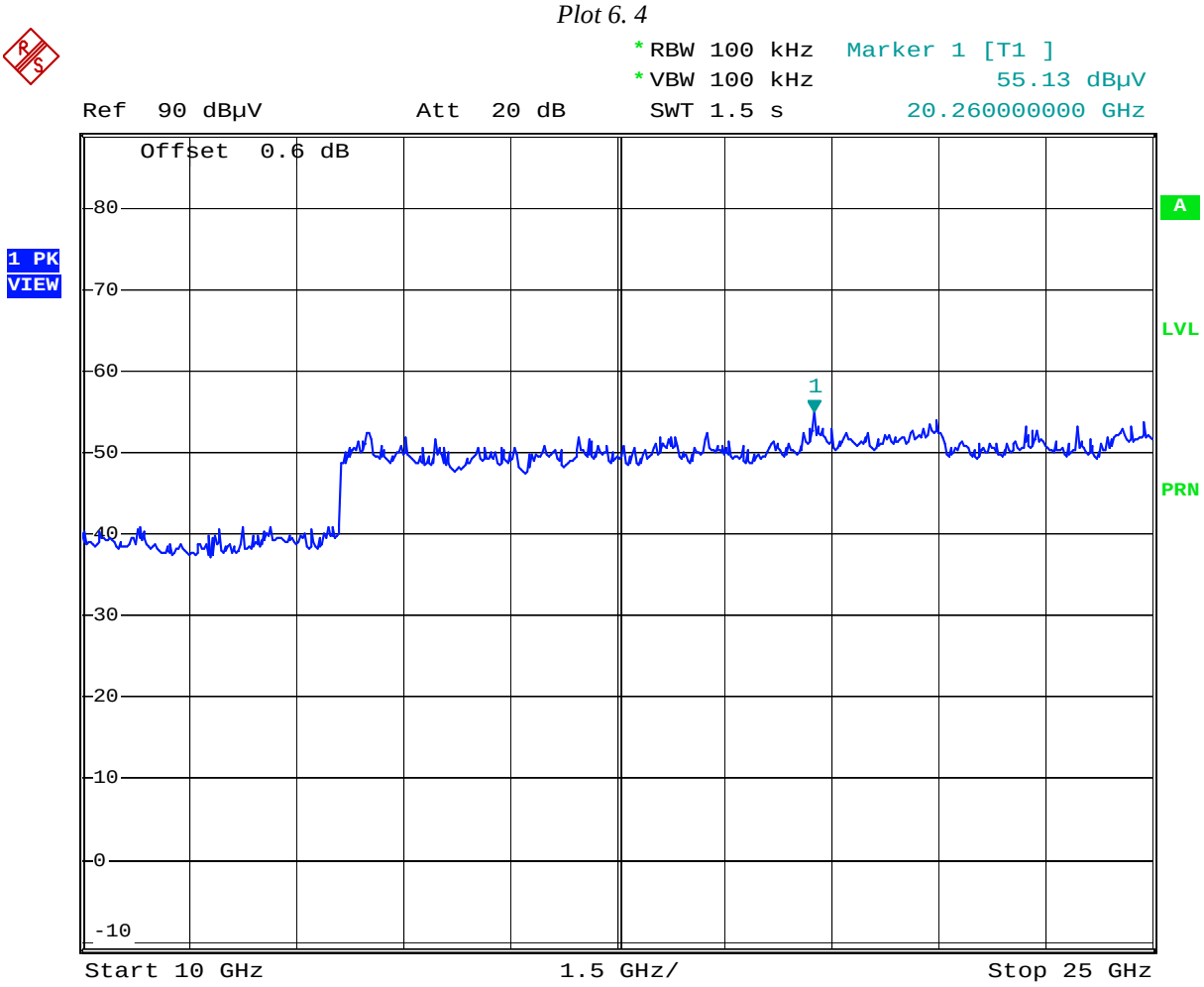
Comment: Spurious emissions, Freq 2402MHz
Date: 12.OCT.2009 10:41:35

Plot 6. 3



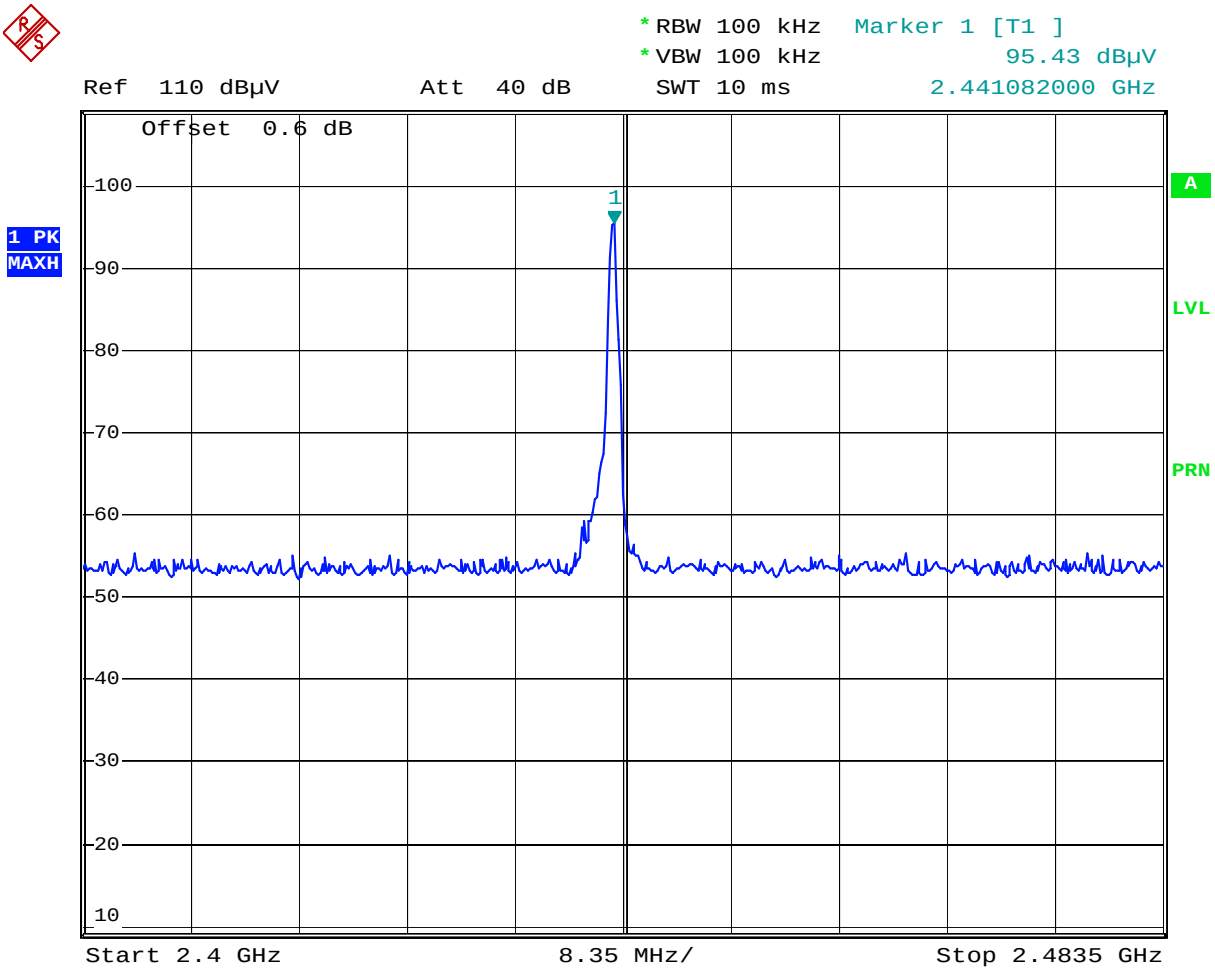
Comment: Spurious emissions, Freq 2402MHz
Date: 12.OCT.2009 10:43:52

Plot 6. 4



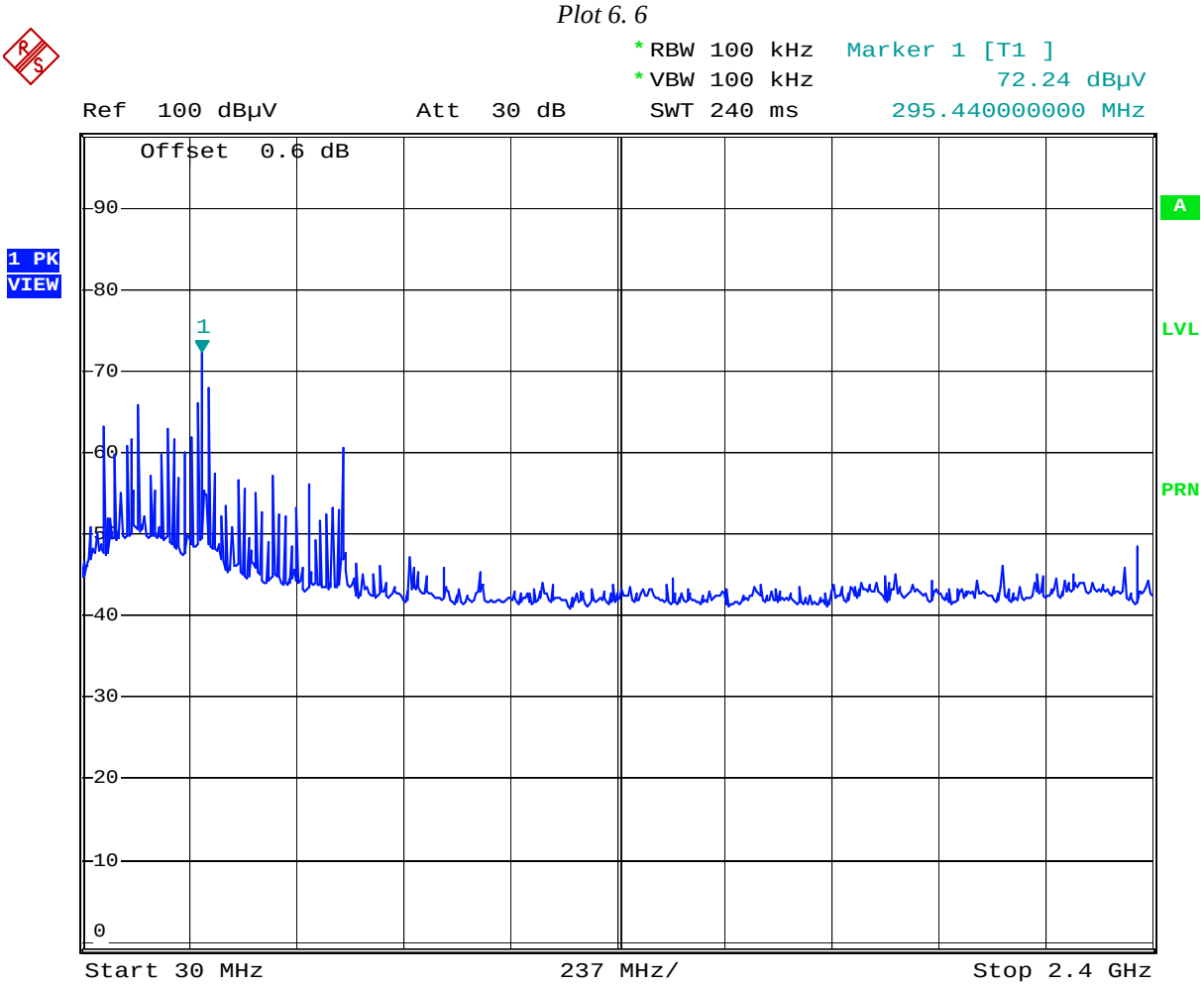
Comment: Spurious emissions, Freq 2402MHz
Date: 12.OCT.2009 10:45:09

Plot 6. 5



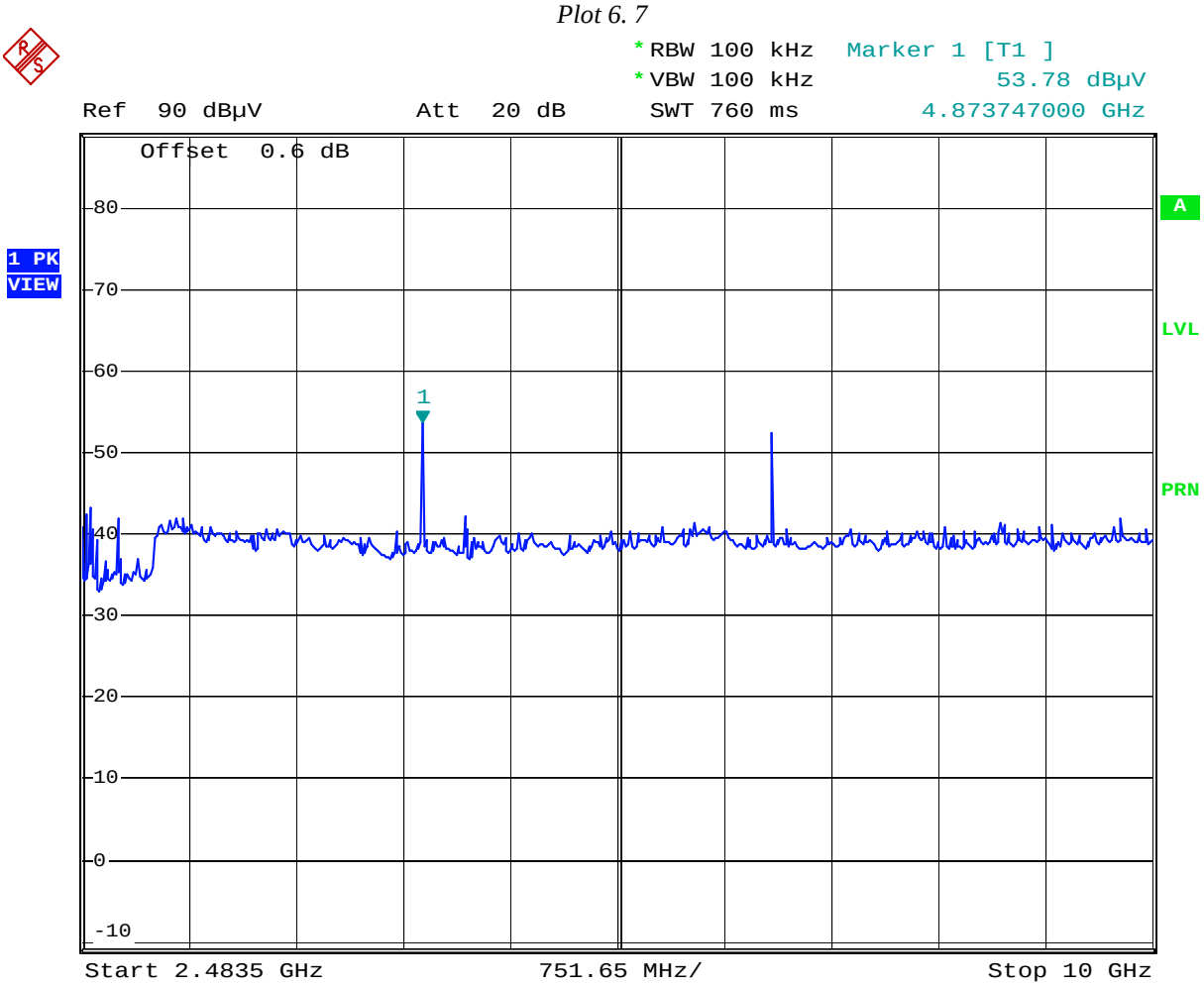
Comment: In-band emissions, Freq 2441MHz
Date: 12.OCT.2009 10:51:40

Plot 6. 6



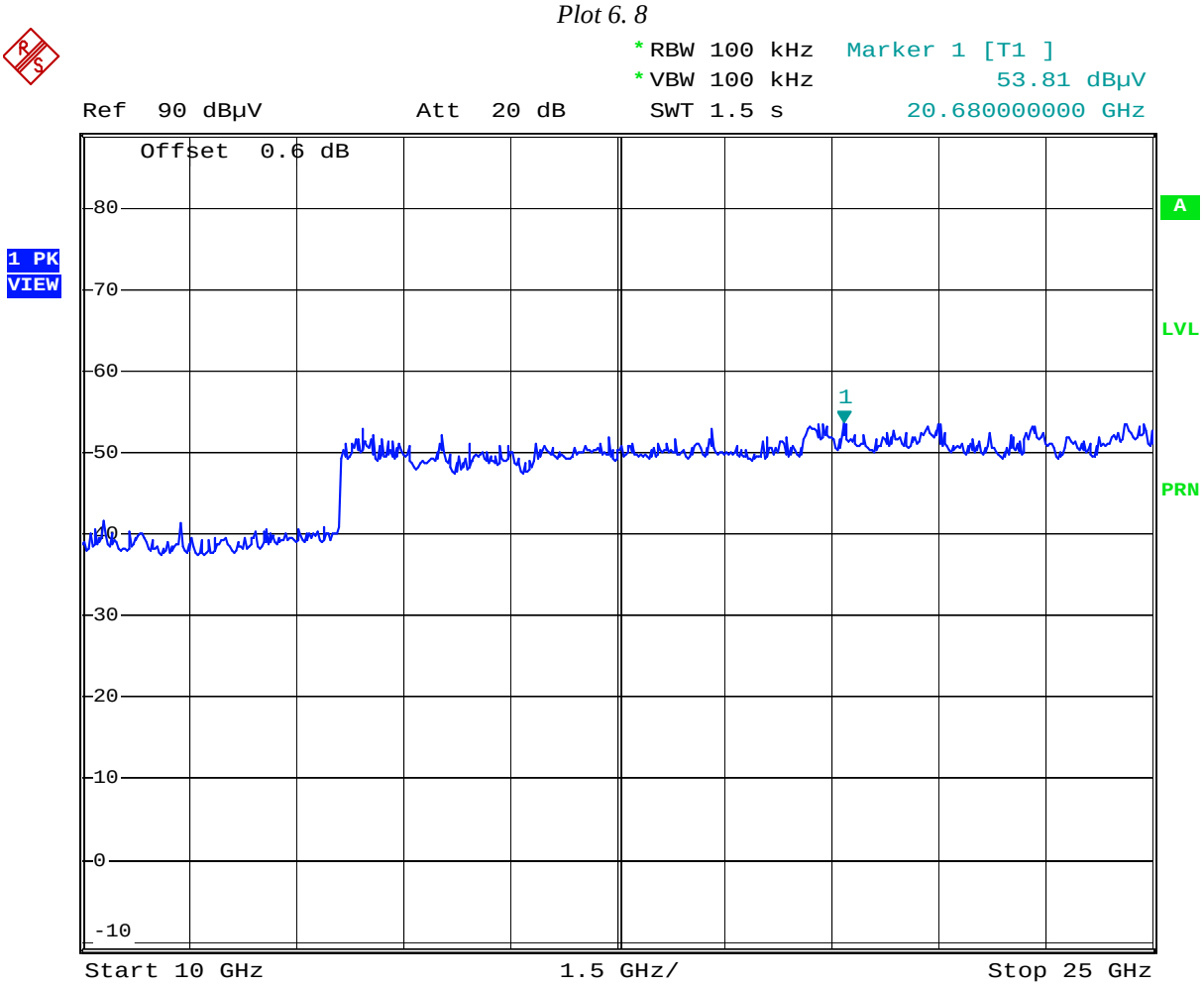
Comment: Spurious emissions, Freq 2441MHz
Date: 12.OCT.2009 10:53:58

Plot 6. 7



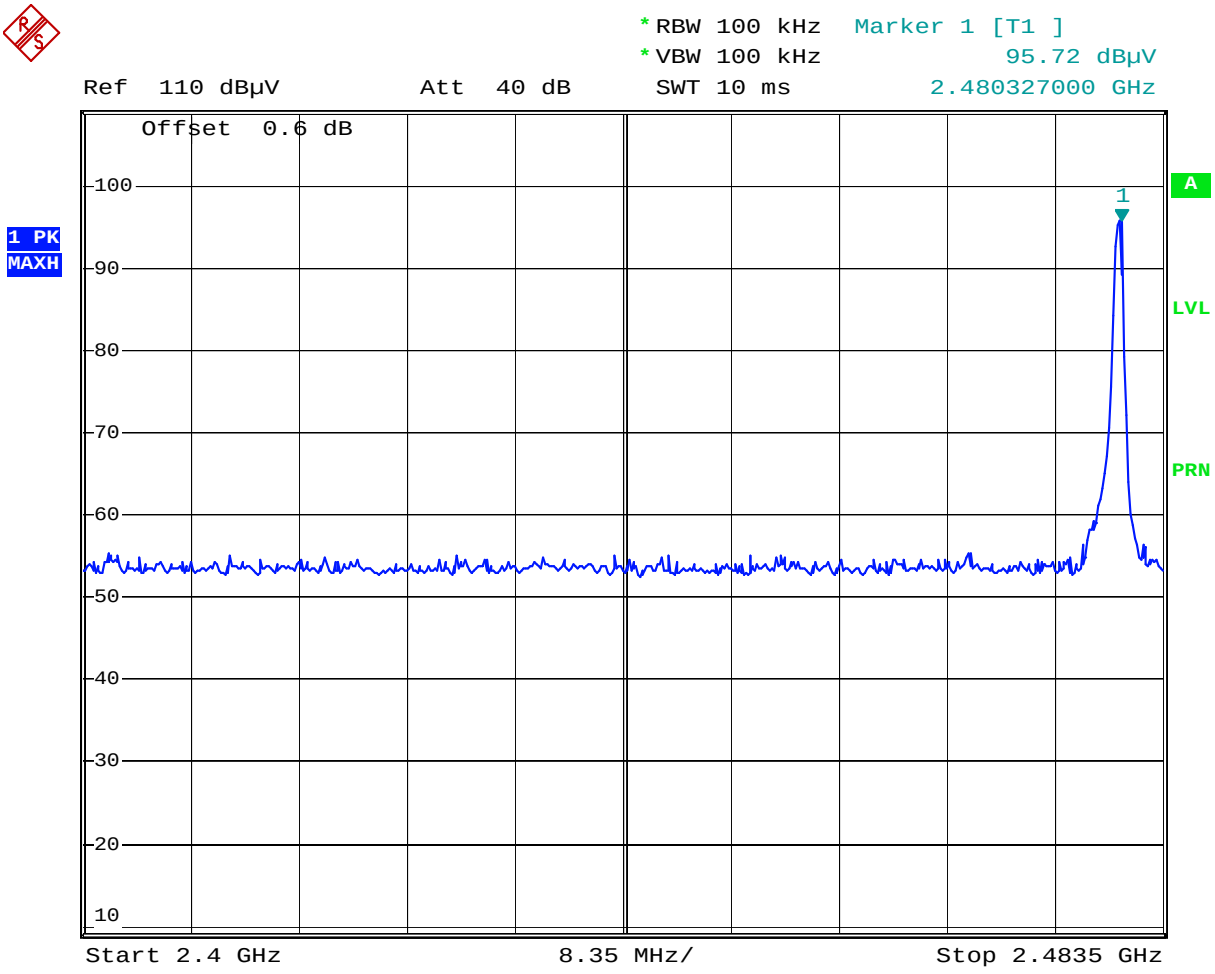
Comment: Spurious emissions, Freq 2441MHz
Date: 12.OCT.2009 11:02:31

Plot 6. 8



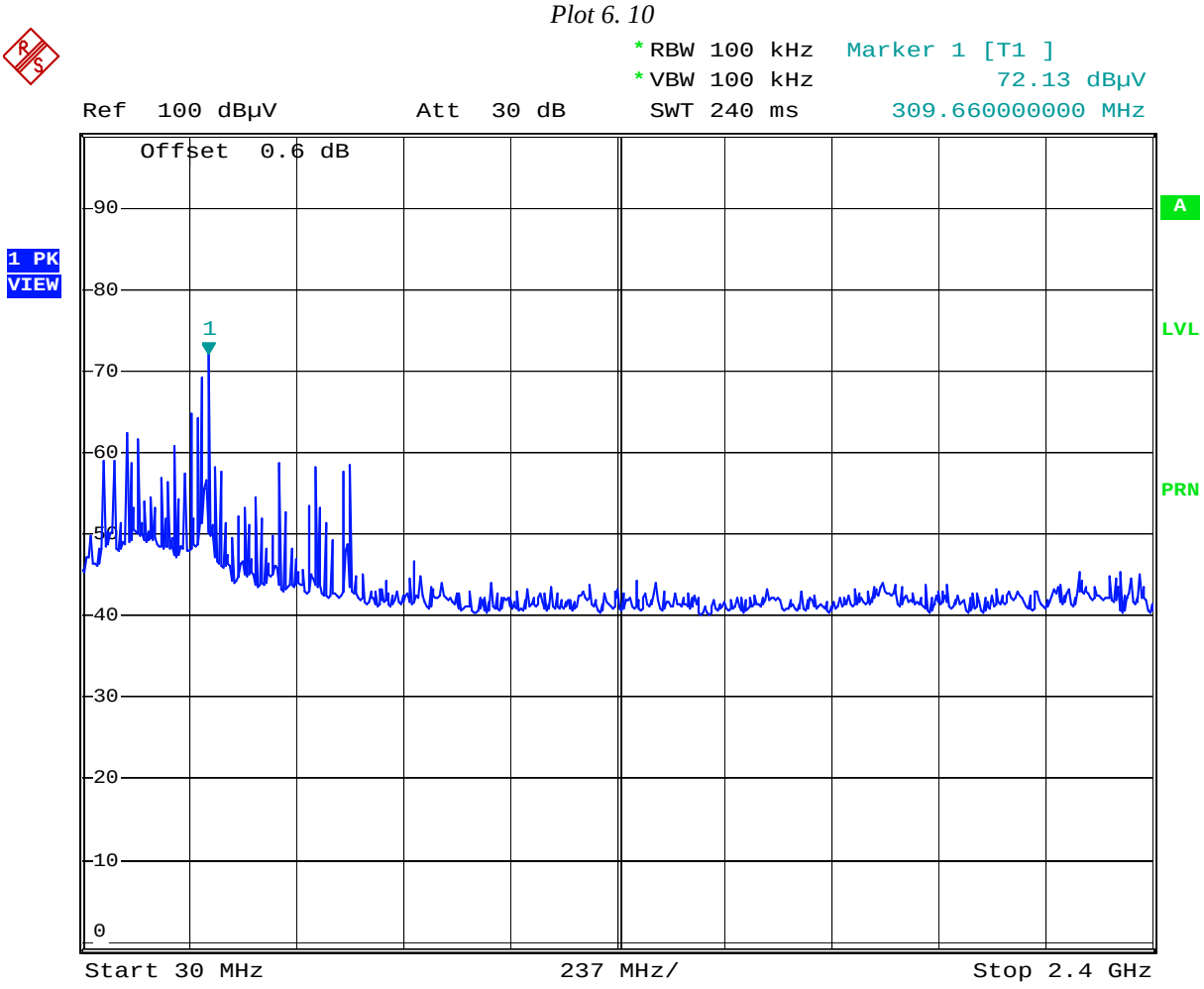
Comment: Spurious emissions, Freq 2441MHz
Date: 12.OCT.2009 11:03:23

Plot 6. 9



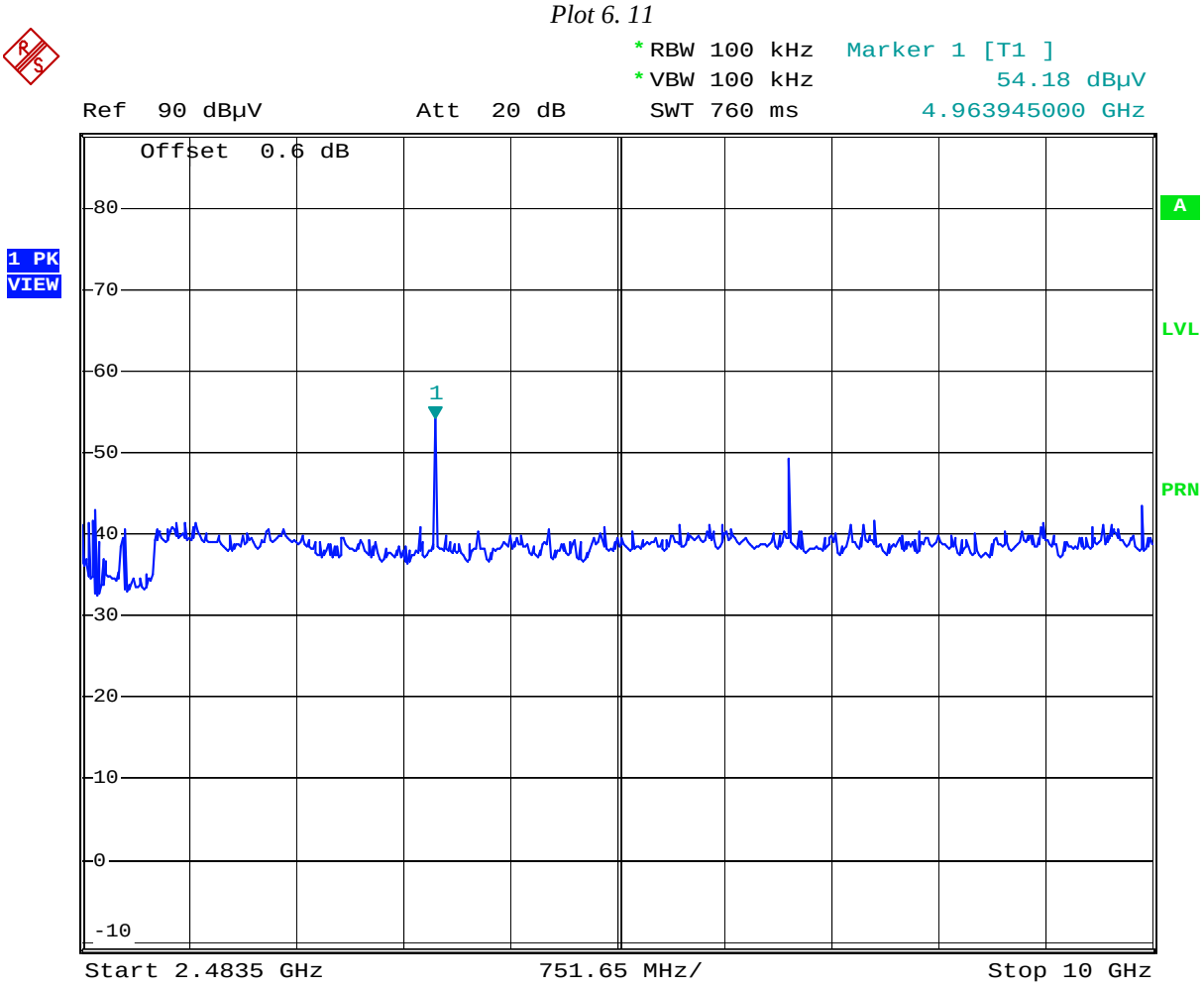
Comment: In-band emissions, Freq 2480MHz
Date: 12.OCT.2009 11:05:58

Plot 6. 10



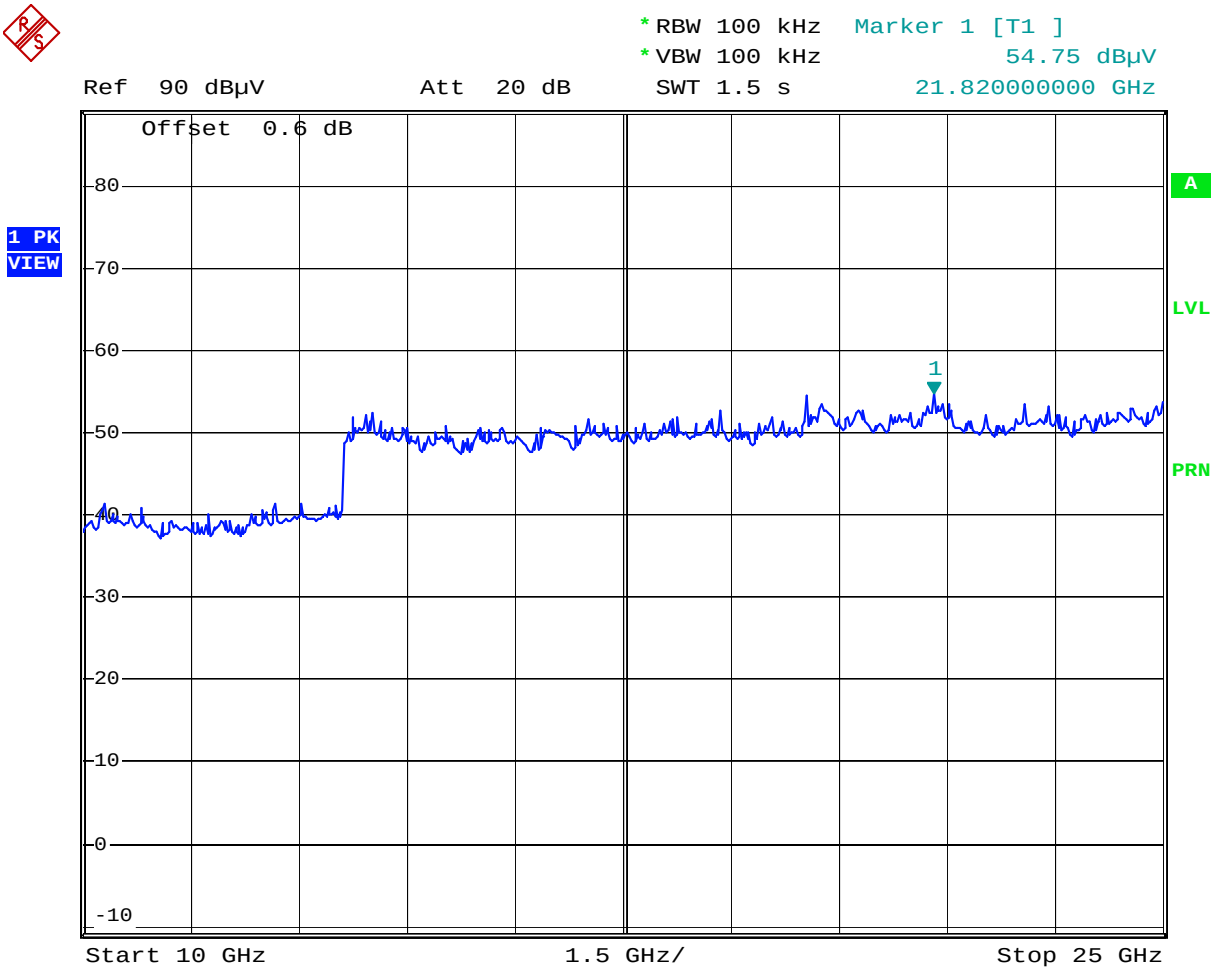
Comment: Spurious emissions, Freq 2480MHz
Date: 12.OCT.2009 11:09:23

Plot 6. 11



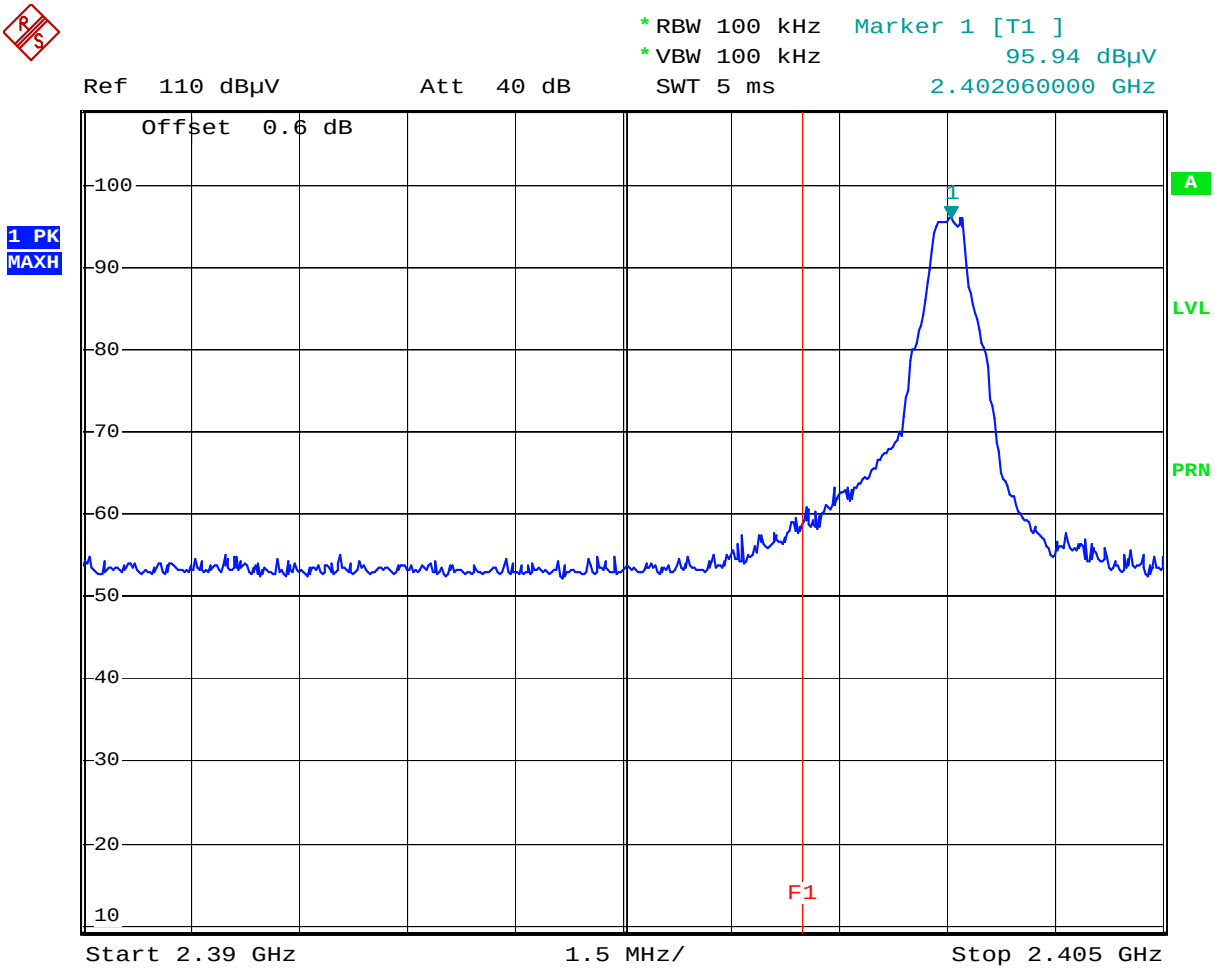
Comment: Spurious emissions, Freq 2480MHz
Date: 12.OCT.2009 11:10:26

Plot 6. 12



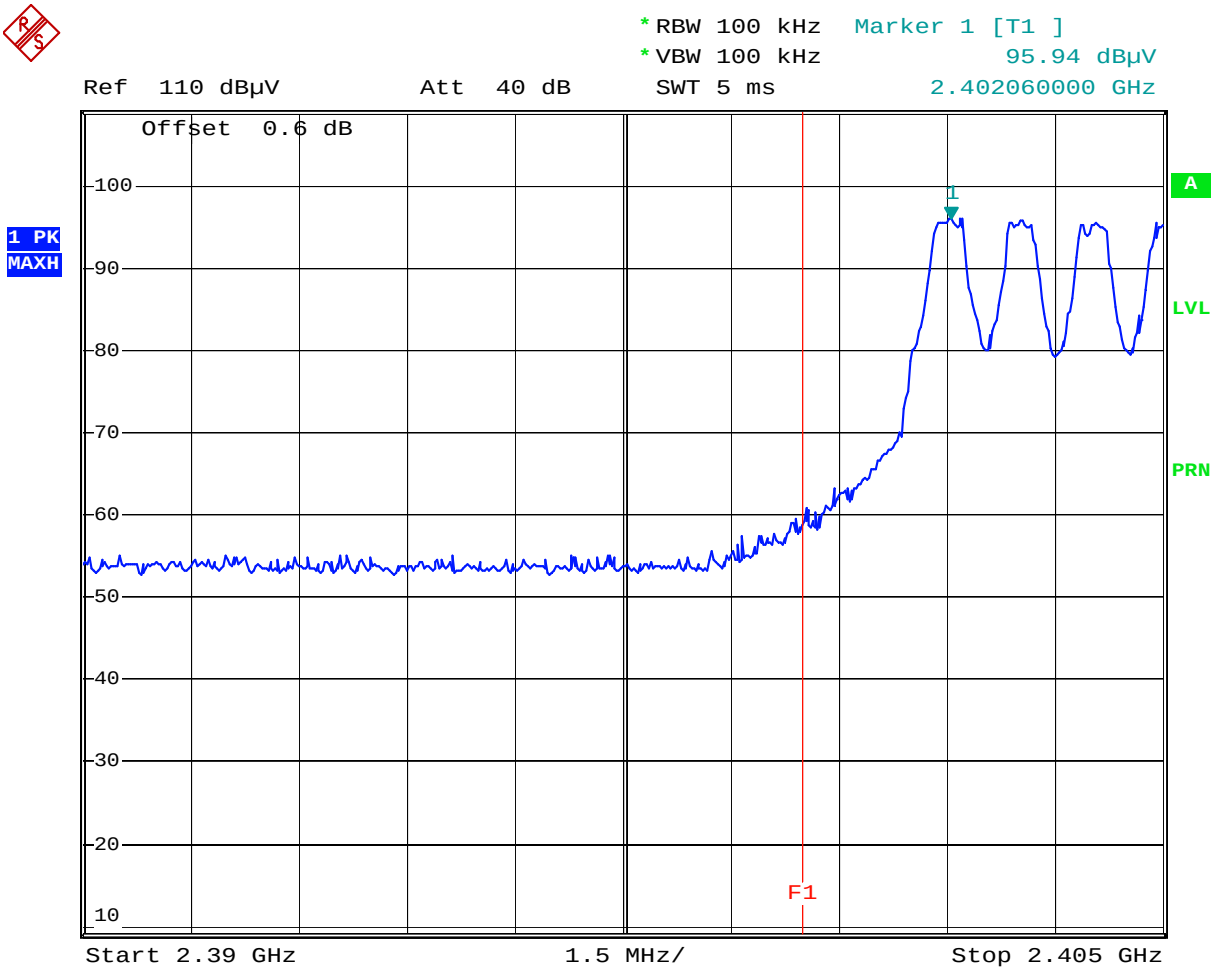
Comment: Spurious emissions, Freq 2480MHz
Date: 12.OCT.2009 11:11:01

Plot 6. 13



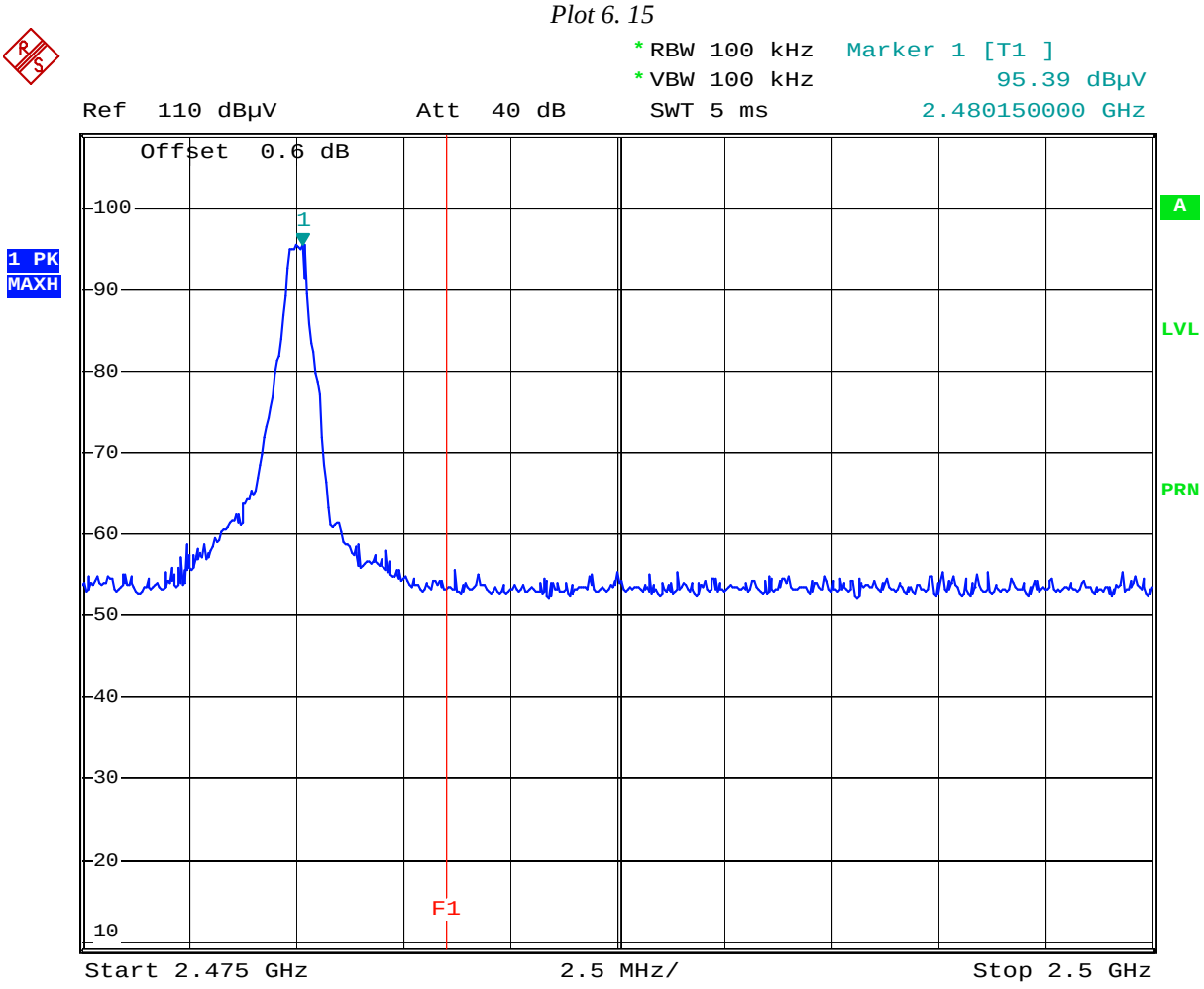
Comment: Spurious emissions, Freq 2402MHz
Date: 12.OCT.2009 11:16:19

Plot 6. 14



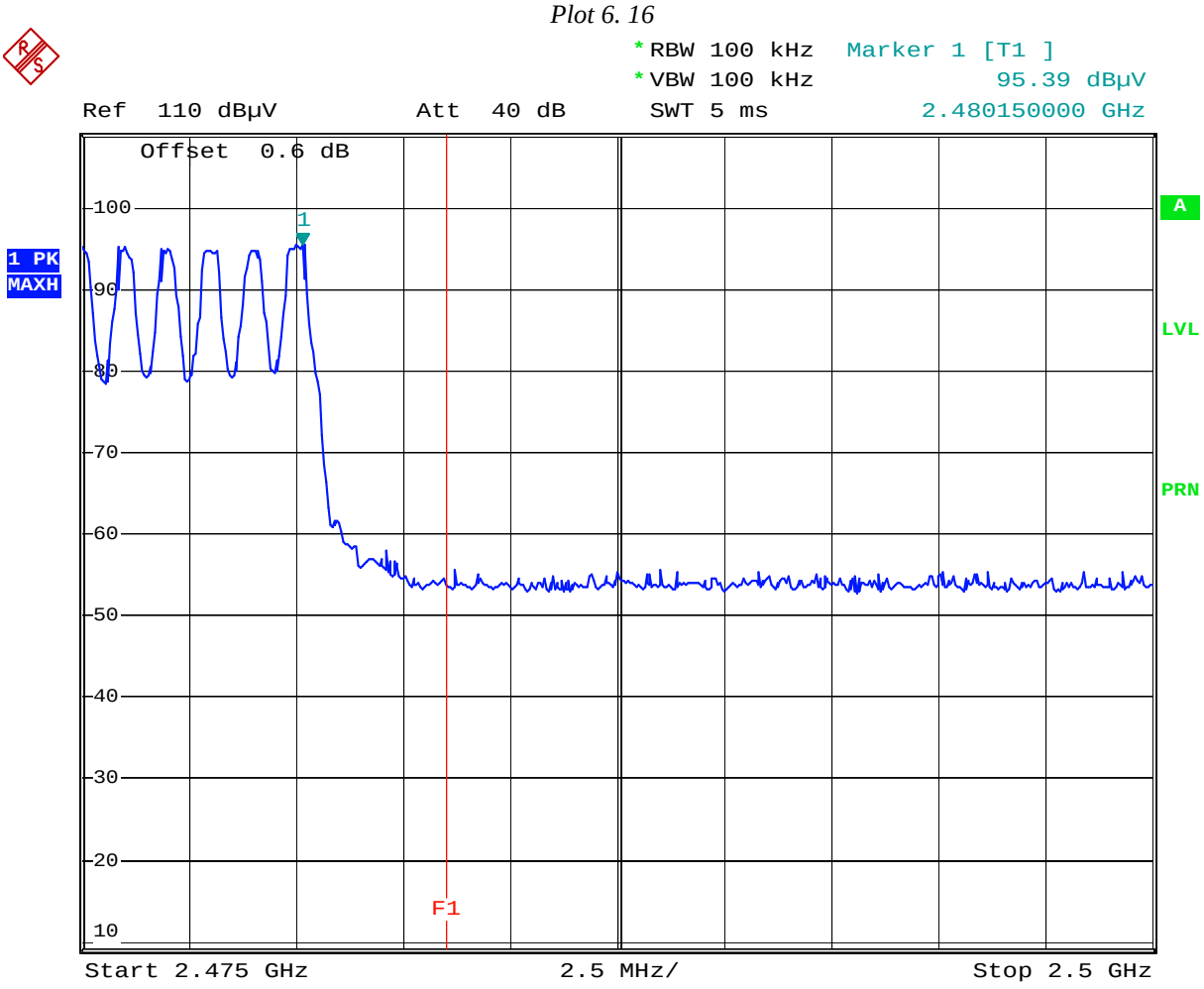
Comment: Spurious emissions, Freq 2402MHz
Date: 12.OCT.2009 11:18:29

Plot 6. 15



Comment: Spurious emissions, Freq 2480MHz
Date: 12.OCT.2009 11:21:01

Plot 6. 16



Comment: Spurious emissions, Freq 2480MHz
Date: 12.OCT.2009 11:23:15

4.7 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 radiated emissions in the restricted bands near the operating band are presented on the following Plots 7.1 – 7.6. On these plots antenna factor and cable loss are included in the OFFSET of the spectrum analyzer reading, therefore the readings are field strength.

The EUT passed the test by 4.1 dB.

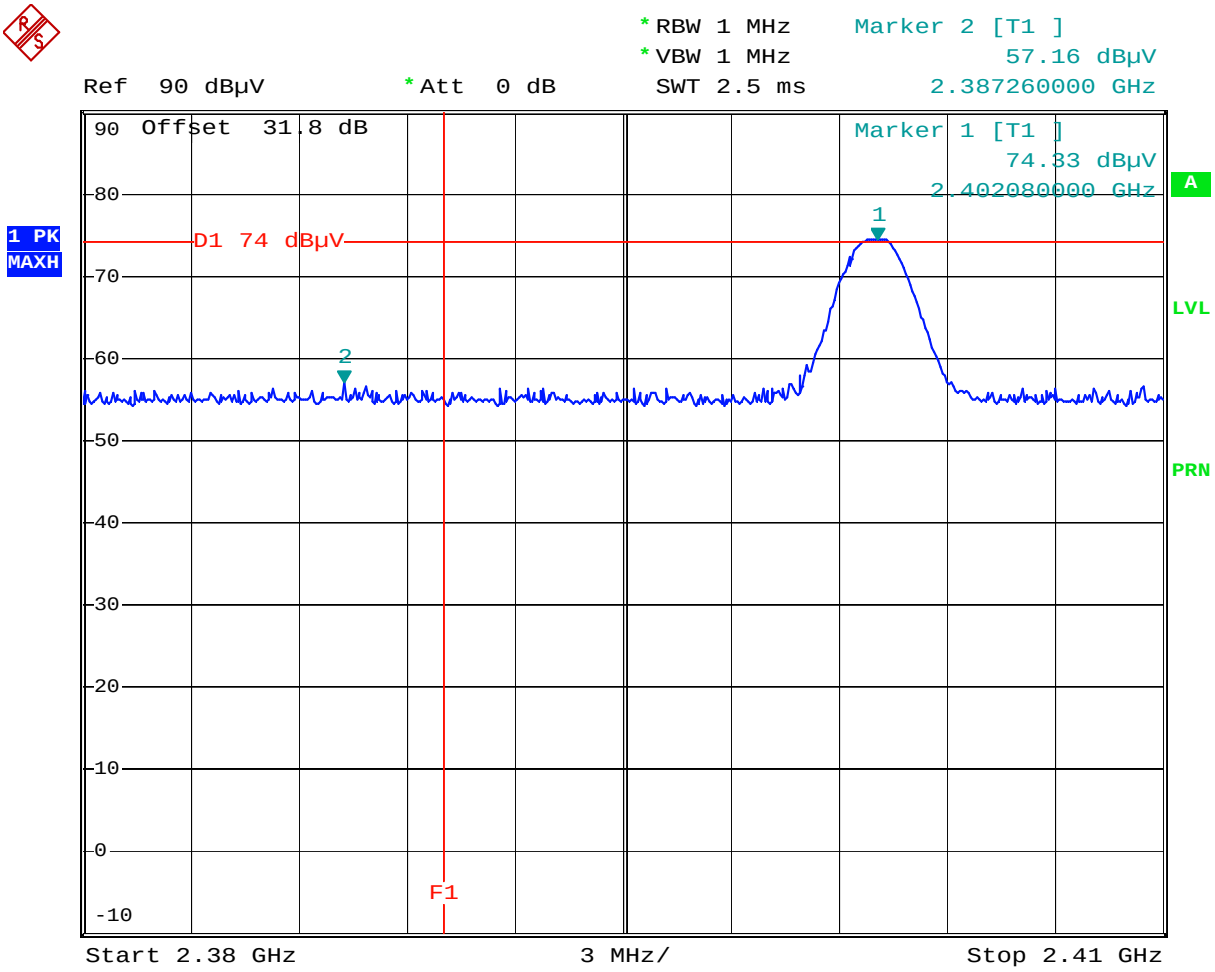
Test Result	
FCC Part 15.247 Radiated Emission in Restricted Bands	
Temperature: 21C	Advanced Medical Optics
Humidity: 50%	Model: Advanced Control Pedal & Remote Control Master 2.0
Test data of [2]RF module for remote control of Monitor mounted in main system	
Test distance = 3 m	
Test date: September 22, 2009	

Frequency MHz	Detector	SA reading dB(uV)	Correction Factor dB	Duty * cycle dB	Ant. Factor dB(1/m)	Field Strength dB(uV/m)	Limit dB(uV/m)	Margin dB
Tx at 2402 MHz								
4804.0	Peak	60.6	-25.8	--	33.0	67.8	74.0	-6.2
12010.0	Peak	36.6	-20.8	--	39.2	55.0	74.0	-19.0
4804.0	Aver	43.9	-25.8	2.3	33.0	48.8	54.0	-5.2
12010.0	Aver	23.1	-20.8	2.3	39.2	39.2	54.0	-14.8
Tx at 2441 MHz								
4882.0	Peak	61.7	-25.2	--	33.2	69.7	74.0	-4.3
7323.0	Peak	47.4	-22.6	--	36.1	60.9	74.0	-13.1
12205.0	Peak	36.6	-21.0	--	39.0	54.6	74.0	-19.4
4882.0	Aver	44.2	-25.2	2.3	33.2	49.9	54.0	-4.1
7323.0	Aver	29.3	-22.6	2.3	36.1	40.5	54.0	-13.5
12205.0	Aver	22.7	-21.0	2.3	39.0	38.4	54.0	-15.6
Tx at 2480 MHz								
4960.0	Peak	61.4	-24.9	--	33.4	69.9	74.0	-4.1
7440.0	Peak	52.5	-22.6	--	36.4	66.3	74.0	-7.7
12400.0	Peak	36.6	-21.3	--	38.7	54.0	74.0	-20.0
4960.0	Aver	41.5	-25.4	2.3	33.4	47.2	54.0	-6.8
7440.0	Aver	32.1	-22.6	2.3	36.6	43.8	54.0	-10.2
12400.0	Aver	22.9	-21.3	2.3	38.7	38.0	54.0	-16.0

* See Appendix A for Duty cycle measurement.

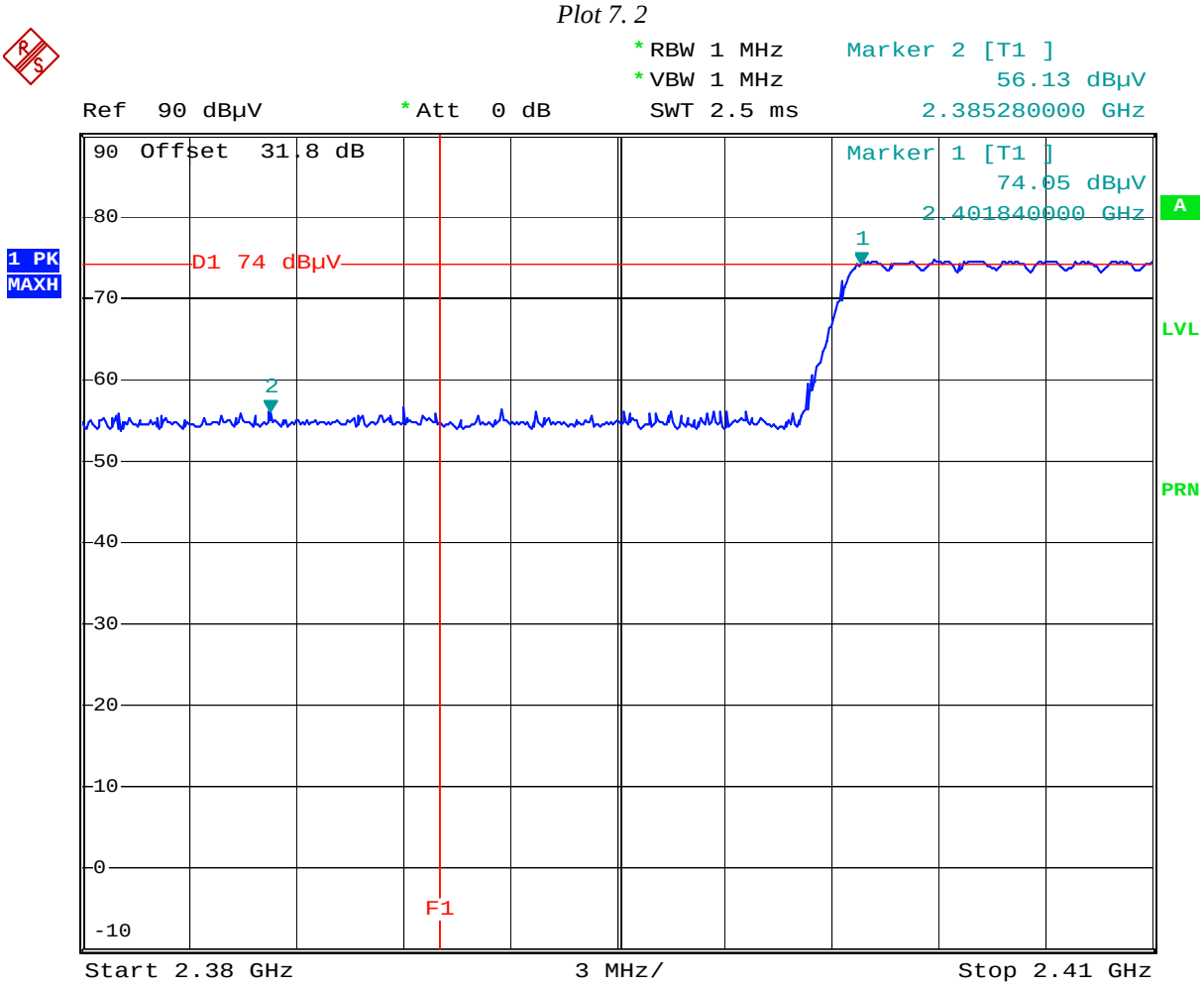
a) RBW = 1 MHz, VBW = 1 MHz - for peak measurements
   RBW = 1MHz, VBW = 100 Hz - for average measurements
b) Correction Factor: Pre-amplifier gain + Cable loss + HP-Filter loss
c) All other emissions are 20 dB below the limit.

Plot 7. 1



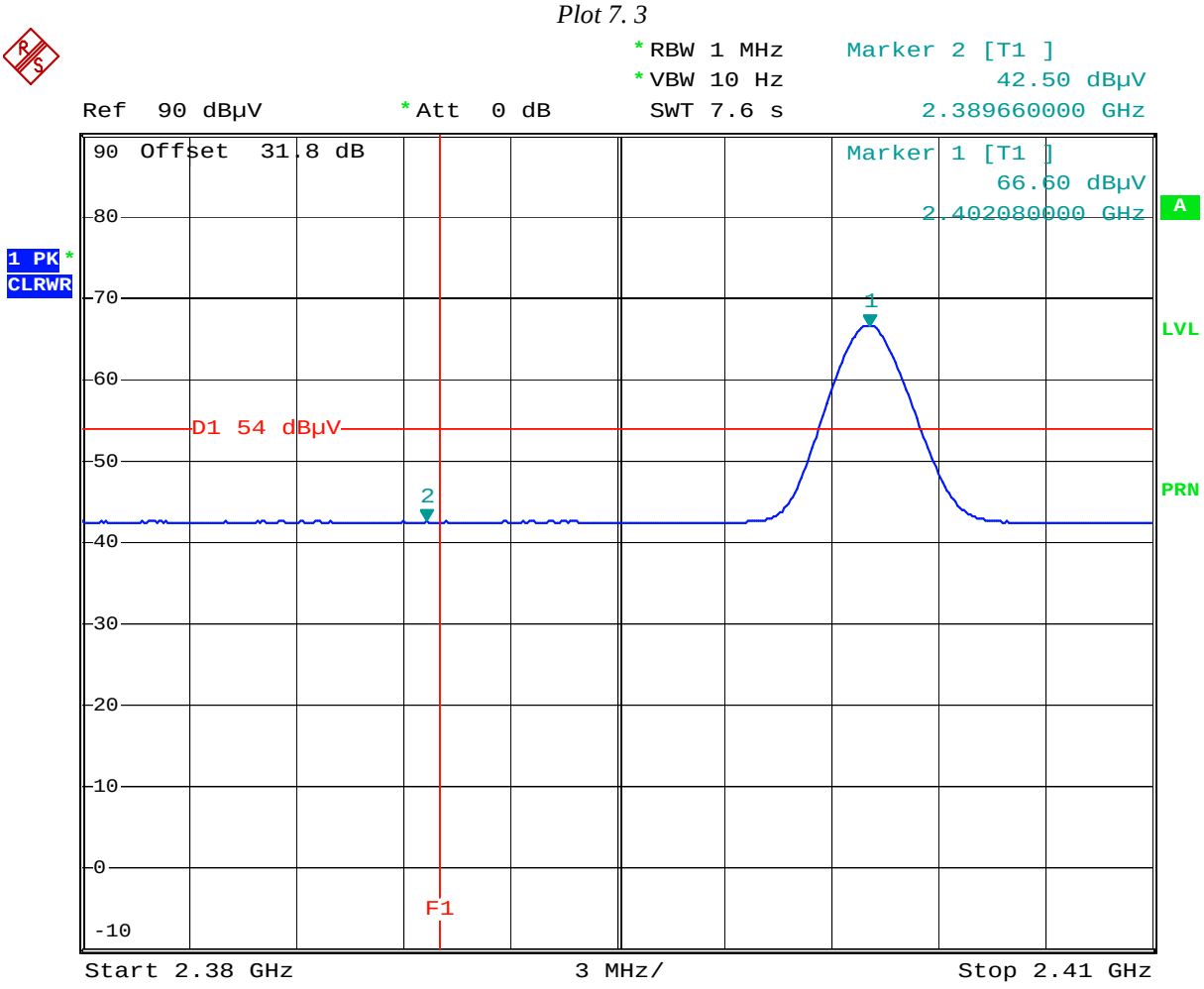
Comment: Emissions on band-edge frequency, peak, freq 2402 MHz
Date: 21.SEP.2009 15:26:17

Plot 7. 2



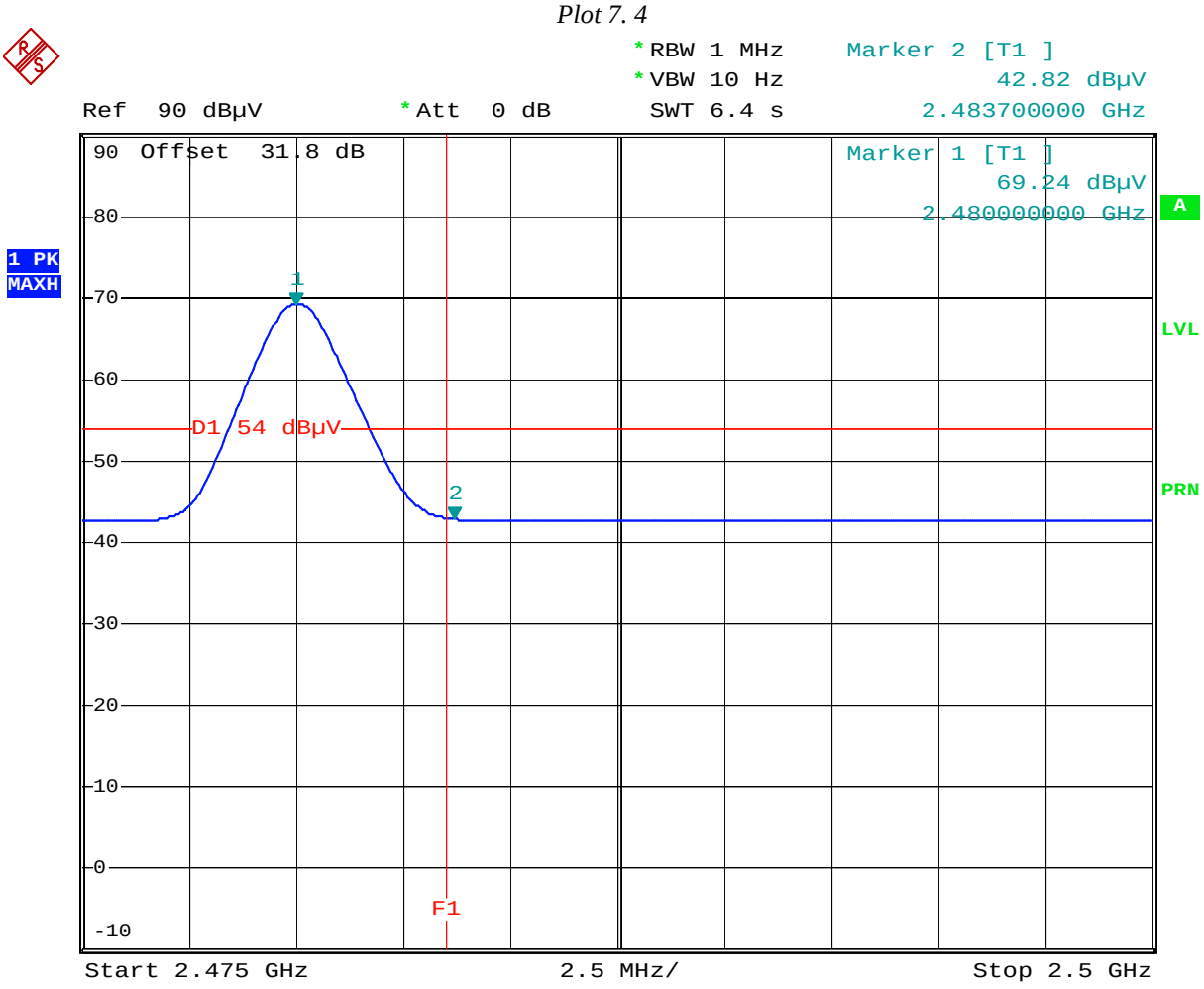
Comment: Emissions on band-edge frequency, peak, freq 2402 MHz
Date: 21.SEP.2009 15:32:04

Plot 7. 3



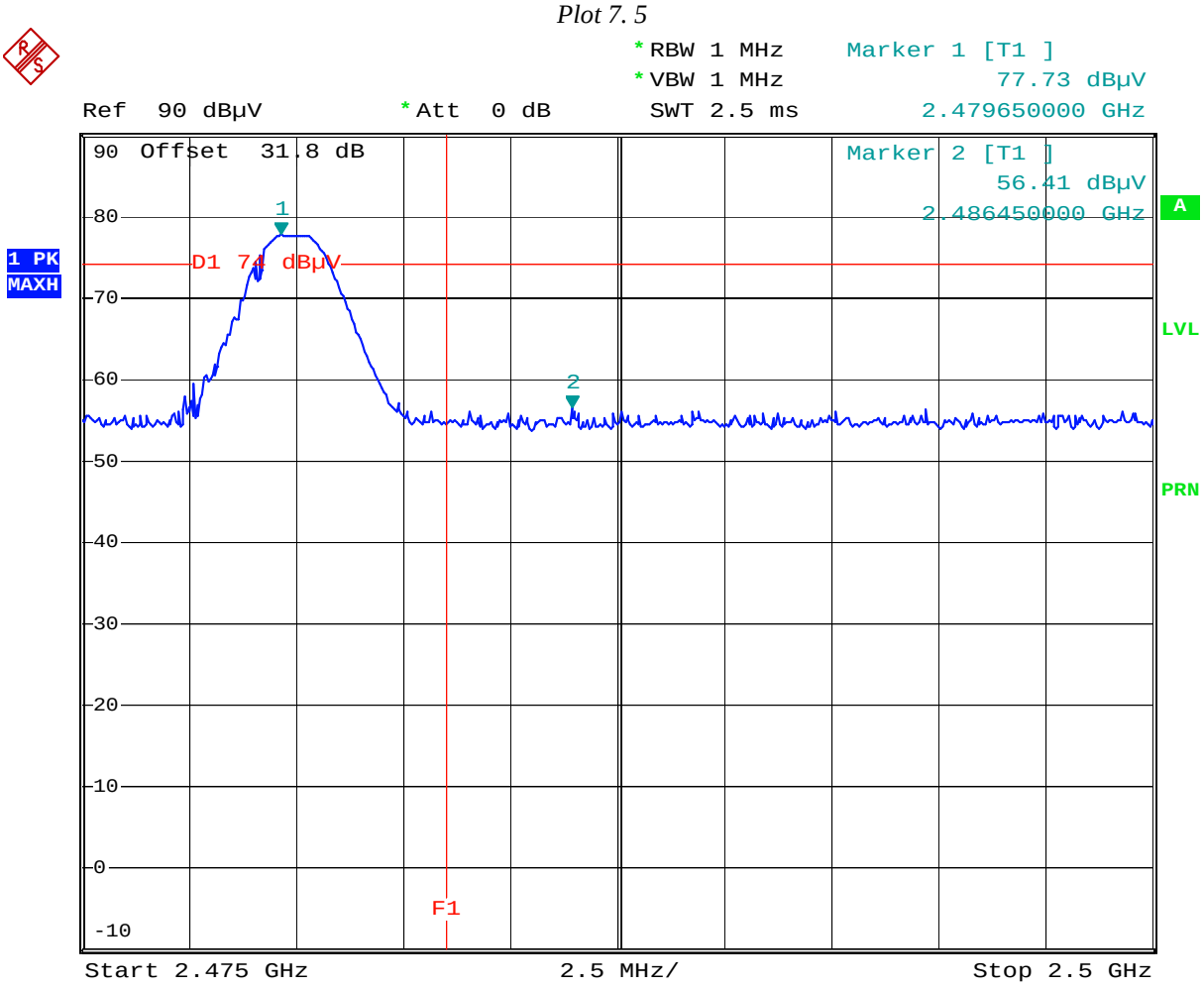
Comment: Emissions on band-edge frequency, average, freq 2402 MHz
Date: 21.SEP.2009 15:34:16

Plot 7. 4



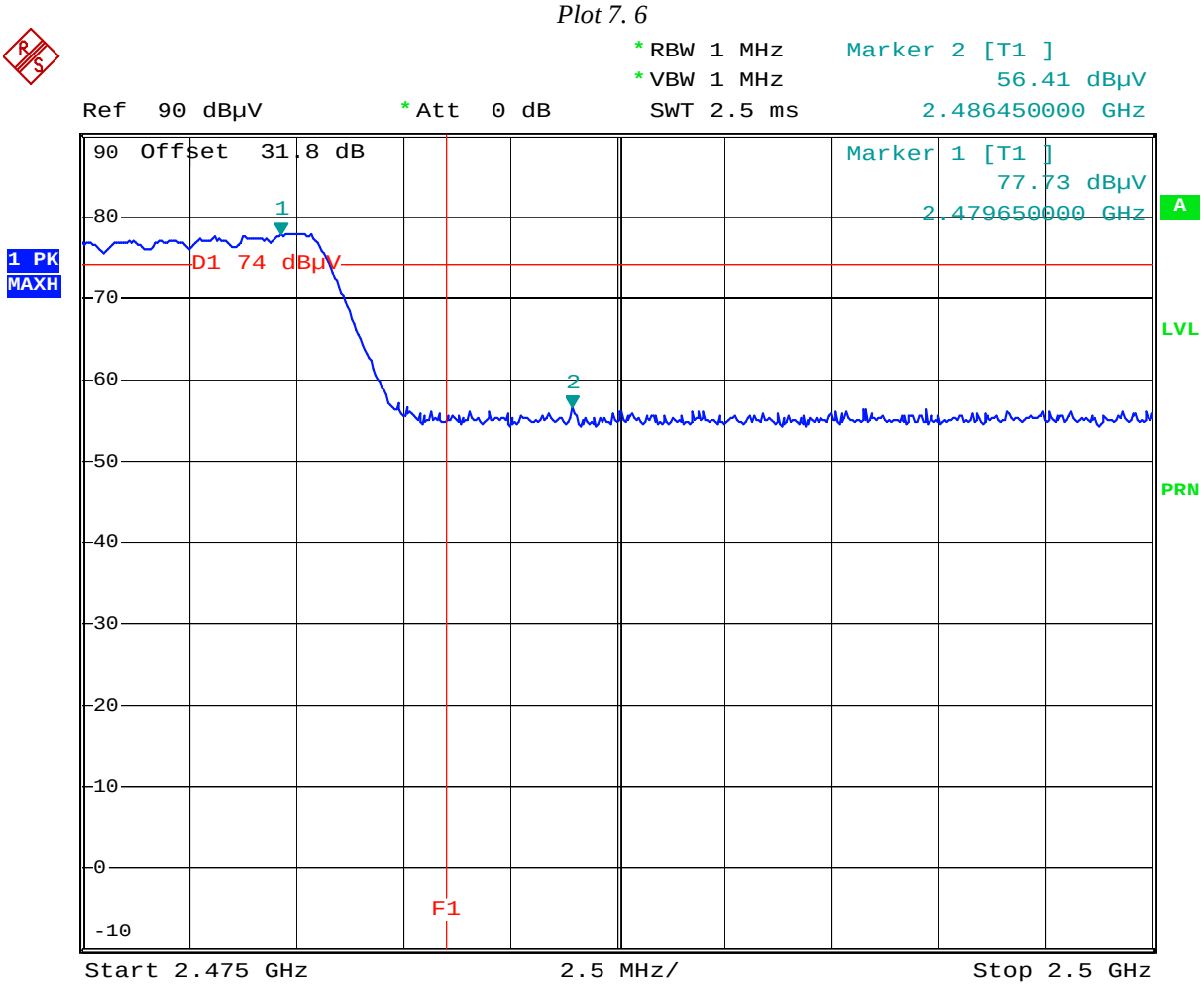
Comment: Emissions on band-edge frequency, average, freq 2480 MHz
Date: 21.SEP.2009 15:41:01

Plot 7. 5



Comment: Emissions on band-edge frequency, peak, freq 2480 MHz
Date: 21.SEP.2009 15:42:37

Plot 7. 6



Comment: Emissions on band-edge frequency, peak, freq 2480 MHz
Date: 21.SEP.2009 15:43:58

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

Test Limit

Limits for Electromagnetic Radiated Emissions, FCC Section 15.109(b) and ICES 003 *

Frequency (MHz)	Class A at 10m dB(µV/m)	Class B at 3m dB(µV/m)
30-88	39	40.0
88-216	43.5	43.5
216-960	46.4	46.0
Above 960	49.5	54.0

* According to FCC Part 15.109(g) an alternative to the radiated emission limits shown above, digital devices may be shown to comply with the limit of CISPR Pub. 22

Test Procedure

Measurements are conducted with a quasi-peak detector instrument in the frequency range of 30 MHz to 1000 MHz and with the average detector instrument in the frequency range above 1000 MHz. The measuring receiver meets the requirements of Section One of CISPR 16 and the measuring antenna correlates to a balanced dipole.

Measurements of the radiated field are made with the antenna located at a distance of 10 meters from the EUT. If the field-strength measurements at 10m cannot be made because of high ambient noise level or for other reasons, measurements of Class B equipment may be made at a closer distance, for example 3m. An inverse proportionality factor of 20 dB per decade should be used to normalize the measured data to the specified distance for determining compliance.

The antenna is adjusted between 1m and 4m in height above the ground plane for maximum meter reading at each test frequency.

The antenna-to-EUT azimuth is varied during the measurement to find the maximum field-strength readings.

The antenna-to-EUT polarization (horizontal and vertical) is varied during the measurements to find the maximum field-strength readings.

The EUT, where intended for tabletop use, is placed on a table whose top is 0.8m above the ground plane. The table is constructed of non-conductive materials. Its dimensions are 1m by 1.5m, but may be extended for a 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.

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

Example Field Strength Calculation

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

FS = RA + AF + CF – PA – DCF

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 (1/m)
AG = Amplifier Gain in dB
DCF=Distance Correction Factor in dB
(Formula: DCF = $20\log_{10}$ (measurement distance/specification distance)

Assume a receiver reading of 52.0 dB (μV) is obtained. The antenna factor of 7.4 dB and cable factor of 1.6 dB is added. The amplifier gain of 29 dB and DCF of 10.5 dB (DCF in this example: $20\log_{10}$ (10/3)) is subtracted, giving field strength of 21.5 dB (μV/m).

RA = 52.0 dB (μV)
AF = 7.4 dB (1/m)
CF = 1.6 dB
AG = 29.0 dB
DCF=10.5 dB
FS = RF + AF + CF – AG – DCF
FS = 52.0 + 7.4 + 1.6 – 29.0 – 10.5
FS = 21.5 dB (μV/m)

Test Results

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

The EUT passed by 5.1 dB for Class B.

Test data of [2]RF module for remote control of Monitor mounted in main system

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

Operator: KK Model: Advanced Control Pedal & Remote Control Master 2.0
October 06, 2009 Company: Advanced Medical Optics

Frequency	Peak FS	Limit@3m	Margin	RA	CF	AG	DCF	AF
(MHz)	dB(uV/m)	dB(uV/m)	dB	dB(uV)	dB	dB	dB	dB(1/m)
147.491	38.4	43.5	-5.1	45.4	1.3	31.9	10.5	13.2
300.428	40.0	46.0	-6.0	45.2	1.8	31.9	10.5	14.4
310.492	41.8	46.0	-4.2	46.6	1.8	31.9	10.5	14.7
314.008	38.1	46.0	-7.9	42.9	1.9	31.9	10.5	14.8
315.18	38.2	46.0	-7.8	42.9	1.9	31.9	10.5	14.9
318.979	37.9	46.0	-8.1	42.0	1.9	31.9	10.5	15.4
397.63	39.3	46.0	-6.7	42.2	2.1	32.0	10.5	16.5
463.913	40.5	46.0	-5.5	41.8	2.3	32.1	10.5	18.1
768.13	38.8	46.0	-7.2	34.8	3.0	32.2	10.5	22.7
797.876	39.7	46.0	-6.3	35.7	3.0	32.0	10.5	22.5
816.104	40.9	46.0	-5.1	36.5	3.1	32.0	10.5	22.8
864.16	38.0	46.0	-8.0	32.9	3.1	31.7	10.5	23.1
940.87	37.9	46.0	-8.1	31.8	3.3	31.1	10.5	23.5
960.19	39.0	54.0	-15.0	32.5	3.3	31.0	10.5	23.6

Test Mode: Rx mode
Temperature: 20 C Humidity : 50 %

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

Operator: KK Model: Advanced Control Pedal & Remote Control Master 2.0
October 06, 2009 Company: Advanced Medical Optics

Frequency	Peak FS	Limit@3m	Margin	RA	CF	AG	DCF	AF
(MHz)	dB(uV/m)	dB(uV/m)	dB	dB(uV)	dB	dB	dB	dB(1/m)
147.491	33.3	43.5	-10.2	40.4	1.3	31.9	10.5	13.1
315.059	33.0	46.0	-13.0	38.7	1.9	31.9	10.5	13.9
397.67	33.9	46.0	-12.1	36.9	2.1	32.0	10.5	16.3
466.177	33.1	46.0	-12.9	34.4	2.3	32.1	10.5	18.0
528.095	32.8	46.0	-13.2	33.2	2.4	32.2	10.5	18.8
744.567	33.2	46.0	-12.8	30.3	2.9	32.2	10.5	21.7
768.089	33.1	46.0	-12.9	29.9	3.0	32.2	10.5	21.9
801.837	36.4	46.0	-9.6	33.2	3.0	32.0	10.5	21.7
816.145	35.5	46.0	-10.5	32.0	3.1	32.0	10.5	21.9
864.16	34.6	46.0	-11.4	29.8	3.1	31.7	10.5	22.8

Test Mode: Rx mode
Temperature: 20 C Humidity : 50 %

4.9 AC Line Conducted Emission

FCC 15.207:

Not Applicable. The EUT does not have any direct connection to public power network. In normal use, EUT is installed inside the host unit and it is DC powered internally.

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 0.123 mW; antenna is fix-mounted, 4.1 dBi gain. Therefore, to comply with RF Exposure Requirement, the MPE is calculated.

The maximum Peak EIRP calculated is -5.0 dBm or 0.32 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.

It is considered that 20cm is the minimum distance that user can go closer to the EUT (Advanced Control Pedal & Remote Control Master 2.0) which is installed inside the Console of WhiteStar Signature Remote Control system.

At 0.2 m, S = 0.00064 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:

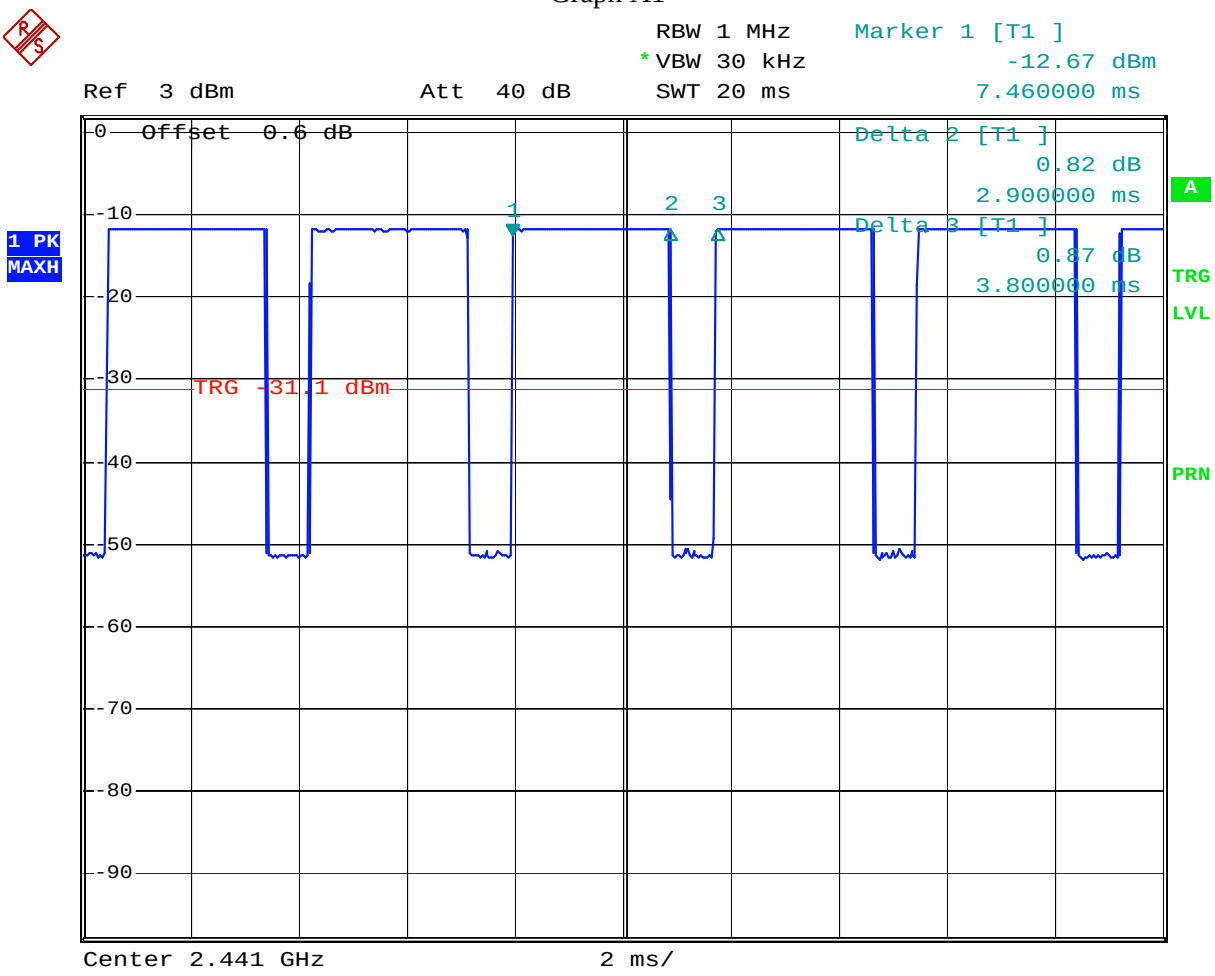
Equipment	Manufacturer	Model/Type	Serial #	Cal Int	Cal Due
Spectrum Analyzer	Rohde&Schwarz	FSP40	036612004	12	10/16/10
BI-Log Antenna	EMCO	3143	9509	12	11/07/09
Pre-Amplifier	Sonoma	310N	185634	12	11/10/09
Pre-Amplifier	Miteq	AMF-4D-001180-24-10P	799159	12	07/29/10
Spectrum Analyzer	Rohde&Schwarz	FSU26	200482	12	02/27/10
Vector Signal Generator	Rohde&Schwarz	SMU200A	102499	12	04/01/10
Horn Antenna	EMCO	3115	9107-3712	12	11/03/10

7.0 Document History

Revision/ Job Number	Writer Initials	Date	Change
1.0 / 3191467	KK	December 03, 2009	Original document

8.0 Appendix A –Graphs for Duty cycle measurement

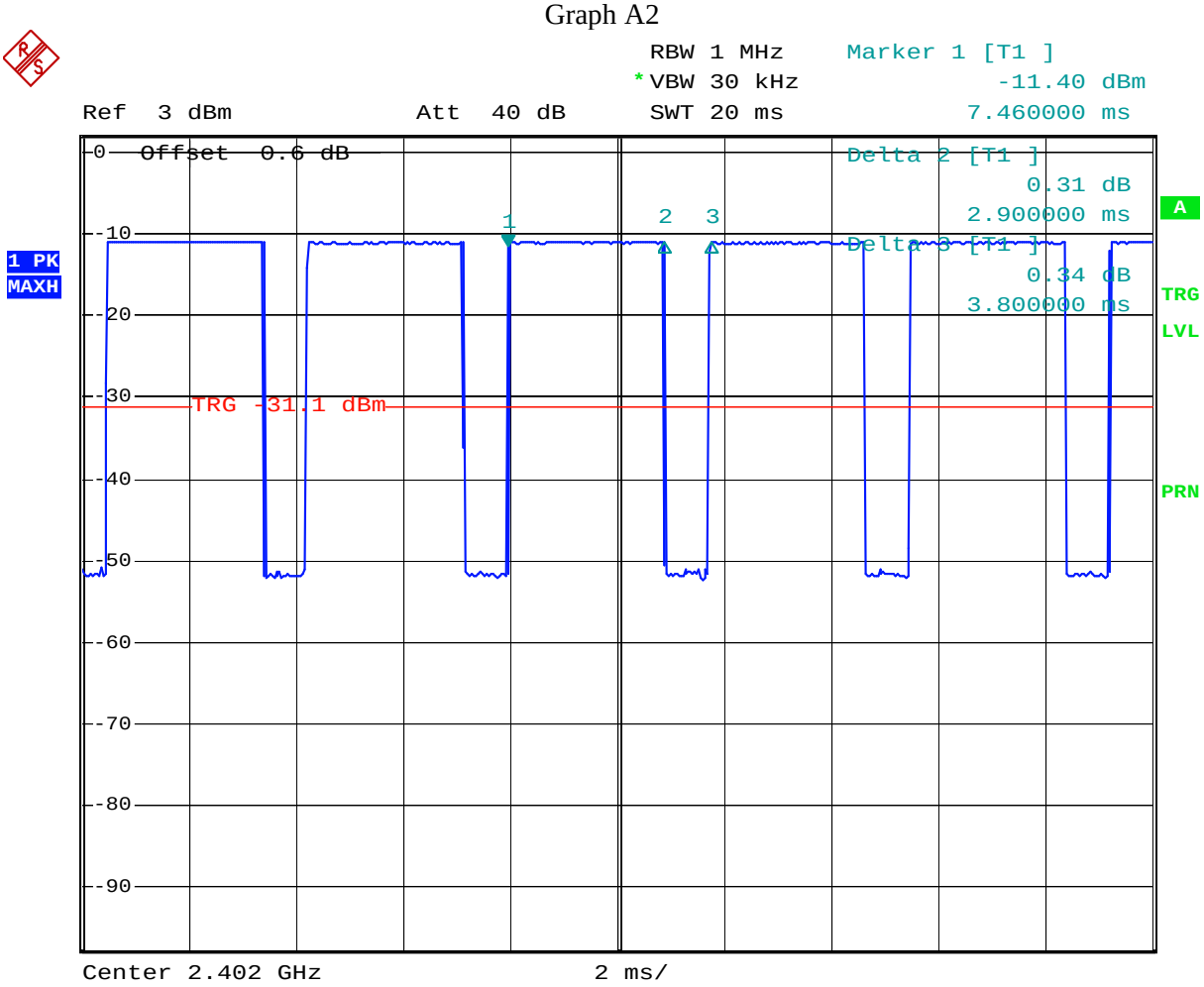
Graph A1



Comment: Duty cycle, freq 2441MHz
Date: 12.OCT.2009 13:00:02

Duty Cycle Calculation = 20 log (2.90/3.8) = -2.3dB

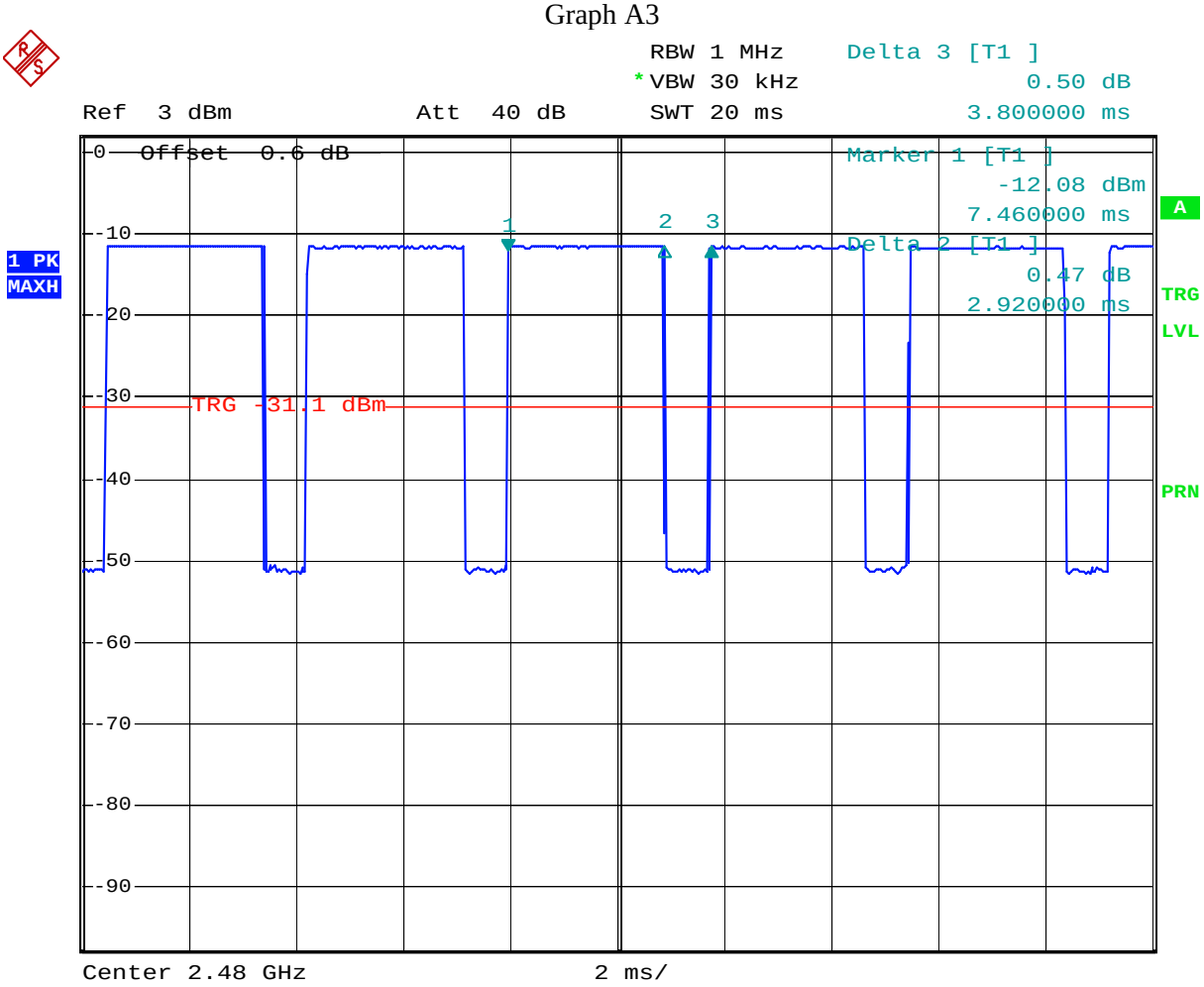
Graph A2



Comment: Duty cycle, freq 2402MHz
Date: 12.OCT.2009 13:02:13

Duty Cycle Calculation = 20 log (2.9/3.8) = -2.3dB

Graph A3



Comment: Duty cycle, freq 2480MHz
Date: 12.OCT.2009 13:16:15

Duty Cycle Calculation = 20 log (2.92/3.8) = -2.3dB