

TEST REPORT

Report Number: 3193115MPK-006

Project Number: 3193115

Report Date: November 22, 2009

**Testing performed on the
PhaseNet Radio Transmitter™
Model: PhaseNet Radio Transmitter
FCC ID: U3DPHASENETT
IC : 5349C-PHASENETT**

to

**FCC Part 15.247 and RSS-210 Issue 7
For**

S&C Electric Company

Test Performed by:
Intertek
1365 Adams Court
Menlo Park, CA 94025

Test Authorized by:
S&C Electric Company
Automation Systems Division
1135 Atlantic Avenue
Alameda, CA 94501-1176 USA


Prepared by:



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Date: November 22, 2009

Reviewed by:



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Date: November 22, 2009

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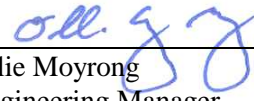
Report No. 3193115MPK-006

Equipment Under Test:	PhaseNet Radio Transmitter TM
Trade Name:	S&C Electric Company
Model No.:	PhaseNet Radio Transmitter
FCC ID:	U3DPHASENETT
IC:	5349C-PHASENETT
Applicant:	S&C Electric Company
Contact:	Mr. Dave Munoz
Address:	Automation Systems Division 1135 Atlantic Avenue Alameda, CA 94501-1176
Country	USA
Tel. Number:	714-247-8579
Fax number:	714-247-8678
Applicable Regulation:	FCC Part 15, Subpart C and RSS-210 Issue 7
Test Site Location:	ITS – Site 1 1365 Adams Drive Menlo Park, CA 94025
Date of Test:	November 09 to 13, 2009

We attest to the accuracy of this report:



Krishna K Vemuri
Test Engineer



Ollie Moyrong
Engineering Manager

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1.0 Introduction

The Equipment under Test (EUT) is a device with one IEEE 802.15.4 transceiver 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)(3)	A8.4(4)	Complies
6-dB Bandwidth	15.247(a)(2)	A8.2(a)	Complies
Power Spectral Density	15.247(e)	A8.2(b)	Complies
Out-of-band Antenna Conducted Emission	15.247(d)	A8.5	Complies
Out-of-Band Radiated Emission (except emissions in Restricted Bands)	15.247(d)	A8.5	Complies
Radiated Emission in Restricted Bands	15.247(d), 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 battery powered.
Radiated Emission from Digital Parts and receiver	15.109	ICES-003	Complies

2.0 General Description

2.1 Product Description

PhaseNet Radio Transmitter can send a variety of data to a matched receiver using IEEE 802.15.4. The transmitter can be coded to 65535 discrete unique receivers over the IEEE 802.15.4 standard communications protocol.

Overview of the EUT

Applicant	S&C Electric Company Automation Systems Division 1135 Atlantic Avenue Alameda, CA 94501-1176 USA
Manufacturer name & address	S&C Electric Company Automation Systems Division 1135 Atlantic Avenue Alameda, CA 94501-1176 USA
Model No.	PhaseNet Radio Transmitter
FCC Identifier	U3DPHASENETT
IC Number	5349C-PHASENETT
Use of Product	Monitoring and transmitting multiple sensor information or other data for application on the electrical power grid
Type of Transmission	IEEE 802.15.4
Rated RF Output	0.37 mW
Frequency Range	2405-2480 MHz
Number of Channel(s)	16
Modulation Type	Offset-Quadrature Phase Shift Keying (O-QPSK)
Data Rate	250Kbps
Antenna(s) type & Gain	On-board antenna, 3.3dBi

A pre-production version of the sample was received on November 09, 2009 in good condition. As declared by the Applicant, it is identical to production units.

Test start date November 09, 2009

Test end date: November 13, 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.

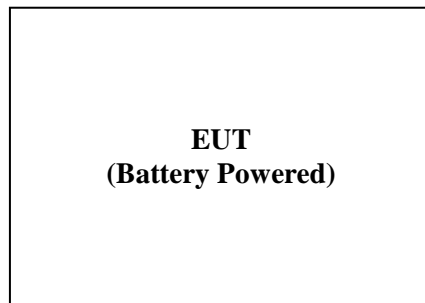
3.0 System Test Configuration

3.1 Support Equipment

None. The EUT is a stand-alone system.

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 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 wired to transmit full power.

EUT was controlled manually to set the radio in different channels during the tests.

The following are the channel numbers and channel frequencies tested.

Channel Selected	Channel number	Frequency MHz
Lower test channel	Channel 00	2405MHz
Middle test channel	Channel 07	2440MHz
Upper test channel	Channel 15	2480MHz

3.4 Software Exercise Program

None.

3.5 Mode of Operation During Test

The EUT was set at one of channels (low, middle, high) during the tests.

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 S&C Electric Company prior to compliance testing).

4.0 Measurement Results

4.1 Conducted Output Power at Antenna Terminals FCC 15.247(b)(3)

Requirements

For systems operating in the 2400-2483.5 MHz band using digital modulation, the maximum peak output power is 1 watt (30 dBm), the conducted power limit is based on the use of antenna with directional gain that do not exceed 6dBi. If the transmitting antenna of directional gain greater than 6dBi are used, the conducted output power from the intentional radiator shall be reduced below the stated value as in FCC 15.247(b)(4)(i).

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

Frequency (MHz)	Output in dBm	Output in mW	Plot number
2405	-4.3	0.37	1.1
2440	-4.9	0.32	1.2
2475	-5.2	0.30	1.3
2480	-14.9	0.032	1.4

Notes: The EUT's antenna has less than 6 dBi gain.

Plot 1.1

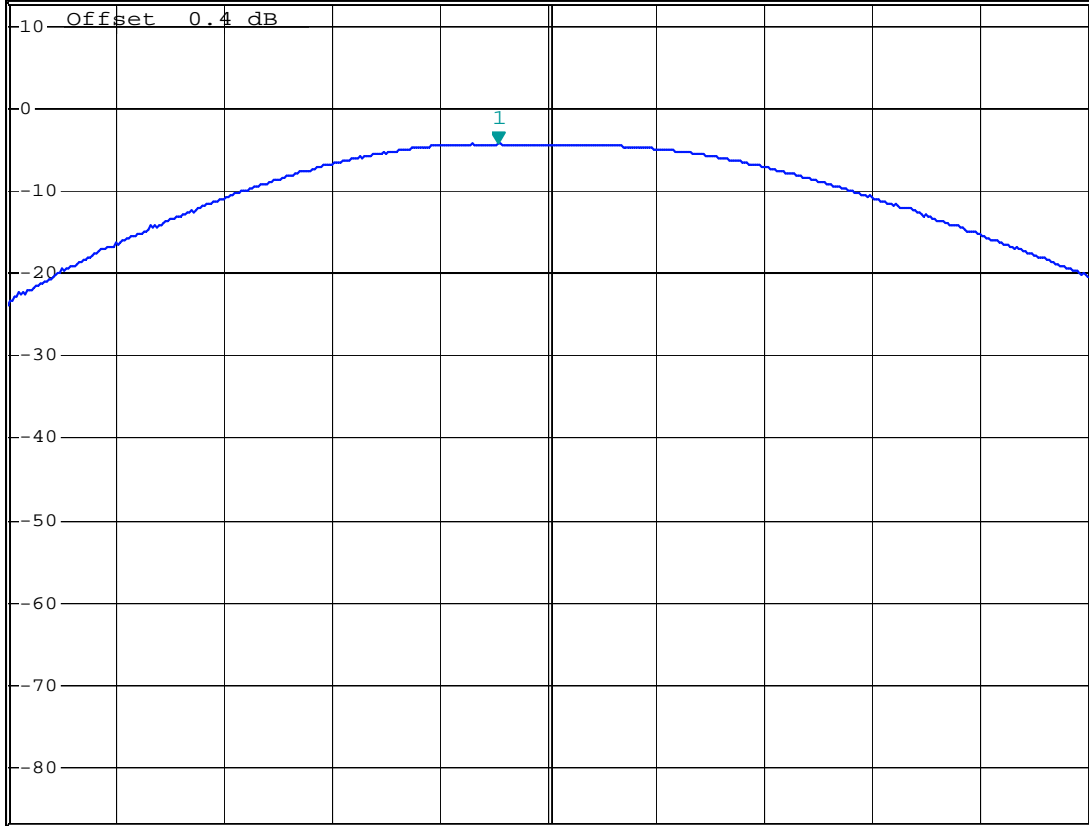


*RBW 3 MHz Marker 1 [T1]
*VBW 3 MHz -4.32 dBm
*SWT 40 ms 2.404540000 GHz

Ref 13 dBm

Att 50 dB

1 PK
MAXH



Center 2.405 GHz

1 MHz/

Span 10 MHz

Comment: Conducted output power
Date: 11.NOV.2009 08:56:35

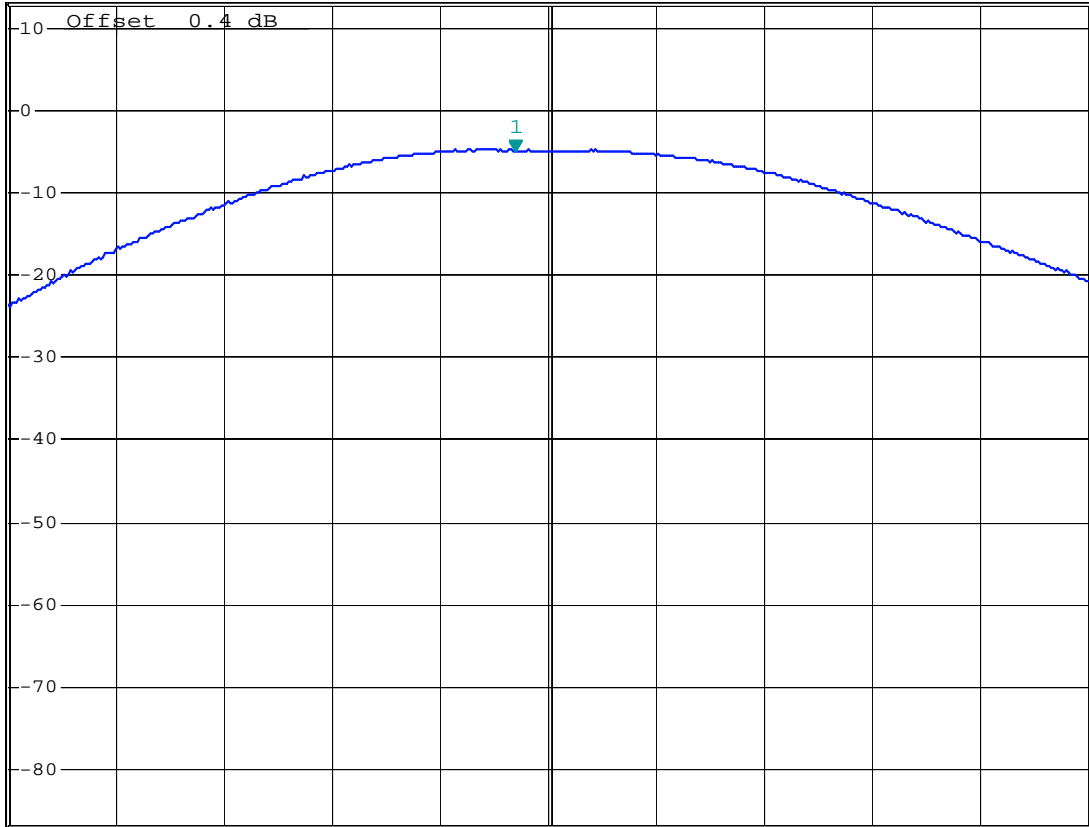
Plot 1.2



*RBW 3 MHz Marker 1 [T1]
 *VBW 3 MHz -4.85 dBm
 *SWT 40 ms 2.439700000 GHz

Ref 13 dBm

Att 50 dB



Center 2.44 GHz

1 MHz/

Span 10 MHz

Comment: Conducted output power
 Date: 11.NOV.2009 08:57:35

Plot 1.3

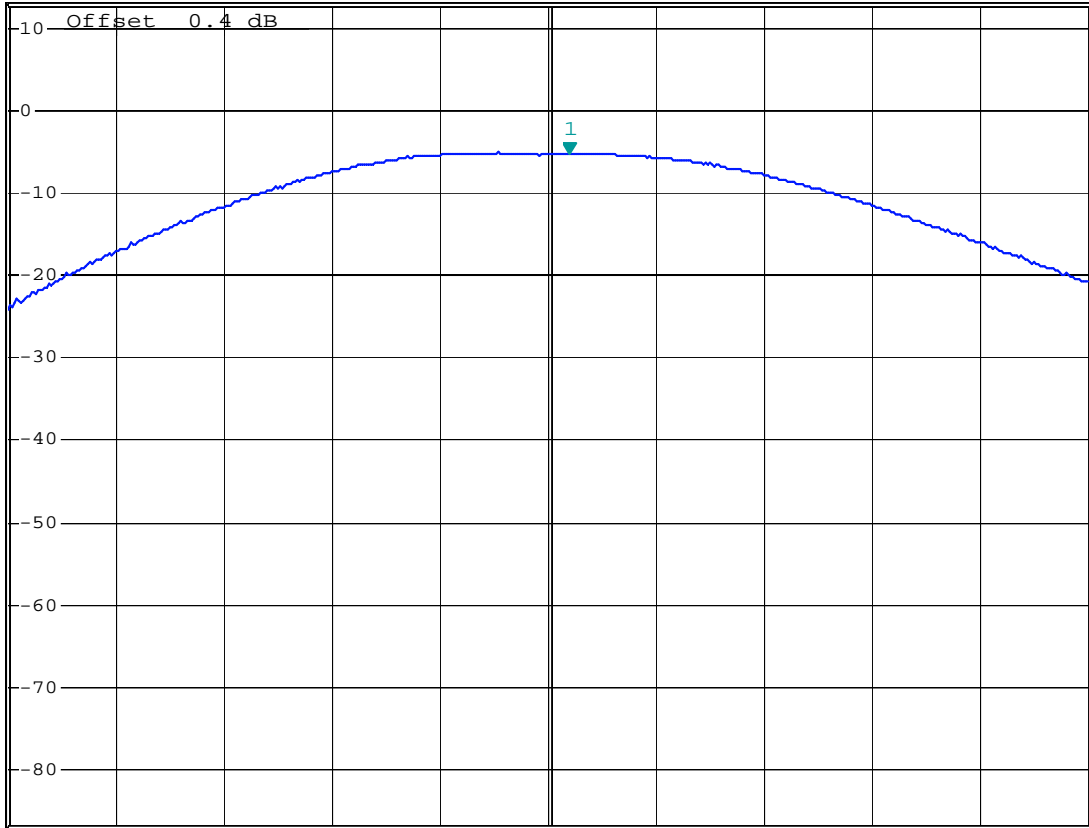


*RBW 3 MHz Marker 1 [T1]
 *VBW 3 MHz -5.18 dBm
 *SWT 40 ms 2.475200000 GHz

Ref 13 dBm

Att 50 dB

1 PK
 MAXH



Comment: Conducted output power
 Date: 11.NOV.2009 08:59:51

Plot 1.4

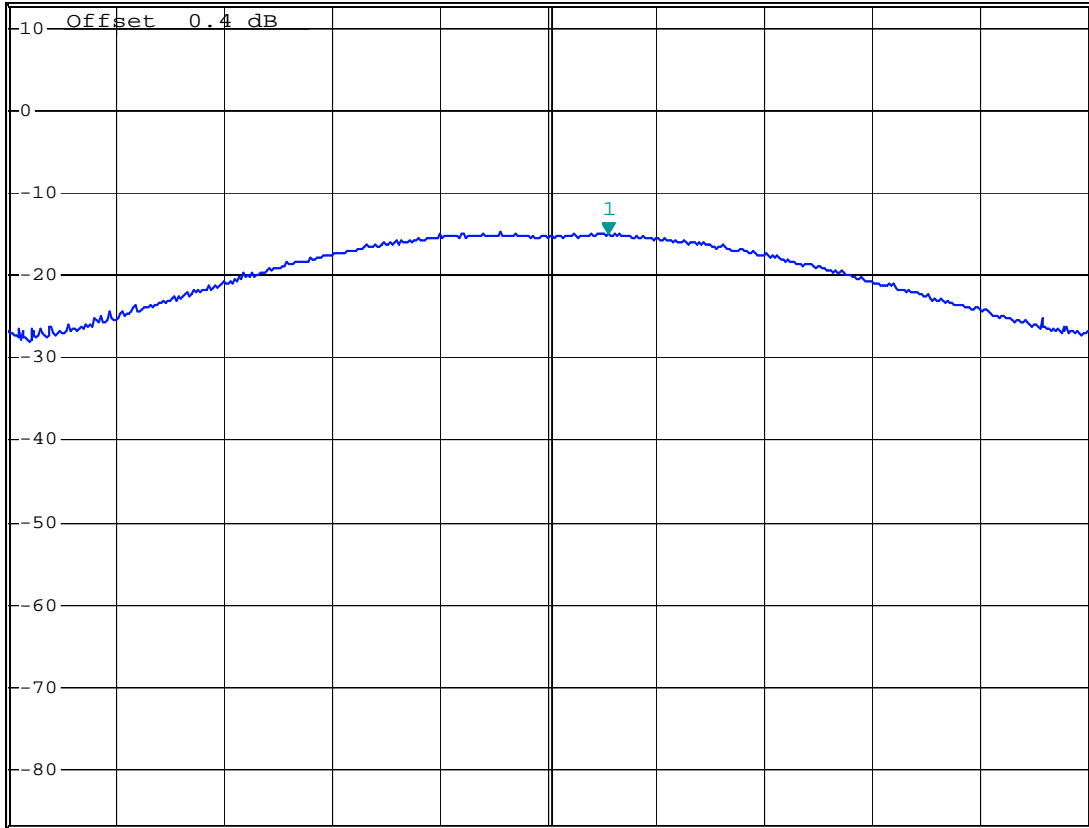


*RBW 3 MHz Marker 1 [T1]
 *VBW 3 MHz -14.92 dBm
 *SWT 40 ms 2.480560000 GHz

Ref 13 dBm

Att 50 dB

1 PK
 MAXH



Comment: Conducted output power
 Date: 11.NOV.2009 08:58:53

4.2 6-dB Bandwidth
FCC 15.247(a)(2)

Requirements

For systems operating in the 2400-2483.5 MHz band using digital modulation, the minimum 6-dB Bandwidth shall be at least 500kHz.

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 total emission bandwidth, $VBW > RBW$. The 6-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)	6-dB channel bandwidth (MHz)	Plot
2405	2.405	2.1
2440	2.439	2.2
2480	2.479	2.3

Frequency (MHz)	Occupied bandwidth (MHz)	Plot
2405	2.770	2.4
2440	2.750	2.5
2480	2.470	2.6

Plot 2.1

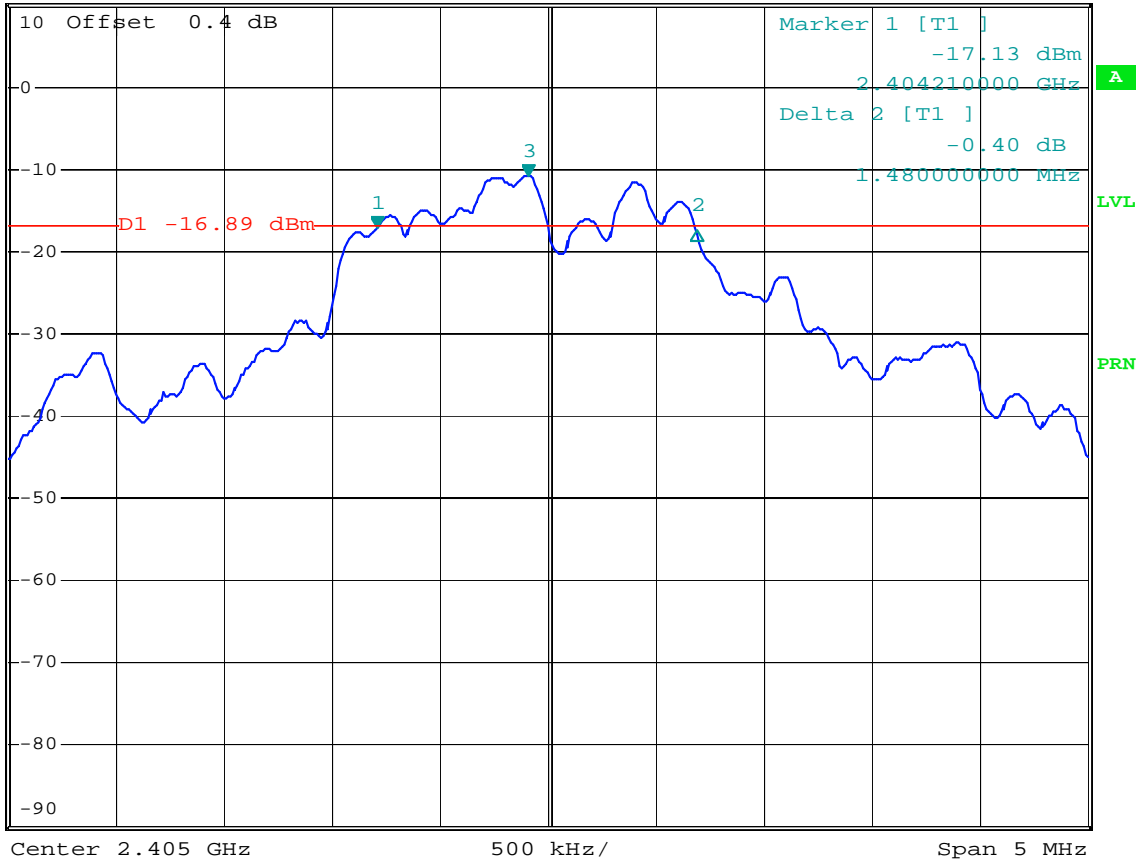


*RBW 100 kHz Marker 3 [T1]
 *VBW 100 kHz -10.89 dBm
 *SWT 40 ms 2.404910000 GHz

Ref 10 dBm

Att 40 dB

1 PK
VIEW



Comment: 6dB Bandwidth
 Date: 11.NOV.2009 09:03:22



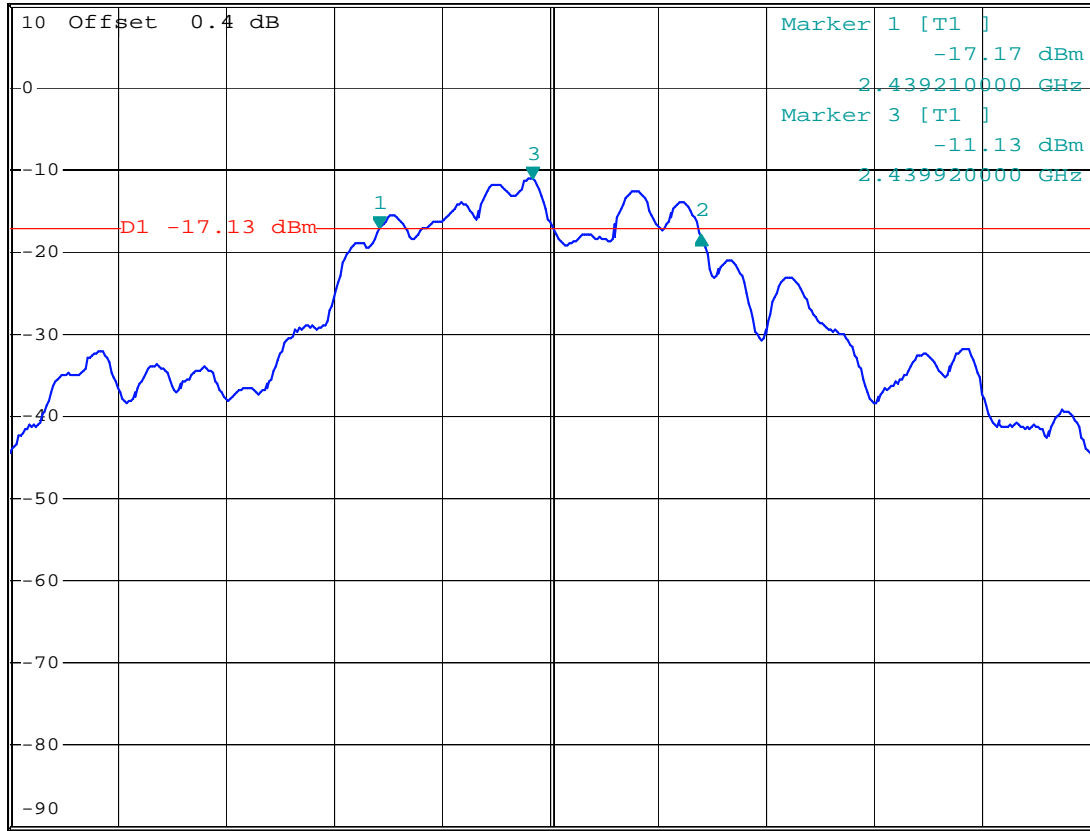
Plot 2.2

*RBW 100 kHz Delta 2 [T1]
 *VBW 100 kHz -0.69 dB
 *SWT 40 ms 1.490000000 MHz

Ref 10 dBm

Att 40 dB

1 PK
VIEW



Center 2.44 GHz 500 kHz/ Span 5 MHz

Comment: 6dB Bandwidth

Date: 11.NOV.2009 09:05:18



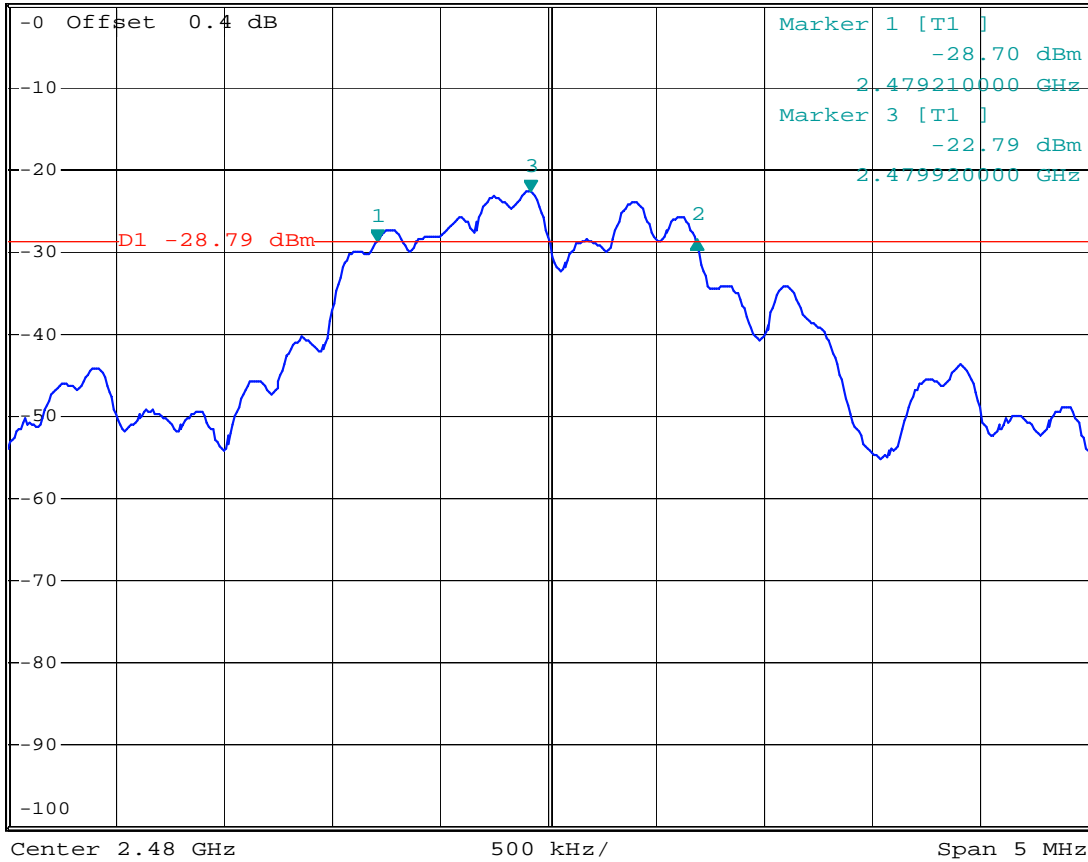
Plot 2.3

*RBW 100 kHz Delta 2 [T1]
 *VBW 100 kHz 0.12 dB
 *SWT 40 ms 1.480000000 MHz

Ref 0 dBm

Att 30 dB

1 PK
VIEW



Comment: 6dB Bandwidth

Date: 11.NOV.2009 09:09:31

Plot 2.4

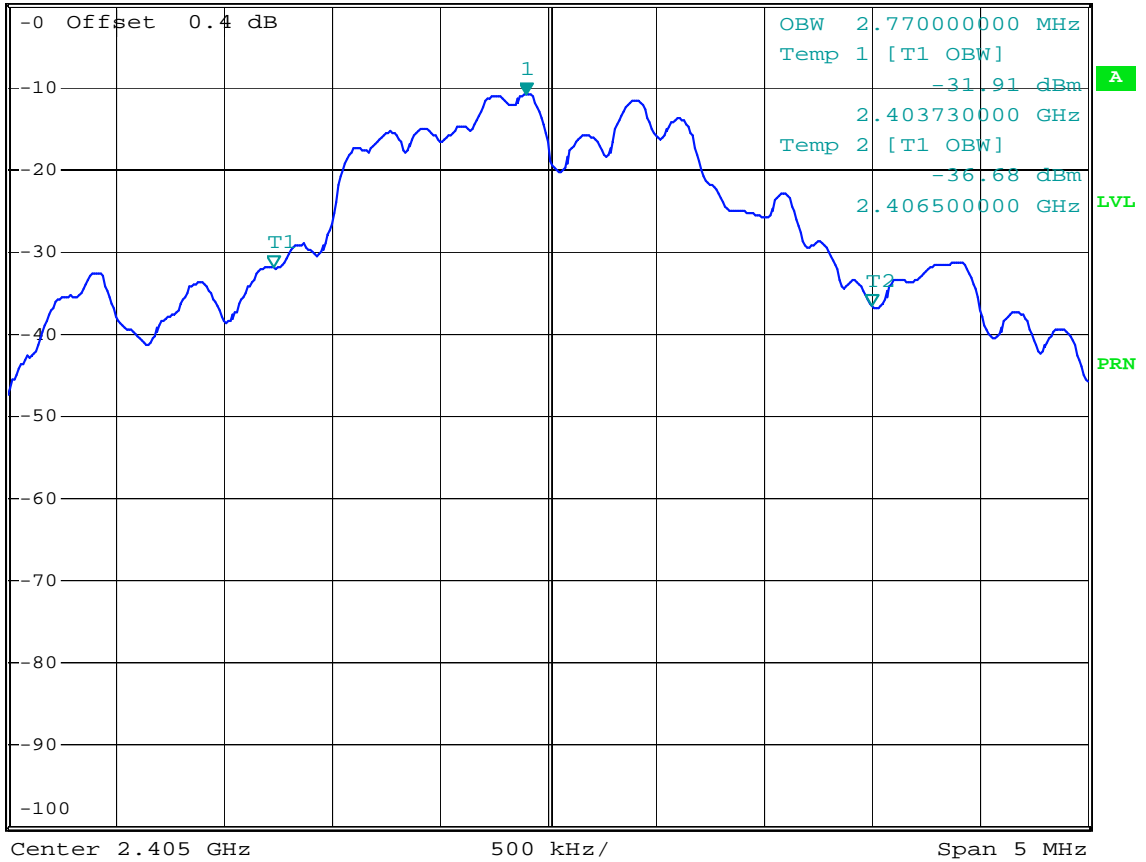


*RBW 100 kHz Marker 1 [T1]
 *VBW 100 kHz -10.90 dBm
 *SWT 40 ms 2.404900000 GHz

Ref 0 dBm

Att 20 dB

1 PK
MAXH



Comment: Occupied Bandwidth
 Date: 11.NOV.2009 09:11:10



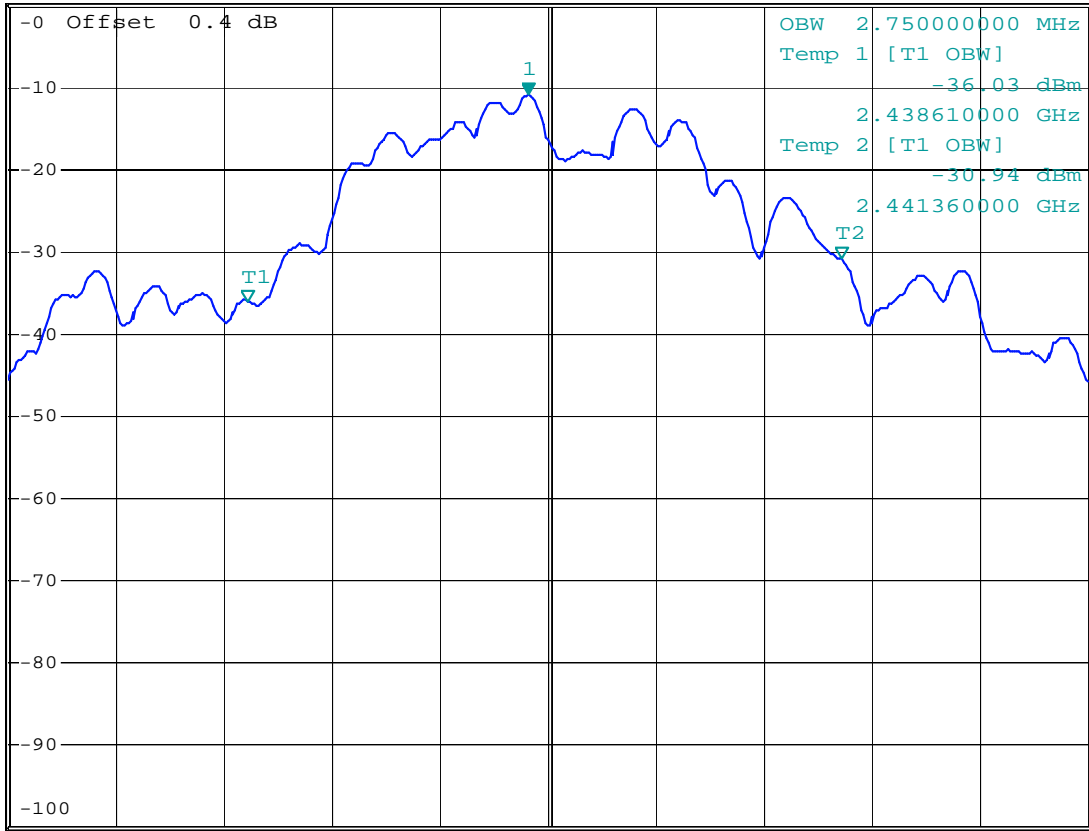
Plot 2.5

*RBW 100 kHz Marker 1 [T1]
 *VBW 100 kHz -10.99 dBm
 *SWT 40 ms 2.439910000 GHz

Ref 0 dBm

Att 20 dB

1 PK
MAXH



Center 2.44 GHz

500 kHz/

Span 5 MHz

Comment: Occupied Bandwidth

Date: 11.NOV.2009 09:12:16

4.3 Out-of Band-Conducted Emissions FCC 15.247(d)

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=2405 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, 2405 MHz	6.13
Emissions on the high band-edge frequency	Fixed channel, 2480 MHz	6.14
Out-of-band low Channel Emissions	Fixed channel, 2405 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 3.1

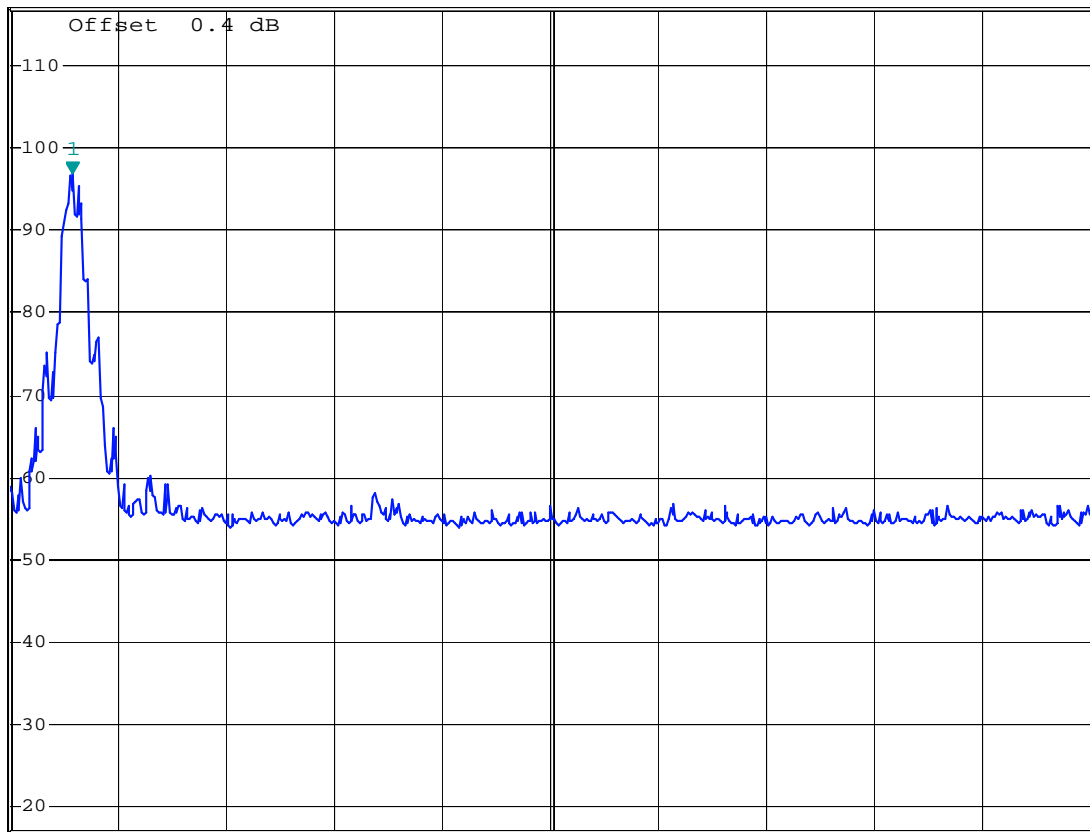


*RBW 100 kHz Marker 1 [T1]
*VBW 100 kHz 96.88 dBµV
SWT 10 ms 2.404843000 GHz

Ref 117 dBµV

Att 40 dB

1 PK
MAXH



Start 2.4 GHz

8.35 MHz/

Stop 2.4835 GHz

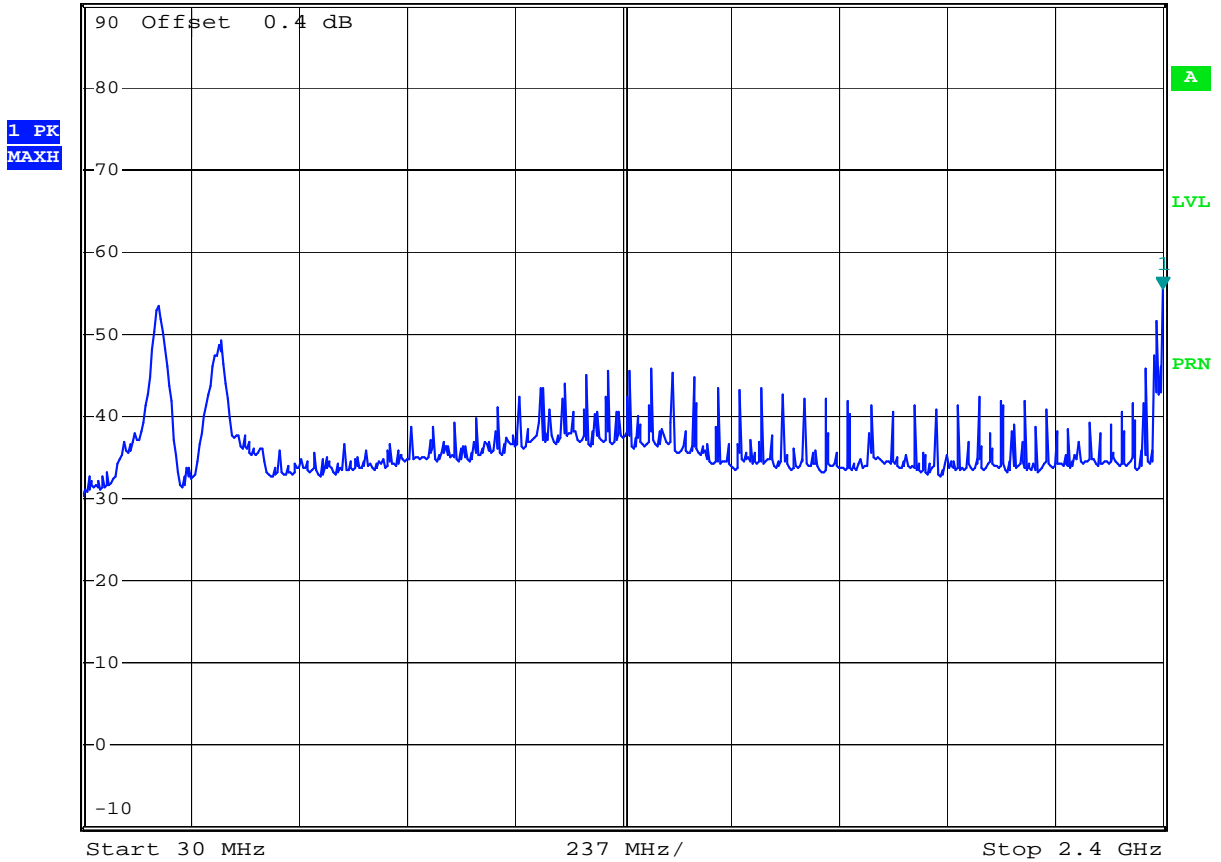
Comment: In-band emissions, Freq 2405 MHz

Date: 11.NOV.2009 09:31:32



Plot 3.2

*RBW 100 kHz Marker 1 [T1]
*VBW 100 kHz 55.42 dBμV
Ref 90 dBμV Att 20 dB SWT 240 ms 2.40000000 GHz



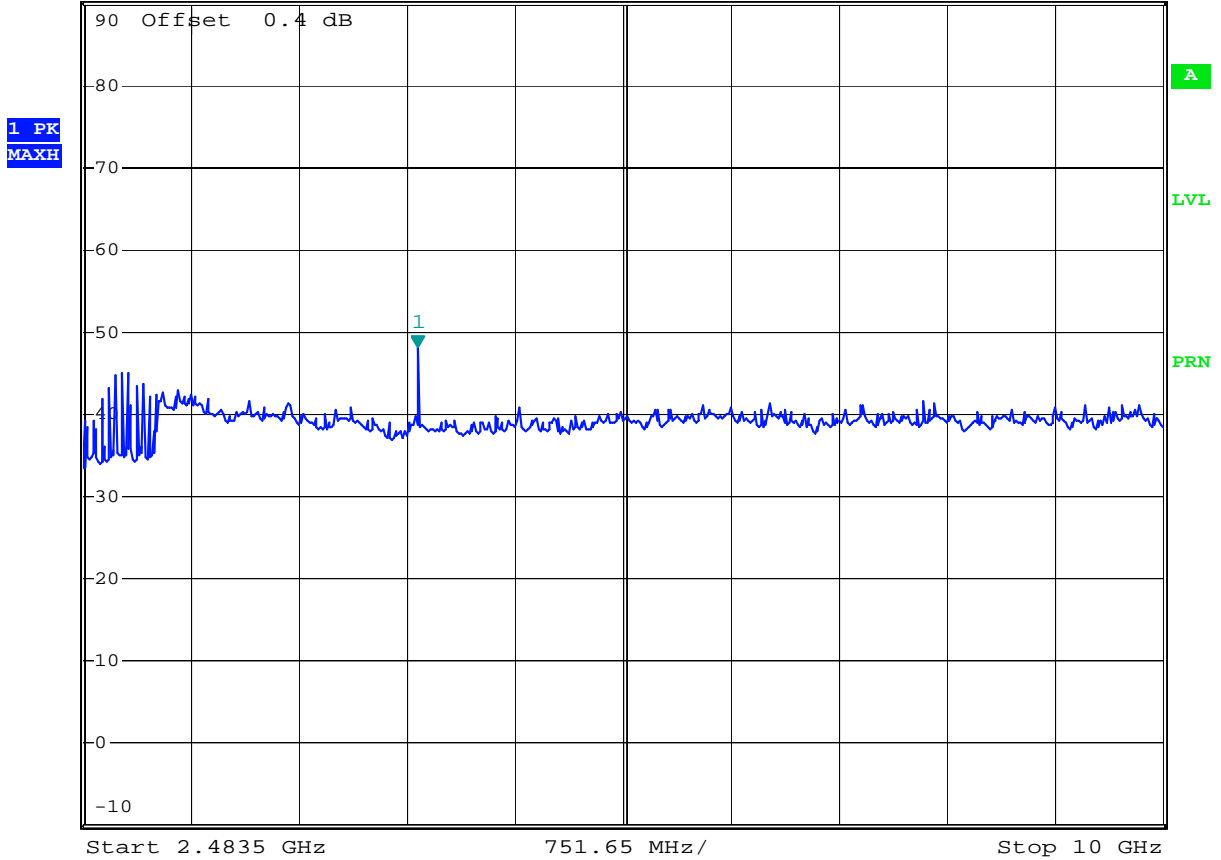
Comment: Spurious emissions, Freq 2405 MHz
Date: 11.NOV.2009 09:32:27



Plot 3.3

*RBW 100 kHz Marker 1 [T1]
*VBW 100 kHz 48.11 dBμV
SWT 760 ms 4.813615000 GHz

Ref 90 dBμV Att 20 dB



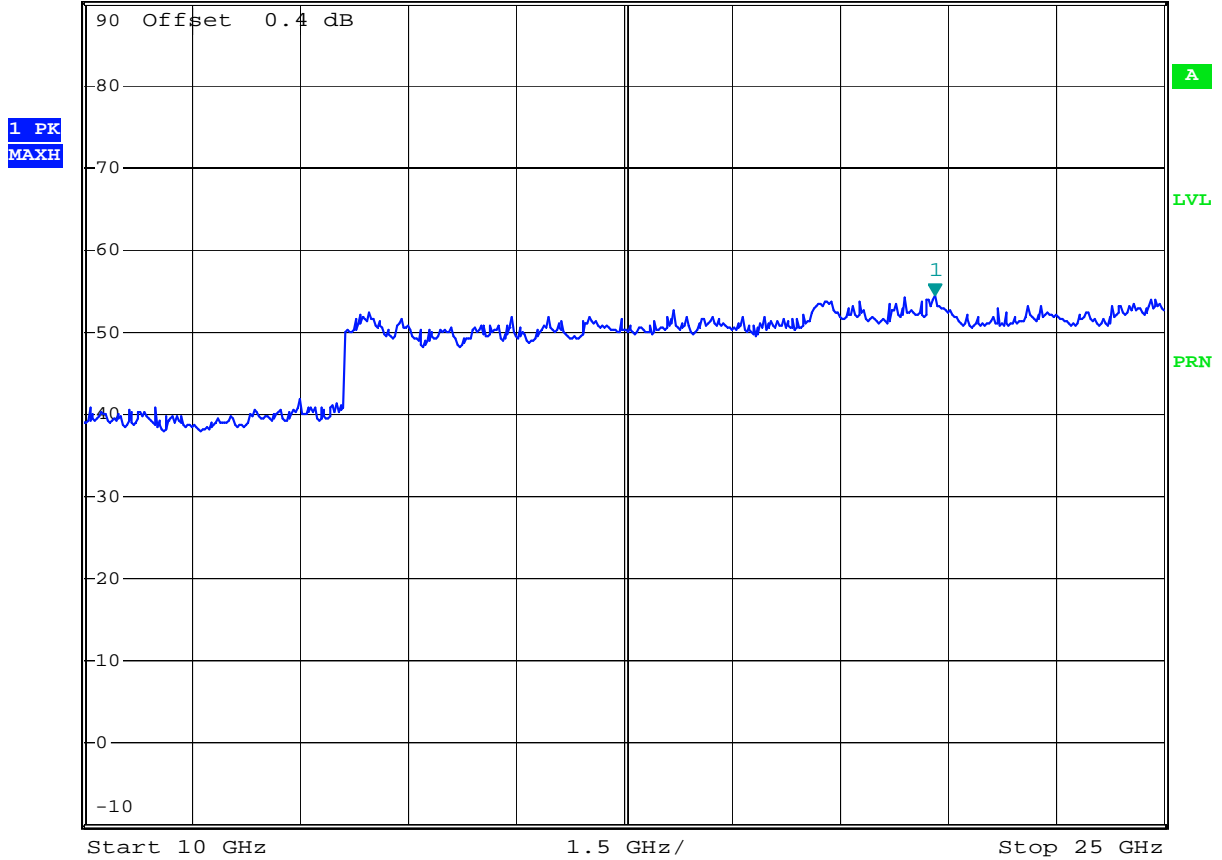
Comment: Spurious emissions, Freq 2405 MHz
Date: 11.NOV.2009 09:33:00

Plot 3.4



*RBW 100 kHz Marker 1 [T1]
*VBW 100 kHz 54.39 dBμV

Ref 90 dBμV Att 20 dB SWT 1.5 s 21.82000000 GHz

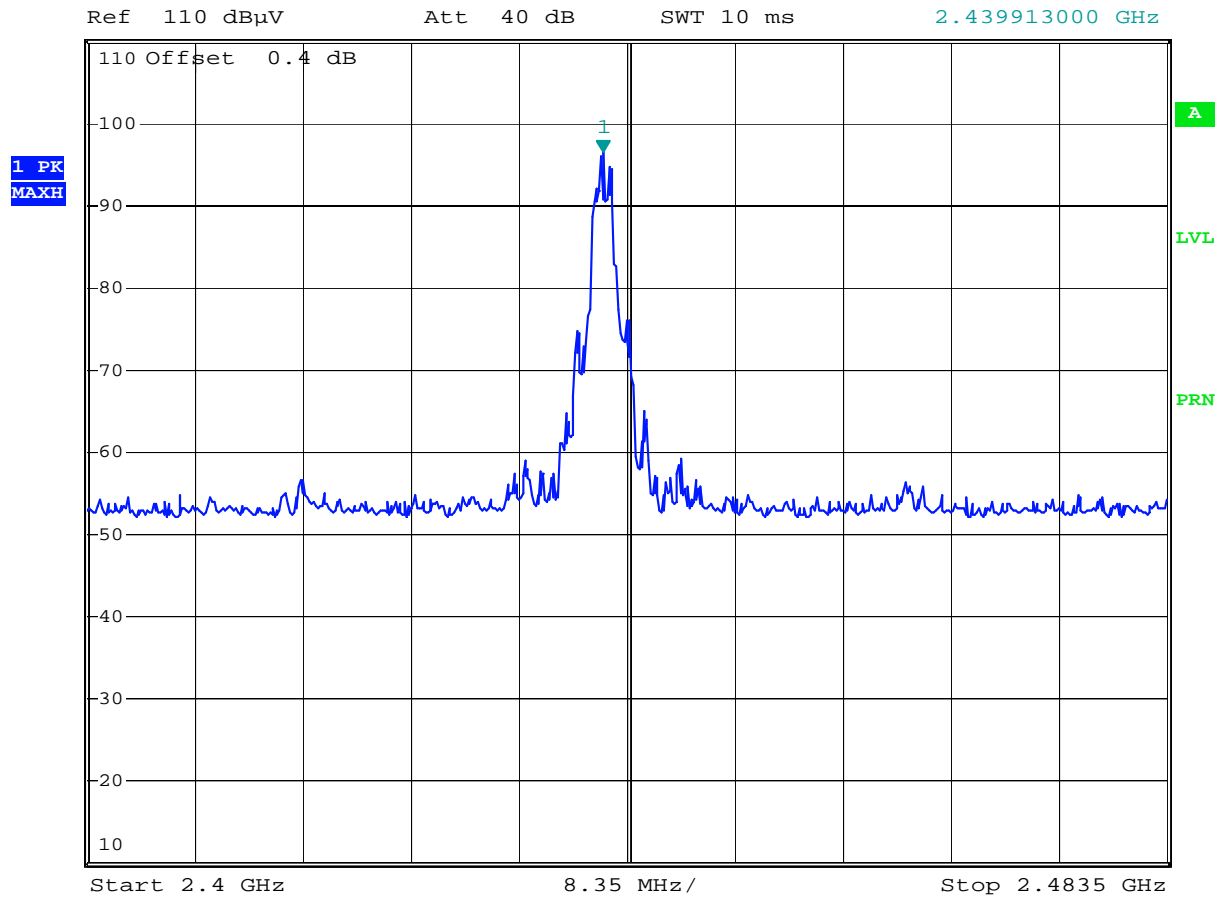


Comment: Spurious emissions, Freq 2405 MHz
Date: 11.NOV.2009 09:33:39



Plot 3.5

*RBW 100 kHz Marker 1 [T1]
*VBW 100 kHz 96.47 dBµV
SWT 10 ms 2.439913000 GHz

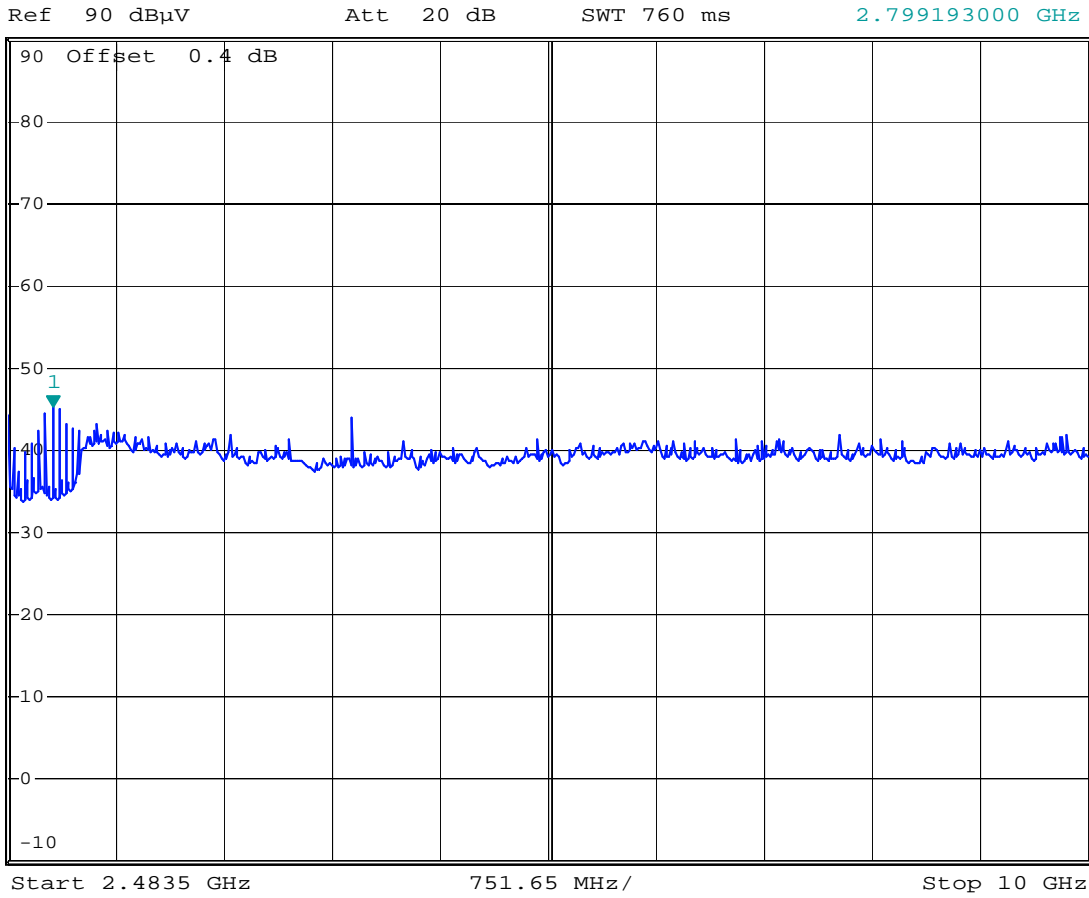


Comment: In-band emissions, Freq 2440 MHz
Date: 11.NOV.2009 09:34:39

Plot 3.7



*RBW 100 kHz Marker 1 [T1]
*VBW 100 kHz 45.23 dBμV
SWT 760 ms 2.799193000 GHz



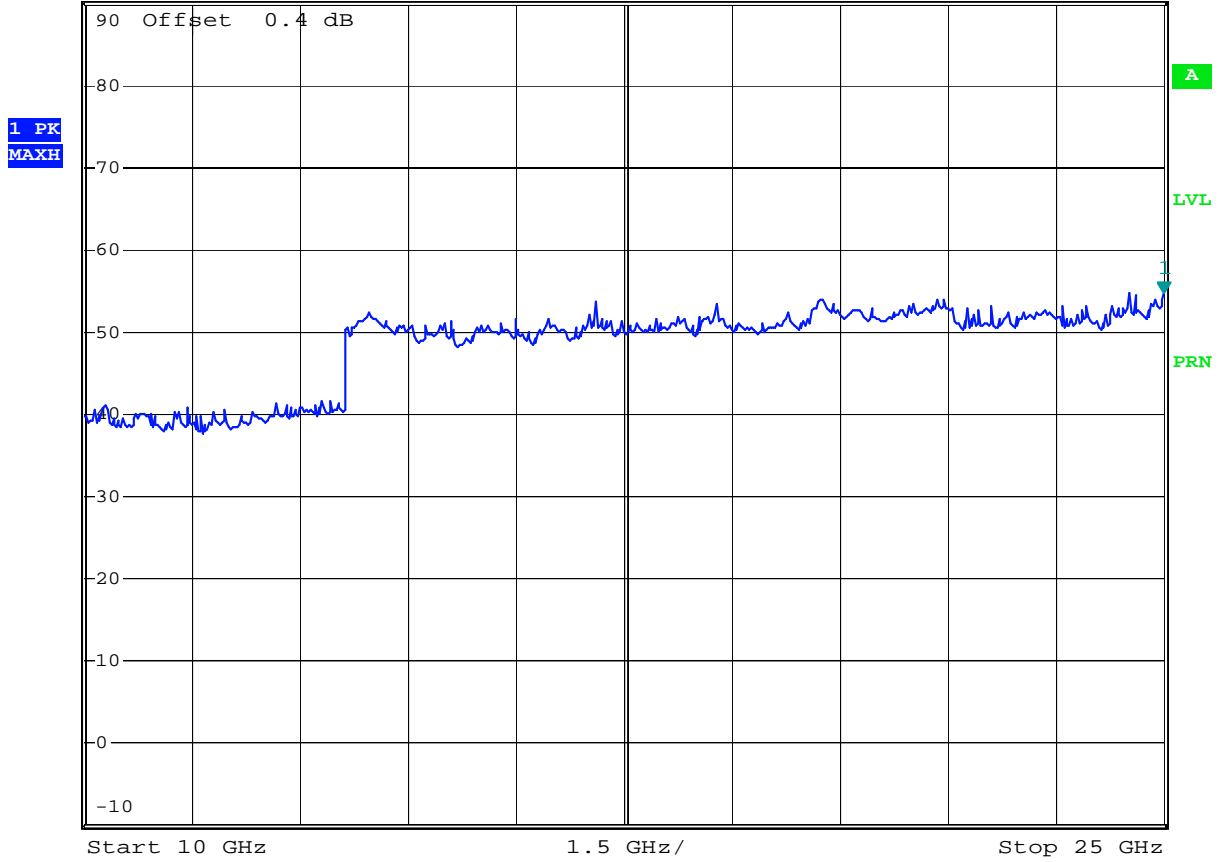
Comment: Spurious emissions, Freq 2440 MHz
Date: 11.NOV.2009 09:35:56

Plot 3.8



*RBW 100 kHz Marker 1 [T1]
*VBW 100 kHz 54.78 dBμV

Ref 90 dBμV Att 20 dB SWT 1.5 s 25.00000000 GHz



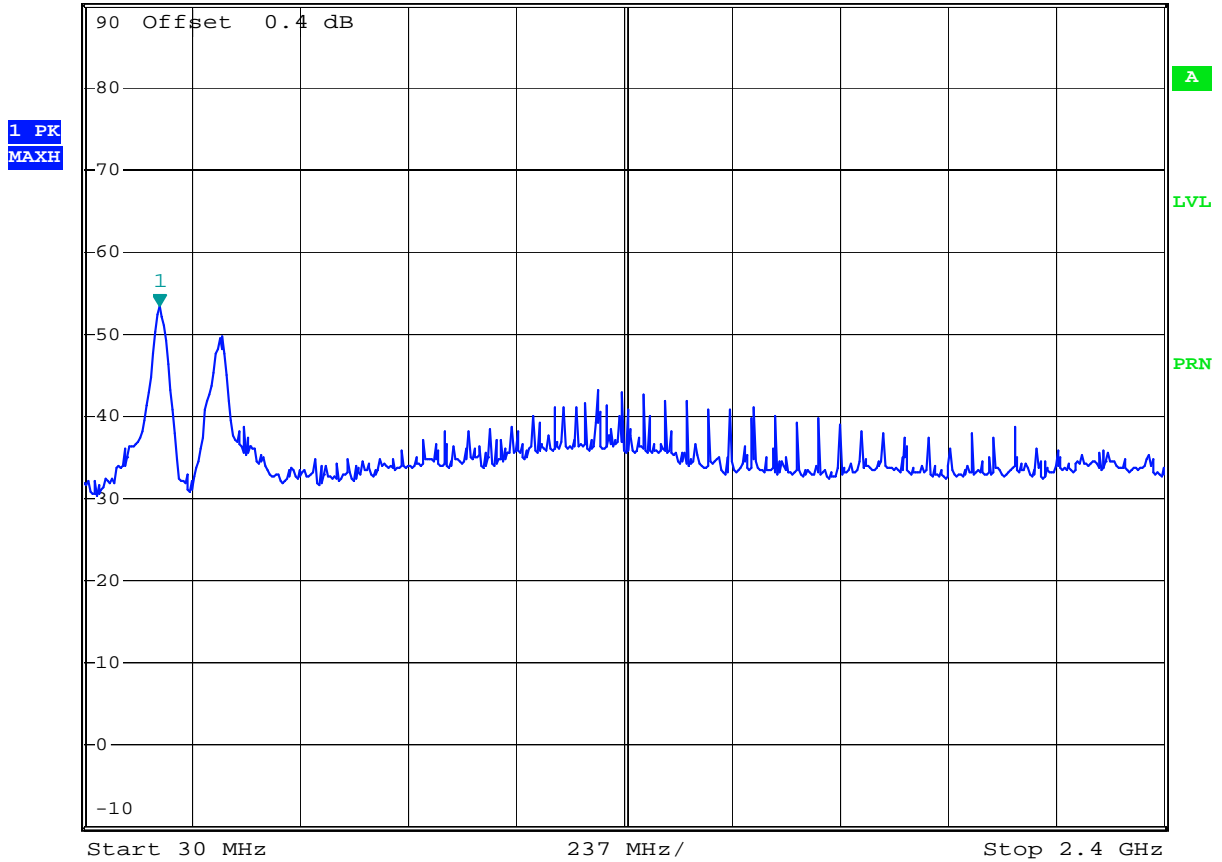
Comment: Spurious emissions, Freq 2440 MHz
Date: 11.NOV.2009 09:36:31

Plot 3.10



*RBW 100 kHz Marker 1 [T1]
*VBW 100 kHz 53.47 dBμV

Ref 90 dBμV Att 20 dB SWT 240 ms 195.90000000 MHz



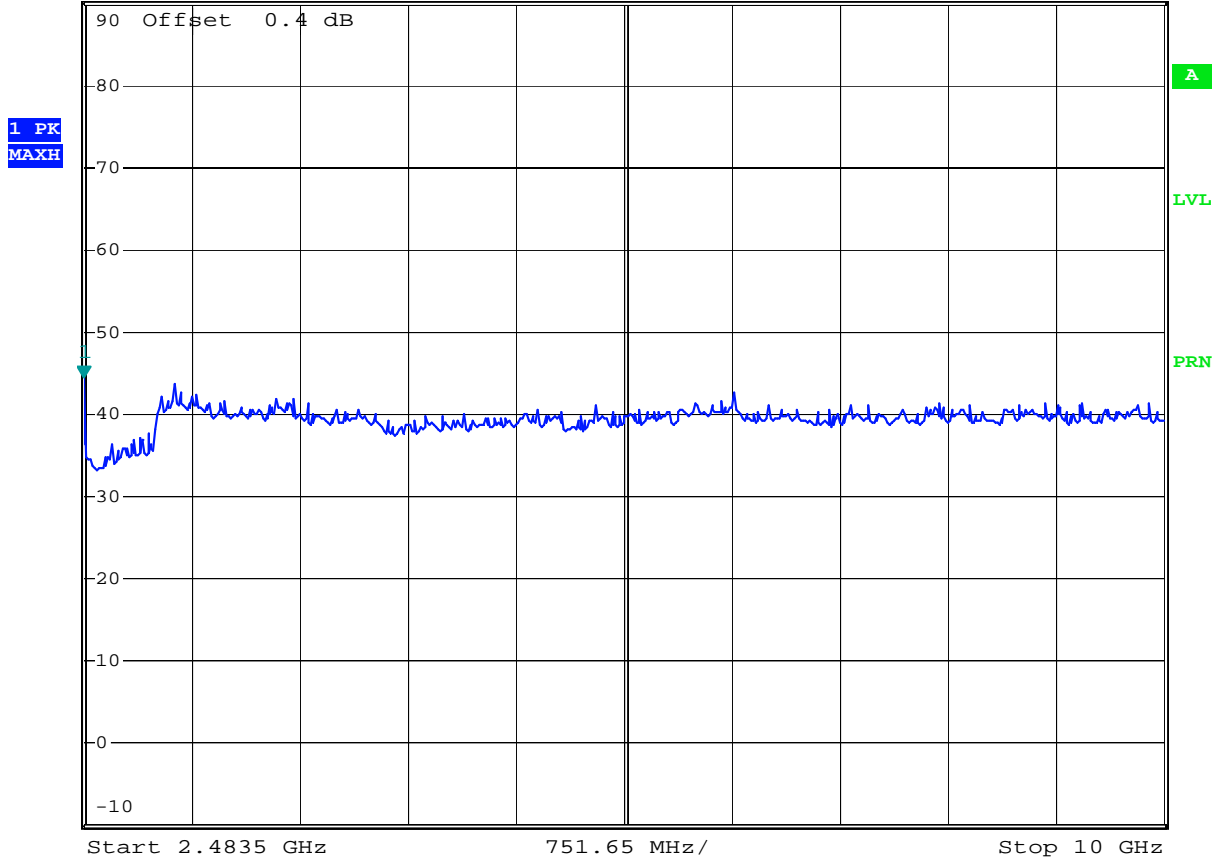
Comment: Spurious emissions, Freq 2480 MHz
Date: 11.NOV.2009 09:38:46

Plot 3.11



*RBW 100 kHz Marker 1 [T1]
 *VBW 100 kHz 44.45 dBμV

Ref 90 dBμV Att 20 dB SWT 760 ms 2.483500000 GHz



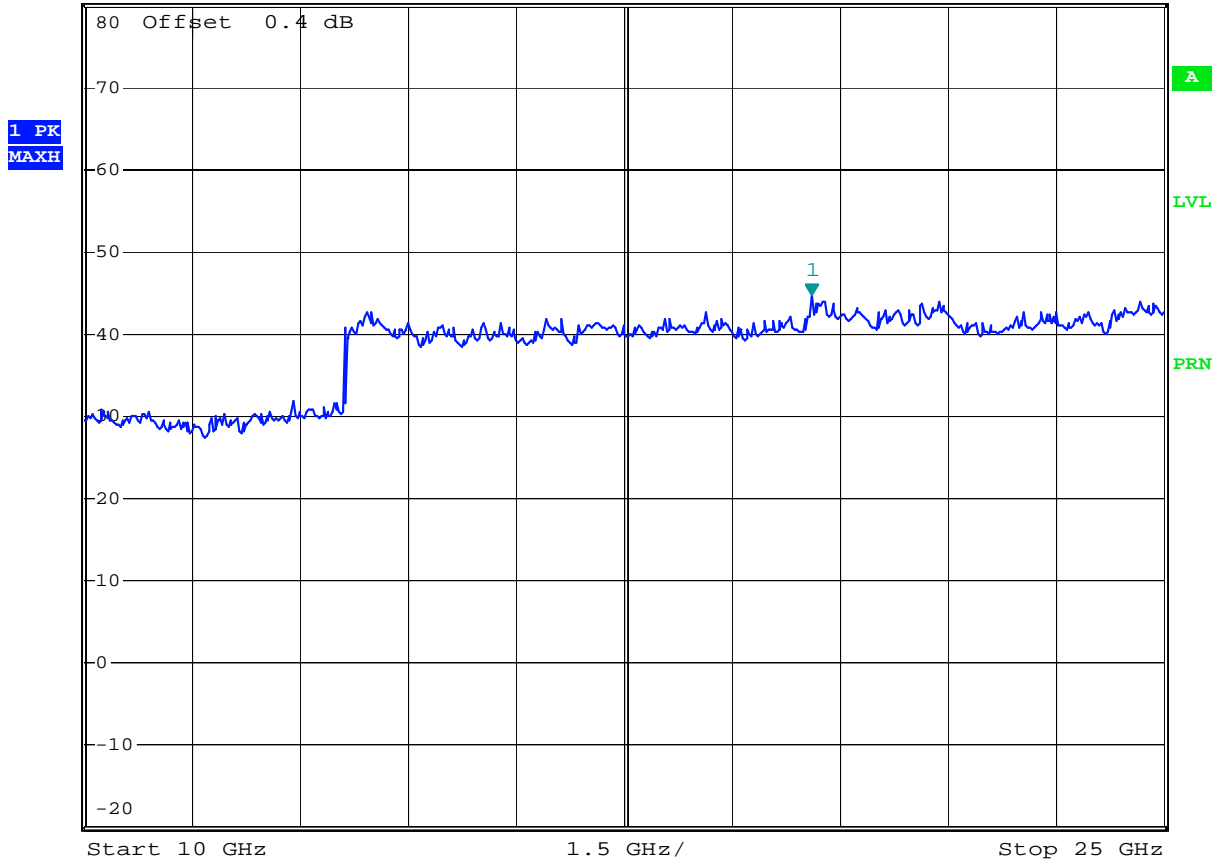
Comment: Spurious emissions, Freq 2480 MHz
 Date: 11.NOV.2009 09:39:24

Plot 3.12



*RBW 100 kHz Marker 1 [T1]
 *VBW 100 kHz 44.62 dBµV

Ref 80 dBµV Att 10 dB SWT 1.5 s 20.11000000 GHz

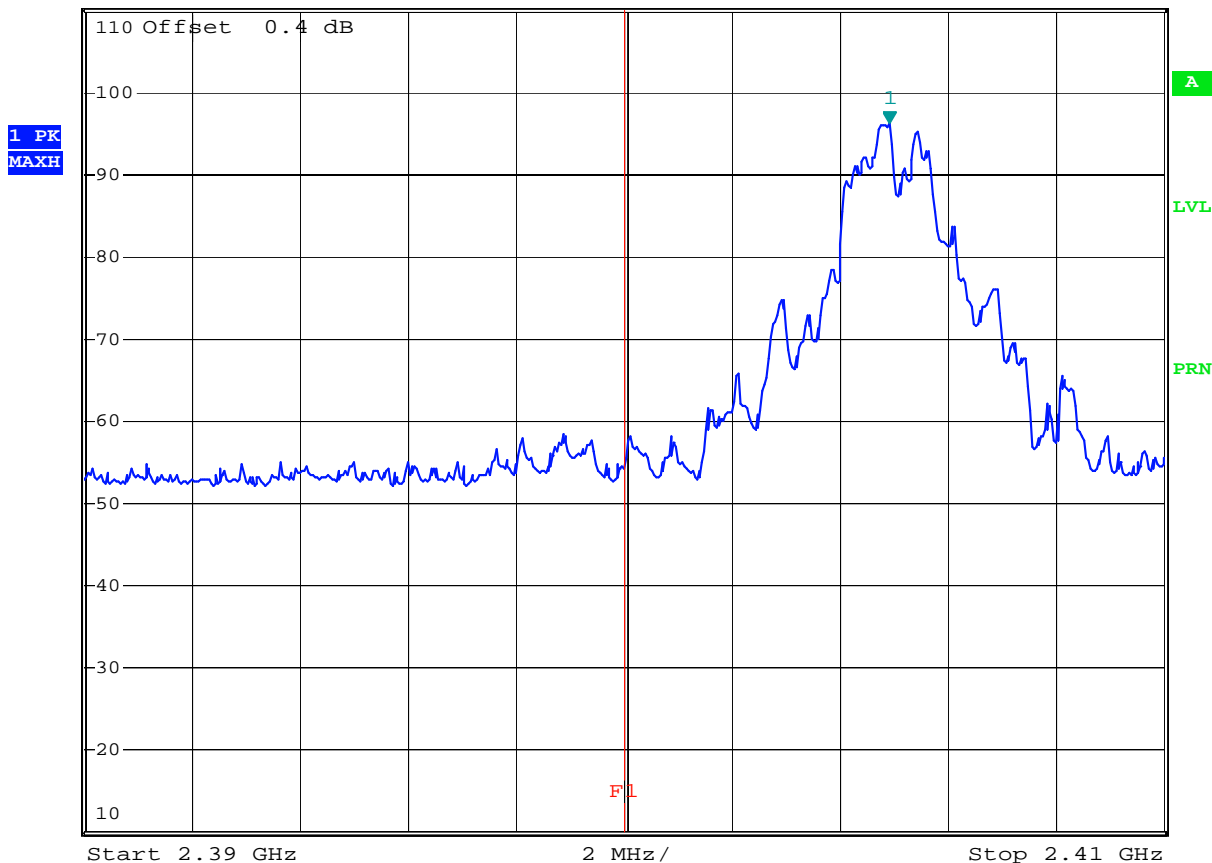


Comment: Spurious emissions, Freq 2480 MHz
 Date: 11.NOV.2009 09:41:14

Plot 3.13



*RBW 100 kHz Marker 1 [T1]
*VBW 100 kHz 96.20 dBµV
Ref 110 dBµV Att 40 dB SWT 5 ms 2.404920000 GHz

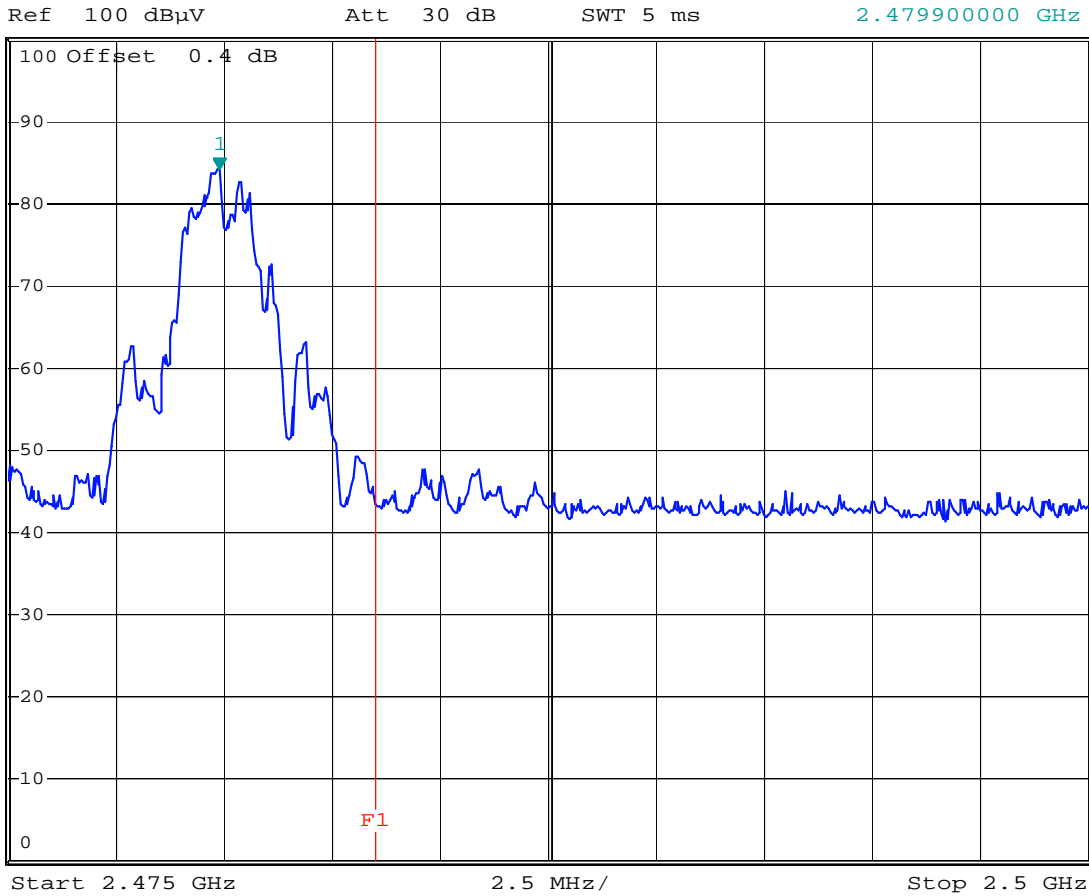


Comment: Spurious emissions, Freq 2405 MHz
Date: 11.NOV.2009 09:42:29

Plot 3.14



*RBW 100 kHz Marker 1 [T1]
*VBW 100 kHz 84.18 dBµV
2.479900000 GHz



Comment: Spurious emissions, Freq 2480 MHz
Date: 11.NOV.2009 09:43:49

4.4 Power Spectral Density
FCC 15.247 (e)

Requirement

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

Procedure

A spectrum analyzer was connected to the antenna port of the transmitter. Initially investigation was performed with 10kHz RBW on the wider span for finding Peak power level. Then centered the Peak Level detected to the center of the spectrum analyzer. Final Power Spectral Density measurement was taken with 3kHz RBW on the narrower span.

Test Result

Refer to the following plots for the test result:

Frequency (MHz)	Power Spectral Density (dBm)	Plot
2405	-14.8	4.1, 4.2
2440	-16.1	4.3, 4.4
2480	-27.3	4.5, 4.6

Plot 4.1

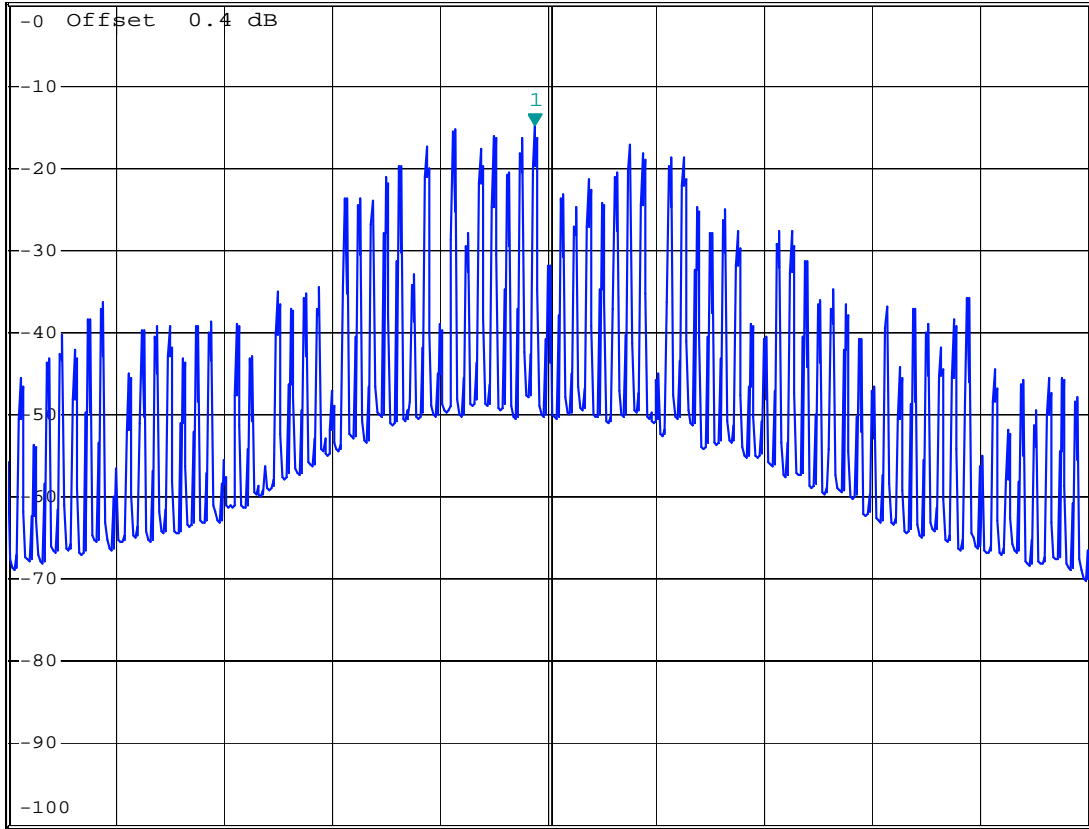


*RBW 10 kHz Marker 1 [T1]
*VBW 100 kHz -14.81 dBm
*SWT 5 s 2.404940000 GHz

Ref 0 dBm

Att 30 dB

1 PK
MAXH



Comment: Power spectral density
Date: 11.NOV.2009 09:15:42

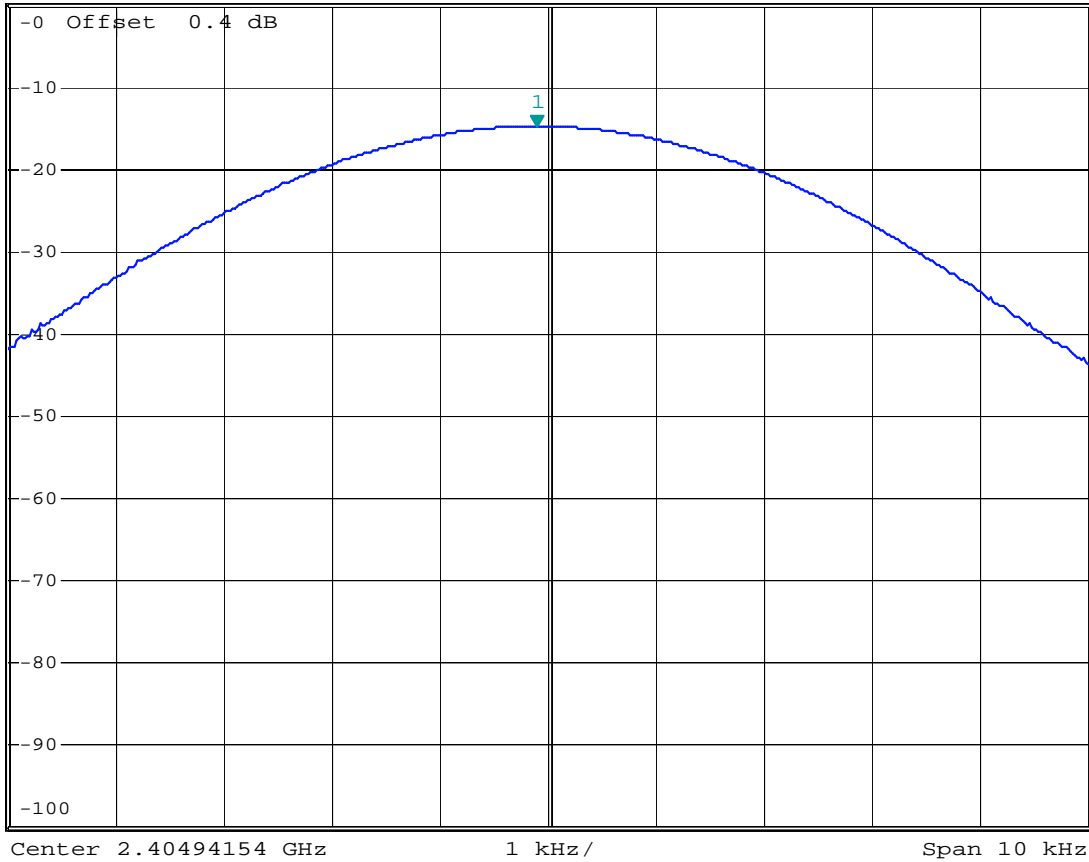
Plot 4.2



*RBW 3 kHz Marker 1 [T1]
*VBW 100 kHz -14.78 dBm
*SWT 5 s 2.404941440 GHz

Ref 0 dBm

Att 30 dB



Comment: Power spectral density
Date: 11.NOV.2009 09:19:05



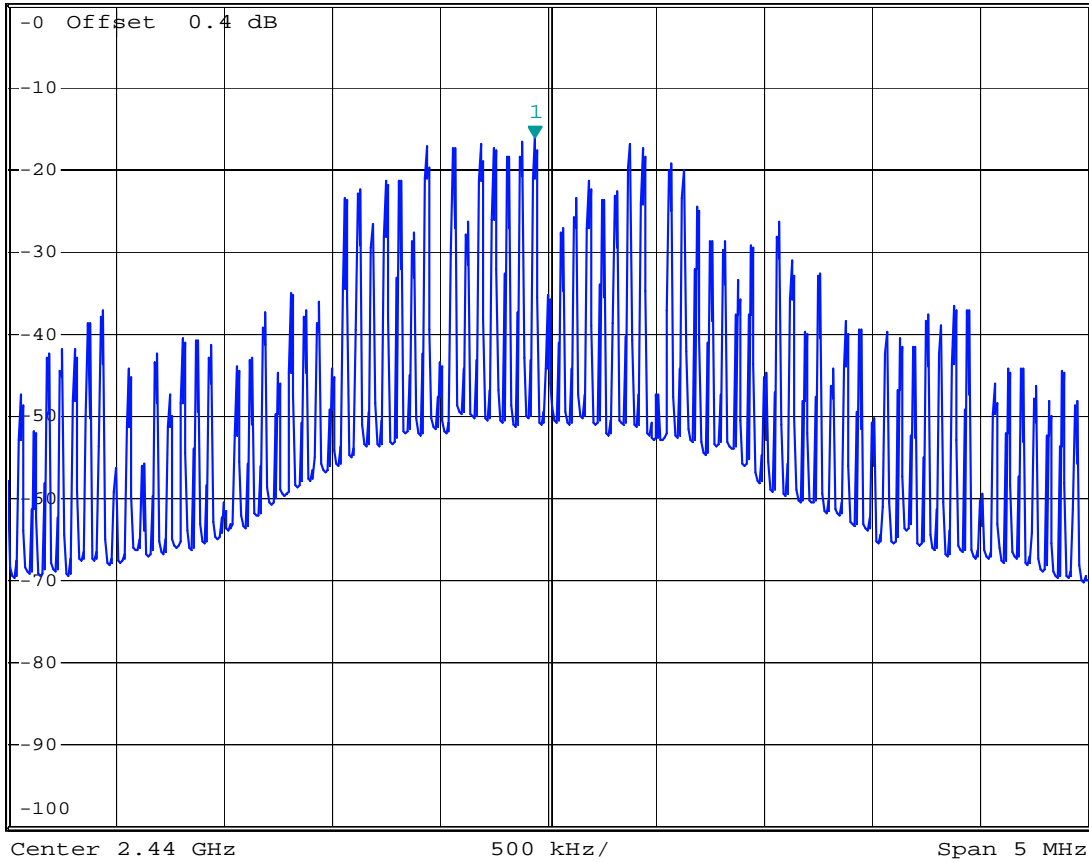
Plot 4.3

*RBW 10 kHz Marker 1 [T1]
*VBW 100 kHz -16.14 dBm
*SWT 5 s 2.439940000 GHz

Ref 0 dBm

Att 30 dB

1 PK
MAXH



Comment: Power spectral density
Date: 11.NOV.2009 09:20:16

Plot 4.4

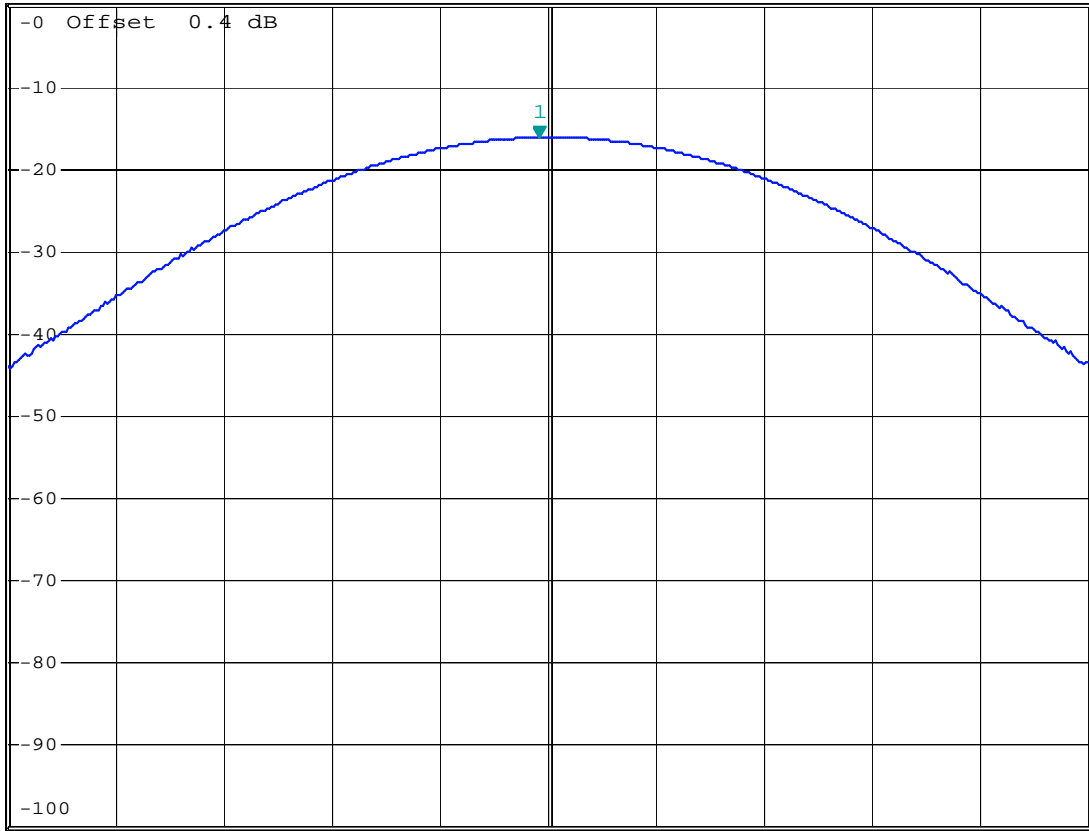


*RBW 3 kHz Marker 1 [T1]
 *VBW 100 kHz -16.13 dBm
 *SWT 5 s 2.439941380 GHz

Ref 0 dBm

Att 30 dB

1 PK
 MAXH



Comment: Power spectral density
 Date: 11.NOV.2009 09:21:06



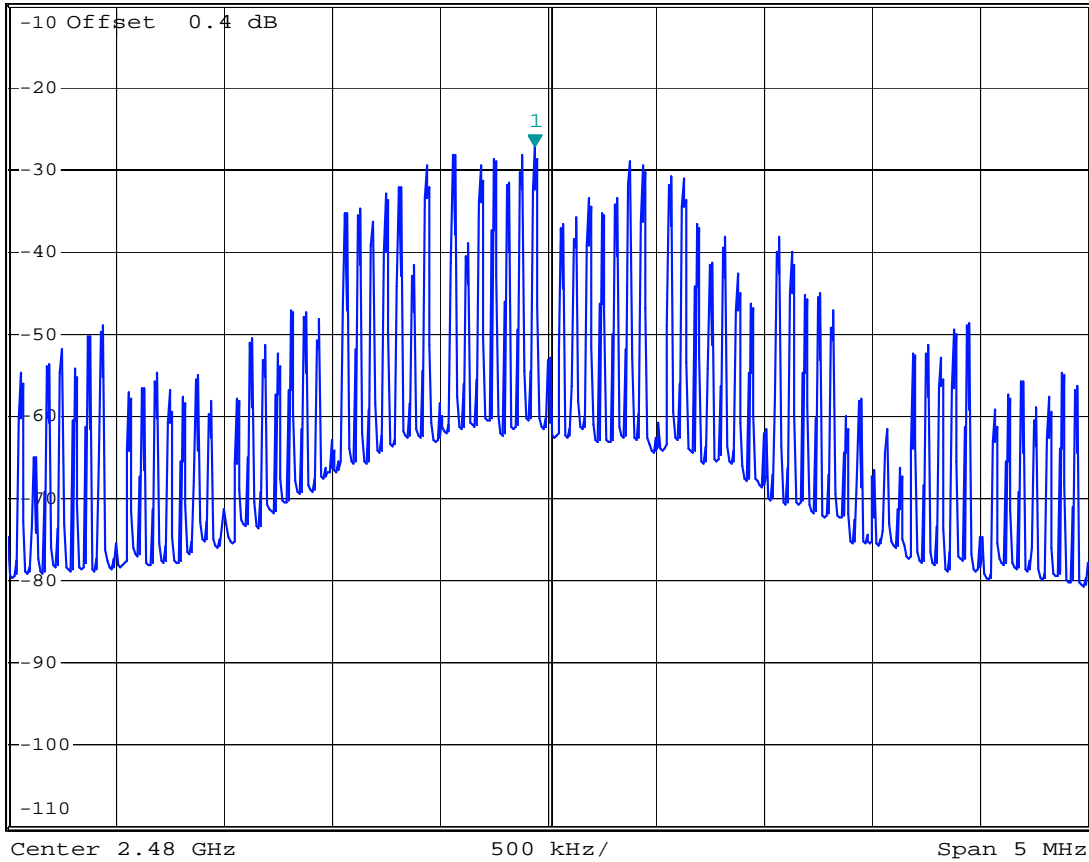
Plot 4.5

*RBW 10 kHz Marker 1 [T1]
*VBW 100 kHz -27.30 dBm
*SWT 5 s 2.479940000 GHz

Ref -10 dBm

Att 20 dB

1 PK
MAXH



Comment: Power spectral density
Date: 11.NOV.2009 09:22:26

Plot 4.6

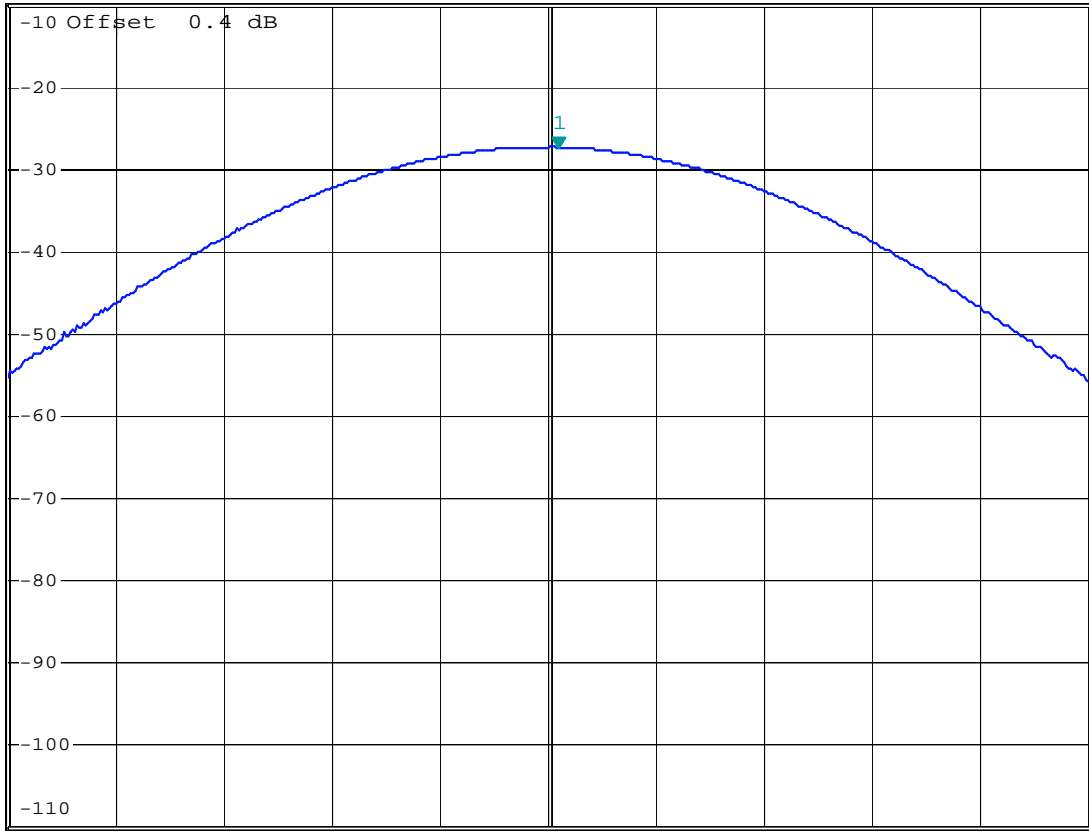


*RBW 3 kHz Marker 1 [T1]
*VBW 100 kHz -27.34 dBm
*SWT 5 s 2.479941720 GHz

Ref -10 dBm

Att 20 dB

1 PK
MAXH



Center 2.47994162 GHz

1 kHz/

Span 10 kHz

Comment: Power spectral density
Date: 11.NOV.2009 09:23:10

4.5 Transmitter Radiated Emissions FCC 15.247 (d), 15.205, 15.209

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(μ V/m)

RA = Receiver Amplitude (including preamplifier) in dB(μ V)

CF = Cable Attenuation Factor in dB

AF = Antenna Factor in dB

AG = Amplifier Gain in dB

Assume a receiver reading of 52.0 dB(μ V) 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(μ V/m). This value in dB(μ V/m) was converted to its corresponding level in μ V/m.

$$RA = 52.0 \text{ dB}(\mu\text{V})$$

$$AF = 7.4 \text{ dB}(1/\text{m})$$

$$CF = 1.6 \text{ dB}$$

$$AG = 29.0 \text{ dB}$$

$$FS = 52.0 + 7.4 + 1.6 - 29.0 = 32 \text{ dB}(\mu\text{V}/\text{m})$$

$$\text{Level in } \mu\text{V}/\text{m} = \text{Common Antilogarithm } [(32 \text{ dB}\mu\text{V}/\text{m})/20] = 39.8 \mu\text{V}/\text{m}$$

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 5.1 – 5.6. 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 5.1 dB.

Test Result	
FCC Part 15.247 Radiated Emission in Restricted Bands	
Temperature: 21C	S&C Electric Company
Humidity: 50%	Model: PhaseNet Radio Transmitter
Test distance = 3 m	
Test date: November 09, 2009	

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 2405 MHz							
4810	Peak	45.1	-25.7	33.1	52.5	74.0	-21.5
12025	Peak	36.2	-20.9	38.2	53.5	74.0	-20.5
4810	Aver	35.6	-25.7	33.1	43.0	54.0	-11.0
12025	Aver	22.7	-20.9	38.2	40.0	54.0	-14.0
Tx at 2440 MHz							
4880	Peak	43.7	-25.2	33.4	51.9	74.0	-22.1
7320	Peak	37.1	-22.7	36.5	50.9	74.0	-23.1
12200	Peak	36.5	-21.1	38.2	53.6	74.0	-20.4
4880	Aver	34.5	-25.2	33.4	42.7	54.0	-11.3
7320	Aver	22.7	-22.7	36.5	36.5	54.0	-17.5
12200	Aver	22.5	-21.1	38.2	39.6	54.0	-14.4
Tx at 2480 MHz							
4960	Peak	41.9	-24.9	33.4	50.4	74.0	-23.6
7440	Peak	36.8	-22.6	36.4	50.6	74.0	-23.4
12400	Peak	36.4	-21.3	38.7	53.8	74.0	-20.2
4960	Aver	33.8	-25.4	33.4	41.8	54.0	-12.2
7440	Aver	23.4	-22.6	36.6	37.4	54.0	-16.6
12400	Aver	22.7	-21.3	38.7	40.1	54.0	-13.9

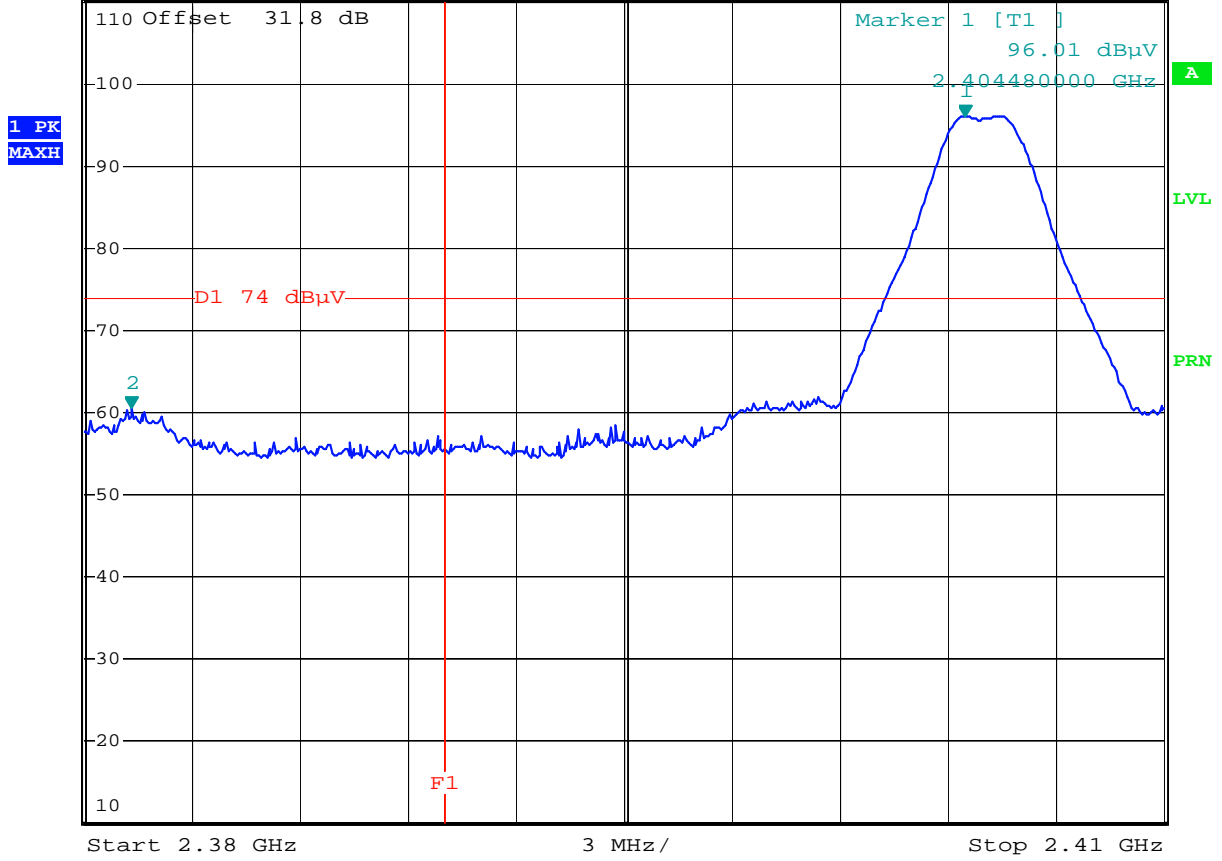
- a) RBW = 1 MHz, VBW = 1 MHz - for peak measurements
RBW = 1MHz, VBW = 100 Hz - for average measurements
- b) Correction Factor: Pre-amplifier gain + Cable loss + HP-Filter loss
- c) All other emissions are 20 dB below the limit.

Plot 5.1



*RBW 1 MHz Marker 2 [T1]
 *VBW 1 MHz 60.53 dBμV
 SWT 2.5 ms 2.381320000 GHz

Ref 110 dBμV *Att 0 dB

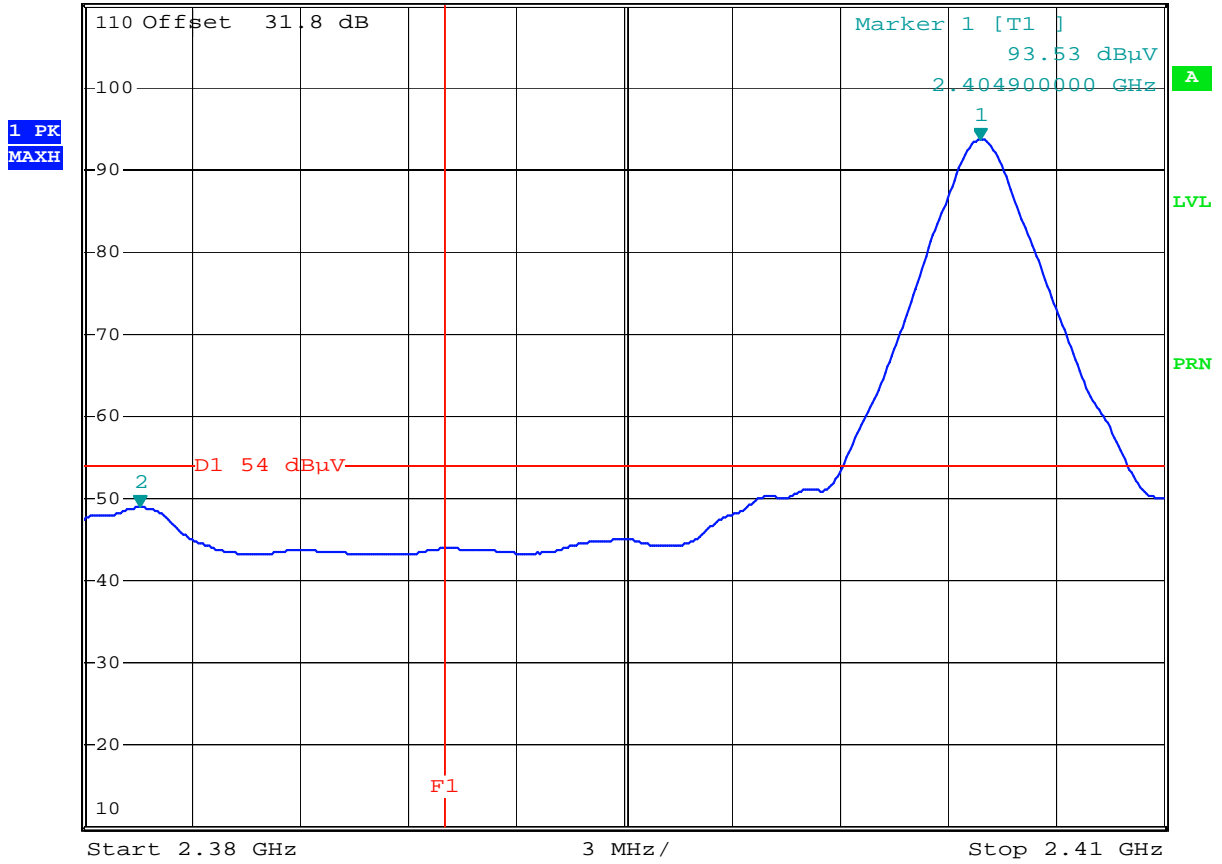


Comment: Emissions on band-edge frequency, peak, freq 2405 MHz
 Date: 9.NOV.2009 09:41:14

Plot 5.2



*RBW 1 MHz Marker 2 [T1]
 *VBW 10 Hz 48.89 dBμV
 Ref 110 dBμV *Att 0 dB SWT 7.6 s 2.381560000 GHz

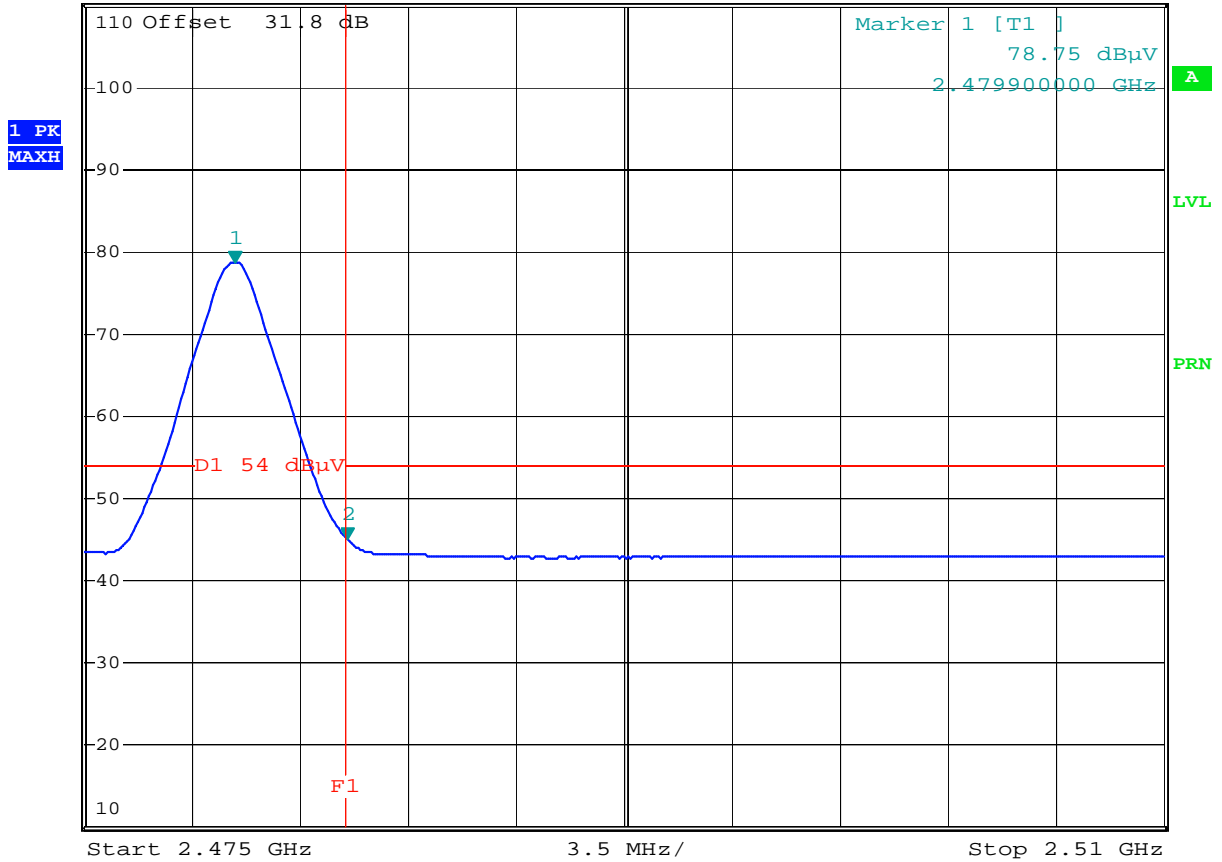


Comment: Emissions on band-edge frequency, average, freq 2405 MHz
 Date: 9.NOV.2009 09:42:52

Plot 5.3



*RBW 1 MHz Marker 2 [T1]
 *VBW 10 Hz 45.00 dBμV
 Ref 110 dBμV *Att 0 dB SWT 8.8 s 2.483540000 GHz

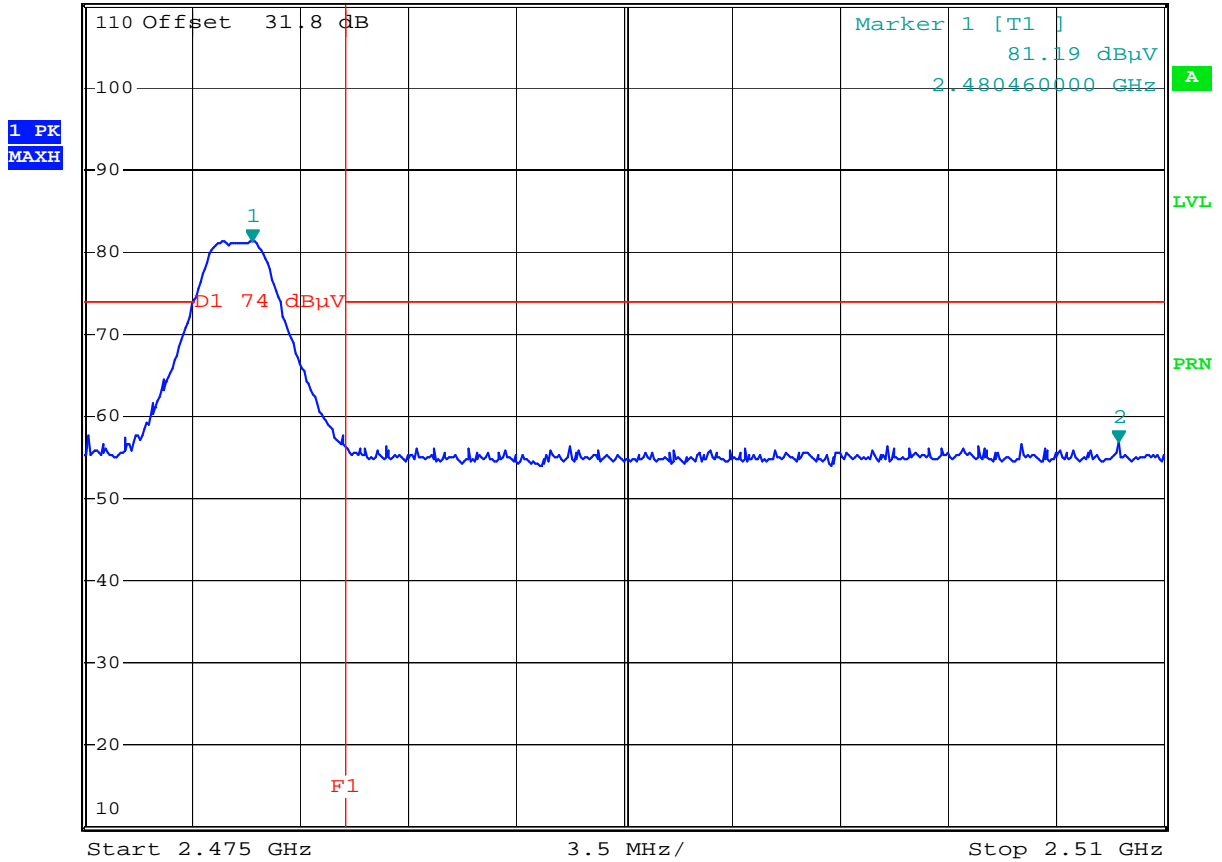


Comment: Emissions on band-edge frequency, average, freq 2480 MHz
 Date: 9.NOV.2009 09:53:55

Plot 5.4



*RBW 1 MHz Marker 2 [T1]
 *VBW 1 MHz 56.92 dBμV
 Ref 110 dBμV *Att 0 dB SWT 2.5 ms 2.508530000 GHz

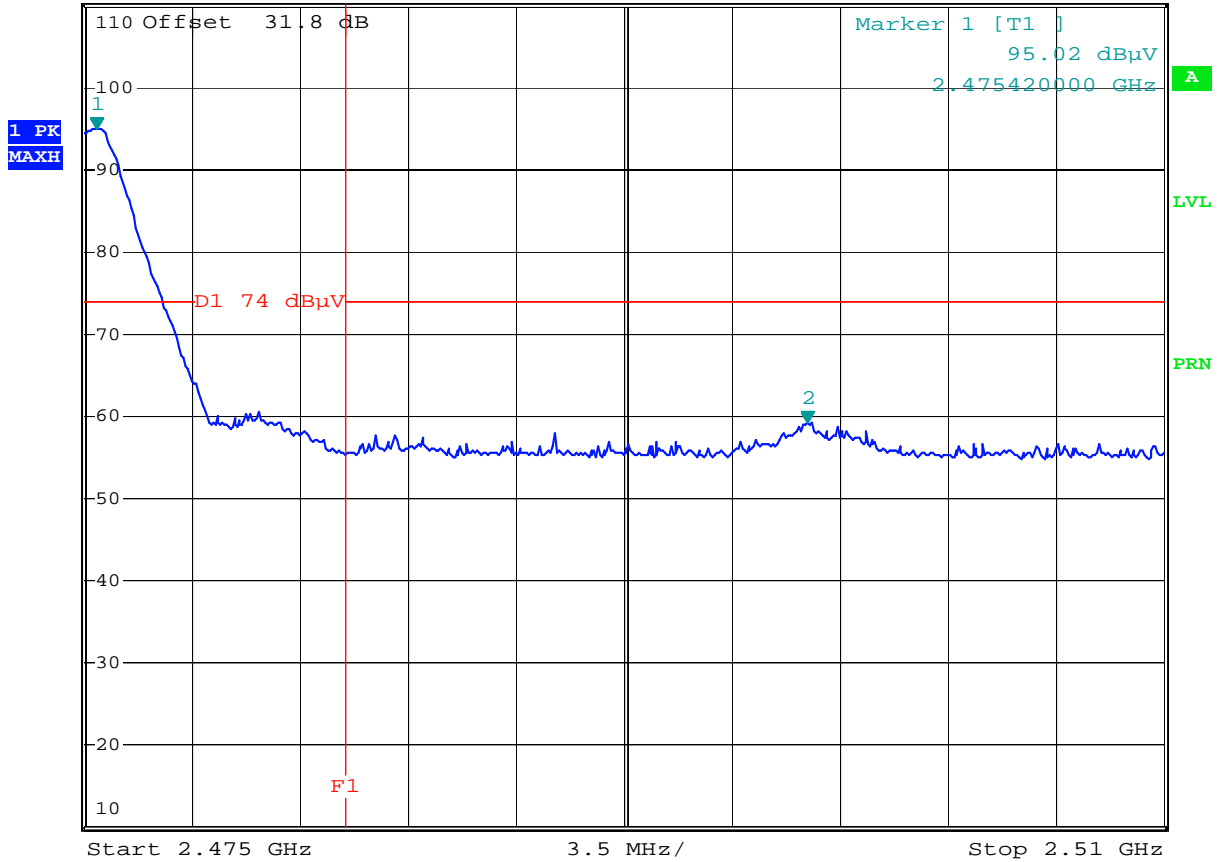


Comment: Emissions on band-edge frequency, peak, freq 2480 MHz
 Date: 9.NOV.2009 09:55:19

Plot 5.5



*RBW 1 MHz Marker 2 [T1]
 *VBW 1 MHz 59.22 dBμV
 Ref 110 dBμV *Att 0 dB SWT 2.5 ms 2.498450000 GHz

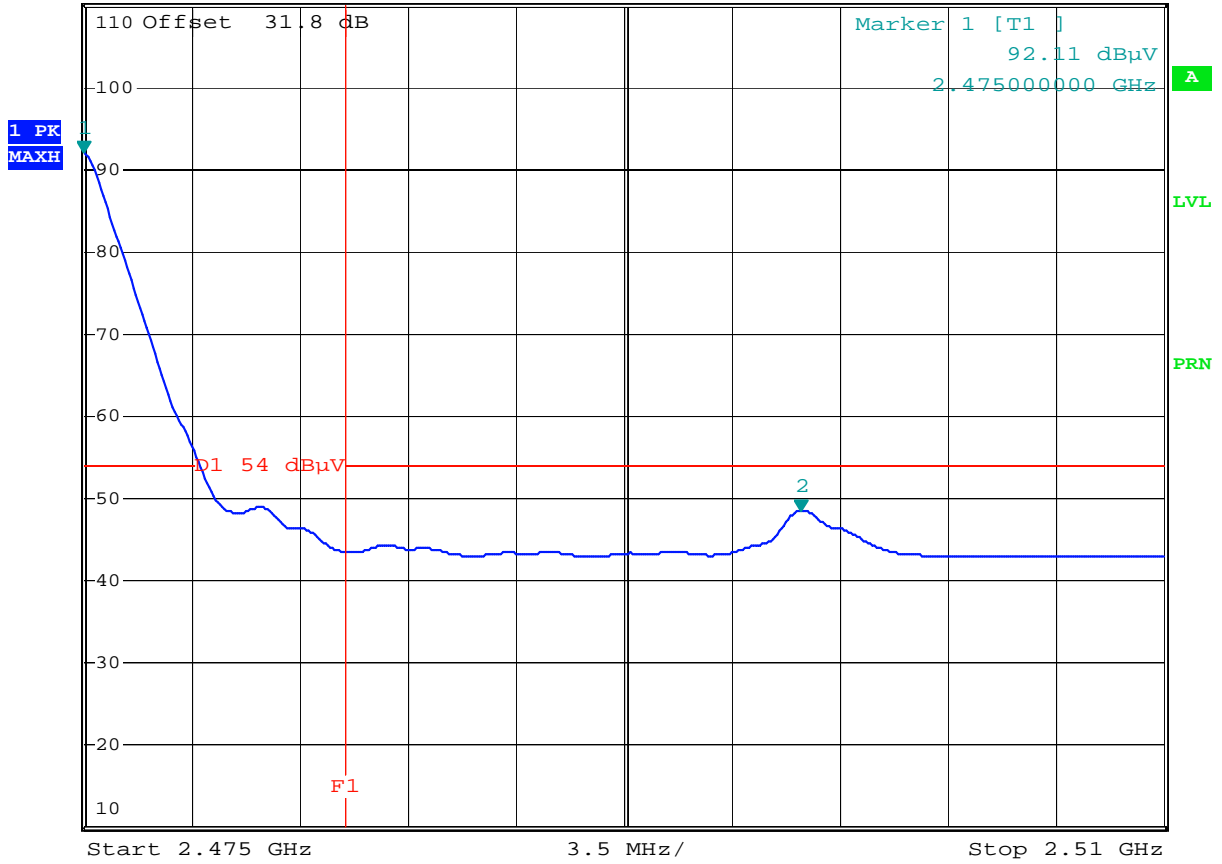


Comment: Emissions on band-edge frequency, peak, freq 2475 MHz
 Date: 9.NOV.2009 10:03:10

Plot 5.6



*RBW 1 MHz Marker 2 [T1]
 *VBW 10 Hz 48.50 dBμV
 Ref 110 dBμV *Att 0 dB SWT 8.8 s 2.498240000 GHz



Comment: Emissions on band-edge frequency, average, freq 2475 MHz
 Date: 9.NOV.2009 10:04:15

4.6 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(μ V/m)	Class B at 3m dB(μ V/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 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 9.4 dB for Class B.

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

Operator: KK
November 09, 2009

Model Number: PhaseNet Radio Transmitter
Company: S&C Electric Company

Frequency (MHz)	Peak FS dB(uV/m)	Limit@3m dB(uV/m)	Margin dB	RA dB(uV)	CF dB	AG dB	DCF dB	AF dB(1/m)
34.4863	26.3	40.0	-13.7	29.1	0.6	32.0	10.5	11.9
45.5604	25.7	40.0	-14.3	30.7	0.7	32.0	10.5	8.0
85.8962	20.1	40.0	-19.9	32.8	0.9	32.0	10.5	7.1
104.407	21.5	43.5	-22.0	30.3	1.0	32.0	10.5	6.1
400.823	28.0	46.0	-18.0	31.6	2.1	32.0	10.5	16.5
458.174	29.4	46.0	-16.6	31.8	2.3	32.1	10.5	17.7
572.755	32.0	46.0	-14.0	32.8	2.5	32.2	10.5	18.8
630.026	31.3	46.0	-14.7	31.3	2.7	32.3	10.5	20.0
801.837	36.6	46.0	-9.4	34.2	3.0	32.0	10.5	21.7
859.108	35.6	46.0	-10.4	32.1	3.1	31.8	10.5	22.7
973.689	36.0	54.0	-18.0	30.1	3.3	30.8	10.5	23.4

Test Mode: Rx mode
Temperature: 20 C

Humidity : 50 %

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

Operator: KK
November 09, 2009

Model Number: PhaseNet Radio Transmitter
Company: S&C Electric Company

Frequency (MHz)	Peak FS dB(uV/m)	Limit@3m dB(uV/m)	Margin dB	RA dB(uV)	CF dB	AG dB	DCF dB	AF dB(1/m)
33.9204	25.5	40.0	-14.5	29.2	0.6	32.0	10.5	6.3
64.1117	22.4	40.0	-17.6	34.3	0.8	32.0	10.5	3.9
65.3646	22.4	40.0	-17.6	34.6	0.8	32.0	10.5	4.3
67.7088	21.1	40.0	-18.9	33.9	0.8	32.0	10.5	4.9
85.8962	25.9	40.0	-14.1	37.7	0.9	32.0	10.5	7.2
572.755	30.6	46.0	-15.4	31.1	2.5	32.2	10.5	19.3
973.729	35.7	54.0	-18.3	29.3	3.3	30.8	10.5	23.7

Test Mode: Rx mode
Temperature: 20 C

Humidity : 50 %



4.7 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 battery powered.

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 0.37 mW; antenna is fix-mounted, 0 dBi gain. Therefore, to comply with RF Exposure Requirement, the MPE is calculated.

The maximum Peak EIRP calculated is -4.3 dBm or 0.37 mW.

The Power Density can be calculated using the formula

$$S = \text{EIRP} / 4\pi D^2$$

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 (PhaseNet Radio Transmitter) which is installed inside the Console of WhiteStar Signature Remote Control system.

At 0.2 m, $S = 0.00074 \text{ W}/\text{m}^2$, which is below the MPE Limit of $10 \text{ W}/\text{m}^2$

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	Antenna Research	LPB-2513/A	1154	12	06/23/10
Horn Antenna	EMCO	3115	9107-3712	12	11/03/10
Pre-Amplifier	Sonoma	310N	185634	12	11/10/09
Pre-Amplifier	Miteq	AMF-4D-001180-24-10P	799159	12	07/28/10
Spectrum Analyzer	Rohde&Schwarz	FSU26	200482	12	11/20/09
Vector Signal Generator	Rohde&Schwarz	SMU200A	102499	12	04/01/10

7.0 Document History

Revision/ Job Number	Writer Initials	Date	Change
1.0 / 3193115	KK	November 22, 2009	Original document