

Test of Digi International, Inc  
2.4 GHz XBee S2C RF Module

To: Japanese ARIB STD-T66

Test Report Serial No.: DIGI55-J2 Rev A



**TEST REPORT**  
FROM  
**MiCOM**Labs

Test of Digi International, Inc  
2.4 GHz XBee S2C RF Module  
to  
To Japanese ARIB STD-T66

Test Report Serial No.: DIGI55-J2 Rev A

This report supersedes: DIGI09-J1 Rev B

**Applicant:** Digi International, Inc  
355 South 520 West, Suite 180  
Lindon  
Utah, 84042 USA

**Product Function:** Data and Control

**Copy No:** pdf    **Issue Date:** 29th March 2017

**This Test Report is Issued Under the Authority of:**

MiCOM Labs, Inc.  
575 Boulder Court  
Pleasanton, CA 94566 USA  
Phone: +1 (925) 462-0304  
Fax: +1 (925) 462-0306  
[www.micomlabs.com](http://www.micomlabs.com)



TESTING CERT #2381.01

**MiCOM Labs is an ISO 17025 Accredited Testing Laboratory**



**Title:** 2.4 GHz XBee S2C RF Module  
**To:** Japanese ARIB STD-T66  
**Serial #:** DIGI55-J2 Rev A  
**Issue Date:** 29th March 2017  
**Page:** 3 of 144

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## ACCREDITATION, LISTINGS & RECOGNITION

### ACCREDITATION - TESTING

MiCOM Labs, Inc. is an accredited Electrical testing laboratory per the international standard EN ISO/IEC 17025. The company is accredited by the American Association for Laboratory Accreditation (A2LA) [www.a2la.org](http://www.a2la.org) test laboratory number 2381.01. MiCOM Labs test schedule is available at the following URL; <http://www.a2la.org/scopepdf/2381-01.pdf>



### Accredited Laboratory

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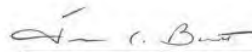
for technical competence in the field of

**Electrical Testing**

This laboratory is accredited in accordance with the recognized International Standard ISO/IEC 17025:2005 General requirements for the competence of testing and calibration laboratories. This accreditation demonstrates technical competence for a defined scope and the operation of a laboratory quality management system (refer to joint ISO-ILAC-IAF Communiqué dated 8 January 2009).



Presented this 4<sup>th</sup> day of February 2016.



Senior Director of Quality & Communications  
For the Accreditation Council  
Certificate Number 2381.01  
Valid to November 30, 2017

For the tests or types of tests to which this accreditation applies, please refer to the laboratory's Electrical Scope of Accreditation.



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## **RECOGNITION**

MiCOM Labs, Inc has widely recognized Electrical testing capabilities. Our international recognition includes Conformity Assessment Body designation by APEC MRA\*\* countries. Our test reports are widely accepted for global type approvals.

<b>Country</b>	<b>Recognition Body</b>	<b>Status</b>	<b>Phase</b>	<b>Identification No.</b>
USA	Federal Communications Commission (FCC)	TCB	-	US0159 Listing #: 102167
Canada	Industry Canada (IC)	FCB	APEC MRA 2	US0159 Listing #: 4143A-2 4143A-3
Japan	MIC (Ministry of Internal Affairs and Communication)	CAB	APEC MRA 2	RCB 210
	VCCI	--	--	A-0012
Europe	European Commission	NB	EU MRA	NB 2280
Australia	Australian Communications and Media Authority (ACMA)	CAB	APEC MRA 1	US0159
Hong Kong	Office of the Telecommunication Authority (OFTA)	CAB	APEC MRA 1	
Korea	Ministry of Information and Communication Radio Research Laboratory (RRL)	CAB	APEC MRA 1	
Singapore	Infocomm Development Authority (IDA)	CAB	APEC MRA 1	
Taiwan	National Communications Commission (NCC) Bureau of Standards, Metrology and Inspection (BSMI)	CAB	APEC MRA 1	
Vietnam	Ministry of Communication (MIC)	CAB	APEC MRA 1	

\*\*APEC MRA – Asia Pacific Economic Community Mutual Recognition Agreement.

Is a recognition agreement under which test lab is accredited to regulatory standards of the APEC member countries.

Phase I - recognition for product testing

Phase II – recognition for both product testing and certification

N/A – Not Applicable

\*\*EU MRA – European Union Mutual Recognition Agreement.

Is a recognition agreement under which test lab is accredited to regulatory standards of the EU member countries.

\*\*NB – Notified Body

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## **PRODUCT CERTIFICATION**

MiCOM Labs, Inc. is an accredited Product Certification Body per the international standard EN ISO/IEC Guide 65. The company is accredited by the American Association for Laboratory Accreditation (A2LA) [www.a2la.org](http://www.a2la.org) test laboratory number 2381.02. MiCOM Labs test schedule is available at the following URL; <http://www.a2la.org/scopepdf/2381-02.pdf>



### **Accredited Product Certification Body**

A2LA has accredited


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This product certification body is accredited in accordance with the recognized International Standard ISO/IEC 17065:2012 *Requirements for bodies certifying products, processes and services*. This accreditation demonstrates technical competence for a defined scope and the operation of a management system.



Presented this 4<sup>th</sup> day of February 2016.



Senior Director of Quality & Communications  
For the Accreditation Council  
Certificate Number 2381.02  
Valid to November 30, 2017

*For the product certification schemes to which this accreditation applies, please refer to the organization's Product Certification Scope of Accreditation.*

#### **United States of America – Telecommunication Certification Body (TCB)**

TCB Identifier – US0159

#### **Industry Canada – Certification Body**

CAB Identifier – US0159

#### **Europe – Notified Body**

Notified Body Identifier - 2280

#### **Japan – Recognized Certification Body (RCB)**

RCB Identifier – 210

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## DOCUMENT HISTORY

Document History		
Revision	Date	Comments
Draft	27 <sup>th</sup> March 27, 2017	Spot Check Verification – firmware update From : XB24CAPIS-001 Firmware (2001) To: 802.15.4 is 2001 DigiMesh is 9000 ZigBee is now 405F
Rev A	29 <sup>th</sup> March 2017	Initial Release
This report was originally issued as DIGI09-J1 Rev B, 18 <sup>th</sup> February 2011		
Rev A	28 <sup>th</sup> December 2010	Initial Release
Rev B	18 <sup>th</sup> February 2011	Correction of typographical error

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**Title:** 2.4 GHz XBee S2C RF Module  
**To:** Japanese ARIB STD-T66  
**Serial #:** DIGI55-J2 Rev A  
**Issue Date:** 29th March 2017  
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## 1. TEST RESULT CERTIFICATE

Applicant:	Digi International, Inc 355 South 520 West, Suite 180 Lindon, Utah, 84042 USA	Tested By:	MiCOM Labs, Inc. 575 Boulder Court, Pleasanton California, 94566, USA
EUT:	Data and Control	Telephone:	+1 925 462 0304
Model No.:	XBee S2C	Fax:	+1 925 462 0306
S/N'(s):	N/A		
Test Date(s):	17-20th December '10	Website:	www.micomlabs.com

STANDARD(S)	TEST RESULTS
Japanese ARIB STD-T66	EQUIPMENT COMPLIES

MiCOM Labs, Inc. tested the equipment mentioned in accordance with the requirements set forth in the above standards. Test results indicate that the equipment tested is capable of demonstrating compliance with the requirements as documented within this report.


### Notes:

1. This document reports conditions under which testing was conducted and the results of testing performed.
2. Details of test methods used have been recorded and kept on file by the laboratory.
3. Test results apply only to the item(s) tested.

Approved & Released for MiCOM Labs, Inc. by:



TESTING CERT #2381.01

  
\_\_\_\_\_  
Graeme Grieve  
Quality Manager MiCOM Labs,

  
\_\_\_\_\_  
Gordon Hurst  
President & CEO MiCOM Labs, Inc.

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## **2. REFERENCES AND MEASUREMENT UNCERTAINTY**

### **2.1. Normative References**

<b>Ref.</b>	<b>Publication</b>	<b>Year</b>	<b>Title</b>
<b>(i)</b>	ARIB STD-T66	2006	Radio Equipment for Second-generation Low-power Data Communication Systems Radio Stations and Wireless Lan Systems' Equipment
<b>(ii)</b>	ANSI C63.4	2009	American National Standards for Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz
<b>(iii)</b>	CISPR 22/ EN 55022	2008 2006+A1:2007	Limits and Methods of Measurements of Radio Disturbance Characteristics of Information Technology Equipment
<b>(iv)</b>	M 3003	Edition 1 Dec. 1997	Expression of Uncertainty and Confidence in Measurements
<b>(v)</b>	LAB34	Edition 1 Aug 2002	The expression of uncertainty in EMC Testing
<b>(vi)</b>	ETSI TR 100 028	2001	Parts 1 and 2 Electromagnetic compatibility and Radio Spectrum Matters (ERM); Uncertainties in the measurement of mobile radio equipment characteristics
<b>(vii)</b>	A2LA	9 <sup>th</sup> June 2010	Reference to A2LA Accreditation Status – A2LA Advertising Policy

### **2.2. Test and Uncertainty Procedures**

Conducted and radiated emission measurements were conducted in accordance with American National Standards Institute ANSI C63.4, listed in the Normative References section of this report.

Measurement uncertainty figures are calculated in accordance with ETSI TR 100 028 Parts 1 and 2.

Measurement uncertainties stated are based on a standard uncertainty multiplied by a coverage factor  $k = 2$ , providing a level of confidence of approximately 95 % in accordance with UKAS document M 3003 listed in the Normative References section of this report.



**Title:** 2.4 GHz XBee S2C RF Module  
**To:** Japanese ARIB STD-T66  
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### 3. PRODUCT DETAILS AND TEST CONFIGURATIONS

#### 3.1. Technical Details

Details	Description
Purpose:	Test of Digi International, Inc 2.4 GHz XBee S2C RF Module to Japan's ARIB STD-T66 regulations
Applicant:	As Manufacturer
Manufacturer:	Digi International, Inc 355 South 520 West, Suite 180 Lindon, Utah, 84042 USA
Laboratory performing the tests:	MiCOM Labs, Inc. 575 Boulder Court Pleasanton, California 94566 USA
Test report reference number:	DIGI55-J2 Rev A
Date EUT received:	16 <sup>th</sup> December 2010
Standard(s) applied:	Japanese ARIB STD-T66
Dates of test (from - to):	17-20th December '10
No of Units Tested:	3
Type of Equipment:	2.4 GHz ZigBee RF Module
Manufacturers Trade Name:	XBee
Model:	XBee S2C
Location for use:	Indoor/Outdoor
Declared Frequency Range(s):	Transmit: 2405 - 2480 MHz: Receive: 2405 - 2480 MHz
Type of Modulation:	O-QPSK (Offset Quadrature Phase Shift Keying) DSSS
Declared Nominal Output Power:	Fixed +5 dBm (Average)
Antenna Gain:	See Section 3.4
Rated Power	4.80 mW/MHz
Antenna Connector(s):	Integral; U.FL or RF Pad
Transmit/Receive Operation:	Time Division Duplex
Number of Channels:	16
Channel Separation:	5 MHz
Rated Input Voltage and Current:	Nominal: 3.3 Vdc 10 mA Minimum: 2.2 Vdc Maximum: 3.6 Vdc
Operating Temperature Range:	Manufacturers declared range -40 to +85°C
Serial Number	N/A
Hardware version	5
Software Version	802.15.4 is 2001 DigiMesh is 9000 ZigBee is now 405F
Frequency Stability (ppm/year):	±20ppm/year
Equipment Dimensions:	0.866 X 1.33 X 0.120 inches
Weight:	7.5 grams
ITU Designator:	2M65G1D
Primary function of equipment:	Zigbee USB 2.4 GHz wireless modem module

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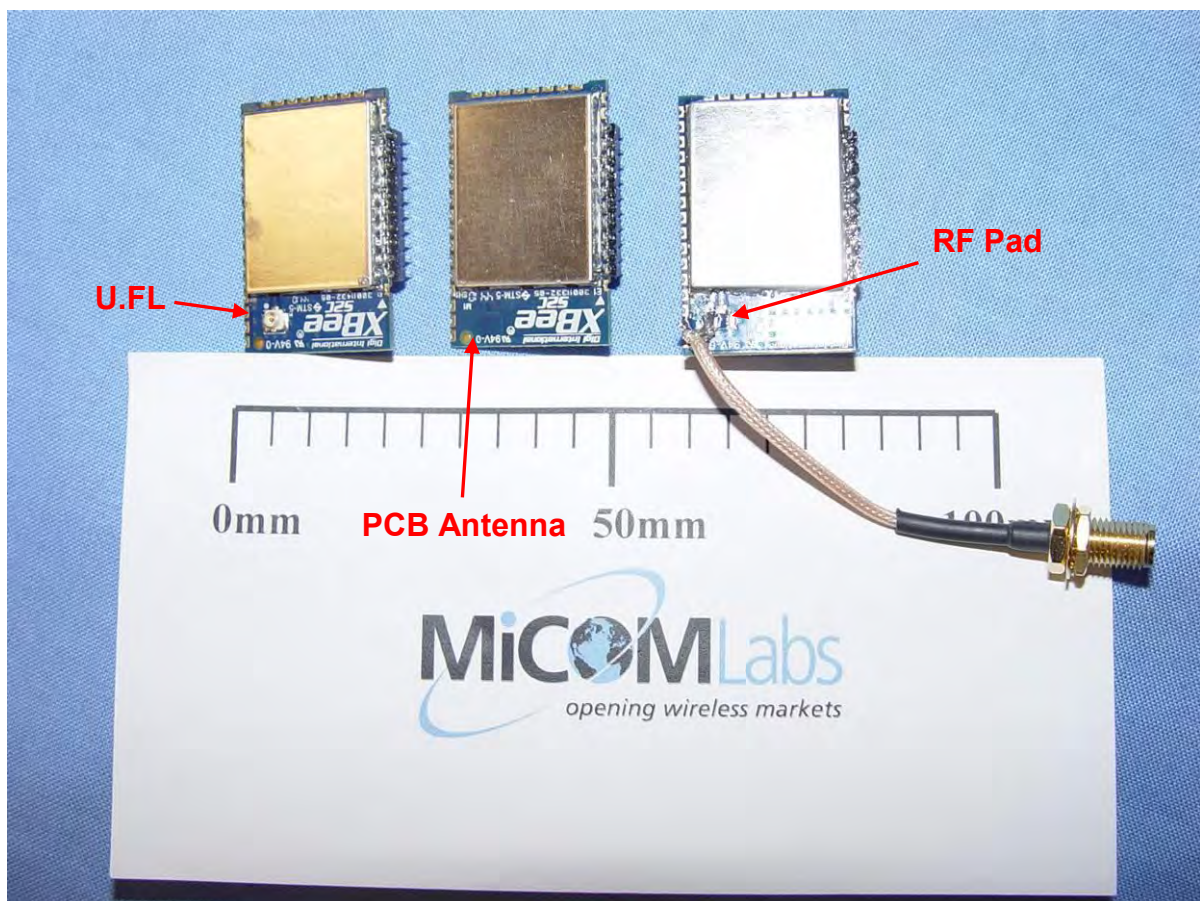
### 3.2. Scope of Test Program

The scope of the test program was to test the Digi International, Inc 2.4 GHz XBee S2C RF Module device in the frequency range 2400 - 2483.5 MHz for compliance against Japan's ARIB STD-T66 regulation.

The device comes with several variations;

- U.FL RF Port - RF IO for U.FL Variant
- PCB antenna - RF IO for PCB Antenna Variant
- Pin 36 RF Port - RF IO for RF pad Variant

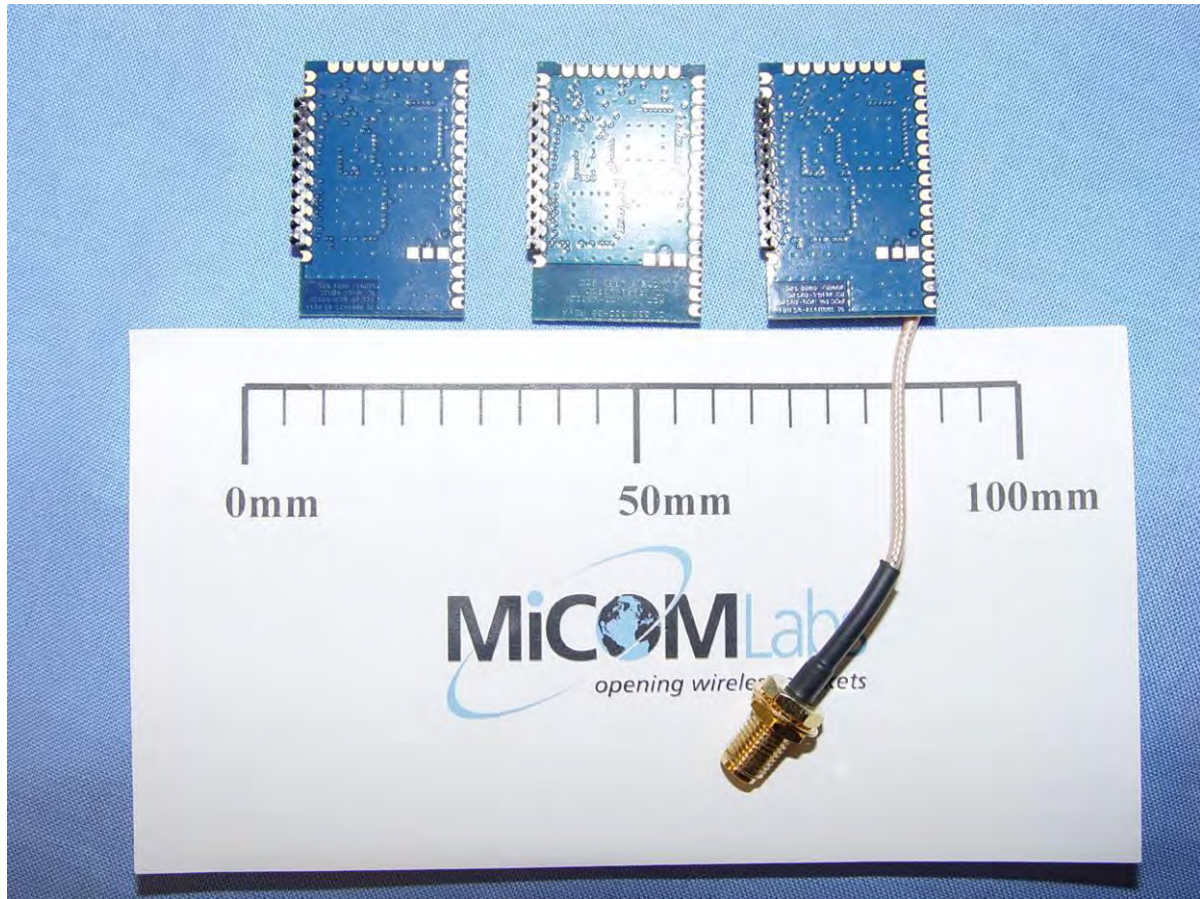
#### Digi International, Inc 2.4 GHz XBee S2C RF Module



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**Digi International, Inc  
2.4 GHz XBee S2C RF Module**



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### 3.3. Equipment Model(s) and Serial Number(s)

Type (EUT/Support)	Equipment Description (Including Brand Name)	Mfr	Model No.	Serial No.
EUT	2.4 GHz wireless module with reverse polarized SMA RF connector (SMA for test purposes only)	Digi International, Inc	XBee S2C	N/A
Support	DC Variable Voltage Supply	Hewlett Packard	HP6574A	US36340203

### 3.4. Antenna Details

1. Integral PCB Antenna: -0.5 dBi
2. Dipole bec AN2400-37A19BX, max. gain +2.76 dBi @ 2.4 GHz
3. Dipole bec R-AN2400-5701RS-Z, max. gain +3.45 dBi @ 2.4 GHz
4. Maxstream whip antenna ¼ Wave Wire Monopole max. gain +1.8 dBi @ 2.4 GHz
5. Nearson S131AH-2450S , ½ wave dipole max. gain +2.0 dBi @ 2.4 GHz
6. Dipole Antenna pulse W1030, max. gain +2.0 dBi @ 2.4 GHz
7. Dipole Antenna pulse W1049B050, max. gain +2.0 dBi @ 2.4 GHz
8. Buffalo WLE-HG-DA Directional max. gain +9 dBi @ 2.4 GHz

### 3.5. Cabling and I/O Ports

Number and type of I/O ports

1. NONE



### **3.6. Test Configurations**

Three individual frequencies were tested covering the entire 2.4 GHz band. These frequencies represent low, mid and high channels (2405, 2440 and 2480 MHz) in the band of operation.

Nominal Voltage: +3.3 Vdc  
Minimum Voltage: +2.2 Vdc  
Maximum Voltage: +3.6 Vdc

### **3.7. Equipment Modifications**

The following modifications were required to bring the equipment into compliance:

1. NONE

### **3.8. Deviations from the Test Standard**

The following deviations from the test standard were required in order to complete the test program:

1. NONE



## 4. TEST SUMMARY

### List of Measurements

The following table represents the list of measurements required under the **ARIB STD-T66**. All tests were conducted. The integral antenna was replaced by a 6" coaxial cable terminated in an SMA connector.

Test Items	Description	Test Condition	Result	Test Report Section
Antenna Power	Output power of device	Conducted	Complies	5.1.1
Frequency Error	Nominal frequency drift	Conducted	Complies	5.1.2
Occupied and Spreading Bandwidths	99% and 90% Occupied BW g mode occupied BW only	Conducted	Complies	5.1.3
Transmitter Spurious Emissions	Emissions above and below 1 GHz	Conducted	Complies	5.1.4
Receiver Spurious Emissions	Emissions above and below 1 GHz	Conducted	Complies	5.1.5
Hopping Frequency Dwell Time	Channel Dwell Time DH1, DH3, DH5	Conducted	N/A	N/A
Interference Protection	Identification code verification	Conducted	Complies	5.1.6
RF Accessibility	Inspection of RF Assembly	N/A (Inspection)	Complies	5.1.7

**Note 1:** Test results reported in this document relate only to the item(s) tested

**Note 2:** The required tests demonstrated compliance as per client declaration of test configuration, monitoring methodology and associated pass/fail criteria

**Note 3:** Section 3.7 'Equipment Modifications' highlight the equipment modifications that were required to bring the product into compliance with the above matrix



## 5. TEST RESULTS

### Ambient Test Conditions.

Temperature: 17 to 23 °C    Relative humidity: 31 to 57 %    Pressure: 999 to 1012 mbar

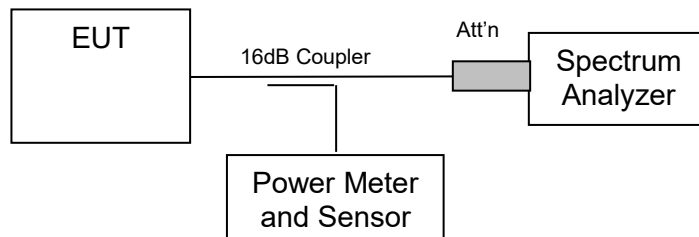
### 5.1. Device Characteristics

#### 5.1.1. Antenna Power

##### Test Procedure

Antenna power measurements were measured using a spectrum analyzer. The EUT was connected to the antenna terminal which was terminated in an SMA connector and operating at the appropriate center frequency. The resolution bandwidth filter on the analyzer was set at 1 MHz.

##### Test Measurement Set up



Measurement set up for Antenna Power

##### Radio Operational Condition

Output Mode: Modulated

Output Power: Maximum

Duty Cycle: 100%

TABLE OF RESULTS –

Channel 2,405 MHz with maximum gain omni-directional antenna 3.45 dBi

Voltage	MODULATED CONDUCTED POWER (mW/MHz)			
	Spectral Density (mW/MHz)	Spectral Density (dBm/MHz)	Peak EIRP (dBm/MHz)	EIRP LIMIT (dBm/MHz)
+3.3 Vdc	2.215	+3.453	+6.903	+12.14
+2.2 Vdc	2.256	+3.533	+6.983	+12.14
+3.6 Vdc	2.206	+3.436	+6.886	+12.14

TABLE OF RESULTS –

Channel 2,440 MHz with maximum gain omni-directional antenna 3.45 dBi

Voltage	MODULATED CONDUCTED POWER (mW/MHz)			
	Spectral Density (mW/MHz)	Spectral Density (dBm/MHz)	Peak EIRP (dBm/MHz)	EIRP LIMIT (dBm/MHz)
+3.3 Vdc	2.293	+3.604	+7.054	+12.14
+2.2 Vdc	2.335	+3.682	+7.132	+12.14
+3.6 Vdc	2.276	+3.572	+7.022	+12.14

TABLE OF RESULTS –

Channel 2,480 MHz with maximum gain omni-directional antenna 3.45 dBi

Voltage	MODULATED CONDUCTED POWER (mW/MHz)			
	Spectral Density (mW/MHz)	Spectral Density (dBm/MHz)	Peak EIRP (dBm/MHz)	EIRP LIMIT (dBm/MHz)
+3.3 Vdc	2.220	+3.464	+6.914	+12.14
+2.2 Vdc	2.261	+3.543	+6.993	+12.14
+3.6 Vdc	2.216	+3.456	+6.906	+12.14



### Rated Antenna Power

Rated Power = 4.80 mW/MHz

### Comparison of measured results to the Rated Power

Center Frequency (MHz)	Measured Power (mW/MHz)	Calculated Range (+20% / -80%) (mW/MHz)	Measured Deviation (%)
2,405	2.206	0.96 – 5.76	-54.0
2,440	2.335	0.96 – 5.76	-51.3

### Antenna Validation – the maximum power = 2.335 mW/MHz (+3.682 dBm/MHz)

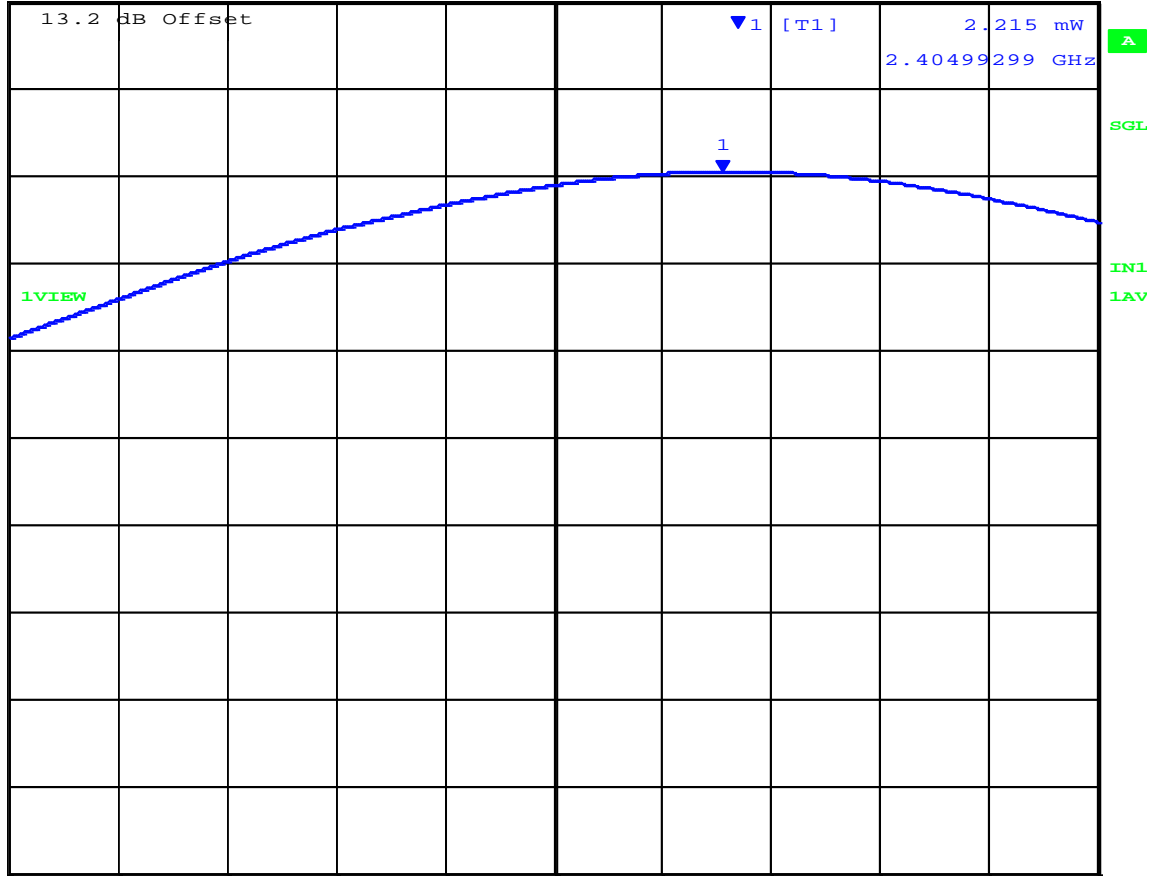
Antenna	Type	Antenna Gain (dBi)	Max <sup>m</sup> Pwr (dBm/MHz)	EIRP (dBm/MHz)	EIRP LIMIT (dBm/MHz)	½ Angle	Half Power Beam-width Limit	Antenna Valid
Integral PCB	Omni	-0.5	+3.682	+3.182	12.14	--	--	yes
Dipole bec AN2400-37A19BX	Omni	+2.76	+3.682	+6.442	12.14	--	--	yes
Dipole bec R-AN2400-5701RS-Z	Omni	+3.45	+3.682	+7.132	12.14	--	--	yes
¼ Wave Monopole Maxstream	Omni	+1.8	+3.682	+5.482	12.14	--	--	yes
½ Wave Dipole Nearson S131AH-2450S	Omni	+2.0	+3.682	+5.682	12.14	--	--	yes
Dipole Pulse W1030	Omni	+2.0	+3.682	+5.682	12.14	--	--	yes
Dipole Pulse W1049B050	Omni	+2.0	+3.682	+5.682	12.14	--	--	yes
Buffalo WLE-HG-DA	Dir 70 Deg	+9.0	+3.682	+12.682	22.14	35°	318.0°	yes

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### Antenna Power Channel 2,405 MHz Nominal Voltage +3.3 Vdc

Marker 1 [T1] RBW 1 MHz RF Att 20 dB  
Ref Lvl 2.215 mW VBW 1 MHz  
199.5 mW 2.40499299 GHz SWT 60 s Unit W



Center 2.404527054 GHz 300 kHz/ Span 3 MHz

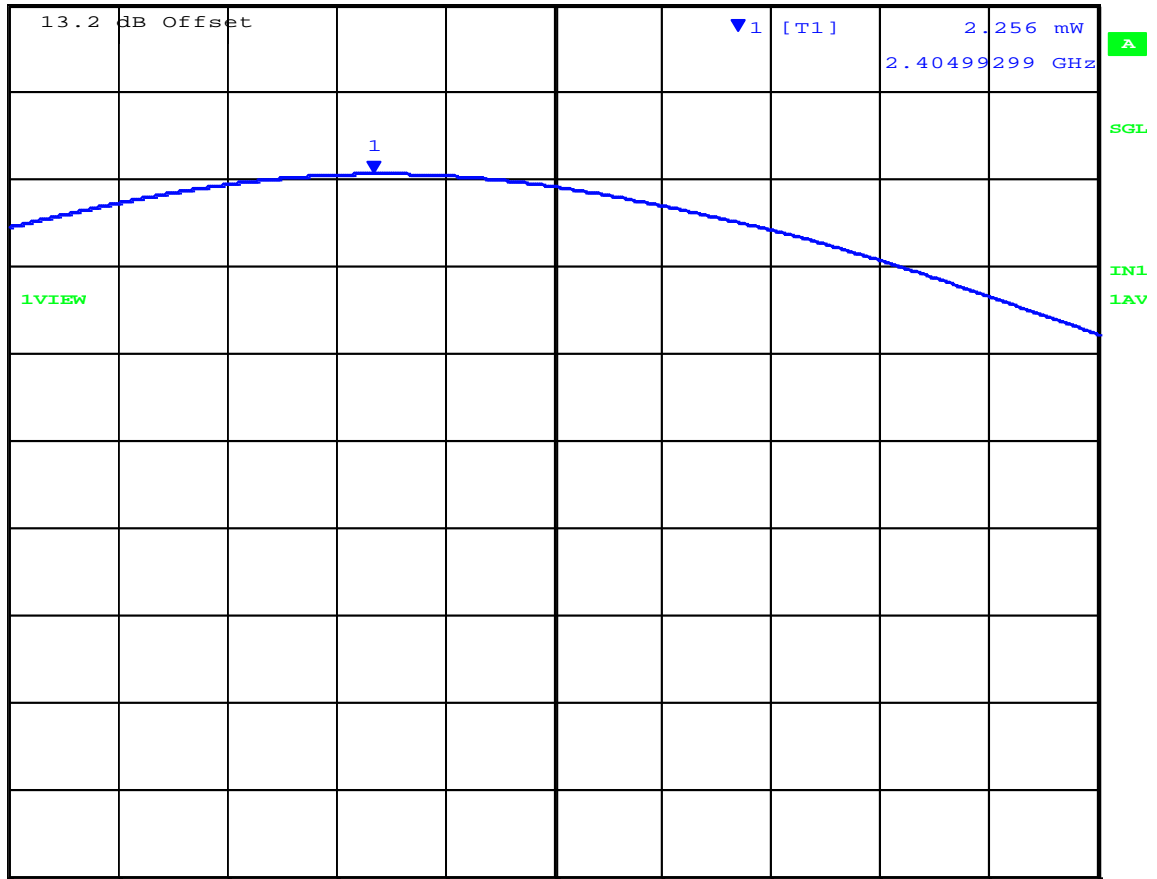
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### Antenna Power Channel 2,405 MHz Minimum Voltage +2.2 Vdc

Marker 1 [T1] RBW 1 MHz RF Att 20 dB  
Ref Lvl 2.256 mW VBW 1 MHz  
199.5 mW 2.40499299 GHz SWT 60 s Unit W



Center 2.405488978 GHz 300 kHz/ Span 3 MHz

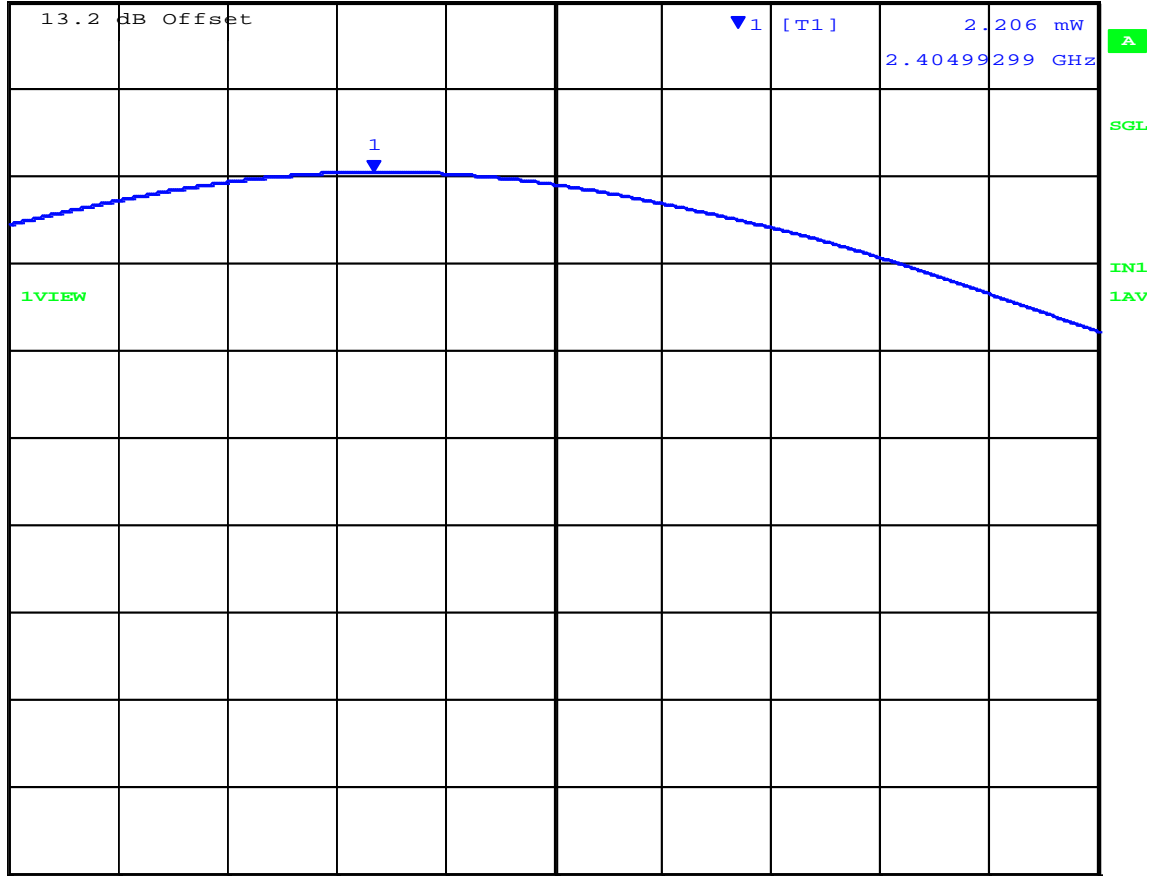
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### Antenna Power Channel 2,405 MHz Maximum Voltage +3.6 Vdc

Marker 1 [T1] RBW 1 MHz RF Att 20 dB  
Ref Lvl 2.206 mW VBW 1 MHz  
199.5 mW 2.40499299 GHz SWT 60 s Unit W



Center 2.405488978 GHz 300 kHz/ Span 3 MHz

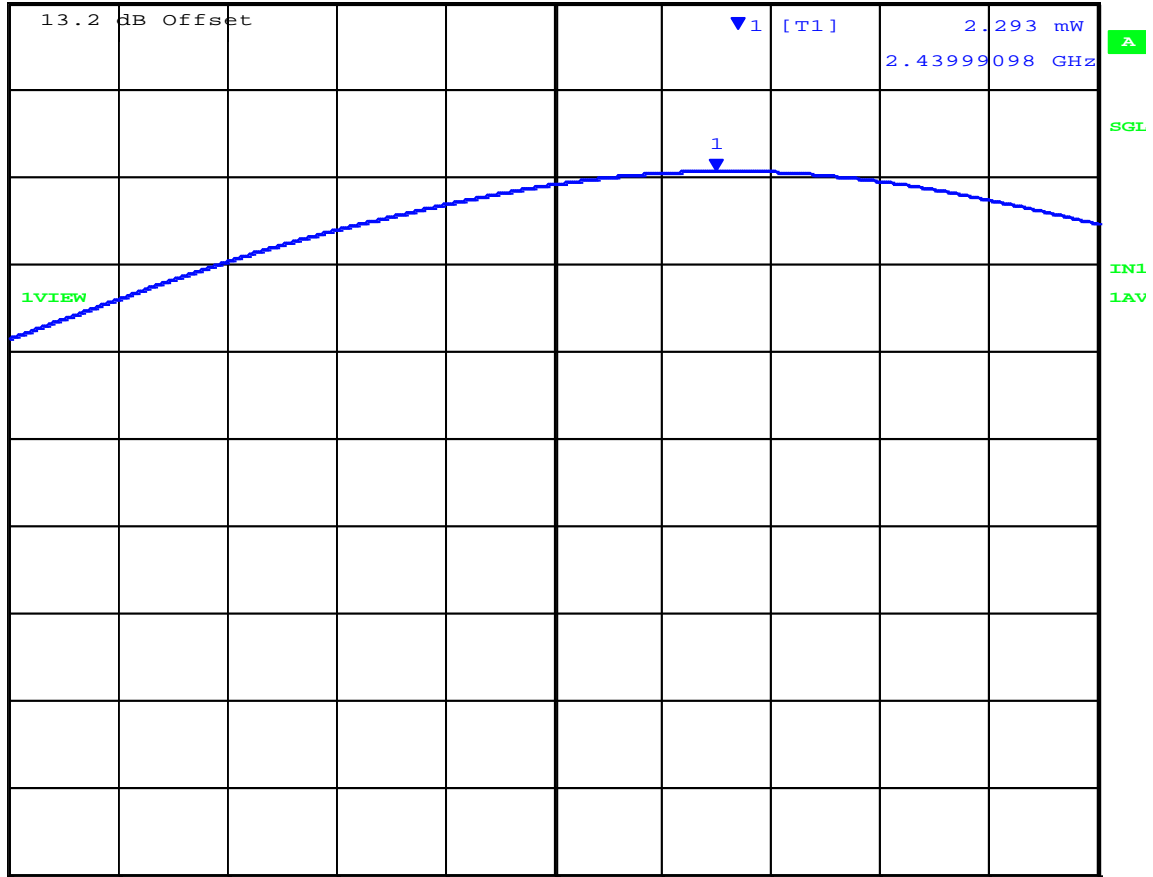
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Antenna Power Channel 2,440 MHz Nominal Voltage +3.3 Vdc

Marker 1 [T1] RBW 1 MHz RF Att 20 dB  
Ref Lvl 2.293 mW VBW 1 MHz  
199.5 mW 2.43999098 GHz SWT 60 s Unit W



Center 2.439543086 GHz 300 kHz/ Span 3 MHz

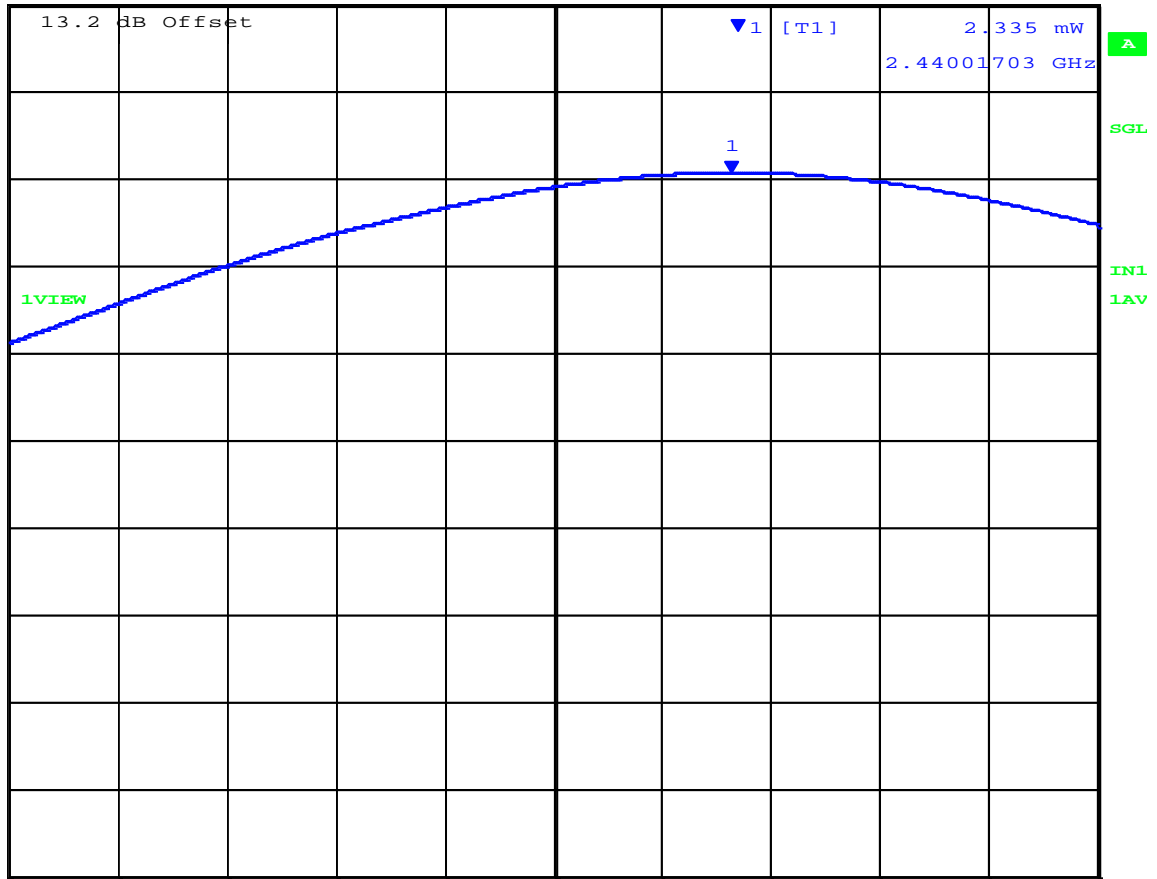
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### Antenna Power Channel 2,440 MHz Minimum Voltage +2.2 Vdc

Marker 1 [T1] RBW 1 MHz RF Att 20 dB  
Ref Lvl 2.335 mW VBW 1 MHz  
199.5 mW 2.44001703 GHz SWT 60 s Unit W



Center 2.439527054 GHz 300 kHz/ Span 3 MHz

Date: 19.DEC.2010 13:20:57

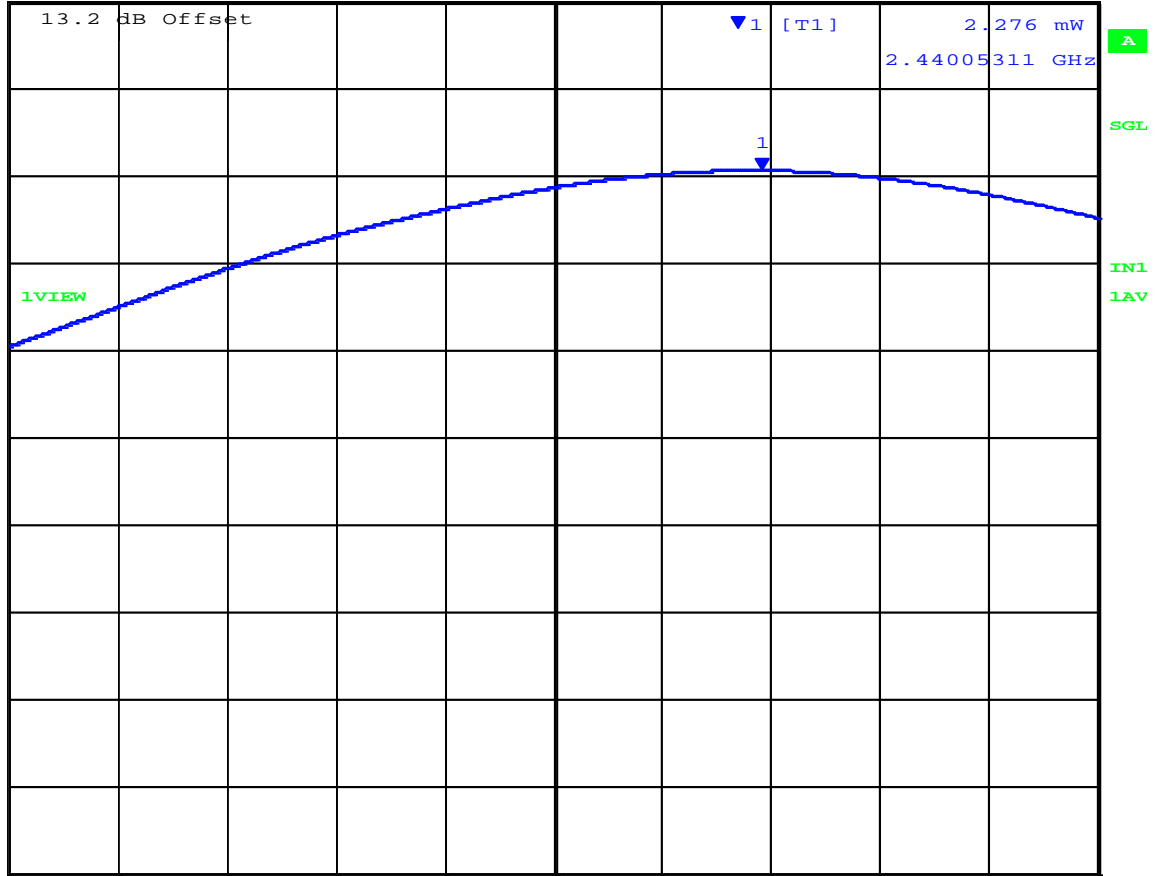
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### Antenna Power Channel 2,440 MHz Maximum Voltage +3.6 Vdc

Marker 1 [T1] RBW 1 MHz RF Att 20 dB  
Ref Lvl 2.276 mW VBW 1 MHz  
199.5 mW 2.44005311 GHz SWT 60 s Unit W



Center 2.439478958 GHz 300 kHz/ Span 3 MHz

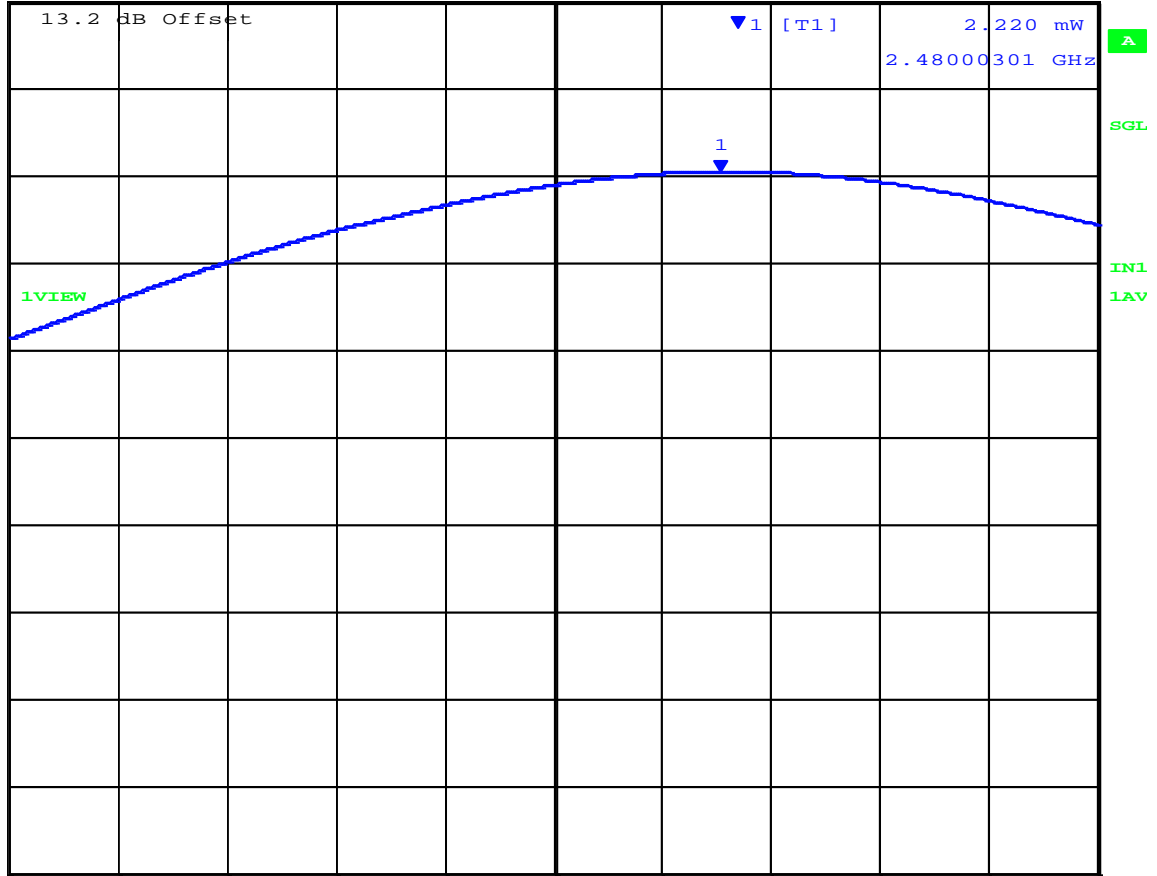
Date: 19.DEC.2010 13:23:44

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Antenna Power Channel 2,480 MHz Nominal Voltage +3.3 Vdc

Marker 1 [T1] RBW 1 MHz RF Att 20 dB  
Ref Lvl 2.220 mW VBW 1 MHz  
199.5 mW 2.48000301 GHz SWT 60 s Unit W



Center 2.479543086 GHz 300 kHz/ Span 3 MHz

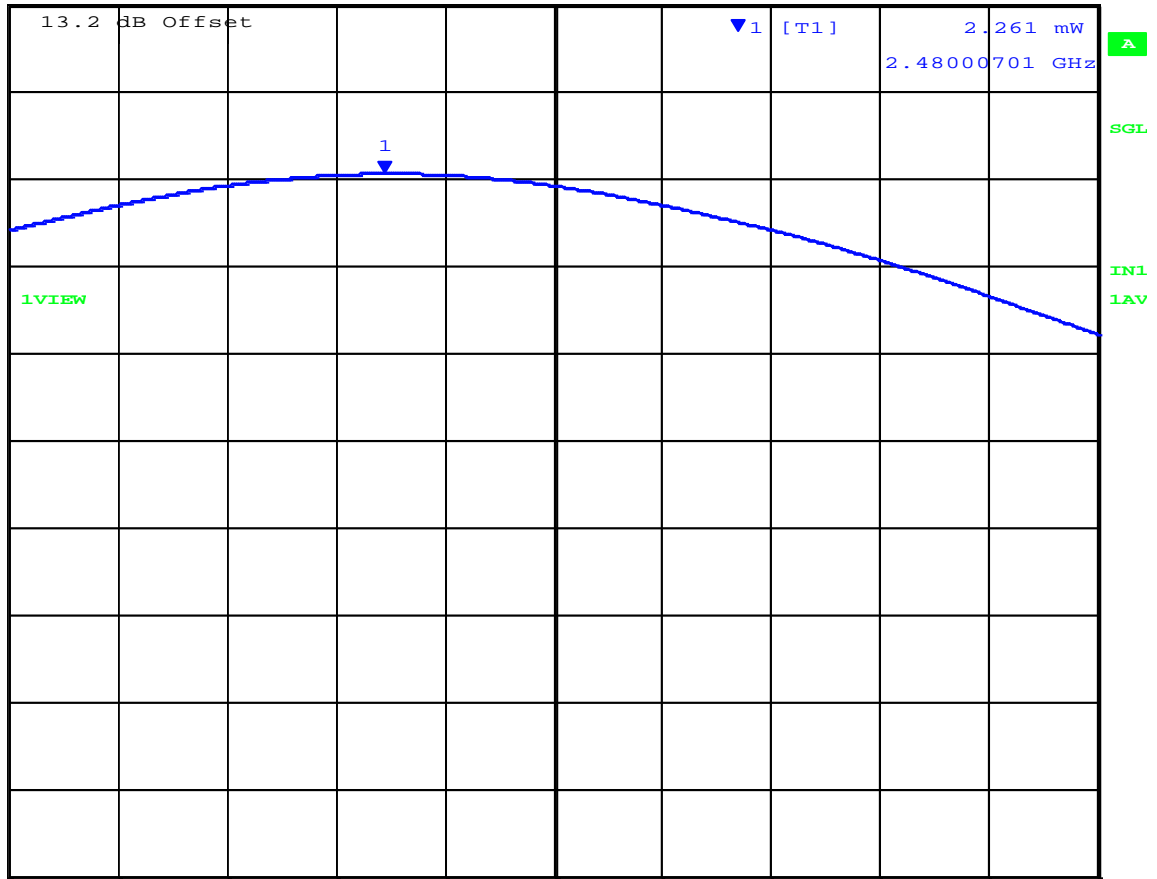
Date: 19.DEC.2010 14:13:36

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### Antenna Power Channel 2,480 MHz Minimum Voltage +2.2 Vdc

Marker 1 [T1] RBW 1 MHz RF Att 20 dB  
Ref Lvl 2.261 mW VBW 1 MHz  
199.5 mW 2.48000701 GHz SWT 60 s Unit W



Center 2.480472946 GHz 300 kHz/ Span 3 MHz

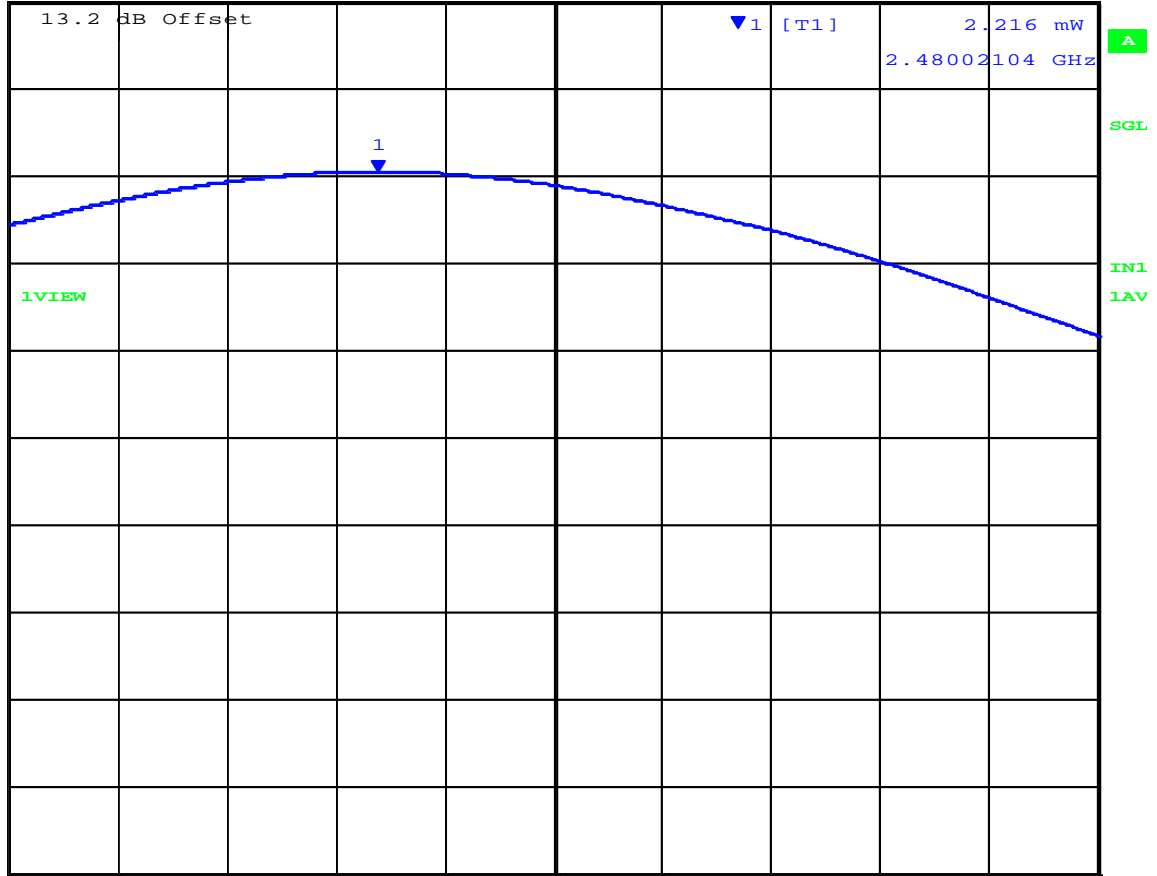
Date: 19.DEC.2010 14:16:20

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### Antenna Power Channel 2,480 MHz Maximum Voltage +3.6 Vdc

Marker 1 [T1] RBW 1 MHz RF Att 20 dB  
Ref Lvl 2.216 mW VBW 1 MHz  
199.5 mW 2.48002104 GHz SWT 60 s Unit W



Center 2.48050501 GHz 300 kHz/ Span 3 MHz

Date: 19.DEC.2010 14:19:09

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**Title:** 2.4 GHz XBee S2C RF Module  
**To:** Japanese ARIB STD-T66  
**Serial #:** DIGI55-J2 Rev A  
**Issue Date:** 29th March 2017  
**Page:** 29 of 144

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## Specification

### Power Limit

The limit for Antenna Power is 10 mW/MHz
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### Laboratory Uncertainty for Power Measurement(s)

Measurement uncertainty	±1.33dB
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### Traceability

Method	Test Equipment Used
Measurements were made per work instruction WI-01 'Measuring RF Output Power'	0223, 0116, 0158, 0193, 0312, 0313, 0314

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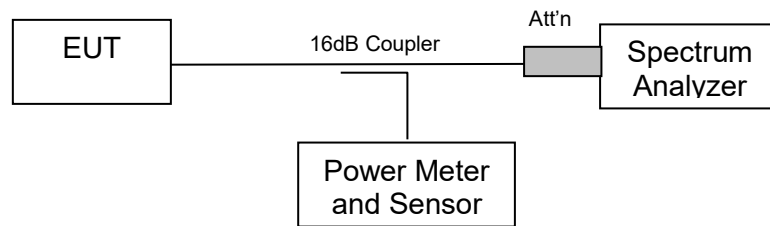
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### 5.1.2. Frequency Error

#### Test Procedure

The Frequency Error was measured with a spectrum analyzer connected to the antenna terminal, while EUT is operating in transmission mode at the appropriate center frequency. The EUT could not be put into CW or single tone mode therefore Frequency Error was measured in modulated mode.

#### Test Measurement Set up



Measurement set up for Frequency Error

#### Radio Operational Condition

Output Mode: un-Modulated (CW)

Duty Cycle: 100%



### Measurement Results for Frequency Error

#### TABLE OF RESULTS

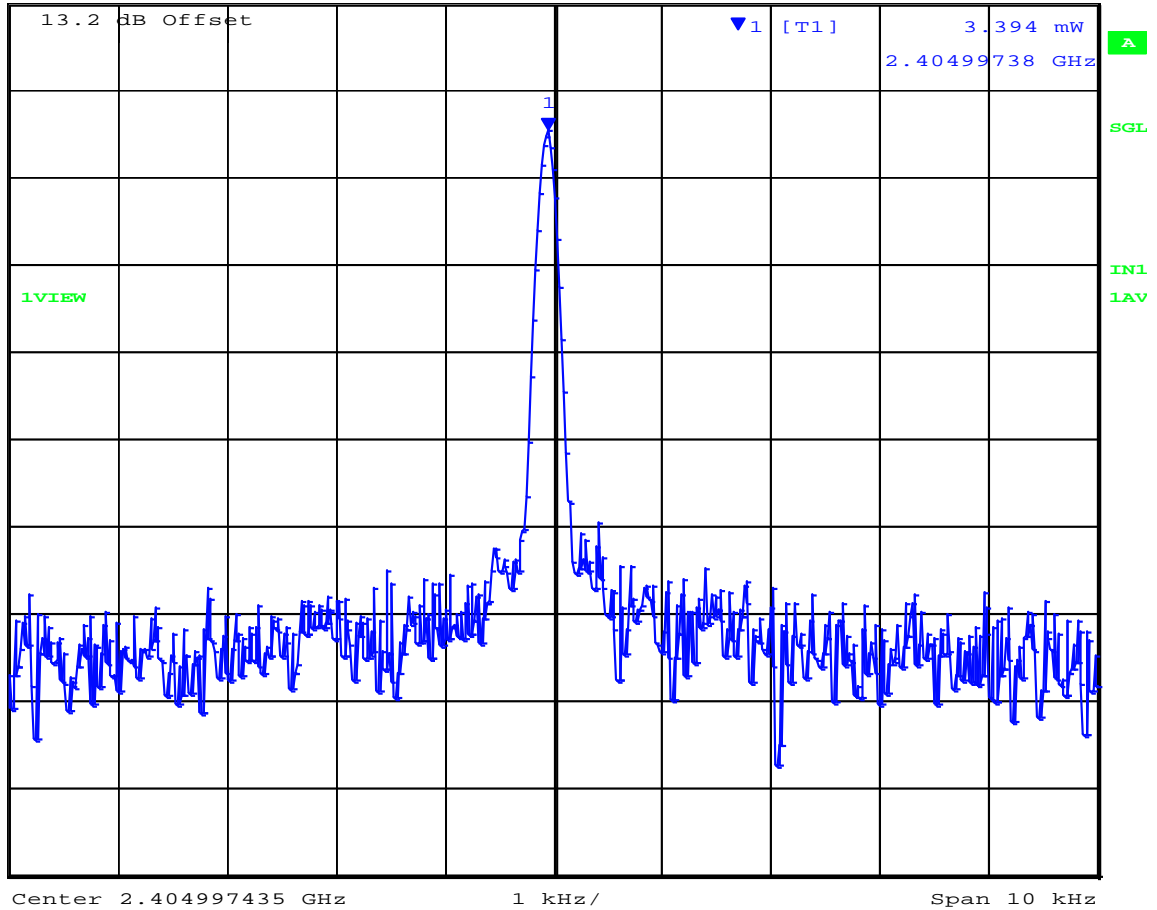
Voltage	FREQUENCY ERROR (ppm)		
	Channel 2,405 MHz		
	Measured Frequency	Frequency Error	
	MHz	$\Delta$ KHz	ppm
+3.3 Vdc	2404.99738	-2.620	-1.09
+2.2 Vdc	2404.99852	-1.480	-0.62
+3.6 Vdc	2404.99717	-2.830	-1.18

**Frequency Error:** The frequency Error shall be  $\leq 50$  ppm



### Frequency Error Channel 2,405 MHz Nominal Voltage +3.3 Vdc

Marker 1 [T1] RBW 100 Hz RF Att 20 dB  
Ref Lvl 3.394 mW VBW 100 Hz  
100 mW 2.40499738 GHz SWT 5 s Unit W



Date: 19.DEC.2010 11:53:31

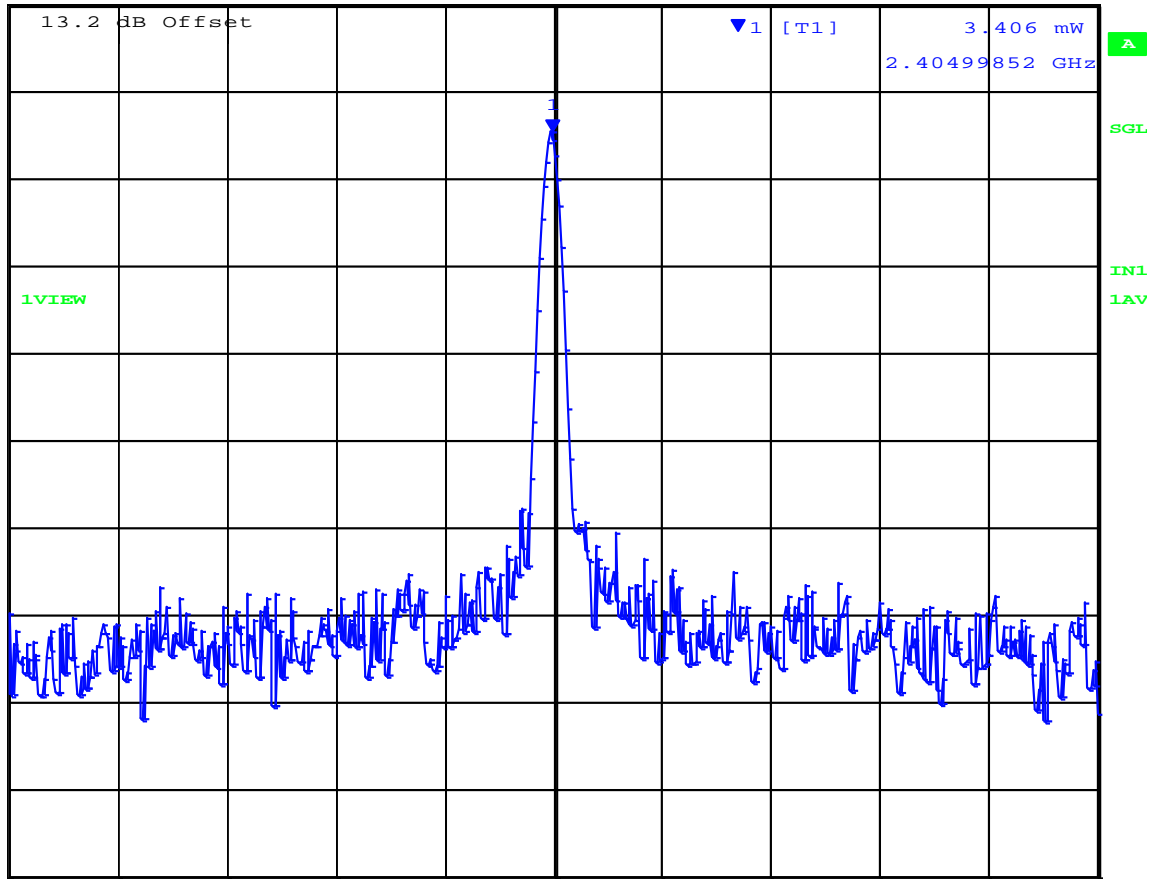
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Frequency Error Channel 2,405 MHz Minimum Voltage +2.2 Vdc

Marker 1 [T1] RBW 100 Hz RF Att 20 dB  
Ref Lvl 3.406 mW VBW 100 Hz  
100 mW 2.40499852 GHz SWT 5 s Unit W



Center 2.404998527 GHz 1 kHz/ Span 10 kHz

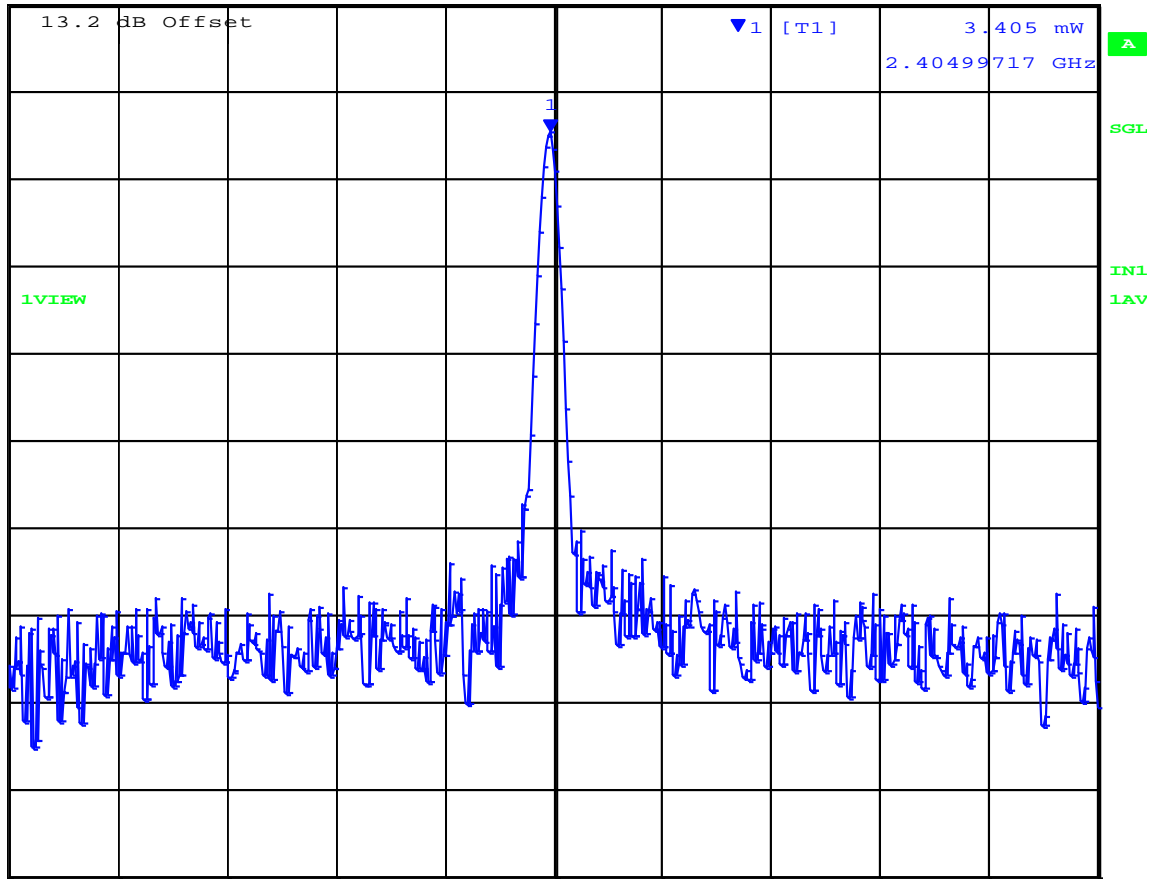
Date: 19.DEC.2010 11:58:27

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### Frequency Error Channel 2,405 MHz Maximum Voltage +3.6 Vdc

Marker 1 [T1] RBW 100 Hz RF Att 20 dB  
Ref Lvl 3.405 mW VBW 100 Hz  
100 mW 2.40499717 GHz SWT 5 s Unit W



Center 2.404997204 GHz 1 kHz/ Span 10 kHz

Date: 19.DEC.2010 12:03:23

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TABLE OF RESULTS

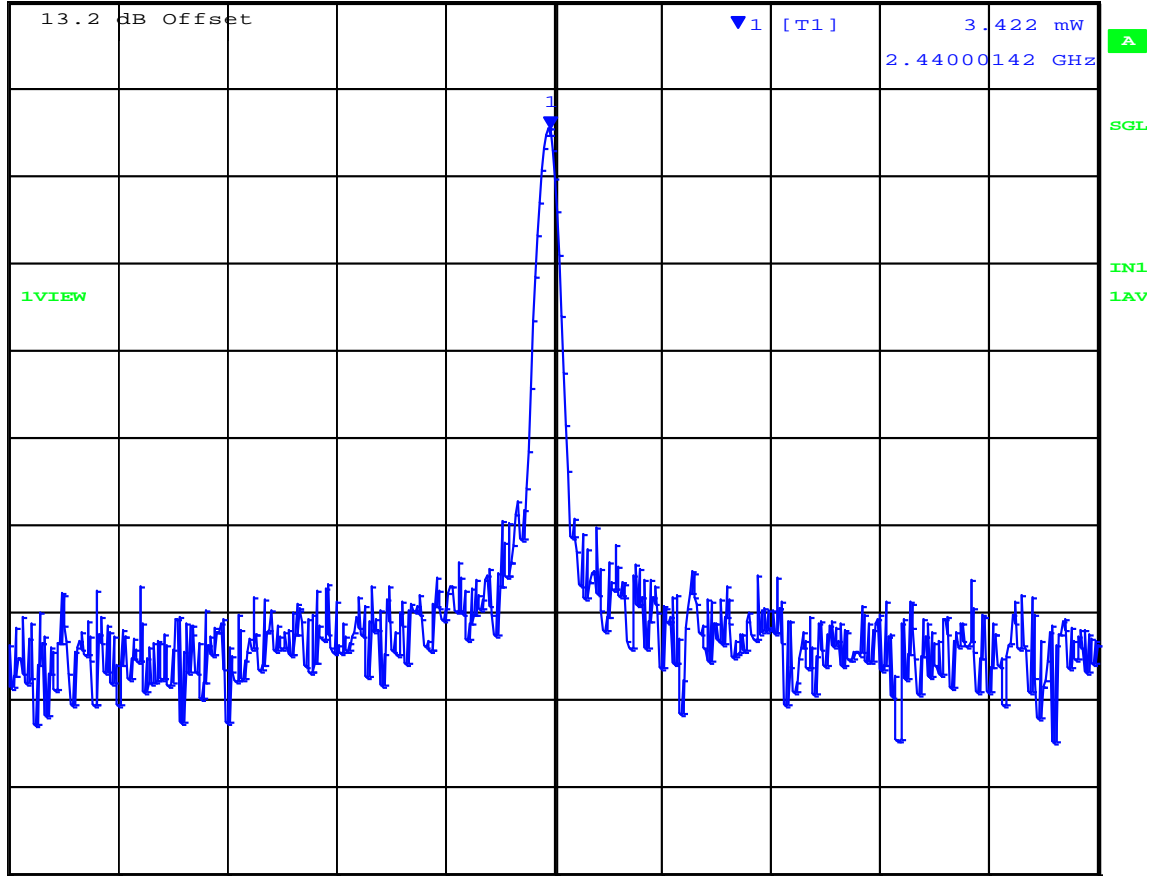
Voltage	FREQUENCY ERROR (ppm)		
	Channel 2,440 MHz		
	Measured Frequency	Frequency Error	
	MHz	$\Delta$ KHz	ppm
+3.3 Vdc	2440.00142	1.420	0.58
+2.2 Vdc	2440.00245	2.450	1.02
+3.6 Vdc	2440.00110	1.100	0.46

**Frequency Error:** The frequency Error shall be  $\leq 50$  ppm



### Frequency Error Channel 2,440 MHz Nominal Voltage +3.3 Vdc

Marker 1 [T1] RBW 100 Hz RF Att 20 dB  
Ref Lvl 3.422 mW VBW 100 Hz  
100 mW 2.44000142 GHz SWT 5 s Unit W



Center 2.440001453 GHz 1 kHz/ Span 10 kHz

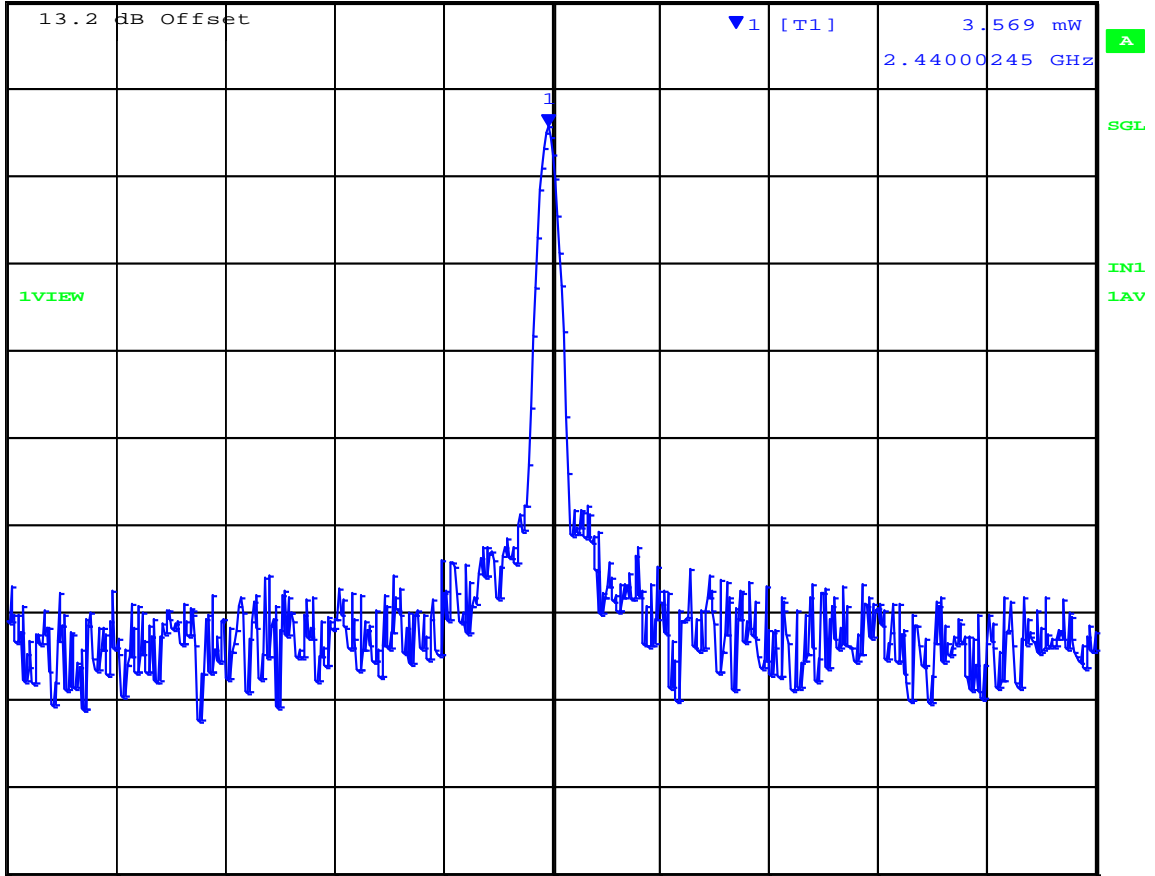
Date: 19.DEC.2010 12:59:52

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Frequency Error Channel 2,440 MHz Minimum Voltage +2.2 Vdc

Marker 1 [T1] RBW 100 Hz RF Att 20 dB  
Ref Lvl 3.569 mW VBW 100 Hz  
100 mW 2.44000245 GHz SWT 5 s Unit W



Center 2.440002485 GHz 1 kHz/ Span 10 kHz

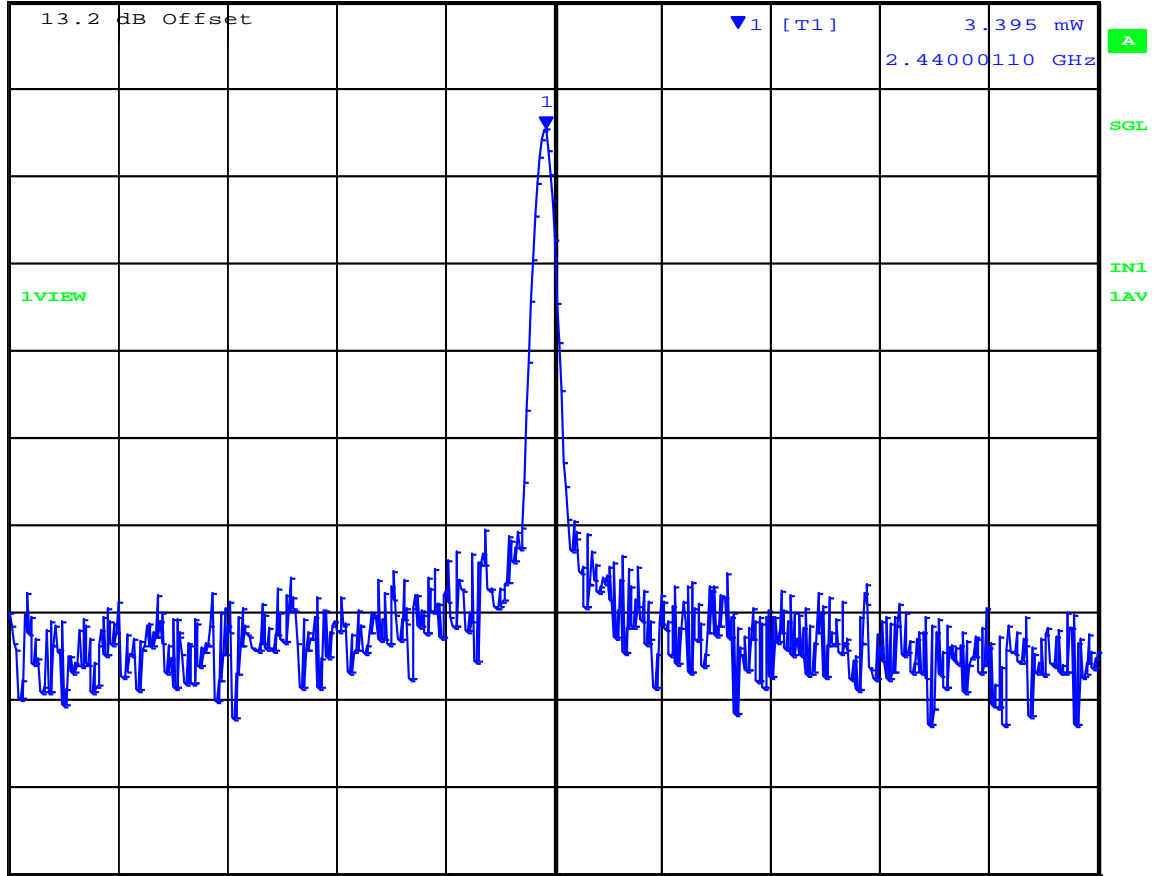
Date: 19.DEC.2010 13:04:48

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Frequency Error Channel 2,440 MHz Maximum Voltage +3.6 Vdc

Marker 1 [T1] RBW 100 Hz RF Att 20 dB  
Ref Lvl 3.395 mW VBW 100 Hz  
100 mW 2.44000110 GHz SWT 5 s Unit W



Center 2.440001172 GHz 1 kHz/ Span 10 kHz

Date: 19.DEC.2010 13:09:44

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TABLE OF RESULTS

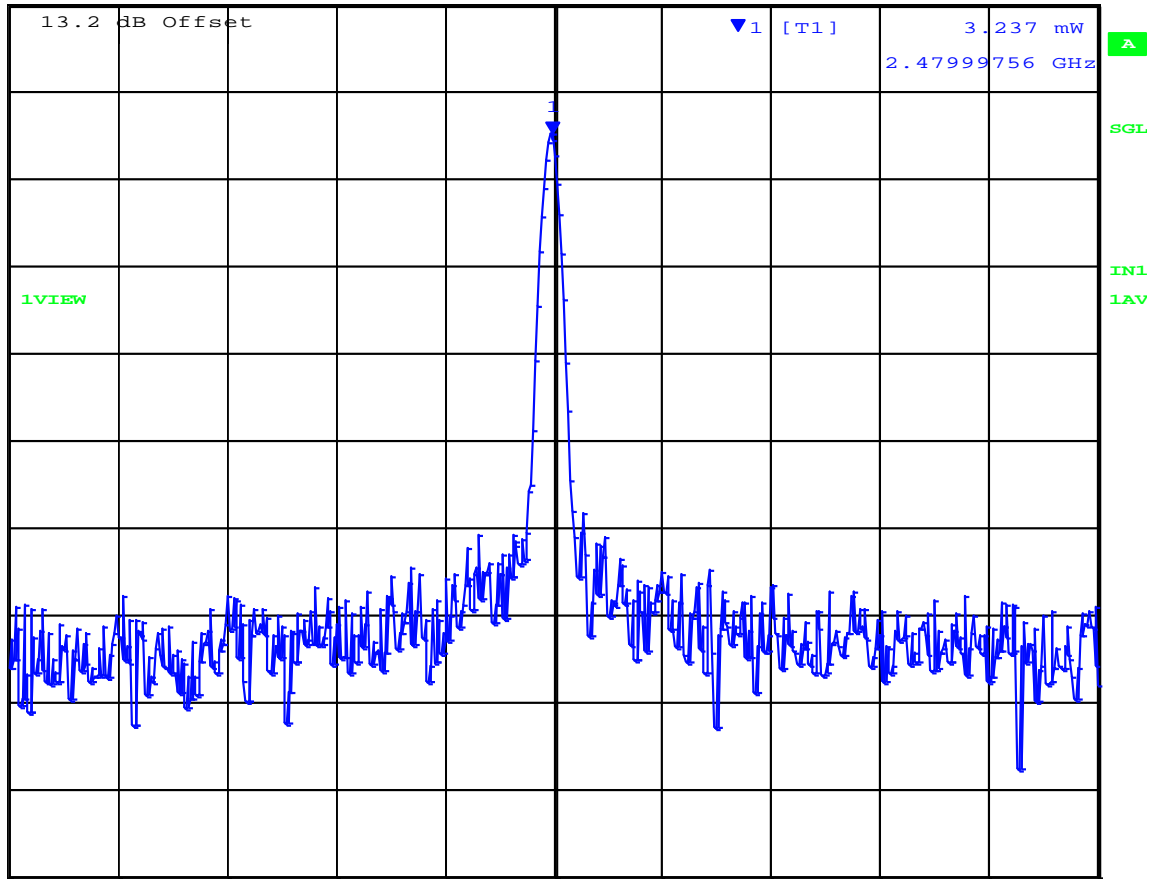
Voltage	FREQUENCY ERROR (ppm)		
	Channel 2,480 MHz		
	Measured Frequency	Frequency Error	
	MHz	$\Delta$ KHz	ppm
+3.3 Vdc	2479.99756	-2.440	-0.98
+2.2 Vdc	2479.99862	-1.380	-0.57
+3.6 Vdc	2479.99726	-2.740	-1.14

**Frequency Error:** The frequency Error shall be  $\leq 50$  ppm



### Frequency Error Channel 2,480 MHz Nominal Voltage +3.3 Vdc

Marker 1 [T1] RBW 100 Hz RF Att 20 dB  
Ref Lvl 3.237 mW VBW 100 Hz  
100 mW 2.47999756 GHz SWT 5 s Unit W



Center 2.479997565 GHz 1 kHz/ Span 10 kHz

Date: 19.DEC.2010 13:55:10

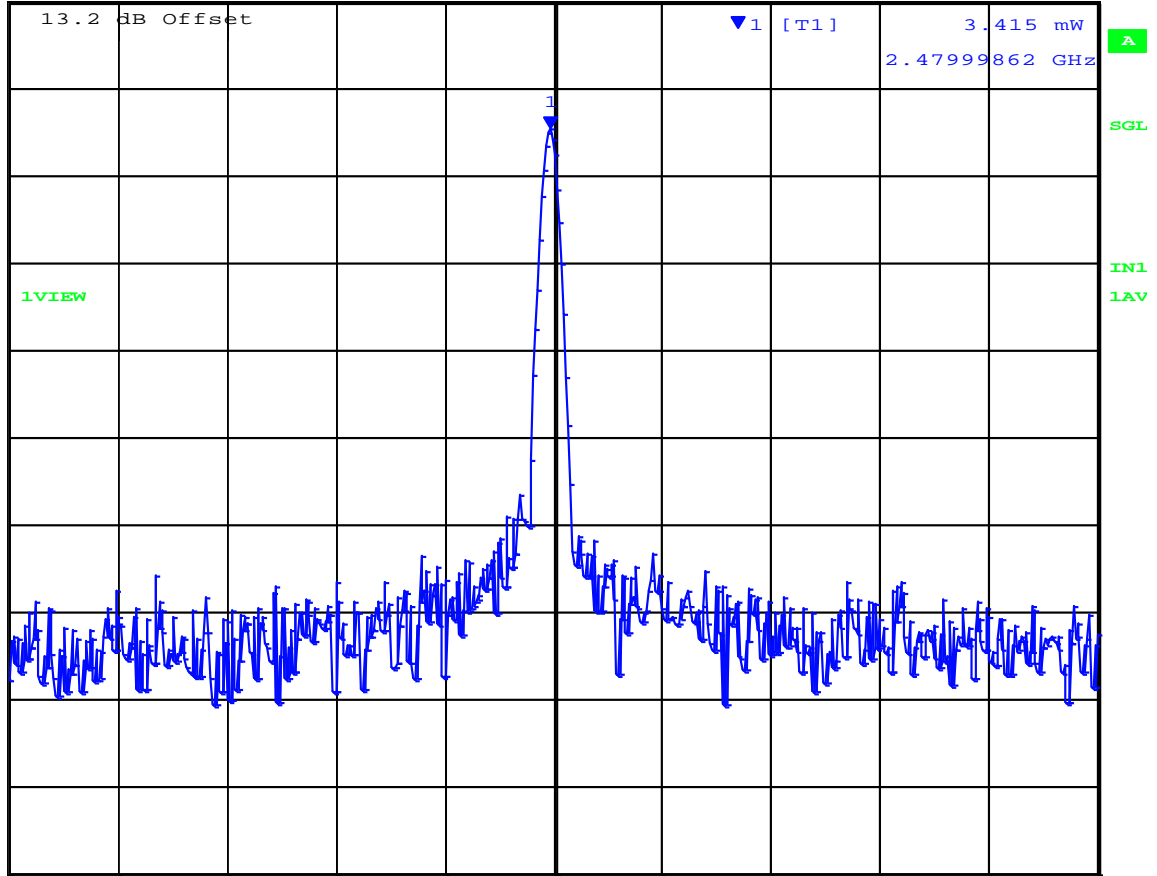
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### Frequency Error Channel 2,480 MHz Minimum Voltage +2.2 Vdc

Marker 1 [T1] RBW 100 Hz RF Att 20 dB  
Ref Lvl 3.415 mW VBW 100 Hz  
100 mW 2.47999862 GHz SWT 5 s Unit W



Center 2.479998647 GHz 1 kHz/ Span 10 kHz

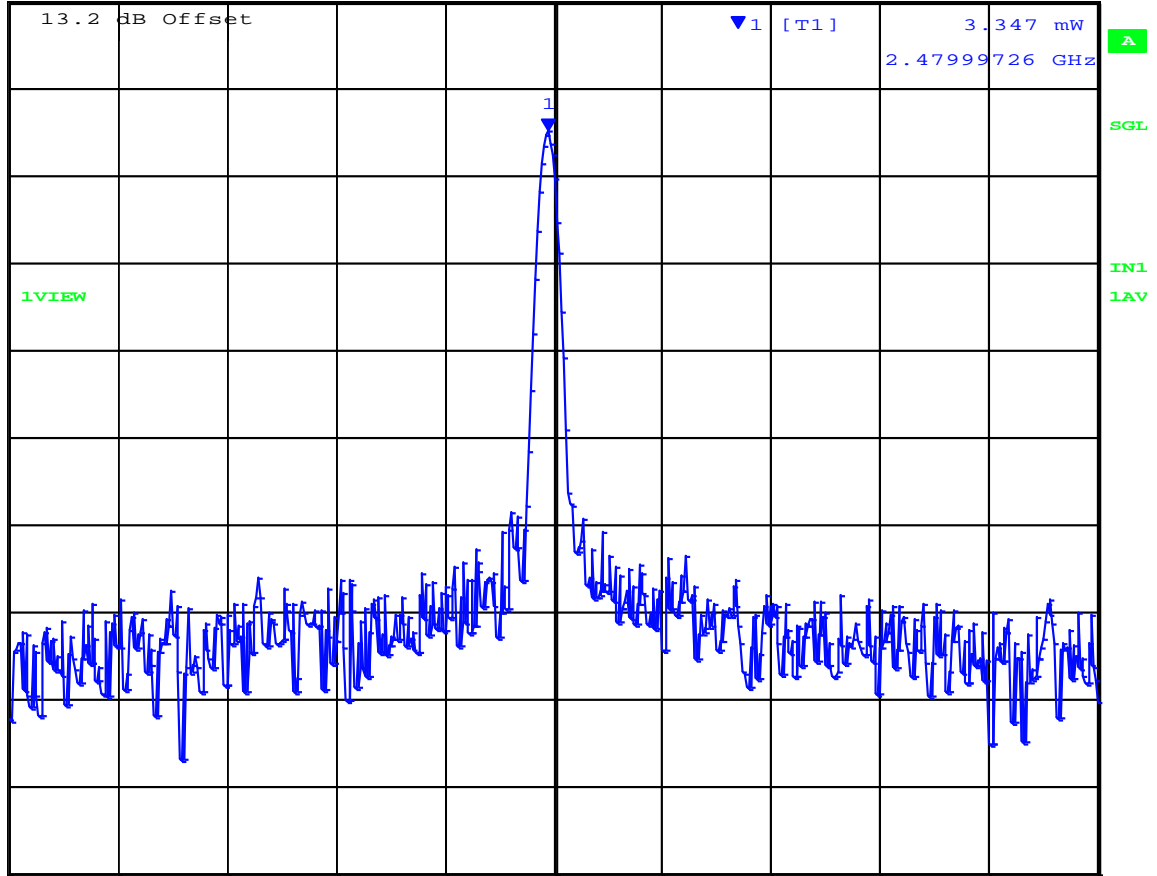
Date: 19.DEC.2010 14:00:07

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Frequency Error Channel 2,480 MHz Maximum Voltage +3.6 Vdc

Marker 1 [T1] RBW 100 Hz RF Att 20 dB  
Ref Lvl 3.347 mW VBW 100 Hz  
100 mW 2.47999726 GHz SWT 5 s Unit W



Center 2.479997315 GHz 1 kHz/ Span 10 kHz

Date: 19.DEC.2010 14:05:02

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**Title:** 2.4 GHz XBee S2C RF Module  
**To:** Japanese ARIB STD-T66  
**Serial #:** DIGI55-J2 Rev A  
**Issue Date:** 29th March 2017  
**Page:** 43 of 144

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## Specification

### Limits

<b>Frequency Error:</b> The frequency Error shall be $\leq 50$ ppm
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## Laboratory Uncertainty for Frequency Measurements

Measurement uncertainty (dB)	$\pm 0.86$ ppm
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## Traceability

Method	Test Equipment Used
Measurements were made per work instruction WI-02 'Frequency Measurement'	0223, 0116, 0158, 0193, 0312, 0313, 0314

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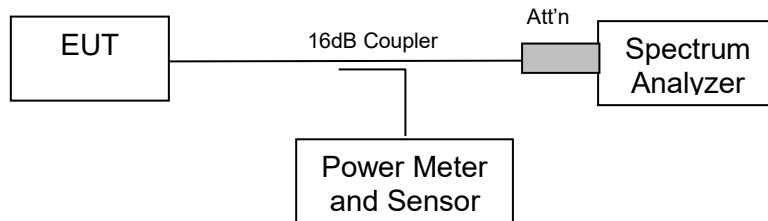
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### 5.1.3. Occupied and Spreading Bandwidths

#### Test Procedure

The Occupied and Spreading Bandwidth was measured with a spectrum analyzer connected to the antenna terminal which was terminated in an SMA connector. The EUT was operating in the operation mode specified in Section 3.6 'Test Conditions' at the appropriate center frequency. The voltage was varied at the input to the device on the separate channels and measurements were recorded.

#### Test Measurement Set up



Measurement set up for Occupied and Spreading Bandwidth test

#### Radio Operational Condition

Output Mode: Modulated

Output Power: Maximum

Duty Cycle: 100 %



**Measurement Results for Occupied Bandwidth (99%) and Spreading Bandwidth (90%)**

TABLE OF RESULTS - Channel 2,405 MHz

Voltage	Occupied Bandwidth - Channel 2,405 MHz		
	99% Bandwidth (MHz)	Spreading Bandwidth (90%) (MHz)	Spreading Factor
+3.3 Vdc	2.629	1.635	26.371
+2.2 Vdc	2.629	1.635	26.371
+3.6 Vdc	2.645	1.635	26.371

Spreading Factor = Spreading Bandwidth / 0.062

**Occupied Bandwidth:** The maximum 99% bandwidth is 26 MHz

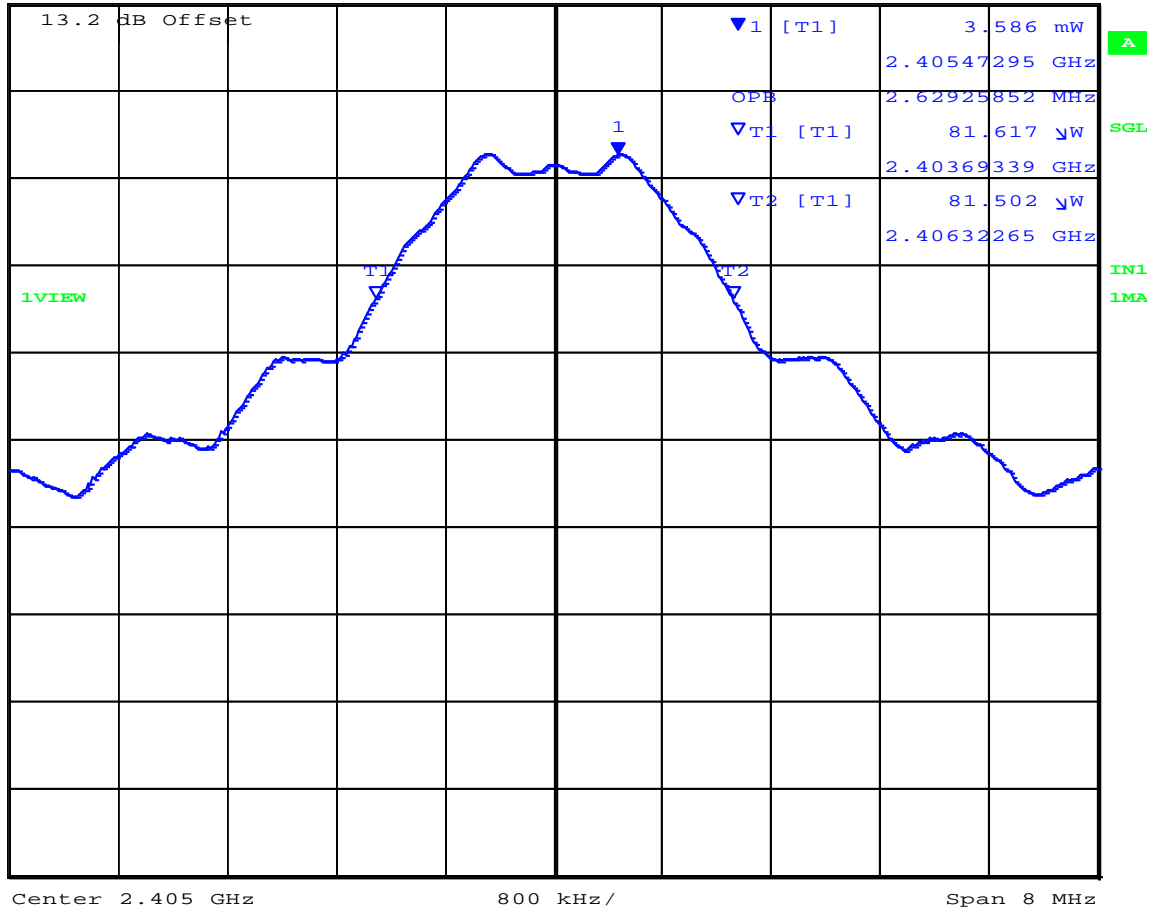
**Spreading Bandwidth:** The minimum Spreading Bandwidth shall be 0.5 MHz

**Spreading Factor:** The minimum spreading factor shall be 5



**99% Bandwidth Channel 2,405 MHz Nominal Voltage +3.3 Vdc**

Marker 1 [T1] RBW 300 kHz RF Att 20 dB  
 Ref Lvl 3.586 mW VBW 300 kHz  
 199.5 mW 2.40547295 GHz SWT 60 s Unit W



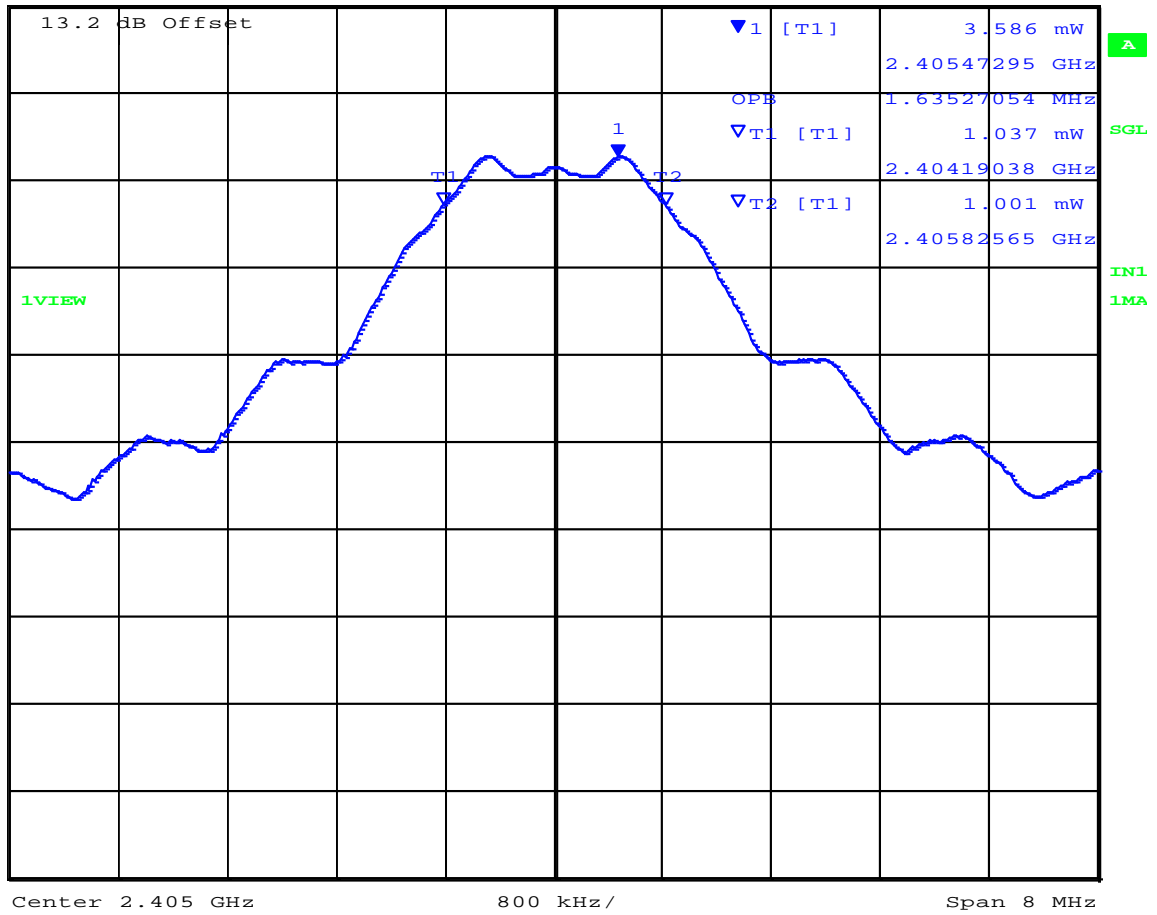
Date: 19.DEC.2010 12:09:00

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90% Bandwidth Channel 2,405 MHz Nominal Voltage +3.3 Vdc

Marker 1 [T1] RBW 300 kHz RF Att 20 dB  
Ref Lvl 3.586 mW VBW 300 kHz  
199.5 mW 2.40547295 GHz SWT 60 s Unit W



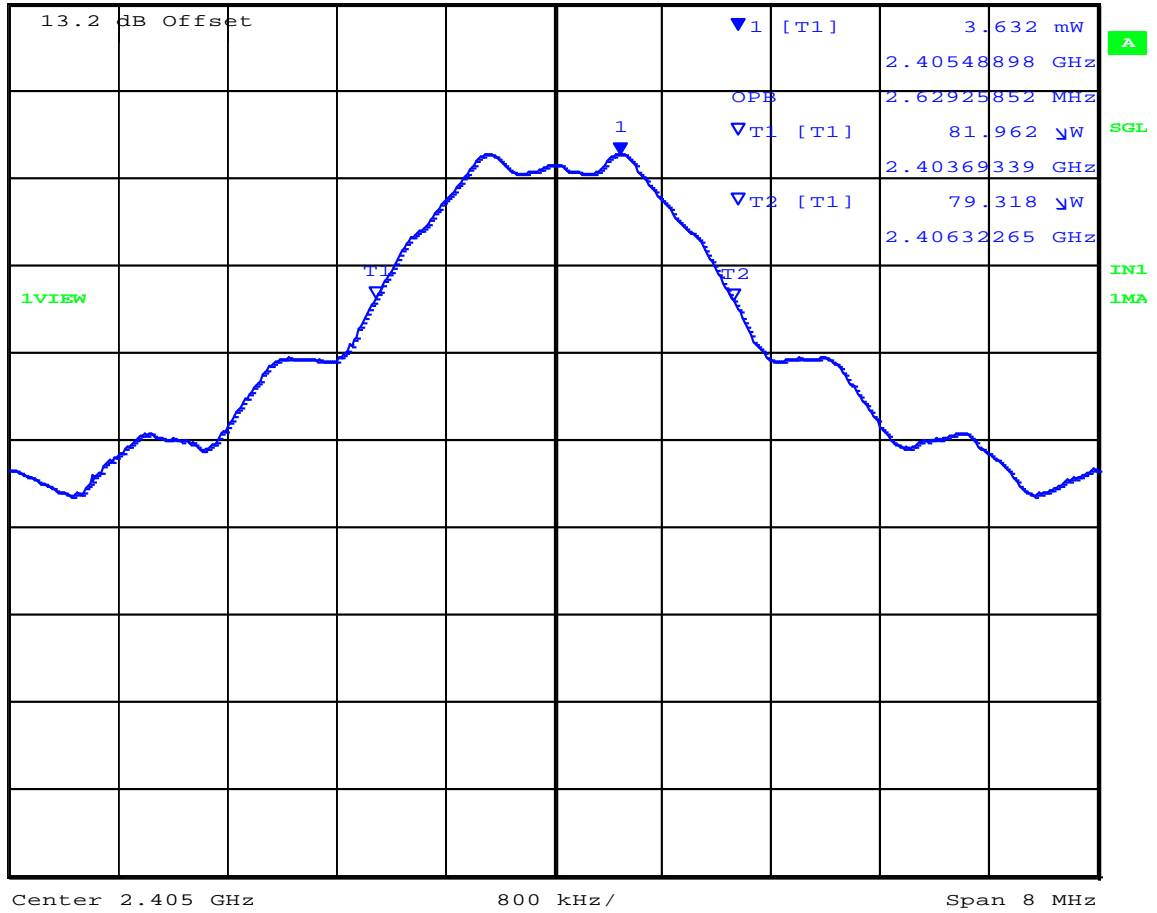
Date: 19.DEC.2010 12:09:07

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99% Bandwidth Channel 2,405 MHz Minimum Voltage +2.2 Vdc

Marker 1 [T1] RBW 300 kHz RF Att 20 dB  
Ref Lvl 3.632 mW VBW 300 kHz  
199.5 mW 2.40548898 GHz SWT 60 s Unit W



Date: 19.DEC.2010 12:11:50

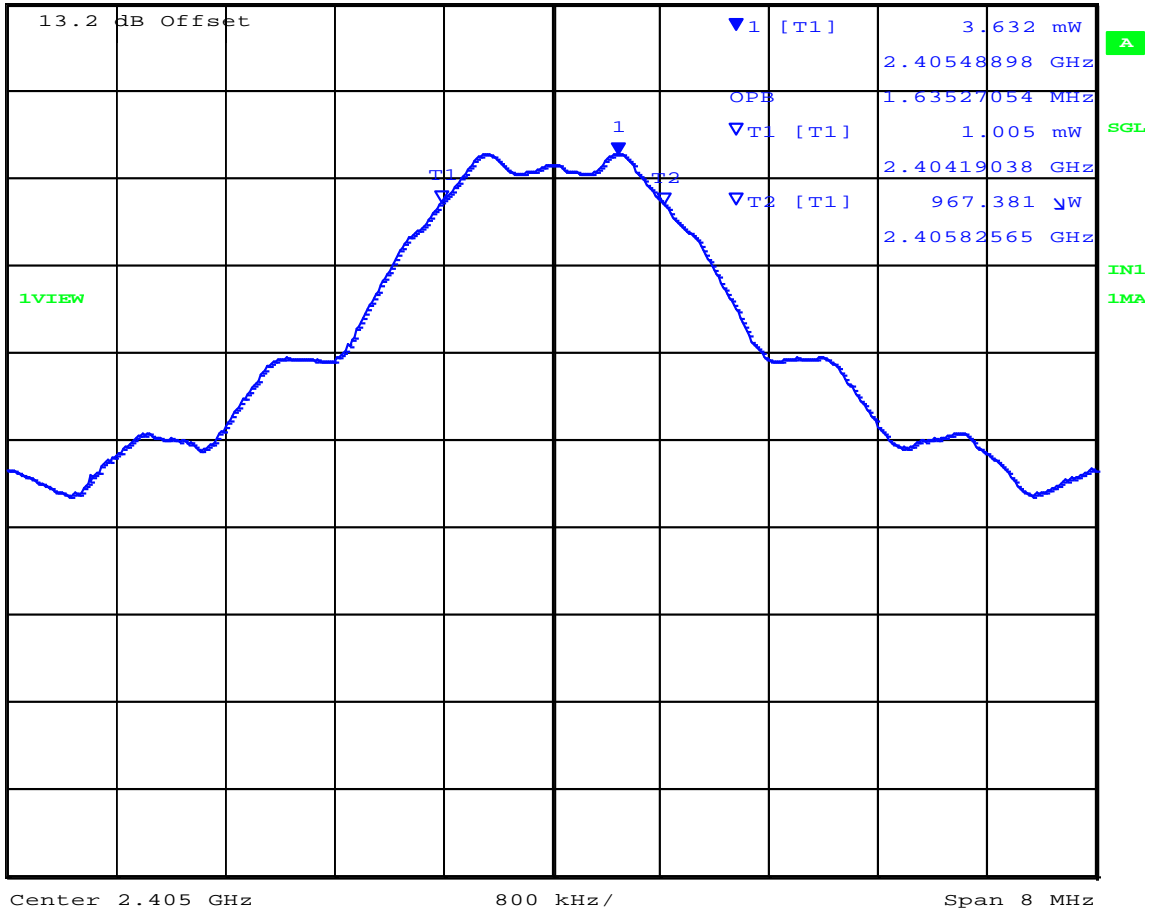
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90% Bandwidth Channel 2,405 MHz Minimum Voltage +2.2 Vdc

Marker 1 [T1] RBW 300 kHz RF Att 20 dB  
Ref Lvl 3.632 mW VBW 300 kHz  
199.5 mW 2.40548898 GHz SWT 60 s Unit W



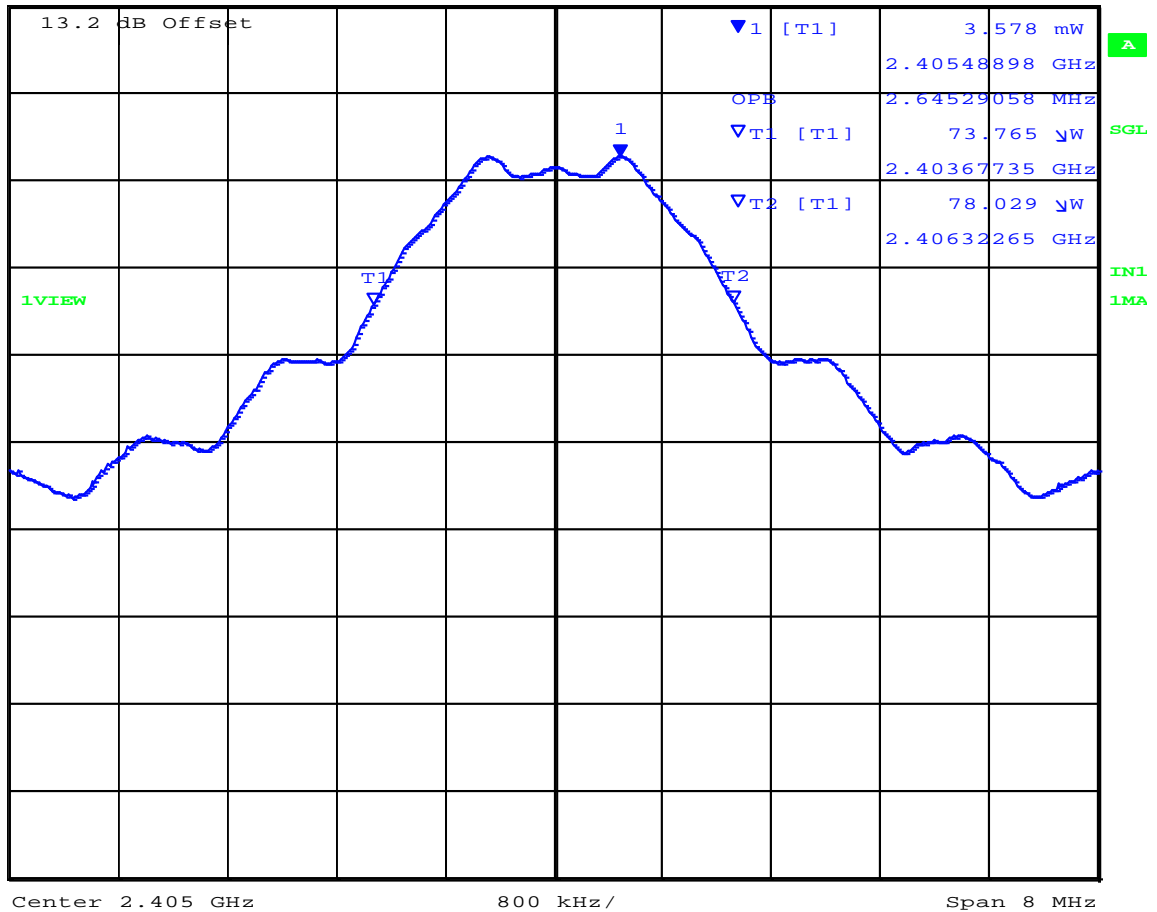
Date: 19.DEC.2010 12:11:57

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99% Bandwidth Channel 2,405 MHz Maximum Voltage +3.6 Vdc

Marker 1 [T1] RBW 300 kHz RF Att 20 dB  
Ref Lvl 3.578 mW VBW 300 kHz  
199.5 mW 2.40548898 GHz SWT 60 s Unit W



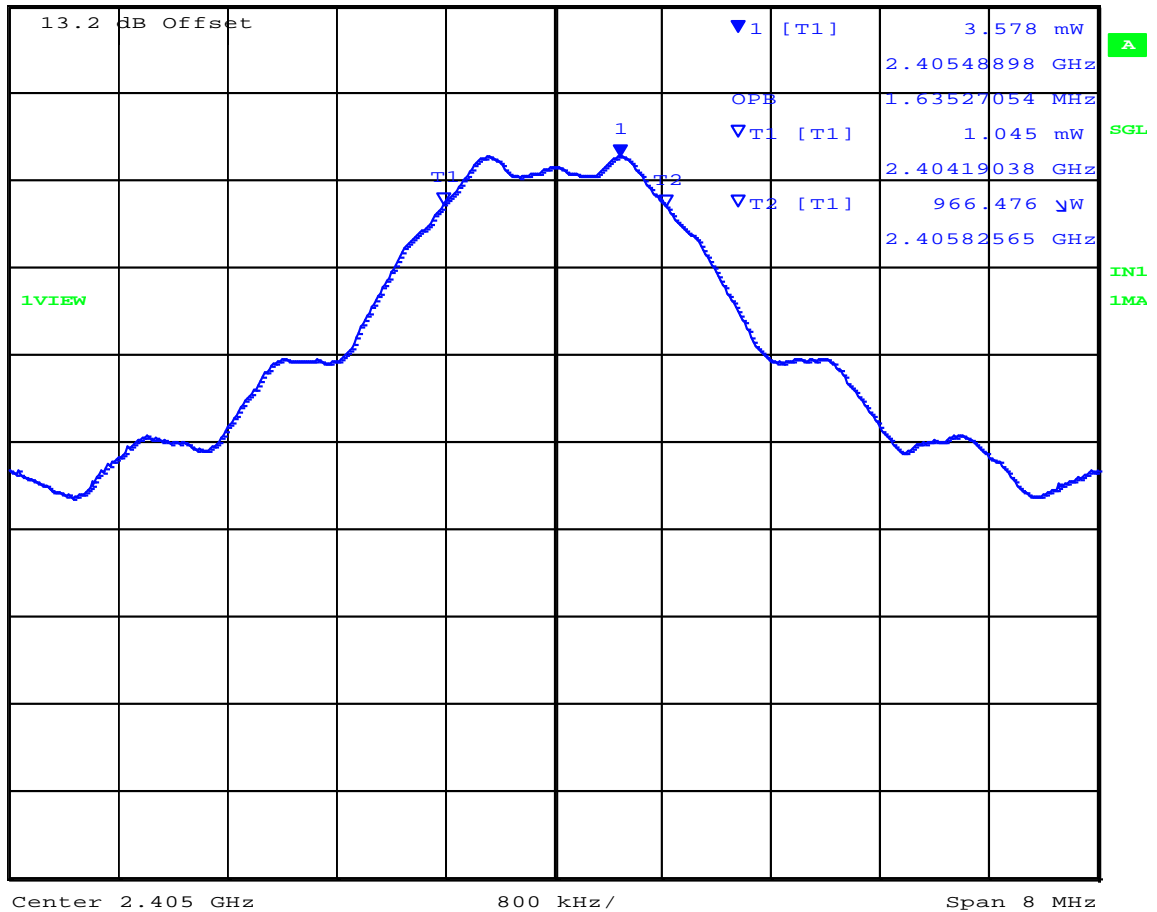
Date: 19.DEC.2010 12:14:40

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90% Bandwidth Channel 2,405 MHz Maximum Voltage +3.6 Vdc

Marker 1 [T1] RBW 300 kHz RF Att 20 dB  
Ref Lvl 3.578 mW VBW 300 kHz  
199.5 mW 2.40548898 GHz SWT 60 s Unit W



Date: 19.DEC.2010 12:14:47

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TABLE OF RESULTS - Channel 2,440 MHz

Voltage	Occupied Bandwidth - Channel 2,440 MHz		
	99% Bandwidth (MHz)	Spreading Bandwidth (90%) (MHz)	Spreading Factor
+3.3 Vdc	2.629	1.635	26.371
+2.2 Vdc	2.597	1.603	25.855
+3.6 Vdc	2.597	1.619	26.113

Spreading Factor = Spreading Bandwidth / 0.062

**Occupied Bandwidth:** The maximum 99% bandwidth is 26 MHz

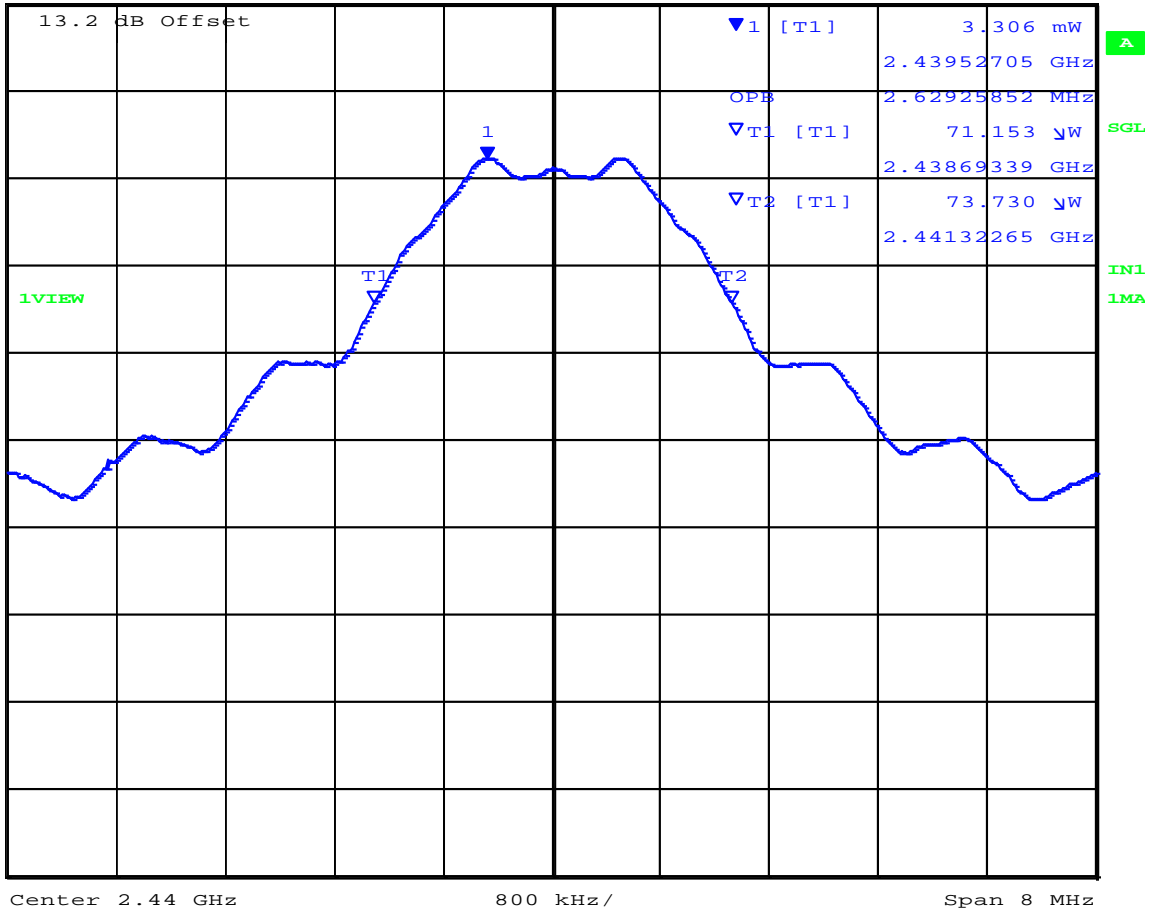
**Spreading Bandwidth:** The minimum Spreading Bandwidth shall be 0.5 MHz

**Spreading Factor:** The minimum spreading factor shall be 5



99% Bandwidth Channel 2,440 MHz Nominal Voltage +3.3 Vdc

Marker 1 [T1] RBW 300 kHz RF Att 20 dB  
Ref Lvl 3.306 mW VBW 300 kHz  
199.5 mW 2.43952705 GHz SWT 60 s Unit W



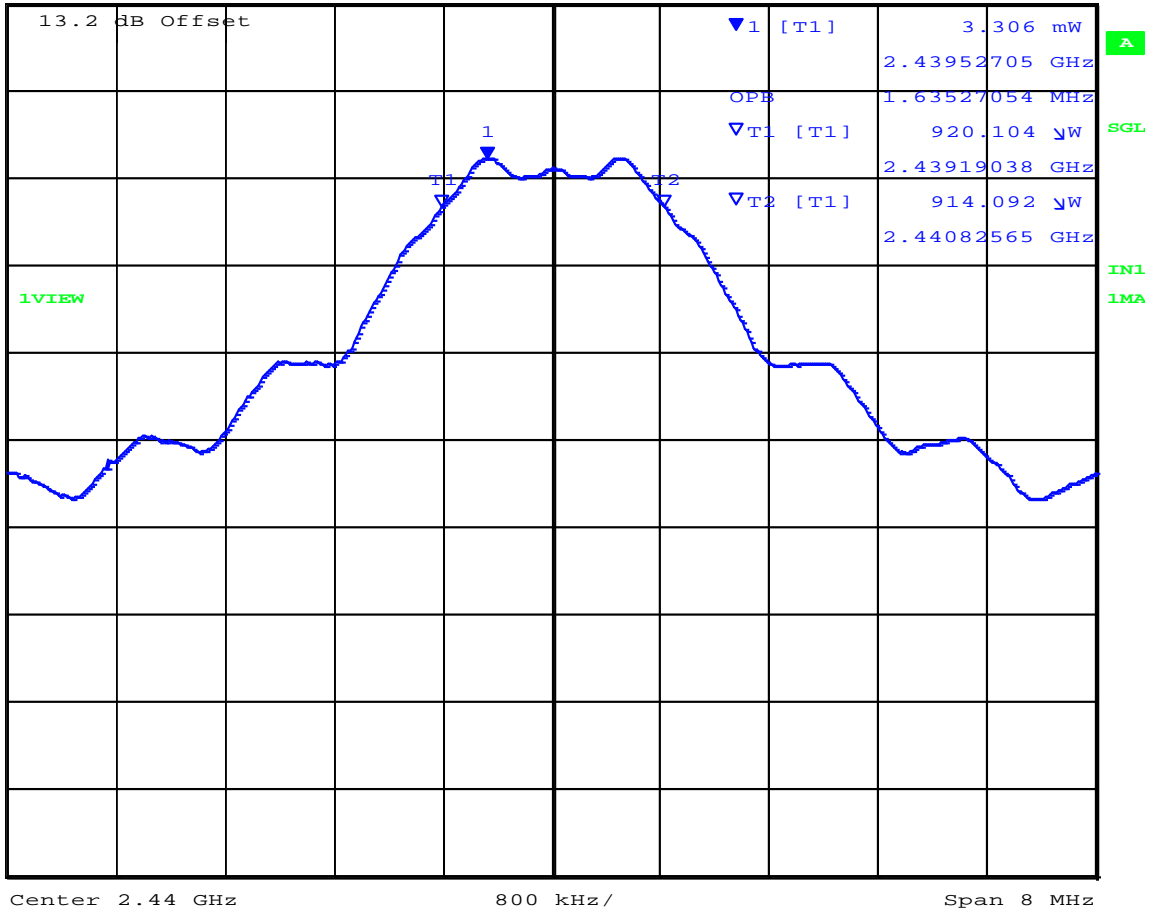
Date: 20.DEC.2010 09:16:14

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90% Bandwidth Channel 2,440 MHz Nominal Voltage +3.3 Vdc

Marker 1 [T1] RBW 300 kHz RF Att 20 dB  
Ref Lvl 3.306 mW VBW 300 kHz  
199.5 mW 2.43952705 GHz SWT 60 s Unit W



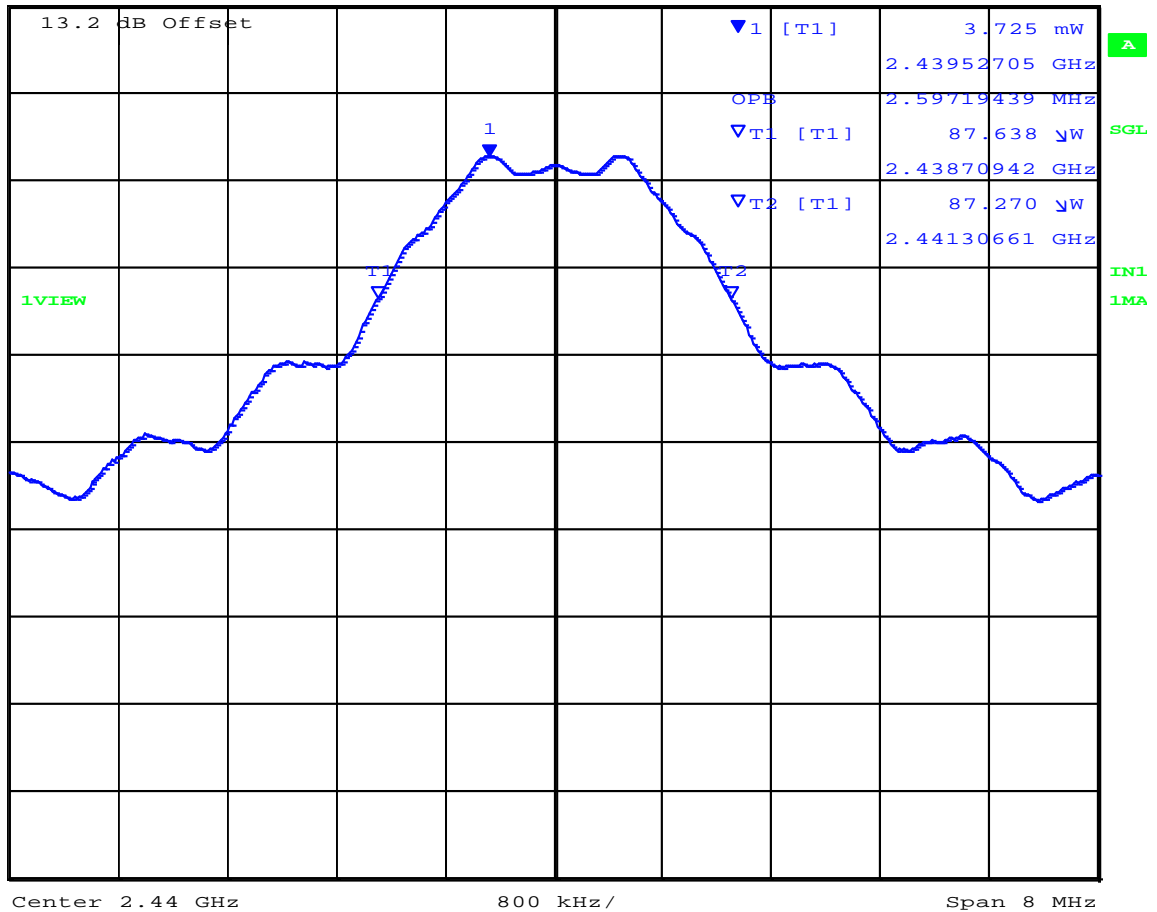
Date: 20.DEC.2010 09:16:21

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99% Bandwidth Channel 2,440 MHz Minimum Voltage +2.2 Vdc

Marker 1 [T1] RBW 300 kHz RF Att 20 dB  
Ref Lvl 3.725 mW VBW 300 kHz  
199.5 mW 2.43952705 GHz SWT 60 s Unit W



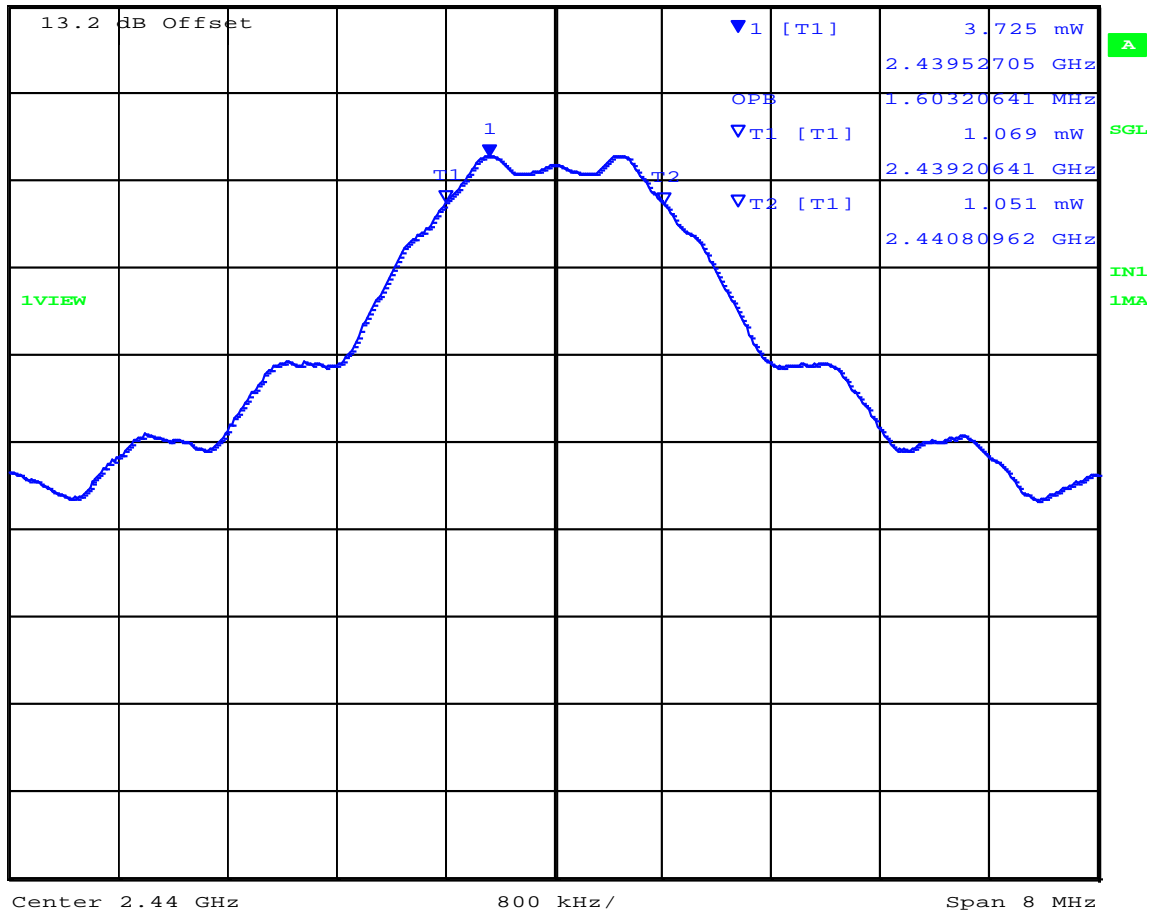
Date: 19.DEC.2010 13:12:15

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90% Bandwidth Channel 2,440 MHz Minimum Voltage +2.2 Vdc

Marker 1 [T1] RBW 300 kHz RF Att 20 dB  
Ref Lvl 3.725 mW VBW 300 kHz  
199.5 mW 2.43952705 GHz SWT 60 s Unit W



Date: 19.DEC.2010 13:12:22

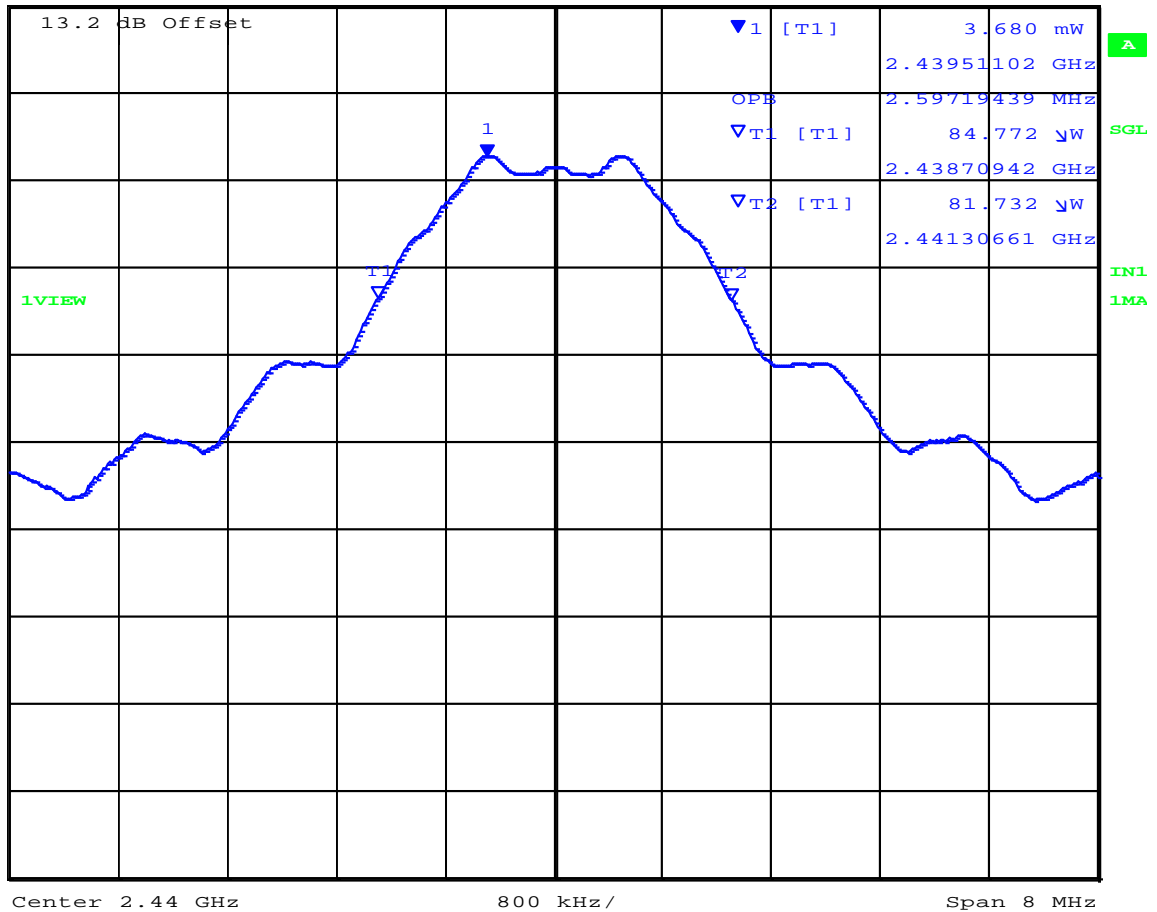
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99% Bandwidth Channel 2,440 MHz Maximum Voltage +3.6 Vdc

Marker 1 [T1] RBW 300 kHz RF Att 20 dB  
Ref Lvl 3.680 mW VBW 300 kHz  
199.5 mW 2.43951102 GHz SWT 60 s Unit W



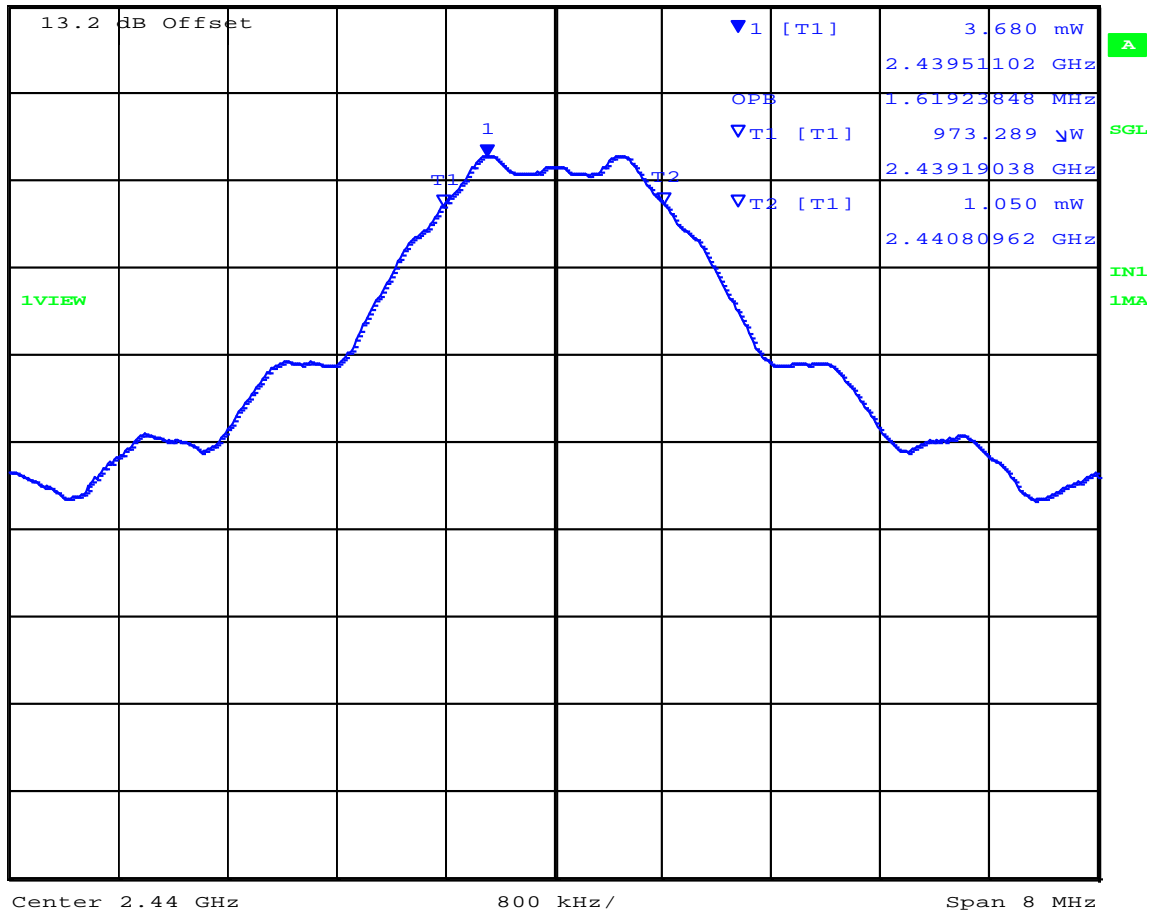
Date: 19.DEC.2010 13:15:04

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90% Bandwidth Channel 2,440 MHz Maximum Voltage +3.6 Vdc

Marker 1 [T1] RBW 300 kHz RF Att 20 dB  
Ref Lvl 3.680 mW VBW 300 kHz  
199.5 mW 2.43951102 GHz SWT 60 s Unit W



Date: 19.DEC.2010 13:15:11

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TABLE OF RESULTS - Channel 2,480 MHz

Voltage	Occupied Bandwidth - Channel 2,480 MHz		
	99% Bandwidth (MHz)	Spreading Bandwidth (90%) (MHz)	Spreading Factor
+3.3 Vdc	2.629	1.635	26.371
+2.2 Vdc	2.597	1.619	26.113
+3.6 Vdc	2.613	1.619	26.113

Spreading Factor = Spreading Bandwidth / 0.062

**Occupied Bandwidth:** The maximum 99% bandwidth is 26 MHz

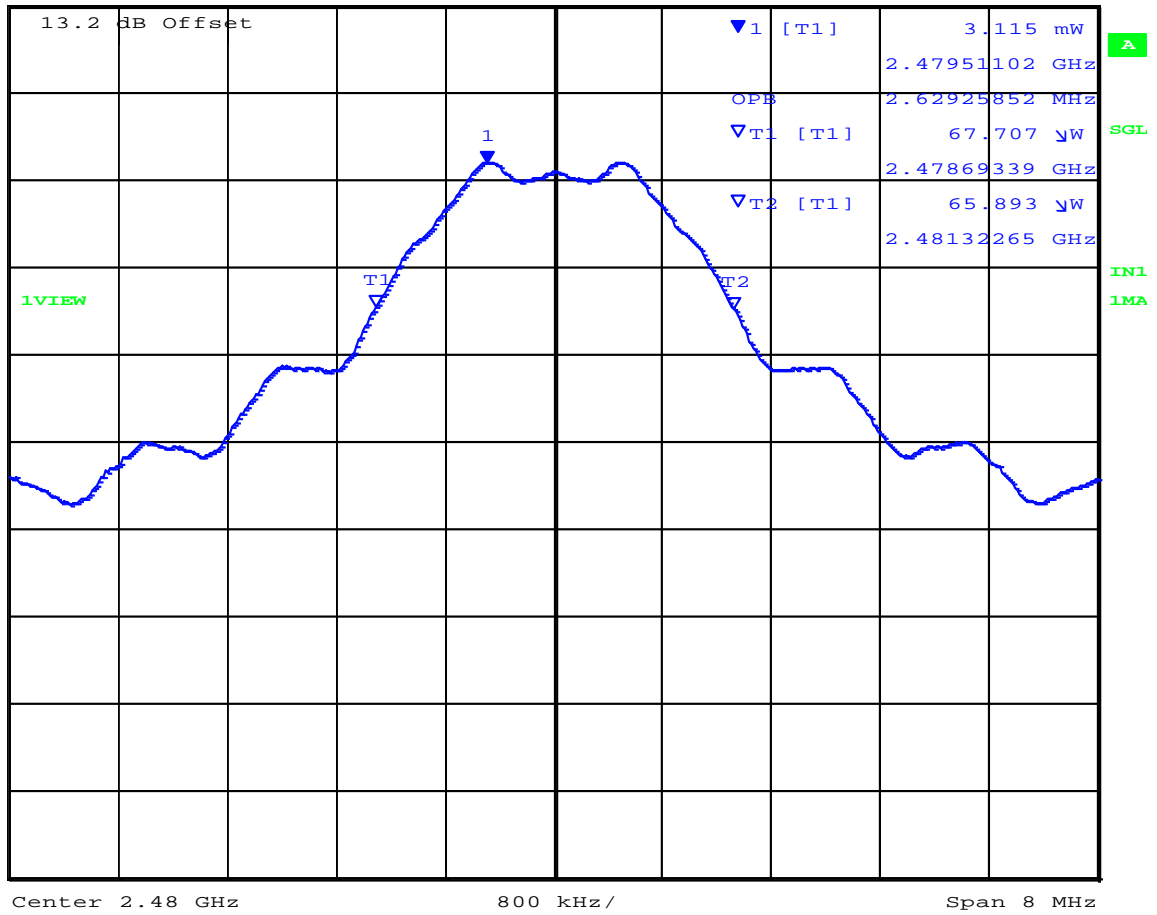
**Spreading Bandwidth:** The minimum Spreading Bandwidth shall be 0.5 MHz

**Spreading Factor:** The minimum spreading factor shall be 5



99% Bandwidth Channel 2,480 MHz Nominal Voltage +3.3 Vdc

Marker 1 [T1] RBW 300 kHz RF Att 20 dB  
Ref Lvl 3.115 mW VBW 300 kHz  
199.5 mW 2.47951102 GHz SWT 60 s Unit W



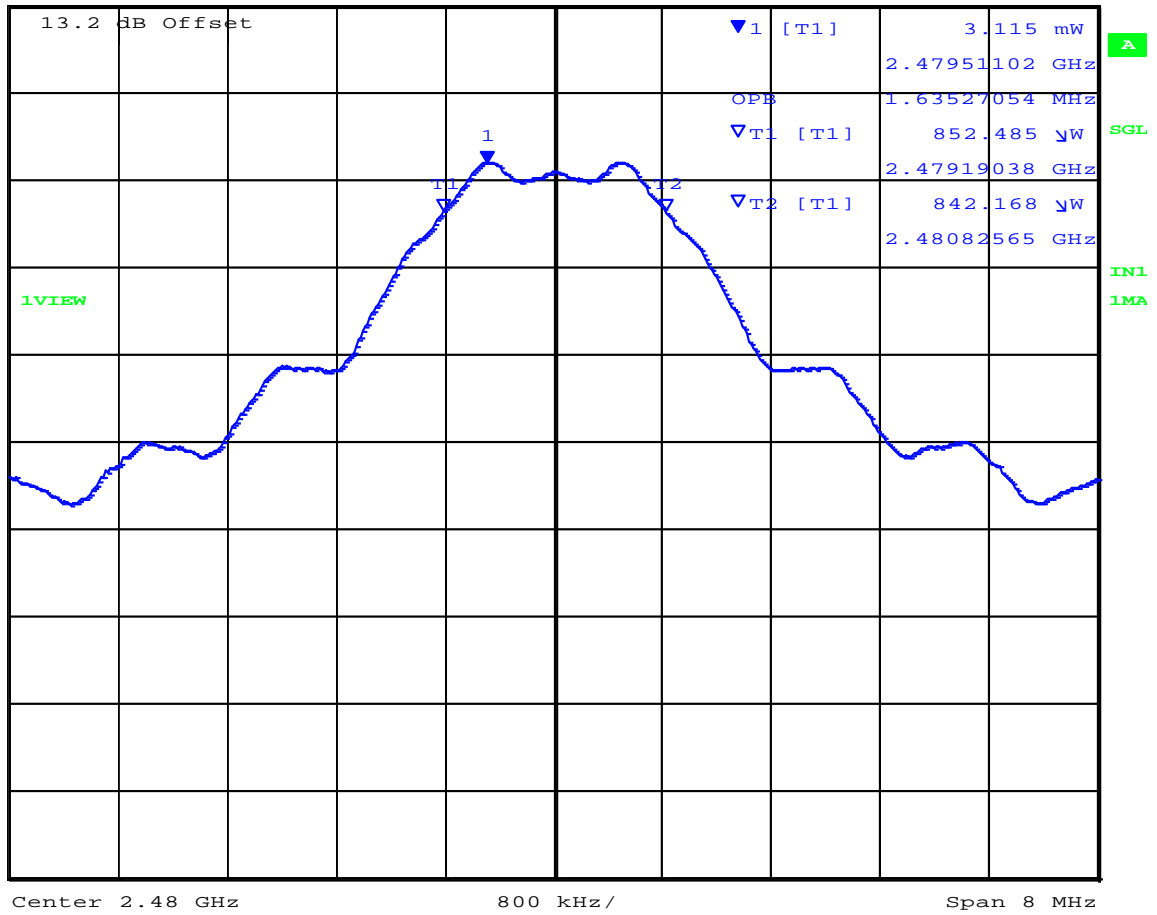
Date: 20.DEC.2010 09:21:59

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90% Bandwidth Channel 2,480 MHz Nominal Voltage +3.3 Vdc

Marker 1 [T1] RBW 300 kHz RF Att 20 dB  
Ref Lvl 3.115 mW VBW 300 kHz  
199.5 mW 2.47951102 GHz SWT 60 s Unit W



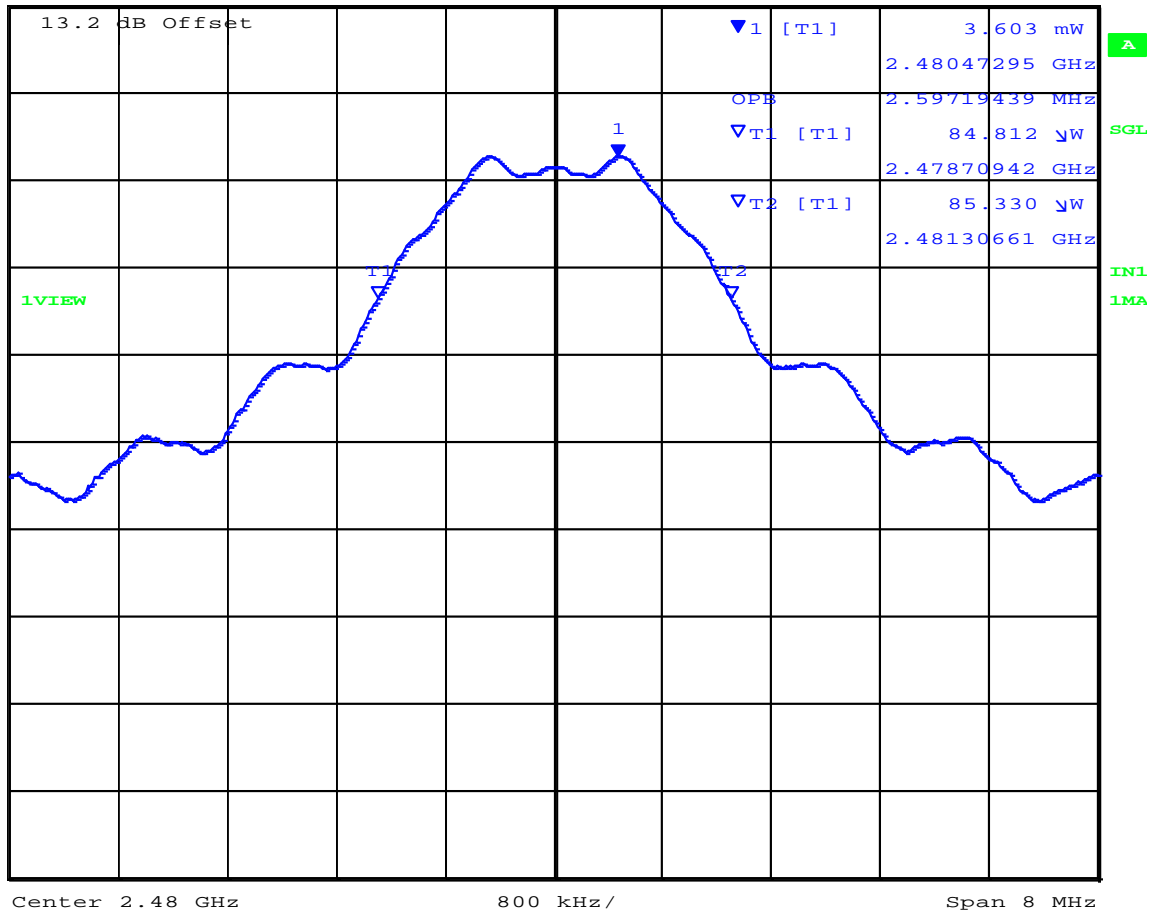
Date: 20.DEC.2010 09:22:05

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99% Bandwidth Channel 2,480 MHz Minimum Voltage +2.2 Vdc

Marker 1 [T1] RBW 300 kHz RF Att 20 dB  
Ref Lvl 3.603 mW VBW 300 kHz  
199.5 mW 2.48047295 GHz SWT 60 s Unit W



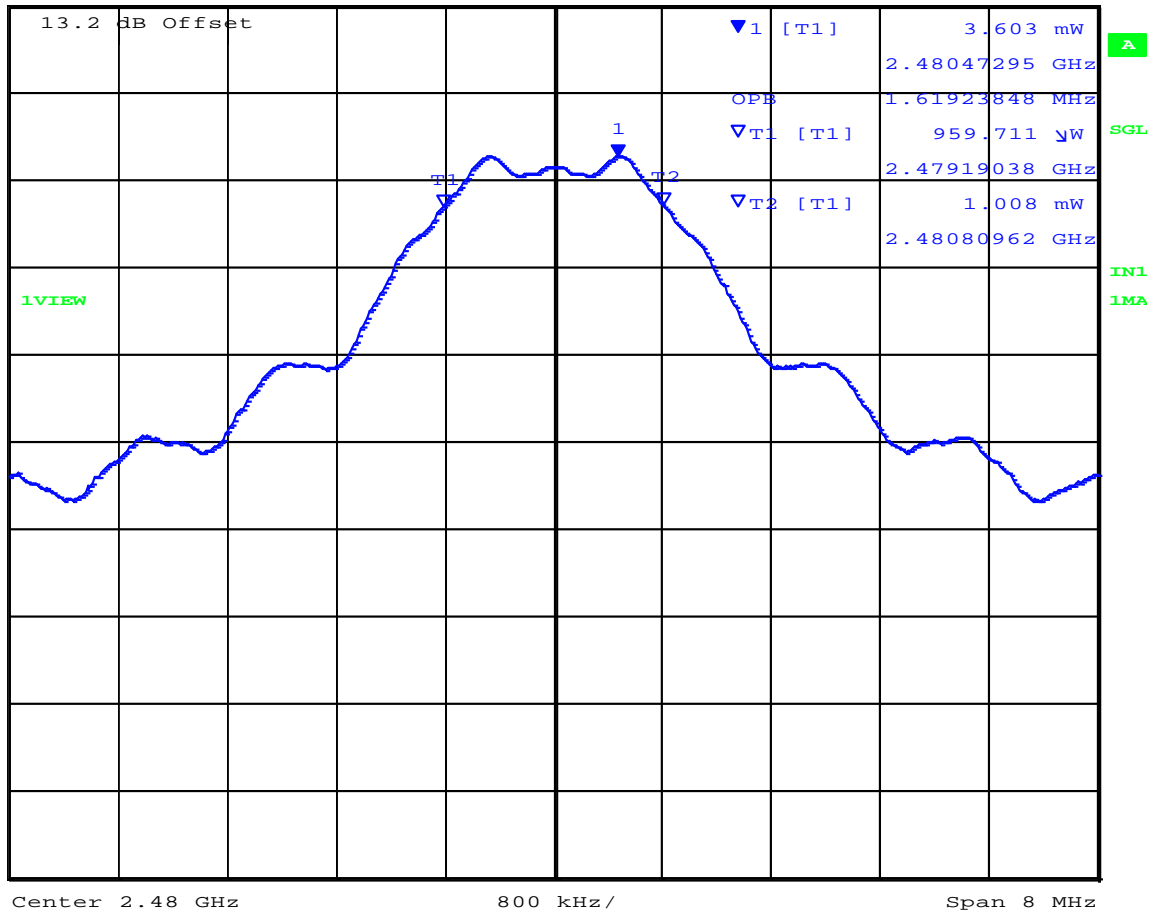
Date: 19.DEC.2010 14:07:39

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90% Bandwidth Channel 2,480 MHz Minimum Voltage +2.2 Vdc

Marker 1 [T1] RBW 300 kHz RF Att 20 dB  
Ref Lvl 3.603 mW VBW 300 kHz  
199.5 mW 2.48047295 GHz SWT 60 s Unit W



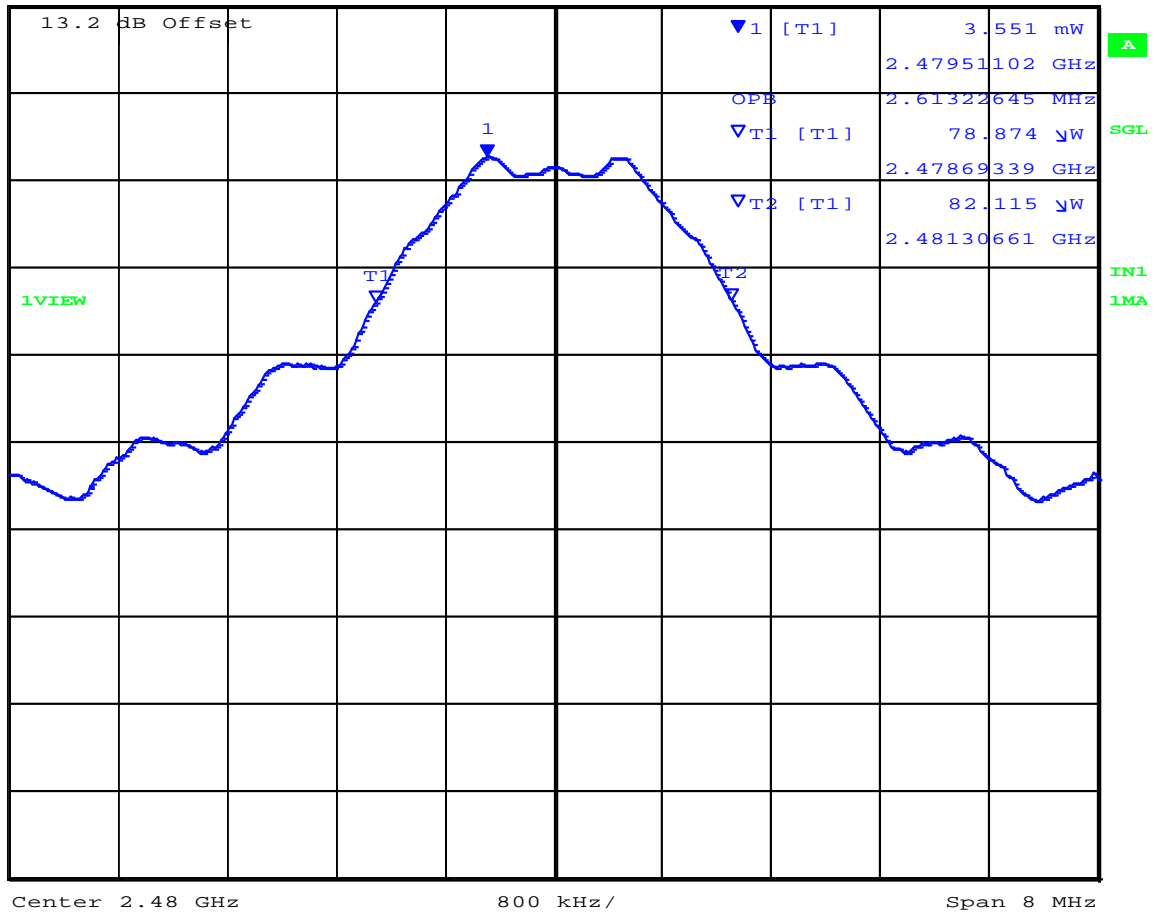
Date: 19.DEC.2010 14:07:46

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99% Bandwidth Channel 2,480 MHz Maximum Voltage +3.6 Vdc

Marker 1 [T1] RBW 300 kHz RF Att 20 dB  
Ref Lvl 3.551 mW VBW 300 kHz  
199.5 mW 2.47951102 GHz SWT 60 s Unit W



Date: 19.DEC.2010 14:10:29

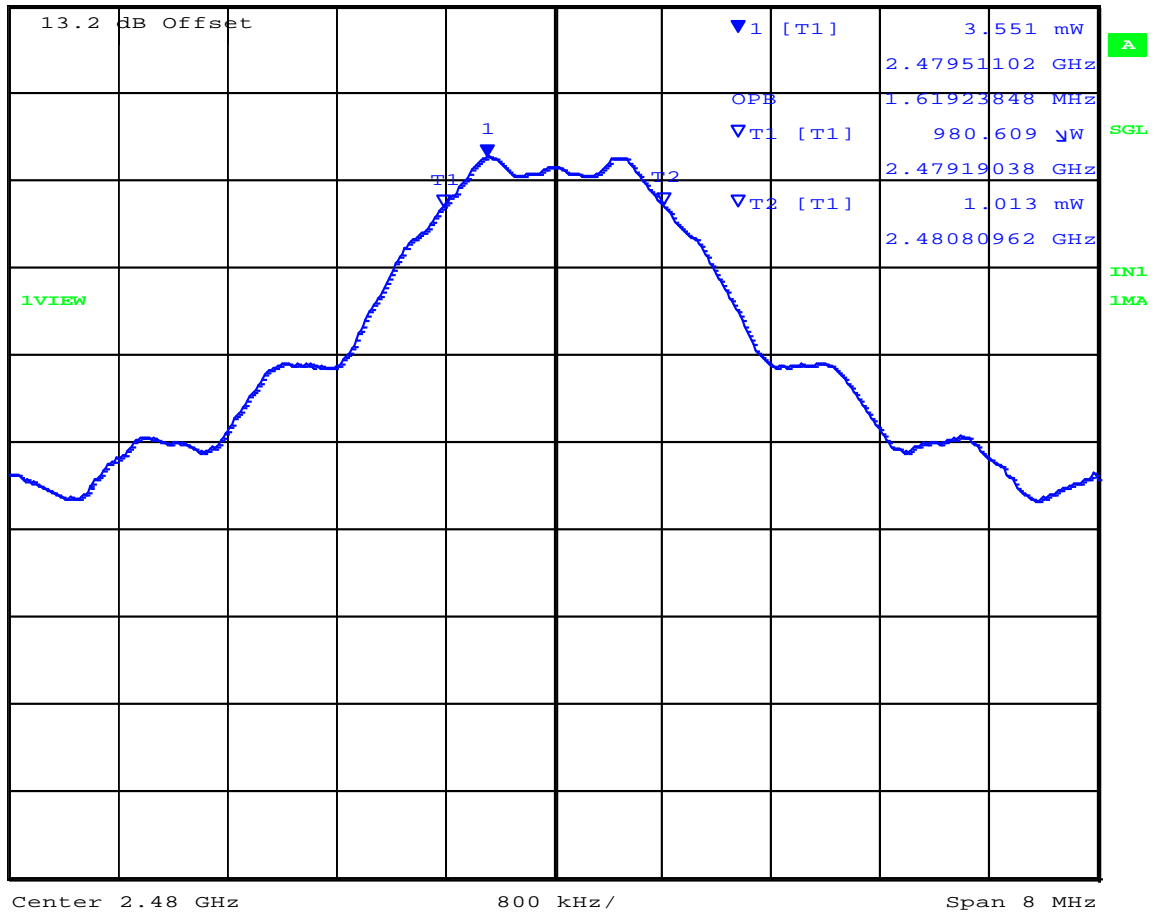
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90% Bandwidth Channel 2,480 MHz Maximum Voltage +3.6 Vdc

Marker 1 [T1] RBW 300 kHz RF Att 20 dB  
Ref Lvl 3.551 mW VBW 300 kHz  
199.5 mW 2.47951102 GHz SWT 60 s Unit W



Date: 19.DEC.2010 14:10:36

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**Title:** 2.4 GHz XBee S2C RF Module  
**To:** Japanese ARIB STD-T66  
**Serial #:** DIGI55-J2 Rev A  
**Issue Date:** 29th March 2017  
**Page:** 66 of 144

---

## Specification

### Limits

**Occupied Bandwidth:** The maximum 99% bandwidth is 26 MHz

**Spreading Bandwidth:** The minimum Spreading Bandwidth shall be 0.5 MHz

**Spreading Factor:** The minimum Spreading Factor shall be 5

## Laboratory Measurement Uncertainty for Spectrum Measurement

Measurement uncertainty	$\pm 2.81$ dB
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## Traceability

Method	Test Equipment Used
Measurements were made per work instruction WI-03 'Measurement of RF Spectrum Mask'	0223, 0116, 0158, 0193, 0312, 0313, 0314

---

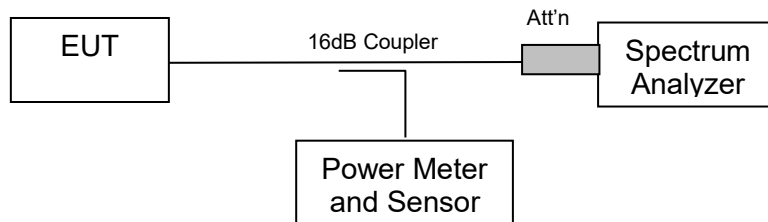
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#### 5.1.4. Transmitter Spurious Emissions

##### Test Procedure

Transmitter Spurious Emissions were measured conductively per the test set up below. The EUT was set on the channel of interest and the spectrum was investigated from 10 – 16,000 MHz.

##### Test Measurement Set up



Measurement set up for Transmitter Spurious Emissions

##### Radio Operational Condition

Output Mode: Modulated

Output Power: Maximum

Duty Cycle: 100 %



TABLE OF RESULTS - Channel 2,405 MHz

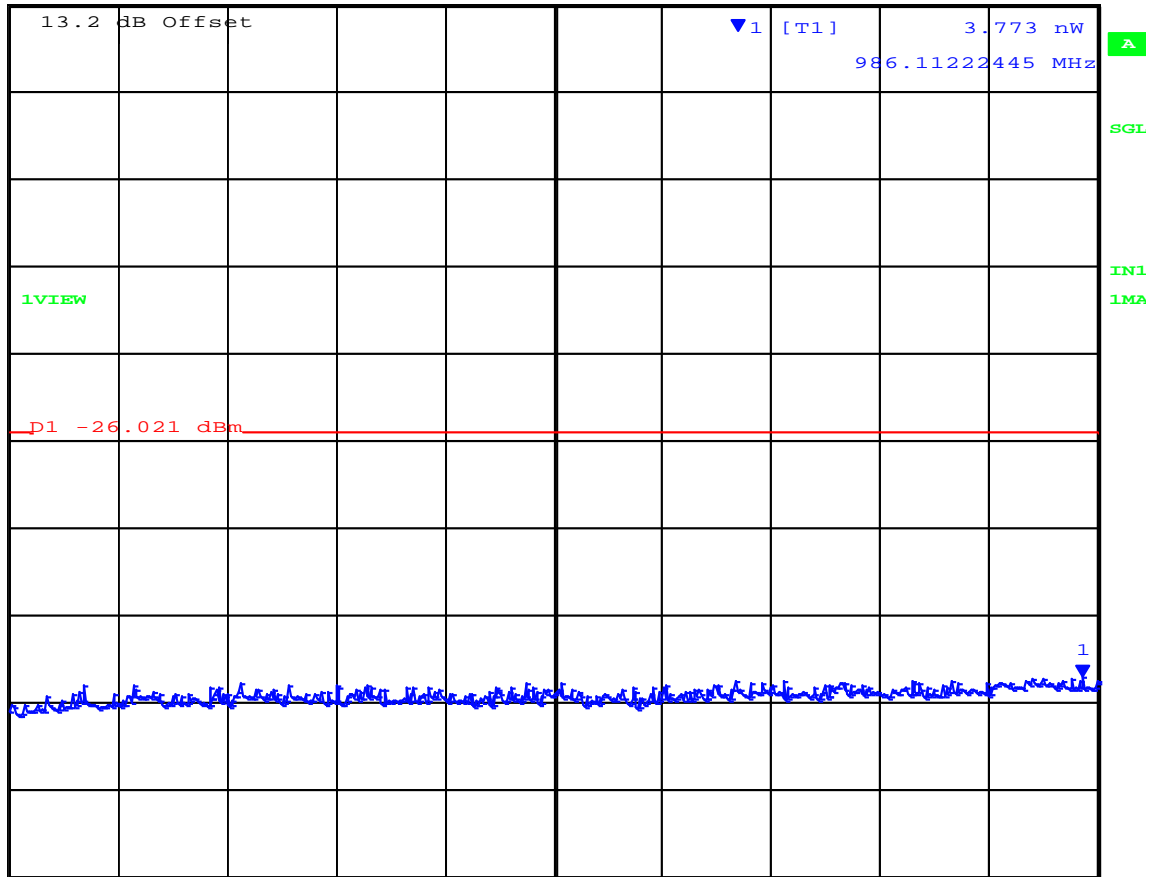
Voltage	Start Frequency (MHz)	Stop Frequency (MHz)	Highest Emission ( $\mu\text{W}/\text{MHz}$ )	Limit ( $\mu\text{W}/\text{MHz}$ )	Margin (dB)
+3.3 Vdc	10.00	1,000.00	0.0038	2.5	-28.21
	1,000.00	2,387.00	0.0359	2.5	-18.43
	2,387.00	2,400.00	0.6040	25	-16.17
	2,483.50	2,496.50	0.0357	25	-28.45
	2,496.50	16,000.00	0.8993	2.5	-4.44
+2.2 Vdc	10.00	1,000.00	0.0043	2.5	-27.65
	1,000.00	2,387.00	0.0315	2.5	-18.99
	2,387.00	2,400.00	0.6154	25	-16.09
	2,483.50	2,496.50	0.0347	25	-28.58
	2,496.50	16,000.00	0.0901	2.5	-14.43
+3.6 Vdc	10.00	1,000.00	0.0042	2.5	-27.78
	1,000.00	2,387.00	0.0359	2.5	-18.43
	2,387.00	2,400.00	0.6040	25	-16.17
	2,483.50	2,496.50	0.0305	25	-29.14
	2,496.50	16,000.00	0.0900	2.5	-14.44

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### Channel 2,405 MHz Transmitter Spurious Emissions 10.00 – 1000.00 MHz +3.3 Vdc

Marker 1 [T1] RBW 100 kHz RF Att 20 dB  
Ref Lvl 3.773 nW VBW 100 kHz  
199.5 mW 986.11222445 MHz SWT 10 s Unit W



Start 10 MHz 99 MHz/ Stop 1 GHz

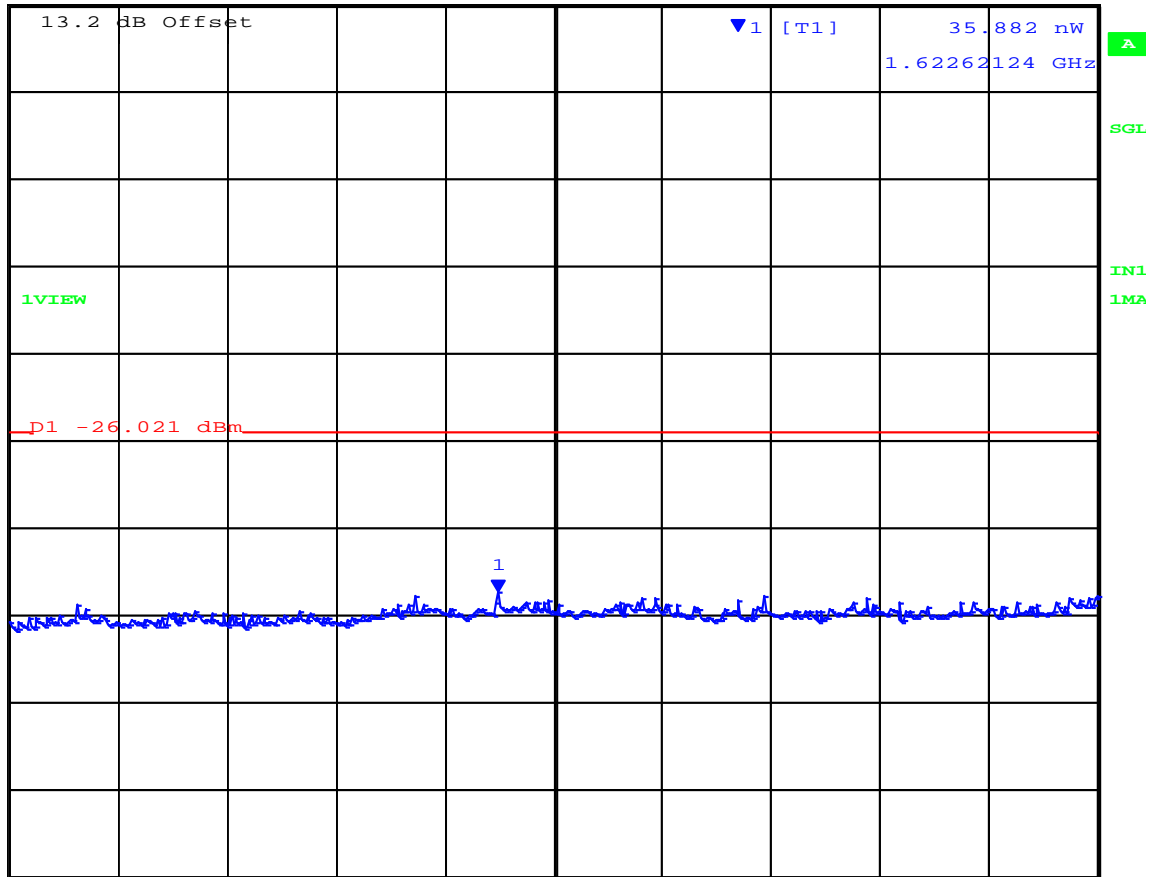
Date: 19.DEC.2010 12:25:02

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Channel 2,405 MHz Transmitter Spurious Emissions  
1000.00 – 2387.00 MHz +3.3 Vdc

Marker 1 [T1] RBW 1 MHz RF Att 20 dB  
Ref Lvl 35.882 nW VBW 1 MHz  
199.5 mW 1.62262124 GHz SWT 10 s Unit W



Start 1 GHz 138.7 MHz/ Stop 2.387 GHz

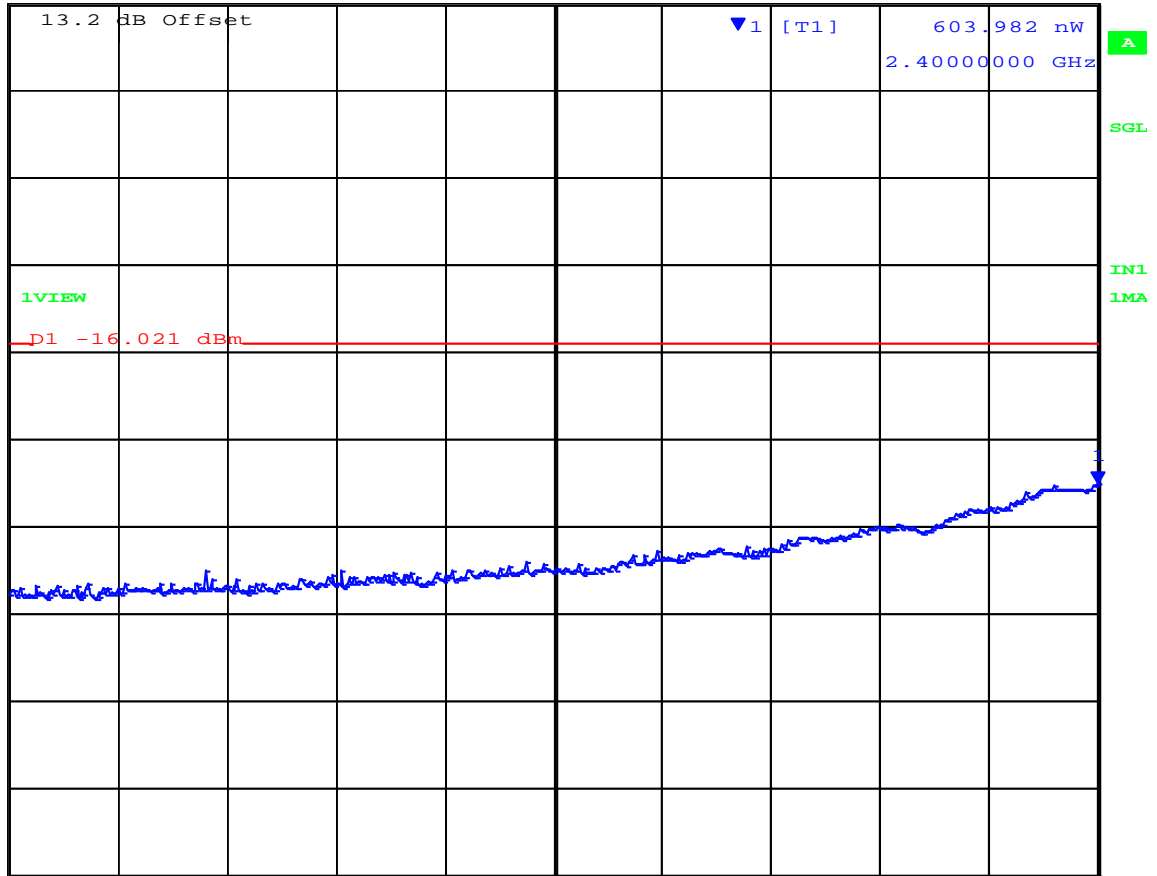
Date: 19.DEC.2010 12:36:42

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Channel 2,405 MHz Transmitter Spurious Emissions  
2387.00 – 2,400.00 MHz +3.3 Vdc

Marker 1 [T1] RBW 1 MHz RF Att 20 dB  
Ref Lvl 603.982 nW VBW 1 MHz  
199.5 mW 2.4000000 GHz SWT 10 s Unit W



Start 2.387 GHz 1.3 MHz/ Stop 2.4 GHz

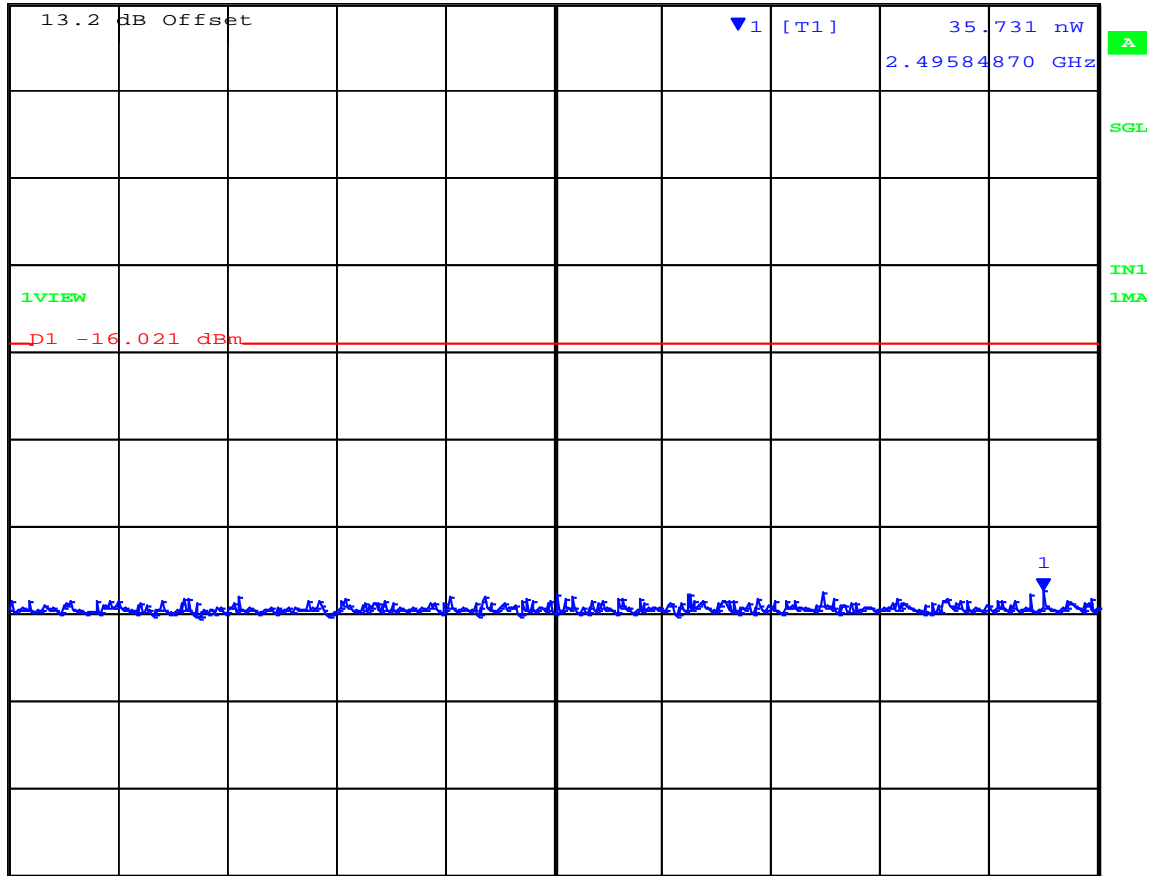
Date: 19.DEC.2010 12:26:53

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Channel 2,405 MHz Transmitter Spurious Emissions  
2,483.50 – 2496.50 MHz +3.3 Vdc

Marker 1 [T1] RBW 1 MHz RF Att 20 dB  
Ref Lvl 35.731 nW VBW 1 MHz  
199.5 mW 2.49584870 GHz SWT 10 s Unit W



Start 2.4835 GHz 1.3 MHz/ Stop 2.4965 GHz

Date: 19.DEC.2010 12:27:46

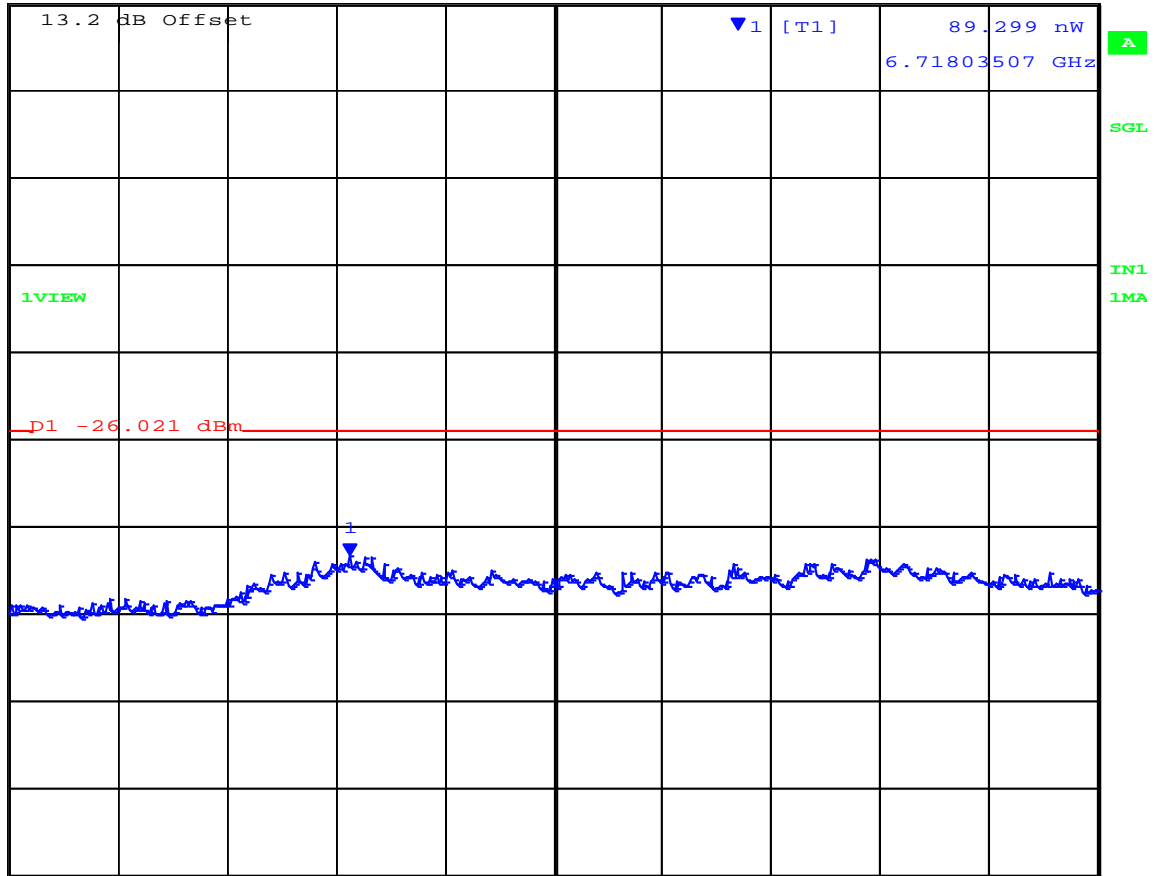
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### Channel 2,405 MHz Transmitter Spurious Emissions 2496.50 – 16,000.00 MHz +3.3 Vdc

Marker 1 [T1] RBW 1 MHz RF Att 20 dB  
Ref Lvl 89.299 nW VBW 1 MHz  
199.5 mW 6.71803507 GHz SWT 10 s Unit W



Start 2.4965 GHz 1.35035 GHz/ Stop 16 GHz

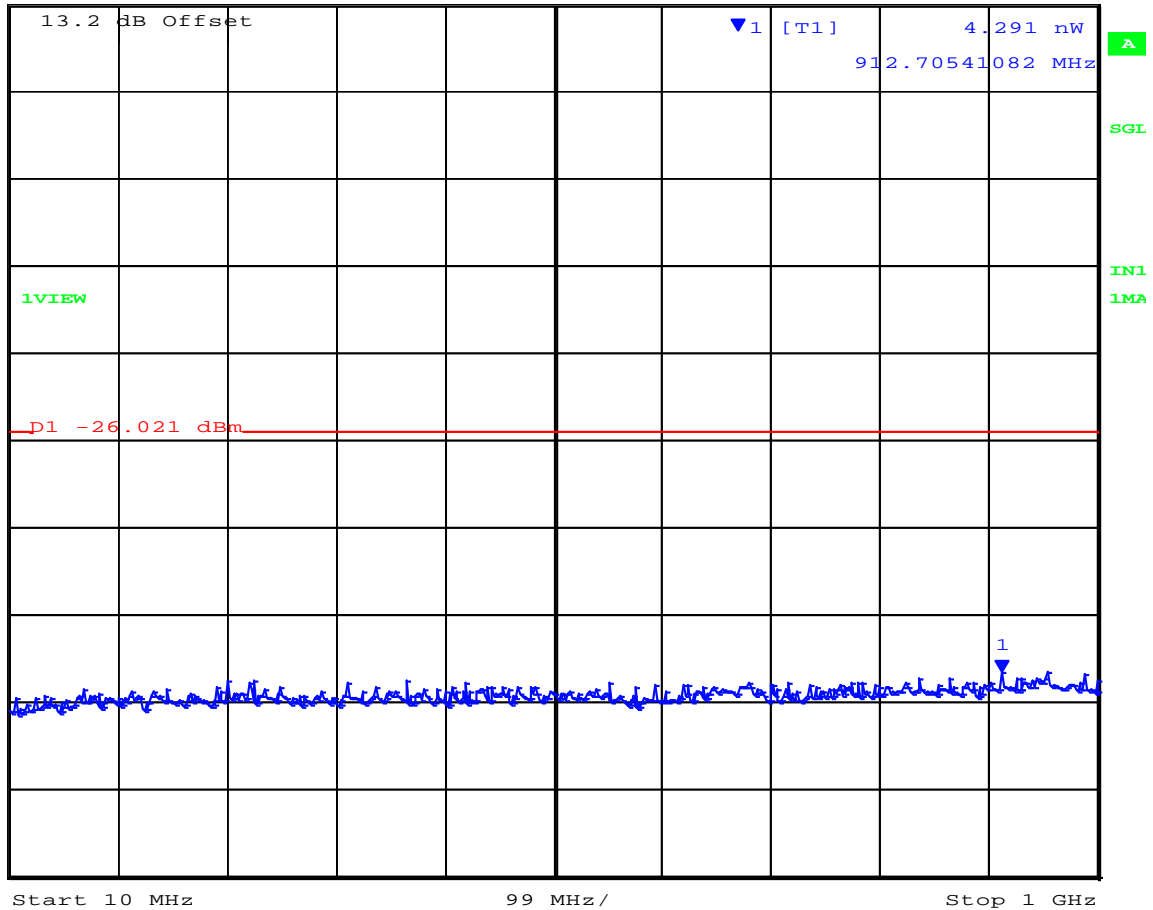
Date: 19.DEC.2010 12:28:39

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### Channel 2,405 MHz Transmitter Spurious Emissions 10.00 – 1000.00 MHz +2.2 Vdc

Marker 1 [T1] RBW 100 kHz RF Att 20 dB  
Ref Lvl 4.291 nW VBW 100 kHz  
199.5 mW 912.70541082 MHz SWT 10 s Unit W



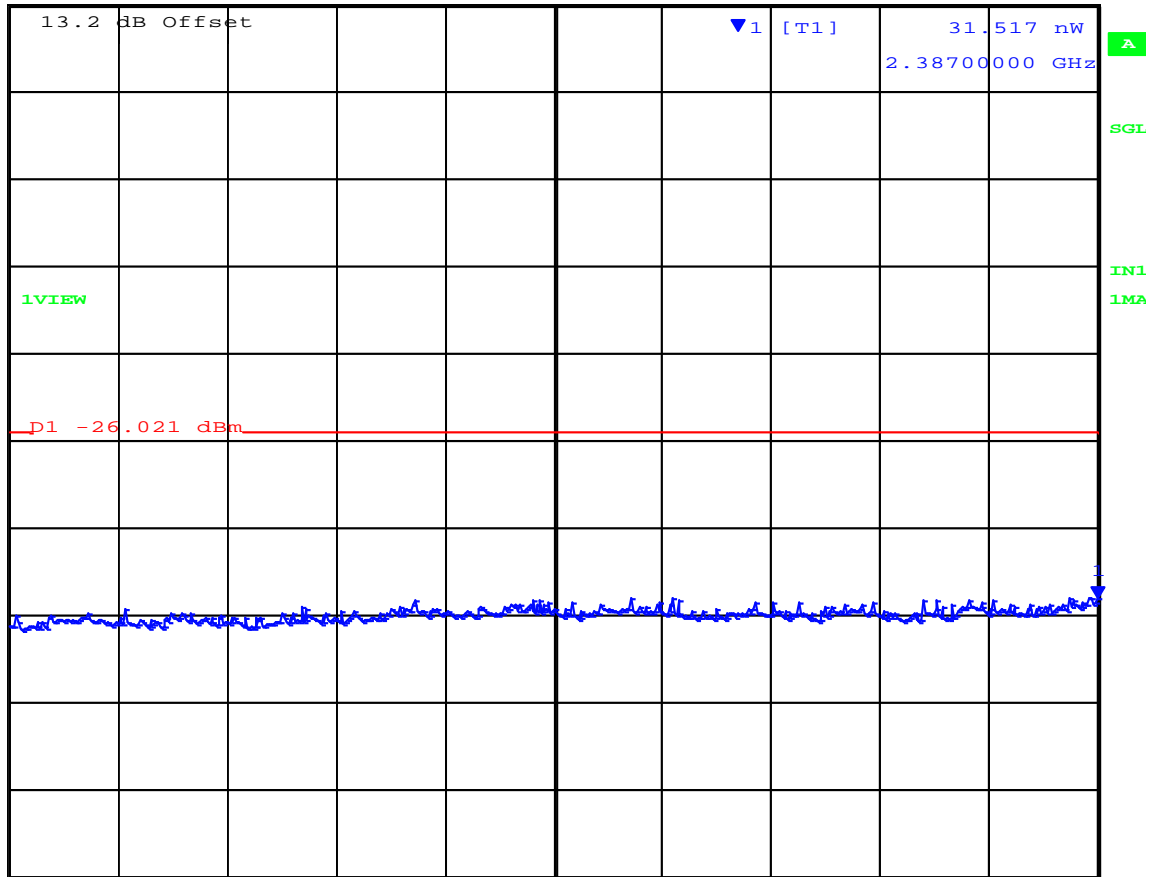
Date: 19.DEC.2010 12:30:24

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### Channel 2,405 MHz Transmitter Spurious Emissions 1000.00 – 2387.00 MHz +2.2 Vdc

Marker 1 [T1] RBW 1 MHz RF Att 20 dB  
Ref Lvl 31.517 nW VBW 1 MHz  
199.5 mW 2.38700000 GHz SWT 10 s Unit W



Start 1 GHz 138.7 MHz/ Stop 2.387 GHz

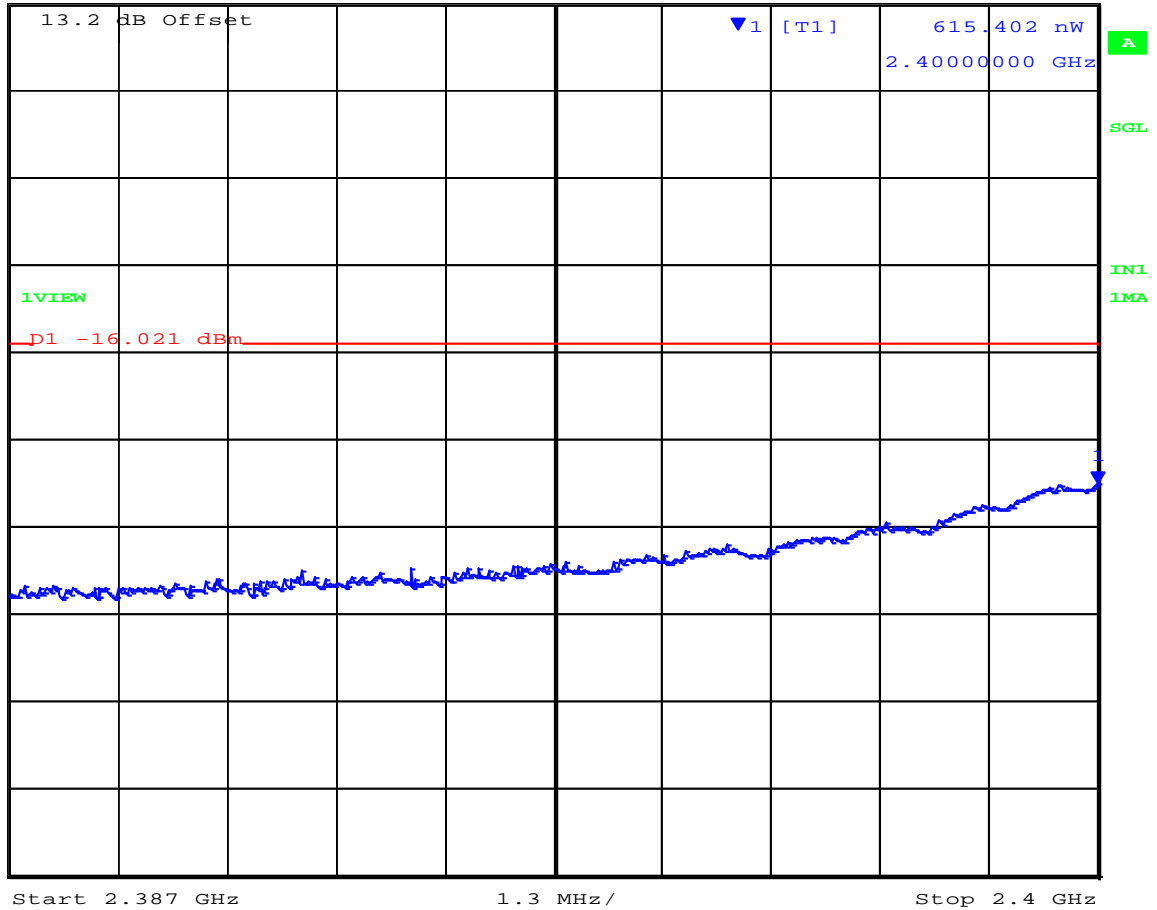
Date: 19.DEC.2010 12:31:23

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Channel 2,405 MHz Transmitter Spurious Emissions  
2387.00 – 2,400.00 MHz +2.2 Vdc

Marker 1 [T1] RBW 1 MHz RF Att 20 dB  
Ref Lvl 615.402 nW VBW 1 MHz  
199.5 mW 2.4000000 GHz SWT 10 s Unit W



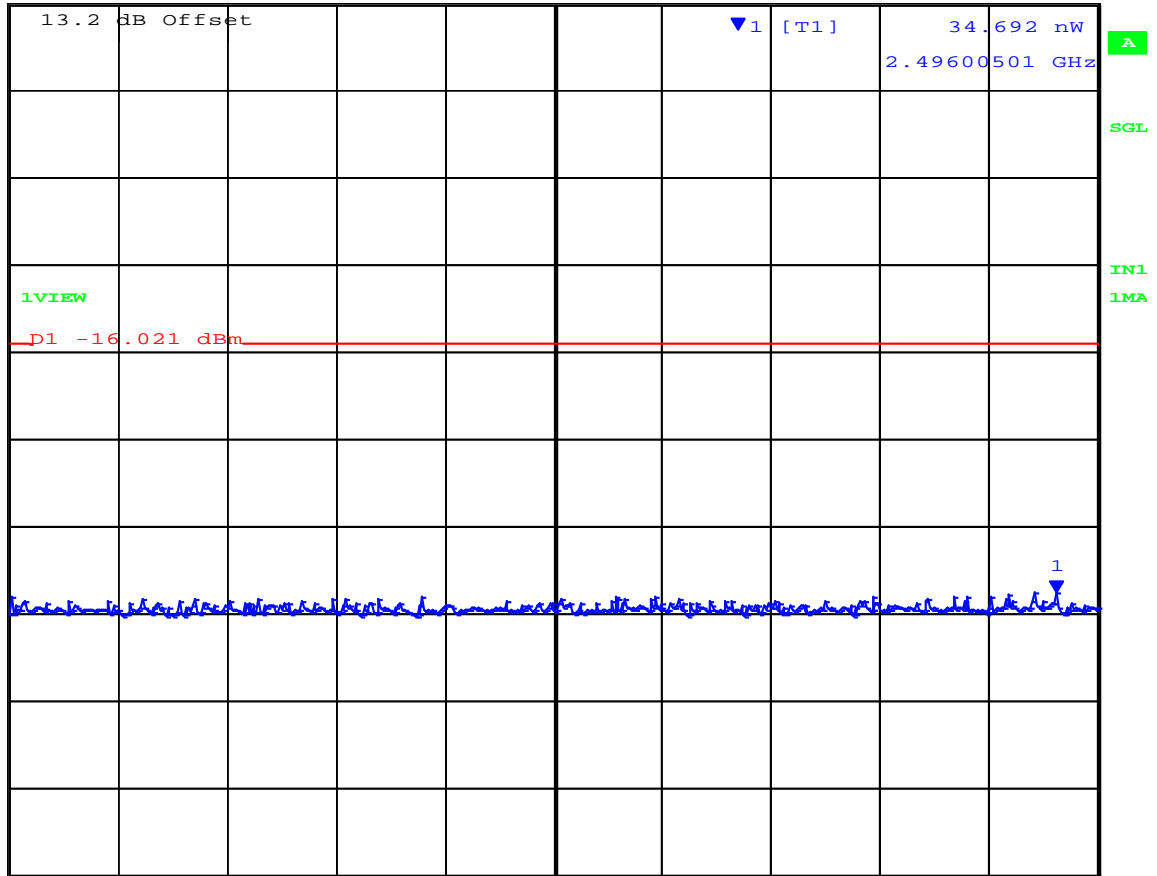
Date: 19.DEC.2010 12:32:15

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Channel 2,405 MHz Transmitter Spurious Emissions  
2,483.50 – 2496.50 MHz +2.2 Vdc

Marker 1 [T1] RBW 1 MHz RF Att 20 dB  
Ref Lvl 34.692 nW VBW 1 MHz  
199.5 mW 2.49600501 GHz SWT 10 s Unit W



Start 2.4835 GHz 1.3 MHz/ Stop 2.4965 GHz

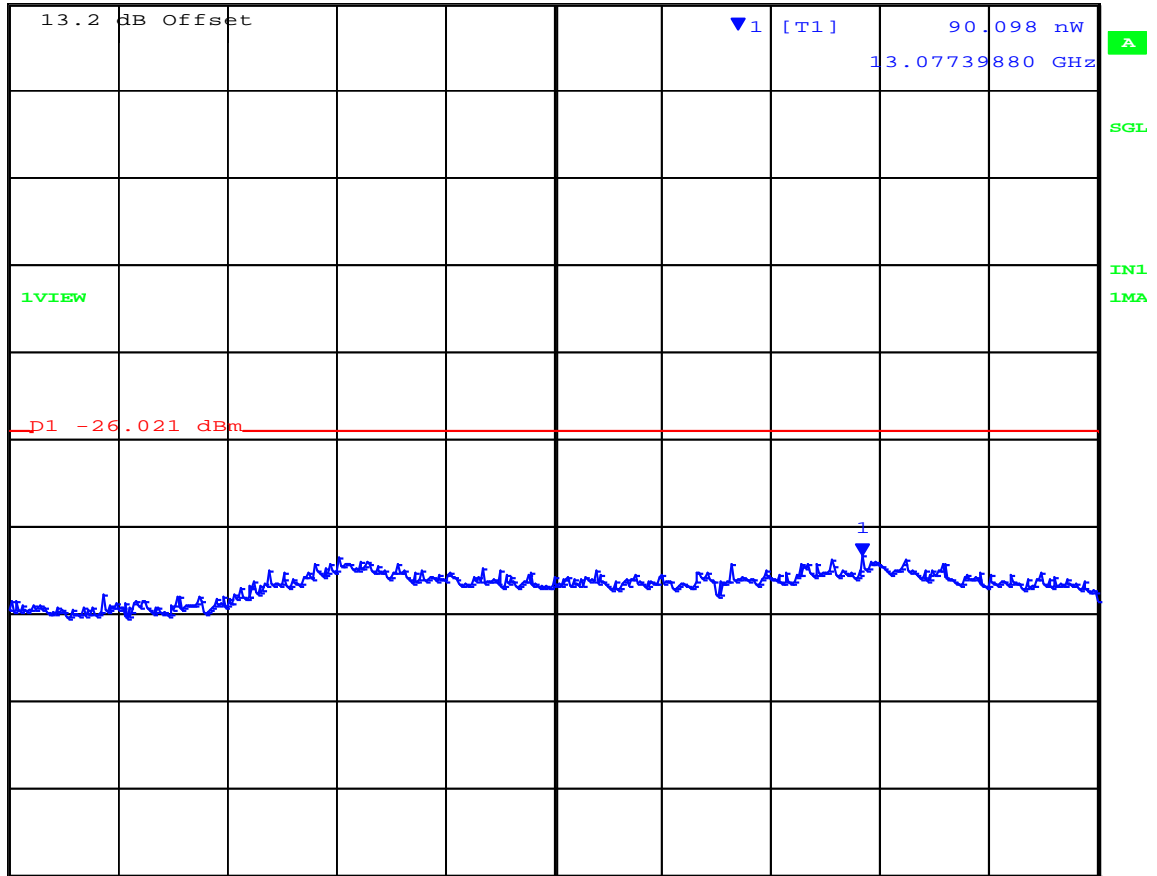
Date: 19.DEC.2010 12:33:08

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Channel 2,405 MHz Transmitter Spurious Emissions  
2496.50 – 16,000.00 MHz +2.2 Vdc

Marker 1 [T1] RBW 1 MHz RF Att 20 dB  
Ref Lvl 90.098 nW VBW 1 MHz  
199.5 mW 13.07739880 GHz SWT 10 s Unit W



Start 2.4965 GHz 1.35035 GHz/ Stop 16 GHz

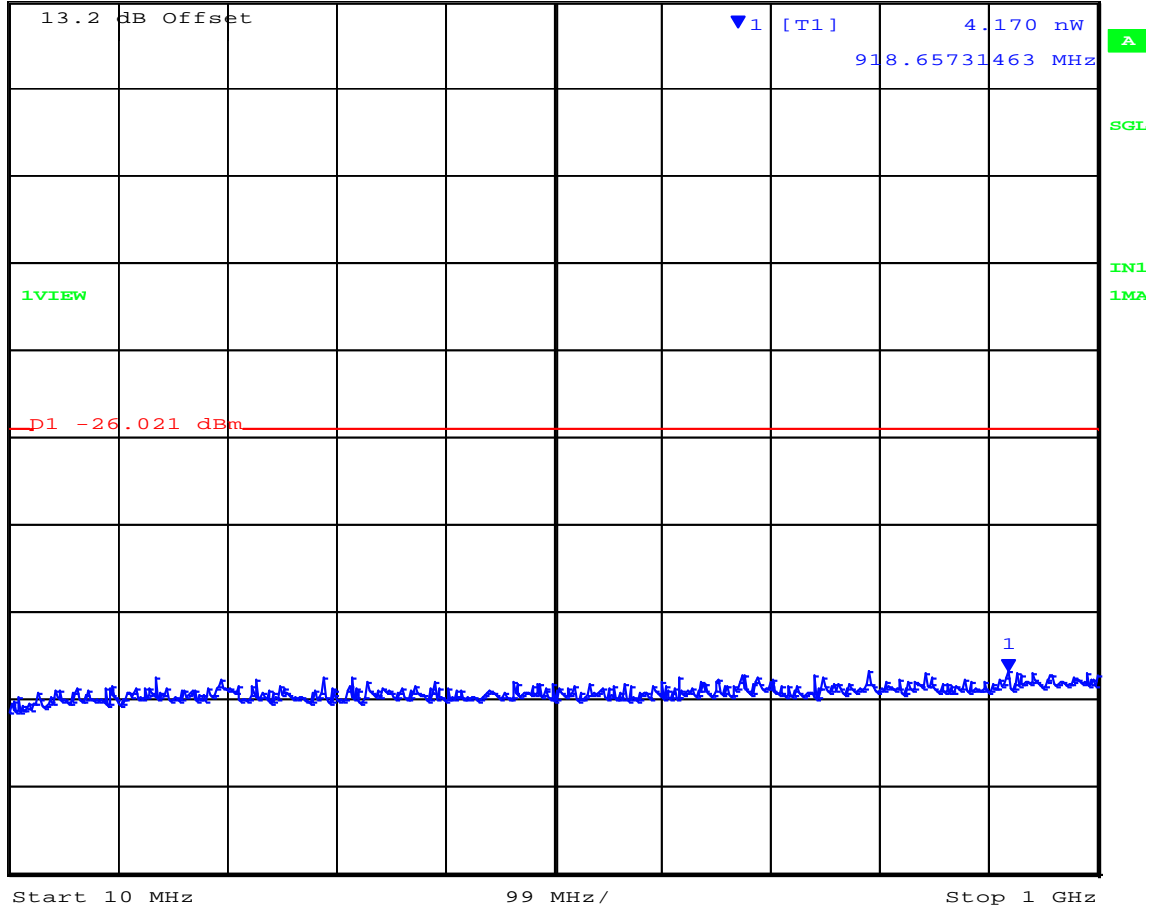
Date: 19.DEC.2010 12:34:01

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### Channel 2,405 MHz Transmitter Spurious Emissions 10.00 – 1000.00 MHz +3.6 Vdc

Marker 1 [T1] RBW 100 kHz RF Att 20 dB  
Ref Lvl 4.170 nW VBW 100 kHz  
199.5 mW 918.65731463 MHz SWT 10 s Unit W



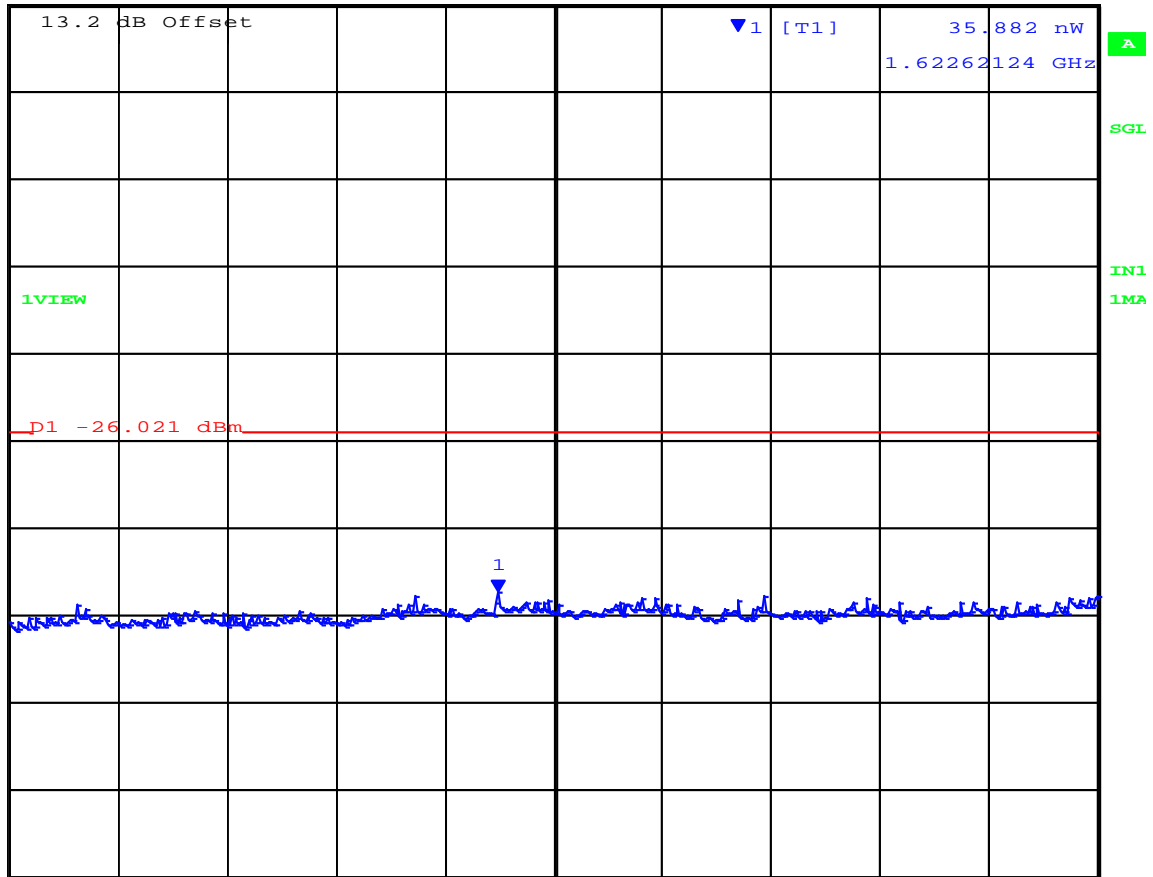
Date: 19.DEC.2010 12:35:43

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Channel 2,405 MHz Transmitter Spurious Emissions  
1000.00 – 2387.00 MHz +3.6 Vdc

Marker 1 [T1] RBW 1 MHz RF Att 20 dB  
Ref Lvl 35.882 nW VBW 1 MHz  
199.5 mW 1.62262124 GHz SWT 10 s Unit W



Start 1 GHz 138.7 MHz/ Stop 2.387 GHz

Date: 19.DEC.2010 12:36:42

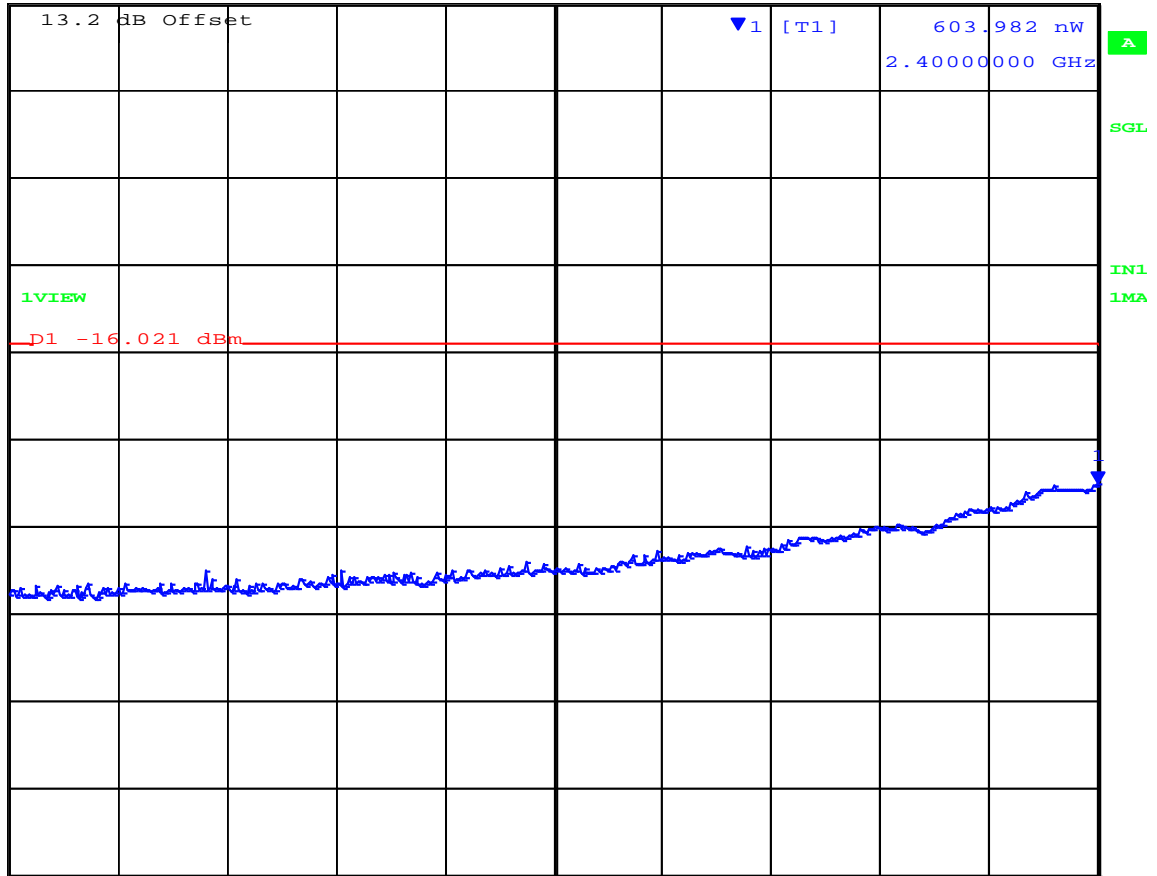
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Channel 2,405 MHz Transmitter Spurious Emissions  
2387.00 – 2,400.00 MHz +3.6 Vdc

Marker 1 [T1] RBW 1 MHz RF Att 20 dB  
Ref Lvl 603.982 nW VBW 1 MHz  
199.5 mW 2.4000000 GHz SWT 10 s Unit W



Start 2.387 GHz 1.3 MHz/ Stop 2.4 GHz

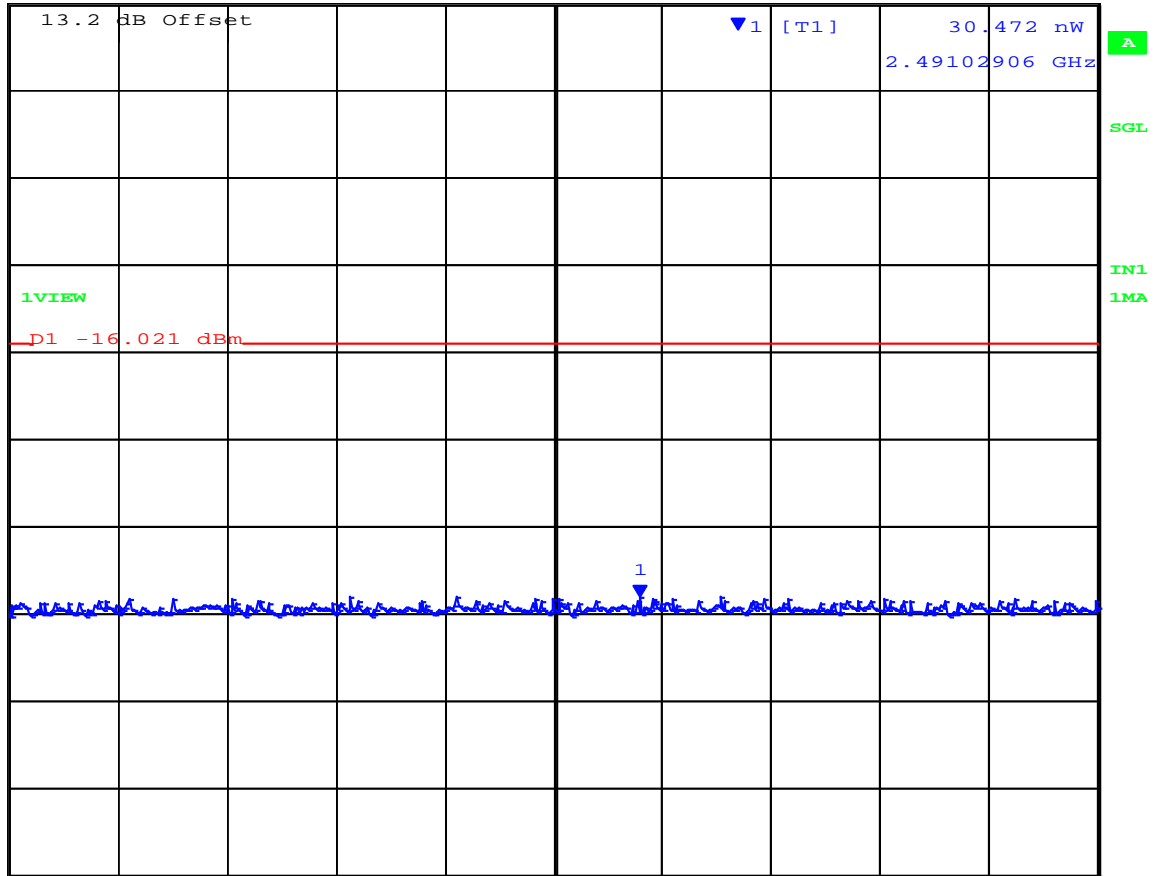
Date: 19.DEC.2010 12:26:53

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Channel 2,405 MHz Transmitter Spurious Emissions  
2,483.50 – 2496.50 MHz +3.6 Vdc

Marker 1 [T1] RBW 1 MHz RF Att 20 dB  
Ref Lvl 30.472 nW VBW 1 MHz  
199.5 mW 2.49102906 GHz SWT 10 s Unit W



Start 2.4835 GHz 1.3 MHz/ Stop 2.4965 GHz

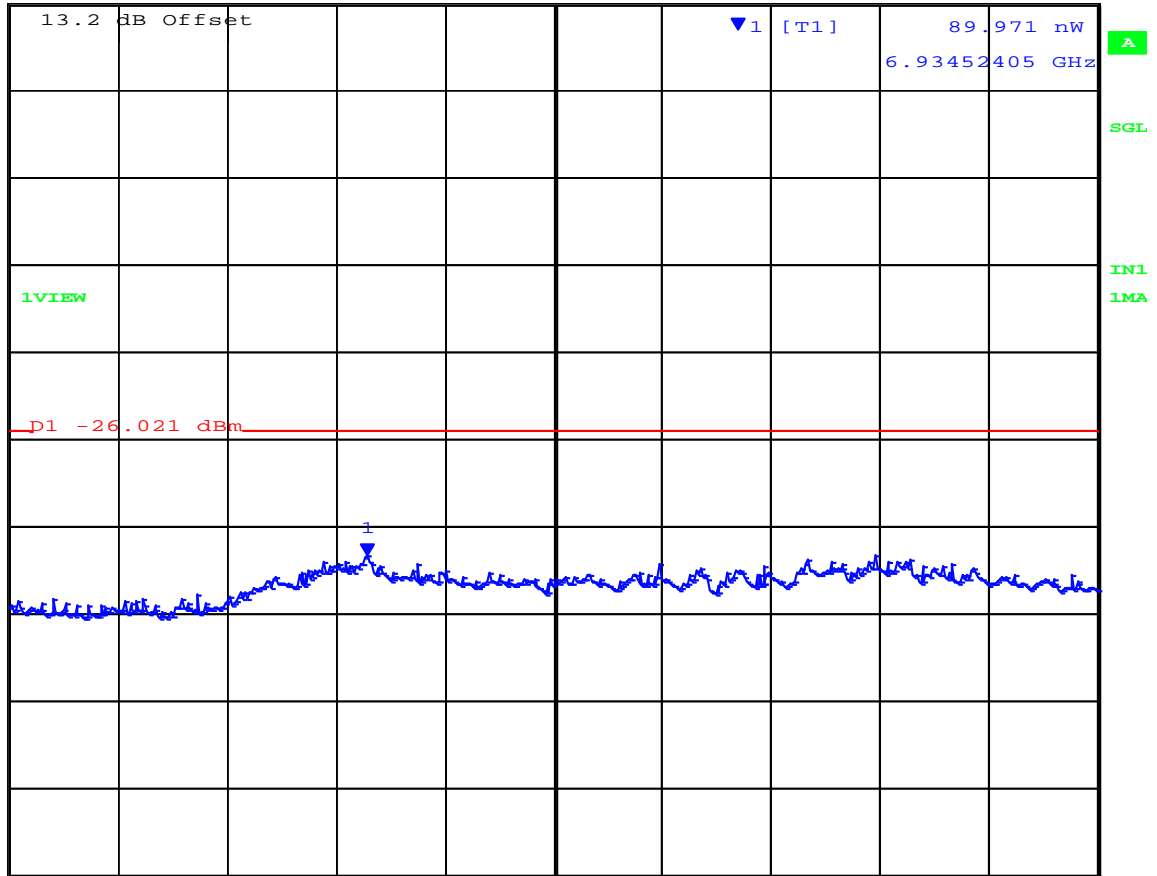
Date: 19.DEC.2010 12:38:27

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### Channel 2,405 MHz Transmitter Spurious Emissions 2496.50 – 16,000.00 MHz +3.6 Vdc

Marker 1 [T1] RBW 1 MHz RF Att 20 dB  
Ref Lvl 89.971 nW VBW 1 MHz  
199.5 mW 6.93452405 GHz SWT 10 s Unit W



Start 2.4965 GHz 1.35035 GHz/ Stop 16 GHz

Date: 19.DEC.2010 12:39:20

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TABLE OF RESULTS - Channel 2,440 MHz

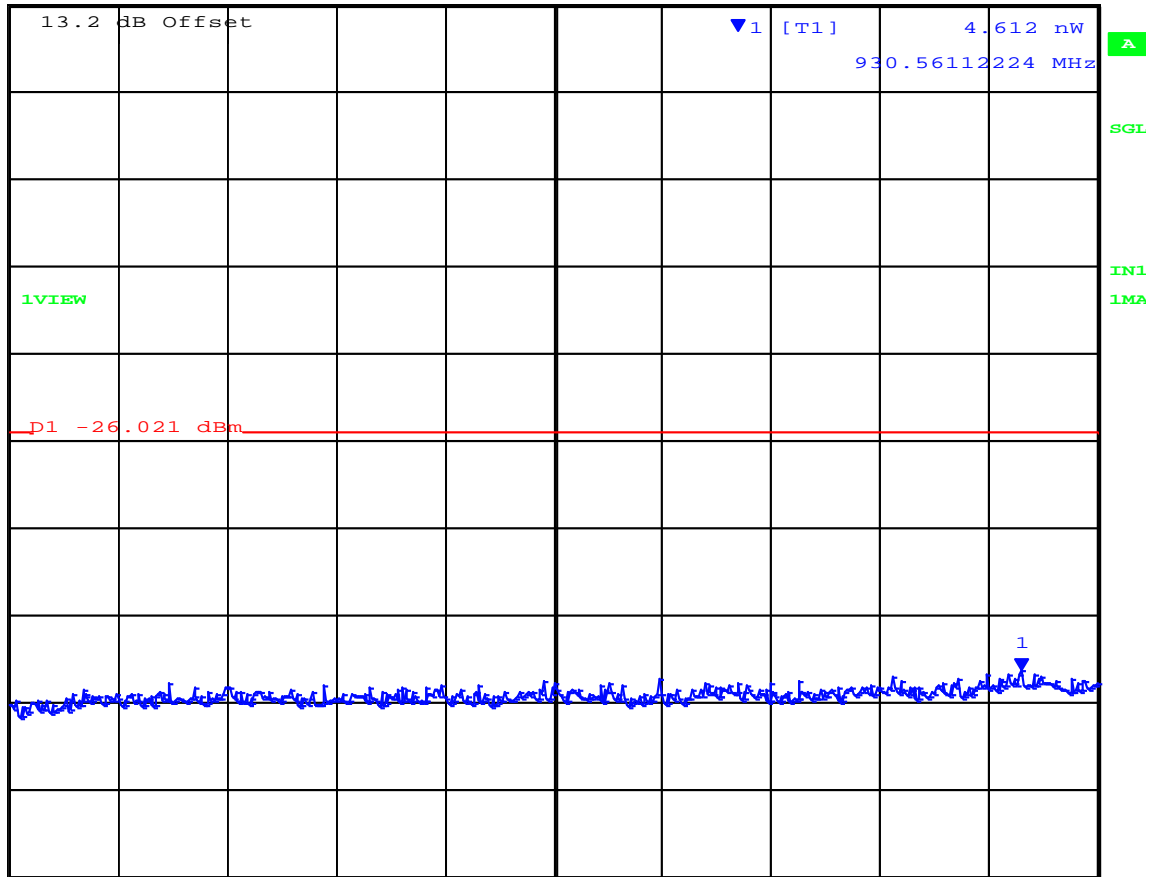
Voltage	Start Frequency (MHz)	Stop Frequency (MHz)	Highest Emission ( $\mu\text{W}/\text{MHz}$ )	Limit ( $\mu\text{W}/\text{MHz}$ )	Margin (dB)
+3.3 Vdc	10.00	1,000.00	0.0046	2.5	-27.34
	1,000.00	2,387.00	0.0353	2.5	-18.50
	2,387.00	2,400.00	0.0380	25	-28.18
	2,483.50	2,496.50	0.0324	25	-28.88
	2,496.50	16,000.00	0.0924	2.5	-14.32
+2.2 Vdc	10.00	1,000.00	0.0048	2.5	-27.21
	1,000.00	2,387.00	0.0340	2.5	-18.66
	2,387.00	2,400.00	0.0429	25	-27.66
	2,483.50	2,496.50	0.0363	25	-28.38
	2,496.50	16,000.00	0.0858	2.5	-14.65
+3.6 Vdc	10.00	1,000.00	0.0046	2.5	-27.35
	1,000.00	2,387.00	0.0387	2.5	-18.11
	2,387.00	2,400.00	0.0403	25	-27.92
	2,483.50	2,496.50	0.0401	25	-27.95
	2,496.50	16,000.00	0.0958	2.5	-14.17

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### Channel 2,440 MHz Transmitter Spurious Emissions 10.00 – 1000.00 MHz +3.3 Vdc

Marker 1 [T1] RBW 100 kHz RF Att 20 dB  
Ref Lvl 4.612 nW VBW 100 kHz  
199.5 mW 930.56112224 MHz SWT 10 s Unit W



Start 10 MHz 99 MHz/ Stop 1 GHz

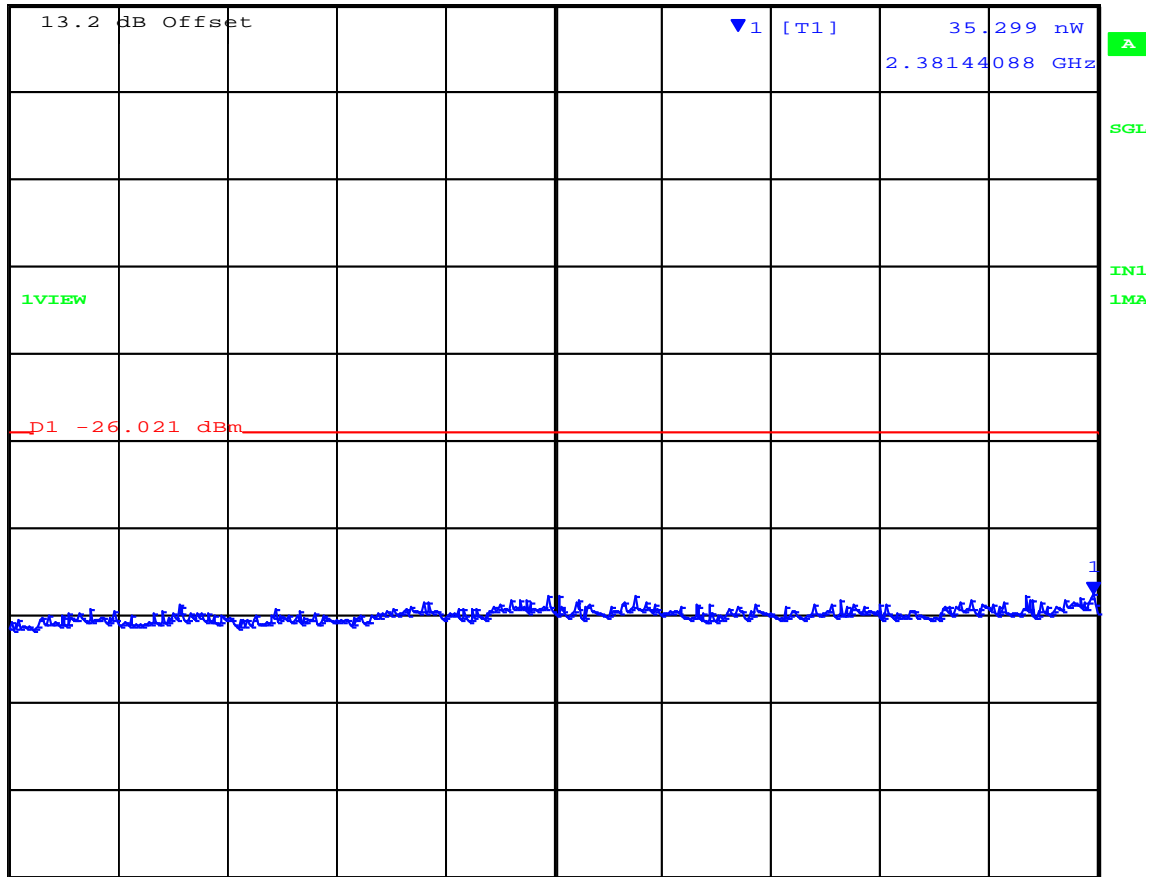
Date: 19.DEC.2010 13:25:26

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### Channel 2,440 MHz Transmitter Spurious Emissions 1000.00 – 2387.00 MHz +3.3 Vdc

Marker 1 [T1] RBW 1 MHz RF Att 20 dB  
Ref Lvl 35.299 nW VBW 1 MHz  
199.5 mW 2.38144088 GHz SWT 10 s Unit W



Start 1 GHz 138.7 MHz/ Stop 2.387 GHz

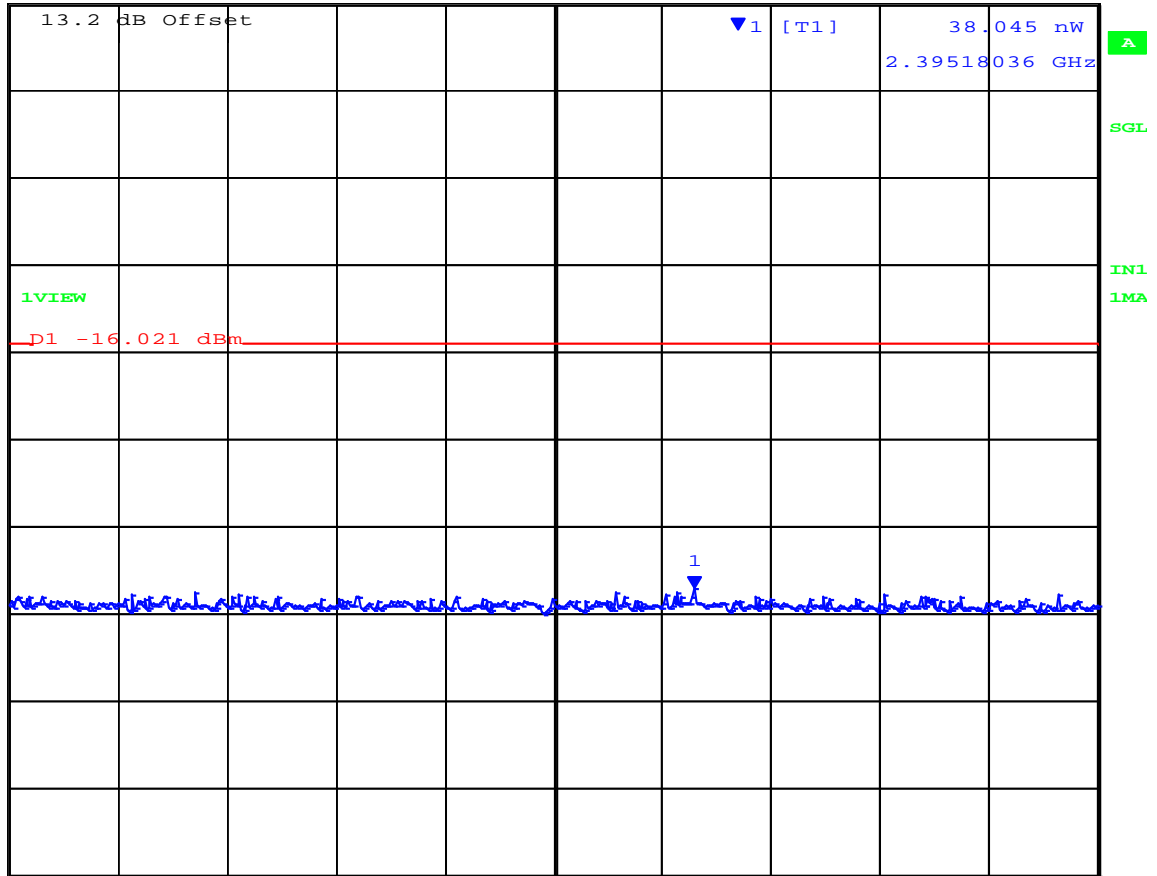
Date: 19.DEC.2010 13:26:25

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Channel 2,440 MHz Transmitter Spurious Emissions  
2387.00 – 2,400.00 MHz +3.3 Vdc

Marker 1 [T1] RBW 1 MHz RF Att 20 dB  
Ref Lvl 38.045 nW VBW 1 MHz  
199.5 mW 2.39518036 GHz SWT 10 s Unit W



Start 2.387 GHz 1.3 MHz/ Stop 2.4 GHz

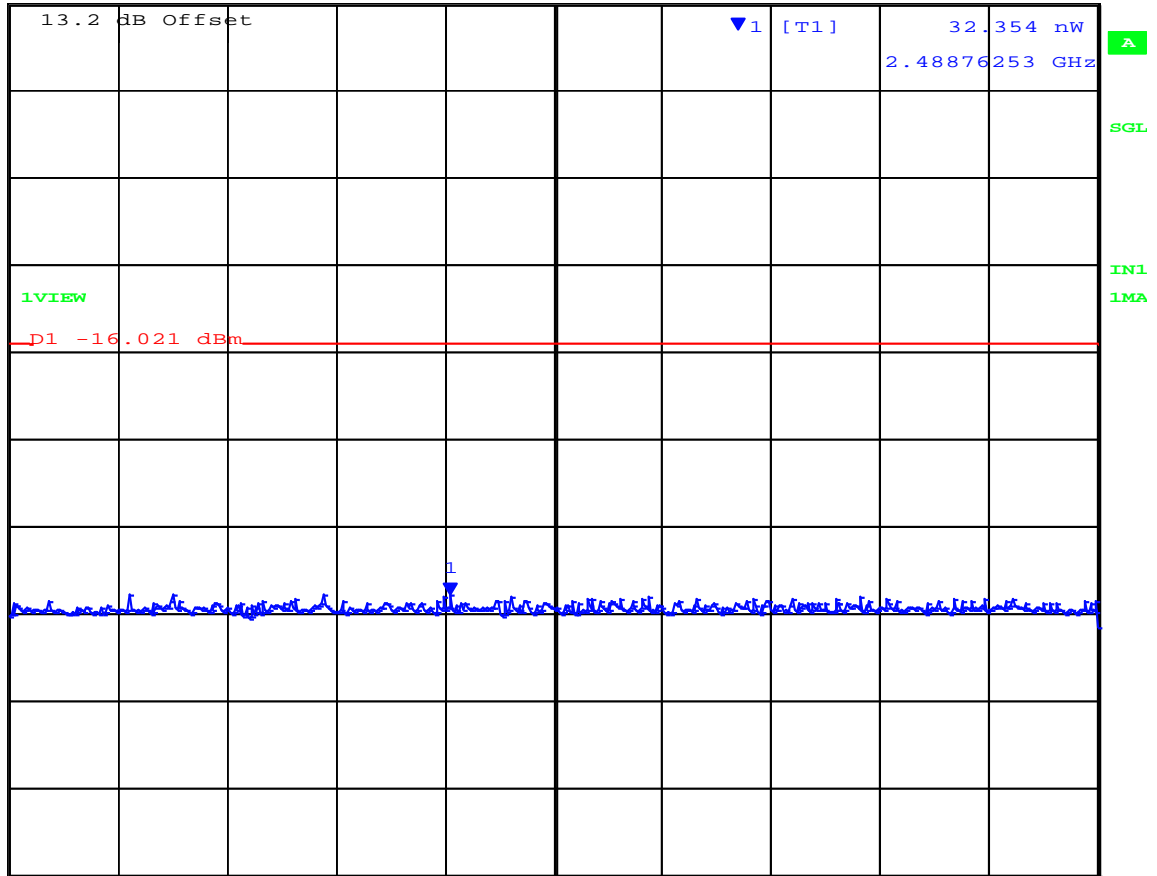
Date: 19.DEC.2010 13:27:18

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Channel 2,440 MHz Transmitter Spurious Emissions  
2,483.50 – 2496.50 MHz +3.3 Vdc

Marker 1 [T1] RBW 1 MHz RF Att 20 dB  
Ref Lvl 32.354 nW VBW 1 MHz  
199.5 mW 2.48876253 GHz SWT 10 s Unit W



Start 2.4835 GHz 1.3 MHz/ Stop 2.4965 GHz

Date: 19.DEC.2010 13:28:11

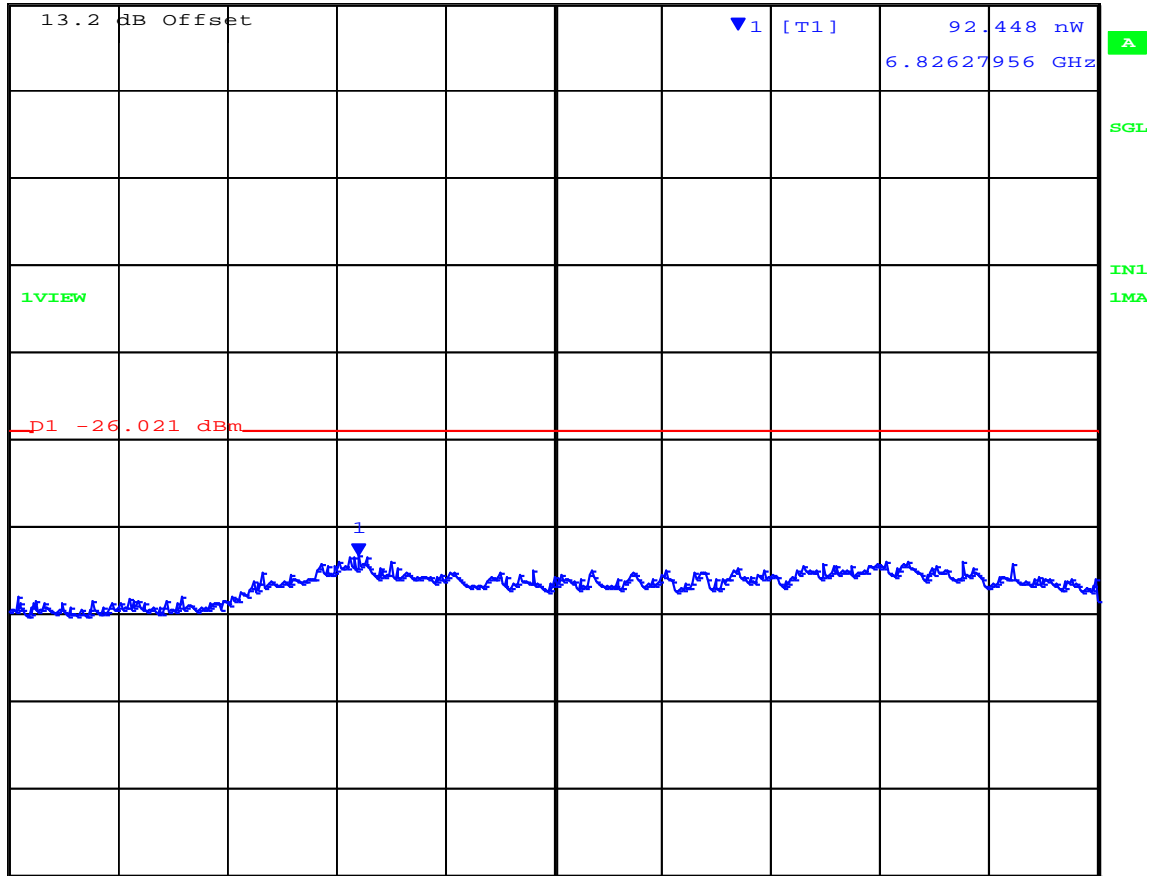
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### Channel 2,440 MHz Transmitter Spurious Emissions 2496.50 – 16,000.00 MHz +3.3 Vdc

Marker 1 [T1] RBW 1 MHz RF Att 20 dB  
Ref Lvl 92.448 nW VBW 1 MHz  
199.5 mW 6.82627956 GHz SWT 10 s Unit W



Start 2.4965 GHz 1.35035 GHz/ Stop 16 GHz

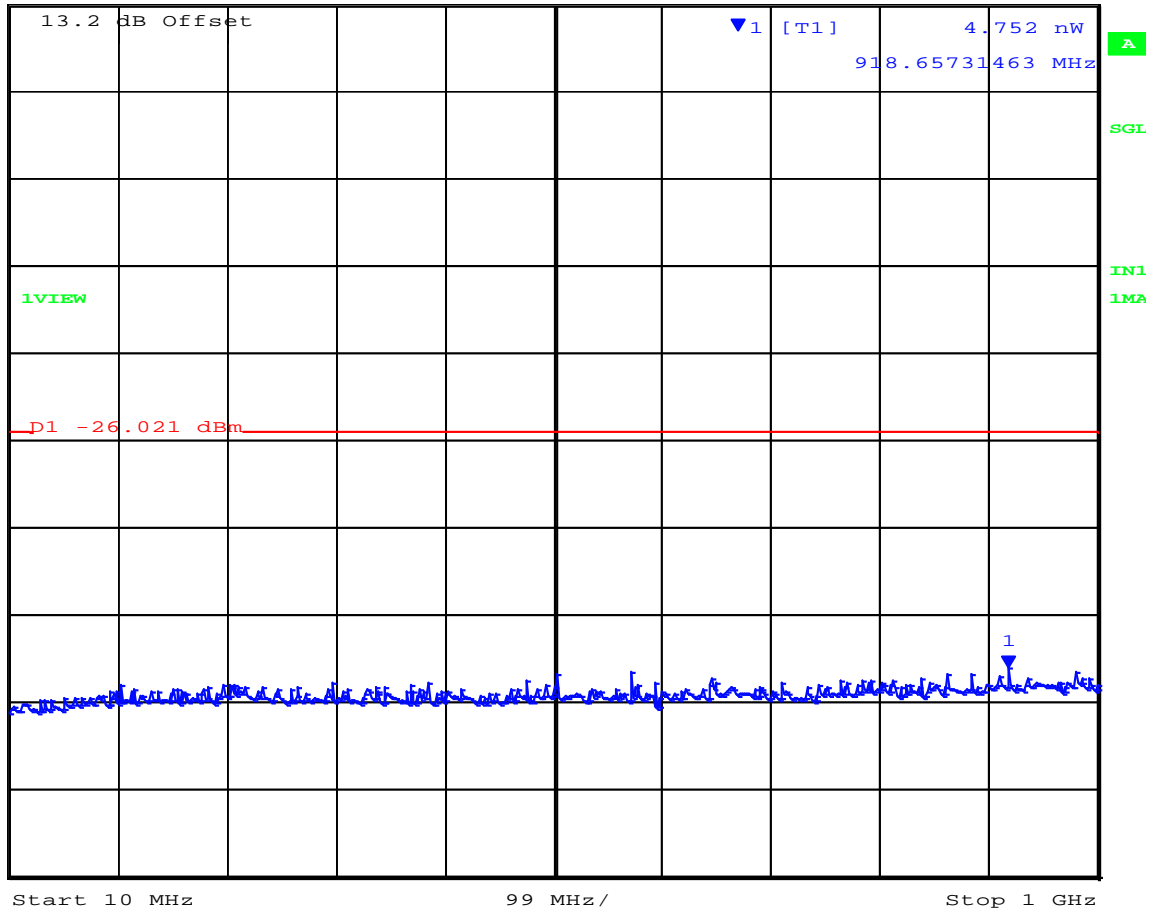
Date: 19.DEC.2010 13:29:04

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### Channel 2,440 MHz Transmitter Spurious Emissions 10.00 – 1000.00 MHz +2.2 Vdc

Marker 1 [T1] RBW 100 kHz RF Att 20 dB  
Ref Lvl 4.752 nW VBW 100 kHz  
199.5 mW 918.65731463 MHz SWT 10 s Unit W



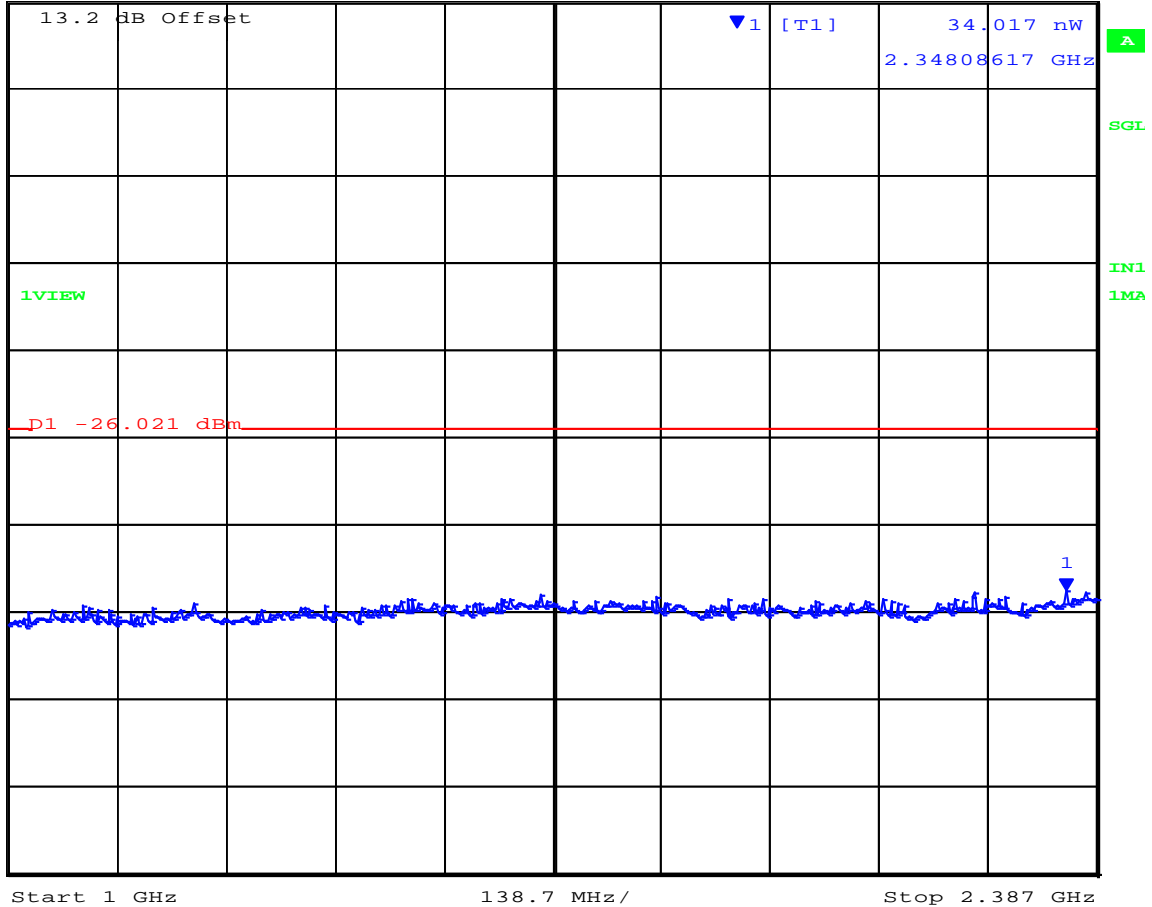
Date: 19.DEC.2010 13:30:48

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Channel 2,440 MHz Transmitter Spurious Emissions  
1000.00 – 2387.00 MHz +2.2 Vdc

Marker 1 [T1] RBW 1 MHz RF Att 20 dB  
Ref Lvl 34.017 nW VBW 1 MHz  
199.5 mW 2.34808617 GHz SWT 10 s Unit W



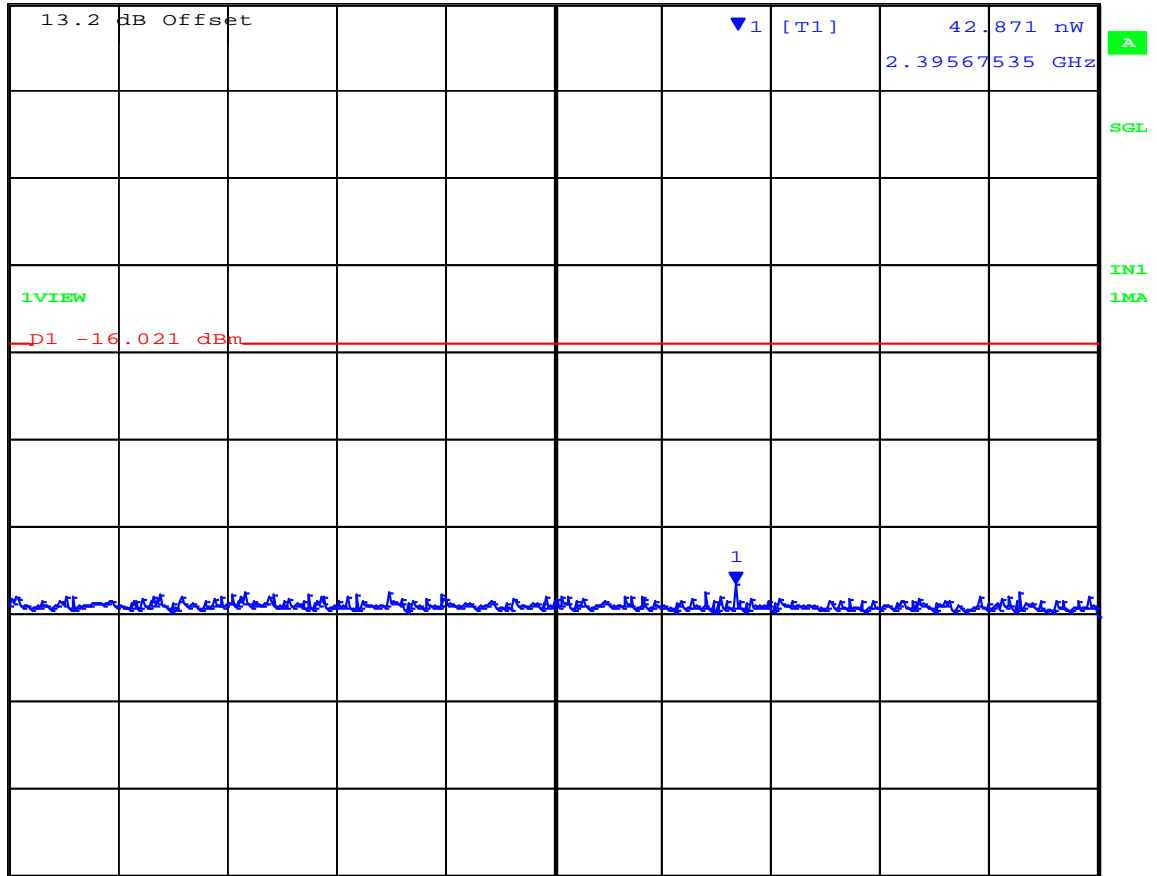
Date: 19.DEC.2010 13:31:47

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Channel 2,440 MHz Transmitter Spurious Emissions  
2387.00 – 2,400.00 MHz +2.2 Vdc

Marker 1 [T1] RBW 1 MHz RF Att 20 dB  
Ref Lvl 42.871 nW VBW 1 MHz  
199.5 mW 2.39567535 GHz SWT 10 s Unit W



Start 2.387 GHz 1.3 MHz/ Stop 2.4 GHz

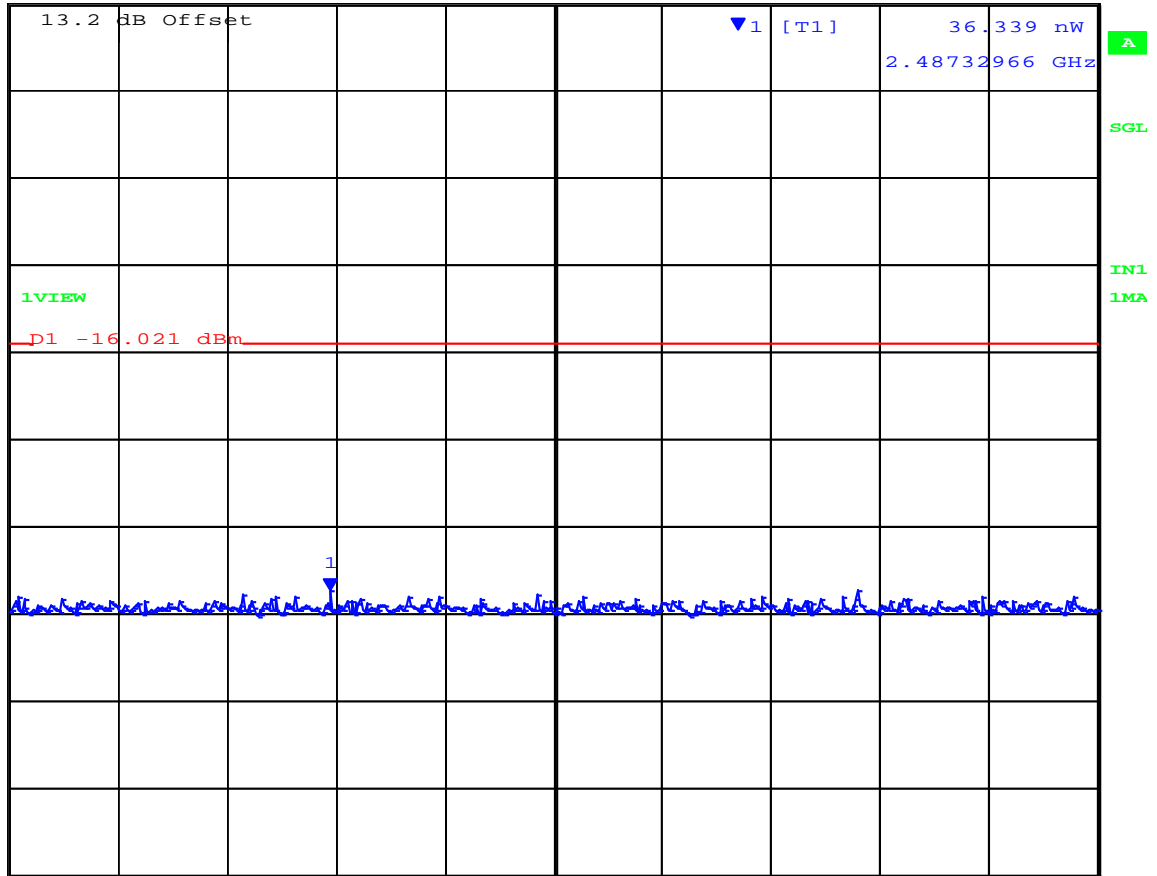
Date: 19.DEC.2010 13:32:40

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Channel 2,440 MHz Transmitter Spurious Emissions  
2,483.50 – 2496.50 MHz +2.2 Vdc

Marker 1 [T1] RBW 1 MHz RF Att 20 dB  
Ref Lvl 36.339 nW VBW 1 MHz  
199.5 mW 2.48732966 GHz SWT 10 s Unit W



Start 2.4835 GHz 1.3 MHz/ Stop 2.4965 GHz

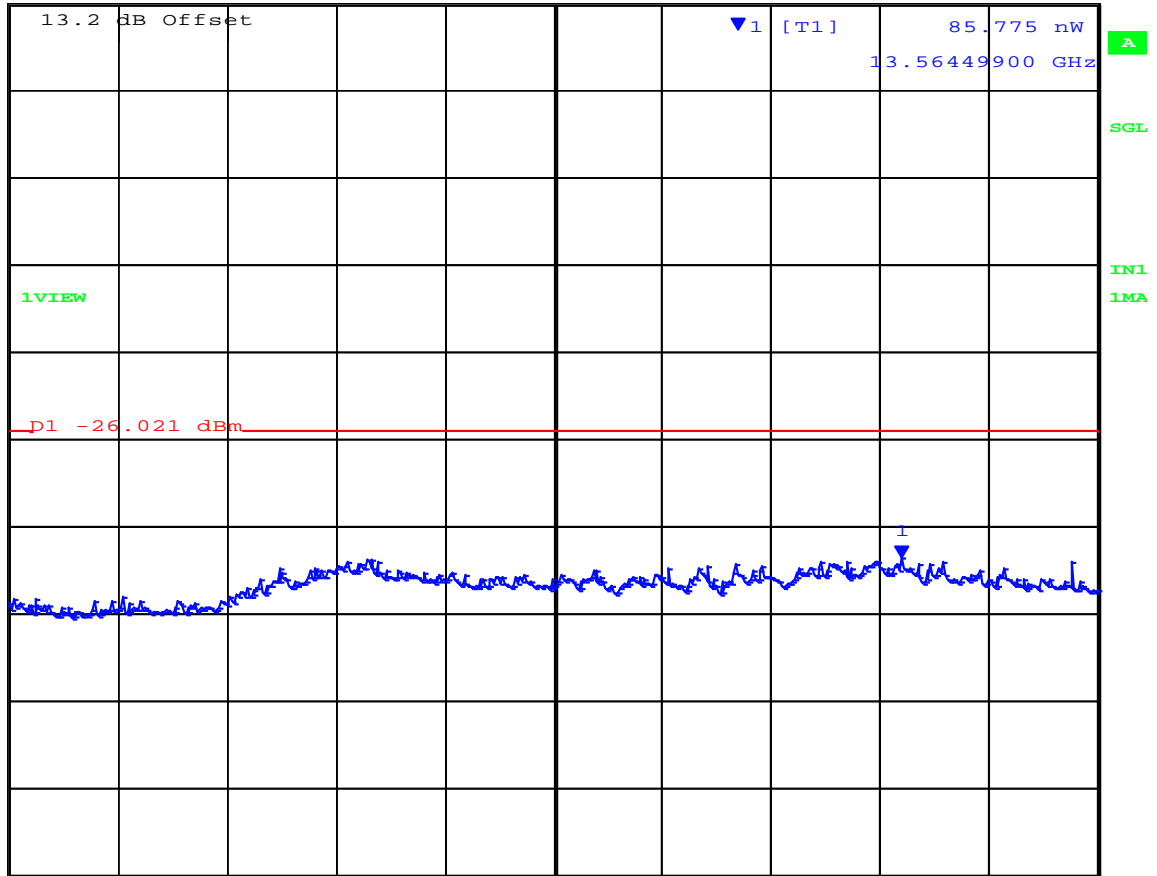
Date: 19.DEC.2010 13:33:32

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Channel 2,440 MHz Transmitter Spurious Emissions  
2496.50 – 16,000.00 MHz +2.2 Vdc

Marker 1 [T1] RBW 1 MHz RF Att 20 dB  
Ref Lvl 85.775 nW VBW 1 MHz  
199.5 mW 13.56449900 GHz SWT 10 s Unit W



Start 2.4965 GHz 1.35035 GHz/ Stop 16 GHz

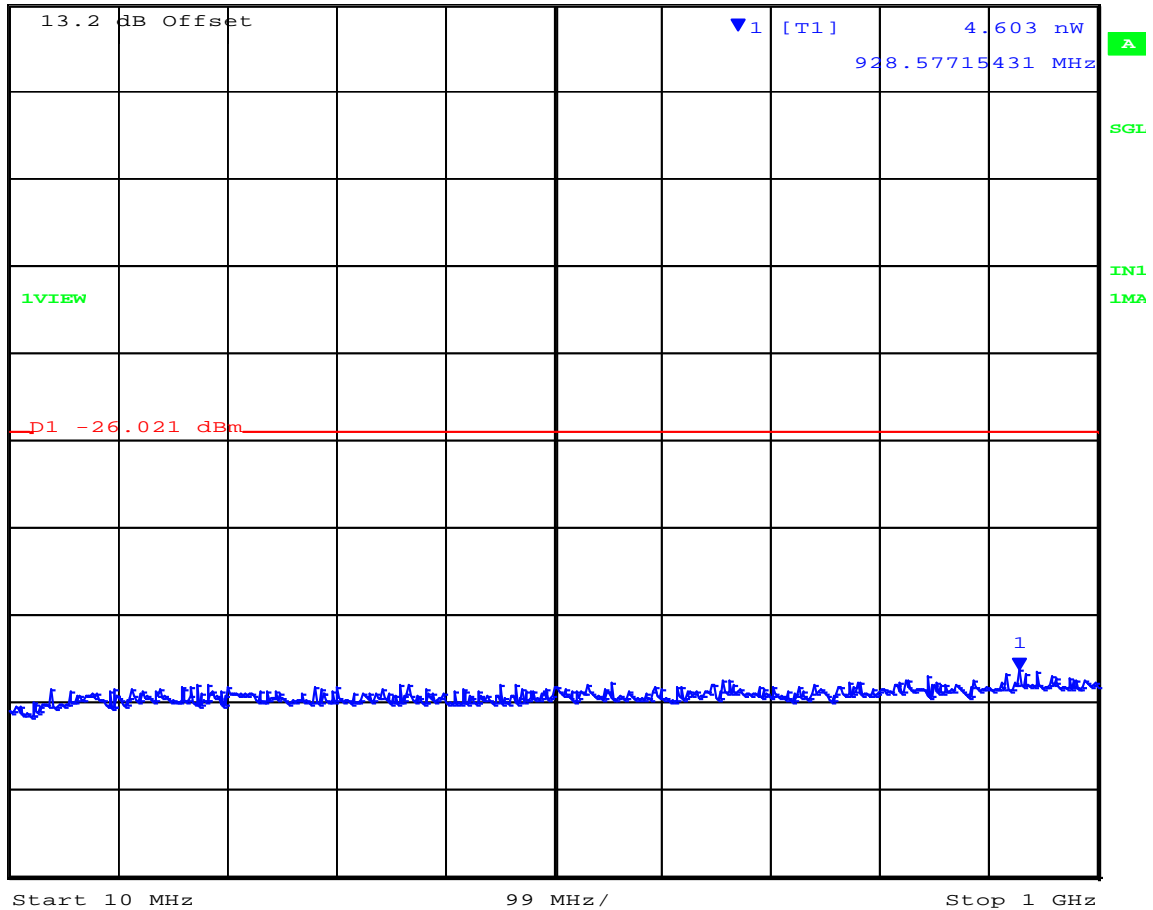
Date: 19.DEC.2010 13:34:25

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### Channel 2,440 MHz Transmitter Spurious Emissions 10.00 – 1000.00 MHz +3.6 Vdc

Marker 1 [T1] RBW 100 kHz RF Att 20 dB  
Ref Lvl 4.603 nW VBW 100 kHz  
199.5 mW 928.57715431 MHz SWT 10 s Unit W



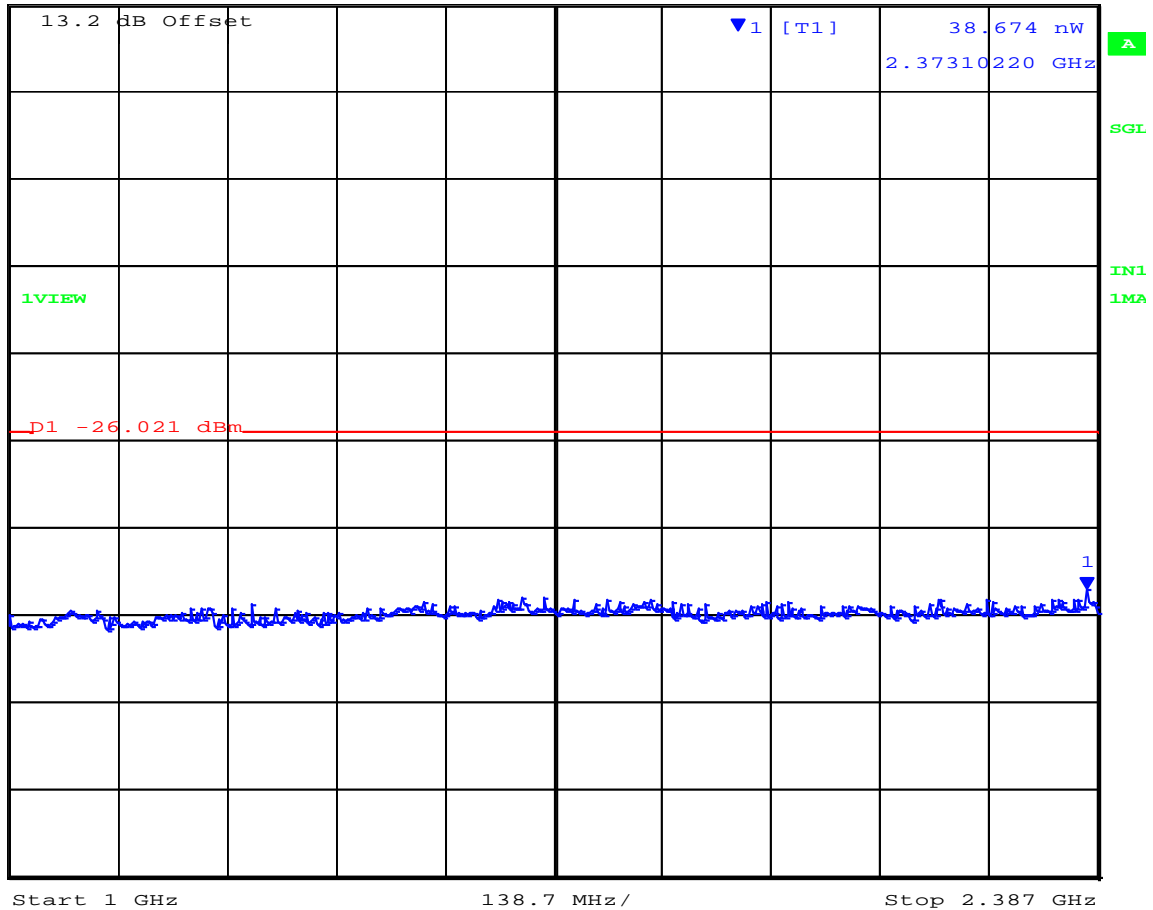
Date: 19.DEC.2010 13:36:07

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### Channel 2,440 MHz Transmitter Spurious Emissions 1000.00 – 2387.00 MHz +3.6 Vdc

Marker 1 [T1] RBW 1 MHz RF Att 20 dB  
Ref Lvl 38.674 nW VBW 1 MHz  
199.5 mW 2.37310220 GHz SWT 10 s Unit W



Date: 19.DEC.2010 13:37:06

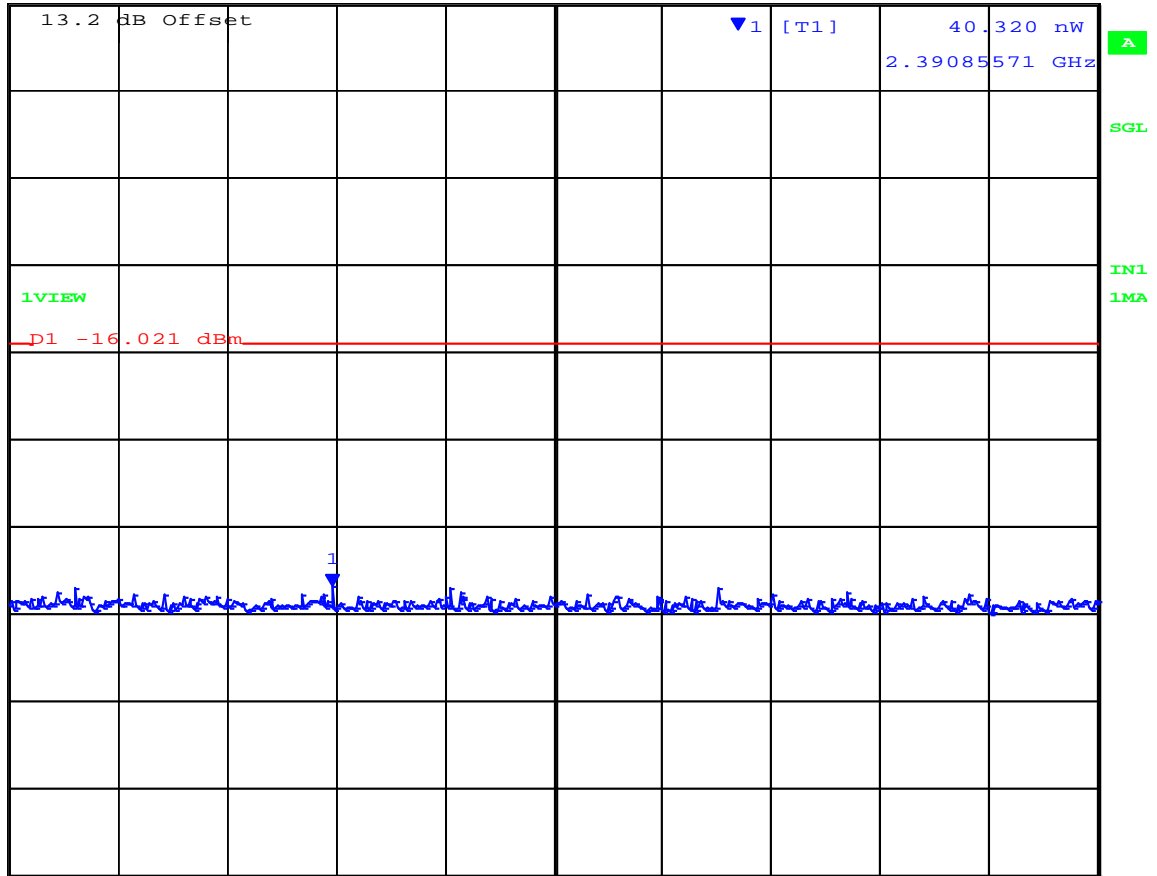
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Channel 2,440 MHz Transmitter Spurious Emissions  
2387.00 – 2,400.00 MHz +3.6 Vdc

Marker 1 [T1] RBW 1 MHz RF Att 20 dB  
Ref Lvl 40.320 nW VBW 1 MHz  
199.5 mW 2.39085571 GHz SWT 10 s Unit W



Start 2.387 GHz 1.3 MHz/ Stop 2.4 GHz

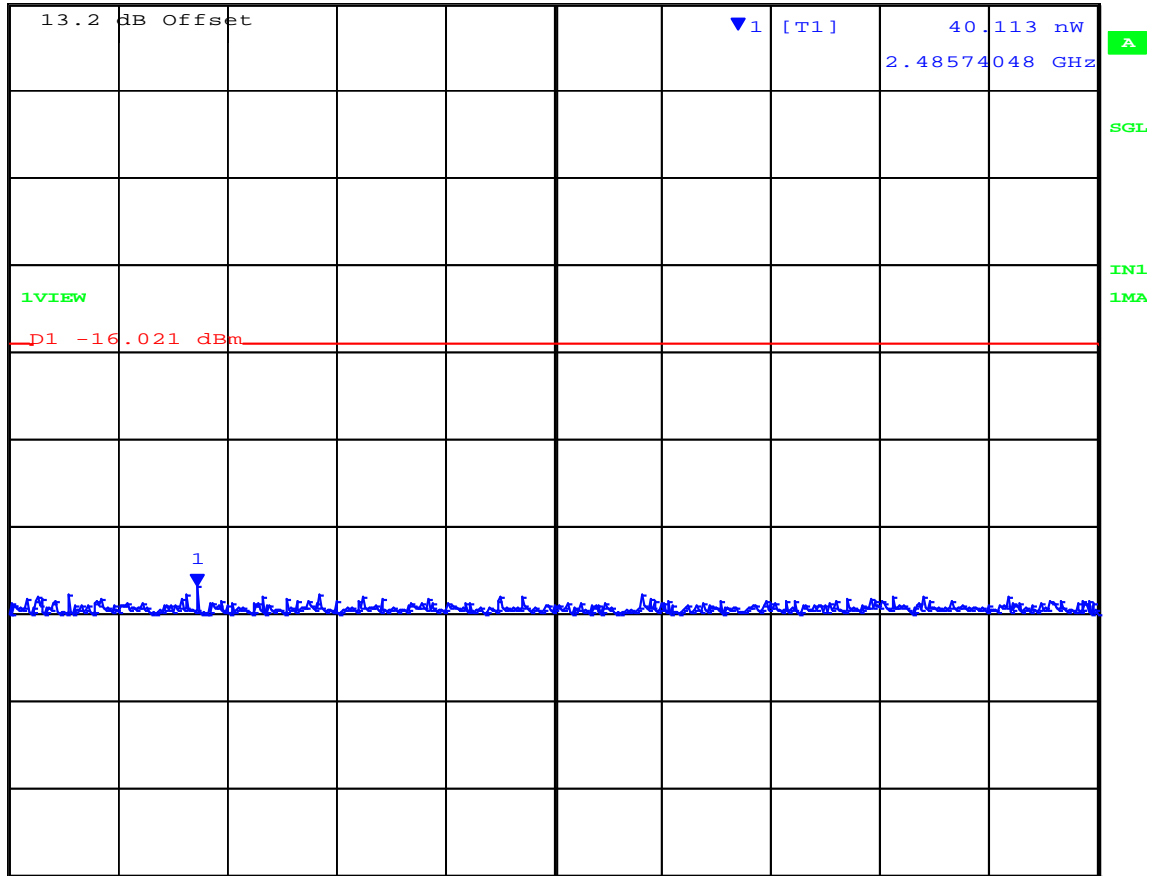
Date: 19.DEC.2010 13:37:59

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Channel 2,440 MHz Transmitter Spurious Emissions  
2,483.50 – 2496.50 MHz +3.6 Vdc

Marker 1 [T1] RBW 1 MHz RF Att 20 dB  
Ref Lvl 40.113 nW VBW 1 MHz  
199.5 mW 2.48574048 GHz SWT 10 s Unit W



Start 2.4835 GHz 1.3 MHz/ Stop 2.4965 GHz

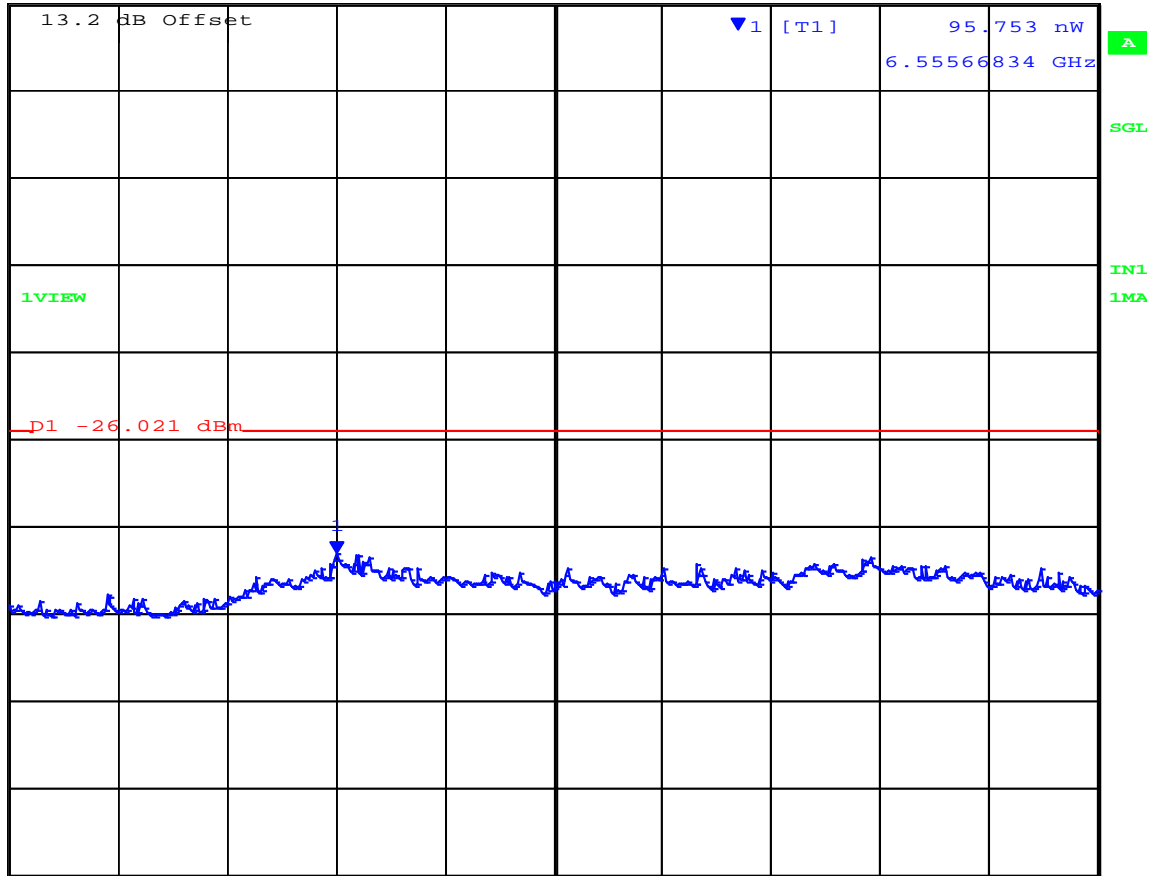
Date: 19.DEC.2010 13:38:52

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### Channel 2,440 MHz Transmitter Spurious Emissions 2496.50 – 16,000.00 MHz +3.6 Vdc

Marker 1 [T1] RBW 1 MHz RF Att 20 dB  
Ref Lvl 95.753 nW VBW 1 MHz  
199.5 mW 6.55566834 GHz SWT 10 s Unit W



Start 2.4965 GHz 1.35035 GHz/ Stop 16 GHz

Date: 19.DEC.2010 13:39:45

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TABLE OF RESULTS - Channel 2,480 MHz

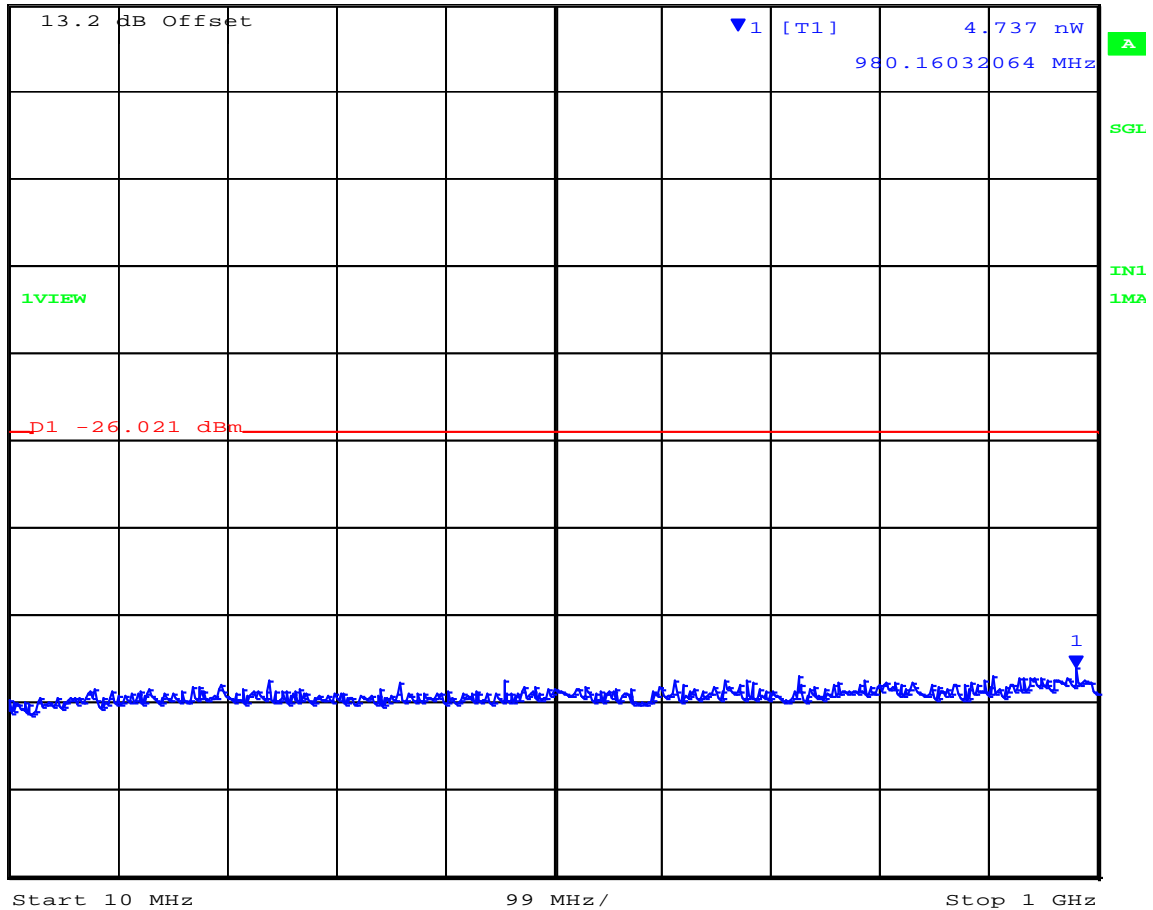
Voltage	Start Frequency (MHz)	Stop Frequency (MHz)	Highest Emission ( $\mu\text{W}/\text{MHz}$ )	Limit ( $\mu\text{W}/\text{MHz}$ )	Margin (dB)
+3.3 Vdc	10.00	1,000.00	0.0047	2.5	-27.22
	1,000.00	2,387.00	0.0374	2.5	-18.25
	2,387.00	2,400.00	0.0356	25	-28.47
	2,483.50	2,496.50	3.1120	25	-9.05
	2,496.50	16,000.00	0.0911	2.5	-14.39
+2.2 Vdc	10.00	1,000.00	0.0043	2.5	-27.61
	1,000.00	2,387.00	0.0352	2.5	-18.52
	2,387.00	2,400.00	0.0369	25	-28.31
	2,483.50	2,496.50	3.0760	25	-9.10
	2,496.50	16,000.00	0.0866	2.5	-14.60
+3.6 Vdc	10.00	1,000.00	0.0048	2.5	-27.20
	1,000.00	2,387.00	0.0353	2.5	-18.50
	2,387.00	2,400.00	0.0407	25	-27.89
	2,483.50	2,496.50	3.0730	25	-9.10
	2,496.50	16,000.00	0.1245	2.5	-13.03

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### Channel 2,480 MHz Transmitter Spurious Emissions 10.00 – 1000.00 MHz +3.3 Vdc

Marker 1 [T1] RBW 100 kHz RF Att 20 dB  
Ref Lvl 4.737 nW VBW 100 kHz  
199.5 mW 980.16032064 MHz SWT 10 s Unit W



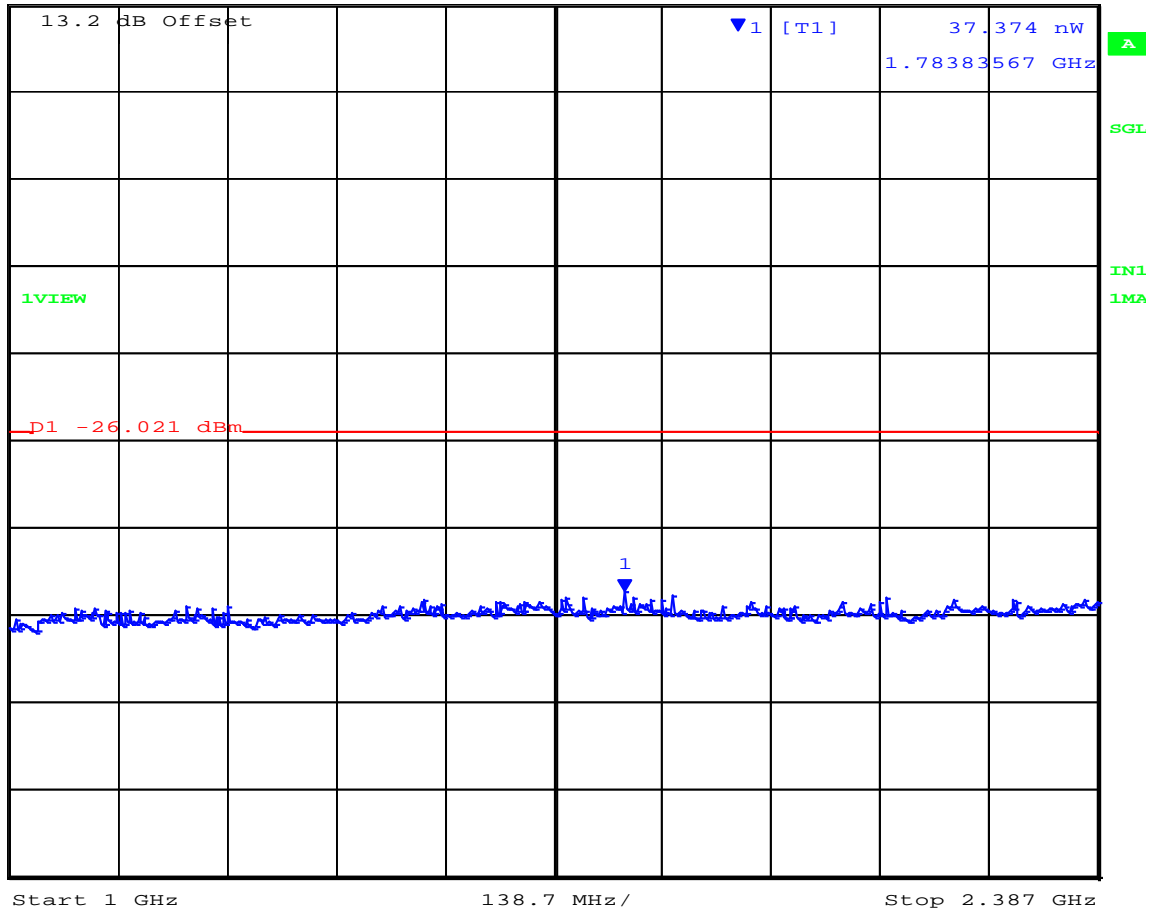
Date: 19.DEC.2010 14:20:51

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### Channel 2,480 MHz Transmitter Spurious Emissions 1000.00 – 2387.00 MHz +3.3 Vdc

Marker 1 [T1] RBW 1 MHz RF Att 20 dB  
Ref Lvl 37.374 nW VBW 1 MHz  
199.5 mW 1.78383567 GHz SWT 10 s Unit W



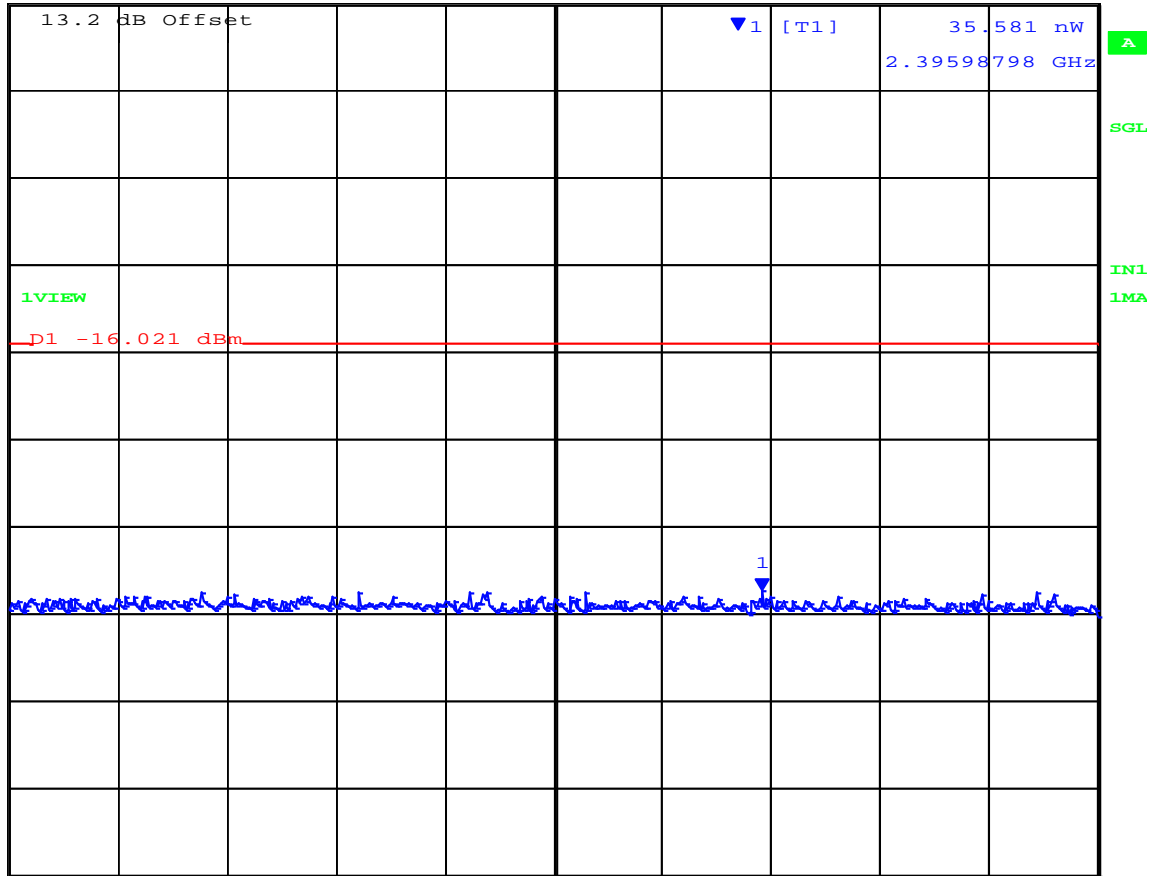
Date: 19.DEC.2010 14:21:49

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Channel 2,480 MHz Transmitter Spurious Emissions  
2387.00 – 2,400.00 MHz +3.3 Vdc

Marker 1 [T1] RBW 1 MHz RF Att 20 dB  
Ref Lvl 35.581 nW VBW 1 MHz  
199.5 mW 2.39598798 GHz SWT 10 s Unit W



Start 2.387 GHz 1.3 MHz/ Stop 2.4 GHz

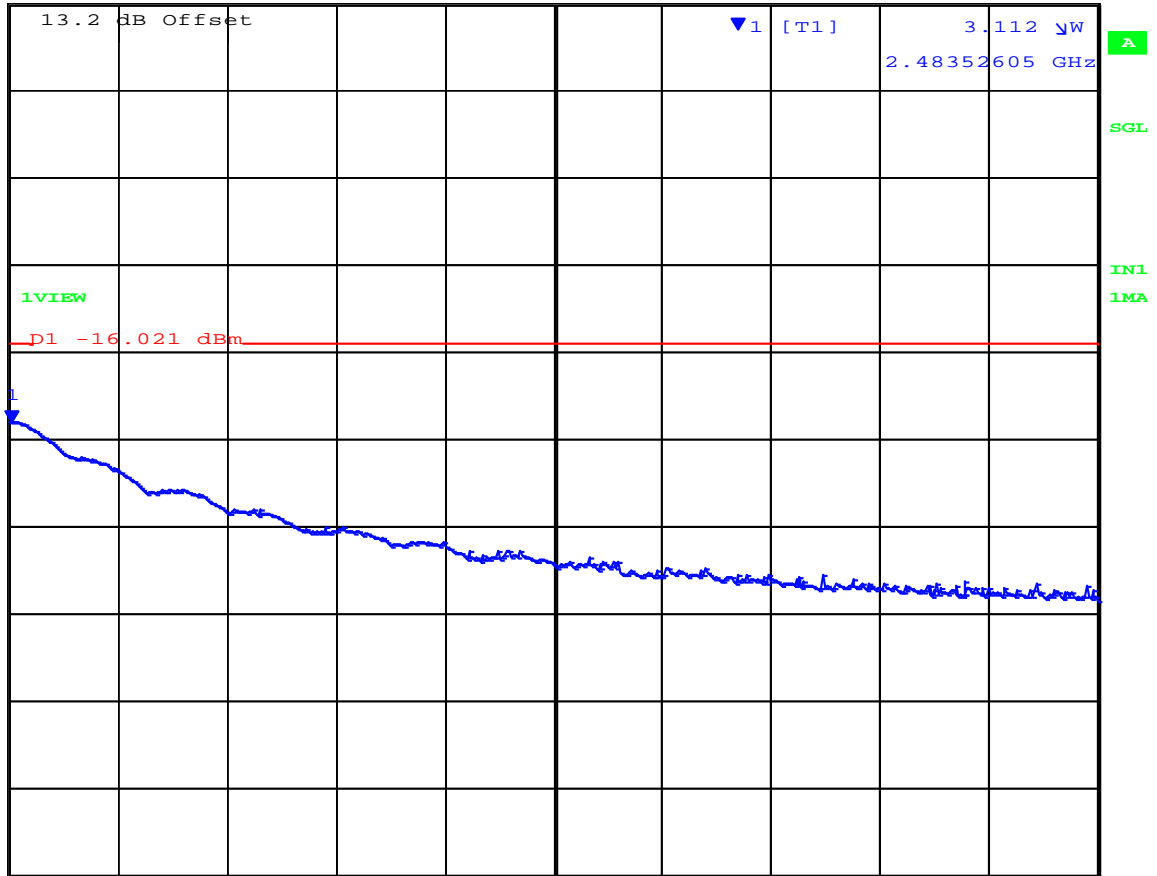
Date: 19.DEC.2010 14:22:42

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### Channel 2,480 MHz Transmitter Spurious Emissions 2,483.50 – 2496.50 MHz +3.3 Vdc

Marker 1 [T1] RBW 1 MHz RF Att 20 dB  
Ref Lvl 3.112  $\mu$ W VBW 1 MHz  
199.5 mW 2.48352605 GHz SWT 10 s Unit W



Start 2.4835 GHz 1.3 MHz/ Stop 2.4965 GHz

Date: 19.DEC.2010 14:23:35

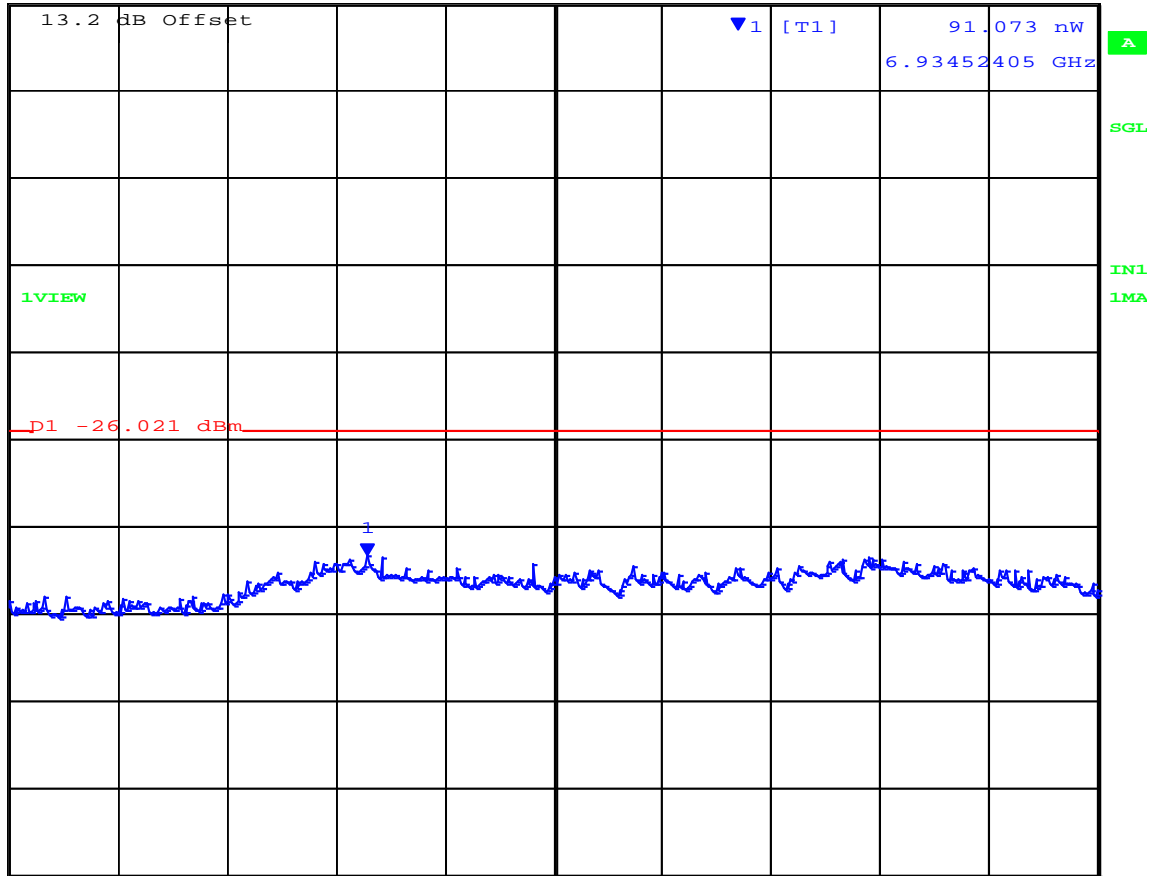
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### Channel 2,480 MHz Transmitter Spurious Emissions 2496.50 – 16,000.00 MHz +3.3 Vdc

Marker 1 [T1] RBW 1 MHz RF Att 20 dB  
Ref Lvl 91.073 nW VBW 1 MHz  
199.5 mW 6.93452405 GHz SWT 10 s Unit W



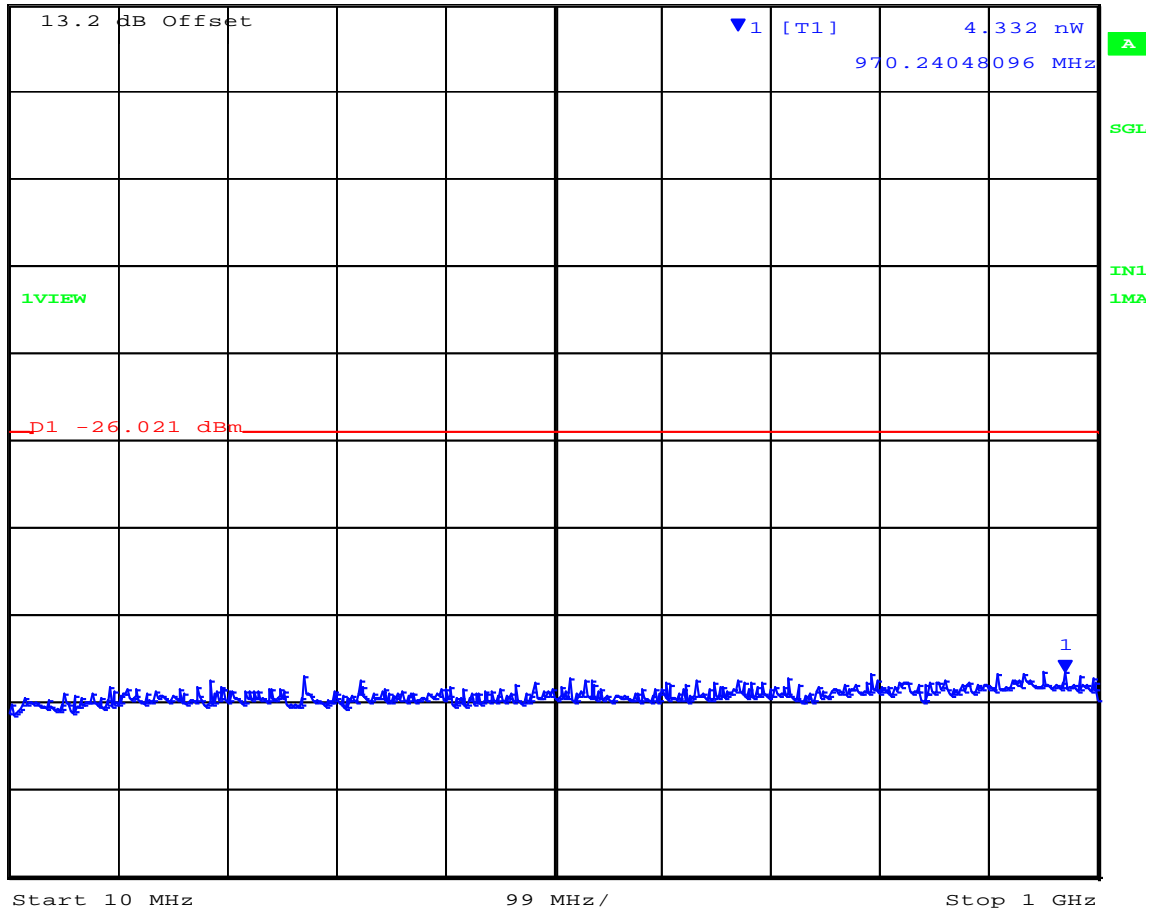
Date: 19.DEC.2010 14:24:28

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### Channel 2,480 MHz Transmitter Spurious Emissions 10.00 – 1000.00 MHz +2.2 Vdc

Marker 1 [T1] RBW 100 kHz RF Att 20 dB  
Ref Lvl 4.332 nW VBW 100 kHz  
199.5 mW 970.24048096 MHz SWT 10 s Unit W



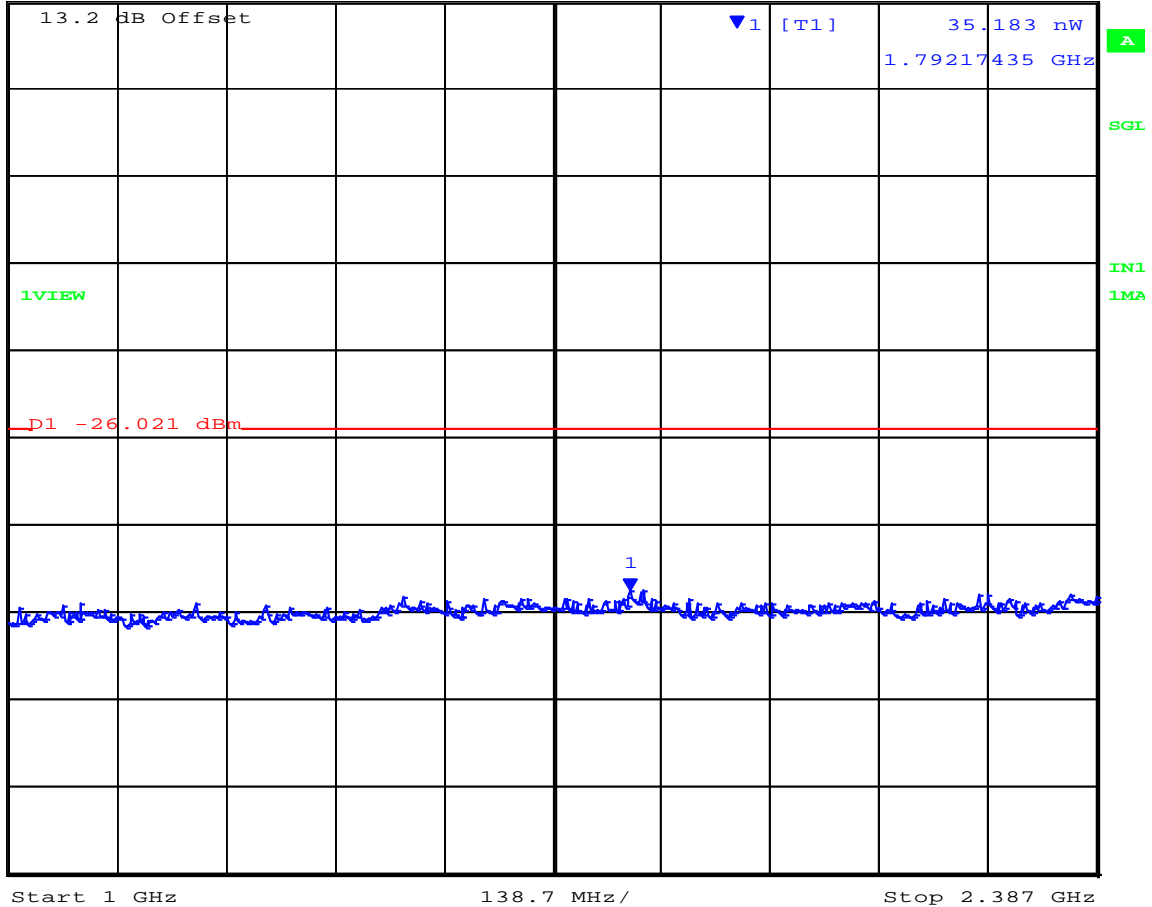
Date: 19.DEC.2010 14:26:12

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### Channel 2,480 MHz Transmitter Spurious Emissions 1000.00 – 2387.00 MHz +2.2 Vdc

Marker 1 [T1] RBW 1 MHz RF Att 20 dB  
Ref Lvl 35.183 nW VBW 1 MHz  
199.5 mW 1.79217435 GHz SWT 10 s Unit W



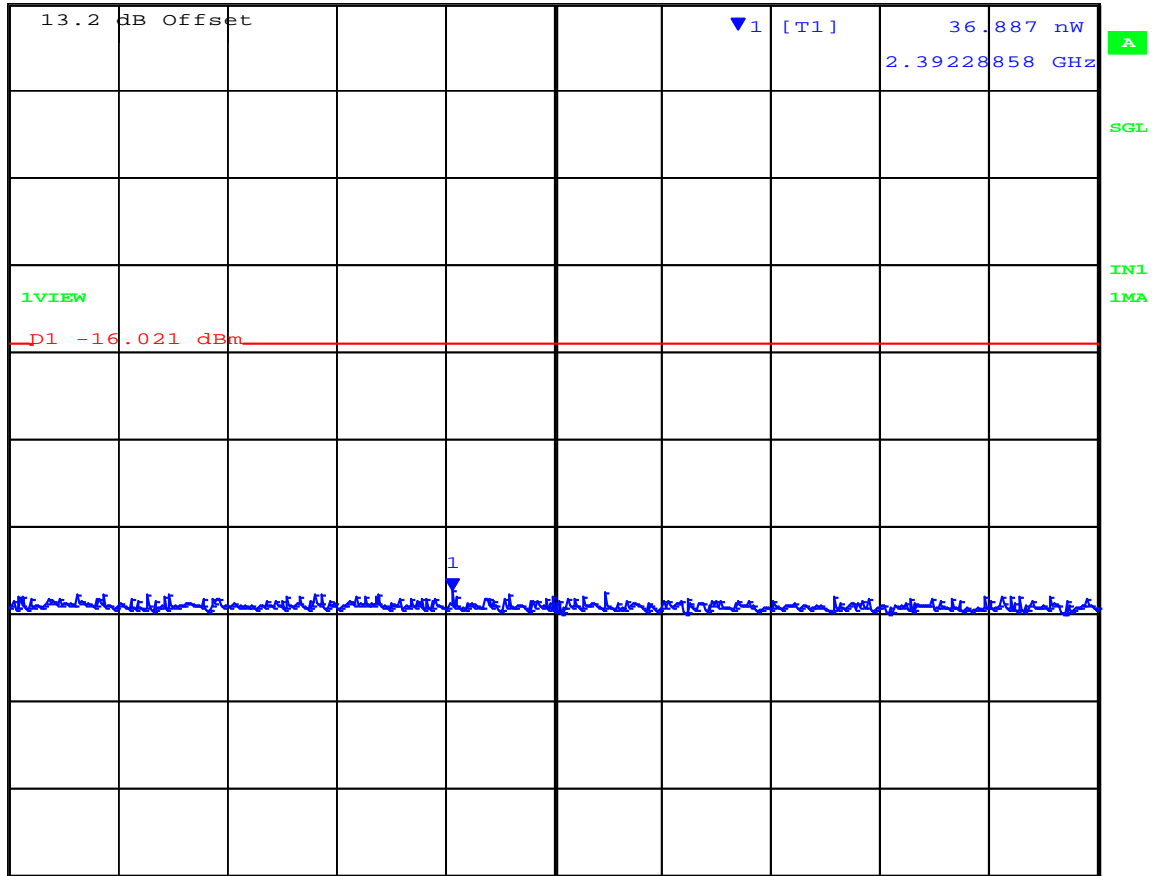
Date: 19.DEC.2010 14:27:11

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Channel 2,480 MHz Transmitter Spurious Emissions  
2387.00 – 2,400.00 MHz +2.2 Vdc

Marker 1 [T1] RBW 1 MHz RF Att 20 dB  
Ref Lvl 36.887 nW VBW 1 MHz  
199.5 mW 2.39228858 GHz SWT 10 s Unit W



Start 2.387 GHz 1.3 MHz/ Stop 2.4 GHz

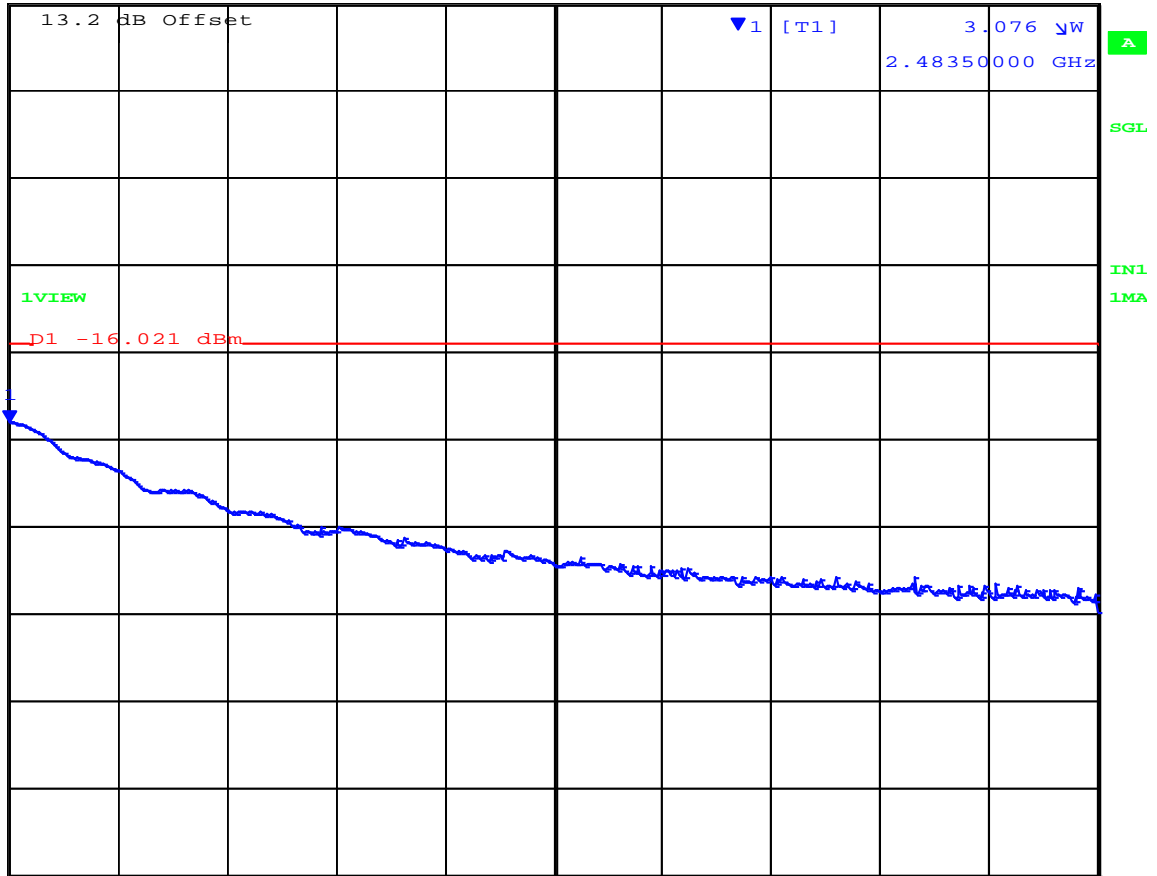
Date: 19.DEC.2010 14:28:03

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### Channel 2,480 MHz Transmitter Spurious Emissions 2,483.50 – 2496.50 MHz +2.2 Vdc

Marker 1 [T1] RBW 1 MHz RF Att 20 dB  
Ref Lvl 3.076  $\mu$ W VBW 1 MHz  
199.5 mW 2.48350000 GHz SWT 10 s Unit W



Start 2.4835 GHz 1.3 MHz/ Stop 2.4965 GHz

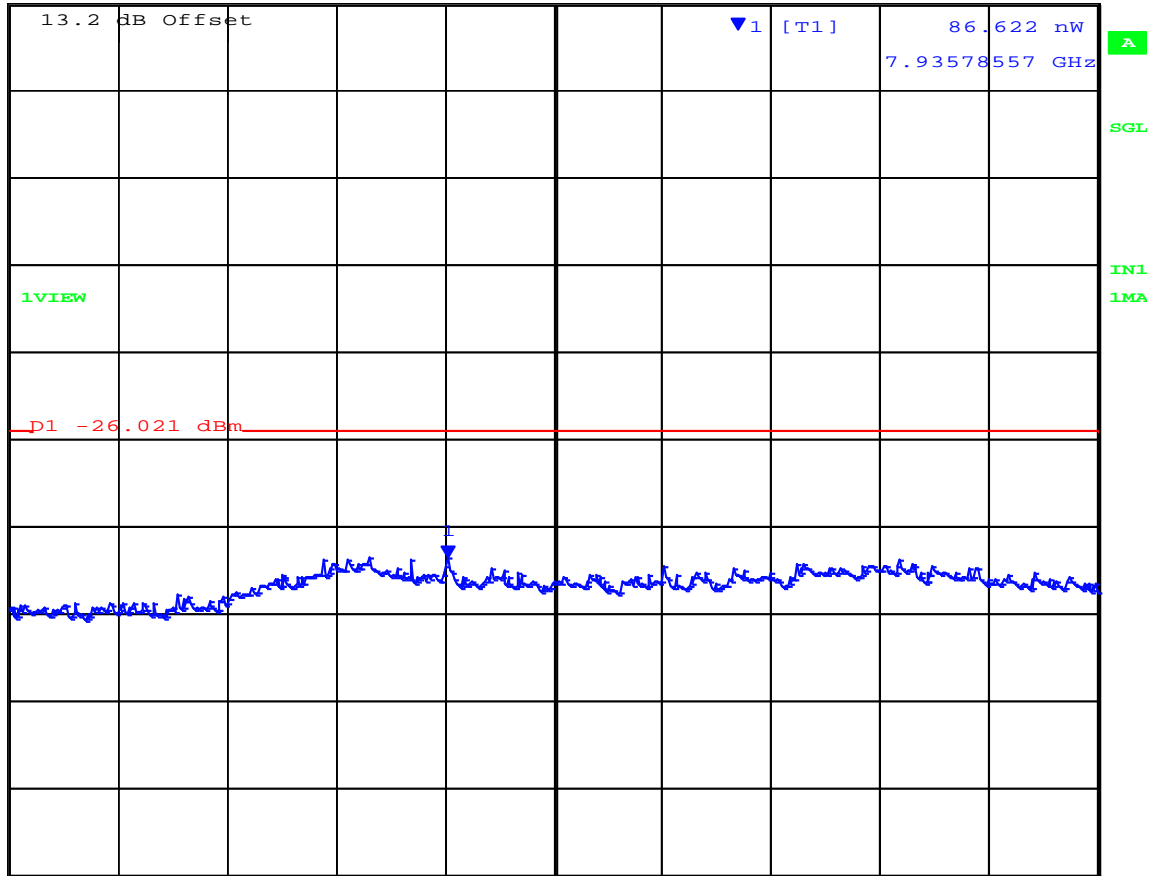
Date: 19.DEC.2010 14:28:56

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Channel 2,480 MHz Transmitter Spurious Emissions  
2496.50 – 16,000.00 MHz +2.2 Vdc

Marker 1 [T1] RBW 1 MHz RF Att 20 dB  
Ref Lvl 86.622 nW VBW 1 MHz  
199.5 mW 7.93578557 GHz SWT 10 s Unit W



Start 2.4965 GHz 1.35035 GHz/ Stop 16 GHz

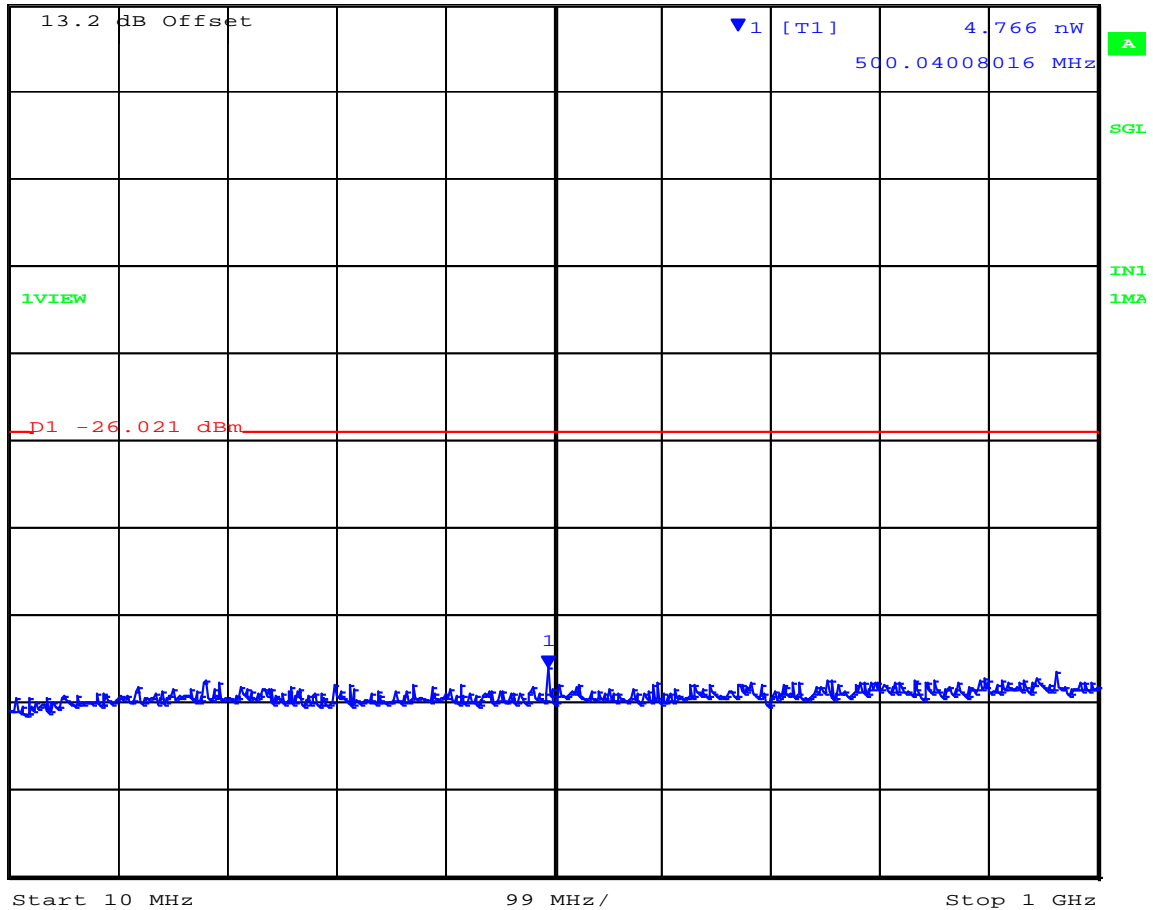
Date: 19.DEC.2010 14:29:49

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### Channel 2,480 MHz Transmitter Spurious Emissions 10.00 – 1000.00 MHz +3.6 Vdc

Marker 1 [T1] RBW 100 kHz RF Att 20 dB  
Ref Lvl 4.766 nW VBW 100 kHz  
199.5 mW 500.04008016 MHz SWT 10 s Unit W



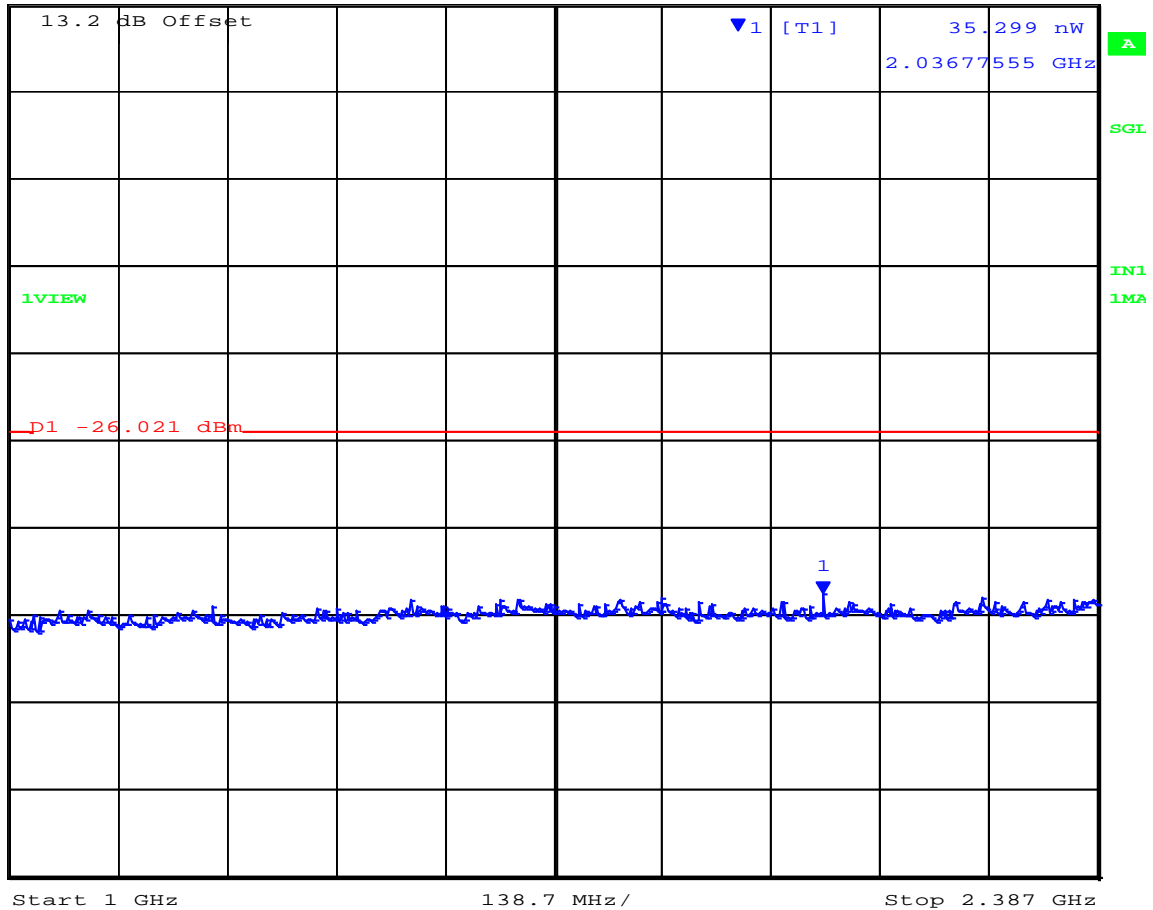
Date: 19.DEC.2010 14:31:31

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Channel 2,480 MHz Transmitter Spurious Emissions  
1000.00 – 2387.00 MHz +3.6 Vdc

Marker 1 [T1] RBW 1 MHz RF Att 20 dB  
Ref Lvl 35.299 nW VBW 1 MHz  
199.5 mW 2.03677555 GHz SWT 10 s Unit W



Date: 19.DEC.2010 14:32:30

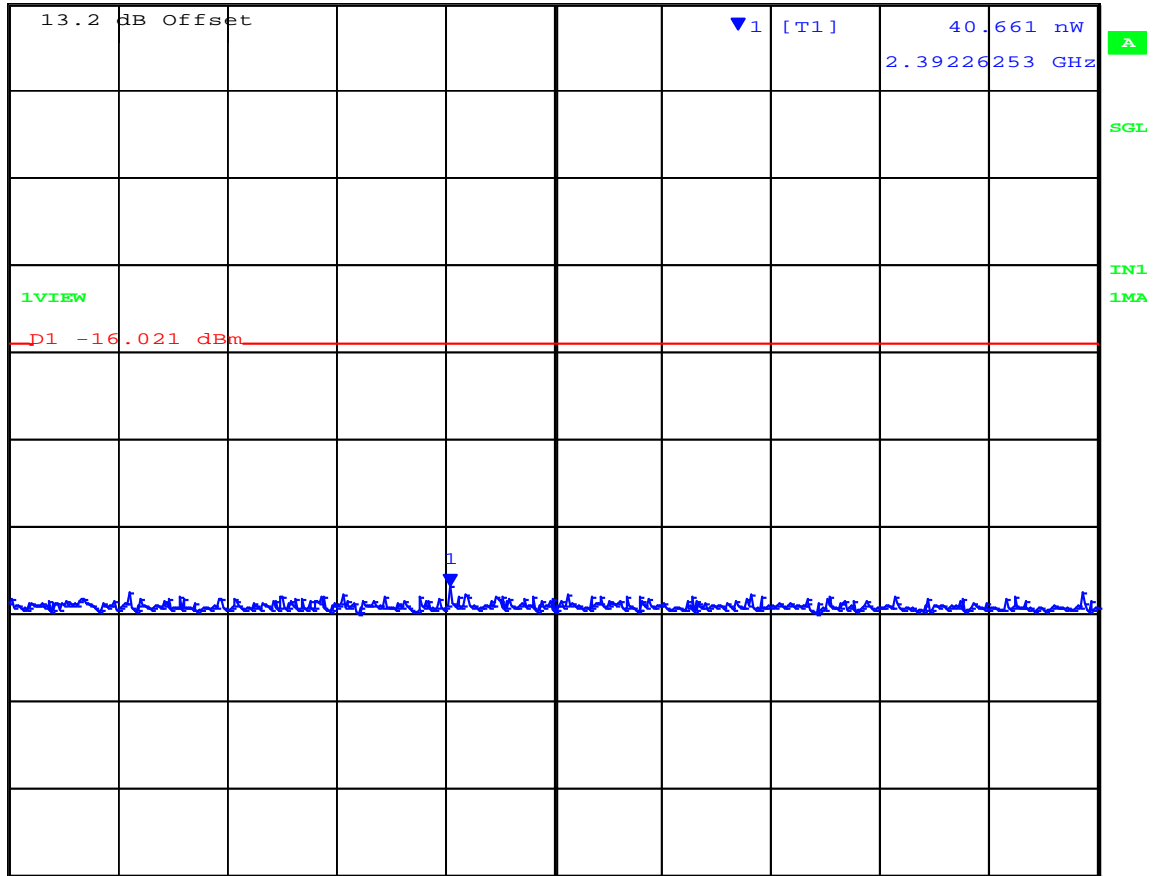
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Channel 2,480 MHz Transmitter Spurious Emissions  
2387.00 – 2,400.00 MHz +3.6 Vdc

Marker 1 [T1] RBW 1 MHz RF Att 20 dB  
Ref Lvl 40.661 nW VBW 1 MHz  
199.5 mW 2.39226253 GHz SWT 10 s Unit W



Start 2.387 GHz 1.3 MHz/ Stop 2.4 GHz

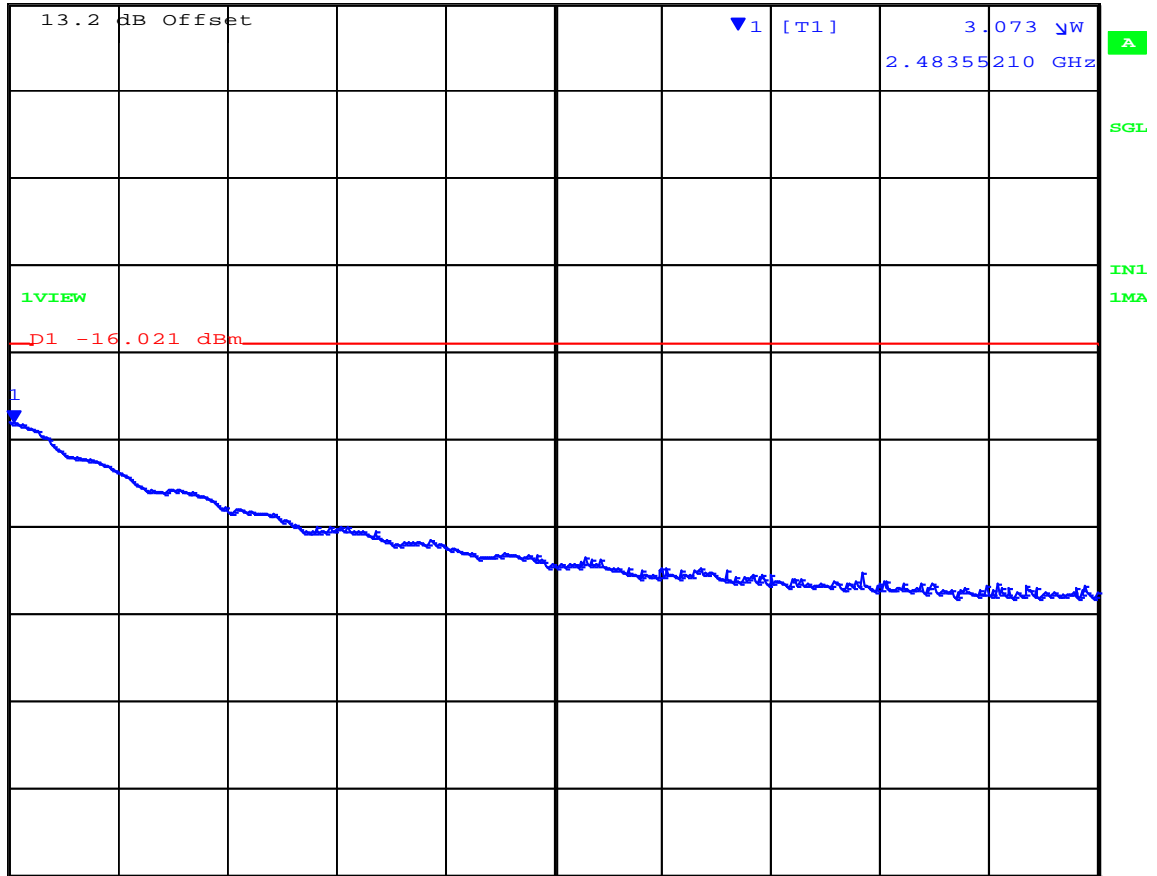
Date: 19.DEC.2010 14:33:22

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Channel 2,480 MHz Transmitter Spurious Emissions  
2,483.50 – 2496.50 MHz +3.6 Vdc

Marker 1 [T1] RBW 1 MHz RF Att 20 dB  
Ref Lvl 3.073  $\mu$ W VBW 1 MHz  
199.5 mW 2.48355210 GHz SWT 10 s Unit W



Start 2.4835 GHz 1.3 MHz/ Stop 2.4965 GHz

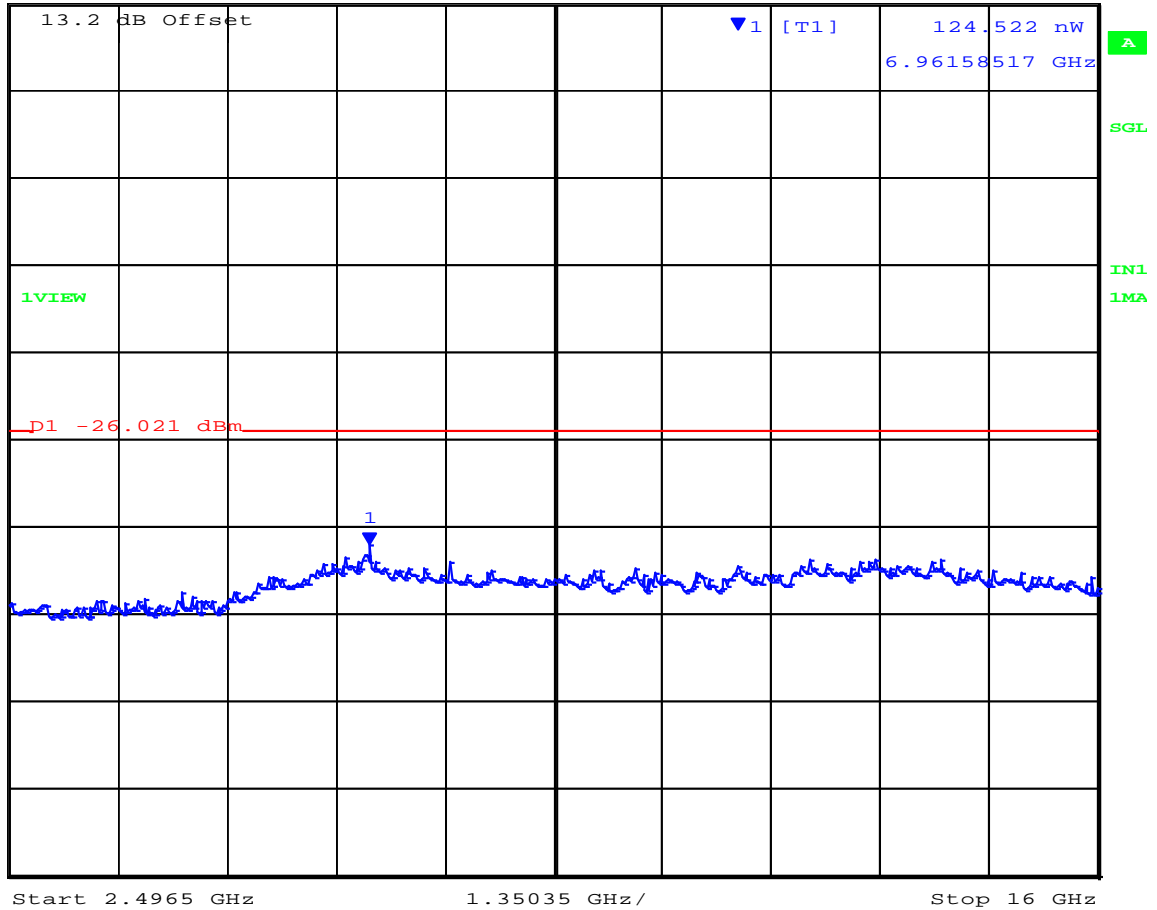
Date: 19.DEC.2010 14:34:15

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### Channel 2,480 MHz Transmitter Spurious Emissions 2496.50 – 16,000.00 MHz +3.6 Vdc

Marker 1 [T1] RBW 1 MHz RF Att 20 dB  
Ref Lvl 124.522 nW VBW 1 MHz  
199.5 mW 6.96158517 GHz SWT 10 s Unit W



Date: 19.DEC.2010 14:35:09

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## Specification

### Transmitter Spurious Emission Limits

Lower Frequency (MHz)	Upper Frequency (MHz)	Limit ( $\mu\text{W}/\text{MHz}$ )
5	2,387	2.5
2,387	2,400	25
2,483.5	2,497	25
2,497	16,000	2.5

### Laboratory Measurement Uncertainty for Conducted Spurious Emissions

Measurement uncertainty	$\pm 2.37$ dB
-------------------------	---------------

### Traceability

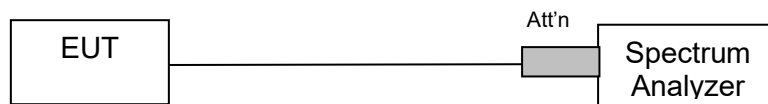
Method	Test Equipment Used
Measurements were made per work instruction WI-05 'Measurement of Spurious Emissions'	0223, 0088, 0116, 0158, 0193, 0312, 0313, 0314

### 5.1.5. Receiver Spurious Emissions

#### Test Procedure

Receiver Spurious Emissions were measured conductively per the test set up below. The EUT was set on the channel of interest and the spectrum was investigated from 5 – 16,000 MHz. As the receiver operates in a continuous receive mode covering all channels only one set of results were taken for all channels.

#### Test Measurement Set up



Measurement set up for Receiver Spurious Emissions

#### Radio Operational Condition

Operational Mode: Receive mode only

Operational Mode: Low, mid and high channels



TABLE OF RESULTS - Channel 2,405 MHz

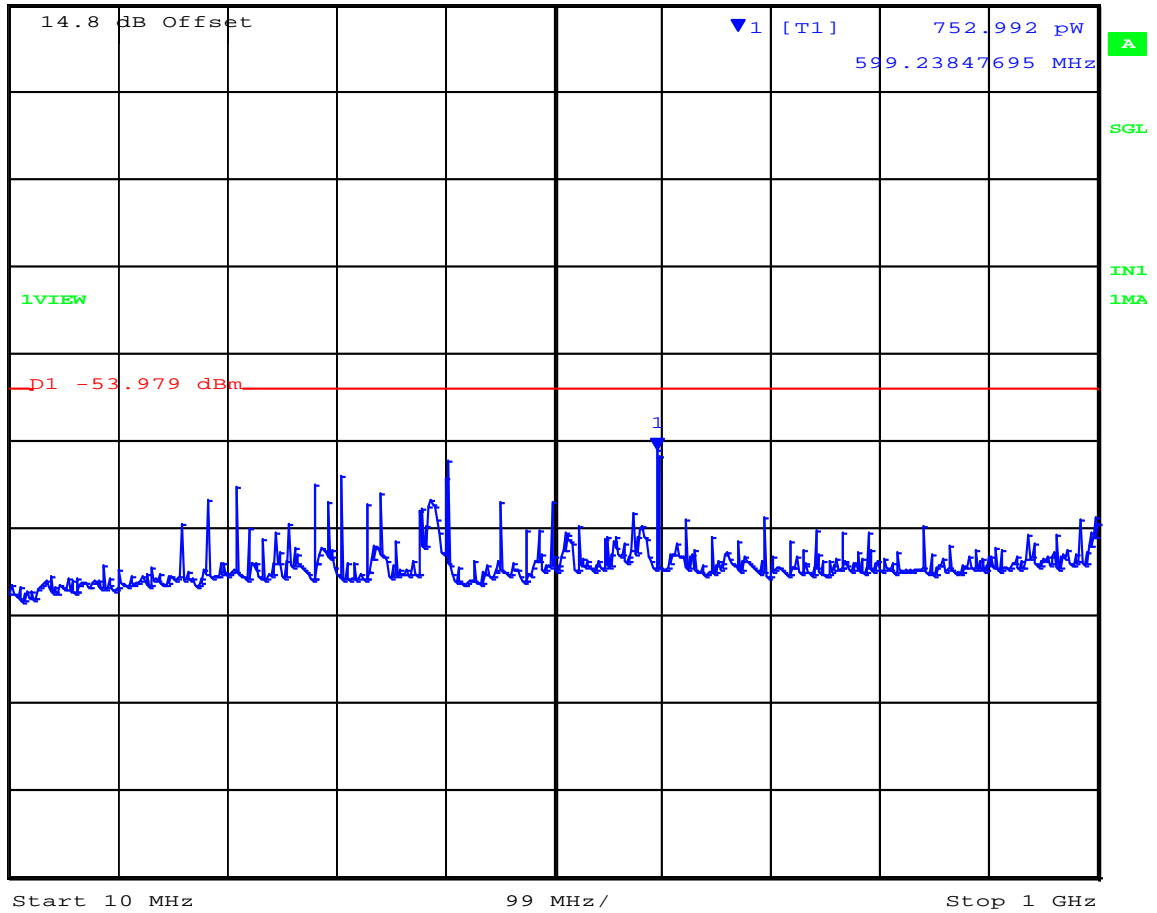
Voltage	Start Frequency (MHz)	Stop Frequency (MHz)	Highest Emission (nW/MHz)	Limit (nW/MHz)	Margin (dB)
+3.3 Vdc	10.00	1,000.00	0.7530	4	-7.25
	1,000.00	16,000.00	6.5120	20	-4.87
+2.2 Vdc	10.00	1,000.00	0.7484	4	-7.28
	1,000.00	16,000.00	6.2120	20	-5.08
+3.6 Vdc	10.00	1,000.00	0.7644	4	-7.19
	1,000.00	16,000.00	6.6110	20	-4.81

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### Channel 2,405 MHz Receiver Spurious Emissions 10 – 1,000 MHz +3.3 Vdc

Marker 1 [T1] RBW 100 kHz RF Att 0 dB  
Ref Lvl 752.992 pW VBW 100 kHz  
100  $\mu$ W 599.23847695 MHz SWT 10 s Unit W



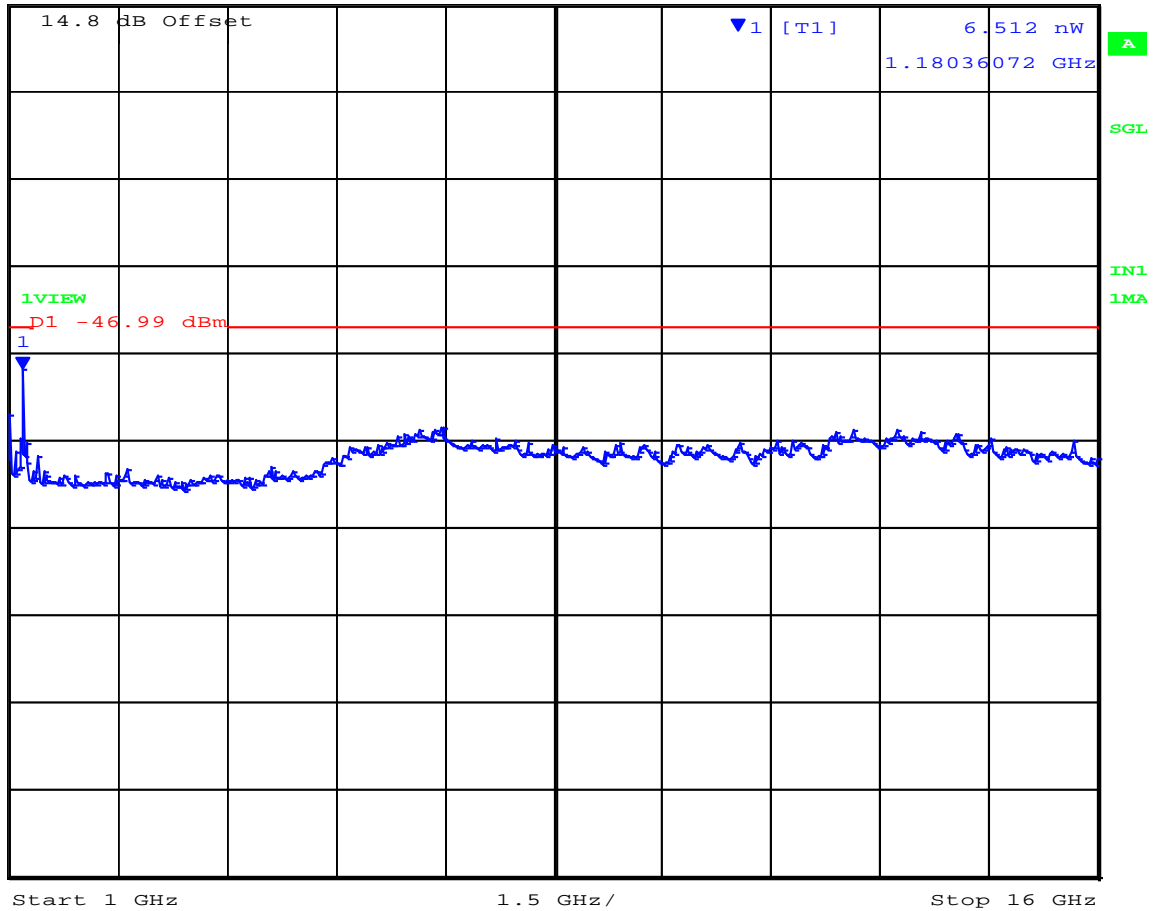
Date: 19.DEC.2010 14:50:48

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### Channel 2,405 MHz Receiver Spurious Emissions 1,000 – 16,000 MHz +3.3 Vdc

Marker 1 [T1] RBW 1 MHz RF Att 0 dB  
Ref Lvl 6.512 nW VBW 1 MHz  
100  $\mu$ W 1.18036072 GHz SWT 60 s Unit W



Date: 19.DEC.2010 14:52:01

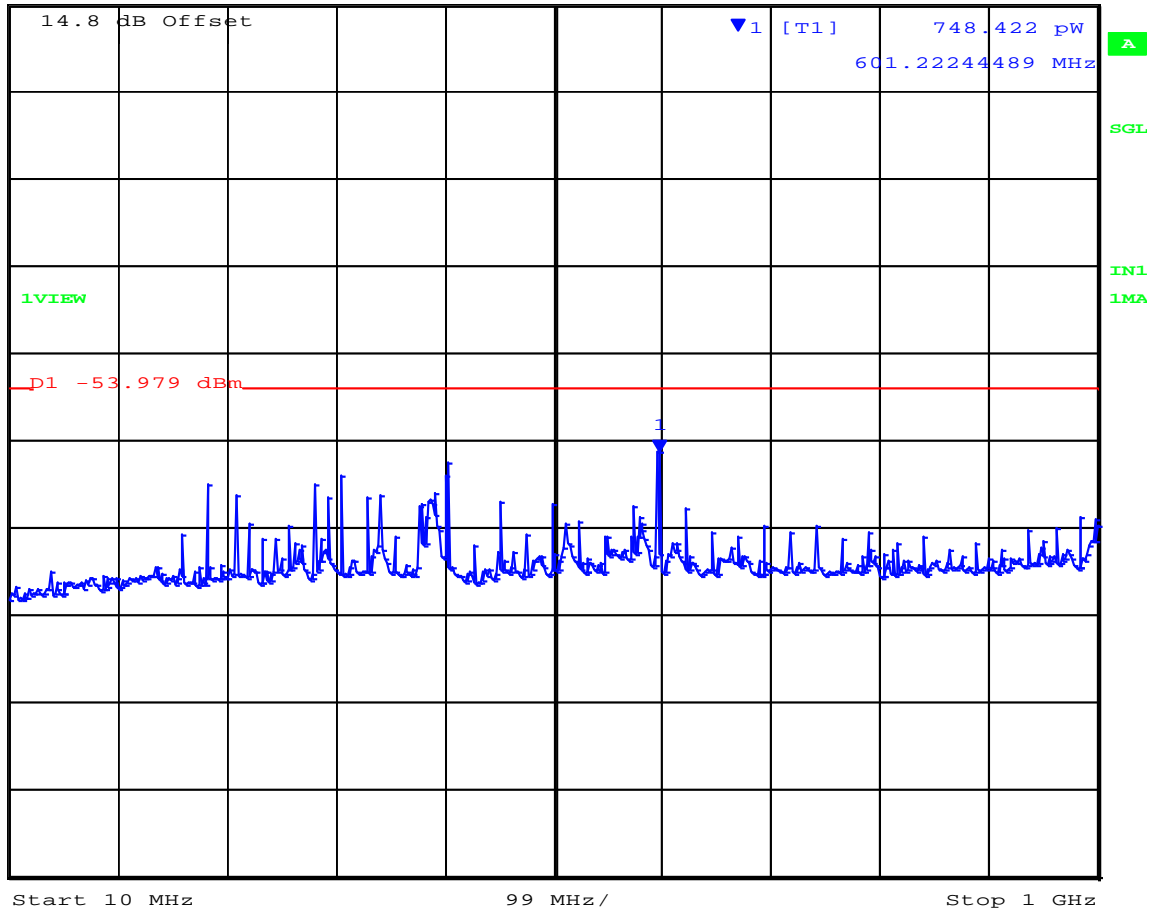
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### Channel 2,405 MHz Receiver Spurious Emissions 10 – 1,000 MHz +2.2 Vdc

Marker 1 [T1] RBW 100 kHz RF Att 0 dB  
Ref Lvl 748.422 pW VBW 100 kHz  
100  $\mu$ W 601.22244489 MHz SWT 10 s Unit W



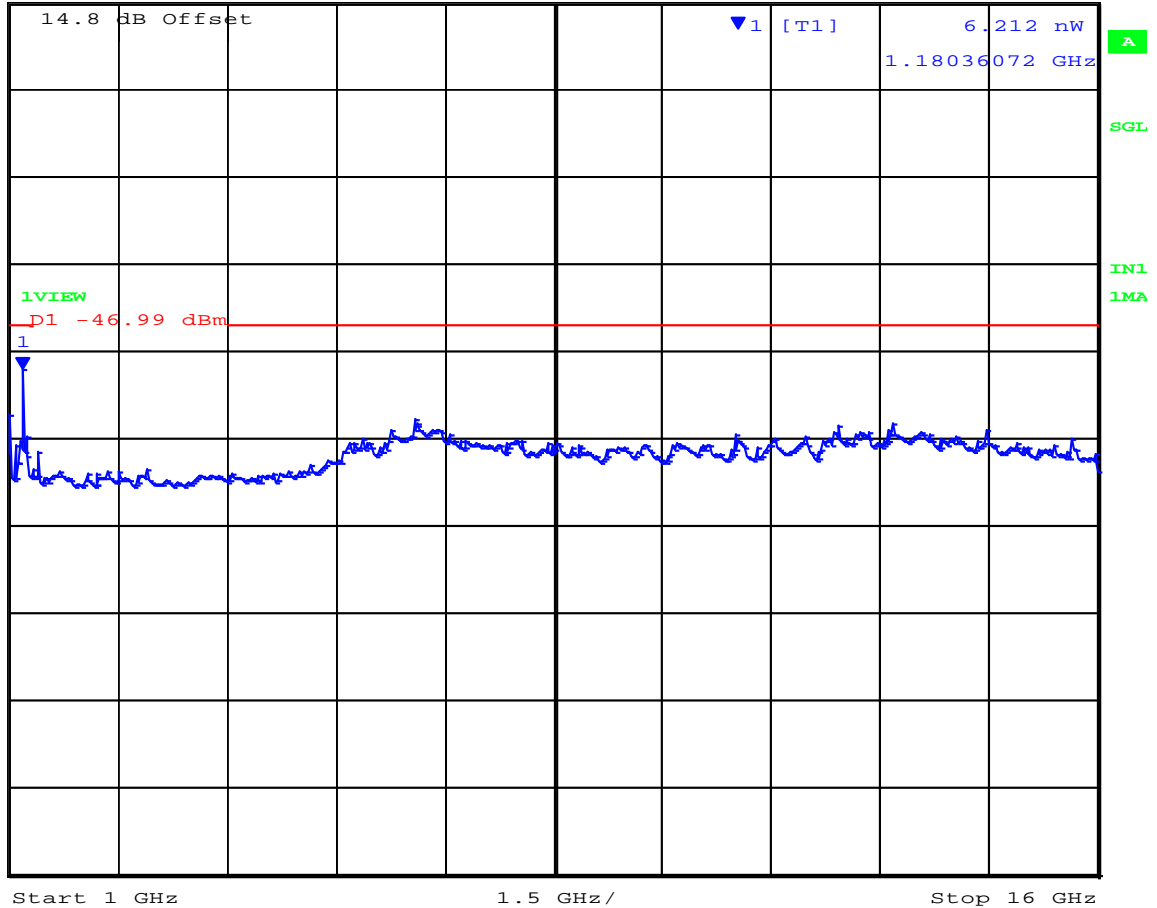
Date: 19.DEC.2010 14:52:46

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### Channel 2,405 MHz Receiver Spurious Emissions 1,000 – 16,000 MHz +2.2 Vdc

Marker 1 [T1] RBW 1 MHz RF Att 0 dB  
Ref Lvl 6.212 nW VBW 1 MHz  
100  $\mu$ W 1.18036072 GHz SWT 60 s Unit W



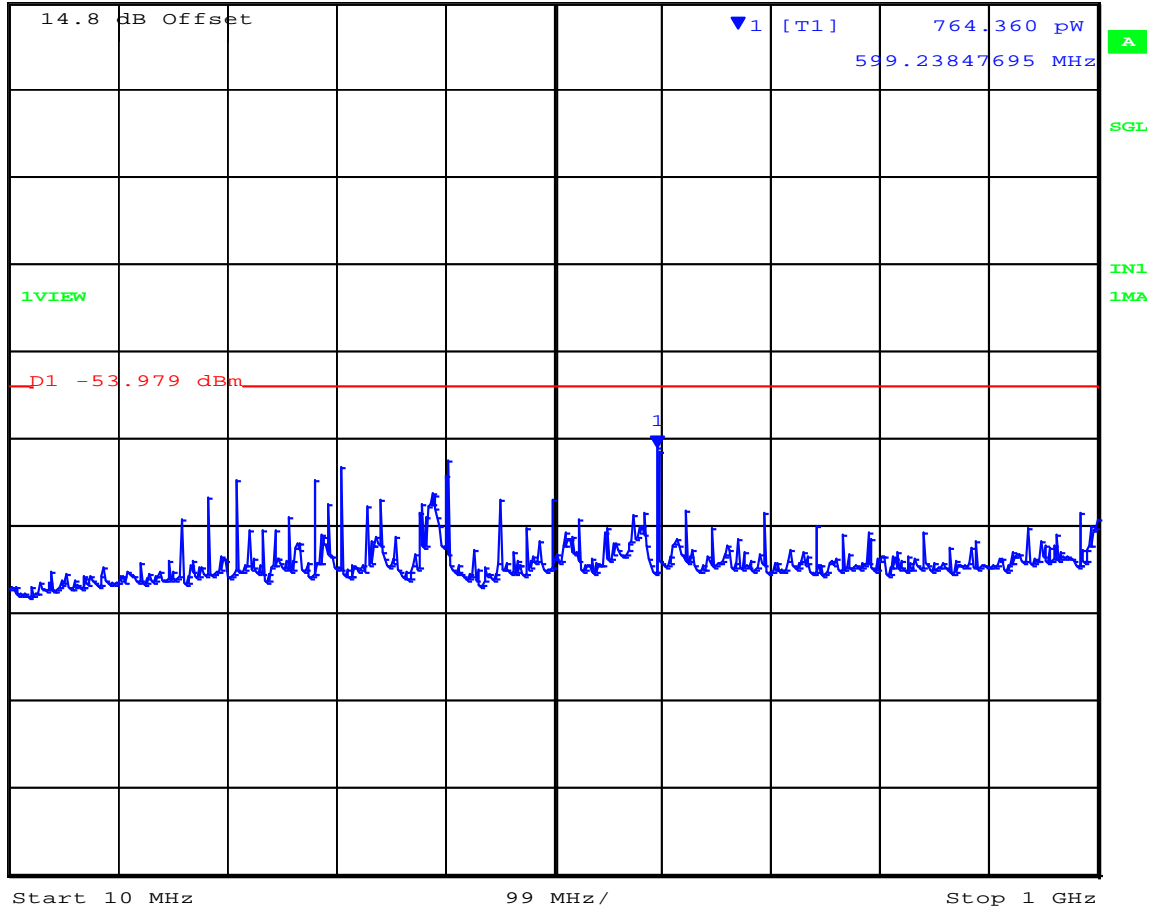
Date: 19.DEC.2010 14:53:59

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### Channel 2,405 MHz Receiver Spurious Emissions 10 – 1,000 MHz +3.6 Vdc

Marker 1 [T1] RBW 100 kHz RF Att 0 dB  
Ref Lvl 764.360 pW VBW 100 kHz  
100 uW 599.23847695 MHz SWT 10 s Unit W



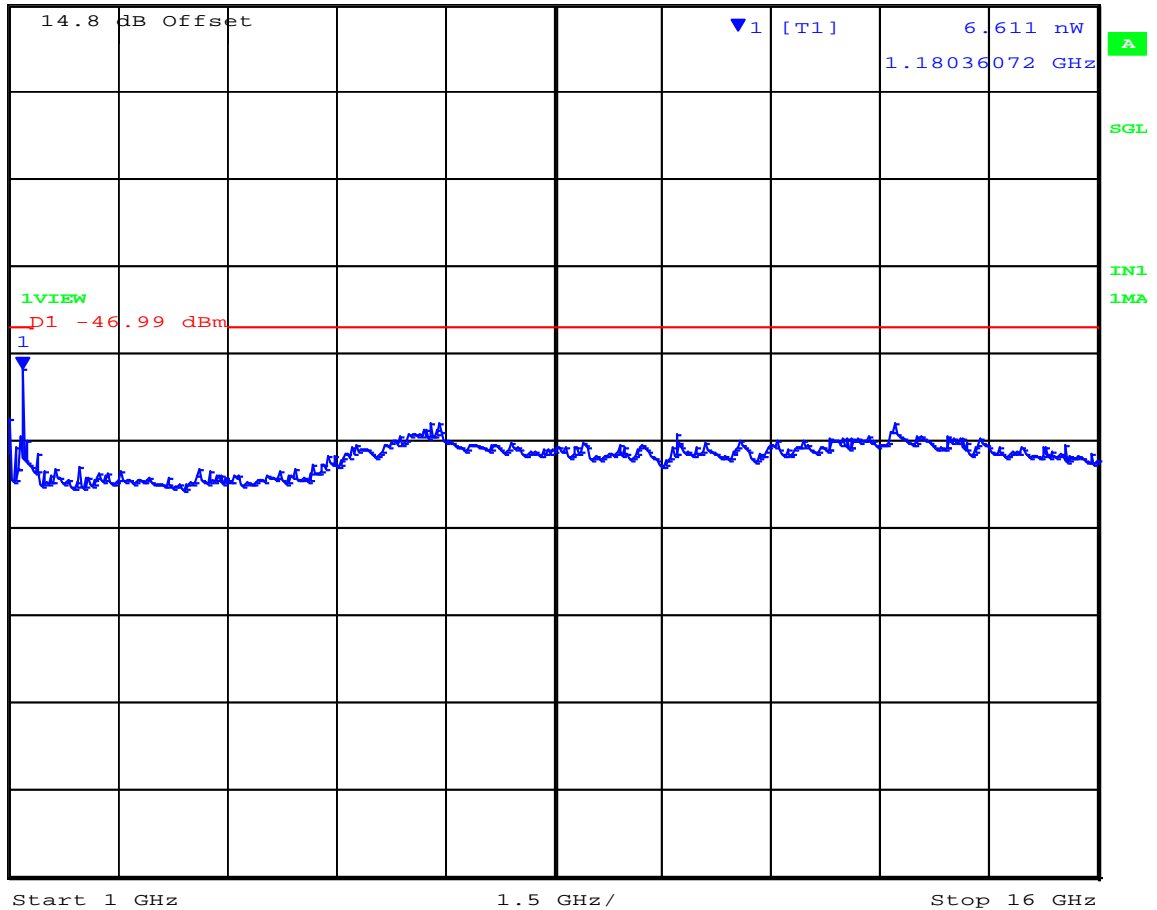
Date: 19.DEC.2010 14:54:45

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### Channel 2,405 MHz Receiver Spurious Emissions 1,000 – 16,000 MHz +3.6 Vdc

Marker 1 [T1] RBW 1 MHz RF Att 0 dB  
Ref Lvl 6.611 nW VBW 1 MHz  
100  $\mu$ W 1.18036072 GHz SWT 60 s Unit W



Date: 19.DEC.2010 14:55:57

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TABLE OF RESULTS - Channel 2,440 MHz

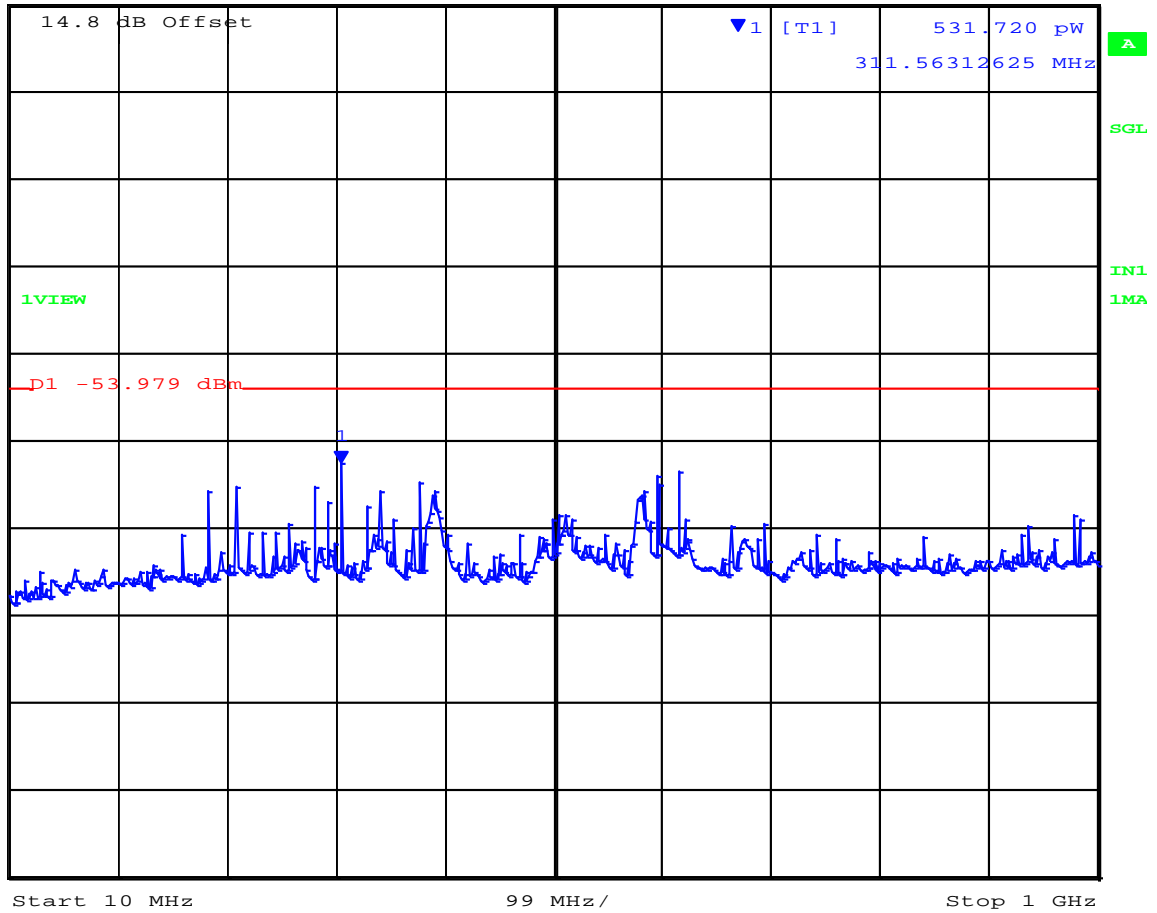
Voltage	Start Frequency (MHz)	Stop Frequency (MHz)	Highest Emission (nW/MHz)	Limit (nW/MHz)	Margin (dB)
+3.3 Vdc	10.00	1,000.00	0.5317	4	-8.76
	1,000.00	16,000.00	6.0760	20	-5.17
+2.2 Vdc	10.00	1,000.00	0.5027	4	-9.01
	1,000.00	16,000.00	6.3470	20	-4.98
+3.6 Vdc	10.00	1,000.00	0.4741	4	-9.26
	1,000.00	16,000.00	6.3830	20	-4.96

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### Channel 2,440 MHz Receiver Spurious Emissions 10 – 1,000 MHz +3.3 Vdc

Marker 1 [T1] RBW 100 kHz RF Att 0 dB  
Ref Lvl 531.720 pW VBW 100 kHz  
100  $\mu$ W 311.56312625 MHz SWT 10 s Unit W



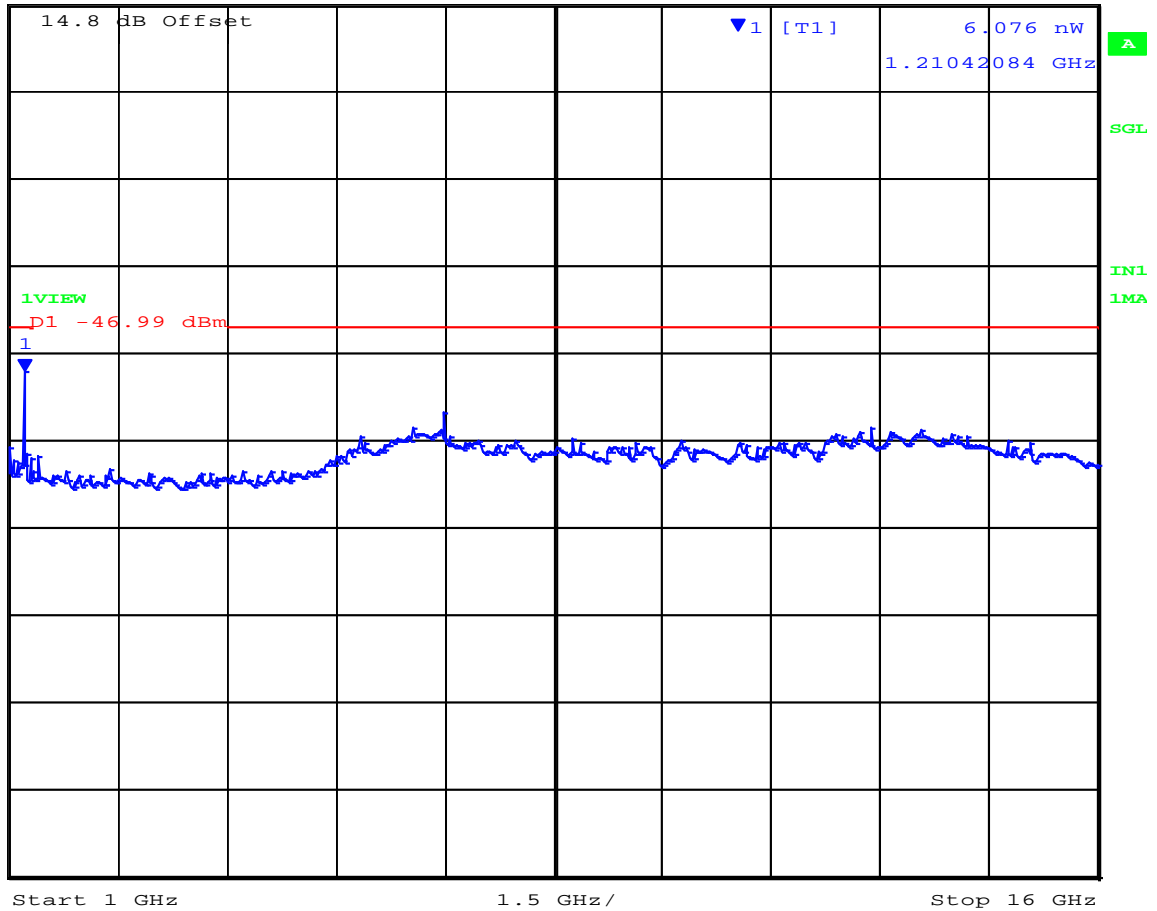
Date: 19.DEC.2010 13:41:30

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### Channel 2,440 MHz Receiver Spurious Emissions 1,000 – 16,000 MHz +3.3 Vdc

Marker 1 [T1] RBW 1 MHz RF Att 0 dB  
Ref Lvl 6.076 nW VBW 1 MHz  
100  $\mu$ W 1.21042084 GHz SWT 60 s Unit W



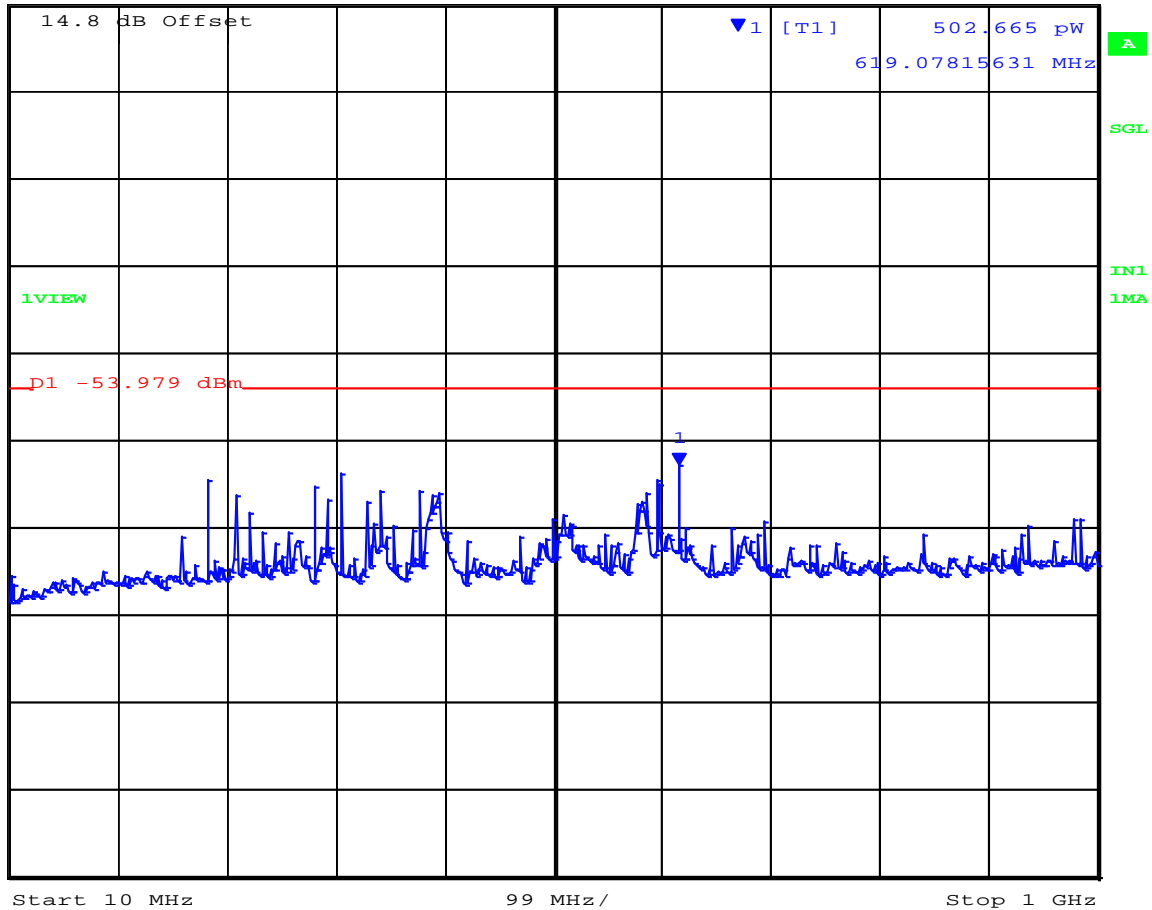
Date: 19.DEC.2010 13:42:42

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### Channel 2,440 MHz Receiver Spurious Emissions 10 – 1,000 MHz +2.2 Vdc

Marker 1 [T1] RBW 100 kHz RF Att 0 dB  
Ref Lvl 502.665 pW VBW 100 kHz  
100  $\mu$ W 619.07815631 MHz SWT 10 s Unit W



Date: 19.DEC.2010 13:43:26

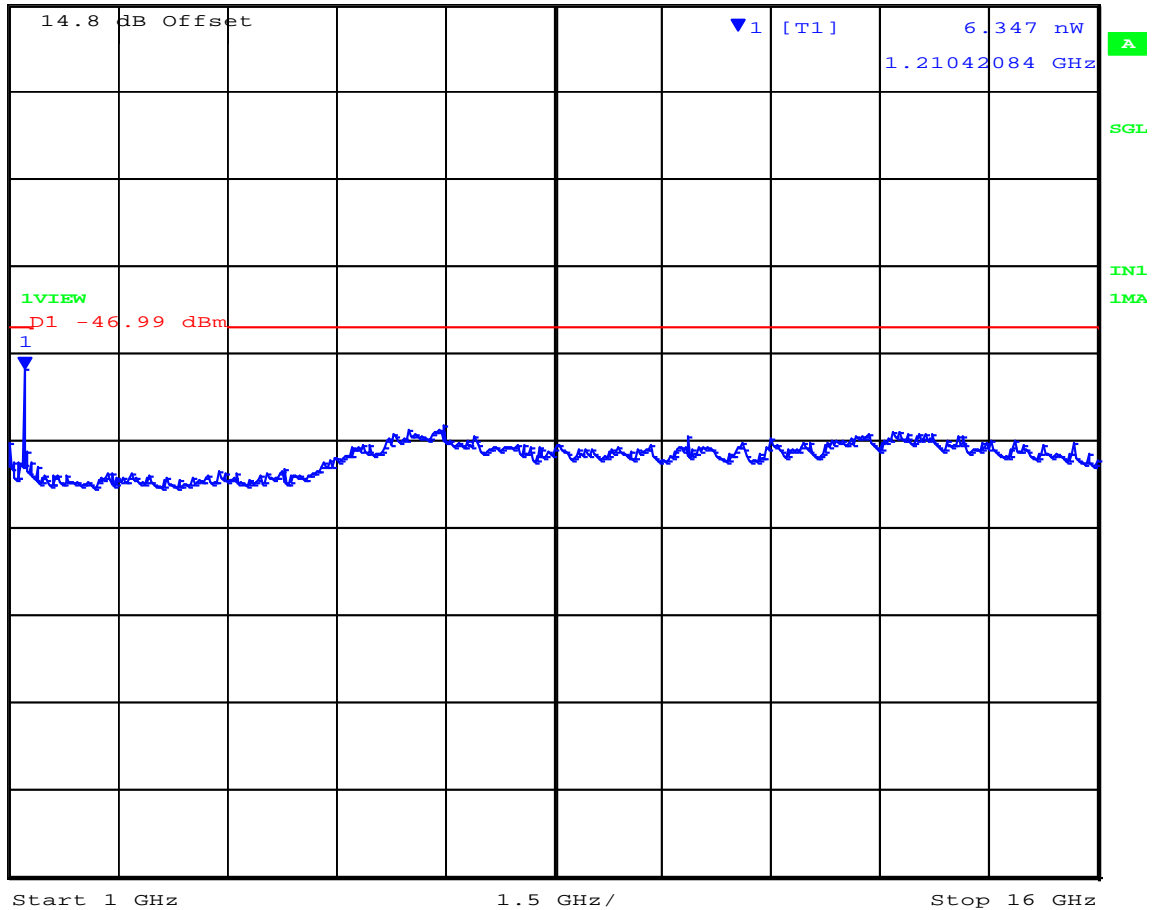
This test report may be reproduced in full only. The document may only be updated by MiCOM Labs personnel. Any changes will be noted in the Document History section of the report.





### Channel 2,440 MHz Receiver Spurious Emissions 1,000 – 16,000 MHz +2.2 Vdc

Marker 1 [T1] RBW 1 MHz RF Att 0 dB  
Ref Lvl 6.347 nW VBW 1 MHz  
100  $\mu$ W 1.21042084 GHz SWT 60 s Unit W



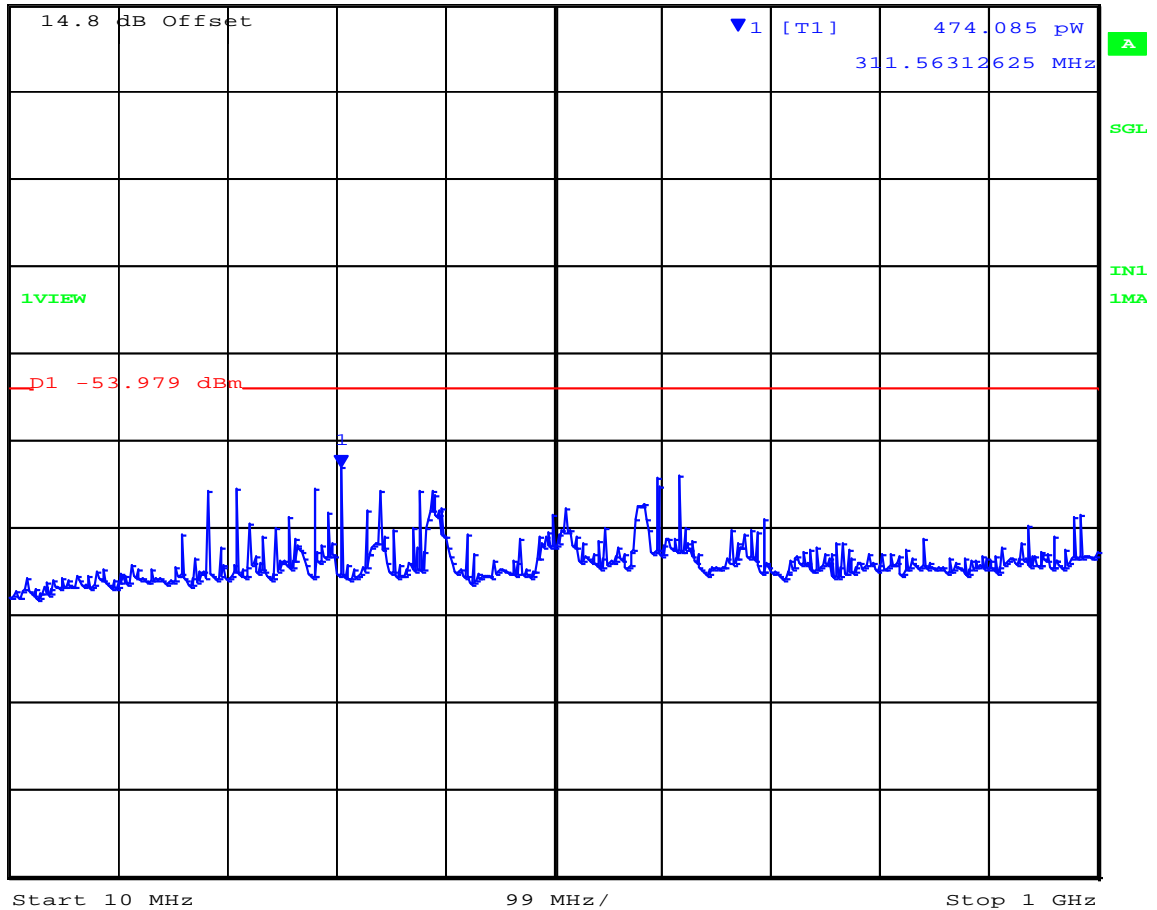
Date: 19.DEC.2010 13:44:39

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### Channel 2,440 MHz Receiver Spurious Emissions 10 – 1,000 MHz +3.6 Vdc

Marker 1 [T1] RBW 100 kHz RF Att 0 dB  
Ref Lvl 474.085 pW VBW 100 kHz  
100 uW 311.56312625 MHz SWT 10 s Unit W



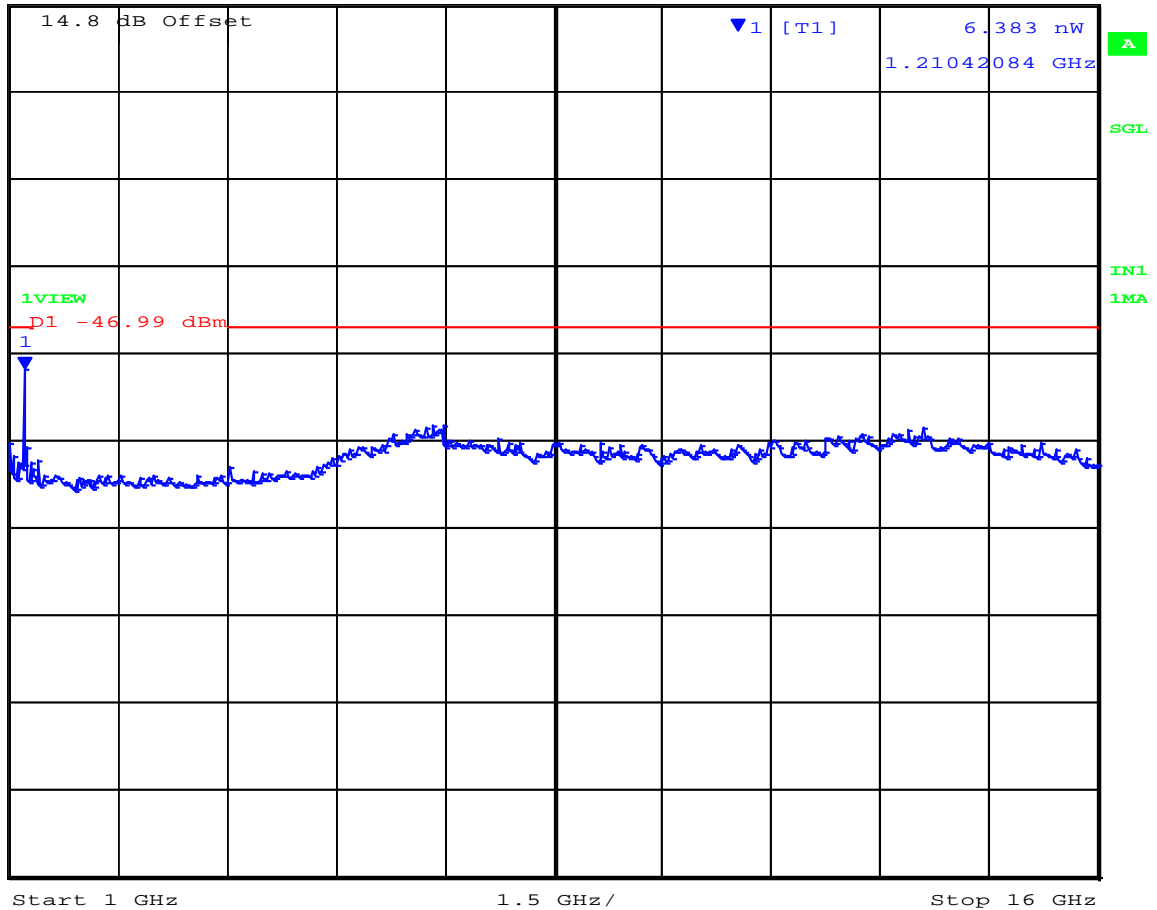
Date: 19.DEC.2010 13:46:02

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### Channel 2,440 MHz Receiver Spurious Emissions 1,000 – 16,000 MHz +3.6 Vdc

Marker 1 [T1] RBW 1 MHz RF Att 0 dB  
Ref Lvl 6.383 nW VBW 1 MHz  
100  $\mu$ W 1.21042084 GHz SWT 60 s Unit W



Date: 19.DEC.2010 13:47:15

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TABLE OF RESULTS - Channel 2,480 MHz

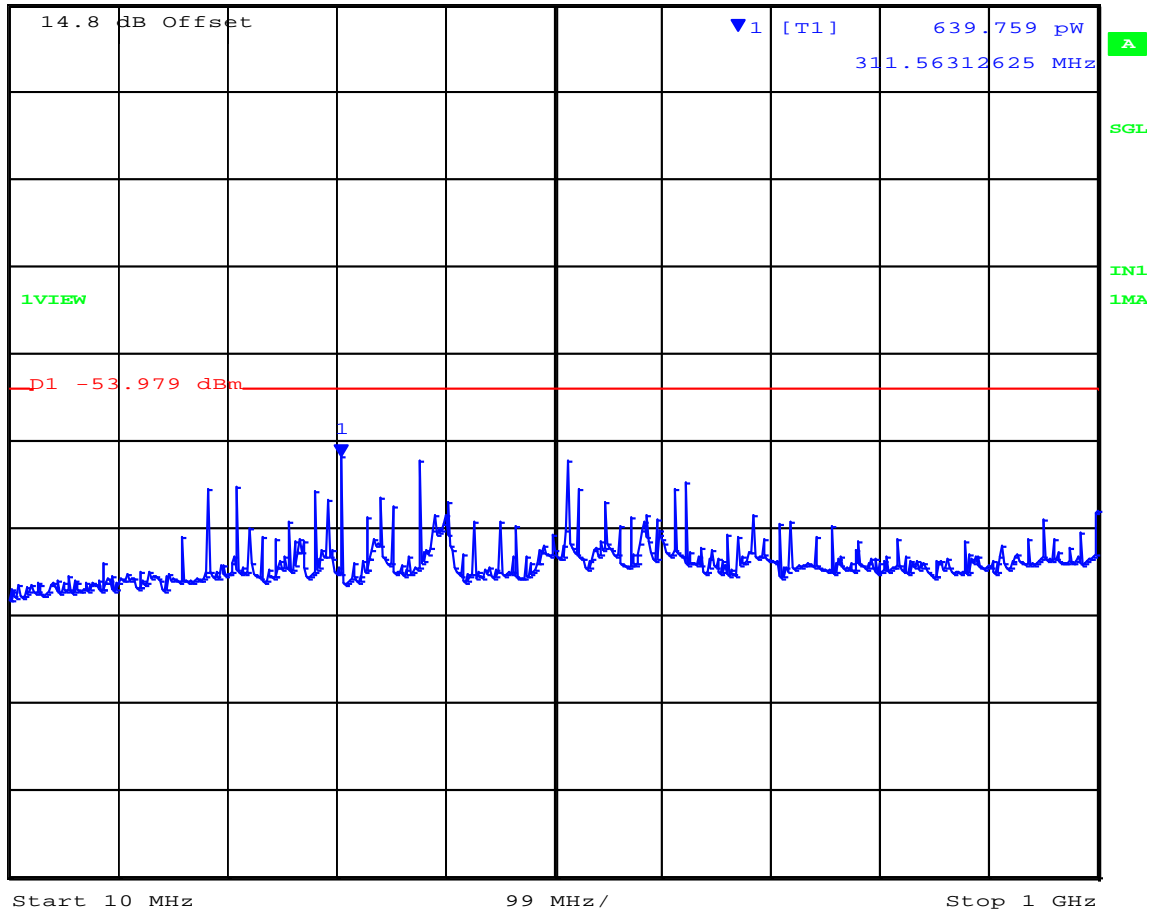
Voltage	Start Frequency (MHz)	Stop Frequency (MHz)	Highest Emission (nW/MHz)	Limit (nW/MHz)	Margin (dB)
+3.3 Vdc	10.00	1,000.00	0.6398	4	-7.96
	1,000.00	16,000.00	7.7730	20	-4.10
+2.2 Vdc	10.00	1,000.00	0.6314	4	-8.02
	1,000.00	16,000.00	8.0320	20	-3.96
+3.6 Vdc	10.00	1,000.00	0.6667	4	-7.78
	1,000.00	16,000.00	7.8580	20	-4.06

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### Channel 2,480 MHz Receiver Spurious Emissions 10 – 1,000 MHz +3.3 Vdc

Marker 1 [T1] RBW 100 kHz RF Att 0 dB  
Ref Lvl 639.759 pW VBW 100 kHz  
100  $\mu$ W 311.56312625 MHz SWT 10 s Unit W



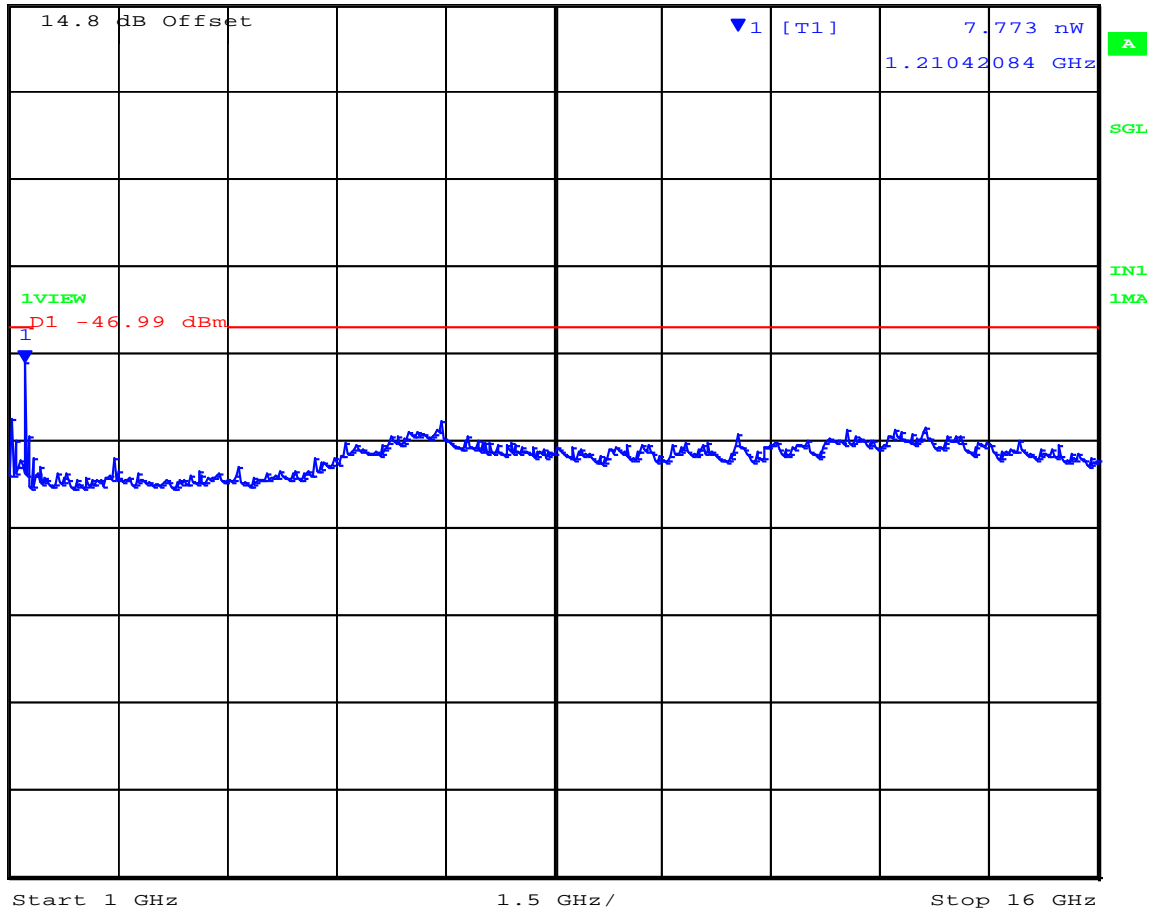
Date: 19.DEC.2010 14:36:55

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### Channel 2,480 MHz Receiver Spurious Emissions 1,000 – 16,000 MHz +3.3 Vdc

Marker 1 [T1] RBW 1 MHz RF Att 0 dB  
Ref Lvl 7.773 nW VBW 1 MHz  
100  $\mu$ W 1.21042084 GHz SWT 60 s Unit W



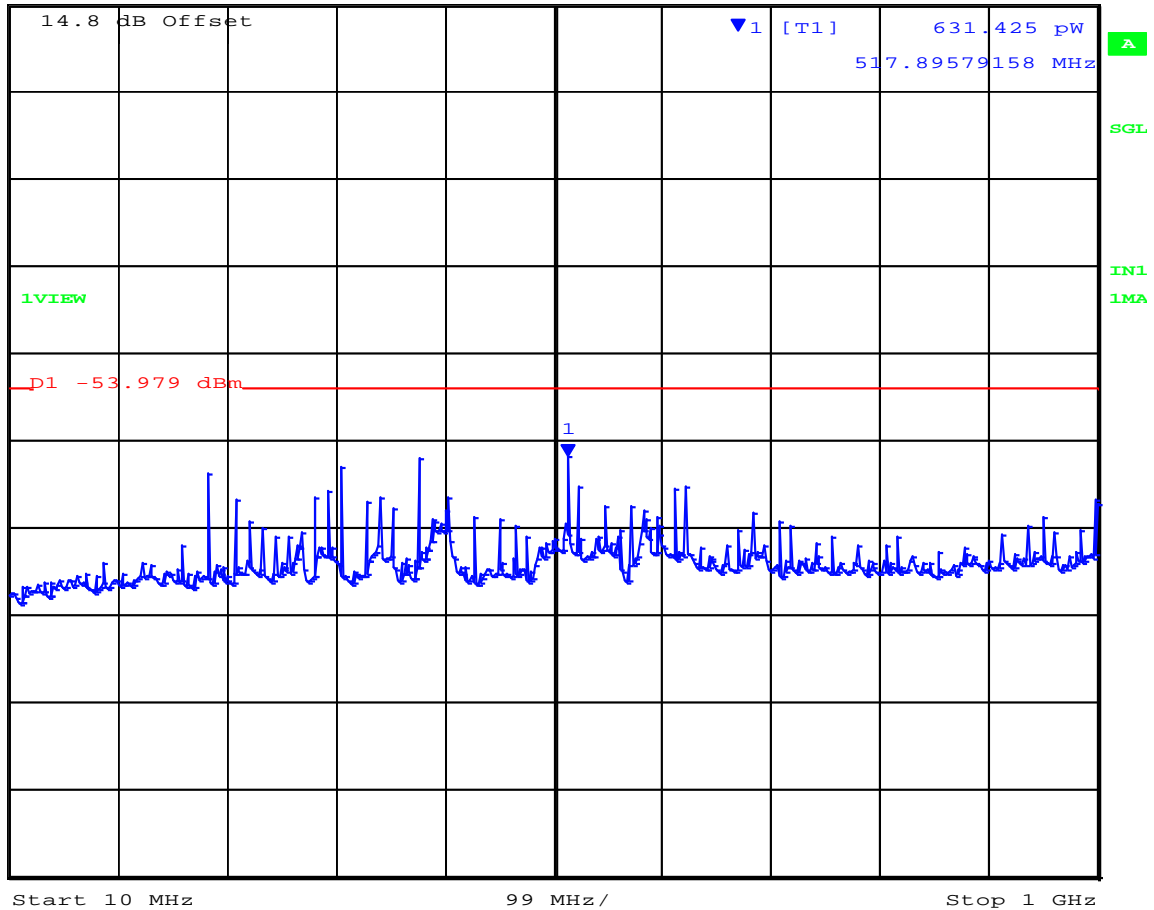
Date: 19.DEC.2010 14:38:08

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### Channel 2,480 MHz Receiver Spurious Emissions 10 – 1,000 MHz +2.2 Vdc

Marker 1 [T1] RBW 100 kHz RF Att 0 dB  
Ref Lvl 631.425 pW VBW 100 kHz  
100 uW 517.89579158 MHz SWT 10 s Unit W



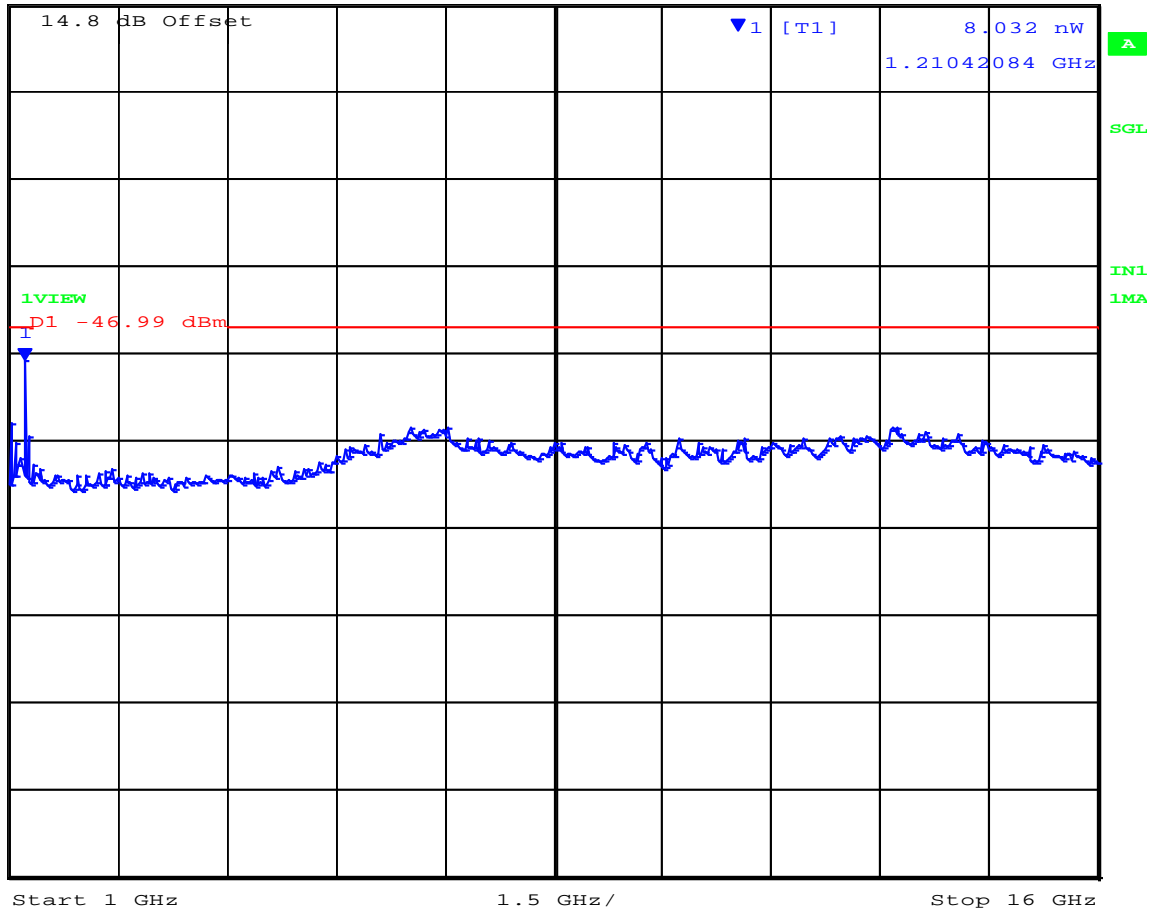
Date: 19.DEC.2010 14:38:54

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### Channel 2,480 MHz Receiver Spurious Emissions 1,000 – 16,000 MHz +2.2 Vdc

Marker 1 [T1] RBW 1 MHz RF Att 0 dB  
Ref Lvl 8.032 nW VBW 1 MHz  
100  $\mu$ W 1.21042084 GHz SWT 60 s Unit W



Date: 19.DEC.2010 14:40:07

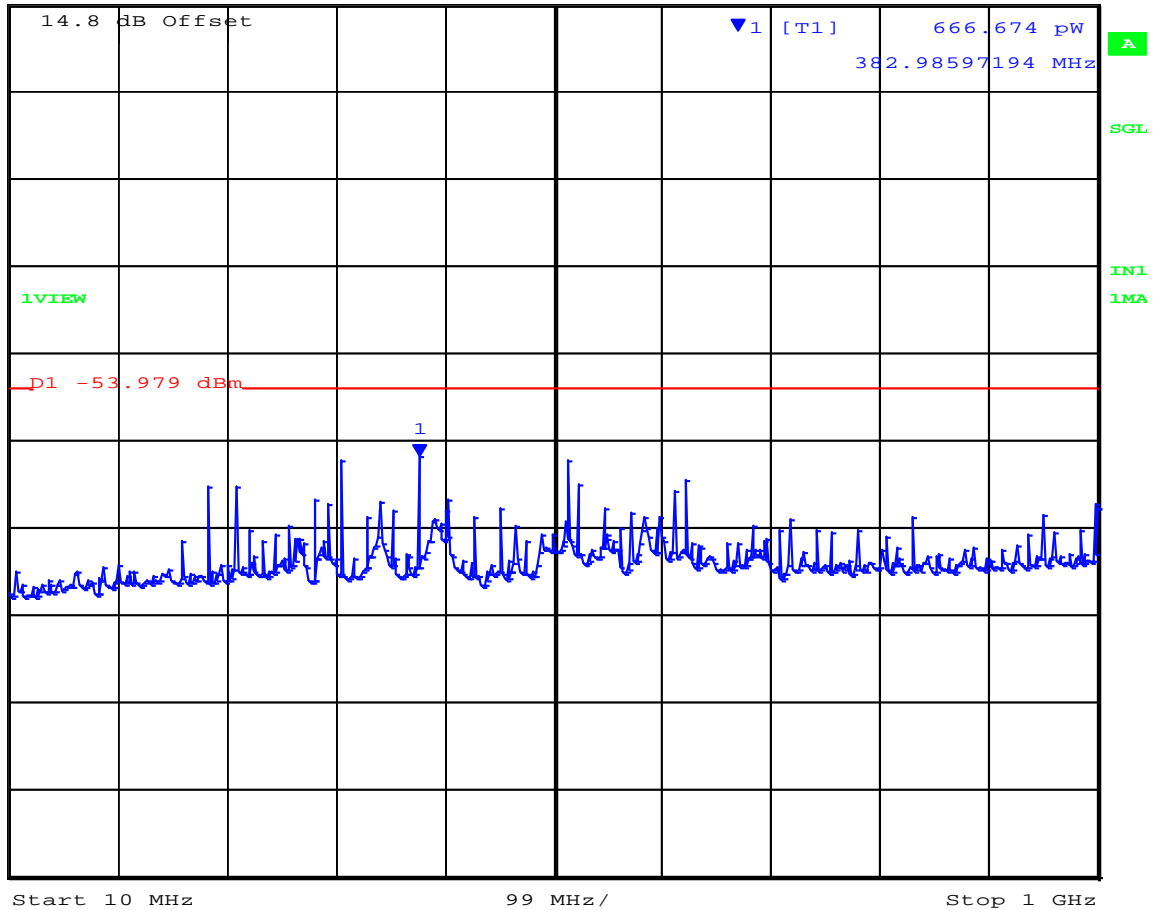
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### Channel 2,480 MHz Receiver Spurious Emissions 10 – 1,000 MHz +3.6 Vdc

Marker 1 [T1] RBW 100 kHz RF Att 0 dB  
Ref Lvl 666.674 pW VBW 100 kHz  
100 uW 382.98597194 MHz SWT 10 s Unit W



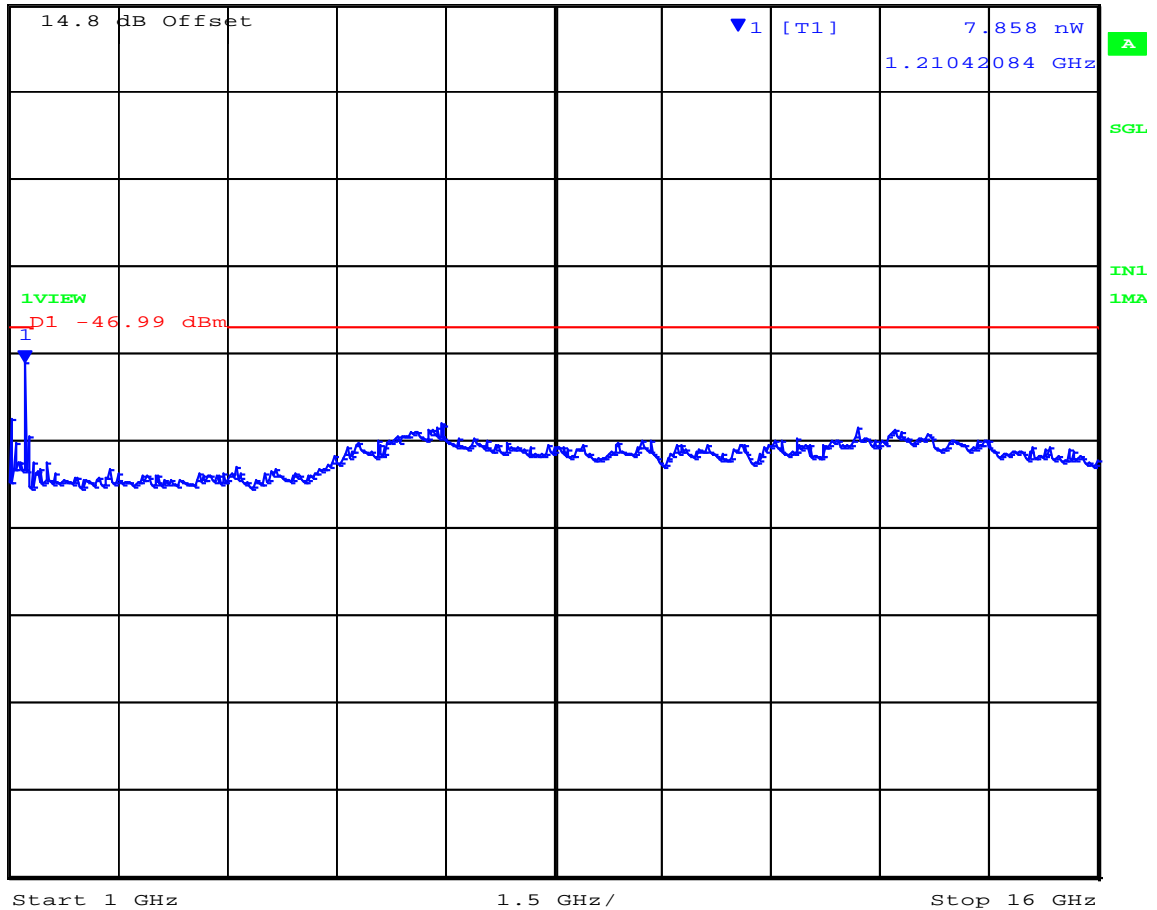
Date: 19.DEC.2010 14:41:28

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### Channel 2,480 MHz Receiver Spurious Emissions 1,000 – 16,000 MHz +3.6 Vdc

Marker 1 [T1] RBW 1 MHz RF Att 0 dB  
Ref Lvl 7.858 nW VBW 1 MHz  
100  $\mu$ W 1.21042084 GHz SWT 60 s Unit W



Date: 19.DEC.2010 14:42:41

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**Title:** 2.4 GHz XBee S2C RF Module  
**To:** Japanese ARIB STD-T66  
**Serial #:** DIGI55-J2 Rev A  
**Issue Date:** 29th March 2017  
**Page:** 139 of 144

## Specification

### Transmitter Spurious Emission Limits

Lower Frequency (MHz)	Upper Frequency (MHz)	Limit (nW/MHz)
5	1,000	4
1,000	16,000	20

### Laboratory Measurement Uncertainty for Conducted Spurious Emissions

Measurement uncertainty	±2.37 dB
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### Traceability

Method	Test Equipment Used
Measurements were made per work instruction WI-05 'Measurement of Spurious Emissions'	0223, 0088, 0116, 0158, 0193, 0312, 0313, 0314

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### 5.1.6. Interference Protection Function

Interference suppression and rejection in Digi brand XBee ZB (Zigbee) S2C radios

1. The RF power output is less than or equal to 8dBm.
2. A Personal Area Network will form. XBee ZB S2C radios will only function in a network of other XBee ZB S2C or XBee® or XBee - PRO® ZB radios. The network of routers and end points will form on the same channel and with the same PAN ID (personal area network ID) as the coordinator. There is to be only one coordinator in a network.
3. Using the Digi X-CTU tool ([http://ftp1.digi.com/support/utilities/40002637\\_c.exe](http://ftp1.digi.com/support/utilities/40002637_c.exe)) "Modem Configuration" tab, the user can change network ID (PAN ID). A radio with a different PAN ID will not respond to radio traffic in this network. This can be done on all radios expected to be included in the network.
4. Radios in the network can also be set to specific channels. To do this, each radio will need to have the same channel mask settings. Using the "Modem Configuration" tab, select the SC – Scan Channels settings. All radios that the user desires to be in this network need to have the same channel settings. All radios will then scan to the same channel, and "associate" with the coordinator. Recommended channels to scan are 15, 20, 21, 22, 25, and 26.

The channel mask is defined as follows:

Bit (Channel):

0 (0x0B)	4 (0x0F)	8 (0x13)	12 (0x17)
1 (0x0C)	5 (0x10)	9 (0x14)	13 (0x18)
2 (0x0D)	6 (0x11)	10 (0x15)	14 (0x19)
3 (0x0E)	7 (0x12)	11 (0x16)	15 (0x1A)

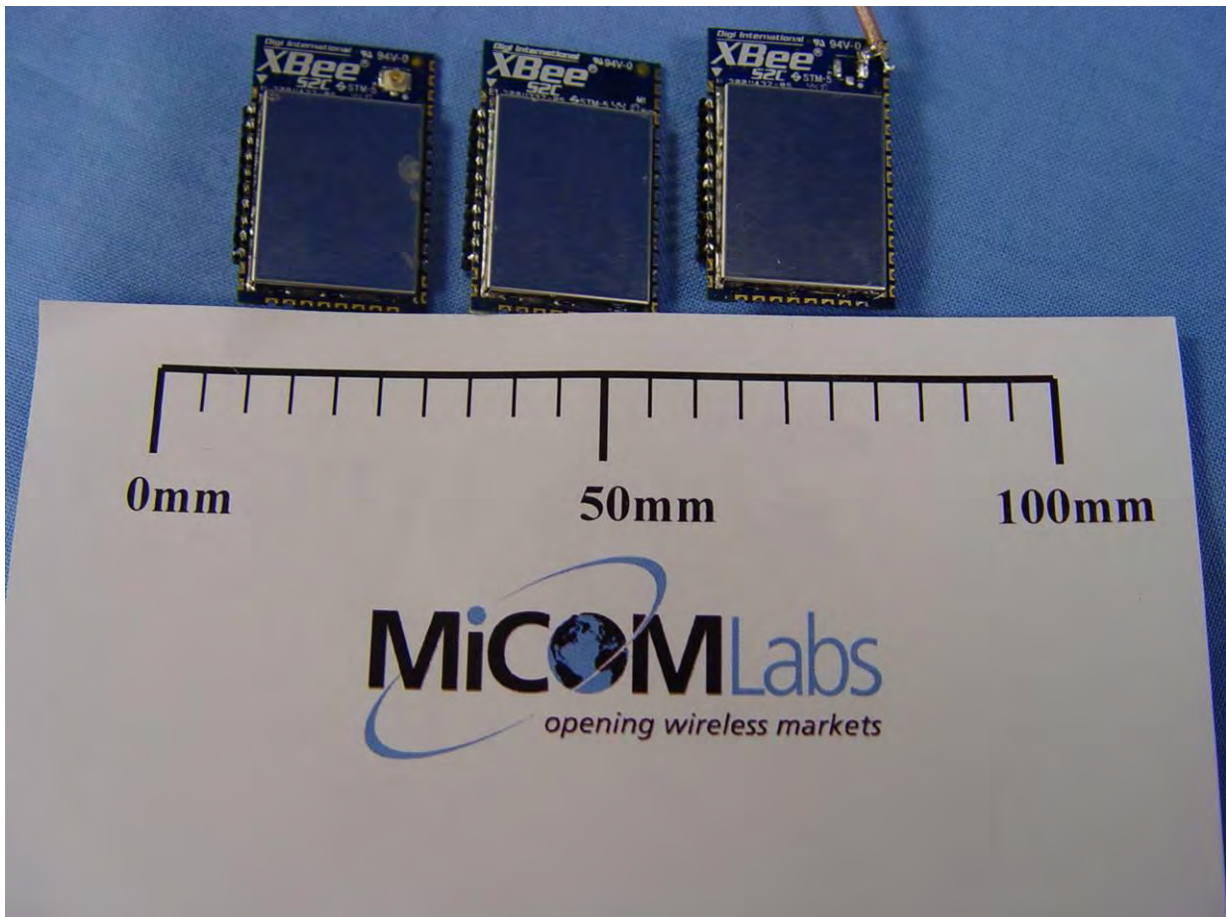
Set the bit in the mask to allow scanning. No radio set on a different channel will respond to traffic on the set channel. Once the bits are set, be sure to "write" the settings.

All of options 2 through 4 are implemented in the MAC or NETWORK layer. Zigbee layers are PHY, MAC and NETWORK.

See chapters 3 and 4 of the XBee ZB S2C Users Manual ([http://ftp1.digi.com/support/documentation/90002002\\_a.pdf](http://ftp1.digi.com/support/documentation/90002002_a.pdf)) for further information on the use and setting for the XBee ZB S2C.

### 5.1.7. RF Accessibility

All components for the XBEE S2C are under the shield. The shield is soldered down on all 4 sides of the perimeter. The shield does not have a break-away section. This prevents unauthorized access and alterations to the module's circuitry. Without the proper equipment and skilled personnel, the module would be damaged during shield removal.



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## 6. PHOTOGRAPHS

### 6.1. General Measurement Test Set-Up



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**Title:** 2.4 GHz XBee S2C RF Module  
**To:** Japanese ARIB STD-T66  
**Serial #:** DIGI55-J2 Rev A  
**Issue Date:** 29th March 2017  
**Page:** 143 of 144

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## **7. TEST EQUIPMENT DETAILS**

<b>Asset #</b>	<b>Instrument</b>	<b>Manufacturer</b>	<b>Part #</b>	<b>Serial #</b>	<b>Last Calibration Date</b>
0223	Power Meter	Hewlett Packard	EPM-442A	US37480256	19 <sup>th</sup> Nov 10
0287	Spectrum Analyzer	Rhode & Schwarz	ESIB40	100201	17 <sup>th</sup> Nov 10
0116	Power Sensor	Hewlett Packard	8485A	3318A19694	17 <sup>th</sup> Nov 10
0158	Barometer /Thermometer	Control Co.	4196	E2846	8 <sup>th</sup> Jan 10
0312	3m SMA Cable	Micro-Coax	UFA210A-1- 1181-3G0300	209092-001	N/A
0313	Coupler	Hewlett Packard	86205A	3140A01285	N/A
0314	20dB N-Type Attenuator	ARRA	N9444-30	1623	N/A

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575 Boulder Court  
Pleasanton, California 94566, USA  
Tel: 1.925.462.0304  
Fax: 1.925.462.0306  
[www.micomlabs.com](http://www.micomlabs.com)