ENGINEERING TEST REPORT

XBee S2D SMT
Model: S2D SMT
FCC ID: MCQ-S2DSM

Applicant:

Digi International Inc.
11001 Bren Road East
Minnetonka, MN 55343

In Accordance With

Federal Communications Commission (FCC)
Part 15, Subpart C, Section 15.247
Digital Modulation Systems (DTS) Operating in 2400 – 2483.5 MHz Band

UltraTech's File No.: 16DIGI109_FCC15C247

This Test report is Issued under the Authority of Tri M. Luu, BASc Vice President of Engineering UltraTech Group of Labs Date: March 18, 2016	
Report Prepared by: Dharmajit Solanki Issued Date: March 18, 2016	Tested by: Hung Trinh Test Dates: February 10 to March 08, 2016

- *The results in this Test Report apply only to the sample(s) tested, and the sample tested is randomly selected.*
- *This report must not be used by the client to claim product endorsement by NVLAP or any agency of the US Government.*

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91038 | 1309 | 46390-2049 | NVLAP LAB CODE 200093-0 | AT-1945 | SL2-IN-E-1119R | Korea KCC-RRA CA2049 | TL363_B | TPTDP DA1300

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EXHIBIT 1. INTRODUCTION

1.1. SCOPE

Reference:	FCC Part 15, Subpart C, Section 15.247
Title:	Code of Federal Regulations (CFR), Title 47 – Telecommunication, Part 15 – Radio Frequency Devices
Purpose of Test:	Equipment Certification for Digital Modulation Systems (DTS) Transmitter Operating in the Frequency Band 2400-2483.5 MHz.
Test Procedures:	▪ ANSI C63.4 ▪ ANSI C63.10 ▪ FCC KDB Publication No. 558074 D01 DTS Meas Guidance v03r04
Environmental Classification:	[x] Commercial, industrial or business environment [x] Residential environment

1.2. RELATED SUBMITTAL(S)/GRANT(S)

None

1.3. NORMATIVE REFERENCES

Publication	Year	Title
47 CFR Parts 0-19	2016	Code of Federal Regulations (CFR), Title 47 – Telecommunication
ANSI C63.4	2014	American National Standard for Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 KHz to 40 GHz
ANSI C63.10	2013	American National Standard for Testing Unlicensed Wireless Devices
CISPR 22 & EN 55022	2008-09, Ed 6 2009	Information Technology Equipment - Radio Disturbance Characteristics - Limits and Methods of Measurement
FCC, KDB Publication No. 558074 D01 DTS Meas Guidance v03r04	2016	Guidance for Performing Compliance Measurements on Digital Transmission Systems (DTS) Operating Under §15.247

EXHIBIT 2. PERFORMANCE ASSESSMENT

2.1. CLIENT INFORMATION

Applicant	
Name:	Digi International Inc.
Address:	11001 Bren Road East Minnetonka, MN 55343 USA
Contact Person:	Mr. Paul Dahl Phone #: 952-912-3444 Fax #: 952-912-4991 Email Address: paul.dahl@digi.com

Manufacturer	
Name:	Digi International Inc.
Address:	11001 Bren Road East Minnetonka, MN 55343 USA
Contact Person:	Mr. Paul Millett Phone #: 801-701-4260 Fax #: 801-765-9895 Email Address: Paul.millett@digi.com

2.2. EQUIPMENT UNDER TEST (EUT) INFORMATION

The following information (with the exception of the Date of Receipt) has been supplied by the applicant.

Brand Name:	Digi International Inc.
Product Name:	XBEE S2D SMT
Model Name or Number:	S2D SMT
Serial Number:	Test Sample
Type of Equipment:	Digital Transmission System (DTS)
Input Power Supply Type:	External DC Power Supply
Primary User Functions of EUT:	ZigBee (802.15.4) connectivity of embedded systems

2.3. EUT'S TECHNICAL SPECIFICATIONS

Transmitter	
Equipment Type:	• Mobile • Base Station (fixed use)
Intended Operating Environment:	▪ Commercial, Industrial or Business environment ▪ Residential environment
Power Supply Requirement:	2.1 to 3.6 VDC @ 100mA Max
RF Output Power Rating:	+8.30 dBm (6.76mW) Peak (2405-2475 MHz) +1.87 dBm (1.54mW) Peak (2480 MHz)
Operating Frequency Range:	2405 – 2480 MHz
RF Output Impedance:	50 Ω
Channel Spacing:	5 MHz
Duty Cycle:	32% or 66% for individual channel(s) depending on the Antenna type, Power setting & Assembly cable loss applied for that configuration)
Modulation Type:	QPSK (DSSS)
Oscillator Frequency(ies):	24 MHz
Antenna/Connector Types:	Integral PCB antenna or U.FL Connector mounted on Module

2.4. ASSOCIATED ANTENNA DESCRIPTION

Antenna Type	Maximum Gain Allowed (dBi)	Required minimum Basic Assembly & Cable Loss for Antenna (dB)
Integral PCB	0.0	0.0
Dipole	2.1	0.63
Omni-Directional	15.0	1.25
Yagi	15.0	1.25
Flat Panel	19.0	1.25

Assembly Cable Loss (The antennas with N connector needs a 91cm SMA to N cable having loss of 0.62dB and all except integral needs basic 12cm UFL to SMA cable having loss of 0.63dB to connect to the module. Combined max total loss is 1.25dB).

2.5. LIST OF EUT'S PORTS

Port Number	EUT's Port Description	Number of Identical Ports	Connector Types	Cable Type (Shielded/Non-shielded)
1	RF port	1	Integrated PCB or U.FL	Shielded cable (N/A for integral antenna)
2	DC supply and I/O port	1	Castellated pad	Direct connection (no cable)

2.6. ANCILLARY EQUIPMENT

The EUT was tested while connected to the following representative configuration of ancillary equipment necessary to exercise the ports during tests:

Ancillary Equipment # 1	
Description:	Test Jig
Brand name:	Digi International
Model Name or Number:	N/A
Serial Number:	N/A
Connected to EUT's Port:	Module Castellated pad

Ancillary Equipment # 2	
Description:	Laptop
Brand name:	IBM
Model Name or Number:	1161-260
Serial Number:	AAA-FV8WK
Connected to EUT's Port:	Test Jig

EXHIBIT 3. EUT OPERATING CONDITIONS AND CONFIGURATIONS DURING TESTS

3.1. CLIMATE TEST CONDITIONS

The climate conditions of the test environment are as follows:

Temperature:	21 to 23°C
Humidity:	45 to 58%
Pressure:	102 kPa
Power Input Source:	3.6 VDC

3.2. OPERATIONAL TEST CONDITIONS & ARRANGEMENT FOR TESTS

Operating Modes:	The transmitter operated in a continuous transmission mode with the carrier modulated as specified in the Test Data.
Special Test Software:	Special software provided by the Applicant to operate the EUT at each channel frequency continuously and in the range of typical modes of operation.
Special Hardware Used:	Test Jig
Transmitter Test Antenna:	The EUT tested with the antenna fitted in a manner typical of normal intended use as integral / non-integral antenna equipment as described with the test results.

Transmitter Test Signals	
Frequency Band(s):	2405 – 2480 MHz
Frequency(ies) Tested:	2405, 2440, 2475 and 2480 MHz
RF Power Output: (measured maximum output power at antenna terminals)	+8.30 dBm (6.76mW) Peak (2405-2475 MHz) +1.87 dBm (1.54mW) Peak (2480 MHz)
Normal Test Modulation:	QPSK
Modulating Signal Source:	Internal

EXHIBIT 4. SUMMARY OF TEST RESULTS

4.1. LOCATION OF TESTS

All of the measurements described in this report were performed at Ultratech Group of Labs located in the city of Oakville, Province of Ontario, Canada.

- AC Power Line Conducted Emissions were performed in UltraTech's shielded room, 24'(L) by 16'(W) by 8'(H).

- Radiated Emissions were performed at the Ultratech's 3-10 TDK Semi-Anechoic Chamber situated in the Town of Oakville, province of Ontario. This test site been calibrated in accordance with ANSI C63.4, and found to be in compliance with the requirements of Sec. 2.948 of the FCC Rules. The descriptions and site measurement data of the Oakville 3-10 TDK Semi-Anechoic Chamber has been filed with FCC office (FCC File No.: 91038) and Industry Canada office (Industry Canada File No.: 2049A-3). Expiry Date: 2017-04-02.

4.2. APPLICABILITY & SUMMARY OF EMC EMISSION TEST RESULTS

FCC Section(s)	Test Requirements	Compliance (Yes/No)
15.203	Antenna requirements	Yes, See Applicant Modular Declaration Ltr
15.207(a)	AC Power Line Conducted Emissions	Yes
15.247(a)(2)	6 dB Bandwidth	Yes
15.247(b)(3)	Peak Conducted Output Power - DTS	Yes
15.247(d), 15.209 & 15.205	Transmitter Band-Edge and Spurious Radiated Emissions	Yes
15.247(e)	Power Spectral Density	Yes
15.247(i), 1.1307, 1.1310, 2.1091	RF Exposure	Yes

4.3. MODIFICATIONS INCORPORATED IN THE EUT FOR COMPLIANCE PURPOSES

None

EXHIBIT 5. TEST DATA

5.1. POWER LINE CONDUCTED EMISSIONS [§15.207(a)]

5.1.1. Limit(s)

The equipment shall meet the limits of the following table:

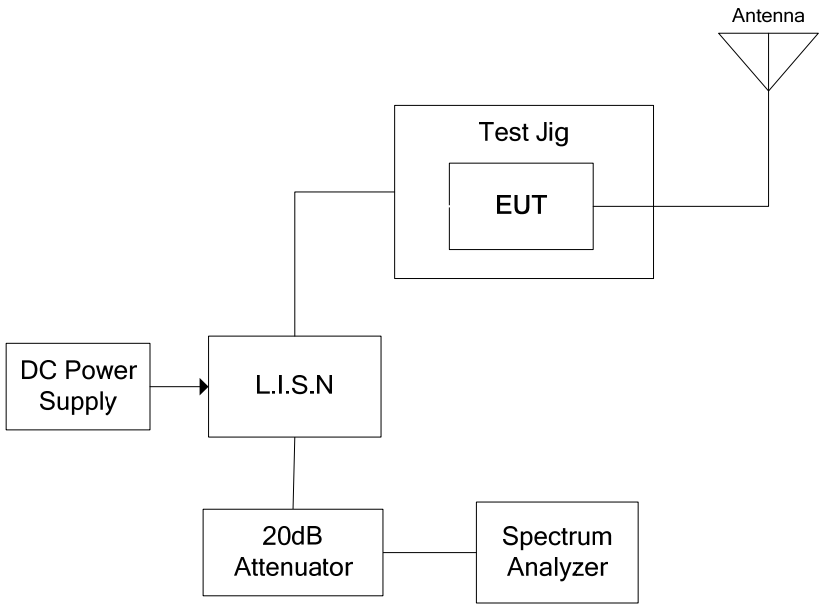
Frequency of emission (MHz)	Conducted Limits (dBμV)	
	Quasi-peak	Average
0.15–0.5 .....……..	66 to 56*	56 to 46*
0.5–5 .....……..	56	46
5-30 ……..	60 ...……..	50

*Decreases linearly with the logarithm of the frequency

5.1.2. Method of Measurements

ANSI C63.4-2009

5.1.3. Test Arrangement

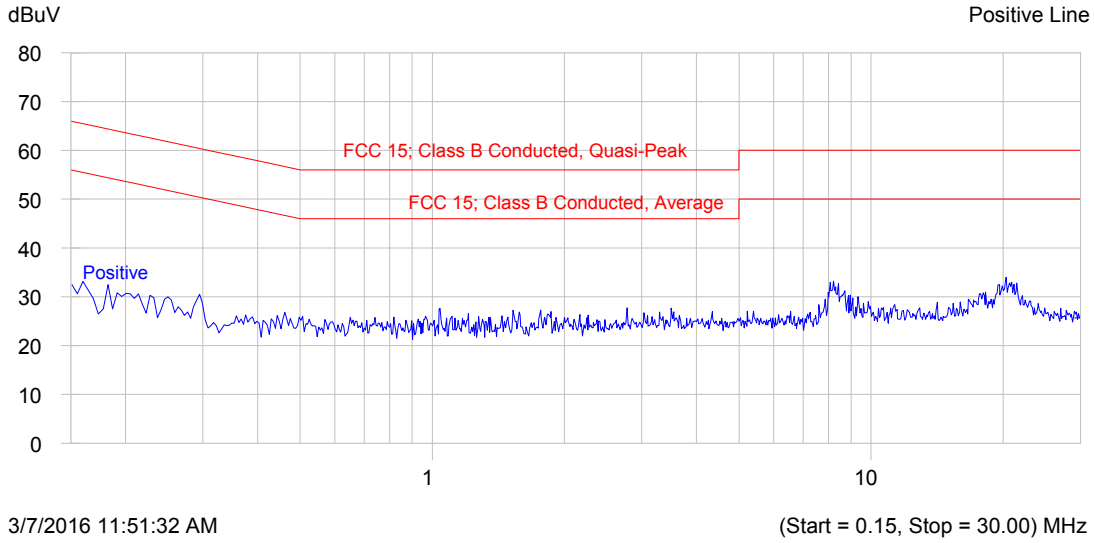


5.1.4. Test Data

Plot 5.1.4.1. Power Line Conducted Emissions; Line Voltage: 3.6 V DC; Line Tested: Positive

Description: TX mode
Setup Name: FCC 15 Class B
Customer Name: Digi International
Project Number: DIGI-109Q
Operator Name: Hung Trinh
EUT Name: XBEE S2D SMT
Date Created: 3/7/2016 11:49:17 AM

Current Graph



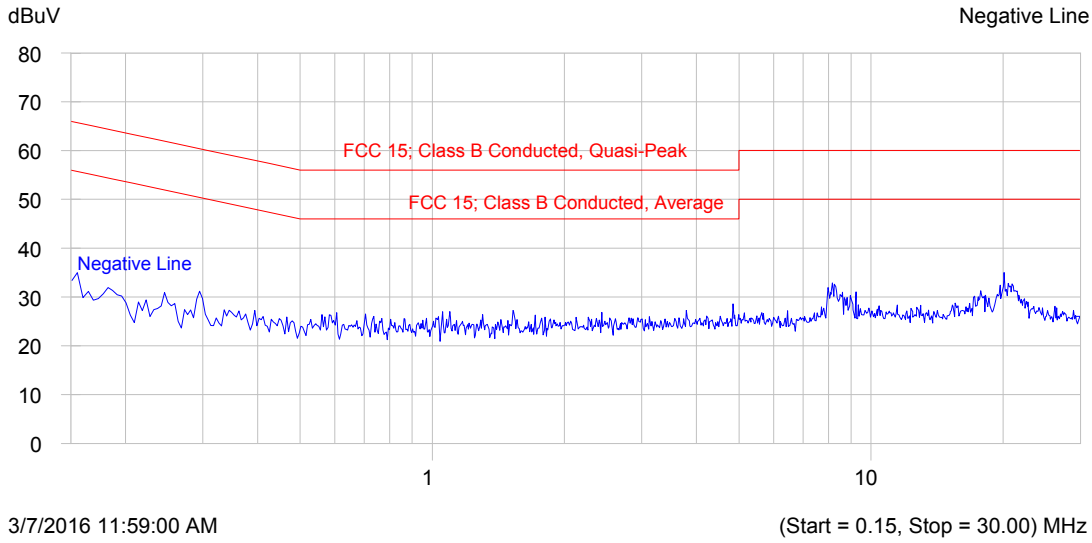
Current List

Frequency MHz	Peak dBuV	QP dBuV	Delta QP-QP Limit dB	Avg dBuV	Delta Avg-Avg Limit dB	Trace Name
0.163	33.1	29.1	-36.5	23.8	-31.8	Positive Line
0.180	32.7	27.6	-37.5	22.0	-33.1	Positive Line
8.211	32.1	28.0	-32.0	16.6	-33.4	Positive Line
20.300	33.3	27.3	-32.7	18.6	-31.4	Positive Line

Plot 5.1.4.2. Power Line Conducted Emissions; Line Voltage: 3.6 V DC; Line Tested: Negative

Description: TX mode
Setup Name: FCC 15 Class B
Customer Name: Digi International
Project Number: DIGI-109Q
Operator Name: Hung Trinh
EUT Name: XBEE S2D SMT
Date Created: 3/7/2016 11:56:37 AM

Current Graph



Current List

Frequency MHz	Peak dBuV	QP dBuV	Delta QP-QP Limit dB	Avg dBuV	Delta Avg-Avg Limit dB	Trace Name
0.159	33.3	29.2	-36.5	23.8	-31.9	Negative Line
0.296	29.3	26.3	-35.5	21.3	-30.5	Negative Line
8.239	33.0	29.1	-30.9	18.1	-31.9	Negative Line
20.111	33.4	27.9	-32.1	21.0	-29.0	Negative Line

5.2. OCCUPIED BANDWIDTH [§ 15.247(a)(2)]

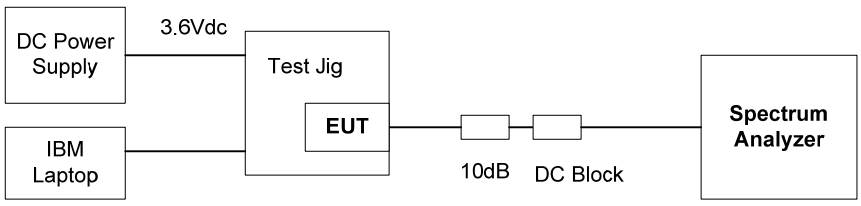
5.2.1. Limit(s)

The minimum 6 dB bandwidth shall be at least 500 kHz.

5.2.2. Method of Measurements

KDB Publication No. 558074 D01 DTS Meas Guidance V03r04, Section 8.1 Option 1

5.2.3. Test Arrangement

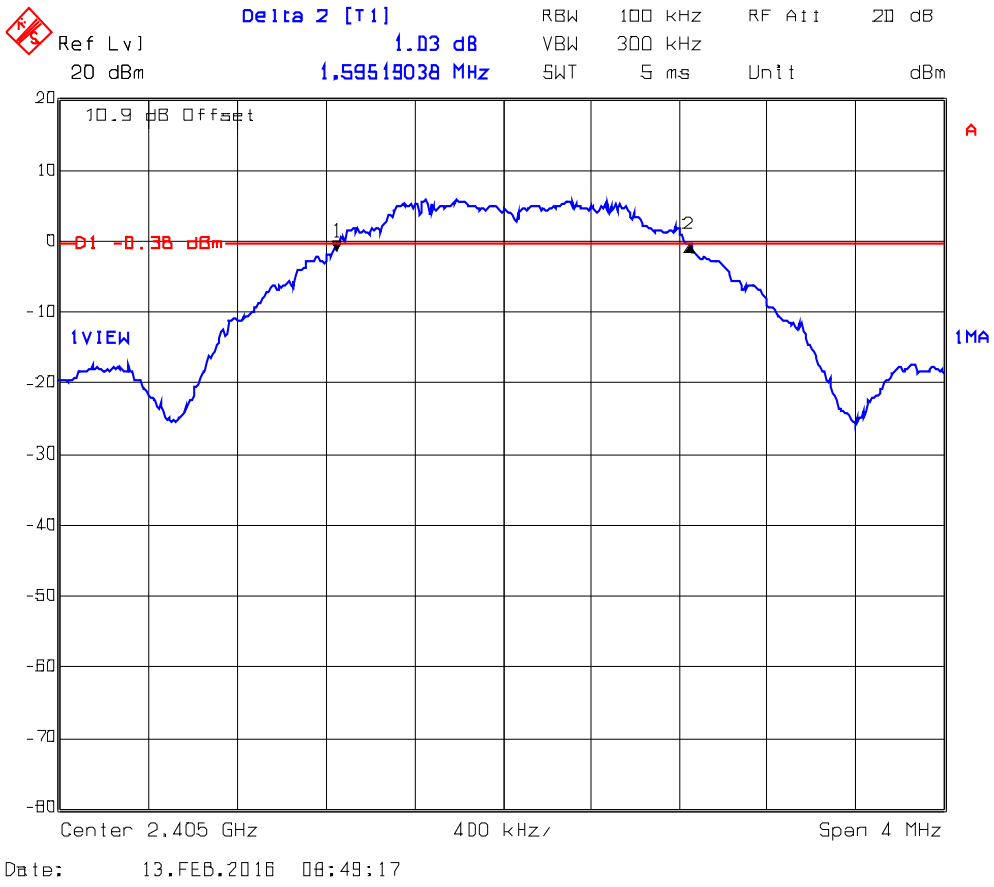


5.2.4. Test Data

Power Setting	Channel Number	Frequency (MHz)	6 dB Bandwidth (MHz)	Minimum 6dB Bandwidth (kHz)
8 Mode 1	11	2405	1.60	> 500 kHz
8 Mode 1	18	2440	1.60	> 500 kHz
8 Mode 1	25	2475	1.61	> 500 kHz
1 Mode 1	26	2480	1.63	> 500 kHz

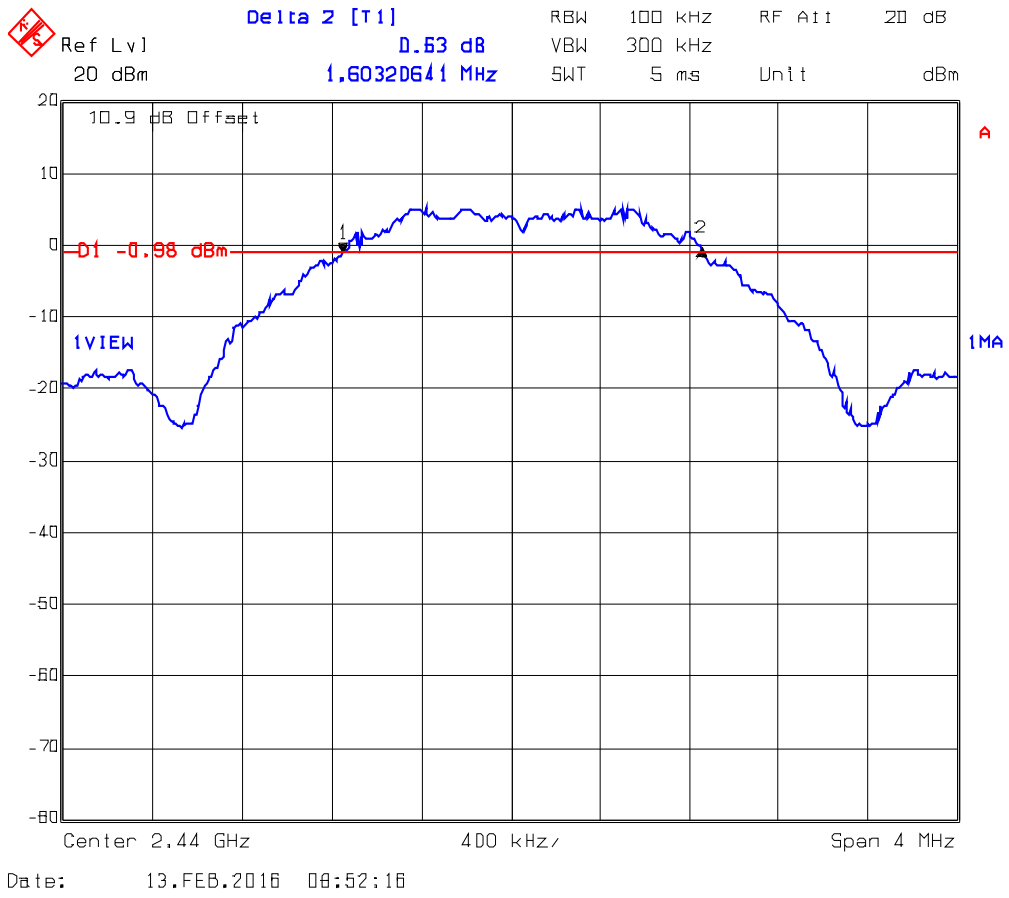
See the following plots for detailed measurements.

Plot 5.2.4.1. 6 dB Bandwidth, Channel 11, 2405 MHz, QPSK Modulation, Power Setting 8, Mode 1



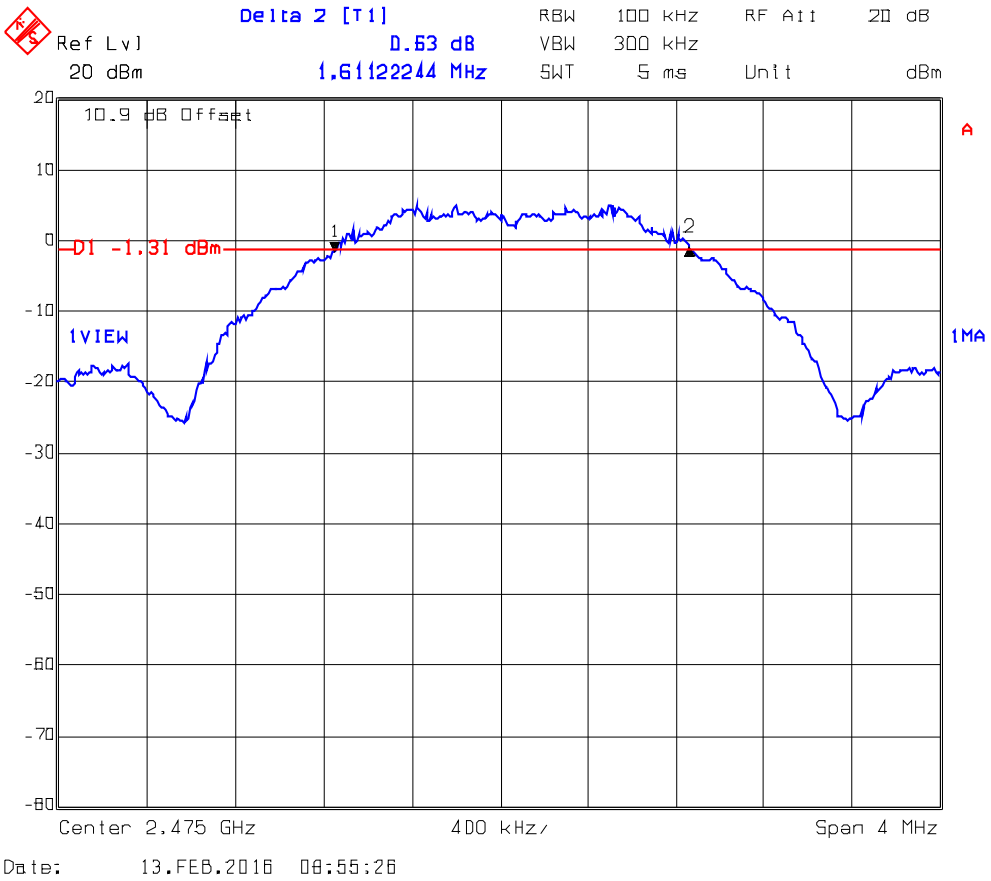
All test results contained in this engineering test report are traceable to National Institute of Standards and Technology (NIST)

Plot 5.2.4.2. 6 dB Bandwidth, Channel 18, 2440 MHz, QPSK Modulation, Power Setting 8, Mode 1

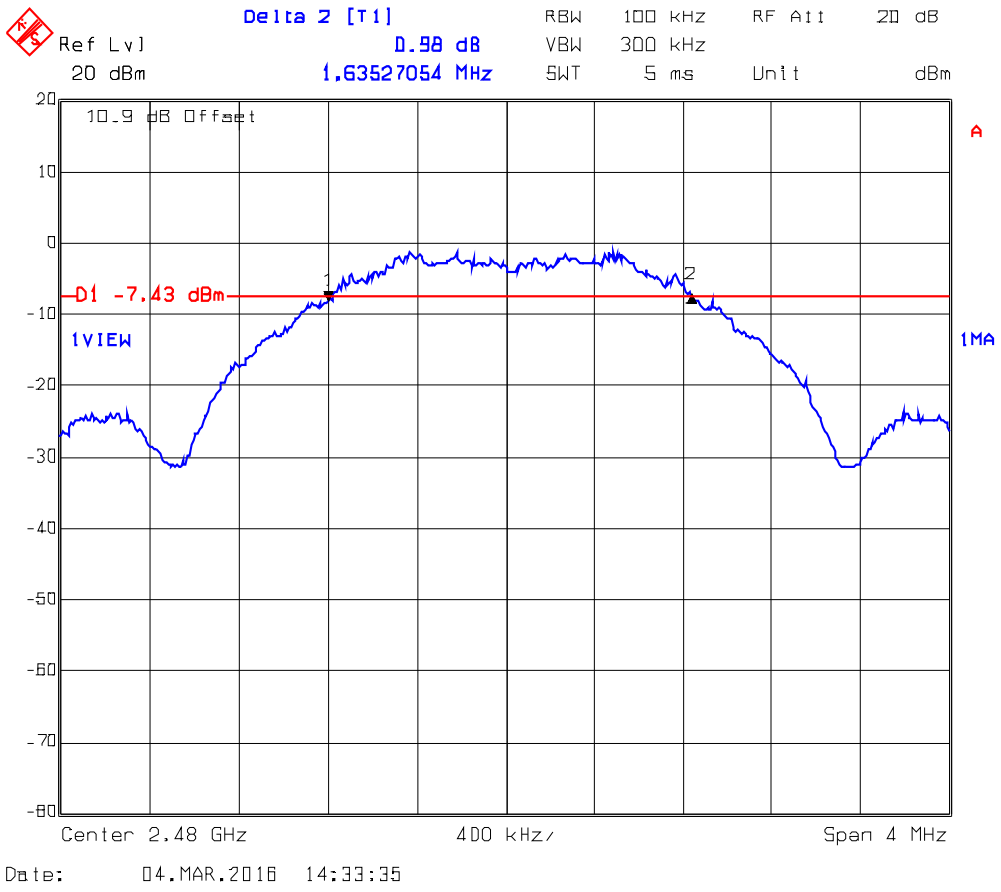


All test results contained in this engineering test report are traceable to National Institute of Standards and Technology (NIST)

Plot 5.2.4.3. 6 dB Bandwidth, Channel 25, 2475 MHz, QPSK Modulation, Power Setting 8, Mode 1



Plot 5.2.4.4. 6 dB Bandwidth, Channel 26, 2480 MHz, QPSK Modulation, Power Setting 1 Mode 1



5.3. PEAK CONDUCTED OUTPUT POWER - DTS [§ 15.247(b)(3)]

5.3.1. Limit(s)

§ 15.247(b)(3): For systems using digital modulation in the 902-928 MHz, 2400-2483.5 MHz, and 5725-5850 MHz bands: 1 Watt. As an alternative to a peak power measurement, compliance with the one Watt limit can be based on a measurement of the maximum conducted output power. Maximum Conducted Output Power is defined as the total transmit power delivered to all antennas and antenna elements averaged across all symbols in the signaling alphabet when the transmitter is operating at its maximum power control level. Power must be summed across all antennas and antenna elements. The average must not include any time intervals during which the transmitter is off or is transmitting at a reduced power level. If multiple modes of operation are possible (e.g., alternative modulation methods), the *maximum conducted output power* is the highest total transmit power occurring in any mode.

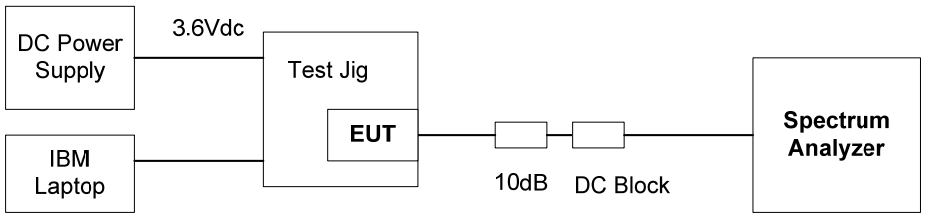
§ 15.247(b)(4): The conducted output power limit specified in paragraph (b) of this section is based on the use of antennas with directional gains that do not exceed 6 dBi. Except as shown in paragraph (c) of this section, if transmitting antennas of directional gain greater than 6 dBi are used, the conducted output power from the intentional radiator shall be reduced below the stated values in paragraphs (b)(1), (b)(2), and (b)(3) of this section, as appropriate, by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

§ 15.247 (b)(4)(i) & (c)(1)(i) Systems operating in the 2400-2483.5 MHz band that are used exclusively for fixed, point-to-point operations may employ transmitting antennas with directional gain greater than 6 dBi provided the maximum conducted output power of the intentional radiator is reduced by 1 dB for every 3 dB that the directional gain of the antenna exceeds 6 dBi.

5.3.2. Method of Measurements & Test Arrangement

KDB Publication No. 558074 D01 DTS Measurement Guidance V03r04, Section 9.1.1 RBW ≥ DTS bandwidth

5.3.3. Test Arrangement



5.3.4. Test Data

Operating Mode	Modulation	Channel Number	Frequency (MHz)	Peak Conducted Power (dBm)	Peak Conducted Power Limit (dBm)
Power Setting +8 Mode 1	QPSK	11	2405	8.30	30
		18	2440	8.06	30
		25	2475	7.66	30
Power Setting +1 Mode 1	QPSK	26	2480	1.87	30
Power Setting -10 Mode 1	QPSK	11	2405	-9.41	30
		18	2440	-9.67	30
		25	2475	-9.81	30
		26	2480	-9.67	30

The following are the antennas having Gains more than 6 dBi: Net gain shall be determined after subtracting the *Basic Assembly Cable Loss (The high gain antennas with N connector needs a 91cm SMA to N cable having loss of 0.62dB and 12cm UFL to SMA basic cable having loss of 0.63dB to connect to module, Combined total loss 1.25dB)

Omni Direction D-Link Antenna 15 dBi gain:

Channel Number	Frequency (MHz)	Modulation	Peak Power (dBm)	Antenna Gain (dBi)	Basic Cable Loss* (dB)	EIRP (dBm)	EIRP Limit (dBm)	Margin (dB)
11	2405	QPSK	8.30	15.00	1.25	22.05	36.00	-13.95
18	2440	QPSK	8.06	15.00	1.25	21.81	36.00	-14.19
25	2475	QPSK	7.66	15.00	1.25	21.41	36.00	-14.59
26	2480	QPSK	1.87	15.00	1.25	15.62	36.00	-20.38

Maxrad Yagi Antenna 15 dBi gain:

Channel Number	Frequency (MHz)	Modulation	Peak Power (dBm)	Antenna Gain (dBi)	Basic Cable Loss* (dB)	EIRP (dBm)	EIRP Limit (dBm)	Margin (dB)
11	2405	QPSK	8.30	15.00	1.25	22.05	36.00	-13.95
18	2440	QPSK	8.06	15.00	1.25	21.81	36.00	-14.19
25	2475	QPSK	7.66	15.00	1.25	21.41	36.00	-14.59
26	2480	QPSK	1.87	15.00	1.25	15.62	36.00	-20.38

Arc Wireless Solution Panel Antenna 19 dBi gain

Channel Number	Frequency (MHz)	Modulation	Peak Power (dBm)	Antenna Gain (dBi)	Basic Cable Loss* (dB)	EIRP (dBm)	EIRP Limit (dBm)	Margin (dB)
11	2405	QPSK	8.30	19.00	1.25	26.05	36.00	-9.95
18	2440	QPSK	8.06	19.00	1.25	25.81	36.00	-10.19
25	2475	QPSK	7.66	19.00	1.25	25.41	36.00	-10.59
26	2480	QPSK	1.87	19.00	1.25	19.62	36.00	-16.38

5.4. TRANSMITTER BAND-EDGE & SPURIOUS RADIATED EMISSIONS AT 3 METERS [§§ 15.247(d), 15.209 & 15.205]

5.4.1. Limit(s)

§ 15.247 (d): In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under paragraph (b)(3) of this section, the attenuation required under this paragraph shall be 30 dB instead of 20 dB. Attenuation below the general limits specified in Section 15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in Section 15.205(a), must also comply with the radiated emission limits specified in Section 15.209(a) (see Section 15.205(c)).

Section 15.205(a) - Restricted Bands of Operation

MHz	MHz	MHz	GHz
0.090–0.110	16.42–16.423	399.9–410	4.5–5.15
[1] 0.495–0.505	16.69475–16.69525	608–614	5.35–5.46
2.1735–2.1905	16.80425–16.80475	960–1240	7.25–7.75
4.125–4.128	25.5–25.67	1300–1427	8.025–8.5
4.17725–4.17775	37.5–38.25	1435–1626.5	9.0–9.2
4.20725–4.20775	73–74.6	1645.5–1646.5	9.3–9.5
6.215–6.218	74.8–75.2	1660–1710	10.6–12.7
6.26775–6.26825	108–121.94	1718.8–1722.2	13.25–13.4
6.31175–6.31225	123–138	2200–2300	14.47–14.5
8.291–8.294	149.9–150.05	2310–2390	15.35–16.2
8.362–8.366	156.52475–156.52525	2483.5–2500	17.7–21.4
8.37625–8.38675	156.7–156.9	2655–2900	22.01–23.12
8.41425–8.41475	162.0125–167.17	3260–3267	23.6–24.0
12.29–12.293	167.72–173.2	3332–3339	31.2–31.8
12.51975–12.52025	240–285	3345.8–3358	36.43–36.5
12.57675–12.57725	322–335.4	3600–4400	([2])
13.36–13.41.			

[1] Until February 1, 1999, this restricted band shall be 0.490–0.510 MHz.
[2] Above 38.6

Section 15.209(a)
-- Field Strength Limits within Restricted Frequency Bands --

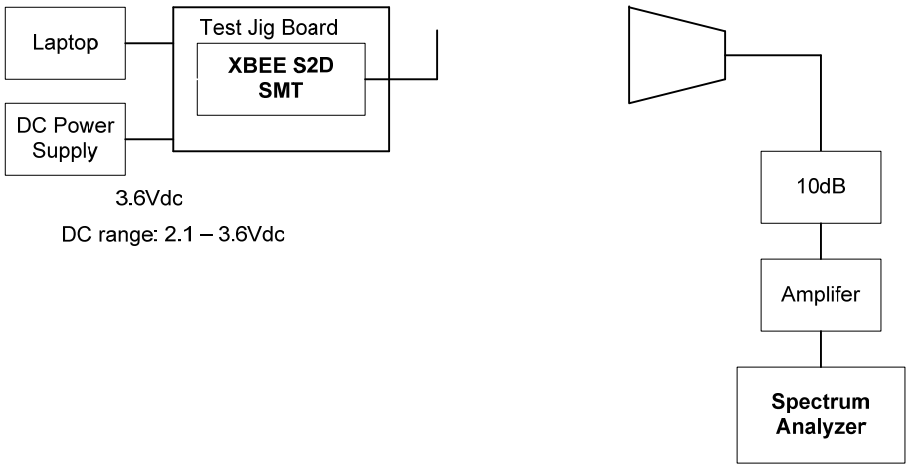
Frequency (MHz)	Field Strength (microvolts/meter)	Measurement Distance (meters)
0.009 - 0.490	2,400 / F (kHz)	300
0.490 - 1.705	24,000 / F (kHz)	30
1.705 - 30.0	30	30
30 – 88	100	3
88 – 216	150	3
216 – 960	200	3
Above 960	500	3

5.4.2. Method of Measurements

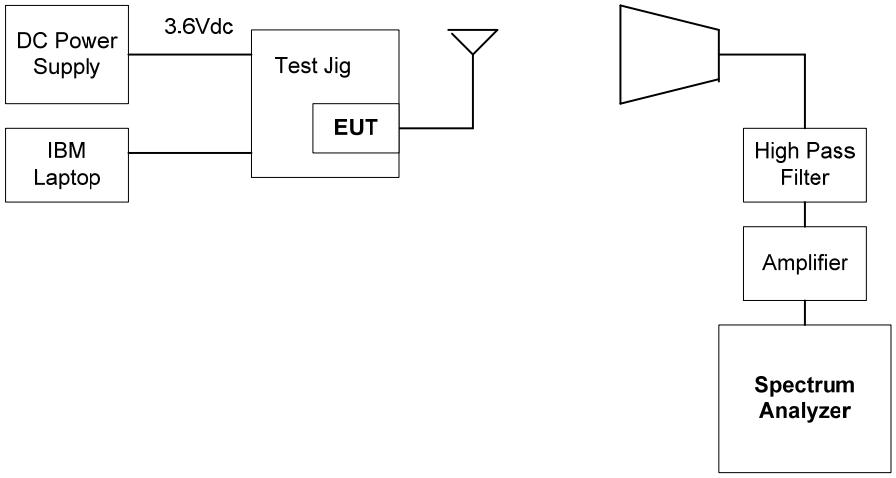
ANSI C63.10 and ANSI 63.4 test procedures.

5.4.3. Test Arrangement

Band-Edge Radiated Set-up Diagram



Tx Radiated Set-up Diagram



5.4.4. Test Data

Remark(s):

- All spurious emissions that are in excess of 20 dB below the specified limit shall be recorded.
- EUT shall be tested in three orthogonal positions.
- The following test results are the worst-case measurements derived from exploratory tests.
- Various duty cycles as listed & its factors were applied to the measured average values to meet the limits.

5.4.4.1. EUT with 0dBi Integral Antenna with 0dB assembly cable loss

5.4.4.1.1. Spurious Radiated Emissions

Fundamental Frequency:	2405 MHz
Power Setting and Operating Mode:	Power 8 Mode 1, QPSK Modulation
Frequency Test Range:	30 MHz - 25 GHz

Frequency (MHz)	RF Peak Level (dBµV/m)	RF Avg Level (dBµV/m)	Antenna Plane (H/V)	Limit 15.209 (dBµV/m)	Limit 15.247 (dBµV/m)	Margin (dB)	Pass/ Fail
2405	107.13	--	V	--	--	--	--
2405	110.70	--	H	--	--	--	--
7215	57.54	46.38	V	54.0	90.7	-40.7	Pass
7215	59.42	48.69	H	54.0	90.7	-42.0	Pass
All other spurious emissions and harmonics are more than 20 dB below the applicable limit.							

*Field strength of emissions appearing within restricted frequency bands shall not exceed the limits in § 15.209.

Fundamental Frequency:	2440 MHz
Power Setting and Operating Mode:	Power 8 Mode 1, QPSK Modulation
Frequency Test Range:	30 MHz - 25 GHz

Frequency (MHz)	RF Peak Level (dBµV/m)	RF Avg Level (dBµV/m)	Antenna Plane (H/V)	Limit 15.209 (dBµV/m)	Limit 15.247 (dBµV/m)	Margin (dB)	Pass/ Fail
2440	107.31	--	V	--	--	--	--
2440	109.87	--	H	--	--	--	--
7320	57.08	45.50	V	54.0	89.9	-8.5	Pass*
7320	61.42	50.11	H	54.0	89.9	-3.9	Pass*
All other spurious emissions and harmonics are more than 20 dB below the applicable limit.							

*Field strength of emissions appearing within restricted frequency bands shall not exceed the limits in § 15.209.

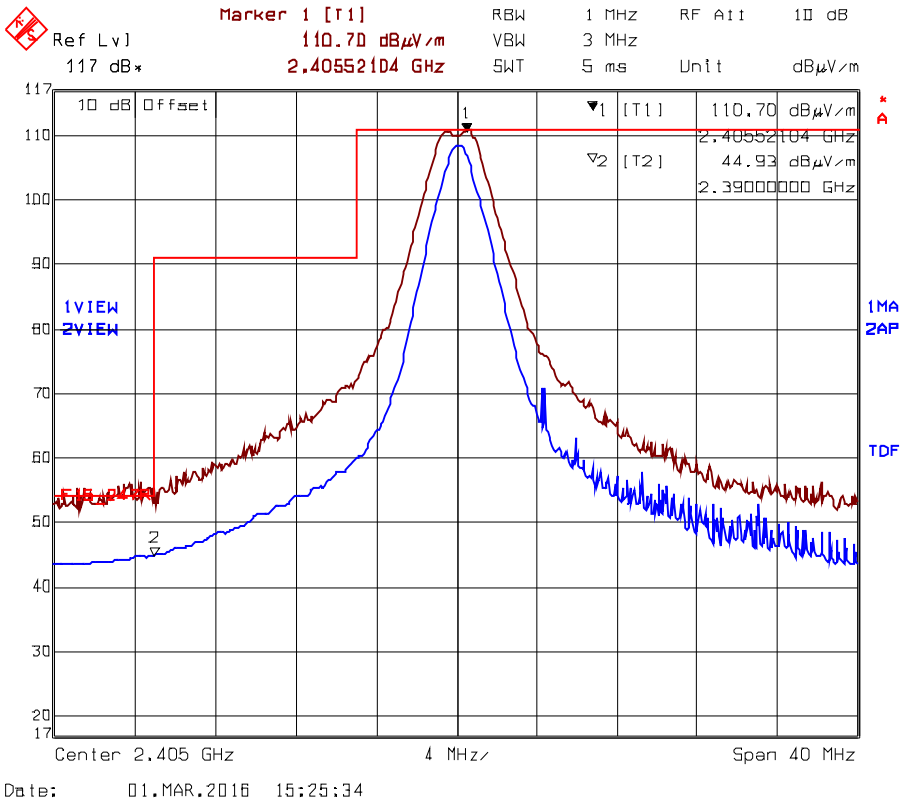
Fundamental Frequency:	2475 MHz
Power Setting and Operating Mode:	Power 8 Mode 1, QPSK Modulation
Frequency Test Range:	30 MHz - 25 GHz

Frequency (MHz)	RF Peak Level (dBµV/m)	RF Avg Level (dBµV/m)	Antenna Plane (H/V)	Limit 15.209 (dBµV/m)	Limit 15.247 (dBµV/m)	Margin (dB)	Pass/ Fail
2475	106.62	--	V	--	--	--	--
2475	108.65	--	H	--	--	--	--
7425	56.73	45.13	V	54.0	88.7	-8.9	Pass*
7425	58.56	47.78	H	54.0	88.7	-6.2	Pass*
All other spurious emissions and harmonics are more than 20 dB below the applicable limit.							

*Field strength of emissions appearing within restricted frequency bands shall not exceed the limits in § 15.209.

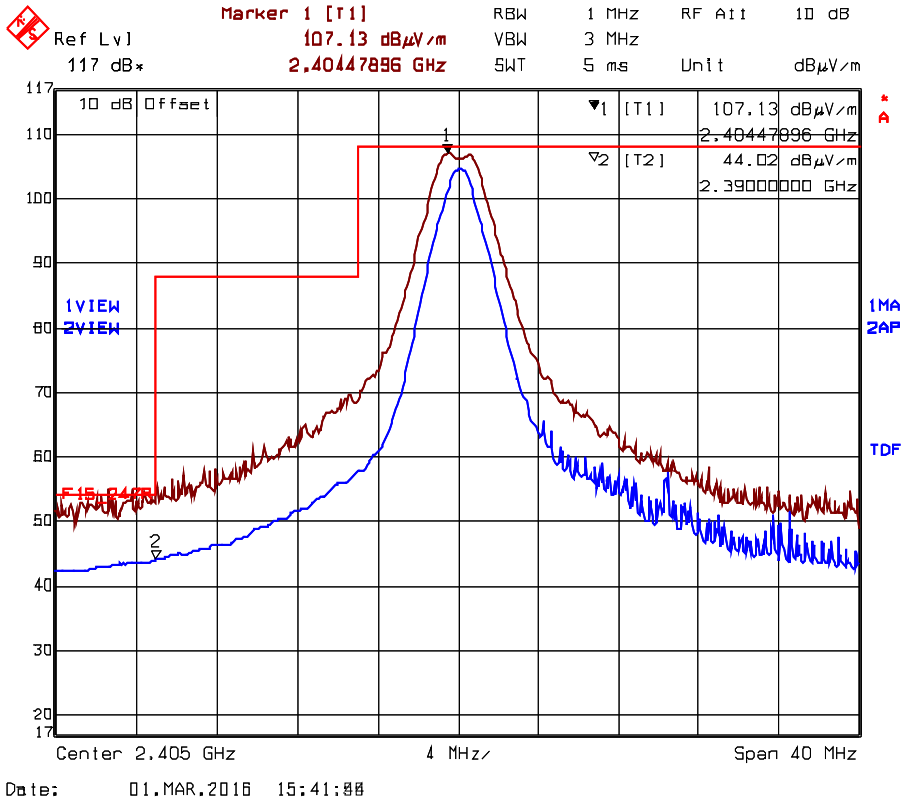
5.4.4.1.2. Band-Edge RF Radiated Emissions

Plot 5.4.4.1.2.1. Band-Edge RF Radiated Emissions at 3 m, Horizontal Polarization
Low End of Frequency Band, Ch11- 2405 MHz, QPSK Modulation, Power 8 Mode 1



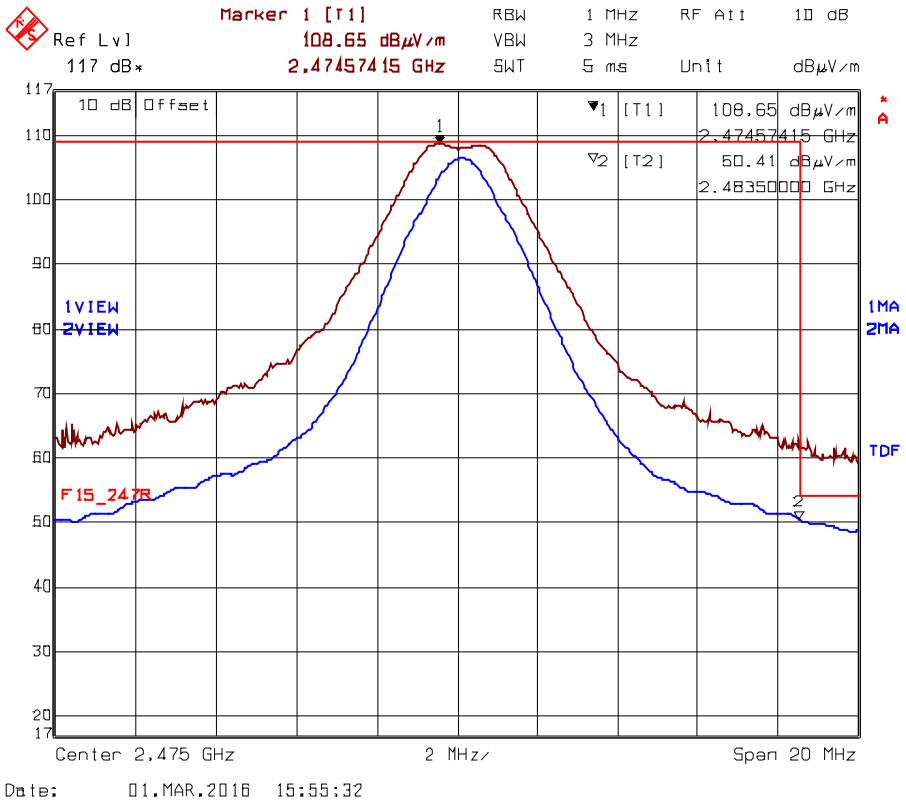
Trace 1: RBW = 1 MHz, VBW = 3 MHz, Trace 2: RBW = 1 MHz, VBW = 10 Hz
Average level at 2390 MHz is 44.93dBµV/m, 100% Duty Cycle can be applied from channel 11 to 25

Plot 5.4.4.1.2.2. Band-Edge RF Radiated Emissions at 3 m, Vertical Polarization
Low End of Frequency Band, Ch11- 2405 MHz, QPSK Modulation, Power 8 Mode 1



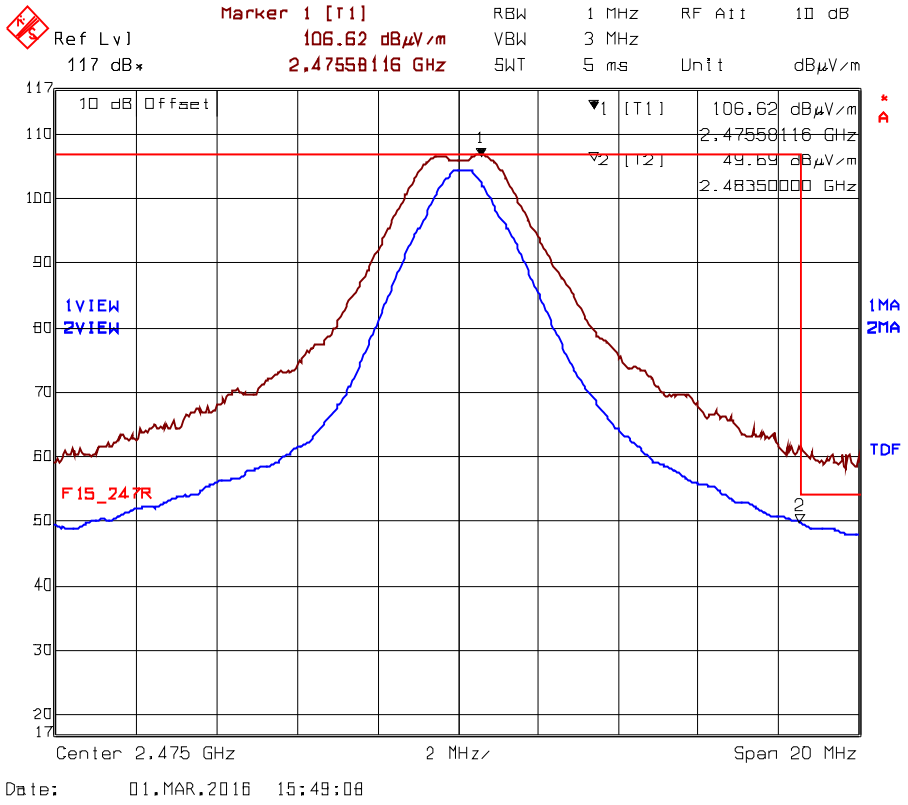
Trace 1: RBW = 1 MHz, VBW = 3 MHz, Trace 2: RBW = 1 MHz, VBW = 10 Hz
Average level at 2390 MHz is 44.02dBµV/m, 100% Duty Cycle can be applied from channel 11 to 25

Plot 5.4.4.1.2.3. Band-Edge RF Radiated Emissions at 3 m, Horizontal Polarization
High End of Frequency Band, Ch25- 2475 MHz, QPSK Modulation, Power 8 Mode 1



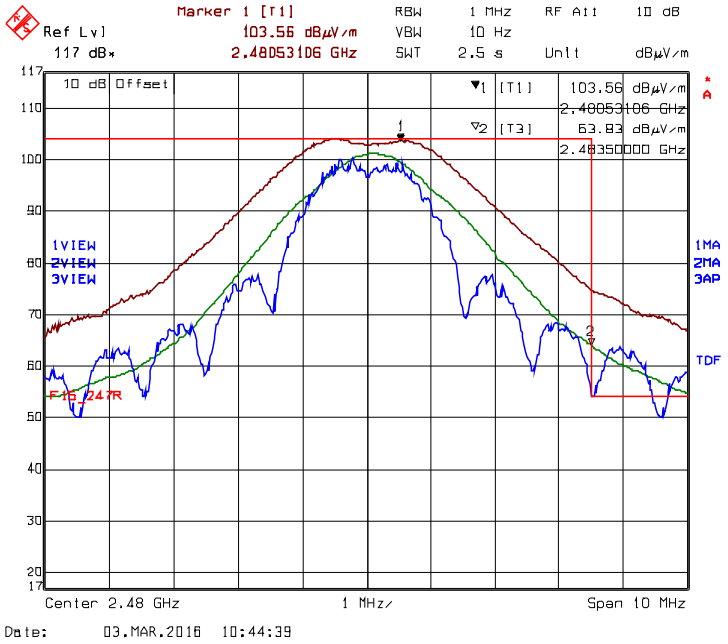
Trace 1: RBW = 1 MHz, VBW = 3 MHz, Trace 2: RBW = 1 MHz, VBW = 10 Hz
Average level at 2483.5 MHz is 50.41dBµV/m, 100% Duty Cycle can be applied from channel 11 to 25

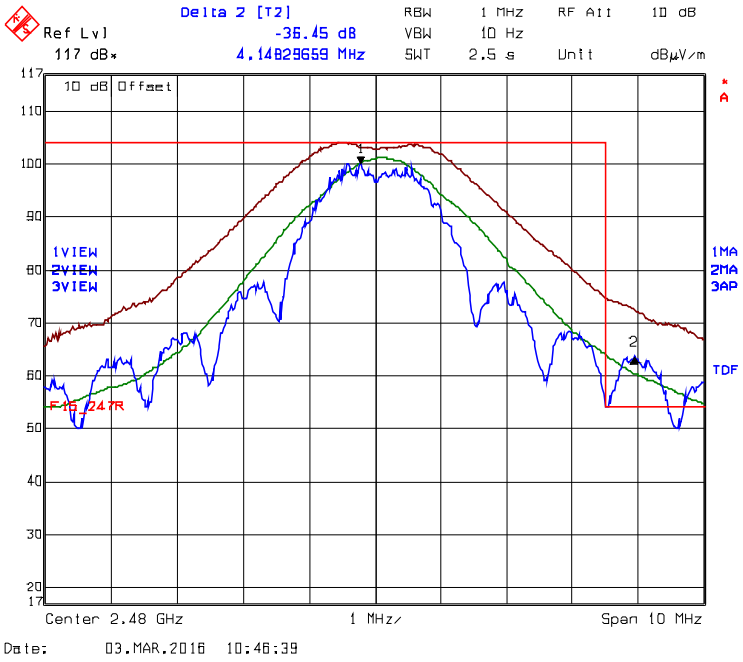
Plot 5.4.4.1.2.4. Band-Edge RF Radiated Emissions at 3 m, Vertical Polarization
High End of Frequency Band, Ch25- 2475 MHz, QPSK Modulation, Power 8 Mode 1



Trace 1: RBW = 1 MHz, VBW = 3 MHz, Trace 2: RBW = 1 MHz, VBW = 10 Hz
Average level at 2483.5 MHz is 49.69dBµV/m, 100% Duty Cycle can be applied from channel 11 to 25

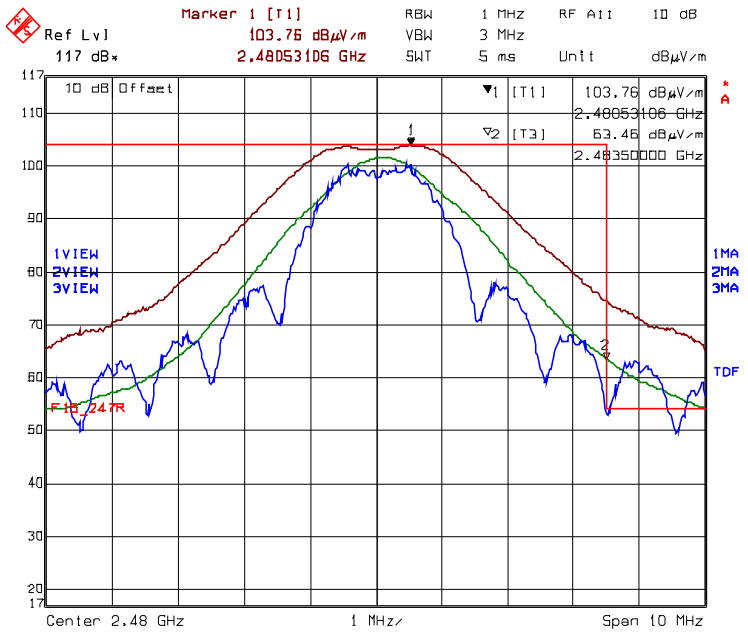
Plot 5.4.4.1.2.5. Band-Edge RF Radiated Emissions at 3 m, Horizontal Polarization
Highest End of Frequency Band, Ch26- 2480 MHz, QPSK Modulation, Power 1 Mode 1 @ 32% Duty Cycle

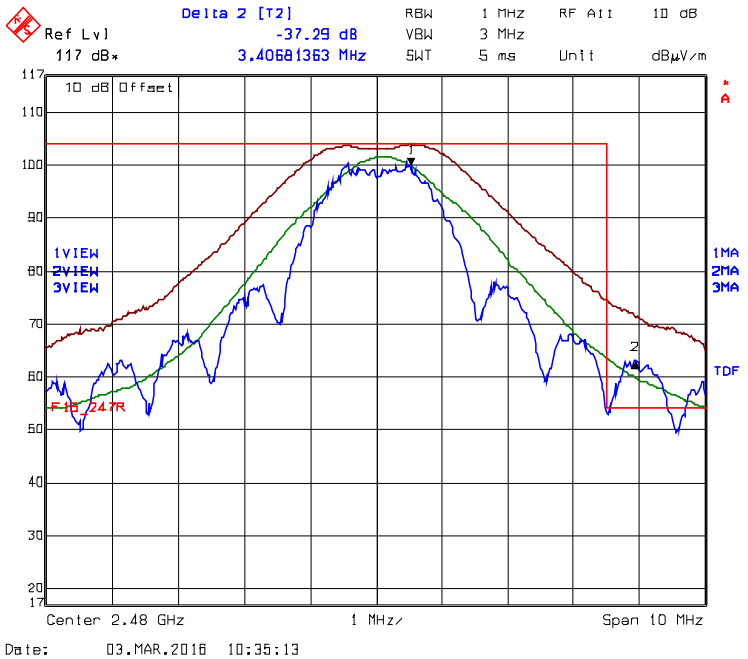




Trace 1: RBW= 1 MHz, VBW= 3 MHz, Trace 2: RBW= 100 kHz, VBW= 300 kHz, Delta (Peak to Band-Edge): 36.45dB
Trace 3: RBW= 1 MHz, VBW= 10 Hz, Peak Band-Edge at 2483.5 MHz: Peak = 103.56dBµV/m – 36.45dB = 67.11dBµV/m; Average: 63.83dBµV/m – 9.90dB= 53.93dBµV/m, Duty cycle is 32% (20*log(0.32)= -9.90dB}

Plot 5.4.4.1.2.6. Band-Edge RF Radiated Emissions at 3 m, Vertical Polarization
Highest End of Frequency Band, Ch26- 2480 MHz, QPSK Modulation, Power 1 Mode 1 @ 32% Duty Cycle





Trace 1: RBW= 1 MHz, VBW= 3 MHz, Trace 2: RBW= 100 kHz, VBW= 300 kHz, Delta (Peak to Band-Edge): 37.29dB
Trace 3: RBW= 1 MHz, VBW= 10 Hz, Peak Band-Edge at 2483.5 MHz: Peak = 103.76dBµV/m – 37.29dB = 66.47dBµV/m; Average: 63.46dBµV/m – 9.90dB= 53.76dBµV/m, Duty cycle is 32% (20*log(0.32)= -9.90dB}

5.4.4.2. EUT with 2.1 dBi Dipole Antenna with 0.63dB Assembly Cable loss

5.4.4.2.1. Spurious Radiated Emissions

Fundamental Frequency:	2405 MHz
Power Setting and Operating Mode:	Power 8 Mode 1, QPSK Modulation
Frequency Test Range:	30 MHz - 25 GHz

Frequency (MHz)	RF Peak Level (dBµV/m)	RF Avg Level (dBµV/m)	Antenna Plane (H/V)	Limit 15.209 (dBµV/m)	Limit 15.247 (dBµV/m)	Margin (dB)	Pass/ Fail
2405	105.92	--	V	--	--	--	--
2405	103.05	--	H	--	--	--	--
7215	57.65	46.51	V	54.0	85.9	-39.4	Pass
7215	59.51	48.59	H	54.0	85.9	-37.3	Pass
All other spurious emissions and harmonics are more than 20 dB below the applicable limit.							

*Field strength of emissions appearing within restricted frequency bands shall not exceed the limits in § 15.209.

Fundamental Frequency:	2440 MHz
Power Setting and Operating Mode:	Power 8 Mode 1, QPSK Modulation
Frequency Test Range:	30 MHz - 25 GHz

Frequency (MHz)	RF Peak Level (dBµV/m)	RF Avg Level (dBµV/m)	Antenna Plane (H/V)	Limit 15.209 (dBµV/m)	Limit 15.247 (dBµV/m)	Margin (dB)	Pass/ Fail
2440	105.16	--	V	--	--	--	--
2440	103.27	--	H	--	--	--	--
7320	59.62	48.91	V	54.0	85.2	-5.1	Pass*
7320	60.82	49.78	H	54.0	85.2	-4.2	Pass*
All other spurious emissions and harmonics are more than 20 dB below the applicable limit.							

*Field strength of emissions appearing within restricted frequency bands shall not exceed the limits in § 15.209.

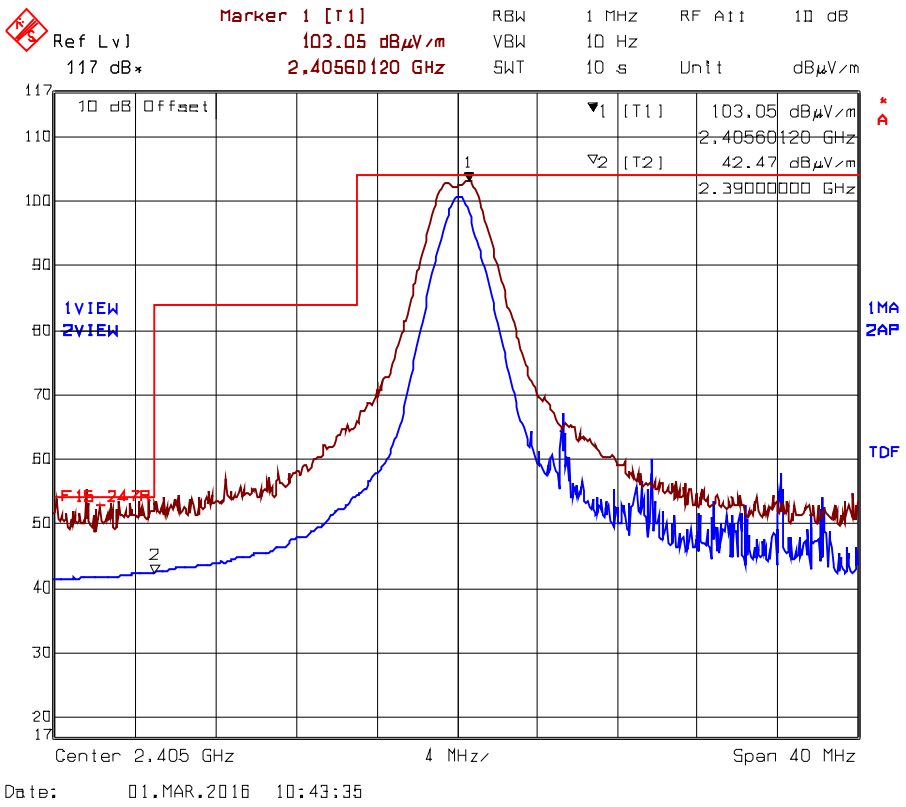
Fundamental Frequency:	2475 MHz
Power Setting and Operating Mode:	Power 8 Mode 1, QPSK Modulation
Frequency Test Range:	30 MHz - 25 GHz

Frequency (MHz)	RF Peak Level (dBµV/m)	RF Avg Level (dBµV/m)	Antenna Plane (H/V)	Limit 15.209 (dBµV/m)	Limit 15.247 (dBµV/m)	Margin (dB)	Pass/ Fail
2475	104.63	--	V	--	--	--	--
2475	103.82	--	H	--	--	--	--
7425	57.71	44.50	V	54.0	84.6	-9.5	Pass*
7425	58.24	47.75	H	54.0	84.6	-6.2	Pass*
All other spurious emissions and harmonics are more than 20 dB below the applicable limit.							

*Field strength of emissions appearing within restricted frequency bands shall not exceed the limits in § 15.209.

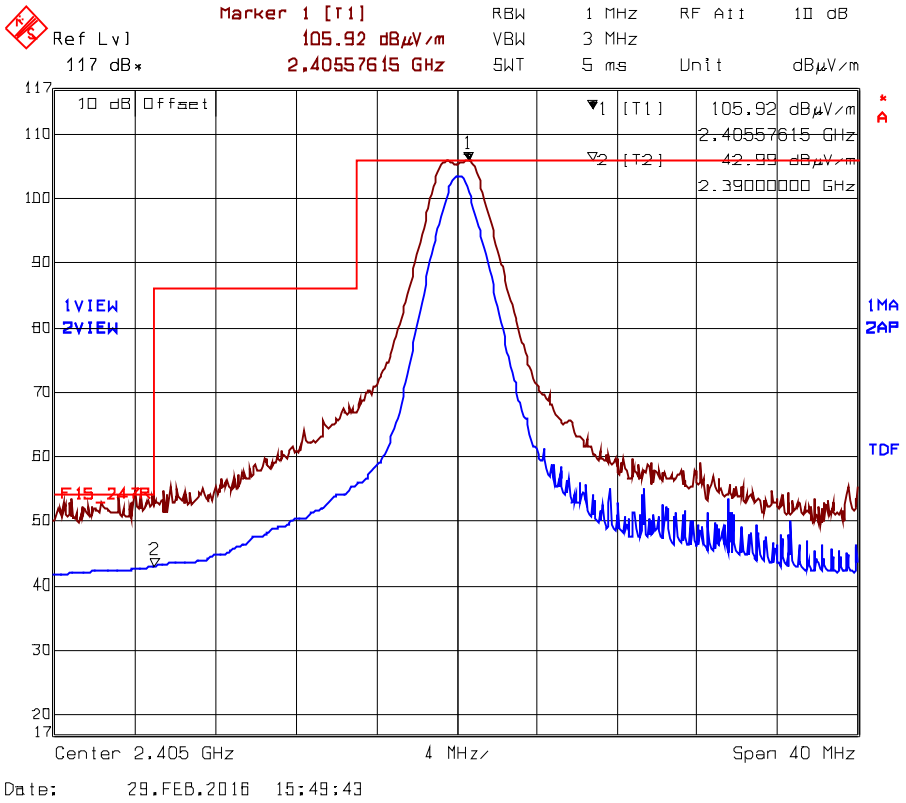
5.4.4.2.2. Band-Edge RF Radiated Emissions

Plot 5.4.4.2.2.1. Band-Edge RF Radiated Emissions at 3 m, Horizontal Polarization
Low End of Frequency Band, Ch11- 2405 MHz, QPSK Modulation, Power 8 Mode 1



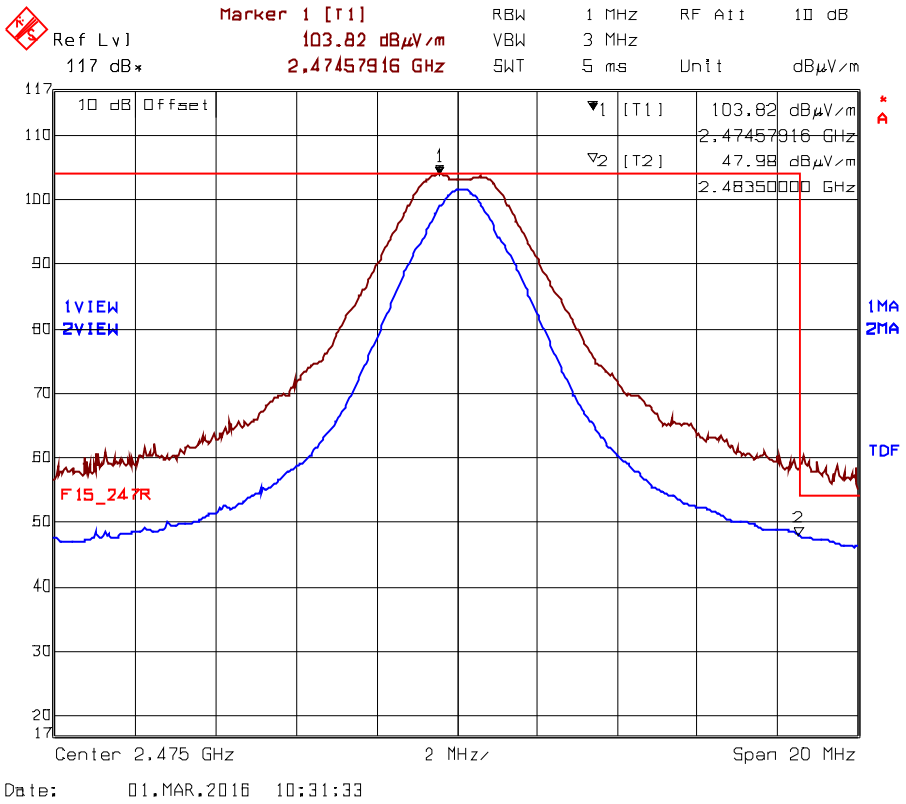
Trace 1: RBW = 1 MHz, VBW = 3 MHz, Trace 2: RBW = 1 MHz, VBW = 10 Hz
Average level at 2390 MHz is 42.47dBµV/m, 100% Duty Cycle can be applied from channel 11 to 25

Plot 5.4.4.2.2.2. Band-Edge RF Radiated Emissions at 3 m, Vertical Polarization
Low End of Frequency Band, Ch11- 2405 MHz, QPSK Modulation, Power 8 Mode 1



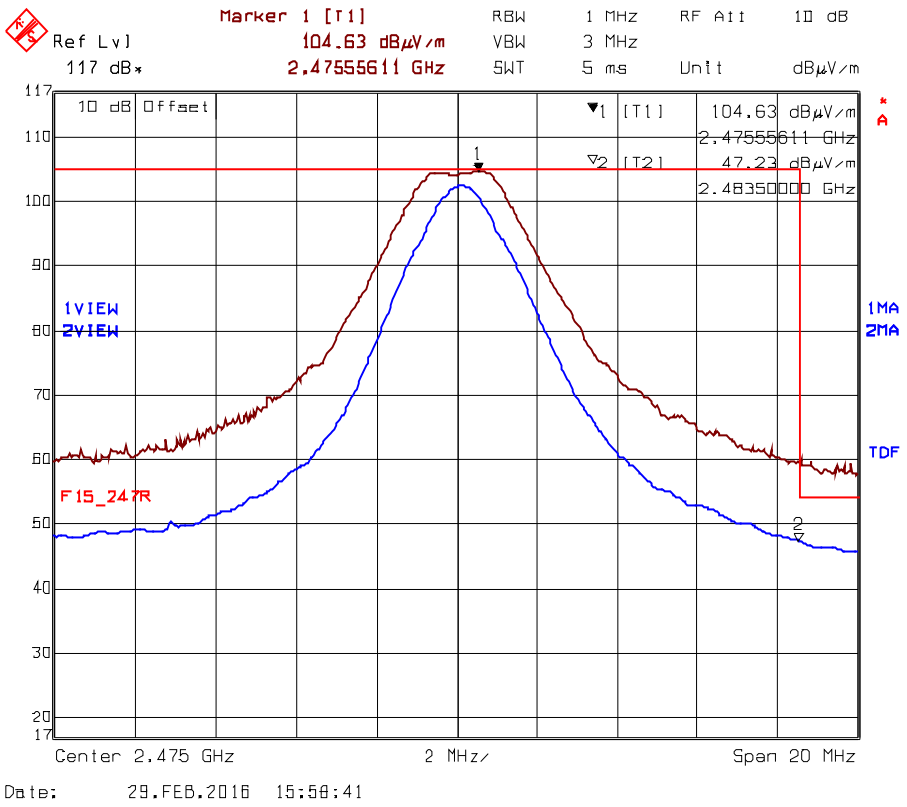
Trace 1: RBW = 1 MHz, VBW = 3 MHz, Trace 2: RBW = 1 MHz, VBW = 10 Hz
Average level at 2390 MHz is 42.99dBµV/m, 100% Duty Cycle can be applied from channel 11 to 25

Plot 5.4.4.2.2.3. Band-Edge RF Radiated Emissions at 3 m, Horizontal Polarization
High End of Frequency Band, Ch25- 2475 MHz, QPSK Modulation, Power 8 Mode 1



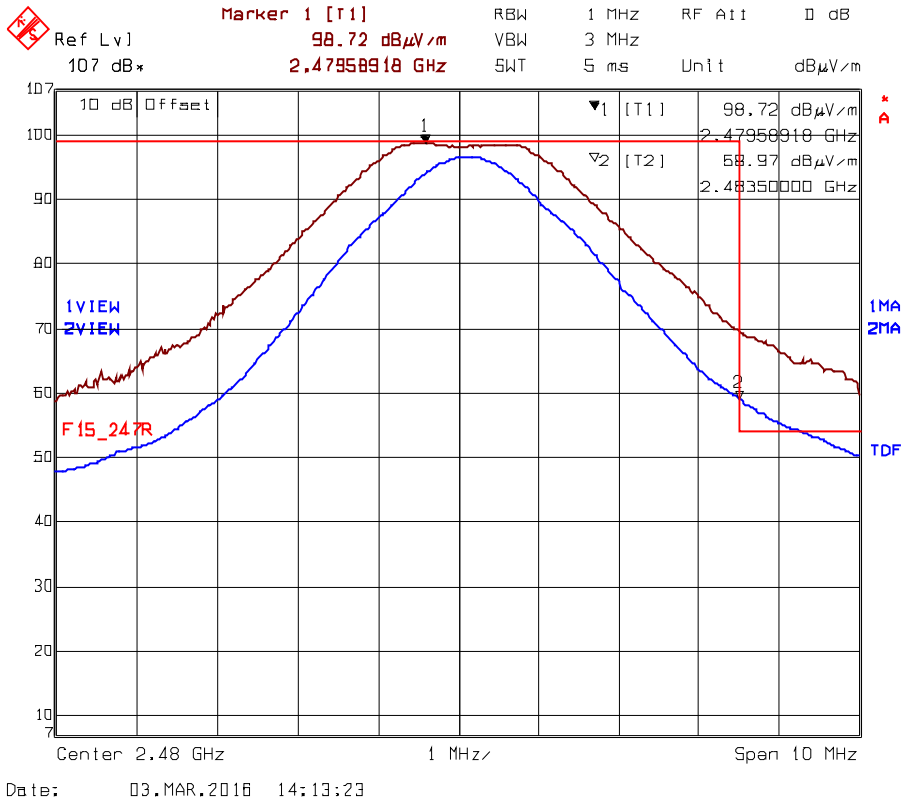
Trace 1: RBW = 1 MHz, VBW = 3 MHz, Trace 2: RBW = 1 MHz, VBW = 10 Hz
Average level at 2483.5 MHz is 47.98dBµV/m, 100% Duty Cycle can be applied from channel 11 to 25

Plot 5.4.4.2.2.4. Band-Edge RF Radiated Emissions at 3 m, Vertical Polarization
High End of Frequency Band, Ch25- 2475 MHz, QPSK Modulation, Power 8 Mode 1



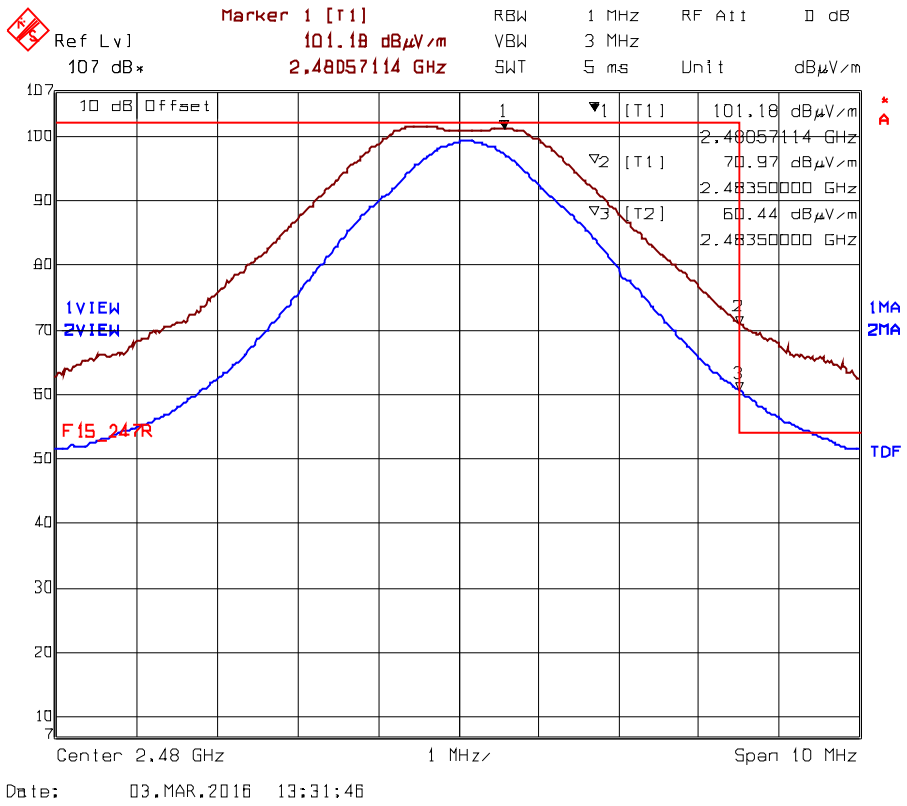
Trace 1: RBW = 1 MHz, VBW = 3 MHz, Trace 2: RBW = 1 MHz, VBW = 10 Hz
Average level at 2483.5 MHz is 47.23dBµV/m, 100% Duty Cycle can be applied from channel 11 to 25

Plot 5.4.4.2.2.5. Band-Edge RF Radiated Emissions at 3 m, Horizontal Polarization
Highest End of Frequency Band, Ch26- 2480 MHz, QPSK Modulation, Power 1 Mode 1 @ 32% Duty Cycle



Trace 1: RBW= 1 MHz, VBW= 3 MHz, Trace 2: RBW= 1 MHz, VBW= 10 Hz
Average: 58.97dBµV/m – 9.90dB= 49.07dBµV/m, Duty cycle is 32% (20*log(0.32)= -9.90dB}

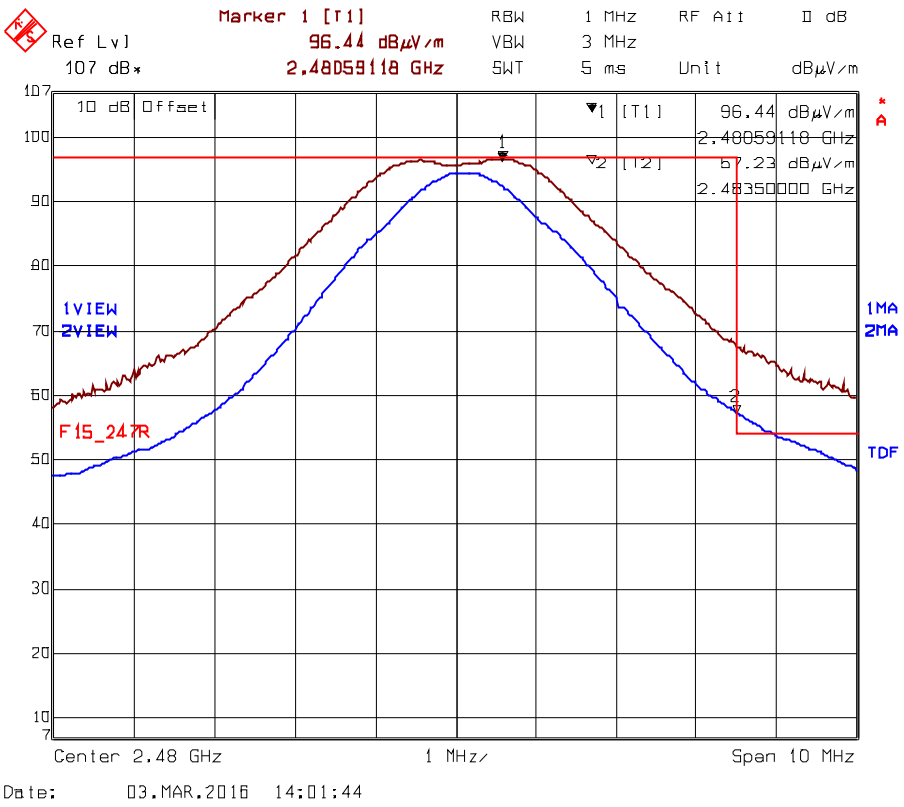
Plot 5.4.4.2.2.6. Band-Edge RF Radiated Emissions at 3 m, Vertical Polarization
Highest End of Frequency Band, Ch26- 2480 MHz, QPSK Modulation, Power 1 Mode 1 @ 32% Duty Cycle



Trace 1: RBW= 1 MHz, VBW= 3 MHz, Trace 2: RBW= 1 MHz, VBW= 10 Hz
Average: 60.44dBµV/m – 9.90dB= 50.54dBµV/m, Duty cycle is 32% (20*log(0.32)= -9.90dB}

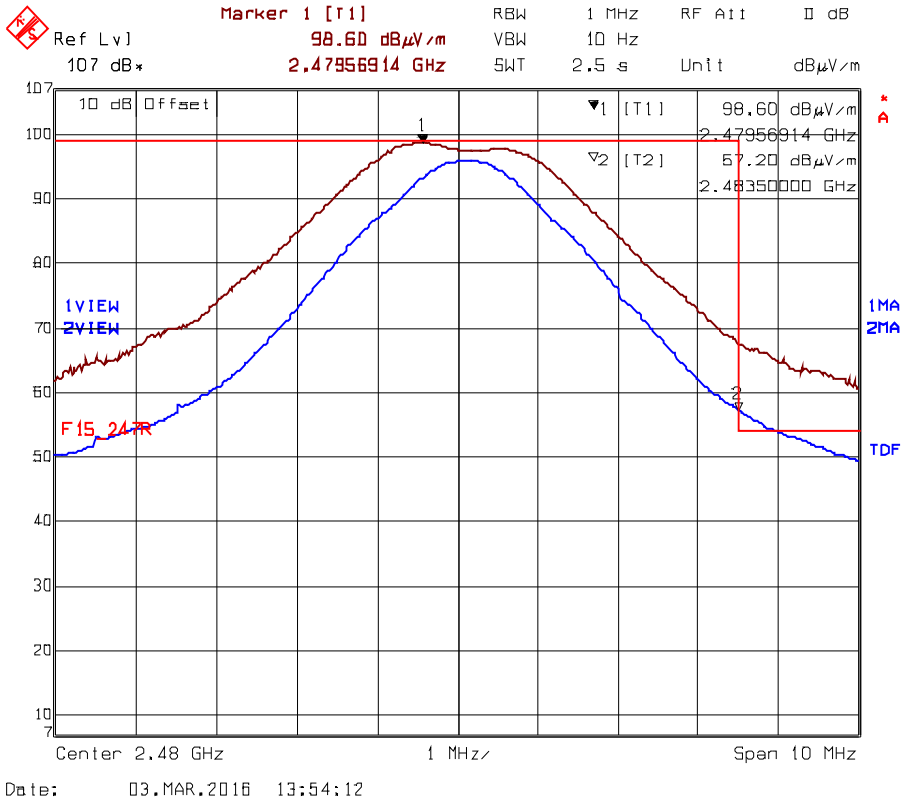
EUT with 2.1 dBi Dipole Antenna @ 66% Duty Cycle requires total 4.63dB Assembly Cable loss

Plot 5.4.4.2.2.7. Band-Edge RF Radiated Emissions at 3 m, Horizontal Polarization
Highest End of Frequency Band, Ch26- 2480 MHz, QPSK Modulation, Power 1 Mode 1 @ 66% Duty Cycle



Trace 1: RBW= 1 MHz, VBW= 3 MHz, Trace 2: RBW= 1 MHz, VBW= 10 Hz
Average level at 2483.5 MHz is 53.62dBµV/m (57.23-3.61), Duty cycle is 66% (20*log(0.66)= 3.61dB}

Plot 5.4.4.2.2.8. Band-Edge RF Radiated Emissions at 3 m, Vertical Polarization
Highest End of Frequency Band, Ch26- 2480 MHz, QPSK Modulation, Power 1 Mode 1 @ 66% Duty Cycle



Trace 1: RBW= 1 MHz, VBW= 3 MHz, Trace 2: RBW= 1 MHz, VBW= 10 Hz
Average level at 2483.5 MHz is 53.59dBµV/m (57.20-3.61), Duty cycle is 66% (20*log(0.66)= 3.61dB}

5.4.4.3. EUT with 15 dBi Omni-directional Antenna and 1.25 dB Basic Assembly Cable Loss

5.4.4.3.1. Spurious Radiated Emissions

Fundamental Frequency:	2405 MHz
Power Setting and Operating Mode:	Power 8 Mode 1, QPSK Modulation
Frequency Test Range:	30 MHz - 25 GHz

Frequency (MHz)	RF Peak Level (dBµV/m)	RF Avg Level (dBµV/m)	Antenna Plane (H/V)	Limit 15.209 (dBµV/m)	Limit 15.247 (dBµV/m)	Margin (dB)	Pass/ Fail
2405	115.16	--	V	--	--	--	--
2405	111.10	--	H	--	--	--	--
7215	57.78	44.35	V	54.0	91.1	-46.7	Pass
7215	55.97	45.38	H	54.0	91.1	-45.7	Pass
All other spurious emissions and harmonics are more than 20 dB below the applicable limit.							

*Field strength of emissions appearing within restricted frequency bands shall not exceed the limits in § 15.209.

Fundamental Frequency:	2440 MHz
Power Setting and Operating Mode:	Power 8 Mode 1, QPSK Modulation
Frequency Test Range:	30 MHz - 25 GHz

Frequency (MHz)	RF Peak Level (dBµV/m)	RF Avg Level (dBµV/m)	Antenna Plane (H/V)	Limit 15.209 (dBµV/m)	Limit 15.247 (dBµV/m)	Margin (dB)	Pass/ Fail
2440	115.27	--	V	--	--	--	--
2440	108.55	--	H	--	--	--	--
7320	56.33	45.74	V	54.0	95.3	-8.3	Pass*
7320	56.75	45.46	H	54.0	95.3	-8.5	Pass*
All other spurious emissions and harmonics are more than 20 dB below the applicable limit.							

*Field strength of emissions appearing within restricted frequency bands shall not exceed the limits in § 15.209.

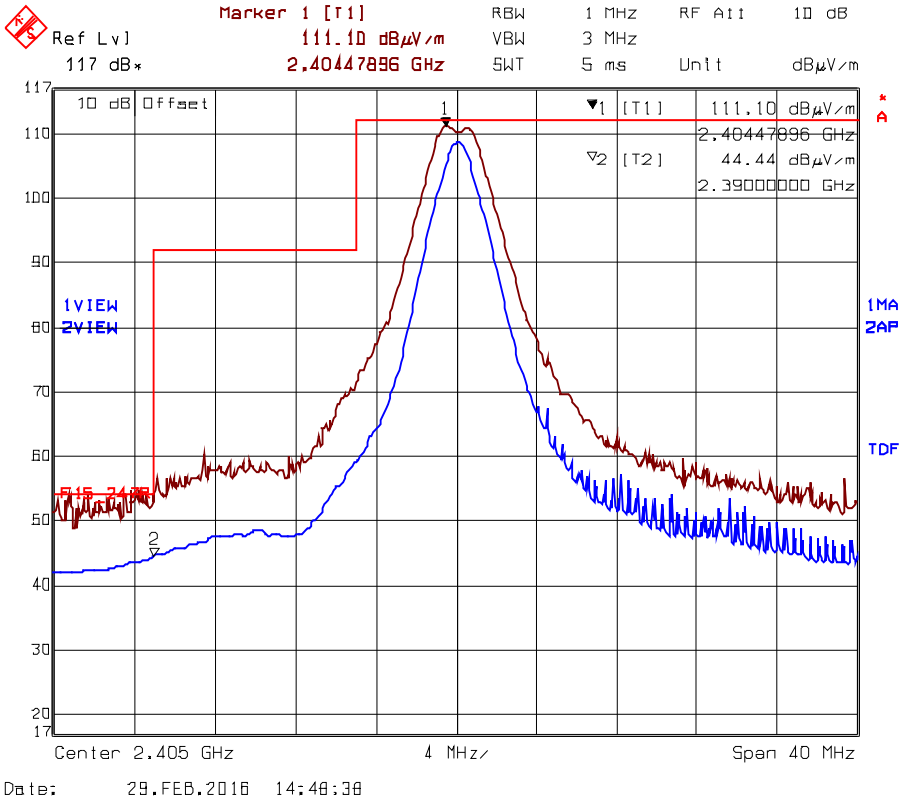
Fundamental Frequency:	2475 MHz
Power Setting and Operating Mode:	Power 8 Mode 1, QPSK Modulation
Frequency Test Range:	30 MHz - 25 GHz

Frequency (MHz)	RF Peak Level (dBµV/m)	RF Avg Level (dBµV/m)	Antenna Plane (H/V)	Limit 15.209 (dBµV/m)	Limit 15.247 (dBµV/m)	Margin (dB)	Pass/ Fail
2475	115.43	--	V	--	--	--	--
2475	106.82	--	H	--	--	--	--
7425	55.36	43.03	V	54.0	95.4	-11.0	Pass*
7425	54.32	41.42	H	54.0	95.4	-12.6	Pass*
All other spurious emissions and harmonics are more than 20 dB below the applicable limit.							

*Field strength of emissions appearing within restricted frequency bands shall not exceed the limits in § 15.209.

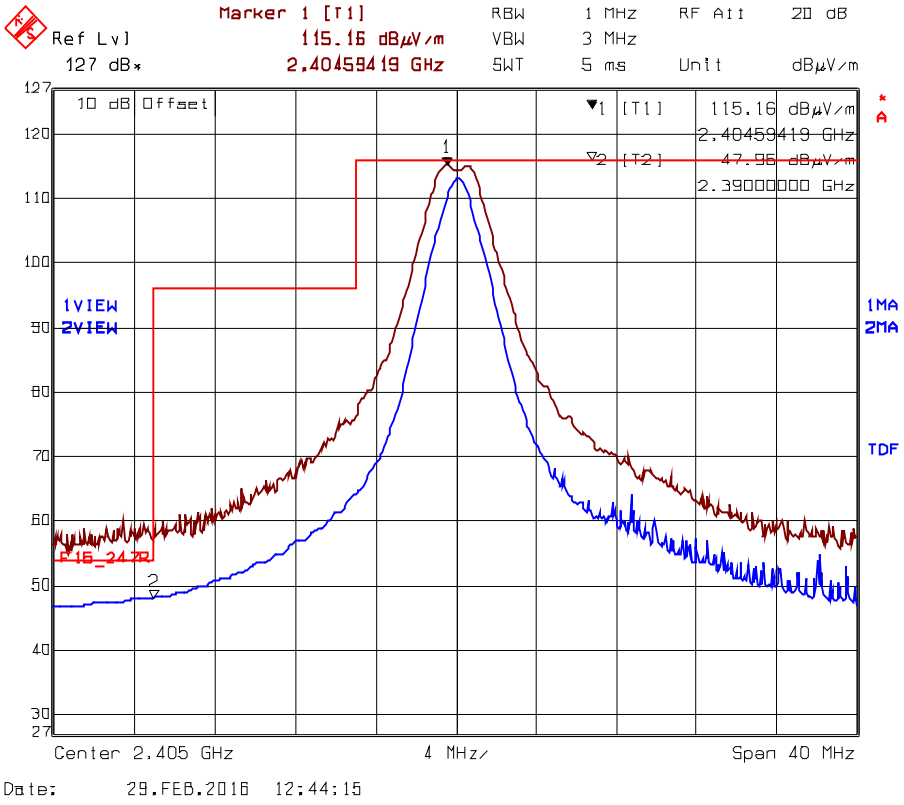
5.4.4.3.2. Band-Edge RF Radiated Emissions

Plot 5.4.4.3.2.1. Band-Edge RF Radiated Emissions at 3 m, Horizontal Polarization
Low End of Frequency Band, Ch11- 2405 MHz, QPSK Modulation, Power 8 Mode 1



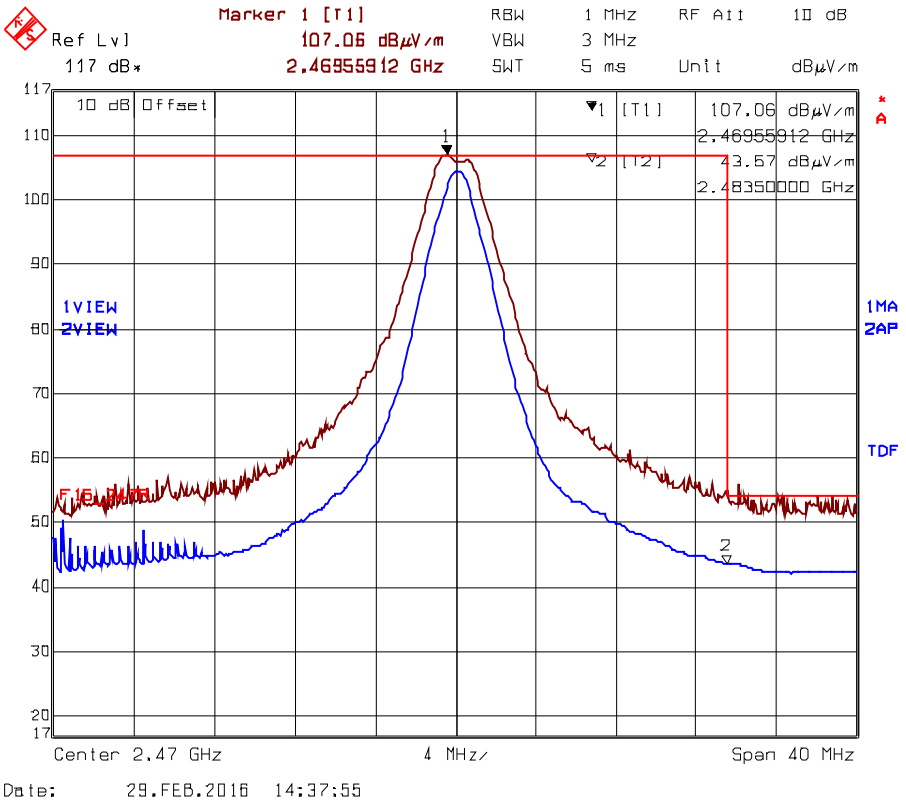
Trace 1: RBW = 1 MHz, VBW = 3 MHz, Trace 2: RBW = 1 MHz, VBW = 10 Hz
Average level at 2390 MHz is 44.44dBµV/m, 100% Duty Cycle can be applied from channel 11 to 24

Plot 5.4.4.3.2.2. Band-Edge RF Radiated Emissions at 3 m, Vertical Polarization
Low End of Frequency Band, Ch11- 2405 MHz, QPSK Modulation, Power 8 Mode 1



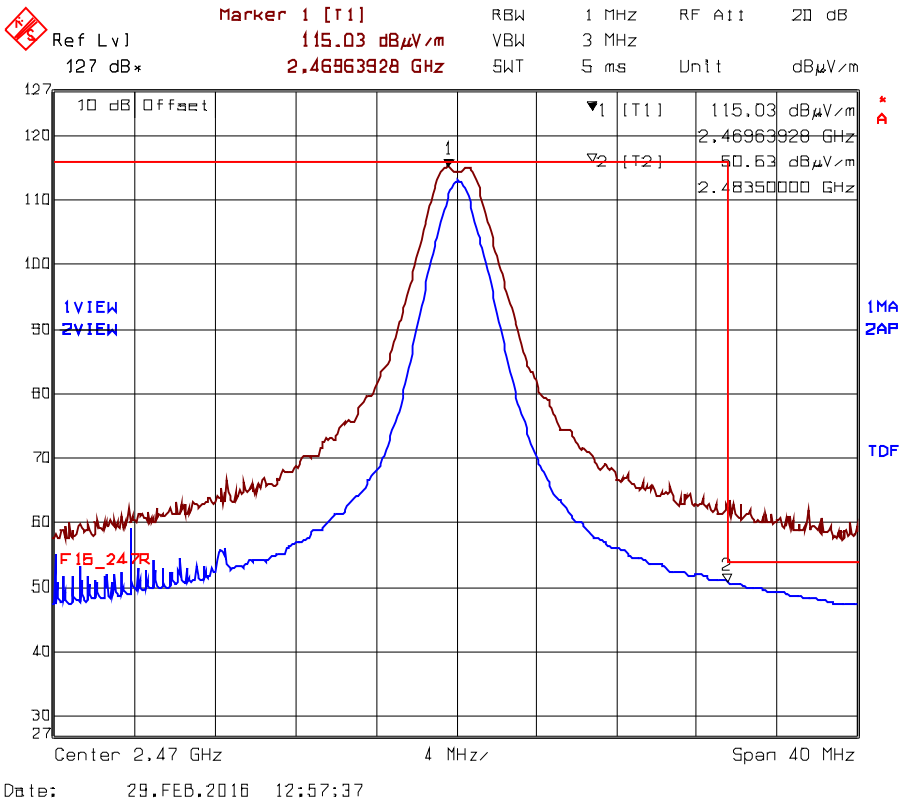
Trace 1: RBW = 1 MHz, VBW = 3 MHz, Trace 2: RBW = 1 MHz, VBW = 10 Hz
Average level at 2390 MHz is 47.96dBµV/m, 100% Duty Cycle can be applied from channel 11 to 24

Plot 5.4.4.3.2.3. Band-Edge RF Radiated Emissions at 3 m, Horizontal Polarization
High End of Frequency Band, Ch24- 2470 MHz, QPSK Modulation, Power 8 Mode 1



Trace 1: RBW = 1 MHz, VBW = 3 MHz, Trace 2: RBW = 1 MHz, VBW = 10 Hz
Average level at 2483.5 MHz is 43.57dBµV/m, 100% Duty Cycle can be applied from channel 11 to 24

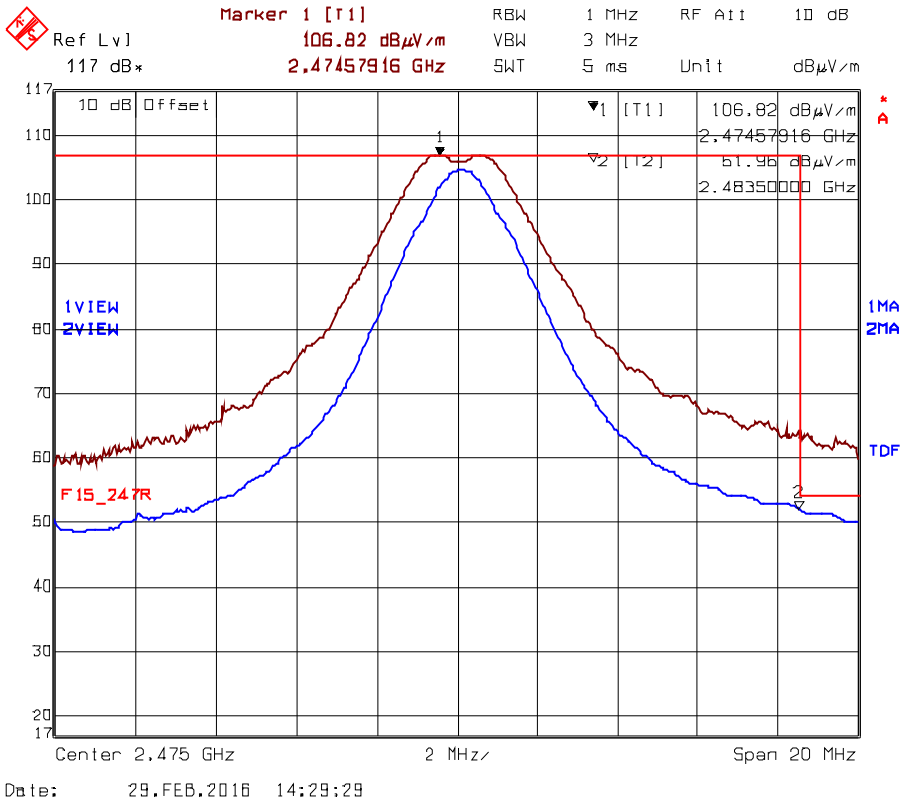
Plot 5.4.4.3.2.4. Band-Edge RF Radiated Emissions at 3 m, Vertical Polarization
High End of Frequency Band, Ch24- 2470 MHz, QPSK Modulation, Power 8 Mode 1



Trace 1: RBW = 1 MHz, VBW = 3 MHz, Trace 2: RBW = 1 MHz, VBW = 10 Hz
Average level at 2483.5 MHz is 50.63dBµV/m, 100% Duty Cycle can be applied from channel 11 to 24

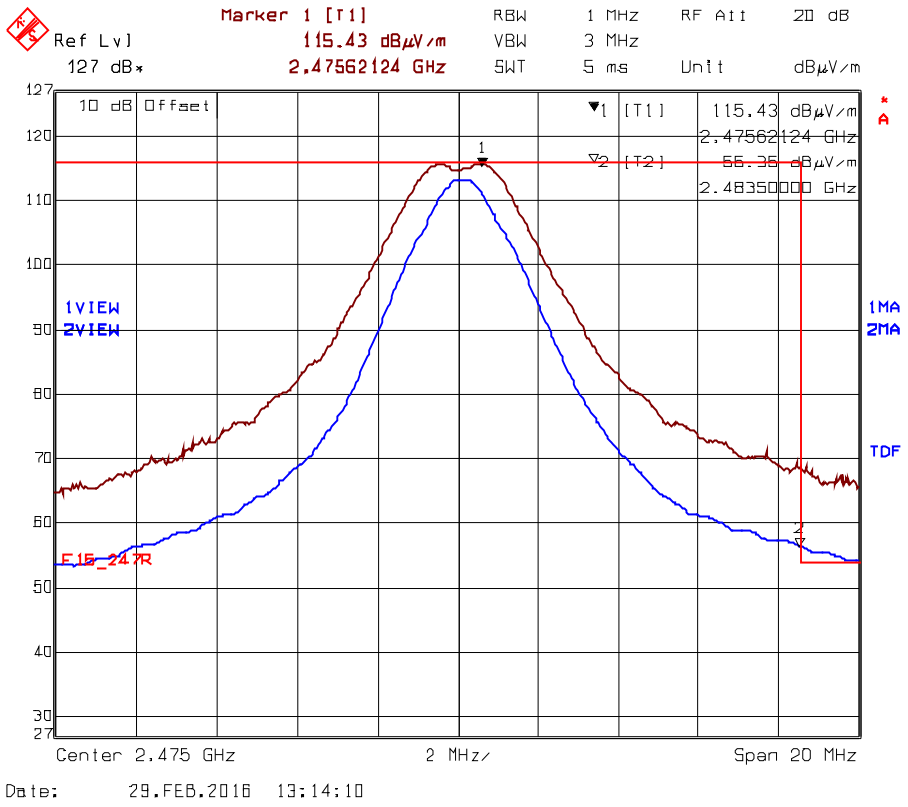
EUT with 15dBi Omni-Directional Antenna @ 66% Duty Cycle requires 1.25dB Assembly Cable loss

Plot 5.4.4.3.2.5. Band-Edge RF Radiated Emissions at 3 m, Horizontal Polarization
High End of Frequency Band, Ch25- 2475 MHz, QPSK Modulation, Power 8 Mode 1@ 66% Duty Cycle



Trace 1: RBW = 1 MHz, VBW = 3 MHz, Trace 2: RBW = 1 MHz, VBW = 10 Hz
Average level at 2483.5 MHz is 48.35dBµV/m (51.96-3.61), Duty cycle is 66% (20*log(0.66)= 3.61dB}

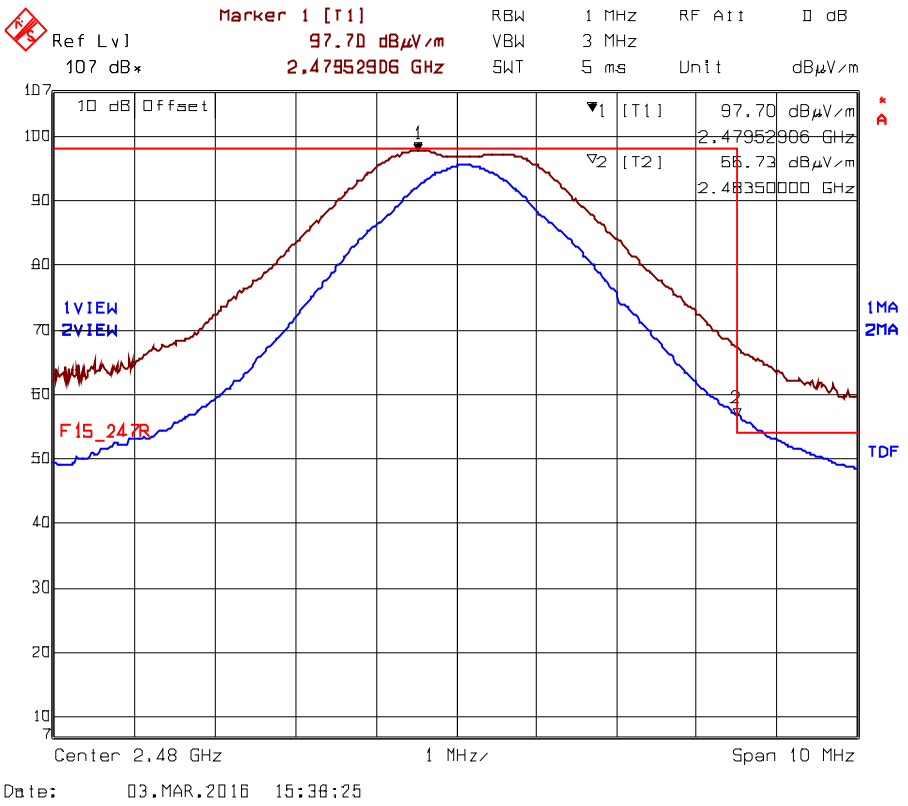
Plot 5.4.4.3.2.6. Band-Edge RF Radiated Emissions at 3 m, Vertical Polarization
High End of Frequency Band, Ch25- 2475 MHz, QPSK Modulation, Power 8 Mode 1@ 66% Duty Cycle



Trace 1: RBW = 1 MHz, VBW = 3 MHz, Trace 2: RBW = 1 MHz, VBW = 10 Hz
Average level at 2483.5 MHz is 52.74dBµV/m (56.35-3.61), Duty cycle is 66% (20*log(0.66)= 3.61dB}

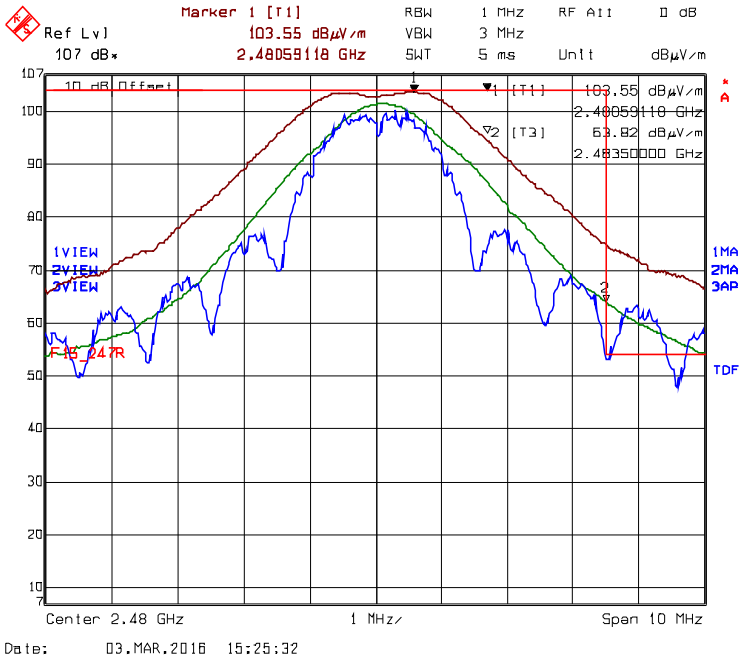
EUT with 15dBi Omni-Directional Antenna @ 32% Duty Cycle requires total 8.75dB Assembly Cable loss

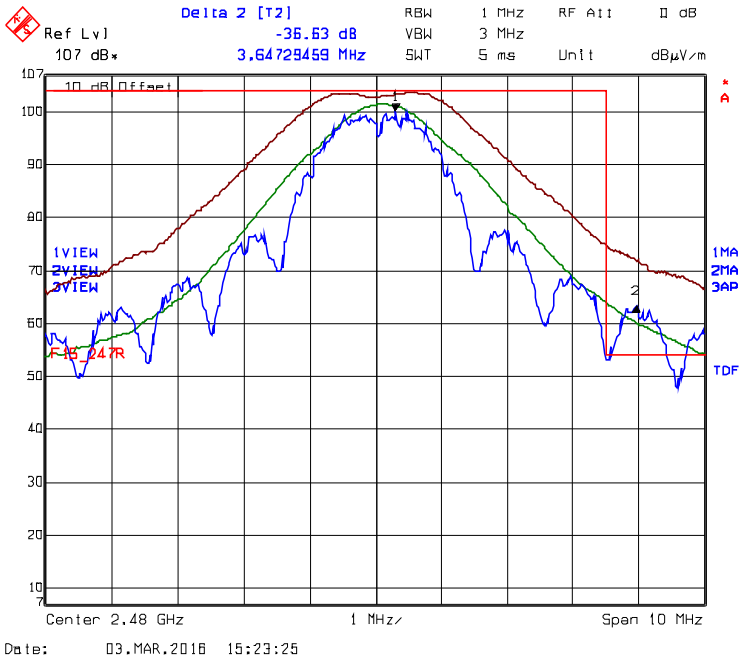
Plot 5.4.4.3.2.7. Band-Edge RF Radiated Emissions at 3 m, Horizontal Polarization
Highest End of Frequency Band, Ch26- 2480 MHz, QPSK Modulation, Power 1 Mode 1 @ 32% Duty Cycle



Trace 1: RBW= 1 MHz, VBW= 3 MHz, Trace 2: RBW= 1 MHz, VBW= 10 Hz
Average: 56.73dBµV/m – 9.90dB= 46.83dBµV/m, Duty cycle is 32% (20*log(0.32)= -9.90dB}

Plot 5.4.4.3.2.8. Band-Edge RF Radiated Emissions at 3 m, Vertical Polarization
Highest End of Frequency Band, Ch26- 2480 MHz, QPSK Modulation, Power 1 Mode 1 @ 32% Duty Cycle

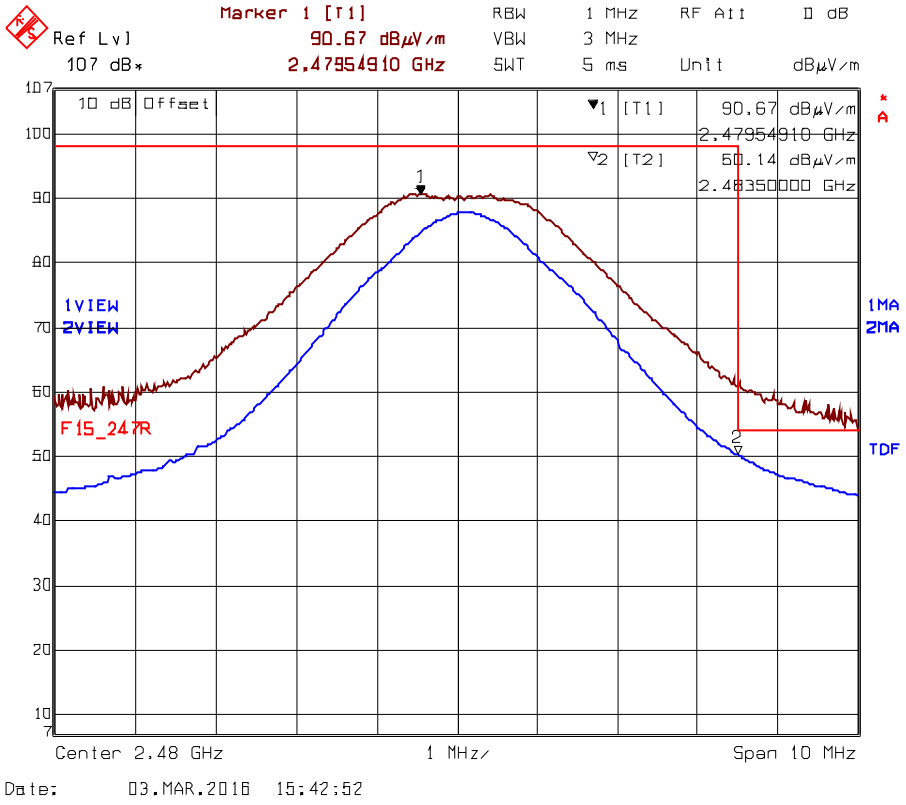




Trace 1: RBW= 1 MHz, VBW= 3 MHz, Trace 2: RBW= 100 kHz, VBW= 300 kHz, Delta (Peak to Band-Edge): 36.63dB
Trace 3: RBW= 1 MHz, VBW= 10 Hz, Peak Band-Edge at 2483.5 MHz: Peak= 103.55dBµV/m – 36.63dB= 66.92dBµV/m
Average: 63.82dBµV/m – 9.90dB= 53.92dBµV/m, Duty cycle is 32% (20*log(0.32)= -9.90dB}

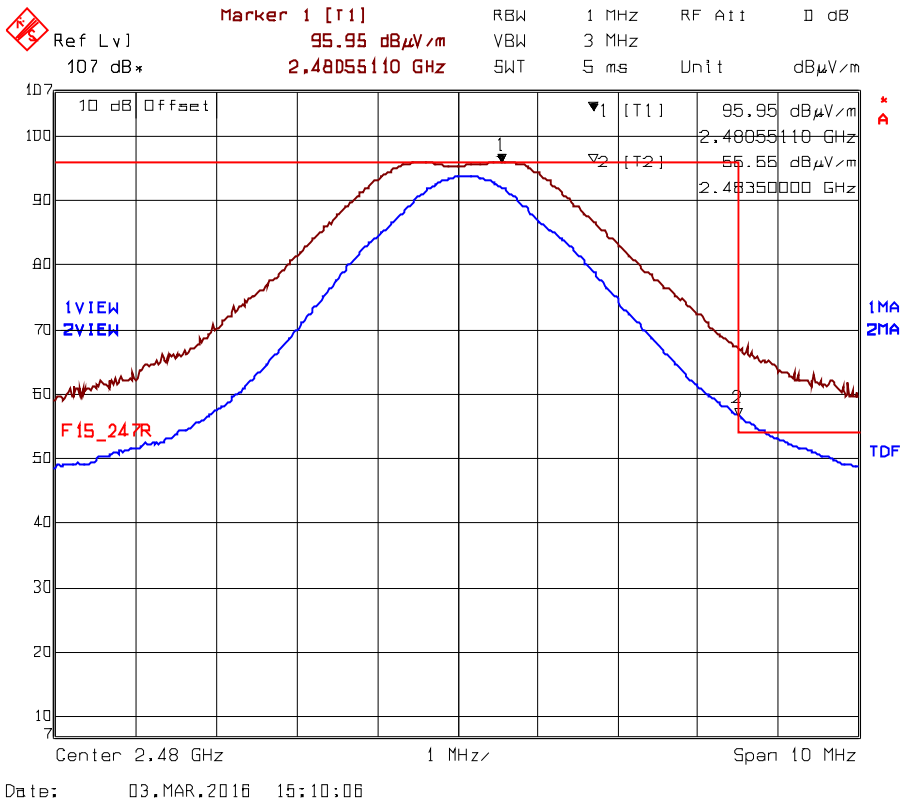
EUT with 15dBi Omni-Directional Antenna @ 66% Duty Cycle requires total 15.75dB Assembly Cable loss

Plot 5.4.4.3.2.9. Band-Edge RF Radiated Emissions at 3 m, Horizontal Polarization
Highest End of Frequency Band, Ch26- 2480 MHz, QPSK Modulation, Power 1 Mode 1 @ 66% Duty Cycle



Trace 1: RBW= 1 MHz, VBW= 3 MHz, Trace 2: RBW= 1 MHz, VBW= 10 Hz
Average level at 2483.5 MHz is 46.53dBµV/m (50.14-3.61), Duty cycle is 66% (20*log(0.66)= 3.61dB}

Plot 5.4.4.3.2.10. Band-Edge RF Radiated Emissions at 3 m, Vertical Polarization
Highest End of Frequency Band, Ch26- 2480 MHz, QPSK Modulation, Power 1 Mode 1 @ 66% Duty Cycle



Trace 1: RBW= 1 MHz, VBW= 3 MHz, Trace 2: RBW= 1 MHz, VBW= 10 Hz
Average level at 2483.5 MHz is 52.94dBµV/m (56.55-3.61), Duty cycle is 66% (20*log(0.66)= 3.61dB}

5.4.4.4. EUT with 15.0 dBi Yagi Antenna with 1.25 dB Assembly Cable Loss

5.4.4.4.1. Spurious Radiated Emissions

Fundamental Frequency:	2405 MHz
Power Setting and Operating Mode:	Power 8 Mode 1, QPSK Modulation
Frequency Test Range:	30 MHz - 25 GHz

Frequency (MHz)	RF Peak Level (dBµV/m)	RF Avg Level (dBµV/m)	Antenna Plane (H/V)	Limit 15.209 (dBµV/m)	Limit 15.247 (dBµV/m)	Margin (dB)	Pass/ Fail
2405	119.38	--	V	--	--	--	--
2405	119.18	--	H	--	--	--	--
7215	57.40	45.60	V	54.0	99.4	-52.0	Pass
7215	60.00	48.51	H	54.0	99.4	-49.4	Pass
All other spurious emissions and harmonics are more than 20 dB below the applicable limit.							

*Field strength of emissions appearing within restricted frequency bands shall not exceed the limits in § 15.209.

Fundamental Frequency:	2440 MHz
Power Setting and Operating Mode:	Power 8 Mode 1, QPSK Modulation
Frequency Test Range:	30 MHz - 25 GHz

Frequency (MHz)	RF Peak Level (dBµV/m)	RF Avg Level (dBµV/m)	Antenna Plane (H/V)	Limit 15.209 (dBµV/m)	Limit 15.247 (dBµV/m)	Margin (dB)	Pass/ Fail
2440	119.22	--	V	--	--	--	--
2440	119.16	--	H	--	--	--	--
7320	55.70	44.81	V	54.0	99.2	-9.2	Pass*
7320	56.85	46.03	H	54.0	99.2	-8.0	Pass*
All other spurious emissions and harmonics are more than 20 dB below the applicable limit.							

*Field strength of emissions appearing within restricted frequency bands shall not exceed the limits in § 15.209.

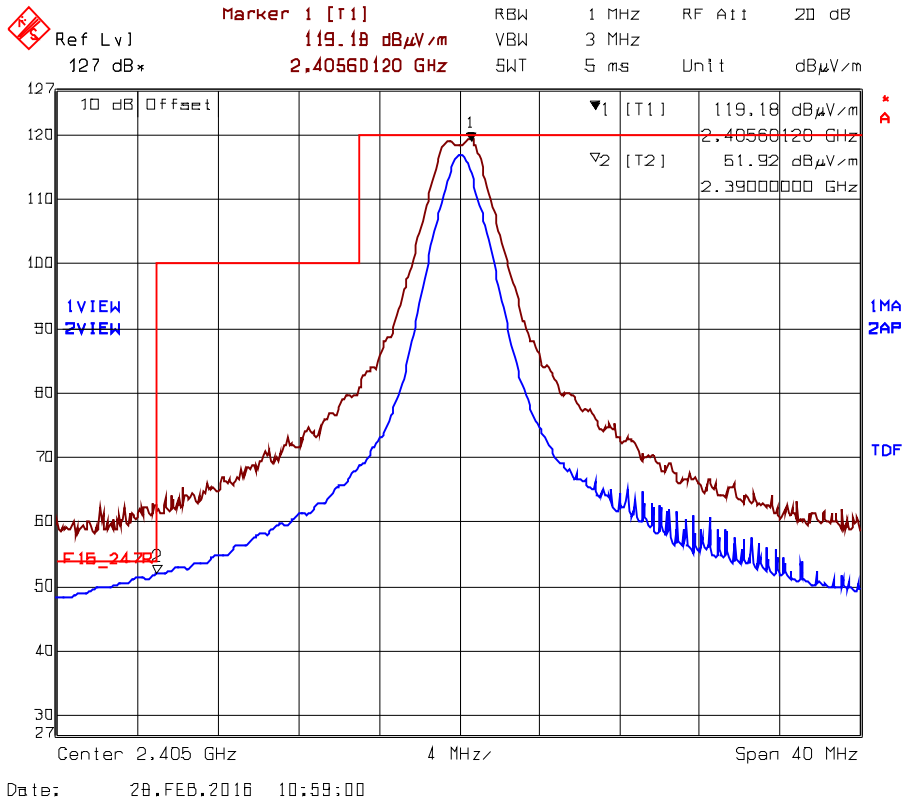
Fundamental Frequency:	2475 MHz
Power Setting and Operating Mode:	Power 8 Mode 1, QPSK Modulation
Frequency Test Range:	30 MHz - 25 GHz

Frequency (MHz)	RF Peak Level (dBµV/m)	RF Avg Level (dBµV/m)	Antenna Plane (H/V)	Limit 15.209 (dBµV/m)	Limit 15.247 (dBµV/m)	Margin (dB)	Pass/ Fail
2475	119.11	--	V	--	--	--	--
2475	118.86	--	H	--	--	--	--
7425	54.33	41.75	V	54.0	99.1	-12.2	Pass*
7425	55.45	44.02	H	54.0	99.1	-10.0	Pass*
All other spurious emissions and harmonics are more than 20 dB below the applicable limit.							

*Field strength of emissions appearing within restricted frequency bands shall not exceed the limits in § 15.209.

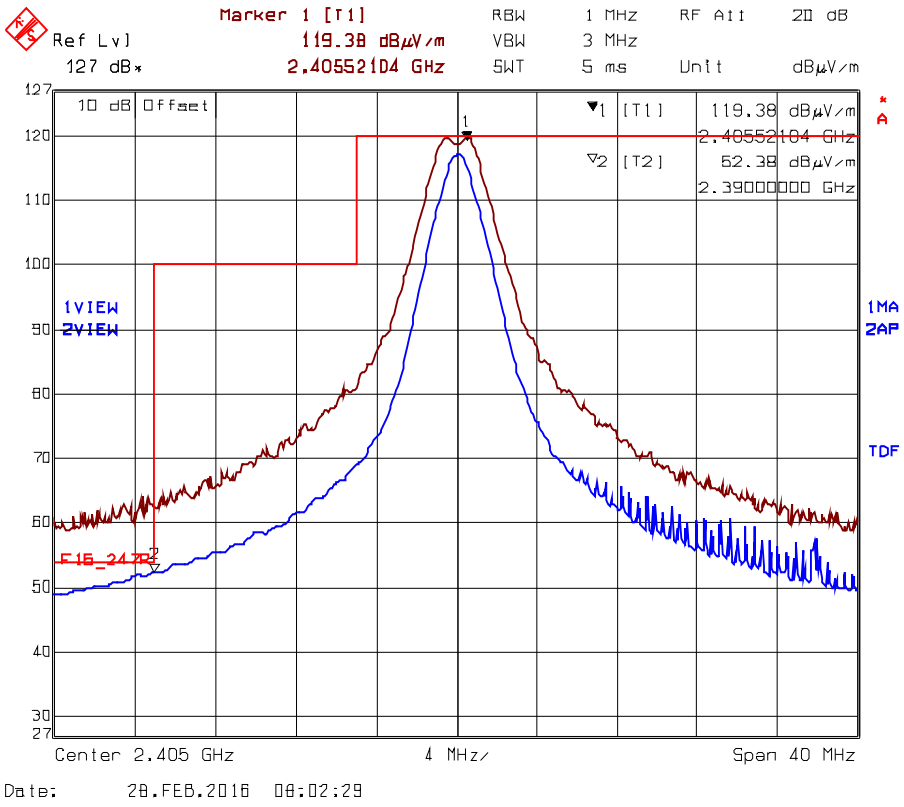
5.4.4.4.2. Band-Edge RF Radiated Emissions

Plot 5.4.4.4.2.1. Band-Edge RF Radiated Emissions at 3 m, Horizontal Polarization
Low End of Frequency Band, Ch11- 2405 MHz, QPSK Modulation, Power 8 Mode 1



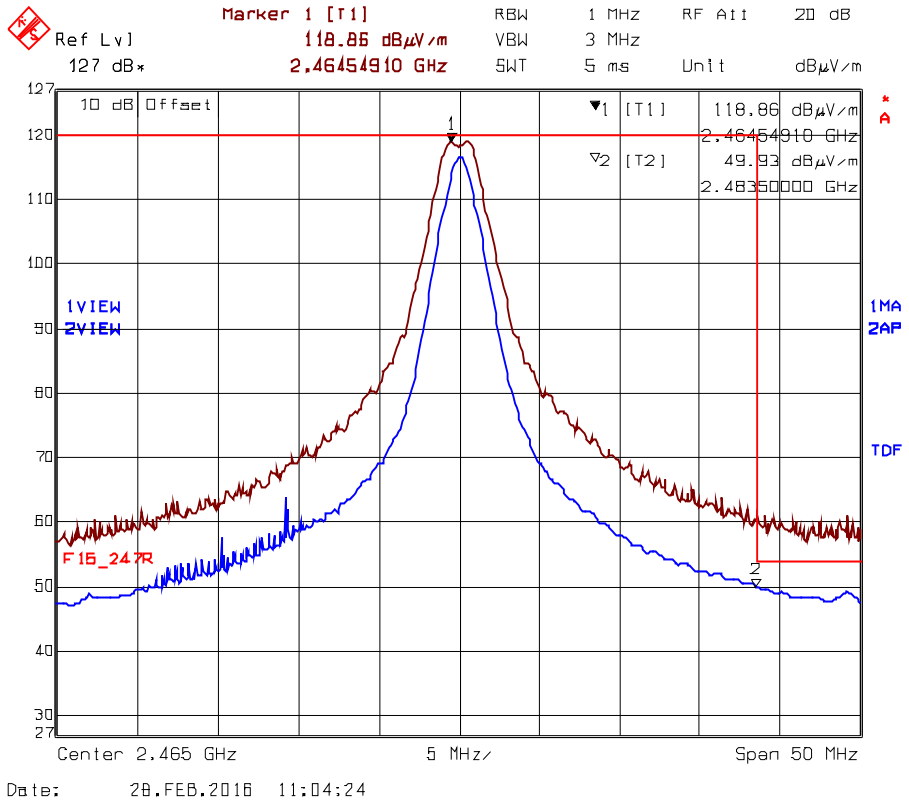
Trace 1: RBW = 1 MHz, VBW = 3 MHz, Trace 2: RBW = 1 MHz, VBW = 10 Hz
Average level at 2390 MHz is 51.92dBµV/m, 100% Duty Cycle can be applied from channel 11 to 23

Plot 5.4.4.4.2.2. Band-Edge RF Radiated Emissions at 3 m, Vertical Polarization
Low End of Frequency Band, Ch11- 2405 MHz, QPSK Modulation, Power 8 Mode 1



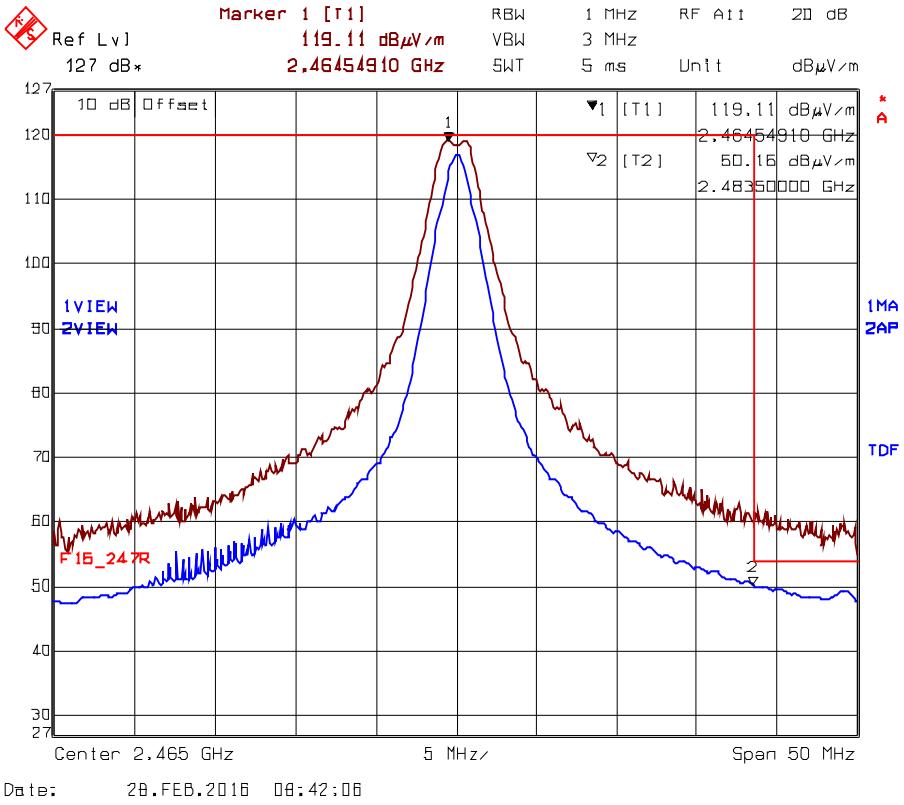
Trace 1: RBW = 1 MHz, VBW = 3 MHz, Trace 2: RBW = 1 MHz, VBW = 10 Hz
Average level at 2390 MHz is 52.38dBµV/m, 100% Duty Cycle can be applied from channel 11 to 23

Plot 5.4.4.4.2.3. Band-Edge RF Radiated Emissions at 3 m, Horizontal Polarization
High End of Frequency Band, Ch23- 2465 MHz, QPSK Modulation, Power 8 Mode 1



Trace 1: RBW = 1 MHz, VBW = 3 MHz, Trace 2: RBW = 1 MHz, VBW = 10 Hz
Average level at 2483.5 MHz is 49.93dBµV/m, 100% Duty Cycle can be applied from channel 11 to 23

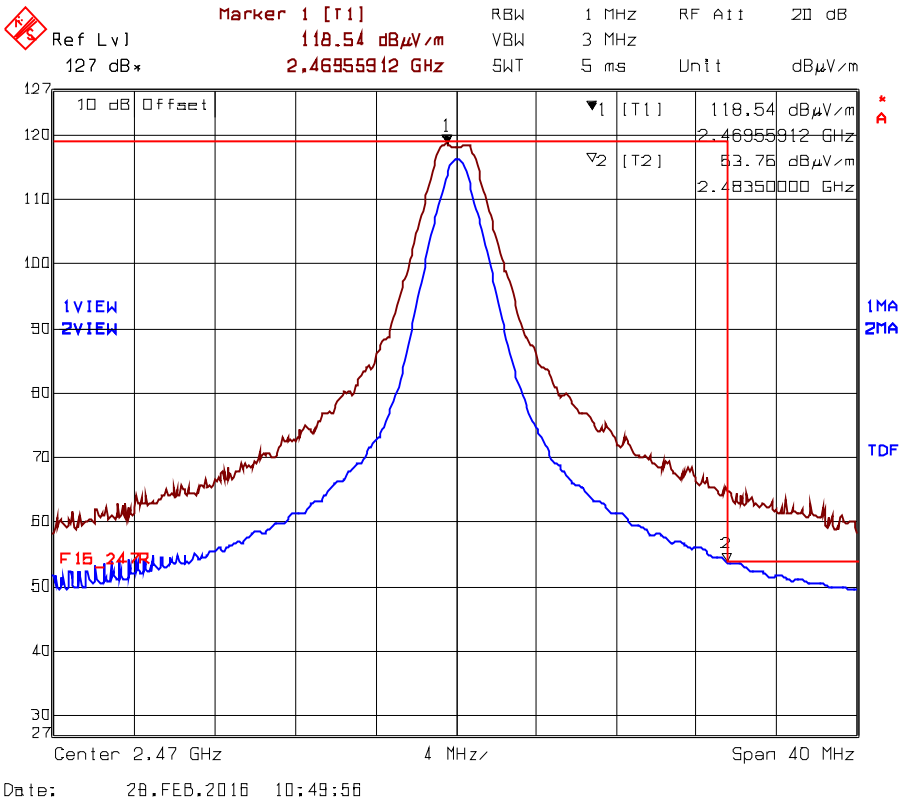
Plot 5.4.4.4.2.4. Band-Edge RF Radiated Emissions at 3 m, Vertical Polarization
High End of Frequency Band, Ch23- 2465 MHz, QPSK Modulation, Power 8 Mode 1



Trace 1: RBW = 1 MHz, VBW = 3 MHz, Trace 2: RBW = 1 MHz, VBW = 10 Hz
Average level at 2483.5 MHz is 50.16dBµV/m, 100% Duty Cycle can be applied from channel 11 to 23

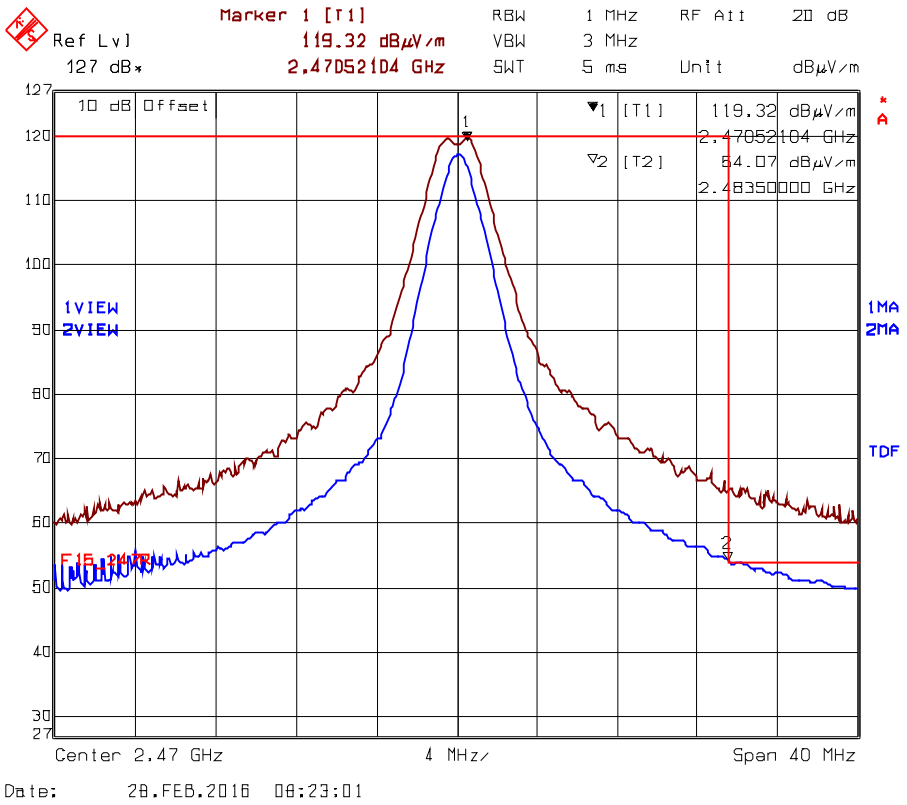
EUT with 15dBi Yagi Antenna @ 66% Duty Cycle requires 1.25dB Assembly Cable loss

Plot 5.4.4.4.2.5. Band-Edge RF Radiated Emissions at 3 m, Horizontal Polarization
High End of Frequency Band, Ch24- 2470 MHz, QPSK Modulation, Power 8 Mode 1 @ 66% Duty Cycle



Trace 1: RBW = 1 MHz, VBW = 3 MHz, Trace 2: RBW = 1 MHz, VBW = 10 Hz
Average level at 2483.5 MHz is 50.15dBµV/m (53.76-3.61) Duty cycle max 32% (-9.90dB), min 66% (-3.61dB)

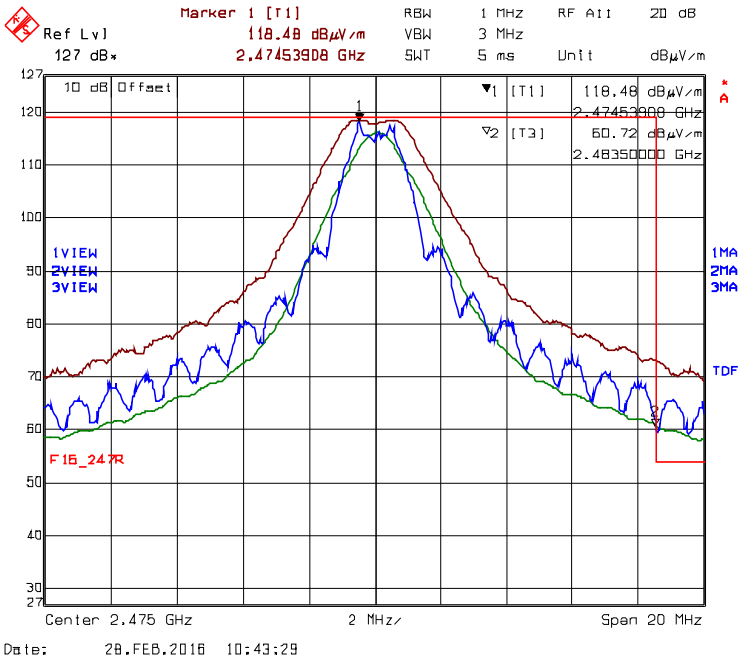
Plot 5.4.4.4.2.6. Band-Edge RF Radiated Emissions at 3 m, Vertical Polarization
High End of Frequency Band, Ch24- 2470 MHz, QPSK Modulation, Power 8 Mode 1 @ 66% Duty Cycle

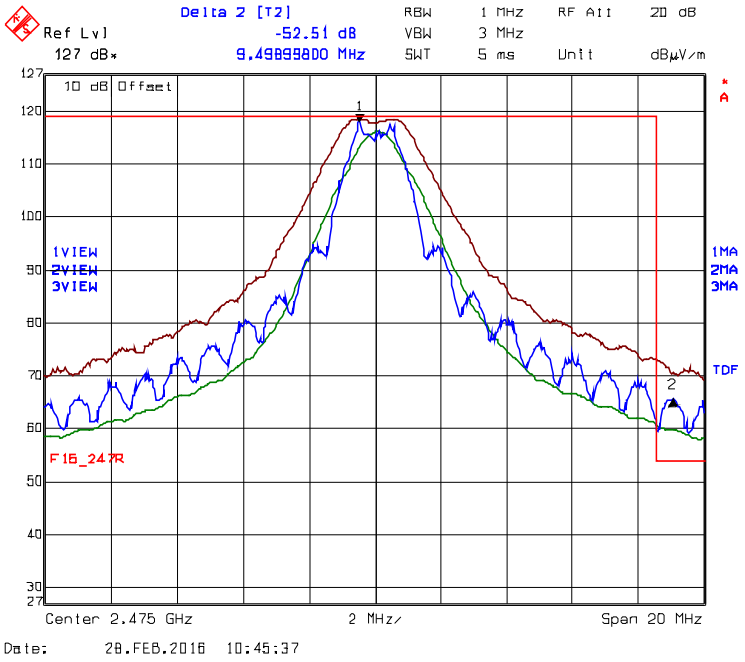


Trace 1: RBW = 1 MHz, VBW = 3 MHz, Trace 2: RBW = 1 MHz, VBW = 10 Hz
Average level at 2483.5 MHz is 50.46dBµV/m (54.07-3.61) Duty cycle max 32% (-9.90dB). min 66% (-3.61dB)

EUT with 15dBi Yagi Antenna @ 32% Duty Cycle requires 1.25dB Assembly Cable loss

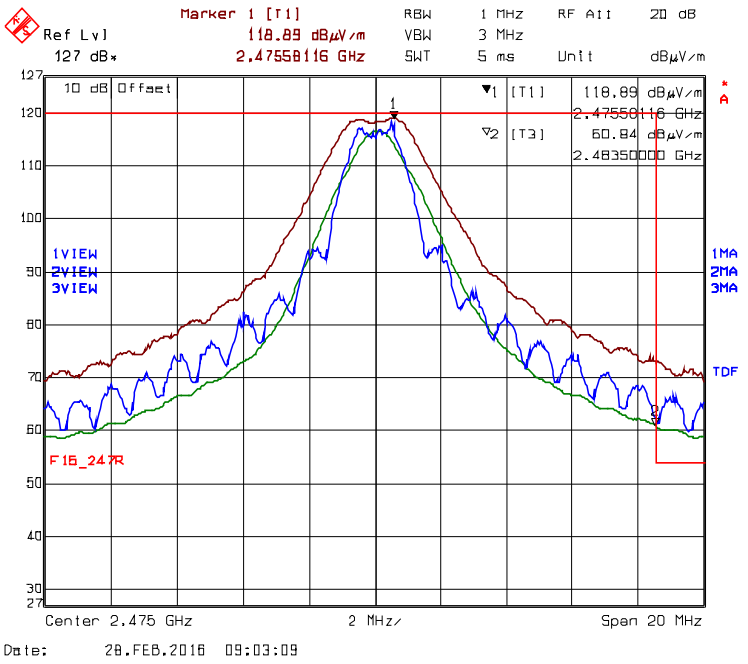
Plot 5.4.4.4.2.7. Band-Edge RF Radiated Emissions at 3 m, Horizontal Polarization
Higher End of Frequency Band, Ch25- 2475 MHz, QPSK Modulation, Power 8 Mode1 @ 32% Duty Cycle

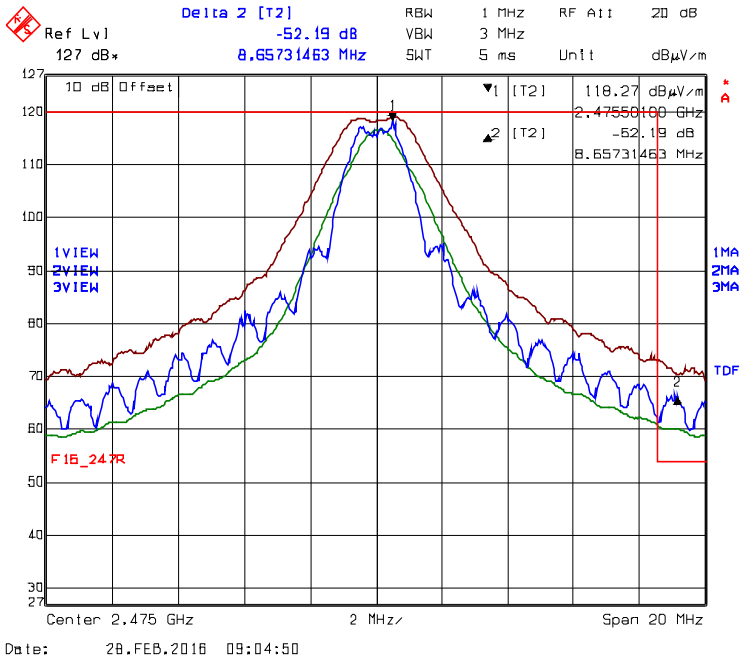




Trace 1: RBW= 1 MHz, VBW= 3 MHz, Trace 2: RBW= 200 kHz, VBW= 1 MHz, Delta (Peak to Band-Edge): 52.51dB
Trace 3: RBW= 1 MHz, VBW= 10 Hz, Peak Band-Edge at 2483.5 MHz: Peak= 118.48dBµV/m – 52.51dB= 65.97dBµV/m
Average: 60.72dBµV/m – 9.90dB= 50.82dBµV/m, Duty cycle is 32% (20*log(0.32)= -9.90dB}

Plot 5.4.4.4.2.8. Band-Edge RF Radiated Emissions at 3 m, Vertical Polarization
Higher End of Frequency Band, Ch25- 2475 MHz, QPSK Modulation, Power 8 Mode 1 @ 32% Duty Cycle

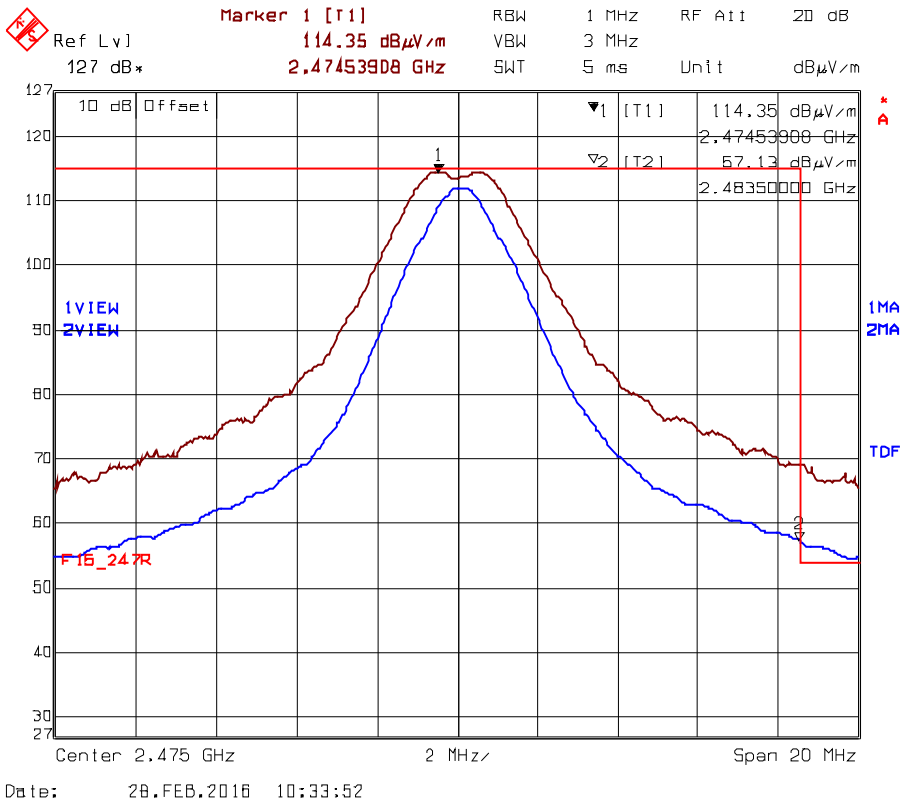




Trace 1: RBW= 1 MHz, VBW= 3 MHz, Trace 2: RBW= 200 kHz, VBW= 1 MHz, Delta (Peak to Band-Edge): 52.19dB
Trace 3: RBW= 1 MHz, VBW= 10 Hz, Peak Band-Edge at 2483.5 MHz: Peak= 118.89dBµV/m – 52.19dB= 66.70dBµV/m
Average: 60.84dBµV/m – 9.90dB= 50.94dBµV/m, Duty cycle is 32% (20*log(0.32)= -9.90dB}

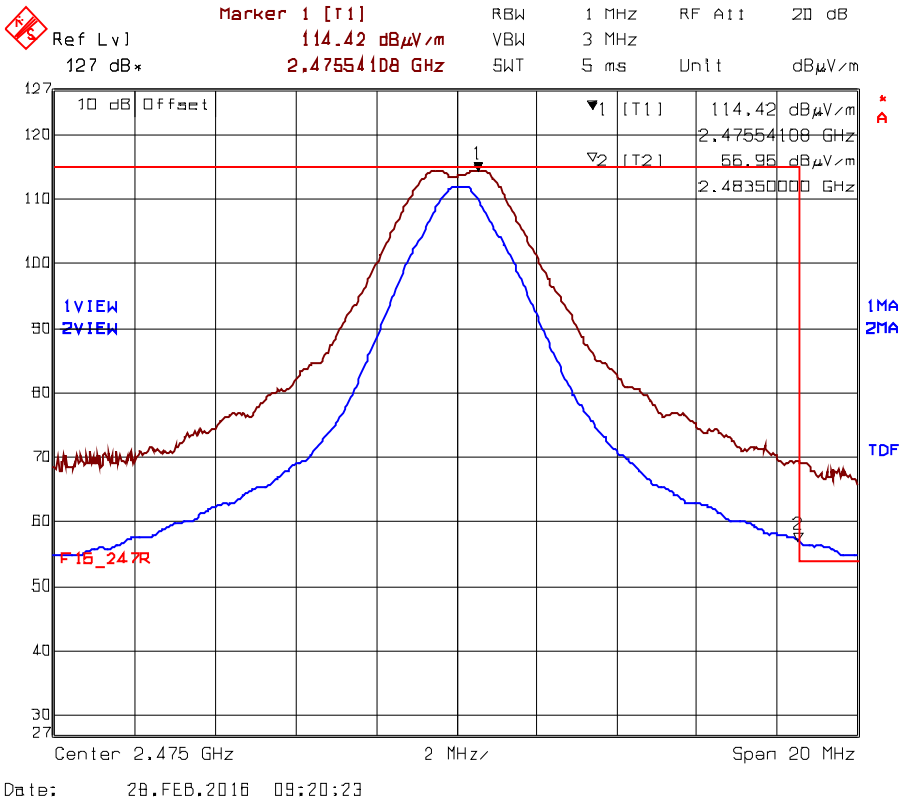
EUT with 15dBi Yagi Antenna @ 66% Duty Cycle requires 6.25dB Assembly Cable loss

Plot 5.4.4.4.2.9. Band-Edge RF Radiated Emissions at 3 m, Horizontal Polarization
Higher End of Frequency Band, Ch25- 2475 MHz, QPSK Modulation, Power 8 Mode 1 @ 66% Duty Cycle



Trace 1: RBW= 1 MHz, VBW= 3 MHz, Trace 2: RBW= 1 MHz, VBW= 10 Hz
Average level at 2483.5 MHz is 53.52dBµV/m (57.13-3.61), Duty cycle is 66% (20*log(0.66)= 3.61dB}

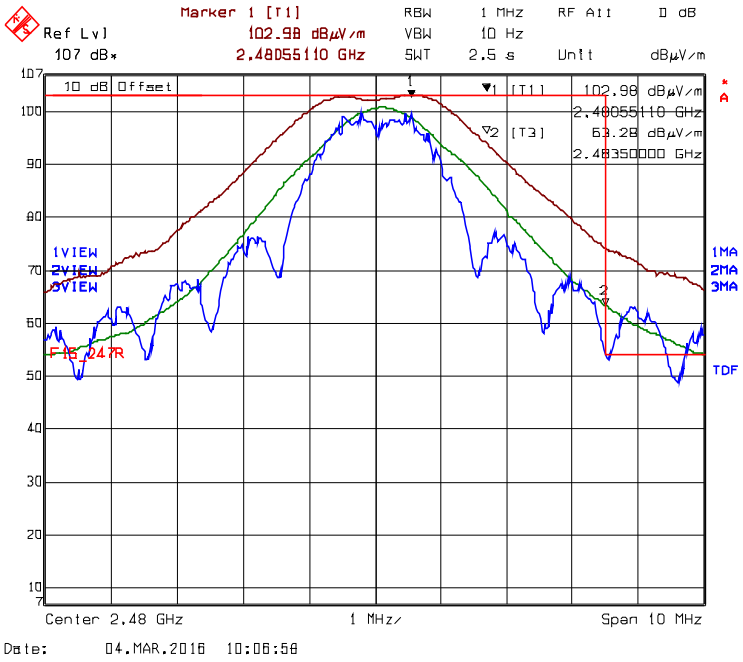
Plot 5.4.4.4.2.10. Band-Edge RF Radiated Emissions at 3 m, Vertical Polarization
Higher End of Frequency Band, Ch25- 2475 MHz, QPSK Modulation, Power 8 Mode 1 @ 66% Duty Cycle

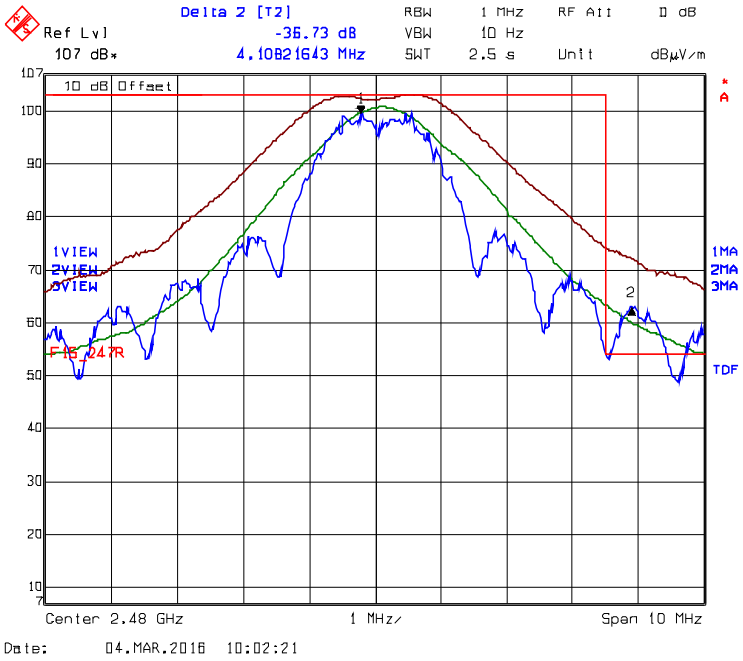


Trace 1: RBW= 1 MHz, VBW= 3 MHz, Trace 2: RBW= 1 MHz, VBW= 10 Hz
Average level at 2483.5 MHz is 53.34dBµV/m (56.95-3.61), Duty cycle is 66% (20*log(0.66)= 3.61dB}

EUT with 15dBi Yagi Antenna @ 32% Duty Cycle requires total 12.25dB Assembly Cable loss

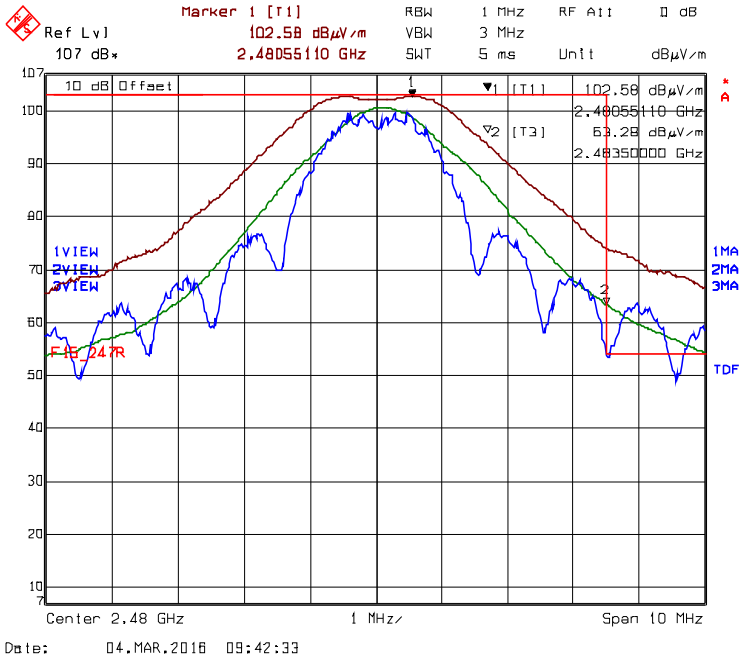
Plot 5.4.4.4.2.11. Band-Edge RF Radiated Emissions at 3 m, Horizontal Polarization
Highest End of Frequency Band, Ch26- 2480 MHz, QPSK Modulation, Power 1 Mode 1 @ 32% Duty Cycle

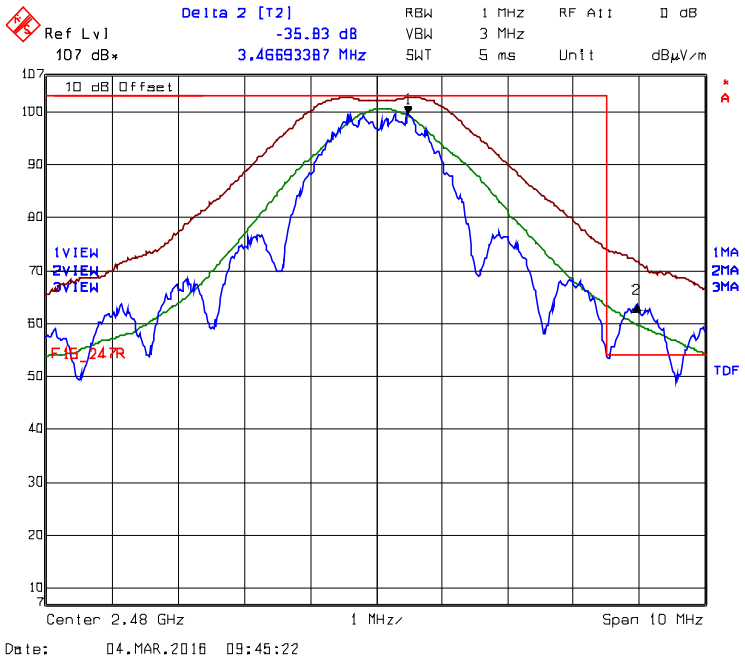




Trace 1: RBW= 1 MHz, VBW= 3 MHz, Trace 2: RBW= 100 kHz, VBW= 300 kHz, Delta (Peak to Band-Edge): 36.73dB
Trace 3: RBW= 1 MHz, VBW= 10 Hz, Peak Band-Edge at 2483.5 MHz: Peak= 102.98dBµV/m – 36.73dB= 66.25dBµV/m
Average: 63.28dBµV/m – 9.90dB= 53.38dBµV/m, Duty cycle is 32% (20*log(0.32)= -9.90dB}

Plot 5.4.4.4.2.12. Band-Edge RF Radiated Emissions at 3 m, Vertical Polarization
Highest End of Frequency Band, Ch26- 2480 MHz, QPSK Modulation, Power 1 Mode 1 @ 32% Duty Cycle

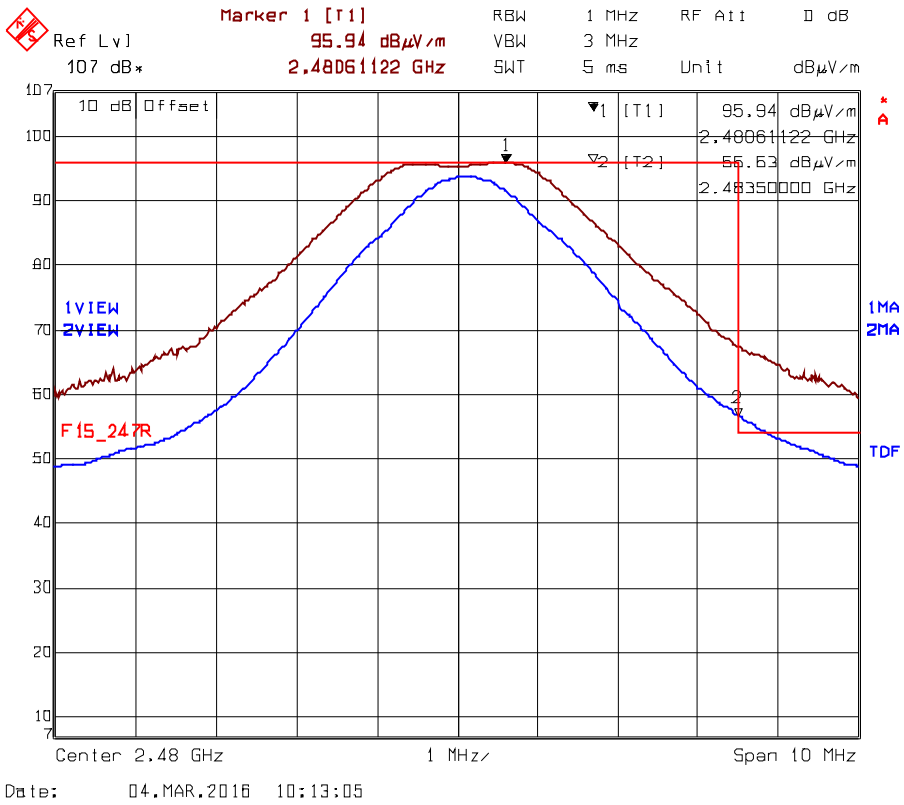




Trace 1: RBW= 1 MHz, VBW= 3 MHz, Trace 2: RBW= 100 kHz, VBW= 300 kHz, Delta (Peak to Band-Edge): 35.83dB
Trace 3: RBW= 1 MHz, VBW= 10 Hz, Peak Band-Edge at 2483.5 MHz: Peak= 102.58dBµV/m – 35.83dB= 66.75dBµV/m
Average: 63.28dBµV/m – 9.90dB= 53.38dBµV/m, Duty cycle is 32% (20*log(0.32)= -9.90dB}

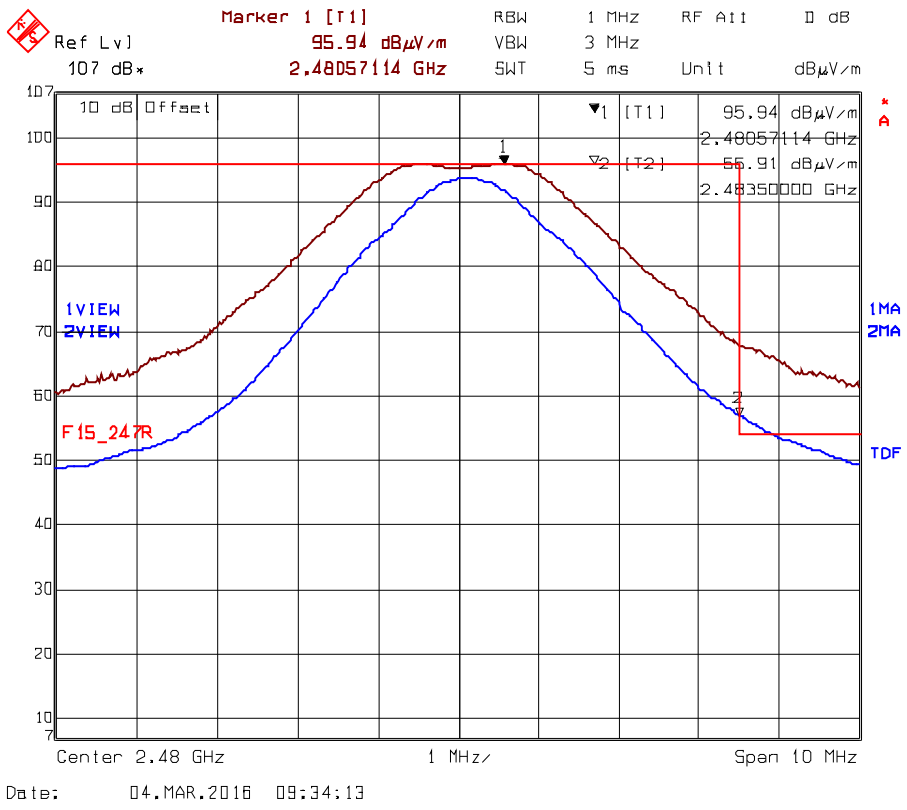
EUT with 15dBi Yagi Antenna @ 66% Duty Cycle requires total 19.25dB Assembly Cable loss

Plot 5.4.4.4.2.13. Band-Edge RF Radiated Emissions at 3 m, Horizontal Polarization
Highest End of Frequency Band, Ch26- 2480 MHz, QPSK Modulation, Power 1 Mode 1 @ 66% Duty Cycle



Trace 1: RBW= 1 MHz, VBW= 3 MHz, Trace 2: RBW= 1 MHz, VBW= 10 Hz
Average level at 2483.5 MHz is 53.02dBµV/m (56.63-3.61), Duty cycle is 66% (20*log(0.66)= 3.61dB}

Plot 5.4.4.4.2.14. Band-Edge RF Radiated Emissions at 3 m, Vertical Polarization
Highest End of Frequency Band, Ch26- 2480 MHz, QPSK Modulation, Power 1 Mode 1 @ 66% Duty Cycle



Trace 1: RBW= 1 MHz, VBW= 3 MHz, Trace 2: RBW= 1 MHz, VBW= 10 Hz
Average level at 2483.5 MHz is 53.59dBµV/m (57.20-3.61), Duty cycle is 66% (20*log(0.66)= 3.61dB}

5.4.4.5. EUT with 19.0 dBi Flat Panel Antenna and 1.25 dB Assembly Cable Loss

5.4.4.5.1. Spurious Radiated Emissions

Fundamental Frequency:	2405 MHz
Power Setting and Operating Mode:	Power 8 Mode 1, QPSK Modulation
Frequency Test Range:	30 MHz - 25 GHz

Frequency (MHz)	RF Peak Level (dBµV/m)	RF Avg Level (dBµV/m)	Antenna Plane (H/V)	Limit 15.209 (dBµV/m)	Limit 15.247 (dBµV/m)	Margin (dB)	Pass/ Fail
2405	123.32	--	V	--	--	--	--
2405	123.44	--	H	--	--	--	--
7215	56.90	45.05	V	54.0	103.4	-58.3	Pass
7215	56.09	44.77	H	54.0	103.4	-58.6	Pass
All other spurious emissions and harmonics are more than 20 dB below the applicable limit.							

*Field strength of emissions appearing within restricted frequency bands shall not exceed the limits in § 15.209.

Fundamental Frequency:	2440 MHz
Power Setting and Operating Mode:	Power 8 Mode 1, QPSK Modulation
Frequency Test Range:	30 MHz - 25 GHz

Frequency (MHz)	RF Peak Level (dBµV/m)	RF Avg Level (dBµV/m)	Antenna Plane (H/V)	Limit 15.209 (dBµV/m)	Limit 15.247 (dBµV/m)	Margin (dB)	Pass/ Fail
2440	123.55	--	V	--	--	--	--
2440	123.17	--	H	--	--	--	--
7320	56.76	45.90	V	54.0	103.6	-8.1	Pass*
7320	56.81	45.98	H	54.0	103.6	-8.0	Pass*
All other spurious emissions and harmonics are more than 20 dB below the applicable limit.							

*Field strength of emissions appearing within restricted frequency bands shall not exceed the limits in § 15.209.

Fundamental Frequency:	2475 MHz
Power Setting and Operating Mode:	Power 8 Mode 1, QPSK Modulation
Frequency Test Range:	30 MHz - 25 GHz

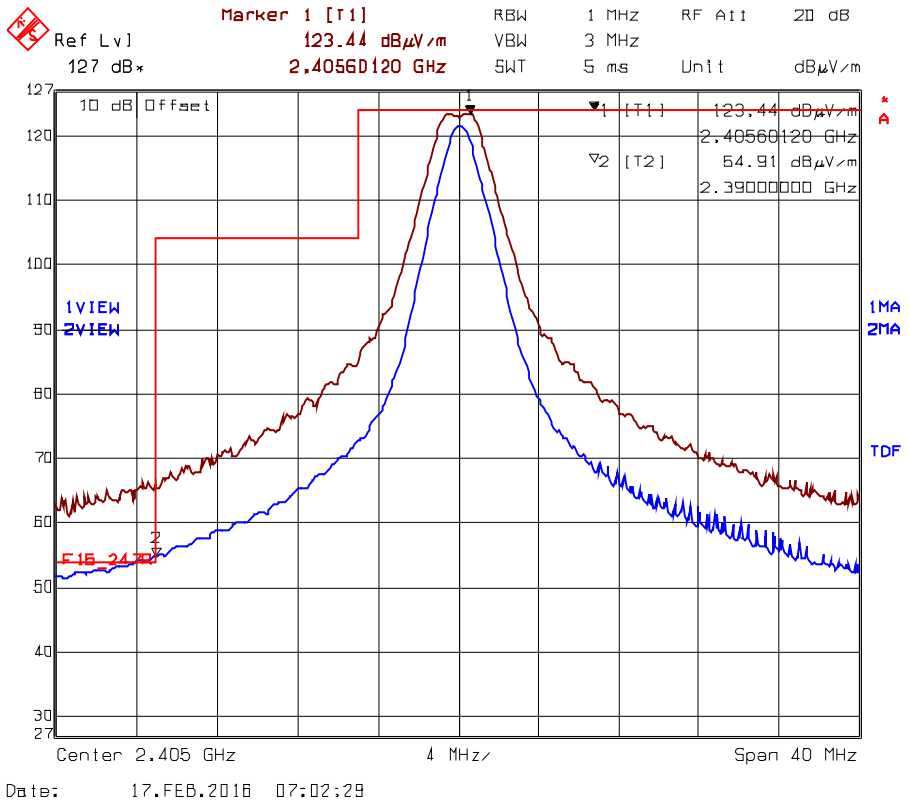
Frequency (MHz)	RF Peak Level (dBµV/m)	RF Avg Level (dBµV/m)	Antenna Plane (H/V)	Limit 15.209 (dBµV/m)	Limit 15.247 (dBµV/m)	Margin (dB)	Pass/ Fail
2475	123.64	--	V	--	--	--	--
2475	123.22	--	H	--	--	--	--
7425	54.56	42.43	V	54.0	103.6	-11.6	Pass*
7425	56.34	44.29	H	54.0	103.6	-9.7	Pass*
All other spurious emissions and harmonics are more than 20 dB below the applicable limit.							

*Field strength of emissions appearing within restricted frequency bands shall not exceed the limits in § 15.209.

5.4.4.5.2. Band-Edge RF Radiated Emissions

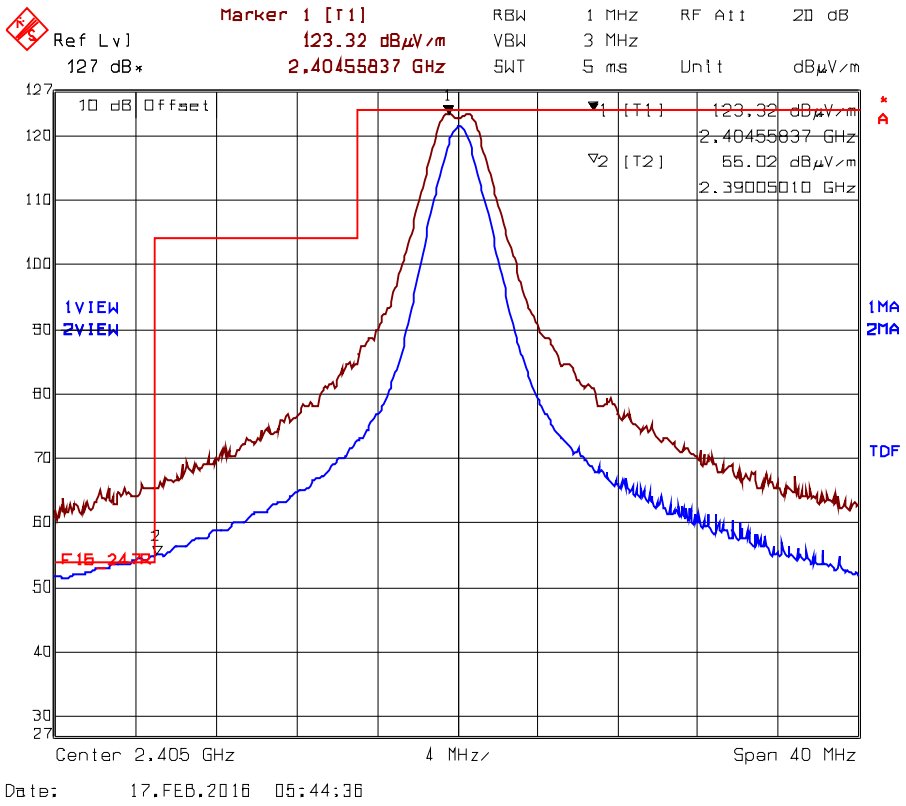
EUT with 19dBi Flat-Panel Antenna @ 66% Duty Cycle requires 1.25dB Assembly Cable loss

Plot 5.4.4.5.2.1. Band-Edge RF Radiated Emissions at 3 m, Horizontal Polarization
Low End of Frequency Band, Ch11- 2405 MHz, QPSK Modulation, Power 8 Mode 1 @ 66% Duty Cycle



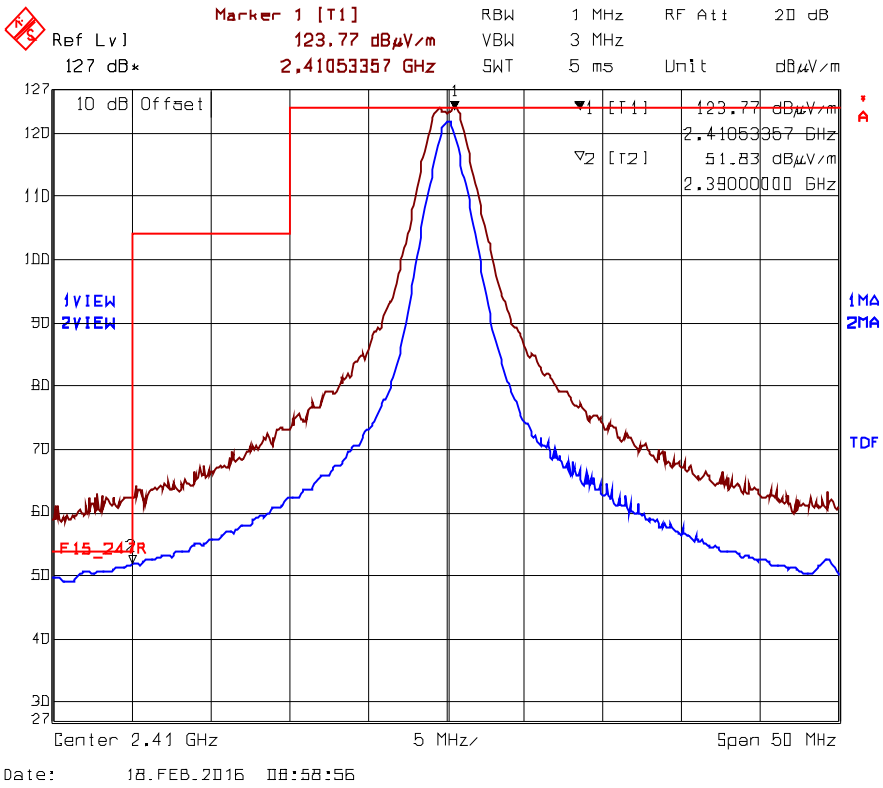
Trace 1: RBW = 1 MHz, VBW = 3 MHz, Trace 2: RBW = 1 MHz, VBW = 10 Hz
Average level at 2390 MHz is 51.30dBµV/m (54.91-3.61), Duty cycle max 32% (-9.90dB). min 66% (-3.61dB)

Plot 5.4.4.5.2.2. Band-Edge RF Radiated Emissions at 3 m, Vertical Polarization
Low End of Frequency Band, Ch11- 2405 MHz, QPSK Modulation, Power 8 Mode 1 @ 66% Duty Cycle



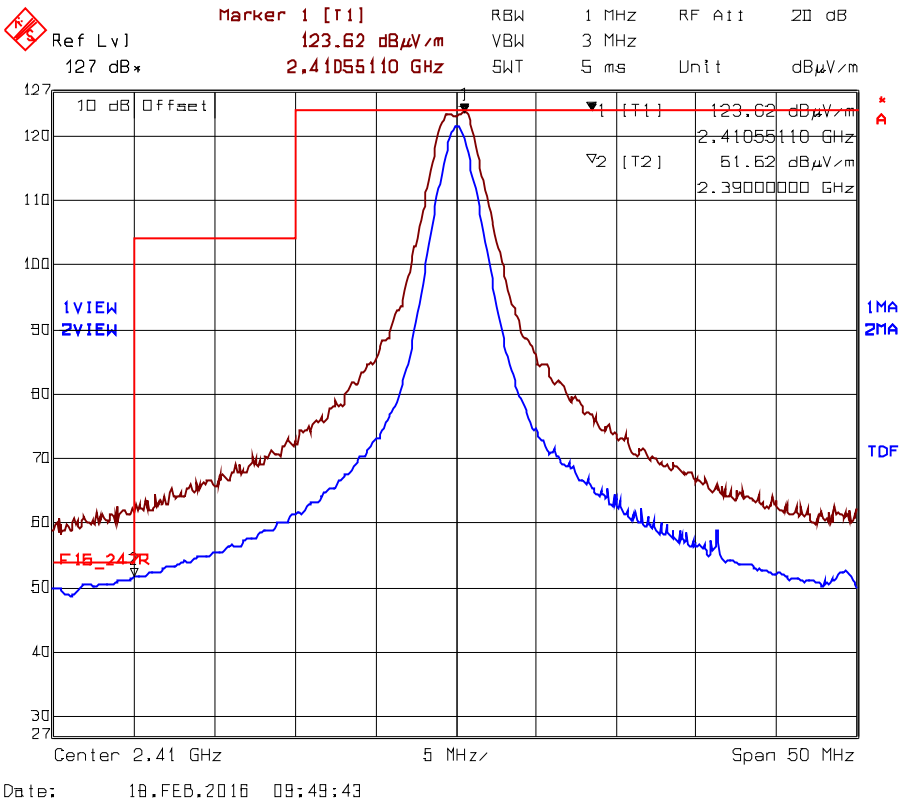
Trace 1: RBW = 1 MHz, VBW = 3 MHz, Trace 2: RBW = 1 MHz, VBW = 10 Hz
Average level at 2390 MHz is 51.41dBµV/m (55.02-3.61), Duty cycle max 32% (-9.90dB). min 66% (-3.61dB)

Plot 5.4.4.5.2.3. Band-Edge RF Radiated Emissions at 3 m, Horizontal Polarization
Low End of Frequency Band, Ch12- 2410 MHz, QPSK Modulation, Power 8 Mode 1



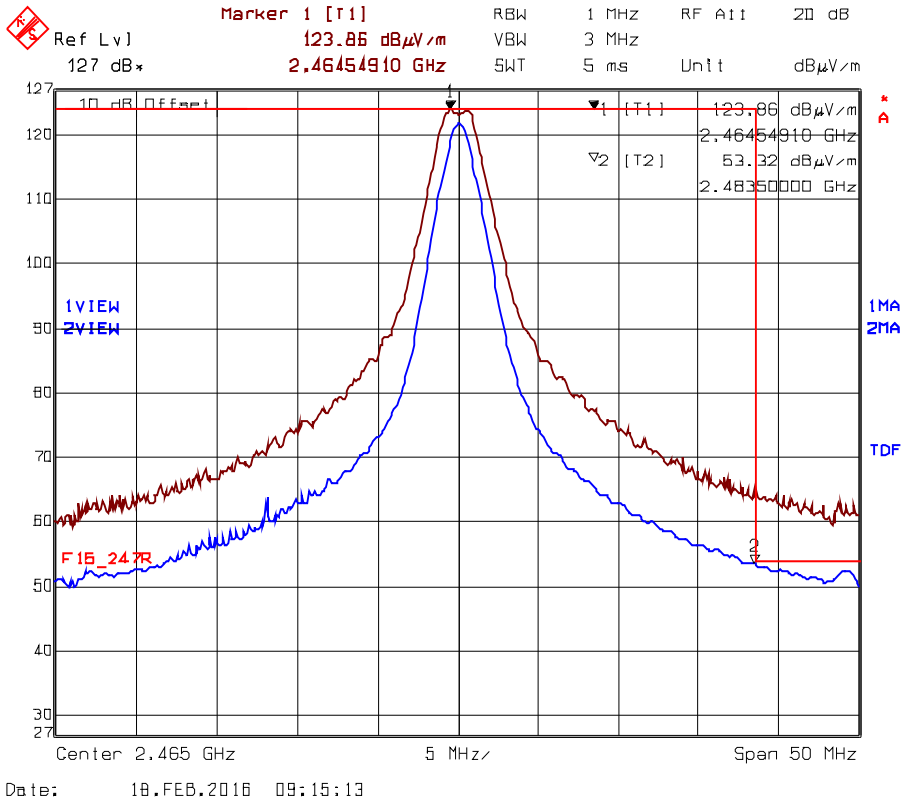
Trace 1: RBW = 1 MHz, VBW = 3 MHz, Trace 2: RBW = 1 MHz, VBW = 10 Hz
Average level at 2390 MHz is 51.83dBµV/m, 100% Duty Cycle can be applied from channel 12 to 23

Plot 5.4.4.5.2.4. Band-Edge RF Radiated Emissions at 3 m, Vertical Polarization
Low End of Frequency Band, Ch12- 2410 MHz, QPSK Modulation, Power 8 Mode 1



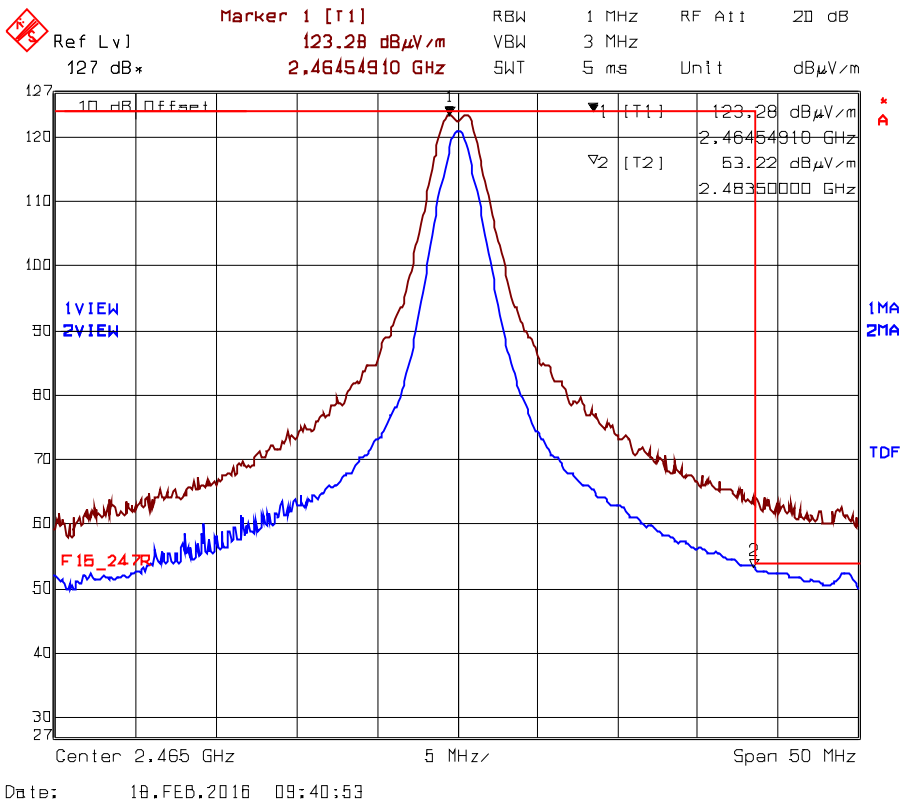
Trace 1: RBW = 1 MHz, VBW = 3 MHz, Trace 2: RBW = 1 MHz, VBW = 10 Hz
Average level at 2390 MHz is 51.62dBµV/m, 100% Duty Cycle can be applied from channel 12 to 23

Plot 5.4.4.5.2.5. Band-Edge RF Radiated Emissions at 3 m, Horizontal Polarization
High End of Frequency Band, Ch23- 2465 MHz, QPSK Modulation, Power 8 Mode 1



Trace 1: RBW = 1 MHz, VBW = 3 MHz, Trace 2: RBW = 1 MHz, VBW = 10 Hz
Average level at 2483.5 MHz is 53.32dBµV/m, 100% Duty Cycle can be applied from channel 12 to 23

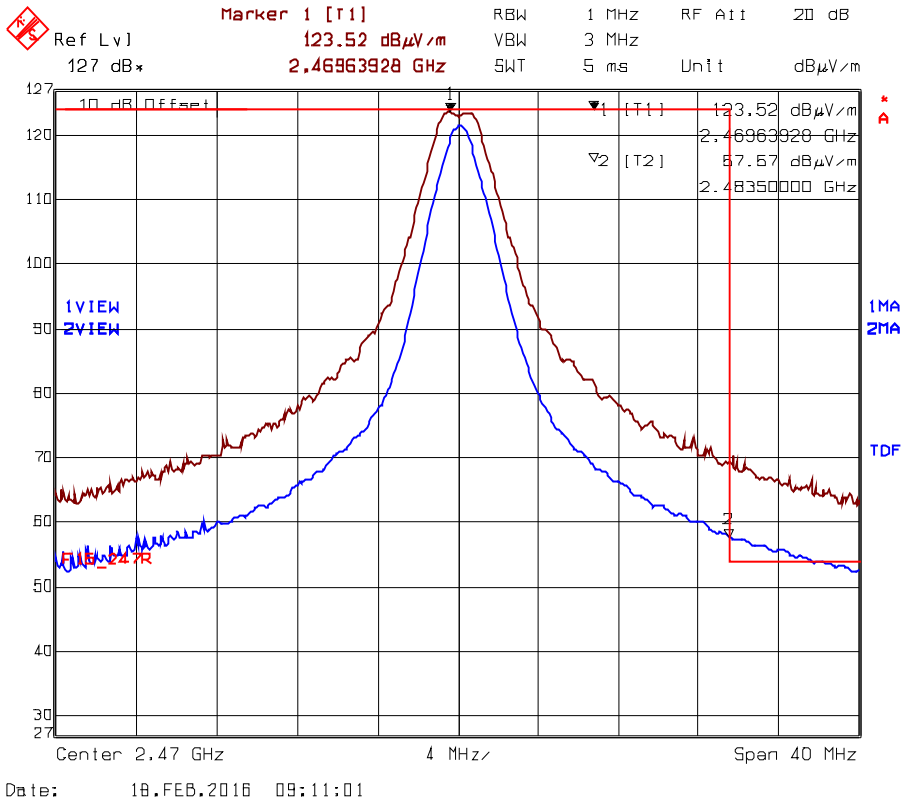
Plot 5.4.4.5.2.6. Band-Edge RF Radiated Emissions at 3 m, Vertical Polarization
High End of Frequency Band, Ch23- 2465 MHz, QPSK Modulation, Power 8 Mode 1



Trace 1: RBW = 1 MHz, VBW = 3 MHz, Trace 2: RBW = 1 MHz, VBW = 10 Hz
Average level at 2483.5 MHz is 53.22dBµV/m, 100% Duty Cycle can be applied from channel 12 to 23

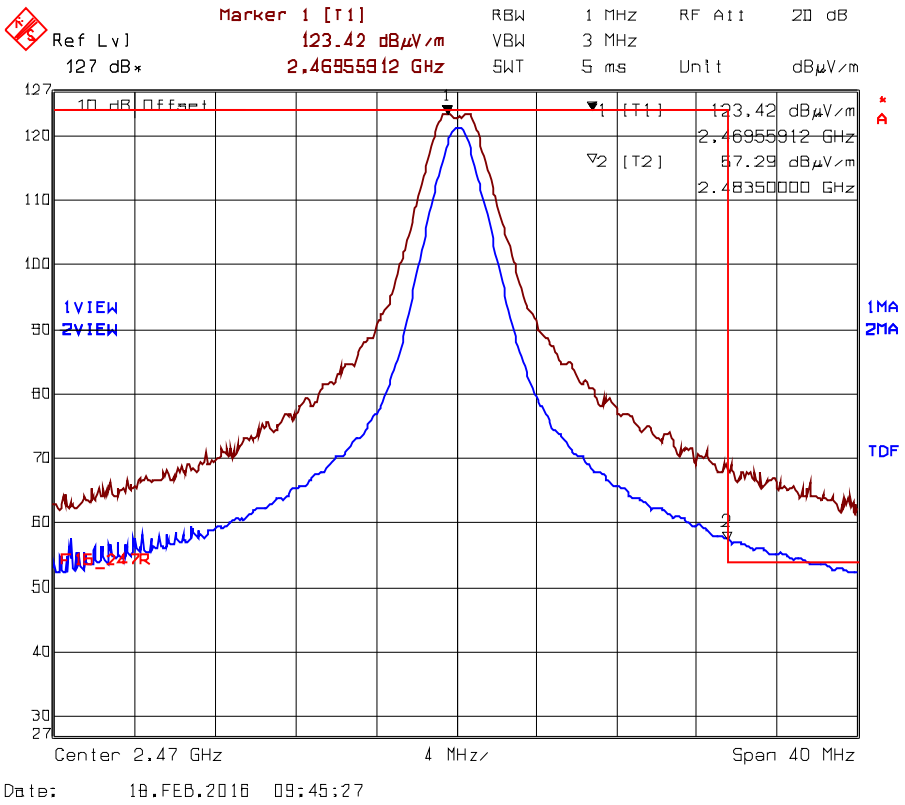
EUT with 19dBi Flat-Panel Antenna @ 66% Duty Cycle requires 1.25dB Assembly Cable loss

Plot 5.4.4.5.2.7. Band-Edge RF Radiated Emissions at 3 m, Horizontal Polarization
High End of Frequency Band, Ch24- 2470 MHz, QPSK Modulation, Power 8 Mode 1 @ 66% Duty Cycle



Trace 1: RBW = 1 MHz, VBW = 3 MHz, Trace 2: RBW = 1 MHz, VBW = 10 Hz
Average level at 2483.5 MHz is 53.96dBµV/m (57.57-3.61),Duty cycle max 32% (-9.90dB), min 66% (-3.61dB)

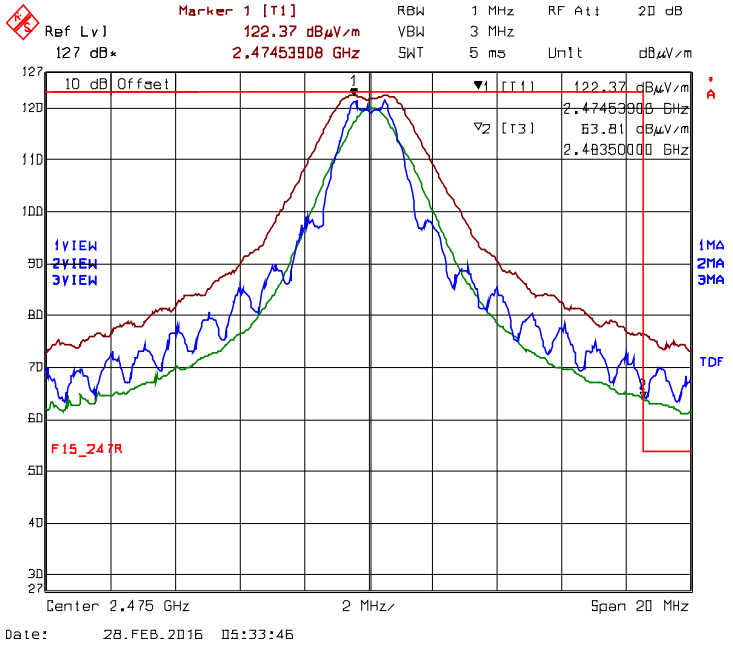
Plot 5.4.4.5.2.8. Band-Edge RF Radiated Emissions at 3 m, Vertical Polarization
High End of Frequency Band, Ch24- 2470 MHz, QPSK Modulation, Power 8 Mode 1 @ 66% Duty Cycle

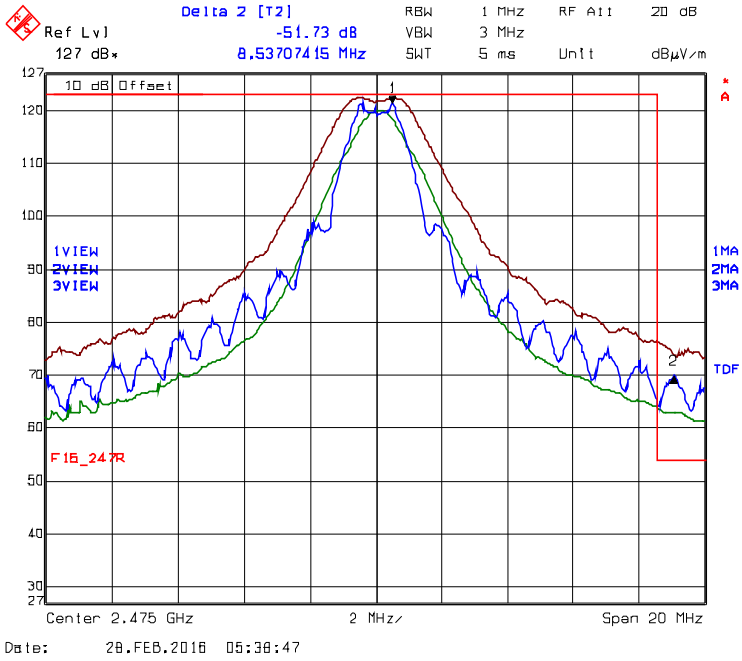


Trace 1: RBW = 1 MHz, VBW = 3 MHz, Trace 2: RBW = 1 MHz, VBW = 10 Hz
Average level at 2483.5 MHz is 53.68dBµV/m (57.29-3.61) Duty cycle max 32% (-9.90dB), min 66% (-3.61dB)

EUT with 19dBi Flat-Panel Antenna @ 32% Duty Cycle requires 2.25dB Assembly Cable loss

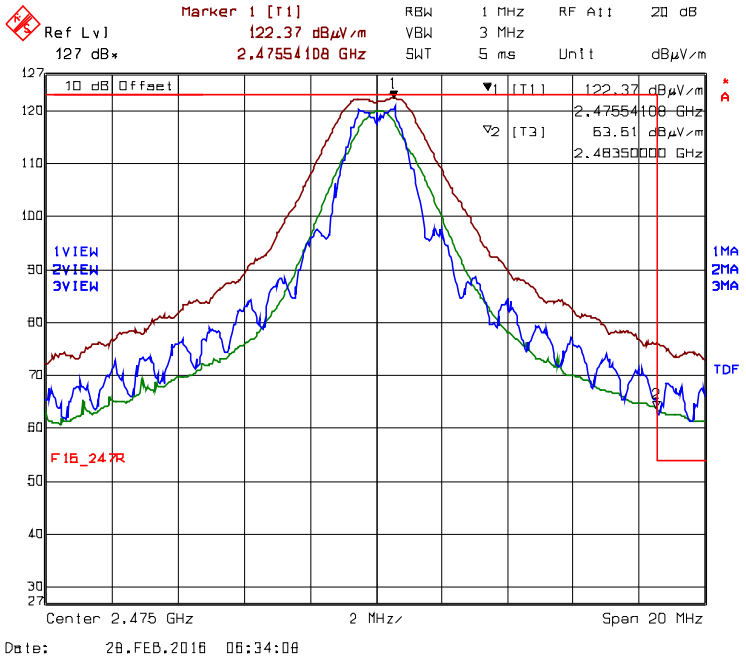
Plot 5.4.4.5.2.9. Band-Edge RF Radiated Emissions at 3 m, Horizontal Polarization
Higher End of Frequency Band, Ch25- 2475 MHz, QPSK Modulation, Power 8 Mode1 @ 32% Duty Cycle

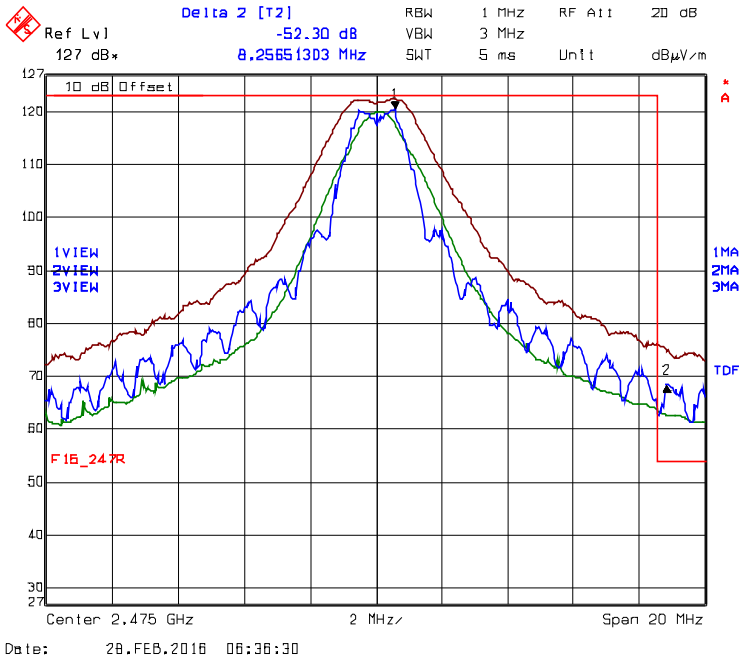




Trace 1: RBW= 1 MHz, VBW= 3 MHz, Trace 2: RBW= 200 kHz, VBW= 1 MHz, Delta (Peak to Band-Edge): 51.73dB
Trace 3: RBW= 1 MHz, VBW= 10 Hz, Peak Band-Edge at 2483.5 MHz: Peak= 122.37dBµV/m – 51.73dB= 70.64dBµV/m
Average: 63.81dBµV/m – 9.90dB= 53.91dBµV/m, Duty cycle is 32% (20*log(0.32)= -9.90dB}

Plot 5.4.4.5.2.10. Band-Edge RF Radiated Emissions at 3 m, Vertical Polarization
Higher End of Frequency Band, Ch25- 2475 MHz, QPSK Modulation, Power 8 Mode 1 @ 32% Duty Cycle

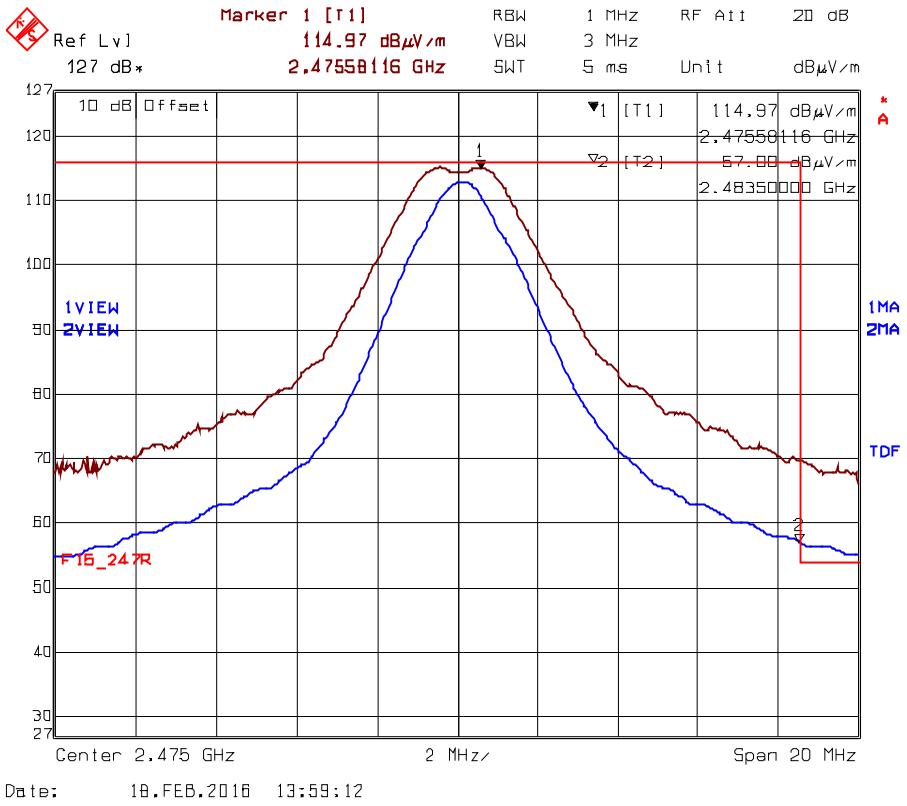




Trace 1: RBW= 1 MHz, VBW= 3 MHz, Trace 2: RBW= 200 kHz, VBW= 1 MHz, Delta (Peak to Band-Edge): 52.30dB
Trace 3: RBW= 1 MHz, VBW= 10 Hz, Peak Band-Edge at 2483.5 MHz: Peak= 122.37dBµV/m – 52.30dB= 70.07dBµV/m
Average: 63.51dBµV/m – 9.90dB= 53.61dBµV/m, Duty cycle is 32% (20*log(0.32)= -9.90dB}

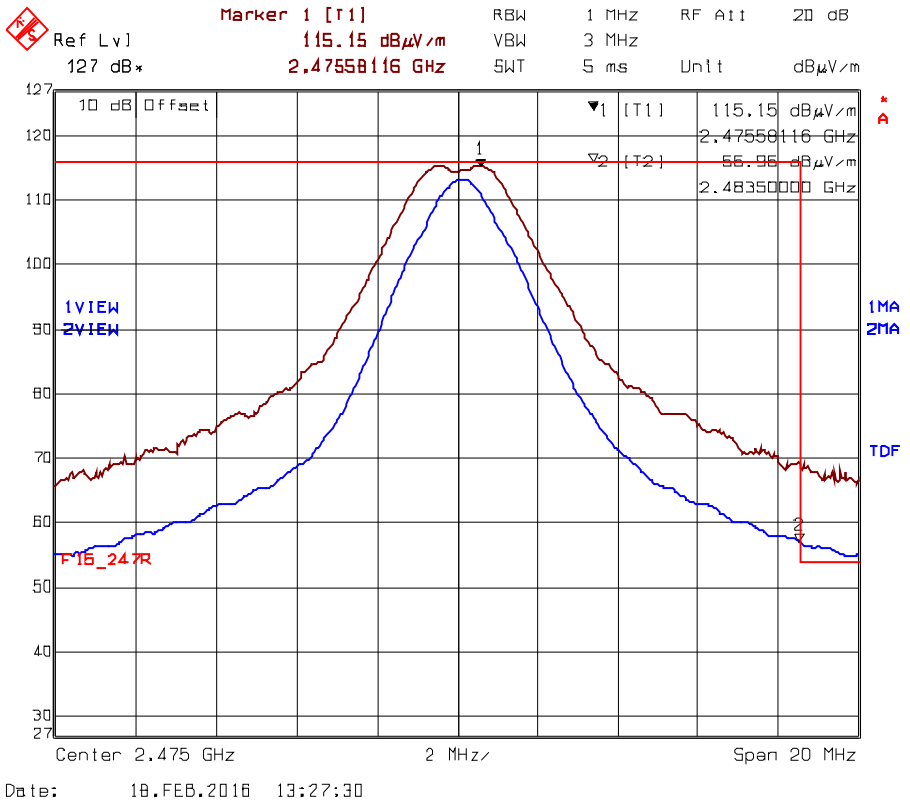
EUT with 19dBi Flat-Panel Antenna @ 66% Duty Cycle requires 9.25dB Assembly Cable loss

Plot 5.4.4.5.2.11. Band-Edge RF Radiated Emissions at 3 m, Horizontal Polarization
Higher End of Frequency Band, Ch25- 2475 MHz, QPSK Modulation, Power 8 Mode 1 @ 66% Duty Cycle



Trace 1: RBW= 1 MHz, VBW= 3 MHz, Trace 2: RBW= 1 MHz, VBW= 10 Hz
Average level at 2483.5 MHz is 53.39dBµV/m (57.0-3.61), Duty cycle is 66% (20*log(0.66)= 3.61dB}

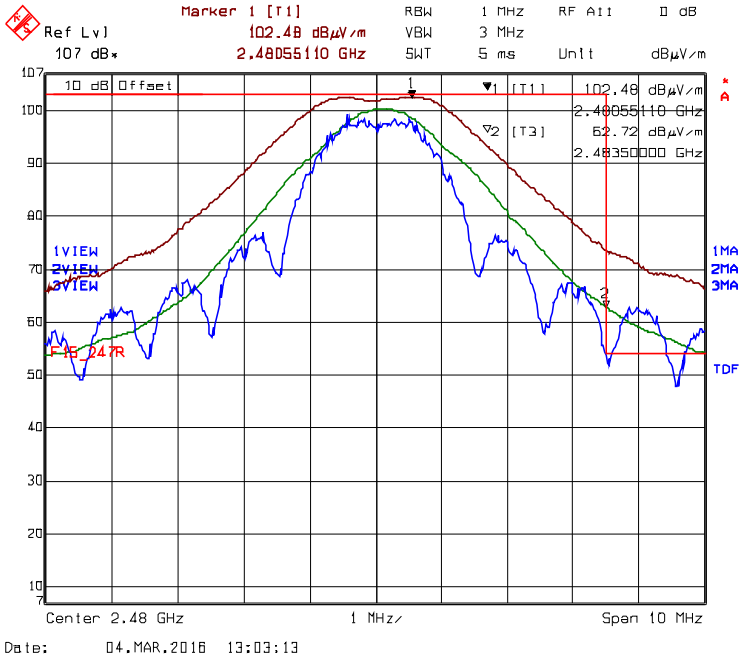
Plot 5.4.4.5.2.12. Band-Edge RF Radiated Emissions at 3 m, Vertical Polarization
Higher End of Frequency Band, Ch25- 2475 MHz, QPSK Modulation, Power 8 Mode 1 @ 66% Duty Cycle

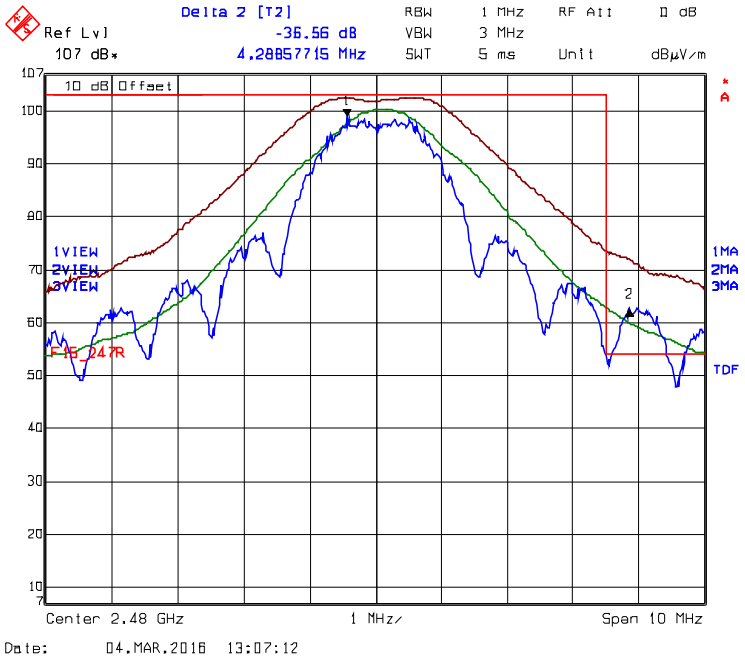


Trace 1: RBW= 1 MHz, VBW= 3 MHz, Trace 2: RBW= 1 MHz, VBW= 10 Hz
Average level at 2483.5 MHz is 53.35dBµV/m (56.96-3.61), Duty cycle is 66% (20*log(0.66)= 3.61dB}

EUT with 19dBi Flat-Panel Antenna @ 32% Duty Cycle requires total 17.25dB Assembly Cable loss

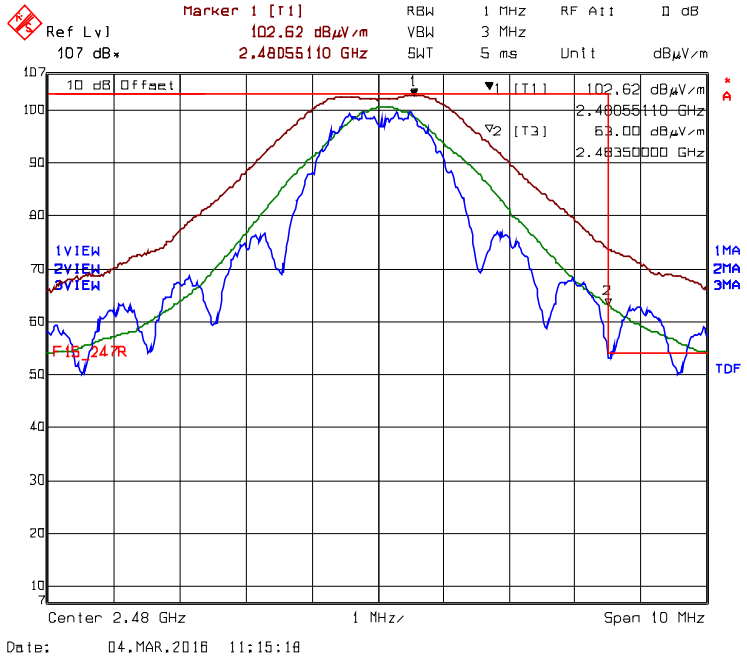
Plot 5.4.4.5.2.13. Band-Edge RF Radiated Emissions at 3 m, Horizontal Polarization
Highest End of Frequency Band, Ch26- 2480 MHz, QPSK Modulation, Power 1 Mode 1 @ 32% Duty Cycle

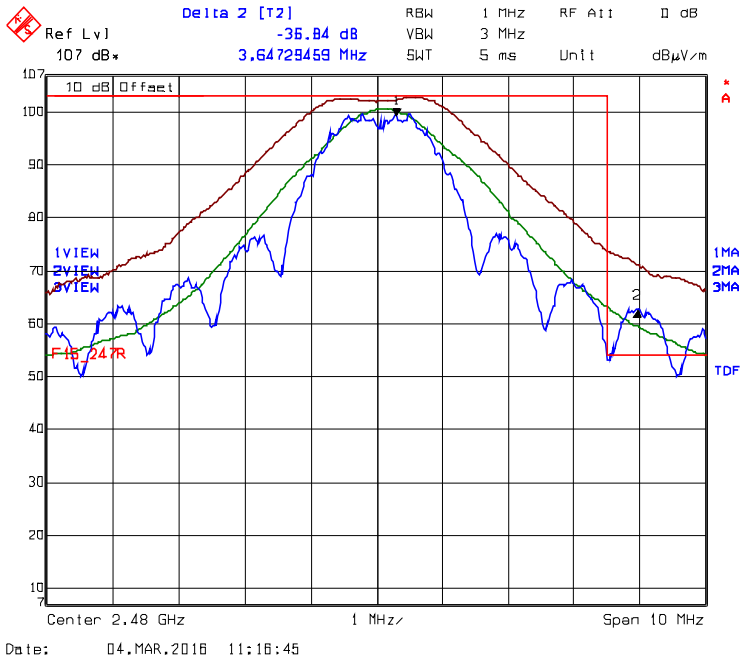




Trace 1: RBW= 1 MHz, VBW= 3 MHz, Trace 2: RBW= 100 kHz, VBW= 300 kHz, Delta (Peak to Band-Edge): 36.56dB
Trace 3: RBW= 1 MHz, VBW= 10 Hz, Peak Band-Edge at 2483.5 MHz: Peak= 102.48dBµV/m – 36.56dB= 65.92dBµV/m
Average: 62.72dBµV/m – 9.90dB= 52.82dBµV/m, Duty cycle is 32% (20*log(0.32)= -9.90dB}

Plot 5.4.4.5.2.14. Band-Edge RF Radiated Emissions at 3 m, Vertical Polarization
Highest End of Frequency Band, Ch26- 2480 MHz, QPSK Modulation, Power 1 Mode 1 @ 32% Duty Cycle

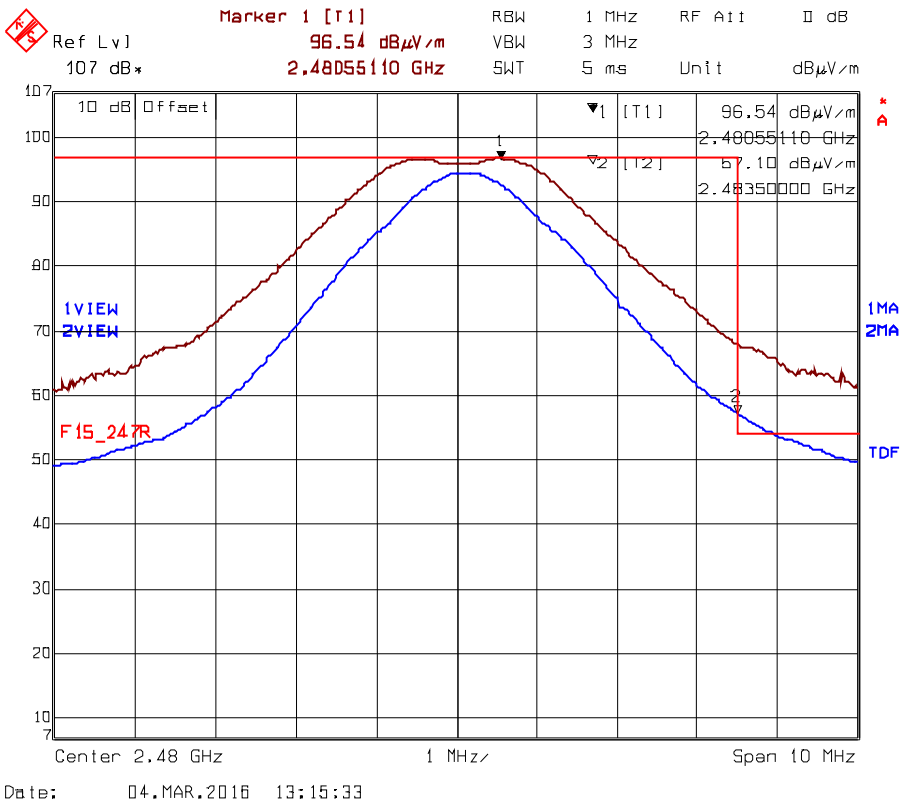




Trace 1: RBW= 1 MHz, VBW= 3 MHz, Trace 2: RBW= 100 kHz, VBW= 300 kHz, Delta (Peak to Band-Edge): 36.84dB
Trace 3: RBW= 1 MHz, VBW= 10 Hz, Peak Band-Edge at 2483.5 MHz: Peak= 102.62dBµV/m – 36.84dB= 65.78dBµV/m
Average: 63.00dBµV/m – 9.90dB= 53.10dBµV/m, Duty cycle is 32% (20*log(0.32)= -9.90dB}

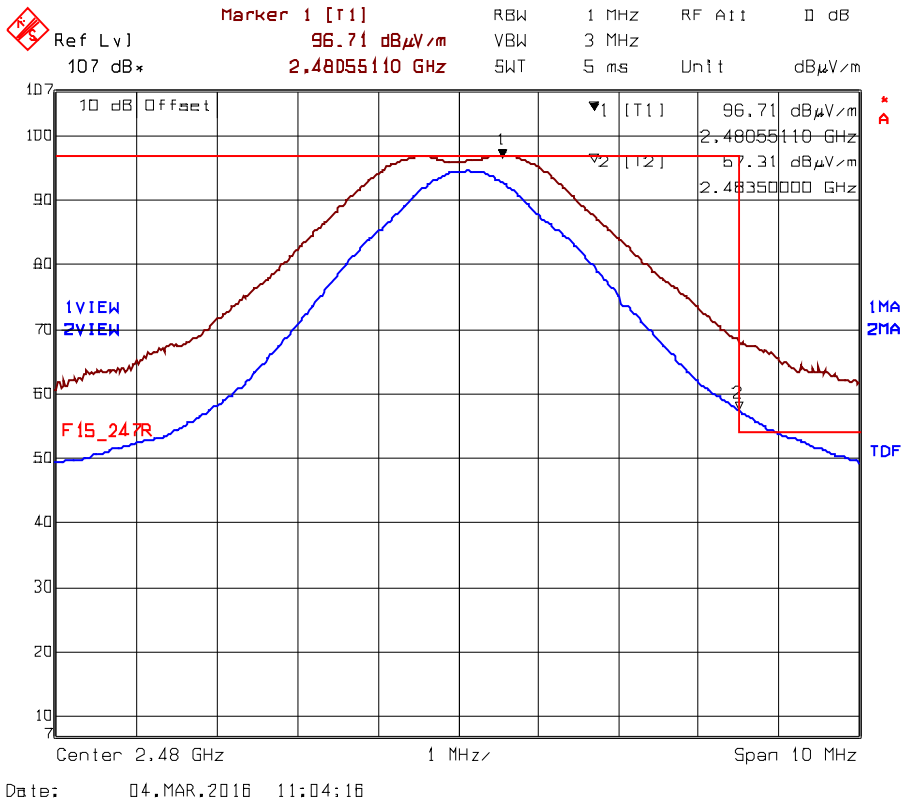
EUT with 19dBi Flat-Panel Antenna @ 66% Duty Cycle requires total 23.25dB Assembly Cable loss

Plot 5.4.4.5.2.15. Band-Edge RF Radiated Emissions at 3 m, Horizontal Polarization
Highest End of Frequency Band, Ch26- 2480 MHz, QPSK Modulation, Power 1 Mode 1 @ 66% Duty Cycle



Trace 1: RBW= 1 MHz, VBW= 3 MHz, Trace 2: RBW= 1 MHz, VBW= 10 Hz
Average level at 2483.5 MHz is 53.49dBµV/m (57.10-3.61), Duty cycle is 66% (20*log(0.66)= 3.61dB}

Plot 5.4.4.5.2.16. Band-Edge RF Radiated Emissions at 3 m, Vertical Polarization
Highest End of Frequency Band, Ch26- 2480 MHz, QPSK Modulation, Power 1 Mode 1 @ 66% Duty Cycle



Trace 1: RBW= 1 MHz, VBW= 3 MHz, Trace 2: RBW= 1 MHz, VBW= 10 Hz
Average level at 2483.5 MHz is 53.70dBµV/m (57.31-3.61), Duty cycle is 66% (20*log(0.66)= 3.61dB}

5.5. POWER SPECTRAL DENSITY [§ 15.247(e)]

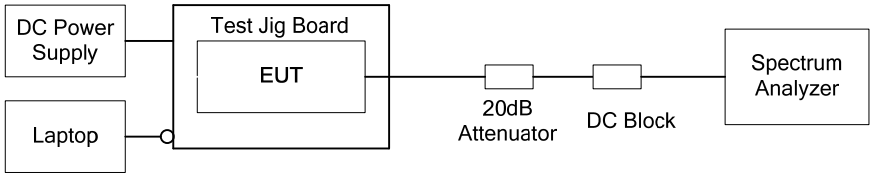
5.5.1. Limit(s)

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

5.5.2. Method of Measurements

Publication No. KDB Publication No. 558074 D01 DTS Meas Guidance V03r04, Section 10.2 Method PKPSD

5.5.3. Test Arrangement

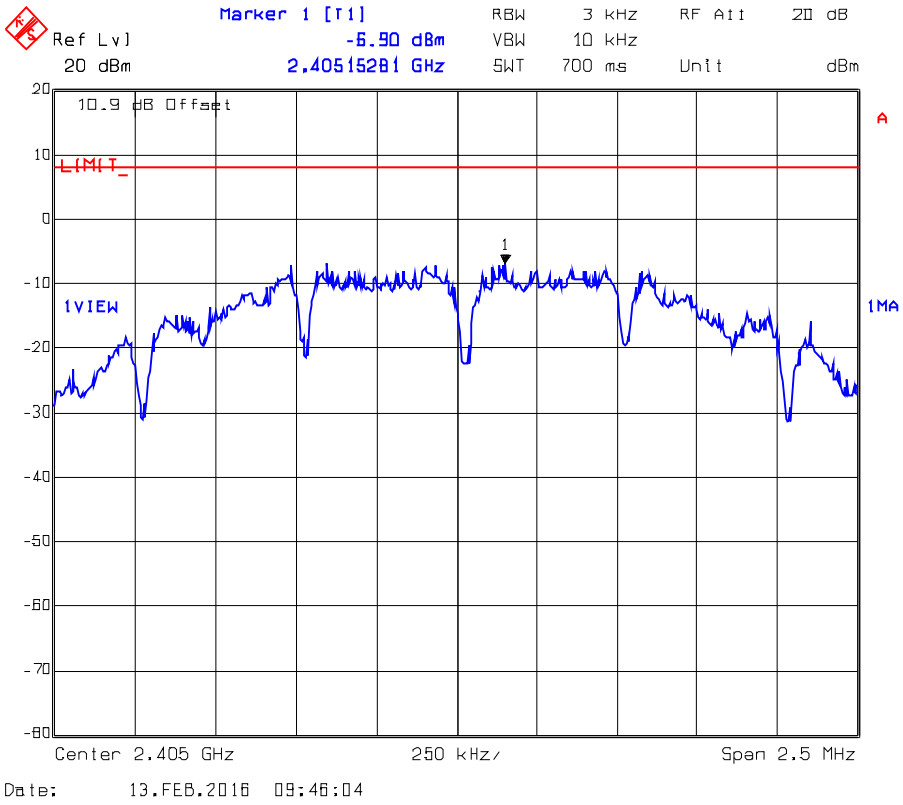


5.5.4. Test Data

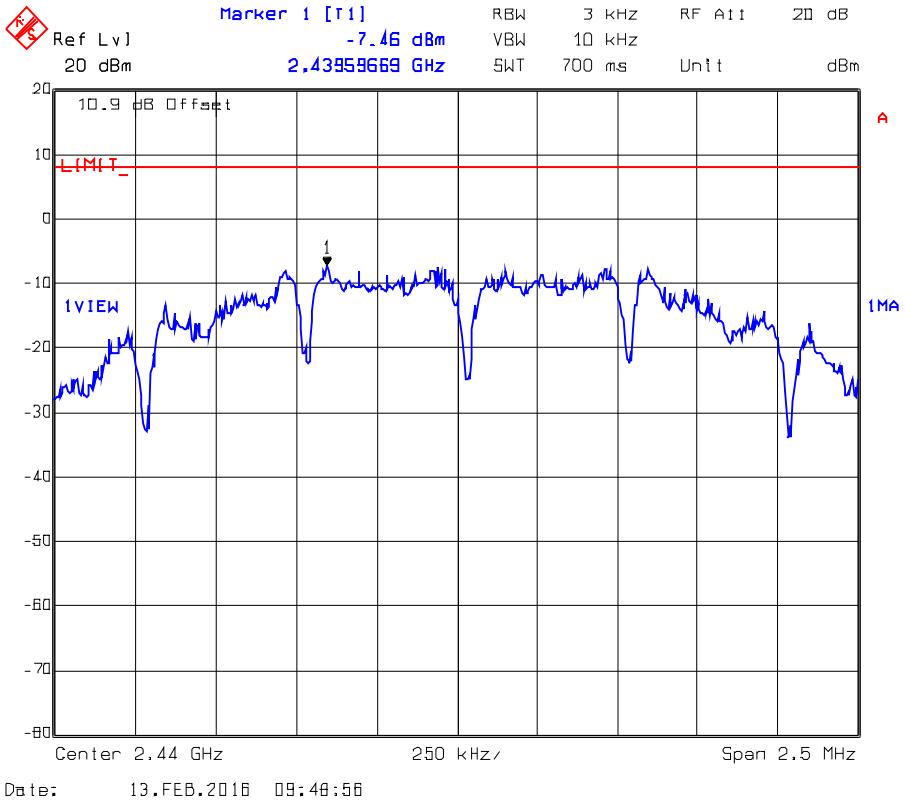
Power Setting	Channel Number	Modulation	Frequency (MHz)	*PSD in 3 kHz BW (dBm)	Limit (dBm)
+8 Mode 1	11	QPSK	2405	-6.90	8
+8 Mode 1	18	QPSK	2440	-7.46	8
+8 Mode 1	25	QPSK	2475	-7.56	8
+1 Mode 1	26	QPSK	2480	-13.75	8

*See the following plots for measurement details.

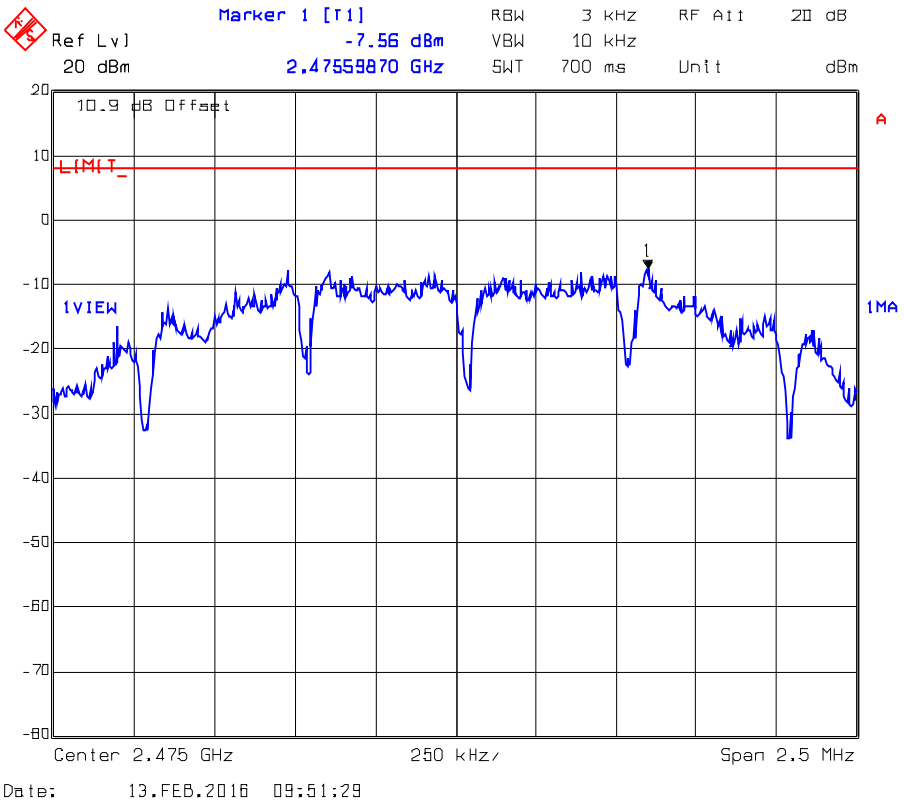
Plot 5.5.4.1. Power Spectral Density, Channel 11, 2405 MHz, QPSK Modulation, Power Setting +8 Mode 1



Plot 5.5.4.2. Power Spectral Density, Channel 18, 2440 MHz, QPSK Modulation, Power Setting +8 Mode 1

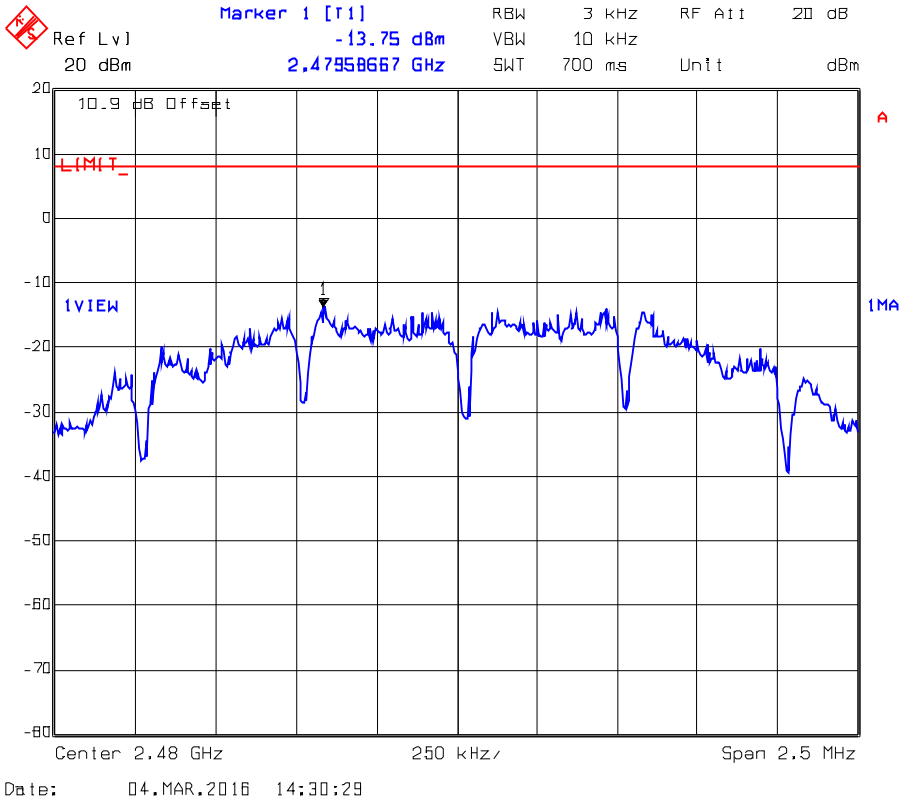


Plot 5.5.4.3. Power Spectral Density, Channel 25, 2475 MHz, QPSK Modulation, Power Setting +8 Mode 1



All test results contained in this engineering test report are traceable to National Institute of Standards and Technology (NIST)

Plot 5.5.4.4. Power Spectral Density, Channel 26, 2480 MHz, QPSK Modulation, Power Setting +1 Mode 1



5.6. RF EXPOSURE REQUIRMENTS [§§ 15.247(e)(i), 1.1310 & 2.1091]

The criteria listed in the following table shall be used to evaluate the environmental impact of human exposure to radio-frequency (RF) radiation.

FCC 47 CFR § 1.1310:

TABLE 1—LIMITS FOR MAXIMUM PERMISSIBLE EXPOSURE (MPE)

Frequency range (MHz)	Electric field strength (V/m)	Magnetic field strength (A/m)	Power density (mW/cm^2)	Averaging time (minutes)
(A) Limits for Occupational/Controlled Exposures				
0.3–3.0	614	1.63	*(100)	6
3.0–30	1842/f	4.89/f	*($900/f^2$)	6
30–300	61.4	0.163	1.0	6
300–1500	.....	.....	f/300	6
1500–100,000	.....	.....	5	6
(B) Limits for General Population/Uncontrolled Exposure				
0.3–1.34	614	1.63	*(100)	30
1.34–30	824/f	2.19/f	*($180/f^2$)	30
30–300	27.5	0.073	0.2	30
300–1500	.....	.....	f/1500	30
1500–100,000	.....	.....	1.0	30

f = frequency in MHz
* = Plane-wave equivalent power density

NOTE 1 TO TABLE 1: Occupational/controlled limits apply in situations in which persons are exposed as a consequence of their employment provided those persons are fully aware of the potential for exposure and can exercise control over their exposure. Limits for occupational/controlled exposure also apply in situations when an individual is transient through a location where occupational/controlled limits apply provided he or she is made aware of the potential for exposure.

NOTE 2 TO TABLE 1: General population/uncontrolled exposures apply in situations in which the general public may be exposed, or in which persons that are exposed as a consequence of their employment may not be fully aware of the potential for exposure or can not exercise control over their exposure.

5.6.1. Method of Measurements

Refer to Sections 1.1310, 2.1091

In order to demonstrate compliance with MPE requirements (see Section 2.1091), the following information is typically needed:

(1) Calculation that estimates the minimum separation distance (20 cm or more) between an antenna and persons required to satisfy power density limits defined for free space.
(2) Antenna installation and device operating instructions for installers (professional/unskilled users), and the parties responsible for ensuring compliance with the RF exposure requirement
(3) Any caution statements and/or warning labels that are necessary in order to comply with the exposure limits
(4) Any other RF exposure related issues that may affect MPE compliance

Calculation Method of RF Safety Distance:

$$S = \frac{P \cdot G}{4 \cdot \pi \cdot r^2} = \frac{EIRP}{4 \cdot \pi \cdot r^2}$$

Where: P: power input to the antenna in mW
EIRP: Equivalent (effective) isotropic radiated power
S: power density mW/cm^2
G: numeric gain of antenna relative to isotropic radiator
r: distance to centre of radiation in cm

5.6.2. RF Evaluation

Evaluation of RF Exposure Compliance Requirements	
RF Exposure Requirements	**Compliance with FCC Rules**
Minimum calculated separation distance between antenna and persons required: ***5.7 cm**	Manufacturer' instruction for separation distance between antenna and persons required: **20 cm**
Antenna installation and device operating instructions for installers (professional/unskilled users), and the parties responsible for ensuring compliance with the RF exposure requirement	Antenna installation and device operating instructions shall be provided to installers to maintain and ensure compliance with RF exposure requirements.
Caution statements and/or warning labels that are necessary in order to comply with the exposure limits	Refer to user's manual for RF exposure Information.
Any other RF exposure related issues that may affect MPE compliance	None

*The minimum separation distance between the antenna and bodies of users are calculated using the following formula:

$$r = \sqrt{\frac{P \cdot G}{4 \cdot \pi \cdot S}} = \sqrt{\frac{EIRP}{4 \cdot \pi \cdot S}}$$

S = 1.0 mW/cm^2
EIRP = 26.05 dBm = $10^{26.05/10}$ mW = 402 mW (Worst Case)

(Minimum Safe Distance, r) = $\sqrt{\frac{EIRP}{4 \cdot \pi \cdot S}} = \sqrt{\frac{402}{4 \cdot \pi \cdot (1.0)}} \approx 5.7cm$

EXHIBIT 6. TEST EQUIPMENT LIST

Test Instruments	Manufacturer	Model No.	Serial No.	Frequency Range	Cal. Due Date
Spectrum Analyzer	Agilent	E7401A	US40240432	9 kHz–1.5 GHz	14 Mar 2017
Attenuator	Pasternack	PE7010-20	-	DC–2 GHz	03 Feb 2017
L.I.S.N	EMCO	3825/2	2209	0.10 -100 MHz	29 Sep 2016
Signal Generator	Hewlett Packard	8648C	3443U00391	0.1 – 3200 MHz	02 Feb 2017
Spectrum Analyzer	Rohde & Schwarz	FSEK30	100077	20Hz–40 GHz	21 Nov 2016
RF Amplifier	Hewlett Packard	84498	3008A00769	1 – 26.5 GHz	20 Aug 2016
Band Reject Filter	Micro-Tronics	BRM50701	105	Cut off 2.4-2.483 GHz	Cal on use
DC Block	Hewlett Packard	11742A	12460	0.045–26.5 GHz	Cal on use
DC Power Supply	Xantrex	HPD 60-5SX	63903	0.1 – 60 Vdc	Cal on use
High Pass Filter	K & L	11SH10-4000/T12000	4	Cut off 2400 MHz	Cal on use
EMI Receiver	Rohde & Schwarz	ESU40	100037	20Hz–40 GHz	08 May 2017
RF Amplifier	Com-Power	PAM-0118A	551052	0.5 – 18 GHz	13 Jul 2016
Biconi-Log Antenna	EMCO	3142C	26873	0.026 – 3 GHz	14 Apr 2016
Horn Antenna	Emco	3155	6570	1 – 18 GHz	11 Sep 2016
Horn Antenna	Emco	3160-09	118385	18 – 26.5 GHz	04 Aug 2016
Attenuator	Pasternack	7024-10	3	DC–26.5 GHz	Cal on use
Attenuator	Pasternack	7024-20	6	DC–26.5 GHz	Cal on use

EXHIBIT 7. MEASUREMENT UNCERTAINTY

The measurement uncertainties stated were calculated in accordance with the requirements of CISPR 16-4-2 @ IEC:2003 and JCGM 100:2008 (GUM 1995) – Guide to the Expression of Uncertainty in Measurement.

7.1. LINE CONDUCTED EMISSION MEASUREMENT UNCERTAINTY

	Line Conducted Emission Measurement Uncertainty (9 kHz – 30 MHz):	**Measured**	**Limit**
u_c	**Combined standard uncertainty:** $u_c(y) = \sqrt{\sum_{I=1}^{m} u_i^2(y)}$	**± 1.44**	**± 1.8**
U	**Expanded uncertainty U:** $U = 2u_c(y)$	**± 2.89**	**± 3.6**

7.2. RADIATED EMISSION MEASUREMENT UNCERTAINTY

	Radiated Emission Measurement Uncertainty @ 3m, Horizontal (30-1000 MHz):	**Measured (dB)**	**Limit (dB)**
u_c	**Combined standard uncertainty:** $u_c(y) = \sqrt{\sum_{I=1}^{m} u_i^2(y)}$	**± 2.39**	**± 2.6**
U	**Expanded uncertainty U:** $U = 2u_c(y)$	**± 4.79**	**± 5.2**

	Radiated Emission Measurement Uncertainty @ 3m, Vertical (30-1000 MHz):	**Measured (dB)**	**Limit (dB)**
u_c	**Combined standard uncertainty:** $u_c(y) = \sqrt{\sum_{I=1}^{m} u_i^2(y)}$	**± 2.39**	**± 2.6**
U	**Expanded uncertainty U:** $U = 2u_c(y)$	**± 4.78**	**± 5.2**

	Radiated Emission Measurement Uncertainty @ 3 m, Horizontal & Vertical (1 – 18 GHz):	**Measured (dB)**	**Limit (dB)**
u_c	**Combined standard uncertainty:** $u_c(y) = \sqrt{\sum_{I=1}^{m} u_i^2(y)}$	**± 1.87**	**Under consideration**
U	**Expanded uncertainty U:** $U = 2u_c(y)$	**± 3.75**	**Under consideration**