Prüfbericht – Produkte
Test Report - Products

TÜVRheinland®

Prüfbericht-Nr.: *Test report no.:*	ULR-TC568820300000071F	**Auftrags-Nr.:** *Order no.:*	166484900 0010	Seite 1 von 75 *Page 1 of 75*
Kunden-Referenz-Nr.: *Client reference no.:*	NA	**Auftragsdatum:** *Order date:*	2020-10-02	
Auftraggeber: *FCC Client:*	Honeywell international corp, 1860 W.Rosegarden lane,Phoenix,Arixona,			
Auftraggeber: *ISED Client:*	Honeywell Technology Solution Lab Devarabisanahalli Village,KR puram Hobli, Bangalore, Karnataka-560103,India			
Prüfgegenstand: *Test item:*	Field Device Access Point Gen3			
Bezeichnungs .: *Identifications .:*	FDAP31,FDAP32,FDAP3P			
Auftrags-Inhalt: *Order content*:	Testing and Issue of test report & Issue FCC and ISED grant certificate			
Prüfgrundlage: *Test specification:*	FCC Part 15 Subpart C 15.247, 15.207 & RSS 247 Issue 2 and RSS Gen Issue 5			
Wareneingangsdatum: *Date of sample receipt:*	2020-11-11			
Prüfmuster-Nr & Serien-Nr.: *Test sample no & serial no.:*	A002947320-001 A002947320-002 & Engineering sample Serial number not available			
Prüfzeitraum: *Testing period:*	2020-11-03 - 2020-11-13			
Ort der Prüfung: *Place of testing:*	Wireless laboratory, Bangalore			
Prüflaboratorium: *Testing laboratory:*	TÜV Rheinland (India) Pvt. Ltd.27/B 2nd Cross Road,Electronic City Phase1,Bangalore-560 100,India FCC Test site registration number: 496599 ISED Test site registration number: 3466E-1			
Prüfergebnis*: *Test result*:*	Pass			

geprüft von: *tested by:*		**genehmigt von:** *authorized by:*	
Datum: *Date:* 2020-11-03	Srinivas	**Ausstellatum:** *Issue date:* 2021-02-18	
Stellung / *Position:*	Srinivasa B R Engineer	**Stellung** / *Position:*	Mahammadgouse Kaladagi Assitant Manager
Sonstiges / *Other:*	FCC ID:S5751307990 IC:573W-51307990	Contains FCC ID:XPYNINAB1 Contains IC:8595A-NINAB1	

Zustand des Prüfgegenstandes bei Anlieferung: Prüfmuster vollständig und unbeschädigt
Condition of the test item at delivery: *Test item complete and undamaged*

* Legende:	1 = sehr gut	2 = gut	3 = befriedigend	4 = ausreichend	5 = mangelhaft
	P(ass) = entspricht o.g. Prüfgrundlage(n)		F(ail) = entspricht nicht o.g. Prüfgrundlage(n)	N/A = nicht anwendbar	N/T = nicht getestet
** Legend:*	*1 = very good*	*2 = good*	*3 = satisfactory*	*4 = sufficient*	*5 = poor*
	P(ass) = passed a.m. test specification(s)		*F(ail) = failed a.m. test specification(s)*	*N/A = not applicable*	*N/T = not tested*

Dieser Prüfbericht bezieht sich nur auf das o.g. Prüfmuster und darf ohne Genehmigung der Prüfstelle nicht auszugsweise vervielfältigt werden. Dieser Bericht berechtigt nicht zur Verwendung eines Prüfzeichens.
This test report only relates to the a. m. test sample. Without permission of the test center this test report is not permitted to be duplicated in extracts. This test report does not entitle to carry any test mark.
V05

TEST SUMMARY

Test Item	Applicable Standard		Result
	FCC	ISED	
Maximum conducted (Peak) output power	FCC 15.247(b)(3)	RSS 247 Issue 2, Section 5.4 (d)	Pass
Maximum Power Spectral Density	FCC 15.247(e)	RSS 247 Issue 2, Section 5.2 (b)	Pass
DTS Bandwidth	FCC 15.247(a)(2)	RSS 247 Issue 2, Section 5.2 (a)	Pass
Emissions in non-restricted frequency bands	FCC 15.247(d)	RSS 247 Issue 2, Section 5.5	Pass
Spurious Radiated Emissions and Restricted Bands of Operation	FCC 15.209 / FCC 15.205	RSS-Gen Issue 5, Section 8.9 /8.10	Pass
Conducted Emissions on a.c Power Lines	FCC 15.207	RSS-Gen Issue 5, Section 8.8	Pass

Note

1. Host products Field device access point (FDAP) has following model variants , all the models are electrically identical & RF characteristics are similar, please refer the model difference summary document filed with this certification for more details.

Model name	Model number
Field device access point	FDAP31
	FDAP32
	FDAP3P

2. Product Field device access point(FDAP) Unit has been integrated with following certified BLE module, and the Host product FDAP is listed with FCC ID: S5751307990 and IC:573W-51307990 by addressing the co-location of BLE transmitter with GXRM transmitter and simultaneous operation of GXRM and BLE transmitters.

Sl No.	Radio Protocol	FCC ID	IC	No of transmitter in the Host	Original module Tested By
1	BLE	XPYNINAB1	8595A-NINAB1	1	7Layers GmbH

3. The product Field Device Access Point Gen3 has 2 RF ports and it is verified that the two ports are electrical identically, and full testing is performed on one single RF port.

Product Category: Electronics Testing
Test Discipline: EMC Test Facility

REVISION HISTORY OF THIS REPORT

Report Number	Version	Description	Issue date
ULR-TC568820300000071F	01	Initial issue of test report	2021-02-08
ULR-TC568820300000071F	02	Updated as per Reviwer comments	2021-02-18

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1 GENERAL REMARKS

1.1 Attachments

All attachments are part of this test report and are issued in separate document

1. TEST SETUP PHOTOS

2: EUT EXTERNAL PHOTOS

3: EUT INTERNAL PHOTOS

4: FCC & IC LABEL AND LABEL LOCATION

5: BLOCK DIAGRAM

6: SPECIFICATION OF EUT

7: SCHEMATIC DIAGRAM

8: BILL OF MATERIAL

9: USER MANUAL

10: MAXIMUM PERMISSIBLE EXPOSURE INFORMATION

2 TEST SITES

2.1 Testing Facilities

1. TÜV Rheinland (India) Pvt.Ltd.,
   27/B, 2nd Cross,
   ElectronicCityPhase1
   Bangalore – 560 100,
   India

2. TUV Rheinland (India) Private Limited
   108 , Beside ISBR Business School,
   Electronic city Phase I
   Bangalore - 560 100.
   India

2.2 List of Test and Measurement Instruments

Table 1: List of test and measurement instruments

Equipment	Manufacturer	Model Name	Serial Number	Firmware Versions	Calibration Due Date	Periodicity	Test Facility
EMI Receiver	Rohde & Schwarz	ESU 40	100288	4.43 SP3	11.10.2021	Yearly	Radiated Spurious Emission
Active loop antenna	Frankonia	LAX-10	LAX-10-800	-	16.07.2021	Yearly	
Baloon and Biconical Antenna	Schwarzbeck mess-elektronik	VHBB-9124 / BBA-9106	01028	-	02.09.2021	Yearly	
Log – Periodic Antenna	Schwarzbeck mess-elektronik	VUSLP-9111B	9111B-111	-	31.08.2021	Yearly	
Horn Antenna	Schwarz beck	BBHA 9120 D	9120D-1944	-	17.07.2021	Yearly	
Horn Antenna	Schwarz beck	BBHA 9170	BBHA 9170-0904	-	29.01.2021	Yearly	
Semi Anechoic Chamber	Frankonia	-	-	-	-	-	
Fully Anechoic Chamber	Albatross	-	-	-	-	-	
Spectrum Analyser	Agilent Technologies	E4407B	US41192 772	A.14.06	10.08.2021	Yearly	Antenna - Port Measurements
EMI Receiver	Rohde & Schwarz	ESW 44	101732	-	10.12.2020	Yearly	AC Power line conducted emission
LISN	Rohde & Schwarz	ENV 216	100022	-	04.09.2021	Yearly	
Pulse Limiter	Rohde & Schwarz	ESH3-Z2	100811	-	05.08.2021	Yearly	

Table 2: Instrument application Software versions

SL. No.	Test Type	Application software	Version
1	Radiated spurious emission measurement in SAC	EMC 32	10.60.00
2	Radiated spurious emission measurement in FAC	EMC 32	10.60.00

3 GENERAL PRODUCT INFORMATION

3.1 Product Function and Intended Use

The Field Device Access Point (FDAP) is a ruggedized industrial radio device intended for use in hazardous location to provide wireless connectivity for Wireless compatible field devices. As an industrial meshing access point, FDAP provides secure and reliable wireless coverage for wireless field devices.

3.2 Ratings and System Details of Equipment under Test

Table 3: Ratings and System Details as declared by Client*

Radio Protocol		IEEE 802.15.4	BLE
Operating Frequency Range		2405 MHz to 2475 MHz	2402 MHz to 2480 MHz
No. of Channels		15 (Refer Table 6)	40 (Refer Table 7)
Channel Spacing		5MHz	2MHz
Maximum Measured Power (conducted)		18.86 dBm	4.1497 dBm as per the BLE module grant
Modulation		DSSS (O-QPSK)	GFSK, 1-DH1
Number of antennas		Four Antennas with GXRM module	Single integrated antenna (Part no: u-blox NINA-B112)
Antenna Gain		Refer the Table 4	3dBi
Data rate supported		250kbits/sec	1 Mbps
Supply Voltage to Product		24 VDC through AC/DC adaptor and PoE Supply	
Environmental conditions	**Storage**	-40 °C to +85 °C	
		Relative humidity 5% to 95% RH	
	Operating	-40 °C to +75 °C	
		Relative humidity 5% to 95%	
EUT Dimension(H x W x L) mm		217 x 319 x 379 mm	

***Disclaimer**: The information/data is supplied by the client and the same is considered to arrive at the final value. Any changes made apart from the specified specification, can directly impact on the tests results. Refer the products user manual for more details.

Table 4 : Antenna details and power level settings used

Module & supported transmit chain	Antennas description	Antenna gain	Power level settings used with respective antennas	Antenna type
GXRM Module Has single transmit chain i.e. SISO only	AIR-ANT2450V-N	5 dBi	20 dB	External antenna - Omni directional
	AIR-ANT2480V-N	8 dBi	17 dB	External antenna - Omni directional
	Laird Technologies - OD24M-5	5 dBi	20 dB	External antenna - Omni directional
	L-COM HGV-2409U 8dBi Omni Antenna	8 dBi	17 dB	External antenna - Omni directional
BLE Module Has single transmit chain i.e. SISO only	NINA-B112	1 dBi	Max as per original module	Integral antenna

***Disclaimer**: The information/data is supplied by the client and the same is considered to arrive at the final value. Any changes made apart from the specified specification, can directly impact on the tests results. Refer the products user manual for more details.

3.3 Measurement Uncertainty:

Reported uncertainties represent expanded uncertainties expressed at approximately the 95% confidence level using a coverage factor of $k = 2$

Table 5: Measurement Uncertainty

Parameter	Uncertainty
Occupied Channel Bandwidth	±5 %
RF output power, conducted	±1.5 dB
Power Spectral Density, conducted	±3 dB
Unwanted Emissions, conducted	±3 dB
All emissions, radiated	±6 dB
Temperature	±3 ℃
Supply Voltages	±3 %
Time	±5 %

Note: The Listed Measurement Uncertainties are the worst-case uncertainty, for the respective test cases. Above Table is for reporting purpose only and not used in determining Final Pass/Fail verdict.

4 TEST SET-UP AND OPERATION MODE

4.1 Principle of Configuration Selection

Transmission was enabled with highest possible duty cycle on low, mid and high channel of BLE and IEEE802.15.4 protocols

4.1.1 EUT Model variants and operating conditions used

Model name	Model number	Rated Power and Voltage	Same Circuit diagram and Schematic and RF functionality
Field device access point	FDAP31	24V DC 1W	Yes
	FDAP32	24V DC 2W	Yes
	FDAP3P	60V PoE 2W	Yes

4.1.1 EUT configuration settings used for testing

Test cases	Model Used
All conducted RF test cases	FDAP31 variant used for testing with GXRM module
All radiated test cases < 1 GHz	FDAP32 used for testing with worst case RF transmission
All radiated test cases > 1 GHz	FDAP31 variant used for testing with GXRM module and BLE module
Power line conducted emission	FDAP32 variant used for testing

4.2 Simultaneous transmission details

1. IEEE 802.15.4 (GXRM transmitter) 1 and IEEE 802.15.4 (GXRM transmitter) 2 does not support simultaneous operation.
2. IEEE 802.15.4 (GXRM transmitter) and BLE transmitter support simultaneous operation. Test results are reported in this test report.

4.3 Test Operation and Test Software

Hardware name: FDAP3x
Hardware Version : Rev A

Software name: FDAP Software
Software Version: R321.2

4.4 Special Accessories and Auxiliary Equipment

- Configuration laptop, DC power supply and 24V DC Adaptor, PoE Supply.

4.5 Countermeasures to achieve EMC Compliance

- None

4.6 TUV Sample identification

Radiated and conducted test sample: A002947320-001 (FDAP Variant)

4.7 List of frequencies

Frequency Band (MHz)	Channel Number	Channel Frequency (MHz)
2400 – 2483.5	**01**	**2405**
	02	2410
	03	2415
	04	2420
	05	2425
	06	2430
	07	2435
	08	**2440**
	09	2445
	10	2450
	11	2455
	12	2460
	13	2465
	14	2470
	15	**2475**

Table 6: List of IEE 802.15.4 Center frequencies

Channel used for IEE 802.15.4 testing

Channel low : 2405MHz Channel mid : 2440MHz Channel High : 2475MHz

Frequency Band (GHz)	Channel No.	Frequency (MHz)
BLE (2.4-2.4835)	**0**	**2402**
	1	2404
	2	2406
	3	2408
	:	:
	:	:
	18	2438
	19	**2440**
	20	2437
	:	:
	:	:
	36	2474
	37	2476
	38	2478
	39	**2480**

Table 7: List of BLE Center frequencies

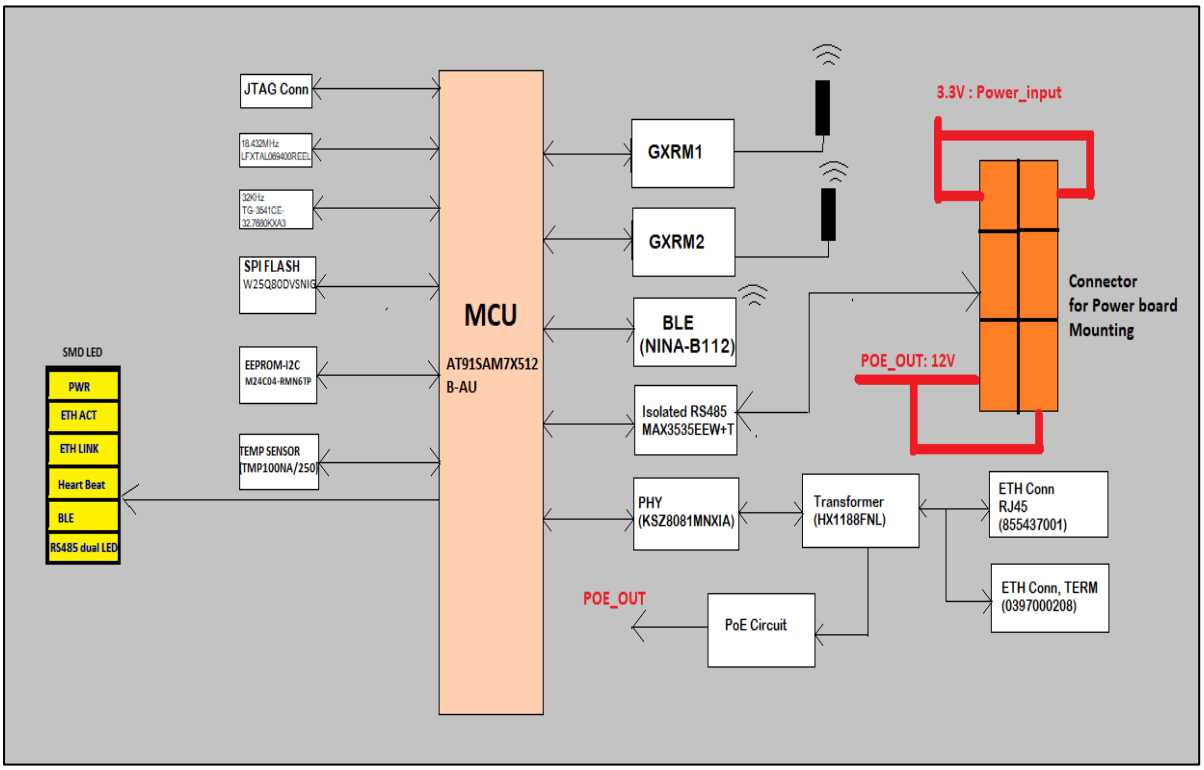
Channel used for BLE testing

Channel low : 2402MHz Channel mid : 2440MHz Channel High : 2480MHz

5 Operational Description

FDAP: It serves as a routing access point for wireless field devices and is located between the wired DCS network and wireless-based wireless field devices. Once deployed in the field, FDAPs self-discover and self-organize into a managed, secure, and redundant wireless field device mesh network. With FDAPs, wireless field devices do not have to route data from other field devices. The following figure illustrates how FDAPs are used in a OneWireless Network.

6 Block Diagram



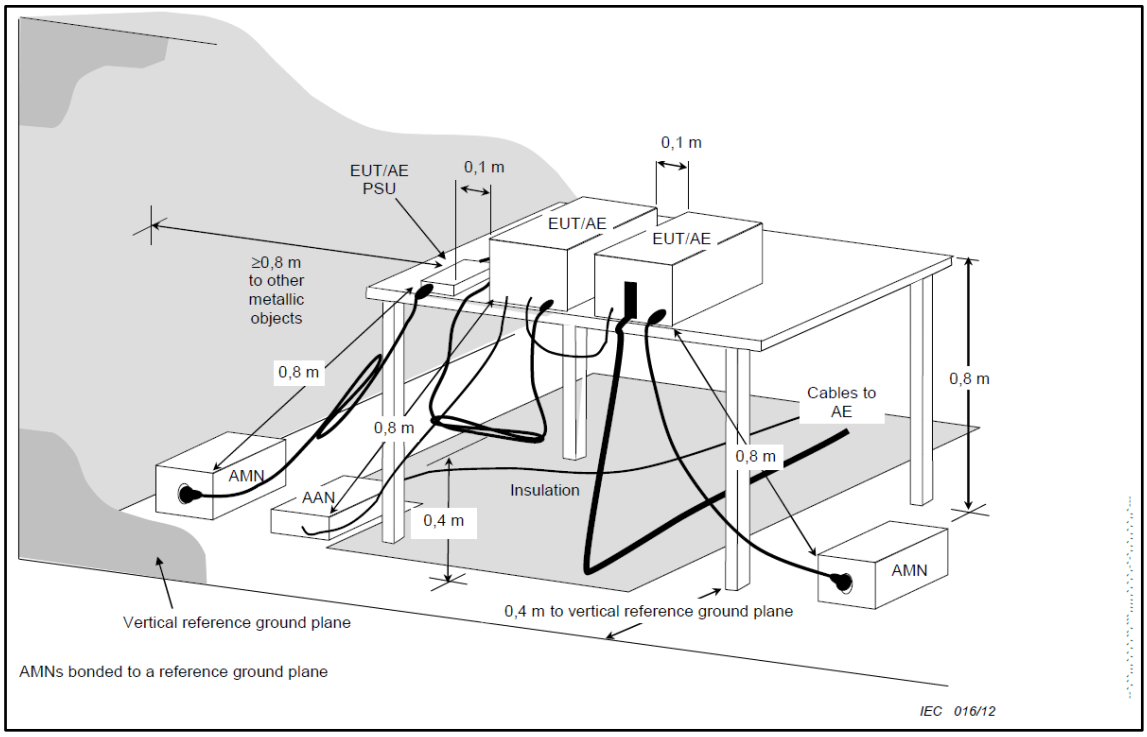
7 TEST METHODOLOGY

7.1 Conducted Spurious Emission Test on AC Power Line

Measured levels of ac power-line conducted emission across the 50Ω LISN port (to which the EUT is connected). All emission voltage and current measurements shall be made on each current-carrying conductor at the plug end of the EUT power cord by the use of mating plugs and receptacles on the LISN, if used. Equipment shall be tested with power cords that are normally supplied or recommended by the manufacturer and that have electrical and shielding characteristics that are the same as those cords normally supplied or recommended by the manufacturer.

The device is placed on the test table, raised 80cm above the referance ground plane. The vertical conducting plane is located 40cm to the rear of the device. AC Conducted emission measurement is made over frequency range from 150kHz to 30MHz, this measurement was performed with EUT powered by 2 methods and both method are tested individually, one with an AC adaptor with 110V AC 60Hz supply and second with Wireless charger with supply 110V AC 60Hz.

7.1.1 Test Setup Configuration



7.2 Radiated Emission Test

The radiated emission measurement was performed according to the procedures in ANSI C63.10-2013. The equipment under test (EUT) was placed at the middle of the 80 cm high turntable for below 1 GHz & 1.5 m height for above 1 GHz measurement, and the EUT is 3 meters far from the measuring antenna. The turntable was rotated 360˚ for obtaining the maximum emission. The height of the measuring antennas was scanned between 1 m and 4 m, and the antenna rotated to repeat the measurements for both the horizontal and vertical antenna polarizations. Repeat the measurement steps until the maximum emissions were obtained. The measurement above 1000 MHz was performed by horn antenna, The measurement below 30 MHz was performed by loop antenna, Measurement from 30 MHz to 200 MHz was performed by Baloon and Biconical Antenna, and mesurement from 200 MHz to 1 GHz was performed by Log-Periodic Antenna.

The EUT was rotated around the X-, Y-, and Z-Axis and the results from worst case axis are recorded

Note: Measured Field strength level (dBµV/m) = Received Emissions(dBµV) + Antenna Factor(dB/m)+ Cable Loss(dB) – Pre-amplifier Gain(dBi)

7.2.1 Test Setup Configuration

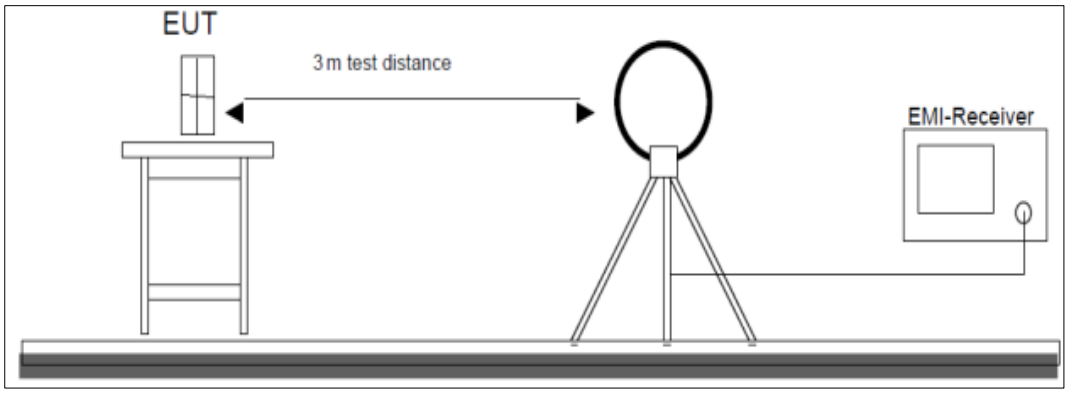


Figure 1: Frequency Range 9 kHz- 30 MHz

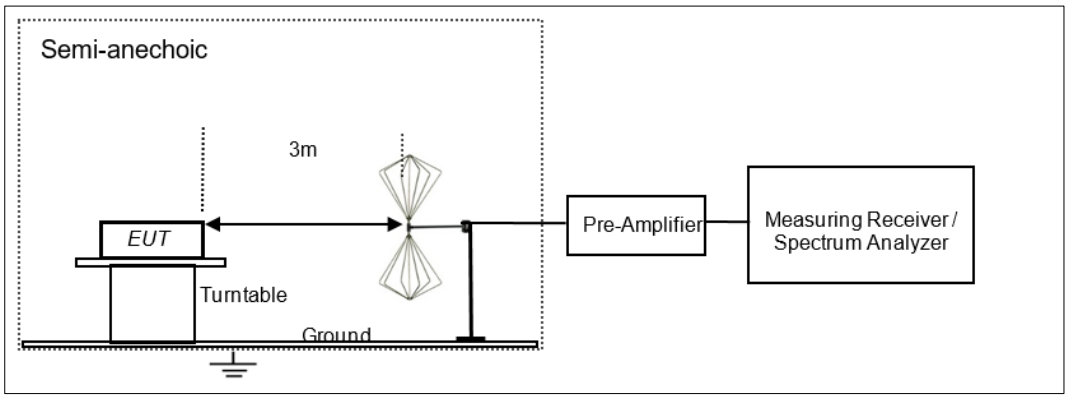


Figure 2: Frequency Range 30 MHz – 200 MHz

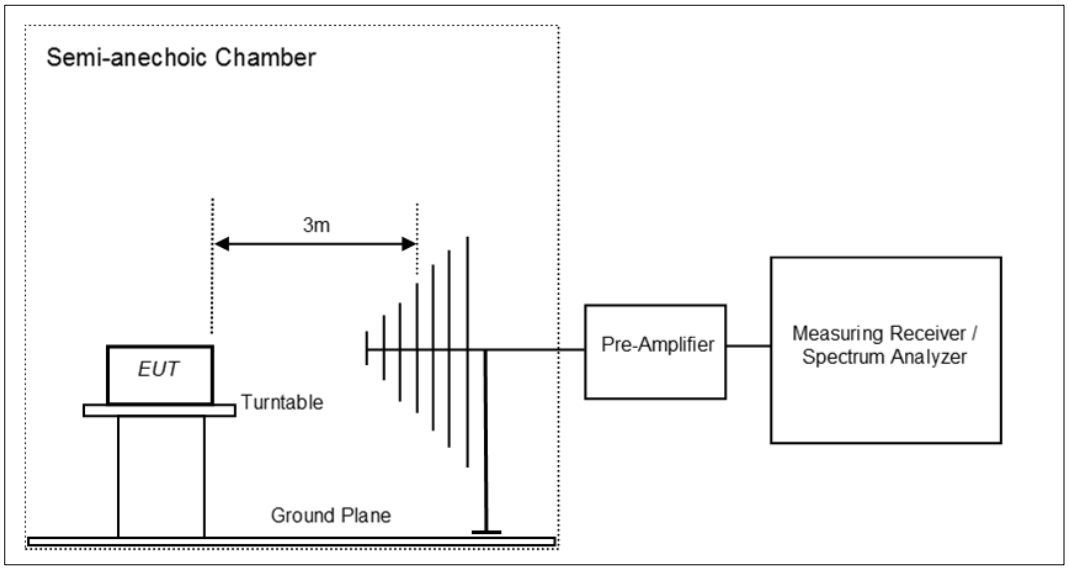


Figure 3: Frequency Range 200 MHz - 1GHz

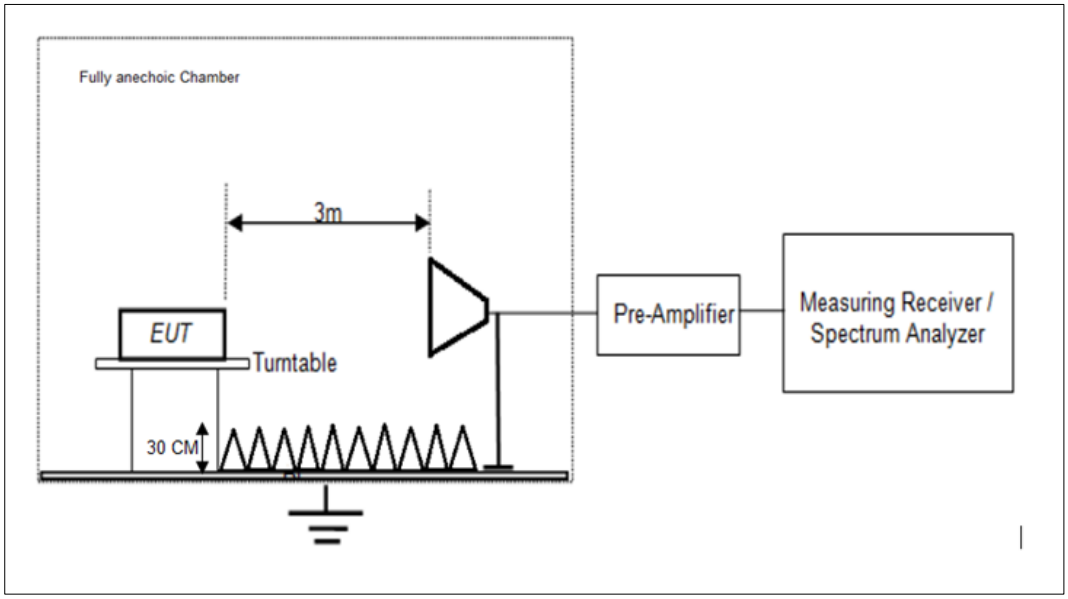


Figure 4: Frequency Range above 1 GHz

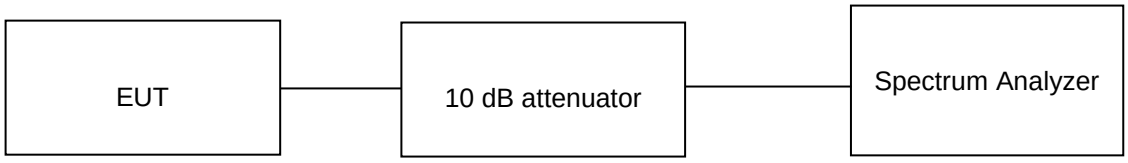
8 TEST RESULTS for GXRM Module

8.1 Maximum Peak Conducted Output Power

Result ***Pass***

RF Protocol	IEE 802.15.4
Test Specification	FCC part 15 Subpart C 15.247 (b)(3) / RSS 247 Issue 2, Section 5.4 (d)
Test Method	Subclause 11.9.1.1 of ANSI C63.10 & KDB 558074 D01 15.247 Measurement Guidance v05r02 Section 8.3.1
Measurement Bandwidth	3MHz
Detector	Peak
Port of testing	Antenna port
Requirement	Power ≤ 1 W (30 dBm) & e.i.r.p ≤ 4 W (36 dBm)

Test Setup:



Test Condition

Normal Test Condition:

Temperature (Norm) = + 25 °C Voltage = 24V DC Supply Relative humidity: 62%

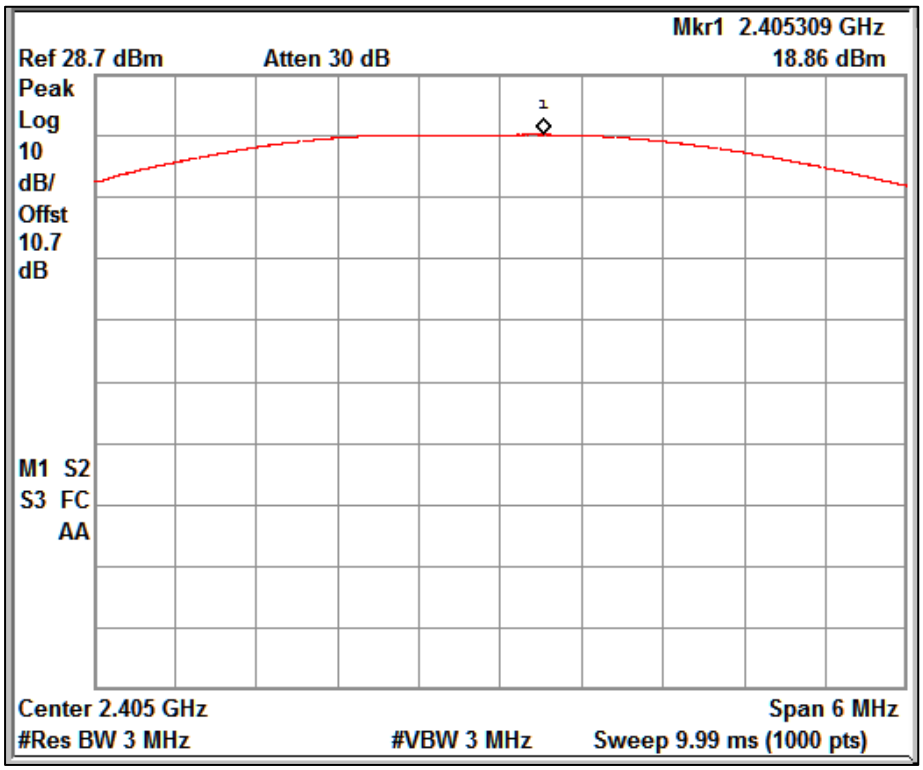
Test results:

Note:
1. All the losses are included during measurement and final values are mentioned in the test report.
2. Total Peak Output power (dBm) = Measured Peak power (dBm) + Attenuator factor (10dB) + Cable loss (0.7dB)
3. This product do not support additional beamforming gain / directional gain, it uses four external Omni antennas with the directional gain details as mentioned in the table 4
4. Maximum (e.i.r.p) = Maximum Peak output power (dBm) + antenna gain (dBi)

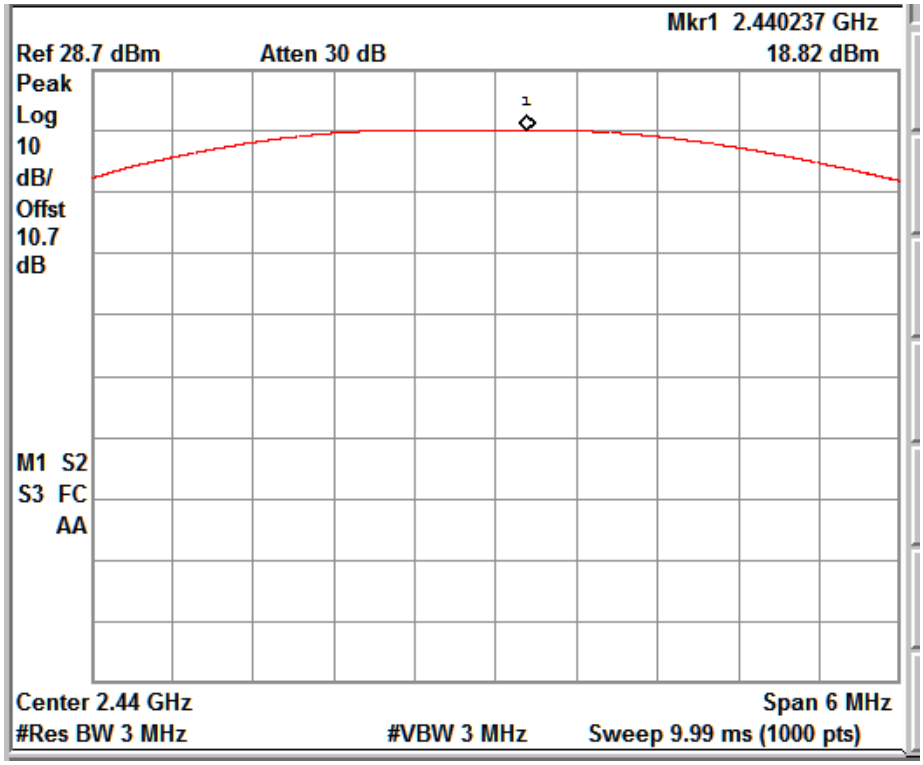
Table 8: Maximum peak condcuted power results

1. Transmitted power 20 dBm and Antenna gain +5dBi

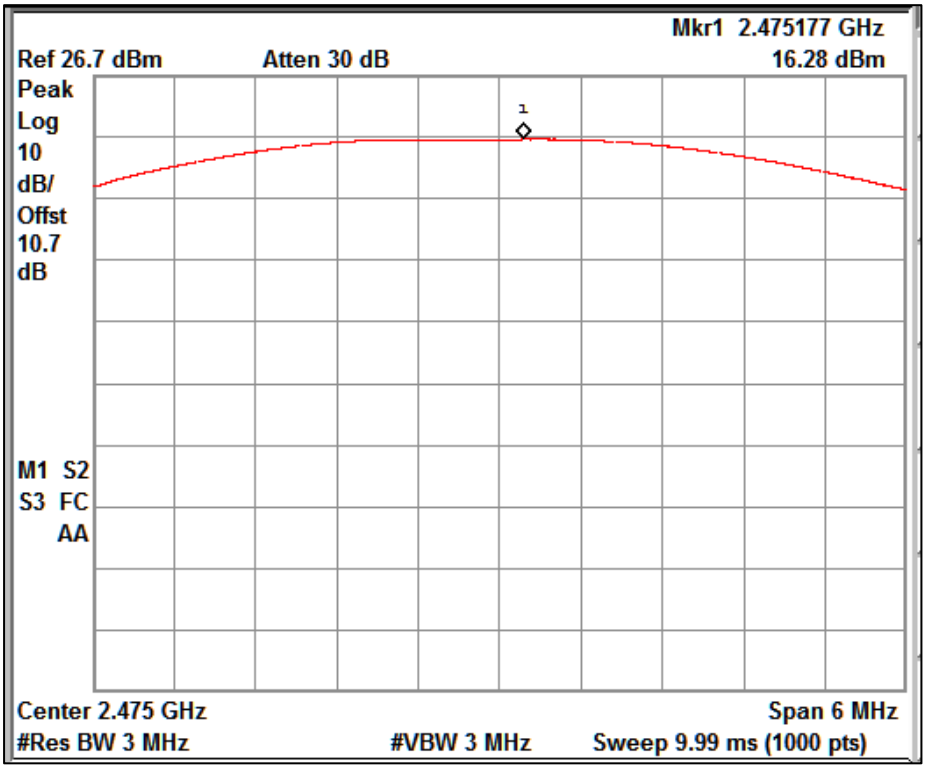
Data Rate (Kbps)	Channel Frequency (MHz)	Measured peak power (dBm)	Duty Cycle %	Duty cycle correction factor (dB)	Maximum Peak Output Power (dBm)	Maximum EIRP (dBm)	Power Limit (dBm)	EIRP Limit (dBm)
250	2405	18.86	100	0	18.86	23.86	30	36
	2440	18.82	100	0	18.82	23.82	30	36
	2475	16.28	100	0	16.28	21.28	30	36



Channel Frequency: 2405MHz



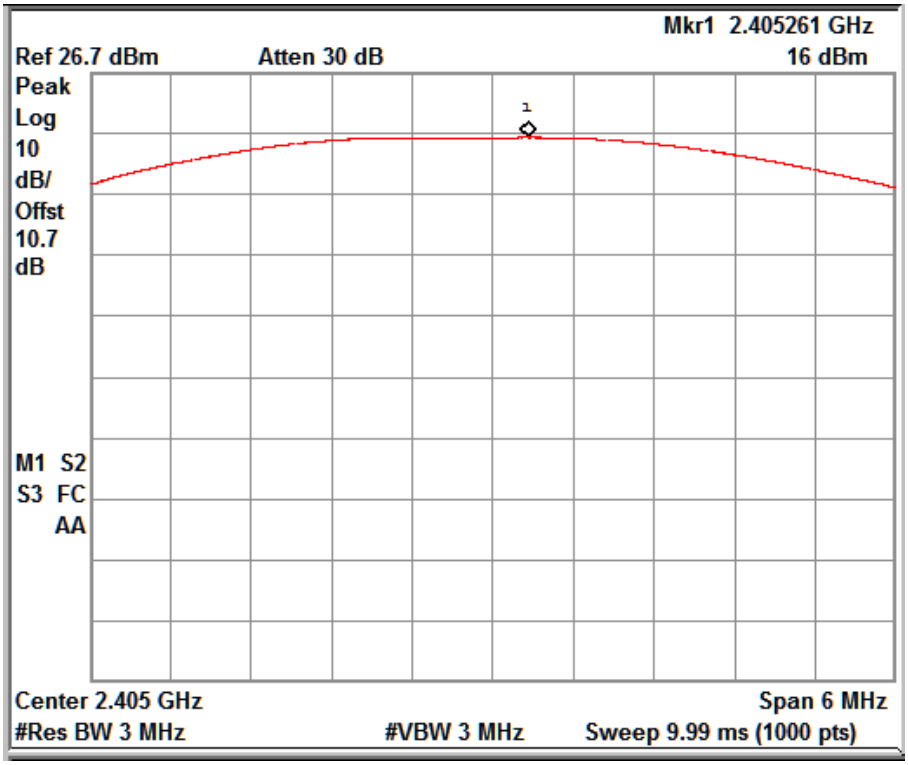
Channel Frequency: 2440MHz



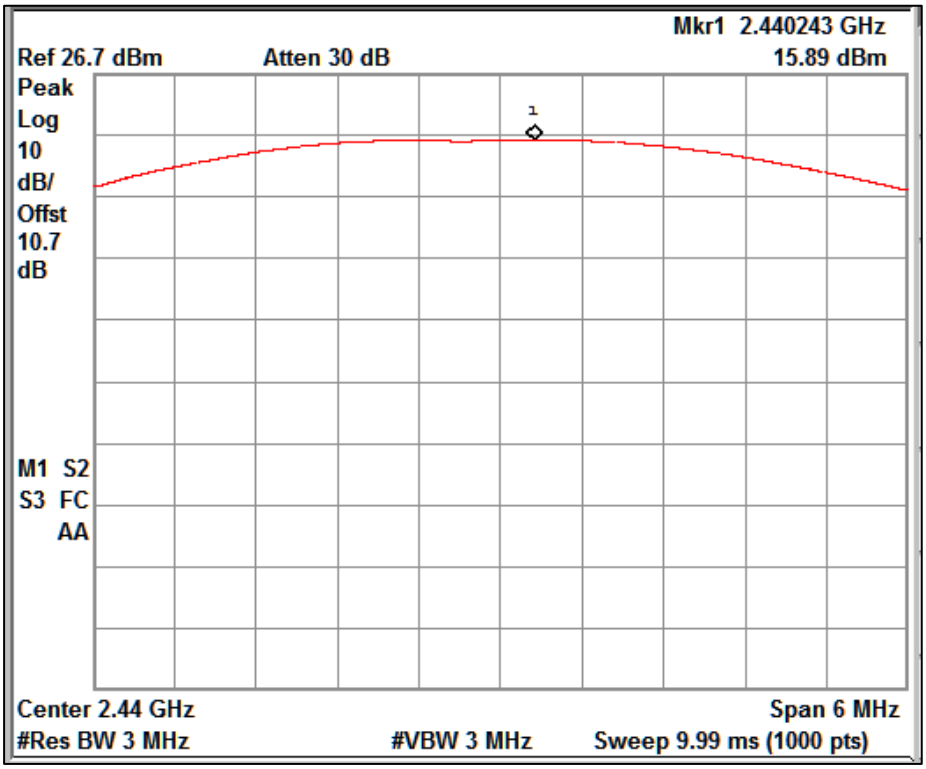
Channel Frequency: 2475MHz

2. Transmitted power 17 dBm and Antenna gain +8dBi

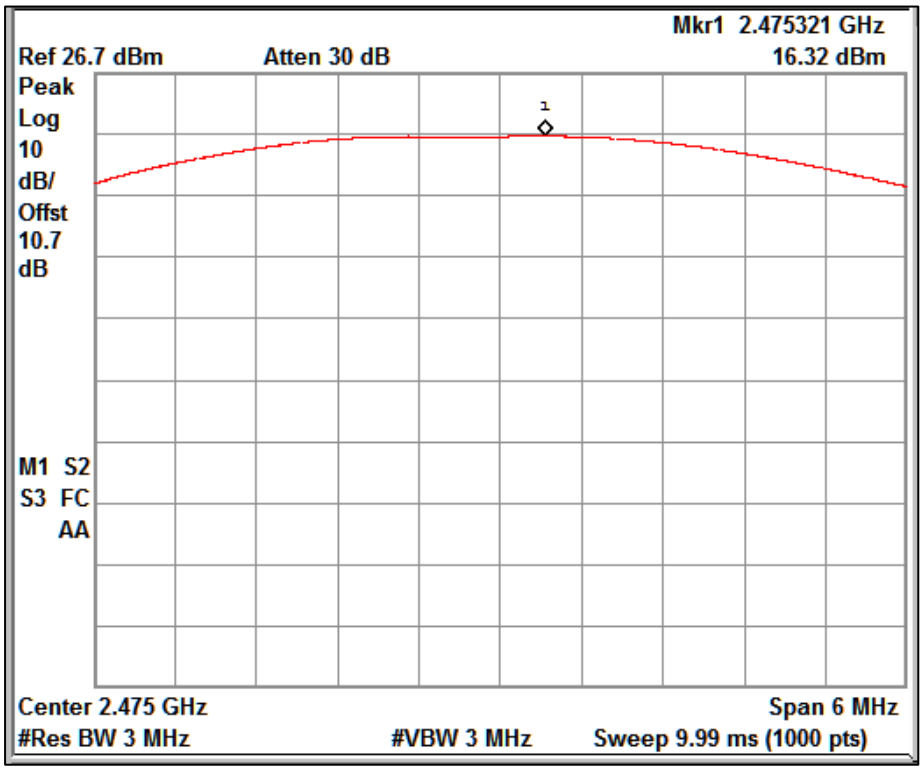
Data Rate (Kbps)	Channel Frequency (MHz)	Maximum peak conducted output power (dBm)	Duty Cycle %	Duty cycle correction factor (dB)	Maximum Peak Output Power (dBm)	Maximum EIRP (dBm)	Power Limit (dBm)	EIRP Limit (dBm)
250	2405	16.00	100.00	0.00	16.00	24.00	28	36
	2440	15.89	100.00	0.00	15.89	23.89	28	36
	2475	16.32	100.00	0.00	16.32	24.32	28	36



Channel Frequency: 2405MHz



Channel Frequency: 2440MHz



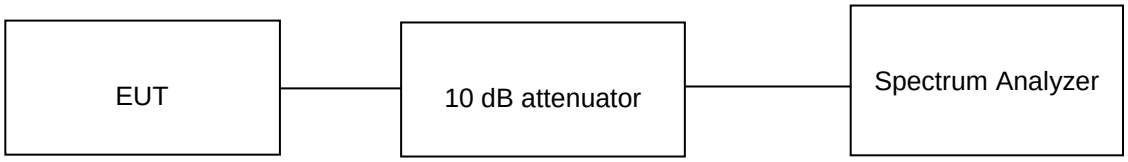
Channel Frequency: 2475MHz

8.2 Maximum Power Spectral Density

Result ***Pass***

RF Protocol	IEE 802.15.4
Test Specification	FCC part 15 Subpart C 15.247 (e) / RSS 247 Issue 2, Section 5.2 (b)
Test Method	Subclause 11.10.2 of ANSI C63.10 and KDB 558074 D01 15.247 Measurement Guidance v05r02 Section 8.4
Measurement Bandwidth	3 kHz
Detector	Peak detector
Port of testing	Antenna port
Requirement	For digitally modulated systems, the power spectral density conducted from the intentional radiator to the antenna shall not be greater than 8 dBm

Test Setup:



Test Condition

Normal Test Condition:

Temperature (Norm) = + 25°C Voltage = 24V DC Supply Relative humidity: 62 %

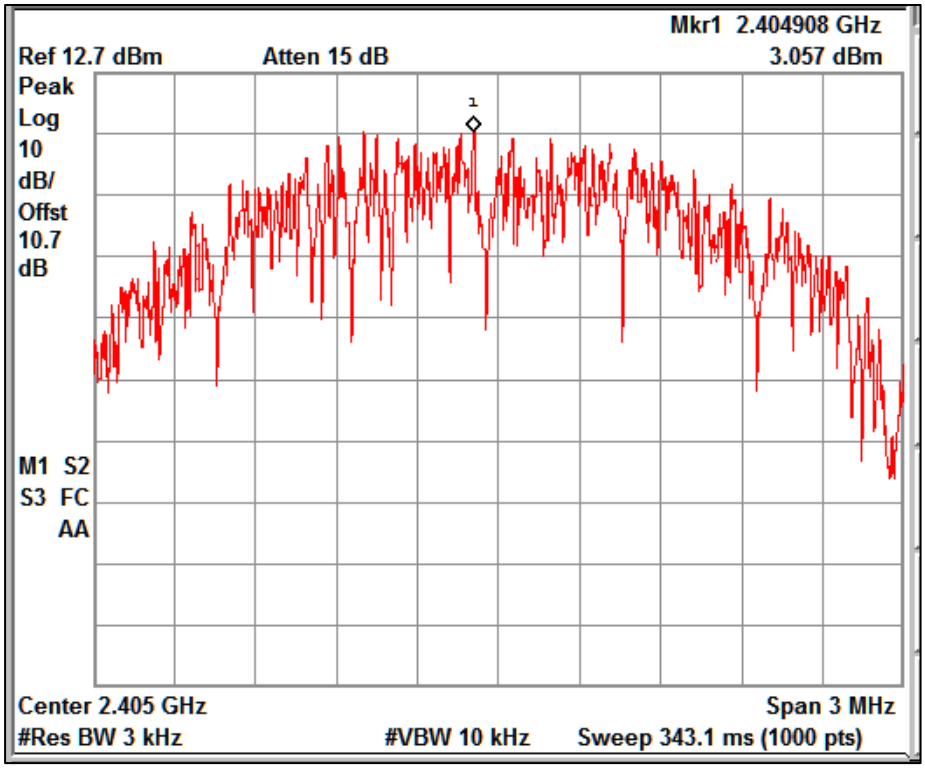
Test results:

Note:
1. All the losses are included during measurement and final values are mentioned in the test report.
2. Total Peak PSD (dBm) = Measured Peak PSD (dBm) + Attenuator factor (10dB) + Cable loss (0.7dB)
3 This product do not support additional beamforming gain / directional gain, it uses four external Omni antennas with the directional gain details as mentioned in table 4.
4. Maximum (e.i.r.p) = Maximum Peak output power (dBm) + antenna gain (dBi)

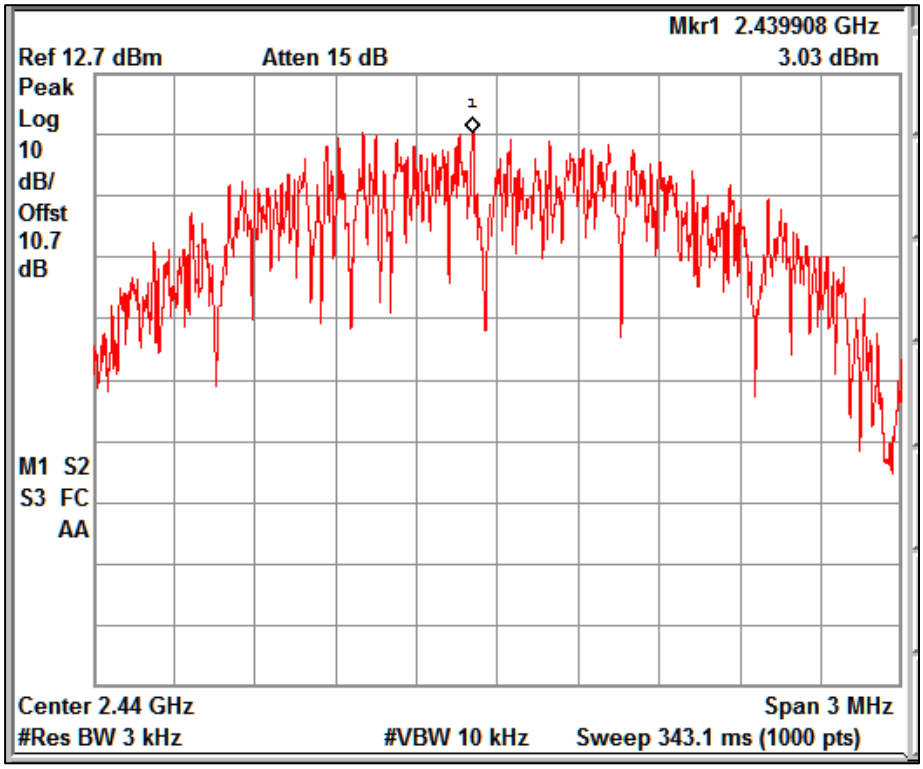
Table 9: Peak PSD test results

3. Transmitted power 20 dBm and Antenna gain +5dBi

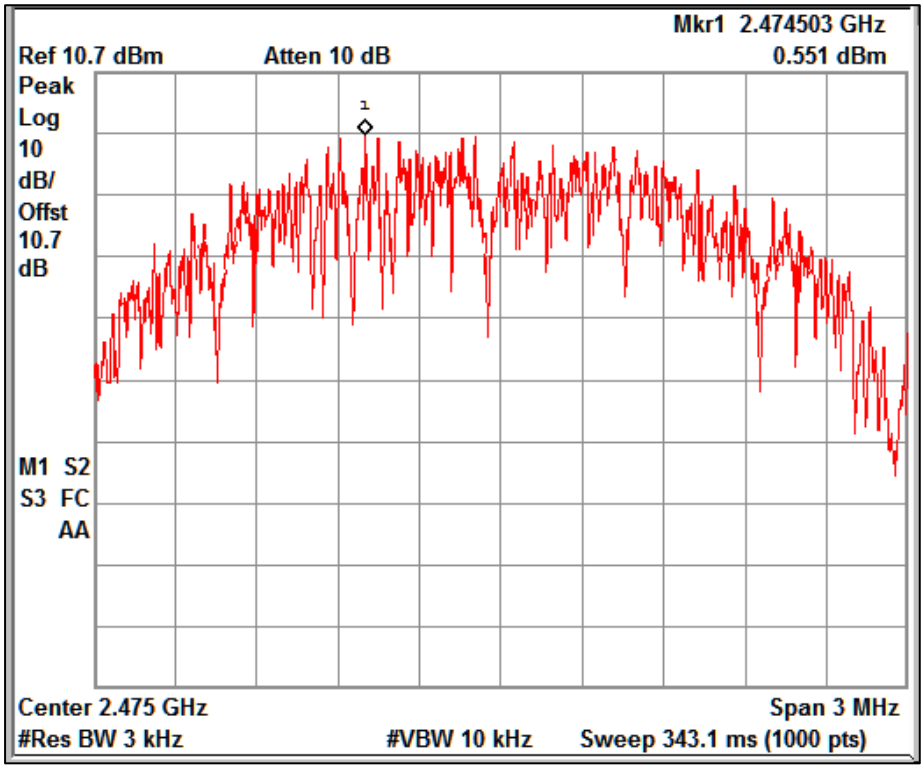
Data Rate (Kbps)	Channel Frequency (MHz)	Maximum peak conducted output power (dBm/3kHz)	Limit (dBm)	Margin (dB)
250	2405	3.05	8	-4.95
	2440	3.03	8	-4.97
	2475	0.55	8	-7.45



Channel Frequency: 2405MHz



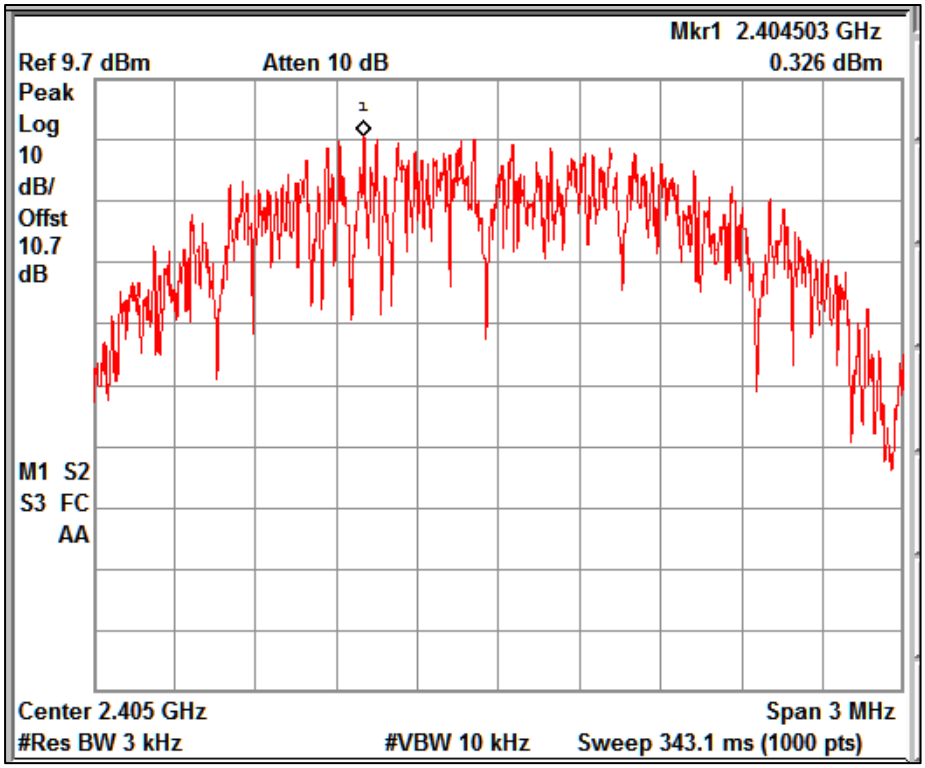
Channel Frequency: 2440MHz



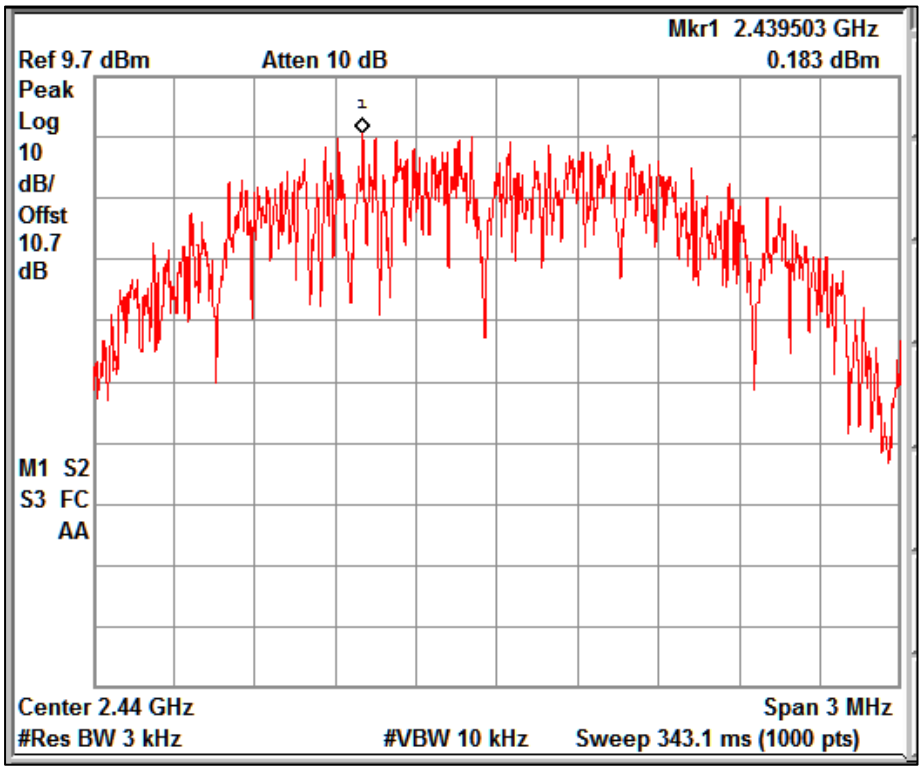
Channel Frequency: 2475MHz

4. Transmitted power 17 dBm and Antenna gain +8dBi

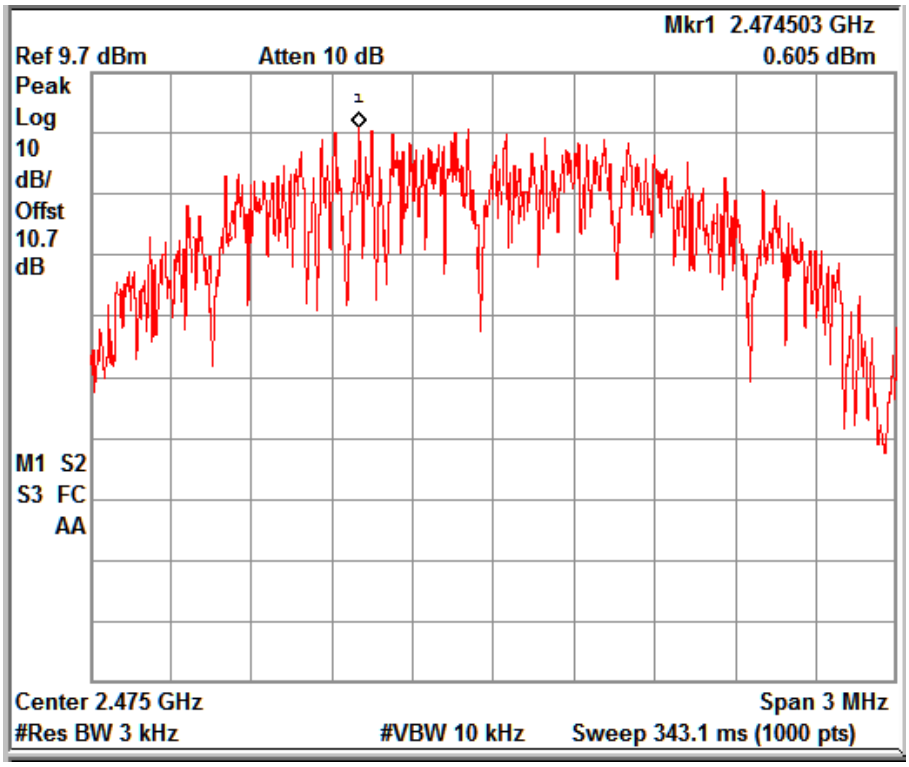
Data Rate (Kbps)	Channel Frequency (MHz)	Maximum peak conducted output power (dBm/3kHz)	Limit (dBm)	Margin (dB)
250	2405	0.32	6	-5.68
	2440	0.18	6	-5.82
	2475	0.60	6	-5.40



Channel Frequency: 2405MHz



Channel Frequency: 2440MHz



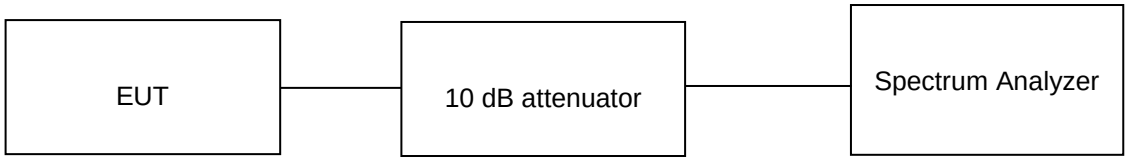
Channel Frequency: 2475MHz

8.3 DTS Bandwidth

Result ***Pass***

RF Protocol	IEE 802.15.4
Test Specification	FCC part 15 Subpart C 15.247 (a) (2) / RSS 247 Issue 2, Section 5.2 (a)
Test Method	Subclause 11.8 of ANSI C63.10 and KDB 558074 D01 15.247 Measurement Guidance v05r02 section 8.2
Measurement Bandwidth	100 kHz
Detector	Peak
Port of testing	Antenna port
Requirement	The minimum 6 dB bandwidth shall be at least 500 kHz

Test Setup:



Test Condition

Normal Test Condition:

Temperature (Norm) = + 25 °C Voltage = 24V DC Supply Relative humidity: 62 %

Test results:

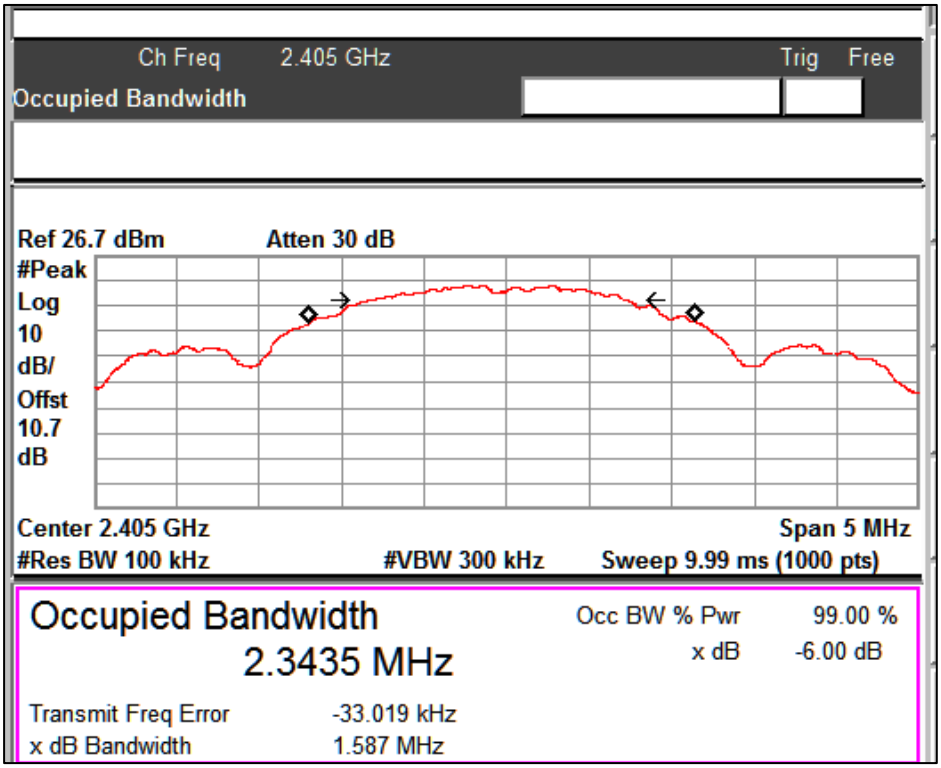
Note:

1. All the losses are included during measurement and final values are mentioned in the test report.
2. For DTS bandwidth measurement RBW of 100kHz is used
3. For 99% bandwidth measurement RBW of 1 to 5% (100kHz) is used

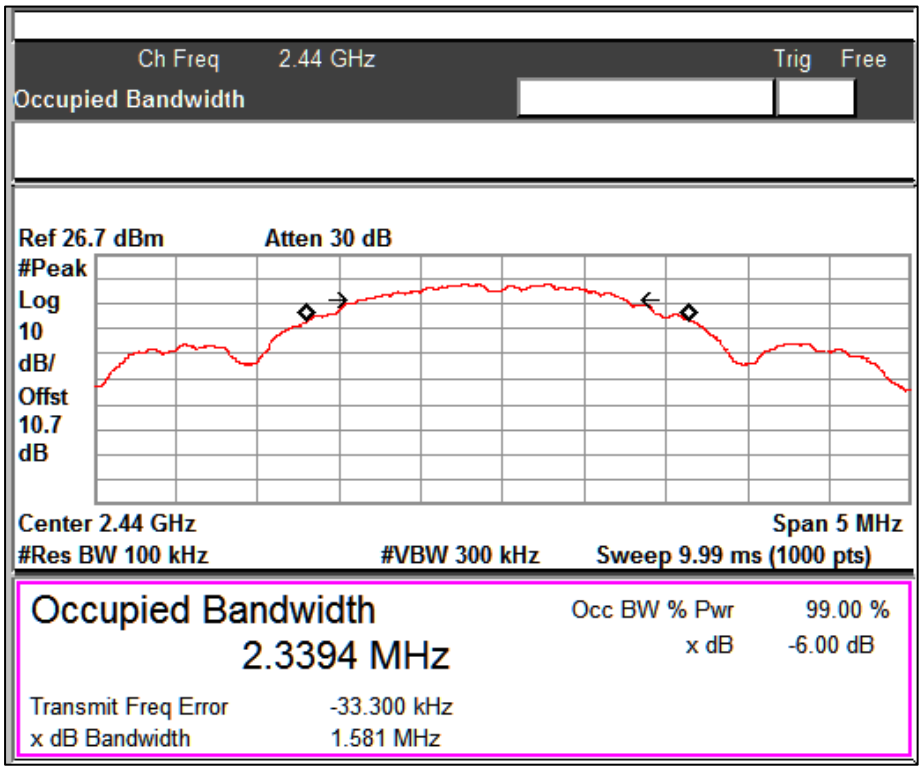
Table 10: DTS Bandwidth & OBW test results

5. Transmitted power 20 dBm and Antenna gain +5dBi

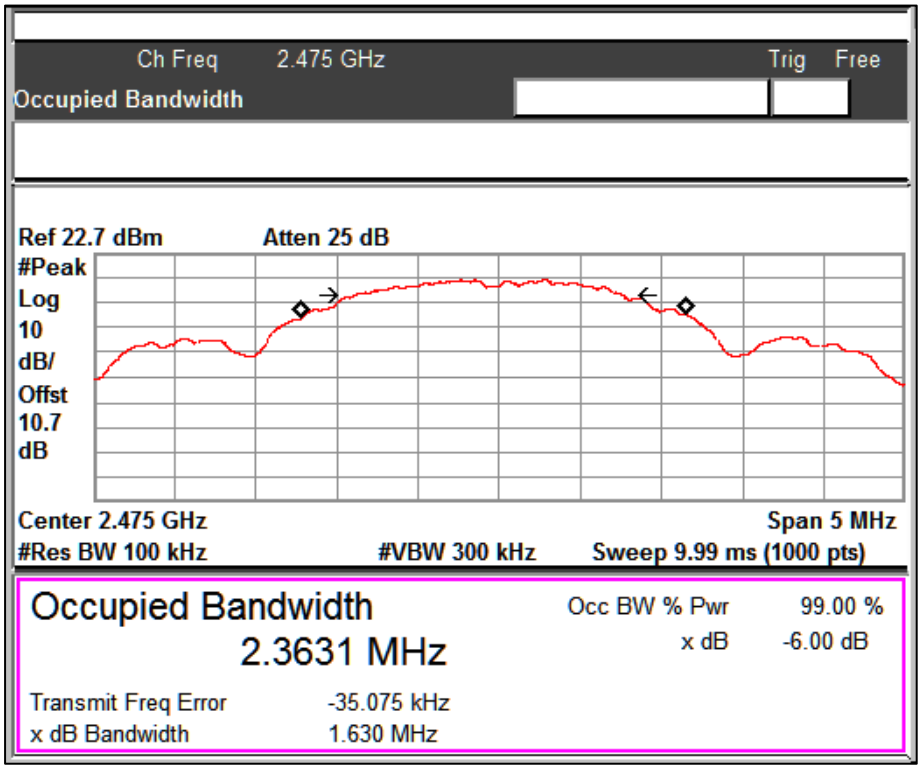
Data Rate (Kbps)	Channel Frequency (MHz)	6 dB Bandwidth (MHz)	99% OBW (MHz)	Minimum Limit (MHz)
250	2405	1.587	2.343	0.5
	2440	1.581	2.339	0.5
	2475	1.630	2.363	0.5



Channel Frequency: 2405MHz



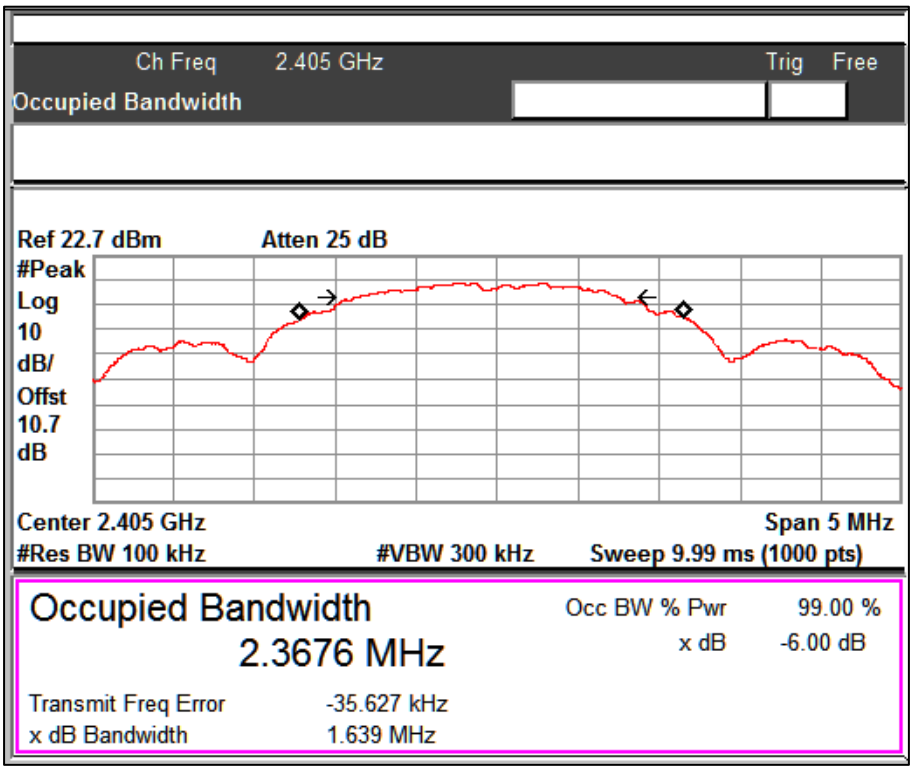
Channel Frequency: 2440MHz



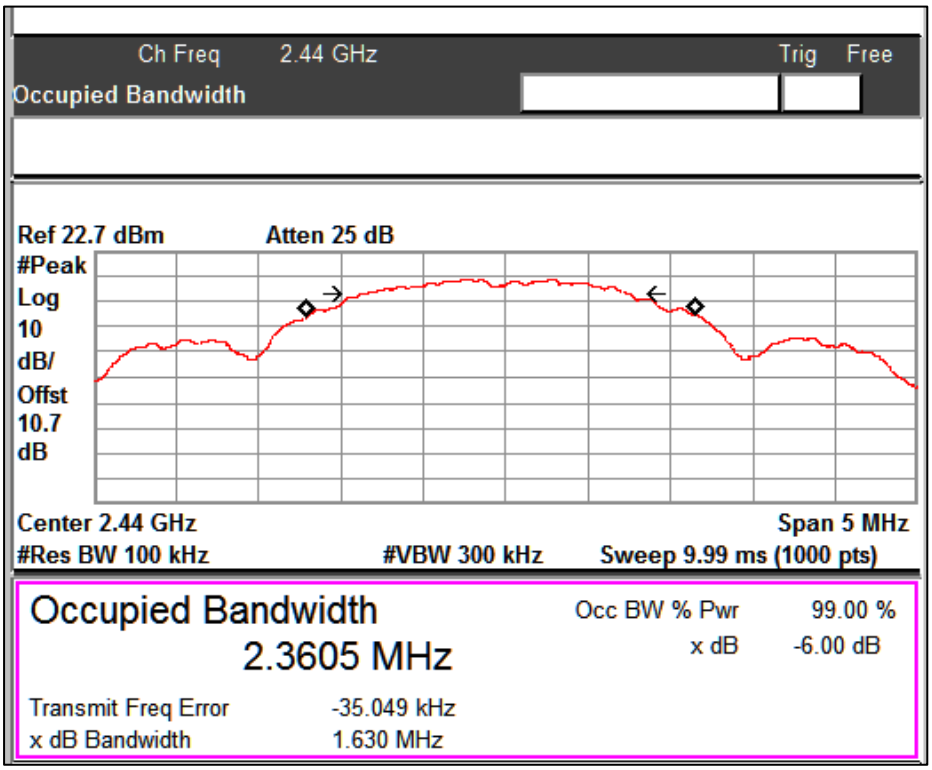
Channel Frequency: 2475MHz

6. Transmitted power 17 dBm and Antenna gain +8dBi

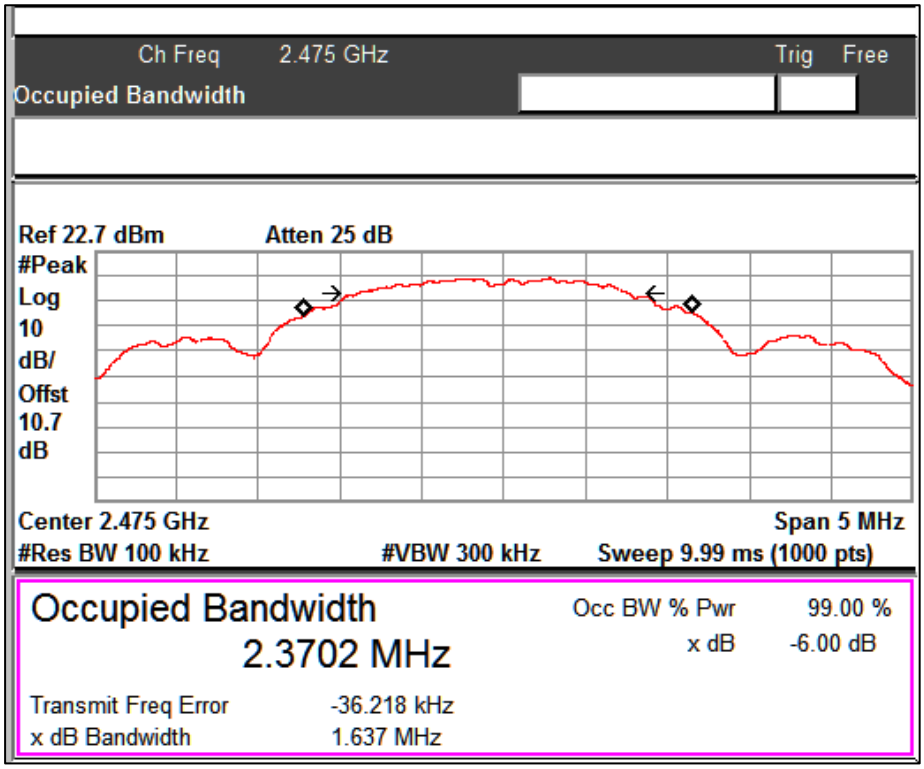
Data Rate (Kbps)	Channel Frequency (MHz)	6 dB Bandwidth (MHz)	99% OBW (MHz)	Minimum Limit (MHz)
250	2405	1.639	2.367	0.5
	2440	1.630	2.360	0.5
	2475	1.637	2.370	0.5



Channel Frequency: 2405MHz



Channel Frequency: 2440MHz



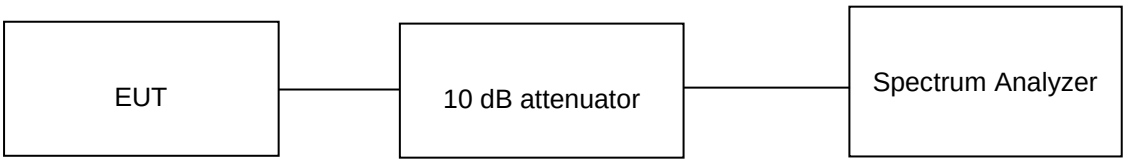
Channel Frequency: 2475MHz

8.4 Emissions in non-restricted frequency bands and Conducted Spurious Emission

Result ***Pass***

RF Protocol	IEE 802.15.4
Test Specification	FCC part 15 Subpart C 15.247 (d) / RSS 247 Issue 2, Section 5.5
Test Method	Subclause 11.11 of ANSI C63.10 and KDB 558074 D01 15.247 Measurement Guidance v05r02 section 8.5
Measurement Bandwidth	100 kHz
Detector	Peak
Port of testing	Antenna port
Requirement	In any 100kHz 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 30dB below that in the 100kHz 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

Test Setup:



Test Condition

Normal Test Condition:

Temperature (Norm) = +25 °C Voltage = 24V DC Pwoer supply Relative humidity: 62 %

Test results:

Note:
1. All the losses are included during measurement and final values are mentioned in the test report.
2. Total Peak PSD (dBm) = Measured Peak PSD (dBm) + Attenuator factor (10dB) + Cable loss (0.7dB)
3 This product do not support additional beamforming gain / directional gain, it uses four external Omni antennas with the directional gain details as mentioned in table 4
4. Maximum (e.i.r.p) = Maximum Peak output power (dBm) + antenna gain (dBi)

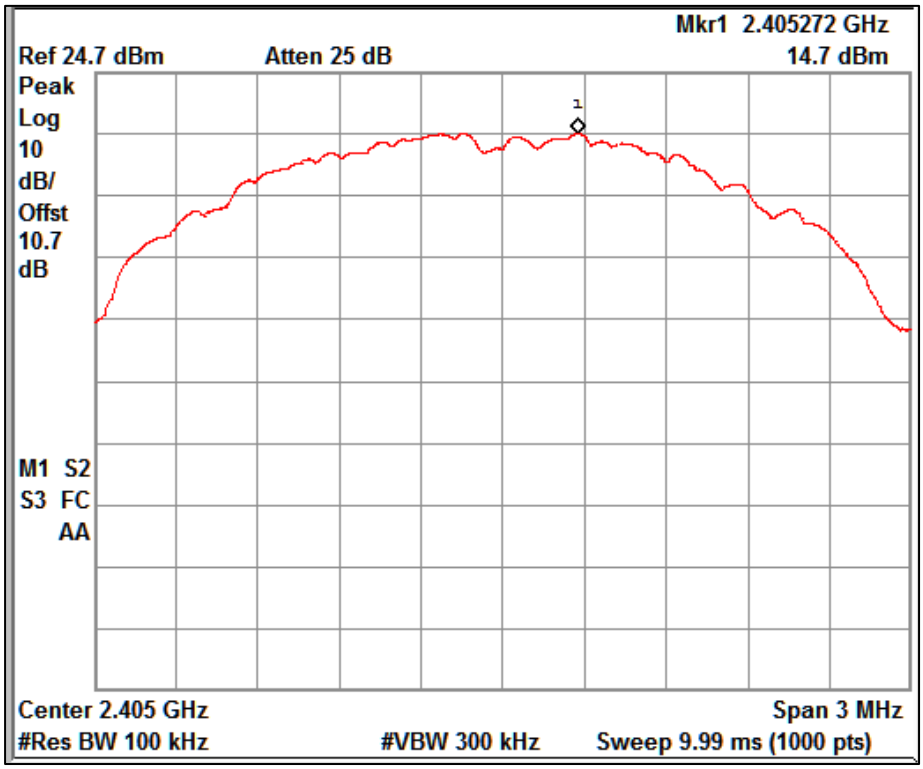
8.4.1 Non restricted bands measurement plots

Table 11: Emissions in non-resrticted bands measurement results

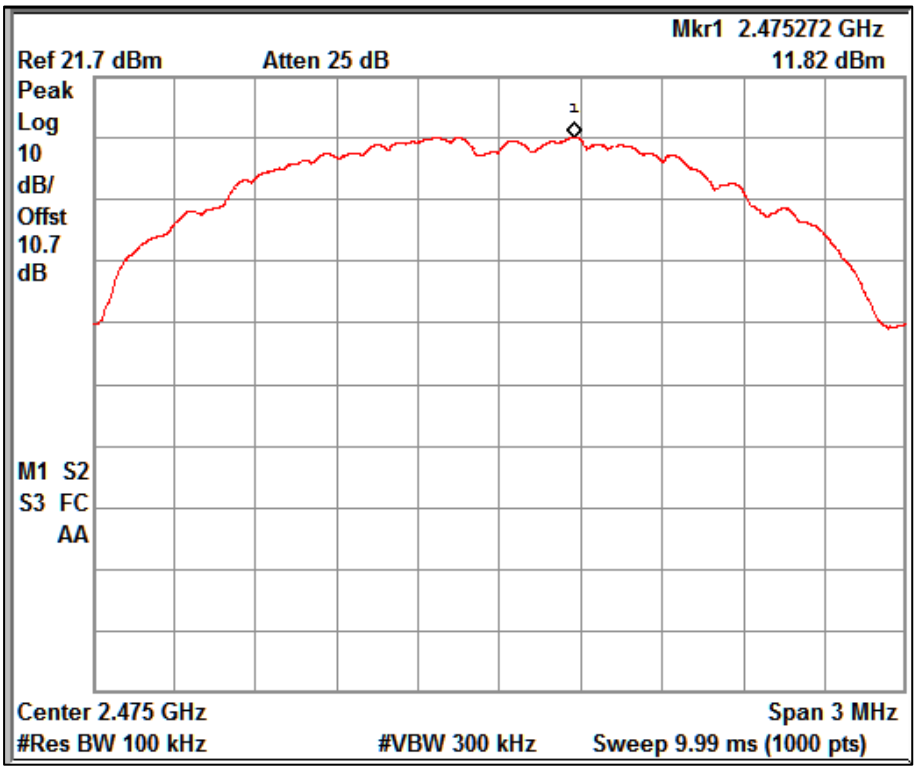
1. Transmitted power 20 dBm and Antenna gain +5dBi

Data Rate (Kbps)	Channel Frequency (MHz)	Reference Value (B) (dBm)	Band edge Frequency (MHz)	Value at Band edge (A) (dBm)	A-B (dBc)	Minimum Limit (dBc)
250	2405	14.7	2400	-29.22	-43.92	20
	2475	11.82	2483.5	-44.20	-56.02	20

Reference level measurement plots:

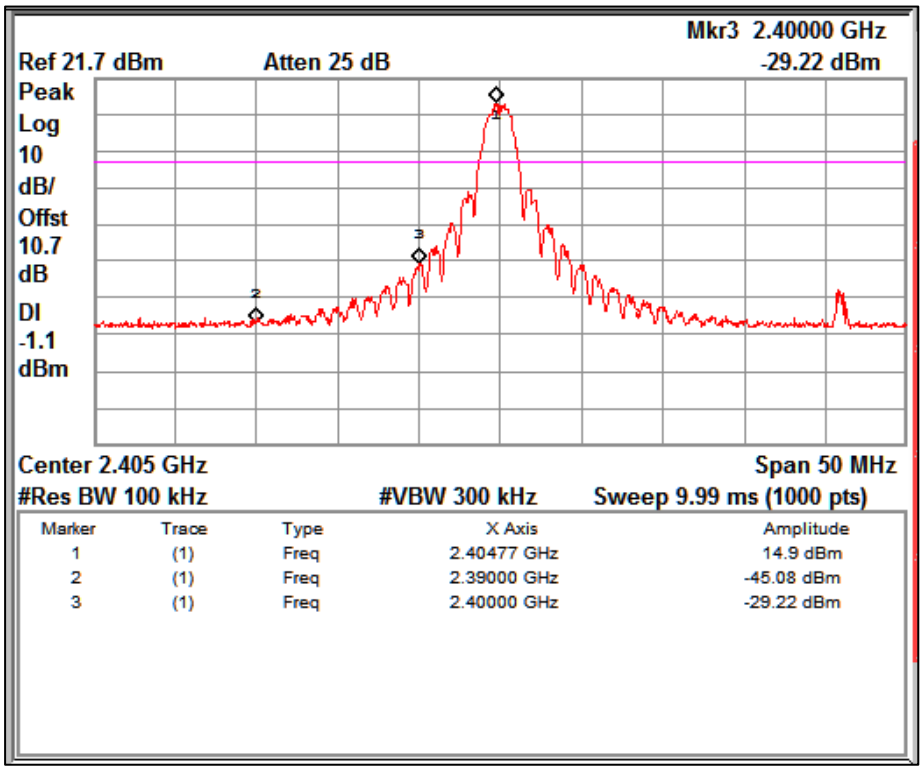


Channel frequency 2405MHz

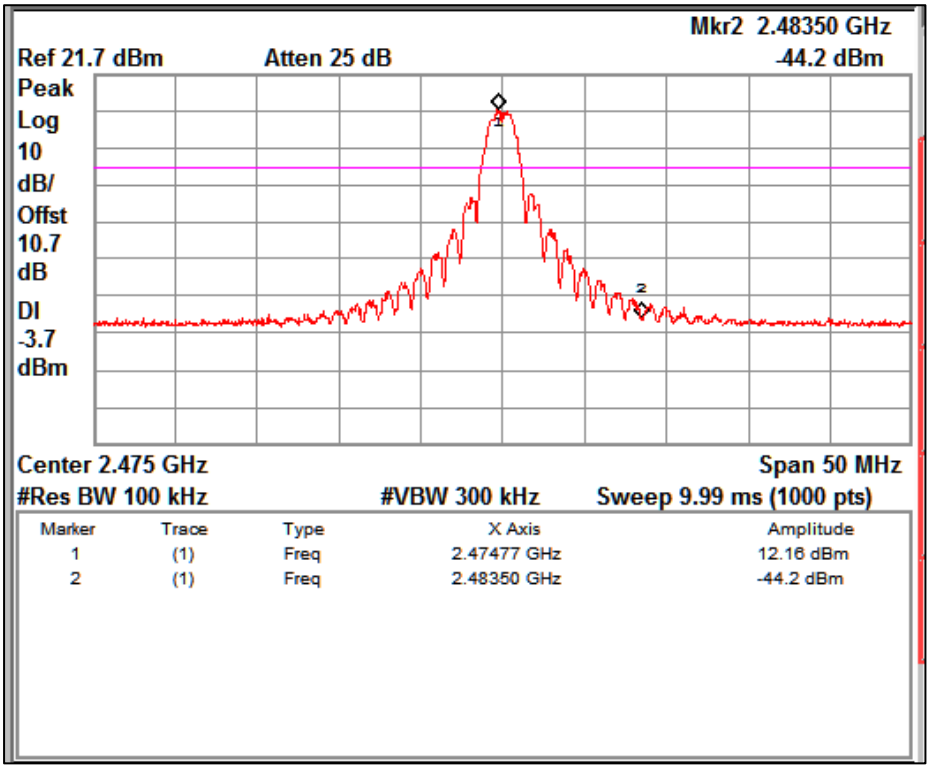


Channel Frequency 2475MHz

Band edge measurement plots



Channel frequency 2405MHz

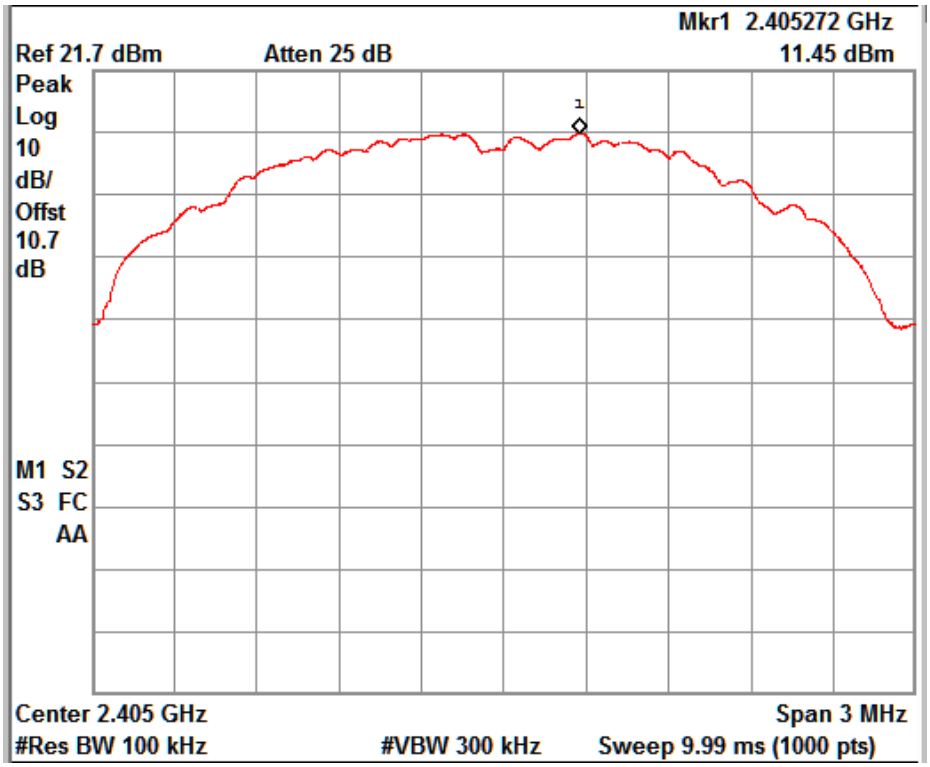


Channel Frequency 2475MHz

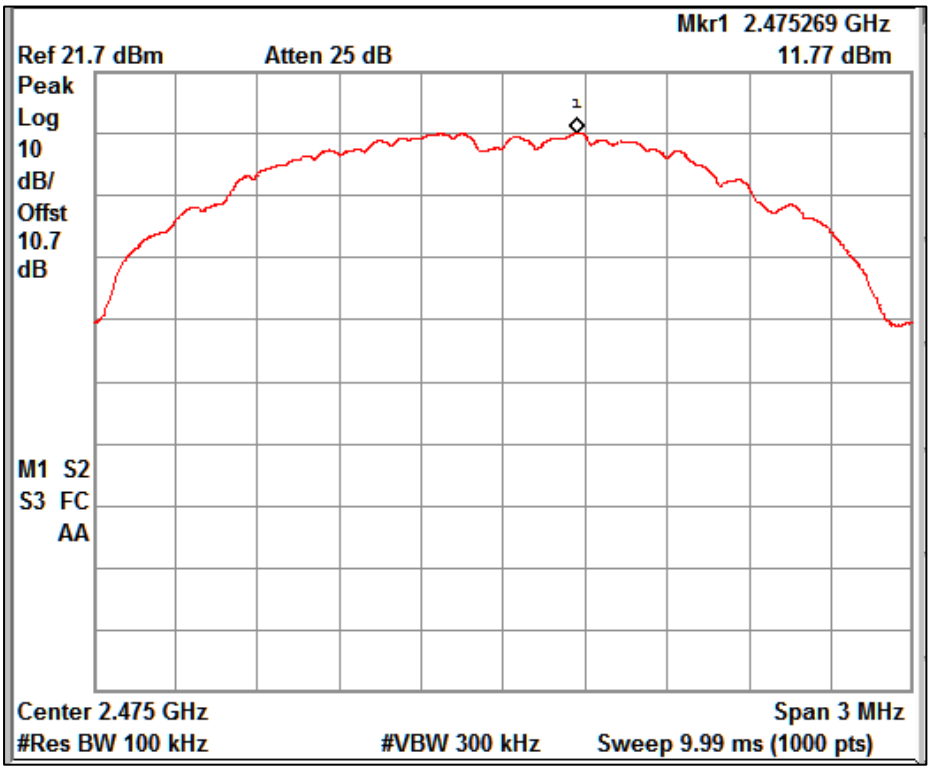
2. Transmitted power 17 dBm and Antenna gain +8dBi

Data Rate (Kbps)	Channel Frequency (MHz)	Reference Value (B) (dBm)	Band edge Frequency (MHz)	Value at Band edge (A) (dBm)	A-B (dBc)	Minimum Limit (dBc)
250	2405	11.45	2400	-31.30	-42.75	20
	2475	11.77	2483.5	-34.80	-46.57	20

Reference level measurement plots:

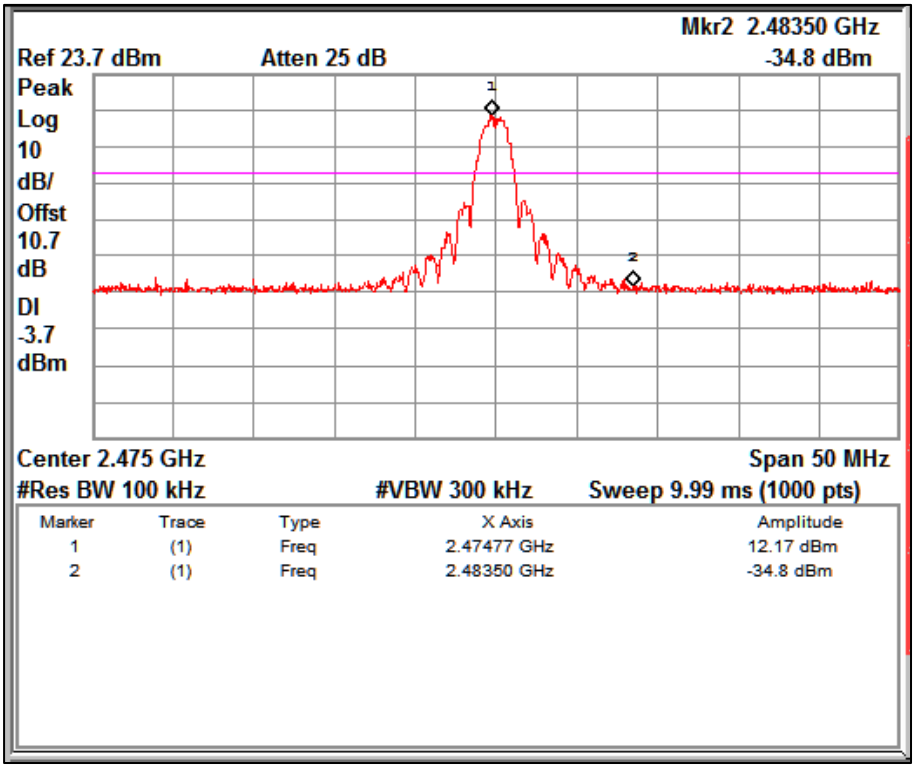


Channel frequency 2405MHz

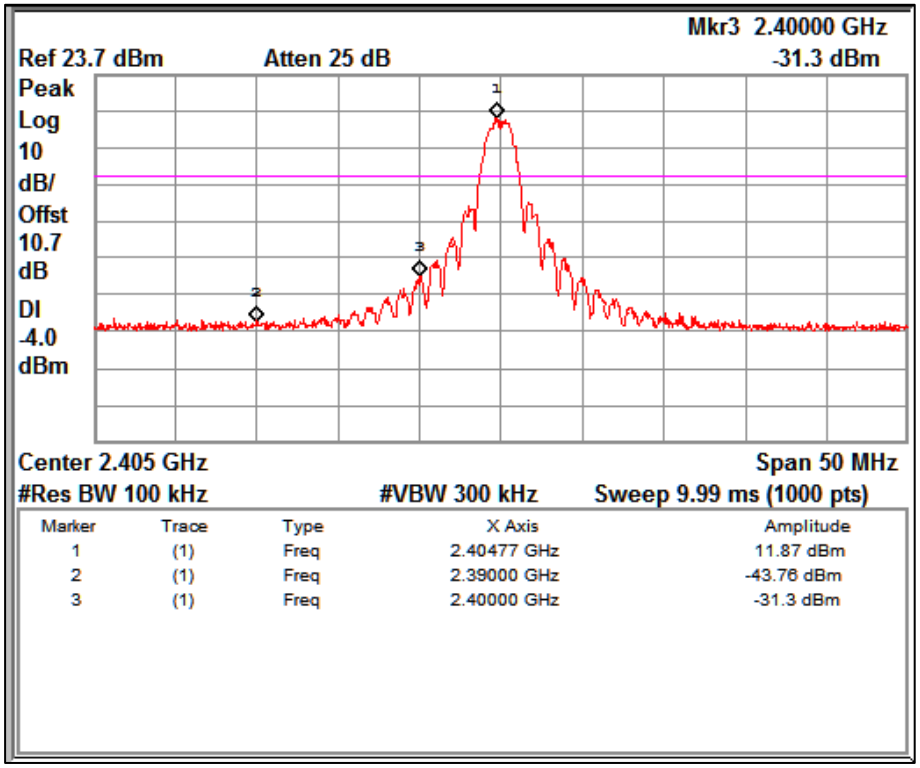


Channel Frequency 2475MHz

Band edge measurement plots

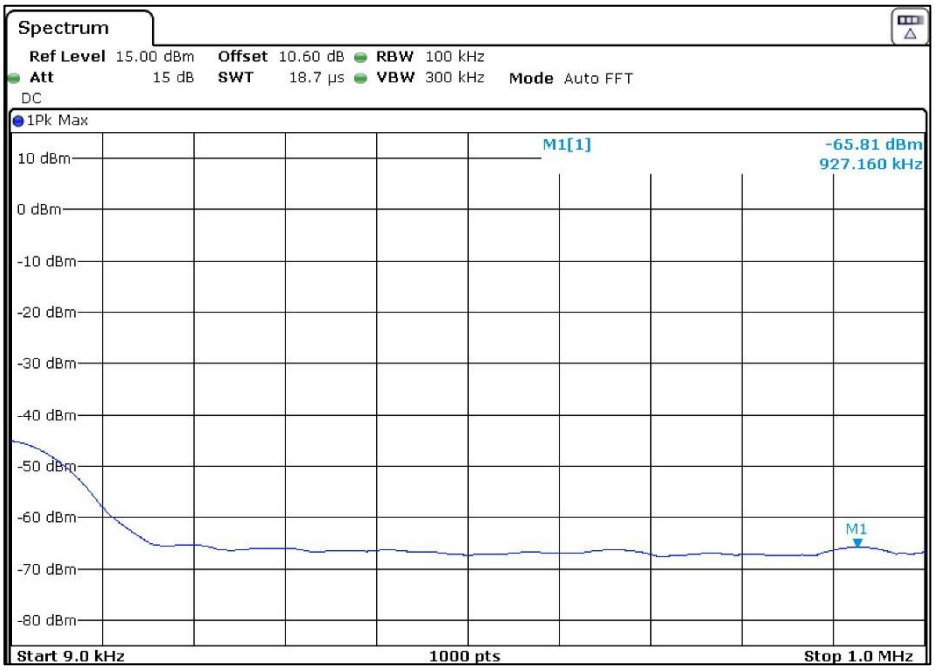


Channel frequency 2405MHz

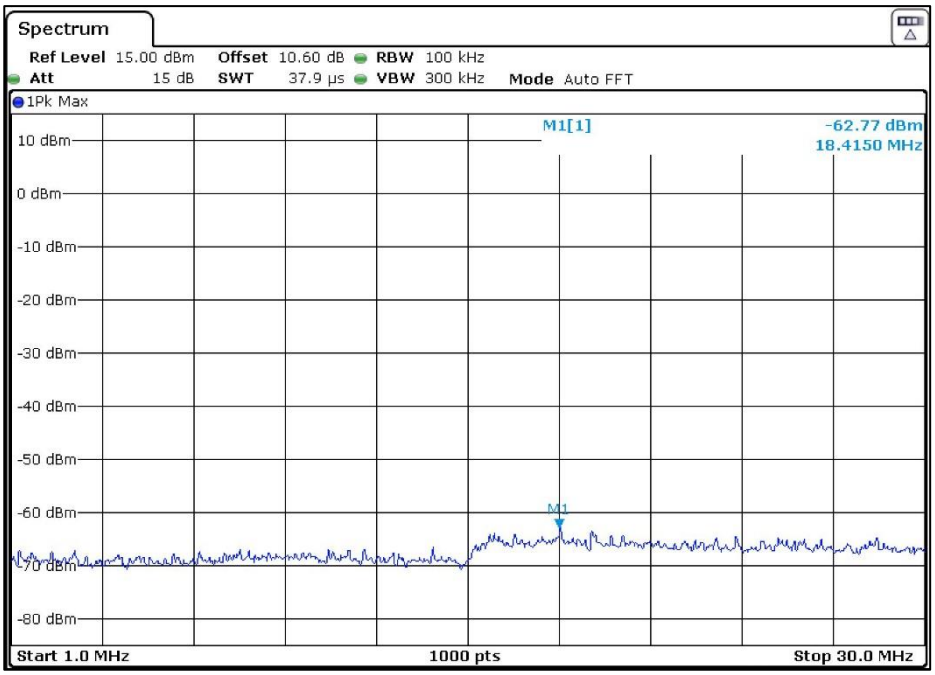


Channel frequency 2405MHz

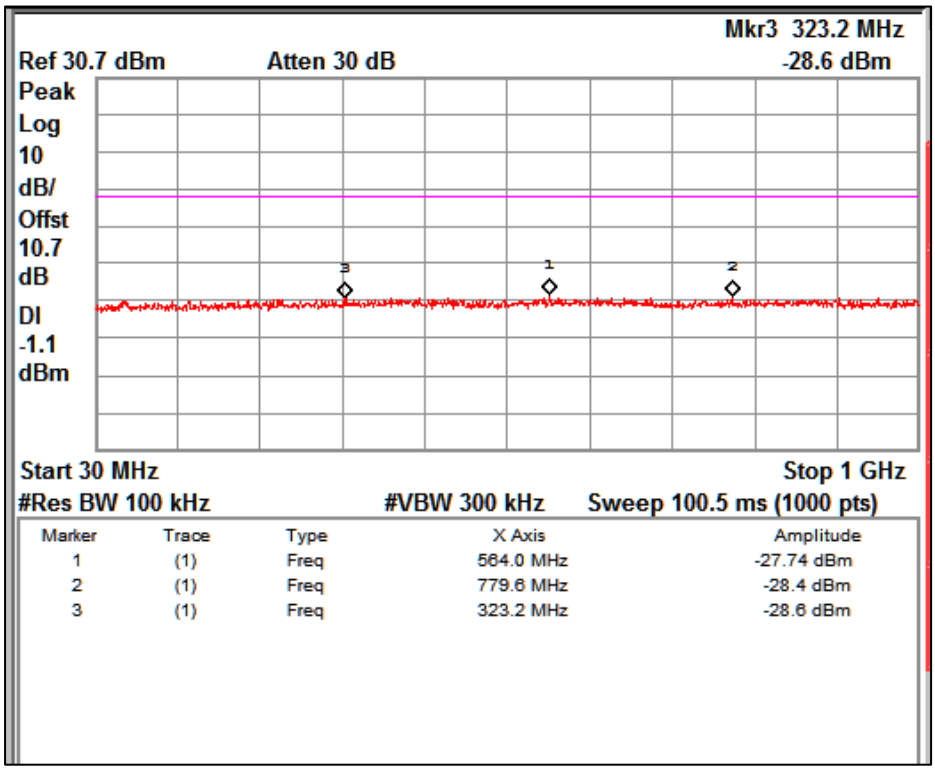
8.4.2 Out-Of-Band Emissions



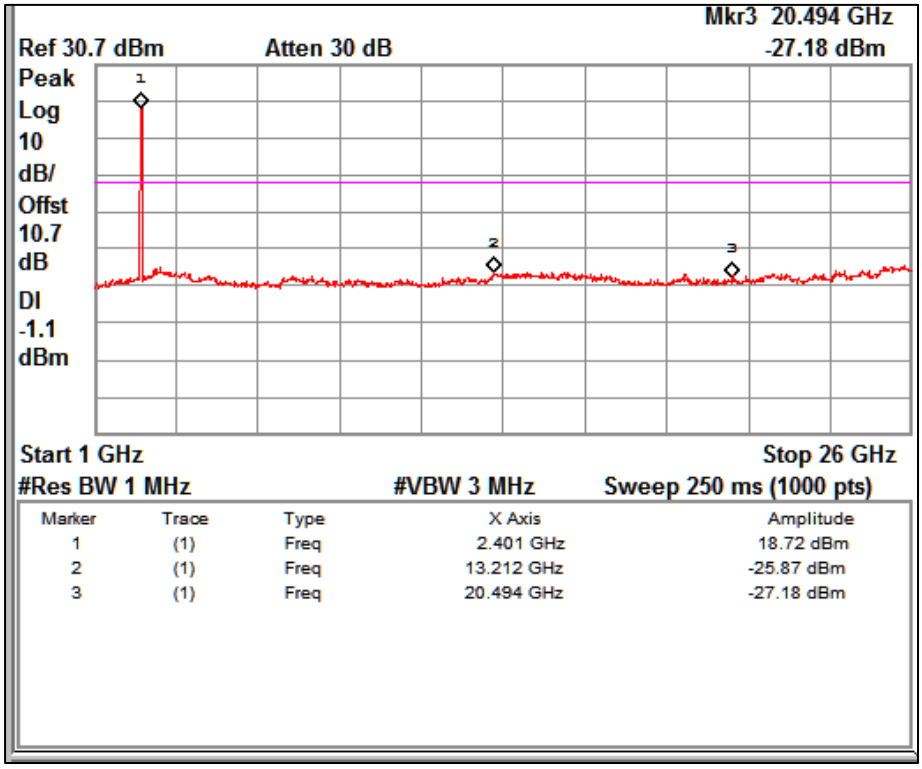
Frequency range: 30MHz-1GHz **Channel frequency: 2405MHz**



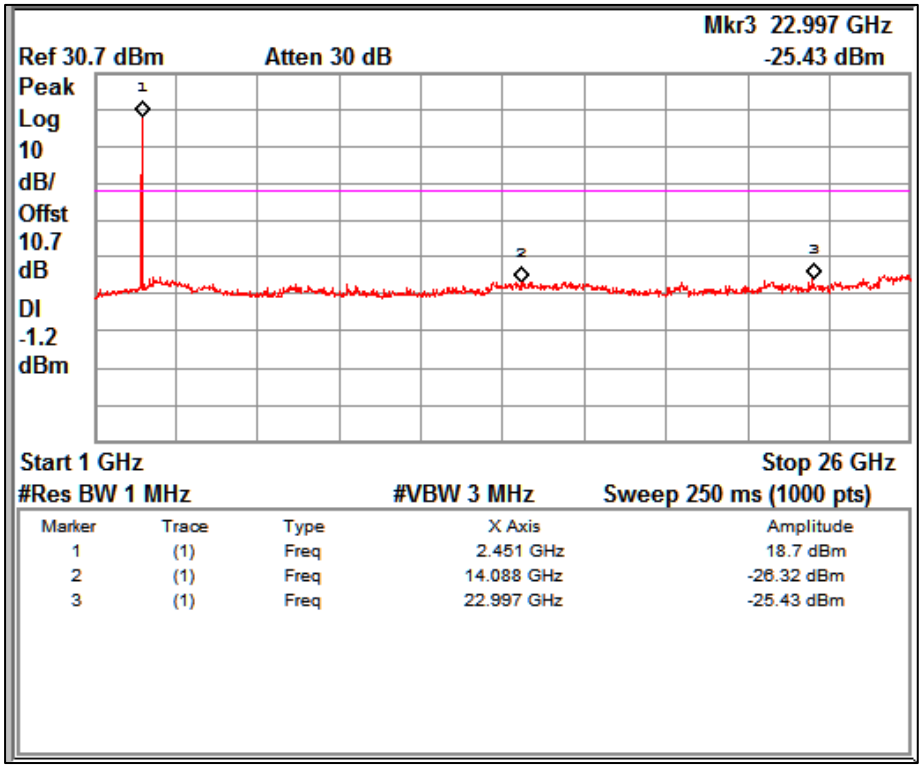
Frequency range: 30MHz-1GHz **Channel frequency: 2405MHz**



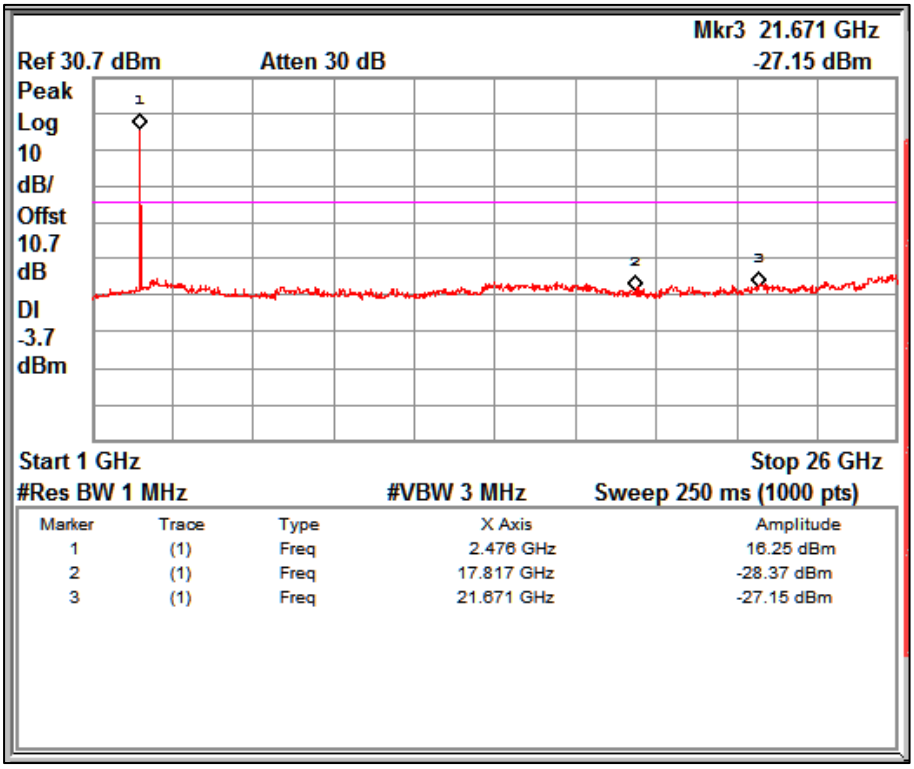
Frequency range: 30MHz-1GHz **Channel frequency: 2405MHz**



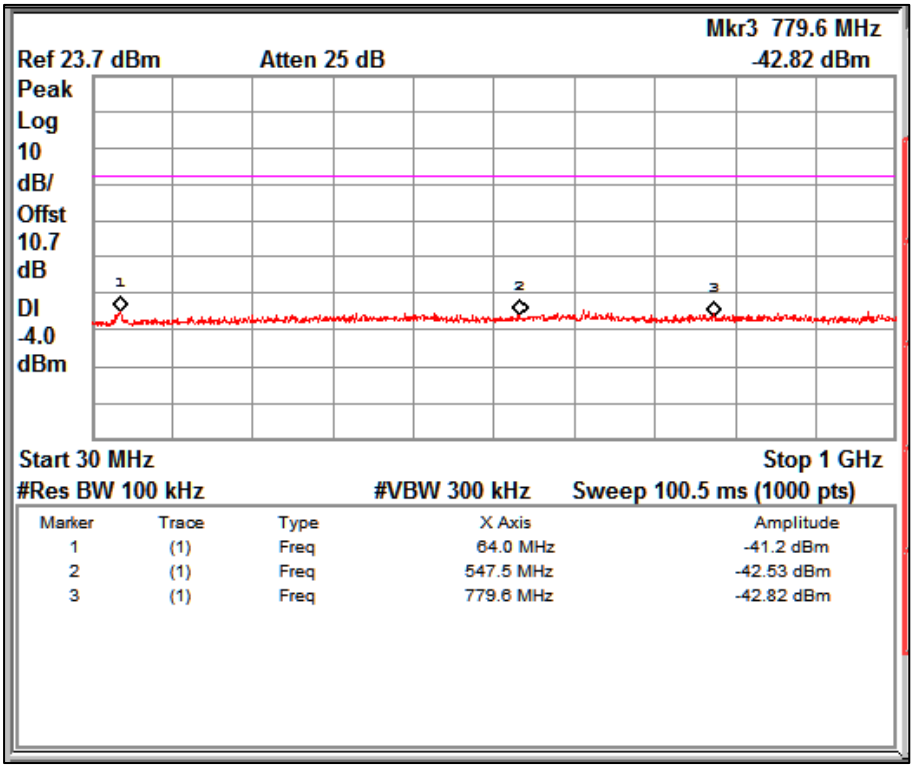
Frequency range: 1GHz to 26 GHz **Channel frequency: 2405MHz**



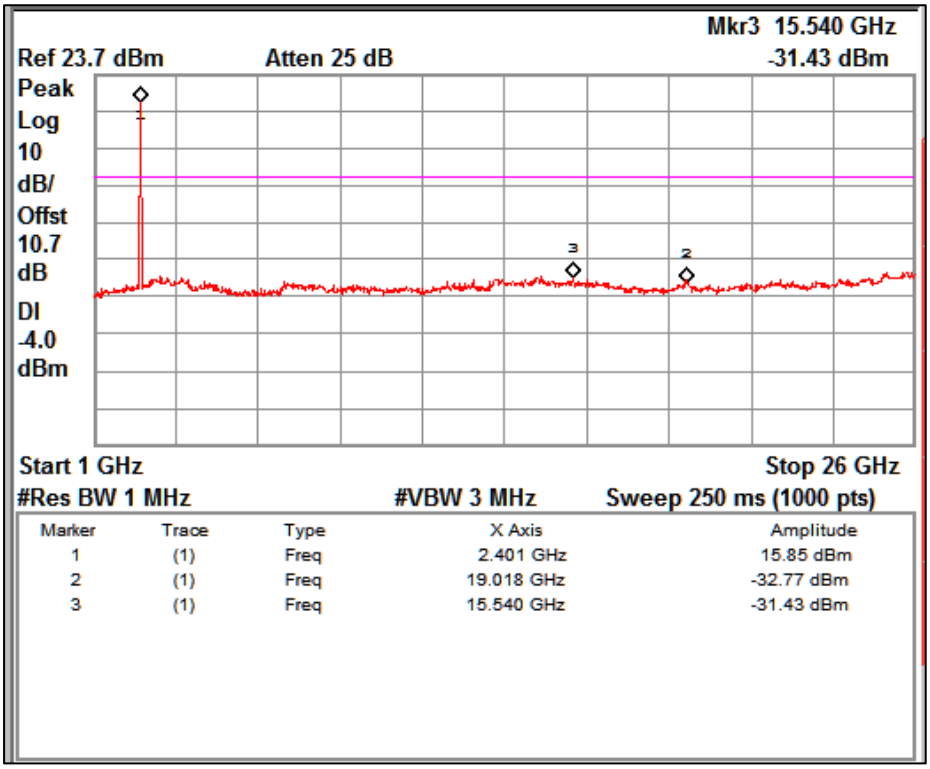
Frequency range: 1GHz to 26GHz **Channel frequency 2440MHz**



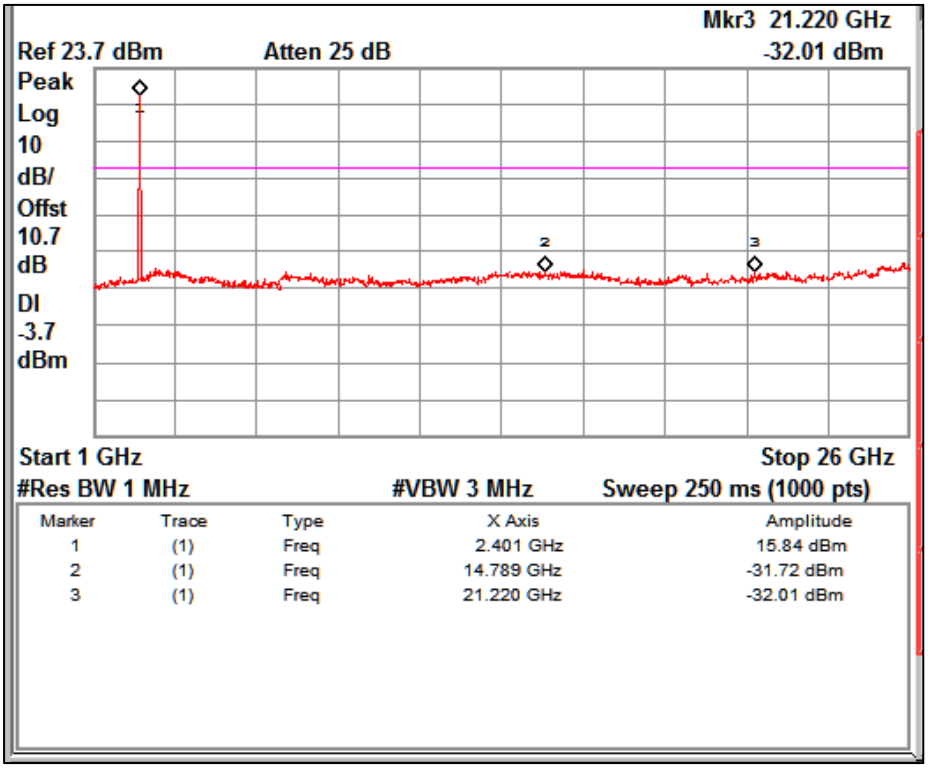
Frequency range: 1GHz to 26GHz **Channel frequency 2475MHz**



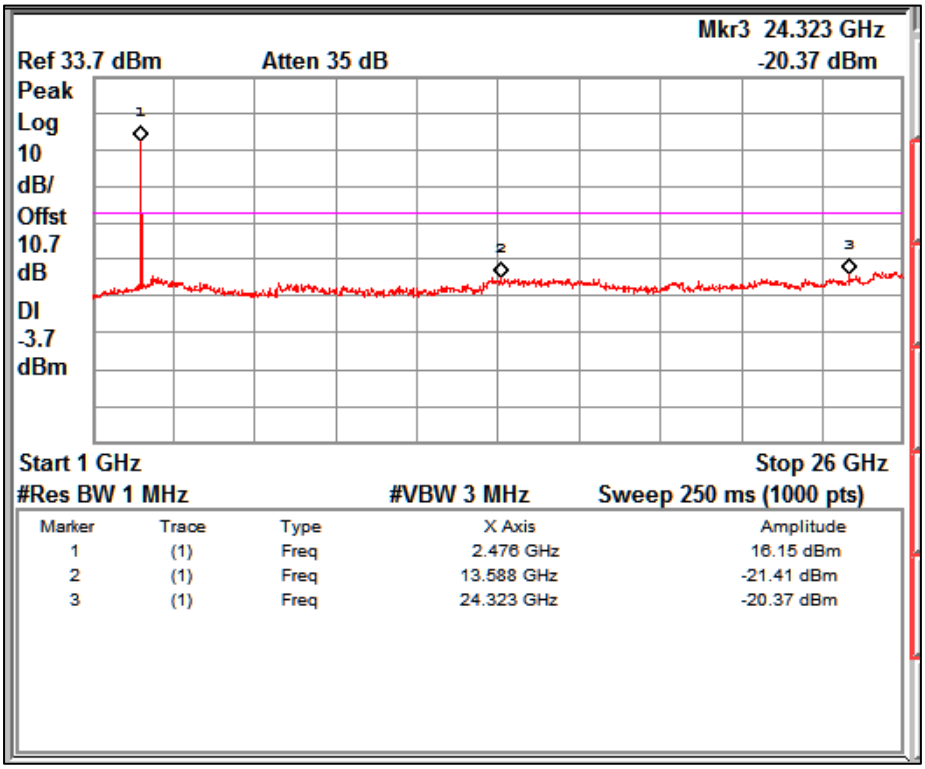
Frequency range: 30MHz-1GHz **Channel frequency: 2405MHz**



Frequency range: 1GHz to 26GHz **Channel frequency 2405MHz**



Frequency range: 1GHz to 26GHz **Channel frequency 2440MHz**



Frequency range: 1GHz to 26GHz **Channel frequency 2475MHz**

8.5 Spurious Radiated Emissions & Restricted Bands of Operation

Result ***Pass***

RF Protocol	IEE 802.15.4
Test Specification	FCC part 15 Subpart C 15.247 (d) / (15.209 & 15.205) / IC RSS-GEN, Section 8.9 and 8.10
Test Method	ANSI C63.10-2013
Measurement Location	Semi anechoic chamber <1GHz Fully anechoic chamber >1GHz
Measurement Bandwidth	100 kHz for frequency range < 1GHz 1 MHz for Frequency range >1GHz
Detector	Refer remarks below
Measuring Distance	3 m
Requirement	As per the limits mentioned in the below table
Test setup	Reffer TEST METHODOLOGY

Table 12: Transmitter limits for Radiated emission

Frequency (MHz)	Field strength (µV/m)	Field strength (dBµV/m)	Distance of Measurement (m)
0.009 – 0.490	2400/F(kHz)	48.50 – 13.80	300*
0.490 – 1.705	24000/F(kHz)	33.80 – 23.00	30*
1.705 -30	30	29.54	30*
30-88	100	40.0	3
88-216	150	43.5	3
216-960	200	46.0	3
Above 960	500	54.0	3

Remark: * The limit shows in the table above of frequency range 0.009 – 0.490, 0.490 – 1.705 MHz and 1.705-30MHz is at 300 meter, 30 meter and 30 meter range respectively, which corresponds to 128.51 – 93.80, 73.80 – 62.96 and 69.54 dBµV/m at 3m range by extrapolation calculation and the measurement of loop antenna.

The emission limits shown in the above table are based on measurements employing a CISPR quasi-peak detector except for the frequency bands 9–90 kHz, 110–490 kHz and above 1000 MHz Radiated emission limits in these three bands are based on measurements employing an average detector.

Test Conditions:

Temperature (Norm) = + 25 ° Relative humidity = 62 %

Voltage = 24V DC through 110V,60Hz AC to DC Adaptor for FDAP32 &

Voltage = 60V DC through PoE adaptor (110V/60Hz input to PoE) for PCAP3A

Test results:

Note: All the losses are included during measurement and final values are mentioned in the test report. Refer TEST METHODOLOGY for more details

Test results for frequency range 9kHz – 30MHz

No emissions found in frequency range 9 kHz to 30 MHz, and measured levels are below 20dB from the limit line, hence not reported

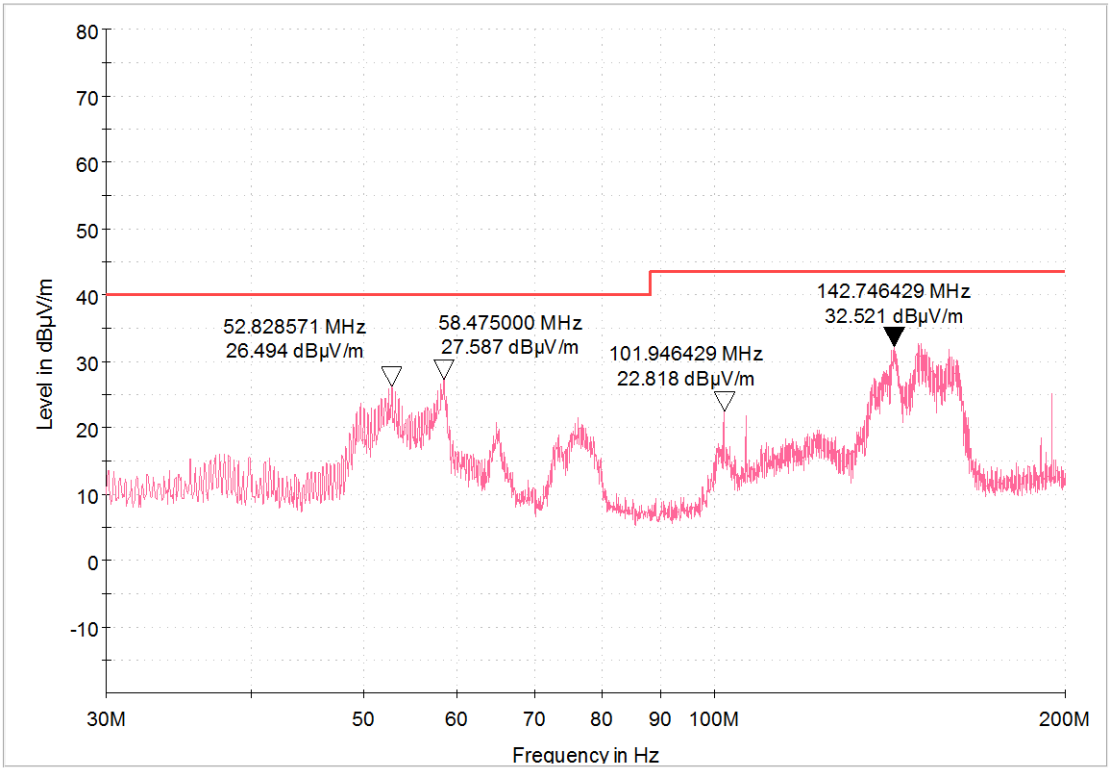
Test results for frequency range 30MHz – 1GHz

Supply voltage : 24V DC
Varient Tested : FDAP32

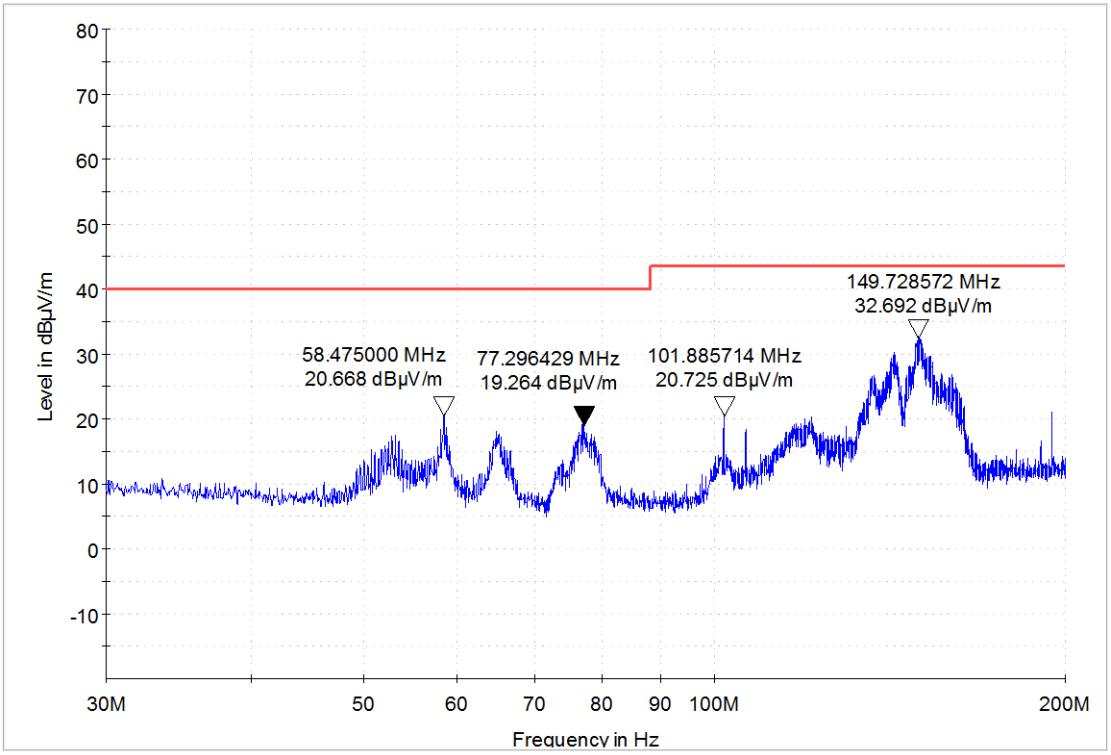
Antenna Polarization	Measured Frequency (MHz)	Field Strength (dBµV/m)	Limit (dBµV/m)	Margin (dB)
Vertical	52.82	26.49(Pk)	40	-13.51
	58.47	27.58(Pk)	40	-12.42
	142.74	32.52(Pk)	43.5	-10.98
	498.37	36.55(Pk)	46	-9.45
	587.09	36.34(Pk)	46	-9.66
	808.75	34.38(Pk)	46	-11.62
Horizontal	58.47	20.66(Pk)	40	-19.34
	101.88	20.72(Pk)	43.5	-22.78
	149.72	32.69(Pk)	43.5	-10.81
	498.31	34.49(Pk)	46	-11.51
	680.05	31.84(Pk)	46	-14.16
	821.78	38.23(Pk)	46	-7.77

Pk: Peak detector

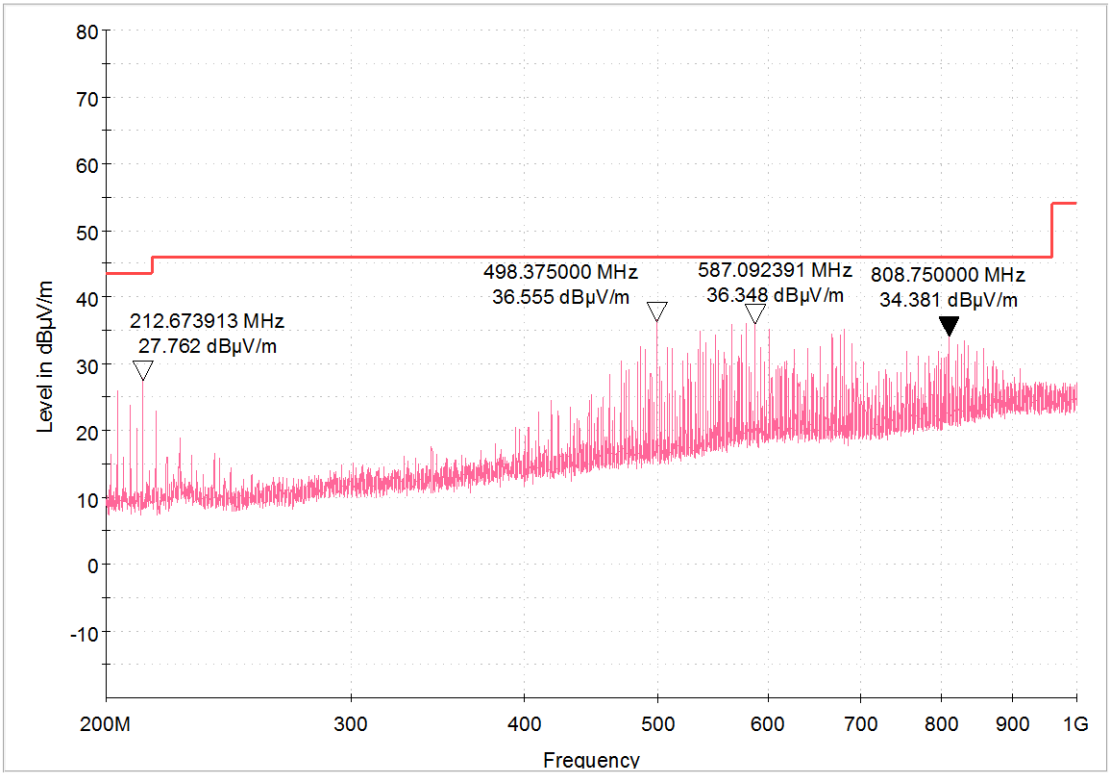
Measurement plots
Supply voltage : 24V DC
Varient Tested : FDAP32



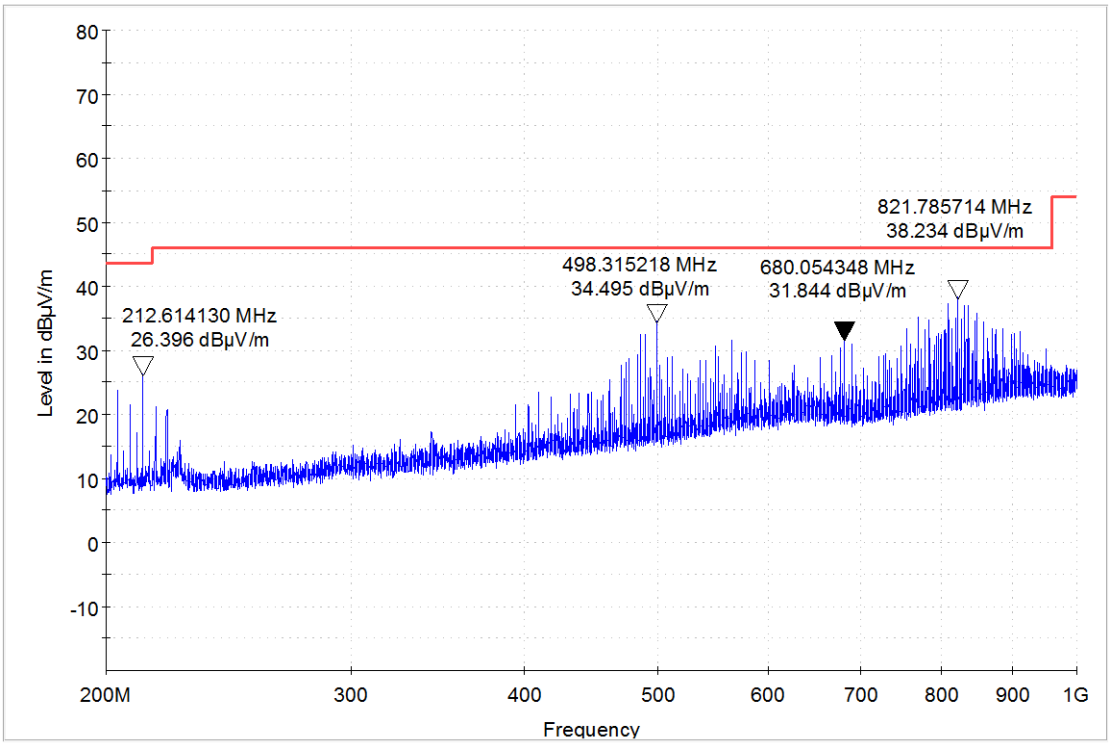
Channel Frequency 30MHz – 200MHz **Polarization Vertical**



Channel Frequency 30MHz – 200MHz **Polarization Horizontal**



Channel Frequency 200MHz to 1GHz **Polarization Vertical**



Channel Frequency 200MHz to 1GHz **Polarization Horizontal**

Test results for the frequencies above 1GHz

Supply voltage : 24V DC
Varient Tested : FDAP31

3. Transmitted power 20 dBm and Antenna: AIR-ANT2450V-N (+5dBi gain)

Channel	Polarization	Frequency (MHz)	Emission level (dBµV/m)	Limit (dBµV/m)	Margin (dB)
2405	Vertical	2390(Pk)	53.47	74*	-20.53
		2390(Av)	43.08	54*	-10.92
		2405(Pk)	116.56	-	-
		2405(Av)	113.36	-	-
		4810(Pk)	43.86	74	-30.14
		4810(Av)	32.04	54	-21.96
		7215(Pk)	46.96	74	-27.04
		7215(Av)	35.68	54	-18.32
	Horizontal	2390(Pk)	38.23	74*	-35.77
		2390(Av)	25.71	54*	-28.29
		2405(Pk)	92.91	-	-
		2405(Av)	89.67	-	-
		4810(Pk)	44.05	74	-29.95
		4810(Av)	32.23	54	-21.77
		7215(Pk)	49.01	74	-24.99
		7215(Av)	36.14	54	-17.86
2440	Vertical	2440(Pk)	116.31	*	-
		2440(Av)	113.19	*	-
		4880(Pk)	44.46	74	-29.54
		4880(Av)	33.59	54	-20.41
		7320(Pk)	48.73	74	-25.27
		7320(Av)	37.12	54	-16.88
	Horizontal	2440(Pk)	94.38	-	-
		2440(Av)	91.25	-	-
		4880(Pk)	45.23	74	-28.77
		4880(Av)	34.79	54	-19.21
		7320(Pk)	47.32	74	-26.68
		7320(Av)	35.85	54	-18.15

- : Fundamental Frequency
***- : Indicate restricted band of operation §15.205**
Pk: Peak Detector; Av: Average Detector

2475	Vertical	2475(Pk)	113.34	-	-
		2475(Av)	110.03	-	-
		2483.5(Pk)	59.85	74*	-14.15
		2483.5(Av)	49.44	54*	-4.56
		4950(Pk)	42.96	74	-31.04
		4950(Av)	30.67	54	-23.33
		7425(Pk)	49.54	74	-24.46
		7425(Av)	37.60	54	-16.40
	Horizontal	2475(Pk)	91.68	-	-
		2475(Av)	88.24	-	-
		2483.5(Pk)	41.39	74*	-32.61
		2483.5(Av)	29.54	54*	-24.46
		4950(Pk)	44.16	74	-29.84
		4950(Av)	33.50	54	-20.50
		7425(Pk)	52.58	74	-21.42
		7425(Av)	42.69	54	-11.31

- : Fundamental Frequency
***- : Indicate restricted band of operation §15.205**
Pk: Peak Detector; Av: Average Detector

4. Transmitted power 20 dBm and Antenna : Laird Technologies - OD24M-5 (+5 dBi gain)

Channel	Polarization	Frequency (MHz)	Emission level (dBµV/m)	Limit (dBµV/m)	Margin (dB)
2405	Vertical	2390(Pk)	53.96	74*	-20.04
		2390(Av)	43.97	54*	-10.03
		2405(Pk)	117.73	-	-
		2405(Av)	114.57	-	-
		4810(Pk)	44.22	74	-29.78
		4810(Av)	32.37	54	-21.63
		7215(Pk)	49.01	74	-24.99
		7215(Av)	35.82	54	-18.18
	Horizontal	2390(Pk)	38.33	74*	-35.67
		2390(Av)	27.16	54*	-26.84
		2405(Pk)	97.65	-	-
		2405(Av)	94.50	-	-
		4810(Pk)	44.07	74	-29.93
		4810(Av)	31.85	54	-22.15
		7215(Pk)	47.25	74	-26.75
		7215(Av)	36.49	54	-17.51
2440	Vertical	2440(Pk)	117.54	*	-
		2440(Av)	114.41	*	-
		4880(Pk)	42.54	74	-31.46
		4880(Av)	31.33	54	-22.67
		7320(Pk)	49.41	74	-24.59
		7320(Av)	37.10	54	-16.90
	Horizontal	2440(Pk)	102.61	-	-
		2440(Av)	99.46	-	-
		4880(Pk)	45.75	74	-28.25
		4880(Av)	34.06	54	-19.94
		7320(Pk)	48.76	74	-25.24
		7320(Av)	36.37	54	-17.63
2475	Vertical	2475(Pk)	115.16	-	-
		2475(Av)	111.82	-	-
		2483.5(Pk)	61.22	74*	-12.78
		2483.5(Av)	50.77	54*	-3.23
		4950(Pk)	42.66	74	-31.34
		4950(Av)	31.39	54	-22.61
		7425(Pk)	50.47	74	-23.53
		7425(Av)	39.05	54	-14.95
	Horizontal	2475(Pk)	98.53	-	-
		2475(Av)	95.15	-	-
		2483.5(Pk)	44.90	74*	-29.10
		2483.5(Av)	34.30	54*	-19.70
		4950(Pk)	44.44	74	-29.56
		4950(Av)	33.85	54	-20.15
		7425(Pk)	51.53	74	-22.47
		7425(Av)	41.26	54	-12.74

- : Fundamental Frequency
***- : Indicate restricted band of operation §15.205**
Pk: Peak Detector; Av: Average Detector

5. Transmitted power 17 dBm and Antenna: AIR-ANT2480V-N (+ 8dBi gain)

Channel	Polarization	Frequency (MHz)	Emission level (dBµV/m)	Limit (dBµV/m)	Margin (dB)
2405	Vertical	2390(Pk)	46.69	74*	-27.31
		2390(Av)	35.93	54*	-18.07
		2405(Pk)	110.43	-	-
		2405(Av)	106.70	-	-
		4810(Pk)	43.23	74	-30.77
		4810(Av)	31.56	54	-22.44
		7215(Pk)	48.42	74	-25.58
		7215(Av)	35.64	54	-18.36
	Horizontal	2390(Pk)	38.06	74*	-35.94
		2390(Av)	26.63	54*	-27.37
		2405(Pk)	97.29	-	-
		2405(Av)	93.89	-	-
		4810(Pk)	43.11	74	-30.89
		4810(Av)	31.12	54	-22.88
		7215(Pk)	47.11	74	-26.89
		7215(Av)	36.02	54	-17.98
2440	Vertical	2440(Pk)	113.27	*	-
		2440(Av)	109.92	*	-
		4880(Pk)	41.98	74	-32.02
		4880(Av)	30.34	54	-23.66
		7320(Pk)	50.35	74	-23.65
		7320(Av)	38.10	54	-15.90
	Horizontal	2440(Pk)	101.40	-	-
		2440(Av)	98.06	-	-
		4880(Pk)	44.03	74	-29.97
		4880(Av)	32.88	54	-21.12
		7320(Pk)	49.01	74	-24.99
		7320(Av)	37.33	54	-16.67
2475	Vertical	2475(Pk)	113.53	-	-
		2475(Av)	87.10	-	-
		2483.5(Pk)	59.77	74*	-14.23
		2483.5(Av)	49.60	54*	-4.40
		4950(Pk)	42.21	74	-31.79
		4950(Av)	29.59	54	-24.41
		7425(Pk)	49.37	74	-24.63
		7425(Av)	38.15	54	-15.85
	Horizontal	2475(Pk)	101.40	-	-
		2475(Av)	98.03	-	-
		2483.5(Pk)	48.03	74*	-25.97
		2483.5(Av)	37.48	54*	-16.52
		4950(Pk)	44.15	74	-29.85
		4950(Av)	32.73	54	-21.27
		7425(Pk)	51.56	74	-22.44
		7425(Av)	41.43	54	-12.57

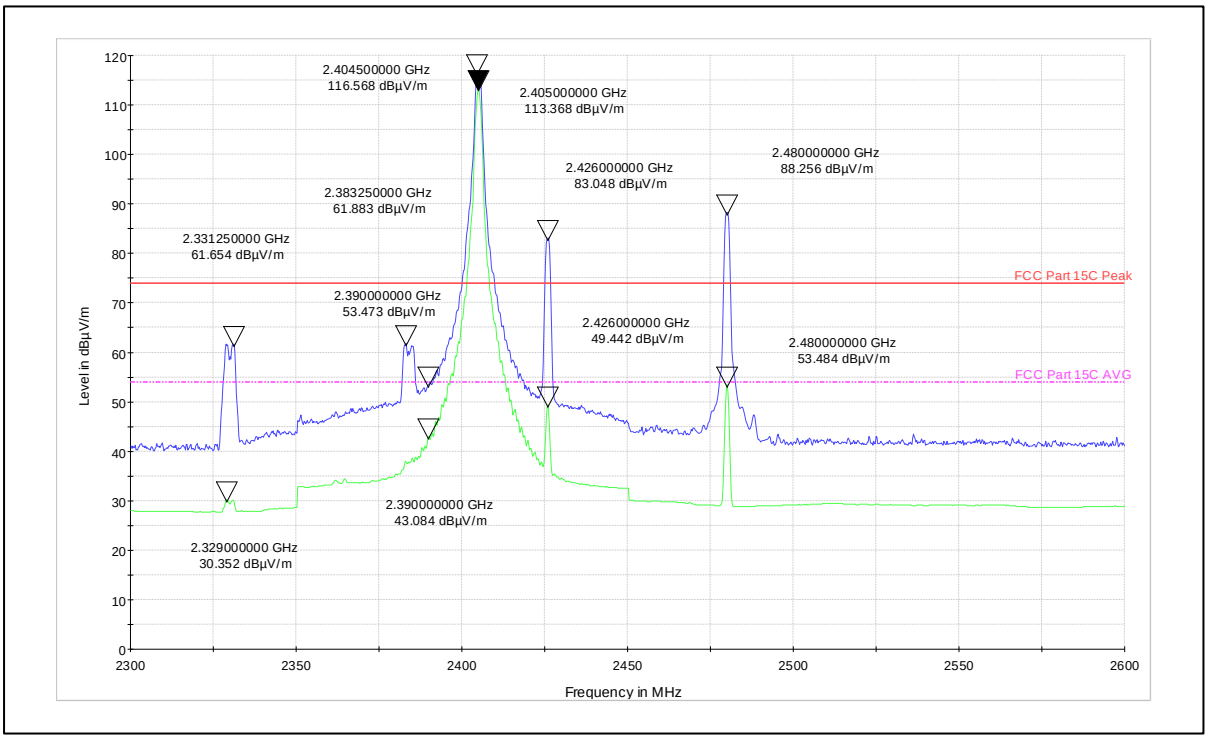
- : Fundamental Frequency
***- : Indicate restricted band of operation §15.205**
Pk: Peak Detector; Av: Average Detector

6. Test results of simultaneous operation of IEEE 802.15.4 and BLE.

Channel	Polarization	Frequency (MHz)	Emission level (dBµV/m)	Limit (dBµV/m)	Margin (dB)
BLE :2402MHz IEEE 802.15.4: 2405MHz	Vertical	2390(Pk)	46.69	74	-27.31
		2390(Av)	35.93	54	-18.07
		2405(Pk)	110.43	-	
		2405(Av)	106.70	-	
		2402(Pk)	78.14	-	
		2402(Av)	64.20	-	
		2426(Pk)	83.04	-	
		2426(Av)	49.44	-	
		2312.5(Pk)	61.65	74	-12.35
		2312.5(Av)	30.35	54	-23.65
		7206(Pk)	48.04	74	-25.96
		7206(Av)	35.60	54	-18.4
	Horizontal	2390(Pk)	38.06	74	-35.94
		2390(Av)	26.63	54	-27.37
		2405(Pk)	97.29	-	
		2405(Av)	93.89	-	
		2402(Pk)	74.52	-	
		2402(Av)	60.59	-	
		2425.75(Pk)	60.98	-	
		2426(Av)	30.57	-	
		2480.25(Pk)	68.53	74	-5.47
		2480(Av)	35.39	54	-18.61
		7206(Pk)	48.63	74	-25.37
		7206(Av)	35.67	54	-18.33
BLE :2440MHz IEEE 802.15.4: 2440MHz	Vertical	2440.25(Pk)	113.27	-	
		2440.25(Av)	109.92	-	
		2440(Pk)	84.01	-	
		2440(Av)	70.60	-	
	Horizontal	2440.25(Pk)	101.40	-	
		2440.25(Av)	98.06	-	
		2440(pk)	79.24	-	
		2440(Av)	65.30	-	
BLE 2480MHz IEEE 802.15.4 : 2475MHz	Vertical	2475(Pk)	113.53	-	
		2475(Av)	87.10	-	
		2402(Pk)	72.98	-	
		2401.7(Av)	38.87	-	
		2483.5(Pk)	59.77	-	
		2483.5(Av)	49.60	-	
		2479.75(Pk)	88.04	-	
		2480	74.09	-	
	Horizontal	2475(Pk)	101.40	-	
		2475(Av)	98.03	-	
		2480(Pk)	48.03	-	
		2480(Av)	37.48	-	
		2402.25	69.13	-	
		2402	36.18	-	
		2483.5(Pk)	44.15	-	
		2483.5(Av)	32.73	-	
		2525	42.51	-	
		2548.75	41.29	-	
		2479.75(Pk)	80.87	-	
		2480	66.94	-	

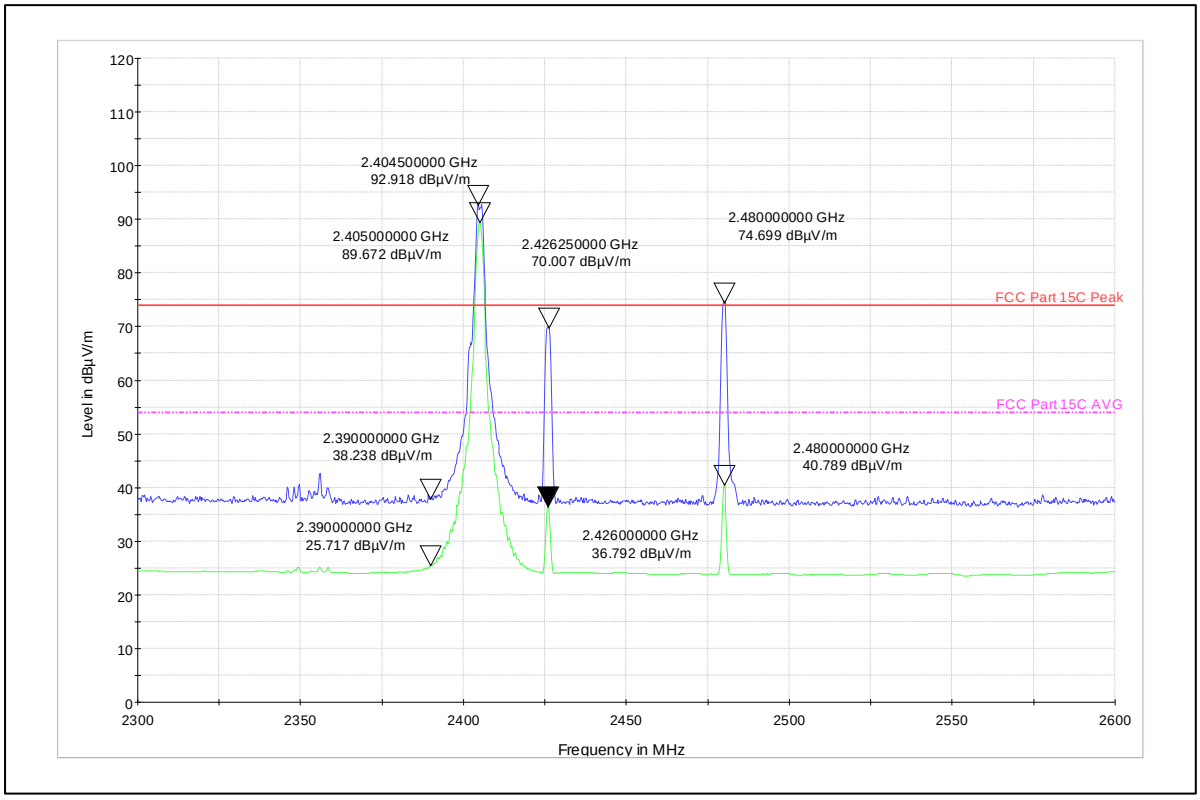
Worst case Plots
Restricted bands check

1. **Transmitted power 20 dBm and Antenna: AIR-ANT2450V-N (+5 dBi gain)**



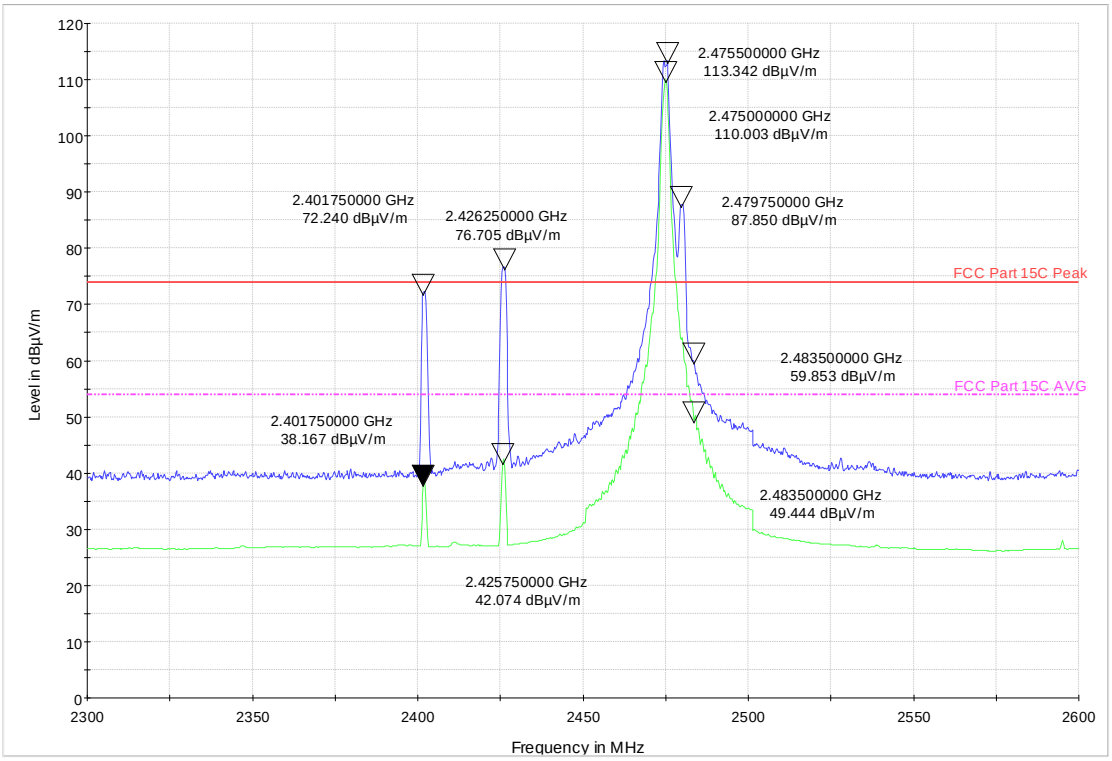
Channel frequency: 2405MHz **Polarization: Vertical**

Note: Emissions in 2426MHz and 2480MHz are intentional frequencies of BLE transmitter.



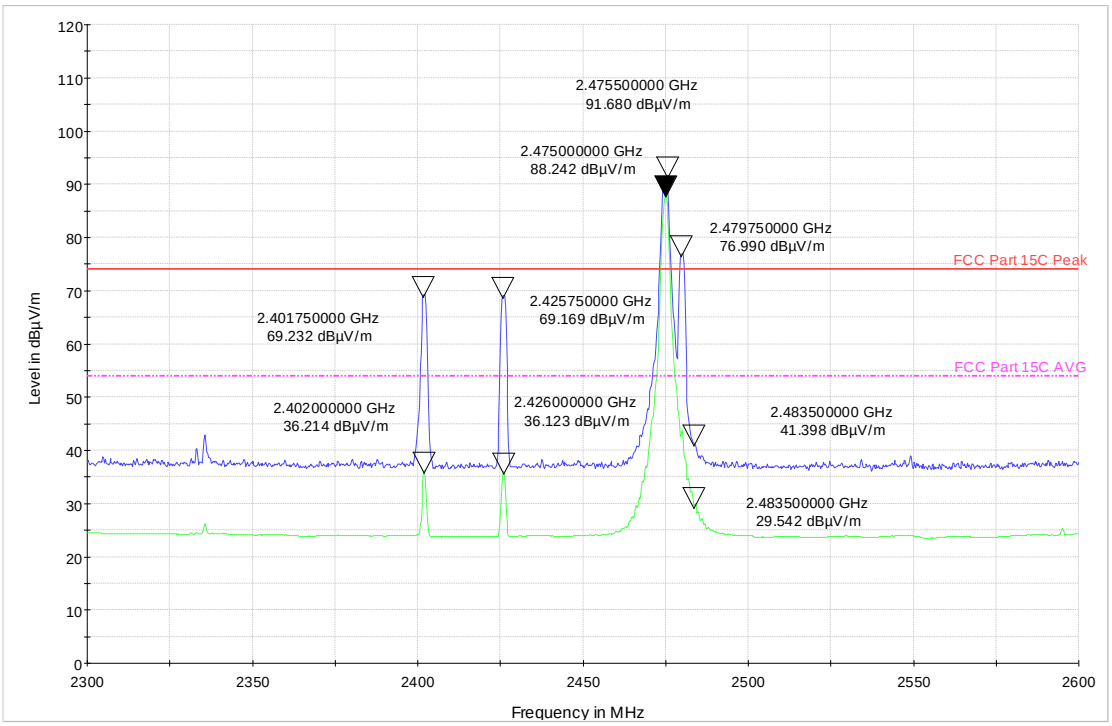
Channel frequency: 2405MHz **Polarization:Horizontal**

Note: Emissions in 2426MHz and 2480MHz are intentional frequencies of BLE transmitter.



Channel Frequency: 2475MHz **Polarization: Vertical**

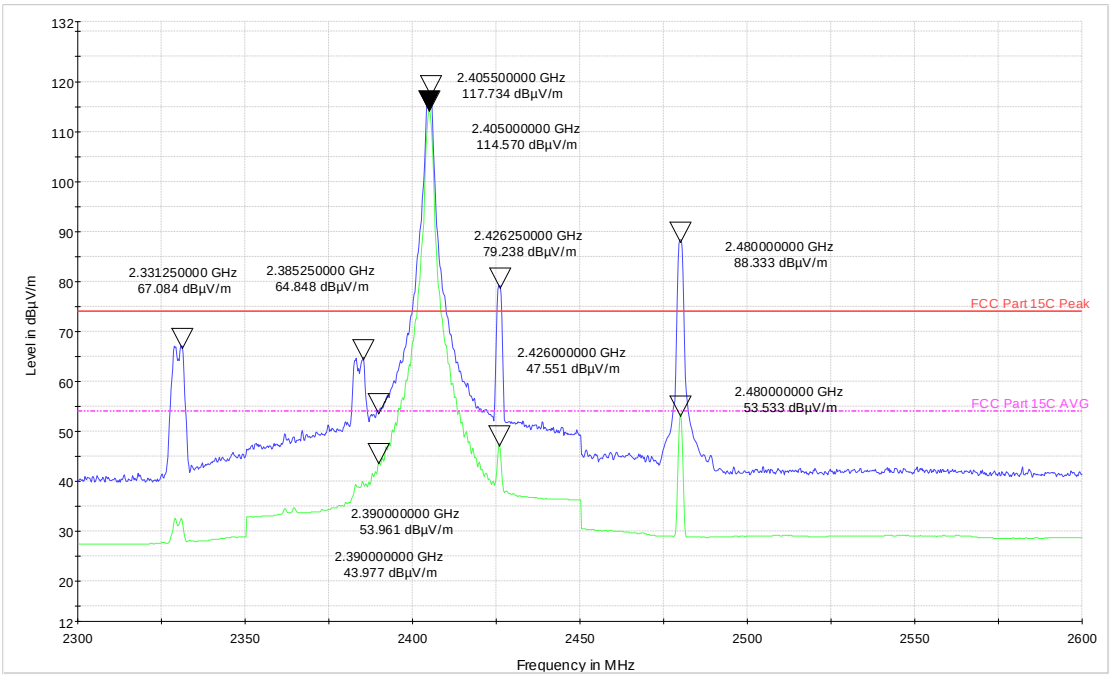
Note: Emissions in 2402MHz and 2426MHz are intentional frequencies of BLE transmitter.



Channel Frequency: 2475MHz **olarization: Horizontal**

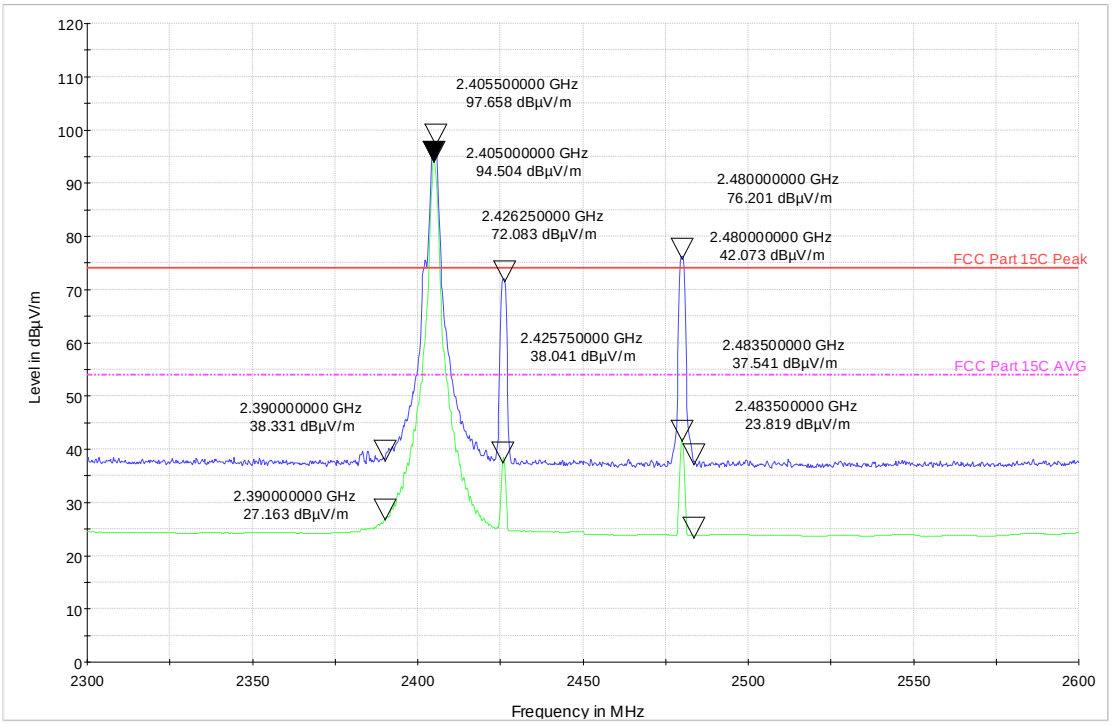
Note: Emissions in 2402MHz and 2426MHz are intentional frequencies of BLE transmitter.

2. Transmitted power 20 dBm and Antenna: Laird Technologies - OD24M-5 (+ 5 dBi gain)



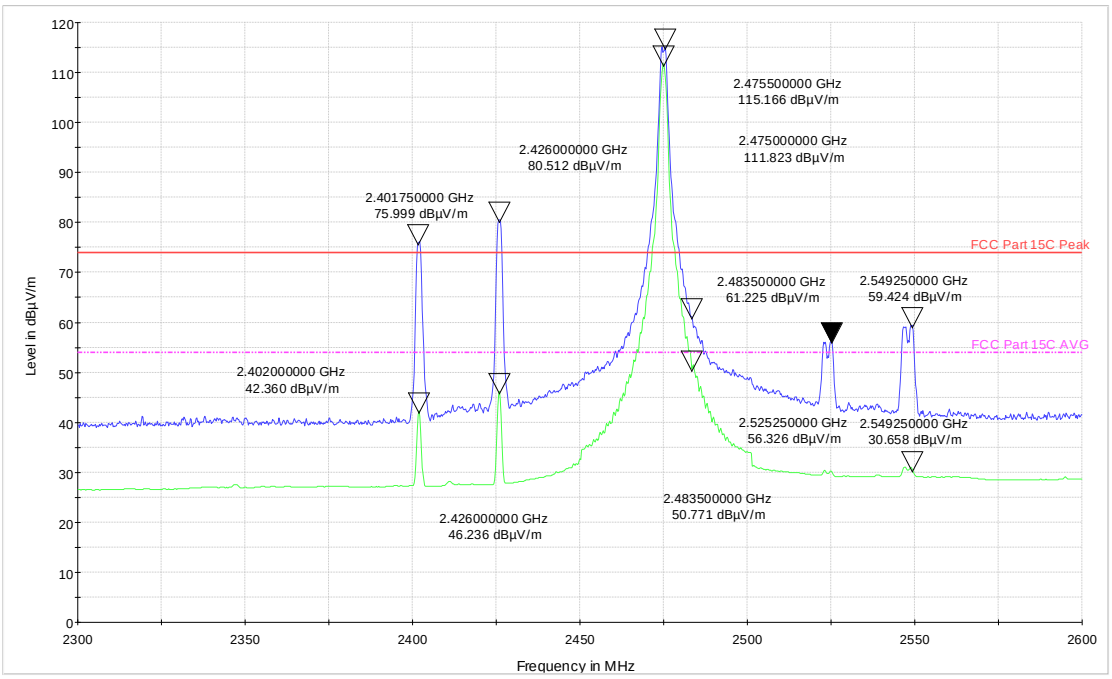
Channel Frequency: 2405MHz **Polarization: Vertical**

Note: Emissions in 2426MHz and 2480MHz are intentional frequencies of BLE transmitter.



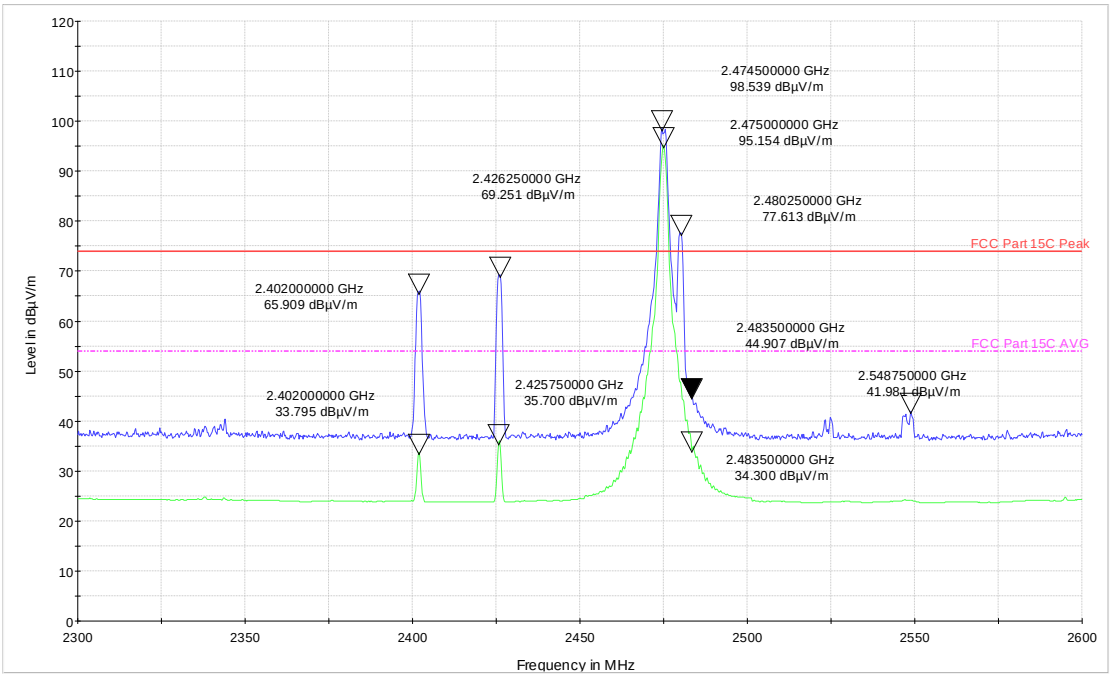
Channel Frequency: 2405MHz **Polarization: Horizontal**

Note: Emissions in 2426MHz and 2480MHz are intentional frequencies of BLE transmitter.



Channel Frequency: 2475MHz **Polarization: Vertical**

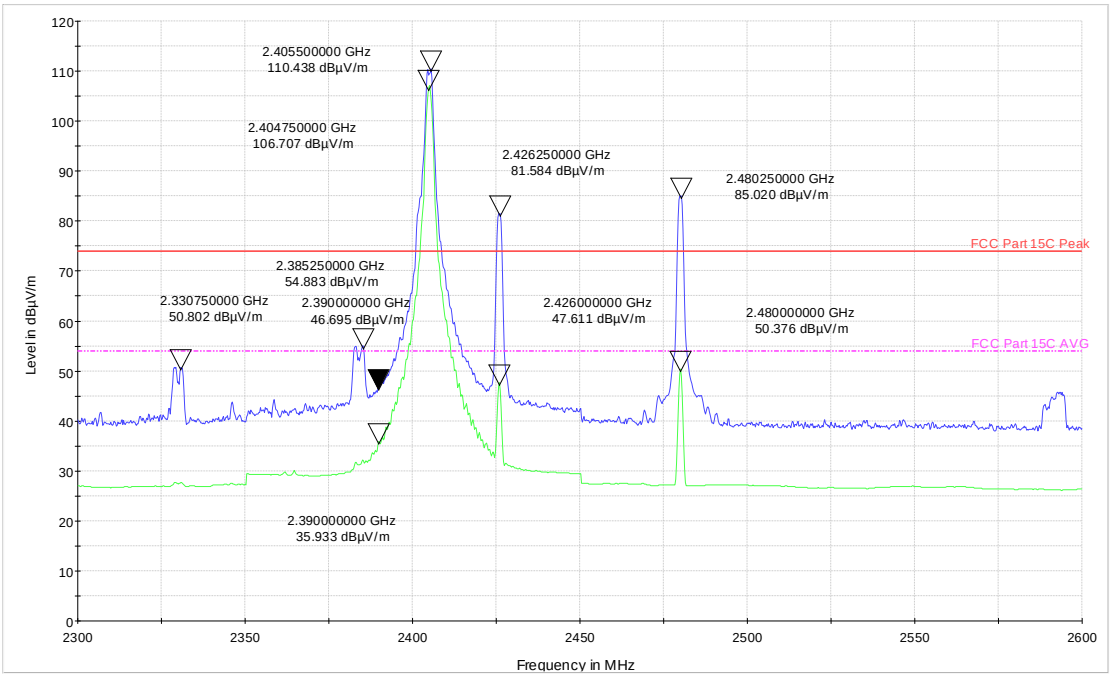
Note: Emissions in 2402MHz and 2426MHz are intentional frequencies of BLE transmitter.



Channel Frequency: 2475MHz **Polarization: Horizontal**

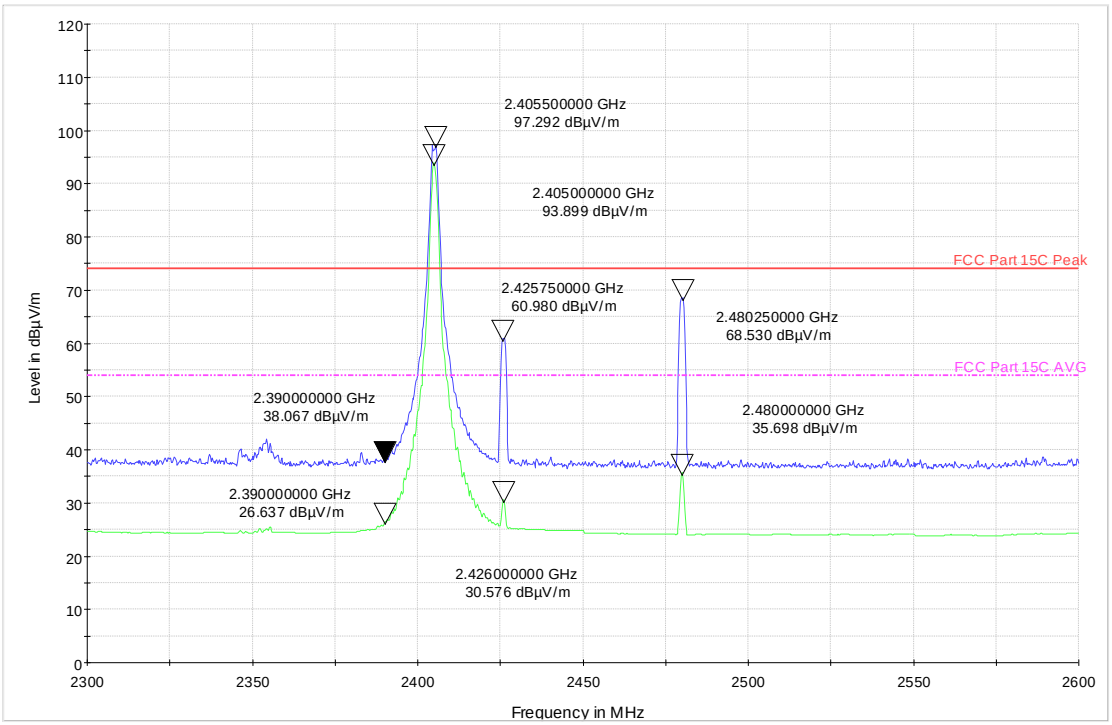
Note: Emissions in 2402MHz and 2426MHz are intentional frequencies of BLE transmitter.

3. Transmitted power 17 dBm and Antenna: AIR-ANT2480V-N (+8 dBi gain)



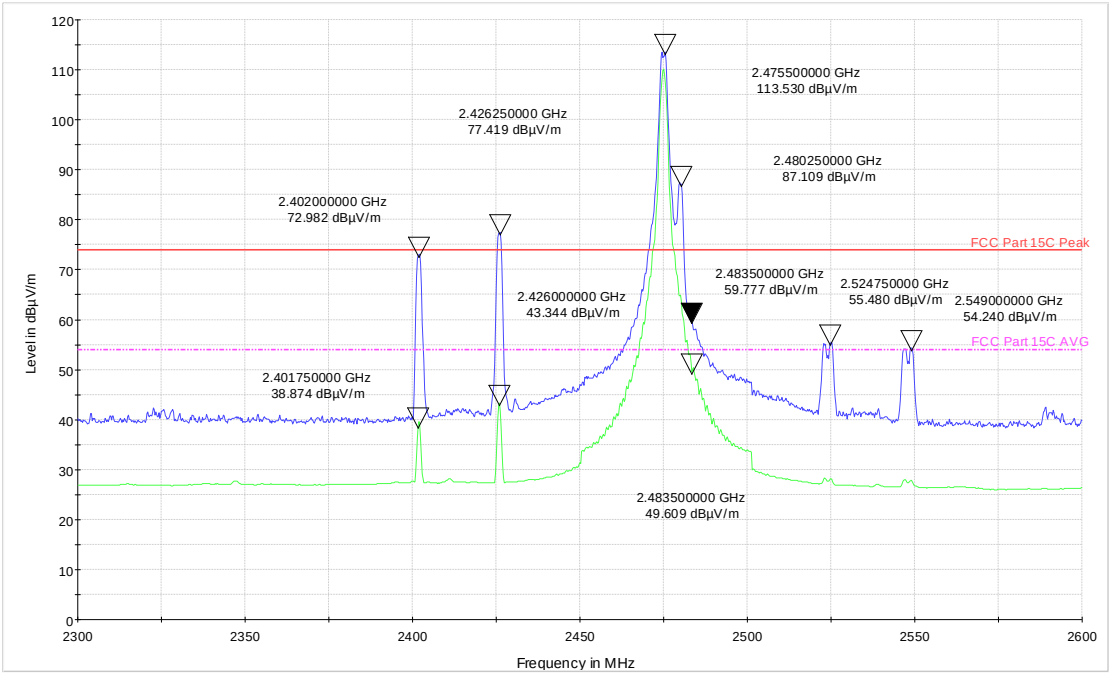
Channel Frequency: 2405MHz **Polarization: Vertical**

Note: Emissions in 2426MHz and 2480MHz are intentional frequencies of BLE transmitter



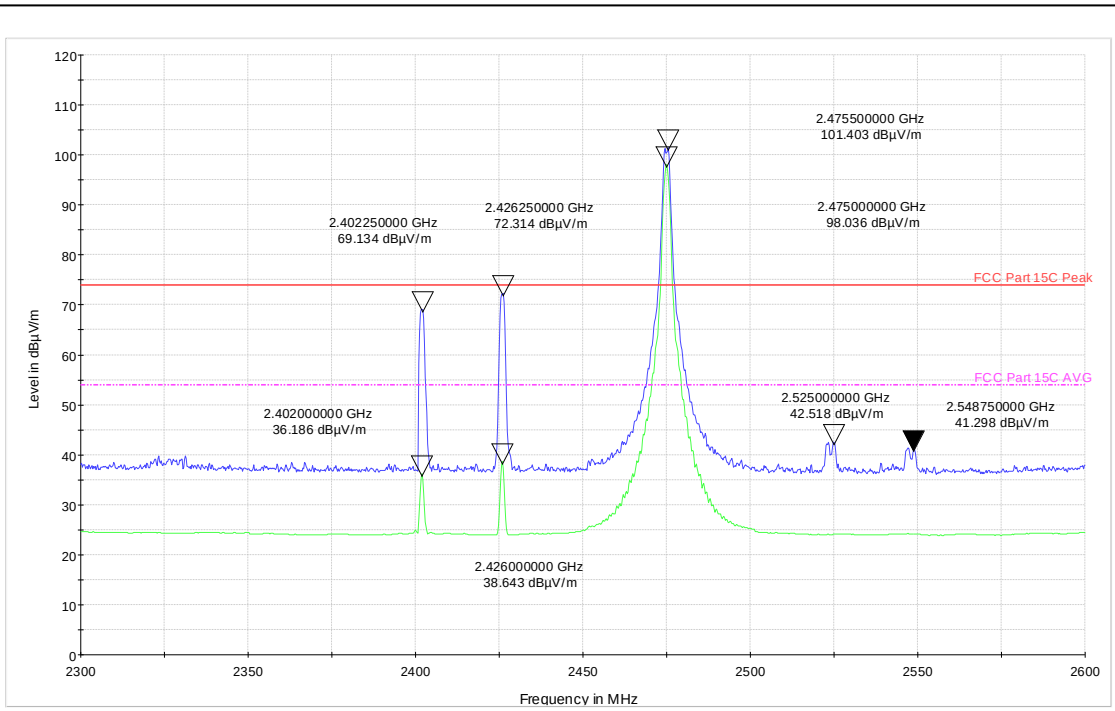
Channel Frequency: 2405MHz **Polarization: Horizontal**

Note: Emissions in 2426MHz and 2480MHz are intentional frequencies of BLE transmitter



Channel Frequency: 2475MHz **Polarization: Vertical**

Note: Emissions in 2426MHz and 2402MHz are intentional frequencies of BLE transmitter



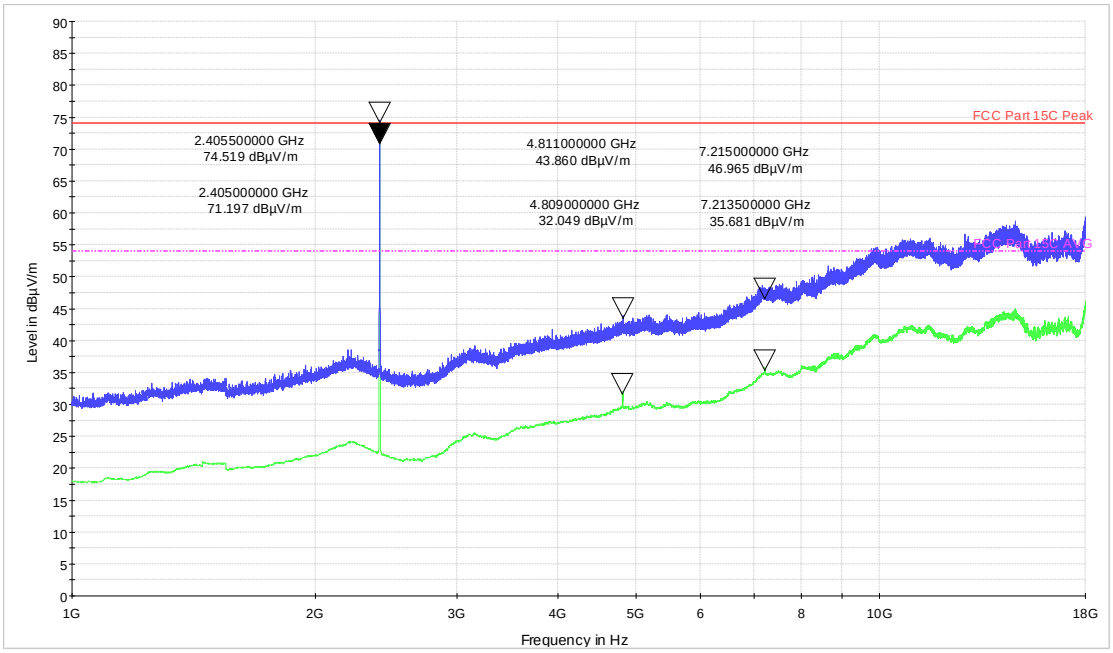
Channel Frequency: 2475MHz **Polarization: Horizontal**

Note: Emissions in 2402MHz and 2426MHz are intentional frequencies of BLE transmitter

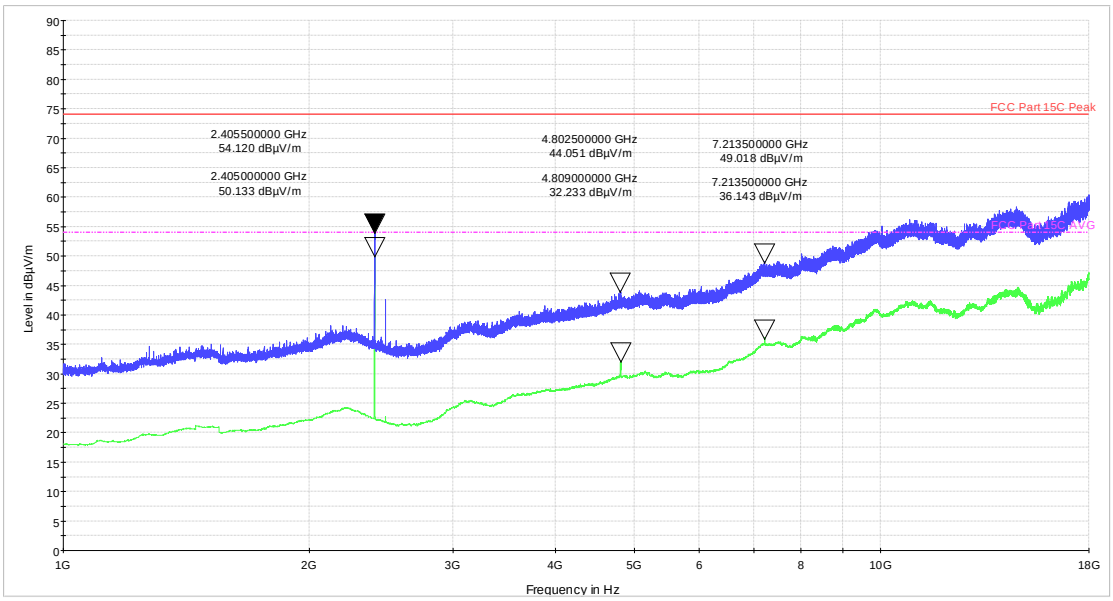
Worst Case: Spurious emissions

Transmitted power 20 dBm and Antenna: AIR-ANT2450V-N (+5 dBi gain)

Channel frequency: 2405MHz

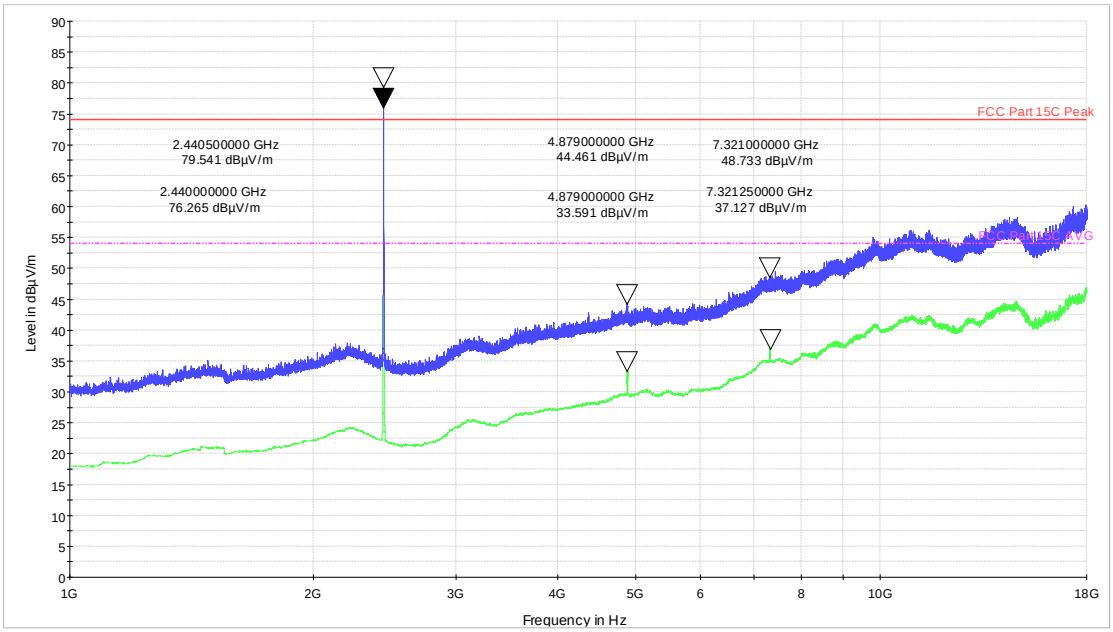


Frequency Range: 1-18GHz **Polarization: Vertical**

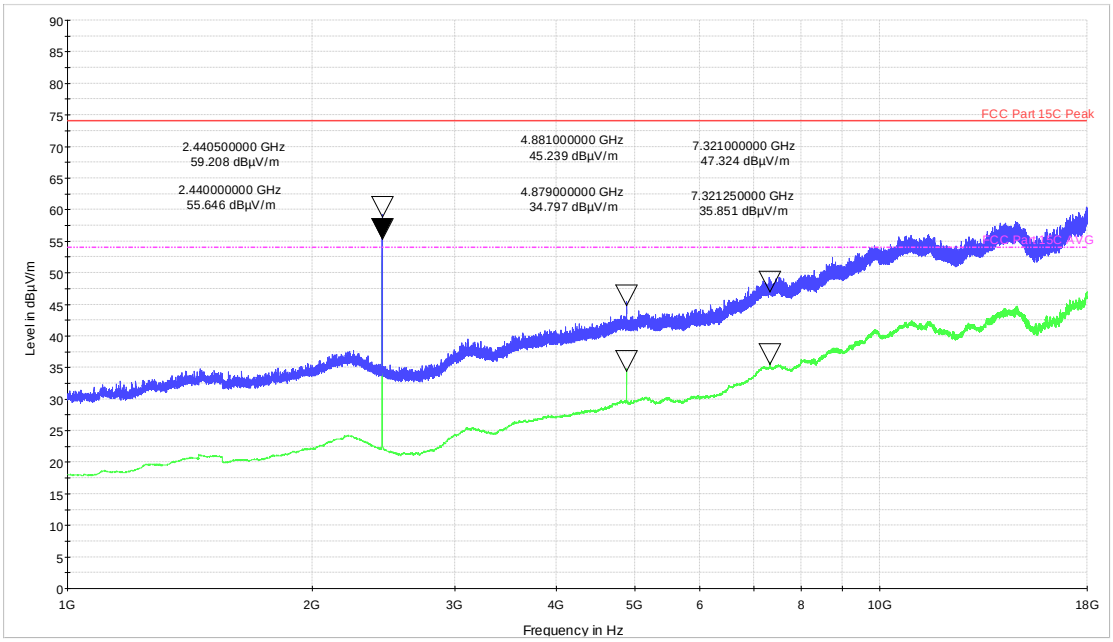


Frequency Range: 1-18GHz **Polarization: Horizontal**

Channel frequency: 2440MHz

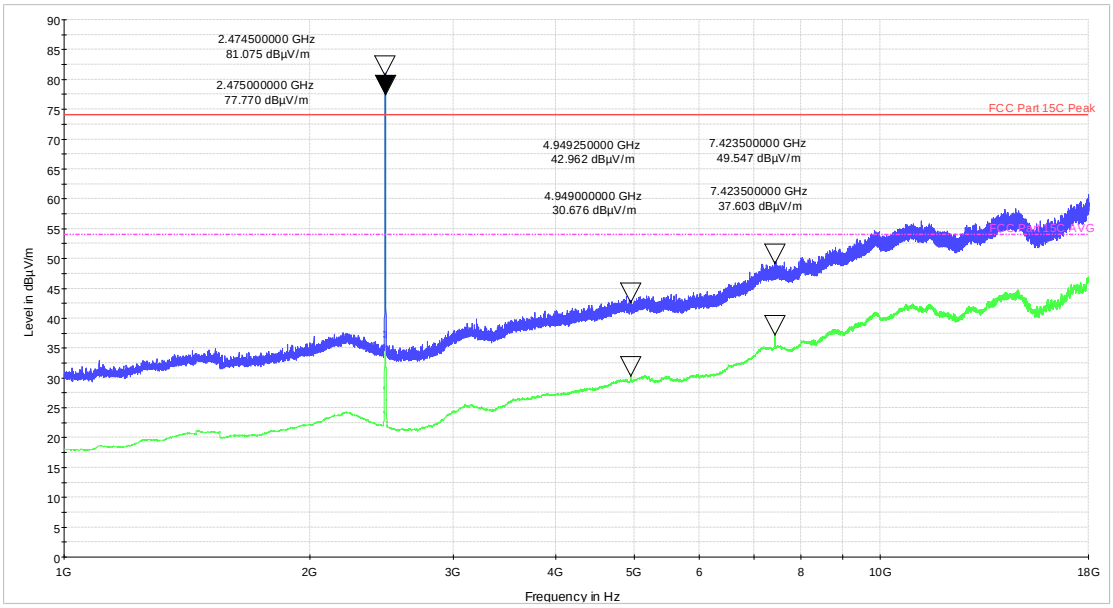


Frequency Range: 1-18GHz **Polarization: Vertical**

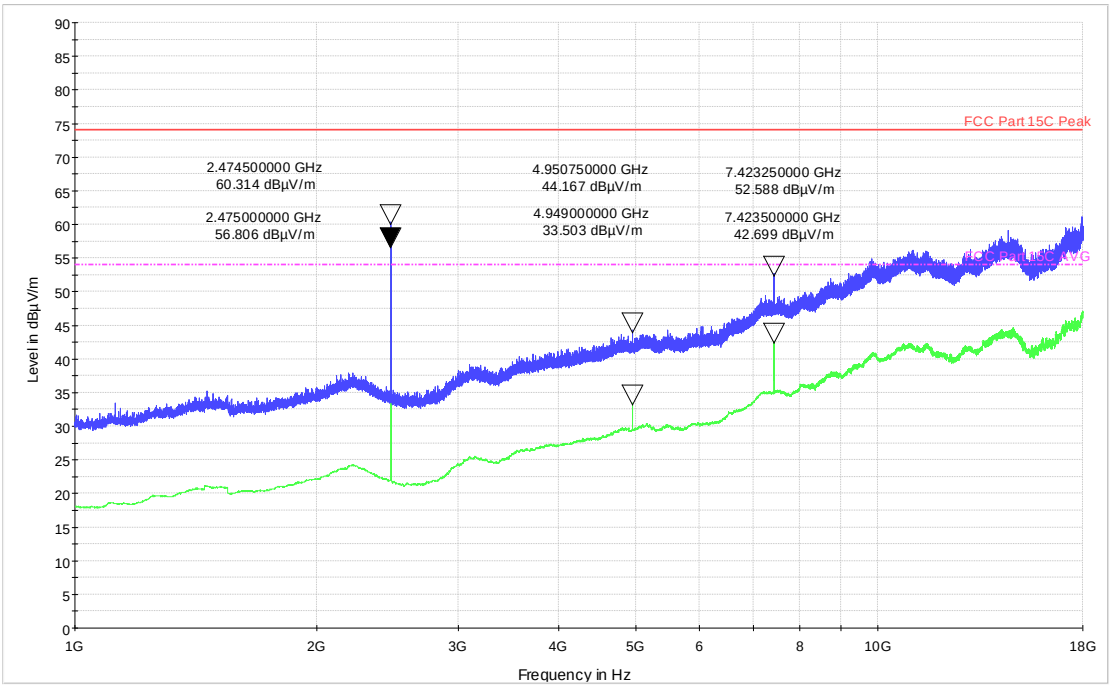


Frequency Range: 1-18GHz **Polarization: Horizontal**

Channel frequency: 2480MHz



Frequency Range: 1-18GHz **Polarization: Vertical**



Frequency Range: 1-18GHz **Polarization: Horizontal**

9 TEST RESULTS FOR BLUETOOTH LOW ENERGY

9.1 Spurious Radiated Emissions & Restricted Bands of Operation

Result ***Pass***

RF Protocol	BLE
Test Specification	FCC part 15 Subpart C 15.247 (d) / (15.209 & 15.205)
Test Method	ANSI C63.10
Measurement Location	Semi Anechoic Chamber 30MHz - 1 GHz Fully Anechoic Chamber 1 GHz - 40GHz
Measurement Bandwidth	100 kHz for frequency range < 1GHz 1 MHz for Frequency range >1GHz
Detector	Refer remarks below
Measuring Distance	3 m
Requirement	As per the limits mentioned in the below table
Test setup	Refer TEST METHODOLOGY

Table 13: Transmitter limits for Radiated emission

Frequency (MHz)	Field strength (µV/m)	Field strength (dBµV/m)	Distance of Measurement (m)
0.009 – 0.490	2400/F(kHz)	48.50 – 13.80	300*
0.490 – 1.705	24000/F(kHz)	33.80 – 23.00	30*
1.705 -30	30	29.54	30*
30-88	100	40.0	3
88-216	150	43.5	3
216-960	200	46.0	3
Above 960	500	54.0	3

Remark: * The limit shows in the table above of frequency range 0.009 – 0.490, 0.490 – 1.705 MHz and 1.705-30MHz is at 300 meter, 30 meter and 30 meter range respectively, which corresponds to 128.51 – 93.80, 73.80 – 62.96 and 69.54 dBµV/m at 3m range by extrapolation calculation and the measurement of loop antenna.

The emission limits shown in the above table are based on measurements employing a CISPR quasi-peak detector except for the frequency bands 9–90 kHz, 110–490 kHz and above 1000 MHz Radiated emission limits in these three bands are based on measurements employing an average detector.

Test Conditions:

Temperature (Norm) = + 22.3 °C Relative humidity: 66%

Voltage = 24V DC through 110V,60Hz AC to DC Adaptor for FDAP32 &

Voltage = 60V DC through PoE adaptor (110V/60Hz input to PoE) for PCAP3A

Test results:

Note: All the losses are included during measurement and final values are mentioned in the test report. Refer TEST METHODOLOGY for more details

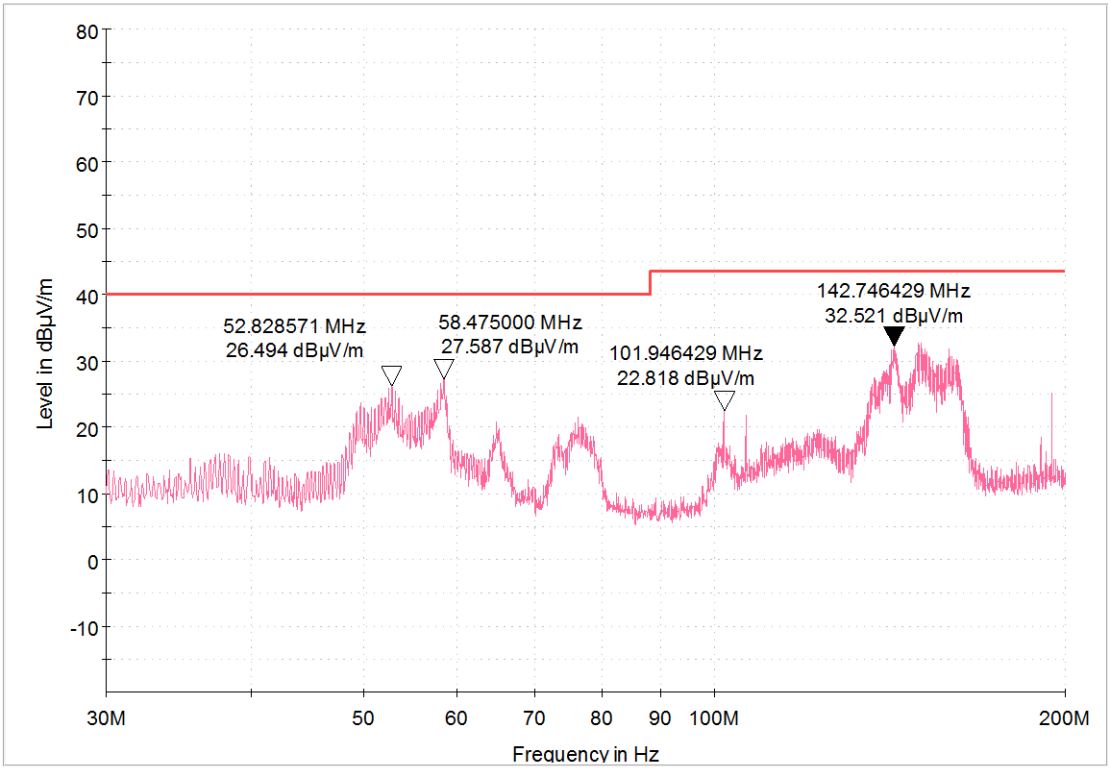
Test results for frequency range 9kHz – 30MHz

No emissions found in frequency range 9 kHz to 30 MHz, and measured levels are below 20dB from the limit line, hence not reported

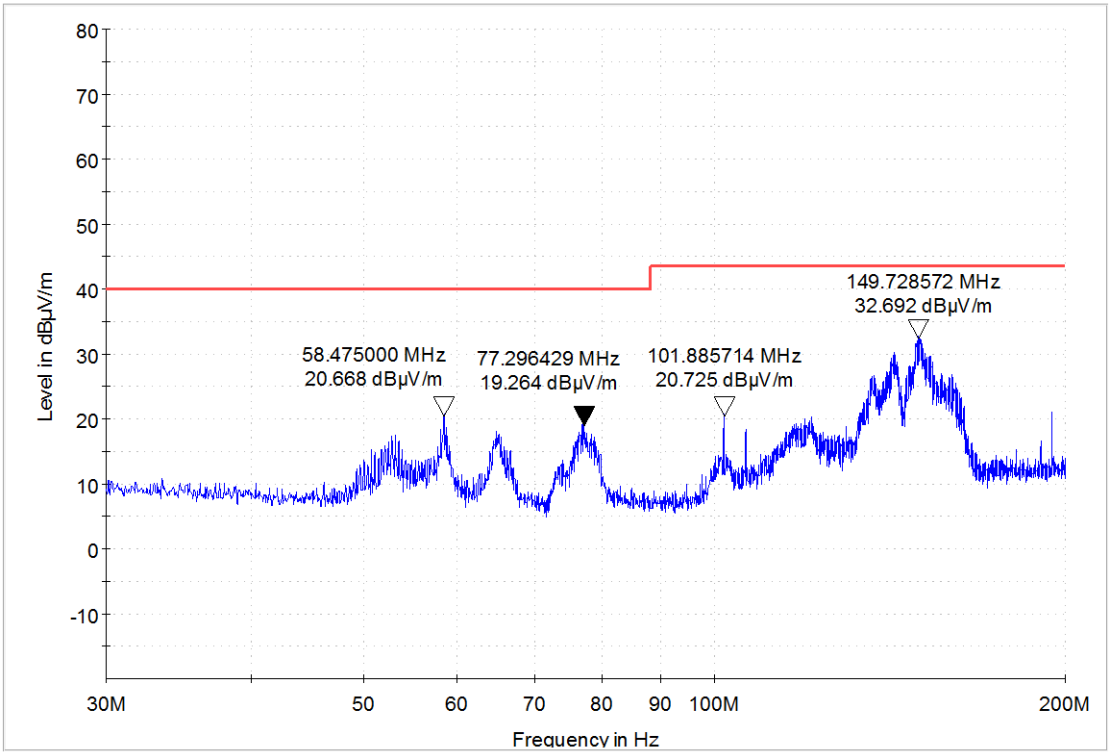
Test results for frequency range 30MHz – 1GHz

Measurement plots
Supply voltage : 24V DC
Varient Tested : FDAP32

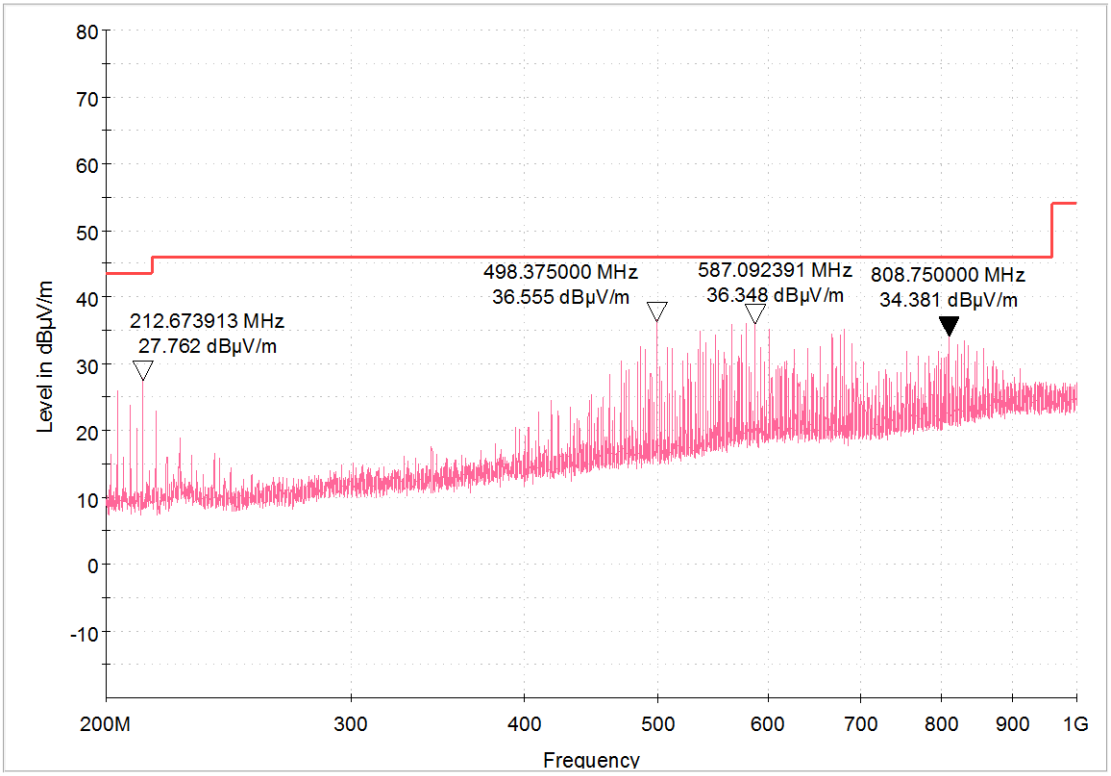
Antenna Polarization	Measured Frequency (MHz)	Field Strength (dBµV/m)	Limit (dBµV/m)	Margin (dB)
Vertical	52.82	26.49(Pk)	40	-13.51
	58.47	27.58(Pk)	40	-12.42
	142.74	32.52(Pk)	43.5	-10.98
	498.37	36.55(Pk)	46	-9.45
	587.09	36.34(Pk)	46	-9.66
	808.75	34.38(Pk)	46	-11.62
Horizontal	58.47	20.66(Pk)	40	-19.34
	101.88	20.72(Pk)	43.5	-22.78
	149.72	32.69(Pk)	43.5	-10.81
	498.31	34.49(Pk)	46	-11.51
	680.05	31.84(Pk)	46	-14.16
	821.78	38.23(Pk)	46	-7.77



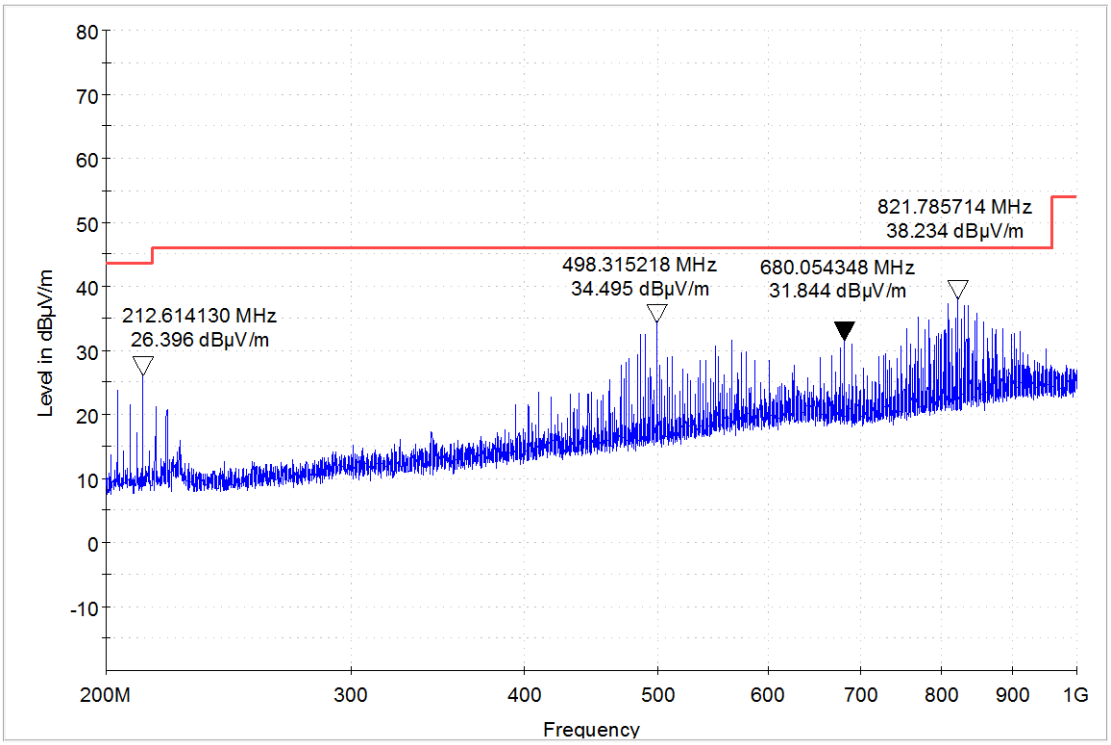
Channel Frequency 30MHz – 200MHz **Polarization Vertical**



Channel Frequency 30MHz – 200MHz **Polarization Horizontal**



Channel Frequency 200MHz to 1GHz **Polarization Vertical**



Channel Frequency 200MHz to 1GHz **Polarization Horizontal**

Test results for the frequencies above 1GHz

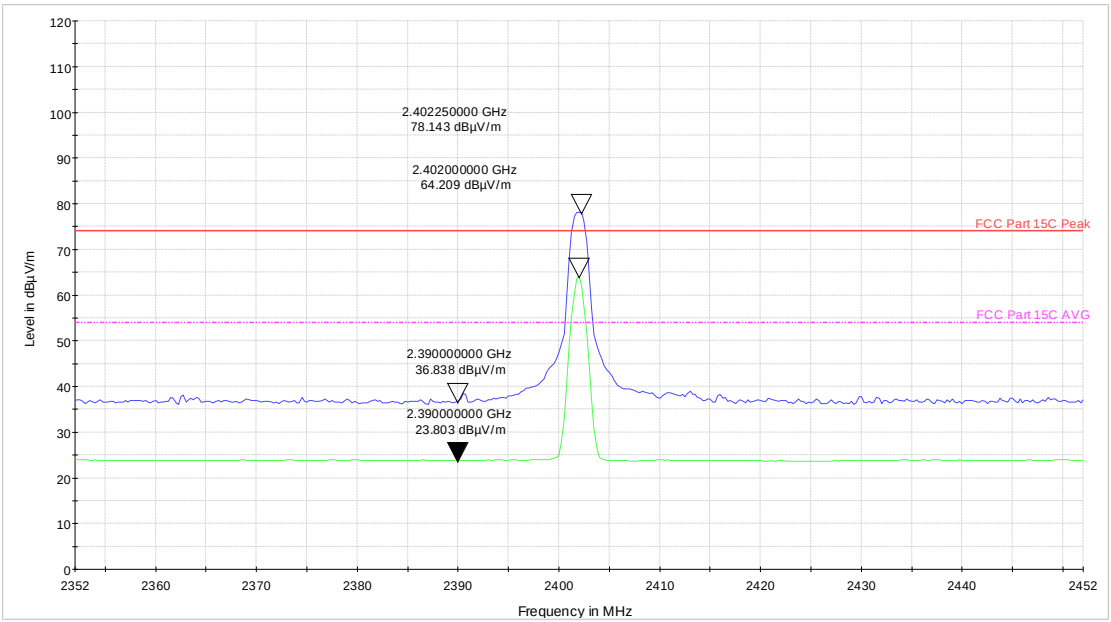
Supply voltage : 24V DC
Varient Tested : FDAP31

Channel Frequency (MHz)	Antenna Polarization	Measured Frequency (MHz)	Field Strength (dBµV/m)	Limit (dBµV/m)	Margin (dB)
2402	Vertical	2390(Pk)	36.83	74*	-37.17
		2390(Av)	23.80	54*	-30.20
		2402(Pk)	78.14	-	-
		2402(Av)	64.20	-	-
		4804(Pk)	42.58	74	-31.42
		4804(Av)	30.58	54	-23.42
		7206(Pk)	48.04	74	-25.96
		7206(Av)	35.60	54	-18.40
	Horizontal	2390(Pk)	36.63	74*	-37.37
		2390(Av)	23.77	54*	-30.23
		2402(Pk)	74.52	-	-
		2402(Av)	60.59	-	-
		4804(Pk)	42.01	74	-31.99
		4804(Av)	30.10	54	-23.90
		7206(Pk)	48.63	74	-25.37
		7206(Av)	35.67	54	-18.33
2440	Vertical	2440(Pk)	84.01	*	-
		2440(Av)	70.06	*	-
		4880(Pk)	42.85	74	-31.15
		4880(Av)	30.44	54	-23.56
		7320(Pk)	48.54	74	
		7320(Av)	35.50	54	
	Horizontal	2440(Pk)	79.24	-	-
		2440(Av)	65.30	-	-
		4880(Pk)	41.90	74	-32.10
		4880(Av)	29.93	54	-24.07
		7320(Pk)	47.13	74	-26.87
		7320(Av)	35.52	54	-18.48
2480	Vertical	2480(Pk)	88.04	-	-
		2480(Av)	74.09	-	-
		2483.5(Pk)	51.07	74*	-22.93
		2483.5(Av)	24.74	54*	-29.26
		4960(Pk)	41.72	74	-32.28
		4960(Av)	30.02	54	-23.98
		7440(Pk)	48.11	74	-25.89
		7440(Av)	35.59	54	-18.41
	Horizontal	2480(Pk)	80.87	-	-
		2480(Av)	66.94	-	-
		2483.5(Pk)	45.01	74*	-28.99
		2483.5(Av)	23.89	54*	-30.11
		4960(Pk)	41.11	74	-32.89
		4960(Av)	29.70	54	-24.30
		7440(Pk)	47.38	74	-26.62
		7440(Av)	35.57	54	-18.43

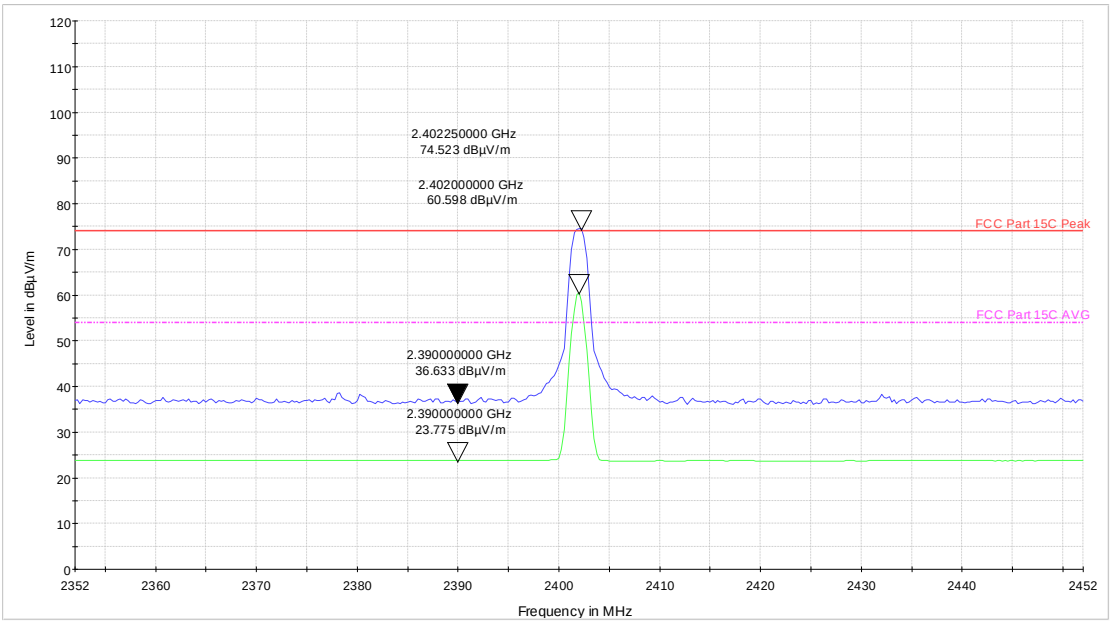
- : Fundamental Frequency
***- : Indicate restricted band of operation §15.205**
Pk: Peak Detector; Av: Average Detector

Restricted bands of operation

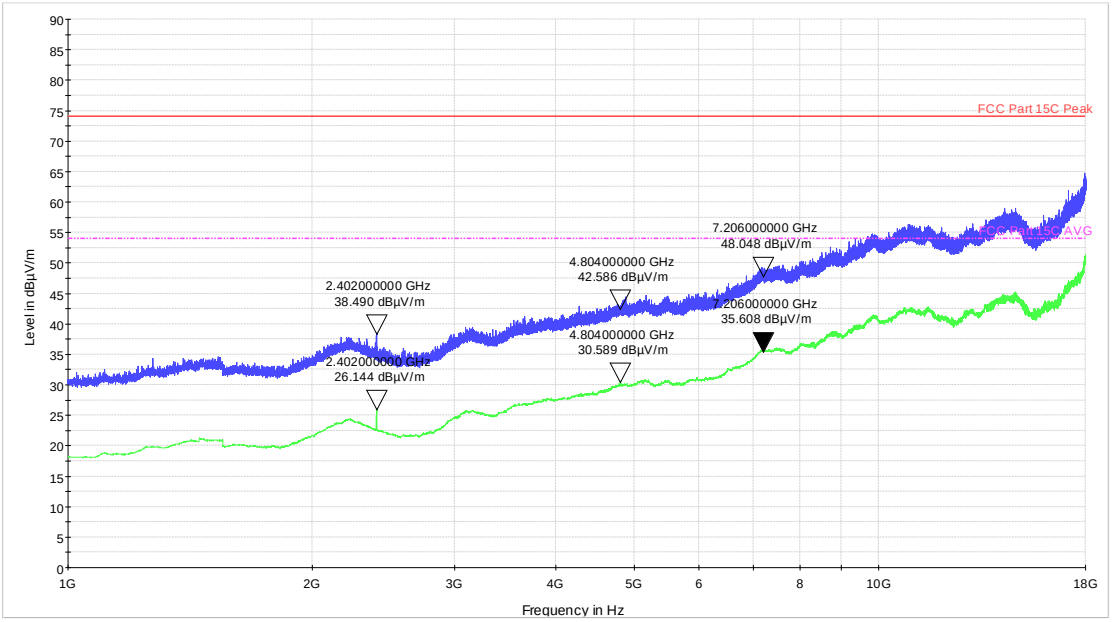
Channel frequency: 2402MHz



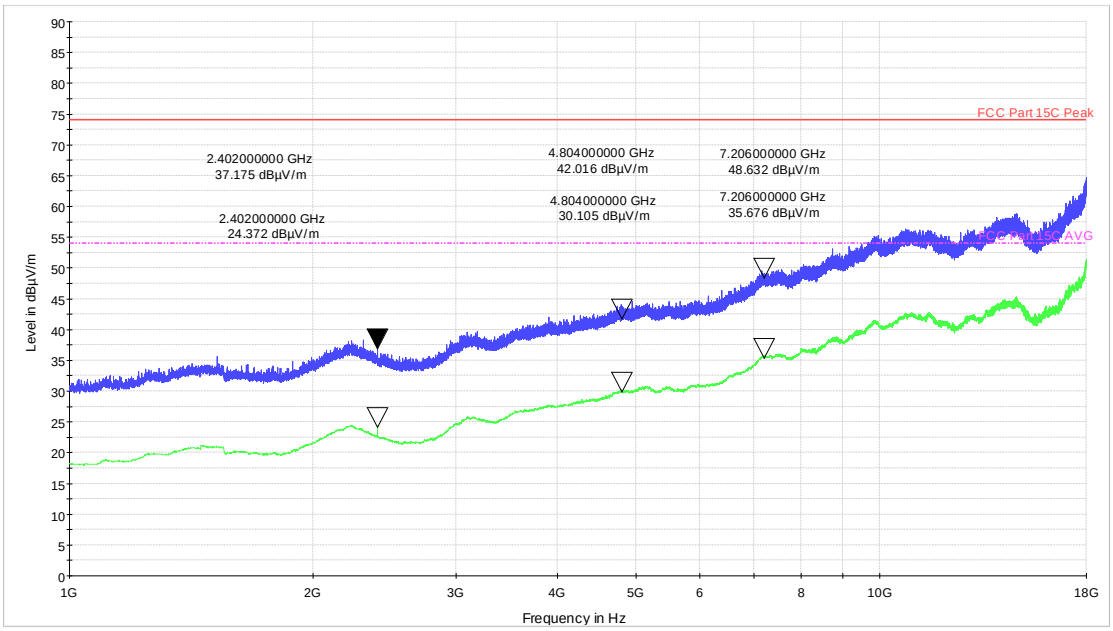
Channel Frequency: 2402MHz **Polarization: Vertical**



Channel Frequency: 2402MHz **Polarization: Horizontal**

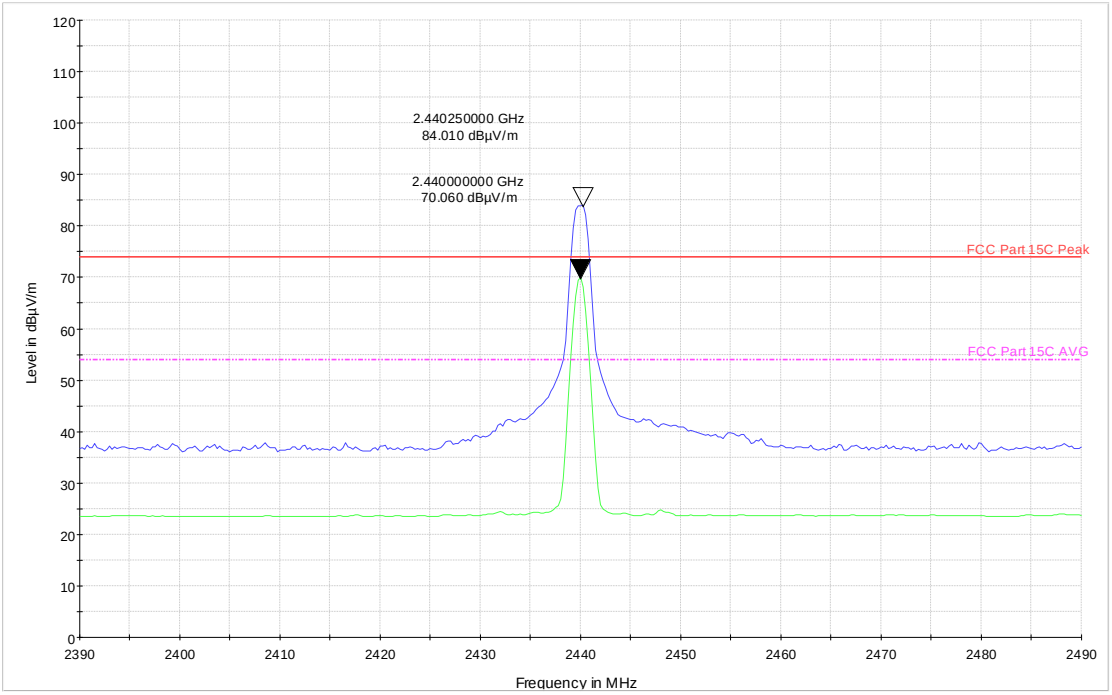


Frequency Range: 1-18GHz **Polarization: Vertical**

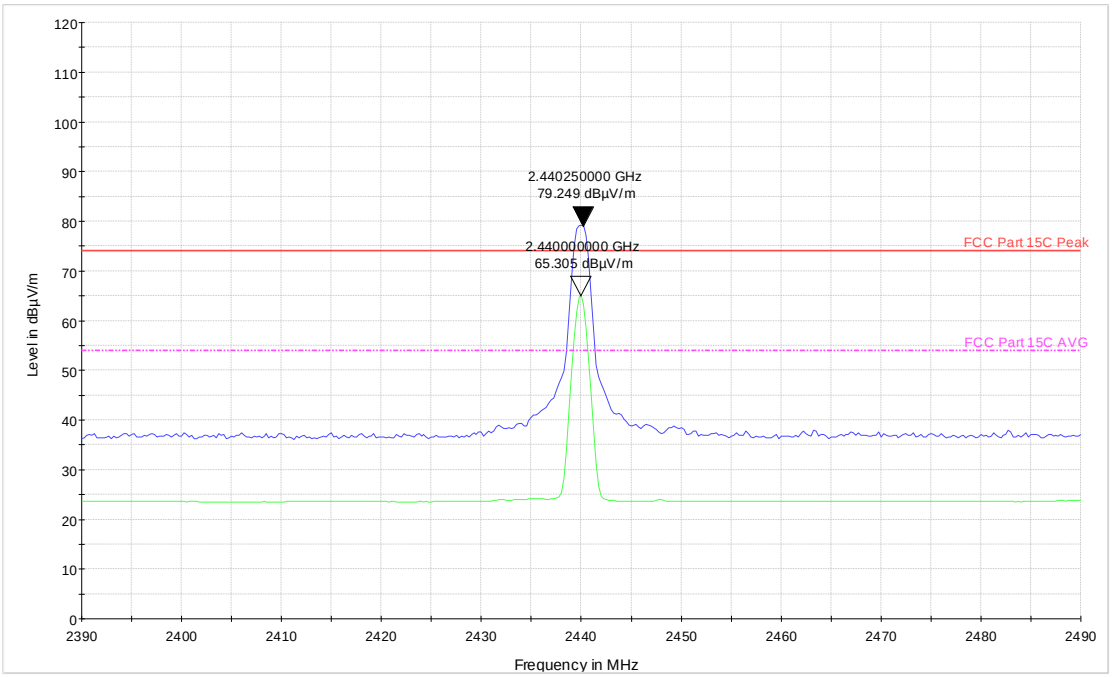


Frequency Range: 1-18GHz **Polarization: Horizontal**

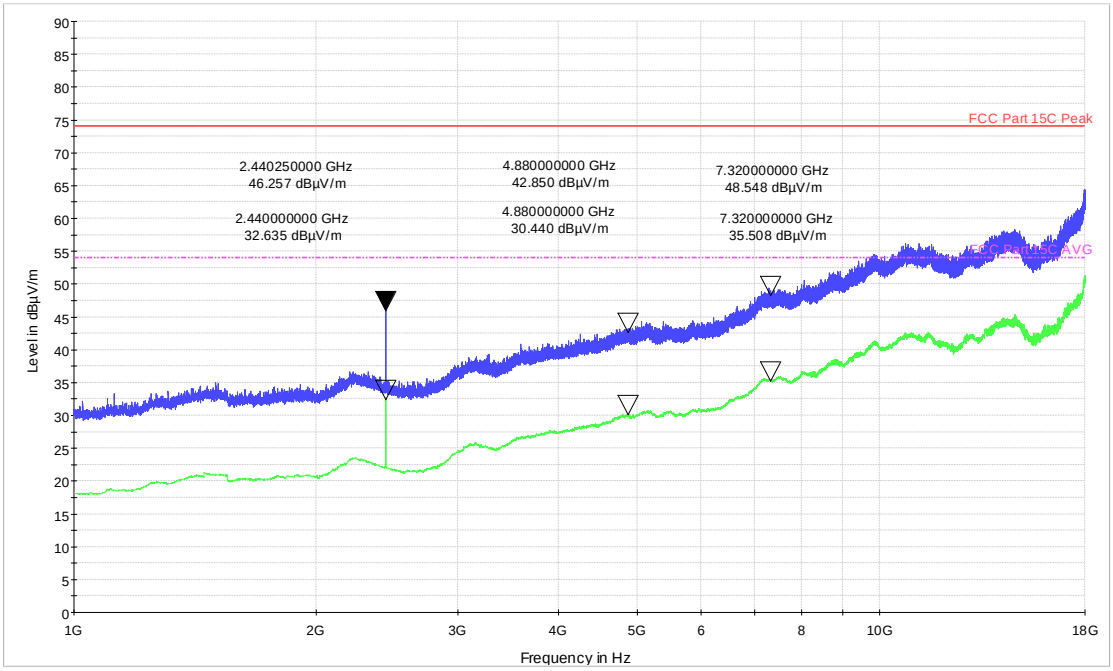
Channel frequnecy: 2440MHz



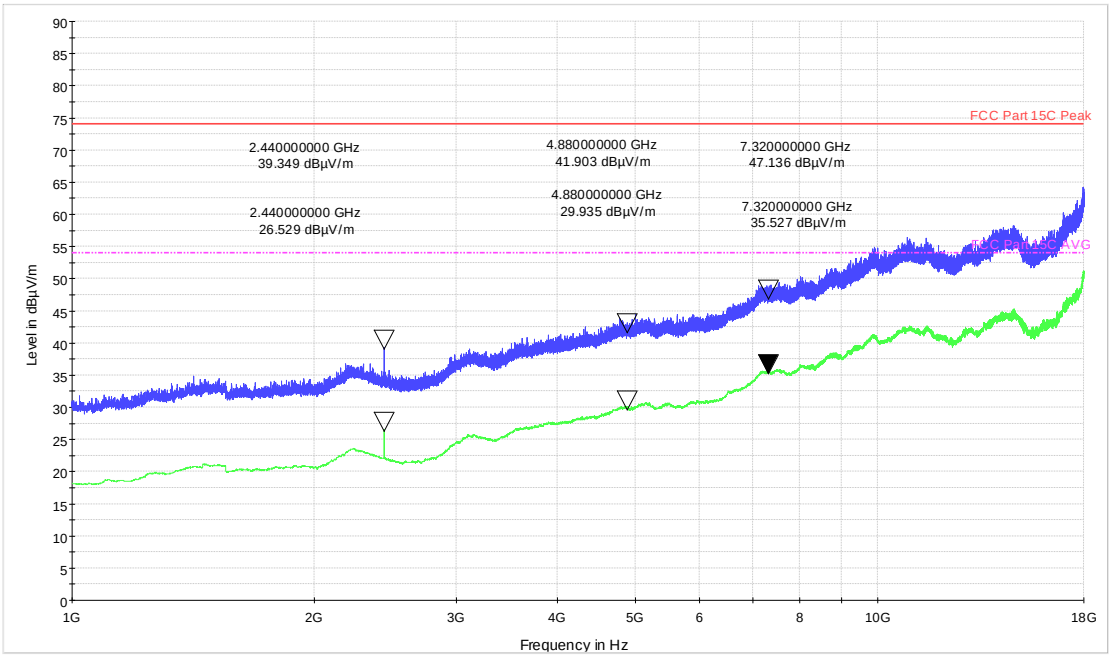
Channel Frequency: 2440MHz **Polarization: Vertical**



Channel Frequency: 2440MHz **Polarization: Horizontal**

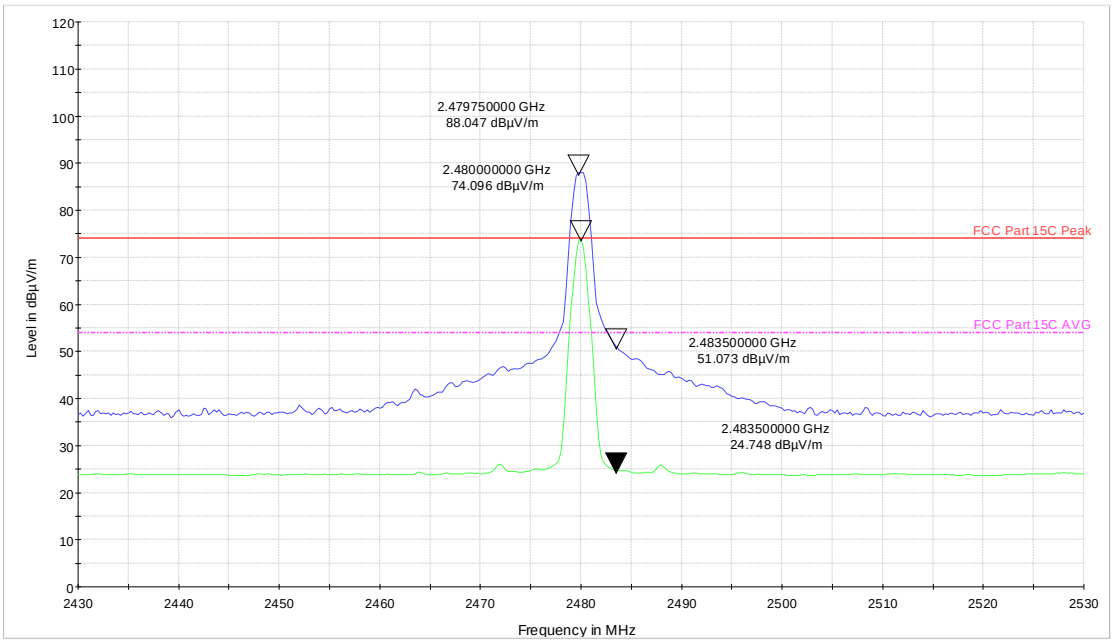


Frequency Range: 1-18GHz **Polarization: Vertical**

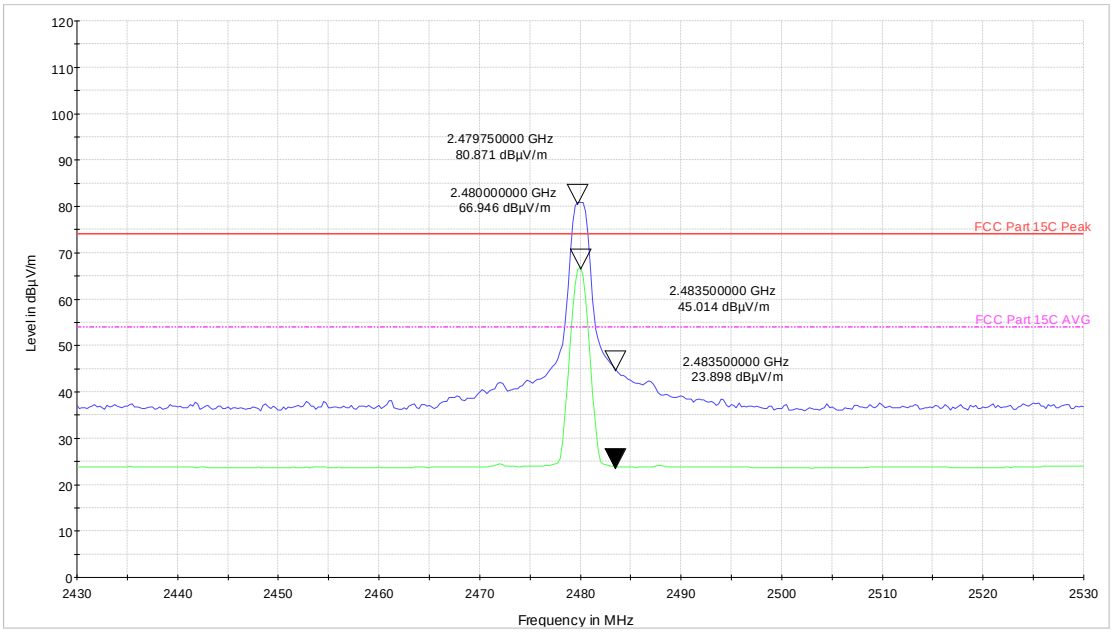


Frequency Range: 1-18GHz **Polarization: Horizontal**

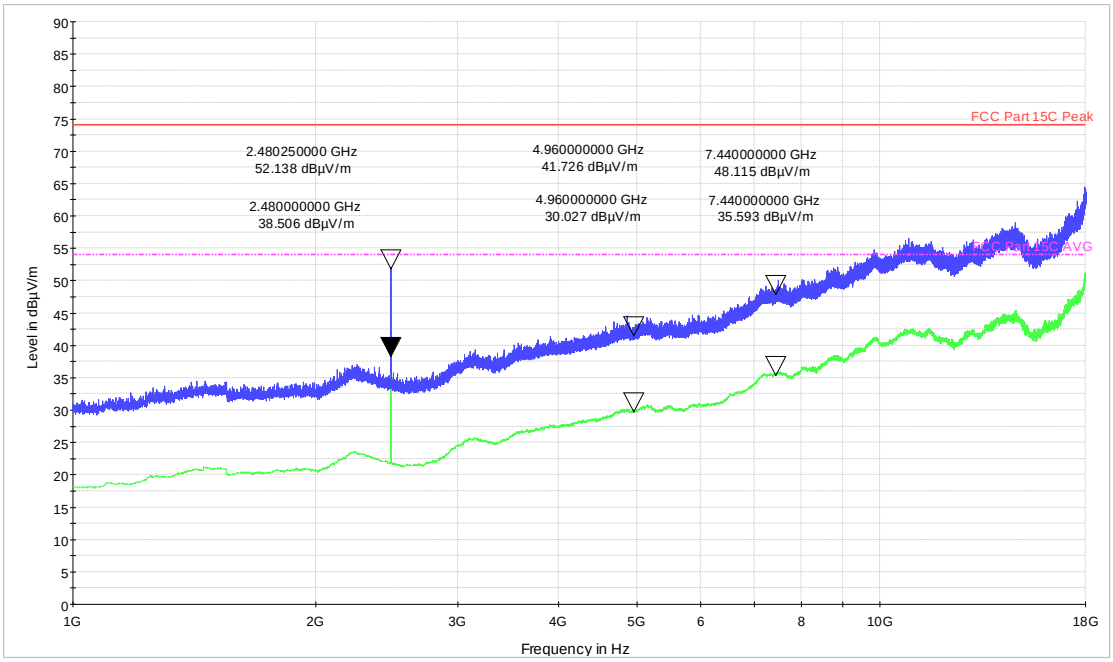
Channel frequency: 2480MHz



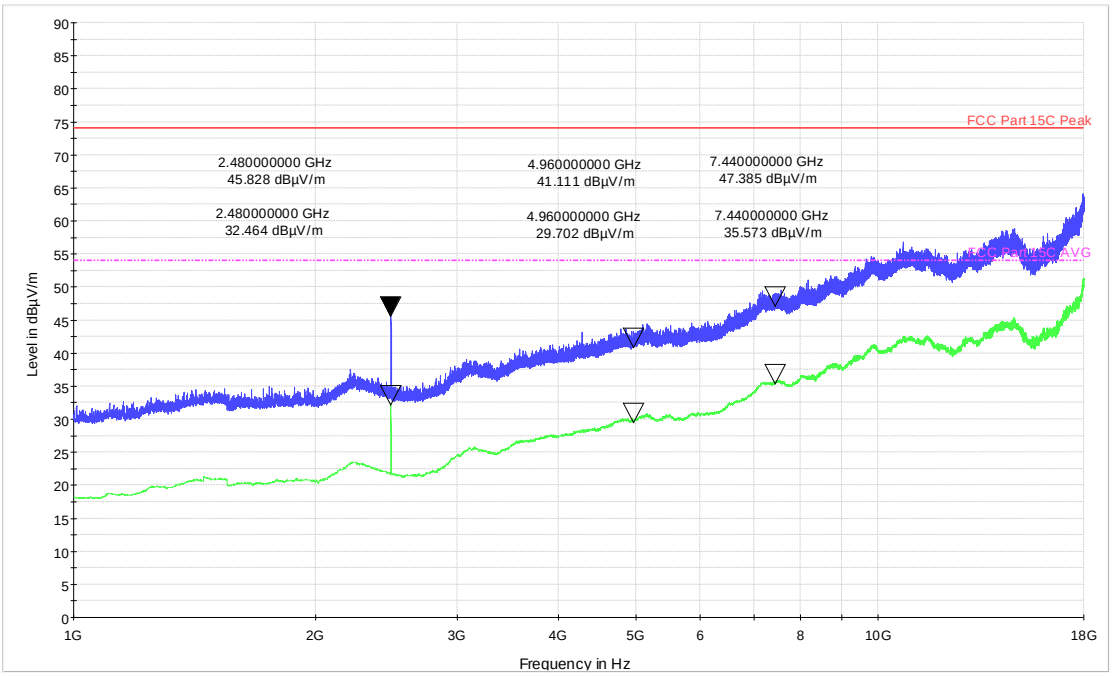
Channel Frequency: 2480MHz **Polarization: Vertical**



Channel Frequency: 2480MHz **Polarization: Horizontal**



Frequency Range: 1-18GHz **Polarization: Vertical**



Frequency Range: 1-18GHz **Polarization: Horizontal**

10 Conducted Spurious Emission Test on AC Power Line

Result ***Pass***

Test Specification	:	FCC Part 15 Section 15.207 / RSS Gen Issue 5 Section 8.8
Test Method	:	ANSI C 63.10-2013
Testing Location	:	Screened room
Measurement Bandwidth	:	9kHz
Frequency Range	:	150kHz – 30MHz
Supply Voltage	:	110VAC,60Hz
Test Method	:	Refer TEST METHODOLOGY

***Note: The product has tested with 110VAC,60Hz power supply**

Limits of section 15.207

Frequency of emission (MHz)	QP Limit (dBµV)	AV Limit (dBµV/m)
0.15 – 0.5	66 – 56*	56 – 46*
0.5 – 5	56	46
5 – 30	60	50

* Decreases with the logarithm of the frequency

Test Conditions:

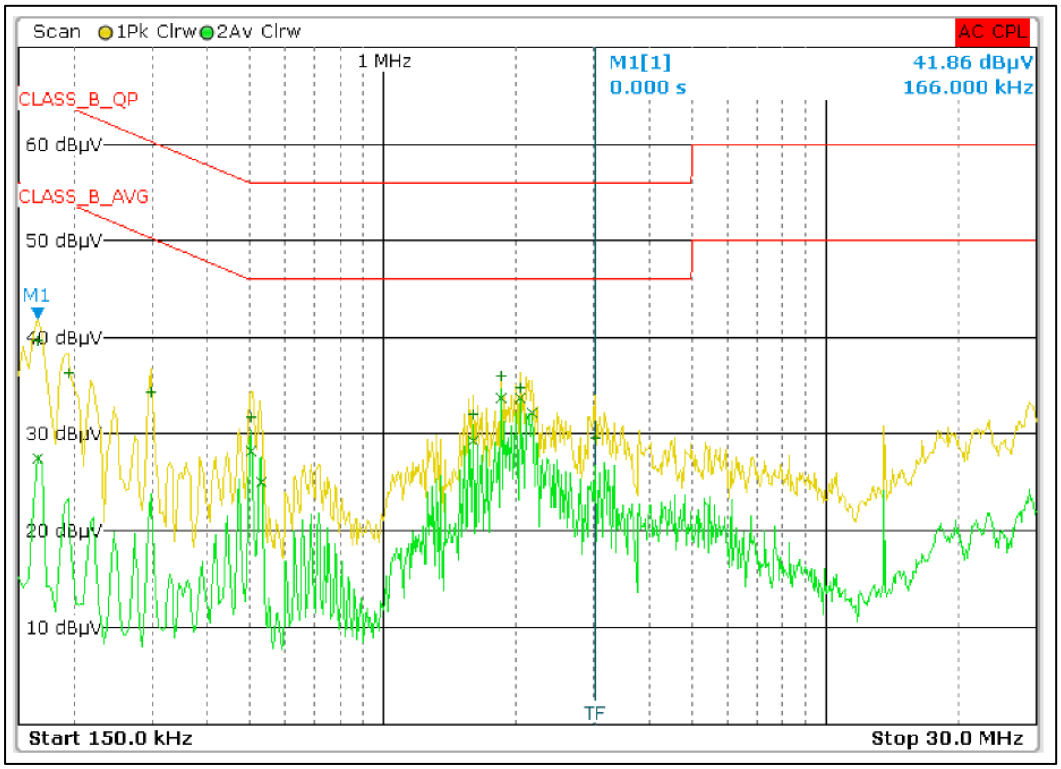
Normal Temperature = +24°C RH = 64 %

Test result:

Voltage = 24V DC through 110V,60Hz AC to DC Adaptor for FDAP32

Trace	Frequency	Level (dBµV)	Phase	Detector	Delta Limit/dB
2	2.046000000 MHz	33.76		Average	-12.24
2	1.850000000 MHz	33.70		Average	-12.30
2	2.166000000 MHz	32.19		Average	-13.81
2	1.598000000 MHz	29.22		Average	-16.78
2	502.000000000 kHz	28.19		Average	-17.81
1	1.850000000 MHz	36.01		Quasi Peak	-19.99
2	530.000000000 kHz	25.04		Average	-20.96
1	2.046000000 MHz	34.84		Quasi Peak	-21.16
1	1.598000000 MHz	32.00		Quasi Peak	-24.00
1	502.000000000 kHz	31.78		Quasi Peak	-24.22
1	166.000000000 kHz	39.72		Quasi Peak	-25.44
1	298.000000000 kHz	34.36		Quasi Peak	-25.94
1	3.014000000 MHz	29.66		Quasi Peak	-26.34
1	194.000000000 kHz	36.31		Quasi Peak	-27.55
2	166.000000000 kHz	27.43		Average	-27.73

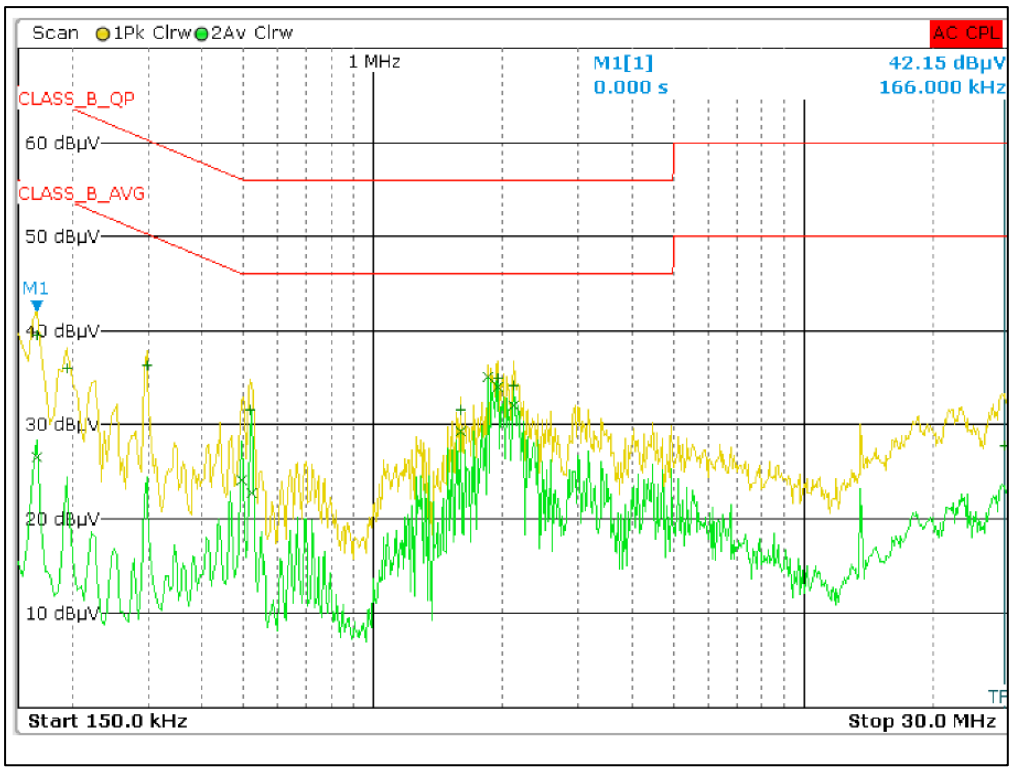
Table: Line



Graph: Line

Trace	Frequency	Level (dBµV)	Phase	Detector	Delta Limit/dB
2	1.850000000 MHz	35.06		Average	-10.94
2	1.946000000 MHz	33.97		Average	-12.03
2	2.122000000 MHz	32.10		Average	-13.90
2	1.598000000 MHz	29.24		Average	-16.76
1	1.946000000 MHz	34.96		Quasi Peak	-21.04
1	2.122000000 MHz	34.21		Quasi Peak	-21.79
2	494.000000000 kHz	24.14		Average	-21.96
2	522.000000000 kHz	22.77		Average	-23.23
1	298.000000000 kHz	36.25		Quasi Peak	-24.05
1	518.000000000 kHz	31.60		Quasi Peak	-24.40
1	1.598000000 MHz	31.60		Quasi Peak	-24.40
1	166.000000000 kHz	39.52		Quasi Peak	-25.64
1	194.000000000 kHz	36.04		Quasi Peak	-27.82
2	166.000000000 kHz	26.48		Average	-28.68
1	29.222000000 MHz	27.70		Quasi Peak	-32.30

Table: Neutral



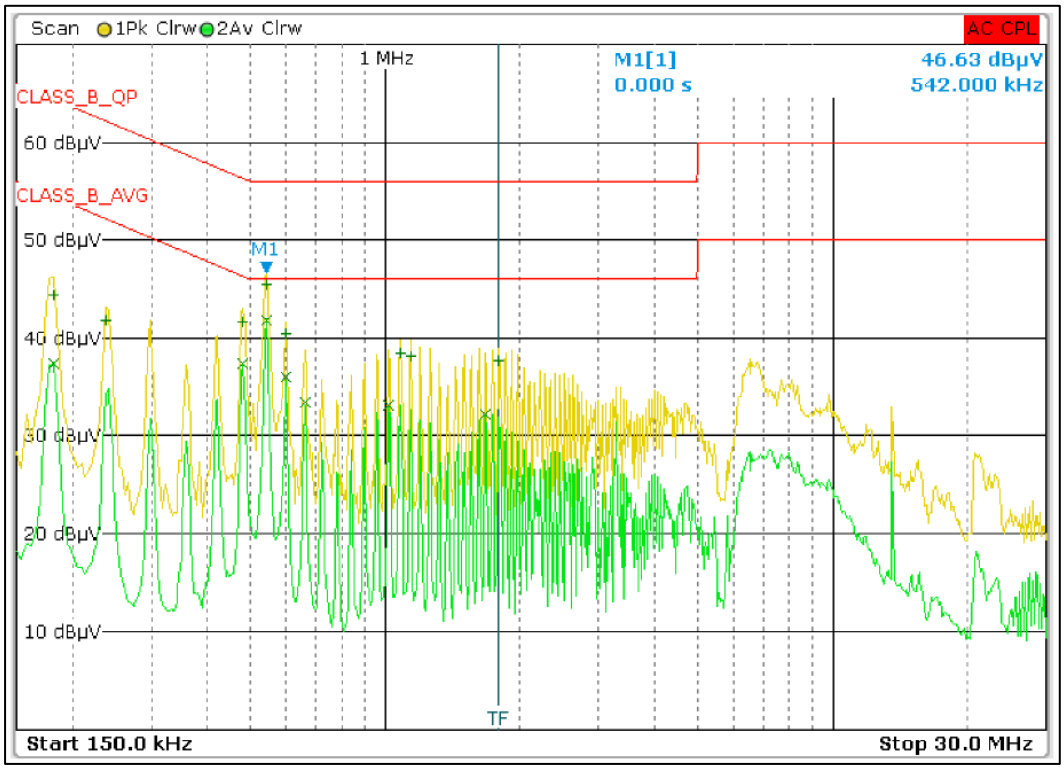
Graph: Neutral

Test result:

Voltage = 60V DC through PoE adaptor (110V/60Hz input to PoE) for PCAP3A

Trace	Frequency	Level (dBµV)	Phase	Detector	Delta Limit/dB
2	542.000000000 kHz	41.82		Average	-4.18
2	482.000000000 kHz	37.33		Average	-8.97
2	602.000000000 kHz	35.99		Average	-10.01
1	542.000000000 kHz	45.51		Quasi Peak	-10.49
2	662.000000000 kHz	33.37		Average	-12.63
2	1.018000000 MHz	33.12		Average	-12.88
2	1.678000000 MHz	32.18		Average	-13.82
1	482.000000000 kHz	41.66		Quasi Peak	-14.64
1	602.000000000 kHz	40.36		Quasi Peak	-15.64
2	182.000000000 kHz	37.35		Average	-17.04
1	1.078000000 MHz	38.47		Quasi Peak	-17.53
1	1.138000000 MHz	38.18		Quasi Peak	-17.82
1	1.798000000 MHz	37.73		Quasi Peak	-18.27
1	182.000000000 kHz	44.31		Quasi Peak	-20.08
1	238.000000000 kHz	41.78		Quasi Peak	-20.39

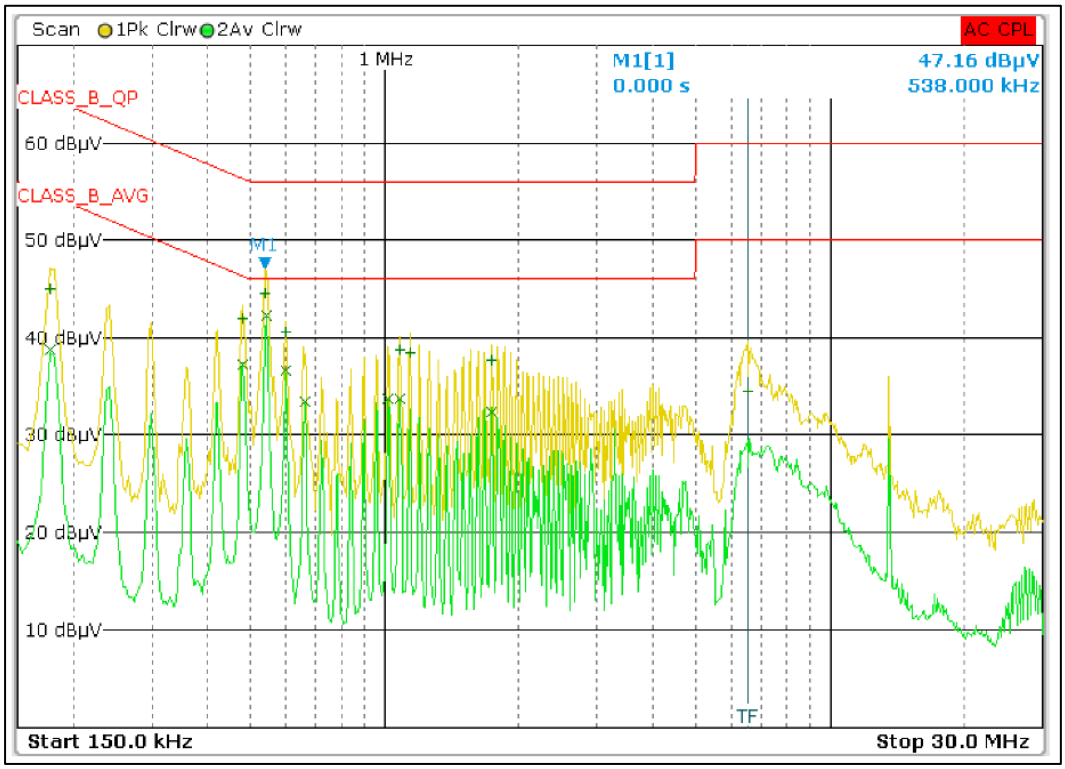
Line Table



Line Graph

Trace	Frequency	Level (dBµV)	Phase	Detector	Delta Limit/dB
2	542.000000000 kHz	42.18		Average	-3.82
2	482.000000000 kHz	37.22		Average	-9.08
2	602.000000000 kHz	36.54		Average	-9.46
1	538.000000000 kHz	44.50		Quasi Peak	-11.50
2	1.078000000 MHz	33.70		Average	-12.30
2	1.018000000 MHz	33.66		Average	-12.34
2	662.000000000 kHz	33.36		Average	-12.64
2	1.738000000 MHz	32.37		Average	-13.63
1	482.000000000 kHz	41.99		Quasi Peak	-14.31
1	602.000000000 kHz	40.51		Quasi Peak	-15.49
2	178.000000000 kHz	38.73		Average	-15.85
1	1.078000000 MHz	38.78		Quasi Peak	-17.22
1	1.138000000 MHz	38.50		Quasi Peak	-17.50
1	1.738000000 MHz	37.63		Quasi Peak	-18.37
1	178.000000000 kHz	45.03		Quasi Peak	-19.55
1	6.530000000 MHz	34.53		Quasi Peak	-25.47

Neutral Table



Neutral Graph

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