Produkte
Products

Prüfbericht - Nr.: *Test Report No.:*	**02423494 001**	**Seite 1 von 26** *Page 1 of 26*
Auftraggeber: *Client:*	**Atmel Norway AS, Vestre Rosten 79, 7075 Tiller, Trondheim, Norway**	
Gegenstand der Prüfung: *Test item:*	**Zigbit Amp 2.4GHz, Unbalanced Output**	
Bezeichnung: *Identification:*	**ATZB-24-U0**	**Serien-Nr.:** *Serial No.* **Engineering Sample**
Wareneingangs-Nr.: *Receipt No.:*	**1403015272**	**Eingangsdatum:** *Date of receipt:* **16.11.2011**
Prüfort: *Testing location:*	**Refer Page 4 of 26 for test facilities**	
Prüfgrundlage: *Test specification:*	**FCC 15, Subpart C**	
Prüfergebnis: *Test Result:*	**Der Prüfgegenstand entspricht oben genannter Prüfgrundlage(n).** *The tests item passed the test specification(s).*	
Prüflaboratorium: *Testing Laboratory:*	**TÜV Rheinland (India) Pvt. Ltd.** 82/A, 3rd Main, West Wing, Electronic City, West Phase, Hosur Road Bangalore – 560 100.	

geprüft / *tested by:*			**kontrolliert /** *reviewed by:*		
13.12.2011	Raghavendra Kulkarni		15.12.2011	Varma Kalyan	
Datum *Date*	**Name/Stellung** *Name/Position*	**Unterschrift** *Signature*	**Datum** *Date*	**Name/Stellung** *Name/Position*	**Unterschrift** *Signature*

Sonstiges /*Other Aspects:* **FCC ID : VW4A090667**

Abkürzungen:				***Abbreviations:***			
	P(ass)	=	***entspricht Prüfgrundlage***		***P(ass)***	=	***passed***
	F(ail)	=	***entspricht nicht Prüfgrundlage***		***F(ail)***	=	***failed***
	N/A	=	***nicht anwendbar***		***N/A***	=	***not applicable***
	N/T	=	***nicht getestet***		***N/T***	=	***not tested***

Test Result Summary

Clause	Test Item	Result
15.247(b)(3)	Conducted Peak RF Output Power	Pass
15.247 (a)(2)	6dB Bandwidth	Pass
15.247(e)	Power Spectral Density	Pass
15.247(d)	Band-edge Compliance	Pass
15.209	Spurious Radiated Emissions	Pass

Content

List of Test and Measurement Instruments

Wipro Technologies, Bangalore

List of Test and Measurements

Equipment	Manufacturer	Type	S/N	Calibration Due Date
EMI Test Receiver	Rohde & Schwarz	ESIB40	100306	24.03.2012
Hybrid Log Periodic Antenna	TDK	HLP3003C	130334	21.03.2012
Broadband Horn Antenna	Schwarzbeck Mess-Electronik	BBHA9170	9170-344	21.03.2012
Double Ridged Horn Antenna	Schwarzbeck Mess-Electronik	BBHA9120D	9120D-687	21.03.2012
Pre-Amplifier	TDK-RFSolution	PA-02	100008	15.02.2012
Spectrum Analyser	Agilent Technologies	E4407B	US41192772	27.01.2012

Testing Facilities

1) Wipro Technologies
Survey No. 70, 77, 78 / 8A, Dodda Kannelli,
Sarjapur Road, Bangalore – 560 035
India

General Product Information

Product Function and Intended Use

2.4GHz.ATZB-A24-U0 Zigbit is an ultra-compact, low-power; high-sensitivity 2.4GHz.IEEE802.15.4/Zigbee OEM module based on the innovative Atmel's mixed signal hardware platform, designed for wireless sensing, control and data acquisition application. It incorporates a Front End RF Module that integrates a PA and an LNA to give superior output power and sensitivity.

This Amp Zigbit module will be used by OEMs to add high power and high sensitivity Zigbee module to their products. These products are used in wide variety of applications based on Zigbee wireless network such as, but not limited to wireless sensor networks.

Ratings and System Details

Operating Frequency	2400 – 2483.5MHz
No. of channel	16
Channel Spacing	5 MHz
Transmitted Power	18.17 dBm
Modulation	DSSS [O-QPSK]
Data Rate	250kbps
Antenna Type	External
Number of antenna	One
Antenna Gain	0 dBi
Supply Voltage	Power from USB Port
Dimensions	38mm x 13.5mm x 2.8mm
Environmental	Operating temperature: -20°C to 70°C Humidity : Not more than 80%

Test Conditions:

Power from USB Port.

Environmental conditions:

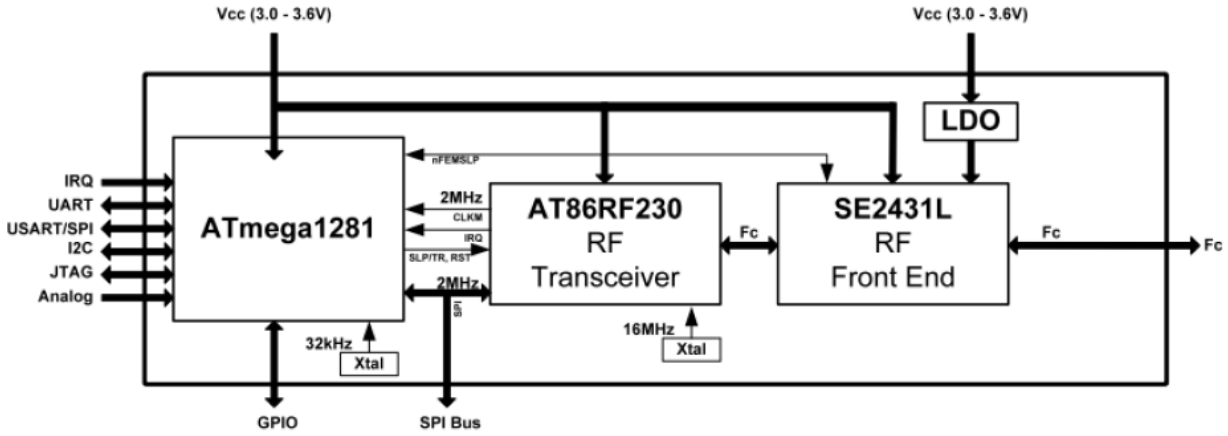
Temperature: +23 º C **RH:** 62%

Operation Descriptions

Depending on the end-user design requirements, The ATZB-A24-U0 Zigbit Can operate as self-contained sensor node, where it would function as a single MCU with radio or it can be paired with host processor driving the module over a serial interface.

The product has a Microcontroller and radio transceiver, interfaced to each other using a serial interface. The serial commands from the microcontroller controls the radio and runs software that allows the product to be part of a Zigbee Compliant network. More detailed functioning of the product is explained in the user manual.

Block Diagram:



Test Set-up and Operation Mode

Principle of Configuration Selection

The test was performed under continuous transmission to obtain the maximum emissions.

Test Operation and Test Software

Hyper terminal in the computer used to enable the continuous transmission and changing channels (low/mid/high) on the EUT for the tests in this report.

Special Accessories and Auxiliary Equipment

The EUT was tested together with the following additional accessory:

- Notebook computer used to power the device through USB cable, set the test configuration (channel and power level)

Countermeasures to achieve EMC Compliance

- None

Table of carrier frequencies

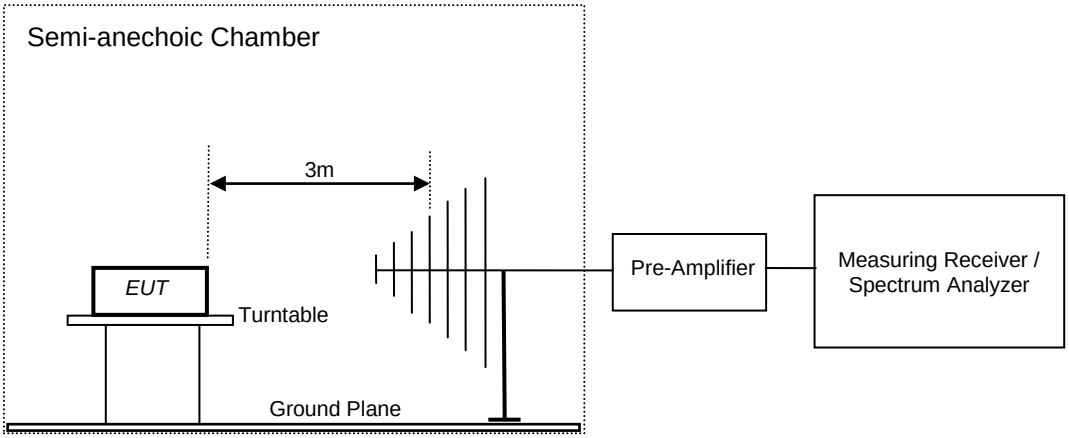
Frequency Band	Channel No.	Frequency (MHz)
2400-2483.5 MHz	11	2405
	12	2410
	13	2415
	14	2420
	15	2425
	16	2430
	17	2435
	18	2440
	19	2445
	20	2450
	21	2455
	22	2460
	23	2465
	24	2470
	25	2475
	26	2480

Test Methodology

Radiated Emission Test

The radiated emission measurement was performed according to the procedures in ANSI C63.4-2003. The equipment under test (EUT) was placed at the middle of the 80 cm high turntable, 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 1m and 4m, 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 1000MHz was performed by horn antenna. The measurement below 30MHz was performed by loop antenna.

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



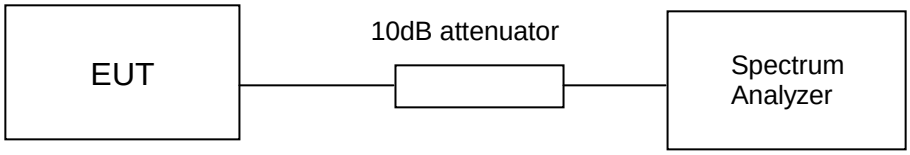
Test Results

Conducted Peak Output Power **Section 15.247(b)(3)**

Result **Pass**

Test Specification	FCC 15.247 (b)(3)
Measurement Bandwidth (RBW)	3MHz
Detector	Peak
Requirement	<1 watt (30dBm). For Digital Transmission System.

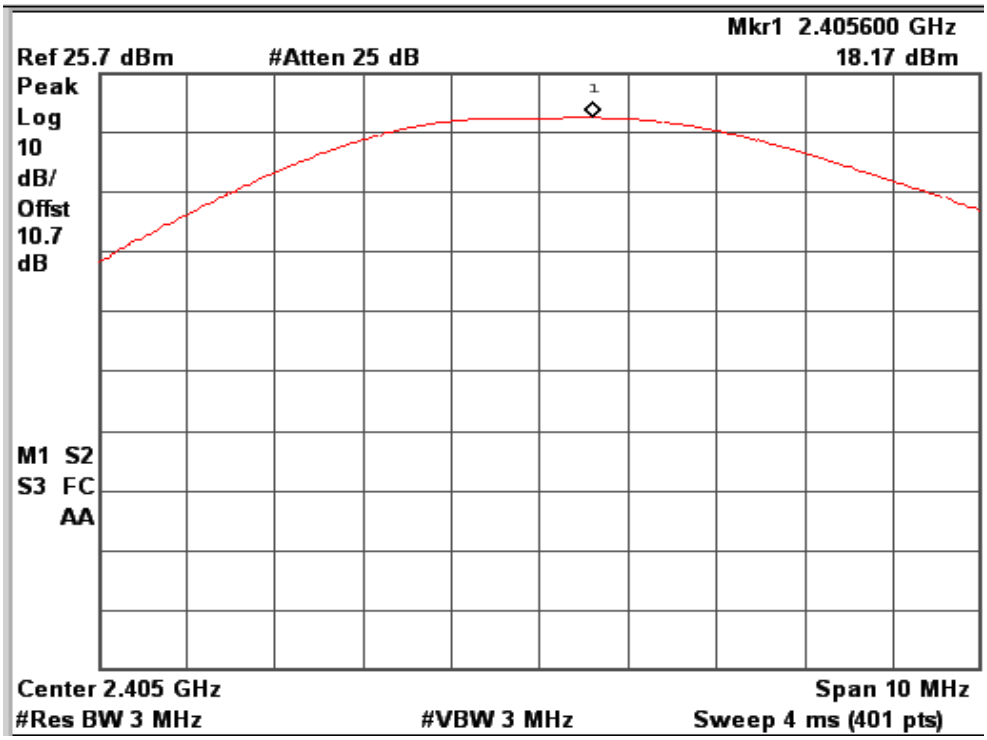
Test Method:



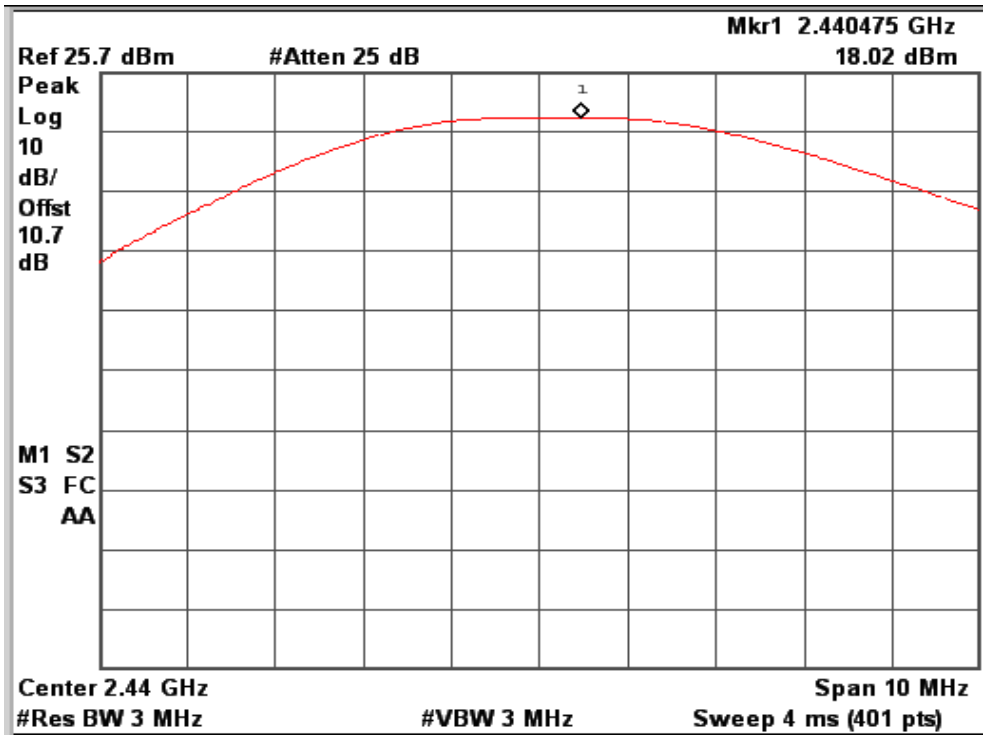
Test Results:

Cable Loss+ Attenuator: 10.7dB
Note: Cable loss and Attenuator Value is included in the Test Results

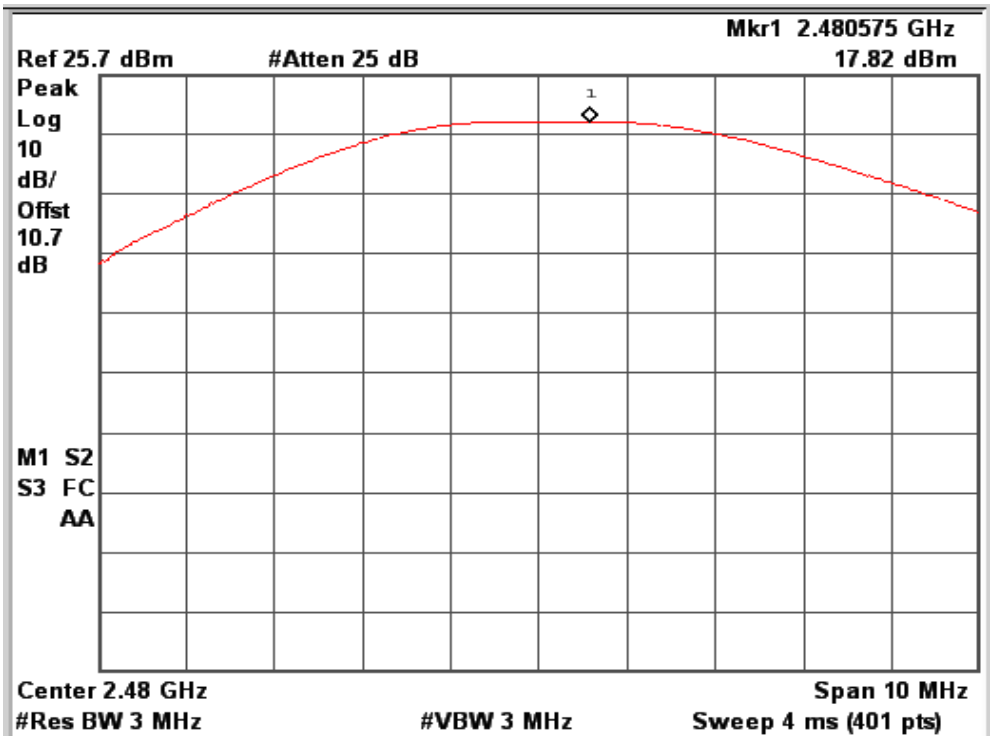
Channel Frequency (MHz)	Output power (dBm)	Limit (dBm)
2405	18.17	30
2440	18.02	30
2480	17.82	30



Channel Frequency: 2405 MHz



Channel Frequency: 2440 MHz



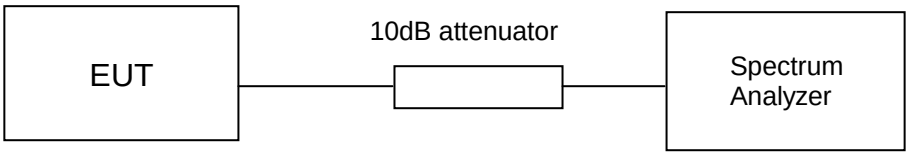
Channel Frequency: 2480 MHz

6 dB Bandwidth **Section 15.247(a)(2)**

Result **Pass**

Test Specification FCC Part 15 Section 15.247 (a) (2)
Detector Function Peak
Requirement The minimum 6 dB bandwidth shall be at least 500 kHz.

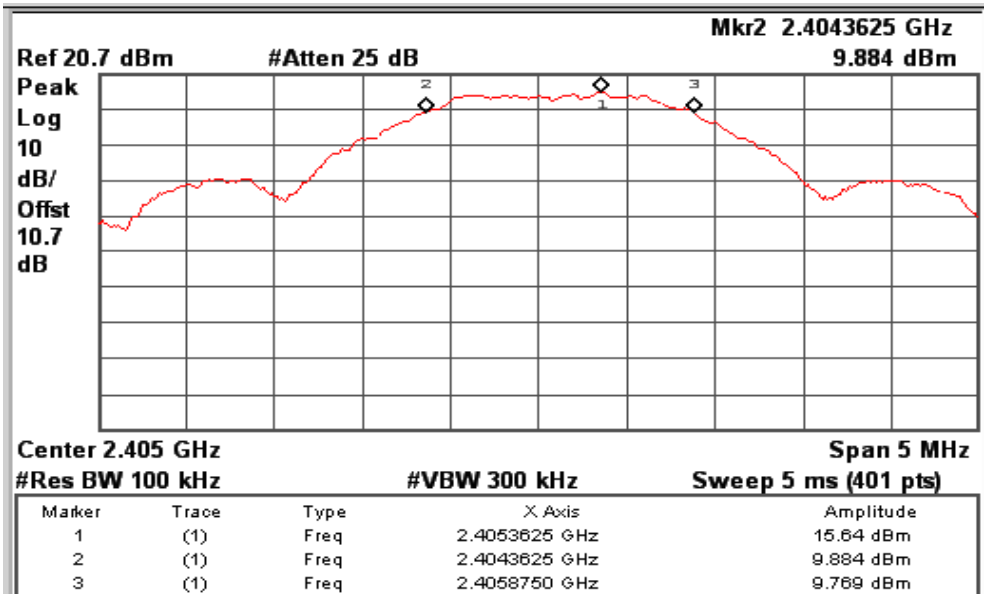
Test Method:



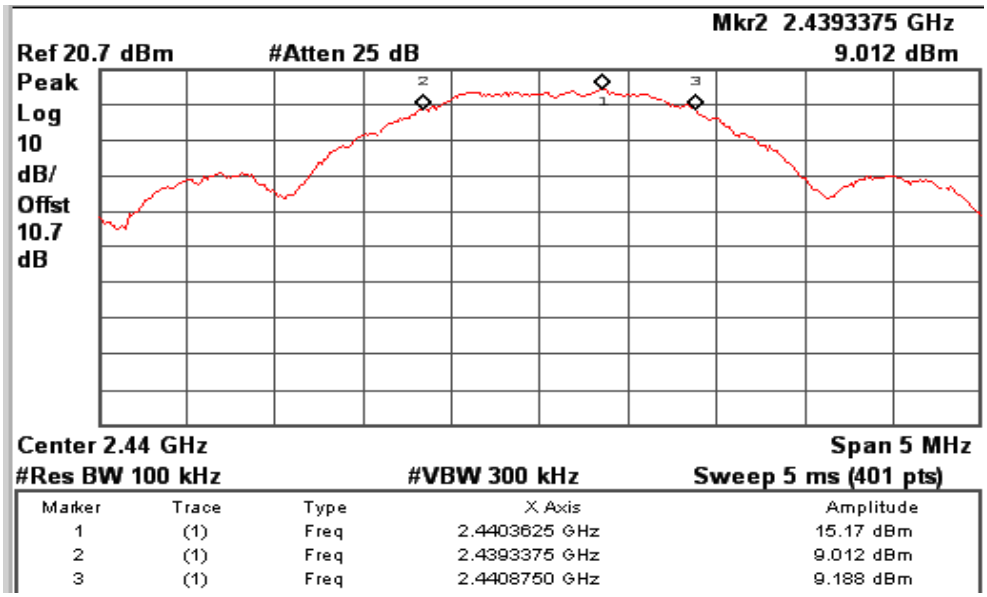
Test Result:

Cable Loss +Attenuator: 10.7dB
Note: Cable loss and Attenuator Value is included in the Test Results

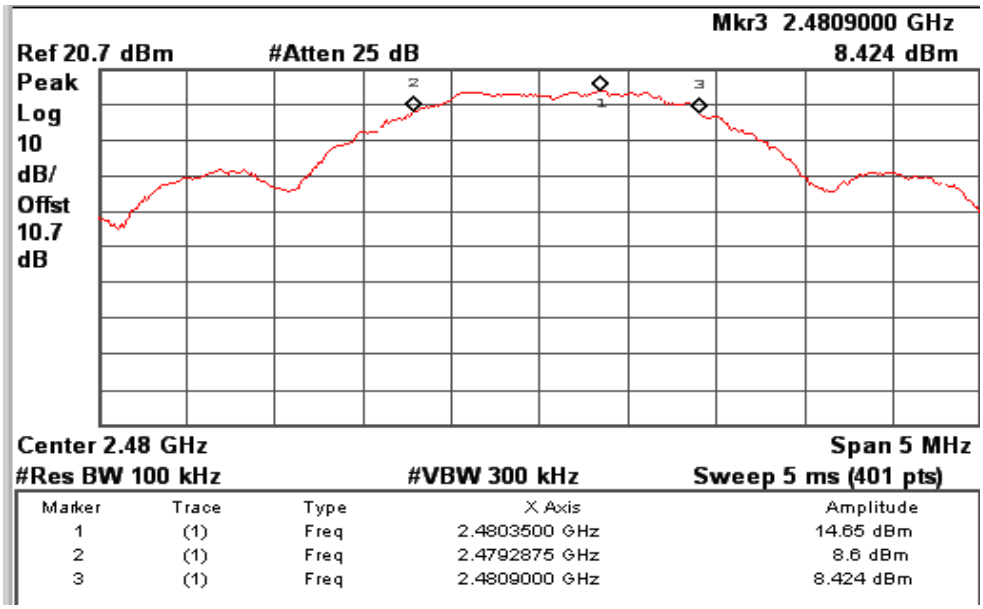
Channel Frequency (MHz)	Lower Frequency (MHz)	Upper Frequency (MHz)	6 dB Bandwidth (MHz)	99% OBW (MHz)
2405	2404.36	2405.87	1.51	2.27
2440	2439.33	2440.87	1.54	2.33
2480	2479.28	2480.90	1.62	2.41



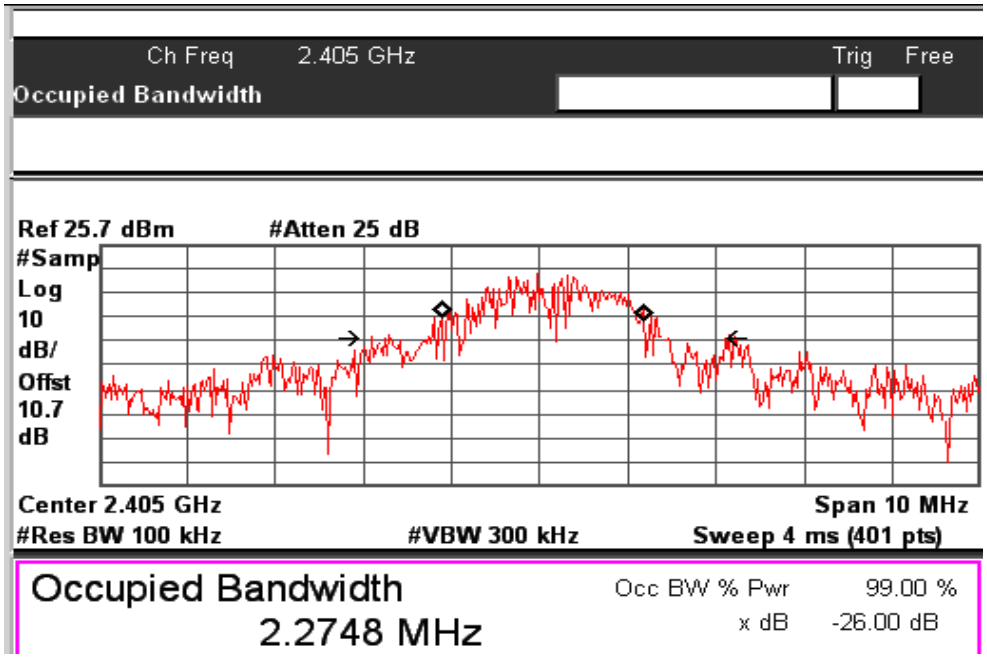
Channel Frequency 2405 MHz



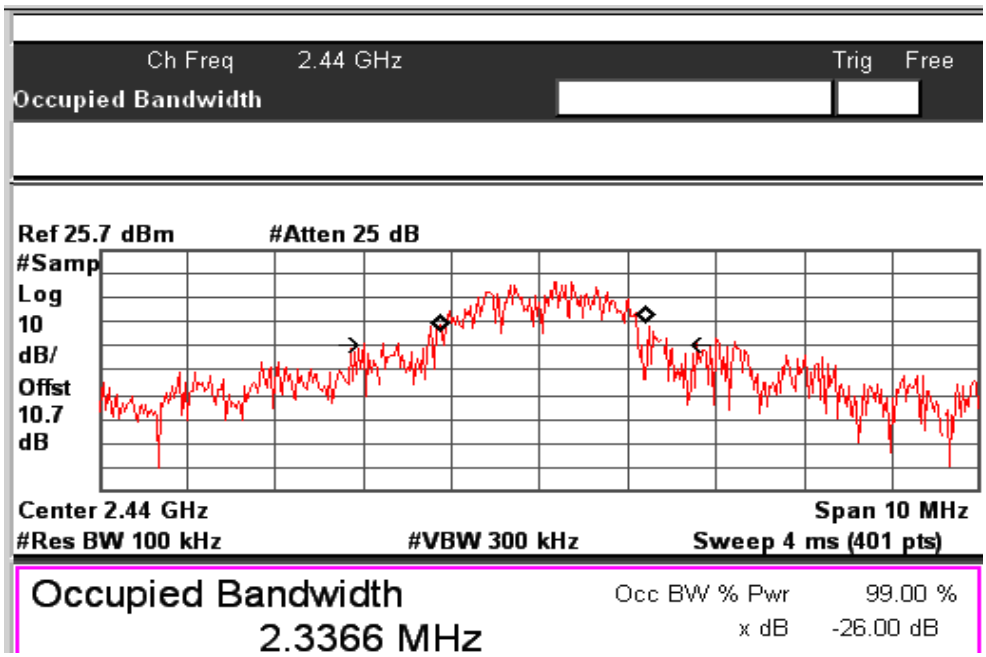
Channel Frequency 2440 MHz



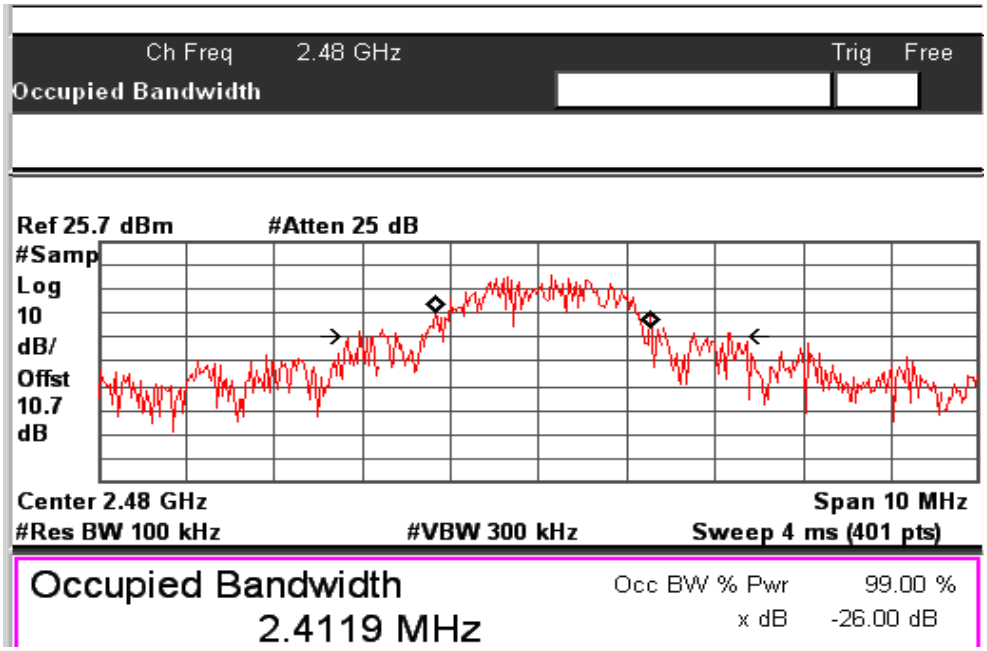
Channel Frequency 2480 MHz



99% Occupied Bandwidth: Channel Low



99% Occupied Bandwidth: Channel Mid



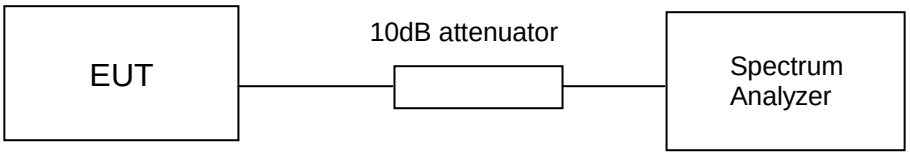
99% Occupied Bandwidth: Channel High

Power Spectral Density **Section 15.247(e)**

Result **Pass**

Test Specification	FCC Part 15 Section 15.247 (e)
Detector Function	Peak
Requirement	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.

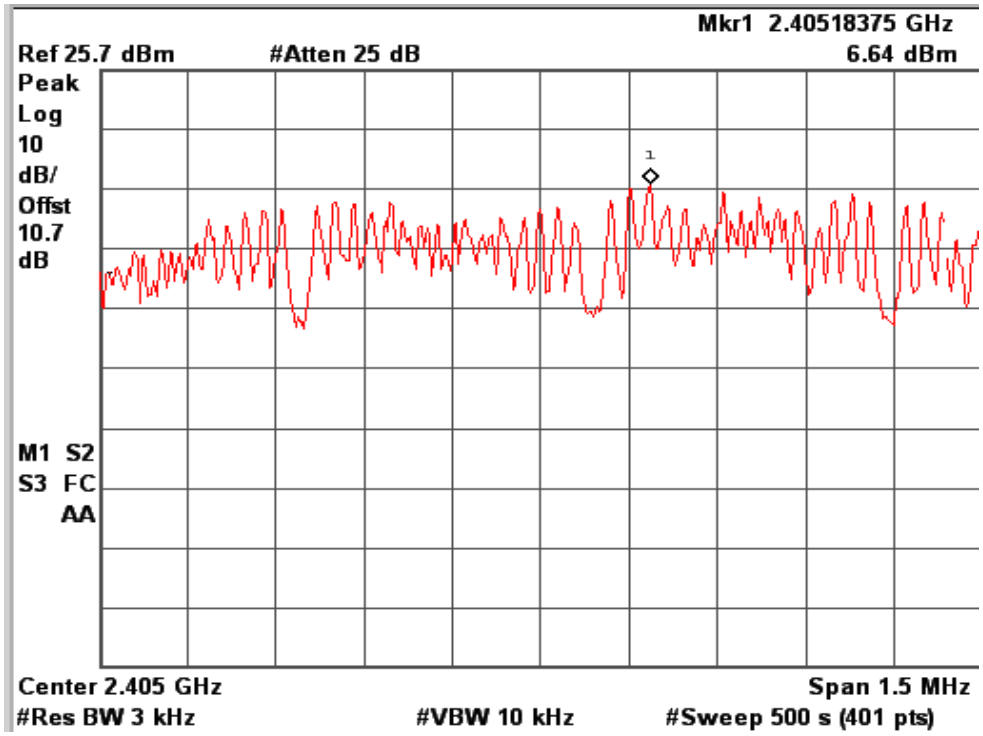
Test Method:



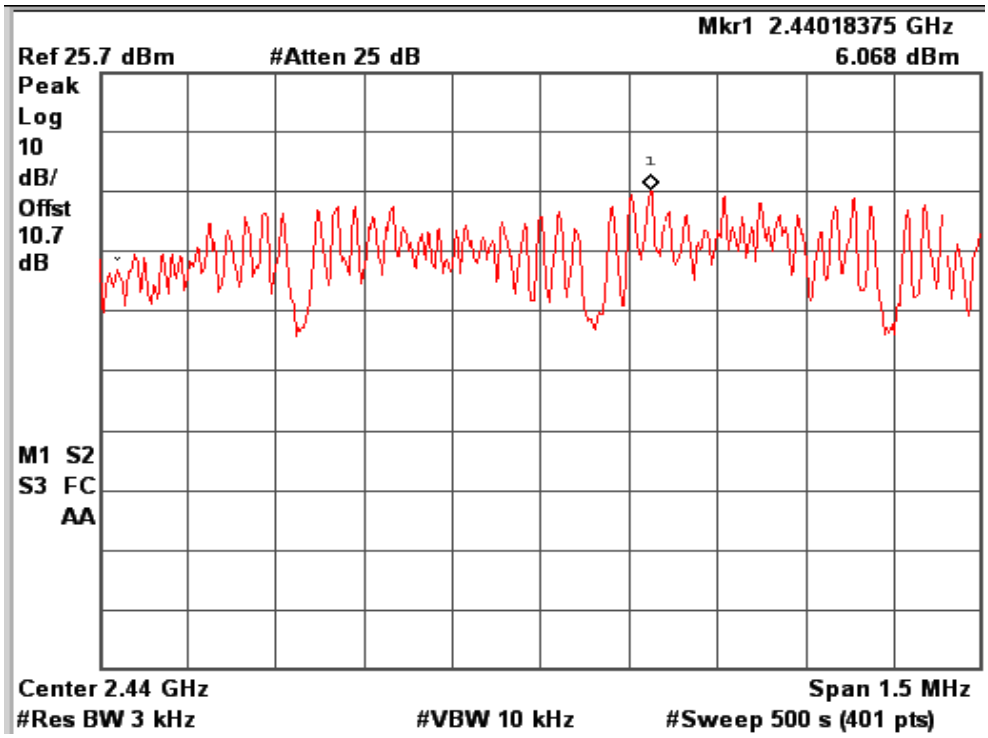
Test Results:

Cable Loss +Attenuator: 10.7dB
Note: Cable loss and Attenuator Value is included in the Test Results.

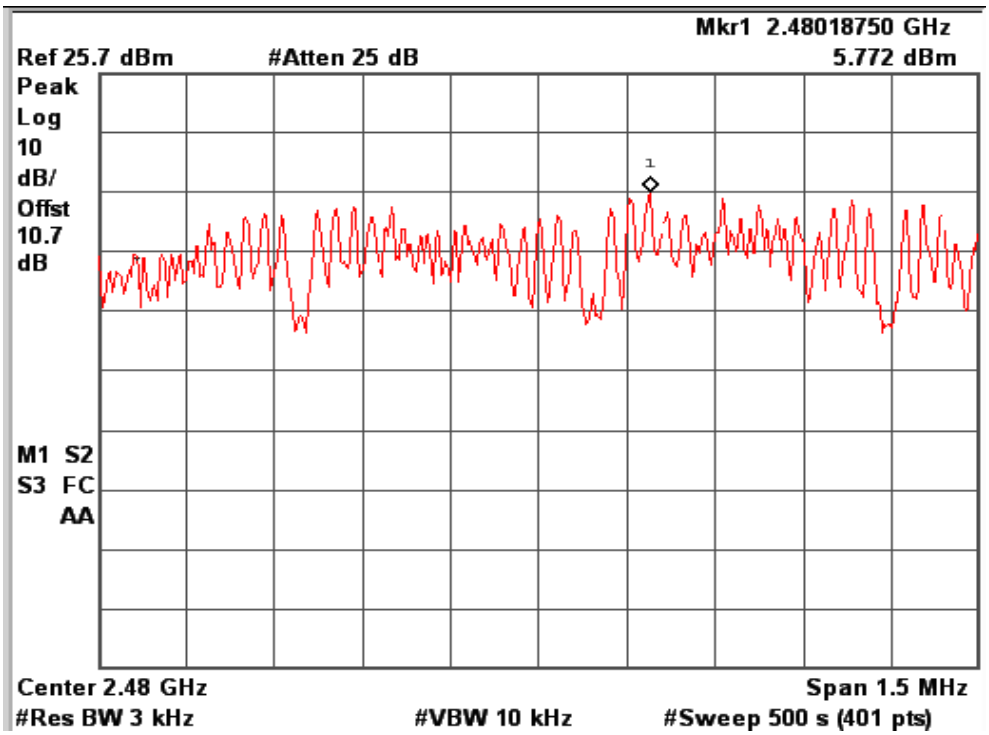
Channel Frequency (MHz)	PSD (dBm)	Limit (dBm)
2405	6.64	08.00
2440	6.06	08.00
2480	5.77	08.00



Channel Frequency 2405 MHz



Channel Frequency 2440 MHz



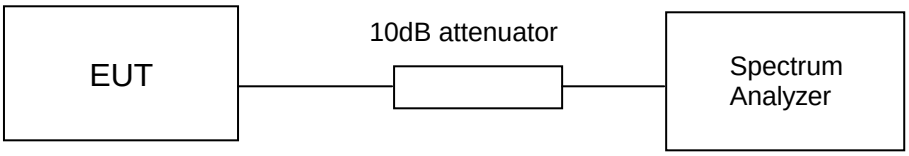
Channel Frequency 2480 MHz

Band-edge Compliance **Section 15.247 (d)**

Result **Pass**

Test Specification	FCC Part 15, Subpart C
Detector Function	Peak
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 20dB 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.

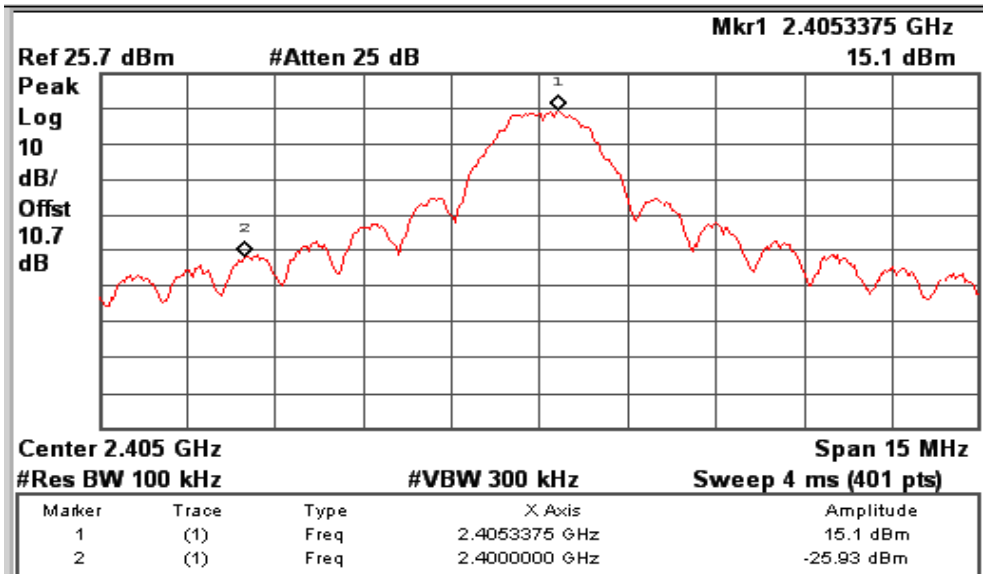
Test Method:



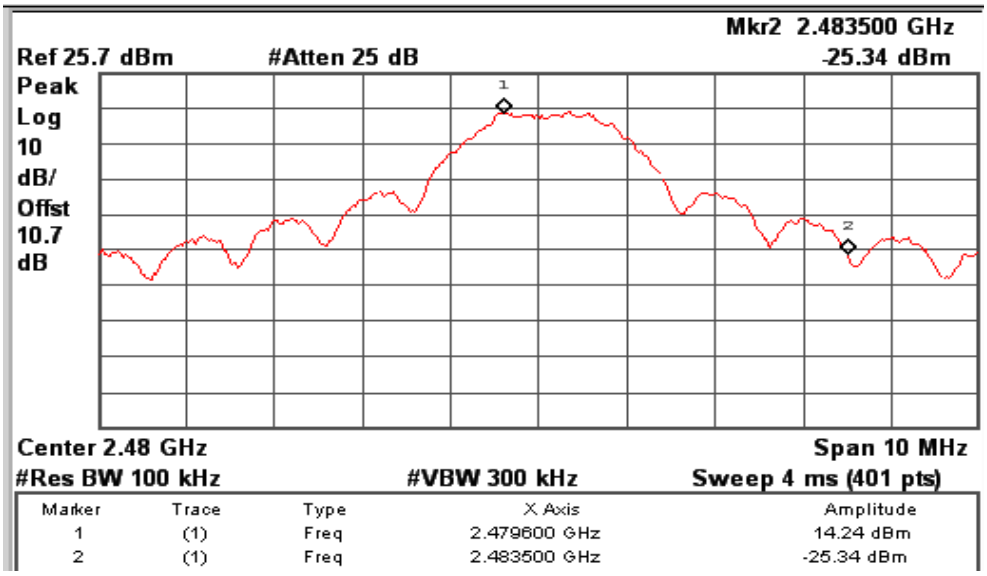
Test Result:

Cable Loss +Attenuator: 10.7dB
Note: Cable loss and Attenuator Value is included in the Test Results

Fundamental Frequency (MHz)	Value at Band Edge		Limit (dBc)
	Frequency (MHz)	Value (dBc)	
2405	2400.00	-41.03	-20
2480	2483.50	-39.58	-20



Channel Frequency 2405 MHz

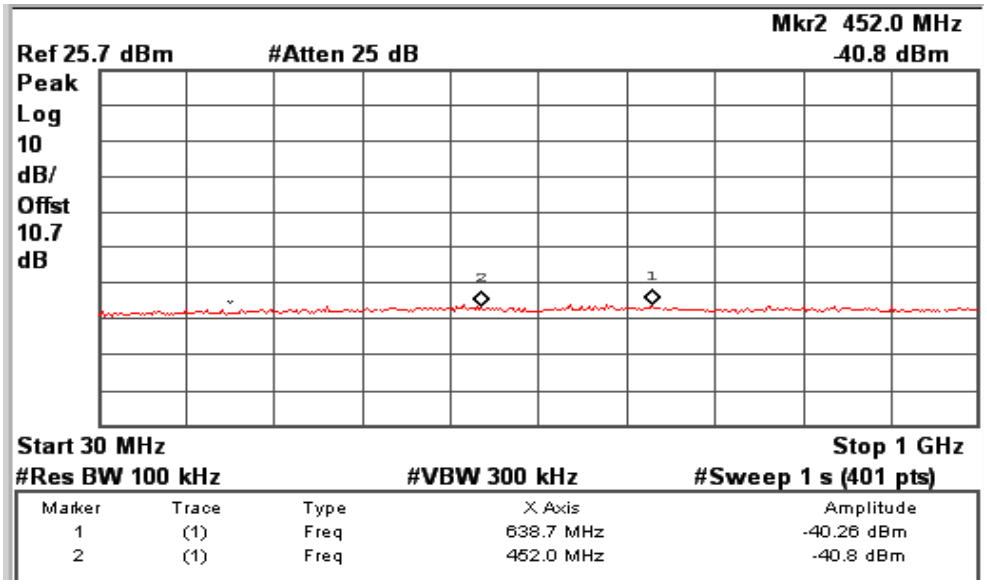


Channel Frequency 2480 MHz

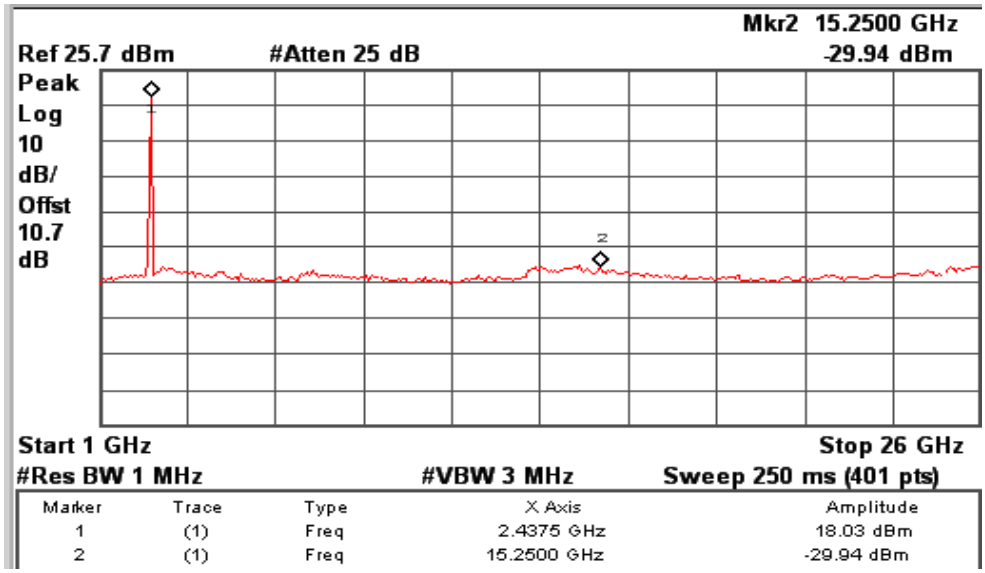
Conducted Spurious Emission

Cable Loss +Attenuator: 10.7dB
Note: Cable loss and Attenuator Value is included in the Test Results

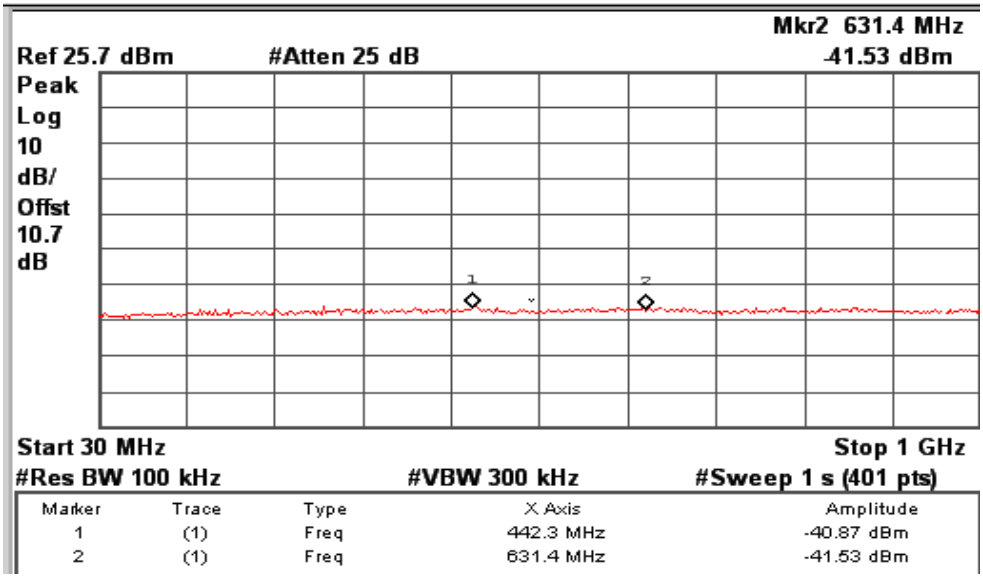
Channel Low



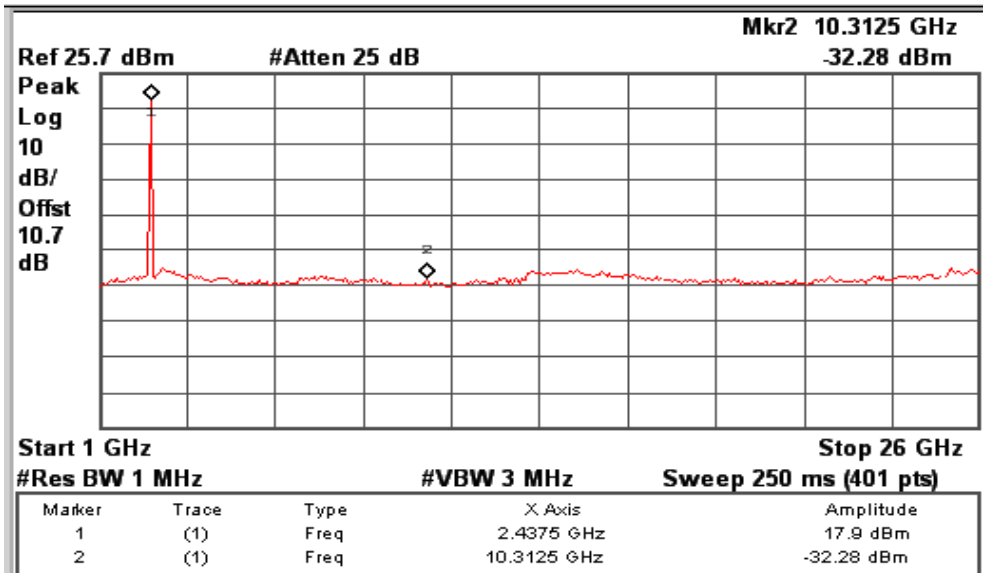
Frequency Range: 30MHz to 1GHz



Frequency Range: 1GHz to 26GHz

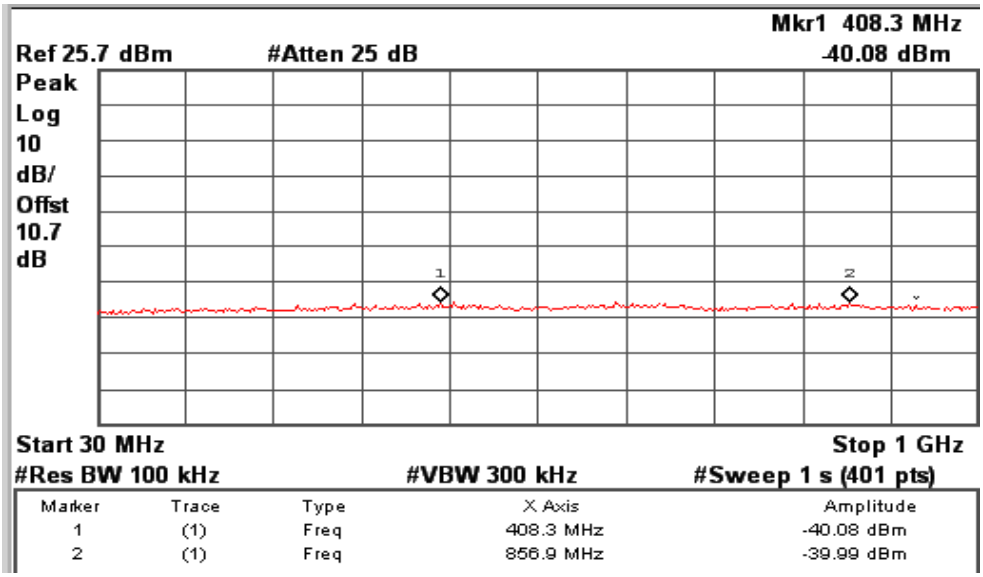


Frequency Range: 30MHz to 1GHz

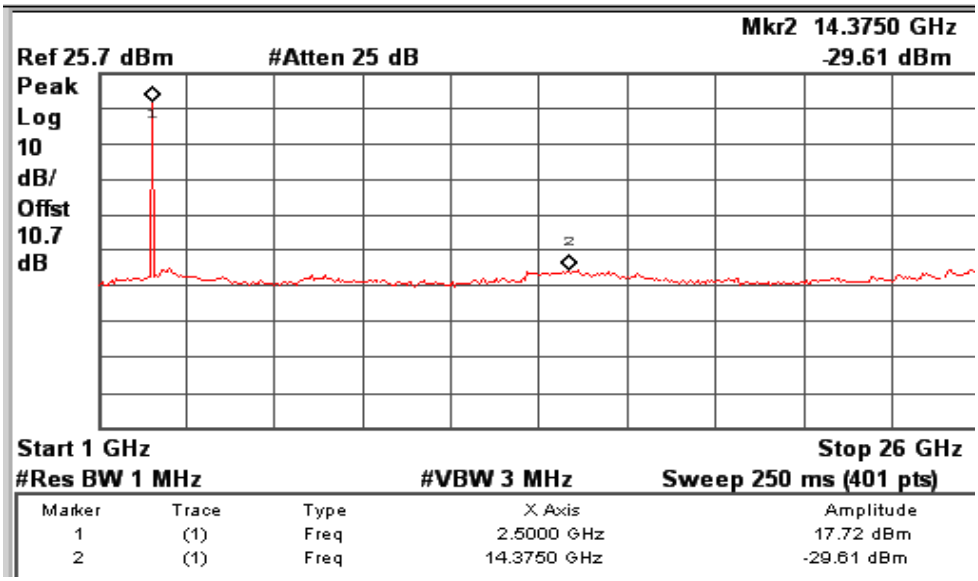


Frequency Range: 1GHz to 26GHz

Channel High



Frequency Range: 30MHz to1GHz



Frequency Range: 1GHz to 26GHz

Spurious Radiated Emissions **Section 15.209**

Result **Pass**

Test Specification	FCC 15.209
Test Method	ANSI C63.4-2003
Measurement Location	Semi Anechoic Chamber
Supply Voltage	Power from USB Port
Measuring Frequency Range	9kHz to 26.5GHz(Up to 10th harmonic of the highest fundamental frequency)
Measuring Distance	3m
Detection	QP for frequency below 1GHz, Peak and Average for frequency above 1GHz
Requirement	As per the limits mentioned in the bellow table

Limit for Radiated Emission of Section 15.209:

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 88, 50 – 53.80, 53.80 – 43.00 and 49.5dBµV/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.

Note: The Radiated Emission Test carried out with 100% duty Cycle. And the Practical Duty Cycle is 8.2 so; the Peak readings were extrapolated to arrive at the average readings by using the following calculation.

Duty Cycle = 0.82/10.0 = 0.082
Duty Cycle Correction Factor = 20*log (duty cycle)
=20*log (0.082)
= -21.72

Average = Peak + (-21.72)

Test Results

Channel	Antenna Polarization	Spurious Emission (MHz)	Field strength (dBµV/m)	Limit (dBµV/m)	Margin (dB)
Low	H	99.90	21.69	43.50	-21.81
		144.00	25.42	43.50	-18.08
		166.00	29.68	43.50	-13.82
		232.40	27.45	46.00	-18.55
		287.25	24.14	46.00	-21.86
		2390.00 (P)	56.62	74.00	-17.38
		2390.00 (Av)	34.90	54.00	-19.10
		2404.50 (P)	110.77	*	-
		2404.50 (Av)	89.05	*	-
		4811.00 (P)	56.29	74.00	-17.71
		4811.00 (Av)	34.57	54.00	-19.43
		7217.00 (P)	51.28	74.00	-22.72
		7217.00(Av)	29.56	54.00	-24.44
	V	99.90	24.68	43.50	-18.82
		144.00	23.81	43.50	-19.69
		166.00	25.18	43.50	-18.32
		232.40	23.69	46.00	-22.31
		2390.00 (P)	54.98	74.00	-19.02
		2390.00 (Av)	33.26	54.00	-20.74
		2404.50 (P)	106.57	*	-
		2404.50 (Av)	84.85	*	-
		4811.00 (P)	53.26	74.00	-20.74
		4811.00 (Av)	31.54	54.00	-22.46
		7217.00 (P)	61.82	74.00	-12.18
		7217.00(Av)	40.10	54.00	-13.90
Mid	H	99.90	21.69	43.50	-21.81
		144.00	25.42	43.50	-18.08
		166.00	29.68	43.50	-13.82
		2441.00 (P)	110.55	*	-
		2441.00 (Av)	88.83	*	-
		4879.00 (P)	50.18	74.00	-23.82
		4879.00 (Av)	28.46	54.00	-25.54
		7318.50 (P)	57.95	74.00	-16.05
		7318.50 (Av)	36.23	54.00	-17.77
	V	99.90	21.69	43.50	-21.81
		144.00	24.42	43.50	-19.08
		166.00	28.68	43.50	-14.82
		2439.50 (P)	102.50	*	-
		2439.50 (Av)	80.78	*	-
		4879.00 (P)	55.39	74.00	-18.61
		4879.00 (Av)	33.67	54.00	-20.33
		7318.50 (P)	61.69	74.00	-12.31
		7318.50 (Av)	39.97	54.00	-14.03
High	H	99.90	20.52	43.50	-22.98
		144.00	21.85	43.50	-21.65
		166.00	28.35	43.50	-15.15
		232.40	28.46	46.00	-17.54
		2481.40 (P)	109.86	*	-
		2481.40 (Av)	88.14	*	-
		2483.50 (P)	72.22	74.00	-01.78
		2483.50 (Av)	50.50	54.00	-03.50

		4959.50 (P)	50.09	74.00	-23.91
		4959.50 (Av)	28.37	54.00	-25.63
		7442.00 (P)	56.28	74.00	-17.72
		7442.00 (Av)	34.56	54.00	-19.44
	V	99.90	24.21	43.50	-19.29
		144.00	24.85	43.50	-18.65
		166.00	25.35	43.50	-18.15
		232.40	23.58	46.00	-22.42
		2481.40 (P)	101.73	*	-
		2481.40 (Av)	80.01	*	-
		2483.50 (P)	71.50	74.00	-02.50
		2483.50 (Av)	49.78	54.00	-04.22
		4959.50 (P)	55.56	74.00	-18.44
		4959.50 (Av)	33.84	54.00	-20.16
		7442.00 (P)	62.10	74.00	-11.90
		7442.00 (Av)	40.38	54.00	-13.62

P--> Peak Detector
Av--> Average Detector
* → Fundamental Frequency

Note: Emission measurement from 1GHz to 26GHz was done by rotating the EUT, and changing the antenna in both height and polarization, to maximize the measured emission. The emission was kept within the illumination area of the 3 dB beamwidth of the antenna so that the maximum emission from the EUT was measured.