Produkte
Products

Prüfbericht - Nr.: *Test Report No.:*	**02423364 001**		**Seite 1 von 40** *Page 1 of 40*
Auftraggeber: *Client:*	**Atmel Norway AS, Vestre Rosten 79, 7075 Tiller, Trondheim, Norway Tel +91-44-30637229 Fax +91-44-30637264**		
Gegenstand der Prüfung: *Test item:*	**ATZB-EVB-24-PCB, MeshBean 2.4GHz PCB Evaluation Board with Antenna**		
Bezeichnung: *Identification:*	**ATZB-EVB-24-PCB**	**Serien-Nr.:** *Serial No.*	**Engineering Sample**
Wareneingangs-Nr.: *Receipt No.:*	**1403015991**	**Eingangsdatum:** *Date of receipt:*	**11.08.2011**
Prüfort: *Testing location:*	**Refer Page 4 of 40 for test facilities**		
Prüfgrundlage: *Test specification:*	**FCC 15, Subpart C**		
Prüfergebnis: *Test Result:*	**Der Prüfgegenstand entspricht oben genannter Prüfgrundlage(n).** *The test items passed the test specification(s).*		
Prüflaboratorium: *Testing Laboratory:*	**TÜV Rheinland (India) Pvt. Ltd.** Alpha Tower, Sigma Soft Tech Park, # 7, Whitefield Main Road, Varthur Kodi, Bangalore – 560066, India		

geprüft / *tested by:*			**kontrolliert /** *reviewed by:*		
16.08.2011	**Saibaba Siddapur Test Engineer**		17.08.2011	G Kalyan Varma Manager	
Datum *Date*	**Name/Stellung** *Name/Position*	**Unterschrift** *Signature*	**Datum** *Date*	**Name/Stellung** *Name/Position*	**Unterschrift** *Signature*

Sonstiges / *Other Aspects:* **FCC ID : VW4A090971**

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 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

The MeshBean 2.4GHz PCB Antenna board is used as a carrier board for ATZB-24-B0 Zigbit to be used as a Zigbee sensor node or a coordinator in a Zigbee network. This product is used by a customer for Zigbee network development and Evaluation.

Ratings and System Details

Operating Frequency	2400 – 2483.50MHz
No. of channel	16
Channel Spacing	5MHz
Transmitted Power	1.73mW
Modulation	DSSS (O-QPSK)
Data Rate	250kbps
Antenna Type	PCB Antenna
Number of antenna	Two
Antenna Gain	0 dBi
Supply Voltage	Power from USB Port
Dimensions	18.8mm x 13.5mm x 2.8 mm
Environmental	-20 to 70 degrees Celsius, <80% RH

Test Conditions: Supply Voltage from USB Port

Environmental conditions: Temperature: +23 º C and RH: 62%

Operation Descriptions

The MeshBean board is intended to evaluate the performance of the ZigBit Module (ATZB-24-B0, FCC ID VW4A090665). The ZigBit module on the MeshBean board provides wireless connectivity, enabling the MeshBean board to be apart of a Zigbee network.

ATZB-EVB-PCB (MeshBean) board is intended to evaluate the performance of a ZigBit module. In turn, a ZigBit module with the embedded BitCloud software provides wireless connectivity for ATZB-EVB (MeshBean) board, enabling it as a node in a Zigbee network. MeshBeans also serve as a reference hardware platform for the customer's target devices utilizing ZigBit modules for wireless communication. The ATZB-EVB-PCB (MeshBean) board can be configured to operate as a network coordinator, a router or an end device, by setting of DIP switches and/or sending AT-commands. The node's role is defined by the embedded application.

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 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, and display the configuration (channel and power level)

Countermeasures to achieve EMC Compliance

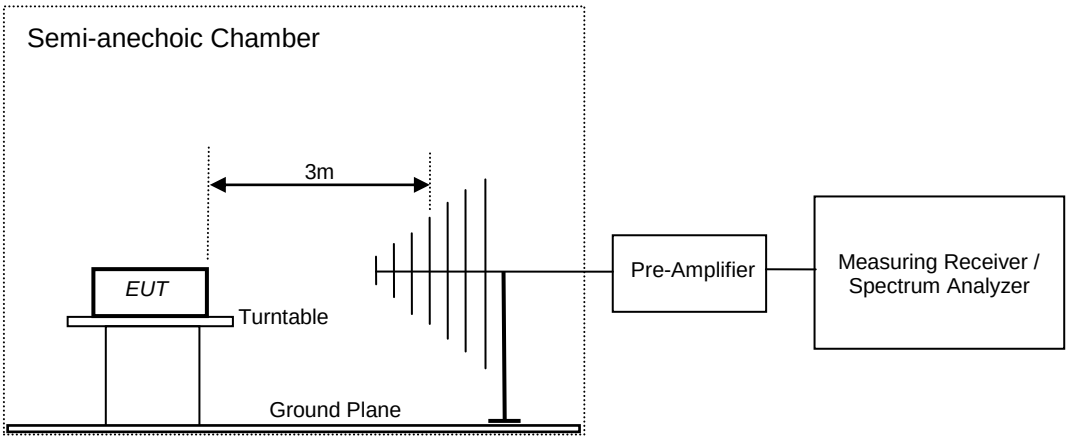
- None

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 in X, Y and Z axes and the worst case results are recorded in this report.



Test Results

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

Result **Pass**

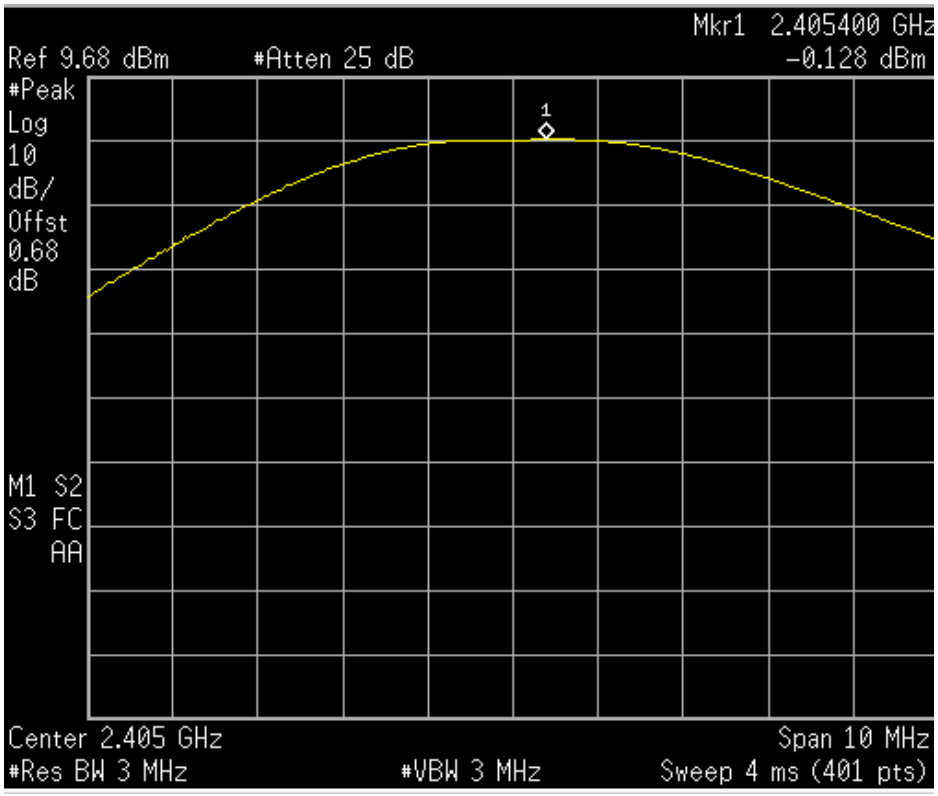
Test Specification	FCC Part 15 Subpart C
Measurement Bandwidth (RBW)	3 MHz
Detector	Peak
Requirement	<1 watt (30dBm) for digital Transmission System

Test Method:

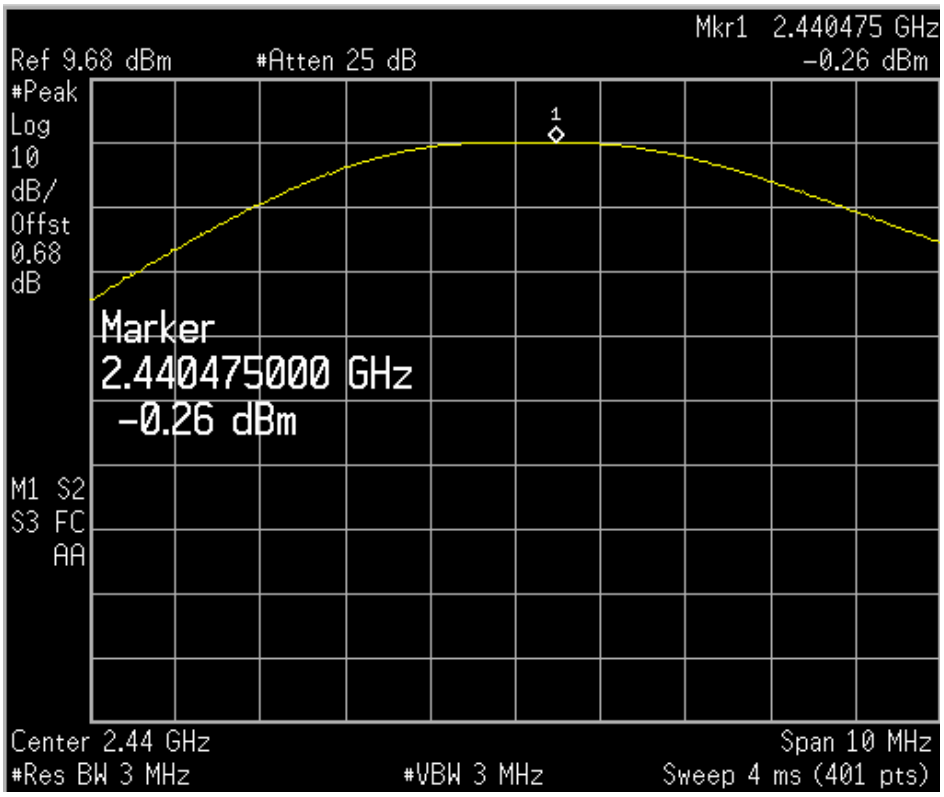
Test Result:

Antenna 1

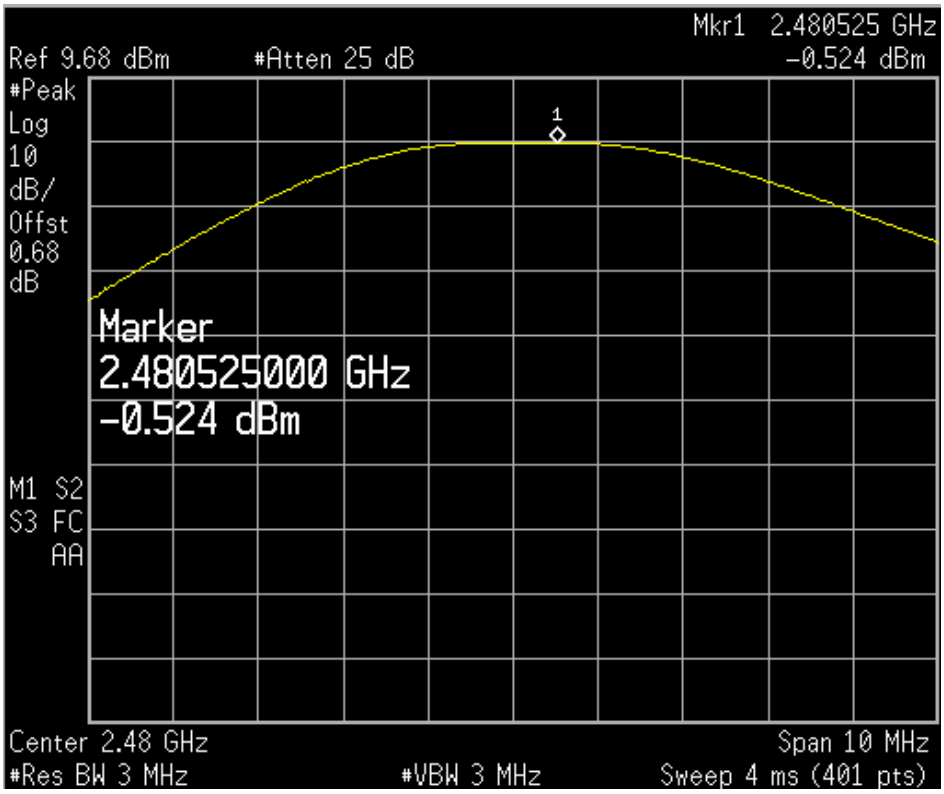
Channel	Frequency (MHz)	Output power (dBm)	Limit (dBm)
Low	2405	-0.128	30
Mid	2440	-0.260	30
High	2480	-0.524	30



Channel Frequency: 2405 MHz



Channel Frequency: 2440 MHz

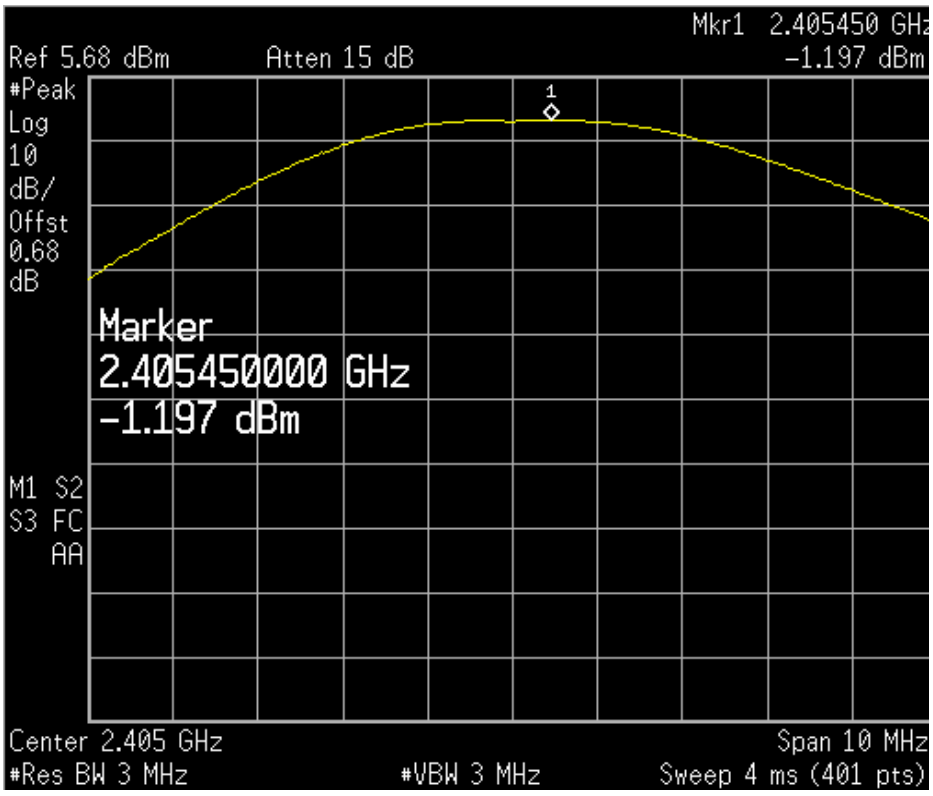


Channel Frequency: 2480 MHz

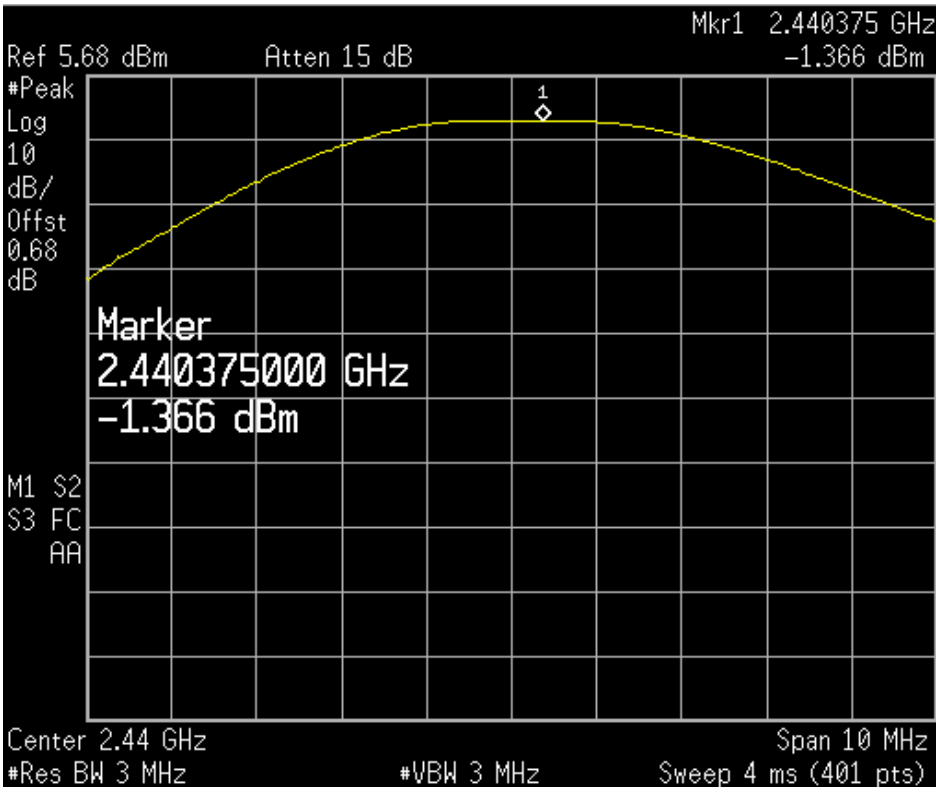
Antenna 2

Test Results:

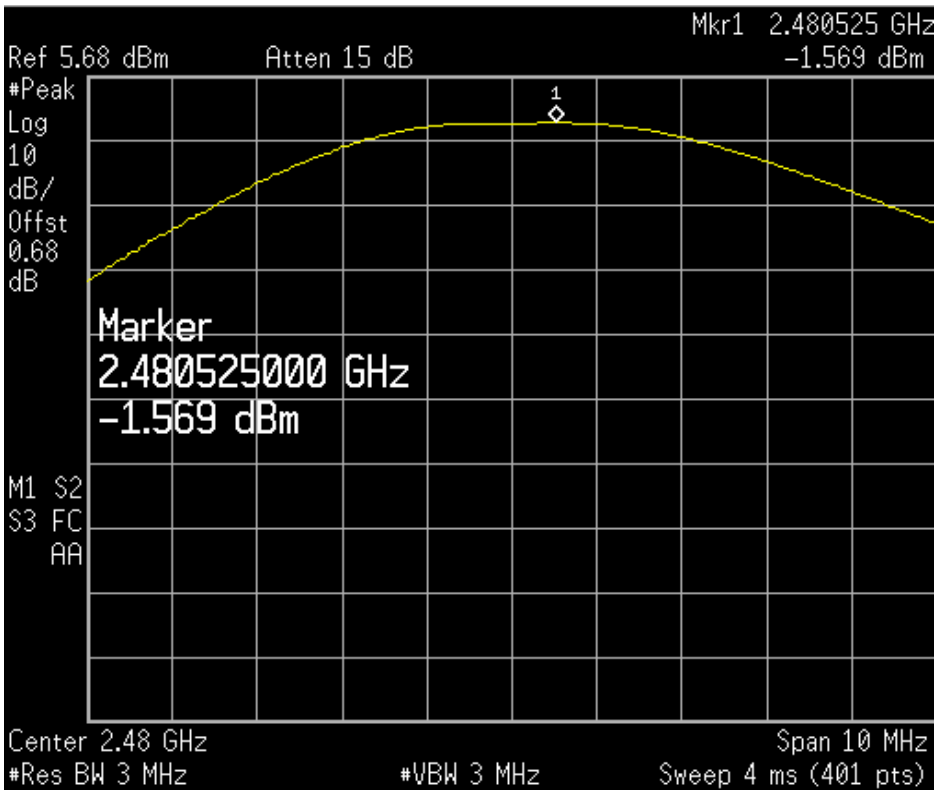
Channel	Frequency (MHz)	Output power (dBm)	Limit (dBm)
Low	2405	-1.197	30
Mid	2440	-1.366	30
High	2480	-1.569	30



Channel Frequency: 2405 MHz



Channel Frequency: 2440 MHz



Channel Frequency: 2480 MHz

Measure-and-sum

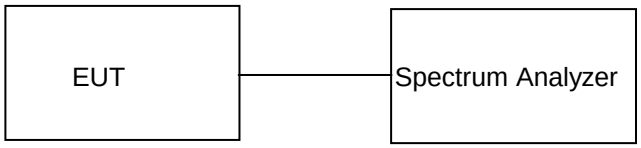
Channel	Frequency (MHz)	Antenna 1 (mW)	Antenna 2 (mW)	Sum Result (mW)	Limit (mW)
Low	2405	0.9709	0.7591	1.73	1000
Mid	2440	0.9418	0.7301	1.67	1000
High	2480	0.8863	0.6967	1.58	1000

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

Result **Pass**

Test Specification FCC Part 15 Subpart C
Detector Peak
Requirement The minimum 6 dB bandwidth shall be at least 500 kHz.

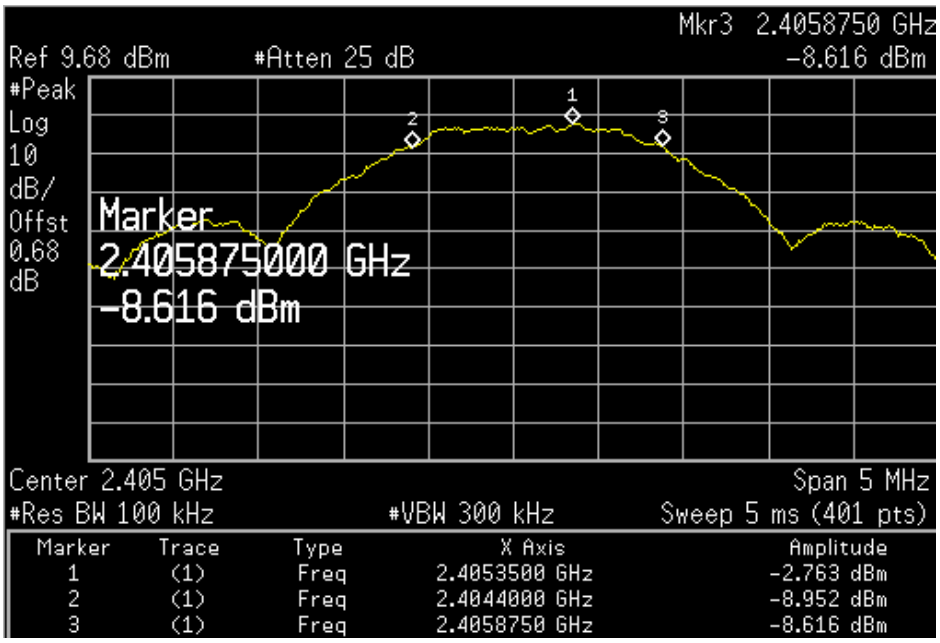
Test Method:



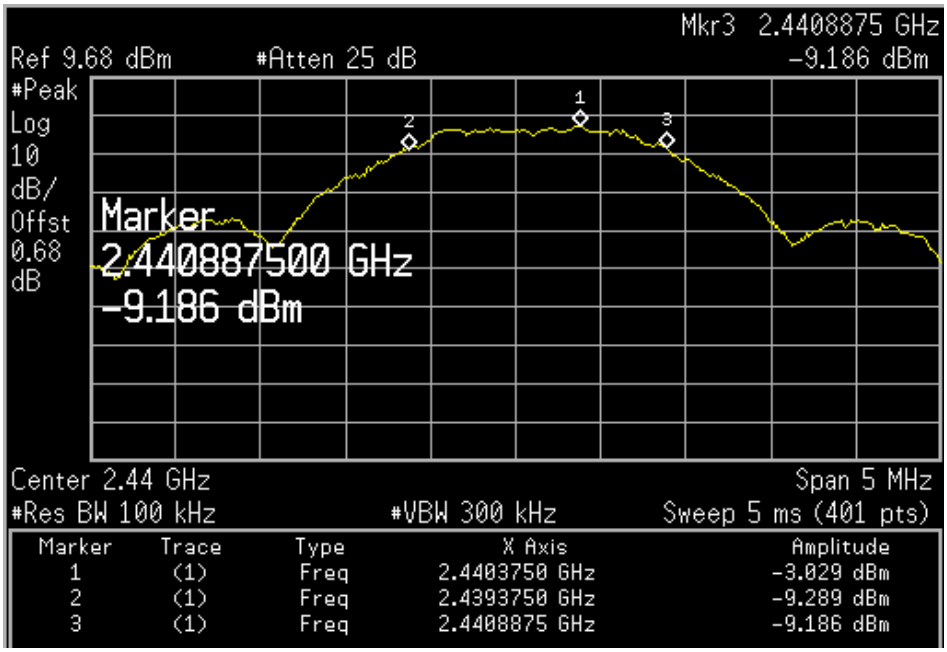
Test Result:

Antenna 1

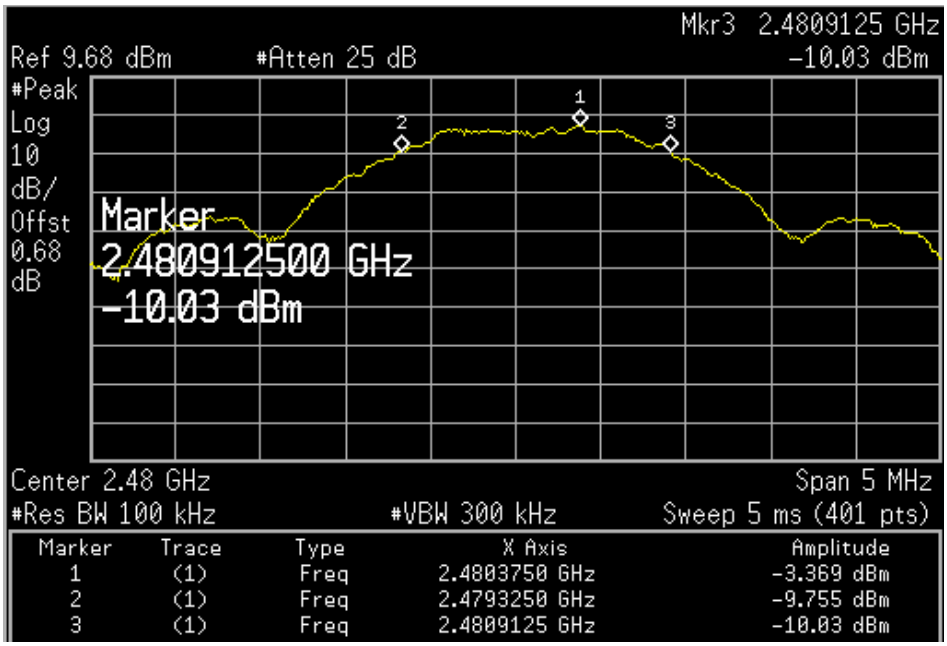
Frequency (MHz)	Lower Frequency (MHz)	Upper Frequency (MHz)	6 dB Bandwidth (MHz)
2405	2404.40	2405.87	1.47
2440	2439.37	2440.88	1.51
2480	2479.32	2480.91	1.59



Channel Frequency 2405 MHz



Channel Frequency 2440 MHz



Channel Frequency 2480 MHz

Antenna 2:

Frequency (MHz)	Lower Frequency (MHz)	Upper Frequency (MHz)	6 dB Bandwidth (MHz)
2405	2404.33	2405.88	1.55
2440	2439.36	2440.88	1.52
2480	2479.35	2480.90	1.55

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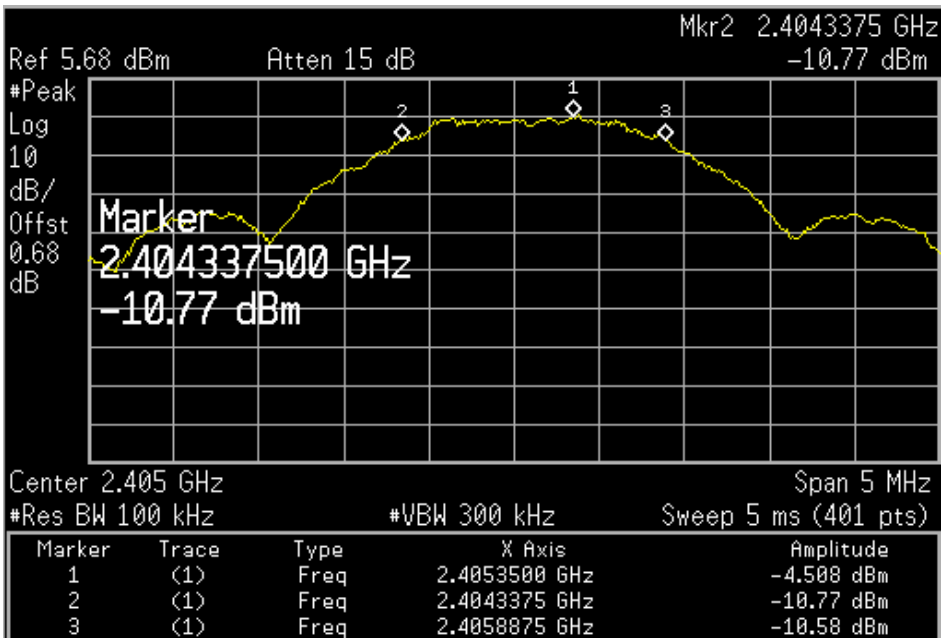
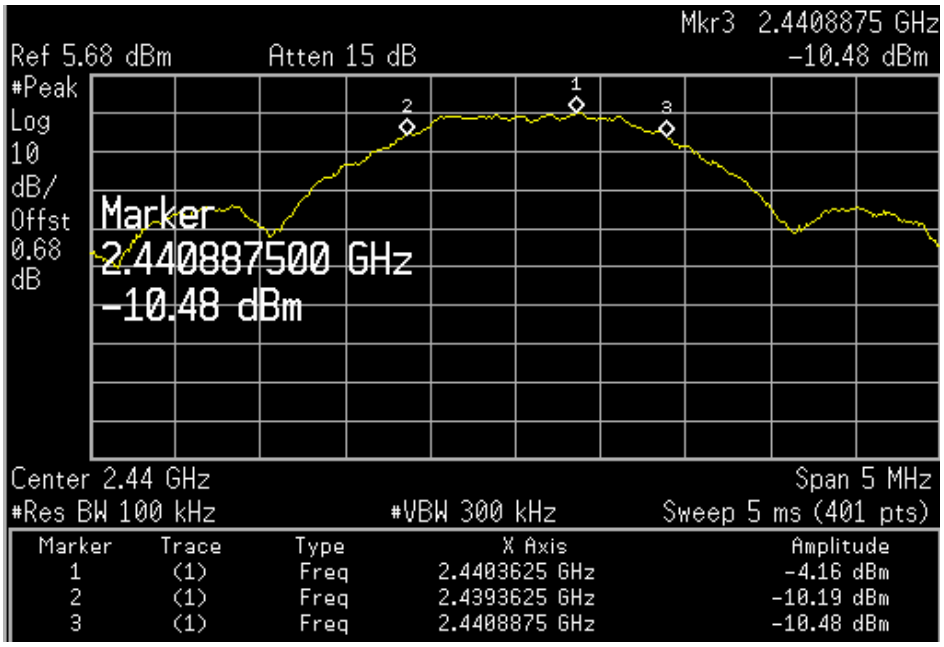
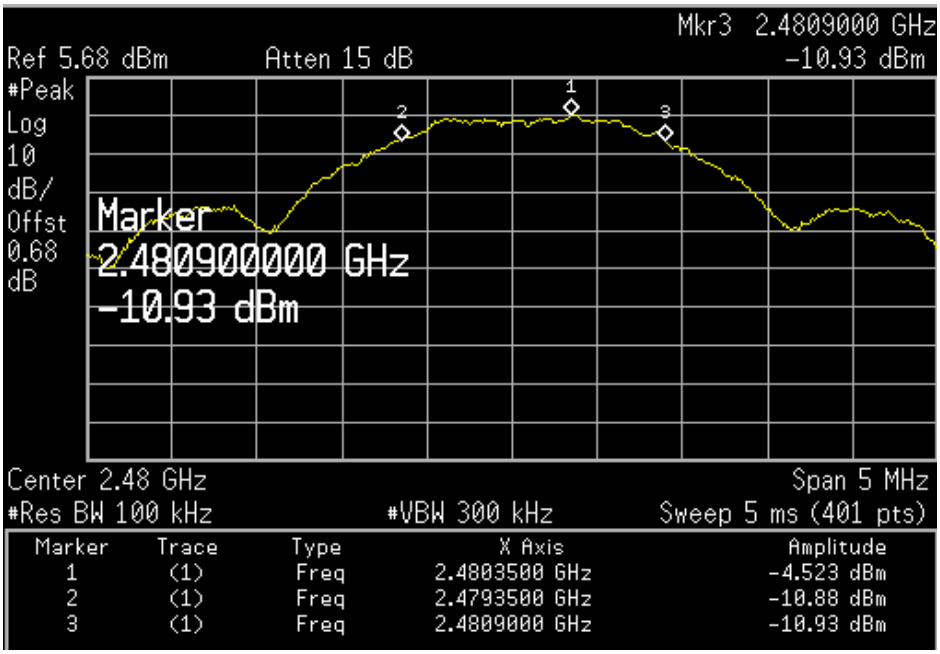


Channel Frequency 2405 MHz



Channel Frequency 2440 MHz

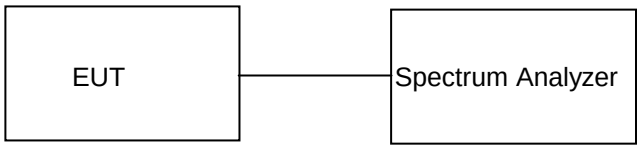


Channel Frequency 2480 MHz

99% Occupied Bandwidth **Section 2.1049**

Test Specification FCC Part 2, Section 2.1049
Bandwidth 100kHz

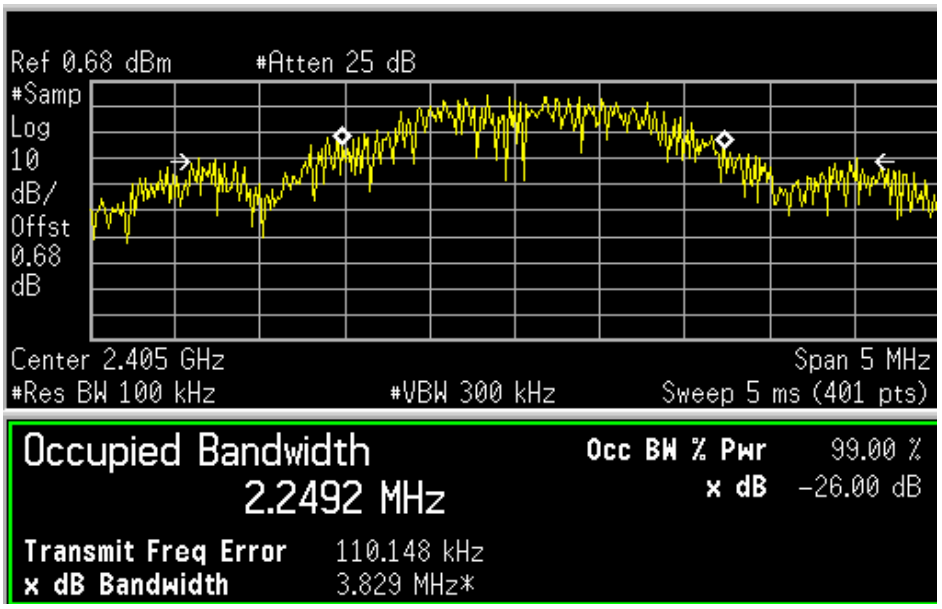
Test Method:



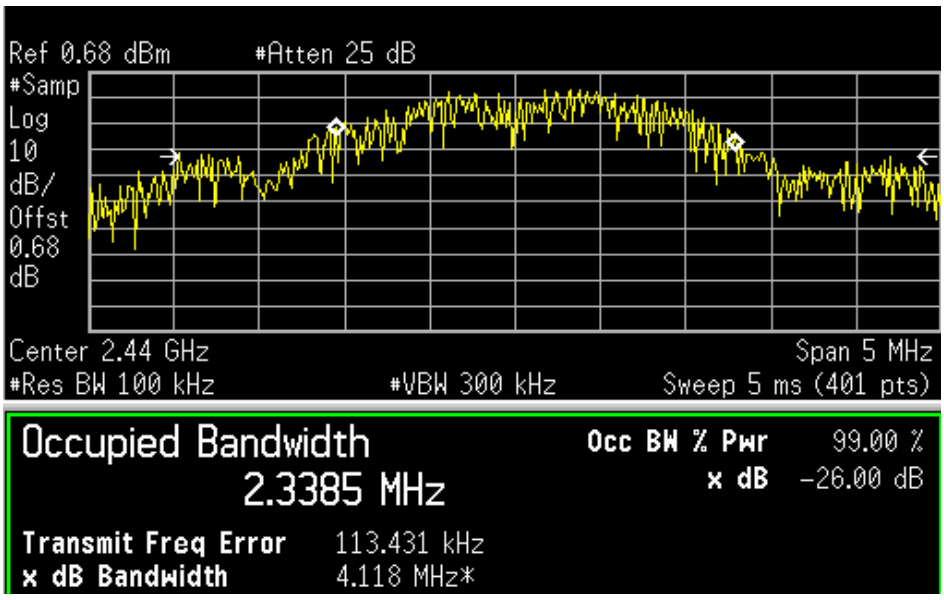
Test Result:

Antenna 1

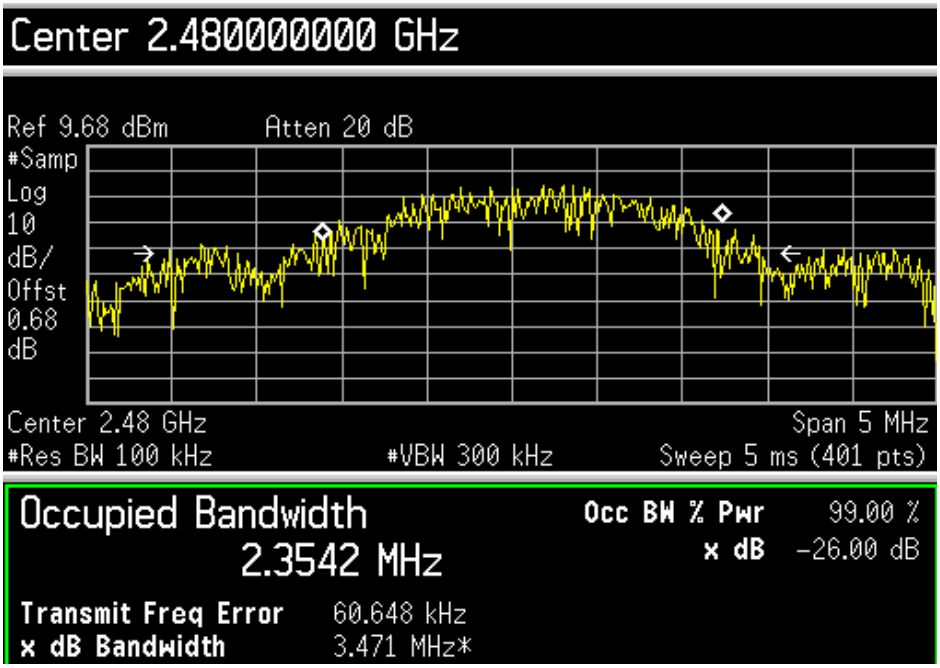
Frequency (MHz)	99% Occupied Bandwidth (MHz)
2405	2.25
2440	2.34
2480	2.35



Channel Frequency 2405 MHz



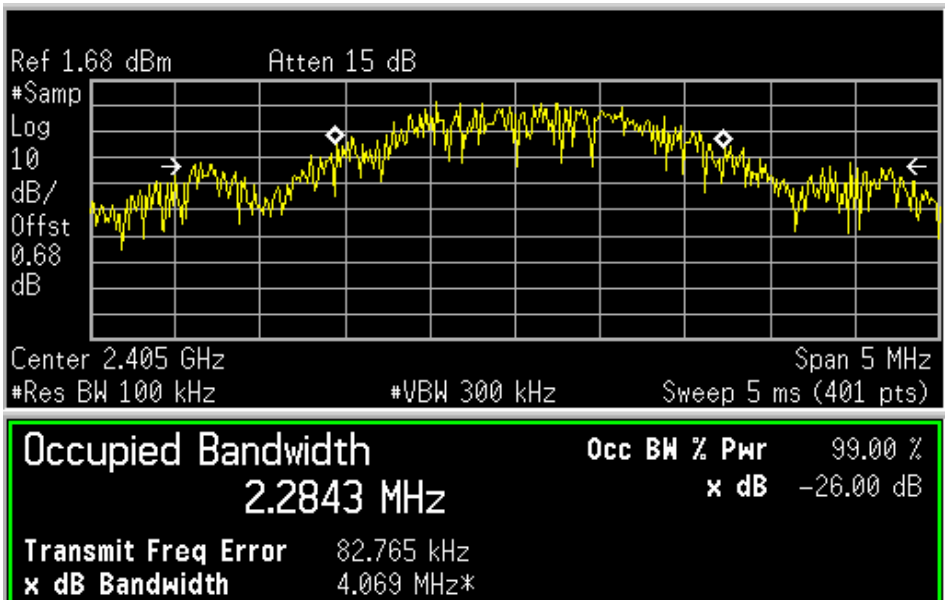
Channel Frequency 2440 MHz



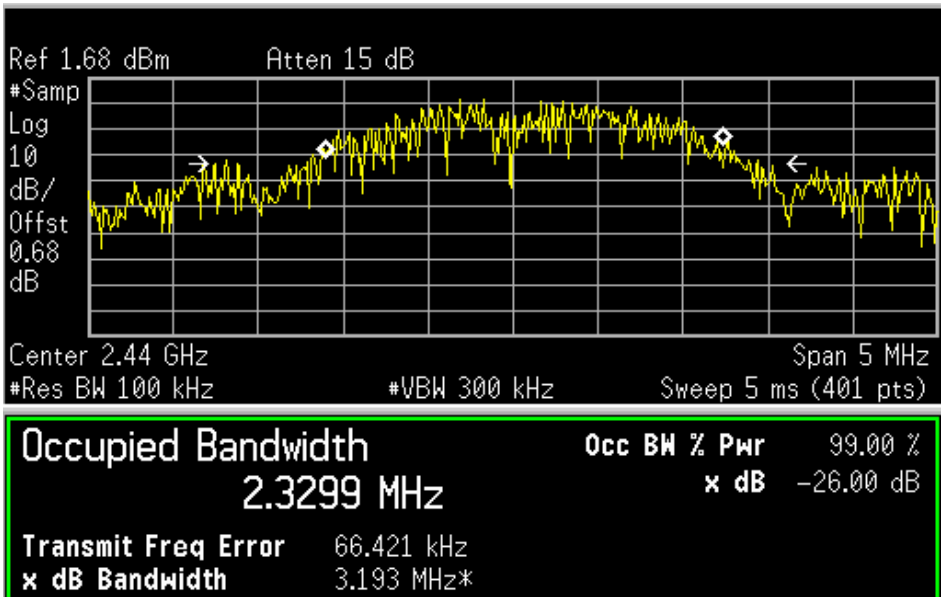
Channel Frequency 2480 MHz

Antenna 2

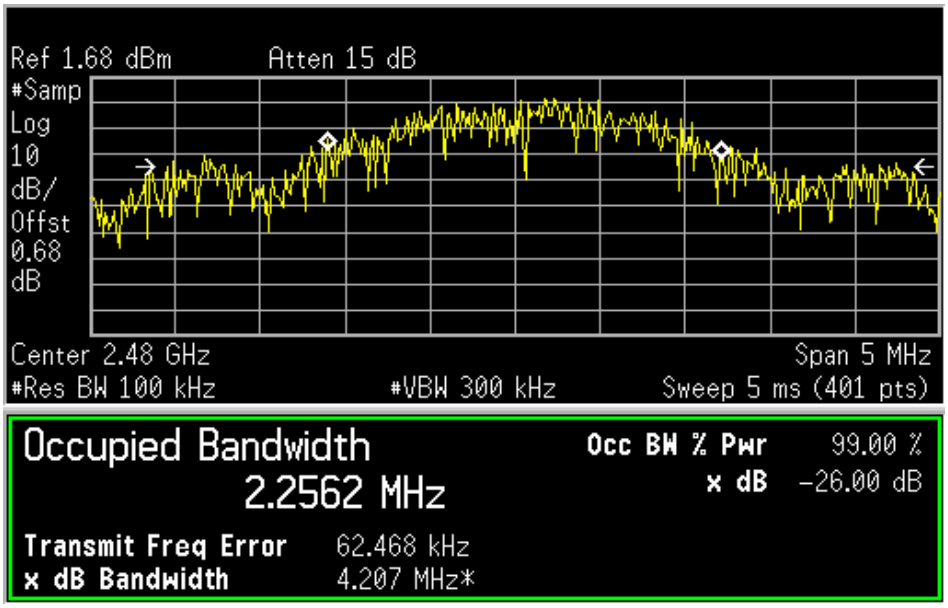
Frequency (MHz)	99% Occupied Bandwidth (MHz)
2405	2.28
2440	2.33
2480	2.25



Channel Frequency 2405 MHz



Channel Frequency 2440 MHz



Channel Frequency 2480 MHz

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

Result **Pass**

Test Specification	FCC Part 15 Subpart C
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:

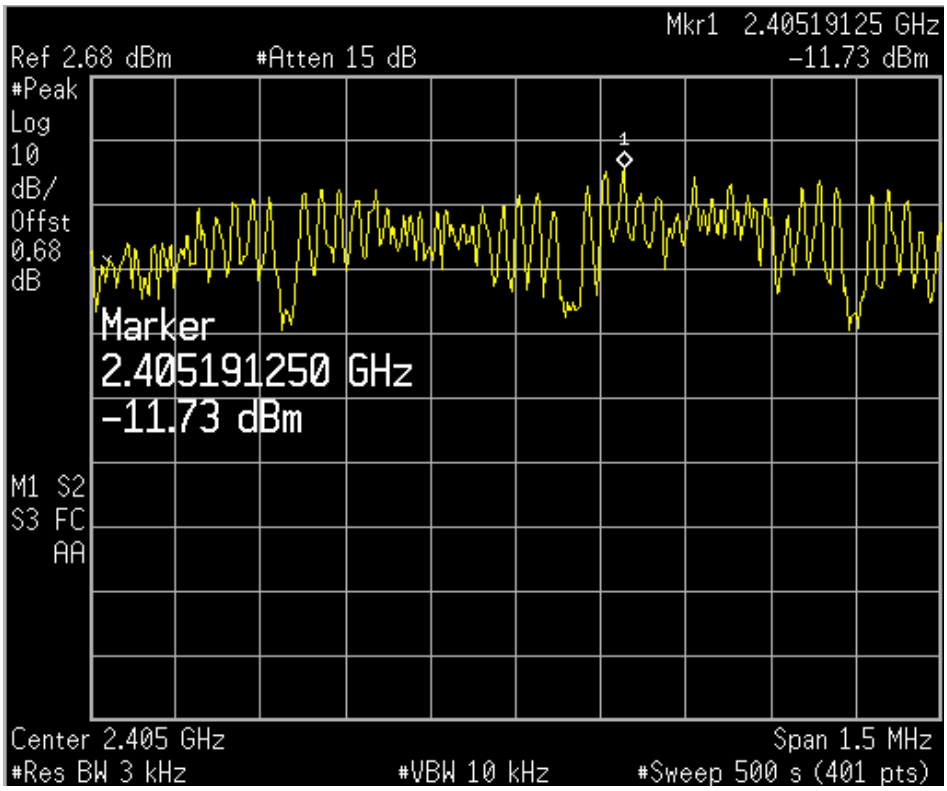
Test Result:

Antenna 1

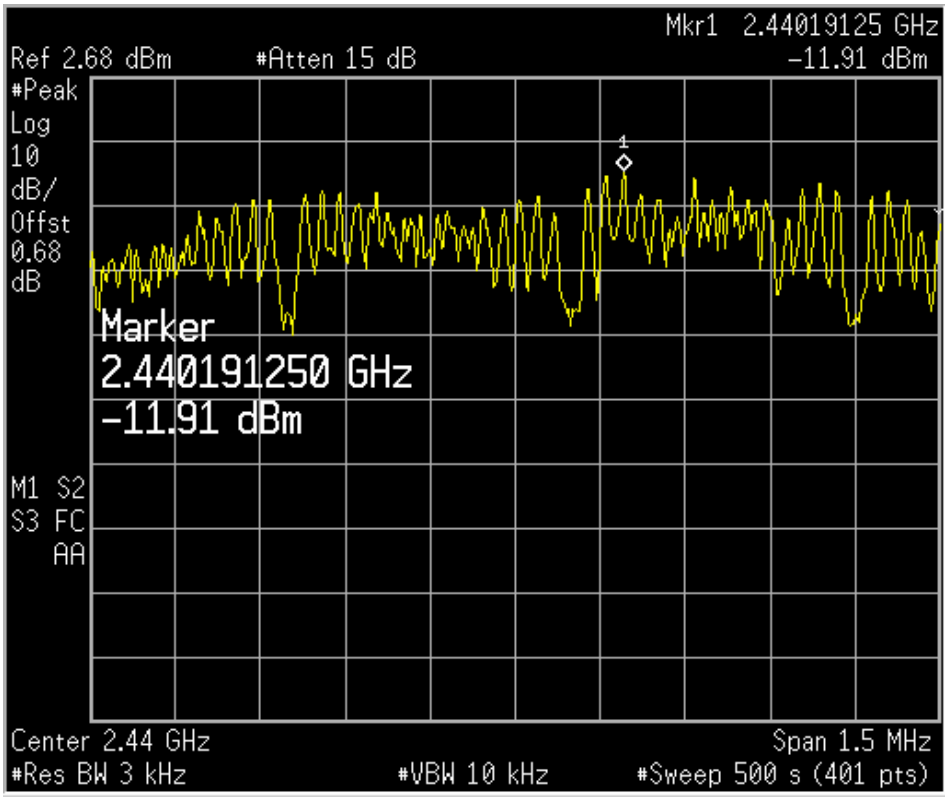
Frequency (MHz)	PSD (dBm)	10 log(N) dB	Total PSD	Limit (dBm)
2405	-11.73	3.010	-8.72	8.00
2440	-11.91	3.010	-8.90	8.00
2480	-12.22	3.010	-9.21	8.00

Where N is the number of outputs = 2.

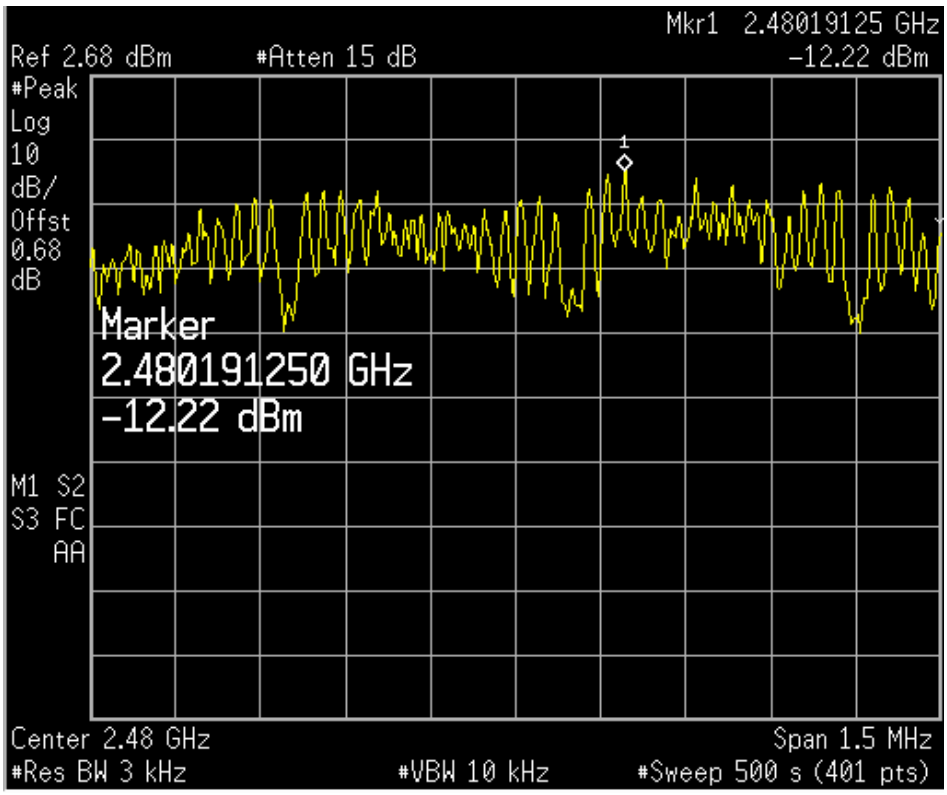
Note: Equipment with Single output, the applicable limit is 8dBm, and Equipment with multiple outputs, the limit is permitted to contribute no more than 1/Nth of the PSD limit.



Channel Frequency 2405 MHz



Channel Frequency 2440 MHz



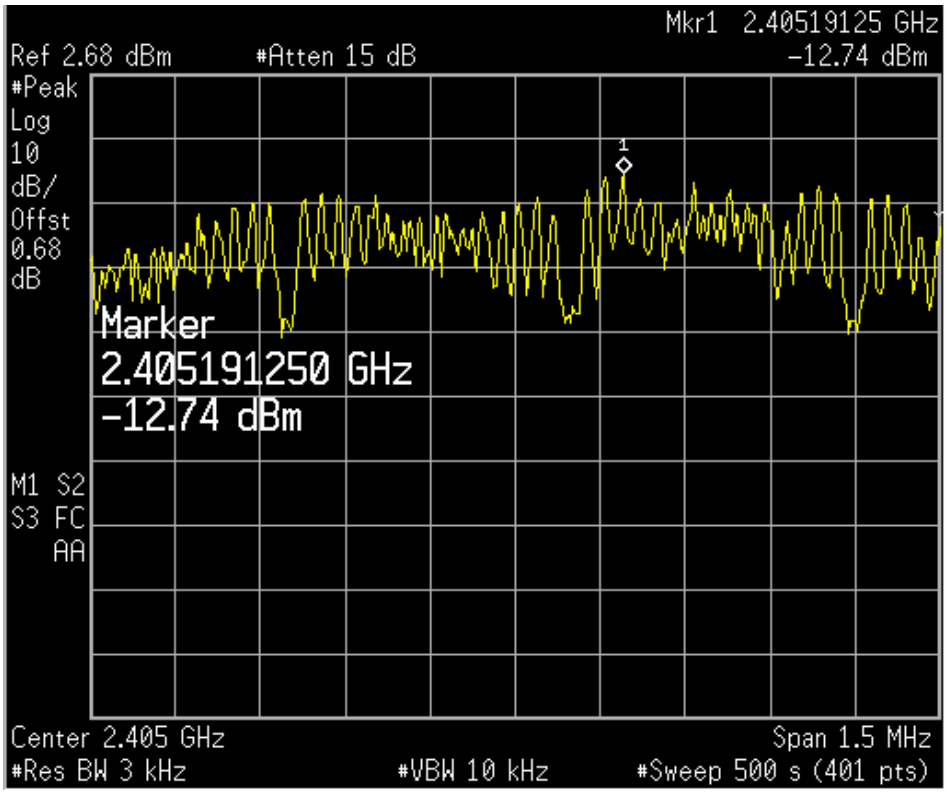
Channel Frequency 2480 MHz

Antenna 2

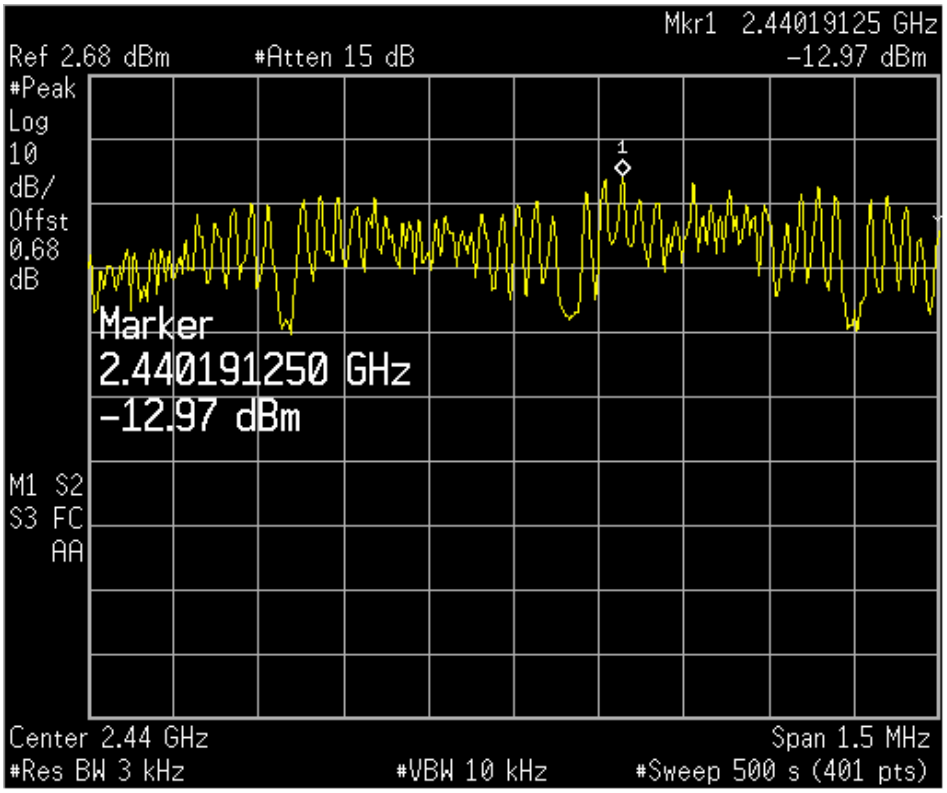
Frequency (MHz)	PSD (dBm)	10 log(N) dB	Total PSD	Limit (dBm)
2405	-12.74	3.010	-9.73	8.00
2440	-12.97	3.010	-9.96	8.00
2480	-13.31	3.010	-10.30	8.00

Where N is the number of outputs = 2.

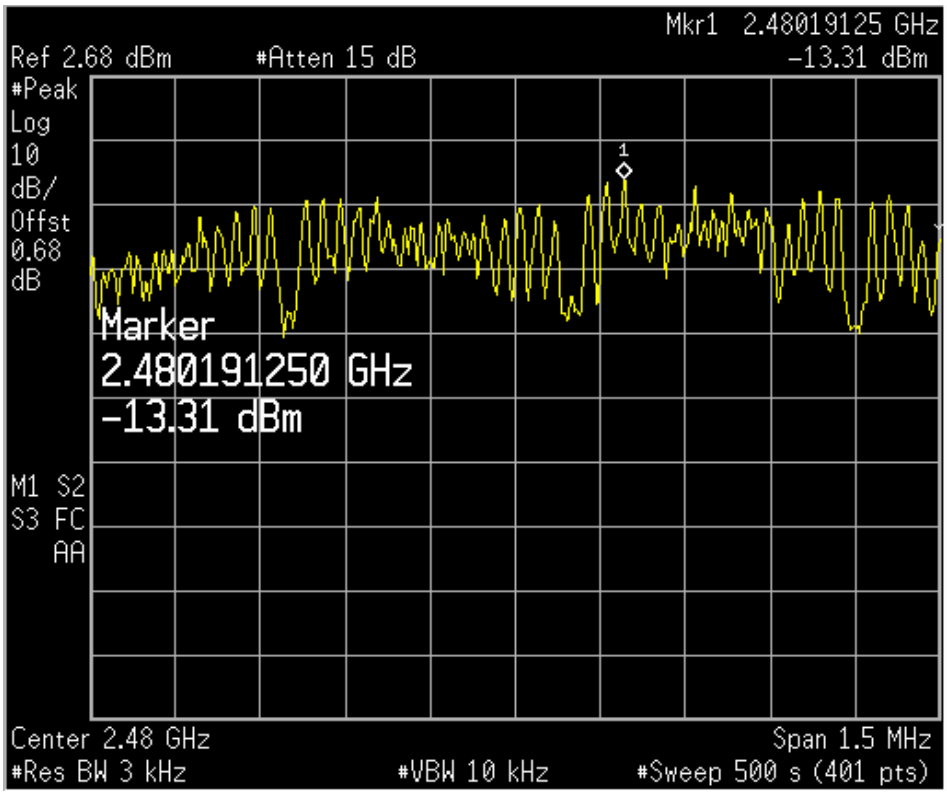
Note: Equipment with Single output, the applicable limit is 8dBm, and Equipment with multiple outputs, the limit is permitted to contribute no more than 1/Nth of the PSD limit.



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 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.

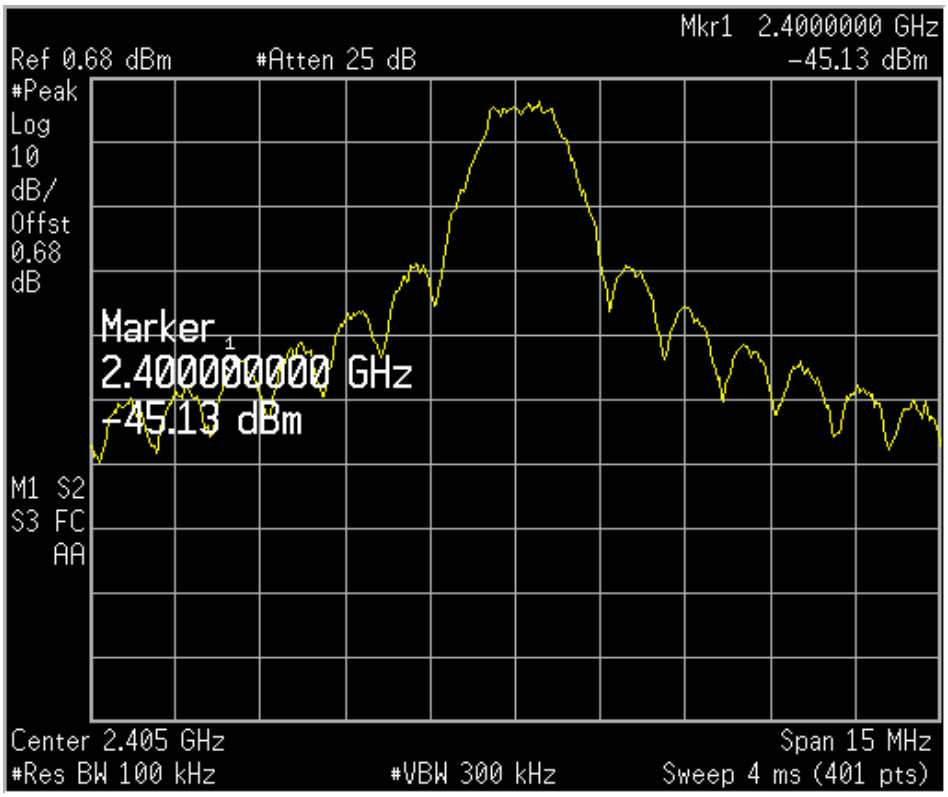
Test Method:

Note: For this test compliance may be demonstrated by confirming that the maximum Out-of-band emission on each individual output is at least 20 dB below the Maximum in-band PSD on that output.

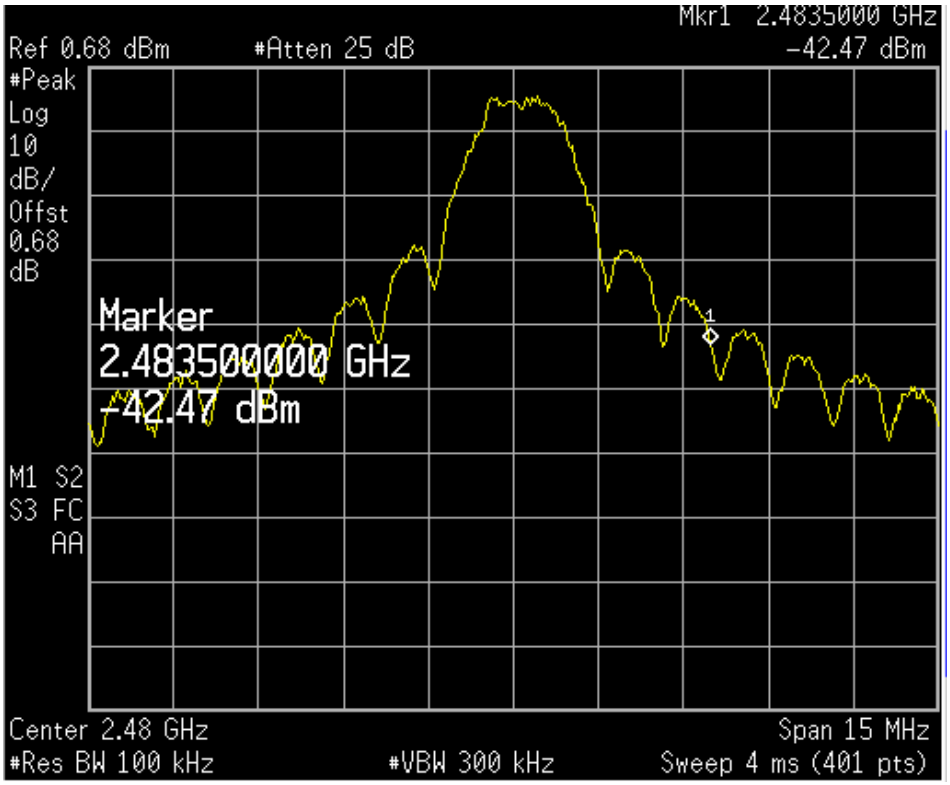
Test Result:

Antenna 1

Channel	Fundamental Frequency (MHz)	Fundamental PSD (dBm)	Value at Band Edge		Relative Difference (dBc)	Limit (dBc)
			Frequency (MHz)	Value (dBm)		
Low	2405	-11.73	2400.00	-45.13	-33.40	-20
High	2480	-12.22	2483.50	-42.47	-30.25	-20



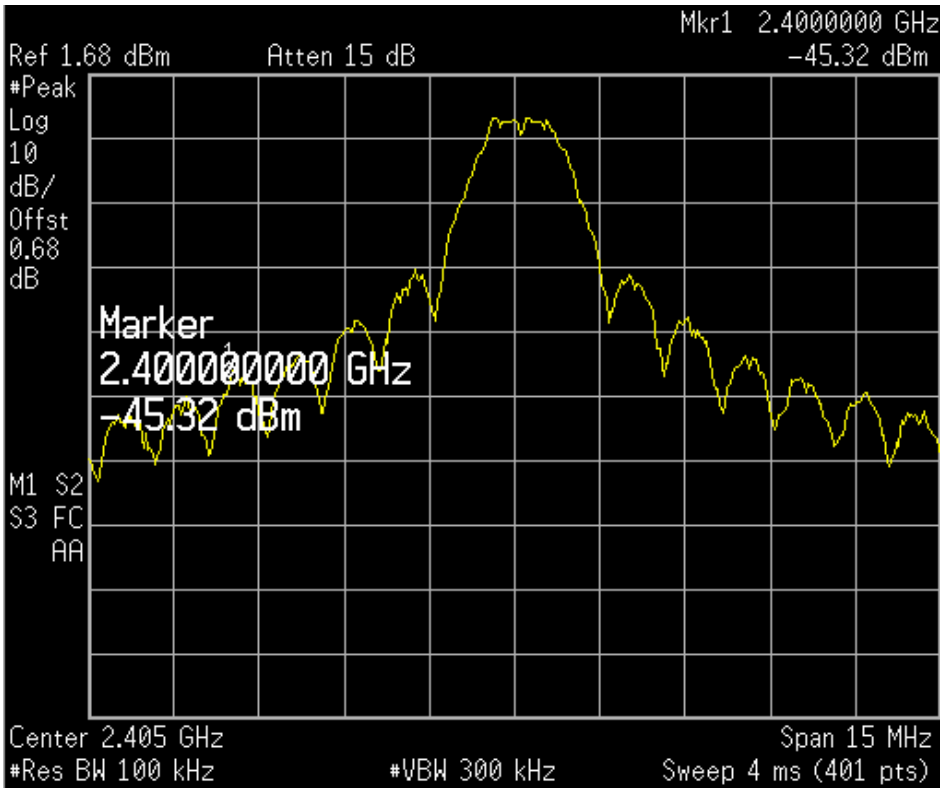
Channel Frequency 2405 MHz



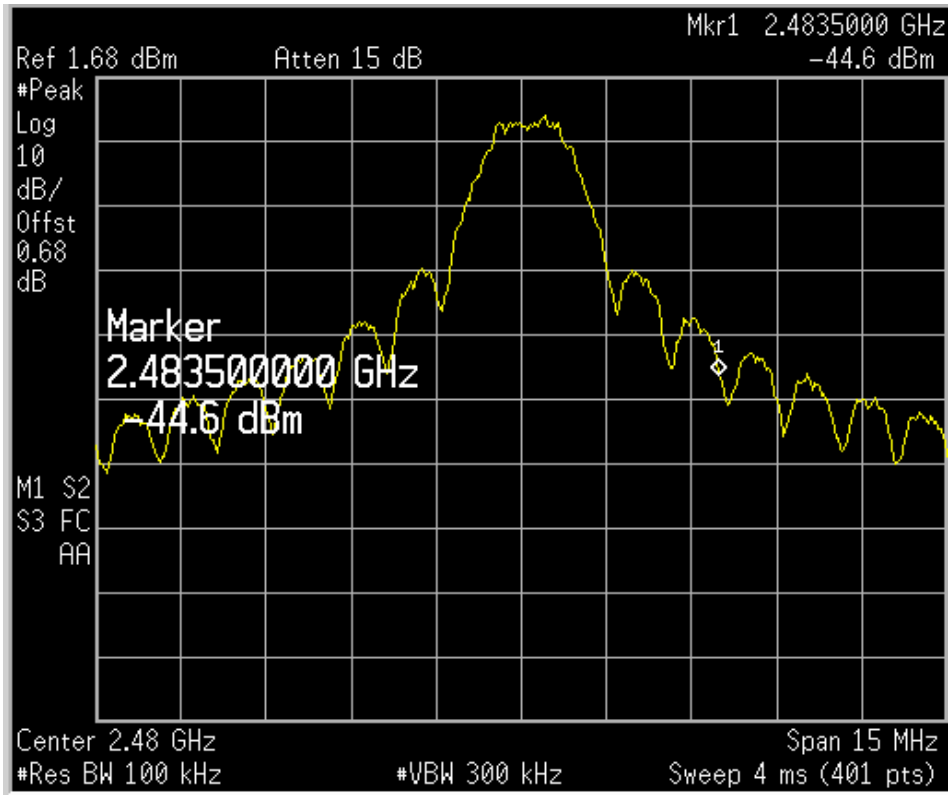
Channel Frequency 2480 MHz

Antenna 2

Channel	Fundamental Frequency (MHz)	Fundamental PSD (dBm)	Value at Band Edge		Relative Difference (dBc)	Limit (dBc)
			Frequency (MHz)	Value (dBm)		
Low	2405	-12.74	2400.00	-45.32	-32.58	-20
High	2480	-13.33	2483.50	-44.60	-31.27	-20



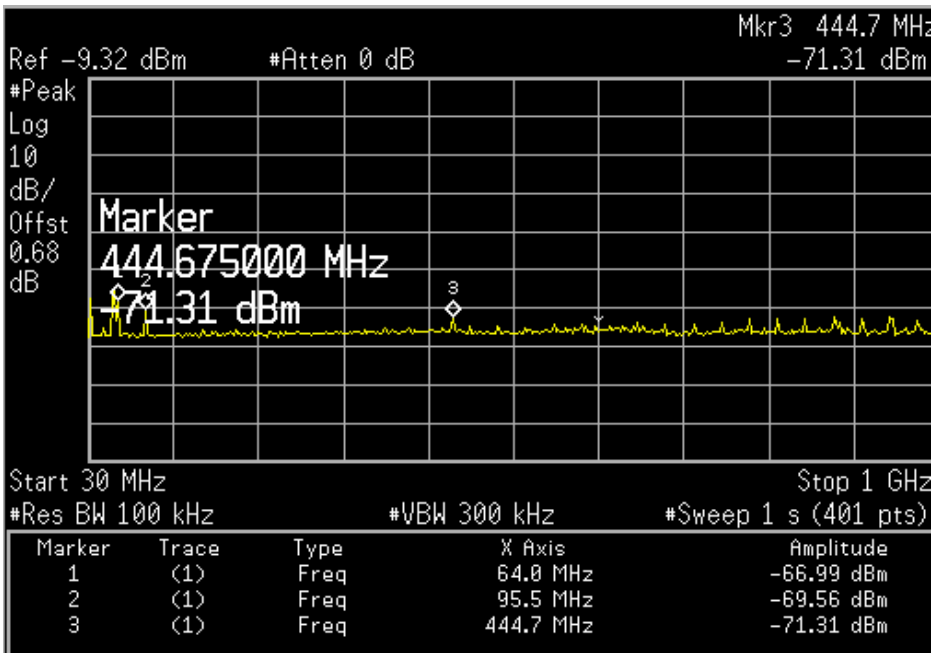
Channel Frequency 2405 MHz

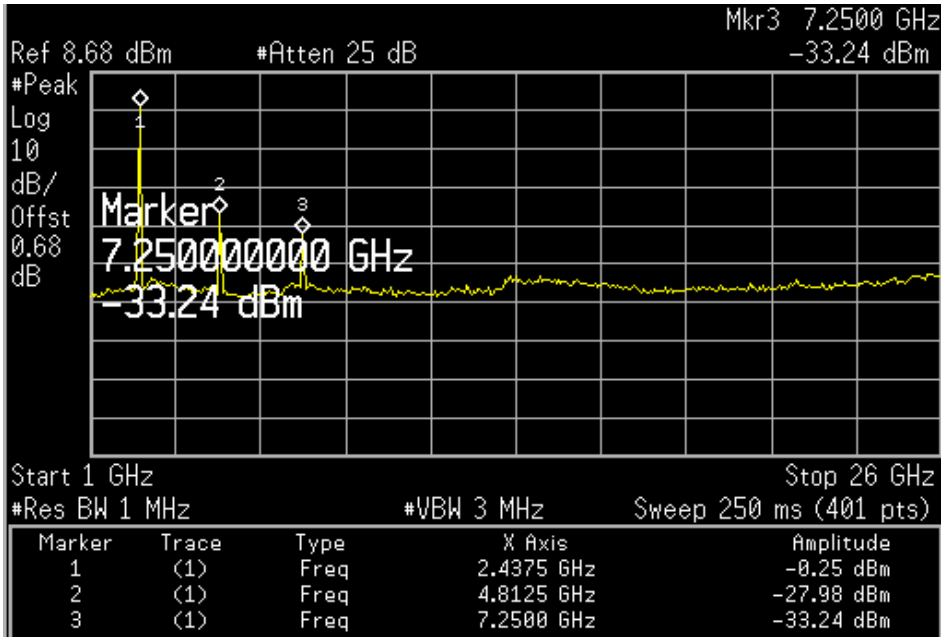


Channel Frequency 2480 MHz

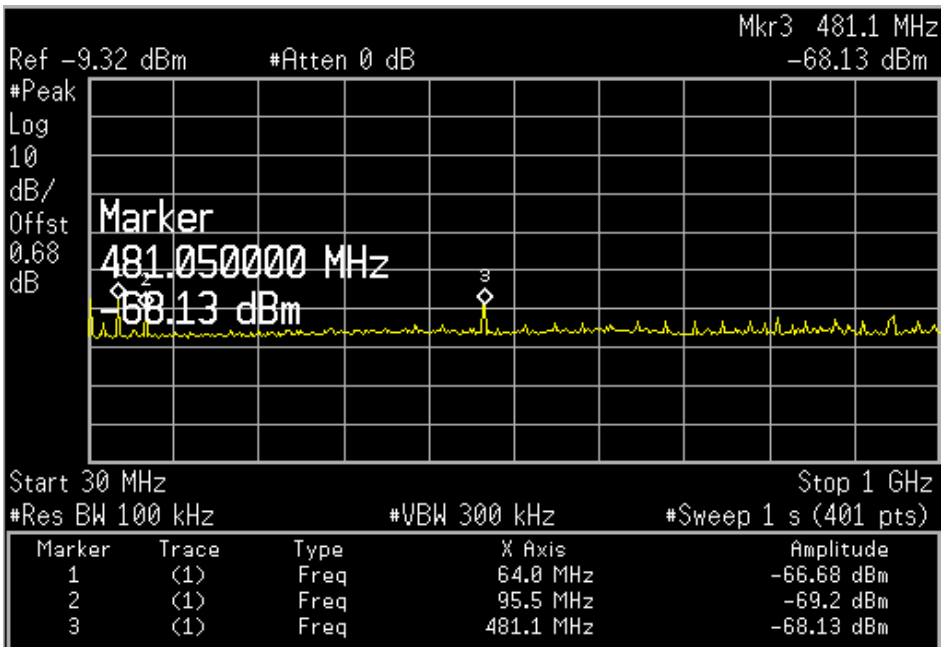
Conducted Spurious Emission:

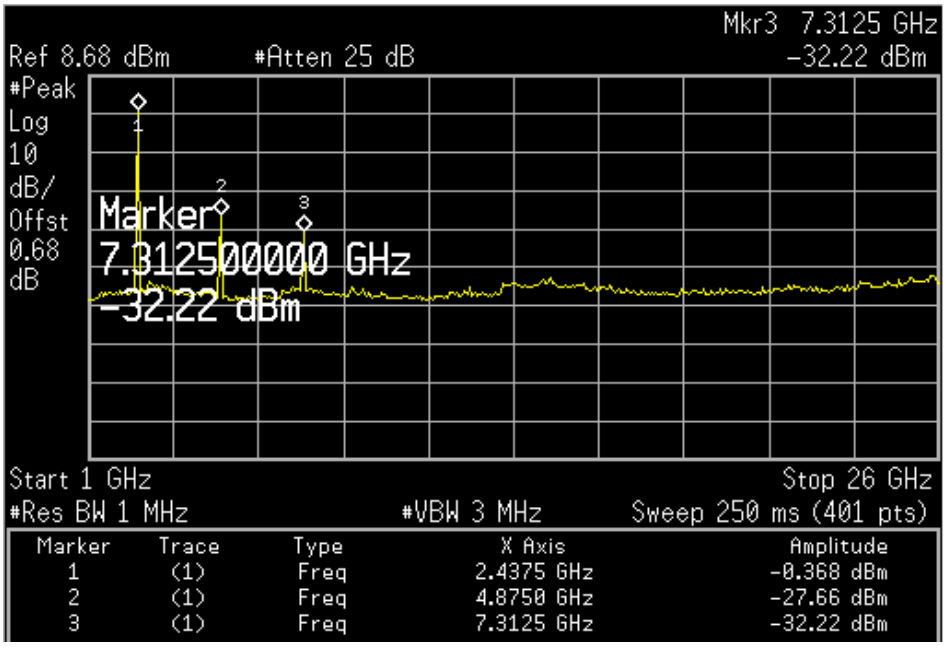
Antenna 1:



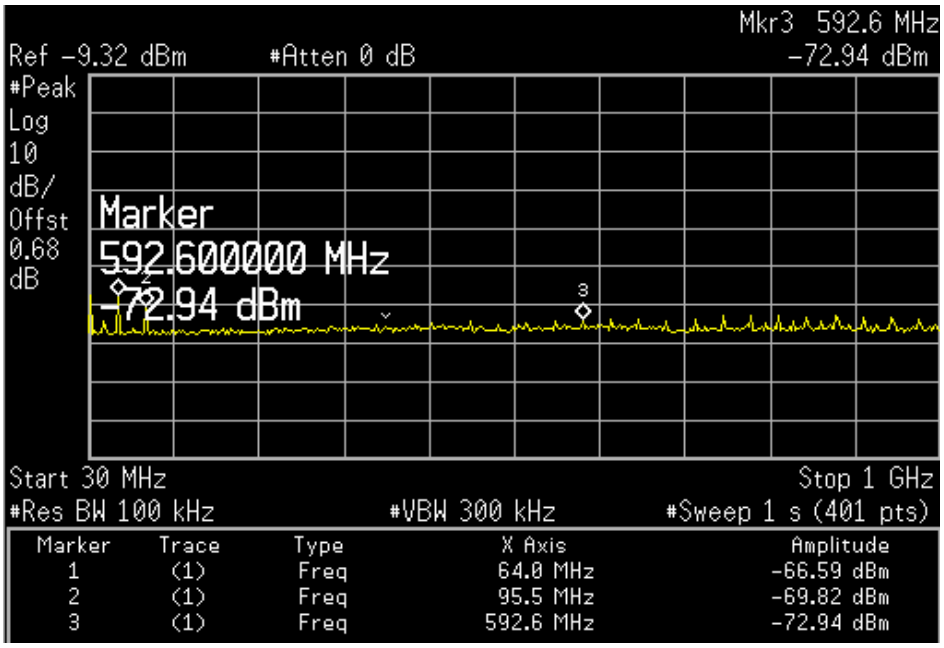


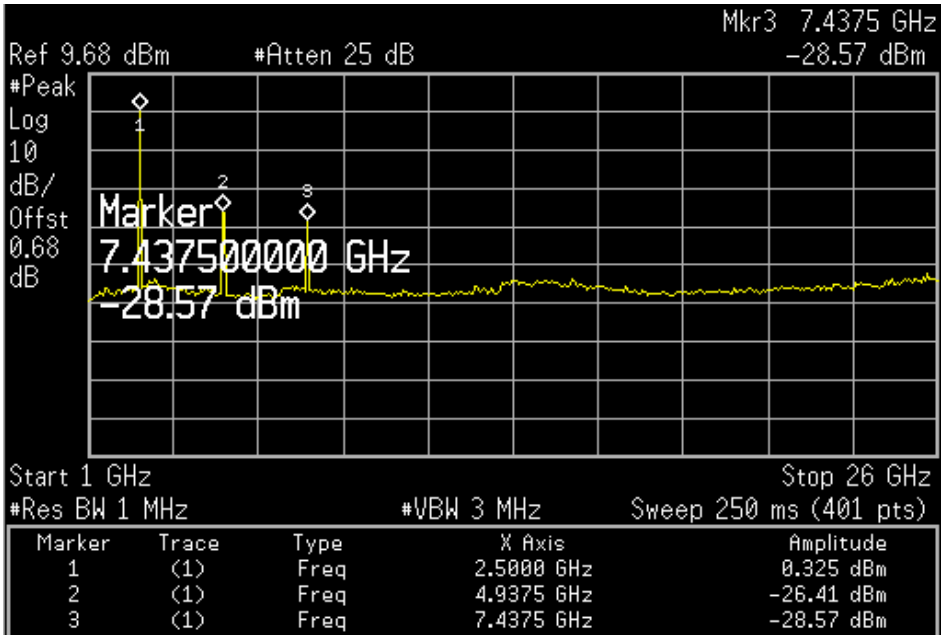
Channel Frequency Low





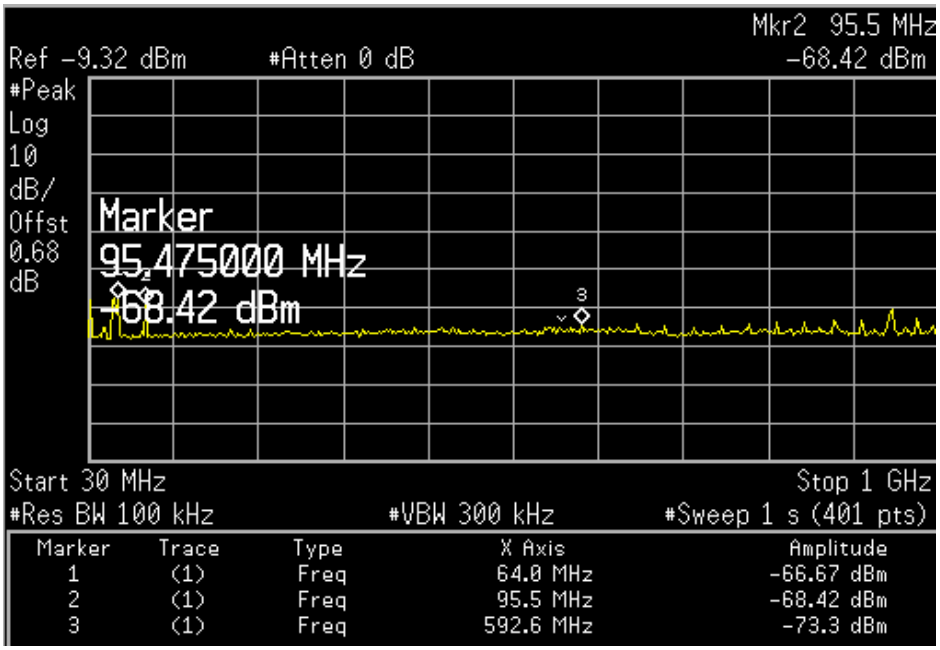
Channel Frequency mid

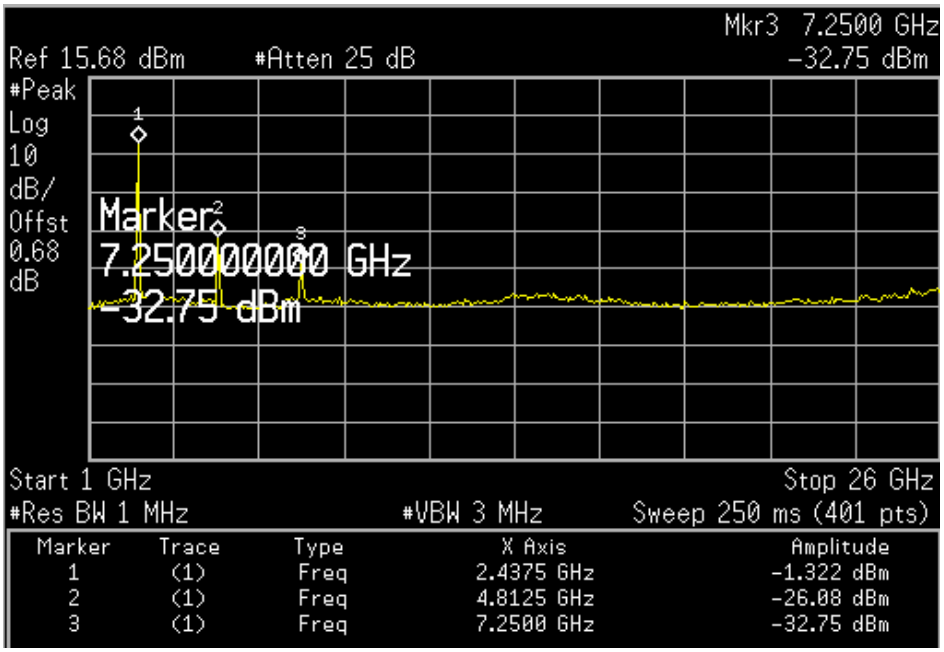




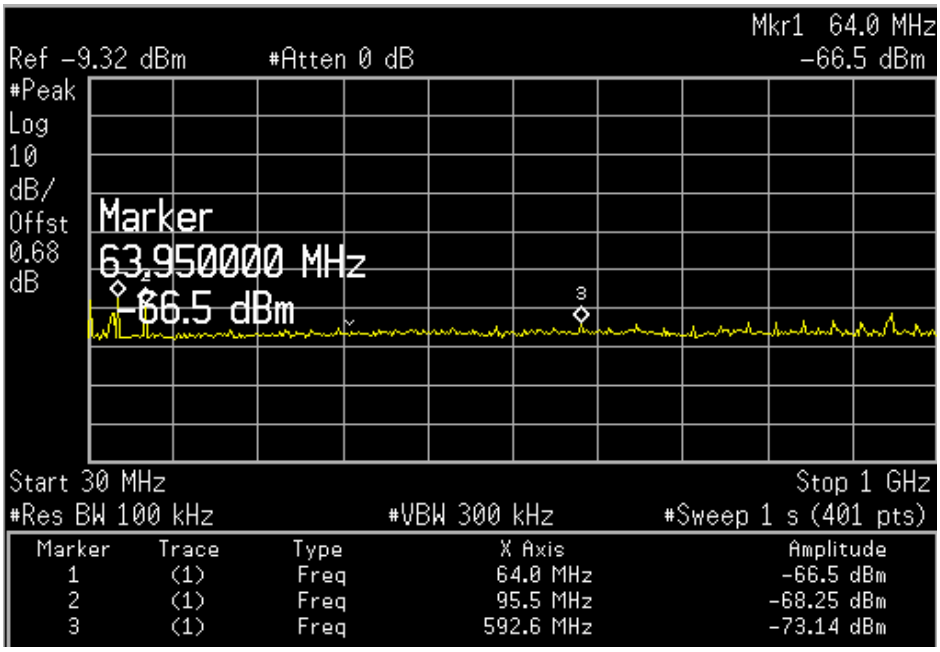
Channel Frequency High

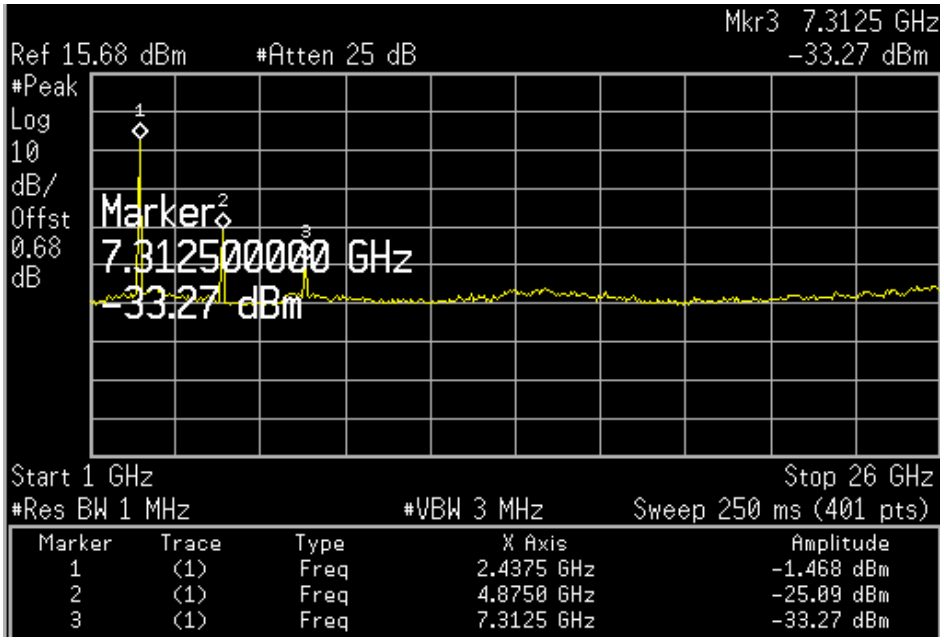
Antenna 2:



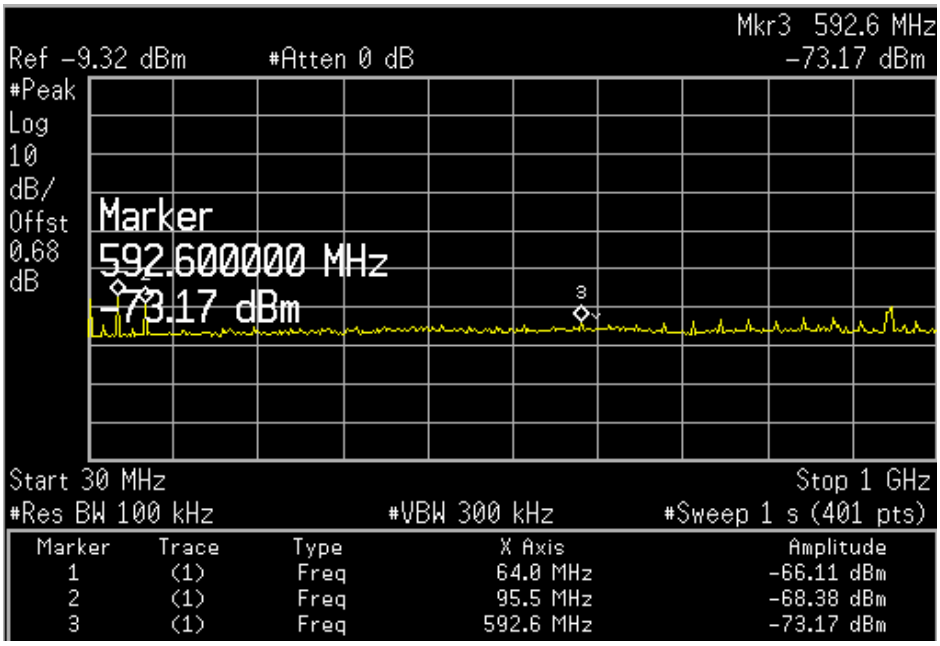


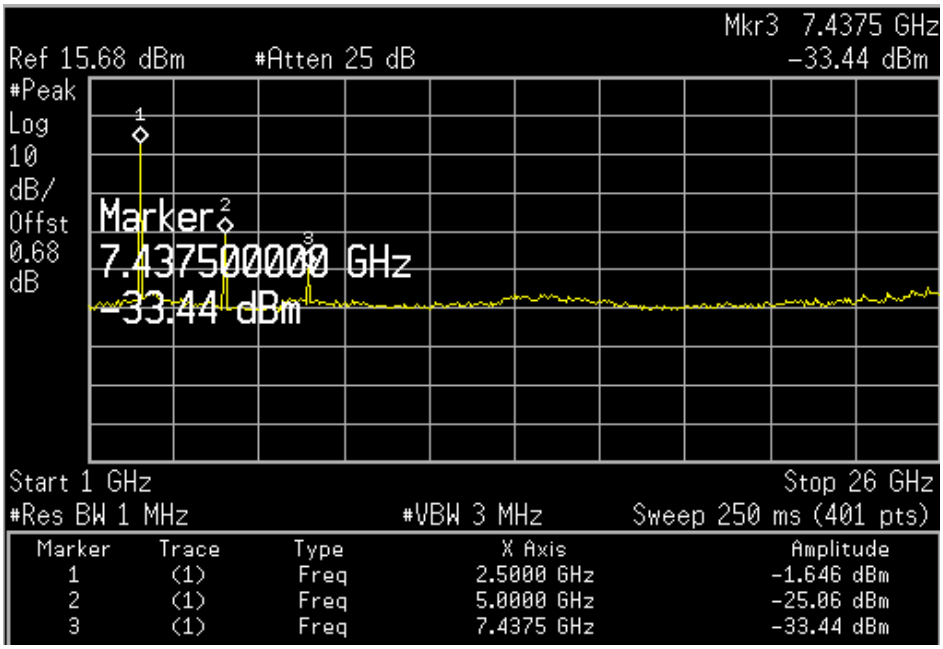
Channel Frequency Low





Channel Frequency Mid





Channel Frequency High

Spurious Radiated Emissions **Section 15.209/15.205**

Result **Pass**

Test Specification	FCC Part 15 Subpart C
Test Method	ANSI C63.4-2003
Measurement Location	Semi Anechoic Chamber
Measuring Distance	3m
Detection	QP for frequency below 1GHz, 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.

Test Results:

Frequency (MHz)	Antenna Polarization	Spurious Emission (MHz)	Field Strength (dBµV/m)	Limit (dBµV/m)	Margin (dB)
2405	V	60.00	30.29	40.00	-09.71
		63.90	34.68	40.00	-05.32
		90.24	28.64	43.50	-14.86
		144.25	32.50	43.50	-11.00
		201.41	31.05	43.50	-12.45
		487.68	32.14	46.00	-13.86
		2390.00 (P)	29.51	74.00	-44.49
		2390.00 (Av)	17.46	54.00	-36.54
		2405.00 (P)	80.69	*	-
		2405.00 (Av)	76.87	*	-
		4811.00 (P)	50.52	74.00	-23.48
		4811.00 (Av)	43.62	54.00	-10.38
		7216.00 (P)	51.37	74.00	-22.63
		7216.00 (Av)	44.20	54.00	-09.80
	H	47.85	25.34	40.00	-14.66
		144.00	39.10	43.50	-04.40
		254.24	29.65	46.00	-16.35
		491.00	32.88	46.00	-13.12
		2390.00 (P)	29.93	74.00	-44.07
		2390.00 (Av)	17.47	54.00	-36.53
		2405.00 (P)	93.65	*	-
		2405.00 (Av)	81.46	*	-
		4811.00 (P)	51.00	74.00	-23.00
		4811.00 (Av)	43.62	54.00	-10.38
		7216.00 (P)	50.41	74.00	-23.59
		7216.00 (Av)	43.82	54.00	-10.18
2440	V	60.00	29.29	40.00	-10.71
		63.90	31.68	40.00	-08.32
		90.24	28.64	43.50	-14.86
		144.25	32.50	43.50	-11.00
		248.41	26.85	46.00	-19.15
		2440.00 (P)	88.61	*	-
		2440.00 (Av)	77.65	*	-
		4880.00 (P)	52.67	74.00	-21.33
		4800.00 (Av)	44.43	54.00	-09.57
		7320.00 (P)	51.64	74.00	-22.36
		7320.00 (Av)	43.85	54.00	-10.15
	H	47.85	25.34	40.00	-14.66
		144.00	39.10	43.50	-04.40
		254.24	29.65	46.00	-16.35
		2440.00 (P)	91.68	*	-
		2440.00 (Av)	78.85	*	-
		4880.00 (P)	51.33	74.00	-22.67
		4800.00 (Av)	42.35	54.00	-11.65
		7320.00 (P)	50.65	74.00	-23.35
		7320.00 (Av)	43.81	54.00	-10.19
2480	V	33.45	33.45	40.00	-06.55
		47.90	37.35	40.00	-02.65
		51.95	33.31	40.00	-06.69
		60.00	35.14	40.00	-04.86
		144.20	34.12	43.50	-09.38

		221.63	24.62	46.00	-21.38
		487.52	31.20	46.00	-14.80
		2481.00 (P)	81.49	*	-
		2481.00 (Av)	75.95	*	-
		2483.50 (P)	29.73	74.00	-44.27
		2483.50 (Av)	17.54	54.00	-36.46
		4958.00 (P)	46.18	74.00	-27.82
		4968.00 (Av)	35.13	54.00	-18.87
		7438.00 (P)	52.14	74.00	-21.86
		7438.00 (Av)	39.74	54.00	-14.26
	H	144.00	37.64	43.50	-5.86
		201.35	30.20	43.50	-13.30
		241.87	28.65	46.00	-17.35
		493.65	31.41	46.00	-14.59
		2481.00 (P)	95.94	*	-
		2481.00 (Av)	89.59	*	-
		2483.50 (P)	32.47	74.00	-41.53
		2483.50 (Av)	23.46	54.00	-30.54
		4958.00 (P)	45.28	74.00	-28.72
		4968.00 (Av)	32.95	54.00	-21.05
		7438.00 (P)	53.16	74.00	-20.84
		7438.00 (Av)	40.18	54.00	-13.82

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