

Produkte
 Products

Prüfbericht - Nr.: 19660130 001		Seite 386318 1 von 25	
<i>Test Report No.:</i>		<i>Page 1 of 25</i>	
Auftraggeber: <i>Client:</i>		Cypress Semiconductor 12230 World Trade Drive #200 San Diego, CA 92128 United States	
Gegenstand der Prüfung: <i>Test item:</i>		PSoC 4 BLE Module with BLE Pioneer Baseboard	
Bezeichnung: <i>Identification:</i>	CY8CKIT-142 PSoC 4 BLE Module	Serien-Nr.: <i>Serial No.</i>	Engineering Sample
Wareneingangs-Nr.: <i>Receipt No.:</i>	1803050066	Eingangsdatum: <i>Date of receipt:</i>	06.11.2014
Prüfört: <i>Testing location:</i>		Refer Page 4 of 25 for test facilities	
Prüfgrundlage: <i>Test specification:</i>		FCC Part 15, Subpart C	
Prüfergebnis: <i>Test Result:</i>		Der Prüfgegenstand entspricht oben genannter Prüfgrundlage(n). <i>The test items passed the test specification(s).</i>	
Prüflaboratorium: <i>Testing Laboratory:</i>		TÜV Rheinland (India) Pvt. Ltd. 82/A, 3rd Main, West Wing, Electronic City Phase 1 Hosur Road, Bangalore – 560 100. India FCC Registration No.: 176555; IC Assigned Code: 3466E	
geprüft / tested by:		kontrolliert / reviewed by:	
21.11.2014	Saibaba Siddapur Sr. Engineer	03.12.2014	Raghavendra Kulkarni Sr. Manager
Datum <i>Date</i>	Name/Stellung <i>Name/Position</i>	Unterschrift <i>Signature</i>	Unterschrift <i>Signature</i>
Sonstiges / Other Aspects: FCC ID : WAP-CY8CKIT-142			
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	
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. <i>This test report 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 safety mark on this or similar products.</i>			

Test Result Summary

Clause	Test Item	Result
FCC 15.247(b) (3)	Maximum Conducted Peak Output Power	Pass
FCC 15.247(a) (2)	DTS (6dB) Bandwidth	Pass
FCC 15.247(e)	Power Spectral Density	Pass
FCC 15.247(d)	Band-edge compliance	Pass
FCC 15.209 / FCC 15.205	Spurious Radiated Emissions and Restricted Bands of Operation	Pass
FCC 15.207	Conducted Emissions on A.C Power lines	Pass

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List of Test and Measurement Instruments**TÜV Rheinland (India) Pvt. Ltd, Bangalore**

Equipment	Manufacturer	Model	S/N	Calibration Due Date
Spectrum Analyser	Agilent Technologies	E4407B	US41192772	27-March-15

TÜV Rheinland (Taiwan) Ltd, Taipei City

Equipment	Manufacturer	Model	S/N	Calibration Due Date
EMI Test Receiver	R&S	ESR7	101062	30-Aug-15
Bilog Antenna	TESEQ	CBL6111D	29802	4-Jul-15
Spectrum Analyzer	R&S	FSV 40	100921	9-Dec-14
Spectrum Analyzer	Agilent	N9010A	MY53470241	19-Jan-15
Horn Antenna	ETS-Lindgren	3117	138160	10-Jan-15
Horn Antenna (18GHz~40GHz)	COM-POWER	AH840	101031	29-Oct-15
Preamplifier (30MHz -1GHz)	HP	8447F	2805A03335	22-Aug-15
Preamplifier (18 GHz -40 GHz)	COM-POWER	PAM-840	461257	25-Aug-15
Pre-Amplifier (1GHz~18GHz)	EM Electronics	EM30180	60558	3-Nov-15
Loop Antenna	Schwarzbeck	FMZB 1513	1513-076	21-Oct-15
EMI Test Receiver	R&S	ESCI7	100797	23-Dec-14
LISN (1 phase)	R&S	ENV216	101243	30-May-15
LISN	Rolf Heine	NNB-2/16Z	99080	25-Aug-15

Testing Facilities:

- 1) TÜV Rheinland (India) Private Limited
No. 108, West Wing
Electronic city Phase I
Bangalore – 560100
- 2) TÜV Rheinland Taiwan Ltd.
11F., No. 758, Sec. 4, Bade Rd., Songshan Dist.,
Taipei City 105, Taiwan, R.O.C.

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General Product Information

Product Function and Intended Use

The EUT CY8CKIT-042-BLE kit enables customers to evaluate and develop Bluetooth Low Energy projects using the PSoC 4 BLE and PRoC BLE devices. CY5670 CySmart USB Dongle is used to build communication with CY8CKIT-142 PSoC 4 BLE Module or CY5671 PRoC BLE Module. The EUT is used for demonstration and evaluation of PSoC 4 BLE and PRoC BLE devices

Ratings and System Details

Operating Frequency	2400 – 2483.5MHz
No. of channel	40
Channel Spacing	2 MHz
Modulation	GFSK
Transmitted Power	0.702 dBm
Data Rate	1 Mbps
Antenna Type	PCB antenna (Meandered Inverted-F Antenna (MIFA))
Number of antenna	One
Antenna Gain	1.6dBi
Supply Voltage	5VDC (Power from USB Adaptor)
Environmental	-20 degrees to +70 degrees C

Test Conditions:

Voltage: 5V DC (Power from USB adaptor)

Environmental conditions:

Temperature: +23 °C **RH:** 62%

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Test Set-up and Operation Mode

Principle of Configuration Selection

Transmission was enabled with highest possible duty cycle on low, mid and high channel.

Test Operation and Test Software

Test software (Cypress PSoC Programmer 3.21) was used to Program the EUTS with Highest possible power and Low, mid and High Channel in 2.4 GHz band on the EUT for the tests in this report.

Special Accessories and Auxiliary Equipment

- None

Countermeasures to achieve EMC Compliance

- None

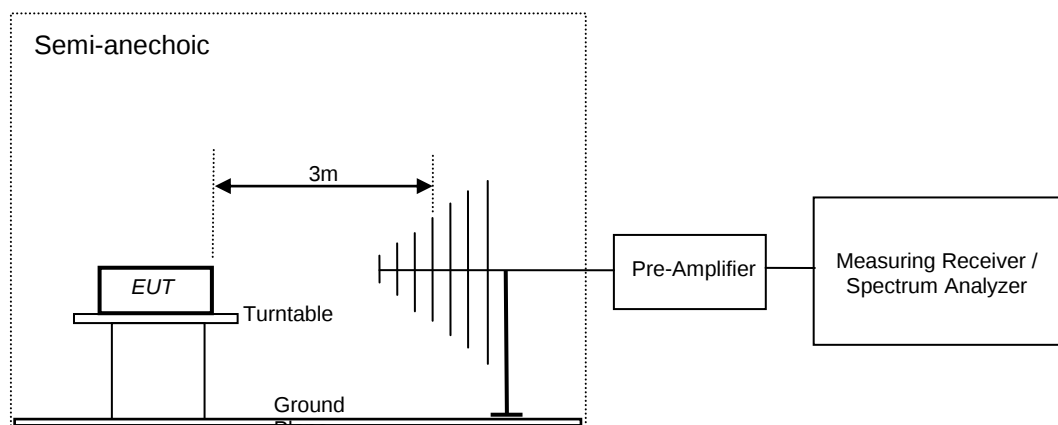
Table of frequencies

Frequency Band	Frequency (MHz)
2400 – 2483.5 MHz	2402
	2404
	2406
	;
	:
	:
	2440
	2442
	2444
	;
	:
	:
	2478
	2480

Test Methodology

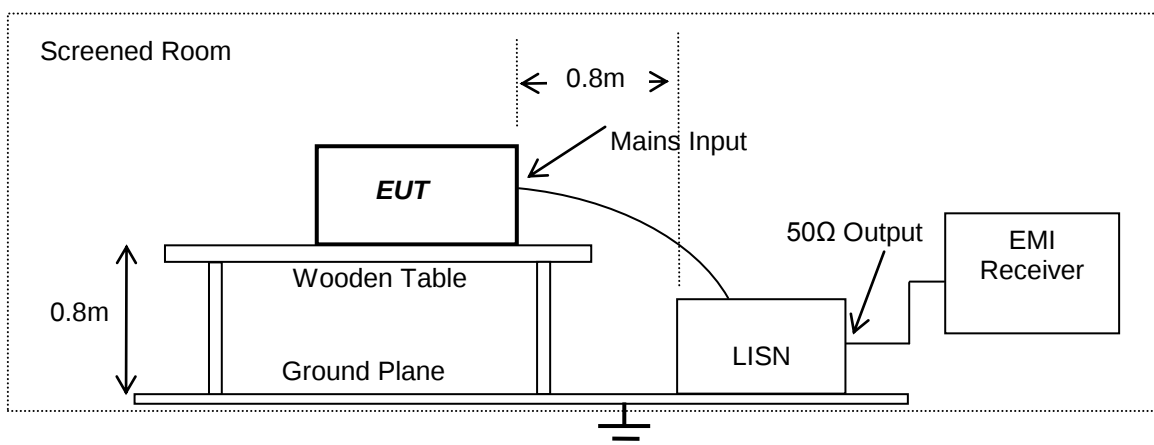
Radiated Emission Test

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.



Conducted Emission Test on A.C. mains line

The equipment under test (EUT) was placed on a wooden table 80cm above the ground plane, the LISN was placed 80cm away from the EUT. The test was performed in accordance with ANSI C63.4: 2003, with the following: an initial measurement was performed in peak and average detection mode on the live and neutral lines. The pre-scan was performed by peak detection on both live and neutral conductors. Any emissions recorded within 20dB of the relevant limit line were re-measured using quasi-peak and average detections, the 6 worst cases were recorded in the table of results.



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Test Results

Maximum Conducted Peak Output Power

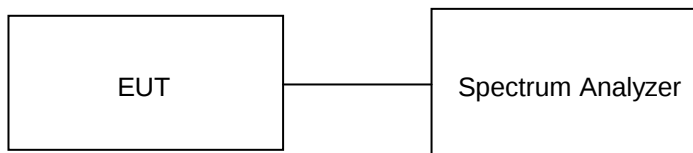
Section 15.247(b) (3)

Result

Pass

Test Specification	FCC Part 15 Subpart C
Measurement Bandwidth (RBW)	1 MHz
Detector	Peak
Requirement	<1 watt (30dBm).

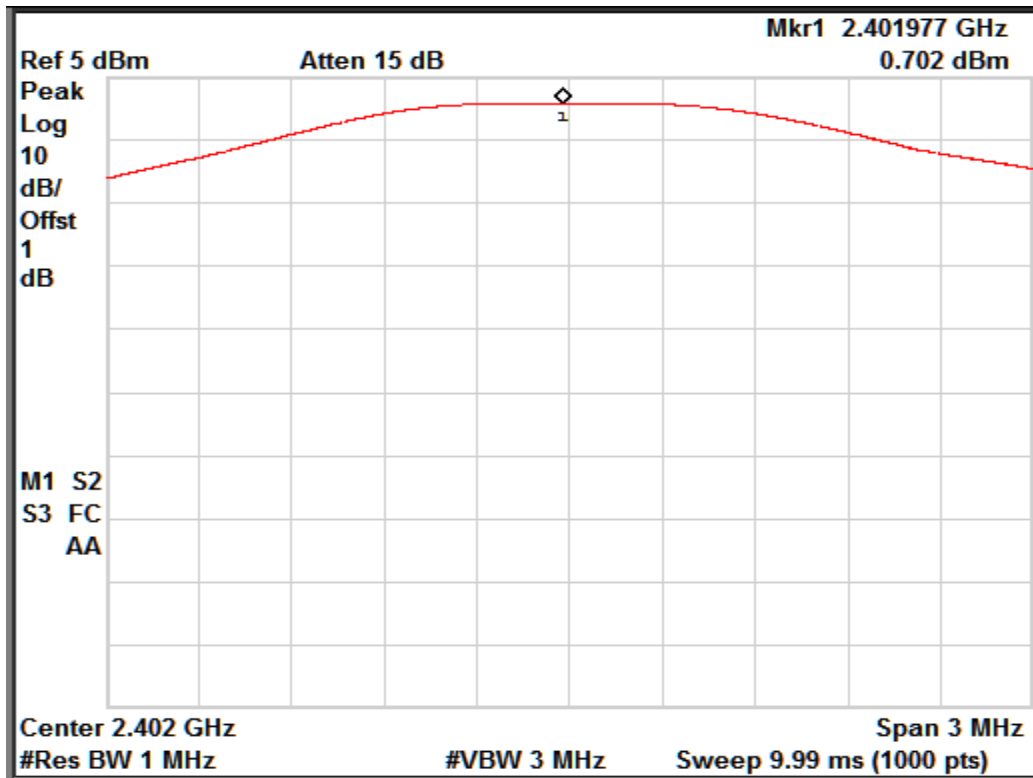
Test Method:



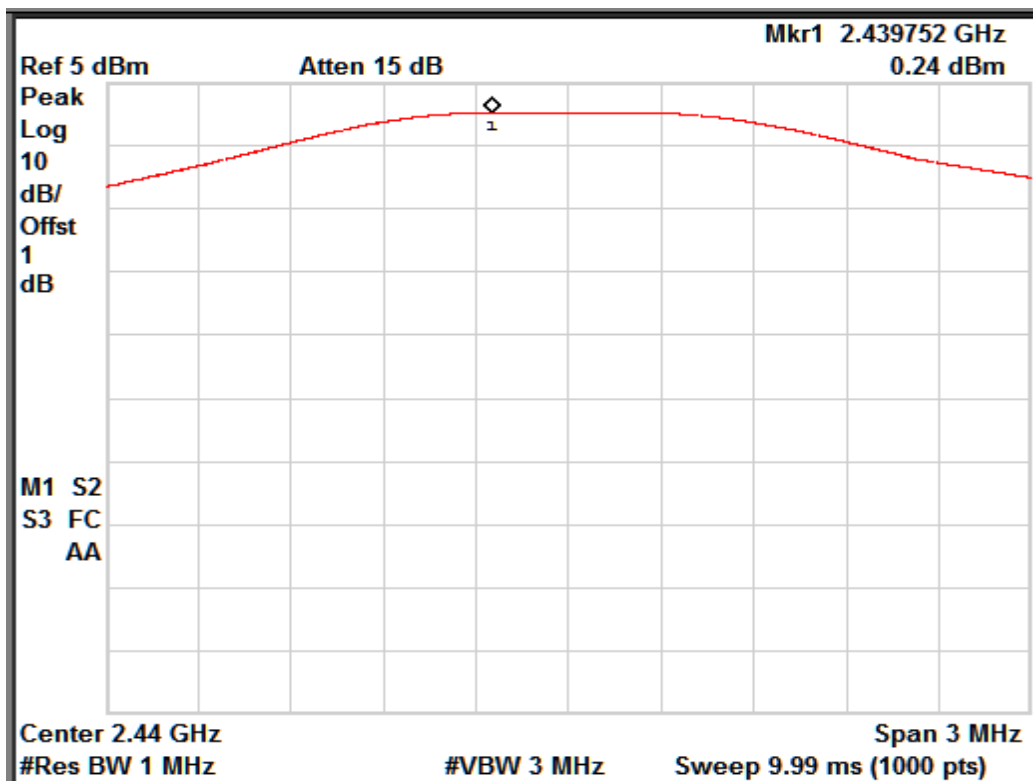
Cable Loss: 1dB (Included in the test results)

Test Result:

Frequency (MHz)	Total Output power (dBm)	Limit (dBm)
2402	0.702	30.00
2440	0.240	30.00
2480	0.086	30.00

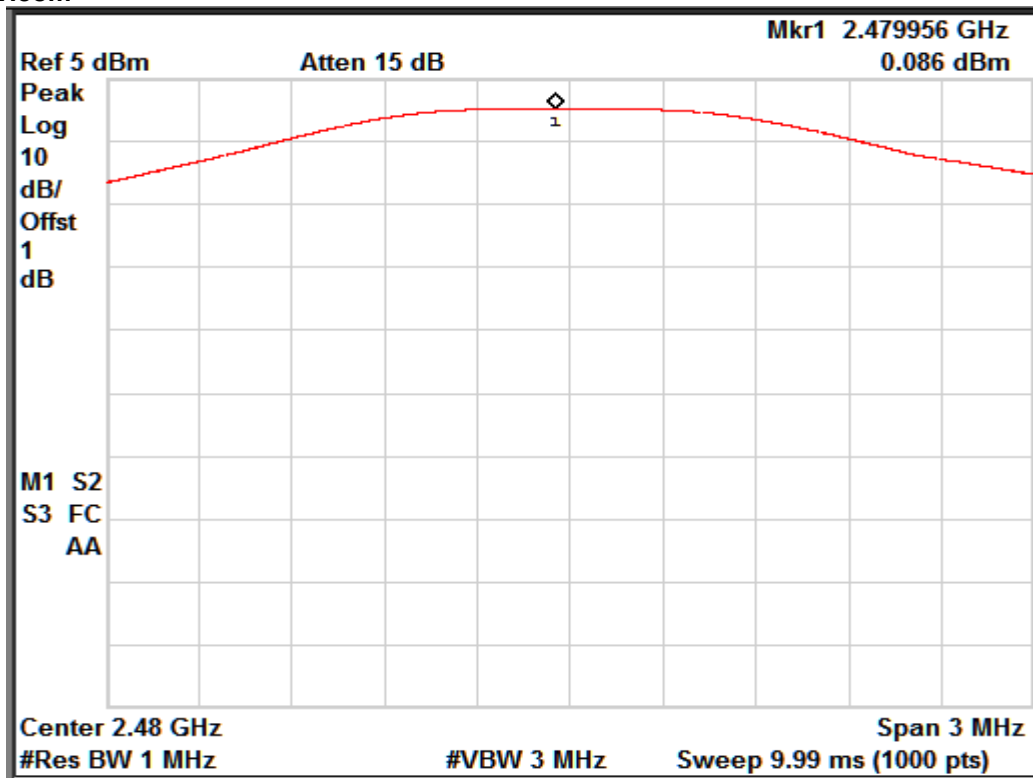


Channel Frequency: 2402 MHz



Channel Frequency: 2440 MHz

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Channel Frequency: 2480 MHz

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Power Spectral Density

Section 15.247(e)

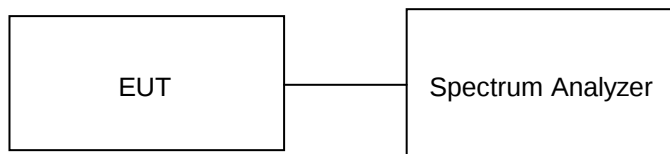
Result

Pass

Test Specification
Detector Function
Requirement

FCC Part 15 Subpart C
Peak
For digitally modulated systems, the power spectral density conducted from the intentional radiator to the antenna shall not be greater than 8 dBm.

Test Method:

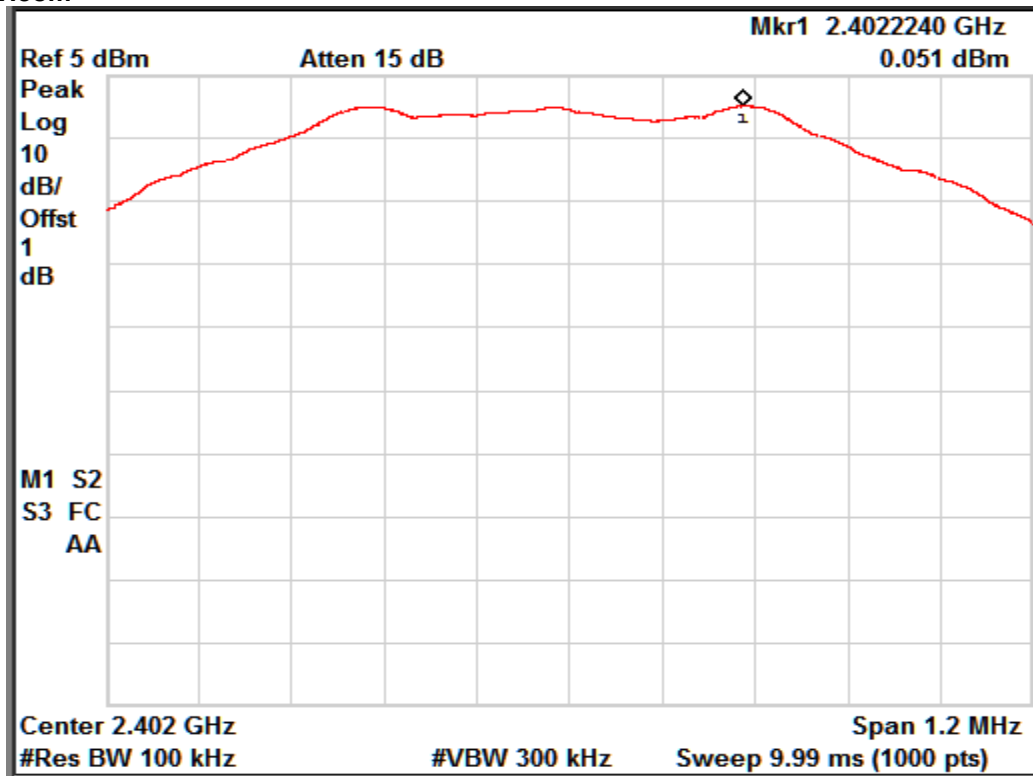


Cable Loss: 1dB (Included in the test results)

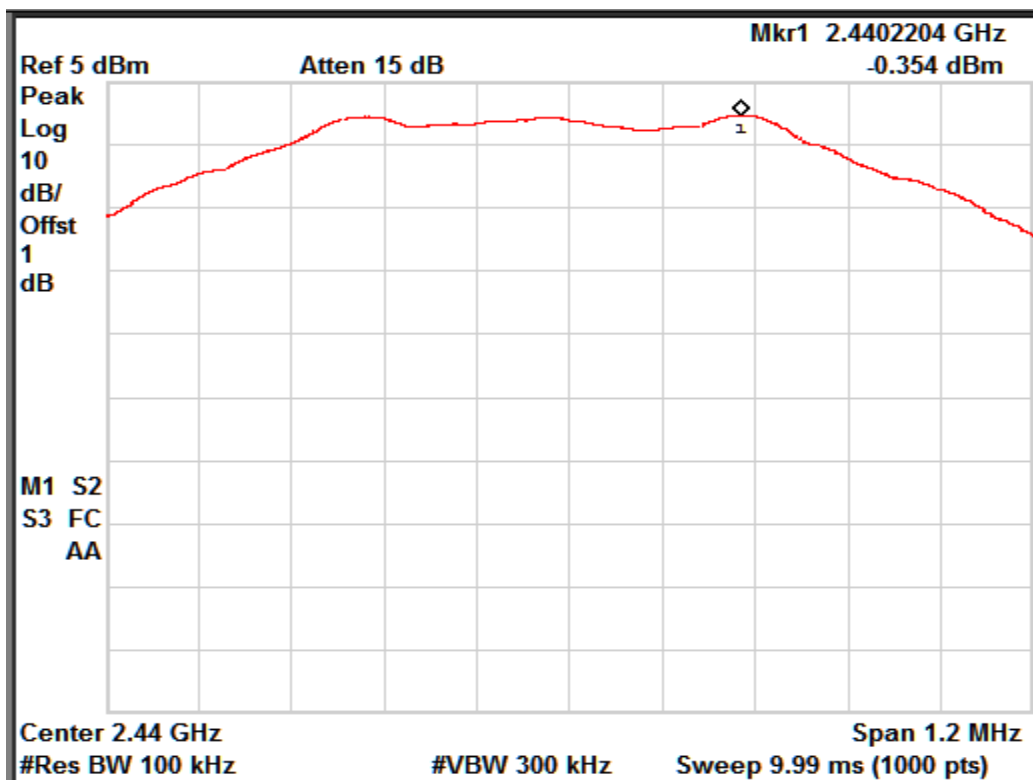
Test Result:

Frequency (MHz)	Total PSD (dBm)	Limit (dBm)
2402	0.051	8
2440	-0.354	8
2480	-0.617	8

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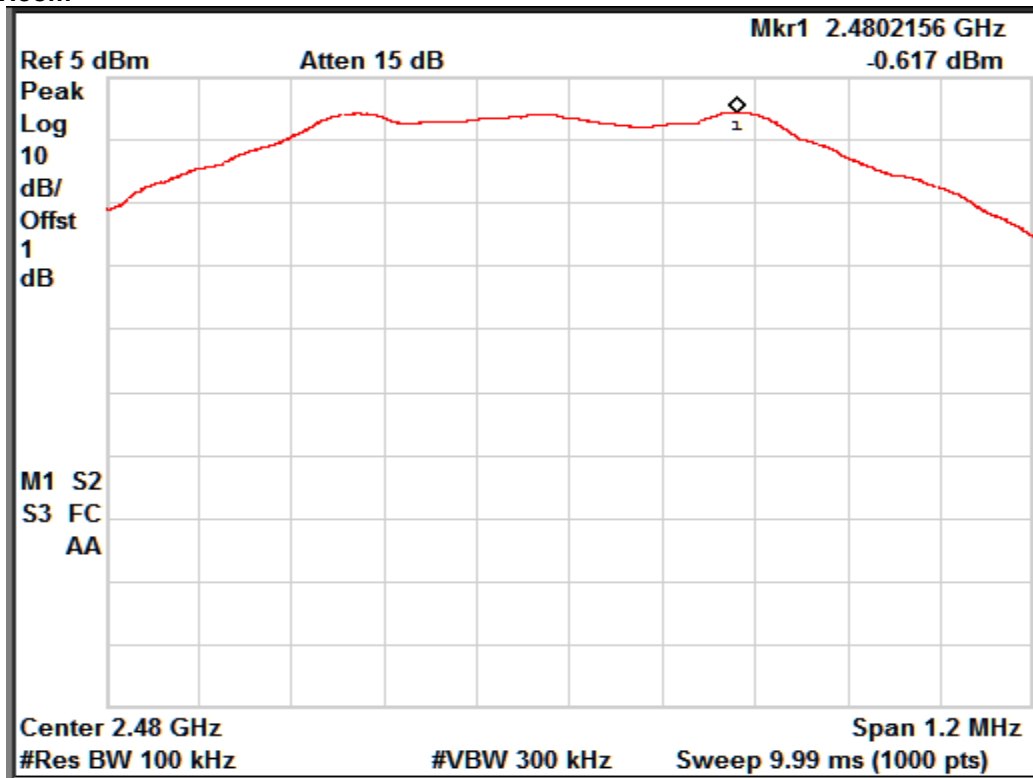


Channel Frequency: 2402 MHz



Channel Frequency: 2440 MHz

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Channel Frequency: 2480 MHz

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6 dB Bandwidth

Section 15.247(a) (2)

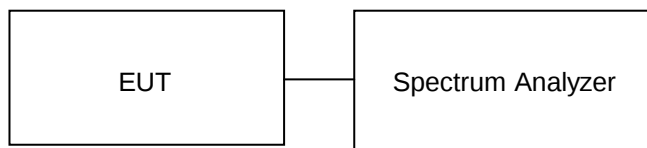
Result

Pass

Test Specification
Requirement

FCC Part 15 Subpart C
The minimum 6 dB bandwidth shall be at least 500 kHz.

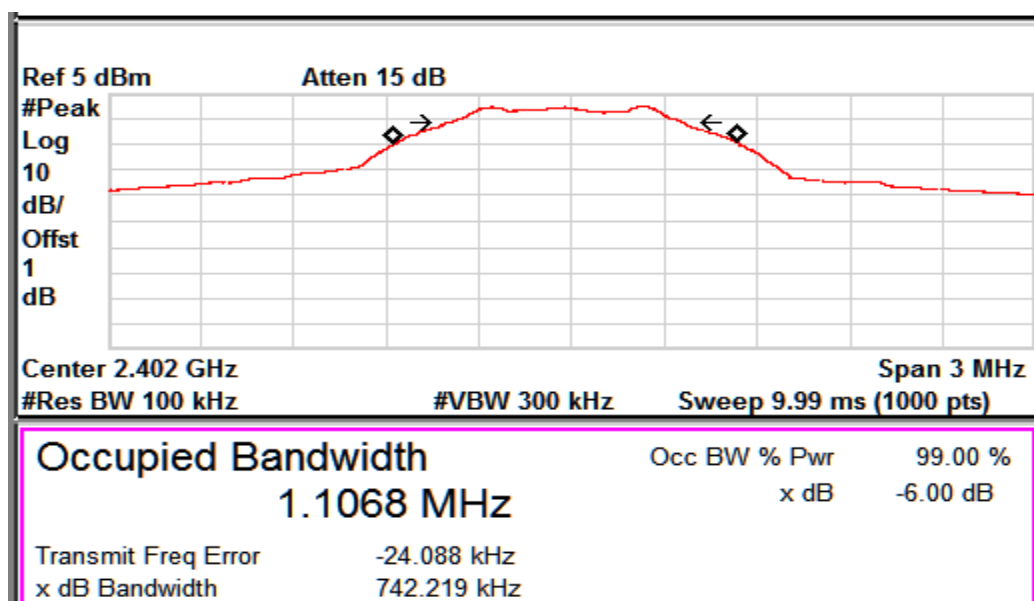
Test Method:



Cable Loss: 1dB (Included in the test results)

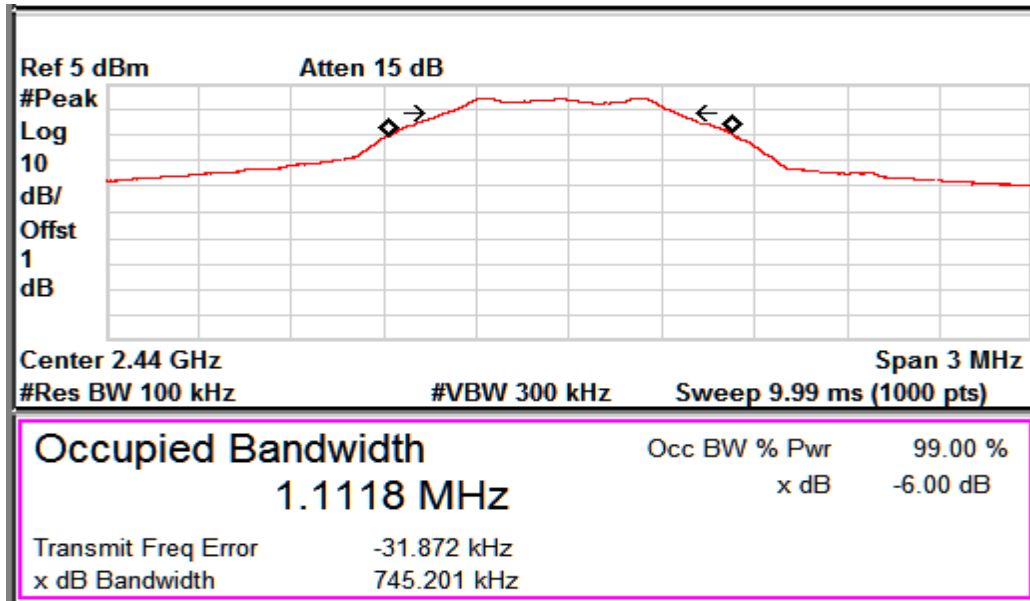
Test Result:

Frequency (MHz)	6 dB Bandwidth (MHz)	OBW (MHz)
2402	0.742219	1.1068
2440	0.745201	1.111
2480	0.752730	1.112

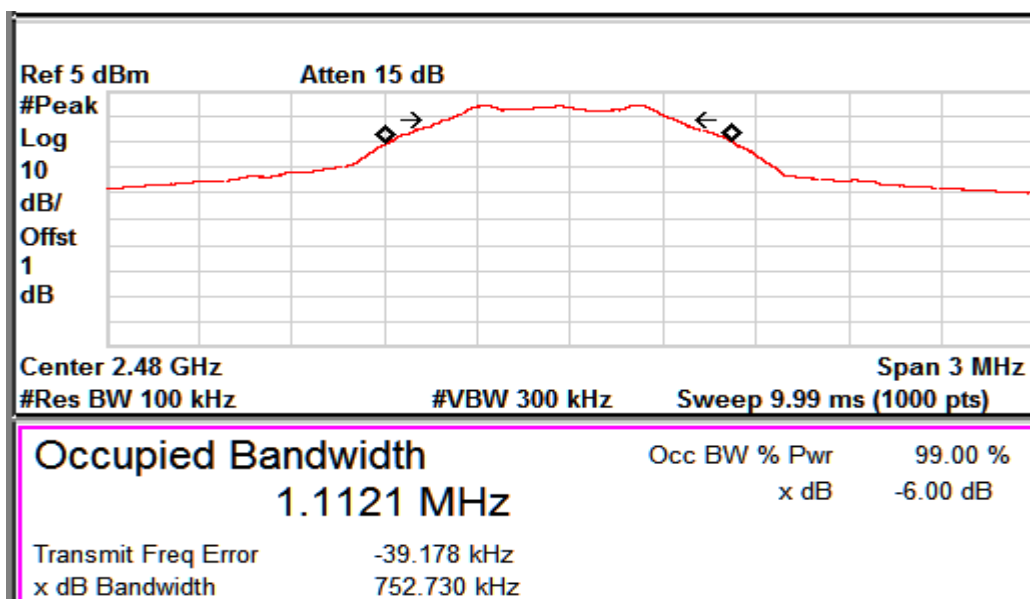


6dB BW and OBW: Channel frequency: 2402 MHz

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6dB BW and OBW: Channel frequency: 2440 MHz



6dB BW and OBW: Channel frequency: 2480 MHz

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Band-edge Compliance

Section 15.247(d)

Result

Pass

Test Specification

FCC Part 15 Subpart C

Detector Function

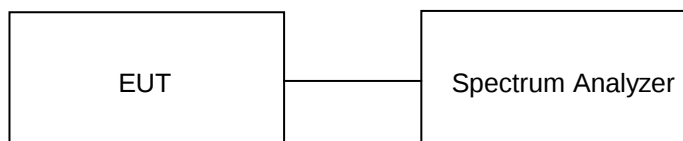
Peak

Requirement

If the peak output power procedure is used to measure the fundamental emission power to demonstrate compliance to **15.247(b)(3)** requirements, then the peak conducted output power measured within any 100 kHz outside the authorized frequency band shall be attenuated by at least 20 dB relative to the maximum measured in-band peak PSD level.

If the average output power procedure is used to measure the fundamental emission power to demonstrate compliance to 15.247(b)(3) requirements, then the power in any 100 kHz outside of the authorized frequency band shall be attenuated by at least 30 dB relative to the maximum measured in-band average PSD level.

Test Method:



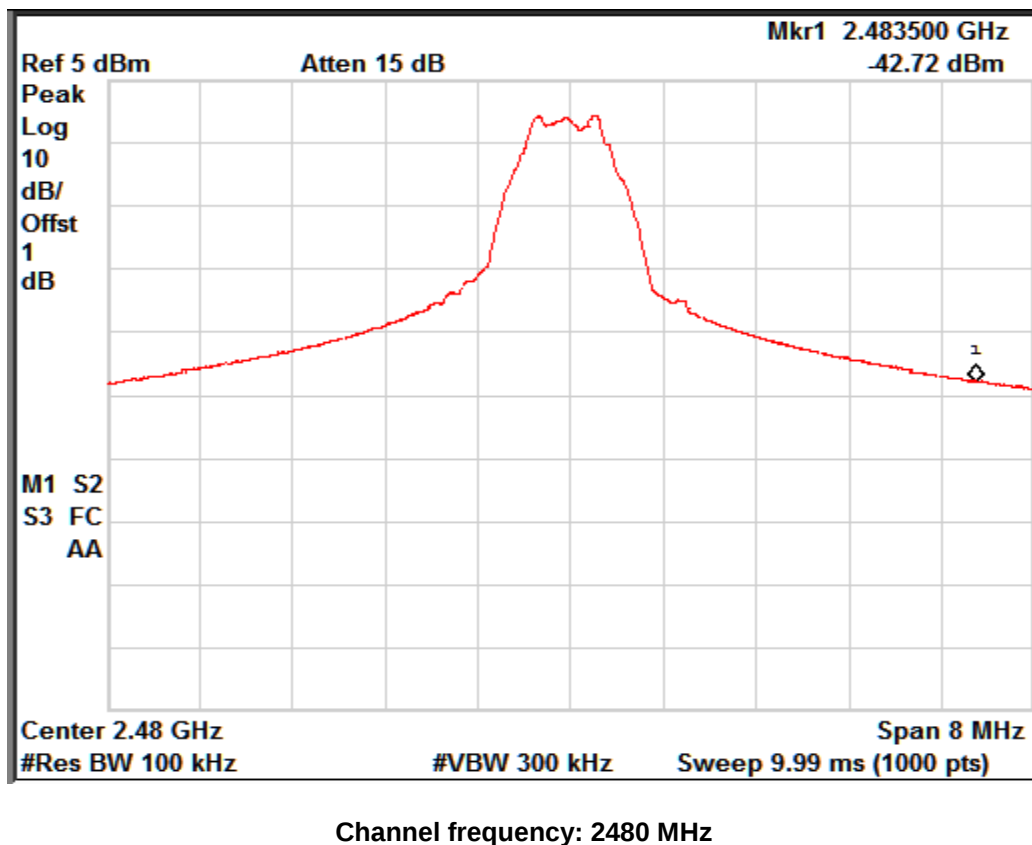
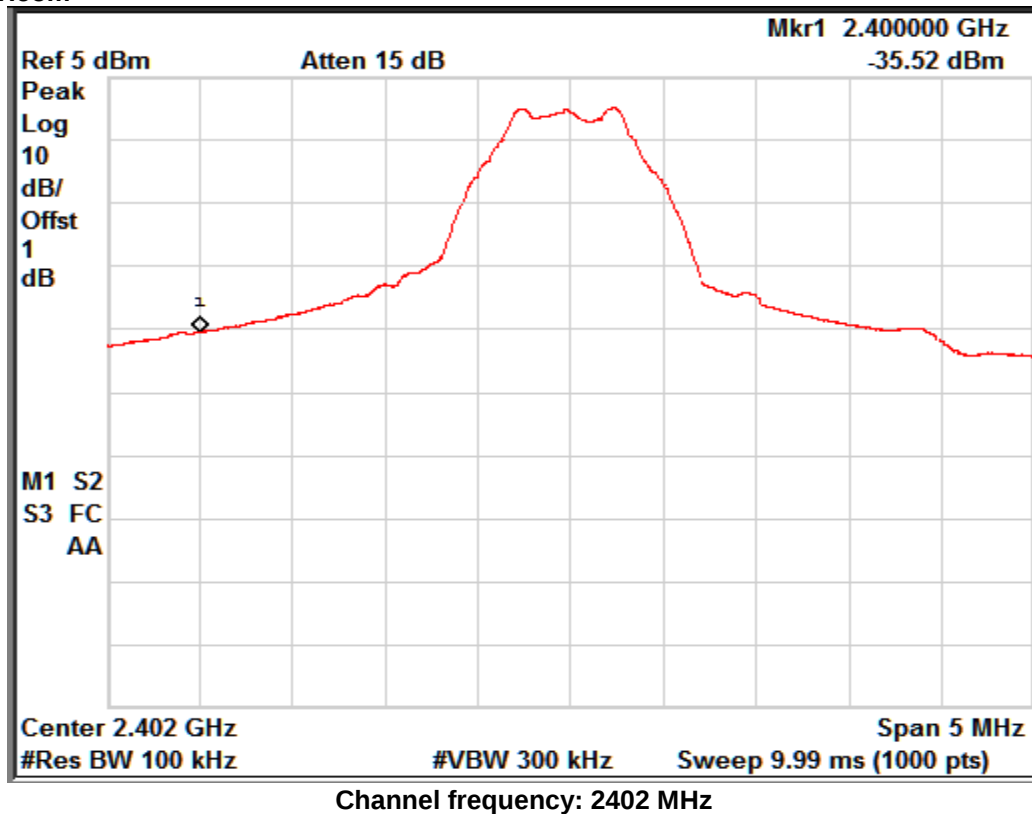
Cable Loss: 1dB (Included in the test results)

Test Result:

Channel Frequency (MHz)	Value at Band Edge				Limit (dB)
	Band Edge Frequency (MHz)	Measured PSD Level*	Band Edge Value (dBm)	Value (dB)	
2402	2400	0.051	-35.52	-35.57	-20.00
2480	2483.5	-0.617	-42.72	-42.10	-20.00

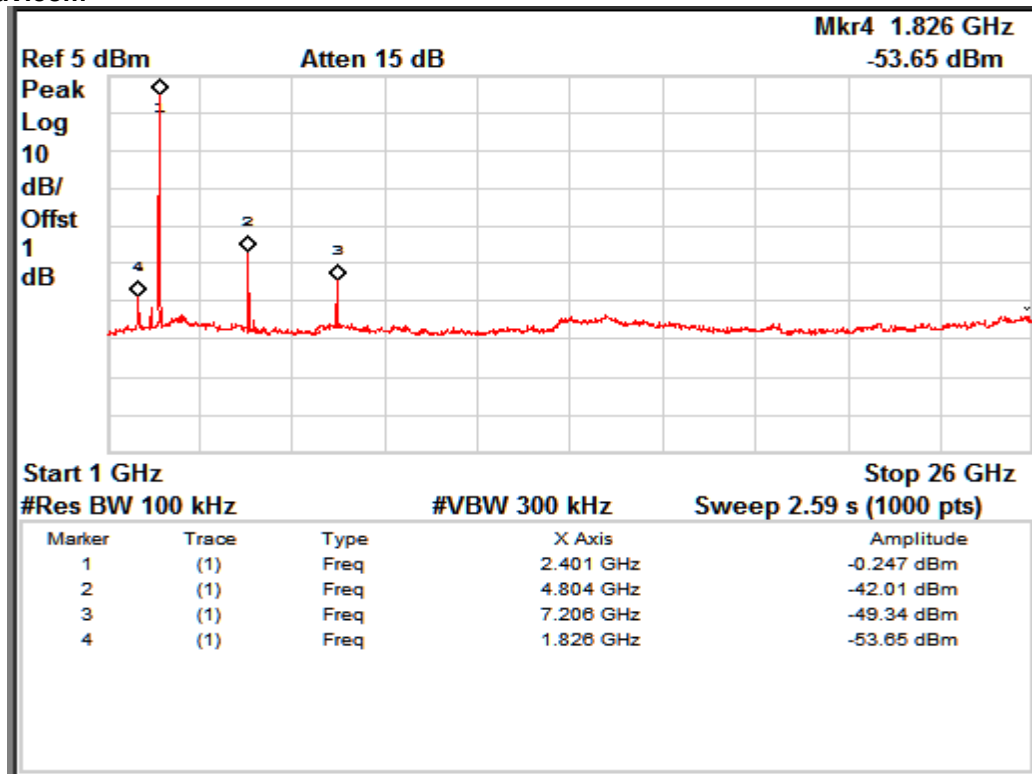
Note: The reference values are taken from the plots reported under the Power spectral Density Section 15.247(e).

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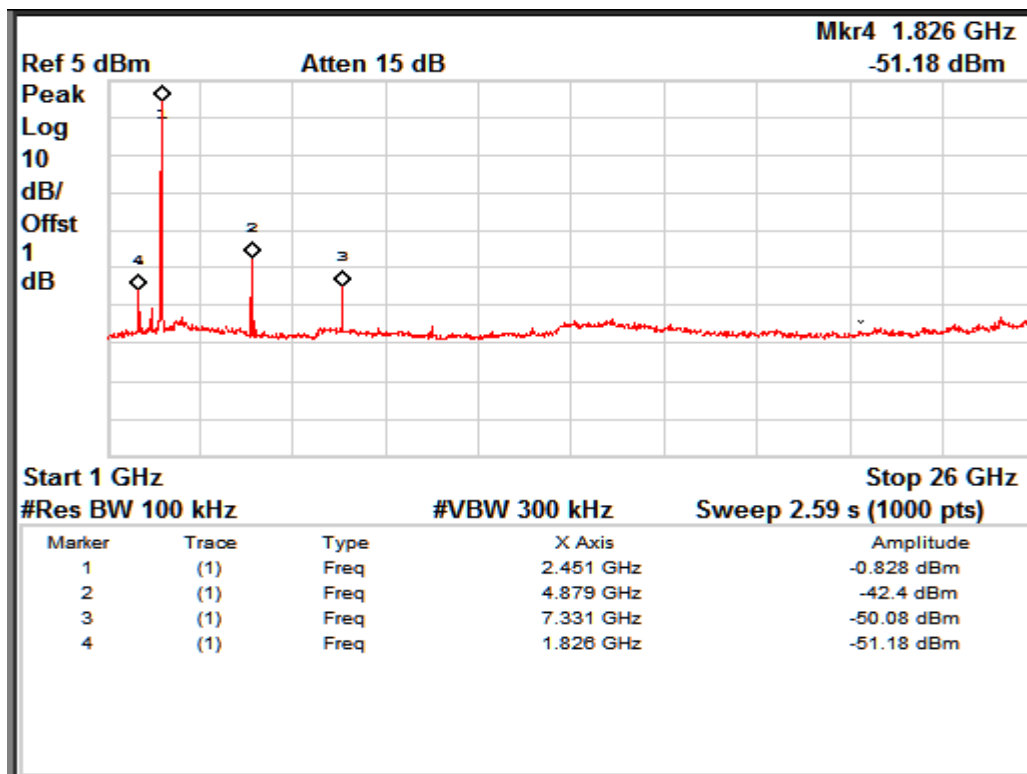


Conducted Spurious Emission

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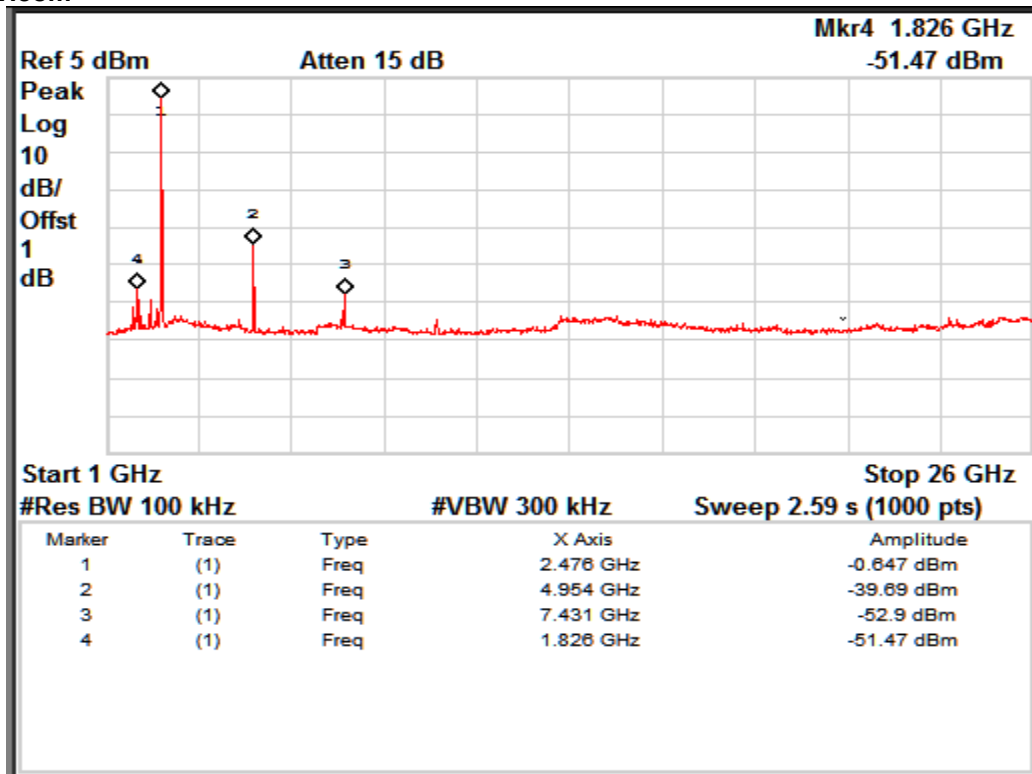


Channel frequency: 2402 MHz



Channel frequency: 2440 MHz

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Channel frequency: 2480 MHz

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**Spurious Radiated Emissions and
Restricted Bands of Operation**

Section 15.209 and 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, 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 ($\mu\text{V/m}$)	Field strength ($\text{dB}\mu\text{V/m}$)	Distance of Measurement (m)
0.009 – 0.490	$2400/F(\text{kHz})$	48.50 – 13.80	300*
0.490 – 1.705	$24000/F(\text{kHz})$	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 49.5dB $\mu\text{V/m}$ 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.

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Test results:

Below 1GHz

Antenna Polarization	Frequency (MHz)	Field Strength Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)
Vertical	30.0000	24.48	40.00	-15.52
	47.0993	25.73	40.00	-14.27
	67.3076	22.36	40.00	-17.64
	117.0512	19.44	43.50	-24.06
	149.6954	21.88	43.50	-21.62
	196.3301	21.10	43.50	-22.40
Horizontal	30.0000	20.91	40.00	-19.09
	145.0320	21.72	43.50	-21.78
	207.2114	26.30	43.50	-17.20
	236.7467	28.62	46.00	-17.38
	286.4903	22.27	46.00	-23.73
	317.5801	22.17	46.00	-23.83

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Above 1GHz

Fundamental Frequency (MHz)	Antenna Polarization	Frequency of Emission (MHz)	Field Strength (dBμV/m)	Limit (dBμV/m)	Margin (dB)
2402	V	2390(Pk)	55.35	74.00	-18.65
		2390(Av)	32.16	54.00	-21.84
		2402(Pk)	94.02	*	-
		2402 (Av)	69.70	*	-
		4804(Pk)	47.46	74.00	-26.54
		5958.33(Pk)	50.12	74.00	-23.88
		7206(Pk)	49.53	74.00	-24.47
		20370.19(Pk)	48.16	74.00	-25.84
	H	2390(Pk)	56.80	74.00	-17.2
		2390(Av)	32.12	54.00	-21.88
		2401.72(Pk)	93.78	*	-
		2401.72(Av)	70.92	*	-
		3642.62(Pk)	46.49	74.00	-27.51
		4804(Pk)	46.14	74.00	-27.86
		7206(Pk)	50.44	74.00	-23.56
		19743.59(Pk)	49.10	74.00	-24.9
2440	V	4880(Pk)	46.36	74.00	-27.64
		6040(Pk)	49.34	74.00	-24.66
		7320(Pk)	49.24	74.00	-24.76
		22154.65(Pk)	49.07	74.00	-24.93
	H	4880(Pk)	46.10	74.00	-27.9
		6557(Pk)	50.53	74.00	-23.47
		7320(Pk)	51.98	74.00	-22.02
		21323.72(Pk)	48.43	74.00	-25.57
2480	V	2483.5(Pk)	66.17	74.00	-7.83
		2483.5(Av)	31.64	54.00	-22.36
		2480.01(Pk)	93.29	*	-
		2480.01(Av)	70.37	*	-
		4960(Pk)	46.26	74.00	-27.74
		6339.74(Pk)	50.15	74.00	-23.85
		7440(Pk)	50.46	74.00	-23.54
		20411.06(Pk)	49.76	74.00	-24.24
	H	2483.5(Pk)	65.87	74.00	-8.13
		2483.5(Av)	31.65	54.00	-22.35
		2480.01(Pk)	91.69	*	-
		2480.01(Av)	71.39	*	-
		4960(Pk)	46.02	74.00	-27.98
		6012.82(Pk)	49.21	74.00	-24.79

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		7440(Pk)	49.35	74.00	-24.65
		22726.76(Pk)	48.25	74.00	-25.75

Pk -> Peak Detector

Av -> Average Detector

*- -> Fundamental frequency

Conducted Emission Test on A.C. Power Line

Section 15.207

Result

Pass

Test Specification : FCC Part 15 Section 15.207
 Test Method : ANSI C63.4-2003
 Testing Location : Screened room
 Measurement Bandwidth : 9kHz
 Frequency Range : 150kHz – 30MHz
 Supply Voltage : 120VAC,60Hz

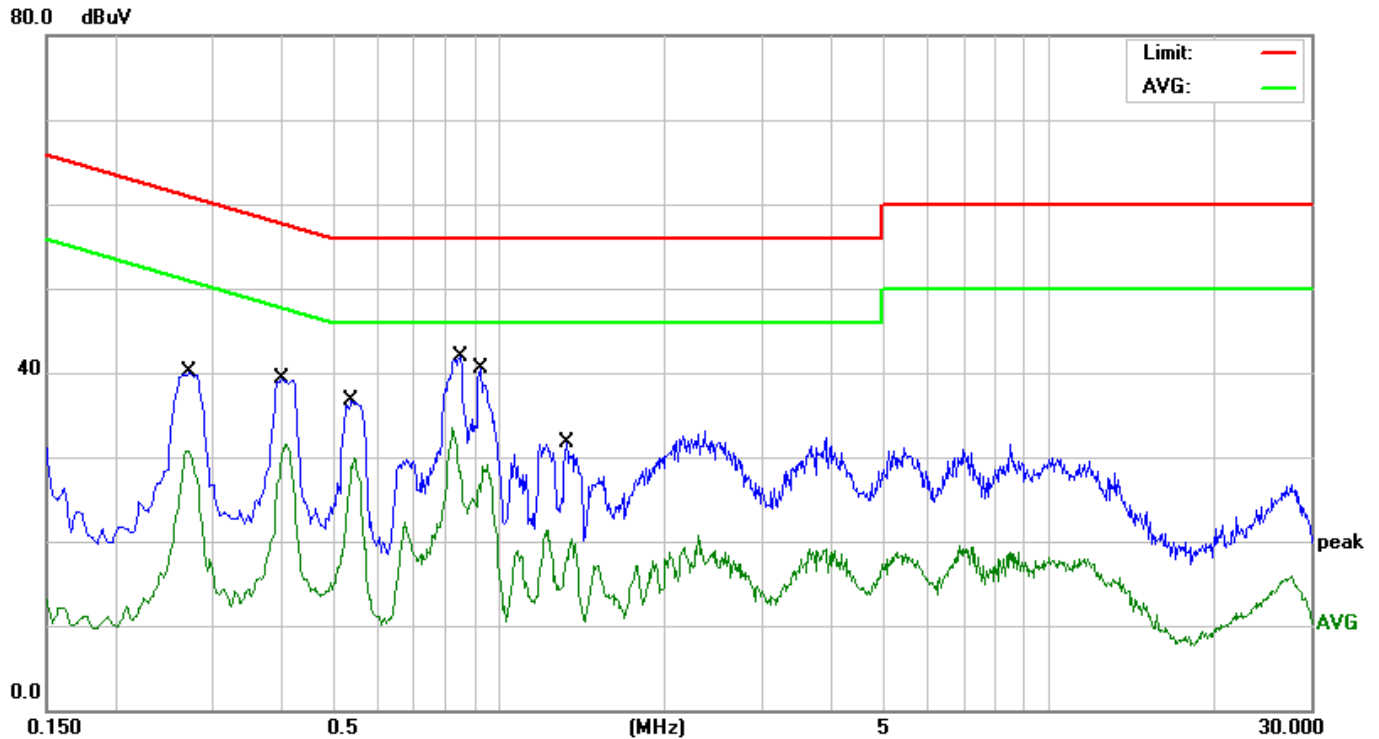
Limit of section 15.207

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

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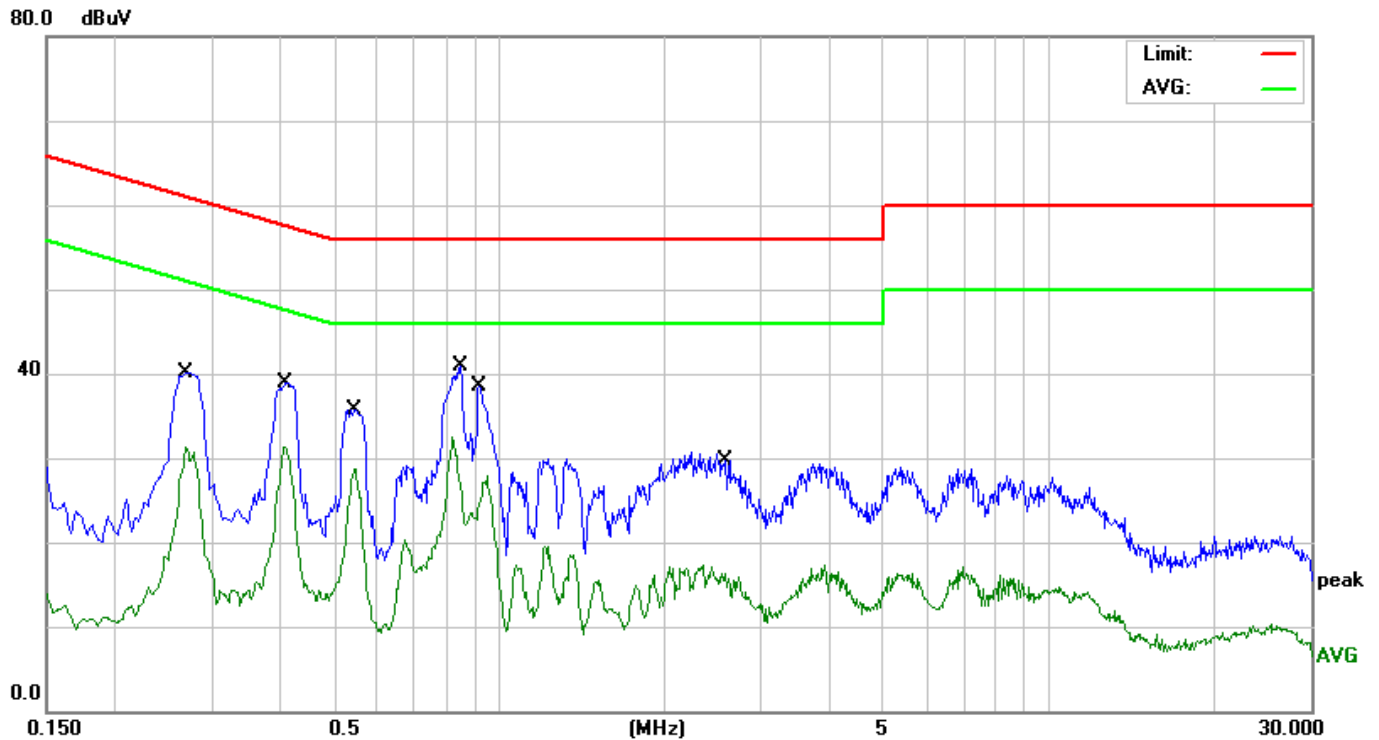
Test Results:



No.	Frequency (MHz)	Factor (dB)	Reading (dBuV)	Level (dBuV)	Limit (dBuV)	Margin (dB)	Detector
1	0.2740	9.62	27.48	37.10	60.99	-23.89	QP
2	0.2740	9.62	20.27	29.89	50.99	-21.10	AVG
3	0.4020	9.63	26.16	35.79	57.81	-22.02	QP
4	0.4020	9.63	20.40	30.03	47.81	-17.78	AVG
5	0.5380	9.63	23.67	33.30	56.00	-22.70	QP
6	0.5380	9.63	18.82	28.45	46.00	-17.55	AVG
7	0.8500	9.63	28.22	37.85	56.00	-18.15	QP
8	0.8500	9.63	17.98	27.61	46.00	-18.39	AVG
9	0.9260	9.63	25.31	34.94	56.00	-21.06	QP
10	0.9260	9.63	16.62	26.25	46.00	-19.75	AVG
11	1.3300	9.63	15.50	25.13	56.00	-30.87	QP
12	1.3300	9.63	7.69	17.32	46.00	-28.68	AVG

Mode: Line

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No.	Frequency (MHz)	Factor (dB)	Reading (dBuV)	Level (dBuV)	Limit (dBuV)	Margin (dB)	Detector
1	0.2700	9.64	27.80	37.44	61.12	-23.68	QP
2	0.2700	9.64	21.02	30.66	51.12	-20.46	AVG
3	0.4100	9.64	26.32	35.96	57.65	-21.69	QP
4	0.4100	9.64	21.33	30.97	47.65	-16.68	AVG
5	0.5460	9.64	23.29	32.93	56.00	-23.07	QP
6	0.5460	9.64	18.97	28.61	46.00	-17.39	AVG
7	0.8500	9.64	26.49	36.13	56.00	-19.87	QP
8	0.8500	9.64	16.42	26.06	46.00	-19.94	AVG
9	0.9220	9.64	24.03	33.67	56.00	-22.33	QP
10	0.9220	9.64	14.64	24.28	46.00	-21.72	AVG
11	2.5740	9.67	14.24	23.91	56.00	-32.09	QP
12	2.5740	9.67	5.75	15.42	46.00	-30.58	AVG

Mode: Neutral

END OF TEST REPORT