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Prüfbericht - Nr.: *Test Report No.:*	**19660187 001**		**Seite 1 von 28** *Page 1 of 28*
Auftraggeber: *Client:*	**American Megatrends India Private Limited Kumaran Nagar, Off Old Mahabalipuram Road Semmanchery, Chennai-600119, India**		
Gegenstand der Prüfung: *Test item:*	**Wireless Spirometer**		
Bezeichnung: *Identification:*	**VA08**	**Serien-Nr.:** *Serial No.*	**Engineering Sample**
Wareneingangs-Nr.: *Receipt No.:*	**1803095548**	**Eingangsdatum:** *Date of receipt:*	**26.08.2015**
Prüfort: *Testing location:*	**Refer Page 4 of 28 for test facilities**		
Prüfgrundlage: *Test specification:*	**FCC Part 15: Subpart C Section 15.247 ANSI C63.10-2013**		
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.** 82/A, 3rd Main, West Wing, Electronic City Phase 1 Hosur Road, Bangalore – 560 100. India **FCC Registration No.: 176555**		

geprüft / *tested by:*			**kontrolliert** / *reviewed by:*		
23.09.2015	Girish Kumar.G Test Engineer	Girish	29.09.2015	Raghavendra Kulkarni Sr. Manager	Kulkarni
Datum *Date*	**Name/Stellung** *Name/Position*	**Unterschrift** *Signature*	**Datum** *Date*	**Name/Stellung** *Name/Position*	**Unterschrift** *Signature*

Sonstiges /*Other Aspects:* **FCC ID : 2AFV6-AMI-SPIRO-01**

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.

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.

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Test Result Summary

Clause	Test Item	Result
FCC 15.203 and 15.204	Antenna Requirement	Pass
FCC 15.247(b) (3)	Maximum Peak Conducted Output Power	Pass
FCC 15.247(a) (2)	DTS Bandwidth	Pass
FCC 15.247(e)	Maximum Power Spectral Density	Pass
FCC 15.247(d)	Emissions in non-restricted frequency bands	Pass
FCC 15.209 / FCC 15.205	Spurious Radiated Emissions and Restricted Bands of Operation	Pass
FCC 15.207	Conducted emission test on a.c Power line	Pass

Note: Conducted measurements are done according to the procedure given in KDB No. **558074 D01 DTS Meas Guidance v03r02**

Content

List of Test and Measurement Instruments

Testing Facilities

1) TÜV Rheinland (India) Pvt. Ltd.
82/A, 3rd Main, West Wing, Electronic City,
West Phase, Hosur Road
Bangalore - 560 100.

Equipment	Manufacturer	Model Name	Serial Number	Calibration Due Date	Periodicity	Used for Test Items
Spectrum Analyser	Agilent Technologies	E4407B	US41192772	15.04.2016	Yearly	Antenna - Port Conducted Tests

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

Equipment	Manufacturer	Model Name	Serial Number	Calibration Due Date	Periodicity	Used for Test Items
EMI Test Receiver	Rohde & Schwarz	ESU 40	100288	20.06.2016	Yearly	Spurious Radiated Emissions
Broadband Antenna	Frankonia	ALX-4000	ALX-4000-806	22.06.2016	Yearly	
Active Loop Antenna	Frankonia	LAX-10	LAX-10-800	22.06.2016	Yearly	
Broadband Horn Antenna	Frankonia	HAX-18	HAX18-802	22.06.2016	Yearly	
Emission Horn Antenna	ETS Lindgren	116706	00107323	22.06.2016	Yearly	
Anechoic Chamber	Frankonia	-	-	-	-	
EMI Test Receiver	Rohde & Schwarz	ESR7	101133	19.11.2015	Yearly	Conducted Emission on AC power lines
Two Line V-Network (LISN)	Rohde & Schwarz	ENV216	100022	04.09.2016	Yearly	

General Product Information

Product Function and Intended Use

Spirometer device is a portable diagnostic system which can measure/monitor the lung function. This device is used to assess the condition of the lungs by measuring the volume of air inhaled and exhaled. The system consists of the electronics part with enclosure and a disposable turbine where the user blows and sucks air. The device calculates the flow rate and other relevant parameters and sends the data wirelessly to the mobile device. The device is powered by 5V DC through a USB micro connector and also has internal battery for power backup. The data acquired by the device can be used to obtain clinical consultation from the doctor or healthcare practitioners. AMI Spirometer is intended to test lung function and can make spirometry testing to the people of all ages, excluding infants and neonates.

Ratings and System Details

Operating Frequency Range	2400MHz – 2483.50MHz
No. of channel	40
Channel Spacing	2MHz
Transmitted Power	-3.89dBm
Number of antenna	One
Antenna Gain and Antenna type	0.5dBi and chip antenna
Supply Voltage to Module	5V DC from Power Charger
Environmental	Operational Temperature: 16ºC to 35º C

Test Conditions:

Supply Voltage: 5V DC from Power Charger

Environmental conditions:

Temperature: +24.6 º C RH: 56%

Test Set-up and Operation Mode

Principle of Configuration Selection

Transmission was enabled with 100% duty cycle on low, mid and high channel.

Test Operation and Test Software

Test software was used to enable the transmission with 100% duty cycle, changing channels (low/mid/high) on the EUT for the tests in this report.

Special Accessories and Auxiliary Equipment

- None

Countermeasures to achieve EMC Compliance

- Testing was conducted with the Power adaptor cable connected to the AC mains (5v supply for charging EUT).

Test Modes – Data Rates and Modulations

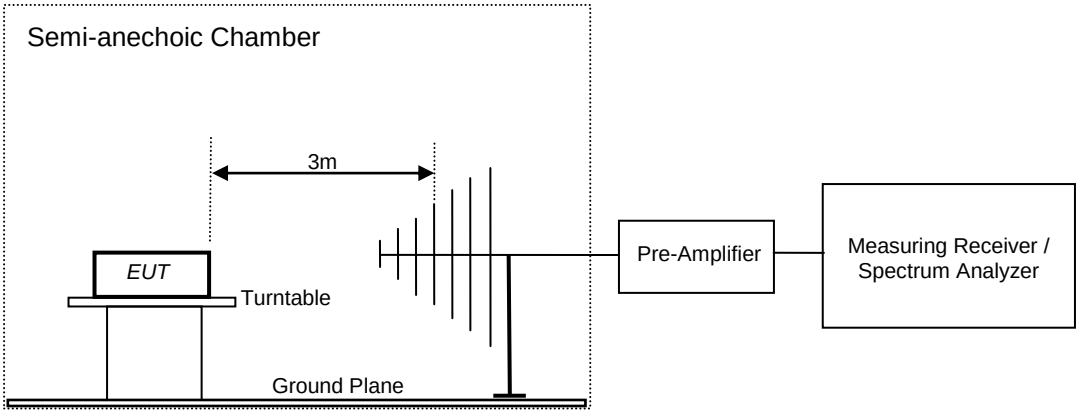
For Radiated spurious emissions, the tests were performed for all data rates and only worst case results are reported in this report.

Test Methodology

Radiated Emission Test

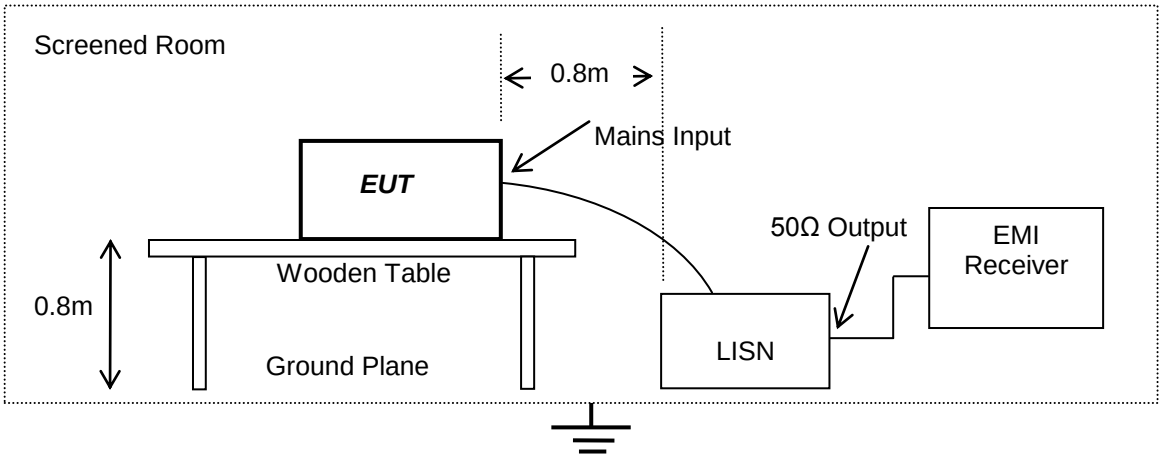
The radiated emission measurement was performed according to the procedures in ANSI C63.10 - 2013. The equipment under test (EUT) was placed at the middle of the 80 cm high turntable for below 1GHz and 1.5m high turntable for above 1GHz, and the EUT is 3 meters far from the measuring antenna. The turntable 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 place 80cm away from the EUT. The test was performed in accordance with ANSI C63.10 - 2013, 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 was recorded in the table of results.



Test Results

Antenna Requirement **Section 15.203 and 15.204**

Result **Pass**

FCC Requirement: No antenna other than that furnished by the responsible party shall be used with the device. Permanently attached antenna is used in the device.

Antenna details:

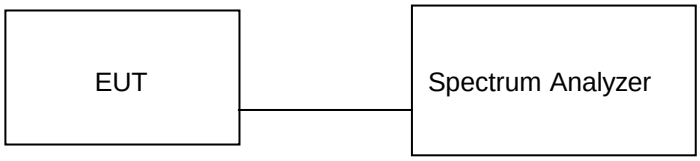
1. Antenna Type: Chip Antenna
2. Manufacturer: Johanson Technology
3. Model no.: 2450AT18A100
4. Peak Gain: 0.5dBi

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

Result **Pass**

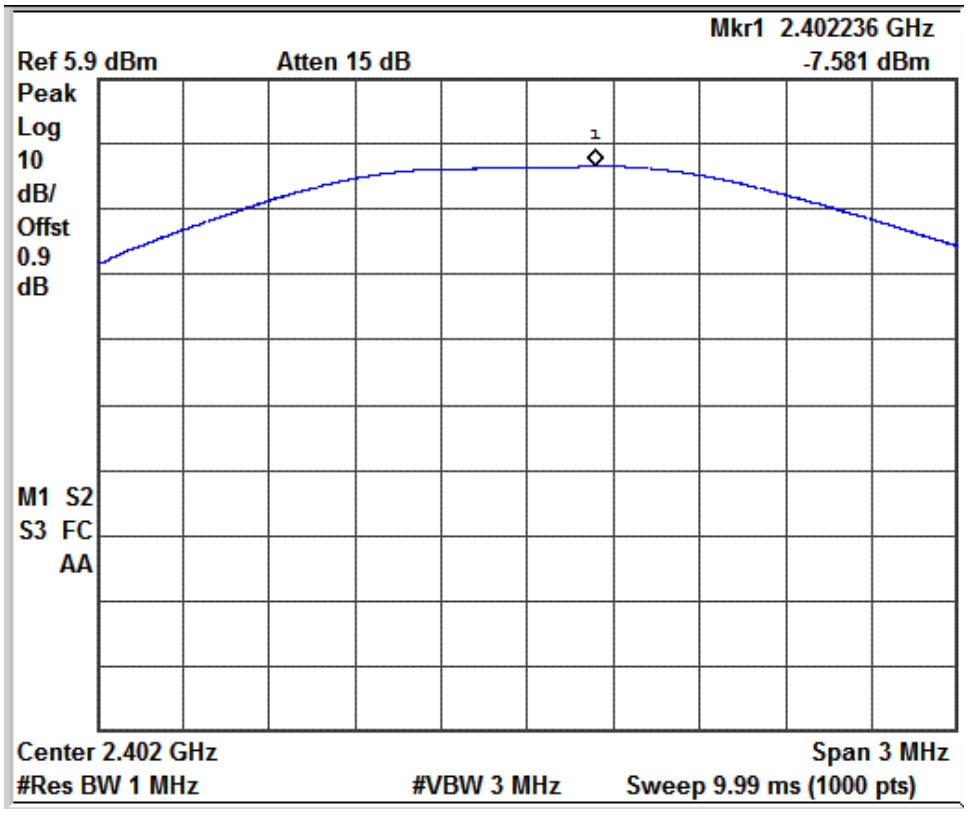
Test Specification	FCC Part 15 Subpart C
Measurement Bandwidth (RBW)	300 kHz/1MHz
Requirement	<1 watt (30dBm).

Test Method:

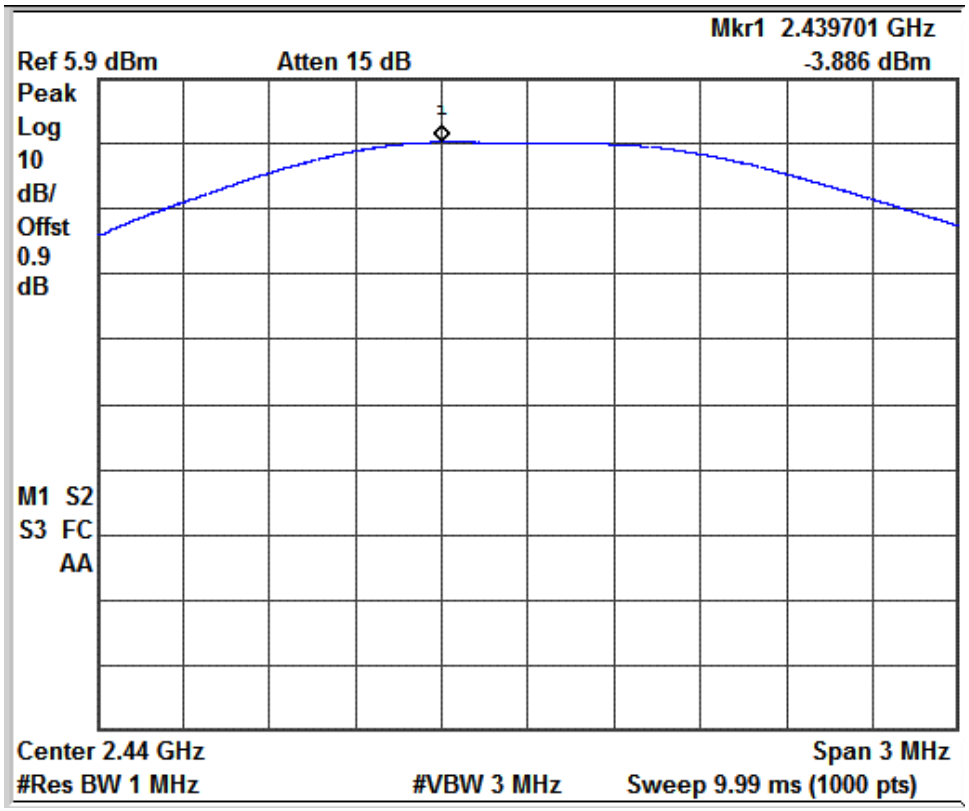


Test Result:

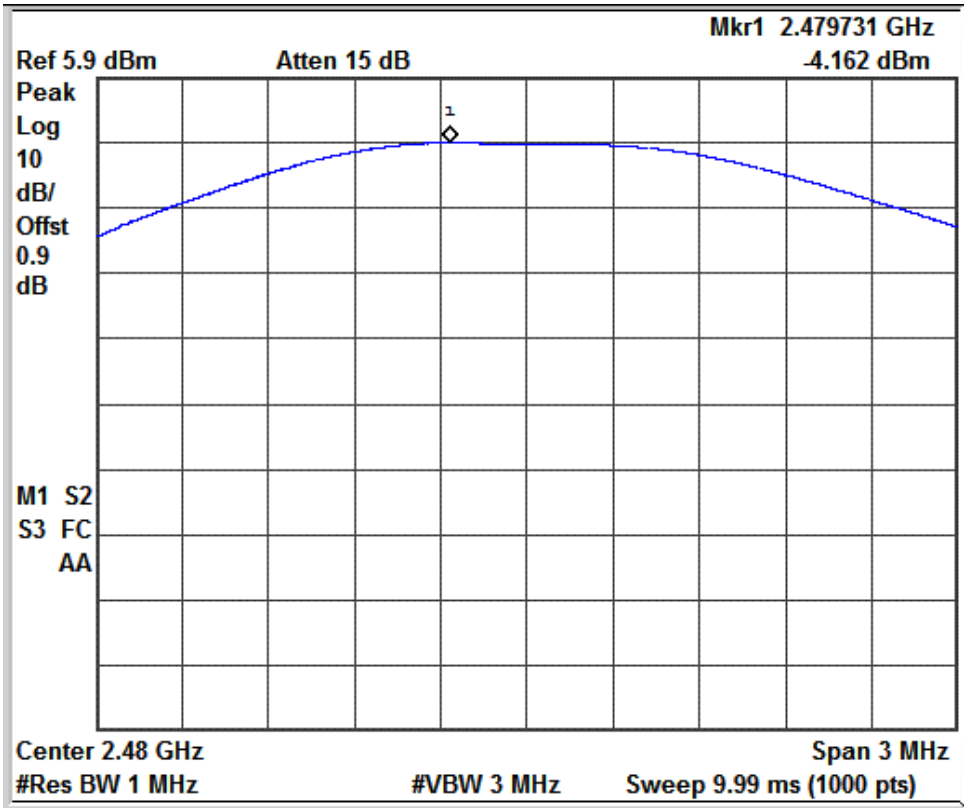
Channel Frequency (MHz)	Total Power (dBm)	Limit (dBm)	Margin (dB)
2402.00	-7.58	30.00	-37.58
2440.00	-3.89	30.00	-33.89
2480.00	-4.16	30.00	-34.16



Channel Frequency: 2402 MHz



Channel Frequency: 2440 MHz



Channel Frequency: 2480 MHz

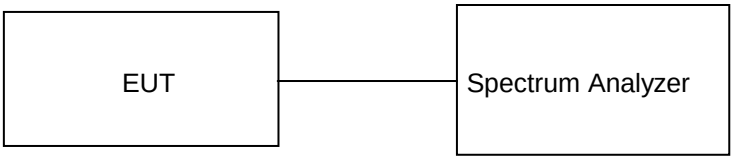
Maximum Power Spectral Density **Section 15.247(e)**

Result **Pass**

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

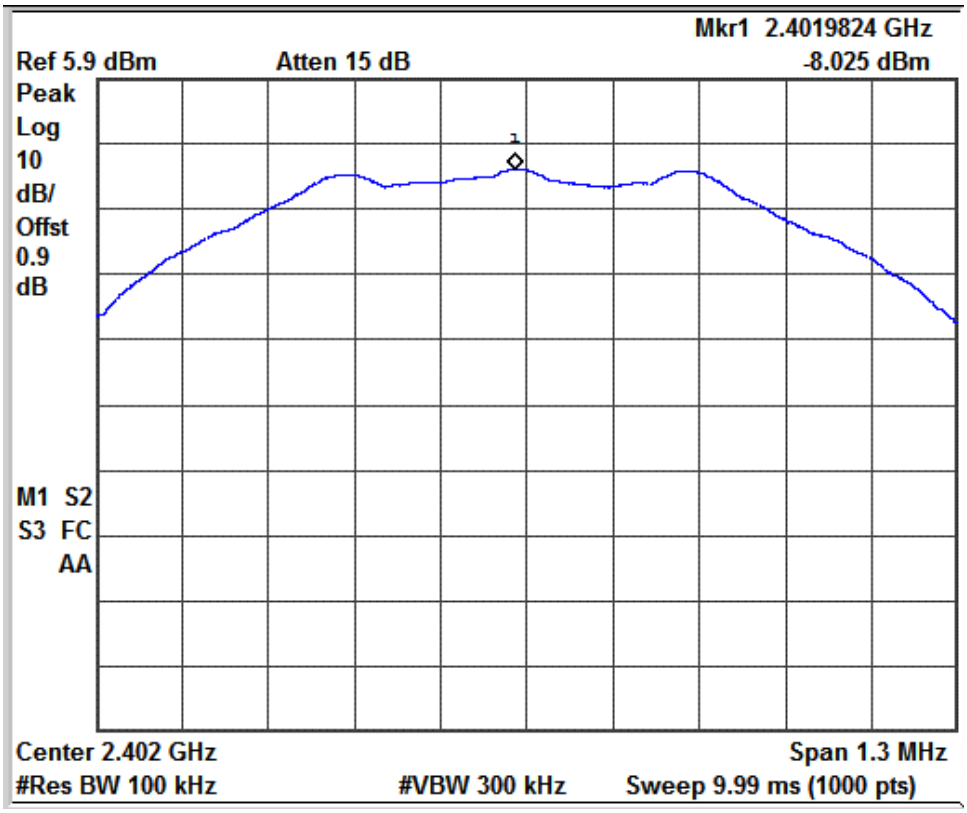
For digitally modulated systems, the power spectral density conducted from the intentional radiator to the antenna shall not be greater than 8 dBm.

Test Method:

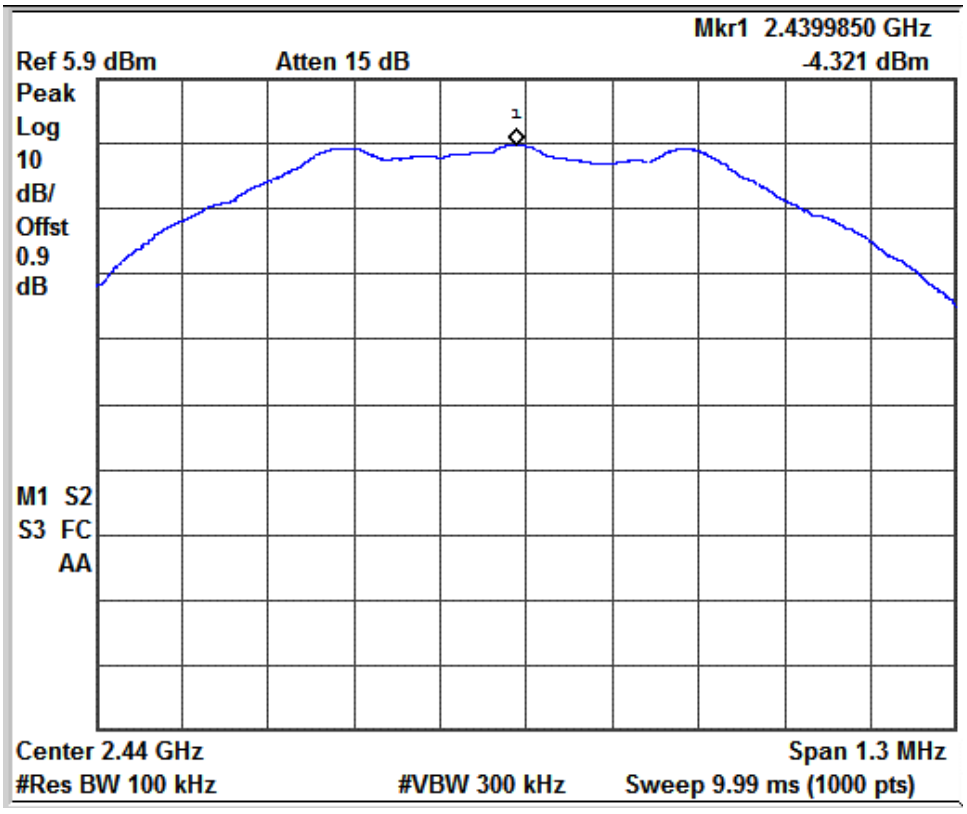


Test Result:

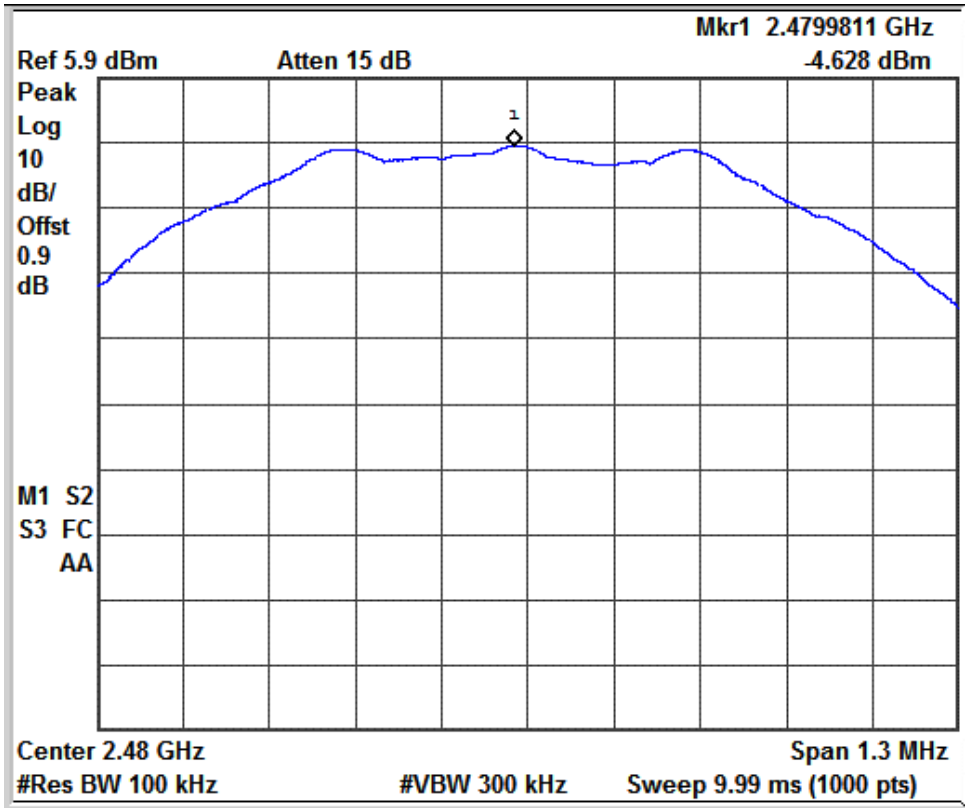
Channel Frequency (MHz)	Total PSD (dBm)	Limit (dBm)	Margin (dB)
2402.00	-8.03	8.00	-16.03
2440.00	-4.32	8.00	-12.32
2480.00	-4.62	8.00	-12.62



Channel Frequency: 2402 MHz



Channel Frequency: 2440 MHz



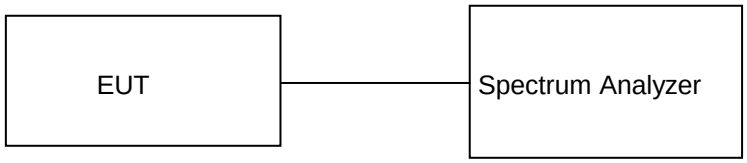
Channel Frequency: 2480 MHz

DTS Bandwidth **Section 15.247(a) (2)**

Result **Pass**

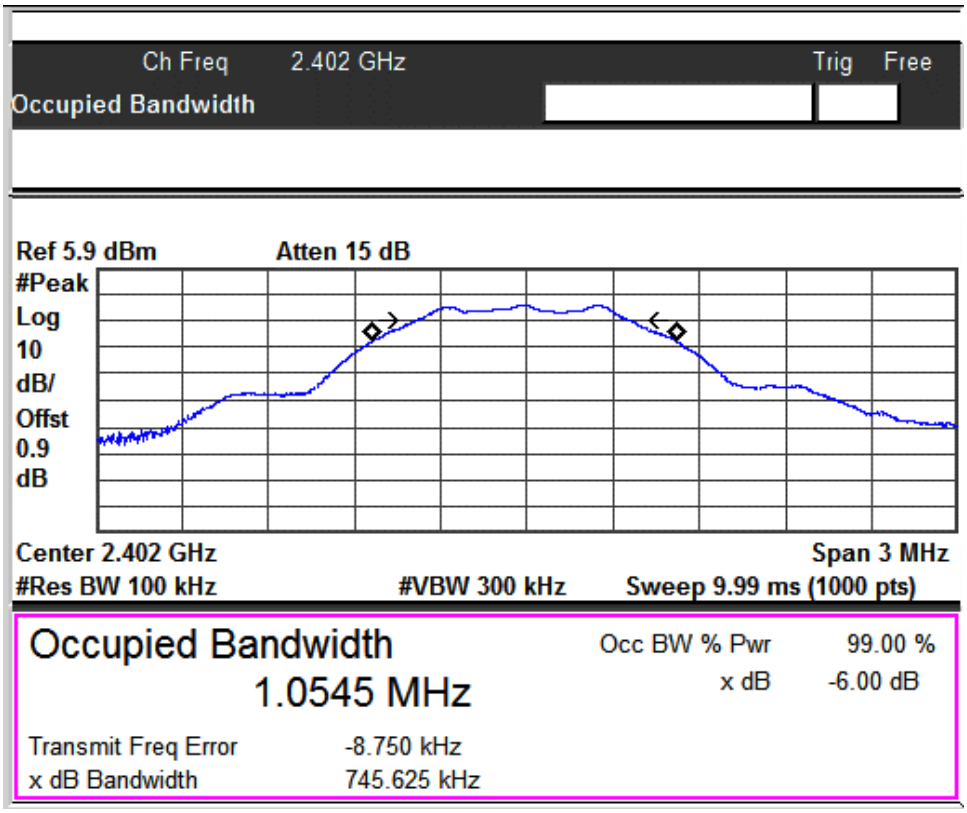
Test Specification FCC Part 15 Section 15.247 (a) (2)
Requirement The minimum 6 dB bandwidth shall be at least 500 kHz.

Test Method:

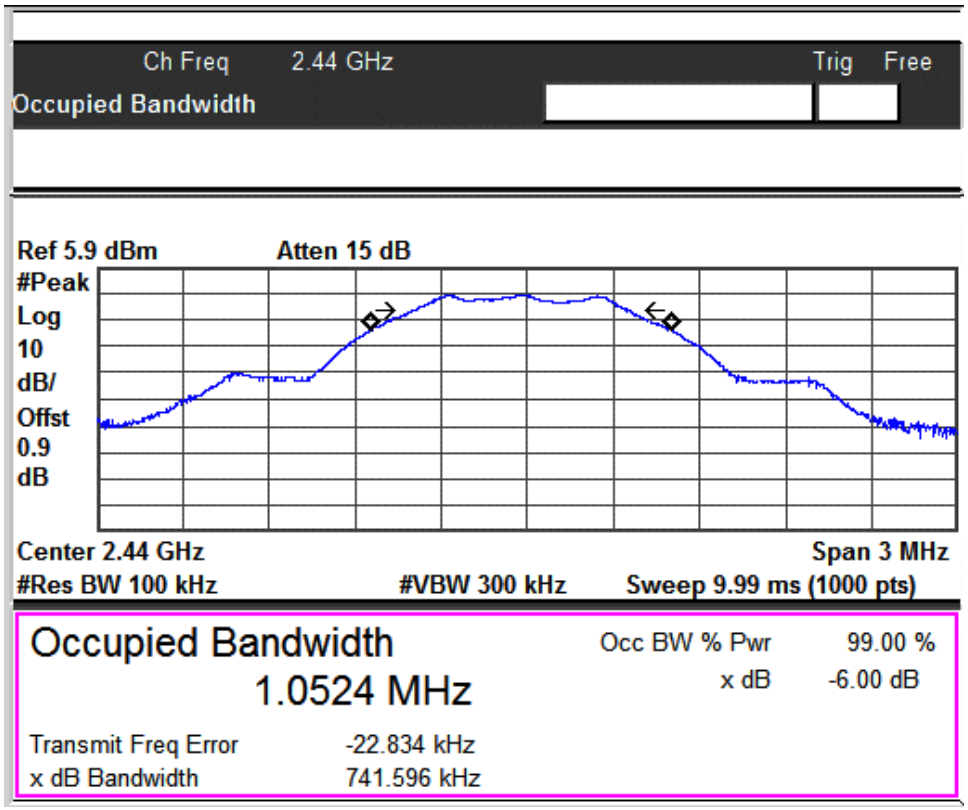


Test Result:

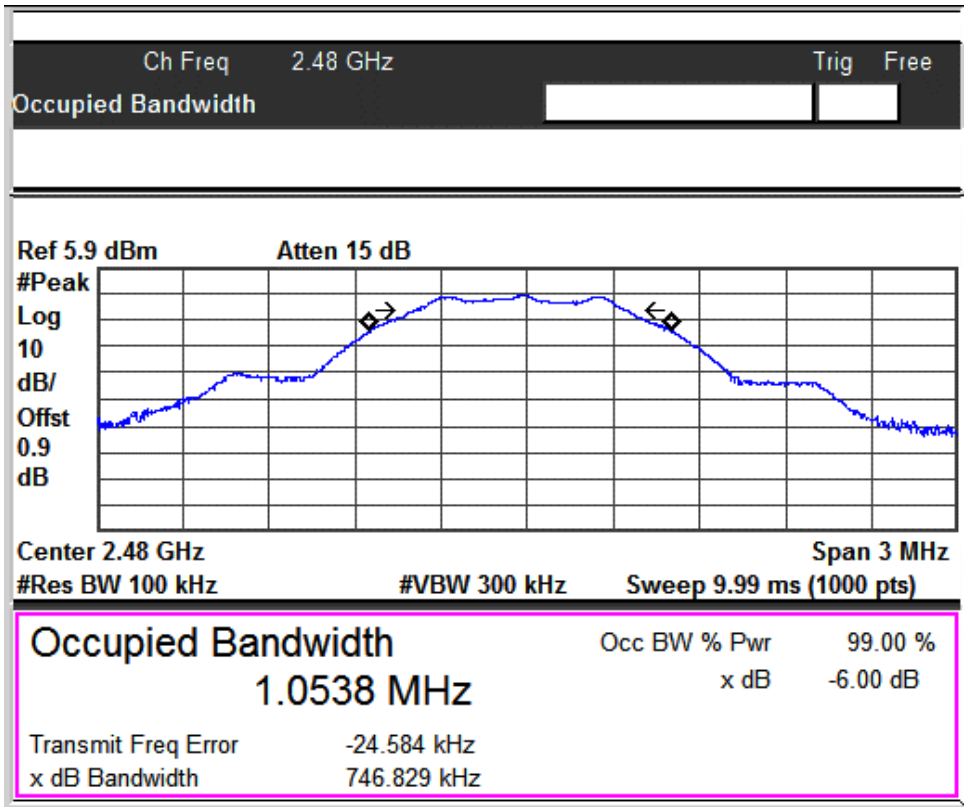
Channel Frequency (MHz)	6 dB Bandwidth (MHz)	99% OBW (MHz)
2402.00	0.75	1.05
2440.00	0.75	1.05
2480.00	0.75	1.05



Channel Frequency: 2402 MHz



Channel Frequency: 2440 MHz



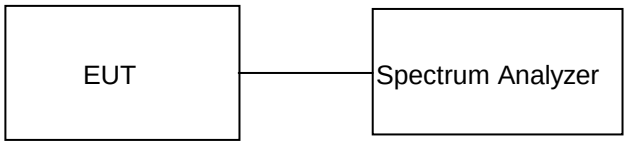
Channel Frequency: 2480 MHz

Emissions in non-restricted frequency bands **Section 15.247(d)**

Result **Pass**

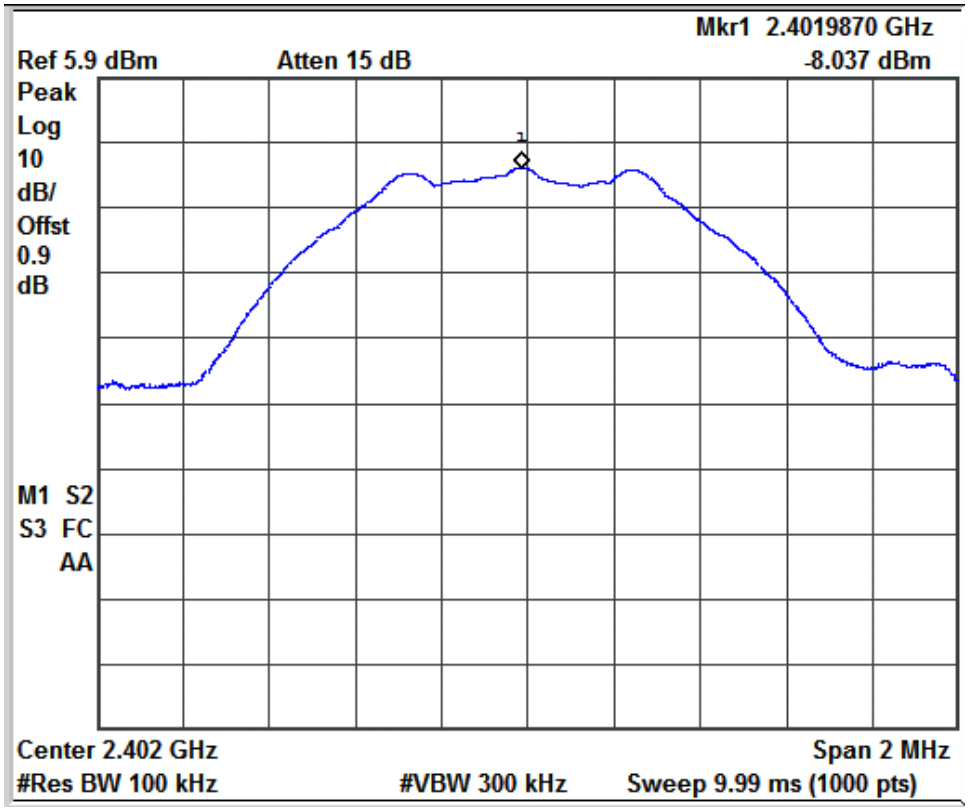
Test Specification	FCC Part 15 Section 15.247(d)
Detector Function	Peak
Requirement	In any 100kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be 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:

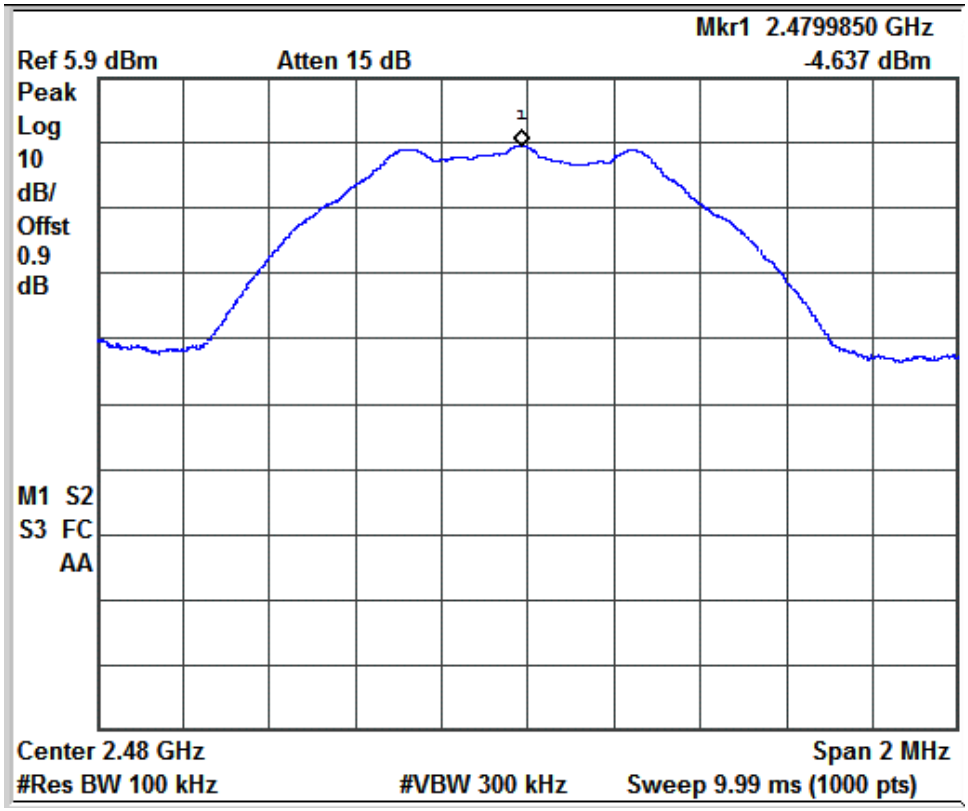


Test Result:

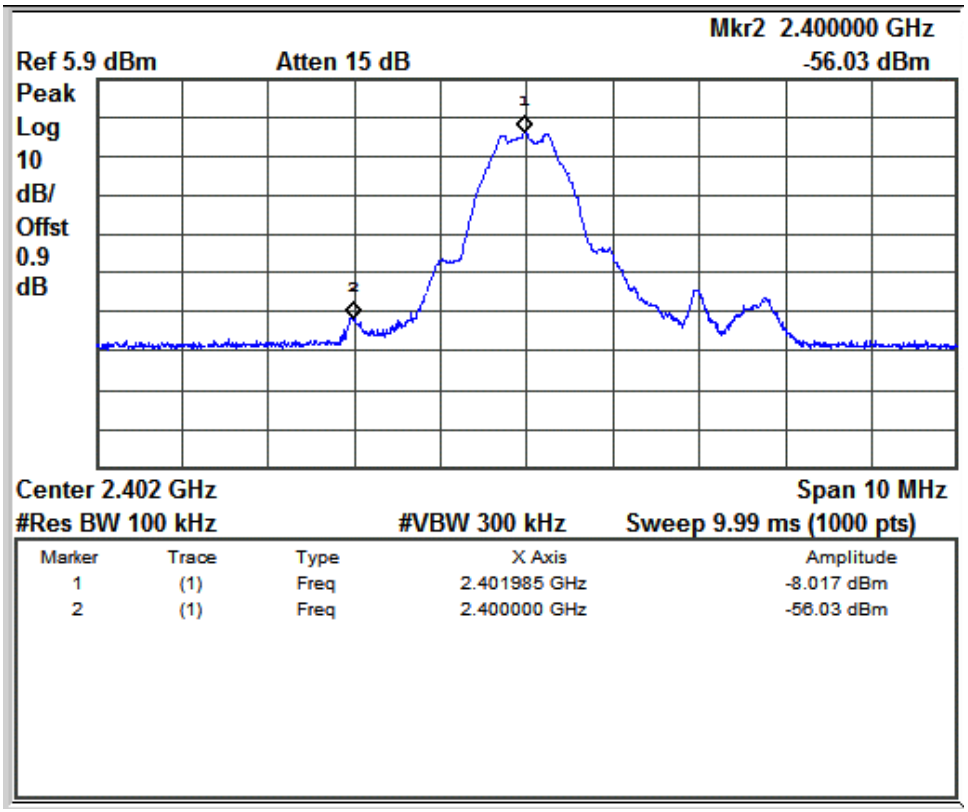
Channel Frequency (MHz)	Value at Band Edge		Reference PSD Value B (dBm)	Band Edge Value A-B (dBc)	Limit (dBc)
	Frequency (MHz)	Value A (dBm)			
2402	2400	-56.03	-8.04	-47.99	-20.00
2480	2483.50	-62.42	-4.64	-57.78	-20.00



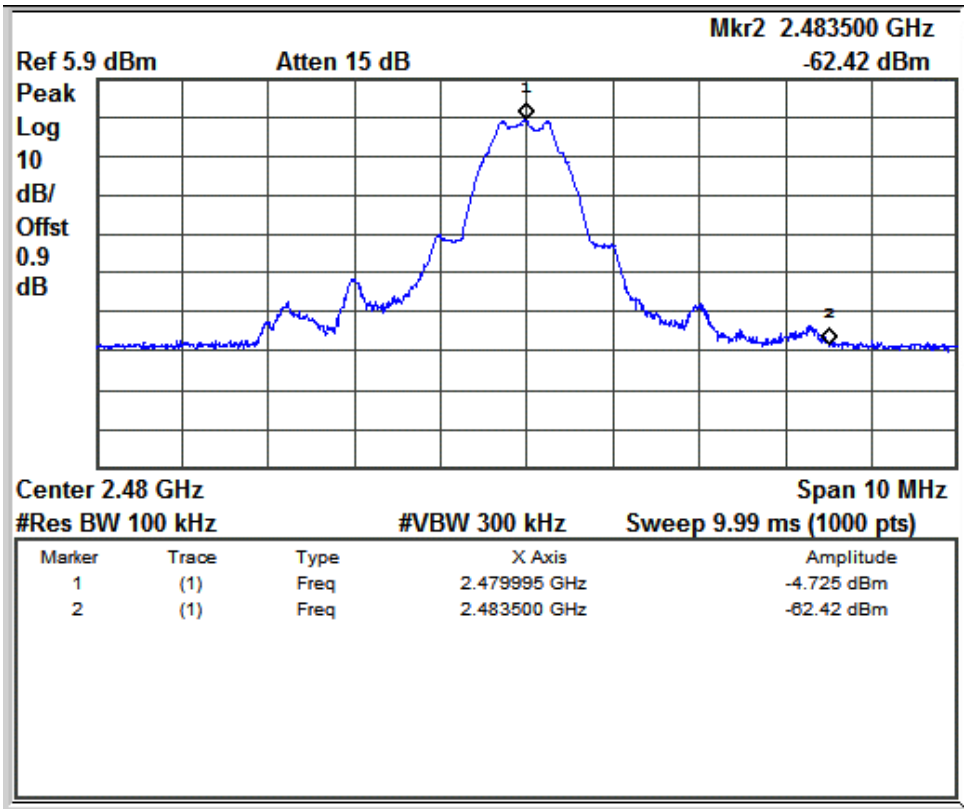
Reference Level Plot Channel Frequency: 2402MHz



Reference Level Plot Channel Frequency: 2480MHz

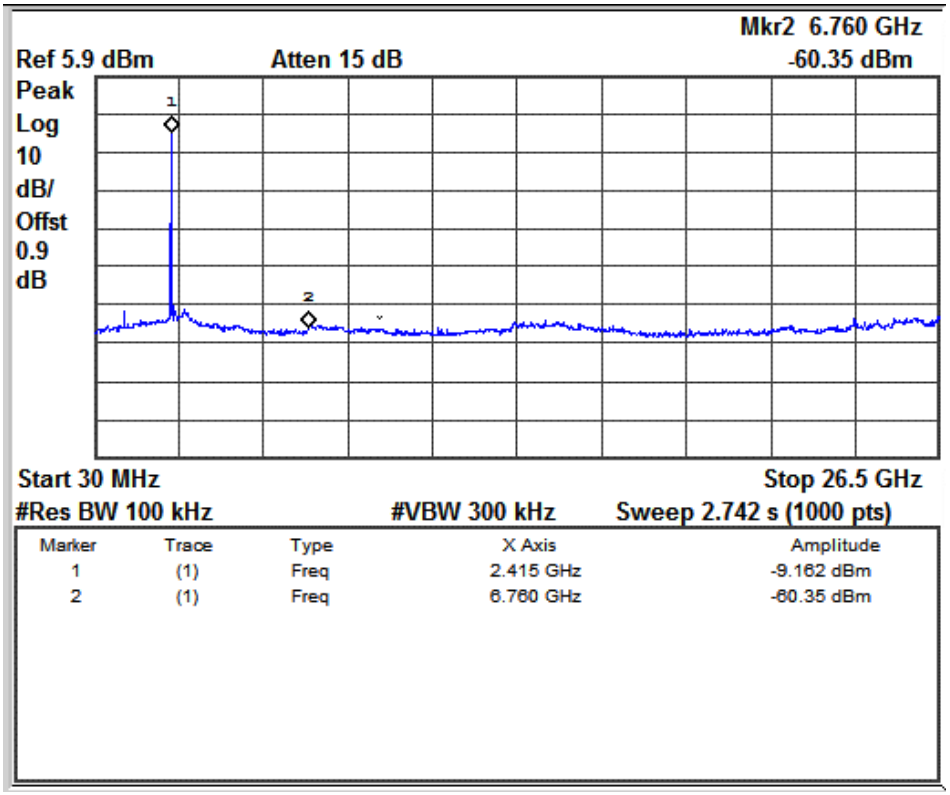


Channel Frequency 2402 MHz

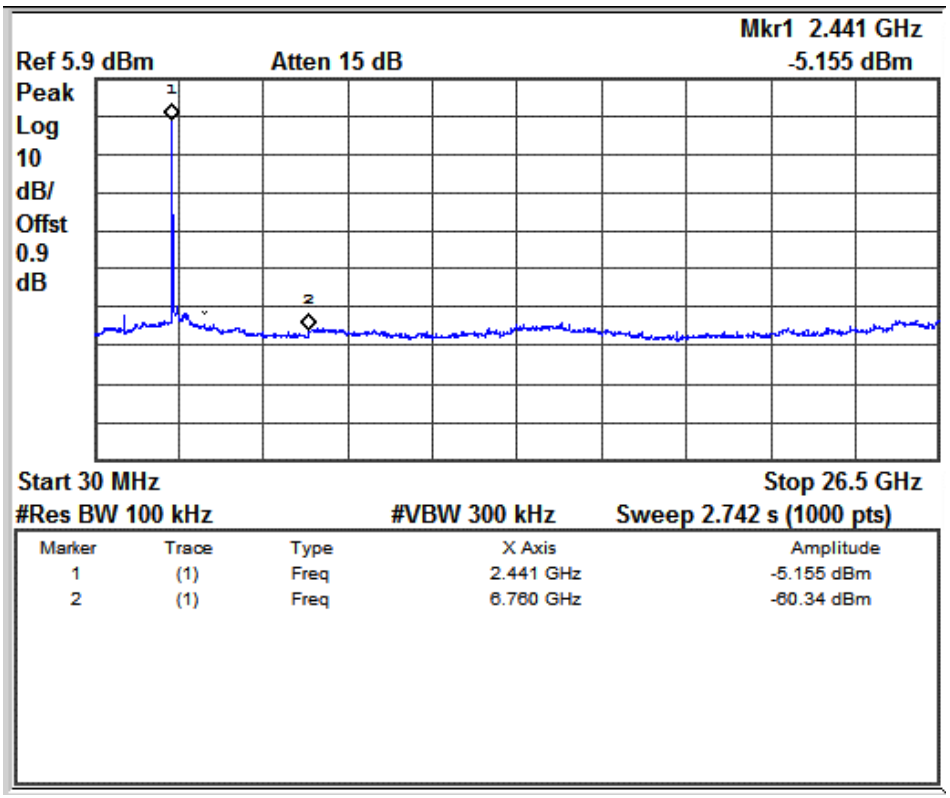


Channel Frequency 2480 MHz

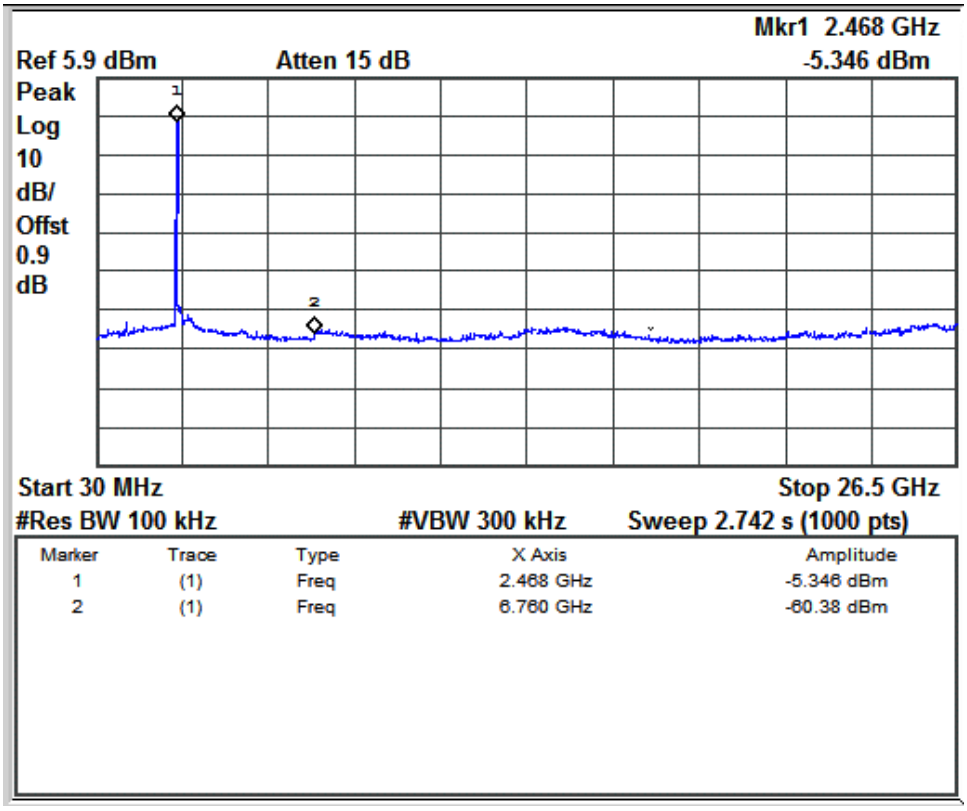
Conducted Spurious Emission



Channel Frequency 2402 MHz



Channel Frequency 2440 MHz



Channel Frequency 2480 MHz

Spurious Radiated Emissions and Restricted Bands of Operation **Section 15.209 and 15.205**

Result **Pass**

Test Specification	FCC Part 15 Section 15.209 &15.205
Test Method	ANSI C63.10-2013
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:

For frequency Range 9kHz - 1 GHz

No emissions found in this frequency range.

For frequency above 1GHz

Test results for worst case data rate are listed below.

Channel	Polarization	Frequency (MHz)	Measured Emission Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)
LOW	V	2390(Pk)	38.64	74	-35.36
		2390(Av)	27.13	54	-26.87
		2402(Pk)	68.22	*	*
		2402(Av)	62.00	*	*
		4804(Pk)	54.59	74	-19.41
		4804(Av)	44.89	54	-09.11
		7206(Pk)	57.00	74	-17.00
		7206(Av)	44.31	54	-09.69
	H	2390(pk)	39.91	74	-34.09
		2390(Av)	27.12	54	-26.88
		2402(Pk)	73.12	*	*
		2402(Av)	69.07	*	*
		4804(Pk)	56.20	74	-17.80
		4804(Av)	46.17	54	-07.83
		7206(Pk)	57.02	74	-16.98
		7206(Av)	44.28	54	-09.72
MID	V	2440(Pk)	79.00	*	*
		2440(Av)	74.54	*	*
		4880(Pk)	53.13	74	-20.87
		4880(Av)	43.12	54	-10.88
		7320(Pk)	56.84	74	-17.16
		7320(Av)	44.90	54	-09.10
	H	2440(Pk)	83.76	*	*
		2440(Av)	79.09	*	*
		4880(Pk)	54.17	74	-19.83
		4880(Av)	44.26	54	-09.74
		7320(Pk)	57.46	74	-16.54
		7320(Av)	44.93	54	-09.07
HIGH	V	2483.5(Pk)	39.27	74	-34.73
		2483.5(Av)	27.30	54	-26.70
		2480(Pk)	81.56	*	*
		2480(Av)	77.38	*	*

		4960(Pk)	53.91	74	-20.09
		4960(Av)	43.61	54	-10.39
		7440(Pk)	57.98	74	-16.02
		7440(Av)	45.64	54	-08.36
	H	2483.5(Pk)	39.05	74	-34.95
		2483.5(Av)	27.61	54	-26.39
		2480(Pk)	87.14	*	*
		2480(Av)	83.12	*	*
		4960(Pk)	53.81	74	-20.19
		4960(Av)	44.21	54	-09.79
		7440(Pk)	57.96	74	-16.04
		7440(Av)	45.63	54	-08.37

Conducted Emission Test on A.C. Power Line **Section 15.207**

Result **Pass**

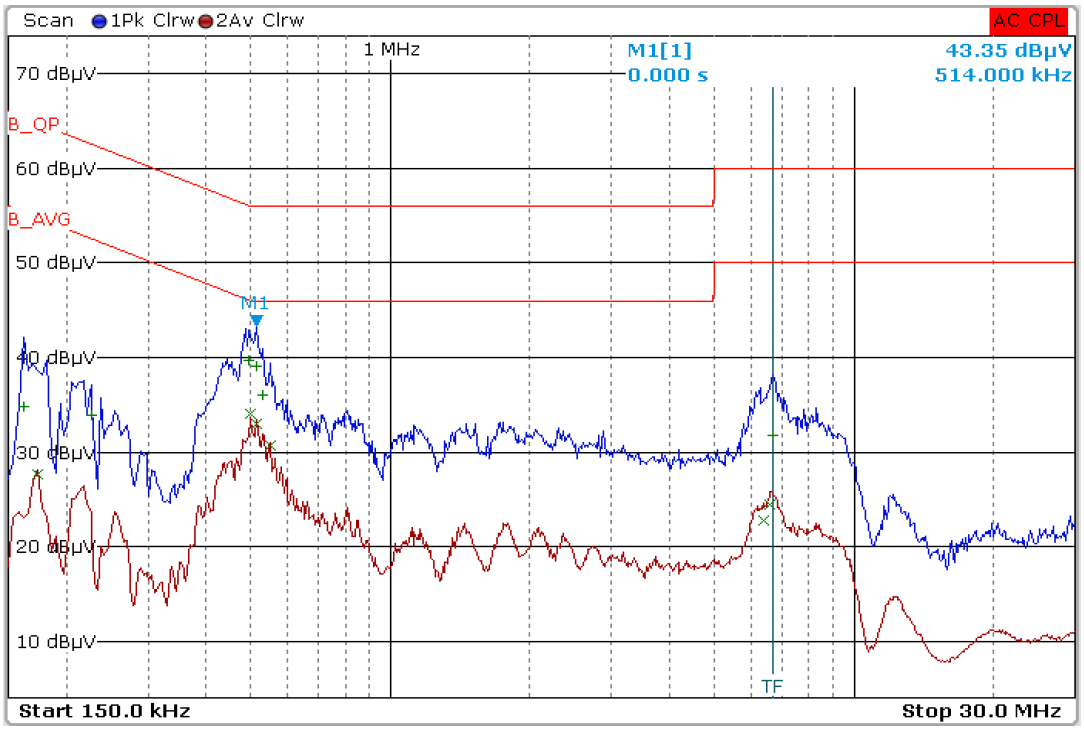
Test Specification	:	FCC Part 15 Section 15.207
Test Method	:	ANSI C63.10-2013
Testing Location	:	Screened room
Measurement Bandwidth	:	9kHz
Frequency Range	:	150kHz – 30MHz
Supply Voltage	:	120VAC,60Hz

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

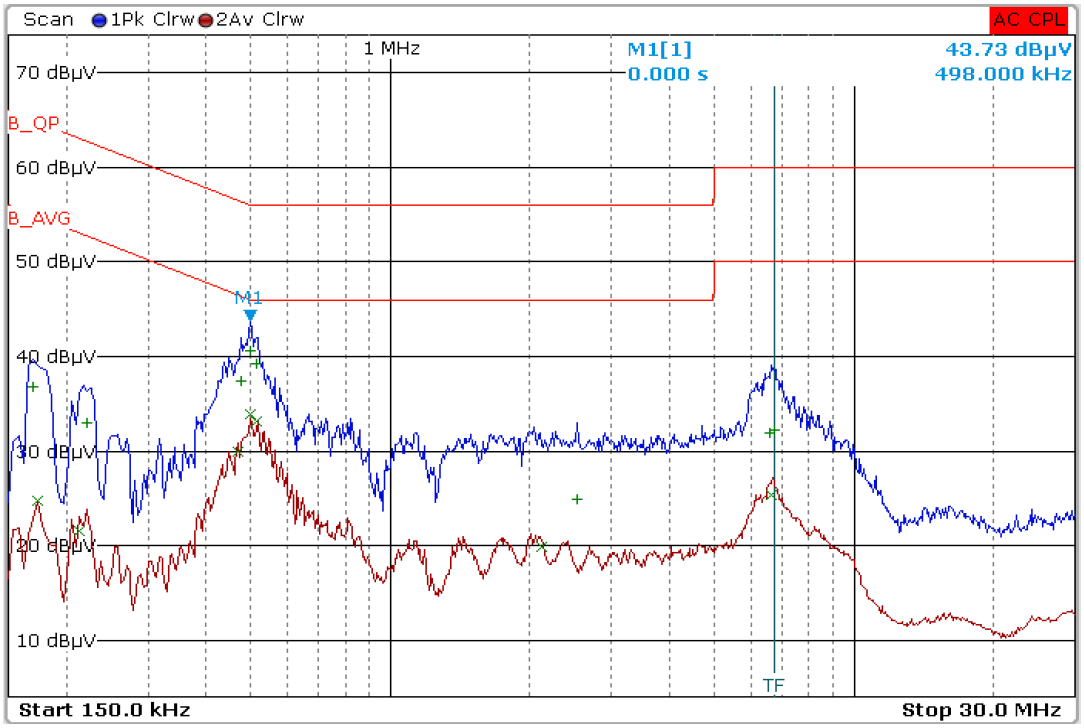
Test Result:



Line Graph

Frequency [MHz]	Emission Level [dBµV]	Limit [dBµV]	Detector
0.494	39.63	56.1	Quasi Peak
0.514	39.11	56.0	Quasi Peak
0.530	36.08	56.0	Quasi Peak
6.670	31.77	60.0	Quasi Peak
0.226	33.86	62.6	Quasi Peak
0.162	34.84	65.4	Quasi Peak
0.498	33.98	46.0	Average
0.514	32.95	46.0	Average
0.550	30.64	46.0	Average
6.610	24.51	50.0	Average
0.174	27.66	54.8	Average
6.374	22.77	50.0	Average

Line: Table



Neutral: Graph

Frequency [MHz]	Emission Level [dBµV]	Limit [dBµV]	Detector
0.498	40.67	56.0	Quasi Peak
0.514	39.21	56.0	Quasi Peak
0.478	37.45	56.4	Quasi Peak
6.730	32.17	60.0	Quasi Peak
6.586	31.94	60.0	Quasi Peak
0.170	36.84	65.0	Quasi Peak
0.498	33.86	46.0	Average
0.514	33.13	46.0	Average
0.470	29.88	46.5	Average
6.614	25.35	50.0	Average
2.118	19.92	46.0	Average
0.174	24.81	54.8	Average

Neutral: Table