

Produkte
 Products

Prüfbericht - Nr.: **19660223 001**
Seite 1 von 27
Test Report No.:
Page 1 of 27
Auftraggeber: Remidio Innovative Solutions Pvt. Ltd.
Client: #108/E-3, VIth Main Road, III Phase
 Peenya Industrial Area,
 Bangalore-560058

Gegenstand der Prüfung: Fundus on Phone Non Mydriatic

Test item:
Bezeichnung: FOPNM-10 **Serien-Nr.:** FOP NM 10-16-03-001-
Identification: Serial No. 0018

Wareneingangs-Nr.: 1803132234 **Eingangsdatum:** 02.05.2016
Receipt No.: *Date of receipt:*
Prüfort: Refer Page 4 of 27 for test facilities
Testing location:
Prüfgrundlage: FCC Part 15, Subpart C
Test specification: ANSI C63.10-2013

Prüfergebnis: Der Prüfgegenstand entspricht oben genannter Prüfgrundlage(n).
Test Result: The test items passed the test specification(s).

Prüflaboratorium: TÜV Rheinland (India) Pvt. Ltd.
Testing Laboratory: 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:**

 19.05.2016 Shrikanth S Naik
 Engineer



 24.05.2016 Raghavendra Kulkarni
 Sr.Manager


Datum **Name/Stellung** **Unterschrift**
Date **Name/Position** **Signature**
Datum **Name/Stellung** **Unterschrift**
Date **Name/Position** **Signature**
Sonstiges / Other Aspects: FCC ID : 2AIHH-FOPNM-10

Abkürzungen:

P(pass)	= entspricht Prüfgrundlage
F(all)	= entspricht nicht Prüfgrundlage
N/A	= nicht anwendbar
N/T	= nicht getestet

Abbreviations:

P(pass)	= passed
F(all)	= failed
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 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.

TÜV Rheinland India Pvt. Ltd. 82/A, 3rd Main, West Wing Electronic City Phase 1, Hosur Road, Bangalore-560100, India
 Tel.: +9180 6723 3500 · Fax: +9180 6723 3542 · Web: www.tuv.com

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)	Emission in the non-restricted frequency bands (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

Note: Conducted measurements are done according to the procedure given in KDB No. **558074**
D01 DTS Meas Guidance v03r05

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Power Spectral Density	Section 15.247(e)
6 dB Bandwidth	Section 15.247(a) (2).....
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Appendix 1: Test Setup Photo

Appendix 2: EUT External Photo

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Appendix 6: Specification of EUT

Appendix 7: Schematic Diagram

Appendix 8: Bill of Material

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Appendix 10: Maximum Permissible Exposure Calculation

List of Test and Measurement Instruments

Equipment	Manufacturer	Model Name	Serial Number	Calibration Due Date	Periodicity	Used for Test Items
EMI Test Receiver	Rohde & Schwarz	ESU 40	100288	23.11.2016	Yearly	Spurious Radiated Emissions
Broadband Antenna	Frankonia	ALX-4000	ALX-4000-806	20.01.2017	Yearly	
Active Loop Antenna	Frankonia	LAX-10	LAX-10-800	22.12.2016	Yearly	
Horn Antenna	Frankonia	HAX-18	HAX18-802	14.03.2017	Yearly	
Double-Ridged Waveguide Horn Antenna	ETS	116706	00107323	02.11.2016	Yearly	
Anechoic Chamber	Frankonia	-	-	-	-	
Spectrum Analyser	Agilent Technologies	E4407B	US41192772	23.04.2017	Yearly	Antenna port conducted measurements
LISN	Rohde & Schwarz	ENV216	100022	12.09.2016	Yearly	Conducted Emission on AC power lines
EMI Receiver	Rohde & Schwarz	ESR7	101133	19.11.2016	Yearly	

Testing Facilities

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

Product Function and Intended Use

FOP NM-10 is intended for screening of the eye for variety of ocular conditions like diabetic retinopathy; macular edema; cataract; glaucoma, corneal ulcers, vitreous hemorrhages etc. Light from the device is shown into the patient eye & the user will use an accessory like the smart phone to capture images of the eye & device does not come in contact with any part of the patient body including the eye. The device can be used at any time & over & over again by a trainer user.

Ratings and System Details

Operating Frequency	2400 – 2483.5MHz
No. of channel	40
Channel Spacing	2 MHz
Modulation	GFSK
Conducted Power	-1.92 dBm / 0.6427mW
Data Rate	1 Mbps
Antenna Type	Inbuilt PCB Antenna
Number of antenna	One
Antenna Gain	3dBi
Supply Voltage	AC to DC adaptor: 9V, 2A Battery: 7.4 V , 1500mAH
Dimension	68 x 248 x 234mm
Environmental	Operating: 0 °C to +45 °C Storage: -10 °C to 70 °C

Test Conditions:**Voltage:** 9VDC from AC to DC adaptor

7.4VDC from battery

Environmental conditions:**Temperature:** +24 °C **RH:** 62%

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Operational Description

FOPNM 10 designed to be used to screen for diseases of the human eye. The device has two modes of operation.

1. Non Mydriatic Mode:

In this mode, IR LED is used for focusing the retina & cool white LED as flash to capture the image of the retina

2. Mydriatic Mode:

In this mode, cool white LED is used for focusing & to capture the image of the retina

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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

A test tool “CSR µEnergy Tools 2.3.0” in laptop is used to enable the transmission at maximum defined power level and to select channels low, mid and high in 2.4 GHz band on the EUT for the tests in this report. Power level value ‘4’ was set in the test tool during testing.

An application in the iPhone (FCC ID: BCG-E2643A) is used to configure the EUT in normal operating condition.

Special Accessories and Auxiliary Equipment

- None

Countermeasures to achieve EMC Compliance

- None

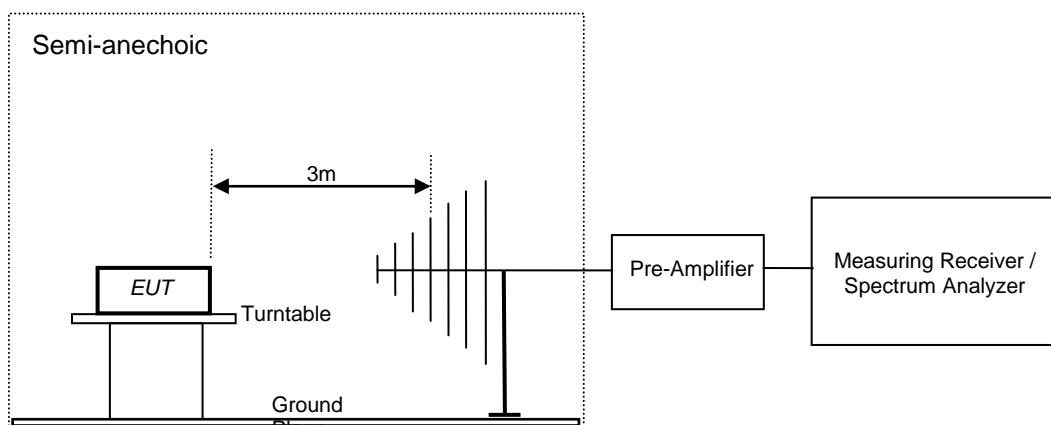
Table of frequencies

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

Radiated Emission Test

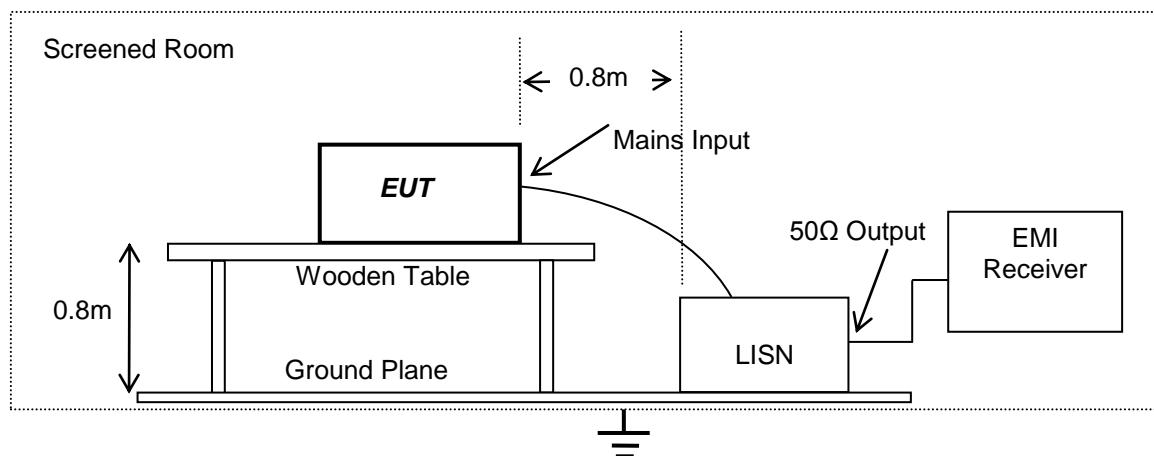
The radiated emission measurement was performed according to the procedures in ANSI C63.10-2013. The equipment under test (EUT) was placed at the middle of the 80 cm high turntable, and the EUT is 3 meters far from the measuring antenna for below 1GHz. The equipment under test (EUT) was placed at the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



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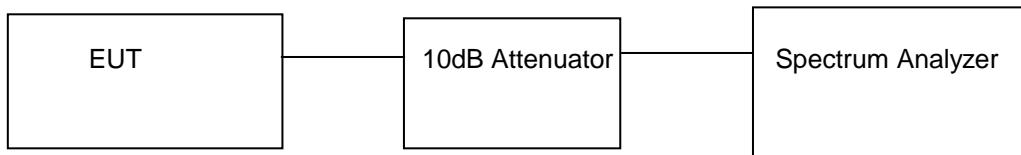
Test Results

Maximum Conducted Peak Output Power Result

Section 15.247(b) (3)
Pass

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

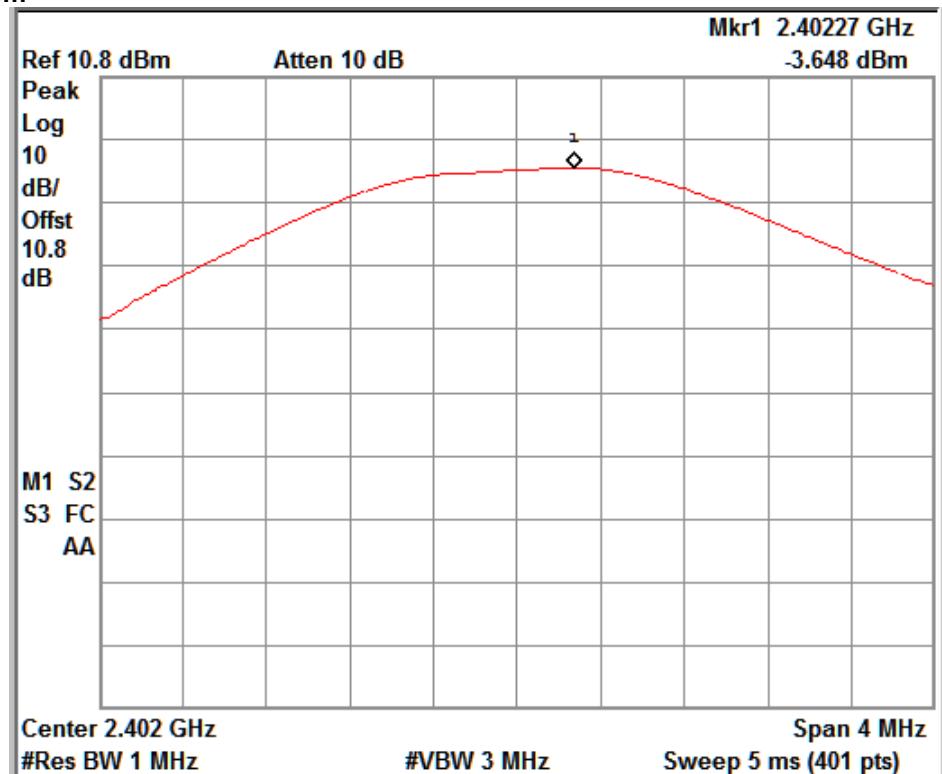
Test Method:



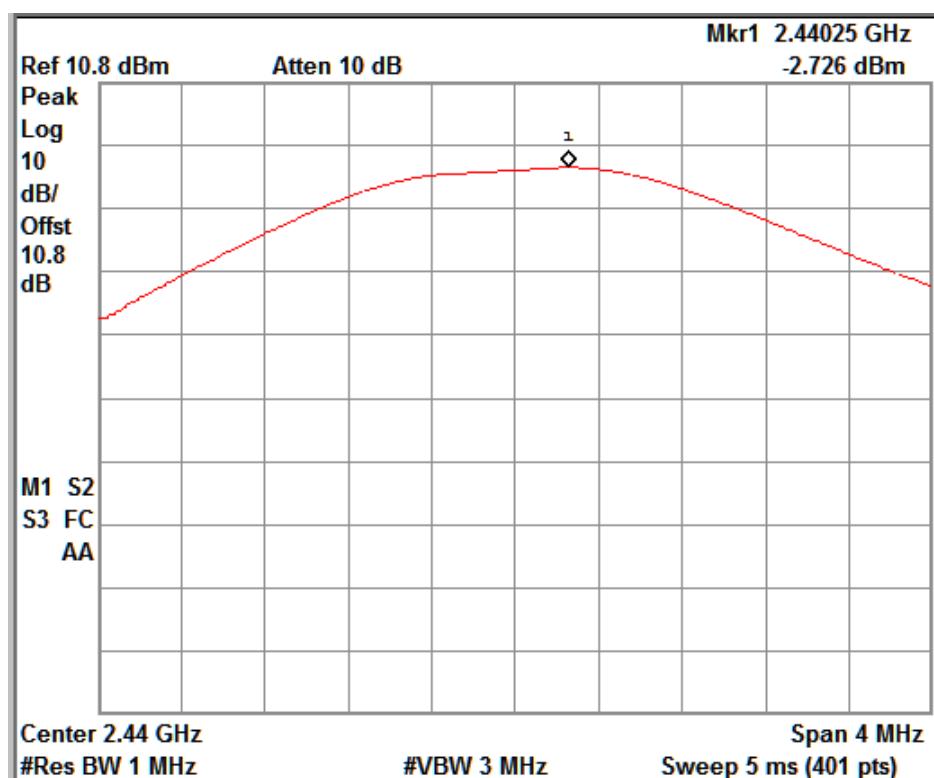
Cable Loss+ Attenuation: 10.8dB (Included in the test results)

Test Result:

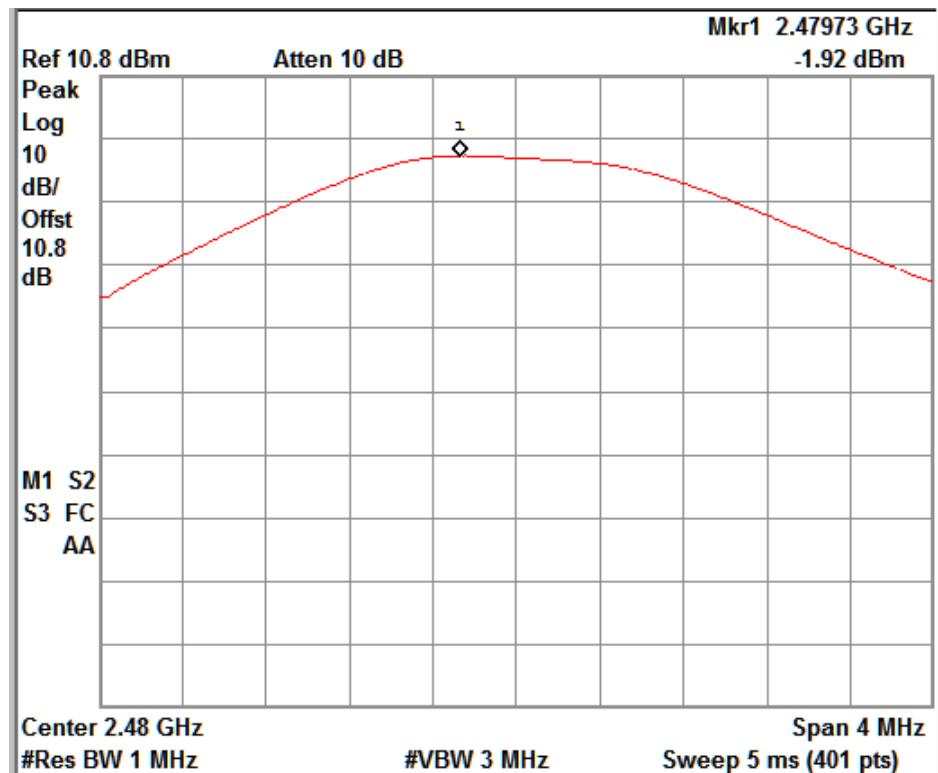
Frequency (MHz)	Total Output power (dBm)	Limit (dBm)
2402	-3.65	30.00
2440	-2.73	30.00
2480	-1.92	30.00



Channel Frequency: 2402 MHz



Channel Frequency: 2440 MHz

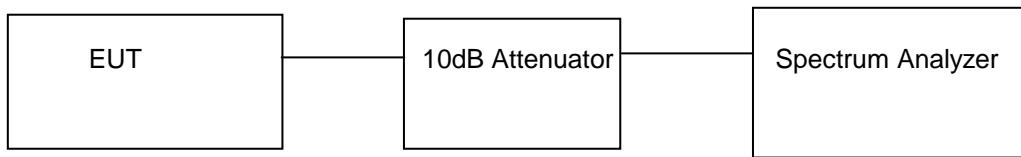


Power Spectral Density**Result****Section 15.247(e)****Pass**

Test Specification
Detector Function
Requirement

FCC Part 15 Subpart C
Peak

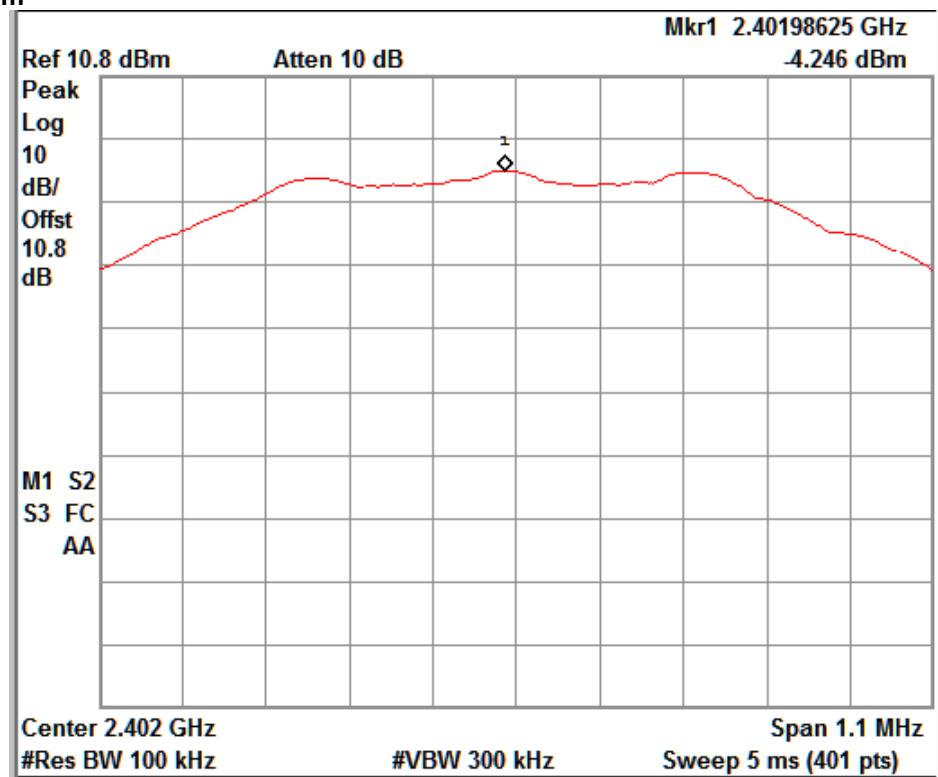
For digitally modulated systems, the power spectral density conducted from the intentional radiator to the antenna shall not be greater than 8 dBm.

Test Method:

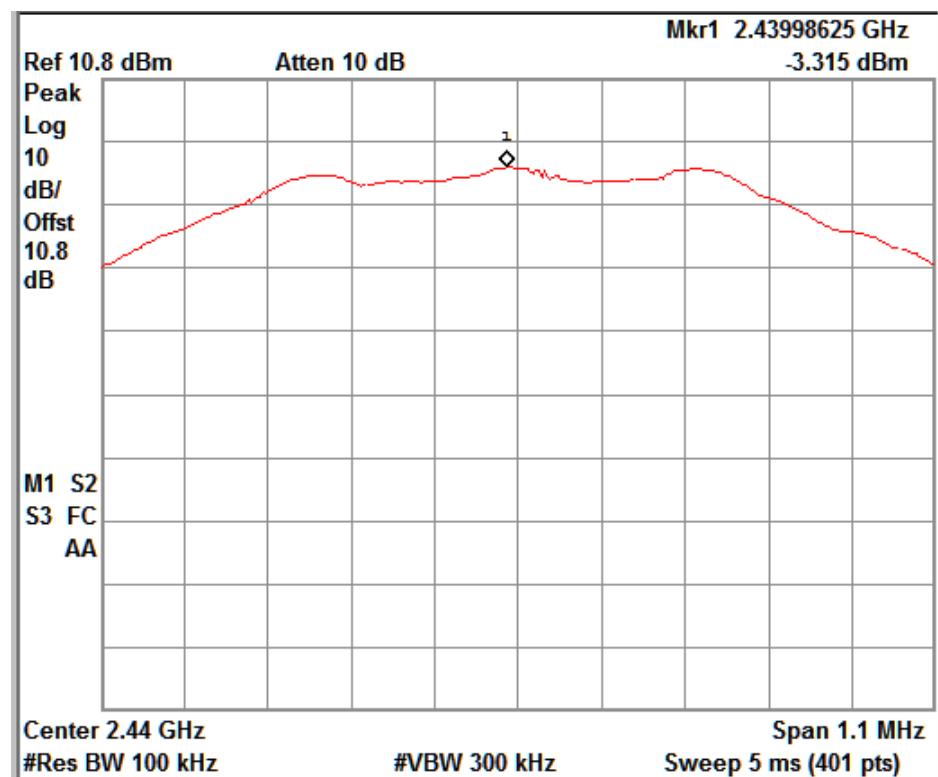
Cable Loss+ Attenuation: 10.8dB (Included in the test results).

Test Result:

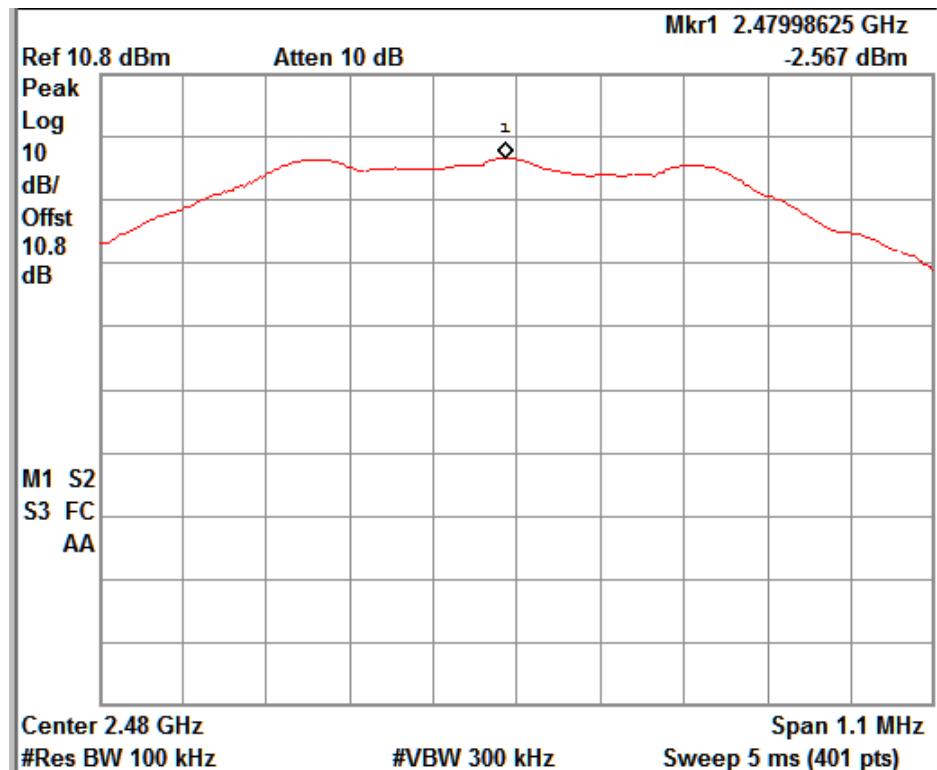
Frequency (MHz)	Total PSD (dBm)	Limit (dBm)
2402	-4.25	8
2440	-3.32	8
2480	-2.57	8



Channel Frequency: 2402 MHz



Channel Frequency: 2440 MHz

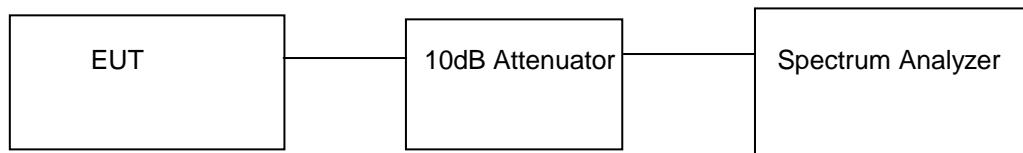


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6 dB Bandwidth
Result

Section 15.247(a) (2)
Pass

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

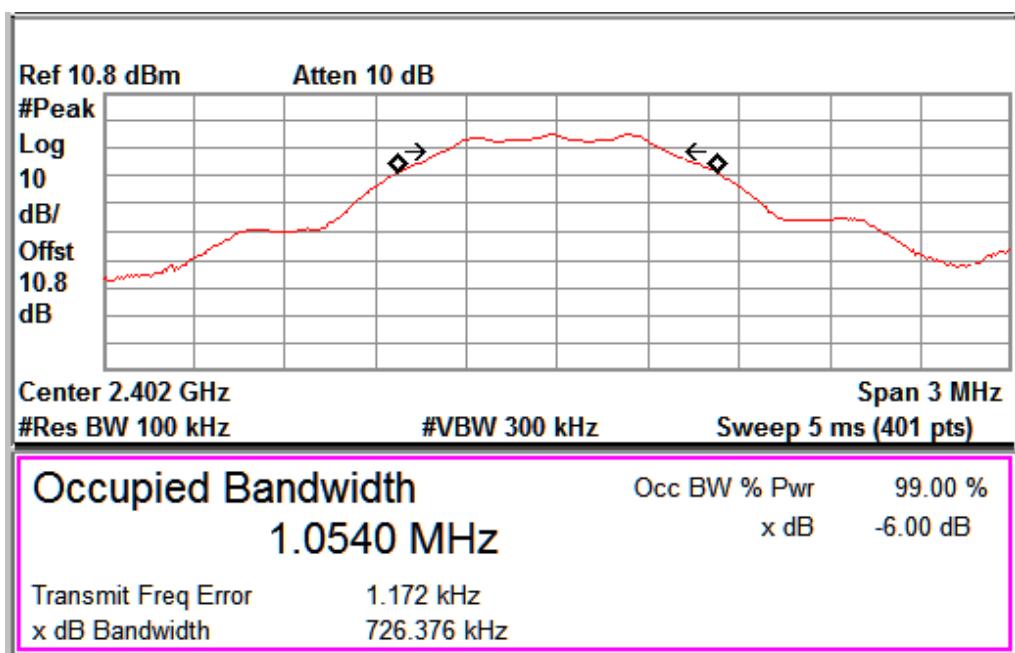
Test Method:



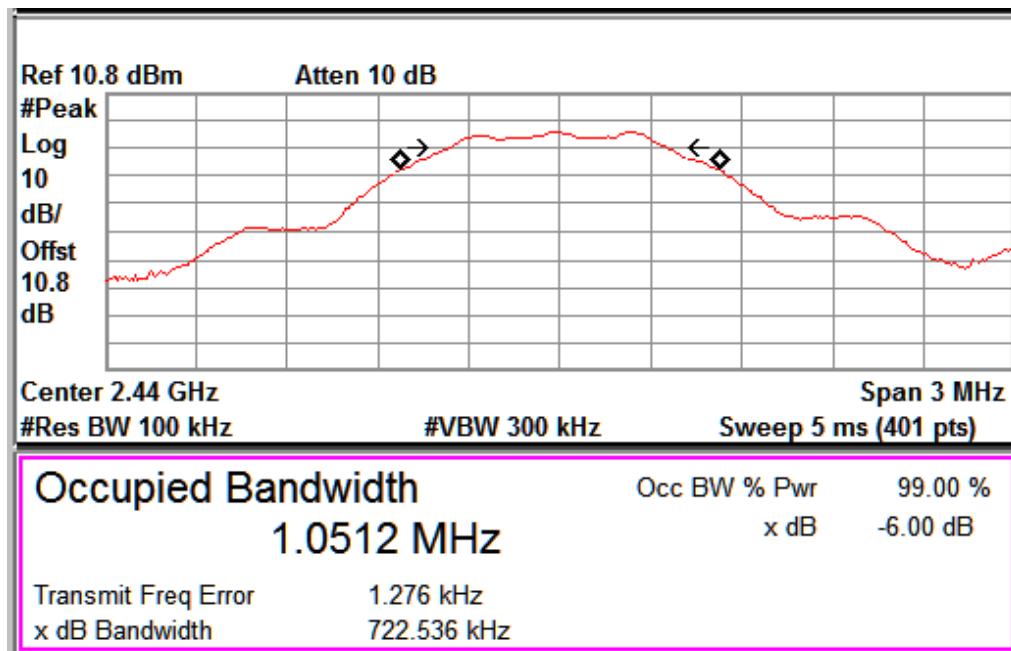
Cable Loss+ Attenuation: 10.8dB (Included in the test results).

Test Result:

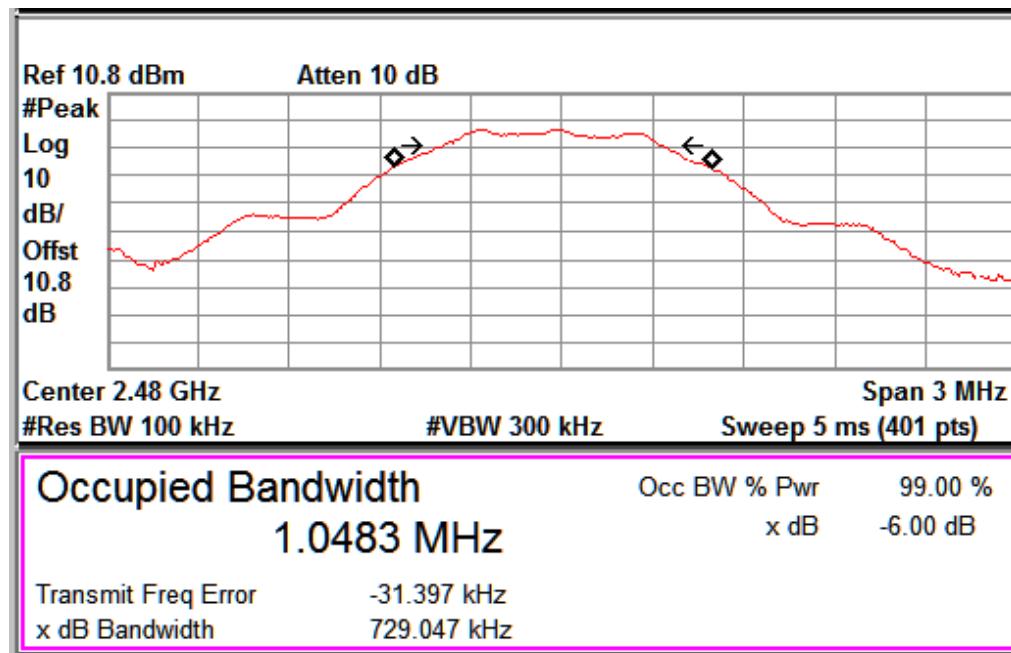
Frequency (MHz)	6 dB Bandwidth (kHz)	OBW (MHz)
2402	726.376	1.054
2440	722.536	1.051
2480	729.047	1.048



6dB BW and OBW: Channel frequency: 2402 MHz



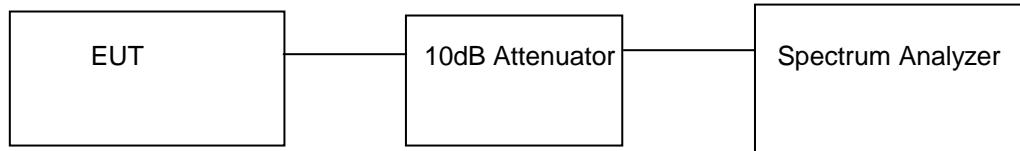
6dB BW and OBW: Channel frequency: 2440 MHz



6dB BW and OBW: Channel frequency: 2480 MHz

Emission in the non-restricted frequency bands
Result
Section 15.247(d)
Pass

Test Specification	FCC Part 15 Subpart C
Detector Function	Peak
Requirement	<p>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.</p> <p>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.</p>

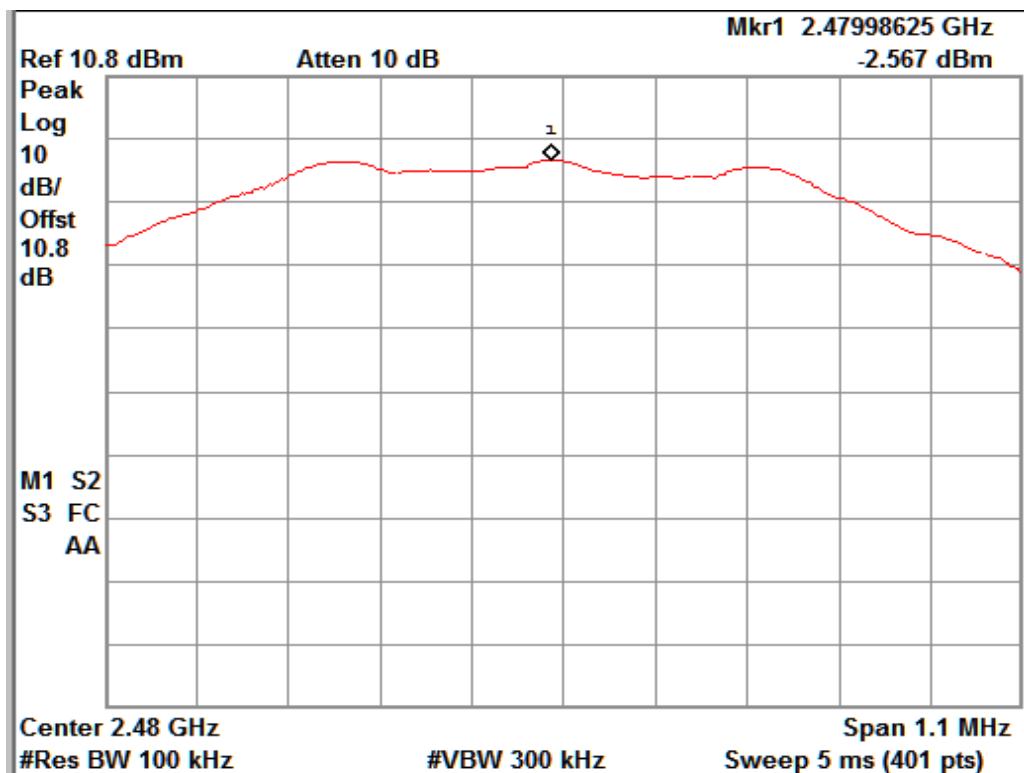
Test Method:


Cable Loss+ Attenuation: 10.8dB (Included in the test results).

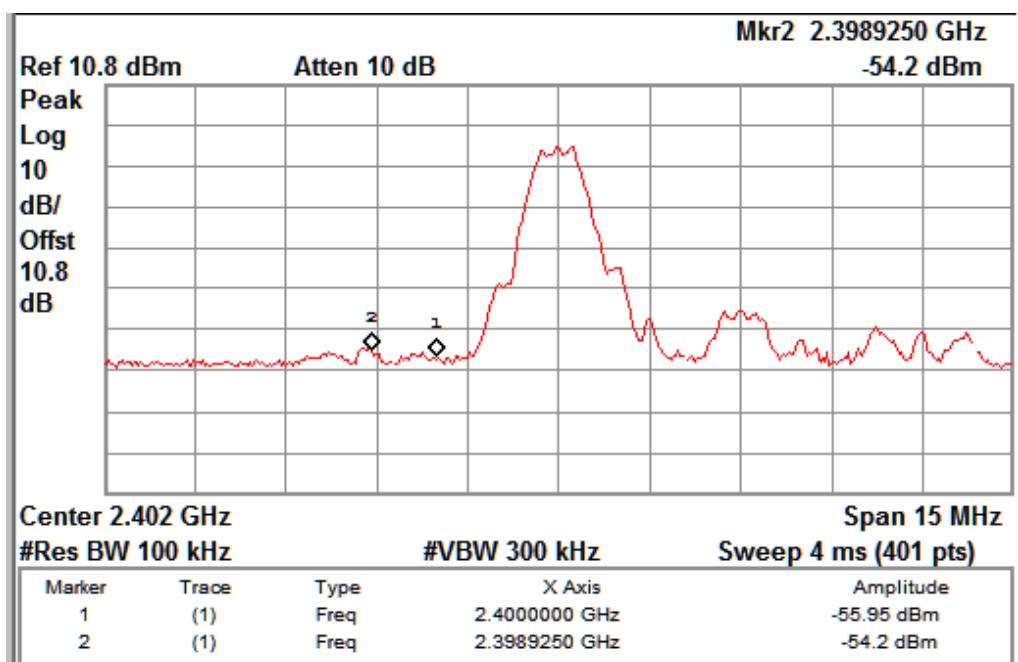
Test Result:

Channel Frequency (MHz)	Value at Band Edge				Limit (dBc)
	Band Edge Frequency (MHz)	Reference PSD Level 'A' in (dBm)	Band Edge Value 'B' in (dBm)	Difference A-B (dBc)	
2402	2400	-2.567	-55.95	53.28	20.00
2480	2483.5	-2.567	-54.83	52.26	20.00

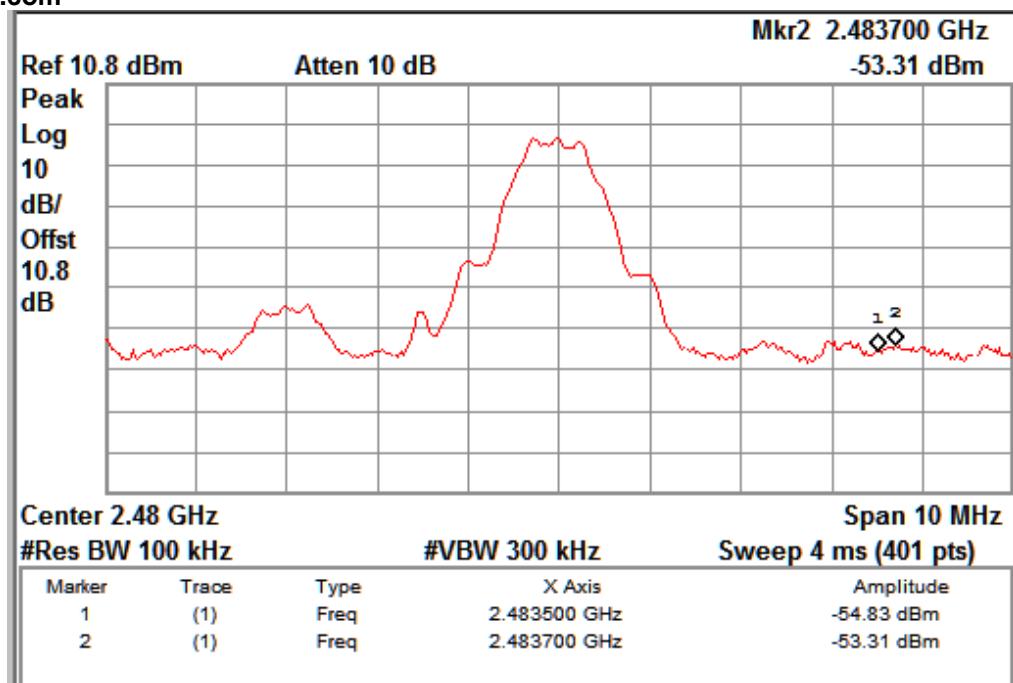
Note: Channel frequency 2480MHz found to contain maximum PSD level and same is used to establish PSD reference level.



PSD Reference Level Plot

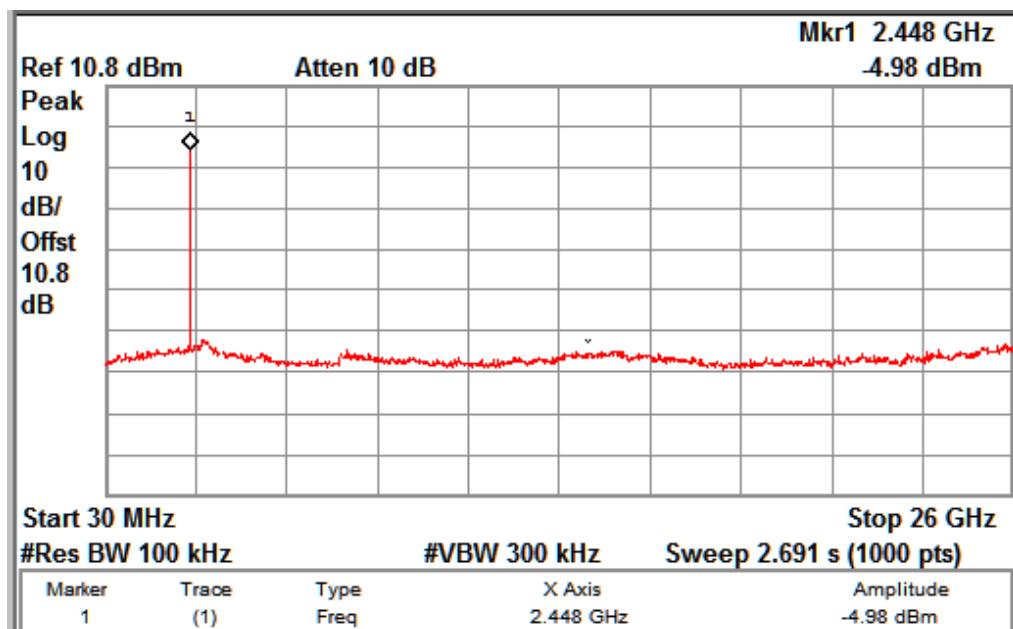
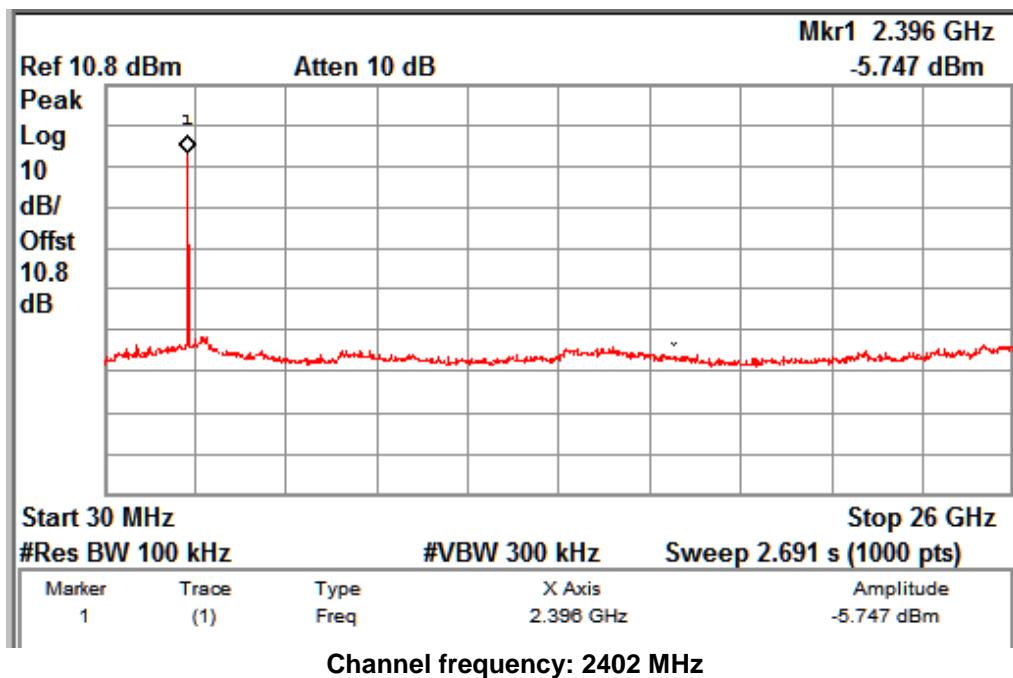


Channel frequency: 2402 MHz

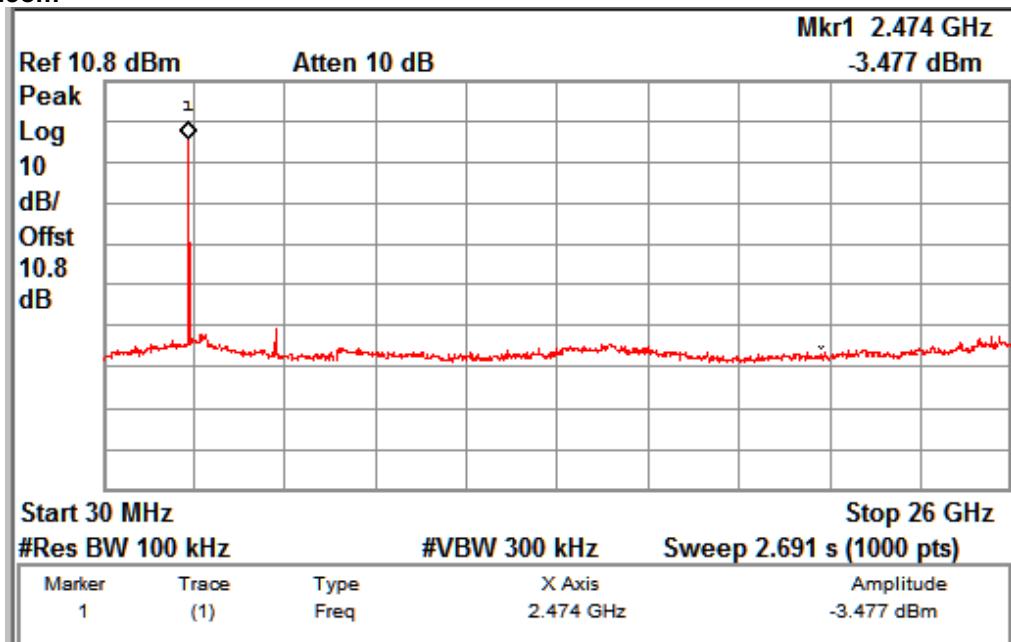


Channel frequency: 2480 MHz

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Conducted Spurious Emission



Channel frequency: 2440 MHz



Channel frequency: 2480 MHz

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

Test Specification	FCC Part 15 Subpart C
Test Method	ANSI C63.10-2013
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 below table

Limit for Radiated Emission of Section 15.209:

Frequency (MHz)	Field strength (μ V/m)	Field strength (dB μ V/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 49.5dB μ 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:

For frequency range 9 KHz to 1 GHz

Note: EUT is tested in battery mode and charging mode. Charge mode test results are found to be worst and test results for same are listed below.

Antenna Polarization	Frequency (MHz)	Field Strength Level (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)
Vertical	70.35	22.40	40	-17.6
	117.39	23.91	43.5	-19.59
	140.92	22.51	43.5	-20.99
Horizontal	No emissions found			

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Frequencies above 1GHz

Fundamental Frequency (MHz)	Antenna Polarization	Frequency of Emission (MHz)	Field Strength (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)
2402	Vertical	2390 (Pk)	45.38	74	-28.62
		2390 (Av)	33.03	54	-20.97
		2402 (Pk)	83.48	*	-
		2402 (Av)	79.47	*	-
		4804 (Pk)	50.74	74	-23.26
		4804 (Av)	40.53	54	-13.47
	Horizontal	2390 (Pk)	43.19	74	-30.81
		2390 (Av)	31.22	54	-22.78
		2402 (Pk)	93.2	*	-
		2402 (Av)	89.29	*	-
		4804 (Pk)	50.06	74	-23.94
		4804 (Av)	38.34	54	-15.66
2440	Vertical	2440 (Pk)	84.76	*	-
		2440 (Av)	80.12	*	-
		4880 (Pk)	53.69	74	-20.31
		4880 (Av)	44.42	54	-9.58
	Horizontal	2440 (Pk)	93.87	*	-
		2440 (Av)	89.21	*	-
		4880 (Pk)	50.57	74	-23.43
		4880 (Av)	38.5	54	-15.5
2480	Vertical	2480 (Pk)	86.52	*	-
		2480 (Av)	82.23	*	-
		2483.5 (Pk)	43.57	74	-30.43
		2483.5 (Av)	31.3	54	-22.7
		4960 (Pk)	53.87	74	-20.13
		4960 (Av)	43.02	54	-10.98
		7440 (Pk)	59.97	74	-14.03
		7440 (Av)	45.54	54	-8.46
	Horizontal	2480 (Pk)	94.17	*	-
		2480 (Av)	90.1	*	-
		2483.5 (Pk)	45.5	74	-28.5
		2483.5 (Av)	36.16	54	-17.84
		4960 (Pk)	53.26	74	-20.74
		4960 (Av)	42.04	54	-11.96
		7440 (Pk)	60.13	74	-13.87
		7440 (Av)	46.78	54	-7.22

Pk -> Peak Detector

Av -> Average Detector

* -> Fundamental frequency

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**Conducted Emission Test on A.C. Power Line
Result**

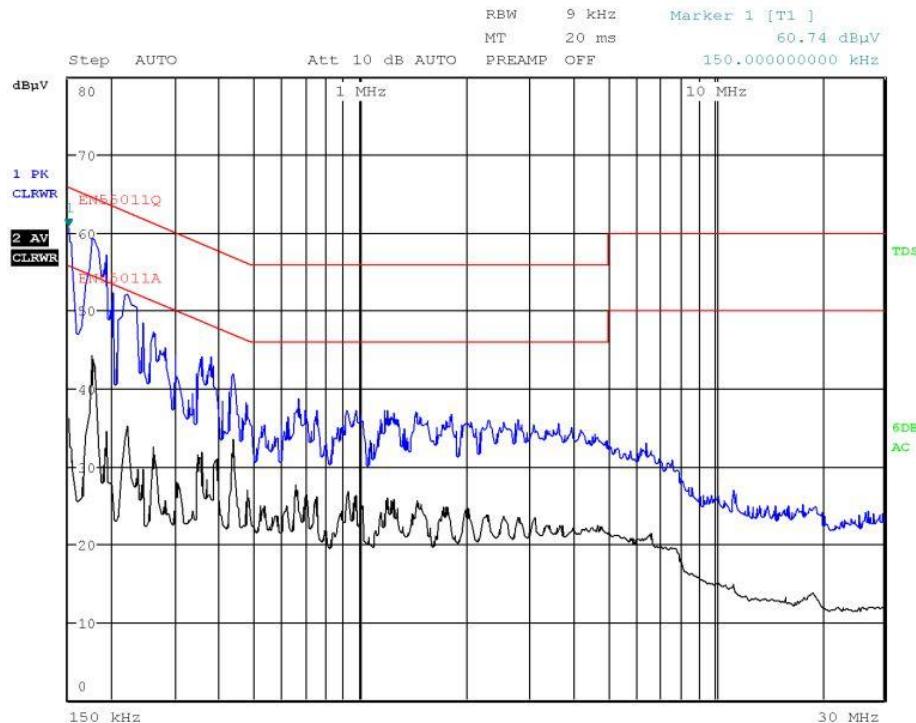
**Section 15.207
Pass**

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 : 110VAC,60Hz

Limit of section 15.207

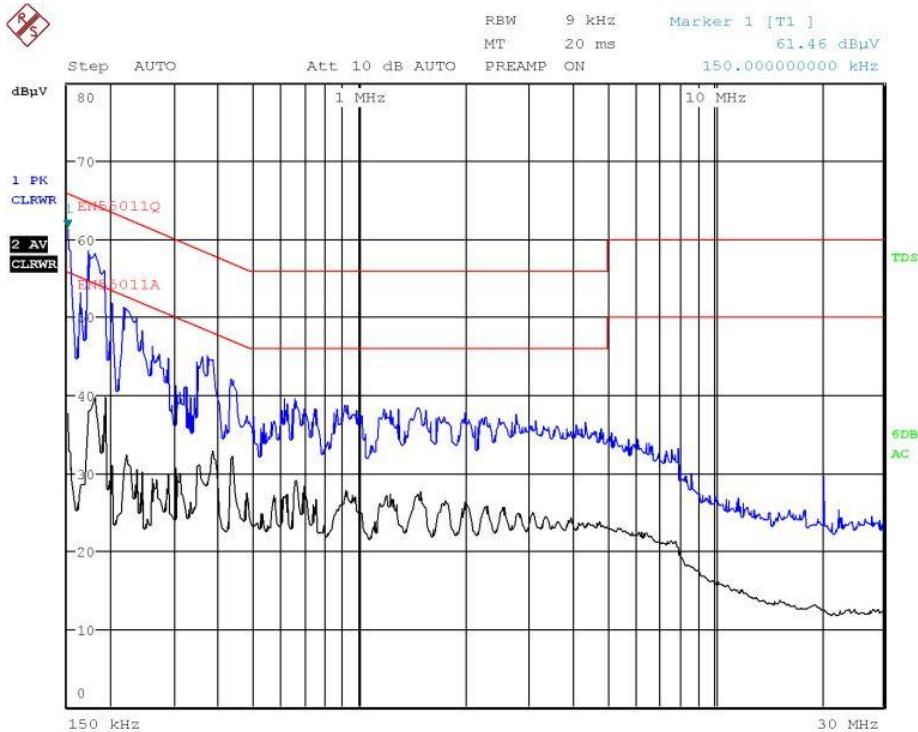
Frequency of Emission (MHz)	QP Limit (dB μ V)	AV Limit (dB μ V/m)
0.15 – 0.5	66 – 56*	56 – 46*
0.5 – 5	56	46
5 – 30	60	50

* Decreases with the logarithm of the frequency

Test Results:


EDIT PEAK LIST (Final Measurement Results)				
Trace1:	EN55011Q			
Trace2:	EN55011A			
Trace3:	---			
TRACE	FREQUENCY	LEVEL dB _{uV}	DELTA	LIMIT dB
1	Quasi Peak 174 kHz	57.66 L1	-7.09	
1	Quasi Peak 150 kHz	55.43 L1	-10.56	
1	Quasi Peak 218 kHz	50.05 L1	-12.83	
2	Average 174 kHz	41.30 L1	-13.46	
2	Average 434 kHz	32.51 L1	-14.66	
1	Quasi Peak 242 kHz	45.43 L1	-16.59	
1	Quasi Peak 258 kHz	44.16 L1	-17.32	
1	Quasi Peak 434 kHz	39.65 L1	-17.52	
1	Quasi Peak 374 kHz	40.50 L1	-17.90	
2	Average 190 kHz	35.95 L1	-18.07	
2	Average 218 kHz	34.59 L1	-18.29	
2	Average 354 kHz	30.13 L1	-18.73	
2	Average 654 kHz	26.87 L1	-19.12	
2	Average 1.182 MHz	25.47 L1	-20.52	
2	Average 922 kHz	25.32 L1	-20.67	
2	Average 1.442 MHz	24.82 L1	-21.17	
2	Average 1.746 MHz	24.52 L1	-21.47	
1	Quasi Peak 666 kHz	34.38 L1	-21.61	
2	Average 150 kHz	34.28 L1	-21.71	
1	Quasi Peak 1.182 MHz	33.75 L1	-22.25	

Mode: Line



EDIT PEAK LIST (Final Measurement Results)				
Trace1:	EN55011Q			
Trace2:	EN55011A			
Trace3:	---			
TRACE	FREQUENCY	LEVEL dBµV	DELTA	LIMIT dB
1 Quasi Peak	170 kHz	55.30	N	-9.65
1 Quasi Peak	150 kHz	55.87	N	-10.12
1 Quasi Peak	214 kHz	48.83	N	-14.21
2 Average	434 kHz	32.57	N	-14.60
2 Average	382 kHz	32.96	N	-15.27
2 Average	178 kHz	38.89	N	-15.67
1 Quasi Peak	198 kHz	46.84	N	-16.84
1 Quasi Peak	430 kHz	40.22	N	-17.03
2 Average	190 kHz	36.90	N	-17.13
1 Quasi Peak	370 kHz	41.23	N	-17.26
2 Average	654 kHz	28.55	N	-17.44
2 Average	910 kHz	27.52	N	-18.47
2 Average	1.478 MHz	26.55	N	-19.44
1 Quasi Peak	906 kHz	36.15	N	-19.84
2 Average	218 kHz	32.87	N	-20.02
2 Average	1.734 MHz	25.92	N	-20.07
2 Average	2.278 MHz	25.25	N	-20.74
2 Average	150 kHz	35.11	N	-20.88
2 Average	302 kHz	29.18	N	-21.00
1 Quasi Peak	162 kHz	44.16	N	-21.19

Mode: Neutral
*****END OF TEST REPORT*****