

Prüfbericht-Nr.: Test report no.:	IN254LFP 001	Auftrags-Nr.: Order no.:	147013404 070	Seite 1 von 47 Page 1 of 47
Kunden-Referenz-Nr.: Client reference no.:	2009322	Auftragsdatum: Order date:	2025-01-24	
Auftraggeber: Client:	ABMRC, LLC 860 Blue Gentian Road, Suite 200, Eagan, Minnesota-55121, USA			
Prüfgegenstand: Test item:	BiWaze Clear			
Bezeichnung / Typ-Nr.: Identification / Type no.:	BK181	Serien -Nr.: Serial no.:	KNS24A007	
Auftrags-Inhalt: Order content:	Testing and issue of Test Report with Grant Certificate			
Prüfgrundlage: Test specification:	FCC Part15 SubpartC 15.247; 15.205; 15.207; 15.209			
Wareneingangsdatum: Date of sample receipt:	2025-09-05			
Prüfmuster-Nr.: Test sample no.:	A004085214-003			
Prüfzeitraum: Testing period:	2025-09-05 - 2025-09-12			
Ort der Prüfung: Place of testing:	Wireless laboratory, Bangalore			
Prüflaboratorium: Testing laboratory:	TÜV Rheinland (India) Pvt.Ltd., 27/B, 2nd Cross, Electronic City Phase1 Bangalore -560 100, India FCC Test site registration number: 496599 ISED Test site registration number: 27711			
Prüfergebnis*: Test result*:	Pass			
geprüft von: tested by:			genehmigt von: authorized by:	
Datum: Date: 2025-11-25	Signed by: Naveen Kumar Muthyalapati Venkata		Ausstellungsdatum: Issue date: 2025-11-25	Signed by: Madhu Nagaraju
Stellung / Position:	M.V.Naveen Kumar Senior Engineer		Stellung / Position:	Madhu K.N Assistant Manager
Sonstiges / Other:	FCC ID: 2ATX9-BK181A			
Zustand des Prüfgegenstandes bei Anlieferung: Condition of the test item at delivery:	Prüfmuster vollständig und unbeschädigt Test item complete and undamaged			
* Legende: P(ass) = entspricht o.g. Prüfgrundlage(n) F(ail) = entspricht nicht o.g. Prüfgrundlage(n) N/A = nicht anwendbar N/T = nicht getestet * Legend: P(ass) = passed a.m. test specification(s) F(ail) = failed a.m. test specification(s) N/A = not applicable N/T = not tested				
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- | | |
|---|--|
| 1 | <p>Alle eingesetzten Prüfmittel waren zum angegebenen Prüfzeitraum gemäß eines festgelegten Kalibrierungsprogramms unseres Prüfhauses kalibriert. Sie entsprechen den in den Prüfprogrammen hinterlegten Anforderungen. Die Rückverfolgbarkeit der eingesetzten Prüfmittel ist durch die Einhaltung der Regelungen unseres Managementsystems gegeben.</p> <p>Detaillierte Informationen bezüglich Prüfkonditionen, Prüfequipment und Messunsicherheiten sind im Prüflabor vorhanden und können auf Wunsch bereitgestellt werden.</p> <p><i>The equipment used during the specified testing period was calibrated according to our test laboratory calibration program. The equipment fulfils the requirements included in the relevant standards. The traceability of the test equipment used is ensured by compliance with the regulations of our management system. Detailed information regarding test conditions, equipment and measurement uncertainty is available in the test laboratory and could be provided on request.</i></p> |
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| 3 | <p>Prüfklausel mit der Note * wurden an qualifizierte Unterauftragnehmer vergeben und sind unter der jeweiligen Prüfklausel des Berichts beschrieben.</p> <p>Abweichungen von Prüfspezifikation(en) oder Kundenanforderungen sind in der jeweiligen Prüfklausel im Bericht aufgeführt.</p> <p><i>Test clauses with remark of * are subcontracted to qualified subcontractors and described under the respective test clause in the report.</i></p> <p><i>Deviations of testing specification(s) or customer requirements are listed in specific test clause in the report.</i></p> |
| 4 | <p>Die Entscheidungsregel für Konformitätserklärungen basierend auf numerischen Messergebnissen in diesem Prüfbericht basiert auf der "Null-Grenzwert-Regel" und der "Einfachen Akzeptanz" gemäß ILAC G8:2019 und IEC Guide 115:2023, es sei denn, in der auf Seite 1 dieses Berichts genannten angewandten Norm ist etwas anderes festgelegt oder vom Kunden gewünscht. Dies bedeutet, dass die Messunsicherheit nicht berücksichtigt wird und daher auch nicht im Prüfbericht angegeben wird. Zu weiteren Informationen bezüglich des Risikos durch diese Entscheidungsregel siehe ILAC G8:2019.</p> <p><i>The decision rule for statements of conformity, based on numerical measurement results, in this test report is based on the "Zero Guard Band Rule" and "Simple Acceptance" in accordance with ILAC G8:2019 and IEC Guide 115:2023, unless otherwise specified in the applied standard mentioned on Page 1 of this report or requested by the customer. This means that measurement uncertainty is not taken in account and hence also not declared in the test report. For additional information to the resulting risk based of this decision rule please refer to ILAC G8:2019.</i></p> |

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TEST SUMMARY

Test Item	FCC Clause	Result
Maximum conducted output power	15.247 (b)(3)	Pass
Maximum Power Spectral Density	15.247(e)	N/T
DTS Bandwidth & Occupied Channel Bandwidth	15.247(a)(2)	N/T
Emissions in non-restricted frequency bands	15.247 (d)	N/T
Spurious Radiated Emissions and Restricted Bands of Operation	15.209 / 15.205	Pass
AC Power lines Conducted emission	15.207	Pass

N/T: Not Tested – These test cases have not been executed, as the product incorporates the certified RF module: **WLAN Module of AP6212SD** from Ampak Technology Inc. This module has been tested at **Bureau Veritas Consumer Products Services (H.K.) Ltd., Taoyuan Branch**, under **FCC ID: ZQ6-AP6212SD**. Therefore, the mentioned test cases are excluded, and relevant details can be found in the module's test reports of FCC: RF150626C12 & RF150626C12-2 corresponding to the respective FCC ID.

FCC Grant Date
28/11/2016

Product Category: Electronics Testing

Test Discipline: EMC Test Facility

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REVISION HISTORY OF THIS REPORT

Report Number	Version	Description	Issue date
IN254LFP 001	01	Initial issue of report	2025-11-25

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1 GENERAL REMARKS

1.1 Attachments

All attachments are part of this test report and are issued in separate document

1. Test Setup photos
2. EUT External Photos
3. EUT Internal Photos
4. FCC Label and Label Location
5. Block Diagram
6. Specification of EUT
7. Schematic Diagrams
8. Bill of Material
9. User Manual
10. Maximum Permissible Exposure Information

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2 TEST SITES

2.1 Testing Facilities

1. TÜV Rheinland (India) Pvt.Ltd.,
27/B, 2nd Cross,
ElectronicCityPhase1
Bangalore – 560 100,
India
2. TUV Rheinland (India) Pvt.Ltd.,
108, Beside ISBR Business School,
Electronic city Phase I
Bangalore - 560 100,
India

2.2 List of Test and Measurement Instruments

Table 1: List of test and measurement instruments

Equipment	Manufacturer	Model Name	Serial Number	Firmware Versions	Calibration Due Date	Periodicity	Test Facility
EMI Receiver	Rohde & Schwarz	ESW 44	103384	3.20SP2	24.06.2026	Yearly	Radiated Spurious Emission
Active loop antenna	Frankonia	LAX-10	LAX-10-800	-	16.04.2026	Yearly	
Balun & Biconical Antenna	Schwarzbeck mess-elektronik	BBA 9106+VH BB 9124	9124-1117	-	27.05.2026	Yearly	
Log-Periodic Antenna	Schwarzbeck mess-elektronik	VUSLP 9111B	9111B-324	-	26.05.2026	Yearly	
Horn Antenna	Schwarzbeck	BBHA 9120 D	9120D-01944	-	12.11.2025	Yearly	
Horn Antenna	Schwarzbeck	BBHA 9170	BBHA 9170-0904	-	14.02.2026	Yearly	
EMI Test Receiver	Rohde & Schwarz	ESW44	101773	1.72.SP1	26.01.2026	Yearly	
Semi Anechoic Chamber	Frankonia	-	-	-	-	-	
Fully Anechoic Chamber	Albatross	-	-	-	-	-	
Spectrum Analyzer	Agilent	E4407B	US411927 72	A.14.07	16.01.2026	Yearly	Conducted Test Parameters
10 dB RF Attenuator (DUT-1)	Rohde & Schwarz	-	-	-	15.10.2025	Yearly	
EMI Receiver	Rohde & Schwarz	ESR7	101133	3.48 SP3	20.05.2026	Yearly	Conducted AC Power line Test
Two Line LISN	Scientific	SMLIN6 3-2	161101	-	06.03.2026	Yearly	
Pulse limiter [0 - 30 MHz]	Rohde & Schwarz	ESH3-Z2	100811	-	26.06.2026	Yearly	

Table 2: Instrument application Software versions

SL. No.	Test Type	Application software	Version
1	Radiated spurious emission measurement in FAC	EMC 32	10.60.20
2	Radiated spurious emission measurement in 10mtr SAC	BAT EMC	3.20.0.17

3 GENERAL PRODUCT INFORMATION

3.1 Product Function and Intended Use

The BiWaze® Clear System is indicated for the loosening and mobilization of secretions, lung expansion therapy, the treatment and prevention of pulmonary atelectasis, and can provide supplemental oxygen when used with an oxygen supply.

The BiWaze Clear System is for use on adult or pediatric patients in acute care (aged 2 years and older) and homecare environments (aged 5 years and older).

The BiWaze Clear System may be used with patient interfaces including face mask, mouthpiece, a trach adapter to endotracheal or tracheostomy tube in acute and home care environments.

The BiWaze Clear System may be used in-line with a ventilator in acute care environments only.

3.2 Ratings and System Details of Equipment under Test

Table 3: Ratings and System Details as declared by Client*

Radio Protocol	Bluetooth Low Energy	Wi-Fi
Operating Frequency Range	2402MHz-2480MHz	2412MHz to 2462MHz
No. of Channels	40	11 (Refer Table 5)
Channel Spacing	2MHz	5MHz
Measured Power (dBm)	3.78dBm@1Mbps_Ch-2402MHz	15.39dBm@2462MHz_b-mode_1Mbps
Modulation	GFSK	802.11b: DSSS, 802.11g/n: OFDM,
Number of antennas	1	1
Antenna Gain	1.05dBi (max peak gain)	1.05dBi(Max Peak Gain)
Antenna Type	PIFA Antenna	
Supply Voltage to Product	100-230VAC 50Hz/60Hz through mains 25.9VDC through internal Battery (Refer the Data sheet)	
Environmental conditions	Storage: Temperature: -25 °C to 70°C Relative Humidity: 10 to 95% (non-condensing) Atmospheric Pressure: 106 kPa to 60 kPa	
	Operating : Temperature: 5 °C to 35 °C Relative Humidity: 15 to 90% (noncondensing) Atmospheric Pressure: 106 kPa to 70 kPa	
EUT Dimension(L x W x H)	27.5 cm L x 23.5 cm W x 9.0 cm H	

***Disclaimer:** The information/data is supplied by the client and the same is considered to arrive at the final value. Any changes made apart from the specified specification, can directly impact on the tests results. Refer the products user manual for more details.

3.3 Measurement Uncertainty:

Reported uncertainties represent expanded uncertainties expressed at approximately the 95% confidence level using a coverage factor of $k = 2$

Table 4: Measurement Uncertainty

Parameter	Uncertainty
RF output power, conducted	± 0.67 dB
Power Spectral Density, conducted	± 0.85 dB
Unwanted Emissions, conducted	± 2.58 dB
All emissions, radiated	± 3.67 dB

4 TEST SET-UP AND OPERATION MODE

4.1 Principle of Configuration Selection

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

4.2 Test Operation and Test Software

Hardware Name: 1463077491-2

UI Software Version: 1.10.0

Firmware Version: 1.9.0

4.3 DUT Configuration

Power Supply: 1 phase 110VAC/60Hz & Internal Battery

Therapy Configuration: Auto Mode(OSC+NEB)

Inhale pressure: 70 cmH₂O with nebulizer function

Oscillation: High

Cycle duration: Extended

Number of cycles: Extended

4.4 Special Accessories and Auxiliary Equipment

Sl. No	Equipment Name	Make	Model No.	Serial No
1	BiWaze Clear Dual Lumen Circuit with Face Mask - Adult Medium	ABMRC	BK287	-
2	Nonin SpO ₂ Reusable Pulse Oximeter Sensor – 8000 series	Nonin	3017LP/3012LP	-
3	Aerogen Nebulizer -Power Cable-Aerogen	Aerogen	BK389	-

4.5 Countermeasures to achieve EMC Compliance

- None

4.6 List of frequencies

Frequency Band (GHz)	Channel No.	Frequency (MHz)
BLE (2.4-2.4835)	0	2402
	1	2404
	2	2406
	3	2408
	:	:
	:	:
	18	2438
	19	2440
	20	2442
	:	:
	:	:
	36	2474
	37	2476
	38	2478
	39	2480

Table 5: List of BLE Centre frequencies

Channel used for BLE testing

Channel low: 2402MHz

Channel mid: 2440MHz

Channel high: 2480MHz

Frequency Band (MHz)	Channel No.	Channel Frequency (MHz)
2412 – 2462	1	2412
	2	2417
	3	2422
	4	2427
	5	2432
	6	2437
	7	2442
	8	2447
	9	2452
	10	2457
	11	2462

Table 6: List of Wi-Fi center Frequencies

Channel used for Wi-Fi 2.4GHz testing

Protocol: WLAN 802.11b

Channel Low : 2412 MHz

Channel Mid : 2437 MHz

Channel High : 2462 MHz

Protocol: WLAN 802.11g

Channel Low : 2412 MHz

Channel Mid : 2437 MHz

Channel High : 2462 MHz

Protocol: WLAN 802.11n_20MHz

Channel Low : 2412 MHz

Channel Mid : 2437 MHz

Channel High : 2462 MHz

4.7 TUV Sample Identification

TUV Sample Identification number: A004085214-003 – Radiated test sample & Conducted test Sample.

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5 Operational Description

The BiWaze Clear System helps to mobilize secretions and provide lung expansion therapy for the treatment and prevention of pulmonary atelectasis and can provide supplemental oxygen when used with an oxygen supply. The airway clearance therapy creates airflow bias which expands the airways and dislodges retained mucus in the lungs and helps treat and prevent atelectasis. BiWaze Clear provides three respiratory therapies: PEP, OSC, and NEB.

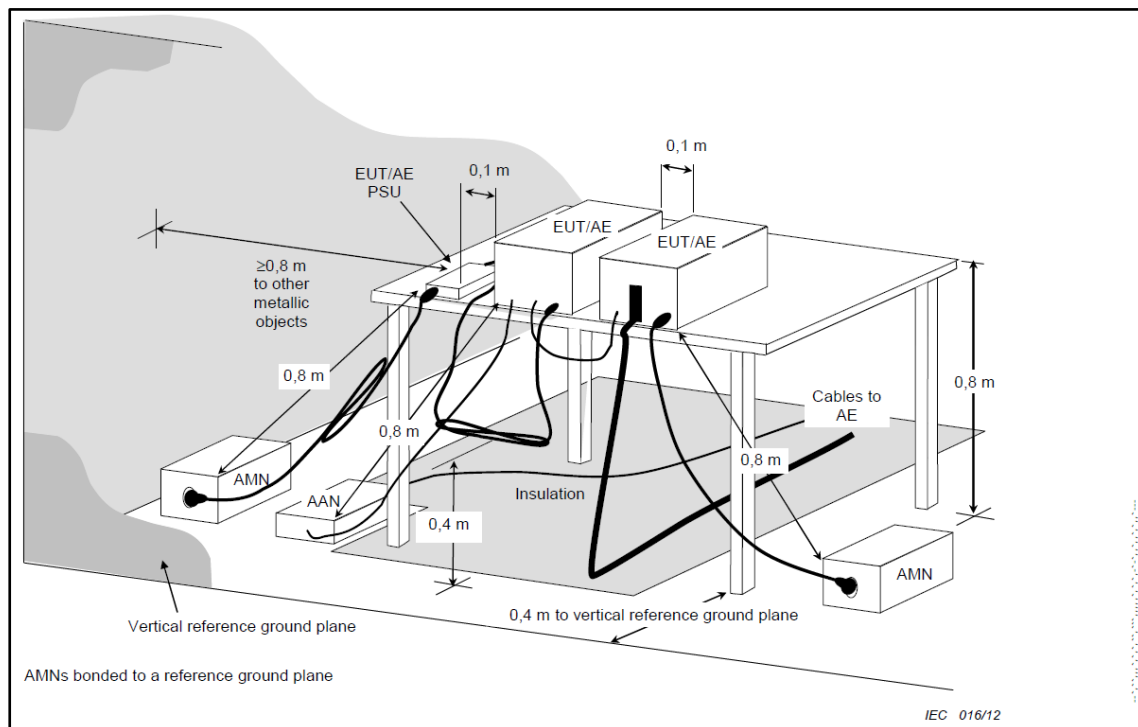
6 TEST METHODOLOGY

6.1 AC Power lines Conducted emission

Measured levels of ac powerline conducted emission across the 50Ω LISN port (to which the EUT is connected). All emission voltage and current measurements shall be made on each current-carrying conductor at the plug end of the EUT power cord by the use of mating plugs and receptacles on the LISN, if used. Equipment shall be tested with power cords that are normally supplied or recommended by the manufacturer and that have electrical and shielding characteristics that are the same as those cords normally supplied or recommended by the manufacturer.

The device is placed on the test table, raised 80cm above the reference ground plane. The vertical conducting plane is located 40cm to the rear of the device. AC Conducted emission measurement is made over frequency range from 150 kHz to 30MHz, this measurement was performed an AC adaptor 110V AC 60Hz supply

6.1.1 Test Setup Configuration



6.2 Radiated Emission Test

The radiated emission measurement was performed according to the procedures in ANSI C63.10-2020. The equipment under test (EUT) was placed at the middle of the 80 cm high turntable for below 1 GHz & 1.5 m height for above 1 GHz measurement, 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 1 m and 4 m, 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 1000 MHz was performed by horn antenna, the measurement below 30 MHz was performed by loop antenna, Measurement from 30 MHz to 200 MHz was performed by Balloon and Biconical Antenna, and measurement from 200 MHz to 1 GHz was performed by Log-Periodic Antenna.

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

6.2.1 Test Setup Configuration

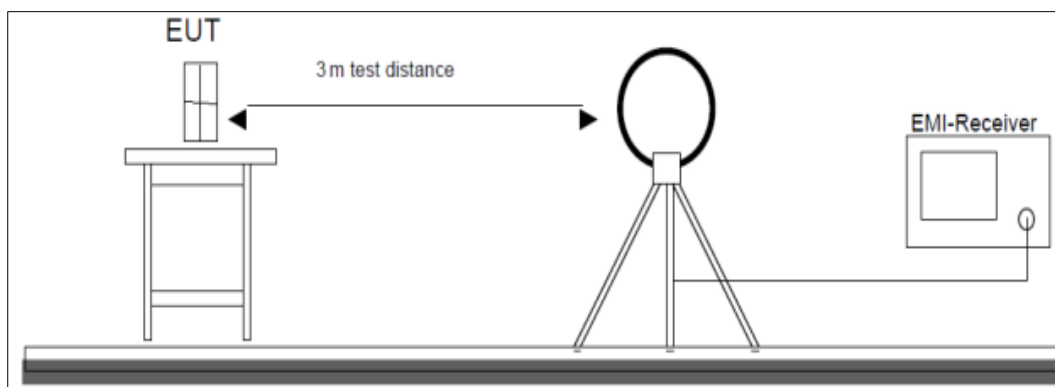


Figure 1: Frequency Range 9 kHz- 30 MHz

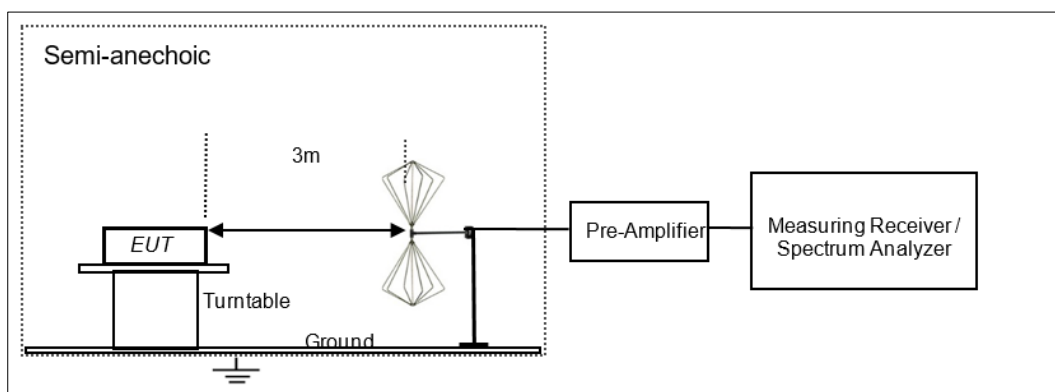


Figure 2: Frequency Range 30 MHz – 200 MHz

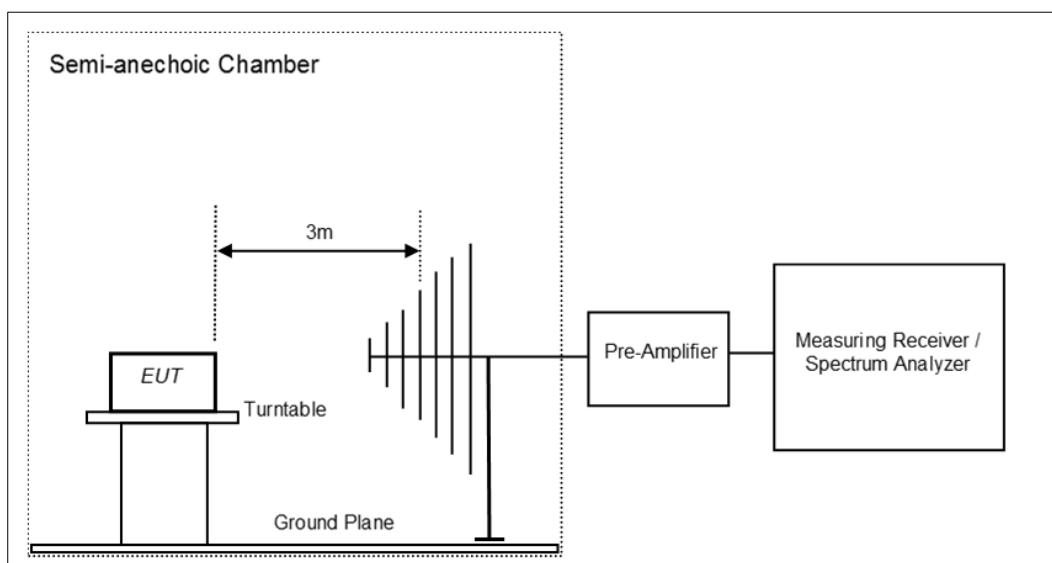


Figure 3: Frequency Range 200 MHz - 1GHz

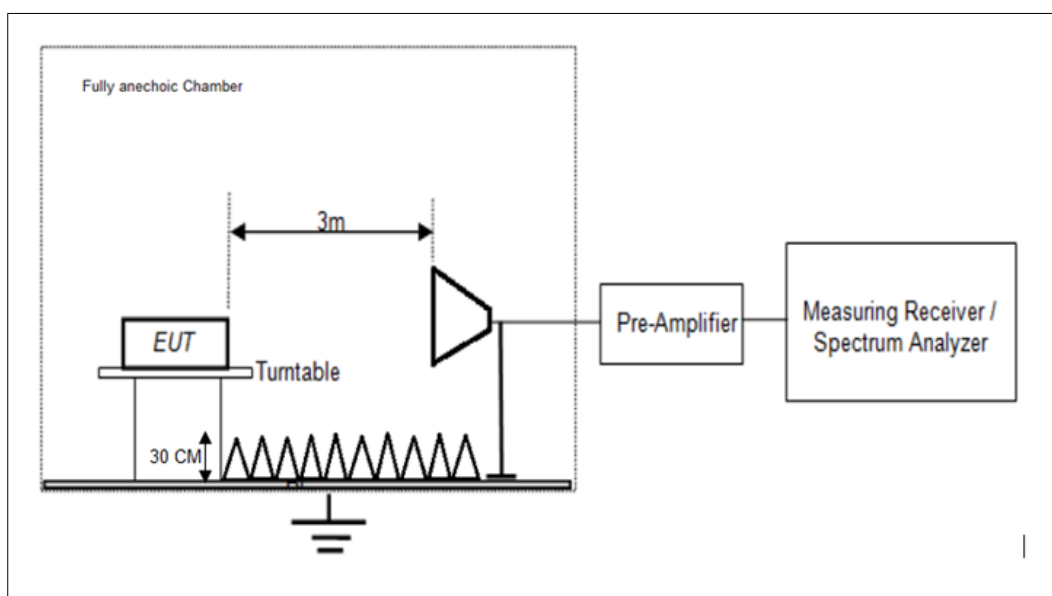


Figure 4: Frequency Range above 1 GHz

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7 TEST RESULTS FOR BLE

7.1 Maximum Conducted Output Power

Result

Pass

Test Specification	FCC part 15 Subpart C 15.247 (b)(3)
Test Method	Subclause 11.9.2.3.2 of ANSI C63.10-2020
Detector	Peak
Port of testing	Conducted mode
Requirement	Power $\leq$ 1 W (30 dBm)

Test Condition

Normal Test Condition:

Temperature (Norm) = +21.8°C Voltage = 110VAC through AC mains Relative humidity: 55%

KDB Guidelines applied:

Measurements were made as per section 8.3.1.1 in KDB 558074 D01 15.247 Measurement Guidance v05r02.

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Test results:

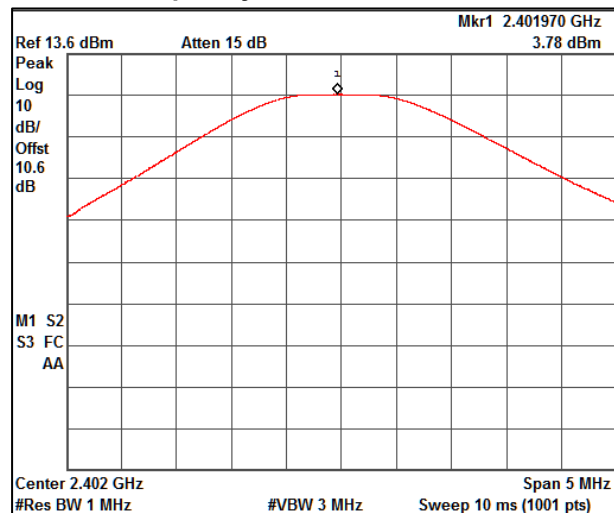
Note:

1. All the losses are included during measurement and final values are mentioned in the test report
2. Total Peak Output power (dBm) = Measured Peak power (dBm) + Cable loss (1dB)
3. This product do not support additional beamforming gain / directional gain, it uses single antenna and hence Directional gain of the single antenna is 1.05 dBi

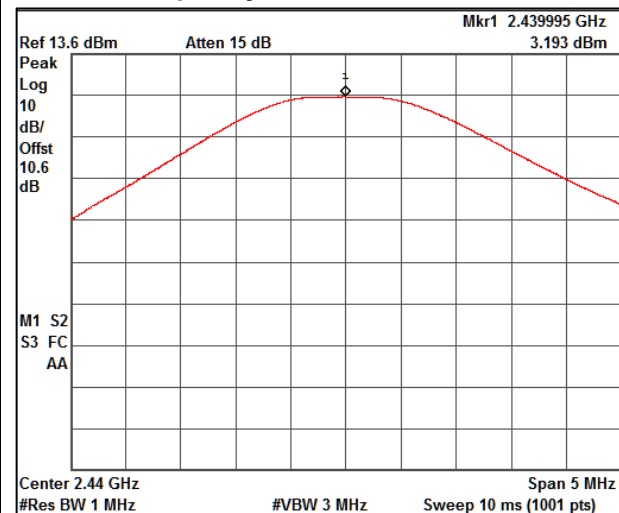
Data rate	Channel Frequency	Measured power (dBm)	Power Limit (dBm)
1Mbps	2402	3.78	30.00
	2440	3.19	30.00
	2480	3.61	30.00

Test Plots:

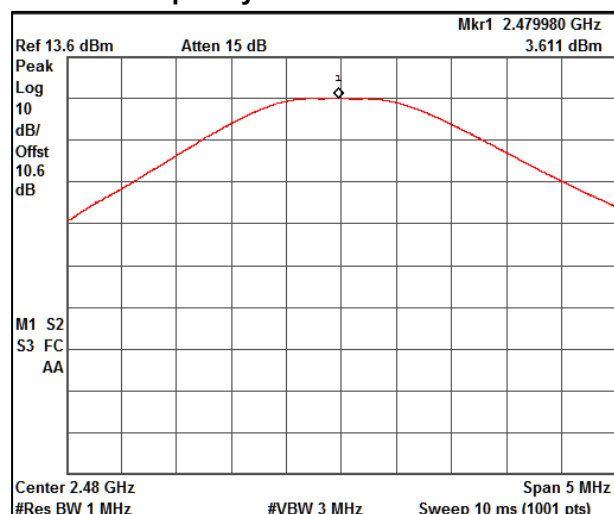
Channel Frequency: 2402MHz



Channel Frequency: 2440MHz



Channel Frequency: 2480MHz



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7.2 Spurious Radiated Emissions & Restricted Bands of Operation

Result

Pass

Test Specification	FCC part 15 Subpart C 15.247 (d) / (15.209 & 15.205)
Test Method	ANSI C63.10-2020
Measurement Location	Semi Anechoic Chamber 9kHz - 1 GHz Fully Anechoic Chamber 1 GHz - 26GHz
Measurement Bandwidth	100 kHz for frequency range < 1GHz 1 MHz for Frequency range >1GHz
Detector	Refer remarks below
Measuring Distance	3 m
Requirement	As per the limits mentioned in the below table
Test setup	Refer TEST METHODOLOGY

Table 7: Transmitter limits for Radiated emission

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 128.51 – 93.80, 73.80 – 62.96 and 69.54 dBμV/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 Conditions:

Temperature (Norm) = +23.4°C Voltage = 110VAC/60Hz Through AC Mains/Internal Battery

Relative humidity: 58%

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Test results:

Note: All the losses are included during measurement and final values are mentioned in the test report. Refer TEST METHODOLOGY for more details

Test results for frequency range 9kHz – 30MHz

No emissions found in frequency range 9 kHz to 30 MHz, and measured levels are below 20dB from the limit line, hence not reported.

Table 8: Test results for frequency range 30MHz – 200MHz

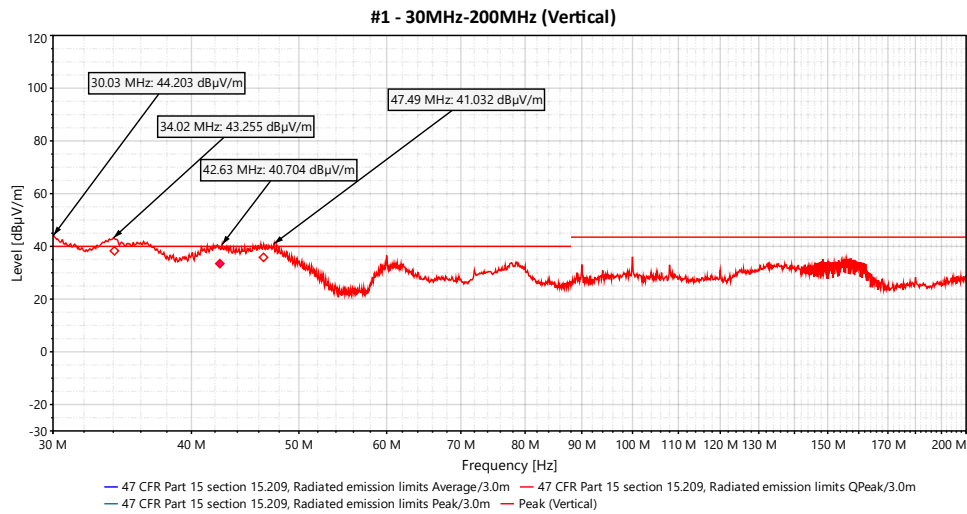
Mode of Operation	Antenna Polarization	Measured Frequency (MHz)	Measured emission (dBμV/m)	Limit (dBμV/m)	Margin (dB)
Charging Mode	Vertical	30.06	39.37	40.00	-0.63
		34.08	38.30	40.00	-1.70
		42.43	33.45	40.00	-6.55
		46.46	35.83	40.00	-4.17
	Horizontal	48.00	31.43	40.00	-8.57
		78.45	34.32	40.00	-5.68
		94.89	36.95	43.50	-6.55
		99.99	36.89	43.50	-6.61
Battery Mode	Vertical	72.03	28.29	40.00	-11.71
		90.00	32.93	43.50	-10.57
		99.99	33.75	43.50	-9.75
	Horizontal	100.02	37.42	43.50	-6.08
		108.00	37.74	43.50	-5.76
		133.62	36.99	43.50	-6.51

Table 9: Test results for frequency range 200MHz – 1GHz

Mode of Operation	Antenna Polarization	Measured Frequency (MHz)	Measured emission (dBμV/m)	Limit (dBμV/m)	Margin (dB)
Charging Mode	Vertical	232.70	35.77	46.00	-10.23
		386.09	32.93	46.00	-13.07
		445.49	33.92	46.00	-12.08
	Horizontal	203.96	35.35	43.50	-8.15
		226.67	41.94	46.00	-4.06
		326.69	37.25	46.00	-8.75
		386.09	37.71	46.00	-8.29
Battery Mode	Vertical	221.45	34.19	46.00	-11.81
		326.69	30.45	46.00	-15.55
		386.09	32.78	46.00	-13.22
		742.49	29.83	46.00	-16.17
	Horizontal	225.47	38.97	46.00	-7.03
		386.09	38.32	46.00	-7.68
		445.49	36.21	46.00	-9.79
		742.49	34.49	46.00	-11.51

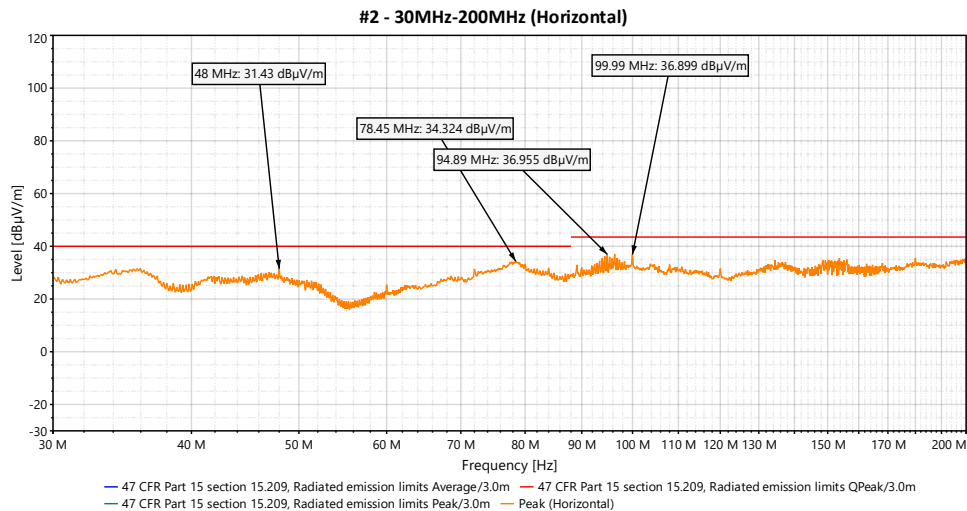
Test Plots:

Mode: Charging Mode



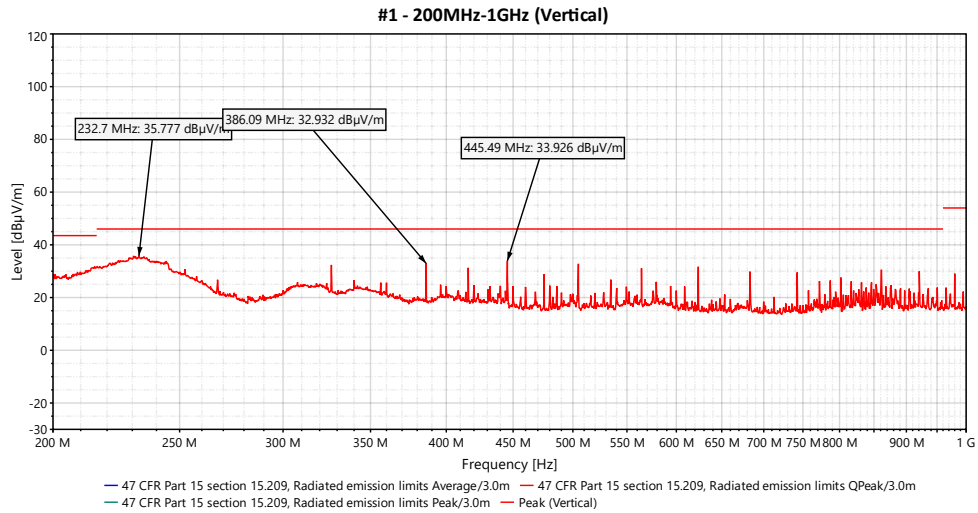
Channel Frequency 30MHz – 200MHz

Polarization Vertical



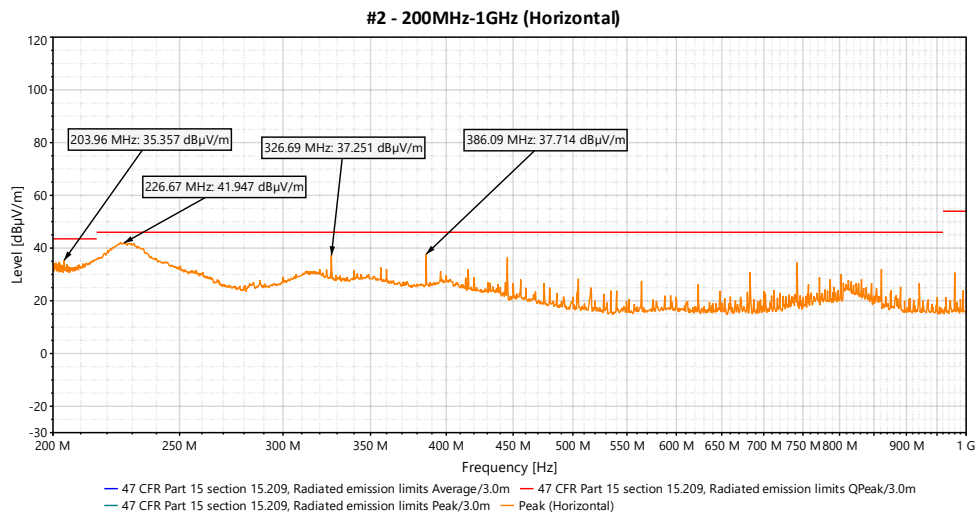
Channel Frequency 30MHz – 200MHz

Polarization Horizontal



Channel Frequency 200MHz – 1GHz

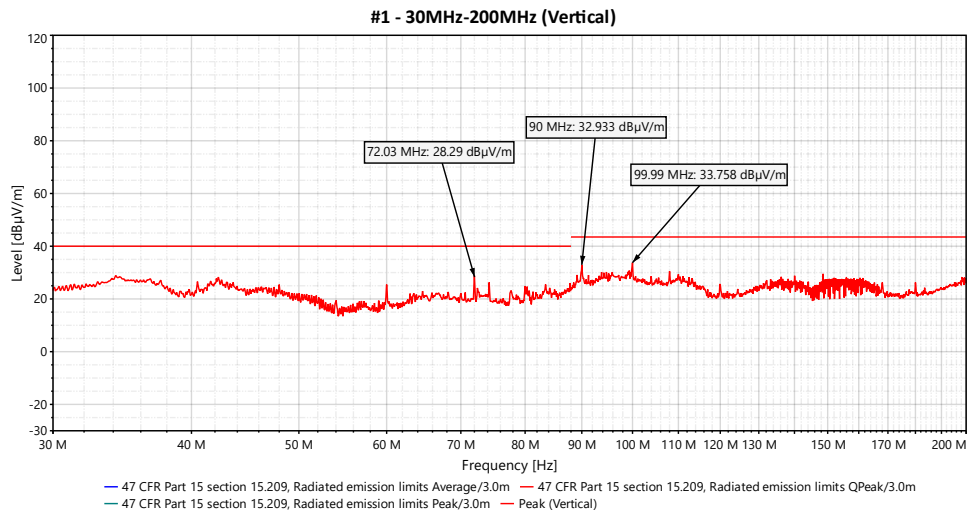
Polarization Vertical



Channel Frequency 200MHz – 1GHz

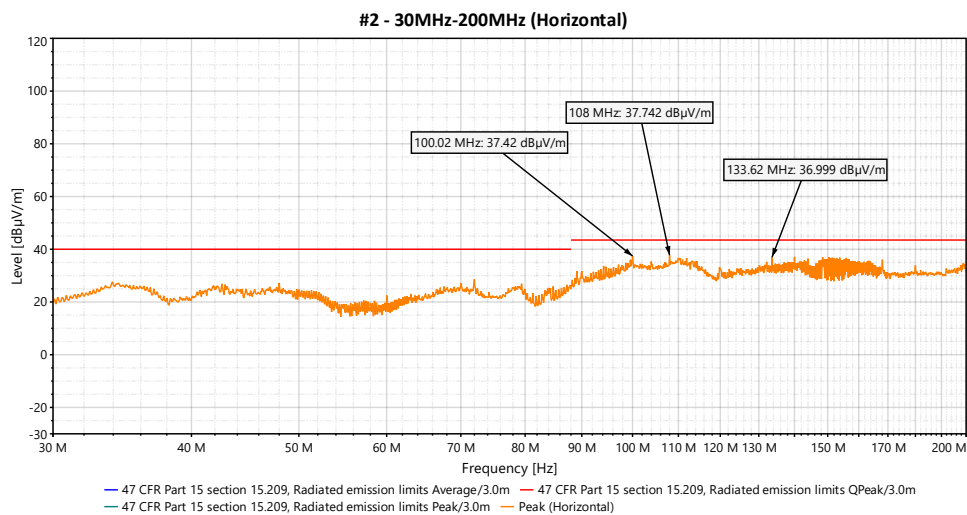
Polarization Horizontal

Mode: Battery



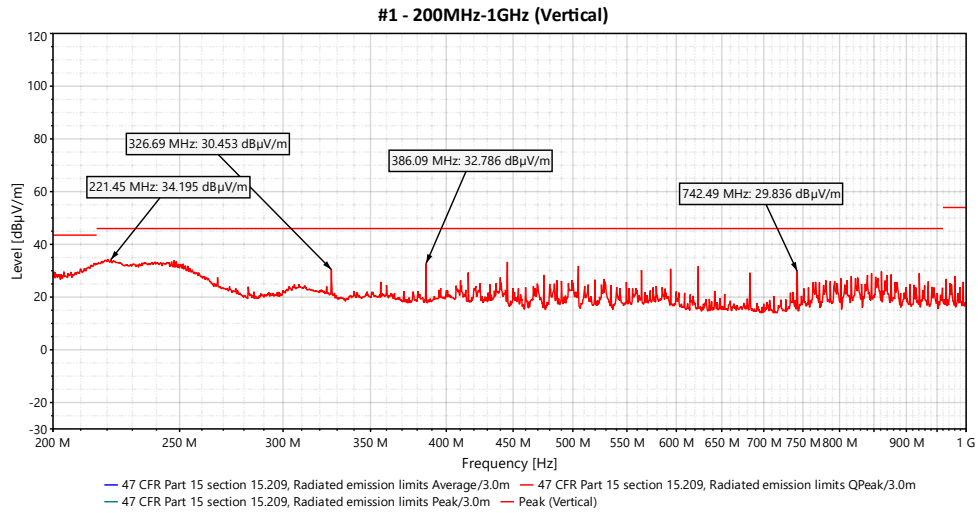
Channel Frequency 30MHz – 200MHz

Polarization Vertical



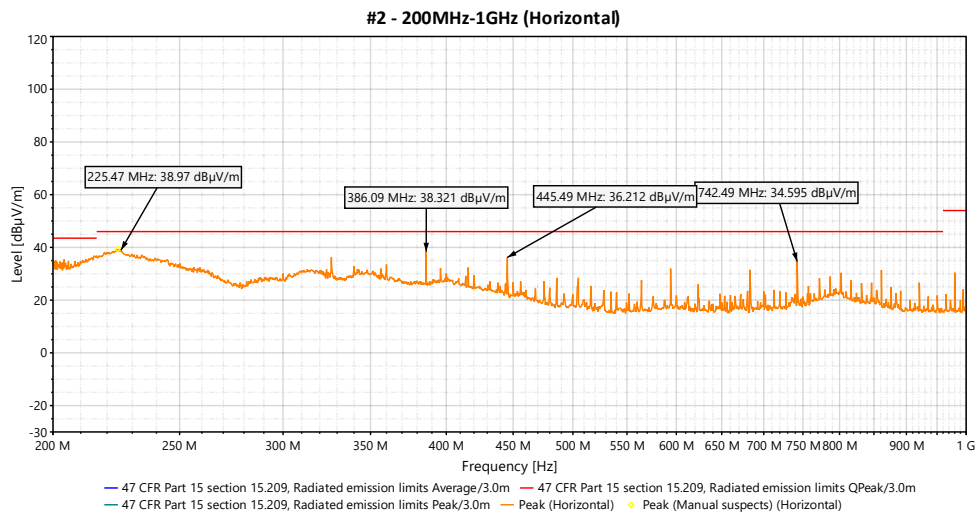
Channel Frequency 30MHz – 200MHz

Polarization Horizontal



Channel Frequency 200MHz – 1GHz

Polarization Vertical



Channel Frequency 200MHz – 1GHz

Polarization Horizontal

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Table 10: Test results for the frequencies above 1GHz:

Data Rate: 1Mbps

Channel Frequency (MHz)	Measured Frequency (MHz)	Antenna Polarization	Measured Emission (dBμV/m)	Limit (dBμV/m)	Margin (dB)
2402	2402(Pk)	Vertical	91.70	-	-
	2402(Av)		86.51	-	-
	2390(Pk)		37.02	74.00*	-36.98
	2390(Av)		24.40	54.00*	-29.60
	4804(Pk)		41.97	74.00	-32.03
	4804(Av)		30.49	54.00	-23.51
	7206(Pk)		48.73	74.00	-25.27
	7206(Av)		35.50	54.00	-18.50
	2402(Pk)	Horizontal	86.26	-	-
	2402(Av)		81.08	-	-
	2390(Pk)		38.01	74.00*	-35.99
	2390(Av)		24.34	54.00*	-29.66
	4804(Pk)		41.63	74.00	-32.37
	4804(Av)		29.94	54.00	-24.06
	7206(Pk)		47.59	74.00	-26.41
	7206(Av)		35.33	54.00	-18.67
2440	2440(Pk)	Vertical	95.49	-	-
	2440(Av)		90.32	-	-
	4880(Pk)		42.01	74.00	-31.99
	4880(Av)		29.98	54.00	-24.02
	7320(Pk)		47.45	74.00	-26.55
	7320(Av)		35.41	54.00	-18.59
	2440(Pk)	Horizontal	88.09	-	-
	2440(Av)		83.01	-	-
	4880(Pk)		42.99	74.00	-31.01
	4880(Av)		29.58	54.00	-24.42
	7320(Pk)		46.86	74.00	-27.14
	7320(Av)		35.22	54.00	-18.78
2480	2480(Pk)	Vertical	98.96	-	-
	2480(Av)		93.85	-	-
	2483.5(Pk)		51.61	74.00*	-22.39
	2483.5(Av)		31.44	54.00*	-22.56
	4960(Pk)		42.34	74.00	-31.66
	4960(Av)		29.70	54.00	-24.30
	7440(Pk)		48.15	74.00	-25.85
	7440(Av)		35.20	54.00	-18.80
	2480(Pk)	Horizontal	92.41	-	-
	2480(Av)		87.23	-	-
	2483.5(Pk)		45.88	74.00*	-28.12
	2483.5(Av)		27.28	54.00*	-26.72
	4960(Pk)		41.65	74.00	-32.35
	4960(Av)		29.68	54.00	-24.32
	7440(Pk)		47.38	74.00	-26.62
	7440(Av)		35.19	54.00	-18.81

_ → Fundamental Frequency

*→ Restricted Band edges

Pk: Peak Detector;

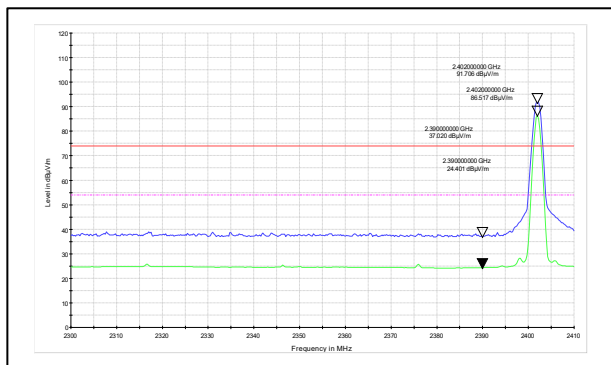
Av: Average Detector

Test Plots:

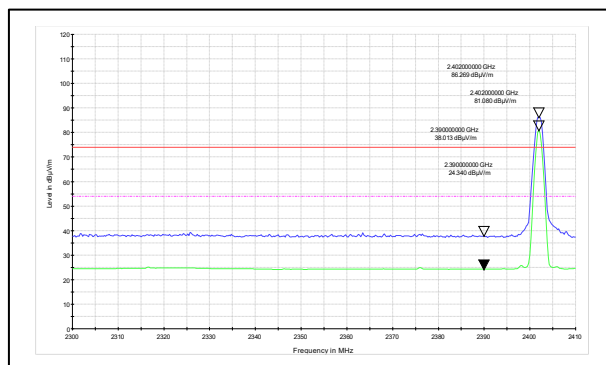
Restricted Bands of Operation

Data Rate: 1Mbps

Channel Frequency: 2402MHz

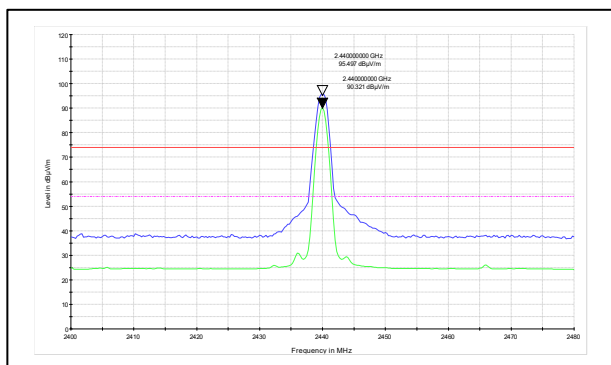


Polarization: Vertical

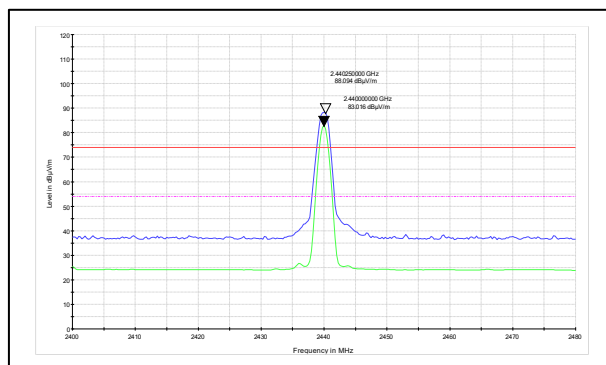


Polarization: Horizontal

Channel Frequency: 2440MHz

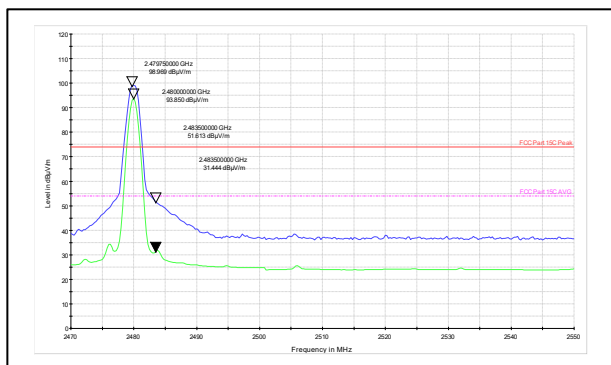


Polarization: Vertical

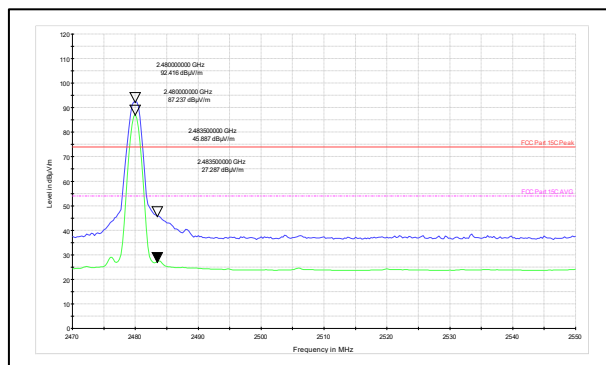


Polarization: Horizontal

Channel Frequency: 2480MHz



Polarization: Vertical



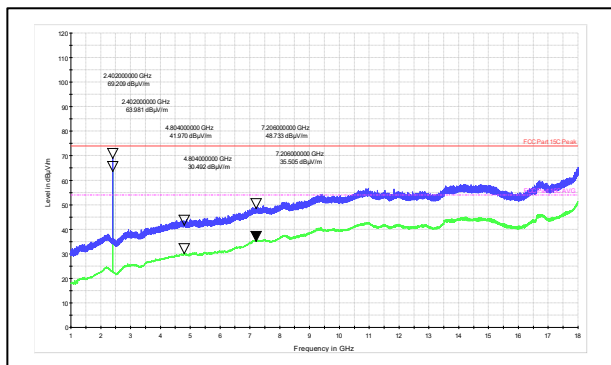
Polarization: Horizontal

Spurious Radiated emission:

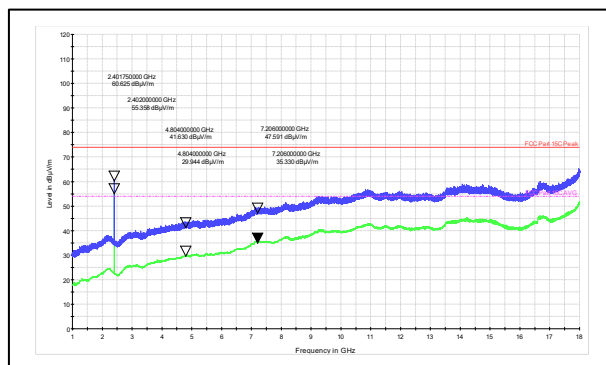
Data Rate: 1Mbps

Frequency Range from 1GHz to 18GHz

Channel Frequency: 2402MHz

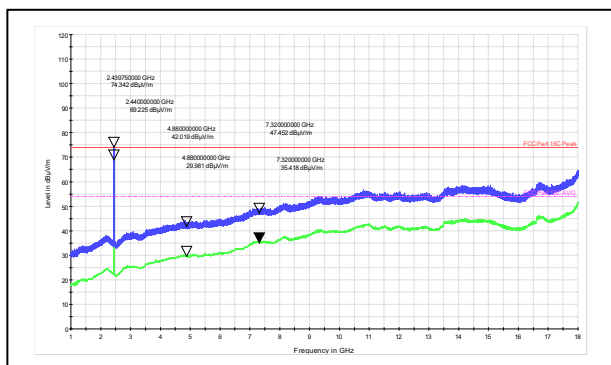


Polarization: Vertical

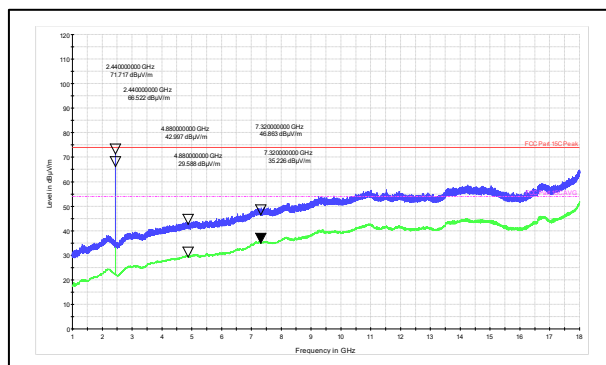


Polarization: Horizontal

Channel Frequency: 2440MHz

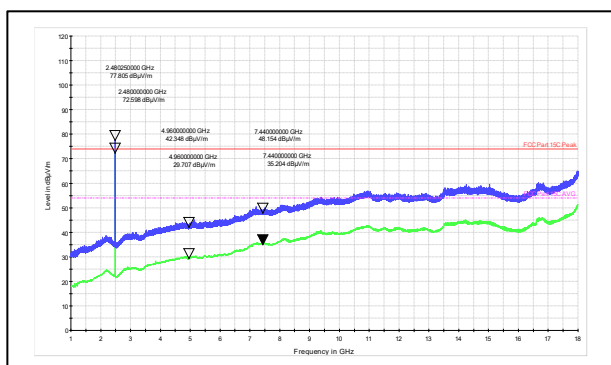


Polarization: Vertical

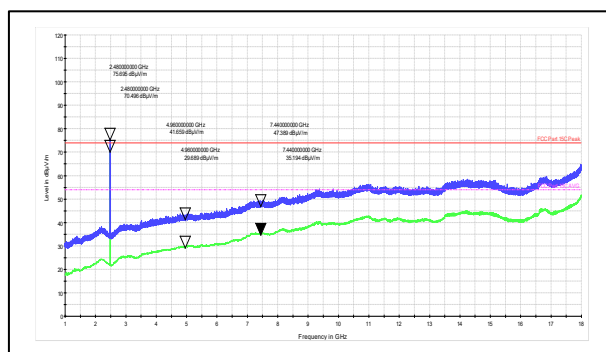


Polarization: Horizontal

Channel Frequency: 2480MHz



Polarization: Vertical



Polarization: Horizontal

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8 TEST RESULTS FOR WI-FI

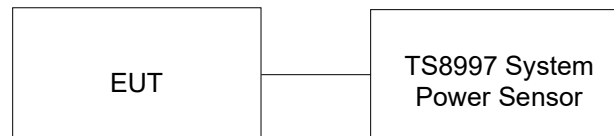
8.1 Maximum Average Conducted Output Power

Result

Pass

Test Specification	FCC part 15 Subpart C 15.247 (b)(3)
Test Method	Subclause 11.9.2.3.2 of ANSI C63.10-2020
Detector	Average (Gated RMS)
Port of testing	Antenna port
Requirement	Power $\leq$ 1 W (30 dBm)

Test Method



Test Condition

Normal Test Condition:

Temperature (Norm) = + 22.3 °C

Voltage = 110VAC/60Hz through mains

Relative humidity: 62%

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Test results:

Note:

1. All the losses are included during measurement and final values are mentioned in the test report.
2. This product do not support additional beamforming gain / directional gain, it uses signal antenna and hence directional gain of the single antenna is 1.05 dBi

Bandwidth	Modulation	Data rate	Channel Frequency (MHz)	Measured Average Power (dBm)	FCC Limit (dBm)
20MHz	802.11b	1Mbps	2412.00	13.91	30.00
			2437.00	14.95	30.00
			2462.00	15.39	30.00
	802.11g	6Mbps	2412.00	13.53	30.00
			2437.00	14.63	30.00
			2462.00	15.02	30.00
	802.11n	MCS0	2412.00	12.15	30.00
			2437.00	13.29	30.00
			2462.00	13.62	30.00

8.2 Spurious Radiated Emissions & Restricted Bands of Operation

Result

Pass

Test Specification	FCC part 15 Subpart C 15.247 (d) / (15.209 & 15.205)
Test Method	ANSI C63.10.2020
Measurement Location	Semi Anechoic Chamber 30MHz - 1 GHz Fully Anechoic Chamber 1 GHz - 40GHz
Measurement Bandwidth	100 kHz for frequency range < 1GHz 1 MHz for Frequency range >1GHz
Detector	Refer remarks below
Measuring Distance	3 m
Requirement	As per the limits mentioned in the below table
Test setup	Refer Clause 7 TEST METHODOLOGY

Table 11: Transmitter limits for Radiated emission

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	54.00	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 128.51 – 93.80, 73.80 – 62.96 and 69.54.00 dBμV/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 Conditions:

Temperature (Norm) = + 22.5 °C Voltage = 110VAC/60Hz through AC mains/Internal Battery

Relative humidity = 62 %

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Test results:

Note: All the losses are included during measurement and final values are mentioned in the test report. Refer Clause 7 TEST METHODOLOGY for more details

Test results for frequency range 9kHz – 30MHz

No emissions found in frequency range 9 kHz to 30 MHz, and measured levels are below 20dB from the limit line, hence not reported.

Table 12: Test results for frequency range 30MHz – 200MHz

Mode of Operation	Antenna Polarization	Measured Frequency (MHz)	Measured emission (dBµV/m)	Limit (dBµV/m)	Margin (dB)
Charging Mode	Vertical	30.06	39.37	40.00	-0.63
		34.08	38.30	40.00	-1.70
		42.43	33.45	40.00	-6.55
		46.46	35.83	40.00	-4.17
	Horizontal	48.00	31.43	40.00	-8.57
		78.45	34.32	40.00	-5.68
		94.89	36.95	43.50	-6.55
		99.99	36.89	43.50	-6.61
Battery Mode	Vertical	72.03	28.29	40.00	-11.71
		90.00	32.93	43.50	-10.57
		99.99	33.75	43.50	-9.75
	Horizontal	100.02	37.42	43.50	-6.08
		108.00	37.74	43.50	-5.76
		133.62	36.99	43.50	-6.51

Table 13: Test results for frequency range 200MHz – 1GHz

Mode of Operation	Antenna Polarization	Measured Frequency (MHz)	Measured emission (dBµV/m)	Limit (dBµV/m)	Margin (dB)
Charging Mode	Vertical	232.70	35.77	46.00	-10.23
		386.09	32.93	46.00	-13.07
		445.49	33.92	46.00	-12.08
	Horizontal	203.96	35.35	43.50	-8.15
		226.67	41.94	46.00	-4.06
		326.69	37.25	46.00	-8.75
		386.09	37.71	46.00	-8.29
Battery Mode	Vertical	221.45	34.19	46.00	-11.81
		326.69	30.45	46.00	-15.55
		386.09	32.78	46.00	-13.22
		742.49	29.83	46.00	-16.17
	Horizontal	225.47	38.97	46.00	-7.03
		386.09	38.32	46.00	-7.68
		445.49	36.21	46.00	-9.79
		742.49	34.49	46.00	-11.51

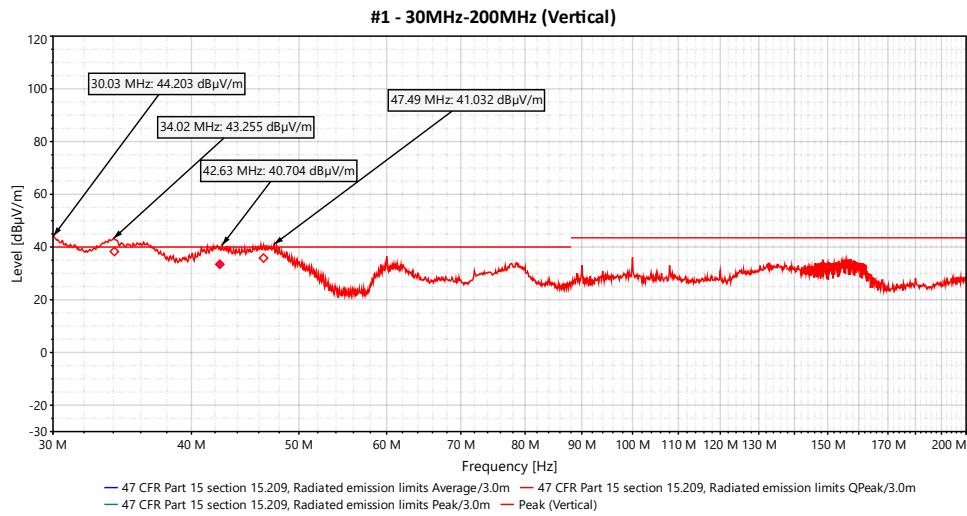
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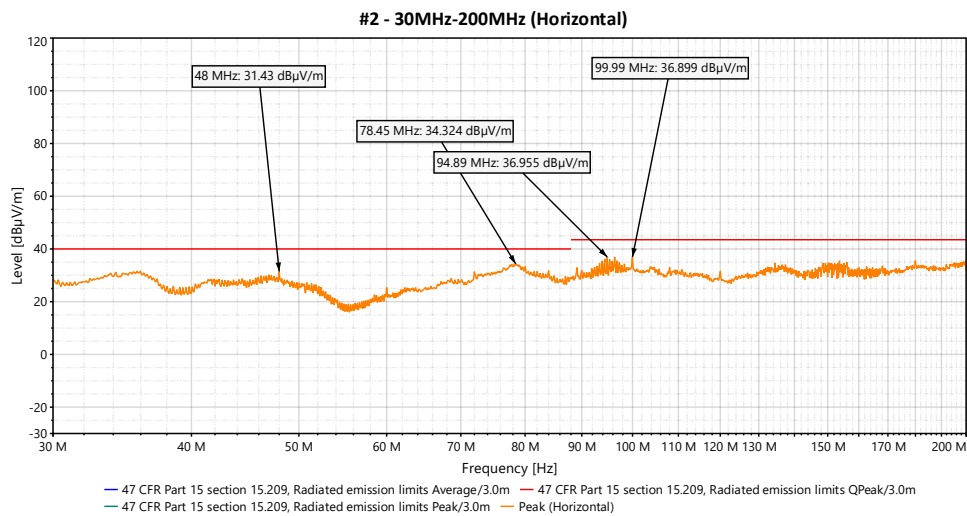
Test Plots:

Mode: Charging Mode



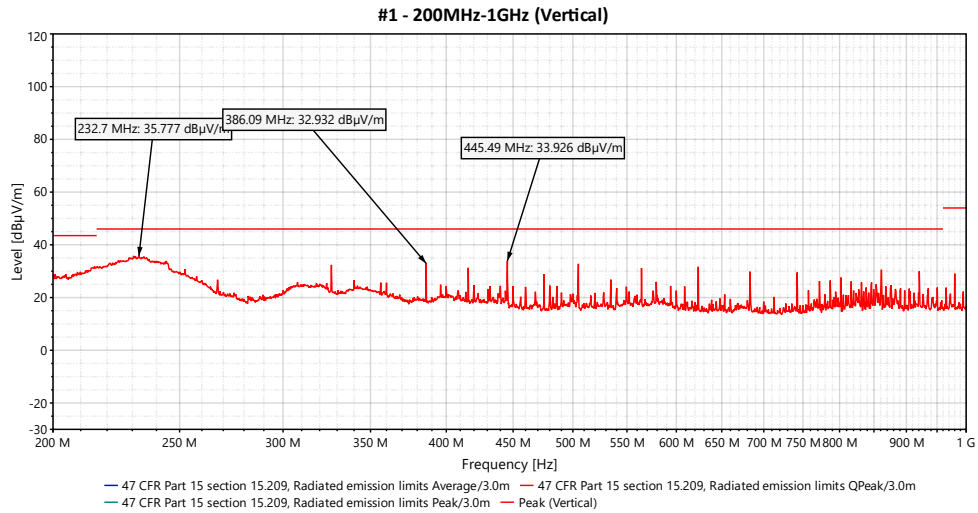
Channel Frequency 30MHz – 200MHz

Polarization Vertical



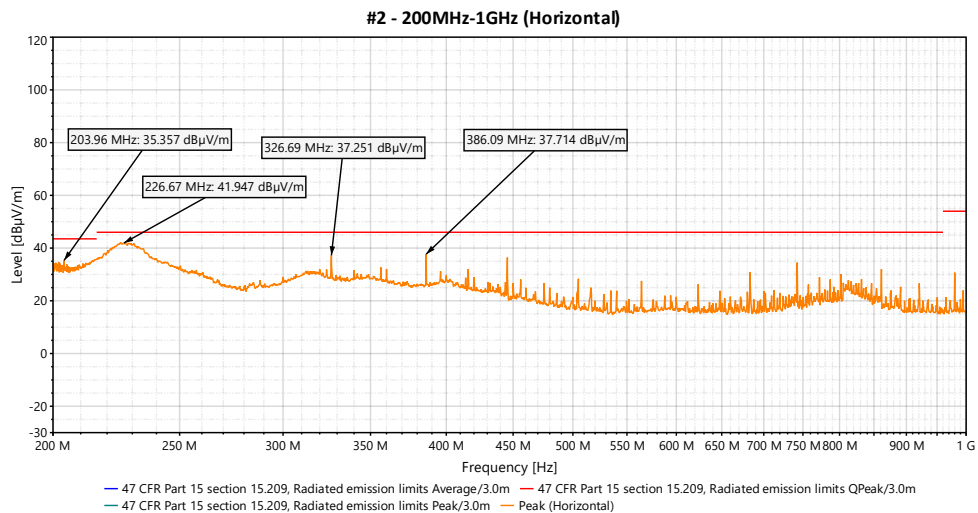
Channel Frequency 30MHz – 200MHz

Polarization Horizontal



Channel Frequency 200MHz – 1GHz

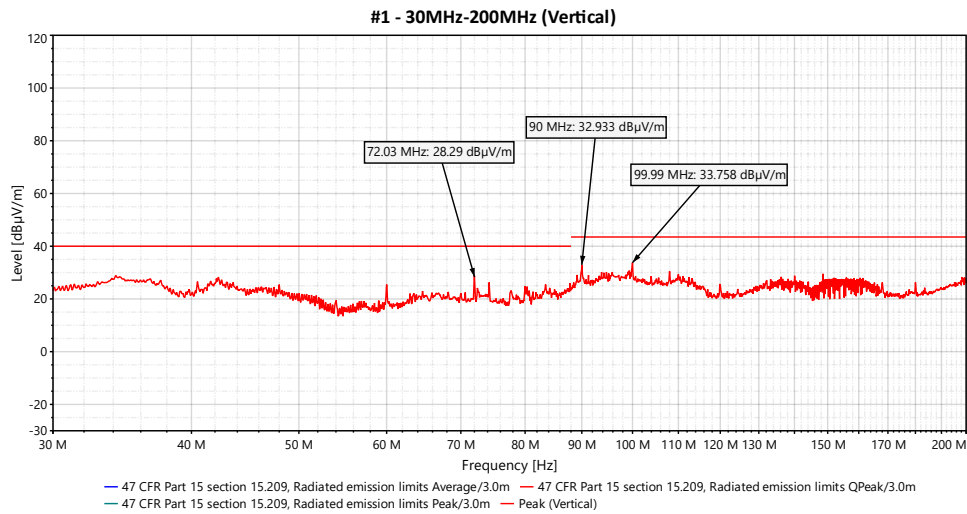
Polarization Vertical



Channel Frequency 200MHz – 1GHz

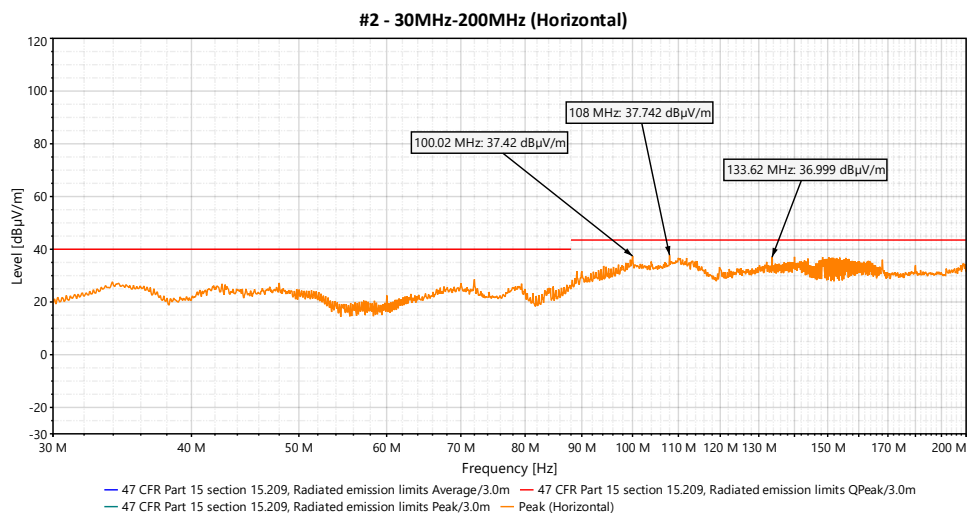
Polarization Horizontal

Mode: Battery



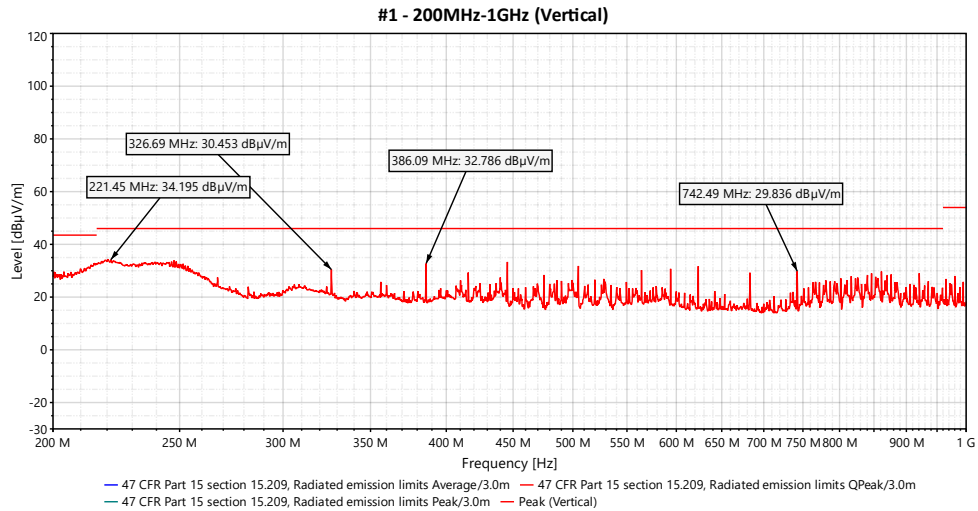
Channel Frequency 30MHz – 200MHz

Polarization Vertical



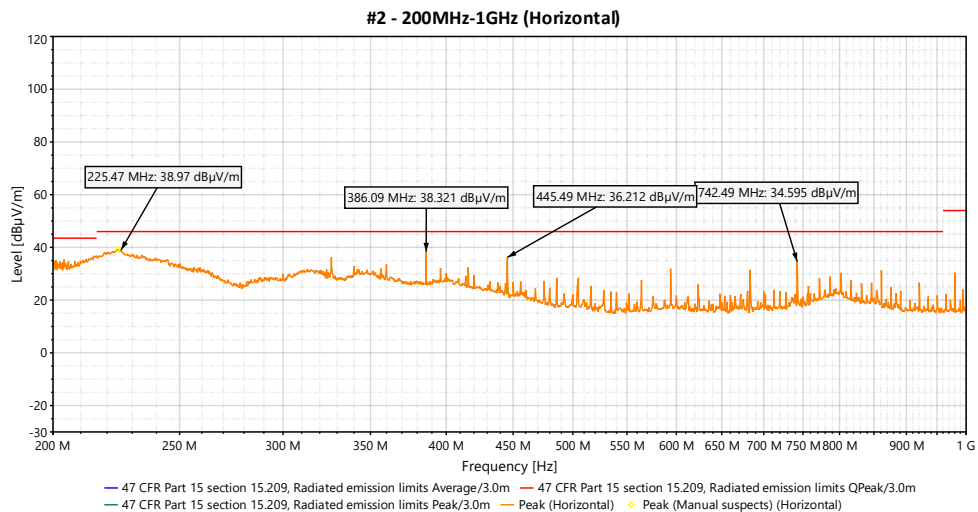
Channel Frequency 30MHz – 200MHz

Polarization Horizontal



Channel Frequency 200MHz – 1GHz

Polarization Vertical



Channel Frequency 200MHz – 1GHz

Polarization Horizontal

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Test results for the frequencies in the range 1 GHz to 26.5 GHz

Modulation: 802.11b

Data Rate: 1Mbps

Channel Frequency (MHz)	Measured Frequency (MHz)	Antenna Polarization	Measured Emission (dBμV/m)	Limit (dBμV/m)	Margin (dB)
2412	2412(Pk)	Vertical	98.63	-	-
	2412(Av)		95.97	-	-
	2390(Pk)		45.36	74.00*	-28.64
	2390(Av)		34.90	54.00*	-19.10
	4824(Pk)		43.73	74.00	-30.27
	4824(Av)		34.02	54.00	-19.98
	7236(Pk)		47.81	74.00	-26.19
	7236(Av)		35.53	54.00	-18.47
	2412(Pk)	Horizontal	91.96	-	-
	2412(Av)		89.57	-	-
	2390(Pk)		53.46	74.00*	-20.54
	2390(Av)		30.06	54.00*	-23.94
	4824(Pk)		42.81	74.00	-31.19
	4824(Av)		30.30	54.00	-23.70
	7236(Pk)		47.05	74.00	-26.95
	7236(Av)		35.41	54.00	-18.59
2437	2437(Pk)	Vertical	101.18	-	-
	2437(Av)		98.68	-	-
	4874(Pk)		44.41	74.00	-29.59
	4874(Av)		34.46	54.00	-19.54
	7311(Pk)		47.16	74.00	-26.84
	7311(Av)		35.40	54.00	-18.60
	2437(Pk)	Horizontal	93.44	-	-
	2437(Av)		90.93	-	-
	4874(Pk)		41.82	74.00	-32.18
	4874(Av)		31.17	54.00	-22.83
	7311(Pk)		47.47	74.00	-26.53
	7311(Av)		35.31	54.00	-18.69
2462	2462(Pk)	Vertical	103.59	-	-
	2462(Av)		101.13	-	-
	2483.5(Pk)		50.16	74.00*	-23.84
	2483.5(Av)		38.25	54.00*	-15.75
	4924(Pk)		49.23	74.00	-24.77
	4924(Av)		44.48	54.00	-9.52
	7386(Pk)		47.60	74.00	-26.40
	7386(Av)		35.59	54.00	-18.41
	2462(Pk)	Horizontal	96.24	-	-
	2462(Av)		93.81	-	-
	2483.5(Pk)		44.04	74.00*	-29.96
	2483.5(Av)		33.03	54.00*	-20.97
	4924(Pk)		44.76	74.00	-29.24
	4924(Av)		35.69	54.00	-18.31
	7386(Pk)		47.22	74.00	-26.78
	7386(Av)		35.41	54.00	-18.59

* : Indicate restricted band of operation §15.205
Pk: Peak Detector; Av: Average Detector

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Modulation: 802.11g

Data Rate: 6Mbps

Channel Frequency (MHz)	Measured Frequency (MHz)	Antenna Polarization	Measured Emission (dBμV/m)	Limit (dBμV/m)	Margin (dB)
2412	2412(Pk)	Vertical	102.08	-	-
	2412(Av)		91.14	-	-
	2390(Pk)		62.94	74.00	-11.06
	2390(Av)		43.07	54.00	-10.93
	4824(Pk)		42.29	74.00	-31.71
	4824(Av)		30.08	54.00	-23.92
	7236(Pk)		47.50	74.00	-26.50
	7236(Av)		35.50	54.00	-18.50
	2412(Pk)	Horizontal	95.42	-	-
	2412(Av)		85.00	-	-
	2390(Pk)		52.90	74.00	-21.10
	2390(Av)		37.00	54.00	-17.00
	4824(Pk)		42.25	74.00	-31.75
	4824(Av)		30.02	54.00	-23.98
	7236(Pk)		48.42	74.00	-25.58
	7236(Av)		35.43	54.00	-18.57
2437	2437(Pk)	Vertical	104.62	-	-
	2437(Av)		93.84	-	-
	4874(Pk)		42.85	74.00	-31.15
	4874(Av)		31.16	54.00	-22.84
	7311(Pk)		48.43	74.00	-25.57
	7311(Av)		35.43	54.00	-18.57
	2437(Pk)	Horizontal	96.95	-	-
	2437(Av)		85.54	-	-
	4874(Pk)		42.27	74.00	-31.73
	4874(Av)		29.74	54.00	-24.26
	7311(Pk)		47.11	74.00	-26.89
	7311(Av)		35.25	54.00	-18.75
2462	2462(Pk)	Vertical	104.28	-	-
	2462(Av)		94.00	-	-
	2483.5(Pk)		70.28	74.00	-3.72
	2483.5(Av)		48.32	54.00	-5.68
	4924(Pk)		42.94	74.00	-31.06
	4924(Av)		30.44	54.00	-23.56
	7386(Pk)		48.10	74.00	-25.90
	7386(Av)		35.55	54.00	-18.45
	2462(Pk)	Horizontal	100.94	-	-
	2462(Av)		89.53	-	-
	2483.5(Pk)		63.91	74.00	-10.09
	2483.5(Av)		45.06	54.00	-8.94
	4924(Pk)		41.05	74.00	-32.95
	4924(Av)		29.65	54.00	-24.35
	7386(Pk)		47.26	74.00	-26.74
	7386(Av)		35.38	54.00	-18.62

* : Indicate restricted band of operation §15.205
Pk: Peak Detector; Av: Average Detector

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Modulation: 802.11n

Data Rate: MCS0

Channel Frequency (MHz)	Measured Frequency (MHz)	Antenna Polarization	Measured Emission (dBμV/m)	Limit (dBμV/m)	Margin (dB)
2412	2412(Pk)	Vertical	99.67	-	-
	2412(Av)		88.96	-	-
	2390(Pk)		58.44	74.00	-15.56
	2390(Av)		40.36	54.00	-13.64
	4824(Pk)		42.48	74.00	-31.52
	4824(Av)		30.13	54.00	-23.87
	7236(Pk)		48.17	74.00	-25.83
	7236(Av)		35.44	54.00	-18.56
	2412(Pk)	Horizontal	94.58	-	-
	2412(Av)		83.25	-	-
	2390(Pk)		51.23	74.00	-22.77
	2390(Av)		34.81	54.00	-19.19
	4824(Pk)		41.64	74.00	-32.36
	4824(Av)		29.72	54.00	-24.28
	7236(Pk)		47.79	74.00	-26.21
	7236(Av)		35.37	54.00	-18.63
2437	2437(Pk)	Vertical	102.81	-	-
	2437(Av)		91.98	-	-
	4874(Pk)		42.18	74.00	-31.82
	4874(Av)		29.91	54.00	-24.09
	7311(Pk)		48.02	74.00	-25.98
	7311(Av)		35.39	54.00	-18.61
	2437(Pk)	Horizontal	96.02	-	-
	2437(Av)		84.40	-	-
	4874(Pk)		42.27	74.00	-31.73
	4874(Av)		29.74	54.00	-24.26
	7311(Pk)		47.44	74.00	-26.56
	7311(Av)		35.26	54.00	-18.74
2462	2462(Pk)	Vertical	105.66	-	-
	2462(Av)		94.64	-	-
	2483.5(Pk)		69.07	74.00	-4.93
	2483.5(Av)		46.74	54.00	-7.26
	4924(Pk)		45.99	74.00	-28.01
	4924(Av)		32.40	54.00	-21.60
	7386(Pk)		48.06	74.00	-25.94
	7386(Av)		35.53	54.00	-18.47
	2462(Pk)	Horizontal	97.31	-	-
	2462(Av)		87.36	-	-
	2483.5(Pk)		62.45	74.00	-11.55
	2483.5(Av)		41.10	54.00	-12.90
	4924(Pk)		42.33	74.00	-31.67
	4924(Av)		29.75	54.00	-24.25
	7386(Pk)		48.43	74.00	-25.57
	7386(Av)		35.45	54.00	-18.55

* : Indicate restricted band of operation §15.205

Pk: Peak Detector; Av: Average Detector

Test Plots:

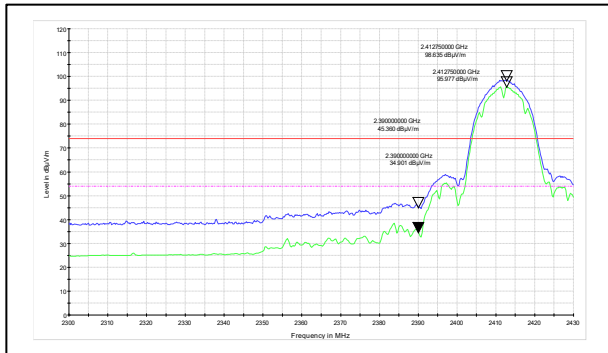
Restricted Bands of Operation

Modulation: 802.11b

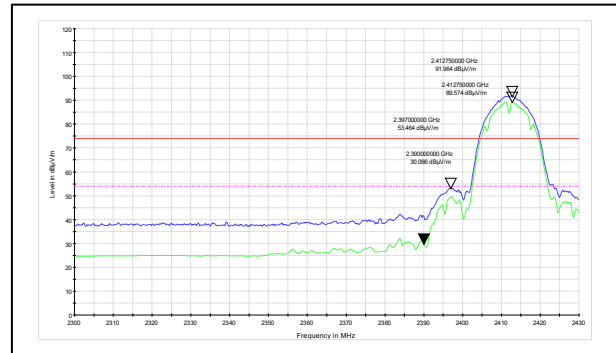
Data Rate: 1Mbps

Frequency Range from 1GHz to 18GHz

Channel Frequency: 2412MHz

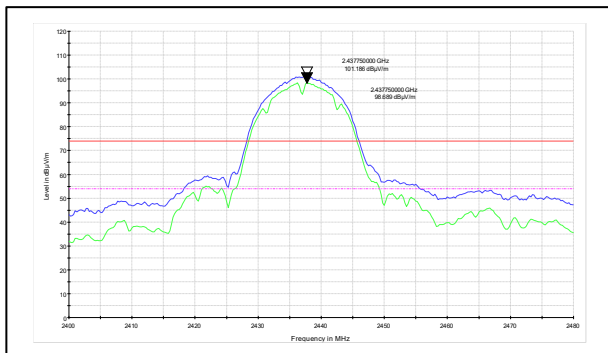


Polarization: Vertical

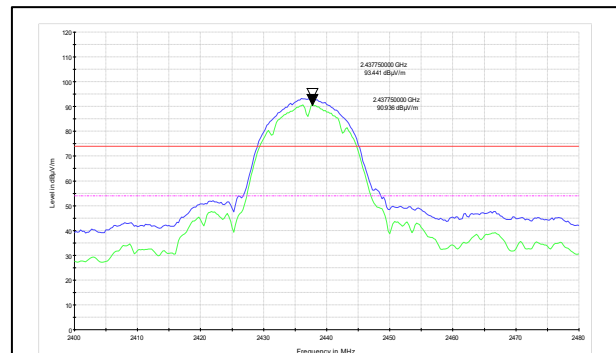


Polarization: Horizontal

Channel Frequency: 2437MHz

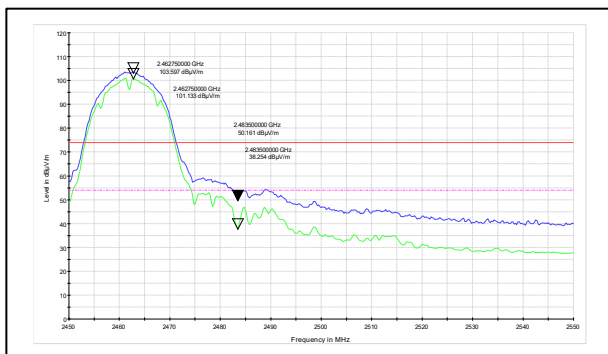


Polarization: Vertical

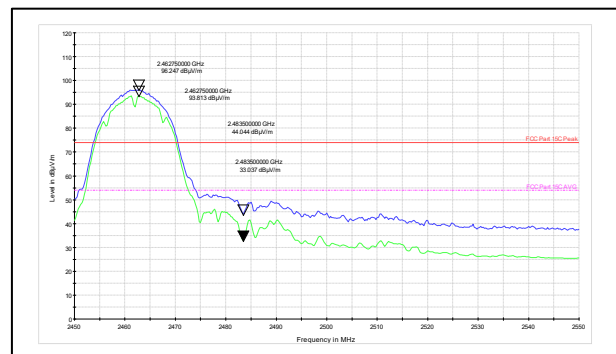


Polarization: Horizontal

Channel Frequency: 2462MHz



Polarization: Vertical



Polarization: Horizontal

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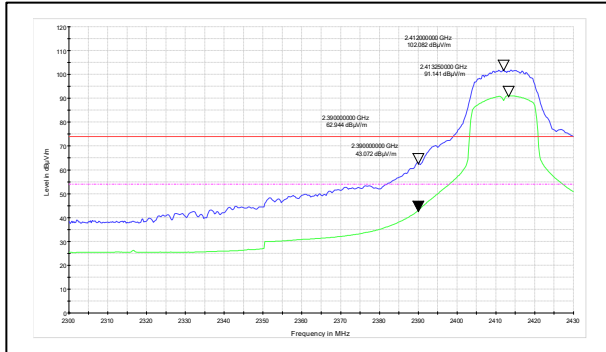
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Modulation: 802.11g

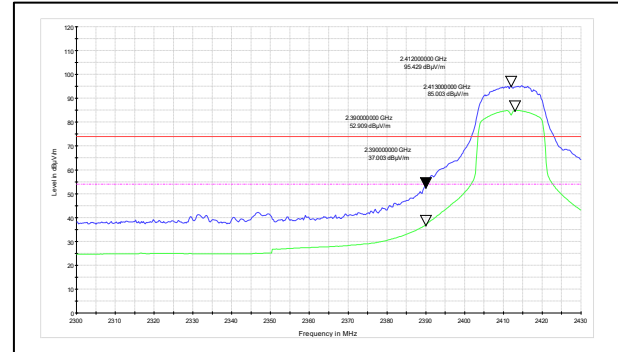
Data Rate: 6Mbps

Frequency Range from 1GHz to 18GHz

Channel Frequency: 2412MHz

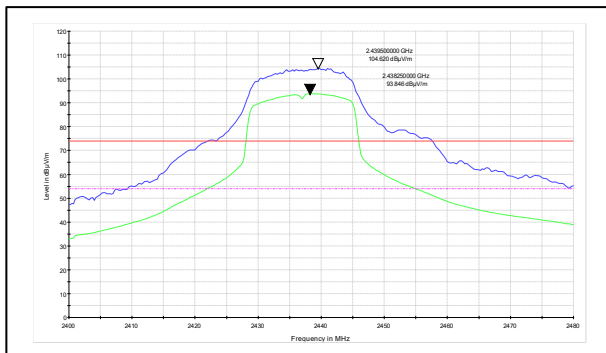


Polarization: Vertical

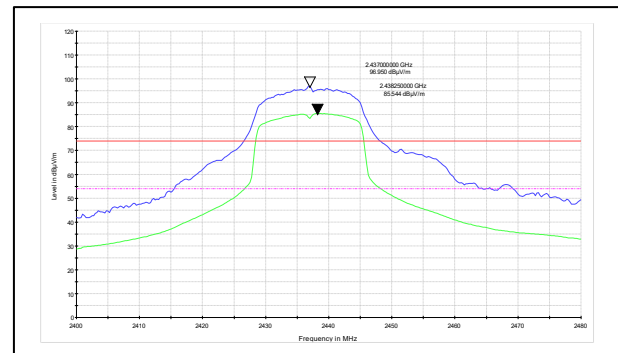


Polarization: Horizontal

Channel Frequency: 2437MHz

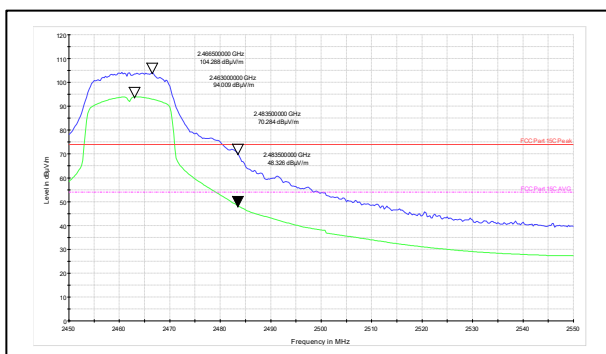


Polarization: Vertical

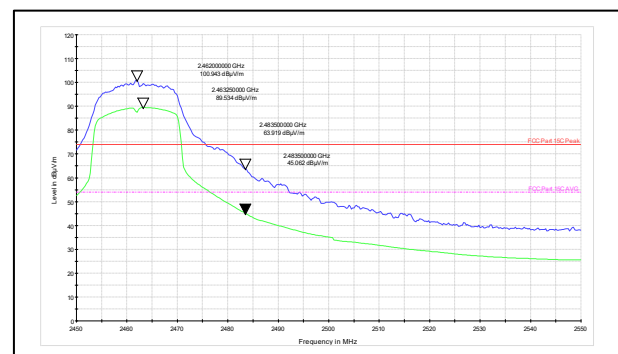


Polarization: Horizontal

Channel Frequency: 2462MHz



Polarization: Vertical



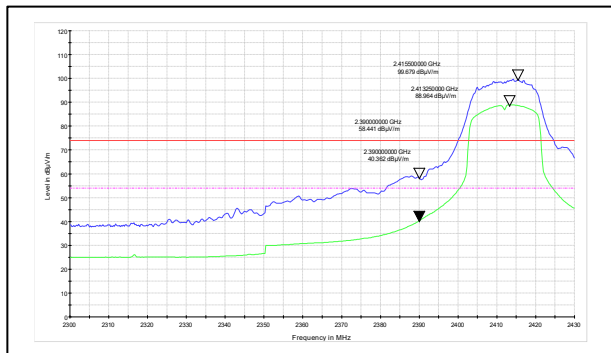
Polarization: Horizontal

Modulation: 802.11n

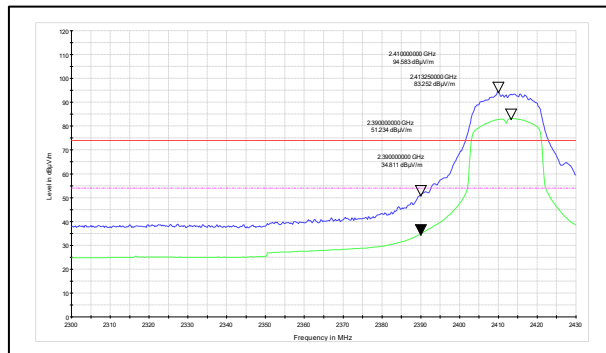
Data Rate: MCS0

Frequency Range from 1GHz to 18GHz

Channel Frequency: 2412MHz

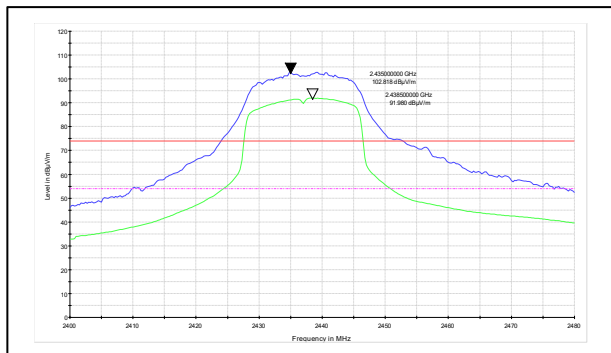


Polarization: Vertical

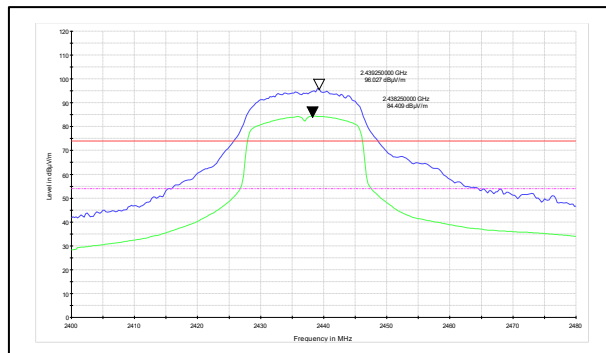


Polarization: Horizontal

Channel Frequency: 2437MHz

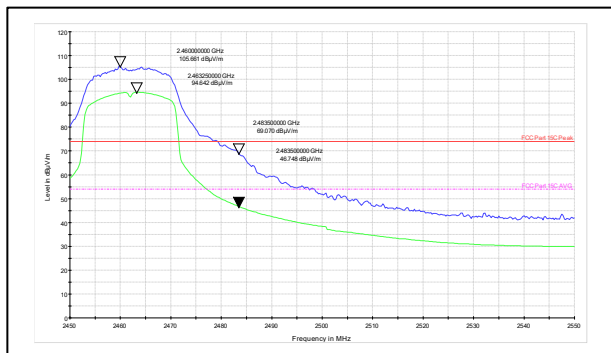


Polarization: Vertical

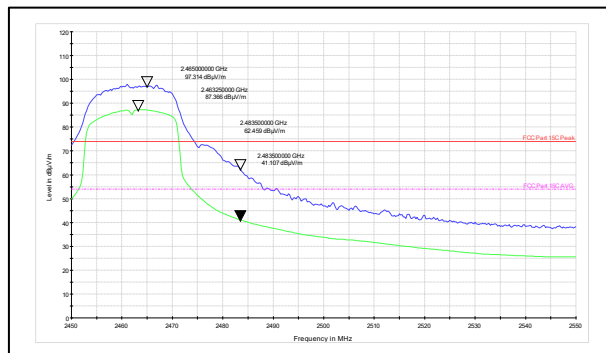


Polarization: Horizontal

Channel Frequency: 2462MHz



Polarization: Vertical



Polarization: Horizontal

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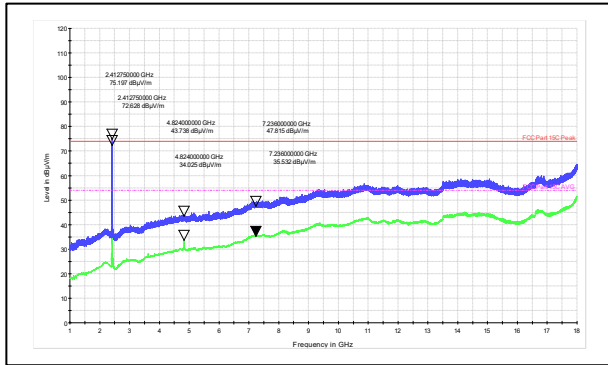
Test Case: Spurious Radaited emission

Modulation: 802.11b

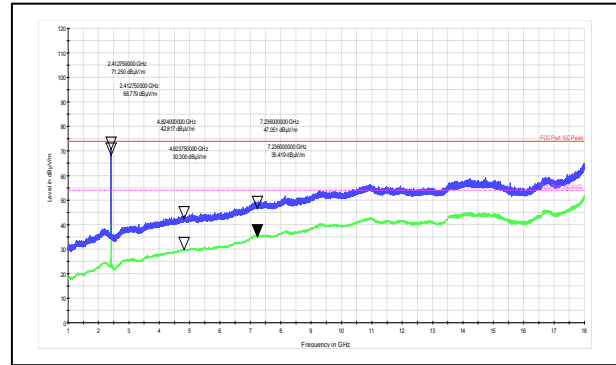
Data Rate: 1Mbps

Frequency Range from 1GHz to 18GHz

Channel Frequency: 2412MHz

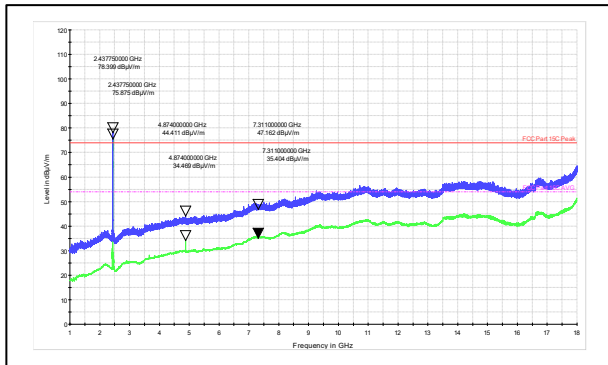


Polarization: Vertical

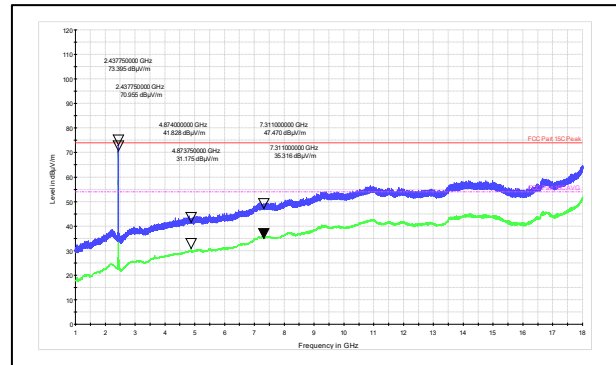


Polarization: Horizontal

Channel Frequency: 2437MHz

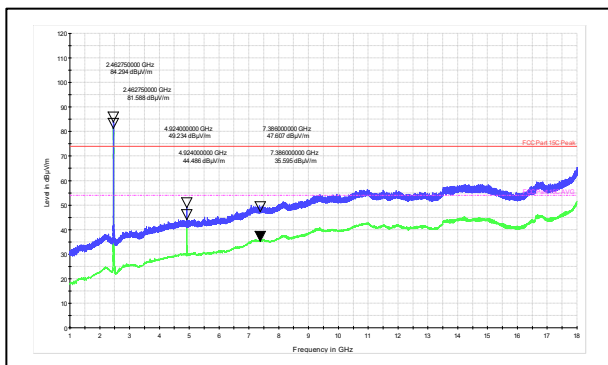


Polarization: Vertical

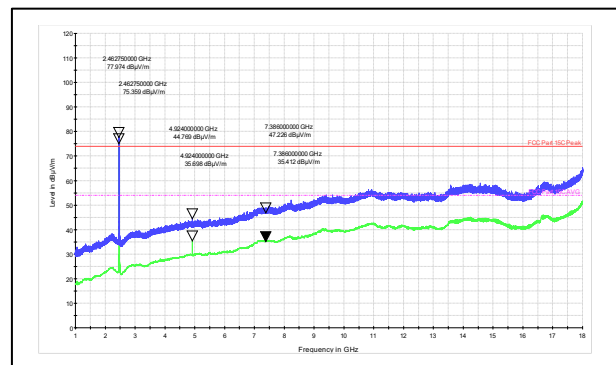


Polarization: Horizontal

Channel Frequency: 2462MHz



Polarization: Vertical



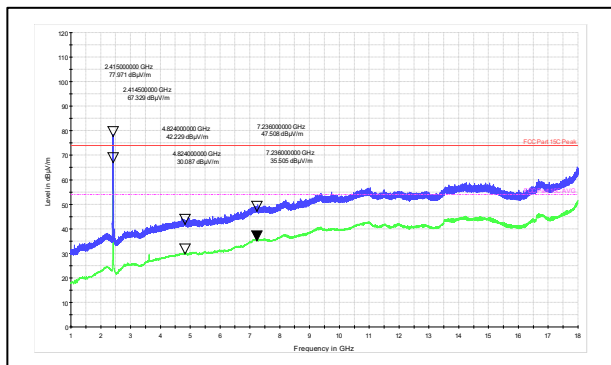
Polarization: Horizontal

Modulation: 802.11g

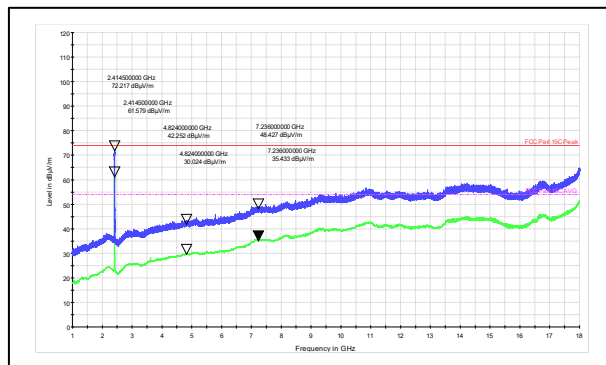
Data Rate: 6Mbps

Frequency Range from 1GHz to 18GHz

Channel Frequency: 2412MHz

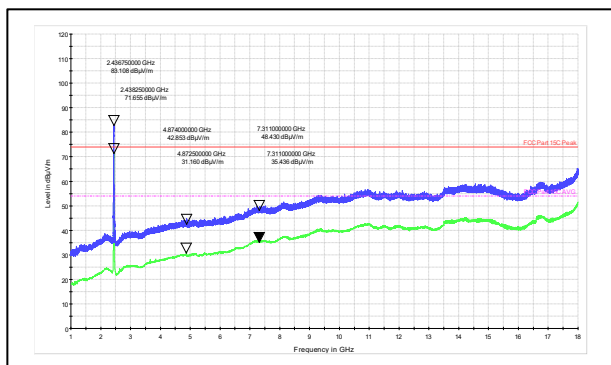


Polarization: Vertical

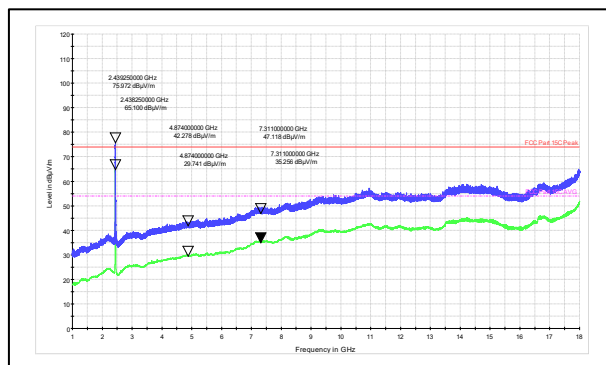


Polarization: Horizontal

Channel Frequency: 2437MHz

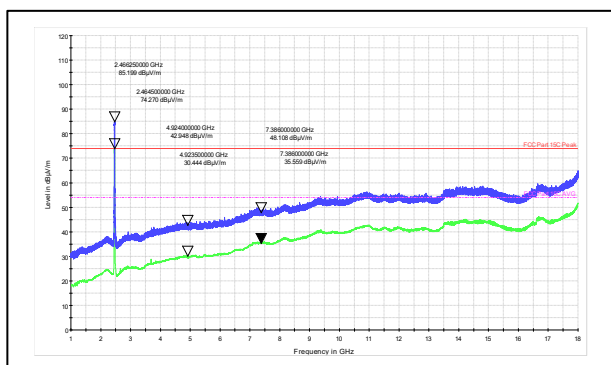


Polarization: Vertical

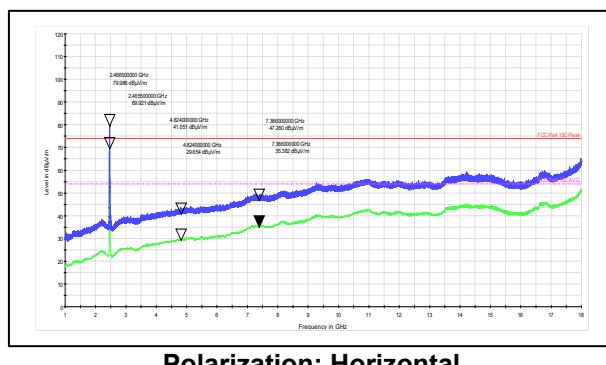


Polarization: Horizontal

Channel Frequency: 2462MHz



Polarization: Vertical



Polarization: Horizontal

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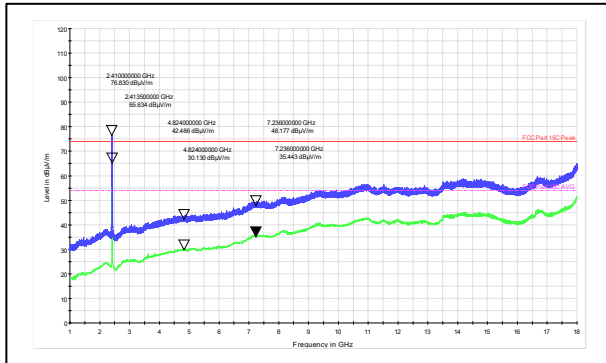
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Modulation: 802.11n

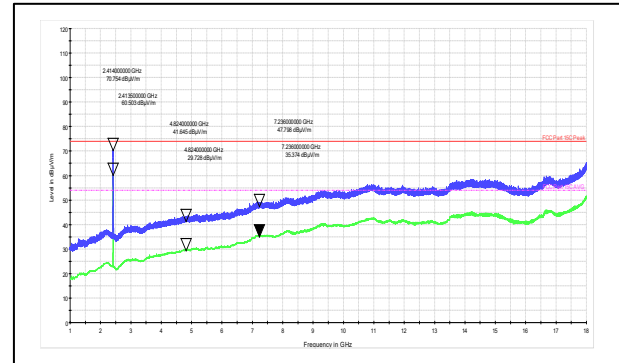
Data Rate: MCS0

Frequency Range from 1GHz to 18GHz

Channel Frequency: 2412MHz

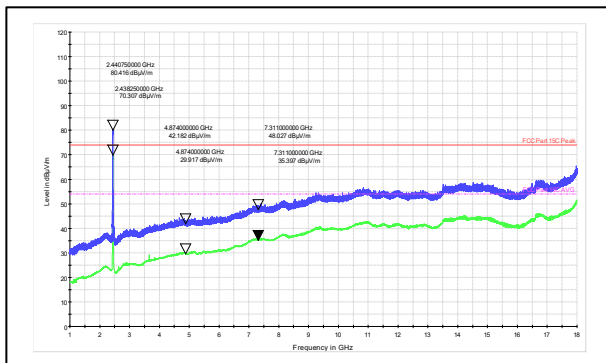


Polarization: Vertical

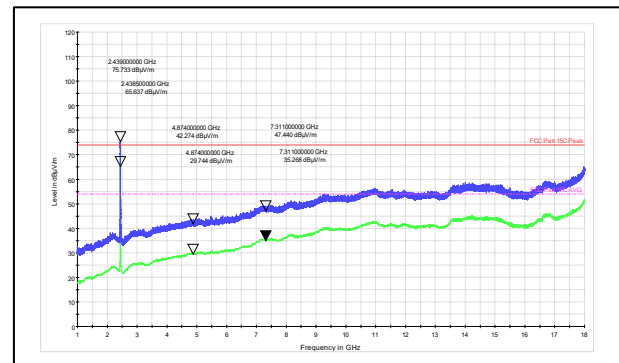


Polarization: Horizontal

Channel Frequency: 2437MHz

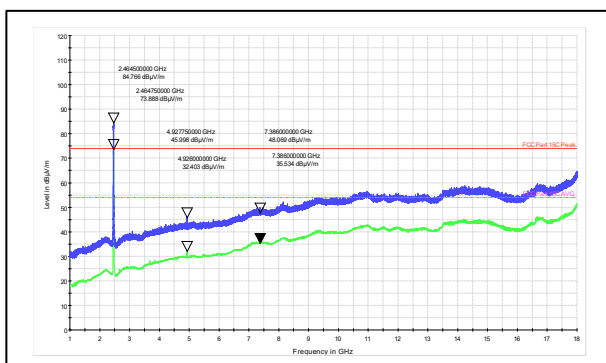


Polarization: Vertical

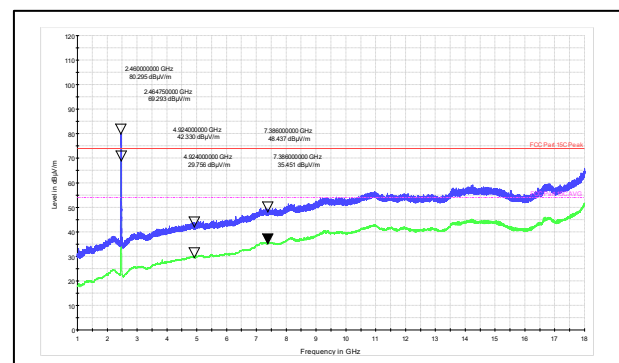


Polarization: Horizontal

Channel Frequency: 2462MHz



Polarization: Vertical



Polarization: Horizontal

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9 AC Power lines Conducted Emission

Result

Pass

Test Specification : FCC Part 15 Section 15.207
Test Method : ANSI C63.10-2020
Testing Location : Screened room
Measurement Bandwidth : 9kHz
Frequency Range : 150kHz – 30MHz
Supply Voltage : 110VAC,60Hz
Test Method : Refer TEST METHODOLOGY

Table 14: Limits for Conducted power line emission

Frequency of emission (MHz)	QP Limit (dBμV)	AV Limit (dBμV)
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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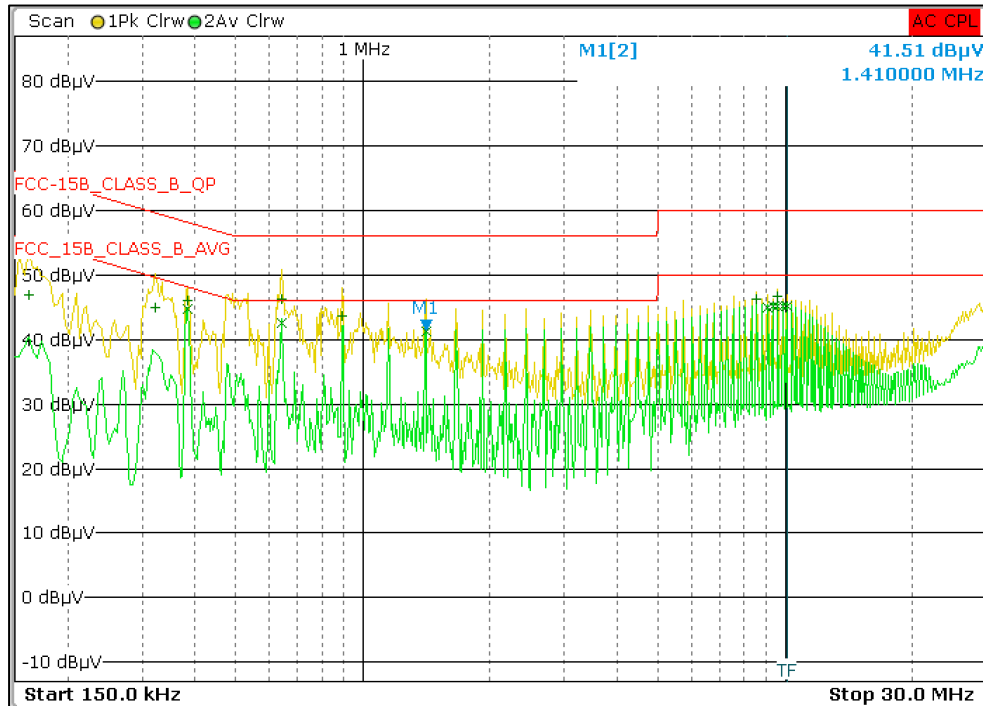
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Test Conditions:

Temperature (Norm) = +22.3°C Voltage = 110VAC/60Hz through mains Relative humidity: 57%

Test results:

110VAC-60Hz-Line



Trace	Frequency	Level (dBμV)	Phase	Detector	Delta Limit/dB
2	642.000000000 kHz	42.66		Average	-3.34
2	386.000000000 kHz	44.69		Average	-3.46
2	1.410000000 MHz	41.35		Average	-4.65
2	1.410000000 MHz	41.33		Average	-4.67
2	10.110000000 MHz	45.23		Average	-4.77
2	9.602000000 MHz	45.14		Average	-4.86
2	9.346000000 MHz	45.10		Average	-4.90
2	9.858000000 MHz	45.07		Average	-4.93
2	9.090000000 MHz	45.06		Average	-4.94
1	642.000000000 kHz	46.20		Quasi Peak	-9.80
1	386.000000000 kHz	46.09		Quasi Peak	-12.06
1	894.000000000 kHz	43.70		Quasi Peak	-12.30
1	9.598000000 MHz	46.62		Quasi Peak	-13.38
1	8.578000000 MHz	46.36		Quasi Peak	-13.64
1	322.000000000 kHz	44.91		Quasi Peak	-14.75
1	162.000000000 kHz	47.01		Quasi Peak	-18.35

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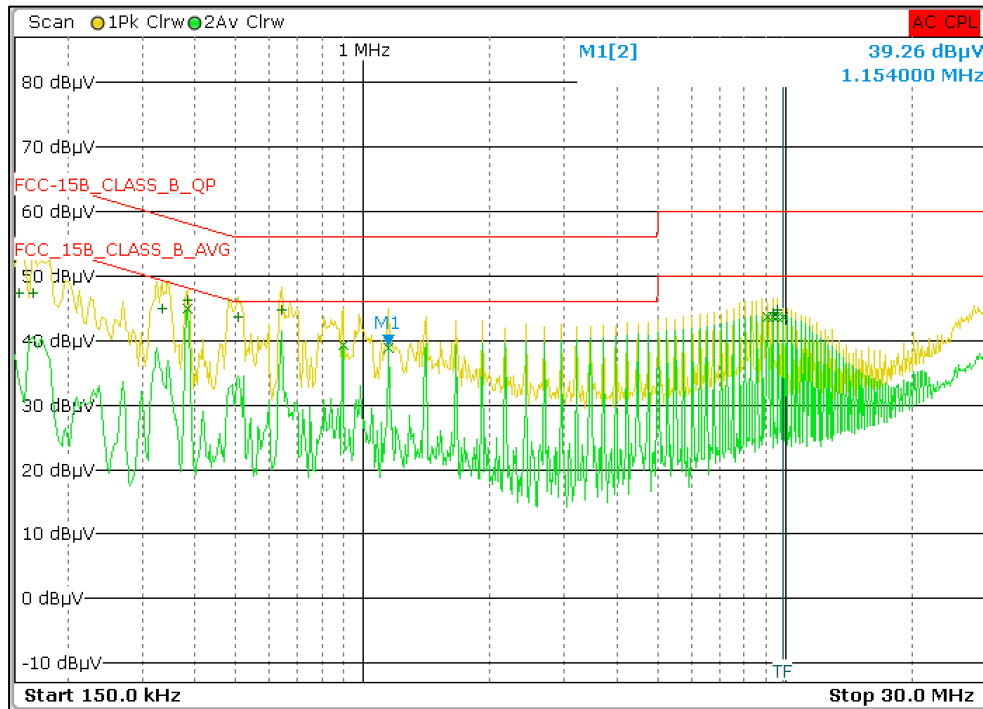
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110VAC-60Hz-Neutral:



Trace	Frequency	Level (dBμV)	Phase	Detector	Delta Limit/dB
2	386.000000000 kHz	44.86		Average	-3.29
2	9.598000000 MHz	43.74		Average	-6.26
2	9.342000000 MHz	43.71		Average	-6.29
2	9.086000000 MHz	43.68		Average	-6.32
2	9.854000000 MHz	43.62		Average	-6.38
2	898.000000000 kHz	39.28		Average	-6.72
2	1.154000000 MHz	38.92		Average	-7.08
1	642.000000000 kHz	44.82		Quasi Peak	-11.18
1	386.000000000 kHz	46.24		Quasi Peak	-11.91
1	506.000000000 kHz	43.70		Quasi Peak	-12.30
1	334.000000000 kHz	44.93		Quasi Peak	-14.42
1	9.598000000 MHz	44.64		Quasi Peak	-15.36
1	9.342000000 MHz	44.26		Quasi Peak	-15.74
1	166.000000000 kHz	47.34		Quasi Peak	-17.82
1	154.000000000 kHz	47.31		Quasi Peak	-18.47

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End of test report