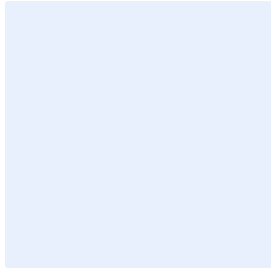


Prüfbericht-Nr.: <i>Test report no.:</i>	IN24TRDD 001	Auftrags-Nr.: <i>Order no.:</i>	146873078 090	Seite 1 von 38 Page 1 of 38
Kunden-Referenz-Nr.: <i>Client reference no.:</i>	2026143	Auftragsdatum: <i>Order date:</i>	2024-01-19	
Auftraggeber: <i>Client:</i>	Schneider Electric 7262 Marconi Street Montreal, QC H2R 2Z5 Canada			
Prüfgegenstand: <i>Test item:</i>	Ecostruxure Flex-Server			
Bezeichnung <i>Identification</i>	Main Model: ESXBFXSVRBCW008 Associated Model: ESXBFXSVRBCW016; ESXBFXSVRBCW032			
Auftrags-Inhalt: <i>Order content:</i>	Testing and issue of Test Report with Grant Certificate			
Prüfgrundlage: <i>Test specification:</i>	FCC Part 15 Subpart C 15.247,15.205, 15.207 & 15.209 RSS 247 Issue 3, RSS Gen Issue 5			
Wareneingangsdatum: <i>Date of sample receipt:</i>	2024-01-23			
Prüfmuster-Nr.: Serien -Nr.: <i>Test sample no:</i> <i>Serial no.:</i>	A003649514-001 Engineering Sample			
Prüfzeitraum: <i>Testing period:</i>	2024-01-24 - 2024-02-09			
Ort der Prüfung: <i>Place of testing:</i>	Wireless laboratory, Bangalore			
Prüflaboratorium: <i>Testing laboratory:</i>	TÜV Rheinland (India) Pvt. Ltd. 27/B,2nd cross road, Electronic city Phase1, Bangalore-560100, India FCC Test Site Registration No: 496599 IC Test Site Registration No: 27711			
Prüfergebnis*: <i>Test result*:</i>	Pass			
geprüft von: <i>tested by:</i>	genehmigt von: <i>authorized by:</i>			
Datum: <i>Date:</i> 2024-07-08				
Stellung / Position:	M.V.Naveen Kumar Senior Engineer	Stellung / Position:	Madhu K.N Assistant Manager	
Sonstiges / Other:	FCC ID: 2BATG-ESXBFXSVRBCW IC: 30486-ESXBFXSVRBCW HVIN: ESXBFXSVRBCW008; ESXBFXSVRBCW016; ESXBFXSVRBCW032			
Zustand des Prüfgegenstandes bei Anlieferung: <i>Condition of the test item at delivery:</i>	Prüfmuster vollständig und unbeschädigt <i>Test item complete and undamaged</i>			
* Legende:	1 = sehr gut P(ass) = entspricht o.g. Prüfgrundlage(n)	2 = gut F(ail) = entspricht nicht o.g. Prüfgrundlage(n)	3 = befriedigend F(ail) = entspricht nicht o.g. Prüfgrundlage(n)	4 = ausreichend N/A = nicht anwendbar
* Legend:	1 = very good P(ass) = passed a.m. test specification(s)	2 = good F(ail) = failed a.m. test specification(s)	3 = satisfactory F(ail) = failed a.m. test specification(s)	4 = sufficient N/A = not applicable
Dieser Prüfbericht bezieht sich nur auf das o.g. Prüfmuster und darf ohne Genehmigung der Prüfstelle nicht auszugsweise vervielfältigt werden. Dieser Bericht berechtigt nicht zur Verwendung eines Prüfzeichens. <i>This test report only 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 test mark.</i>				

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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> |
| 2 | <p>Wie vertraglich vereinbart, wurde dieses Dokument nur digital unterzeichnet. Der TÜV Rheinland hat nicht überprüft, welche rechtlichen oder sonstigen diesbezüglichen Anforderungen für dieses Dokument gelten. Diese Überprüfung liegt in der Verantwortung des Benutzers dieses Dokuments. Auf Verlangen des Kunden kann der TÜV Rheinland die Gültigkeit der digitalen Signatur durch ein gesondertes Dokument bestätigen. Diese Anfrage ist an unseren Vertrieb zu richten. Eine Umweltgebühr für einen solchen zusätzlichen Service wird erhoben.</p> <p><i>As contractually agreed, this document has been signed digitally only. TUV Rheinland has not verified and unable to verify which legal or other pertaining requirements are applicable for this document. Such verification is within the responsibility of the user of this document. Upon request by its client, TUV Rheinland can confirm the validity of the digital signature by a separate document. Such request shall be addressed to our Sales department. An environmental fee for such additional service will be charged.</i></p> |
| 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 in diesem Prüfbericht basiert auf der "Null-Grenzwert-Regel" und der "Einfachen Akzeptanz" gemäß ILAC G8:2019 und IEC Guide 115:2021, 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.</p> <p><i>The decision rule for statements of conformity in this test report is based on the "Zero Guard Band Rule" and "Simple Acceptance" in accordance with ILAC G8:2019 and IEC Guide 115:2021, 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.</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 on Conducted emission	15.207	Pass

Note:

NA: Not applicable

*N/T: Not tested Since the Product uses certified module “ **802.11 ac/a/b/g/n + Bluetooth 4.2 module** ” Model no: **ST60-SIPT** , from **Laird Technologies** and test results can be found in module test report No: “ **FR740701AC & CR740701AC** ” and respective **FCC ID: SQG-60SIPT** & **IC: 3147A- 602230C** issued by **International Certification Corp** with address: No. 14-1,Lane 19, Wen San 3rd St., Kwei Shan District, Tao Yuan City 333, Taiwan, R.O.C

Product Category: Electronics Testing

Test Discipline: EMC Test Facility

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REVISION HISTORY OF THIS REPORT

Report Number	Version	Description	Issue date
IN24TRDD 001	01	Initial issue of report	2024-07-08

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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,
Electronic City Phase1
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	101773	1.72 SP5	26.01.2025	Yearly	Radiated Spurious Emission
Horn Antenna	Schwarzbeck	BBHA 9120 D	9120D-1944	-	28.10.2024	Yearly	
Baloon and Biconical Antenna	Schwarzbeck mess-elektronik	VHBB-9124 / BBA-9106	01028	-	08.02.2025	Yearly	
Log-Periodic Antenna	Schwarzbeck mess-elektronik	VUSLP-9111B	9111B-111	-	03.02.2025	Yearly	
Active loop antenna	Frankonia	LAX-10	LAX-10-800	-	02.03.2024	Yearly	
Fully Anechoic Chamber	Albatross	-	-	-	-	-	
EMI Receiver	Rohde & Schwarz	ESW 44	103384	4.73 SP5	10.05.2025	Yearly	Antenna – Port Conducted Test (TS8997) system
Signal Analyser	Rohde & Schwarz	FSV7	101644	FW 3.30 SP1	09.02.2025	Yearly	
Open Switch & Control Unit	Rohde & Schwarz	OSP120 Incl. B157	OSP120-101323 & B157-100894	FW 1.27.0.0	05.01.2025	Yearly	
Pulse Limiter	Rohde & Schwarz	ESH3-Z2	100811	-	12-07-2024	Yearly	AC Powerlines Test Case
Two Line V-Network (LISN)	Rohde & Schwarz	ENV216	100022	-	05.10.2024	Yearly	
EMI Receiver	Rohde & Schwarz	ESR7	101133		29.07.2024	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

ESXB Flex-Server is a multiprotocol IoT gateway that has been designed specifically for industrial and commercial applications. It enables businesses to perform bi-directional data/control communication between a range of sensors and devices on-premise and cloud. Exposed physical interfaces include RS485, USB ports, power connector, LEDs, Switches and Ethernet.

3.2 Ratings and System Details of Equipment under Test

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

Radio Protocol	Wi-Fi 2.4GHz
Operating Frequency Range	2412MHz to 2462MHz
No. of Channels	11
Channel Spacing	5MHz
Measured conducted power(dBm)	26.47dBm@2437MHz g-mode 20MHz, Data Rate: 6Mbps
Modulation	802.11b: DSSS-DBPSK, DQPSK, CCK 802.11g/n: OFDM-BPSK, QPSK, 16QAM, 64QAM
Number of antennas	1(SISO Mode)
Antenna Gain	2dBi
Antenna Type	Dipole Antenna
Supply Voltage to Product	12VDC through AC/DC Adapter
Environmental conditions	-20°C to +65°C
	0°C to +50°C
EUT Dimension(L x W x H)	33.6 x 17.6 x 4.1 cm

***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
Occupied Channel Bandwidth	$\pm 5 \%$
RF output power, conducted	$\pm 1.5 \text{ dB}$
Power Spectral Density, conducted	$\pm 3 \text{ dB}$
Unwanted Emissions, conducted	$\pm 3 \text{ dB}$
All emissions, radiated	$\pm 6 \text{ dB}$
Temperature	$\pm 3 \text{ }^{\circ}\text{C}$
Supply Voltages	$\pm 3 \%$
Time	$\pm 5 \%$

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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 & Version: Gateway CB V3.3

Software Name & Version: Zenatix Gateway Image (v2.0)

Hardware Version Identification Number(HVIN): Refer the Cover Page

4.3 Special Accessories and Auxiliary Equipment

Product	Manufacture	Model	Specifications
AC/DC Adapter	Meanwell SMPS	RS-25-12	I/P Voltage: 100-240VAC 0.35A 50/60Hz O/P Voltage: +12V = 1.3A

4.4 Countermeasures to achieve EMC Compliance

- None

4.5 List of frequencies

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 5: List of Wi-Fi center Frequencies

Channel used for Wi-Fi 2.4GHz testing

Channel used for Wi-Fi testing

Channel Bandwidth 20 MHz

Channel low: 2412MHz

Channel mid: 2437MHz

Channel high: 2462MHz

Channel Bandwidth 40 MHz

Channel low: 2422MHz

Channel mid: 2437MHz

Channel High: 2452MHz

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4.6 TUV Sample Identification

1. TUV Sample Identification number: – A003649514-001– Radiated test Sample, Conducted Sample

4.7 Report Reference

Note: Product **Ecostruxure Flex-Server** has multiple protocols. All the supported wireless protocols and their respective test results are issued in separate test reports, following table lists the report numbers.

Radio Protocol	Report Number
RF test report for FCC Part15 Subpart C & RSS 247 Issue 3, RSS Gen Issue 5	IN24TRDD 001
RF test report for FCC Part15 Subpart E & RSS 247 Issue 3, RSS Gen Issue 5	IN24QRE8 001
RF test report for FCC Part22 Subpart H & RSS Gen Issue 5, RSS 132 Issue 4	IN24778M 001
RF test report for FCC Part24 Subpart E & RSS Gen Issue 5, RSS-133 Issue 6	IN249G94 001
RF test report for FCC Part27 Subpart C & RSS Gen Issue 5, RSS 139 Issue 4, RSS 199 Issue 4, RSS 130 Issue 2	IN244I1B 001
RF test report for FCC Part90 Subpart S & RSS Gen Issue 5, RSS-132 Issue 4	IN2443F6 001

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5 Operational Description

ESXB Flex-Server has support for multiple protocols, these devices can be configured and connected to the gateway using an online portal. The gateway connects to the cloud downloads the configuration and enables the communication between cloud and sensing and control devices.

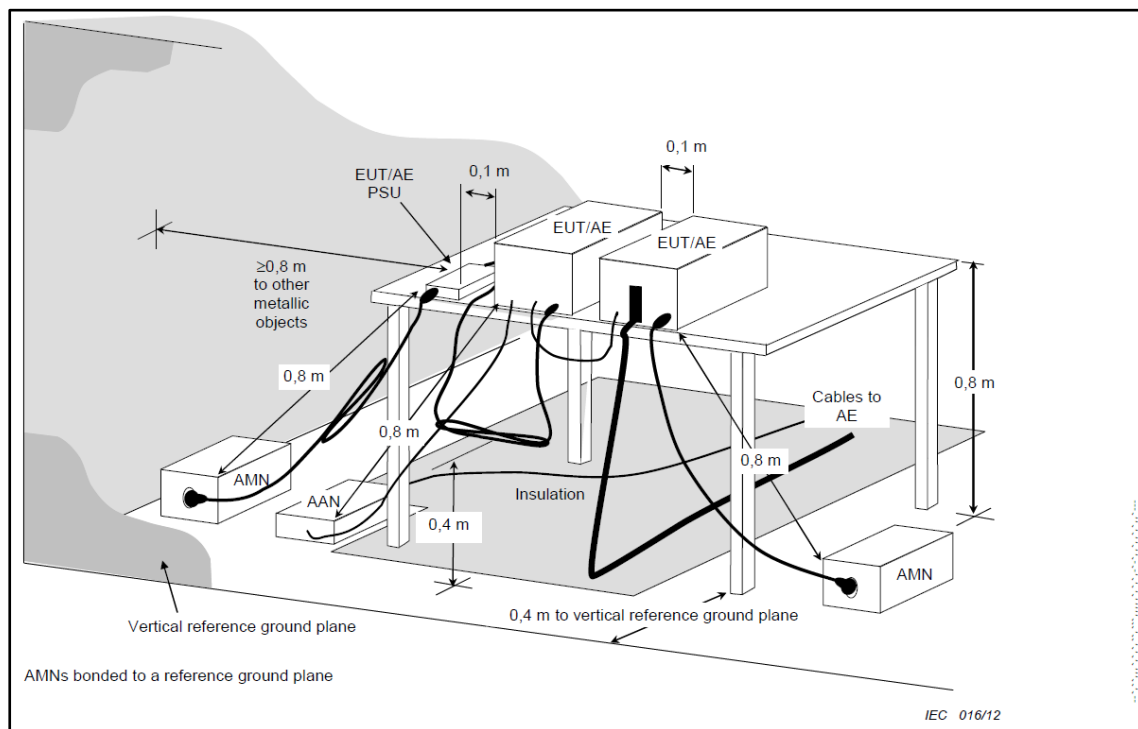
6 TEST METHODOLOGY

6.1 AC Power line Conducted emission

Measured levels of ac power-line 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 30 MHz, 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 C63.10-2013. 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

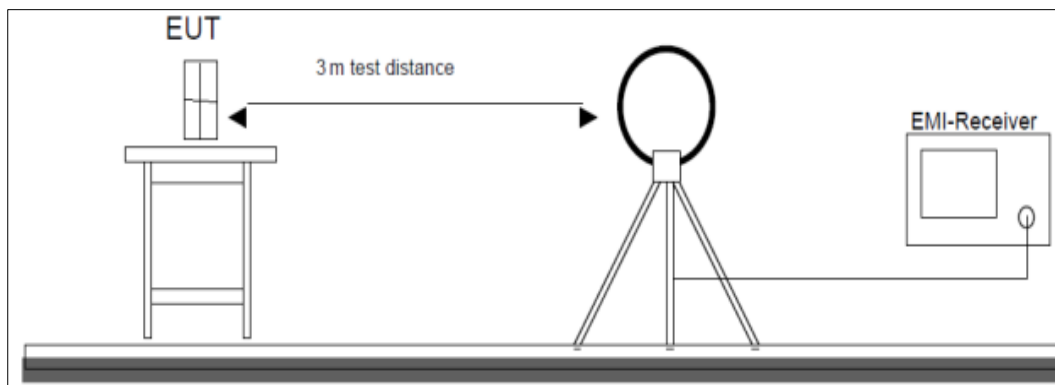


Figure 1: Frequency Range 9 kHz- 30 MHz

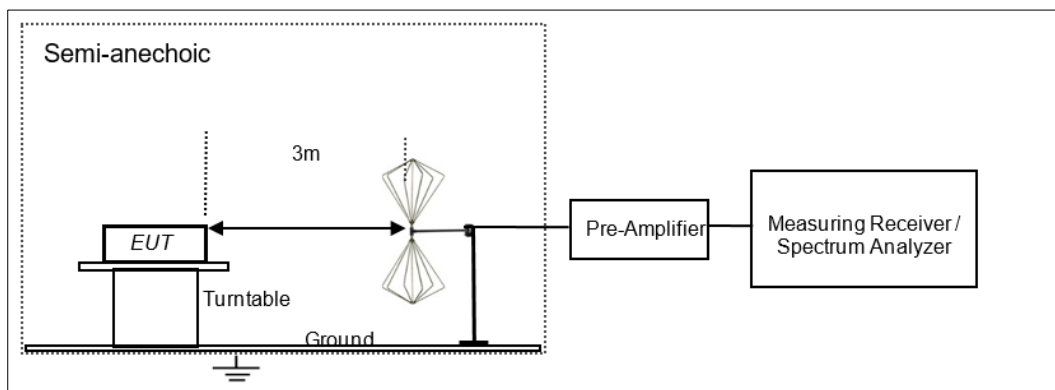


Figure 2: Frequency Range 30 MHz – 200 MHz

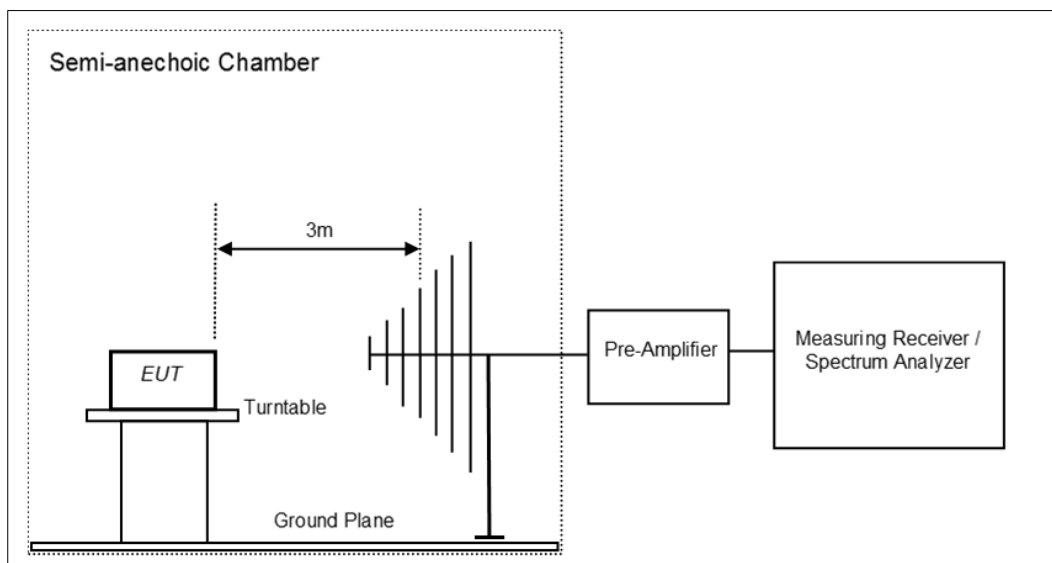


Figure 3: Frequency Range 200 MHz - 1GHz

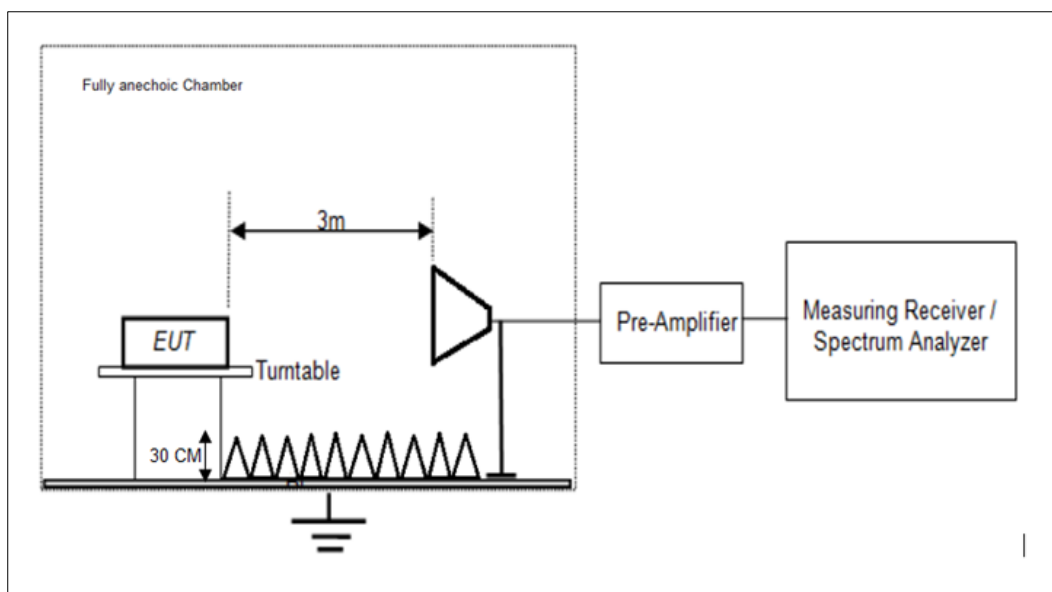


Figure 4: Frequency Range above 1 GHz

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7 TEST RESULTS

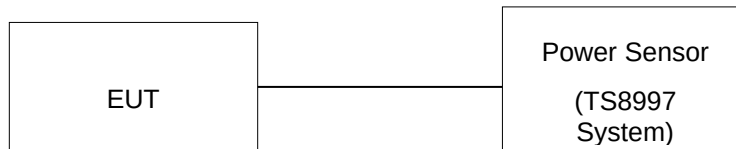
7.1 Maximum Average Conducted Output Power

Result

Pass

Test Specification	FCC part 15 Subpart C 15.247 (b)(3) RSS 247 Issue 3 Section 5.4 (d)
Test Method	Subclause 11.9.2.3.2 of ANSI C63.10
Detector	Average (Gated RMS)
Port of testing	Antenna port
Requirement	Power ≤ 1 W (30 dBm) e.i.r.p ≤ 4 W (36dBm)

Test Method



Test Condition

Normal Test Condition:

Temperature (Norm) = + 22.3 °C Voltage = 12VDC Through AC/DC Adapter Relative humidity: 62%

KDB Guidelines applied:

Measurements were made as per section 8.3.2.3 in KDB 558074 D01 15.247 Measurement Guidance v05r02.

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Test results:

Note:

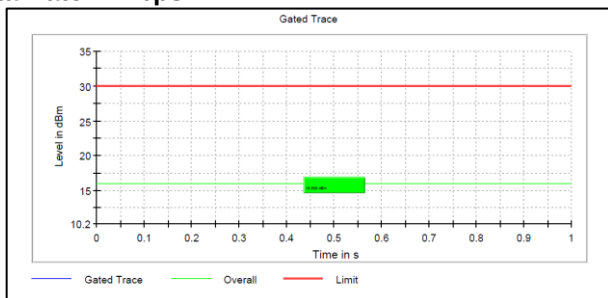
1. All the losses are included during measurement and final values are mentioned in the test report.
2. Total Average Output power (dBm) = Measured Average power (dBm) + Attenuator factor (10dB) + Cable loss (0.4dB)
3. This product do not support additional beamforming gain / directional gain, it uses signal antenna and hence directional gain of the single antenna is 2.00 dBi

Mode	Data rate	Measured Frequency (MHz)	Measured Power (dBm)	Measured e.i.r.p (dBm)	Limit (dBm)	e.i.r.p limit (dBm)
b	1 Mbps	2412	15.89	17.89	30.00	36.00
		2437	17.76	19.76	30.00	36.00
		2462	17.08	19.08	30.00	36.00
g	6 Mbps	2412	14.00	16.00	30.00	36.00
		2437	17.86	19.86	30.00	36.00
		2462	14.17	16.17	30.00	36.00
n-20	MCS0	2412	13.27	15.27	30.00	36.00
		2437	18.05	20.05	30.00	36.00
		2462	12.37	14.37	30.00	36.00
n-40	MCS0	2422	11.24	13.24	30.00	36.00
		2437	16.07	18.07	30.00	36.00
		2452	11.24	13.24	30.00	36.00

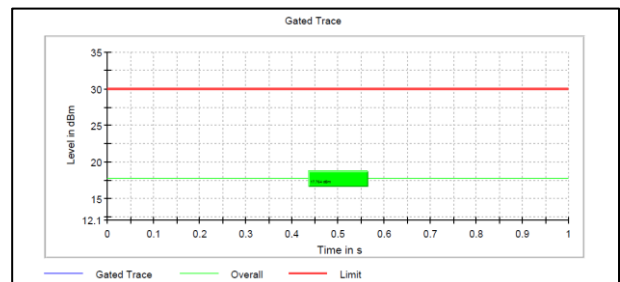
***Note:** Testing has been performed in SISO Mode of Chain-0.

Test Plots:

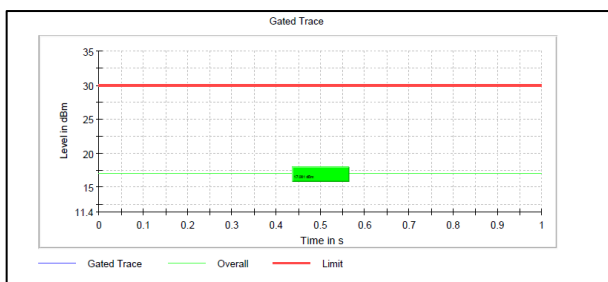
Modulation: 802.11b
Data Rate: 1Mbps



Channel Frequency: 2412MHz



Channel Frequency: 2437MHz



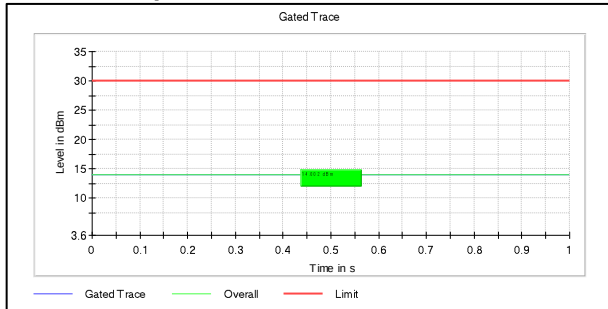
Channel Frequency: 2462MHz

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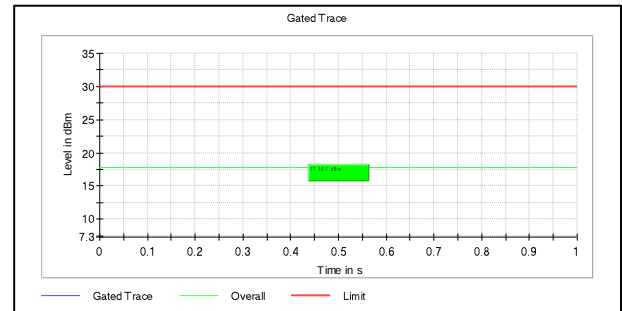
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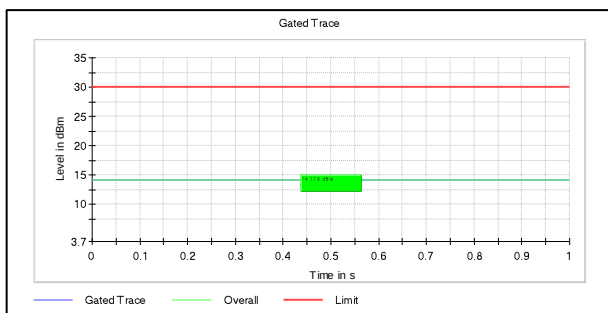
Modulation: 802.11g
Data Rate: 6Mbps



Channel Frequency: 2412MHz

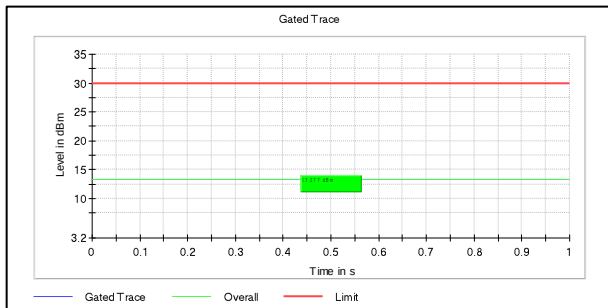


Channel Frequency: 2437MHz

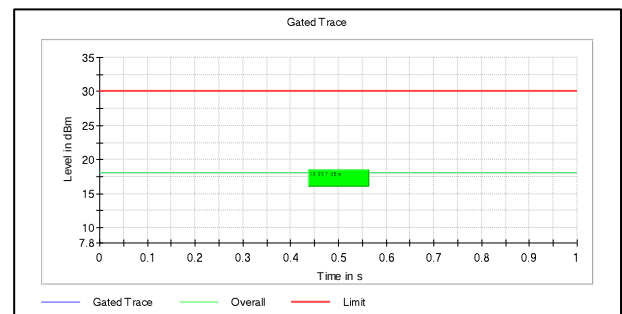


Channel Frequency: 2462MHz

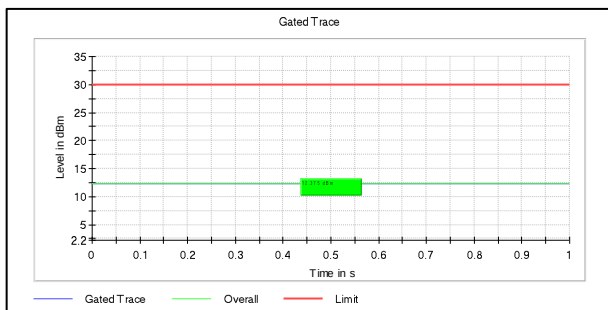
Modulation: 802.11n-20MHz
Data Rate: MCS0



Channel Frequency: 2412MHz



Channel Frequency: 2437MHz



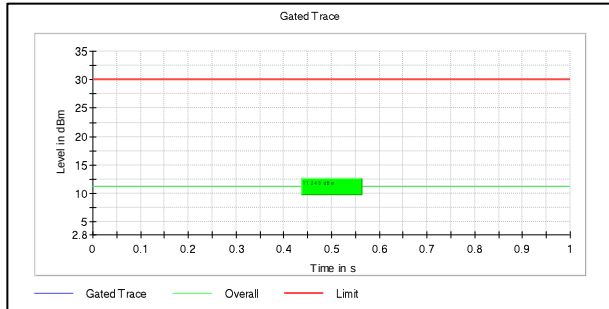
Channel Frequency: 2462MHz

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Test Report No.:

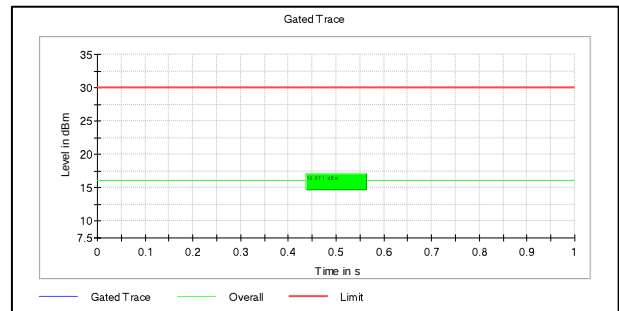
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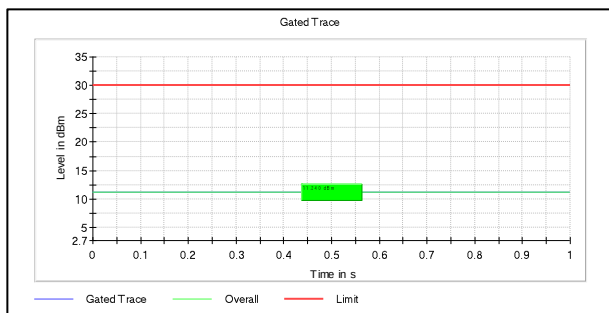
Modulation: 802.11n-40MHz
Data Rate: MCS0



Channel Frequency: 2422MHz



Channel Frequency: 2437MHz



Channel Frequency: 2452MHz

Peak Output Power:

Modulation	Data Rate (Mbps)	Frequency (MHz)	Peak Output Power (dBm)	e.i.r.p (dBm)	Limit (dBm)	e.i.r.p Limit (dBm)
b	1	2412	20.96	22.96	30.00	36.00
		2437	20.81	22.81	30.00	36.00
		2462	19.95	21.95	30.00	36.00
g	6	2412	25.05	27.05	30.00	36.00
		2437	26.47	28.47	30.00	36.00
		2462	24.21	26.21	30.00	36.00
n-20	MCS0	2412	24.69	26.69	30.00	36.00
		2437	26.19	28.19	30.00	36.00
		2462	21.68	23.68	30.00	36.00
n-40	MCS0	2422	22.20	24.20	30.00	36.00
		2437	24.65	26.65	30.00	36.00
		2452	20.07	22.07	30.00	36.00

***Note:** Above peak output power extracted from the module report no: FR740701AC & CR740701AC in SISO mode of Chain-0.

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) RSS Gen Issue 5 Section 8.9 & 8.10
Test Method	ANSI C63.10.2013
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 6 TEST METHODOLOGY

Table 6: 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 = 12VDC through AC/DC Adapter

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 6 TEST METHODOLOGY for more details.

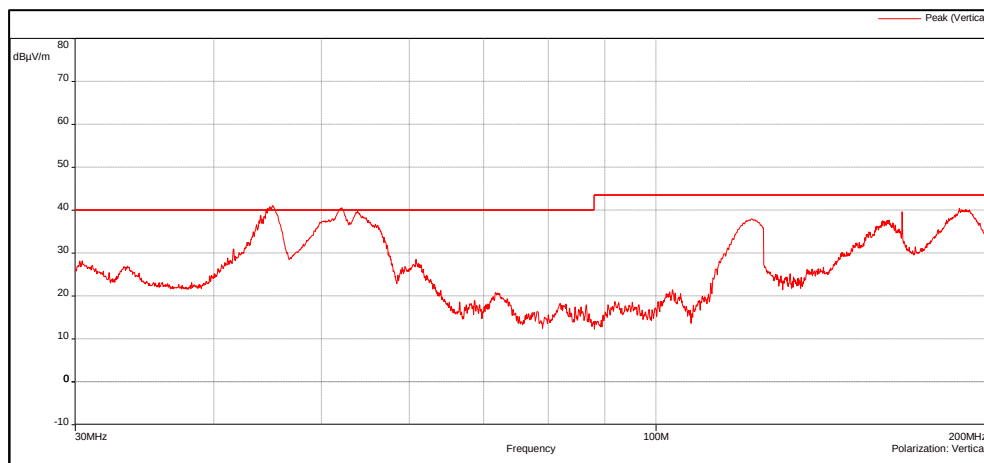
Test results for frequency range 9kHz – 30MHz

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

Test results for frequency range 30MHz – 200MHz

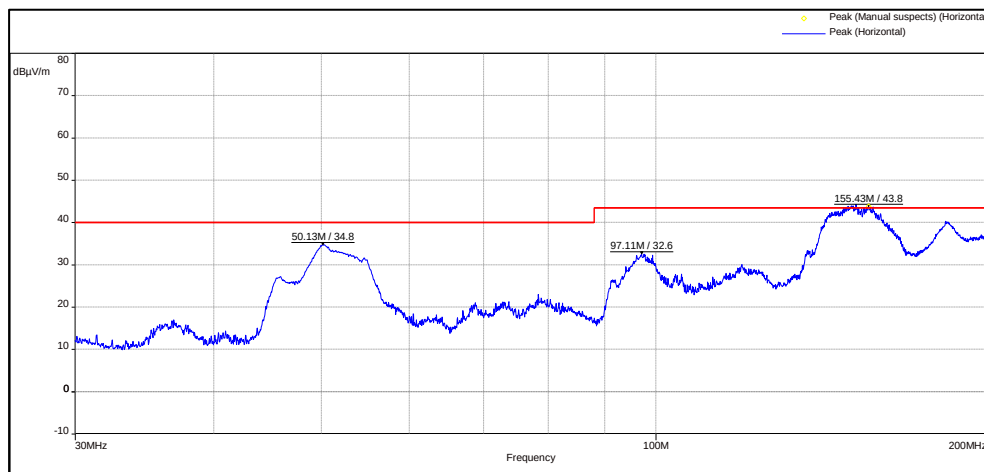
Antenna Polarization	Measured Frequency (MHz)	Measured emission (dBμV/m)	Limit (dBμV/m)	Margin (dB)
Vertical	44.82(QP)	32.04	40.00	-7.96
	51.93(QP)	34.29	40.00	-5.71
Horizontal	50.13(PK)	34.80	40.00	-5.20
	97.11(PK)	32.60	40.00	-7.40
	148.22(Av)	38.37	40.00	-1.63
	154.63(Av)	38.47	40.00	-1.53

Test Plots:



Frequency Range: 30MHz to 200MHz

Polarization: Vertical



Frequency Range: 30MHz to 200MHz

Polarization: Horizontal

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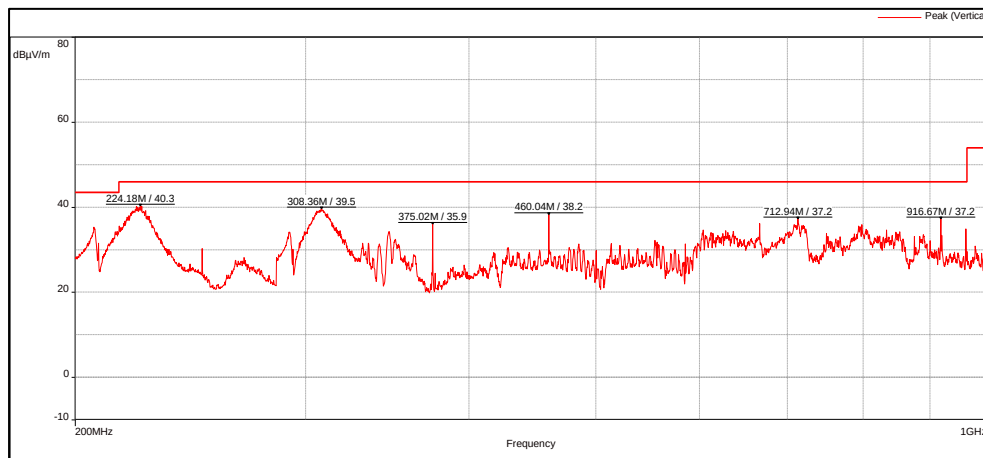
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Test results for frequency range 200MHz – 1GHz

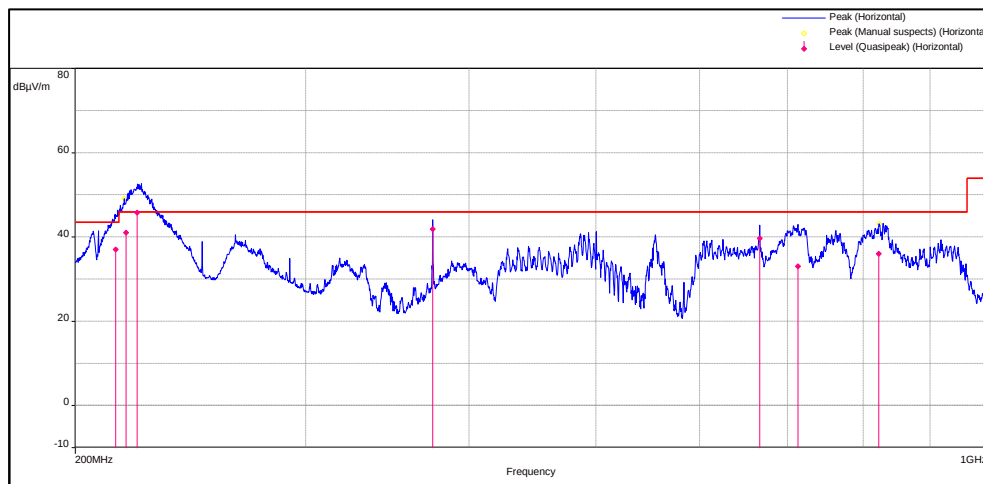
Antenna Polarization	Measured Frequency (MHz)	Measured emission (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)
Vertical	224.18(PK)	40.30	43.50	-3.20
	308.36(PK)	39.50	43.50	-4.00
	375.02(PK)	35.90	43.50	-7.60
	460.04(PK)	38.20	43.50	-5.30
	712.94(PK)	37.20	43.50	-6.30
	916.67(PK)	37.20	43.50	-6.30
Horizontal	214.778(QP)	37.02	43.50	-6.48
	218.696(QP)	41.00	46.00	-5.00
	223.004(QP)	45.82	46.00	-0.18
	375.008(QP)	41.88	46.00	-4.12
	666.692(QP)	39.64	46.00	-6.36
	712.91(QP)	33.09	46.00	-12.91
	821.798(QP)	36.02	46.00	-9.98

Test Plots:



Frequency Range: 200MHz to 1GHz

Polarization: Vertical



Frequency Range: 200MHz to 1GHz

Polarization: Vertical

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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	103.54	-	-
	2412(Av)		101.16	-	-
	2390(Pk)		49.47	74.00*	-24.53
	2390(Av)		38.36	54.00*	-15.64
	4824(Pk)		50.42	74.00	-23.58
	4824(Av)		47.40	54.00	-6.60
	7236(Pk)		46.88	74.00	-27.12
	7236(Av)		34.83	54.00	-19.17
	2412(Pk)	Horizontal	99.72	-	-
	2412(Av)		97.32	-	-
	2390(Pk)		46.27	74.00*	-27.73
	2390(Av)		34.84	54.00*	-19.16
	4824(Pk)		43.75	74.00	-30.25
	4824(Av)		37.37	54.00	-16.63
	7236(Pk)		47.60	74.00	-26.40
	7236(Av)		34.42	54.00	-19.58
2437	2437(Pk)	Vertical	105.47	-	-
	2437(Av)		103.08	-	-
	4874(Pk)		53.44	74.00	-20.56
	4874(Av)		51.40	54.00	-2.60
	7311(Pk)		47.46	74.00	-26.54
	7311(Av)		36.42	54.00	-17.58
	2437(Pk)	Horizontal	101.13	-	-
	2437(Av)		98.75	-	-
	4874(Pk)		45.58	74.00	-28.42
	4874(Av)		39.66	54.00	-14.34
	7311(Pk)		46.56	74.00	-27.44
	7311(Av)		34.47	54.00	-19.53
2462	2462(Pk)		105.07	-	-
	2462(Av)		102.76	-	-
	2483.5(Pk)		50.16	74.00*	-23.84
	2483.5(Av)		39.24	54.00*	-14.76
	4924(Pk)		46.87	74.00	-27.13
	4924(Av)		42.28	54.00	-11.72
	7386(Pk)		46.69	74.00	-27.31
	7386(Av)		34.41	54.00	-19.59
	2462(Pk)		100.88	-	-
	2462(Av)		98.51	-	-
	2483.5(Pk)		46.39	74.00*	-27.61
	2483.5(Av)		34.44	54.00*	-19.56
	4924(Pk)		48.09	74.00	-25.91
	4924(Av)		44.61	54.00	-9.39
	7386(Pk)		47.05	74.00	-26.95
	7386(Av)		34.60	54.00	-19.40

-: Indicates fundamental frequency

*: 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	105.53	-	-
	2412(Av)		96.24	-	-
	2390(Pk)		69.02	74.00*	-4.98
	2390(Av)		49.60	54.00*	-4.40
	4824(Pk)		47.57	74.00	-26.43
	4824(Av)		33.46	54.00	-20.54
	7236(Pk)		47.71	74.00	-26.29
	7236(Av)		34.63	54.00	-19.37
	2412(Pk)	Horizontal	101.75	-	-
	2412(Av)		92.40	-	-
	2390(Pk)		60.45	74.00*	-13.55
	2390(Av)		42.87	54.00*	-11.13
	4824(Pk)		40.89	74.00	-33.11
	4824(Av)		28.73	54.00	-25.27
	7236(Pk)		47.27	74.00	-26.73
	7236(Av)		34.46	54.00	-19.54
2437	2437(Pk)	Vertical	108.27	-	-
	2437(Av)		99.58	-	-
	4874(Pk)		56.05	74.00	-17.95
	4874(Av)		41.78	54.00	-12.22
	7311(Pk)		48.45	74.00	-25.55
	7311(Av)		35.38	54.00	-18.62
	2437(Pk)	Horizontal	104.69	-	-
	2437(Av)		95.76	-	-
	4874(Pk)		47.15	74.00	-26.85
	4874(Av)		33.37	54.00	-20.63
	7311(Pk)		46.92	74.00	-27.08
	7311(Av)		34.44	54.00	-19.56
2462	2462(Pk)		105.76	-	-
	2462(Av)		96.64	-	-
	2483.5(Pk)		67.54	74.00*	-6.46
	2483.5(Av)		47.61	54.00*	-6.39
	4924(Pk)		53.50	74.00	-20.50
	4924(Av)		39.12	54.00	-14.88
	7386(Pk)		47.19	74.00	-26.81
	7386(Av)		34.94	54.00	-19.06
	2462(Pk)		101.55	-	-
	2462(Av)		92.12	-	-
	2483.5(Pk)		55.93	74.00*	-18.07
	2483.5(Av)		38.64	54.00*	-15.36
	4924(Pk)		41.96	74.00	-32.04
	4924(Av)		29.71	54.00	-24.29
	7386(Pk)		46.90	74.00	-27.10
	7386(Av)		34.57	54.00	-19.43

-: Indicates fundamental frequency

*: Indicate restricted band of operation §15.205

Pk: Peak Detector; Av: Average Detector

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Modulation: 802.11n_HT20

Data Rate: MCS0

Channel Frequency (MHz)	Measured Frequency (MHz)	Antenna Polarization	Measured Emission (dBμV/m)	Limit (dBμV/m)	Margin (dB)
2412	2412(Pk)	Vertical	104.22	-	-
	2412(Av)		95.37	-	-
	2390(Pk)		69.36	74.00*	-4.64
	2390(Av)		49.90	54.00*	-4.10
	4824(Pk)		46.40	74.00	-27.60
	4824(Av)		32.19	54.00	-21.81
	7236(Pk)		46.97	74.00	-27.03
	7236(Av)		34.64	54.00	-19.36
	2412(Pk)	Horizontal	100.35	-	-
	2412(Av)		91.48	-	-
	2390(Pk)		60.79	74.00*	-13.21
	2390(Av)		43.42	54.00*	-10.58
	4824(Pk)		41.64	74.00	-32.36
	4824(Av)		29.29	54.00	-24.71
	7236(Pk)		47.91	74.00	-26.09
	7236(Av)		34.54	54.00	-19.46
2437	2437(Pk)	Vertical	107.90	-	-
	2437(Av)		99.42	-	-
	4874(Pk)		56.82	74.00	-17.18
	4874(Av)		42.40	54.00	-11.60
	7311(Pk)		48.38	74.00	-25.62
	7311(Av)		35.39	54.00	-18.61
	2437(Pk)	Horizontal	104.22	-	-
	2437(Av)		95.73	-	-
	4874(Pk)		45.68	74.00	-28.32
	4874(Av)		31.14	54.00	-22.86
	7311(Pk)		47.15	74.00	-26.85
	7311(Av)		34.64	54.00	-19.36
2462	2462(Pk)		103.39	-	-
	2462(Av)		94.76	-	-
	2483.5(Pk)		59.60	74.00*	-14.40
	2483.5(Av)		42.97	54.00*	-11.03
	4924(Pk)		47.92	74.00	-26.08
	4924(Av)		33.55	54.00	-20.45
	7386(Pk)		46.99	74.00	-27.01
	7386(Av)		34.81	54.00	-19.19
	2462(Pk)		99.28	-	-
	2462(Av)		90.38	-	-
	2483.5(Pk)		50.41	74.00*	-23.59
	2483.5(Av)		37.04	54.00*	-16.96
	4924(Pk)		41.73	74.00	-32.27
	4924(Av)		29.30	54.00	-24.70
	7386(Pk)		47.25	74.00	-26.75
	7386(Av)		34.69	54.00	-19.31

-: Indicates fundamental frequency

*: Indicate restricted band of operation §15.205

Pk: Peak Detector; Av: Average Detector

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Modulation: 802.11n-40MHz

Data Rate: MCS0

Channel Frequency (MHz)	Measured Frequency (MHz)	Antenna Polarization	Measured Emission (dBµV/m)	Limit (dBµV/m)	Margin (dB)
2422	2422(Pk)	Vertical	99.79	-	-
	2422(Av)		90.97	-	-
	2390(Pk)		61.51	74.00*	-12.49
	2390(Av)		49.73	54.00*	-4.27
	4844(Pk)		44.19	74.00	-29.81
	4844(Av)		30.31	54.00	-23.69
	7266(Pk)		46.59	74.00	-27.41
	7266(Av)		34.63	54.00	-19.37
	2422(Pk)	Horizontal	95.96	-	-
	2422(Av)		87.14	-	-
	2390(Pk)		54.98	74.00*	-19.02
	2390(Av)		43.94	54.00*	-10.06
	4844(Pk)		42.18	74.00	-31.82
	4844(Av)		28.91	54.00	-25.09
	7266(Pk)		45.91	74.00	-28.09
	7266(Av)		34.64	54.00	-19.36
2437	2437(Pk)	Vertical	103.59	-	-
	2437(Av)		95.02	-	-
	4874(Pk)		48.60	74.00	-25.40
	4874(Av)		36.23	54.00	-17.77
	7311(Pk)		46.19	74.00	-27.81
	7311(Av)		34.76	54.00	-19.24
	2437(Pk)	Horizontal	99.88	-	-
	2437(Av)		91.30	-	-
	4874(Pk)		42.54	74.00	-31.46
	4874(Av)		31.07	54.00	-22.93
	7311(Pk)		46.63	74.00	-27.37
	7311(Av)		34.49	54.00	-19.51
2452	2452(Pk)	Vertical	99.18	-	-
	2452(Av)		90.64	-	-
	2483.5(Pk)		54.59	74.00*	-19.41
	2483.5(Av)		42.76	54.00*	-11.24
	4904(Pk)		44.31	74.00	-29.69
	4904(Av)		31.57	54.00	-22.43
	7356(Pk)		46.79	74.00	-27.21
	7356(Av)		34.63	54.00	-19.37
	2452(Pk)	Horizontal	94.81	-	-
	2452(Av)		86.14	-	-
	2483.5(Pk)		48.84	74.00*	-25.16
	2483.5(Av)		37.34	54.00*	-16.66
	4904(Pk)		40.91	74.00	-33.09
	4904(Av)		28.97	54.00	-25.03
	7356(Pk)		46.76	74.00	-27.24
	7356(Av)		34.57	54.00	-19.43

-: Indicates fundamental frequency

*: Indicate restricted band of operation §15.205

Pk: Peak Detector; Av: Average Detector

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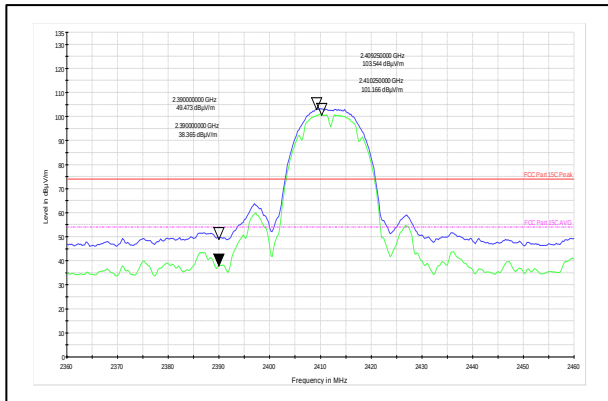
Test Plots:

Restricted Bands of Operation:

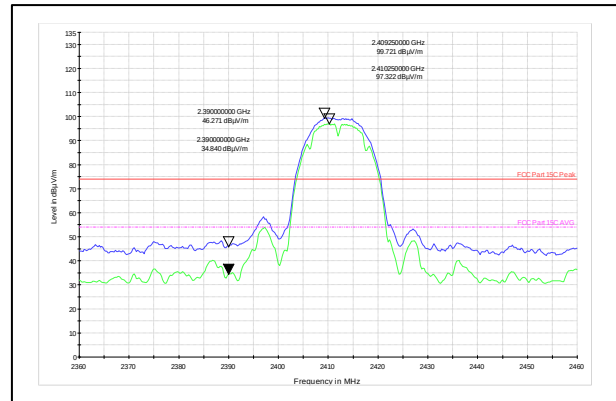
Modulation: 802.11b

Data Rate: 1Mbps

Channel Frequency: 2412MHz

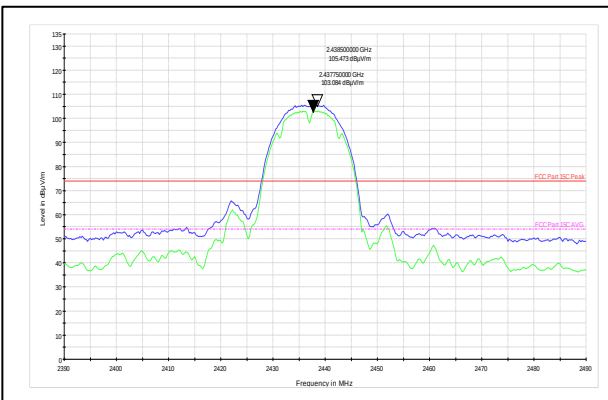


Polarization: Vertical

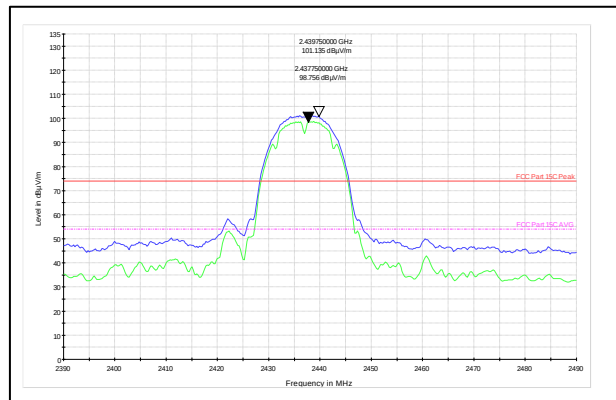


Polarization: Horizontal

Channel Frequency: 2437MHz

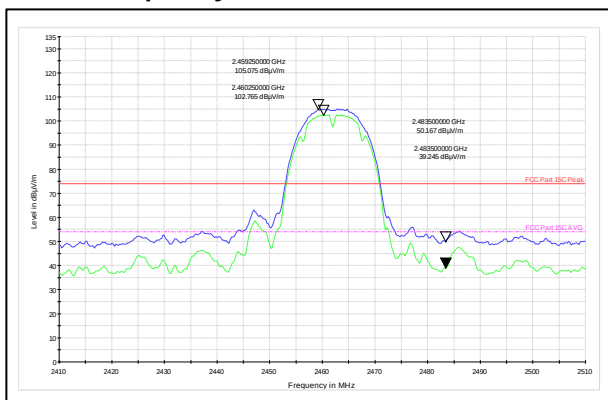


Polarization: Vertical

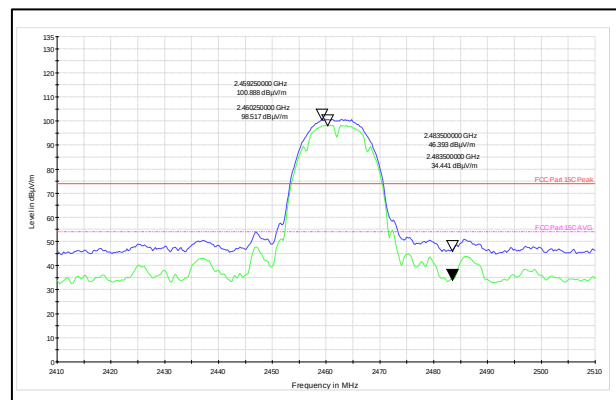


Polarization: Horizontal

Channel Frequency: 2462MHz



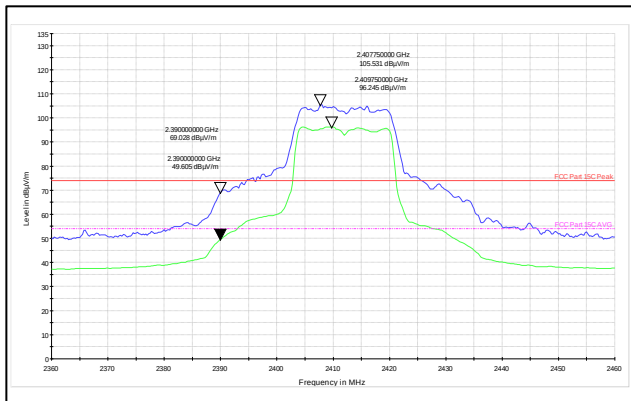
Polarization: Vertical



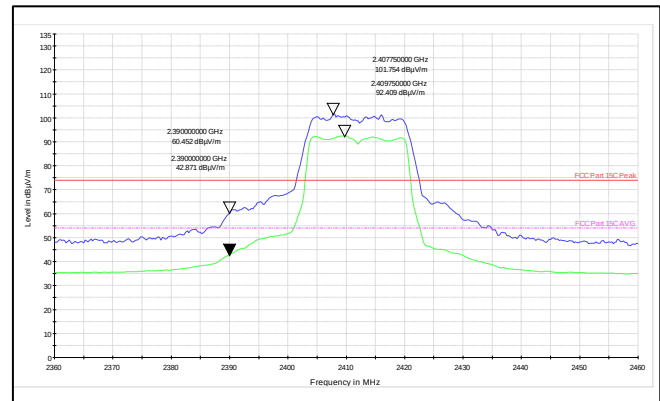
Polarization: Horizontal

Modulation: 802.11g

Channel Frequency: 2412MHz

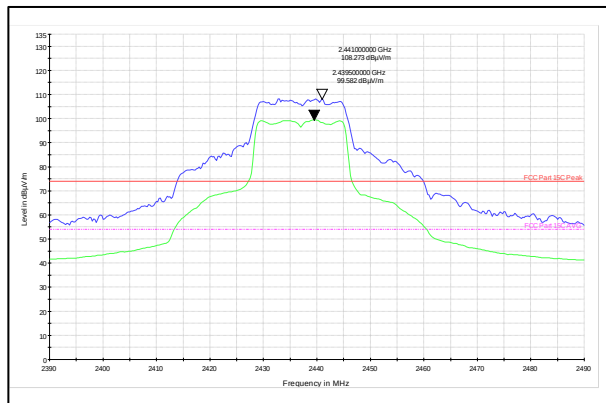


Polarization: Vertical

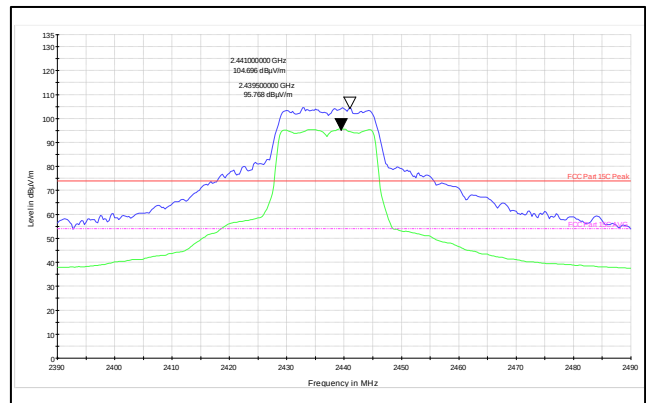


Polarization: Horizontal

Channel Frequency: 2437MHz

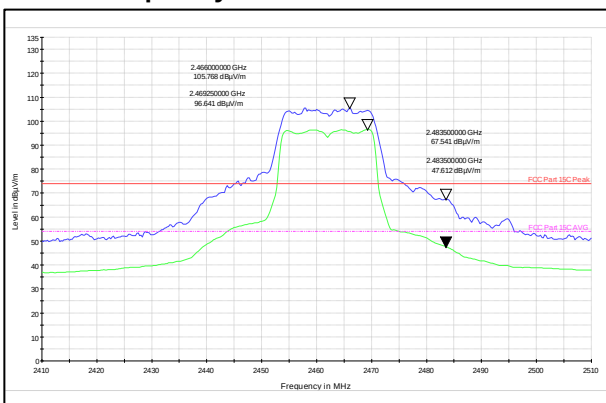


Polarization: Vertical

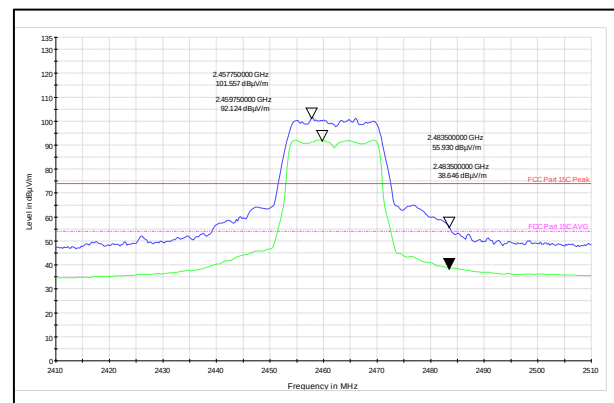


Polarization: Horizontal

Channel Frequency: 2462MHz



Polarization: Vertical

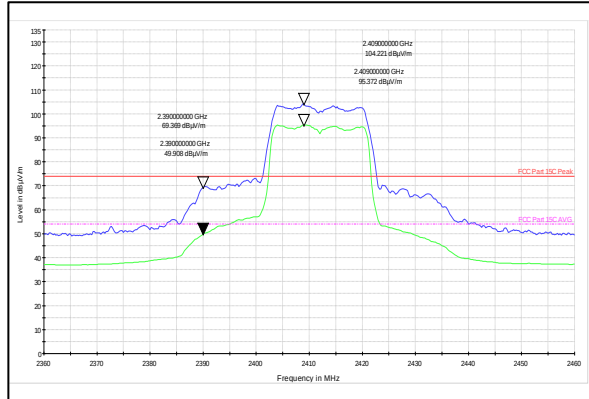


Polarization: Horizontal

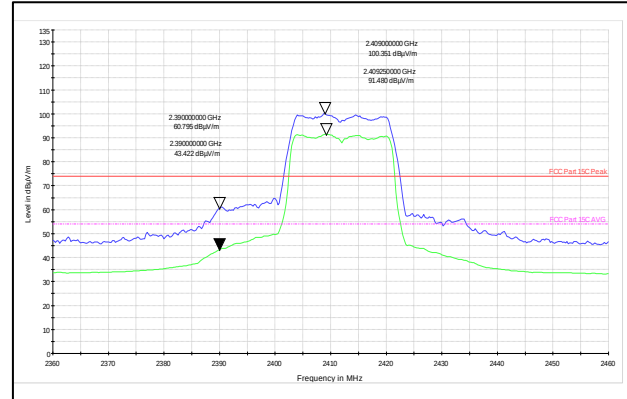
Modulation: 802.11n-20MHz

Data Rate: MCS0

Channel Frequency: 2412MHz

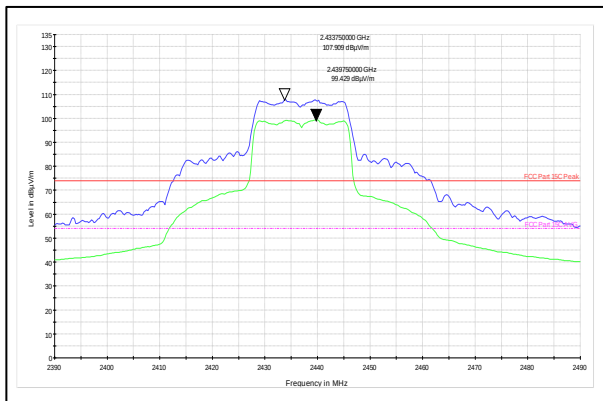


Polarization: Vertical

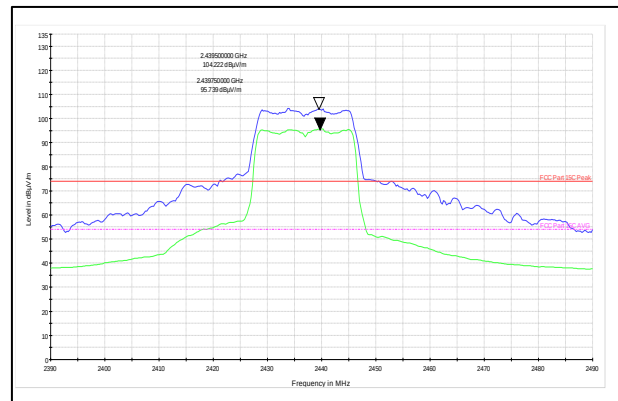


Polarization: Horizontal

Channel Frequency: 2437MHz

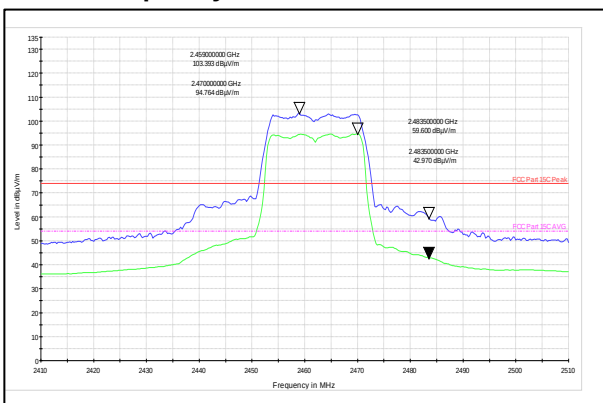


Polarization: Vertical

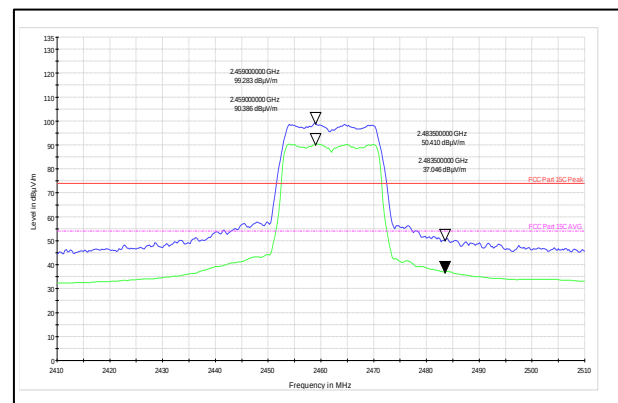


Polarization: Horizontal

Channel Frequency: 2462MHz



Polarization: Vertical

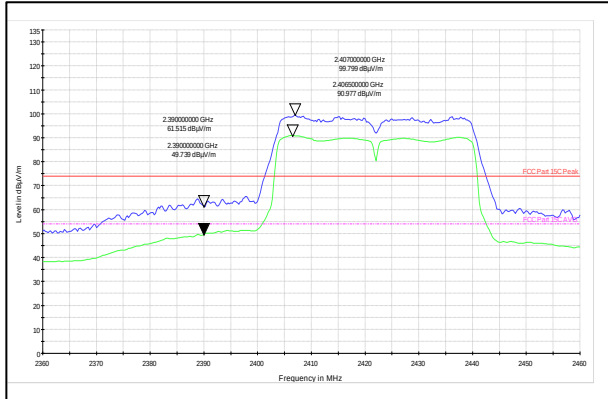


Polarization: Horizontal

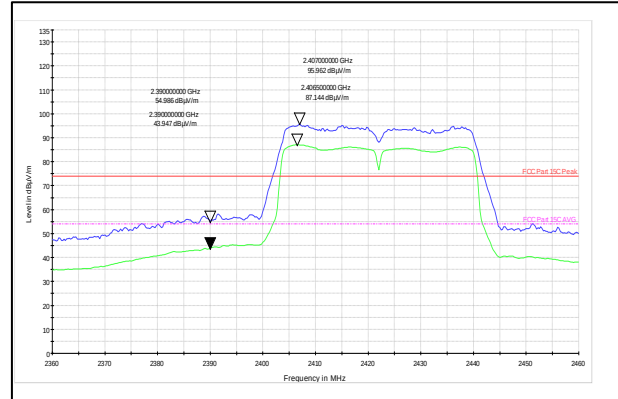
Modulation: 802.11n-40MHz

Data Rate: MCS0

Channel Frequency: 2422MHz

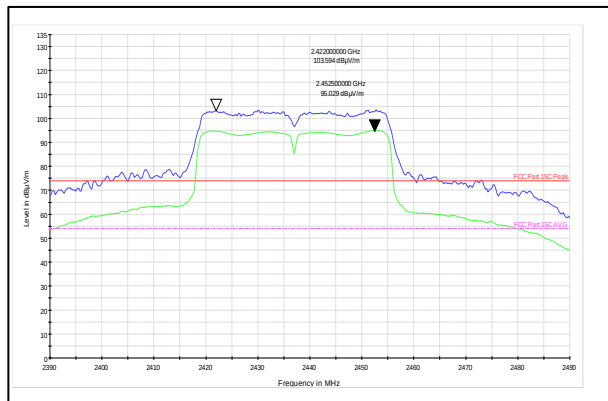


Polarization: Vertical

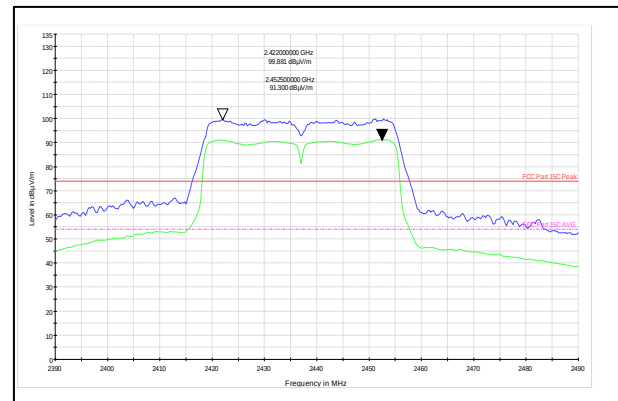


Polarization: Horizontal

Channel Frequency: 2437MHz

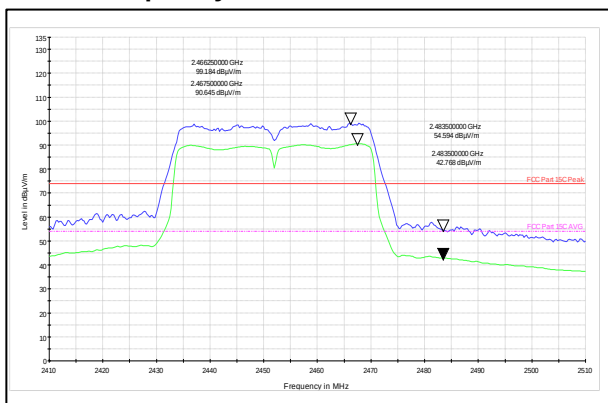


Polarization: Vertical

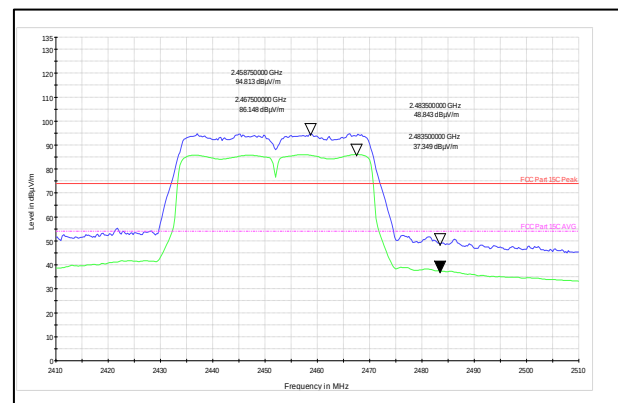


Polarization: Horizontal

Channel Frequency: 2452MHz



Polarization: Vertical



Polarization: Horizontal

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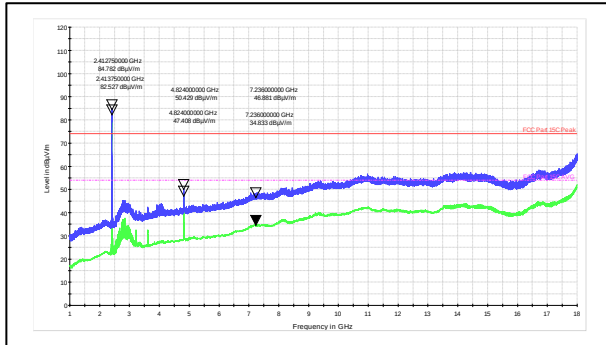
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Test Plots for Spurious Radiated emission:

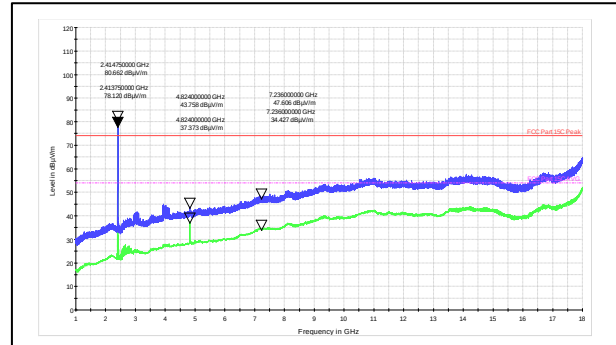
Modulation: 802.11b

Data Rate: 1Mbps

Channel Frequency: 2412MHz

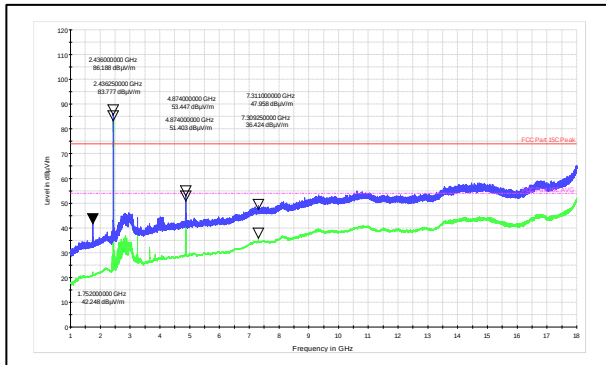


Polarization: Vertical

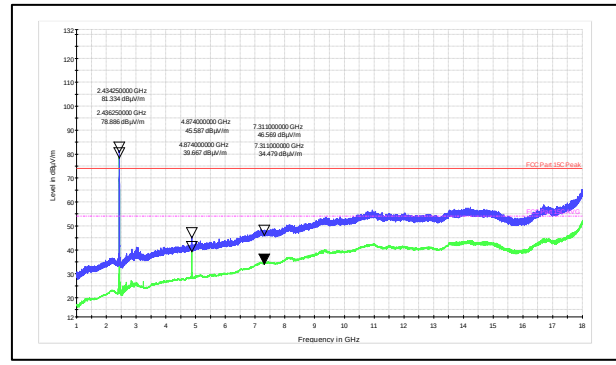


Polarization: Horizontal

Channel Frequency: 2437MHz

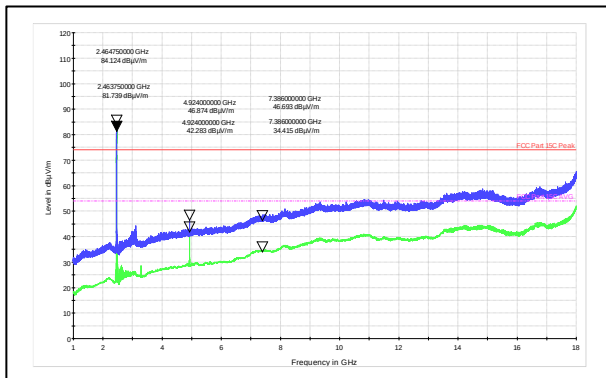


Polarization: Vertical

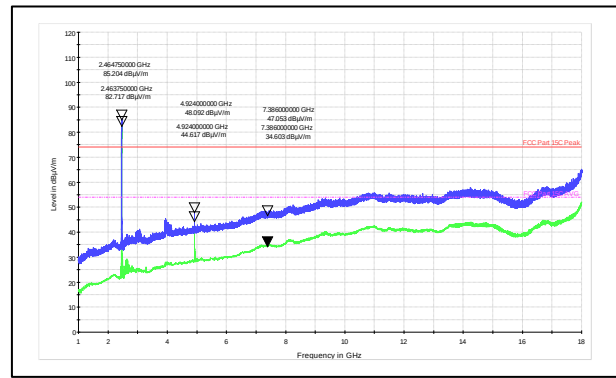


Polarization: Horizontal

Channel Frequency: 2462MHz



Polarization: Vertical

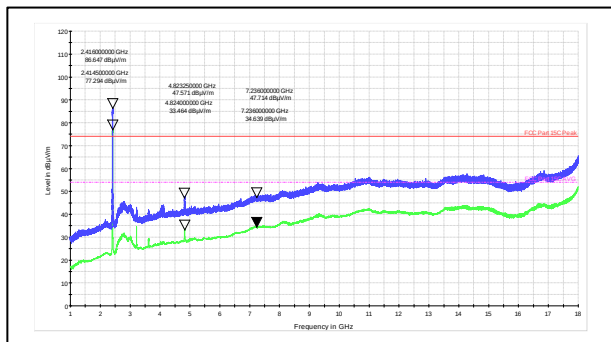


Polarization: Horizontal

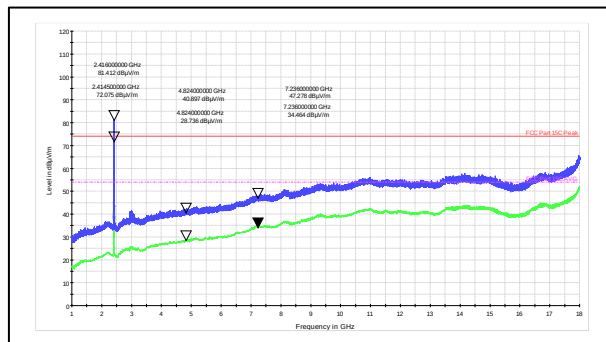
Modulation: 802.11g

Data Rate: 6Mbps

Channel Frequency: 2412MHz

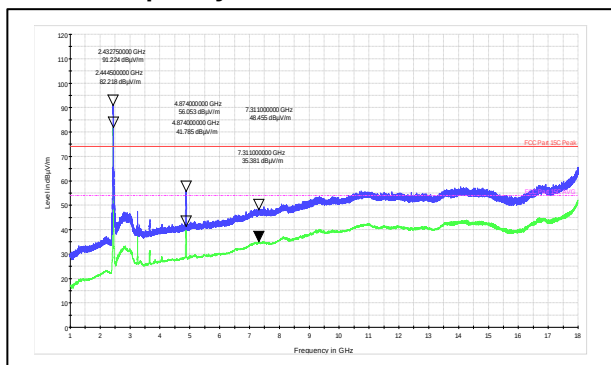


Polarization: Vertical

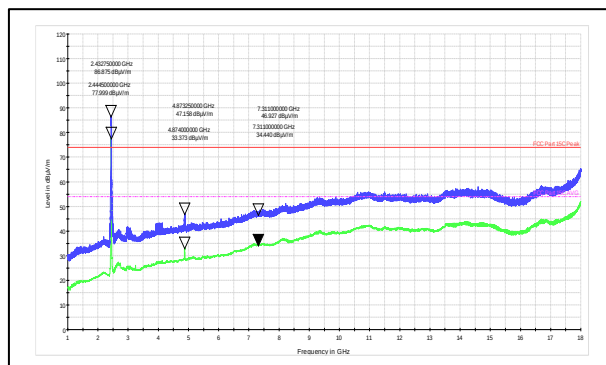


Polarization: Horizontal

Channel Frequency: 2437MHz

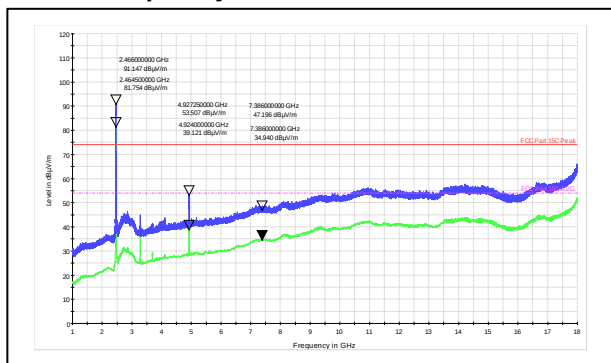


Polarization: Vertical

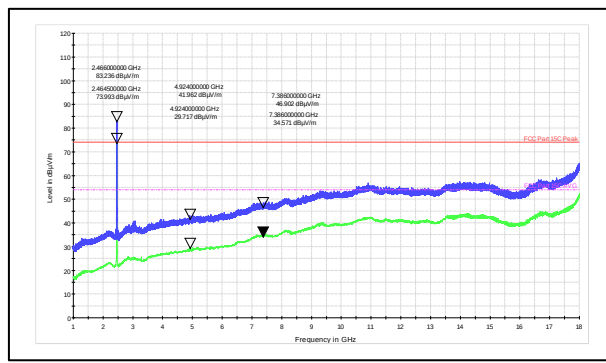


Polarization: Horizontal

Channel Frequency: 2462MHz



Polarization: Vertical

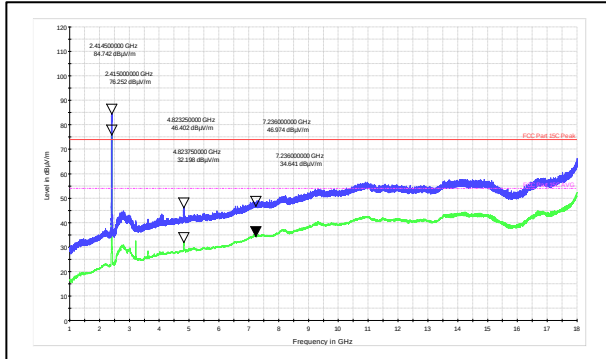


Polarization: Horizontal

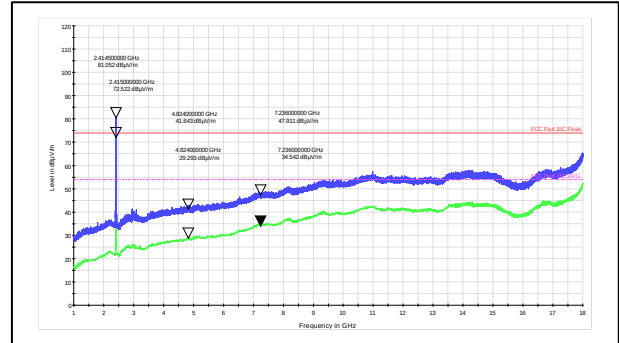
Modulation: 802.11n-20MHz

Data Rate: MCS0

Channel Frequency: 2412MHz

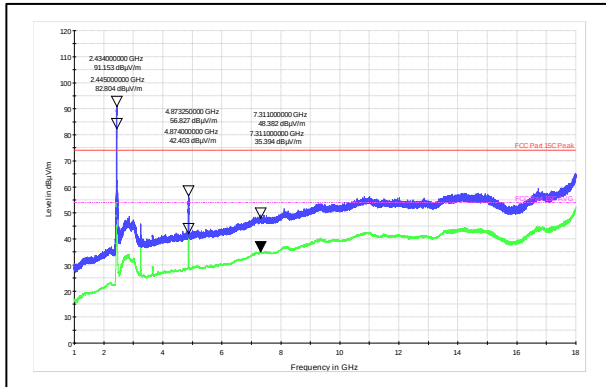


Polarization: Vertical

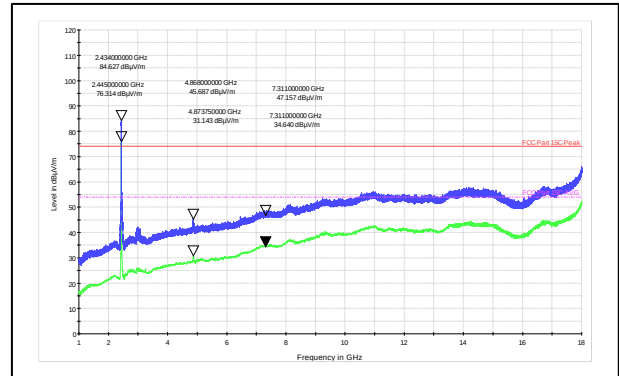


Polarization: Horizontal

Channel Frequency: 2437MHz

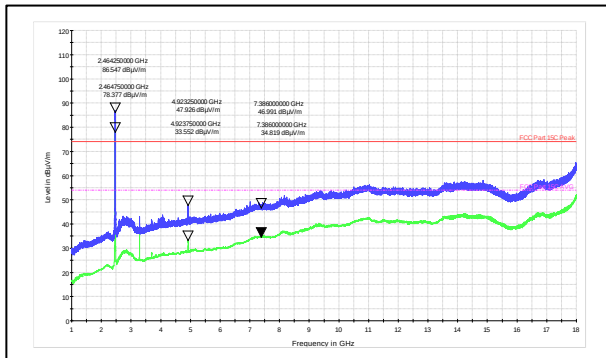


Polarization: Vertical

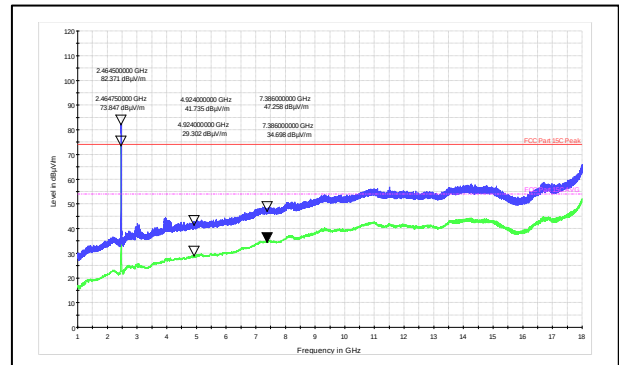


Polarization: Horizontal

Channel Frequency: 2462MHz



Polarization: Vertical



Polarization: Horizontal

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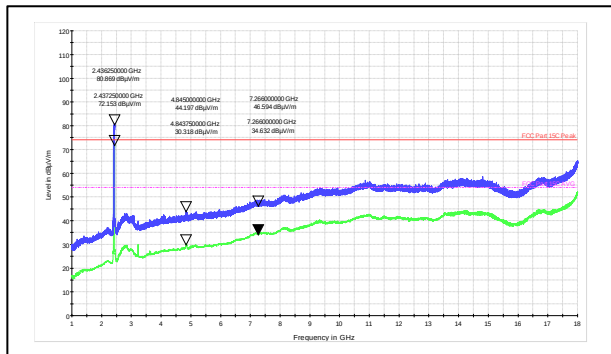
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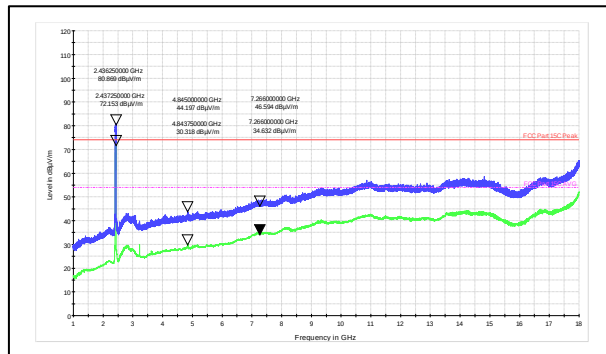
Modulation: 802.11n-40MHz

Data Rate: MCS0

Channel Frequency: 2422MHz

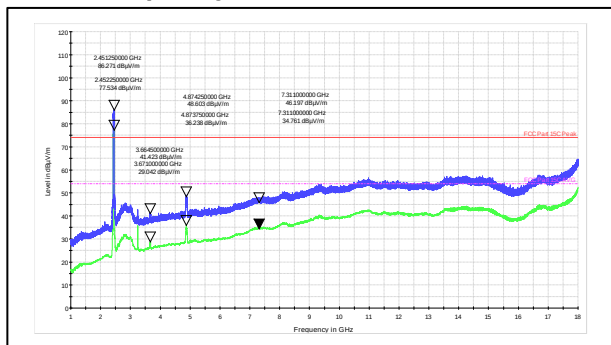


Polarization: Vertical

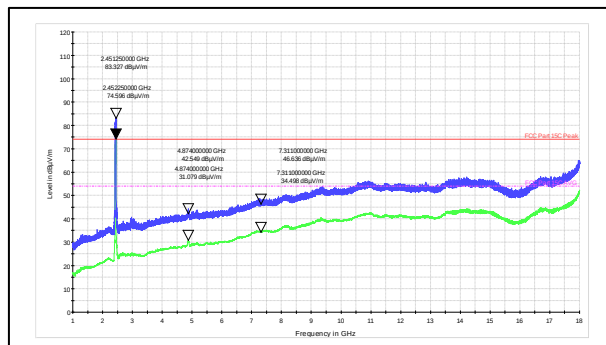


Polarization: Horizontal

Channel Frequency: 2437MHz

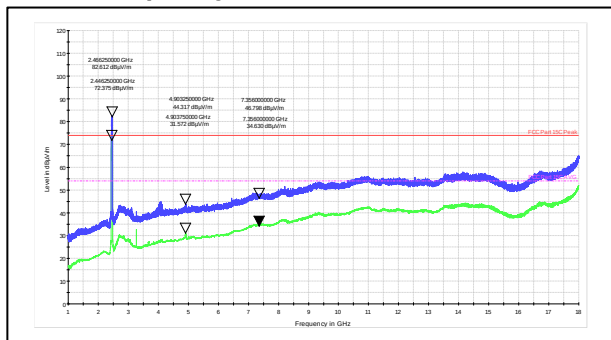


Polarization: Vertical

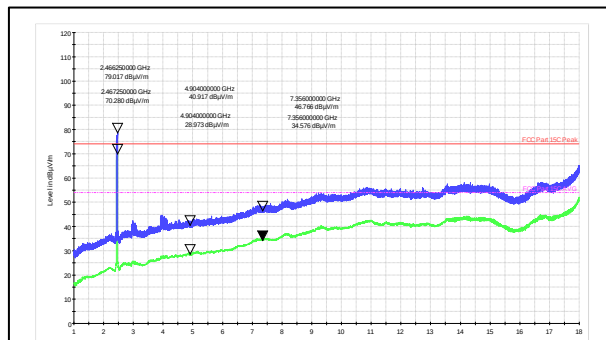


Polarization: Horizontal

Channel Frequency: 2452MHz



Polarization: Vertical



Polarization: Horizontal

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8 AC Powerlines conducted emission

Result

Pass

Test Specification: FCC Part 15 Section 15.207
RSS Gen Issue 5 Section 8.8

Test Method: ANSI C 63.10-2013

Testing Location: Screened room

Measurement Bandwidth: 9kHz

Frequency Range: 150kHz – 30MHz

Supply Voltage: 110VAC,60Hz

Test Method: Refer TEST METHODOLOGY

Table 7: Limits for Conducted powerline 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

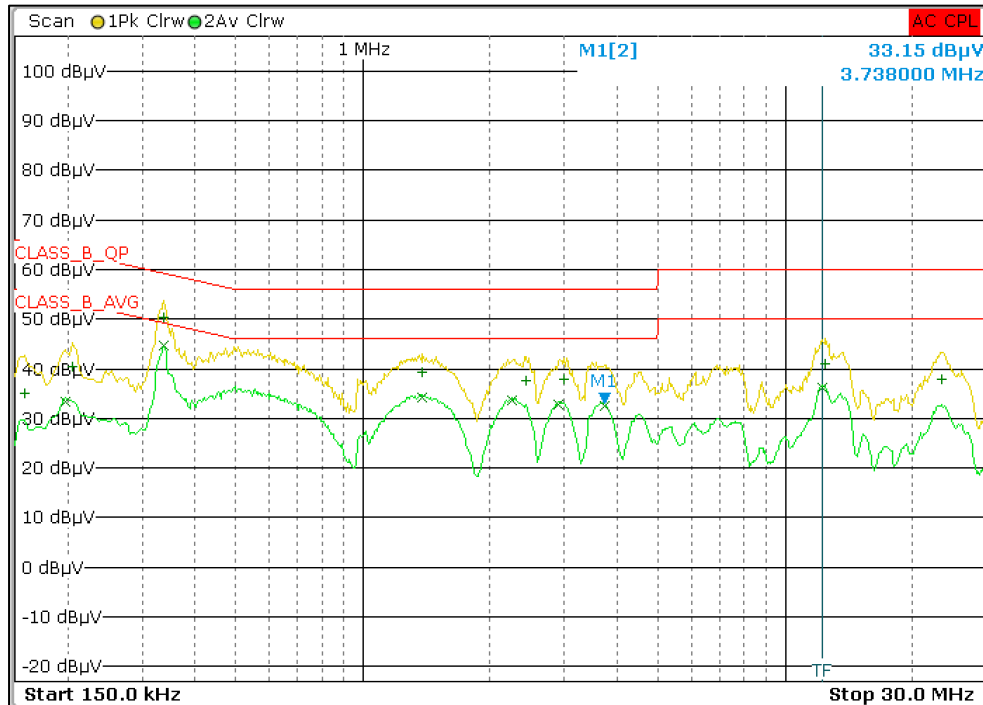
* Decreases with the logarithm of the frequency

Test Conditions:

Temperature (Norm) = +22.3 °C Voltage = 110V AC (Through AC to DC Adapter) Relative humidity: 64%

Test results:

110VAC-60Hz-Line



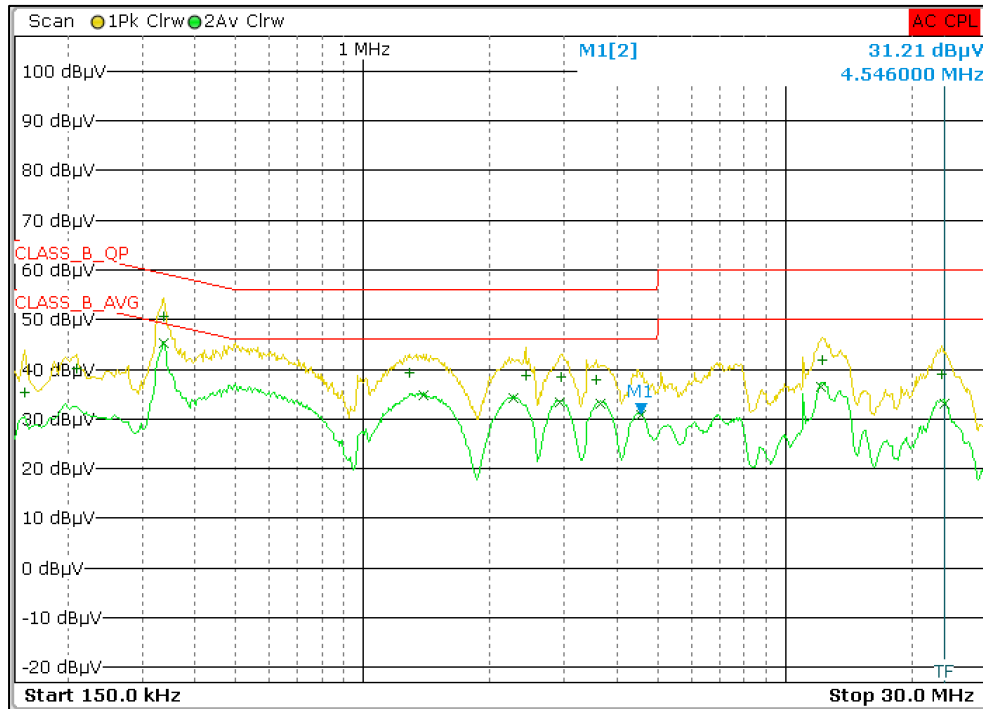
Trace	Frequency	Level (dBµV)	Phase	Detector	Delta Limit/dB
2	338.000000000 kHz	44.61		Average	-4.64
1	338.000000000 kHz	50.30		Quasi Peak	-8.95
2	1.382000000 MHz	34.20		Average	-11.80
2	2.250000000 MHz	33.58		Average	-12.42
2	2.906000000 MHz	32.77		Average	-13.23
2	3.738000000 MHz	32.40		Average	-13.60
2	12.206000000 MHz	36.16		Average	-13.84
1	1.386000000 MHz	39.21		Quasi Peak	-16.79
1	2.998000000 MHz	37.84		Quasi Peak	-18.16
1	2.430000000 MHz	37.63		Quasi Peak	-18.37
1	12.454000000 MHz	40.90		Quasi Peak	-19.10
2	198.000000000 kHz	33.41		Average	-20.28
1	23.422000000 MHz	37.97		Quasi Peak	-22.03
1	206.000000000 kHz	40.54		Quasi Peak	-22.83
1	158.000000000 kHz	35.17		Quasi Peak	-30.40

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110VAC-60Hz-Neutral:



Trace	Frequency	Level (dBμV)	Phase	Detector	Delta Limit/dB
2	338.000000000 kHz	45.13		Average	-4.12
2	338.000000000 kHz	45.12		Average	-4.13
1	338.000000000 kHz	50.61		Quasi Peak	-8.64
1	338.000000000 kHz	50.60		Quasi Peak	-8.65
2	1.394000000 MHz	34.71		Average	-11.29
2	2.270000000 MHz	34.14		Average	-11.86
2	2.922000000 MHz	33.30		Average	-12.70
2	3.650000000 MHz	32.99		Average	-13.01
2	12.154000000 MHz	36.51		Average	-13.49
2	4.546000000 MHz	30.69		Average	-15.31
1	1.290000000 MHz	39.32		Quasi Peak	-16.68
2	23.798000000 MHz	33.15		Average	-16.85
1	2.426000000 MHz	38.62		Quasi Peak	-17.38
1	2.954000000 MHz	38.36		Quasi Peak	-17.64
1	3.558000000 MHz	37.96		Quasi Peak	-18.04
1	12.226000000 MHz	41.92		Quasi Peak	-18.08
1	23.426000000 MHz	39.09		Quasi Peak	-20.91
1	210.000000000 kHz	40.21		Quasi Peak	-23.00
1	158.000000000 kHz	35.40		Quasi Peak	-30.17

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11 Power level used for testing

802.11b _1Mbps	
Channel Frequency (MHz)	Power level (dBm)
2412	16
2437	18
2462	17
802.11g _6Mbps	
Channel Frequency (MHz)	Power level (dBm)
2412	14
2437	18
2462	14
802.11n HT 20 MCS0	
Channel Frequency (MHz)	Power level (dBm)
2412	13
2437	18
2462	12
802.11n _40 MCS0	
Channel Frequency (MHz)	Power level (dBm)
2422	11
2437	16
2452	11

End of test report