

Prüfbericht-Nr.: Test report no.:	IN25M7QI 001	Auftrags-Nr.: Order no.:	147064681 010	Seite 1 von 45 Page 1 of 45
Kunden-Referenz-Nr.: Client reference no.:	2566340	Auftragsdatum: Order date:	2025-05-30	
Auftraggeber: Client:	75F Inc. , 1650 W, 82nd St, #200, Bloomington, Minnesota, USA - 55431			
Prüfgegenstand: Test item:	Smart Node			
Bezeichnung / Typ-Nr.: Identification / Type no.:	7X-SN-C3X-X			
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 RSS Gen Issue 5; RSS 247 Issue 3			
Wareneingangsdatum: Date of sample receipt:	2025-06-03			
Prüfmuster-Nr.: Test sample no:	A004010288-001 A004010288-002			
Prüfzeitraum: Testing period:	2025-06-10 - 2025-06-16			
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:	X 	genehmigt von: authorized by:	X 	
Datum: Date: 2025-07-01	Signed by: Likhithesh MD	Ausstellungsdatum: Issue date: 2025-07-04	Signed by: Madhu Nagaraju	
Stellung / Position:	Senior Engineer	Stellung / Position:	Assistant Manager	
Sonstiges / Other:	FCC ID: 2AVZO-101393 IC: 25972-101393 HVIN: 101393SN			
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				
Dieser Prüfbericht bezieht sich nur auf das o.g. Prüfmuster und darf ohne Genehmigung der Prüfstelle nicht auszugsweise vervielfältigt werden. Dieser Bericht berechtigt nicht zur Verwendung eines Prüfzeichens. This test report only relates to the above mentioned 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.				

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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	ISED	Result
Maximum conducted (Peak) output power	15.247 (b)(3)	RSS 247 Issue 3 Section 5.4(d)	Pass
Maximum Power Spectral Density	FCC 15.247(e)	RSS 247 Issue 3 Section 5.2(b)	Pass
DTS Bandwidth & 99% Bandwidth	FCC 15.247(a)(2)	RSS 247 Issue 3 Section 5.2(a) RSS Gen Issue 5 Section 6.7	Pass
Emissions in non-restricted frequency bands	15.247 (d)	RSS 247 Issue 3 Section 5.5	Pass
Spurious Radiated Emissions and Restricted Bands of Operation	15.247 (d) / FCC 15.209 / FCC 15.205	RSS-Gen Issue 5, Section 8.9 /8.10	Pass
AC Power lines Conducted emission	FCC 15.207	RSS Gen Issue 5 Section 8.8	Pass
Antenna Requirement	FCC 15.203	RSS Gen Issue 5 Section 6.8	Complied

Product Category: Electronics Testing

Test Discipline: EMC Test Facility

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REVISION HISTORY OF THIS REPORT

Report Number	Version	Description	Issue date
IN25M7QI 001	01	Initial issue of report	2025-07-04

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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	101732	4.73 SP5	17.09.2025	Yearly	Radiated Spurious Emission
Loop Antenna	Schwarzbeck	FMZB 1519 B	1519B-00111	-	11-11-2025	Yearly	
Baloon and Biconical Antenna	Schwarzbeck mess-elektronik	VHBB-9124 / BBA-9106	01028	-	11.04.2026	Yearly	
Log-Periodic Antenna	Schwarzbeck mess-elektronik	VUSLP 9111B	9111B-111	-	13.03.2026	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	16.09.2025	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	-	08-07-2025	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	Conducted Emissions on a.c power Lines	BAT EMC	3.20.0.17

3 GENERAL PRODUCT INFORMATION

3.1 Product Function and Intended Use

Smart Node is aimed at being an upgrade to the existing SmartNode. Better connectors, more relays and analog out to control more loads. It is envisaged as a general-purpose device that controls dampers for airflow and a couple of lights. It operates off 24v and has inputs for measuring room and airflow temperatures.

3.2 Ratings and System Details of Equipment under Test

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

Protocol		BLE (Bluetooth Low Energy)
Operating Frequency Range		2402MHz to 2480MHz
Channel Spacing		2MHz
Maximum measured e.i.r.p (dBm)		7.35dBm@ 2402MHz
Modulation		GFSK
Data Rate		1Mbps
Number of antennas		1
Antenna Gain & Antenna Type		4.9dBi
Antenna Part Number		2108792-1
Supply Voltage to Product		24VDC / VAC Nominal
Environmental conditions	Operating Condition	0°C to +50°C
	Storage Condition	-10°C to +70°C
EUT Dimension (L * W * H)		140 x 155 x 30 mm

***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.

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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 Version Identification Number (HVIN): 101057HSL
Software version: SmartNode firmware 100.7
Software Name: TeraTerm 5.0
Hardware Name: SmartNode
Hardware revision: 101393 rev 0.2

4.3 Special Accessories and Auxiliary Equipment

- None

4.4 Simultaneous Transmission

- This product does not support Simultaneous transmission.

4.5 Countermeasures to achieve EMC Compliance

- None

4.6 List of frequencies

Frequency Band (MHz)	Channel No.	Channel Frequency (MHz)
2402 – 2480 BLE	0	2402
	1	2404
	2	2406
	3	2408
	:	:
	11	2424
	12	2426
	:	:
	19	2440
	20	2442
	:	:
	:	:
	:	:
	:	:
	36	2474
	37	2476
	38	2478
	39	2480

Table 5: List of BLE Centre frequencies

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Channel used for BLE testing.

Channel low: 2402MHz

Channel mid: 2440MHz

Channel high : 2480MHz

4.7 TUV Sample Identification

1. TUV Sample Identification number: A004010288-001 – Radiated test Sample.
A004010288-002 --Conducted test Sample

5 Operational Description

“Smart Node” can be powered from a 24VAC/DC power source. Power is accepted through the 24V/GND labelled terminal ports accessible from the side. The rectification from 24V ac/dc to DC voltage happen onboard to 16V, 5V DC, 3.3V DC for powering peripheral circuitry on the device. This board also has the RS485 driver which uses OOK modulation to send data over power of 24V (POR) to 75F proprietary sensors and stats. 1 x RS485 terminal which is for the BACNET.

“Smart Node” has one integrated BLE radio. The ST controller has the integrated radio for Bluetooth which transmits from 2402MHz to 2480MHz and max TX power of 6dBm. The antenna used for this is an FPC antenna with a peak gain of 4.3dBi.

It is used as control equipment for HVAC systems

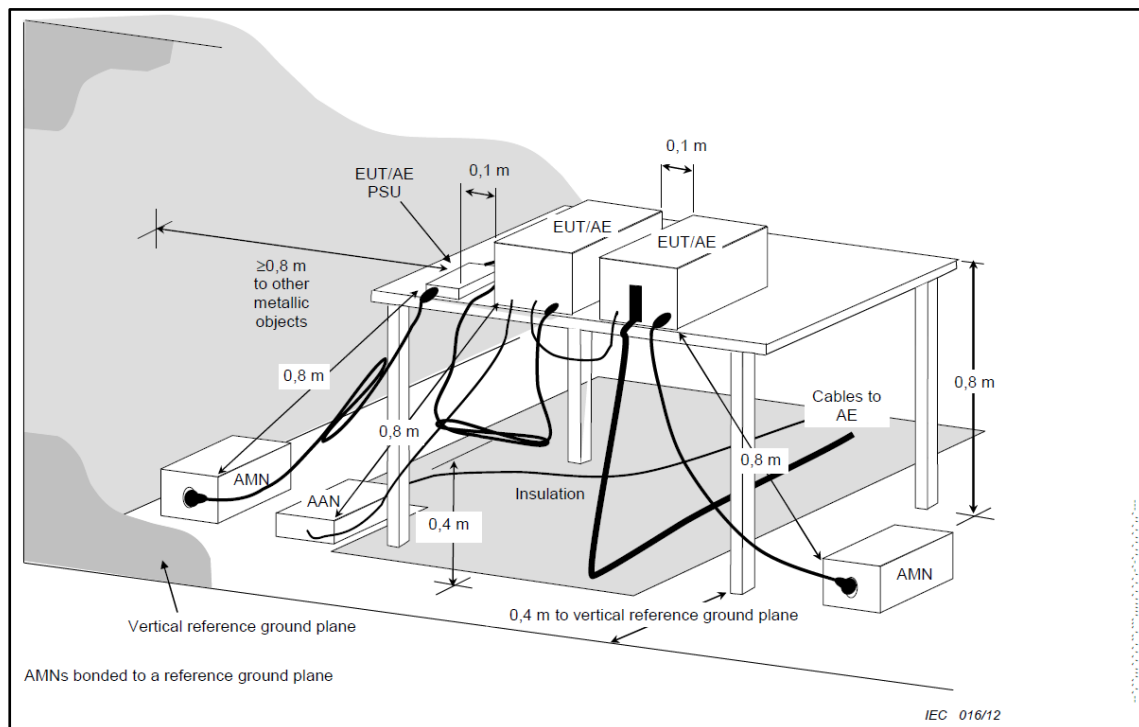
6 TEST METHODOLOGY

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 C63.10-2013. 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

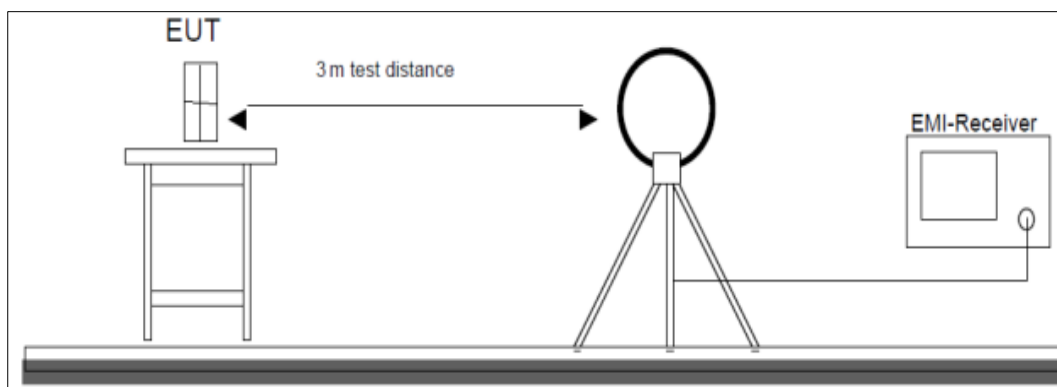


Figure 1: Frequency Range 9 kHz- 30 MHz

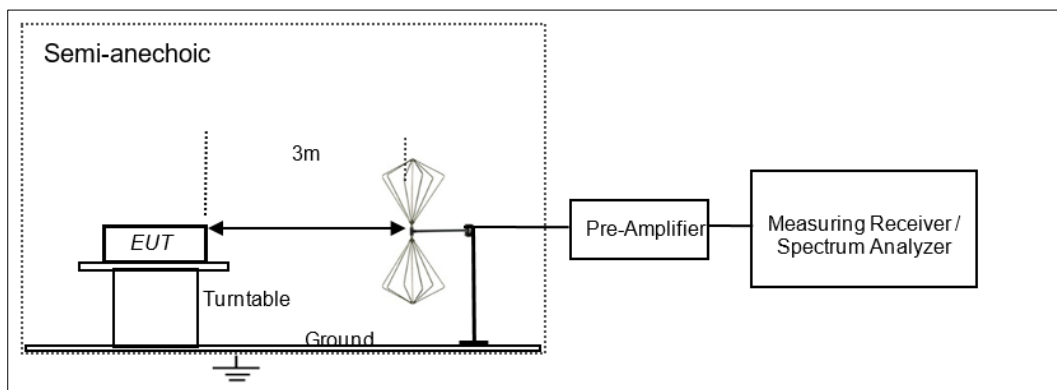


Figure 2: Frequency Range 30 MHz – 200 MHz

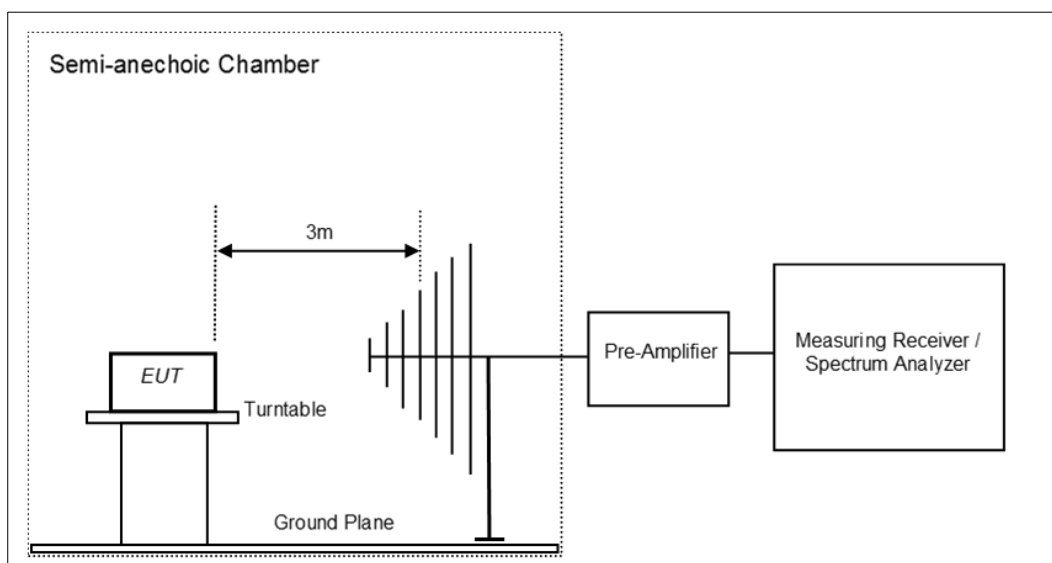


Figure 3: Frequency Range 200 MHz - 1GHz

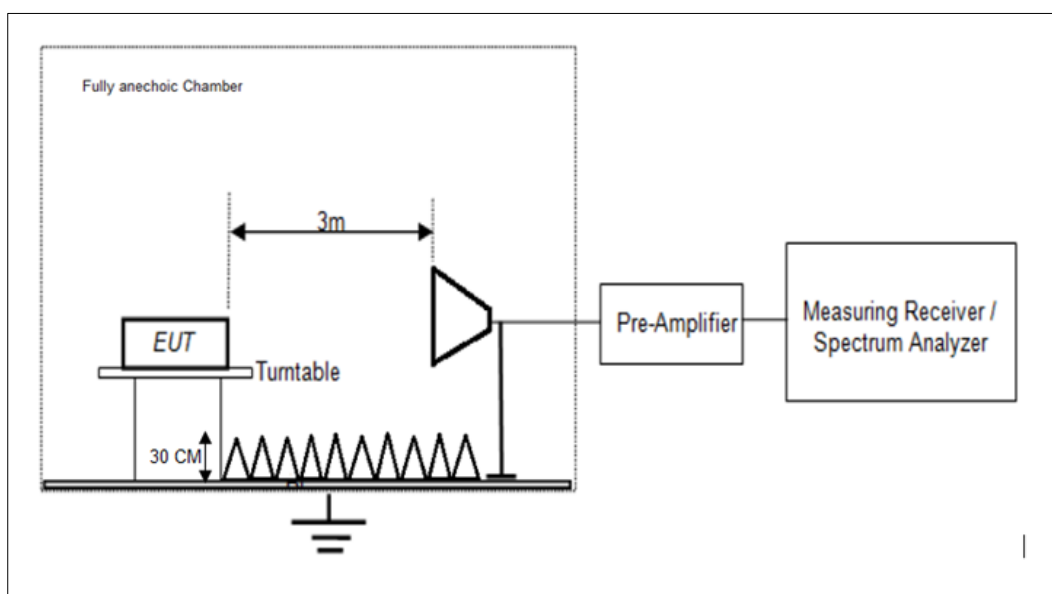


Figure 4: Frequency Range above 1 GHz

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7 TEST RESULTS

7.1 Maximum Peak Conducted Output Power

Result

Pass

Test Specification	FCC part 15 Subpart C 15.247 (b)(3)/ RSS 247 Issue 3 5.4 (d)
Test Method	Subclause 11.9.1.1 of ANSI C63.10
Measurement Bandwidth	1MHz
Detector	Peak
Port of testing	Conducted mode
Requirement	Power ≤ 1 W (30 dBm) & e.i.r.p ≤ 4 W (36dBm)

Test Condition

Normal Test Condition:

Temperature (Norm) = +21.8°C Voltage = 24 VDC through DC supply 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:

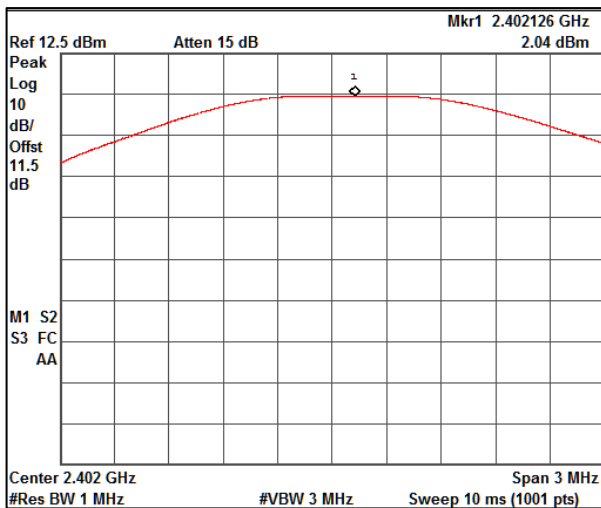
Note:

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 does not support additional beamforming gain / directional gain, it uses single antenna and hence Directional gain of the single antenna is 4.9 dBi

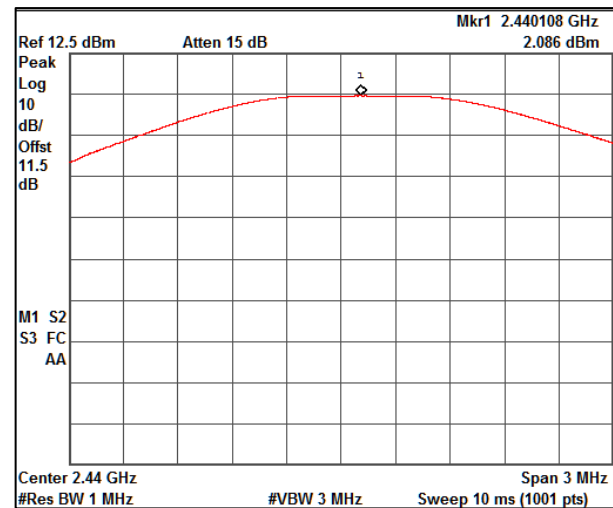
Data rate	Channel frequency	Measured power (dBm)	Measured e.i.r.p (dBm)	FCC/ISED Limit (dBm)	e.i.r.p limit (dBm)
1 Mbps	2402.00	2.04	6.94	30.00	36.00
	2440.00	2.08	6.98	30.00	36.00
	2480.00	2.45	7.35	30.00	36.00

Test Plots:

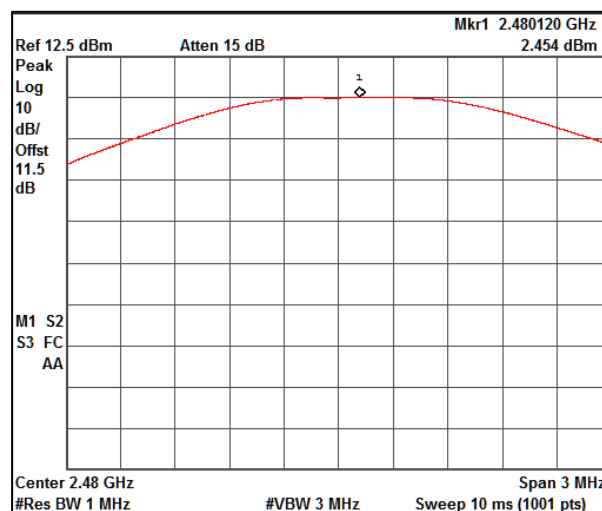
Data Rate: 1Mbps



Channel frequency: 2402MHz



Channel frequency: 2440MHz



Channel frequency: 2480MHz

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7.2 DTS Bandwidth & 99% Bandwidth

Result

Pass

Test Specification	FCC part 15 Subpart C 15.247 (a) (2)/ RSS 247 Issue 3 Section 5.2(a)/ RSS Gen Issue 5 Section 6.7
Test Method	Subclause 11.8.1 of ANSI C63.10 for DTS Subclause 6.9.3 of ANSI C63.10 for OBW
Measurement Bandwidth	100 kHz for DTS Bandwidth 1% to 5% of OBW
Detector	Peak
Port of testing	Conducted mode
Requirement	Systems using digital modulation techniques may operate in the 902-928 MHz, 2400-2483.5 MHz, and 5725-5850 MHz bands. The minimum 6 dB bandwidth shall be at least 500 kHz.

Test Condition

Normal Test Condition:

Temperature (Norm) = +21.8°C Voltage = 24 VDC through DC supply Relative humidity: 55%

KDB Guidelines applied:

Measurements were made as per section 8.2 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.

Data rate	Channel frequency	99% BW (MHz)	6dB BW (MHz)	Limit (MHz)
1 Mbps	2402.00	1.013	628.986	0.50
	2440.00	1.019	628.950	0.50
	2480.00	1.014	629.483	0.50

Test Plots:

99% Bandwidth:

Data Rate: 1Mbps

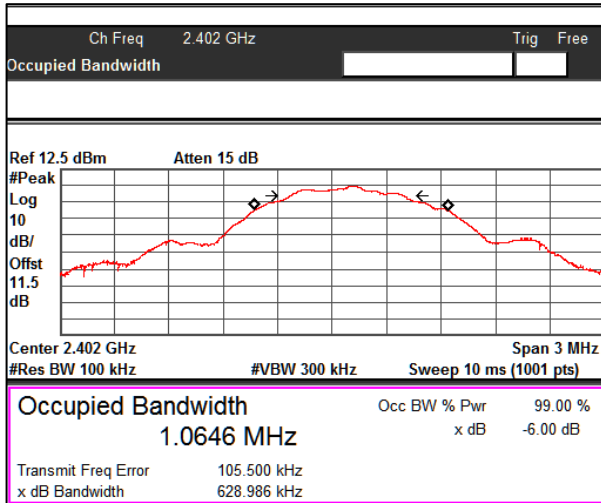


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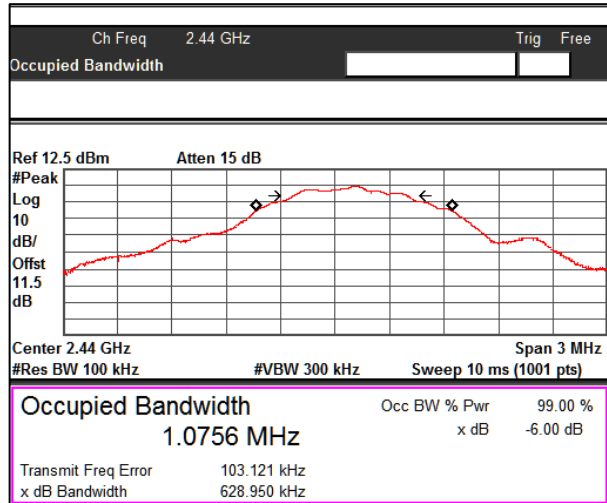
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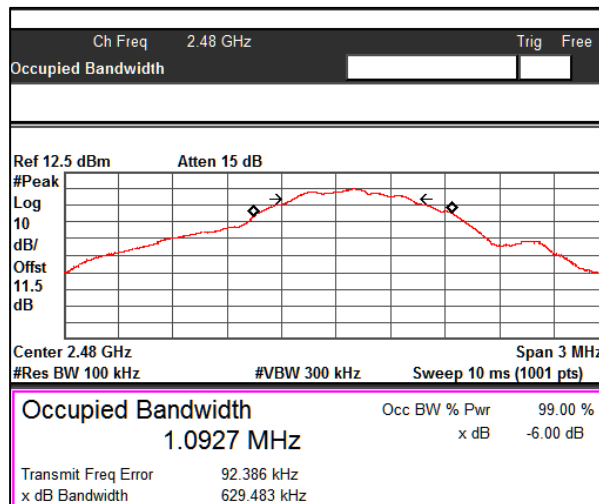
DTS Bandwidth:
Data Rate: 1Mbps



Channel frequency: 2402MHz



Channel frequency: 2440MHz



Channel frequency: 2480MHz

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7.3 Power Spectral Density

Result

Pass

Test Specification	FCC Part 15 Subpart C Section 15.247 (e)/RSS 247 Issue 3 Section 5.2(b)
Test Method	Subclause 11.10.2 of ANSI C63.10
Measurement Bandwidth	3 kHz
Detector	Peak
Port of testing	Conducted mode
Requirement	For digitally modulated systems, the power spectral density conducted from the intentional radiator to the antenna shall not be greater than 8 dBm in any 100 kHz band during any time interval of continuous transmission.

Test Condition

Normal Test Condition:

Temperature (Norm) = +21.8°C Voltage = 24 VDC through DC supply Relative humidity: 55%

KDB Guidelines applied:

Measurements were made as per section 8.4 in KDB 558074 D01 15.247 Measurement Guidance v05r02.

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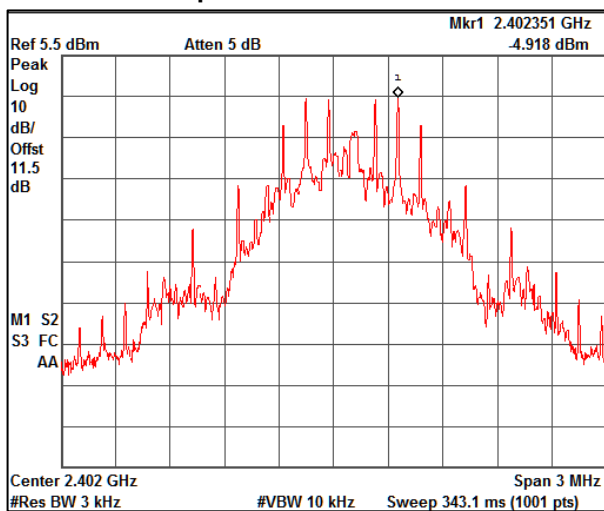
Test results:

Note: All the losses are included during measurement and final values are mentioned in the test report.

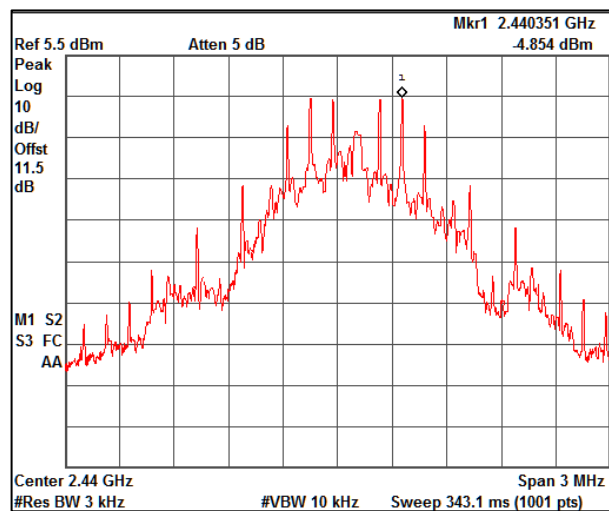
Data rate	Channel Frequency (MHz)	Measured PSD (dBm)	Limit (dBm in any 3kHz)
1 Mbps	2402.00	-4.91	8.00
	2440.00	-4.85	8.00
	2480.00	-4.49	8.00

Test Plots:

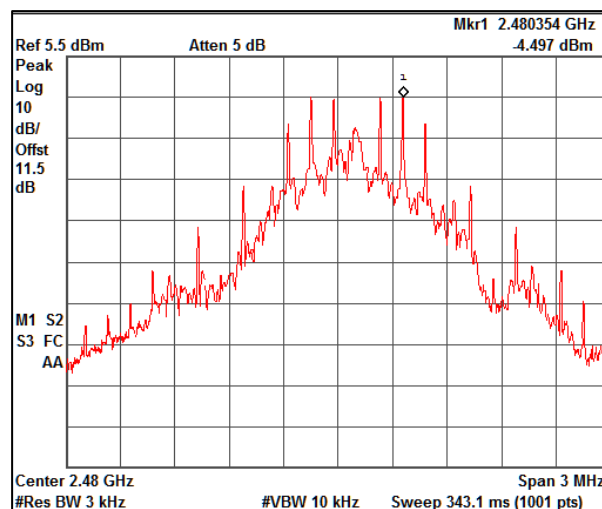
Data Rate: 1Mbps



Channel frequency: 2402MHz



Channel frequency: 2440MHz



Channel frequency: 2480MHz

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7.4 Emissions in non-restricted frequency bands and Conducted Spurious Emission

Result

Pass

Test Specification	FCC part 15 Subpart C 15.247 (d)/RSS 247 Issue 3 Section 5.5
Test Method	Subclause 11.11.3 of ANSI C63.10
Measurement Bandwidth	100 kHz
Detector	Peak
Port of testing	Conducted mode
Requirement	In any 100kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 30dB below that in the 100kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, the attenuation required under this paragraph shall be 30 dB instead of 20 dB

Test Condition

Normal Test Condition:

Temperature (Norm) = +21.8°C Voltage = 24 VDC through DC supply Relative humidity: 55%

KDB Guidelines applied:

Measurements were made as per section 8.5 in KDB 558074 D01 15.247 Measurement Guidance v05r02.

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Test results:

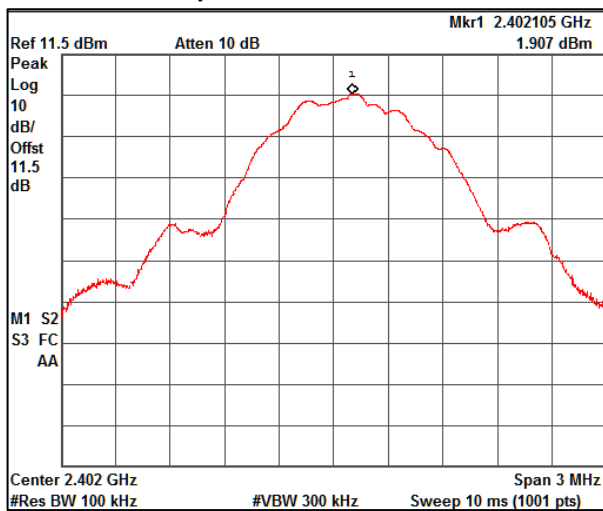
Note: All the losses are included during measurement and final values are mentioned in the test report

Band edge

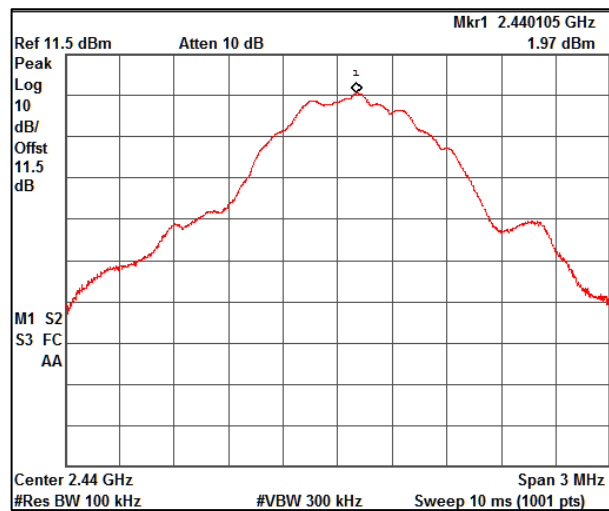
Data rate	Channel Frequency (MHz)	Band edge frequency (MHz)	Value at band edge (A) (dBm)	Reference value (B) (dBm)	A-B (dBc)	Minimum Limit (dBc)
1 Mbps	2402.00	2400.00	-51.28	1.90	-53.18	-20.00
	2480.00	2483.50	-54.77	2.32	-57.09	-20.00

Reference Plots:

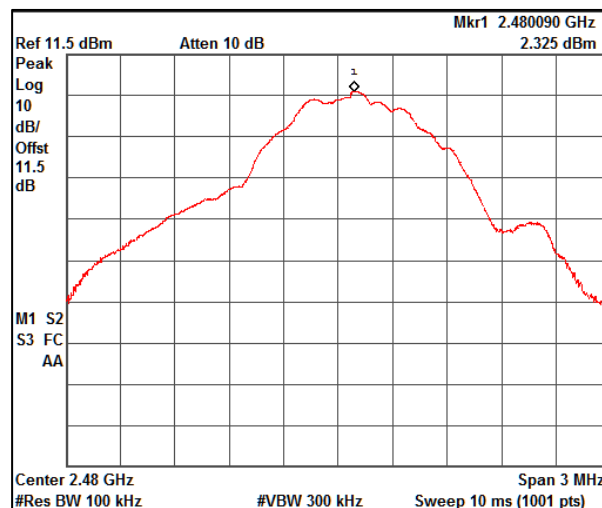
Data Rate: 1Mbps



Channel frequency: 2402MHz



Channel frequency: 2440MHz



Channel frequency: 2480MHz

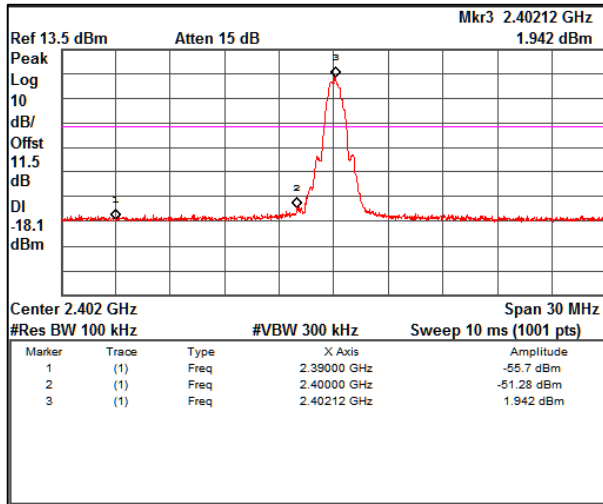
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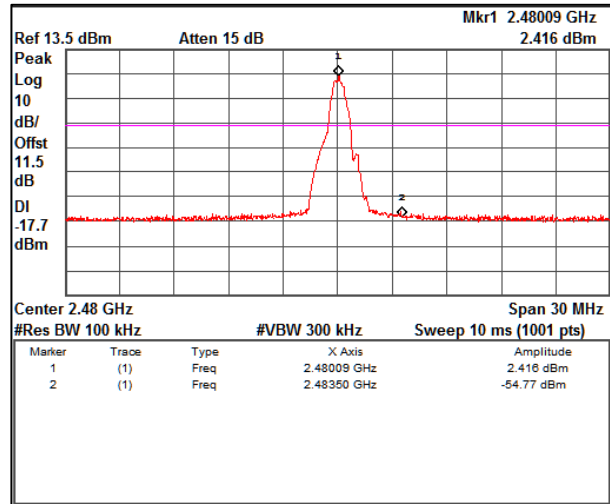
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Bandedge Plots:

Data Rate: 1Mbps



Channel frequency: 2402MHz



Channel frequency: 2480MHz

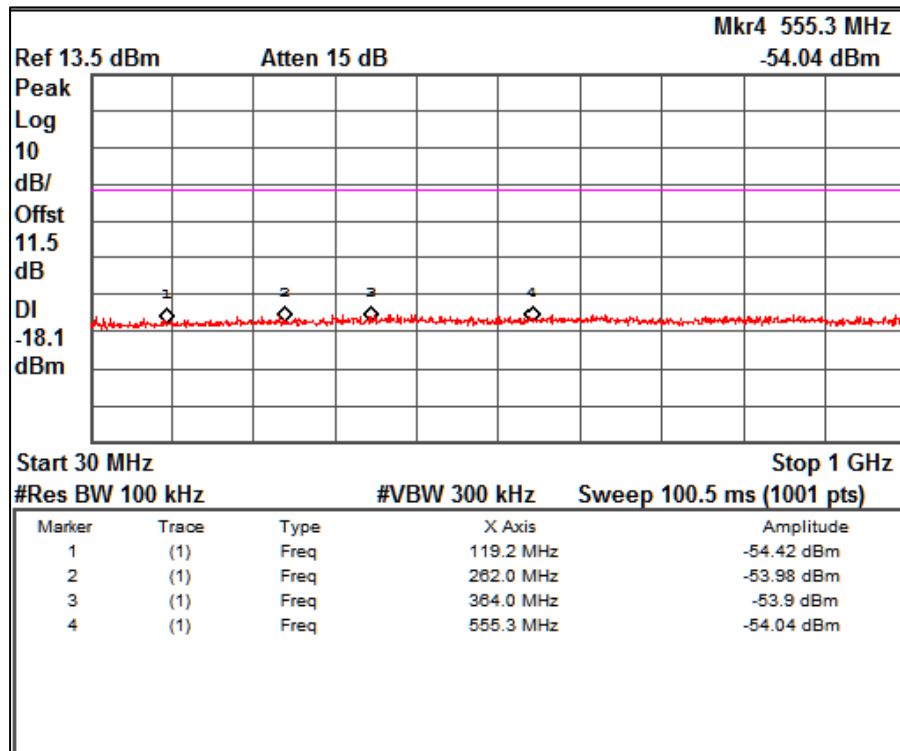
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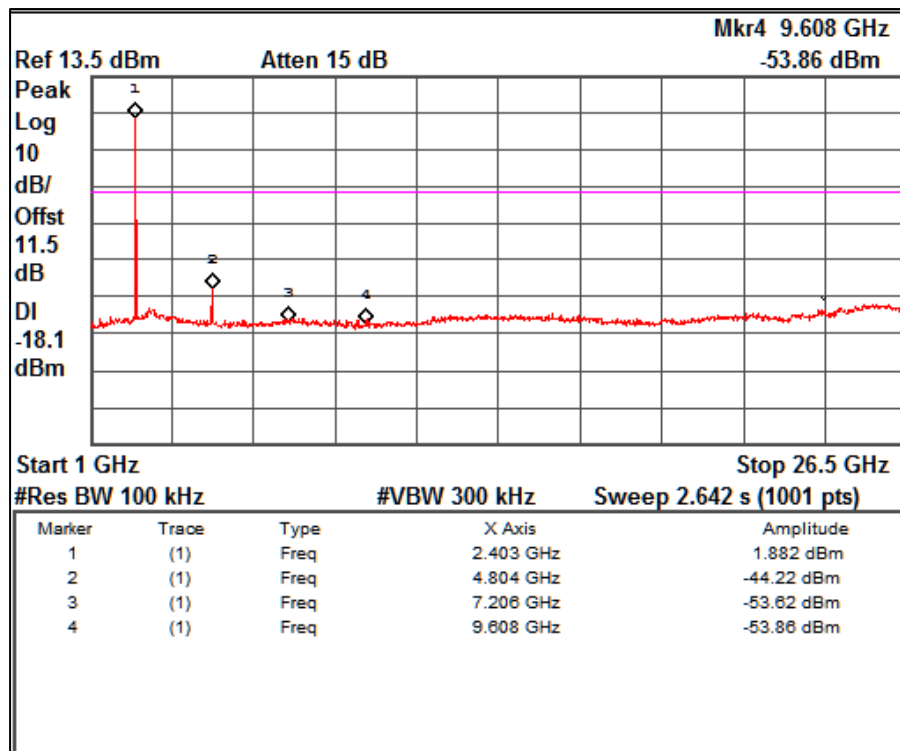
7.4.1 Out-Of-Band Emissions

Data Rate: 1Mbps



Channel Frequency: 2402MHz

Frequency Range 30MHz – 1GHz



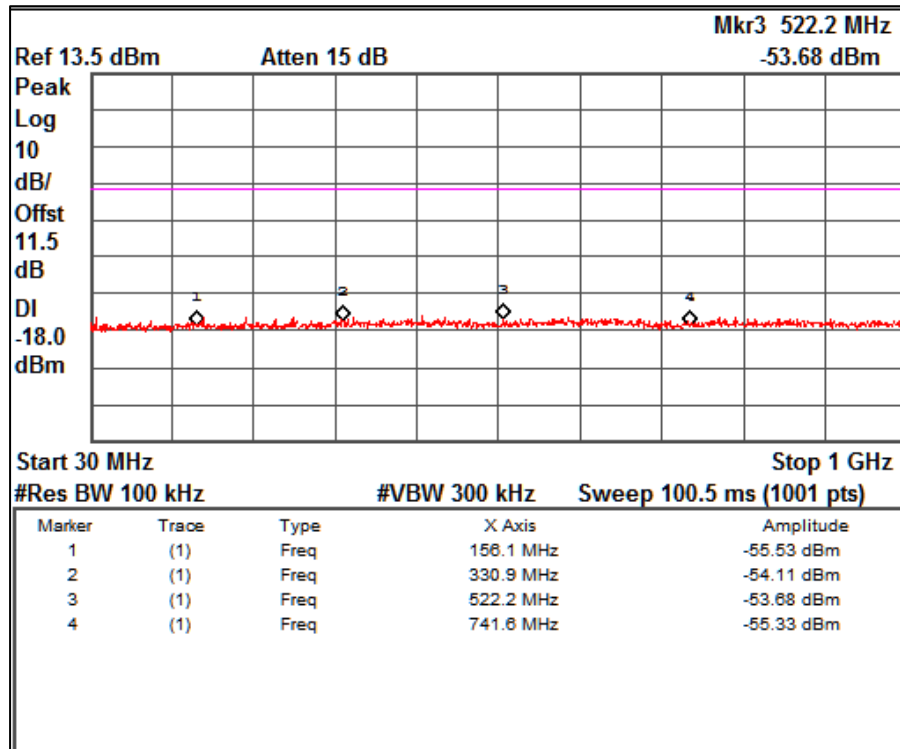
Channel Frequency: 2402MHz

Frequency Range 1GHz to 26.5GHz

Prüfbericht - Nr.:
Test Report No.:

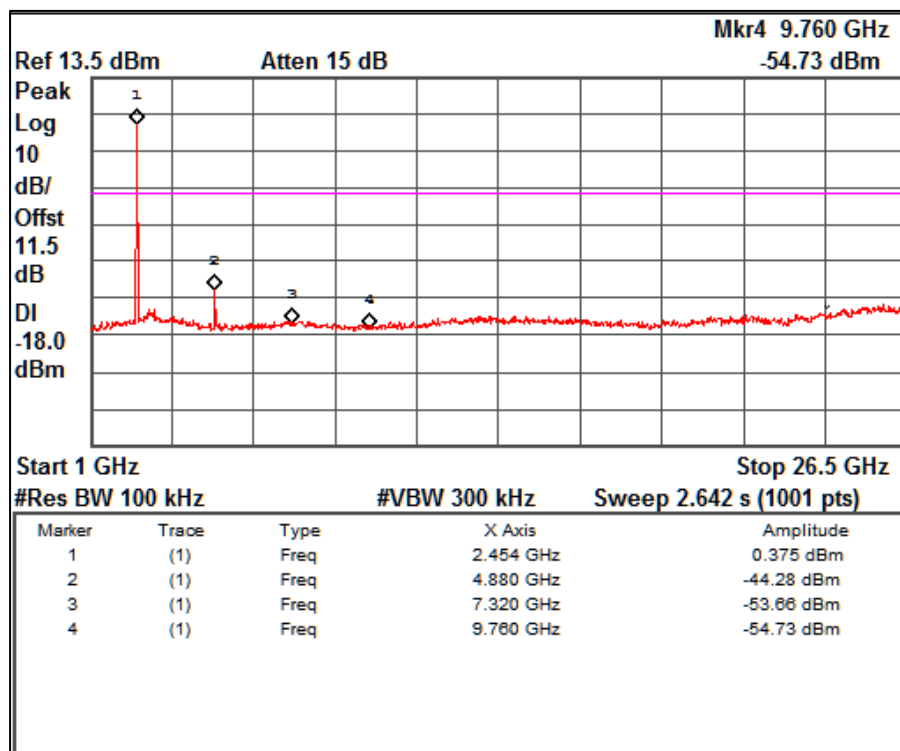
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Channel Frequency: 2440MHz

Frequency Range 30MHz – 1GHz



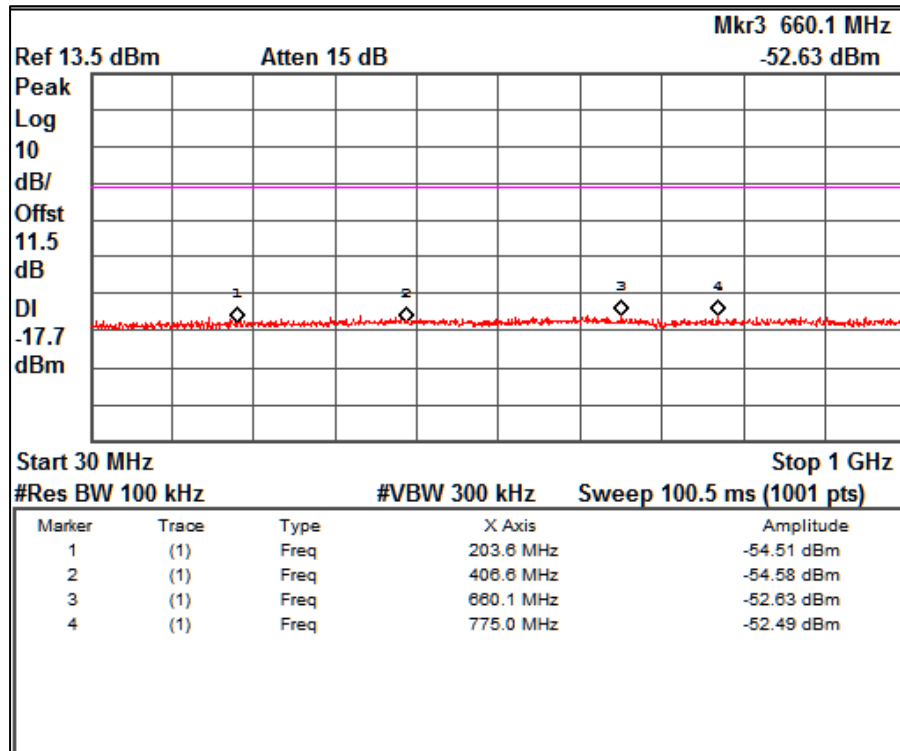
Channel Frequency: 2440MHz

Frequency Range: 1GHz – 26.5GHz

Prüfbericht - Nr.:
Test Report No.:

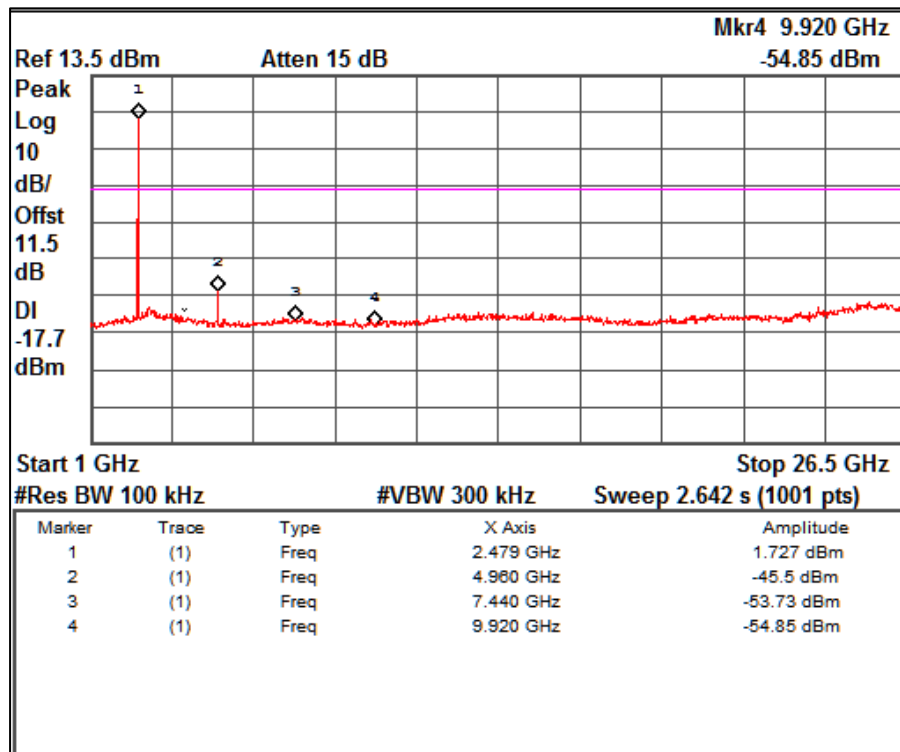
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Channel Frequency: 2480MHz

Frequency Range 30MHz – 1GHz



Channel Frequency: 2480MHz

Frequency Range: 1GHz – 26.5GHz

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7.5 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
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 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	54.0	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) = +21.8°C

Voltage = 24 VDC through DC supply

Relative humidity: 55%

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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

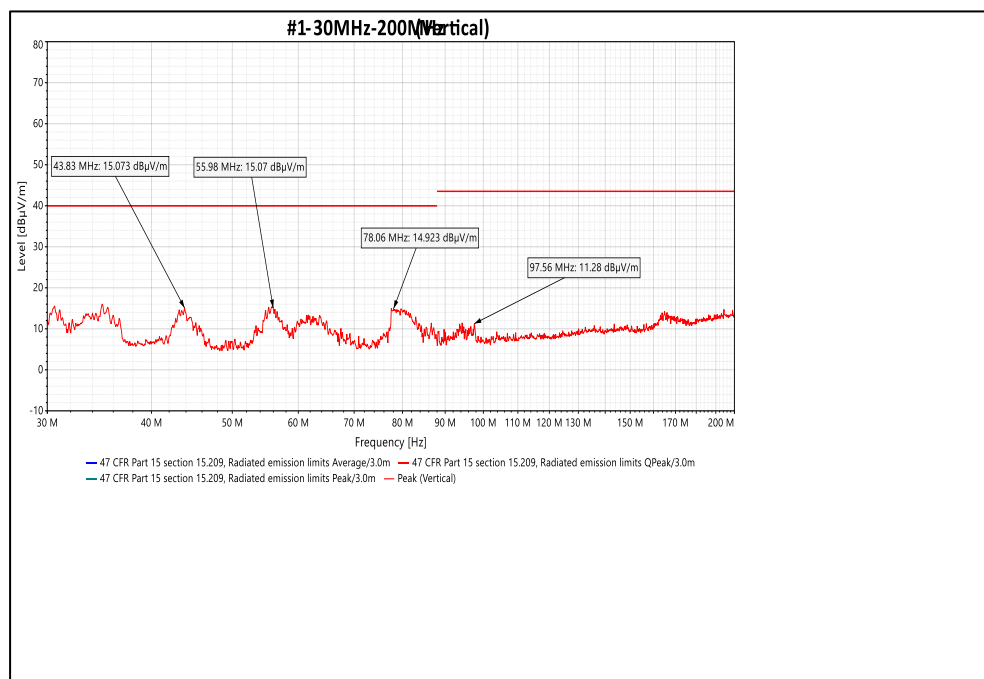
Test results for frequency range 9kHz – 30MHz

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 7: Test results for frequency range 30MHz – 1GHz

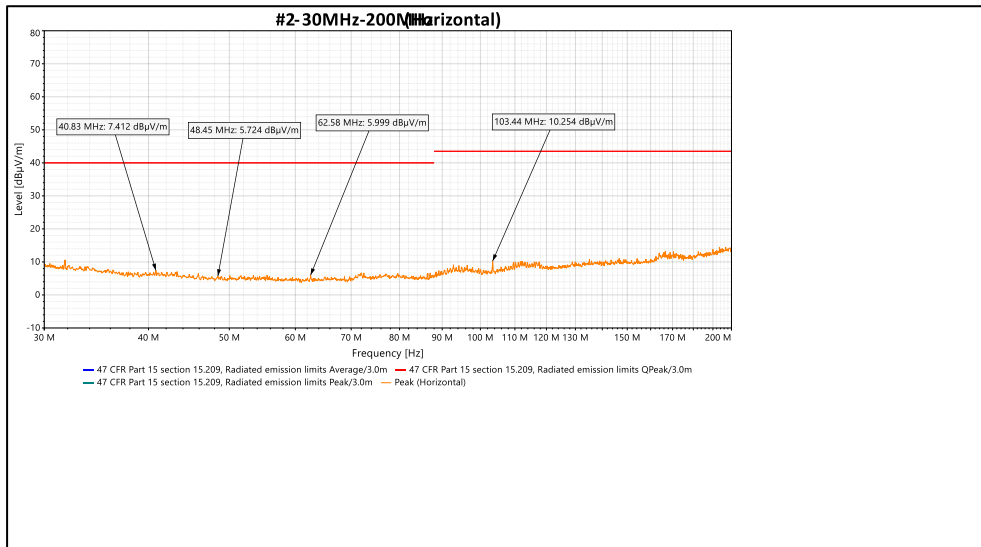
Test Plots:

Antenna Polarization	Measured Frequency (MHz)	Emission level (dBµV/m)	Limit (dBµV/m)	Margin (dB)
Vertical	43.83	15.07	40.00	-24.93
	55.98	15.07	40.00	-24.93
	78.06	14.92	40.00	-25.08
	97.56	11.28	43.50	-32.22
	335.18	24.4	46.00	-21.60
	391.34	25.76	46.00	-20.24
	538.01	26.95	46.00	-19.05
Horizontal	634.64	25.13	46.00	-20.87
	40.83	7.41	40.00	-32.59
	48.45	5.72	40.00	-34.28
	62.58	5.99	40.00	-34.01
	103.44	10.25	43.50	-33.25
	334.16	28.55	46.00	-17.45
	393.5	31.67	46.00	-14.33
	547.79	29.25	46.00	-16.75
	796.34	29.56	46.00	-16.44



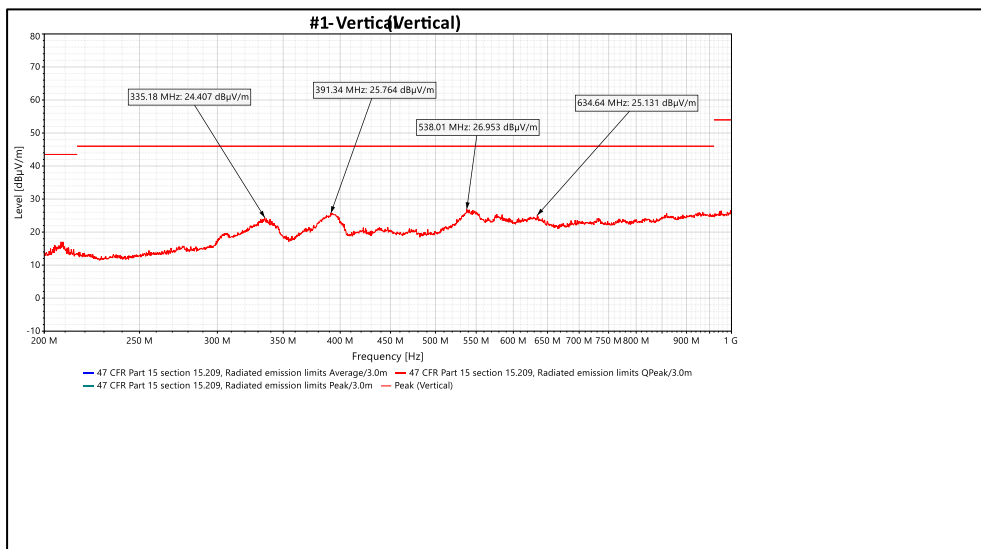
Channel Frequency 30MHz – 200MHz

Polarization Vertical



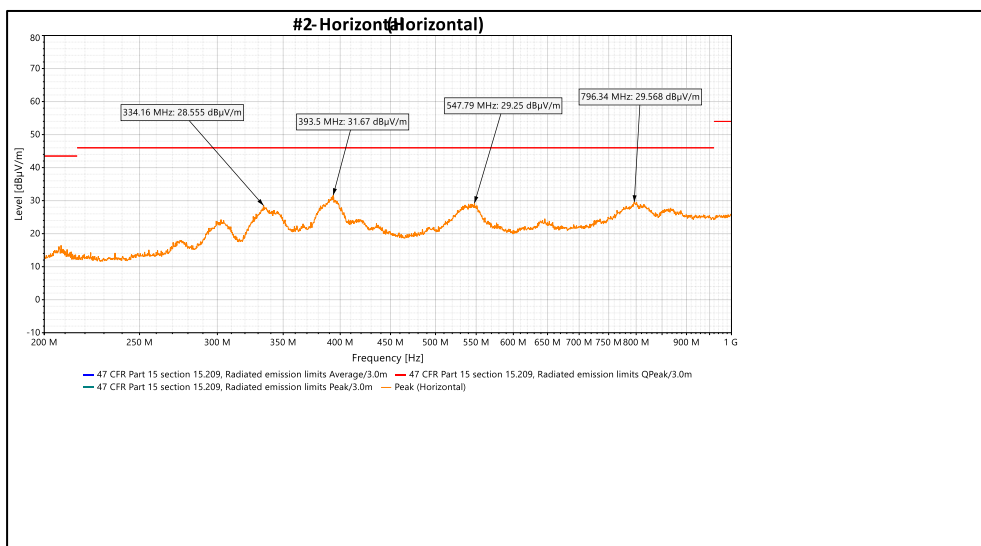
Channel Frequency 30MHz – 200MHz

Polarization Horizontal



Channel Frequency 200MHz – 1GHz

Polarization Vertical



Channel Frequency 200MHz – 1GHz

Polarization Horizontal

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Table 8: 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	97.09	-	-
	2402(Av)		92.46	-	-
	2390(Pk)		38.61	74.00*	-35.39
	2390(Av)		24.91	54.00*	-29.09
	4804(Pk)		56.41	74.00	-17.59
	4804(Av)		48.20	54.00	-5.80
	7206(Pk)		51.69	74.00	-22.31
	7206(Av)		39.83	54.00	-14.17
	2402(Pk)	Horizontal	96.70	-	-
	2402(Av)		92.07	-	-
	2390(Pk)		38.11	74.00*	-35.89
	2390(Av)		25.01	54.00*	-28.99
	4804(Pk)		57.70	74.00	-16.30
	4804(Av)		49.62	54.00	-4.38
	7206(Pk)		48.76	74.00	-25.24
	7206(Av)		37.87	54.00	-16.13
2440	2440(Pk)	Vertical	96.15	-	-
	2440(Av)		91.52	-	-
	4880(Pk)		55.71	74.00	-18.29
	4880(Av)		47.46	54.00	-6.54
	7320(Pk)		52.49	74.00	-21.51
	7320(Av)		40.95	54.00	-13.05
	2440(Pk)	Horizontal	97.28	-	-
	2440(Av)		92.63	-	-
	4880(Pk)		54.34	74.00	-19.66
	4880(Av)		45.42	54.00	-8.58
	7320(Pk)		48.73	74.00	-25.27
	7320(Av)		37.01	54.00	-16.99
2480	2480(Pk)	Vertical	95.10	-	-
	2480(Av)		90.48	-	-
	2483.5(Pk)		42.43	74.00*	-31.57
	2483.5(Av)		28.99	54.00*	-25.01
	4960(Pk)		51.77	74.00	-22.23
	4960(Av)		42.62	54.00	-11.38
	7440(Pk)		51.63	74.00	-22.37
	7440(Av)		39.55	54.00	-14.45
	2480(Pk)	Horizontal	97.20	-	-
	2480(Av)		92.57	-	-
	2483.5(Pk)		44.71	74.00*	-29.29
	2483.5(Av)		30.42	54.00*	-23.58
	4960(Pk)		51.91	74.00	-22.09
	4960(Av)		42.74	54.00	-11.26
	7440(Pk)		48.31	74.00	-25.69
	7440(Av)		37.32	54.00	-16.68

_ → Fundamental Frequency

*→ Restricted Band edges

Pk: Peak Detector;

Av: Average Detector

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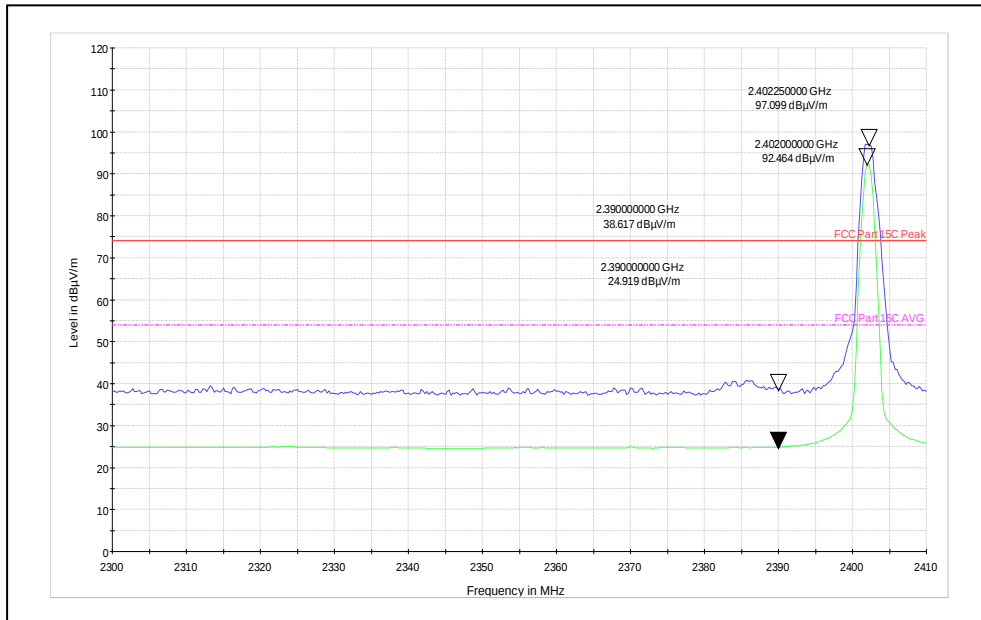
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Test Plots:

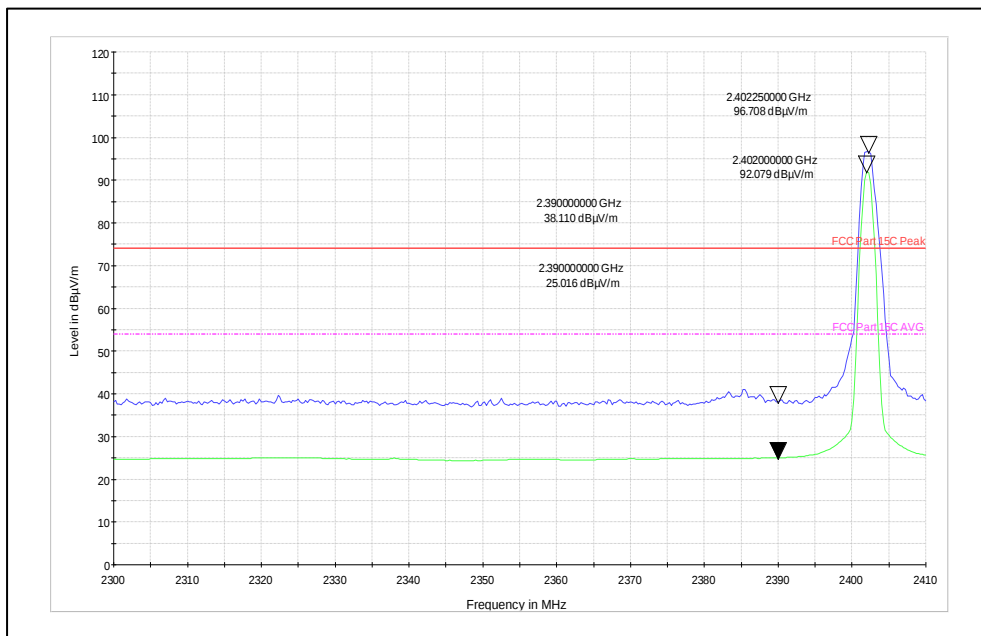
Restricted Bands of Operation

Data Rate: 1Mbps



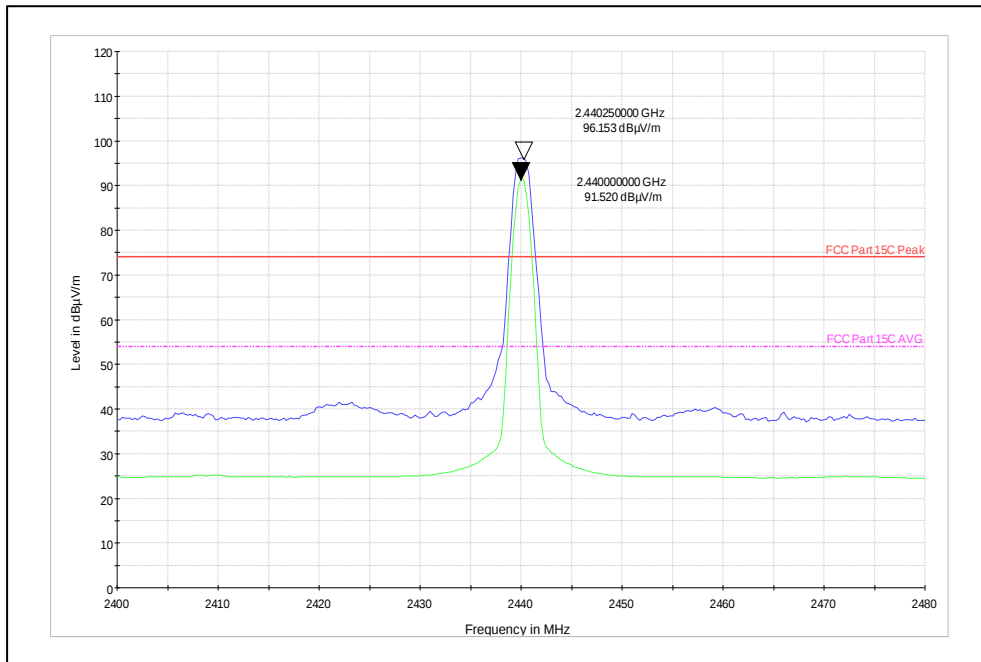
Channel Frequency: 2402MHz

Polarization: Vertical



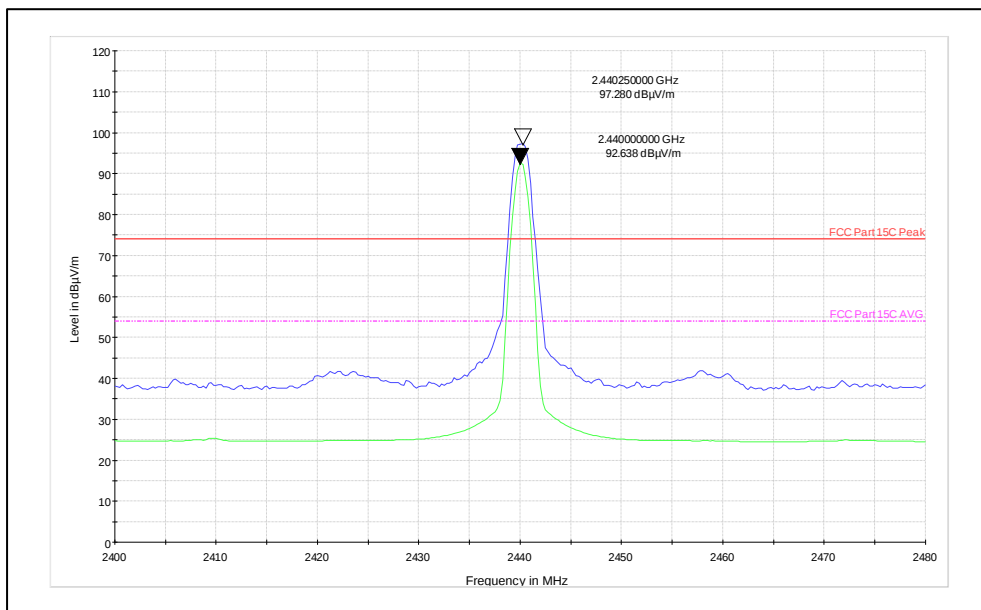
Channel Frequency: 2402MHz

Polarization: Horizontal



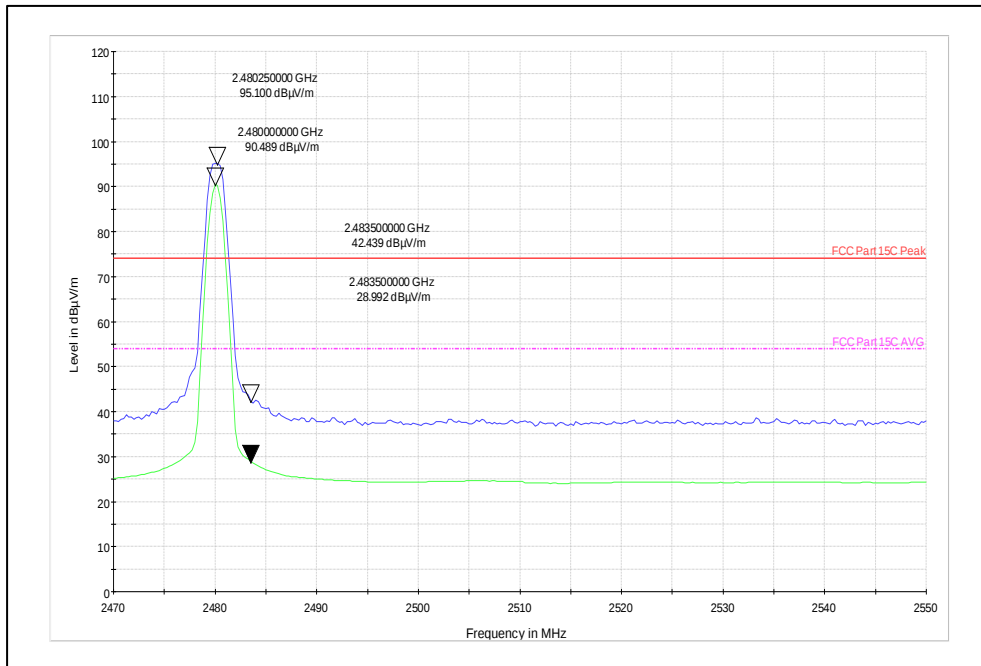
Channel Frequency: 2440MHz

Polarization: Vertical



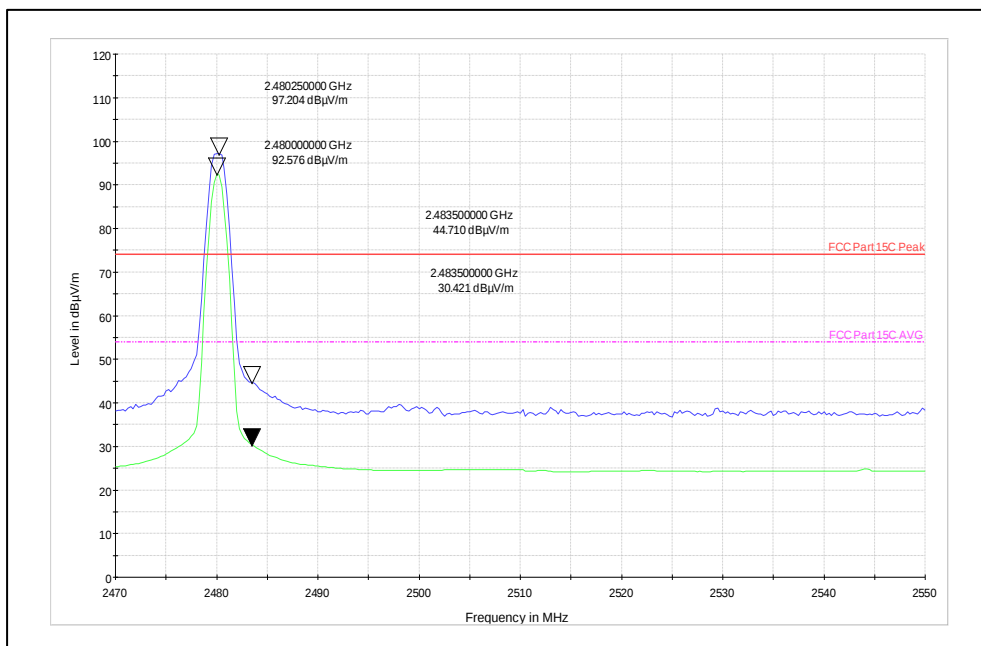
Channel Frequency: 2440MHz

Polarization: Horizontal



Channel Frequency: 2480MHz

Polarization: Vertical



Channel Frequency: 2480MHz

Polarization: Horizontal

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Test Report No.:

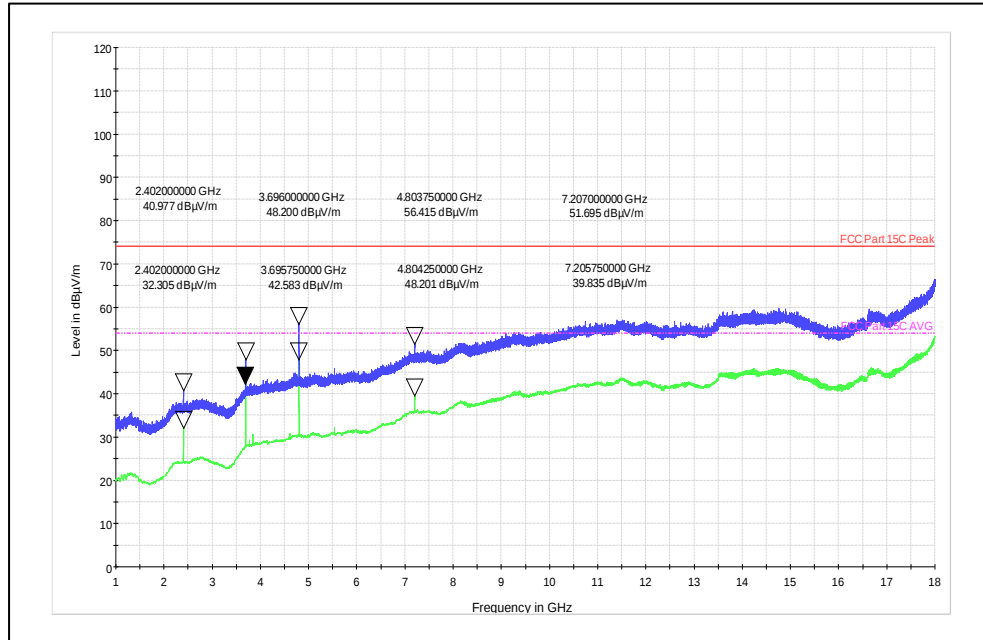
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Spurious Radiated emission:

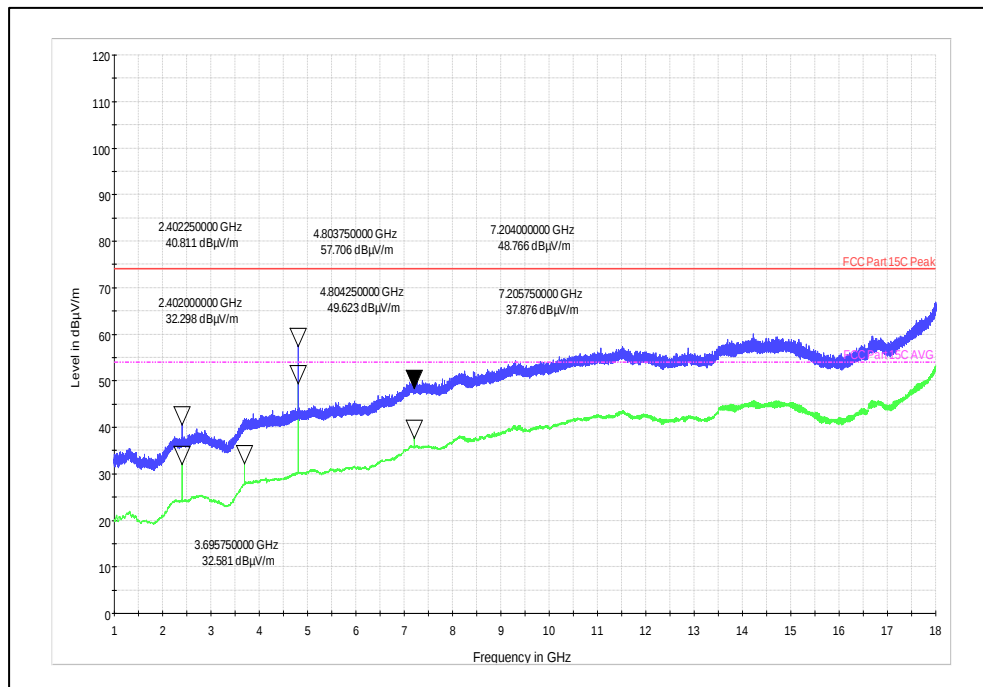
Data Rate: 1Mbps

Channel frequency: 2402MHz



Polarization: Vertical

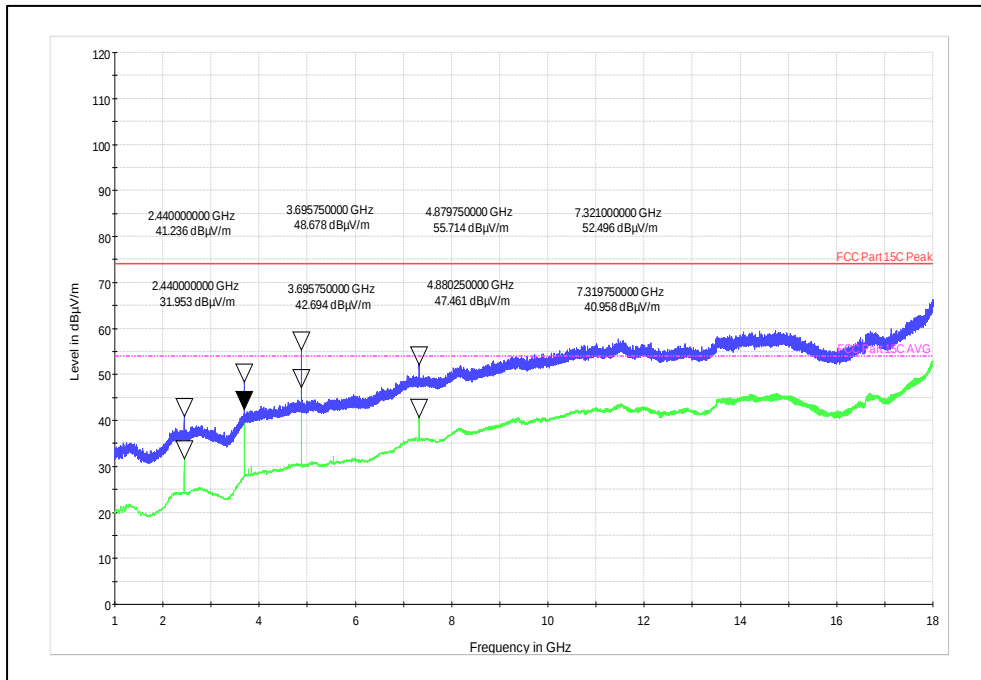
Frequency range: 1GHz to 18GHz



Polarization: Horizontal

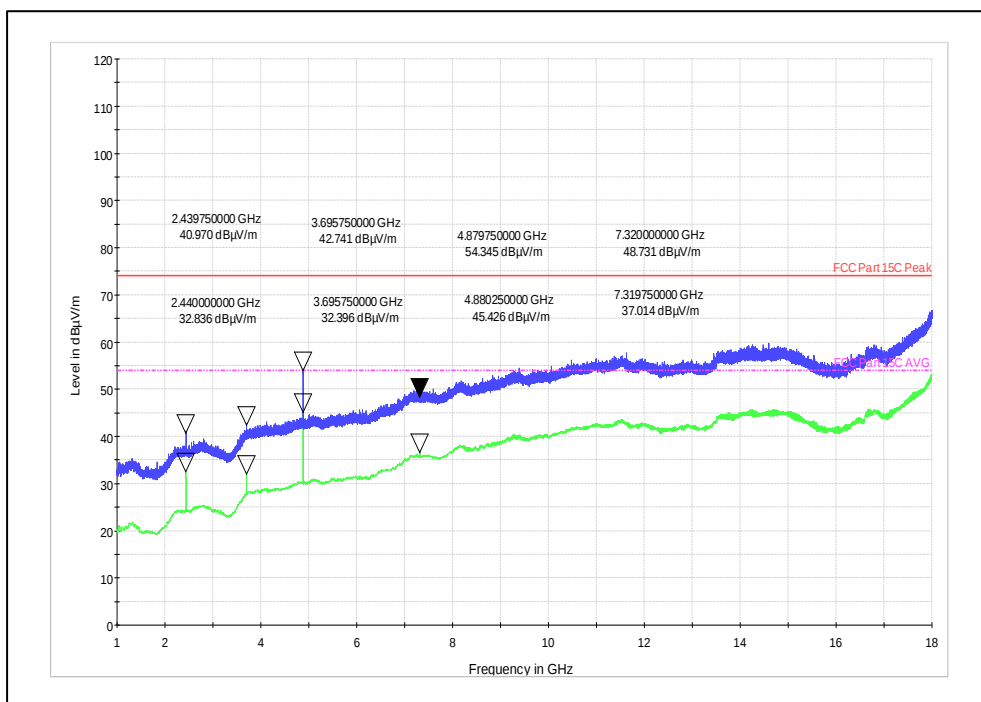
Frequency range: 1GHz to 18GHz

Channel frequency: 2440MHz



Polarization: Vertical

Frequency range: 1GHz to 18GHz



Polarization: Horizontal

Frequency range: 1GHz to 18GHz

Prüfbericht - Nr.:

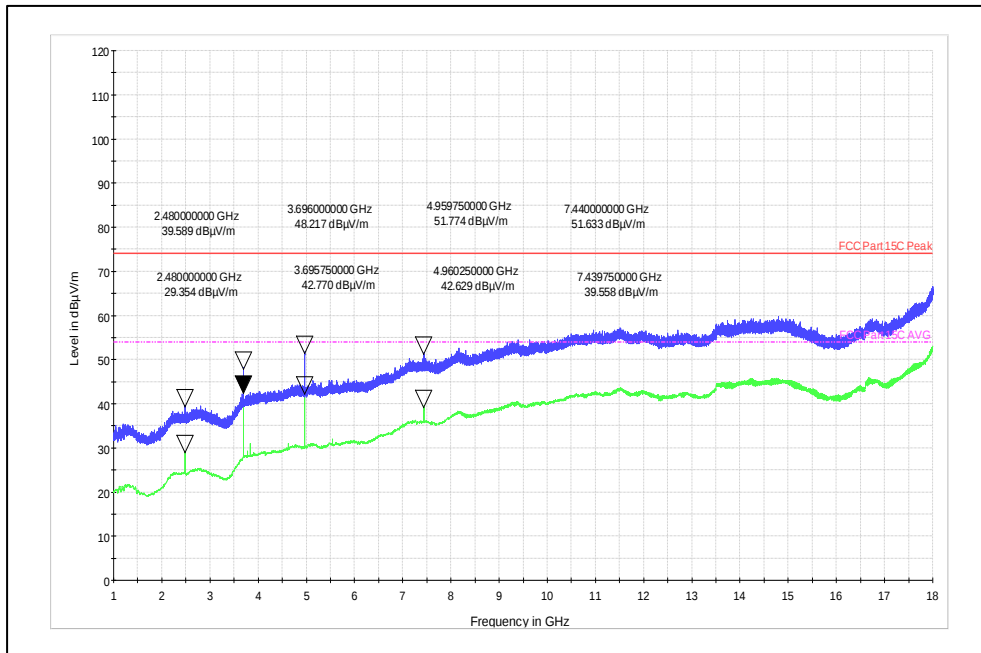
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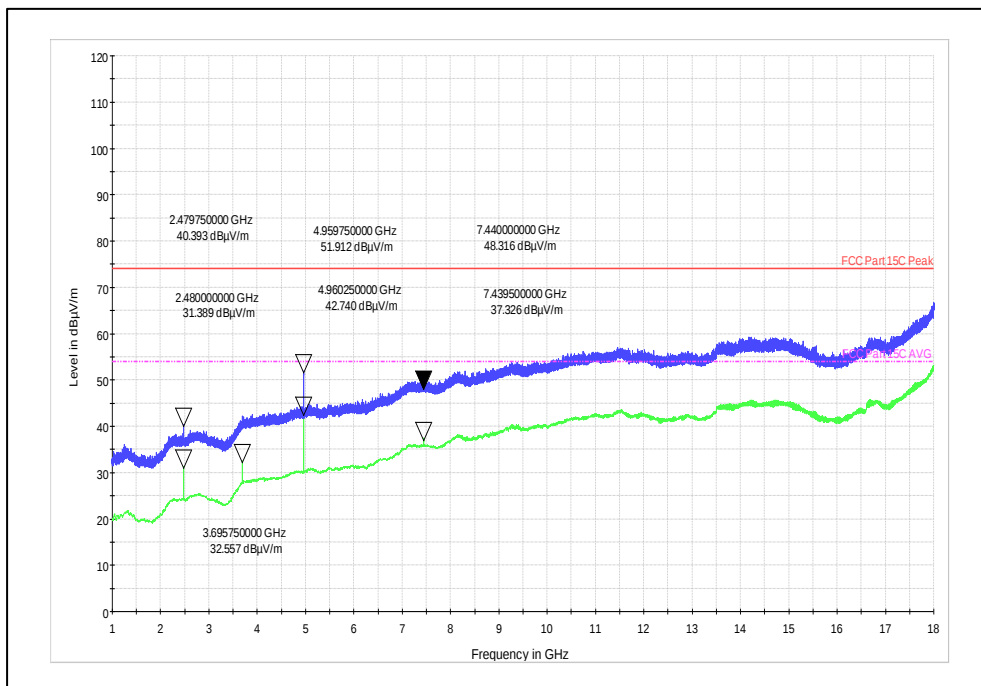
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Channel frequency: 2480MHz



Polarization: Vertical

Frequency range: 1GHz to 18GHz



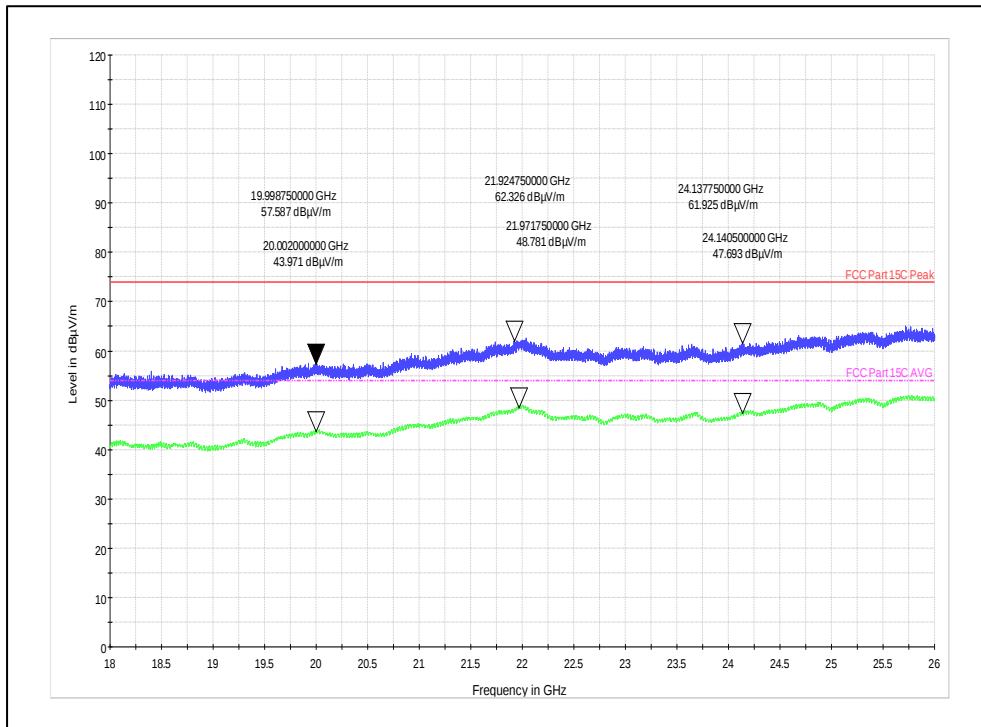
Polarization: Horizontal

Frequency range: 1GHz to 18GHz

Prüfbericht - Nr.:
Test Report No.:

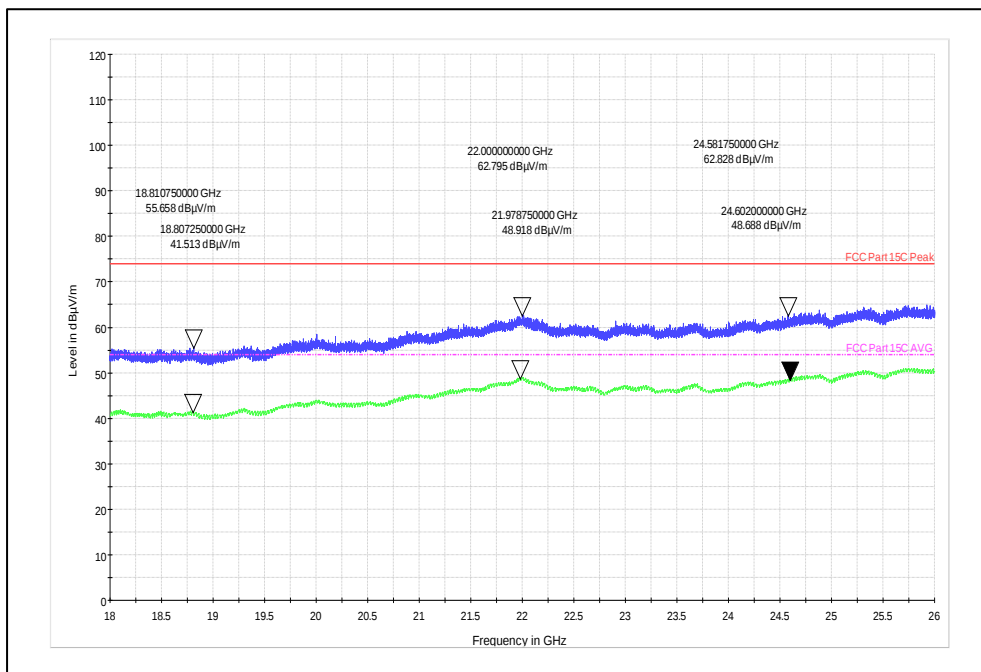
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Polarization: Vertical

Frequency range: 18GHz to 26GHz

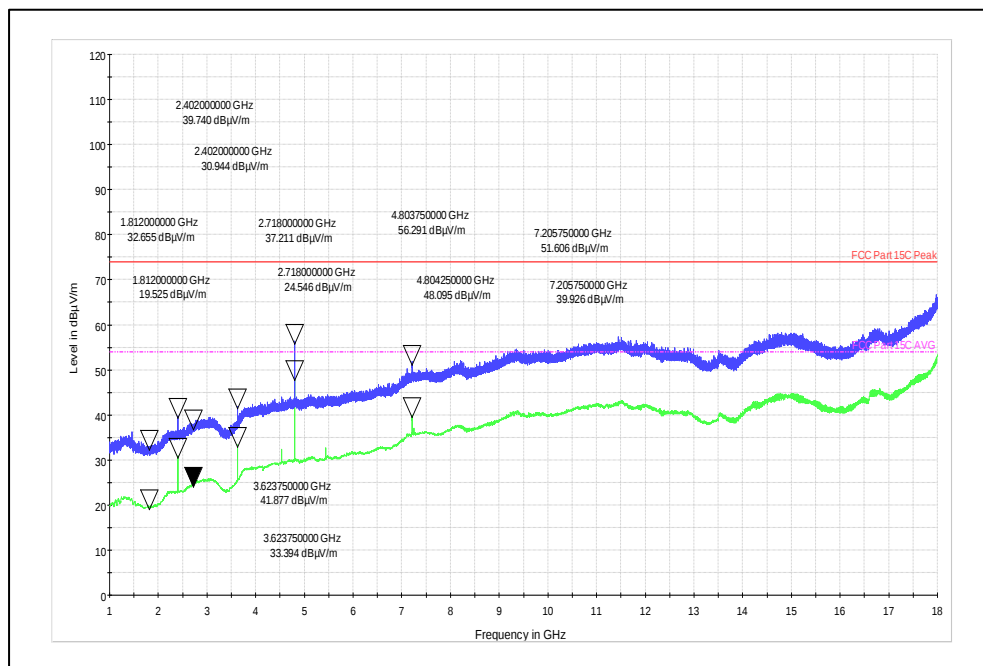


Polarization: Horizontal

Frequency range: 18GHz to 26GHz

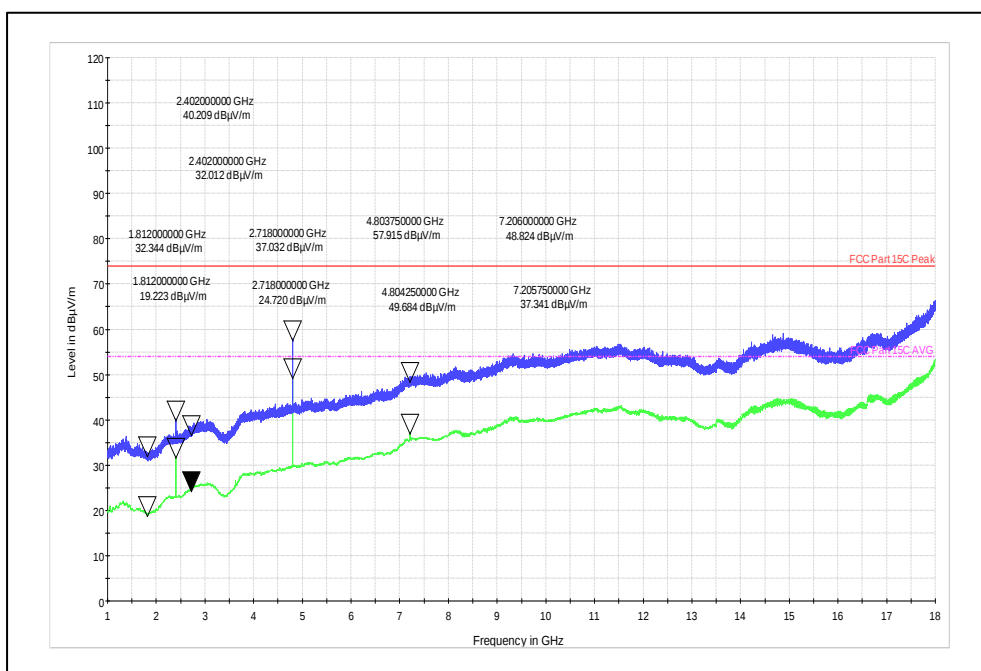
7.6 Simultaneous Operation for BLE and LoRa

Channel Frequency (MHz)	Measured Frequency (MHz)	Antenna Polarization	Measured Emission (dBμV/m)	Limit (dBμV/m)	Margin (dB)
2402	4804(Pk)	Vertical	56.29	74	-17.71
	4804(Av)		48.09	54	-5.91
	7206(Pk)		51.60	74	-22.40
	7206(Av)		39.92	54	-14.08
	4804(Pk)	Horizontal	57.91	74	-16.09
	4804(Av)		49.68	54	-4.32
	7206(Pk)		48.82	74	-25.18
	7206(Av)		37.34	54	-16.66
906	1812(Pk)	Vertical	32.65	74	-41.35
	1812(Av)		19.52	54	-34.48
	2718(Pk)		37.21	74	-36.79
	2718(Av)		24.54	54	-29.46
	1812(Pk)	Horizontal	32.34	74	-41.66
	1812(Av)		19.22	54	-34.78
	2718(Pk)		37.03	74	-36.97
	2718(Av)		24.72	54	-29.28



Polarization: Vertical

Frequency range: 1GHz to 18GHz



Polarization: Horizontal

Frequency range: 1GHz to 18GHz

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7.7 AC Power lines 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 9: Limits for Conducted power line emission

Frequency of Emission (MHz)	QP Limit (dBµV/m)	AV Limit (dBµV/m)
0.15 - 0.5	66 - 56*	56 - 46*
0.5 - 5	56	46
5 - 30	60	50

* Decreases with the logarithm of the frequency

Test Conditions:

Temperature (Norm) = +22.3°C Voltage = 110VAC through AC-DC Adapter Relative humidity: 57%

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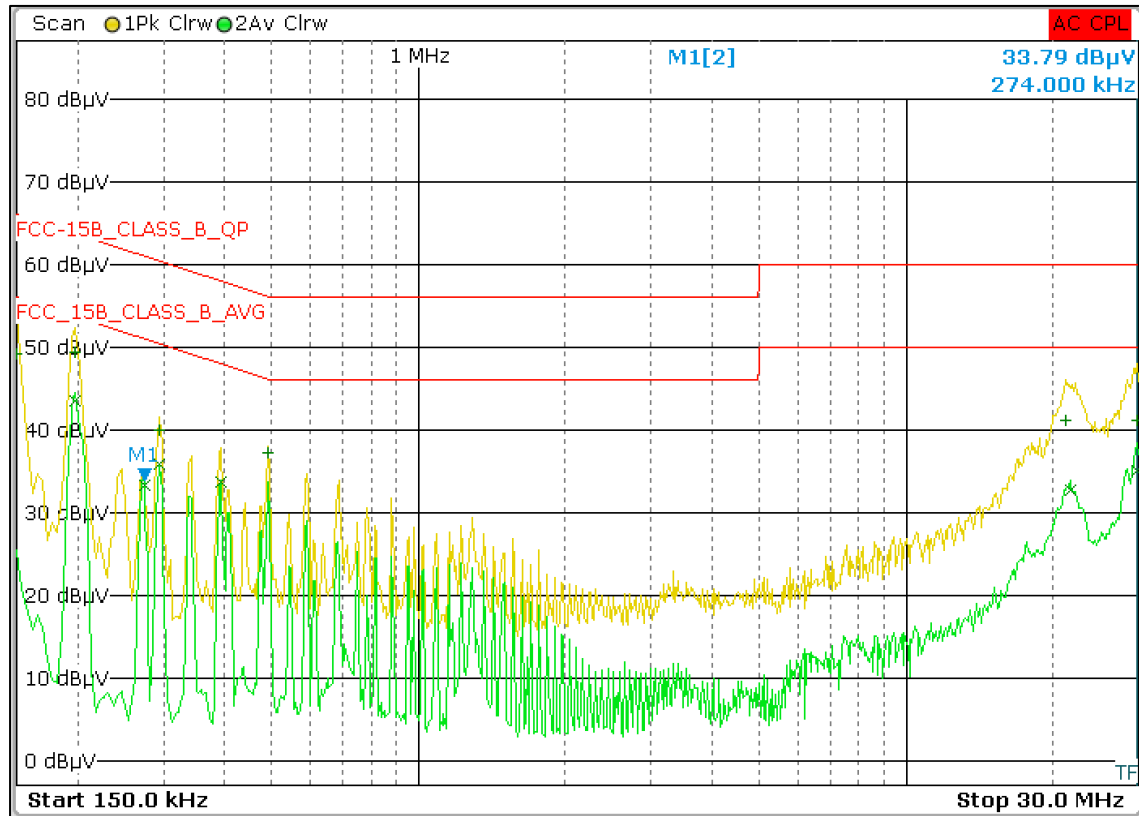
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Test results:

110VAC-60Hz-Line



Final Results

Meas Time 1.0 s
Margin 6.0 dB
Peaks 25

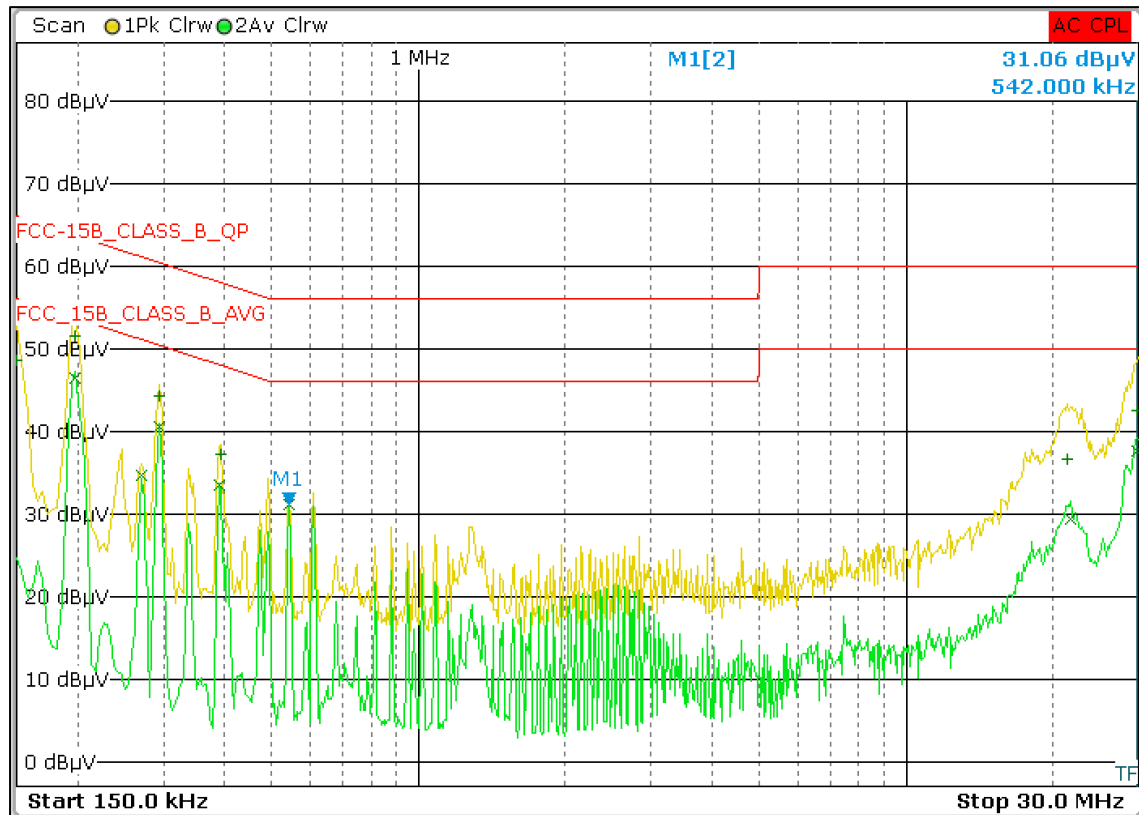
Trace	Frequency	Level (dBμV)	Phase	Detector	Delta Limit/dB
2	198.000000000 kHz	43.46		Average	-10.23
1	198.000000000 kHz	49.36		Quasi Peak	-14.33
2	394.000000000 kHz	33.63		Average	-14.35
2	294.000000000 kHz	35.74		Average	-14.67
2	29.738000000 MHz	35.13		Average	-14.87
1	150.000000000 kHz	49.14		Quasi Peak	-16.86
2	21.782000000 MHz	32.74		Average	-17.26
2	274.000000000 kHz	33.33		Average	-17.67
1	21.194000000 MHz	41.11		Quasi Peak	-18.89
1	29.738000000 MHz	41.11		Quasi Peak	-18.89
1	490.000000000 kHz	37.27		Quasi Peak	-18.90
1	294.000000000 kHz	39.93		Quasi Peak	-20.48

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110VAC-60Hz-Neutral:



Final Results

Meas Time	1.0 s				
Margin	6.0 dB				
Peaks	25				
Trace	Frequency	Level (dBμV)	Phase	Detector	Delta Limit/dB
2	198.00000000 kHz	46.33		Average	-7.36
2	294.00000000 kHz	40.51		Average	-9.90
1	198.00000000 kHz	51.46		Quasi Peak	-12.23
2	29.730000000 MHz	37.68		Average	-12.32
2	390.00000000 kHz	33.46		Average	-14.60
2	542.00000000 kHz	31.17		Average	-14.83
1	294.00000000 kHz	44.33		Quasi Peak	-16.08
2	270.00000000 kHz	34.63		Average	-16.49
1	150.00000000 kHz	48.59		Quasi Peak	-17.41
1	29.874000000 MHz	42.52		Quasi Peak	-17.48
2	21.674000000 MHz	29.39		Average	-20.61
1	394.00000000 kHz	37.16		Quasi Peak	-20.82
1	21.478000000 MHz	36.64		Quasi Peak	-23.36

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*****End of test report*****