

Prüfbericht-Nr.: Test report no.:	IN22JC5S 001 ULR-TC568822300000001F	Auftrags-Nr.: 166582984 001 Order no.:	Seite 1 von 45 Page 1 of 45
Kunden-Referenz-Nr.: Client reference no.:	NA	Auftragsdatum: 2021-08-30 Order date:	
Auftraggeber: Client:	UGen 291, Independence Blvd, Suite 522 Virginia Beach, VA 23462, USA		
Prüfgegenstand: Test item:	UGen Sensor		
Bezeichnung / Series-No.: Identification / serial no.:	Engineering sample		
Auftrags-Inhalt: Order content:	Testing and issue of Test Report and Grant Certificate		
Prüfgrundlage: Test specification:	FCC Part 15 Subpart C 15.205, 15.207, 15.209, 15.215 & 15.249		
Wareneingangsdatum: Date of sample receipt:	2021-09-09		
Prüfmuster-Nr.: Test sample no.:	A003216335-001		
Prüfzeitraum: Testing period:	2021-09-23 - 2021-09-29		
Ort der Prüfung: Place of testing:	Wireless laboratory, Bangalore		
Prüflaboratorium: Testing laboratory:	TÜV Rheinland (India) Pvt. Ltd. 27/B, 2nd cross road, Electronic city Phase 1, Bangalore-560100, India FCC Test Site Registration No: 496599		
Prüfergebnis*: Test result*:	Pass		
geprüft von: tested by:	genehmigt von: authorized by:		
Datum: Date: 2021-09-29	Ausstellatum: Issue date: 2022-12-15		
Stellung / Position: Yogesh V Engineer	Stellung / Position: Lokesh Ramu Manager		
Sonstiges / Other:	FCC ID: 2A3Q9-USNSRV3		
Zustand des Prüfgegenstandes bei Anlieferung: Condition of the test item at delivery:	Prüfmuster vollständig und unbeschädigt Test item complete and undamaged		
* Legende: 1 = sehr gut 2 = gut 3 = befriedigend 4 = ausreichend 5 = mangelhaft P(ass) = entspricht o.g. Prüfgrundlage(n) F(ail) = entspricht nicht o.g. Prüfgrundlage(n) N/A = nicht anwendbar N/T = nicht getestet * Legend: 1 = very good 2 = good 3 = satisfactory 4 = sufficient 5 = poor 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 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.			

Prüfbericht - Nr.:
Test Report No.:

ULR-TC568822300000001F

Seite 2 von 45
Page 2 of 45

TEST SUMMARY

Test Item	Applicable Standard	Result
	FCC	
20 Emission Bandwidth	FCC 15.215 (c)	Pass
Spurious Radiated Emissions and Restricted Bands of Operation	FCC 15.209 / FCC 15.205 / FCC 15.249	Pass
Conducted Emissions on a.c Power Lines	FCC 15.207	Pass

Note: Limited test cases are performed since the Product uses Certified module FCC ID: **X8WBT840** from **Fanstel Corporation, Taipei** Lab.

Product Category: Electronics Testing
Test Discipline: EMC Test Facility

Prüfbericht - Nr.:
Test Report No.:

ULR-TC568822300000001F

Seite 3 von 45
Page 3 of 45

REVISION HISTORY OF THIS REPORT

Report Number	Version	Description	Issue date
ULR-TC568822300000001F	01	Initial issue of report	2022-12-05
ULR-TC568822300000001F	02	Reviewer comments updated	2022-12-15

Prüfbericht - Nr.:

Test Report No.:

ULR-TC568822300000001F

Seite 4 von 45

Page 4 of 45

Table of Contents

1	GENERAL REMARKS	5
1.1	Attachments	5
2	TEST SITES	6
2.1	Testing Facilities.....	6
2.2	List of Test and Measurement Instruments.....	6
3	GENERAL PRODUCT INFORMATION.....	7
3.1	Product Function and Intended Use.....	7
3.2	Ratings and System Details of Equipment under Test	7
3.3	Measurement Uncertainty:	8
4	TEST SET-UP AND OPERATION MODE.....	9
4.1	Principle of Configuration Selection	9
4.2	Test Operation and Test Software	9
4.3	Special Accessories and Auxiliary Equipment	9
4.4	Countermeasures to achieve EMC Compliance	9
4.5	List of frequencies	9
5	TEST METHODOLOGY	10
5.1	Conducted Spurious Emission Test on AC Power Line.....	10
5.1.1	Test Setup Configuration	10
5.2	Radiated Emission Test	11
5.2.1	Test Setup Configuration	11
6	TEST RESULTS	13
6.1	20dB Emission Bandwidth	13
6.2	Spurious Radiated Emissions & Restricted Bands of Operation	17
7	Conducted Spurious Emission Test on AC Power Line	42
8	LIST OF TABLES.....	45
9	LIST OF FIGURES	45

Prüfbericht - Nr.:
Test Report No.:

ULR-TC568822300000001F

Seite 5 von 45
Page 5 of 45

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 DIAGRAM
- 8:** BILL OF MATERIAL
- 9:** USER MANUAL
- 10:** MAXIMUM PERMISSIBLE EXPOSURE INFORMATION

Prüfbericht - Nr.:
Test Report No.:

ULR-TC568822300000001F

Seite 6 von 45
Page 6 of 45

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

Radiated Measurement site type :
Fully anechoic chamber (used for above 1 GHz
measurements)

Radiated Measurement site type :
Semi anechoic chamber (used for below 1 GHz
measurements)

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	19.08.2022	Yearly	Radiated Spurious Emission
EMI Receiver	Rohde & Schwarz	ESW 44	101773	1.72SP1	12.02.2023	Yearly	
Active loop antenna	Frankonia	LAX-18	LAX-10-800	-	31.01.2023	Yearly	
Balloon and Biconical Antenna	Schwarzbeck	VHBB-9124 / BBA-9106	1028	-	03.02.2023	Yearly	
Log - Periodical Antenna	Schwarzbeck	VUSLP-9111B	9111B-111	-	04.02.2023	Yearly	
Horn Antenna	Schwarzbeck	BBHA 9120 D	9120D-1944	-	18.10.2023	Yearly	
Horn Antenna	Schwarzbeck	BBHA 9170	BBHA 9170-0904	-	06.09.2022	Yearly	
Semi Anechoic Chamber	Frankonia	-	-	-	-	-	
Fully Anechoic Chamber	Albatross	-	-	-	-	-	
EMI Receiver	Rohde & Schwarz	ESR7	101133	3.48 SP3	14.07.2022	Yearly	Conducted AC Power line Test
Pulse Limiter	Rohde & Schwarz	ESH3-Z2	100811	-	29.07.2022	Yearly	
LISN	Rohde & Schwarz	ENV216	100022	-	07.10.2022	Yearly	

Table 2: Instrument application Software versions

SL. No.	Test Type	Application software	Version
1	Radiated spurious emission measurement in SAC	EMC 32	10.60.00
2	Radiated spurious emission measurement in FAC	EMC 32	10.60.00

3 GENERAL PRODUCT INFORMATION

3.1 Product Function and Intended Use

The UGen wearable device has an IMU, which will detect motion of device along with movements. This movements will be checked using the software algorithm. Movements of devices is measured and compared using algorithm and if it's not correct it will give user an indication using Vibrations/ buzzer. Device will be used to store some specified movement used in Exercise. Device will send information to BLE server for tracking/monitoring the data

3.2 Ratings and System Details of Equipment under Test

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

Radio Protocol		BLE 5.0
Operating Frequency Range		2402-2480MHz
No. of Channels		40 Channels
Channel Spacing		2 MHz
Maximum transmitted power (dBm)		+4 dBm
Modulation		GFSK
Number of antennas		1
Antenna Gain		-3.38 dBi
Antenna Type		PCB antenna
Supply Voltage to Product		5V (Though USB)
Environmental conditions	Storage	-40° to 85°C
	Operating	0° to 70°C
EUT Dimension(L X W X H)		49 x 35.5 x 11.78 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.

Prüfbericht - Nr.:
Test Report No.:

ULR-TC568822300000001F

Seite 8 von 45
Page 8 of 45

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	$\pm 5 \%$

Note: The Listed Measurement Uncertainties are the worst-case uncertainty, for the respective test cases. Above Table is for reporting purpose only and not used in determining Final Pass/Fail verdict.

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 (HVIN) : V3.1
Test Firmware name & Version : s132 and Putty 0.74
Software Version : 1.0

4.3 Special Accessories and Auxiliary Equipment

- None

4.4 Countermeasures to achieve EMC Compliance

- None

4.5 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	2437
	:	:
	:	:
	36	2474
	37	2476
	38	2478
	39	2480

Table 5: List of BLE Center frequencies

Channel used for BLE testing

Channel low : 2402MHz

Channel mid : 2442MHz

Channel High : 2480MHz

Note:

TUV Sample Identification number : **A003216335-001**- Radiated test Sample

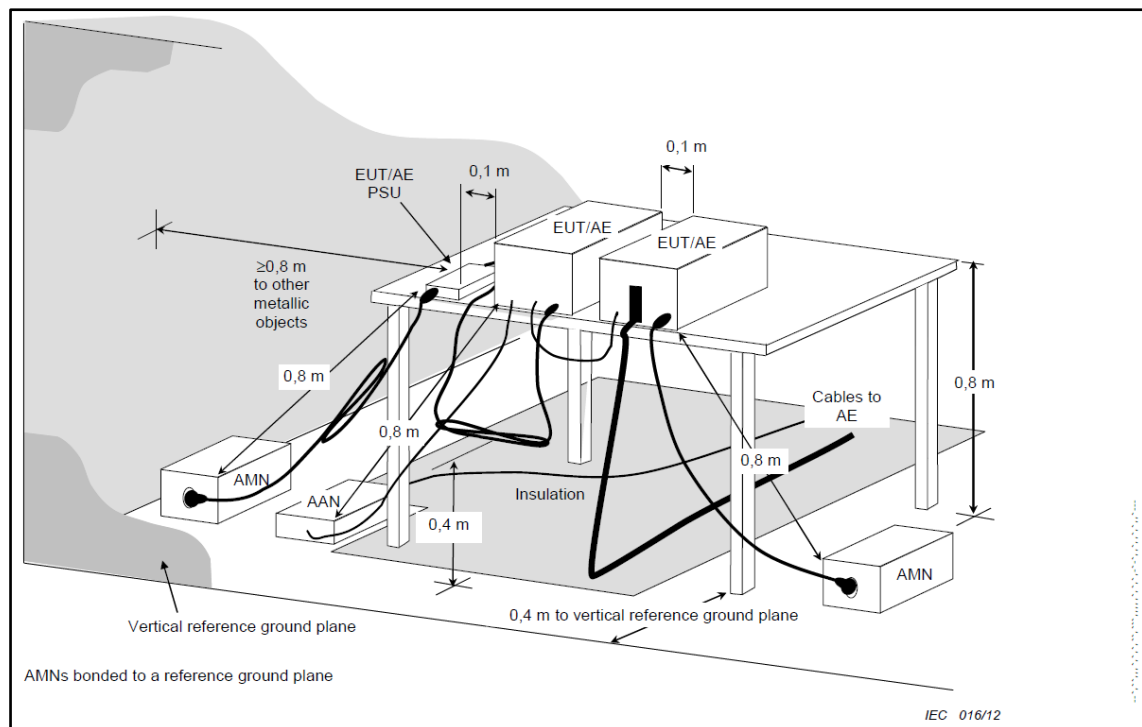
5 TEST METHODOLOGY

5.1 Conducted Spurious Emission Test on AC Power Line

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 150kHz to 30MHz, this measurement was performed with EUT powered by 2 methods and both method are tested individually, one with an AC adaptor with 110V AC 60Hz supply and second with Wireless charger with supply 110V AC 60Hz.

5.1.1 Test Setup Configuration



5.2 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 Baloon 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

5.2.1 Test Setup Configuration

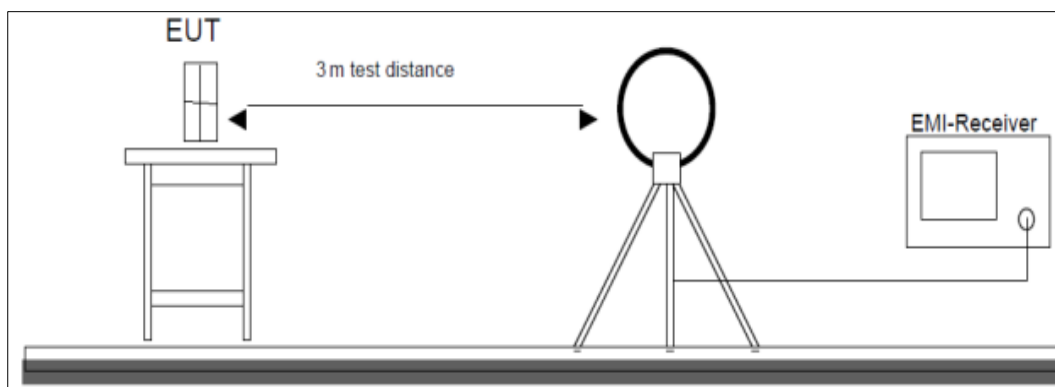


Figure 1: Frequency Range 9 kHz - 30 MHz

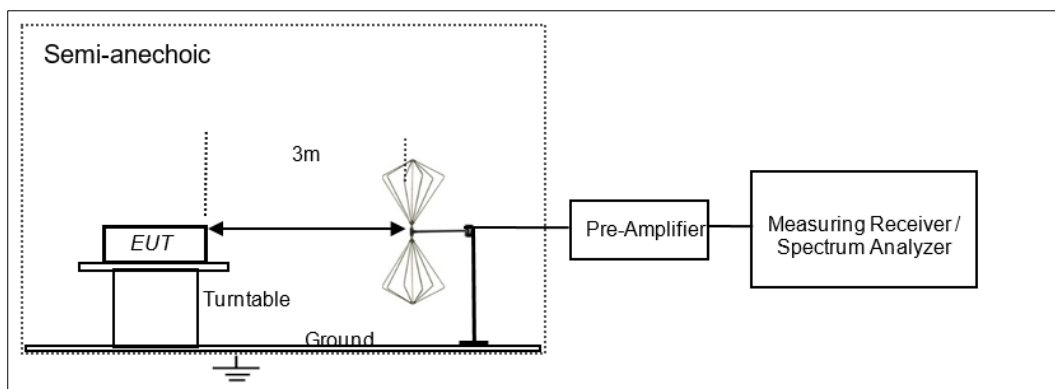


Figure 2: Frequency Range 30 MHz - 200 MHz

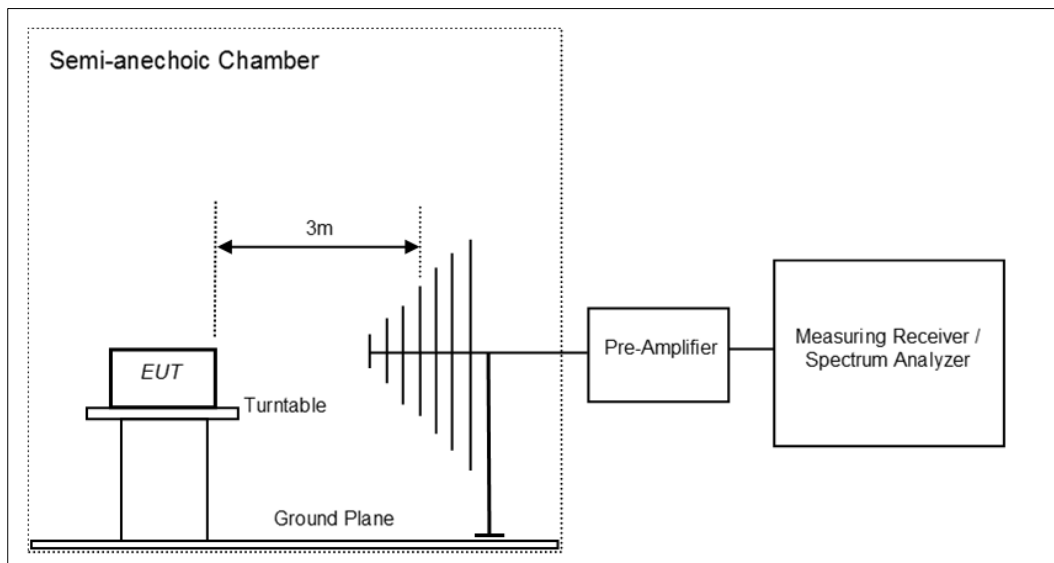


Figure 3: Frequency Range 200 MHz - 1GHz

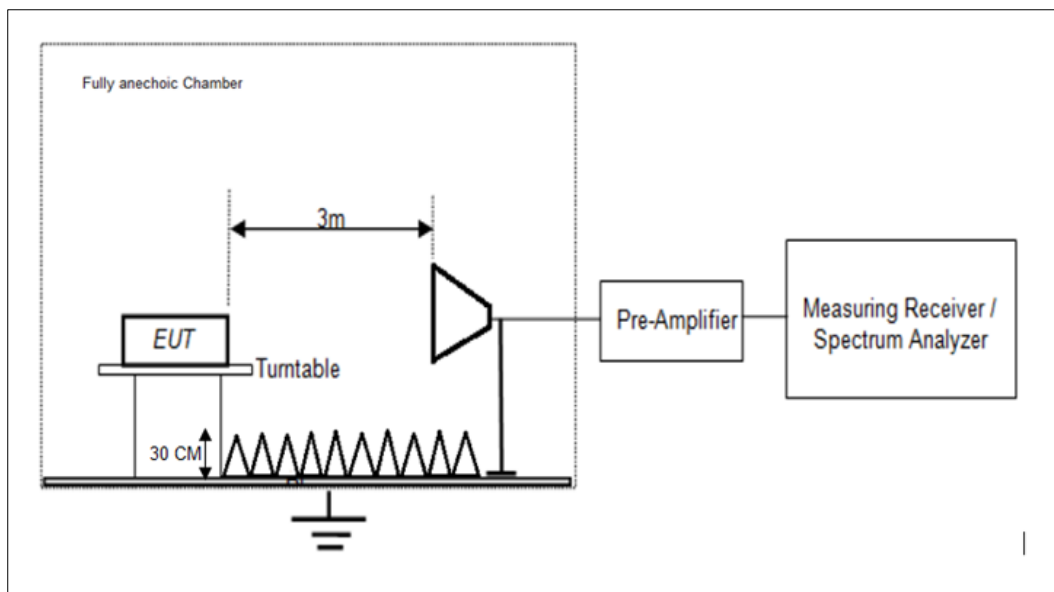


Figure 4: Frequency Range above 1 GHz

Prüfbericht - Nr.:
Test Report No.:

ULR-TC568822300000001F

Seite 13 von 45
Page 13 of 45

6 TEST RESULTS

6.1 20dB Emission Bandwidth

Result

Pass

Test Specification	FCC part 15 Subpart C 15.215 (c)
Test Method	ANSI C63.10
Measurement Location	Fully Anechoic Chamber 1 GHz - 40GHz
Measurement Bandwidth	100kHz
Detector	Peak
Measuring Distance	3 m
Test setup	Refer TEST METHODOLOGY

Test Condition

Normal Test Condition:

Temperature (Norm) = + 22.3 °C Voltage = 3.0V DC (Battery powered) Relative humidity: 66%

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

Data rate	Channel Frequency (MHz)	Antenna Polarization	20 dB Bandwidth (MHz)
250kbps	2402	Vertical	1.22
		Horizontal	1.21
	2442	Vertical	1.20
		Horizontal	1.20
	2480	Vertical	1.21
		Horizontal	1.21
1Mbps	2402	Vertical	1.27
		Horizontal	1.26
	2442	Vertical	1.26
		Horizontal	1.28
	2480	Vertical	1.26
		Horizontal	1.26
2Mbps	2402	Vertical	2.42
		Horizontal	2.38
	2442	Vertical	2.42
		Horizontal	2.44
	2480	Vertical	2.45
		Horizontal	2.44

Prüfbericht - Nr.:
Test Report No.:

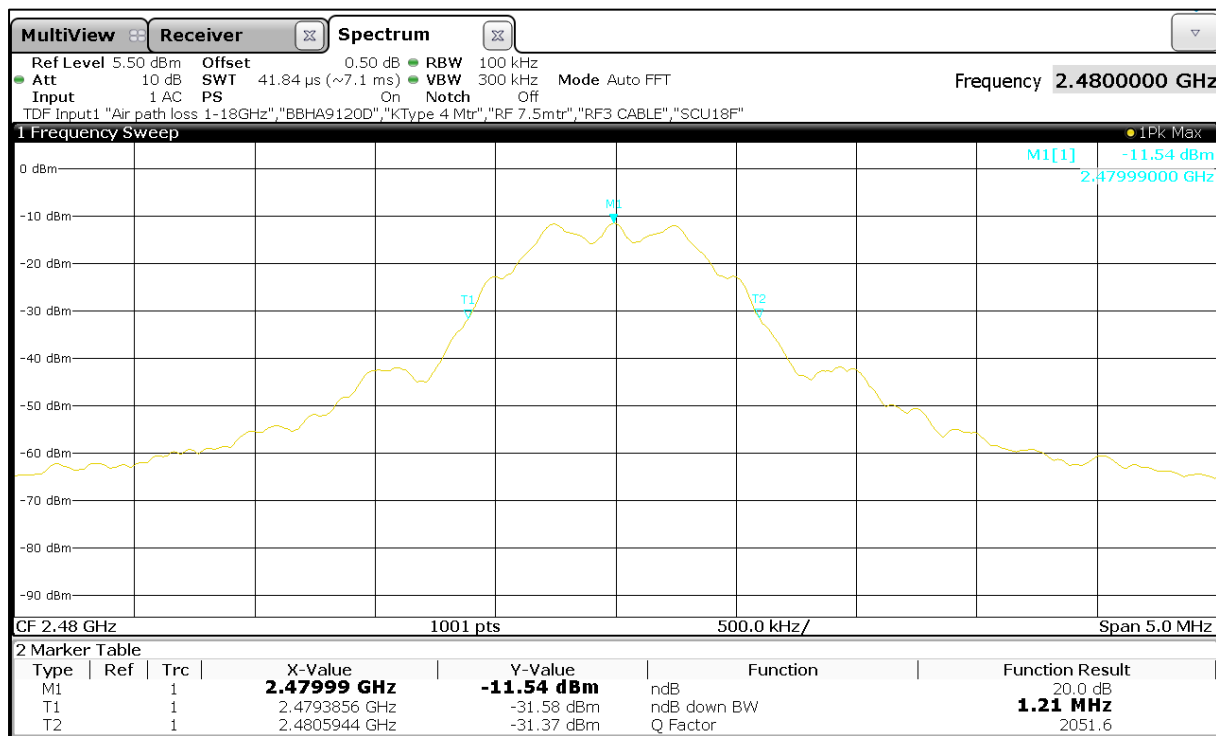
ULR-TC568822300000001F

Seite 14 von 45
Page 14 of 45

Test Plots:

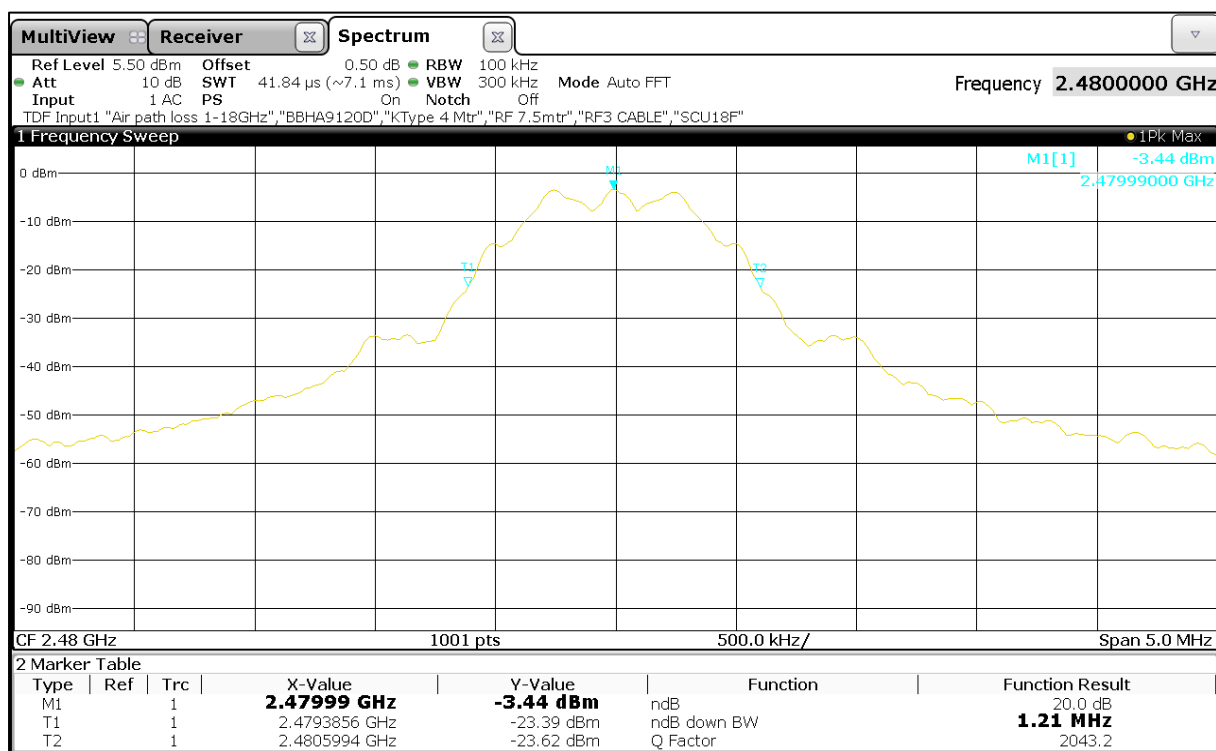
Worst case plots reported

Data rate: 250kbps



Channel Frequency: 2480MHz

Polarization: Vertical



Channel Frequency: 2480MHz

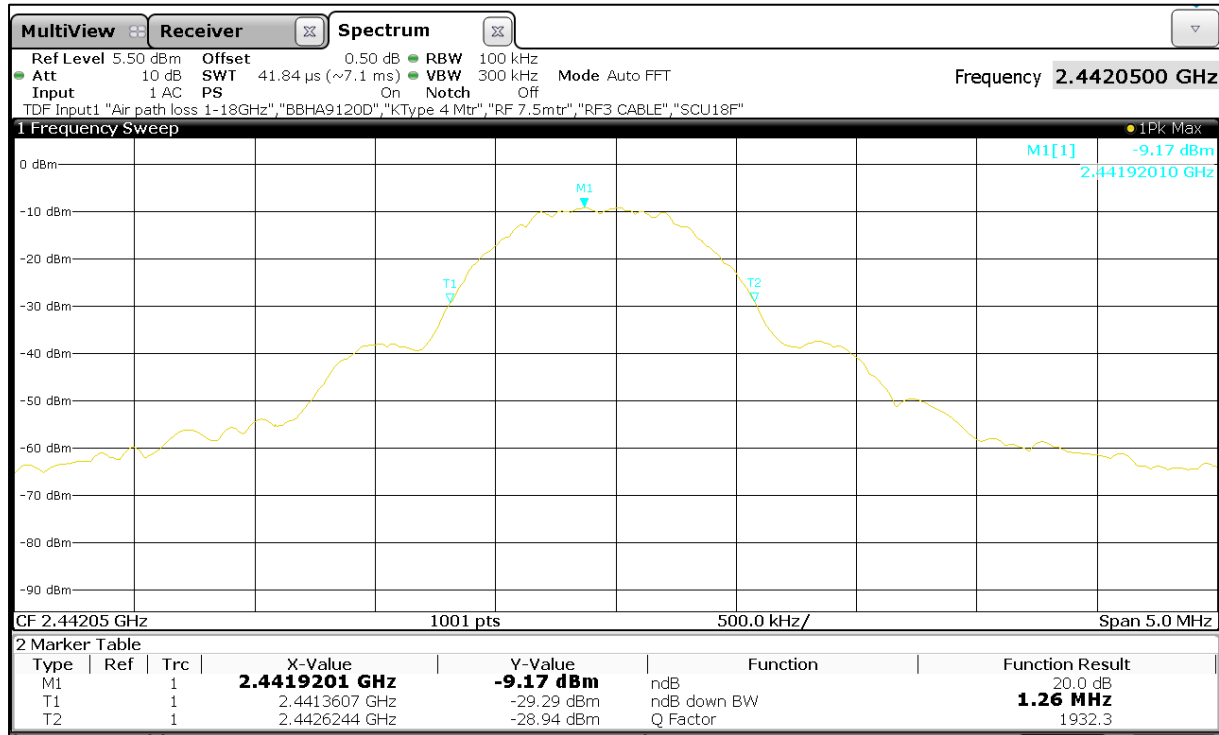
Polarization: Horizontal

Prüfbericht - Nr.:
Test Report No.:

ULR-TC568822300000001F

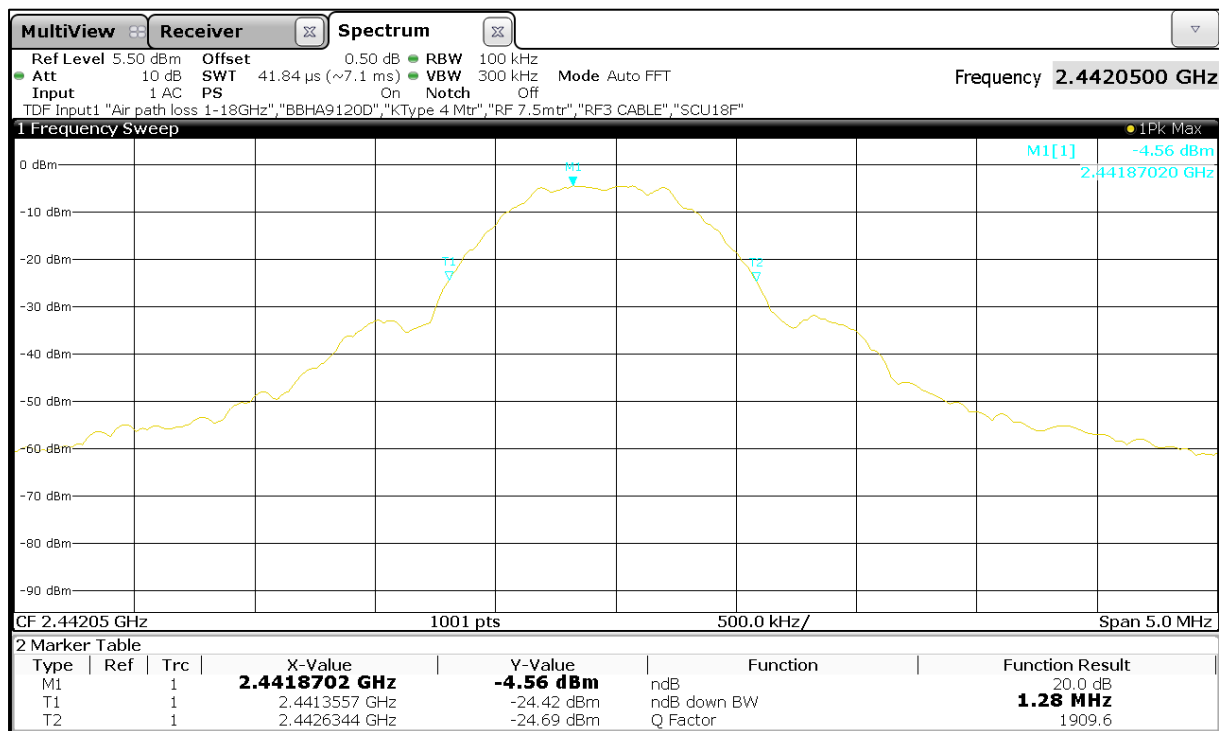
Seite 15 von 45
Page 15 of 45

Data rate: 1Mbps



Channel Frequency: 2442MHz

Polarization: Vertical



Channel Frequency: 2442MHz

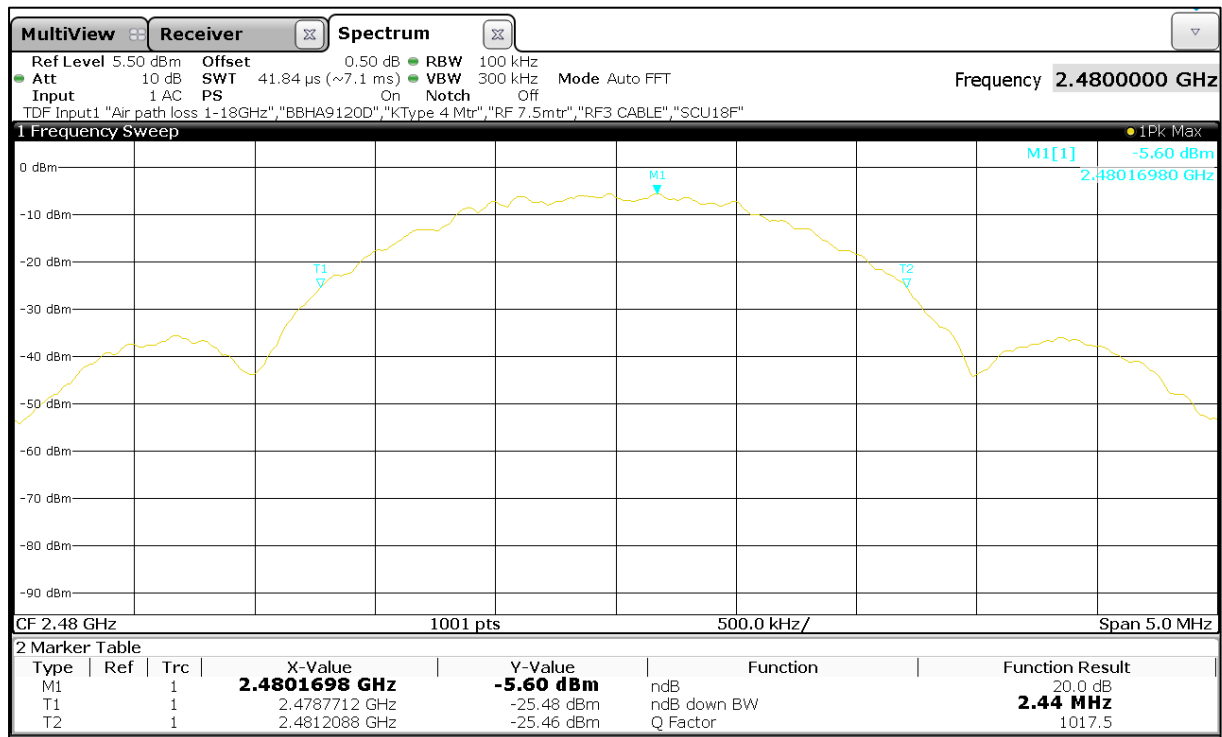
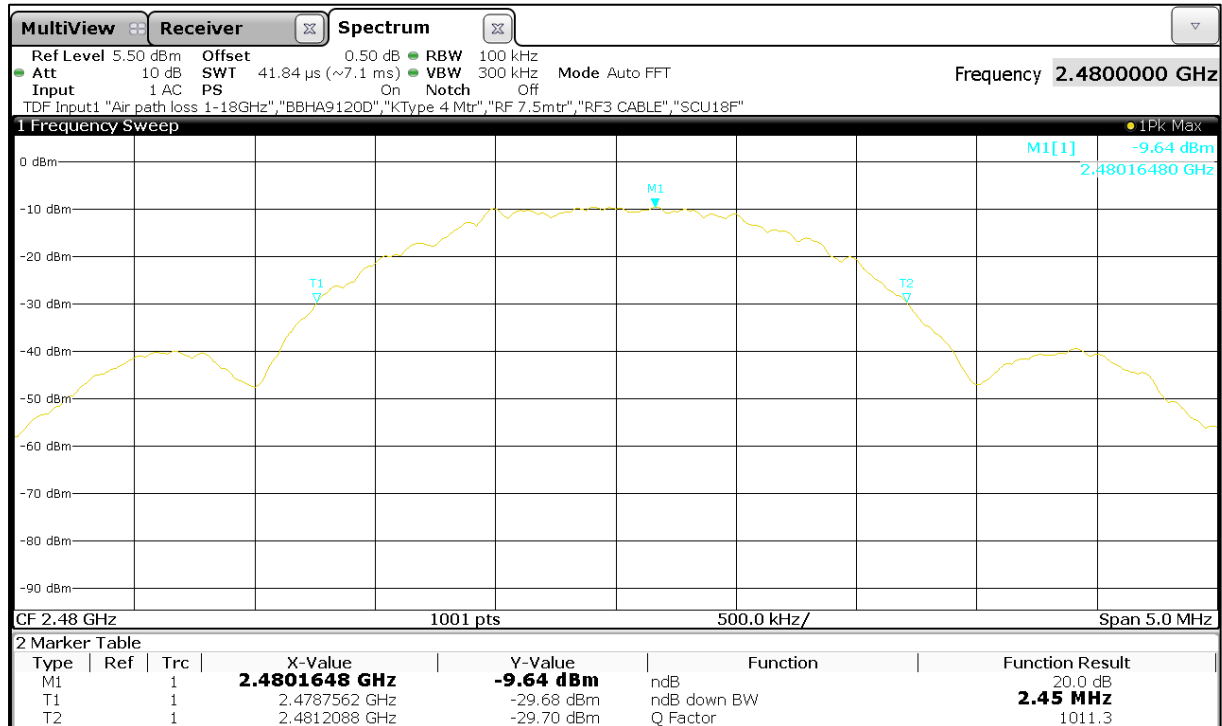
Polarization: Horizontal

Prüfbericht - Nr.:
Test Report No.:

ULR-TC568822300000001F

Seite 16 von 45
Page 16 of 45

Data rate: 2Mbps



Prüfbericht - Nr.:
Test Report No.:

ULR-TC568822300000001F

Seite 17 von 45
Page 17 of 45

6.2 Spurious Radiated Emissions & Restricted Bands of Operation

Result

Pass

Test Specification	FCC part 15 Subpart C 15.247 (d) / (15.209, 15.205 & 15.249)
Test Method	ANSI C63.10
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 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

Frequency (MHz)	Field strength (mV/m)	Field strength (dBμV/m)	Distance of Measurement (m)
2400 – 2483.5	50	114 at Peak & 94 at Average	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) = + 22.3 °C

Voltage = 3.0V DC (Battery powered)

Relative humidity: 66%

Prüfbericht - Nr.:
Test Report No.:

ULR-TC568822300000001F

Seite 18 von 45
Page 18 of 45

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

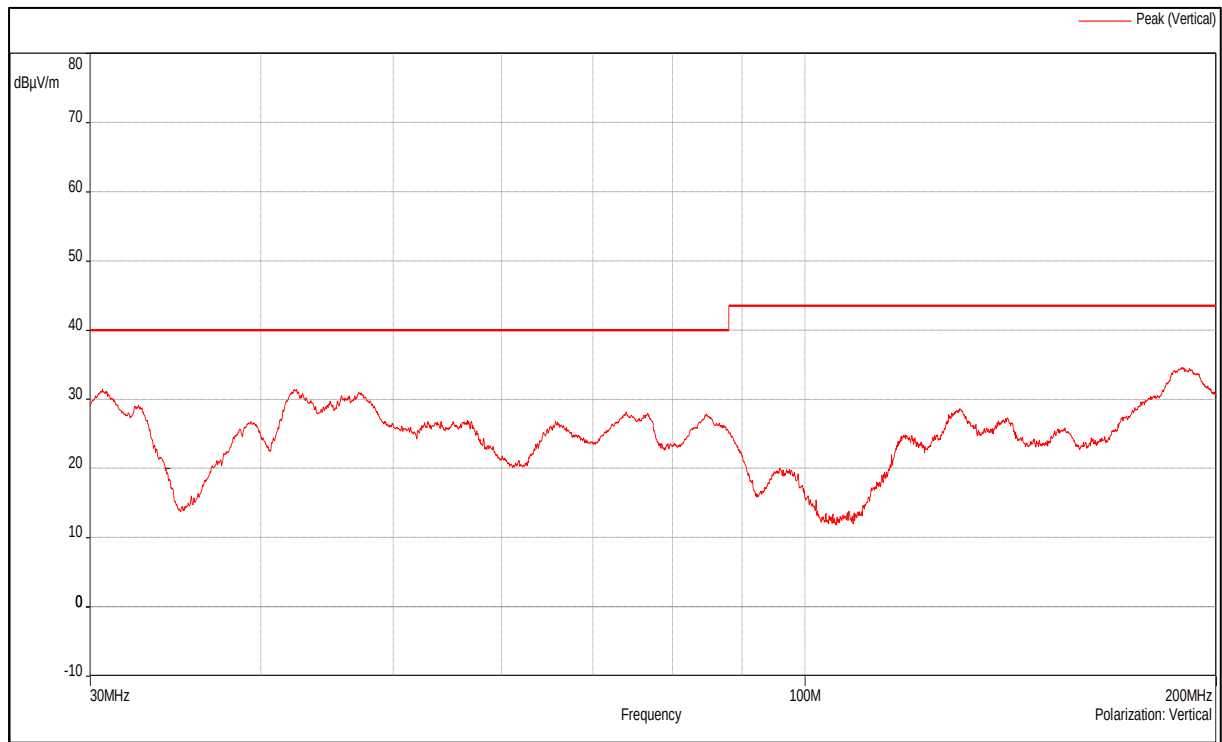
Test results for frequency range 30MHz – 1GHz

Antenna Polarization	Measured Frequency (MHz)	Measured Emission (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)
Vertical	30.69	30.57	40.00	-9.43
	42.42	29.90	40.00	-10.10
	46.77	29.43	40.00	-10.57
	203.16	23.23	43.50	-20.27
	232.10	19.86	46.00	-26.14
	882.26	23.74	46.00	-22.26
Horizontal	141.93	30.00	43.50	-13.50
	172.50	28.42	43.50	-15.08
	185.73	32.96	43.50	-10.54
	202.80	17.14	43.50	-26.36
	581.59	19.42	46.00	-26.58
	953.92	23.46	46.00	-22.54

Prüfbericht - Nr.:
Test Report No.:

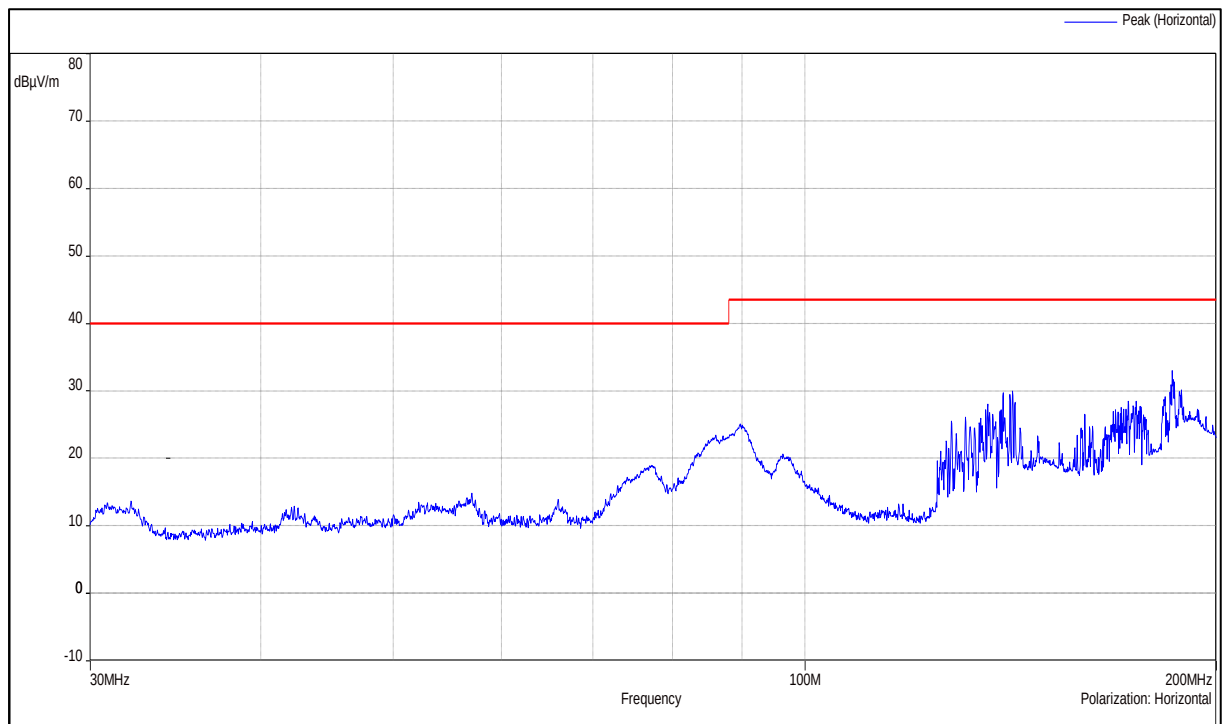
ULR-TC568822300000001F

Seite 19 von 45
Page 19 of 45



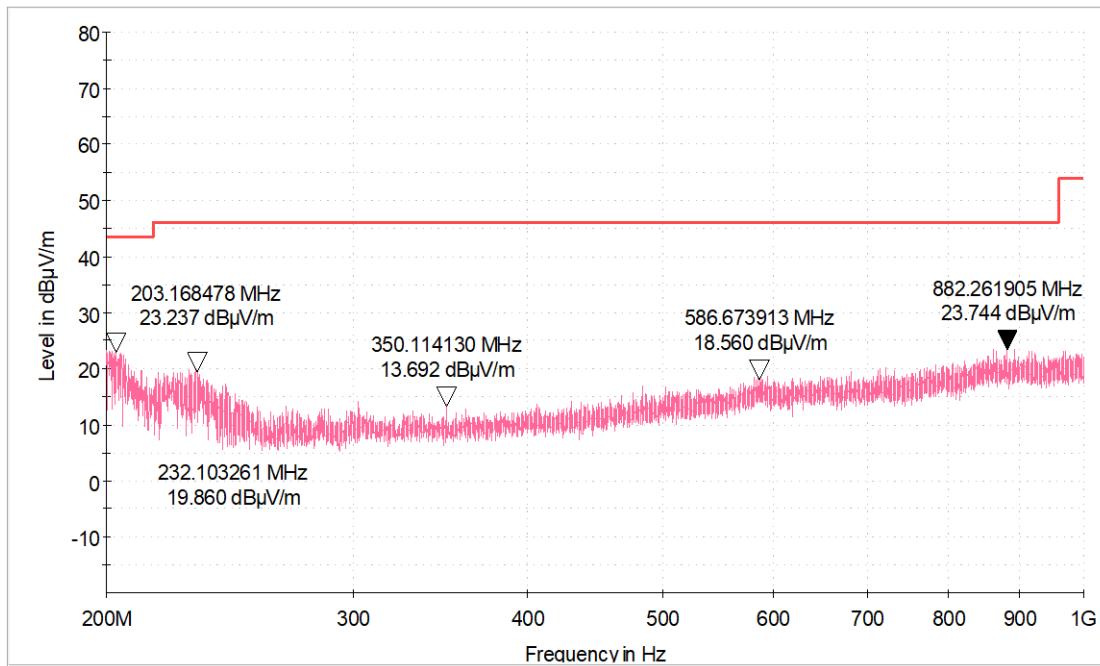
Channel Frequency 30MHz – 200MHz

Polarization: Vertical



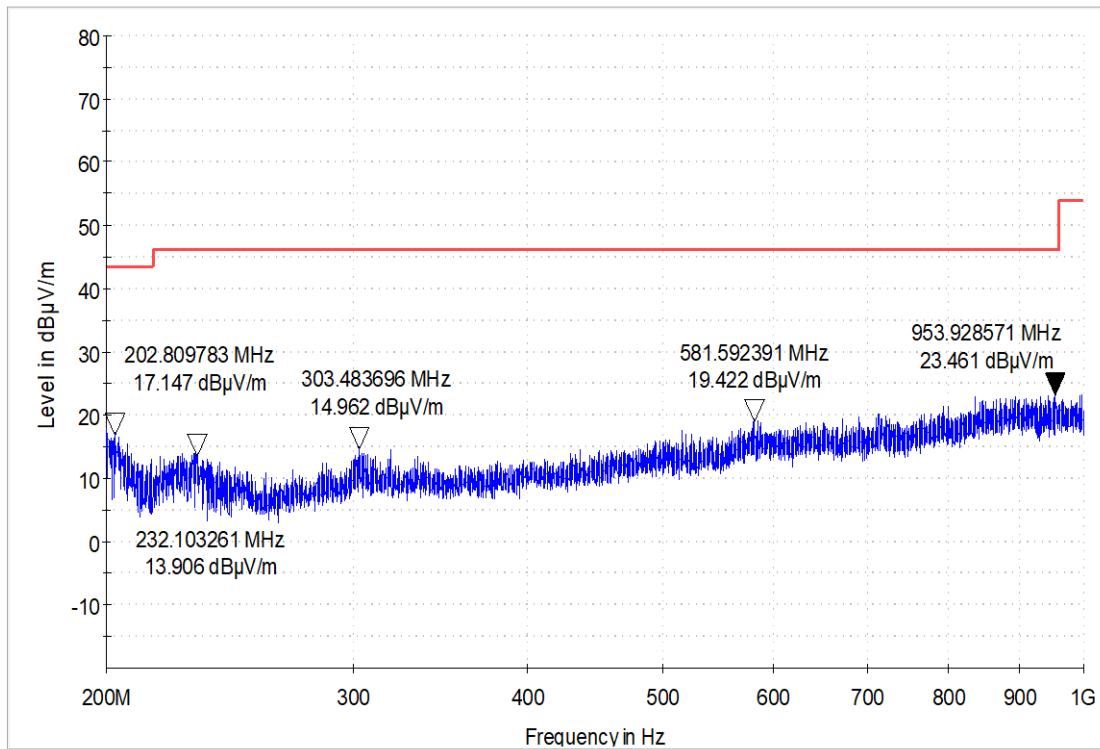
Channel Frequency 30MHz – 200MHz

Polarization: Horizontal



Channel Frequency 200MHz – 1GHz

Polarization: Vertical



Channel Frequency 200MHz – 1GHz

Polarization: Horizontal

Prüfbericht - Nr.:
Test Report No.:

ULR-TC568822300000001F

Seite 21 von 45
Page 21 of 45

Data rate: 250kbps

Channel Frequency (MHz)	Antenna Polarization	Measured Frequency (MHz)	Measured Emission (dBµV/m)	Limit (dBµV/m)	Margin (dB)
2402	Vertical	2390(Pk)	36.16	74*	-37.84
		2390(Av)	22.78	54*	-31.22
		2400(Pk)	43.44	74	-30.56
		2400(Av)	26.52	54	-27.48
		2402(Pk)	79.68	114	-34.32
		2402(Av)	79.02	94	-14.98
		4804(Pk)	47.67	74	-26.33
		4804(Av)	41.48	54	-12.52
		7206(Pk)	52.88	74	-21.12
		7206(Av)	44.41	54	-9.59
	Horizontal	2390(Pk)	36.29	74*	-37.71
		2390(Av)	23.12	54*	-30.88
		2400(Pk)	48.55	74	-25.45
		2400(Av)	30.71	54	-23.29
		2402(Pk)	85.42	114	-28.58
		2402(Av)	84.77	94	-9.23
		4804(Pk)	48.35	74	-25.65
		4804(Av)	42.94	54	-11.06
		7206(Pk)	49.04	74	-24.96
		7206(Av)	36.85	54	-17.15
2442	Vertical	2442(Pk)	81.39	114	-32.61
		2442(Av)	80.80	94	-13.20
		4884(Pk)	49.56	74	-24.44
		4884(Av)	44.58	54	-9.42
		7326(Pk)	51.97	74	-22.03
		7326(Av)	43.05	54	-10.95
	Horizontal	2442(Pk)	86.47	114	-27.53
		2442(Av)	85.96	94	-8.04
		4880(Pk)	50.18	74	-23.82
		4880(Av)	45.58	54	-8.42
		7326(Pk)	48.96	74	-25.04
		7326(Av)	35.52	54	-18.48
2480	Vertical	2480(Pk)	83.29	114	-30.71
		2480(Av)	82.63	94	-11.37
		2483.5(Pk)	41.05	74*	-32.95
		2483.5(Av)	24.01	54*	-29.99
		4960(Pk)	48.82	74	-25.18
		4960(Av)	42.72	54	-11.28
		7440(Pk)	49.74	74	-24.26
		7440(Av)	39.34	54	-14.66
	Horizontal	2480(Pk)	88.26	114	-25.74
		2480(Av)	87.61	94	-6.39
		2483.5(Pk)	46.12	74*	-27.88
		2483.5(Av)	26.04	54*	-27.96
		4960(Pk)	49.09	74	-24.91
		4960(Av)	43.82	54	-10.18
		7440(Pk)	49.58	74	-24.42
		7440(Av)	36.30	54	-17.70

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

Prüfbericht - Nr.:
Test Report No.:

ULR-TC568822300000001F

Seite 22 von 45
Page 22 of 45

Data rate: 1Mbps

Channel Frequency (MHz)	Antenna Polarization	Measured Frequency (MHz)	Measured Emission (dBμV/m)	Limit (dBμV/m)	Margin (dB)
2402	Vertical	2390(Pk)	43.19	74*	-30.81
		2390(Av)	23.29	54*	-30.71
		2400(Pk)	44.20	74	-29.80
		2400(Av)	24.16	54	-29.84
		2402(Pk)	80.30	114	-33.70
		2402(Av)	73.97	94	-20.03
		4804(Pk)	51.28	74	-22.72
		4804(Av)	42.00	54	-12.00
		7206(Pk)	52.64	74	-21.36
		7206(Av)	41.13	54	-12.87
	Horizontal	2390(Pk)	38.17	74*	-35.83
		2390(Av)	22.94	54*	-31.06
		2400(Pk)	46.38	74	-27.62
		2400(Av)	25.47	54	-28.53
		2402(Pk)	83.57	114	-30.43
		2402(Av)	76.76	94	-17.24
		4804(Pk)	48.53	74	-25.47
		4804(Av)	38.60	54	-15.40
		7206(Pk)	49.35	74	-24.65
		7206(Av)	37.37	54	-16.63
2442	Vertical	2442(Pk)	80.16	114	-33.84
		2442(Av)	73.04	94	-20.96
		4880(Pk)	52.20	74	-21.80
		4880(Av)	42.20	54	-11.80
		7326(Pk)	51.45	74	-22.55
		7326(Av)	39.16	54	-14.84
	Horizontal	2442(Pk)	87.08	114	-26.92
		2442(Av)	80.00	94	-14.00
		4884(Pk)	48.00	74	-26.00
		4884(Av)	36.59	54	-17.41
		7326(Pk)	49.09	74	-24.91
		7326(Av)	35.06	54	-18.94
2480	Vertical	2480(Pk)	88.77	114	-25.23
		2480(Av)	77.71	94	-16.29
		2483.5(Pk)	43.19	74*	-30.81
		2483.5(Av)	23.38	54*	-30.62
		4960(Pk)	50.01	74	-23.99
		4960(Av)	41.06	54	-12.94
		7440(Pk)	53.70	74	-20.30
		7440(Av)	42.64	54	-11.36
	Horizontal	2480(Pk)	85.57	114	-28.43
		2480(Av)	79.16	94	-14.84
		2483.5(Pk)	44.05	74*	-29.95
		2483.5(Av)	23.81	54*	-30.19
		4960(Pk)	50.38	74	-23.62
		4960(Av)	40.54	54	-13.46
		7440(Pk)	49.68	74	-24.32
		7440(Av)	37.60	54	-16.40

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

Prüfbericht - Nr.:
Test Report No.:

ULR-TC568822300000001F

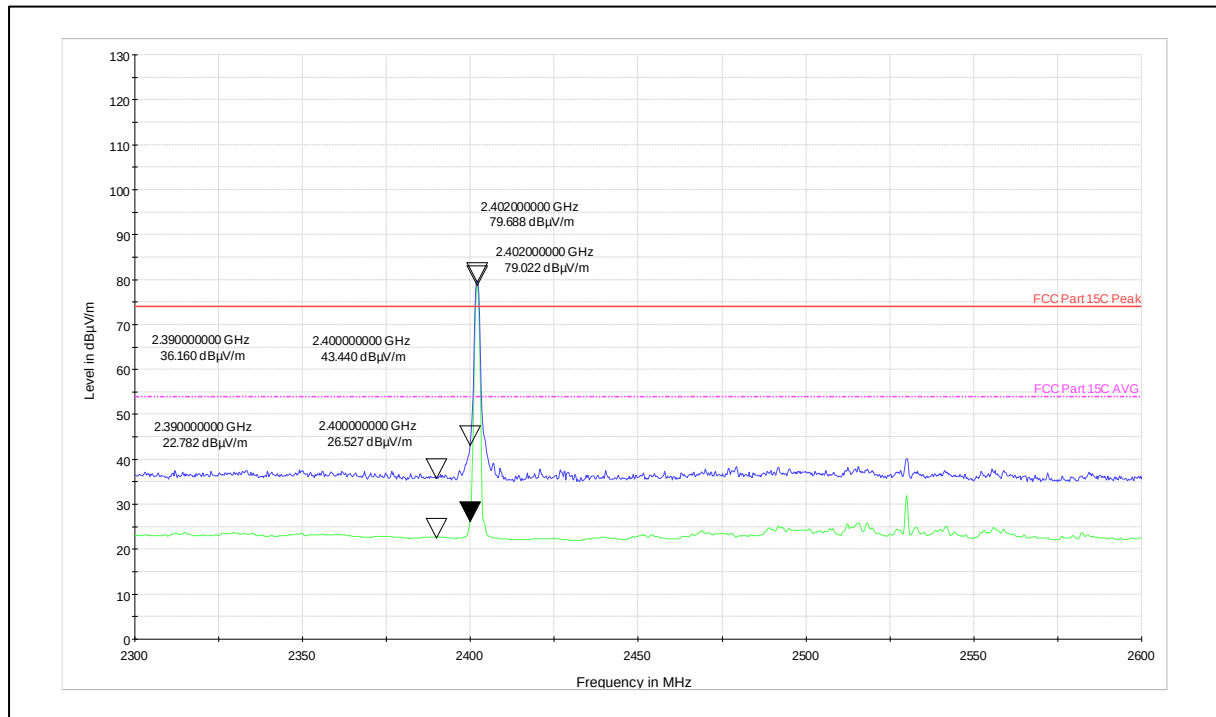
Seite 23 von 45
Page 23 of 45

Data rate: 2Mbps

Channel Frequency (MHz)	Antenna Polarization	Measured Frequency (MHz)	Emission level (dBµV/m)	Limit (dBµV/m)	Margin (dB)
2402	Vertical	2390(Pk)	40.52	74*	-33.48
		2390(Av)	23.44	54*	-30.56
		2400(Pk)	55.40	74	-18.60
		2400(Av)	40.42	54	-13.58
		2402(Pk)	85.34	114	-28.66
		2402(Av)	78.07	94	-15.93
		4804(Pk)	50.22	74	-23.78
		4804(Av)	40.29	54	-13.71
		7206(Pk)	52.47	74	-21.53
		7206(Av)	39.86	54	-14.14
	Horizontal	2390(Pk)	36.37	74*	-37.63
		2390(Av)	23.11	54*	-30.89
		2400(Pk)	53.54	74	-20.46
		2400(Av)	38.35	54	-15.65
		2402(Pk)	83.19	114	-30.81
		2402(Av)	75.94	94	-18.06
		4804(Pk)	46.68	74	-27.32
		4804(Av)	35.73	54	-18.27
		7206(Pk)	49.33	74	-24.67
		7206(Av)	36.7	54	-17.30
2442	Vertical	2442(Pk)	79.89	114	-34.11
		2442(Av)	72.76	94	-21.24
		4884(Pk)	49.99	74	-24.01
		4884(Av)	38.74	54	-15.26
		7326(Pk)	52.07	74	-21.93
		7326(Av)	39.4	54	-14.60
	Horizontal	2442(Pk)	87.2	114	-26.80
		2442(Av)	79.91	94	-14.09
		4880(Pk)	47.45	74	-26.55
		4880(Av)	36.55	54	-17.45
		7326(Pk)	48.63	74	-25.37
		7326(Av)	35.09	54	-18.91
2480	Vertical	2480(Pk)	84.24	114	-29.76
		2480(Av)	76.97	94	-17.03
		2483.5(Pk)	43.22	74*	-30.78
		2483.5(Av)	24.89	54*	-29.11
		4960(Pk)	49.3	74	-24.70
		4960(Av)	38.02	54	-15.98
		7440(Pk)	49.18	74	-24.82
		7440(Av)	36.41	54	-17.59
	Horizontal	2480(Pk)	86.5	114	-27.50
		2480(Av)	79.16	94	-14.84
		2483.5(Pk)	44.65	74*	-29.35
		2483.5(Av)	25.81	54*	-28.19
		4960(Pk)	45.34	74	-28.66
		4960(Av)	33.35	54	-20.65
		7440(Pk)	49.03	74	-24.97
		7440(Av)	35.07	54	-18.93

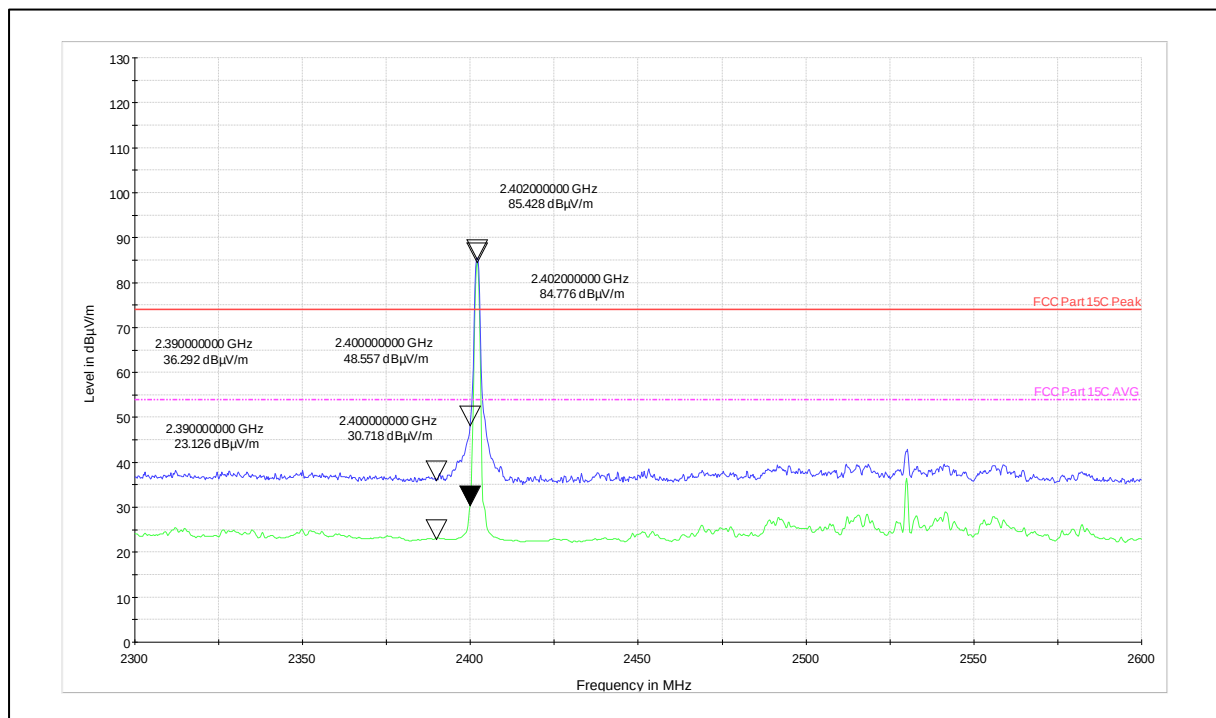
*- : Indicate restricted band of operation §15.205
Pk: Peak Detector; Av: Average Detector

Data rate: 250Kbps



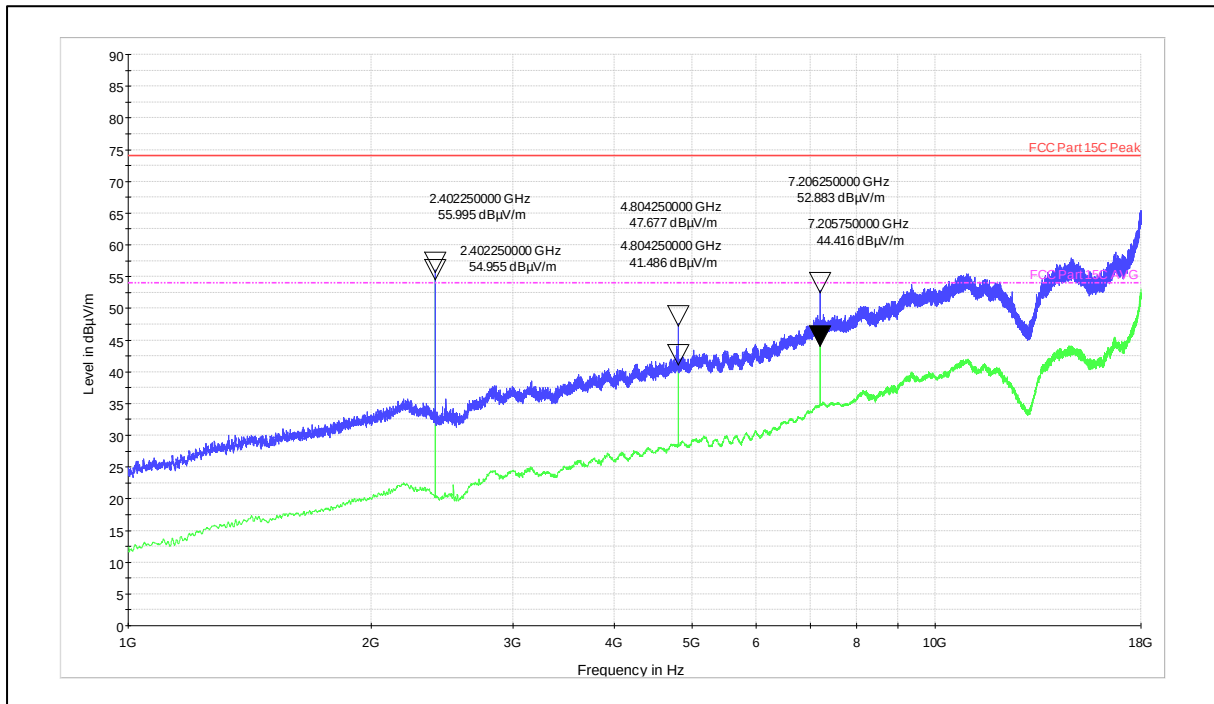
Channel Frequency 2402MHz

Polarization: Vertical



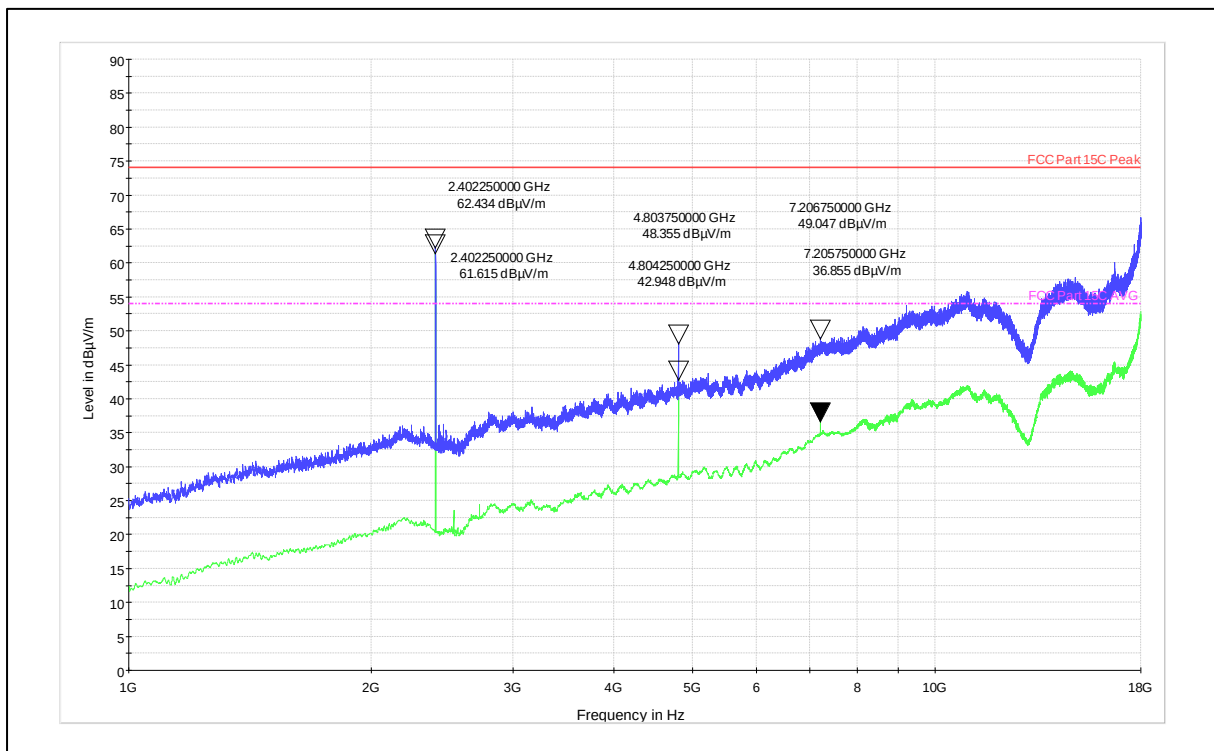
Channel Frequency 2402MHz

Polarization: Horizontal



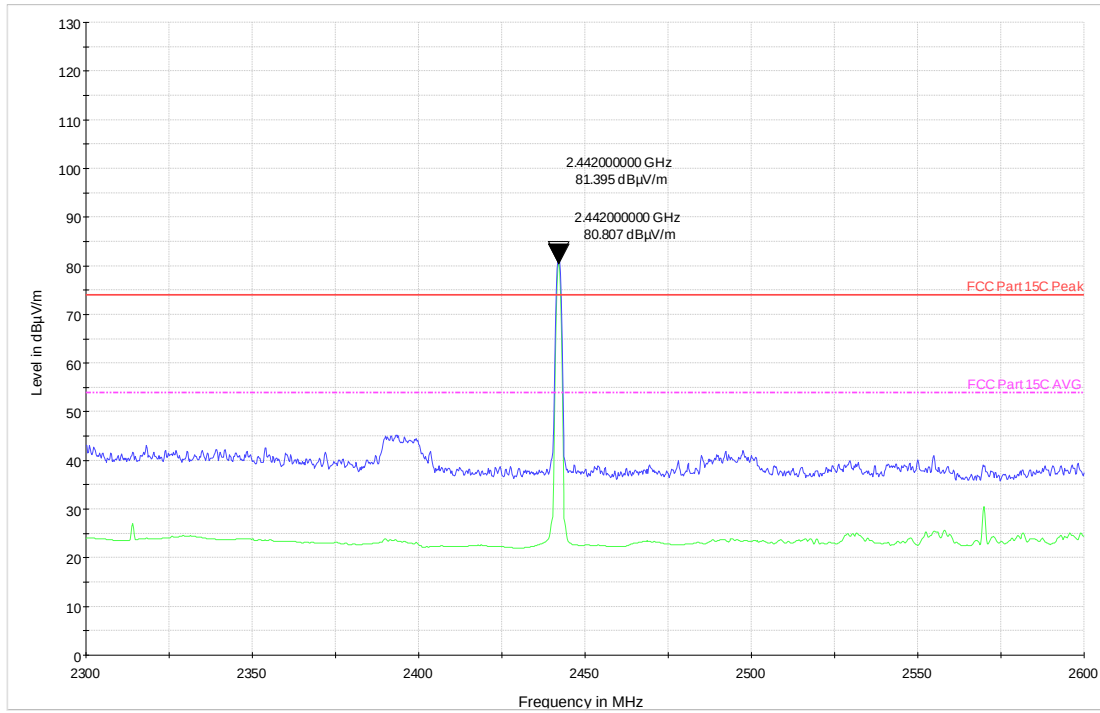
Frequency Range: 1GHz – 18GHz

Polarization: Vertical



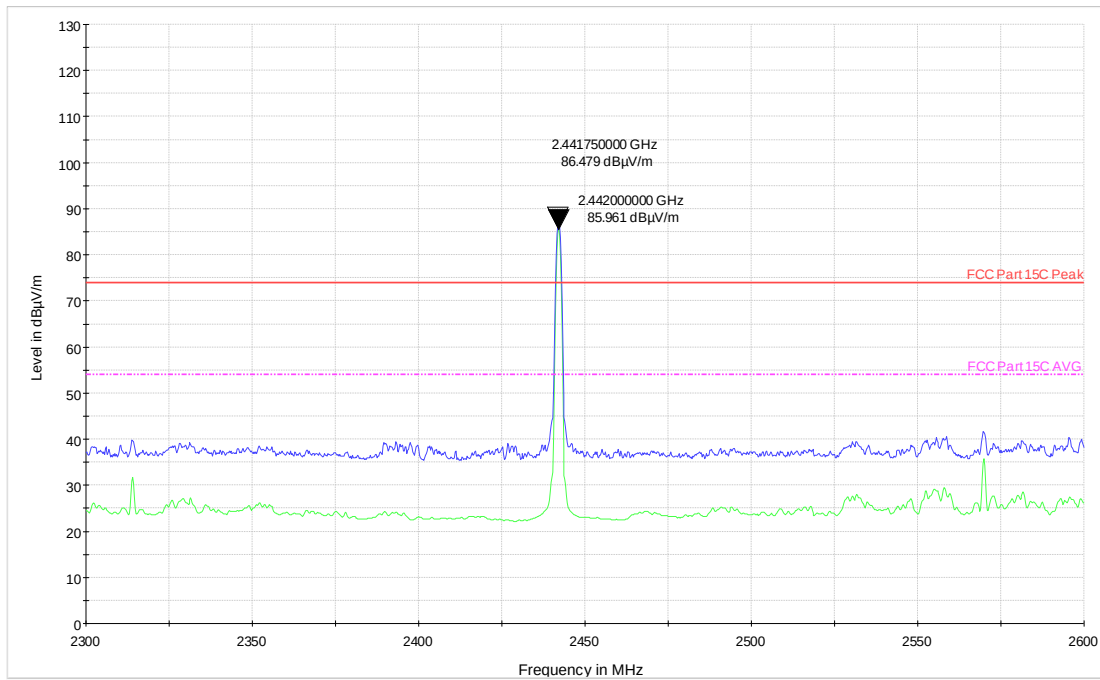
Frequency Range: 1GHz – 18GHz

Polarization: Horizontal



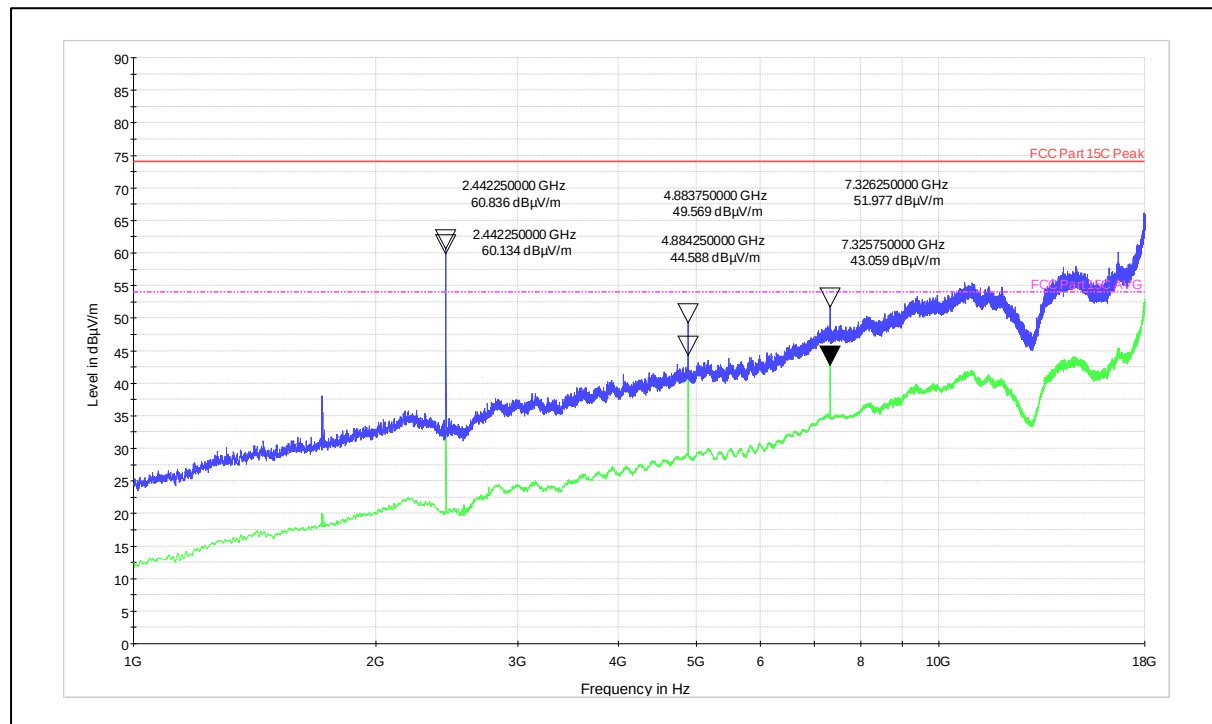
Channel Frequency: 2442MHz

Polarization: Vertical



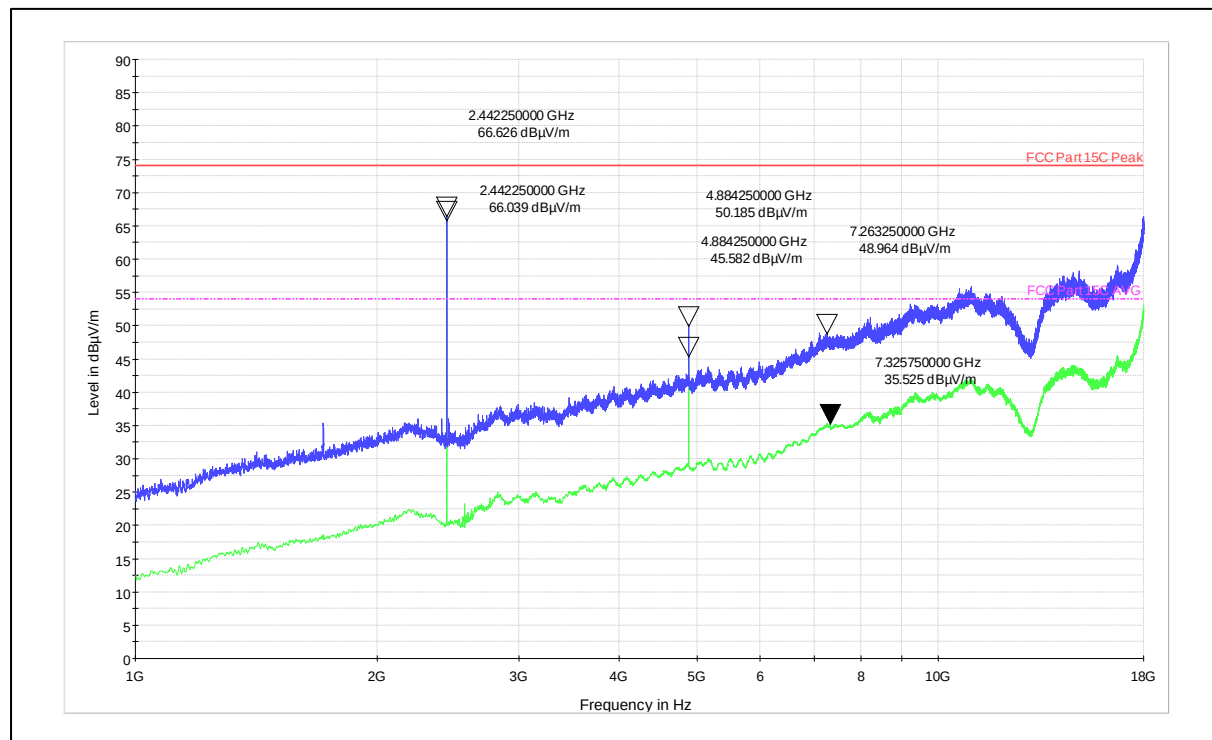
Channel Frequency: 2442MHz

Polarization: Horizontal



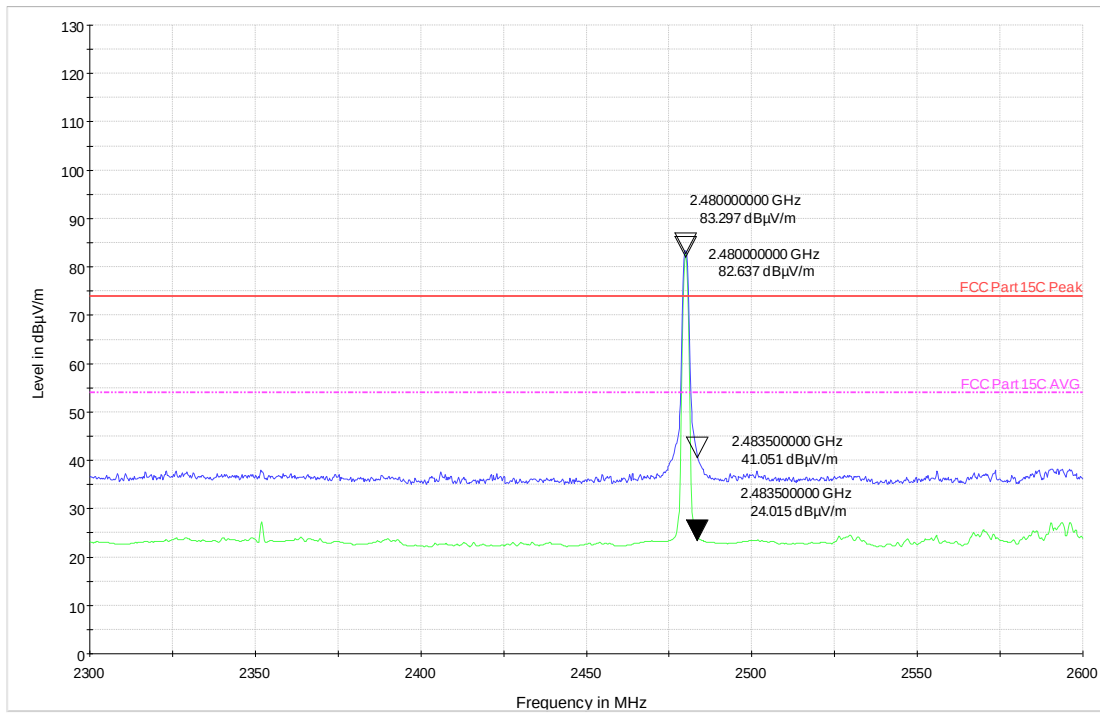
Frequency Range: 1GHz – 18GHz

Polarization: Vertical



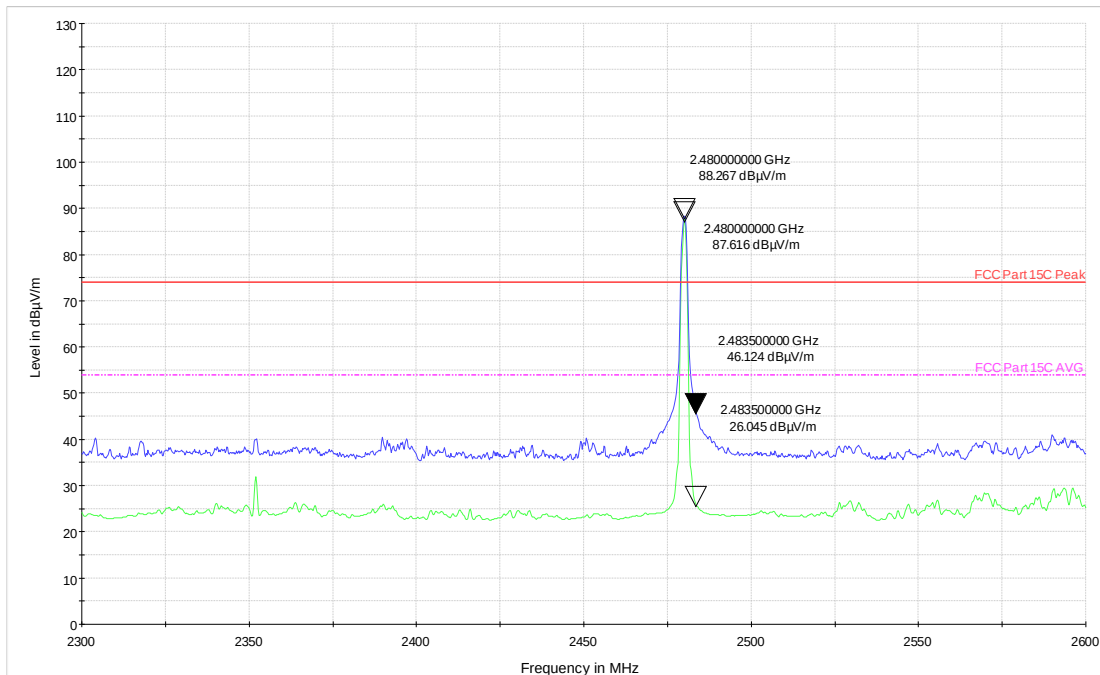
Frequency Range: 1GHz – 18GHz

Polarization: Horizontal



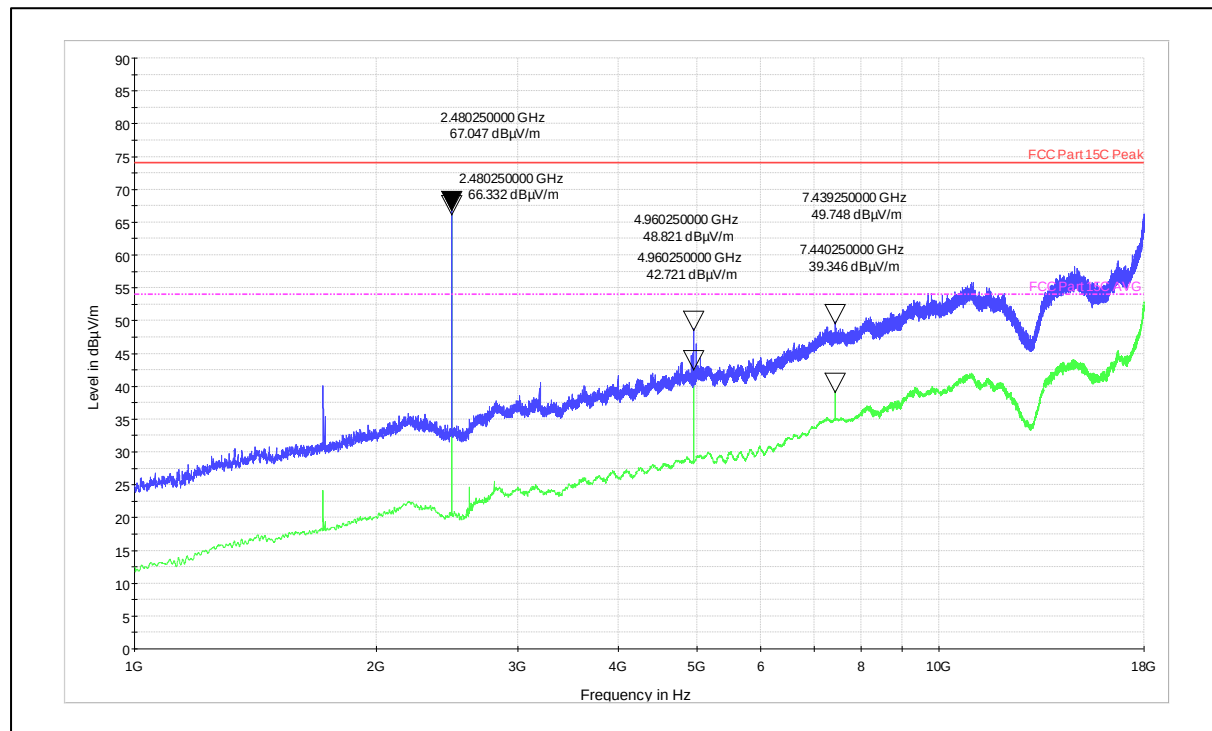
Channel Frequency: 2480MHz

Polarization: Vertical



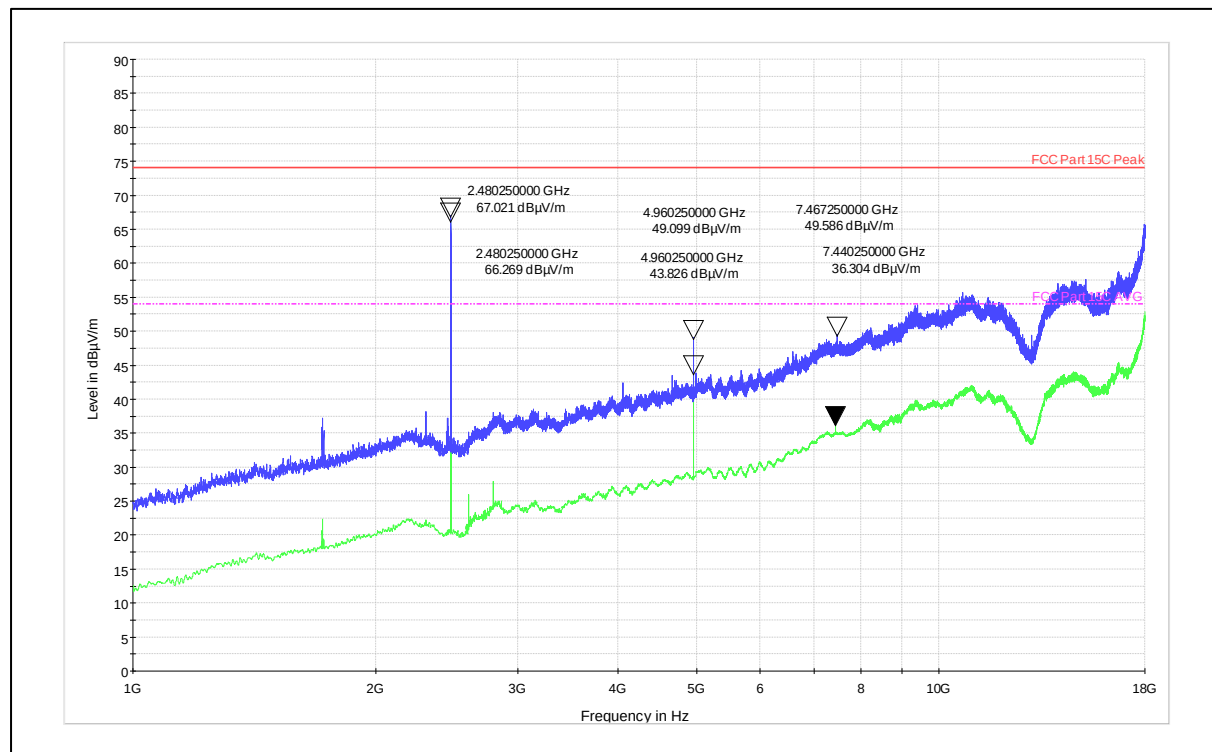
Channel Frequency: 2480MHz

Polarization: Horizontal



Frequency Range: 1GHz – 18GHz

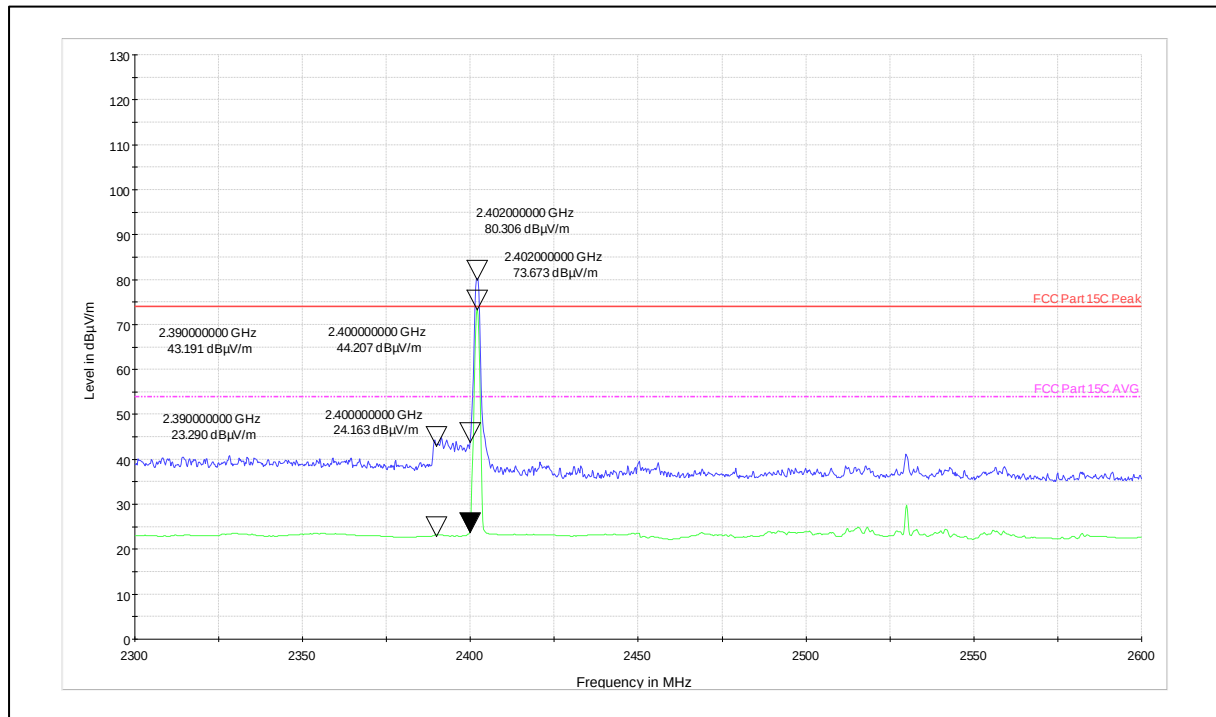
Polarization: Vertical



Frequency Range: 1GHz – 18GHz

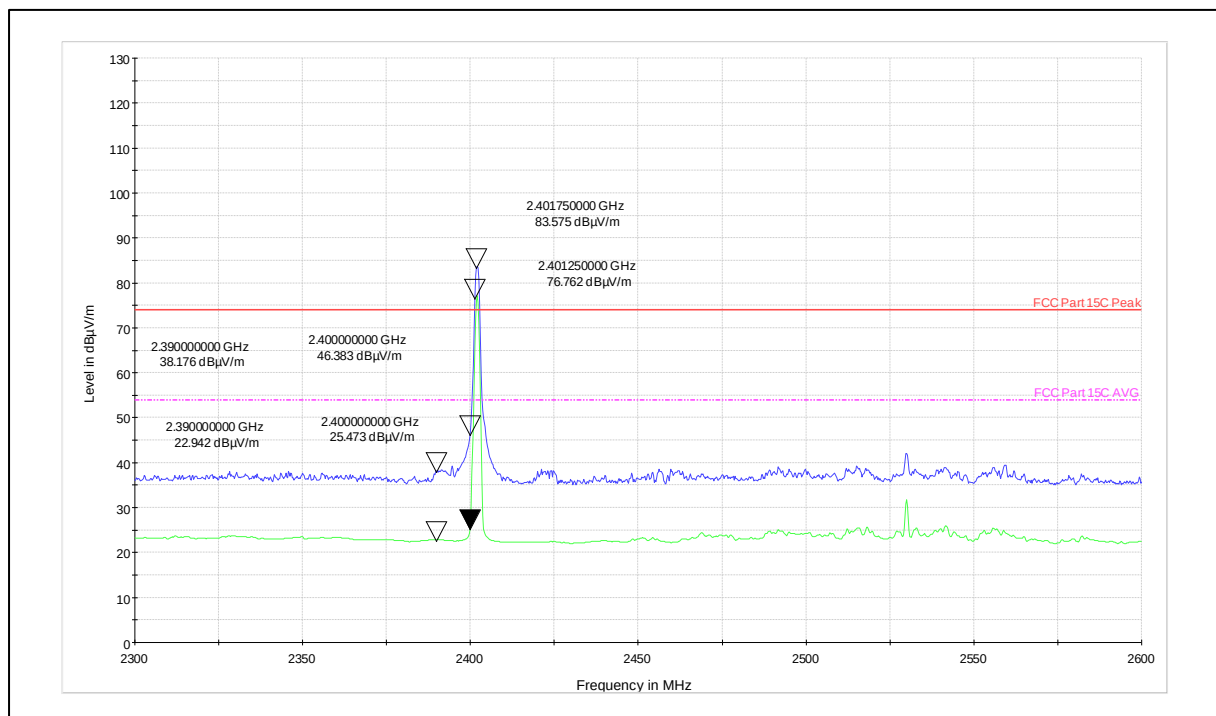
Polarization: Horizontal

Data rate: 1Mbps



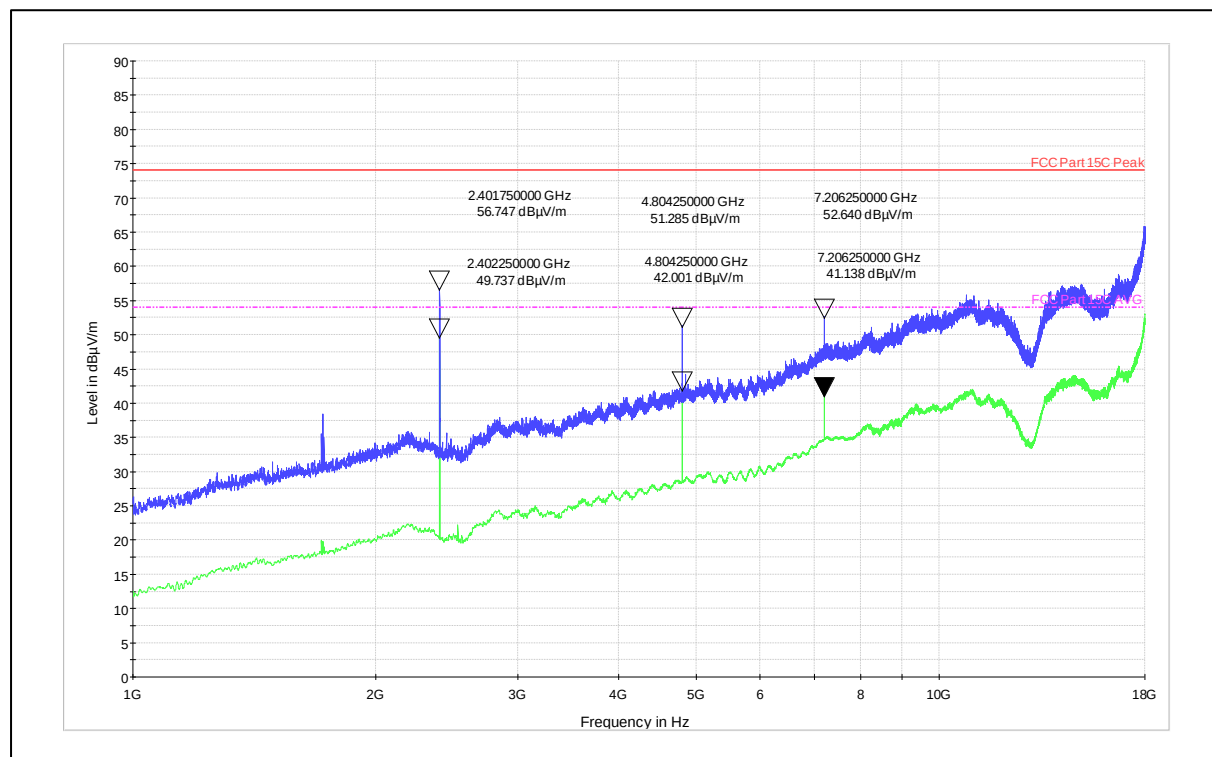
Channel Frequency: 2402MHz

Polarization: Vertical



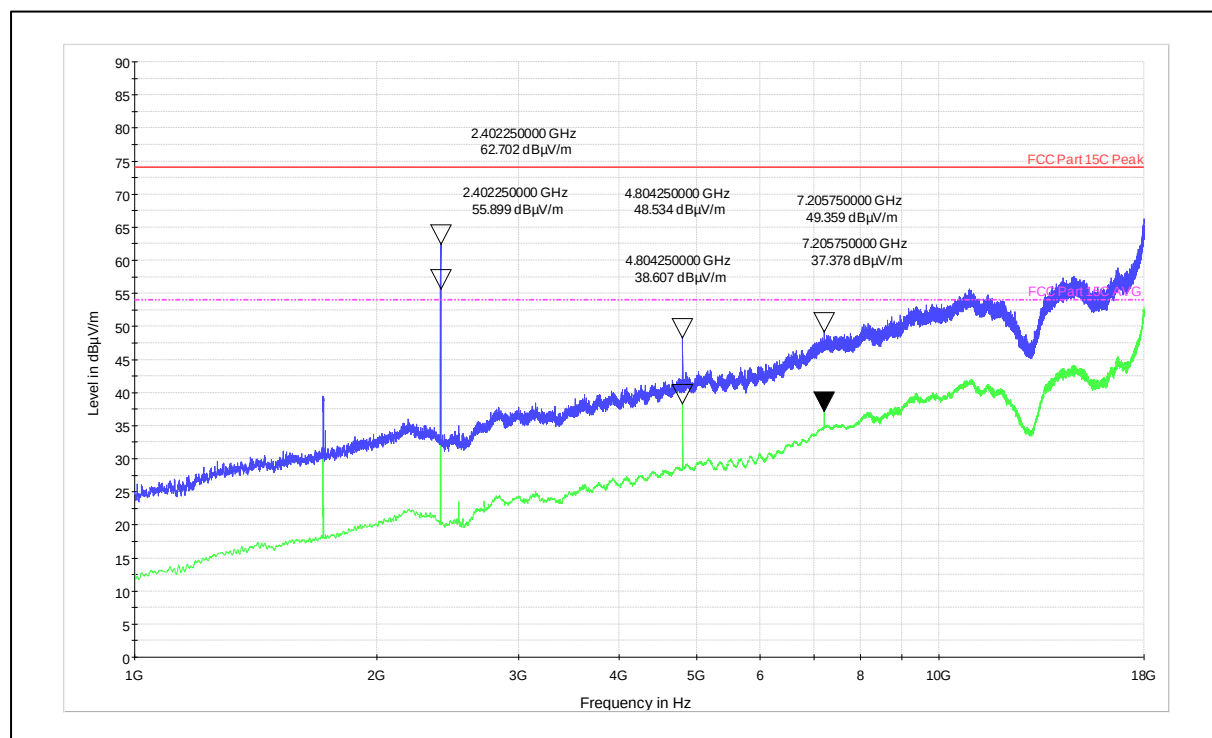
Channel Frequency: 2402MHz

Polarization: Horizontal



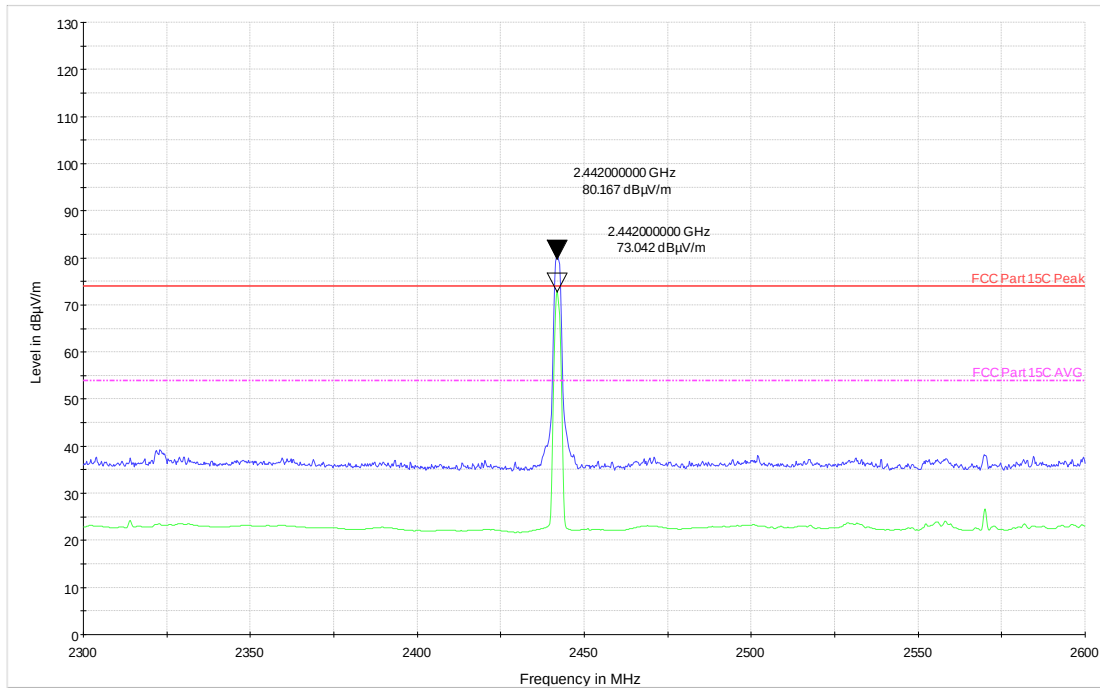
Frequency Range: 1GHz – 18GHz

Polarization: Vertical



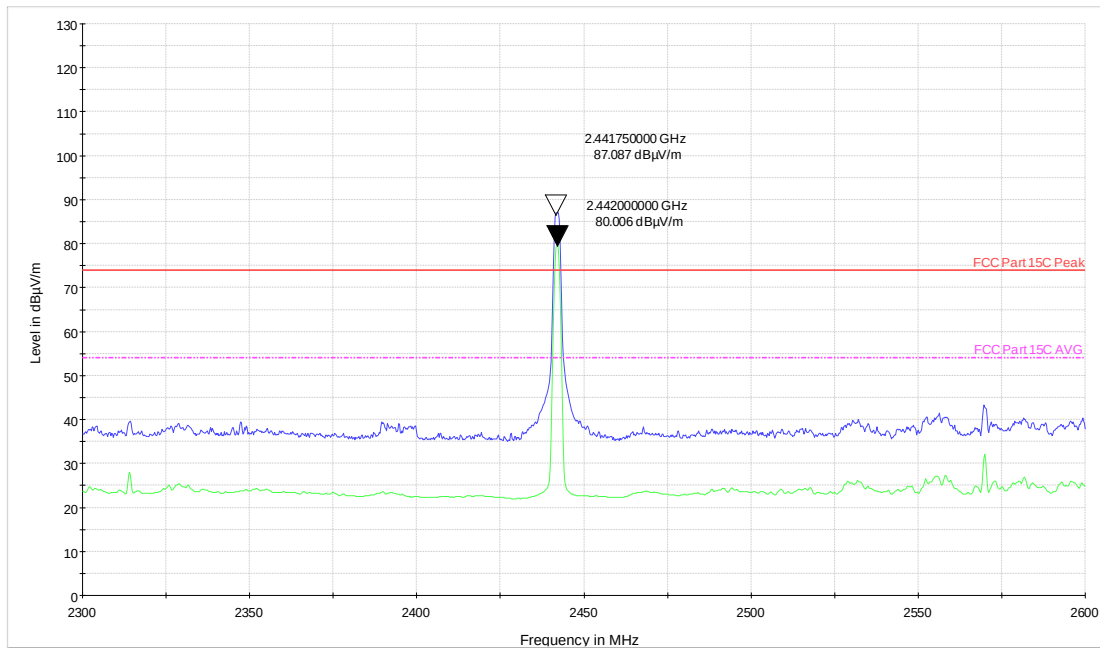
Frequency Range: 1GHz – 18GHz

Polarization: Horizontal



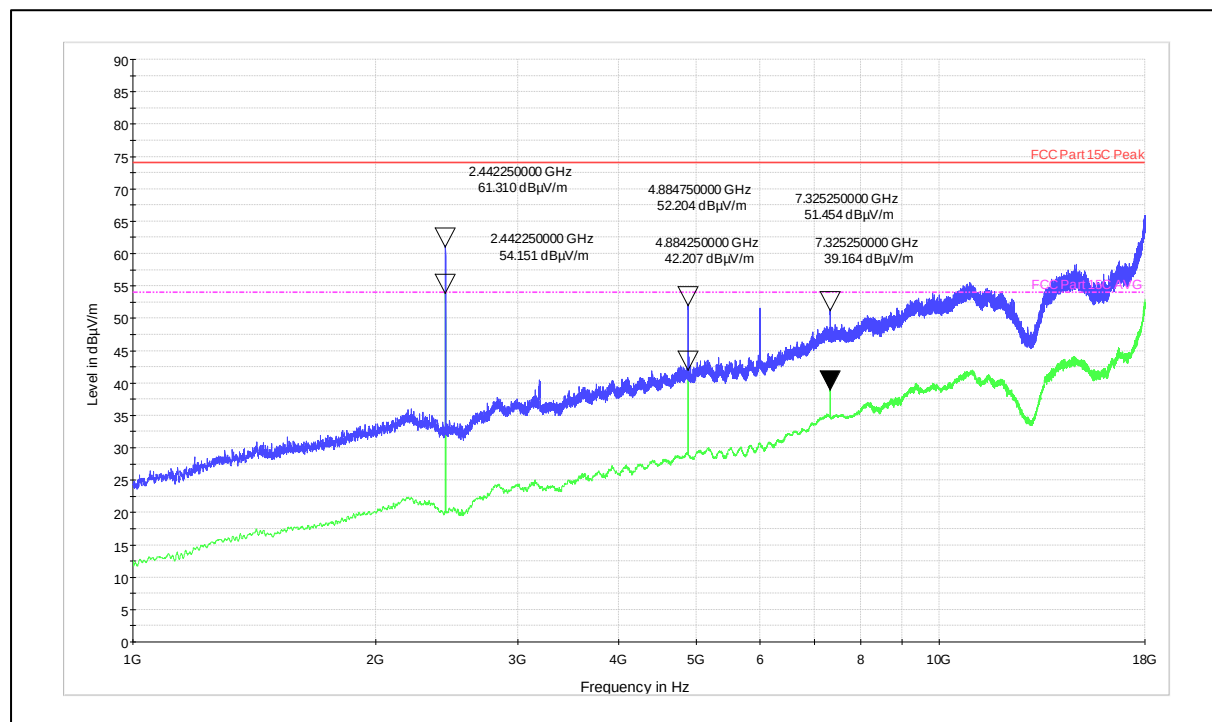
Channel Frequency: 2442MHz

Polarization: Vertical



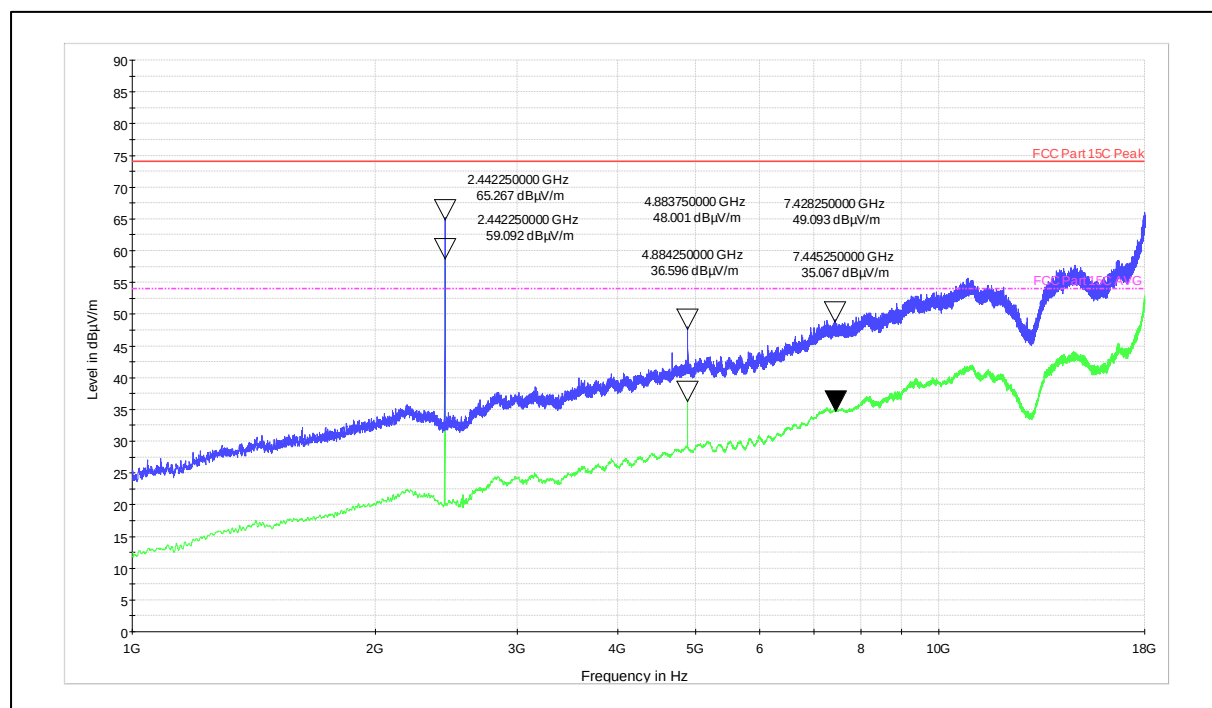
Channel Frequency: 2442MHz

Polarization: Vertical



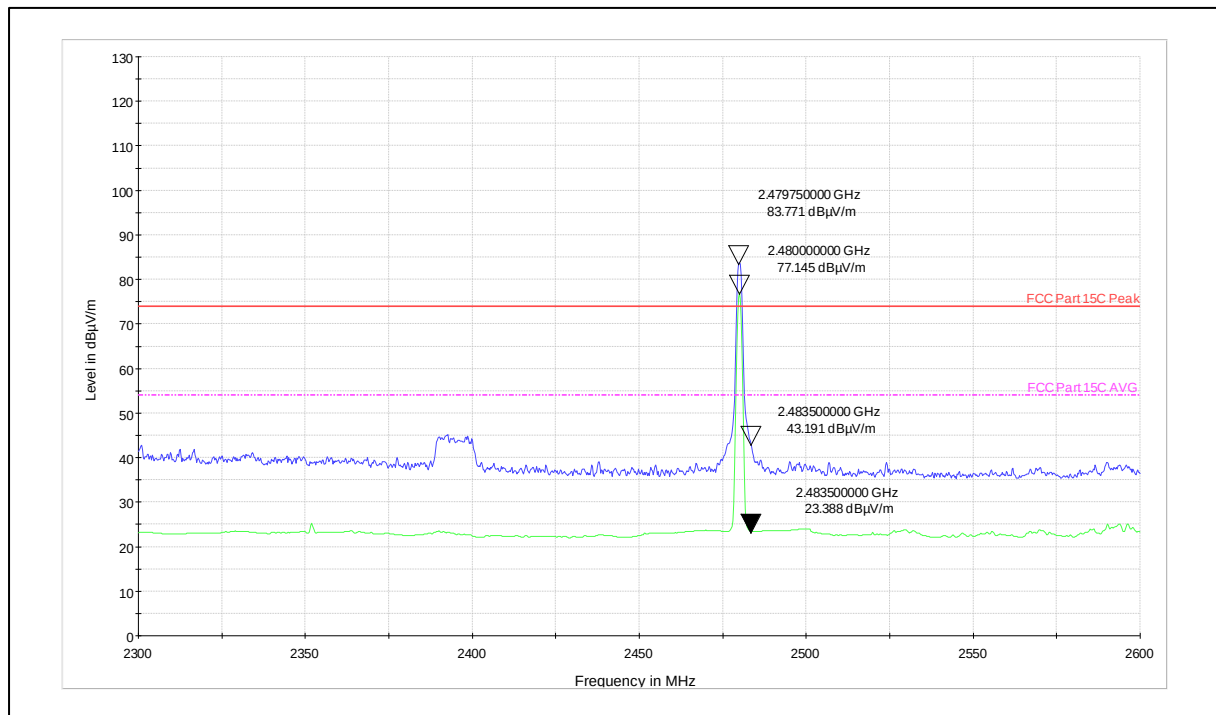
Frequency Range: 1GHz – 18GHz

Polarization: Vertical



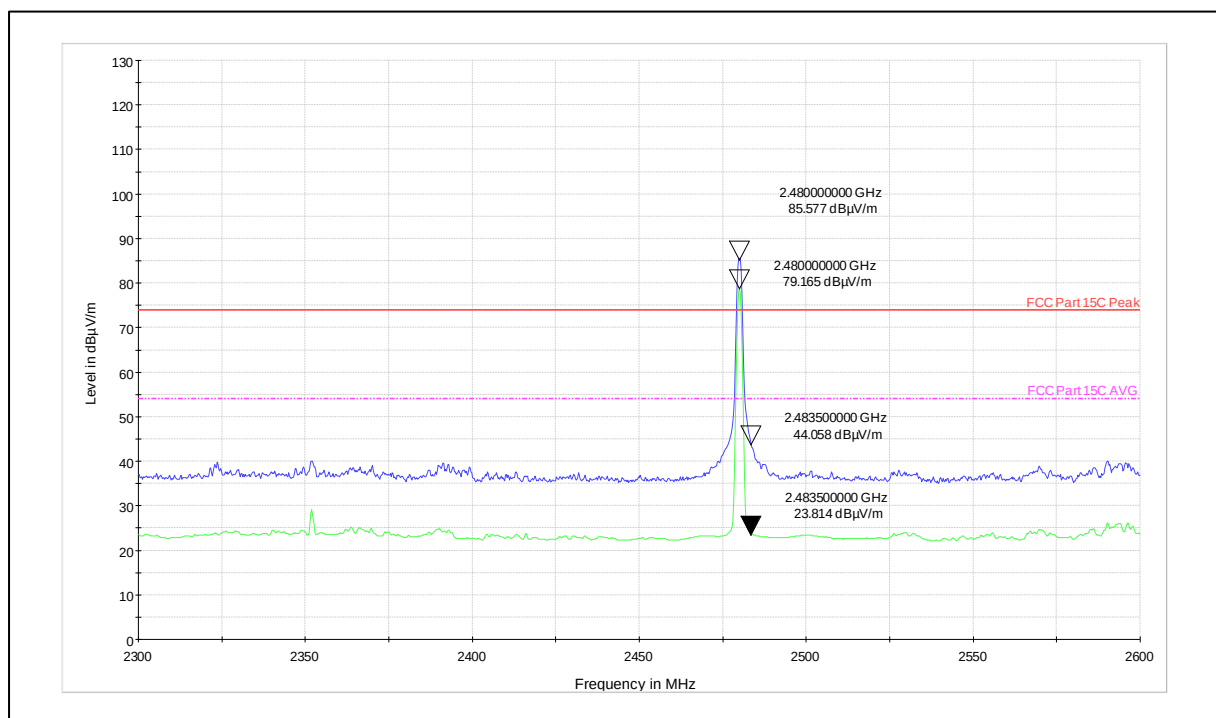
Frequency Range: 1GHz – 18GHz

Polarization: Horizontal



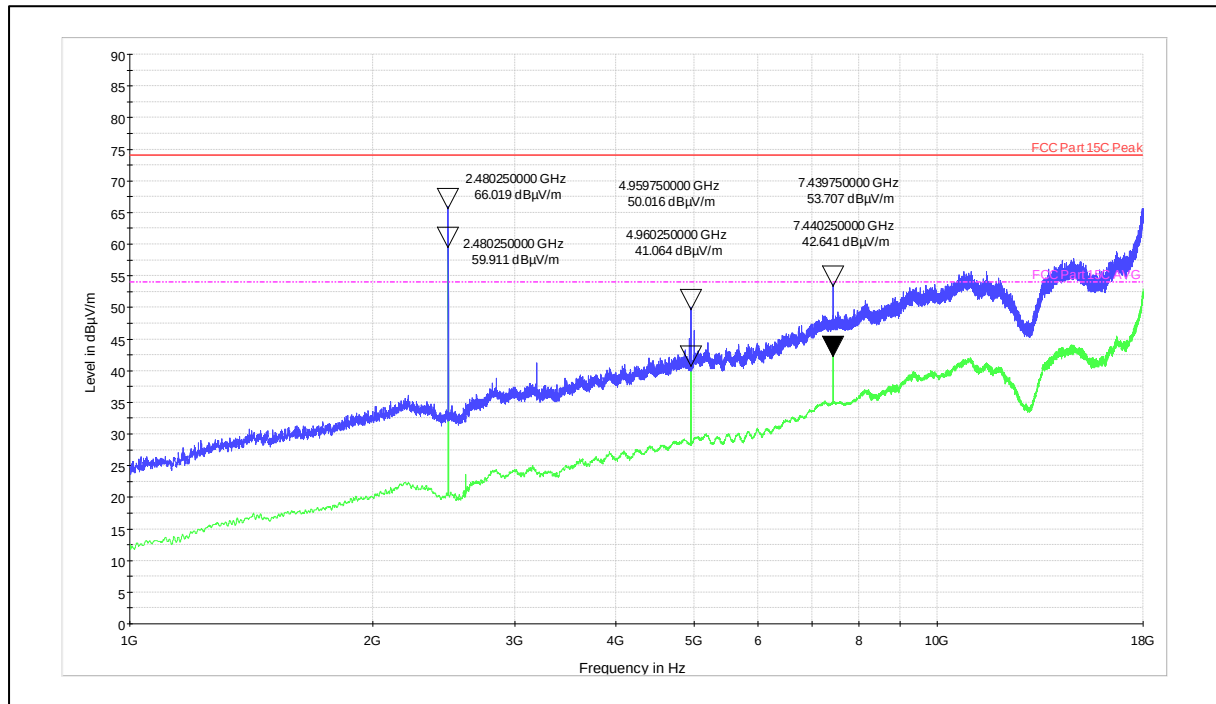
Channel Frequency: 2480MHz

Polarization: Vertical



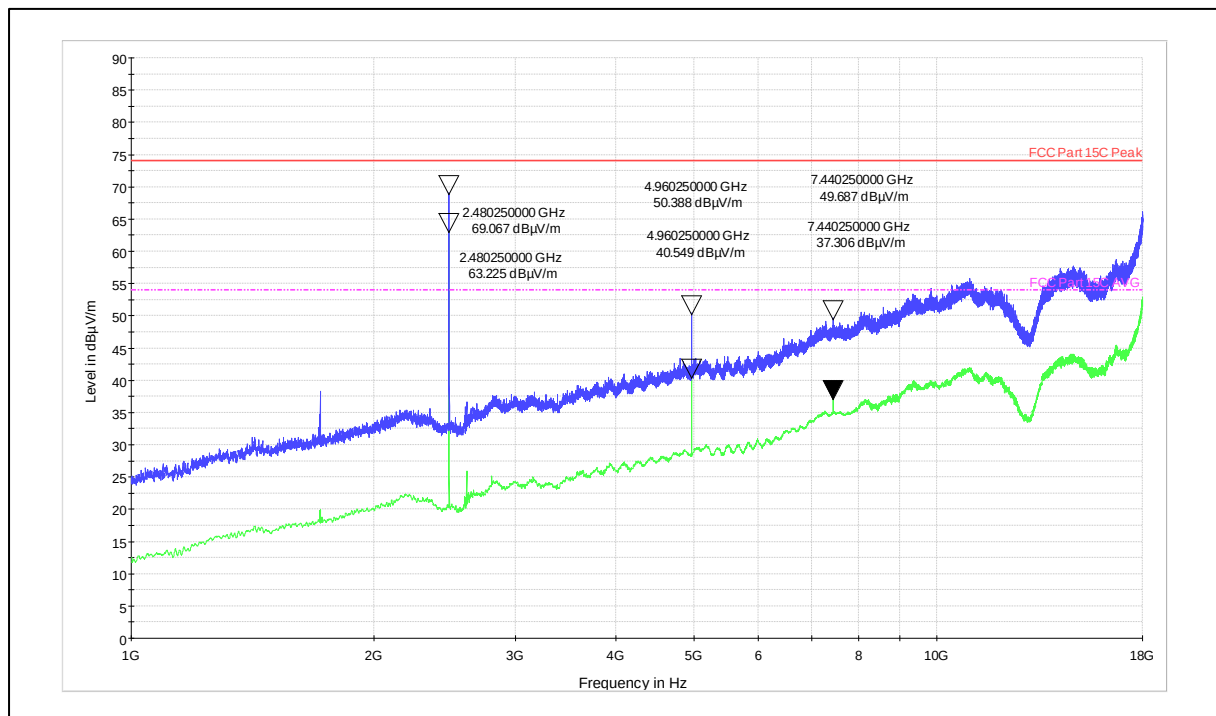
Channel Frequency: 2480MHz

Polarization: Horizontal



Frequency Range: 1GHz – 18GHz

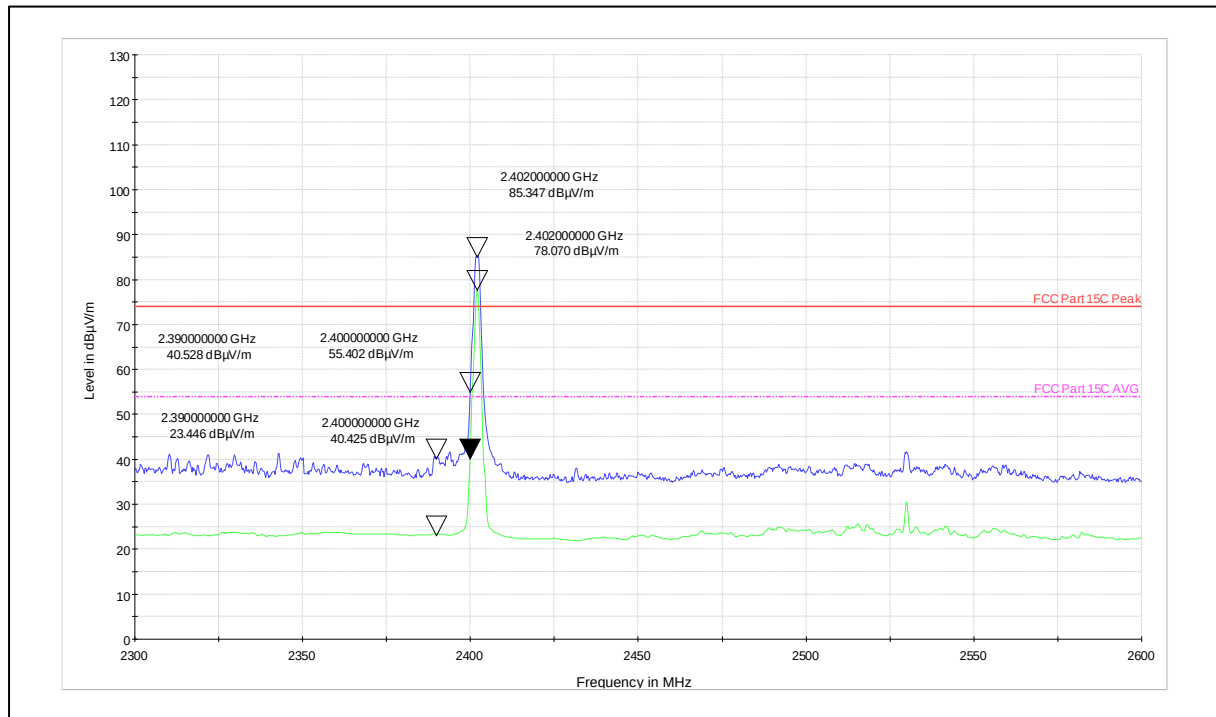
Polarization: Vertical



Frequency Range: 1GHz – 18GHz

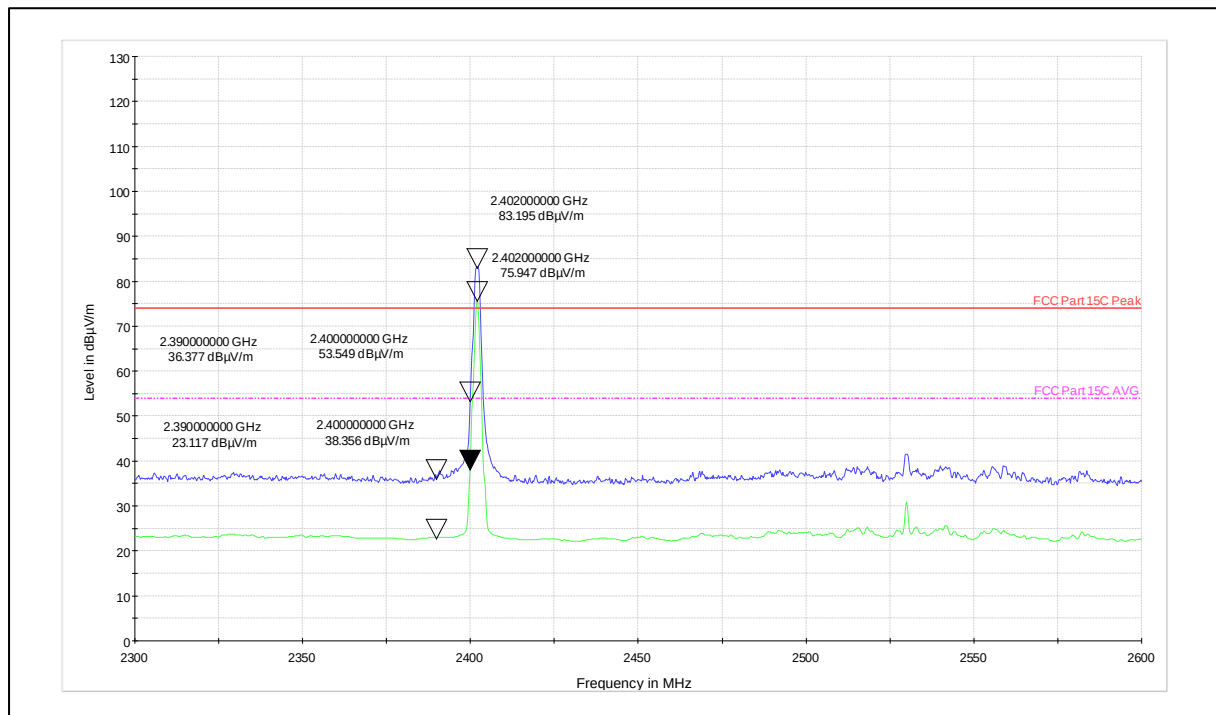
Polarization: Horizontal

Data rate: 2Mbps



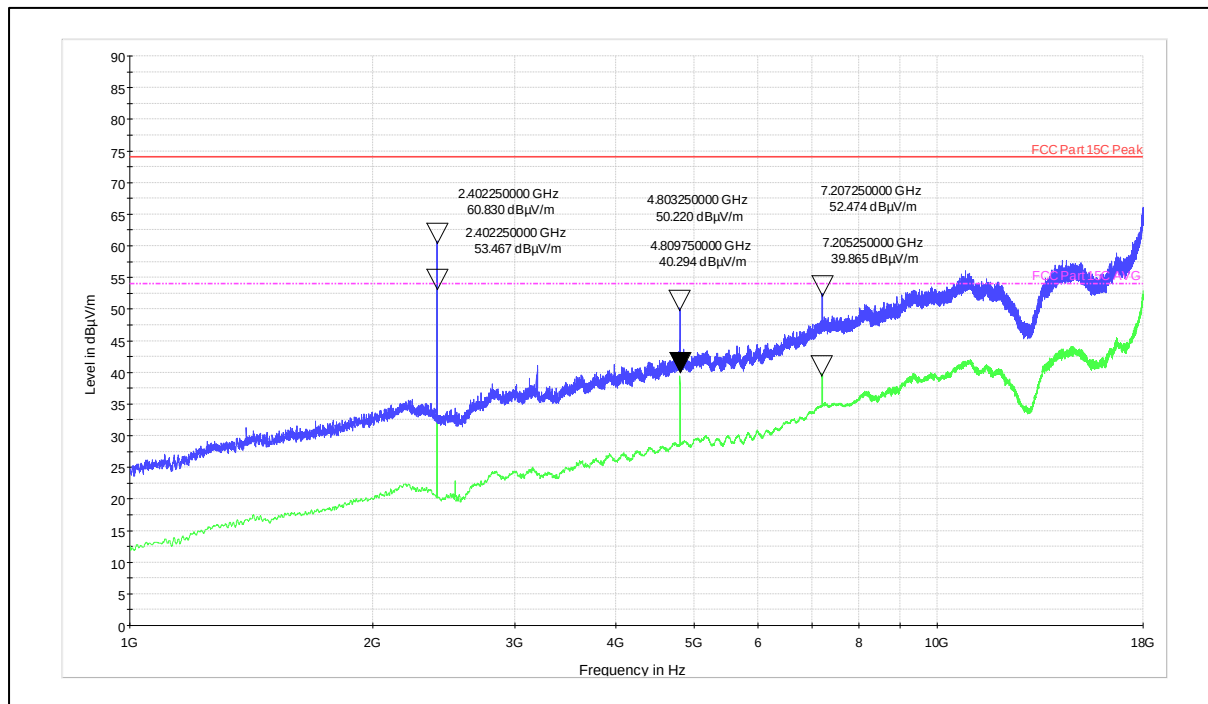
Channel Frequency: 2402MHz

Polarization: Vertical



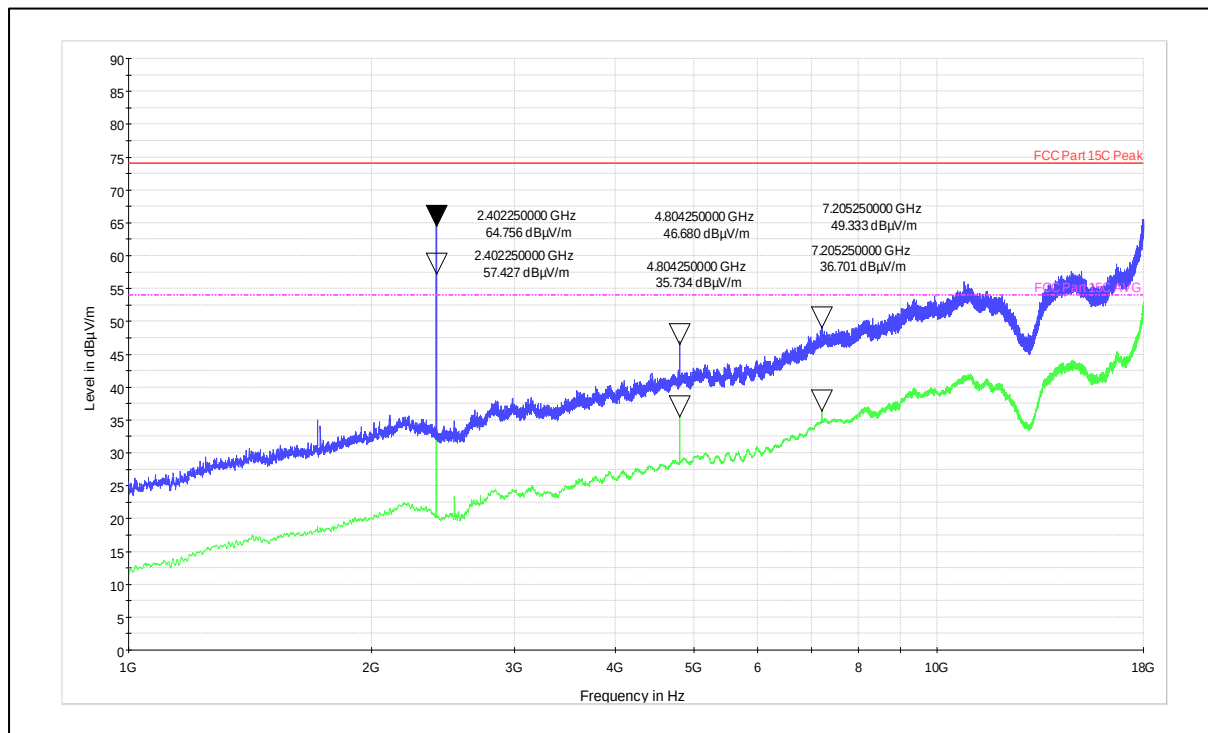
Channel Frequency: 2402MHz

Polarization: Horizontal



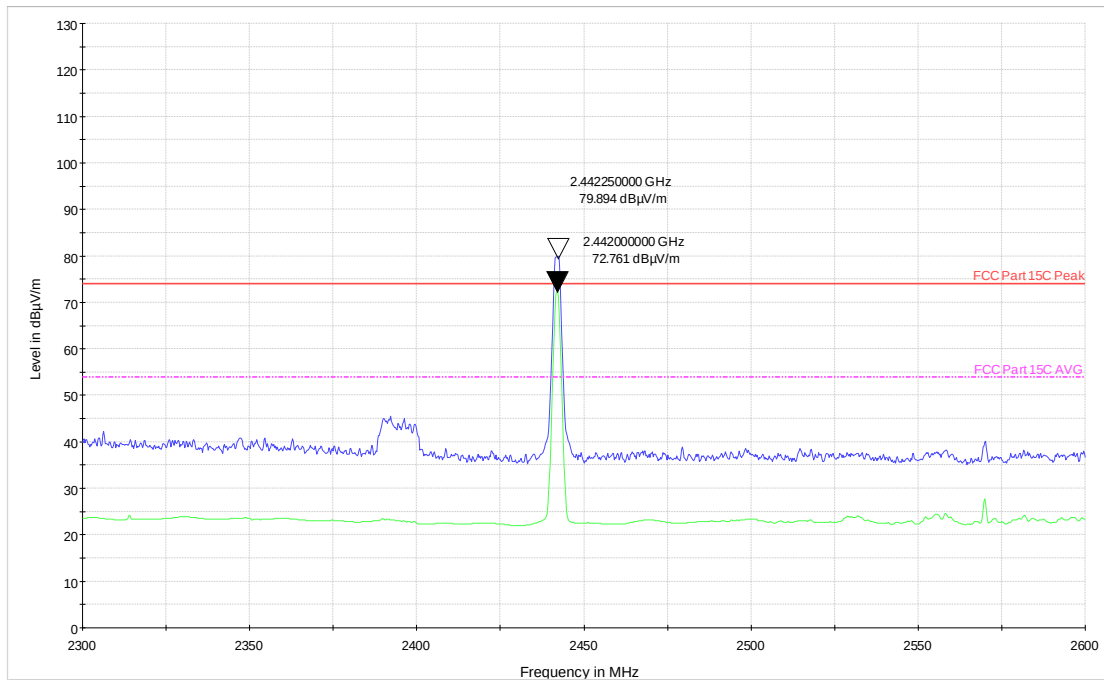
Frequency Range: 1GHz – 18GHz

Polarization: Vertical



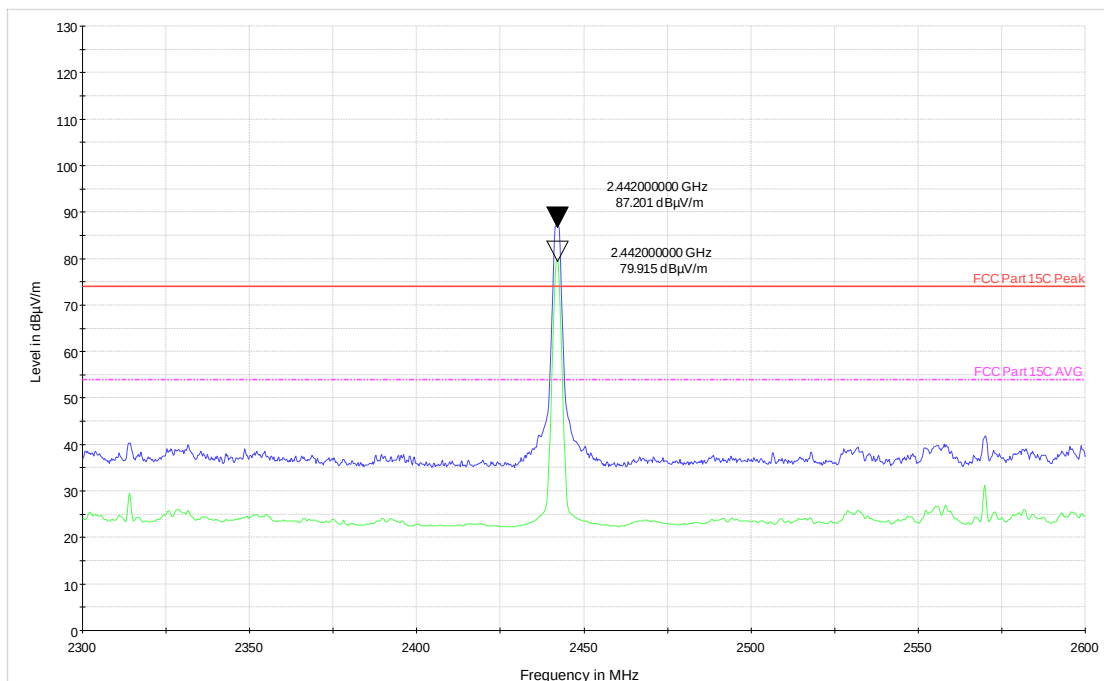
Frequency Range: 1GHz – 18GHz

Polarization: Horizontal



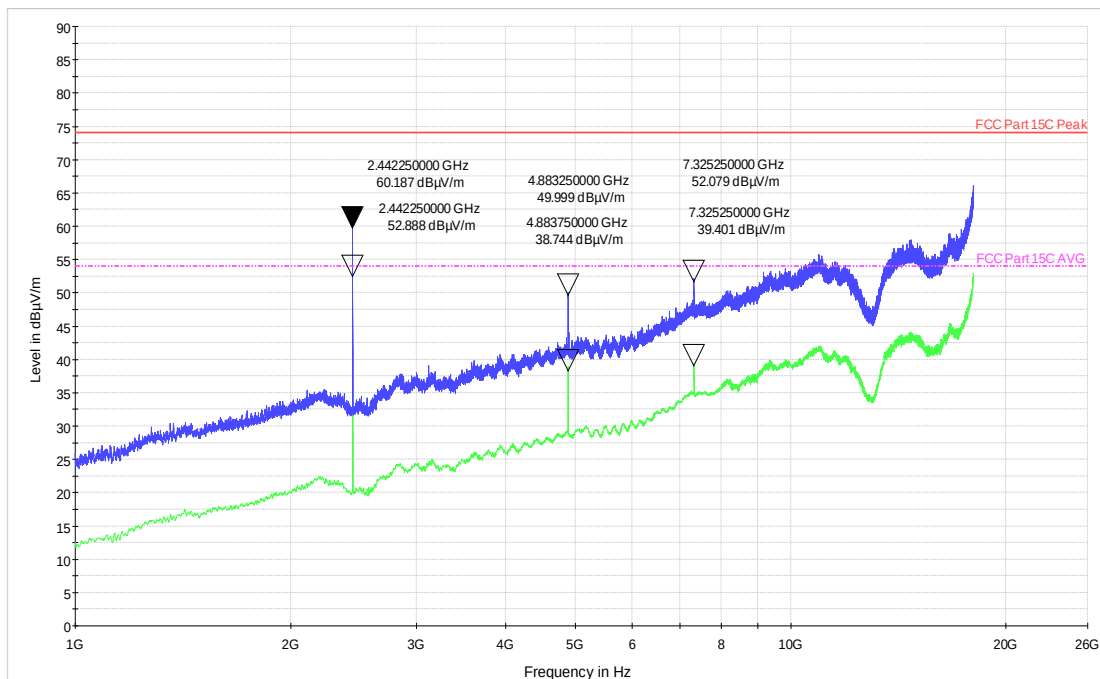
Channel Frequency: 2442MHz

Polarization: Vertical



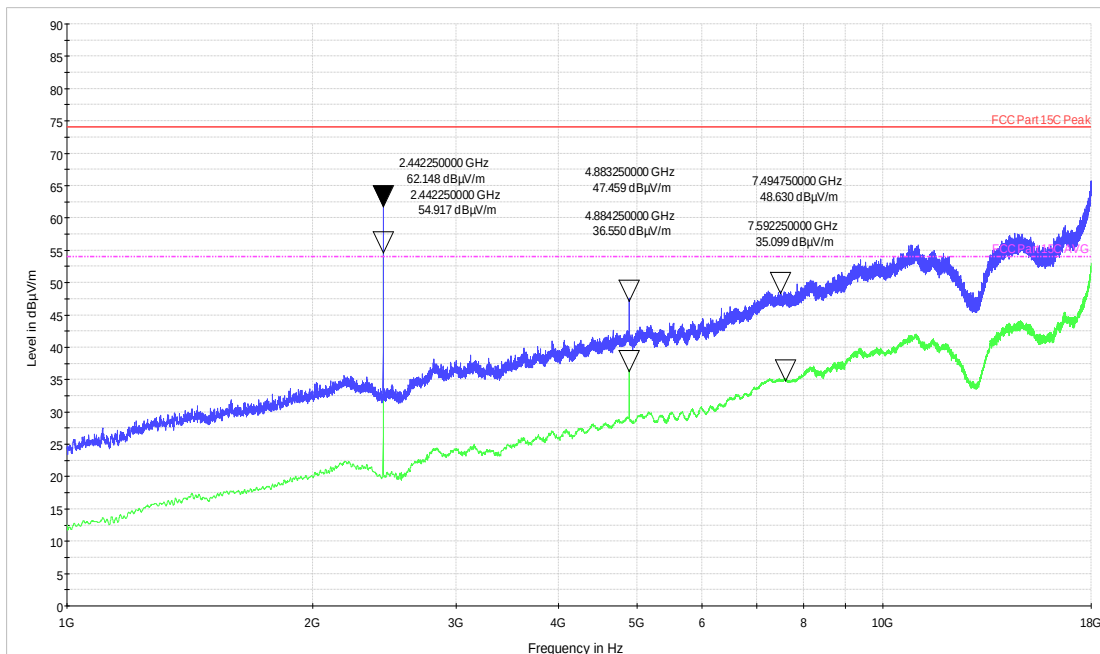
Channel Frequency: 2442MHz

Polarization: Horizontal



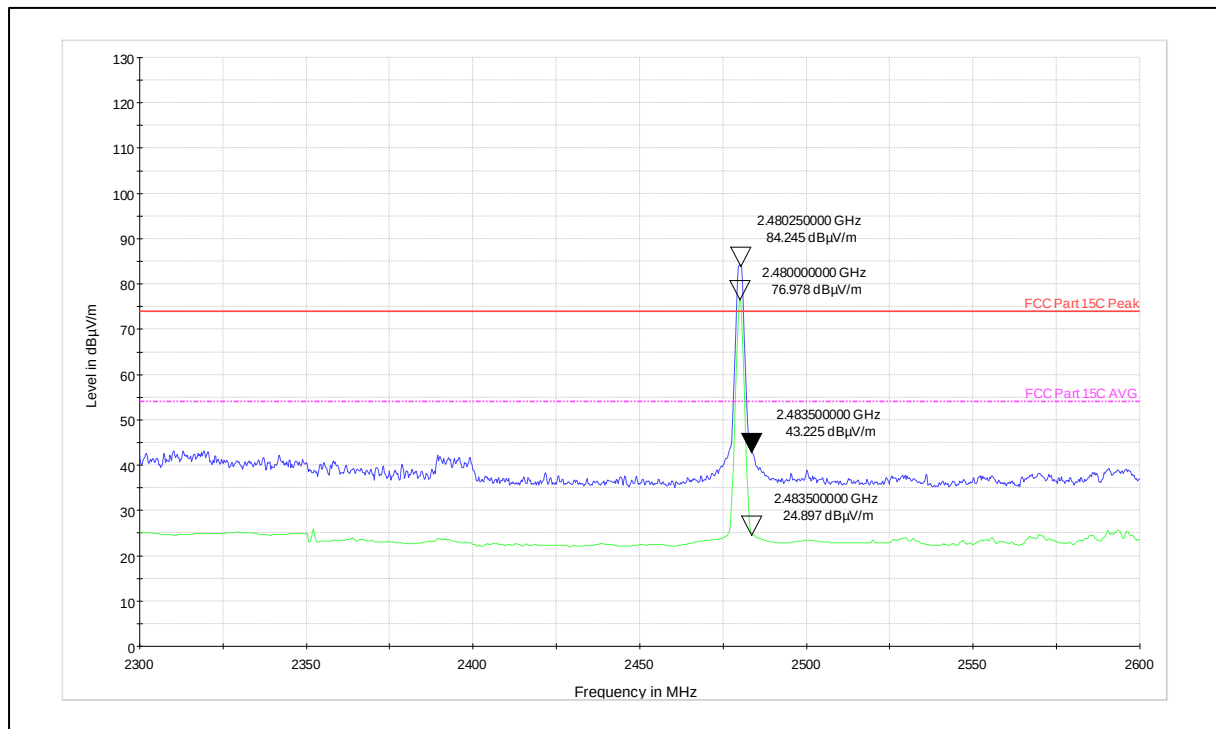
Frequency Range: 1GHz – 18GHz

Polarization: Vertical



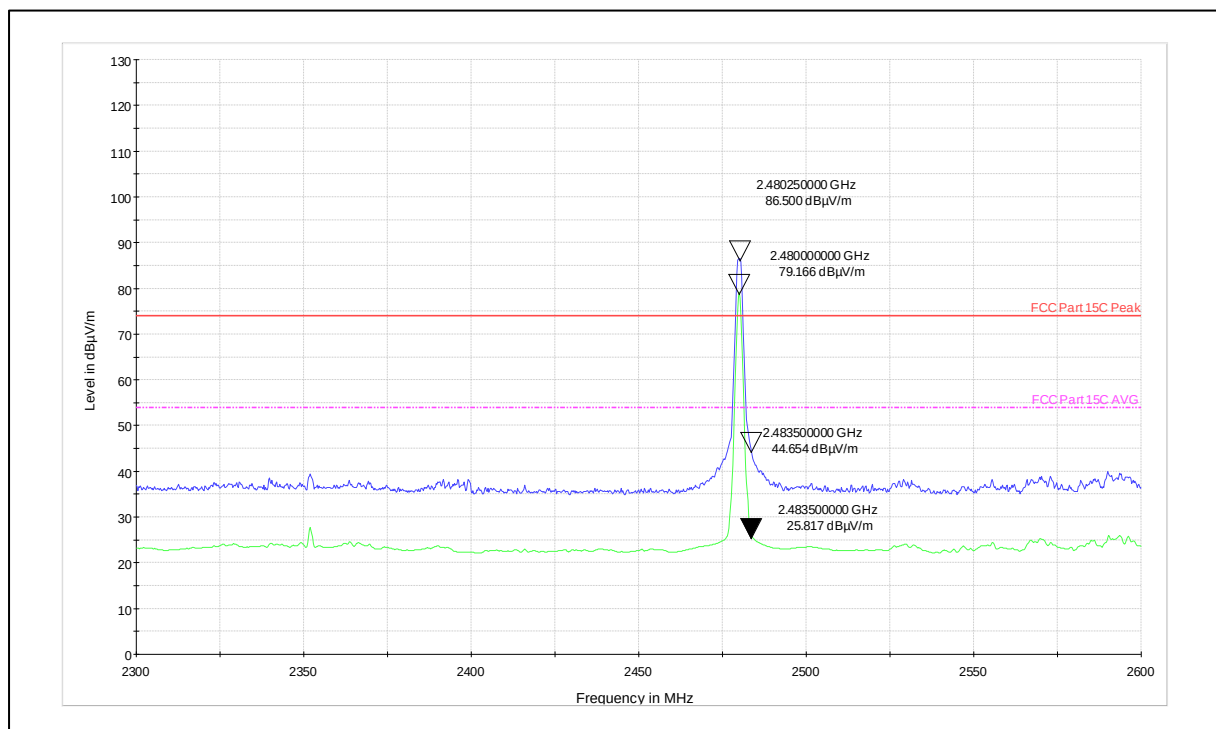
Frequency Range: 1GHz – 18GHz

Polarization: Horizontal



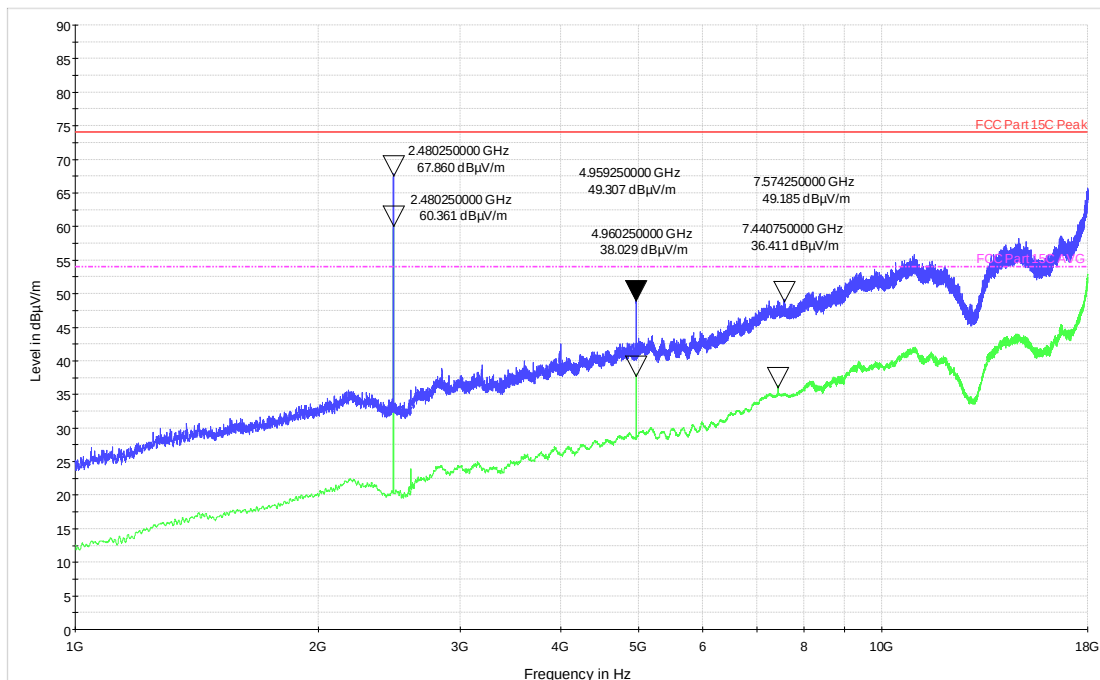
Channel Frequency: 2480MHz

Polarization: Vertical



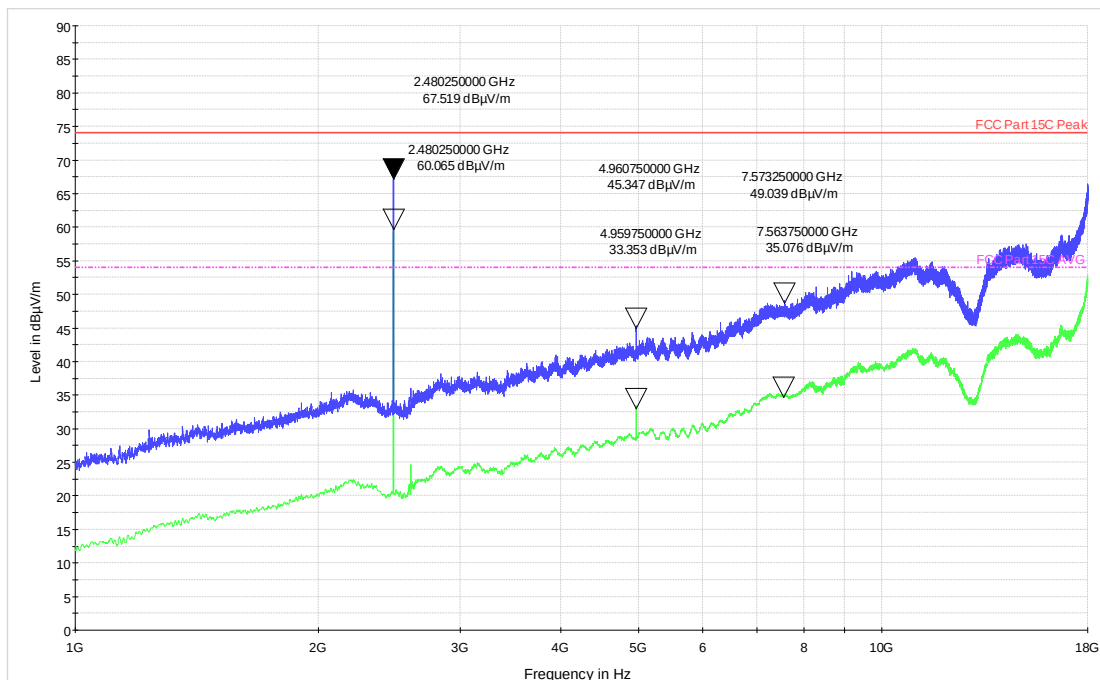
Channel Frequency: 2480MHz

Polarization: Horizontal



Frequency Range: 1GHz – 18GHz

Polarization: Vertical



Frequency Range: 1GHz – 18GHz

Polarization: Horizontal

No emissions found above 18GHz

Prüfbericht - Nr.:
Test Report No.:

ULR-TC568822300000001F

Seite 42 von 45
Page 42 of 45

7 Conducted Spurious Emission Test on AC Power Line

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

***Note: The product has tested with AC to DC adapter**

Limits of section 15.207

Frequency of emission (MHz)	Conducted limit (dBµV)	
	Quasi-peak (dBµV)	Average (dBµV)
0.15-0.5	66-56*	56-46*
0.5-5	56	46
5-30	60	50

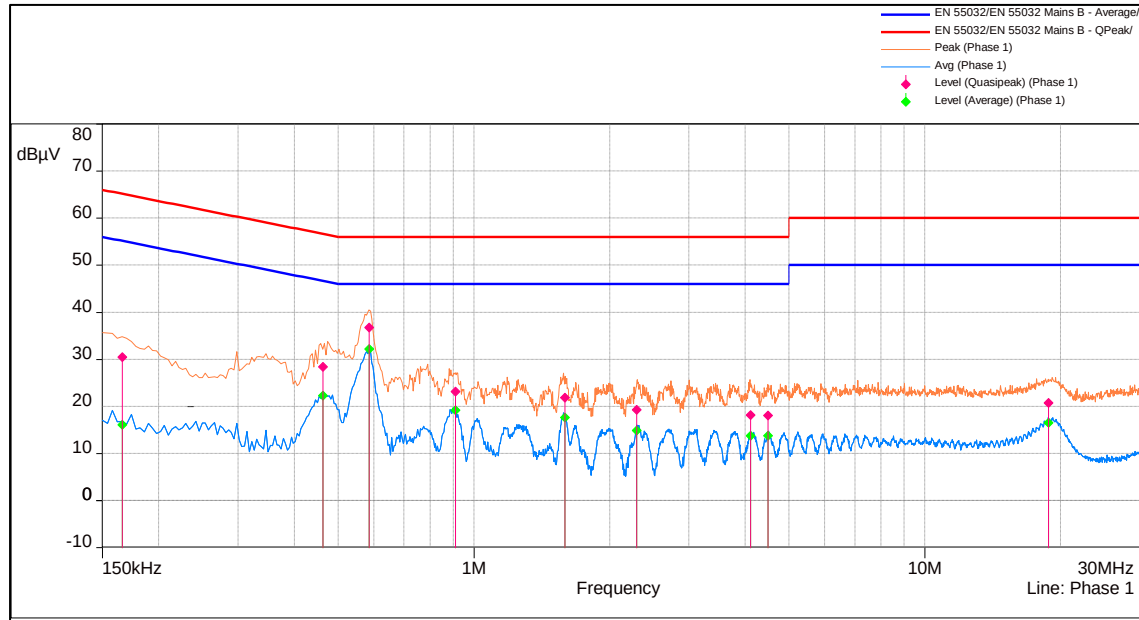
* Decreases with the logarithm of the frequency

Test Conditions:

Normal Temperature = +24°C Voltage (V norm) = 110V AC (Through AC to DC Adapter) Relative Humidity = 64%

Test Results:

110V 60Hz Line



Quasipeak					
Frequency (MHz)	Correction (dB)	Level (dBμV)	Limit (dBμV)	Margin (dB)	Comments
0.58555	20.24	36.74	56	-19.26	Pass
0.4629	20.08	28.45	56.66	-28.2	Pass
0.91015	20.5	23.13	56	-32.87	Pass
1.591	20.46	21.9	56	-34.1	Pass
0.1675	20.22	30.48	65.16	-34.68	Pass
2.293	20.5	19.3	56	-36.7	Pass
4.10575	20.54	18.16	56	-37.84	Pass
4.48795	20.54	18.09	56	-37.91	Pass
18.8005	20.27	20.77	60	-39.23	Pass

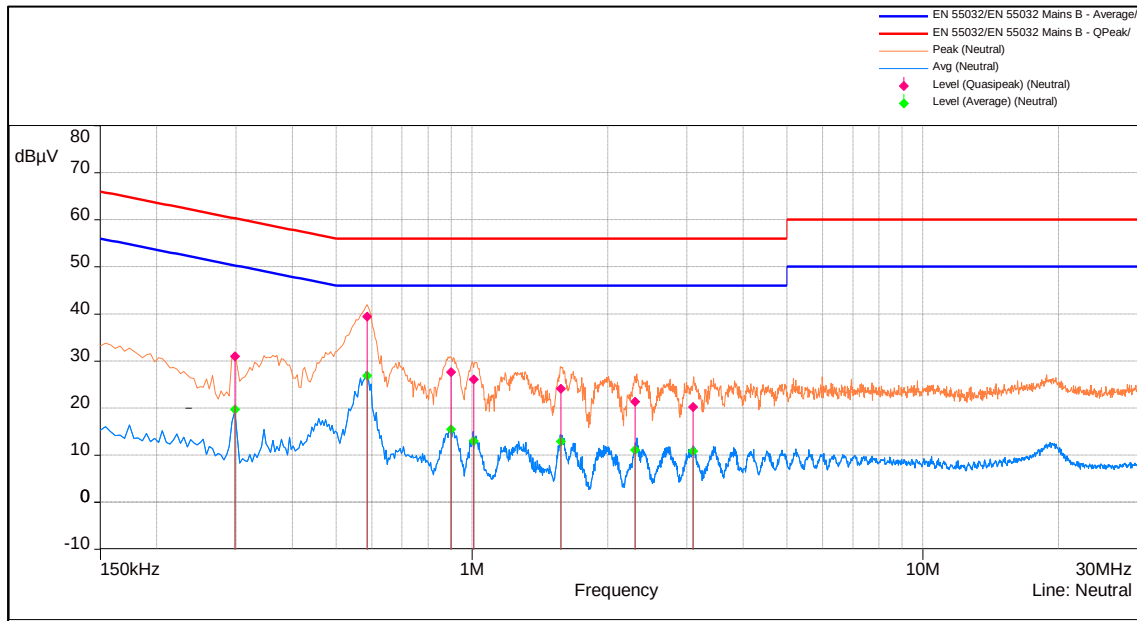
Average					
Frequency (MHz)	Correction (dB)	Level (dBμV)	Limit (dBμV)	Margin (dB)	Comments
0.58555	20.24	32.24	46	-13.76	Pass
0.4629	20.08	22.27	46.66	-24.38	Pass
0.91015	20.5	19.24	46	-26.76	Pass
1.591	20.46	17.68	46	-28.32	Pass
2.293	20.22	14.92	46	-31.08	Pass
4.10575	20.5	13.81	46	-32.19	Pass
4.48795	20.54	13.81	46	-32.19	Pass
18.8005	20.54	16.55	50	-33.45	Pass
0.1675	20.27	16.14	55.16	-39.02	Pass

Prüfbericht - Nr.:
Test Report No.:

ULR-TC568822300000001F

Seite 44 von 45
Page 44 of 45

110V 60Hz Neutral



Quasipeak					
Frequency (MHz)	Correction (dB)	Level (dBµV)	Limit (dBµV)	Margin (dB)	Comments
0.58695	20.39	39.42	56	-16.58	Pass
0.8998	20.62	27.64	56	-28.36	Pass
0.2971	19.96	31.02	60.3	-29.28	Pass
1.0114	20.49	26.1	56	-29.9	Pass
1.5745	20.54	24.07	56	-31.93	Pass
2.3004	20.58	21.36	56	-34.64	Pass
3.0936	20.61	20.2	56	-35.8	Pass

Average					
Frequency (MHz)	Correction (dB)	Level (dBµV)	Limit (dBµV)	Margin (dB)	Comments
0.2971	19.96	19.68	50.3	-30.62	Pass
0.58695	20.39	26.84	46	-19.16	Pass
0.8998	20.62	15.49	46	-30.51	Pass
1.0114	20.49	13.01	46	-32.99	Pass
1.5745	20.54	12.94	46	-33.06	Pass
2.3004	20.58	11.09	46	-34.91	Pass
3.0936	20.61	10.83	46	-35.17	Pass

Prüfbericht - Nr.:
Test Report No.:

ULR-TC568822300000001F

Seite 45 von 45
Page 45 of 45

8 LIST OF TABLES

Table 1: List of test and measurement instruments	6
Table 2: Instrument application Software versions	6
Table 3: Ratings and System Details as declared by Client*	7
Table 4: Measurement Uncertainty	8
Table 5: List of BLE Center frequencies	9
Table 6: Transmitter limits for Radiated emission	17

9 LIST OF FIGURES

Figure 1: Frequency Range 9 kHz- 30 MHz	11
Figure 2: Frequency Range 30 MHz – 200 MHz	11
Figure 3: Frequency Range 200 MHz - 1GHz	12
Figure 4: Frequency Range above 1 GHz	12

*****END OF TEST REPORT*****