

Prüfbericht-Nr.: <i>Test report no.:</i>	ULR-TC568820300000018F	Auftrags-Nr.: <i>Order no.:</i>	166232885 0030	Seite 1 von 38 Page 1 of 38
Kunden-Referenz-Nr.: <i>Client reference no.:</i>	NA	Auftragsdatum: <i>Order date:</i>	2020-02-10	
Auftraggeber: <i>Client:</i>	Adyton LLC 550 LOCKPORT RD Rochester Hills 48307 Michigan United states			
Prüfgegenstand: <i>Test item:</i>	Pythia			
Bezeichnung / Serien -Nr.: <i>Identification / Serial no.:</i>	PY-M1.0-0001 PY-M1.0-0002			
Auftrags-Inhalt: <i>Order content:</i>	Testing & issue of test report and FCC Grant Certificate			
Prüfgrundlage: <i>Test specification:</i>	FCC Part 15 Subpart C 15.247, 15.207, ANSI C63.10-2013			
Wareneingangsdatum: <i>Date of sample receipt:</i>	2020-02-17			
Prüfmuster-Nr.: <i>Test sample no.:</i>	A001064342-001 A001064342-002			
Prüfzeitraum: <i>Testing period:</i>	2020-02-17 - 2020-05-19			
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, Electronic City Phase I, Bangalore – 560100, India			
Prüfergebnis*: <i>Test result*:</i>	Pass			
geprüft von: <i>tested by:</i>	genehmigt von: <i>authorized by:</i>			
Datum: <i>Date:</i>	2020-02-17	Ausstellatum: <i>Issue date:</i>	10.06.2020	
Stellung / Position:	Rajesh M Gowda Engineer	Stellung / Position:	Mahammadgouse Kaladagi Assistant Manager	
Sonstiges / Other:	FCC ID :2AVV5-PF24V1			
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>				

Prüfbericht - Nr.:
Test Report No.:

ULR-TC568820300000018F

Seite 2 von 38
Page 2 of 38

TEST SUMMARY

Test Item	FCC Clause	Remarks
Maximum conducted (average) output power	FCC 15.247(b)(3)	Pass
Maximum Power Spectral Density	FCC 15.247(e)	N/T
DTS Bandwidth	FCC 15.247(a) (2)	N/T
Emissions in non-restricted frequency bands	FCC 15.247(d)	N/T
Spurious Radiated Emissions and Restricted Bands of Operation	FCC 15.209 / FCC 15.205	Pass
Conducted Emissions on a.c Power Lines	FCC 15.207	N/T

Product Category: Electronics Testing
Test Discipline: EMC Test Facility

Note:

1. *N/T: Not tested – These test cases are not tested, the product uses certified RF module ESP32-WROVER-B from ESPRESSIF SYSTEMS (SHANGHAI) CO., LTD, with **FCC ID: 2AC7Z-ESP32WROVERB**
2. This product contains Wi-Fi 2.4 GHz and Bluetooth module since client is not using Bluetooth module it is completely disabled.

Prüfbericht - Nr.:
Test Report No.:

ULR-TC568820300000018F

Seite 3 von 38
Page 3 of 38

REVISION HISTORY OF THIS REPORT

Report Number	Version	Description	Issue date
ULR-TC568820300000018F	01	Initial issue of report	10.06.2020

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	Test modes – data rates and modulations	9
4.6	List of Frequencies and Frequency bands.....	9
4.7	Report references.....	10
5	Operational Description of the product	11
6	Block Diagram of the product	11
7	TEST METHODOLOGY	12
7.1	Radiated Emission Test	12
7.1.1	Test Setup Configuration	12
8	TEST RESULTS	14
8.1	Maximum Average Conducted Output Power.....	14
8.2	Spurious Radiated Emissions & Restricted Bands of Operation	16
9	LIST OF TABLES.....	38

Prüfbericht - Nr.:
Test Report No.:

ULR-TC568820300000018F

Seite 5 von 38
Page 5 of 38

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

Prüfbericht - Nr.:
Test Report No.:

ULR-TC568820300000018F

Seite 6 von 38
Page 6 of 38

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) Private Limited
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	Used for Test Items
EMI Test Receiver	Rohde & Schwarz	ESU 40	100288	4.43 SP3	11.10.2020	Yearly	Radiated Spurious Emission
Biconical Antenna	Schwarzbeck	VHBB91 24+BBA 9106	9124-1208+9106-0525	-	16.01.2021	Yearly	
Log - Periodical Antenna	Schwarzbeck	VUSLP 9111 B	VUSLP91 18A-0733	-	17.01.2021	Yearly	
Horn Antenna	Schwarzbeck	BBHA 9120 D	9120D-1944	-	17.07.2020	Yearly	
Semi Anechoic Chamber	Frankonia	-	-	-	-	-	
Fully Anechoic Chamber	Albatross	-	-	-	-	-	
USB Peak power sensor	Boonton	55006	10231	FW 3.2.4.0	09.01.2021	Yearly	Antenna-Port Conducted test

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

Pythia is designed for mobile workflow learning, performance assurance, and performance improvement in environments where people work with their hands and can't efficiently or safely use cell phone, printed text, computers, or most other performance support and workflow learning aids. Users will verbally request processes, listen to an instruction, perform the instruction, and continue listening & performing steps until the process is completed. The data collected is intended to reveal performance, process, organizational, and other continuous improvement opportunities for businesses.

3.2 Ratings and System Details of Equipment under Test

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

Radio Protocol		Wi-Fi
Frequency Range		2412MHz to 2462MHz
No. of channel		11 (Refer Table 5)
Channel Spacing		5MHz
Maximum Measured Power (e.i.r.p)		16.34 dBm (1Mbps 2462MHz)
Transmitted Power settings		802.11n, MCS7 mode : +14dBm maximum 802.11b Mode: +20dBm maximum 802.11g Mode: +16dBm Maximum
Modulation		802.11b: DSSS (CSK) 802.11g/n: OFDM (BPSK/QPSK/16QAM/64QAM)
Number of antenna		1
Antenna Gain and Type		2.0 dBi and PCB Antenna
Supply Voltage		5 VDC USB Charging, 3.0 VDC to 4.2 VDC Battery Input
Dimensions		95 x 34 x 17 mm (L x W x H)
Environmental Condition	Operating	-10°C to +70°C temperature, Relative Humidity < 70 %
	Storage	0°C to +50°C temperature, Relative Humidity < 60 %

***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	$\pm 5 \%$

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

Test software was used to enable the continuous transmission, changing channels (low/mid/high) and data rates on the EUT for the tests in this report.

Software Version of Pythia Earphone: ESP RFTool_2.3.exe

APP Software Version: ESP32_RF_TEST_BIN_V1.5.0_20190812.bin

Hardware version - Hardware Version: Pythai_V1

4.3 Special Accessories and Auxiliary Equipment

- None

4.4 Countermeasures to achieve EMC Compliance

- None

4.5 Test modes – data rates and modulations

- For radiated spurious emissions only the worst case results and are reported in this report.

4.6 List of Frequencies and Frequency bands

Frequency Band (MHz)	Channel No.	Channel Frequency (MHz)
2400 – 2483.5	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

Protocol: Wi-Fi:

Channel Bandwidth: 20MHz

Channel low: 2412MHz

Channel mid: 2437MHz

Channel High: 2462MHz

Note:

TUV Sample Identification number:	Conducted sample	-	A001064342-002
	Radiated & SAR test Sample	-	A001064342-001

4.7 Report references

Note: Product Pythia 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.

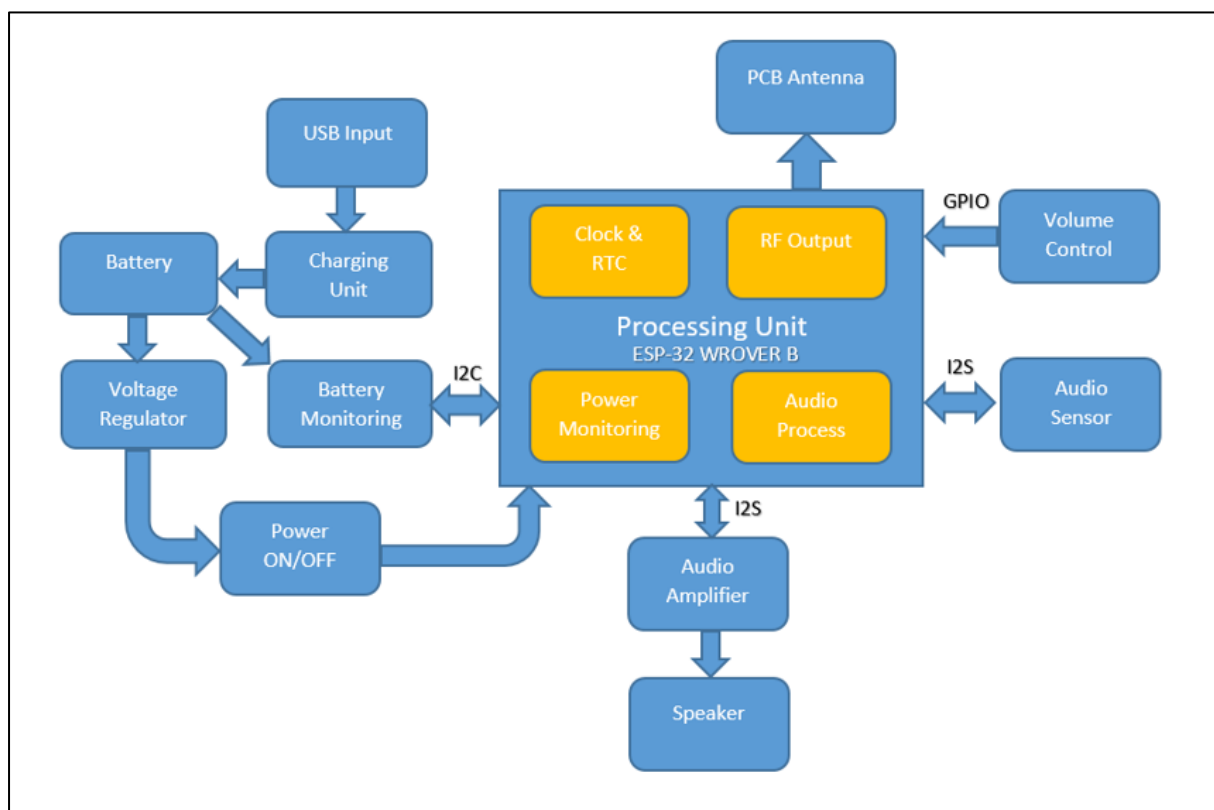
Radio Protocol	Report Number
RF test report for Wi-Fi (2.4GHz) - (This report)	ULR-TC568820300000018F
SAR test report for Wi-Fi (2.4 GHz)	ULR-TC568820300000019F

5 Operational Description of the product

Pythia is a mobile workflow learning and mobile performance assurance system. It verbally delivers step-by-step work instructions on demand and captures worker performance at process step granularity, via cloud database records and a conversational and/or mechanical interface to an 802.11n Wi-Fi earphone.

Operating Pythia requires a cloud database record, a Pythia Wi-Fi earphone, and an 802.11n Wi-Fi network. Upon powering up the earphone, the earphone automatically connects to a pre-configured Wi-Fi network, users verbally request a standard operating procedure (SOP) by title, the request is passed to the cloud, and the record is found. After finding the record, the system consecutively converts text fields to speech, plays them on-the-fly to the earphone, and tracks how long it takes users to advance through each step. Users navigate the system using a verbal wake word, verbal commands, or by pressing a button on the earphone.

6 Block Diagram of the product



7 TEST METHODOLOGY

7.1 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

Note: Field strength (dB μ V/m) = Measured value (dB μ V) +Cable loss (dB) +antenna factor (dB)-preamplifier gain (dB)

7.1.1 Test Setup Configuration

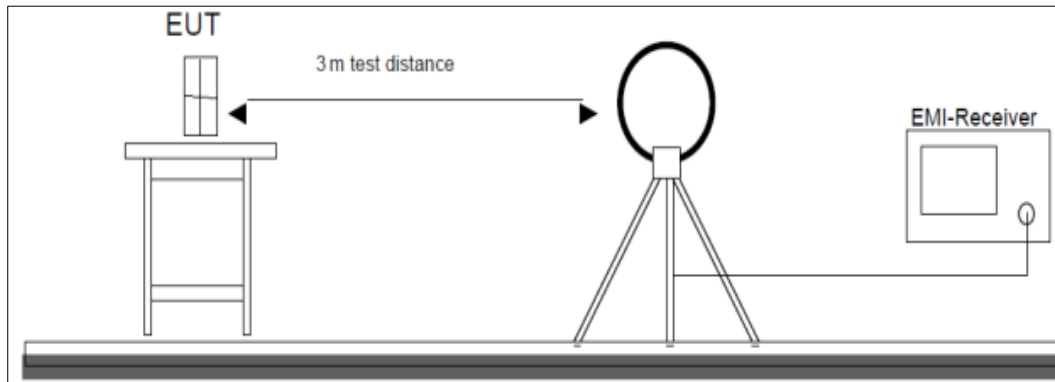


Figure 1: Frequency Range 9 kHz- 30 MHz

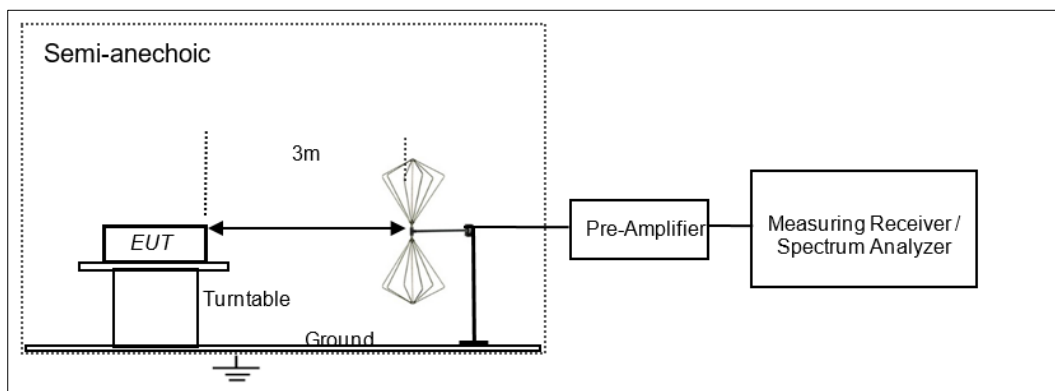


Figure 2: Frequency Range 30 MHz – 200 MHz

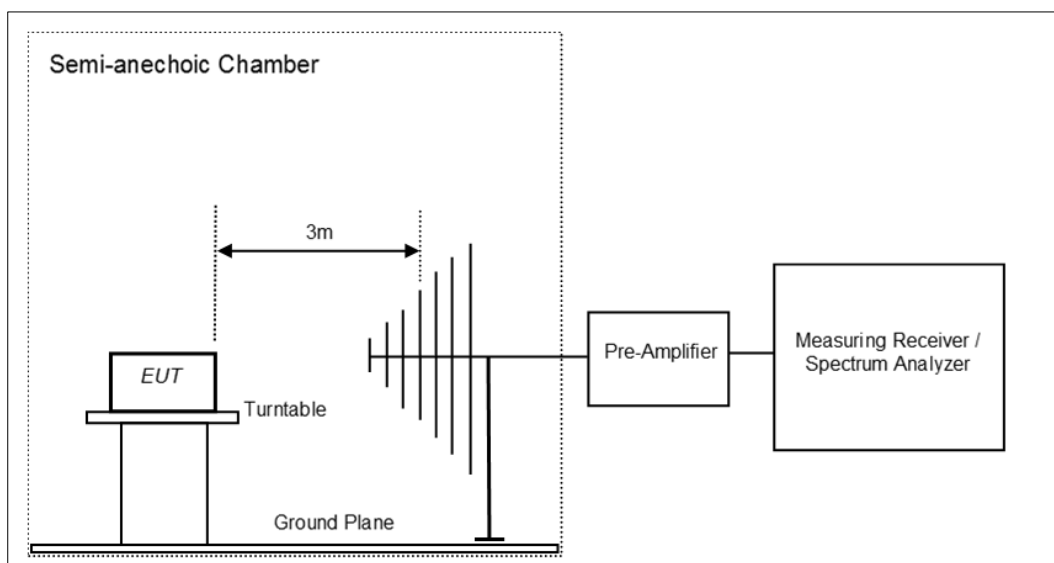


Figure 3: Frequency Range 200 MHz - 1GHz

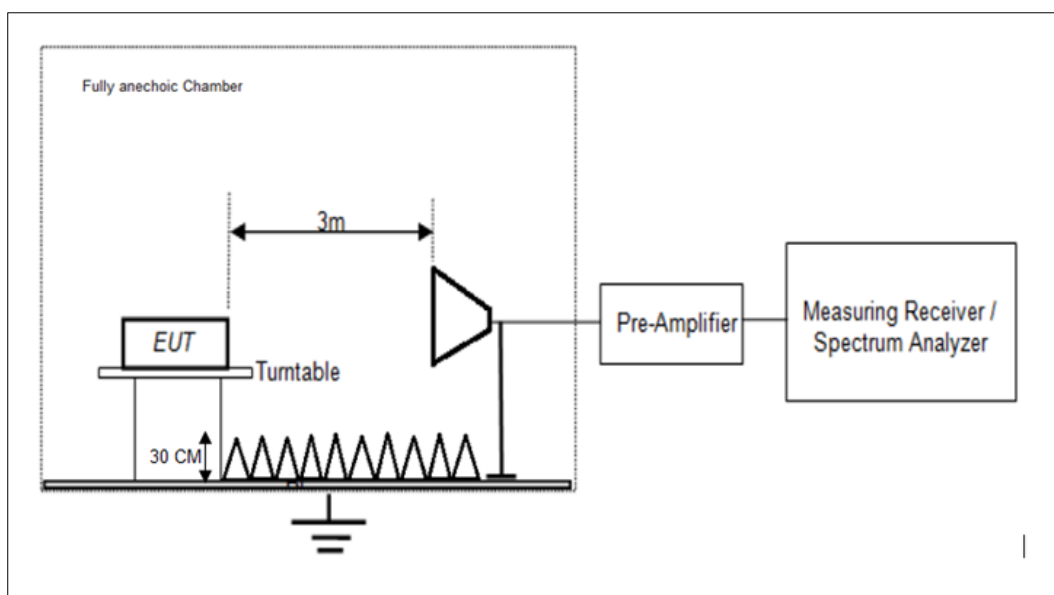


Figure 4: Frequency Range above 1 GHz

Prüfbericht - Nr.:
Test Report No.:

ULR-TC568820300000018F

Seite 14 von 38
Page 14 of 38

8 TEST RESULTS

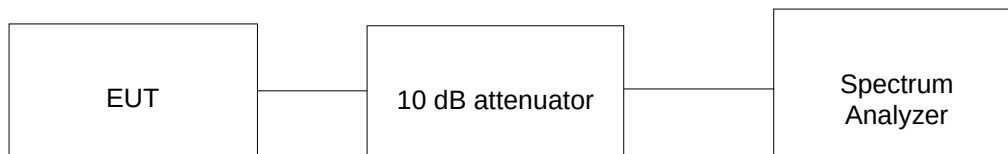
8.1 Maximum Average Conducted Output Power

Result

Pass

Test Specification	FCC part 15 Subpart C 15.247 (b)(3)
Test Method	Subclause 11.9.2.2.4 of ANSI C63.10
Measurement Bandwidth	300 kHz
Detector	Average sample detector
Port of testing	Antenna port
Requirement	Power $\leq$ 1 W (30 dBm)

Test Method



Test Condition

Normal Test Condition:

Normal Temperature = +25 °C Voltage (V norm) = 4.2V Battery Input Relative Humidity = 63.2 %

KDB Guidelines applied:

Measurements were made as per section 8.3.2.2 in KDB 558074 D01 15.247 Measurement Guidance v05r02.

Prüfbericht - Nr.:
Test Report No.:

ULR-TC568820300000018F

Seite 15 von 38
Page 15 of 38

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 (0.6dB)
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
4. Maximum (e.i.r.p) = Maximum Average output power (dBm) + antenna gain (2.00 dBi)

Mode	Data rate (Mbps)	Channel Number	Channel Frequency (MHz)	Maximum Average output power (dBm)
b	1	1	2412	15.75
		6	2437	16.00
		11	2462	16.34
	11	1	2412	15.87
		6	2437	15.97
		11	2462	16.31
g	6	1	2412	14.69
		6	2437	15.01
		11	2462	15.28
	24	1	2412	13.50
		6	2437	13.31
		11	2462	13.72
	54	1	2412	11.39
		6	2437	11.22
		11	2462	11.59
n_20MHz	MCS0	1	2412	15.16
		6	2437	15.24
		11	2462	15.55
	MCS4	1	2412	12.38
		6	2437	12.40
		11	2462	13.10
	MCS7	1	2412	9.47
		6	2437	9.67
		11	2462	10.26

8.2 Spurious Radiated Emissions & Restricted Bands of Operation

Result

Pass

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

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.

Normal Test Condition:

Normal Temperature = +25 °C

Voltage (V norm) = 4.2V Battery Input

Relative Humidity = 63.2 %

Prüfbericht - Nr.:
Test Report No.:

ULR-TC568820300000018F

Seite 17 von 38
Page 17 of 38

Test results:

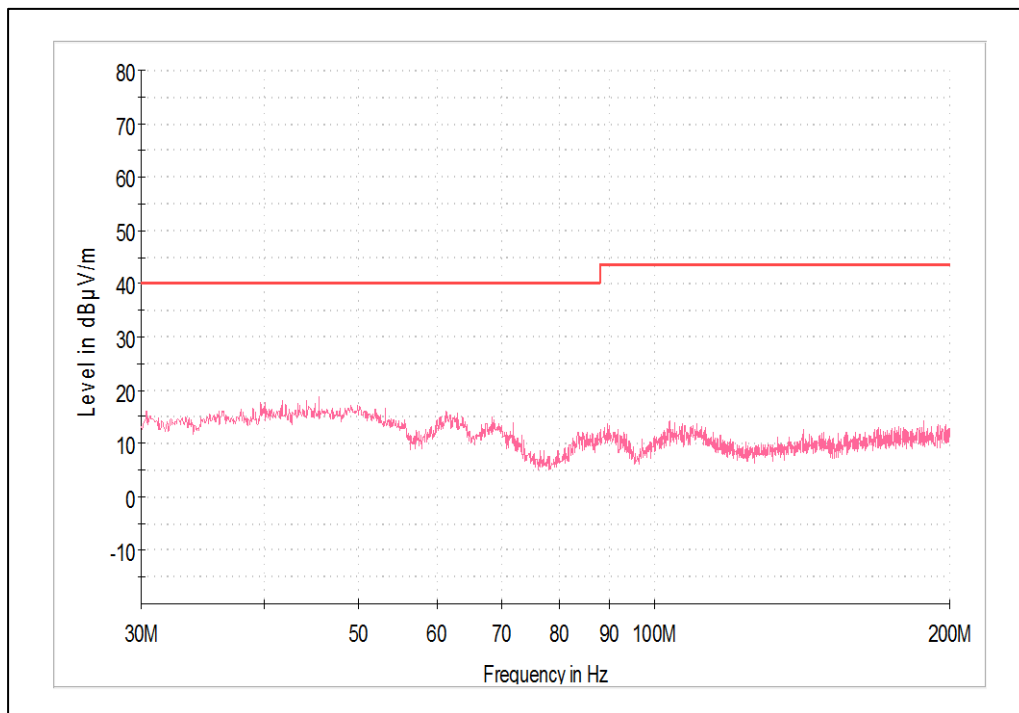
Note: All the losses are included during measurement and final values are mentioned in the test report. Refer TEST METHODOLOGY for more details

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 – 1 GHz

Antenna Polarization	Frequency (MHz)	Quasi Peak (dBμV/m)	Limit (dBμV/m)	Margin (dB)
Vertical	319.98369	21.96	46.00	-24.04
	359.260870	11.12	46.00	-34.88
	480.02173	80.52	46.00	34.52
	640.000000	33.10	46.00	-12.90
Horizontal	319.98369	30.62	46.00	-15.38
	479.96195	23.17	46.00	-22.83
	640.0000	27.41	46.00	-18.59
	880.595238	30.83	46.00	-15.17



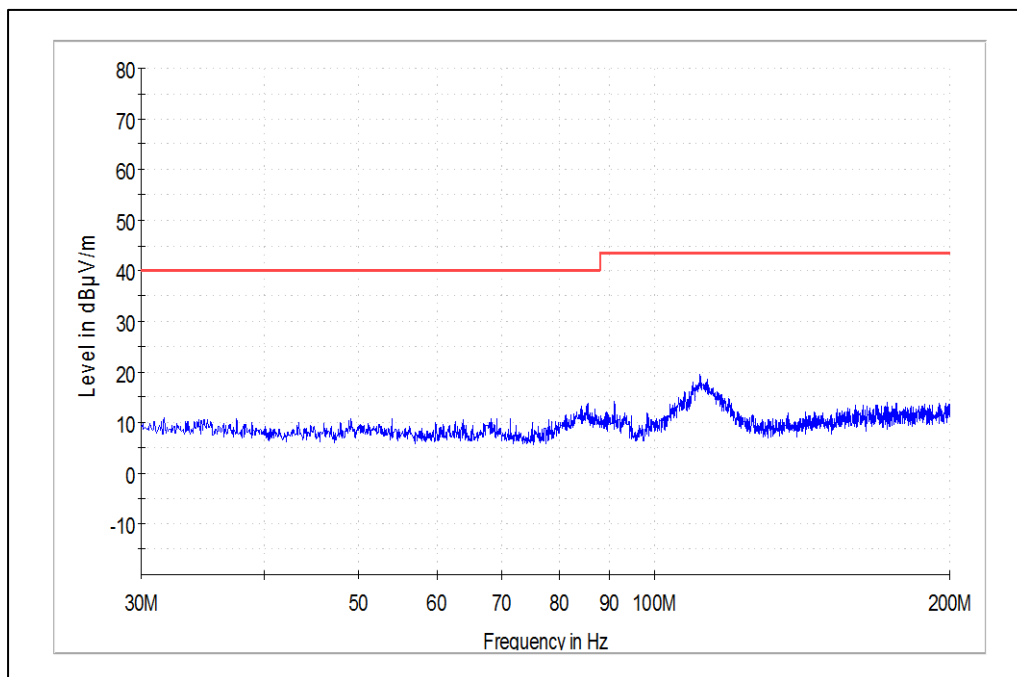
Channel Frequency 30MHz – 200MHz

Polarization Vertical

Prüfbericht - Nr.:
Test Report No.:

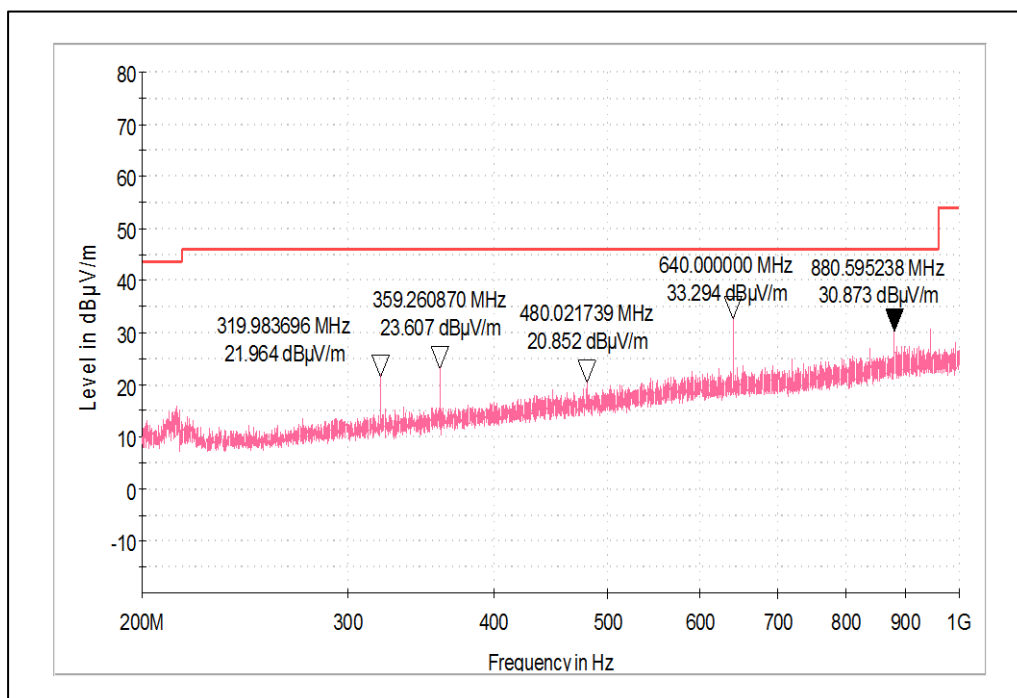
ULR-TC568820300000018F

Seite 18 von 38
Page 18 of 38



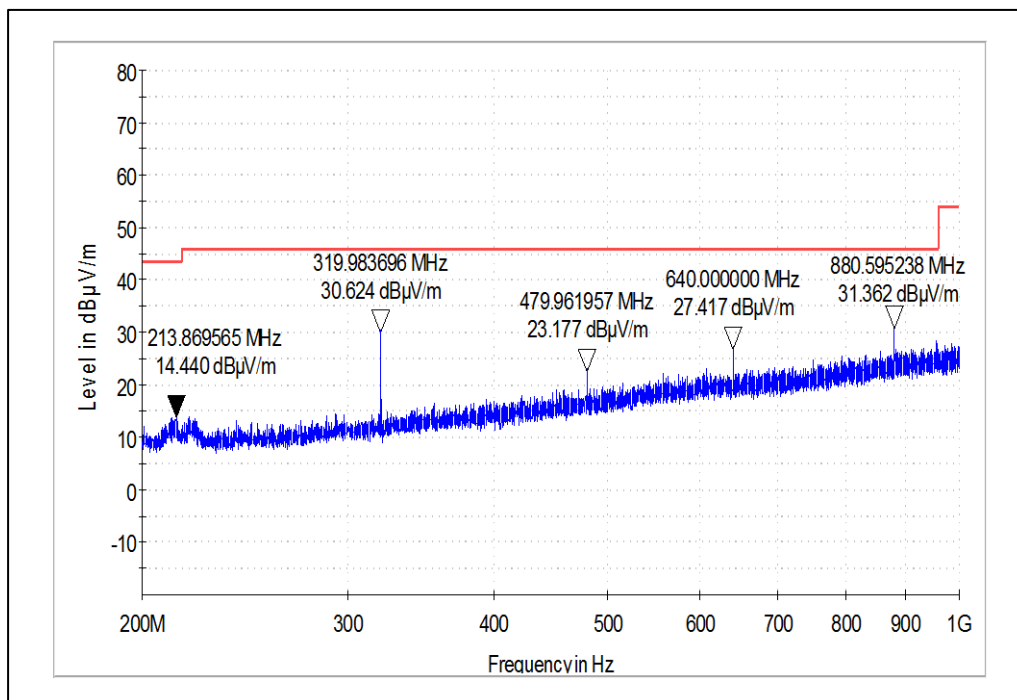
Channel Frequency 30MHz – 200MHz

Polarization Horizontal



Channel Frequency 200MHz – 1GHz

Polarization Vertical



Channel Frequency 200MHz – 1GHz

Polarization Horizontal

Prüfbericht - Nr.:
Test Report No.:

ULR-TC568820300000018F

Seite 20 von 38
Page 20 of 38

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

Modulation: 802.11b

Data Rate: 1Mbps

Channel Frequency (MHz)	Antenna Polarization	Measured Frequency (MHz)	Field Strength (dBµV/m)	Limit (dBµV/m)	Margin (dB)
2412	Vertical	2390(Pk)	39.40	74*	-34.60
		2390(Av)	24.67	54*	-29.33
		2412(Pk)	89.70	-	-
		2412(Av)	80.54	-	-
		4824(Pk)	49.69	74	-24.31
		4824(Av)	39.35	54	-14.65
		7236(Pk)	No Harmonics Found		
		7236(Av)			
	Horizontal	2390(Pk)	39.24	74*	-34.76
		2390(Av)	24.54	54*	-29.46
		2412(Pk)	87.90	-	-
		2412(Av)	78.75	-	-
		4824(Pk)	46.14	74	-27.86
		4824(Av)	36.21	54	-17.79
		7236(Pk)	No Harmonics Found		
		7236(Av)			
2437	Vertical	2437(Pk)	91.22	-	-
		2437(Av)	81.91	-	-
		4874(Pk)	49.63	74	-24.37
		4874(Av)	39.53	54	-14.47
		7311(Pk)	No Harmonics Found		
		7311(Av)			
	Horizontal	2437(Pk)	91.37	-	-
		2437(Av)	82.24	-	-
		4874(Pk)	46.78	74	-27.22
		4874(Av)	36.51	54	-17.49
		7311(Pk)	No Harmonics Found		
		7311(Av)			
2462	Vertical	2483.5(Pk)	44.82	74*	-29.18
		2483.5(Av)	33.1	54*	-20.90
		2462(Pk)	92.06	-	-
		2462(Av)	82.81	-	-
		4924(Pk)	50.53	74	-23.47
		4924(Av)	40.7	54	-13.30
		7386(Pk)	No Harmonics Found		
		7386(Av)			
	Horizontal	2483.5(Pk)	42.28	74*	-31.72
		2483.5(Av)	29.34	54*	-24.66
		2462(Pk)	90.38	-	-
		2462(Av)	81.2	-	-
		4924(Pk)	48.2	74	-25.80
		4924(Av)	37.97	54	-16.03
		7386(Pk)	No Harmonics Found		
		7386(Av)			

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

Prüfbericht - Nr.:
Test Report No.:

ULR-TC568820300000018F

Seite 21 von 38
Page 21 of 38

Data rate: 11Mbps

Channel Frequency (MHz)	Antenna Polarization	Measured Frequency (MHz)	Field Strength (dBμV/m)	Limit (dBμV/m)	Margin (dB)
2412	Vertical	2390(Pk)	39.41	74*	-34.59
		2390(Av)	25.33	54*	-28.67
		2412(Pk)	90.86	-	-
		2412(Av)	82.82	-	-
		4824(Pk)	52.62	74	-21.38
		4824(Av)	39.39	54	-14.61
		7236(Pk)	No Harmonics Found		
		7236(Av)			
	Horizontal	2390(Pk)	38.59	74*	-35.41
		2390(Av)	24.97	54*	-29.03
		2412(Pk)	89.31	-	-
		2412(Av)	81.25	-	-
		4824(Pk)	51.87	74	-22.13
		4824(Av)	38.59	54	-15.41
		7236(Pk)	No Harmonics Found		
		7236(Av)			
2437	Vertical	2437(Pk)	90.49	-	-
		2437(Av)	82.40	-	-
		4874(Pk)	52.36	74	-21.64
		4874(Av)	38.79	54	-15.21
		7311(Pk)	No Harmonics Found		
		7311(Av)			
	Horizontal	2437(Pk)	87.88	-	-
		2437(Av)	79.79	-	-
		4874(Pk)	53.22	74	-20.78
		4874(Av)	39.68	54	-14.32
		7311(Pk)	No Harmonics Found		
		7311(Av)			
2462	Vertical	2483.5(Pk)	39.58	74*	-34.42
		2483.5(Av)	26.25	54*	-27.75
		2462(Pk)	90.15	-	-
		2462(Av)	82.13	-	-
		4924(Pk)	52.19	74	-21.81
		4924(Av)	38.77	54	-15.23
		7386(Pk)	No Harmonics Found		
		7386(Av)			
	Horizontal	2483.5(Pk)	38.57	74*	-35.43
		2483.5(Av)	25.40	54*	-28.60
		2462(Pk)	87.49	-	-
		2462(Av)	79.52	-	-
		4924(Pk)	50.96	74	-23.04
		4924(Av)	36.68	54	-17.32
		7386(Pk)	No Harmonics Found		
		7386(Av)			

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

Prüfbericht - Nr.:
Test Report No.:

ULR-TC568820300000018F

Seite 22 von 38
Page 22 of 38

Modulation: 802.11g

Data rate: 6Mbps

Channel Frequency (MHz)	Antenna Polarization	Measured Frequency (MHz)	Field Strength (dBμV/m)	Limit (dBμV/m)	Margin (dB)
2412	Vertical	2390(Pk)	39.31	74*	-34.69
		2390(Av)	25.63	54*	-28.37
		2412(Pk)	88.34	-	-
		2412(Av)	79.36	-	-
		4824(Pk)	48.31	74	-25.69
		4824(Av)	34.86	54	-19.14
		7236(Pk)	No Harmonics Found		
		7236(Av)			
	Horizontal	2390(Pk)	41.06	74*	-32.94
		2390(Av)	21.02	54*	-32.98
		2412(Pk)	83.70	-	-
		2412(Av)	74.77	-	-
		4824(Pk)	46.71	74	-27.29
		4824(Av)	32.70	54	-21.30
		7236(Pk)	No Harmonics Found		
		7236(Av)			
2437	Vertical	2437(Pk)	87.99	-	-
		2437(Av)	78.99	-	-
		4874(Pk)	48.17	74	-25.83
		4874(Av)	34.63	54	-19.37
		7311(Pk)	No Harmonics Found		
		7311(Av)			
	Horizontal	2437(Pk)	85.14	-	-
		2437(Av)	76.13	-	-
		4874(Pk)	46.33	74	-27.67
		4874(Av)	33.04	54	-20.96
		7311(Pk)	No Harmonics Found		
		7311(Av)			
2462	Vertical	2483.5(Pk)	49.24	74*	-24.76
		2483.5(Av)	36.73	54*	-17.27
		2462(Pk)	88.52	-	-
		2462(Av)	79.74	-	-
		4924(Pk)	46.73	74	-27.27
		4924(Av)	33.68	54	-20.32
		7386(Pk)	No Harmonics Found		
		7386(Av)			
	Horizontal	2483.5(Pk)	45.23	74*	-28.77
		2483.5(Av)	32.55	54*	-21.45
		2462(Pk)	84.42	-	-
		2462(Av)	75.75	-	-
		4924(Pk)	46.62	74	-27.38
		4924(Av)	33.28	54	-20.72
		7386(Pk)	No Harmonics Found		
		7386(Av)			

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

Prüfbericht - Nr.:
Test Report No.:

ULR-TC568820300000018F

Seite 23 von 38
Page 23 of 38

Data rate: 24Mbps

Channel Frequency (MHz)	Antenna Polarization	Measured Frequency (MHz)	Field Strength (dBµV/m)	Limit (dBµV/m)	Margin (dB)
2412	Vertical	2390(Pk)	48.38	74*	-25.62
		2390(Av)	30.08	54*	-23.92
		2412(Pk)	87.48	-	-
		2412(Av)	77.84	-	-
		4824(Pk)	46.25	74	-27.75
		4824(Av)	33.70	54	-20.30
		7236(Pk)	No Harmonics Found		
		7236(Av)			
	Horizontal	2390(Pk)	46.09	74*	-27.91
		2390(Av)	28.06	54*	-25.94
		2412(Pk)	83.08	-	-
		2412(Av)	73.42	-	-
		4824(Pk)	44.10	74	-29.90
		4824(Av)	30.83	54	-23.17
		7236(Pk)	No Harmonics Found		
		7236(Av)			
2437	Vertical	2437(Pk)	86.31	-	-
		2437(Av)	76.86	-	-
		4874(Pk)	45.71	74	-28.29
		4874(Av)	33.21	54	-20.79
		7311(Pk)	No Harmonics Found		
		7311(Av)			
	Horizontal	2437(Pk)	83.73	-	-
		2437(Av)	74.28	-	-
		4874(Pk)	45.04	74	-28.96
		4874(Av)	32.04	54	-21.96
		7311(Pk)	No Harmonics Found		
		7311(Av)			
2462	Vertical	2483.5(Pk)	48.57	74*	-25.43
		2483.5(Av)	32.75	54*	-21.25
		2462(Pk)	86.50	-	-
		2462(Av)	77.11	-	-
		4924(Pk)	45.09	74	-28.91
		4924(Av)	32.42	54	-21.58
		7386(Pk)	No Harmonics Found		
		7386(Av)			
	Horizontal	2483.5(Pk)	44.51	74*	-29.49
		2483.5(Av)	29.03	54*	-24.97
		2462(Pk)	82.55	-	-
		2462(Av)	73.10	-	-
		4924(Pk)	44.67	74	-29.33
		4924(Av)	31.62	54	-22.38
		7386(Pk)	No Harmonics Found		
		7386(Av)			

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

Prüfbericht - Nr.:
Test Report No.:

ULR-TC568820300000018F

Seite 24 von 38
Page 24 of 38

Data rate: 54Mbps

Channel Frequency (MHz)	Antenna Polarization	Measured Frequency (MHz)	Field Strength (dBμV/m)	Limit (dBμV/m)	Margin (dB)
2412	Vertical	2390(Pk)	39.22	74*	-34.78
		2390(Av)	25.37	54*	-28.63
		2412(Pk)	86.59	-	-
		2412(Av)	76.24	-	-
		4824(Pk)	44.55	74	-29.45
		4824(Av)	31.87	54	-22.13
		7236(Pk)	No Harmonics Found		
		7236(Av)			
	Horizontal	2390(Pk)	39.40	74*	-34.60
		2390(Av)	25.18	54*	-28.82
		2412(Pk)	81.95	-	-
		2412(Av)	71.55	-	-
		4824(Pk)	43.58	74	-30.42
		4824(Av)	30.19	54	-23.81
		7236(Pk)	No Harmonics Found		
		7236(Av)			
2437	Vertical	2437(Pk)	85.41	-	-
		2437(Av)	75.04	-	-
		4874(Pk)	43.67	74	-30.33
		4874(Av)	31.17	54	-22.83
		7311(Pk)	No Harmonics Found		
		7311(Av)			
	Horizontal	2437(Pk)	80.93	-	-
		2437(Av)	70.56	-	-
		4874(Pk)	43.27	74	-30.73
		4874(Av)	29.95	54	-24.05
		7311(Pk)	No Harmonics Found		
		7311(Av)			
2462	Vertical	2483.5(Pk)	43.97	74*	-30.03
		2483.5(Av)	28.97	54*	-25.03
		2462(Pk)	85.72	-	-
		2462(Av)	75.39	-	-
		4924(Pk)	43.27	74	-30.73
		4924(Av)	30.51	54	-23.49
		7386(Pk)	No Harmonics Found		
		7386(Av)			
	Horizontal	2483.5(Pk)	40.35	74*	-33.65
		2483.5(Av)	26.46	54*	-27.54
		2462(Pk)	82.23	-	-
		2462(Av)	71.92	-	-
		4924(Pk)	43.23	74	-30.77
		4924(Av)	30.13	54	-23.87
		7386(Pk)	No Harmonics Found		
		7386(Av)			

*: Indicate restricted band of operation §15.205

Pk: Peak Detector; Av: Average Detector

Prüfbericht - Nr.:
Test Report No.:

ULR-TC568820300000018F

Seite 25 von 38
Page 25 of 38

Modulation: 802.11 n HT20

Data rate: MCS0

Channel Frequency (MHz)	Antenna Polarization	Measured Frequency (MHz)	Field Strength (dBµV/m)	Limit (dBµV/m)	Margin (dB)
2412	Vertical	2390(Pk)	47.97	74*	-26.03
		2390(Av)	33.34	54*	-20.66
		2412(Pk)	89.76	-	-
		2412(Av)	80.16	-	-
		4824(Pk)	48.70	74	-25.30
		4824(Av)	35.20	54	-18.80
		7236(Pk)	No Harmonics Found		
		7236(Av)			
	Horizontal	2390(Pk)	44.30	74*	-29.70
		2390(Av)	29.80	54*	-24.20
		2412(Pk)	85.21	-	-
		2412(Av)	75.33	-	-
		4824(Pk)	46.56	74	-27.44
		4824(Av)	32.81	54	-21.19
		7236(Pk)	No Harmonics Found		
		7236(Av)			
2437	Vertical	2437(Pk)	88.60	-	-
		2437(Av)	79.06	-	-
		4874(Pk)	48.49	74	-25.51
		4874(Av)	34.13	54	-19.87
		7311(Pk)	No Harmonics Found		
		7311(Av)			
	Horizontal	2437(Pk)	84.26	-	-
		2437(Av)	74.67	-	-
		4874(Pk)	46.90	74	-27.10
		4874(Av)	32.85	54	-21.15
		7311(Pk)	No Harmonics Found		
		7311(Av)			
2462	Vertical	2483.5(Pk)	52.60	74*	-21.40
		2483.5(Av)	38.21	54*	-15.79
		2462(Pk)	89.40	-	-
		2462(Av)	79.93	-	-
		4924(Pk)	48.06	74	-25.94
		4924(Av)	33.77	54	-20.23
		7386(Pk)	No Harmonics Found		
		7386(Av)			
	Horizontal	2483.5(Pk)	46.92	74*	-27.08
		2483.5(Av)	33.15	54*	-20.85
		2462(Pk)	84.41	-	-
		2462(Av)	74.92	-	-
		4924(Pk)	46.84	74	-27.16
		4924(Av)	33.01	54	-20.99
		7386(Pk)	No Harmonics Found		
		7386(Av)			

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

Prüfbericht - Nr.:
Test Report No.:

ULR-TC568820300000018F

Seite 26 von 38
Page 26 of 38

Data rate: MCS4

Channel Frequency (MHz)	Antenna Polarization	Measured Frequency (MHz)	Field Strength (dBµV/m)	Limit (dBµV/m)	Margin (dB)
2412	Vertical	2390(Pk)	47.87	74*	-26.13
		2390(Av)	30.27	54*	-23.73
		2412(Pk)	88.85	-	-
		2412(Av)	78.33	-	-
		4824(Pk)	45.36	74	-28.64
		4824(Av)	33.07	54	-20.93
		7236(Pk)	No Harmonics Found		
		7236(Av)			
	Horizontal	2390(Pk)	44.55	74*	-29.45
		2390(Av)	27.75	54*	-26.25
		2412(Pk)	83.32	-	-
		2412(Av)	73.01	-	-
		4824(Pk)	45.31	74	-28.69
		4824(Av)	31.72	54	-22.28
		7236(Pk)	No Harmonics Found		
		7236(Av)			
2437	Vertical	2437(Pk)	88.13	-	-
		2437(Av)	77.69	-	-
		4874(Pk)	45.21	74	-28.79
		4874(Av)	32.65	54	-21.35
		7311(Pk)	No Harmonics Found		
		7311(Av)			
	Horizontal	2437(Pk)	83.38	-	-
		2437(Av)	72.77	-	-
		4874(Pk)	44.93	74	-29.07
		4874(Av)	31.09	54	-22.91
		7311(Pk)	No Harmonics Found		
		7311(Av)			
2462	Vertical	2483.5(Pk)	50.11	74*	-23.89
		2483.5(Av)	34.44	54*	-19.56
		2462(Pk)	88.42	-	-
		2462(Av)	77.97	-	-
		4924(Pk)	44.49	74	-29.51
		4924(Av)	32.12	54	-21.88
		7386(Pk)	No Harmonics Found		
		7386(Av)			
	Horizontal	2483.5(Pk)	44.77	74*	-29.23
		2483.5(Av)	29.42	54*	-24.58
		2462(Pk)	82.75	-	-
		2462(Av)	72.27	-	-
		4924(Pk)	43.92	74	-30.08
		4924(Av)	31.03	54	-22.97
		7386(Pk)	No Harmonics Found		
		7386(Av)			

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

Prüfbericht - Nr.:

Test Report No.:

ULR-TC568820300000018F

Seite 27 von 38

Page 27 of 38

Data rate: MCS7

Channel Frequency (MHz)	Antenna Polarization	Measured Frequency (MHz)	Field Strength (dBμV/m)	Limit (dBμV/m)	Margin (dB)
2412	Vertical	2390(Pk)	40.00	74*	-34.00
		2390(Av)	26.74	54*	-27.26
		2412(Pk)	86.25	-	-
		2412(Av)	75.54	-	-
		4824(Pk)	44.11	74	-29.89
		4824(Av)	31.03	54	-22.97
		7236(Pk)	No Harmonics Found		
		7236(Av)			
	Horizontal	2390(Pk)	37.60	74*	-36.40
		2390(Av)	25.34	54*	-28.66
		2412(Pk)	80.72	-	-
		2412(Av)	70.01	-	-
		4824(Pk)	43.14	74	-30.86
		4824(Av)	29.98	54	-24.02
		7236(Pk)	No Harmonics Found		
		7236(Av)			
2437	Vertical	2437(Pk)	84.45	-	-
		2437(Av)	73.78	-	-
		4874(Pk)	43.40	74	-30.60
		4874(Av)	30.37	54	-23.63
		7311(Pk)	No Harmonics Found		
		7311(Av)			
	Horizontal	2437(Pk)	80.79	-	-
		2437(Av)	70.05	-	-
		4874(Pk)	43.02	74	-30.98
		4874(Av)	30.14	54	-23.86
		7311(Pk)	No Harmonics Found		
		7311(Av)			
2462	Vertical	2483.5(Pk)	42.30	74*	-31.70
		2483.5(Av)	28.35	54*	-25.65
		2462(Pk)	84.08	-	-
		2462(Av)	73.13	-	-
		4924(Pk)	43.33	74	-30.67
		4924(Av)	30.10	54	-23.90
		7386(Pk)	No Harmonics Found		
		7386(Av)			
	Horizontal	2483.5(Pk)	38.69	74*	-35.31
		2483.5(Av)	25.94	54*	-28.06
		2462(Pk)	78.76	-	-
		2462(Av)	67.98	-	-
		4924(Pk)	42.62	74	-31.38
		4924(Av)	28.60	54	-25.40
		7386(Pk)	No Harmonics Found		
		7386(Av)			

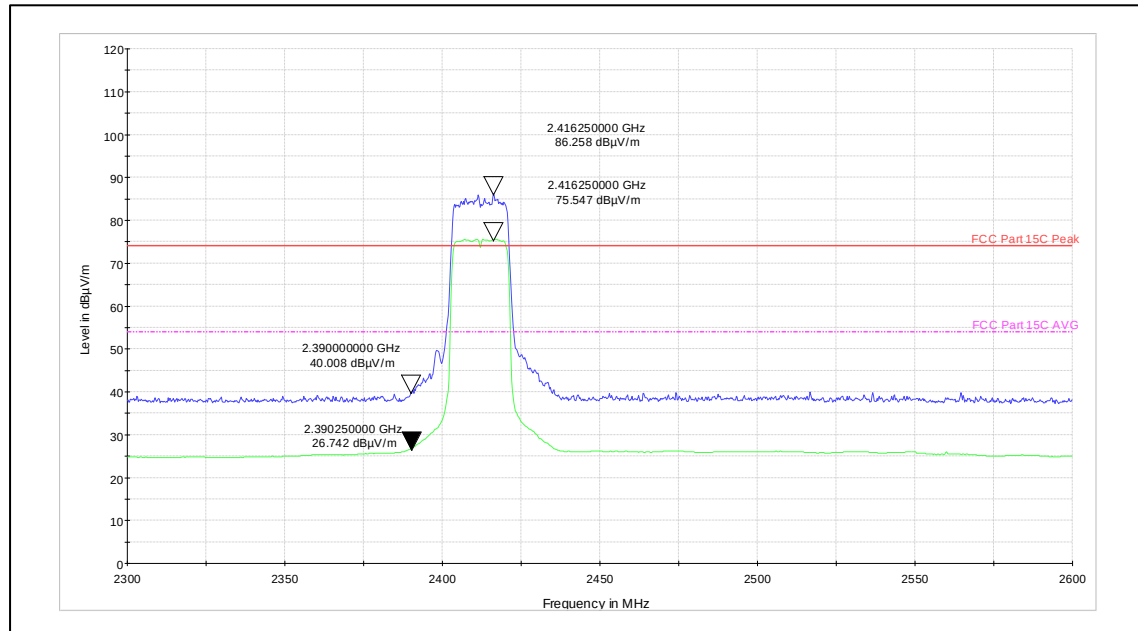
*- : Indicate restricted band of operation §15.205

Pk: Peak Detector; Av: Average Detector

Worst case emissions for Restricted Frequency Bands

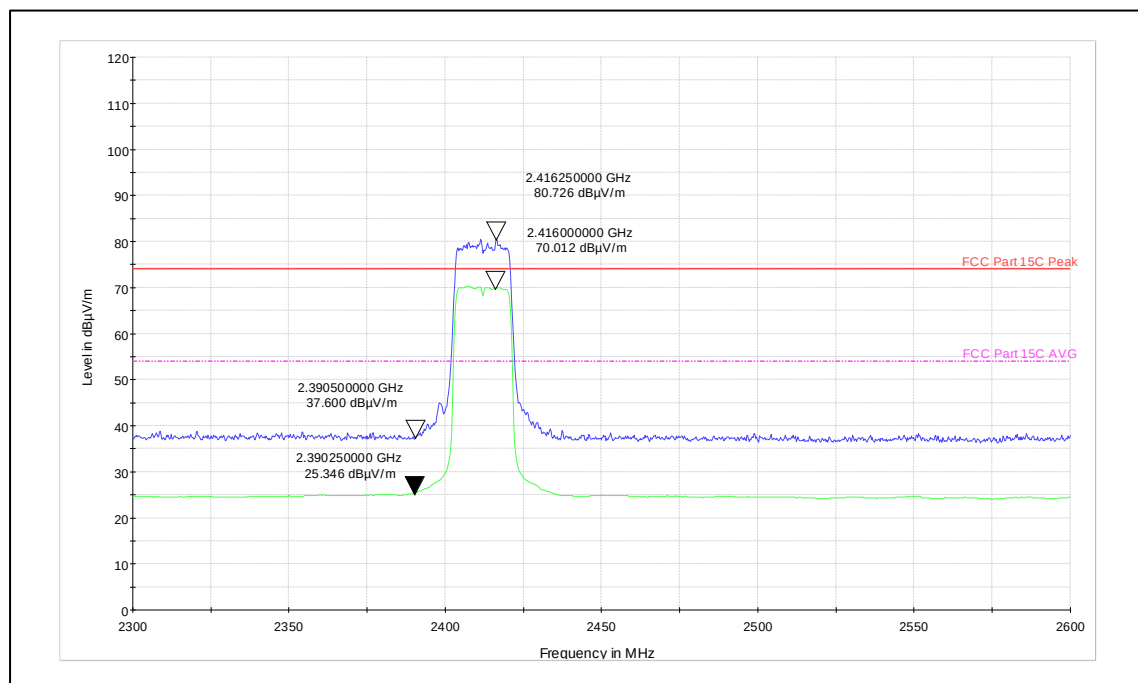
Data rate: MCS7

Channel Frequency: 2412MHz



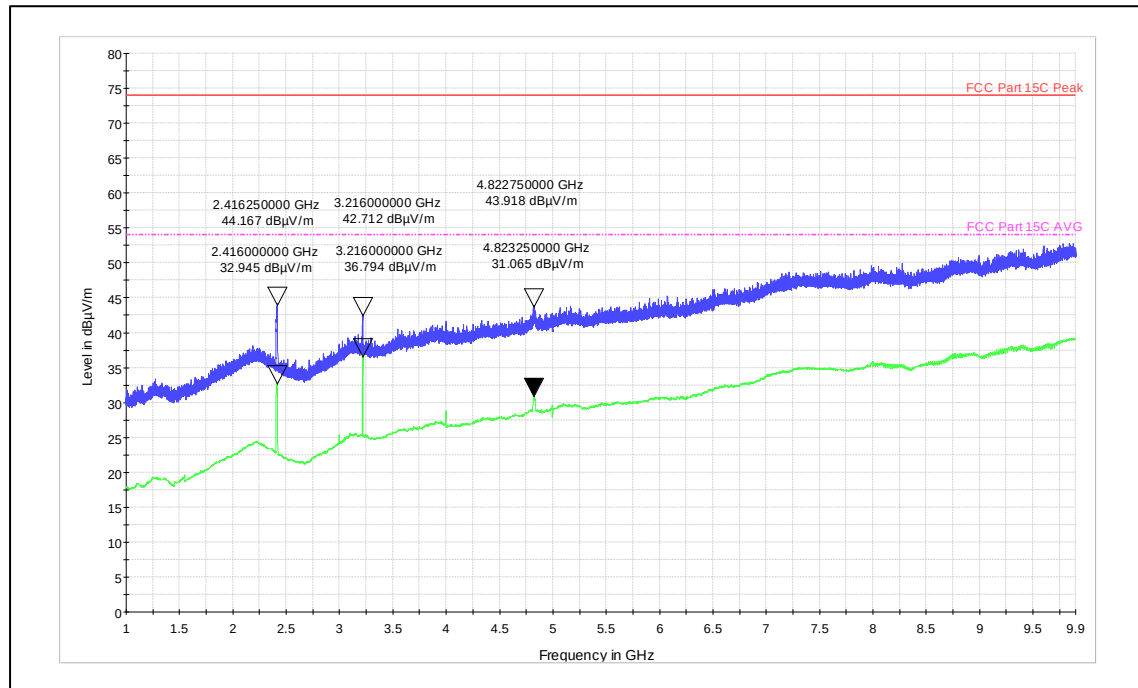
Channel Frequency: 2412MHz

Polarization: Vertical



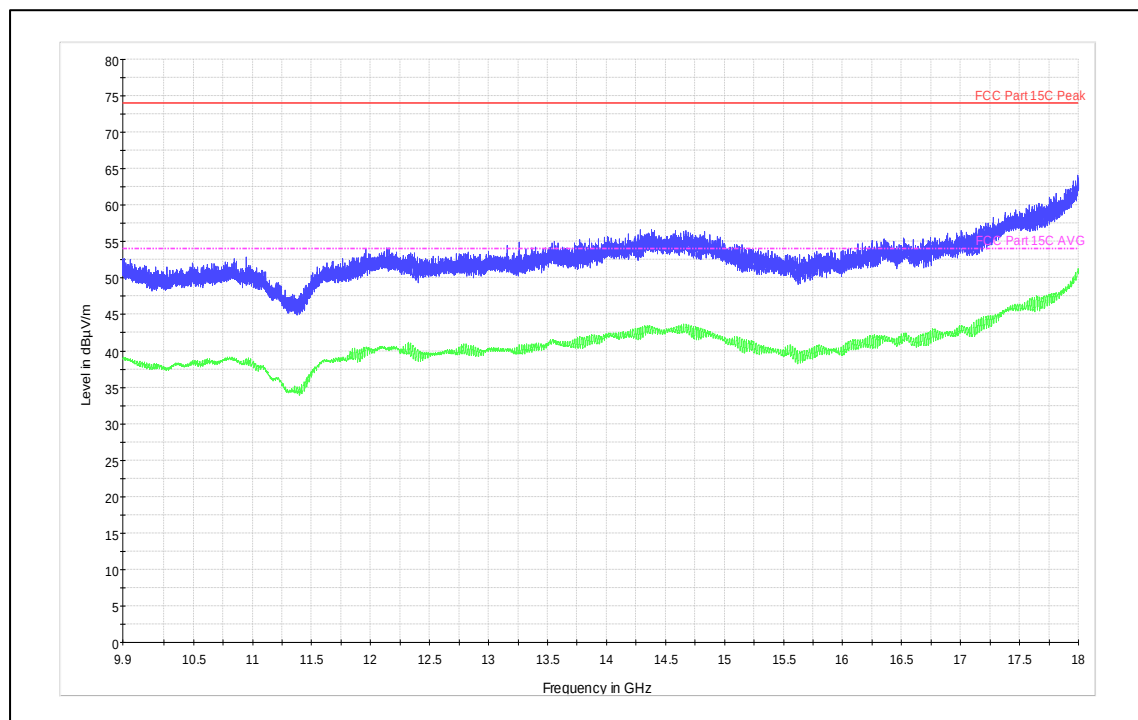
Channel Frequency: 2412MHz

Polarization: Horizontal



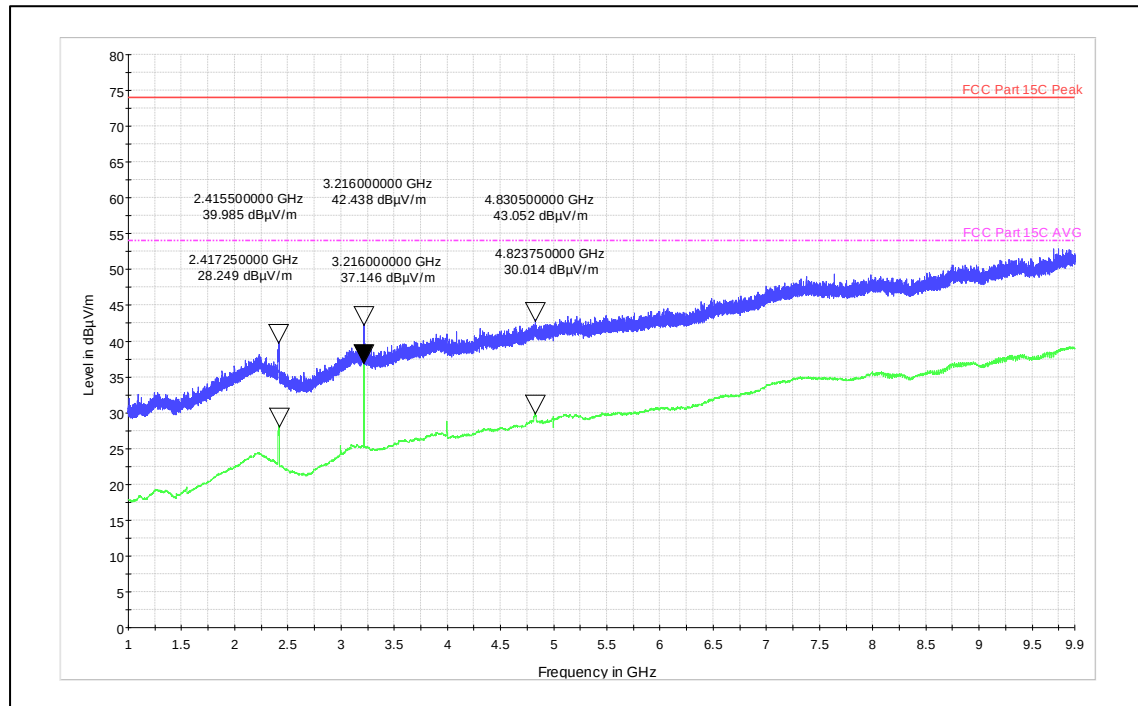
Frequency Range: 1 GHz– 9.9 GHz

Polarization: Vertical



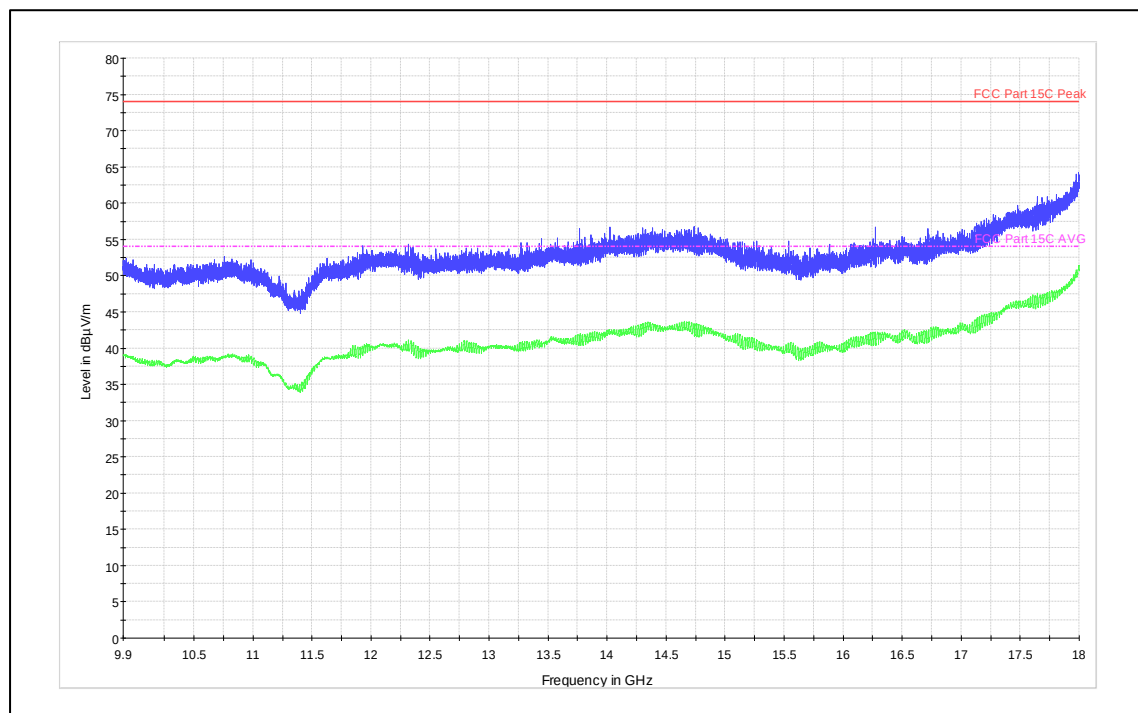
Frequency Range: 9.9 GHz– 18 GHz

Polarization: Vertical



Frequency Range: 1 GHz– 9.9 GHz

Polarization: Horizontal



Frequency Range: 9.9 GHz– 18 GHz

Polarization: Horizontal

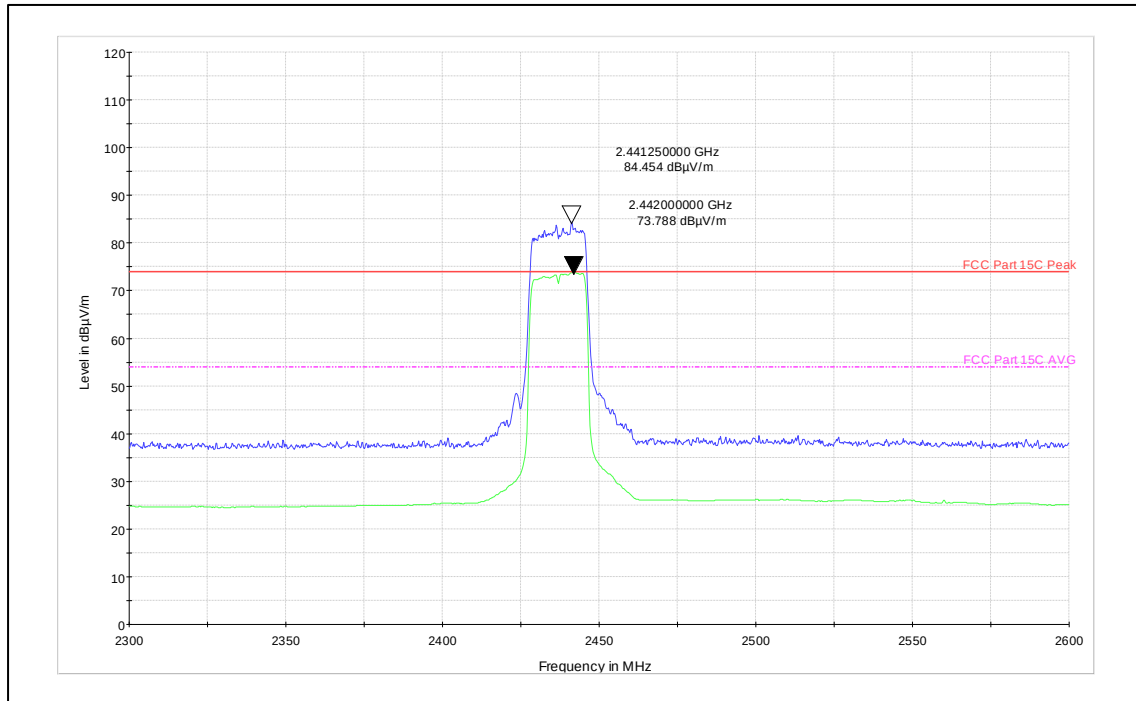
Prüfbericht - Nr.:
Test Report No.:

ULR-TC568820300000018F

Seite 31 von 38
Page 31 of 38

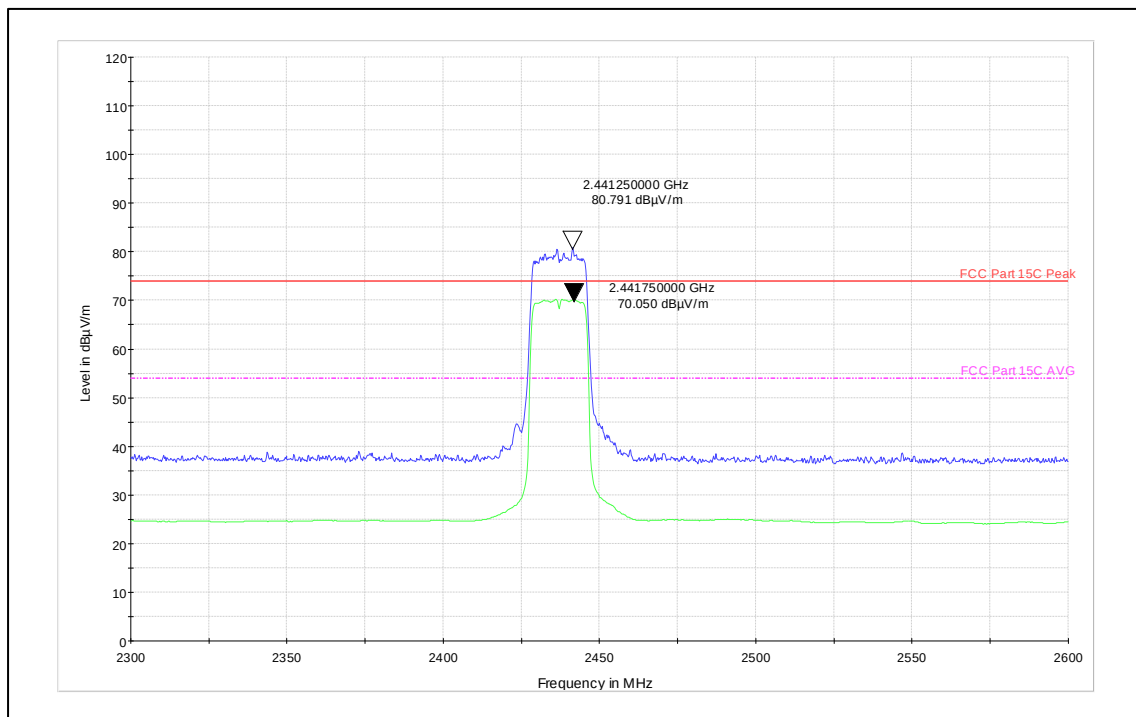
Data rate: MCS7

Channel Frequency: 2437MHz



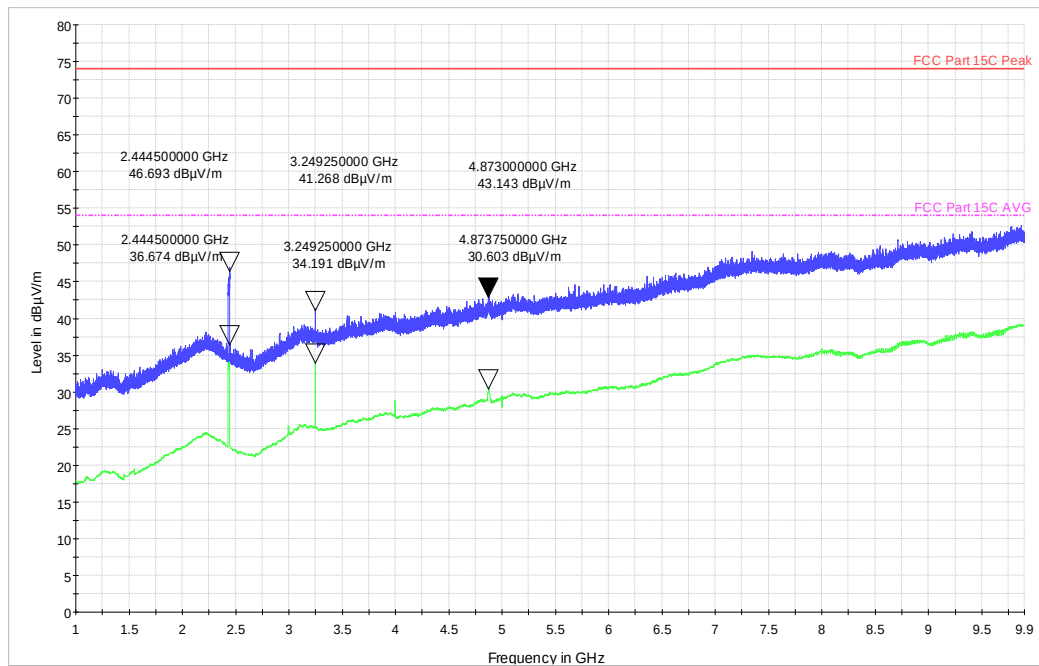
Channel Frequency: 2437 MHz

Polarization: Vertical



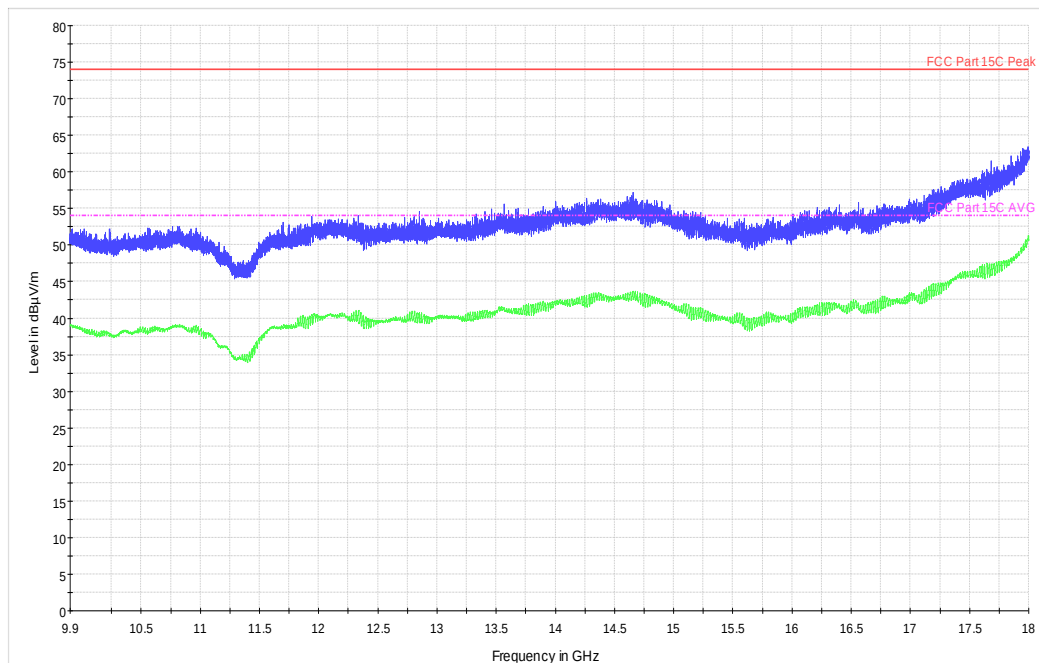
Channel Frequency: 2437 MHz

Polarization: Horizontal



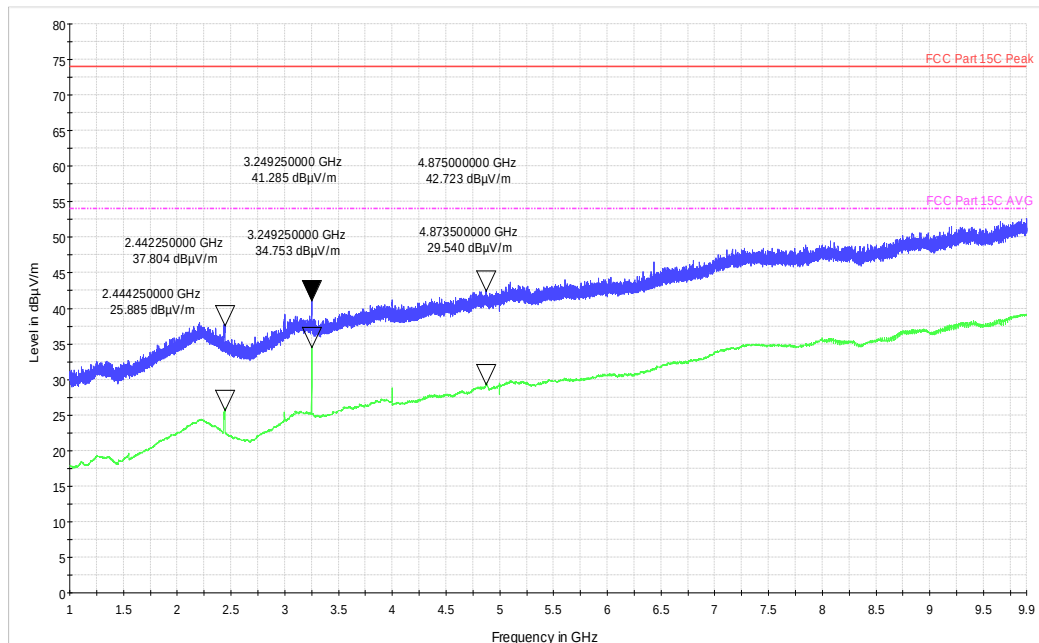
Frequency Range: 1 GHz– 9.9 GHz

Polarization: Vertical



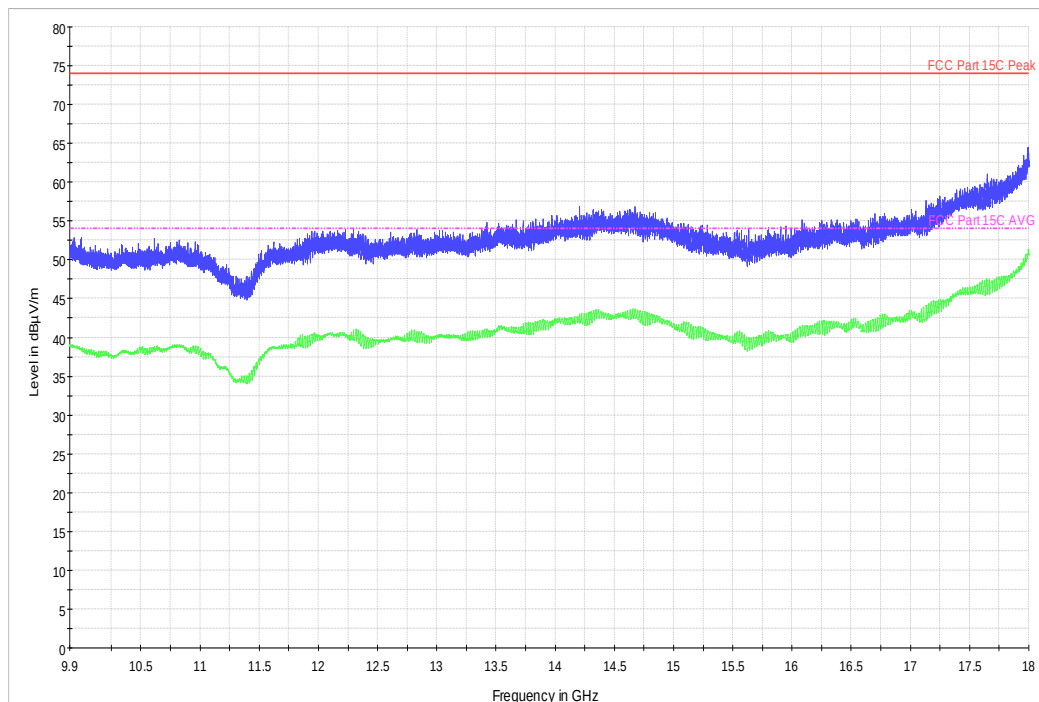
Frequency Range: 9.9 GHz– 18 GHz

Polarization: Vertical



Frequency Range: 1 GHz– 9.9 GHz

Polarization: Horizontal



Frequency Range: 9.9 GHz– 18 GHz

Polarization: Horizontal

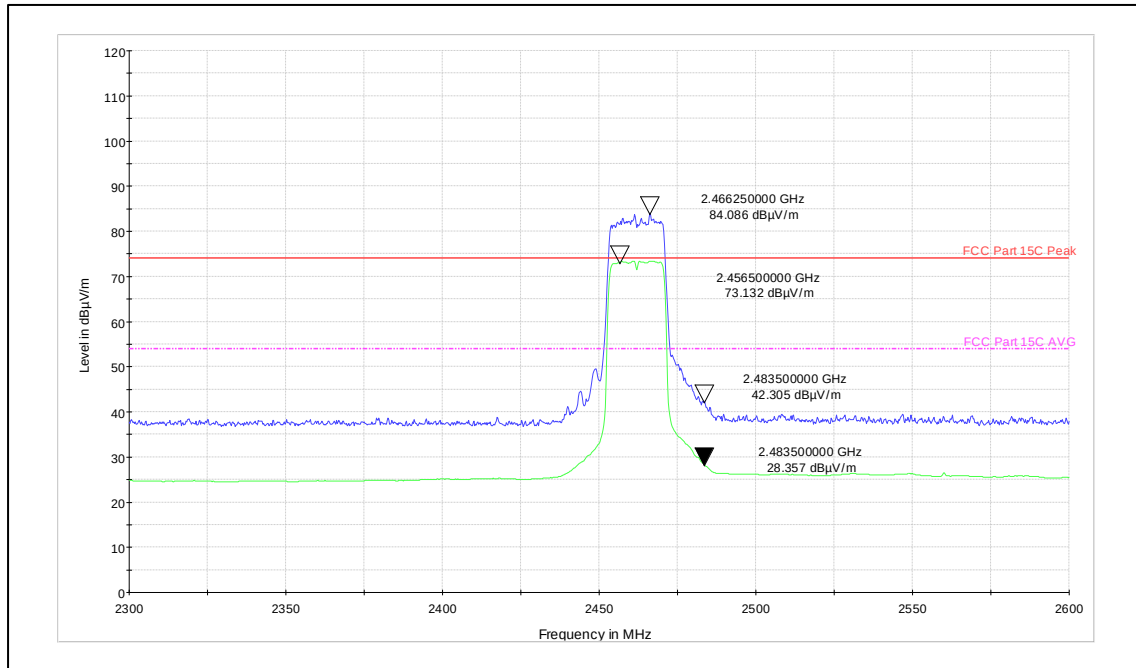
Prüfbericht - Nr.:
Test Report No.:

ULR-TC568820300000018F

Seite 34 von 38
Page 34 of 38

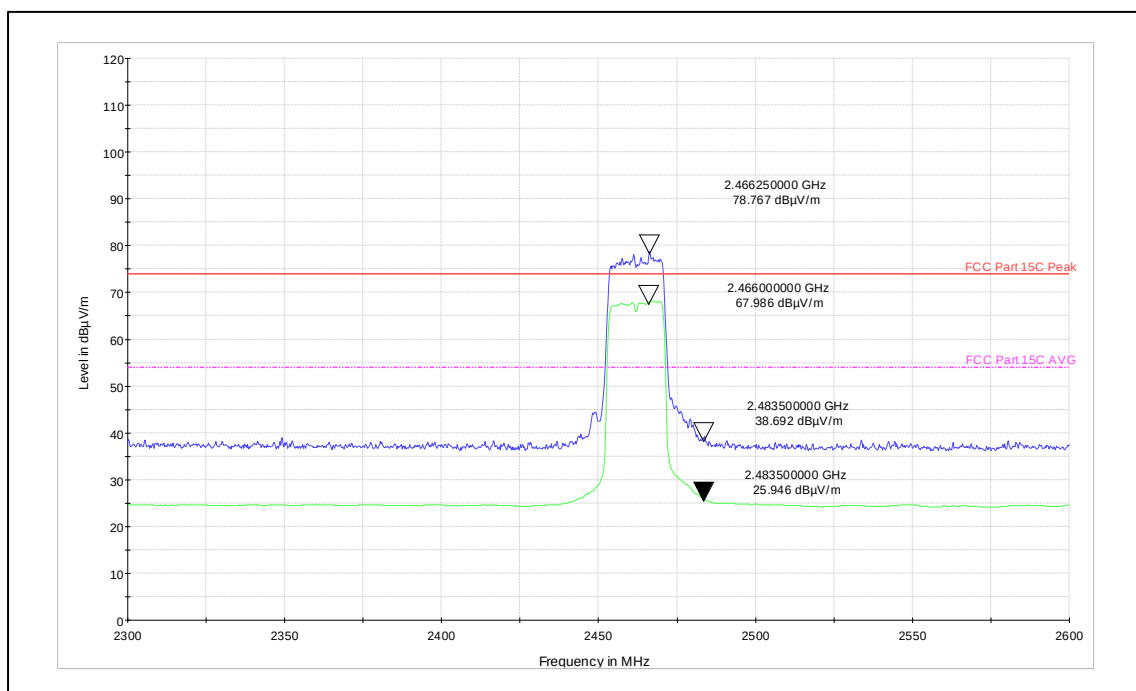
Data rate: MCS7

Channel Frequency: 2462MHz



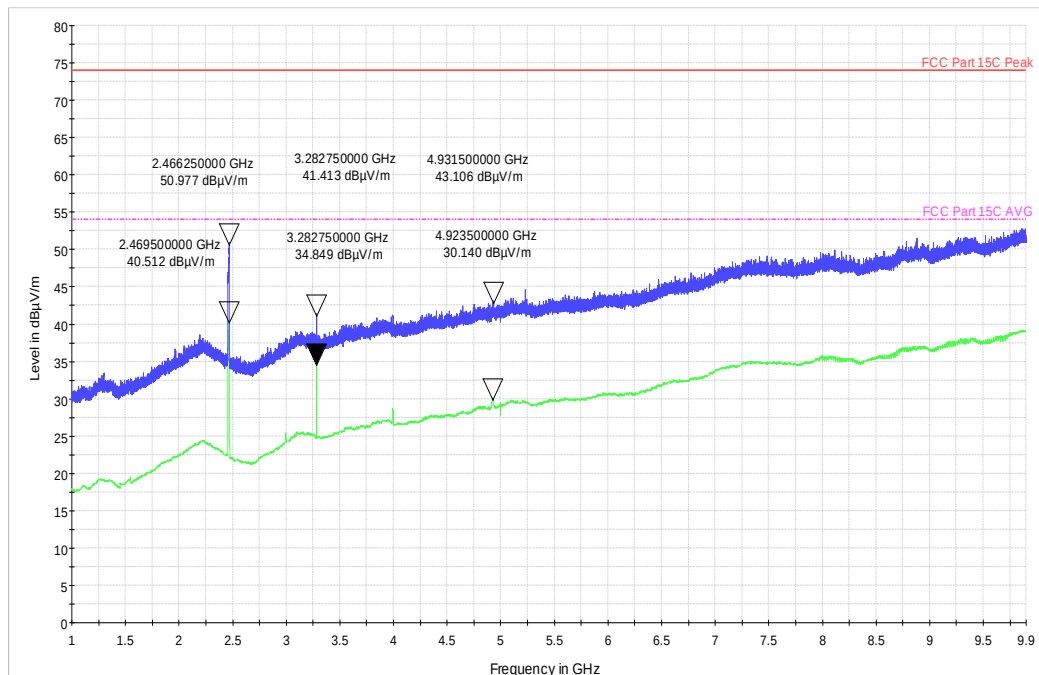
Channel Frequency: 2462 MHz

Polarization: Vertical



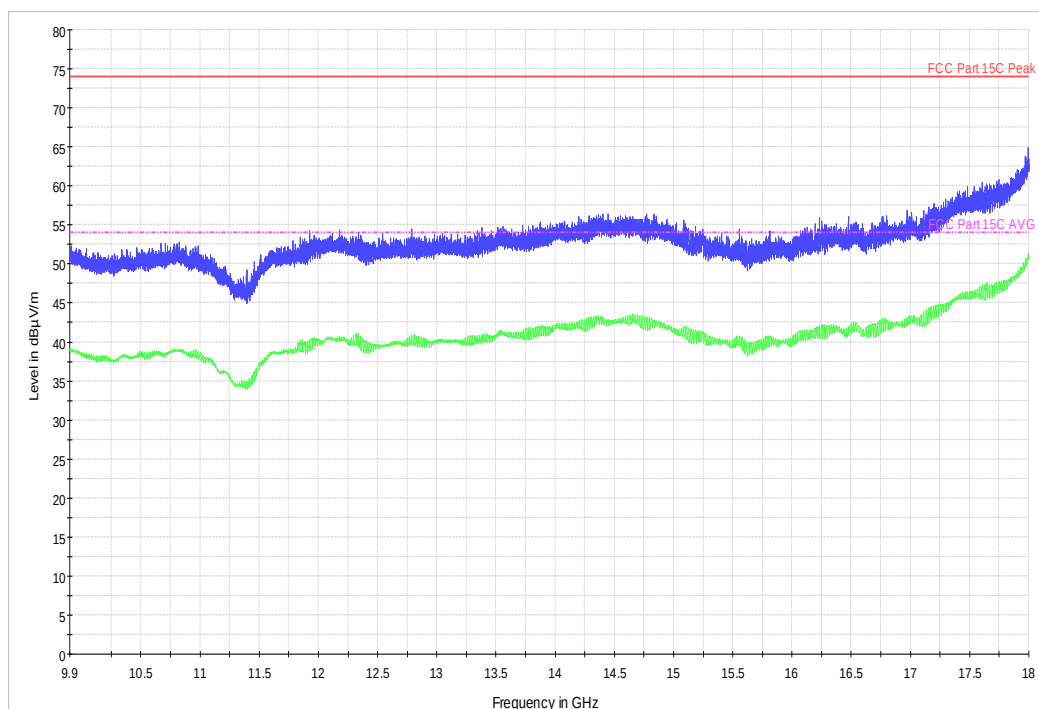
Channel Frequency: 2462 MHz

Polarization: Vertical



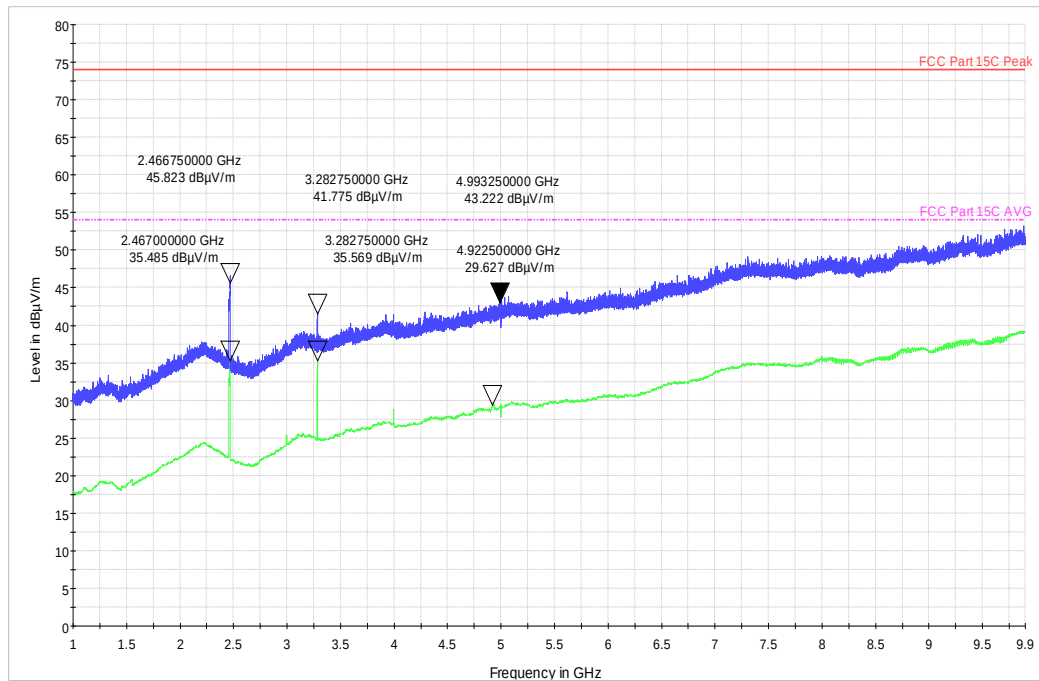
Frequency Range: 1 GHz – 9.9 GHz

Polarization: Vertical



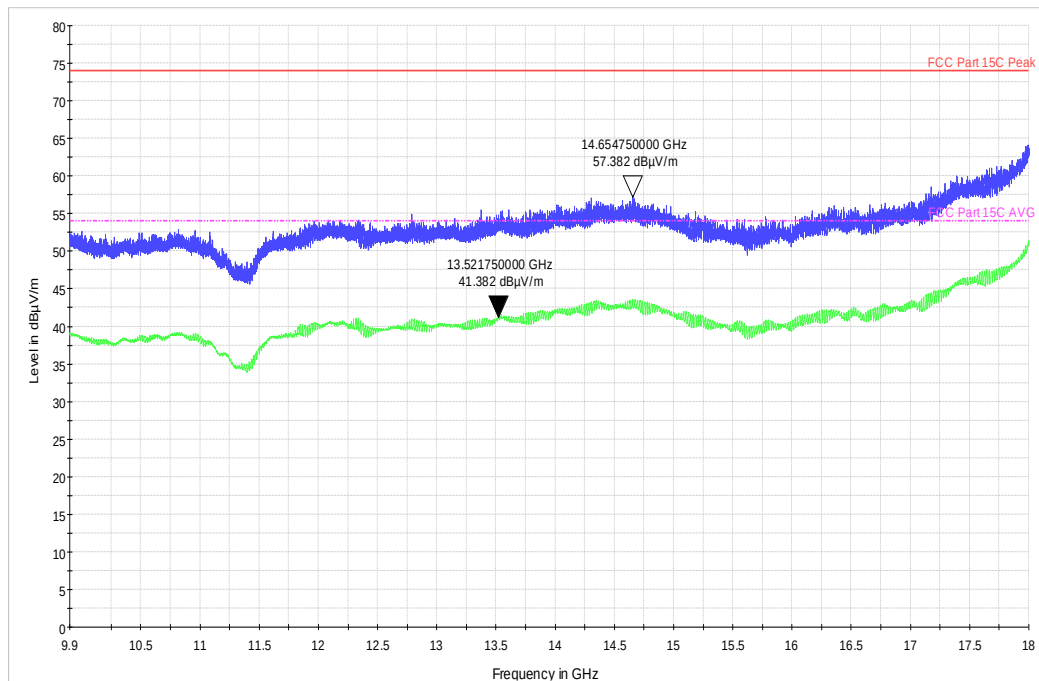
Frequency Range: 9.9 GHz– 18 GHz

Polarization: Vertical



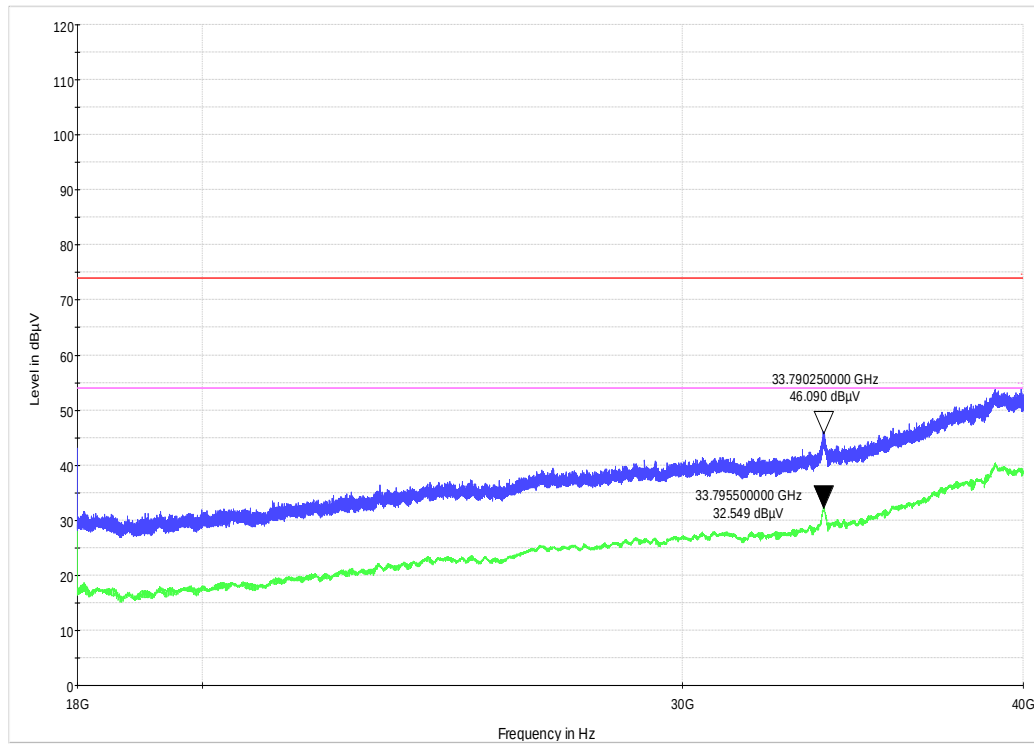
Frequency Range: 1 GHz – 9.9 GHz

Polarization: Horizontal



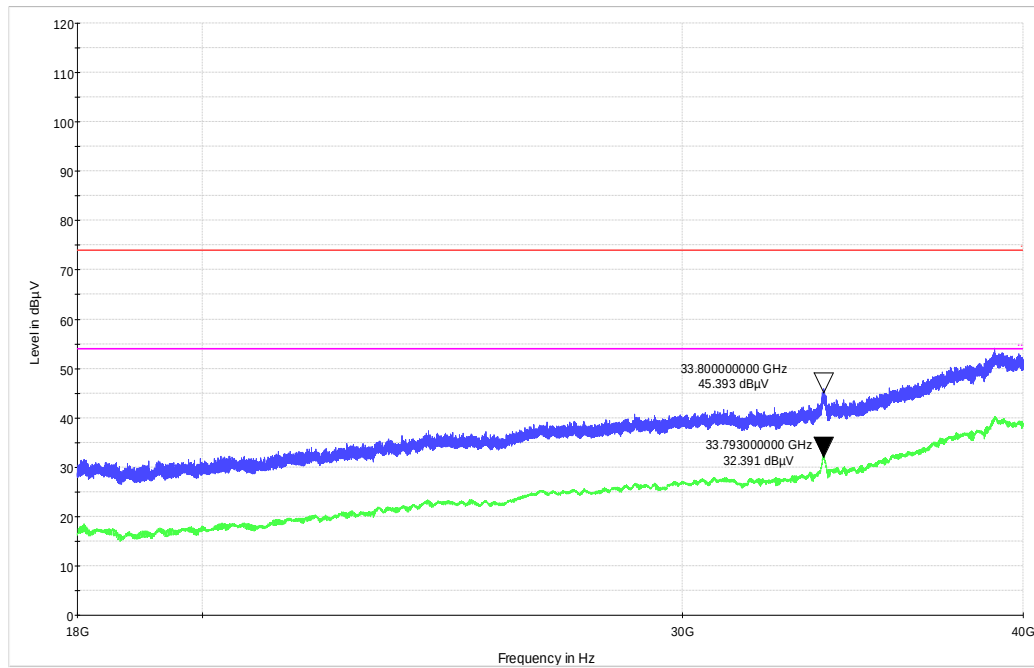
Frequency Range: 9.9 GHz – 18 GHz

Polarization: Horizontal



Channel Frequency: 18 - 40 GHz

Polarization: Vertical



Channel Frequency: 18 - 40 GHz

Polarization: Horizontal

Prüfbericht - Nr.:
Test Report No.:

ULR-TC568820300000018F

Seite 38 von 38
Page 38 of 38

9 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 Wi-Fi center Frequencies	9
Table 6: Transmitter limits for Radiated emission	16

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