

Prüfbericht-Nr.: <i>Test report no.:</i>	ULR- TC568820300000022F	Auftrags-Nr.: <i>Order no.:</i>	166233800 0030	Seite 1 von 65 Page 1 of 65
Kunden-Referenz-Nr.: <i>Client reference no.:</i>	NA	Auftragsdatum: <i>Order date:</i>	2020-02-12	
Auftraggeber: <i>Client:</i>	LifeSignals, Inc. 39355 California Street Suite 305 Fremont, CA 94538. USA			
Prüfgegenstand: <i>Test item:</i>	Life Signal Multi Parameter Remote Monitoring Platform			
Bezeichnung / Serien -Nr.: <i>Identification / Serial no.:</i>	LP1550			
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			
Wareneingangsdatum: <i>Date of sample receipt:</i>	2020-02-11			
Prüfmuster-Nr.: <i>Test sample no.:</i>	A001063812-013 A001063812-014			
Prüfzeitraum: <i>Testing period:</i>	2020-02-20 –2020-02-27			
Ort der Prüfung: <i>Place of testing:</i>	Wireless laboratory, Bangalore			
Prüflaboratorium: <i>Testing laboratory:</i>	TÜV Rheinland (India) Pvt. Ltd. 27/B, 2nd Cross Road, Electronic City Phase1, Bangalore – 560 100, India			
Prüfergebnis*: <i>Test result*:</i>	Pass			
geprüft von: <i>tested by:</i>	genehmigt von: <i>authorized by:</i>			
Datum: <i>Date:</i> 2020-02-20		Ausstellatum: <i>Issue date:</i> 2020-08-18		
Stellung / Position:	Rajesh M Gowda Engineer	Stellung / Position:	Mahammadgouse Kaladagi Assistant Manager	
Sonstiges / Other:	FCC ID: 2AHV9-LP1550			
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 N/A = nicht anwendbar	4 = ausreichend N/T = nicht getestet
* Legend:	1 = very good P(ass) = passed a.m. test specification(s)	2 = good F(ail) = failed a.m. test specification(s)	3 = satisfactory N/A = not applicable	4 = sufficient 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. <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>				

V05

Prüfbericht - Nr.:

Test Report No.:

ULR-TC568820300000022F

Seite 2 von 65

Page 2 of 65

TEST SUMMARY

Section	Test item	Result
15.247 (b) (3)	Maximum Conducted Output Power	Pass
15.247 (a) (2)	6 dB / DTS Bandwidth	Pass
15.247 (e)	Maximum Power Spectral Density	Pass
15.247 (d)	Emissions in non – restricted band	Pass
15.247 (a)(1)	Conducted Spurious Emissions	Pass
15.247 (d) / (15.209 & 15.205)	Radiated spurious emissions and emissions in Restricted bands of operation	Pass

Discipline: Electronics Testing
Group: EMC Test Facility

REVISION HISTORY OF THIS REPORT

Report Number	Version	Description	Issue date
ULR-TC568820300000022F	1.0	Initial issue of Report	2020-08-10
ULR-TC568820300000022F	2.0	EUT Photo in Cover Page is updated	2020-08-18

Table of Contents

1	GENERAL REMARKS	4
1.1	Complimentary Materials.....	4
2	TEST SITES.....	5
2.1	Testing Facilities.....	5
2.2	List of Test and Measurement Instruments.....	5
3	GENERAL PRODUCT INFORMATION	6
3.1	Product Function and Intended Use.....	6
3.2	Ratings and System Details	6
3.3	Measurement Uncertainty:	7
4	TEST SET-UP AND OPERATION MODE	8
4.1	Principle of Configuration Selection	8
4.2	Operation and Software of the EUT	8
4.3	Special Accessories and Auxiliary Equipment	8
4.4	Countermeasures to achieve EMC Compliance	8
4.5	List of Frequencies and Frequency bands	8
5	TEST METHODOLOGY	9
5.1	Radiated Emission Test	9
5.1.1	Test Setup Configuration	9
6	TEST RESULTS	11
6.1	Maximum Average conducted output power.....	11
6.2	Maximum Power Spectral Density	19
6.3	DTS Bandwidth	27
6.4	Emissions in non-restricted frequency bands and Conducted Spurious emissions	34
6.4.1	Emissions in non-restricted frequency bands	34
6.4.2	Out-Of-Band Emissions.....	40
6.5	Radiated spurious emissions and emissions in restricted bands of operation	48
7	LIST OF TABLES	65
8	LIST OF FIGURES.....	65

Prüfbericht - Nr.:

Test Report No.:

ULR-TC568820300000022F

Seite 4 von 65

Page 4 of 65

1 GENERAL REMARKS

1.1 Complimentary Materials

All attachments are integral part of this test report.

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

2 TEST SITES

2.1 Testing Facilities

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

2.2 List of Test and Measurement Instruments

Table 1: Test and measurements instrument used

Equipment	Manufacturer	Model Name	Serial Number	Firmware Versions	Calibration Due Date	Periodicity	Used for Test Items
Spectrum Analyser	Agilent Technologies	E4407B	US41192772	A.14.06	28-03-2020	Yearly	Antenna - Port Measurements
EMI Receiver	Rohde & Schwarz	ESU 40	100288	4.43 SP3	11-10-2020	Yearly	Radiated Spurious Emission
Active loop antenna	Schwarzbeck	FMZB 1519 B	1519B-00111	-	15-07-2020	Yearly	
Biconical Antenna	Schwarzbeck mess-elektronik	VHBB-9124 / BBA-9106	9124-1117	-	19-06-2020	Yearly	
Log-Periodic Antenna	Schwarzbeck mess-elektronik	VUSLP-9111B	9111B-324	-	21-06-2020	Yearly	
Broadband Horn Antenna	Frankonia	HAX-18	HAX18-802	-	18-06-2020	Yearly	
10m Semi Anechoic Chamber	Frankonia	-	-	-	-	-	
3m Fully Anechoic Chamber	Albatross	-	-	-	-	-	

Table 2: Instrument application Software versions

Sl. No	Test Type	Application software	Version
1	Radiated spurious emission measurement- 3 meter Fully Anechoic Chamber	EMC 32	10.60.00

3 GENERAL PRODUCT INFORMATION

3.1 Product Function and Intended Use

The LifeSignals Multi-Parameter Remote Monitoring Platform is a wireless remote monitoring system intended for use by healthcare professionals for continuous collection physiological data in home and healthcare settings. This can include Electrocardiography, Heart Rate, Respiration Rate, skin temperature & body posture in home and healthcare settings. Data is transmitted wirelessly from LifeSignals Biosensor to Remote secure server for display, storage and analysis. The LifeSignals Multi-Parameter Remote Monitoring Platform is intended for detection of changes in the QT interval of an ECG*.

The LifeSignals Multi-Parameter Remote Monitoring Platform is intended for non-critical and adult population.

The LifeSignals Multi-Parameter Remote Monitoring Platform can include the ability to notify healthcare professionals when Physiological parameters falls outside the set limits.

* **Note:** The LifeSignals Multi-Parameter Remote Monitoring Platform does not perform any arrhythmia analysis of ECG data by itself (other than QT interval detection), as it is intended to be used with compatible 3rd party analysis software.

3.2 Ratings and System Details

Table 3: Ratings and System Details

Operating frequency range	2400 MHz to 2483.5 MHz	
Radio Protocol	WLAN 802.11b	
Channel Spacing	5 MHz	
Modulation Type	Complimentary Code Keying (CCK) and Direct-sequence spread spectrum (DSSS)	
Data rate	1, 2, 5.5 and 11 Mbps	
Maximum Measured Power (e.i.r.p)	-0.19 dBm (1Mbps 2412MHz)	
Number of antennas	1	
Antenna type	Meanderline antenna Printed on PCB	
Antenna gain	2412 MHz	-2 dBi
	2437 MHz	-1.2 dBi
	2462 MHz	-1 dBi
Supply Voltage to Product	3V dc power by internal Li-Mno2 primary battery	
Dimensions	115 mm x 110 mm	
Environmental conditions	+0°C to +45°C (32°F to 113°F)	

***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-TC568820300000022F

Seite 7 von 65

Page 7 of 65

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 on low, mid and high channels.

As the product supports WLAN 802.11 b mode only, hence conducted and radiated mode tests were done for all the b mode supported data rates.

4.2 Operation and Software of the EUT

- Hardware Version : 7000000022A
- Software Version : TAG_LADDU_P3 version 1.24.3

4.3 Special Accessories and Auxiliary Equipment

FTDI-ECP IF V1(Test Jig)

Used for issuing the command to EUT for transmitting with highest possible duty cycle at different required data rate. This test jig needed for conducting tests as per this report and not needed for intended use.

4.4 Countermeasures to achieve EMC Compliance

None

4.5 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

Note:

1. TUV Sample Identification number:
Conducted sample - A001063812-013
Radiated sample - A001063812-014

5 TEST METHODOLOGY

5.1 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.

5.1.1 Test Setup Configuration

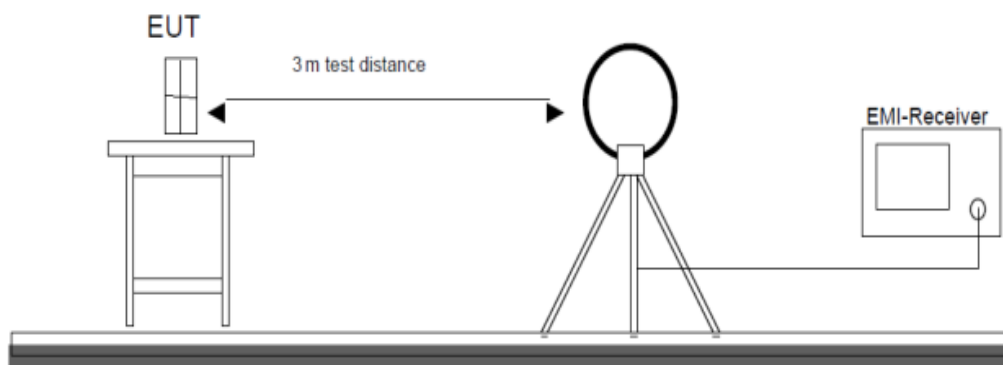


Figure 1: Frequency Range 9 kHz- 30 MHz

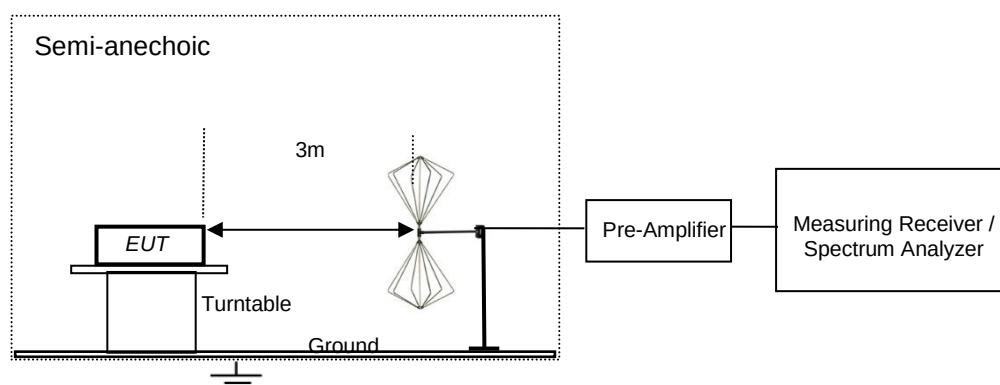


Figure 2: Frequency Range 30 MHz – 200 MHz

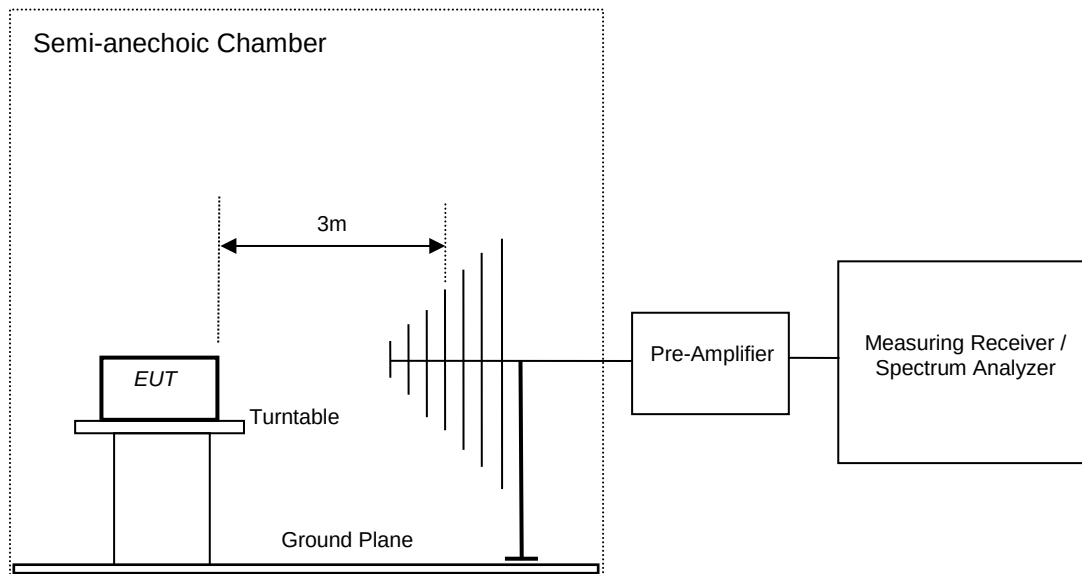


Figure 3: Frequency Range 200 MHz - 1GHz

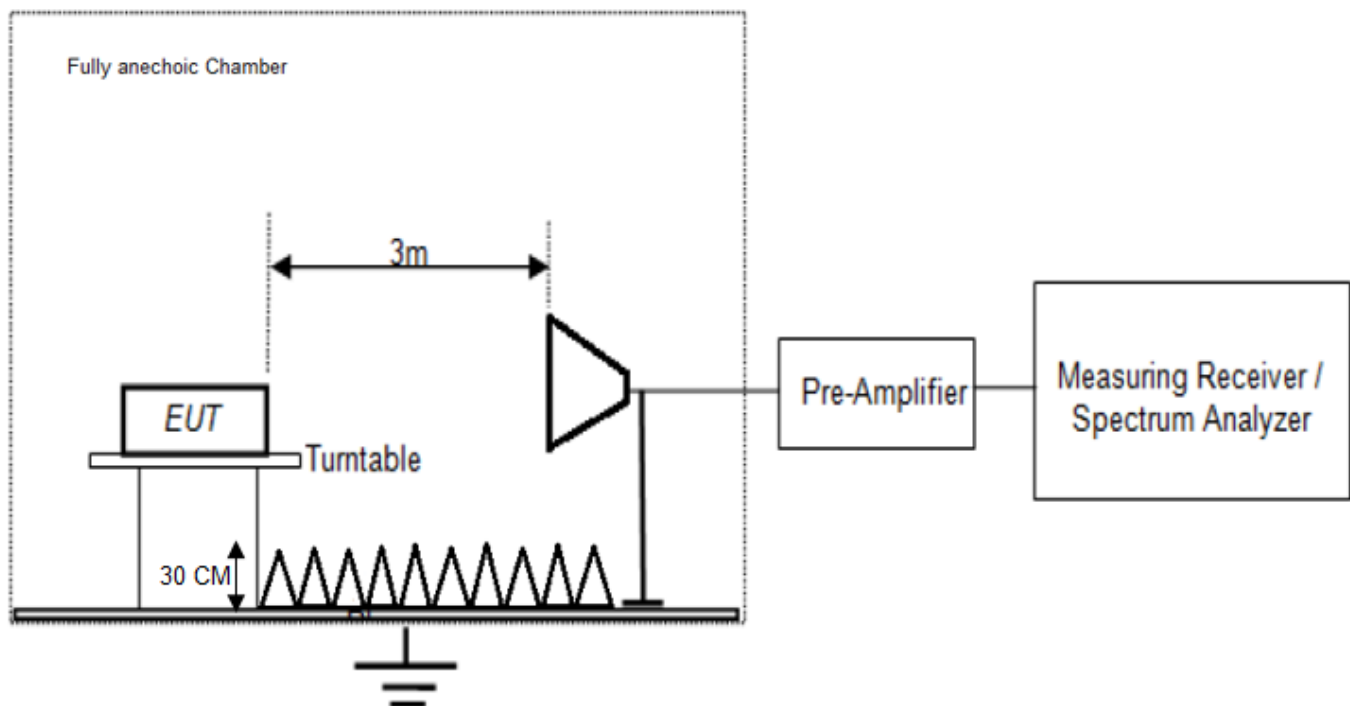


Figure 4: Frequency Range 1GHz – 26GHz

6 Test Results

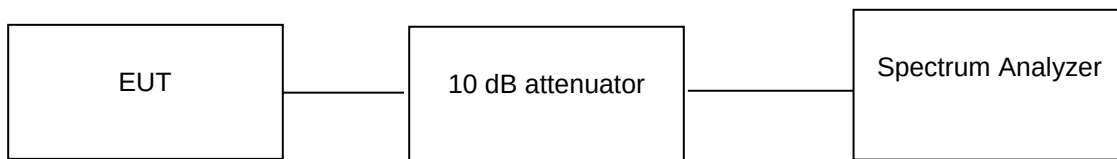
6.1 Maximum Average conducted output power

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 ≤ 1 W (30 dBm) & e.i.r.p ≤ 4 W (36 dBm)

Test Setup:



Environmental and Test conditions:

Normal Temperature = +25 °C

Voltage (V norm) = 2.8 V DC

Relative humidity = 70 %

KDB Guidelines applied:

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

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 (0.8dB)
3. This product do not support additional beamforming gain / directional gain, it uses signal antenna and hence directional gain of the single antenna is -1 dBi
4. Maximum (e.i.r.p) = Maximum Average output power (dBm) + antenna gain (-1 dBi)

Prüfbericht - Nr.:

Test Report No.:

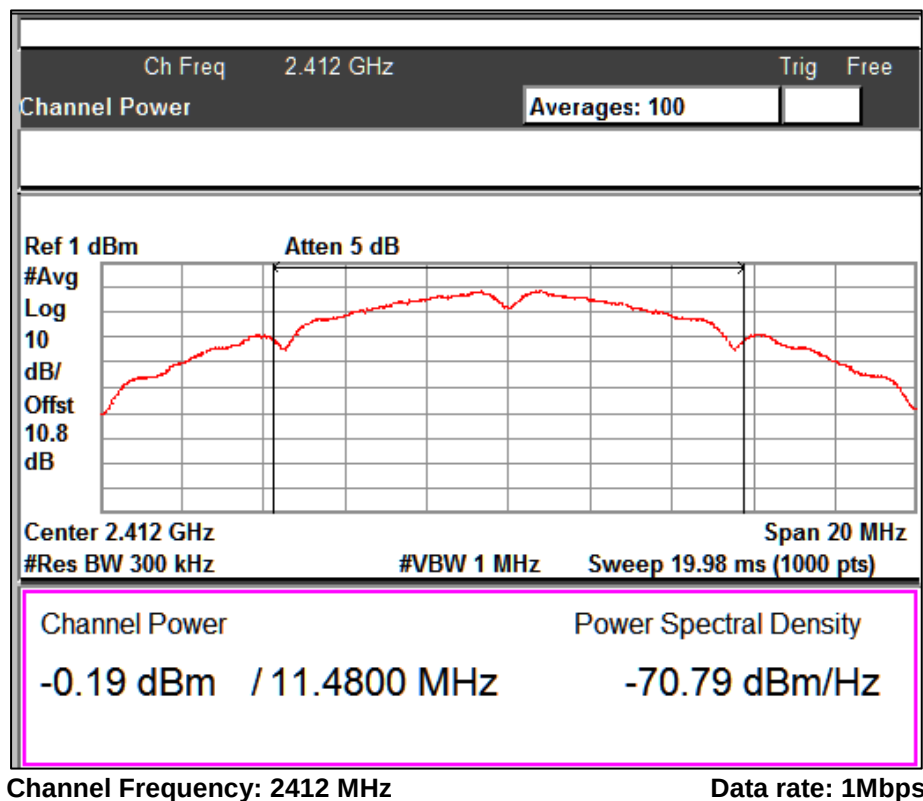
ULR-TC568820300000022F

Seite 12 von 65

Page 12 of 65

Modulation: 802.11b

802.11 Protocol	Data rate (Mbps)	Channel Frequency (MHz)	Measured Average Power (dBm)	Duty Cycle (%)	Duty Cycle Correction Factor(dB)	Maximum Average Output Power (dBm)	Maximum (e.i.r.p) dBm	Power Limit (dBm)	e.i.r.p Limit (dBm)
b	1	2412	-0.19	100	0.00	-0.19	-1.19	30	36
		2437	-1.19	100	0.00	-1.19	-2.19	30	36
		2462	-0.48	100	0.00	-0.48	-1.48	30	36
	2	2412	-0.54	100	0.00	-0.54	-1.54	30	36
		2437	-1.40	100	0.00	-1.40	-2.40	30	36
		2462	-0.76	100	0.00	-0.76	-1.76	30	36
	5.5	2412	-0.28	100	0.00	-0.28	-1.28	30	36
		2437	-1.23	100	0.00	-1.23	-2.23	30	36
		2462	-0.66	100	0.00	-0.66	-1.66	30	36
	11	2412	-0.55	100	0.00	-0.55	-1.55	30	36
		2437	-1.39	100	0.00	-1.39	-2.39	30	36
		2462	-0.88	100	0.00	-0.88	-1.88	30	36



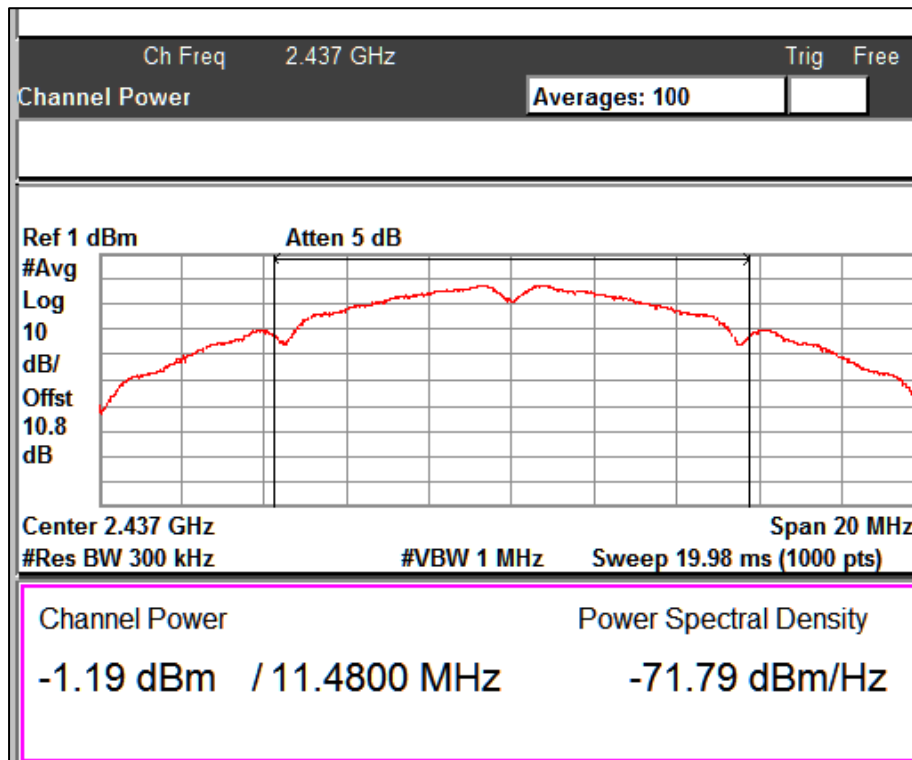
Prüfbericht - Nr.:

Test Report No.:

ULR-TC568820300000022F

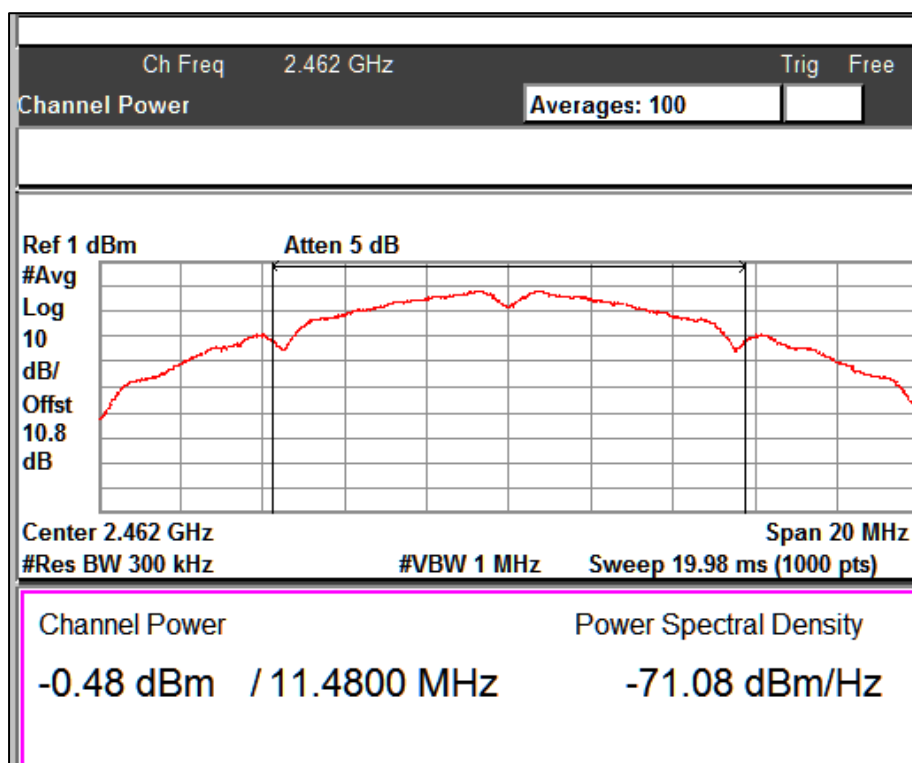
Seite 13 von 65

Page 13 of 65



Channel Frequency: 2437 MHz

Data rate: 1Mbps



Channel Frequency: 2462 MHz

Data rate: 1Mbps

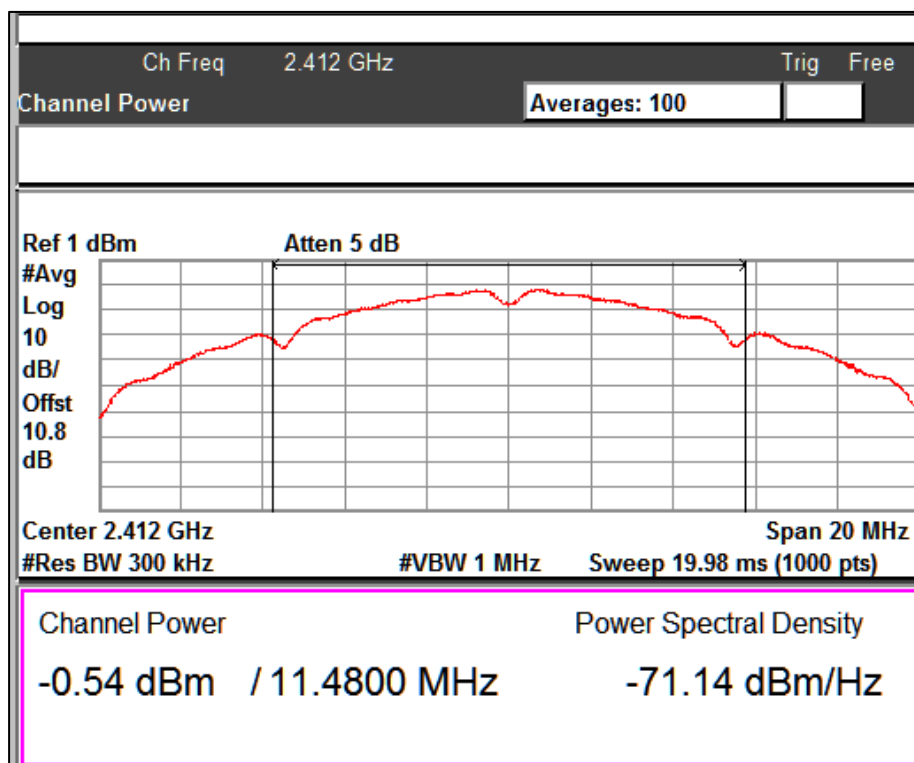
Prüfbericht - Nr.:

Test Report No.:

ULR-TC568820300000022F

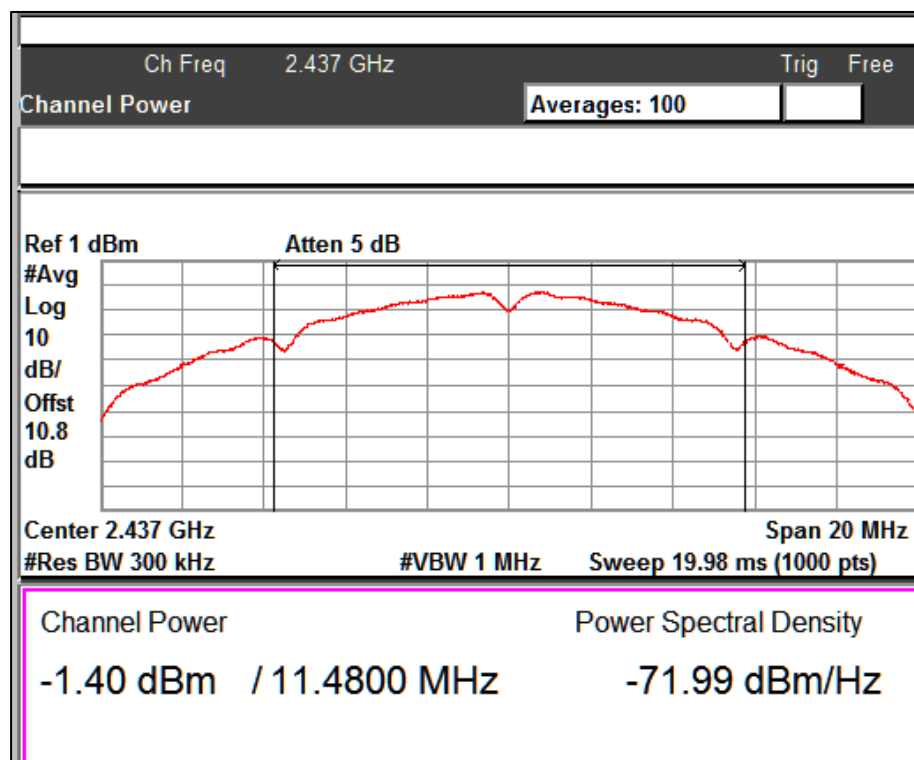
Seite 14 von 65

Page 14 of 65



Channel Frequency: 2412 MHz

Data rate: 2Mbps



Channel Frequency: 2437 MHz

Data rate: 2Mbps

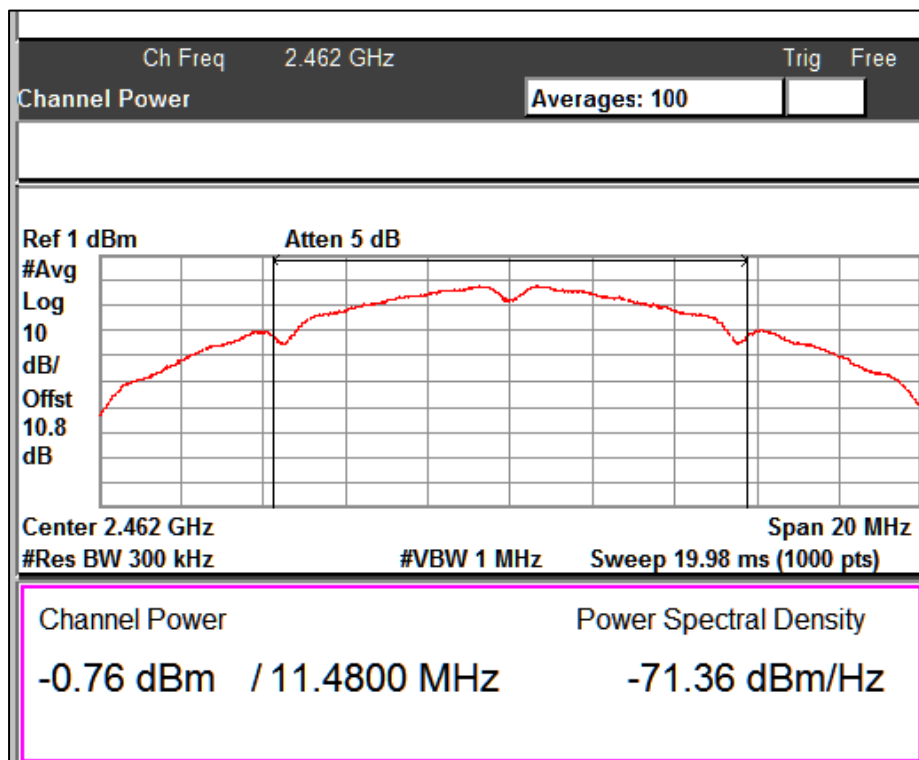
Prüfbericht - Nr.:

Test Report No.:

ULR-TC568820300000022F

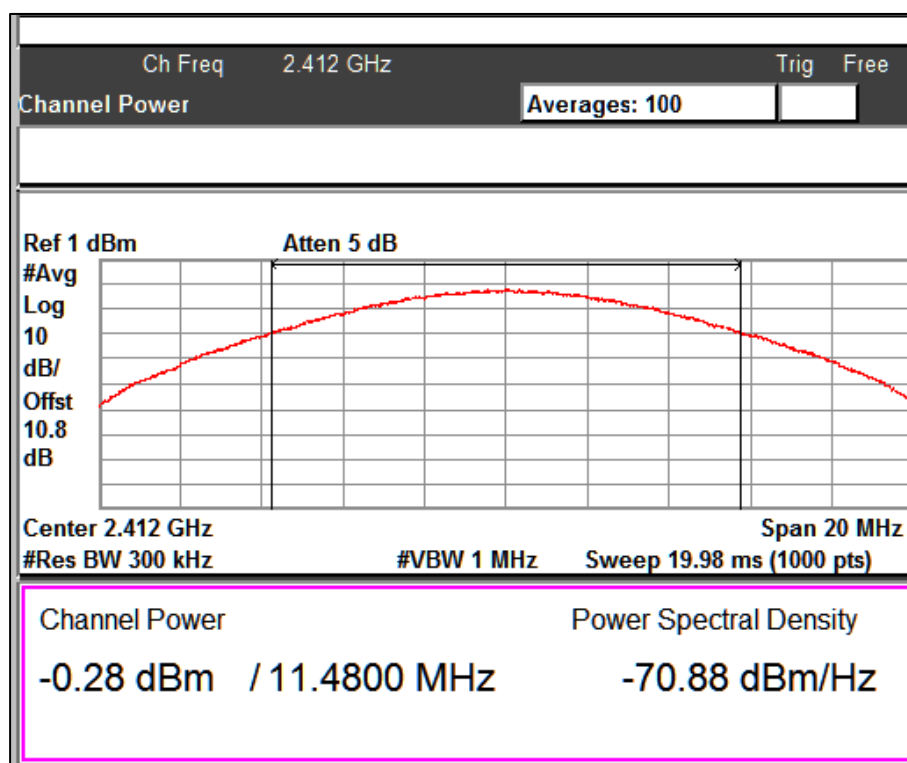
Seite 15 von 65

Page 15 of 65



Channel Frequency: 2462 MHz

Data rate: 2Mbps



Channel Frequency: 2412 MHz

Data rate: 5.5Mbps

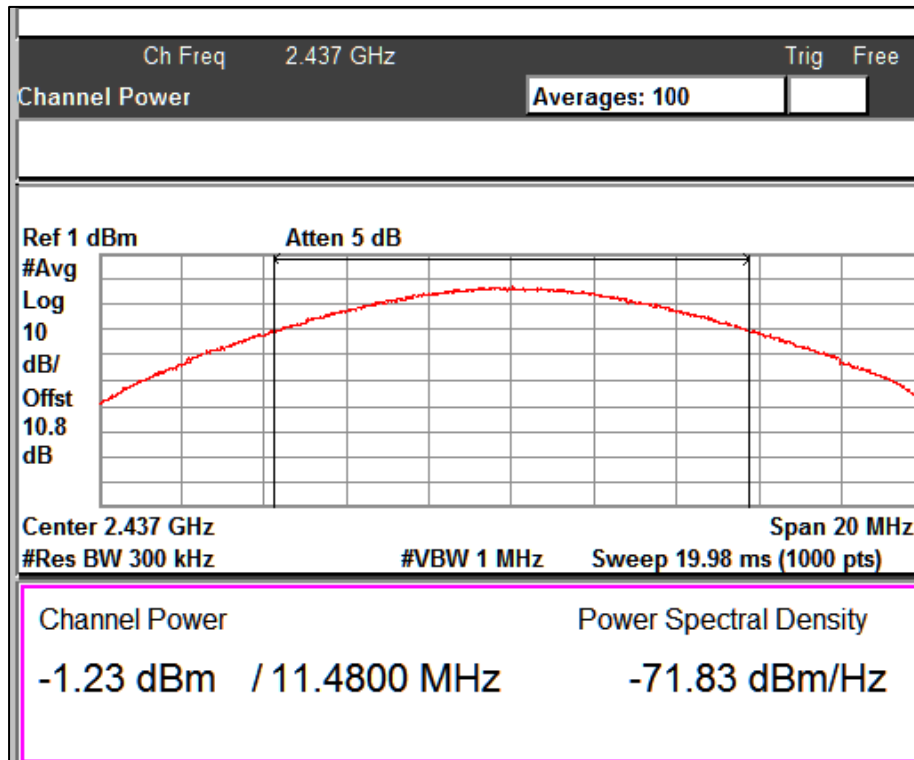
Prüfbericht - Nr.:

Test Report No.:

ULR-TC568820300000022F

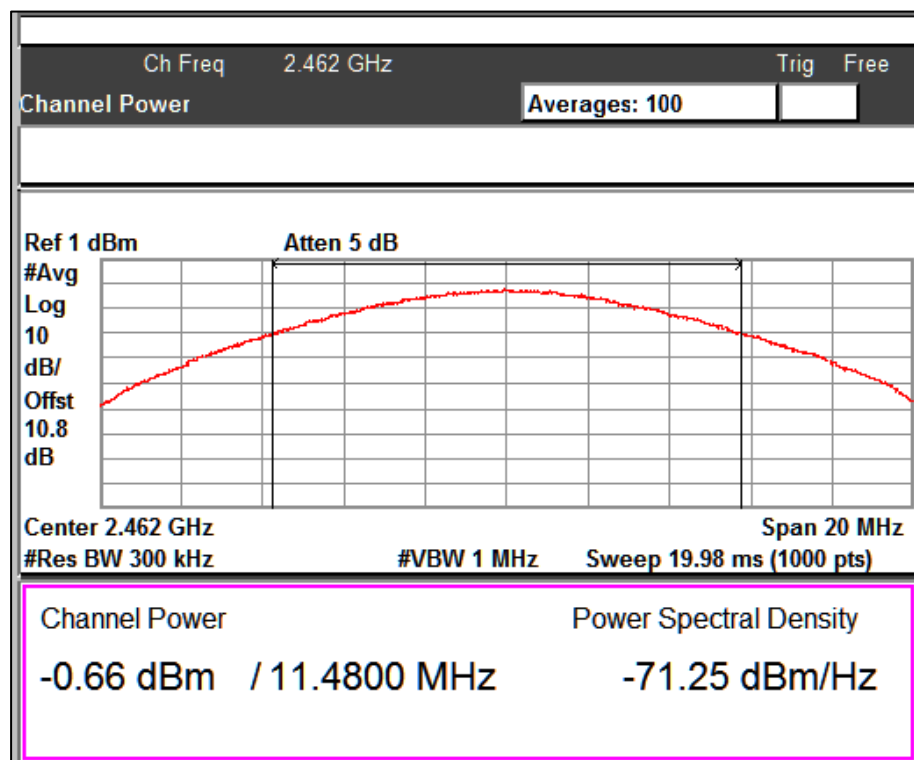
Seite 16 von 65

Page 16 of 65



Channel Frequency: 2437 MHz

Data rate: 5.5Mbps



Channel Frequency: 2462 MHz

Data rate: 5.5Mbps

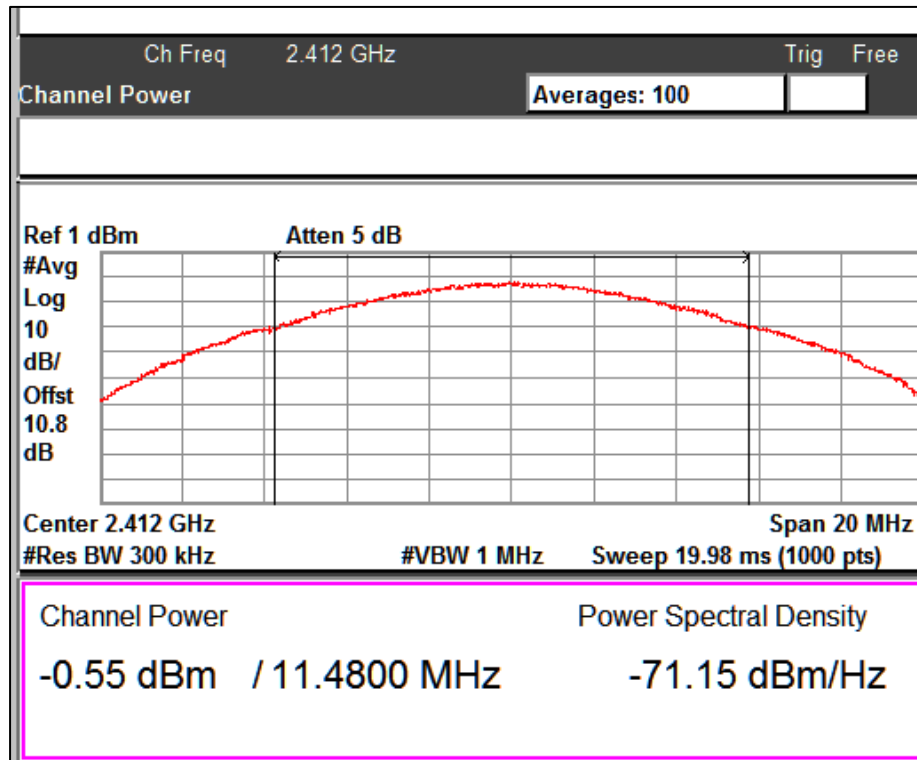
Prüfbericht - Nr.:

Test Report No.:

ULR-TC568820300000022F

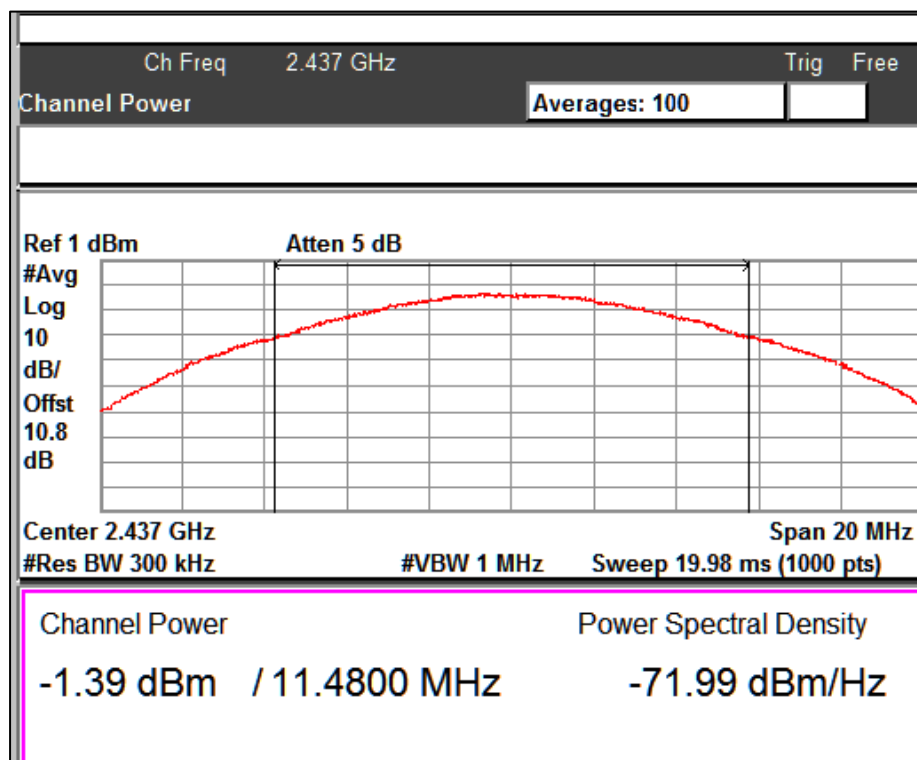
Seite 17 von 65

Page 17 of 65



Channel Frequency: 2412 MHz

Data rate: 11Mbps



Channel Frequency: 2437 MHz

Data rate: 11Mbps

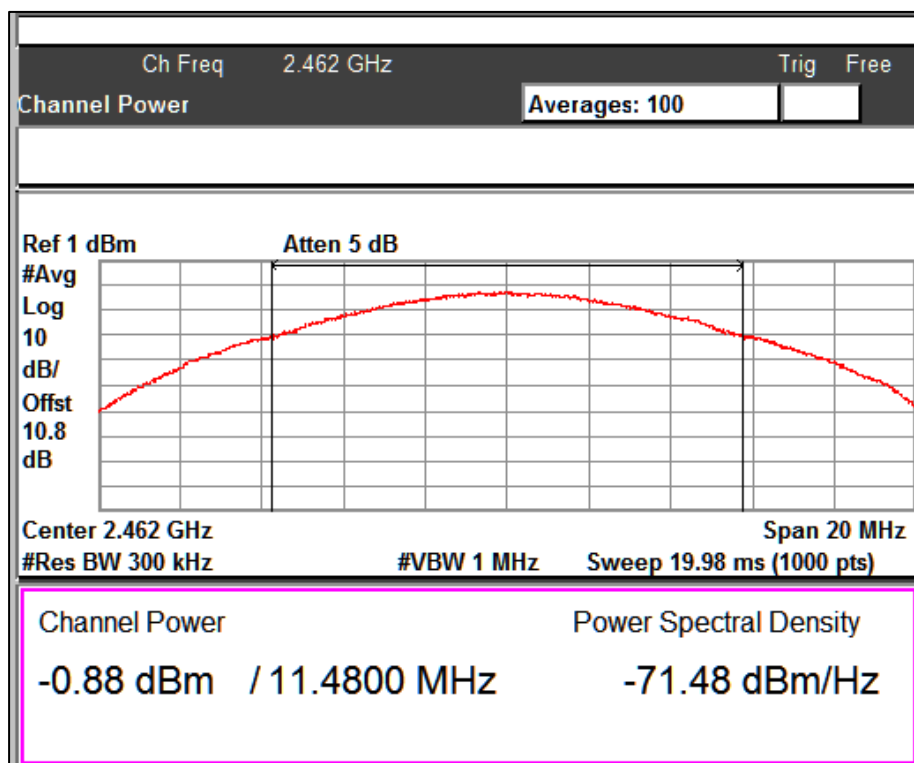
Prüfbericht - Nr.:

Test Report No.:

ULR-TC568820300000022F

Seite 18 von 65

Page 18 of 65



Channel Frequency: 2462 MHz

Data rate: 11Mbps

Prüfbericht - Nr.:

Test Report No.:

ULR-TC568820300000022F

Seite 19 von 65

Page 19 of 65

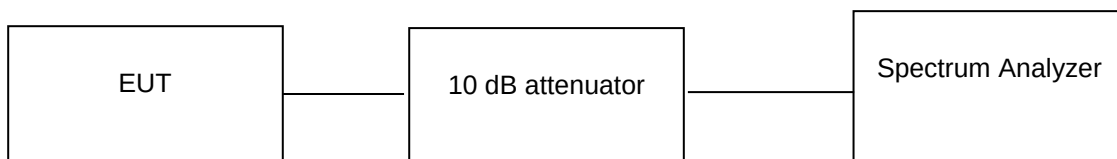
6.2 Maximum Power Spectral Density

Result

Pass

Test Specification	FCC part 15 Subpart C 15.247 (e)
Test Method	Subclause 11.10.5 of ANSI C63.10
Detector Function	Average sample detector
Measurement Bandwidth	100 kHz
Port of testing	Antenna port
Requirement	For digitally modulated systems, the power spectral density conducted from the intentional radiator to the antenna shall not be greater than 8 dBm.

Test Setup:



Environmental and Test conditions:

Normal Temperature = +25 °C

Voltage (V norm) = 2.8 V DC

Relative Humidity = 70 %

KDB Guidelines applied:

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

Test results

Note:

1. All the losses are included during measurement and final values are mentioned in the test report.
2. Total Average PSD (dBm) = Measured Average PSD (dBm) + Attenuator factor (10dB) + Cable loss (0.8dB)
3. This product do not support additional beamforming gain / directional gain, it uses signal antenna and hence directional gain of the single antenna is -1 dBi
10 dB attenuator + 0.8 Cable loss = 10.8 dB offset is considered in below result

Prüfbericht - Nr.:

Test Report No.:

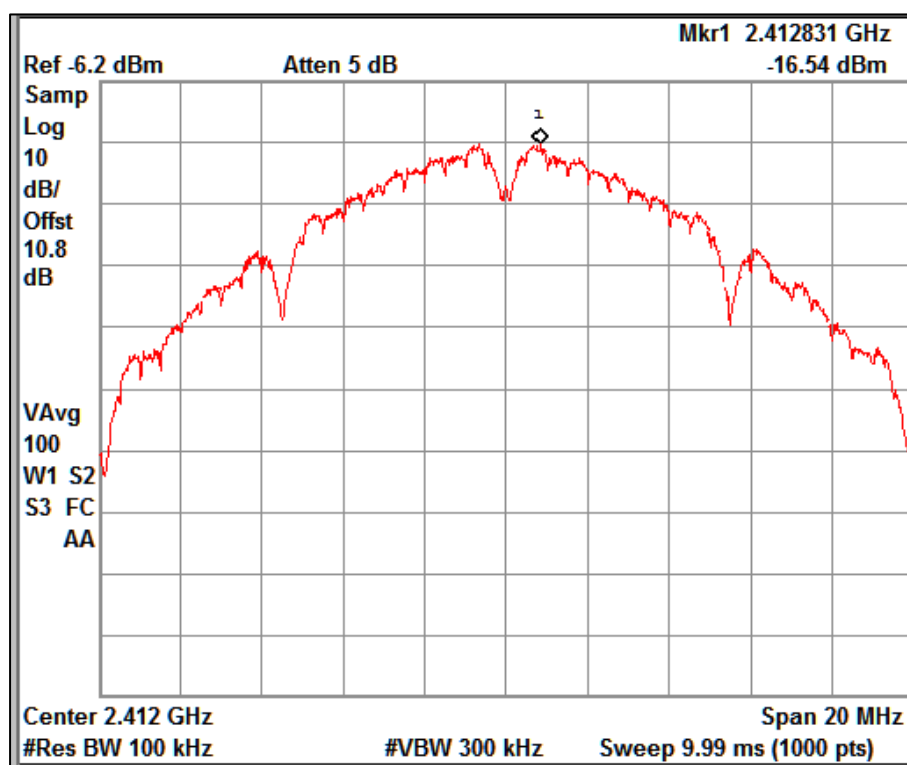
ULR-TC568820300000022F

Seite 20 von 65

Page 20 of 65

Modulation: 802.11b

802.11 Protocol	Data rate (Mbps)	Channel Frequency (MHz)	Measured Average PSD (dBm)	Duty Cycle %	Duty Correction Factor (dB)	Maximum Average PSD (dBm)	Limit (dBm)
b	1	2412	-16.54	100.00	0.00	-16.54	8
		2437	-17.44	100.00	0.00	-17.44	8
		2462	-16.89	100.00	0.00	-16.89	8
	2	2412	-17.68	100.00	0.00	-17.68	8
		2437	-18.07	100.00	0.00	-18.07	8
		2462	-18.21	100.00	0.00	-18.21	8
	5.5	2412	-17.10	100.00	0.00	-17.10	8
		2437	-19.51	100.00	0.00	-19.51	8
		2462	-17.83	100.00	0.00	-17.83	8
	11	2412	-18.74	100.00	0.00	-18.74	8
		2437	-19.36	100.00	0.00	-19.36	8
		2462	-18.76	100.00	0.00	-18.76	8



Channel Frequency: 2412 MHz

Data rate: 1Mbps

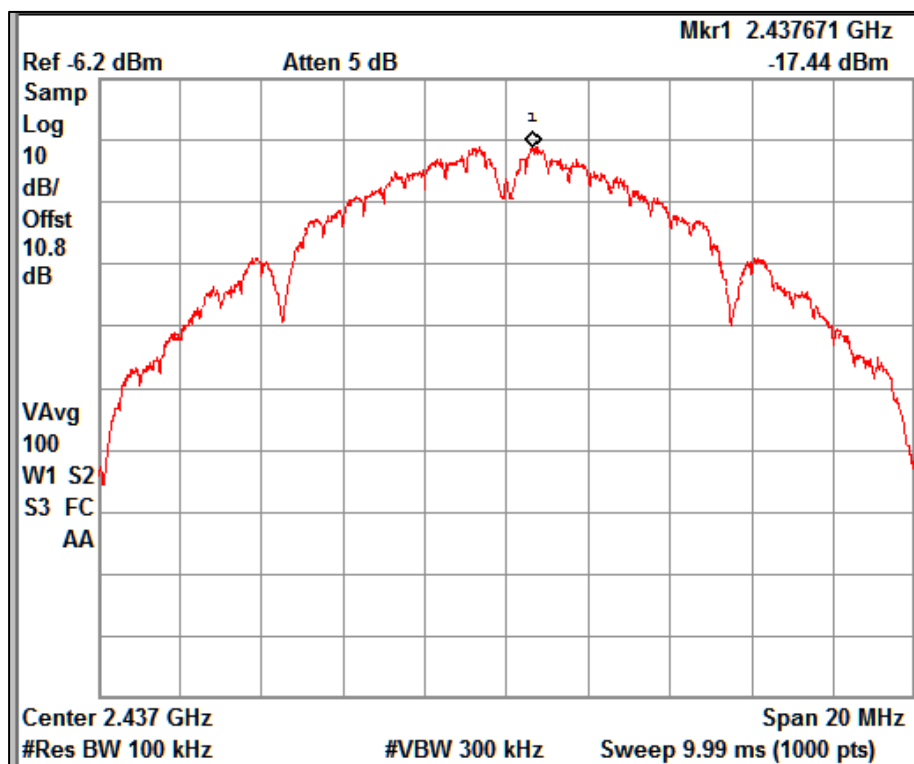
Prüfbericht - Nr.:

Test Report No.:

ULR-TC568820300000022F

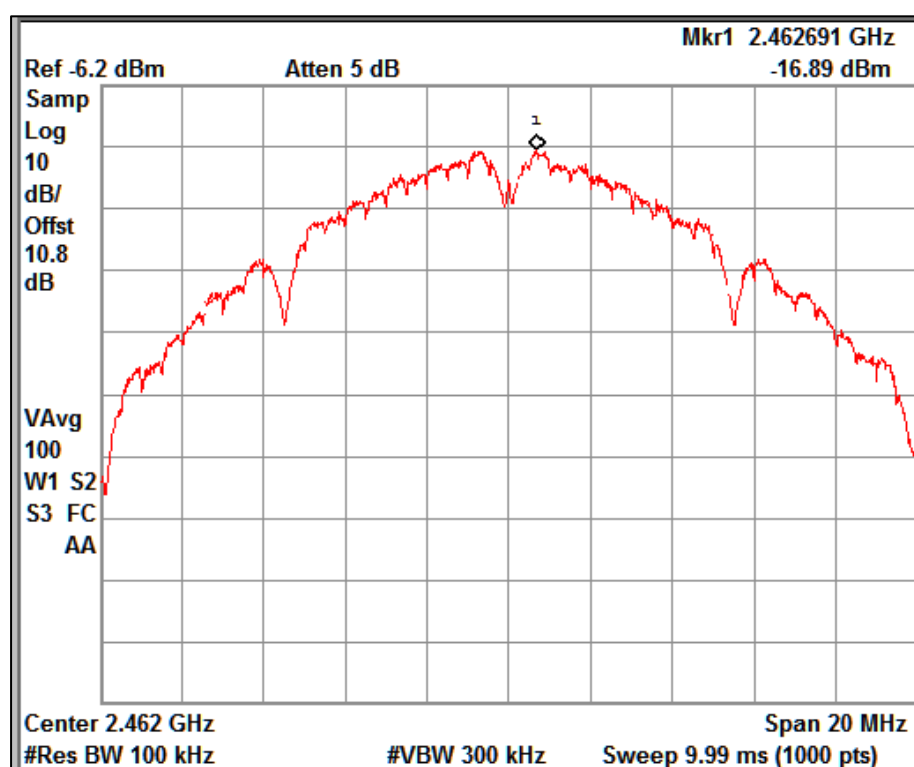
Seite 21 von 65

Page 21 of 65



Channel Frequency: 2437 MHz

Data rate: 1Mbps



Channel Frequency: 2462 MHz

Data rate: 1Mbps

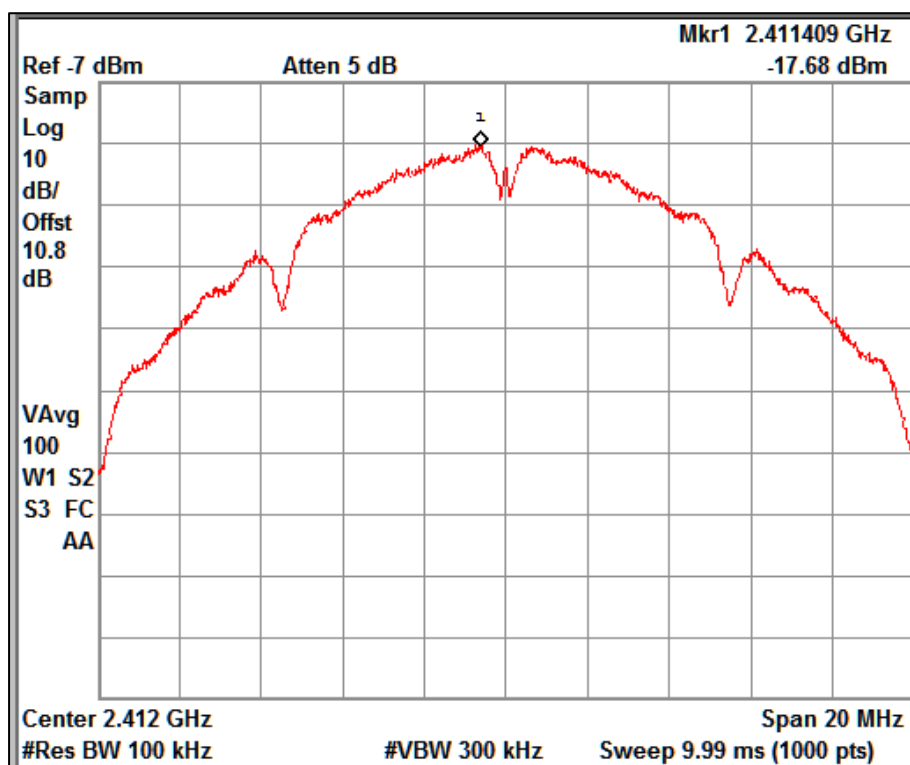
Prüfbericht - Nr.:

Test Report No.:

ULR-TC568820300000022F

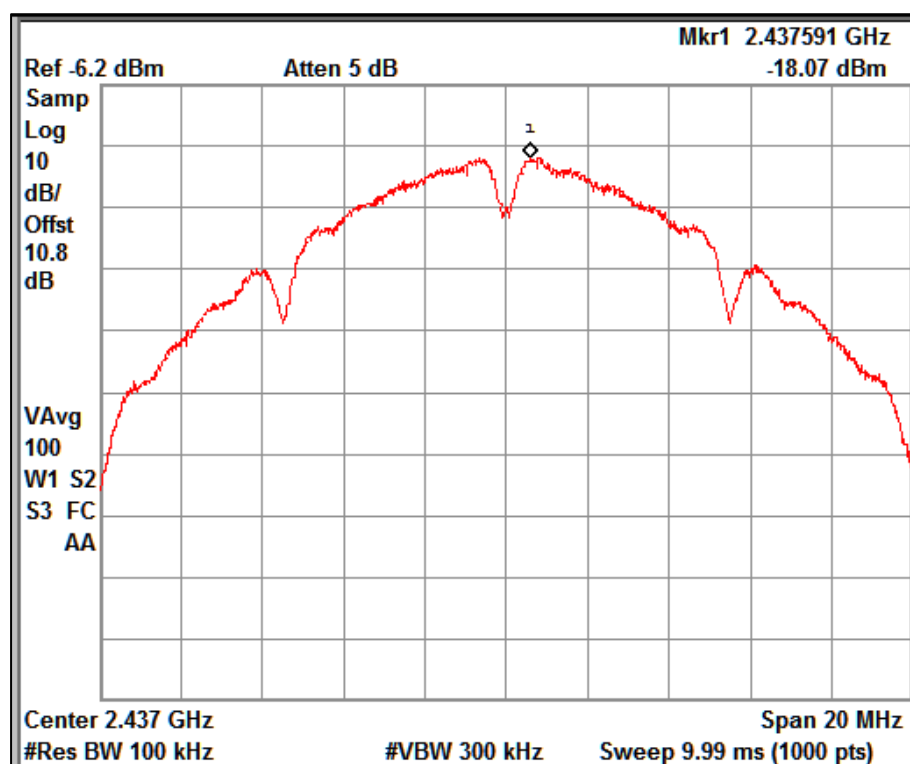
Seite 22 von 65

Page 22 of 65



Channel Frequency: 2412 MHz

Data rate: 2Mbps



Channel Frequency : 2437 MHz

Data rate: 2Mbps

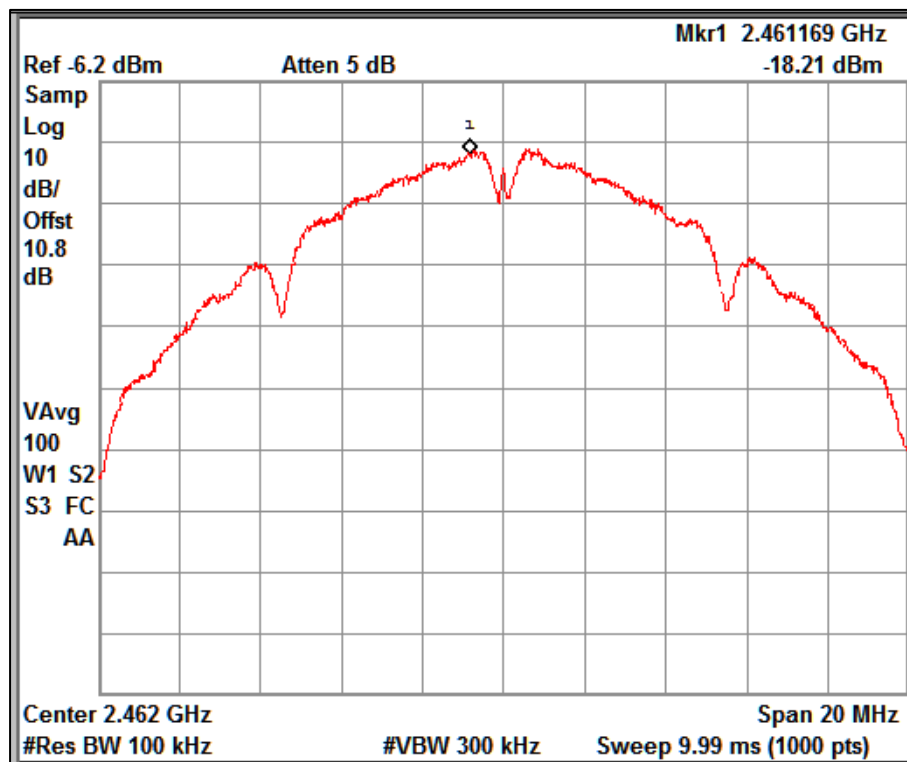
Prüfbericht - Nr.:

Test Report No.:

ULR-TC568820300000022F

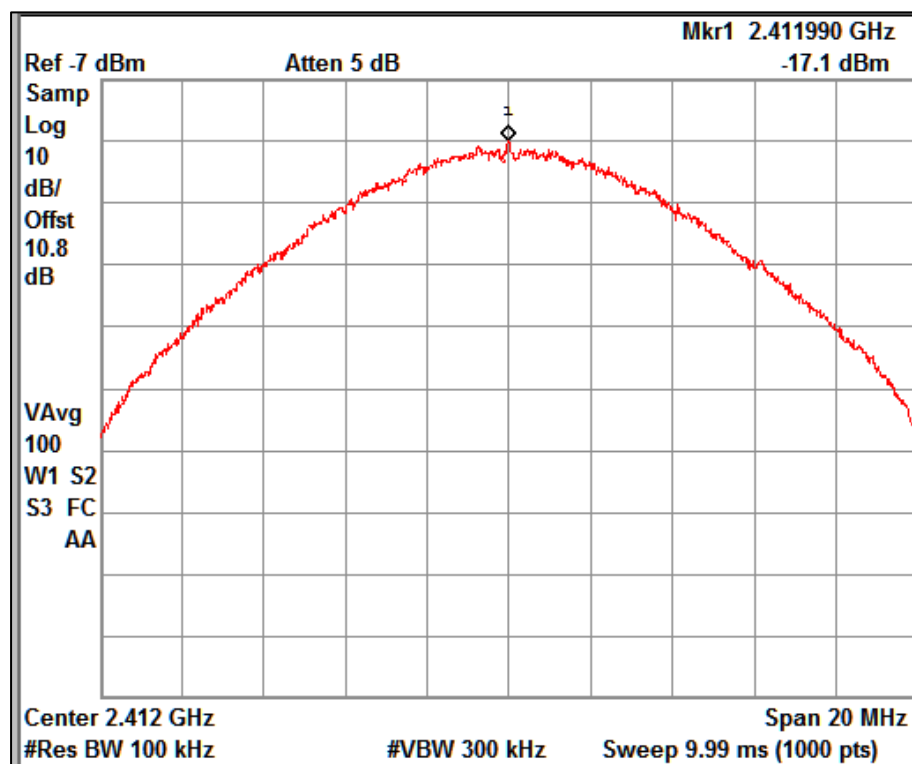
Seite 23 von 65

Page 23 of 65



Channel Frequency: 2462 MHz

Data rate: 2Mbps



Channel Frequency: 2412 MHz

Data rate: 5.5Mbps

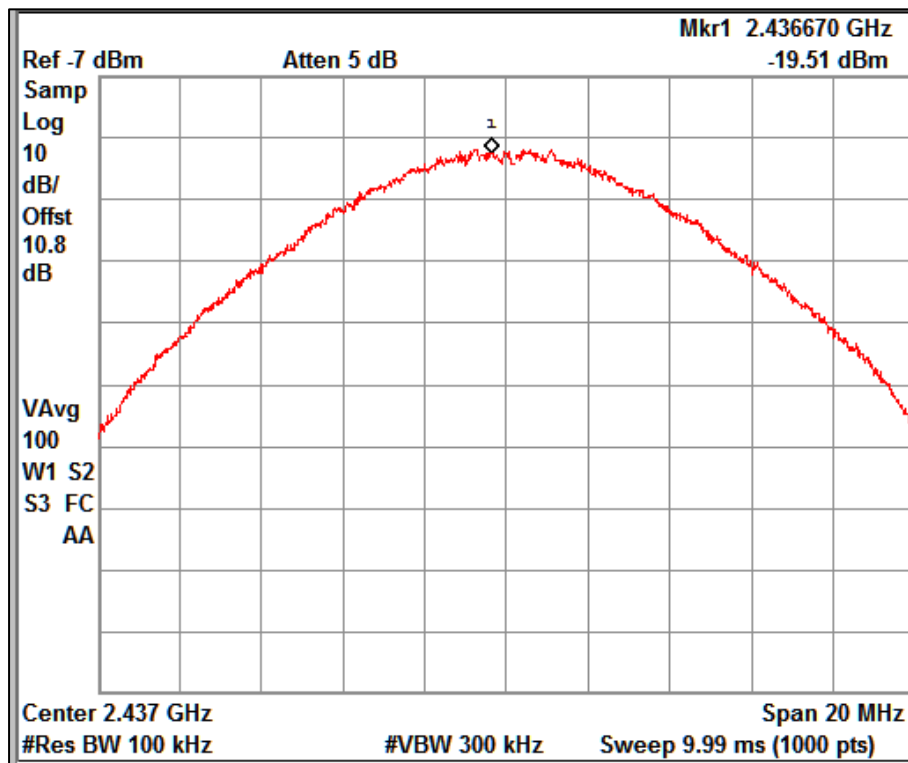
Prüfbericht - Nr.:

Test Report No.:

ULR-TC568820300000022F

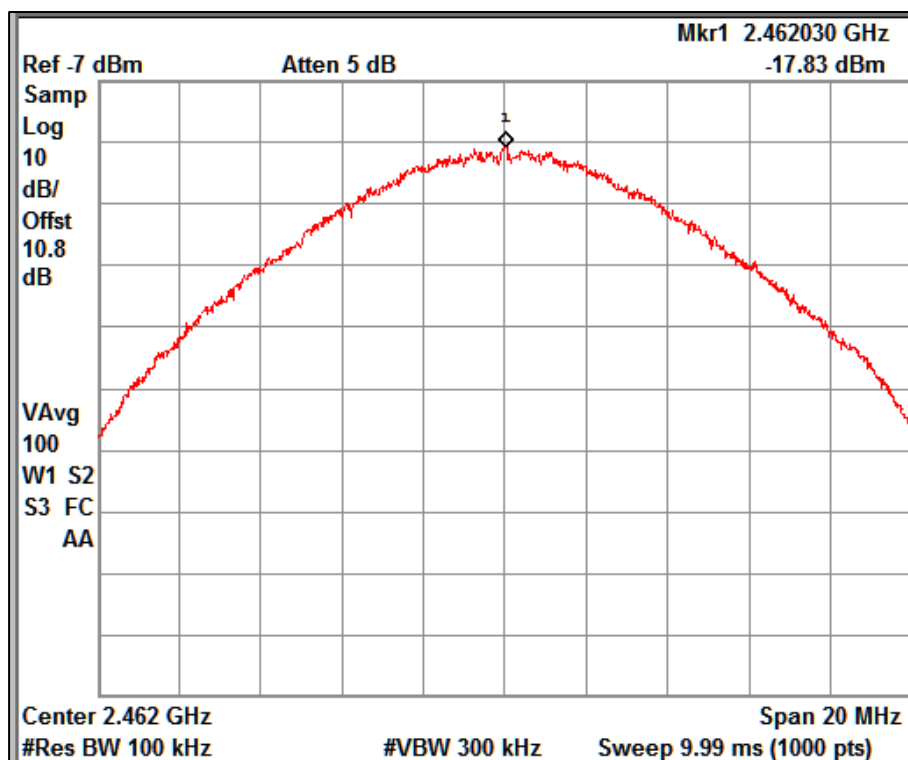
Seite 24 von 65

Page 24 of 65



Channel Frequency: 2437 MHz

Data rate: 5.5Mbps



Channel Frequency: 2462 MHz

Data rate: 5.5Mbps

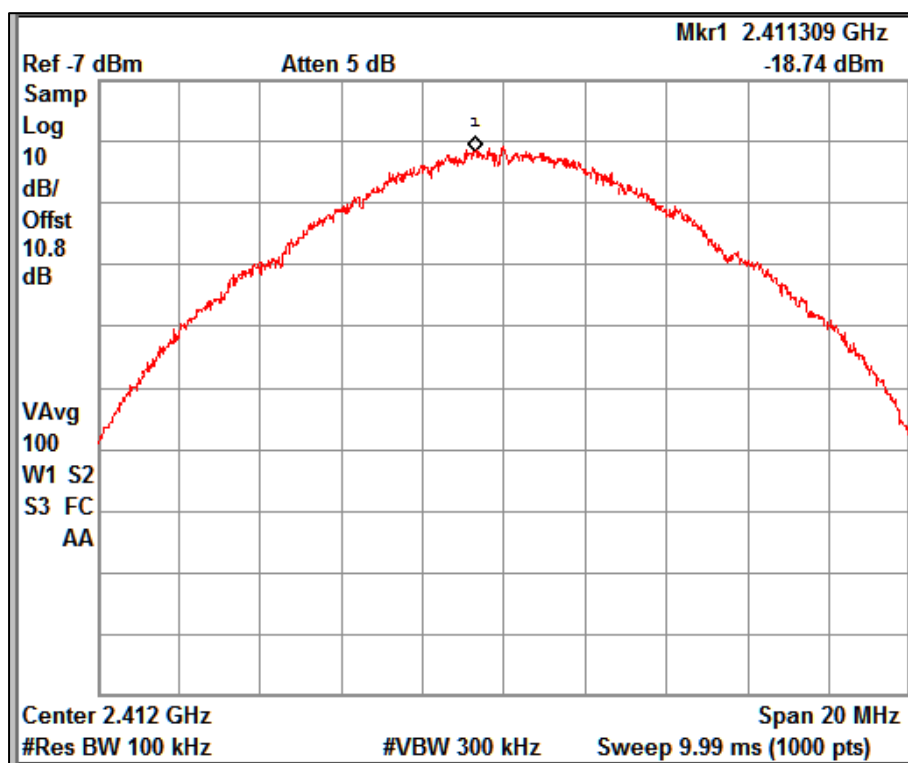
Prüfbericht - Nr.:

Test Report No.:

ULR-TC568820300000022F

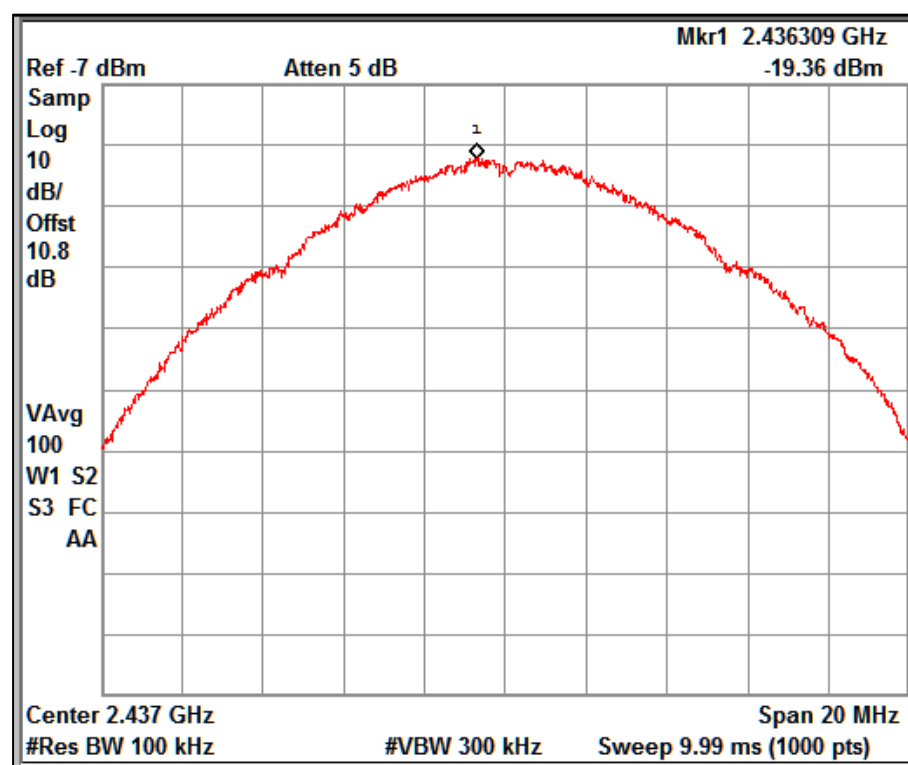
Seite 25 von 65

Page 25 of 65



Channel Frequency: 2412 MHz

Data rate: 11Mbps



Channel Frequency: 2437 MHz

Data rate: 11Mbps

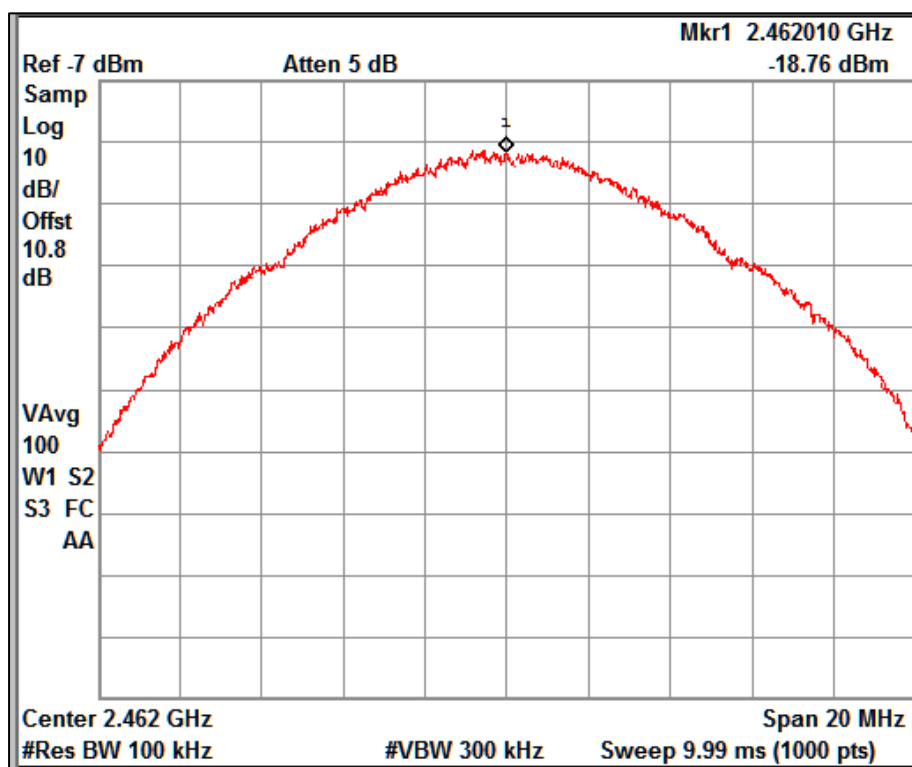
Prüfbericht - Nr.:

Test Report No.:

ULR-TC568820300000022F

Seite 26 von 65

Page 26 of 65



Channel Frequency: 2462 MHz

Data rate: 11Mbps

Prüfbericht - Nr.:

Test Report No.:

ULR-TC568820300000022F

Seite 27 von 65

Page 27 of 65

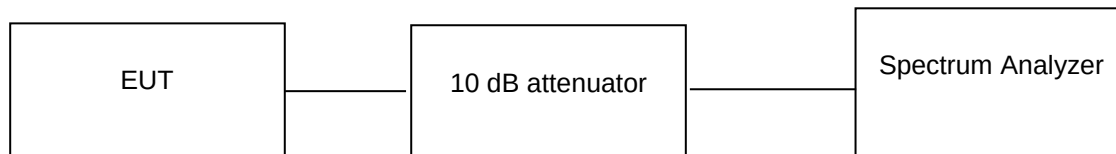
6.3 DTS Bandwidth

Result

Pass

Test Specification	FCC part 15 Subpart C 15.247 (a) (2) 5.2 (a)
Test Method	Subclause 11.8 of ANSI C63.10
Detector	Peak
Measurement Bandwidth	100 kHz
Port of testing	Antenna Port
Requirement	The minimum 6 dB bandwidth shall be at least 500 kHz.

Test Setup:



Environmental and Test conditions:

Normal Temperature = +25 °C

Voltage (V norm) = 2.8 V DC

Relative Humidity = 70 %

KDB Guidelines applied:

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

Test results

Note:

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

Modulation: 802.11b

802.11 Protocol	Data rate (Mbps)	Frequency (MHz)	6dB bandwidth (MHz)	99% OBW (MHz)	Minimum Limit (MHz)
b	1	2412	6.02	11.48	0.5
		2437	6.03	10.86	0.5
		2462	5.58	11.25	0.5
	2	2412	5.48	11.36	0.5
		2437	5.71	10.78	0.5
		2462	5.74	10.92	0.5
	5.5	2412	5.76	10.91	0.5
		2437	6.27	10.81	0.5
		2462	5.57	10.87	0.5
	11	2412	5.16	11.02	0.5
		2437	5.70	10.92	0.5
		2462	5.15	10.93	0.5

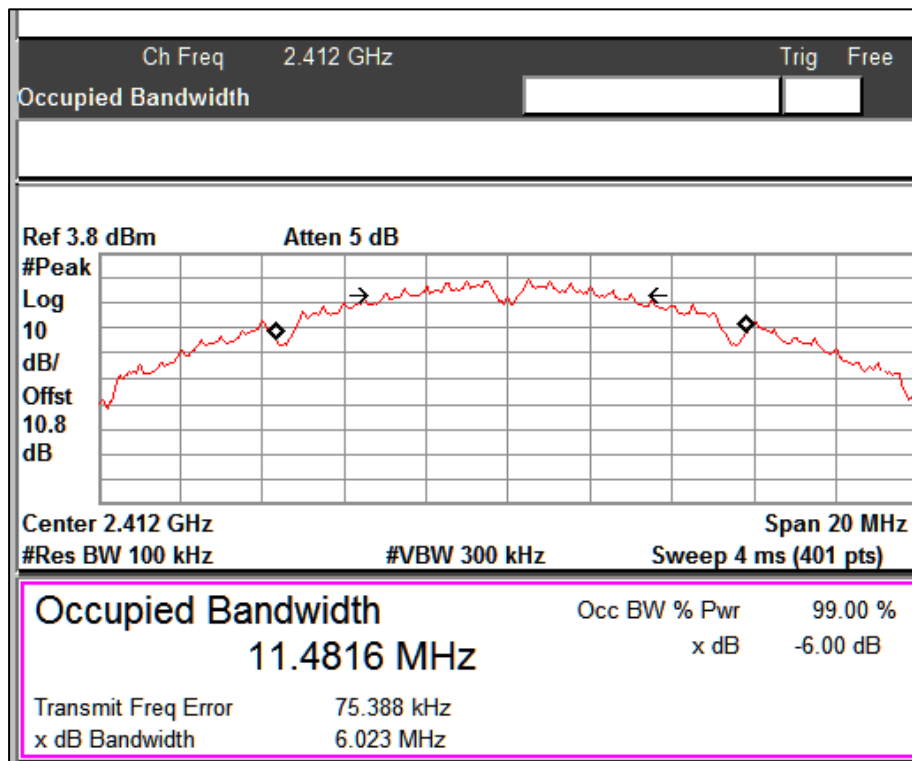
Prüfbericht - Nr.:

Test Report No.:

ULR-TC568820300000022F

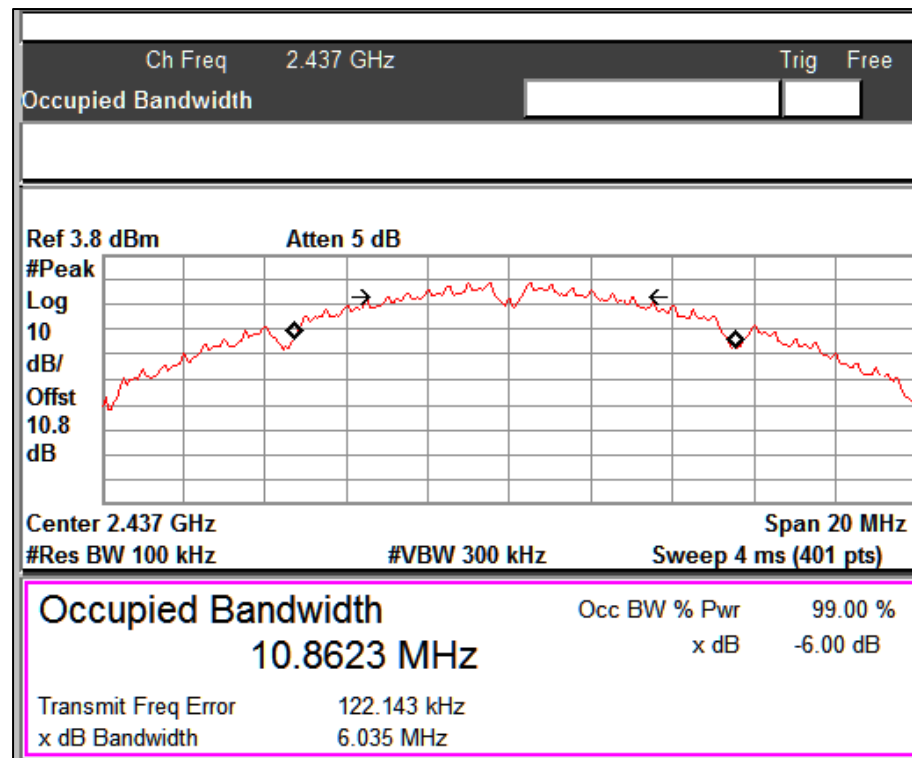
Seite 28 von 65

Page 28 of 65



Channel Frequency: 2412 MHz

Data Rate: 1Mbps



Channel Frequency: 2437 MHz

Data Rate: 1Mbps

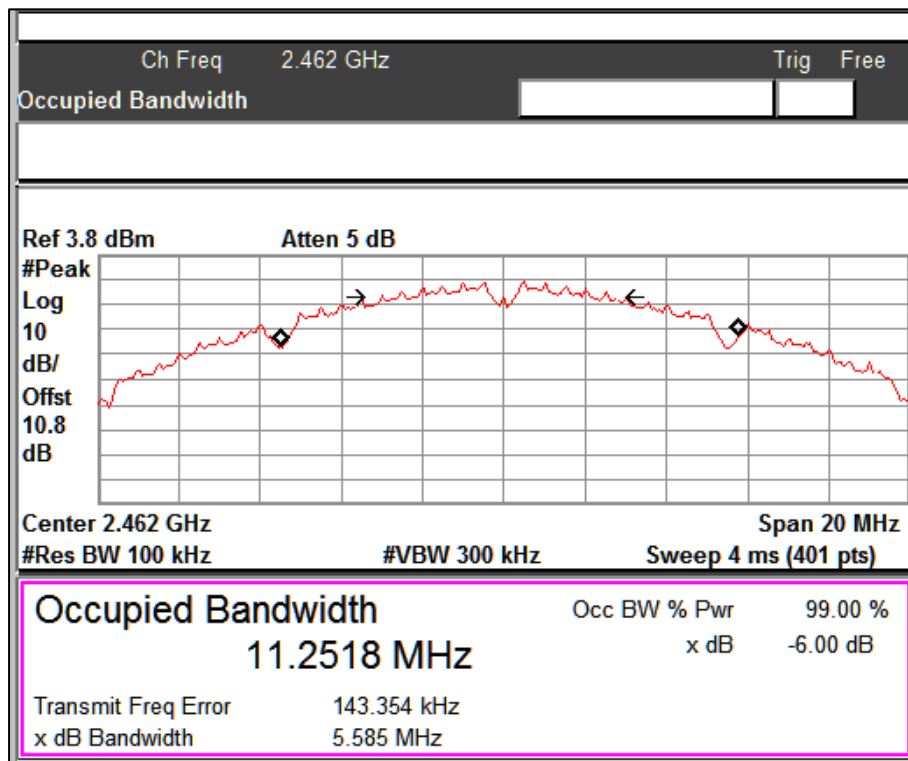
Prüfbericht - Nr.:

Test Report No.:

ULR-TC568820300000022F

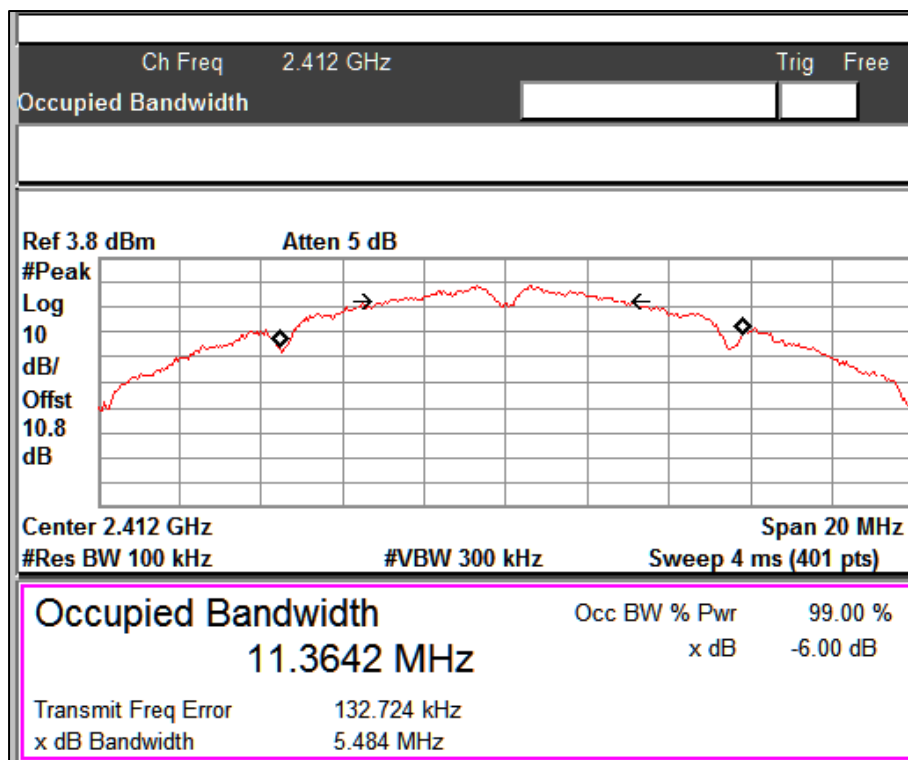
Seite 29 von 65

Page 29 of 65



Channel Frequency: 2462 MHz

Data Rate: 1Mbps



Channel Frequency: 2412 MHz

Data Rate: 2Mbps

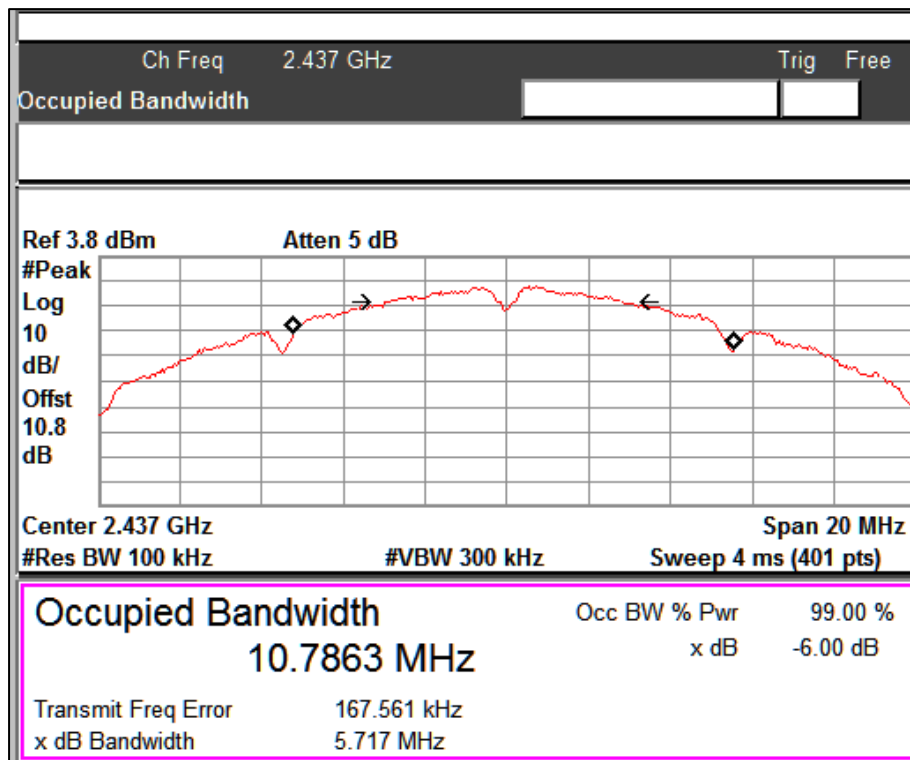
Prüfbericht - Nr.:

Test Report No.:

ULR-TC568820300000022F

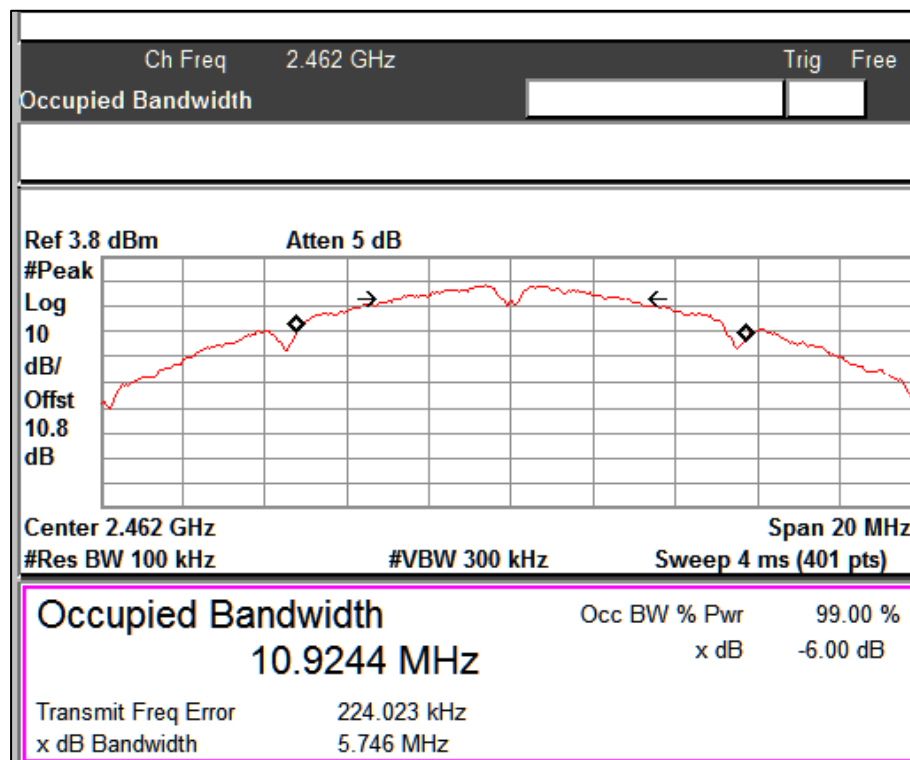
Seite 30 von 65

Page 30 of 65



Channel Frequency: 2437 MHz

Data Rate: 2Mbps



Channel Frequency: 2462 MHz

Data Rate: 2Mbps

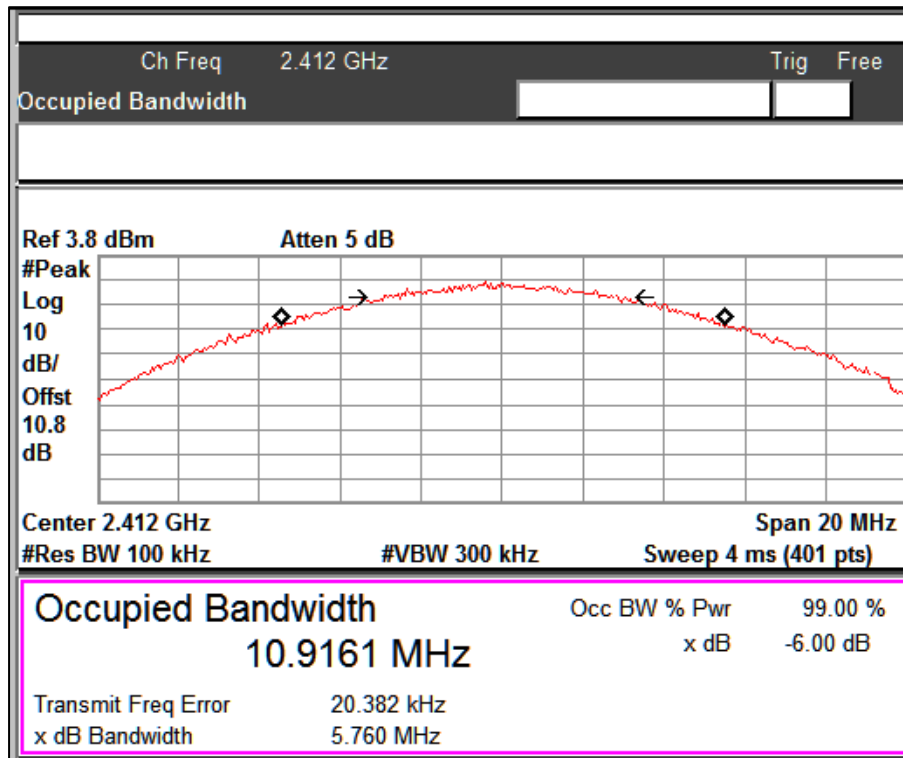
Prüfbericht - Nr.:

Test Report No.:

ULR-TC568820300000022F

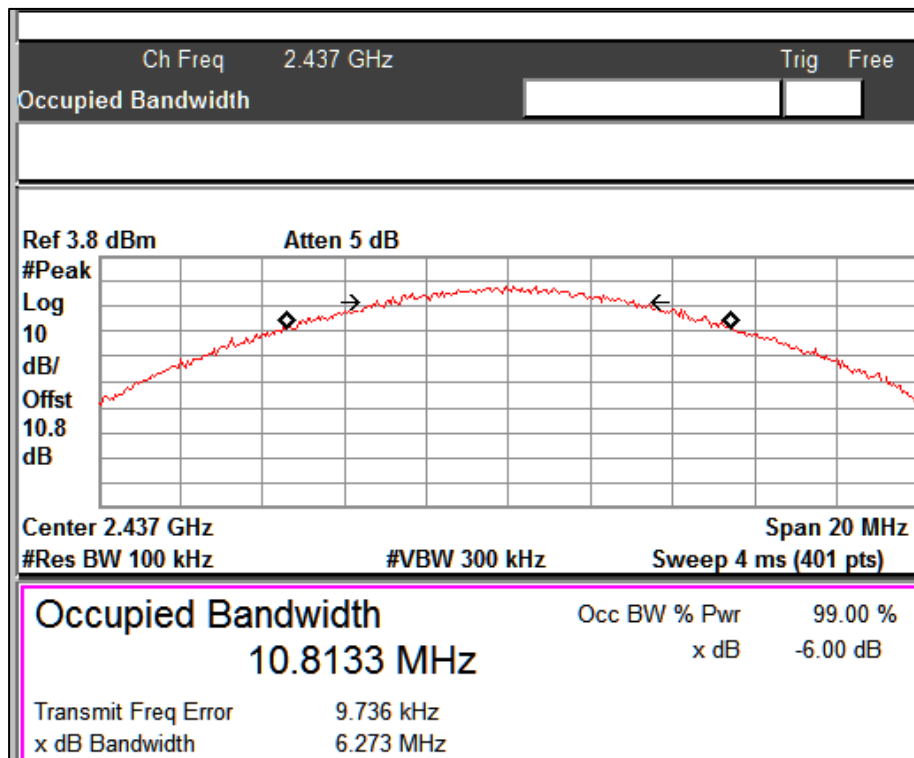
Seite 31 von 65

Page 31 of 65



Channel Frequency: 2412 MHz

Data Rate: 5.5Mbps



Channel Frequency: 2437 MHz

Data Rate: 5.5Mbps

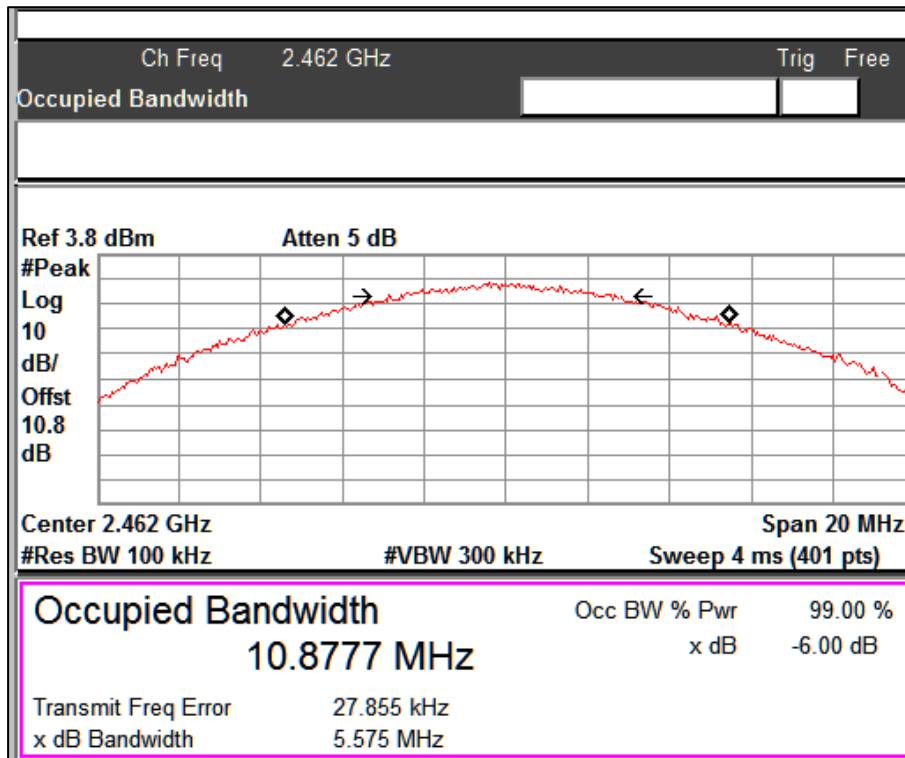
Prüfbericht - Nr.:

Test Report No.:

ULR-TC568820300000022F

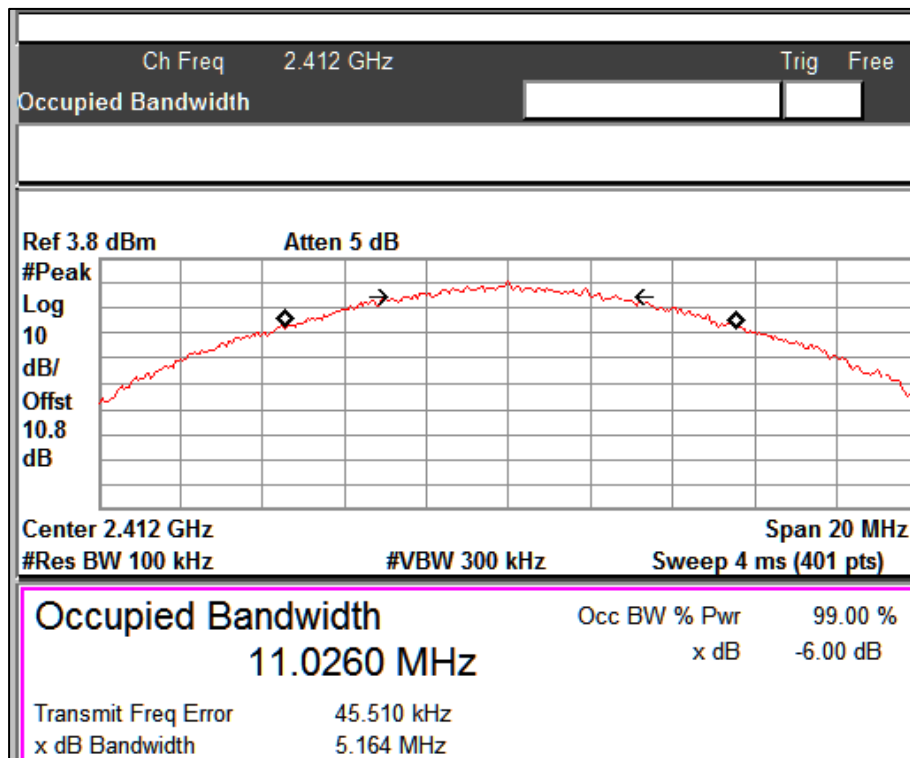
Seite 32 von 65

Page 32 of 65



Channel Frequency: 2462 MHz

Data Rate: 5.5Mbps



Channel Frequency: 2412 MHz

Data Rate: 11Mbps

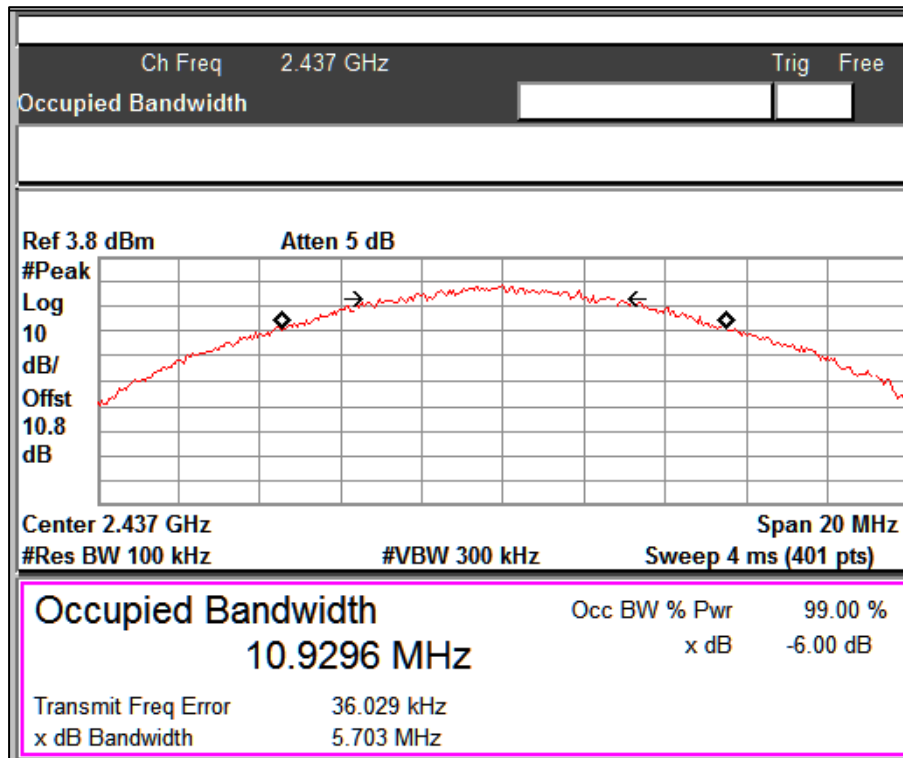
Prüfbericht - Nr.:

Test Report No.:

ULR-TC568820300000022F

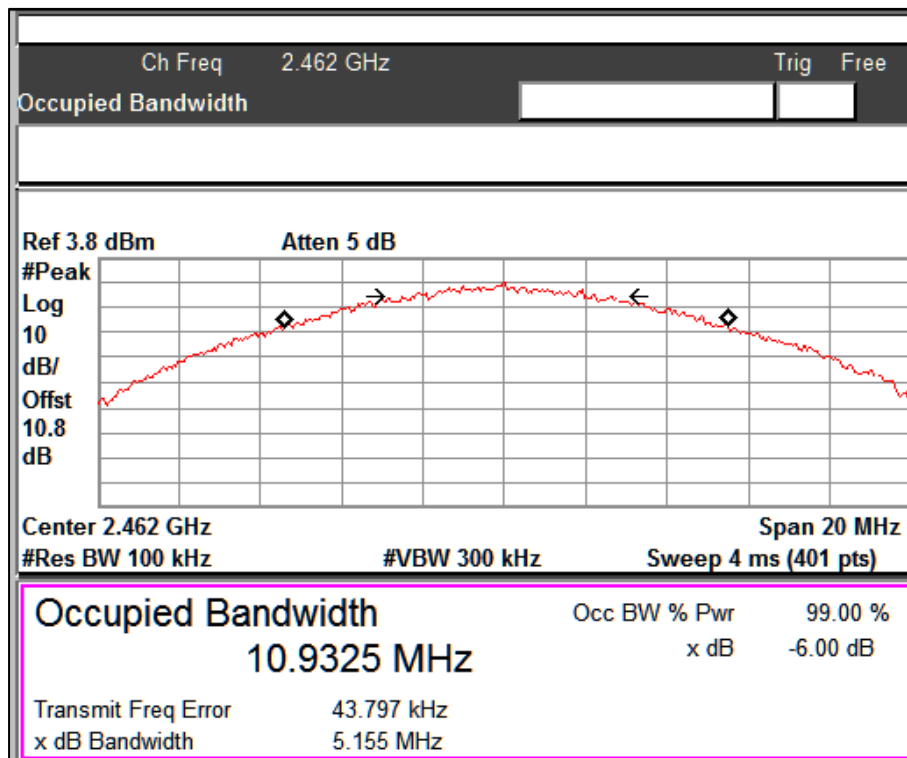
Seite 33 von 65

Page 33 of 65



Channel Frequency: 2437 MHz

Data Rate: 11Mbps



Channel Frequency: 2462 MHz

Data Rate: 11Mbps

Prüfbericht - Nr.:

Test Report No.:

ULR-TC568820300000022F

Seite 34 von 65

Page 34 of 65

6.4 Emissions in non-restricted frequency bands and Conducted Spurious emissions

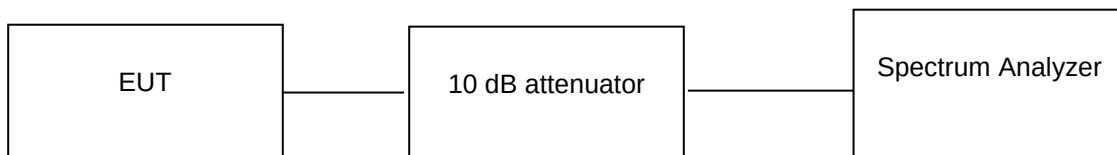
6.4.1 Emissions in non-restricted frequency bands

Result

Pass

Test Specification	FCC part 15 Subpart C 15.247 (d)
Test Method	Subclause 11.11 of ANSI C63.10
Detector Function	Peak
Port of testing	Antenna port
Measurement Bandwidth	100 kHz
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.

Test Setup:



Environmental and Test conditions:

Normal Temperature = +25 °C

Voltage (V norm) = 2.8 V DC

Relative Humidity = 70 %

KDB Guidelines applied:

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

Test Results:

Note:

1. All the losses are included during measurement and final values are mentioned in the test report.
2. Final Value (dBm) = Measured Value (dBm) + Attenuator factor (10dB) + Cable loss (0.8dB)
3. This product do not support additional beamforming gain / directional gain, it uses signal antenna and hence directional gain of the single antenna is -1 dBi

Prüfbericht - Nr.:

Test Report No.:

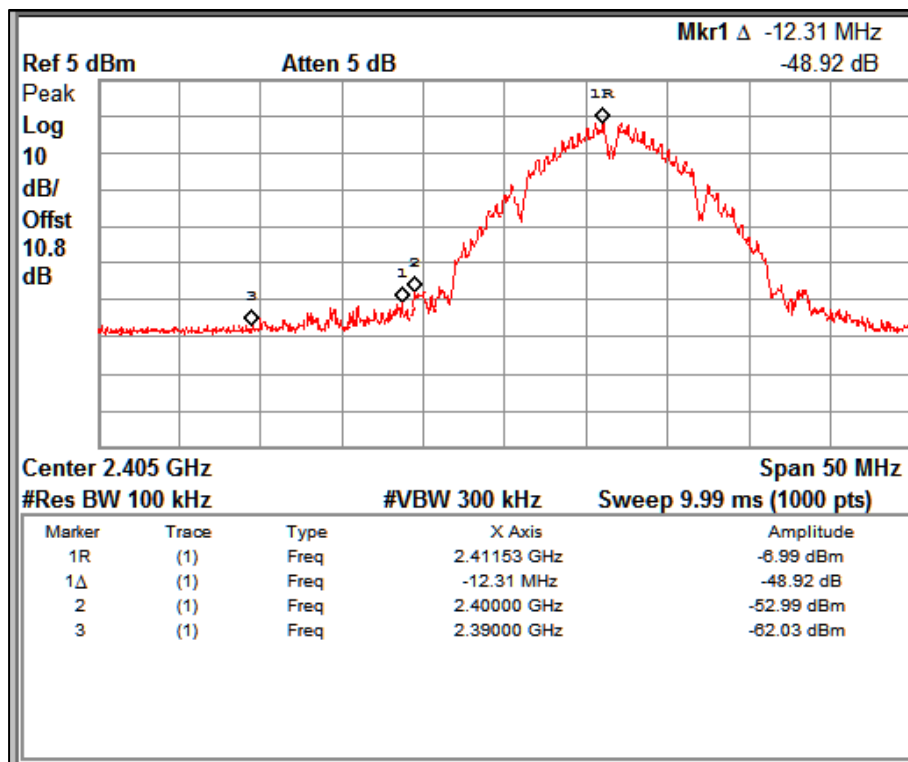
ULR-TC568820300000022F

Seite 35 von 65

Page 35 of 65

Modulation 802.11b

802.11 Protocol	Data rate (Mbps)	Channel Frequency (MHz)	Reference PSD Value B (dBm)	Value at Band Edge		Band Edge Value A~B (dBm)	Limit (dB)
				Frequency (MHz)	Value A (dBm)		
b	1	2412	-6.92	2396.51	-55.29	-48.37	-30
		2462	-7.09	2483.5	-62.36	-55.27	-30
	2	2412	-7.47	2398.02	-54.99	-47.52	-30
		2462	-7.58	2483.5	-63.49	-55.91	-30
	5.5	2412	-6.85	2398.86	-55.57	-48.72	-30
		2462	-7.62	2483.5	-63.46	-55.84	-30
	11	2412	-5.41	2398.56	-55.28	-49.87	-30
		2462	-5.84	2483.5	-63.56	-57.72	-30



Channel Frequency: 2412 MHz

Data rate: 1Mbps

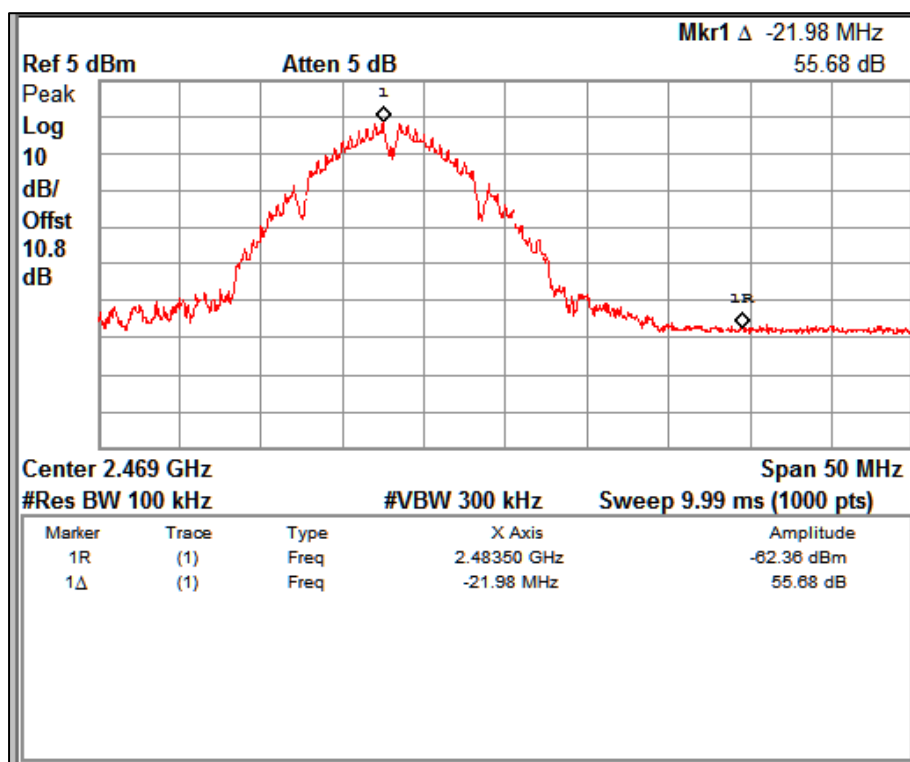
Prüfbericht - Nr.:

Test Report No.:

ULR-TC568820300000022F

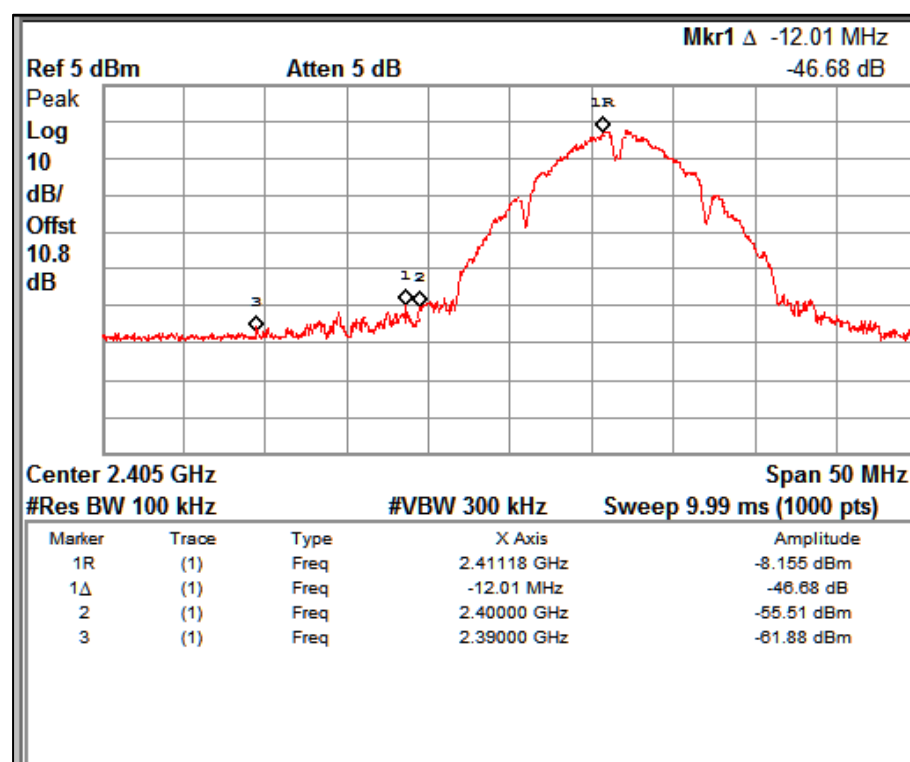
Seite 36 von 65

Page 36 of 65



Channel Frequency: 2462 MHz

Data rate: 1Mbps



Channel Frequency: 2412 MHz

Data rate: 2Mbps

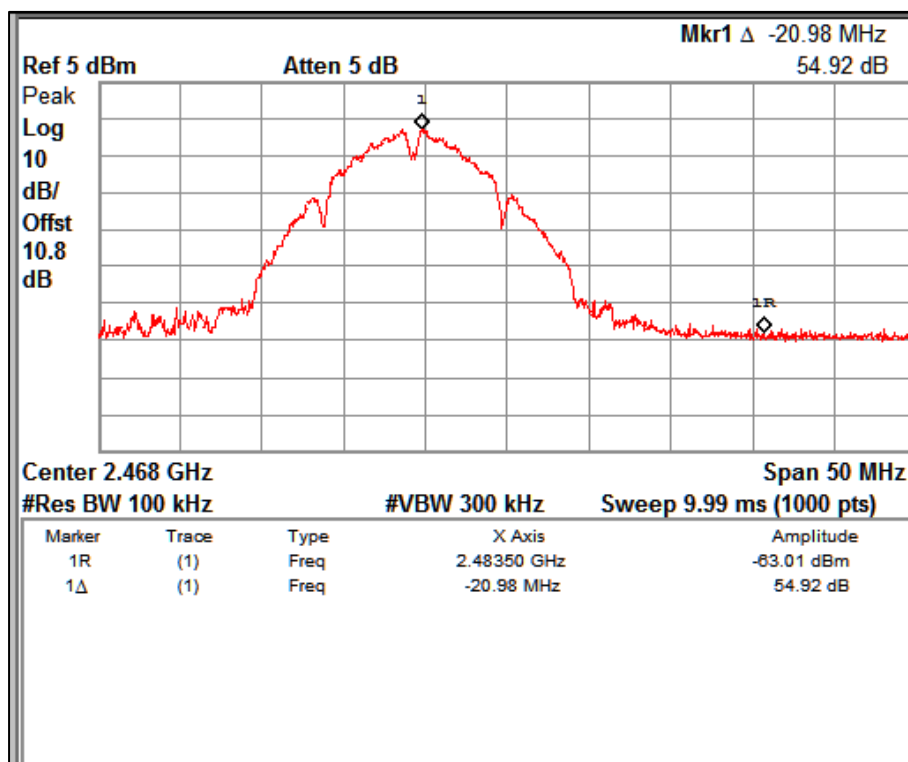
Prüfbericht - Nr.:

Test Report No.:

ULR-TC568820300000022F

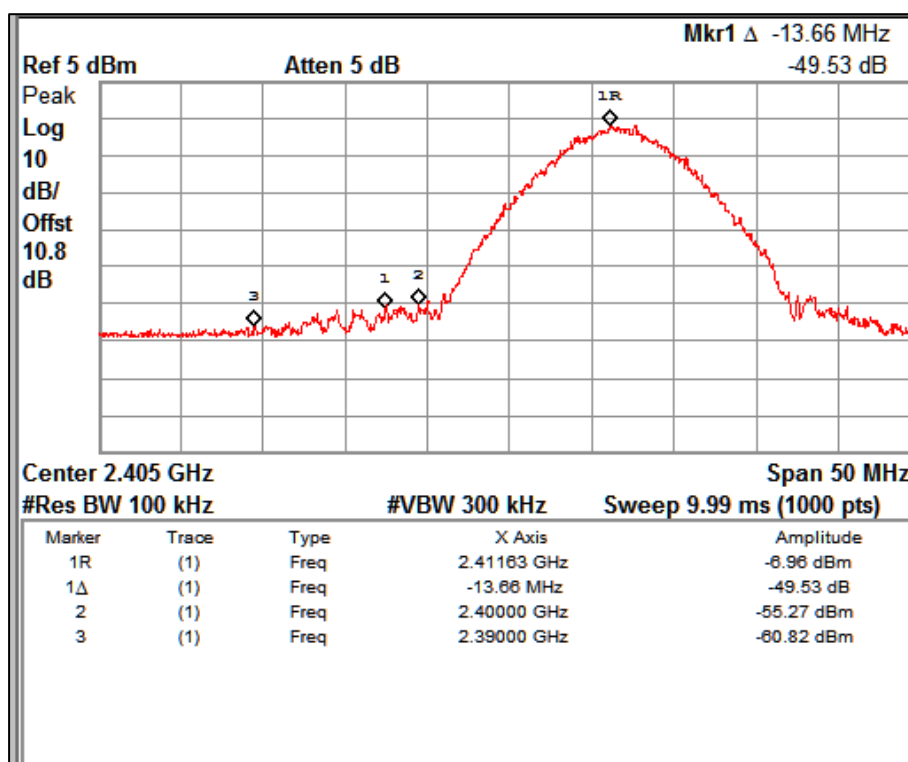
Seite 37 von 65

Page 37 of 65



Channel Frequency: 2462 MHz

Data rate: 2Mbps



Channel Frequency: 2412 MHz

Data rate: 5.5Mbps

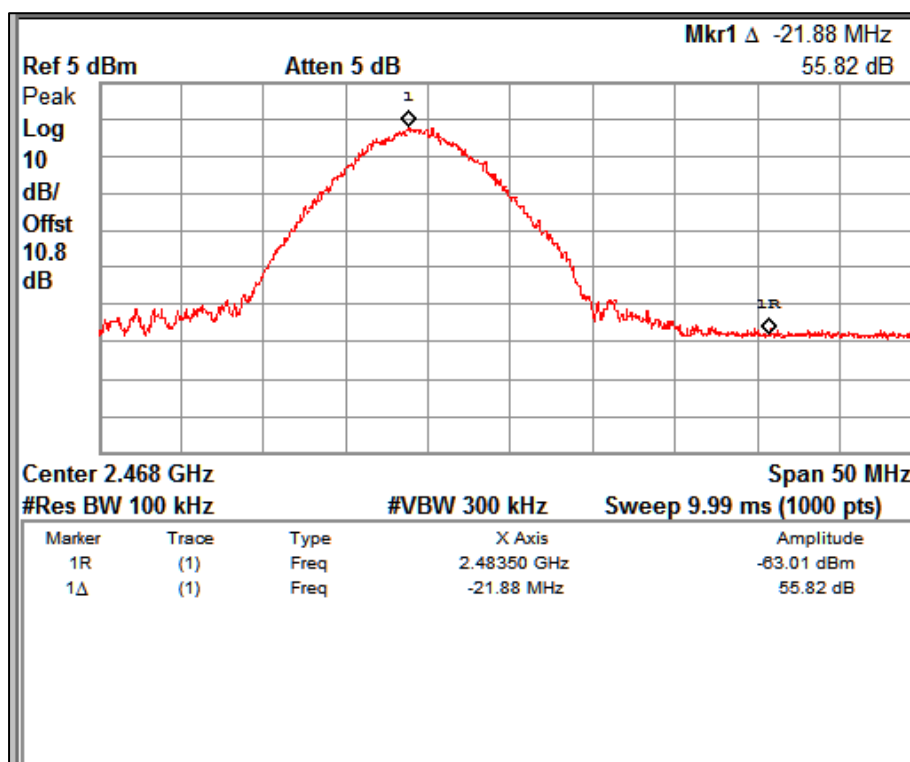
Prüfbericht - Nr.:

Test Report No.:

ULR-TC568820300000022F

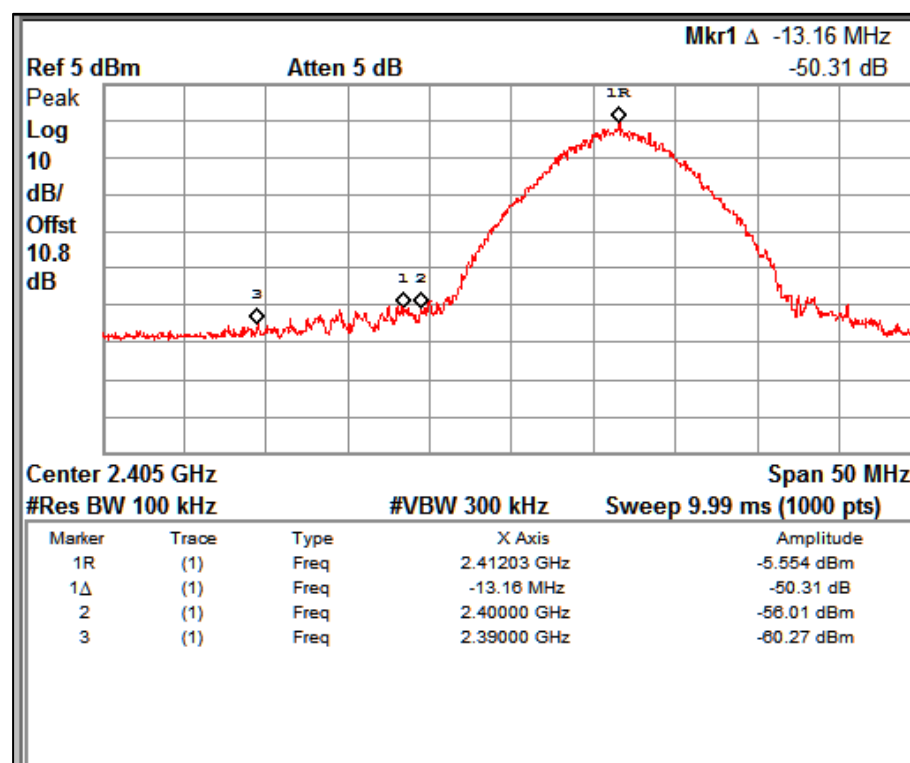
Seite 38 von 65

Page 38 of 65



Channel Frequency: 2462 MHz

Data rate: 5.5Mbps



Channel Frequency: 2412 MHz

Data rate: 11Mbps

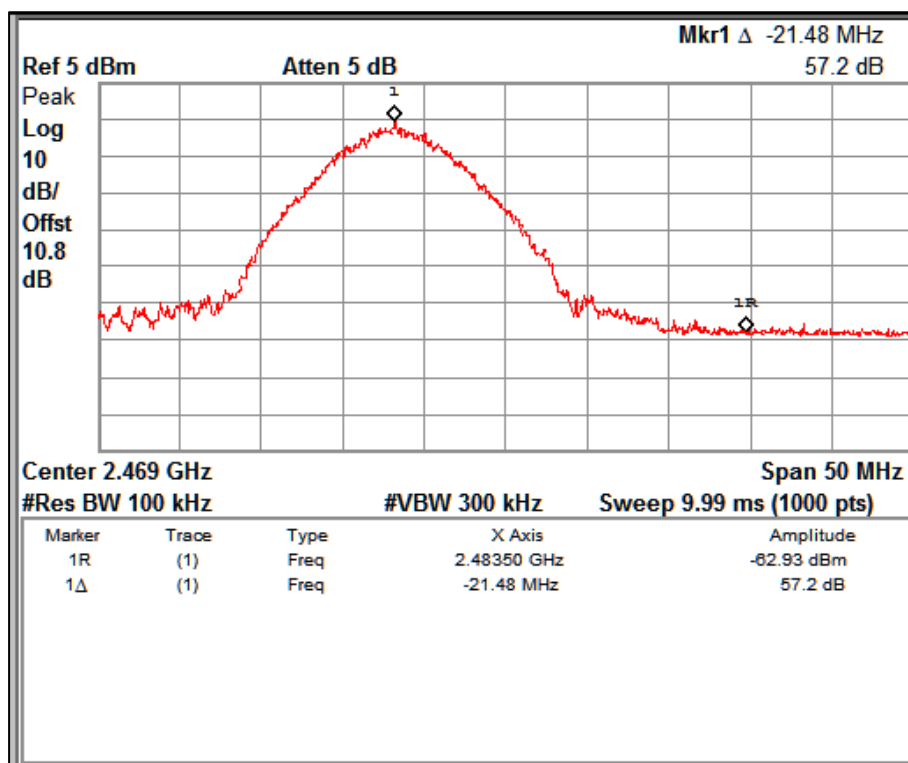
Prüfbericht - Nr.:

Test Report No.:

ULR-TC568820300000022F

Seite 39 von 65

Page 39 of 65



Channel Frequency: 2462 MHz

Data rate: 11Mbps

Prüfbericht - Nr.:

Test Report No.:

ULR-TC568820300000022F

Seite 40 von 65

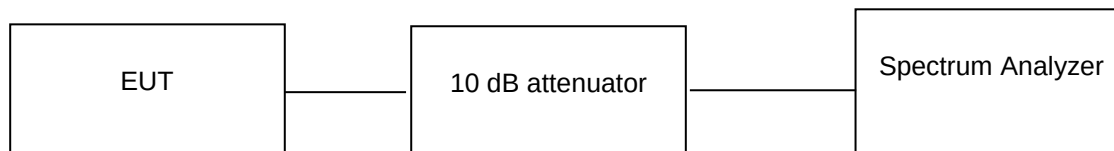
Page 40 of 65

6.4.2 Out-Of-Band Emissions

Result

Pass

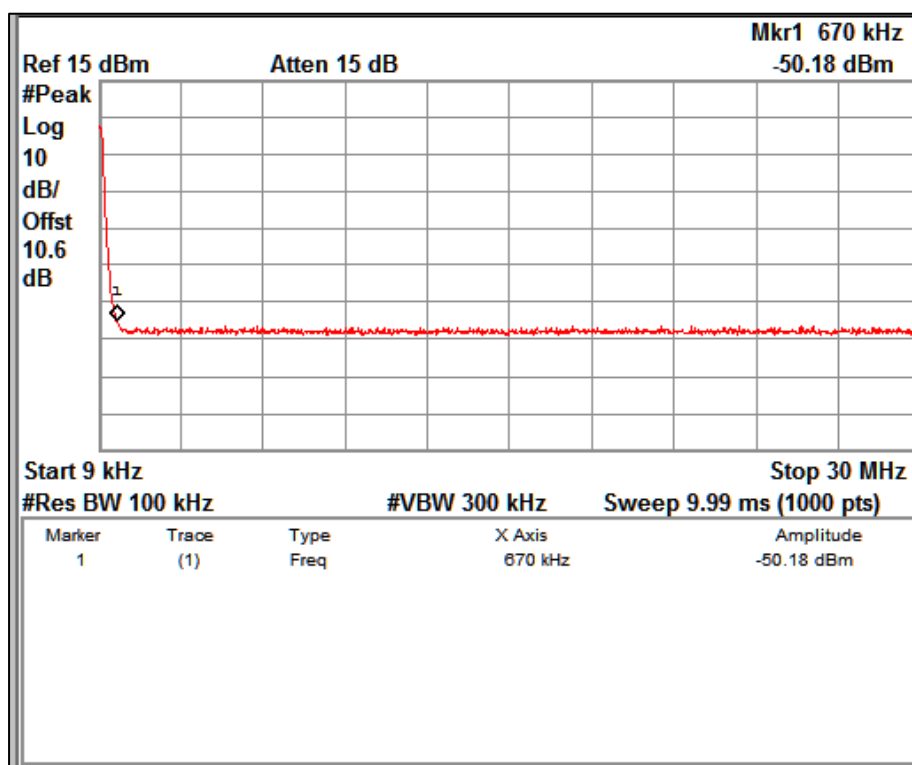
Test Method:



Modulation: 802.11b

Data Rate: 1Mbps

9 KHz-30 MHz



Prüfbericht - Nr.:

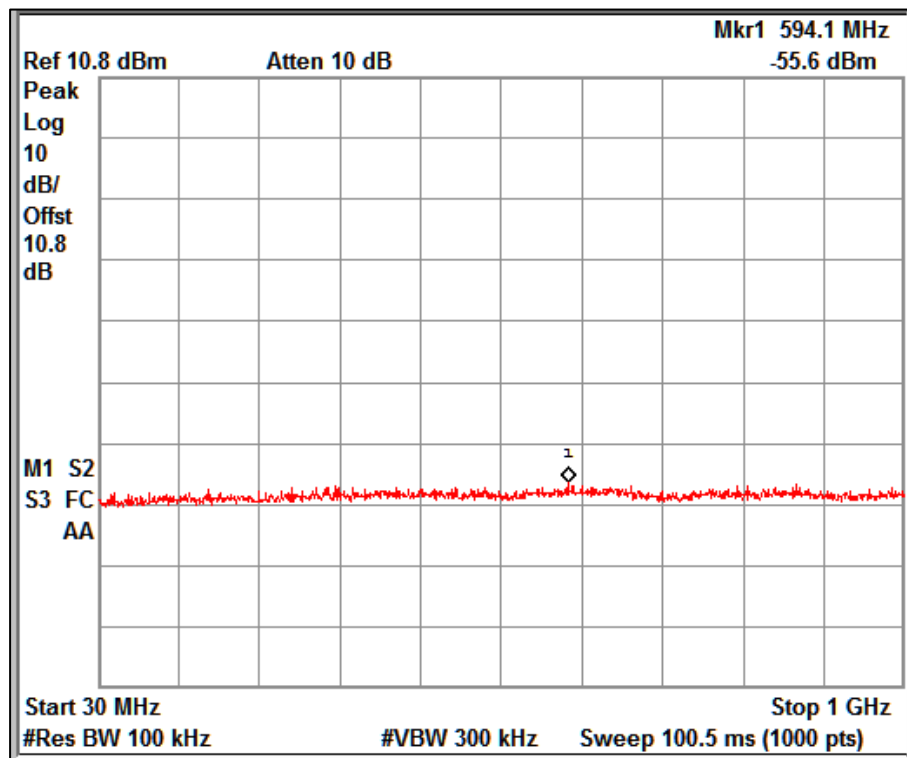
Test Report No.:

ULR-TC568820300000022F

Seite 41 von 65

Page 41 of 65

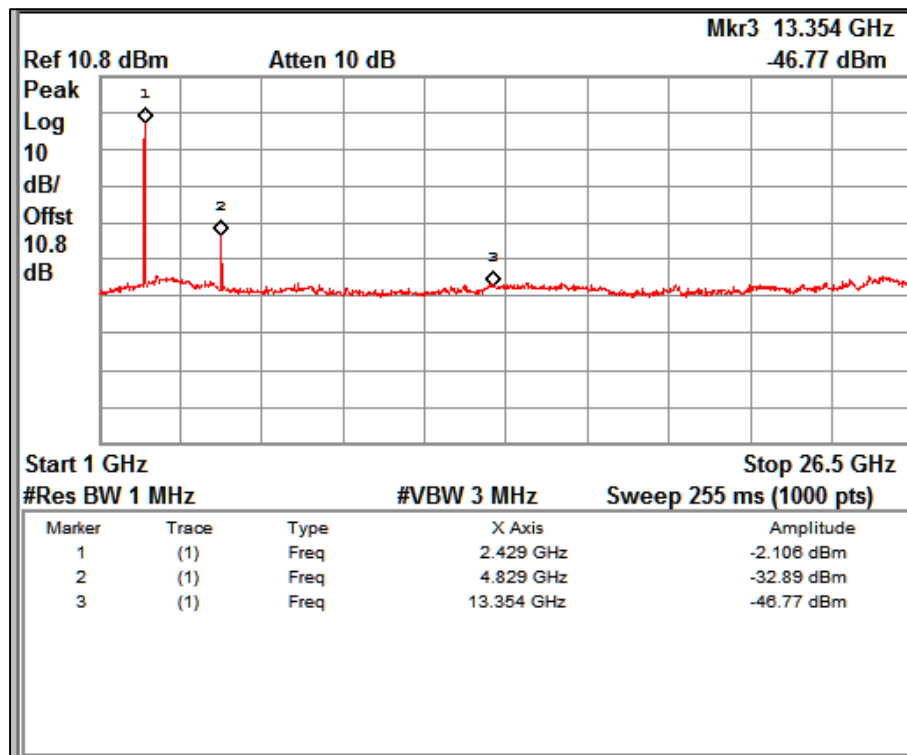
30MHz-1GHz



Channel Frequency: 2412 MHz

Data rate: 1Mbps

1GHz-26.5GHz



Channel Frequency: 2412 MHz

Data rate: 1Mbps

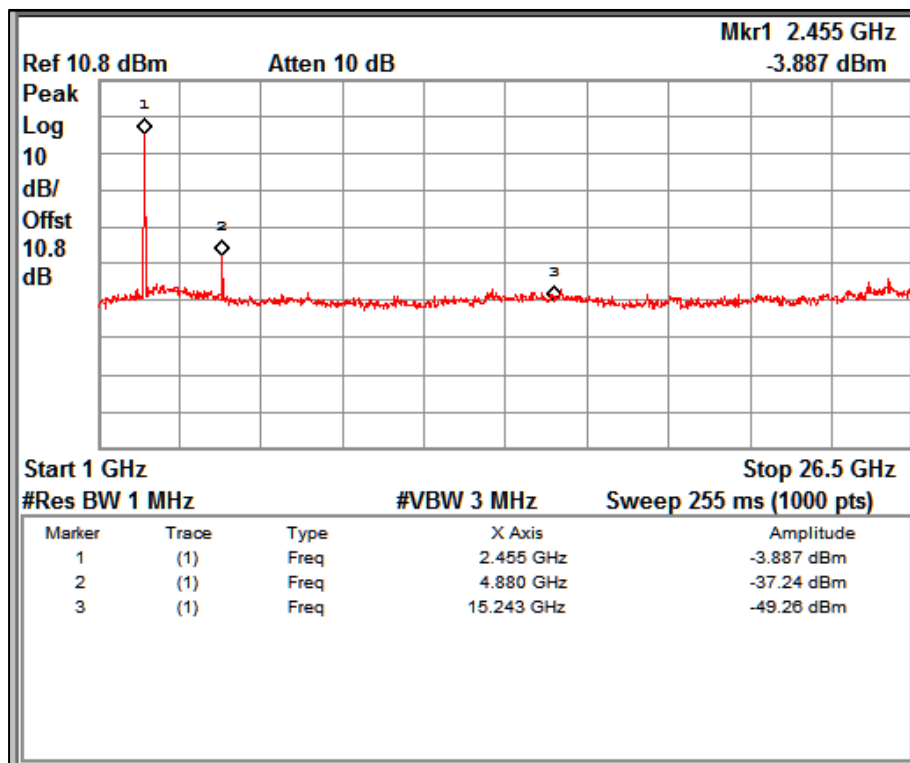
Prüfbericht - Nr.:

Test Report No.:

ULR-TC568820300000022F

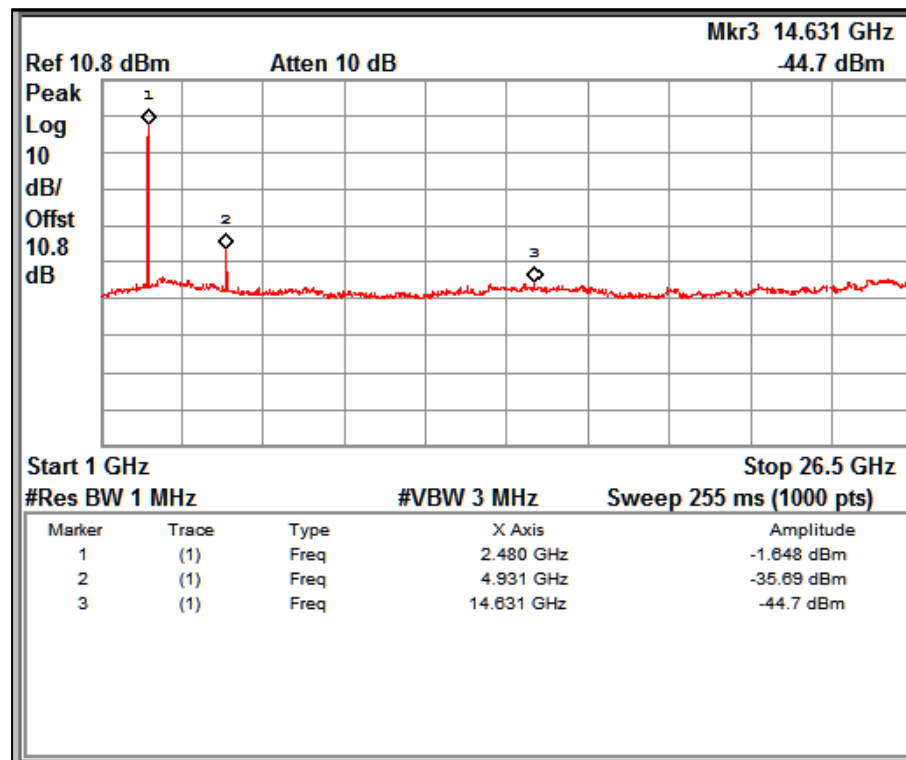
Seite 42 von 65

Page 42 of 65



Channel Frequency : 2437 MHz

Data rate:1Mbps



Channel Frequency: 2462 MHz

Data rate: 1Mbps

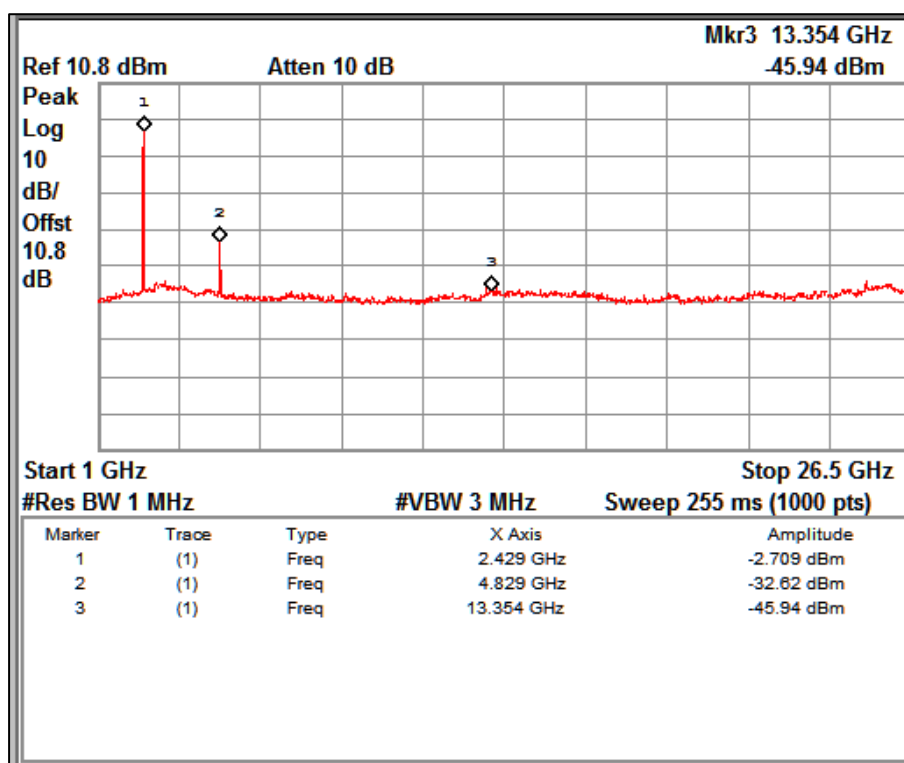
Prüfbericht - Nr.:

Test Report No.:

ULR-TC568820300000022F

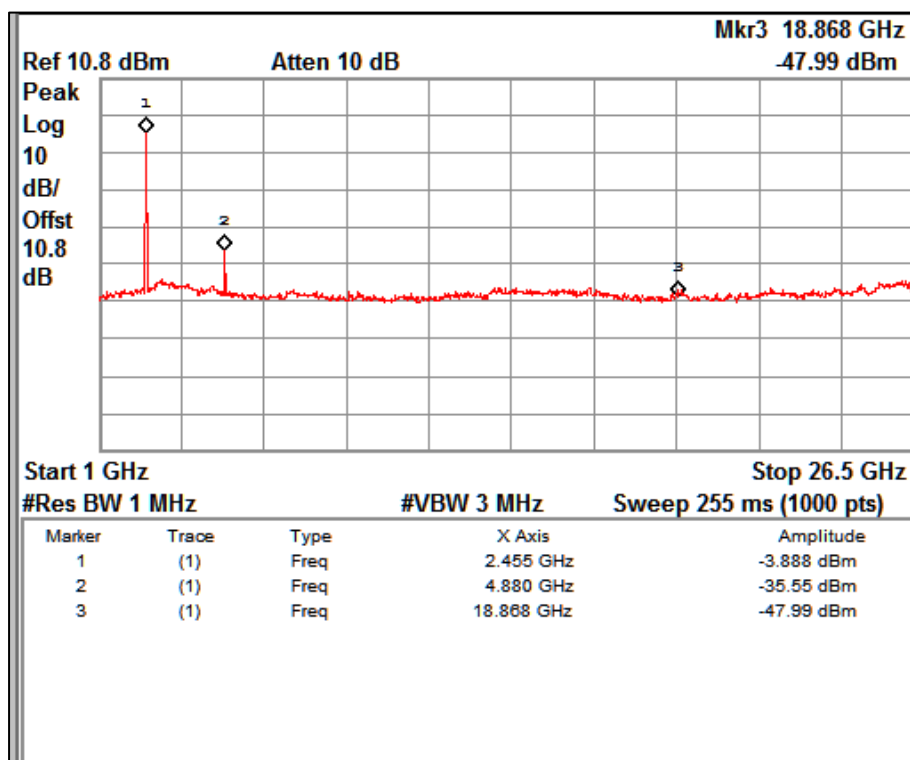
Seite 43 von 65

Page 43 of 65



Channel Frequency: 2412 MHz

Data rate: 2Mbps



Channel Frequency: 2437 MHz

Data rate: 2Mbps

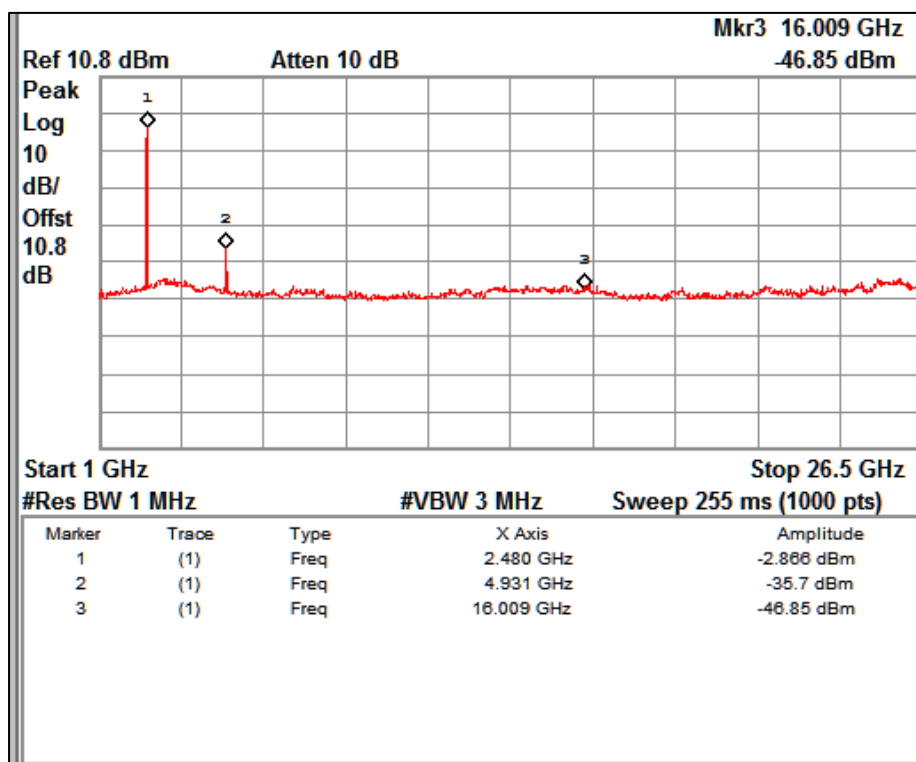
Prüfbericht - Nr.:

Test Report No.:

ULR-TC568820300000022F

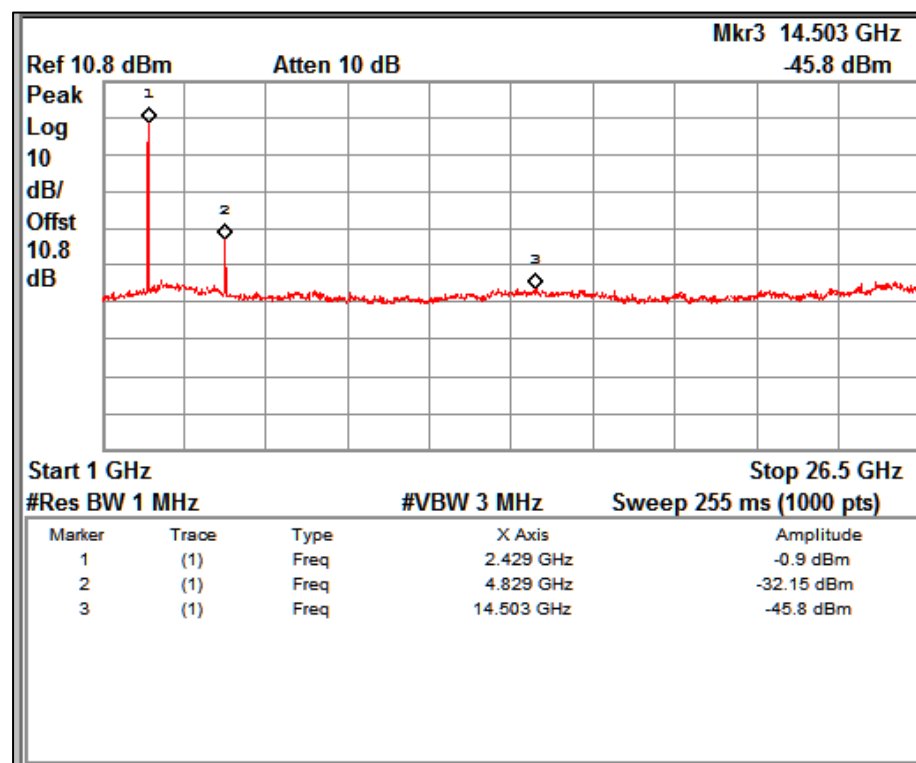
Seite 44 von 65

Page 44 of 65



Channel Frequency: 2462 MHz

Data rate: 2Mbps



Channel Frequency: 2412 MHz

Data rate: 5.5Mbps

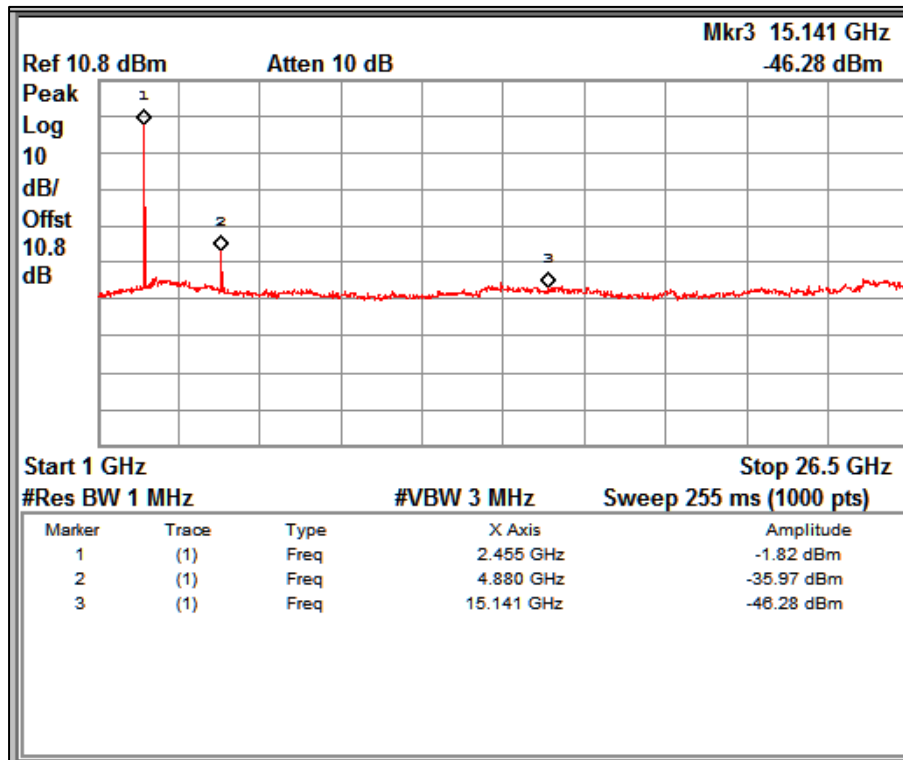
Prüfbericht - Nr.:

Test Report No.:

ULR-TC568820300000022F

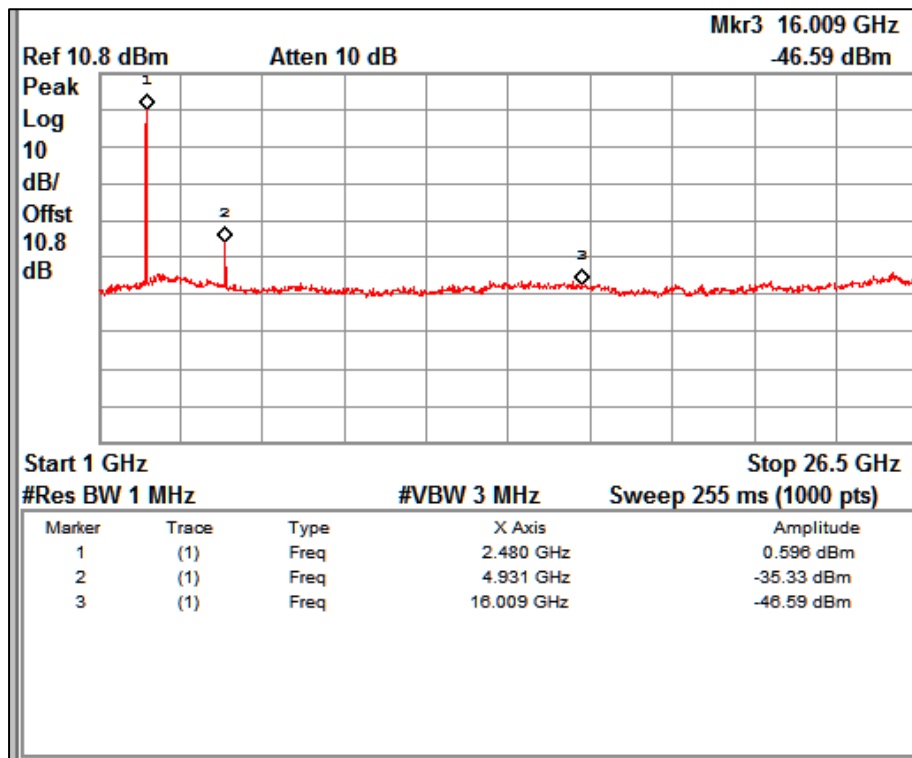
Seite 45 von 65

Page 45 of 65



Channel Frequency: 2437 MHz

Data rate: 5.5Mbps



Channel Frequency: 2462 MHz

Data rate: 5.5Mbps

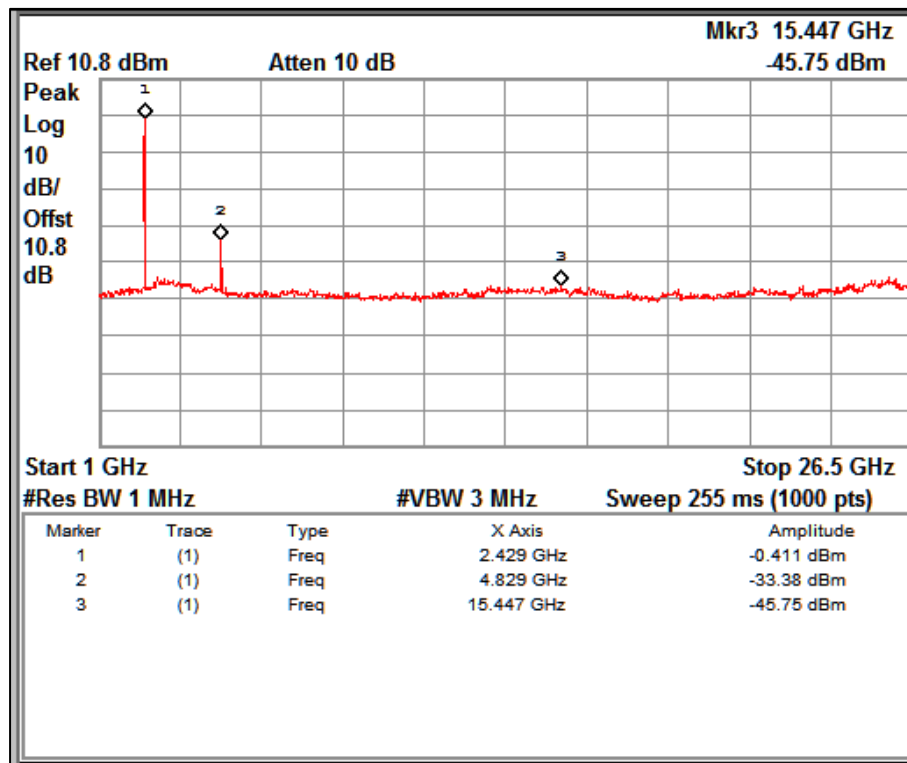
Prüfbericht - Nr.:

Test Report No.:

ULR-TC568820300000022F

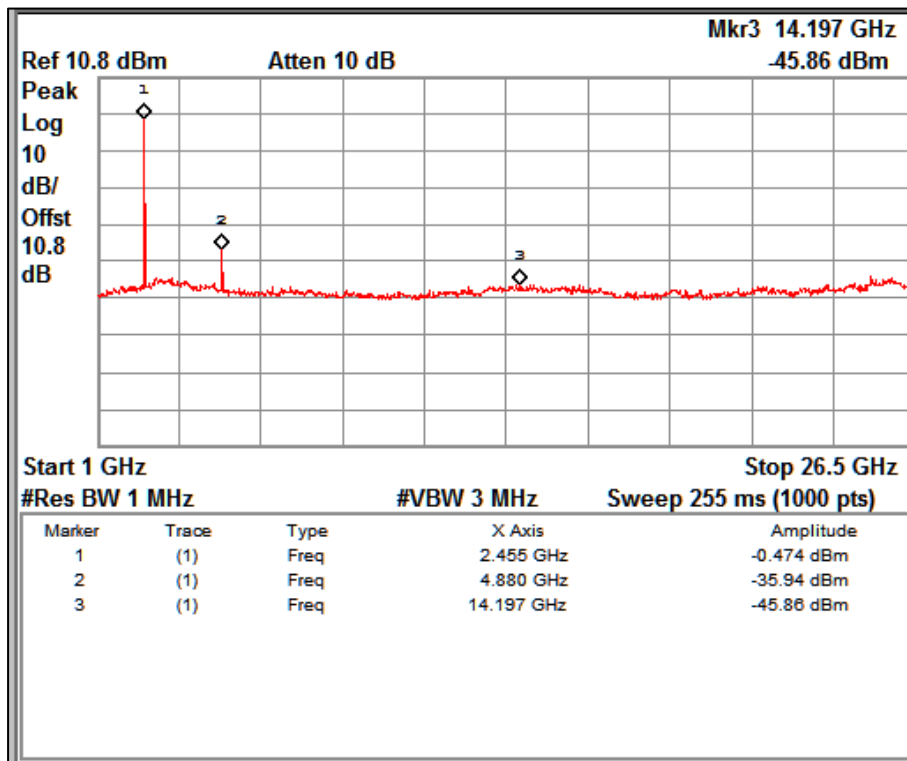
Seite 46 von 65

Page 46 of 65



Channel Frequency : 2412 MHz

Data rate:11Mbps



Channel Frequency: 2437 MHz

Data rate: 11Mbps

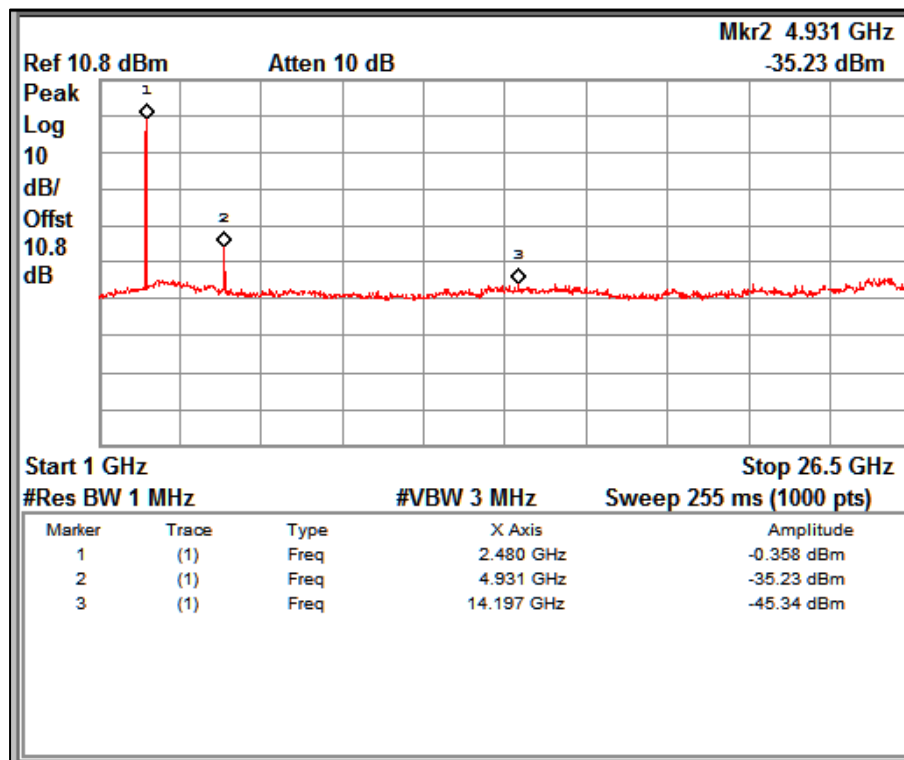
Prüfbericht - Nr.:

Test Report No.:

ULR-TC568820300000022F

Seite 47 von 65

Page 47 of 65



Channel Frequency: 2462 MHz

Data rate: 11Mbps

Prüfbericht - Nr.:

Test Report No.:

ULR-TC568820300000022F

Seite 48 von 65

Page 48 of 65

6.5 Radiated spurious emissions and emissions in 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

Limits for Radiated Emission of Section 15.209:

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 128-93.8, 73.80-62.95, 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:

Supply Voltage: 110V AC 60Hz

Environmental conditions:

Normal Temperature = +25 °C

Voltage (V norm) = 2.8 V DC

Relative Humidity = 70 %

Prüfbericht - Nr.:

Test Report No.:

ULR-TC568820300000022F

Seite 49 von 65

Page 49 of 65

Note:

Measurements were made as per section 8.6 in KDB 558074 D01 15.247 Measurement Guidance v05r02

Test results:

Note: All the losses are included during measurement and final values are mentioned in the test report. Refer Clause 5 TEST METHODOLOGY for more details

Test results:

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 the frequencies in range between 30MHz-1GHz

Polarization	Frequency (MHz)	Peak (dBµV/m)	Limit (dBµV/m)	Margin (dB)
Vertical	36.43	10.81	40.00	-29.19
	49.67	8.75	40.00	-31.25
	157.74	13.25	43.50	-30.25
	454.01	18.58	46.00	-27.42
	560.78	21.73	46.00	-24.27
	880.59	30.79	46.00	-15.21
Horizontal	31.03	11.34	40.00	-28.66
	57.74	8.94	40.00	-31.06
	148.63	13.36	43.50	-30.14
	386.64	17.50	46.00	-28.50
	513.79	20.43	46.00	-25.57
	880.59	33.99	46.00	-12.01

Prüfbericht - Nr.:

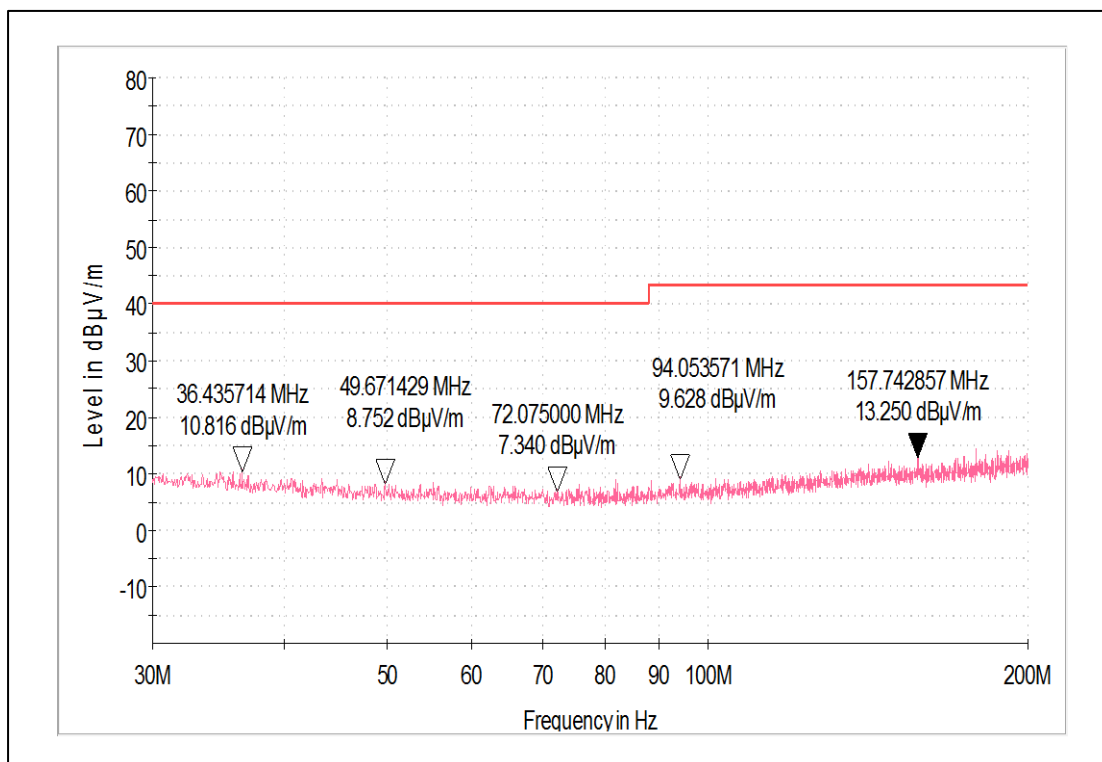
Test Report No.:

ULR-TC568820300000022F

Seite 50 von 65

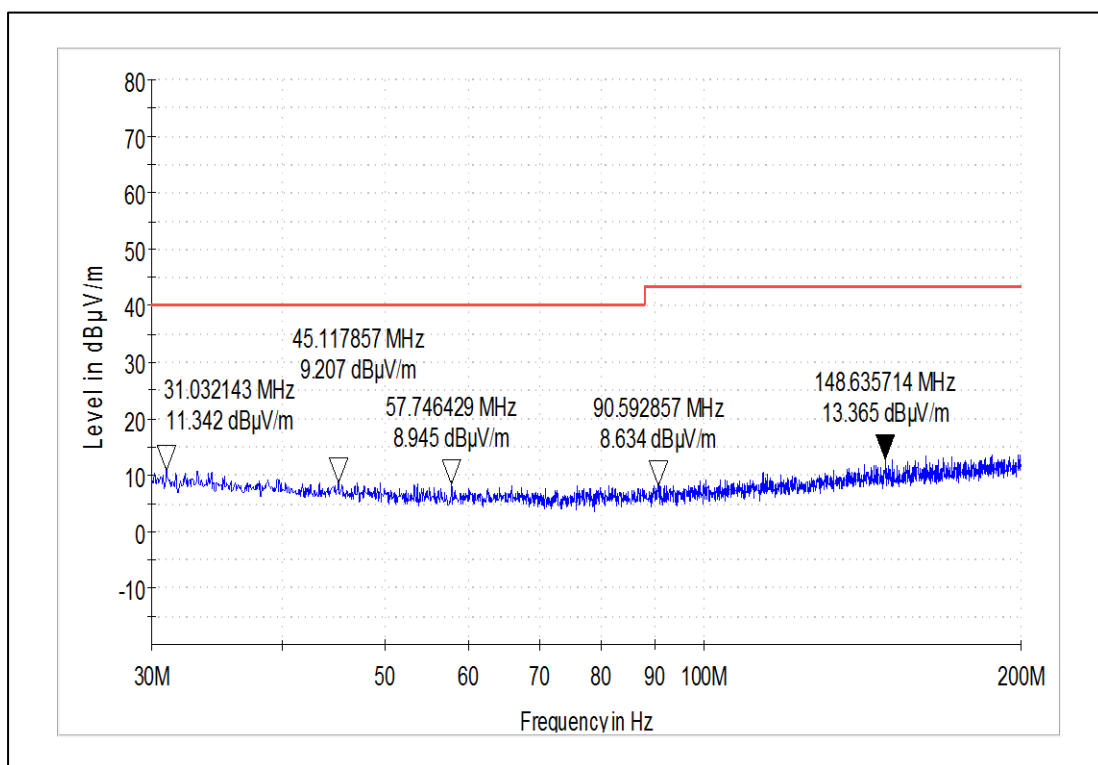
Page 50 of 65

Test Plots:



Frequency Range: 30MHz-200MHz

Polarization: Vertical



Frequency Range: 30MHz-200MHz

Polarization: Horizontal

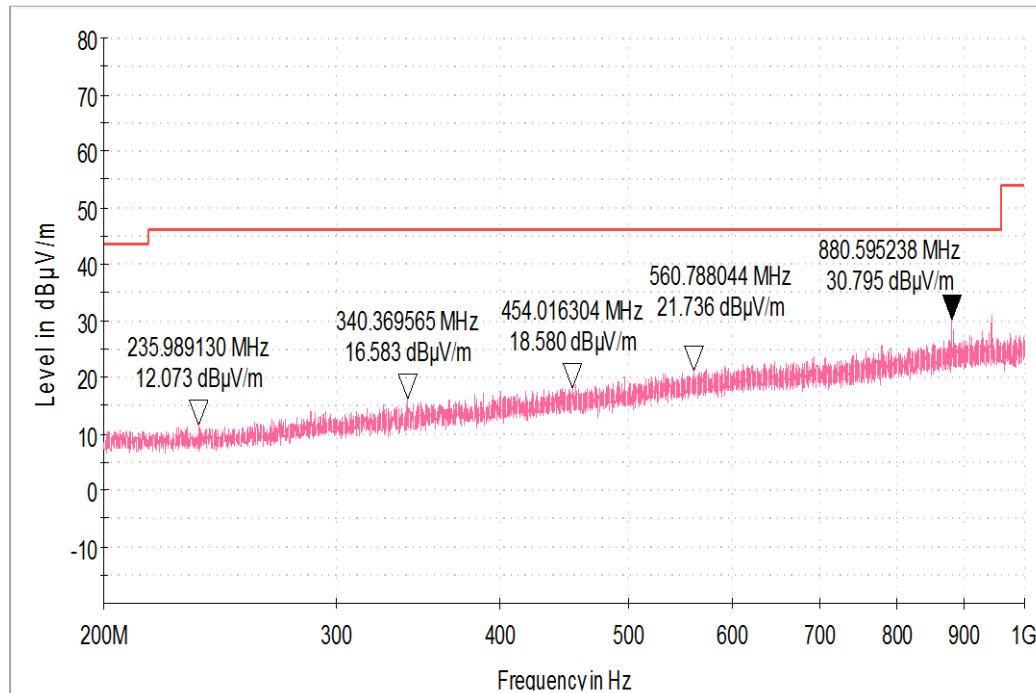
Prüfbericht - Nr.:

Test Report No.:

ULR-TC568820300000022F

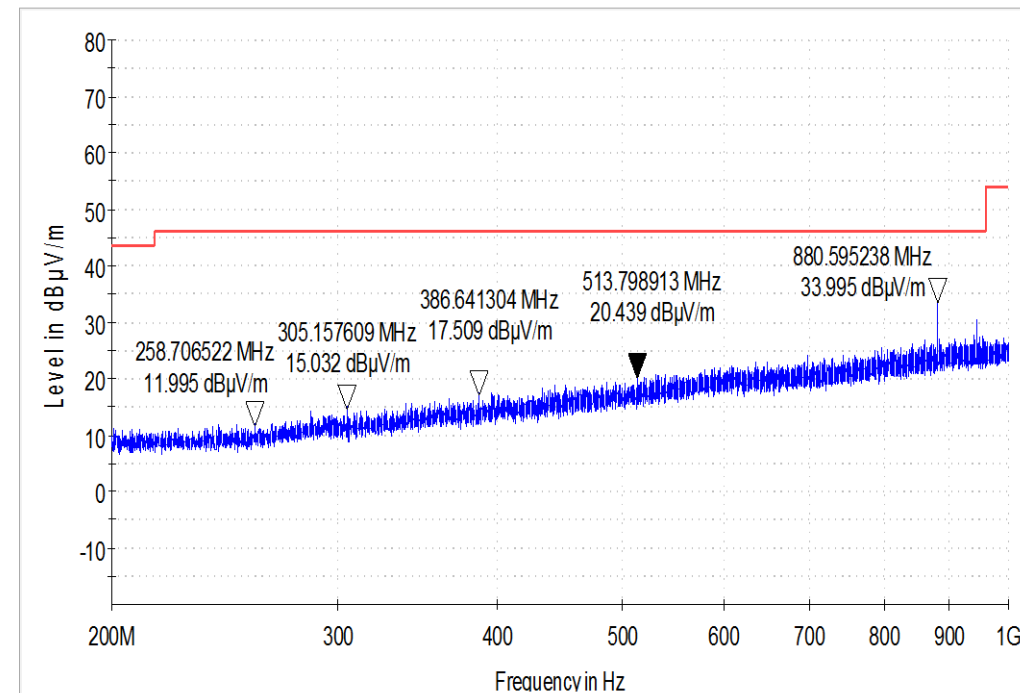
Seite 51 von 65

Page 51 of 65



Frequency Range: 200MHz-1GHz

Polarization:Vertical



Frequency Range: 200MHz-1GHz

Polarization:Horizontal

Prüfbericht - Nr.:

Test Report No.:

ULR-TC568820300000022F

Seite 52 von 65

Page 52 of 65

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

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)	42.12	74*	-31.88
		2390(Av)	28.63	54*	-25.37
		2412(Pk)	93.84	*	-
		2412(Av)	86.57	*	-
		4824(pk)	44.50	74	-29.50
		4824(Av)	34.70	54	-19.30
		7236(Pk)	No Harmonics Found		
		7236(Av)			
	Horizontal	2390(Pk)	38.23	74*	-35.77
		2390(Av)	26.56	54*	-27.44
		2412(Pk)	89.43	*	-
		2412(Av)	83.42	*	-
		4824(Pk)	43.80	74	-30.20
		4824(Av)	34.76	54	-19.24
		7236(Pk)	No Harmonics Found		
		7236(Av)			
2437	Vertical	2437(Pk)	94.32	*	-
		2437(Av)	87.14	*	-
		4874(Pk)	44.07	74	-29.93
		4874(Av)	35.07	54	-18.93
		7311(Pk)	No Harmonics Found		
		7311(Av)			
	Horizontal	2437(Pk)	89.06	*	-
		2437(Av)	81.97	*	-
		4874(Pk)	44.58	74	-29.42
		4874(Av)	35.92	54	-18.08
		7311(pk)	No Harmonics Found		
		7311(Av)			
2462	Vertical	2462(Pk)	93.36	*	-
		2462(Av)	86.00	*	-
		2483.5(Pk)	38.44	74*	-35.56
		2483.5(Av)	27.53	54*	-26.47
		4924(Pk)	43.68	74	-30.32
		4924(Av)	33.22	54	-20.78
		7386(Pk)	No Harmonics Found		
		7386(Av)			
	Horizontal	2462(Pk)	88.62	*	-
		2462(Av)	81.19	*	-
		2483.5(Pk)	37.63	74*	-36.37
		2483.5(Av)	25.59	54*	-28.41
		4924(Pk)	44.86	74	-29.14
		4924(Av)	36.29	54	-17.71
		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-TC568820300000022F

Seite 53 von 65

Page 53 of 65

Data rate : 2Mbps

Channel Frequency (MHz)	Antenna Polarization	Measured Frequency (MHz)	Field Strength (dBµV/m)	Limit (dBµV/m)	Margin (dB)
2412	Vertical	2390(Pk)	41.47	74*	-32.53
		2390(Av)	27.64	54*	-26.36
		2412(Pk)	90.34	*	-
		2412(Av)	86.37	*	-
		4824(pk)	43.79	74	-30.21
		4824(Av)	33.87	54	-20.13
		7236(Pk)	No Harmonics Found		
		7236(Av)			
	Horizontal	2390(Pk)	38.49	74*	-35.51
		2390(Av)	25.92	54*	-28.08
		2412(Pk)	85.96	*	-
		2412(Av)	81.84	*	-
		4824(Pk)	43.53	74	-30.47
		4824(Av)	32.32	54	-21.68
		7236(Pk)	No Harmonics Found		
		7236(Av)			
2437	Vertical	2437(Pk)	90.52	*	-
		2437(Av)	86.18	*	-
		4874(Pk)	43.68	74	-30.32
		4874(Av)	33.39	54	-20.61
		7311(Pk)	No Harmonics Found		
		7311(Av)			
	Horizontal	2437(Pk)	84.83	*	-
		2437(Av)	80.67	*	-
		4874(Pk)	44.15	74	-29.85
		4874(Av)	33.78	54	-20.22
		7311(pk)	No Harmonics Found		
		7311(Av)			
2462	Vertical	2462(Pk)	89.19	*	-
		2462(Av)	84.86	*	-
		2483.5(Pk)	38.19	74*	-35.81
		2483.5(Av)	26.05	54*	-27.95
		4924(Pk)	42.81	74	-31.19
		4924(Av)	31.77	54	-22.23
		7386(Pk)	No Harmonics Found		
		7386(Av)			
	Horizontal	2462(Pk)	85.01	*	-
		2462(Av)	80.87	*	-
		2483.5(Pk)	36.87	74*	-37.13
		2483.5(Av)	24.80	54*	-29.20
		4924(Pk)	44.72	74	-29.28
		4924(Av)	34.27	54	-19.73
		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-TC568820300000022F

Seite 54 von 65

Page 54 of 65

Data rate : 5.5Mbps

Channel Frequency (MHz)	Antenna Polarization	Measured Frequency (MHz)	Field Strength (dBµV/m)	Limit (dBµV/m)	Margin (dB)
2412	Vertical	2390(Pk)	42.67	74*	-31.33
		2390(Av)	27.79	54*	-26.21
		2412(Pk)	93.55	*	-
		2412(Av)	86.11	*	-
		4824(pk)	43.06	74	-30.94
		4824(Av)	30.81	54	-23.19
		7236(Pk)	No Harmonics Found		
		7236(Av)			
	Horizontal	2390(Pk)	39.73	74*	-34.27
		2390(Av)	26.06	54*	-27.94
		2412(Pk)	89.42	*	-
		2412(Av)	82.00	*	-
		4824(Pk)	43.54	74	-30.46
		4824(Av)	30.14	54	-23.86
		7236(Pk)	No Harmonics Found		
		7236(Av)			
2437	Vertical	2437(PK)	93.83	*	-
		2437(Av)	86.10	*	-
		4874(Pk)	44.10	74	-29.90
		4874(Av)	30.73	54	-23.27
		7311(Pk)	No Harmonics Found		
		7311(Av)			
	Horizontal	2437(Pk)	88.94	*	-
		2437(Av)	81.16	*	-
		4874(Pk)	44.31	74	-29.69
		4874(Av)	31.04	54	-22.96
		7311(pk)	No Harmonics Found		
		7311(Av)			
2462	Vertical	2462(Pk)	92.46	*	-
		2462(Av)	84.78	*	-
		2483.5(Pk)	38.18	74*	-35.82
		2483.5(Av)	25.63	54*	-28.37
		4924(Pk)	43.03	74	-30.97
		4924(Av)	30.02	54	-23.98
		7386(Pk)	No Harmonics Found		
		7386(Av)			
	Horizontal	2462(Pk)	88.05	*	-
		2462(Av)	80.39	*	-
		2483.5(Pk)	37.30	74*	-36.70
		2483.5(Av)	24.68	54*	-29.32
		4924(Pk)	44.49	74	-29.51
		4924(Av)	31.15	54	-22.85
		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-TC568820300000022F

Seite 55 von 65

Page 55 of 65

Data rate : 11Mbps

Channel Frequency (MHz)	Antenna Polarization	Measured Frequency (MHz)	Field Strength (dBμV/m)	Limit (dBμV/m)	Margin (dB)
2412	Vertical	2390(Pk)	41.26	74*	-32.74
		2390(Av)	27.26	54*	-26.74
		2412(Pk)	93.24	*	-
		2412(Av)	84.89	*	-
		4824(pk)	44.28	74	-29.72
		4824(Av)	32.42	54	-21.58
		7236(Pk)	No Harmonics Found		
		7236(Av)			
	Horizontal	2390(Pk)	39.66	74*	-34.34
		2390(Av)	26.24	54*	-27.76
		2412(Pk)	89.92	*	-
		2412(Av)	81.55	*	-
		4824(Pk)	43.73	74	-30.27
		4824(Av)	31.35	54	-22.65
		7236(Pk)	No Harmonics Found		
		7236(Av)			
2437	Vertical	2437(Pk)	94.09	*	-
		2437(Av)	85.67	*	-
		4874(Pk)	43.40	74	-30.60
		4874(Av)	32.00	54	-22.00
		7311(Pk)	No Harmonics Found		
		7311(Av)			
	Horizontal	2437(Pk)	89.34	*	-
		2437(Av)	80.84	*	-
		4874(Pk)	44.62	74	-29.38
		4874(Av)	32.38	54	-21.62
		7311(pk)	No Harmonics Found		
		7311(Av)			
2462	Vertical	2462(Pk)	93.22	*	-
		2462(Av)	84.79	*	-
		2483.5(Pk)	38.52	74*	-35.48
		2483.5(Av)	25.61	54*	-28.39
		4924(Pk)	43.05	74	-30.95
		4924(Av)	30.59	54	-23.41
		7386(Pk)	No Harmonics Found		
		7386(Av)			
	Horizontal	2462(Pk)	88.97	*	-
		2462(Av)	80.30	*	-
		2483.5(Pk)	36.89	74*	-37.11
		2483.5(Av)	24.63	54*	-29.37
		4924(Pk)	44.71	74	-29.29
		4924(Av)	32.46	54	-21.54
		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.:

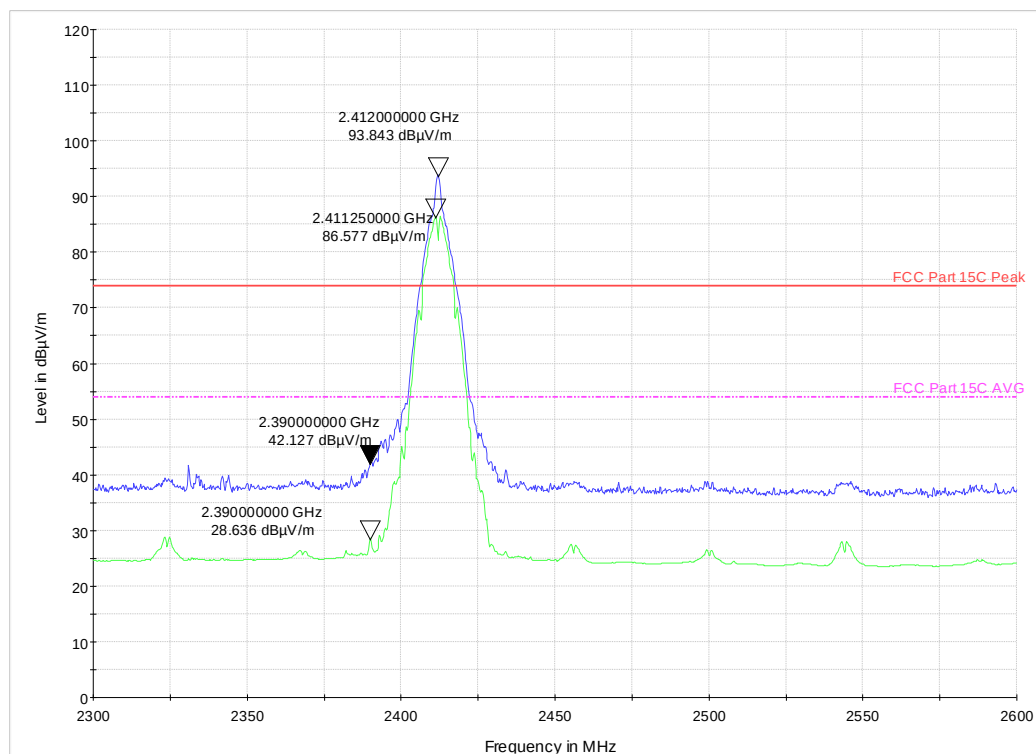
ULR-TC568820300000022F

Seite 56 von 65

Page 56 of 65

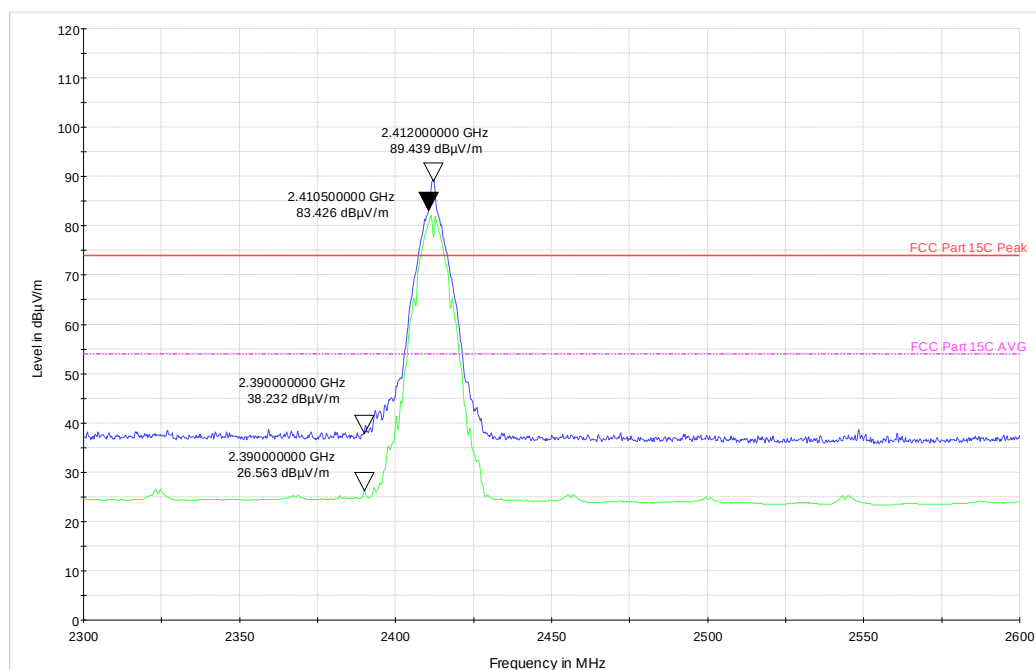
Worst Case Plots:

802.11b: 1Mbps



Channel Frequency: 2412MHz

Polarization:Vertical



Channel Frequency: 2412MHz

Polarization:Horizontal

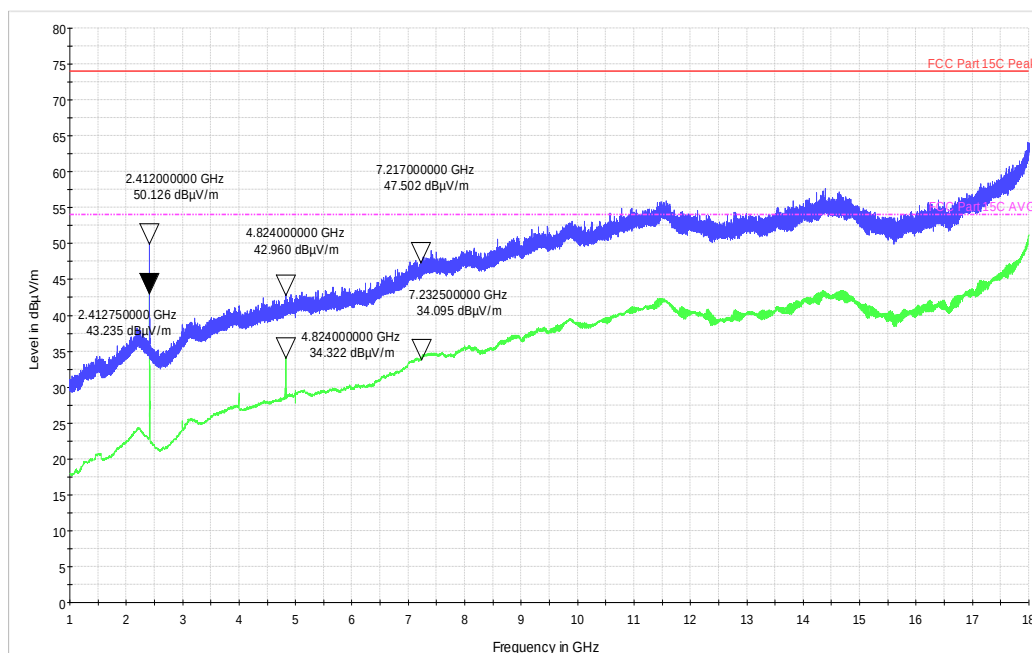
Prüfbericht - Nr.:

Test Report No.:

ULR-TC568820300000022F

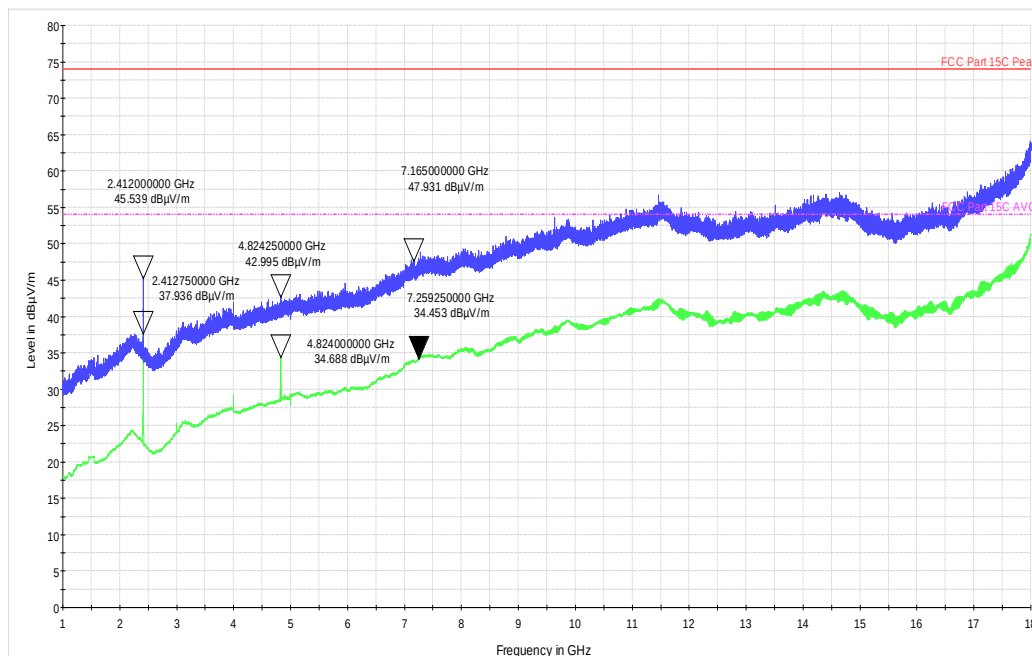
Seite 57 von 65

Page 57 of 65



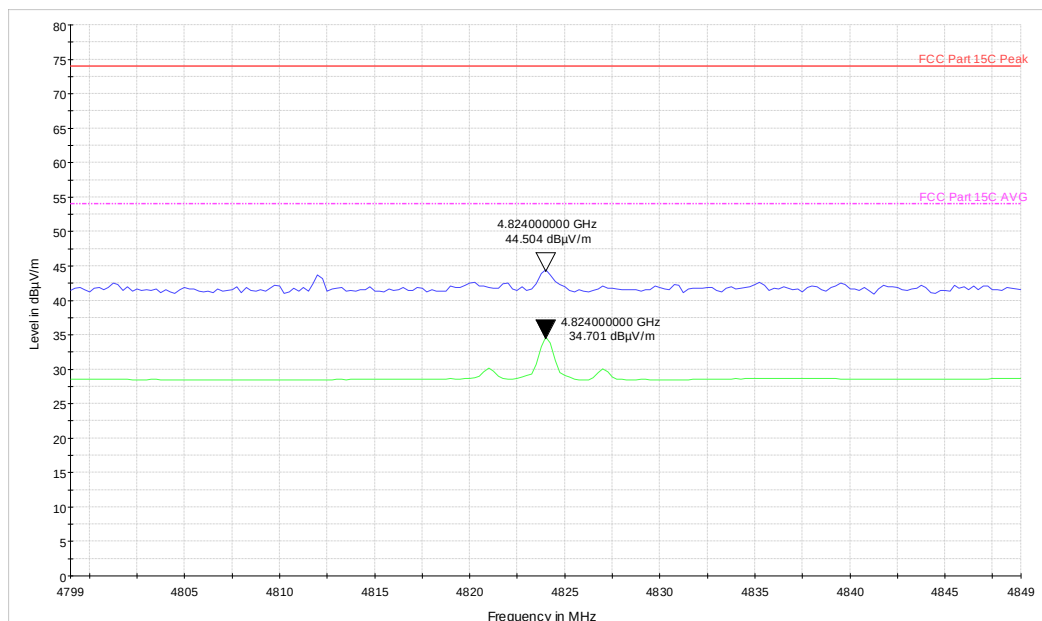
Frequency Range: 1-18GHz

Polarization:Vertical



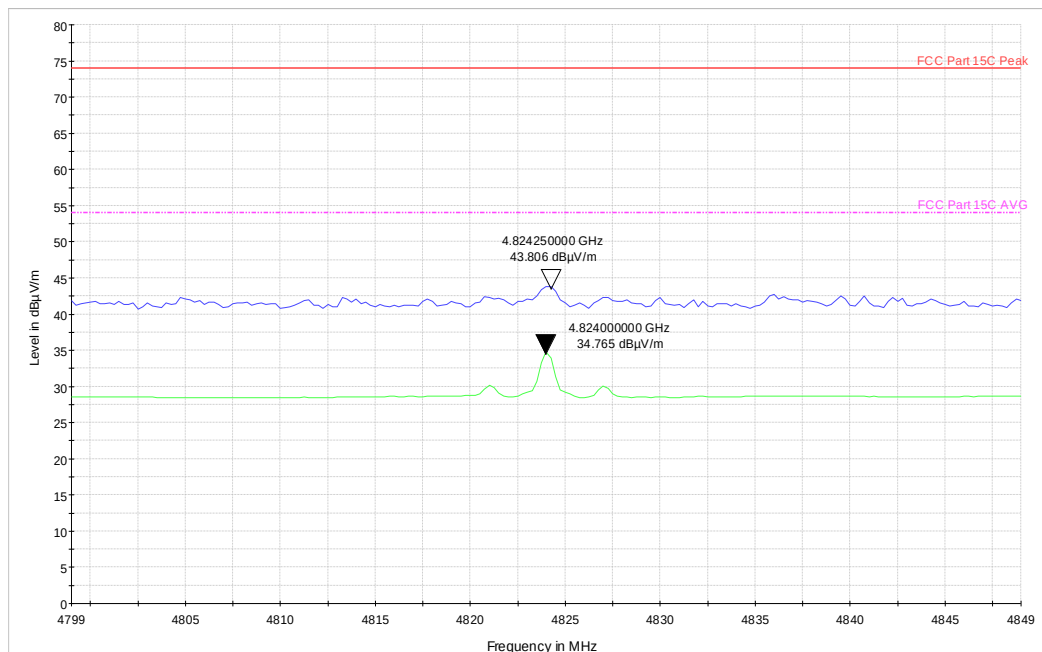
Frequency Range: 1-18GHz

Polarization:Horizontal



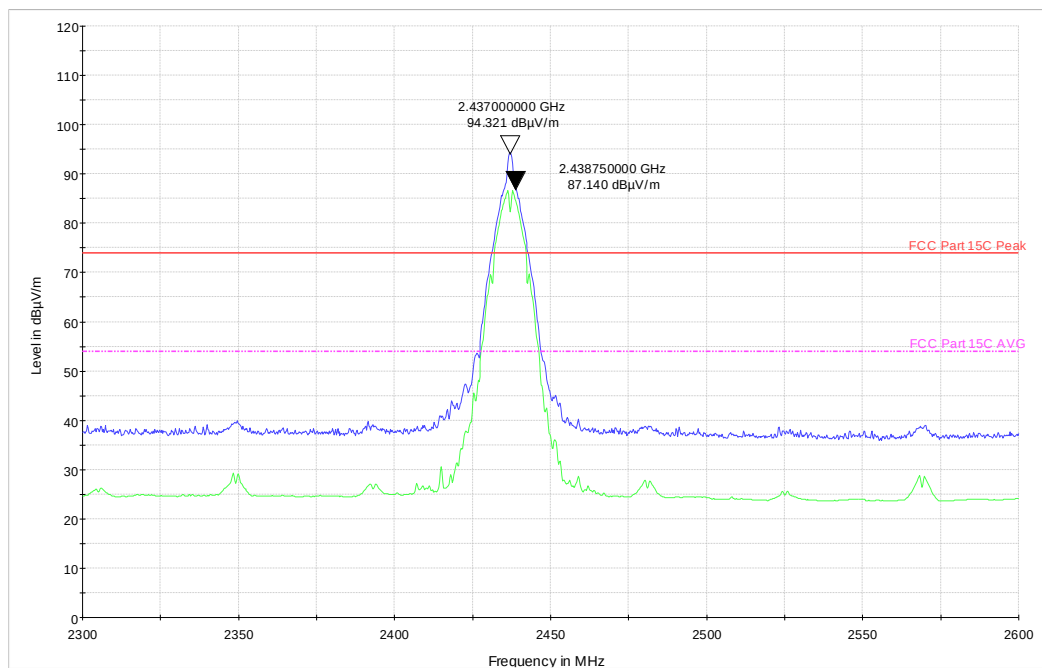
Frequency Range: Harmonics2

Polarization:Vertical



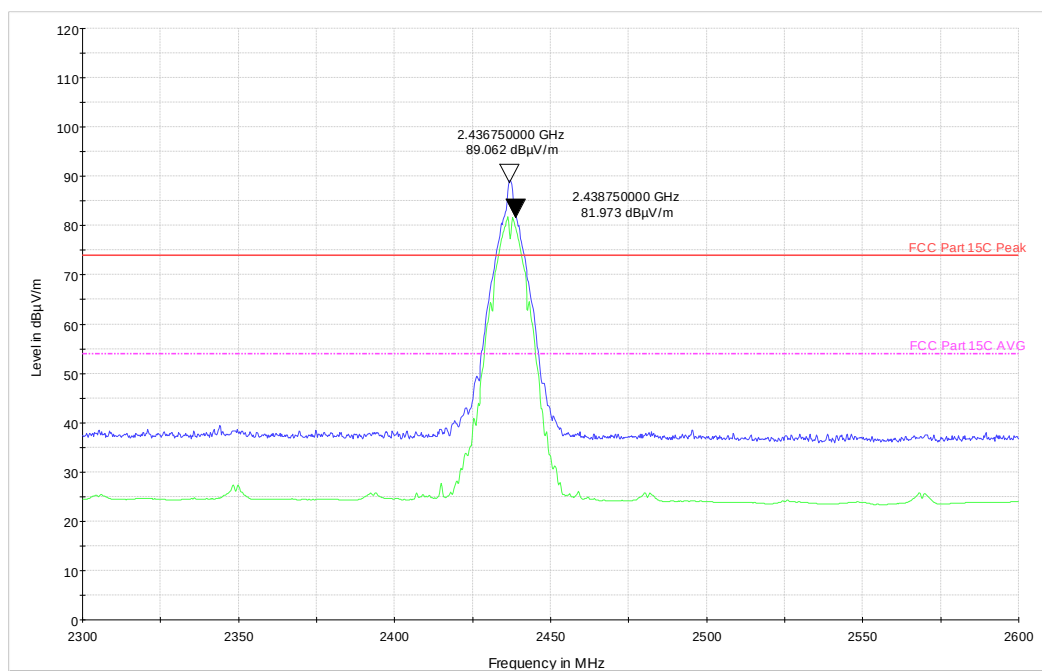
Frequency Range: Harmonics2

Polarization:Horizontal



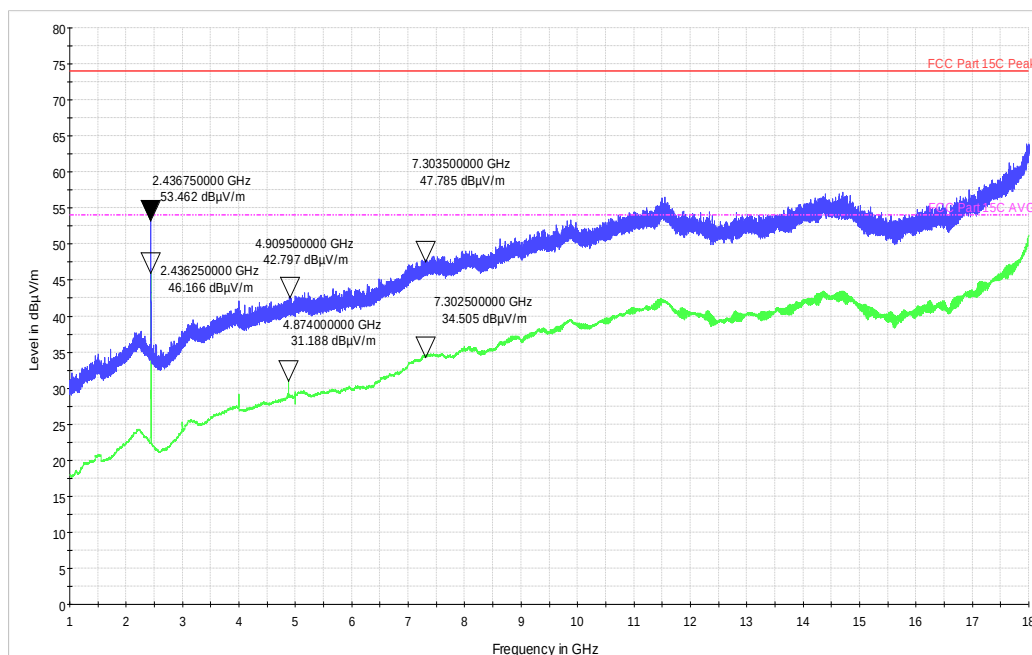
Channel Frequency: 2437MHz

Polarization:Vertical



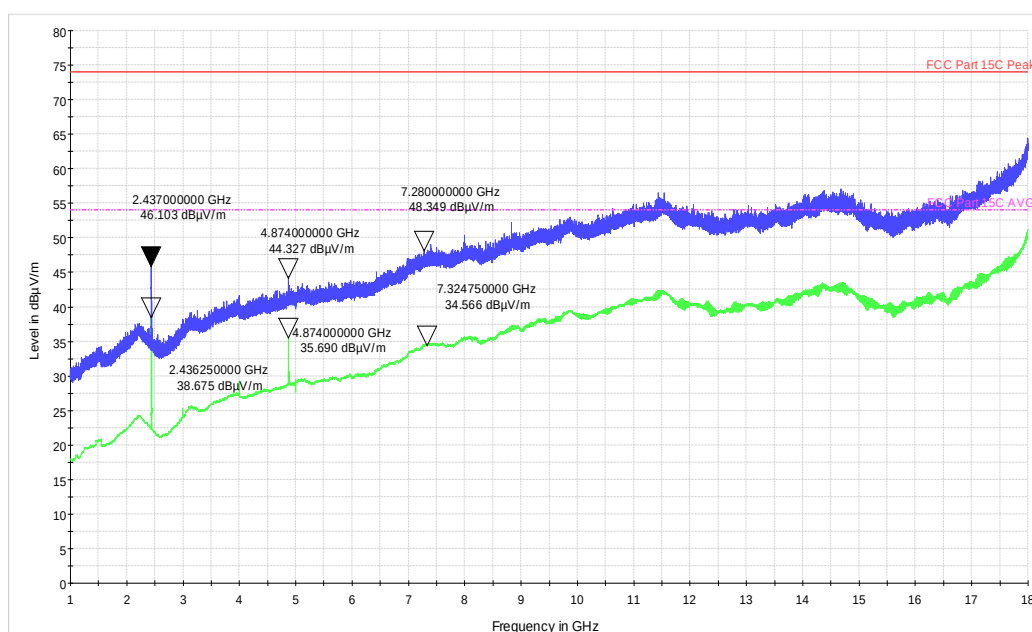
Channel Frequency: 2437MHz

Polarization:Horizontal



Frequency Range: 1-18GHz

Polarization:Vertical



Frequency Range: 1-18GHz

Polarization:Horizontal

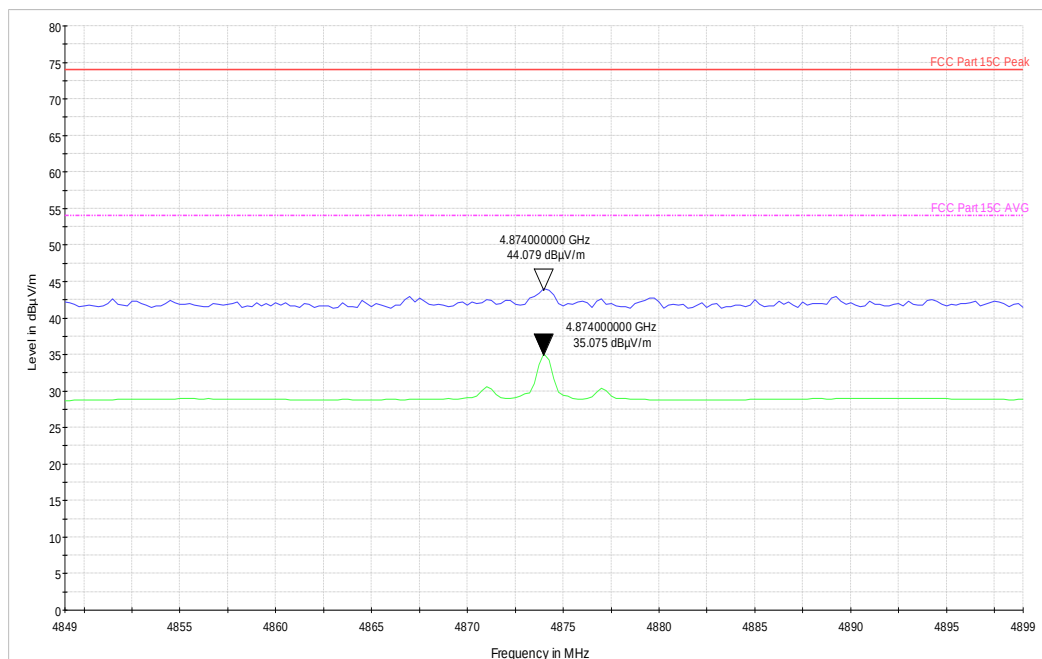
Prüfbericht - Nr.:

Test Report No.:

ULR-TC568820300000022F

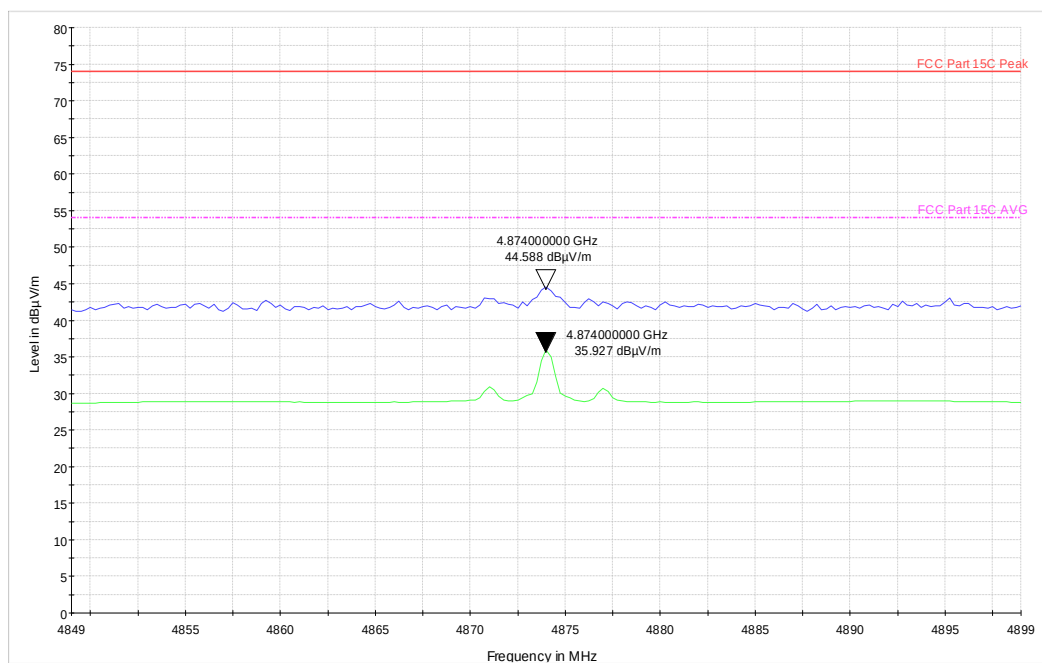
Seite 61 von 65

Page 61 of 65



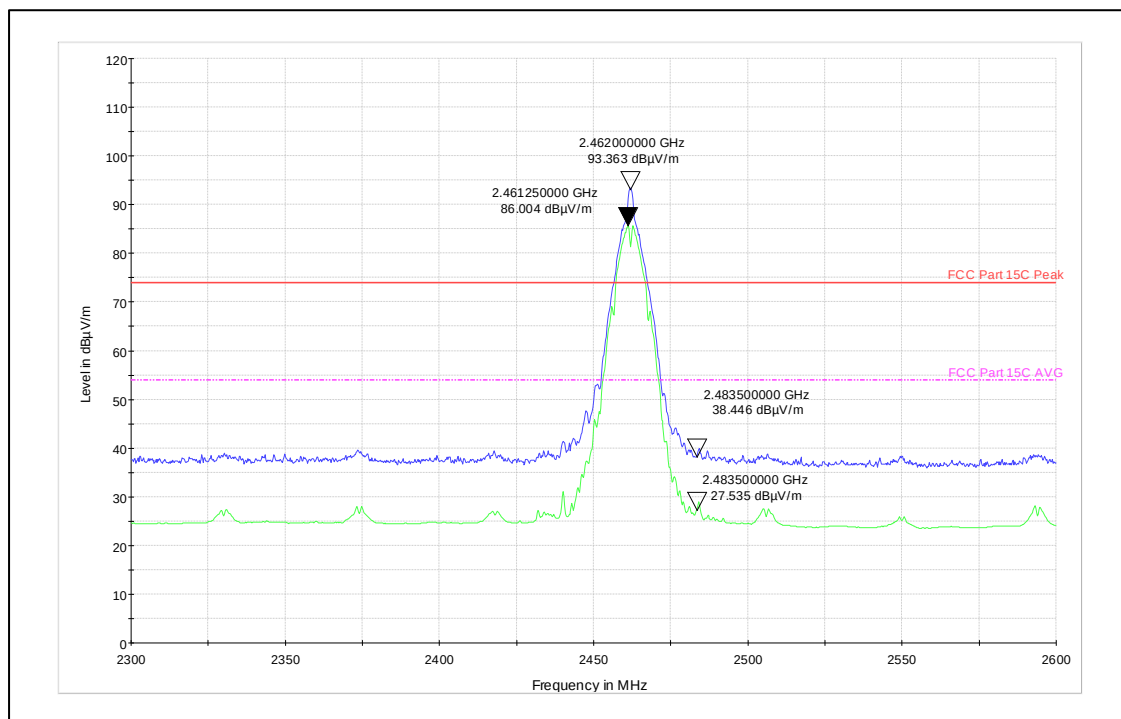
Frequency Range: Harmonics-2

Polarization: Vertical



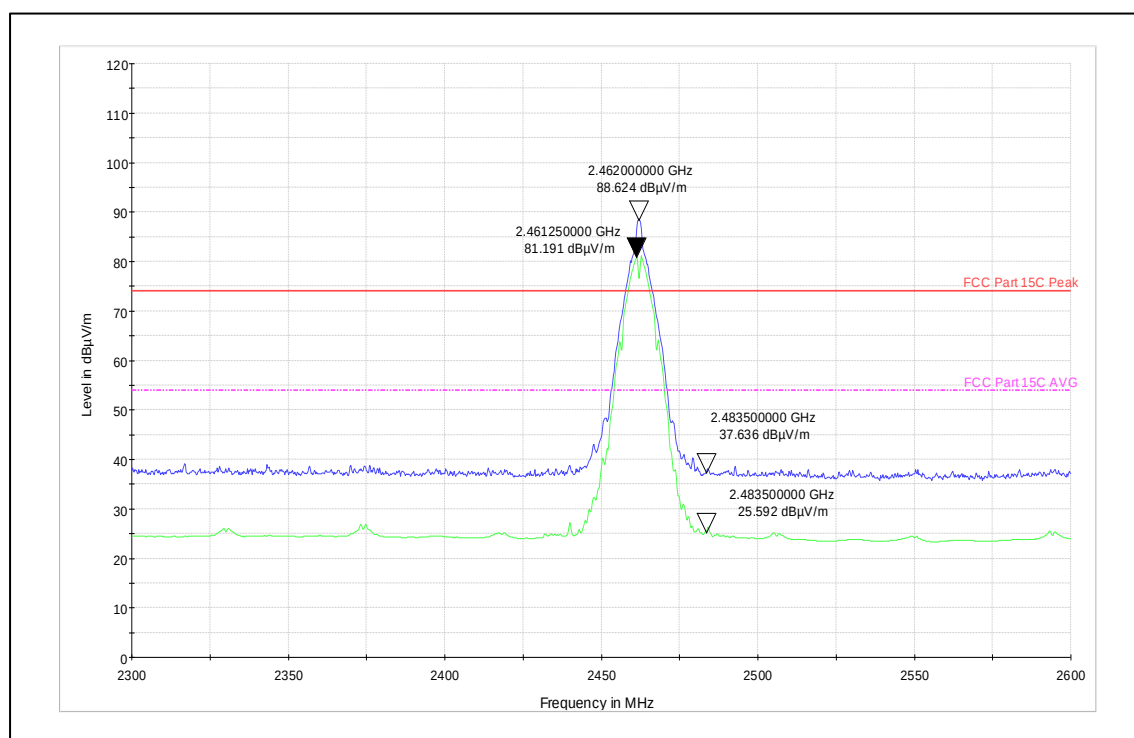
Frequency Range: Harmonics-2

Polarization: Horizontal



Channel Frequency: 2462MHz

Polarization:Vertical



Channel Frequency: 2462MHz

Polarization:Horizontal

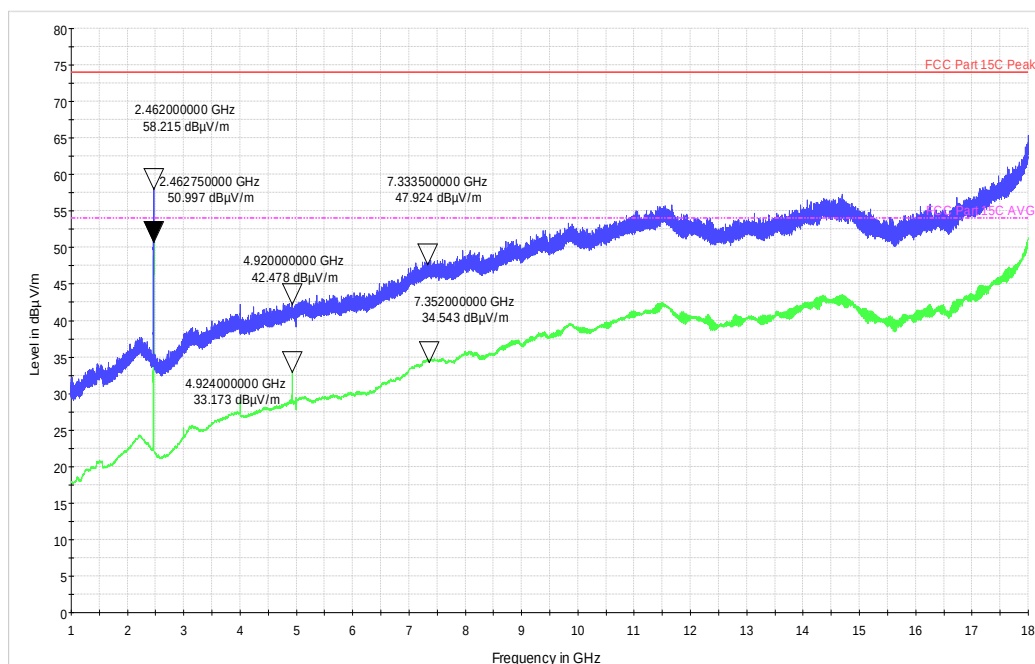
Prüfbericht - Nr.:

Test Report No.:

ULR-TC568820300000022F

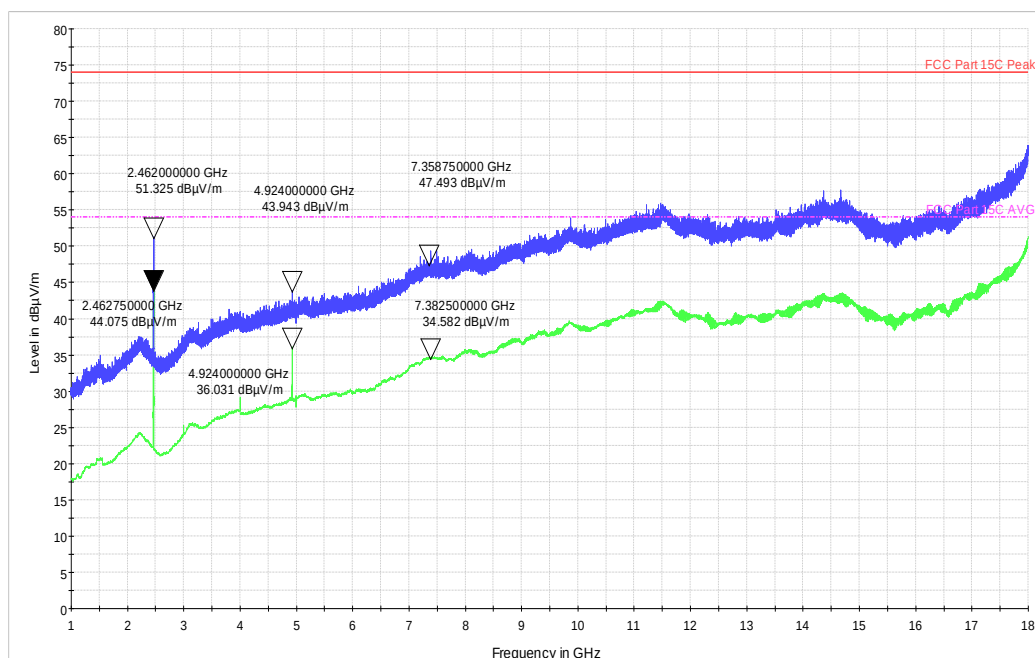
Seite 63 von 65

Page 63 of 65



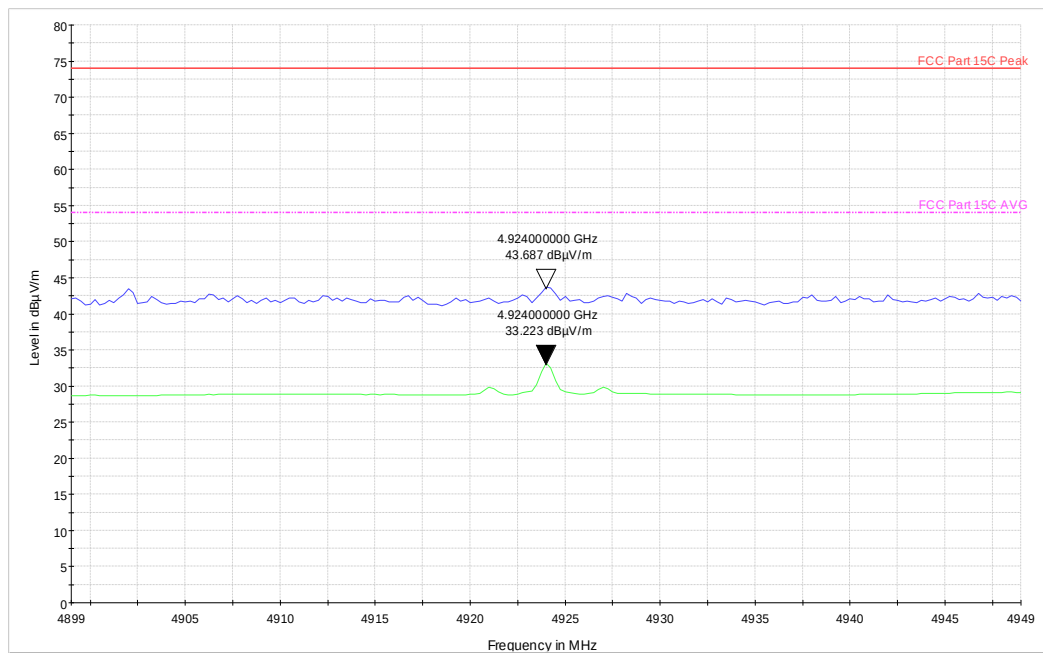
Frequency Range: 1-18GHz

Polarization:Vertical



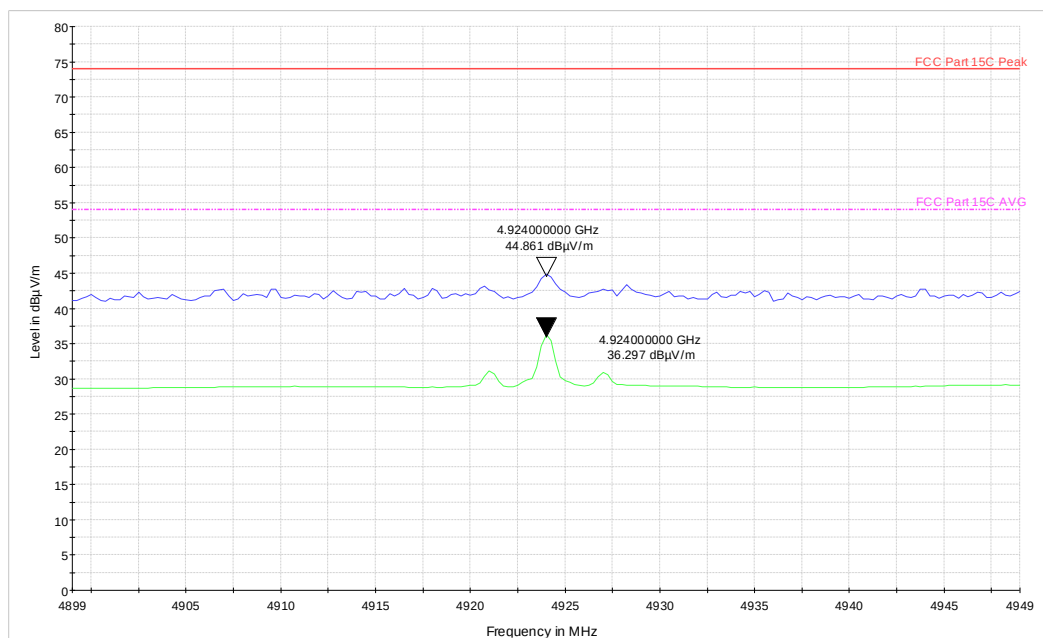
Frequency Range: 1-18GHz

Polarization:Horizontal



Frequency Range: Harmonics2

Polarization:Vertical



Frequency Range: Harmonics2

Polarization:Horizontal

Prüfbericht - Nr.:

Test Report No.:

ULR-TC568820300000022F

Seite 65 von 65

Page 65 of 65

7 LIST OF TABLES

Table 1: Test and measurements instrument used.....	5
Table 2: Instrument application Software versions	5
Table 3: Ratings and System Details	6
Table 4: Measurement Uncertainty	7
Table 5: List of Wi-Fi center Frequencies	8

8 LIST OF FIGURES

Figure 1: Frequency Range 9 kHz- 30 MHz	9
Figure 2: Frequency Range 30 MHz – 200 MHz	9
Figure 3: Frequency Range 200 MHz - 1GHz	10
Figure 4: Frequency Range 1GHz – 26GHz.....	10

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